

Königswinkel 10

32825 Blomberg, Germany

Phone +49 (0) 52 35 95 00-0

Fax +49 (0) 52 35 95 00-10

office@phoenix-testlab.de

[www.phoenix-testlab.de](http://www.phoenix-testlab.de)

# Test Report

Report Number:

**F160090E1**

Equipment under Test (EUT):

**Harman/Becker Audi MIB 2  
Main Unit of Modular Infotainment Kit**

Applicant:

**Harman Becker Automotive Systems GmbH**

Manufacturer:

**Harman Becker Automotive Systems GmbH**



Deutsche  
Akkreditierungsstelle  
D-PL-17186-01-01  
D-PL-17186-01-02  
D-PL-17186-01-03

## References

- [1] **ANSI C63.10-2013**, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- [2] **FCC CFR 47 Part 15 (June 2015)**, Radio Frequency Devices
- [3] **RSS-247 (May 2015)**, Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
- [4] **RSS-Gen Issue 4 (November 2014)**, General Requirements for Compliance of Radio Apparatus

## Test Result

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test.  
The complete test results are presented in the following.

|                      |                              |                                                                                                          |                           |
|----------------------|------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------|
| Test engineer:       | <u>Paul NEUFELD</u><br>Name  | <u></u><br>Signature | <u>29.04.2016</u><br>Date |
| Authorized reviewer: | <u>Bernd STEINER</u><br>Name | <u></u><br>Signature | <u>29.04.2016</u><br>Date |

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# 1 Identification

## 1.1 Applicant

|                                                                |                                        |
|----------------------------------------------------------------|----------------------------------------|
| Name:                                                          | Harman Becker Automotive Systems GmbH  |
| Address:                                                       | Becker-Görling-Str. 16, 76307 Karlsbad |
| Country:                                                       | Germany                                |
| Name for contact purposes:                                     | Mr. Stefan BLASCHEK                    |
| Phone:                                                         | +49 7248 71 3382                       |
| Fax:                                                           | +49 7248 71 3802                       |
| eMail Address:                                                 | stefan.blaschek@harman.com             |
| Applicant represented during the test by the following person: | -                                      |

## 1.2 Manufacturer

|                                                                |                                        |
|----------------------------------------------------------------|----------------------------------------|
| Name:                                                          | Harman Becker Automotive Systems GmbH  |
| Address:                                                       | Becker-Görling-Str. 16, 76307 Karlsbad |
| Country:                                                       | Germany                                |
| Name for contact purposes:                                     | Mr. Stefan BLASCHEK                    |
| Phone:                                                         | +49 7248 71 3382                       |
| Fax:                                                           | +49 7248 71 3802                       |
| eMail Address:                                                 | stefan.blaschek@harman.com             |
| Applicant represented during the test by the following person: | -                                      |

## 1.3 Test Laboratory

The tests were carried out by: **PHOENIX TESTLAB GmbH**  
**Königswinkel 10**  
**32825 Blomberg**  
**Germany**

Accredited by *Deutsche Akkreditierungsstelle GmbH* in compliance with  
DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-02.

## 1.4 EUT (Equipment Under Test)

|                            |                                                  |
|----------------------------|--------------------------------------------------|
| Test object: *             | IEEE 802.11/b/g/n WLAN / BT 3.0 + HS transceiver |
| Model / PMN: *             | MIB2 Main-Unit                                   |
| Host Marketing Name: *     | N. A.                                            |
| FCC ID: *                  | T8GA270                                          |
| IC: *                      | 6434A-A270                                       |
| Serial number: *           | P074KB0FB000474                                  |
| PCB identifier / HVIN: *   | MIB2 Main-Unit                                   |
| Hardware version: *        | HW50                                             |
| Software version / FVIN: * | R5447                                            |

### WLAN channels:

|            |     |          |     |          |
|------------|-----|----------|-----|----------|
| Channel 01 | RX: | 2412 MHz | TX: | 2412 MHz |
| Channel 02 | RX: | 2417 MHz | TX: | 2417 MHz |
| Channel 03 | RX: | 2422 MHz | TX: | 2422 MHz |
| Channel 04 | RX: | 2427 MHz | TX: | 2427 MHz |
| Channel 05 | RX: | 2432 MHz | TX: | 2432 MHz |
| Channel 06 | RX: | 2437 MHz | TX: | 2437 MHz |
| Channel 07 | RX: | 2442 MHz | TX: | 2442 MHz |
| Channel 08 | RX: | 2447 MHz | TX: | 2447 MHz |
| Channel 09 | RX: | 2452 MHz | TX: | 2452 MHz |
| Channel 10 | RX: | 2457 MHz | TX: | 2457 MHz |
| Channel 11 | RX: | 2462 MHz | TX: | 2462 MHz |

### Bluetooth channels

|            |     |          |     |          |
|------------|-----|----------|-----|----------|
| Channel 0  | RX: | 2402 MHz | TX: | 2402 MHz |
| Channel 39 | RX: | 2441 MHz | TX: | 2441 MHz |
| Channel 78 | RX: | 2480 MHz | TX: | 2480 MHz |

