

InterLab®

# EMC TEST REPORT on

Car Radio

MIB3 OI

**Report Reference:** MDE\_PREH\_1602\_EMCa

**Dated on:** 2018-03-15

**Test Laboratory:**

7layers GmbH  
Borsigstr. 11  
40880 Ratingen  
Germany



**Test Location:**

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**Note:**

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the testing laboratory.

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## 0. Testplan / Summary

Standard: EN 301 489-1

V2.1.1 (2017-02)

Chapter 8.3			
Conducted Interference Voltage, DC Input or Output		Basic Standard:	EN 55032 +C1
Testparameter:		0.15-30 MHz, Class B, AV/QP-Detector	
OP-Mode	Setup	Port	Final Result
BTTEST	setup_01	DC	passed
WLANCL5	setup_02	DC	passed

Chapter 9.2			
RF-Electromagnetic Field		Basic Standard:	EN 61000-4-3 +A1 +A2
Testparameter:		3 V/m, 1 kHz, 80% AM, 80-6000 MHz, log 1%	
OP-Mode	Setup	Port	Final Result
BTTEST	setup_01	Enclosure	passed
WLANCL24	setup_02	Enclosure	passed
WLANCL5	setup_02	Enclosure	passed
Testparameter:		6 V/m, 1 kHz, 80% AM, 80-6000 MHz, log 1%	
OP-Mode	Setup	Port	Final Result
BTSCAN	setup_01	Enclosure	passed
WLANRX24	setup_02	Enclosure	passed
WLANRX5	setup_02	Enclosure	passed
Testparameter:		6 V/m, 1 kHz, 80% AM, 80-6000 MHz, log 1% (for -19: additional spot frequencies)	
OP-Mode	Setup	Port	Final Result
GPSRX	setup_03	Enclosure	passed

Chapter 9.6			
Transients, Vehicular env.; Pulse 1		Basic Standard:	ISO 7637-2
Testparameter:		12V: Us= -112V; t1≥0.5s; Ri: 10 Ohm; n=10	
OP-Mode	Setup	Port	Final Result
BTSCAN	setup_01	DC	passed
BTTEST	setup_01	DC	passed
GPSRX	setup_03	DC	passed
WLANCL24	setup_02	DC	passed
WLANCL5	setup_02	DC	passed
WLANRX24	setup_02	DC	passed
WLANRX5	setup_02	DC	passed
Transients, Vehicular env.; Pulse 2a		Basic Standard:	ISO 7637-2
Testparameter:		12V: Us=+55V; t1=0.2..5s; n=10	
OP-Mode	Setup	Port	Final Result
BTSCAN	setup_01	DC	passed
BTTEST	setup_01	DC	passed
GPSRX	setup_03	DC	passed
WLANCL24	setup_02	DC	passed
WLANCL5	setup_02	DC	passed
WLANRX24	setup_02	DC	passed
WLANRX5	setup_02	DC	passed

<b>Transients, Vehicular env.; Pulse 2b</b>		<b>Basic Standard:</b>	<b>ISO 7637-2</b>	<b>2011</b>
<b>Testparameter:</b>	12V: Us=+10V; td=0.2..2s; n=10			
<b>OP-Mode</b>	<b>Setup</b>	<b>Port</b>	<b>Final Result</b>	
BTSCAN	setup_01	DC	passed	
BTTEST	setup_01	DC	passed	
GPSRX	setup_03	DC	passed	
WLANCL24	setup_02	DC	passed	
WLANCL5	setup_02	DC	passed	
WLANRX24	setup_02	DC	passed	
WLANRX5	setup_02	DC	passed	
<b>Transients, Vehicular env.; Pulse 3a</b>		<b>Basic Standard:</b>	<b>ISO 7637-2</b>	<b>2011</b>
<b>Testparameter:</b>	12V: Us=-165V; 20min.			
<b>OP-Mode</b>	<b>Setup</b>	<b>Port</b>	<b>Final Result</b>	
BTSCAN	setup_01	DC	passed	
BTTEST	setup_01	DC	passed	
GPSRX	setup_03	DC	passed	
WLANCL24	setup_02	DC	passed	
WLANCL5	setup_02	DC	passed	
WLANRX24	setup_02	DC	passed	
WLANRX5	setup_02	DC	passed	
<b>Transients, Vehicular env.; Pulse 3b</b>		<b>Basic Standard:</b>	<b>ISO 7637-2</b>	<b>2011</b>
<b>Testparameter:</b>	12V: Us=+112V; 20min.			
<b>OP-Mode</b>	<b>Setup</b>	<b>Port</b>	<b>Final Result</b>	
BTSCAN	setup_01	DC	passed	
BTTEST	setup_01	DC	passed	
GPSRX	setup_03	DC	passed	
WLANCL24	setup_02	DC	passed	
WLANCL5	setup_02	DC	passed	
WLANRX24	setup_02	DC	passed	
WLANRX5	setup_02	DC	passed	
<b>Transients, Vehicular env.; Pulse 4</b>		<b>Basic Standard:</b>	<b>ISO 7637-2 / 16750-2</b>	<b>2011 / 2012</b>
<b>Testparameter:</b>	12V: Us6=3V; Us=5V; tf=5ms; t6=15ms; tr=100ms; n=10			
<b>OP-Mode</b>	<b>Setup</b>	<b>Port</b>	<b>Final Result</b>	
BTSCAN	setup_01	DC	passed	
BTTEST	setup_01	DC	passed	
GPSRX	setup_03	DC	passed	
WLANCL24	setup_02	DC	passed	
WLANCL5	setup_02	DC	passed	
WLANRX24	setup_02	DC	passed	
WLANRX5	setup_02	DC	passed	

\* deviation from Standard: for details see chapter 3. Test details

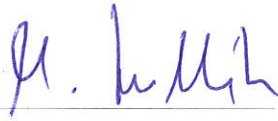
Part 1 of EN 301 489 together with the product related parts 17 (V3.1.1 2017-02) and 19 (V2.1.0 Draft 2017-03) specify the applicable EMC tests, the methods of measurement, the limits and the performance criteria. In case of differences between these parts, part 17 or 19 takes precedence.

The test plan matrix was proposed by the laboratory based on the available information to cover the relevant operating modes, applicable ports and EUT sides.

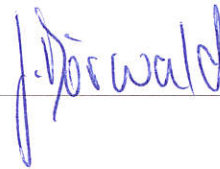
Not all supported operating modes were tested. The focus is on the representative operating modes to cover radio access technologies and frequency bands.

Tests have been carried out at cable lengths < 3 m. The cable length listed at the port description is the max. length that influences the test selection.

Responsible for  
Accreditation Scope:



Responsible  
for Test Report:



7 layers GmbH, Borsigstr. 11  
40880 Ratingen, Germany  
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## 1. Administrative Data

### 1.1 Testing Laboratory

Company Name: 7layers GmbH

Address: Borsigstr. 11  
40880 Ratingen  
Germany

Laboratory Accreditation No.: DAkkS D-PL-12140-01-00

Responsible for Accreditation Scope: Dipl.-Ing. Bernhard Retka      Dipl.-Ing. Thomas Hoell  
Dipl.-Ing. Robert Machulec      Dipl.-Ing. Andreas Petz  
Dipl.-Ing. Marco Kullik      Dipl.-Ing. Wolfgang Richter

Report Template Version: 2017-02-16

### 1.2 Project Data

Responsible for Test Report: B.Sc. Jens Dörwald

Date of Test(s): 2017-12-26 to 2018-02-07

Date of Report: 2018-03-15

No. of Pages in Annex: 4

### 1.3 Applicant Data

Company Name: Preh Car Connect GmbH

Address: Gewerbepark Merbitz 5  
01156 Dresden  
Germany

Contact Person: Mr. Christian Stopp

### 1.4 Manufacturer Data

Company Name: please see applicant data

Address:

Contact Person:

## 2. Test Object Data

### 2.1 General EUT Description

According to applicant's information:

The EUT is a navigation car radio. It has a build AM/FM and DAB tuner as well as a GPS receiver for navigation purposes and a Bluetooth and WLAN transceiver. This test report focuses on the BT, WLAN (2.4GHz, 5GHz) and GPS functionality of the EUT.

**Equipment under Test:** Car Radio  
**Type Designation:** MIB3 OI  
**Kind of Device:** 2.4 GHz Transceiver (WLAN & BT), 5 GHz WLAN, GPS  
**(optional)** Receiver  
**Voltage Type:** DC  
**Test Voltage level:** 12 V

☐ Grounding with Power Supply

☒ No Grounding

**Additional Grounding:**

☒ Conducting Surface

☒ Isolating Surface

☐ Mounting Position defined

☒ Mounting Position not defined

☐ Sensitive to Magnetic Fields

☒ Not Sensitive to Magnetic Fields

☐ Industrial Environment

☒ Household, light industrial Environment

☐ Fixed Use

☐ Portable Use

☒ Vehicular Use

Ports	Max. Cable Length (m)	Shielded	Process Guide
Digital I/O	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Analogue I/O	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DAB	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
AM/FM	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
USB	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GPS	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cable harness incl. DC	3	<input type="checkbox"/>	<input type="checkbox"/>
Enclosure	0	<input type="checkbox"/>	<input type="checkbox"/>

## 2.2 EUT: Type, S/N, Short Descriptions etc. used in this Test Report

Short Description	Equipment under Test	Type Designation	HW Status	SW Status	Serial No.
EUT A (Code: DE1288000 ad01)	Car Radio	MIB3 OI	X07	R055	YD5-00103.07.1700170153
EUT B (Code: DE1288000 ah01)	Car Radio	MIB3 OI	X07	R055	YD5-00130.06.1700170432
EUT C (Code: DE1288000 ai01)	Car Radio	MIB3 OI	X07	R055	YD5-00130.06.1700170128

## 2.3 Auxiliary Equipment

Short Description	Auxiliary Equipment	Type Designation	HW Status	SW Status	Serial No.
AUX 1	RE Laptop Fujitsu	Fujitsu Lifebook Eseries E781	2012-03	Win7 Prof. Engl.	DSCK013817
AUX 2	Power Supply of AUX 1	Fujitsu Ltd. PJW1942NA	-	-	13300281B
AUX 3	Display	5G6919606	-	-	VDD-02410.09.1793926332
AUX 4	LINKSYS WRT 1900 ACS	WLAN Access Point	-	-	18E1060C507110
AUX 5	GSM/GNSS Antenna	External Combi-Antenna cellular & GNS "shark finn"	-	-	-
AUX 6	Life Box	-	-	-	-

## 2.4 EUT Setups

Setup No.	Combination of EUTs	Remarks
setup_01	EUT A + AUX 3 + AUX 5 + AUX 6	representative setup for testing BT.
setup_02	EUT B + AUX 1 + AUX 2 + AUX 4 + AUX 5 + AUX 6	representative setup for testing WLAN.
setup_03	EUT C + AUX 1 + AUX 2 + AUX 3 + AUX 6	representative setup for testing GPS.

## 2.5 Operating Modes

Op. Mode	Description of Operating Modes	Remarks
BTSCAN	Bluetooth scan mode	The EUT is in Bluetooth inquiry and/or page scan mode (receive mode).
BTTEST	Bluetooth test mode	The EUT is connected to the signalling unit in loop back mode on a single frequency (2441 MHz) and the BER and/or the PER is monitored.
GPSRX	GPS reception	The EUT receives a simulated GPS signal (L1 band, 4 satellites simulated, location: static, satellite positions and time: dynamic).
WLANCL24	WLAN client mode 2.4 GHz	The EUT is in WLAN client mode connected to an access point on frequency 2442 MHz (CH:7).
WLANCL5	WLAN client mode 5 GHz	The EUT is in WLAN client mode connected to an access point on frequency 5785 MHz (CH:157).
WLANRX24	WLAN local RX mode 2.4 GHz	The EUT is in WLAN local RX mode on frequency 2442 MHz (CH:7).
WLANRX5	WLAN local RX mode 5 GHz	The EUT is in WLAN local RX mode on frequency 5785 MHz (CH:157).

## 2.6 Performance Criteria

Short Description	Performance Criteria	Remarks
CR	<p>Performance criteria for continuous phenomena applied to receivers</p> <p>In general: (EN 301 489-1)</p> <ul style="list-style-type: none"> <li>- a communication link shall be maintained during and after the test,</li> <li>- no loss of user control functions or stored data.</li> </ul> <p>Bluetooth, WLAN: (EN 301 489-17)</p> <ul style="list-style-type: none"> <li>- The performance criterion A shall apply.</li> <li>- Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.</li> </ul> <p>GNSS (GPS, GLONASS, Galileo): (EN301 489-19)</p> <ul style="list-style-type: none"> <li>- the maintenance of the EUT memory assessed at the conclusion of the test</li> <li>- the ability to receive and store messages at the conclusion of the test</li> <li>- during the test no false calls shall occur</li> <li>- at the conclusion of the test comprising the series of individual exposures the EUT shall operate as intended with no loss of functions or stored data (messages), as declared by the manufacturer.</li> </ul>	<p>In general: (EN 301 489-1)</p> <p>Transients and surges in the vehicular environment: For receivers, pulse 3a and 3b the performance criteria for continuous phenomena for receivers shall apply.</p> <p>GNSS (GPS, GLONASS, Galileo): (EN 301 489-19)</p> <p>The correct position shall be displayed and the simulated time shall be updated continuously and correctly.</p>
Criterion A	<p>for immunity tests with phenomena of a continuous nature</p> <p>Bluetooth, WLAN: (EN 301 489-17)</p> <p>During test:</p> <ul style="list-style-type: none"> <li>- Shall operate as intended.</li> <li>- May show degradation of performance (specified by manufacturer).</li> <li>- Shall be no loss of function.</li> <li>- Shall be no unintentional transmissions.</li> </ul> <p>After test:</p> <ul style="list-style-type: none"> <li>- Shall operate as intended.</li> <li>- Shall be no degradation of performance (specified by manufacturer).</li> <li>- Shall be no loss of function.</li> <li>- Shall be no loss of stored data or user programmable functions.</li> </ul>	<ul style="list-style-type: none"> <li>- Bluetooth test mode (BTTEST): Bit Error Rate (BER) &lt; 0.1 %, Packet Error Rate (PER) &lt; 1 %.</li> <li>- Bluetooth scan mode (BTSCAN): No unintentional transmission.</li> <li>- WLAN TX Mode (WLANTX): WLAN ping shell not be interrupted.</li> </ul>
Criterion B	<p>for immunity tests with phenomena of a transient nature</p> <p>Bluetooth, WLAN: (EN 301 489-17)</p> <p>During test:</p> <ul style="list-style-type: none"> <li>- May show loss of function (one or more).</li> <li>- May show degradation of performance (specified by manufacturer).</li> <li>- No unintentional transmissions.</li> </ul> <p>After test:</p> <ul style="list-style-type: none"> <li>- Functions shall be self-recoverable.</li> <li>- Shall operate as intended after recovering.</li> <li>- Shall be no degradation of performance (specified by manufacturer).</li> <li>- Shall be no loss of stored data or user programmable functions.</li> </ul>	<ul style="list-style-type: none"> <li>- Bluetooth test mode (BTTEST): Bit Error Rate (BER) &lt; 0.3 %, Packet Error Rate (PER) &lt; 3 %.</li> <li>- In the Bluetooth Test Mode, a device may not automatically re-establish the link if it was lost. In this case a manual intervention becomes necessary to activate the test mode and set-up the link again.</li> <li>- Bluetooth scan mode (BTSCAN): No unintentional transmission.</li> <li>- WLAN TX Mode (WLANTX): WLAN ping shell not be interrupted.</li> </ul>

Criterion C	<p>for immunity tests with power interruptions exceeding a certain time</p> <p>Bluetooth, WLAN: (EN 301 489-17)</p> <p>During test:</p> <ul style="list-style-type: none"> <li>- May be loss of function (one or more).</li> </ul> <p>After test:</p> <ul style="list-style-type: none"> <li>- Functions shall be recoverable by the operator.</li> <li>- Shall operate as intended after recovering.</li> <li>- Shall be no degradation of performance (specified by manufacturer).</li> </ul>	N/A for this EUT / for the performed tests.
CT	<p>Performance criteria for continuous phenomena applied to transmitters</p> <p>In general: (EN 301 489-1)</p> <ul style="list-style-type: none"> <li>- a communication link shall be maintained during and after the test,</li> <li>- no loss of user control functions or stored data,</li> <li>- unintentional transmission must not occur in Idle mode.</li> </ul> <p>Bluetooth, WLAN: (EN 301 489-17)</p> <ul style="list-style-type: none"> <li>- The performance criterion A shall apply.</li> <li>- Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.</li> </ul>	<p>In general: (EN 301 489-1)</p> <p>Transients and surges in the vehicular environment: For transmitters, pulse 3a and 3b the performance criteria for continuous phenomena for transmitters shall apply.</p>
TR	<p>Performance criteria for transient phenomena applied to receivers</p> <p>Bluetooth, WLAN: (EN 301 489-17)</p> <ul style="list-style-type: none"> <li>- The performance criterion B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 s duration for which performance criteria C shall apply.</li> </ul> <p>GNSS (GPS, GLONASS, Galileo): (EN 301 489-19)</p> <ul style="list-style-type: none"> <li>- the storage of messages in the memory of the EUT at the start of the test.</li> <li>- unintentional responses of the EUT during the test</li> <li>- the maintenance of the EUT memory assessed at the conclusion of the test</li> <li>- the ability to receive and store messages at the conclusion of the test</li> <li>- during the test no false calls shall occur</li> <li>- at the conclusion of the test comprising the series of individual exposures the EUT shall operate as intended with no loss of functions or stored data (messages), as declared by the manufacturer.</li> </ul>	<p>In general: (EN 301 489-1)</p> <ul style="list-style-type: none"> <li>- Transients and surges in the vehicular environment: For pulses 1, 2a, 2b, and 4 a communication link need not to be maintained during the EMC exposure and may have to be re-established after the test.</li> </ul> <p>GNSS (GPS, GLONASS, Galileo): (EN 301 489-19)</p> <p>The correct position shall be displayed and the simulated time shall be updated correctly.</p>
TT	<p>Performance criteria for transient phenomena applied to transmitters</p> <p>Bluetooth, WLAN: (EN 301 489-17)</p> <ul style="list-style-type: none"> <li>- The performance criterion B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 s duration, for which performance criteria C shall apply.</li> <li>- Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.</li> </ul>	<p>In general: (EN 301 489-1)</p> <ul style="list-style-type: none"> <li>- Transients and surges in the vehicular environment: For pulses 1, 2a, 2b, and 4 a communication link need not to be maintained during the EMC exposure and may have to be re-established after the test.</li> </ul>

### 3. Test Details

#### 3.1 Conducted Interference Voltage, DC Input or Output

**Standard:** EN 301 489-1 V2.1.1 (2017-02) **Basic Standard:** EN 55032 +C1 2015/2016

##### 3.1.1 Test Description

The test set-up was realised according to the used basic standard.  
The test was performed according to the used basic standard.  
For test setup please see chap. Photo Report.

##### 3.1.2 Test Protocol

Temperature: 23 °C Test Setup: Grounding: Signalling device: ☒ Airlink  
Air Pressure: 1015 hPa ☒ Table Top ☐ With Power Supply CMU200 ☐ Cable Connection  
Humidity: 32 % ☐ Floorstanding ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter		
BTTEST	setup_01	DC	0.15-30 MHz, Class B, AV/QP-Detector		
Diagram	Detector	Powerline	Add. Scan Information	Remarks	Result
1.03	QP; AV	- -> GND	prescan: fast PK/AV; final scan: QP/AV detector	please see diagram	passed
1.04	QP; AV	+ -> GND	prescan: fast PK/AV; final scan: QP/AV detector	please see diagram	passed

Remark: 12 V

Temperature: 23 °C Test Setup: Grounding: Signalling device: ☒ Airlink  
Air Pressure: 1015 hPa ☒ Table Top ☐ With Power Supply AUX 4 ☐ Cable Connection  
Humidity: 32 % ☐ Floorstanding ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter		
WLANCL5	setup_02	DC	0.15-30 MHz, Class B, AV/QP-Detector		
Diagram	Detector	Powerline	Add. Scan Information	Remarks	Result
1.01	QP; AV	+ -> GND	prescan: fast PK/AV; final scan: QP/AV detector	please see diagram	passed
1.02	QP; AV	- -> GND	prescan: fast PK/AV; final scan: QP/AV detector	please see diagram	passed

Remark: 12 V

##### 3.1.3 Test result: Conducted Interference Voltage, DC Input or Output

EN 301 489-1		Op. Mode	Setup	Port	Result
		BTTEST	setup_01	DC	passed
		WLANCL5	setup_02	DC	passed

## 3.2 RF-Electromagnetic Field

Standard: EN 301 489-1

V2.1.1 (2017-02)

Basic Standard: EN 61000-4-3 +A1  
+A2

2006/2008  
/2010 \*

### 3.2.1 Test Description

The test set-up was realised according to the used basic standard.  
The test was performed according to the used basic standard.  
For test setup please see chap. Photo Report.

### 3.2.2 Test Protocol

Temperature: 22 °C      Test Setup:      Grounding:      Signalling device: ☐ Airlink  
Air Pressure: 995 hPa      ☒ Table Top      ☐ With Power Supply      -      ☐ Cable Connection  
Humidity: 37 %      ☐ Floorstanding      ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
BTSCAN	setup_01	Enclosure	6 V/m, 1 kHz, 80% AM, 80-6000 MHz, log 1%

Diagram No.	Radiation to	EUT Pos.	Antenna Pol.	Reaction of EUT	Remarks	Result
-	bottom side	vertical	horizontal	no reaction recognized	none	Criterion A
-	left side	horizontal	vertical	no reaction recognized	none	Criterion A
-	rear side	horizontal	horizontal	no reaction recognized	none	Criterion A

Remark: Three sides of the setup were tested using double the fieldstrength. The dwell time at each frequency was set to 1s.

Temperature: 22 °C      Test Setup:      Grounding:      Signalling device: ☒ Airlink  
Air Pressure: 995 hPa      ☒ Table Top      ☐ With Power Supply      CBT      ☐ Cable Connection  
Humidity: 37 %      ☐ Floorstanding      ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
BTTEST	setup_01	Enclosure	3 V/m, 1 kHz, 80% AM, 80-6000 MHz, log 1%

Diagram No.	Radiation to	EUT Pos.	Antenna Pol.	Reaction of EUT	Remarks	Result
-	top side	vertical	horizontal	no reaction recognized	none	Criterion A
-	bottom side	vertical	vertical	no reaction recognized	none	Criterion A
-	right side	horizontal	vertical	no reaction recognized	none	Criterion A
-	rear side	horizontal	vertical	no reaction recognized	none	Criterion A
-	left side	horizontal	horizontal	no reaction recognized	none	Criterion A
-	front side	horizontal	horizontal	no reaction recognized	none	Criterion A

Remark: Six sides of the setup were tested. The dwell time at each frequency was set to 1s.

Temperature: 22 °C      Test Setup:      Grounding:      Signalling device: ☒ Airlink  
Air Pressure: 1009 hPa      ☒ Table Top      ☐ With Power Supply      SMBV100A      ☐ Cable Connection  
Humidity: 30 %      ☐ Floorstanding      ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
GPSRX	setup_03	Enclosure	6 V/m, 1 kHz, 80% AM, 80-6000 MHz, log 1% (for -19: additional spot frequencies)

Diagram No.	Radiation to	EUT Pos.	Antenna Pol.	Reaction of EUT	Remarks	Result
-	bottom side	vertical	horizontal	no reaction recognized	none	CT / CR
-	top side	vertical	vertical	no reaction recognized	none	CT / CR
-	right side	horizontal	horizontal	no reaction recognized	none	CT / CR
-	rear side	horizontal	horizontal	no reaction recognized	none	CT / CR
-	left side	horizontal	vertical	no reaction recognized	none	CT / CR
-	front side	horizontal	vertical	no reaction recognized	none	CT / CR

Remark: Six sides of the setup were tested using double the fieldstrength. The dwell time at each frequency was set to 1s.

Temperature: 22 °C Test Setup: ☒ Table Top ☐ With Power Supply Signalling device: ☒ Airlink  
 Air Pressure: 1000 hPa ☐ Floorstanding ☒ None AUX 4 ☐ Cable Connection  
 Humidity: 36 % ☐

Op. Mode	Setup	Port	Test Parameter			
WLANCL24	setup_02	Enclosure	3 V/m, 1 kHz, 80% AM, 80-6000 MHz, log 1%			
Diagram No.	Radiation to	EUT Pos.	Antenna Pol.	Reaction of EUT	Remarks	Result
-	bottom side	vertical	horizontal	no reaction recognized	none	Criterion A
-	left side	horizontal	vertical	no reaction recognized	none	Criterion A
-	front side	horizontal	vertical	no reaction recognized	none	Criterion A

Remark: Three sides of the setup were tested. The dwell time at each frequency was set to 1s.

Temperature: 22 °C Test Setup: ☒ Table Top ☐ With Power Supply Signalling device: ☒ Airlink  
 Air Pressure: 1000 hPa ☐ Floorstanding ☒ None AUX 4 ☐ Cable Connection  
 Humidity: 36 % ☐

Op. Mode	Setup	Port	Test Parameter			
WLANCL5	setup_02	Enclosure	3 V/m, 1 kHz, 80% AM, 80-6000 MHz, log 1%			
Diagram No.	Radiation to	EUT Pos.	Antenna Pol.	Reaction of EUT	Remarks	Result
-	top side	vertical	vertical	no reaction recognized	none	Criterion A
-	rear side	horizontal	horizontal	no reaction recognized	none	Criterion A
-	right side	horizontal	horizontal	no reaction recognized	none	Criterion A

Remark: Three sides of the setup were tested. The dwell time at each frequency was set to 1s.

Temperature: 22 °C Test Setup: ☒ Table Top ☐ With Power Supply Signalling device: ☐ Airlink  
 Air Pressure: 1000 hPa ☐ Floorstanding ☒ None - ☐ Cable Connection  
 Humidity: 36 % ☐

Op. Mode	Setup	Port	Test Parameter			
WLANRX24	setup_02	Enclosure	6 V/m, 1 kHz, 80% AM, 80-6000 MHz, log 1%			
Diagram No.	Radiation to	EUT Pos.	Antenna Pol.	Reaction of EUT	Remarks	Result
-	top side	vertical	horizontal	no reaction recognized	none	Criterion A
-	right side	horizontal	vertical	no reaction recognized	none	Criterion A
-	rear side	horizontal	vertical	no reaction recognized	none	Criterion A

Remark: Three sides of the setup were tested using double the fieldstrength. The dwell time at each frequency was set to 1s.

Temperature: 22 °C Test Setup: ☒ Table Top ☐ With Power Supply Signalling device: ☐ Airlink  
 Air Pressure: 1000 hPa ☐ Floorstanding ☒ None - ☐ Cable Connection  
 Humidity: 36 % ☐

Op. Mode	Setup	Port	Test Parameter			
WLANRX5	setup_02	Enclosure	6 V/m, 1 kHz, 80% AM, 80-6000 MHz, log 1%			
Diagram No.	Radiation to	EUT Pos.	Antenna Pol.	Reaction of EUT	Remarks	Result
-	bottom side	vertical	vertical	no reaction recognized	none	Criterion A
-	left side	horizontal	horizontal	no reaction recognized	none	Criterion A
-	front side	horizontal	horizontal	no reaction recognized	none	Criterion A



Remark: Three sides of the setup were tested using double the fieldstrength. The dwell time at each frequency was set to 1s.

### 3.2.3 Test result: RF-Electromagnetic Field

EN 301 489-1	Op. Mode	Setup	Port	Result
	BTSCAN	setup_01	Enclosure	<b>passed</b>
	BTTEST	setup_01	Enclosure	<b>passed</b>
	GPSRX	setup_03	Enclosure	<b>passed</b>
	WLANCL24	setup_02	Enclosure	<b>passed</b>
	WLANCL5	setup_02	Enclosure	<b>passed</b>
	WLANRX24	setup_02	Enclosure	<b>passed</b>
	WLANRX5	setup_02	Enclosure	<b>passed</b>

### 3.3 Transients, Vehicular env.; Pulse 1

Standard: EN 301 489-1

V2.1.1 (2017-02)

Basic Standard: ISO 7637-2

2011

#### 3.3.1 Test Description

The test set-up was realised according to the used basic standard.  
The test was performed according to the used basic standard.

#### 3.3.2 Test Protocol

Temperature: 23 °C      Test Setup:      Grounding:      Signalling device: ☐ Airlink  
Air Pressure: 1006 hPa      ☐ Table Top      ☐ With Power Supply      -      ☐ Cable Connection  
Humidity: 35 %      ☐ Floorstanding      ☒ None      ☐

Op. Mode	Setup	Port	Test Parameter				
BTSCAN	setup_01	DC	12V: Us= -112V; t1≥0.5s; Ri: 10 Ohm; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
1	-112 V	10 Ohm	0.5s	10	loss of communication link, display switches off	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C      Test Setup:      Grounding:      Signalling device: ☒ Airlink  
Air Pressure: 1006 hPa      ☐ Table Top      ☐ With Power Supply      CBT      ☐ Cable Connection  
Humidity: 35 %      ☐ Floorstanding      ☒ None      ☐

Op. Mode	Setup	Port	Test Parameter				
BTTEST	setup_01	DC	12V: Us= -112V; t1≥0.5s; Ri: 10 Ohm; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
1	-112 V	10 Ohm	0.5s	10	loss of communication link, display switches off	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C      Test Setup:      Grounding:      Signalling device: ☒ Airlink  
Air Pressure: 1007 hPa      ☐ Table Top      ☐ With Power Supply      SMBV100A      ☐ Cable Connection  
Humidity: 29 %      ☐ Floorstanding      ☒ None      ☐

Op. Mode	Setup	Port	Test Parameter				
GPSRX	setup_03	DC	12V: Us= -112V; t1≥0.5s; Ri: 10 Ohm; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
1	-112 V	10 Ohm	0.5s	10	loss of communication link, display switches off	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	TT / TR

Remark: none

Temperature: 23 °C      Test Setup:      Grounding:      Signalling device: ☒ Airlink  
Air Pressure: 1006 hPa      ☐ Table Top      ☐ With Power Supply      AUX 4      ☐ Cable Connection  
Humidity: 35 %      ☐ Floorstanding      ☒ None      ☐

Op. Mode	Setup	Port	Test Parameter				
WLANCL24	setup_02	DC	12V: Us= -112V; t1≥0.5s; Ri: 10 Ohm; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
1	-112 V	10 Ohm	0.5s	10	loss of communication link	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    AUX 4    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter				
WLANCL5	setup_02	DC	12V: Us= -112V; t1≥0.5s; Ri: 10 Ohm; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
1	-112 V	10 Ohm	0.5s	10	loss of communication link	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
 Humidity: 37 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter				
WLANRX24	setup_02	DC	12V: Us= -112V; t1≥0.5s; Ri: 10 Ohm; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
1	-112 V	10 Ohm	0.5s	10	loss of communication link	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1006 hPa    ☒ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
 Humidity: 37 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter				
WLANRX5	setup_02	DC	12V: Us= -112V; t1≥0.5s; Ri: 10 Ohm; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
1	-112 V	10 Ohm	0.5s	10	loss of communication link	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

### 3.3.3 Test result: Transients, Vehicular env.; Pulse 1

EN 301 489-1		Op. Mode	Setup	Port	Result
		BTSCAN	setup_01	DC	passed
		BTTEST	setup_01	DC	passed
		GPSRX	setup_03	DC	passed
		WLANCL24	setup_02	DC	passed
		WLANCL5	setup_02	DC	passed
		WLANRX24	setup_02	DC	passed
		WLANRX5	setup_02	DC	passed

### 3.4 Transients, Vehicular env.; Pulse 2a

Standard: EN 301 489-1

V2.1.1 (2017-02)

Basic Standard: ISO 7637-2

2011

#### 3.4.1 Test Description

The test set-up was realised according to the used basic standard.  
The test was performed according to the used basic standard.

#### 3.4.2 Test Protocol

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter				
BTSCAN	setup_01	DC	12V: Us=+55V; t1=0.2..5s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2a	+55 V	2 Ohm	0.2s	10	no reaction recognized	12 V	Criterion A

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    CBT    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter				
BTTEST	setup_01	DC	12V: Us=+55V; t1=0.2..5s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2a	+55 V	2 Ohm	0.2s	10	no reaction recognized	12 V	Criterion A

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1007 hPa    ☐ Table Top    ☐ With Power Supply    SMBV100A    ☐ Cable Connection  
Humidity: 29 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter				
GPSRX	setup_03	DC	12V: Us=+55V; t1=0.2..5s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2a	+55 V	2 Ohm	0.2s	10	no reaction recognized	12 V	TT / TR

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    AUX 4    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter				
WLANCL24	setup_02	DC	12V: Us=+55V; t1=0.2..5s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2a	+55 V	2 Ohm	0.2s	10	no reaction recognized	12 V	Criterion A

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    AUX 4    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
WLANCL5	setup_02	DC	12V: Us=+55V; t1=0.2..5s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2a	+55 V	2 Ohm	0.2s	10	no reaction recognized	12 V	Criterion A

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
WLANRX24	setup_02	DC	12V: Us=+55V; t1=0.2..5s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2a	+55 V	2 Ohm	0.2s	10	no reaction recognized	12 V	Criterion A

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
WLANRX5	setup_02	DC	12V: Us=+55V; t1=0.2..5s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2a	+55 V	2 Ohm	0.2s	10	no reaction recognized	12 V	Criterion A

Remark: none

### 3.4.3 Test result: Transients, Vehicular env.; Pulse 2a

EN 301 489-1				Op. Mode	Setup	Port	Result
				BTSCAN	setup_01	DC	passed
				BTTEST	setup_01	DC	passed
				GPSRX	setup_03	DC	passed
				WLANCL24	setup_02	DC	passed
				WLANCL5	setup_02	DC	passed
				WLANRX24	setup_02	DC	passed
				WLANRX5	setup_02	DC	passed

### 3.5 Transients, Vehicular env.; Pulse 2b

Standard: EN 301 489-1

V2.1.1 (2017-02)

Basic Standard: ISO 7637-2

2011

#### 3.5.1 Test Description

The test set-up was realised according to the used basic standard.  
The test was performed according to the used basic standard.

#### 3.5.2 Test Protocol

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
BTSCAN	setup_01	DC	12V: Us=+10V; td=0.2..2s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2b	+10 V	0.05 Ohm	2s	10	loss of communication link, display switches off	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    CBT    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
BTTEST	setup_01	DC	12V: Us=+10V; td=0.2..2s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2b	+10 V	0.05 Ohm	2s	10	loss of communication link, display switches off	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1007 hPa    ☐ Table Top    ☐ With Power Supply    SMBV100A    ☐ Cable Connection  
Humidity: 29 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
GPSRX	setup_03	DC	12V: Us=+10V; td=0.2..2s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2b	+10 V	0.05 Ohm	2s	10	loss of communication link, display switches off	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	TT / TR

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    AUX 4    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
WLANCL24	setup_02	DC	12V: Us=+10V; td=0.2..2s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2b	+10 V	0.05 Ohm	2s	10	loss of communication link	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    AUX 4    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
WLANCL5	setup_02	DC	12V: Us=+10V; td=0.2..2s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2b	+10 V	0.05 Ohm	2s	10	loss of communication link	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
WLANRX24	setup_02	DC	12V: Us=+10V; td=0.2..2s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2b	+10 V	0.05 Ohm	2s	10	loss of communication link	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
WLANRX5	setup_02	DC	12V: Us=+10V; td=0.2..2s; n=10				
Pulse	Test Voltage	Gen.Input Res.	t1	No. of Pulses	Reaction of EUT	Remarks	Result
2b	+10 V	0.05 Ohm	2s	10	loss of communication link	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

### 3.5.3 Test result: Transients, Vehicular env.; Pulse 2b

EN 301 489-1	Op. Mode	Setup	Port	Result
	BTSCAN	setup_01	DC	passed
	BTTEST	setup_01	DC	passed
	GPSRX	setup_03	DC	passed
	WLANCL24	setup_02	DC	passed
	WLANCL5	setup_02	DC	passed
	WLANRX24	setup_02	DC	passed
	WLANRX5	setup_02	DC	passed

### 3.6 Transients, Vehicular env.; Pulse 3a

Standard: EN 301 489-1

V2.1.1 (2017-02)

Basic Standard: ISO 7637-2

2011

#### 3.6.1 Test Description

The test set-up was realised according to the used basic standard.  
The test was performed according to the used basic standard.

#### 3.6.2 Test Protocol

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter		
BTSCAN	setup_01	DC	12V: Us=-165V; 20min.		
Pulse	Test Voltage	Test Time	Reaction of EUT	Remarks	Result
3a	-165 V	20 min.	no reaction recognized	none	Criterion A

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    CBT    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter		
BTTEST	setup_01	DC	12V: Us=-165V; 20min.		
Pulse	Test Voltage	Test Time	Reaction of EUT	Remarks	Result
3a	-165 V	20 min.	no reaction recognized	none	Criterion A

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1007 hPa    ☐ Table Top    ☐ With Power Supply    SMBV100A    ☐ Cable Connection  
Humidity: 29 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter		
GPSRX	setup_03	DC	12V: Us=-165V; 20min.		
Pulse	Test Voltage	Test Time	Reaction of EUT	Remarks	Result
3a	-165 V	20 min.	no reaction recognized	none	TT / TR

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    AUX 4    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter		
WLANCL24	setup_02	DC	12V: Us=-165V; 20min.		
Pulse	Test Voltage	Test Time	Reaction of EUT	Remarks	Result
3a	-165 V	20 min.	no reaction recognized	none	Criterion A

Remark: none



Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
 Air Pressure: 1006 hPa    ☒ Table Top    ☐ With Power Supply    AUX 4    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode	Setup	Port	Test Parameter		
WLANCL5	setup_02	DC	12V: Us=-165V; 20min.		
Pulse	Test Voltage	Test Time	Reaction of EUT	Remarks	Result
3a	-165 V	20 min.	no reaction recognized	none	Criterion A

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1006 hPa    ☒ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode		Setup	Port	Test Parameter		
WLANRX24		setup_02	DC	12V: Us=-165V; 20min.		
Pulse	Test Voltage	Test Time	Reaction of EUT		Remarks	Result
3a	-165 V	20 min.	no reaction recognized		none	Criterion A

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None    ☐

Op. Mode		Setup	Port	Test Parameter		
WLANRX5		setup_02	DC	12V: Us=-165V; 20min.		
Pulse	Test Voltage	Test Time	Reaction of EUT		Remarks	Result
3a	-165 V	20 min.	no reaction recognized		none	Criterion A

Remark: none

### 3.6.3 Test result: Transients, Vehicular env.; Pulse 3a

EN 301 489-1	Op. Mode	Setup	Port	Result
	BTSCAN	setup_01	DC	passed
	BTTEST	setup_01	DC	passed
	GPSRX	setup_03	DC	passed
	WLANCL24	setup_02	DC	passed
	WLANCL5	setup_02	DC	passed
	WLANRX24	setup_02	DC	passed
	WLANRX5	setup_02	DC	passed

### 3.7 Transients, Vehicular env.; Pulse 3b

Standard: EN 301 489-1

V2.1.1 (2017-02)

Basic Standard: ISO 7637-2

2011

#### 3.7.1 Test Description

The test set-up was realised according to the used basic standard.  
The test was performed according to the used basic standard.

#### 3.7.2 Test Protocol

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
Air Pressure: 1006 hPa    ☒ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter		
BTSCAN	setup_01	DC	12V: Us=+112V; 20min.		
Pulse	Test Voltage	Test Time	Reaction of EUT	Remarks	Result
3b	+112 V	20 min.	no reaction recognized	none	Criterion A

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    CBT    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter		
BTTEST	setup_01	DC	12V: Us=+112V; 20min.		
Pulse	Test Voltage	Test Time	Reaction of EUT	Remarks	Result
3b	+112 V	20 min.	no reaction recognized	none	Criterion A

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1007 hPa    ☐ Table Top    ☐ With Power Supply    SMBV100A    ☐ Cable Connection  
Humidity: 29 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter		
GPSRX	setup_03	DC	12V: Us=+112V; 20min.		
Pulse	Test Voltage	Test Time	Reaction of EUT	Remarks	Result
3b	+112 V	20 min.	no reaction recognized	none	TT / TR

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    AUX 4    ☐ Cable Connection  
Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter		
WLANCL24	setup_02	DC	12V: Us=+112V; 20min.		
Pulse	Test Voltage	Test Time	Reaction of EUT	Remarks	Result
3b	+112 V	20 min.	no reaction recognized	none	Criterion A

Remark: none

☒ Airlink

12V:  $U_s = +112V$ ; 20min.

☐ Airlink

12V:  $U_s = +112V$ ; 20min.

☐ Airlink

12V:  $U_s = +112V$ ; 20min.

**EN 301 489-1**

BTSCAN	setup_01	DC	<b>passed</b>
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### 3.8 Transients, Vehicular env.; Pulse 4

Standard: EN 301 489-1

V2.1.1 (2017-02)

Basic Standard: ISO 7637-2 / 16750- 2011 / 2012

2

#### 3.8.1 Test Description

The test set-up was realised according to the used basic standard.

The test was performed according to the used basic standard.

#### 3.8.2 Test Protocol

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    -    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
BTSCAN	setup_01	DC	12V: Us6=3V; Us=5V; tf=5ms; t6=15ms; tr=100ms; n=10				
Vs	Va	t7	t11	No. of Pulses	Reaction of EUT	Remarks	Result
Us6: 3 V	Us: 5 V	t6: 15ms	tr: 100ms	10	loss of communication link, display switches off	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    CBT    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
BTTEST	setup_01	DC	12V: Us6=3V; Us=5V; tf=5ms; t6=15ms; tr=100ms; n=10				
Vs	Va	t7	t11	No. of Pulses	Reaction of EUT	Remarks	Result
Us6: 3 V	Us: 5 V	t6: 15ms	tr: 100ms	10	loss of communication link, display switches off	EUT goes off and on during testing, manual reset of OP-mode necessary after the test.	Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
 Air Pressure: 1007 hPa    ☐ Table Top    ☐ With Power Supply    SMBV100A    ☐ Cable Connection  
 Humidity: 29 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
GPSRX	setup_03	DC	12V: Us6=3V; Us=5V; tf=5ms; t6=15ms; tr=100ms; n=10				
Vs	Va	t7	t11	No. of Pulses	Reaction of EUT	Remarks	Result
Us6: 3 V	Us: 5 V	t6: 15ms	tr: 100ms	10	no reaction recognized	none	TT / TR

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☒ Airlink  
 Air Pressure: 1006 hPa    ☐ Table Top    ☐ With Power Supply    AUX 4    ☐ Cable Connection  
 Humidity: 35 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter				
WLANCL24	setup_02	DC	12V: Us6=3V; Us=5V; tf=5ms; t6=15ms; tr=100ms; n=10				
Vs	Va	t7	t11	No. of Pulses	Reaction of EUT	Remarks	Result
Us6: 3 V	Us: 5 V	t6: 15ms	tr: 100ms	10	no reaction recognized	none	Criterion A

Remark: none

☒ Airlink

Criterion A
-------------

☐ Airlink

Criterion A

☐ Airlink

Criterion A
-------------

**EN 301 489-1**

**passed**

## 4. Testequipment

### Anechoic Chamber (FAC)

<b>Manufacturer</b>		various		<b>Hardware Version</b>	
<b>Serial No.</b>				<b>Software Version</b>	
<b>Equipment</b>	<b>Type</b>	<b>Serial No.</b>	<b>Manufacturer</b>	<b>Hardware</b>	<b>Software</b>
Antenna mast	ASP 1.2/1.8-10kg	-	Maturo		
	PAS 2.5-10 kg	-	Maturo		
Controller	MCU	-	Maturo		
EUT support table	PTT 1.2x0.8-S	-	Maturo		
Fully Anechoic Room	8.8x4.6x4.1m3	B83117-S40-X191	Albatross Projects		
Turn Table	TT 1.5 WI	-	Maturo		

### Anechoic Chamber (SAC/FAC)

<b>Manufacturer</b>		various		<b>Hardware Version</b>	
<b>Serial No.</b>				<b>Software Version</b>	
<b>Equipment</b>	<b>Type</b>	<b>Serial No.</b>	<b>Manufacturer</b>	<b>Hardware</b>	<b>Software</b>
Air Compressor (pneumatic)			Atlas Copco		
Controller	MCU	961208	Maturo GmbH		
EMC Camera	CE-CAM/1		CE-SYS		
EMC Camera for observation of EUT	CCD-400E	0005033	Mitsubishi		
Filter ISDN	B84312-C110-E1		Siemens & Matsushita		
Filter telephone systems / modem	B84312-C40-B1		Siemens & Matsushita		
Filter Universal 1A	B84312-C30-H3		Siemens & Matsushita		
Fully/Semi AE Chamber	10.58x6.38x6.00 m <sup>3</sup>		Frankonia		
Turntable	DS 420S	420/573/99	HD GmbH, H. Deisel		
Valve Control Unit (pneum.)	VE 615P	615/348/99	HD GmbH, H. Deisel		

## Auxiliary Test Equipment

Manufacturer		various		Hardware Version		
Serial No.				Software Version		
Equipment	Type	Serial No.	Manufacturer	Hardware	Software	
Broadband Resist. Power Divider N	1506A / 93459	LM390	Weinschel			
Broadband Resist. Power Divider SMA	1515 / 93459	LN673	Weinschel			
Digital Multimeter 03	Fluke 177	86670383	Fluke Europe B.V.			
Digital Oscilloscope	TDS 784C	B021311	Tektronix			
Fibre optic link Satellite	FO RS232 Link	181-018	Pontis			
Fibre optic link Transceiver	FO RS232 Link	182-018	Pontis			
I/Q Modulation Generator	AMIQ-B1	832085/018	Rohde & Schwarz			
Notch Filter ultra stable	WRCA800/960-6EEK 24		Wainwright			
Signal Analyser 26 GHz	FSIQ26	840061/005	Rohde & Schwarz			
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	838164/004	Rohde & Schwarz			
	FSP3	836277/011	Rohde & Schwarz			
Temperature Chamber	KWP 120/70	59226012190010	Weiss			
	S-1.2C-B	393/25-1389-27RF	Thermotron			
	VT 4002	58566002150010	Vötsch			
ThermoHygro Datalogger 03	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH			
ThermoHygro_01	430202		Fischer			

## Click Noise

-

Manufacturer				Hardware Version		
Serial No.				Software Version		
Equipment	Type	Serial No.	Manufacturer	Hardware	Software	
Four-Line V-Network	ESH2-Z5	7A-0261	Rohde & Schwarz			
Test Receiver	ESCS 30	7A-00235	Rohde & Schwarz			

## EMI Conducted Auxiliary Equipment

Manufacturer		various				Hardware Version	
Serial No.						Software Version	
Equipment	Type	Serial No.	Manufacturer	Hardware	Software		
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber + Suhner				
Coupling-Decoupling-Network	ENY41	100002	Rohde & Schwarz				
DC V-Network	ESH 3-Z6	100570	Rohde & Schwarz				
	ESH 3-Z6	100489	Rohde & Schwarz				
	ISN ST08	36292	Teseq				
Impedance Stabilization Network	ISN T800	36159	Teseq				
	ISN T8-Cat6	32187	Teseq				
	ESH 3-Z5	829996/002	Rohde & Schwarz				
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz				

## EMI Radiated Auxiliary Equipment

Manufacturer		various				Hardware Version	
Serial No.						Software Version	
Equipment	Type	Serial No.	Manufacturer	Hardware	Software		
Antenna Mast 4 m	AM 4.0	180/11920513	Maturo				
Biconical dipole	VUBA 9117	9117108	Schwarzbeck				
Broadband Amplifier 18 GHz-26 GHz	JS4-18002600-32-5P	849785	Miteq				
Broadband Amplifier 30 MHz-18 GHz	JS4-00101800-35-5P	896037	Miteq				
Broadband Amplifier 30 MHz-26 GHz	JS4-00102600-42-5A	619368	Miteq				
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz				
	HF 906	357357/002	Rohde & Schwarz				
	HF 907	102444	Rohde & Schwarz				
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic				
	5HC2700/12750-1.5-KK	9942012	Trilithic				
	5HC3500/18000-1.2-KK	200035008	Trilithic				
Log.-per. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz				
	HL 562 Ultralog	830547/003	Rohde & Schwarz				
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz				
Standard Gain / Pyramidal Horn Antenna 26.5 GHz	Model 3160-09	9910-1184	EMCO				
Tilt device (Rohacell)	TD1.5-10kg	024/3790709	Maturo				



## EMI Test System

**Manufacturer** Rohde&Schwarz

**Hardware Version**

**Serial No.**

**Software Version** for EN 55022: ES-K1 Ver. 1.71 SP2

Equipment	Type	Serial No.	Manufacturer	Hardware	Software
EMI Analyzer	ESI 26	830482/004	Rohde & Schwarz	3.3	2.08
Signal Generator	SMR 20	846834/008	Rohde & Schwarz		
Spectrum Analyser	FSW43	103779	Rohde & Schwarz		

## EMS Conducted Test System

TS9986

**Manufacturer** Rohde & Schwarz

**Hardware Version**

**Serial No.**

**Software Version** EMS-K1 V1.20

Equipment	Type	Serial No.	Manufacturer	Hardware	Software
100-V Insertion Unit	URV5-Z4	829212/015	Rohde & Schwarz		
10-V Insertion Unit	URV5-Z2	829384/049	Rohde & Schwarz		
Attenuator, 20dB	10-A-MFN-20	9823	Biro		
Attenuator, 6dB	150-A-FFN-06	9851	Biro		
Cable CPPA1 (Amplifier to 'CDN')	RG214	W61.01+W51.01	Huber + Suhner		
Calibration Fixture	BCICF-4	126	FCC		
CDN 50 to 150 Ohm adapter	CR 100 A	143	Lüthi		
CDN-Adapter Short f. Calibration	1072.2358.00		Rohde & Schwarz		
Coaxial Resistor	100-T-FN	9915	Biro		
Coupling- Decoupling-Network	CDN 801-S1	1692	Lüthi		
	ENY41	100002	Rohde & Schwarz		
Coupling- Decoupling- Network (CDN01)	CDN 801-M2/M3	948	Lüthi		
Coupling- Decoupling- Network (CDN02)	CDN 801-M2/M3	1723	Lüthi		
Coupling- Decoupling- Network S1 150 kHz-230 MHz	S1	A4010039	Dr. Hubert		
Impedance Stabilization Network	ISN ST08	36292	Teseq		
	ISN T800	36159	Teseq		
	ISN T8-Cat6	32187	Teseq		
Passive Impedance Adapter	801-150-50-BCI	276	FCC		
	801-150-50-BCI	275	FCC		
Power Amplifier	BSA 0122-100	994618A	Bonn Elektronik		
RF Millivoltmeter	URV 5	828999/025	Rohde & Schwarz		
RF Current Clamp (BCI)	F-120-9A	127	FCC		
RF Current Probe (BCI)	F-52	68	FCC		
Signal Generator	SMY 01	829552/028	Rohde & Schwarz		
	SMY 02	829309/018	Rohde & Schwarz		

## EMS Radiated Test System

## TS9981

**Manufacturer** Rohde & Schwarz

**Hardware Version**

**Serial No.**

**Software Version** EMS-K1 V1.20

Equipment	Type	Serial No.	Manufacturer	Hardware	Software
E-Field Probe	RSS1006A/LPS1001 A	10I00037 SNO81	Dare!! Instruments		
E-Field Probe (for EMR-200)	Typ-8	N-0028	Wandel & Goltermann	8.2	3.00
EM Radiation Meter	EMR-200	R-0071	Wandel & Goltermann		
Horn Antenna	SH800	S0043	Satimo		
Load Resistor 50 Ohm	8141, 2.5 GHz, 250 W	11737	Bird		
Log.-per. Antenna	HL 046	337201/010	Rohde & Schwarz		
	HL 562 ULTRALOG	830547/003	Rohde & Schwarz		
Milli Voltmeter	URY	891852/084	Rohde & Schwarz		
Peak Power Sensor 50 Ohm	NRV-Z32	830914/014	Rohde & Schwarz		
	NRV-Z32	830914/013	Rohde & Schwarz		
Power Amplifier	BBA150 BC250	102404	Rohde & Schwarz		
	BBA150 D110E100	102445	Rohde & Schwarz		
	BLMA 1020-25	035360	Bonn		
	BLMA 2040-20	087106	Bonn		
	BLWA 0810-160/50	994618B	Bonn		
Power Sensor	NRV-Z1	836219/005	Rohde & Schwarz		
	NRV-Z1	832279/015	Rohde & Schwarz		
Powermeter	NRVS	831308/005	Rohde & Schwarz		
	NRVS	831308/007	Rohde & Schwarz		
Pulse Converter (for SMY02)	TS-CNV	338722/016	Rohde & Schwarz		
Signal Generator	SMB100A	107695	Rohde & Schwarz		
	SME03	836169/049	Rohde & Schwarz		
	SMP02	829076/017	Rohde & Schwarz		

## EMS Transient Test Simulator (ISO 7637-2)

## UCS 200-N

**Manufacturer** EM Test

**Hardware Version**

**Serial No.** see single devices

**Software Version** ISOCONTROL 5.3.1.0

Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Ultra-Compact Simulator for automotive pulses	UCS 200N50	P1404129963	EM Test		Firmware-No.: 000612, V 2.30a01
Voltage Drop Simulator for automotive pulses	VDS 200N10	P1338124613	EM Test		Firmware-No.: 000942, V 1.20a01

## EMS Transient Test System (IEC 61000-4-X)

## UCS 500-M

<b>Manufacturer</b>	EM Test		<b>Hardware Version</b>	none	
<b>Serial No.</b>	see single devices		<b>Software Version</b>	none	
<b>Equipment</b>	<b>Type</b>	<b>Serial No.</b>	<b>Manufacturer</b>	<b>Hardware</b>	<b>Software</b>
Capacitive coupling clamp	HFK				
Coupling network EMC Competence Center Dsseldorf	CNV 508	7A-00231	EM Test		
ESD Generator + Network DM1	emtest dito + DM1	Dito: P1749209951, DM1: P1750211604	AMETEK CTS GmbH (Switzerland)		Firmware 2.31
ESD Gun	P 18	0499-40	EM Test		
Multi-Tester	UCS-500 M4	0499-40	EM Test	V 1.30	SWN 001284
Single-phase transformer	V 4070	C99380	EM Test		
	V 4780 S2	0207-24	EM Test		
Surge-Generator EMC Competence Center Dsseldorf	PSurge 4010	7A-00138	Haefely Trench		

## EUT Audio Monitoring System

<b>Manufacturer</b>			<b>Hardware Version</b>		
<b>Serial No.</b>			<b>Software Version</b>		
<b>Equipment</b>	<b>Type</b>	<b>Serial No.</b>	<b>Manufacturer</b>	<b>Hardware</b>	<b>Software</b>
Audio Analyzer	UPL	830768/015	Rohde & Schwarz	B6, B8, B10	2.01
Dual Microphone Supply	5935	2102432	Brüel & Kjær		
Microphone	4134	2123631	Brüel & Kjær		
Microphone Preamplifiers	2669	2152256	Brüel & Kjær		

## EUT Digital Signalling System

Manufacturer			Hardware Version		
Serial No.			Software Version		
Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Bluetooth Signalling Unit	CBT	100589	Rohde & Schwarz	B55 FPGA Digital: V2.30 FPGA RF: V3.00	CBT V4.61
	CBT (1153.9000.35)	100302	Rohde & Schwarz	B55 FPGA Digital: V2.24 FPGA RF: V3.00	CBT V4.40
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz	B4, B41, B5, B6, B61, B19	3.55
GNSS / Broadcast Signalling Unit	SMBV100A	26001	Rohde & Schwarz	RF-Board: 02.29, Vector Board 09.05	FW 3.01.130.48
GPS Signalling Unit	SMU200A	100912	Rohde & Schwarz	MB: 07.05, FMR: 50.00	FW 02.05.269.77
Signalling Unit for Bluetooth Spurious Emissions	PTW60	100004	Rohde & Schwarz		5.40
Universal Radio Communication Tester	CMU 200	837983/052	Rohde & Schwarz	B11, B21v14, B21/2, B41, B52v14, B52/2, B53/2, B54v14, B56v14, B66, B68v3.04, B95	SW: V4.21 FW µP1: v8.50
	CMU 200	102366	Rohde & Schwarz	B11, B21v14, B21/2, B41, B52v14, B52/2, B53/2, B56v14, B66, B68v3.04	SW: V4.21 / 4.50 FW µP1: v8.50
	CMW500	149268	Rohde & Schwarz		
	CMW500	107500	Rohde & Schwarz		

## Harmonics / Flicker Test System

-

Manufacturer			Hardware Version		
Serial No.			Software Version		
Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Flickermeter/Harmonic Analyser	B10	M7095	Spitzenberger & Spies		
Line Impedance Simulation System	-	B6279	Spitzenberger & Spies		
Power Amplifier	EP 1200B	B6278	Spitzenberger & Spies		
Variable Oscillator	NA / BI	B6278	Spitzenberger & Spies		

## Power Magnetic Field

-

**Manufacturer** -

**Hardware Version**

**Serial No.** -

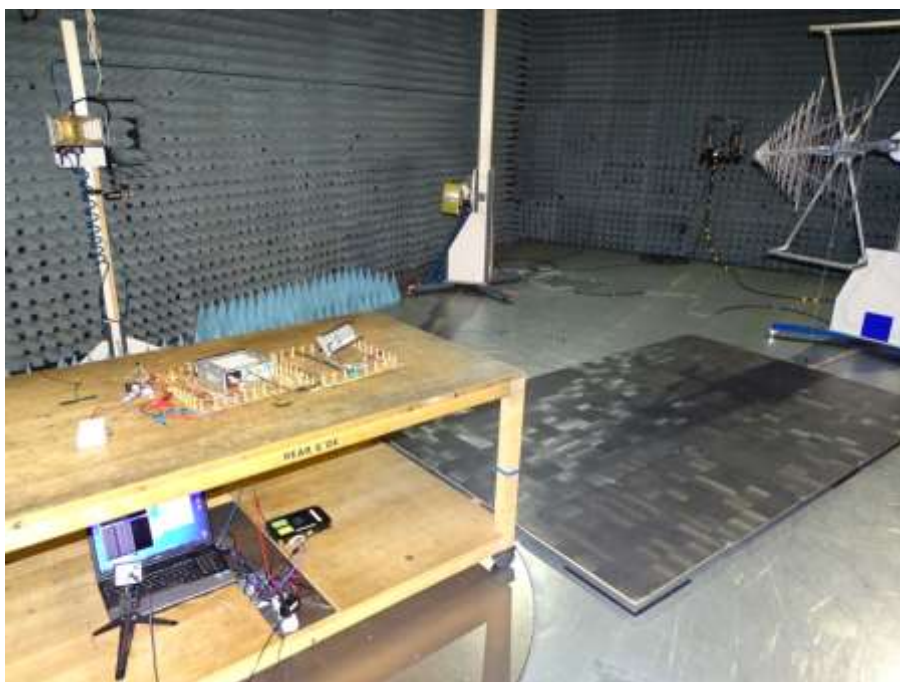
**Software Version**

Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Current Source	EP 1200/B	B6278	Spitzenberger & Spies		
Current Transformer	MC 2630	P1534163031	EM Test (Switzerland) GmbH		
Inductive Coil	Standard Square Coil 1m X 1m, 1 turn	1	7layers GmbH - Richwol		
True RMS Clampmeter	Fluke 325	31270091WS	Fluke		
Variable Oscillator	NA/BI	B6278	Spitzenberger & Spies		

## 5. Photo Report



Picture 1 : setup for the test "Conducted interference voltage", DC



Picture 2 : setup for the test "RF-electromagnetic field"





**Picture 3** : setup for the test "RF-electromagnetic field", detailed view



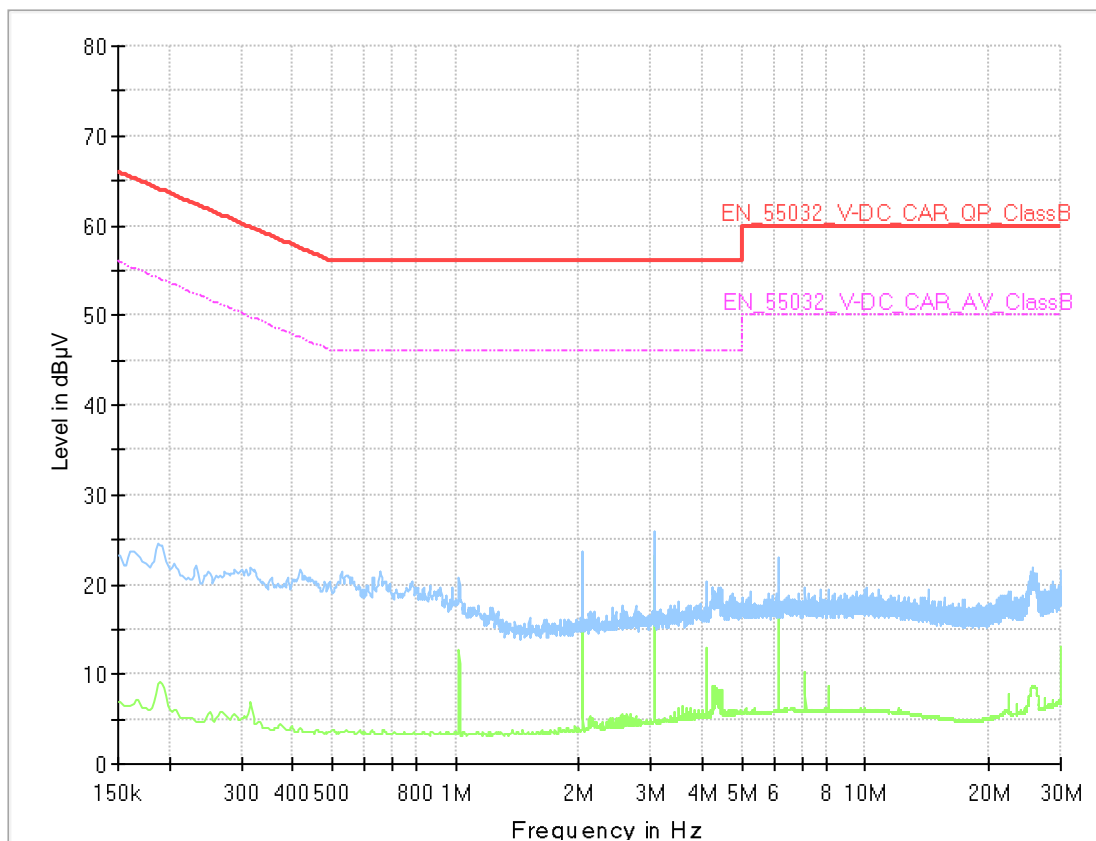
**Picture 4** : setup for the test "Vehicular Pulses / Transients and Surges"

