PHOENIX TESTLAB
Königswinkel 10
32825 Blomberg
Germany
Phone: +49 (0) 52 35 95 00-0
Fax: +49 (0) 52 35 95 00-10

Test Report

Report Number: F111592E3

Applicant:

connectBlue AB

Manufacturer:

connectBlue AB

Equipment under Test (EUT):

cB-0946

Laboratory (CAB) accredited by
Deutsche Gesellschaft für Akkreditierung mbH
in compliance with DIN EN ISO/IEC 17025
under the Reg. No. DGA-PL-105/99-22,
FCC Test site registration number 90877 and
Industry Canada Test site registration IC3469A-1

REFERENCES

[1] **ANSI C63.4-2009** American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

[2] **FCC CFR 47 Part 15 (October 2009)** Radio Frequency Devices

[3] **Publication Number 558074 (March 2005)** Measurement of Digital Transmission Systems Operating under Section 15.247

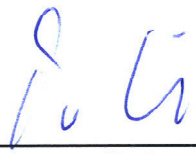
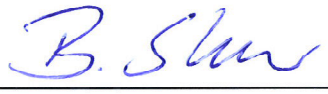
[4] **RSS-210 Issue 8 (December 2010)** Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

[5] **RSS-Gen Issue 3 (December 2010)** General Requirements and Information for the Certification of Radiocommunication Equipment

[6] **Publication Number 913591 (March 2007)** Measurement of radiated emissions at the edge of the band for a Part 15 RF Device

TEST RESULT

The requirements of the tests performed as shown in the overview (clause 3) were fulfilled by the equipment under test.
The complete test results are presented in the following.

Test engineer:	Thomas KÜHN		27 June 2011
	Name	Signature	Date
Authorized reviewer:	Bernd STEINER		27 June 2011
	Name	Signature	Date

RESERVATION

This test report is only valid in its original form.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

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1 IDENTIFICATION

1.1 Applicant

Name:	connectBlue AB
Address:	Norra Vallgatan 64 3V Malmö SE-211 19
Country:	Sweden
Name for contact purposes:	Mr. Martin Engdahl
Phone:	+ 46 40 63 07 100
Fax:	+ 46 40 23 71 37
eMail Address:	martin.engdahl@connectblue.se
Applicant represented during the test by the following person:	-

1.2 Manufacturer

Name:	connectBlue AB
Address:	Norra Vallgatan 64 3V Malmö SE-211 19
Country:	Sweden
Name for contact purposes:	Mr. Martin Engdahl
Phone:	+ 46 40 63 07 100
Fax:	+ 46 40 23 71 37
eMail Address:	martin.engdahl@connectblue.se
Applicant represented during the test by the following person:	-

1.3 Test laboratory

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

accredited by DGA Deutsche Gesellschaft für Akkreditierung mbH in compliance with DIN EN ISO/IEC 17025 under Reg. No. DGA-PL-105/99-22, FCC Test site registration number 90877 and Industry Canada Test site registration IC3469A-1.

1.4 EUT (Equipment Under Test)

Test object: *	**Bluetooth module**
Type: *	cB-0946
FCC ID: *	**PVH0946**
IC: *	**5325A-0946**
Serial number: *	None
PCB identifier: *	cB-0946-A1 and cB-0946-B1
Hardware version: *	1.0
Software version: *	1.0

1.5 Technical data of equipment

Channel 1	RX:	2402 MHz	TX:	2402 MHz
Channel 39	RX:	2441 MHz	TX:	2441 MHz
Channel 79	RX:	2480 MHz	TX:	2480 MHz

Fulfills Bluetooth specification: *	3.0 with EDR (class 1) and 4.0 (BLE)					
Adaptive frequency hopping: *	Yes					
Antenna type: *	Integral and external (refer table below)					
Antenna gain: *	Refer table below					
Antenna connector: *	With internal antenna, no antenna connector is mounted. For external antennas a Hirose U.FL connector is used					
Power supply: *	U_{nom}=	3.3 V DC	U_{min}=	3.0 V DC	U_{max}=	6.0 V DC
Type of modulation: *	FHSS: GFSK (1 Mbps and BLE), π/4-DPQSK (2 Mbps) or 8DPSK (3 Mbps)					
Operating frequency range:*	2402 MHz to 2480 MHz					
Number of channels: *	79 / 40					
Temperature range: *	-40 °C to +85 °C					
Lowest / highest Internal clock frequency: *	32.768 kHz / 72.00 MHz					

* declared by the applicant.

The following external I/O cables were used:

Identification	Connector		Length
	EUT	Ancillary	
DC in (carrier board)	6.3 mm jack plug	-	2 m *
-	-	-	-

*: Length during the test if no other specified.

Used antennas:

Antenna name	Manufacturer	Antenna Type	Cable length / connector	Gain [dBi] *
FR05-01-N-0-102	Fractus	Internal	-	1.0
FR05-S1-N-0-104	Fractus	Internal	-	0
SOA 2400/360/3/20/V	Huber+Suhner	Monopole	1.5 m cable to SMA	3
SOA 2400/360/3/20/V	Huber+Suhner	Monopole	1.5 m cable to SMA + 4 m cable to MCX	0 (incl. cable)
SOA 2400/360/3/20/V	Huber+Suhner	Monopole	1.5 m cable to MCX	3
FlatWhip-2400 (RPSMA)	ProAnt	Monopole	RPSMA connector	3
Outside-2400	ProAnt	Monopole	U.FL/10 cm cable and U.FL/25 cm cable	3
Ex-IT 2400 RP-SMA 28-001	ProAnt	Monopole	RPSMA connector	3
Ex-IT 2400 RP-SMA 70-002	ProAnt	Monopole	RPSMA connector	3
Ex-IT 2400 RP-SMA 70-001	ProAnt	Monopole	RPSMA connector	3
Ex-IT 2400 MHF 70-001	ProAnt	Monopole	10 cm cable with U.FL connector	3
WCR2400-SMRP	Laird Technologies **	Monopole	RPSMA connector	2
WCR2400-IP04 WCR2400-IP10	Laird Technologies **	Monopole	RPSMA connector and cable to U.FL with cable length 10 cm and 25 cm	2
R380.500.139	Radiall	Monopole	RPSMA connector	2
IHF-242	Joymax	Monopole	Cable to MCX and IPC (U.FL) connector	2
Ex-IT 2400 MHF 28	ProAnt	Monopole	10 cm cable with U.FL connector	2
SOA 2400/360/6/0/V	Huber+Suhner	Monopole	4 m cable to MCX	1.1 (incl. cable)
PSTG0-2400HS (RPSMA)	Mobile Mark	Monopole	RPSMA connector	0
SPA 2400/75/8/0/V	Huber+Suhner	Patch	SMA, 4 m cable to MCX	3.4 (incl. cable)
SPA 2400/70/9/0/RCP	Huber+Suhner	Patch	SMA, 4 m cable to MCX	3.4 (incl. cable)
InSide-2400	ProAnt	Patch	Cable to U.FL 10 cm	3
NanoBlue-IP04	Laird Technologies **	Patch	Cable to U.FL 10 cm	2
PlanTec m70cxr (RPSMA)	REEL	Patch	Cable to RPSMA connector, cable length 20 cm, 100 cm and 300 cm	1
OnBoard 2400 CP (TwinGain-2400 antenna on cB-0924 PCB) In this report called EPA antenna	ProAnt	Patch	U.FL	3

*: declared by the applicant
**: previous Centurion

1.6 Dates

Date of receipt of test sample:	16 May 2011
Start of test:	16 May 2011
End of test:	22 June 2011

2 OPERATIONAL STATES

The EUT is intended to be used in several Bluetooth applications. Because the cB-0946 is a module, which will be implemented in a final application, it was mounted on a carrier board to connect the power supply and change the operation modes of the EUT from a Laptop with test software. As pretests have shown there was no measurable difference between the version with pin list connector or without pin list connector. Therefore all measurements were carried out with the version with pin list connector.

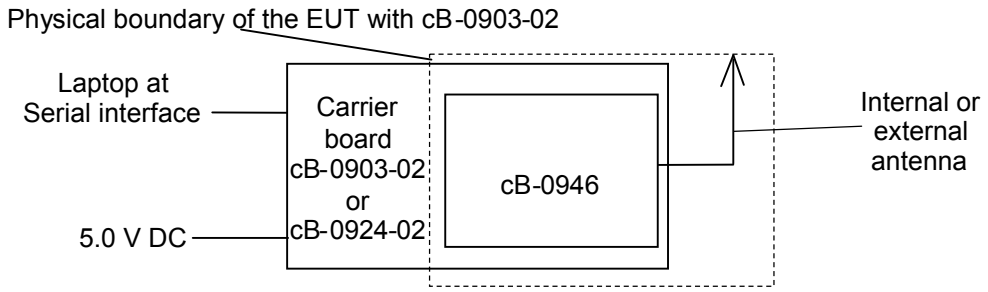
The tests were carried out with unmodified samples with an internal antenna (cB-0946-A1-01 and cB-0946-A1-03, samples marked with “62” and “54” for TX and RX tests and unmodified sample with an antenna connector (cB-0946-A1-02, sample marked with “59” for TX and RX.

During the tests the test sample was powered with 3.3 V DC via the carrier board cB-0903-02 or cB-0924-02. The cB-0924-02 also contains the EPA antenna (OnBoard 2400 CP).

For selecting an operation mode, a personal computer with a software delivered by the applicant was connected to the carrier board. After adjusting the operating mode, the personal computer was removed. To do this the test-engineer was instructed by the applicant.

The following operation modes were used during the tests in Bluetooth Low Energy (BLE) mode:

Operation mode	Description of the operation mode	Modulation	Data rate / Mbps
6	Continuous transmitting on 2402 MHz	GFSK	1
7	Continuous transmitting on 2440 MHz	GFSK	1
8	Continuous transmitting on 2480 MHz	GFSK	1
9	Transmitter hopping on all channels	GFSK	1
10	Continuous receiving on 2440 MHz		



Preliminary tests were performed in different data rates and different orthogonal directions, to find worst-case configuration and position. The data rate shown in the table below shows the found worst-case rate with respect to specific test item. The following table shows a list of the test modes used for the results, documented in this report. The radiated emission measurement was carried out in the orthogonal direction that emits the highest spurious emission levels.

The 3 orthogonal axes were defined as Pos.1 EUT lying flat, Pos.2 EUT standing vertical on the shorter side (of the carrier board) and Pos 3 EUT standing vertical on the longer side (of the carrier board).

The following test modes were adjusted during the tests:

Test items	Operation mode
6 dB bandwidth	6, 7, 8
Maximum peak output power	6, 7, 8
Power spectral density	6, 7, 8
Band edge compliance	6, 8, 9
Radiated emissions (transmitter)	6, 7, 8
Conducted emissions on supply line	9
Radiated emissions (receiver)	10

The results of the EUT operates in Bluetooth mode (with and without EDR) were documented in a separate test report.

3 ADDITIONAL INFORMATION

As declared by the applicant the EUT is available in different Variants. For this variants the model name is extended as described below:

cB-0946-A1-01 Module with SMD Fractus antenna FR05-S1-N-0-102.
cB-0946-A1-02 Module with external antenna connector.
cB-0946-A1-03 Module with SMD Fractus antenna FR05-S1-N-0-104.

The module is also available with a mounted JST connector (refer also pictures in Annex B of this test report). As declared by the applicant the versions with this connector will be not handled with a version number.

Bluetooth Low Energy (BLE) fulfils not the requirements for a FCC CFR 47 Part 15.247 FHSS equipment, because in some cases less than 15 hopping channels were used. Due to this fact EUTs operating in this mode were classified as FCC CFR 47 Part 15.247 DTS equipment. The results of the EUT operates in Bluetooth mode (with and without Enhanced Data Rate (EDR)) will be documented in a separate test report. Object of this test report is the Bluetooth Low Energy (BLE) mode of the EUT only.

4 OVERVIEW

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	RSS 210, Issue 8 [4] or RSS-Gen, Issue 3 [5]	Status	Refer page
6 dB bandwidth	General	15.247 (a) (2)	A8.2 (a) [4]	Passed	11 et seq.
Maximum peak output power	General	15.247 (b) (3), (4)	A8.4 (4) [4]	Passed	14 et seq.
Power spectral density	2400.0 - 2483.5	15.247 (e)	A8.2 (b) [4]	Passed	16 et seq.
Band edge compliance	2400.0 - 2483.5	15.247 (d)	A8.5 [4]	Passed	19 et seq.
Radiated emissions (transmitter)	0.009 - 25,000	15.205 (a) 15.209 (a)	7.2.2 [5], 2.5 [4]	Passed	36 et seq.
Conducted emissions on supply line	0.15 - 30	15.207 (a)	7.2.4 [5]	Passed	85 et seq.
Radiated emissions (receiver)	0.009 – 12,500	15.109 (a)	6.1 [5]	Passed	Annex D

5 TEST RESULTS

5.1 6 dB bandwidth

5.1.1 Method of measurement (6 dB bandwidth)

The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT has to be switched on, the transmitter shall work with its maximum data rate.

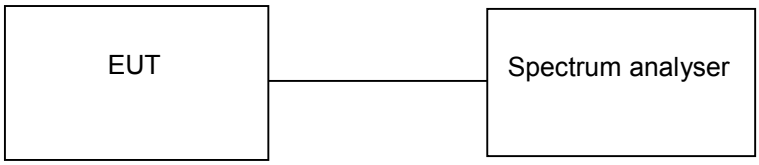
The following spectrum analyser settings shall be used:

- Span: App. 2 to 3 times the 6 dB bandwidth, centred on the actual channel.
- Resolution bandwidth: 100 kHz.
- Video bandwidth: 100 kHz.
- Sweep: Auto.
- Detector function: peak.
- Trace mode: Max hold.

After trace stabilisation the marker shall be set on the signal peak. The first display line has to be set on this value. The second display line has to be set 6 dB below the first line (or the peak marker). The frequency lines shall be set on the intersection points between the second display line and the measured curve.

The measurement will be performed at the upper, the lower end and the middle of the assigned frequency band.

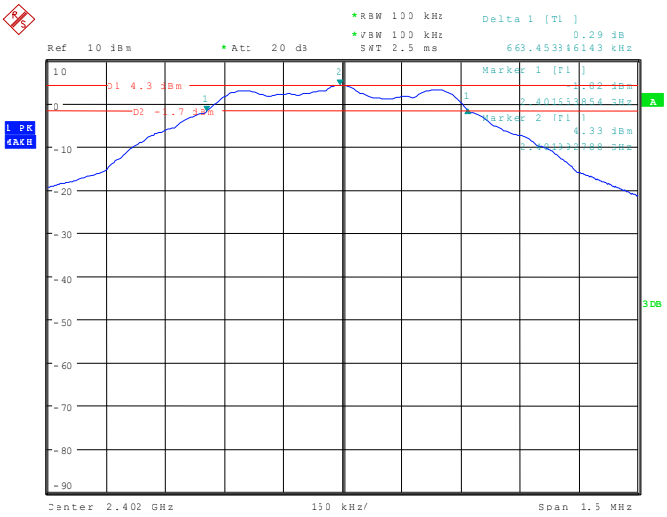
Test set-up:



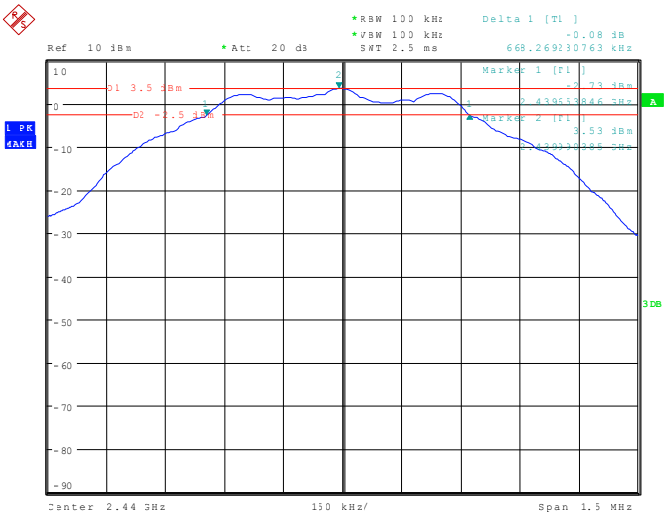
5.1.2 Test results (6 dB bandwidth)

Ambient temperature	21 °C	Relative humidity	60 %

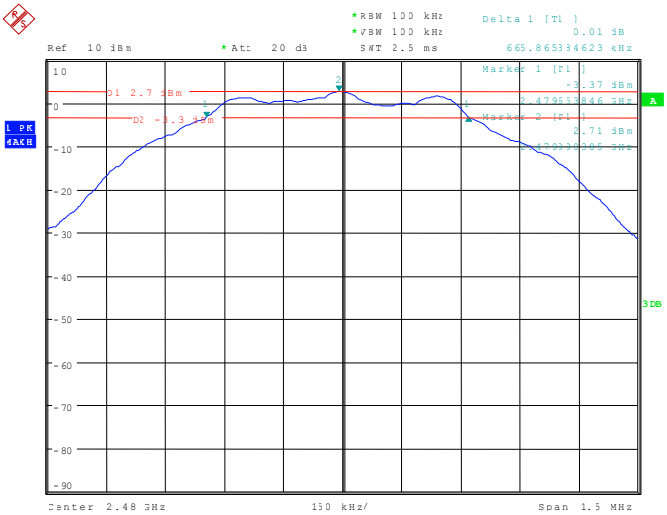
111592_310.wmf: 6 dB bandwidth at the lower end of the assigned frequency band:



111592_311.wmf: 6 dB bandwidth at the middle of the assigned frequency band:



111592_312.wmf: 6 dB bandwidth at the upper end of the assigned frequency band:



Operation mode 6 to 8			
Channel number	Channel frequency [MHz]	6 dB bandwidth [kHz]	Bandwidth limit [kHz]
1	2402	663.454	>500 kHz
19	2440	668.269	>500 kHz
39	2480	665.865	>500 kHz
Measurement uncertainty		$< \pm 1*10^{-7}$	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
30

5.2 Maximum peak output power

5.2.1 Method of measurement (maximum peak output power)

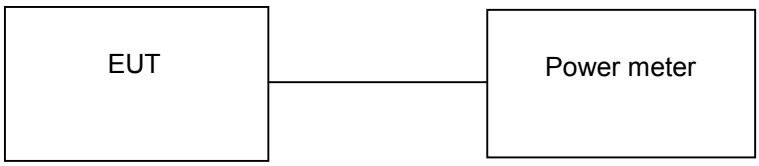
The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT has to be switched on.

The following power meter settings shall be used:

- Filter No. auto.
- Measuring time 0.136 s to 26 s.
- Used peak sensor NRV –Z32.

The measurement will be performed at the upper and lower end and the middle of the assigned frequency band.

Test set-up:



5.2.2 Test results (maximum peak output power)

Ambient temperature	21 °C	Relative humidity	60 %

Operation mode 6 to 8				
Channel number	Channel frequency [MHz]	Maximum peak output power [dBm]	Antenna gain [dBi]	Peak power limit [dBm]
0	2402	0.3	3.4	30.0
19	2440	-0.5	3.4	30.0
39	2480	-1.3	3.4	30.0
Measurement uncertainty			+0.66 dB / -0.72 dB	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
166, 167

5.3 Power spectral density

5.3.1 Method of measurement (power spectral density)

The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed.

The following spectrum analyser settings shall be used:

- Span: 1.5 MHz, centred at the maximum peak of the emission.
- Resolution bandwidth: 3 kHz.
- Video bandwidth: 30 kHz.
- Sweep: 500 s.
- Detector function: peak.
- Trace mode: Max hold.

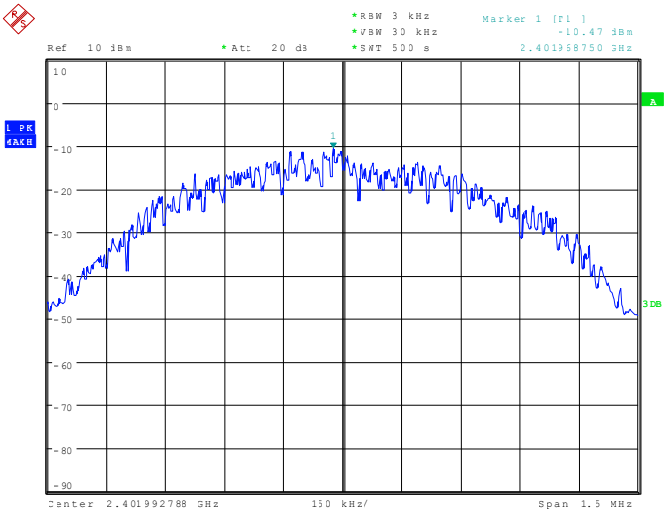
After trace stabilisation the marker shall be set on the signal peak. The indicated level is the power spectral density.

Test set-up:

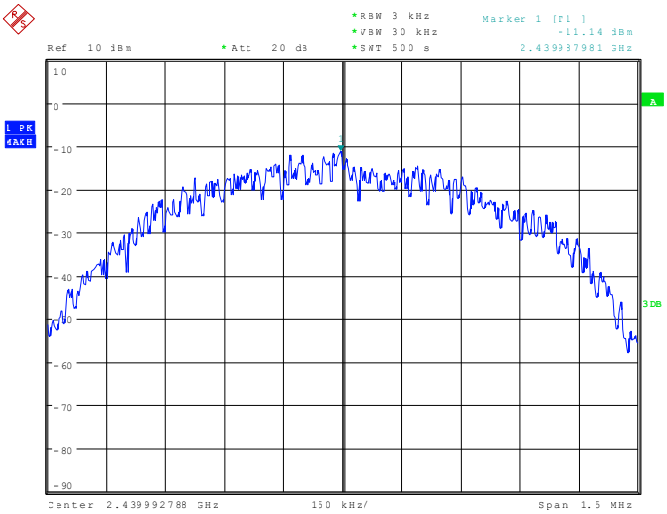
5.3.2 Test results (power spectral density)

Ambient temperature	21 °C	Relative humidity	60 %

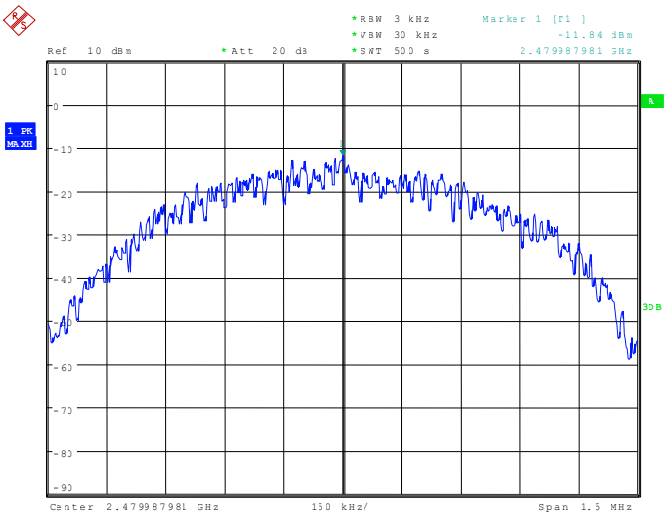
111592_315.wmf: Power spectral density at the lower end of the assigned frequency band:



111592_314.wmf: Power spectral density at the middle of the assigned frequency band:



111592_313.wmf: Power spectral density at the upper end of the assigned frequency band:



Operation mode 6 to 8				
Channel number	Channel frequency [MHz]	Power spectral density [dBm / 3 kHz]	Antenna gain [dBi]	Power spectral density limit [dBm / 3 kHz]
0	2402	-10.5	3.4	8.0
19	2440	-11.1	3.4	8.0
39	2480	-11.8	3.4	8.0
Measurement uncertainty			+1.1 dB / -1.5 dB	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
30

5.4 Band-edge compliance

5.4.1 Method of measurement (band-edge compliance (radiated))

The same test set-up as used for the final radiated emission measurement shall be used (refer also subclause 5.7.1 of this test report). The measurements shall be carried out with using a resolution bandwidth of 100 kHz.