## 1.5 Technical Data of Equipment

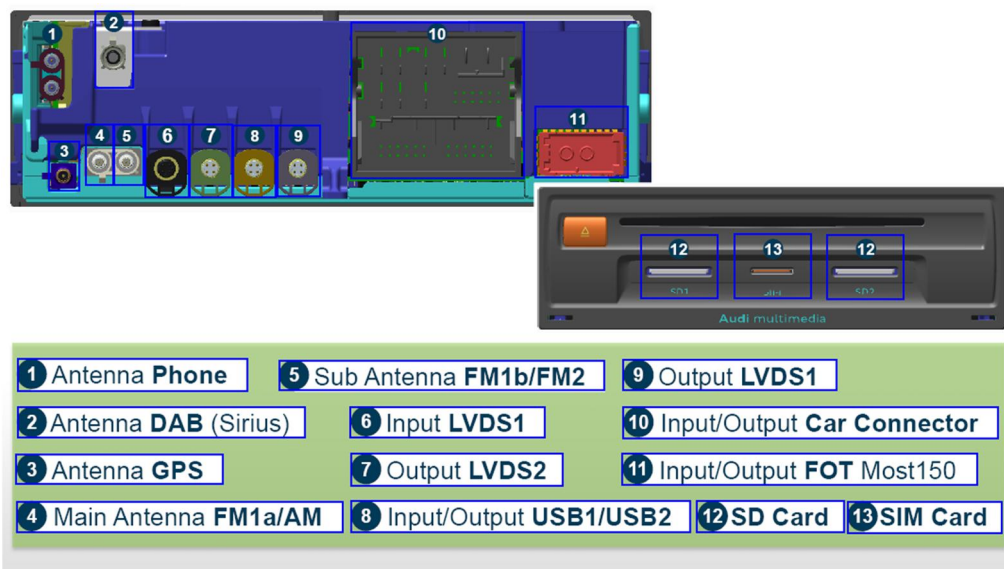
|                                              |                                                            |
|----------------------------------------------|------------------------------------------------------------|
| Fulfills Radio specification: *              | WLAN IEEE, 802.11b, 802.11g, 802.11n, / Bluetooth 3.0 + HS |
| Antenna type (Bluetooth/WLAN) :*             | PCB Antenna                                                |
| Antenna gain (Bluetooth): *                  | -2.7 dBi                                                   |
| Antenna gain (WLAN): *                       | -0.8 dBi                                                   |
| Antenna connector: *                         | none                                                       |
| Power supply - EUT                           | 12 V DC by vehicle                                         |
| Type of modulation: *                        | DSSS; OFDM                                                 |
| Operating frequency range:*                  | 2412 MHz to 2462 MHz                                       |
| Number of channels: *                        | 11                                                         |
| Temperature range: *                         | - 20 °C to +55 °C                                          |
| Lowest / highest internal clock frequency: * | 32.768 kHz / 900 MHz                                       |

\*Declared by the applicant.

The following external I/O cables were used:

| Identification                                                                                                                            | Connector        |                                                                                                                           | Length                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
|                                                                                                                                           | EUT              | Ancillary                                                                                                                 |                                                                              |
| <b>Cable Harness/Main-Connector</b><br>DC Port<br>Debug Interface<br><br>AudioOutput<br>CAN (I-CAN) to CAN-Box<br>CAN (BT-MIB) to Display | 10 Car Connector | PowerSupply<br>Debug Interface<br>(LevelShifterBoard)<br>AudioOutput<br>CAN (I-CAN) to CAN-Box<br>CAN (BT-MIB) to Display | about 80cm<br>about 20cm<br><br>about 30cm<br>about 30+90cm<br>about 30+50cm |
| Antenna GPS                                                                                                                               | 3 Antenna GPS    | type „Wisi AG13“                                                                                                          | About 180cm                                                                  |
| LVDS Output                                                                                                                               | 7 Output LVDS    | Front Display                                                                                                             | about 100cm                                                                  |
| Most Bus                                                                                                                                  | 11 FOT MOST 150  | No ext. MOST comp.                                                                                                        | closed ring                                                                  |
| USB                                                                                                                                       | Level Shifter    | To test PC                                                                                                                | about 150cm                                                                  |

\*: Length during the test if not other specified.



## 1.6 Dates

|                                 |            |
|---------------------------------|------------|
| Date of receipt of test sample: | 18.01.2016 |
| Start of test:                  | 05.02.2016 |
| End of test:                    | 29.02.2016 |

## 2 Operational States

The EUT is a main unit of a modular infotainment kit for cars with a GSM/UMTS module as well as a WLAN (802.11 b/g/n, 2.4 GHz) and Bluetooth module with separate integral antennas for WLAN and Bluetooth. In IEEE 802.11n mode it supports 20 MHz bandwidth channels (MCS7), providing 72.2 Mbit/s data rate.

The aim of this report is a class 2 permissive change, because the applicant has added an additional display in front of the EUT. For this the radiated output power is checked and on spot frequencies the spurious emission measurement was repeated.

The output power of the WLAN part was reduced intentionally by the grantee as documented in chapter 5.1.2 of this report.

Only the two worst case results for Bluetooth were repeated in this test report.

| Operation mode | Description of the operation mode   | BT mode | BT channel | Modulation | Data rate |
|----------------|-------------------------------------|---------|------------|------------|-----------|
| 1              | Continuous transmitting on 2402 MHz | 3DH5    | 0          | 8DQPSK     | 3 MBit/s  |
| 2              | Continuous transmitting on 2441 MHz | 2DH5    | 39         | PI/4 DQPSK | 2 MBit/s  |

| Operation mode | Description of the operation mode   | WLAN mode | WLAN channel | Modulation | Data rate |
|----------------|-------------------------------------|-----------|--------------|------------|-----------|
| 3              | Continuous transmitting on 2412 MHz | 802.11b   | 1            | DSSS       | 11 MBit/s |
| 4              | Continuous transmitting on 2437 MHz | 802.11b   | 6            | DSSS       | 11 MBit/s |
| 5              | Continuous transmitting on 2462 MHz | 802.11b   | 11           | DSSS       | 11 MBit/s |

| Operation mode | Description of the operation mode   | WLAN mode | WLAN channel | Modulation | Data rate |
|----------------|-------------------------------------|-----------|--------------|------------|-----------|
| 6              | Continuous transmitting on 2412 MHz | 802.11g   | 1            | OFDM       | 6 MBit/s  |
| 7              | Continuous transmitting on 2437 MHz | 802.11g   | 6            | OFDM       | 6 MBit/s  |
| 8              | Continuous transmitting on 2462 MHz | 802.11g   | 11           | OFDM       | 6 MBit/s  |

| Operation mode | Description of the operation mode   | WLAN mode | WLAN channel | Modulation | Data rate   |
|----------------|-------------------------------------|-----------|--------------|------------|-------------|
| 9              | Continuous transmitting on 2412 MHz | 802.11n20 | 1            | OFDM       | 72.2 MBit/s |
| 10             | Continuous transmitting on 2437 MHz | 802.11n20 | 6            | OFDM       | 72.2 MBit/s |
| 11             | Continuous transmitting on 2462 MHz | 802.11n20 | 11           | OFDM       | 72.2 MBit/s |



Each test case was performed in the following operation modes:

| Test case                   | Operation mode  |
|-----------------------------|-----------------|
| Maximum Peak Output Power   | 1, 3 - 11       |
| DTS Bandwidth               | Not performed * |
| Peak Power Spectral Density | Not performed*  |
| Band Edge Compliance        | 11              |
| Maximum Unwanted Emissions  | 2, 6            |

\* Not tested because not necessary for C2PC.