# Test Report

## Diagram 1.01

### Common Information

Test Description:	Conducted Emissions
Test Standard:	EN 55032
EUT / Setup Code:	DE1288000ah01
Operating Conditions:	WLAN Client TX 5G
Operator Name:	URO
Comment:	+ -> GND @ 12 V DC
Legend:	Trace: blue = PK, green = CISPR AV; Star: red or blue = critical frequency; Rhombus: blue = final QP, green = final CISPR AV
Tested Port / used LISN:	DC => 2 x ESH3-Z6 (CAR-LISN)
Termination of other ports:	N/A



### Final Result

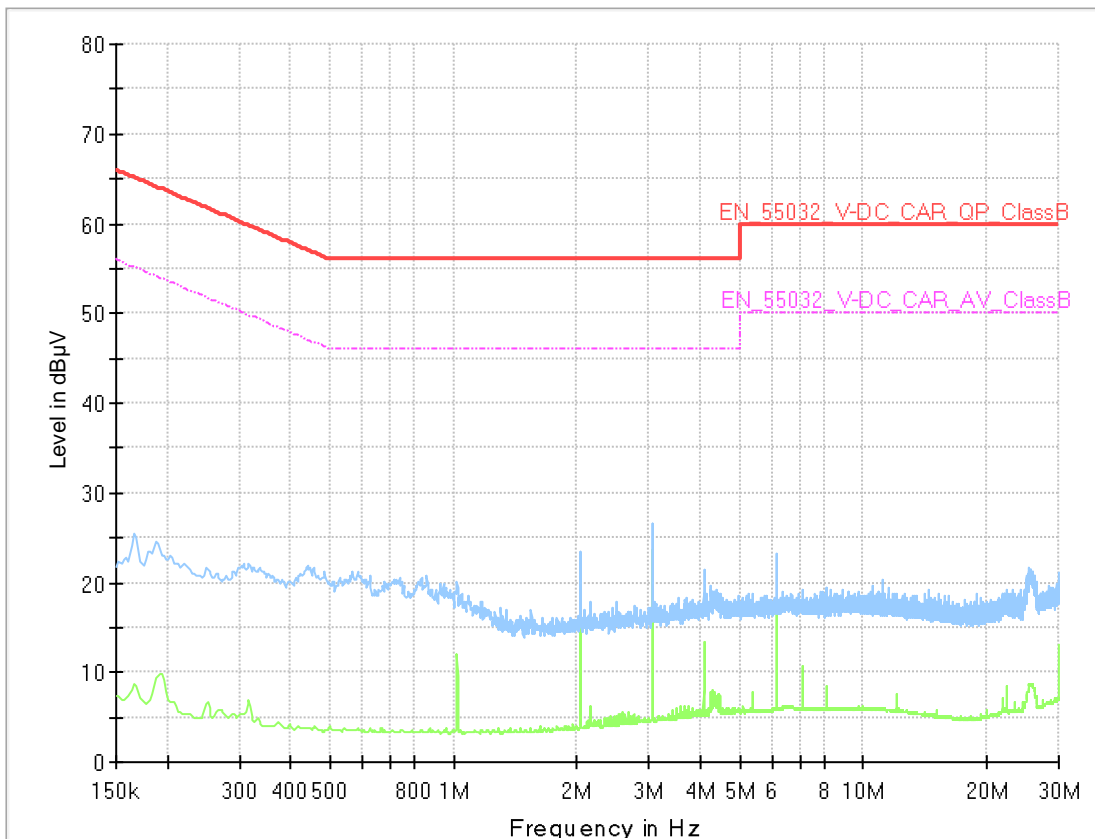
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
---	---	---	---	---	---	---	---	---



## Diagram 1.02

### Common Information

Test Description:	Conducted Emissions
Test Standard:	EN 55032
EUT / Setup Code:	DE1288000ah01
Operating Conditions:	WLAN Client TX 5G
Operator Name:	URO
Comment:	- -> GND @ 12 V DC
Legend:	Trace: blue = PK, green = CISPR AV; Star: red or blue = critical frequency; Rhombus: blue = final QP, green = final CISPR AV
Tested Port / used LISN:	DC => 2 x ESH3-Z6 (CAR-LISN)
Termination of other ports:	N/A



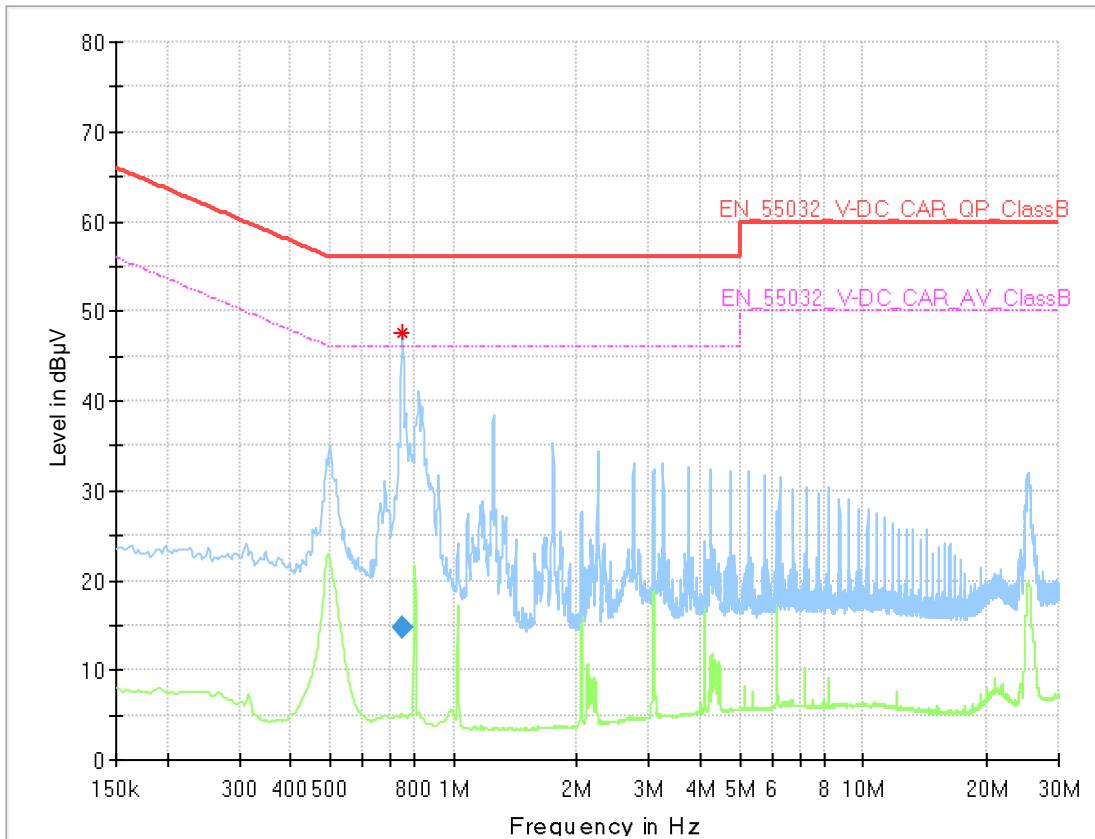
### Final\_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
---	---	---	---	---	---	---		---

## Diagram 1.03

### Common Information

Test Description:	Conducted Emissions
Test Standard:	EN 55032
EUT / Setup Code:	DE1288000ad01
Operating Conditions:	BT Testmode TX, CH78
Operator Name:	URO
Comment:	- -> GND @ 12 V DC
Legend:	Trace: blue = PK, green = CISPR AV; Star: red or blue = critical frequency; Rhombus: blue = final QP, green = final CISPR AV
Tested Port / used LISN:	DC => 2 x ESH3-Z6 (CAR-LISN)
Termination of other ports:	N/A



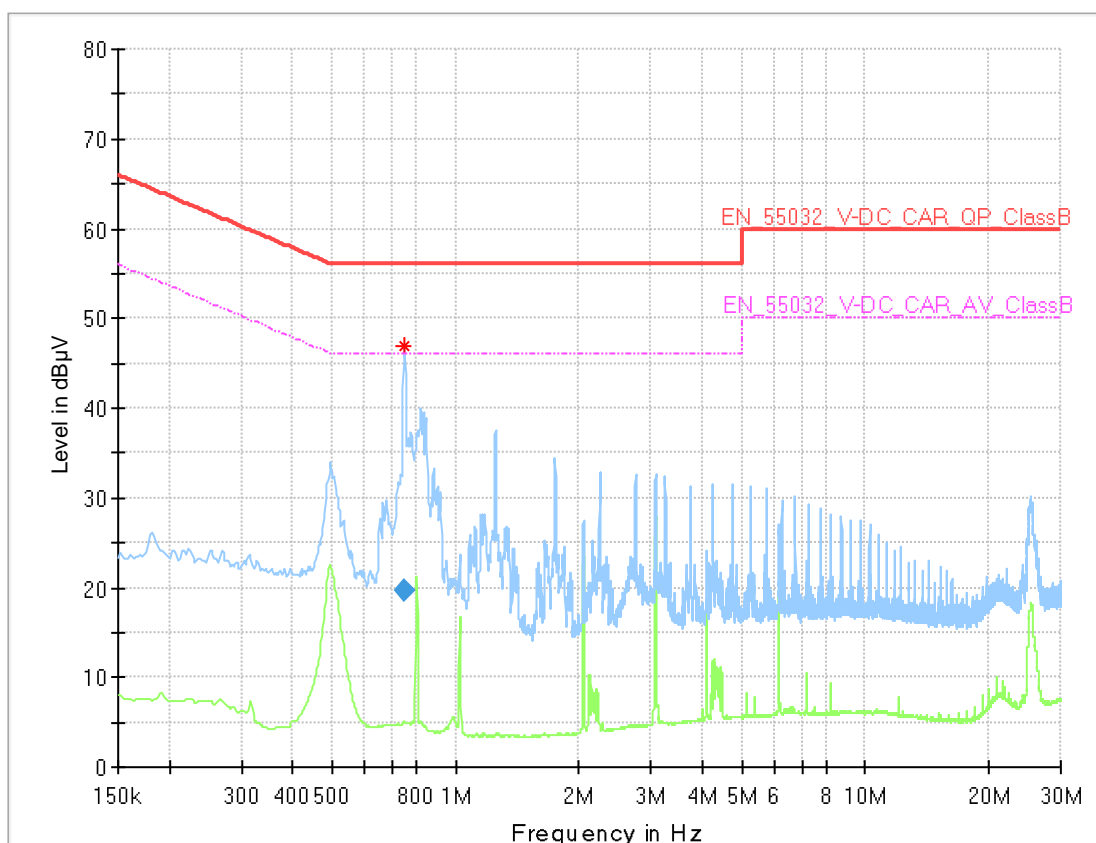
### Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.750750	14.76	---	56.00	41.24	1000.0	9.000	Minus	10

## Diagram 1.04

### Common Information

Test Description:	Conducted Emissions
Test Standard:	EN 55032
EUT / Setup Code:	DE1288000ad01
Operating Conditions:	BT Testmode TX, CH78
Operator Name:	URO
Comment:	+ -> GND @ 12 V DC
Legend:	Trace: blue = PK, green = CISPR AV; Star: red or blue = critical frequency; Rhombus: blue = final QP, green = final CISPR AV
Tested Port / used LISN:	DC => 2 x ESH3-Z6 (CAR-LISN)
Termination of other ports:	N/A



### Final\_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.750750	19.66	---	56.00	36.34	1000.0	9.000	Plus	10

InterLab®

# EMC TEST REPORT on

Car Radio

MIB3 OI

**Report Reference:** MDE\_PREH\_1602\_EMCb

**Dated on:** 2018-03-15

**Test Laboratory:**

7layers GmbH  
Borsigstr. 11  
40880 Ratingen  
Germany



**Test Location:**

7layers GmbH  
Borsigstr. 11  
40880 Ratingen  
Germany

**Note:**

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the testing laboratory.

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## 0. Testplan / Summary

Standard: EN 55032 +C1

2015/2016

Chapter	A.2, Table Clause A1.4 + A4.4		
Radiated Interference Field Strength		Basic Standard:	CISPR 16-2-3
Testparameter:	30-1000 MHz, Class B, QP-Detector		
OP-Mode	Setup	Port	Final Result
AM_MF_1kHz	setup_01	Enclosure	passed
DAB_1kHz	setup_01	Enclosure	passed
FM_1kHz	setup_01	Enclosure	passed

Chapter	A.2, Table Clause A5.1 + A5.2		
Radiated Interference Field Strength		Basic Standard:	CISPR 16-2-3
Testparameter:	1-6 GHz, Class B, PK/AV-Detector		
OP-Mode	Setup	Port	Final Result
AM_MF_1kHz	setup_01	Enclosure	passed
DAB_1kHz	setup_01	Enclosure	passed
FM_1kHz	setup_01	Enclosure	passed

Chapter	A.3, Table Clause A13.4		
Conducted Interference Voltage, Receiver Port		Basic Standard:	CISPR 16-2-3
Testparameter:	30-2150 MHz, Class B, AV/QP-Detector		
OP-Mode	Setup	Port	Final Result
FM_1kHz	setup_01	AM/FM Antenna	passed

Chapter	A.3, Table Clause A8.2 + A12.1		
Conducted Interference Voltage, Receiver Port		Basic Standard:	CISPR 16-2-3
Testparameter:	0.15-30 MHz, Class B, AV/QP-Detector		
OP-Mode	Setup	Port	Final Result
AM_MF_1kHz	setup_01	AM/FM Antenna	passed
DAB_1kHz	setup_01	DAB Antenna	passed

Standard: EN 55035

2017

Chapter	5, Table Clause 1.2 + 1.3		
RF-Electromagnetic Field		Basic Standard:	EN 61000-4-3 +A1 +A2
Testparameter:	3 V/m, 80 MHz - 1000 MHz; 1.8, 2.6, 3.5, 5.0 GHz; 80% AM, log 1%		
OP-Mode	Setup	Port	Final Result
AM_MF_400Hz	setup_01	Enclosure	passed
DAB_440Hz	setup_01	Enclosure	passed
FM_400Hz	setup_01	Enclosure	passed

Chapter 5, Table Clause 1.4			
<b>ESD Air Discharge</b>		<b>Basic Standard:</b> EN 61000-4-2	<b>2009</b>
<b>Testparameter:</b> up to 8 kV			
OP-Mode	Setup	Port	Final Result
AM_MF_400Hz	setup_01	Enclosure	passed
DAB_440Hz	setup_01	Enclosure	passed
FM_400Hz	setup_01	Enclosure	passed
<b>ESD Indirect Contact Discharge</b>		<b>Basic Standard:</b> EN 61000-4-2	<b>2009</b>
<b>Testparameter:</b> 4 kV			
OP-Mode	Setup	Port	Final Result
AM_MF_400Hz	setup_01	Enclosure	passed
DAB_440Hz	setup_01	Enclosure	passed
FM_400Hz	setup_01	Enclosure	passed

\* deviation from Standard: for details see chapter 3. Test details

This test report focuses on the broadcast receiver functionality of the device (DAB/FM/AM) and not on the RF functionality (e.g. Bluetooth, WiFi).

EN 55032:2015

Table A4: Requirements for radiated emissions up to 1 GHz

Table A4.4 used: FAR 3 m

Table A5: Requirements for radiated emissions at frequencies above 1 GHz

Table A5.1 used: FAR 3 m (1000 to 3000 MHz)

Table A5.2 used: FAR 3 m (3000 to 6000 MHz)

Responsible for  
Accreditation Scope:

*M. K. K.*

Responsible  
for Test Report:

*J. Dorwald*



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## 1. Administrative Data

### 1.1 Testing Laboratory

Company Name: 7layers GmbH  
Address: Borsigstr. 11  
40880 Ratingen  
Germany  
Laboratory Accreditation No.: DAkkS D-PL-12140-01-00  
Responsible for Accreditation Scope: Dipl.-Ing. Bernhard Retka Dipl.-Ing. Thomas Hoell  
Dipl.-Ing. Robert Machulec Dipl.-Ing. Andreas Petz  
Dipl.-Ing. Marco Kullik Dipl.-Ing. Wolfgang Richter  
Report Template Version: 2017-02-16

### 1.2 Project Data

Responsible for Test Report: B.Sc. Jens Dörwald  
Date of Test(s): 2018-02-14 to 2018-02-20  
Date of Report: 2018-03-15  
No. of Pages in Annex: 21

### 1.3 Applicant Data

Company Name: Preh Car Connect GmbH  
Address: Gewerbepark Merbitz 5  
01156 Dresden  
Germany  
Contact Person: Mr. Christian Stopp

### 1.4 Manufacturer Data

Company Name: please see applicant data  
Address:  
Contact Person:

## 2. Test Object Data

### 2.1 General EUT Description

According to applicant's information:

The EUT is a navigation car radio. It has a build AM/FM and DAB tuner as well as a GPS receiver for navigation purposes and a Bluetooth and WLAN transceiver. This test report focuses on the broadcast receiver functionality of the EUT.

**Equipment under Test:** Car Radio  
**Type Designation:** MIB3 OI  
**Kind of Device:** 2.4 GHz Transceiver (WLAN & BT), 5 GHz WLAN, GPS Receiver, Broadcast Receiver  
**(optional)**

**Voltage Type:** DC

**Test Voltage level:** 12 V

☐ Grounding with Power Supply

☒ No Grounding

**Additional Grounding:**

☐ Sensitive to Magnetic Fields

☒ Not Sensitive to Magnetic Fields

☐ Industrial Environment

☒ Household, light industrial Environment

☒ Conducting Surface

☒ Isolating Surface

☐ Mounting Position defined

☒ Mounting Position not defined

☐ Fixed Use

☐ Portable Use

☒ Vehicular Use

Ports	Max. Cable Length (m)	Shielded	Process Guide
Digital I/O	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Analogue I/O	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
DAB	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
AM/FM	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
USB	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
GPS	3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cable harness incl. DC	3	<input type="checkbox"/>	<input type="checkbox"/>
Enclosure	0	<input type="checkbox"/>	<input type="checkbox"/>



## 2.2 EUT: Type, S/N, Short Descriptions etc. used in this Test Report

Short Description	Equipment under Test	Type Designation	HW Status	SW Status	Serial No.
EUT A (Code: DE1288000aj01)	Car Radio	MIB3 OI	X07	R055	YD5-00105.07.1700170010

## 2.3 Auxiliary Equipment

Short Description	Auxiliary Equipment	Type Designation	HW Status	SW Status	Serial No.
AUX 1	Display	5G0919606	-	-	4TU-00126.01.171KL20214
AUX 2	Life Box	-	-	-	-
AUX 3	Speaker 1	-	-	-	-
AUX 4	Speaker 2	-	-	-	-

## 2.4 EUT Setups

Setup No.	Combination of EUTs	Remarks
setup_01	EUT A + AUX 1 + AUX 2 + AUX 3 + AUX 4	representative setup for testing

## 2.5 Operating Modes

Op. Mode	Description of Operating Modes	Remarks
AM_MF_1kHz	broadcast receiver AM 999 kHz	The broadcast receiver is tuned to 999 kHz. Volume = appr. 50% of maximum Signal generator SFE 100 (@ 999 kHz, -57.7 dBm, 40 % AM, audio signal 1 kHz) connected via cable to broadcast receiver tuner port AM/FM.
AM_MF_400Hz	broadcast receiver AM 999 kHz, SINAD evaluation during EMS radiated	The broadcast receiver is tuned to 999 kHz. Volume = appr. 50% of maximum Signal generator SMBV100A (@ 999 kHz, -57.7 dBm, 40 % AM, audio signal 400 Hz) connected via cable to broadcast receiver tuner port AM/FM.
DAB_1kHz	broadcast receiver DAB 202.928 MHz	The broadcast receiver is tuned to 202.928 MHz at 64 kbps. Volume = appr. 50% of maximum Signal generator SMBV100A (@ 202.928 MHz, -57.7 dBm, DAB BW 1.536 MHz, audio signal 1 kHz) connected via cable to broadcast receiver tuner port DAB.
DAB_440Hz	broadcast receiver DAB 202.928 MHz, SINAD evaluation during EMS radiated	The broadcast receiver is tuned to 202.928 MHz at 40 kbps. Volume = appr. 50% of maximum Signal generator SMBV100A (@ 202.928 MHz, -57.7 dBm, DAB BW 1.536 MHz, audio signal 440 Hz) connected via cable to broadcast receiver tuner port DAB.
FM_1kHz	broadcast receiver FM 98 MHz	The broadcast receiver is tuned to 98 MHz. Volume = appr. 50% of maximum Signal generator SMBV100A (@ 98 MHz, -57.7 dBm, 60.8 kHz FM deviation, audio signal 1 kHz) connected via cable to broadcast receiver tuner port AM/FM.
FM_400Hz	broadcast receiver FM 98 MHz SINAD evaluation during EMS radiated	The broadcast receiver is tuned to 98 MHz. Volume = appr. 50% of maximum Signal generator SMBV100A (@ 98 MHz, -57.7 dBm, 60.8 kHz FM deviation, audio signal 400 Hz) connected via cable to broadcast receiver tuner port AM/FM.

## 2.6 Performance Criteria

Short Description	Performance Criteria	Remarks
Criterion A	for immunity tests with phenomena of a continuous nature Broadcast receiver (EN 55035): During test: - No degradation of performance - No loss of function or change of operating state After test: - Operate as intended - No loss of function - No degradation of performance	SINAD Measurement; the measured SINAD value must be > 12 dB during the measurement
Criterion B	for immunity tests with phenomena of a transient nature Broadcast receiver (EN 55035): During test: - May be loss of function (one or more) - No unintentional responses After test: - Operate as intended - Lost function(s) shall be self-recoverable - No degradation of performance	SINAD Measurement; the measured SINAD value must be > 12 dB before and after the measurement
Criterion C	for immunity tests with power interruptions exceeding a certain time Broadcast receiver (EN 55035): During test: - May be loss of function (one or more). After test: - Functions shall be recoverable by the operator. - Shall operate as intended after recovering.	not applicable for the performed tests

## 3. Test Details

### 3.1 Conducted Interference Voltage, Receiver Port

Standard: EN 55032 +C1

2015/2016

Basic Standard: CISPR 16-2-3

#### 3.1.1 Test Description

The test set-up was realised according to the used basic standard.  
The test was performed according to the used basic standard.  
For test setup please see chap. Photo Report.

#### 3.1.2 Test Protocol

Temperature: 23 °C      Test Setup:      Grounding:      Signalling device: ☐ Airlink  
Air Pressure: 1007 hPa      ☒ Table Top      ☐ With Power Supply      SMBV100A      ☒ Cable Connection  
Humidity: 30 %      ☐ Floorstanding      ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter		
AM_MF_1kHz	setup_01	AM/FM Antenna	0.15-30 MHz, Class B, AV/QP-Detector		
Diagram	Detector	Powerline	Add. Scan Information	Remarks	Result
1.02	QP; AV	Asymmetric	prescan: fast peak; final scan: QP-detector	please see diagram	passed

Remark: Tested with CDN-S1 - Dr. Hubert

Temperature: 23 °C      Test Setup:      Grounding:      Signalling device: ☐ Airlink  
Air Pressure: 1007 hPa      ☒ Table Top      ☐ With Power Supply      SMBV100A      ☒ Cable Connection  
Humidity: 30 %      ☐ Floorstanding      ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter		
DAB_1kHz	setup_01	DAB Antenna	0.15-30 MHz, Class B, AV/QP-Detector		
Diagram	Detector	Powerline	Add. Scan Information	Remarks	Result
1.03	QP; AV	Asymmetric	prescan: fast peak; final scan: QP-detector	please see diagram	passed

Remark: Tested with CDN-S1 - Dr. Hubert

Temperature: 25 °C      Test Setup:      Grounding:      Signalling device: ☐ Airlink  
Air Pressure: 1015 hPa      ☒ Table Top      ☐ With Power Supply      SFE100      ☒ Cable Connection  
Humidity: 43 %      ☐ Floorstanding      ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter		
FM_1kHz	setup_01	AM/FM Antenna	30-2150 MHz, Class B, AV/QP-Detector		
Diagram	Detector	Powerline	Add. Scan Information	Remarks	Result
1.01	Peak	Asymmetric	prescan: fast peak; final scan: QP-detector	please see diagram	passed

Remark: Tested with 6 dB coupler

#### 3.1.3 Test result: Conducted Interference Voltage, Receiver Port

EN 55032 +C1		Op. Mode	Setup	Port	Result
		AM_MF_1kHz	setup_01	AM/FM Antenna	passed
		DAB_1kHz	setup_01	DAB Antenna	passed
		FM_1kHz	setup_01	AM/FM Antenna	passed

## 3.2 Radiated Interference Field Strength

Standard: EN 55032 +C1

2015/2016

Basic Standard: CISPR 16-2-3

### 3.2.1 Test Description

The test set-up was realised in a semi anechoic chamber with a measuring distance of 3 m in the frequency range 30 MHz - 1 GHz and above 1 GHz in a fully anechoic chamber with a measuring distance of 3 m according to the used basic standard.

The test was performed according to the used basic standard.

For test setup please see chap. Photo Report.

### 3.2.2 Test Protocol

Temperature: 24 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1010 hPa    ☒ Table Top    ☐ With Power Supply    SMBV100A    ☒ Cable Connection  
 Humidity: 32 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
AM_MF_1kHz	setup_01	Enclosure	1-6 GHz, Class B, PK/AV-Detector
Diagram	Add. scan information	Remark	Result
2.02	scan with Peak and Average detectors	please see diagram	passed

Temperature: 24 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1010 hPa    ☒ Table Top    ☐ With Power Supply    SMBV100A    ☒ Cable Connection  
 Humidity: 32 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
AM_MF_1kHz	setup_01	Enclosure	30-1000 MHz, Class B, QP-Detector
Diagram	Add. scan information	Remark	Result
2.01	prescan: peak; final scan: QP-detector	please see diagram	passed

Remark: none

Temperature: 24 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1010 hPa    ☒ Table Top    ☐ With Power Supply    SMBV100A    ☒ Cable Connection  
 Humidity: 32 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
DAB_1kHz	setup_01	Enclosure	1-6 GHz, Class B, PK/AV-Detector
Diagram	Add. scan information	Remark	Result
2.06	scan with Peak and Average detectors	please see diagram	passed

Temperature: 24 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1010 hPa    ☒ Table Top    ☐ With Power Supply    SMBV100A    ☒ Cable Connection  
 Humidity: 32 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
DAB_1kHz	setup_01	Enclosure	30-1000 MHz, Class B, QP-Detector
Diagram	Add. scan information	Remark	Result
2.05	prescan: fast peak; final scan: QP-detector	please see diagram	passed

Remark: none

Temperature: 24 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
 Air Pressure: 1010 hPa    ☒ Table Top    ☐ With Power Supply    SMBV100A    ☒ Cable Connection  
 Humidity: 32 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
FM_1kHz	setup_01	Enclosure	1-6 GHz, Class B, PK/AV-Detector
Diagram	Add. scan information	Remark	Result
2.04	scan with Peak and Average detectors	please see diagram	passed

Temperature: 24 °C      Test Setup:      Grounding:      Signalling device: ☐ Airlink  
Air Pressure: 1010 hPa      ☒ Table Top      ☐ With Power Supply      SMBV100A      ☒ Cable Connection  
Humidity: 32 %      ☐ Floorstanding      ☒ None

Op. Mode	Setup	Port	Test Parameter
FM_1kHz	setup_01	Enclosure	30-1000 MHz, Class B, QP-Detector

Diagram	Add. scan information	Remark	Result
2.03	prescan: peak; final scan: QP-detector	please see diagram	passed

Remark: none

### 3.2.3 Test result: Radiated Interference Field Strength

EN 55032 +C1	Op. Mode	Setup	Port	Result
	AM_MF_1kHz	setup_01	Enclosure	<b>passed</b>
	AM_MF_1kHz	setup_01	Enclosure	<b>passed</b>
	DAB_1kHz	setup_01	Enclosure	<b>passed</b>
	DAB_1kHz	setup_01	Enclosure	<b>passed</b>
	FM_1kHz	setup_01	Enclosure	<b>passed</b>
	FM_1kHz	setup_01	Enclosure	<b>passed</b>

### 3.3 ESD Air Discharge

Standard: EN 55035

2017

Basic Standard: EN 61000-4-2

2009

#### 3.3.1 Test Description

The test set-up was realised according to the used basic standard.  
The test was performed according to the used basic standard.  
For test setup please see chap. Photo Report.

#### 3.3.2 Test Protocol

Temperature: 23 °C      Test Setup:      Grounding:      Signalling device: ☐ Airlink  
Air Pressure: 1015 hPa      ☒ Table Top      ☐ With Power Supply      SMBV100A      ☒ Cable Connection  
Humidity: 31 %      ☐ Floorstanding      ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
AM_MF_400Hz	setup_01	Enclosure	up to 8 kV
Test Voltage	Reaction of EUT	Remarks	Result
+2 kV	no reaction recognized	none	Criterion B
+4 kV	no reaction recognized	none	Criterion B
+8 kV	no reaction recognized	none	Criterion B
-2 kV	no reaction recognized	none	Criterion B
-4 kV	no reaction recognized	none	Criterion B
-8 kV	no reaction recognized	none	Criterion B

Remark: none

Temperature: 23 °C      Test Setup:      Grounding:      Signalling device: ☐ Airlink  
Air Pressure: 1015 hPa      ☒ Table Top      ☐ With Power Supply      SMBV100A      ☒ Cable Connection  
Humidity: 31 %      ☐ Floorstanding      ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
DAB_440Hz	setup_01	Enclosure	up to 8 kV
Test Voltage	Reaction of EUT	Remarks	Result
+2 kV	no reaction recognized	none	Criterion B
+4 kV	no reaction recognized	none	Criterion B
+8 kV	no reaction recognized	none	Criterion B
-2 kV	no reaction recognized	none	Criterion B
-4 kV	no reaction recognized	none	Criterion B
-8 kV	no reaction recognized	none	Criterion B

Remark: none

Temperature: 23 °C      Test Setup:      Grounding:      Signalling device: ☐ Airlink  
Air Pressure: 1015 hPa      ☒ Table Top      ☐ With Power Supply      SMBV100A      ☒ Cable Connection  
Humidity: 31 %      ☐ Floorstanding      ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
FM_400Hz	setup_01	Enclosure	up to 8 kV
Test Voltage	Reaction of EUT	Remarks	Result
+2 kV	no reaction recognized	none	Criterion B
+4 kV	no reaction recognized	none	Criterion B
+8 kV	no reaction recognized	none	Criterion B
-2 kV	no reaction recognized	none	Criterion B
-4 kV	no reaction recognized	none	Criterion B
-8 kV	no reaction recognized	none	Criterion B

Remark: none

### 3.3.3 Test result: ESD Air Discharge

EN 55035	Op. Mode	Setup	Port	Result
	AM_MF_400Hz	setup_01	Enclosure	<b>passed</b>
	DAB_440Hz	setup_01	Enclosure	<b>passed</b>
	FM_400Hz	setup_01	Enclosure	<b>passed</b>

### 3.4 ESD Indirect Contact Discharge

Standard: EN 55035

2017

Basic Standard: EN 61000-4-2

2009

#### 3.4.1 Test Description

The test set-up was realised according to the used basic standard.  
The test was performed according to the used basic standard.  
For test setup please see chap. Photo Report.

#### 3.4.2 Test Protocol

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
Air Pressure: 1015 hPa    ☒ Table Top    ☐ With Power Supply    SMBV100A    ☒ Cable Connection  
Humidity: 31 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
AM_MF_400Hz	setup_01	Enclosure	4 kV
Test Voltage	Reaction of EUT		Remarks
+4 kV	no reaction recognized		none
-4 kV	no reaction recognized		none
			Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
Air Pressure: 1015 hPa    ☒ Table Top    ☐ With Power Supply    SMBV100A    ☒ Cable Connection  
Humidity: 31 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
DAB_440Hz	setup_01	Enclosure	4 kV
Test Voltage	Reaction of EUT		Remarks
+4 kV	no reaction recognized		none
-4 kV	no reaction recognized		none
			Criterion B

Remark: none

Temperature: 23 °C    Test Setup:    Grounding:    Signalling device: ☐ Airlink  
Air Pressure: 1015 hPa    ☒ Table Top    ☐ With Power Supply    SMBV100A    ☒ Cable Connection  
Humidity: 31 %    ☐ Floorstanding    ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter
FM_400Hz	setup_01	Enclosure	4 kV
Test Voltage	Reaction of EUT		Remarks
+4 kV	no reaction recognized		none
-4 kV	no reaction recognized		none
			Criterion B

Remark: none

#### 3.4.3 Test result: ESD Indirect Contact Discharge

EN 55035	Op. Mode	Setup	Port	Result
	AM_MF_400Hz	setup_01	Enclosure	passed
	DAB_440Hz	setup_01	Enclosure	passed
	FM_400Hz	setup_01	Enclosure	passed



### 3.5 RF-Electromagnetic Field

Standard: EN 55035

2017

Basic Standard: EN 61000-4-3 +A1  
+A2

2006/2008  
/2010 \*

#### 3.5.1 Test Description

The test set-up was realised according to the used basic standard.  
The test was performed according to the used basic standard.  
For test setup please see chap. Photo Report.

#### 3.5.2 Test Protocol

Temperature: 23 °C Test Setup: Grounding: Signalling device: ☐ Airlink  
Air Pressure: 1010 hPa ☒ Table Top ☐ With Power Supply SMBV100A ☒ Cable Connection  
Humidity: 30 % ☐ Floorstanding ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter			
AM_MF_400Hz	setup_01	Enclosure	3 V/m, 80 MHz - 1000 MHz; 1.8, 2.6, 3.5, 5.0 GHz; 80% AM, log 1%			
Diagram No.	Radiation to	EUT Pos.	Antenna Pol.	Reaction of EUT	Remarks	Result
03-01	front side	horizontal	horizontal	please see diagram	none	Criterion A
03-02	left side	horizontal	horizontal	please see diagram	none	Criterion A
03-03	rear side	horizontal	vertical	please see diagram	none	Criterion A
03-04	bottom side	vertical	vertical	please see diagram	none	Criterion A

Remark: The tested sides of each op-mode complement each other to obtain the complete number of tested sides and antenna polarisations. The dwell time at each frequency (from 80 MHz up to 1 GHz) was set to 1s and above 1 GHz the dwell was set to 3s for the spot frequencies.

Temperature: 23 °C Test Setup: Grounding: Signalling device: ☐ Airlink  
Air Pressure: 1010 hPa ☒ Table Top ☐ With Power Supply SMBV100A ☒ Cable Connection  
Humidity: 30 % ☐ Floorstanding ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter			
DAB_440Hz	setup_01	Enclosure	3 V/m, 80 MHz - 1000 MHz; 1.8, 2.6, 3.5, 5.0 GHz; 80% AM, log 1%			
Diagram No.	Radiation to	EUT Pos.	Antenna Pol.	Reaction of EUT	Remarks	Result
03-09	rear side	horizontal	horizontal	please see diagram	none	Criterion A
03-10	right side	horizontal	vertical	please see diagram	none	Criterion A
03-11	bottom side	vertical	horizontal	please see diagram	none	Criterion A
03-12	top side	vertical	vertical	please see diagram	none	Criterion A

Remark: The tested sides of each op-mode complement each other to obtain the complete number of tested sides and antenna polarisations. The dwell time at each frequency (from 80 MHz up to 1 GHz) was set to 1s and above 1 GHz the dwell was set to 3s for the spot frequencies.

Temperature: 23 °C Test Setup: Grounding: Signalling device: ☐ Airlink  
Air Pressure: 1010 hPa ☒ Table Top ☐ With Power Supply SMBV100A ☒ Cable Connection  
Humidity: 30 % ☐ Floorstanding ☒ None  
☐

Op. Mode	Setup	Port	Test Parameter			
FM_400Hz	setup_01	Enclosure	3 V/m, 80 MHz - 1000 MHz; 1.8, 2.6, 3.5, 5.0 GHz; 80% AM, log 1%			
Diagram No.	Radiation to	EUT Pos.	Antenna Pol.	Reaction of EUT	Remarks	Result
03-05	front side	horizontal	vertical	please see diagram	none	Criterion A
03-06	left side	horizontal	vertical	please see diagram	none	Criterion A
03-07	right side	horizontal	horizontal	please see diagram	none	Criterion A
03-08	top side	vertical	horizontal	please see diagram	none	Criterion A

Remark: The tested sides of each op-mode complement each other to obtain the complete number of tested sides and antenna polarisations. The dwell time at each frequency (from 80 MHz up to 1 GHz) was set to 1s and above 1 GHz the dwell was set to 3s for the spot frequencies.

### 3.5.3 Test result: RF-Electromagnetic Field

EN 55035	Op. Mode	Setup	Port	Result
	AM_MF_400Hz	setup_01	Enclosure	<b>passed</b>
	DAB_440Hz	setup_01	Enclosure	<b>passed</b>
	FM_400Hz	setup_01	Enclosure	<b>passed</b>

## 4. Testequipment

### Anechoic Chamber (FAC)

Manufacturer		various		Hardware Version	
Serial No.				Software Version	
Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Antenna mast	ASP 1.2/1.8-10kg	-	Maturo		
	PAS 2.5-10 kg	-	Maturo		
Controller	MCU	-	Maturo		
EUT support table	PTT 1.2x0.8-S	-	Maturo		
Fully Anechoic Room	8.8x4.6x4.1m3	B83117-S40-X191	Albatross Projects		
Turn Table	TT 1.5 WI	-	Maturo		

### Anechoic Chamber (SAC/FAC)

Manufacturer		various		Hardware Version	
Serial No.				Software Version	
Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Air Compressor (pneumatic)			Atlas Copco		
Controller	MCU	961208	Maturo GmbH		
EMC Camera	CE-CAM/1		CE-SYS		
EMC Camera for observation of EUT	CCD-400E	0005033	Mitsubishi		
Filter ISDN	B84312-C110-E1		Siemens & Matsushita		
Filter telephone systems / modem	B84312-C40-B1		Siemens & Matsushita		
Filter Universal 1A	B84312-C30-H3		Siemens & Matsushita		
Fully/Semi AE Chamber	10.58x6.38x6.00 m <sup>3</sup>		Frankonia		
Turntable	DS 420S	420/573/99	HD GmbH, H. Deisel		
Valve Control Unit (pneum.)	VE 615P	615/348/99	HD GmbH, H. Deisel		

## Auxiliary Test Equipment

Manufacturer		Hardware Version			
Serial No.		Software Version			
Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Broadband Resist. Power Divider N	1506A / 93459	LM390	Weinschel		
Broadband Resist. Power Divider SMA	1515 / 93459	LN673	Weinschel		
Digital Multimeter 03	Fluke 177	86670383	Fluke Europe B.V.		
Digital Oscilloscope	TDS 784C	B021311	Tektronix		
Fibre optic link Satellite	FO RS232 Link	181-018	Pontis		
Fibre optic link Transceiver	FO RS232 Link	182-018	Pontis		
I/Q Modulation Generator	AMIQ-B1	832085/018	Rohde & Schwarz		
Notch Filter ultra stable	WRCA800/960-6EEK 24		Wainwright		
Signal Analyser 26 GHz	FSIQ26	840061/005	Rohde & Schwarz		
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	838164/004	Rohde & Schwarz		
	FSP3	836277/011	Rohde & Schwarz		
Temperature Chamber	KWP 120/70	59226012190010	Weiss		
	S-1.2C-B	393/25-1389-27RF	Thermotron		
	VT 4002	58566002150010	Vötsch		
ThermoHygro Datalogger 03	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH		
ThermoHygro_01	430202		Fischer		

## Click Noise

-

Manufacturer		Hardware Version			
Serial No.		Software Version			
Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Four-Line V-Network	ESH2-Z5	7A-0261	Rohde & Schwarz		
Test Receiver	ESCS 30	7A-00235	Rohde & Schwarz		

## EMI Conducted Auxiliary Equipment

Manufacturer		Hardware Version			
Serial No.		Software Version			
Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber + Suhner		
Coupling-Decoupling-Network	ENY41	100002	Rohde & Schwarz		
DC V-Network	ESH 3-Z6	100570	Rohde & Schwarz		
	ESH 3-Z6	100489	Rohde & Schwarz		
	ISN ST08	36292	Teseq		
Impedance Stabilization Network	ISN T800	36159	Teseq		
	ISN T8-Cat6	32187	Teseq		
	ESH 3-Z5	829996/002	Rohde & Schwarz		
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz		

## EMI Radiated Auxiliary Equipment

Manufacturer		Hardware Version			
Serial No.		Software Version			
Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Antenna Mast 4 m	AM 4.0	180/11920513	Maturo		
Biconical dipole	VUBA 9117	9117108	Schwarzbeck		
Broadband Amplifier 18 GHz-26 GHz	JS4-18002600-32-5P	849785	Miteq		
Broadband Amplifier 30 MHz-18 GHz	JS4-00101800-35-5P	896037	Miteq		
Broadband Amplifier 30 MHz-26 GHz	JS4-00102600-42-5A	619368	Miteq		
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz		
	HF 906	357357/002	Rohde & Schwarz		
	HF 907	102444	Rohde & Schwarz		
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic		
	5HC2700/12750-1.5-KK	9942012	Trilithic		
	5HC3500/18000-1.2-KK	200035008	Trilithic		
Log.-per. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz		
	HL 562 Ultralog	830547/003	Rohde & Schwarz		
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz		
Standard Gain / Pyramidal Horn Antenna 26.5 GHz	Model 3160-09	9910-1184	EMCO		
Tilt device (Rohacell)	TD1.5-10kg	024/3790709	Maturo		

## EMI Test System

**Manufacturer** Rohde&Schwarz

**Hardware Version**

**Serial No.**

**Software Version** for EN 55022: ES-K1 Ver. 1.71 SP2

Equipment	Type	Serial No.	Manufacturer	Hardware	Software
EMI Analyzer	ESI 26	830482/004	Rohde & Schwarz	3.3	2.08
Signal Generator	SMR 20	846834/008	Rohde & Schwarz		
Spectrum Analyser	FSW43	103779	Rohde & Schwarz		

## EMS Conducted Test System

TS9986

**Manufacturer** Rohde & Schwarz

**Hardware Version**

**Serial No.**

**Software Version** EMS-K1 V1.20

Equipment	Type	Serial No.	Manufacturer	Hardware	Software
100-V Insertion Unit	URV5-Z4	829212/015	Rohde & Schwarz		
10-V Insertion Unit	URV5-Z2	829384/049	Rohde & Schwarz		
Attenuator, 20dB	10-A-MFN-20	9823	Biro		
Attenuator, 6dB	150-A-FFN-06	9851	Biro		
Cable CPPA1 (Amplifier to 'CDN')	RG214	W61.01+W51.01	Huber + Suhner		
Calibration Fixture	BCICF-4	126	FCC		
CDN 50 to 150 Ohm adapter	CR 100 A	143	Lüthi		
CDN-Adapter Short f. Calibration	1072.2358.00		Rohde & Schwarz		
Coaxial Resistor	100-T-FN	9915	Biro		
Coupling- Decoupling-Network	CDN 801-S1	1692	Lüthi		
	ENY41	100002	Rohde & Schwarz		
Coupling- Decoupling- Network (CDN01)	CDN 801-M2/M3	948	Lüthi		
Coupling- Decoupling- Network (CDN02)	CDN 801-M2/M3	1723	Lüthi		
Coupling- Decoupling- Network S1 150 kHz-230 MHz	S1	A4010039	Dr. Hubert		
Impedance Stabilization Network	ISN ST08	36292	Teseq		
	ISN T800	36159	Teseq		
	ISN T8-Cat6	32187	Teseq		
Passive Impedance Adapter	801-150-50-BCI	276	FCC		
	801-150-50-BCI	275	FCC		
Power Amplifier	BSA 0122-100	994618A	Bonn Elektronik		
RF Millivoltmeter	URV 5	828999/025	Rohde & Schwarz		
RF Current Clamp (BCI)	F-120-9A	127	FCC		
RF Current Probe (BCI)	F-52	68	FCC		
Signal Generator	SMY 01	829552/028	Rohde & Schwarz		
	SMY 02	829309/018	Rohde & Schwarz		

## EMS Radiated Test System

## TS9981

**Manufacturer** Rohde & Schwarz

**Hardware Version**

**Serial No.**

**Software Version** EMS-K1 V1.20

Equipment	Type	Serial No.	Manufacturer	Hardware	Software
E-Field Probe	RSS1006A/LPS1001 A	10I00037 SNO81	Dare!! Instruments		
E-Field Probe (for EMR-200)	Typ-8	N-0028	Wandel & Goltermann	8.2	3.00
EM Radiation Meter	EMR-200	R-0071	Wandel & Goltermann		
Horn Antenna	SH800	S0043	Satimo		
Load Resistor 50 Ohm	8141, 2.5 GHz, 250 W	11737	Bird		
Log.-per. Antenna	HL 046	337201/010	Rohde & Schwarz		
	HL 562 ULTRALOG	830547/003	Rohde & Schwarz		
Milli Voltmeter	URY	891852/084	Rohde & Schwarz		
Peak Power Sensor 50 Ohm	NRV-Z32	830914/014	Rohde & Schwarz		
	NRV-Z32	830914/013	Rohde & Schwarz		
Power Amplifier	BBA150 BC250	102404	Rohde & Schwarz		
	BBA150 D110E100	102445	Rohde & Schwarz		
	BLMA 1020-25	035360	Bonn		
	BLMA 2040-20	087106	Bonn		
	BLWA 0810-160/50	994618B	Bonn		
Power Sensor	NRV-Z1	836219/005	Rohde & Schwarz		
	NRV-Z1	832279/015	Rohde & Schwarz		
Powermeter	NRVS	831308/005	Rohde & Schwarz		
	NRVS	831308/007	Rohde & Schwarz		
Pulse Converter (for SMY02)	TS-CNV	338722/016	Rohde & Schwarz		
Signal Generator	SMB100A	107695	Rohde & Schwarz		
	SME03	836169/049	Rohde & Schwarz		
	SMP02	829076/017	Rohde & Schwarz		

## EMS Transient Test Simulator (ISO 7637-2)

## UCS 200-N

**Manufacturer** EM Test

**Hardware Version**

**Serial No.** see single devices

**Software Version** ISOCONTROL 5.3.1.0

Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Ultra-Compact Simulator for automotive pulses	UCS 200N50	P1404129963	EM Test		Firmware-No.: 000612, V 2.30a01
Voltage Drop Simulator for automotive pulses	VDS 200N10	P1338124613	EM Test		Firmware-No.: 000942, V 1.20a01

## EMS Transient Test System (IEC 61000-4-X)

## UCS 500-M

<b>Manufacturer</b>	EM Test		<b>Hardware Version</b>	none	
<b>Serial No.</b>	see single devices		<b>Software Version</b>	none	
<b>Equipment</b>	<b>Type</b>	<b>Serial No.</b>	<b>Manufacturer</b>	<b>Hardware</b>	<b>Software</b>
Capacitive coupling clamp	HFK				
Coupling network EMC Competence Center Dsseldorf	CNV 508	7A-00231	EM Test		
ESD Generator + Network DM1	emtest dito + DM1	Dito: P1749209951, DM1: P1750211604	AMETEK CTS GmbH (Switzerland)		Firmware 2.31
ESD Gun	P 18	0499-40	EM Test		
Multi-Tester	UCS-500 M4	0499-40	EM Test	V 1.30	SWN 001284
Single-phase transformer	V 4070	C99380	EM Test		
	V 4780 S2	0207-24	EM Test		
Surge-Generator EMC Competence Center Dsseldorf	PSurge 4010	7A-00138	Haefely Trench		

## EUT Audio Monitoring System

<b>Manufacturer</b>			<b>Hardware Version</b>		
<b>Serial No.</b>			<b>Software Version</b>		
<b>Equipment</b>	<b>Type</b>	<b>Serial No.</b>	<b>Manufacturer</b>	<b>Hardware</b>	<b>Software</b>
Audio Analyzer	UPL	830768/015	Rohde & Schwarz	B6, B8, B10	2.01
Dual Microphone Supply	5935	2102432	Brüel & Kjær		
Microphone	4134	2123631	Brüel & Kjær		
Microphone Preamplifiers	2669	2152256	Brüel & Kjær		



## EUT Digital Signalling System

Manufacturer			Hardware Version		
Serial No.			Software Version		
Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Bluetooth Signalling Unit	CBT	100589	Rohde & Schwarz	B55 FPGA Digital: V2.30 FPGA RF: V3.00	CBT V4.61
	CBT (1153.9000.35)	100302	Rohde & Schwarz	B55 FPGA Digital: V2.24 FPGA RF: V3.00	CBT V4.40
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz	B4, B41, B5, B6, B61, B19	3.55
GNSS / Broadcast Signalling Unit	SMBV100A	26001	Rohde & Schwarz	RF-Board: 02.29, Vector Board 09.05	FW 3.01.130.48
GPS Signalling Unit	SMU200A	100912	Rohde & Schwarz	MB: 07.05, FMR: 50.00	FW 02.05.269.77
Signalling Unit for Bluetooth Spurious Emissions	PTW60	100004	Rohde & Schwarz		5.40
Universal Radio Communication Tester	CMU 200	837983/052	Rohde & Schwarz	B11, B21v14, B21/2, B41, B52v14, B52/2, B53/2, B54v14, B56v14, B66, B68v3.04, B95	SW: V4.21 FW µP1: v8.50
	CMU 200	102366	Rohde & Schwarz	B11, B21v14, B21/2, B41, B52v14, B52/2, B53/2, B56v14, B66, B68v3.04	SW: V4.21 / 4.50 FW µP1: v8.50
	CMW500	149268	Rohde & Schwarz		
	CMW500	107500	Rohde & Schwarz		

## Harmonics / Flicker Test System

-

Manufacturer			Hardware Version		
Serial No.			Software Version		
Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Flickermeter/Harmonic Analyser	B10	M7095	Spitzenberger & Spies		
Line Impedance Simulation System	-	B6279	Spitzenberger & Spies		
Power Amplifier	EP 1200B	B6278	Spitzenberger & Spies		
Variable Oscillator	NA / BI	B6278	Spitzenberger & Spies		

## Power Magnetic Field

-

**Manufacturer** -

**Hardware Version**

**Serial No.** -

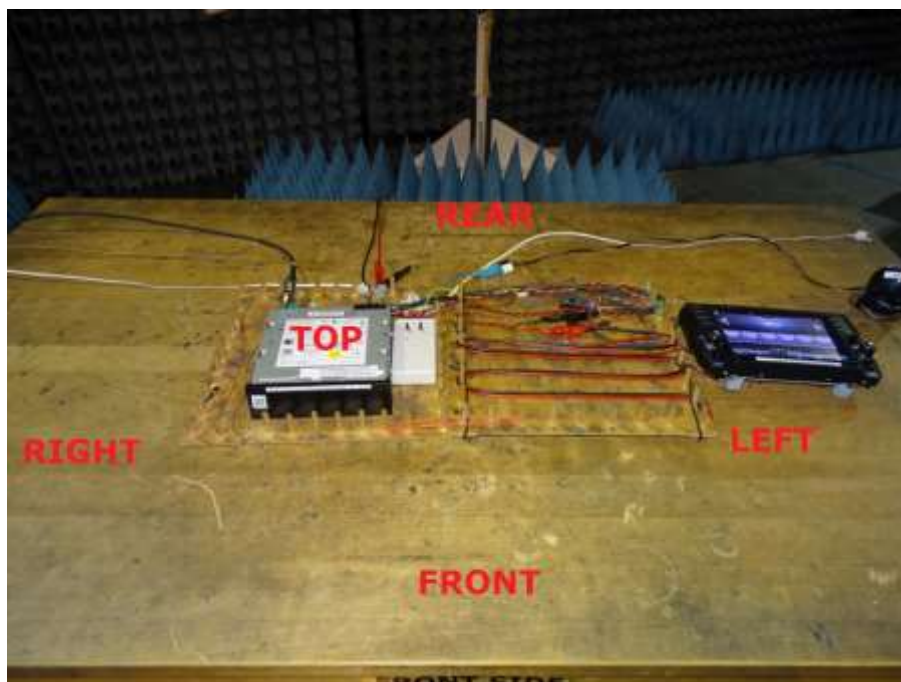
**Software Version**

Equipment	Type	Serial No.	Manufacturer	Hardware	Software
Current Source	EP 1200/B	B6278	Spitzenberger & Spies		
Current Transformer	MC 2630	P1534163031	EM Test (Switzerland) GmbH		
Inductive Coil	Standard Square Coil 1m X 1m, 1 turn	1	7layers GmbH - Richwol		
True RMS Clampmeter	Fluke 325	31270091WS	Fluke		
Variable Oscillator	NA/BI	B6278	Spitzenberger & Spies		

## 5. Photo Report



Picture 1 : setup for the test "RF-electromagnetic field"



Picture 2 : setup for the test "RF-electromagnetic field", detailed view



**Picture 3 : setup for the test "Radiated Interference Field Strength", 30 MHz to 6000 MHz**



**Picture 4 : setup for the test "Conducted interference voltage"**



**Picture 5** : setup for the test "Conducted interference voltage"



**Picture 6** : setup for the test "ESD Air Discharge"



Diagram 1.01

Common Information

Test Description:Conducted Emissions

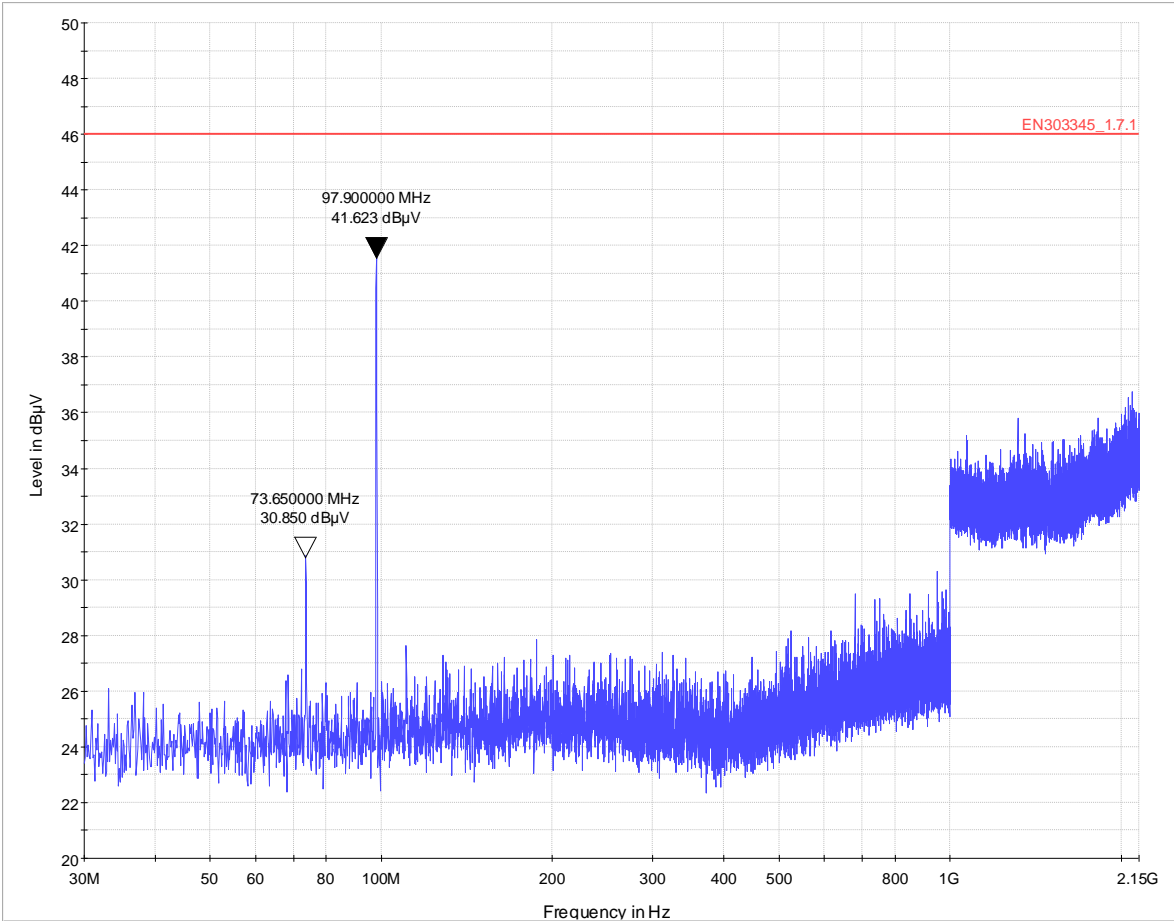
Test Standard:EN55032 Class B

EUT / Setup Code:DE1288000aj01

Operating Conditions:FM 98MHz, 1kHz sine

Operator Name:SCH

Comment:Tested in Radiolab



Final\_Result

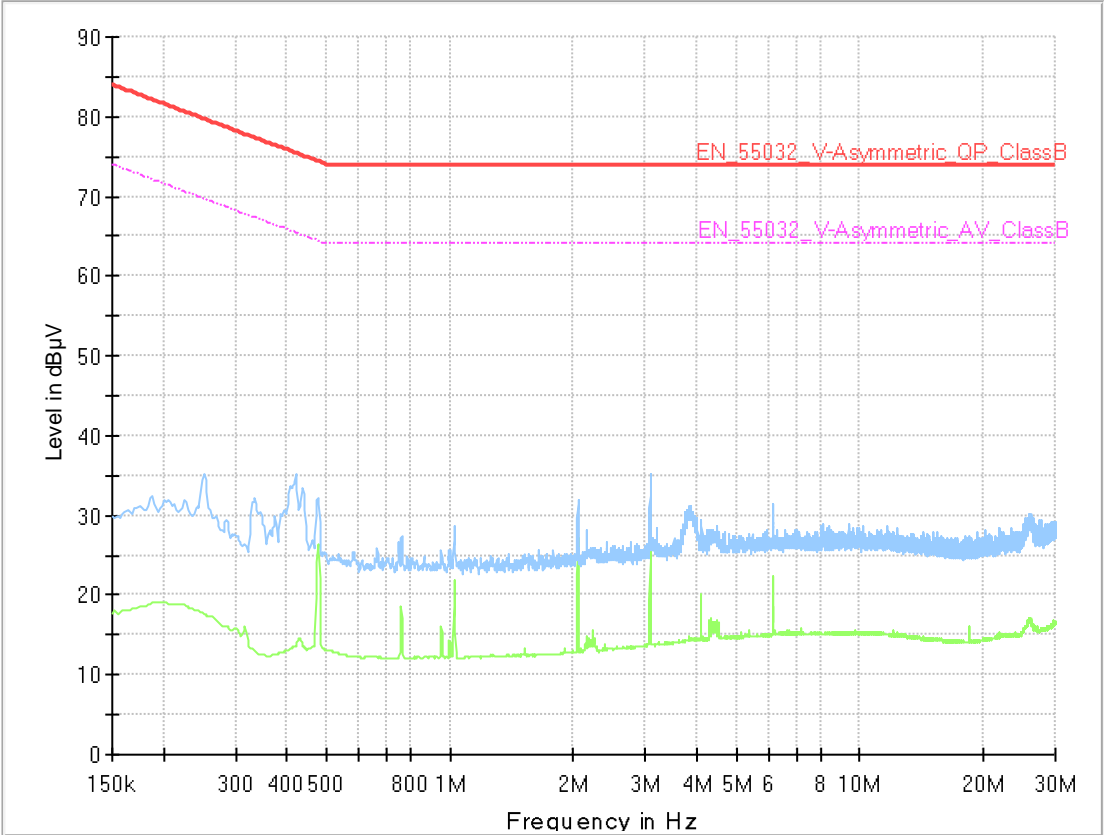
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Comment
---	---	---	---	---	---	---	---	---	---

Diagram 1.02

Common Information

Test Description:  
Test Standard:  
EUT / Setup Code:  
Operating Conditions:  
Operator Name:  
Comment:  
Legend:

Conducted Emissions  
EN55032 Class B  
DE1288000aj01  
AM 999kHz, 1kHz sine  
MER  
powered 13 V DC  
Curve: blue = PK, green = AV



Final\_Result

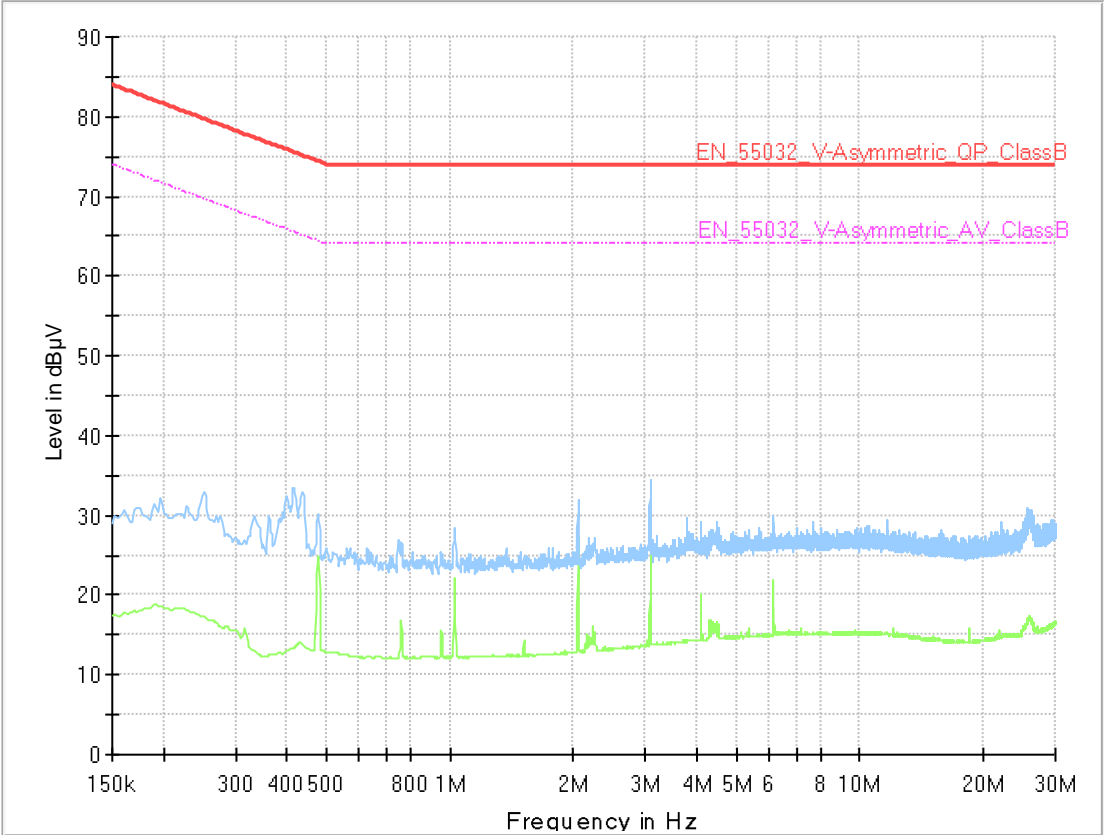
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Comm ent

