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FCC Measurement/Technical Report on

Kleer transceivers of NBT EVO RSE

FCC ID: T8GB173
IC: 6434A-B173

Report Reference: MDE_HARMAN_1404_FCCb

Test Laboratory:
7Layers AG
Borsigstrasse 11
40880 Ratingen
Germany

DAkkS Deutsche Akkreditierungsstelle D-PL-12140-01-01

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Summary

Technical Report Summary

Type of Authorization
Certification for an Intentional Radiator (Digital Device / Spread Spectrum).

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-11 Edition) and 15 (10-1-11 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

§ 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

Note:
The tests were selected and performed with reference to the FCC measurement guide line "Measurement of Digital Transmission Systems Operating under Section 15.247 March 23, 2005"
Instead of applying ANSI C63.4–1992 which is referenced in the FCC Public Note, the newer ANSI C63.4–2009 is applied.

Summary Test Results:

The EUT complied with all performed tests as listed in chapter 0 Measurement Summary.

Measurement Summary

FCC Part 15, Subpart C	**§ 15.207**		
Conducted emissions (AC power line)			
The measurement was performed according to ANSI C63.4			2009
OP-Mode	**Setup**	**Port**	**Final Result**
–	–	–	N/A

FCC Part 15, Subpart C	**§ 15.247 (a) (1)**		
Occupied bandwidth			
The measurement was performed according to FCC § 15.31			10-1-11 Edition
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_02	Temp.ant.connector	passed
op-mode 2	Setup_02	Temp.ant.connector	passed
op-mode 3	Setup_02	Temp.ant.connector	passed

FCC Part 15, Subpart C	**§ 15.247 (b) (1)**		
Peak power output			
The measurement was performed according to FCC § 15.31			10-1-11 Edition
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_02	Temp.ant.connector	passed
op-mode 2	Setup_02	Temp.ant.connector	passed
op-mode 3	Setup_02	Temp.ant.connector	passed

FCC Part 15, Subpart C	**§ 15.247 (d)**		
Spurious RF conducted emissions			
The measurement was performed according to FCC § 15.31			10-1-11 Edition
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_02	Temp.ant.connector	passed
op-mode 2	Setup_02	Temp.ant.connector	passed
op-mode 3	Setup_02	Temp.ant.connector	passed

FCC Part 15, Subpart C	**§ 15.247 (d), § 15.35 (b), § 15.209**		
Spurious radiated emissions			
The measurement was performed according to ANSI C63.4			2009
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_01	Enclosure	passed
op-mode 2	Setup_01	Enclosure	passed
op-mode 3	Setup_01	Enclosure	passed

FCC Part 15, Subpart C	§ 15.247 (d)		
Band edge compliance			
The measurement was performed according to FCC § 15.31 / ANSI C63.4			10-1-11 Edition / 2009
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_02	Temp.ant.connector	passed
op-mode 3	Setup_02	Temp.ant.connector	passed
op-mode 3	Setup_01	Enclosure	passed

FCC Part 15, Subpart C	§ 15.247 (e)		
Power density			
The measurement was performed according to FCC § 15.31			10-1-11
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_02	Temp.ant.connector	passed
op-mode 2	Setup_02	Temp.ant.connector	passed
op-mode 3	Setup_02	Temp.ant.connector	passed

N/A not applicable (the EUT is powered by DC)

Responsible for Accreditation Scope: B. Rath

Responsible for Test Report: D. Gall

Administrative Data

Testing Laboratory

Company Name:	7Layers AG
Address	Borsigstr. 11 40880 Ratingen Germany

This facility has been fully described in a report submitted to the FCC and accepted under the registration number 96716 .

The test facility is also accredited by the following accreditation organisation:

Laboratory accreditation no.:	DAkkS D-PL-12140-01-01
Responsible for Accreditation Scope:	Dipl.-Ing. Bernhard Retka Dipl.-Ing. Robert Machulec Dipl.-Ing. Thomas Hoell Dipl.-Ing. Andreas Petz Dipl.-Ing. Marco Kullik
Report Template Version:	2012-03-14

Project Data

Responsible for testing and report:	Dipl.-Ing. Daniel Gall
Date of Test(s):	2014-09-26 to 2012-10-07
Date of Report:	2014-10-13

Applicant Data

Company Name:	Harman Becker Automotive Systems GmbH
Address:	Becker-Göring-Straße 16 76307 Karlsbad Germany
Contact Person:	Mr. Stefan Blaschek

Manufacturer Data

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

Test object Data

General EUT Description

Equipment under Test:	2 Kleer transceivers
Type Designation:	NBT EVO RSE
Kind of Device:	Part of Car Audio System
(optional)	
Voltage Type:	DC (vehicular)
Voltage Level:	12.0 V
Tested Modulation Type:	FSK (MSK)

General product description:

The Kleer Transceiver is operating in the 2.4 GHz ISM band in the range 2403.0 – 2478.0 MHz and uses the Direct Sequence Spread Spectrum (DSSS) Modulation.
The Kleer technology supports 16 channels in the 2.4 GHz ISM band, each spaced by 5 MHz whilst the nominal bandwidth is designed as 3 MHz.
The Kleer technology provides Dynamic Frequency Selection.

Specific product description for the EUT:

The EUT is a part of a car audio system for vehicular use containing two Kleer transceivers (indicated by "K1" and "K2") which can operate simultaneously and independently from each other.

The EUT provides the following ports:

Ports
Temporary antenna connectors (connector L and R)
Enclosure
BroadReach Interface to NBT EVO headunit
MOST-Interface
USB connector
HDMI/MHL Interface
"Car Connector" (incl. DC power)
CID left
CID right
Earphone Jack left
Earphone Jack right
AV In Jack

The main components of the EUT are listed and described in Chapter 0

EUT Main components

Type, S/N, Short Descriptions etc. used in this Test Report

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status	Date of Receipt
EUT A (Code: DE1009002ab01)	Kleer transceivers	NBT EVO RSE	BE173FR0E 7510105	1.4	-	–
Remark: EUT A is equipped with integral antennas (gain = 4.1 dBi).						
EUT B (Code: DE1009002aa01)	Kleer transceivers	NBT EVO RSE	BE173G/0E7 510468	1.4	-	–
Remark: EUT B is equipped with temporary antenna connectors.						

NOTE: The short description is used to simplify the identification of the EUT in this test report.

Ancillary Equipment

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	HW Status	SW Status	Serial no.	FCC ID
–	–	–	–	–	–	–

Auxiliary Equipment

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Auxiliary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	Serial no.	HW Status	SW Status	FCC ID
AUX1	USB-Adapter Board	-(device used to connect to KLEER module)	-	-	-	-
AUX2 (DE1009002_ae02)	uMost-Board	– (device used for BUS simulation)	–	UMOST II–30GW-LS 2014.785-273	–	–

NOTE: AUX1 is connected to the EUT via a fibre-optics link (no galvanic connection).

EUT Setups

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

Setup No.	Combination of EUTs	Description and Rationale
Setup_01	EUT A + AUX1-2	setup for radiated measurements (AUX1 is used to enable the Kleer test mode), both transceivers are operated simultaneously at different op-modes (see below)
Setup_02	EUT B + AUX1-2	setup for conducted measurements (AUX1 is used to enable the Kleer test mode), the measurements are performed for each transceiver separately

Operating Modes

This chapter describes the operating modes of the EUTs used for testing.