### 3 Additional Information

This report contains the results in WLAN and Bluetooth mode of the equipment under test.

Adapter Interface was modified to fit to the additional display. Circuit is the same, only changes in the PCB placement were made.

### 4 Overview

| Application                        | Frequency range [MHz] | FCC 47 CFR Part 15 section [2]         | RSS-247 [3] or RSS-Gen, Issue 4 [4] | Status        | Refer page |
|------------------------------------|-----------------------|----------------------------------------|-------------------------------------|---------------|------------|
| Maximum Peak Output Power          | 2400.0 - 2483.5       | 15.247 (b) (1), (3), (4)               | 5.4 (2) [3]                         | Passed        | 11 et seq  |
| DTS Bandwidth                      | 2400.0 - 2483.5       | 15.247 (a) (2)                         | 5.2 (1) [3]                         | Not performed | -          |
| Peak Power Spectral Density        | 2400.0 - 2483.5       | 15.247 (e)                             | 5.2 (2) [3]                         | Not performed | -          |
| Band edge compliance               | 2400.0 - 2483.5       | 15.247 (d)                             | 5.5 [3]<br>8.9 [4],<br>8.10 [4]     | Passed        | 15 et seq. |
| Radiated emissions (transmitter)   | 0.009 – 26,500        | 15.247 (d)<br>15.205 (a)<br>15.209 (a) | 5.5 [3]<br>8.9 [4],<br>8.10 [4]     | Passed        | 16 et seq. |
| Conducted emissions on supply line | 0.15 - 30             | 15.207 (a)                             | 8.8 [4]                             | Not performed | -          |

## 5 Results

### 5.1 Maximum peak output power

#### 5.1.1 Method of measurement

The EUT was measured in a radiated setup within an anechoic chamber. The radiated measurement setup was made according to chapter 5.3.1 of this test report.

#### Acceptable measurement configurations

Annex G of [1] is used for calculating radiated values to conducted values.

Procedure of clause 11.9.1.1 of [1] was used for the measurement in Bluetooth mode.  
Procedure of clause 11.9.1.2 of [1] was used for the measurement in WLAN mode.

The measurement was performed at the upper and lower end and the middle of the assigned frequency band for WLAN and at the lower end of the assigned frequency band for Bluetooth.

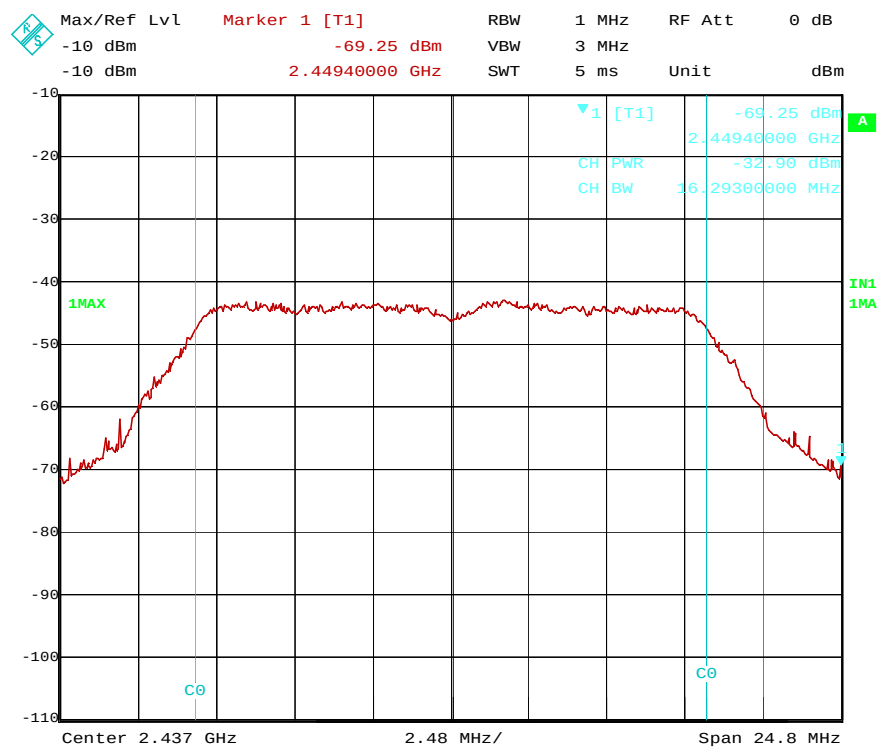
The measurement result in [dB $\mu$ V/m] was calculated to [dBm] using the formula in chapter 11.12.2.2 e) in [1].