Diagram 1.03

Common Information

Test Description:  
Test Standard:  
EUT / Setup Code:  
Operating Conditions:  
Operator Name:  
Comment:  
Legend:

Conducted Emissions  
EN55032 Class B  
DE1288000aj01  
DAB 202.928MHz  
SAL  
powered 13 V DC  
Curve: blue = PK, green = AV



Final\_Result

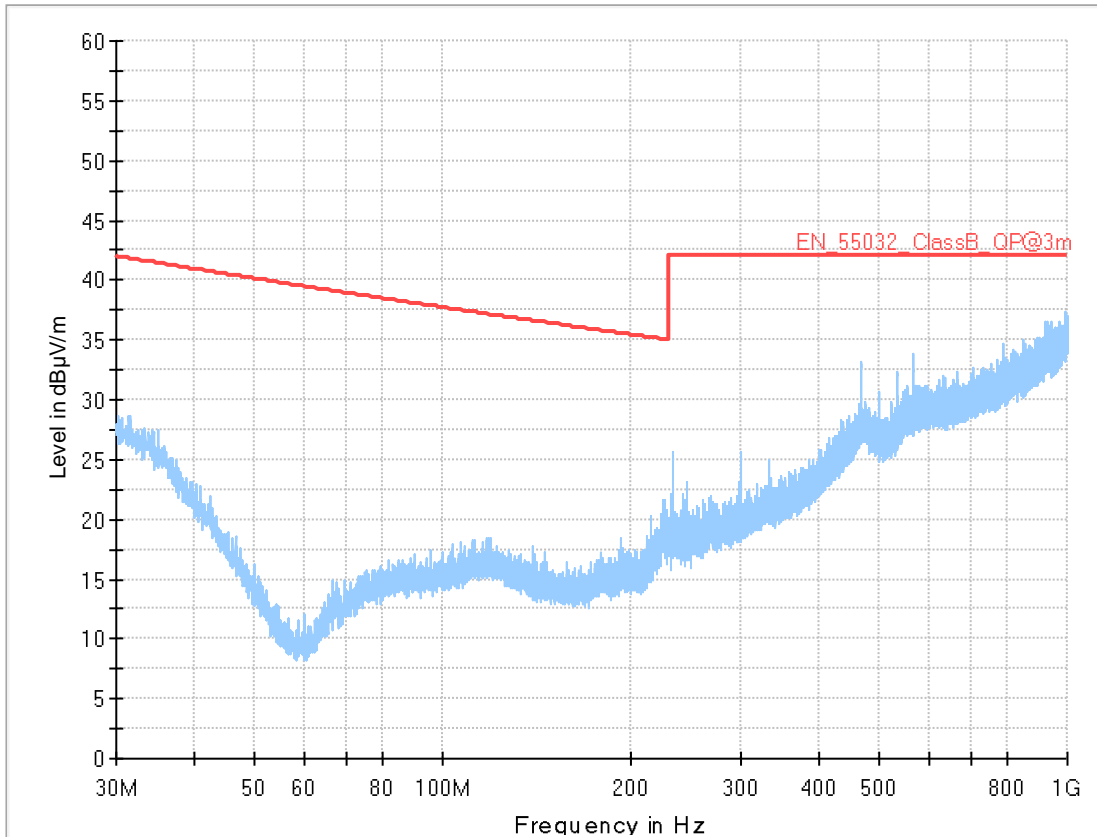
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Comm ent



## Diagram 2.01

### Common Information

Test Description:	Radiated Emissions in FAR at 3 m
Standard:	EN55032 Class B
EUT:	DE1288000aj01
Operating Conditions:	AM MF; 999 kHz; 1 kHz AF; Volume: 50 %
Operator Name:	ASO
Comment:	powered 12 V DC
Legend:	Curve: blue = PK, Star = critical freq., Rhombus: blue = final QP



### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---	---	---

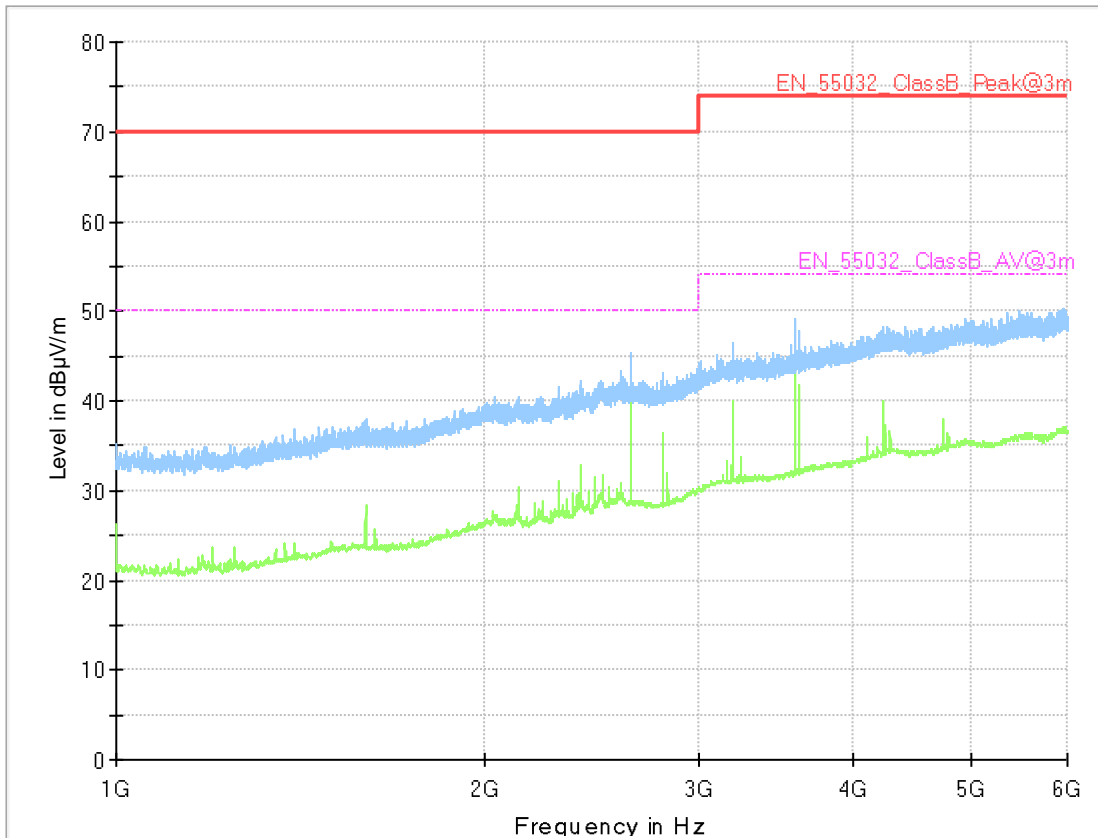
### Final\_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---	---	---

## Diagram 2.02

### Common Information

Test Description:	Radiated Emissions 1-6 GHz in FAR at 3 m
Standard:	EN55032 Class B
EUT:	DE1288000aj01
Operating Conditions:	AM MF; 999 kHz; 1 kHz AF; Volume: 50 %
Operator Name:	ASO
Comment:	powered 12 V DC
Legend:	Curve: blue = PK, green = AV, Star = critical freq., Rhombus: blue = final PK, green = final CAV



### Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---		---	---

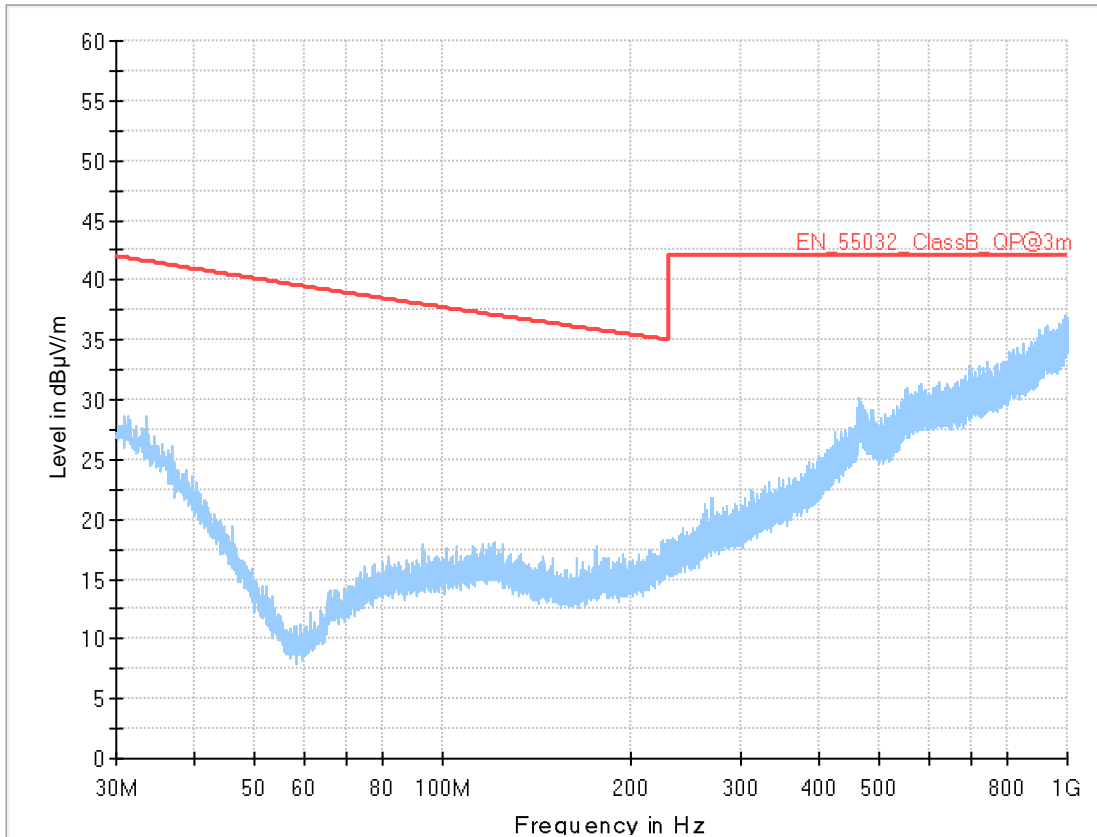
### Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---		---	---

## Diagram 2.03

### Common Information

Test Description:	Radiated Emissions in FAR at 3 m
Standard:	EN55032 Class B
EUT:	DE1288000aj01
Operating Conditions:	FM; 98 MHz; 1 kHz AF; Volume: 50 %
Operator Name:	ASO
Comment:	powered 12 V DC
Legend:	Curve: blue = PK, Star = critical freq., Rhombus: blue = final QP



### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---		---	---

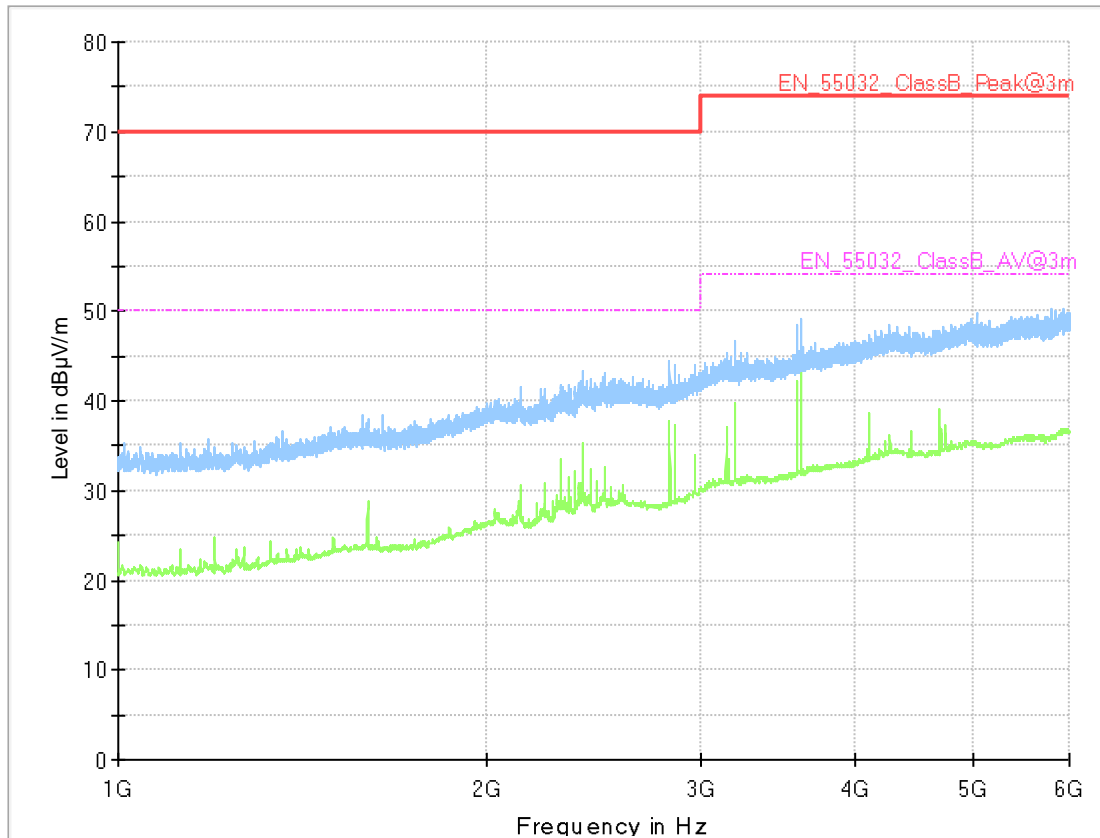
### Final\_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---		---	---

## Diagram 2.04

### Common Information

Test Description:	Radiated Emissions 1-6 GHz in FAR at 3 m
Standard:	EN55032 Class B
EUT:	DE1288000aj01
Operating Conditions:	FM; 98 MHz; 1 kHz AF; Volume: 50 %
Operator Name:	ASO
Comment:	powered 12 V DC
Legend:	Curve: blue = PK, green = AV, Star = critical freq., Rhombus: blue = final PK, green = final CAV



### Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---		---	---

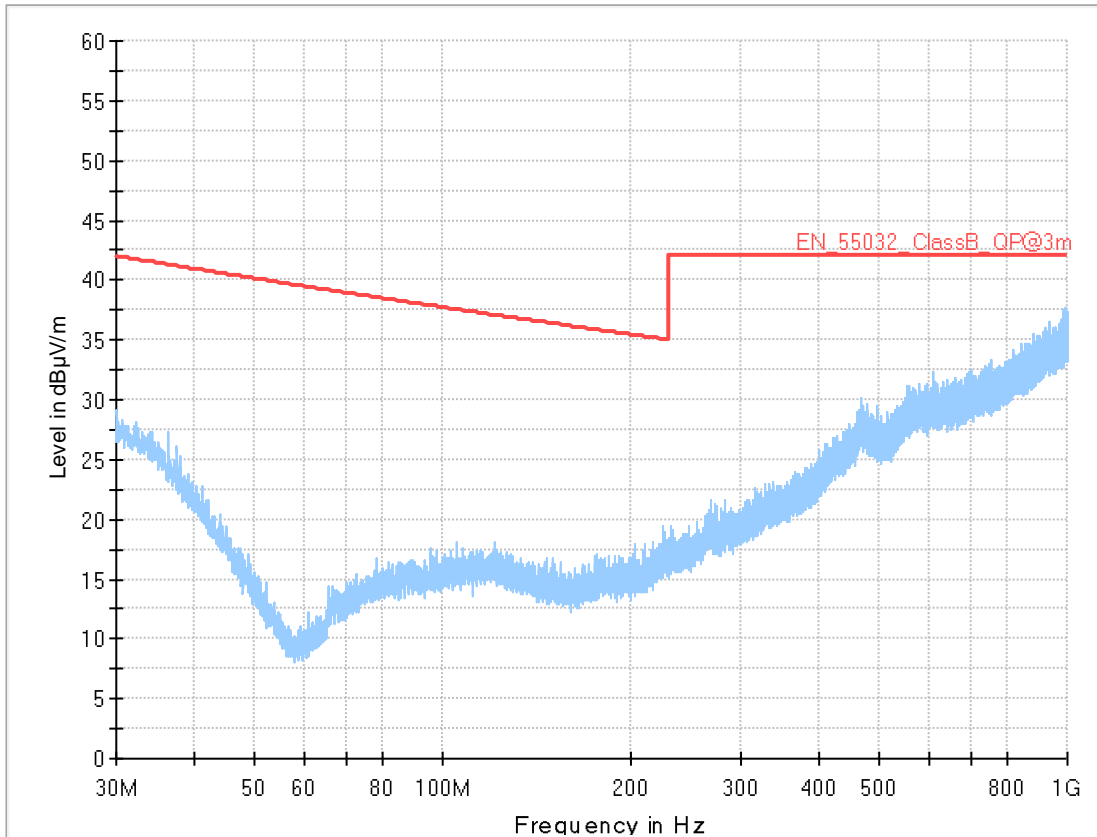
### Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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## Diagram 2.05

### Common Information

Test Description:	Radiated Emissions in FAR at 3 m
Standard:	EN55032 Class B
EUT:	DE1288000aj01
Operating Conditions:	DAB; 202.928 MHz; 1 kHz AF; 64 kbps; Volume: 50 %
Operator Name:	ASO
Comment:	powered 12 V DC
Legend:	Curve: blue = PK, Star = critical freq., Rhombus: blue = final QP



### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---	---	---

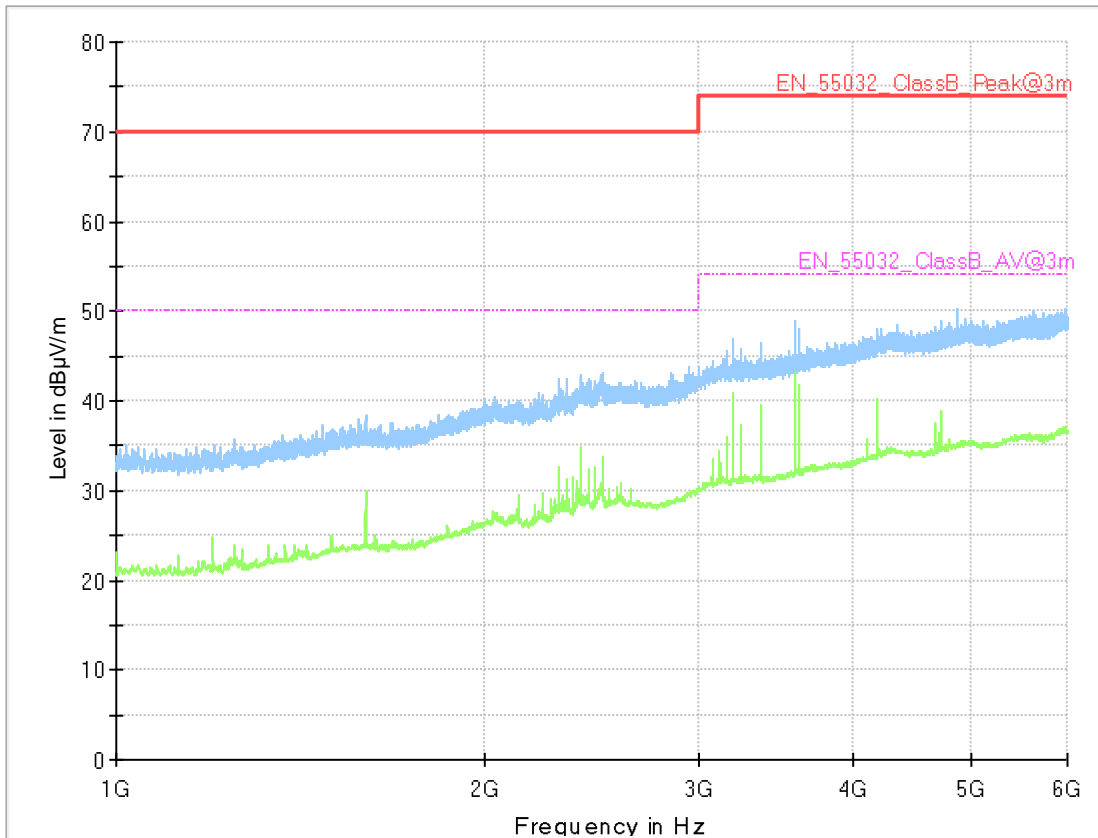
### Final\_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---	---	---

## Diagram 2.06

### Common Information

Test Description: Radiated Emissions 1-6 GHz in FAR at 3 m  
 Standard: EN55032 Class B  
 EUT: DE1288000aj01  
 Operating Conditions: DAB; 202.928 MHz; 1 kHz AF; 64 kbps; Volume: 50%  
 Operator Name: ASO  
 Comment: powered 12 V DC  
 Legend: Curve: blue = PK, green = AV, Star = critical freq., Rhombus: blue = final PK, green = final CAV



### Critical Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---		---	---

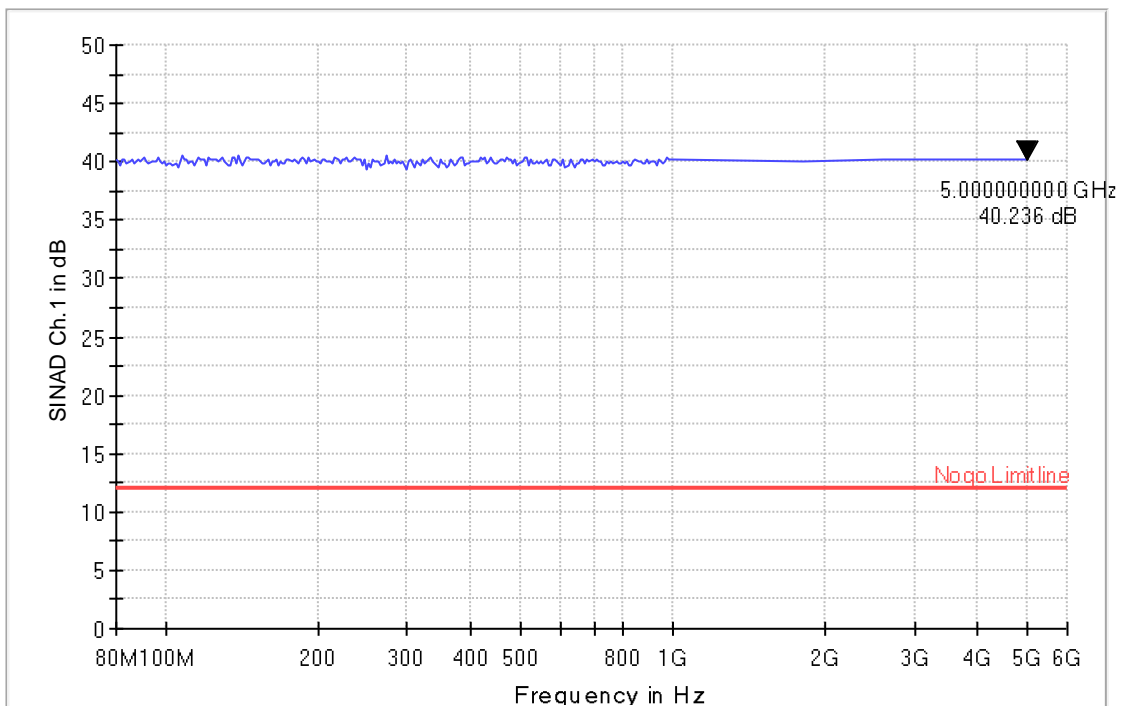
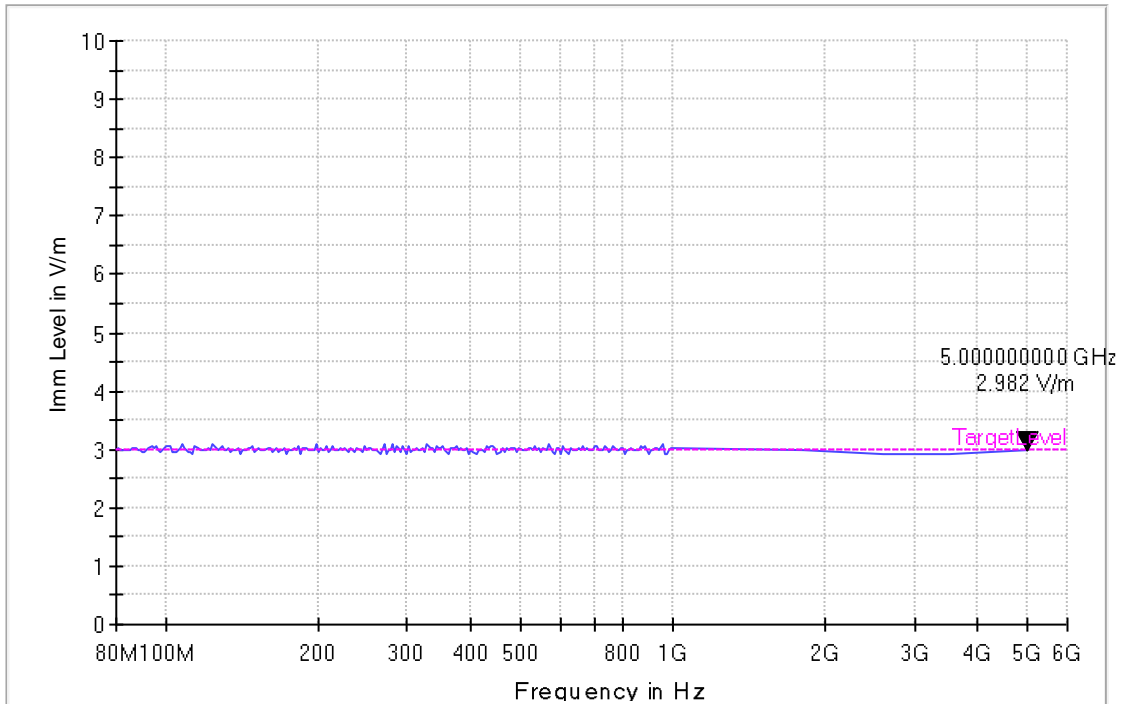
### Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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## Diagram 03-01

### Common Information

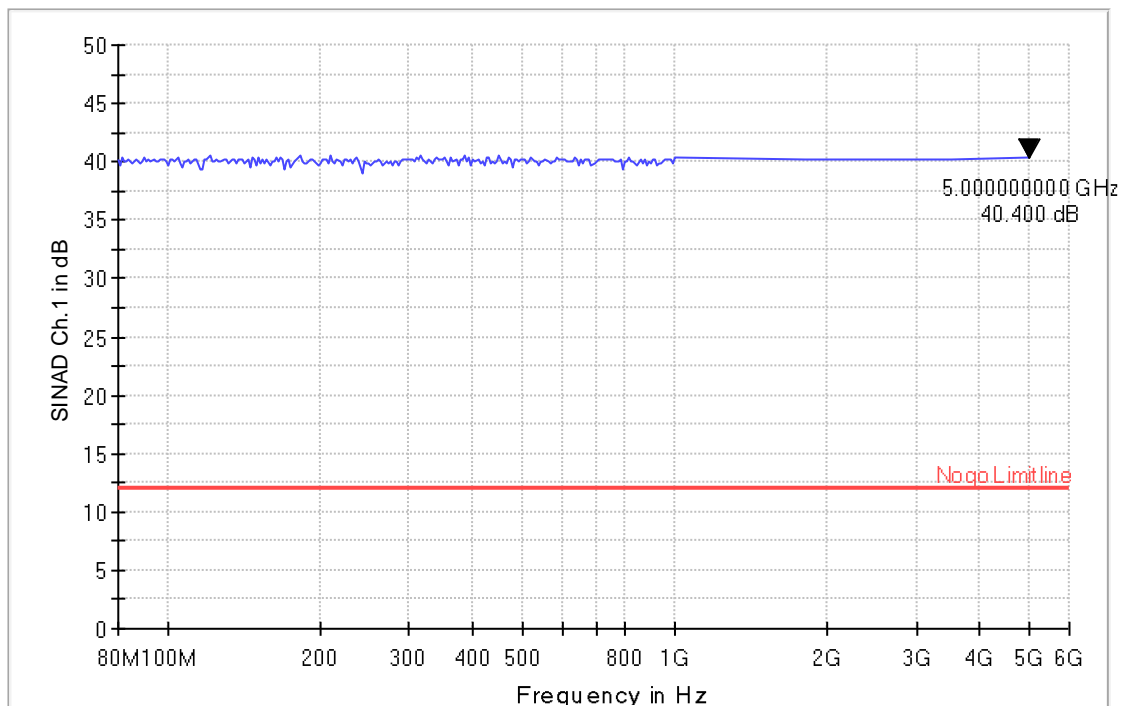
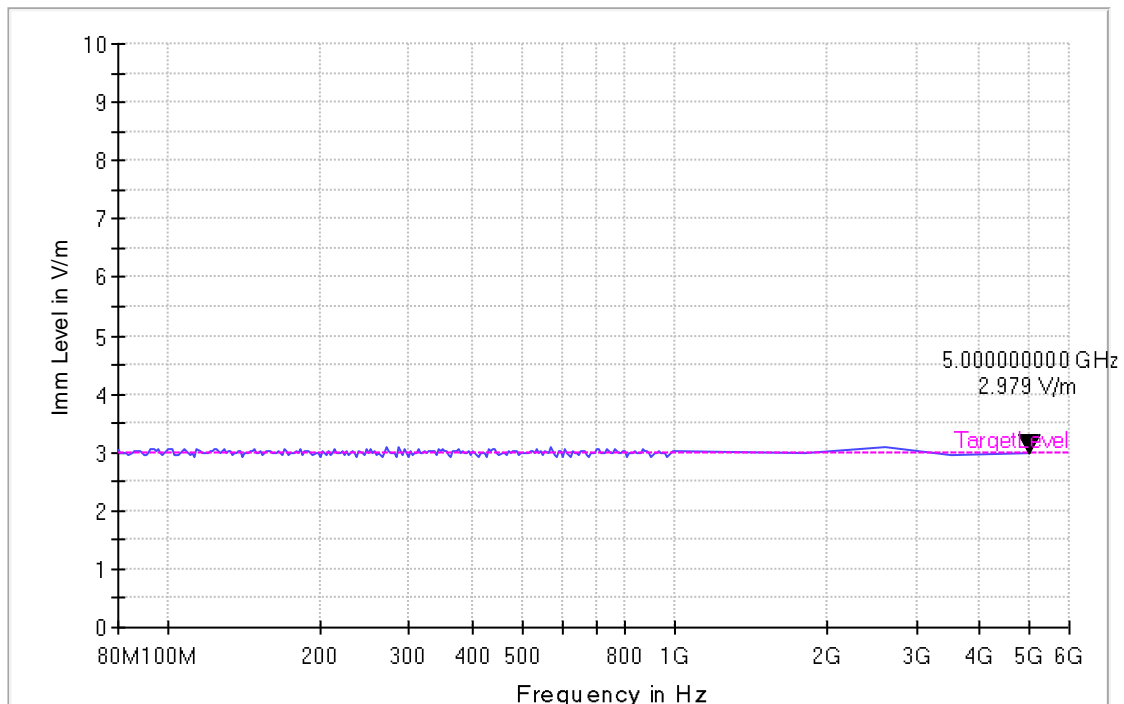
Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	AM-MF 999 kHz, 400 Hz sine @ AM/FM Port
Operator Name:	URO
Comment:	front side, EUT horizontal, antenna horizontal



## Diagram 03-02

### Common Information

Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	AM-MF 999 kHz, 400 Hz sine @ AM/FM Port
Operator Name:	URO
Comment:	left side, EUT horizontal, antenna horizontal

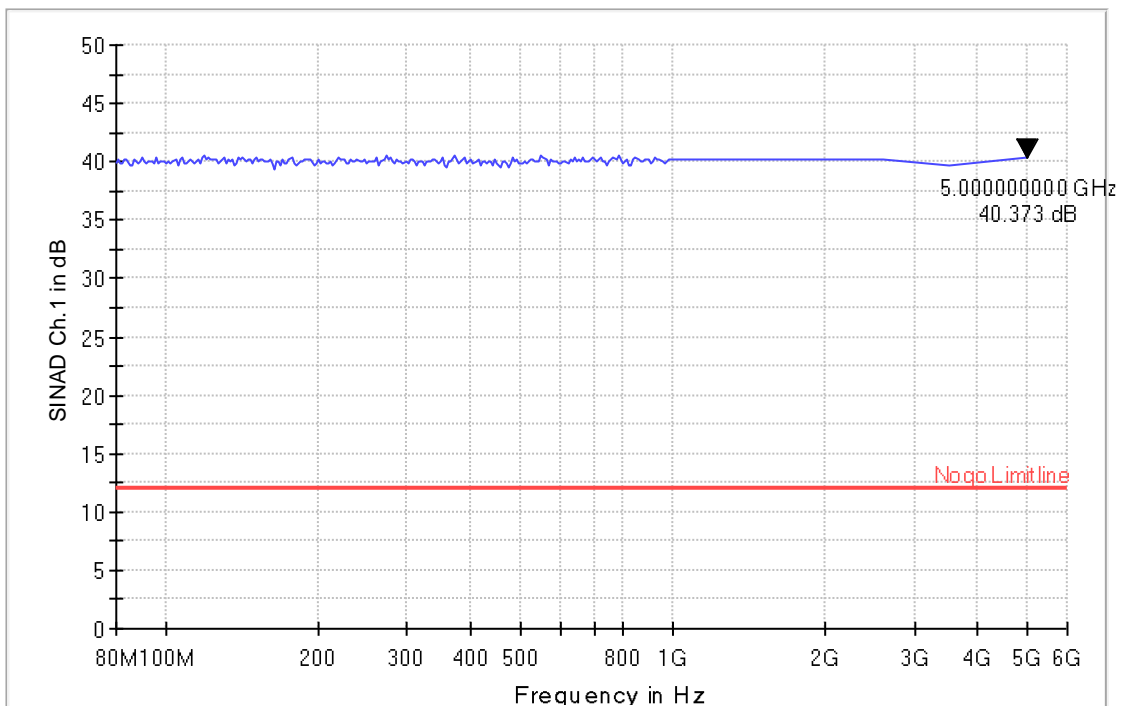
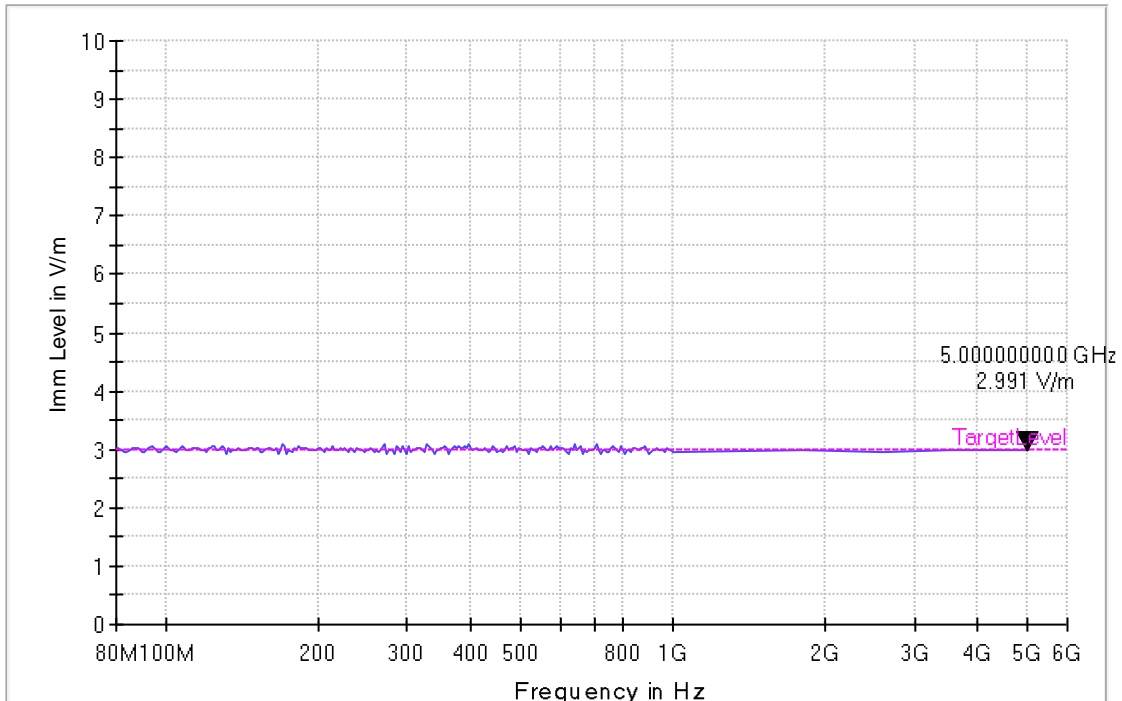




## Diagram 03-03

### Common Information

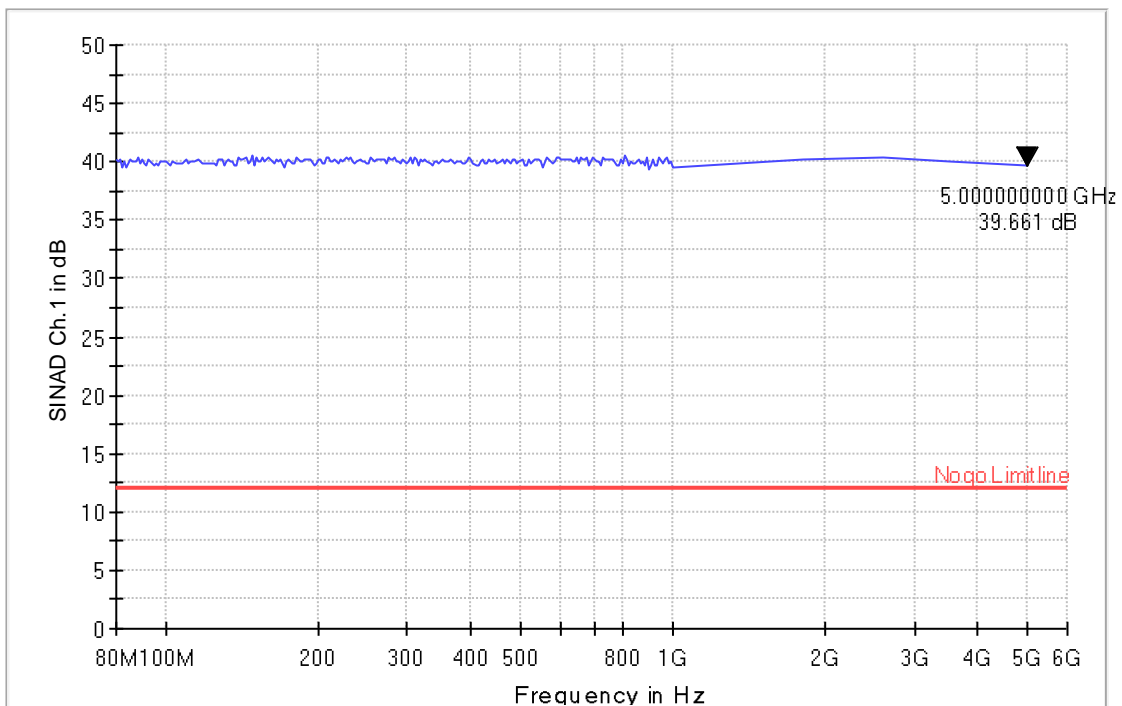
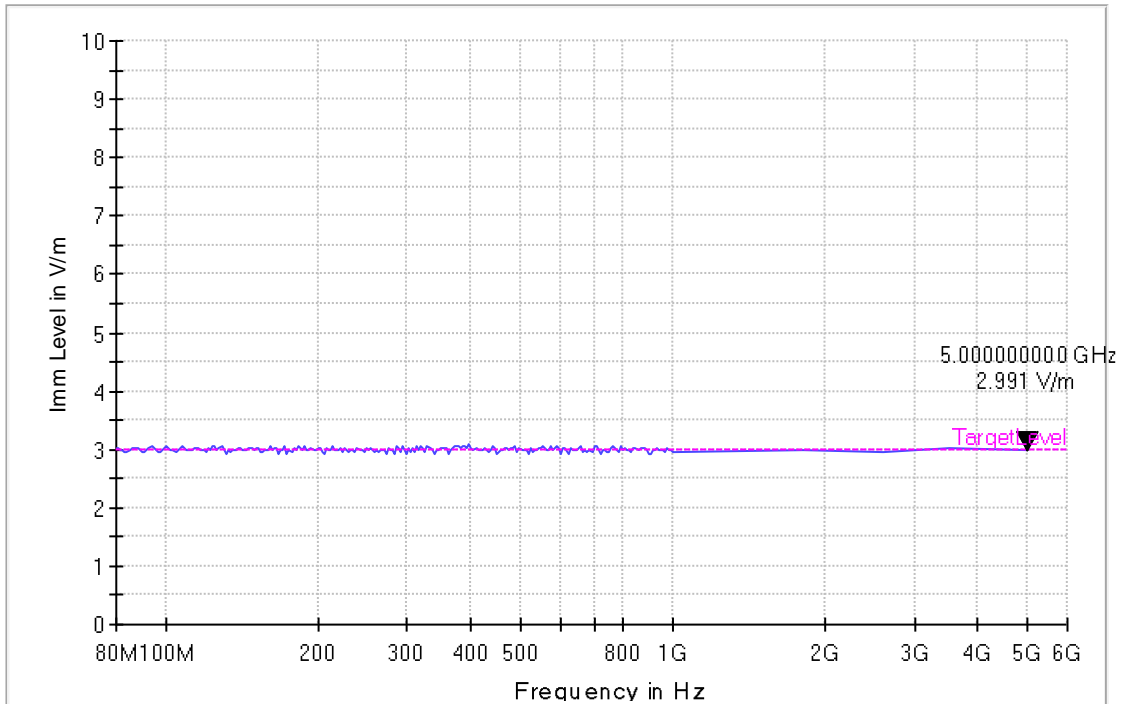
Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	AM-MF 999 kHz, 400 Hz sine @ AM/FM Port
Operator Name:	URO
Comment:	rear side, EUT horizontal, antenna vertical



## Diagram 03-04

### Common Information

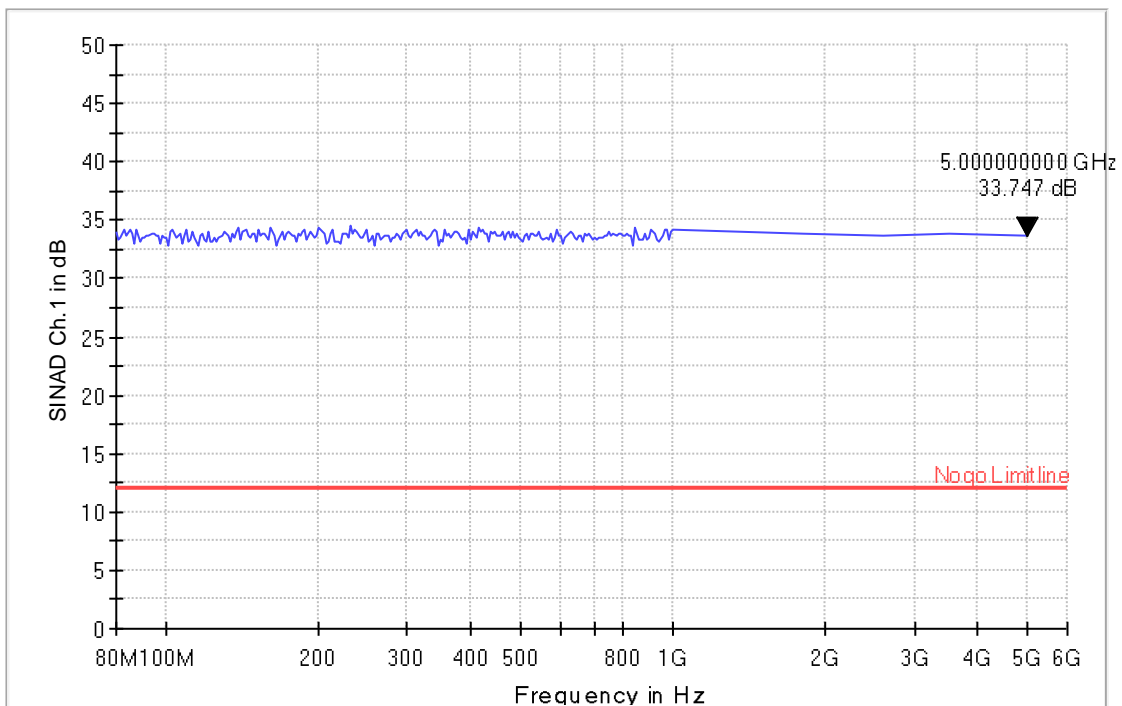
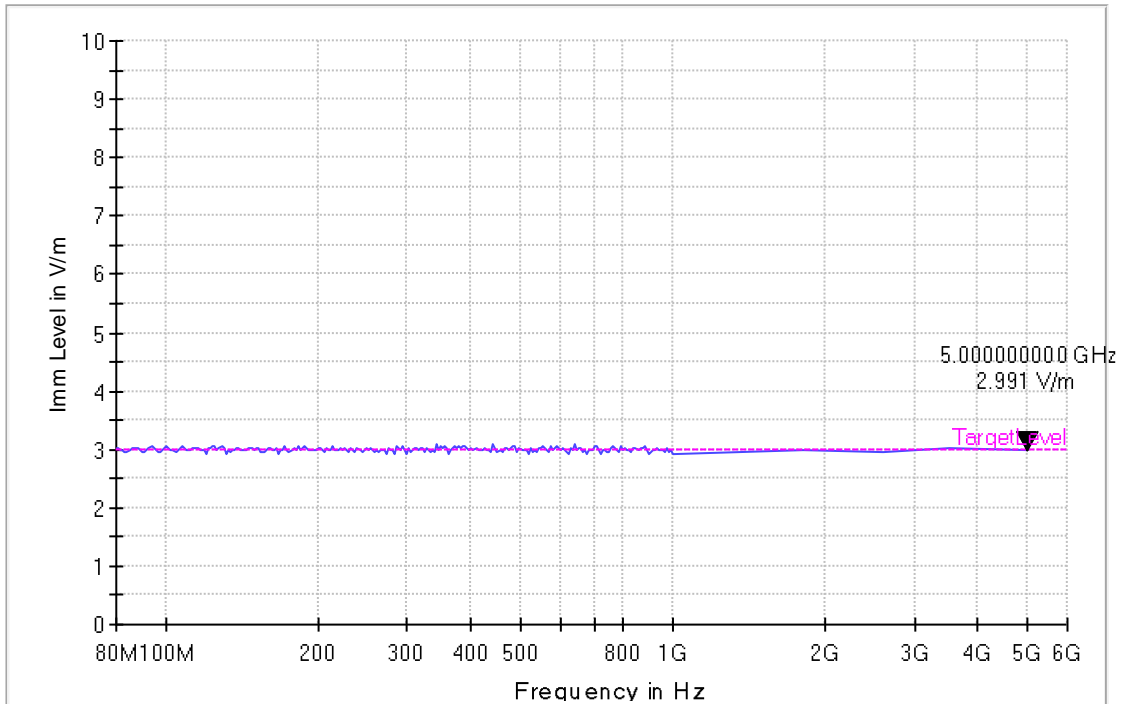
Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	AM-MF 999 kHz, 400 Hz sine @ AM/FM Port
Operator Name:	URO
Comment:	bottom side, EUT vertical, antenna vertical



## Diagram 03-05

### Common Information

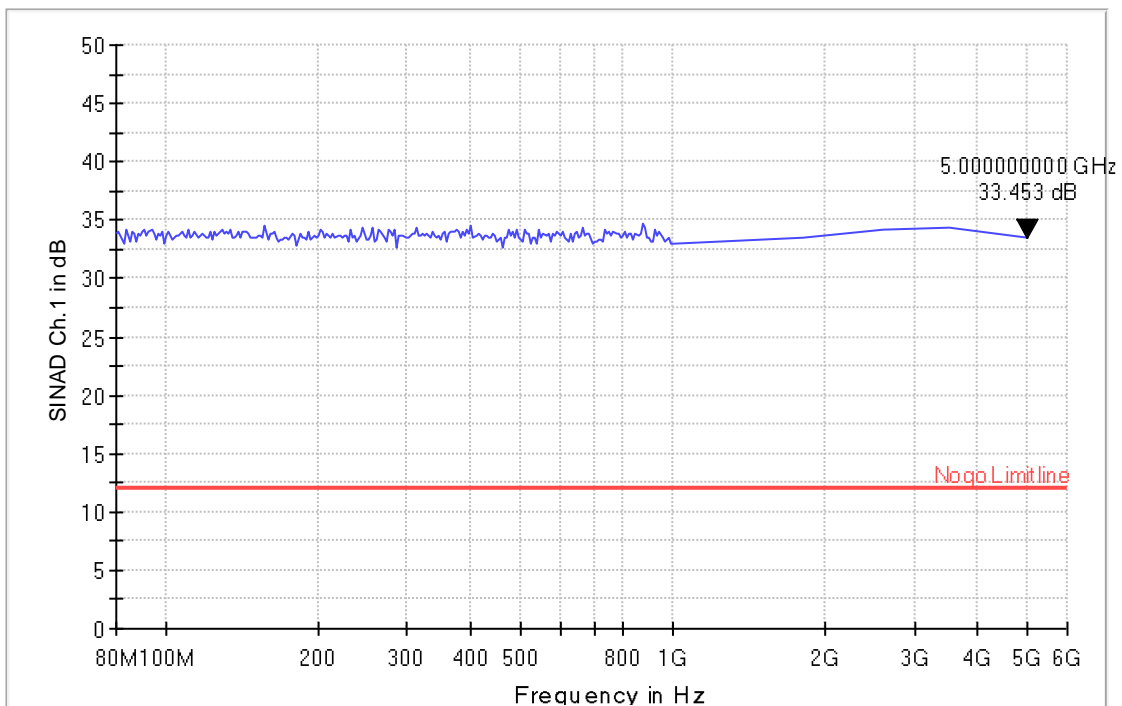
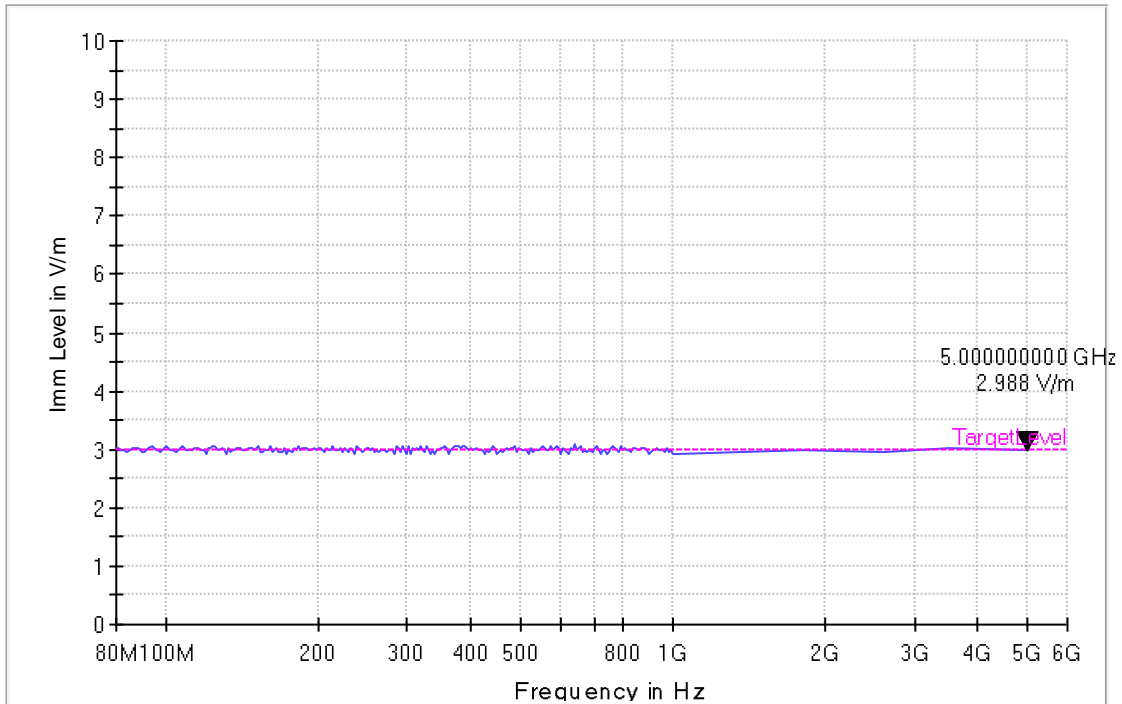
Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	FM 98 MHz, 400 Hz sine @ AM/FM Port
Operator Name:	URO
Comment:	front side, EUT horizontal, antenna vertical



## Diagram 03-06

### Common Information

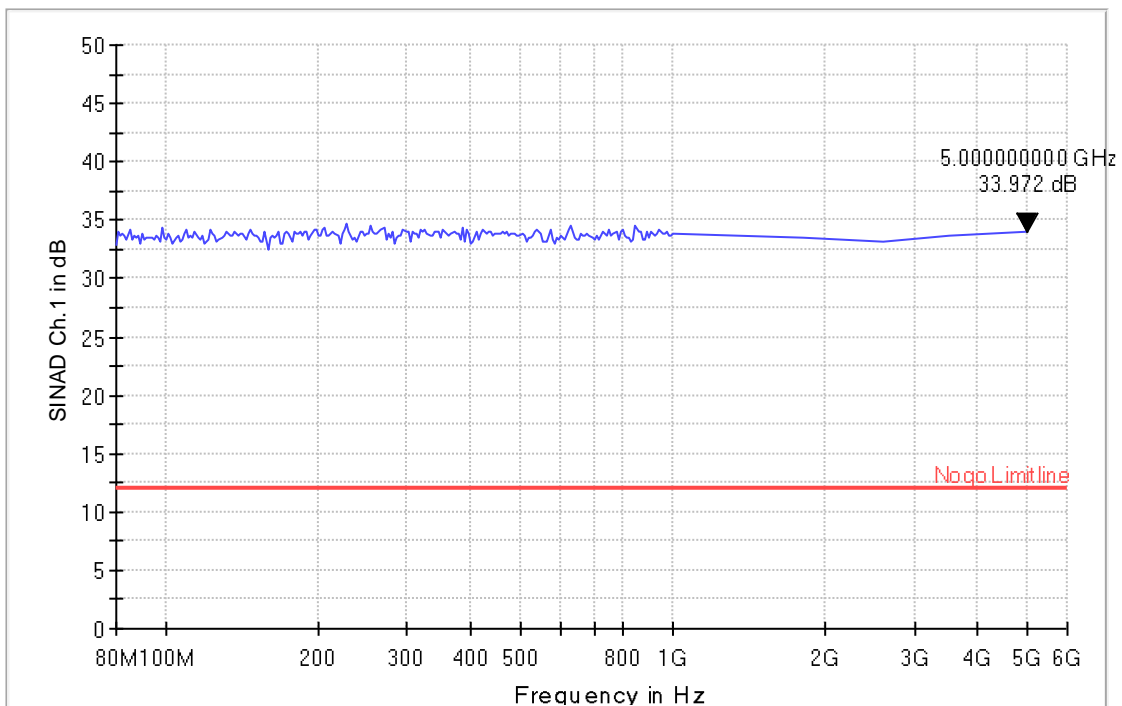
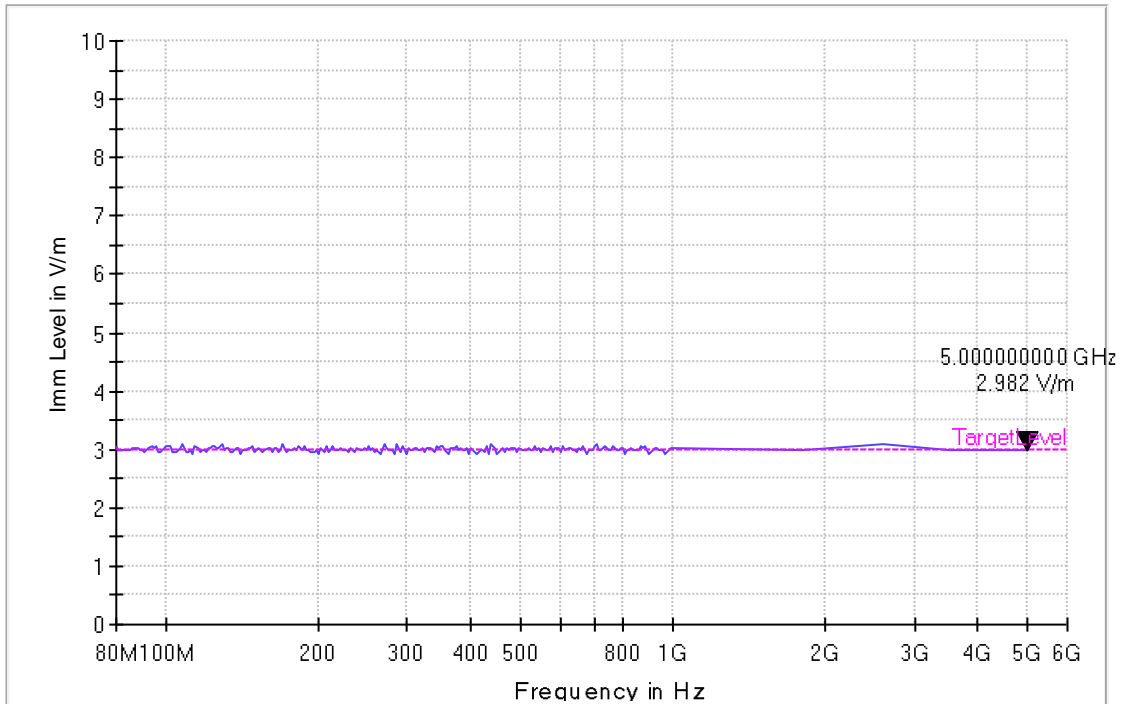
Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	FM 98 MHz, 400 Hz sine @ AM/FM Port
Operator Name:	URO
Comment:	left side, EUT horizontal, antenna vertical



## Diagram 03-07

### Common Information

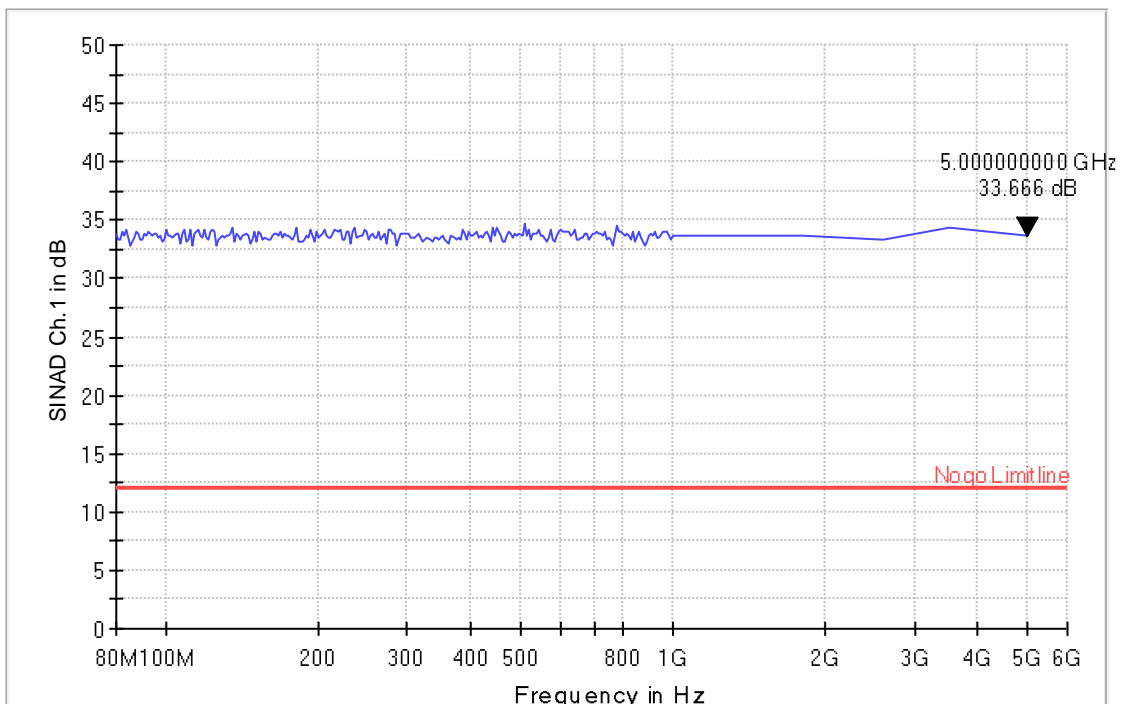
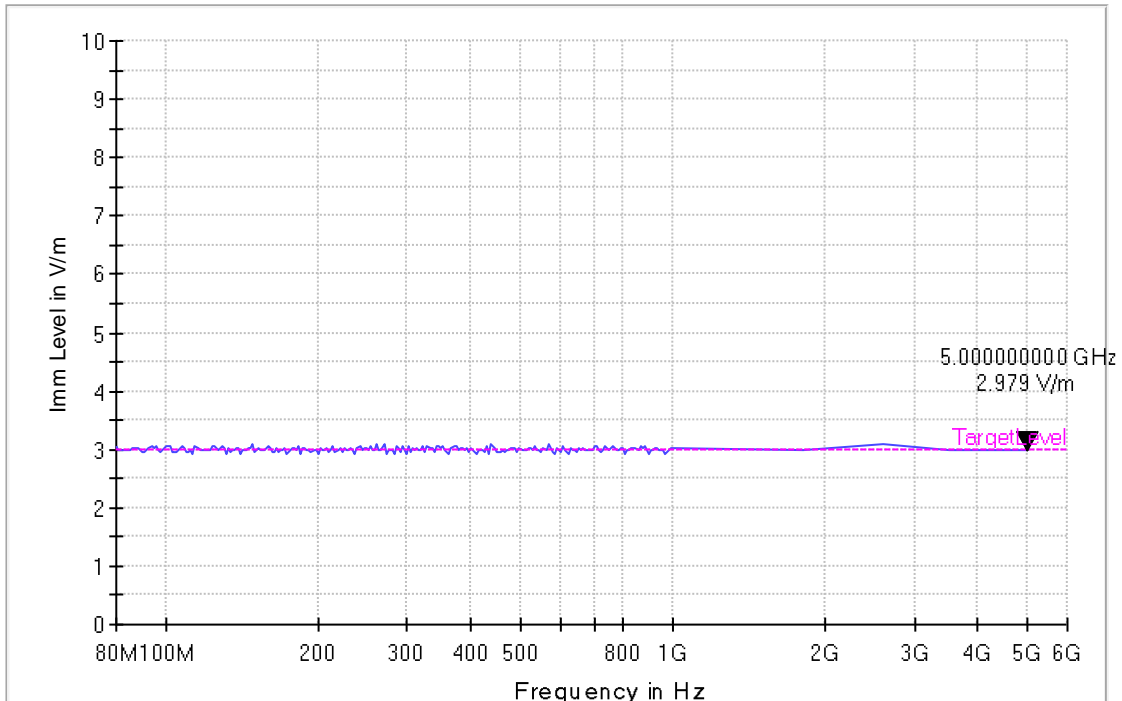
Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	FM 98 MHz, 400 Hz sine @ AM/FM Port
Operator Name:	URO
Comment:	right side, EUT horizontal, antenna horizontal