Op. Mode	Description of Operating Modes	Remarks
op-mode 1	TX-mode, the EUT transmits on the lowest channel (2403 MHz)	Operation on lowest frequency (channel 0)
op-mode 2	TX-mode, the EUT transmits on the mid channel (2438 MHz)	Operation on mid frequency (channel 7)
op-mode 3	TX-mode, the EUT transmits on the highest channel (2478 MHz)	Operation on highest frequency (channel 15)

Special software used for testing

The EUT is running in a Kleer test mode set by a special software provided by the applicant. A batch-file "B075 BMW NBT RSE" is used to control the EUT.

Product labelling

FCC ID label

Please refer to the documentation of the applicant.

Location of the label on the EUT

Please refer to the documentation of the applicant.

Test Results

Occupied bandwidth

Standard FCC Part 15, 10-1-11 Subpart C

The test was performed according to: FCC §15.31

Test Description

The Equipment Under Test (EUT) was setup to perform the occupied bandwidth measurements.
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.
The results recorded were measured with the modulation which produce the worst-case (widest) occupied bandwidth.
The EUT was connected to spectrum analyzer via a short coax cable with a known loss.
Analyzer settings:
- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Span: 30 MHz

Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (a) (2)
Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Used conversion factor: Output power (dBm) = 10 log (Output power (W) / 1mW)

Test Protocol

Temperature: 22 °C
Air Pressure: 997 hPa
Humidity: 38 %

Op. Mode	Setup	Port
op-mode 1	Setup_02	Temp.ant.connector

6 dB bandwidth MHz	Remarks
1.81	Connector 1 (next to HDMI port)
1.93	Connector 2 (next to USB port)

Remark: None

Op. Mode	Setup	Port
op-mode 2	Setup_02	Temp.ant.connector

6 dB bandwidth MHz	Remarks
1.99	Connector 1 (next to HDMI port)
1.99	Connector 2 (next to USB port)

Remark: None

Op. Mode	Setup	Port
op-mode 3	Setup_02	Temp.ant.connector

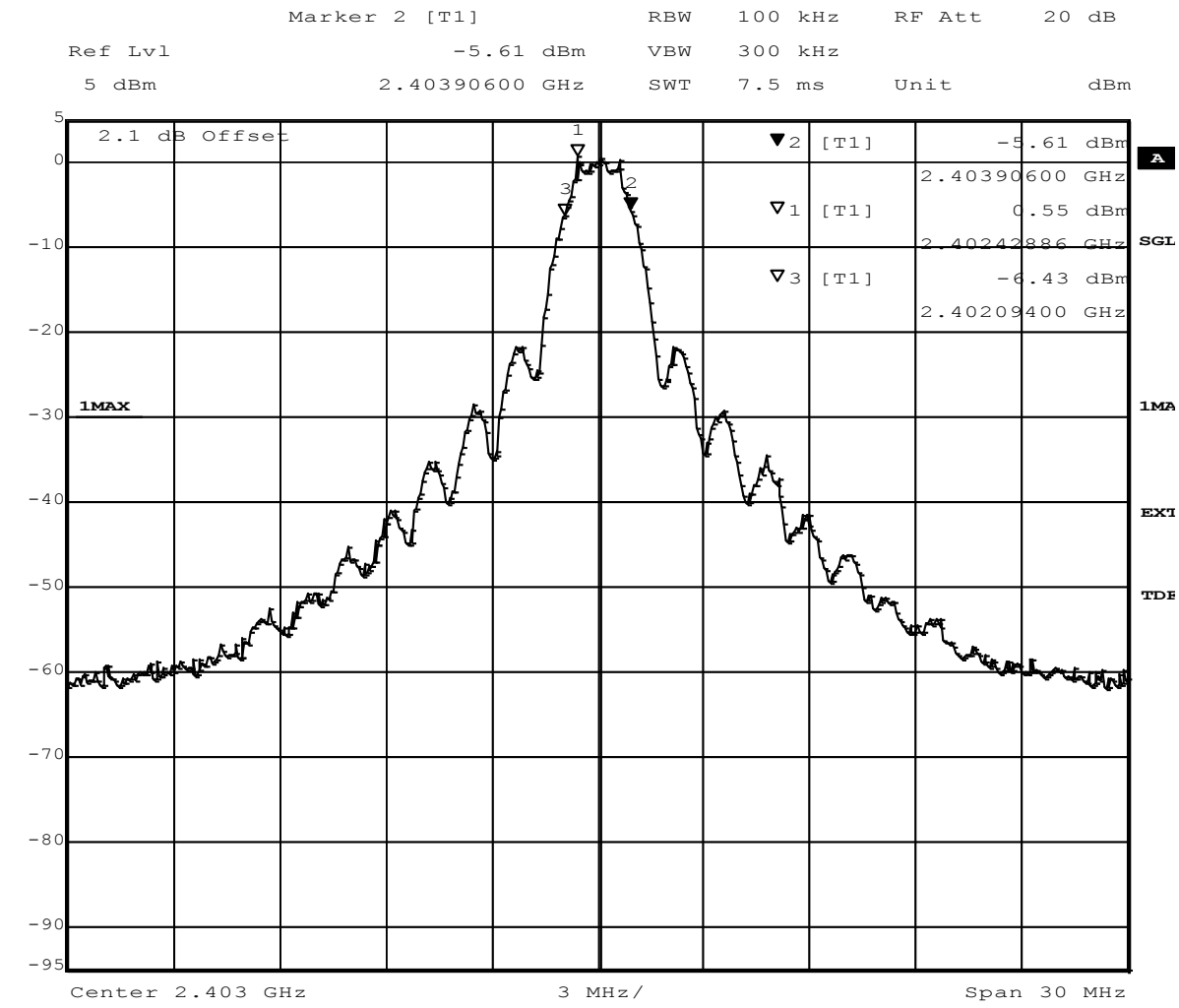
6 dB bandwidth MHz	Remarks
1.87	Connector 1 (next to HDMI port)
1.99	Connector 2 (next to USB port)

Remark: None.

Test result: Occupied bandwidth

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed

Measurement Plot (showing the highest value, "worst case")



Title: 6dB Bandwidth
Comment A: CH B: 2403 MHz; 6dB bandwidth (kHz):1812
Date: 18.SEP.2014 11:39:55

Peak power output

Standard FCC Part 15, 10-1-11 Subpart C

The test was performed according to: FCC §15.31

Test Description

The Equipment Under Test (EUT) was set up to perform the output power measurements. The results recorded were measured with the modulation which produces the worst-case (highest) output power. The reference level of the spectrum analyzer was set higher than the output power of the EUT. The EUT was connected to the spectrum analyzer via a short coax cable with a known loss.

Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (b) (3)
For systems using digital modulation techniques in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands: 1 watt.

Used conversion factor: Limit (dBm) = 10 log (Limit (W)/1mW)
==> Maximum Output Power: 30 dBm

Test Protocol

Temperature: 23 °C
Air Pressure: 1003 hPa
Humidity: 35 %

Op. Mode	Setup	Port
op-mode 1	Setup_03	Temp.ant.connector

Output power dBm	Remarks
3.3	Connector 1 (next to HDMI port)
3.6	Connector 2 (next to USB port)

Remark: Antenna gain is excluded in the given value.

