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: F111592E2

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] **FCC Public Notice DA 00-705 (March 2000)**

[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 4) were fulfilled by the equipment under test.
The complete test results are presented in the following.

Test engineer:	Thomas KÜHN		22 June 2011
	Name	Signature	Date
Authorized reviewer:	Bernd STEINER		22 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
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:	7 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.

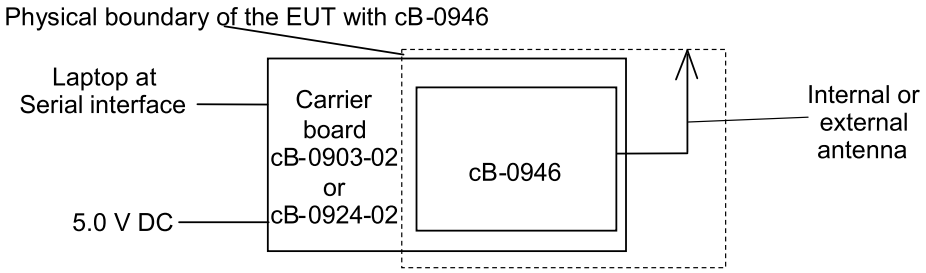
The tests were carried out with unmodified samples with an internal antenna (cB-0946-A1-01 and cB-0946-A1-03, samples marked with “62” and “54” for TX and RX tests and unmodified sample with an antenna connector (cB-0946-A1-02, sample marked with “59” for TX and RX.

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 mode:

Operation mode	Description of the operation mode	Modulation	Data rate / Mbps
1	Continuous transmitting on 2402 MHz	GFSK	1
1a		π/4-DQPSK	2
1b		8DPSK	3
2	Continuous transmitting on 2441 MHz	GFSK	1
2a		π/4-DQPSK	2
2b		8DPSK	3
3	Continuous transmitting on 2480 MHz	GFSK	1
3a		π/4-DQPSK	2
3b		8DPSK	3
4	Transmitter hopping on all channels	GFSK	1
4a		π/4-DQPSK	2
4b		8DPSK	3
5	Continuous receiving on 2441 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
20 dB bandwidth	1b, 2b, 3b (3 Mbps)
Carrier frequency separation	1b, 2b, 3b (3 Mbps)
Number of hopping channels	4
Dwell time	2, 2a, 2b (1-, 2- and 3 Mbps)
Maximum peak output power	1, 1a, 1b, 2, 2a, 2b, 3, 3a and 3b (1-, 2- and 3 Mbps)
Band edge compliance (radiated)	1, 3, 4 (1 Mbps)
Radiated emissions (transmitter)	1, 2, 3 (1 Mbps)
Conducted emissions on supply line	4b (3 Mbps)
Radiated emissions (receiver)	5

The results of the EUT operates in Bluetooth Low Energy – modes 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 Low Energy (BLE) mode will be documented in a separate test report. Object of this test report is the Bluetooth operation with and without Enhanced Data Rate (EDR) of the module 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
20 dB bandwidth	General	15.247 (a) (1)	A8.1 (a) [4]	Passed	11 et seq.
Carrier frequency separation	General	15.247 (a) (1)	A8.1 (b) [4]	Passed	14 et seq.
Number of hopping channels	2400.0 - 2483.5	15.247 (a) (1) (iii)	A8.1 (d) [4]	Passed	17 et seq.
Dwell time	2400.0 - 2483.5	15.247 (a) (1) (iii)	A8.1 (d) [4]	Passed	19 et seq.
Maximum peak output power	2400.0 - 2483.5	15.247 (b) (1)	A8.4 (2) [4]	Passed	23 et seq.
Band edge compliance	2400.0 - 2483.5	15.247 (d)	A8.5 [4]	Passed	26 et seq.
Radiated emissions (transmitter)	0.009 - 25,000	15.205 (a) 15.209 (a)	7.2.2 [5] 2.5 [4]	Passed	43 et seq.
Conducted emissions on supply line	0.15 - 30	15.207 (a)	7.2.4 [5]	Passed	96 et seq.
Radiated emissions (receiver)	0.009 – 12,500	15.109 (a)	6.1 [5]	Passed	Annex D

5 TEST RESULTS

5.1 20 dB bandwidth

5.1.1 Method of measurement (20 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 and the hopping function has to be disenabled, the transmitter shall work with its maximum data rate.

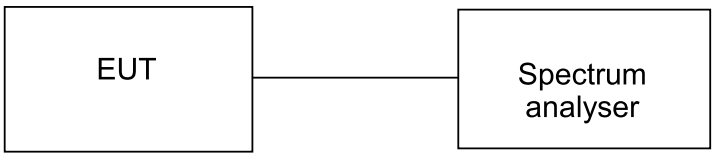
The following spectrum analyser settings shall be used:

- Span: App. 2 to 3 times the 20 dB bandwidth, centred on the actual hopping channel.
- Resolution bandwidth: ≥ 1 % of the 20 dB bandwidth.
- 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 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:

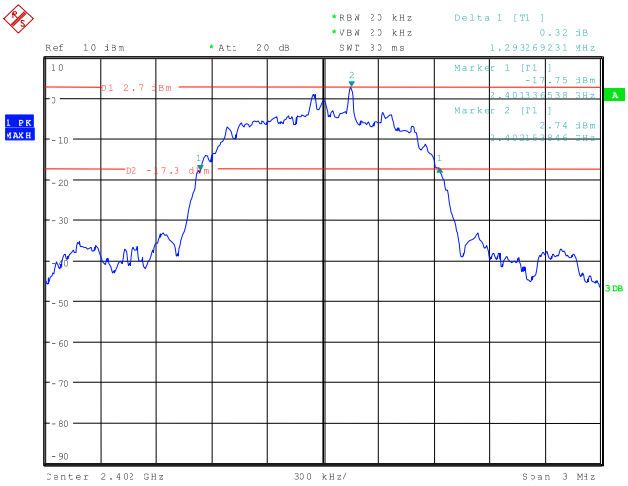


5.1.2 Test results (20 dB bandwidth)

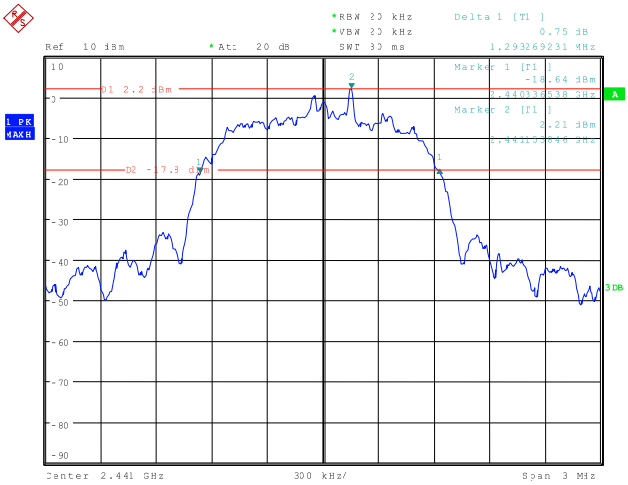
Ambient temperature	21 °C

Relative humidity	45 %

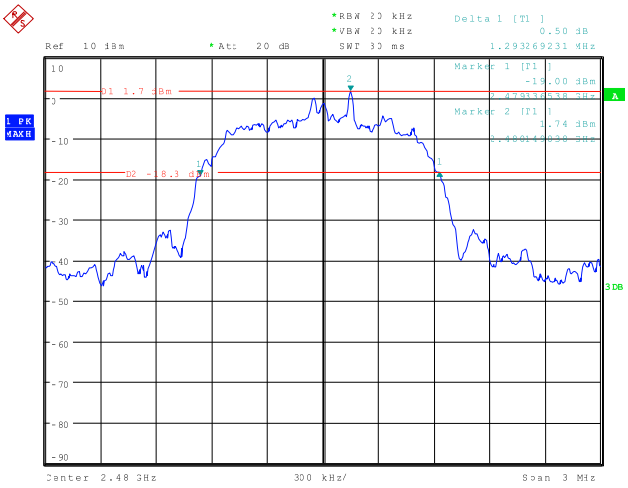
111592_223.wmf: 20 dB bandwidth at the lower end of the assigned frequency band:



111592_224.wmf: 20 dB bandwidth at the middle of the assigned frequency band:



111592_225.wmf: 20 dB bandwidth at the upper end of the assigned frequency band:



Channel number	Channel frequency [MHz]	20 dB bandwidth [kHz]
Operation mode 1b, 2b, 3b		
0	2402	1293.269
39	2441	1293.269
78	2480	1293.269
Measurement uncertainty		+0.66 dB / -0.72 dB

TEST EQUIPMENT USED FOR THE TEST:
30

5.2 Carrier frequency separation

5.2.1 Method of measurement (carrier frequency separation)

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 and the hopping function has to be enabled.

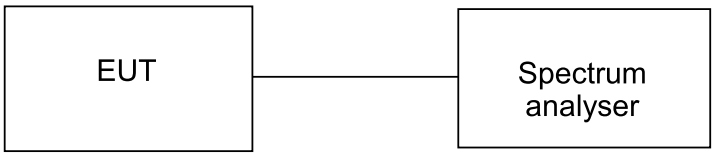
The following spectrum analyser settings shall be used:

- Span: Wide enough to capture the peaks of two adjacent channels.
- Resolution bandwidth: ≥ 1 % of the span.
- Video bandwidth: ≥ the resolution bandwidth.
- Sweep: Auto.
- Detector function: peak.
- Trace mode: Max hold.

After trace stabilisation the marker and the delta marker function will be used to determine the separation between the peaks of two adjacent channel signals.

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

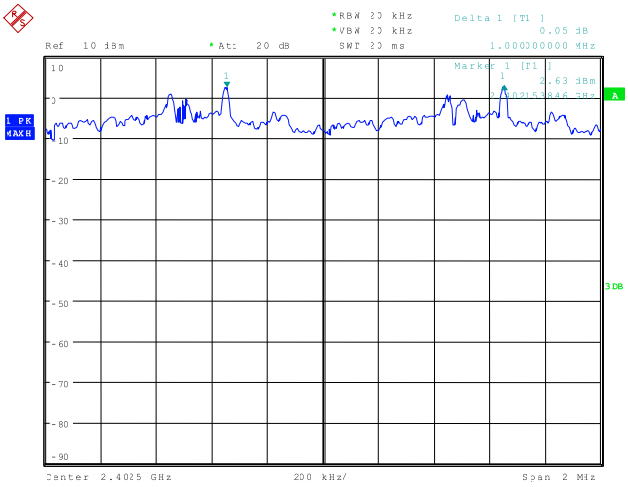
Test set-up:



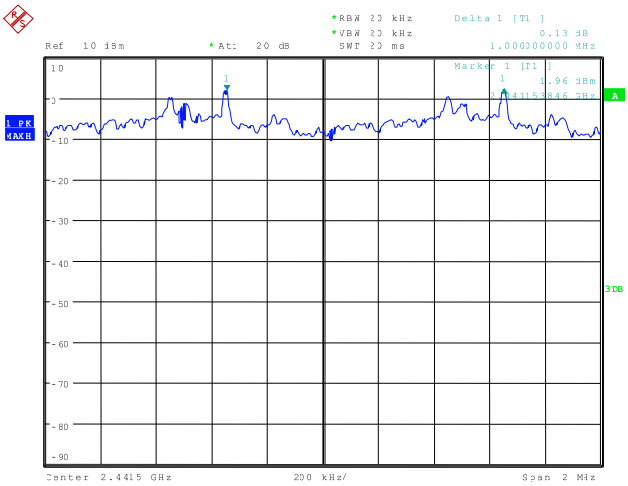
5.2.2 Test results (carrier frequency separation)

Ambient temperature	21 °C	Relative humidity	45 %

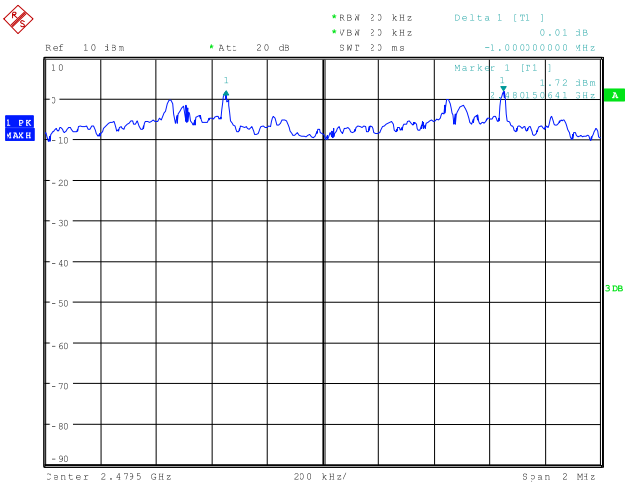
111592_229.wmf: Channel separation at the lower end of the assigned frequency band:



111592_230.wmf: Channel separation at the middle of the assigned frequency band:



111592_231.wmf: Channel separation at the upper end of the assigned frequency band:



Channel number	Channel frequency [MHz]	Channel separation [kHz]	Minimum limit [kHz]
Operation mode 4b			
0	2402	1000.000	862.179 ($^2/_3$ of the 20 dB bandwidth)
39	2441	1000.000	862.179 ($^2/_3$ of the 20 dB bandwidth)
78	2480	1000.000	862.179 ($^2/_3$ of the 20 dB bandwidth)
Measurement uncertainty			$<10^{-7}$

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
30

5.3 Number of hopping frequencies

5.3.1 Method of measurement (number of hopping frequencies)

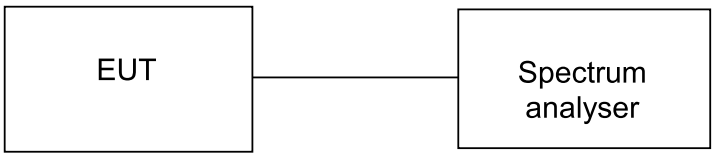
The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT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

The following spectrum analyser settings shall be used:

- Span: Equal to the assigned frequency band.
- Resolution bandwidth: ≥ 1 % of the span.
- Video bandwidth: ≥ the resolution bandwidth.
- Sweep: Auto.
- Detector function: Peak.
- Trace mode: Max hold.

After trace stabilisation the number of hopping channels could be counted. It might be possible to divide the span into some sub ranges in order to clearly show all hopping frequencies.

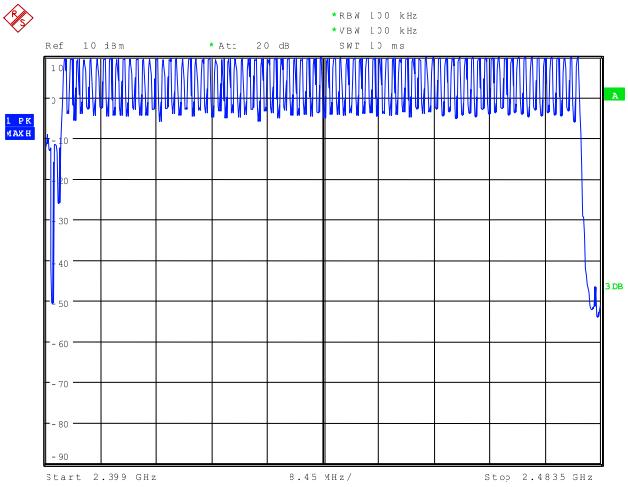
Test set-up:



5.3.2 Test results (number of hopping frequencies)

Ambient temperature	21 °C	Relative humidity	45 %

111592_236.wmf: Number of hopping channels:



Number of hopping channels	Limit
Operation mode 4	
79	At least 15

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
30

5.4 Dwell time

5.4.1 Method of measurement (dwell time)

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 and the hopping function has to be enabled.

The following spectrum analyser settings shall be used:

- Span: Zero, centred on a hopping channel.
- Resolution bandwidth: 1 MHz.
- Video bandwidth: ≥ the resolution bandwidth.
- Sweep: As necessary to capture the entire dwell time per hopping channel.
- Detector function: peak.
- Trace mode: Max hold.

The marker and delta marker function of the spectrum analyser will be used to determine the dwell time.

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

If the EUT is possible to operate with different mode of operation (data rates, modulation formats etc.) the test will be repeated with every different operation mode of the EUT.

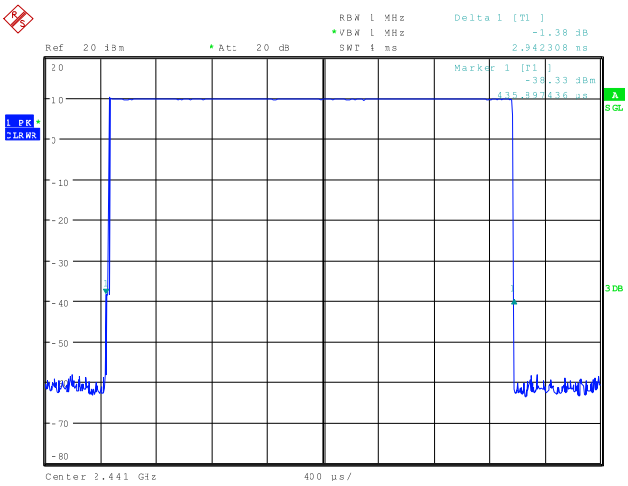
Test set-up:

5.4.2 Test results (dwell time)

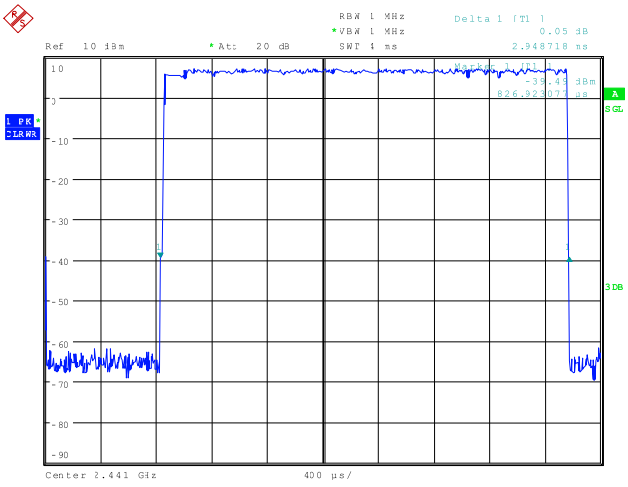
Ambient temperature	21 °C

Relative humidity	45 %

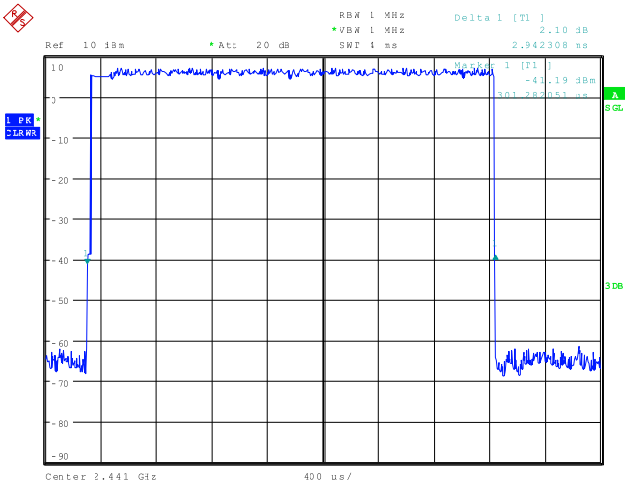
111592_239.wmf: Dwell time at the middle of the assigned frequency band:



111592_238.wmf: Dwell time at the middle of the assigned frequency band:



111592_237.wmf: Dwell time at the middle of the assigned frequency band:



The dwell time is calculated with the following formula:

Dwell time = t_{pulse} x n_{hops} / number of hopping channels x 31.6 (equal to 0.4 s x number of hopping channels)

Where:

t_{pulse} is the measured pulse time (pls. refer the plots of the spectrum analyser above) [s],
n_{hops} is the number of hops per second in the actual operating mode of the transmitter [1/s].

The hopping rate of the system is 1600 hops per second and the system uses 79 channels. For this reason one time slot has a length of 625 µs.

With the used hopping modes DH5, 2DH5 and 3DH5 a packet need 5 timeslots for transmitting and the next timeslot for receiving. So the system makes in worst case 267 hops per second in transmit mode
(n_{hops} = 267 1/s).

Operation mode 2				
Channel number	Channel frequency [MHz]	t_{pulse} [µs]	Dwell time [ms]	Limit [ms]
39	2441	2492.308	313.847	400
Operation mode 2a				
Channel number	Channel frequency [MHz]	t_{pulse} [µs]	Dwell time [ms]	Limit [ms]
39	2441	2948.718	314.530	400
Operation mode 2b				
Channel number	Channel frequency [MHz]	t_{pulse} [µs]	Dwell time [ms]	Limit [ms]
39	2441	2942.308	313.847	400
Measurement uncertainty			$<10^{-7}$	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
30

5.5 Maximum peak output power

5.5.1 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 and the hopping function has to be disenabled.

The following spectrum analyser settings shall be used:

- Span: Approx. 5 times the 20 dB bandwidth, centred on a hopping channel.
- Resolution bandwidth: > the 20 dB bandwidth of the emission being measured.
- 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 indicated level is the peak output power, which has to be corrected with the value of the cable loss and an external attenuation (if necessary).