## Diagram 03-08

### Common Information

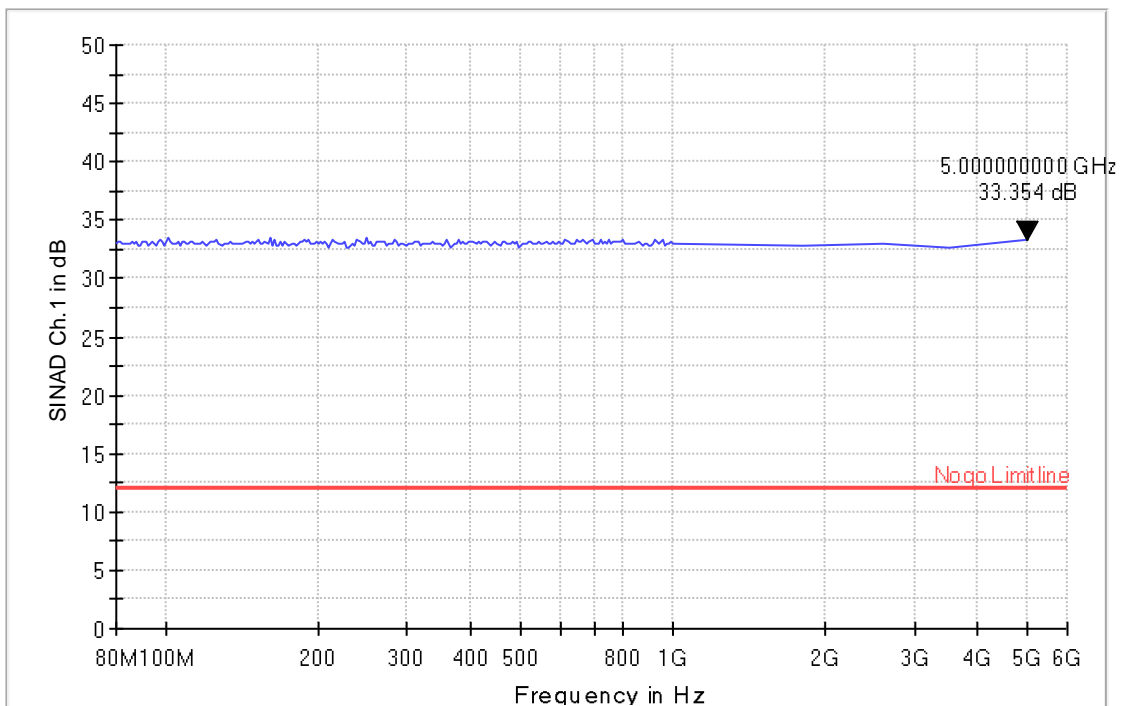
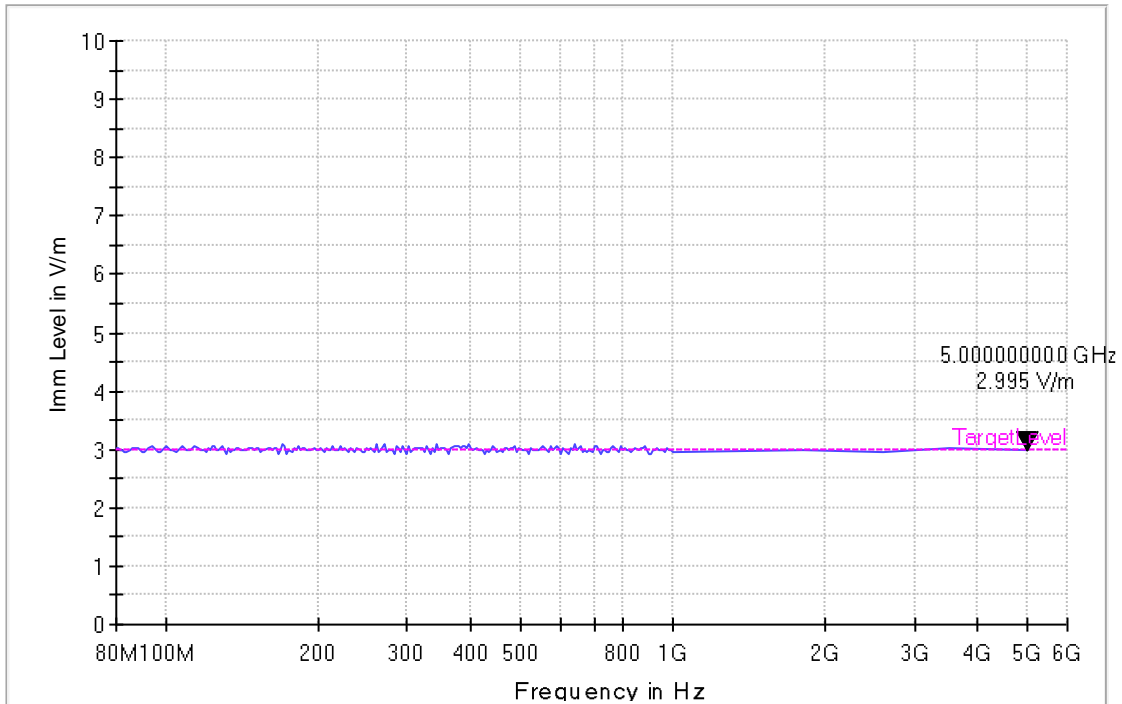
Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	FM 98 MHz, 400 Hz sine @ AM/FM Port
Operator Name:	URO
Comment:	top side, EUT vertical, antenna horizontal



## Diagram 03-09

### Common Information

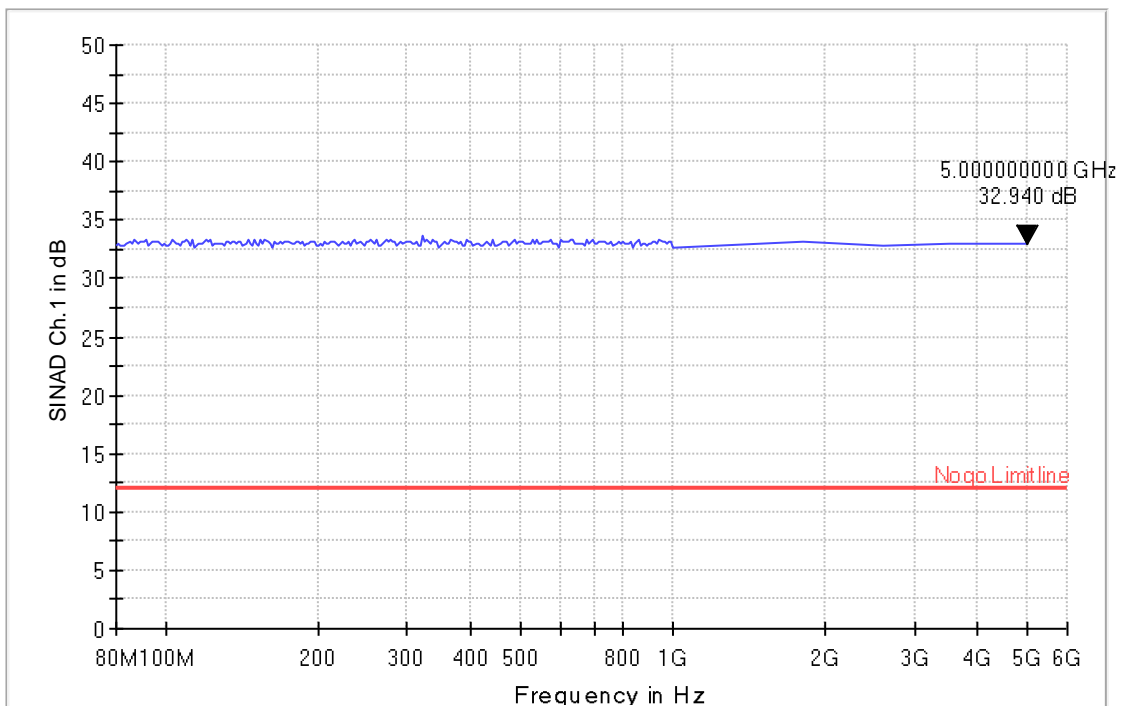
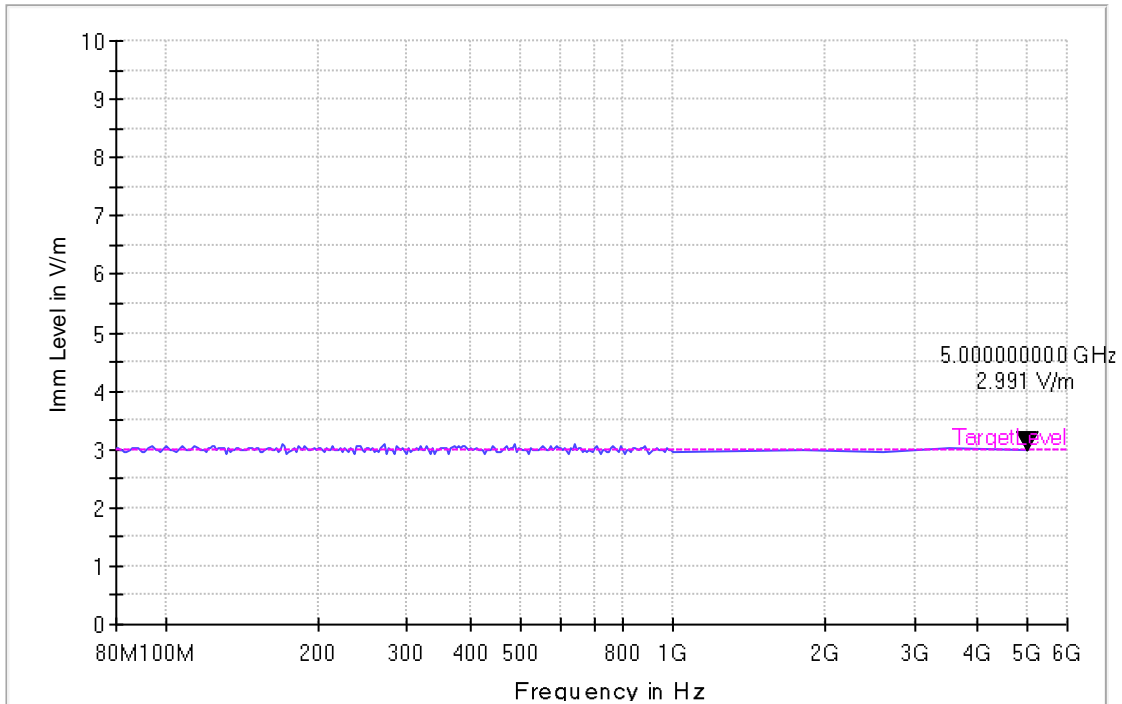
Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	DAB 202.928 MHz, 440 Hz sine @ DAB Port
Operator Name:	URO
Comment:	rear side, EUT horizontal, antenna horizontal



## Diagram 03-10

### Common Information

Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	DAB 202.928 MHz, 440 Hz sine @ DAB Port
Operator Name:	URO
Comment:	right side, EUT horizontal, antenna vertical

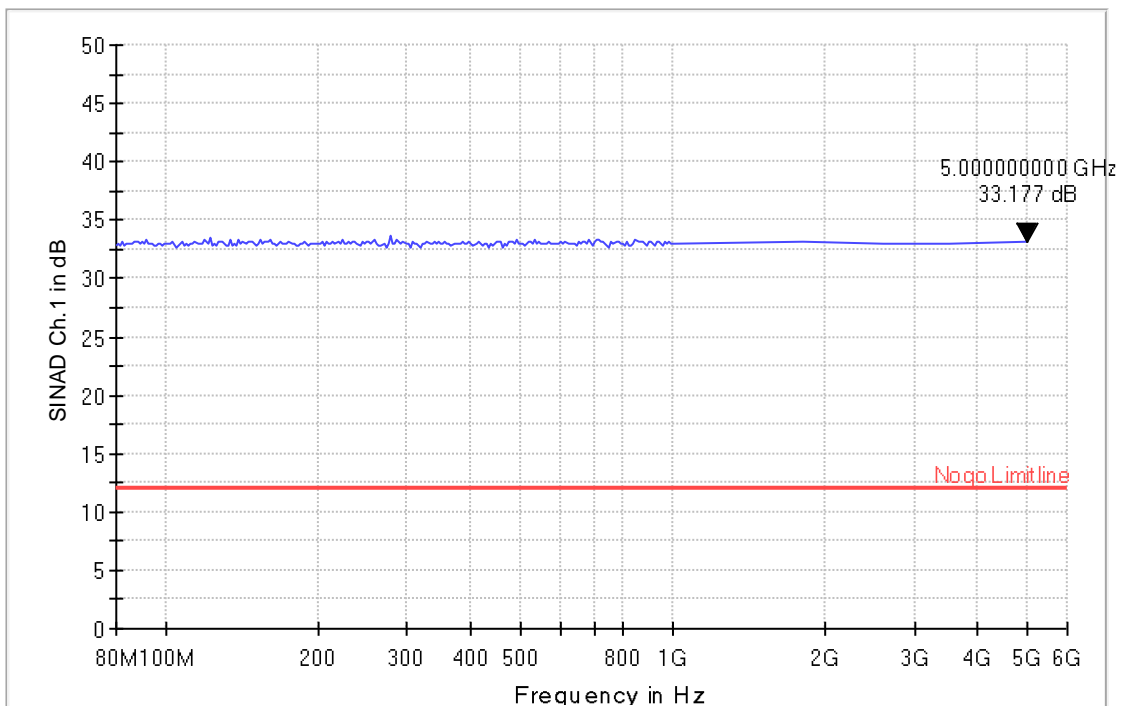
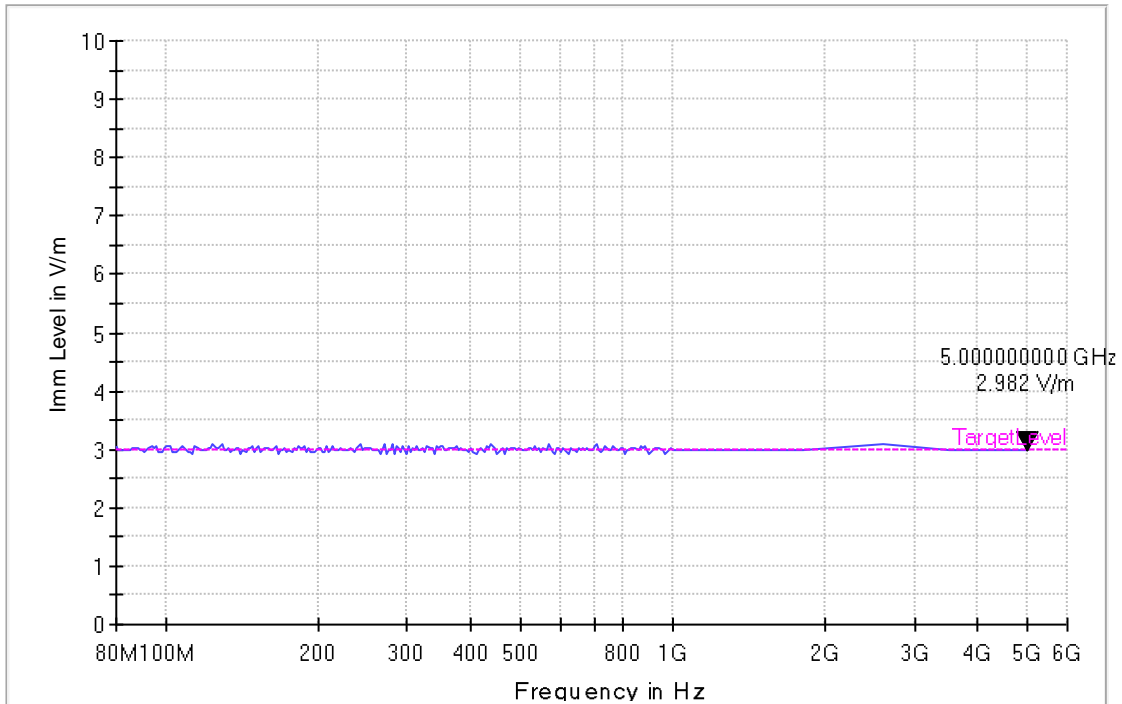




## Diagram 03-11

### Common Information

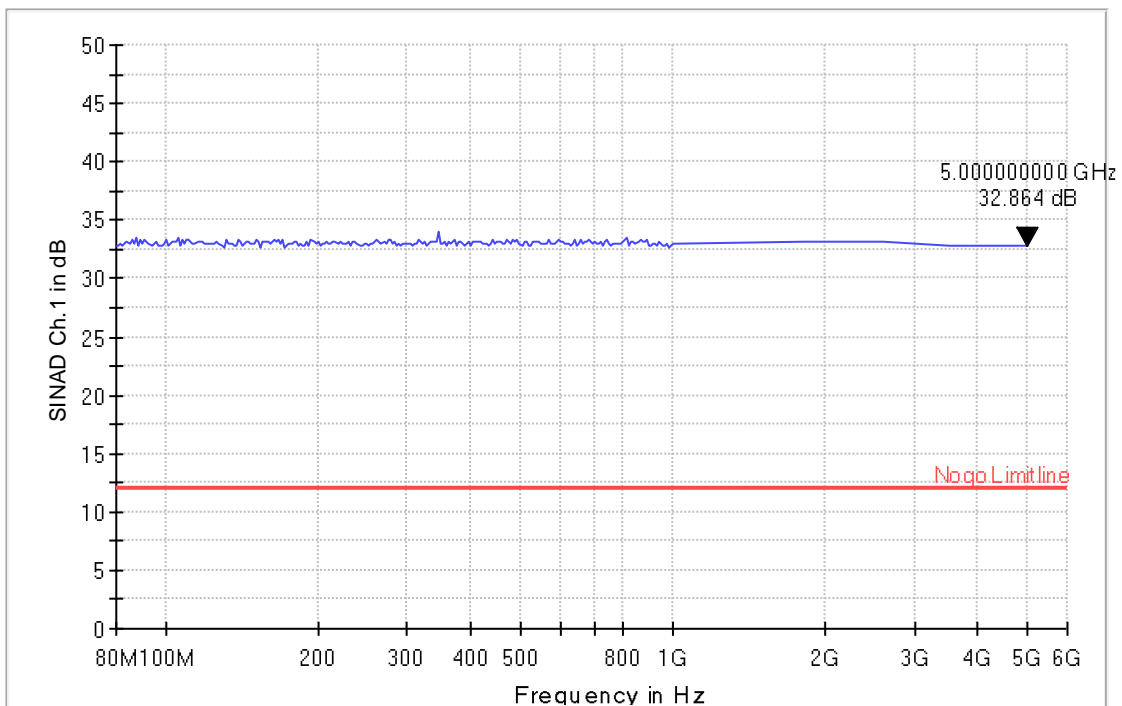
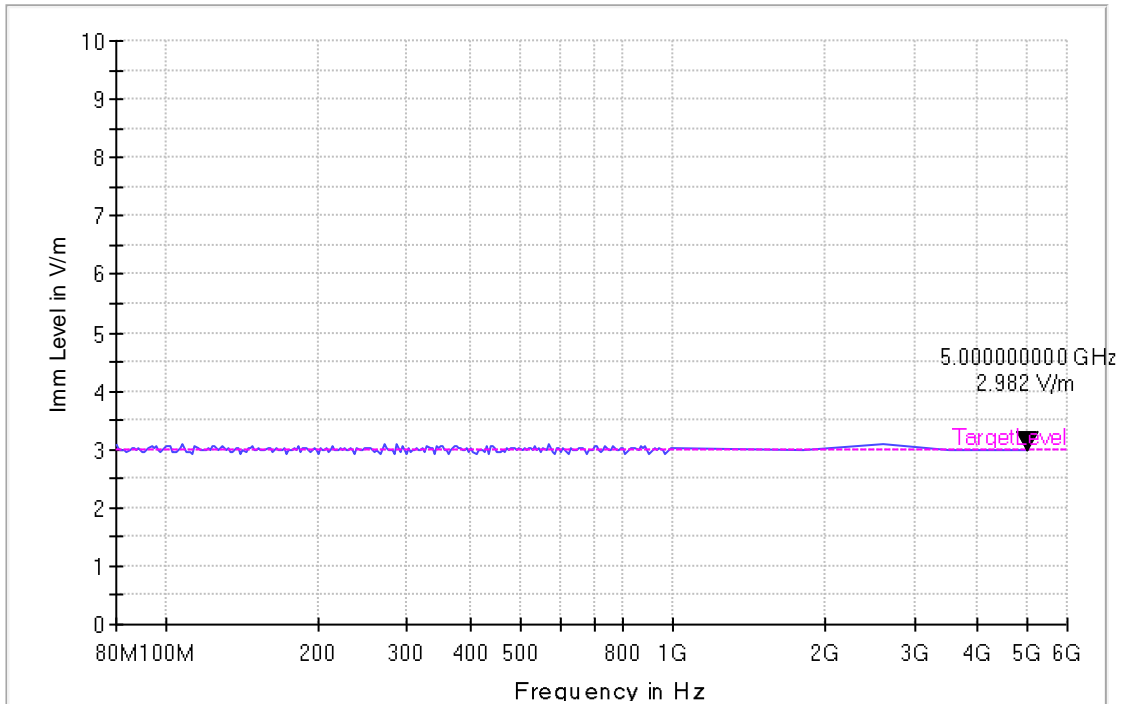
Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	DAB 202.928 MHz, 440 Hz sine @ DAB Port
Operator Name:	URO
Comment:	bottom side, EUT vertical, antenna horizontal



## Diagram 03-12

### Common Information

Test Description:	Radiated Immunity, EN 61000-4-3, EN55035 - SINAD
EUT / Setup Code:	DE1288000aj01
Operating Conditions:	DAB 202.928 MHz, 440 Hz sine @ DAB Port
Operator Name:	URO
Comment:	top side, EUT vertical, antenna vertical



# Radio Test Report

**Test Report Reference: MDE\_PREH\_1602\_RADa**

**on**

**MIB3 OI  
Car Radio**

**according to:**

**ETSI EN 300 328 V2.1.1**

Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

**Test Laboratory:**

7layers GmbH  
Borsigstrasse 11  
40880 Ratingen  
Germany



**Note:**

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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*a Bureau Veritas  
Group Company*

*www.7layers.com*

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

**List of measurements**

The list shows "**Essential radio test suite**" as specified in table A.1 in the standard ETSI EN 300 328.

Harmonized Standard ETSI EN 300 328						Test Documentation
The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the RED						
Requirement			Requirement Conditionality	Test Specification		Final Result
No	Description	Reference: Clause No	Condition	E/O	Reference: Clause No	
1	RF Output Power	4.3.1.2	Mandatory for FHSS	Essential Radio Test Suite	5.4.2	N/P
2	Duty cycle, Tx-Sequence, Tx-gap	4.3.1.3	Non-adaptive, FHSS devices, $\geq 10$ dBm output power	Essential Radio Test Suite	5.4.2	N/A
3	Accumulated Transmitter time, Frequency Occupation and Hopping Sequence	4.3.1.4	Mandatory for FHSS	Essential Radio Test Suite	5.4.4	N/P
4	Hopping Frequency Separation	4.3.1.5	Mandatory for FHSS	Essential Radio Test Suite	5.4.5	N/P
5	Medium Utilisation	4.3.1.6	Non-adaptive, FHSS devices, $\geq 10$ dBm output power	Essential Radio Test Suite	5.4.2	N/A
6	Adaptivity	4.3.1.7	Adaptive FHSS devices, $\geq 10$ dBm output power	Essential Radio Test Suite	5.4.6	N/A
7	Occupied Channel Bandwidth	4.3.1.8	Mandatory for FHSS	Essential Radio Test Suite	5.4.7	N/P
8	Transmitter unwanted emissions in the OOB domain	4.3.1.9	Mandatory for FHSS	Essential Radio Test Suite	5.4.8	N/P
9	Transmitter unwanted emissions in the spurious domain	4.3.1.10	Mandatory for FHSS	Essential Radio Test Suite	5.4.9	Passed
10	Receiver spurious emissions	4.3.1.11	Mandatory for FHSS	Essential Radio Test Suite	5.4.10	Passed
11	Receiver Blocking	4.3.1.12	Mandatory for FHSS	Essential Radio Test Suite	5.4.11	N/P
12	Geo-location capability	4.3.1.13	Geo location Capability FHSS device	Essential Radio Test Suite	-	N/A
13	RF Output Power	4.3.2.2	Mandatory for non-FHSS	Essential Radio Test Suite	5.4.2	N/P
14	Power Spectral Density	4.3.2.3	Mandatory for non-FHSS	Essential Radio Test Suite	5.4.3	N/P
15	Duty cycle, Tx-Sequence, Tx-gap	4.3.2.4	Non-adaptive, non-FHSS devices, $\geq 10$ dBm output power	Essential Radio Test Suite	5.4.2	N/A
16	Medium Utilisation	4.3.2.5	Non-adaptive, non-FHSS devices, $\geq 10$ dBm output power	Essential Radio Test Suite	5.4.2	N/A
17	Adaptivity	4.3.2.6	Adaptive non-FHSS devices, $> 10$ dBm output power	Essential Radio Test Suite	5.4.6	N/P
18	Occupied Channel Bandwidth	4.3.2.7	Mandatory for non-FHSS	Essential Radio Test Suite	5.4.7	N/P
19	Transmitter unwanted emissions in the OOB domain	4.3.2.8	Mandatory for non-FHSS	Essential Radio Test Suite	5.4.8	N/P
20	Transmitter unwanted emissions in the spurious domain	4.3.2.9	Mandatory for non-FHSS	Essential Radio Test Suite	5.4.9	Passed
21	Receiver spurious emissions	4.3.2.10	Mandatory for non-FHSS	Essential Radio Test Suite	5.4.10	Passed

**TEST REPORT REFERENCE:**

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22	Receiver Blocking	4.3.2.11	Mandatory for non-FHSS	Essential Radio Test Suite	5.4.11	N/P
23	Geo-location capability	4.3.2.12	Geo location Capability Non-FHSS device	Essential Radio Test Suite	-	N/A

**Notes:**

**The test report focuses on the Essential Radio Test Suite (E)**

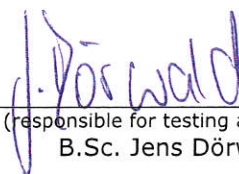
N/A Not applicable. Test not applicable because the conditional functionality is not fulfilled.  
 N/P Not performed.

**Comment:**

Not all tests were performed, because the Equipment under Test (EUT) includes a pre-certified WLAN module (LBEE6ZZ1FD). Therefore only radiated spurious emissions were performed.



(responsible for accreditation scope)  
 Dipl.-Ing. Marco Kullik



(responsible for testing and report)  
 B.Sc. Jens Dörwald



7 layers GmbH, Borsigstr. 11  
 40880 Ratingen, Germany  
 Phone +49 (0)2102 749 0

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

**Administrative Data:**

**Testing Laboratory**

Company Name: 7layers GmbH  
Address: Borsigstr. 11  
40880 Ratingen  
Germany  
Laboratory accreditation no: DAkkS D-PL-12140-01-00  
Responsible for accreditation scope: Dipl.-Ing. Marco Kullik  
Report Template Version: 2017-12-15

**Project Data**

Responsible for testing and report: B.Sc. Jens Dörwald  
Date of Report: 2018-03-15  
Testing Period: 2017-11-23 to 2018-02-22

**Applicant Data**

Company Name: Preh Car Connect GmbH  
Address: Gewerbepark Merbitz 5  
01156 Dresden  
Germany  
Contact Person: Mr. Christian Stopp

**Manufacturer Data**

Company Name: please see applicant data  
Address:  
Contact Person:

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

**Test object Data**

**General Description of Radio Device**

Kind of Device product description	2.4 GHz Transceiver (WLAN & BT), 5 GHz WLAN, GPS Receiver
Product name	Car Radio
Type	MIB3 OI
<b>Declared EUT data by the supplier</b>	
Maximum Channel Occupancy Time (COT)	-
Power Supply Type	DC
Normal Voltage	12 V
Low Voltage	9 V
High Voltage	18 V
Normal Temperature	25 °C
Low Temperature	-40 °C
High Temperature	70 °C
Antenna type / gain	Integral / 2.4 GHz: -10 dBi
Beamforming gain	-
Number Of Transmit Chains	1
Number Of Receive Chains	1
Output Power [E.I.R.P.]	BT: 4 dBm, WLAN 2.4GHz: 18 dBm
Type of TX / RX chains	-
Dwell Time (FHSS modulation)	BT: 625 µs (x-DH1 packets, equivalent to one time slot) within 98.75 ms to 3.125 ms (x-DH5 packets, equivalent to five time slots) within 296.25 ms. This is equivalent to one complete hopping sequence over 79 channels.
Minimal Channel Occupation time (FHSS modulation)	BT: 625 µs, x-DH1 packets (equivalent to one time slot) within 98.75 ms (equivalent to one complete hopping sequence over 79 channels).
Other modulation than FHSS	yes
FHSS modulation	yes
Max. No. of Hopping frequencies (adaptive FHSS modulation)	BT: 79

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

Min. No. of Hopping frequencies (adaptive FHSS modulation)	BT: 20
Occupied Channel Bandwidth	BT: 1 MHz WLAN b/g/n: 20 MHz
Operating Modes, used Modulations and Data Rates for testing	BT: GFSK Modulation, 1-DHx packets WLAN: mode b, DSSS, 1 Mbps
Adaptive Technology	Non LBT-based
CCA (LBT based Adaptivity)	-
Frequency of Channels (Lowest/Mid/Highest):	BT: 2402/2441/2480 MHz WLAN 2.4 GHz: 2412/2442/2472 MHz
Geo location Capability	not supported



**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

**Tested Radio Devices**

Sample Name	Sample Code	Description
DE1288000	ad01	radiated sample
Sample Parameter	Value	
HW Version	X07	
SW Version	R055	
Serial No.	YD5-00103.07.1700170153	
Comment	BT sample with display connected	

Sample Name	Sample Code	Description
DE1288000	ah01	radiated sample
Sample Parameter	Value	
HW Version	X07	
SW Version	R055	
Serial No.	YD5-00130.06.1700170432	
Comment	WLAN sample without display connected	

**General description of ancillary equipment**

Device	Details (Manufacturer, Type Model, OUT Code)	Reason for using
-	-	-

**General description of auxiliary equipment**

Device	Details (Manufacturer, HW, SW, S/N)	Description
GSM/GNSS Antenna	VW Kombi, GSM/GNSS Antenna, -, -, -	External Combi-Antenna cellular & GNS "shark finn"
Life Box	-, Life Box, -; -;	Keep aöive box

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

**TEST RESULTS**

**Transmitter unwanted emissions in the spurious domain**

**CLAUSE 5.4.9**

Ambient temperature: 22 °C  
 Relative humidity: 38 %  
 Low Channel  
 Radio Technology: BT GFSK  
 (1-DH1)

Measurement Method	Frequency [MHz]	Spurious Level Peak Detector [dBm]	Spurious Level TDP RMS [dBm]	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
Conducted	-	-	-	-	-	>6dB
Radiated	750.0	-57.1	-57.1	100	-54.0	3.1

Ambient temperature: 22 °C  
 Relative humidity: 38 %  
 High Channel  
 Radio Technology: BT GFSK  
 (1-DH1)

Measurement Method	Frequency [MHz]	Spurious Level Peak Detector [dBm]	Spurious Level TDP RMS [dBm]	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
Conducted	-	-	-	-	-	>6dB
Radiated	750.0	-56.4	-56.9	100	-54.0	2.9

**COMMENTS:**

- Tested frequency range: 30 MHz – 12.75 GHz.
- The measurement was performed in the worst case operating mode in respect to output power.
- At least spurious emissions that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- The peaks found were independent from the set Transmitter frequency.

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

**Limits: EN 300328, clause 4.3.1.10.3/4.3.2.9.3**

Equipment Type	Frequency range	Maximum power, e.r.p. ( $\leq 1$ GHz) e.i.r.p. ( $> 1$ GHz)	Bandwidth
All types of equipment	30 MHz to 47 MHz	-36 dBm	100 kHz
	47 MHz to 74 MHz	-54 dBm	100 kHz
	74 MHz to 87.5 MHz	-36 dBm	100 kHz
	87.5 MHz to 118 MHz	-54 dBm	100 kHz
	118 MHz to 174 MHz	-36 dBm	100 kHz
	174 MHz to 230 MHz	-54 dBm	100 kHz
	230 MHz to 470 MHz	-36 dBm	100 kHz
	470 MHz to 862 MHz	-54 dBm	100 kHz
	862 MHz to 1 GHz	-36 dBm	100 kHz
	1 GHz to 12.75 GHz	-30 dBm	1 MHz

**TEST EQUIPMENT USED:**

- Radiated Emissions
- R&S TS8997

# TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADa

## Receiver spurious emissions

## CLAUSE 5.4.10

Ambient temperature: 23 °C  
Relative humidity: 40 %  
Hopping Radio  
Technology: BT

Measurement Method	Frequency [MHz]	Spurious Level Peak Detector [dBm]	Spurious Level TDP RMS [dBm]	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
Radiated	625.0	-61.1	-73.3	100	-57.0	16.3
Radiated	750.0	-55.0	-58.4	100	-57.0	1.4
Radiated	1371.6	-51.4	-53.1	1000	-47.0	6.1
Radiated	1599.8	-49.6	-51.6	1000	-47.0	4.6
Radiated	1771.2	-49.9	-51.6	1000	-47.0	4.6
Radiated	3410.4	-47.9	-51.3	1000	-47.0	4.3
Radiated	3421.5	-45.1	-51.4	1000	-47.0	4.4
Radiated	3437.2	-48.2	-51.7	1000	-47.0	4.7
Radiated	3519.5	-47.7	-49.2	1000	-47.0	2.2
Conducted	-	-	-	-	-	>6dB

### COMMENTS:

- Tested frequency range: 30 MHz – 12.75 GHz.
- At least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- The peaks found in WLAN RX mode were independent from the set Receiver frequency.

### Limits: EN 300328, clause 4.3.1.11.3/4.3.2.10.3

Equipment Type	Frequency range	Maximum power, e.r.p. ( $\leq 1$ GHz) e.i.r.p. ( $> 1$ GHz)	Bandwidth
All types of equipment	30 MHz to 1 GHz 1 GHz to 12.75 GHz	-57 dBm -47 dBm	100 kHz 1 MHz

### TEST EQUIPMENT USED:

- Radiated Emissions
- R&S TS8997

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

**Transmitter unwanted emissions in the spurious domain**

**CLAUSE 5.4.9**

Ambient temperature: 22 °C  
 Relative humidity: 37 %  
 Low Channel  
 Radio Technology: Wlan b  
 (DSSS)

Measurement Method	Frequency [MHz]	Spurious Level Peak Detector [dBm]	Spurious Level TDP RMS [dBm]	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
Radiated	-	-	-	-	-	>6dB
Conducted	-	-	-	-	-	>6dB

Ambient temperature: 22 °C  
 Relative humidity: 37 %  
 High Channel  
 Radio Technology: Wlan b  
 (DSSS)

Measurement Method	Frequency [MHz]	Spurious Level Peak Detector [dBm]	Spurious Level TDP RMS [dBm]	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
Radiated	-	-	-	-	-	>6dB
Conducted	-	-	-	-	-	>6dB

**COMMENTS:**

- Tested frequency range: 30 MHz – 12.75 GHz.
- The measurement was performed in the worst case operating mode in respect to output power.
- At least spurious emissions that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- Such values have not been found.

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

**Limits: EN 300328, clause 4.3.1.10.3/4.3.2.9.3**

Equipment Type	Frequency range	Maximum power, e.r.p. ( $\leq 1$ GHz) e.i.r.p. ( $> 1$ GHz)	Bandwidth
All types of equipment	30 MHz to 47 MHz	-36 dBm	100 kHz
	47 MHz to 74 MHz	-54 dBm	100 kHz
	74 MHz to 87.5 MHz	-36 dBm	100 kHz
	87.5 MHz to 118 MHz	-54 dBm	100 kHz
	118 MHz to 174 MHz	-36 dBm	100 kHz
	174 MHz to 230 MHz	-54 dBm	100 kHz
	230 MHz to 470 MHz	-36 dBm	100 kHz
	470 MHz to 862 MHz	-54 dBm	100 kHz
	862 MHz to 1 GHz	-36 dBm	100 kHz
	1 GHz to 12.75 GHz	-30 dBm	1 MHz

**TEST EQUIPMENT USED:**

- Radiated Emissions
- R&S TS8997

## TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADa

### Receiver spurious emissions

### CLAUSE 5.4.10

Ambient temperature: 22 °C  
Relative humidity: 37 %  
Low Channel  
Radio  
Technology:  
WLAN

Measurement Method	Frequency [MHz]	Spurious Level Peak Detector [dBm]	Spurious Level TDP RMS [dBm]	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
Conducted	-	-	-	-	-	>6dB
Radiated	-	-	-	-	-	>6dB

Ambient temperature: 22 °C  
Relative humidity: 37 %  
High Channel  
Radio  
Technology:  
WLAN

Measurement Method	Frequency [MHz]	Spurious Level Peak Detector [dBm]	Spurious Level TDP RMS [dBm]	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
Conducted	-	-	-	-	-	>6dB
Radiated	-	-	-	-	-	>6dB

#### COMMENTS:

- Tested frequency range: 30 MHz – 12.75 GHz.
- At least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- Such values have not been found.
- Tested with ah01 sample without display connected.

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

**Limits: EN 300328, clause 4.3.1.11.3/4.3.2.10.3**

<b>Equipment Type</b>	<b>Frequency range</b>	<b>Maximum power, e.r.p. (<math>\leq</math> 1 GHz) e.i.r.p. (<math>&gt;</math> 1 GHz)</b>	<b>Bandwidth</b>
All types of equipment	30 MHz to 1 GHz 1 GHz to 12.75 GHz	-57 dBm -47 dBm	100 kHz 1 MHz

**TEST EQUIPMENT USED:**

- Radiated Emissions
- R&S TS8997



**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

**Test Equipment used for tests**

**1 R&S TS8997**  
EN300328/301893 Test Lab

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	SMB100A	Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	107695	2017-07	2020-07
1.2	MFS	Rubidium Frequency Standard	Datum-Beverly	5489/001	2017-07	2018-07
1.3	1515 / 93459	Broadband Power Divider SMA (Aux)	Weinschel Associates	LN673		
1.4	VT 4002	Climatic Chamber	Vötsch	58566002150010	2016-03	2018-03
1.5	A8455-4	4 Way Power Divider (SMA)		-		
1.6	Opus10 THI (8152.00)	ThermoHygro Datalogger 03 (Environ)	Lufft Mess- und Regeltechnik GmbH	7482	2017-03	2019-03
1.7	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	259291	2016-10	2019-10
1.8	OSP120	Switching Unit with integrated power meter	Rohde & Schwarz	101158	2016-11	2018-11

**2 Radiated Emissions**  
Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.1	NRV-Z1	Sensor Head A	Rohde & Schwarz	827753/005	2017-05	2018-05
2.2	MFS	Rubidium Frequency Normal MFS	Datum GmbH	002	2017-10	2018-10
2.3	Opus10 TPR (8253.00)	ThermoAirpressure Datalogger 13 (Environ)	Lufft Mess- und Regeltechnik GmbH	13936	2017-04	2019-04
2.4	Anechoic Chamber	10.58 x 6.38 x 6.00 m <sup>3</sup>	Frankonia	none	2016-05	2019-05
2.5	FS-Z60	Harmonic Mixer 40 - 60 GHz	Rohde & Schwarz Memmingen	100178	2016-12	2019-12
2.6	FS-Z220	Harmonic Mixer 140 - 220 GHz	Rohde & Schwarz Memmingen	101005	2017-03	2020-03
2.7	SGH-05	Antenna (140 - 220 GHz)		075		
2.8	HL 562	Ultralog new biconicals	Rohde & Schwarz	830547/003	2015-06	2018-06
2.9	5HC2700/12750 -1.5-KK	High Pass Filter	Trilithic	9942012		

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.10	ASP 1.2/1.8-10 kg	Antenna Mast	Maturo GmbH	-		
2.11	Fully Anechoic Room	8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001-PRB	2015-06	2018-06
2.12	JS4-18002600-32-5P	Broadband Amplifier 18 GHz - 26 GHz	Miteq	849785		
2.13	FSW 43	Spectrum Analyzer	Rohde & Schwarz	103779	2016-12	2018-12
2.14	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronik GmbH	00083069		
2.15	SGH-19	Antenna (40 - 60 GHz)		093		
2.16	WHKX 7.0/18G-8SS	High Pass Filter	Wainwright	09		
2.17	4HC1600/12750-1.5-KK	High Pass Filter	Trilithic	9942011		
2.18	Chroma 6404	AC Power Source	Chroma ATE INC.	64040001304		
2.19	JS4-00102600-42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368		
2.20	TT 1.5 WI	Turn Table	Maturo GmbH	-		
2.21	HL 562 Ultralog	Log.-per. Antenna	Rohde & Schwarz	100609	2016-04	2019-04
2.22	FS-Z325	Harmonic Mixer 220 - 325 GHz	Rohde & Schwarz Memmingen	101006	2017-03	2020-03
2.23	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronik GmbH	00086675		
2.24	SGH-08	Antenna (90 - 140 GHz)		064		
2.25	SGH-12	Antenna (60 - 90 GHz)		326		
2.26	5HC3500/18000-1.2-KK	High Pass Filter	Trilithic	200035008		
2.27	FS-Z140	Harmonic Mixer 90 -140 GHz	Rohde & Schwarz Memmingen	101007	2017-02	2020-02
2.28	Opus10 THI (8152.00)	ThermoHygro Datalogger 12 (Environ)	Lufft Mess- und Regeltechnik GmbH	12482	2017-03	2019-03
2.29	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2016-11	2018-11
2.30	JS4-00101800-35-5P	Broadband Amplifier 30 MHz - 18 GHz	Miteq	896037		
2.31	AS 620 P	Antenna mast	HD GmbH	620/37		
2.32	Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	Maturo GmbH	TD1.5-10kg/024/3790709		

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.33	SGH-03	Antenna (220 - 325 GHz)		060		
2.34	FS-Z90	Harmonic Mixer 60 - 90 GHz	Rohde & Schwarz Memmingen	101686	2017-03	2020-03
2.35	PAS 2.5 - 10 kg	Antenna Mast	Maturo GmbH	-		
2.36	AM 4.0	Antenna mast	Maturo GmbH	AM4.0/180/11920513		
2.37	HF 907	Double-ridged horn	Rohde & Schwarz	102444	2015-05	2018-05

The calibration interval is the time interval between "Last Calibration" and "Calibration Due"

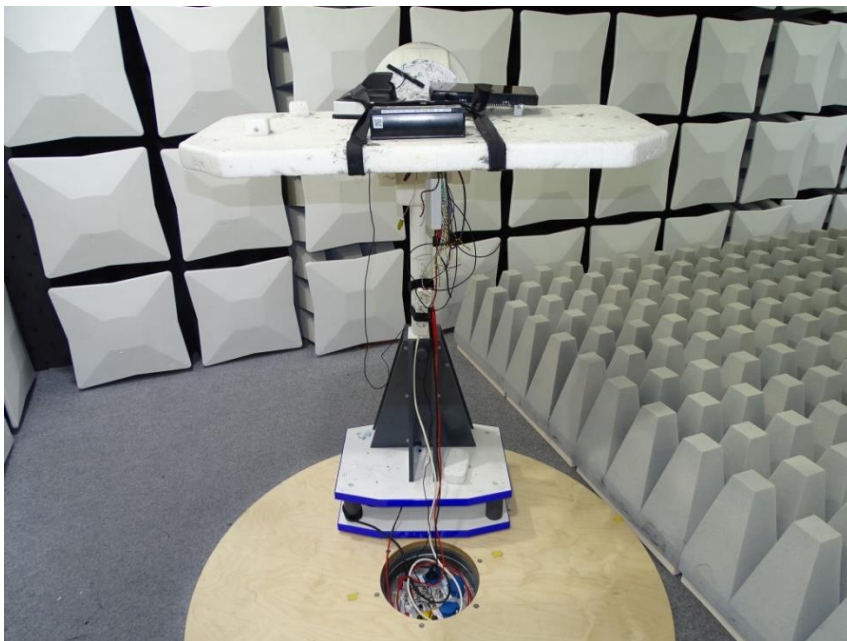
**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

**Photo Report**



Setup for radiated spurious emissions with ad01 sample



Setup for radiated spurious emissions (detailed view) with ad01 sample

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADa

## Measurement Uncertainties

Parameter	Uncertainty
Occupied channel Bandwidth	$\pm 5\%$
RF Output Power, conducted	$\pm 1.0 \text{ dB}$
Power Spectral Density, conducted	$\pm 2.0 \text{ dB}$
Unwanted Emissions, conducted	$\pm 2.0 \text{ dB}$
All emissions, radiated	$\pm 4.5 \text{ dB}$
Temperature	$\pm 0.3 \text{ }^{\circ}\text{C}$
Humidity	$\pm 3\%$
DC and low frequency voltages	$\pm 1.5\% + 2 \text{ digits}$
Time	$\pm 5\%$
Duty Cycle	$\pm 5\%$

# Radio Test Report

**Test Report Reference: MDE\_PREH\_1602\_RADb**

**on**

## MIB3 OI Car Radio

**according to:**

**ETSI EN 303 413 V1.1.1 (2017-06)**

Satellite Earth Stations and Systems (SES);

Global Navigation Satellite System (GNSS) receivers;

Radio equipment operating in the 1 164 MHz to 1 300 MHz and 1 559 MHz to 1 610 MHz frequency bands;

Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

**Test Laboratory:**

7layers GmbH  
Borsigstrasse 11  
40880 Ratingen  
Germany



**Note:**

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

**7layers GmbH**

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**Geschäftsführer/**

**Managing Directors:**

Frank Spiller  
Bernhard Retka  
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**Registergericht/registered:**

Düsseldorf HRB 75554  
USt-Id.-Nr./VAT-No. DE203159652  
Steuer-Nr./TAX-No. 147/5869/0385

*a Bureau Veritas  
Group Company*

*www.7layers.com*

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADb

**List of measurements**

The list shows "**Essential radio test suite**" as specified in table A.1 in the standard ETSI EN 303 413.

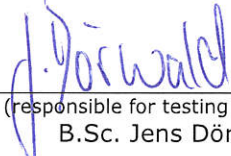
Harmonized Standard ETSI EN 303 413						Test Documentation
The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the RED						
Requirement			Requirement Conditionality	Test Specification		Final Result
No	Description	Reference: Clause No		E/O	Reference: Clause No	
1	Adjacent Signal Selectivity	4.2.1		Essential Radio Test Suite	EN 303413, clause 5.4	Passed
2	Spurious Emission	4.2.2		Essential Radio Test Suite	EN 303413, clause 5.5	Passed

**Notes:**

**The test report focuses on the Essential Radio Test Suite (E)**

- E Essential Radio Test Suite.
- O Other Test Suite.
- N/A Not applicable. Test not applicable because the conditional functionality is not fulfilled.
- N/P Not performed.

  
 (responsible for accreditation scope)  
 Dipl.-Ing. Marco Kullik

  
 (responsible for testing and report)  
 B.Sc. Jens Dörwald



7 layers GmbH, Borsigstr. 11  
 40880 Ratingen, Germany  
 Phone +49 (0)2102 749 0

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADb

**Administrative Data:**

**Testing Laboratory**

Company Name: 7layers GmbH  
Address: Borsigstr. 11  
40880 Ratingen  
Germany  
Laboratory accreditation no: DAkkS D-PL-12140-01-00  
Responsible for accreditation scope: Dipl.-Ing. Marco Kullik  
Report Template Version: 2017-12-15

**Project Data**

Responsible for testing and report: B.Sc. Jens Dörwald  
Date of Report: 2018-03-15  
Testing Period: 2018-01-01 to 2018-01-25

**Applicant Data**

Company Name: Preh Car Connect GmbH  
Address: Gewerbepark Merbitz 5  
01156 Dresden  
Germany  
Contact Person: Mr. Christian Stopp

**Manufacturer Data**

Company Name: please see applicant data  
Address:  
Contact Person:



**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADb

**Test object Data**

**General Description of Radio Device**

Kind of Device product description	2.4 GHz Transceiver (WLAN & BT), 5 GHz WLAN, GPS Receiver
Product name	Car Radio
Type	MIB3 OI
<b>Declared EUT data by the supplier</b>	
Supply Voltage	12.0 V DC
Supported GNSS & Signal Designations	GPS: L1 band
Antenna Port(s)	GPS: external 50 Ohm

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADb

**Tested Radio Devices**

Sample Name	Sample Code	Description
DE1288000	ad01	radiated sample
Sample Parameter	Value	
HW Version	X07	
SW Version	R055	
Serial No.	YD5-00103.07.1700170153	
Comment	-	

Sample Name	Sample Code	Description
DE1288000	ai01	radiated sample
Sample Parameter	Value	
HW Version	X07	
SW Version	R055	
Serial No.	YD5-00130.06.1700170128	
Comment	-	

**General description of ancillary equipment**

Device	Details (Manufacturer, Type Model, OUT Code)	Reason for using
-	-	-

**General description of auxiliary equipment**

Device	Details (Manufacturer, HW, SW, S/N)	Description
AC Adapter (for Laptop RE 03)	Fujitsu Ltd., -, -, 13300281B	Model PJW1942NA
Display	-, -, -, VDD-02410.09.1793926332	Display
GSM/GNSS Antenna	-, -, -, -	External Combi-Antenna cellular & GNS "shark finn"
Laptop RE 03 (Fujitsu)	Fujitsu, -, -, DSCK013817	Lifebook Eseries E781
Life Box	-, -, -, -	Display

## TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADb

## TEST RESULTS

### Adjacent Signal Selectivity

### CLAUSE EN 303413, clause 5.4

Ambient temperature:

23 °C

Air Pressure:

40 hPa

Humidity:

1002 %

GNSS System GPS; GNSS signal Designation L1

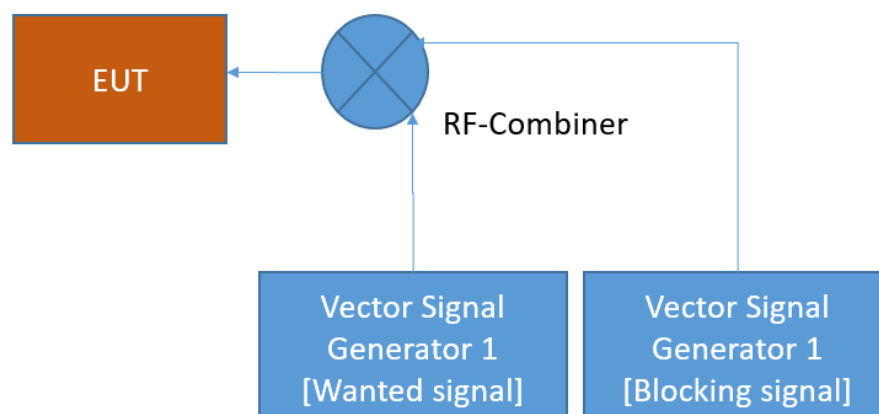
GNSS Signal Operating Frequency [MHz]	Wanted Signal Level [dBm]	Test Point Center Frequency [MHz]	Adjacent Frequency Signal Power Level [dBm]	Measured C/N0 w/o Interferer [dB-Hz]	Measured C/N0 with Interferer [dB-Hz]	Delta C/N0 [dB-Hz]	Limit Delta C/N0 [dB]	Marg in to Limit [dB]
1575.420	-128.5	1524.000	-65.0	32.25	32.25	0.00	1.00	1.00
1575.420	-128.5	1548.000	-95.0	32.25	32.25	0.00	1.00	1.00
1575.420	-128.5	1554.000	-105.0	32.00	32.25	-0.25	1.00	0.75
1575.420	-128.5	1615.000	-105.0	32.25	32.25	0.00	1.00	1.00
1575.420	-128.5	1627.000	-85.0	32.25	32.25	0.00	1.00	1.00

### Definition:

GUE adjacent frequency band selectivity is the ability of the GUE to achieve the specified performance in the presence of noise produced by signals operating in accordance with the allocation table of the ITU Radio Regulations [i.13] in frequency bands adjacent or near-adjacent to the relevant RNSS band.

### Test Setup:

The test was performed with the following setup:



Test Setup; Adjacent Signal Selectivity

## TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADb

## COMMENTS:

- The measurement was performed conducted.
- The power of the wanted signals were set according Annex B.2, chapter B.2.2
- The power and frequencies of the unwanted signals were set according chapter 4.2.1.2
- The shape of the unwanted signal is according Annex B.1, Figure B-1
- The conducted measurement setup was according chapter 5.3.2
- Number of simulated satellites:  
GPS: 4, location & time: dynamic, position: static

## Limits: EN 303413 v1.1.1, clause 4.2.1.2

## Equation 4-1: Maximum degradation in C/N<sub>0</sub>

$\leq 1 \text{ dB}$
---------------------

**Table 4-1: GNSS, GNSS signal and RNSS frequency bands**

GNSS	GNSS Signal Designations	RNSS Frequency Band [MHz]
BDS	B1	1559 - 1610
Galileo	E1	1559 - 1610
	E5a	1164 - 1215
	E5b	1164 - 1215
	E6	1215 - 1300
GLONASS	G1	1559 - 1610
	G2	1215 - 1300
GPS	L1	1559 - 1610
	L2	1215 - 1300
	L5	1164 - 1215
SBAS	L1	1559 - 1610
	L5	1164 - 1215

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADb

**Table 4-2: Frequency bands, adjacent channel frequency signal test point centre frequencies and power levels for the 1559 MHz to 1610 MHz RNSS band**

Frequency band [MHz]	Test point centre frequency [MHz]	Adjacent frequency signal power level [dBm]	Comments
1518 - 1525	1524	-65.0	MSS (space-to-Earth) band
1525 - 1549	1548	-95.0	MSS (space-to-Earth) band
1549 - 1559	1554	-105.0	MSS (space-to-Earth) band
1559 - 1610	GUE RNSS band under test		
1610 - 1625	1615	-105.0	MSS (Earth-to-space) band
1625 - 1640	1627	-85.0	MSS (Earth-to-space) band

**Table 4-3: Frequency bands, adjacent channel frequency signal test point centre frequencies and power levels for the 1164 MHz to 1300 MHz RNSS band**

Frequency band [MHz]	Test point centre frequency [MHz]	Adjacent frequency signal power level [dBm]	Comments
960 - 1164	1154	-75.0	AMRS, ARNS band
1164 - 1215	GUE RNSS band under test		
1215 - 1260	GUE RNSS band under test		
1260 - 1300	GUE RNSS band under test		
1300 - 1350	1310	-85.0	Radiolocation, ARNS, RNSS (Earth-to-space) band

**Table 4-4: Adjacent frequency signal**

Parameter	Value	Comments
Frequency	See table 4-2 and table 4-3	
Power level	See table 4-2 and table 4-3	
Bandwidth	1 MHz	See clause B.1 for details
Format	AWGN	

**TEST EQUIPMENT USED:**

- Radio Lab

## TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADb

### Spurious Emission

### CLAUSE EN 303413, clause 5.5

Ambient temperature: 23 °C  
 Relative humidity: 37 %  
 GNSS System: GPS; GNSS Signal  
 Designation: L1

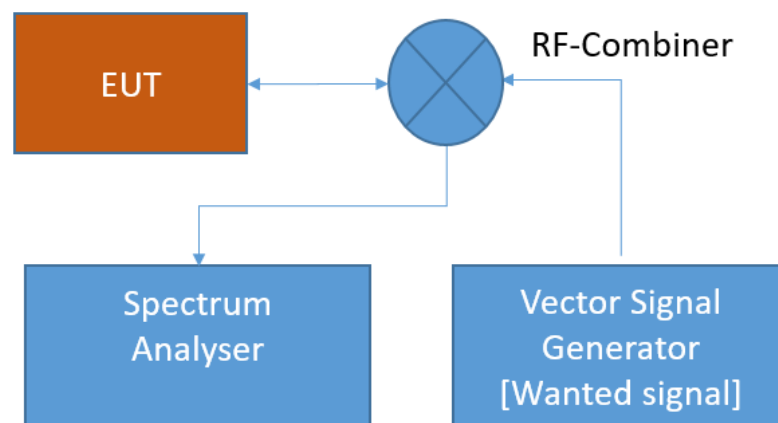
Measurement Method	Frequency [MHz]	Spurious Level Peak Detector [dBm]	Spurious Level TDP RMS [dBm]	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
Radiated	375.0	-62.1	-71.0	100	-57.0	14.0
Radiated	700.0	-64.8	-67.9	100	-57.0	10.9
Radiated	750.0	-56.4	-57.7	100	-57.0	0.7
Radiated	3082.2	-48.2	-59.9	1000	-47.0	12.9
Radiated	3410.4	-47.6	-50.4	1000	-47.0	3.4
Radiated	3437.3	-47.8	-53.7	1000	-47.0	6.7
Conducted	-	-	-	-	-	>6dB

### Definition:

Receiver spurious emissions are emissions at any frequency when the GUE is in receive-only operating mode.

### Test Setups:

The conducted test was performed with the following setup:

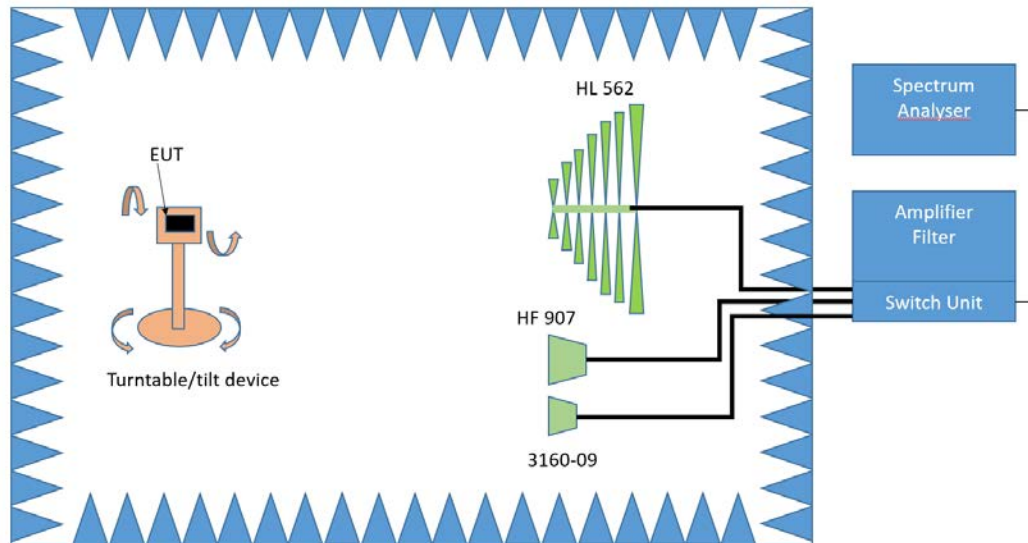


Test Setup; Spurious Emissions Conducted

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADb

The radiated test was performed with the following setup:



Test Setup; Spurious Emission Radiated (FAC)

**COMMENTS:**

- Tested frequency range: 30 MHz – 8.3 GHz.
- At least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- The test was performed without GNSS signal.