Op. Mode	Setup	Port
op-mode 2	Setup_03	Temp.ant.connector

Output power dBm	Remarks
3.3	Connector 1 (next to HDMI port)
3.0	Connector 2 (next to USB port)

Remark: Antenna gain is excluded in the given value.

Op. Mode	Setup	Port
op-mode 3	Setup_03	Temp.ant.connector

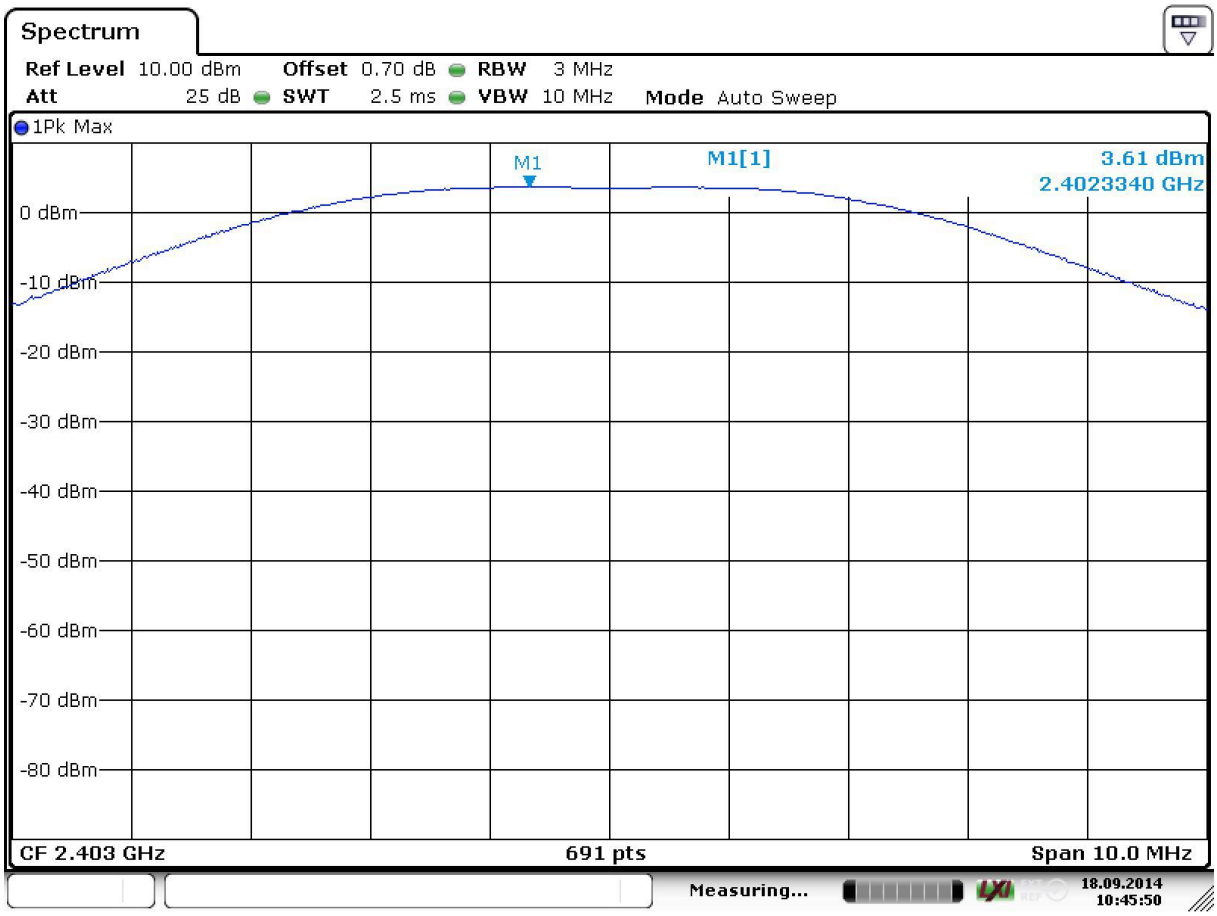
Output power dBm	Remarks
2.6	Connector 1 (next to HDMI port)
2.4	Connector 2 (next to USB port)

Remark: Antenna gain is excluded in the given value.

Test result: Peak power output

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed

Measurement Plot (showing the highest value, "worst case")



Date: 18.SEP.2014 10:45:50

Spurious RF conducted emissions

Standard FCC Part 15, 10-1-11 Subpart C

The test was performed according to: FCC §15.31

Test Description

The Equipment Under Test (EUT) was set up to perform the spurious emissions measurements.
The EUT was connected to spectrum analyzer via a short coax cable with a known loss.
Analyzer settings:
- Detector: Peak-Maxhold
- Frequency range: 30 – 25000 MHz
- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Sweep Time: 330 s

The reference value for the measurement of the spurious RF conducted emissions is determined during the test "band edge compliance" (cf. chapter 0). This value is used to calculate the 20 dBc limit.

Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (c)
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Test Protocol

Temperature: 22 °C
Air Pressure: 997 hPa
Humidity: 38 %

Op. Mode	Setup	Port
op-mode 1	Setup_02	Temp.ant.connector, Connector 1

Frequency MHz	Measurement value dBm	Reference value dBm	Limit dBm	Margin to limit dB
9588	-38.62	0.53	–19.47	19.15

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Op. Mode	Setup	Port
op-mode 1	Setup_02	Temp.ant.connector, Connector 2

Frequency MHz	Measurement value dBm	Reference value dBm	Limit dBm	Margin to limit dB
-	-	0.97	–19.03	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Op. Mode	Setup	Port
op-mode 2	Setup_02	Temp.ant.connector, Connector 1

Frequency MHz	Measurement value dBm	Reference value dBm	Limit dBm	Margin to limit dB
-	–	–0.5	–19.5	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Op. Mode	Setup	Port
op-mode 2	Setup_02	Temp.ant.connector, Connector 2

Frequency MHz	Measurement value dBm	Reference value dBm	Limit dBm	Margin to limit dB
-	–	–0.53	–20.53	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Op. Mode	Setup	Port
op-mode 3	Setup_02	Temp.ant.connector, Connector 1

Frequency MHz	Measurement value dBm	Reference value dBm	Limit dBm	Margin to limit dB
-	-	–1.00	–21.00	-

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Op. Mode	Setup	Port
op-mode 3	Setup_02	Temp.ant.connector, Connector 2