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

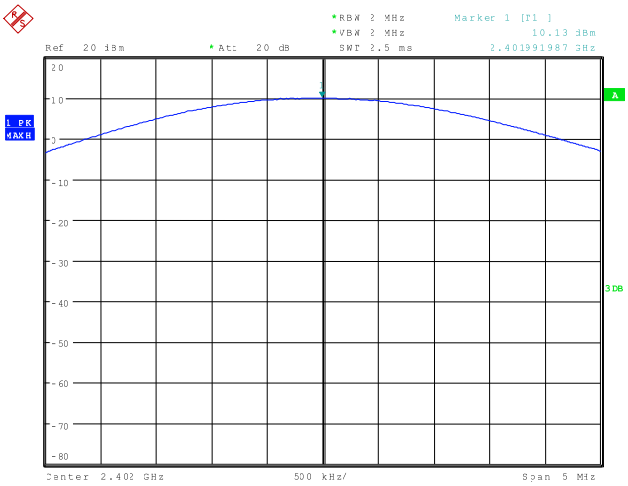
Test set-up:

5.5.2 Test results (maximum peak output power)

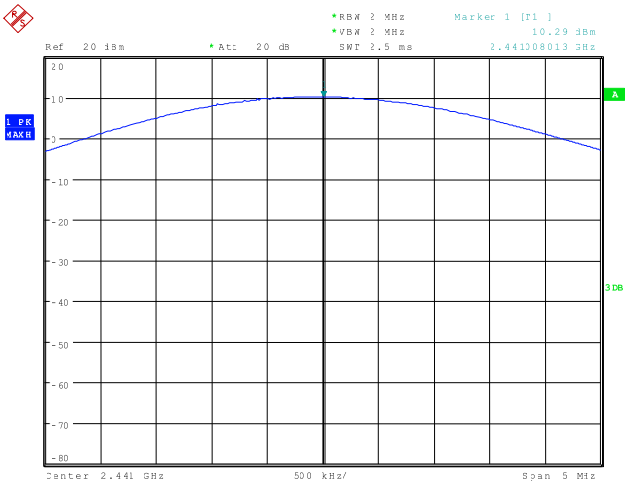
Ambient temperature	21 °C

Relative humidity	45 %

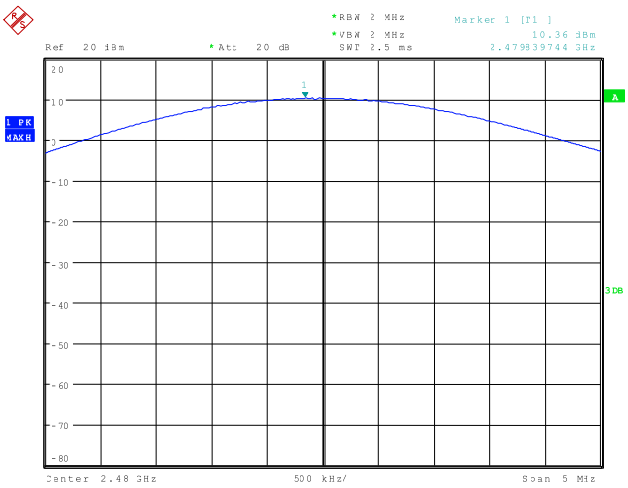
111592_241.wmf: Maximum peak output power at the lower end of the assigned frequency band (operation mode 1):



111592_242.wmf: Maximum peak output power at the middle of the assigned frequency band (operation mode 2):



111592_243.wmf: Maximum peak output power at the upper end of the assigned frequency band (operation mode 3):



Operation mode	Channel number	Channel frequency [MHz]	Maximum peak output power [dBm]	Antenna gain [dBi]	Peak power limit [dBm]
1 1a 1b	0	2402	10.1 8.0 8.1	3.4	30.0
2 2a 2b	39	2441	10.3 7.8 7.9	3.4	30.0
3 3a 3b	78	2480	10.4 7.6 7.7	3.4	30.0
Measurement uncertainty				+0.66 dB / -0.72 dB	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
30

5.6 Band-edge compliance

5.6.1 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.

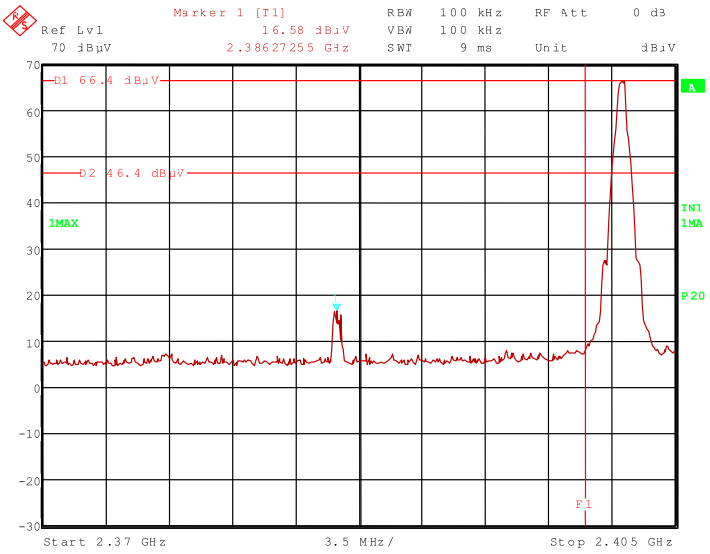
5.6.2 Test result (band-edge compliance (radiated)) with internal antenna

Ambient temperature	21 °C

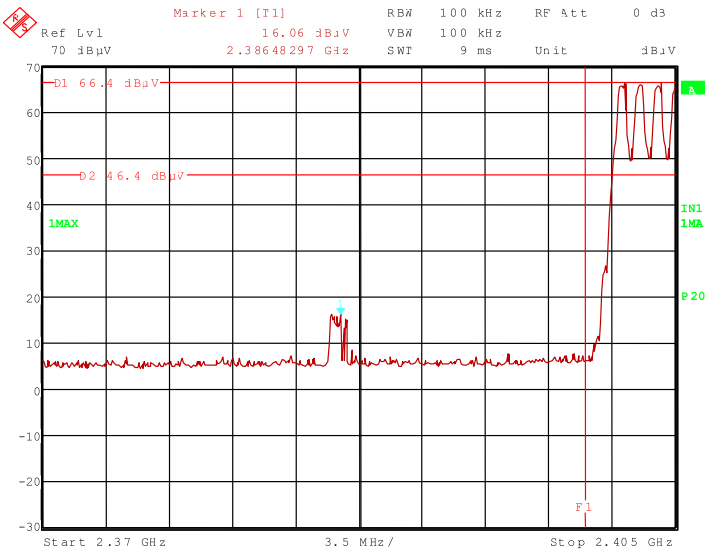
Relative humidity	50 %

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.

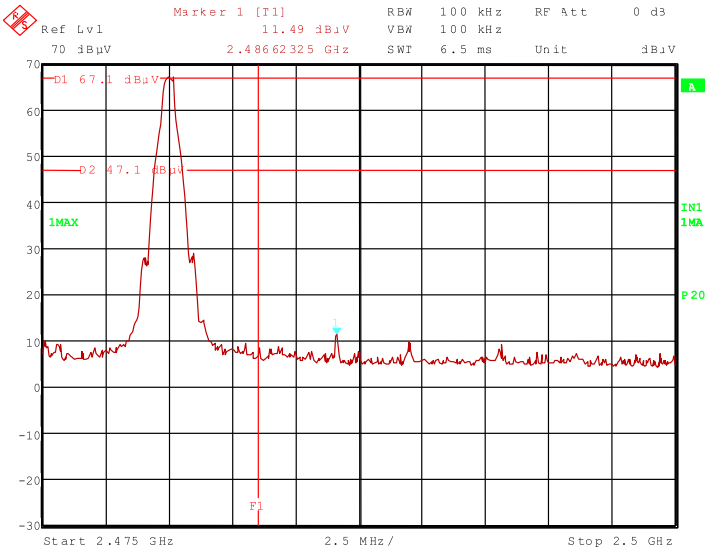
111592_3.wmf: Radiated band-edge compliance, lower band edge, hopping off (operation mode 1):



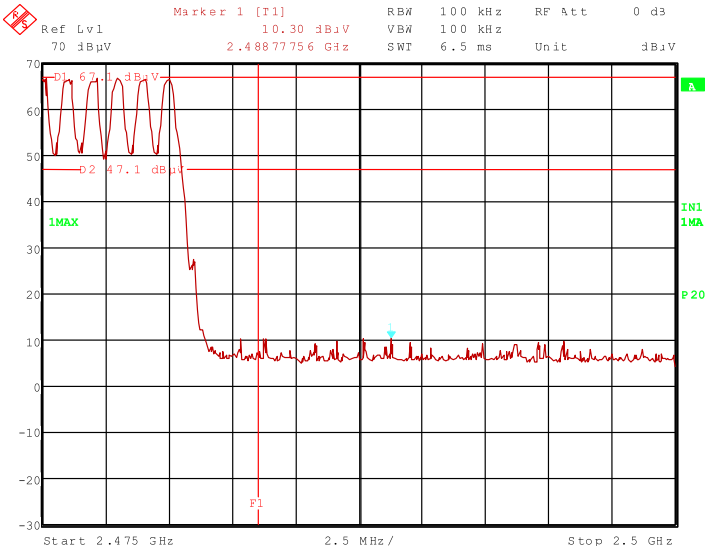
111592_4.wmf: Radiated band-edge compliance, lower band edge, hopping on (operation mode 4):



111592_6.wmf: Radiated band-edge compliance, upper band edge, hopping off (operation mode 3):



111592_7.wmf: Radiated band-edge compliance, upper band edge, hopping on (operation mode 4):



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	98.5	-	-	66.5	28.3	0.0	3.7	150	Vert.	-
2.3865	52.2	74.0	21.8	20.2	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	95.5	-	-	63.5	28.3	0.0	3.7	150	Vert.	-
2.3865	34.4	54.0	19.6	2.4	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	98.5	-	-	66.5	28.3	0.0	3.7	150	Vert.	-
2.3865	52.2	74.0	21.8	20.2	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	95.5	-	-	63.5	28.3	0.0	3.7	150	Vert.	-
2.3865	34.4	54.0	19.6	2.4	28.3	0.0	3.7	150	Vert.	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	97.8	-	-	65.5	28.5	0.0	3.8	150	Vert.	-
2.4866	44.4	74.0	29.6	12.1	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	94.9	-	-	62.6	28.5	0.0	3.8	150	Vert.	-
2.4866	27.5	54.0	26.5	-4.8	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	97.8	-	-	65.5	28.5	0.0	3.8	150	Vert.	-
2.4888	42.6	74.0	31.4	10.3	28.5	0.0	3.8	150	Vert.	2488.8
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	94.9	-	-	62.6	28.5	0.0	3.8	150	Vert.	-
2.4888	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			

Test: Passed

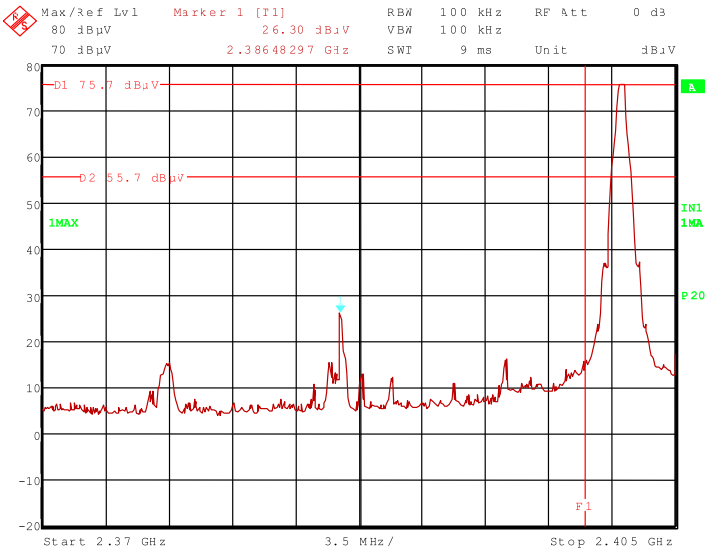
TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 34, 36, 44

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

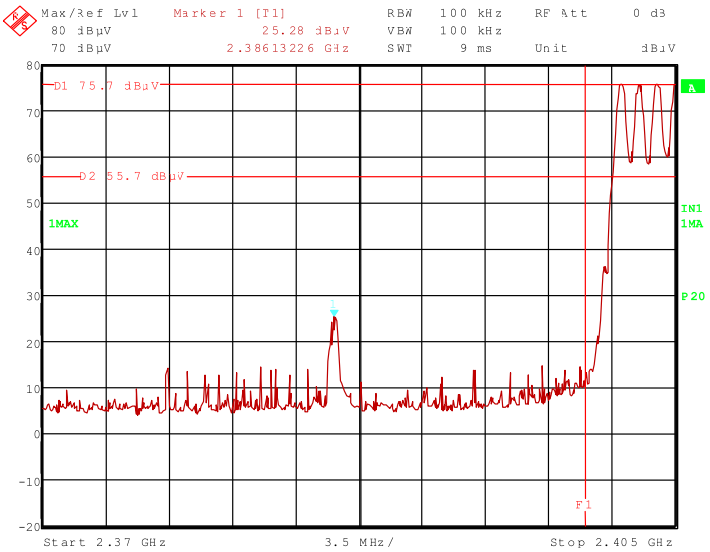
Ambient temperature	21 °C	Relative humidity	52 %

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.

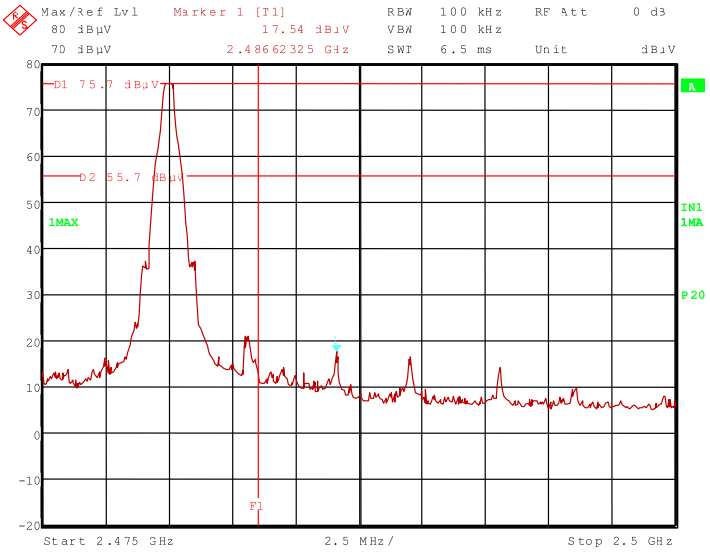
111592_28.wmf: Radiated band-edge compliance, lower band edge, hopping off (operation mode 1):



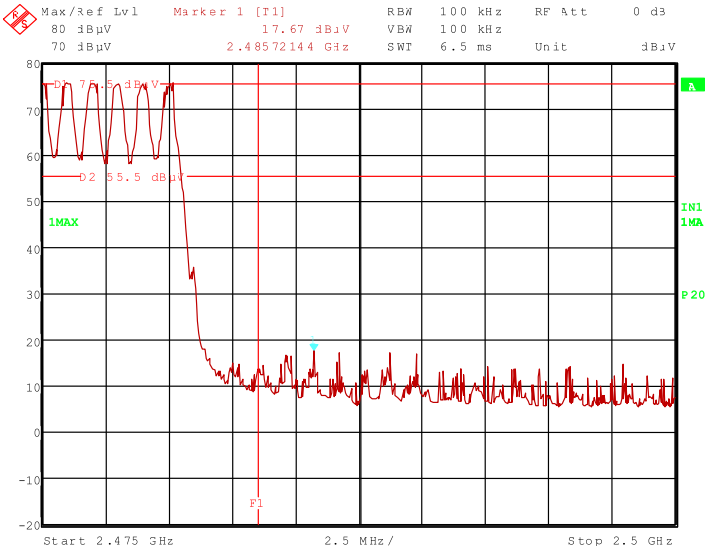
111592_29.wmf: Radiated band-edge compliance, lower band edge, hopping on (operation mode 4):



111592_25.wmf: Radiated band-edge compliance, upper band edge, hopping off (operation mode 3):



111592_30.wmf: Radiated band-edge compliance, upper band edge, hopping on (operation mode 4):



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	107.9	-	-	75.9	28.3	0.0	3.7	150	Vert.	-
2.3864	57.8	74.0	16.2	25.8	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	105.1	-	-	73.1	28.3	0.0	3.7	150	Vert.	-
2.3864	27.2	54.0	26.8	-4.8	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	107.9	-	-	75.9	28.3	0.0	3.7	150	Vert.	-
2.3861	57.6	74.0	16.4	25.6	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	105.1	-	-	73.1	28.3	0.0	3.7	150	Vert.	-
2.3861	27.0	54.0	27.0	-5.0	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	108.5	-	-	76.2	28.5	0.0	3.8	150	Hor.	-
2.4866	52.3	74.0	21.7	20.0	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	105.6	-	-	73.3	28.5	0.0	3.8	150	Hor.	-
2.4866	29.7	54.0	24.3	-2.6	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	108.5	-	-	76.2	28.5	0.0	3.8	150	Hor.	-
2.4859	49.8	74.0	24.2	17.5	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	105.6	-	-	73.3	28.5	0.0	3.8	150	Hor.	-
2.4859	27.3	54.0	26.7	-5.0	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

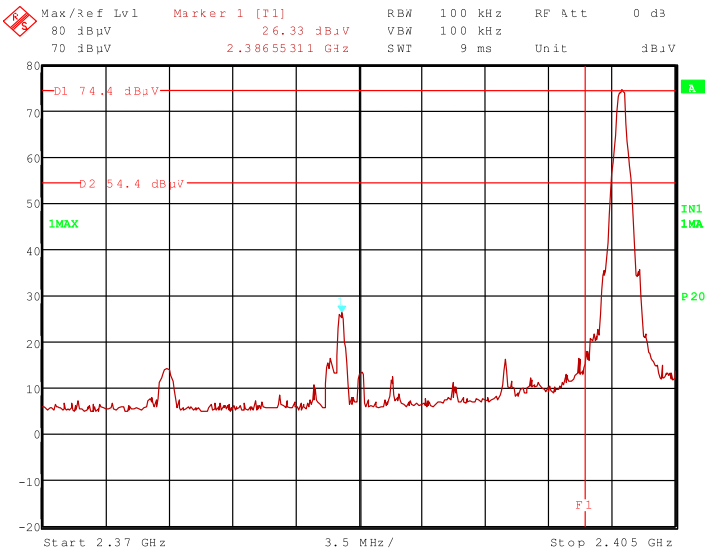
5.6.4 Test result (band-edge compliance (radiated)) with external patch antenna

Ambient temperature	21 °C

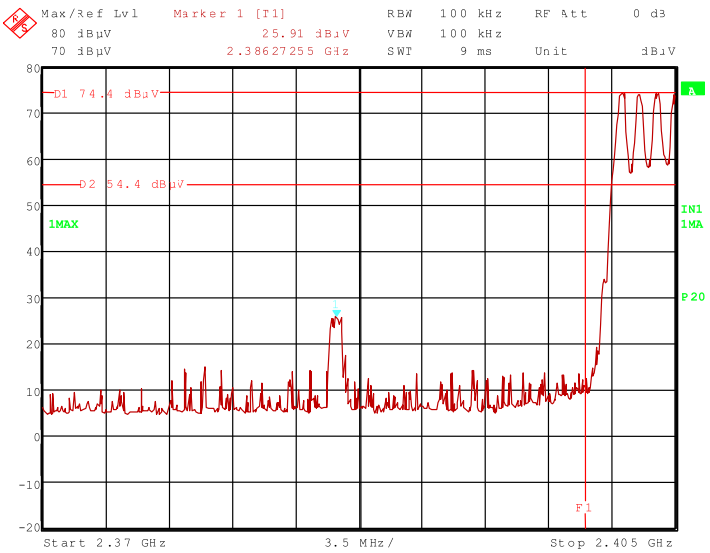
Relative humidity	52 %

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.