**Limits: EN 303 413 v1.1.1, clause 4.2.2.2**

Frequency range	Maximum power, e.r.p. ( $\leq 1$ GHz) e.i.r.p. ( $> 1$ GHz)	Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 8.3 GHz	-47 dBm	1 MHz

**TEST EQUIPMENT USED:**

- Radiated Emissions

# TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADb

## Test Equipment used for tests

### 1 Radiated Emissions

Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	NRV-Z1	Sensor Head A	Rohde & Schwarz	827753/005	2017-05	2018-05
1.2	MFS	Rubidium Frequency Normal MFS	Datum GmbH	002	2017-10	2018-10
1.3	Opus10 TPR (8253.00)	ThermoAirpressure Datalogger 13 (Environ)	Lufft Mess- und Regeltechnik GmbH	13936	2017-04	2019-04
1.4	Anechoic Chamber	10.58 x 6.38 x 6.00 m <sup>3</sup>	Frankonia	none	2016-05	2019-05
1.5	HL 562	Ultralog new biconicals	Rohde & Schwarz	830547/003	2015-06	2018-06
1.6	5HC2700/12750-1.5-KK	High Pass Filter	Trilithic	9942012		
1.7	ASP 1.2/1.8-10 kg	Antenna Mast	Maturo GmbH	-		
1.8	Fully Anechoic Room	8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001-PRB	2015-06	2018-06
1.9	JS4-18002600-32-5P	Broadband Amplifier 18 GHz - 26 GHz	Miteq	849785		
1.10	FSW 43	Spectrum Analyzer	Rohde & Schwarz	103779	2016-12	2018-12
1.11	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronik GmbH	00083069		
1.12	WHKX 7.0/18G-8SS	High Pass Filter	Wainwright	09		
1.13	4HC1600/12750-1.5-KK	High Pass Filter	Trilithic	9942011		
1.14	Chroma 6404	AC Power Source	Chroma ATE INC.	64040001304		
1.15	JS4-00102600-42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368		
1.16	TT 1.5 WI	Turn Table	Maturo GmbH	-		
1.17	HL 562 Ultralog	Log.-per. Antenna	Rohde & Schwarz	100609	2016-04	2019-04
1.18	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronik GmbH	00086675		
1.19	5HC3500/18000-1.2-KK	High Pass Filter	Trilithic	200035008		
1.20	Opus10 THI (8152.00)	ThermoHygro Datalogger 12 (Environ)	Lufft Mess- und Regeltechnik GmbH	12482	2017-03	2019-03



**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADb

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.21	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2016-11	2018-11
1.22	JS4-00101800-35-5P	Broadband Amplifier 30 MHz - 18 GHz	Miteq	896037		
1.23	AS 620 P	Antenna mast	HD GmbH	620/37		
1.24	Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	Maturo GmbH	TD1.5-10kg/024/3790709		
1.25	PAS 2.5 - 10 kg	Antenna Mast	Maturo GmbH	-		
1.26	AM 4.0	Antenna mast	Maturo GmbH	AM4.0/180/11920513		
1.27	HF 907	Double-ridged horn	Rohde & Schwarz	102444	2015-05	2018-05

## 2 Radio Lab

Conducted Radio Test Lab

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.1	SMB100A	Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	107695	2017-07	2020-07
2.2	MFS	Rubidium Frequency Standard	Datum-Beverly	5489/001	2017-07	2018-07
2.3	FSV30	Signal Analyzer 10 Hz - 30 GHz	Rohde & Schwarz	103005	2016-02	2018-02
2.4	SMP03	Signal Generator 2 GHz - 27 GHz	Rohde & Schwarz	833680/003	2017-09	2020-09
2.5	FSIQ26	Signal Analyser	Rohde & Schwarz	840061/005	2017-05	2019-05
2.6	Chroma 6404	AC Power Source	Chroma ATE INC.	64040001304		
2.7	VT 4002	Climatic Chamber	Vötsch	58566002150010	2016-03	2018-03
2.8	WA1515	Broadband Power Divider SMA	Weinschel Associates	A855		
2.9	A8455-4	4 Way Power Divider (SMA)		-		
2.10	Opus10 THI (8152.00)	ThermoHygro Datalogger 03 (Environ)	Lufft Mess- und Regeltechnik GmbH	7482	2017-03	2019-03
2.11	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	259291	2016-10	2019-10

The calibration interval is the time interval between "Last Calibration" and "Calibration Due"

**TEST REPORT REFERENCE:**

**MDE\_PREH\_1602\_RADb**

**Photo Report**



**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADb

## Measurement Uncertainties

Parameter	Uncertainty
Uncertainty in conducted measurements	$\pm 1.0$ dB
Uncertainty in radiated measurements	$\pm 4.5$ dB
Spurious Emissions, conducted	$\pm 2.0$ dB
Spurious Emissions, radiated	$\pm 4.5$ dB

# Inter|Lab<sup>®</sup>

## Radio Test Report

**Test Report Reference: MDE\_PREH\_1602\_RADc**

on

### MIB3 OI Car Radio

**according to:**

**ETSI EN 300 440 V2.1.1 (2017-03)**

Short Range Devices (SRD);

Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Harmonized Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

**Test Laboratory:**

7layers GmbH  
Borsigstrasse 11  
40880 Ratingen  
Germany



Deutsche  
Akkreditierungsstelle  
D-PL-12140-01-00

**Note:**

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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## TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADc

## List of measurements

The list of measured parameters called for in EN 300 440,  
Table A.1: HS Requirements and conformance Test specifications Table (HS-RTT).


Harmonized Standard EN 300 440 The following requirements and test specifications are relevant to the presumption of conformity under Article 3.2 of Directive 2014/53/EU							Test Outcome	
Essential Requirement			Requirement Conditionality		Test Specification		Result	Page
No.	Description	Reference Clause No.	U/C	Condition	E/O	Reference Clause No.		
1	Equivalent isotropically radiated power	4.2.1.1	U		E	5.3.1	N/P	-
2	Permitted range of operating frequencies	4.2.1.2	U		E	5.3.2	N/P	-
3	Unwanted emissions in the spurious domain	4.2.1.3	U		E	5.3.3	passed	7
4	Duty cycle	4.2.1.4	C	Does apply for RFID in 2446 MHz to 2454 MHz only	O		N/A (3)	-
5	Adjacent channel selectivity	4.2.2.1	C	Applies to Category 1 receivers only. Does not apply to GBSAR (see note)	E	5.4.1	N/A (4)	-
6	Blocking or desensitization	4.2.2.2	C	Applies to Category 1 and Category 2 receivers. Does not apply to GBSAR (see note)	E	5.4.2	N/A (4)	-
7	Spurious radiations	4.2.2.3	U		E	5.4.3	passed	8
8	2,45 GHz RFID systems	4.2.3	C	Applies to 2,45 GHz RFID systems only	E	5.5	N/A	-
9	Effective radiated power	4.2.4.1	C	Applies to GBSAR systems only	E	5.6.1	N/A	-
10	Permitted range of operating frequencies	4.2.4.2	C	Applies to GBSAR only	E	5.6.2	N/A	-
11	DAA threshold	4.2.4.3	C	Applies to GBSAR only	E	5.6.3	N/A	-
12	Minimum listen time	4.2.4.3.1.1	C	Applies to GBSAR only	E	5.6.4.1	N/A	-
13	Minimum listen time after detection	4.2.4.3.1.2	C	Applies to GBSAR only	E	5.6.4.2	N/A	-
14	Maximum transmit on-time	4.2.4.3.1.3	C	Applies to GBSAR only	E	5.6.4.3	N/A	-
15	Minimum transmit off-time	4.2.4.3.1.4	C	Applies to GBSAR only	E	5.6.4.4	N/A	-
16	Antenna pattern	4.2.4.4	C	Applies to GBSAR only	E	5.6.5	N/A	-
17	Unwanted emissions in the spurious domain	4.2.4.5	C	Applies to GBSAR only	E	5.6.6	N/A	-


NOTE : GBSAR is radar for which items 9 to 17 apply.

- N/A Not applicable.  
 N/P Not performed.  
 (3) No test specified.  
 (4) Test not applicable because receiver is classified as category 3.

### Comment:

Not all tests were performed, because the Equipment under Test (EUT) includes a pre-certified WLAN module (LBEE6ZZ1FD). Therefore only radiated spurious emissions were performed.

  
 (responsible for accreditation scope)  
 Dipl.-Ing. Marco Kullik

  
 (responsible for testing and report)  
 B.Sc. Jens Dörwald



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**TEST REPORT REFERENCE:**

**MDE\_PREH\_1602\_RADc**

**Administrative Data:**

**Testing Laboratory**

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Laboratory accreditation no.: DAkkS D-PL-12140-01-00  
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Dipl.-Ing. Marco Kullik  
Dipl.-Ing. Wolfgang Richter  
Report Template Version: 2015-12-01

**Project Data**

Responsible for testing and report: B.Sc. Jens Dörwald  
Date of Testing: 2017-12-31 to 2018-01-10  
Date of Report: 2018-03-15

**Applicant Data**

Company Name: Preh Car Connect GmbH  
Address: Gewerbepark Merbitz 5  
01156 Dresden  
Germany  
Contact Person: Mr. Christian Stopp



**TEST REPORT REFERENCE:**

**MDE\_PREH\_1602\_RADc**

**Test object Data**

**General Description of Radio Device**

According to applicant's declaration

Kind of Device product description	Car Radio with BT, WLAN, GPS and Broadcast Receiver Relevant for EN 300 440: 5 GHz WLAN transceiver that is intended to operate in the frequency range 5725 MHz to 5850 MHz			
Product name	Car Radio			
Type	MIB3 OI			
Voltage Type	DC			
Voltage level (nominal)	12.0 V			
Normal and extreme test conditions (see note)	T <sub>nor</sub> = +20 °C	T <sub>min</sub> = -40 °C	T <sub>max</sub> = +60 °C	
	V <sub>nor</sub> = 12.0 V	V <sub>min</sub> = 9.0 V	V <sub>max</sub> = 18.0 V	
Output Power [E.I.R.P]	14.0 dBm			
Antenna type / gain	integral / -10.0 dBi			
No. of TX chains	1			
Duty Cycle (linear)	~ 1.0			
Test modulation pattern	a-mode 6 Mbps (BPSK), 20 MHz			
Nominal Bandwidth	TX and RX: 20 MHz			
Receiver Category	3			
Test frequencies supported by the device Frequency / MHz (Channel)	Bandwidth: lowest: mid: highest:	20 MHz 5745 (149) 5785 (157) 5825 (165)	40 MHz 5755 (151) – 5795 (159)	80 MHz 5775 (155) – –
Operating modes	Standard: IEEE 802.11 a,n,ac			

Note: The extreme and normal test conditions are specified by the applicant.

**TEST REPORT REFERENCE:**

**MDE\_PREH\_1602\_RADc**

**Tested Radio Devices**

Sample Name	Sample Code	Description
DE1288000	ah01	radiated sample
<b>Sample Parameter</b>	<b>Value</b>	
Serial No.	YD5-00130.06.1700170432	
HW Version	X07	
SW Version	R055	
Comment	-	

**General description of ancillary equipment**

<b>Description</b>	<b>Details</b> (Manufacturer, Type, S/N, HW, SW)	<b>Reason for using</b>
-	-	-



**TEST REPORT REFERENCE:**

**MDE\_PREH\_1602\_RADc**

**General description of auxiliary equipment**

<b>Description</b>	<b>Details</b> (Manufacturer, Type, S/N, HW, SW)	<b>Reason for using</b>
External Combi- Antenna cellular & GNS "shark finn"	VW Kombi, GSM/GNSS Antenna, -, -, -	-
Life box	-, Life Box, -, -, -	Keep aöive box

**TEST REPORT REFERENCE:**

**MDE\_PREH\_1602\_RADc**

## Test Outcome

**Unwanted emissions in the spurious domain (radiated)**

**CLAUSE 5.3.3**

**Ambient temperature: 23 °C    Relative humidity: 37 %**

**Transmitter operating on 5785 MHz (CH157), a-mode 6 Mbps (BPSK), 20 MHz.**

Spurious Frequency (MHz)	Spurious Emission Level (dBm)	Measurement Bandwidth (kHz)	Comment
-	-	100 (f < 1 GHz) 1000 (f > 1 GHz)	pre-scan result (peak value)
-	-	100 (f < 1 GHz) 1000 (f > 1 GHz)	≤ 1 GHz (QP value) > 1 GHz (peak value)
Measurement uncertainty:    ± 4.5 dB			

### COMMENTS:

- Tested frequency range 25 MHz to 40 GHz
- No final measurement is performed until pre-scan (worst-case) result stays below the limit.
- At least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- Such values have not been found.

**TEST REPORT REFERENCE:**

**MDE\_PREH\_1602\_RADc**

**Receiver spurious radiations (radiated)**

**CLAUSE 5.4.3**

**Ambient temperature: 23 °C    Relative humidity: 37 %**

**Receiver operating on 5785 MHz (CH157), Transmitter off or standby**

Spurious Frequency (MHz)	Spurious Emission Level (dBm)	Measurement Bandwidth (kHz)	Comment
–	–	100 (f < 1 GHz) 1000 (f > 1 GHz)	pre-scan result (peak value)
–	–	100 (f < 1 GHz) 1000 (f > 1 GHz)	≤ 1 GHz (QP value) > 1 GHz (peak value)
Measurement uncertainty:    ± 4.5 dB			

**COMMENTS:**

- Tested frequency range 25 MHz to 40 GHz.
- No final measurement is performed until pre-scan (worst-case) result stays below the limit.
- At least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- Such values have not been found.

**Limits:**

State	25 MHz to 1 GHz	Frequencies > 1 GHz
<b>Receiver Operating</b>	–57 dBm	–47 dBm

**TEST EQUIPMENT USED: 1.1 – 1.37**

**TEST REPORT REFERENCE:**

**MDE\_PREH\_1602\_RADc**

**Test Equipment used for tests**

**1 Radiated Emissions**

Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	NRV-Z1	Sensor Head A	Rohde & Schwarz	827753/005	2017-05	2018-05
1.2	MFS	Rubidium Frequency Normal MFS	Datum GmbH	002	2017-10	2018-10
1.3	Opus10 TPR (8253.00)	ThermoAirpressure Datalogger 13 (Environ)	Lufft Mess- und Regeltechnik GmbH	13936	2017-04	2019-04
1.4	Anechoic Chamber	10.58 x 6.38 x 6.00 m <sup>3</sup>	Frankonia	none	2016-05	2019-05
1.5	FS-Z60	Harmonic Mixer 40 - 60 GHz	Rohde & Schwarz Memmingen	100178	2016-12	2019-12
1.6	FS-Z220	Harmonic Mixer 140 - 220 GHz	Rohde & Schwarz Memmingen	101005	2017-03	2020-03
1.7	SGH-05	Antenna (140 - 220 GHz)		075		
1.8	HL 562	Ultralog new biconicals	Rohde & Schwarz	830547/003	2015-06	2018-06
1.9	5HC2700/12750-1.5-KK	High Pass Filter	Trilithic	9942012		
1.10	ASP 1.2/1.8-10 kg	Antenna Mast	Maturo GmbH	-		
1.11	Fully Anechoic Room	8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001-PRB	2015-06	2018-06
1.12	JS4-18002600-32-5P	Broadband Amplifier 18 GHz - 26 GHz	Miteq	849785		
1.13	FSW 43	Spectrum Analyzer	Rohde & Schwarz	103779	2016-12	2018-12
1.14	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronik GmbH	00083069		
1.15	SGH-19	Antenna (40 - 60 GHz)		093		
1.16	WHKX 7.0/18G-8SS	High Pass Filter	Wainwright	09		
1.17	4HC1600/12750-1.5-KK	High Pass Filter	Trilithic	9942011		
1.18	Chroma 6404	AC Power Source	Chroma ATE INC.	64040001304		
1.19	JS4-00102600-42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368		
1.20	TT 1.5 WI	Turn Table	Maturo GmbH	-		
1.21	HL 562 Ultralog	Log.-per. Antenna	Rohde & Schwarz	100609	2016-04	2019-04

**TEST REPORT REFERENCE:**

**MDE\_PREH\_1602\_RADc**

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.22	FS-Z325	Harmonic Mixer 220 - 325 GHz	Rohde & Schwarz Memmingen	101006	2017-03	2020-03
1.23	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronik GmbH	00086675		
1.24	SGH-08	Antenna (90 - 140 GHz)		064		
1.25	SGH-12	Antenna (60 - 90 GHz)		326		
1.26	5HC3500/18000-1.2-KK	High Pass Filter	Trilithic	200035008		
1.27	FS-Z140	Harmonic Mixer 90 -140 GHz	Rohde & Schwarz Memmingen	101007	2017-02	2020-02
1.28	Opus10 THI (8152.00)	ThermoHygro Datalogger 12 (Environ)	Lufft Mess- und Regeltechnik GmbH	12482	2017-03	2019-03
1.29	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2016-11	2018-11
1.30	JS4-00101800-35-5P	Broadband Amplifier 30 MHz - 18 GHz	Miteq	896037		
1.31	AS 620 P	Antenna mast	HD GmbH	620/37		
1.32	Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	Maturo GmbH	TD1.5-10kg/024/3790709		
1.33	SGH-03	Antenna (220 - 325 GHz)		060		
1.34	FS-Z90	Harmonic Mixer 60 - 90 GHz	Rohde & Schwarz Memmingen	101686	2017-03	2020-03
1.35	PAS 2.5 - 10 kg	Antenna Mast	Maturo GmbH	-		
1.36	AM 4.0	Antenna mast	Maturo GmbH	AM4.0/180/11920513		
1.37	HF 907	Double-ridged horn	Rohde & Schwarz	102444	2015-05	2018-05

The calibration interval is the time interval between "Last Calibration" and "Calibration Due"

**TEST REPORT REFERENCE:**

**MDE\_PREH\_1602\_RADc**

**Photo Report**



Setup Photo: radiated spurious emissions

# Radio Test Report

**Test Report Reference: MDE\_PREH\_1602\_RADd**

**on**

## MIB3 OI

### Car Radio

**according to:**

**Final Draft ETSI EN 303 345 V1.1.7 (2017-03)**

Broadcast Sound Receivers;

Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

**Test Laboratory:**

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Borsigstrasse 11  
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Germany



**Note:**

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**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd


**List of measurements**

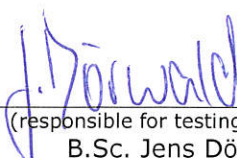
The list shows " <b>Essential radio test suite</b> " as specified in table A.1 in the standard Final Draft ETSI EN 303 345.						
<b>Standard Final Draft ETSI EN 303 345</b>						<b>Test Documentation</b>
The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the RED						
Requirement			Requirement Conditionality	Test Specification		Final Result
No	Description	Reference: Clause No		E/O	Reference: Clause No	
1	Sensitivity	4.2.4		Essential Radio Test Suite	5.3.4	Passed
2	Receiver Adjacent Channel Selectivity and Blocking	4.2.5		Essential Radio Test Suite	5.3.5	Passed
3	Unwanted Emissions in the Spurious Domain	4.2.6		Essential Radio Test Suite	5.3.6	Passed

**Notes:**

**The test report focuses on the Essential Radio Test Suite (E)**

- E Essential Radio Test Suite.
- O Other Test Suite.

  
 (responsible for accreditation scope)  
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**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

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Laboratory accreditation no: DAkkS D-PL-12140-01-00  
Responsible for accreditation scope: Dipl.-Ing. Marco Kullik  
Report Template Version: 2017-07-05

**Project Data**

Responsible for testing and report: B.Sc. Jens Dörwald  
Date of Report: 2018-03-15  
Testing Period: 2018-02-15 to 2018-02-20

**Applicant Data**

Company Name: Preh Car Connect GmbH  
Address: Gewerbepark Merbitz 5  
01156 Dresden  
Germany  
Contact Person: Mr. Christian Stopp

**Manufacturer Data**

Company Name: please see applicant data  
Address:  
Contact Person:

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

**Test object Data****General Description of Radio Device**

Kind of Device product description	Car Radio Infotainment system with AM/FM/DAB receiver
Product name	Car Radio
Type	MIB3 OI
<b>Declared EUT data by the supplier</b>	
OUT Description	The OUT is a car head unit with a built-in broadcast receiver.
Supported broadcast technologies	The OUT supports the following broadcast technologies: AM-MF (526.5 kHz - 1606.5 kHz) FM-VHF Band II (87.5 MHz - 108.0 MHz) DAB-VHF Band III (174.0 MHz - 240.0 MHz)
Supply Voltage	12 V DC
AM Antenna Type	External, 50 $\Omega$
FM Antenna Type	External, 50 $\Omega$
DAB Antenna Type	External, 50 $\Omega$

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

**Tested Radio Devices**

Sample Name	Sample Code	Description
EUT A	DE1288000aj01	Radiated and Conducted
Sample Parameter	Value	
Serial No.	YD5-00105.07.1700170010	
SW Version	X055	
HW Version	X07	
Comment	-	

**General description of ancillary equipment**

Device	Details (Manufacturer, Type Model, OUT Code)	Reason for using
-	-	-

**General description of auxiliary equipment**

Device	Details (Manufacturer, HW, SW, S/N)	Description
AUX 1	-, -, -, -	Speaker
AUX 2	-, -, -, -	Display
AUX 3	-, Life box, -; -;	Keep alive box

**Used setups**

Setup	Equipment	Description
S01_AJ01	EUT A + AUX 1 + AUX 2 + AUX 3	Typical Setup; used for all tests

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

**TEST RESULTS**

**Sensitivity**

**CLAUSE 5.3.4**

Ambient temperature: 23 °C  
Relative humidity: 30 %

**Setup: S01\_AJ01**

Demodulation AM; Tuned Frequency Band MF

Wanted Signal Frequency [MHz]	Reference Sensitivity Level [dBm]	SNR [dB]	Limit SNR [dB]	Margin to Limit [dBm]
0.999	-65.0	48.3	28.0	20.3

Demodulation FM; Tuned Frequency Band VHF Band II

Wanted Signal Frequency [MHz]	Reference Sensitivity Level [dBm]	SNR [dB]	Limit SNR [dB]	Margin to Limit [dBm]
98.000	-90.0	44.5	40.0	4.5

Demodulation DAB; Tuned Frequency Band VHF Band III

Wanted Signal Frequency [MHz]	Reference Sensitivity Level [dBm]	Clean Audio (10 s no impairment)
202.928	-94.0	YES

**COMMENTS:**

- The measurement was performed conducted.
- The wanted and unwanted signals parameters were set according chapter 4.2.3
- The conducted measurement setup was according chapter 5.3.3/5.3.5
- The radiated measurement setup was according chapter 5.3.2/5.3.5. A Fully Anechoic Chamber according EN 55032, table A.1, annex C and annex D was used

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

**Limits: Final Draft EN 303345 v1.1.7, clause 4.2.4.2**

**Table 5: Sensitivity requirements**

Test	De-modulation	Tuned Frequency Band	Wanted Signal Centre Frequency [MHz]	Required Sensitivity Limit	
				Conducted [dBm]	Radiated [dBμV/m]
1	AM	LF	0.216	-65.0	74.0
2		MF	0.999	-65.0	66.0
3		HF	9.9	-65.0	60.0
4	FM	VHF band II	98.0	-90.0	50.0 (see note 1)
5	DAB	VHF band III	202.928	-94.0	37.0 (see note 2)
6	DRM	LF	0.216	-101.0	58.0
7		MF	0.999	-101.0	52.0
8		HF 1	4.0	-101.0	44.0
9		HF 2	19.0	-101.0	40.0
10		VHF band I	65.0	-102.0	45.0
11		VHF band II	100.0	-102.0	46.0
12		VHF band III	200.0	-102.0	51.0
NOTE 1: For products with an integral antenna, the requirement is relaxed to 67 dBμV/m. NOTE 2 For products with an integral antenna, the requirement is relaxed to 50 dBμV/m.					

**Table 6: Impairment criteria for sensitivity tests**

Demodulation	Impairment Criteria
AM	SNR $\geq$ 28 dBQ ref 40% AM
FM	SNR $\geq$ 40 dBQ ref $\pm$ 60.8 kHz deviation; clean audio (see note 1)
DAB	Clean audio (see note 2)
DRM	Clean audio (see note 2)
NOTE 1: Clean audio is defined as 10 seconds of audio with no subjective impairments (e.g. clicks resulting from FM threshold effects). NOTE 2: Clean audio is defined as 10 seconds of audio with no subjective impairments (e.g. muting, clicks, warbles or squeaks).	

**TEST EQUIPMENT USED:**

- Radio Laboratory

## TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADd

### Receiver Adjacent Channel Selectivity and Blocking

### CLAUSE 5.3.5

Ambient temperature: 23 °C  
Relative humidity: 30 %

**Setup:** S01\_AJ01

Demodulation AM; Tuned Frequency Band MF

Wanted Signal Operating Frequency [MHz]	Wanted Signal Level [dBm]	Unwanted Frequency [N]	Blocking Signal Offset [kHz]	I/C Ratio [dB]	Blocking Level [dBm]	SNR [dB]	Limit SNR [dB]	Margin to Limit [dBm]
0.999	-59.0	-Blocking	-90	40.0	-19.0	33.7	28.0	5.7
0.999	-59.0	-3	-27	35.0	-24.0	37.6	28.0	9.6
0.999	-59.0	-2	-18	25.0	-34.0	40.0	28.0	12.0
0.999	-59.0	-1	-9	-5.0	-64.0	46.4	28.0	18.4
0.999	-59.0	+1	9	-5.0	-64.0	46.2	28.0	18.2
0.999	-59.0	+2	18	25.0	-34.0	40.7	28.0	12.7
0.999	-59.0	+3	27	35.0	-24.0	37.9	28.0	9.9
0.999	-59.0	Blocking	90	40.0	-19.0	34.8	28.0	6.8

Demodulation FM; Tuned Frequency Band VHF Band II

Wanted Signal Operating Frequency [MHz]	Wanted Signal Level [dBm]	Unwanted Frequency [N+1]	Blocking Signal Offset [kHz]	I/C Ratio [dB]	Blocking Level [dBm]	SNR [dB]	Limit SNR [dB]	Margin to Limit [dBm]
98.000	-84.0	-Blocking	-800	30.0	-54.0	48.1	40.0	8.1
98.000	-84.0	-4	-400	30.0	-54.0	44.3	40.0	4.3
98.000	-84.0	-3	-300	17.0	-67.0	46.4	40.0	6.4
98.000	-84.0	-2	-200	3.0	-81.0	47.2	40.0	7.2
98.000	-84.0	+2	200	3.0	-81.0	48.0	40.0	8.0
98.000	-84.0	+3	300	17.0	-67.0	47.2	40.0	7.2
98.000	-84.0	+4	400	30.0	-54.0	43.4	40.0	3.4
98.000	-84.0	Blocking	800	30.0	-54.0	47.8	40.0	7.8

Demodulation DAB; Tuned Frequency Band VHF Band III

Wanted Signal Operating Frequency [MHz]	Wanted Signal Level [dBm]	Unwanted Frequency [N]	Blocking Signal Offset [kHz]	I/C Ratio [dB]	Blocking Level [dBm]	Limit SNR [dB]	Clean Audio (10 s no impairment)
202.928	-70.0	-Blocking	-12000	40.0	-30.0	28.0	YES
202.928	-70.0	-3	-5136	45.0	-25.0	28.0	YES
202.928	-70.0	-2	-3424	40.0	-30.0	28.0	YES
202.928	-70.0	-1	-1712	35.0	-35.0	28.0	YES
202.928	-70.0	+1	1712	35.0	-35.0	28.0	YES
202.928	-70.0	+2	3424	40.0	-30.0	28.0	YES
202.928	-70.0	+3	5136	45.0	-25.0	28.0	YES
202.928	-70.0	Blocking	12000	40.0	-30.0	28.0	YES

#### COMMENTS:

- The measurement was performed conducted.
- The wanted and unwanted signals parameters were set according chapter 4.2.3
- The conducted measurement setup was according chapter 5.3.3/5.3.5

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

- The radiated measurement setup was according chapter 5.3.2/5.3.5. A Fully Anechoic Chamber according EN 55032, table A.1, annex C and annex D was used.

**TEST REPORT REFERENCE:**

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**Limits: Final Draft EN 303345 v1.1.7, clause 4.2.5.2**

**Table 8: Adjacent channel selectivity and blocking requirements**

Test	De-modulation	Tuned Frequency Band	C Wanted Signal Centre Frequency [MHz]	C Wanted Signal Level		Required I/C Ratio (see notes 1 and 2)			
				Conducted [dBm]	Radiated [dBµV/m]	N=1 [dB]	N=2 [dB]	N=3 [dB]	Blocking [dB]
1R	AM (built-in or integral antenna, see note 4)	LF	0.216	n/a	80.0	-30	10	20	20
2R		MF	0.999	n/a	72.0	-30	10	20	20
3R		HF	9.9	n/a	66.0	-30	10	20	20
1C	AM (external antenna)	LF	0.216	-59.0	n/a	-5	25	35	40
2C		MF	0.999	-59.0	n/a	-5	25	35	40
3C		HF	9.9	-59.0	n/a	-5	25	35	40
4R	FM (built-in or integral antenna, see note 4)	VHF band II	98.0	n/a	56 (see note 3)	-15	-3	35	40
4C	FM (external antenna)	VHF band II	98.0	-84.0	n/a	3	17	8	20
5	DAB	VHF band III	202.928	-70.0	61.0	35	40	30	30
6	DRM	LF	0.216	-91.0	68.0	25	35	45	40
7		MF	0.999	-91.0	62.0	25	35	45	50
8		HF 1	4.0	-91.0	54.0	25	35	45	50
9		HF 2	19.0	-91.0	54.0	25	35	45	50
10		VHF band I	65.0	-91.0	50.0	35	40	45	50
11		VHF band II	100.0	-92.0	55.0	35	40	45	50
12		VHF band III	200.0	-92.0	61.0	35	40	45	50
NOTE 1: The frequency of the interferer shall be calculated using the channel spacing data in table 7 for each of the 6 defined adjacent channels $N = \{-3, -2, -1, +1, +2, +3\}$ and the two blocking offsets. Each row of table 8 thus defines 8 individual tests									
NOTE 2 The minimum level of I for the relevant level of impairment is calculated by adding the I/C ratio to the wanted C level.									
NOTE 3: The wanted signal level for receivers with integral antenna is 73 dBµV/m.									
NOTE 4: The ACS and blocking requirements for AM and FM devices are currently separated into different limits for radiated and conducted testing methods. These limits are likely to be unified in a future revision of the present document. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union									



**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

**Table 9: Impairment criteria for adjacent channel selectivity and blocking tests**

Demodulation	Impairment Criteria
AM	SNR $\geq$ 28 dBQ ref 40% AM
FM	SNR $\geq$ 40 dBQ ref $\pm 60.8$ kHz deviation; clean audio (see note 1)
DAB	Clean audio (see note 2)
DRM	Clean audio (see note 2)
NOTE 1: Clean audio is defined as 10 seconds of audio with no subjective impairments (e.g. clicks resulting from FM threshold effects).	
NOTE 2: Clean audio is defined as 10 seconds of audio with no subjective impairments (e.g. muting, clicks, warbles or squeaks).	

**TEST EQUIPMENT USED:**

- Radio Laboratory

## TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADd

### Unwanted Emissions in the Spurious Domain

### CLAUSE 5.3.6

Ambient temperature:

24 °C

Relative humidity:

32 %

#### Setup: S01\_AJ01

Demodulation AM; Tuned Frequency Band MF

Operating Mode: EUT receiving on: 0.999 MHz

Measurement Method	Frequency [MHz]	Spurious Level [dBμV]	Detector	RBW [kHz]	Limit [dBμV]	Margin to Limit [dB]
Conducted	-	-	-	-	-	>6dB

Measurement Method	Frequency [MHz]	Spurious Level [dBμV/m]	Detector	RBW [kHz]	Limit [dBμV/m]	Margin to Limit [dB]
Radiated	-	-	-	-	-	>6dB

Demodulation FM; Tuned Frequency Band VHF Band II

Operating Mode: EUT receiving on: 98 MHz

Measurement Method	Frequency [MHz]	Spurious Level [dBμV]	Detector	RBW [kHz]	Limit [dBμV]	Margin to Limit [dB]
Conducted	-	-	-	-	-	>6dB

Measurement Method	Frequency [MHz]	Spurious Level [dBμV/m]	Detector	RBW [kHz]	Limit [dBμV/m]	Margin to Limit [dB]
Radiated	-	-	-	-	-	>6dB

Demodulation DAB; Tuned Frequency Band VHF Band III

Operating Mode: EUT receiving on: 202.928 MHz

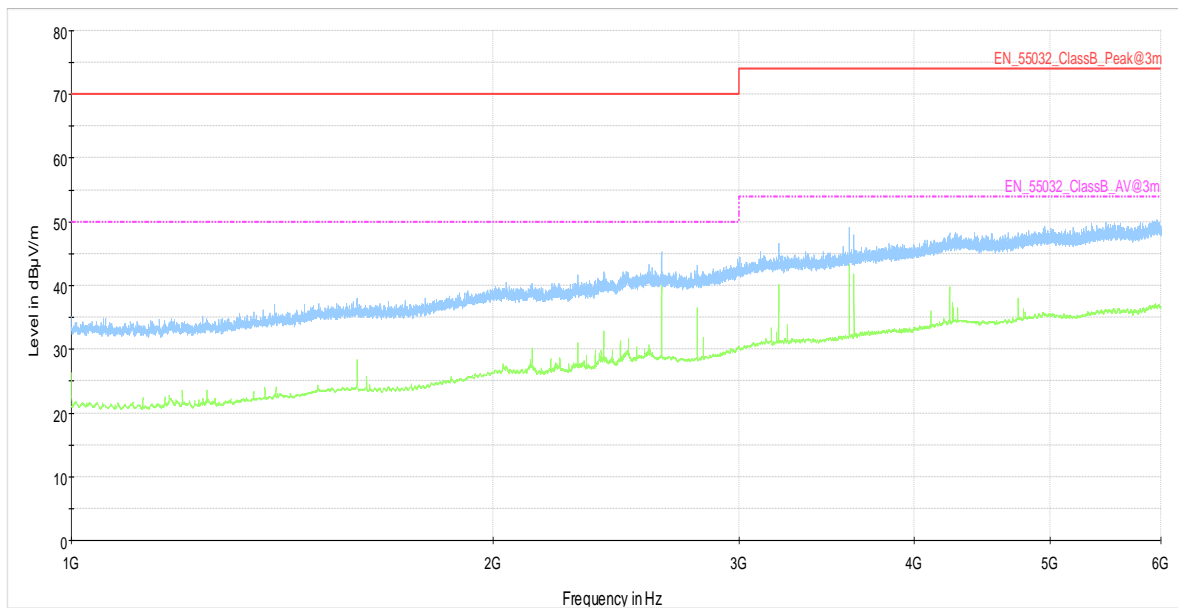
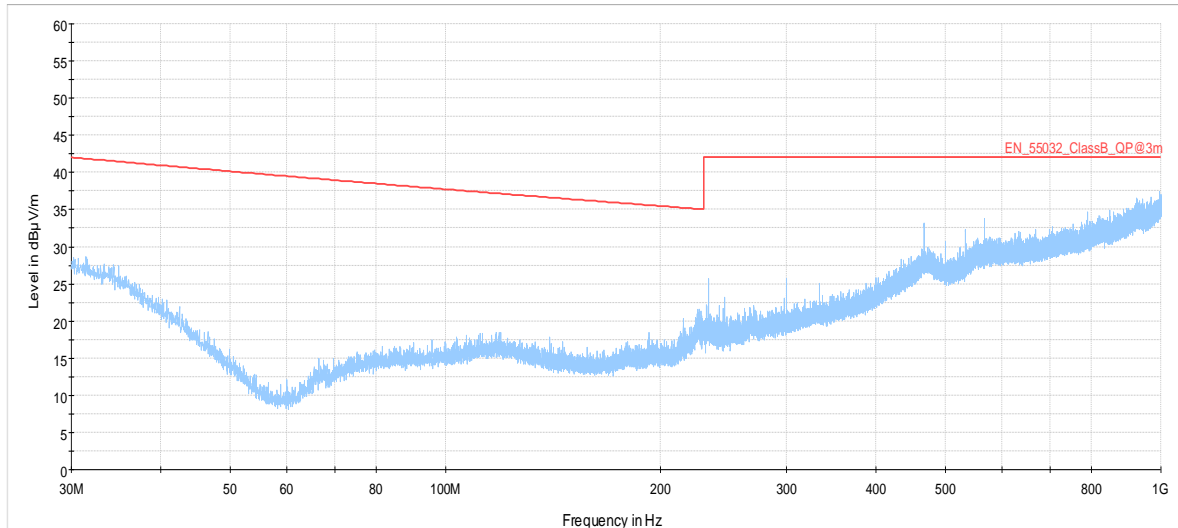
Measurement Method	Frequency [MHz]	Spurious Level [dBμV]	Detector	RBW [kHz]	Limit [dBμV]	Margin to Limit [dB]
Conducted	-	-	-	-	-	>6dB

Measurement Method	Frequency [MHz]	Spurious Level [dBμV/m]	Detector	RBW [kHz]	Limit [dBμV/m]	Margin to Limit [dB]
Radiated	-	-	-	-	-	>6dB

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

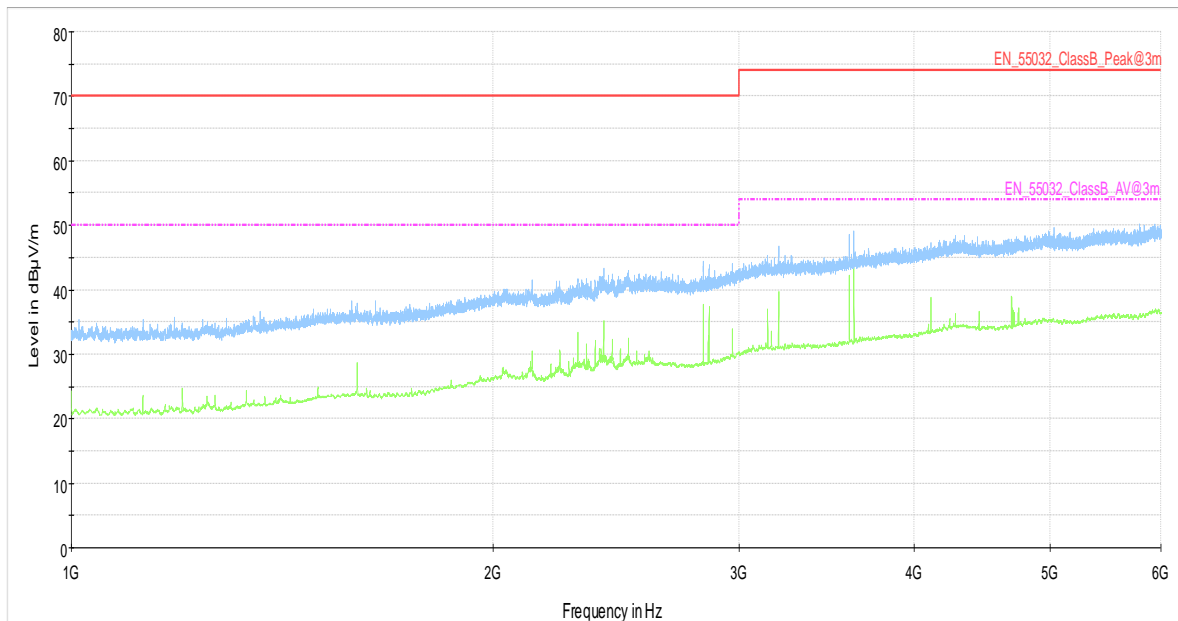
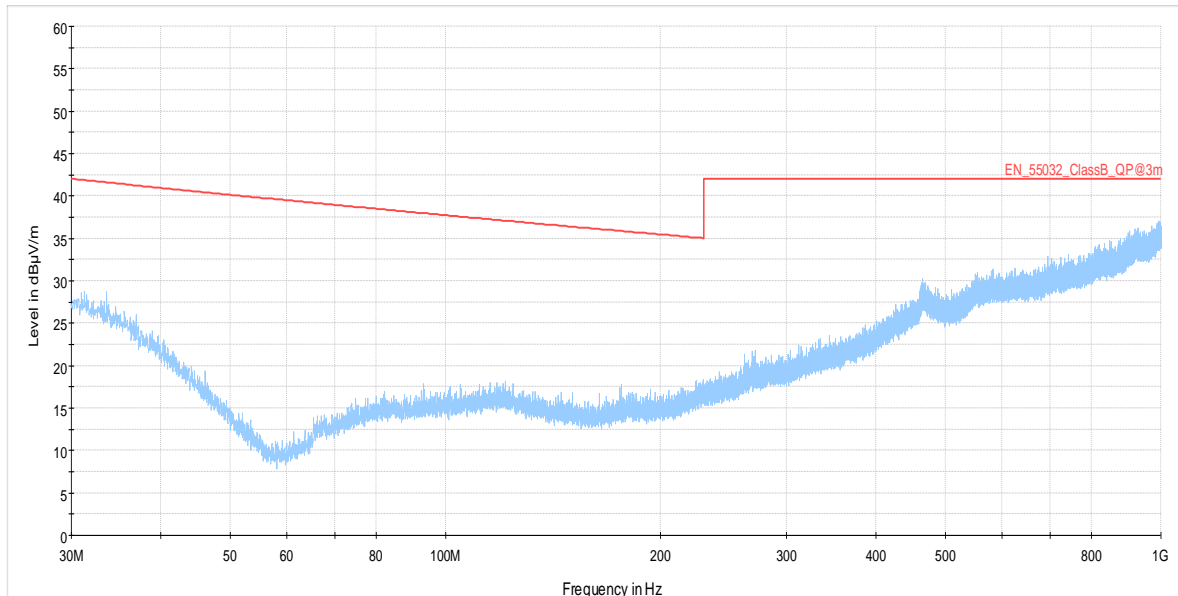
Measurement Method = Radiated, Demodulation = AM, Tuned Frequency Band = MF,  
Signalling = Conducted; Setup: S01\_AJ01



# TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADd

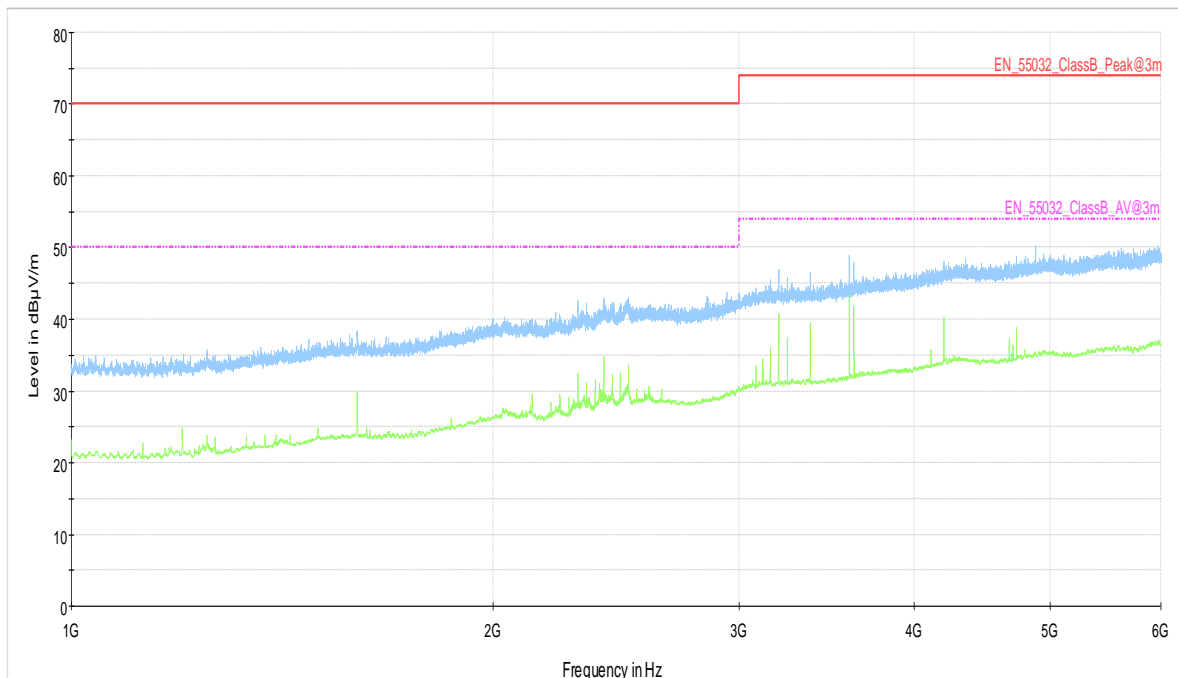
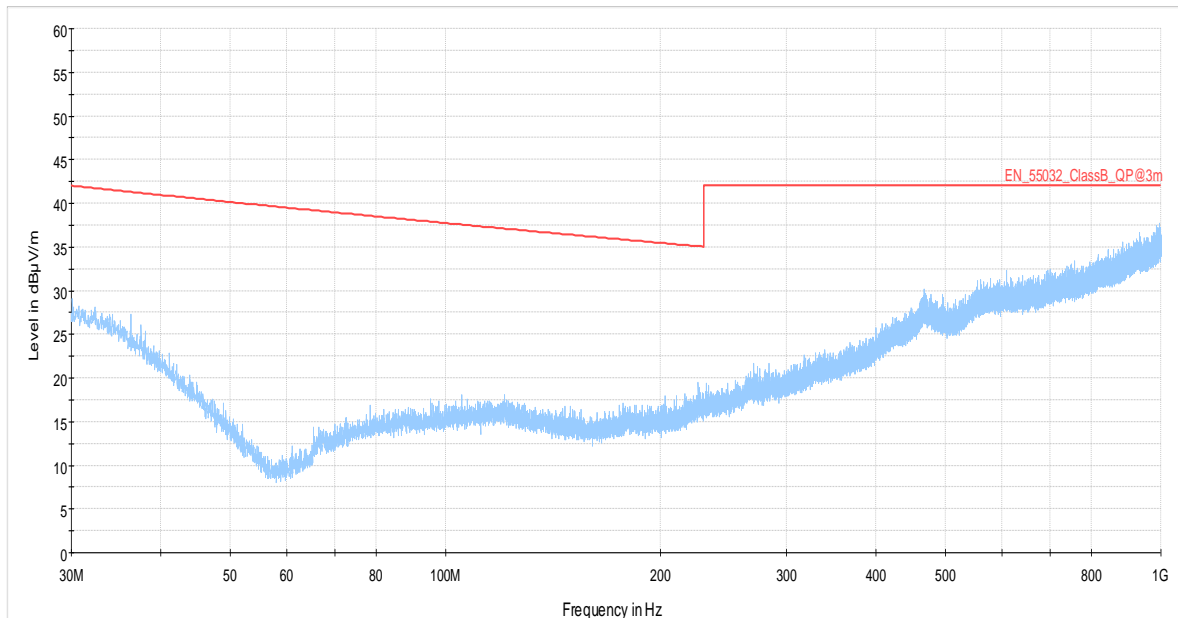
Measurement Method = Radiated, Demodulation = FM, Tuned Frequency Band = VHF Band II,  
Signalling = Conducted; Setup: S01\_AJ01



**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

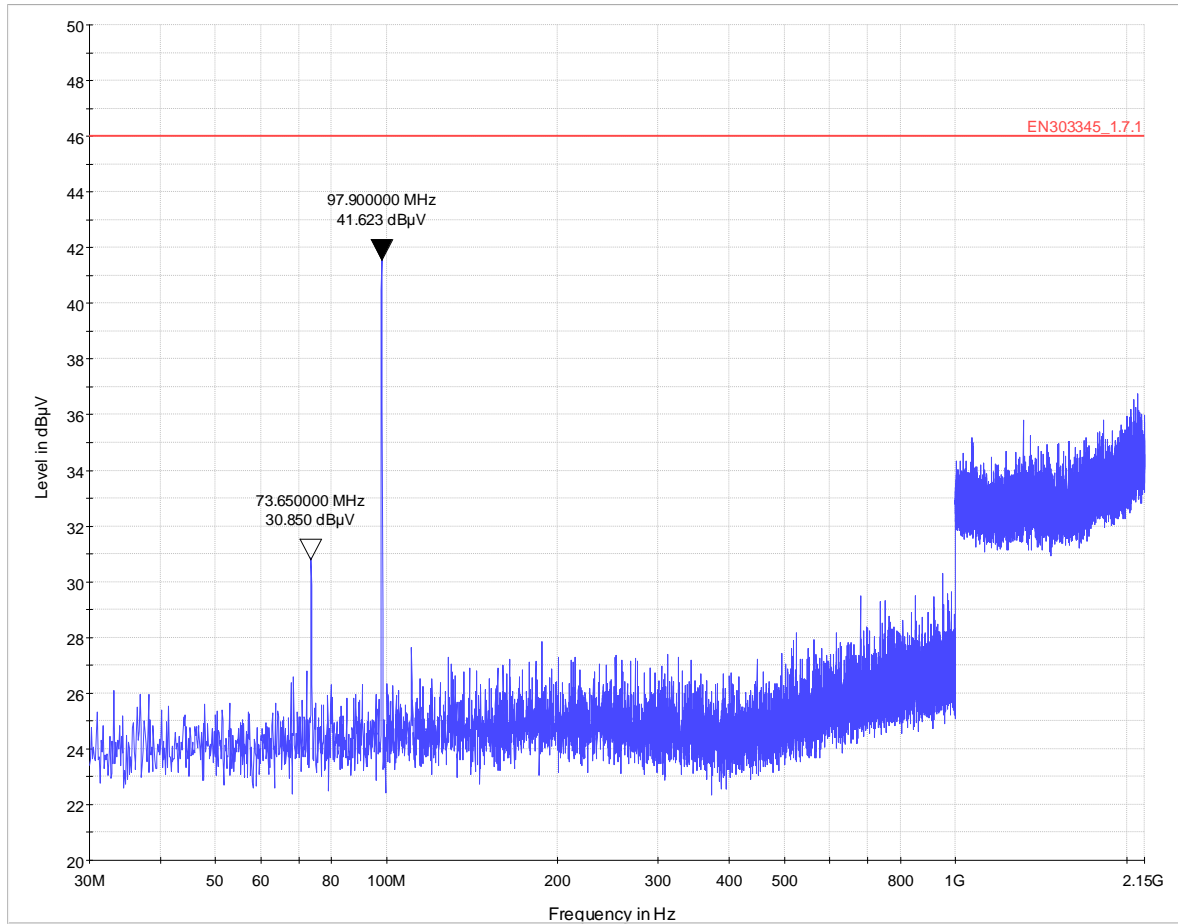
Measurement Method = Radiated, Demodulation = DAB, Tuned Frequency Band = VHF Band III, Signalling = Conducted; Setup: S01\_AJ01



**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

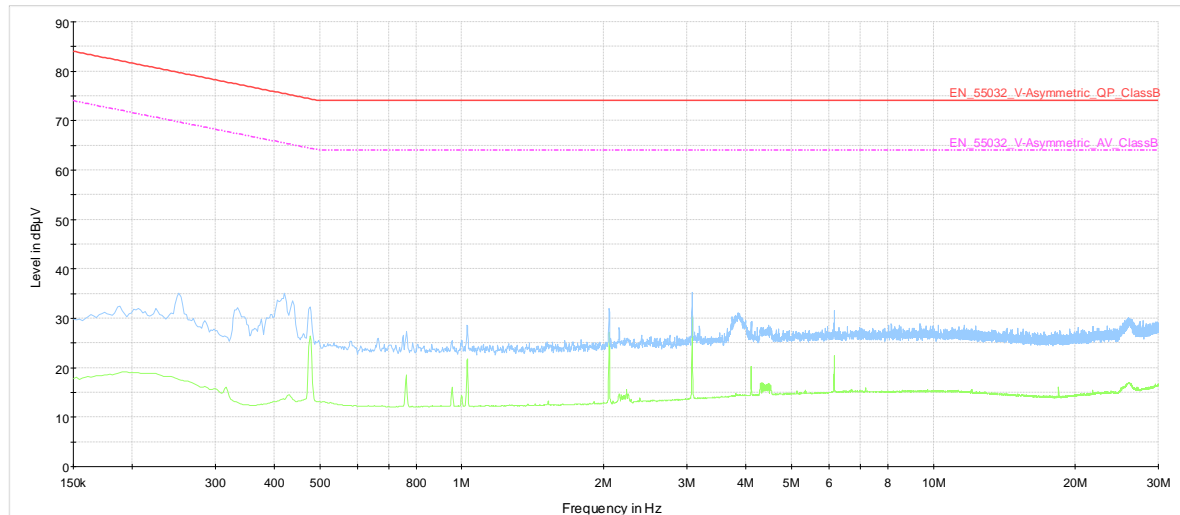
Measurement Method = Conducted, Demodulation = FM, Tuned Frequency Band = VHF Band II, Signalling = Conducted; Setup: S01\_AJ01



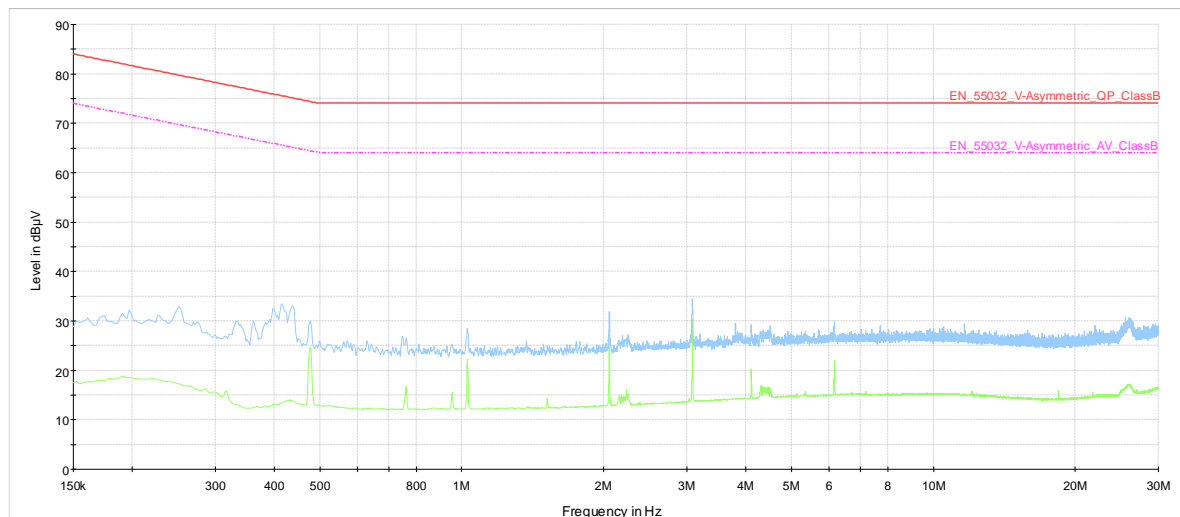
**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

Measurement Method = Conducted, Demodulation = AM, Tuned Frequency Band = MF,  
Signalling = Conducted; Setup: S01\_AJ01



Measurement Method = Conducted, Demodulation = DAB, Tuned Frequency Band = VHF Band III, Signalling = Conducted; Setup: S01\_AJ01



**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

**COMMENTS:**

- **Radiated Measurements:**
  - Tested frequency range: 30 MHz – 6 GHz.
  - Tests were performed in a FAR
  - Measurement distance: 3 m
  - Limits: Table A.4 (FM receiver: Table A.4 +Table A.6) / Table A.5
- **Conducted Measurements:**
  - **FM receiver (differential voltage emissions):**
    - Tested frequency range: 30 MHz – 2150 MHz
    - Limits: Table A.13
  - **AM / DAB receiver (asymmetric mode conducted emissions)**
    - 150 kHz – 30 MHz
    - Limits: Table A.12
    - An AAN was used
- At least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.



**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

**Limits: EN 303345, clause 4.2.6.2**

**EN 55032**

**Table A.4 – Requirements for radiated emissions at frequencies up to 1 GHz for class B equipment**

Table clause	Frequency range [MHz]	Measurement			Class B limits [dBμV/m]
		Facility	Distance [m]	Detector type / bandwidth	
A4.2	30 to 230	OATS/SAC	3	Quasi Peak / 120 kHz	40
	230 to 1000				47
A4.4	30 to 230	FAR	3	Quasi Peak / 120 kHz	42 to 35
	230 to 1000				42
Apply only table clause A4.1 or A4.2 or A4.3 or A4.4 across the entire frequency range.					
These requirements are not applicable to the local oscillator and harmonics frequencies of equipment covered by Table A.6.					

**Table A.5 – Requirements for radiated emissions at frequencies above 1 GHz for class B equipment**

Table clause	Frequency range [MHz]	Measurement			Class B limits [dBμV/m]
		Facility	Distance [m]	Detector type / bandwidth	
A5.1	1000 to 3000	FSOATS	3	Average / 1 MHz	50
	3000 to 6000				54
A5.2	1000 to 3000	FSOATS	3	Peak / 1 MHz	70
	3000 to 6000				74
Apply A5.1 and A5.2 across the frequency range from 1 000 MHz to the highest required frequency of measurement derived from Table 1.					

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

**Table A.6 – Requirements for radiated emissions from FM receivers**

Table clause	Frequency range [MHz]	Measurement			Class B limits [dBμV/m]	
		Facility	Distance [m]	Detector type / bandwidth	Fundamental	Harm-onics
A6.2	30 to 230	OATS/SAC	3	Quasi Peak / 120 kHz	60	52
	230 to 300					52
	300 to 1000					56
A6.4	30 to 230	FAR	3	Quasi Peak / 120 kHz	62 to 55	54 to 47
	230 to 300				55	47
	300 to 1000				55	51
Apply only A6.1 or A6.2 or A6.3 or A6.4 across the entire frequency range.						
These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the LO. Signals at all other frequencies shall be compliant with the limits given in Table A.4.						

**Table A.12 – Requirements for asymmetric mode conducted emissions from Class B equipment**

**Applicable to**

1. wired network ports (3.1.32)
2. optical fibre ports (3.1.25) with metallic shield or tension members
3. broadcast receiver tuner ports (3.1.8)
4. antenna ports (3.1.3)

Table clause	Frequency range [MHz]	Measurement		Class B voltage limits [dBµV]
		Coupling Device	Detector type / bandwidth	
A12.1	0.15 to 0.5	AAN	Quasi Peak / 9 kHz	84 to 74
	0.5 to 30			74
A12.2	0.15 to 0.5	AAN	Average / 9 kHz	74 to 64
	0.5 to 30			64

The choice of coupling device and measurement procedure is defined in Annex C.

Screened ports including TV broadcast receiver tuner ports are measured with a common-mode impedance of 150 Ω. This is typically accomplished with the screen terminated by 150 Ω to earth.

AC mains ports that also have the function of a wired network port shall meet the limits given in Table A.10. The measurement shall cover the entire frequency range.

Measurement is required at only one EUT supply voltage and frequency.

Applicable to ports listed above and intended to connect to cables longer than 3 m.

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

**Table A.13 – Requirements for conducted differential voltage emissions from Class B equipment**

Applicable to						
1. TV broadcast receiver tuner ports (3.1.8) with an accessible connector						
2. RF modulator output ports (3.1.29)						
3. FM broadcast receiver tuner ports (3.1.8) with an accessible connector						
Table clause	Frequency range [MHz]	Detector type / bandwidth	Class B voltage limits [dBµV]			Appli-cability
			Other	Local Oscillator Fundamental	Local Oscillator Harmonics	
A13.1	30 to 950	For frequencies ≤ 1 GHz	46	46	46	See <sup>a</sup>
	950 to 2150		46	54	54	
A13.2	30 to 300	Quasi Peak / 120 kHz	46	54	50	See <sup>c</sup>
	300 to 1000				52	
A13.4	30 to 300	Peak / 1 MHz	46	66	59	See <sup>d</sup>
	300 to 1000				52	
a Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers.						
c Frequency modulation audio receivers and PC tuner cards.						
d Frequency modulation car radios.						
The term 'other' refers to all emissions other than the fundamental and the harmonics of the LO.						
The measurement shall cover the entire frequency range.						
The EUT shall be tuned in accordance with Table B.3 and clause C.4.2.1.						