The following spectrum analyser settings shall be used:

- Span: Wide enough to capture the peak level of the emission on the channel closest to the band-edge, as well as any modulation products, which fall outside the assigned frequency band.
- Resolution bandwidth: 100 kHz.
- Video bandwidth: ≥ the resolution bandwidth.
- Sweep: Auto.
- Detector function: Peak.
- Trace mode: Max hold.

After trace stabilisation the marker shall be set on the signal peak. The first display line has to be set on this value. The second display line has to be set 20 dB below the first line (or the peak marker). The frequency line shall be set on the edge of the assigned frequency band. 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. This frequency shall be measured with the EMI receiver as described in subclause 5.7.1 of this test report, but 100 kHz resolution bandwidth shall be used.

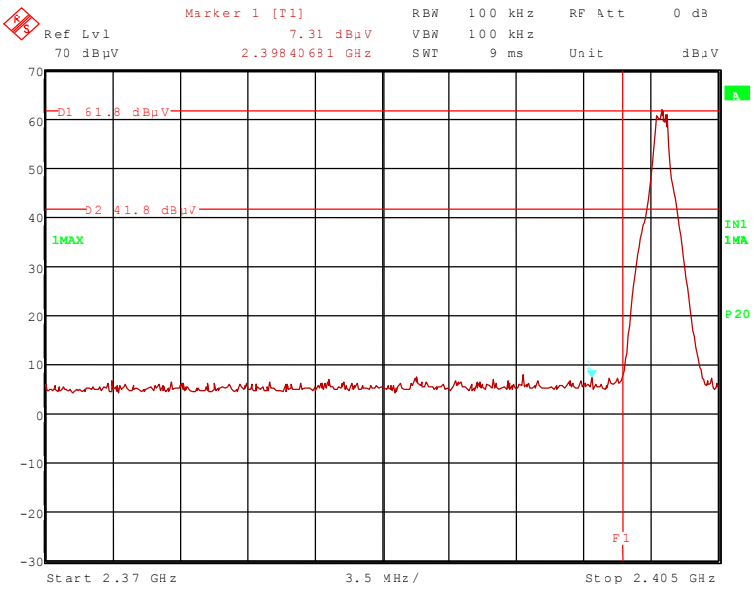
The measurement will be performed at the upper end of the assigned frequency band and with hopping on and off.

5.4.2 Test result (band-edge compliance (radiated)) with internal antenna

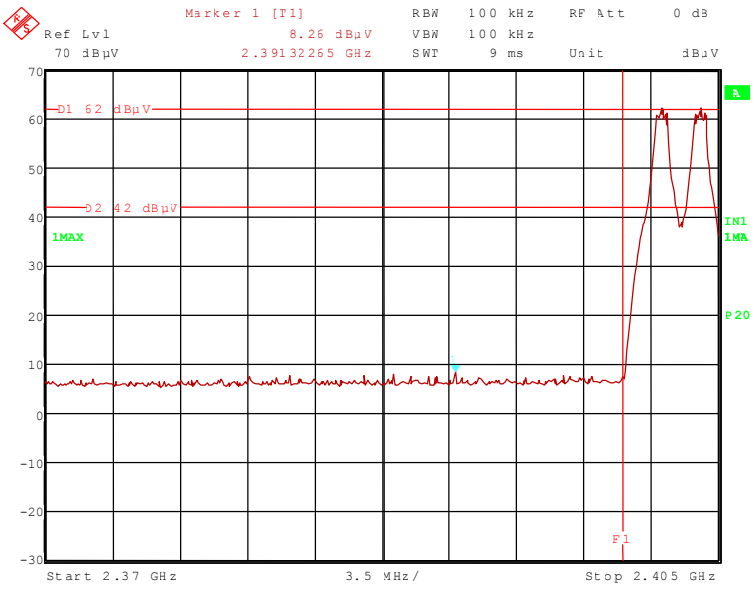
Ambient temperature	21 °C	Relative humidity	45 %

Remark: This measurement was carried out by using internal antenna type Fractus FR05-S1-N-0-102, because pre-tests have shown that this antenna causes the highest emissions of internal antennas in question.

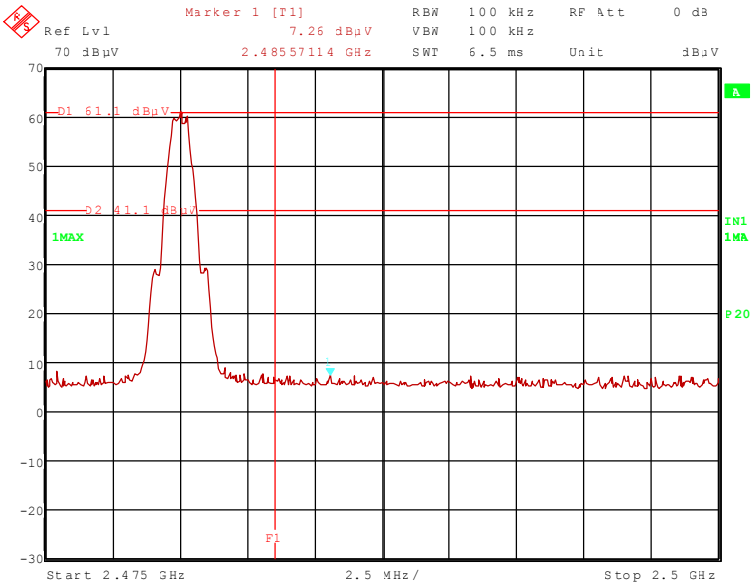
111592_85.wmf: Radiated band-edge compliance, lower band edge, hopping off (operation mode 6):



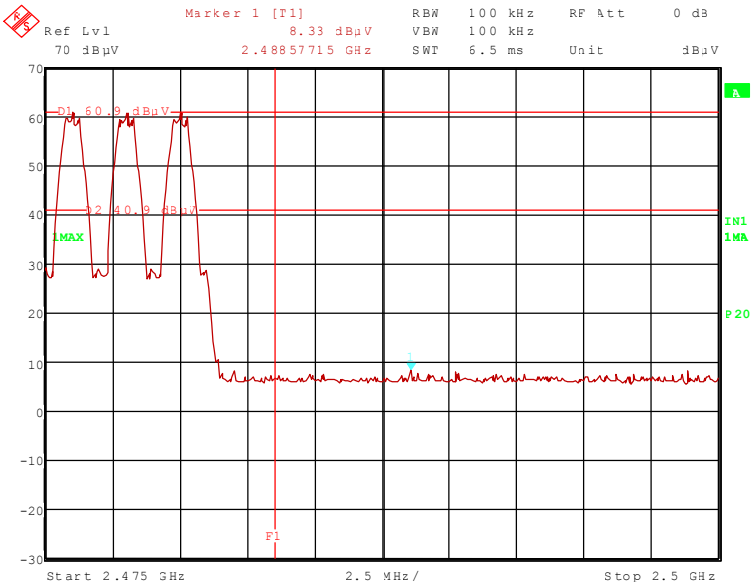
111592_137.wmf: Radiated band-edge compliance, lower band edge, hopping on (operation mode 9):



111592_82.wmf: Radiated band-edge compliance, upper band edge, hopping off (operation mode 8):



111592_136.wmf: Radiated band-edge compliance, upper band edge, hopping on (operation mode 9):



The plots on the page before are showing the radiated band-edge compliance for the upper band-edge, with and without hopping. The display line 1 (D1) in these plots represents the highest level within the assigned frequency band. The display line 2 (D2) represents the 20 dB offset to this highest level and shows the compliance with FCC 47 CFR Part 15.247 (d). The frequency line 1 (F1) shows the edge of the assigned frequency.

Band-edge compliance (lower band edge. hopping disenabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	94.1	-	-	62.1	28.3	0.0	3.7	150	Vert.	-
2.3985	39.3	74.1	34.8	7.3	28.3	0.0	3.7	150	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	89.1	-	-	57.1	28.3	0.0	3.7	150	Vert.	-
2.3985	26.3	69.1	42.8	-5.7	28.3	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (lower band edge. hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	94.1	-	-	62.1	28.3	0.0	3.7	150	Vert.	-
2.3914	40.2	74.1	33.9	8.2	28.3	0.0	3.7	100	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	89.1	-	-	57.1	28.3	0.0	3.7	150	Vert.	-
2.3914	26.0	69.1	43.1	-6.0	28.3	0.0	3.7	100	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (upper band edge. hopping disenabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	94.0	-	-	61.7	28.5	0.0	3.8	150	Vert.	-
2.4856	40.0	74.0	34.0	7.7	28.5	0.0	3.8	150	Vert.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	88.9	-	-	56.6	28.5	0.0	3.8	150	Vert.	-
2.4856	26.8	54.0	27.2	-5.5	28.5	0.0	3.8	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (upper band edge. hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	94.0	-	-	61.7	28.5	0.0	3.8	150	Vert.	-
2.4886	40.6	74.0	33.4	8.3	28.5	0.0	3.8	100	Hor.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	88.9	-	-	56.6	28.5	0.0	3.8	150	Vert.	-
2.4886	26.8	54.0	27.2	-5.5	28.5	0.0	3.8	100	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

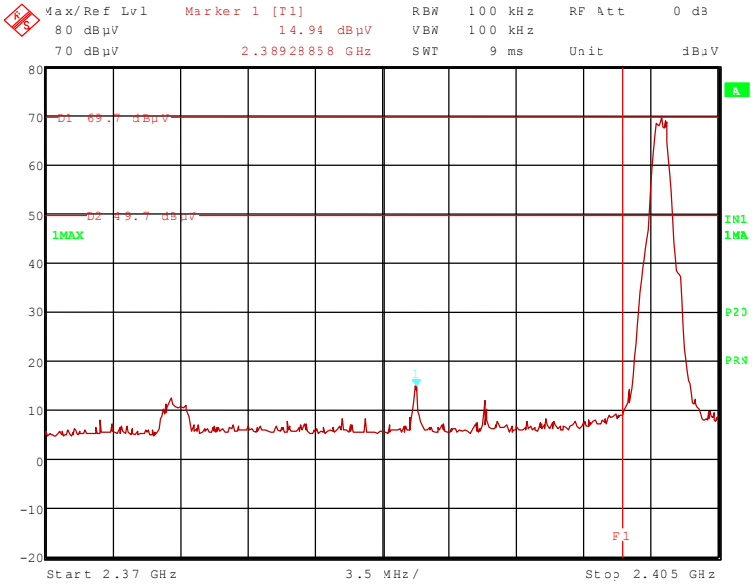
TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 34, 36, 44

5.4.3 Test result (band-edge compliance (radiated)) with external monopole antenna

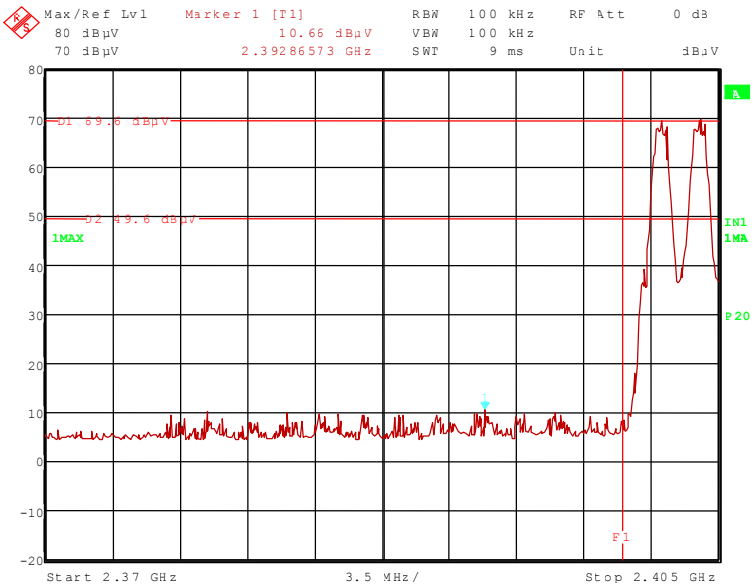
Ambient temperature	21 °C	Relative humidity	42 %

Remark: This measurement was carried out by using the external monopole antenna type Huber+Suhner SOA 2400/360/6/0/V, because additional pre-tests have shown that this antenna causes the highest emissions of all monopole antennas in question.

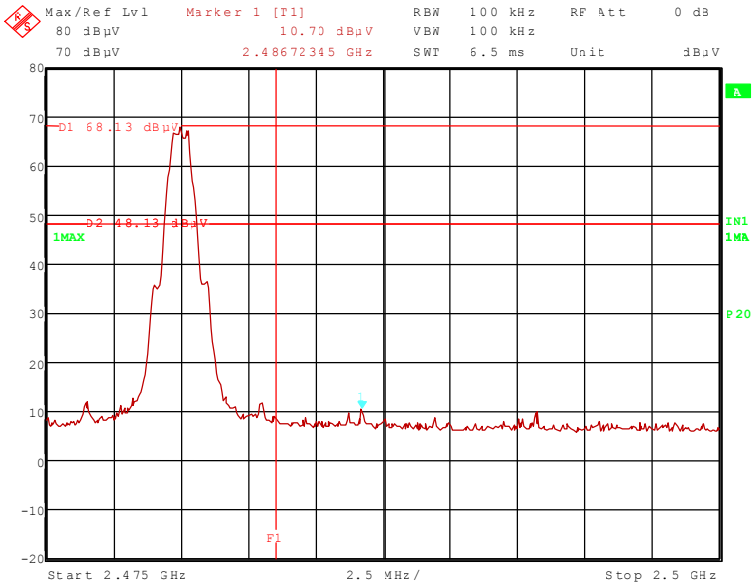
111592_68.wmf: Radiated band-edge compliance, lower band edge, hopping off (operation mode 6):



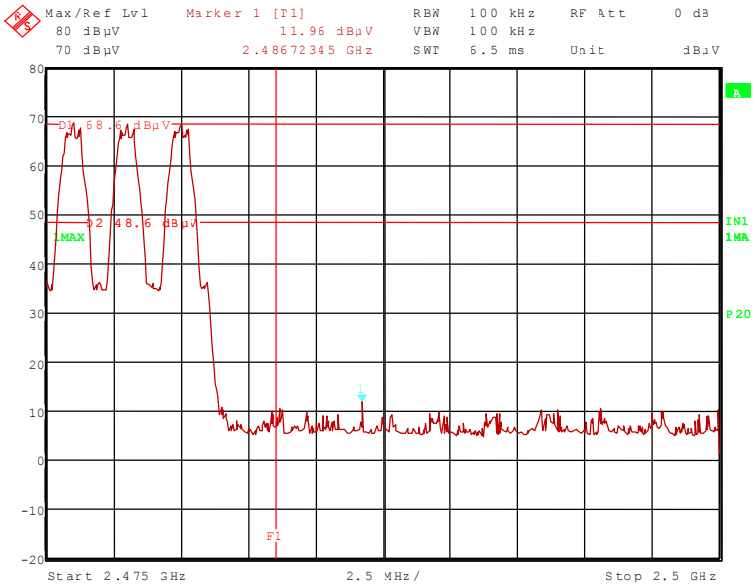
111592_138.wmf: Radiated band-edge compliance, lower band edge, hopping on (operation mode 9):



111592_71.wmf: Radiated band-edge compliance, upper band edge, hopping off (operation mode 8):



111592_139.wmf: Radiated band-edge compliance, upper band edge, hopping on (operation mode 9):



The plots on the page before are showing the radiated band-edge compliance for the upper band-edge, with and without hopping. The display line 1 (D1) in these plots represents the highest level within the assigned frequency band. The display line 2 (D2) represents the 20 dB offset to this highest level and shows the compliance with FCC 47 CFR Part 15.247 (d). The frequency line 1 (F1) shows the edge of the assigned frequency.

Band-edge compliance (lower band edge, hopping disenabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	101.8	-	-	69.8	28.3	0.0	3.7	150	Vert.	-
2.3893	45.0	74.0	29.0	13.0	28.3	0.0	3.7	150	Vert.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	89.3	-	-	57.3	28.3	0.0	3.7	150	Vert.	-
2.3893	30.2	54.0	23.8	-1.8	28.3	0.0	3.7	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (lower band edge. hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	101.8	-	-	69.8	28.3	0.0	3.7	150	Vert.	-
2.3929	43.1	81.8	38.7	11.1	28.3	0.0	3.7	150	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	89.3	-	-	57.3	28.3	0.0	3.7	150	Vert.	-
2.3929	26.6	69.3	42.7	-5.4	28.3	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (upper band edge, hopping disenabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	100.7	-	-	68.4	28.5	0.0	3.8	150	Vert.	-
2.4867	18.4	74.0	55.6	12.6	28.5	26.5	3.8	150	Vert.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	88.4	-	-	56.1	28.5	0.0	3.8	150	Vert.	-
2.4867	2.0	54.0	52.0	-3.8	28.5	26.5	3.8	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (upper band edge, hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	100.7	-	-	68.4	28.5	0.0	3.8	150	Vert.	-
2.4868	43.7	74.0	30.3	11.4	28.5	0.0	3.8	150	Hor.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	88.4	-	-	56.1	28.5	0.0	3.8	150	Vert.	-
2.4868	27.0	54.0	27.0	-5.3	28.5	0.0	3.8	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

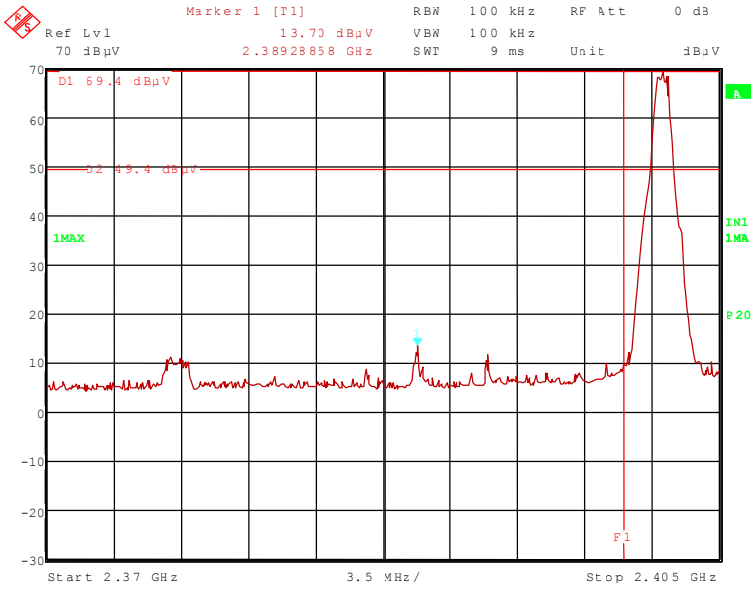
TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 34, 36, 44

5.4.4 Test result (band-edge compliance (radiated)) with external patch antenna

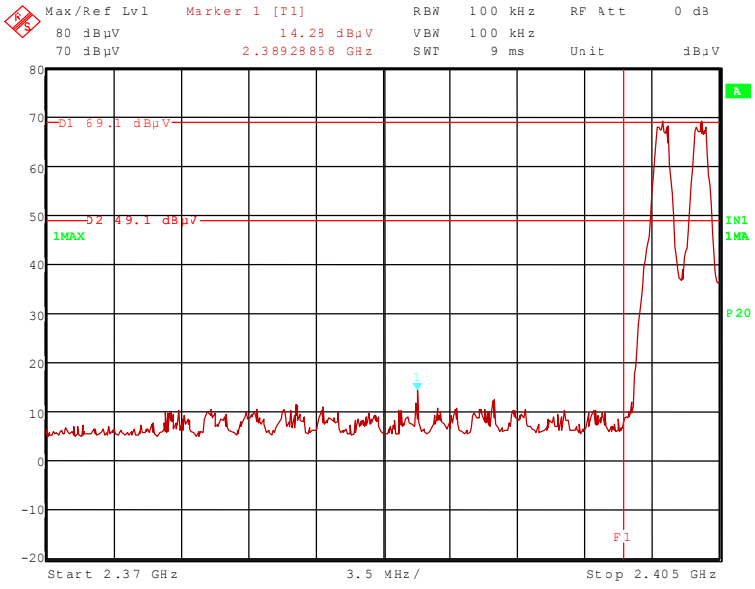
Ambient temperature	21 °C	Relative humidity	37 %

Remark: This measurement was carried out by using the external patch antenna type Huber+Suhner SPA 2400/70/9/0/RCP, because of this antenna has the highest antenna gain of all external patch antennas in question. Additional pre-tests have shown that this antenna causes the highest emissions of all patch antennas in question.

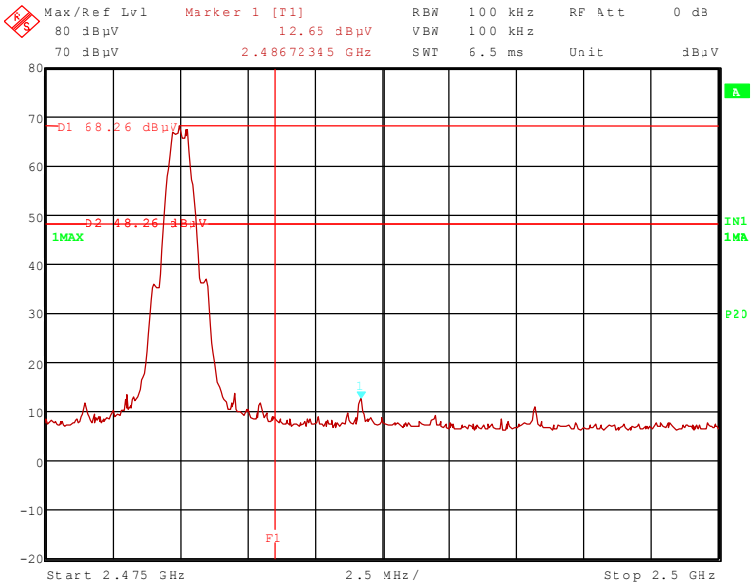
111592_63.wmf: Radiated band-edge compliance, lower band edge, hopping off (operation mode 6):



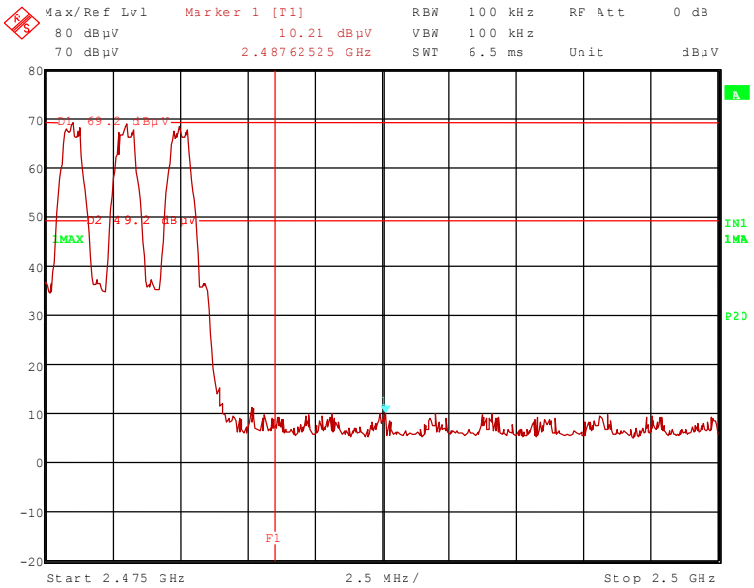
111592_140.wmf: Radiated band-edge compliance, lower band edge, hopping on (operation mode 9):



111592_66.wmf: Radiated band-edge compliance, upper band edge, hopping off (operation mode 8):



111592_141.wmf: Radiated band-edge compliance, upper band edge, hopping on (operation mode 9):



The plots on the page before are showing the radiated band-edge compliance for the upper band-edge, with and without hopping. The display line 1 (D1) in these plots represents the highest level within the assigned frequency band. The display line 2 (D2) represents the 20 dB offset to this highest level and shows the compliance with FCC 47 CFR Part 15.247 (d). The frequency line 1 (F1) shows the edge of the assigned frequency.