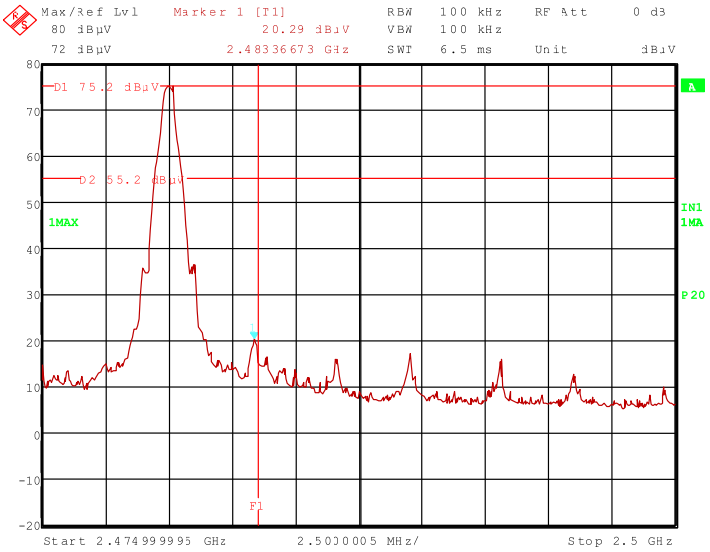
111592_15.wmf: Radiated band-edge compliance, lower band edge, hopping off (operation mode 1):



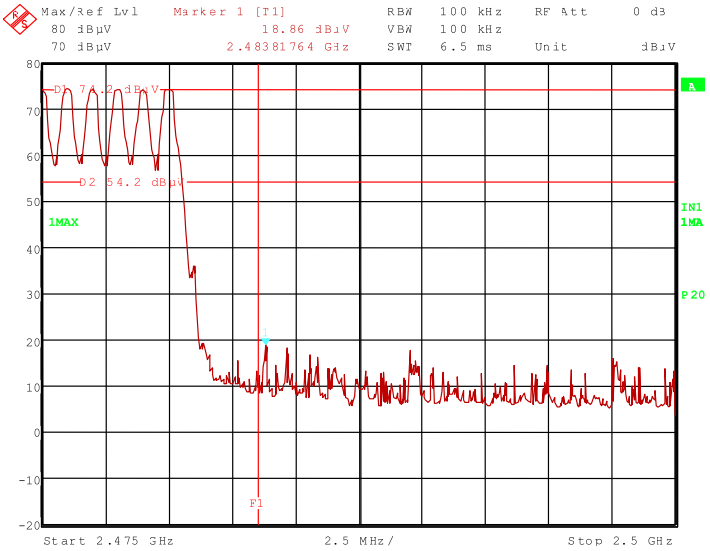
111592_16.wmf: Radiated band-edge compliance, lower band edge, hopping on (operation mode 4):



111592_12.wmf: Radiated band-edge compliance, upper band edge, hopping off (operation mode 3):



111592_17.wmf: Radiated band-edge compliance, upper band edge, hopping on (operation mode 4):



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	106.4	-	-	74.4	28.3	0.0	3.7	150	Hor.	-
2.3866	58.0	74.0	16.0	26.0	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	103.6	-	-	71.6	28.3	0.0	3.7	150	Vert.	-
2.3866	27.0	54.0	27.0	-5.0	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	106.4	-	-	74.4	28.3	0.0	3.7	150	Hor.	-
2.3866	56.0	74.0	18.0	24.0	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	103.6	-	-	71.6	28.3	0.0	3.7	150	Vert.	-
2.3866	26.2	54.0	27.8	-5.8	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	107.8	-	-	75.5	28.5	0.0	3.8	150	Hor.	-
2.4834	51.8	87.8	36.0	19.5	28.5	0.0	3.8	150	Hor.	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
2.480	104.7	-	-	72.4	28.5	0.0	3.8	150	Hor.	-
2.4834	30.6	84.7	54.1	-1.7	28.5	0.0	3.8	150	Hor.	No
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	107.8	-	-	75.5	28.5	0.0	3.8	150	Hor.	-
2.4839	51.5	74.0	22.5	19.2	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	104.7	-	-	72.4	28.5	0.0	3.8	150	Hor.	-
2.4839	27.8	54.0	26.2	-4.5	28.5	0.0	3.8	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

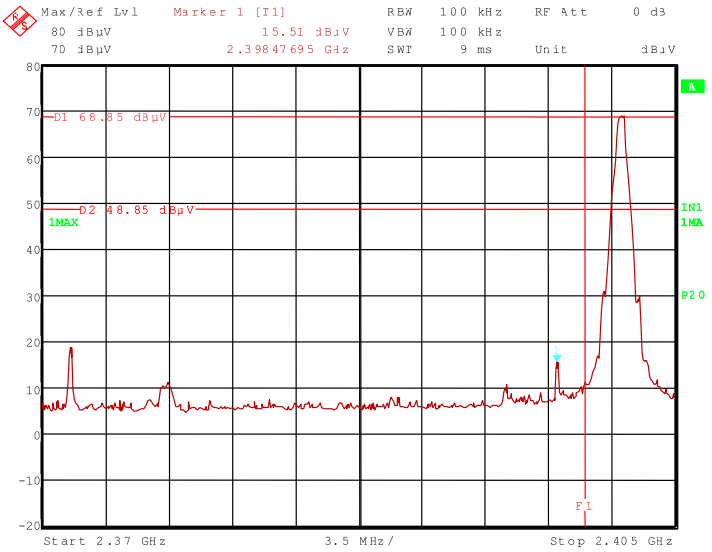
TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 34, 36, 44

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

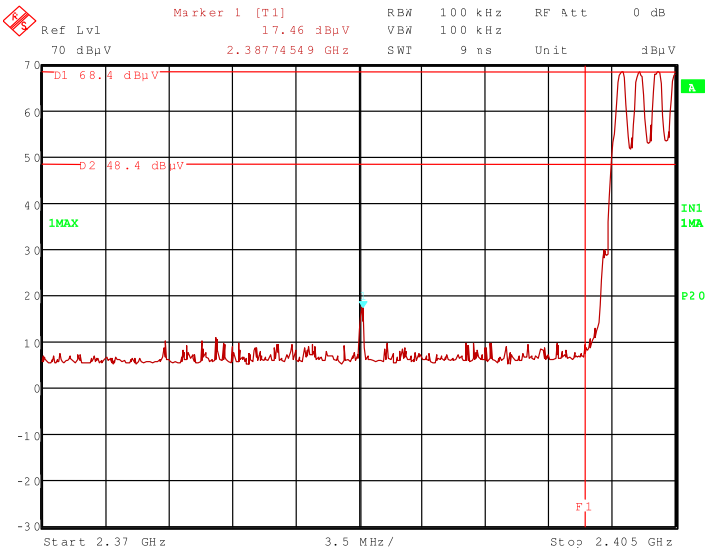
Ambient temperature	20 °C

Relative humidity	46 %

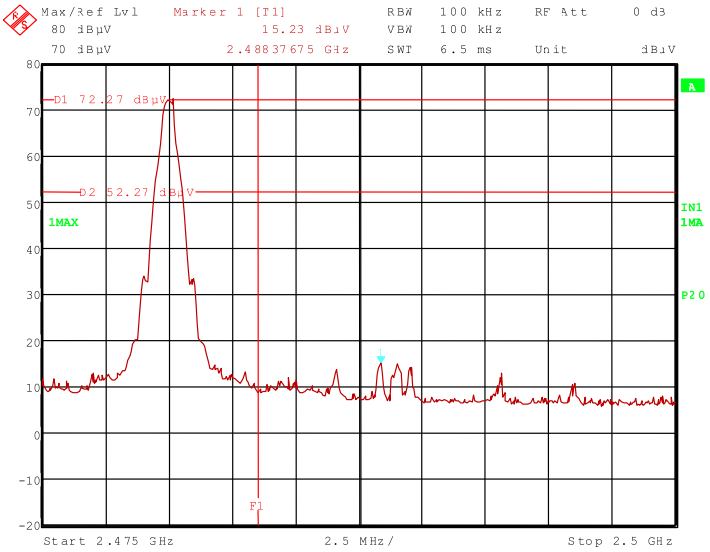
111592_105.wmf: Radiated band-edge compliance, lower band edge, hopping off (operation mode 1):



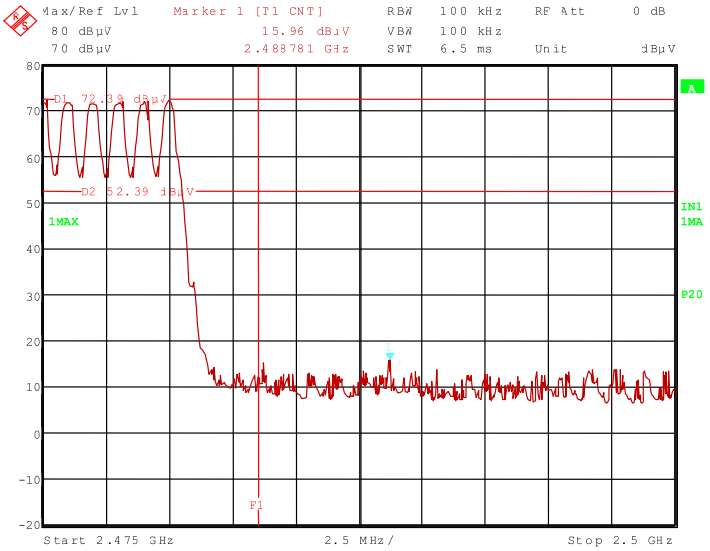
111592_110.wmf: Radiated band-edge compliance, lower band edge, hopping on (operation mode 4):



111592_108.wmf: Radiated band-edge compliance, upper band edge, hopping off (operation mode 3):



111592_109.wmf: Radiated band-edge compliance, upper band edge, hopping on (operation mode 4):



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	101.1	-	-	69.1	28.3	0.0	3.7	150	Hor.	-
2.3985	47.4	81.1	33.7	15.4	28.3	0.0	3.7	100	Hor.	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	98.2	-	-	66.2	28.3	0.0	3.7	150	Hor.	-
2.3985	27.6	78.2	50.6	-4.4	28.3	0.0	3.7	100	Hor.	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	101.1	-	-	69.1	28.3	0.0	3.7	150	Hor.	-
2.3877	49.2	74.0	24.8	17.2	28.3	0.0	3.7	100	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	98.2	-	-	66.2	28.3	0.0	3.7	150	Hor.	-
2.3877	29.1	54.0	24.9	-2.9	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	105.1	-	-	72.8	28.5	0.0	3.8	150	Hor.	-
2.4884	47.0	74.0	27.0	14.7	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	102.1	-	-	69.8	28.5	0.0	3.8	150	Hor.	-
2.4884	27.6	54.0	26.4	-4.7	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	105.1	-	-	72.8	28.5	0.0	3.8	150	Hor.	-
2.4887	46.3	74.0	27.7	14.0	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	102.1	-	-	69.8	28.5	0.0	3.8	150	Hor.	-
2.4887	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			

Test: Passed

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

5.7 Radiated emissions

5.7.1 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.

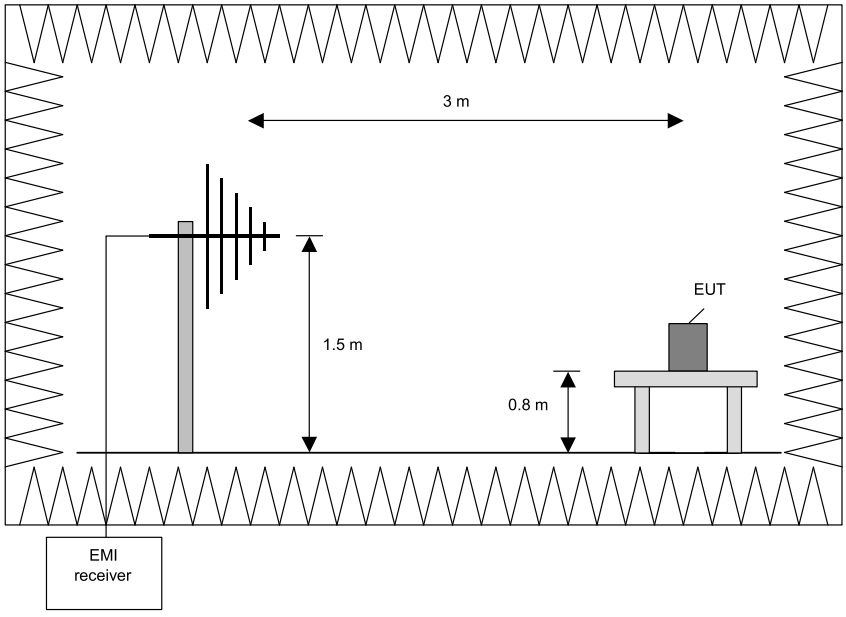
Preliminary measurement (30 MHz to 1 GHz)

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:

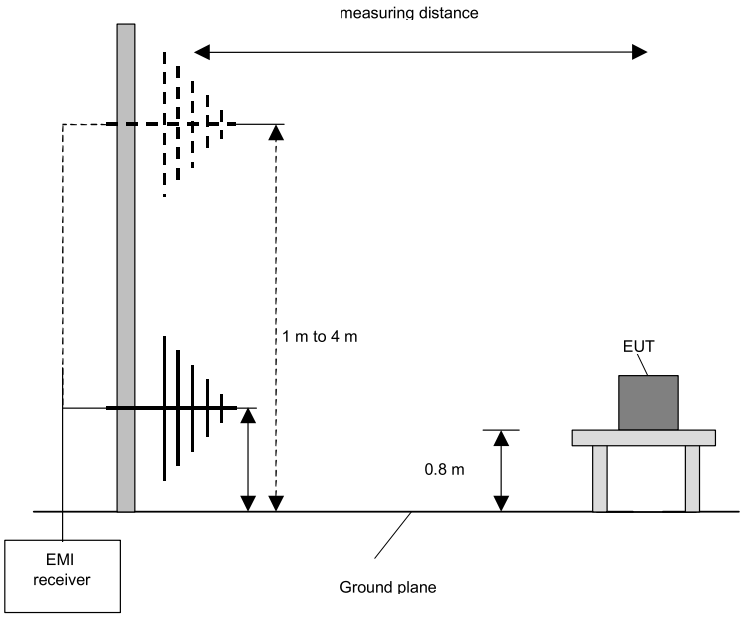
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the 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)

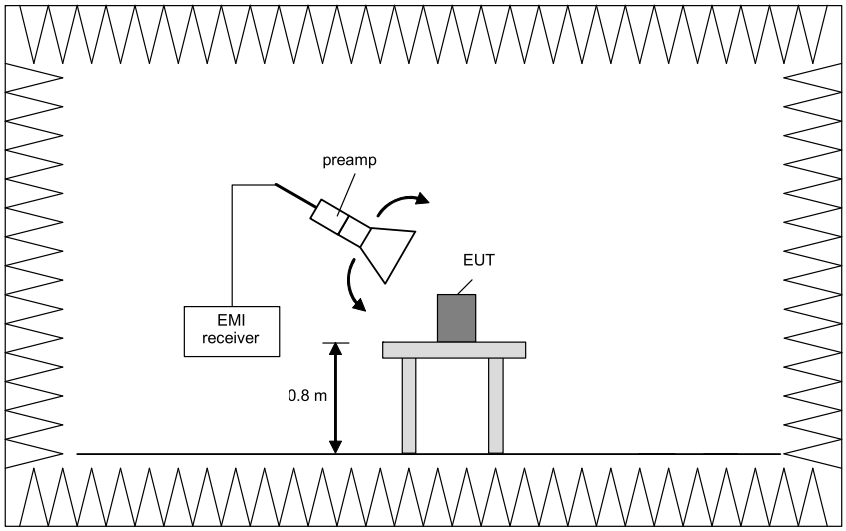
This measurement will be performed in a fully anechoic chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance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

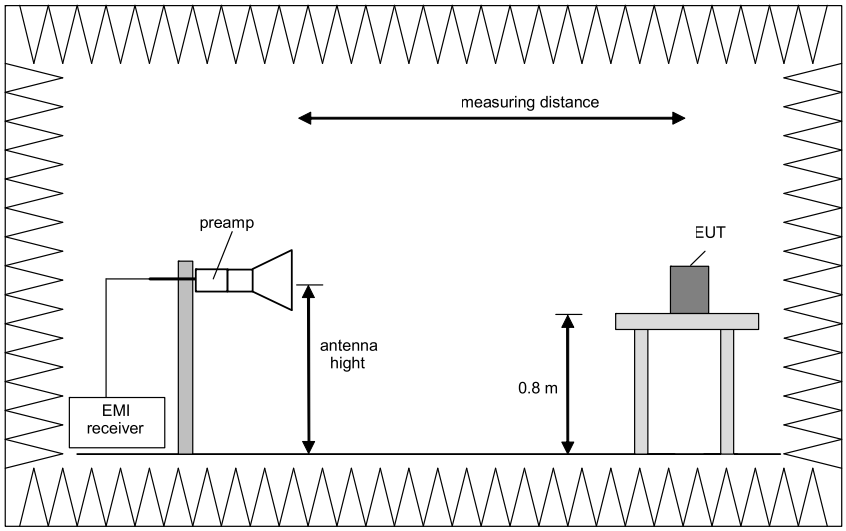


Final measurement (1 GHz to 110 GHz)

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.

5.7.2 Test results (radiated emissions)

5.7.2.1 Preliminary radiated emission measurement with external patch antenna

Ambient temperature	20 °C	Relative humidity	50 %

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.

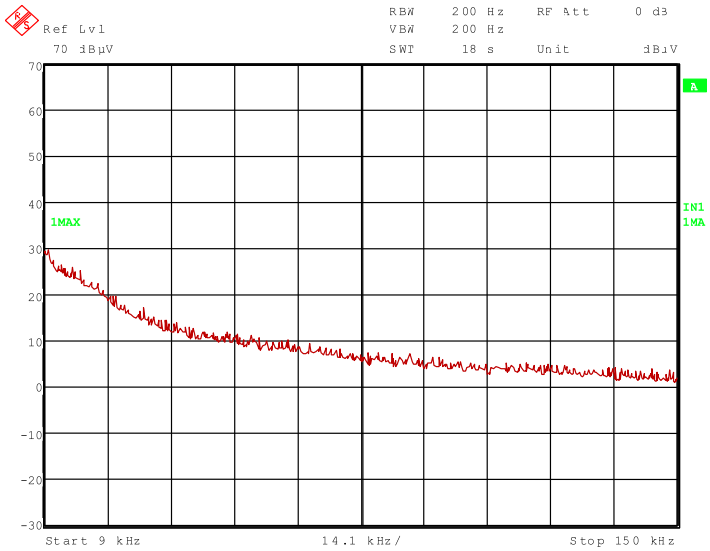
Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

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.

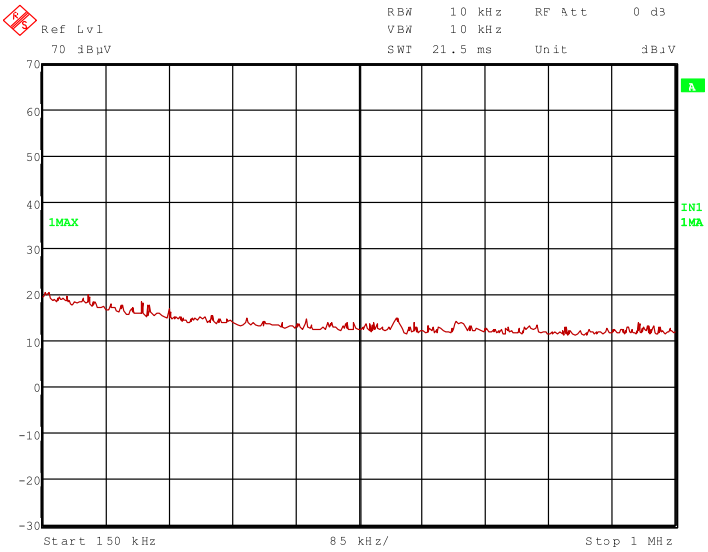
Remark: As pre-tests have shown, the emissions in the frequency range 9 kHz to 1 GHz are not depending on the transmitter operation mode. The largest emissions in this frequency range were emitted if an external antenna is used. Therefore the emissions in this frequency range were measured only with 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_33.wmf: Spurious emissions from 9 kHz to 150 kHz (operation mode 2):

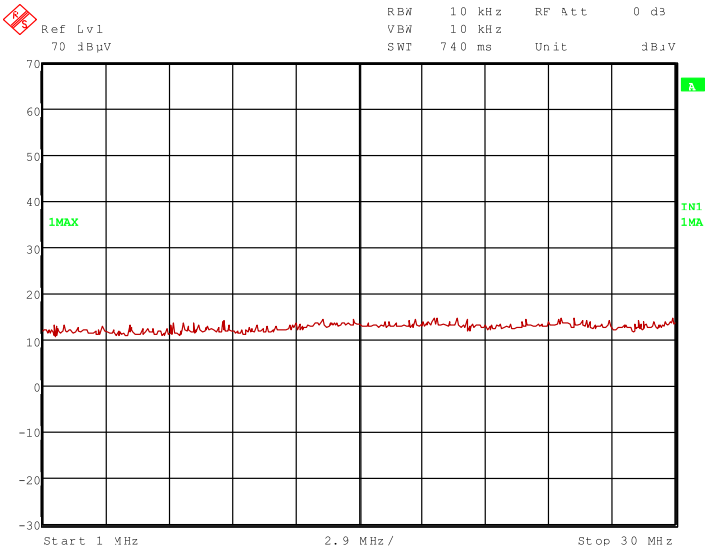


TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 39, 43, 44, 46, 49 - 51, 55, 72

111592_34.wmf: Spurious emissions from 150 kHz to 1 MHz (operation mode 2):

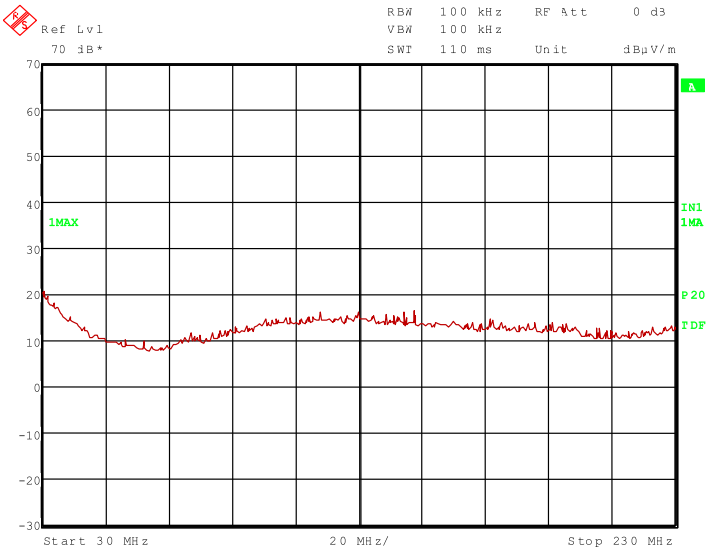


111592_35.wmf: Spurious emissions from 1 MHz to 30 MHz (operation mode 2):

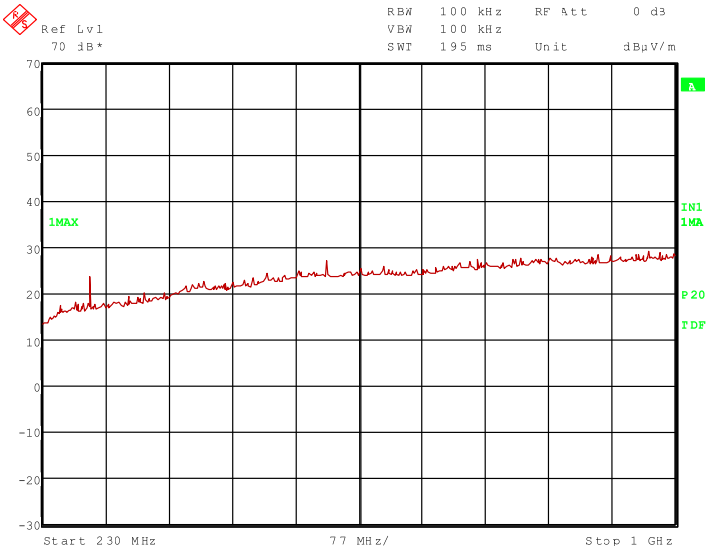


No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no measurements were carried out on the outdoor test site.