## 5.1.2 Test results

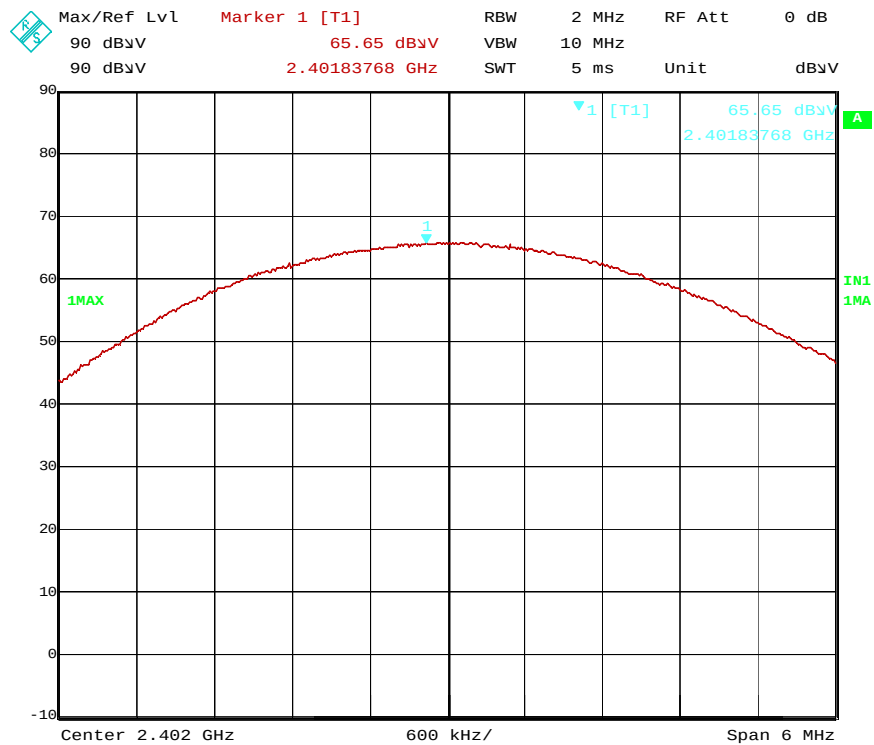
|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 21 °C | Relative humidity | 40 % |
|---------------------|-------|-------------------|------|

The following results were measured in a radiated setup. The plot shows an exemplary measurement result for the worst documented case. The other results are listed in the following table.

Power\_ch6\_6M.wmf: Maximum peak output power (operation mode 11):



Power\_2DH5\_ch0.wmf: Maximum peak output power (operation mode 1):



The highest antenna gain for Bluetooth is -2.7 dBi. Therefore no reduction of the Peak power limit is necessary.

Results for Bluetooth:

| Operation Mode          | Frequency [MHz] | Antenna gain combined [dBi] | Reading [dBμV] | Antenna factor [1/m] | Cable Loss [dB] | Meas. Result [dBμV/m] | EIRP Peak Power [dBm] | Conducted Peak Power [dBm] | Limit [dBm] |
|-------------------------|-----------------|-----------------------------|----------------|----------------------|-----------------|-----------------------|-----------------------|----------------------------|-------------|
| 1                       | 2402            | -2.7                        | 65.7           | 28.3                 | 3.0             | 97.0                  | 1.8                   | 4.5                        | 30          |
| Measurement uncertainty |                 |                             |                | +2.2 dB / -3.6 dB    |                 |                       |                       |                            |             |

The highest antenna gain for WLAN is -0.8 dBi. Therefore no reduction of the Peak power limit is necessary.

Results for WLAN:

| Operation Mode          | Frequency [MHz] | Antenna gain combined [dBi] | Reading [dBm] | Antenna factor [1/m] | Cable Loss [dB] | EIRP Peak Power [dBm] | Conducted Peak Power [dBm] | Limit [dBm] |
|-------------------------|-----------------|-----------------------------|---------------|----------------------|-----------------|-----------------------|----------------------------|-------------|
| 7                       | 2412            | -0.8                        | -37.8         | 28.2                 | 3.0             | 6.0                   | 6.8                        | 30          |
| 8                       | 2437            | -0.8                        | -37.5         | 28.3                 | 3.0             | 6.4                   | 7.2                        | 30          |
| 9                       | 2462            | -0.8                        | -38.2         | 28.4                 | 2.9             | 5.8                   | 6.6                        | 30          |
| 10                      | 2412            | -0.8                        | -33.2         | 28.2                 | 3.0             | 10.6                  | 11.4                       | 30          |
| 11                      | 2437            | -0.8                        | -32.9         | 28.3                 | 3.0             | 11.0                  | 11.8                       | 30          |
| 12                      | 2462            | -0.8                        | -33.3         | 28.4                 | 3.1             | 10.7                  | 11.5                       | 30          |
| 13                      | 2412            | -0.8                        | -33.4         | 28.2                 | 3.0             | 10.4                  | 11.2                       | 30          |
| 14                      | 2437            | -0.8                        | -32.7         | 28.3                 | 3.0             | 11.2                  | 12.0                       | 30          |
| 15                      | 2462            | -0.8                        | -33.3         | 28.4                 | 2.9             | 10.7                  | 11.5                       | 30          |
| Measurement uncertainty |                 |                             |               | +2.2 dB / -3.6 dB    |                 |                       |                            |             |

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

6, 8 – 11, 13, 17, 18, 33

## 5.2 Band-edge compliance

### 5.2.1 Method of measurement (band edges next to restricted bands (radiated))

The EUT was measured in a radiated setup within an anechoic chamber. The radiated measurement setup was made according to chapter 5.3.1 of this test report.

After trace stabilisation the marker shall be set on the signal peak. The frequency line shall be set on the edge of the assigned frequency band. Now set the second marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is higher than that at the band-edge. The level of the measured field strength shall be compared to the general limits specified in § 15.205.