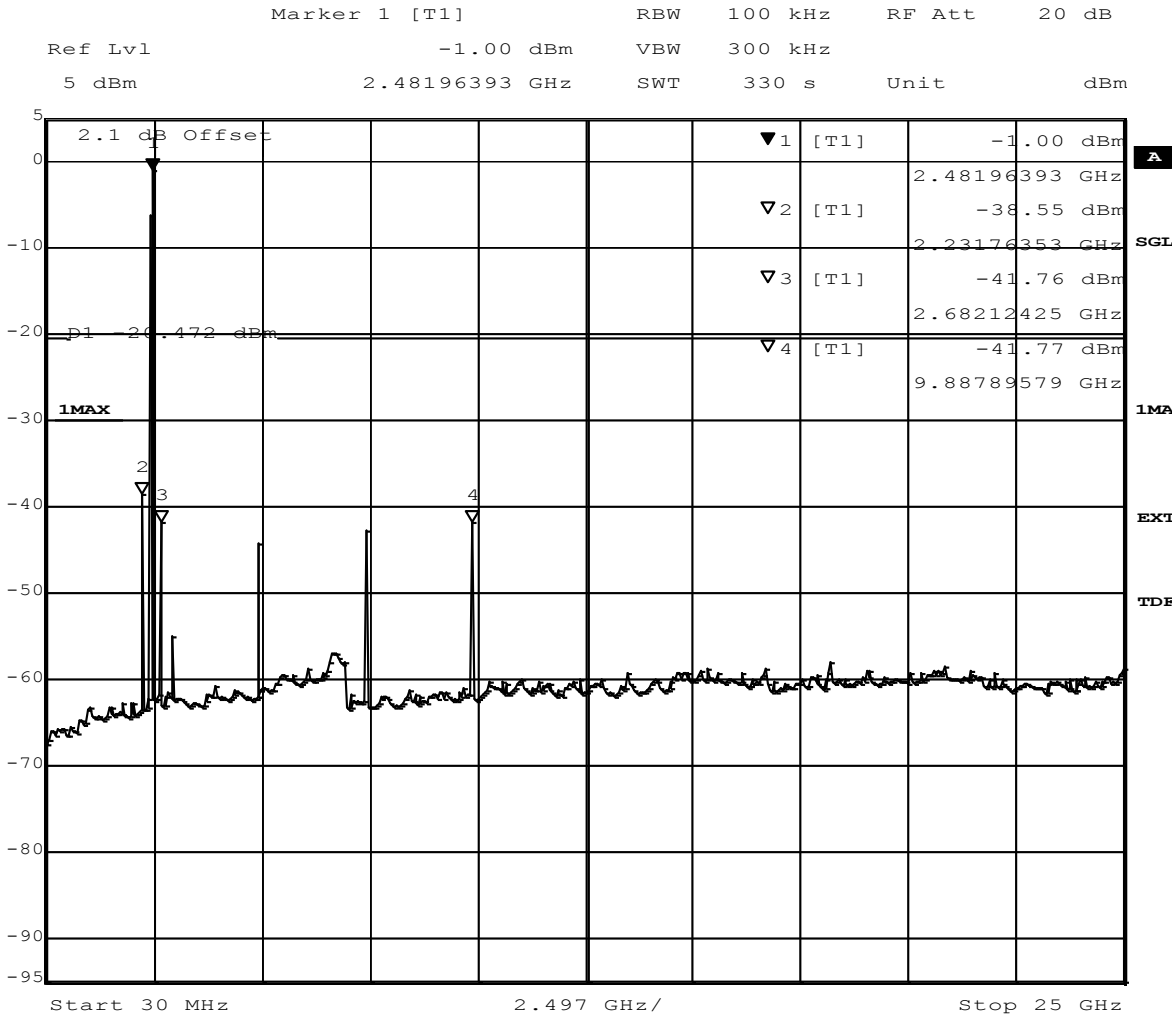
Frequency MHz	Measurement value dBm	Reference value dBm	Limit dBm	Margin to limit dB
2232	–38.55	–0.47	–20.47	18.08

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Test result: Spurious RF conducted emissions

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed

Measurement Plot (showing the highest value, "worst case")



Title: spurious emissions
Comment A: CH T: 2478 MHz
Date: 18.SEP.2014 08:21:58

Spurious radiated emissions

Standard FCC Part 15, 10-1-11 Subpart C

The test was performed according to: ANSI C63.4–2009

Test Description

The test set-up was made in accordance to the general provisions of ANSI C63.4–2009 in a typical installation configuration. The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m² in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.
The test was performed at the distance of 3 m between the EUT and the receiving antenna. The measurement procedure is implemented into the EMI test software ES-K1 from R&S. The radiated emissions measurements were made in a typical installation configuration. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is performed at 2 axes. A pre-check is also performed while the EUT is powered from both AC and DC (battery) power in order to find the worst-case operating condition.

1. Measurement up to 30 MHz
The test set-up was made in accordance to the general provisions of ANSI C 63.4-2009. The Equipment Under Test (EUT) was set up on a non-conductive table in the anechoic chamber.
The radiated emissions measurements were made in a typical installation configuration. The measurement procedure is implemented into the EMI test software ES-K1 from R&S. The Loop antenna HFH2-Z2 is used.
Step 1: pre measurement
- Anechoic chamber
- Antenna distance: 10 m
- Detector: Peak-Maxhold
- Frequency range: 0.009 - 0.15 and 0.15 – 30 MHz
- Frequency steps: 0.1 kHz and 5 kHz
- IF–Bandwidth: 0.2 kHz and 10 kHz
- Measuring time / Frequency step: 100 ms

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.
Step 2: final measurement
For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is to find the maximum emission level.
- Open area test side
- Antenna distance: according to the Standard
- Detector: Quasi-Peak
- Frequency range: 0.009 – 30 MHz
- Frequency steps: measurement at frequencies detected in step 1
- IF–Bandwidth: 200 Hz - 10 kHz
- Measuring time / Frequency step: 100 ms

2. Measurement above 30 MHz and up to 1 GHz

Step 1: Preliminary scan

Preliminary test to identify the highest amplitudes relative to the limit.

Settings for step 1:

- Antenna distance: 3 m
- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 µs
- Turntable angle range: –180° to 180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: second measurement

For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –180° to 180°
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):

- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:

- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3: final measurement

In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.

For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by +/- 22.5° around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by +/- 25 cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –22.5° to + 22.5° around the determined value
- Height variation range: -0.25m to + 0.25m around the determined value

Step 4: final measurement with QP detector

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:
- Detector: Quasi-Peak(< 1 GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

3. Measurement above 1 GHz

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:
The Equipment Under Test (EUT) was set up on a non-conductive support at 1.4 m height in the fully-anechoic chamber. The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements, inverse linear-distance squared for the power reference level measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18–25 GHz) are used, the steps 2-4 are omitted. Step 1 was performed with one height of the receiving antenna only.
EMI receiver settings:
- Detector: Peak, Average
- IF Bandwidth = 1 MHz

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.
For the data rate in mode n the test is performed as worst-case-check in order to verify that emissions have a comparable level as found at modes b and g. Typically, the measurement is performed in the frequency range 1 to 8 GHz but it depends on the emissions found during the test for the modes b and g. Please refer to the results for the used frequency range.

Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (d)
... In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limit(dBµV/m @10m)
0.009 – 0.49	2400/F(kHz)	300	Limit (dBµV/m) + 30 dB
0.49 – 1.705	24000/F(kHz)	30	Limit (dBµV/m) + 10 dB
1.705 – 30	30	30	Limit (dBµV/m) + 10 dB

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limit (dBµV/m)
30 – 88	100	3	40.0
88 – 216	150	3	43.5
216 – 960	200	3	46.0
above 960	500	3	54.0

§15.35(b)
..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

Test Protocol

Temperature: 22–24 °C
Air Pressure: 998–1029 hPa
Humidity: 32–36 %

Measurement up to 30 MHz

Op. Mode	Setup	Port
op-mode 2 (transmitter 1) op-mode 1 (transmitter 2)	Setup_01	Enclosure

Antenna Polarisation	Frequency MHz	Corrected value dBµV/m		Limit dBµV/m	Limit dBµV/m	Margin to limit dB	Margin to limit dB
		PK	AV	PK	AV	PK	AV
0°	-	-	–	–	–	–	–
90°	–	–	–	–	–	–	–

Remark: No (further) spurious emissions in the range 20 dB below the limit found therefore step 2 was not performed. A peak at 99.2 kHz is an emission from the loop antenna's power supply.