Band-edge compliance (lower band edge. hopping disenabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	101.5	-	-	69.5	28.3	0.0	3.7	150	Hor.	-
2.3893	45.6	74.0	28.4	13.6	28.3	0.0	3.7	150	Hor.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	96.6	-	-	64.6	28.3	0.0	3.7	150	Hor.	-
2.3893	27.9	54.0	26.1	-4.1	28.3	0.0	3.7	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (lower band edge. hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	101.5	-	-	69.5	28.3	0.0	3.7	150	Hor.	-
2.3893	45.2	74.0	28.8	13.2	28.3	0.0	3.7	150	Hor.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	96.6	-	-	64.6	28.3	0.0	3.7	150	Hor.	-
2.3893	26.8	54.0	27.2	-5.2	28.3	0.0	3.7	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (upper band edge. hopping disenabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	100.8	-	-	68.5	28.5	0.0	3.8	150	Hor.	-
2.4867	18.6	74.0	55.4	12.8	28.5	26.5	3.8	150	Hor.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	88.5	-	-	56.2	28.5	0.0	3.8	150	Hor.	-
2.4867	1.0	54.0	53.0	-4.8	28.5	26.5	3.8	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (upper band edge. hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	100.8	-	-	68.5	28.5	0.0	3.8	150	Hor.	-
2.4877	42.7	74.0	31.3	10.4	28.5	0.0	3.8	100	Hor.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	88.5	-	-	56.2	28.5	0.0	3.8	150	Hor.	-
2.4877	26.9	54.0	27.1	-5.4	28.5	0.0	3.8	100	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

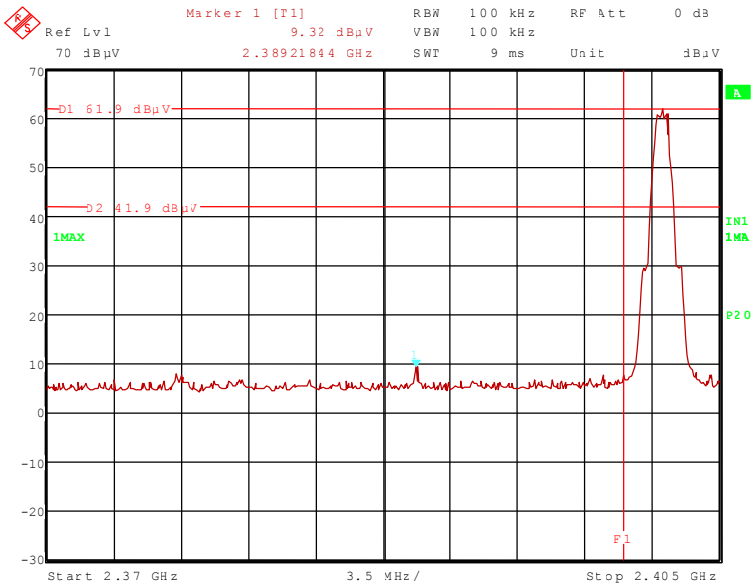
TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 34, 36, 44

5.4.5 Test result (band-edge compliance (radiated)) with EPA antenna

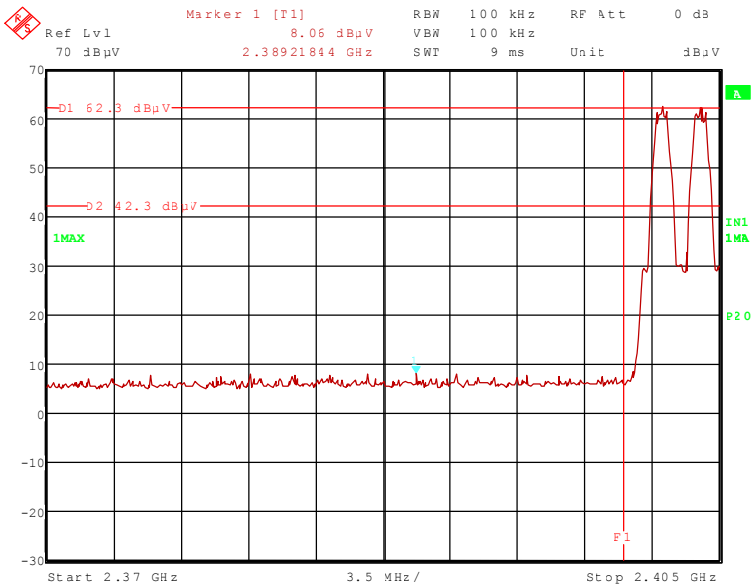
Ambient temperature	21 °C

Relative humidity	37 %

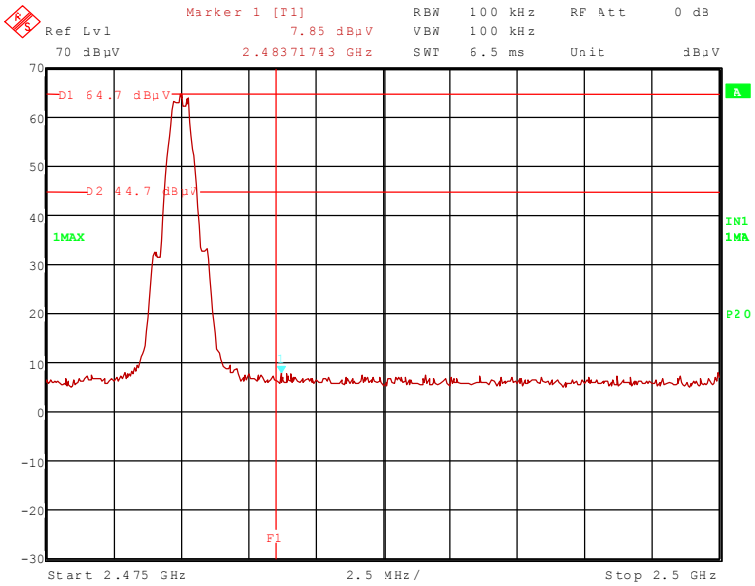
111592_115.wmf: Radiated band-edge compliance, lower band edge, hopping off (operation mode 6):



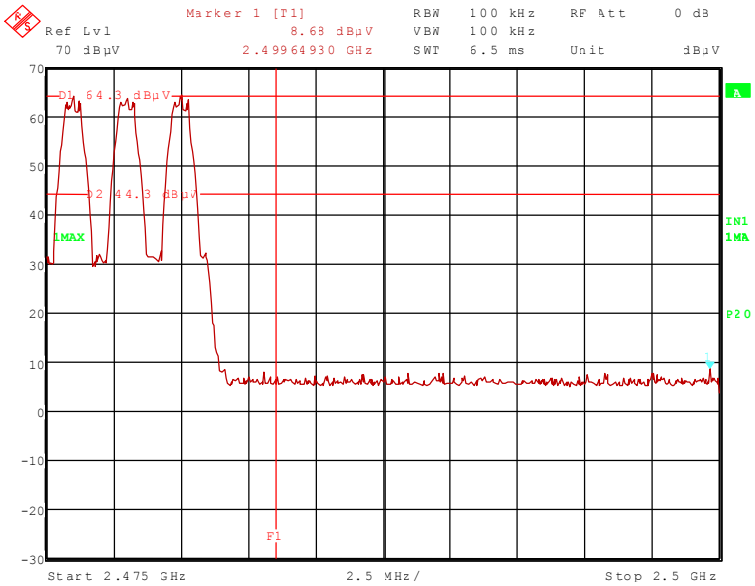
111592_134.wmf: Radiated band-edge compliance, lower band edge, hopping on (operation mode 9):



111592_118.wmf: Radiated band-edge compliance, upper band edge, hopping off (operation mode 8):



111592_135.wmf: Radiated band-edge compliance, upper band edge, hopping on (operation mode 9):



The plots on the page before are showing the radiated band-edge compliance for the upper band-edge, with and without hopping. The display line 1 (D1) in these plots represents the highest level within the assigned frequency band. The display line 2 (D2) represents the 20 dB offset to this highest level and shows the compliance with FCC 47 CFR Part 15.247 (d). The frequency line 1 (F1) shows the edge of the assigned frequency.

Band-edge compliance (lower band edge. hopping disenabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	94.2	-	-	62.2	28.3	0.0	3.7	150	Hor.	-
2.3893	41.5	74.0	32.5	9.5	28.3	0.0	3.7	100	Hor.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	89.2	-	-	57.2	28.3	0.0	3.7	150	Hor.	-
2.3893	26.2	54.0	27.8	-5.8	28.3	0.0	3.7	100	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (lower band edge. hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	94.2	-	-	62.2	28.3	0.0	3.7	150	Hor.	-
2.3893	41.5	74.0	32.5	9.5	28.3	0.0	3.7	100	Hor.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	89.2	-	-	57.2	28.3	0.0	3.7	150	Hor.	-
2.3893	26.0	54.0	28.0	-6.0	28.3	0.0	3.7	100	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (upper band edge. hopping disenabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	97.3	-	-	65.0	28.5	0.0	3.8	150	Hor.	-
2.4837	40.4	74.0	33.6	8.1	28.5	0.0	3.8	150	Hor.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	92.3	-	-	60.0	28.5	0.0	3.8	150	Hor.	-
2.4837	27.1	54.0	26.9	-5.2	28.5	0.0	3.8	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (upper band edge. hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	97.3	-	-	65.0	28.5	0.0	3.8	150	Hor.	-
2.4997	41.0	74.0	33.0	8.7	28.5	0.0	3.8	150	Hor.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	92.3	-	-	60.0	28.5	0.0	3.8	150	Hor.	-
2.4997	26.8	54.0	27.2	-5.5	28.5	0.0	3.8	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 34, 36, 44

5.5 Radiated emissions

5.5.1 Method of measurement (radiated emissions)

The radiated emission measurement is subdivided into four stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 30 MHz to 1 GHz.
- A final measurement carried out on an open area test side with reflecting ground plane and various antenna height in the frequency range 30 MHz to 1 GHz.
- A preliminary measurement carried out in a fully anechoic chamber with a variable antenna distance and height in the frequency range 1 GHz to 110 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 110 GHz.

All measurements will be carried out with the EUT working on the middle of the assigned frequency band.

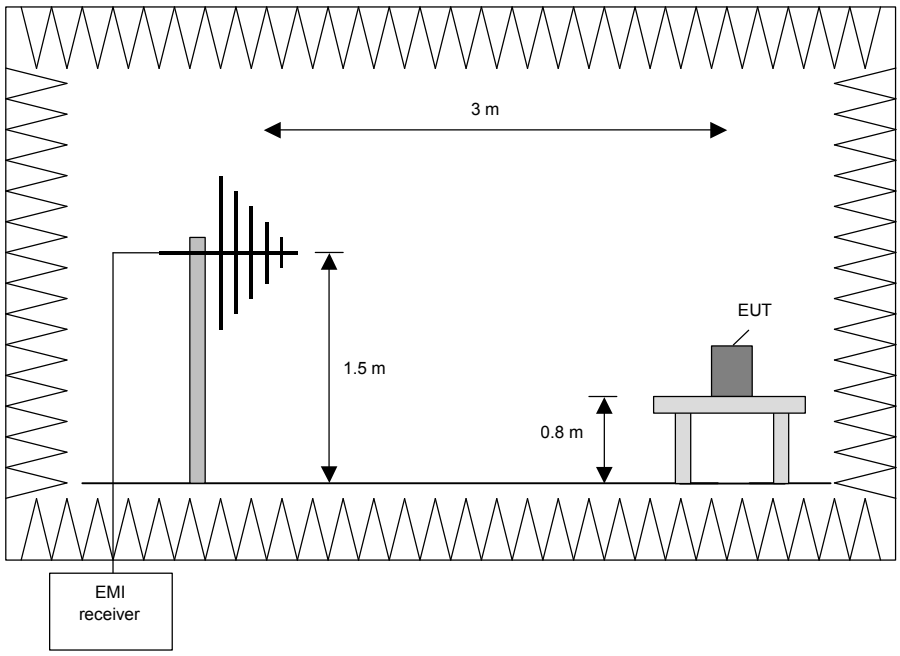
Preliminary measurement (30 MHz to 1 GHz)

In the first stage a preliminary measurement will be performed in a fully anechoic chamber with a measuring distance of 3 meter. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2009 [1].

The frequency range 30 MHz to 1 GHz will be measured with an EMI Receiver 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 °.

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

Frequency range	Resolution bandwidth
30 MHz to 230 MHz	100 kHz
230 MHz to 1 GHz	100 kHz



Procedure preliminary measurement:

Prescans were performed in the frequency range 30 MHz to 230 MHz and 230 MHz to 1 GHz.
The following procedure will be used:

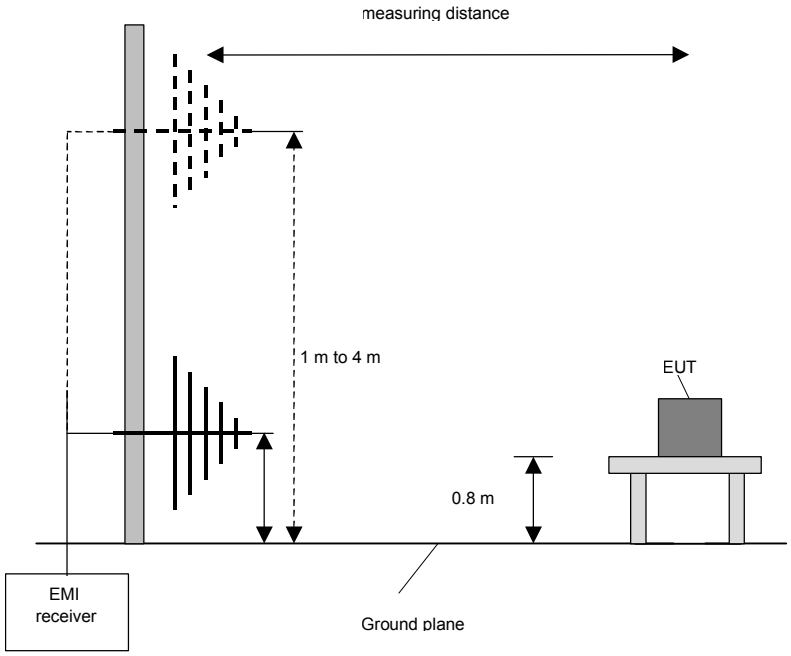
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
6. Repeat 1) to 4) with the other orthogonal axes of the EUT (because of EUT is a module and might be used in a handheld equipment application).
7. Repeat 1) to 5) with the vertical polarisation of the measuring antenna.

Final measurement (30 MHz to 1 GHz)

A final measurement on an open area test site will be performed on selected frequencies found in the preliminary measurement. During this test the EUT will be rotated in the range of 0 ° to 360 °, the measuring antenna will be set to horizontal and vertical polarisation and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

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

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	120 kHz



Procedure final measurement:

The following procedure will be used:

1) Measure on the selected frequencies at an antenna height of 1 m and a EUT azimuth of 23 °.
2) Move the antenna from 1 m to 4 m and note the maximum value at each frequency.
3) Rotate the EUT by 45 ° and repeat 2) until an azimuth of 337 ° is reached.
4) Repeat 1) to 3) for the other orthogonal antenna polarization.
5) Move the antenna and the turntable to the position where the maximum value is detected.
6) Measure while moving the antenna slowly +/- 1 m.
7) Set the antenna to the position where the maximum value is found.
8) Measure while moving the turntable +/- 45 °.
9) Set the turntable to the azimuth where the maximum value is found.
10) Measure with Final detector (QP and AV) and note the value.
11) Repeat 5) to 10) for each frequency.
12) Repeat 1) to 11) for each orthogonal axes of the EUT (because of EUT is a module and might be used in a handheld equipment application).

Preliminary and final measurement (1 GHz to 110 GHz)

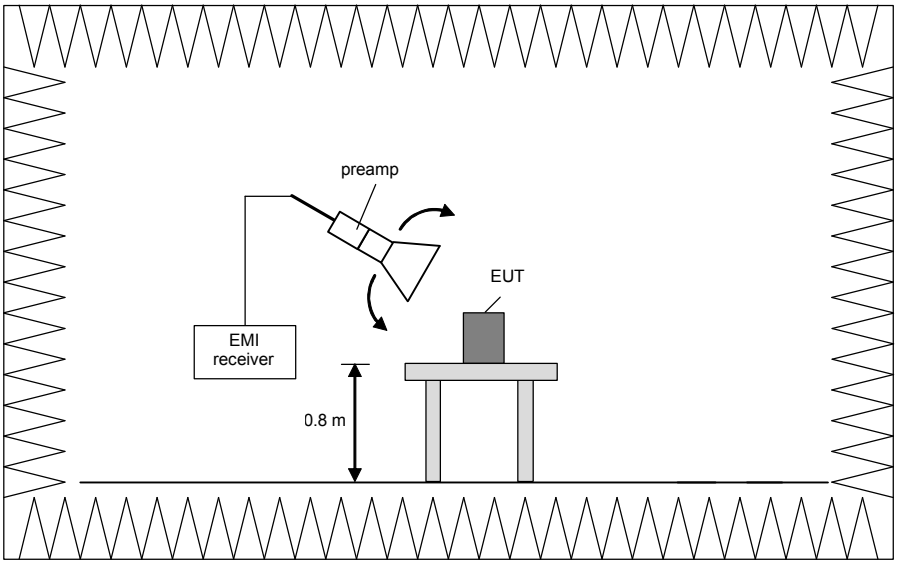
This measurement will be performed in a fully anechoic chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2009 [1].

Preliminary measurement (1 GHz to 110 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, the antenna close to the EUT and while moving the antenna over all sides of the EUT. With the spectrum analyser in CLEAR / WRITE mode the cone of the emission should be found and than the measuring distance will be set to 3 m with the receiving antenna moving in this cone of emission. At this position the final measurement will be carried out.

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 26.5 GHz	100 kHz
26.5 GHz to 40 GHz	100 kHz
40 GHz to 60 GHz	100 kHz
50 GHz to 75 GHz	100 kHz
75 GHz to 110 GHz	100 kHz

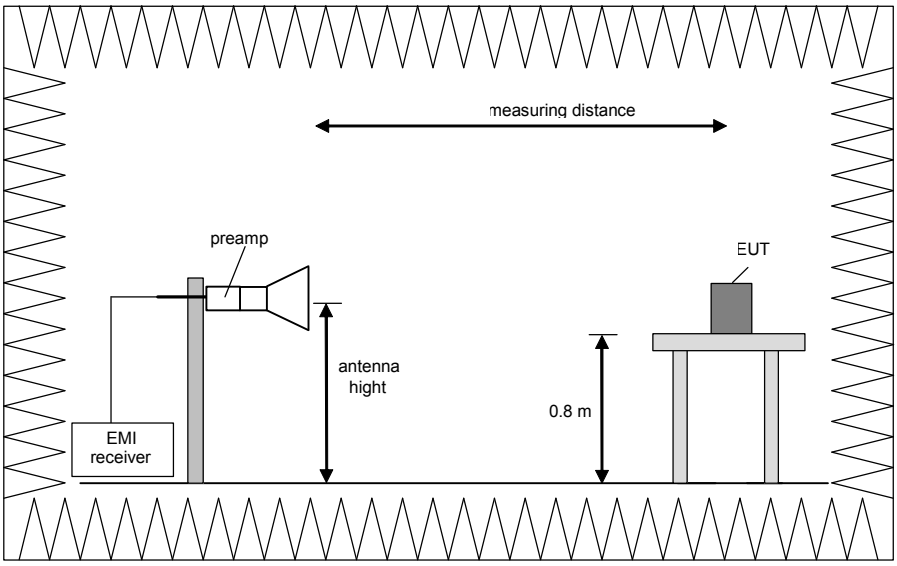


Final measurement (1 GHz to 110 GHz)

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 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 ° in order to have the antenna inside the cone of radiation.

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 26.5 GHz	1 MHz
26.5 GHz to 40 GHz	1 MHz
40 GHz to 60 GHz	1 MHz
50 GHz to 75 GHz	1 MHz
75 GHz to 110 GHz	1 MHz



Procedure of measurement:

The measurements were performed in the frequency range 1 GHz to 4 GHz, 4 GHz to 12 GHz, 12 GHz to 18 GHz, 18 GHz to 26.5 GHz, 26.5 GHz to 40 GHz, 40 GHz to 60 GHz, 60 GHz to 75 GHz and 75 GHz to 110 GHz.
The following procedure will be used:

1) Monitor the frequency range at horizontal polarisation and move the antenna over all sides of the EUT (if necessary move the EUT to another orthogonal axis).
2) Change the antenna polarisation and repeat 1) with vertical polarisation.
3) Make a hardcopy of the spectrum.
4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
5) Change the analyser mode to Clear / Write and found the cone of emission.
6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3 m and the antenna will be still inside the cone of emission.
7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarisation and azimuth and the peak and average detector, which causes the maximum emission.
8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

Step 1) to 6) are defined as preliminary measurement.

5.5.2 Test results (radiated emissions)

5.5.2.1 Preliminary radiated emission measurement with external patch antenna

Ambient temperature	°C	Relative humidity	%

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

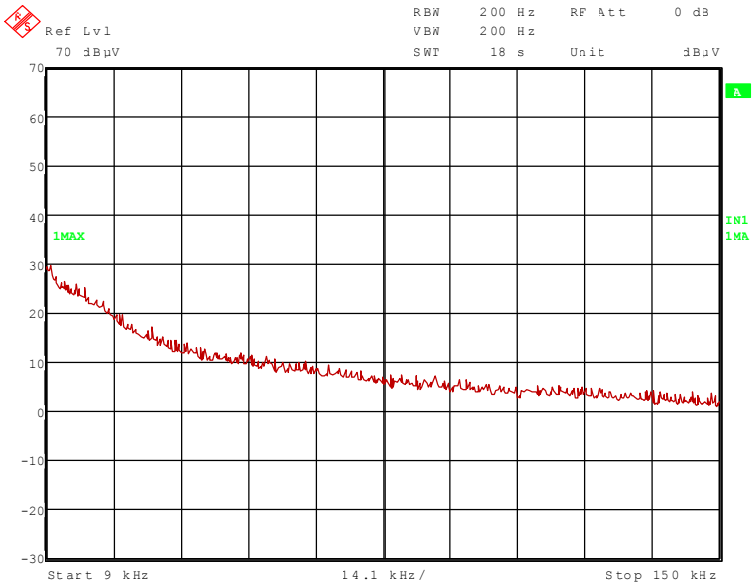
Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 3.3 V DC via the carrier board.