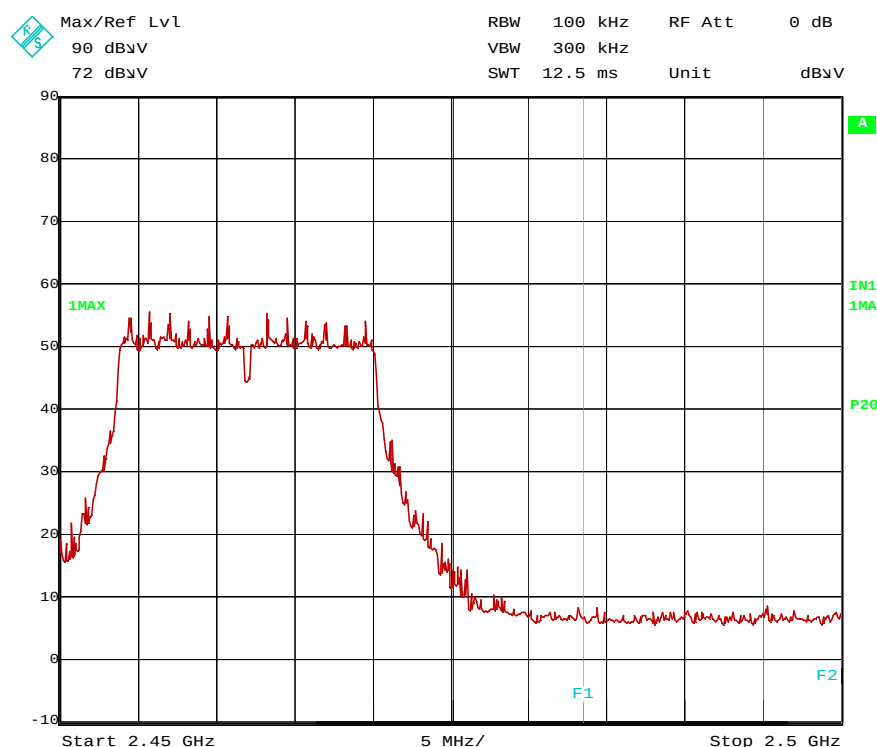
The measurement was performed only for WLAN at the upper end of the 2.4 GHz band.

### 5.2.2 Test result (band edges next to restricted bands (radiated))

|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 22 °C | Relative humidity | 59 % |
|---------------------|-------|-------------------|------|

The following plot shows the measurement result. No final measurement was performed, because no spurious emissions were detected during the preliminary measurement.

BandEdge\_High120°.wmf: Radiated band-edge compliance (operation mode 15):



Test: Passed

|                                   |
|-----------------------------------|
| TEST EQUIPMENT USED FOR THE TEST: |
| 6, 8 – 11, 13, 17, 18, 33         |

## 5.3 Maximum unwanted emissions

### 5.3.1 Method of measurement (radiated emissions)

The radiated emission measurement is subdivided into five stages.

- A preliminary measurement carried out in a fully anechoic chamber with a variable antenna distance and height in the frequency range 1 GHz to 25 / 40 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 25 / 40 GHz.

#### Preliminary and final measurement (1 GHz to 25 GHz)

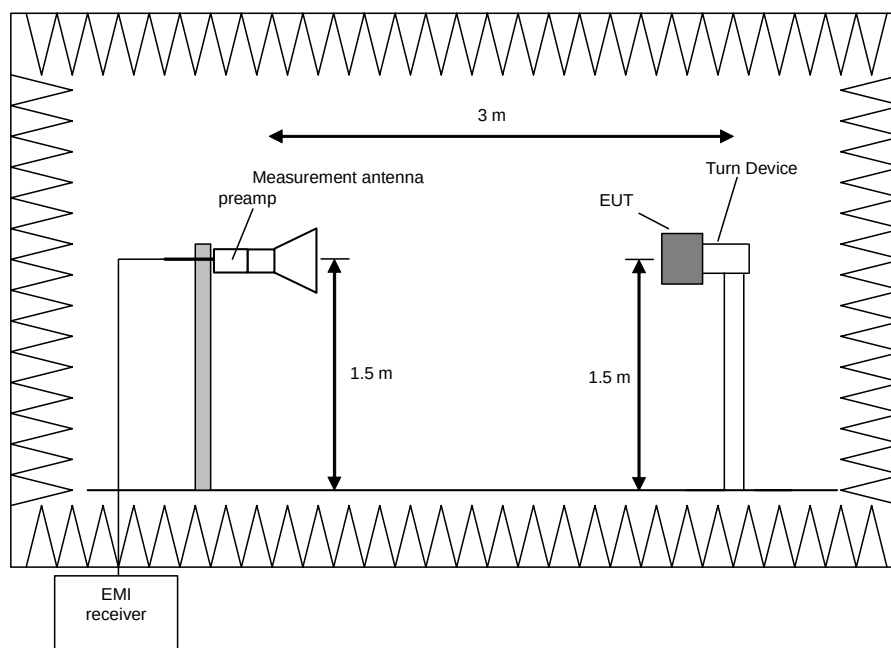
This measurement will be performed in a fully anechoic chamber. Table top devices will set up on a non-conducting turn device on the height of 1.5m. The set-up of the Equipment under test will be in accordance to [1].

#### Preliminary measurement (1 GHz to 25 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The spectrum analyser set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °. This measurement is repeated after raising the EUT in 30° steps according 6.6.5.4 in [1].

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range         | Resolution bandwidth |
|-------------------------|----------------------|
| 1 GHz to 4 GHz          | 100 kHz              |
| 4 GHz to 12 GHz         | 100 kHz              |
| 12 GHz to 18 GHz        | 100 kHz              |
| 18 GHz to 25 / 26.5 GHz | 100 kHz              |
| 26.5 GHz to 40 GHz      | 100 kHz              |





#### Procedure preliminary measurement:

Prescans were performed in the frequency range 1 to 40 GHz.