Measurement above 30 MHz

Op. Mode	Setup	Port
op-mode 1 (transmitter 1) op-mode 2 (transmitter 2)	Setup_01	Enclosure

Polari-sation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin to limit dB	Margin to limit dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Hor. + Vert.	125	42.6	-	-	43.5	-	-	0.9	-
	1125	–	45.1	35.6	–	74.0	54.0	28.9	18.4
	1500	–	46.6	37.8	–	74.0	54.0	27.4	16.2
	2369	–	52.2	43.2	–	74.0	54.0	21.8	10.8
	4877	–	4.1	36.3	–	74.0	54.0	29.9	17.7

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Op. Mode	Setup	Port
op-mode 2 (transmitter 1) op-mode 3 (transmitter 2)	Setup_01	Enclosure

Polari-sation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin to limit dB	Margin to limit dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Hor. + Vert.	113	33.5	-	-	43.5	-	-	10.0	-
	125	42.5	-	-	43.5	-	-	1.0	-
	138	35.9	-	-	43.5	-	-	7.6	-
	248	36.2	-	-	46.0	-	-	9.8	-
	1125	–	46.5	37.7	–	74.0	54.0	27.5	16.3
	1500	–	45.9	37.8	–	74.0	54.0	28.1	16.2
	2439	–	52.9	41.7	–	74.0	54.0	21.1	12.3
	4957	–	46.0	38.7	–	74.0	54.0	28.0	15.3

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Op. Mode	Setup	Port
op-mode 3 (transmitter 1) op-mode 1 (transmitter 2)	Setup_01	Enclosure

Polari-sation	Frequency MHz	Corrected value dBµV/m			Limit dBµV /m	Limit dBµV /m	Limit dBµV /m	Margin to limit dB	Margin to limit dB
		QP	PK	AV	QP	PK	AV	QP/PK	AV
Hor. + Vert.	125	40.0	-	-	43.5	-	-	3.5	-
	1125	–	46.5	36.8	–	74.0	54.0	27.5	17.2
	1500	–	44.8	35.4	–	74.0	54.0	29.2	18.6
	2484	–	57.0	45.2	–	74.0	54.0	17.0	8.8
	2478	–	43.5	35.9	–	74.0	54.0	30.5	18.1

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

Test result: Spurious radiated emissions

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed

Band edge compliance

Standard FCC Part 15, 10-1-11 Subpart C

The test was performed according to: ANSI C63.4–2009, FCC §15.31

Test Description

The procedure to show compliance with the band edge requirement is divided into two measurements:
1. Show compliance of the lower and higher band edge by a conducted measurement

For the conducted measurement, the Equipment Under Test (EUT) is placed in a shielded room. The EUT is set to transmit on the lowest channel. The lower band edge is 2400 MHz and the EUT is set to transmit on the highest channel. The higher band edge is 2483.5 MHz.
Analyzer settings for conducted measurement:
- Detector: Peak
- RBW / VBW = 100 / 300 kHz

2. Show compliance of the higher band edge falls in to restricted bands by a radiated measurement.
The radiated emissions measurements are performed in a typical installation configuration inside the fully anechoic chamber using a horn antenna at 1 m distance.
EMI receiver settings for radiated measurement:
- Detector: Peak, Average
- IF Bandwidth = 1 MHz

Test Requirements / Limits

FCC Part 15.247 (d)
"In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. ...
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c))."

For the conducted measurement the RF power at the band edge shall be "at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power..."

For the radiated measurement of the higher band edge connected to a restricted band the limit is "specified in Section 15.209(a)".

Test Protocol

Lower band edge

Conducted measurement

Temperature: 22 °C
Air Pressure: 997 hPa
Humidity: 38 %

Op. Mode	Setup	Port
op-mode 1	Setup_02	Temp.ant.connector, Connector 1

Frequency MHz	Measured value dBm	Reference value dBm	Limit dBm	Margin to limit dB
2400.00	–34.04	0.53	–19.47	14.6

Remark: None.

Op. Mode	Setup	Port
op-mode 1	Setup_02	Temp.ant.connector, Connector 2

Frequency MHz	Measured value dBm	Reference value dBm	Limit dBm	Margin to limit dB
2400.00	–32.53	0.97	–19.03	13.5

Remark: None.

Higher band edge

Conducted measurement

Temperature: 22 °C
Air Pressure: 997 hPa
Humidity: 38 %

Op. Mode	Setup	Port
op-mode 3	Setup_02	Temp.ant.connector, Connector 1

Frequency MHz	Measured value dBm	Reference value dBm	Limit dBm	Margin to limit dB
2483.50	–46.13	–0.99	–20.99	25.1

Remark: None.

Op. Mode	Setup	Port
op-mode 3	Setup_02	Temp.ant.connector, Connector 2

Frequency MHz	Measured value dBm	Reference value dBm	Limit dBm	Margin to limit dB
2483.50	–45.55	–0.47	–20.47	25.1

Remark: None.

Radiated measurement

Temperature: 24 °C
Air Pressure: 1029 hPa
Humidity: 32 %

Op. Mode	Setup	Port
op-mode 3 (transmitter 1) op-mode 1 (transmitter 2)	Setup_01	Enclosure

Frequency MHz	Polari-sation	Corrected value dBµV/m		Limit dBµV/m	Limit dBµV/m	Margin to limit dB	Margin to limit dB
		PK	AV	PK	AV	PK	AV
2483.50	Hor. + Vert.	57.0	45.2	74.0	54.0	17.0	8.8

Remark: Please see annex for the measurement plot.