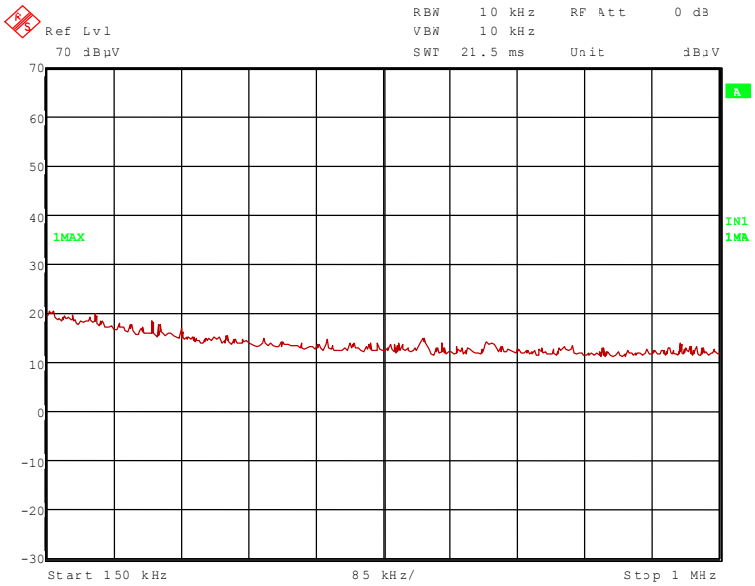
Remark: As pre-tests have shown, the emissions in the frequency range 9 kHz to 1 GHz are not depending on the transmitter operation mode. The largest emissions in this frequency range were emitted if an external antenna is used. Therefore the emissions in this frequency range were measured only with the transmitter operates in operation mode 2 and the external patch Huber+Suhner SPA 2400/70/9/0/RCP is used, because this antenna has the highest gain from the antennas in question. Additional pre-tests have shown that this antenna causes also in the frequency range 1 GHz to 25 GHz the highest emissions of all patch antennas in question.

111592_303.wmf: Spurious emissions from 9 kHz to 150 kHz (operation mode 7):

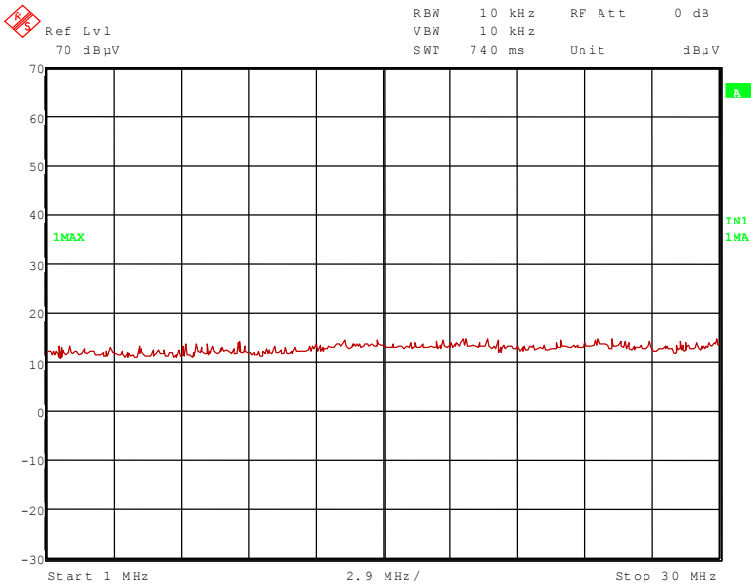


TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 37, 39, 43, 44, 46, 49 - 51, 55, 72

111592_304.wmf: Spurious emissions from 150 kHz to 1 MHz (operation mode 7):

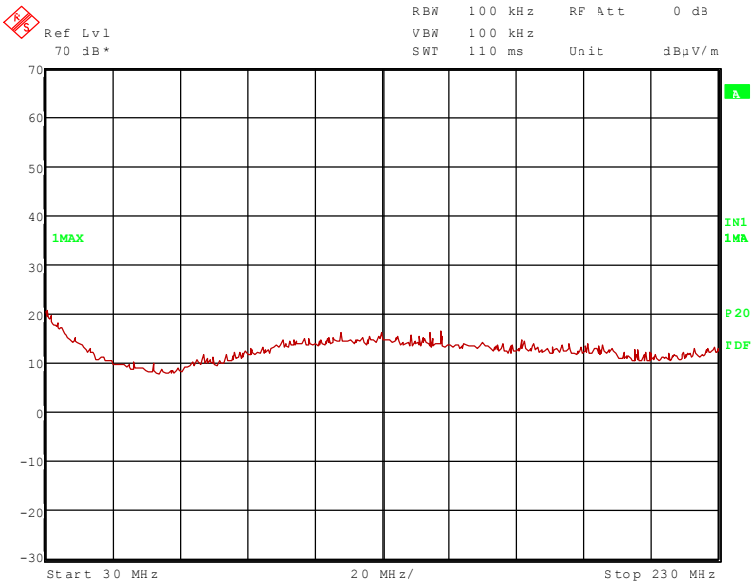


111592_305.wmf: Spurious emissions from 1 MHz to 30 MHz (operation mode 7):

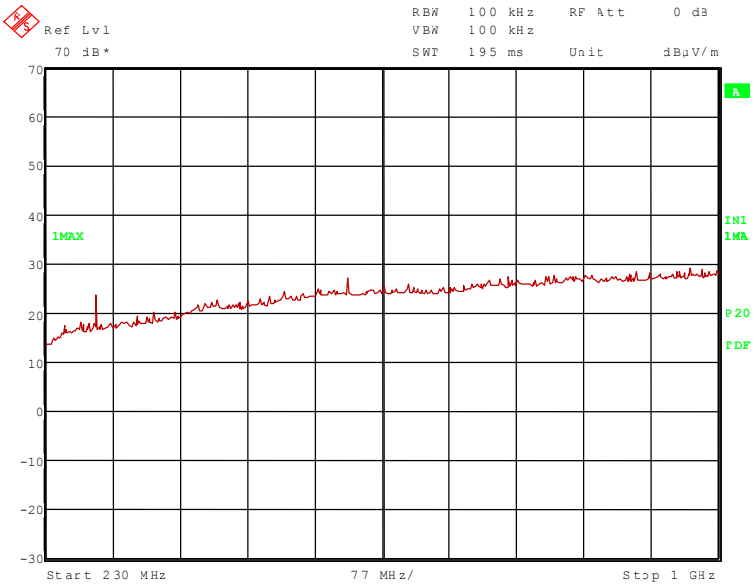


No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no measurements were carried out on the outdoor test site.

111592_306.wmf: Spurious emissions from 30 MHz to 230 MHz (operation mode 7):



111592_307.wmf: Spurious emissions from 230 MHz to 1 GHz (operation mode 7):



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

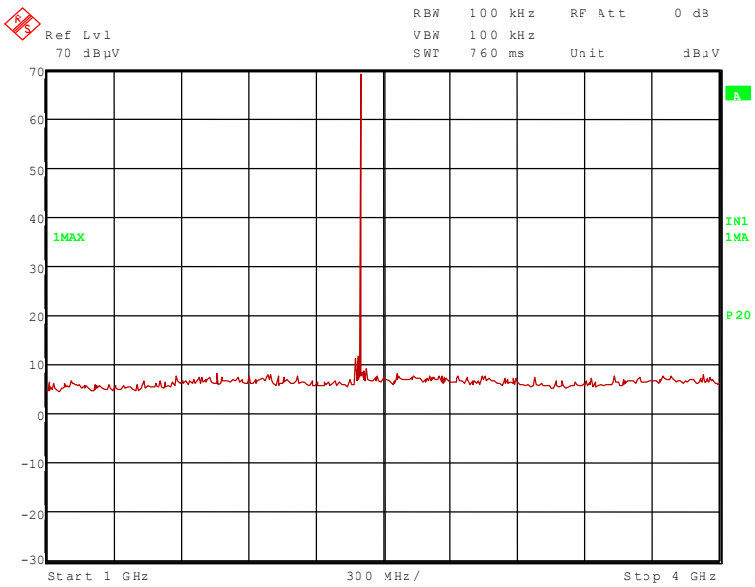
288.000 MHz and 576.000 MHz.

No frequencies were found inside the restricted bands during the radiated emission test.

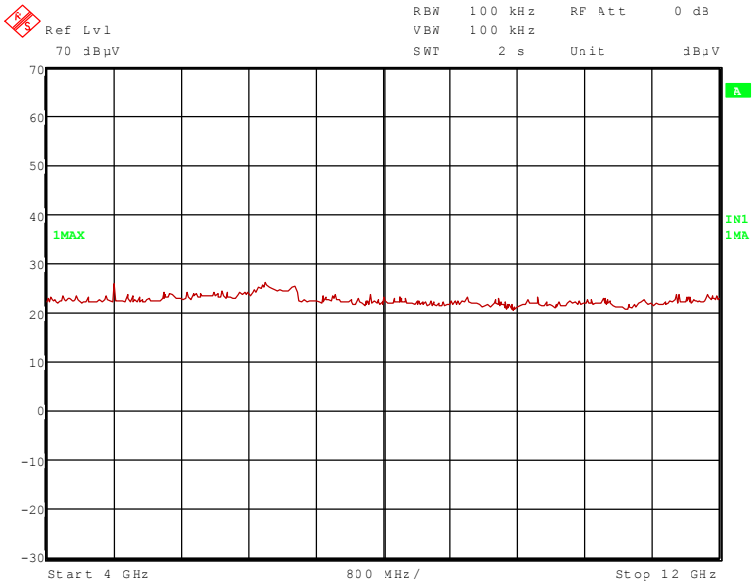
These frequencies have to be measured on the open area test site. The result is presented in the following.

Transmitter operates at the lower end of the assigned frequency band

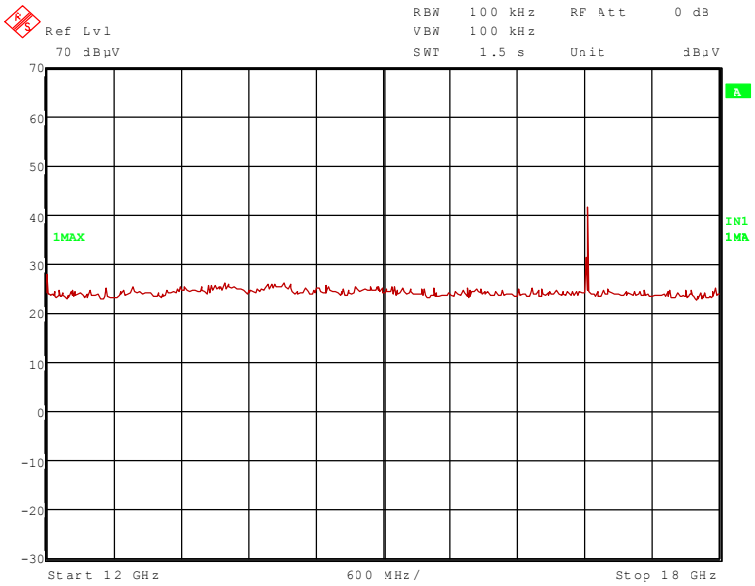
111592_62.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 6):



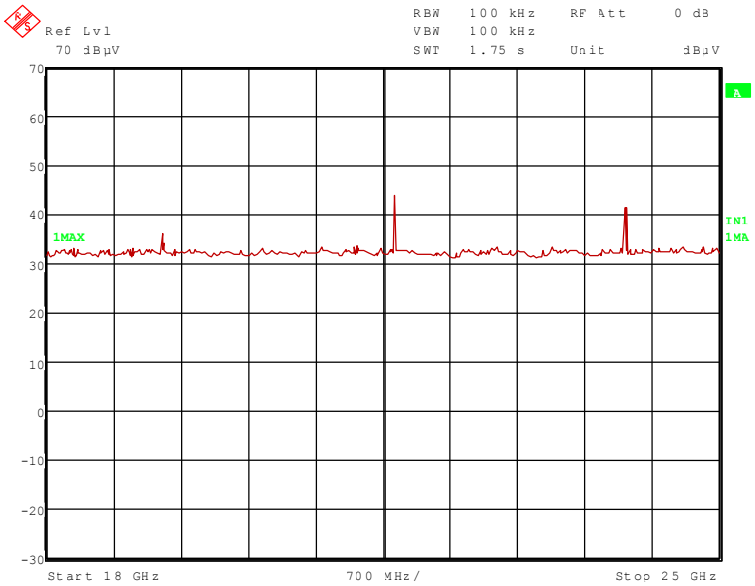
111592_77.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 6):



111592_92.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 6):



111592_97.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 6):



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

- 2.3765 GHz, 4.804 GHz, 12.010 GHz and 19.216 GHz.

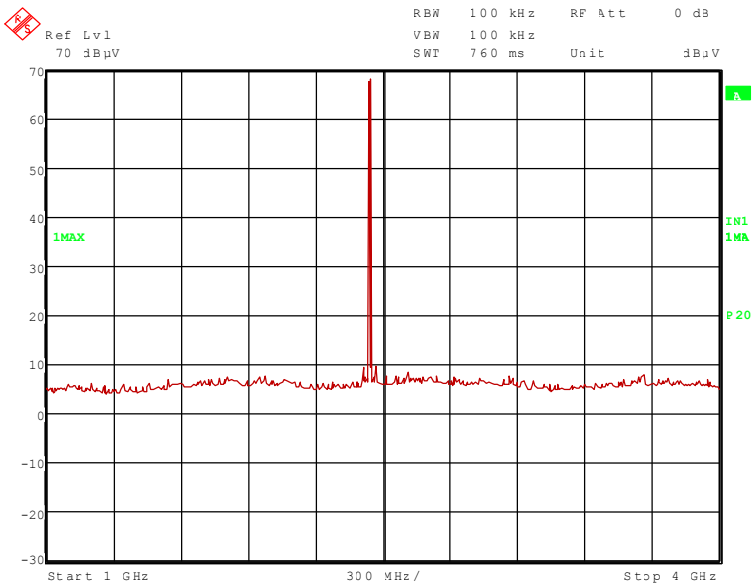
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.402 GHz, 16.814 GHz, 21.618 GHz and 24.020 GHz.

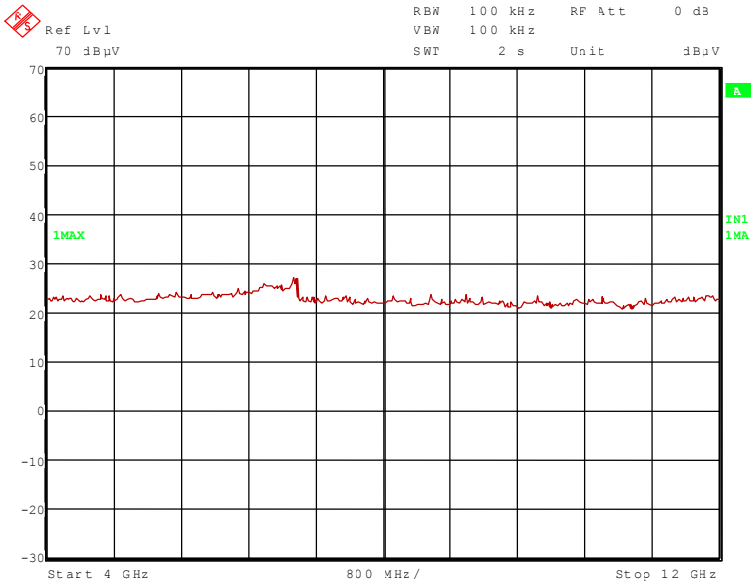
These frequencies have to be measured in a final measurement. The results were presented in the following.

Transmitter operates on the middle of the assigned frequency band

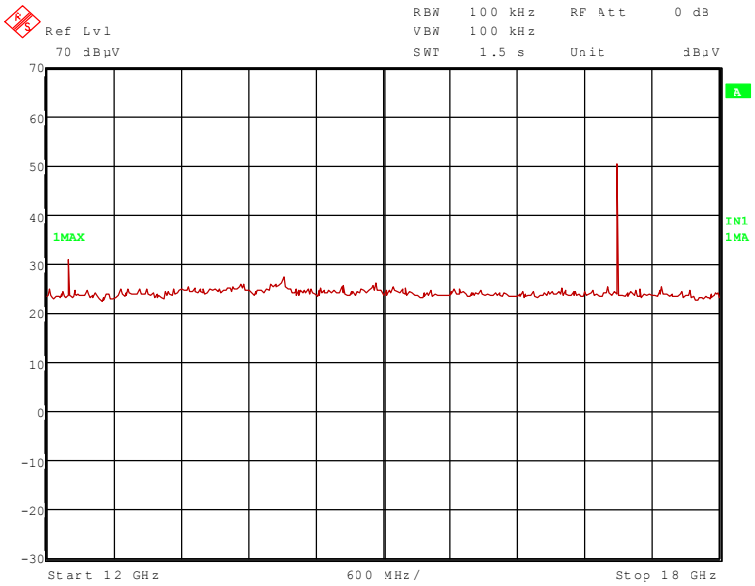
111592_64.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 7):



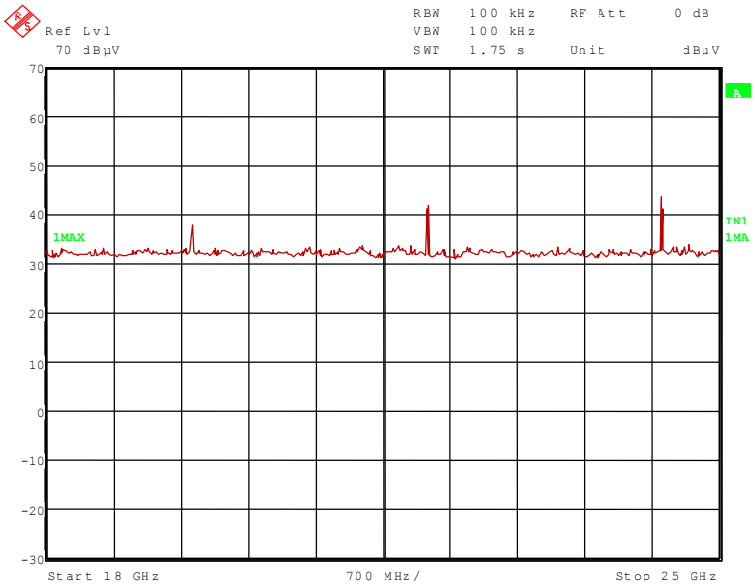
111592_76.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 7):



111592_93.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 7):



111592_96.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 7):



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

- 12.200 GHz and 19.520 GHz.

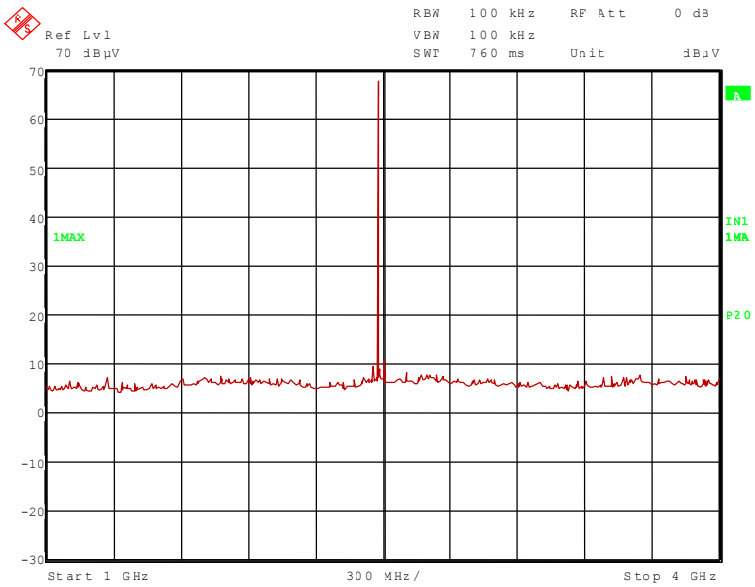
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.4143 GHz, 2.440 GHz, 2.4656 GHz, 17.080 GHz, 21.960 GHz and 24.600 GHz.

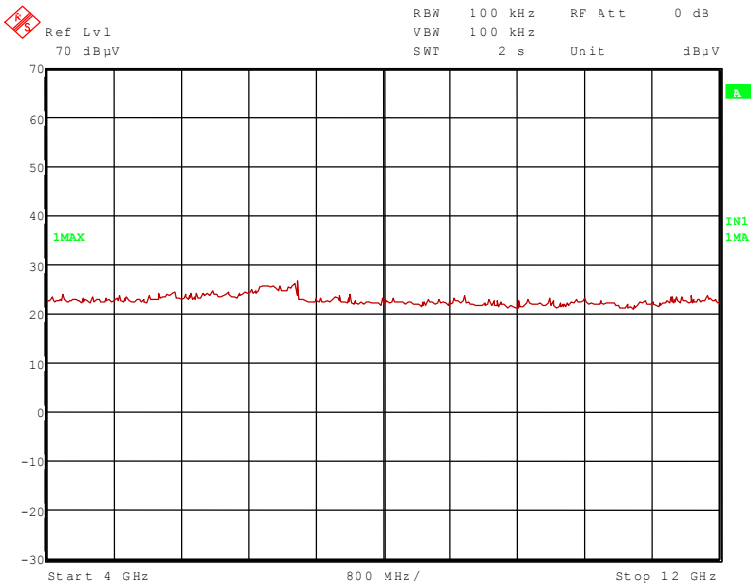
These frequencies have to be measured in a final measurement. The results were presented in the following.

Transmitter operates on the upper end of the assigned frequency

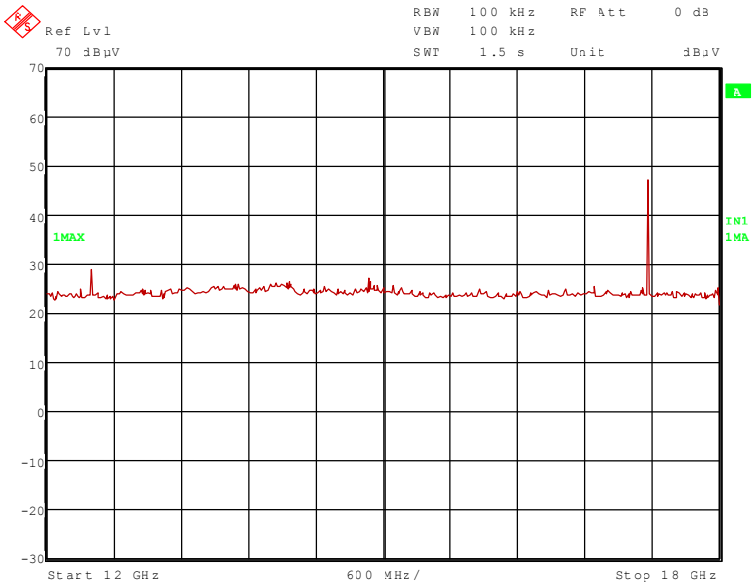
111592_65.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 8):



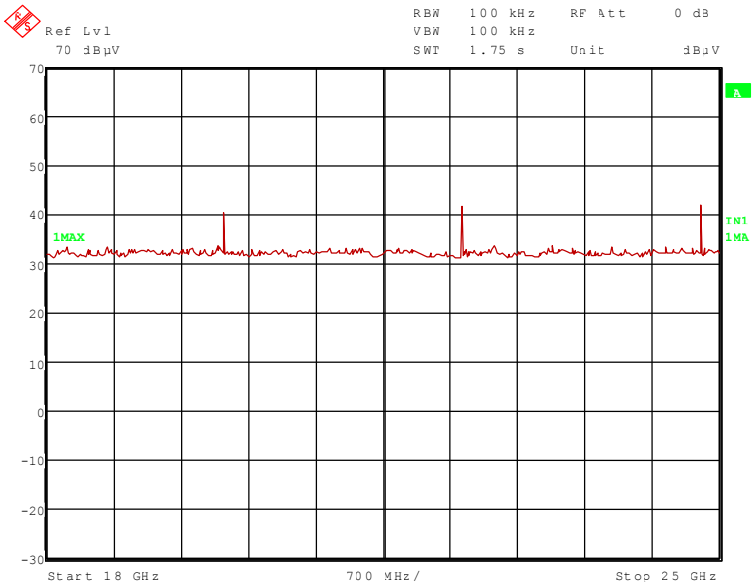
111592_75.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 8):



111592_94.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 8):



111592_95.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 8):



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

- 12.400 GHz, 19.840 GHz and 22.320 GHz.

