

TEST REPORT

Test Report Reference: F091568E1

Equipment under Test / model name: cB-0926-02 and cB-0926-03

FCC ID: PVH0926

IC: 5325A-0926

Serial Number: None

Applicant: connectBlue AB

Manufacturer: connectBlue AB

**Test 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 and
FCC Test site registration number 90877**

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1 IDENTIFICATION

1.1 APPLICANT

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	Malmö SE-211 19
Country:	Sweden
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1.2 MANUFACTURER

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	Malmö SE-211 19
Country:	Sweden
Name for contact purposes:	Mr. Martin Engdahl
Tel:	+ 46 40 63 07 100
Fax:	+ 46 40 23 71 37
e-mail address:	martin.engdahl@connectblue.se

1.3 DATES

Date of receipt of test sample:	23 June 2009
Start of test:	23 June 2009
End of test:	23 October 2009

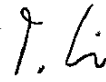
TEST REPORT REFERENCE: F091568E1

1.4 TEST LABORATORY

The tests were carried out at: **PHOENIX TESTLAB GmbH**
Königswinkel 10
D-32825 Blomberg Phone: **+49 (0) 52 35 / 95 00-0**
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accredited by Deutsche Gesellschaft für Akkreditierung mbH in compliance with DIN EN ISO/IEC 17025 under Reg. No. DGA-PL-105/99-22, Industry Canada Test site registration IC3469A-1 and FCC Test site registration number 90877.

Test engineer: Thomas KÜHN
Name



24 November 2009
Date

Test report checked: Bernd STEINER
Name



24 November 2009
Date

PHOENIX TESTLAB GmbH
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32825 Blomberg
Tel. 0 52 35 / 95 00-0
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Stamp

1.5 RESERVATION

This test report is only valid in its original form.

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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 REFERENCE.

1.6 NORMATIVE REFERENCES

- [1] **ANSI C63.4-2003** 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** Radio Frequency Devices
- [3] **FCC Public Notice DA 00-705 (March 2000)**
- [4] **RSS-210 Issue 7 (June 2007)** Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment
- [5] **RSS-Gen Issue 2 (June 2007)** 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

1.7 TEST RESULTS

The requirements of this test document are fulfilled by the equipment under test. The complete test results are presented in the following.

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2 TECHNICAL DATA OF EQUIPMENT

Type of equipment: *	a-, b-, g-, n-WLAN module				
Type designation / model name: *	cB-0926-02, cB-0926-03				
Hardware / software version: *	2.5 / 1.2				
FCC ID: *	PVH0926				
IC: *	5235A-0926				
Antenna type: *	The antenna connectors are not mounted on versions with internal antenna. On versions intended for external antenna there are two Hirose U.FL connectors J4 = Rx & Tx, J5 = Rx only (diversity antenna) Refer table in clause 2.2				
Antenna gain: *	Refer table in clause 2.2				
Power supply: *	U _{nom} =	5.0 V DC	U _{min} =	3.3 V DC	U _{max} = 5.5 V DC
Type of modulation: *	DSSS/OFDM				
Operating frequency range: *	2.412 to 2.462 GHz (11 channels with 5 MHz channel separation)				
Number of channels: *	11				
Temperature range: *	-30 °C to +85 °C				

*: declared by the applicant

The following external I/O cables were used:

Cable	Length	Shielding	Connector
DC in (carrier board)	2 m *	No	6.3 mm jack plug
RS 232 (carrier board)	2 m *	Yes	9 pole D-Sub connector

*: Length during the test if no other specified.

2.1 PERIPHERY DEVICES

The following equipment was used as control unit and ancillary equipment:

- A personal computer with a configuration-software was used. It was connected temporary to the SPI (cB-0926-02) / SDIO (cB-0926-03) interface of the WLAN module via RS 232 interface of the PC and the adapter board, for setting the equipment into the necessary operation mode. During emission measurements the personal computer and the adapter board were disconnected.
- An adapter board type cB-0717-02 was used to connect the carrier board with the EUT with the RS 232 interface of the used PC.
- For the conducted emission measurement on AC mains an AC / DC adaptor type Mascot type 2121 was used to supply the EUT with 5.0 V DC.
- During all test the EUT's were mounted on a carrier board type cB-0903-03.

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2.2 USED ANTENNAS

Model name*	Antenna type	Cable length / connector	Rated Antenna gain*
Fractus, FR05-S1-N-0-104	Internal SMD	-	0.0
Centurion Technologies, NanoBlue-IP04	Patch	10 cm / U.FL	+2.0
Centurion, WCR-2400 -IP04 -IP10 -SMA -SMRP	Monopole	10cm flying lead / U.FL 25cm flying lead / U.FL - / SMA - / RSMA -	+2.0
Huber+Suhner, SPA 2400/75/8/0/V	Patch	flying lead MCX	+7.5
Huber+Suhner, SOA 2400/360/6/0/V	Monopole	- / female N	+6.0
Huber+Suhner, SOA 2400/360/4/20/V	Monopole	- / SMA	+4.0
Joymax, IG-103	Monopole	- / female N	+8.5
Joymax, IW-145	Monopole	- / SMA or RPSMA	+4.0
Joymax, IH-151	Monopole	- / SMA, RPSMA or TNC	+5.0
Joymax, IHF-242	Monopole	Cable to MCX and IPC (U.FL) connector	+2.0
Mobile Mark, SDM2-2400/1575	Patch	flying lead U.FL	+2.0
Mobile Mark, PSTG0-2400HS	Monopole	- / SMA or RPSMA	0.0
ProAnt, FlatWhip-2400	Monopole	- / SMA or RPSMA	+3.0
ProAnt, TwinGain-2400	Patch	- / SMA or RPSMA	+8.0 (circular pol.)
ProAnt, InSide-2400	Patch	10 cm / U.FL	+3.0
ProAnt, InSide-WLAN	Patch	10 cm / U.FL	+3.0
ProAnt, Outside-2400	Monopole	10 cm / U.FL 25 cm / U.FL	+3.0
ProAnt, Ex-IT 2400 -SMA 28-001 -RP-SMA 28-001	Monopole	SMA RSMA	+3.0
ProAnt, Ex-IT 2400-MHF 28	Monopole	10 cm flying lead U.FL	+2.0
ProAnt, Ex-IT 2400 -SMA 70-001 -RP-SMA 70-001 -MHF 70-001	Monopole	SMA RSMA 10cm flying lead U.FL	+3.0
ProAnt, Ex-IT WLAN - SMA - RP-SMA	Monopole	SMA RSMA	+3.0
ProAnt, Ex-IT 2400 -SMA 70-002 -RP-SMA 70-002	Monopole	SMA RSMA	+3.0
Radiall, R380.500. -124 -127 -139	Monopole	SMA SMA RSMA	+2.0
SEW EURODRIVE, SEW EURODRIVE Type 1 300 081 0	Patch	SMA	+6.0 (circular pol.)
PlanTec, m70cxr REEL	Patch	20cm / SMA or RPSMA 100 cm / SMA or RPSMA 300cm / SMA or RPSMA	+1.0
WiMo Antennen, Notebookantenna NB 2400	Patch	flying lead U.FL	+2.0

*: declared by the applicant

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3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

The EUT is a WLAN module, which is intended to be used in several applications. All radiated tests were carried out with samples with integral antenna (cB-0926-02 No. 6 and cB-0926-03 No. 5) and samples with external antenna (cB-0926-02 No. 4 and cB-0926-03 No.10). The conductive tests were carried out at the U.FL connector of the samples with external antenna port.

During all tests the EUT was powered with 5.0 V DC via the carrier board. The operation mode was adjusted with the help of a configuration-software on a laptop computer. For setting the equipment into the necessary operation mode, the computer was connected temporary to the SPI / SDIO interface of the WLAN module via RS 232 to the adapter board. After adjusting the required operation mode, the adaptor board could be removed.

The EUT contains also a 5 GHz a- and n-mode WLAN. Object of this test report is the 2.4 GHz b-, g- and n-mode WLAN only. The results of the measurements of the 5 GHz WLAN will be documented in a separate test report.

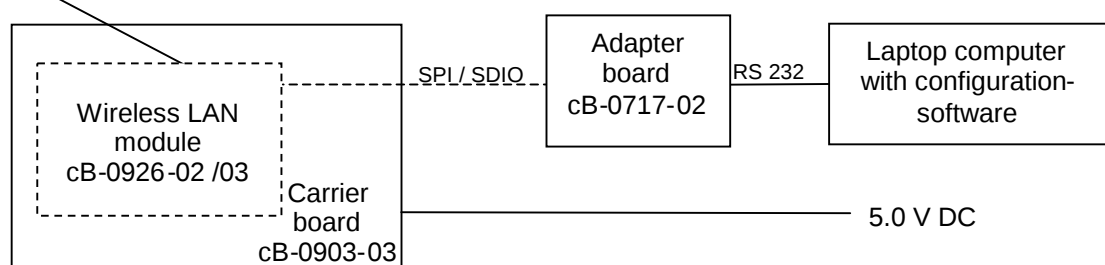
For adjusting the output power with the test software, a power setting of 58 was used during all tests.

During the tests, the EUTs were not labelled with an FCC/IC-label.

The following operation modes were used during the tests:

Operation mode	Description of the operation mode
1	Continuous transmitting on 2412 MHz, g, b or n-mode, with all applicable data rates
2	Continuous transmitting on 2437 MHz, g, b or n-mode, with all applicable data rates
3	Continuous transmitting on 2462 MHz, g, b or n-mode, with all applicable data rates
4	Continuous receiving on 2412 MHz
5	Continuous receiving on 2437 MHz
6	Continuous receiving on 2462 MHz

Physical boundary of the EUT



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4 LIST OF MEASUREMENTS

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section	RSS 210, Issue 7 [3] or RSS-Gen, Issue 2 [4]	Status	Refer page
6 dB bandwidth	General	15.247 (a) (2)	A8.2 (1) [3]	Passed	10 et seq.
Maximum peak output power	2400.0 – 2483.5	15.247 (b) (3), (4)	A8.4 (4) [3], 7.1.4 [4]	Passed	17 et seq.
Power spectral density	2400.0 – 2483.5	15.247 (e)	A8.2 (2) [3]	Passed	19 et seq.
Band edge compliance	2400.0 – 2483.5	15.247 (d)	A8.5 [3]	Passed	26 et seq.
Radiated emissions (transmitter)	30 – 25,000	15.205 (a) 15.209 (a)	A8.5 [3], 4.7 [4]	Passed	39 et seq.
Conducted emissions on supply line	0.15 – 30	15.207 (a)	7.2.2 [4]	Passed	109 et seq.
Radiated emissions (receiver)	30 – 12,500	-	2.6 [3], 7.2.3 [4]	Passed	Annex D

5 ADDITIONAL INFORMATION

The EUT is intended to be used in different final applications. Therefore all radiated tests were carried out in three orthogonal directions to cover hand held applications. The results in this test report are showing the maximum of these three measurements. For the orientation during the test, please refer also the photographs in annex A of this test report.

The EUT is available with two different power supply circuits. The conducted emission measurement on the power supply line as well the radiated emission measurements were showing no noticeable difference between the variants. There for they were not documented separately.

Also the use of the SPI interface (cB-0926-02) shows no measurable difference to the use of the SDIO interface (cB-0926-03).

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6 TEST RESULTS

6.1 6 dB BANDWIDTH

6.1.1 METHOD OF MEASUREMENT (6 dB BANDWIDTH)

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

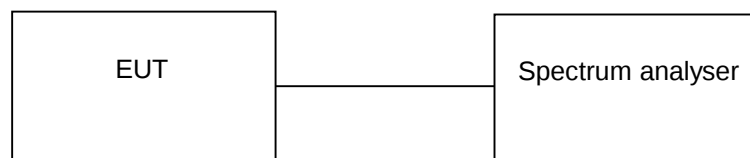
The following spectrum analyser settings shall be used:

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

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

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

Test set-up:

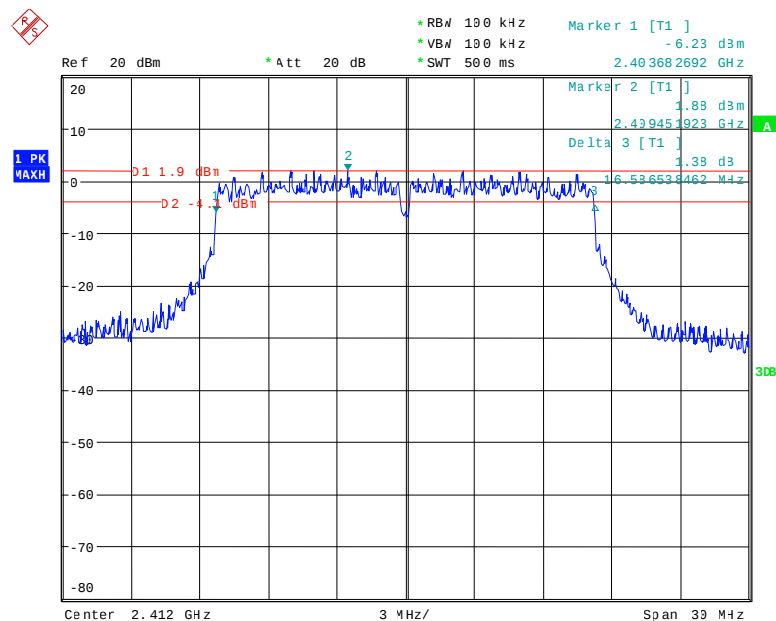


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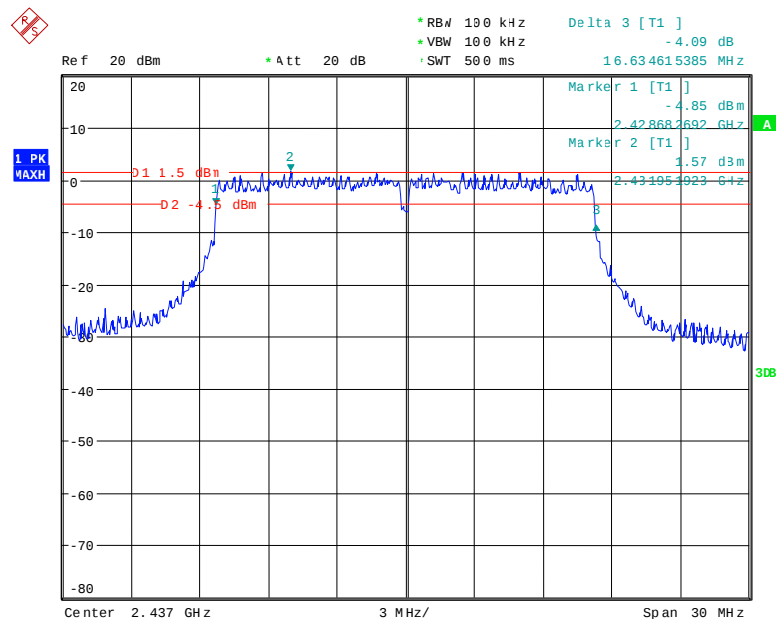
6.1.2 TEST RESULTS (6 dB BANDWIDTH)

Ambient temperature	21 °C	Relative humidity	45 %
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91568_218.wmf: 6 dB bandwidth at the lower end of the assigned frequency band, g-mode, 54 M/bit/s:

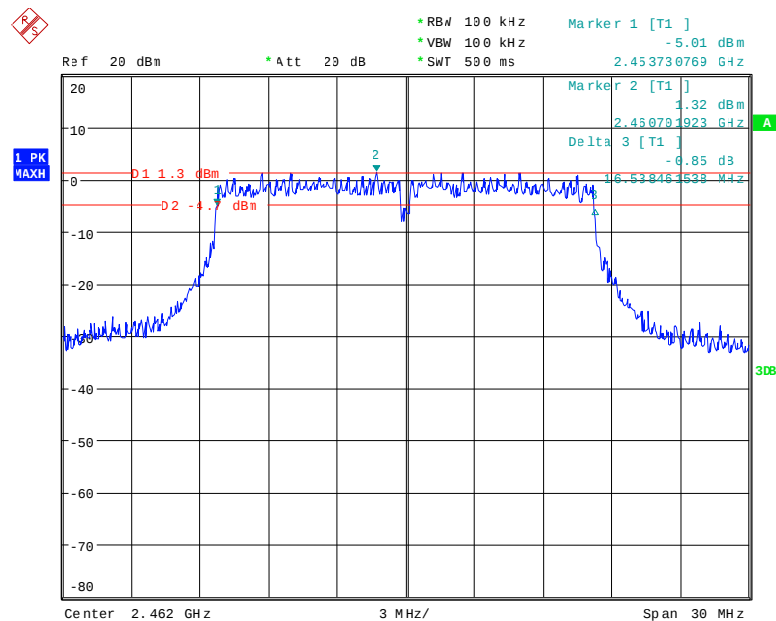


91568_217.wmf: 6 dB bandwidth at the middle of the assigned frequency band, g-mode, 54 M/bit/s:

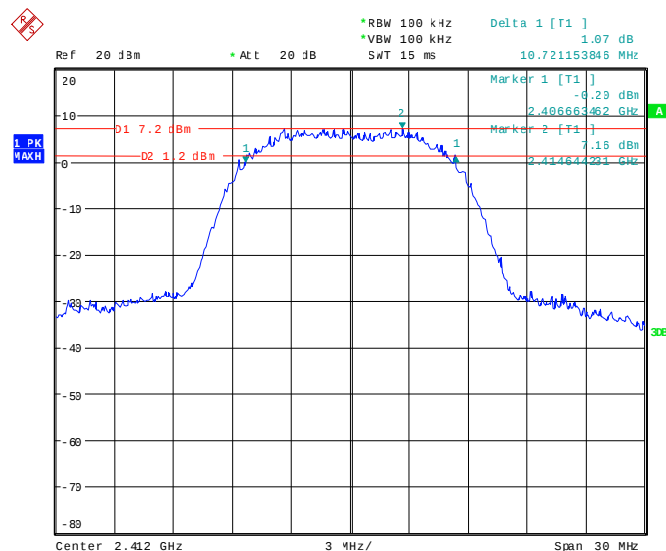


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91568_219.wmf: 6 dB bandwidth at the upper end of the assigned frequency band, g-mode, 54 M/bit/s:

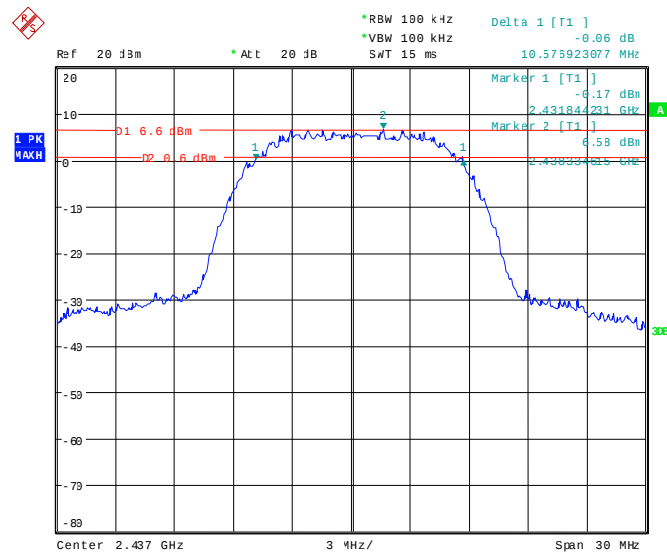


91568_222.wmf: 6 dB bandwidth at the lower end of the assigned frequency band, b-mode, 11 M/bit/s:

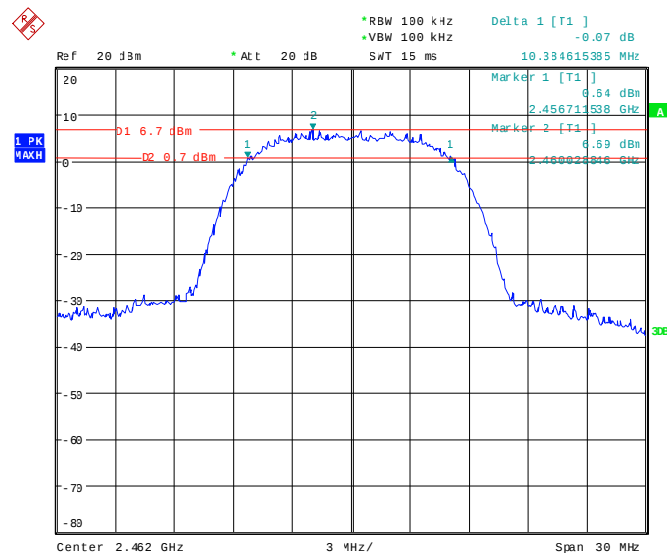


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91568_221.wmf: 6 dB bandwidth at the middle of the assigned frequency band, b-mode, 11 M/bit/s:

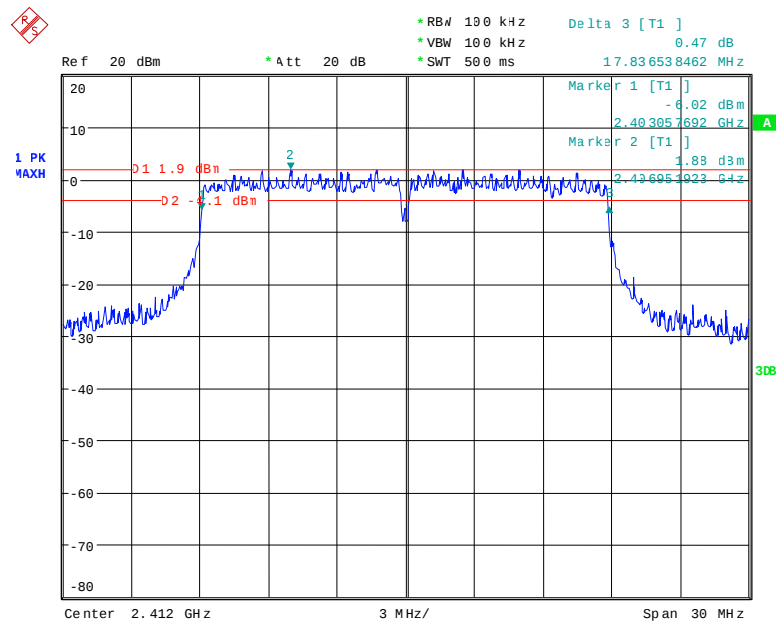


91568_220.wmf: 6 dB bandwidth at the upper end of the assigned frequency band, b-mode, 11 M/bit/s:

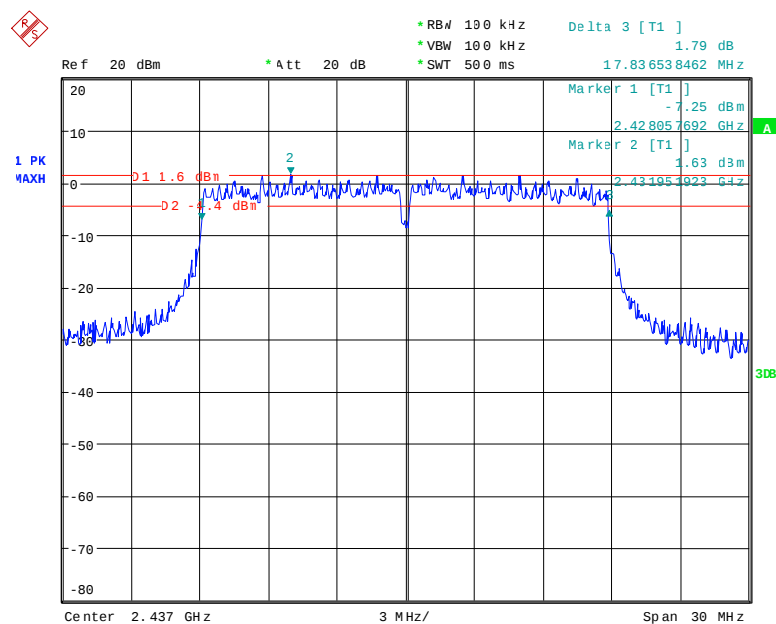


TEST REPORT REFERENCE: F091568E1

91568_225.wmf: 6 dB bandwidth at the lower end of the assigned frequency band, n-mode 54 Mbps:

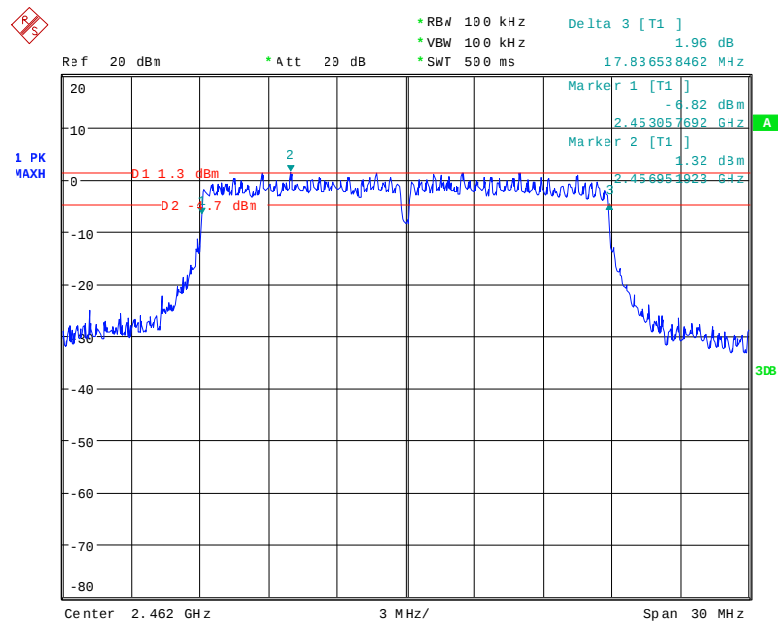


91568_224.wmf: 6 dB bandwidth at the middle of the assigned frequency band, n (2.4 GHz), 54 Mbps:



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91568_223.wmf: 6 dB bandwidth at the upper end of the assigned frequency band, n-mode, 546 Mbps:



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Operation mode 1 to 3 g-mode with 54 Mbps data rate (worst case)		
Channel number	Channel frequency [MHz]	6dB bandwidth [MHz]
1	2412	16.586538
6	2437	16.634615
11	2462	16.538462
Operation mode 1 to 3 b-mode with 11 Mbps data rate (worst case)		
Channel number	Channel frequency [MHz]	6dB bandwidth [MHz]
1	2412	10.721154
6	2437	10.576923
11	2462	10.384615
Operation mode 1 to 3 n-mode with 54 Mbps data rate (worst case)		
Channel number	Channel frequency [MHz]	6dB bandwidth [MHz]
1	2412	17.836538
6	2437	17.836538
11	2462	17.836538
Measurement uncertainty		$< \pm 1 \cdot 10^{-7}$

TEST EQUIPMENT USED FOR THE TEST:

31, 46, 54

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6.2 MAXIMUM PEAK OUTPUT POWER

6.2.1 METHOD OF MEASUREMENT (MAXIMUM PEAK OUTPUT POWER)

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

The following power meter settings shall be used:

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

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

Test set-up:



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6.2.2 TEST RESULTS (MAXIMUM PEAK OUTPUT POWER)

Ambient temperature	21 °C	Relative humidity	45 %
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Because the maximum antenna gain exceed the 6.0 dBi, the limit is reduced by the amount of the exceedance.