The following procedure will be used:

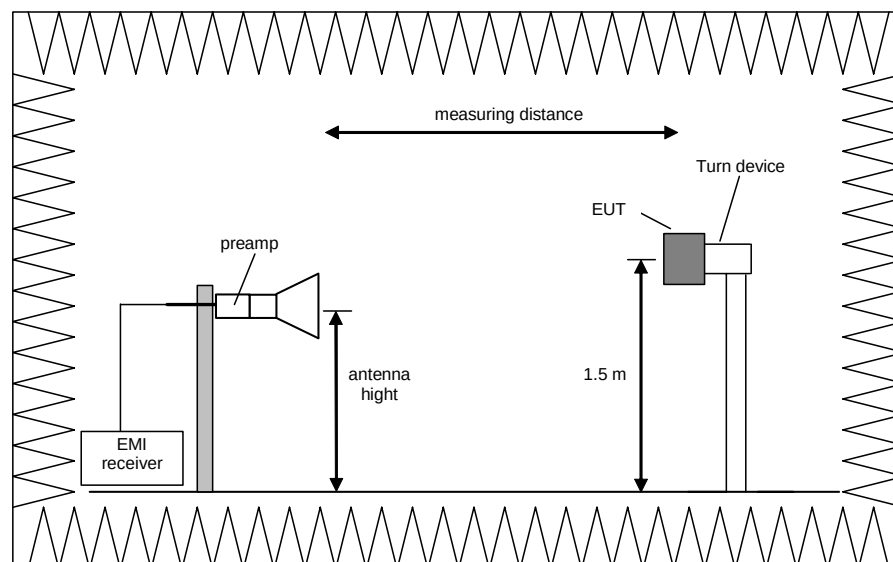
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Rotate the EUT by 360° to maximize the detected signals.
3. Repeat 1) to 2) with the vertical polarisation of the measuring antenna.
4. Make a hardcopy of the spectrum.
5. Repeat 1) to 4) with the EUT raised by an angle of 30° (60°, 90°, 120° and 150°) according to 6.6.5.4 in [1].
6. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
7. The measurement antenna polarisation, with the according EUT position (Turntable and Turn device) which produces the highest emission for each frequency will be used for the final measurement. The six closest values to the applicable limit will be used for the final measurement.

#### **Final measurement (1 GHz to 40 GHz)**

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1 MHz. The measurement will be performed by rotating the turntable through 0 to 360° in the worst-case EUT orientation which was obtained during the preliminary measurements.

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range         | Resolution bandwidth |
|-------------------------|----------------------|
| 1 GHz to 4 GHz          | 1 MHz                |
| 4 GHz to 12 GHz         | 1 MHz                |
| 12 GHz to 18 GHz        | 1 MHz                |
| 18 GHz to 25 / 26.5 GHz | 1 MHz                |
| 26.5 GHz to 40 GHz      | 1 MHz                |



Procedure of measurement:

The measurements were performed in the frequency ranges 1 GHz to 4 GHz, 4 GHz to 12 GHz, 12 GHz to 18 GHz, 18 GHz to 26.5 GHz and 26.5 – 40 GHz.

The following procedure will be used:

- 1) Set the turntable and the turn device to obtain the worst-case emission for the first frequency identified in the preliminary measurements.
- 2) Set the measurement antenna polarisation to the orientation with the highest emission for the first frequency identified in the preliminary measurements.
- 3) Set the spectrum analyser to EMI mode with peak and average detector activated.
- 4) Rotate the turntable from 0° to 360° to find the EUT angle that produces the highest emissions.
- 5) Note the highest displayed peak and average values
- 6) Repeat the steps 1) to 5) for each frequency detected during the preliminary measurements.

## 5.3.2 Test results (radiated emissions) – antenna and cabinet emission

### 5.3.2.1 Preliminary radiated emission measurement

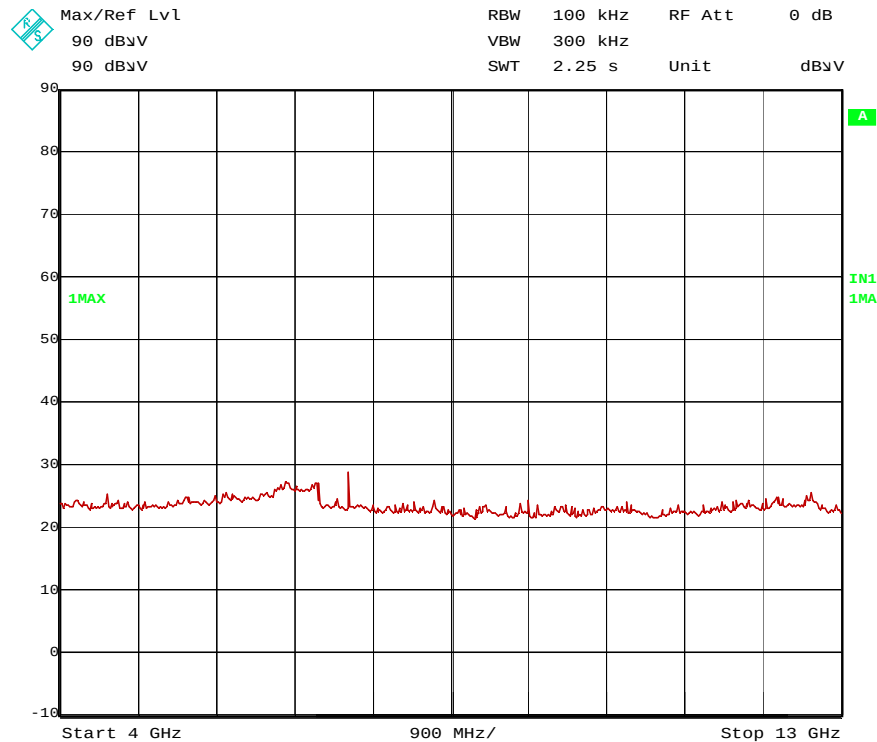
|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 21 °C | Relative humidity | 40 % |
|---------------------|-------|-------------------|------|

|                  |                                                                                                                     |
|------------------|---------------------------------------------------------------------------------------------------------------------|
| Position of EUT: | The EUT was set-up on a turn device on a height of 1.5 m. The distance between EUT and antenna was 3 m.             |
| Cable guide:     | For detail information of test set-up and the cable guide refer to the pictures in the Annex A of the test report.  |
| Test record:     | All results are shown in the following.                                                                             |
| Supply voltage:  | During all measurements the host of the EUT was powered with 12 V DC via a car battery.                             |
| Remark:          | Only the worst case spurious emissions frequencies identified in the original report were repeated for this report. |

## Results for Bluetooth

### Transmitter operates at the middle of the assigned frequency band (operation mode 2)

154064\_Low\_1-4G\_90°.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 2):



The following frequencies were found inside the restricted bands during the preliminary radiated emission test:

- 7323 MHz.