111592_31.wmf: Spurious emissions from 30 MHz to 230 MHz (operation mode 2):



111592_32.wmf: Spurious emissions from 230 MHz to 1 GHz (operation mode 2):



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

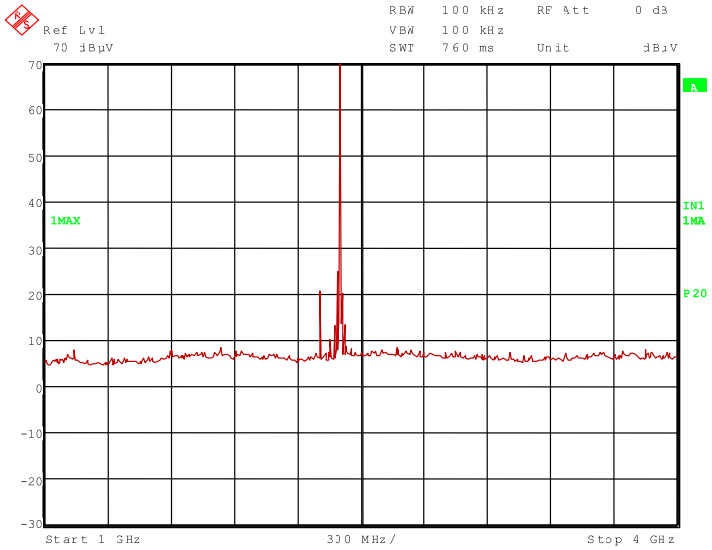
288.000 MHz and 576.000 MHz.

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

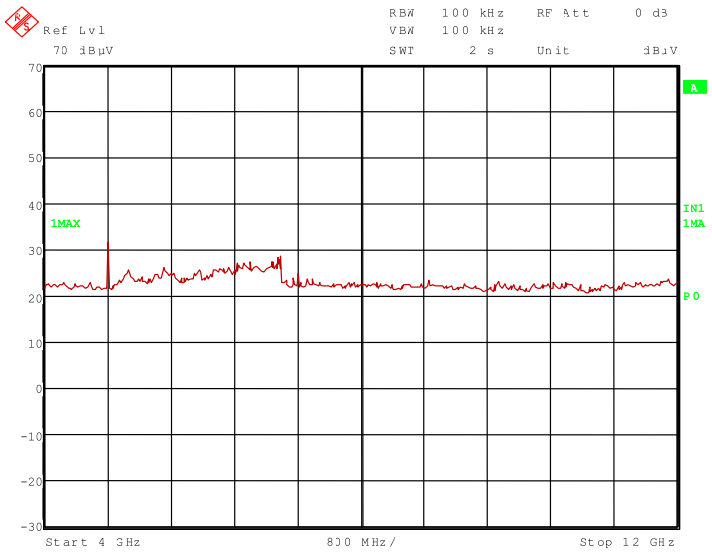
These frequencies have to be measured on the open area test site. The result is presented in the following.

Transmitter operates at the lower end of the assigned frequency band

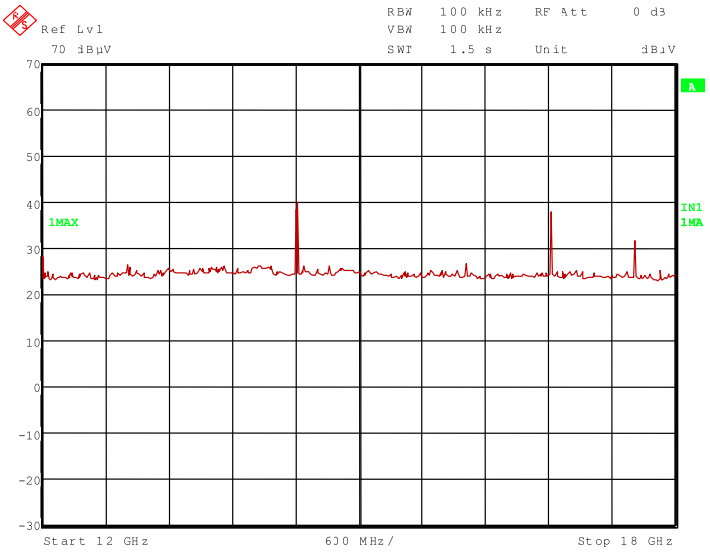
111592_14.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 1):



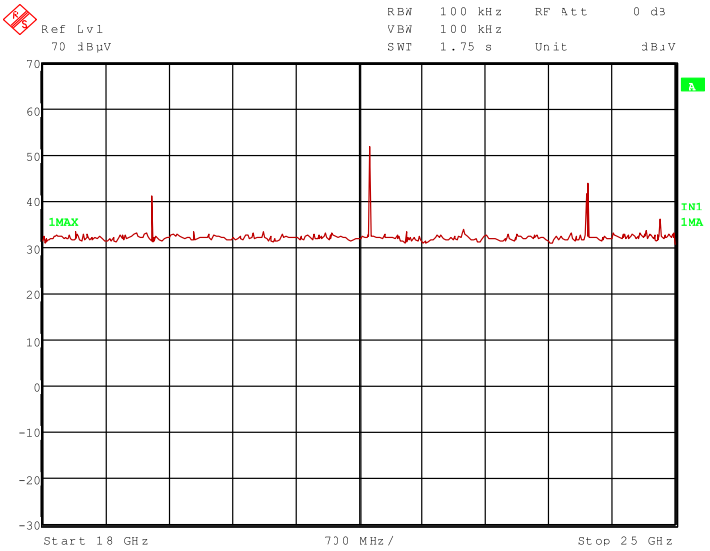
111592_20.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 1):



111592_36.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 1):



111592_41.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 1):



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

- 2.3866 GHz, 4.804 GHz, 12.010 GHz and 19.216 GHz.

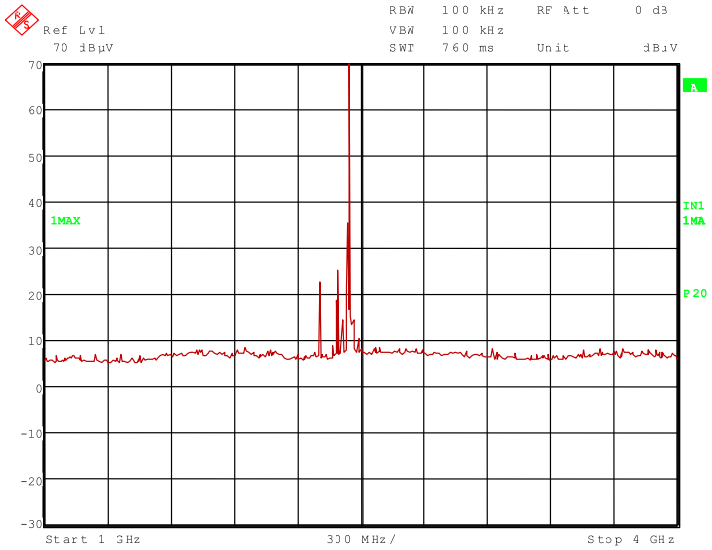
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.306 GHz, 2.402 GHz, 7.206 GHz, 14.412 GHz, 16.814 GHz, 17.615 GHz, 21.618 GHz, 24.020 GHz and 24.819 GHz.

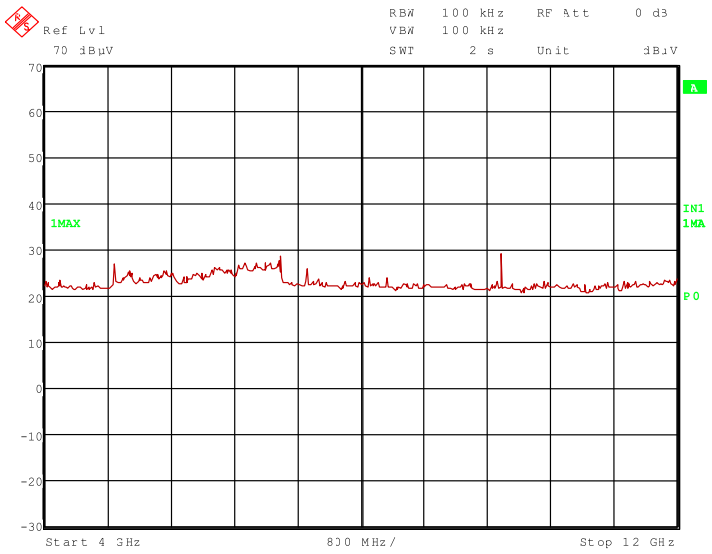
These frequencies have to be measured in a final measurement. The results were presented in the following.

Transmitter operates on the middle of the assigned frequency band

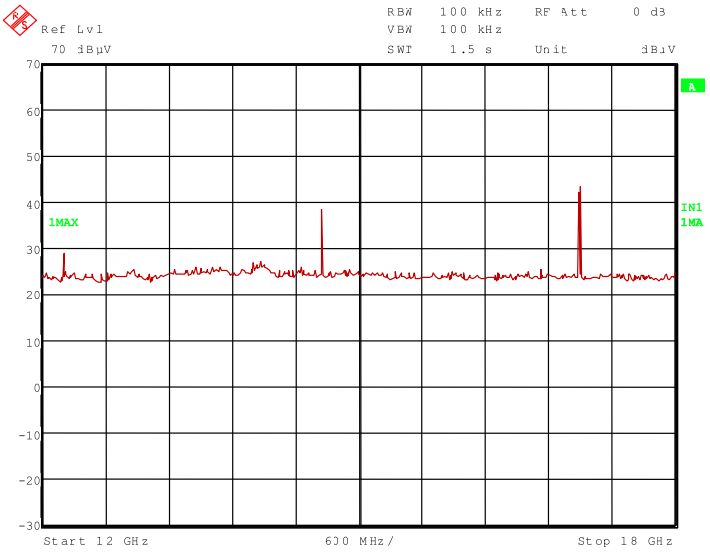
111592_13.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 2):



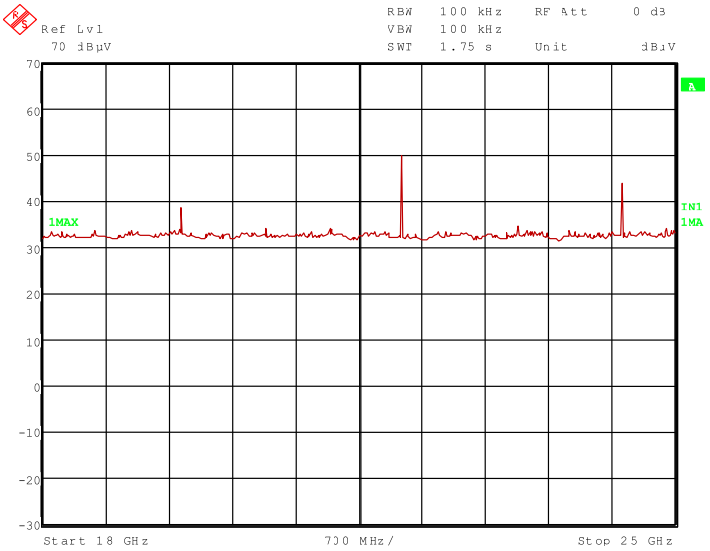
111592_19.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 2):



111592_37.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 2):



111592_40.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 2):



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

- 2.3861 GHz, 4.882 GHz, 7.323 GHz, 12.205 GHz and 19.528 GHz.

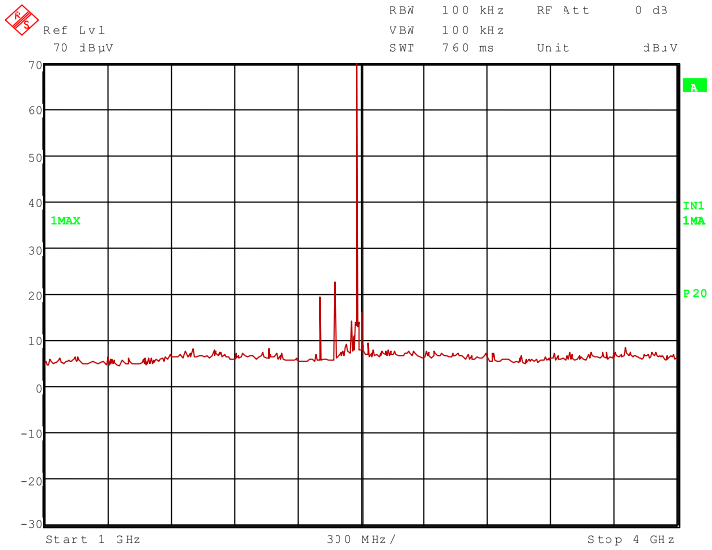
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.3055 GHz, 2.441 GHz, 9.764 GHz, 14.646 GHz, 17.087 GHz, 21.969 GHz and 24.410 GHz.

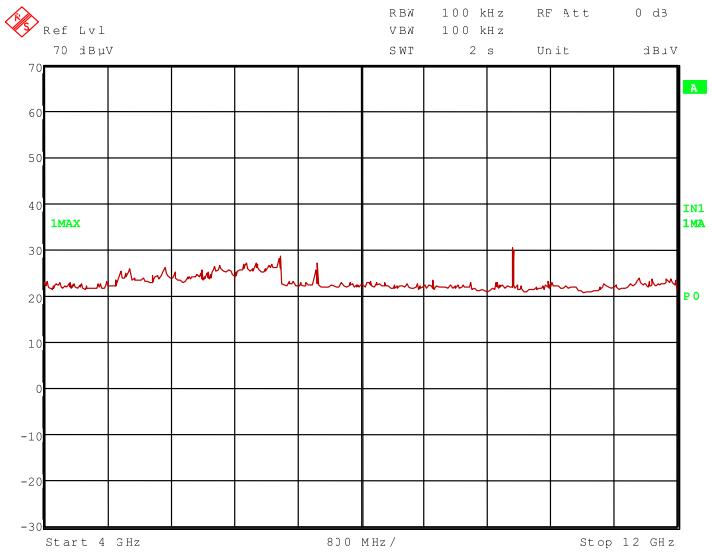
These frequencies have to be measured in a final measurement. The results were presented in the following.

Transmitter operates on the upper end of the assigned frequency

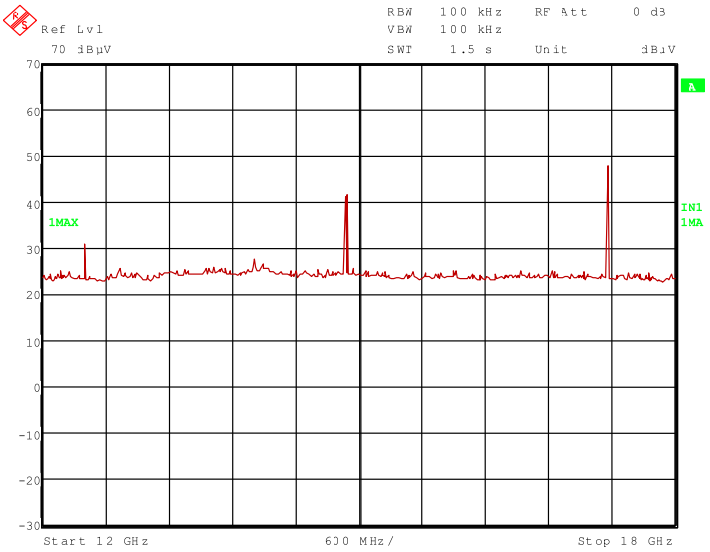
111592_11.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 3):



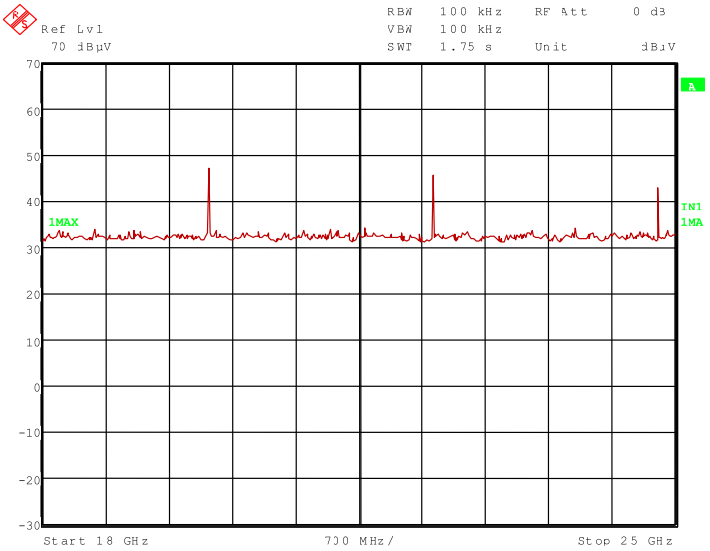
111592_18.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 3):



111592_38.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 3):



111592_39.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 3):



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

- 2.3743 GHz, 4.960 GHz, 7.440 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:

- 2.3059 GHz, 2.480 GHz, 9.920 GHz, 14.880 GHz, 17.360 and 24.800 GHz.

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

5.7.2.2 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.

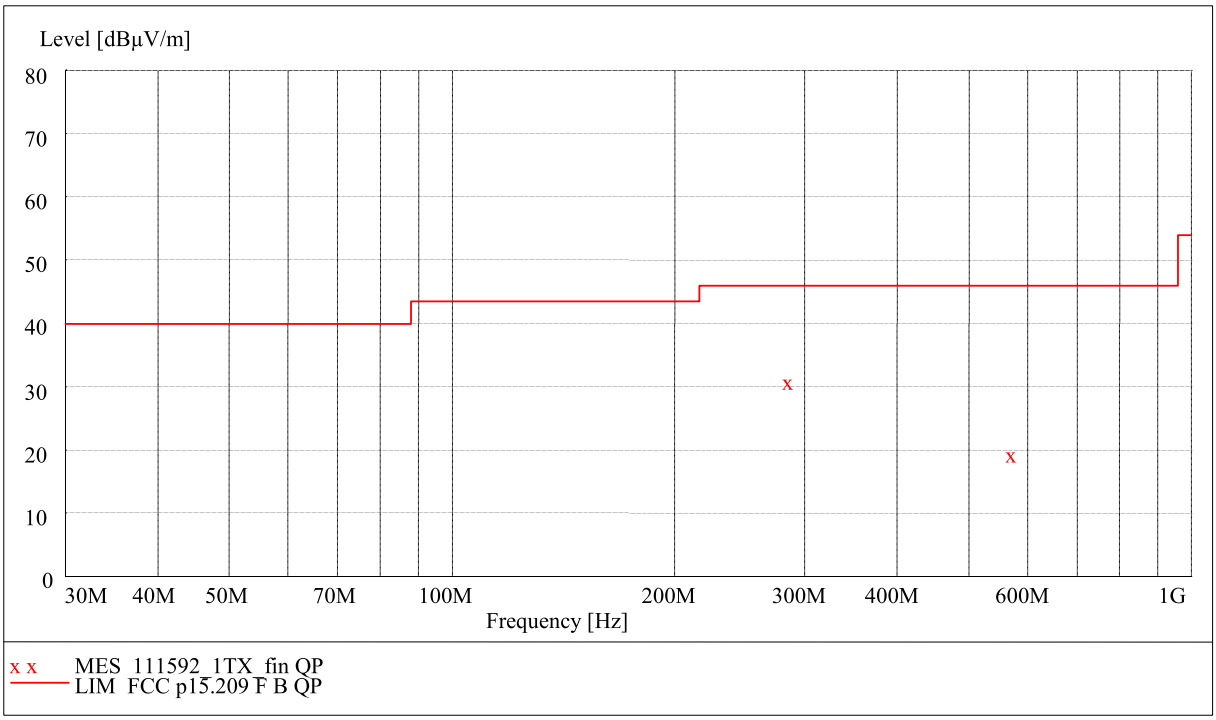
Test record: All results are shown in the following.