Operation mode 1 to 3 g-mode with 6 Mbps data rate (worst case)				
Channel number	Channel frequency [MHz]	Maximum peak output power [dBm]	Antenna gain [dBi]	Peak power limit [dBm]
1	2412	19.7	8.5	27.5
6	2437	19.6	8.5	27.5
11	2462	19.5	8.5	27.5
Operation mode 1 to 3 b-mode with 6 Mbps data rate (worst case)				
Channel number	Channel frequency [MHz]	Maximum peak output power [dBm]	Antenna gain [dBi]	Peak power limit [dBm]
1	2412	19.7	8.5	27.5
6	2437	19.6	8.5	27.5
11	2462	19.5	8.5	27.5
Operation mode 1 to 3 n-mode with 6 Mbps data rate (worst case)				
Channel number	Channel frequency [MHz]	Maximum peak output power [dBm]	Antenna gain [dBi]	-Peak power limit [dBm]
1	2412	19.8	8.5	27.5
6	2437	19.7	8.5	27.5
11	2462	19.6	8.5	27.5
Measurement uncertainty			+0.66 dB / -0.72 dB	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
46, 166, 167

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6.3 POWER SPECTRAL DENSITY

6.3.1 METHOD OF MEASUREMENT (POWER SPECTRAL DENSITY)

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

The following spectrum analyser settings shall be used:

- Span: 1.5 MHz, centred on the actual channel.
- Resolution bandwidth: 3 kHz.
- Video bandwidth: 30 kHz.
- Sweep: 500 s.
- Detector function: peak.
- Trace mode: Max hold.

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

Test set-up:

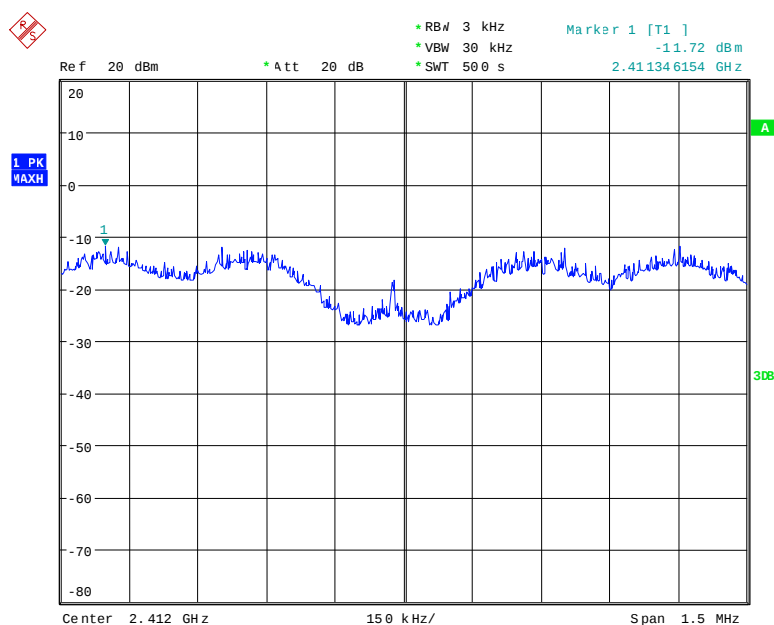


TEST REPORT REFERENCE: F091568E1

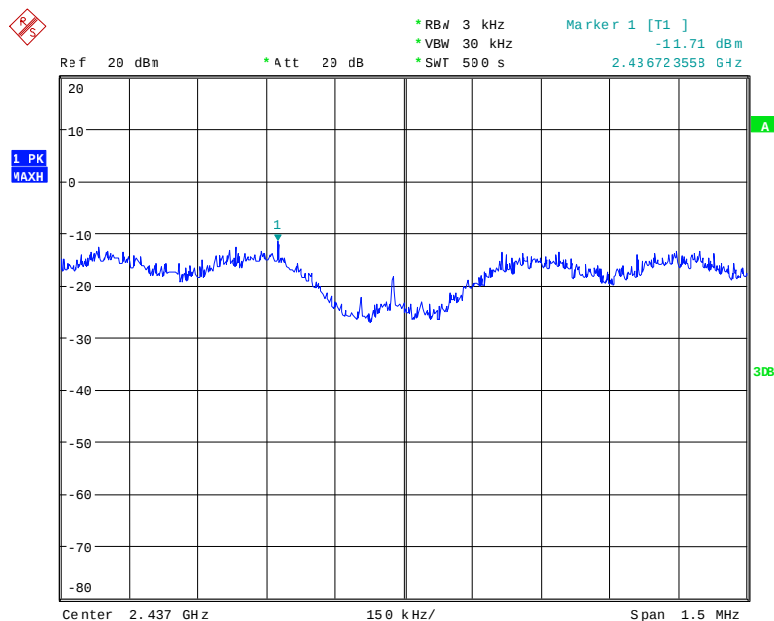
6.3.2 TEST RESULTS (POWER SPECTRAL DENSITY)

Ambient temperature	21 °C	Relative humidity	45 %
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91568_226.wmf: Power spectral density at the lower end of the assigned frequency band, g-mode, 6 Mbps:

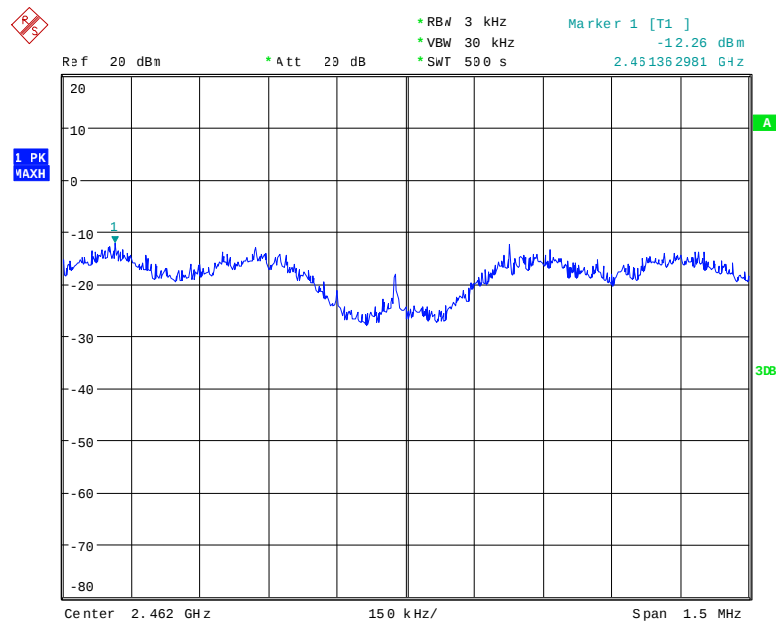


91568_227.wmf: Power spectral density at the middle of the assigned frequency band, g-mode, 6 Mbps:

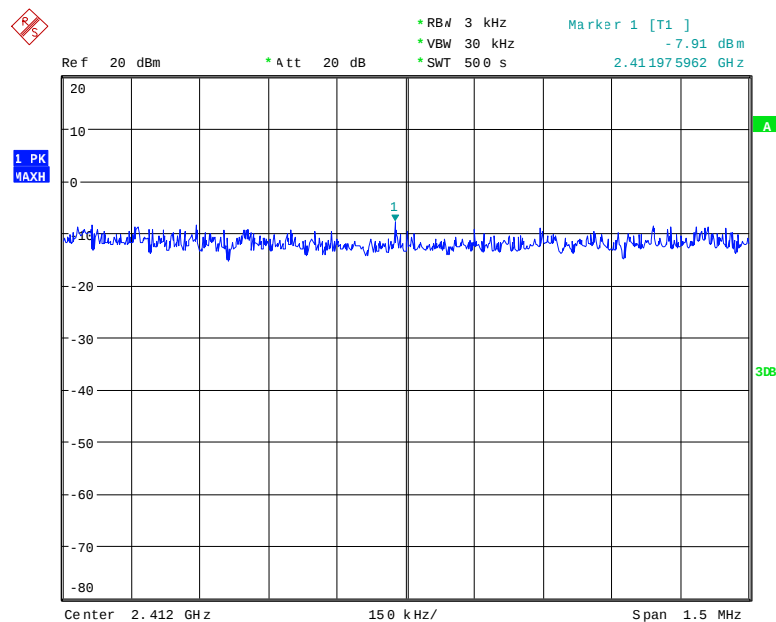


TEST REPORT REFERENCE: F091568E1

91568_228.wmf: Power spectral density at the upper end of the assigned frequency band, g-mode, 6 Mbps:

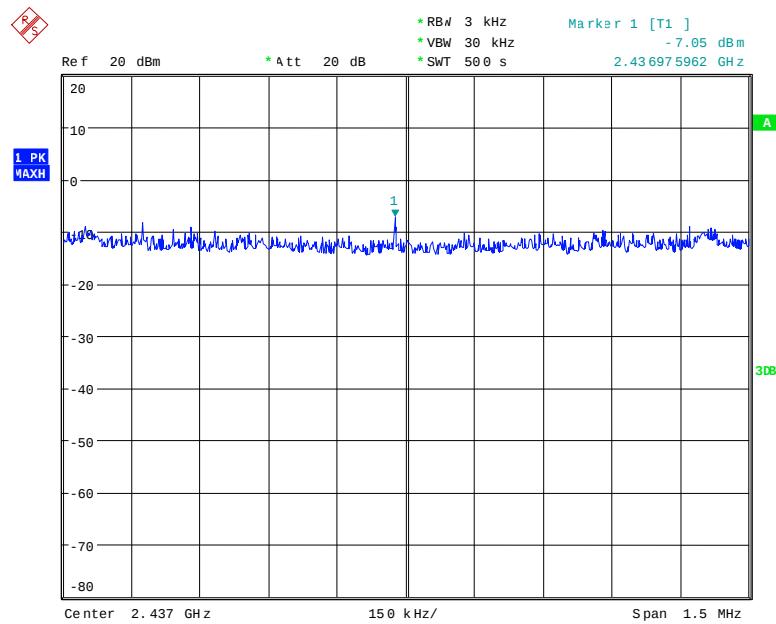


91568_229.wmf: Power spectral density at the lower end of the assigned frequency band, b-mode, 11 Mbps:

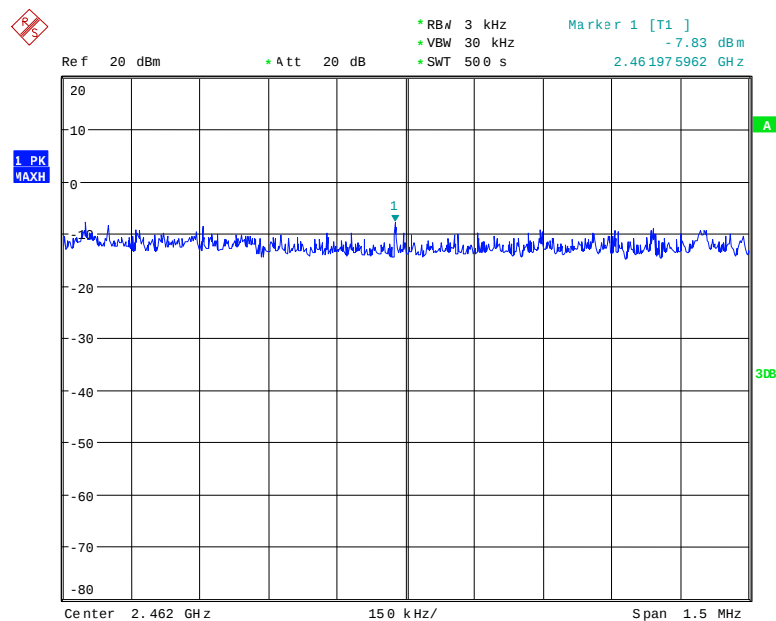


TEST REPORT REFERENCE: F091568E1

91568_230.wmf: Power spectral density at the middle of the assigned frequency band, b-mode, 11 Mbps:

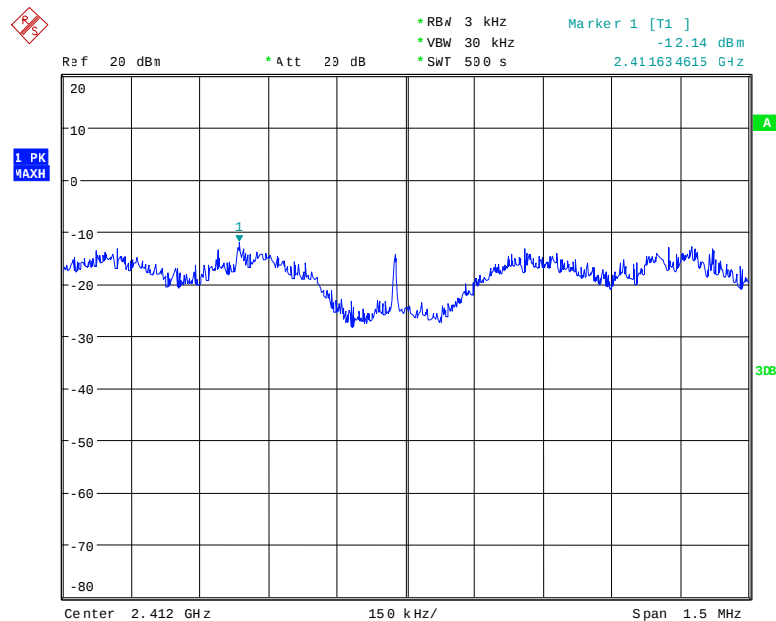


91568_231.wmf: Power spectral density at the upper end of the assigned frequency band, b-mode, 11 Mbps:

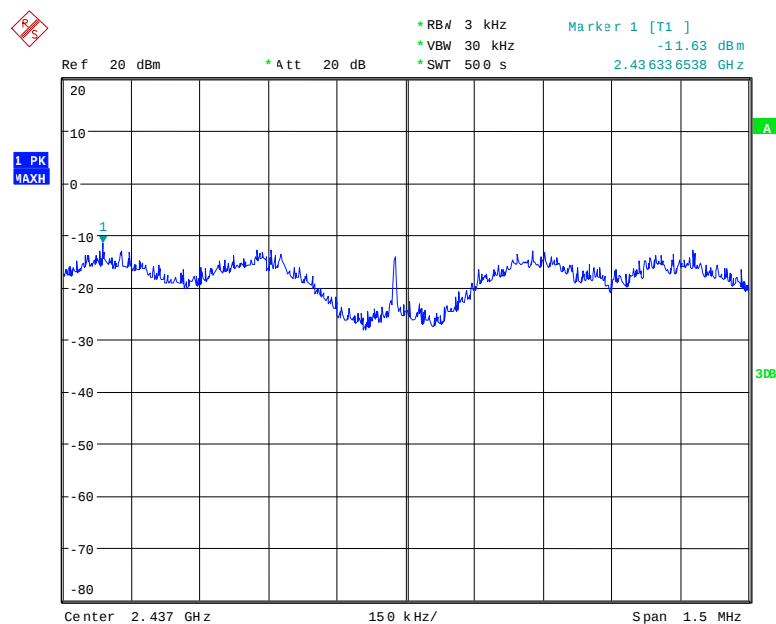


TEST REPORT REFERENCE: F091568E1

91568_232.wmf: Power spectral density at the lower end of the assigned frequency band, n-mode, 54 Mbps:

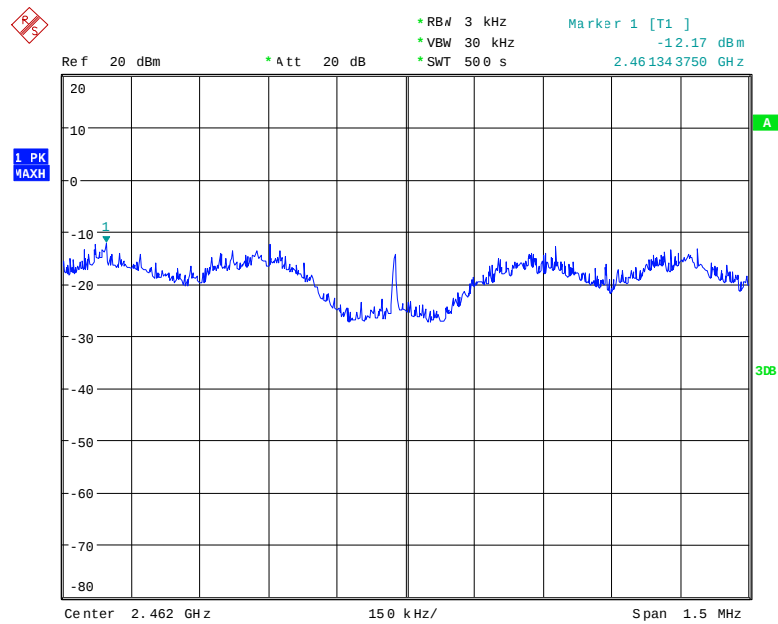


91568_233.wmf: Power spectral density at the middle of the assigned frequency band, n-mode, 54 Mbps:



TEST REPORT REFERENCE: F091568E1

91568_234.wmf: Power spectral density at the upper end of the assigned frequency band, n-mode, 54 Mbps:



TEST REPORT REFERENCE: F091568E1

Because the maximum antenna gain exceed the 6.0 dBi, the limit is reduced by the amount of the exceedance.

Operation mode 1 to 3 g-mode with 6 Mbps data rate (worst case)				
Channel number	Channel frequency [MHz]	Power spectral density [dBm / 3 kHz]	Antenna gain [dBi]	Power spectral density limit [dBm / 3 kHz]
1	2412	-10.8 *	8.5	5.5
6	2437	-10.8 *	8.5	5.5
11	2462	-11.4 *	8.5	5.5
Operation mode 1 to 3 b-mode with 11 Mbps data rate (worst case)				
Channel number	Channel frequency [MHz]	Power spectral density [dBm / 3 kHz]	Antenna gain [dBi]	Power spectral density limit [dBm / 3 kHz]
1	2412	-7.0 *	8.5	5.5
6	2437	-6.2 *	8.5	5.5
11	2462	-6.9 *	8.5	5.5
Operation mode 1 to 3 b-mode with 54 Mbps data rate (worst case)				
Channel number	Channel frequency [MHz]	Power spectral density [dBm / 3 kHz]	Antenna gain [dBi]	Power spectral density limit [dBm / 3 kHz]
1	2412	-11.2 *	8.5	5.5
6	2437	-10.7 *	8.5	5.5
11	2462	-11.3 *	8.5	5.5
Measurement uncertainty			+1.1 dB / -1.5 dB	

* cable loss of 0.9 dB respected

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

31, 46, 54

TEST REPORT REFERENCE: F091568E1

6.4 BAND-EDGE COMPLIANCE

6.4.1 METHOD OF MEASUREMENT (BAND-EDGE COMPLIANCE)

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 antenna, which causes the highest field strength on the wanted frequency.

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: $\geq$ the resolution bandwidth.
- Sweep: Auto.
- Detector function: Peak.
- Trace mode: Max hold.

The same test set-up as used for the final radiated emission measurement shall be used (refer also subclause 6.5.1 of this test report). The measurements shall be carried out with using a resolution bandwidth of 100 kHz.

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 6.5.1 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.

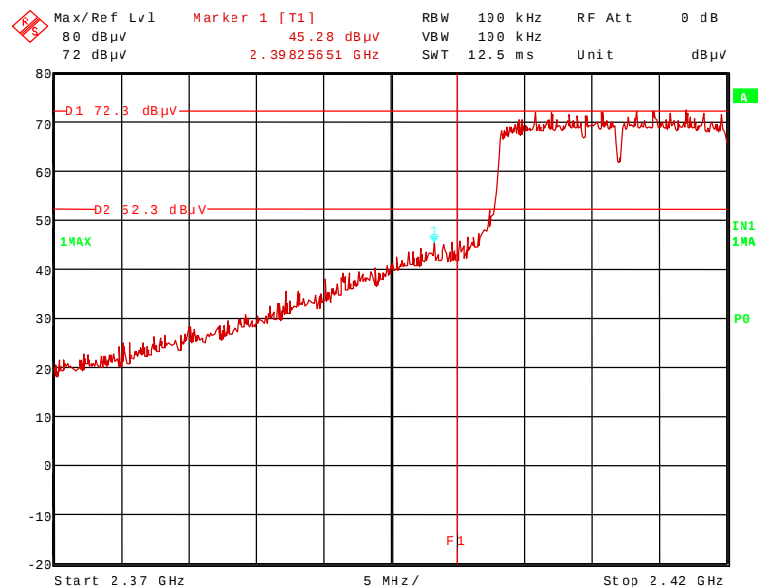
The plots at the next pages are showing radiated band-edge compliance with the worst case operation mode. The display line 1 (D1) in these plots represents the highest level within the assigned frequency band. The display line 2 (D2) represents the 20 dB offset to this highest level and shows the compliance with FCC 47 CFR Part 15.247 (d). The frequency line 1 (F1) shows the edge of the assigned frequency. The following tables are showing the results for the radiated band edge compliance for all applicable operation modes with the worst case data rate, causing the highest emissions at the band edges.