**TEST EQUIPMENT USED:**

- Radiated Emissions
- Conducted Emissions
- Radio Laboratory

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

**Test Equipment used for tests**
**1 Radio Laboratory**  
EN303345 Test Lab

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	SFE100	Test Transmitter	Rohde & Schwarz	132520	2016-03	2019-03
1.2	MFS	Rubidium Frequency Standard	Datum-Beverly	5489/001	2017-07	2018-06
1.3	1515 / 93459	Broadband Power Divider SMA (Aux)	Weinschel Associates	LN673	-	-
1.4	FSV30	Signal Analyzer 10 Hz - 30 GHz	Rohde & Schwarz	103005	2016-02	2018-02
1.5	SMBV100A	Vector Signal Generator 9 kHz - 3 GHz	Rohde & Schwarz	260001	2018/01	2021/01
1.6	24315	DC-Block	MTS Systemtechnik	025613-0024	-	-
1.7	PSC-4 1W-DCS-S1	4 Way Power Divider (BNC)	MTS Systemtechnik	000000-0001	-	-
1.8	Opus10 THI (8152.00)	ThermoHygro Datalogger 03 (Environ)	Lufft Mess- und Regeltechnik GmbH	7482	2017-03	2019-03
1.9	SMBV100A	Vector Signal Generator 9 kHz - 6 GHz	Rohde & Schwarz	259291	2016-10	2019-10
1.10	OSP120	Switching Unit with integrated power meter	Rohde & Schwarz	101158	2016-11	2018-11

**2 Radiated Emissions**  
Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.1	NRV-Z1	Sensor Head A	Rohde & Schwarz	827753/005	2017-05	2018-05
2.2	NRVD	Power Meter	Rohde & Schwarz	828110/016	2017-05	2018-05
2.3	MFS	Rubidium Frequency Normal MFS	Datum GmbH	002	2017-10	2018-10
2.4	Opus10 TPR (8253.00)	Thermo Airpressure Datalogger 13 (Environ)	Lufft Mess- und Regeltechnik GmbH	13936	2017-04	2019-04
2.5	Anechoic Chamber	10.58 x 6.38 x 6.00 m <sup>3</sup>	Frankonia	none	2016-05	2019-05
2.6	HL 562	Ultralog new biconicals	Rohde & Schwarz	830547/003	2015-06	2018-06
2.7	5HC2700/12750-1.5-KK	High Pass Filter	Trilithic	9942012		
2.8	ASP 1.2/1.8-10 kg	Antenna Mast	Maturo GmbH	-		

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

2.9	Fully Anechoic Room	8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001-PRB	2015-07	2018-07
2.10	JS4-18002600-32-5P	Broadband Amplifier 18 GHz - 26 GHz	Miteq	849785		
2.11	FSW 43	Spectrum Analyzer	Rohde & Schwarz	103779	2016-12	2018-12
2.12	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronik GmbH	00083069		
2.13	WHKX 7.0/18G-8SS	High Pass Filter	Wainwright	09		
2.14	4HC1600/12750-1.5-KK	High Pass Filter	Trilithic	9942011		
2.15	Chroma 6404	AC Power Source	Chroma ATE INC.	64040001304		
2.16	JS4-00102600-42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368		
2.17	TT 1.5 WI	Turn Table	Maturo GmbH	-		
2.18	HL 562 Ultralog	Log.-per. Antenna	Rohde & Schwarz	100609	2016-04	2019-04
2.19	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronik GmbH	00086675		
2.20	5HC3500/18000-1.2-KK	High Pass Filter	Trilithic	200035008		
2.21	HFH2-Z2	Loop Antenna	Rohde & Schwarz	829324/006	2018-01	2021-01
2.22	Opus10 THI (8152.00)	ThermoHygro Datalogger 12 (Environ)	Lufft Mess- und Regeltechnik GmbH	12482	2017-03	2019-03
2.23	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2016-11	2018-11
2.24	JS4-00101800-35-5P	Broadband Amplifier 30 MHz - 18 GHz	Miteq	896037		
2.25	AS 620 P	Antenna mast	HD GmbH	620/37		
2.26	Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	Maturo GmbH	TD1.5-10kg/024/3790709		
2.27	PAS 2.5 - 10 kg	Antenna Mast	Maturo GmbH	-		
2.28	AM 4.0	Antenna mast	Maturo GmbH	AM4.0/180/11920513		
2.29	HF 907	Double-ridged horn	Rohde & Schwarz	102444	2015-05	2018-05

# TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADd

## 3 Conducted Emissions Shielded Room 02

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
3.1	Opus10 TPR (8253.00)	ThermoAirpressure Datalogger 13 (Environ)	Lufft Mess- und Regeltechnik GmbH	13936		
3.2	ESH 3-Z5	Two-Line V-Network	Rohde & Schwarz	828304/029		
3.3	ESH 3-Z6	One-Line V-Network	Rohde & Schwarz	100570		
3.4	EP 1200/B, NA/B1	Amplifier with integrated variable Oscillator	Spitzenberger & Spieß	B6278	2015-07	2018-07
3.5	ISN T800	Impedance Stabilization Network	Teseq	36159		
3.6	1506A / 93459	Broadband Power Divider N (Aux)	Weinschel Associates	LM390		
3.7	Chroma 6404	AC Power Source	Chroma ATE INC.	64040001304		
3.8	ISN/CDN ST08	Impedance Stabilization Network, Coupling Decoupling Network	Teseq	36292		
3.9	CMU 200	Universal Radio Communication Tester	Rohde & Schwarz	102366	2016-06	2019-06
3.10	Shielded Room 02	Shielded Room for conducted testing, 12qm	Frankonia	-		
3.11	ISN/CDN T8-Cat6	Impedance Stabilization Network, Coupling Decoupling Network	Teseq	32187		
3.12	ESH 3-Z5	Two-Line V-Network	Rohde & Schwarz	829996/002		
3.13	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2016-11	2018-11
3.14	ESH 3-Z6	One-Line V-Network	Rohde & Schwarz	100489	2017-05	2020-05
3.15	ISN/CDN ENY41	Impedance Stabilization Network, Coupling Decoupling Network	Rohde & Schwarz	100002		
3.16	Opus10 THI (8152.00)	ThermoHygro Datalogger 02 (Environ)	Lufft Mess- und Regeltechnik GmbH	7489		
3.17	CMW 500	CMW 500	Rohde & Schwarz	107500	2017-07	2019-07

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
3.18	CDN-S1	Coupling/Decoupling Network	Dr. Hubert GmbH	A4010039	2015-05	2018-05

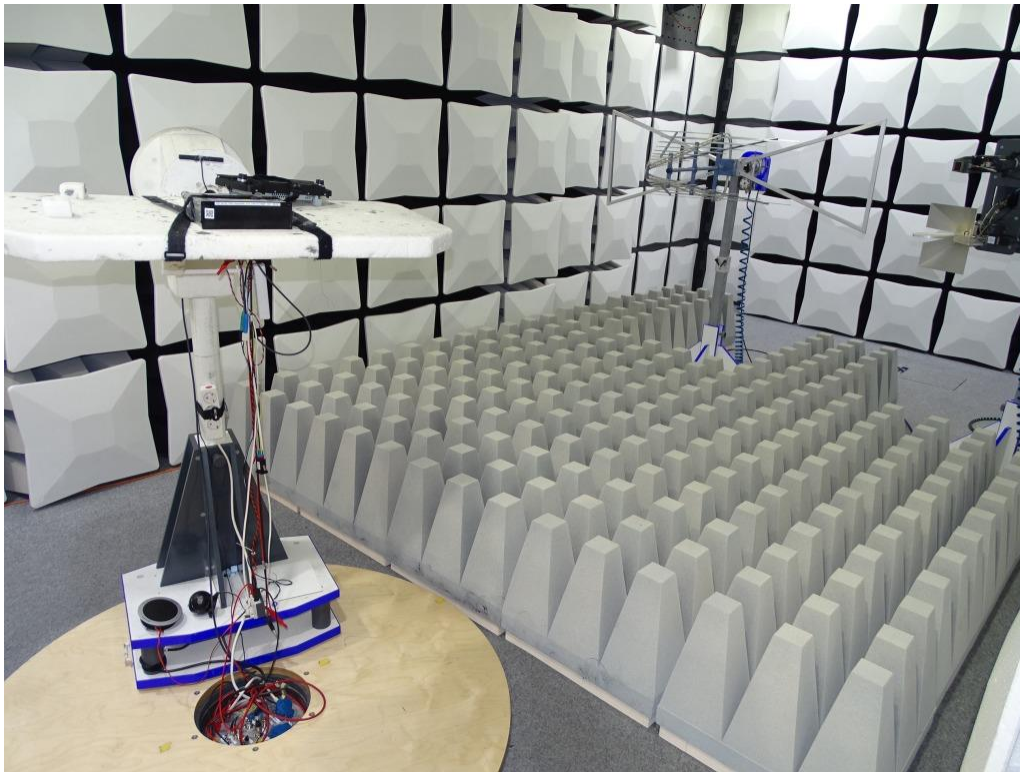
The calibration interval is the time interval between "Last Calibration" and "Calibration Due"



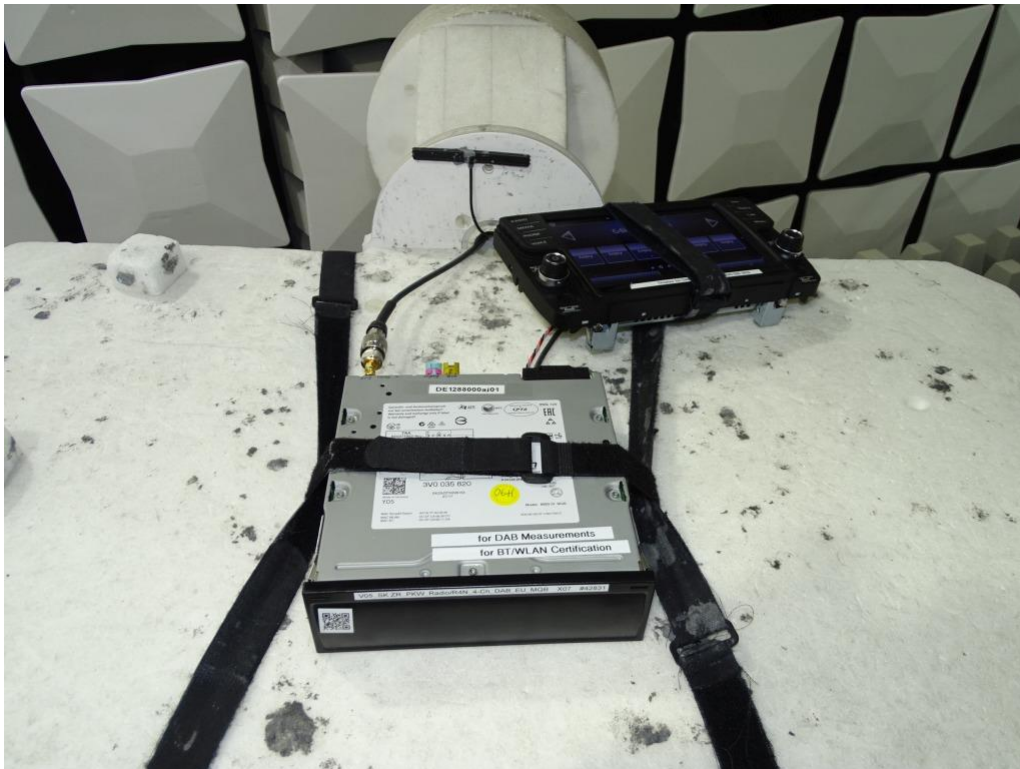
**TEST REPORT REFERENCE:**

**MDE\_PREH\_1602\_RADd**

## **Photo Report**



Test Setup Radiated Spurious emissions



Test Setup Radiated Spurious Emissions; OUT-detailed view



**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADd

**Measurement Uncertainties**

Parameter	Uncertainty
Uncertainty in conducted measurements	$\pm 1.0$ dB
Uncertainty in radiated measurements	$\pm 4.5$ dB
Spurious Emissions, conducted	$\pm 3.4$ dB
Spurious Emissions, radiated	$\pm 3.9$ dB ( $\leq 1$ GHz), $\pm 5.5$ dB ( $> 1$ GHz)

# Radio Test Report

**Test Report Reference: MDE\_PREH\_1602\_RADe**

**on**

## MIB3 OI Car Radio

**according to:**

**ETSI EN 301 893 V2.1.1 (2017-05)**

5 GHz RLAN;

Harmonised Standard covering the essential requirements  
of article 3.2 of Directive 2014/53/EU

**Test Laboratory:**

7layers GmbH  
Borsigstrasse 11  
40880 Ratingen  
Germany



**Note:**

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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Group Company*

*www.7layers.com*

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADe

**List of measurements**

The list shows "**Essential radio test suite**" as specified in table A.1 in the standard ETSI EN 301 893.

Harmonized Standard ETSI EN 301 893						Test Documentation
The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the RED						
Requirement			Requirement Conditionality	Test Specification		Final Result
No	Description	Reference: Clause No		E/O	Reference: Clause No	
1	Carrier frequencies	4.2.1	Unconditional	Essential Radio Test Suite	5.4.2	N/P
2	Nominal, and occupied channel bandwidth	4.2.2	Unconditional	Essential Radio Test Suite	5.4.3	N/P
3	RF output power	4.2.3	Unconditional	Essential Radio Test Suite	5.4.4	N/P
4	Transmit Power Control (TPC)	4.2.3	Output Power 5250-5350 MHz <= 20 dBm OR Output Power 5470-5725 MHz <= 27 dBm	Essential Radio Test Suite	5.4.4	N/P
5	Power Density	4.2.3	Unconditional	Essential Radio Test Suite	5.4.4	N/P
6	Transmitter unwanted emissions outside the 5 GHz RLAN bands	4.2.4.1	Unconditional	Essential Radio Test Suite	5.4.5	Passed
7	Transmitter unwanted emissions within the 5 GHz RLAN bands	4.2.4.2	Unconditional	Essential Radio Test Suite	5.4.6	N/P
8	Receiver spurious emissions	4.2.5	Unconditional	Essential Radio Test Suite	5.4.7	Passed
9	DFS: Channel Availability Check	4.2.6.2.2	Lower subband 5250-5350 MHz OR Higher subband 5470-5725 supported; Slave Device with Output Power >= 23 dBm OR Master	Essential Radio Test Suite	5.4.8.2.1.2	N/A
10	DFS: Off-Channel CAC - Radar Detection Threshold	4.2.6.2.3	Lower subband 5250-5350 MHz OR Higher subband 5470-5725 supported; Slave Device with Output Power >= 23 dBm OR Master with DFS supported	Essential Radio Test Suite	5.4.8.2.1.4.2	N/A
11	DFS: Off-Channel CAC - Detection Probability	4.2.6.2.3	Lower subband 5250-5350 MHz OR Higher subband 5470-5725 supported; Slave Device with Output Power >= 23 dBm OR Master with DFS supported	Other Test Suite	5.4.8.2.1.4.3	N/A
12	DFS: In service Monitoring	4.2.6.2.4	Lower subband 5250-5350 MHz OR Higher subband 5470-5725 supported; Slave Device with Output Power >= 23 dBm OR Master	Essential Radio Test Suite	5.4.8.2.1.5	N/A

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADe

13	DFS: Channel shutdown	4.2.6.2.5	Lower subband 5250-5350 MHz OR Higher subband 5470-5725 supported	Essential Radio Test Suite	5.4.8.2.1.6	N/A
14	DFS: Non-occupancy period	4.2.6.2.6	Lower subband 5250-5350 MHz OR Higher subband 5470-5725 supported; Slave Device with Output Power $\geq 23$ dBm OR Master	Essential Radio Test Suite	5.4.8.2.1.6	N/A
15	DFS: Uniform spreading	4.2.6.2.7	Lower subband 5250-5350 MHz OR Higher subband 5470-5725 supported; Master	No test specified		N/A
16	Adaptivity	4.2.7	Unconditional	Essential Radio Test Suite	5.4.9	N/A
17	Receiver Blocking	4.2.8	Unconditional		5.4.10	N/P
18	User Access Restrictions	4.2.9	Unconditional	No test specified		N/P
19	Geo-location capability	4.2.10	Geo-Location Capability implemented	No test specified		N/A

**Notes:**


**The test report focuses on the Essential Radio Test Suite (E)**

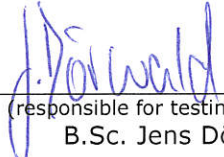
N/A Not applicable. Test not applicable because the conditional functionality is not fulfilled.  
N/P Not performed.

**Comment:**

Not all tests were performed, because the Equipment under Test (EUT) includes a pre-certified WLAN module (LBEE6ZZ1FD). Therefore only radiated spurious emissions were performed.

The EUT supports only the lower sub-band from 5150MHz to 5250MHz and the upper band from 5725 MHz to 5850 MHz.

  
(responsible for accreditation scope)  
Dipl.-Ing. Marco Kullik

  
(responsible for testing and report)  
B.Sc. Jens Dörwald



7 layers GmbH, Borsigstr. 11  
40880 Ratingen, Germany  
Phone +49 (0)2102 749 0

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADe

**Administrative Data:**

**Testing Laboratory**

Company Name: 7layers GmbH  
Address: Borsigstr. 11  
40880 Ratingen  
Germany  
Laboratory accreditation no: DAkkS D-PL-12140-01-00  
Responsible for accreditation scope: Dipl.-Ing. Marco Kullik  
Report Template Version: 2017-12-15

**Project Data**

Responsible for testing and report: B.Sc. Jens Dörwald  
Date of Report: 2018-03-15  
Testing Period: 2018-02-17 to 2018-02-17

**Applicant Data**

Company Name: Preh Car Connect GmbH  
Address: Gewerbepark Merbitz 5  
01156 Dresden  
Germany  
Contact Person: Mr. Christian Stopp

**Manufacturer Data**

Company Name: please see applicant data  
Address:  
Contact Person:

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADe

**Test object Data**

**General Description of Radio Device**

Kind of Device product description	2.4 GHz Transceiver (WLAN & BT), 5 GHz WLAN, GPS Receiver
Product name	Car Radio
Type	MIB3 OI
<b>Declared EUT data by the supplier</b>	
Nominal Bandwidth	WLAN a: 20 MHz WLAN n: 20 MHz, 40 MHz
Power Supply Type	DC
Normal Voltage	12 V
Low Voltage	9 V
High Voltage	18 V
Normal Temperature	25 °C
Low Temperature	-40 °C
High Temperature	+70 °C
Antenna Type	Integral
Antenna Gain	-10 dBi
Beamforming Gain	-
Number of Transmit Chains	1
Number of Receive Chains	1
Type of TX / RX Chains	-
Transmit Power Control (TPC) supported	Yes
Adaptive Technology	No
Test Frequency C7 [highest channel in lower band]	5240 MHz
Operating Modes	WLAN a: IEEE 802.11a WLAN n: IEEE 802.11n
Test Modulation Pattern	WLAN a: 6 Mbps / 54 Mbps WLAN n: MSC7 (40 MHz)
Slave without Radar Interference Detection	DFS not supported

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADe

**Tested Radio Devices**

Sample Name	Sample Code	Description
DE1288000	ah01	radiated sample
Sample Parameter	Value	
HW Version	X07	
SW Version	R055	
Serial No.	YD5-00130.06.1700170432	
Comment	-	

**General description of ancillary equipment**

Device	Details (Manufacturer, Type Model, OUT Code)	Reason for using
-	-	-

**General description of auxiliary equipment**

Device	Details (Manufacturer, HW, SW, S/N)	Description
GSM/GNSS Antenna	VW Kombi, GSM/GNSS Antenna, -, -, -	External Combi-Antenna cellular & GNS "shark finn"
Life Box	-, Life Box, -; -;	Keep aöive box

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADe

**TEST RESULTS**

**Transmitter unwanted emissions outside the 5 GHz RLAN bands**

**CLAUSE 5.4.5**

Ambient temperature: 24 °C  
Relative humidity: 32 %  
Channel: C7  
Radio Technology:  
WLAN a, 6 Mbps

Measurement Method	Frequency [MHz]	Spurious Level Peak Detector [dBm]	Spurious Level TDP RMS [dBm]	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
Radiated	-	-	-	-	-	>6dB

**COMMENTS:**

- At least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- Such values have not been found.

**Limits: Transmitter unwanted emission limits outside the 5 GHz RLAN bands, EN 301 893 , subclause 4.5.1.2**

Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 5,15 GHz	-30 dBm	1 MHz
5,35 GHz to 5,47 GHz	-30 dBm	1 MHz
5,725 GHz to 26,0 GHz	-30 dBm	1 MHz

**TEST EQUIPMENT USED:**

- Radiated Emissions



# TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADe

## Receiver spurious emissions

## CLAUSE 5.4.7

Ambient temperature: 24 °C  
Relative humidity: 32 %  
Channel: C7

Measurement Method	Frequency [MHz]	Spurious Level Peak Detector [dBm]	Spurious Level TDP RMS [dBm]	RBW [kHz]	Limit [dBm]	Margin to Limit [dB]
Radiated	3200.0	-48.8	-51.5	1000	-47.0	4.5

### COMMENTS:

- At least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- Test was performed radiated

### Limits: Transmitter unwanted emission limits outside the 5 GHz RLAN bands EN 301 893 V1.7.1, subclause 4.6.2

Frequency range	Maximum power ERP (<= 1GHz) EIRP (> 1 GHz)	Bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 26 GHz	-47 dBm	1 MHz

### TEST EQUIPMENT USED:

- Radiated Emissions

## TEST REPORT REFERENCE:

MDE\_PREH\_1602\_RADe

## Test Equipment used for tests

### 1 Radiated Emissions

Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	NRV-Z1	Sensor Head A	Rohde & Schwarz	827753/005	2017-05	2018-05
1.2	MFS	Rubidium Frequency Normal MFS	Datum GmbH	002	2017-10	2018-10
1.3	Opus10 TPR (8253.00)	ThermoAirpressure Datalogger 13 (Environ)	Lufft Mess- und Regeltechnik GmbH	13936	2017-04	2019-04
1.4	Anechoic Chamber	10.58 x 6.38 x 6.00 m <sup>3</sup>	Frankonia	none	2016-05	2019-05
1.5	HL 562	Ultralog new biconicals	Rohde & Schwarz	830547/003	2015-06	2018-06
1.6	5HC2700/12750-1.5-KK	High Pass Filter	Trilithic	9942012		
1.7	ASP 1.2/1.8-10 kg	Antenna Mast	Maturo GmbH	-		
1.8	Fully Anechoic Room	8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001-PRB	2015-06	2018-06
1.9	JS4-18002600-32-5P	Broadband Amplifier 18 GHz - 26 GHz	Miteq	849785		
1.10	FSW 43	Spectrum Analyzer	Rohde & Schwarz	103779	2016-12	2018-12
1.11	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronik GmbH	00083069		
1.12	WHKX 7.0/18G-8SS	High Pass Filter	Wainwright	09		
1.13	4HC1600/12750-1.5-KK	High Pass Filter	Trilithic	9942011		
1.14	Chroma 6404	AC Power Source	Chroma ATE INC.	64040001304		
1.15	JS4-00102600-42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368		
1.16	TT 1.5 WI	Turn Table	Maturo GmbH	-		
1.17	HL 562 Ultralog	Log.-per. Antenna	Rohde & Schwarz	100609	2016-04	2019-04
1.18	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronik GmbH	00086675		
1.19	5HC3500/18000-1.2-KK	High Pass Filter	Trilithic	200035008		
1.20	HFH2-Z2	Loop Antenna	Rohde & Schwarz	829324/006	2018-01	2021-01
1.21	Opus10 THI (8152.00)	ThermoHygro Datalogger 12 (Environ)	Lufft Mess- und Regeltechnik GmbH	12482	2017-03	2019-03

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADe

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.22	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2016-11	2018-11
1.23	JS4-00101800-35-5P	Broadband Amplifier 30 MHz - 18 GHz	Miteq	896037		
1.24	AS 620 P	Antenna mast	HD GmbH	620/37		
1.25	Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	Maturo GmbH	TD1.5-10kg/024/3790709		
1.26	ESIB 26	Spectrum Analyzer	Rohde & Schwarz	830482/004	2018-01	2020-01
1.27	PAS 2.5 - 10 kg	Antenna Mast	Maturo GmbH	-		
1.28	AM 4.0	Antenna mast	Maturo GmbH	AM4.0/180/11920513		
1.29	HF 907	Double-ridged horn	Rohde & Schwarz	102444	2015-05	2018-05

The calibration interval is the time interval between "Last Calibration" and "Calibration Due"

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADe

## **Photo Report**



Setup photo for radiated spurious emissions

**TEST REPORT REFERENCE:**

MDE\_PREH\_1602\_RADe

**Measurement Uncertainties**

<b>Parameter</b>	<b>Uncertainty</b>
RF Frequency	$\pm 1 \times 10^{-6}$
RF Output Power, conducted	$\pm 1.0$ dB
RF Power, radiated	$\pm 4.5$ dB
Spurious Emissions, conducted	$\pm 2.0$ dB
Spurious Emissions, radiated	$\pm 4.5$ dB
Temperature	$\pm 0.3$ °C
Humidity	$\pm 3\%$
Time	$\pm 5\%$

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Gewerbepark Merbitz 5 · 01156 Dresden

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Marc Seidel

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Datum  
28.08.2020

## Declaration of Conformity Directive 2014/53/EU

We declare under our sole responsibility that our product:

Type of Device: Car Radio Infotainment-System

Name: **MIB Standard 2 – PQ+/NAV with BT and WLAN**

if used for its intended use complies with the essential protection requirements relating to the:

### Radio Equipment Directive (2014/53/EU)

The notified body PHOENIX TESTLAB (notified body number 0700) has carried out an assessment of the essential requirements according to 2014/53/EU Annex for radio and issued the following EU-type examination (module B) certificate:

Certificate No: 17-111084

The Product is labelled with the CE mark:



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Geschäftsführung:  
Stavros Mitrakis (Vors.)  
Christoph Lenz

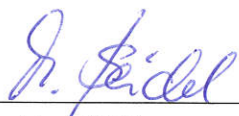
Commerzbank AG, Filiale Dresden  
IBAN: DE94 8508 0000 0502 3518 00  
BIC (SWIFT-Code): DRESDEFF850

Amtsgericht Dresden  
HRB 657  
UST-IdNr.: DE140212281

The assessment of this product has been based on the following standards:

- EN 60950-1 2006+A11:2009+A1:2010+A12+2011
- EN 301 489-1 V2.2.0
- EN 301 489-3 V1.6.1
- EN 301 489-17 V3.1.1
- EN 55035 2012-10
- EN 300 328 V2.1.1
- EN 300 340-2 V1.4.1(09/2010)
- EN 303 345 V1.1.7(03/2017)
- EN 62311 (09/2008)
- EN 62479 (09/2011)
- EN 55032 2016-02
- EN 303 413 V1.1.0

Dresden,

  
Direktor R&D  
JOYNEXT GmbH

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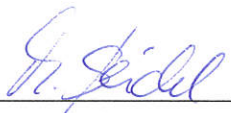
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Dresden,

  
Direktor R&D  
JOYNEXT GmbH

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Geschäftsführung:  
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Christoph Lenz

Commerzbank AG, Filiale Dresden  
IBAN: DE94 8508 0000 0502 3518 00  
BIC (SWIFT-Code): DRESDEFF850

Amtsgericht Dresden  
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Datum  
28.08.2020

## Declaration of Conformity Directive 2014/53/EU

We declare under our sole responsibility that our product:

Type of Device: Car Radio Infotainment-System

Name: **MIB Standard 2 – PQ+/NAV with BT**

if used for its intended use complies with the essential protection requirements relating to the:

### Radio Equipment Directive (2014/53/EU)

The notified body PHOENIX TESTLAB (notified body number 0700) has carried out an assessment of the essential requirements according to 2014/53/EU Annex for radio and issued the following EU-type examination (module B) certificate:

Certificate No: 17-111083

The Product is labelled with the CE mark:



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BIC (SWIFT-Code): DRESDEFF850

Amtsgericht Dresden  
HRB 657  
UST-IdNr.: DE140212281

The assessment of this product has been based on the following standards:

- EN 60950-1 2006+A11:2009+A1:2010+A12+2011
- EN 301 489-1 V2.2.0
- EN 301 489-17 V3.1.1
- EN 55035 2012-10
- EN 300 328 V2.1.1
- EN 303 345 V1.1.7(03/2017)
- EN 62311 (09/2008)
- EN 62479 (09/2011)
- EN 55032 2016-02

Dresden,

  
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Datum  
28.08.2020

## Declaration of Conformity Directive 2014/53/EU

We declare under our sole responsibility that our product:

Type of Device: Car Radio Infotainment-System

Name: **MIB Standard 2 – PQ+/NAV with BT**

if used for its intended use complies with the essential protection requirements relating to the:

### Radio Equipment Directive (2014/53/EU)

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Dresden,

  
Direktor R&D  
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28.08.2020

## Declaration of Conformity Directive 2014/53/EU

We declare under our sole responsibility that our product:

Type of Device: Car Radio Infotainment-System

Name: **MIB Standard 2 –ZR with BT**

if used for its intended use complies with the essential protection requirements relating to the:

### Radio Equipment Directive (2014/53/EU)

The notified body PHOENIX TESTLAB (notified body number 0700) has carried out an assessment of the essential requirements according to 2014/53/EU Annex for radio and issued the following EU-type examination (module B) certificate:

Certificate No: 17-111080

The Product is labelled with the CE mark:



The assessment of this product has been based on the following standards:

- EN 60950-1 2006+A11:2009+A1:2010+A12+2011
- EN 301 489-1 V2.2.0
- EN 301 489-17 V3.1.1
- EN 55035 2012-10
- EN 300 328 V2.1.1
- EN 303 345 V1.1.7(03/2017)
- EN 62311 (09/2008)
- EN 62479 (09/2011)
- EN 55032 2016-02

Dresden,

  
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JOYNEXT GmbH

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28.08.2020

## Declaration of Conformity Directive 2014/53/EU

We declare under our sole responsibility that our product:

Type of Device: Car Radio Infotainment-System

Name: **MIB Standard 2 – ZR with BT**

if used for its intended use complies with the essential protection requirements relating to the:

### Radio Equipment Directive (2014/53/EU)

The Product is labelled with the CE mark:



The assessment of this product has been based on the following standards:

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Direktor R&D  
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Datum  
28.08.2020

## Declaration of Conformity Directive 2014/53/EU

We declare under our sole responsibility that our product:

Type of Device: Car Radio Infotainment-System

Name: **MIB Standard 2 –ZR+/NAV with BT and WLAN**

if used for its intended use complies with the essential protection requirements relating to the:

### Radio Equipment Directive (2014/53/EU)

The notified body PHOENIX TESTLAB (notified body number 0700) has carried out an assessment of the essential requirements according to 2014/53/EU Annex for radio and issued the following EU-type examination (module B) certificate:

Certificate No: 17-111082a

The Product is labelled with the CE mark:



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BIC (SWIFT-Code): DRESDEFF850

Amtsgericht Dresden  
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UST-IdNr.: DE140212281

The assessment of this product has been based on the following standards:

- EN 60950-1                    2006+A11:2009+A1:2010+A12+2011
- EN 301 489-1                V2.2.0
- EN 301 489-3                V1.6.1
- EN 301 489-17              V3.1.1
- EN 55035                    2012-10
- EN 300 328                  V2.1.1
- EN 300 340-2                V1.4.1(09/2010)
- EN 303 345                  V1.1.7(03/2017)
- EN 62311                    (09/2008)
- EN 62479                    (09/2011)
- EN 55032                    2016-02
- EN 303 413                  V1.1.0

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Name: **MIB Standard 2 – ZR +/-NAV with BT and WLAN**

if used for its intended use complies with the essential protection requirements relating to the:

### Radio Equipment Directive (2014/53/EU)

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Type of Device: Car Radio Infotainment-System

Name: **MIB Standard 2 –ZR+/NAV with BT**

if used for its intended use complies with the essential protection requirements relating to the:

### Radio Equipment Directive (2014/53/EU)

The notified body PHOENIX TESTLAB (notified body number 0700) has carried out an assessment of the essential requirements according to 2014/53/EU Annex for radio and issued the following EU-type examination (module B) certificate:

Certificate No: 17-111081

The Product is labelled with the CE mark:



JOYNEXT GmbH  
Gewerbepark Merbitz 5, 01156 Dresden  
Tel. +49 (0) 351 - 453 55 - 0  
Fax +49 (0) 351 - 453 55 - 40

Geschäftsführung:  
Stavros Mitrakis (Vors.)  
Christoph Lenz

Commerzbank AG, Filiale Dresden  
IBAN: DE94 8508 0000 0502 3518 00  
BIC (SWIFT-Code): DRESDEFF850

Amtsgericht Dresden  
HRB 657  
UST-IdNr.: DE140212281

The assessment of this product has been based on the following standards:

- EN 60950-1 2006+A11:2009+A1:2010+A12+2011
- EN 301 489-1 V2.2.0
- EN 301 489-17 V3.1.1
- EN 55035 2012-10
- EN 300 328 V2.1.1
- EN 303 345 V1.1.7(03/2017)
- EN 62311 (09/2008)
- EN 62479 (09/2011)
- EN 55032 2016-02

Dresden,

  
Direktor R&D  
JOYNEXT GmbH

**JOYNEXT**  
物联智行

JOYNEXT GmbH  
Gewerbepark Merbitz 5  
D - 01156 Dresden

JOYNEXT GmbH  
Gewerbepark Merbitz 5 · 01156 Dresden

Name  
Marc Seidel

Telefon  
+49 (0) 351- 453 55 - 6600

Datum  
28.08.2020

## Declaration of Conformity Directive 2014/53/EU

We declare under our sole responsibility that our product:

Type of Device: Car Radio Infotainment-System

Name: **MIB Standard 2 – ZR +/NAV with BT**

if used for its intended use complies with the essential protection requirements relating to the:


### Radio Equipment Directive (2014/53/EU)

The Product is labelled with the CE mark:



The assessment of this product has been based on the following standards:

Dresden,

  
Direktor R&D  
JOYNEXT GmbH

**JOYNEXT**  
联 联 智 行  
JOYNEXT GmbH  
Gewerbepark Merbitz 5  
D – 01156 Dresden

# TEST REPORT

IEC 62368-1

## Audio/video, information and communication technology equipment

### Part 1: Safety requirements

**Report Number**..... : **S44369-00-00RT**

Date of issue..... : 2018-10-29

Total number of pages ..... : 53

**Applicant's name** ..... : **7layers GmbH**

Address ..... : Borsigstraße 11  
40880 Ratingen  
Germany

#### Test specification:

Standard..... : IEC 62368-1:2014/Cor1:2015/Cor2:2015

EN 62368-1:2014/AC:2015

Test procedure..... : Compliance Test

Non-standard test method..... : N/A

**Test Report Form No.** ..... : IEC62368\_1B

Test Report Form(s) Originator..... : UL(US)

Master TRF..... : 2014-03

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**This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.**



#### General disclaimer:

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the Issuing Testing Laboratory.



Deutsche  
Akkreditierungsstelle  
D-PL-12030-01-01  
D-PL-12030-01-02

Test Item description .....	SELV supplied radio unit		
Trade Mark .....	Preh		
Manufacturer .....	Preh Car Connect GmbH		
Model/Type reference .....	MIB STD 2		
Ratings .....	12 V DC (Vehicle electrical system)		
Testing procedure and testing location:			
<input checked="" type="checkbox"/>	Testing Laboratory:		
Testing location/ address .....	CSA Group Bayern GmbH Ohmstrasse 1-4 94342 Strasskirchen Germany		
Tested by (name + signature).....	Tobias Rehm (Test Engineer)		Tobias Rehm 2018.11.06 16:45:40 +01'00'
Approved by (name + signature) .....	Josef Kellermeier (Safety Team Lead)		Josef Kellermeier 2018.11.07 08:14:15 +01'00'

<b>List of Attachments (including a total number of pages in each attachment):</b> Attachment 1: S44369-00-01RT_photo_documentation (10 pages) Attachment 2: S44369-00-02RT European group differences and national differences (Pages: 12)	
<b>Summary of testing:</b>	
<b>Tests performed (name of test and test clause):</b> 5.2 Classification of electrical energy sources 6.2.2 Classification of power sources 6.3.2 Temperature measurement 6.2.3 Classification of PIS 9.2 Classification of thermal energy sources B.2.5 Input test B.4 Fault condition tests F.3.10 Test for performance of markings	<b>Testing location:</b> CSA Group Bayern GmbH Ohmstrasse 1-4 94342 Strasskirchen Germany

**Summary of compliance with National Differences:****List of countries addressed**

EN Members.

☒ **The product fulfils the requirements of**

IEC 62368-1:2014/Cor1:2015/Cor2:2015

EN 62368-1:2014/AC:2015



**Copy of marking plate:**

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.





TEST ITEM PARTICULARS:	
Classification of use by.....:	<input checked="" type="checkbox"/> Ordinary person <input type="checkbox"/> Instructed person <input type="checkbox"/> Skilled person <input checked="" type="checkbox"/> Children likely to be present
Supply Connection.....:	<input type="checkbox"/> AC Mains <input type="checkbox"/> DC Mains <input checked="" type="checkbox"/> External Circuit - not Mains connected - <input checked="" type="checkbox"/> ES1 <input type="checkbox"/> ES2 <input type="checkbox"/> ES3
Supply % Tolerance .....	<input type="checkbox"/> +10%/-10% <input checked="" type="checkbox"/> +20%/-15% <input type="checkbox"/> +____%/ -____% <input type="checkbox"/> None
Supply Connection – Type .....	<input type="checkbox"/> pluggable equipment type A - <input type="checkbox"/> non-detachable supply cord <input type="checkbox"/> appliance coupler <input type="checkbox"/> direct plug-in <input type="checkbox"/> mating connector <input type="checkbox"/> pluggable equipment type B - <input type="checkbox"/> non-detachable supply cord <input type="checkbox"/> appliance coupler <input type="checkbox"/> permanent connection <input type="checkbox"/> mating connector <input checked="" type="checkbox"/> other: DC jack
Considered current rating of protective device as part of building or equipment installation .....	N/A; Installation location: <input type="checkbox"/> building; <input type="checkbox"/> equipment
Equipment mobility .....	<input type="checkbox"/> movable <input type="checkbox"/> hand-held <input type="checkbox"/> transportable <input type="checkbox"/> stationary <input checked="" type="checkbox"/> for building-in <input type="checkbox"/> direct plug-in <input type="checkbox"/> rack-mounting <input type="checkbox"/> wall-mounted
Over voltage category (OVC) .....	<input type="checkbox"/> OVC I <input type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV <input checked="" type="checkbox"/> other: DC supplied (not directly connected to mains).
Class of equipment .....	<input type="checkbox"/> Class I <input type="checkbox"/> Class II <input checked="" type="checkbox"/> Class III
Access location .....	<input type="checkbox"/> restricted access location <input checked="" type="checkbox"/> N/A
Pollution degree (PD) .....	<input type="checkbox"/> PD 1 <input checked="" type="checkbox"/> PD 2 <input type="checkbox"/> PD 3
Manufacturer's specified maxium operating ambient:	70°C
IP protection class .....	<input checked="" type="checkbox"/> IPX0 <input type="checkbox"/> IP____
Power Systems .....	<input type="checkbox"/> TN <input type="checkbox"/> TT <input type="checkbox"/> IT - ____ V L-L <input checked="" type="checkbox"/> N/A
Altitude during operation (m) .....	<input checked="" type="checkbox"/> 2000 m or less <input type="checkbox"/> ____ m
Altitude of test laboratory (m) .....	<input checked="" type="checkbox"/> 2000 m or less <input type="checkbox"/> ____ m
Mass of equipment (kg) .....	<input checked="" type="checkbox"/> kg
<b>POSSIBLE TEST CASE VERDICTS:</b>	
- test case does not apply to the test object.....:	N/A

- test object does meet the requirement .....	P (Pass)
- test object does not meet the requirement.....	F (Fail)
<b>TESTING:</b>	
Date of receipt of test item .....	2018-07-30
Date (s) of performance of tests.....	2018-09-10 to 2018-10-05
<b>GENERAL REMARKS:</b>	
<b>Test Report History:</b>	
This report may consist of more than one report and is valid only with additional or previous issued reports:	
<b>Test Report No.:</b>	<b>Modifications:</b>
<b>S44369-00-00RT</b> (this report)	Origin Test Report. IEC 62368-1:2014/Cor1:2015/Cor2:2015 EN 62368-1:2014/AC:2015
<b>Statement of the measurement uncertainty</b>	
<p>The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was determined for all measurements listed in this test report acc. to GUM („Guide to the Expression of Uncertainty in Measurement“) and ISO Guide 115 („Application of uncertainty of measurement to conformity assessment activities in the electro technical sector“) and checked against the requirements of current OD 5014 and documented in the quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.</p>	
<p><b>"(See Enclosure #)" refers to additional information appended to the report.</b>  <b>"(See appended table)" refers to a table appended to the report.</b></p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
<b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC60950-1:</b>	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided .....	<input type="checkbox"/> <b>Yes</b> <input checked="" type="checkbox"/> <b>Not applicable</b>
<b>When differences exist; they shall be identified in the General product information section.</b>	
<b>Name and address of factory (ies).....</b>	Preh Car Connect GmbH Gewerbepark Merbitz 5 01156 Dresden Germany
<b>GENERAL PRODUCT INFORMATION:</b>	
<b>Product Description –</b>	
<p>The EUT is a SELV supplied radio unit system for vehicles.  It is power supplied via the vehicle electrical system.</p>	

Operating Temperature: -40°C to 70°C

Notes:

- The unit is power supplied by vehicle electrical system → SELV.
- Vehicle supply considered as PS2
- The PCB material fulfils the flammability requirement of UL 94 V-0.
- The enclosure material fulfils the flammability requirement of UL 94 V-0 (metal) and UL 94 .
- Class III
  - Automotive navigation
  - Sound system
  - Bluetooth
  - GPS

**Model Differences –**

N/A

**Additional application considerations – (Considerations used to test a component or sub-assembly) –**

N/A

**ENERGY SOURCE IDENTIFICATION AND CLASSIFICATION TABLE:**

(Note 1: Identify the following six (6) energy source forms based on the origin of the energy.)

(Note 2: The identified classification e.g., ES2, TS1, should be with respect to its ability to cause pain or injury on the body or its ability to ignite a combustible material. Any energy source can be declared Class 3 as a worse case classification e.g. PS3, ES3.

**Electrically-caused injury (Clause 5):**

(Note: Identify type of source, list sub-assembly or circuit designation and corresponding energy source classification)

Example: +5 V dc input

ES1

**Source of electrical energy**
**Corresponding classification (ES)**

DC input

ES1

**Electrically-caused fire (Clause 6):**

(Note: List sub-assembly or circuit designation and corresponding energy source classification)

Example: Battery pack (maximum 85 watts):

PS2

**Source of power or PIS**
**Corresponding classification (PS)**

DC input

PS2

**Injury caused by hazardous substances (Clause 7)**

(Note: Specify hazardous chemicals, whether produces ozone or other chemical construction not addressed as part of the component evaluation.)

Example: Liquid in filled component

Glycol

**Source of hazardous substances**
**Corresponding chemical**

N/A

N/A

**Mechanically-caused injury (Clause 8)**

(Note: List moving part(s), fan, special installations, etc. & corresponding MS classification based on Table 35.)

Example: Wall mount unit

MS2

**Source of kinetic/mechanical energy**
**Corresponding classification (MS)**

Mass of equipment

MS1

Edges and corners

MS1

**Thermal burn injury (Clause 9)**

(Note: Identify the surface or support, and corresponding energy source classification based on type of part, location, operating temperature and contact time in Table 38.)

Example: Hand-held scanner – thermoplastic enclosure

TS1

**Source of thermal energy**
**Corresponding classification (TS)**

Enclosure

TS1

**Radiation (Clause 10)**

(Note: List the types of radiation present in the product and the corresponding energy source classification.)

Example: DVD – Class 1 Laser Product

RS1

**Type of radiation**
**Corresponding classification (RS)**

N/A

N/A

**ENERGY SOURCE DIAGRAM**

Indicate which energy sources are included in the energy source diagram. Insert diagram below

**EUT: ES1 / PS2 / MS1 / TS1**

<b>OVERVIEW OF EMPLOYED SAFEGUARDS</b>				
<b>Clause</b>	<b>Possible Hazard</b>			
5.1	Electrically-caused injury			
Body Part (e.g. Ordinary)	Energy Source (ES3: Primary Filter circuit)	Safeguards		
		Basic	Supplementary	Reinforced (Enclosure)
Ordinary	ES1	---	---	---
6.1	Electrically-caused fire			
Material part (e.g. mouse enclosure)	Energy Source (PS2: 100 Watt circuit)	Safeguards		
		Basic	Supplementary	Reinforced
Enclosure	PS2	Enclosure Material: Metal	PCB material V-0	---
7.1	Injury caused by hazardous substances			
Body Part (e.g., skilled)	Energy Source (hazardous material)	Safeguards		
		Basic	Supplementary	Reinforced
N/A	---	---	---	---
8.1	Mechanically-caused injury			
Body Part (e.g. Ordinary)	Energy Source (MS3:High Pressure Lamp)	Safeguards		
		Basic	Supplementary	Reinforced (Enclosure)
Ordinary	MS1 (mass / edges and corners)	---	---	---
9.1	Thermal Burn			
Body Part (e.g., Ordinary)	Energy Source (TS2)	Safeguards		
		Basic	Supplementary	Reinforced
Ordinary	TS1	---	---	---
10.1	Radiation			
Body Part (e.g., Ordinary)	Energy Source (Output from audio port)	Safeguards		
		Basic	Supplementary	Reinforced
N/A	---	---	---	---
Supplementary Information:				
(1) See attached energy source diagram for additional details.				
(2) "N" – Normal Condition; "A" – Abnormal Condition; "S" Single Fault				

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>4</b>	<b>GENERAL REQUIREMENTS</b>		<b>P</b>
4.1.1	Acceptance of materials, components and subassemblies	(See Table 4.1.2)	P
4.1.2	Use of components		P
4.1.3	Equipment design and construction		P
4.1.15	Markings and instructions .....	(See Annex F)	P
4.4.4	Safeguard robustness		P
4.4.4.2	Steady force tests.....	EUT is for building-in.	N/A
4.4.4.3	Drop tests.....	EUT is for building-in.	N/A
4.4.4.4	Impact tests.....	EUT is for building-in.	N/A
4.4.4.5	Internal accessible safeguard enclosure and barrier tests .....	No internal accessible safeguard.	N/A
4.4.4.6	Glass Impact tests .....	No glasses used.	N/A
4.4.4.74	Thermoplastic material tests .....	Metal enclosure.	N/A
4.4.4.8	Air comprising a safeguard .....	---	N/A
4.4.4.9	Accessibility and safeguard effectiveness	EUT is for building-in.	N/A
4.5	Explosion		P
4.6	Fixing of conductors		P
4.6.1	Fix conductors not to defeat a safeguard		P
4.6.2	10 N force test applied to .....	---	N/A
4.7	Equipment for direct insertion into mains socket - outlets	EUT is not intended for direct insertion into mains socket – outlet.	N/A
4.7.2	Mains plug part complies with the relevant standard .....	---	N/A
4.7.3	Torque (Nm).....	---	N/A
4.8	Products containing coin/button cell batteries	No batteries used.	N/A
4.8.2	Instructional safeguard		N/A
4.8.3	Battery Compartment Construction		N/A
	Means to reduce the possibility of children removing the battery .....	---	—
4.8.4	Battery Compartment Mechanical Tests .....	---	N/A
4.8.5	Battery Accessibility		N/A
4.9	Likelihood of fire or shock due to entry of conductive object.....	(See Annex P)	P

IEC 62368-1			
Clause	Requirement + Test		Verdict
<b>5</b>	<b>ELECTRICALLY-CAUSED INJURY</b>		<b>P</b>
5.2.1	Electrical energy source classifications .....	(See appended table 5.2)	P
5.2.2	ES1, ES2 and ES3 limits	Only ES1 circuits.	P
5.2.2.2	Steady-state voltage and current .....	(See appended table 5.2)	P
5.2.2.3	Capacitance limits.....	---	N/A
5.2.2.4	Single pulse limits .....	---	N/A
5.2.2.5	Limits for repetitive pulses .....	---	N/A
5.2.2.6	Ringing signals .....	No ringing signals.	N/A
5.2.2.7	Audio signals .....	ES1	P
5.3	Protection against electrical energy sources	Only ES1 circuits.	N/A
5.3.1	General Requirements for accessible parts to ordinary, instructed and skilled persons		N/A
5.3.2.1	Accessibility to electrical energy sources and safeguards		N/A
5.3.2.2	Contact requirements		N/A
	a) Test with test probe from Annex V .....	---	N/A
	b) Electric strength test potential (V).....	---	N/A
	c) Air gap (mm) .....	---	N/A
5.3.2.4	Terminals for connecting stripped wire		N/A
5.4	Insulation materials and requirements		N/A
5.4.1.2	Properties of insulating material	Functional insulation only.	N/A
5.4.1.3	Humidity conditioning .....	---	N/A
5.4.1.4	Maximum operating temperature for insulating materials .....	---	N/A
5.4.1.5	Pollution degree .....	PD 2	—
5.4.1.5.2	Test for pollution degree 1 environment and for an insulating compound		N/A
5.4.1.5.3	Thermal cycling		N/A
5.4.1.6	Insulation in transformers with varying dimensions	No transformers used.	N/A
5.4.1.7	Insulation in circuits generating starting pulses	No starting impulses generated.	N/A
5.4.1.8	Determination of working voltage		N/A
5.4.1.9	Insulating surfaces		N/A
5.4.1.10	Thermoplastic parts on which conductive metallic parts are directly mounted		N/A
5.4.1.10.2	Vicat softening temperature .....	---	N/A
5.4.1.10.3	Ball pressure .....	---	N/A
5.4.2	Clearances	Only ES1 circuits.	N/A



IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.4.2.2	Determining clearance using peak working voltage		N/A
5.4.2.3	Determining clearance using required withstand voltage .....	---	N/A
	a) a.c. mains transient voltage.....	---	—
	b) d.c. mains transient voltage .....	---	—
	c) external circuit transient voltage .....	---	—
	d) transient voltage determined by measurement ..	---	—
5.4.2.4	Determining the adequacy of a clearance using an electric strength test		N/A
5.4.2.5	Multiplication factors for clearances and test voltages.....	---	N/A
5.4.3	Creepage distances .....	Only ES1 circuits.	N/A
5.4.3.1	General		N/A
5.4.3.3	Material Group .....	---	—
5.4.4	Solid insulation		N/A
5.4.4.2	Minimum distance through insulation .....	---	N/A
5.4.4.3	Insulation compound forming solid insulation		N/A
5.4.4.4	Solid insulation in semiconductor devices		N/A
5.4.4.5	Cemented joints		N/A
5.4.4.6	Thin sheet material		N/A
5.4.4.6.1	General requirements		N/A
5.4.4.6.2	Separable thin sheet material		N/A
	Number of layers (pcs) .....	---	N/A
5.4.4.6.3	Non-separable thin sheet material		N/A
5.4.4.6.4	Standard test procedure for non-separable thin sheet material.....	---	N/A
5.4.4.6.5	Mandrel test		N/A
5.4.4.7	Solid insulation in wound components		N/A
5.4.4.9	Solid insulation at frequencies >30 kHz.....	---	N/A
5.4.5	Antenna terminal insulation	Only functional insulation used.	N/A
5.4.5.1	General		N/A
5.4.5.2	Voltage surge test		N/A
	Insulation resistance (M $\Omega$ ) .....	---	—
5.4.6	Insulation of internal wire as part of supplementary safeguard .....	---	N/A
5.4.7	Tests for semiconductor components and for cemented joints		N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.4.8	Humidity conditioning	Functional insulation Short circuiting of functional insulating causes no hazard.	N/A
	Relative humidity (%)..... :	---	---
	Temperature (°C) ..... :	---	---
	Duration (h) ..... :	---	---
5.4.9	Electric strength test..... :	---	N/A
5.4.9.1	Test procedure for a solid insulation type test		N/A
5.4.9.2	Test procedure for routine tests		N/A
5.4.10	Protection against transient voltages between external circuit	DC supplied.	N/A
5.4.10.1	Parts and circuits separated from external circuits		N/A
5.4.10.2	Test methods		N/A
5.4.10.2.1	General		N/A
5.4.10.2.2	Impulse test..... :	---	N/A
5.4.10.2.3	Steady-state test ..... :	---	N/A
5.4.11	Insulation between external circuits and earthed circuitry..... :	---	N/A
5.4.11.1	Exceptions to separation between external circuits and earth		N/A
5.4.11.2	Requirements		N/A
	Rated operating voltage $U_{op}$ (V) ..... :	---	---
	Nominal voltage $U_{peak}$ (V) ..... :	---	---
	Max increase due to variation $U_{sp}$ ..... :	---	---
	Max increase due to ageing $\Delta U_{sa}$ ..... :	---	---
	$U_{op} = U_{peak} + \Delta U_{sp} + \Delta U_{sa}$ ..... :	---	---
5.5	Components as safeguards		
5.5.1	General		N/A
5.5.2	Capacitors and RC units	No capacitors or RC units used as safeguards.	N/A
5.5.2.1	General requirement		N/A
5.5.2.2	Safeguards against capacitor discharge after disconnection of a connector ..... :	---	N/A
5.5.3	Transformers	No transformers used.	N/A
5.5.4	Optocouplers	No optocouplers used as safeguards.	N/A
5.5.5	Relays	No relays used.	N/A
5.5.6	Resistors	No resistors used as safeguard.	N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.5.7	SPD's	DC supplied.	N/A
5.5.7.1	Use of an SPD connected to reliable earthing		N/A
5.5.7.2	Use of an SPD between mains and protective earth		N/A
5.5.8	Insulation between the mains and external circuit consisting of a coaxial cable .....	EUT is not directly connected to the mains.	N/A
5.6	Protective conductor		N/A
5.6.2	Requirement for protective conductors	No protective conductor provided.	N/A
5.6.2.1	General requirements		N/A
5.6.2.2	Colour of insulation		N/A
5.6.3	Requirement for protective earthing conductors		N/A
	Protective earthing conductor size (mm <sup>2</sup> ) .....	---	---
5.6.4	Requirement for protective bonding conductors		N/A
5.6.4.1	Protective bonding conductors		N/A
	Protective bonding conductor size (mm <sup>2</sup> ). ....	---	---
	Protective current rating (A) .....	---	---
5.6.4.3	Current limiting and overcurrent protective devices		N/A
5.6.5	Terminals for protective conductors		N/A
5.6.5.1	Requirement		N/A
	Conductor size (mm <sup>2</sup> ), nominal thread diameter (mm). ....	---	N/A
5.6.5.2	Corrosion		N/A
5.6.6	Resistance of the protective system		N/A
5.6.6.1	Requirements		N/A
5.6.6.2	Test Method Resistance (Ω) .....	---	N/A
5.6.7	Reliable earthing		N/A
5.7	Prospective touch voltage, touch current and protective conductor current		N/A
5.7.2	Measuring devices and networks	Class III equipment.	N/A
5.7.2.1	Measurement of touch current .....	---	N/A
5.7.2.2	Measurement of prospective touch voltage		N/A
5.7.3	Equipment set-up, supply connections and earth connections		N/A
	System of interconnected equipment (separate connections/single connection) .....	---	---
	Multiple connections to mains (one connection at a time/simultaneous connections) .....	---	---
5.7.4	Earthed conductive accessible parts .....	---	N/A

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.7.5	Protective conductor current		N/A
	Supply Voltage (V).....:	---	---
	Measured current (mA).....:	---	---
	Instructional Safeguard.....:	---	N/A
5.7.6	Prospective touch voltage and touch current due to external circuits		N/A
5.7.6.1	Touch current from coaxial cables		N/A
5.7.6.2	Prospective touch voltage and touch current from external circuits		N/A
5.7.7	Summation of touch currents from external circuits		N/A
	a) Equipment with earthed external circuits Measured current (mA).....:	---	N/A
	b) Equipment whose external circuits are not referenced to earth. Measured current (mA).....:	---	N/A

<b>6</b>	<b>ELECTRICALLY- CAUSED FIRE</b>		P
6.2	Classification of power sources (PS) and potential ignition sources (PIS)		P
6.2.2	Power source circuit classifications	PS2	P
6.2.2.1	General	Refer below:	P
6.2.2.2	Power measurement for worst-case load fault... :	(See appended table 6.2.2)	P
6.2.2.3	Power measurement for worst-case power source fault..... :	(See appended table 6.2.2)	P
6.2.2.4	PS1 ..... :	(See appended table 6.2.2)	P
6.2.2.5	PS2 ..... :	(See appended table 6.2.2)	P
6.2.2.6	PS3 ..... :	No PS3 circuits.	N/A
6.2.3	Classification of potential ignition sources	Refer below:	P
6.2.3.1	Arcing PIS ..... :	No voltages > 50 V	N/A
6.2.3.2	Resistive PIS ..... :	(See appended table 6.2.3.2)	P
6.3	Safeguards against fire under normal operating and abnormal operating conditions		P
6.3.1 (a)	No ignition and attainable temperature value less than 90 % defined by ISO 871 or less than 300 °C for unknown materials ..... :	(See appended table 5.4.1.5, 6.3.2, 9.0, B.2.6)	P
6.3.1 (b)	Combustible materials outside fire enclosure	HB75	P
6.4	Safeguards against fire under single fault conditions		P
6.4.1	Safeguard Method	Control of fire spread.	P
6.4.2	Reduction of the likelihood of ignition under single fault conditions in PS1 circuits	Method "control of fire spread" used.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
6.4.3	Reduction of the likelihood of ignition under single fault conditions in PS2 and PS3 circuits	Method "control of fire spread" used.	N/A
6.4.3.1	General		N/A
6.4.3.2	Supplementary Safeguards		N/A
	Special conditions if conductors on printed boards are opened or peeled		N/A
6.4.3.3	Single Fault Conditions ..... :	---	N/A
	Special conditions for temperature limited by fuse		N/A
6.4.4	Control of fire spread in PS1 circuits	No supplementary safeguards needed in PS1 circuits.	P
6.4.5	Control of fire spread in PS2 circuits		P
6.4.5.2	Supplementary safeguards ..... :	Metal enclosure.	P
6.4.6	Control of fire spread in PS3 circuit	No PS3 circuits.	N/A
6.4.7	Separation of combustible materials from a PIS		P
6.4.7.1	General ..... :	(See tables 6.2.3.1 and 6.2.3.2)	P
6.4.7.2	Separation by distance		N/A
6.4.7.3	Separation by a fire barrier		P
6.4.8	Fire enclosures and fire barriers		P
6.4.8.1	Fire enclosure and fire barrier material properties	Metal enclosure used.	P
6.4.8.2.1	Requirements for a fire barrier		N/A
6.4.8.2.2	Requirements for a fire enclosure	Metal enclosure used.	P
6.4.8.3	Constructional requirements for a fire enclosure and a fire barrier		P
6.4.8.3.1	Fire enclosure and fire barrier openings	Refer below:	P
6.4.8.3.2	Fire barrier dimensions	Not used.	N/A
6.4.8.3.3	Top Openings in Fire Enclosure: dimensions (mm) ..... :	Max. 4.8 mm	P
	Needle Flame test		N/A
6.4.8.3.4	Bottom Openings in Fire Enclosure, condition met a), b) and/or c) dimensions (mm) ..... :	No openings in bottom of enclosure.	N/A
	Flammability tests for the bottom of a fire enclosure ..... :	---	N/A
6.4.8.3.5	Integrity of the fire enclosure, condition met: a), b) or c) ..... :	No doors or covers in enclosure.	N/A
6.4.8.4	Separation of PIS from fire enclosure and fire barrier distance (mm) or flammability rating ..... :	Metal enclosure used.	P
6.5	Internal and external wiring		N/A
6.5.1	Requirements	No wirings in PS2 circuits.	N/A
6.5.2	Cross-sectional area (mm <sup>2</sup> ) ..... :	---	—

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Clause	Requirement + Test	Result - Remark	Verdict
6.5.3	Requirements for interconnection to building wiring .....	---	N/A
6.6	Safeguards against fire due to connection to additional equipment		N/A
	External port limited to PS2 or complies with Clause Q.1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

<b>7</b>	<b>INJURY CAUSED BY HAZARDOUS SUBSTANCES</b>		N/A
7.2	Reduction of exposure to hazardous substances	No hazardous substances.	N/A
7.3	Ozone exposure	EUT does not emit ozone.	N/A
7.4	Use of personal safeguards (PPE)	Not required.	N/A
	Personal safeguards and instructions .....	---	—
7.5	Use of instructional safeguards and instructions	Not required.	N/A
	Instructional safeguard (ISO 7010) .....	---	—
7.6	Batteries.....	No batteries used.	N/A

<b>8</b>	<b>MECHANICALLY-CAUSED INJURY</b>		P
8.1	General	Refer below:	P
8.2	Mechanical energy source classifications	MS1	P
8.3	Safeguards against mechanical energy sources		P
8.4	Safeguards against parts with sharp edges and corners	No sharp edges and corners.	N/A
8.4.1	Safeguards		N/A
8.5	Safeguards against moving parts	Fan is not accessible.	N/A
8.5.1	MS2 or MS3 part required to be accessible for the function of the equipment		N/A
8.5.2	Instructional Safeguard .....	---	—
8.5.4	Special categories of equipment comprising moving parts		N/A
8.5.4.1	Large data storage equipment		N/A
8.5.4.2	Equipment having electromechanical device for destruction of media		N/A
8.5.4.2.1	Safeguards and Safety Interlocks .....	No safety interlocks.	N/A
8.5.4.2.2	Instructional safeguards against moving parts		N/A
	Instructional Safeguard .....		—
8.5.4.2.3	Disconnection from the supply		N/A
8.5.4.2.4	Probe type and force (N) .....		N/A
8.5.5	High Pressure Lamps		N/A
8.5.5.1	Energy Source Classification		N/A
8.5.5.2	High Pressure Lamp Explosion Test .....	No high-pressure lamps used.	N/A
8.6	Stability		N/A
8.6.1	Product classification	MS1	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Instructional Safeguard .....	EUT is MS1. No safeguard required.	—
8.6.2	Static stability		N/A
8.6.2.2	Static stability test		N/A
	Applied Force .....	---	—
8.6.2.3	Downward Force Test		N/A
8.6.3	Relocation stability test		N/A
	Unit configuration during 10° tilt .....	---	—
8.6.4	Glass slide test		N/A
8.6.5	Horizontal force test (Applied Force) .....	---	N/A
	Position of feet or movable parts.....	---	—
8.7	Equipment mounted to wall or ceiling		N/A
8.7.1	Mounting Means (Length of screws (mm) and mounting surface) .....	---	N/A
8.7.2	Direction and applied force .....	---	N/A
8.8	Handles strength	No handles for lifting or carrying.	N/A
8.8.1	Classification		N/A
8.8.2	Applied Force .....	---	N/A
8.9	Wheels or casters attachment requirements	No wheels or casters.	N/A
8.9.1	Classification		N/A
8.9.2	Applied force .....	---	—
8.10	Carts, stands and similar carriers	No such parts.	N/A
8.10.1	General		N/A
8.10.2	Marking and instructions		N/A
	Instructional Safeguard .....	---	—
8.10.3	Cart, stand or carrier loading test and compliance		N/A
	Applied force .....	---	—
8.10.4	Cart, stand or carrier impact test		N/A
8.10.5	Mechanical stability		N/A
	Applied horizontal force (N) .....	---	—
8.10.6	Thermoplastic temperature stability (°C) .....	---	N/A
8.11	Mounting means for rack mounted equipment	EUT is not rack mounted.	N/A
8.11.1	General		N/A
8.11.2	Product Classification		N/A
8.11.3	Mechanical strength test, variable <i>N</i> .....	---	N/A
8.11.4	Mechanical strength test 250N, including end stops		N/A



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Clause	Requirement + Test	Result - Remark	Verdict

8.12	Telescoping or rod antennas .....	No such parts.	N/A
	Button/Ball diameter (mm) .....	---	—

<b>9</b>	<b>THERMAL BURN INJURY</b>		<b>P</b>
9.2	Thermal energy source classifications	TS1	P
9.3	Safeguard against thermal energy sources	Only TS1, no safeguards required.	N/A
9.4	Requirements for safeguards		N/A
9.4.1	Equipment safeguard		N/A
9.4.2	Instructional safeguard .....	---	N/A

<b>10</b>	<b>RADIATION</b>		<b>N/A</b>
10.2	Radiation energy source classification	No radiation sources in EUT.	N/A
10.2.1	General classification		N/A
10.3	Protection against laser radiation		N/A
	Laser radiation that exists equipment:		—
	Normal, abnormal, single-fault .....	---	N/A
	Instructional safeguard .....	---	—
	Tool.....	---	—
10.4	Protection against visible, infrared, and UV radiation		N/A
10.4.1	General		N/A
10.4.1.a)	RS3 for Ordinary and instructed persons .....	---	N/A
10.4.1.b)	RS3 accessible to a skilled person.....	---	N/A
	Personal safeguard (PPE) instructional safeguard .....	---	—
10.4.1.c)	Equipment visible, IR, UV does not exceed RS1. :	---	N/A
10.4.1.d)	Normal, abnormal, single-fault conditions .....	---	N/A
10.4.1.e)	Enclosure material employed as safeguard is opaque .....	---	N/A
10.4.1.f)	UV attenuation .....	---	N/A
10.4.1.g)	Materials resistant to degradation UV .....	---	N/A
10.4.1.h)	Enclosure containment of optical radiation .....	---	N/A
10.4.1.i)	Exempt Group under normal operating conditions.....	---	N/A
10.4.2	Instructional safeguard .....	---	N/A
10.5	Protection against x-radiation		N/A
10.5.1	X- radiation energy source that exists equipment :	EUT does not emit x-radiation.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Normal, abnormal, single fault conditions		N/A
	Equipment safeguards..... :	---	N/A
	Instructional safeguard for skilled person ..... :	---	N/A
10.5.3	Most unfavourable supply voltage to give maximum radiation ..... :	---	—
	Abnormal and single-fault condition ..... :	---	N/A
	Maximum radiation (pA/kg)..... :	---	N/A
10.6	Protection against acoustic energy sources		N/A
10.6.1	General		N/A
10.6.2	Classification		N/A
	Acoustic output, dB(A) ..... :	---	N/A
	Output voltage, unweighted r.m.s..... :	---	N/A
10.6.4	Protection of persons		N/A
	Instructional safeguards..... :	---	N/A
	Equipment safeguard prevent ordinary person to RS2..... :	---	—
	Means to actively inform user of increase sound pressure ..... :	---	—
	Equipment safeguard prevent ordinary person to RS2..... :	---	—
10.6.5	Requirements for listening devices (headphones, earphones, etc.)		N/A
10.6.5.1	Corded passive listening devices with analog input		N/A
	Input voltage with 94 dB(A) $L_{Aeq}$ acoustic pressure output ..... :	---	—
10.6.5.2	Corded listening devices with digital input		N/A
	Maximum dB(A)..... :	---	—
10.6.5.3	Cordless listening device		N/A
	Maximum dB(A)..... :	---	—