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_1TX

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	31.5	46.0	14.5	16.7	12.9	1.9	107	244	Hor.	1
576.000	20.0	46.0	26.0	-2.0	19.2	2.8	111	180	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

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

Ambient temperature	20 °C	Relative humidity	50 %

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 1)

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.
2.306	59.0	86.4	27.4	27.5	27.9	0.0	3.6	150	Hor.	No	1
2.3866	62.1	74.0	11.9	30.1	28.3	0.0	3.7	150	Hor.	Yes	1
2.402	106.4	-	-	74.4	28.3	0.0	3.7	150	Hor.	-	1
4.804	50.3	74.0	23.7	38.1	32.6	25.7	5.3	150	Vert.	Yes	1
7.206	52.7	86.4	33.7	34.8	35.7	24.6	6.8	150	Hor.	No	1
12.010	48.2	74.0	25.8	38.0	33.6	25.9	2.5	100	Vert.	Yes	1
14.412	56.2	86.4	30.2	46.5	33.7	26.5	2.5	100	Vert.	No	1
16.814	52.7	86.4	33.7	43.9	33.8	27.5	2.5	100	Vert.	No	1
17.615	49.3	86.4	37.1	39.9	33.9	27.0	2.5	100	Vert.	No	1
19.216	49.5	74.0	24.5	48.1	37.1	38.2	2.5	100	Vert.	Yes	1
21.618	57.6	86.4	28.8	56.2	37.2	38.3	2.5	100	Vert.	No	1
24.020	51.9	86.4	34.5	51.0	37.2	38.8	2.5	100	Vert.	No	1
24.819	45.5	86.4	40.9	44.7	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.
2.306.0	34.1	83.6	49.5	2.6	27.9	0.0	3.6	150	Vert.	No	1
2.386.6	35.1	54.0	18.9	3.1	28.3	0.0	3.7	150	Vert.	Yes	1
2.402	103.6	-	-	71.6	28.3	0.0	3.7	150	Vert.	-	1
4.804.0	43.2	54.0	10.8	31.0	32.6	25.7	5.3	150	Vert.	Yes	1
7.206	41.0	83.6	42.6	23.1	35.7	24.6	6.8	150	Hor.	No	1
12.010	35.8	54.0	18.2	25.6	33.6	25.9	2.5	100	Vert.	Yes	1
14.412	45.8	83.6	37.8	36.1	33.7	26.5	2.5	100	Vert.	No	1
16.814	41.9	83.6	41.7	33.1	33.8	27.5	2.5	100	Vert.	No	1
17.615	37.2	83.6	46.4	27.8	33.9	27.0	2.5	100	Vert.	No	1
19.216	38.0	54.0	16.0	36.6	37.1	38.2	2.5	150	Hor.	Yes	1
21.618	46.9	83.6	36.7	45.5	37.2	38.3	2.5	100	Vert.	No	1
24.020	40.5	83.6	43.1	39.6	37.2	38.8	2.5	100	Vert.	No	1
24.819	32.7	83.6	50.9	31.9	37.3	39.0	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 2)

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.
2.3055	59.3	87.6	28.3	27.8	27.9	0.0	3.6	150	Hor.	No	1
2.3861	62.2	74.0	11.8	30.2	28.3	0.0	3.7	150	Hor.	Yes	1
2.441	107.6	-	-	75.5	28.4	0.0	3.7	150	Hor.	-	1
4.882	47.0	74.0	27.0	34.6	32.8	25.7	5.3	150	Vert.	Yes	1
7.323	53.8	74.0	20.2	35.4	36.2	24.6	6.8	150	Hor.	Yes	1
9.764	58.6	87.6	29.0	37.3	37.3	23.9	7.9	150	Hor.	No	1
12.205	48.6	74.0	25.4	38.4	33.6	25.9	2.5	100	Vert.	Yes	1
14.646	55.0	87.6	32.6	45.4	33.7	26.6	2.5	100	Vert.	No	1
17.087	58.2	87.6	29.4	49.3	33.8	27.4	2.5	100	Vert.	No	1
19.528	50.8	74.0	23.2	49.4	37.1	38.2	2.5	100	Vert.	Yes	1
21.969	57.5	87.6	30.1	56.1	37.2	38.3	2.5	100	Vert.	No	1
24.410	51.9	87.6	35.7	51.1	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.
2.3055	33.9	84.7	50.8	2.4	27.9	0.0	3.6	150	Hor.	No	1
2.386	35.0	54.0	19.0	3.0	28.3	0.0	3.7	150	Hor.	Yes	1
2.441	104.7	-	-	72.6	28.4	0.0	3.7	150	Hor.	-	1
4.882	38.0	54.0	16.0	25.6	32.8	25.7	5.3	150	Vert.	Yes	1
7.323	42.6	54.0	11.4	24.2	36.2	24.6	6.8	150	Hor.	Yes	1
9.764	48.1	84.7	36.6	26.8	37.3	23.9	7.9	150	Hor.	No	1
12.205	36.8	54.0	17.2	26.6	33.6	25.9	2.5	100	Vert.	Yes	1
14.646	44.3	84.7	40.4	34.7	33.7	26.6	2.5	100	Vert.	No	1
17.087	47.9	84.7	36.8	39.0	33.8	27.4	2.5	100	Vert.	No	1
19.528	39.8	54.0	14.2	38.4	37.1	38.2	2.5	100	Vert.	Yes	1
21.969	47.9	84.7	36.8	46.5	37.2	38.3	2.5	100	Vert.	No	1
24.410	41.4	84.7	43.3	40.6	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 3)

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.
2.3059	55.7	87.8	32.1	24.2	27.9	0.0	3.6	150	Hor.	No	1
2.3743	56.1	74.0	17.9	24.3	28.2	0.0	3.6	150	Hor.	Yes	1
2.480	107.8	-	-	75.5	28.5	0.0	3.8	150	Hor.	-	1
4.960	47.2	74.0	26.8	34.6	32.9	25.6	5.3	150	Vert.	Yes	1
7.440	55.4	74.0	18.6	36.8	36.3	24.5	6.8	150	Hor.	Yes	1
9.920	59.6	87.8	28.2	38.2	37.4	23.9	7.9	150	Hor.	No	1
12.400	49.7	74.0	24.3	39.4	33.7	25.9	2.5	100	Vert.	Yes	1
14.880	56.7	87.8	31.1	47.2	33.7	26.7	2.5	100	Vert.	No	1
17.360	63.6	87.8	24.2	54.4	33.9	27.2	2.5	100	Vert.	No	1
19.840	54.8	74.0	19.2	53.6	37.0	38.3	2.5	100	Vert.	Yes	1
22.320	54.7	74.0	19.3	53.3	37.2	38.3	2.5	100	Vert.	Yes	1
24.800	49.8	87.8	38.0	49.0	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.
2.3059	34.0	84.7	50.7	2.5	27.9	0.0	3.6	150	Hor.	No	1
2.3743	34.3	54.0	19.7	2.5	28.2	0.0	3.6	150	Hor.	Yes	1
2.480	104.7	-	-	72.4	28.5	0.0	3.8	150	Hor.	-	1
4.960	36.4	54.0	17.6	23.8	32.9	25.6	5.3	150	Vert.	Yes	1
7.440	44.8	54.0	9.2	26.2	36.3	24.5	6.8	150	Hor.	Yes	1
9.920	49.1	84.7	35.6	27.7	37.4	23.9	7.9	150	Hor.	No	1
12.400	37.1	54.0	16.9	26.8	33.7	25.9	2.5	100	Vert.	Yes	1
14.880	45.1	84.7	39.6	35.6	33.7	26.7	2.5	100	Vert.	No	1
17.360	53.8	84.7	30.9	44.6	33.9	27.2	2.5	100	Vert.	No	1
19.840	44.7	54.0	9.3	43.5	37.0	38.3	2.5	100	Vert.	Yes	1
22.320	43.9	54.0	10.1	42.5	37.2	38.3	2.5	100	Vert.	Yes	1
24.800	38.7	84.7	46.0	37.9	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

5.7.2.4 Preliminary radiated emission measurement with external monopole antenna

Ambient temperature	20 °C	Relative humidity	50 %

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.

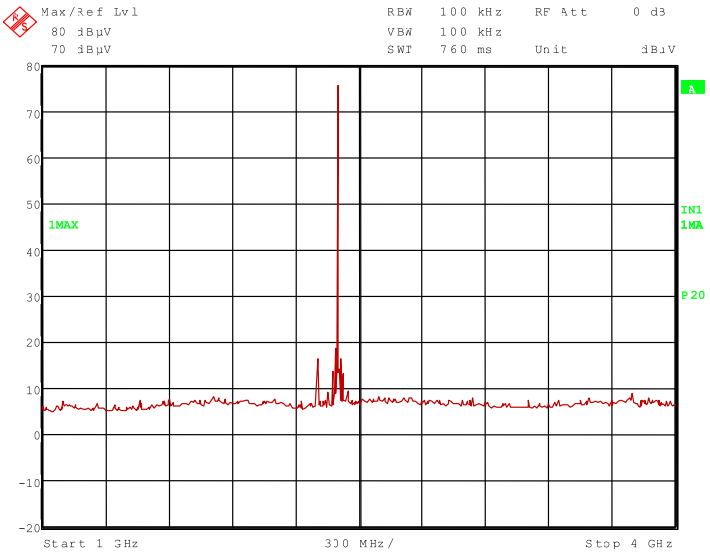
Test record: All results are shown in the following.

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

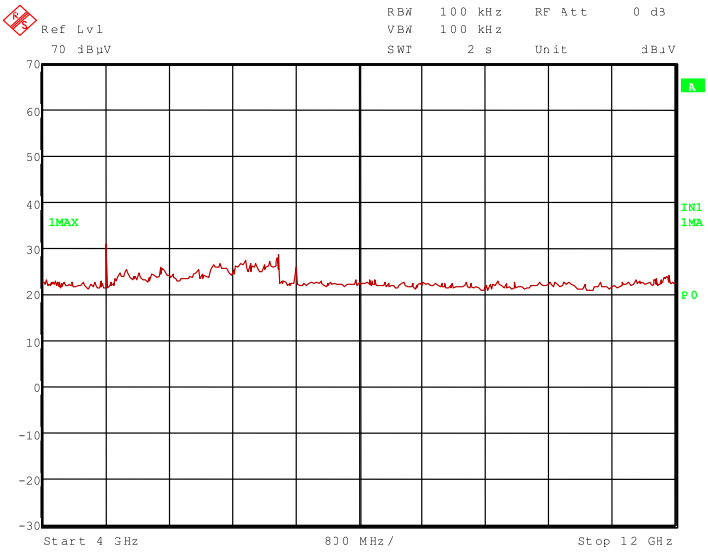
Remark: The emission measurement in this frequency range was carried out by using the external monopole antenna type Huber+Suhner SOA 2400/360/6/0/V, because additional pre-tests have shown that this antenna causes the highest emissions of all monopole antennas in question.

Transmitter operates at the lower end of the assigned frequency band

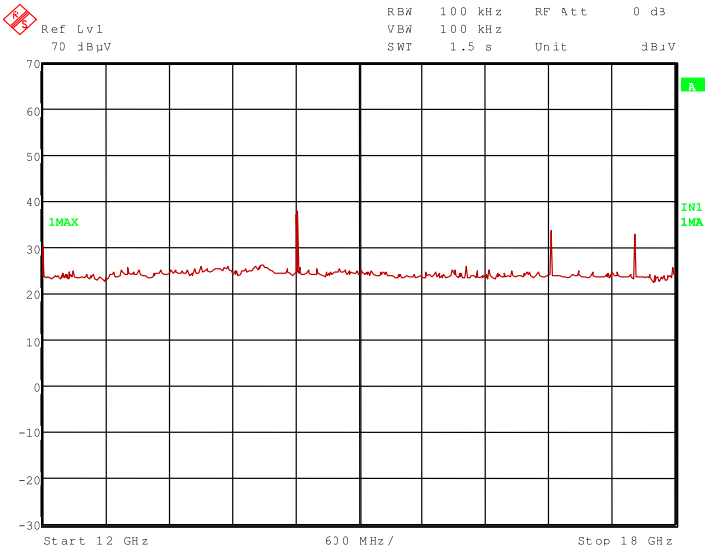
111592_27.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 1):



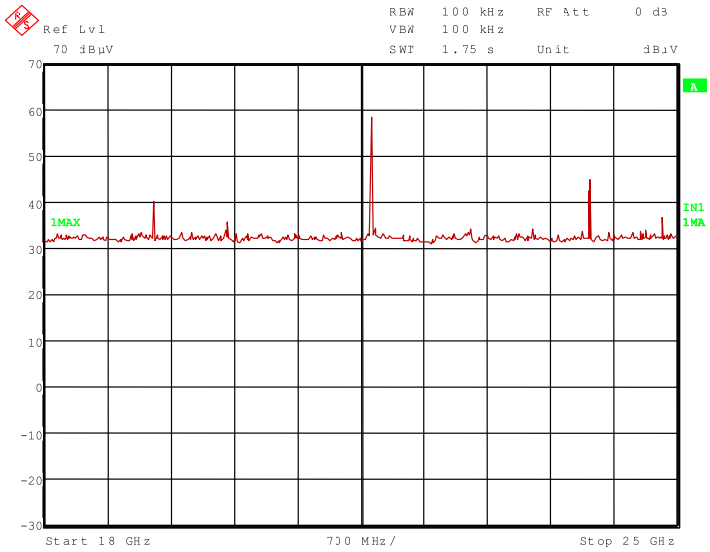
111592_21.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 1):



111592_42.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 1):



111592_43.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 1):



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

- 4.804 GHz, 12.010 GHz, 19.216 GHz and 20.018 GHz.

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

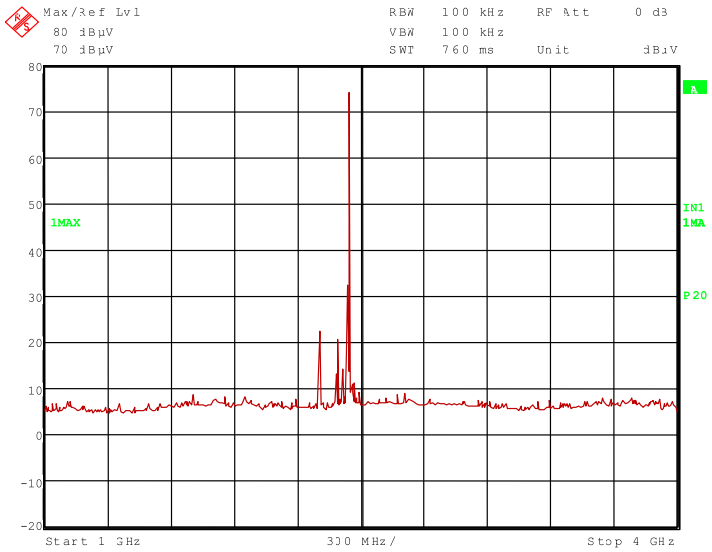
- 2.306 GHz, 2.402 GHz, 7.206 GHz, 14.412 GHz, 16.814 GHz, 17.615 GHz, 21.618 GHz, 24.020 GHz and 24.819 GHz.

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

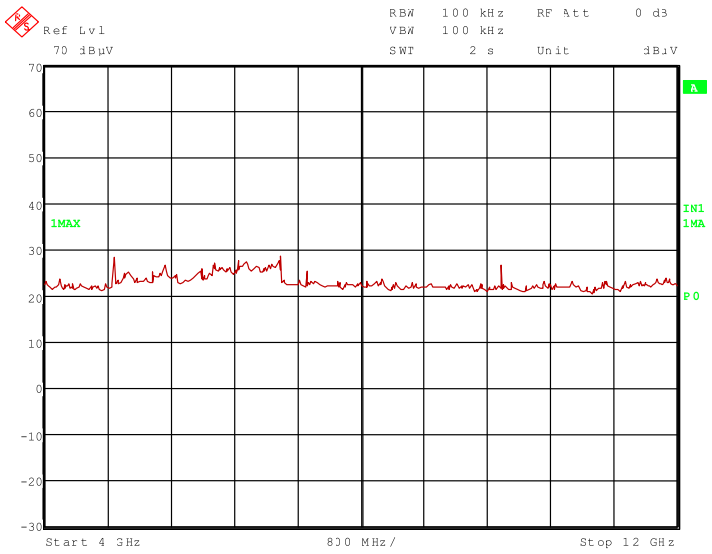
TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 34, 36, 37, 39, 44, 46, 49 - 51, 72

Transmitter operates on the middle of the assigned frequency band

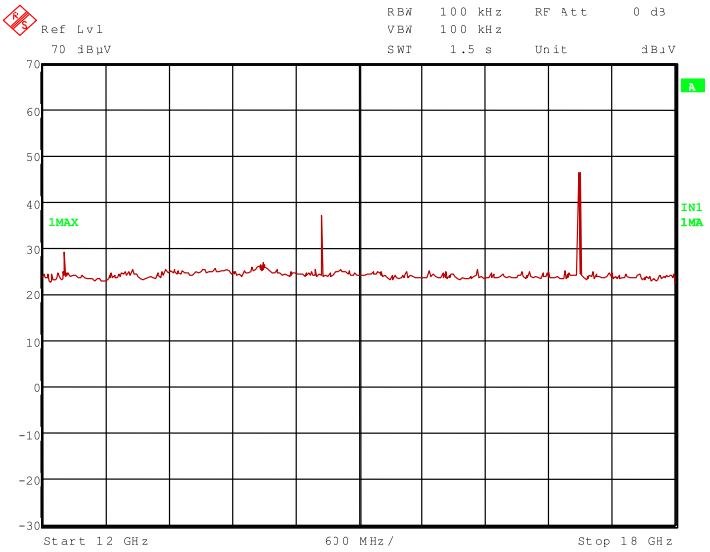
111592_26.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 2):



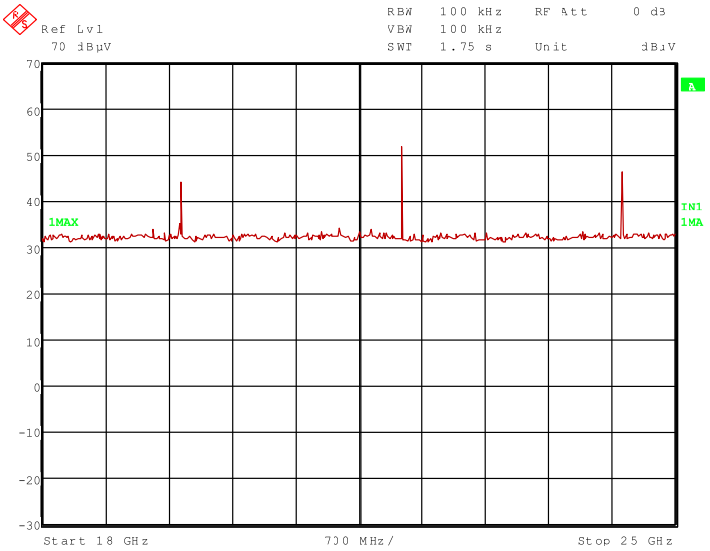
111592_22.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 2):



111592_44.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 2):



111592_45.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 2):



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

- 2.3861 GHz, 4.882 GHz, 7.323 GHz, 12.202 GHz and 19.528 GHz.

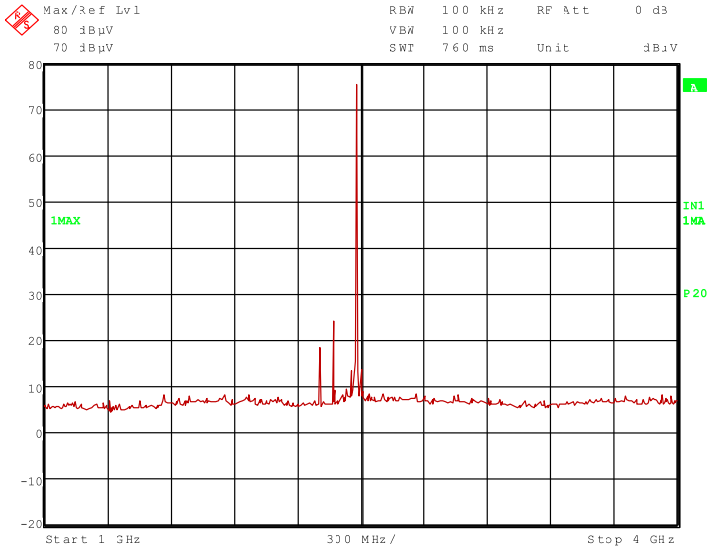
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.306 GHz, 2.441 GHz, 9.764 GHz, 14.646 GHz, 17.087 GHz, 21.969 GHz and 24.410 GHz.

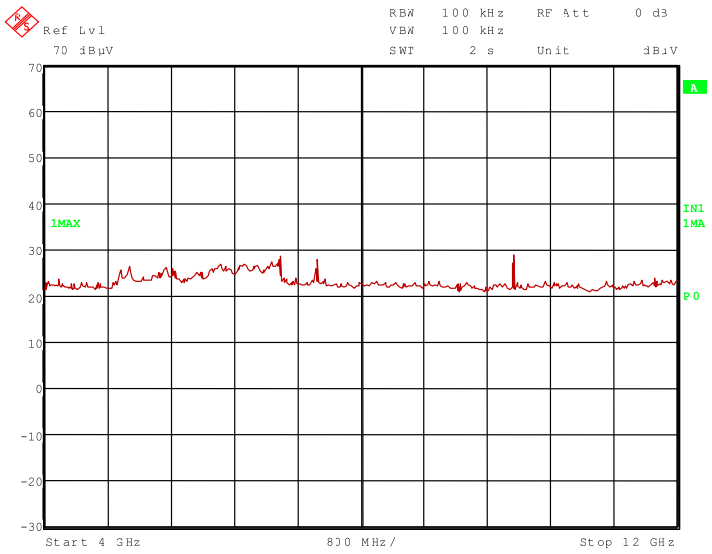
These frequencies have to be measured in a final measurement. The results were presented in the following.