TEST REPORT REFERENCE: F091568E1

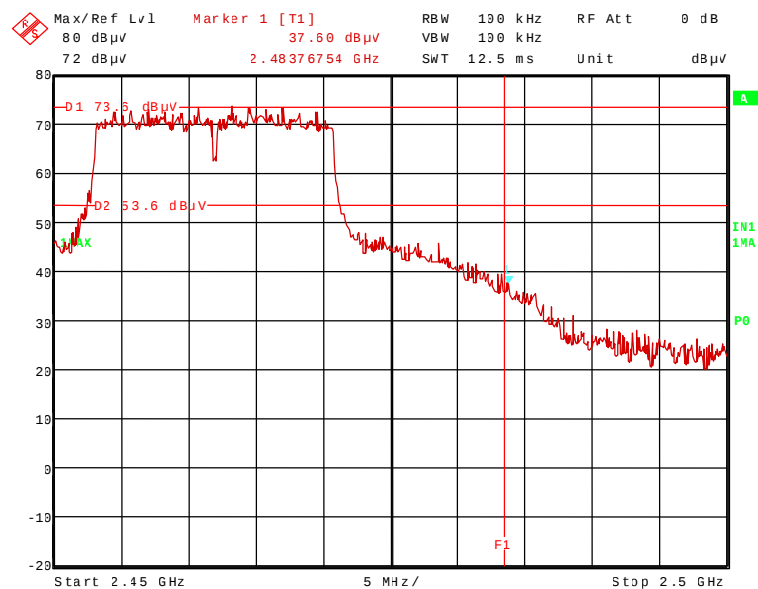
6.4.2 TEST RESULT (BAND-EDGE COMPLIANCE) with internal antenna

Ambient temperature	21 °C	Relative humidity	38 %
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91568_24.wmf: Radiated band-edge compliance, lower band edge, n-mode, 54 Mbps:



91568_25.wmf: Radiated band-edge compliance, upper band edge, n-mode, 54 Mbps:



TEST REPORT REFERENCE: F091568E1

6.4.3 TEST RESULT (BAND-EDGE COMPLIANCE) g-mode with internal antenna

Band-edge compliance (g-mode, 54 Mbps (worst case), lower band edge)										
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
2.412	112.8	-	-	80.3	28.8	0.0	3.7	150	Hor.	-
2.3986	76.3	92.8	16.5	43.8	28.8	0.0	3.7	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
2.412	79.2	-	-	46.7	28.8	0.0	3.7	150	Hor.	-
2.3986	42.7	59.2	16.5	10.2	28.8	0.0	3.7	150	Hor.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (g-mode, 54 Mbps (worst case), upper band edge)										
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
2.462	114.8	-	-	82.2	28.9	0.0	3.7	150	Hor.	-
2.4836	68.9	74.0	5.1	36.1	29.0	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
2.462	79.8	-	-	47.2	28.9	0.0	3.7	150	Hor.	-
2.4836	41.0	54.0	13.0	8.2	29.0	0.0	3.8	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

TEST REPORT REFERENCE: F091568E1

6.4.4 TEST RESULT (BAND-EDGE COMPLIANCE) b-mode with internal antenna

Band-edge compliance (b-mode, 11 Mbps (worst case), lower band edge)										
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
2.412	115.8	-	-	83.3	28.8	0.0	3.7	150	Hor.	-
2.3980	67.1	95.8	28.7	34.6	28.8	0.0	3.7	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
2.412	86.9	-	-	54.4	28.8	0.0	3.7	150	Hor.	-
2.3980	43.4	66.9	23.5	10.9	28.8	0.0	3.7	150	Hor.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (b-mode, 11 Mbps (worst case), upper band edge)										
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
2.462	111.9	-	-	79.3	28.9	0.0	3.7	150	Hor.	-
2.4836	57.1	74.0	16.9	24.3	29.0	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
2.462	86.0	-	-	53.4	28.9	0.0	3.7	150	Hor.	-
2.4836	40.4	54.0	13.6	7.6	29.0	0.0	3.8	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

TEST REPORT REFERENCE: F091568E1

6.4.5 TEST RESULT (BAND-EDGE COMPLIANCE) n-mode with internal antenna

Band-edge compliance (n-mode, 54 Mbps (worst case), lower band edge)										
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
2.412	112.6	-	-	80.1	28.8	0.0	3.7	150	Hor.	-
2.3987	75.9	92.6	16.7	43.4	28.8	0.0	3.7	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
2.412	79.5	-	-	47.0	28.8	0.0	3.7	150	Hor.	-
2.3987	42.1	59.5	17.4	9.6	28.8	0.0	3.7	150	Hor.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (n-mode, 54 Mbps (worst case), upper band edge)										
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
2.462	114.4	-	-	81.8	28.9	0.0	3.7	150	Hor.	-
2.4838	72.8	74.0	1.2	40.0	29.0	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
2.462	80.1	-	-	47.5	28.9	0.0	3.7	150	Hor.	-
2.4838	41.3	54.0	12.7	8.5	29.0	0.0	3.8	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

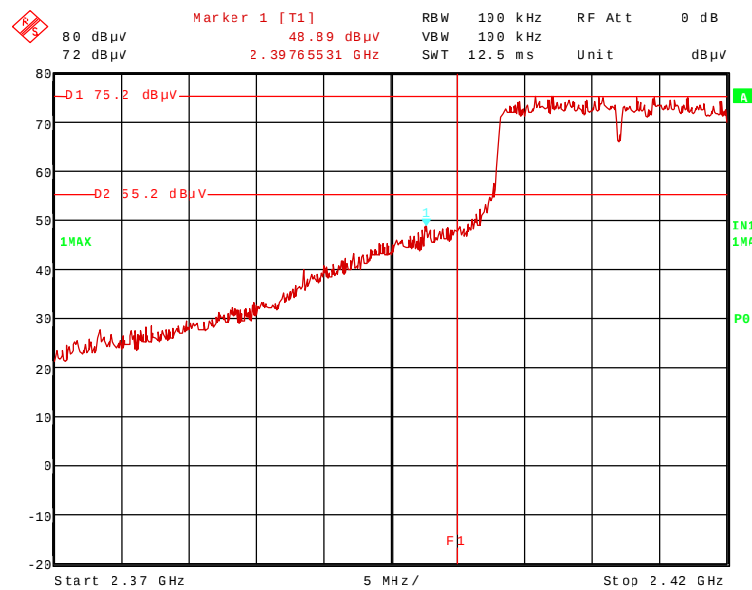
TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 34, 36, 44

TEST REPORT REFERENCE: F091568E1

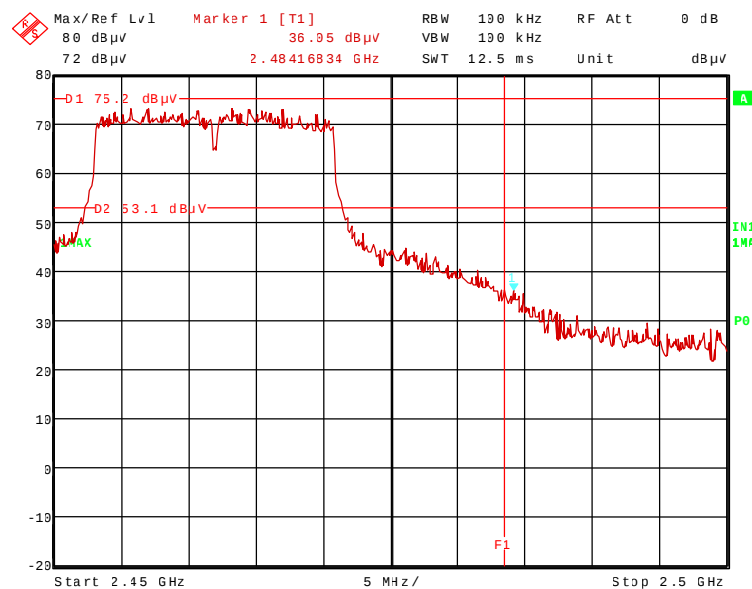
6.4.6 TEST RESULT (BAND-EDGE COMPLIANCE) with external patch antenna

Ambient temperature	21 °C	Relative humidity	38 %
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91568_111.wmf: Radiated band-edge compliance, lower band edge, n-mode 54 Mbps:



91568_112.wmf: Radiated band-edge compliance, upper band edge, n-mode 54 Mbps:



TEST REPORT REFERENCE: F091568E1

6.4.7 TEST RESULT (BAND-EDGE COMPLIANCE) g-mode with external patch antenna

As external patch antenna the SPA 2400/75/8/0/V with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all patch antennas.

Band-edge compliance (g-mode, 54 Mbps (worst case), lower band edge)										
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
2.412	114.8	-	-	82.3	28.8	0.0	3.7	150	Vert.	-
2.3988	80.5	94.8	14.3	48.0	28.8	0.0	3.7	150	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dBμV/m	Limit dBμV/m	Margin dB	Readings dBμV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.412	79.9	-	-	47.4	28.8	0.0	3.7	150	Vert.	-
2.3988	43.0	59.9	16.9	10.5	28.8	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (g-mode, 54 Mbps (worst case), lower band edge)										
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
2.462	114.6	-	-	82.0	28.9	0.0	3.7	150	Vert.	-
2.484	65.2	74.0	8.8	32.4	29.0	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
2.462	80.6	-	-	48.0	28.9	0.0	3.7	150	Vert.	-
2.484	31.6	54.0	22.4	-1.2	29.0	0.0	3.8	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

TEST REPORT REFERENCE: F091568E1

6.4.8 TEST RESULT (BAND-EDGE COMPLIANCE) b-mode with external patch antenna

As external patch antenna the SPA 2400/75/8/0/V with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all patch antennas.

Band-edge compliance (b-mode, 11 Mbps (worst case), lower band edge)										
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
2.412	114.8	-	-	82.3	28.8	0.0	3.7	150	Vert.	-
2.399	76.9	94.8	17.9	44.4	28.8	0.0	3.7	150	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dBμV/m	Limit dBμV/m	Margin dB	Readings dBμV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.412	91.4	-	-	58.9	28.8	0.0	3.7	150	Vert.	-
2.399	47.1	71.4	24.3	14.6	28.8	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (b-mode, 11 Mbps (worst case), lower band edge)										
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
2.462	114.6	-	-	82.0	28.9	0.0	3.7	150	Vert.	-
2.4837	60.5	74.0	13.5	27.7	29.0	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
2.462	80.6	-	-	48.0	28.9	0.0	3.7	150	Vert.	-
2.4837	34.5	54.0	19.5	1.7	29.0	0.0	3.8	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

TEST REPORT REFERENCE: F091568E1

6.4.9 TEST RESULT (BAND-EDGE COMPLIANCE) n-mode with external patch antenna

As external patch antenna the SPA 2400/75/8/0/V with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all patch antennas.

Band-edge compliance (n-mode, 54 Mbps (worst case), lower band edge)										
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
2.412	114.6	-	-	82.1	28.8	0.0	3.7	150	Vert.	-
2.3976	81.0	94.6	13.6	48.5	28.8	0.0	3.7	150	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.412	80.9	-	-	48.4	28.8	0.0	3.7	150	Vert.	-
2.3976	43.6	60.9	17.3	11.1	28.8	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (n-mode, 54 Mbps (worst case), lower band edge)										
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
2.462	114.7	-	-	82.1	28.9	0.0	3.7	150	Vert.	-
2.4842	69.6	74.0	4.4	36.8	29.0	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
2.462	80.4	-	-	47.8	28.9	0.0	3.7	150	Vert.	-
2.4842	42.1	54.0	11.9	9.3	29.0	0.0	3.8	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

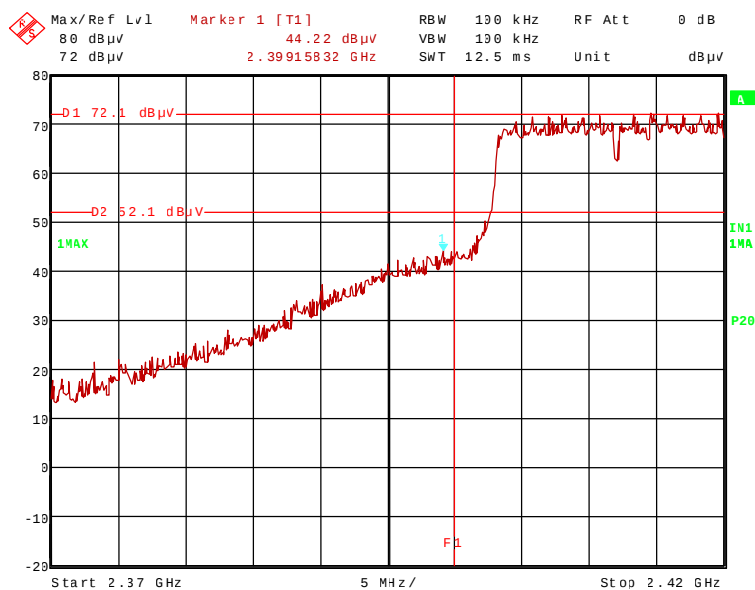
29, 31 – 34, 36, 44

TEST REPORT REFERENCE: F091568E1

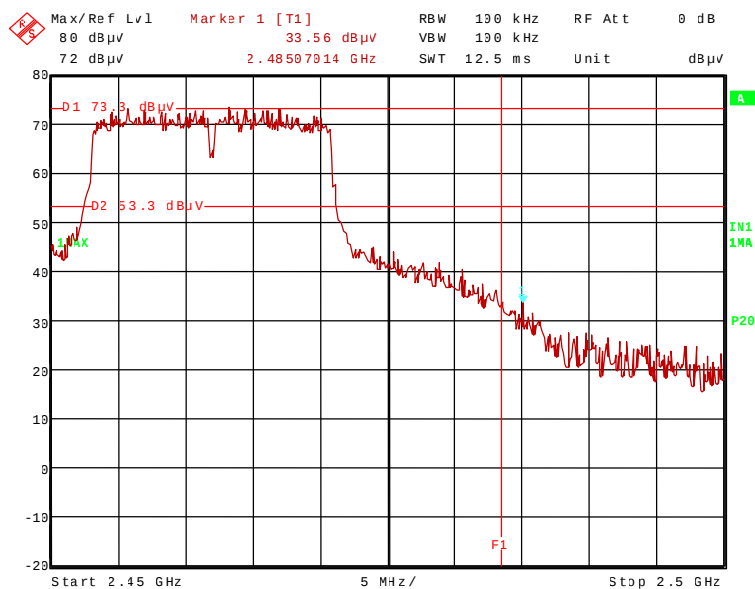
6.4.10 TEST RESULT (BAND-EDGE COMPLIANCE) with external monopole antenna

Ambient temperature	21 °C	Relative humidity	38 %
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91568_185.wmf: Radiated band-edge compliance, lower band edge, n-mode 54 Mbps:



91568_184.wmf: Radiated band-edge compliance, upper band edge, n-mode 54 Mbps:



TEST REPORT REFERENCE: F091568E1

6.4.11 TEST RESULT (BAND-EDGE COMPLIANCE) g-mode with external monopole antenna

As external monopole antenna the IG-103 with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all monopole antennas.

Band-edge compliance (g-mode, 54 Mbps (worst case), lower band edge)										
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
2.412	112.9	-	-	80.4	28.8	0.0	3.7	150	Vert.	-
2.3979	76.5	92.9	16.4	44.0	28.8	0.0	3.7	150	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.412	78.0	-	-	45.5	28.8	0.0	3.7	150	Vert.	-
2.3979	40.5	58.0	17.5	8.0	28.8	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (g-mode, 54 Mbps (worst case), lower band edge)										
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
2.462	114.6	-	-	82.0	28.9	0.0	3.7	150	Vert.	-
2.4845	65.7	74.0	8.3	32.9	29.0	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
2.462	79.9	-	-	47.3	28.9	0.0	3.7	150	Vert.	-
2.4845	32.1	54.0	21.9	-0.7	29.0	0.0	3.8	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

TEST REPORT REFERENCE: F091568E1

6.4.12 TEST RESULT (BAND-EDGE COMPLIANCE) b-mode with external monopole antenna

As external monopole antenna the IG-103 with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all monopole antennas.

Band-edge compliance (b-mode, 11 Mbps (worst case), lower band edge)										
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
2.412	112.6	-	-	80.1	28.8	0.0	3.7	150	Vert.	-
2.397	71.7	92.6	20.9	39.2	28.8	0.0	3.7	150	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dBμV/m	Limit dBμV/m	Margin dB	Readings dBμV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.412	88.9	-	-	56.4	28.8	0.0	3.7	150	Vert.	-
2.397	41.5	68.9	27.4	9.0	28.8	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (b-mode, 11 Mbps (worst case), lower band edge)										
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
2.462	115.1	-	-	82.5	28.9	0.0	3.7	150	Vert.	-
2.4836	59.1	74.0	14.9	26.3	29.0	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
2.462	91.4	-	-	58.8	28.9	0.0	3.7	150	Vert.	-
2.4836	40.9	54.0	13.1	8.1	29.0	0.0	3.8	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

TEST REPORT REFERENCE: F091568E1

6.4.13 TEST RESULT (BAND-EDGE COMPLIANCE) n-mode with external monopole antenna

As external monopole antenna the IG-103 with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all monopole antennas.

Band-edge compliance (n-mode, 54 Mbps (worst case), lower band edge)										
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
2.412	112.5	-	-	80.0	28.8	0.0	3.7	150	Vert.	-
2.3992	78.6	92.5	13.9	46.1	28.8	0.0	3.7	150	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.412	77.9	-	-	45.4	28.8	0.0	3.7	150	Vert.	-
2.3992	41.0	57.9	16.9	8.5	28.8	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (n-mode, 54 Mbps (worst case), lower band edge)										
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
2.462	114.9	-	-	82.3	28.9	0.0	3.7	150	Vert.	-
2.4851	66.3	74.0	7.7	33.5	29.0	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
2.462	79.9	-	-	47.3	28.9	0.0	3.7	150	Vert.	-
2.4851	33.0	54.0	21.0	0.2	29.0	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

TEST REPORT REFERENCE: F091568E1

6.5 RADIATED EMISSIONS

6.5.1 METHOD OF MEASUREMENT (RADIATED EMISSIONS)

The radiated emission measurement is subdivided into five stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 9 kHz to 1 GHz.
- A final measurement carried out on an outdoor test side without reflecting ground plane and a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- 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 25 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 25 GHz.

All measurements will be carried out with the EUT working on the middle and upper and lower edge of the assigned frequency band. For this reason the hopping function of the EUT has to be disabled.

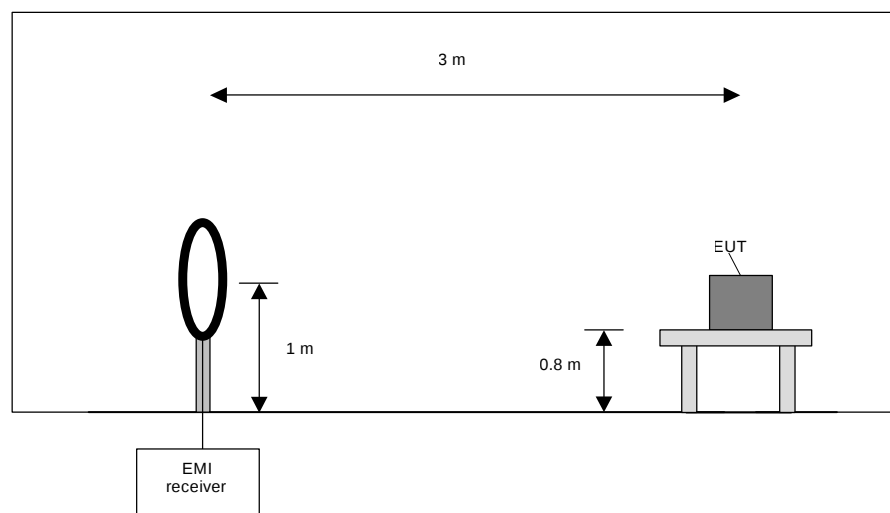
Preliminary measurement (9 kHz to 30 MHz):

In the first stage a preliminary measurement will be performed in a shielded room with a measuring distance of 3 meters. 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 C63.4-2003 [1].

The frequency range 9 kHz to 30 MHz will be monitored with a spectrum analyser while the system and its cables will be manipulated to find out the configuration with the maximum emission levels if applicable. The EMI Receiver will be set to MAX Hold mode. The EUT and the measuring antenna will be rotated around their vertical axis to found the maximum emissions.

The resolution bandwidth of the spectrum analyser will be set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	10 kHz



TEST REPORT REFERENCE: F091568E1

Preliminary measurement procedure:

Prescans were performed in the frequency range 9 kHz to 150 kHz and 150 kHz to 30 MHz.

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 frequencies of highest detected emission with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
- 6) Repeat steps 1) to 5) with the other orthogonal axes of the EUT (because of EUT is a module and might be used in a handheld equipment application).
- 7) Rotate the measuring antenna and repeat steps 1) to 5).

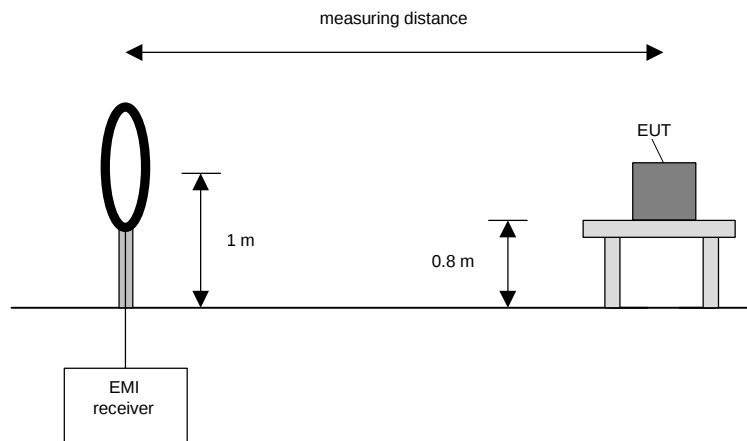
Final measurement (9 kHz to 30 MHz):

In the second stage a final measurement will be performed on an open area test site with no conducting ground plane in a measuring distances of 3 m, 10 m and 30 m. In the case where larger measuring distances are required the results will be extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with a EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where an average detector will be used according Section 15.209 (d) [2].

On the during the preliminary measurement detected frequencies the final measurement will be performed while rotating the EUT and the measuring antenna in the range of 0 ° to 360 ° around their vertical axis until the maximum value is found.

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

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz



TEST REPORT REFERENCE: F091568E1

Final measurement procedure:

The following procedure will be used:

- 1) Monitor the frequency range with the measuring antenna at vertical orientation parallel to the EUT at an azimuth of 0 °.
- 2) Rotate the EUT by 360 ° to maximize the detected signals and note the azimuth and orientation.
- 3) Rotate the measuring antenna to find the maximum and note the value.
- 4) Rotate the measuring antenna and repeat steps 1) to 3) until the maximum value is found.
- 5) Repeat steps 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).

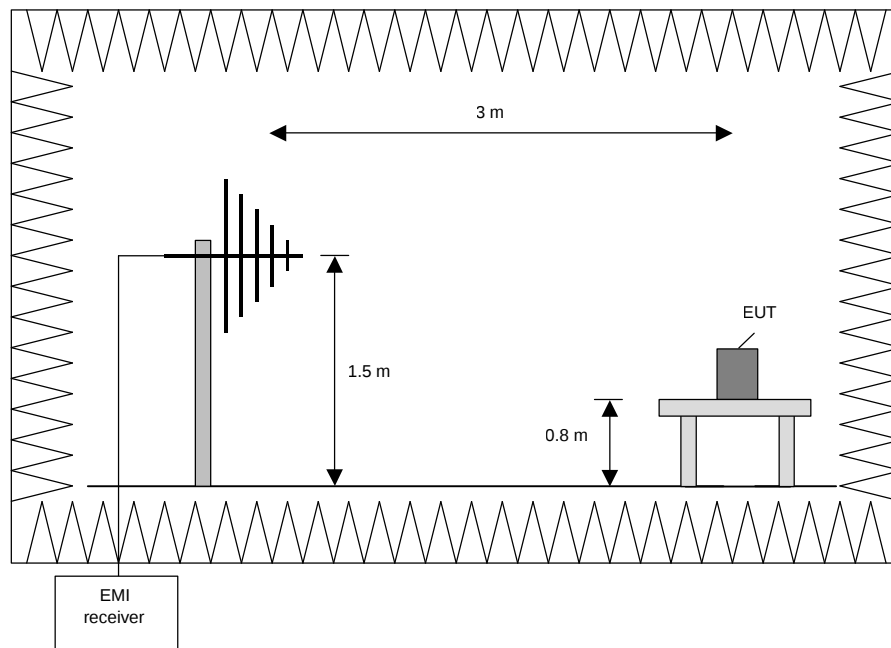
Preliminary measurement (30 MHz to 1 GHz)

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 C63.4-2003 [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



TEST REPORT REFERENCE: F091568E1

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:

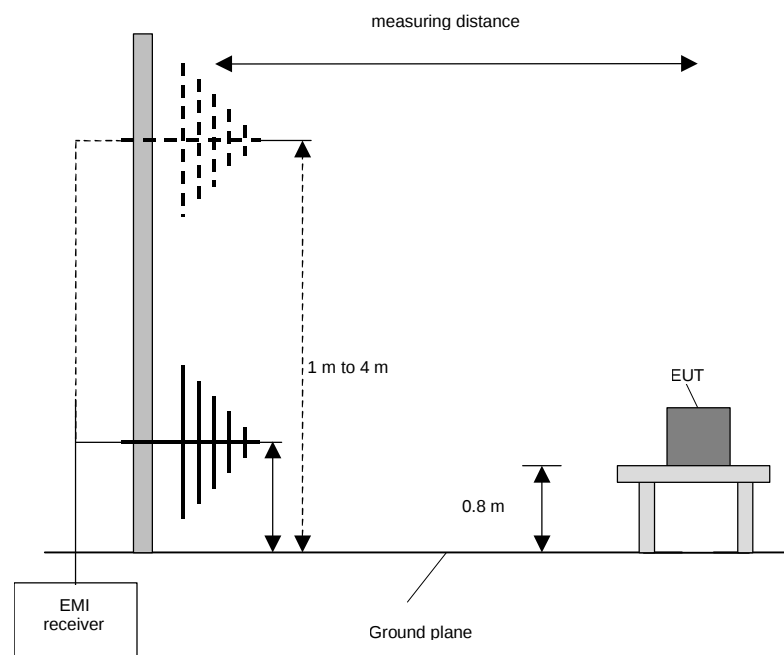
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the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



TEST REPORT REFERENCE: F091568E1

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 25 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 C63.4-2003 [1].