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

- 2.454 GHz, 2.4738 GHz, 2.480 GHz, 2.5057 GHz, 17.360 GHz and 24.800 GHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

5.5.2.2 Final radiated emission measurement (30 MHz to 1 GHz) with external patch antenna

Ambient temperature	20 °C	Relative humidity	66 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

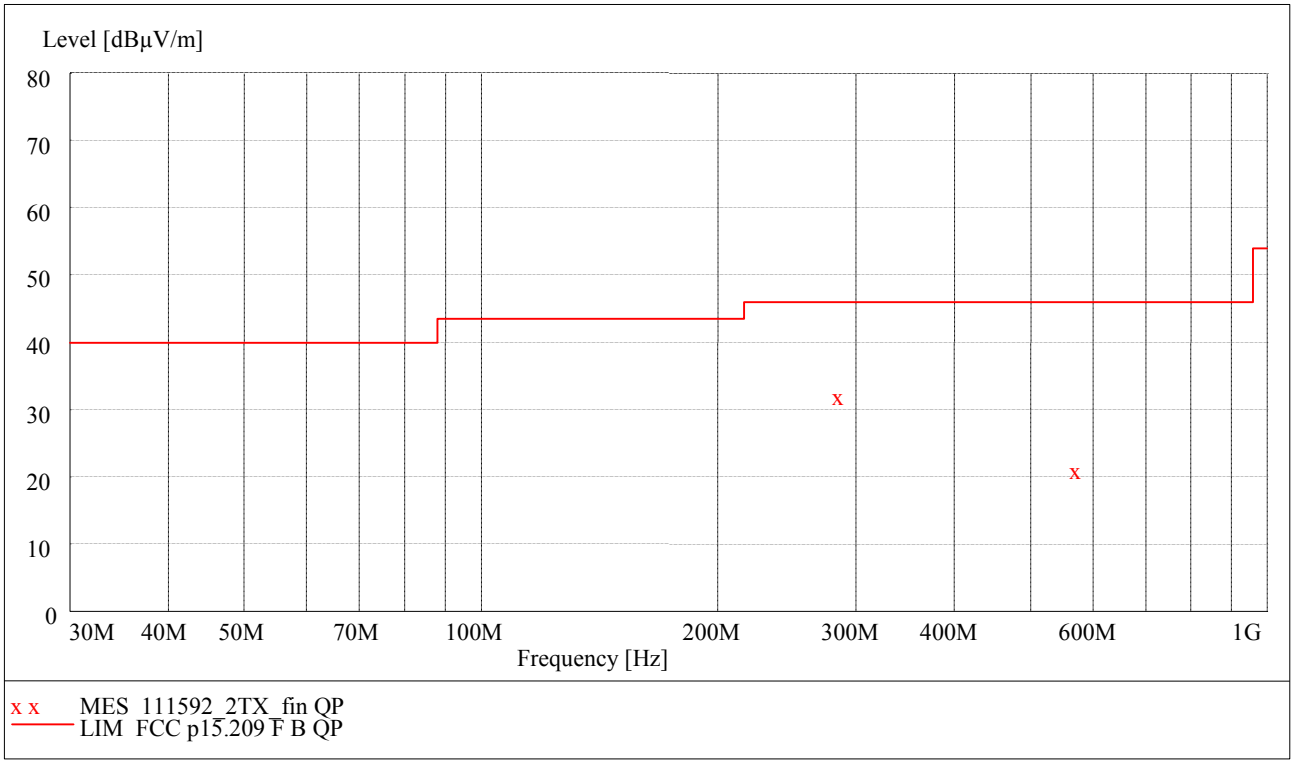
Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 3.3 V DC via the carrier board.

Test results: The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + cable loss [dB] + antenna factor [dB/m]

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with an x are the measured results of the standard final measurement on the open area test site.



Data record name: 111592_2TX

The results of the standard subsequent measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

The measurement time with the quasi-peak measuring detector is 1 second.

Result measured with the quasipeak detector:
(This value is marked in the diagram by an x)

Spurious emissions outside restricted bands										
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.	Pos.
288.000	32.5	46.0	13.5	17.7	12.9	1.9	110	90	Hor.	1
576.000	21.6	46.0	24.4	-0.4	19.2	2.8	138	315	Vert.	1
Measurement uncertainty				+2.2 dB / -3.6 dB						

The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + cable loss [dB] + antenna factor [dB/m]

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
14 – 20

5.5.2.3 Final radiated emission measurement (1 GHz to 25 GHz) with external patch antenna

Ambient temperature	21 °C	Relative humidity	37 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 3.3 V DC by the carrier board.

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

Remark: The emission measurement in this frequency range was carried out by using the external patch antenna type Huber+Suhner SPA 2400/70/9/0/RCP, because of this antenna has the highest antenna gain of all external patch antennas in question. Additional pre-tests have shown that this antenna causes the highest emissions of all patch antennas in question.

Transmitter operates at the lower end of the assigned frequency band (operation mode 6)

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.3765	56.3	74.0	17.7	24.4	28.2	0.0	3.7	150	Hor.	Yes	1
2.402	101.5	-	-	69.5	28.3	0.0	3.7	150	Hor.	-	1
4.804	46.1	74.0	27.9	33.9	32.6	25.7	5.3	150	Vert.	Yes	1
12.010	47.4	74.0	26.6	37.2	33.6	25.9	2.5	100	Vert.	Yes	1
16.814	58.2	81.5	23.3	49.4	33.8	27.5	2.5	100	Vert.	No	1
19.216	47.4	74.0	26.6	46.0	37.1	38.2	2.5	100	Vert.	Yes	1
21.618	52.4	81.5	29.1	51.0	37.2	38.3	2.5	100	Vert.	No	1
24.020	50.5	81.5	31.0	49.6	37.2	38.8	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.3765	35.0	54.0	19.0	3.1	28.2	0.0	3.7	150	Hor.	Yes	1
2.402	96.6	-	-	64.6	28.3	0.0	3.7	150	Hor.	-	1
4.804	34.7	54.0	19.3	22.5	32.6	25.7	5.3	150	Vert.	Yes	1
12.010	34.3	54.0	19.7	24.1	33.6	25.9	2.5	150	Vert.	Yes	1
16.814	45.7	76.6	30.9	36.9	33.8	27.5	2.5	150	Vert.	No	1
19.216	34.4	54.0	19.6	33.0	37.1	38.2	2.5	100	Vert.	Yes	1
21.618	39.4	76.6	37.2	38.0	37.2	38.3	2.5	100	Vert.	No	1
24.020	37.7	76.6	38.9	36.8	37.2	38.8	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

<u>Transmitter operates at the middle of the assigned frequency band (operation mode 7)</u>

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.4143	43.7	80.6	36.9	11.6	28.4	0.0	3.7	150	Hor.	No	1
2.440	100.6	-	-	68.5	28.4	0.0	3.7	150	Hor.	-	1
2.4656	43.8	80.6	36.8	11.6	28.5	0.0	3.7	150	Hor.	No	1
12.200	47.8	74.0	26.2	37.6	33.6	25.9	2.5	100	Vert.	Yes	1
17.080	61.7	80.6	18.9	52.8	33.8	27.4	2.5	100	Vert.	No	1
19.520	47.9	74.0	26.1	46.5	37.1	38.2	2.5	100	Vert.	Yes	1
21.960	52.7	80.6	27.9	51.3	37.2	38.3	2.5	100	Vert.	No	1
24.600	51.4	80.6	29.2	50.7	37.2	39.0	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.4143	27.5	68.3	40.8	-4.6	28.4	0.0	3.7	150	Hor.	No	1
2.440	88.3	-	-	56.2	28.4	0.0	3.7	150	Hor.	-	1
2.4656	27.3	68.3	41.0	-4.9	28.5	0.0	3.7	150	Hor.	No	1
12.200	34.8	54.0	19.2	24.6	33.6	25.9	2.5	100	Vert.	Yes	1
17.080	49.6	68.3	18.7	40.7	33.8	27.4	2.5	100	Vert.	No	1
19.520	34.7	54.0	19.3	33.3	37.1	38.2	2.5	100	Vert.	Yes	1
21.960	39.4	68.3	28.9	38.0	37.2	38.3	2.5	100	Vert.	No	1
24.600	38.3	68.3	30.0	37.6	37.2	39.0	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Transmitter operates at the upper end of the assigned frequency band (operation mode 8)

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.454	43.4	80.8	37.4	11.3	28.4	0.0	3.7	150	Hor.	No	1
2.4738	45.4	80.8	35.4	13.2	28.5	0.0	3.7	150	Hor.	No	1
2.480	100.8	-	-	68.5	28.5	0.0	3.8	150	Hor.	-	1
2.5057	17.4	80.8	63.4	11.4	28.6	26.4	3.8	150	Hor.	No	1
12.400	48.3	74.0	25.7	38.0	33.7	25.9	2.5	100	Vert.	Yes	1
17.360	63.5	80.8	17.3	54.3	33.9	27.2	2.5	100	Vert.	No	1
19.840	48.7	74.0	25.3	47.5	37.0	38.3	2.5	100	Vert.	Yes	1
22.320	50.7	74.0	23.3	49.3	37.2	38.3	2.5	100	Vert.	Yes	1
24.800	50.5	80.8	30.3	49.7	37.3	39.0	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.454	27.7	68.5	40.8	-4.4	28.4	0.0	3.7	150	Hor.	No	1
2.4738	27.4	68.5	41.1	-4.8	28.5	0.0	3.7	150	Hor.	No	1
2.480	88.5	-	-	56.2	28.5	0.0	3.8	150	Hor.	-	1
2.5057	1.6	68.5	66.9	-4.4	28.6	26.4	3.8	150	Hor.	No	1
12.400	35.1	54.0	18.9	24.8	33.7	25.9	2.5	100	Vert.	Yes	1
17.360	51.6	68.5	16.9	42.4	33.9	27.2	2.5	100	Vert.	No	1
19.840	35.6	54.0	18.4	34.4	37.0	38.3	2.5	100	Vert.	Yes	1
22.320	37.4	54.0	16.6	36.0	37.2	38.3	2.5	100	Vert.	Yes	1
24.800	37.4	68.5	31.1	36.6	37.3	39.0	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
29, 31 –34, 36, 37, 39, 44, 46, 49 - 51, 72

5.5.2.4 Preliminary radiated emission measurement with internal antenna

Ambient temperature	21 °C	Relative humidity	45 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

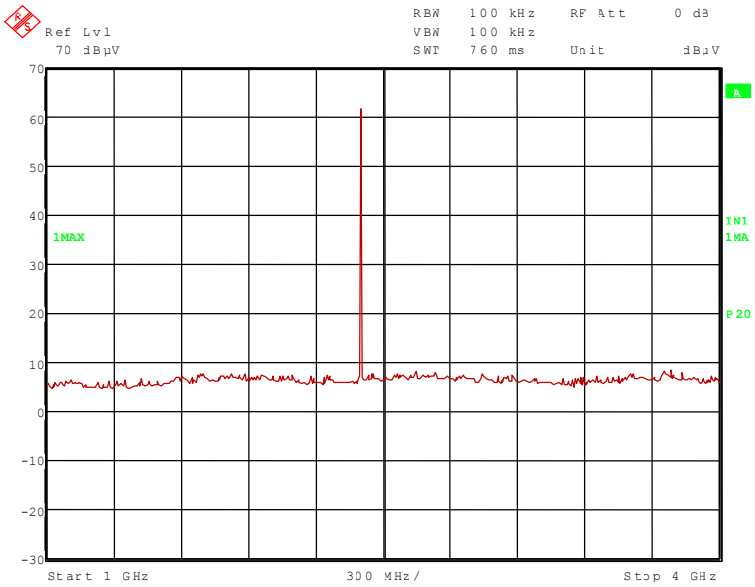
Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 3.3 V DC via the carrier board.

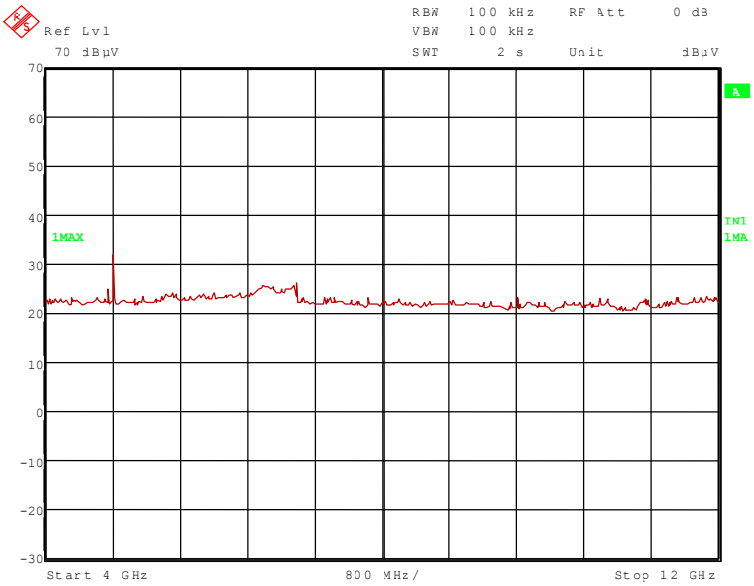
Remark: This measurement was carried out by using internal antenna type Fractus FR05-S1-N-0-102, because pre-tests have shown that this antenna causes the highest emissions of internal antennas in question.

Transmitter operates at the lower end of the assigned frequency band

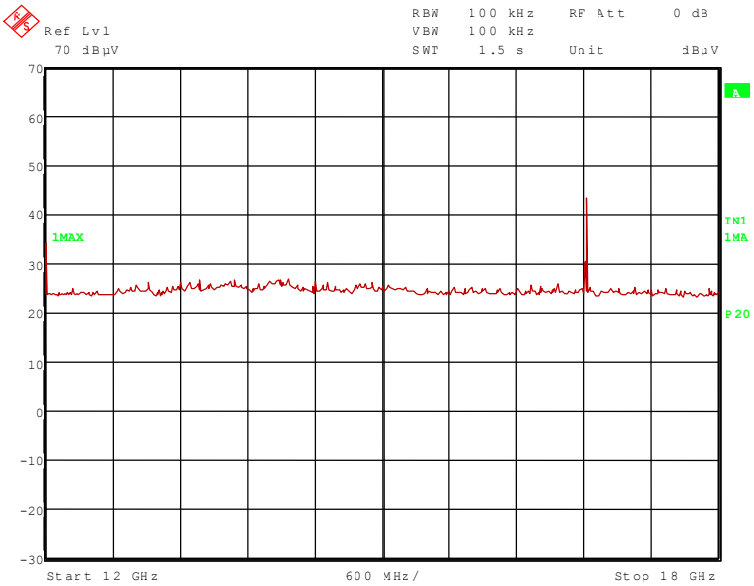
111592_84.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 6):



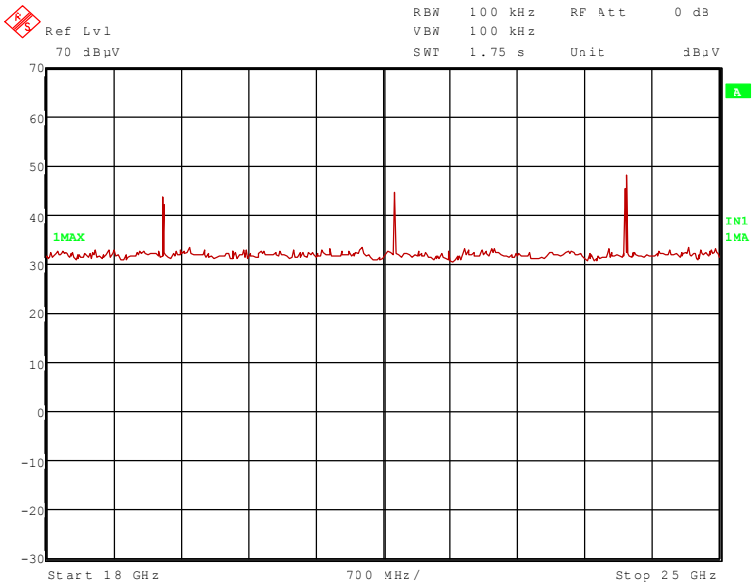
111592_78.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 6):



111592_86.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 6):



111592_91.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 6):



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

- 4.804 GHz, 12.010 GHz and 19.216 GHz.

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

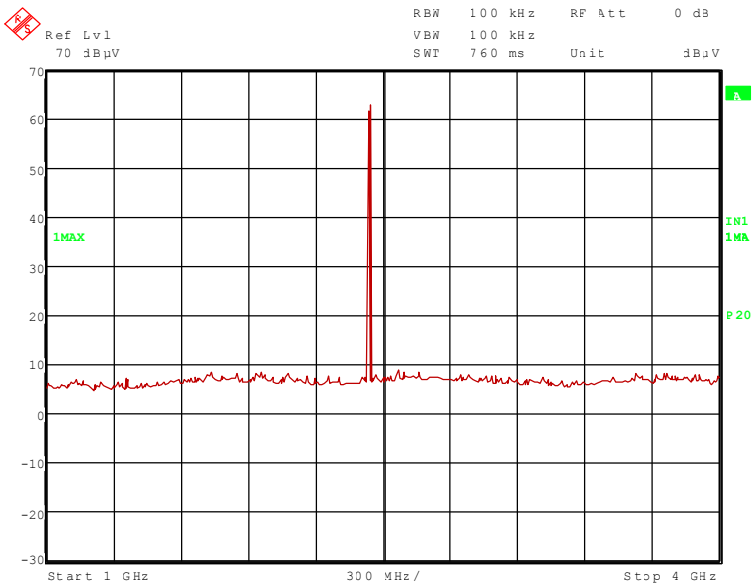
- 2.402 GHz, 16.814 GHz, 21.618 GHz and 24.020 GHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

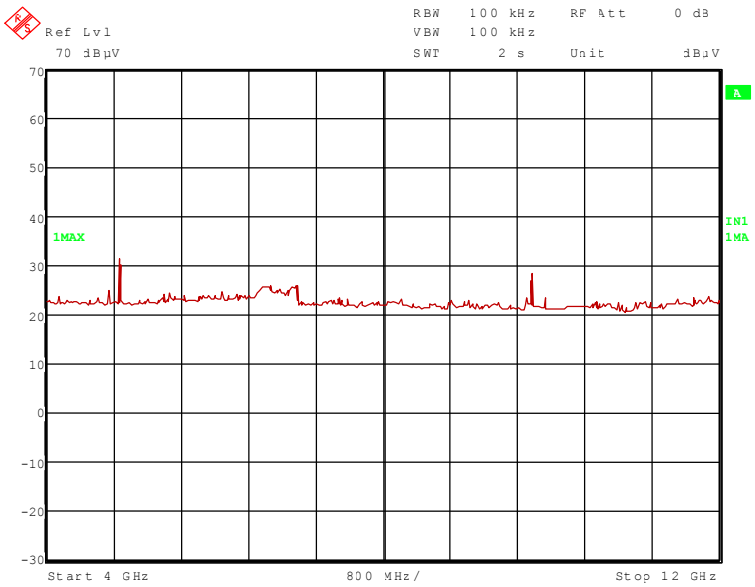
TEST EQUIPMENT USED FOR THE TEST:
29, 31 –34, 36, 37, 39, 44, 46, 49 - 51, 72

Transmitter operates on the middle of the assigned frequency band

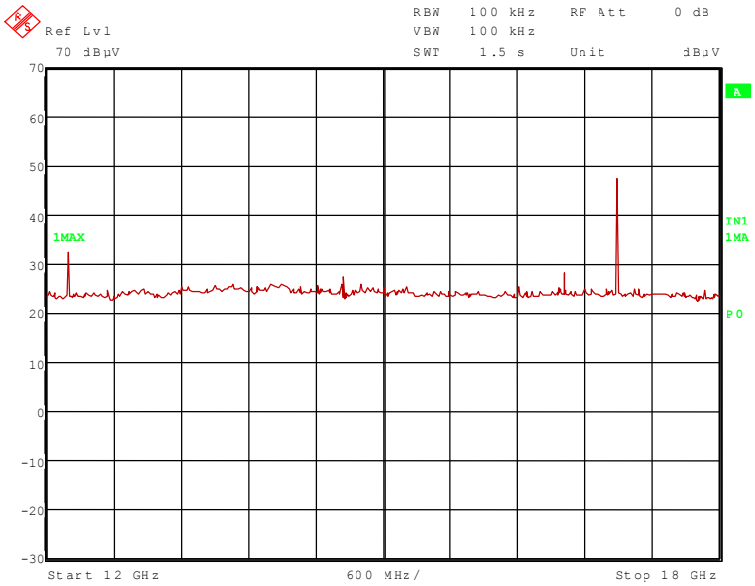
111592_83.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 7):



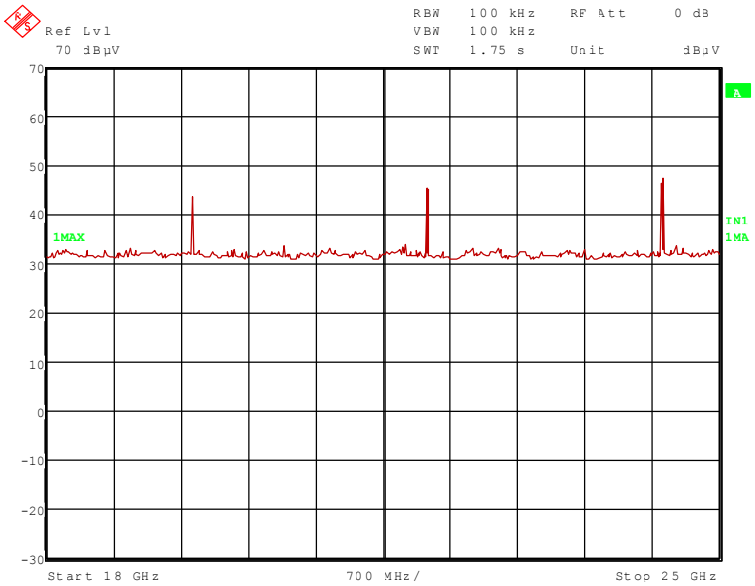
111592_79.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 7):



111592_87.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 7):



111592_90.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 7):



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

- 4.880 GHz, 12.200 GHz and 19.520 GHz.

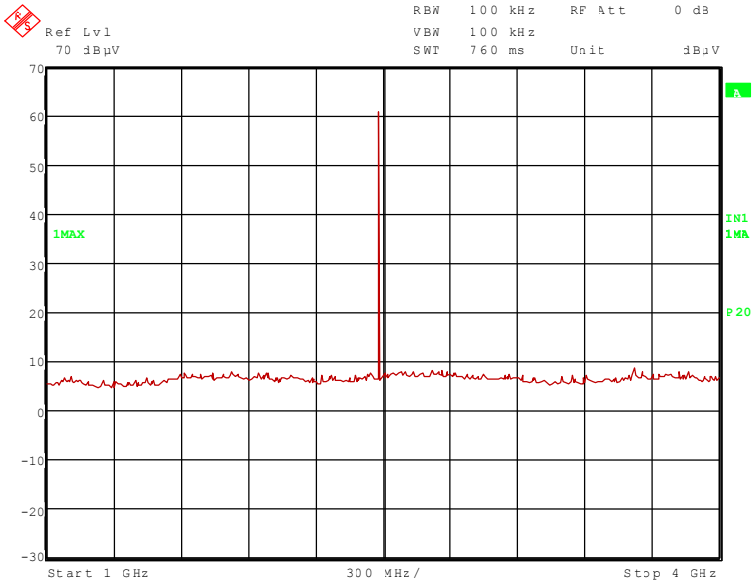
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.440 GHz, 9.760 GHz, 14.640 GHz, 16.608 GHz, 17.080 GHz, 21.960 GHz and 24.400 GHz.