The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

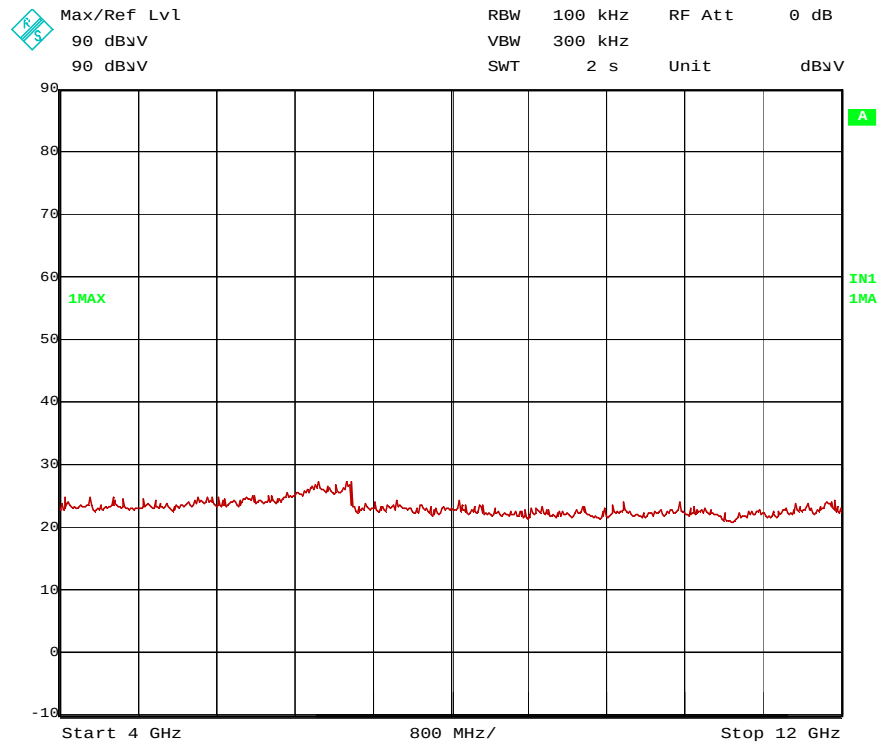
-

These frequency has to be measured in a final measurement. The results are presented in the following.

## Results for WLAN

### Transmitter operates at the middle of the assigned frequency band (operation mode 10)

SpurEm\_ch1\_6M 0°.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 10):



No spurious emissions were found during the preliminary measurement. Therefore no final measurement was performed

TEST EQUIPMENT USED FOR THE TEST:

6, 8 – 11, 13, 17, 18, 33

### 5.3.2.2 Final radiated emission measurement (9 kHz to 1 GHz)

No emissions were found during the preliminary measurement. Therefore no results for the final measurements are submitted.

### 5.3.2.3 Final radiated emission measurement (1 GHz to 25 GHz)

|                     |       |                   |      |
|---------------------|-------|-------------------|------|
| Ambient temperature | 21 °C | Relative humidity | 40 % |
|---------------------|-------|-------------------|------|

Position of EUT: The EUT was set-up on a turn device on a height of 1.5 m. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the Annex A of the test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the host of the EUT was powered with 12 V DC via a car battery.

Resolution bandwidth: For all measurements a resolution bandwidth of 1 MHz was used.

Additional information: For simplification all values were compared to the restricted band limits. All Emissions were measured in the EUT angle that had the highest spurious emissions.

## Results for Bluetooth

### Transmitter operates at the middle of the assigned frequency band (operation mode 2)

#### Result measured with the peak detector:

| Frequency<br>MHz        | Meas.<br>Result<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB | Readings<br>dBμV  | Antenna<br>factor<br>1/m | Preamp<br>dB | Cable<br>loss<br>dB | Height<br>cm | Pol. | Angle / ° |
|-------------------------|---------------------------|-----------------|--------------|-------------------|--------------------------|--------------|---------------------|--------------|------|-----------|
| 7323.0                  | 54.0                      | 74.0            | 20.0         | 35.8              | 36.1                     | 24.7         | 6.8                 | 150          | Ver. | 60        |
| Measurement uncertainty |                           |                 |              | +2.2 dB / -3.6 dB |                          |              |                     |              |      |           |

#### Result measured with the average detector:

| Frequency<br>MHz        | Meas.<br>Result<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB | Readings<br>dBμV  | Antenna<br>factor<br>1/m | Preamp<br>dB | Cable<br>loss<br>dB | Height<br>cm | Pol. | Angle / ° |
|-------------------------|---------------------------|-----------------|--------------|-------------------|--------------------------|--------------|---------------------|--------------|------|-----------|
| 7323.0                  | 40.8                      | 54.0            | 13.2         | 22.6              | 36.1                     | 24.7         | 6.8                 | 150          | Ver. | 60        |
| Measurement uncertainty |                           |                 |              | +2.2 dB / -3.6 dB |                          |              |                     |              |      |           |

Test: Passed

|                                   |
|-----------------------------------|
| TEST EQUIPMENT USED FOR THE TEST: |
| 6, 8 – 11, 13, 17, 18, 33         |