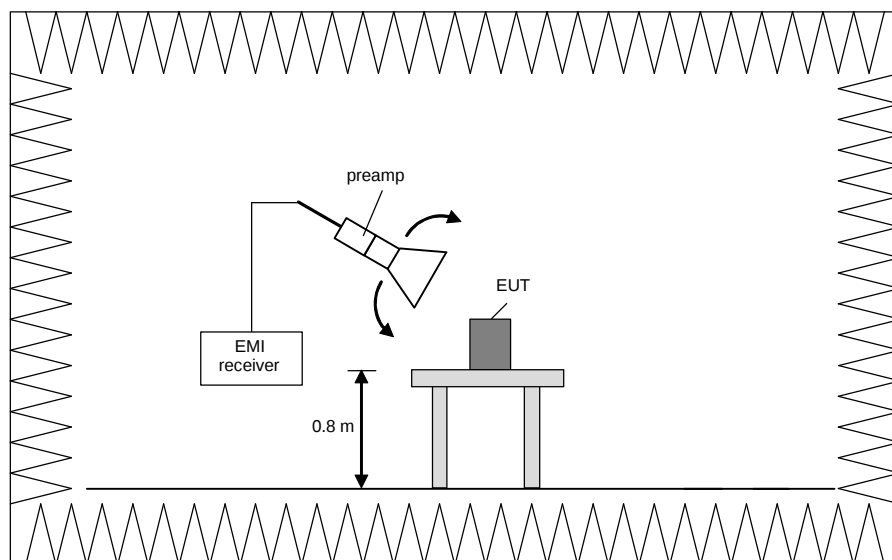
Preliminary measurement (1 GHz to 25 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The spectrum analyser set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna, 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 25 GHz	100 kHz

TEST REPORT REFERENCE: F091568E1

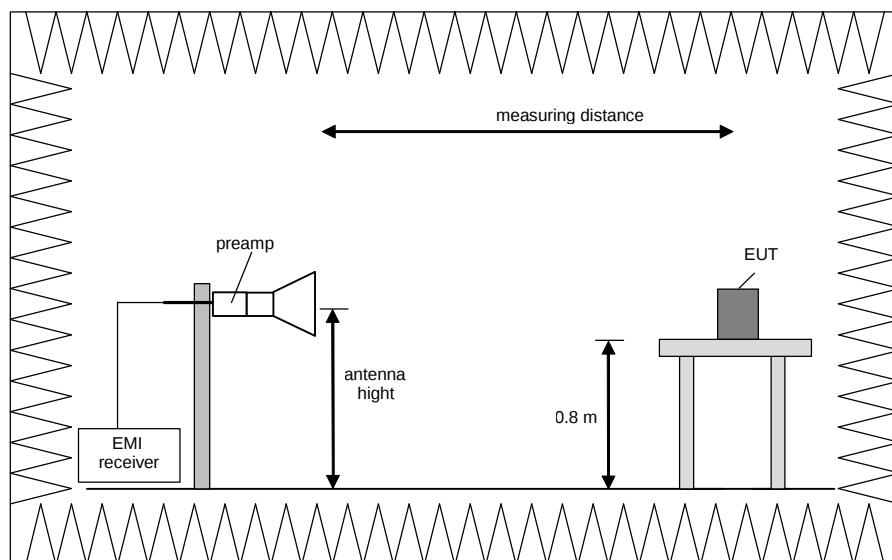


Final measurement (1 GHz to 25 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The 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 25 GHz	1 MHz



TEST REPORT REFERENCE: F091568E1

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 and 18 GHz to 25 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.

TEST REPORT REFERENCE: F091568E1

6.5.2 TEST RESULTS (RADIATED EMISSIONS) WITH INTERNAL ANTENNA

6.5.2.1 PRELIMINARY MEASUREMENT (9 kHz to 1 GHz)

Ambient temperature	21 °C	Relative humidity	36 %
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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.

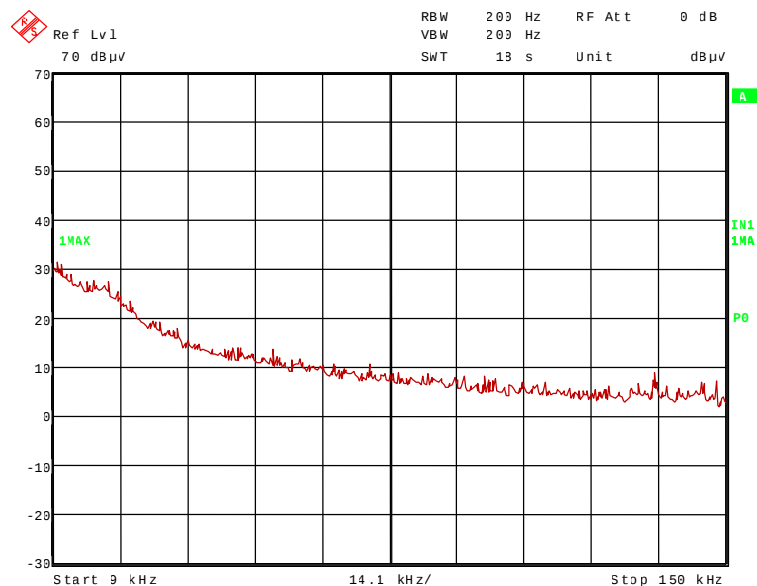
Cable guide: The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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 or frequency. Therefore, the emissions in this frequency range were measured only in b-mode with 11 Mbps and transmit in the middle of the assigned frequency range (operation mode 2).

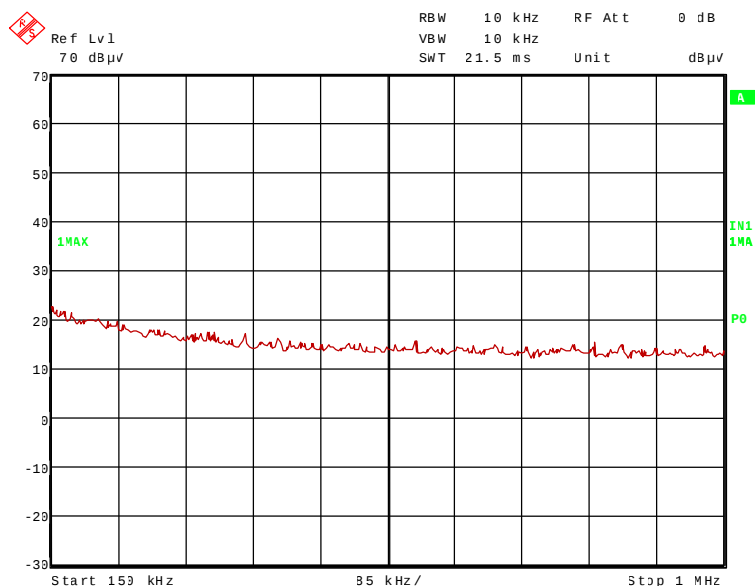
91568_20.wmf: Spurious emissions from 9 kHz to 150 kHz (b-mode, 11 Mbps, operation mode 2):



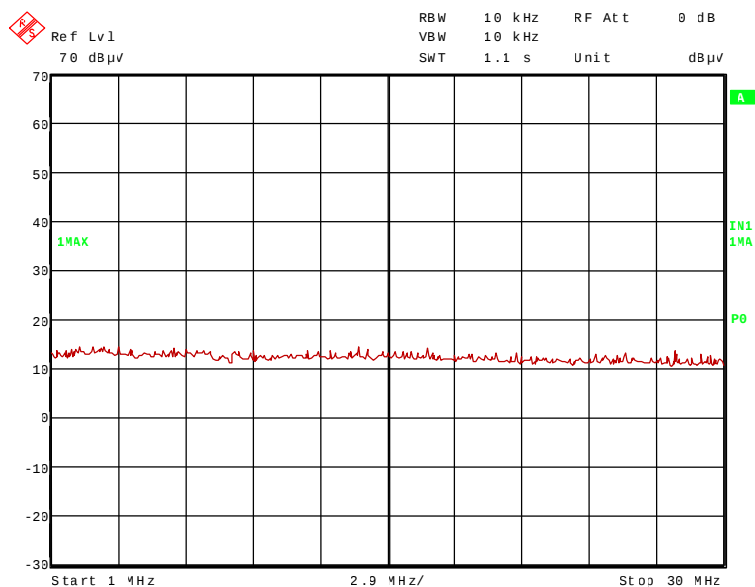
TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 35, 43, 46, 55

TEST REPORT REFERENCE: F091568E1

91568_21.wmf: Spurious emissions from 150 kHz to 1 MHz (b-mode, 11 Mbps, operation mode 2):



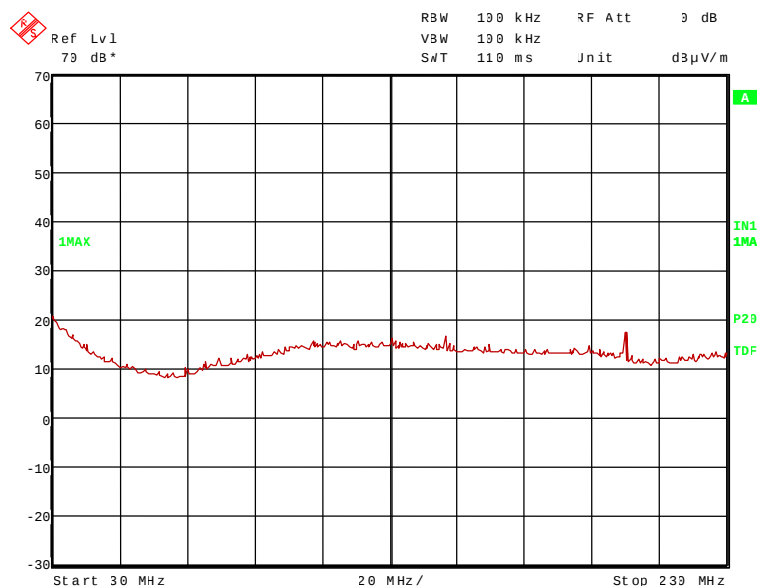
91568_22.wmf: Spurious emissions from 1 MHz to 30 MHz (b-mode, 11 Mbps, operation mode 2):



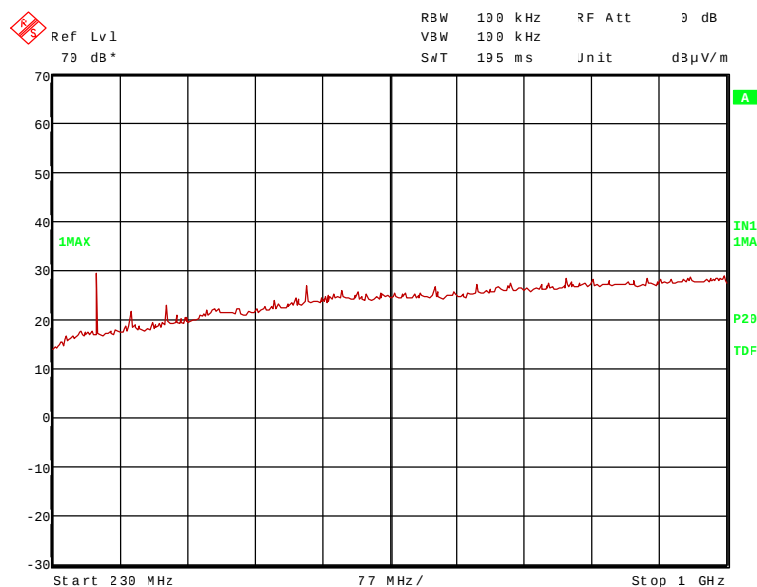
No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test inside this frequency range, so no measurements were carried out on the outdoor test site.

TEST REPORT REFERENCE: F091568E1

91568_315.wmf: Spurious emissions from 30 MHz to 230 MHz (b-mode, 11 Mbps, operation mode 2):



91568_316.wmf: Spurious emissions from 230 MHz to 1 GHz (b-mode, 11 Mbps, operation mode 2):



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

- 280.000 MHz.

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

- 200.000 MHz.

These frequencies have to be measured in a final measurement on an open area test-site. The results were presented in the following.

TEST REPORT REFERENCE: F091568E1

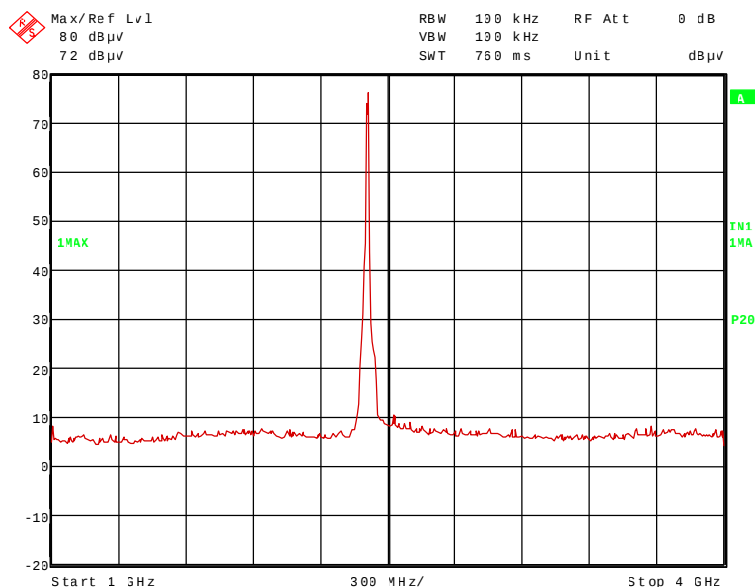
6.5.2.2 PRELIMINARY MEASUREMENT (1 GHz to 25 GHz), b-mode, internal antenna

Ambient temperature	21 °C	Relative humidity	40 %
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- 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 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: All results are shown in the following.
- Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.
- Remark: The plots at the next pages are showing radiated spurious emissions with the worst case operation mode. The tables of the final measurements in the next clauses are showing the results for the radiated spurious emissions for all applicable operation modes with the worst case data rate, causing the highest emissions at the band edges.

Transmitter operates at the lower end of the assigned frequency band (operation mode 1)

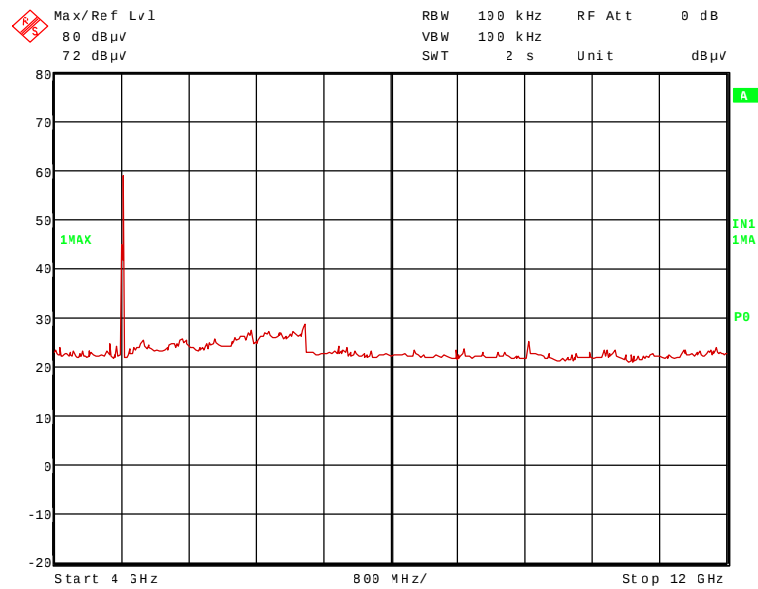
91568_1.wmf: Spurious emissions from 1 GHz to 4 GHz (b-mode, 11 Mbps):



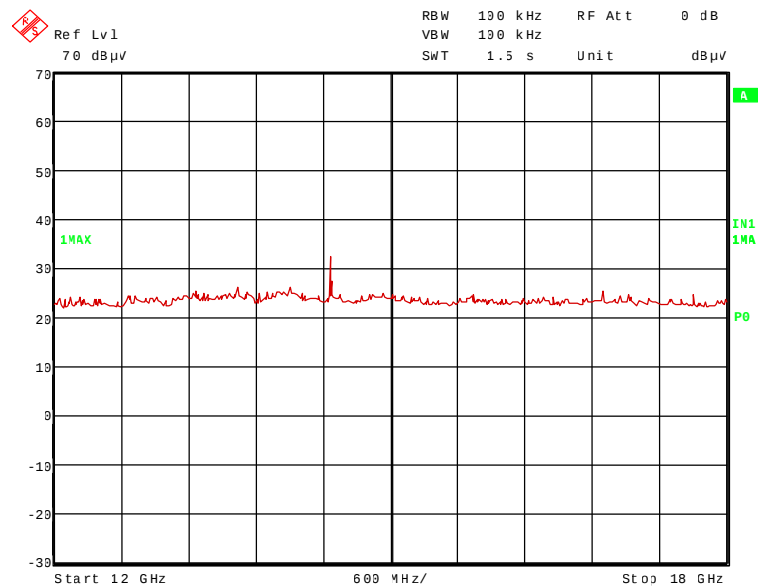
TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 34, 36, 37, 39, 44, 46, 49 – 51, 72

TEST REPORT REFERENCE: F091568E1

91568_5.wmf: Spurious emissions from 4 GHz to 12 GHz (b-mode, 11 Mbps):

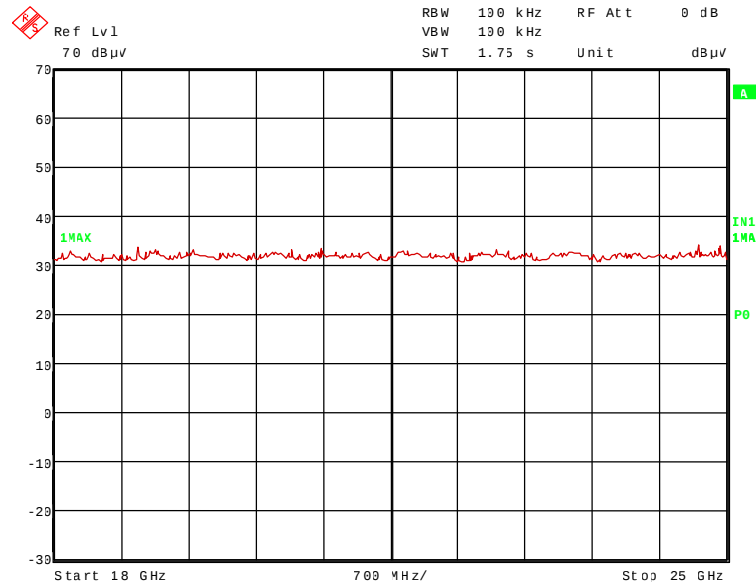


91568_72.wmf: Spurious emissions from 12 GHz to 18 GHz (b-mode, 11 Mbps):



TEST REPORT REFERENCE: F091568E1

91568_73.wmf: Spurious emissions from 18 GHz to 25 GHz (b-mode, 11 Mbps):



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

- 4.824 GHz and 14.472 GHz.

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

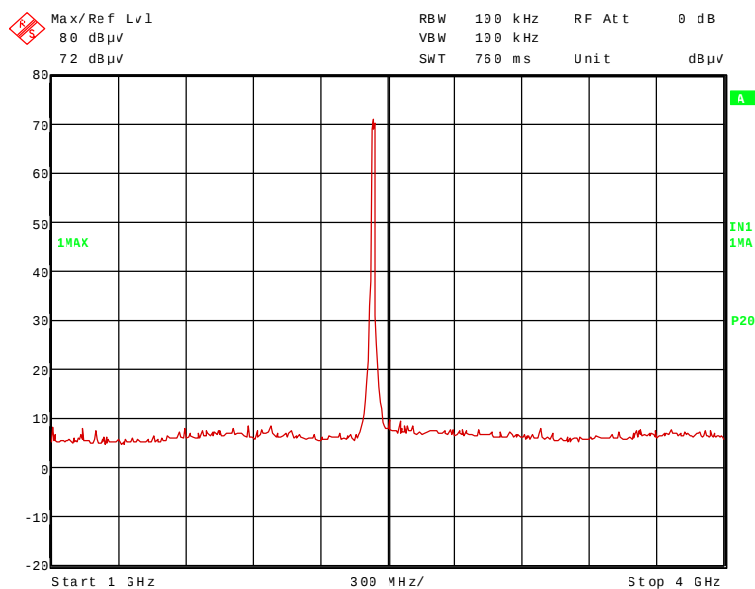
- 2.412 GHz.

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

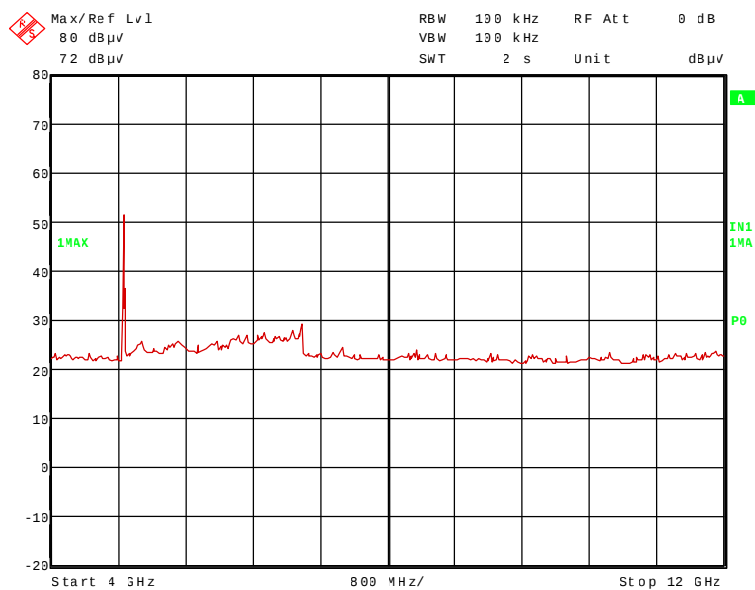
TEST REPORT REFERENCE: F091568E1

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

91568_10.wmf: Spurious emissions from 1 GHz to 4 GHz (b-mode, 11 Mbps):

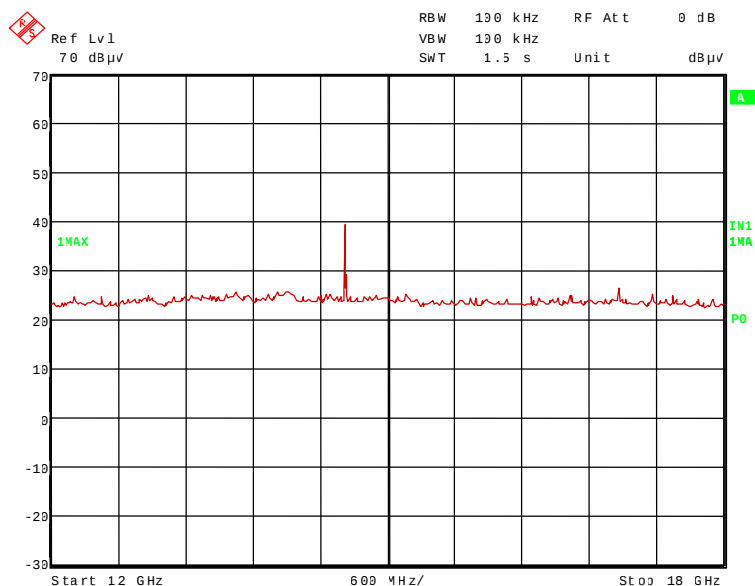


91568_11.wmf: Spurious emissions from 4 GHz to 12 GHz (b-mode, 11 Mbps):

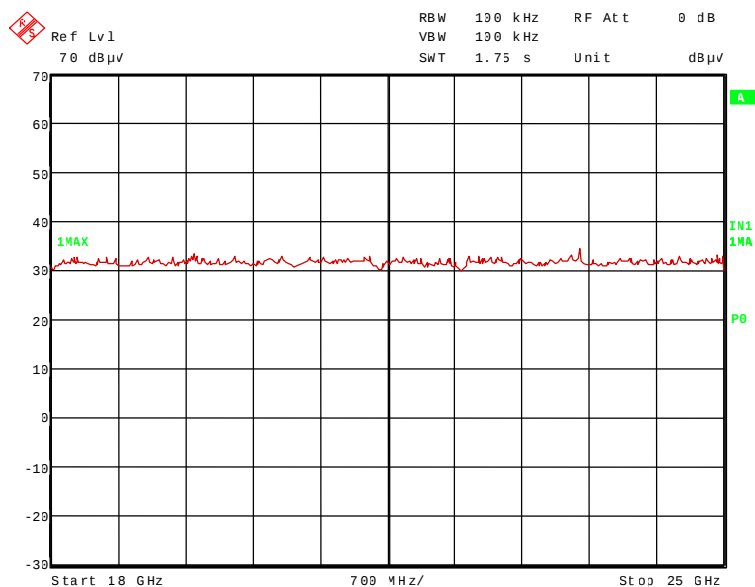


TEST REPORT REFERENCE: F091568E1

91568_75.wmf: Spurious emissions from 12 GHz to 18 GHz (b-mode, 11 Mbps):



91568_74.wmf: Spurious emissions from 18 GHz to 25 GHz (b-mode, 11 Mbps):



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

- 4.874 GHz.