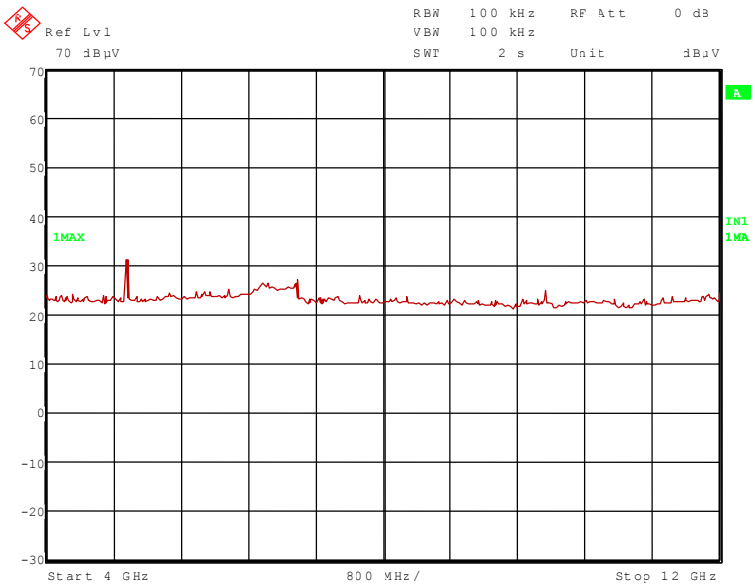
These frequencies have to be measured in a final measurement. The results were presented in the following.

Transmitter operates on the upper end of the assigned frequency

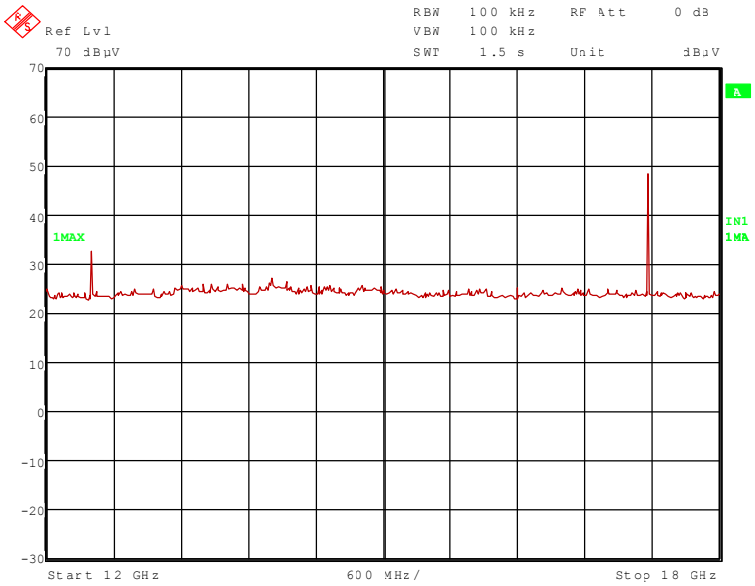
111592_81.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 8):



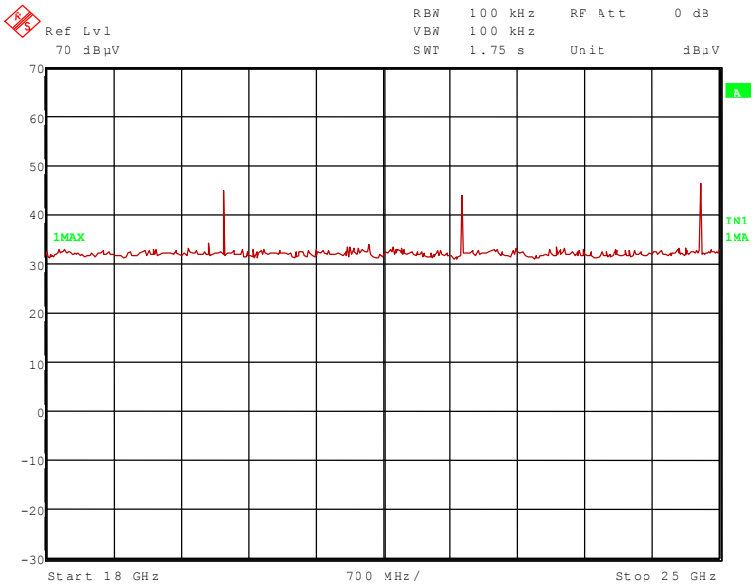
111592_80.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 8):



111592_88.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 8):



111592_89.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 8):



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

- 4.960 GHz, 12.400 GHz, 19.840 GHz and 22.320 GHz.

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

- 2.480 GHz, 9.920 GHz, 17.360 GHz and 24.800 GHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

5.5.2.5 Final radiated emission measurement (1 GHz to 25 GHz) with internal antenna

Ambient temperature	21 °C	Relative humidity	45 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 3.3 V DC by the carrier board.

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

Transmitter operates at the lower end of the assigned frequency band (operation mode 6)

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.402	94.1	-	-	62.1	28.3	0.0	3.7	150	Vert.	-	2
4.804	50.6	74.0	23.4	38.4	32.6	25.7	5.3	150	Hor.	Yes	2
12.010	52.1	74.0	21.9	41.9	33.6	25.9	2.5	100	Hor.	Yes	2
16.814	56.4	74.1	17.7	47.6	33.8	27.5	2.5	100	Vert.	No	2
19.216	51.2	74.0	22.8	49.8	37.1	38.2	2.5	100	Hor.	Yes	2
21.618	54.4	74.1	19.7	53.0	37.2	38.3	2.5	100	Hor.	No	2
24.020	53.3	74.1	20.8	52.4	37.2	38.8	2.5	100	Hor.	No	2
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.402	89.1	-	-	57.1	28.3	0.0	3.7	150	Vert.	-	2
4.804	40.9	54.0	13.1	28.7	32.6	25.7	5.3	150	Hor.	Yes	2
12.010	39.8	54.0	14.2	29.6	33.6	25.9	2.5	150	Vert.	Yes	2
16.814	44.1	69.1	25.0	35.3	33.8	27.5	2.5	150	Vert.	No	2
19.216	37.9	54.0	16.1	36.5	37.1	38.2	2.5	100	Hor.	Yes	2
21.618	12.0	69.1	57.1	10.6	37.2	38.3	2.5	100	Hor.	No	2
24.020	40.0	69.1	29.1	39.1	37.2	38.8	2.5	100	Vert.	No	2
Measurement uncertainty						+2.2 dB / -3.6 dB					

Transmitter operates at the middle of the assigned frequency band (operation mode 7)

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.440	95.0	-	-	62.9	28.4	0.0	3.7	150	Vert.	-	2
4.880	50.3	74.0	23.7	37.9	32.8	25.7	5.3	150	Hor.	Yes	2
9.760	56.1	75.0	18.9	34.8	37.3	23.9	7.9	150	Hor.	No	2
12.200	50.7	74.0	23.3	40.5	33.6	25.9	2.5	100	Hor.	Yes	2
14.640	44.8	75.0	30.2	35.2	33.7	26.6	2.5	100	Hor.	No	2
16.608	43.8	75.0	31.2	35.1	33.8	27.6	2.5	100	Vert.	No	2
17.080	59.9	75.0	15.1	51.0	33.8	27.4	2.5	100	Vert.	No	2
19.520	51.6	74.0	22.4	50.2	37.1	38.2	2.5	100	Hor.	Yes	2
21.960	55.3	75.0	19.7	53.9	37.2	38.3	2.5	100	Hor.	No	2
24.400	52.8	75.0	22.2	52.0	37.2	38.9	2.5	100	Vert.	No	2
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.440	83.1	-	-	51.0	28.4	0.0	3.7	150	Vert.	-	2
4.880	40.4	54.0	13.6	28.0	32.8	25.7	5.3	150	Hor.	Yes	2
9.760	43.2	63.1	19.9	21.9	37.3	23.9	7.9	150	Hor.	No	2
12.200	38.1	54.0	15.9	27.9	33.6	25.9	2.5	100	Hor.	Yes	2
14.640	31.4	63.1	31.7	21.8	33.7	26.6	2.5	100	Hor.	No	2
16.608	29.8	63.1	33.3	21.1	33.8	27.6	2.5	100	Vert.	No	2
17.080	48.0	63.1	15.1	39.1	33.8	27.4	2.5	100	Vert.	No	2
19.520	37.8	54.0	16.2	36.4	37.1	38.2	2.5	100	Hor.	Yes	2
21.960	43.0	63.1	20.1	41.6	37.2	38.3	2.5	100	Hor.	No	2
24.400	39.4	63.1	23.7	38.6	37.2	38.9	2.5	100	Vert.	No	2
Measurement uncertainty						+2.2 dB / -3.6 dB					

Transmitter operates at the upper end of the assigned frequency band (operation mode 8)

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.480	94.0	-	-	61.7	28.5	0.0	3.8	150	Vert.	-	2
4.960	49.4	74.0	24.6	36.8	32.9	25.6	5.3	150	Hor.	Yes	2
9.920	54.6	74.0	19.4	33.2	37.4	23.9	7.9	150	Hor.	No	2
12.400	50.4	74.0	23.6	40.1	33.7	25.9	2.5	100	Hor.	Yes	2
17.360	61.7	74.0	12.3	52.5	33.9	27.2	2.5	100	Vert.	No	2
19.840	52.8	74.0	21.2	51.6	37.0	38.3	2.5	100	Hor.	Yes	2
22.320	52.6	74.0	21.4	51.2	37.2	38.3	2.5	100	Hor.	Yes	2
24.800	53.2	74.0	20.8	52.4	37.3	39.0	2.5	100	Vert.	No	2
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.480	88.9	-	-	56.6	28.5	0.0	3.8	150	Vert.	-	2
4.960	39.0	54.0	15.0	26.4	32.9	25.6	5.3	150	Hor.	Yes	2
9.920	41.3	68.9	27.6	19.9	37.4	23.9	7.9	150	Hor.	No	2
12.400	37.5	54.0	16.5	27.2	33.7	25.9	2.5	100	Hor.	Yes	2
17.360	50.0	68.9	18.9	40.8	33.9	27.2	2.5	100	Vert.	No	2
19.840	39.7	54.0	14.3	38.5	37.0	38.3	2.5	100	Hor.	Yes	2
22.320	39.7	54.0	14.3	38.3	37.2	38.3	2.5	100	Hor.	Yes	2
24.800	40.0	68.9	28.9	39.2	37.3	39.0	2.5	100	Vert.	No	2
Measurement uncertainty						+2.2 dB / -3.6 dB					

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
29, 31 –34, 36, 37, 39, 44, 46, 49 - 51, 72

5.5.2.6 Preliminary radiated emission measurement with external monopole antenna

Ambient temperature	21 °C	Relative humidity	42 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

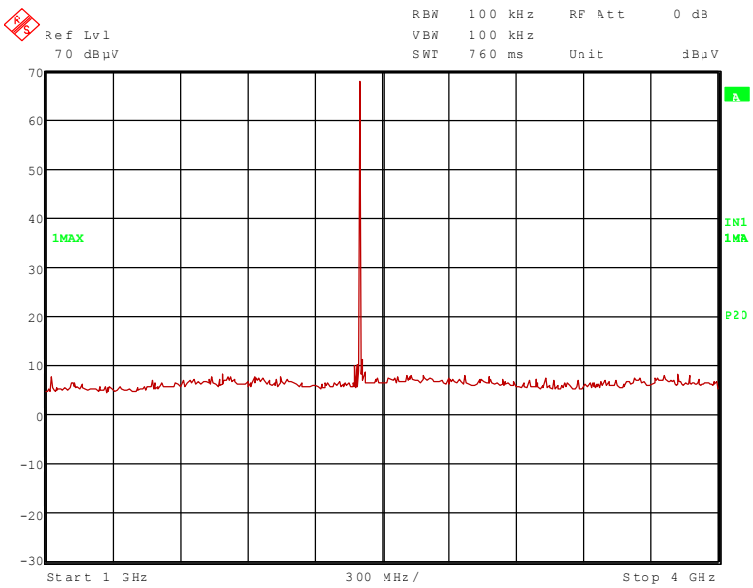
Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 3.3 V DC via the carrier board.

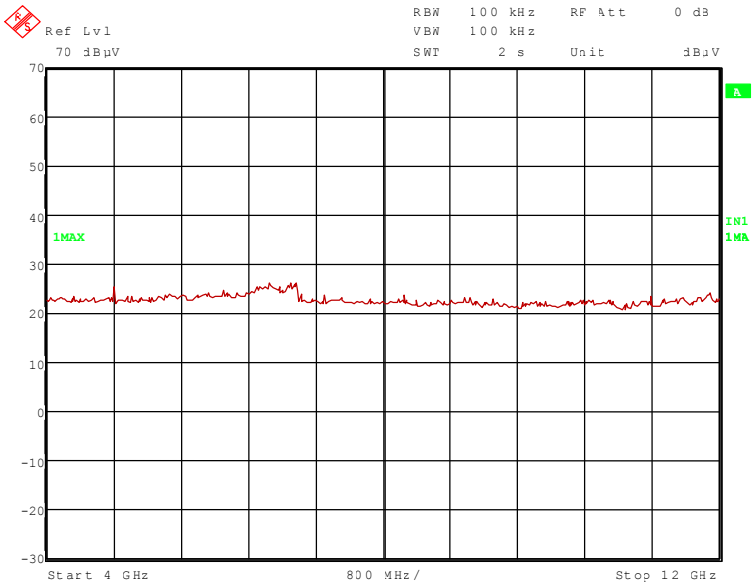
Remark: The emission measurement in this frequency range was carried out by using the external monopole antenna type Huber+Suhner SOA 2400/360/6/0/V, because additional pre-tests have shown that this antenna causes the highest emissions of all monopole antennas in question.

Transmitter operates at the lower end of the assigned frequency band

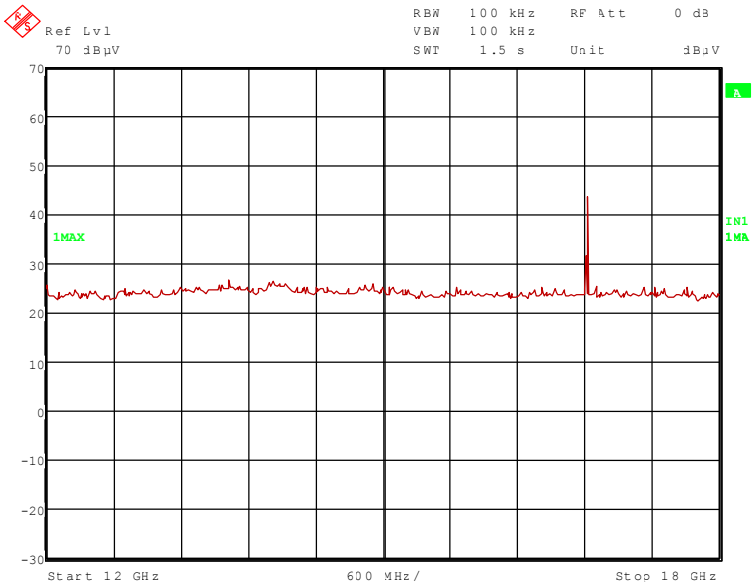
111592_67.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 6):



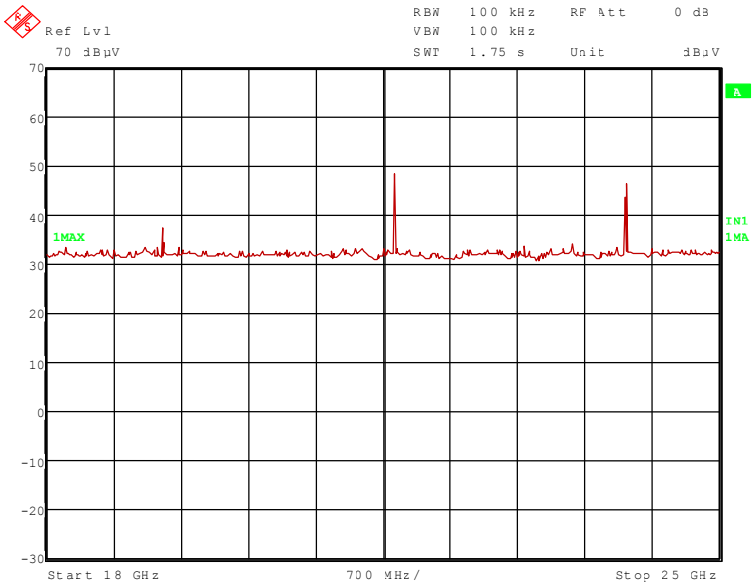
111592_72.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 6):



111592_98.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 6):



111592_103.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 6):



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

- 2.37645 GHz, 4.804 GHz and 19.216 GHz.

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

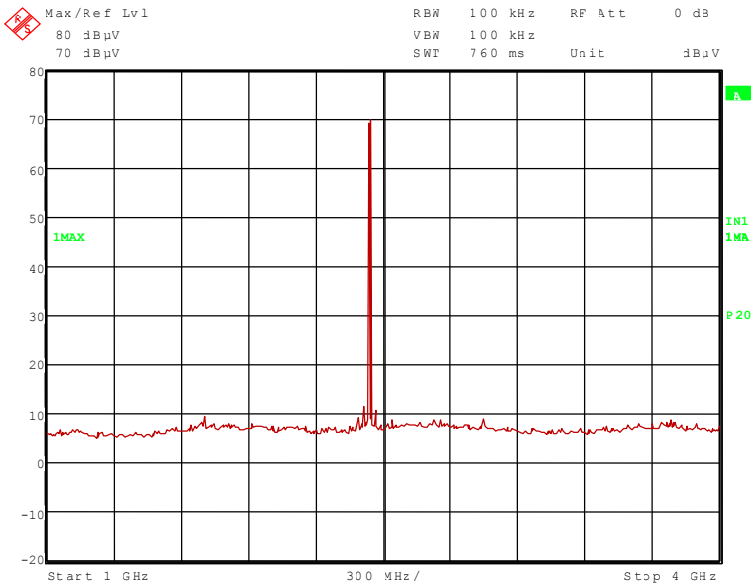
- 2.402 GHz, 2.4417 GHz, 2.4143 GHz, 2.4267 GHz, 16.814 GHz, 21.618 GHz and 24.020 GHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

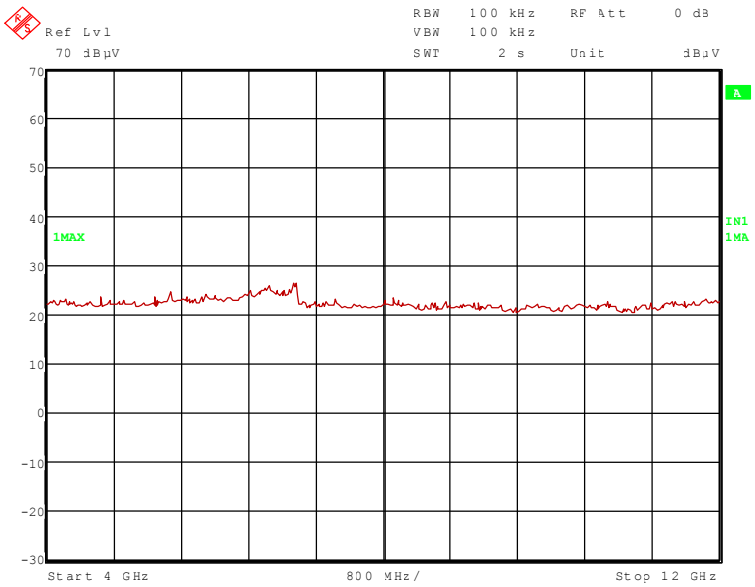
TEST EQUIPMENT USED FOR THE TEST:
29, 31 –34, 36, 37, 39, 44, 46, 49 - 51, 72

Transmitter operates on the middle of the assigned frequency band

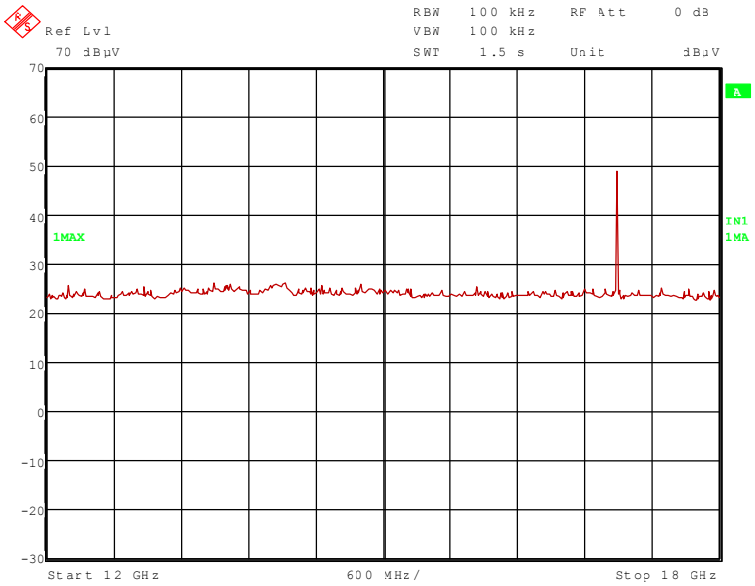
111592_69.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 7):



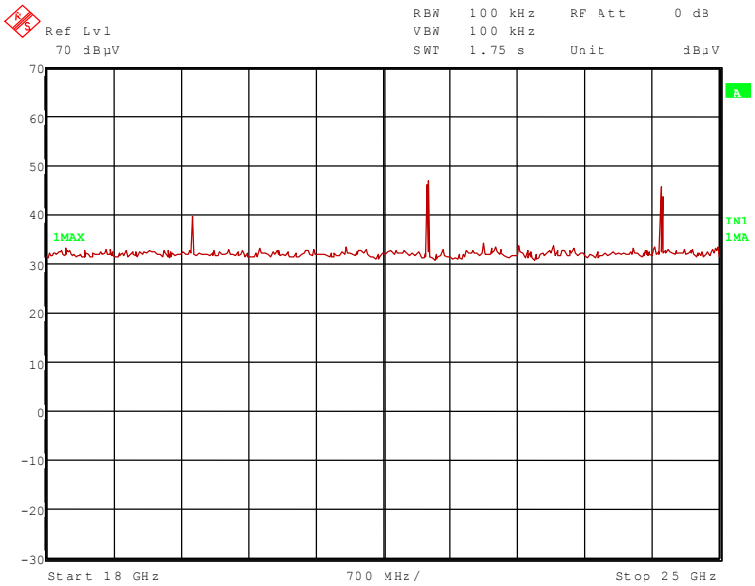
111592_73.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 7):



111592_99.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 7):



111592_102.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 7):



The following frequency was found inside the restricted bands during the preliminary radiated emission test:

- 19.520 GHz.

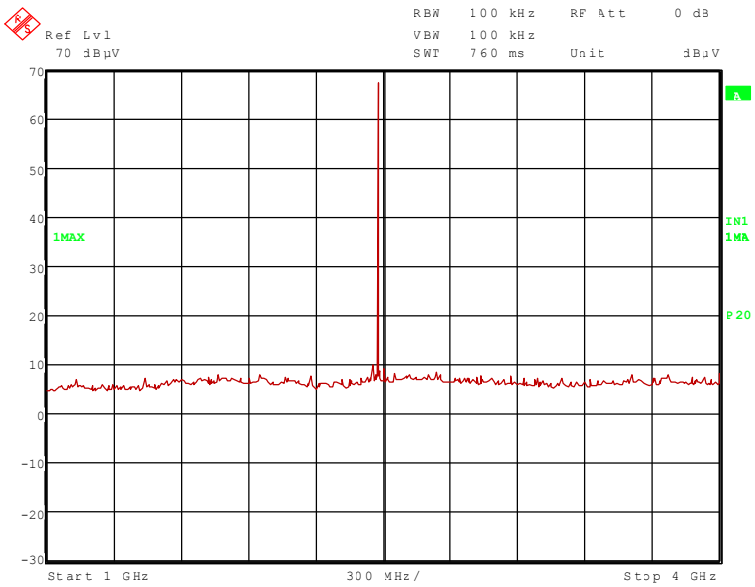
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.4142 GHz, 2.440 GHz, 2.4654 GHz, 17.080 GHz, 21.960 GHz and 24.400 GHz.