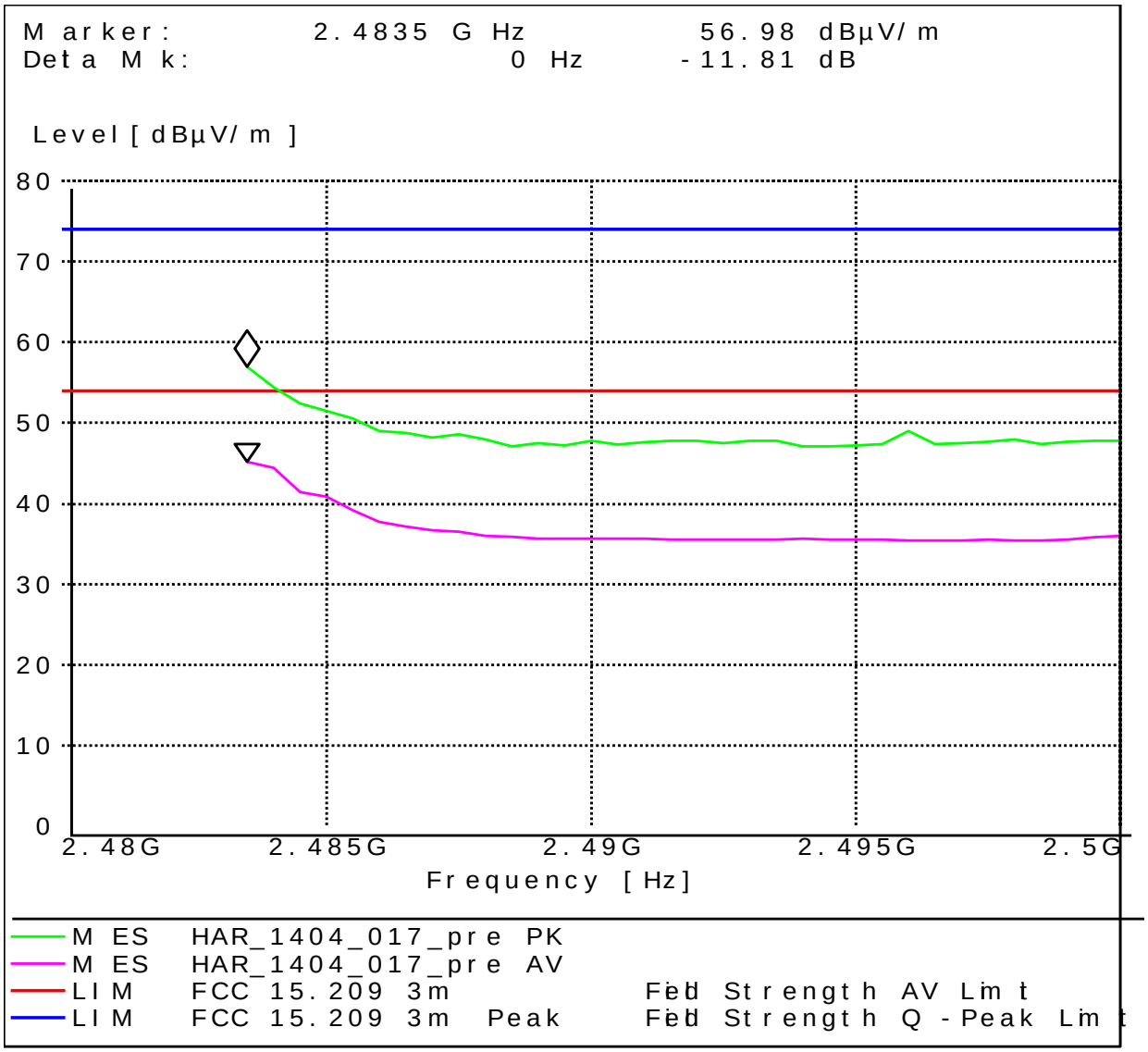
Op. Mode	Setup	Port
op-mode 2 (transmitter 1) op-mode 3 (transmitter 2)	Setup_01	Enclosure

Frequency MHz	Polari-sation	Corrected value dBµV/m		Limit dBµV/m	Limit dBµV/m	Margin to limit dB	Margin to limit dB
		PK	AV	PK	AV	PK	AV
2483.50	Hor. + Vert.	52.9	41.7	74.0	54.0	21.1	12.3

Test result: Band edge compliance

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 3	passed

Measurement Plot (showing the highest value, "worst case")



Power density

Standard FCC Part 15, 10-1-11 Subpart C

The test was performed according to: FCC §15.31

Test Description

The EUT was connected to spectrum analyzer via a short coax cable with a known loss.
Analyzer settings:
- Detector: Peak-Maxhold
- Resolution Bandwidth (RBW): 3 kHz
- Video Bandwidth (VBW): 30 kHz
- Sweep Time: Coupled

Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (e)

For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
…
The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Protocol

Temperature: 22 °C
Air Pressure: 997 hPa
Humidity: 38 %

Op. Mode	Setup	Port
op-mode 1	Setup_02	Temp.ant.connector

Power density dBm/3 kHz	Remarks
–13.1	Connector 1 (next to HDMI port)
–11.1	Connector 2 (next to USB port)

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 2	Setup_02	Temp.ant.connector

Power density dBm/3 kHz	Remarks
–12.9	Connector 1 (next to HDMI port)
–11.2	Connector 2 (next to USB port)

Remark: Please see annex for the measurement plot.

Op. Mode	Setup	Port
op-mode 3	Setup_02	Temp.ant.connector

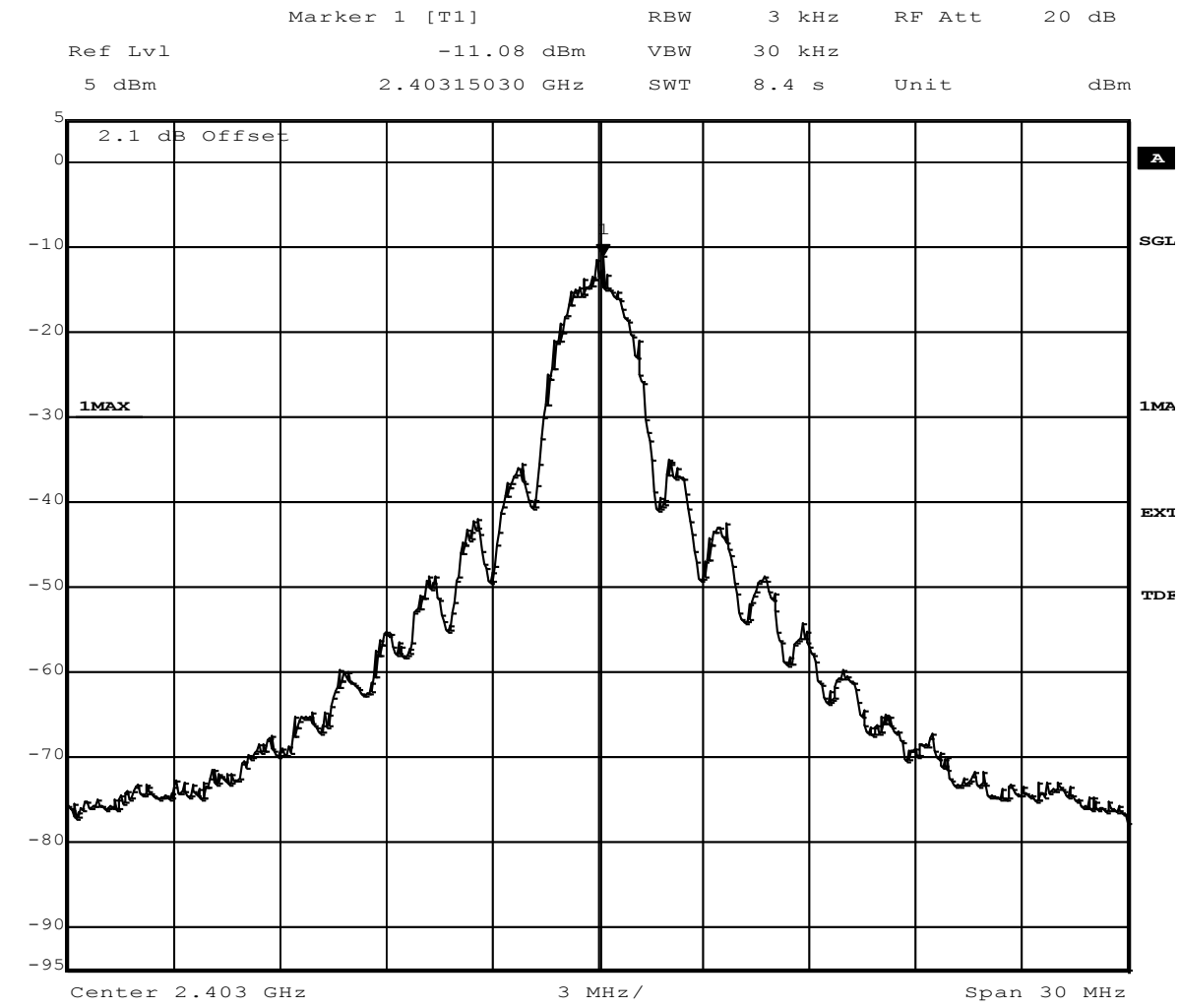
Power density dBm/3 kHz	Remarks
–13.9	Connector 1 (next to HDMI port)
–13.8	Connector 2 (next to USB port)

Remark: Please see annex for the measurement plot.