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

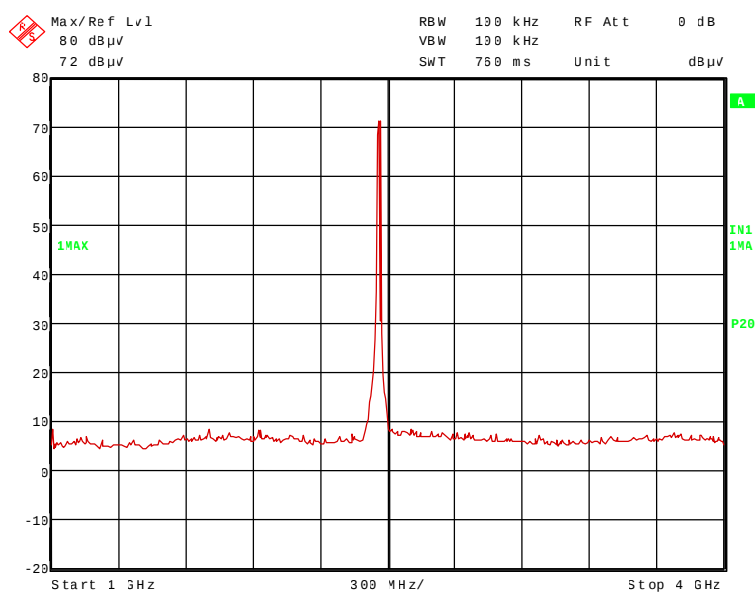
- 2.437 GHz and 14.622 GHz.

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

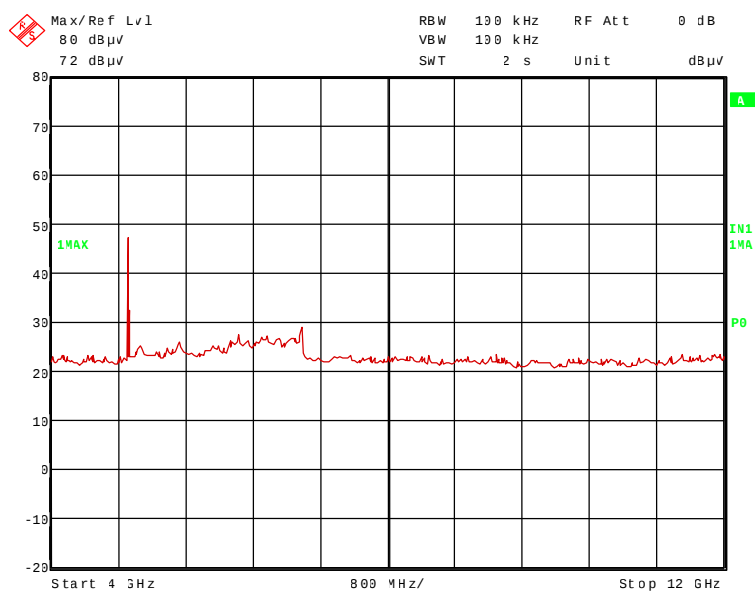
TEST REPORT REFERENCE: F091568E1

Transmitter operates at the upper end of the assigned frequency band (operation mode 3)

91568_15.wmf: Spurious emissions from 1 GHz to 4 GHz (b-mode, 11 Mbps):

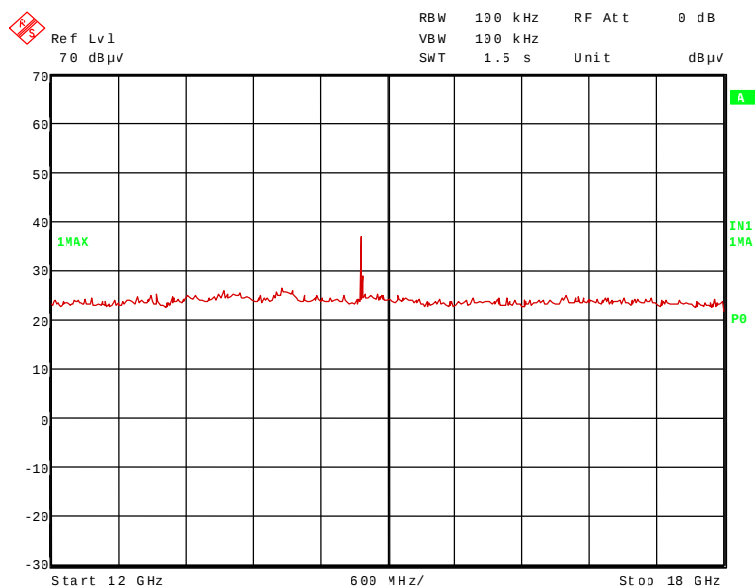


91568_18.wmf: Spurious emissions from 4 GHz to 12 GHz (b-mode, 11 Mbps):

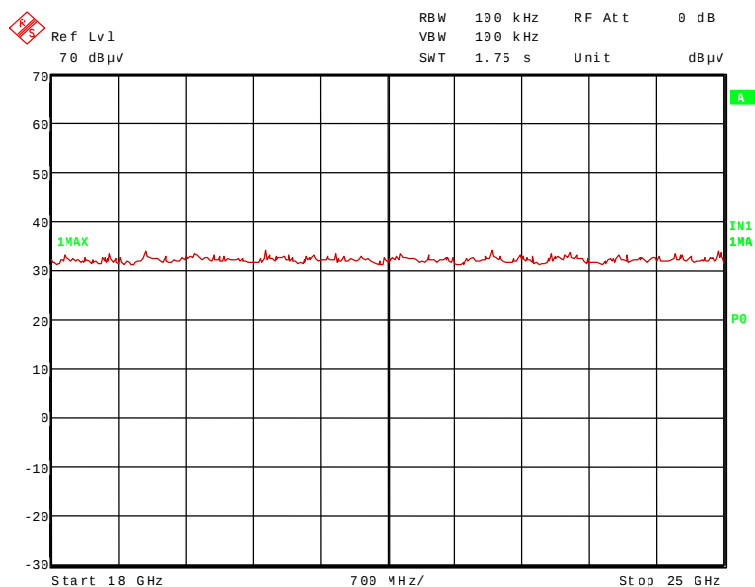


TEST REPORT REFERENCE: F091568E1

91568_76.wmf: Spurious emissions from 12 GHz to 18 GHz (b-mode, 11 Mbps):



91568_77.wmf: Spurious emissions from 18 GHz to 25 GHz (b-mode, 11 Mbps):



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

- 4.924 GHz.

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

- 2.462 GHz and 14.772 GHz.

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

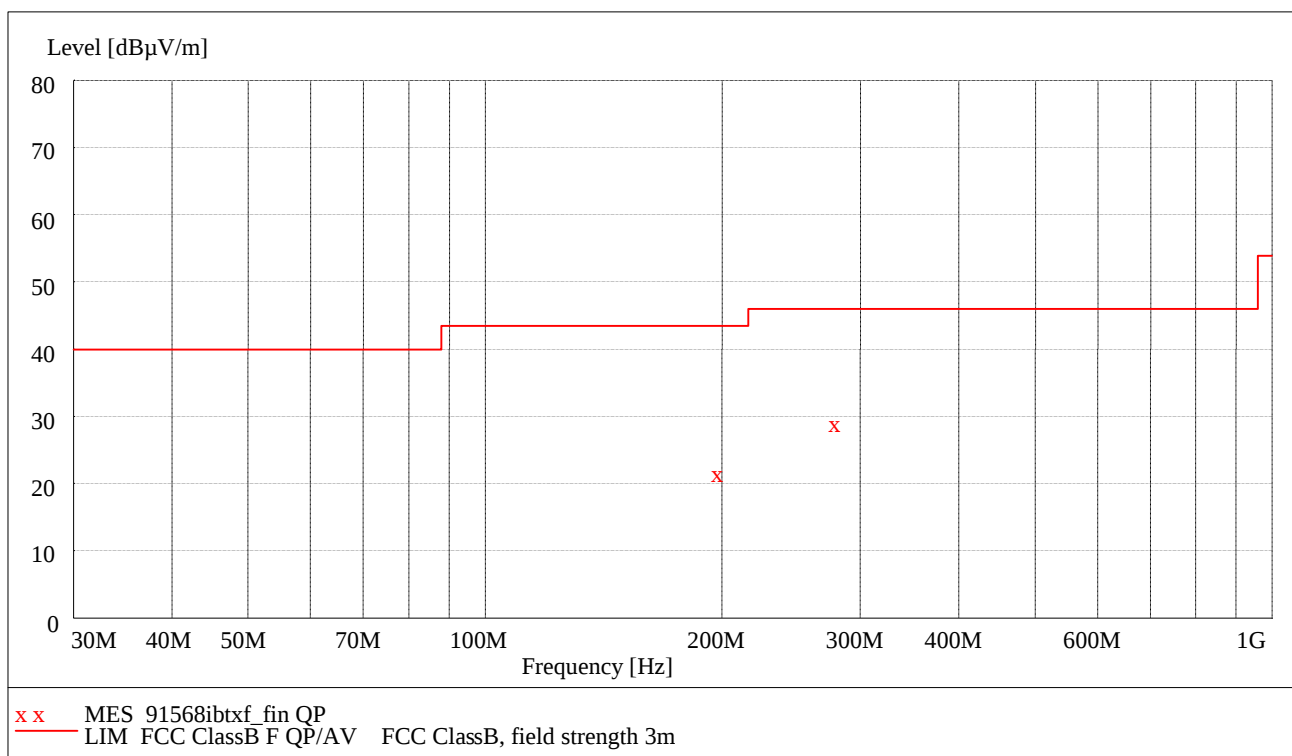
TEST REPORT REFERENCE: F091568E1

6.5.2.3 FINAL MEASUREMENT (30 MHz to 1 GHz) b-mode, internal antenna

Ambient temperature	21 °C	Relative humidity	45 %
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- 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:** For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.
- Supply voltage:** During all measurements the EUT was supplied with 5.0 DC.
- Test record:** The test was carried out in test mode 2 (b-mode with 11 Mbps) of the EUT, because there was no difference to the other test modes.
- Resolution bandwidth:** For all measurements a resolution bandwidth of 120 kHz was used.
- Test results:** The test results were calculated with the following formula:
- $$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{cable loss [dB]} + \text{antenna factor [dB/m]}$$

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 subsequent measurement on the open area test site.



Data record name: 91568ibtxf

TEST REPORT REFERENCE: F091568E1

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:

(These values are 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.
200.000	22.1	11.8	43.5	11.7	8.9	1.5	100.0	247.0	Hor.
Spurious emissions in 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.
280.000	29.8	16.7	46.0	15.3	12.6	1.9	100.0	112.0	Hor.
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

TEST REPORT REFERENCE: F091568E1

6.5.2.4 FINAL MEASUREMENT (1 GHz to 25 GHz) g-mode, internal antenna

Ambient temperature	21 °C	Relative humidity	40 %
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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 cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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

Remark: The worst case data rate for this measurement was 6 Mbps.

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
2.412	112.8	-	-	80.3	28.8	0.0	3.7	150	Hor.	-
4.824	71.8	74.0	2.2	58.5	33.7	25.7	5.3	150	Hor.	Yes
12.060	60.3	74.0	13.7	50.1	33.6	25.9	2.5	100	Hor.	Yes
14.472	57.0	74.0	17.0	47.3	33.7	26.5	2.5	100	Hor.	Yes
16.884	53.0	92.8	39.8	44.2	33.8	27.5	2.5	100	Hor.	No
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
2.412	79.2	-	-	46.7	28.8	0.0	3.7	150	Hor.	-
4.824	44.4	54.0	9.6	31.1	33.7	25.7	5.3	150	Hor.	Yes
12.060	32.3	54.0	21.7	22.1	33.6	25.9	2.5	100	Hor.	Yes
14.472	30.8	54.0	23.2	21.1	33.7	26.5	2.5	100	Hor.	Yes
16.884	31.2	59.2	28.0	22.4	33.8	27.5	2.5	100	Hor.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.437	114.0	-	-	81.5	28.8	0.0	3.7	150	Hor.	-
4.874	67.3	74.0	6.7	54	33.8	25.7	5.2	150	Hor.	Yes
12.185	57.7	74.0	16.3	47.5	33.6	25.9	2.5	100	Vert.	Yes
14.622	60.7	94.0	33.3	51.1	33.7	26.6	2.5	100	Hor.	No
17.059	51.7	94.0	42.3	42.9	33.8	27.5	2.5	100	Hor.	No
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
2.437	79.9	-	-	47.4	28.8	0.0	3.7	150	Hor.	-
4.874	44.3	54.0	9.7	31	33.8	25.7	5.2	150	Hor.	Yes
12.185	31.9	54.0	22.1	21.7	33.6	25.9	2.5	100	Vert.	Yes
14.622	32.0	59.9	27.9	22.4	33.7	26.6	2.5	100	Hor.	No
17.059	30.0	59.9	29.9	21.2	33.8	27.5	2.5	100	Hor.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.462	114.8	-	-	82.2	28.9	0.0	3.7	150	Hor.	-
4.924	62.1	74.0	11.9	48.5	33.9	25.6	5.3	150	Hor.	Yes
14.772	56.5	94.8	38.3	47.0	33.7	26.7	2.5	100	Hor.	No
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
2.462	79.8	-	-	47.2	28.9	0.0	3.7	150	Hor.	-
4.924	42.6	54.0	11.4	29	33.9	25.6	5.3	150	Hor.	Yes
14.772	31.5	59.8	28.3	22.0	33.7	26.7	2.5	100	Hor.	No
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

TEST REPORT REFERENCE: F091568E1

6.5.2.5 FINAL MEASUREMENT (1 GHz to 25 GHz) b-mode, internal antenna

Ambient temperature	21 °C	Relative humidity	40 %
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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 cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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

Remark: The worst case data rate for this measurement was 11 Mbps.

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
2.412	115.8	-	-	83.3	28.8	0.0	3.7	150	Hor	-
4.824	71.3	74.0	2.7	58	33.7	25.7	5.3	150	Hor	Yes
14.472	54.8	74.0	19.2	45.1	33.7	26.5	2.5	100	Vert.	Yes
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
2.412	86.9	-	-	54.4	28.8	0.0	3.7	150	Hor.	-
4.824	53.9	54.0	0.1	40.6	33.7	25.7	5.3	150	Hor.	Yes
14.472	34.4	54.0	19.6	24.7	33.7	26.5	2.5	150	Vert.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.437	112.1	-	-	79.6	28.8	0.0	3.7	150	Hor.	-
4.874	65.9	74.0	8.1	52.6	33.8	25.7	5.2	150	Hor.	Yes
14.622	54.6	92.1	37.5	45.0	33.7	26.6	2.5	100	Hor.	No
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
2.437	86.0	-	-	53.5	28.8	0.0	3.7	150	Hor.	-
4.874	49.9	54.0	4.1	36.6	33.8	25.7	5.2	150	Hor.	Yes
14.622	34.2	66.0	31.8	24.6	33.7	26.6	2.5	100	Hor.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.462	114.8	-	-	82.2	28.9	0.0	3.7	150	Hor.	-
4.924	62.1	74.0	11.9	48.5	33.9	25.6	5.3	150	Hor.	Yes
14.772	56.5	94.8	38.3	47.0	33.7	26.7	2.5	100	Hor.	No
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
2.462	79.8	-	-	47.2	28.9	0.0	3.7	150	Hor.	-
4.924	42.6	54.0	11.4	29	33.9	25.6	5.3	150	Hor.	Yes
14.772	31.5	59.8	28.3	22.0	33.7	26.7	2.5	100	Hor.	No
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

TEST REPORT REFERENCE: F091568E1

6.5.2.6 FINAL MEASUREMENT (1 GHz to 25 GHz) n-mode, internal antenna

Ambient temperature	21 °C	Relative humidity	40 %
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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 cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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

Remark: The worst case data rate for this measurement was 6 Mbps.

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
2.412	112.6	-	-	80.1	28.8	0.0	3.7	150	Hor.	-
4.824	71.4	74.0	2.6	58.1	33.7	25.7	5.3	150	Hor.	Yes
14.472	56.0	74.0	18.0	46.3	33.7	26.5	2.5	100	Hor.	Yes
16.884	51.8	92.6	40.8	43.0	33.8	27.5	2.5	100	Hor.	No
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
2.412	79.5	-	-	47.0	28.8	0.0	3.7	150	Hor.	-
4.824	38.2	54.0	15.8	24.9	33.7	25.7	5.3	150	Hor.	Yes
14.472	32.1	54.0	21.9	22.4	33.7	26.5	2.5	100	Hor.	Yes
16.884	29.8	59.5	29.7	21.0	33.8	27.5	2.5	100	Hor.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.437	113.8	-	-	81.3	28.8	0.0	3.7	150	Hor.	-
4.874	66.3	74.0	7.7	53	33.8	25.7	5.2	150	Hor.	Yes
14.622	58.7	93.8	35.1	49.1	33.7	26.6	2.5	100	Hor.	No
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
2.437	79.9	-	-	47.4	28.8	0.0	3.7	150	Hor.	-
4.874	44.1	54.0	9.9	30.8	33.8	25.7	5.2	150	Hor.	Yes
14.622	31.4	59.9	28.5	21.8	33.7	26.6	2.5	100	Hor.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.462	114.4	-	-	81.8	28.9	0.0	3.7	150	Hor.	-
4.924	58.8	74.0	15.2	45.2	33.9	25.6	5.3	150	Hor.	Yes
14.772	58.3	94.4	36.1	48.8	33.7	26.7	2.5	100	Hor.	No
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
2.462	80.1	-	-	47.5	28.9	0.0	3.7	150	Hor.	-
4.924	42.8	54.0	11.2	29.2	33.9	25.6	5.3	150	Hor.	Yes
14.772	31.9	60.1	28.2	22.4	33.7	26.7	2.5	100	Hor.	No
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

TEST REPORT REFERENCE: F091568E1

6.5.3 TEST RESULTS (RADIATED EMISSIONS) WITH EXTERNAL PATCH ANTENNA

6.5.3.1 PRELIMINARY MEASUREMENT (9 kHz to 1 GHz)

Ambient temperature	21 °C	Relative humidity	39 %
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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.

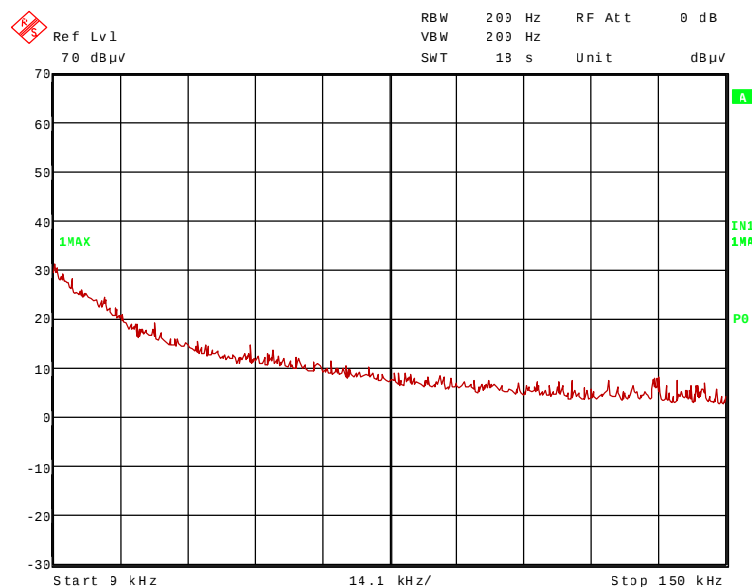
Cable guide: The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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 or frequency. Therefore, the emissions in this frequency range were measured only in b-mode with 11 Mbps and transmit in the middle of the assigned frequency range (operation mode 2). As external patch antenna the SPA 2400/75/8/0/V with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all patch antennas.

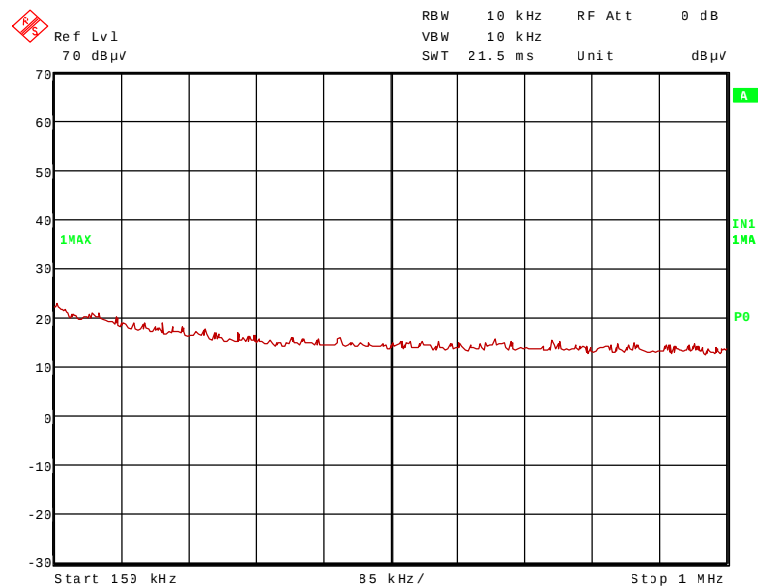
91568_329.wmf: Spurious emissions from 9 kHz to 150 kHz (b-mode, 11 Mbps, operation mode 2):



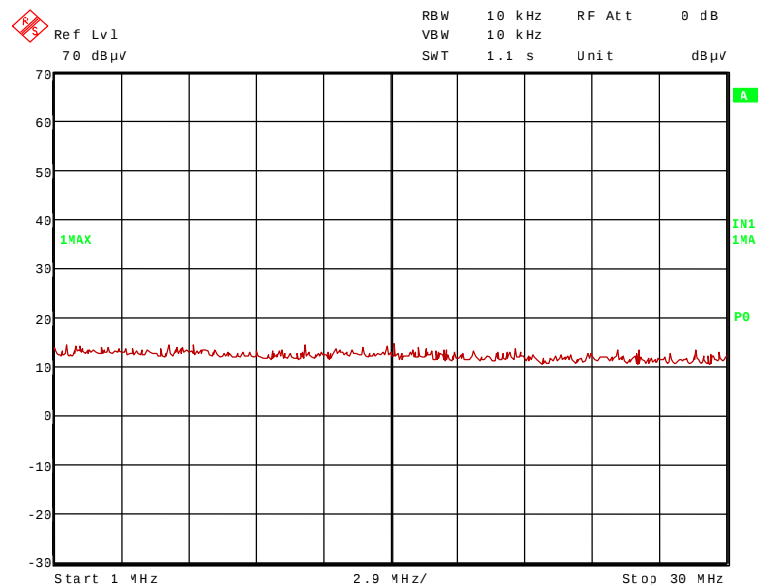
TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 35, 43, 46, 55

TEST REPORT REFERENCE: F091568E1

91568_330.wmf: Spurious emissions from 150 kHz to 1 MHz (b-mode, 11 Mbps, operation mode 2):



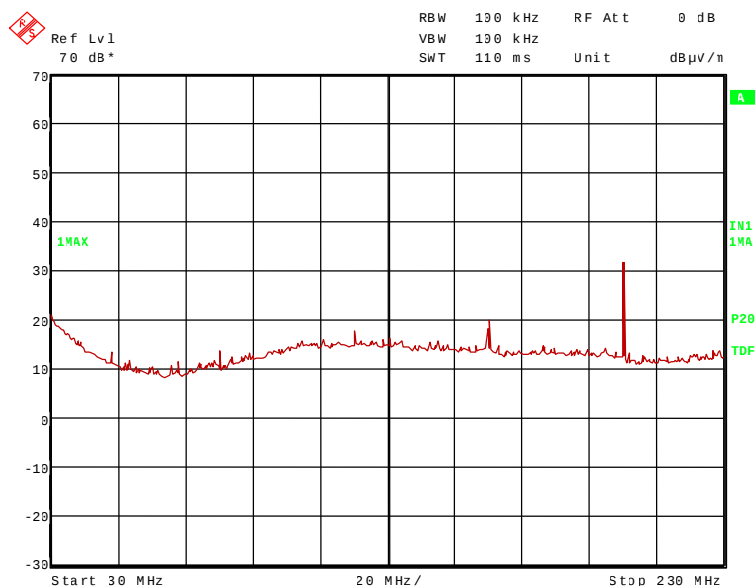
91568_331.wmf: Spurious emissions from 1 MHz to 30 MHz (b-mode, 11 Mbps, operation mode 2):



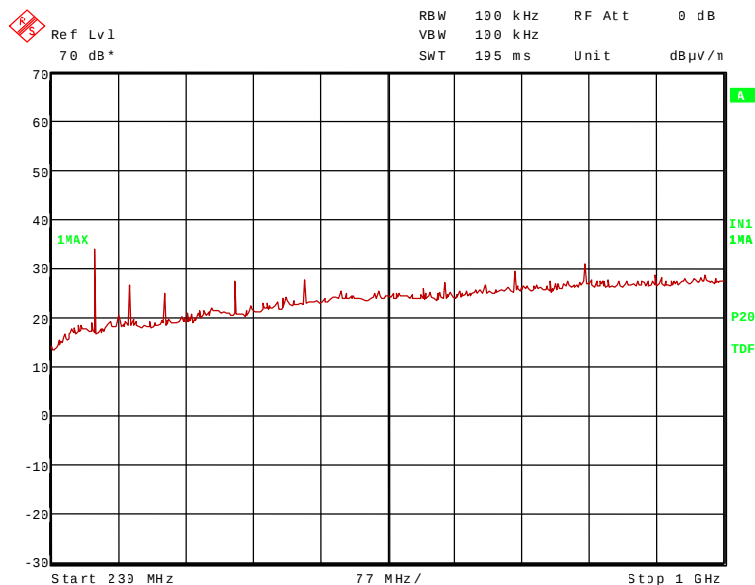
No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test inside this frequency range, so no measurements were carried out on the outdoor test site.