Transmitter operates on the upper end of the assigned frequency

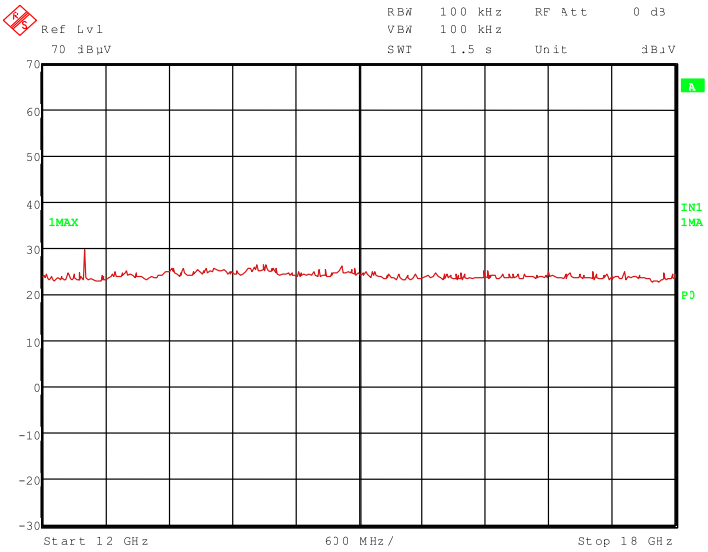
111592_24.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 3):



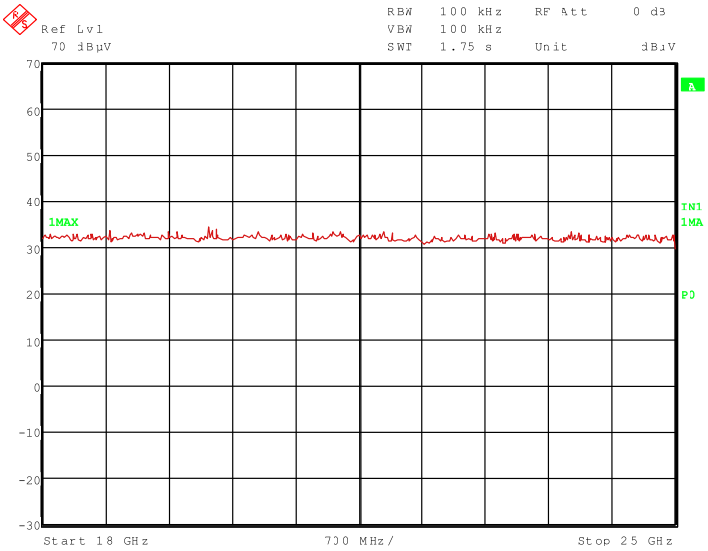
111592_23.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 3):



111592_47.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 3):



111592_46.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 3):



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

- 2.3743 GHz, 4.960 GHz, 7.440 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:

- 2.3059 GHz, 2.480 GHz, 9.920 GHz, 14.880 GHz, 17.360 and 24.800 GHz.

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

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

Ambient temperature	20 °C	Relative humidity	50 %

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 1)

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.
2.306	58.1	87.9	29.8	26.6	27.9	0.0	3.6	150	Vert.	No	1
2.402	107.9	-	-	75.9	28.3	0.0	3.7	150	Vert.	-	1
4.804	50.4	74.0	23.6	38.2	32.6	25.7	5.3	150	Vert.	Yes	1
7.206	53.1	87.9	34.8	35.2	35.7	24.6	6.8	150	Hor.	No	1
12.010	48.4	74.0	25.6	38.2	33.6	25.9	2.5	150	Vert.	Yes	1
14.412	54.5	87.9	33.4	44.8	33.7	26.5	2.5	100	Vert.	No	1
16.814	50.2	87.9	37.7	41.4	33.8	27.5	2.5	100	Vert.	No	1
17.615	49.0	87.9	38.9	39.6	33.9	27.0	2.5	100	Vert.	No	1
19.216	49.6	74.0	24.4	48.2	37.1	38.2	2.5	100	Vert.	Yes	1
20.018	46.0	74.0	28.0	44.8	37.0	38.3	2.5	100	Vert.	Yes	1
21.618	61.1	87.9	26.8	59.7	37.2	38.3	2.5	100	Vert.	No	1
24.020	51.7	87.9	36.2	50.8	37.2	38.8	2.5	100	Vert.	No	1
24.819	47.2	87.9	40.7	46.4	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.
2.3060	34.1	85.1	51.0	2.6	27.9	0.0	3.6	150	Vert.	No	1
2.402	105.1	-	-	73.1	28.3	0.0	3.7	150	Vert.	-	1
4.804	42.7	54.0	11.3	30.5	32.6	25.7	5.3	150	Vert.	Yes	1
7.206	42.3	85.1	42.8	24.4	35.7	24.6	6.8	150	Hor.	No	1
12.010	35.9	54.0	18.1	25.7	33.6	25.9	2.5	100	Vert.	Yes	1
14.412	43.8	85.1	41.3	34.1	33.7	26.5	2.5	100	Vert.	No	1
16.814	38.2	85.1	46.9	29.4	33.8	27.5	2.5	100	Vert.	No	1
17.615	36.9	85.1	48.2	27.5	33.9	27.0	2.5	100	Vert.	No	1
19.216	38.4	54.0	15.6	37.0	37.1	38.2	2.5	100	Vert.	Yes	1
20018	32.8	54.0	21.2	31.6	37.0	38.3	2.5	100	Vert.	Yes	1
21618	51.6	85.1	33.5	50.2	37.2	38.3	2.5	100	Vert.	No	1
24020	41.3	85.1	43.8	40.4	37.2	38.8	2.5	100	Vert.	No	1
24819	33.9	85.1	51.2	33.1	37.3	39.0	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 2)

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.
2.306	58.5	86.6	28.1	27.0	27.9	0.0	3.6	150	Vert.	No	1
2.3861	61.2	74.0	12.8	29.2	28.3	0.0	3.7	150	Vert.	Yes	1
2.441	106.6	-	-	74.5	28.4	0.0	3.7	150	Vert.	-	1
4.882	47.3	74.0	26.7	34.9	32.8	25.7	5.3	150	Vert.	Yes	1
7.323	53.4	74.0	20.6	35.0	36.2	24.6	6.8	150	Hor.	Yes	1
9.764	56.2	86.6	30.4	34.9	37.3	23.9	7.9	150	Vert.	No	1
12.202	49.3	74.0	24.7	39.1	33.6	25.9	2.5	100	Vert.	Yes	1
14.646	54.7	86.6	31.9	45.1	33.7	26.6	2.5	100	Vert.	No	1
17.087	59.0	86.6	27.6	50.1	33.8	27.4	2.5	100	Vert.	No	1
19.528	52.7	74.0	21.3	51.3	37.1	38.2	2.5	100	Vert.	Yes	1
21.969	62.0	86.6	24.6	60.6	37.2	38.3	2.5	100	Vert.	No	1
24.410	56.3	86.6	30.3	55.5	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.
2.306	34.0	83.7	49.7	2.5	27.9	0.0	3.6	150	Vert.	No	1
2.386	34.9	54.0	19.1	2.9	28.3	0.0	3.7	150	Vert.	Yes	1
2.441	103.7	-	-	71.6	28.4	0.0	3.7	150	Vert.	-	1
4.882	38.2	54.0	15.8	25.8	32.8	25.7	5.3	150	Vert.	Yes	1
7.323	42.3	54.0	11.7	23.9	36.2	24.6	6.8	150	Hor.	Yes	1
9.764	44.7	83.7	39.0	23.4	37.3	23.9	7.9	150	Vert.	No	1
12.202	36.9	54.0	17.1	26.7	33.6	25.9	2.5	100	Vert.	Yes	1
14.646	44.0	83.7	39.7	34.4	33.7	26.6	2.5	100	Vert.	No	1
17.087	49.4	83.7	34.3	40.5	33.8	27.4	2.5	100	Vert.	No	1
19.528	40.9	54.0	13.1	39.5	37.1	38.2	2.5	100	Vert.	Yes	1
21.969	51.8	83.7	31.9	50.4	37.2	38.3	2.5	100	Vert.	No	1
24.410	44.9	83.7	38.8	44.1	37.2	38.9	2.5	100	Vert.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

<u>Transmitter operates at the upper end of the assigned frequency band (operation mode 3)</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.
2.3059	57.3	88.5	31.2	25.8	27.9	0.0	3.6	150	Vert.	No	1
2.3743	59.7	74.0	14.3	27.9	28.2	0.0	3.6	150	Vert.	Yes	1
2.480	108.5	-	-	76.2	28.5	0.0	3.8	150	Vert.	-	1
4.960	48.0	74.0	26.0	35.4	32.9	25.6	5.3	150	Vert.	Yes	1
7.440	54.3	74.0	19.7	35.7	36.3	24.5	6.8	150	Hor.	Yes	1
9.920	57.5	88.5	31.0	36.1	37.4	23.9	7.9	150	Vert.	No	1
12.400	48.1	74.0	25.9	37.8	33.7	25.9	2.5	100	Vert.	Yes	1
14.880	54.9	88.5	33.6	45.4	33.7	26.7	2.5	100	Vert.	No	1
17.360	64.7	88.5	23.8	55.5	33.9	27.2	2.5	100	Vert.	No	1
19.840	54.4	74.0	19.6	53.2	37.0	38.3	2.5	100	Vert.	Yes	1
22.320	54.0	74.0	20.0	52.6	37.2	38.3	2.5	100	Vert.	Yes	1
24.800	55.0	88.5	33.5	54.2	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.
2.3059	34.0	85.6	51.6	2.5	27.9	0.0	3.6	150	Vert.	No	1
2.3743	34.3	54.0	19.7	2.5	28.2	0.0	3.6	150	Vert.	Yes	1
2.480	105.6	-	-	73.3	28.5	0.0	3.8	150	Vert.	-	1
4.960	37.9	54.0	16.1	25.3	32.9	25.6	5.3	150	Vert.	Yes	1
7.440	43.6	54.0	10.4	25.0	36.3	24.5	6.8	150	Hor.	Yes	1
9.920	46.1	85.6	39.5	24.7	37.4	23.9	7.9	150	Vert.	No	1
12.400	35.7	54.0	18.3	25.4	33.7	25.9	2.5	100	Vert.	Yes	1
14.880	43.9	85.6	41.7	34.4	33.7	26.7	2.5	100	Vert.	No	1
17.360	54.9	85.6	30.7	45.7	33.9	27.2	2.5	100	Vert.	No	1
19.840	44.1	54.0	9.9	42.9	37.0	38.3	2.5	100	Vert.	Yes	1
22.320	43.3	54.0	10.7	41.9	37.2	38.3	2.5	100	Vert.	Yes	1
24.800	43.6	85.6	42.0	42.8	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

5.7.2.6 Preliminary radiated emission measurement with EPA antenna

Ambient temperature	21 °C	Relative humidity	38 %

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.

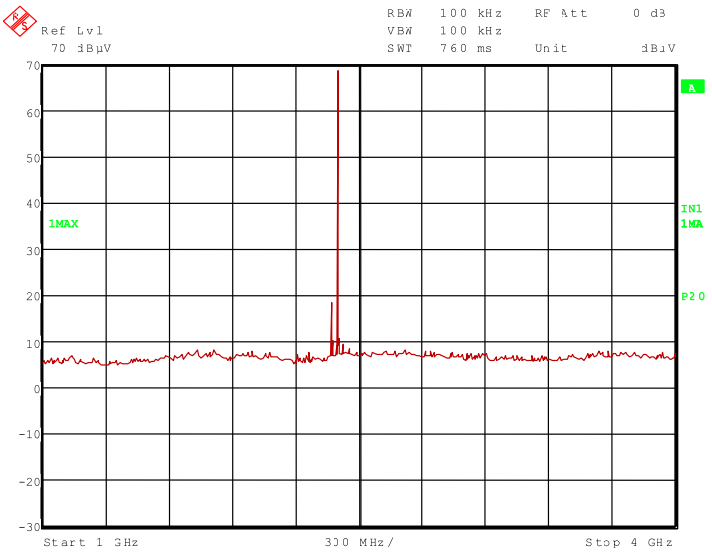
Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

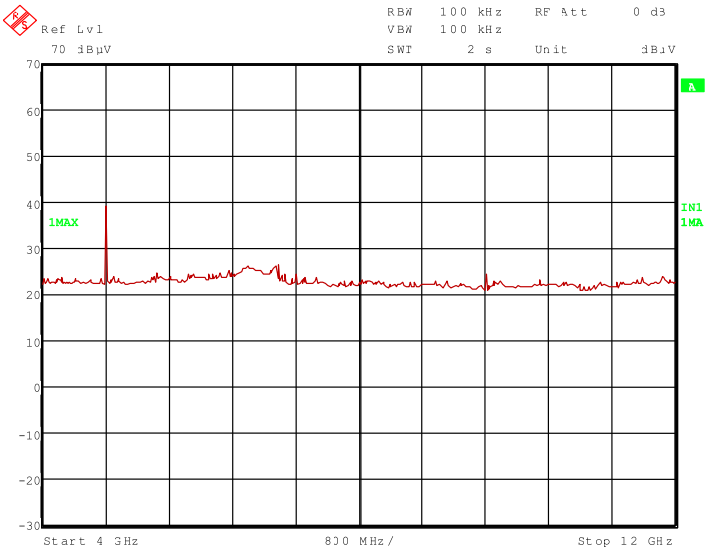
Supply voltage: During all measurements the EUT was supplied with 3.3 V DC via EPA circuit.

Transmitter operates at the lower end of the assigned frequency band

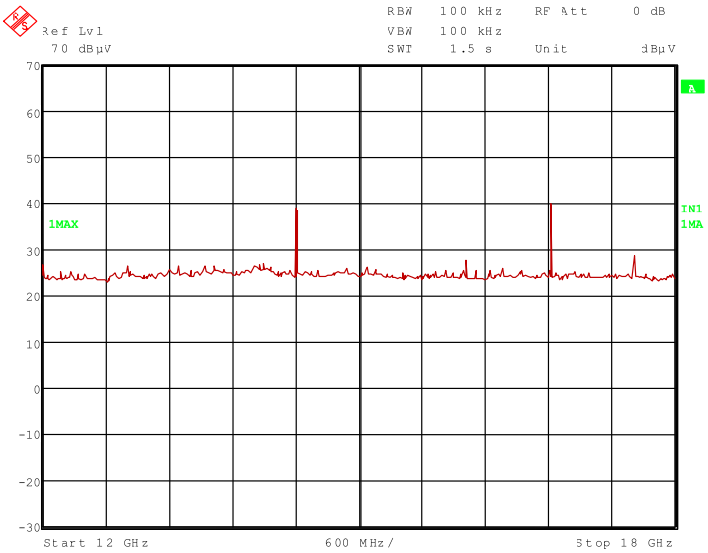
111592_104.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 1):



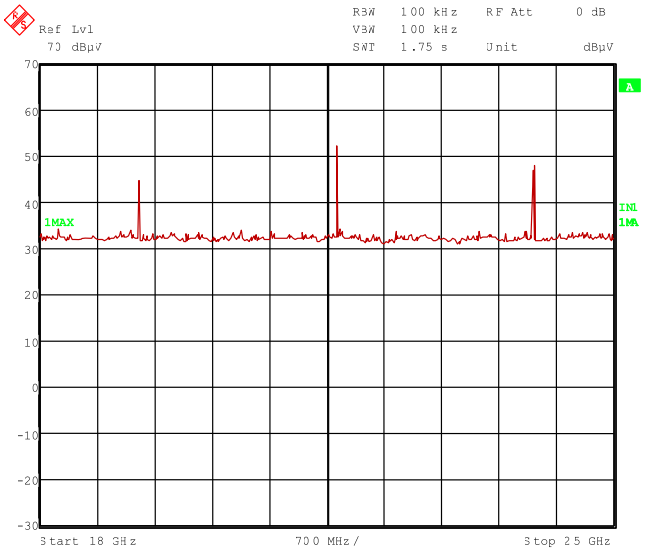
111592_111.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 1):



111592_133.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 1):



111592_128.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 1):



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

- 2.3717 GHz, 4.804 GHz, 12.010 GHz, 16.012 GHz and 19.216 GHz.

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

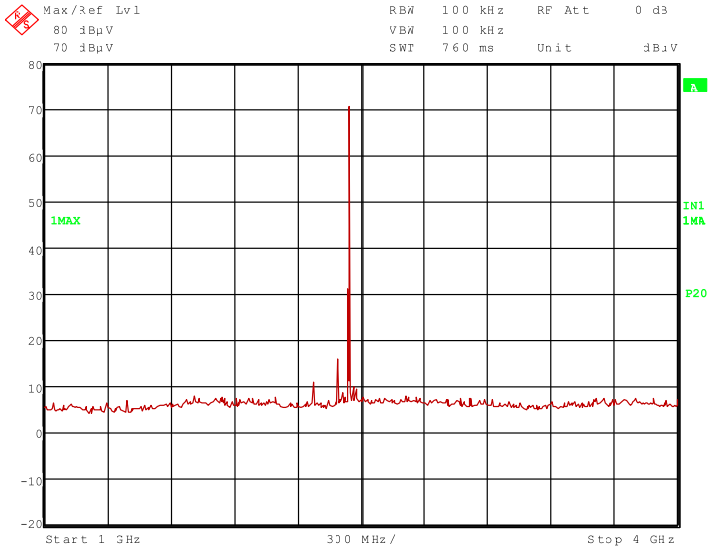
- 2.402 GHz, 9.608 GHz, 14.412 GHz, 16.814 GHz, 17.616 GHz, 21.618 GHz, and 24.020 GHz.

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

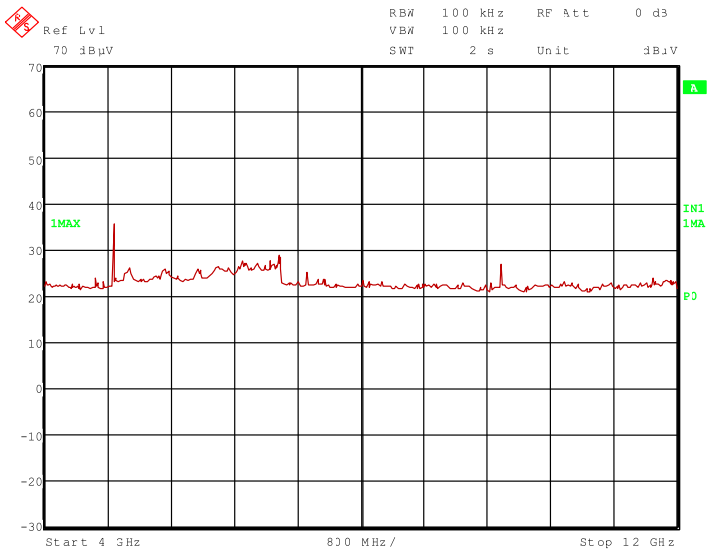
TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 34, 36, 37, 39, 44, 46, 49 - 51, 72

Transmitter operates on the middle of the assigned frequency band

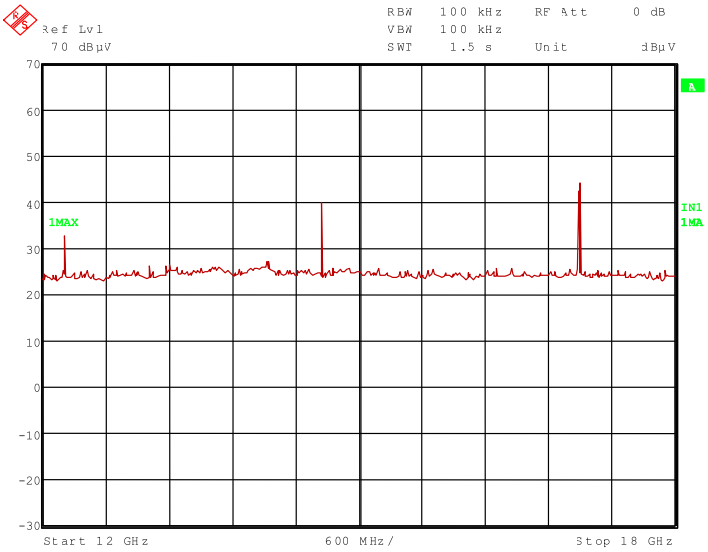
111592_106.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 2):



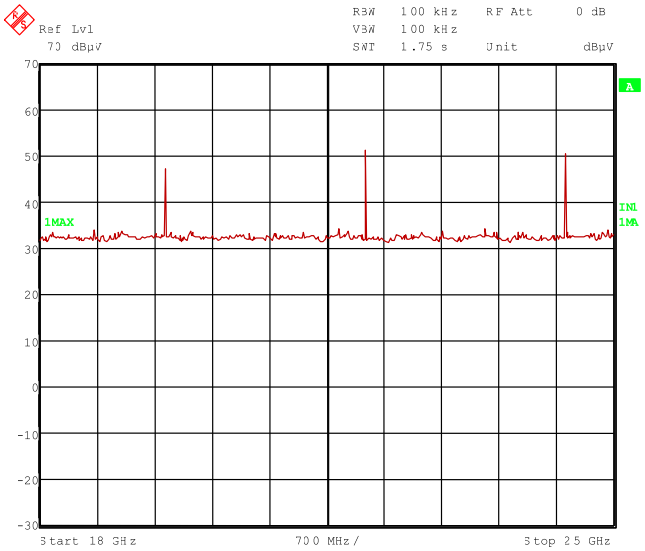
111592_112.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 2):



111592_132.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 2):



111592_129.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 2):



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

- 2.2769 GHz, 2.3876 GHz, 4.882 GHz, 7.323 GHz, 12.205 GHz and 19.528 GHz.

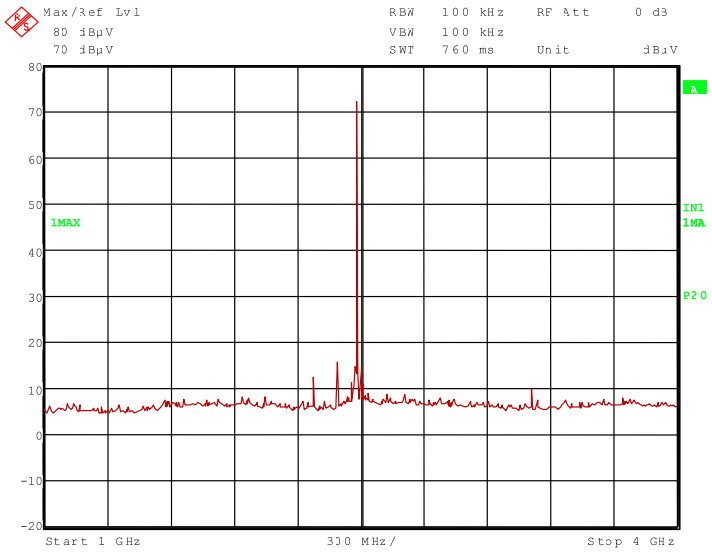
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.441 GHz, 2.4476 GHz, 9.764 GHz, 14.646 GHz, 17.087 GHz, 21.969 GHz and 24.410 GHz.