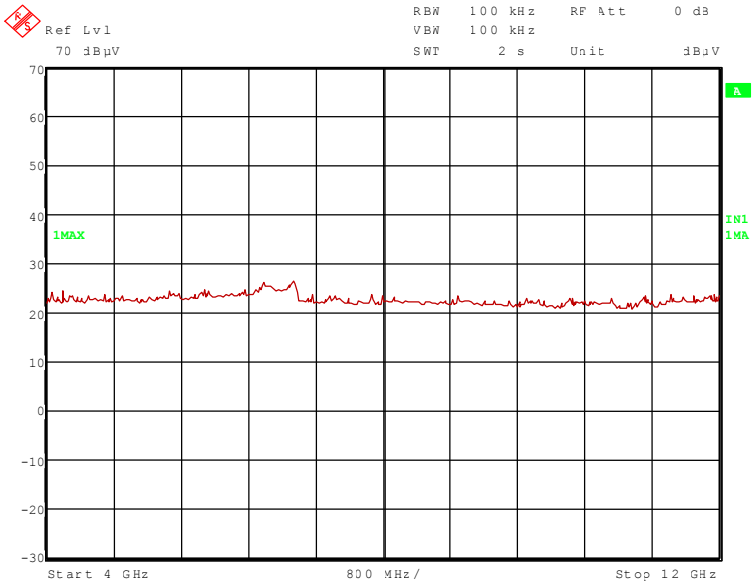
These frequencies have to be measured in a final measurement. The results were presented in the following.

Transmitter operates on the upper end of the assigned frequency

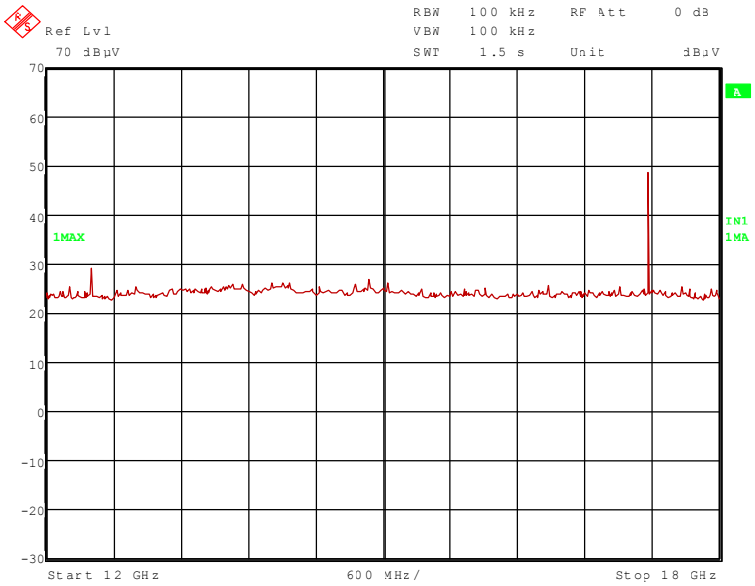
111592_70.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 8):



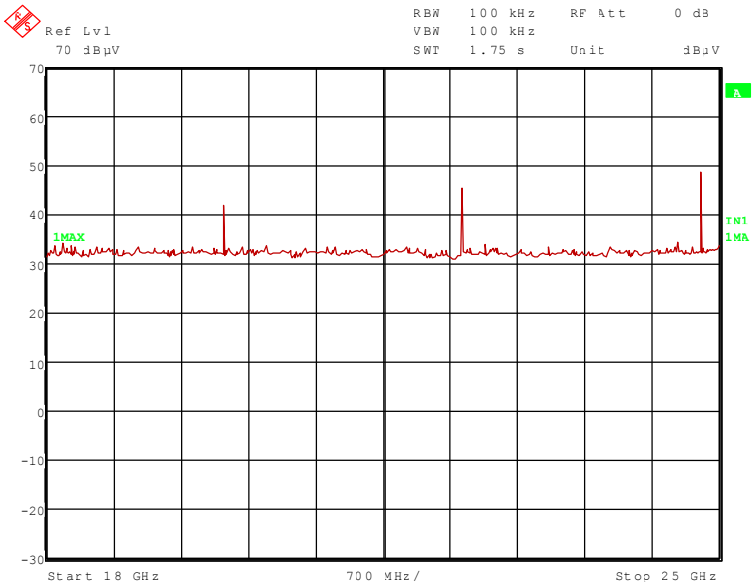
111592_74.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 8):



111592_100.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 8):



111592_101.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 8):



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

- 12.400 GHz, 19.840 GHz and 22.320 GHz.

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

- 2.4542 GHz, 2.480 GHz, 2.5056 GHz, 17.360 GHz and 24.800 GHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

5.5.2.7 Final radiated emission measurement (1 GHz to 25 GHz) with external monopole antenna

Ambient temperature	21 °C	Relative humidity	42 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 3.3 V DC by the carrier board.

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

Remark: The emission measurement in this frequency range was carried out by using the external monopole antenna type Huber+Suhner SOA 2400/360/6/0/V, because additional pre-tests have shown that this antenna causes the highest emissions of all monopole antennas in question.

Transmitter operates at the lower end of the assigned frequency band (operation mode 6)

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.37645	43.5	74.0	30.5	11.6	28.2	0.0	3.7	150	Vert.	Yes	1
2.402	101.8	-	-	69.8	28.3	0.0	3.7	150	Vert.	-	1
2.4143	44.1	81.8	37.7	12.0	28.4	0.0	3.7	150	Vert.	No	1
2.4267	42.4	81.8	39.4	10.3	28.4	0.0	3.7	150	Vert.	No	1
2.4417	39.5	81.8	42.3	7.4	28.4	0.0	3.7	150	Vert.	No	1
4.804	45.6	74.0	28.4	33.4	32.6	25.7	5.3	100	Vert.	Yes	1
16.814	57.5	81.8	24.3	48.7	33.8	27.5	2.5	100	Vert.	No	1
19.216	47.2	74.0	26.8	45.8	37.1	38.2	2.5	100	Vert.	Yes	1
21.618	55.4	81.8	26.4	54.0	37.2	38.3	2.5	100	Vert.	No	1
24.020	53.5	81.8	28.3	52.6	37.2	38.8	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.37645	26.4	54.0	27.6	-5.5	28.2	0.0	3.7	150	Vert.	Yes	1
2.402	89.3	-	-	57.3	28.3	0.0	3.7	150	Vert.	-	1
2.4143	27.5	69.3	41.8	-4.6	28.4	0.0	3.7	150	Vert.	No	1
2.4267	27.4	69.3	41.9	-4.7	28.4	0.0	3.7	100	Vert.	No	1
2.4417	26.7	69.3	42.6	-5.4	28.4	0.0	3.7	150	Vert.	No	1
4.804	33.6	54.0	20.4	21.4	32.6	25.7	5.3	100	Vert.	Yes	1
16.814	45.5	69.3	23.8	36.7	33.8	27.5	2.5	100	Vert.	No	1
19.216	34.2	54.0	19.8	32.8	37.1	38.2	2.5	100	Vert.	Yes	1
21.618	42.8	69.3	26.5	41.4	37.2	38.3	2.5	100	Vert.	No	1
24.020	40.9	69.3	28.4	40.0	37.2	38.8	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

<u>Transmitter operates at the middle of the assigned frequency band (operation mode 7)</u>

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.4142	43.3	82.2	38.9	11.2	28.4	0.0	3.7	150	Vert.	No	1
2.440	102.2	-	-	70.1	28.4	0.0	3.7	150	Vert.	-	1
2.4654	43.2	82.2	39.0	11.0	28.5	0.0	3.7	150	Vert.	No	1
17.080	62.5	82.2	19.7	53.6	33.8	27.4	2.5	100	Vert.	No	1
19.520	48.9	74.0	25.1	47.5	37.1	38.2	2.5	100	Vert.	Yes	1
21.960	56.6	82.2	25.6	55.2	37.2	38.3	2.5	100	Vert.	No	1
24.400	53.3	82.2	28.9	52.5	37.2	38.9	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.4142	27.4	69.9	42.5	-4.7	28.4	0.0	3.7	150	Vert.	No	1
2.440	89.9	-	-	57.8	28.4	0.0	3.7	150	Vert.	-	1
2.4654	27.8	69.9	42.1	-4.4	28.5	0.0	3.7	150	Vert.	No	1
17.080	50.5	69.9	19.4	41.6	33.8	27.4	2.5	100	Vert.	No	1
19.520	35.8	54.0	18.2	34.4	37.1	38.2	2.5	100	Vert.	Yes	1
21.960	43.5	69.9	26.4	42.1	37.2	38.3	2.5	100	Vert.	No	1
24.400	40.4	69.9	29.5	39.6	37.2	38.9	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Transmitter operates at the upper end of the assigned frequency band (operation mode 8)

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.4542	43.2	80.7	37.5	11.1	28.4	0.0	3.7	150	Vert.	No	1
2.480	100.7	-	-	68.4	28.5	0.0	3.8	150	Vert.	-	1
2.5056	43.1	80.7	37.6	10.7	28.6	0.0	3.8	150	Vert.	No	1
12.400	47.0	74.0	27.0	36.7	33.7	25.9	2.5	100	Vert.	Yes	1
17.360	64.3	80.7	16.4	55.1	33.9	27.2	2.5	100	Vert.	No	1
19.840	49.7	74.0	24.3	48.5	37.0	38.3	2.5	100	Vert.	Yes	1
22.320	53.3	74.0	20.7	51.9	37.2	38.3	2.5	100	Vert.	Yes	1
24.800	53.4	80.7	27.3	52.6	37.3	39.0	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.4542	27.7	68.4	40.7	-4.4	28.4	0.0	3.7	150	Vert.	No	1
2.480	88.4	-	-	56.1	28.5	0.0	3.8	150	Vert.	-	1
2.5056	27.6	68.4	40.8	-4.8	28.6	0.0	3.8	150	Vert.	No	1
12.400	34.3	54.0	19.7	24.0	33.7	25.9	2.5	150	Hor.	Yes	1
17.360	52.2	68.4	16.2	43.0	33.9	27.2	2.5	150	Vert.	No	1
19.840	36.6	54.0	17.4	35.4	37.0	38.3	2.5	100	Vert.	Yes	1
22.320	39.9	54.0	14.1	38.5	37.2	38.3	2.5	100	Vert.	Yes	1
24.800	40.3	68.4	28.1	39.5	37.3	39.0	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
29, 31 –34, 36, 37, 39, 44, 46, 49 - 51, 72

5.5.2.8 Preliminary radiated emission measurement with EPA antenna

Ambient temperature	21 °C	Relative humidity	37 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

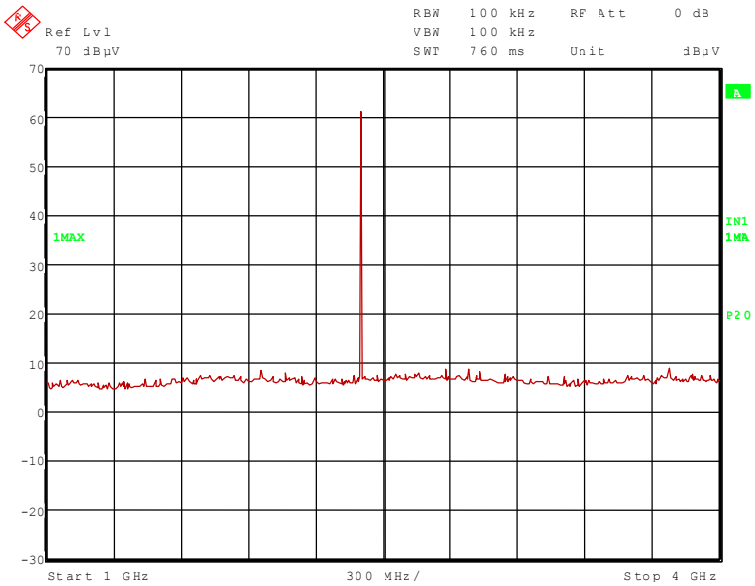
Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

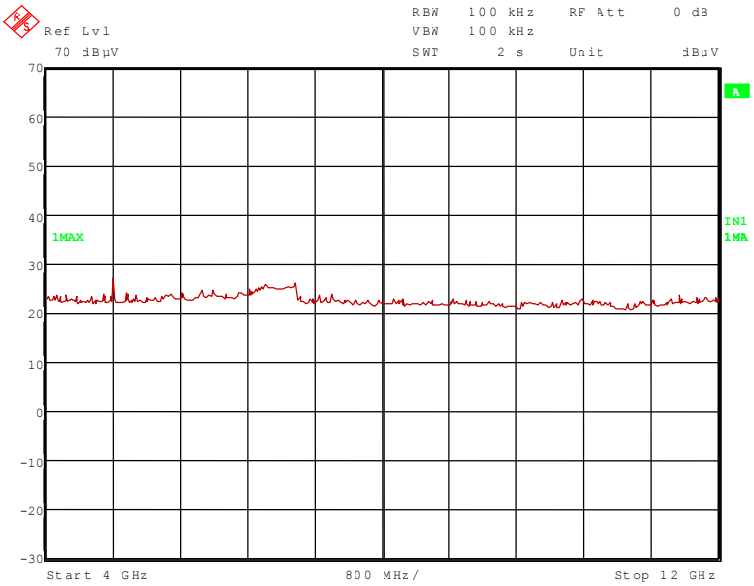
Supply voltage: During all measurements the EUT was supplied with 3.3 V DC via EPA circuit.

Transmitter operates at the lower end of the assigned frequency band

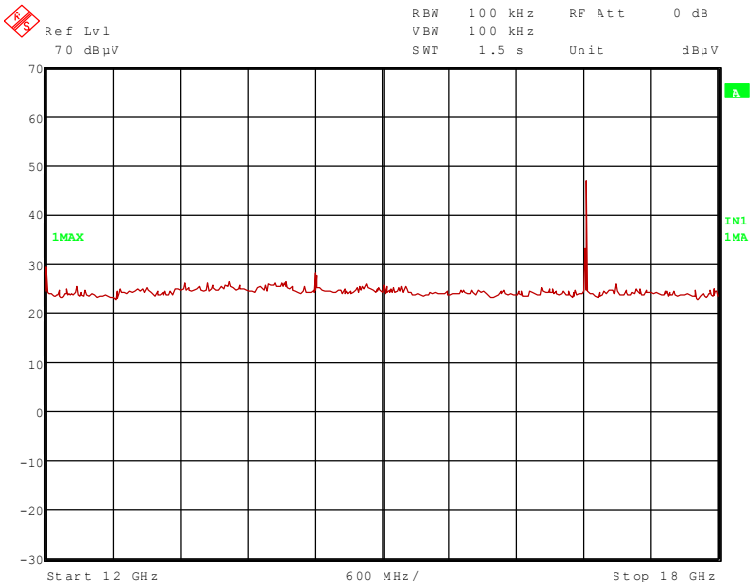
111592_114.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 6):



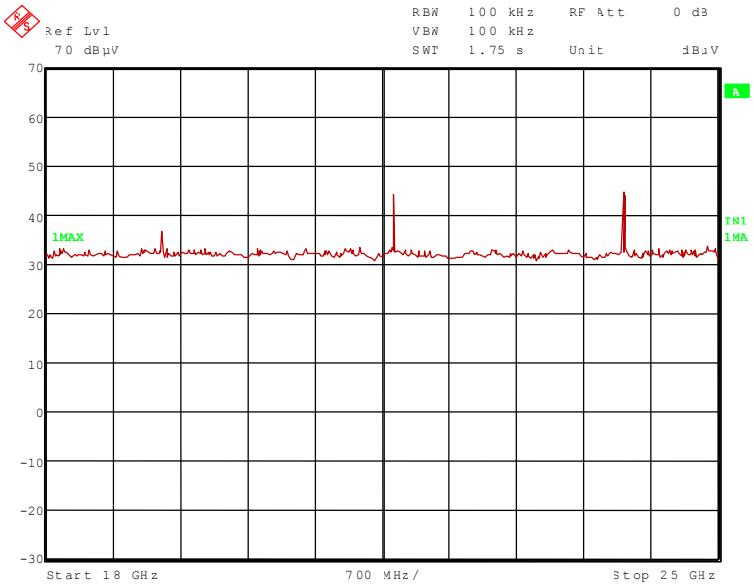
111592_121.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 6):



111592_122.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 6):



111592_127.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 6):



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

- 4.804 GHz, 12.010 GHz and 19.216 GHz.

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

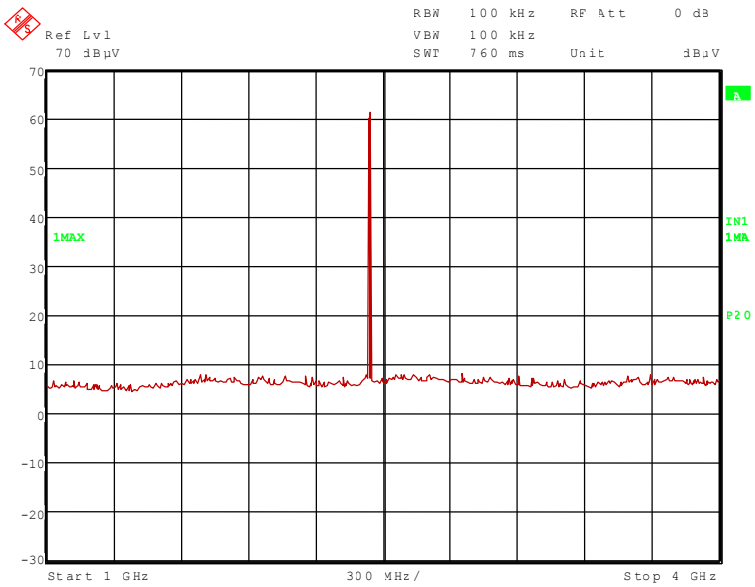
- 2.402 GHz, 14.412 GHz, 16.814 GHz, 21.618 GHz and 24.020 GHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

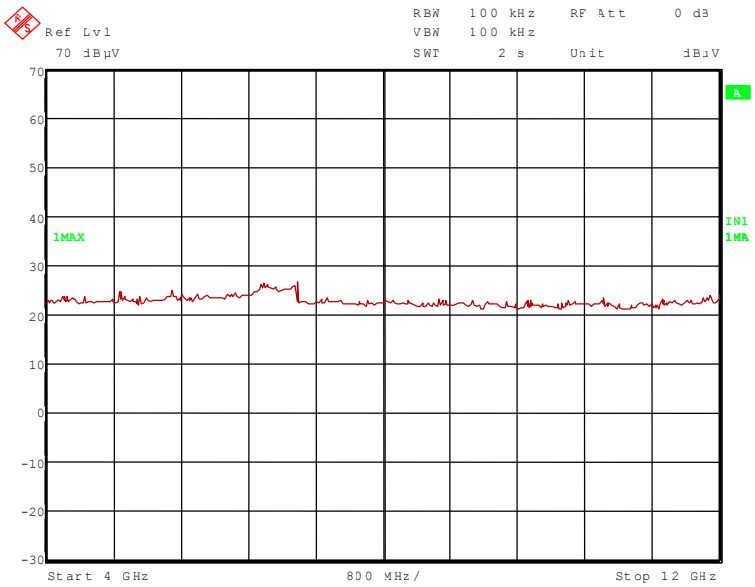
TEST EQUIPMENT USED FOR THE TEST:
29, 31 –34, 36, 37, 39, 44, 46, 49 - 51, 72

Transmitter operates on the middle of the assigned frequency band

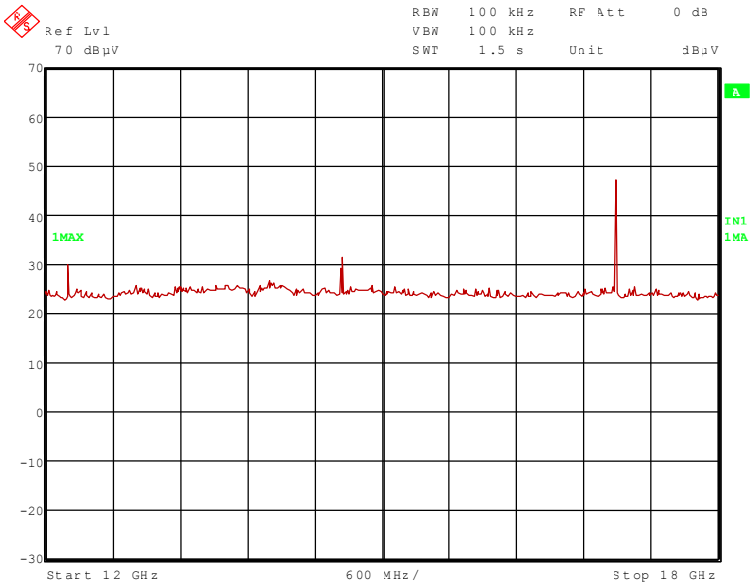
111592_116.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 7):



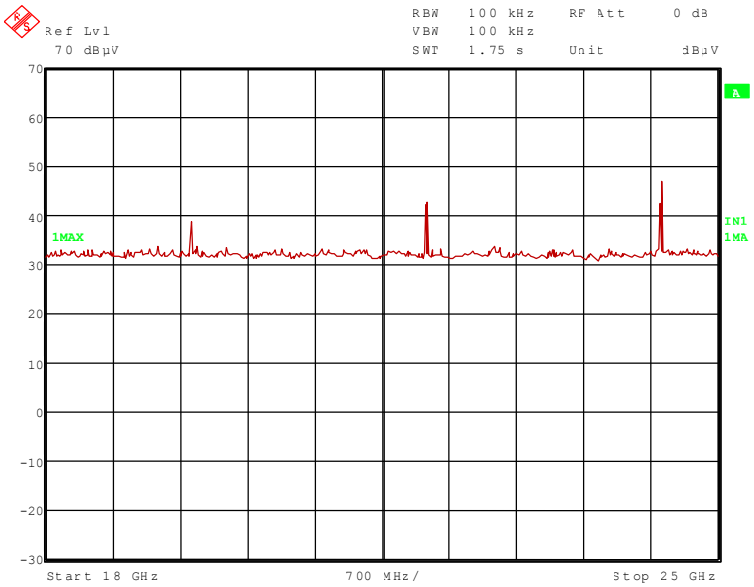
111592_120.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 7):



111592_123.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 7):



111592_126.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 7):



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

- 12.200 GHz and 19.520 GHz.