TEST REPORT REFERENCE: F091568E1

91568_303.wmf: Spurious emissions from 30 MHz to 230 MHz (b-mode, 11 Mbps, operation mode 2):



91568_304.wmf: Spurious emissions from 230 MHz to 1 GHz (b-mode, 11 Mbps, operation mode 2):



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

- 280.000 MHz.

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

- 80.000 MHz, 160.000 MHz, 200.000 MHz, 440.000 MHz and 840.000 MHz.

These frequencies have to be measured in a final measurement on an open area test-site. The results were presented in the following.

TEST REPORT REFERENCE: F091568E1

6.5.3.2 PRELIMINARY MEASUREMENT (1 GHz to 25 GHz), b-mode, external patch antenna

Ambient temperature	21 °C	Relative humidity	39 %
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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 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.

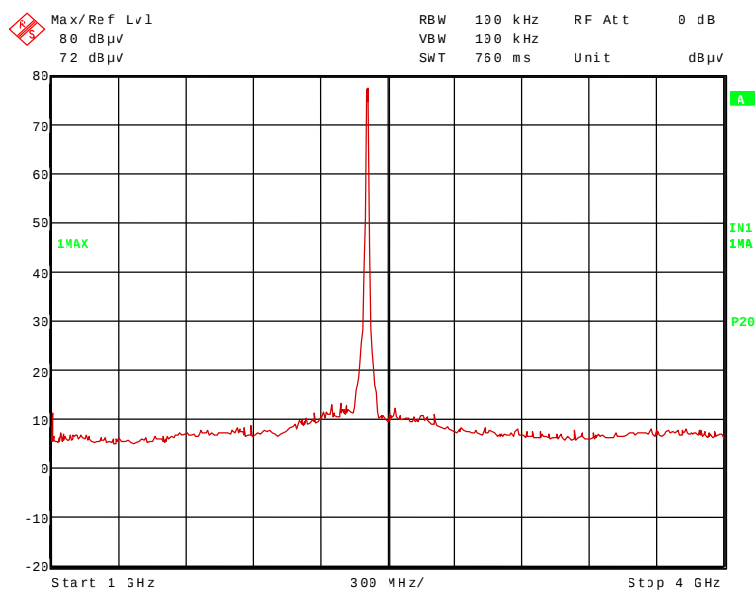
Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

Remark: The plots at the next pages are showing radiated spurious emissions with the worst case operation mode. The tables of the final measurements in the next clauses are showing the results for the radiated spurious emissions for all applicable operation modes with the worst case data rate. As external patch antenna the SPA 2400/75/8/0/V with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all patch antennas.

Transmitter operates at the lower end of the assigned frequency band (operation mode 1)

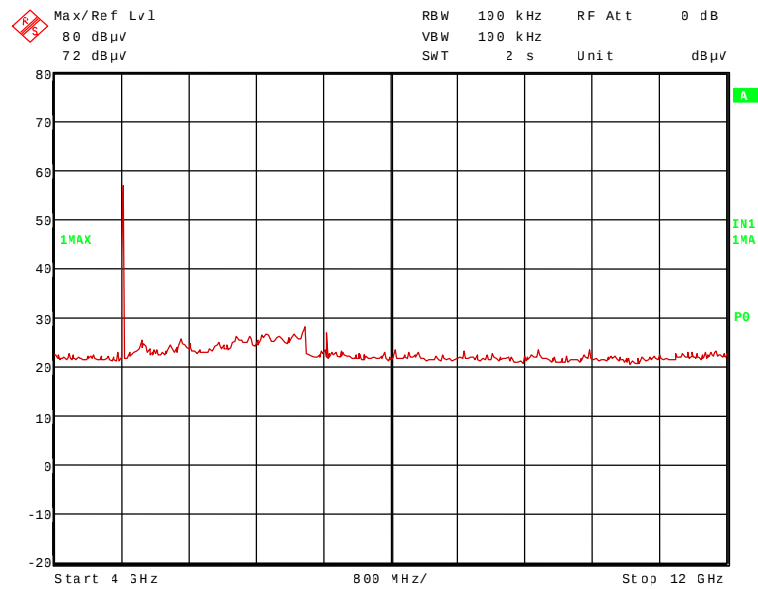
91568_102.wmf: Spurious emissions from 1 GHz to 4 GHz (b-mode, 11 Mbps):



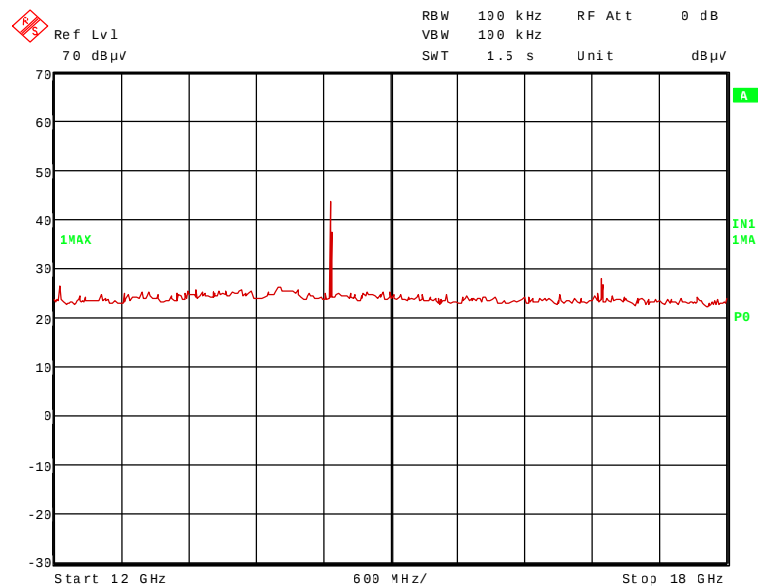
TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 34, 36, 37, 39, 44, 46, 49 – 51, 72

TEST REPORT REFERENCE: F091568E1

91568_97.wmf: Spurious emissions from 4 GHz to 12 GHz (b-mode, 11 Mbps):

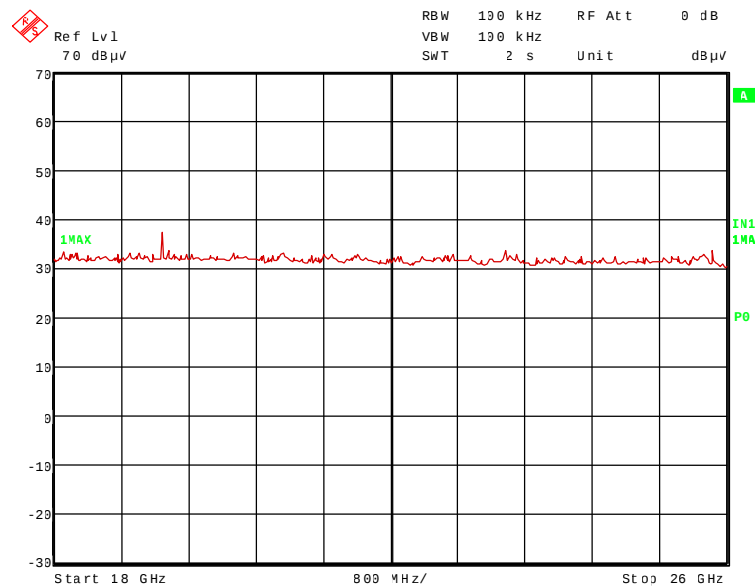


91568_129.wmf: Spurious emissions from 12 GHz to 18 GHz (b-mode, 11 Mbps):



TEST REPORT REFERENCE: F091568E1

91568_130.wmf: Spurious emissions from 18 GHz to 26 GHz (b-mode, 11 Mbps):



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

- 1.0081 GHz, 4.824 GHz, 14.472 GHz and 19.296 GHz.

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

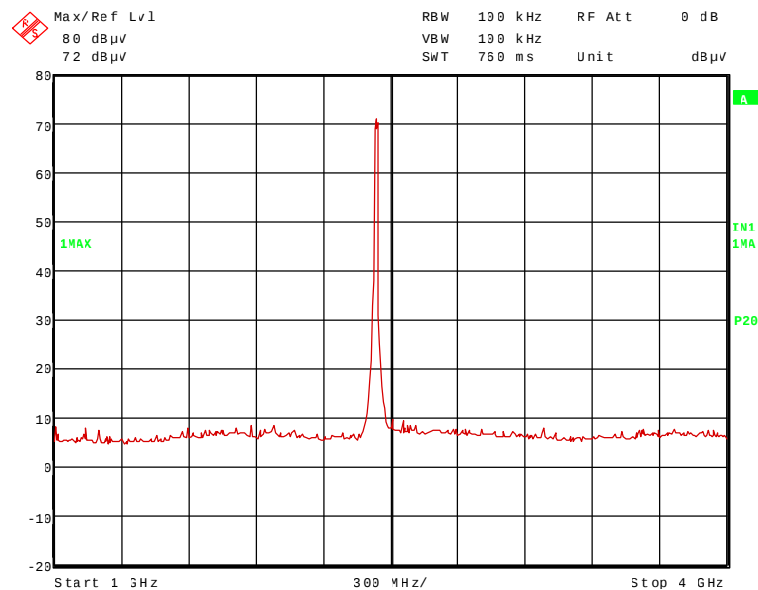
- 2.412 GHz, 7.236 GHz and 16.884 GHz.

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

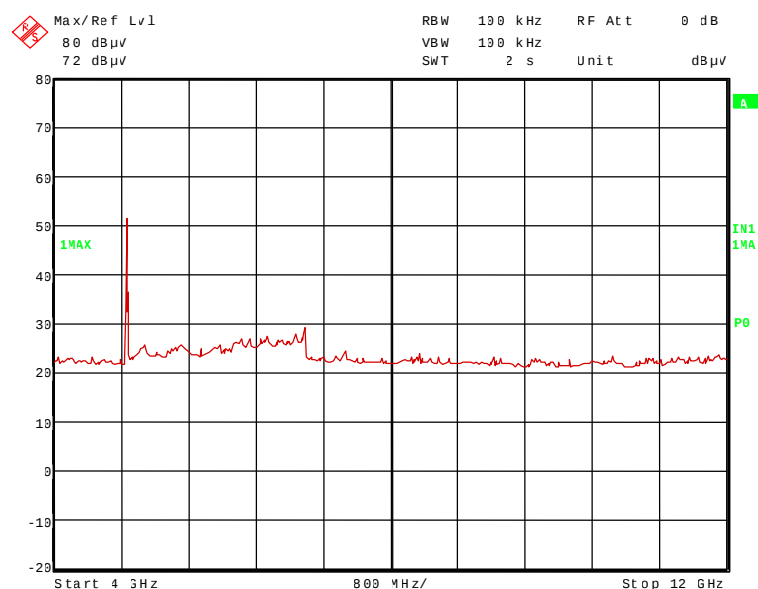
TEST REPORT REFERENCE: F091568E1

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

91568_10.wmf: Spurious emissions from 1 GHz to 4 GHz (b-mode, 11 Mbps):

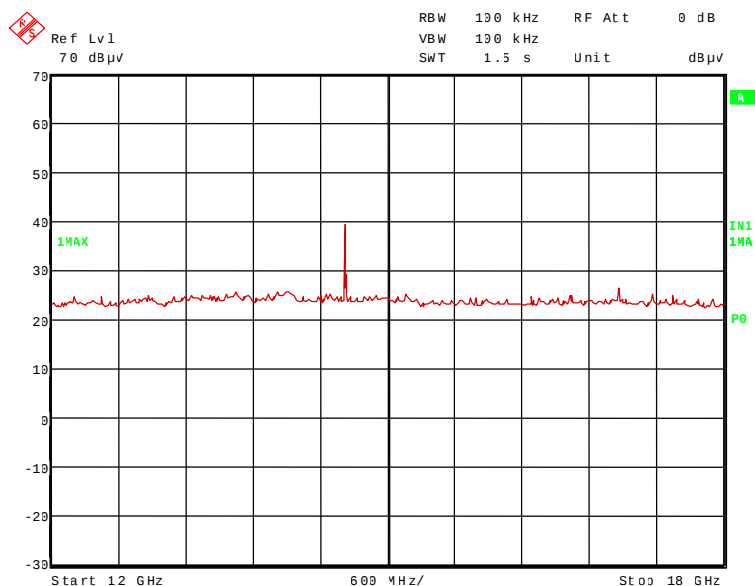


91568_11.wmf: Spurious emissions from 4 GHz to 12 GHz (b-mode, 11 Mbps):

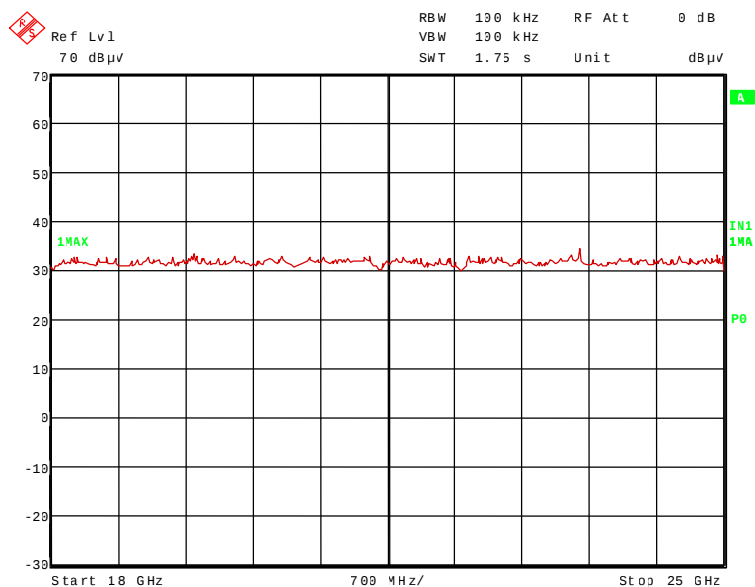


TEST REPORT REFERENCE: F091568E1

91568_75.wmf: Spurious emissions from 12 GHz to 18 GHz (b-mode, 11 Mbps):



91568_74.wmf: Spurious emissions from 18 GHz to 25 GHz (b-mode, 11 Mbps):



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

- 1.0081 GHz, 4.874 GHz and 7.311 GHz.

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

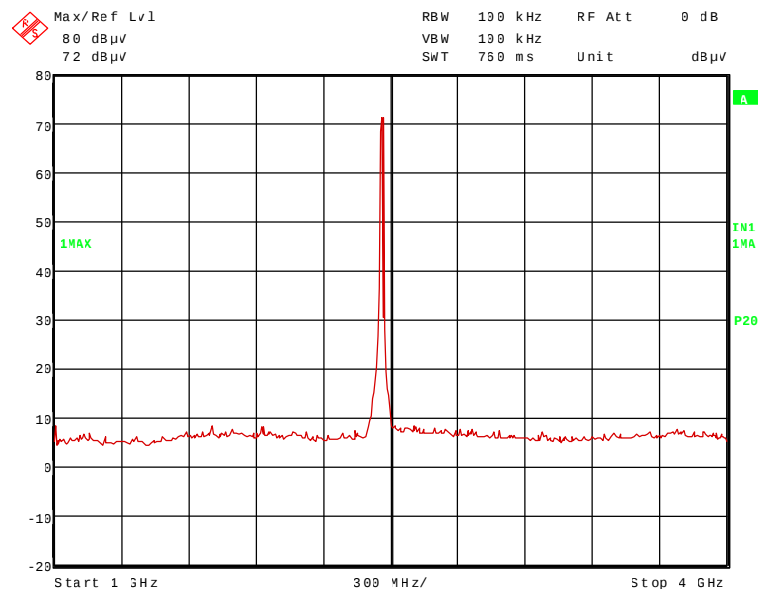
- 2.437 GHz and 14.622 GHz.

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

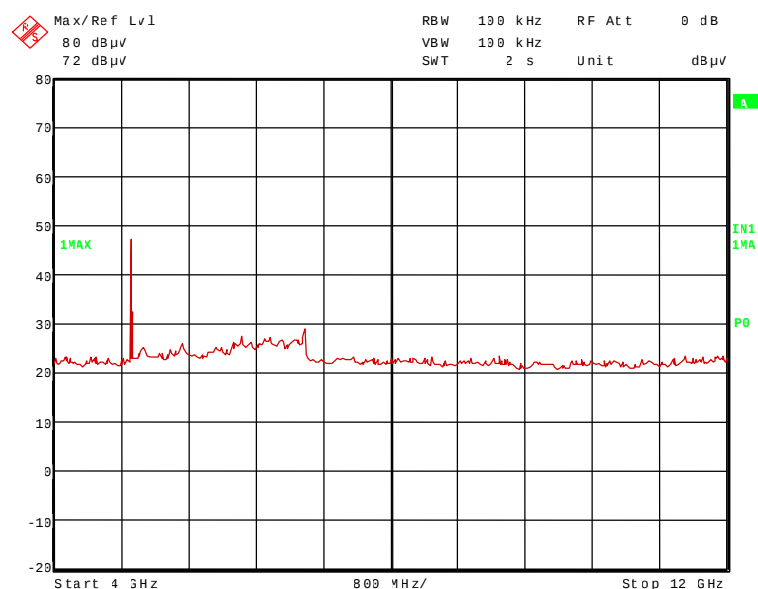
TEST REPORT REFERENCE: F091568E1

Transmitter operates at the upper end of the assigned frequency band (operation mode 3)

91568_15.wmf: Spurious emissions from 1 GHz to 4 GHz (b-mode, 11 Mbps):

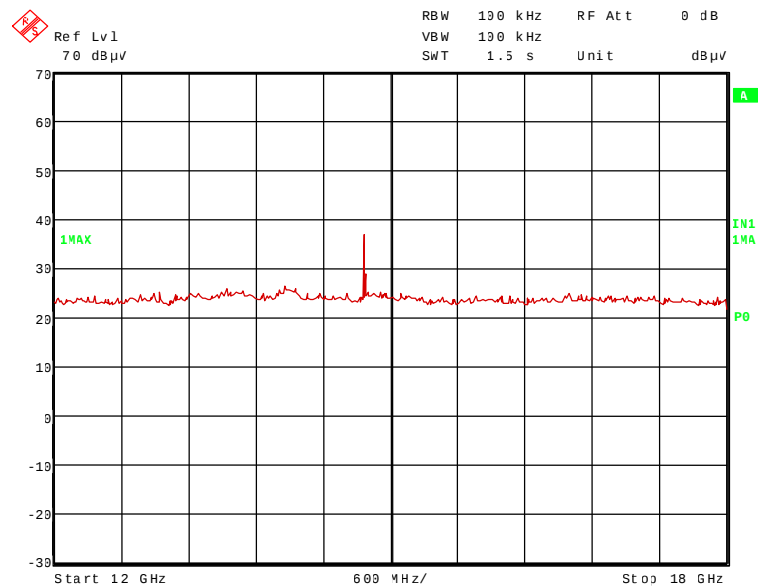


91568_18.wmf: Spurious emissions from 4 GHz to 12 GHz (b-mode, 11 Mbps):

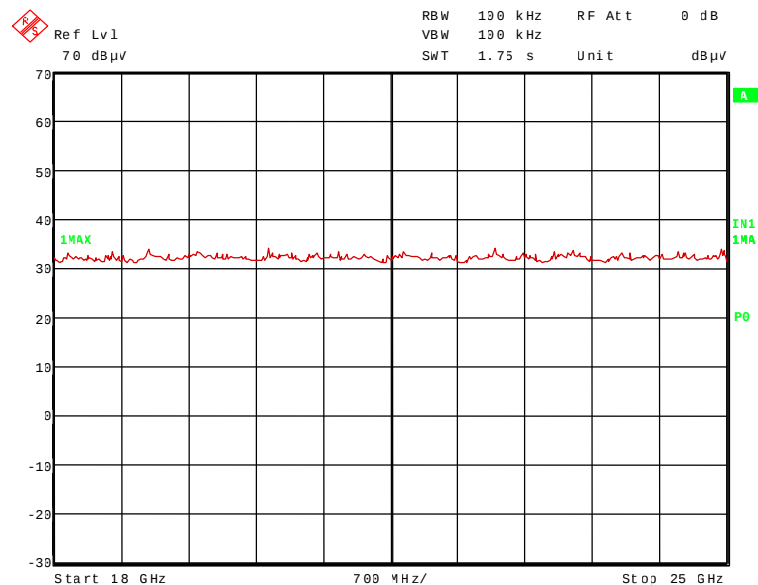


TEST REPORT REFERENCE: F091568E1

91568_76.wmf: Spurious emissions from 12 GHz to 18 GHz (b-mode, 11 Mbps):



91568_77.wmf: Spurious emissions from 18 GHz to 25 GHz (b-mode, 11 Mbps):



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

- 1.0081 GHz and 4.924 GHz.

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

- 2.462 GHz and 14.772 GHz.

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

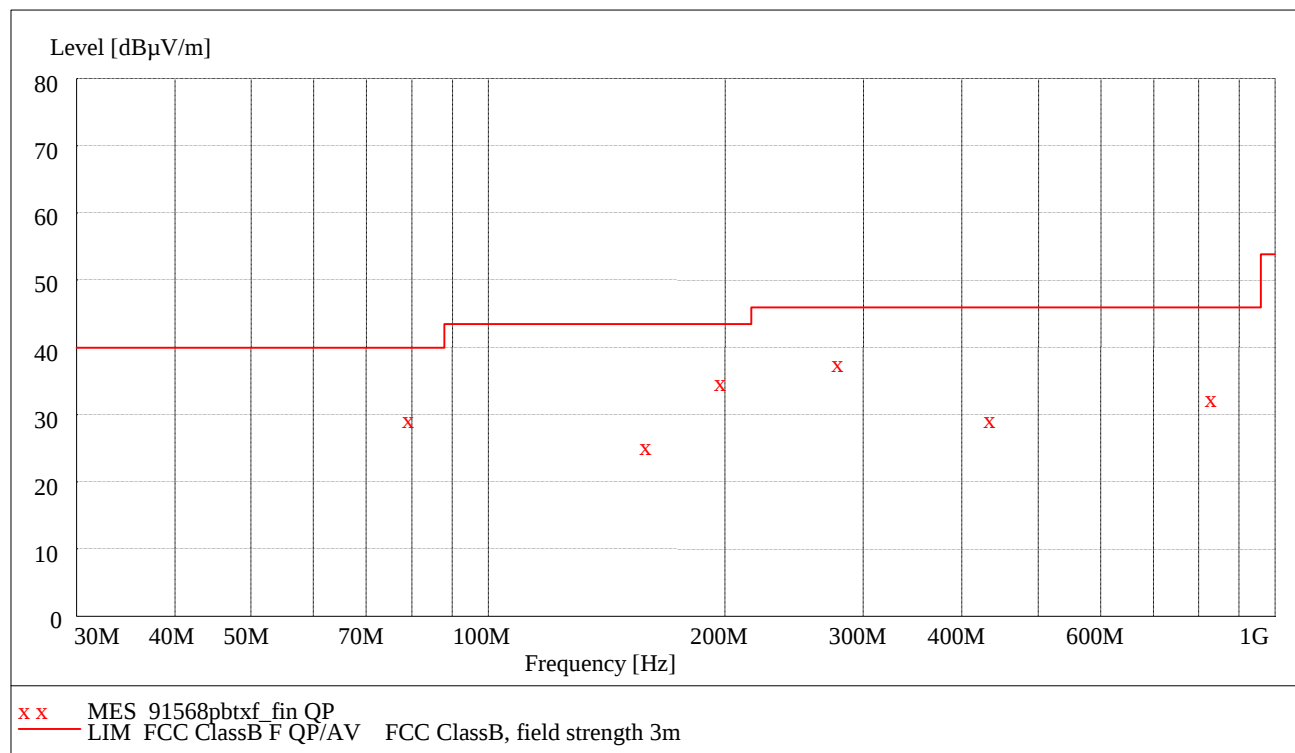
TEST REPORT REFERENCE: F091568E1

6.5.3.3 FINAL MEASUREMENT (30 MHz to 1 GHz) b-mode, external patch antenna

Ambient temperature	21 °C	Relative humidity	45 %
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- 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:** For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.
- Supply voltage:** During all measurements the EUT was supplied with 5.0 DC.
- Test record:** The test was carried out in test mode 2 (b-mode with 11 Mbps) of the EUT, because there was no difference to the other test modes. As external patch antenna the SPA 2400/75/8/0/V with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all patch antennas.
- Resolution bandwidth:** For all measurements a resolution bandwidth of 120 kHz was used.
- Test results:** The test results were calculated with the following formula:
- $$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{cable loss [dB]} + \text{antenna factor [dB/m]}$$

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 subsequent measurement on the open area test site.