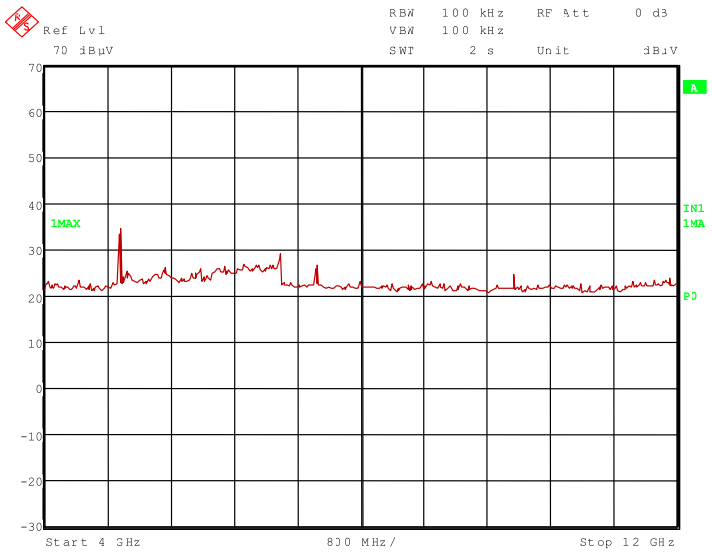
These frequencies have to be measured in a final measurement. The results were presented in the following.

Transmitter operates on the upper end of the assigned frequency

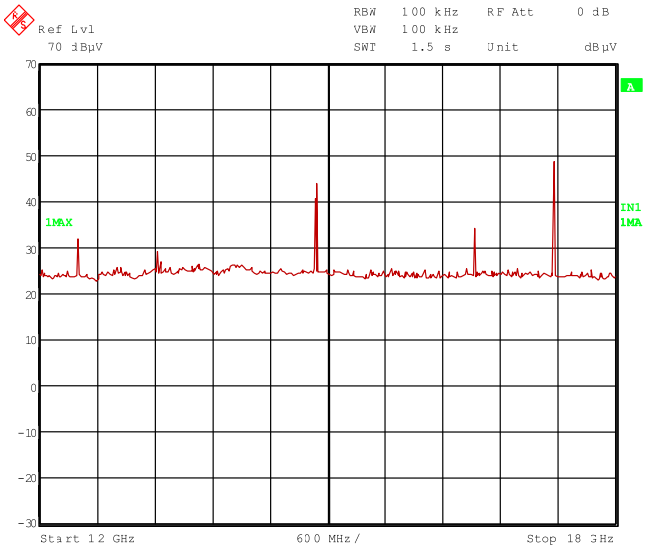
111592_107.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 3):



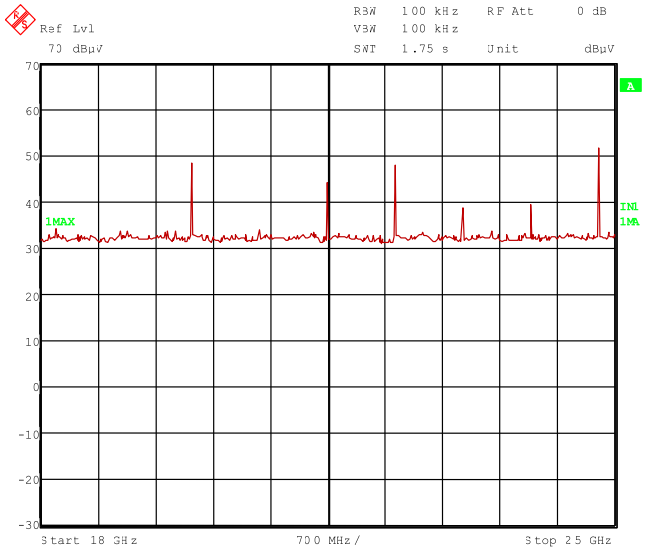
111592_113.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 3):



111592_131.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 3):



111592_130.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 3):



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

- 2.2769 GHz, 2.3879 GHz, 4.960 GHz, 7.440 GHz, 12.400 GHz, 19.840 GHz, 22.320 GHz and 23.975 GHz.

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

- 2.480 GHz, 2.5057 GHz, 9.920 GHz, 14.880 GHz, 16.532 GHz, 17.360 GHz, 21.495 GHz, 23.175 GHz and 24.800 GHz.

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

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

Ambient temperature	21 °C	Relative humidity	38 %

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 EPA circuit.

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 1)

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.
2.3717	55.9	74.0	18.1	24.1	28.2	0.0	3.6	150	Hor.	Yes	1
2.402	101.1	-	-	69.1	28.3	0.0	3.7	150	Hor.	-	1
4.804	54.8	74.0	19.2	42.6	32.6	25.7	5.3	150	Vert.	Yes	1
9.608	55.4	81.1	25.7	34.2	37.3	23.9	7.8	150	Hor.	No	1
12.010	47.3	74.0	26.7	37.1	33.6	25.9	2.5	100	Hor.	Yes	1
14.412	54.6	81.1	26.5	44.9	33.7	26.5	2.5	100	Hor.	No	1
16.012	45.8	74.0	28.2	36.8	33.8	27.3	2.5	100	Hor.	Yes	1
16.814	55.9	81.1	25.2	47.1	33.8	27.5	2.5	100	Hor.	No	1
17.616	47.9	81.1	33.2	38.5	33.9	27.0	2.5	100	Hor.	No	1
19.216	48.4	74.0	25.6	47.0	37.1	38.2	2.5	100	Vert.	Yes	1
21.618	56.4	81.1	24.7	55.0	37.2	38.3	2.5	100	Hor.	No	1
24.020	55.2	81.1	25.9	54.3	37.2	38.8	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.
2.3717	34.6	54.0	19.4	2.8	28.2	0.0	3.6	150	Hor.	Yes	1
2.402	98.2	-	-	66.2	28.3	0.0	3.7	150	Hor.	-	1
4.804	49.3	54.0	4.7	37.1	32.6	25.7	5.3	150	Vert.	Yes	1
9.608	42.9	78.2	35.3	21.7	37.3	23.9	7.8	150	Hor.	No	1
12.010	35.0	54.0	19.0	24.8	33.6	25.9	2.5	100	Hor.	Yes	1
14.412	43.8	78.2	34.4	34.1	33.7	26.5	2.5	100	Hor.	No	1
16.012	32.7	54.0	21.3	23.7	33.8	27.3	2.5	100	Hor.	Yes	1
16.814	45.5	78.2	32.7	36.7	33.8	27.5	2.5	100	Hor.	No	1
17.616	35.7	78.2	42.5	26.3	33.9	27.0	2.5	100	Hor.	No	1
19.216	36.7	54.0	17.3	35.3	37.1	38.2	2.5	100	Vert.	Yes	1
21.618	40.6	78.2	37.6	39.2	37.2	38.3	2.5	100	Hor.	No	1
24.020	43.8	78.2	34.4	42.9	37.2	38.8	2.5	100	Hor.	No	1
Measurement uncertainty						+2.2 dB / -3.6 dB					

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

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.
2.2769	43.7	74.0	30.3	12.4	27.7	0.0	3.6	150	Vert.	Yes	1
2.3876	48.4	74.0	25.6	16.4	28.3	0.0	3.7	150	Hor.	Yes	1
2.441	104.7	-	-	72.6	28.4	0.0	3.7	150	Hor.	-	1
2.4476	44.0	84.7	40.7	11.9	28.4	0.0	3.7	150	Vert.	No	1
4.882	52.9	74.0	21.1	40.5	32.8	25.7	5.3	150	Hor.	Yes	1
7.323	53.5	74.0	20.5	35.1	36.2	24.6	6.8	150	Vert.	Yes	1
9.764	57.3	84.7	27.4	36.0	37.3	23.9	7.9	150	Hor.	No	1
12.205	50.6	74.0	23.4	40.4	33.6	25.9	2.5	100	Hor.	Yes	1
14.646	57.6	84.7	27.1	48.0	33.7	26.6	2.5	100	Hor.	No	1
17.087	56.9	84.7	27.8	48.0	33.8	27.4	2.5	100	Hor.	No	1
19.528	49.3	74.0	24.7	47.9	37.1	38.2	2.5	100	Vert.	Yes	1
21.969	56.4	74.0	17.6	55.0	37.2	38.3	2.5	100	Vert.	No	1
24.410	57.5	74.0	16.5	56.7	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.
2.2769	26.5	54.0	27.5	-4.8	27.7	0.0	3.6	150	Hor.	Yes	1
2.3876	27.4	54.0	26.6	-4.6	28.3	0.0	3.7	150	Hor.	Yes	1
2.441	101.8	-	-	69.7	28.4	0.0	3.7	150	Hor.	-	1
2.4476	27.0	81.8	54.8	-5.1	28.4	0.0	3.7	100	Vert.	No	1
4.882	47.1	54.0	6.9	34.7	32.8	25.7	5.3	150	Hor.	Yes	1
7.323	41.6	54.0	12.4	23.2	36.2	24.6	6.8	150	Vert.	Yes	1
9.764	45.9	81.8	35.9	24.6	37.3	23.9	7.9	150	Hor.	No	1
12.205	39.6	54.0	14.4	29.4	33.6	25.9	2.5	100	Hor.	Yes	1
14.646	47.6	81.8	34.2	38.0	33.7	26.6	2.5	100	Hor.	No	1
17.087	46.5	81.8	35.3	37.6	33.8	27.4	2.5	100	Hor.	No	1
19.528	36.4	54.0	17.6	35.0	37.1	38.2	2.5	100	Hor.	Yes	1
21.969	44.0	54.0	10.0	42.6	37.2	38.3	2.5	100	Hor.	No	1
24.410	45.5	54.0	8.5	44.7	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 3)

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.
2.2769	45.7	74.0	28.3	14.4	27.7	0.0	3.6	150	Vert.	Yes	1
2.3879	49.2	74.0	24.8	17.2	28.3	0.0	3.7	150	Hor.	Yes	1
2.480	105.1	-	-	72.8	28.5	0.0	3.8	150	Hor.	-	1
2.5057	46.9	85.1	38.2	14.5	28.6	0.0	3.8	150	Vert.	No	1
4.960	51.4	74.0	22.6	38.8	32.9	25.6	5.3	150	Hor.	Yes	1
7.440	54.4	74.0	19.6	35.8	36.3	24.5	6.8	150	Vert.	Yes	1
9.920	55.6	85.1	29.5	34.2	37.4	23.9	7.9	150	Hor.	No	1
12.400	50.4	74.0	23.6	40.1	33.7	25.9	2.5	100	Hor.	Yes	1
14.880	58.1	85.1	27.0	48.6	33.7	26.7	2.5	100	Hor.	No	1
16.532	49.8	85.1	35.3	41.1	33.8	27.6	2.5	100	Hor.	No	1
17.360	62.2	85.1	22.9	53.0	33.9	27.2	2.5	100	Hor.	No	1
19.840	53.3	74.0	20.7	52.1	37.0	38.3	2.5	100	Vert.	Yes	1
21.495	49.4	85.1	35.7	48.0	37.2	38.3	2.5	100	Vert.	No	1
22.320	52.5	74.0	21.5	51.1	37.2	38.3	2.5	100	Hor.	Yes	1
23.175	43.4	85.1	41.7	42.1	37.2	38.4	2.5	100	Vert.	No	1
23.975	46.0	74.0	28.0	45.1	37.2	38.8	2.5	100	Vert.	Yes	1
24.800	55.4	85.1	29.7	54.6	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.
2.2769	25.2	54.0	28.8	-6.1	27.7	0.0	3.6	150	Hor.	Yes	1
2.3879	26.1	54.0	27.9	-5.9	28.3	0.0	3.7	150	Hor.	Yes	1
2.480	102.1	-	-	69.8	28.5	0.0	3.8	150	Hor.	-	1
2.5057	27.6	82.1	54.5	-4.8	28.6	0.0	3.8	150	Vert.	No	1
4.960	45.3	54.0	8.7	32.7	32.9	25.6	5.3	150	Hor.	Yes	1
7.440	44.1	54.0	9.9	25.5	36.3	24.5	6.8	150	Vert.	Yes	1
9.920	43.2	82.1	38.9	21.8	37.4	23.9	7.9	150	Hor.	No	1
12.400	39.3	54.0	14.7	29.0	33.7	25.9	2.5	100	Hor.	Yes	1
14.880	47.9	82.1	34.2	38.4	33.7	26.7	2.5	100	Hor.	No	1
16.532	38.9	82.1	43.2	30.2	33.8	27.6	2.5	150	Hor.	No	1
17.360	52.5	82.1	29.6	43.3	33.9	27.2	2.5	150	Hor.	No	1
19.840	42.8	54.0	11.2	41.6	37.0	38.3	2.5	100	Vert.	Yes	1
21.495	36.9	82.1	45.2	35.5	37.2	38.3	2.5	100	Vert.	No	1
22.320	39.9	54.0	14.1	38.5	37.2	38.3	2.5	100	Hor.	Yes	1
23.175	29.8	82.1	52.3	28.5	37.2	38.4	2.5	100	Vert.	No	1
23.975	32.9	54.0	21.1	32.0	37.2	38.8	2.5	100	Vert.	Yes	1
24.800	38.6	82.1	43.5	37.8	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

5.7.2.8 Preliminary radiated emission measurement with internal antenna

Ambient temperature	21 °C	Relative humidity	55 %

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.

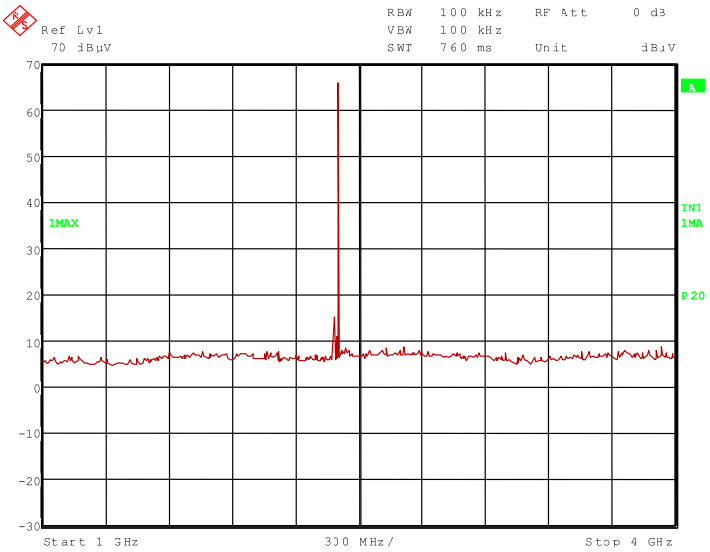
Test record: All results are shown in the following.

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

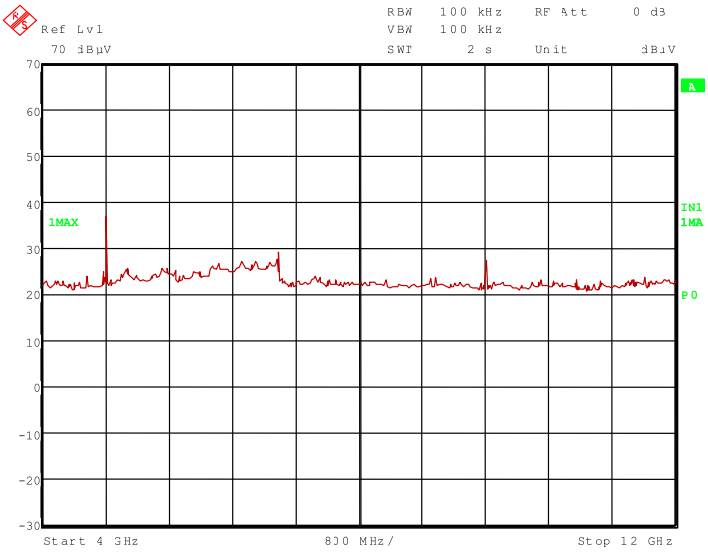
Remark: This measurement was carried out by using internal antenna type Fractus FR05-S1-N-0-102, because pre-tests have shown that this antenna causes the highest emissions of internal antennas in question.

Transmitter operates at the lower end of the assigned frequency band

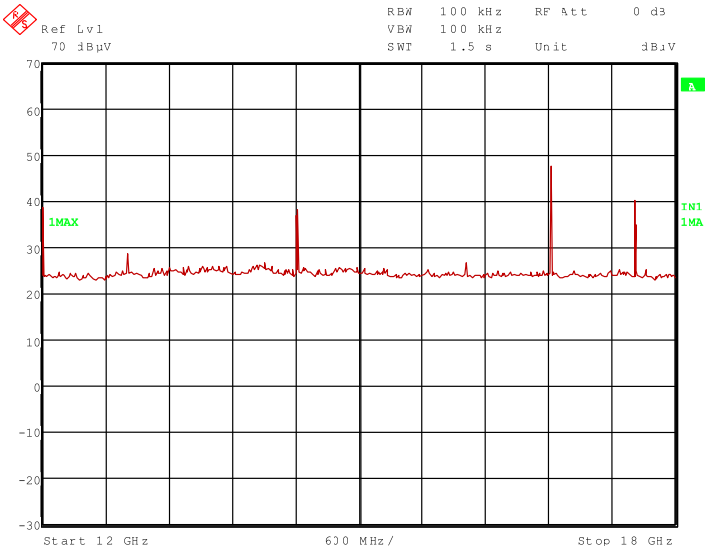
111592_2.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 1):



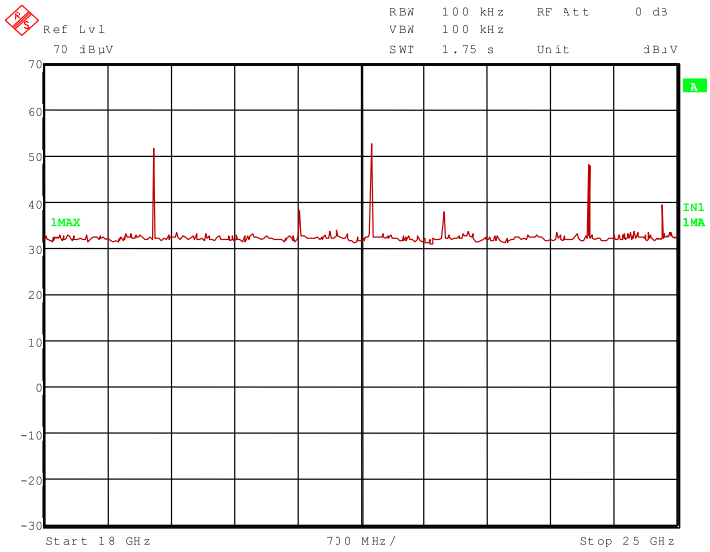
111592_10.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 1):



111592_48.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 1):



111592_49.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 1):



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

- 4.8028 GHz, 4.804 GHz, 12.010 GHz, 19.216 GHz, 20.818 GHz and 22.420 GHz.

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

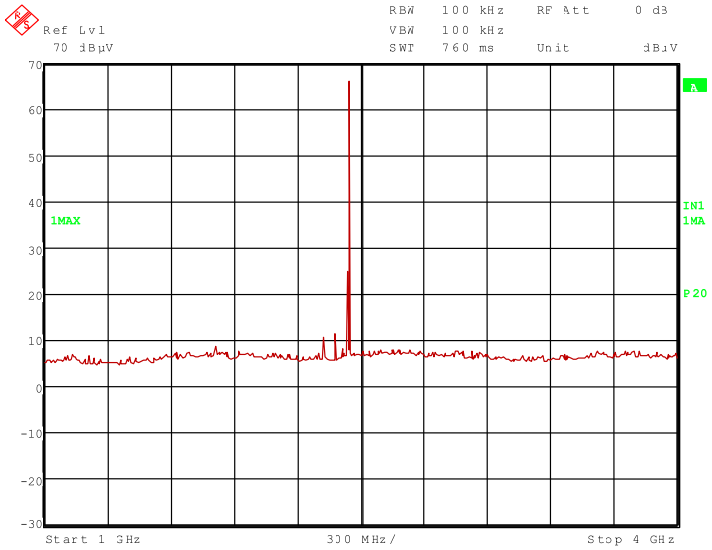
- 2.397 GHz, 2.402 GHz, 9.608 GHz, 12.810 GHz, 14.412 GHz, 16.814 GHz, 17.615 GHz, 21.618 GHz, 24.020 GHz and 24.819 GHz.