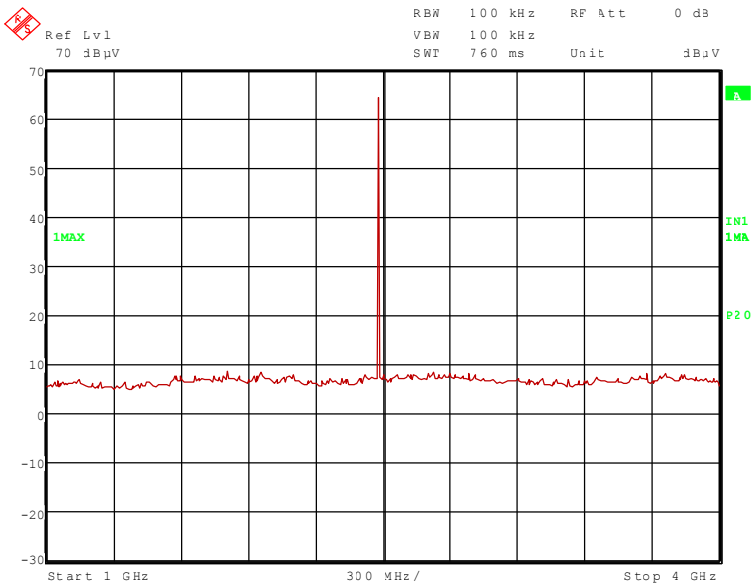
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.440 GHz, 14.640 GHz, 17.080 GHz, 21.960 GHz and 24.400 GHz.

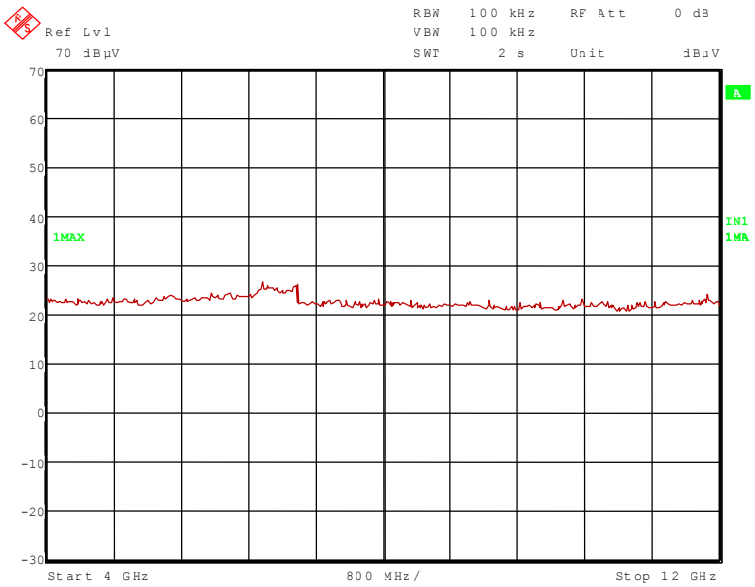
These frequencies have to be measured in a final measurement. The results were presented in the following.

Transmitter operates on the upper end of the assigned frequency

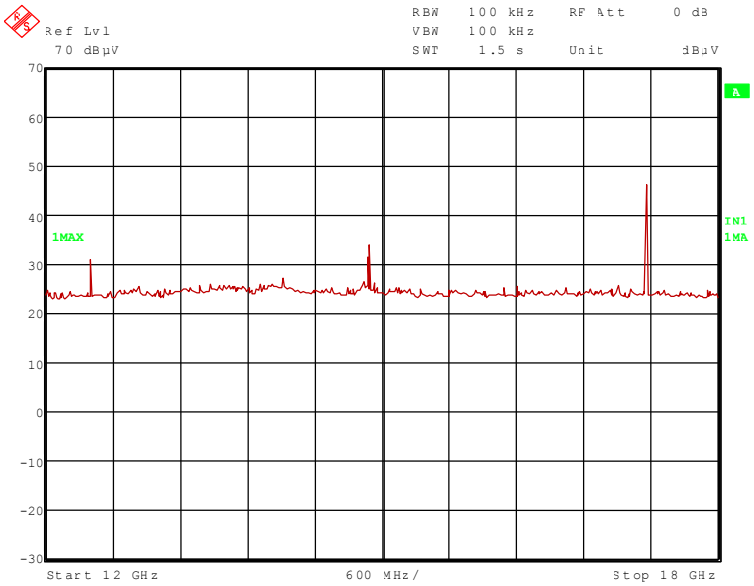
111592_117.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 8):



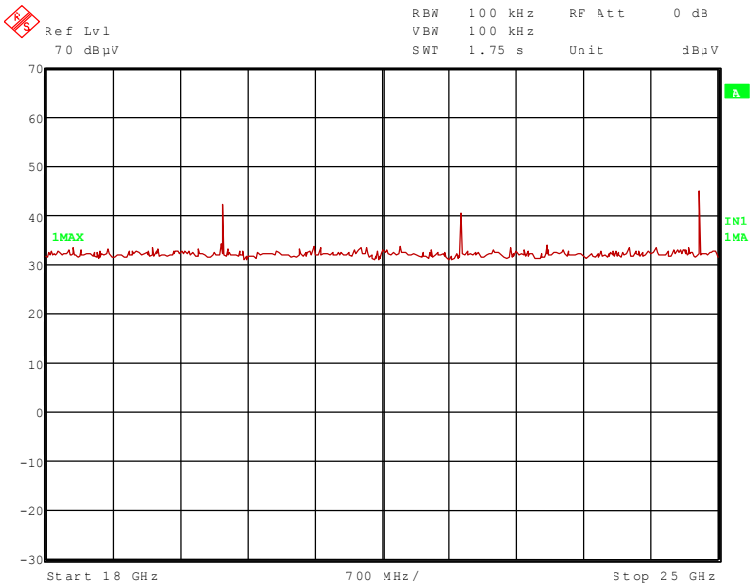
111592_119.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 8):



111592_124.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 8):



111592_125.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 8):



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

- 12.400 GHz, 19.840 GHz and 22.320 GHz.

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

- 2.480 GHz, 14.880 GHz, 17.360 GHz and 24.800 GHz.

These frequencies have to be measured in a final measurement. The results were presented in the following.

5.5.2.9 Final radiated emission measurement (1 GHz to 25 GHz) with EPA antenna

Ambient temperature	21 °C	Relative humidity	37 %

Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 3.3 V DC by the carrier board.

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

Transmitter operates at the lower end of the assigned frequency band (operation mode 6)

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.402	94.2	-	-	62.2	28.3	0.0	3.7	150	Hor.	-	1
4.804	45.7	74.0	28.3	33.5	32.6	25.7	5.3	150	Vert.	Yes	1
12.010	48.4	74.0	25.6	38.2	33.6	25.9	2.5	100	Hor.	Yes	1
14.412	46.9	74.2	27.3	37.2	33.7	26.5	2.5	100	Hor.	No	1
16.814	58.3	74.2	15.9	49.5	33.8	27.5	2.5	100	Hor.	No	1
19.216	45.9	74.0	28.1	44.5	37.1	38.2	2.5	100	Vert.	Yes	1
21.618	51.3	74.2	22.9	49.9	37.2	38.3	2.5	100	Vert.	No	1
24.020	50.6	74.2	23.6	49.7	37.2	38.8	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.402	89.2	-	-	57.2	28.3	0.0	3.7	150	Hor.	-	1
4.804	34.0	54.0	20.0	21.8	32.6	25.7	5.3	150	Vert.	Yes	1
12.010	34.9	54.0	19.1	24.7	33.6	25.9	2.5	100	Hor.	Yes	1
14.412	34.2	69.2	35.0	24.5	33.7	26.5	2.5	100	Hor.	No	1
16.814	45.9	69.2	23.3	37.1	33.8	27.5	2.5	100	Hor.	No	1
19.216	32.2	54.0	21.8	30.8	37.1	38.2	2.5	100	Vert.	Yes	1
21.618	37.2	69.2	32.0	35.8	37.2	38.3	2.5	100	Vert.	No	1
24.020	35.8	69.2	33.4	34.9	37.2	38.8	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Transmitter operates at the middle of the assigned frequency band (operation mode 7)

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.440	93.9	-	-	61.8	28.4	0.0	3.7	150	Hor.	-	1
12.200	48.7	74.0	25.3	38.5	33.6	25.9	2.5	100	Hor.	Yes	1
14.640	49.3	74.0	24.7	39.7	33.7	26.6	2.5	100	Hor.	No	1
17.080	58.1	74.0	15.9	49.2	33.8	27.4	2.5	100	Vert.	No	1
19.520	47.9	74.0	26.1	46.5	37.1	38.2	2.5	100	Vert.	Yes	1
21.960	51.1	74.0	22.9	49.7	37.2	38.3	2.5	100	Hor.	No	1
24.400	52.8	74.0	21.2	52.0	37.2	38.9	2.5	100	Hor.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.440	88.9	-	-	56.8	28.4	0.0	3.7	150	Hor.	-	1
12.200	35.7	54.0	18.3	25.5	33.6	25.9	2.5	100	Hor.	Yes	1
14.640	37.0	68.9	31.9	27.4	33.7	26.6	2.5	100	Hor.	No	1
17.080	46.1	68.9	22.8	37.2	33.8	27.4	2.5	100	Vert.	No	1
19.520	34.6	54.0	19.4	33.2	37.1	38.2	2.5	100	Vert.	Yes	1
21.960	37.8	68.9	31.1	36.4	37.2	38.3	2.5	100	Hor.	No	1
24.400	39.9	68.9	29.0	39.1	37.2	38.9	2.5	100	Hor.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Transmitter operates at the upper end of the assigned frequency band (operation mode 8)

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.480	97.3	-	-	65.0	28.5	0.0	3.8	150	Hor.	-	1
12.400	48.1	74.0	25.9	37.8	33.7	25.9	2.5	100	Hor.	Yes	1
14.880	50.9	77.3	26.4	41.4	33.7	26.7	2.5	100	Hor.	No	1
17.360	59.9	77.3	17.4	50.7	33.9	27.2	2.5	100	Hor.	No	1
19.840	49.4	74.0	24.6	48.2	37.0	38.3	2.5	100	Vert.	Yes	1
22.320	49.3	74.0	24.7	47.9	37.2	38.3	2.5	100	Vert.	Yes	1
24.800	51.8	77.3	25.5	51.0	37.3	39.0	2.5	100	Hor.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band	Pos.
2.480	92.3	-	-	60.0	28.5	0.0	3.8	150	Hor.	-	1
12.400	35.6	54.0	18.4	25.3	33.7	25.9	2.5	100	Hor.	Yes	1
14.880	38.1	72.3	34.2	28.6	33.7	26.7	2.5	100	Hor.	No	1
17.360	47.6	72.3	24.7	38.4	33.9	27.2	2.5	100	Hor.	No	1
19.840	36.5	54.0	17.5	35.3	37.0	38.3	2.5	100	Vert.	Yes	1
22.320	35.7	54.0	18.3	34.3	37.2	38.3	2.5	100	Vert.	Yes	1
24.800	39.1	72.3	33.2	38.3	37.3	39.0	2.5	100	Hor.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
29, 31 –34, 36, 37, 39, 44, 46, 49 - 51, 72

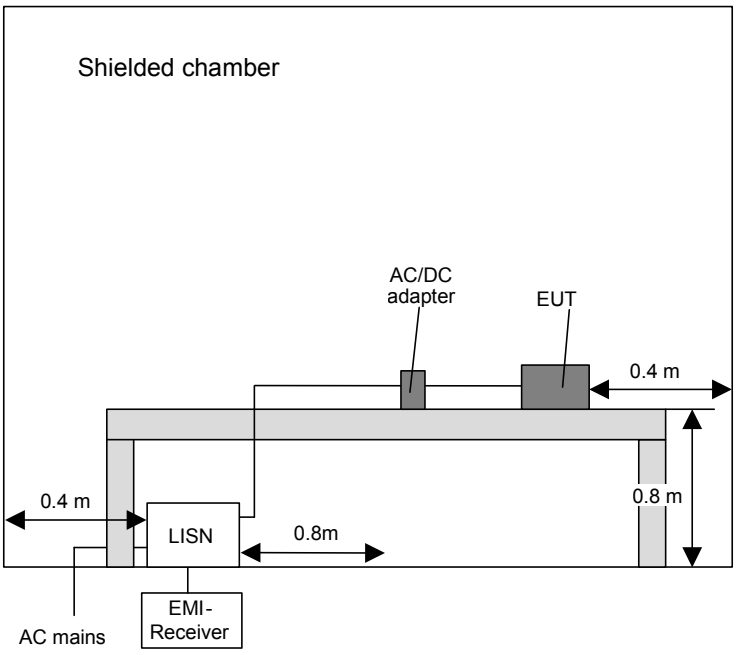
5.6 Conducted emissions on power supply lines (150 kHz to 30 MHz)

5.6.1 Method of measurement

This test will be carried out in a shielded chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices will be placed directly on the ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2009 [1].

The frequency range 150 kHz to 30 MHz will be measured with an EMI Receiver set to MAX Hold mode with peak and average detector and a resolution bandwidth of 9 kHz. A scan will be carried out on the phase (or plus pole in case of DC powered devices) of the AC mains network. If levels detected 10 dB below the appropriable limit, this emission will be measured with the average and quasi-peak detector on all lines.

Frequency range	Resolution bandwidth
150 kHz to 30 MHz	9 kHz



5.6.2 Test results (conducted emissions on power supply lines)

Ambient temperature	20 °C	Relative humidity	66 %

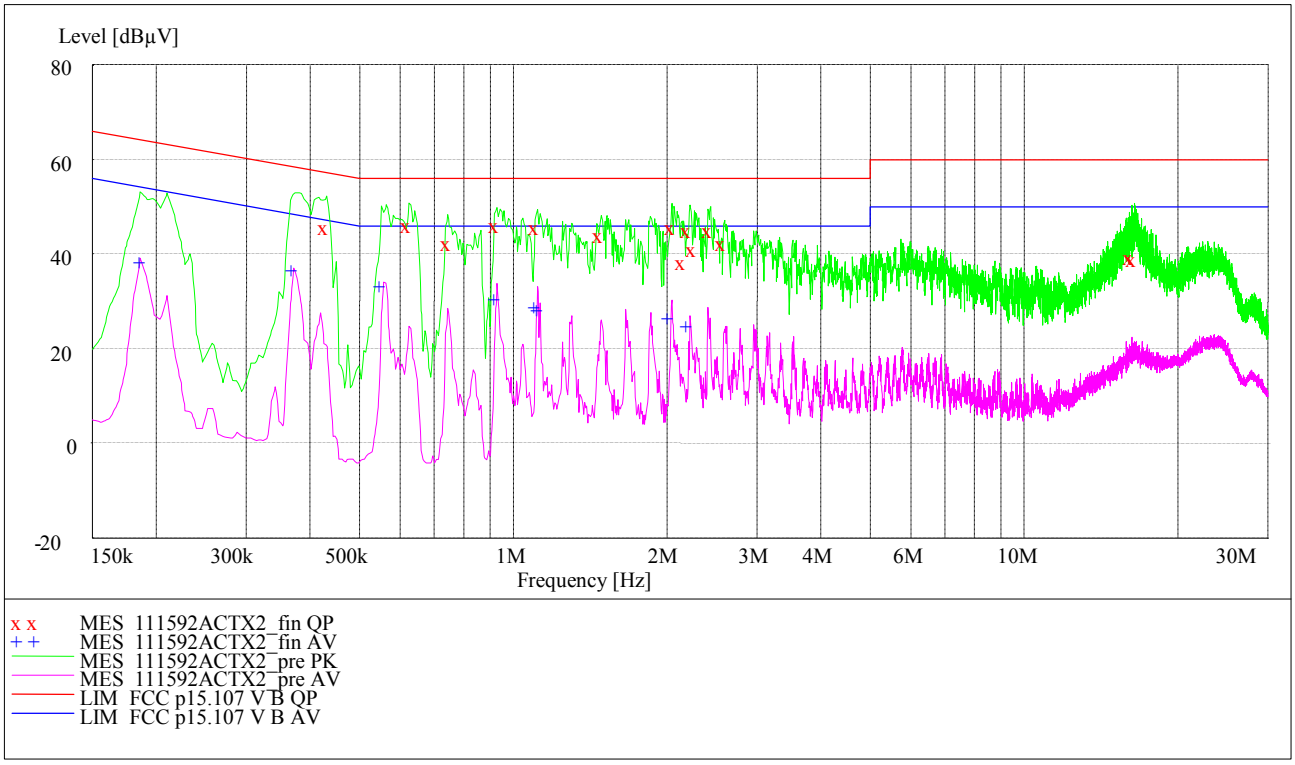
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.

Cable guide: The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The EUT operates in operation mode 4. All results are shown in the following.

Supply voltage: During the measurement the EUT was supplied 5 V DC by an AC / DC adaptor type Mascot 2121, which was supplied by 120 V AC / 60 Hz.

The curves in the diagram only represent for each frequency point the maximum measured value of all preliminary measurements which were made for each power supply line. The top measured curve represents the peak measurement and the bottom measured curve the average measurement. The quasi-peak measured points are marked by an x and the average measured points by an +.



Data record name: 111592ACTX2

Result measured with the quasipeak detector:
(These values are marked in the diagram by an x)

Frequency MHz	Level dBµV	Transducer dB	Limit dBµV	Margin dB	Line	PE
0.4308	46.2	0.7	57.2	11.0	L1	FLO
0.6252	47.0	0.6	56.0	9.0	L1	FLO
0.7494	43.3	0.6	56.0	12.7	L1	FLO
0.9276	47.0	0.5	56.0	9.0	L1	FLO
1.1166	46.5	0.5	56.0	9.5	L1	FLO
1.4874	44.6	0.6	56.0	11.4	L1	FLO
2.0508	46.6	0.8	56.0	9.4	L1	FLO
2.1498	39.1	0.8	56.0	16.9	L1	FLO
2.2200	46.0	0.8	56.0	10.0	L1	FLO
2.2677	42.2	0.8	56.0	13.8	L1	FLO
2.4324	45.6	0.8	56.0	10.4	L1	FLO
2.5962	43.0	0.8	56.0	13.0	L1	FLO
16.2852	40.1	3.2	60.0	19.9	N	FLO
16.4445	39.9	3.3	60.0	20.1	N	FLO
Measurement uncertainty				+3.6 dB / -4.5 dB		

Data record name: 111592ACTX2_fin QP

Result measured with the average detector:
(These values are marked in the diagram by an +)

Frequency MHz	Level dBµV	Transducer dB	Limit dBµV	Margin dB	Line	PE
0.1869	39.2	1.0	54.2	14.9	L1	FLO
0.3732	37.5	0.7	48.4	10.9	L1	FLO
0.5586	33.9	0.7	46.0	12.1	L1	FLO
0.9267	31.3	0.5	46.0	14.7	L1	FLO
1.1130	29.6	0.5	46.0	16.4	L1	FLO
1.1211	28.8	0.5	46.0	17.2	L1	FLO
2.0418	27.4	0.8	46.0	18.6	L1	FLO
2.2227	25.4	0.8	46.0	20.6	L1	FLO
Measurement uncertainty				+3.6 dB / -4.5 dB		

Data record name: 111592ACTX2_fin AV

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
1 – 4, 20

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 -	480662	Weekly verification (system cal.)	
2	EMI Receiver	ESIB 26	Rohde & Schwarz	1088.7490	481182	02/08/2010	02/2012
3	LISN	NSLK8128	Schwarzbeck	8128161	480138	05/07/2010	05/2012
4	High pass filter	HR 0.13-5ENN	FSY Microwave Inc.	DC 0109 SN 002	480340	Weekly verification (system cal.)	
14	Open area test site	-	Phoenix Test-Lab	-	480085	Weekly verification (system cal.)	
15	Measuring receiver	ESIB7	Rohde & Schwarz	100304	480521	03/15/2010	03/2012
16	Controller	HD100	Deisel	100/670	480139	-	-
17	Turntable	DS420HE	Deisel	420/620/80	480087	-	-
18	Antenna support	AS615P	Deisel	615/310	480086	-	-
19	Antenna	CBL6111 D	Chase	25761	480894	09/18/2008	09/2012
20	EMI Software	ES-K1	Rohde & Schwarz	-	480111	-	-
29	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303	Weekly verification (system cal.)	
30	Spectrum analyser	FSU	Rohde & Schwarz	200125	480956	04/15/2010	04/2012
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355	03/17/2010	03/2012
32	Controller	MCU	Maturo	MCU/043/971107	480832	-	-
33	Turntable	DS420HE	Deisel	420/620/80	480315	-	-
34	Antenna support	AS615P	Deisel	615/310	480187	-	-
35	Antenna	CBL6112 B	Chase	2688	480328	04/21/2011	04/2014
36	Antenna	3115 A	EMCO	9609-4918	480183	11/04/2008	11/2011
37	Standard Gain Horn 11.9 GHz – 18 GHz	18240-20	Flann Microwave	483	480294	Six month verification (system cal.)	
39	Standard Gain Horn 17.9 GHz – 26.7 GHz	20240-20	Flann Microwave	411	480297	Six month verification (system cal.)	
43	RF-cable No. 30	RTK 081	Rosenberger	-	410141	Weekly verification (system cal.)	
44	RF-cable No. 31	RTK 081	Rosenberger	-	410142	Weekly verification (system cal.)	
46	RF-cable 1 m	KPS-1533-400-KPS	Insulated Wire	-	480301	Six month verification (system cal.)	
49	Preamplifier	JS3-00101200-23-5A	Miteq	681851	480337	Six month verification (system cal.)	
50	Preamplifier	JS3-12001800-16-5A	Miteq	571667	480343	Six month verification (system cal.)	
51	Preamplifier	JS3-18002600-20-5A	Miteq	658697	480342	Six month verification (system cal.)	
55	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	03/10/2010	03/2012
72	4 GHz High Pass Filter	WHKX4.0/18G-8SS	Wainwright Instruments	1	480587	Weekly verification (system cal.)	
166	Power Meter	NRVD	Rohde & Schwarz	833697/030	480589	03/17/2010	03/2012
167	Peak Power Sensor	NRV-Z32	Rohde & Schwarz	849745/016	480551	03/16/2010	03/2012

7 REPORT HISTORY

Report Number	Date	Comment
F111592E3	27 June 2011	Document created

8 LIST OF ANNEXES

ANNEX A TEST SET-UP PHOTOS 10 pages

111592_1.JPG: cB-0946 with internal antenna, test set-up fully anechoic chamber (pos. 2)
111592_4.JPG: cB-0946 with external patch antenna, test set-up fully anechoic chamber (pos. 1)
111592_9.JPG: cB-0946 with external monopole antenna, test set-up fully anechoic chamber (pos. 1)
111592_26.JPG: cB-0946 with EPA antenna, test set-up fully anechoic chamber (pos. 3)
111592_16.JPG: cB-0946 with external patch antenna, test set-up fully anechoic chamber
111592_15.JPG: cB-0946 with external patch antenna, test set-up fully anechoic chamber
111592_2.JPG: cB-0946 with internal antenna, test set-up fully anechoic chamber
111592_19.JPG: cB-0946 with external monopole antenna, test set-up fully anechoic chamber
111592_33.JPG: cB-0946 with external patch antenna, test set-up open area test site
111592_35.JPG: cB-0946 with external patch antenna, test set-up shielded chamber

ANNEX B INTERNAL PHOTOGRAPHS 11 pages

111592_b.JPG: cB-0946 mounted on the cB-0903-03 (carrier board)
111592_j.JPG: cB-0946 mounted on the cB-0924-02 (EPA)
111592_i.JPG: cB-0946 with internal antenna, PCB, top view
111592_h.JPG: cB-0946 with internal antenna, PCB, top view, shielding removed
111592_g.JPG: cB-0946 with antenna connector, PCB, top view
111592_f.JPG: cB-0946, PCB, bottom view
111592_d.JPG: cB-0903-03, PCB, top view
111592_c.JPG: cB-0903-03, PCB, bottom view
111592_l.JPG: cB-0924-02, top view
111592_k.JPG: cB-0924-02, bottom view
111592_m.JPG: cB-0924-02, bottom view, antenna removed

Annex C EXTERNAL PHOTOGRAPHS - pages

Because the EUT is a module, which is intended to be implemented inside a final application, no external photographs were available

ANNEX D RESULTS OF THE RECEIVER MEASUREMENTS 11 PAGES