Data record name: 91568pbtxf

TEST REPORT REFERENCE: F091568E1

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:

(These values are marked in the diagram by an x)

Spurious emissions outside restricted bands									
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
80.000	29.8	40.0	10.2	20.6	8.2	1.0	150.0	112.0	Vert.
160.000	26.1	43.5	17.4	13.5	11.1	1.5	150.0	68.0	Hor.
200.000	35.5	43.5	8.0	25.1	8.9	1.5	100.0	23.0	Vert.
440.000	29.8	46.0	16.2	11.0	16.4	2.4	200.0	157.0	Hor.
840.000	33.0	46.0	13.0	7.1	22.7	3.2	200.0	23.0	Vert.
Spurious emissions in restricted bands									
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
280.000	38.1	46.0	7.9	23.6	12.6	1.9	100.0	112.0	Hor.
Measurement uncertainty				+2.2 dB / -3.6 dB					

The test results were calculated with the following formula:

$$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{cable loss [dB]} + \text{antenna factor [dB/m]}$$

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

14 – 20

TEST REPORT REFERENCE: F091568E1

6.5.3.4 FINAL MEASUREMENT (1 GHz to 25 GHz) g-mode, external patch antenna

Ambient temperature	21 °C	Relative humidity	39 %
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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 cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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

Remark: The worst case data rate for this measurement was 6 Mbps. As external patch antenna the SPA 2400/75/8/0/V with a 10 cm cable antenna was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all patch antennas.

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
1.0081	19.1	74.0	54.9	19.0	24.2	26.5	2.4	100	Hor.	Yes
2.412	114.8	-	-	82.3	28.8	0.0	3.7	150	Vert.	-
4.824	69.0	74.0	5.0	55.7	33.7	25.7	5.3	150	Hor.	Yes
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
1.0081	11.1	54.0	42.9	11.0	24.2	26.5	2.4	100	Hor.	Yes
2.412	79.9	-	-	47.4	28.8	0.0	3.7	150	Vert.	-
4.824	38.4	54.0	15.6	25.1	33.7	25.7	5.3	150	Hor.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
1.0081	45.6	74.0	28.4	19.0	24.2	0.0	2.4	150	Hor.	Yes
2.437	114.7	-	-	82.2	28.8	0.0	3.7	150	Vert.	-
4.874	66.5	74.0	7.5	53.2	33.8	25.7	5.2	150	Hor.	Yes
14.622	52.6	94.7	42.1	43.0	33.7	26.6	2.5	100	Vert.	No
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
1.0081	37.6	54.0	16.4	11.0	24.2	0.0	2.4	150	Hor.	Yes
2.437	80.6	-	-	48.1	28.8	0.0	3.7	150	Vert.	-
4.874	37.0	54.0	17.0	23.7	33.8	25.7	5.2	150	Hor.	Yes
14.622	30.9	60.6	29.7	21.3	33.7	26.6	2.5	100	Vert.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
1.0081	45.6	74.0	28.4	19.0	24.2	0.0	2.4	150	Hor.	Yes
2.462	114.6	-	-	82.0	28.9	0.0	3.7	150	Vert.	-
4.924	63.7	74.0	10.3	50.1	33.9	25.6	5.3	150	Vert.	Yes
14.772	53.9	94.6	40.7	44.4	33.7	26.7	2.5	100	Hor.	No
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
1.0081	37.6	54.0	16.4	11.0	24.2	0.0	2.4	150	Hor.	Yes
2.462	80.6	-	-	48.0	28.9	0.0	3.7	150	Vert.	-
4.924	38.9	54.0	15.1	25.3	33.9	25.6	5.3	150	Vert.	Yes
14.772	31.3	60.6	29.3	21.8	33.7	26.7	2.5	100	Hor.	No
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

TEST REPORT REFERENCE: F091568E1

6.5.3.5 FINAL MEASUREMENT (1 GHz to 25 GHz) b-mode, external patch antenna

Ambient temperature	21 °C	Relative humidity	39 %
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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 cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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

Remark: The worst case data rate for this measurement was 11 Mbps. As external patch antenna the SPA 2400/75/8/0/V with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all patch antennas.

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
1.0081	45.6	74.0	28.4	19.0	24.2	0.0	2.4	150	Hor.	Yes
2.412	114.8	-	-	82.3	28.8	0.0	3.7	150	Vert.	-
4.824	73.2	74.0	0.8	59.9	33.7	25.7	5.3	150	Hor.	Yes
7.236	59.9	94.8	34.9	40.8	36.9	24.6	6.8	150	Hor.	No
14.472	56.3	74.0	17.7	46.6	33.7	26.5	2.5	100	Vert.	Yes
16.884	46.5	94.8	48.3	37.7	33.8	27.5	2.5	100	Hor.	No
19.296	46.9	74.0	27.1	45.5	37.1	38.2	2.5	100	Hor.	Yes
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
1.0081	37.6	54.0	16.4	11.0	24.2	0.0	2.4	150	Hor.	Yes
2.412	91.4	-	-	58.9	28.8	0.0	3.7	150	Vert.	-
4.824	53.8	54.0	0.2	40.5	33.7	25.7	5.3	150	Hor.	Yes
7.236	38.0	71.4	33.4	18.9	36.9	24.6	6.8	150	Hor.	No
14.472	38.4	54.0	15.6	28.7	33.7	26.5	2.5	100	Vert.	Yes
16.884	30.4	71.4	41.0	21.6	33.8	27.5	2.5	100	Hor.	No
19.296	33.4	54.0	20.6	32.0	37.1	38.2	2.5	100	Hor.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
1.0081	45.6	74.0	28.4	19.0	24.2	0.0	2.4	150	Hor.	Yes
2.437	114.4	-	-	81.9	28.8	0.0	3.7	150	Vert.	-
4.874	70.5	74.0	3.5	57.2	33.8	25.7	5.2	150	Hor.	Yes
7.311	56.6	74.0	17.4	37.3	37.1	24.6	6.8	150	Hor.	Yes
14.622	58.9	94.4	35.5	49.3	33.7	26.6	2.5	100	Hor.	No
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
1008.100	37.6	54.0	16.4	11.0	24.2	0.0	2.4	150	Hor.	Yes
2437.000	90.9	-	-	58.4	28.8	0.0	3.7	150	Vert.	-
4874.000	51.7	54.0	2.3	38.4	33.8	25.7	5.2	150	Hor.	Yes
7311.000	38.1	54.0	15.9	18.8	37.1	24.6	6.8	150	Hor.	Yes
14622.000	40.0	70.9	30.9	30.4	33.7	26.6	2.5	100	Hor.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
1.0081	45.6	74.0	28.4	19.0	24.2	0.0	2.4	150	Hor.	Yes
2.462	114.6	-	-	82.0	28.9	0.0	3.7	150	Vert.	-
4.924	63.7	74.0	10.3	50.1	33.9	25.6	5.3	150	Vert.	Yes
14.772	53.9	94.6	40.7	44.4	33.7	26.7	2.5	100	Hor.	No
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
1.0081	37.6	54.0	16.4	11.0	24.2	0.0	2.4	150	Hor.	Yes
2.462	80.6	-	-	48.0	28.9	0.0	3.7	150	Vert.	-
4.924	38.9	54.0	15.1	25.3	33.9	25.6	5.3	150	Vert.	Yes
14.772	31.3	60.6	29.3	21.8	33.7	26.7	2.5	100	Hor.	No
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

TEST REPORT REFERENCE: F091568E1

6.5.3.6 FINAL MEASUREMENT (1 GHz to 25 GHz) n-mode, external patch antenna

Ambient temperature	21 °C	Relative humidity	39 %
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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 cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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

Remark: The worst case data rate for this measurement was 6 Mbps. As external patch antenna the SPA 2400/75/8/0/V with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all patch antennas.

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
1.0081	45.6	74.0	28.4	19.0	24.2	0.0	2.4	150	Hor.	Yes
2.412	114.6	-	-	82.1	28.8	0.0	3.7	150	Vert.	-
4.824	68.4	74.0	5.6	55.1	33.7	25.7	5.3	150	Hor.	Yes
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
1.0081	37.6	54.0	16.4	11.0	24.2	0.0	2.4	150	Hor.	Yes
2.412	80.9	-	-	48.4	28.8	0.0	3.7	150	Vert.	-
4.824	38.0	54.0	16.0	24.7	33.7	25.7	5.3	150	Hor.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
1.0081	45.6	74.0	28.4	19.0	24.2	0.0	2.4	150	Hor.	Yes
2.437	114.8	-	-	82.3	28.8	0.0	3.7	150	Vert.	-
4.874	65.9	74.0	8.1	52.6	33.8	25.7	5.2	150	Hor.	Yes
14.622	51.2	94.8	43.6	41.6	33.7	26.6	2.5	100	Vert.	No
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
1.0081	37.6	54.0	16.4	11.0	24.2	0.0	2.4	150	Hor.	Yes
2.437	80.7	-	-	48.2	28.8	0.0	3.7	150	Vert.	-
4.874	37.5	54.0	16.5	24.2	33.8	25.7	5.2	150	Hor.	Yes
14.622	30.8	60.7	29.9	21.2	33.7	26.6	2.5	100	Vert.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
1.0081	45.6	74.0	28.4	19.0	24.2	0.0	2.4	150	Hor.	Yes
2.462	114.7	-	-	82.1	28.9	0.0	3.7	150	Vert.	-
4.924	62.5	74.0	11.5	48.9	33.9	25.6	5.3	150	Vert.	Yes
14.772	54.2	94.7	40.5	44.7	33.7	26.7	2.5	100	Hor.	No
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
1.0081	37.6	54.0	16.4	11.0	24.2	0.0	2.4	150	Hor.	Yes
2.462	80.4	-	-	47.8	28.9	0.0	3.7	150	Vert.	-
4.924	38.7	54.0	15.3	25.1	33.9	25.6	5.3	150	Vert.	Yes
14.772	31.3	60.4	29.1	21.8	33.7	26.7	2.5	100	Hor.	No
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

TEST REPORT REFERENCE: F091568E1

6.5.4 TEST RESULTS (RADIATED EMISSIONS) WITH EXTERNAL MONOPOLE ANTENNA

6.5.4.1 PRELIMINARY MEASUREMENT (9 kHz to 1 GHz)

Ambient temperature	21 °C	Relative humidity	43 %
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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.

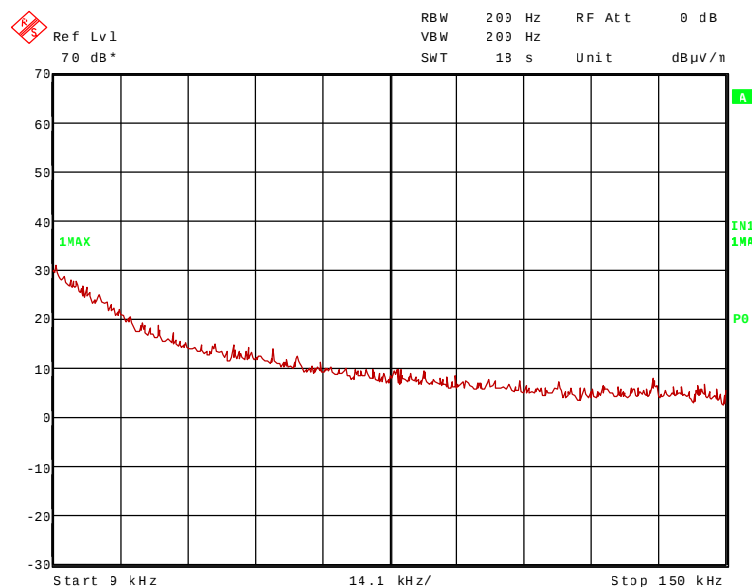
Cable guide: The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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 or frequency. Therefore, the emissions in this frequency range were measured only in b-mode with 11 Mbps and transmit in the middle of the assigned frequency range (operation mode 2). As external monopole antenna the IG-103 with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all monopole antennas.

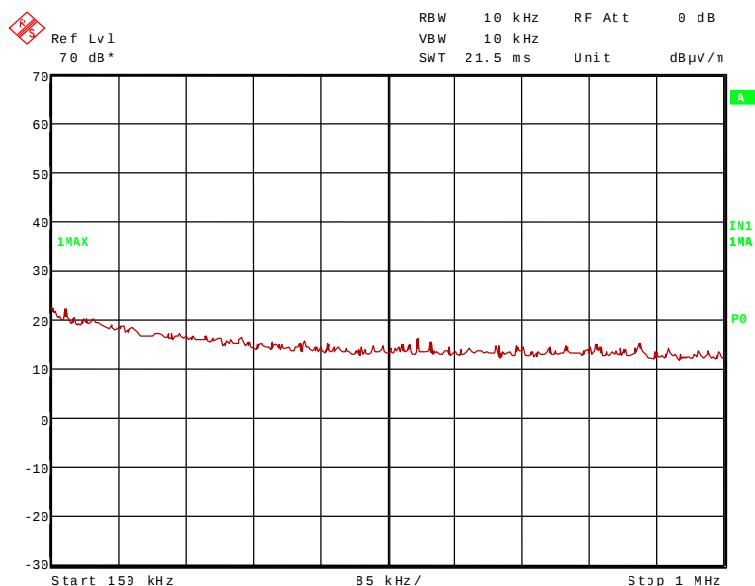
91568_323.wmf: Spurious emissions from 9 kHz to 150 kHz (b-mode, 11 Mbps, operation mode 2):



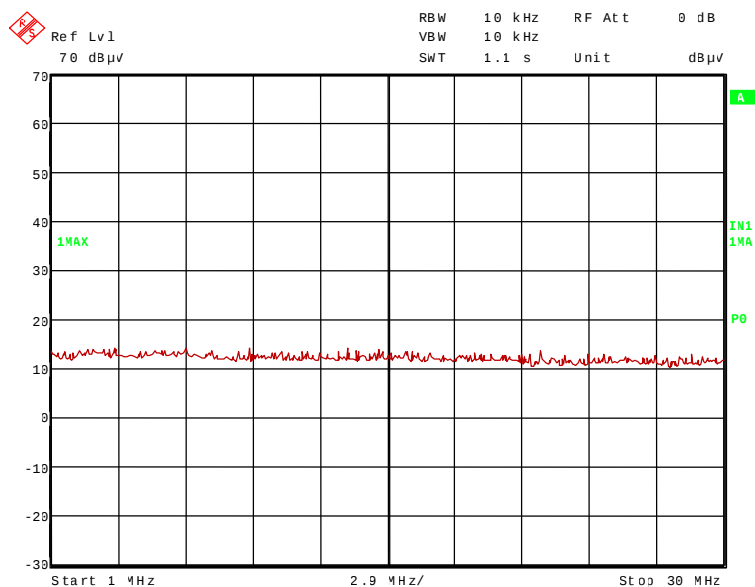
TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 35, 43, 46, 55

TEST REPORT REFERENCE: F091568E1

91568_324.wmf: Spurious emissions from 150 kHz to 1 MHz (b-mode, 11 Mbps, operation mode 2):



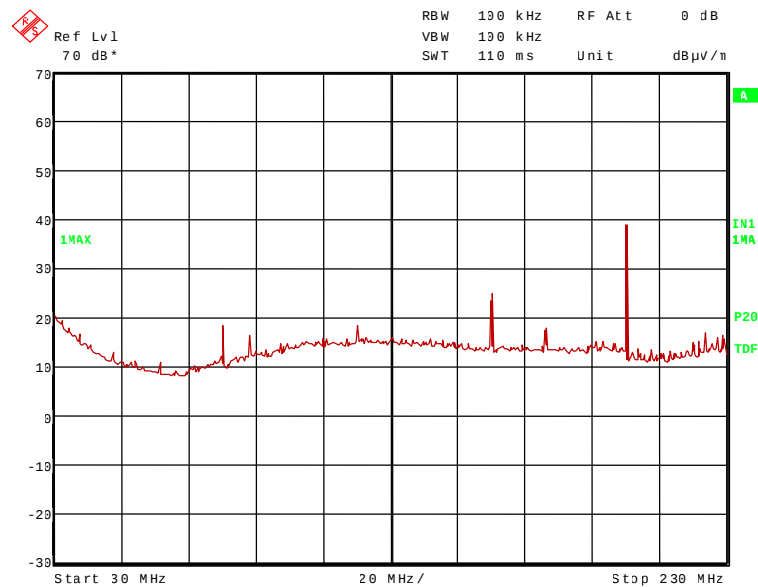
91568_325.wmf: Spurious emissions from 1 MHz to 30 MHz (b-mode, 11 Mbps, operation mode 2):



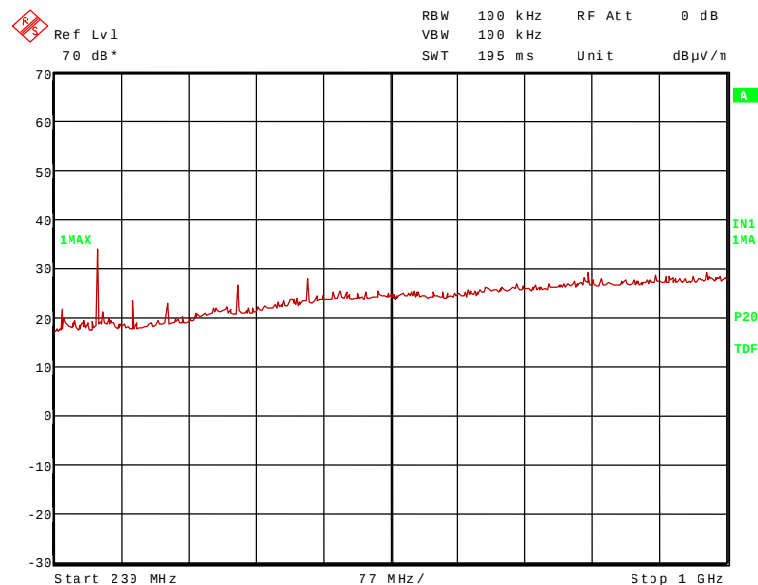
No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test inside this frequency range, so no measurements were carried out on the outdoor test site.

TEST REPORT REFERENCE: F091568E1

91568_311.wmf: Spurious emissions from 30 MHz to 230 MHz (b-mode, 11 Mbps, operation mode 2):



91568_312.wmf: Spurious emissions from 230 MHz to 1 GHz (b-mode, 11 Mbps, operation mode 2):



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

- 280.000 MHz.

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

- 80.000 MHz, 160.000 MHz, 200.000 MHz, 440.000 MHz and 840.000 MHz.

These frequencies have to be measured in a final measurement on an open area test-site. The results were presented in the following.

TEST REPORT REFERENCE: F091568E1

6.5.4.2 PRELIMINARY MEASUREMENT (1 GHz to 25 GHz), b-mode, external monopole antenna

Ambient temperature	21 °C	Relative humidity	43 %
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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 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.

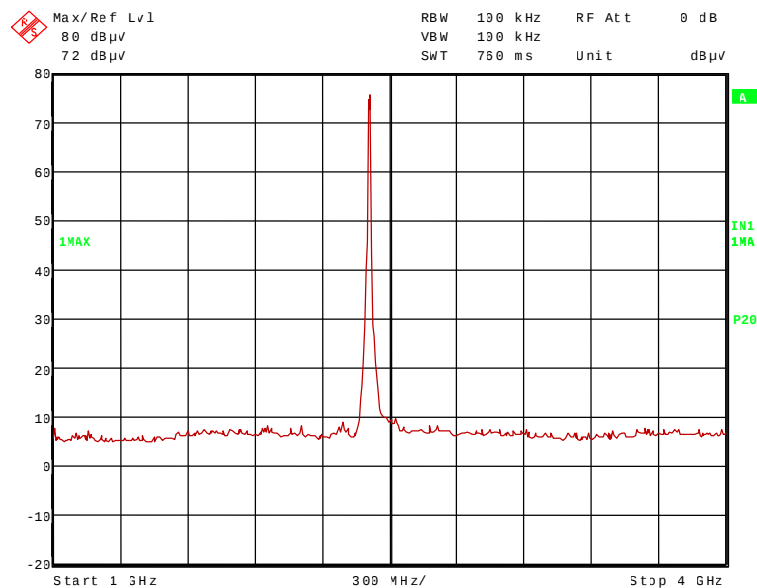
Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

Remark: The plots at the next pages are showing radiated spurious emissions with the worst case operation mode. The tables of the final measurements in the next clauses are showing the results for the radiated spurious emissions for all applicable operation modes with the worst case data rate. As external monopole antenna the IG-103 with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all monopole antennas.

Transmitter operates at the lower end of the assigned frequency band (operation mode 1)

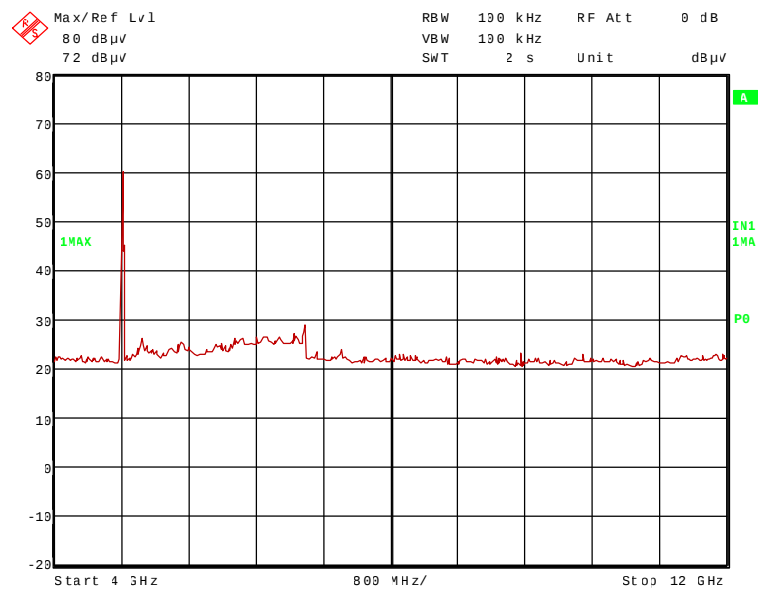
91568_176.wmf: Spurious emissions from 1 GHz to 4 GHz (b-mode, 11 Mbps):



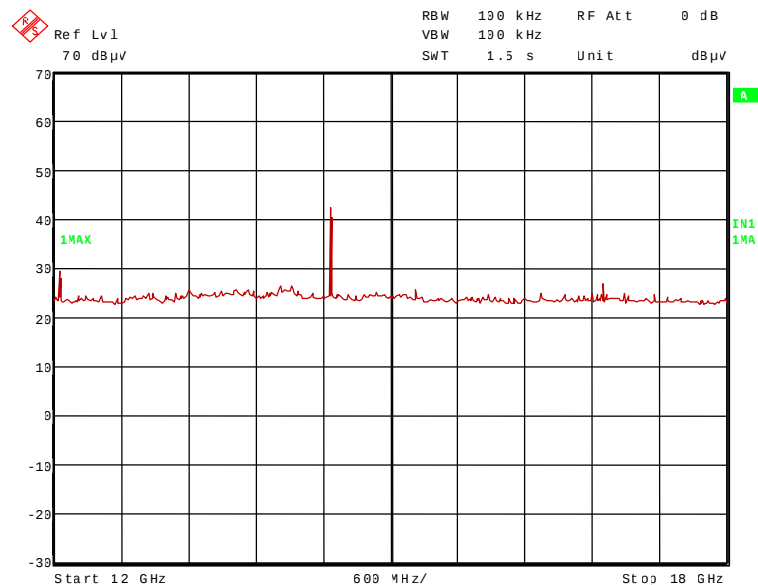
TEST EQUIPMENT USED FOR THE TEST:
29, 31 – 34, 36, 37, 39, 44, 46, 49 – 51, 72

TEST REPORT REFERENCE: F091568E1

91568_189.wmf: Spurious emissions from 4 GHz to 12 GHz (b-mode, 11 Mbps):

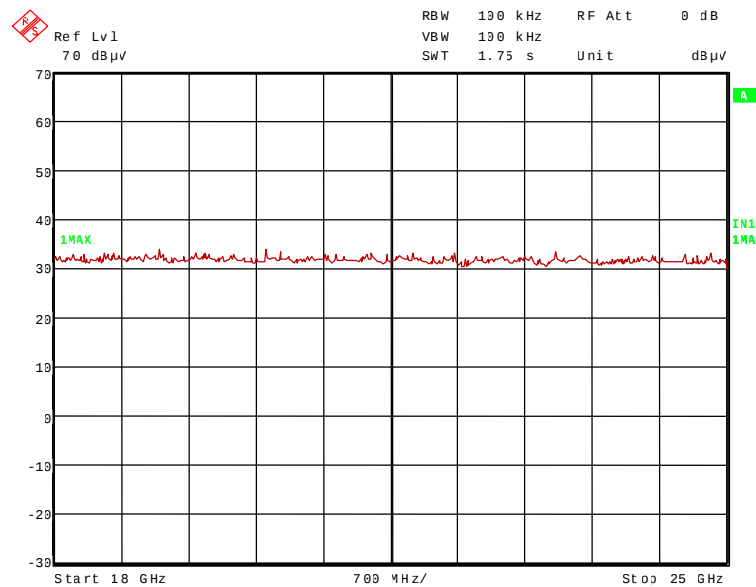


91568_129.wmf: Spurious emissions from 12 GHz to 18 GHz (b-mode, 11 Mbps):



TEST REPORT REFERENCE: F091568E1

91568_205.wmf: Spurious emissions from 18 GHz to 25 GHz (b-mode, 11 Mbps):



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

- 4.824 GHz, 12.060 GHz and 14.472 GHz.