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

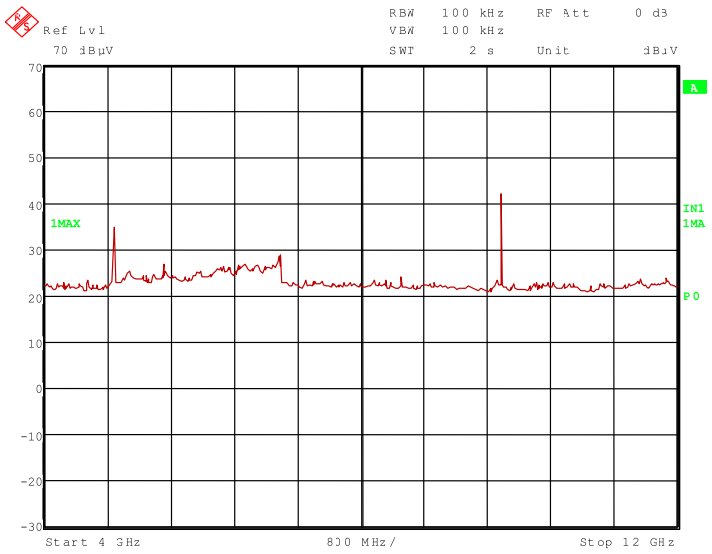
TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 34, 36, 37, 39, 44, 46, 49 - 51, 72

Transmitter operates on the middle of the assigned frequency band

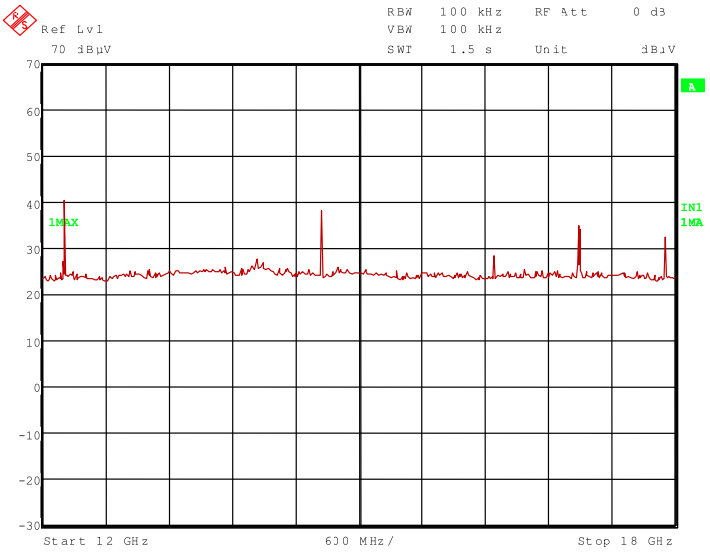
111592_1.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 2):



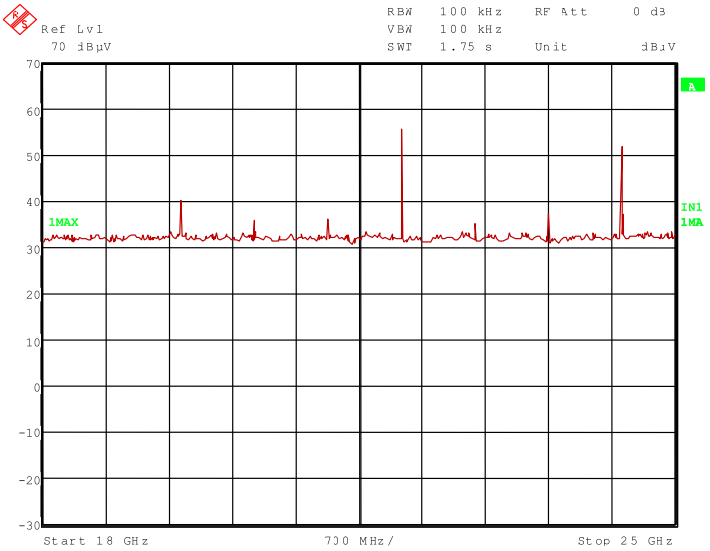
111592_9.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 2):



111592_51.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 2):



111592_50.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 2):



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

- 2.324 GHz, 2.3756 GHz, 4.882 GHz, 12.205 GHz, 17.902 GHz and 19.528 GHz.

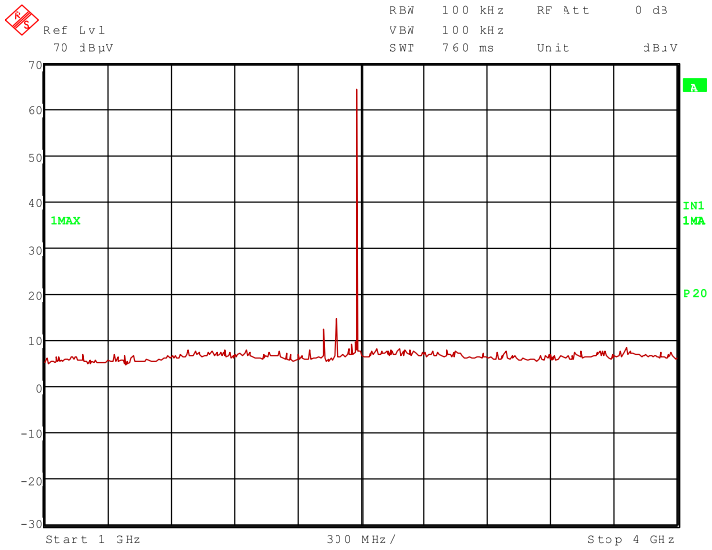
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.441 GHz, 9.764 GHz, 14.646 GHz, 17.087 GHz, 21.969 GHz, 23.596 GHz and 24.410 GHz.

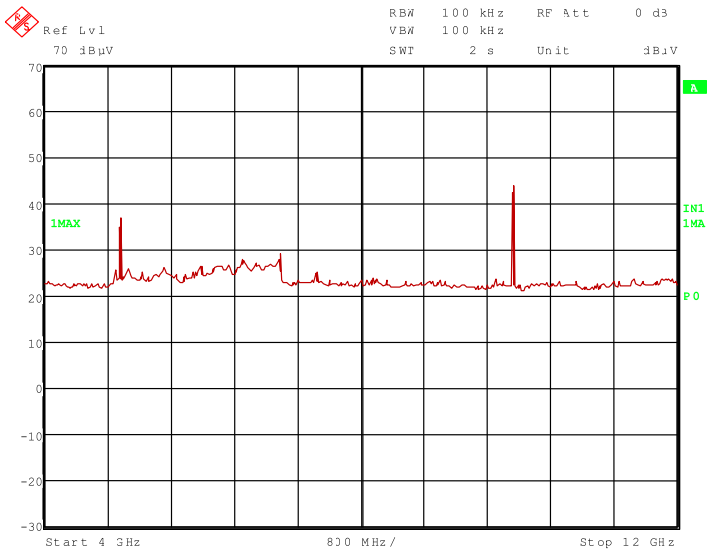
These frequencies have to be measured in a final measurement. The results were presented in the following.

Transmitter operates on the upper end of the assigned frequency

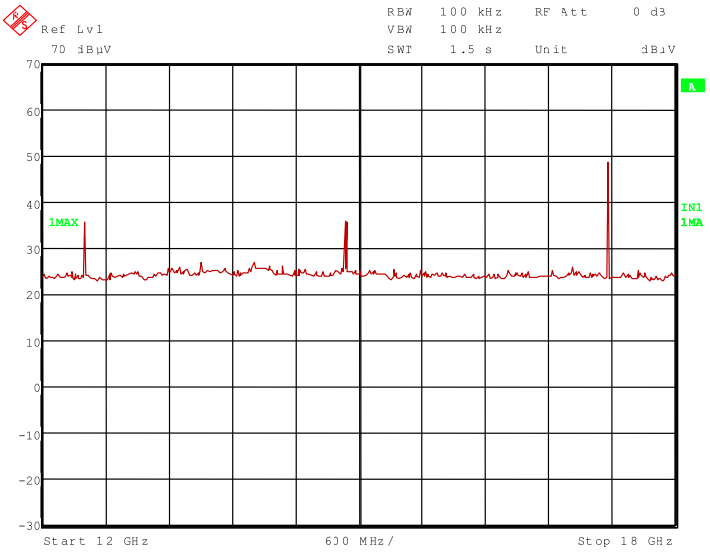
111592_5.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 3):



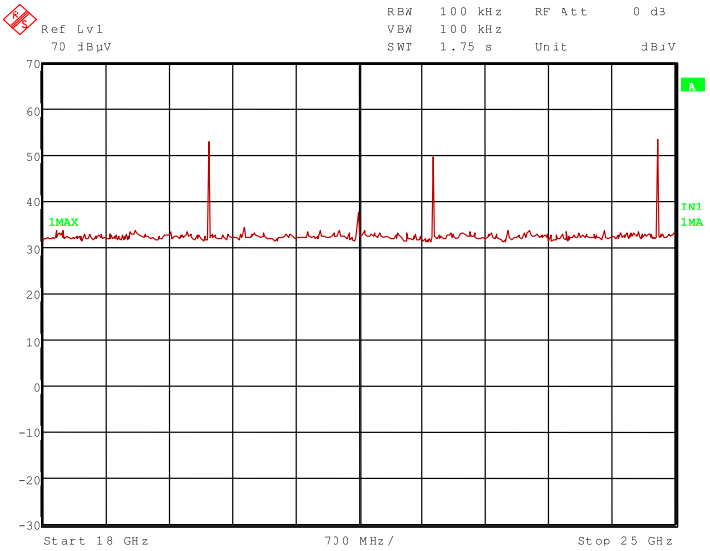
111592_8.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 3):



111592_52.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 3):



111592_53.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 3):



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

- 2.3115 GHz, 2.385 GHz, 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, 14.880 GHz, 17.360 GHz, 21.494 GHz and 24.800 GHz.

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

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

Ambient temperature	21 °C	Relative humidity	55 %

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 1)

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.
2.397	54.1	78.5	24.4	22.1	28.3	0.0	3.7	150	Vert.	No	2
2.402	98.5	-	-	66.5	28.3	0.0	3.7	150	Vert.	-	2
4.8028	46.1	74.0	27.9	33.9	32.6	25.7	5.3	150	Vert.	Yes	2
4.804	52.9	74.0	21.1	40.7	32.6	25.7	5.3	150	Hor.	Yes	2
9.608	56.0	78.5	22.5	34.8	37.3	23.9	7.8	150	Hor.	No	2
12.010	53.4	74.0	20.6	43.2	33.6	25.9	2.5	100	Hor.	Yes	2
12.810	47.9	78.5	30.6	37.8	33.6	26.0	2.5	100	Hor.	No	2
14.412	52.0	78.5	26.5	42.3	33.7	26.5	2.5	100	Hor.	No	2
16.814	59.8	78.5	18.7	51.0	33.8	27.5	2.5	100	Vert.	No	2
17.615	54.8	78.5	23.7	45.4	33.9	27.0	2.5	100	Vert.	No	2
19.216	57.4	74.0	16.6	56.0	37.1	38.2	2.5	100	Hor.	Yes	2
20.818	47.8	74.0	26.2	46.5	37.1	38.3	2.5	100	Hor.	Yes	2
21.618	59.1	78.5	19.4	57.7	37.2	38.3	2.5	100	Hor.	No	2
22.420	48.5	74.0	25.5	47.2	37.2	38.4	2.5	100	Hor.	Yes	2
24.020	54.9	78.5	23.6	54.0	37.2	38.8	2.5	100	Vert.	No	2
24.819	47.5	78.5	31.0	46.7	37.3	39.0	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.
2.397	35.3	75.5	40.2	3.3	28.3	0.0	3.7	150	Vert.	No	2
2.402	95.5	-	-	63.5	28.3	0.0	3.7	150	Vert.	-	2
4.802	31.9	54.0	22.1	19.7	32.6	25.7	5.3	150	Vert.	Yes	2
4.804	47.2	54.0	6.8	35.0	32.6	25.7	5.3	150	Hor.	Yes	2
9.608	44.7	75.5	30.8	23.5	37.3	23.9	7.8	150	Hor.	No	2
12.010	42.0	54.0	12.0	31.8	33.6	25.9	2.5	100	Hor.	Yes	2
12.810	35.2	75.5	40.3	25.1	33.6	26.0	2.5	100	Hor.	No	2
14.412	40.8	75.5	34.7	31.1	33.7	26.5	2.5	100	Hor.	No	2
16.814	49.9	75.5	25.6	41.1	33.8	27.5	2.5	100	Vert.	No	2
17.615	43.7	75.5	31.8	34.3	33.9	27.0	2.5	150	Vert.	No	2
19.216	47.1	54.0	6.9	45.7	37.1	38.2	2.5	150	Hor.	Yes	2
20.818	34.8	54.0	19.2	33.5	37.1	38.3	2.5	150	Hor.	Yes	2
21.618	47.7	75.5	27.8	46.3	37.2	38.3	2.5	150	Hor.	No	2
22.420	36.4	54.0	17.6	35.1	37.2	38.4	2.5	150	Hor.	Yes	2
24.020	41.8	75.5	33.7	40.9	37.2	38.8	2.5	100	Vert.	No	2
24.819	34.3	75.5	41.2	33.5	37.3	39.0	2.5	100	Hor.	No	2
Measurement uncertainty						+2.2 dB / -3.6 dB					

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

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.
2.324	51.0	74.0	23.0	19.4	28.0	0.0	3.6	150	Vert.	Yes	2
2.3756	53.0	74.0	21.0	21.1	28.2	0.0	3.7	150	Vert.	Yes	2
2.441	98.6	-	-	66.5	28.4	0.0	3.7	150	Vert.	-	2
4.882	50.9	74.0	23.1	38.5	32.8	25.7	5.3	150	Hor.	Yes	2
9.764	67.3	78.6	11.3	46.0	37.3	23.9	7.9	150	Hor.	No	2
12.205	54.0	74.0	20.0	43.8	33.6	25.9	2.5	100	Hor.	Yes	2
14.646	53.5	78.6	25.1	43.9	33.7	26.6	2.5	100	Vert.	No	2
17.087	52.9	78.6	25.7	44.0	33.8	27.4	2.5	100	Vert.	No	2
17.902	53.9	74.0	20.1	44.3	33.9	26.8	2.5	100	Vert.	Yes	2
19.528	50.5	74.0	23.5	49.1	37.1	38.2	2.5	100	Hor.	Yes	2
21.969	63.1	78.6	15.5	61.7	37.2	38.3	2.5	100	Hor.	No	2
23.596	46.5	78.6	32.1	45.3	37.2	38.5	2.5	100	Vert.	No	2
24.410	57.7	78.6	20.9	56.9	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.
2.324	33.8	54.0	20.2	2.2	28.0	0.0	3.6	150	Vert.	Yes	2
2.376	34.1	54.0	19.9	2.2	28.2	0.0	3.7	150	Vert.	Yes	2
2.441	95.6	-	-	63.5	28.4	0.0	3.7	150	Vert.	-	2
4.882	45.0	54.0	9.0	32.6	32.8	25.7	5.3	150	Hor.	Yes	2
9.764	58.6	75.6	17.0	37.3	37.3	23.9	7.9	150	Hor.	No	2
12.205	42.7	54.0	11.3	32.5	33.6	25.9	2.5	100	Hor.	Yes	2
14.646	42.4	75.6	33.2	32.8	33.7	26.6	2.5	100	Vert.	No	2
17.087	39.1	75.6	36.5	30.2	33.8	27.4	2.5	100	Vert.	No	2
17.902	39.7	54.0	14.3	30.1	33.9	26.8	2.5	100	Vert.	Yes	2
19.528	39.0	54.0	15.0	37.6	37.1	38.2	2.5	100	Hor.	Yes	2
21.969	52.1	75.6	23.5	50.7	37.2	38.3	2.5	100	Hor.	No	2
23.596	34.2	75.6	41.4	33.0	37.2	38.5	2.5	100	Vert.	No	2
24.410	45.5	75.6	30.1	44.7	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 3)

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.
2.3115	52.6	74.0	21.4	21.1	27.9	0.0	3.6	150	Vert.	Yes	2
2.385	54.2	74.0	19.8	22.2	28.3	0.0	3.7	150	Vert.	Yes	2
2.480	97.8	-	-	65.5	28.5	0.0	3.8	150	Vert.	-	2
4.960	53.8	74.0	20.2	41.2	32.9	25.6	5.3	150	Hor.	Yes	2
9.920	67.8	77.8	10.0	46.4	37.4	23.9	7.9	150	Hor.	No	2
12.400	49.7	74.0	24.3	39.4	33.7	25.9	2.5	100	Hor.	Yes	2
14.880	52.1	77.8	25.7	42.6	33.7	26.7	2.5	100	Vert.	No	2
17.360	62.0	77.8	15.8	52.8	33.9	27.2	2.5	100	Vert.	No	2
19.840	59.4	74.0	14.6	58.2	37.0	38.3	2.5	100	Hor.	Yes	2
21.494	42.5	77.8	35.3	41.1	37.2	38.3	2.5	100	Hor.	No	2
22.320	58.0	74.0	16.0	56.6	37.2	38.3	2.5	100	Hor.	Yes	2
24.800	55.6	77.8	22.2	54.8	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.
2.3115	33.7	54.0	20.3	2.2	27.9	0.0	3.6	150	Vert.	Yes	2
2.385	34.4	54.0	19.6	2.4	28.3	0.0	3.7	150	Vert.	Yes	2
2.480	94.9	-	-	62.6	28.5	0.0	3.8	150	Vert.	-	2
4.960	48.2	54.0	5.8	35.6	32.9	25.6	5.3	150	Hor.	Yes	2
9.920	59.0	74.9	15.9	37.6	37.4	23.9	7.9	150	Hor.	No	2
12.400	37.9	54.0	16.1	27.6	33.7	25.9	2.5	100	Hor.	Yes	2
14.880	40.8	74.9	34.1	31.3	33.7	26.7	2.5	100	Vert.	No	2
17.360	52.6	74.9	22.3	43.4	33.9	27.2	2.5	100	Vert.	No	2
19.840	49.2	54.0	4.8	48.0	37.0	38.3	2.5	100	Hor.	Yes	2
21.494	35.6	74.9	39.3	34.2	37.2	38.3	2.5	100	Hor.	No	2
22.320	45.2	54.0	8.8	43.8	37.2	38.3	2.5	100	Hor.	Yes	2
24.800	45.2	74.9	29.7	44.4	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

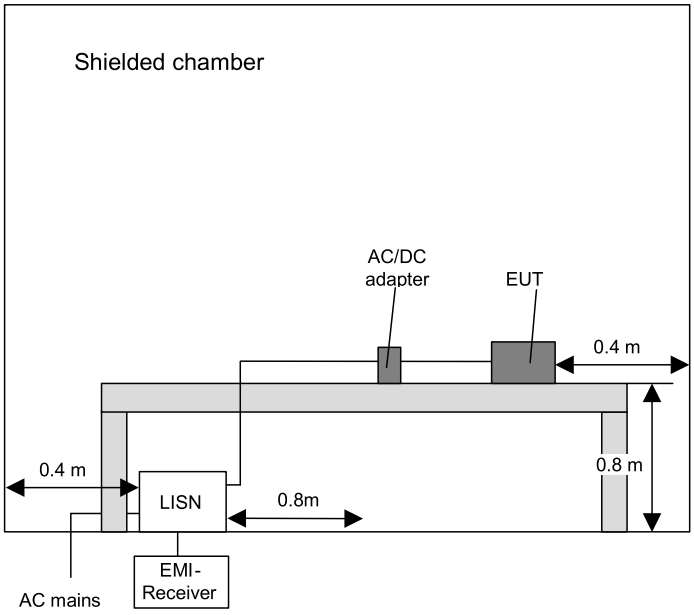
5.8 Conducted emissions on power supply lines (150 kHz to 30 MHz)

5.8.1 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



5.8.2 Test results (conducted emissions on power supply lines)

Ambient temperature	20 °C	Relative humidity	66 %

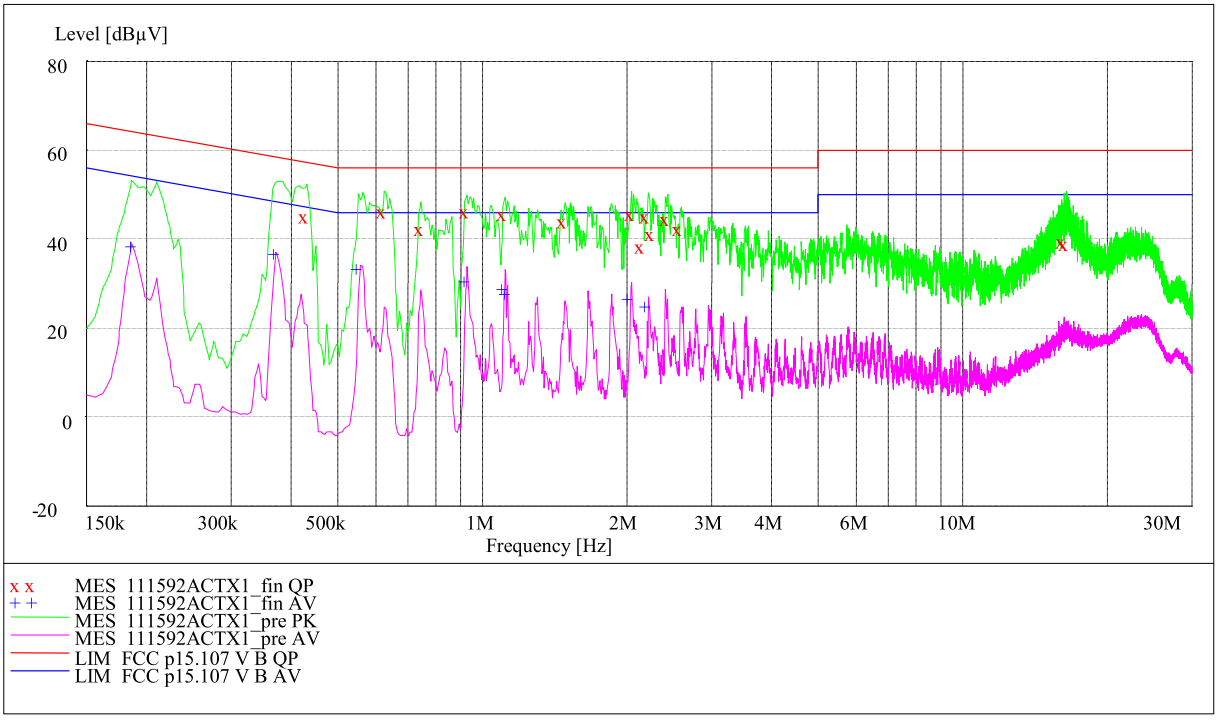
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.

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: 111592ACTX1

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: 111592ACTX1_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: 111592ACTX1_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	WHKX4.0/18 G-8SS	Wainwright Instruments	1	480587	Weekly verification (system cal.)	

7 REPORT HISTORY

Report Number	Date	Comment
F111592E2	22 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 10 PAGES