Test result: Power density

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed

Measurement Plot (showing the highest value, "worst case")



Title: Power Density
Comment A: CH B: 2403 MHz;
Date: 17.SEP.2014 15:19:28

Test Equipment

1 Test Equipment Details

1.1 List of Used Test Equipment

The calibration, hardware and software states are shown for the testing period.

Test Equipment Anechoic Chamber

Lab ID:	**Lab 3**	
Manufacturer:	Frankonia	
Description:	Anechoic Chamber for radiated testing	
Type:	10.58x6.38x6.00 m³	
	NSA (FCC)	2014/01/09

Single Devices for Anechoic Chamber

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Air compressor	none	-	Atlas Copco
Anechoic Chamber	10.58 x 6.38 x 6.00 m³ FCC listing 96716 3m Part15/18	none	Frankonia 2014/01/09
Controller Maturo	MCU	961208	Maturo GmbH
EMC camera	CE-CAM/1	-	CE-SYS
EMC camera Nr.2	CCD-400E	0005033	Mitsubishi
Filter ISDN	B84312-C110-E1		Siemens&Matsushita
Filter Universal 1A	BB4312-C30-H3	-	Siemens&Matsushita

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID:	**Lab 3**
Description:	Equipment for emission measurements
Serial Number:	see single devices

Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Antenna mast	AM 4.0	AM4.0/180/11920513	Maturo GmbH
Antenna mast	AS 620 P	620/37	HD GmbH
Biconical Broadband Antenna	SBA 9119	9119-005	Schwarzbeck
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck
	Calibration Details		*Last Execution*
	Standard Calibration		2012/01/18
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2+W38.01-2	Kabel Kusch
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02-2+W38.02-2	Rosenberger Micro-Coax
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution*

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
	Standard Calibration		2012/05/18
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution*
	Standard Calibration		2012/06/26
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright
Horn Antenna Schwarzbeck 15-26 GHz BBHA 9170	BBHA 9170		
Log.-per. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution*
	Standard Calibration		2012/12/18
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution*
	Standard calibration		2011/10/27
Pyramidal Horn Antenna 26,5 GHz	3160-09	00083069	EMCO Elektronik GmbH
Pyramidal Horn Antenna 40 GHz	3160-10	00086675	EMCO Elektronik GmbH
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5-10kg/024/3790709	Maturo GmbH

Test Equipment Auxiliary Test Equipment

Lab ID:	**Lab 3, Lab 4**
Manufacturer:	see single devices
Description:	Single Devices for various Test Equipment
Type:	various
Serial Number:	none

Single Devices for Auxiliary Test Equipment

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Broadband Power Divider N (Aux)	1506A / 93459	LM390	Weinschel Associates
Broadband Power Divider SMA	WA1515	A855	Weinschel Associates
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.
	Calibration Details		*Last Execution*
	Customized calibration		2013/12/04
Fibre optic link Satellite (Aux)	FO RS232 Link	181-018	Pontis
Fibre optic link Transceiver (Aux)	FO RS232 Link	182-018	Pontis
Isolating Transformer	LTS 604	1888	Thalheimer Transformatorenwerke GmbH
Notch Filter Ultra Stable (Aux)	WRCA800/960-6EEK	24	Wainwright
Signal Analyzer	FSV30	103005	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution*
	Standard		2014/02/10
Spectrum Analyser	FSP3	836722/011	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution*
	Standard		2012/06/13
Spectrum Analyser	FSU26	200418	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2014/07/29
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG

Test Equipment Digital Signalling Devices

Lab ID: **Lab 3, Lab 4**
Description: Signalling equipment for various wireless technologies.

Single Devices for Digital Signalling Devices

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Bluetooth Signalling Unit CBT	CBT	100589	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution*
	Standard calibration		2011/11/24
CMW500	CMW500	107500	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2014/01/27
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution*
	Standard calibration		2011/11/28
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz GmbH & Co. KG
	HW/SW Status		*Date of Start* *Date of End*
	Hardware: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B56V14, B68 3v04, PCMCIA, U65V04 Software: K21 4v21, K22 4v21, K23 4v21, K24 4v21, K42 4v21, K43 4v21, K53 4v21, K56 4v22, K57 4v22, K58 4v22, K59 4v22, K61 4v22, K62 4v22, K63 4v22, K64 4v22, K65 4v22, K66 4v22, K67 4v22, K68 4v22, K69 4v22 Firmware: µP1 8v50 02.05.06 ---		2007/07/16
Universal Radio Communication Tester	CMU 200	837983/052	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution*
	Standard calibration		2011/12/07
	HW/SW Status		*Date of Start* *Date of End*
	HW options: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02 SW options: K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10, K28 4v10, K42 4v11, K43 4v11, K53 4v10, K65 4v10, K66 4v10, K68 4v10, Firmware: µP1 8v40 01.12.05 ---		2007/01/02
	SW: K62, K69		2008/11/03
Vector Signal Generator	SMU200A	100912	Rohde & Schwarz GmbH & Co. KG

Test Equipment Emission measurement devices

Lab ID:	**Lab 3**
Description:	Equipment for emission measurements
Serial Number:	see single devices

Single Devices for Emission measurement devices

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Personal Computer	Dell	30304832059	Dell
Power Meter	NRVD	828110/016	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2014/05/13
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2014/05/13
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG
	Standard Calibration		2014/01/07
	HW/SW Status		*Date of Start* *Date of End*
	Firmware-Update 4.34.4 from 3.45 during calibration		2009/12/03

Test Equipment Multimeter 12

Lab ID:	**Lab 5**
Description:	Ex-Tech 520
Serial Number:	05157876

Single Devices for Multimeter 12

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Digital Multimeter 12 (Multimeter)	EX520	05157876	Extech Instruments Corp.
	Calibration Details		*Last Execution*
	Customized calibration		2013/12/04

Test Equipment Radio Lab Test Equipment

Lab ID: **Lab 4**
Description: Radio Lab Test Equipment

Single Devices for Radio Lab Test Equipment

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Broadband Power Divider SMA	WA1515	A856	Weinschel Associates
Coax Attenuator 10dB SMA 2W	4T-10	F9401	Weinschel Associates
Coax Attenuator 10dB SMA 2W	56-10	W3702	Weinschel Associates
Coax Attenuator 10dB SMA 2W	56-10	W3711	Weinschel Associates
Coax Cable Huber&Suhner	Sucotest 2,0m		Huber&Suhner
Coax Cable Rosenberger Micro Coax FA210A0010003030 SMA/SMA 1,0m	FA210A0010003030	54491-2	Rosenberger Micro-Coax
Power Meter	NRVD	828110/016	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2014/05/13
RF Step Attenuator RSP	RSP	833695/001	Rohde & Schwarz GmbH & Co.KG
Rubidium Frequency Standard	Datum, Model: MFS	5489/001	Datum-Beverly
	Standard calibration		2014/07/03
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2014/05/13
Signal Generator SME	SME03	827460/016	Rohde & Schwarz GmbH & Co.KG
	Calibration Details		*Last Execution*
	Standard calibration		2011/11/25
Signal Generator SMP	SMP02	836402/008	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution*
	Standard calibration		2013/05/06
Spectrum Analyser	FSIQ26	840061/005	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution*
	Standard Calibration		2013/02/12