<b>B</b>	<b>NORMAL OPERATING CONDITION TESTS, ABNORMAL OPERATING CONDITION TESTS AND SINGLE FAULT CONDITION TESTS</b>		P
B.2	Normal Operating Conditions	Refer below:	P
B.2.1	General requirements..... :	(See Test Item Particulars and appended test tables)	P
	Audio Amplifiers and equipment with audio amplifiers ..... :	ES1	P
B.2.3	Supply voltage and tolerances		P

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Clause	Requirement + Test	Result - Remark	Verdict
B.2.5	Input test.....:	(See appended table B.2.5)	P
B.3	Simulated abnormal operating conditions		N/A
B.3.1	General requirements.....:	---	N/A
B.3.2	Covering of ventilation openings	No accessible ventilation openings.	N/A
B.3.3	D.C. mains polarity test	EUT is not directly connected to a mains supply.	N/A
B.3.4	Setting of voltage selector .....	No voltage selector provided.	N/A
B.3.5	Maximum load at output terminals .....	No accessible output terminals.	N/A
B.3.6	Reverse battery polarity	No batteries used.	N/A
B.3.7	Abnormal operating conditions as specified in Clause E.2.	No amplifiers used.	N/A
B.3.8	Safeguards functional during and after abnormal operating conditions		P
B.4	Simulated single fault conditions		P
B.4.2	Temperature controlling device open or short-circuited .....		P
B.4.3	Motor tests		P
B.4.3.1	Motor blocked or rotor locked increasing the internal ambient temperature .....	Motor blocked.	P
B.4.4	Short circuit of functional insulation		P
B.4.4.1	Short circuit of clearances for functional insulation		P
B.4.4.2	Short circuit of creepage distances for functional insulation		P
B.4.4.3	Short circuit of functional insulation on coated printed boards	No coated PCB used.	N/A
B.4.5	Short circuit and interruption of electrodes in tubes and semiconductors		N/A
B.4.6	Short circuit or disconnect of passive components		N/A
B.4.7	Continuous operation of components	No such components used.	N/A
B.4.8	Class 1 and Class 2 energy sources within limits during and after single fault conditions		P
B.4.9	Battery charging under single fault conditions.....:	No batteries used.	N/A
<b>C</b>	<b>UV RADIATION</b>		N/A
C.1	Protection of materials in equipment from UV radiation	EUT is not exposed to UV radiation.	N/A
C.1.2	Requirements		N/A
C.1.3	Test method		N/A
C.2	UV light conditioning test		N/A
C.2.1	Test apparatus		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
C.2.2	Mounting of test samples		N/A
C.2.3	Carbon-arc light-exposure apparatus		N/A
C.2.4	Xenon-arc light exposure apparatus		N/A
<b>D</b>	<b>TEST GENERATORS</b>		N/A
D.1	Impulse test generators		N/A
D.2	Antenna interface test generator		N/A
D.3	Electronic pulse generator		N/A
<b>E</b>	<b>TEST CONDITIONS FOR EQUIPMENT CONTAINING AUDIO AMPLIFIERS</b>		N/A
E.1	Audio amplifier normal operating conditions	EUT is for building-in.	N/A
	Audio signal voltage (V)..... :	---	—
	Rated load impedance ( $\Omega$ ) ..... :	---	N/A
E.2	Audio amplifier abnormal operating conditions	---	N/A
<b>F</b>	<b>EQUIPMENT MARKINGS, INSTRUCTIONS, AND INSTRUCTIONAL SAFEGUARDS</b>		P
F.1	General requirements		P
	Instructions – Language ..... :	---	—
F.2	Letter symbols and graphical symbols		N/A
F.2.1	Letter symbols according to IEC60027-1		N/A
F.2.2	Graphic symbols IEC, ISO or manufacturer specific		N/A
F.3	Equipment markings		P
F.3.1	Equipment marking locations		P
F.3.2	Equipment identification markings	Refer below:	P
F.3.2.1	Manufacturer identification ..... :	Preh Car Connect GmbH	—
F.3.2.2	Model identification ..... :	MIB STD 2	—
F.3.3	Equipment rating markings	EUT is not directly connected to the mains.	P
F.3.3.1	Equipment with direct connection to mains		N/A
F.3.3.2	Equipment without direct connection to mains		P
F.3.3.3	Nature of supply voltage..... :	==	—
F.3.3.4	Rated voltage..... :	12 V	—
F.3.3.4	Rated frequency..... :	---	—
F.3.3.6	Rated current or rated power..... :	---	—
F.3.3.7	Equipment with multiple supply connections		N/A
F.3.4	Voltage setting device	Not used.	N/A
F.3.5	Terminals and operating devices	Not used.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
F.3.5.1	Mains appliance outlet and socket-outlet markings .....	No outlets provided.	N/A
F.3.5.2	Switch position identification marking .....	No switches provided.	N/A
F.3.5.3	Replacement fuse identification and rating markings .....	The fuse is part of the internal wiring system of the car in which the EuT is installed. The required identification marking is provided in the wiring instruction of the automotive system in which the EuT is installed. Maintenance and installation only by the manufacturer or well trained service personal.	N/A
F.3.5.4	Replacement battery identification marking.....	No batteries in equipment.	N/A
F.3.5.5	Terminal marking location		N/A
F.3.6	Equipment markings related to equipment classification	EUT is a class III device.	N/A
F.3.6.1	Class I Equipment		N/A
F.3.6.1.1	Protective earthing conductor terminal		N/A
F.3.6.1.2	Neutral conductor terminal		N/A
F.3.6.1.3	Protective bonding conductor terminals		N/A
F.3.6.2	Class II equipment (IEC60417-5172)	Class III equipment.	N/A
F.3.6.2.1	Class II equipment with or without functional earth		N/A
F.3.6.2.2	Class II equipment with functional earth terminal marking		N/A
F.3.7	Equipment IP rating marking .....	---	—
F.3.8	External power supply output marking	No external power supply.	N/A
F.3.9	Durability, legibility and permanence of marking		P
F.3.10	Test for permanence of markings		P
F.4	Instructions		N/A
	a) Equipment for use in locations where children not likely to be present - marking		N/A
	b) Instructions given for installation or initial use		N/A
	c) Equipment intended to be fastened in place		N/A
	d) Equipment intended for use only in restricted access area		N/A
	e) Audio equipment terminals classified as ES3 and other equipment with terminals marked in accordance F.3.6.1		N/A
	f) Protective earthing employed as safeguard		N/A
	g) Protective earthing conductor current exceeding ES 2 limits		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	h) Symbols used on equipment		N/A
	i) Permanently connected equipment not provided with all-pole mains switch		N/A
j)	j) Replaceable components or modules providing safeguard function		N/A
F.5	Instructional safeguards		N/A
	Where "instructional safeguard" is referenced in the test report it specifies the required elements, location of marking and/or instruction		N/A
<b>G</b>	<b>COMPONENTS</b>		N/A
<b>G.1</b>	<b>Switches</b>		N/A
G.1.1	General requirements	No switches used.	N/A
G.1.2	Ratings, endurance, spacing, maximum load		N/A
<b>G.2</b>	<b>Relays</b>		N/A
G.2.1	General requirements	No relays used.	N/A
G.2.2	Overload test		N/A
G.2.3	Relay controlling connectors supply power		N/A
G.2.4	Mains relay, modified as stated in G.2		N/A
<b>G.3</b>	<b>Protection Devices</b>		N/A
G.3.1	Thermal cut-offs		N/A
G.3.1.1a) &b)	Thermal cut-outs separately approved according to IEC 60730 with conditions indicated in a) & b)		N/A
G.3.1.1c)	Thermal cut-outs tested as part of the equipment as indicated in c)		N/A
G.3.1.2	Thermal cut-off connections maintained and secure		N/A
G.3.2	Thermal links		N/A
G.3.2.1a)	Thermal links separately tested with IEC 60691		N/A
G.3.2.1b)	Thermal links tested as part of the equipment		N/A
	Aging hours (H) .....	---	—
	Single Fault Condition .....	---	—
	Test Voltage (V) and Insulation Resistance ( $\Omega$ ) ..	---	—
G.3.3	PTC Thermistors		N/A
G.3.4	Overcurrent protection devices		N/A
G.3.5	Safeguards components not mentioned in G.3.1 to G.3.5		N/A
G.3.5.1	Non-resettable devices suitably rated and marking provided		N/A
G.3.5.2	Single faults conditions.....	---	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
<b>G.4</b>	<b>Connectors</b>		N/A
G.4.1	Spacings	Only ES1 circuits.	N/A
G.4.2	Mains connector configuration .....	---	N/A
G.4.3	Plug is shaped that insertion into mains socket-outlets or appliance coupler is unlikely		N/A
<b>G.5</b>	<b>Wound Components</b>		N/A
G.5.1	Wire insulation in wound components.....	No wound components.	N/A
G.5.1.2 a)	Two wires in contact inside wound component, angle between 45° and 90°		N/A
G.5.1.2 b)	Construction subject to routine testing		N/A
G.5.2	Endurance test on wound components		N/A
G.5.2.1	General test requirements		N/A
G.5.2.2	Heat run test		N/A
	Time (s) .....	---	—
	Temperature (°C) .....	---	—
G.5.2.3	Wound Components supplied by mains		N/A
<b>G.5.3</b>	<b>Transformers</b>		N/A
G.5.3.1	Requirements applied (IEC61204-7, IEC61558-1/-2, and/or IEC62368-1).....	No transformers used.	N/A
	Position.....	---	—
	Method of protection .....	---	—
G.5.3.2	Insulation		N/A
	Protection from displacement of windings.....		—
G.5.3.3	Overload test.....	---	N/A
G.5.3.3.1	Test conditions		N/A
G.5.3.3.2	Winding Temperatures testing in the unit		N/A
G.5.3.3.3	Winding Temperatures - Alternative test method		N/A
<b>G.5.4</b>	<b>Motors</b>		N/A
G.5.4.1	General requirements	No mains supplied motors inside the equipment. DC fan is a separate approved component.	N/A
	Position .....	---	—
G.5.4.2	Test conditions		N/A
G.5.4.3	Running overload test		N/A
G.5.4.4	Locked-rotor overload test		N/A
	Test duration (days) .....	---	—
G.5.4.5	Running overload test for d.c. motors in secondary circuits		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.5.4.5.2	Tested in the unit		N/A
	Electric strength test (V) ..... :	---	—
G.5.4.5.3	Tested on the Bench - Alternative test method; test time (h) ..... :		N/A
	Electric strength test (V) ..... :	---	—
G.5.4.6	Locked-rotor overload test for d.c. motors in secondary circuits		N/A
G.5.4.6.2	Tested in the unit		N/A
	Maximum Temperature ..... :	---	N/A
	Electric strength test (V) ..... :	---	N/A
G.5.4.6.3	Tested on the bench - Alternative test method; test time (h)..... :	---	N/A
	Electric strength test (V) ..... :	---	N/A
G.5.4.7	Motors with capacitors		N/A
G.5.4.8	Three-phase motors		N/A
G.5.4.9	Series motors		N/A
	Operating voltage ..... :	---	—
<b>G.6</b>	<b>Wire Insulation</b>		N/A
G.6.1	General	Only ES1 circuits.	N/A
G.6.2	Solvent-based enamel wiring insulation		N/A
<b>G.7</b>	<b>Mains supply cords</b>		N/A
G.7.1	General requirements	No supply cords provided.	N/A
	Type ..... :	---	—
	Rated current (A)..... :	---	—
	Cross-sectional area (mm <sup>2</sup> ), (AWG)..... :	---	—
G.7.2	Compliance and test method		N/A
G.7.3	Cord anchorages and strain relief for non- detachable power supply cords		N/A
G.7.3.2	Cord strain relief		N/A
G.7.3.2.1	Requirements		N/A
	Strain relief test force (N)..... :	---	—
G.7.3.2.2	Strain relief mechanism failure		N/A
G.7.3.2.3	Cord sheath or jacket position, distance (mm) ... :	---	—
G.7.3.2.4	Strain relief comprised of polymeric material		N/A
G.7.4	Cord Entry..... :	---	N/A
G.7.5	Non-detachable cord bend protection		N/A
G.7.5.1	Requirements		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
G.7.5.2	Mass (g) ..... :	---	—
	Diameter (m) ..... :	---	—
	Temperature (°C) ..... :	---	—
G.7.6	Supply wiring space		N/A
G.7.6.2	Stranded wire		N/A
G.7.6.2.1	Test with 8 mm strand		N/A
<b>G.8</b>	<b>Varistors</b>		N/A
G.8.1	General requirements		N/A
G.8.2	Safeguard against shock		N/A
G.8.3	Safeguard against fire		N/A
G.8.3.2	Varistor overload test ..... :	---	N/A
G.8.3.3	Temporary overvoltage..... :	---	N/A
<b>G.9</b>	<b>Integrated Circuit (IC) Current Limiters</b>		N/A
G.9.1 a)	Manufacturer defines limit at max. 5A.		N/A
G.9.1 b)	Limiters do not have manual operator or reset		N/A
G.9.1 c)	Supply source does not exceed 250 VA ..... :	---	—
G.9.1 d)	IC limiter output current (max. 5A) ..... :	---	—
G.9.1 e)	Manufacturers' defined drift ..... :	---	—
G.9.2	Test Program 1		N/A
G.9.3	Test Program 2		N/A
G.9.4	Test Program 3		N/A
<b>G.10</b>	<b>Resistors</b>		N/A
G.10.1	General requirements	No resistors used as safeguards.	N/A
G.10.2	Resistor test		N/A
G.10.3	Test for resistors serving as safeguards between the mains and an external circuit consisting of a coaxial cable		N/A
G.10.3.1	General requirements		N/A
G.10.3.2	Voltage surge test		N/A
G.10.3.3	Impulse test		N/A
<b>G.11</b>	<b>Capacitor and RC units</b>		N/A
G.11.1	General requirements	Not used as safeguards.	N/A
G.11.2	Conditioning of capacitors and RC units		N/A
G.11.3	Rules for selecting capacitors		N/A
<b>G.12</b>	<b>Optocouplers</b>		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Optocouplers comply with IEC 60747-5-5:2007 Spacing or Electric Strength Test (specify option and test results)..... :	Not used as safeguards.	N/A
	Type test voltage Vini ..... :	---	—
	Routine test voltage, Vini,b ..... :	---	—
<b>G.13</b>	<b>Printed boards</b>		N/A
G.13.1	General requirements	Functional insulation only. Refer to clause B.4.4	N/A
G.13.2	Uncoated printed boards		N/A
G.13.3	Coated printed boards		N/A
G.13.4	Insulation between conductors on the same inner surface		N/A
	Compliance with cemented joint requirements (Specify construction)..... :		—
G.13.5	Insulation between conductors on different surfaces		N/A
	Distance through insulation ..... :	---	N/A
	Number of insulation layers (pcs) ..... :	---	—
G.13.6	Tests on coated printed boards		N/A
G.13.6.1	Sample preparation and preliminary inspection		N/A
G.13.6.2a)	Thermal conditioning		N/A
G.13.6.2b)	Electric strength test		N/A
G.13.6.2c)	Abrasion resistance test		N/A
<b>G.14</b>	<b>Coating on components terminals</b>		N/A
G.14.1	Requirements ..... :	---	N/A
<b>G.15</b>	<b>Liquid filled components</b>		N/A
G.15.1	General requirements	Not used.	N/A
G.15.2	Requirements		N/A
G.15.3	Compliance and test methods		N/A
G.15.3.1	Hydrostatic pressure test		N/A
G.15.3.2	Creep resistance test		N/A
G.15.3.3	Tubing and fittings compatibility test		N/A
G.15.3.4	Vibration test		N/A
G.15.3.5	Thermal cycling test		N/A
G.15.3.6	Force test		N/A
G.15.4	Compliance		N/A
<b>G.16</b>	<b>IC including capacitor discharge function (ICX)</b>		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
a)	Humidity treatment in accordance with sc5.4.8 – 120 hours		N/A
b)	Impulse test using circuit 2 with $U_c$ = to transient voltage .....	---	N/A
C1)	Application of ac voltage at 110% of rated voltage for 2.5 minutes		N/A
C2)	Test voltage .....	---	—
D1)	10,000 cycles on and off using capacitor with smallest capacitance resistor with largest resistance specified by manufacturer		N/A
D2)	Capacitance .....	---	—
D3)	Resistance .....	---	—
<b>H</b>	<b>CRITERIA FOR TELEPHONE RINGING SIGNALS</b>		N/A
H.1	General		N/A
H.2	Method A		N/A
H.3	Method B		N/A
H.3.1	Ringling signal		N/A
H.3.1.1	Frequency (Hz) .....	---	—
H.3.1.2	Voltage (V) .....	---	—
H.3.1.3	Cadence; time (s) and voltage (V) .....	---	—
H.3.1.4	Single fault current (mA):.....	---	—
H.3.2	Tripping device and monitoring voltage.....	---	N/A
H.3.2.1	Conditions for use of a tripping device or a monitoring voltage complied with		N/A
H.3.2.2	Tripping device		N/A
H.3.2.3	Monitoring voltage (V) .....	---	—
<b>J</b>	<b>INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION</b>		N/A
	General requirements		N/A
<b>K</b>	<b>SAFETY INTERLOCKS</b>		N/A
K.1	General requirements	No safety interlocks used.	N/A
K.2	Components of safety interlock safeguard mechanism .....	---	N/A
K.3	Inadvertent change of operating mode		N/A
K.4	Interlock safeguard override		N/A
K.5	Fail-safe		N/A
	Compliance.....	---	N/A
K.6	Mechanically operated safety interlocks		N/A
K.6.1	Endurance requirement		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
K.6.2	Compliance and Test method.....:	---	N/A
K.7	Interlock circuit isolation		N/A
K.7.1	Separation distance for contact gaps & interlock circuit elements (type and circuit location) .....	---	N/A
K.7.2	Overload test, Current (A) .....	---	N/A
K.7.3	Endurance test		N/A
K.7.4	Electric strength test .....	---	N/A
<b>L</b>	<b>DISCONNECT DEVICES</b>		N/A
L.1	General requirements	Class III equipment.	N/A
L.2	Permanently connected equipment		N/A
L.3	Parts that remain energized		N/A
L.4	Single phase equipment		N/A
L.5	Three-phase equipment		N/A
L.6	Switches as disconnect devices		N/A
L.7	Plugs as disconnect devices		N/A
L.8	Multiple power sources		N/A
<b>M</b>	<b>EQUIPMENT CONTAINING BATTERIES AND THEIR PROTECTION CIRCUITS</b>		N/A
M.1	General requirements	No batteries in equipment.	N/A
M.2	Safety of batteries and their cells		N/A
M.2.1	Requirements		N/A
M.2.2	Compliance and test method (identify method) .. :	---	N/A
M.3	Protection circuits		N/A
M.3.1	Requirements		N/A
M.3.2	Tests		N/A
	- Overcharging of a rechargeable battery		N/A
	- Unintentional charging of a non-rechargeable battery		N/A
	- Reverse charging of a rechargeable battery		N/A
	- Excessive discharging rate for any battery		N/A
M.3.3	Compliance .....	---	N/A
M.4	Additional safeguards for equipment containing secondary lithium battery		N/A
M.4.1	General		N/A
M.4.2	Charging safeguards		N/A
M.4.2.1	Charging operating limits		N/A
M.4.2.2a)	Charging voltage, current and temperature.....:	---	—
M.4.2.2 b)	Single faults in charging circuitry .....	---	—

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Clause	Requirement + Test	Result - Remark	Verdict
M.4.3	Fire Enclosure		N/A
M.4.4	Endurance of equipment containing a secondary lithium battery		N/A
M.4.4.2	Preparation		N/A
M.4.4.3	Drop and charge/discharge function tests		N/A
	Drop		N/A
	Charge		N/A
	Discharge		N/A
M.4.4.4	Charge-discharge cycle test		N/A
M.4.4.5	Result of charge-discharge cycle test		N/A
M.5	Risk of burn due to short circuit during carrying		N/A
M.5.1	Requirement		N/A
M.5.2	Compliance and Test Method (Test of P.2.3)		N/A
M.6	Prevention of short circuits and protection from other effects of electric current		N/A
M.6.1	Short circuits		N/A
M.6.1.1	General requirements		N/A
M.6.1.2	Test method to simulate an internal fault		N/A
M.6.1.3	Compliance (Specify M.6.1.2 or alternative method) ..... :	---	N/A
M.6.2	Leakage current (mA) ..... :	---	N/A
M.7	Risk of explosion from lead acid and NiCd batteries		N/A
M.7.1	Ventilation preventing explosive gas concentration		N/A
M.7.2	Compliance and test method		N/A
M.8	Protection against internal ignition from external spark sources of lead acid batteries		N/A
M.8.1	General requirements		N/A
M.8.2	Test method		N/A
M.8.2.1	General requirements		N/A
M.8.2.2	Estimation of hypothetical volume $V_z$ (m <sup>3</sup> /s) ..... :	---	—
M.8.2.3	Correction factors..... :	---	—
M.8.2.4	Calculation of distance $d$ (mm) ..... :	---	—
M.9	Preventing electrolyte spillage		N/A
M.9.1	Protection from electrolyte spillage		N/A
M.9.2	Tray for preventing electrolyte spillage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.10	Instructions to prevent reasonably foreseeable misuse (Determination of compliance: inspection, data review; or abnormal testing) .....	---	N/A
<b>N</b>	<b>ELECTROCHEMICAL POTENTIALS</b>		N/A
	Metal(s) used .....	Pollution degree considered	---
<b>O</b>	<b>MEASUREMENT OF CREEPAGE DISTANCES AND CLEARANCES</b>		N/A
	Figures O.1 to O.20 of this Annex applied .....	---	---
<b>P</b>	<b>SAFEGUARDS AGAINST ENTRY OF FOREIGN OBJECTS AND SPILLAGE OF INTERNAL LIQUIDS</b>		N/A
P.1	General requirements	EUT is for building-in. No openings in accessible enclosure.	N/A
P.2.2	Safeguards against entry of foreign object		N/A
	Location and Dimensions (mm) .....	---	---
P.2.3	Safeguard against the consequences of entry of foreign object		N/A
P.2.3.1	Safeguards against the entry of a foreign object		N/A
	Openings in transportable equipment		N/A
	Transportable equipment with metalized plastic parts .....	---	N/A
P.2.3.2	Openings in transportable equipment in relation to metallized parts of a barrier or enclosure (identification of supplementary safeguard) .....	---	N/A
P.3	Safeguards against spillage of internal liquids	No internal liquids.	N/A
P.3.1	General requirements		N/A
P.3.2	Determination of spillage consequences		N/A
P.3.3	Spillage safeguards		N/A
P.3.4	Safeguards effectiveness		N/A
P.4	Metallized coatings and adhesive securing parts		N/A
P.4.2 a)	Conditioning testing		N/A
	Tc (°C) .....	---	---
	Tr (°C) .....	---	---
	Ta (°C) .....	---	---
P.4.2 b)	Abrasion testing .....	---	N/A
P.4.2 c)	Mechanical strength testing .....	---	N/A
<b>Q</b>	<b>CIRCUITS INTENDED FOR INTERCONNECTION WITH BUILDING WIRING</b>		N/A
Q.1	Limited power sources	EUT is not intended for interconnection with building wiring.	N/A
Q.1.1 a)	Inherently limited output		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
Q.1.1 b)	Impedance limited output		N/A
	- Regulating network limited output under normal operating and simulated single fault condition		N/A
Q.1.1 c)	Overcurrent protective device limited output		N/A
Q.1.1 d)	IC current limiter complying with G.9		N/A
Q.1.2	Compliance and test method		N/A
Q.2	Test for external circuits – paired conductor cable		N/A
	Maximum output current (A) ..... : ---		—
	Current limiting method ..... : ---		—
<b>R</b>	<b>LIMITED SHORT CIRCUIT TEST</b>		N/A
R.1	General requirements	No PE provided.	N/A
R.2	Determination of the overcurrent protective device and circuit		N/A
R.3	Test method Supply voltage (V) and short-circuit current (A)). ..... : ---		N/A
<b>S</b>	<b>TESTS FOR RESISTANCE TO HEAT AND FIRE</b>		N/A
S.1	Flammability test for fire enclosures and fire barrier materials of equipment where the steady state power does not exceed 4 000 W	Metal enclosure used.	N/A
	Samples, material ..... : ---		—
	Wall thickness (mm)..... : ---		—
	Conditioning (°C)..... : ---		—
	Test flame according to IEC 60695-11-5 with conditions as set out		N/A
	- Material not consumed completely		N/A
	- Material extinguishes within 30s		N/A
	- No burning of layer or wrapping tissue		N/A
S.2	Flammability test for fire enclosure and fire barrier integrity		N/A
	Samples, material ..... : ---		—
	Wall thickness (mm)..... : ---		—
	Conditioning (°C)..... : ---		—
	Test flame according to IEC 60695-11-5 with conditions as set out		N/A
	Test specimen does not show any additional hole		N/A
S.3	Flammability test for the bottom of a fire enclosure		N/A
	Samples, material ..... : ---		—
	Wall thickness (mm)..... : ---		—

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Clause	Requirement + Test	Result - Remark	Verdict
	Cheesecloth did not ignite		N/A
S.4	Flammability classification of materials		N/A
S.5	Flammability test for fire enclosures and fire barrier materials of equipment where the steady state power does not exceed 4 000 W		N/A
	Samples, material .....	---	---
	Wall thickness (mm).....	---	---
	Conditioning (test condition), (°C).....	---	---
	Test flame according to IEC 60695-11-20 with conditions as set out		N/A
	After every test specimen was not consumed completely		N/A
	After fifth flame application, flame extinguished within 1 min		N/A
<b>T</b>	<b>MECHANICAL STRENGTH TESTS</b>		N/A
T.1	General requirements	EUT is for building-in.	N/A
T.2	Steady force test, 10 N .....	---	N/A
T.3	Steady force test, 30 N .....	---	N/A
T.4	Steady force test, 100 N .....	---	N/A
T.5	Steady force test, 250 N .....	---	N/A
T.6	Enclosure impact test	---	N/A
	Fall test		N/A
	Swing test		N/A
T.7	Drop test .....	---	N/A
T.8	Stress relief test .....	Metal enclosure used.	N/A
T.9	Impact Test (glass)		N/A
T.9.1	General requirements		N/A
T.9.2	Impact test and compliance		N/A
	Impact energy (J).....	---	---
	Height (m) .....	---	---
T.10	Glass fragmentation test .....	---	N/A
T.11	Test for telescoping or rod antennas		N/A
	Torque value (Nm) .....	---	---
<b>U</b>	<b>MECHANICAL STRENGTH OF CATHODE RAY TUBES (CRT) AND PROTECTION AGAINST THE EFFECTS OF IMPLOSION</b>		N/A
U.1	General requirements	No such parts used.	N/A



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Clause	Requirement + Test	Result - Remark	Verdict
U.2	Compliance and test method for non-intrinsically protected CRTs		N/A
U.3	Protective Screen .....:	---	N/A
<b>V</b>	<b>DETERMINATION OF ACCESSIBLE PARTS (FINGERS, PROBES AND WEDGES)</b>		N/A
V.1	Accessible parts of equipment	EUT is for building-in.	N/A
V.2	Accessible part criterion	No accessible parts.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict

4.1.2	TABLE: List of critical components					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity <sup>1</sup>	
Enclosure material	Various	Various	Metal Min. 0.7 mm	EN 62368-1	Accepted	
Front plastic	COVESTRO DEUTSCHLAND AG	Bayblend T65XF	HB	ANSI/UL 746C ANSI/UL 94	UL E41613	
Front plastic	Various	Various	Min HB	UL 94	UL	
Audio Connectors	IMS Connector Systems Kft.	HSD(m)-PCB Plug	HB 100V DC 1.5A	EN 62368-1	Accepted	
PCB	Various	Various	V-0 Min 105°C	UI 94	UL	
Display	TRULY OPTO- ELECTRONICS LTD	I-Touch Module	VCC 3.8V DC AVDD 14.5 V DC VBL 23.5V DC 85°C Metal shielding	EN 62368-1	Accepted	
Quad-Lock Connectors	Yamaichi Electronics	P2775A21	24 V 16 A V-0 85°C	EN 62368-1	Accepted	
Supplementary information: <sup>1)</sup> Provided evidence ensures the agreed level of compliance. See OD-CB2039. <sup>2)</sup> Description line content is optional. Main line description needs to clearly detail the component used for testing						

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Clause	Requirement + Test	Result - Remark	Verdict

4.8.4, 4.8.5	TABLE: Lithium coin/button cell batteries mechanical tests			N/A
(The following mechanical tests are conducted in the sequence noted.)				
4.8.4.2	TABLE: Stress Relief test			—
Part		Material	Oven Temperature (°C)	Comments
4.8.4.3	TABLE: Battery replacement test			—
Battery part no..... :				—
Battery Installation/withdrawal		Battery Installation/Removal Cycle		Comments
		1		
		2		
		3		
		4		
		5		
		6		
		8		
		9		
		10		
4.8.4.4	TABLE: Drop test			—
Impact Area		Drop Distance	Drop No.	Observations
			1	
			2	
			3	
4.8.4.5	TABLE: Impact			—
Impacts per surface		Surface tested	Impact energy (Nm)	Comments
4.8.4.6	TABLE: Crush test			—
Test position		Surface tested	Crushing Force (N)	Duration force applied (s)
Supplementary information:				

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

<b>4.8.5</b>	<b>TABLE: Lithium coin/button cell batteries mechanical test result</b>			N/A
Test position	Surface tested	Force (N)	Duration force applied (s)	
Supplementary information:				

5.2	Table: Classification of electrical energy sources						P
5.2.2.2 – Steady State Voltage and Current conditions							
No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters			ES Class
				U (Vrms or Vpk)	I (Apk or Arms)	Hz	
1	12	Input	Normal	12 Vrms	---	DC	ES1
			Abnormal	---	---	---	
			Single fault – SC/OC	12 Vrms	---	DC	
2	12	Speaker	Normal	16 Vrms	---	DC	ES1
			Abnormal	---	---	---	
			Single fault – SC/OC	16 Vrms	---	DC	
			Normal				
			Abnormal				
			Single fault – SC/OC				

5.2.2.3 - Capacitance Limits						
No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters		ES Class
				Capacitance, nF	Upk (V)	
			Normal			
			Abnormal			
			Single fault – SC/OC			

5.2.2.4 - Single Pulses							
No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters			ES Class
				Duration (ms)	Upk (V)	Ipk (mA)	
			Normal				
			Abnormal				

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Clause	Requirement + Test			Result - Remark		Verdict	
			Single fault – SC/OC				
5.2.2.5 - Repetitive Pulses							
No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters			ES Class
				Off time (ms)	Upk (V)	Ipk (mA)	
			Normal				
			Abnormal				
			Single fault – SC/OC				
Test Conditions: Normal – Abnormal - Supplementary information: SC=Short Circuit, OC=Short Circuit							

IEC 62368-1							
Clause	Requirement + Test			Result - Remark		Verdict	
5.4.1.4, 6.3.2, 9.0, B.2.6	TABLE: Temperature measurements						P
	Supply voltage (V) .....	12	12*				—
	Ambient T <sub>min</sub> (°C) .....	24	24				—
	Ambient T <sub>max</sub> (°C) .....	24	24				—
	T <sub>ma</sub> (°C) .....	70	70				—
Maximum measured temperature T of part/at:		T (°C)				Allowed T <sub>max</sub> (°C)	
#1 – Display		26	72			94	
#2 – PCB top		32	78			130	
#3 – PCB bottom		35	81			130	
#4 – Plastic front		28	--			60	
Supplementary information: values marked with * have been calculated at 70°C ambient temperature. T <sub>cal</sub> (°C) = T <sub>meas</sub> – T <sub>amb</sub> + T <sub>mra</sub> T <sub>mra</sub> is the maximum ambient temperature: 70°C T <sub>meas</sub> is the measured temperature T <sub>cal</sub> is the calculated maximum product temperature at T <sub>mra</sub> .							
Temperature T of winding:		t <sub>1</sub> (°C)	R <sub>1</sub> (Ω)	t <sub>2</sub> (°C)	R <sub>2</sub> (Ω)	T (°C)	Allowed T <sub>max</sub> (°C)
Supplementary information: Note 1: T <sub>ma</sub> should be considered as directed by applicable requirement Note 2: T <sub>ma</sub> is not included in assessment of Touch Temperatures (Clause 9)							

5.4.1.10.2	TABLE: Vicat softening temperature of thermoplastics			N/A
Penetration (mm) ..... :				—
Object/ Part No./Material		Manufacturer/t rademark	T softening (°C)	
supplementary information:				

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Clause	Requirement + Test	Result - Remark	Verdict
<b>5.4.1.10.3</b>	<b>TABLE: Ball pressure test of thermoplastics</b>		N/A
Allowed impression diameter (mm) .....		≤ 2 mm	—
Object/Part No./Material	Manufacturer/trademark	Test temperature (°C)	Impression diameter (mm)
Supplementary information:			

5.4.2.2, 5.4.2.4 and 5.4.3	TABLE: Minimum Clearances/Creepage distance						N/A
Clearance (cl) and creepage distance (cr) at/of/between:	Up (V)	U r.m.s. (V)	Frequency (kHz) <sup>1</sup>	Required cl (mm)	cl (mm) <sup>2</sup>	Required <sup>3</sup> cr (mm)	cr (mm)
Supplementary information:							
Note 1: Only for frequency above 30 kHz							
Note 2: See table 5.4.2.4 if this is based on electric strength test							
Note 3: Provide Material Group							
Functional insulation short-circuited.							

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

5.4.2.3	TABLE: Minimum Clearances distances using required withstand voltage				N/A
	Overvoltage Category (OV):				
	Pollution Degree:				
Clearance distanced between:		Required withstand voltage	Required cl (mm)	Measured cl (mm)	
Supplementary information:					

5.4.2.4	TABLE: Clearances based on electric strength test			N/A
Test voltage applied between:		Required cl (mm)	Test voltage (kV) peak/ r.m.s. / d.c.	Breakdown Yes / No
Supplementary information:				

<b>5.4.4.2, 5.4.4.5 c) 5.4.4.9</b>	<b>TABLE: Distance through insulation measurements</b>					N/A
Distance through insulation di at/of:	Peak voltage (V)	Frequency (kHz)	Material	Required DTI (mm)	DTI (mm)	
Supplementary information:						



IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

<b>5.4.9</b>	<b>TABLE: Electric strength tests</b>			N/A
Test voltage applied between:		Voltage shape (AC, DC)	Test voltage (V)	Breakdown Yes / No
Supplementary information:				

5.5.2.2	TABLE: Stored discharge on capacitors					N/A
Supply Voltage (V), Hz	Test Location	Operating Condition (N, S)	Switch position On or off	Measured Voltage (after 2 seconds)	ES Classification	
Supplementary information: X-capacitors installed for testing are: <input type="checkbox"/> bleeding resistor rating: <input type="checkbox"/> ICX: Notes: A. Test Location: Phase to Neutral; Phase to Phase; Phase to Earth; and/or Neutral to Earth B. Operating condition abbreviations: N – Normal operating condition (e.g., normal operation, or open fuse); S –Single fault condition						

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

<b>5.6.6.2</b>	<b>TABLE: Resistance of protective conductors and terminations</b>			N/A
Accessible part	Test current (A)	Duration (min)	Voltage drop (V)	Resistance ( $\Omega$ )
Supplementary information:				

5.7.2.2, 5.7.4	TABLE: Earthed accessible conductive part		N/A
Supply voltage ..... :			—
Location	Test conditions specified in 6.1 of IEC 60990 or Fault Condition No in IEC 60990 clause 6.2.2.1 through 6.2.2.8, except for 6.2.2.7	Touch current (mA)	
	1		
	2*		
	3		
	4		
	5		
	6		
	8		
Supplementary Information:			
Notes:			
[1] Supply voltage is the anticipated maximum Touch Voltage			
[2] Earthed neutral conductor [Voltage differences less than 1% or more]			
[3] Specify method used for measurement as described in IEC 60990 sub-clause 4.3			
[4] IEC60990, sub-clause 6.2.2.7, Fault 7 not applicable.			
[5] (*) IEC60990, sub-clause 6.2.2.2 is not applicable if switch or disconnect device (e.g., appliance coupler) provided.			

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

6.2.2	Table: Electrical power sources (PS) measurements for classification					P
Source	Description	Measurement	Max Power after 3 s	Max Power after 5 s <sup>*)</sup>	PS Classification	
A	DC input / EUT	Power (W) :	92.5	92.5	PS2	
		V <sub>A</sub> (V) :	18.5	18.5		
		I <sub>A</sub> (A) :	5	5		
B	Output	Power (W) :	85	85	PS2	
		V <sub>A</sub> (V) :	14.4	14.4		
		I <sub>A</sub> (A) :	6	6		
C		Power (W) :				
		V <sub>A</sub> (V) :				
		I <sub>A</sub> (A) :				
Supplementary Information: (*) Measurement taken only when limits at 3 seconds exceed PS1 limits						

6.2.3.1	Table: Determination of Potential Ignition Sources (Arcing PIS)				N/A
Location	Open circuit voltage After 3 s (V <sub>p</sub> )	Measured r.m.s current (I <sub>rms</sub> )	Calculated value (V <sub>p</sub> x I <sub>rms</sub> )	Arcing PIS? Yes / No	
Supplementary information:					
An Arcing PIS requires a minimum of 50 V (peak) a.c. or d.c. An Arcing PIS is established when the product of the open circuit voltage (V <sub>p</sub> ) and normal operating condition rms current (I <sub>rms</sub> ) is greater than 15.					

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

<b>6.2.3.2</b>	<b>Table: Determination of Potential Ignition Sources (Resistive PIS)</b>				<b>P</b>
Circuit Location (x-y)	Operating Condition (Normal / Describe Single Fault)	Measured wattage or VA During first 30 s (W / VA)	Measured wattage or VA After 30 s (W / VA)	Protective Circuit, Regulator, or PTC Operated? Yes / No (Comment)	Resistive PIS? Yes/No
Input	Normal	< 1 W	< 1 W	No	No
<p>Supplementary Information:</p> <p>A combination of voltmeter, VA and ammeter IA may be used instead of a wattmeter.</p> <p>If a separate voltmeter and ammeter are used, the product of (VA x IA) is used to determine Resistive PIS classification.</p> <p>A Resistive PIS: (a) dissipates more than 15 W, measured after 30 s of normal operation, <u>or</u> (b) under single fault conditions has either a power exceeding 100 W measured immediately after the introduction of the fault if electronic circuits, regulators or PTC devices are used, or has an available power exceeding 15 W measured 30 s after introduction of the fault.</p>					

8.5.5	TABLE: High Pressure Lamp		N/A
Description		Values	Energy Source Classification
Lamp type.....:			—
Manufacturer.....:			—
Cat no.....:			—
Pressure (cold) (MPa) .....			MS_
Pressure (operating) (MPa) .....			MS_
Operating time (minutes) .....			—
Explosion method.....:			—
Max particle length escaping enclosure (mm) .:			MS_
Max particle length beyond 1 m (mm) .....			MS_
Overall result .....			
Supplementary information:			

<b>IEC 62368-1</b>			
Clause	Requirement + Test	Result - Remark	Verdict

<b>B.2.5</b>	<b>TABLE: Input test</b>						<b>P</b>
U (V)	I (A)	I rated (A)	P (W)	P rated (W)	Fuse No	I fuse (A)	Condition/status
12	1.43	---	17.16	---	---	---	Normal running
10.2	1.78	---	18.16	---	---	---	Normal running
14.4	1.27	---	18.29	---	---	---	Normal running
Supplementary information: Equipment may be have rated current or rated power or both. Both should be measured							

<b>B.3</b>	<b>TABLE: Abnormal operating condition tests</b>							<b>N/A</b>
Ambient temperature (°C) .....								—
Power source for EUT: Manufacturer, model/type, output rating ..								—
Component No.	Abnormal Condition	Supply voltage, (V)	Test time (ms)	Fuse no.	Fuse current, (A)	T-couple	Temp. (°C)	Observation
Supplementary information:								

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

<b>B.4</b>	<b>TABLE: Fault condition tests</b>							<b>P</b>
Ambient temperature (°C) .....								—
Power source for EUT: Manufacturer, model/type, output rating ..								—
Component No.	Fault Condition	Supply voltage, (V)	Test time (h)	Fuse no.	Fuse current, (A)	T-couple	Temp. (°C)	Observation
DC input	S-C	12	1h	--	--	K	37	No danger, no high temperature
Supplementary information:								
Short-circuit of functional insulation cannot cause a hazard.								

Annex M	TABLE: Batteries								N/A	
The tests of Annex M are applicable only when appropriate battery data is not available										
Is it possible to install the battery in a reverse polarity position?..... :										
	Non-rechargeable batteries			Rechargeable batteries						
	Discharging		Un-intentional charging	Charging		Discharging		Reversed charging		
	Meas. current	Manuf. Specs.		Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.	
Max. current during normal condition										
Max. current during fault condition										
Test results:									Verdict	
- Chemical leaks										
- Explosion of the battery										
- Emission of flame or expulsion of molten metal										
- Electric strength tests of equipment after completion of tests										
Supplementary information:										

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

<b>Annex M.4</b>	<b>Table: Additional safeguards for equipment containing secondary lithium batteries</b>				N/A
Battery/Cell No.	Test conditions	Measurements			Observation
		U	I (A)	Temp (C)	
	Normal				
	Abnormal				
	Single fault –SC/OC				
	Normal				
	Abnormal				
	Single fault – SC/OC				
Supplementary Information:					
Battery identification	Charging at $T_{lowest}$ (°C)	Observation	Charging at $T_{highest}$ (°C)	Observation	
Supplementary Information:					

Annex Q.1	TABLE: Circuits intended for interconnection with building wiring (LPS)					N/A
Note: Measured UOC (V) with all load circuits disconnected:						
Output Circuit	Components	U <sub>oc</sub> (V)	I <sub>sc</sub> (A)		S (VA)	
			Meas.	Limit	Meas.	Limit
Supplementary Information: SC=Short circuit, OC=Open circuit						

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

<b>T.2, T.3, T.4, T.5</b>	<b>TABLE: Steady force test</b>				<b>N/A</b>
Part/Location	Material	Thickness (mm)	Force (N)	Test Duration (sec)	Observation
Supplementary information:					

T.6, T.9	TABLE: Impact tests				N/A
Part/Location	Material	Thickness (mm)	Vertical distance (mm)	Observation	
Supplementary information:					

T.7	TABLE: Drop tests				N/A
Part/Location	Material	Thickness (mm)	Drop Height (mm)	Observation	
Supplementary information:					

<b>T.8</b>	<b>TABLE: Stress relief test</b>				<b>N/A</b>
Part/Location	Material	Thickness (mm)	Oven Temperature (°C)	Duration (h)	Observation
Supplementary information:					



**List of test equipment used:**

Test ID	Model Type	Kind of Equipment	Equipment No.
S CL&CR	Digital Measuring Slide 150mm	Holox 412805_150	01-03/34-17-002
	Digital Micrometer 0 - 25 mm	Digital Micrometer	01-03/50-05-014
S Load	DC load 3229.0	Electrical Load DC	01-03/50-16-012
S Mark	N-Hexan	Testbenzin	01-03/50-05-045
	Stopwatch K&R	Stoppuhr	02-03/50-05-019
S Mech	Forcemeter 321.20N	Forcemeter	01-03/34-05-001
	Steelruler 300 mm	Steel Ruler 300 mm	01-03/34-05-006
S Power	DC 30 V/3A	DC Power Supply	01-03/30-05-010
	DC 30 V/3A	DC Power Supply	01-03/30-05-012
	METRAHIT 29S	TRMS-Multimeter	02-03/32-08-002
S Temp	ADGT Top Message	Delphin	02-03/38-07-002

## Attachment S43401-00-01HK to Test Report S43401-00-00HK: Photo Documentation



## Attachment S43401-00-01HK to Test Report S43401-00-00HK: Photo Documentation

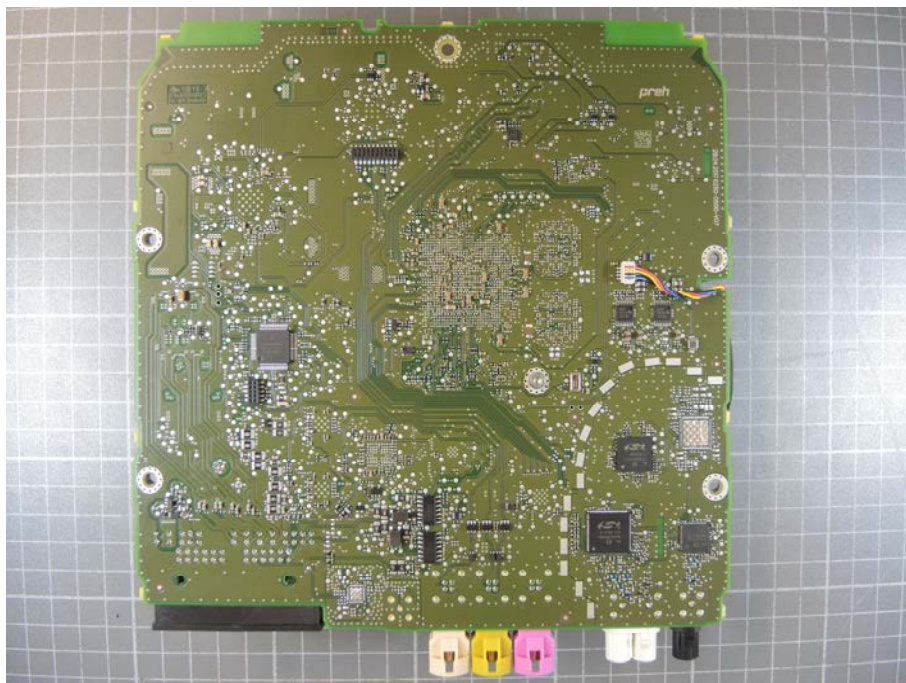


## **Attachment S43401-00-01HK to Test Report S43401-00-00HK: Photo Documentation**





## Attachment S43401-00-01HK to Test Report S43401-00-00HK: Photo Documentation



## Attachment S43401-00-01HK to Test Report S43401-00-00HK: Photo Documentation



# TEST REPORT

IEC 62368-1

## Audio/video, information and communication technology equipment

### Part 1: Safety requirements

**Report Number..... : S43401-00-00HK**

Date of issue..... : 2018-01-24

Total number of pages ..... : 53

**Applicant's name ..... : 7layers GmbH**

Address ..... : Borsigstraße 11  
40880 Ratingen  
Germany

#### Test specification:

Standard..... : IEC 62368-1:2014/Cor1:2015/Cor2:2015

EN 62368-1:2014/AC:2015

Test procedure..... : Compliance Test

Non-standard test method..... : N/A

**Test Report Form No. .... : IEC62368\_1B**

Test Report Form(s) Originator..... : UL(US)

Master TRF..... : 2014-03

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#### General disclaimer:



The test results presented in this report relate only to the object tested.

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Deutsche  
Akkreditierungsstelle  
D-PL-12030-01-01  
D-PL-12030-01-02



Test Item description .....	SELV supplied head unit		
Trade Mark .....	Preh		
Manufacturer .....	Preh Car Connect GmbH		
Model/Type reference .....	MIB 3		
Ratings .....	12 V DC (Vehicle electrical system)		
Testing procedure and testing location:			
<input checked="" type="checkbox"/>	Testing Laboratory:		
Testing location/ address .....	CSA Group Bayern GmbH Ohmstrasse 1-4 94342 Strasskirchen Germany		
Tested by (name + signature).....	Markus Hackl (Test Engineer)		Markus Hackl 2018.01.24 07:14:32 +01'00'
Approved by (name + signature) .....	Josef Kellermeier (Safety Team Lead)		Josef Kellermeier 2018.01.24 07:17:56 +01'00'

<b>List of Attachments (including a total number of pages in each attachment):</b> Attachment 1: S43401-00-01HK_photo_documentation (5 pages)	
<b>Summary of testing:</b>	
<b>Tests performed (name of test and test clause):</b> 5.2 Classification of electrical energy sources 6.2.2 Classification of power sources 6.3.2 Temperature measurement 6.2.3 Classification of PIS 9.2 Classification of thermal energy sources B.2.5 Input test B.4 Fault condition tests F.3.10 Test for performance of markings	<b>Testing location:</b> CSA Group Bayern GmbH Ohmstrasse 1-4 94342 Strasskirchen Germany



**Summary of compliance with National Differences:****List of countries addressed**

EN Members.

☒ **The product fulfils the requirements of**

IEC 62368-1:2014/Cor1:2015/Cor2:2015

EN 62368-1:2014/AC:2015

### Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



TEST ITEM PARTICULARS:	
Classification of use by.....:	<input type="checkbox"/> Ordinary person <input type="checkbox"/> Instructed person <input checked="" type="checkbox"/> Skilled person <input type="checkbox"/> Children likely to be present
Supply Connection.....:	<input type="checkbox"/> AC Mains <input type="checkbox"/> DC Mains <input checked="" type="checkbox"/> External Circuit - not Mains connected - <input checked="" type="checkbox"/> ES1 <input type="checkbox"/> ES2 <input type="checkbox"/> ES3
Supply % Tolerance .....	<input type="checkbox"/> +10%/-10% <input checked="" type="checkbox"/> +20%/-15% <input type="checkbox"/> +____%/ -____% <input type="checkbox"/> None
Supply Connection – Type .....	<input type="checkbox"/> pluggable equipment type A - <input type="checkbox"/> non-detachable supply cord <input type="checkbox"/> appliance coupler <input type="checkbox"/> direct plug-in <input type="checkbox"/> mating connector <input type="checkbox"/> pluggable equipment type B - <input type="checkbox"/> non-detachable supply cord <input type="checkbox"/> appliance coupler <input type="checkbox"/> permanent connection <input type="checkbox"/> mating connector <input checked="" type="checkbox"/> other: DC jack
Considered current rating of protective device as part of building or equipment installation .....	N/A; Installation location: <input type="checkbox"/> building; <input type="checkbox"/> equipment
Equipment mobility .....	<input type="checkbox"/> movable <input type="checkbox"/> hand-held <input type="checkbox"/> transportable <input type="checkbox"/> stationary <input checked="" type="checkbox"/> for building-in <input type="checkbox"/> direct plug-in <input type="checkbox"/> rack-mounting <input type="checkbox"/> wall-mounted
Over voltage category (OVC) .....	<input type="checkbox"/> OVC I <input type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV <input checked="" type="checkbox"/> other: DC supplied (not directly connected to mains).
Class of equipment .....	<input type="checkbox"/> Class I <input type="checkbox"/> Class II <input checked="" type="checkbox"/> Class III
Access location .....	<input type="checkbox"/> restricted access location <input checked="" type="checkbox"/> N/A
Pollution degree (PD) .....	<input type="checkbox"/> PD 1 <input checked="" type="checkbox"/> PD 2 <input type="checkbox"/> PD 3
Manufacturer's specified maximum operating ambient:	85°C
IP protection class .....	<input checked="" type="checkbox"/> IPX0 <input type="checkbox"/> IP____
Power Systems .....	<input type="checkbox"/> TN <input type="checkbox"/> TT <input type="checkbox"/> IT - ____ V L-L <input checked="" type="checkbox"/> N/A
Altitude during operation (m) .....	<input checked="" type="checkbox"/> 2000 m or less <input type="checkbox"/> ____ m
Altitude of test laboratory (m) .....	<input checked="" type="checkbox"/> 2000 m or less <input type="checkbox"/> ____ m
Mass of equipment (kg) .....	<input checked="" type="checkbox"/> 1.10 kg
<b>POSSIBLE TEST CASE VERDICTS:</b>	
- test case does not apply to the test object .....	N/A

- test object does meet the requirement .....	P (Pass)
- test object does not meet the requirement.....	F (Fail)
<b>TESTING:</b>	
Date of receipt of test item .....	2017-10-23
Date (s) of performance of tests.....	2017-12-13 to 2017-01-16
<b>GENERAL REMARKS:</b>	
<b>Test Report History:</b>	
This report may consist of more than one report and is valid only with additional or previous issued reports:	
<b>Test Report No.:</b>	<b>Modifications:</b>
<b>S43401-00-00HK</b> (this report)	Origin Test Report. IEC 62368-1:2014/Cor1:2015/Cor2:2015 EN 62368-1:2014/AC:2015
<b>Statement of the measurement uncertainty</b>	
<p>The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was determined for all measurements listed in this test report acc. to GUM („Guide to the Expression of Uncertainty in Measurement“) and ISO Guide 115 (“Application of uncertainty of measurement to conformity assessment activities in the electro technical sector“) and checked against the requirements of current OD 5014 and documented in the quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.</p>	
<p>“(See Enclosure #)” refers to additional information appended to the report. “(See appended table)” refers to a table appended to the report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
<b>Manufacturer’s Declaration per sub-clause 4.2.5 of IEC60950-1:</b>	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....	<input type="checkbox"/> <b>Yes</b> <input checked="" type="checkbox"/> <b>Not applicable</b>
<b>When differences exist; they shall be identified in the General product information section.</b>	
<b>Name and address of factory (ies).....</b>	Preh Car Connect GmbH Gewerbepark Merbitz 5 01156 Dresden Germany
<b>GENERAL PRODUCT INFORMATION:</b>	
<b>Product Description –</b> The EUT is a SELV supplied head unit system for vehicles. It is power supplied via the vehicle electrical system.	

Weight: 1.10 kg

Operating Temperature: -40°C – +85°C

Notes:

- The unit is power supplied by vehicle electrical system → SELV.
- Vehicle supply considered as LPS.
- The PCB material fulfils the flammability requirement of UL 94 V-0.
- The enclosure material fulfils the flammability requirement of UL 94 V-0 (metal) and UL 94 HB.
- Class III

**Model Differences –**

N/A

**Additional application considerations – (Considerations used to test a component or sub-assembly) –**

N/A

**ENERGY SOURCE IDENTIFICATION AND CLASSIFICATION TABLE:**

(Note 1: Identify the following six (6) energy source forms based on the origin of the energy.)

(Note 2: The identified classification e.g., ES2, TS1, should be with respect to its ability to cause pain or injury on the body or its ability to ignite a combustible material. Any energy source can be declared Class 3 as a worse case classification e.g. PS3, ES3.

**Electrically-caused injury (Clause 5):**

(Note: Identify type of source, list sub-assembly or circuit designation and corresponding energy source classification)

Example: +5 V dc input

ES1

Source of electrical energy	Corresponding classification (ES)
DC input	ES1

**Electrically-caused fire (Clause 6):**

(Note: List sub-assembly or circuit designation and corresponding energy source classification)

Example: Battery pack (maximum 85 watts):

PS2

Source of power or PIS	Corresponding classification (PS)
DC input	PS2

**Injury caused by hazardous substances (Clause 7)**

(Note: Specify hazardous chemicals, whether produces ozone or other chemical construction not addressed as part of the component evaluation.)

Example: Liquid in filled component

Glycol

Source of hazardous substances	Corresponding chemical
N/A	N/A

**Mechanically-caused injury (Clause 8)**

(Note: List moving part(s), fan, special installations, etc. & corresponding MS classification based on Table 35.)

Example: Wall mount unit

MS2

Source of kinetic/mechanical energy	Corresponding classification (MS)
Mass of equipment	MS1
Edges and corners	MS1
Fan	MS1

**Thermal burn injury (Clause 9)**

(Note: Identify the surface or support, and corresponding energy source classification based on type of part, location, operating temperature and contact time in Table 38.)

Example: Hand-held scanner – thermoplastic enclosure

TS1

Source of thermal energy	Corresponding classification (TS)
Enclosure	TS1

**Radiation (Clause 10)**

(Note: List the types of radiation present in the product and the corresponding energy source classification.)