## 6 Test equipment and ancillaries used for tests

| No. | Test equipment                                   | Type                       | Manufacturer              | Serial No.               | PM. No. | Cal. Date                               | Cal. Due |
|-----|--------------------------------------------------|----------------------------|---------------------------|--------------------------|---------|-----------------------------------------|----------|
| 1   | Shielded chamber M47                             | -                          | Albatross Projects        | B83117-C6439-T262<br>-   | 480662  | Weekly verification<br>(system cal.)    |          |
| 2   | EMI Receiver                                     | ESIB 26                    | Rohde & Schwarz           | 1088.7490                | 481182  | 21.03.2014                              | 03/2016  |
| 3   | LISN                                             | NSLK8128                   | Schwarzbeck               | 8128155                  | 480058  | 21.03.2014                              | 03/2016  |
| 4   | High pass filter                                 | HR 0.13-<br>5ENN           | FSY Microwave<br>Inc.     | DC 0109 SN 002           | 480340  | Weekly verification<br>(system cal.)    |          |
| 5   | EMI Software                                     | ES-K1                      | Rohde & Schwarz           | -                        | 480111  | -                                       | -        |
| 6   | Fully anechoic chamber<br>M20                    | -                          | Albatross Projects        | B83107-E2439-T232        | 480303  | Weekly verification<br>(system cal.)    |          |
| 7   | Spectrum analyser                                | FSU                        | Rohde & Schwarz           | 200125                   | 480956  | 17.02.2016                              | 02/2018  |
| 8   | Measuring receiver                               | ESI 40                     | Rohde & Schwarz           | 100064                   | 480355  | 26.02.2014                              | 02/2016  |
|     |                                                  |                            |                           |                          |         | 03.02.2015                              | 02/2017  |
| 9   | Controller                                       | MCU                        | Maturo                    | MCU/043/971107           | 480832  | -                                       | -        |
| 10  | Turntable                                        | DS420HE                    | Deisel                    | 420/620/80               | 480315  | -                                       | -        |
| 11  | Antenna support                                  | AS615P                     | Deisel                    | 615/310                  | 480187  | -                                       | -        |
| 12  | Antenna                                          | CBL6112 B                  | Chase                     | 2688                     | 480328  | 14.04.2014                              | 04/2017  |
| 13  | Antenna                                          | 3115 A                     | EMCO                      | 9609-4918                | 480183  | 11/2014                                 | 11/2017  |
| 14  | Standard Gain Horn<br>11.9 GHz – 18 GHz          | 18240-20                   | Flann Microwave           | 483                      | 480294  | Six month verification<br>(system cal.) |          |
| 15  | Standard Gain Horn<br>17.9 GHz – 26.7 GHz        | 20240-20                   | Flann Microwave           | 411                      | 480297  | Six month verification<br>(system cal.) |          |
| 16  | Standard Gain Horn<br>Antenne 26.4 – 40.1<br>GHz | 22240-20                   | Flann Microwave           | 469                      | 480229  | Six month verification<br>(system cal.) |          |
| 17  | RF-cable No. 3                                   | Sucoflex<br>106B           | Huber&Suhner              | 0563/6B / Kabel 3        | 480670  | Weekly verification<br>(system cal.)    |          |
| 18  | RF-cable No. 40                                  | Sucoflex<br>106B           | Huber&Suhner              | 0708/6B / Kabel 40       | 481330  | Weekly verification<br>(system cal.)    |          |
| 19  | RF-cable No. 36                                  | Sucoflex<br>106B           | Huber&Suhner              | 500003/6B / Kabel<br>36- | 481680  | Weekly verification<br>(system cal.)    |          |
| 20  | RF-cable 1 m                                     | KPS-1533-<br>400-KPS       | Insulated Wire            | -                        | 480300  | Six month verification<br>(system cal.) |          |
| 21  | RF-cable 2 m                                     | KPS-1533-<br>800-KPS       | Insulated Wire            |                          | 480302  | Six month verification<br>(system cal.) |          |
| 22  | Preamplifier                                     | JS3-<br>00101200-<br>23-5A | Miteq                     | 681851                   | 480337  | Six month verification<br>(system cal.) |          |
| 23  | Preamplifier                                     | JS3-<br>12001800-<br>16-5A | Miteq                     | 571667                   | 480343  | Six month verification<br>(system cal.) |          |
| 24  | Preamplifier                                     | JS3-<br>18002600-<br>20-5A | Miteq                     | 658697                   | 480342  | Six month verification<br>(system cal.) |          |
| 25  | Loop antenna                                     | HFH2-Z2                    | Rohde & Schwarz           | 832609/014               | 480059  | 02/2014                                 | 02/2016  |
| 26  | Power Meter                                      | NRVD                       | Rohde & Schwarz           | 833697/030               | 480589  | 02/2016                                 | 07/2018  |
| 27  | Peak Power Sensor                                | NRV-Z32                    | Rohde & Schwarz           | 849745/016               | 480551  | 02/2016                                 | 07/2018  |
| 28  | 4 GHz High Pass Filter                           | WHKX4.0/18<br>G-8SS        | Wainwright<br>Instruments | 1                        | 480587  | Weekly verification<br>(system cal.)    |          |

|    |                          |              |                          |                |        |                                      |         |
|----|--------------------------|--------------|--------------------------|----------------|--------|--------------------------------------|---------|
| 29 | Single Control Unit      | SCU          | Maturo GmbH              | SCU/006/971107 | 480831 | Calibration not necessary            |         |
| 30 | High-pass Filter         | H26G40G1     | Microwave Circuits, Inc. | 33471          | 480593 | Six month verification (system cal.) |         |
| 31 | Temperature Test Chamber | MK 240       | Binder                   | 05-79022       | 480462 | 18.02.2014                           | 08/2015 |
| 32 | Multimeter               | Fluke 175    | Fluke Deutschland GmbH   | 18660318       | 481515 | 10/2014                              | 10/2016 |
| 33 | Turn Device              | TDF 1.5-10Kg | Maturo                   | -              | 482034 | -                                    |         |

## 7 Report History

| Report Number | Date       | Comment             |
|---------------|------------|---------------------|
| F160090E1     | 29.04.2016 | Initial Test Report |
|               |            |                     |
|               |            |                     |
|               |            |                     |



## 8 List of Annexes

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| 160090_40.jpg | Test setup - Radiated emission > 1 GHz (fully anechoic chamber) |
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| 160090_06.jpg | EUT – Main main unit label view                  |
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| 160090_16.jpg | EUT – Main Unit without front panel – 3D view    |
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