Test Equipment Regulatory Bluetooth RF Test Solution

Lab ID:	**Lab 5**
Description:	Regulatory Bluetooth RF Tests
Type:	Bluetooth RF
Serial Number:	001

Single Devices for Regulatory Bluetooth RF Test Solution

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
ADU 200 Relay Box 7	Relay Box	A04380	Ontrak Control Systems Inc.
Bluetooth Signalling Unit CBT	CBT	100302	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2014/08/29
Power Meter NRVD	NRVD	832025/059	
	Standard calibration		2014/08/29
Power Sensor NRV Z1 A	PROBE	832279/013	
	Standard calibration		2014/08/28
Power Supply	NGSM 32/10	2725	
	Standard calibration		2013/06/20
Rubidium Frequency Normal MFS	Datum MFS	002	Datum GmbH
Signal Analyser FSIQ26	1119.6001.26	832695/007	Rohde & Schwarz GmbH & Co.KG
Vector Signal Generator SMIQ03B	SMIQ03B	832870/017	
	Standard calibration		2013/06/21

Test Equipment Shielded Room 07

Lab ID:	**Lab 5**
Description:	Shielded Room 4m x 6m

Test Equipment T/A Logger 13

Lab ID:	**Lab 3, Lab 4**
Description:	Lufft Opus10 TPR
Type:	Opus10 TPR
Serial Number:	13936

Single Devices for T/A Logger 13

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
ThermoAirpressure Datalogger 13 (Environ)	Opus10 TPR (8253.00)	13936	Lufft Mess- und Regeltechnik GmbH
	Calibration Details		*Last Execution*
	Customized calibration		2013/02/07

Test Equipment T/H Logger 03

Lab ID:	**Lab 4**
Description:	Lufft Opus10
Serial Number:	7482

Single Devices for T/H Logger 03

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
ThermoHygro Datalogger 03 (Environ)	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH
	Calibration Details		*Last Execution*
	Customized calibration		2013/02/07

Test Equipment T/H Logger 12

Lab ID:	**Lab 3**
Description:	Lufft Opus10
Serial Number:	12482

Single Devices for T/H Logger 12

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
ThermoHygro Datalogger 12 (Environ)	Opus10 THI (8152.00)	12482	Lufft Mess- und Regeltechnik GmbH
	Calibration Details		*Last Execution*
	Customized calibration		2013/01/07

Test Equipment T/H Logger 15

Lab ID:	**Lab 5**
Description:	Lufft Opus10
Serial Number:	13985

Single Devices for T/H Logger 15

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
ThermoHygro Datalogger 15 (Environ)	Opus10 THI (8152.00)	13985	Lufft Mess- und Regeltechnik GmbH
	Calibration Details		*Last Execution*
	Customized calibration		2013/01/07

Test Equipment Temperature Chamber 01

Lab ID:	**Lab 5**
Manufacturer:	see single devices
Description:	Temperature Chamber KWP 120/70
Type:	Weiss
Serial Number:	see single devices

Single Devices for Temperature Chamber 01

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Temperature Chamber Weiss 01	KWP 120/70	59226012190010	Weiss Umwelttechnik GmbH
	Customized calibration		2014/03/12

Test Equipment Temperature Chamber 05

Lab ID:	**Lab 4**
Manufacturer:	see single devices
Description:	Temperature Chamber VT4002
Type:	Vötsch
Serial Number:	see single devices

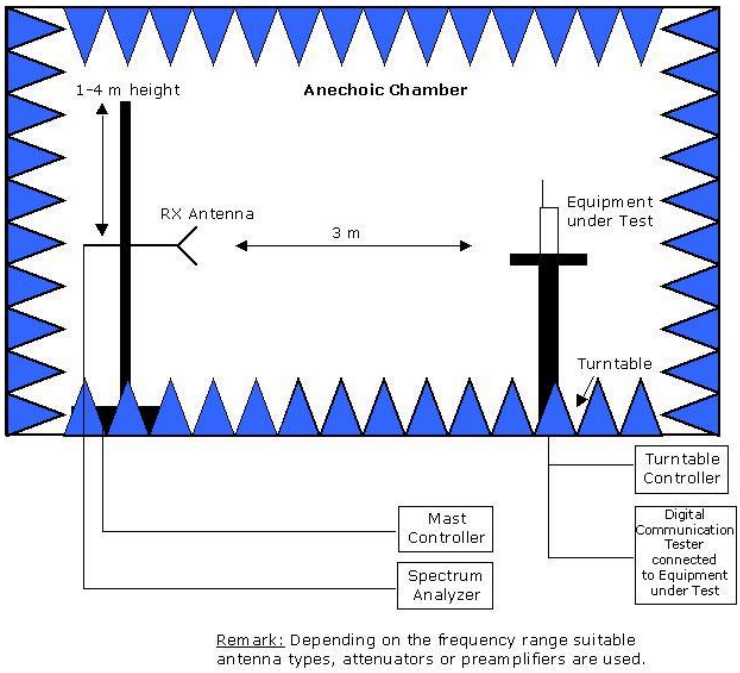
Single Devices for Temperature Chamber 05

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Temperature Chamber Vötsch 05	VT 4002	58566080550010	Vötsch
	Customized calibration		2014/03/11

Photo Report

Photos are included in an external report.

Setup Drawings



Drawing 1: Setup in the Anechoic chamber:
Measurements below 1 GHz: Semi-anechoic, conducting ground plane.
Measurements above 1 GHz: Fully-anechoic, absorbers on all surfaces.

FCC and IC Correlation of measurement requirements

The following tables show the correlation of measurement requirements for WLAN equipment and Digital Apparatus from FCC and IC standards.

WLAN equipment

Measurement	FCC reference	IC reference
Conducted emissions on AC mains	§ 15.207	RSS-Gen: 7.2.4
Occupied bandwidth	§ 15.247 (a) (1)	RSS-210: A8.1
Peak power output	§ 15.247 (b) (1)	RSS-210: A8.4
Spurious RF conducted emissions	§ 15.247 (d)	RSS-Gen: 6; RSS-210: A8.5
Spurious radiated emissions	§ 15.247 (d)	RSS-Gen: 6; RSS-210: A8.5
Band edge compliance	§ 15.247 (d)	RSS-210: A8.5
Power density	§ 15.247 (e)	RSS-210: A8.2 (b)
Antenna requirement	§ 15.203 / 15.204	RSS-Gen: 7.1.2

Digital Apparatus

Measurement	FCC reference	IC reference
Conducted Emissions (AC Power Line)	§ 15.107	ICES-003
Spurious Radiated Emissions	§ 15.109	ICES-003