Example: DVD – Class 1 Laser Product

RS1

Type of radiation	Corresponding classification (RS)
N/A	N/A

**ENERGY SOURCE DIAGRAM**

Indicate which energy sources are included in the energy source diagram. Insert diagram below

**EUT: ES1 / PS2 / MS1 / TS1**

<b>OVERVIEW OF EMPLOYED SAFEGUARDS</b>				
<b>Clause</b>	<b>Possible Hazard</b>			
5.1	Electrically-caused injury			
Body Part (e.g. Ordinary)	Energy Source (ES3: Primary Filter circuit)	Safeguards		
		Basic	Supplementary	Reinforced (Enclosure)
Skilled person	ES1	---	---	---
6.1	Electrically-caused fire			
Material part (e.g. mouse enclosure)	Energy Source (PS2: 100 Watt circuit)	Safeguards		
		Basic	Supplementary	Reinforced
Enclosure	PS2	Enclosure Material: Metal	PCB material V-0	---
7.1	Injury caused by hazardous substances			
Body Part (e.g., skilled)	Energy Source (hazardous material)	Safeguards		
		Basic	Supplementary	Reinforced
N/A	---	---	---	---
8.1	Mechanically-caused injury			
Body Part (e.g. Ordinary)	Energy Source (MS3:High Pressure Lamp)	Safeguards		
		Basic	Supplementary	Reinforced (Enclosure)
Skilled person	MS1 (mass / edges and corners / Fan)	---	---	---
9.1	Thermal Burn			
Body Part (e.g., Ordinary)	Energy Source (TS2)	Safeguards		
		Basic	Supplementary	Reinforced
Skilled person	TS1	---	---	---
10.1	Radiation			
Body Part (e.g., Ordinary)	Energy Source (Output from audio port)	Safeguards		
		Basic	Supplementary	Reinforced
N/A	---	---	---	---
Supplementary Information:				
(1) See attached energy source diagram for additional details.				
(2) "N" – Normal Condition; "A" – Abnormal Condition; "S" Single Fault				



IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>4</b>	<b>GENERAL REQUIREMENTS</b>		P
4.1.1	Acceptance of materials, components and subassemblies	(See Table 4.1.2)	P
4.1.2	Use of components		P
4.1.3	Equipment design and construction		P
4.1.15	Markings and instructions .....	(See Annex F)	P
4.4.4	Safeguard robustness		P
4.4.4.2	Steady force tests.....	EUT is for building-in.	N/A
4.4.4.3	Drop tests.....	EUT is for building-in.	N/A
4.4.4.4	Impact tests.....	EUT is for building-in.	N/A
4.4.4.5	Internal accessible safeguard enclosure and barrier tests .....	No internal accessible safeguard.	N/A
4.4.4.6	Glass Impact tests .....	No glasses used.	N/A
4.4.4.74	Thermoplastic material tests .....	Metal enclosure.	N/A
4.4.4.8	Air comprising a safeguard .....	---	N/A
4.4.4.9	Accessibility and safeguard effectiveness	EUT is for building-in.	N/A
4.5	Explosion		P
4.6	Fixing of conductors		P
4.6.1	Fix conductors not to defeat a safeguard		P
4.6.2	10 N force test applied to .....	---	N/A
4.7	Equipment for direct insertion into mains socket - outlets	EUT is not intended for direct insertion into mains socket – outlet.	N/A
4.7.2	Mains plug part complies with the relevant standard .....	---	N/A
4.7.3	Torque (Nm).....	---	N/A
4.8	Products containing coin/button cell batteries	No batteries used.	N/A
4.8.2	Instructional safeguard		N/A
4.8.3	Battery Compartment Construction		N/A
	Means to reduce the possibility of children removing the battery .....	---	—
4.8.4	Battery Compartment Mechanical Tests .....	---	N/A
4.8.5	Battery Accessibility		N/A
4.9	Likelihood of fire or shock due to entry of conductive object.....	(See Annex P)	P

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

<b>5</b>	<b>ELECTRICALLY-CAUSED INJURY</b>		P
5.2.1	Electrical energy source classifications .....	(See appended table 5.2)	P
5.2.2	ES1, ES2 and ES3 limits	Only ES1 circuits.	P
5.2.2.2	Steady-state voltage and current .....	(See appended table 5.2)	P
5.2.2.3	Capacitance limits.....	---	N/A
5.2.2.4	Single pulse limits .....	---	N/A
5.2.2.5	Limits for repetitive pulses .....	---	N/A
5.2.2.6	Ringing signals .....	No ringing signals.	N/A
5.2.2.7	Audio signals .....	ES1	P
5.3	Protection against electrical energy sources	Only ES1 circuits.	N/A
5.3.1	General Requirements for accessible parts to ordinary, instructed and skilled persons		N/A
5.3.2.1	Accessibility to electrical energy sources and safeguards		N/A
5.3.2.2	Contact requirements		N/A
	a) Test with test probe from Annex V .....	---	N/A
	b) Electric strength test potential (V).....	---	N/A
	c) Air gap (mm) .....	---	N/A
5.3.2.4	Terminals for connecting stripped wire		N/A
5.4	Insulation materials and requirements		N/A
5.4.1.2	Properties of insulating material	LPS supplied equipment. Functional insulation only.	N/A
5.4.1.3	Humidity conditioning .....	---	N/A
5.4.1.4	Maximum operating temperature for insulating materials .....	---	N/A
5.4.1.5	Pollution degree .....	PD 2	—
5.4.1.5.2	Test for pollution degree 1 environment and for an insulating compound		N/A
5.4.1.5.3	Thermal cycling		N/A
5.4.1.6	Insulation in transformers with varying dimensions	No transformers used.	N/A
5.4.1.7	Insulation in circuits generating starting pulses	No starting impulses generated.	N/A
5.4.1.8	Determination of working voltage		N/A
5.4.1.9	Insulating surfaces		N/A
5.4.1.10	Thermoplastic parts on which conductive metallic parts are directly mounted		N/A
5.4.1.10.2	Vicat softening temperature .....	---	N/A
5.4.1.10.3	Ball pressure .....	---	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5.4.2	Clearances	Only ES1 circuits.	N/A
5.4.2.2	Determining clearance using peak working voltage		N/A
5.4.2.3	Determining clearance using required withstand voltage .....	---	N/A
	a) a.c. mains transient voltage..... :	---	—
	b) d.c. mains transient voltage .....	---	—
	c) external circuit transient voltage .....	---	—
	d) transient voltage determined by measurement .. :	---	—
5.4.2.4	Determining the adequacy of a clearance using an electric strength test		N/A
5.4.2.5	Multiplication factors for clearances and test voltages..... :	---	N/A
5.4.3	Creepage distances .....	Only ES1 circuits.	N/A
5.4.3.1	General		N/A
5.4.3.3	Material Group .....	---	—
5.4.4	Solid insulation		N/A
5.4.4.2	Minimum distance through insulation .....	---	N/A
5.4.4.3	Insulation compound forming solid insulation		N/A
5.4.4.4	Solid insulation in semiconductor devices		N/A
5.4.4.5	Cemented joints		N/A
5.4.4.6	Thin sheet material		N/A
5.4.4.6.1	General requirements		N/A
5.4.4.6.2	Separable thin sheet material		N/A
	Number of layers (pcs) .....	---	N/A
5.4.4.6.3	Non-separable thin sheet material		N/A
5.4.4.6.4	Standard test procedure for non-separable thin sheet material..... :	---	N/A
5.4.4.6.5	Mandrel test		N/A
5.4.4.7	Solid insulation in wound components		N/A
5.4.4.9	Solid insulation at frequencies >30 kHz..... :	---	N/A
5.4.5	Antenna terminal insulation	Only functional insulation used.	N/A
5.4.5.1	General		N/A
5.4.5.2	Voltage surge test		N/A
	Insulation resistance (M $\Omega$ )..... :	---	—
5.4.6	Insulation of internal wire as part of supplementary safeguard .....	---	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5.4.7	Tests for semiconductor components and for cemented joints		N/A
5.4.8	Humidity conditioning	Functional insulation Short circuiting of functional insulating causes no hazard.	N/A
	Relative humidity (%)..... :	---	—
	Temperature (°C) ..... :	---	—
	Duration (h) ..... :	---	—
5.4.9	Electric strength test..... :	---	N/A
5.4.9.1	Test procedure for a solid insulation type test		N/A
5.4.9.2	Test procedure for routine tests		N/A
5.4.10	Protection against transient voltages between external circuit	DC supplied.	N/A
5.4.10.1	Parts and circuits separated from external circuits		N/A
5.4.10.2	Test methods		N/A
5.4.10.2.1	General		N/A
5.4.10.2.2	Impulse test..... :	---	N/A
5.4.10.2.3	Steady-state test ..... :	---	N/A
5.4.11	Insulation between external circuits and earthed circuitry..... :	---	N/A
5.4.11.1	Exceptions to separation between external circuits and earth		N/A
5.4.11.2	Requirements		N/A
	Rated operating voltage $U_{op}$ (V) ..... :	---	—
	Nominal voltage $U_{peak}$ (V)..... :	---	—
	Max increase due to variation $U_{sp}$ ..... :	---	—
	Max increase due to ageing $\Delta U_{sa}$ ..... :	---	—
	$U_{op} = U_{peak} + \Delta U_{sp} + \Delta U_{sa}$ ..... :	---	—
5.5	Components as safeguards		
5.5.1	General		N/A
5.5.2	Capacitors and RC units	No capacitors or RC units used as safeguards.	N/A
5.5.2.1	General requirement		N/A
5.5.2.2	Safeguards against capacitor discharge after disconnection of a connector ..... :	---	N/A
5.5.3	Transformers	No transformers used.	N/A
5.5.4	Optocouplers	No optocouplers used as safeguards.	N/A
5.5.5	Relays	No relays used.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
5.5.6	Resistors	No resistors used as safeguard.	N/A
5.5.7	SPD's	DC supplied.	N/A
5.5.7.1	Use of an SPD connected to reliable earthing		N/A
5.5.7.2	Use of an SPD between mains and protective earth		N/A
5.5.8	Insulation between the mains and external circuit consisting of a coaxial cable .....	EUT is not directly connected to the mains.	N/A
5.6	Protective conductor		N/A
5.6.2	Requirement for protective conductors	No protective conductor provided.	N/A
5.6.2.1	General requirements		N/A
5.6.2.2	Colour of insulation		N/A
5.6.3	Requirement for protective earthing conductors		N/A
	Protective earthing conductor size (mm <sup>2</sup> ) .....	---	—
5.6.4	Requirement for protective bonding conductors		N/A
5.6.4.1	Protective bonding conductors		N/A
	Protective bonding conductor size (mm <sup>2</sup> ). ....	---	—
	Protective current rating (A) .....	---	—
5.6.4.3	Current limiting and overcurrent protective devices		N/A
5.6.5	Terminals for protective conductors		N/A
5.6.5.1	Requirement		N/A
	Conductor size (mm <sup>2</sup> ), nominal thread diameter (mm). ....	---	N/A
5.6.5.2	Corrosion		N/A
5.6.6	Resistance of the protective system		N/A
5.6.6.1	Requirements		N/A
5.6.6.2	Test Method Resistance (Ω) .....	---	N/A
5.6.7	Reliable earthing		N/A
5.7	Prospective touch voltage, touch current and protective conductor current		N/A
5.7.2	Measuring devices and networks	Class III equipment.	N/A
5.7.2.1	Measurement of touch current .....	---	N/A
5.7.2.2	Measurement of prospective touch voltage		N/A
5.7.3	Equipment set-up, supply connections and earth connections		N/A
	System of interconnected equipment (separate connections/single connection) .....	---	—
	Multiple connections to mains (one connection at a time/simultaneous connections) .....	---	—

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Clause	Requirement + Test	Result - Remark	Verdict
5.7.4	Earthed conductive accessible parts.....:	---	N/A
5.7.5	Protective conductor current		N/A
	Supply Voltage (V).....:	---	—
	Measured current (mA).....:	---	—
	Instructional Safeguard.....:	---	N/A
5.7.6	Prospective touch voltage and touch current due to external circuits		N/A
5.7.6.1	Touch current from coaxial cables		N/A
5.7.6.2	Prospective touch voltage and touch current from external circuits		N/A
5.7.7	Summation of touch currents from external circuits		N/A
	a) Equipment with earthed external circuits Measured current (mA).....:	---	N/A
	b) Equipment whose external circuits are not referenced to earth. Measured current (mA).....:	---	N/A

<b>6</b>	<b>ELECTRICALLY- CAUSED FIRE</b>		P
6.2	Classification of power sources (PS) and potential ignition sources (PIS)		P
6.2.2	Power source circuit classifications	PS2	P
6.2.2.1	General	Refer below:	P
6.2.2.2	Power measurement for worst-case load fault... :	(See appended table 6.2.2)	P
6.2.2.3	Power measurement for worst-case power source fault.....:	(See appended table 6.2.2)	P
6.2.2.4	PS1 .....	(See appended table 6.2.2)	P
6.2.2.5	PS2 .....	(See appended table 6.2.2)	P
6.2.2.6	PS3 .....	No PS3 circuits.	N/A
6.2.3	Classification of potential ignition sources	Refer below:	P
6.2.3.1	Arcing PIS .....	No voltages > 50 V	N/A
6.2.3.2	Resistive PIS .....	(See appended table 6.2.3.2)	P
6.3	Safeguards against fire under normal operating and abnormal operating conditions		P
6.3.1 (a)	No ignition and attainable temperature value less than 90 % defined by ISO 871 or less than 300 °C for unknown materials .....	(See appended table 5.4.1.5, 6.3.2, 9.0, B.2.6)	P
6.3.1 (b)	Combustible materials outside fire enclosure	HB75	P
6.4	Safeguards against fire under single fault conditions		P
6.4.1	Safeguard Method	Control of fire spread.	P
6.4.2	Reduction of the likelihood of ignition under single fault conditions in PS1 circuits	Method "control of fire spread" used.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
6.4.3	Reduction of the likelihood of ignition under single fault conditions in PS2 and PS3 circuits	Method "control of fire spread" used.	N/A
6.4.3.1	General		N/A
6.4.3.2	Supplementary Safeguards		N/A
	Special conditions if conductors on printed boards are opened or peeled		N/A
6.4.3.3	Single Fault Conditions ..... :	---	N/A
	Special conditions for temperature limited by fuse		N/A
6.4.4	Control of fire spread in PS1 circuits	No supplementary safeguards needed in PS1 circuits.	P
6.4.5	Control of fire spread in PS2 circuits		P
6.4.5.2	Supplementary safeguards ..... :	Metal enclosure.	P
6.4.6	Control of fire spread in PS3 circuit	No PS3 circuits.	N/A
6.4.7	Separation of combustible materials from a PIS		P
6.4.7.1	General ..... :	(See tables 6.2.3.1 and 6.2.3.2)	P
6.4.7.2	Separation by distance		N/A
6.4.7.3	Separation by a fire barrier		P
6.4.8	Fire enclosures and fire barriers		P
6.4.8.1	Fire enclosure and fire barrier material properties	Metal enclosure used.	P
6.4.8.2.1	Requirements for a fire barrier		N/A
6.4.8.2.2	Requirements for a fire enclosure	Metal enclosure used.	P
6.4.8.3	Constructional requirements for a fire enclosure and a fire barrier		P
6.4.8.3.1	Fire enclosure and fire barrier openings	Refer below:	P
6.4.8.3.2	Fire barrier dimensions	Not used.	N/A
6.4.8.3.3	Top Openings in Fire Enclosure: dimensions (mm) ..... :	Max. 4.6 mm	P
	Needle Flame test		N/A
6.4.8.3.4	Bottom Openings in Fire Enclosure, condition met a), b) and/or c) dimensions (mm) ..... :	No openings in bottom of enclosure.	N/A
	Flammability tests for the bottom of a fire enclosure ..... :	---	N/A
6.4.8.3.5	Integrity of the fire enclosure, condition met: a), b) or c) ..... :	No doors or covers in enclosure.	N/A
6.4.8.4	Separation of PIS from fire enclosure and fire barrier distance (mm) or flammability rating ..... :	Metal enclosure used.	P
6.5	Internal and external wiring		N/A
6.5.1	Requirements	No wirings in PS2 circuits.	N/A
6.5.2	Cross-sectional area (mm <sup>2</sup> ) ..... :	---	—

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Clause	Requirement + Test	Result - Remark	Verdict
6.5.3	Requirements for interconnection to building wiring .....	---	N/A
6.6	Safeguards against fire due to connection to additional equipment		N/A
	External port limited to PS2 or complies with Clause Q.1		N/A



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Clause	Requirement + Test	Result - Remark	Verdict

<b>7</b>	<b>INJURY CAUSED BY HAZARDOUS SUBSTANCES</b>		N/A
7.2	Reduction of exposure to hazardous substances	No hazardous substances.	N/A
7.3	Ozone exposure	EUT does not emit ozone.	N/A
7.4	Use of personal safeguards (PPE)	Not required.	N/A
	Personal safeguards and instructions .....	---	—
7.5	Use of instructional safeguards and instructions	Not required.	N/A
	Instructional safeguard (ISO 7010) .....	---	—
7.6	Batteries.....	No batteries used.	N/A

<b>8</b>	<b>MECHANICALLY-CAUSED INJURY</b>		P
8.1	General	Refer below:	P
8.2	Mechanical energy source classifications	MS1	P
8.3	Safeguards against mechanical energy sources		P
8.4	Safeguards against parts with sharp edges and corners	No sharp edges and corners.	N/A
8.4.1	Safeguards		N/A
8.5	Safeguards against moving parts	Fan is not accessible.	N/A
8.5.1	MS2 or MS3 part required to be accessible for the function of the equipment		N/A
8.5.2	Instructional Safeguard .....	---	—
8.5.4	Special categories of equipment comprising moving parts		N/A
8.5.4.1	Large data storage equipment		N/A
8.5.4.2	Equipment having electromechanical device for destruction of media		N/A
8.5.4.2.1	Safeguards and Safety Interlocks .....	No safety interlocks.	N/A
8.5.4.2.2	Instructional safeguards against moving parts		N/A
	Instructional Safeguard .....		—
8.5.4.2.3	Disconnection from the supply		N/A
8.5.4.2.4	Probe type and force (N) .....		N/A
8.5.5	High Pressure Lamps		N/A
8.5.5.1	Energy Source Classification		N/A
8.5.5.2	High Pressure Lamp Explosion Test .....	No high-pressure lamps used.	N/A
8.6	Stability		N/A
8.6.1	Product classification	MS1	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Instructional Safeguard .....	EUT is MS1. No safeguard required.	—
8.6.2	Static stability		N/A
8.6.2.2	Static stability test		N/A
	Applied Force .....	---	—
8.6.2.3	Downward Force Test		N/A
8.6.3	Relocation stability test		N/A
	Unit configuration during 10° tilt .....	---	—
8.6.4	Glass slide test		N/A
8.6.5	Horizontal force test (Applied Force) .....	---	N/A
	Position of feet or movable parts.....	---	—
8.7	Equipment mounted to wall or ceiling		N/A
8.7.1	Mounting Means (Length of screws (mm) and mounting surface) .....	---	N/A
8.7.2	Direction and applied force .....	---	N/A
8.8	Handles strength	No handles for lifting or carrying.	N/A
8.8.1	Classification		N/A
8.8.2	Applied Force .....	---	N/A
8.9	Wheels or casters attachment requirements	No wheels or casters.	N/A
8.9.1	Classification		N/A
8.9.2	Applied force .....	---	—
8.10	Carts, stands and similar carriers	No such parts.	N/A
8.10.1	General		N/A
8.10.2	Marking and instructions		N/A
	Instructional Safeguard .....	---	—
8.10.3	Cart, stand or carrier loading test and compliance		N/A
	Applied force .....	---	—
8.10.4	Cart, stand or carrier impact test		N/A
8.10.5	Mechanical stability		N/A
	Applied horizontal force (N) .....	---	—
8.10.6	Thermoplastic temperature stability (°C) .....	---	N/A
8.11	Mounting means for rack mounted equipment	EUT is not rack mounted.	N/A
8.11.1	General		N/A
8.11.2	Product Classification		N/A
8.11.3	Mechanical strength test, variable <i>N</i> .....	---	N/A
8.11.4	Mechanical strength test 250N, including end stops		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

8.12	Telescoping or rod antennas .....	No such parts.	N/A
	Button/Ball diameter (mm).....:	---	—

<b>9</b>	<b>THERMAL BURN INJURY</b>		<b>P</b>
9.2	Thermal energy source classifications	TS1	P
9.3	Safeguard against thermal energy sources	Only TS1, no safeguards required.	N/A
9.4	Requirements for safeguards		N/A
9.4.1	Equipment safeguard		N/A
9.4.2	Instructional safeguard .....	---	N/A

<b>10</b>	<b>RADIATION</b>		<b>N/A</b>
10.2	Radiation energy source classification	No radiation sources in EUT.	N/A
10.2.1	General classification		N/A
10.3	Protection against laser radiation		N/A
	Laser radiation that exists equipment:		—
	Normal, abnormal, single-fault .....	---	N/A
	Instructional safeguard .....	---	—
	Tool.....:	---	—
10.4	Protection against visible, infrared, and UV radiation		N/A
10.4.1	General		N/A
10.4.1.a)	RS3 for Ordinary and instructed persons .....	---	N/A
10.4.1.b)	RS3 accessible to a skilled person.....:	---	N/A
	Personal safeguard (PPE) instructional safeguard .....	---	—
10.4.1.c)	Equipment visible, IR, UV does not exceed RS1. :	---	N/A
10.4.1.d)	Normal, abnormal, single-fault conditions .....	---	N/A
10.4.1.e)	Enclosure material employed as safeguard is opaque .....	---	N/A
10.4.1.f)	UV attenuation .....	---	N/A
10.4.1.g)	Materials resistant to degradation UV .....	---	N/A
10.4.1.h)	Enclosure containment of optical radiation.....:	---	N/A
10.4.1.i)	Exempt Group under normal operating conditions.....:	---	N/A
10.4.2	Instructional safeguard .....	---	N/A
10.5	Protection against x-radiation		N/A
10.5.1	X- radiation energy source that exists equipment :	EUT does not emit x-radiation.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Normal, abnormal, single fault conditions		N/A
	Equipment safeguards..... :	---	N/A
	Instructional safeguard for skilled person ..... :	---	N/A
10.5.3	Most unfavourable supply voltage to give maximum radiation ..... :	---	—
	Abnormal and single-fault condition ..... :	---	N/A
	Maximum radiation (pA/kg)..... :	---	N/A
10.6	Protection against acoustic energy sources		N/A
10.6.1	General		N/A
10.6.2	Classification		N/A
	Acoustic output, dB(A) ..... :	---	N/A
	Output voltage, unweighted r.m.s..... :	---	N/A
10.6.4	Protection of persons		N/A
	Instructional safeguards..... :	---	N/A
	Equipment safeguard prevent ordinary person to RS2..... :	---	—
	Means to actively inform user of increase sound pressure ..... :	---	—
	Equipment safeguard prevent ordinary person to RS2..... :	---	—
10.6.5	Requirements for listening devices (headphones, earphones, etc.)		N/A
10.6.5.1	Corded passive listening devices with analog input		N/A
	Input voltage with 94 dB(A) $L_{Aeq}$ acoustic pressure output ..... :	---	—
10.6.5.2	Corded listening devices with digital input		N/A
	Maximum dB(A)..... :	---	—
10.6.5.3	Cordless listening device		N/A
	Maximum dB(A)..... :	---	—

<b>B</b>	<b>NORMAL OPERATING CONDITION TESTS, ABNORMAL OPERATING CONDITION TESTS AND SINGLE FAULT CONDITION TESTS</b>		P
B.2	Normal Operating Conditions	Refer below:	P
B.2.1	General requirements..... :	(See Test Item Particulars and appended test tables)	P
	Audio Amplifiers and equipment with audio amplifiers ..... :	ES1	P
B.2.3	Supply voltage and tolerances		P

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Clause	Requirement + Test	Result - Remark	Verdict
B.2.5	Input test.....:	(See appended table B.2.5)	P
B.3	Simulated abnormal operating conditions		N/A
B.3.1	General requirements.....:	---	N/A
B.3.2	Covering of ventilation openings	No accessible ventilation openings.	N/A
B.3.3	D.C. mains polarity test	EUT is not directly connected to a mains supply.	N/A
B.3.4	Setting of voltage selector .....	No voltage selector provided.	N/A
B.3.5	Maximum load at output terminals .....	No accessible output terminals.	N/A
B.3.6	Reverse battery polarity	No batteries used.	N/A
B.3.7	Abnormal operating conditions as specified in Clause E.2.	No amplifiers used.	N/A
B.3.8	Safeguards functional during and after abnormal operating conditions		P
B.4	Simulated single fault conditions		P
B.4.2	Temperature controlling device open or short-circuited .....		P
B.4.3	Motor tests		P
B.4.3.1	Motor blocked or rotor locked increasing the internal ambient temperature .....	Motor blocked.	P
B.4.4	Short circuit of functional insulation		P
B.4.4.1	Short circuit of clearances for functional insulation		P
B.4.4.2	Short circuit of creepage distances for functional insulation		P
B.4.4.3	Short circuit of functional insulation on coated printed boards	No coated PCB used.	N/A
B.4.5	Short circuit and interruption of electrodes in tubes and semiconductors		N/A
B.4.6	Short circuit or disconnect of passive components		N/A
B.4.7	Continuous operation of components	No such components used.	N/A
B.4.8	Class 1 and Class 2 energy sources within limits during and after single fault conditions		P
B.4.9	Battery charging under single fault conditions.....:	No batteries used.	N/A
<b>C</b>	<b>UV RADIATION</b>		N/A
C.1	Protection of materials in equipment from UV radiation	EUT is not exposed to UV radiation.	N/A
C.1.2	Requirements		N/A
C.1.3	Test method		N/A
C.2	UV light conditioning test		N/A
C.2.1	Test apparatus		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
C.2.2	Mounting of test samples		N/A
C.2.3	Carbon-arc light-exposure apparatus		N/A
C.2.4	Xenon-arc light exposure apparatus		N/A
<b>D</b>	<b>TEST GENERATORS</b>		N/A
D.1	Impulse test generators		N/A
D.2	Antenna interface test generator		N/A
D.3	Electronic pulse generator		N/A
<b>E</b>	<b>TEST CONDITIONS FOR EQUIPMENT CONTAINING AUDIO AMPLIFIERS</b>		N/A
E.1	Audio amplifier normal operating conditions	Only skilled persons. EUT is for building-in.	N/A
	Audio signal voltage (V)..... :	---	—
	Rated load impedance ( $\Omega$ ) ..... :	---	N/A
E.2	Audio amplifier abnormal operating conditions	---	N/A
<b>F</b>	<b>EQUIPMENT MARKINGS, INSTRUCTIONS, AND INSTRUCTIONAL SAFEGUARDS</b>		P
F.1	General requirements		P
	Instructions – Language ..... :	---	—
F.2	Letter symbols and graphical symbols		N/A
F.2.1	Letter symbols according to IEC60027-1		N/A
F.2.2	Graphic symbols IEC, ISO or manufacturer specific		N/A
F.3	Equipment markings		P
F.3.1	Equipment marking locations		P
F.3.2	Equipment identification markings	Refer below:	P
F.3.2.1	Manufacturer identification ..... :	Preh Car Connect GmbH	—
F.3.2.2	Model identification ..... :	MIB3	—
F.3.3	Equipment rating markings	EUT is not directly connected to the mains.	P
F.3.3.1	Equipment with direct connection to mains		N/A
F.3.3.2	Equipment without direct connection to mains		P
F.3.3.3	Nature of supply voltage..... :	==	—
F.3.3.4	Rated voltage..... :	12 V	—
F.3.3.4	Rated frequency..... :	---	—
F.3.3.6	Rated current or rated power..... :	---	—
F.3.3.7	Equipment with multiple supply connections		N/A
F.3.4	Voltage setting device	Not used.	N/A
F.3.5	Terminals and operating devices	Not used.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
F.3.5.1	Mains appliance outlet and socket-outlet markings .....	No outlets provided.	N/A
F.3.5.2	Switch position identification marking .....	No switches provided.	N/A
F.3.5.3	Replacement fuse identification and rating markings .....	The fuse is part of the internal wiring system of the car in which the EuT is installed. The required identification marking is provided in the wiring instruction of the automotive system in which the EuT is installed. Maintenance and installation only by the manufacturer or well trained service personal.	N/A
F.3.5.4	Replacement battery identification marking.....	No batteries in equipment.	N/A
F.3.5.5	Terminal marking location		N/A
F.3.6	Equipment markings related to equipment classification	EUT is a class III device.	N/A
F.3.6.1	Class I Equipment		N/A
F.3.6.1.1	Protective earthing conductor terminal		N/A
F.3.6.1.2	Neutral conductor terminal		N/A
F.3.6.1.3	Protective bonding conductor terminals		N/A
F.3.6.2	Class II equipment (IEC60417-5172)	Class III equipment.	N/A
F.3.6.2.1	Class II equipment with or without functional earth		N/A
F.3.6.2.2	Class II equipment with functional earth terminal marking		N/A
F.3.7	Equipment IP rating marking .....	---	—
F.3.8	External power supply output marking	No external power supply.	N/A
F.3.9	Durability, legibility and permanence of marking		P
F.3.10	Test for permanence of markings		P
F.4	Instructions		N/A
	a) Equipment for use in locations where children not likely to be present - marking		N/A
	b) Instructions given for installation or initial use		N/A
	c) Equipment intended to be fastened in place		N/A
	d) Equipment intended for use only in restricted access area		N/A
	e) Audio equipment terminals classified as ES3 and other equipment with terminals marked in accordance F.3.6.1		N/A
	f) Protective earthing employed as safeguard		N/A
	g) Protective earthing conductor current exceeding ES 2 limits		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	h) Symbols used on equipment		N/A
	i) Permanently connected equipment not provided with all-pole mains switch		N/A
j)	j) Replaceable components or modules providing safeguard function		N/A
F.5	Instructional safeguards		N/A
	Where "instructional safeguard" is referenced in the test report it specifies the required elements, location of marking and/or instruction		N/A
<b>G</b>	<b>COMPONENTS</b>		N/A
<b>G.1</b>	<b>Switches</b>		N/A
G.1.1	General requirements	No switches used.	N/A
G.1.2	Ratings, endurance, spacing, maximum load		N/A
<b>G.2</b>	<b>Relays</b>		N/A
G.2.1	General requirements	No relays used.	N/A
G.2.2	Overload test		N/A
G.2.3	Relay controlling connectors supply power		N/A
G.2.4	Mains relay, modified as stated in G.2		N/A
<b>G.3</b>	<b>Protection Devices</b>		N/A
G.3.1	Thermal cut-offs		N/A
G.3.1.1a) &b)	Thermal cut-outs separately approved according to IEC 60730 with conditions indicated in a) & b)		N/A
G.3.1.1c)	Thermal cut-outs tested as part of the equipment as indicated in c)		N/A
G.3.1.2	Thermal cut-off connections maintained and secure		N/A
G.3.2	Thermal links		N/A
G.3.2.1a)	Thermal links separately tested with IEC 60691		N/A
G.3.2.1b)	Thermal links tested as part of the equipment		N/A
	Aging hours (H) .....	---	—
	Single Fault Condition .....	---	—
	Test Voltage (V) and Insulation Resistance ( $\Omega$ ) ..	---	—
G.3.3	PTC Thermistors		N/A
G.3.4	Overcurrent protection devices		N/A
G.3.5	Safeguards components not mentioned in G.3.1 to G.3.5		N/A
G.3.5.1	Non-resettable devices suitably rated and marking provided		N/A
G.3.5.2	Single faults conditions.....	---	N/A



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Clause	Requirement + Test	Result - Remark	Verdict
<b>G.4</b>	<b>Connectors</b>		N/A
G.4.1	Spacings	Only ES1 circuits.	N/A
G.4.2	Mains connector configuration .....	---	N/A
G.4.3	Plug is shaped that insertion into mains socket-outlets or appliance coupler is unlikely		N/A
<b>G.5</b>	<b>Wound Components</b>		N/A
G.5.1	Wire insulation in wound components.....	No wound components.	N/A
G.5.1.2 a)	Two wires in contact inside wound component, angle between 45° and 90°		N/A
G.5.1.2 b)	Construction subject to routine testing		N/A
G.5.2	Endurance test on wound components		N/A
G.5.2.1	General test requirements		N/A
G.5.2.2	Heat run test		N/A
	Time (s) .....	---	—
	Temperature (°C) .....	---	—
G.5.2.3	Wound Components supplied by mains		N/A
<b>G.5.3</b>	<b>Transformers</b>		N/A
G.5.3.1	Requirements applied (IEC61204-7, IEC61558-1/-2, and/or IEC62368-1).....	No transformers used.	N/A
	Position.....	---	—
	Method of protection .....	---	—
G.5.3.2	Insulation		N/A
	Protection from displacement of windings .....		—
G.5.3.3	Overload test.....	---	N/A
G.5.3.3.1	Test conditions		N/A
G.5.3.3.2	Winding Temperatures testing in the unit		N/A
G.5.3.3.3	Winding Temperatures - Alternative test method		N/A
<b>G.5.4</b>	<b>Motors</b>		N/A
G.5.4.1	General requirements	No mains supplied motors inside the equipment. DC fan is a separate approved component.	N/A
	Position .....	---	—
G.5.4.2	Test conditions		N/A
G.5.4.3	Running overload test		N/A
G.5.4.4	Locked-rotor overload test		N/A
	Test duration (days) .....	---	—
G.5.4.5	Running overload test for d.c. motors in secondary circuits		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.5.4.5.2	Tested in the unit		N/A
	Electric strength test (V) ..... :	---	—
G.5.4.5.3	Tested on the Bench - Alternative test method; test time (h) ..... :		N/A
	Electric strength test (V) ..... :	---	—
G.5.4.6	Locked-rotor overload test for d.c. motors in secondary circuits		N/A
G.5.4.6.2	Tested in the unit		N/A
	Maximum Temperature ..... :	---	N/A
	Electric strength test (V) ..... :	---	N/A
G.5.4.6.3	Tested on the bench - Alternative test method; test time (h)..... :	---	N/A
	Electric strength test (V) ..... :	---	N/A
G.5.4.7	Motors with capacitors		N/A
G.5.4.8	Three-phase motors		N/A
G.5.4.9	Series motors		N/A
	Operating voltage ..... :	---	—
<b>G.6</b>	<b>Wire Insulation</b>		N/A
G.6.1	General	Only ES1 circuits.	N/A
G.6.2	Solvent-based enamel wiring insulation		N/A
<b>G.7</b>	<b>Mains supply cords</b>		N/A
G.7.1	General requirements	No supply cords provided.	N/A
	Type ..... :	---	—
	Rated current (A)..... :	---	—
	Cross-sectional area (mm <sup>2</sup> ), (AWG)..... :	---	—
G.7.2	Compliance and test method		N/A
G.7.3	Cord anchorages and strain relief for non- detachable power supply cords		N/A
G.7.3.2	Cord strain relief		N/A
G.7.3.2.1	Requirements		N/A
	Strain relief test force (N)..... :	---	—
G.7.3.2.2	Strain relief mechanism failure		N/A
G.7.3.2.3	Cord sheath or jacket position, distance (mm) ... :	---	—
G.7.3.2.4	Strain relief comprised of polymeric material		N/A
G.7.4	Cord Entry..... :	---	N/A
G.7.5	Non-detachable cord bend protection		N/A
G.7.5.1	Requirements		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
G.7.5.2	Mass (g) ..... :	---	—
	Diameter (m) ..... :	---	—
	Temperature (°C) ..... :	---	—
G.7.6	Supply wiring space		N/A
G.7.6.2	Stranded wire		N/A
G.7.6.2.1	Test with 8 mm strand		N/A
<b>G.8</b>	<b>Varistors</b>		N/A
G.8.1	General requirements		N/A
G.8.2	Safeguard against shock		N/A
G.8.3	Safeguard against fire		N/A
G.8.3.2	Varistor overload test ..... :	---	N/A
G.8.3.3	Temporary overvoltage..... :	---	N/A
<b>G.9</b>	<b>Integrated Circuit (IC) Current Limiters</b>		N/A
G.9.1 a)	Manufacturer defines limit at max. 5A.		N/A
G.9.1 b)	Limiters do not have manual operator or reset		N/A
G.9.1 c)	Supply source does not exceed 250 VA ..... :	---	—
G.9.1 d)	IC limiter output current (max. 5A) ..... :	---	—
G.9.1 e)	Manufacturers' defined drift ..... :	---	—
G.9.2	Test Program 1		N/A
G.9.3	Test Program 2		N/A
G.9.4	Test Program 3		N/A
<b>G.10</b>	<b>Resistors</b>		N/A
G.10.1	General requirements	No resistors used as safeguards.	N/A
G.10.2	Resistor test		N/A
G.10.3	Test for resistors serving as safeguards between the mains and an external circuit consisting of a coaxial cable		N/A
G.10.3.1	General requirements		N/A
G.10.3.2	Voltage surge test		N/A
G.10.3.3	Impulse test		N/A
<b>G.11</b>	<b>Capacitor and RC units</b>		N/A
G.11.1	General requirements	Not used as safeguards.	N/A
G.11.2	Conditioning of capacitors and RC units		N/A
G.11.3	Rules for selecting capacitors		N/A
<b>G.12</b>	<b>Optocouplers</b>		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Optocouplers comply with IEC 60747-5-5:2007 Spacing or Electric Strength Test (specify option and test results)..... :	Not used as safeguards.	N/A
	Type test voltage Vini ..... :	---	—
	Routine test voltage, Vini,b ..... :	---	—
<b>G.13</b>	<b>Printed boards</b>		N/A
G.13.1	General requirements	Functional insulation only. Refer to clause B.4.4	N/A
G.13.2	Uncoated printed boards		N/A
G.13.3	Coated printed boards		N/A
G.13.4	Insulation between conductors on the same inner surface		N/A
	Compliance with cemented joint requirements (Specify construction)..... :		—
G.13.5	Insulation between conductors on different surfaces		N/A
	Distance through insulation ..... :	---	N/A
	Number of insulation layers (pcs) ..... :	---	—
G.13.6	Tests on coated printed boards		N/A
G.13.6.1	Sample preparation and preliminary inspection		N/A
G.13.6.2a)	Thermal conditioning		N/A
G.13.6.2b)	Electric strength test		N/A
G.13.6.2c)	Abrasion resistance test		N/A
<b>G.14</b>	<b>Coating on components terminals</b>		N/A
G.14.1	Requirements ..... :	---	N/A
<b>G.15</b>	<b>Liquid filled components</b>		N/A
G.15.1	General requirements	Not used.	N/A
G.15.2	Requirements		N/A
G.15.3	Compliance and test methods		N/A
G.15.3.1	Hydrostatic pressure test		N/A
G.15.3.2	Creep resistance test		N/A
G.15.3.3	Tubing and fittings compatibility test		N/A
G.15.3.4	Vibration test		N/A
G.15.3.5	Thermal cycling test		N/A
G.15.3.6	Force test		N/A
G.15.4	Compliance		N/A
<b>G.16</b>	<b>IC including capacitor discharge function (ICX)</b>		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
a)	Humidity treatment in accordance with sc5.4.8 – 120 hours		N/A
b)	Impulse test using circuit 2 with $U_c$ = to transient voltage .....	---	N/A
C1)	Application of ac voltage at 110% of rated voltage for 2.5 minutes		N/A
C2)	Test voltage .....	---	—
D1)	10,000 cycles on and off using capacitor with smallest capacitance resistor with largest resistance specified by manufacturer		N/A
D2)	Capacitance .....	---	—
D3)	Resistance .....	---	—
<b>H</b>	<b>CRITERIA FOR TELEPHONE RINGING SIGNALS</b>		N/A
H.1	General		N/A
H.2	Method A		N/A
H.3	Method B		N/A
H.3.1	Ringing signal		N/A
H.3.1.1	Frequency (Hz) .....	---	—
H.3.1.2	Voltage (V) .....	---	—
H.3.1.3	Cadence; time (s) and voltage (V) .....	---	—
H.3.1.4	Single fault current (mA):.....	---	—
H.3.2	Tripping device and monitoring voltage.....	---	N/A
H.3.2.1	Conditions for use of a tripping device or a monitoring voltage complied with		N/A
H.3.2.2	Tripping device		N/A
H.3.2.3	Monitoring voltage (V) .....	---	—
<b>J</b>	<b>INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION</b>		N/A
	General requirements		N/A
<b>K</b>	<b>SAFETY INTERLOCKS</b>		N/A
K.1	General requirements	No safety interlocks used.	N/A
K.2	Components of safety interlock safeguard mechanism .....	---	N/A
K.3	Inadvertent change of operating mode		N/A
K.4	Interlock safeguard override		N/A
K.5	Fail-safe		N/A
	Compliance.....	---	N/A
K.6	Mechanically operated safety interlocks		N/A
K.6.1	Endurance requirement		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
K.6.2	Compliance and Test method.....:	---	N/A
K.7	Interlock circuit isolation		N/A
K.7.1	Separation distance for contact gaps & interlock circuit elements (type and circuit location) .....	---	N/A
K.7.2	Overload test, Current (A) .....	---	N/A
K.7.3	Endurance test		N/A
K.7.4	Electric strength test .....	---	N/A
<b>L</b>	<b>DISCONNECT DEVICES</b>		N/A
L.1	General requirements	Class III equipment.	N/A
L.2	Permanently connected equipment		N/A
L.3	Parts that remain energized		N/A
L.4	Single phase equipment		N/A
L.5	Three-phase equipment		N/A
L.6	Switches as disconnect devices		N/A
L.7	Plugs as disconnect devices		N/A
L.8	Multiple power sources		N/A
<b>M</b>	<b>EQUIPMENT CONTAINING BATTERIES AND THEIR PROTECTION CIRCUITS</b>		N/A
M.1	General requirements	No batteries in equipment.	N/A
M.2	Safety of batteries and their cells		N/A
M.2.1	Requirements		N/A
M.2.2	Compliance and test method (identify method) .. :	---	N/A
M.3	Protection circuits		N/A
M.3.1	Requirements		N/A
M.3.2	Tests		N/A
	- Overcharging of a rechargeable battery		N/A
	- Unintentional charging of a non-rechargeable battery		N/A
	- Reverse charging of a rechargeable battery		N/A
	- Excessive discharging rate for any battery		N/A
M.3.3	Compliance .....	---	N/A
M.4	Additional safeguards for equipment containing secondary lithium battery		N/A
M.4.1	General		N/A
M.4.2	Charging safeguards		N/A
M.4.2.1	Charging operating limits		N/A
M.4.2.2a)	Charging voltage, current and temperature.....:	---	—
M.4.2.2 b)	Single faults in charging circuitry .....	---	—

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Clause	Requirement + Test	Result - Remark	Verdict
M.4.3	Fire Enclosure		N/A
M.4.4	Endurance of equipment containing a secondary lithium battery		N/A
M.4.4.2	Preparation		N/A
M.4.4.3	Drop and charge/discharge function tests		N/A
	Drop		N/A
	Charge		N/A
	Discharge		N/A
M.4.4.4	Charge-discharge cycle test		N/A
M.4.4.5	Result of charge-discharge cycle test		N/A
M.5	Risk of burn due to short circuit during carrying		N/A
M.5.1	Requirement		N/A
M.5.2	Compliance and Test Method (Test of P.2.3)		N/A
M.6	Prevention of short circuits and protection from other effects of electric current		N/A
M.6.1	Short circuits		N/A
M.6.1.1	General requirements		N/A
M.6.1.2	Test method to simulate an internal fault		N/A
M.6.1.3	Compliance (Specify M.6.1.2 or alternative method) ..... :	---	N/A
M.6.2	Leakage current (mA) ..... :	---	N/A
M.7	Risk of explosion from lead acid and NiCd batteries		N/A
M.7.1	Ventilation preventing explosive gas concentration		N/A
M.7.2	Compliance and test method		N/A
M.8	Protection against internal ignition from external spark sources of lead acid batteries		N/A
M.8.1	General requirements		N/A
M.8.2	Test method		N/A
M.8.2.1	General requirements		N/A
M.8.2.2	Estimation of hypothetical volume $V_z$ (m <sup>3</sup> /s) ..... :	---	—
M.8.2.3	Correction factors..... :	---	—
M.8.2.4	Calculation of distance $d$ (mm) ..... :	---	—
M.9	Preventing electrolyte spillage		N/A
M.9.1	Protection from electrolyte spillage		N/A
M.9.2	Tray for preventing electrolyte spillage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
M.10	Instructions to prevent reasonably foreseeable misuse (Determination of compliance: inspection, data review; or abnormal testing) .....	---	N/A
<b>N</b>	<b>ELECTROCHEMICAL POTENTIALS</b>		N/A
	Metal(s) used .....	Pollution degree considered	—
<b>O</b>	<b>MEASUREMENT OF CREEPAGE DISTANCES AND CLEARANCES</b>		N/A
	Figures O.1 to O.20 of this Annex applied .....	---	—
<b>P</b>	<b>SAFEGUARDS AGAINST ENTRY OF FOREIGN OBJECTS AND SPILLAGE OF INTERNAL LIQUIDS</b>		N/A
P.1	General requirements	EUT is for building-in. No openings in accessible enclosure.	N/A
P.2.2	Safeguards against entry of foreign object		N/A
	Location and Dimensions (mm) .....	---	—
P.2.3	Safeguard against the consequences of entry of foreign object		N/A
P.2.3.1	Safeguards against the entry of a foreign object		N/A
	Openings in transportable equipment		N/A
	Transportable equipment with metalized plastic parts .....	---	N/A
P.2.3.2	Openings in transportable equipment in relation to metallized parts of a barrier or enclosure (identification of supplementary safeguard) .....	---	N/A
P.3	Safeguards against spillage of internal liquids	No internal liquids.	N/A
P.3.1	General requirements		N/A
P.3.2	Determination of spillage consequences		N/A
P.3.3	Spillage safeguards		N/A
P.3.4	Safeguards effectiveness		N/A
P.4	Metallized coatings and adhesive securing parts		N/A
P.4.2 a)	Conditioning testing		N/A
	Tc (°C) .....	---	—
	Tr (°C) .....	---	—
	Ta (°C) .....	---	—
P.4.2 b)	Abrasion testing .....	---	N/A
P.4.2 c)	Mechanical strength testing .....	---	N/A
<b>Q</b>	<b>CIRCUITS INTENDED FOR INTERCONNECTION WITH BUILDING WIRING</b>		N/A
Q.1	Limited power sources	EUT is not intended for interconnection with building wiring.	N/A
Q.1.1 a)	Inherently limited output		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
Q.1.1 b)	Impedance limited output		N/A
	- Regulating network limited output under normal operating and simulated single fault condition		N/A
Q.1.1 c)	Overcurrent protective device limited output		N/A
Q.1.1 d)	IC current limiter complying with G.9		N/A
Q.1.2	Compliance and test method		N/A
Q.2	Test for external circuits – paired conductor cable		N/A
	Maximum output current (A) ..... : ---		—
	Current limiting method ..... : ---		—
<b>R</b>	<b>LIMITED SHORT CIRCUIT TEST</b>		N/A
R.1	General requirements	No PE provided.	N/A
R.2	Determination of the overcurrent protective device and circuit		N/A
R.3	Test method Supply voltage (V) and short-circuit current (A)). ..... : ---		N/A
<b>S</b>	<b>TESTS FOR RESISTANCE TO HEAT AND FIRE</b>		N/A
S.1	Flammability test for fire enclosures and fire barrier materials of equipment where the steady state power does not exceed 4 000 W	Metal enclosure used.	N/A
	Samples, material ..... : ---		—
	Wall thickness (mm)..... : ---		—
	Conditioning (°C)..... : ---		—
	Test flame according to IEC 60695-11-5 with conditions as set out		N/A
	- Material not consumed completely		N/A
	- Material extinguishes within 30s		N/A
	- No burning of layer or wrapping tissue		N/A
S.2	Flammability test for fire enclosure and fire barrier integrity		N/A
	Samples, material ..... : ---		—
	Wall thickness (mm)..... : ---		—
	Conditioning (°C)..... : ---		—
	Test flame according to IEC 60695-11-5 with conditions as set out		N/A
	Test specimen does not show any additional hole		N/A
S.3	Flammability test for the bottom of a fire enclosure		N/A
	Samples, material ..... : ---		—
	Wall thickness (mm)..... : ---		—

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Clause	Requirement + Test	Result - Remark	Verdict
	Cheesecloth did not ignite		N/A
S.4	Flammability classification of materials		N/A
S.5	Flammability test for fire enclosures and fire barrier materials of equipment where the steady state power does not exceed 4 000 W		N/A
	Samples, material .....	---	—
	Wall thickness (mm) .....	---	—
	Conditioning (test condition), (°C) .....	---	—
	Test flame according to IEC 60695-11-20 with conditions as set out		N/A
	After every test specimen was not consumed completely		N/A
	After fifth flame application, flame extinguished within 1 min		N/A
<b>T</b>	<b>MECHANICAL STRENGTH TESTS</b>		N/A
T.1	General requirements	EUT is for building-in.	N/A
T.2	Steady force test, 10 N .....	---	N/A
T.3	Steady force test, 30 N .....	---	N/A
T.4	Steady force test, 100 N .....	---	N/A
T.5	Steady force test, 250 N .....	---	N/A
T.6	Enclosure impact test	---	N/A
	Fall test		N/A
	Swing test		N/A
T.7	Drop test .....	---	N/A
T.8	Stress relief test .....	Metal enclosure used.	N/A
T.9	Impact Test (glass)		N/A
T.9.1	General requirements		N/A
T.9.2	Impact test and compliance		N/A
	Impact energy (J) .....	---	—
	Height (m) .....	---	—
T.10	Glass fragmentation test .....	---	N/A
T.11	Test for telescoping or rod antennas		N/A
	Torque value (Nm) .....	---	—
<b>U</b>	<b>MECHANICAL STRENGTH OF CATHODE RAY TUBES (CRT) AND PROTECTION AGAINST THE EFFECTS OF IMPLOSION</b>		N/A
U.1	General requirements	No such parts used.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
U.2	Compliance and test method for non-intrinsically protected CRTs		N/A
U.3	Protective Screen .....: ---		N/A
<b>V</b>	<b>DETERMINATION OF ACCESSIBLE PARTS (FINGERS, PROBES AND WEDGES)</b>		N/A
V.1	Accessible parts of equipment	EUT is for building-in.	N/A
V.2	Accessible part criterion	No accessible parts.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict

<b>4.1.2</b>	<b>TABLE: List of critical components</b>					<b>P</b>
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity <sup>1</sup>	
Enclosure material	Various	Various	Metal Min. 0.7 mm	EN 62368-1	---	
Front plastic	Covestro Deutschland AG	T65	PC / ABS 1.5 mm UL94 HB	IEC 60695-11- 11, -20 UL 94	cURus E41613	
Fan	Yen Sun Technology Corp.	FD084020HL- N	8.5 Vdc / 0.11 A 7600 rpm. 0.286 m³/min. UL94 V-0	UL 507	UR E187205	
PCB	Dynamic Electronic Co. Ltd.	KM-V0	UL94 V-0 130°C 1.5 mm	UL 796 UL 94	cURus E255400	
PCB	Various	Various	UL94 V-0 130°C 1.5 mm	UL 796 UL 94	---	
Supplementary information: <sup>1)</sup> Provided evidence ensures the agreed level of compliance. See OD-CB2039. <sup>2)</sup> Description line content is optional. Main line description needs to clearly detail the component used for testing						

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Clause	Requirement + Test	Result - Remark	Verdict

4.8.4, 4.8.5	TABLE: Lithium coin/button cell batteries mechanical tests			N/A
(The following mechanical tests are conducted in the sequence noted.)				
4.8.4.2	TABLE: Stress Relief test			—
Part		Material	Oven Temperature (°C)	Comments
4.8.4.3	TABLE: Battery replacement test			—
Battery part no..... :			—	
Battery Installation/withdrawal		Battery Installation/Removal Cycle		Comments
		1		
		2		
		3		
		4		
		5		
		6		
		8		
		9		
		10		
4.8.4.4	TABLE: Drop test			—
Impact Area		Drop Distance	Drop No.	Observations
			1	
			2	
			3	
4.8.4.5	TABLE: Impact			—
Impacts per surface		Surface tested	Impact energy (Nm)	Comments
4.8.4.6	TABLE: Crush test			—
Test position		Surface tested	Crushing Force (N)	Duration force applied (s)
Supplementary information:				

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Clause	Requirement + Test	Result - Remark	Verdict

<b>4.8.5</b>	<b>TABLE: Lithium coin/button cell batteries mechanical test result</b>			N/A
Test position	Surface tested	Force (N)	Duration force applied (s)	
Supplementary information:				

5.2		Table: Classification of electrical energy sources					P
5.2.2.2 – Steady State Voltage and Current conditions							
No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters			ES Class
				U (Vrms or Vpk)	I (Apk or Arms)	Hz	
1	12	Input	Normal	12 Vrms	---	DC	ES1
			Abnormal	---	---	---	
			Single fault – SC/OC	12 Vrms	---	DC	
2	12	Speaker	Normal	16 Vrms	---	DC	ES1
			Abnormal	---	---	---	
			Single fault – SC/OC	16 Vrms	---	DC	
3	12	USB	Normal	5 Vrms	---	DC	ES1
			Abnormal	---	---	---	
			Single fault – SC/OC	5 Vrms	---	DC	
5.2.2.3 - Capacitance Limits							
No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters		ES Class	
				Capacitance, nF	Upk (V)		
			Normal				
			Abnormal				
			Single fault – SC/OC				
5.2.2.4 - Single Pulses							
No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters			ES Class
				Duration (ms)	Upk (V)	Ipk (mA)	
			Normal				
			Abnormal				

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Clause	Requirement + Test			Result - Remark		Verdict	
			Single fault – SC/OC				
5.2.2.5 - Repetitive Pulses							
No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters			ES Class
				Off time (ms)	Upk (V)	Ipk (mA)	
			Normal				
			Abnormal				
			Single fault – SC/OC				
Test Conditions: Normal – Abnormal - Supplementary information: SC=Short Circuit, OC=Short Circuit							

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Clause	Requirement + Test			Result - Remark			Verdict	
5.4.1.4, 6.3.2, 9.0, B.2.6	TABLE: Temperature measurements						P	
	Supply voltage (V) .....	12	12**	12*		—		
	Ambient T <sub>min</sub> (°C) .....	24	23**	85*		—		
	Ambient T <sub>max</sub> (°C) .....	24	24**	85*		—		
	T <sub>ma</sub> (°C) .....	85	85**	85*		—		
Maximum measured temperature T of part/at:		T (°C)				Allowed T <sub>max</sub> (°C)		
#1 – Fan		28	39**	89*		90		
#2 – Connector (A103)		32	38**	93*		105		
#3 – Capacitor (C175)		35	50**	96*		105		
#4 – PCB near CPU		38	60**	99*		130		
#5 – Connector (X104)		44	63**	105*		105		
#6 – PCB		42	65**	103*		130		
#7 – PCB near IC157		48	67**	109*		130		
#8 – Plastic front		26	27**	87*		94		
Supplementary information:								
Note 1:								
values marked with * have been calculated at 85°C ambient temperature.								
T <sub>cal</sub> (°C) = T <sub>meas</sub> – T <sub>amb</sub> + T <sub>mra</sub>								
T <sub>mra</sub> is the maximum ambient temperature: 85°C								
T <sub>meas</sub> is the measured temperature								
T <sub>cal</sub> is the calculated maximum product temperature at T <sub>mra</sub> .								
Note 2: T <sub>ma</sub> is not included in assessment of Touch Temperatures (Clause 9)								
** Fan blocked								
Temperature T of winding:		t <sub>1</sub> (°C)	R <sub>1</sub> (Ω)	t <sub>2</sub> (°C)	R <sub>2</sub> (Ω)	T (°C)	Allowed T <sub>max</sub> (°C)	Insulation class
Supplementary information:								
Note 1: T <sub>ma</sub> should be considered as directed by applicable requirement								
Note 2: T <sub>ma</sub> is not included in assessment of Touch Temperatures (Clause 9)								



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Clause	Requirement + Test	Result - Remark	Verdict
5.4.1.10.2	TABLE: Vicat softening temperature of thermoplastics		N/A
Penetration (mm) ..... :			—
Object/ Part No./Material		Manufacturer/t rademark	T softening (°C)
supplementary information:			

5.4.1.10.3	TABLE: Ball pressure test of thermoplastics			N/A
Allowed impression diameter (mm) .....:			≤ 2 mm	—
Object/Part No./Material	Manufacturer/trademark	Test temperature (°C)	Impression diameter (mm)	
Supplementary information:				

<b>5.4.2.2, 5.4.2.4 and 5.4.3</b>	<b>TABLE: Minimum Clearances/Creepage distance</b>						N/A
Clearance (cl) and creepage distance (cr) at/of/between:	Up (V)	U r.m.s. (V)	Frequenc y (kHz) <sup>1</sup>	Required cl (mm)	cl (mm) <sup>2</sup>	Required <sup>3</sup> cr (mm)	cr (mm)
Supplementary information:							
Note 1: Only for frequency above 30 kHz							
Note 2: See table 5.4.2.4 if this is based on electric strength test							
Note 3: Provide Material Group							
Functional insulation short-circuited.							

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Clause	Requirement + Test	Result - Remark	Verdict

5.4.2.3	TABLE: Minimum Clearances distances using required withstand voltage				N/A
	Overvoltage Category (OV):				
	Pollution Degree:				
Clearance distanced between:		Required withstand voltage	Required cl (mm)	Measured cl (mm)	
Supplementary information:					

5.4.2.4	TABLE: Clearances based on electric strength test			N/A
Test voltage applied between:		Required cl (mm)	Test voltage (kV) peak/ r.m.s. / d.c.	Breakdown Yes / No
Supplementary information:				

5.4.4.2, 5.4.4.5 c) 5.4.4.9	TABLE: Distance through insulation measurements					N/A
Distance through insulation di at/of:	Peak voltage (V)	Frequency (kHz)	Material	Required DTI (mm)	DTI (mm)	
Supplementary information:						

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Clause	Requirement + Test	Result - Remark	Verdict

<b>5.4.9</b>	<b>TABLE: Electric strength tests</b>			N/A
Test voltage applied between:		Voltage shape (AC, DC)	Test voltage (V)	Breakdown Yes / No
Supplementary information:				

5.5.2.2	TABLE: Stored discharge on capacitors					N/A
Supply Voltage (V), Hz	Test Location	Operating Condition (N, S)	Switch position On or off	Measured Voltage (after 2 seconds)	ES Classification	

Supplementary information:

X-capacitors installed for testing are:

☐ bleeding resistor rating:

☐ ICX:

Notes:

A. Test Location:

Phase to Neutral; Phase to Phase; Phase to Earth; and/or Neutral to Earth

B. Operating condition abbreviations:

N – Normal operating condition (e.g., normal operation, or open fuse); S –Single fault condition

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Clause	Requirement + Test	Result - Remark	Verdict

<b>5.6.6.2</b>	<b>TABLE: Resistance of protective conductors and terminations</b>			N/A
Accessible part	Test current (A)	Duration (min)	Voltage drop (V)	Resistance (Ω)
Supplementary information:				

5.7.2.2, 5.7.4	TABLE: Earthed accessible conductive part		N/A
Supply voltage..... :			—
Location	Test conditions specified in 6.1 of IEC 60990 or Fault Condition No in IEC 60990 clause 6.2.2.1 through 6.2.2.8, except for 6.2.2.7	Touch current (mA)	
	1		
	2*		
	3		
	4		
	5		
	6		
	8		
Supplementary Information:			
Notes:			
[1] Supply voltage is the anticipated maximum Touch Voltage			
[2] Earthed neutral conductor [Voltage differences less than 1% or more]			
[3] Specify method used for measurement as described in IEC 60990 sub-clause 4.3			
[4] IEC60990, sub-clause 6.2.2.7, Fault 7 not applicable.			
[5] (*) IEC60990, sub-clause 6.2.2.2 is not applicable if switch or disconnect device (e.g., appliance coupler) provided.			

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Clause	Requirement + Test	Result - Remark	Verdict

6.2.2	Table: Electrical power sources (PS) measurements for classification					P
Source	Description	Measurement	Max Power after 3 s	Max Power after 5 s <sup>*)</sup>	PS Classification	
A	DC input / EUT	Power (W) :	92.5	92.5	PS2	
		V <sub>A</sub> (V) :	18.5	18.5		
		I <sub>A</sub> (A) :	5	5		
B	USB	Power (W) :	2.5		PS1	
		V <sub>A</sub> (V) :	5			
		I <sub>A</sub> (A) :	0.5			
C	Output FL, FR RL, RR	Power (W) :	85	85	PS2	
		V <sub>A</sub> (V) :	14.4	14.4		
		I <sub>A</sub> (A) :	6	6		
Supplementary Information: (*) Measurement taken only when limits at 3 seconds exceed PS1 limits						

6.2.3.1	Table: Determination of Potential Ignition Sources (Arcing PIS)				N/A
Location	Open circuit voltage After 3 s (V <sub>p</sub> )	Measured r.m.s current (I <sub>rms</sub> )	Calculated value (V <sub>p</sub> x I <sub>rms</sub> )	Arcing PIS? Yes / No	
Supplementary information:					
An Arcing PIS requires a minimum of 50 V (peak) a.c. or d.c. An Arcing PIS is established when the product of the open circuit voltage (V <sub>p</sub> ) and normal operating condition rms current (I <sub>rms</sub> ) is greater than 15.					

IEC 62368-1			
Clause	Requirement + Test	Result - Remark	Verdict

<b>6.2.3.2</b>	<b>Table: Determination of Potential Ignition Sources (Resistive PIS)</b>				<b>P</b>
Circuit Location (x-y)	Operating Condition (Normal / Describe Single Fault)	Measured wattage or VA During first 30 s (W / VA)	Measured wattage or VA After 30 s (W / VA)	Protective Circuit, Regulator, or PTC Operated? Yes / No (Comment)	Resistive PIS? Yes/No
Input	Normal	< 1 W	< 1 W	No	No
<p>Supplementary Information:</p> <p>A combination of voltmeter, VA and ammeter IA may be used instead of a wattmeter.</p> <p>If a separate voltmeter and ammeter are used, the product of (VA x IA) is used to determine Resistive PIS classification.</p> <p>A Resistive PIS: (a) dissipates more than 15 W, measured after 30 s of normal operation, <u>or</u> (b) under single fault conditions has either a power exceeding 100 W measured immediately after the introduction of the fault if electronic circuits, regulators or PTC devices are used, or has an available power exceeding 15 W measured 30 s after introduction of the fault.</p>					

8.5.5	TABLE: High Pressure Lamp		N/A
Description		Values	Energy Source Classification
Lamp type.....:			—
Manufacturer.....:			—
Cat no.....:			—
Pressure (cold) (MPa) .....			MS_
Pressure (operating) (MPa) .....			MS_
Operating time (minutes) .....			—
Explosion method.....:			—
Max particle length escaping enclosure (mm) .:			MS_
Max particle length beyond 1 m (mm) .....			MS_
Overall result .....			
Supplementary information:			

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Clause	Requirement + Test	Result - Remark	Verdict

B.2.5	TABLE: Input test						P
U (V)	I (A)	I rated (A)	P (W)	P rated (W)	Fuse No	I fuse (A)	Condition/status
12	1.43	---	17.16	---	---	---	Normal running
12	1.27	---	15.24	---	---	---	PQ mode
12	1.23	---	14.76	---	---	---	Display disconnected
10.2	1.78	---	18.16	---	---	---	Normal running
14.4	1.27	---	18.29	---	---	---	Normal running
Supplementary information: Equipment may be have rated current or rated power or both. Both should be measured							

B.3	TABLE: Abnormal operating condition tests							N/A
Ambient temperature (°C) .....								—
Power source for EUT: Manufacturer, model/type, output rating ..								—
Component No.	Abnormal Condition	Supply voltage, (V)	Test time (ms)	Fuse no.	Fuse current, (A)	T-couple	Temp. (°C)	Observation
Supplementary information:								

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Clause	Requirement + Test	Result - Remark	Verdict

<b>B.4</b>	<b>TABLE: Fault condition tests</b>							<b>P</b>
Ambient temperature (°C) .....								—
Power source for EUT: Manufacturer, model/type, output rating ..								—
Component No.	Fault Condition	Supply voltage, (V)	Test time (ms)	Fuse no.	Fuse current, (A)	T-couple	Temp. (°C)	Observation
Fan	blocked	12	150 min.	---	---	K	39	No hazard, no high temperatures
USB output	Sc	12	5000	---	---	---	---	No hazard. Max 0.5 A
Output FL, FR RL, RR	Sc	45	5000	---	---	---	---	No hazard. 85 VA
Supplementary information: The device is LPS supplied. The highest voltage is 12 Vdc. Short-circuit of functional insulation cannot cause a hazard.								

Annex M	TABLE: Batteries								N/A	
The tests of Annex M are applicable only when appropriate battery data is not available										
Is it possible to install the battery in a reverse polarity position?..... :										
	Non-rechargeable batteries			Rechargeable batteries						
	Discharging		Un-intentional charging	Charging		Discharging		Reversed charging		
	Meas. current	Manuf. Specs.		Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.	
Max. current during normal condition										
Max. current during fault condition										
Test results:									Verdict	
- Chemical leaks										
- Explosion of the battery										
- Emission of flame or expulsion of molten metal										
- Electric strength tests of equipment after completion of tests										
Supplementary information:										



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Clause	Requirement + Test	Result - Remark	Verdict

<b>Annex M.4</b>	<b>Table: Additional safeguards for equipment containing secondary lithium batteries</b>				N/A
Battery/Cell No.	Test conditions	Measurements			Observation
		U	I (A)	Temp (C)	
	Normal				
	Abnormal				
	Single fault –SC/OC				
	Normal				
	Abnormal				
	Single fault – SC/OC				
Supplementary Information:					
Battery identification	Charging at $T_{lowest}$ (°C)	Observation	Charging at $T_{highest}$ (°C)	Observation	
Supplementary Information:					

Annex Q.1	TABLE: Circuits intended for interconnection with building wiring (LPS)					N/A
Note: Measured UOC (V) with all load circuits disconnected:						
Output Circuit	Components	U <sub>oc</sub> (V)	I <sub>sc</sub> (A)		S (VA)	
			Meas.	Limit	Meas.	Limit
Supplementary Information: SC=Short circuit, OC=Open circuit						

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Clause	Requirement + Test	Result - Remark	Verdict

<b>T.2, T.3, T.4, T.5</b>	<b>TABLE: Steady force test</b>					<b>N/A</b>
Part/Location	Material	Thickness (mm)	Force (N)	Test Duration (sec)	Observation	
Supplementary information:						

<b>T.6, T.9</b>	<b>TABLE: Impact tests</b>					<b>N/A</b>
Part/Location	Material	Thickness (mm)	Vertical distance (mm)	Observation		
Supplementary information:						

<b>T.7</b>	<b>TABLE: Drop tests</b>					<b>N/A</b>
Part/Location	Material	Thickness (mm)	Drop Height (mm)	Observation		
Supplementary information:						

<b>T.8</b>	<b>TABLE: Stress relief test</b>					<b>N/A</b>
Part/Location	Material	Thickness (mm)	Oven Temperature (°C)	Duration (h)	Observation	
Supplementary information:						

**List of test equipment used:**

Test ID	Model Type	Kind of Equipment	Manufacturer	Equipment No.	Next Calib.	Last Calib.
S All	DC Power Supply 0-60 V	DC Power Supply	Elabo GmbH	02-03/50-12-018		
	DC Power Supply 0-60 V	DC Power Supply	Elabo GmbH	02-03/50-12-020		
S Load	DC load 3229.0	Electrical Load DC	STATRON Gerätetechnik	01-03/50-16-012		
S Mark	N-Hexan	Testbenzin	emitel GmbH	01-03/50-05-045		
S Mech	Sliding Ruler 0 - 150 mm	Preisser Digi-Met	Conrad Elektronik SE	01-03/50-07-001	06/11/2018	06/11/2017
S Power	METRA HIT ENERGY	TRMS-Multimeter	GOSSSEN-METRAWATT G	01-03/32-13-001	01/08/2018	01/08/2017
S Temp	E780	Fujitsu Lifebook	Fujitsu Siemens Computers	02-01/01-10-007		
	ADGT Top Message	Delphin	Delphin Technology AG	02-03/38-07-002	25/01/2018	25/01/2017