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

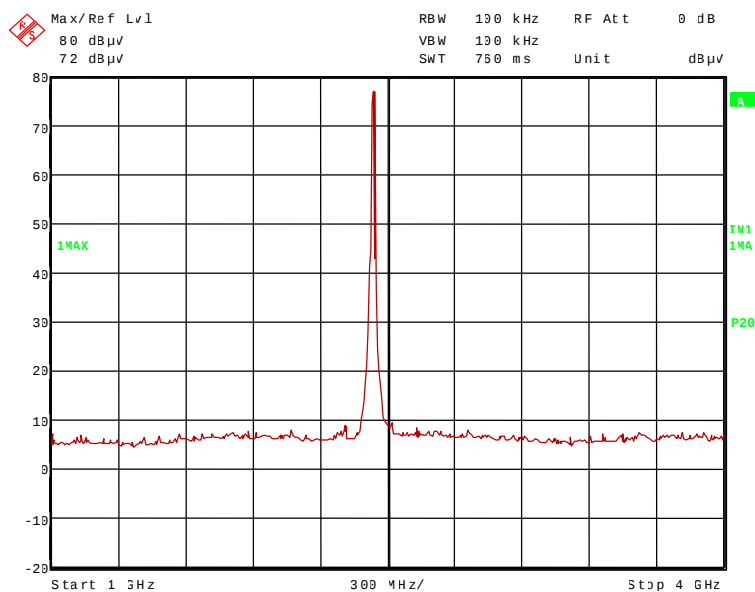
- 2.412 GHz and 16.884 GHz.

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

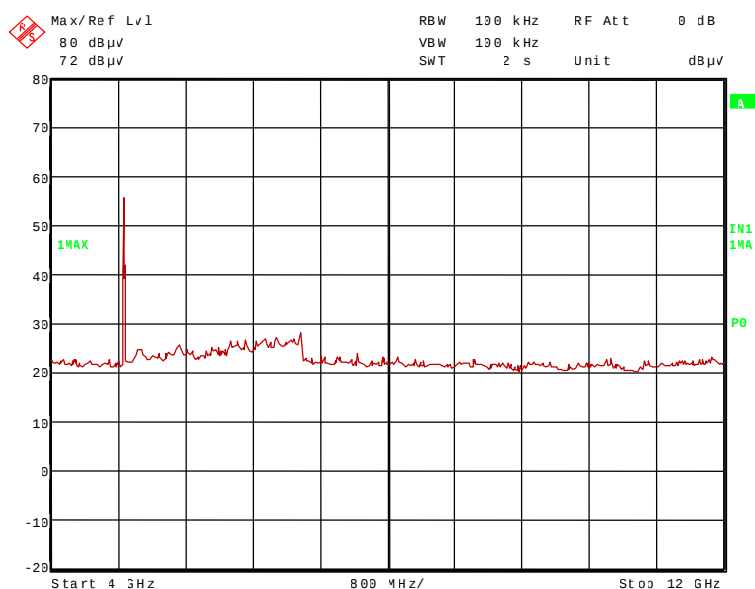
TEST REPORT REFERENCE: F091568E1

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

91568_177.wmf: Spurious emissions from 1 GHz to 4 GHz (b-mode, 11 Mbps):

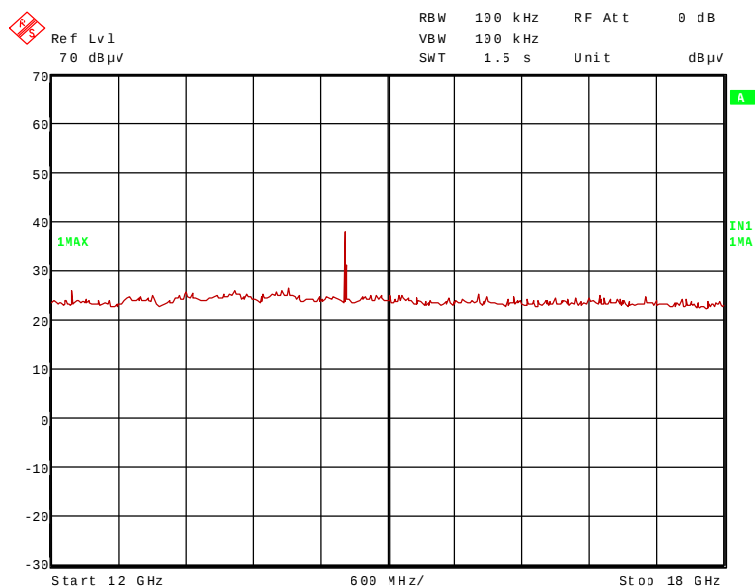


91568_190.wmf: Spurious emissions from 4 GHz to 12 GHz (b-mode, 11 Mbps):

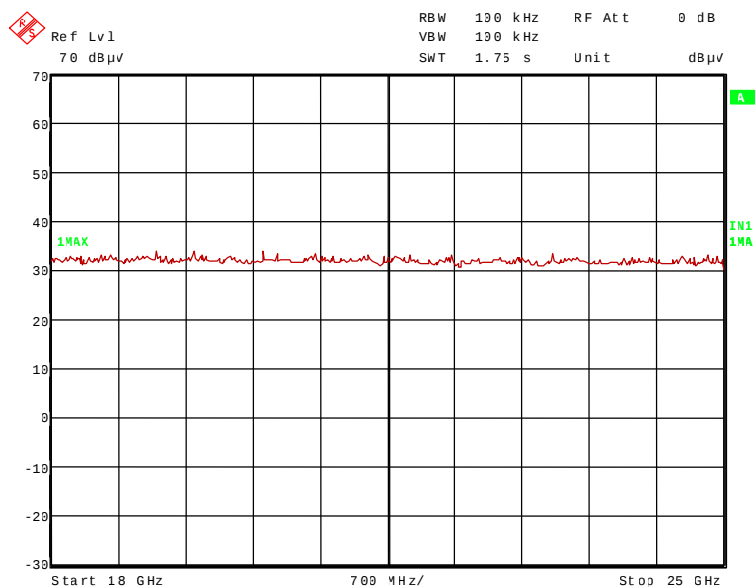


TEST REPORT REFERENCE: F091568E1

91568_209.wmf: Spurious emissions from 12 GHz to 18 GHz (b-mode, 11 Mbps):



91568_206.wmf: Spurious emissions from 18 GHz to 25 GHz (b-mode, 11 Mbps):



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

- 4.874 GHz and 12.185 GHz.

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

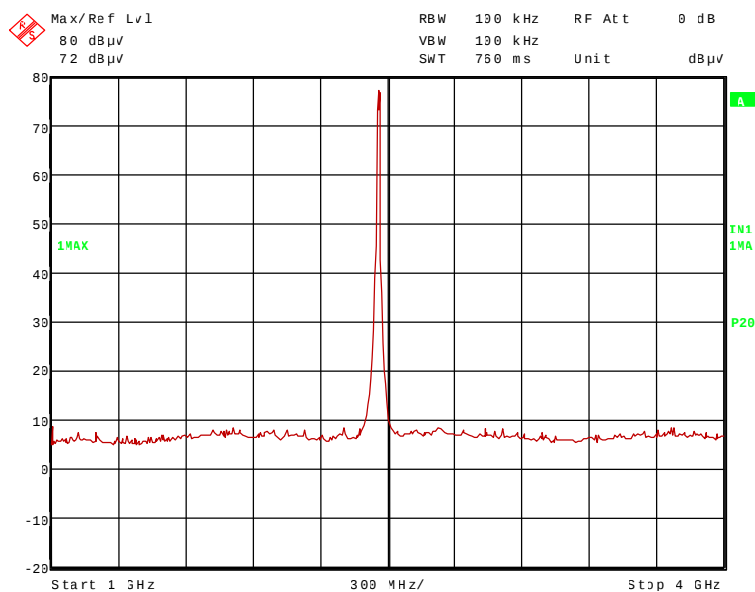
- 2.437 GHz and 14.622 GHz.

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

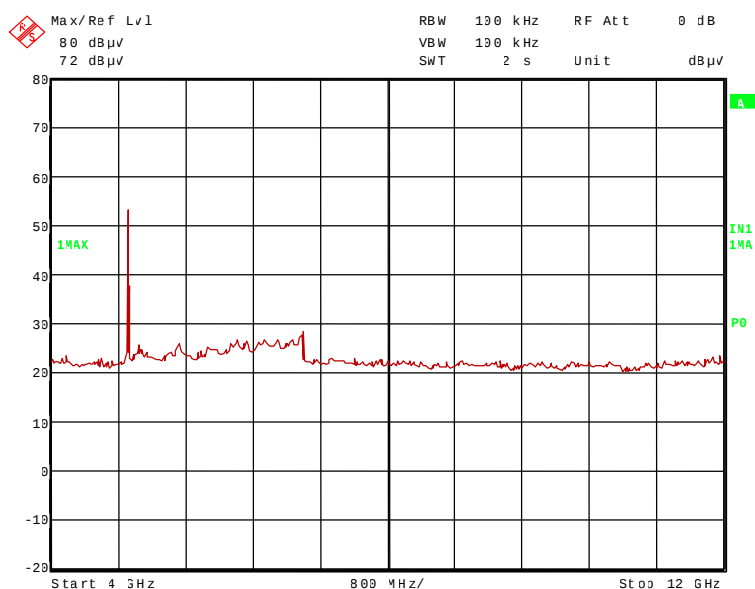
TEST REPORT REFERENCE: F091568E1

Transmitter operates at the upper end of the assigned frequency band (operation mode 3)

91568_178.wmf: Spurious emissions from 1 GHz to 4 GHz (b-mode, 11 Mbps):

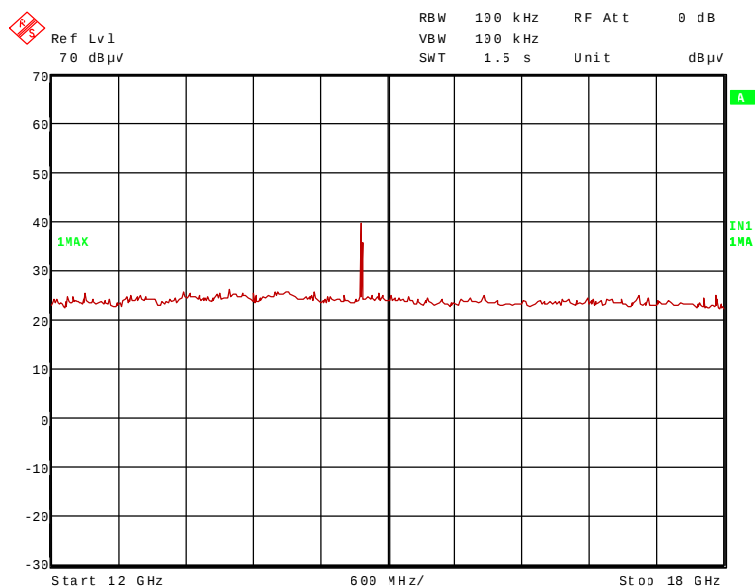


91568_191.wmf: Spurious emissions from 4 GHz to 12 GHz (b-mode, 11 Mbps):

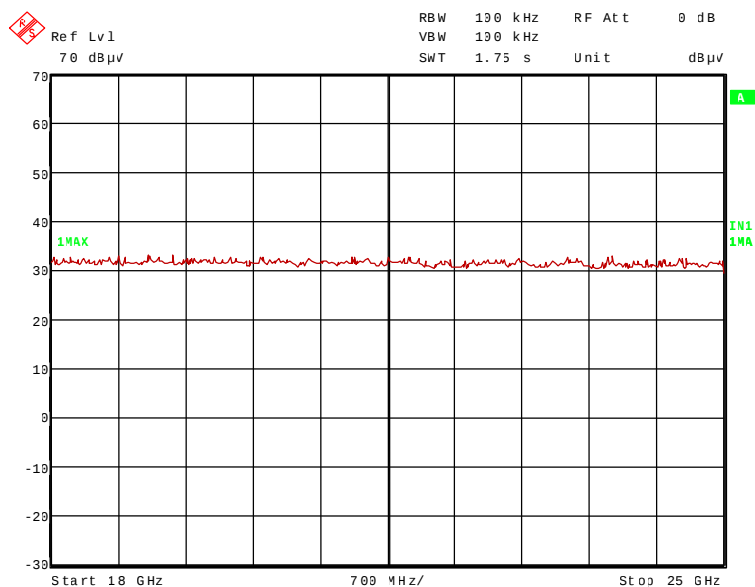


TEST REPORT REFERENCE: F091568E1

91568_208.wmf: Spurious emissions from 12 GHz to 18 GHz (b-mode, 11 Mbps):



91568_207.wmf: Spurious emissions from 18 GHz to 25 GHz (b-mode, 11 Mbps):



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

- 4.924 GHz, 7.386 GHz and 12.160 GHz.

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

- 2.462 GHz, 14.772 GHz and 17.024 GHz.

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

TEST REPORT REFERENCE: F091568E1

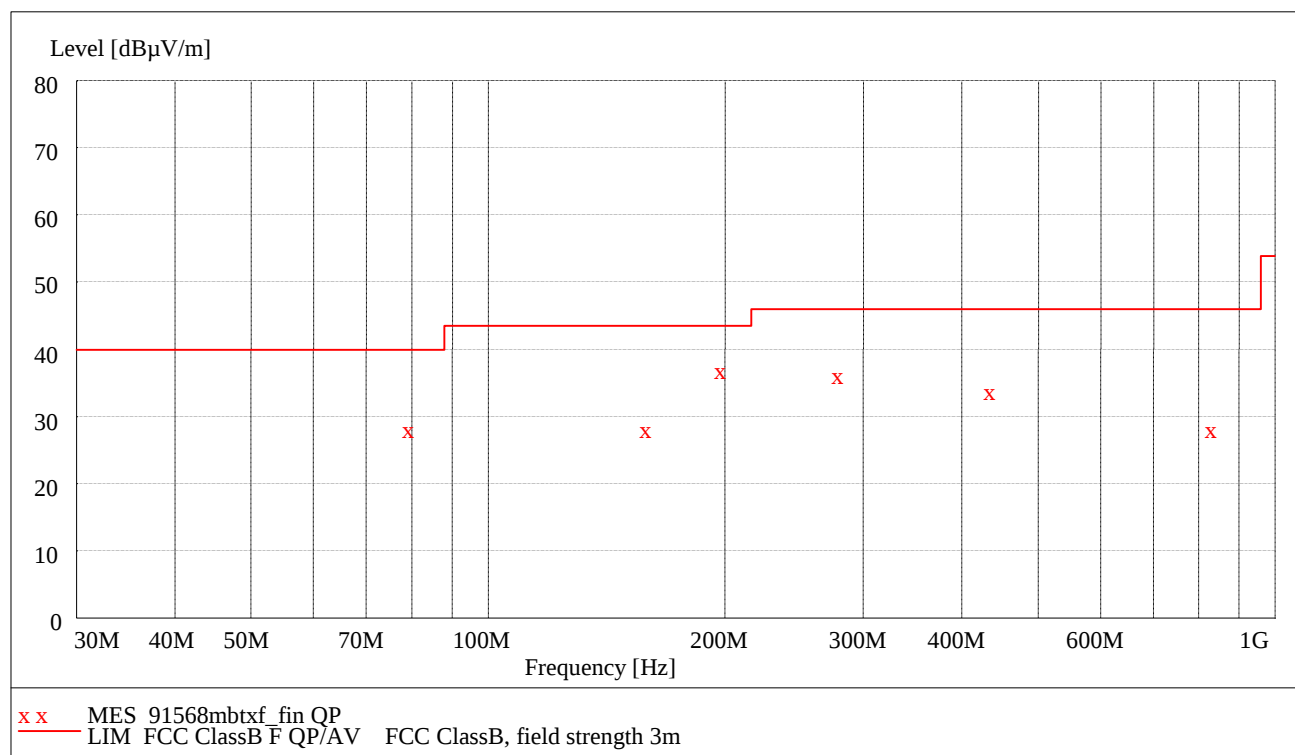
6.5.4.3 FINAL MEASUREMENT (30 MHz to 1 GHz) b-mode, external monopole antenna

Ambient temperature	21 °C	Relative humidity	45 %
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- 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:** For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.
- Supply voltage:** During all measurements the EUT was supplied with 5.0 DC.
- Test record:** The test was carried out in test mode 2 (b-mode with 11 Mbps) of the EUT, because there was no difference to the other test modes. As external monopole antenna the IG-103 with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all monopole antennas.
- Resolution bandwidth:** For all measurements a resolution bandwidth of 120 kHz was used.
- Test results:** The test results were calculated with the following formula:

$$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{cable loss [dB]} + \text{antenna factor [dB/m]}$$

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 subsequent measurement on the open area test site.



Data record name: 91568mbtxf

TEST REPORT REFERENCE: F091568E1

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:
(These values are 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.
80.000	28.8	40.0	11.2	19.6	8.2	1.0	100.0	203.0	Vert.
160.000	28.7	43.5	14.8	16.1	11.1	1.5	150.0	337.0	Vert.
200.000	37.7	43.5	5.8	27.3	8.9	1.5	200.0	158.0	Vert.
440.000	34.3	46.0	11.7	15.5	16.4	2.4	150.0	247.0	Vert.
840.000	28.0	46.0	17.1	2.1	22.7	3.2	100.0	157.0	Hor.
Spurious emissions in 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.
280.000	36.6	46.0	9.4	22.1	12.6	1.9	100.0	112.0	Hor.
Measurement uncertainty				+2.2 dB / -3.6 dB					

The test results were calculated with the following formula:

$$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{cable loss [dB]} + \text{antenna factor [dB/m]}$$

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

14 – 20

TEST REPORT REFERENCE: F091568E1

6.5.4.4 FINAL MEASUREMENT (1 GHz to 25 GHz) g-mode, external monopole antenna

Ambient temperature	21 °C	Relative humidity	42 %
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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 cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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

Remark: The worst case data rate for this measurement was 6 Mbps. As external monopole antenna the IG-103 with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all monopole antennas.

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
2.412	112.9	-	-	80.4	28.8	0.0	3.7	150	Vert.	-
4.824	71.5	74.0	2.5	58.2	33.7	25.7	5.3	150	Vert.	Yes
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
2.412	78.0	-	-	45.5	28.8	0.0	3.7	150	Vert.	-
4.824	41.6	54.0	12.4	28.3	33.7	25.7	5.3	150	Vert.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.437	114.6	-	-	82.1	28.8	0.0	3.7	150	Vert.	-
4.874	69.4	74.0	4.6	56.1	33.8	25.7	5.2	150	Vert.	Yes
14.622	50.9	94.6	43.7	41.3	33.7	26.6	2.5	120	Vert.	No
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
2.437	80.0	-	-	47.5	28.8	0.0	3.7	150	Vert.	-
4.874	40.7	54.0	13.3	27.4	33.8	25.7	5.2	150	Vert.	Yes
14.622	30.6	60.0	29.4	21.0	33.7	26.6	2.5	120	Vert.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.462	114.6	-	-	82.0	28.9	0.0	3.7	150	Vert.	-
4.924	63.5	74.0	10.5	49.9	33.9	25.6	5.3	150	Vert.	Yes
14.772	52.4	94.6	42.2	42.9	33.7	26.7	2.5	120	Vert.	No
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
2.462	79.9	-	-	47.3	28.9	0.0	3.7	150	Vert.	-
4.924	39.1	54.0	14.9	25.5	33.9	25.6	5.3	150	Vert.	Yes
14.772	30.9	59.9	29.0	21.4	33.7	26.7	2.5	120	Vert.	No
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

TEST REPORT REFERENCE: F091568E1

6.5.4.5 FINAL MEASUREMENT (1 GHz to 25 GHz) b-mode, external monopole antenna

Ambient temperature	21 °C	Relative humidity	42 %
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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 cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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

Remark: The worst case data rate for this measurement was 11 Mbps. As external monopole antenna the IG-103 with a 10 cm cable antenna was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all monopole antennas.

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
2.412	112.6	-	-	80.1	28.8	0.0	3.7	150	Vert.	-
4.824	73.8	74.0	0.2	60.5	33.7	25.7	5.3	150	Vert.	Yes
12.060	49.5	74.0	24.5	39.3	33.6	25.9	2.5	120	Vert.	Yes
14.472	55.2	74.0	18.8	45.5	33.7	26.5	2.5	120	Vert.	Yes
16.884	46.3	92.6	46.3	37.5	33.8	27.5	2.5	120	Vert.	No
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
2.412	88.9	-	-	56.4	28.8	0.0	3.7	150	Vert.	-
4.824	53.9	54.0	0.1	40.6	33.7	25.7	5.3	150	Vert.	Yes
12.060	31.8	54.0	22.2	21.6	33.6	25.9	2.5	120	Vert.	Yes
14.472	37.6	54.0	16.4	27.9	33.7	26.5	2.5	120	Vert.	Yes
16.884	30.0	68.9	38.9	21.2	33.8	27.5	2.5	120	Vert.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.437	114.8	-	-	82.3	28.8	0.0	3.7	150	Vert.	-
4.874	71.5	74.0	2.5	58.2	33.8	25.7	5.2	150	Vert.	Yes
12.185	46.2	74.0	27.8	36.0	33.6	25.9	2.5	120	Vert.	Yes
14.622	56.8	94.8	38.0	47.2	33.7	26.6	2.5	120	Vert.	No
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
2.437	91.2	-	-	58.7	28.8	0.0	3.7	150	Vert.	-
4.874	53.2	54.0	0.8	39.9	33.8	25.7	5.2	150	Vert.	Yes
12.185	31.0	54.0	23.0	20.8	33.6	25.9	2.5	120	Vert.	Yes
14.622	38.8	71.2	32.4	29.2	33.7	26.6	2.5	120	Vert.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.462	114.1	-	-	81.5	28.9	0.0	3.7	150	Vert.	-
4.924	66.9	74.0	7.1	53.3	33.9	25.6	5.3	150	Hor.	Yes
7.386	54.6	74.0	19.4	35.1	37.2	24.5	6.8	150	Hor.	Yes
12.160	44.4	74.0	29.6	34.2	33.6	25.9	2.5	100	Hor.	Yes
14.772	59.1	94.1	35.0	49.6	33.7	26.7	2.5	100	Hor.	No
17.024	43.5	94.1	50.6	34.7	33.8	27.5	2.5	100	Vert.	No
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
2.462	90.6	-	-	58.0	28.9	0.0	3.7	150	Vert.	-
4.924	48.5	54.0	5.5	34.9	33.9	25.6	5.3	150	Hor.	Yes
7.386	38.3	54.0	15.7	18.8	37.2	24.5	6.8	150	Hor.	Yes
12.160	30.6	54.0	23.4	20.4	33.6	25.9	2.5	100	Hor.	Yes
14.772	40.9	70.6	29.7	31.4	33.7	26.7	2.5	100	Hor.	No
17.024	29.7	70.6	40.9	20.9	33.8	27.5	2.5	100	Vert.	No
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

TEST REPORT REFERENCE: F091568E1

6.5.4.6 FINAL MEASUREMENT (1 GHz to 25 GHz) n-mode, external monopole antenna

Ambient temperature	21 °C	Relative humidity	42 %
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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 cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC.

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

Remark: The worst case data rate for this measurement was 6 Mbps. As external monopole antenna the IG-103 with a 10 cm antenna cable was used, because of the highest gain of this antenna type. Additionally pre-tests have shown that this antenna caused the highest spurious emissions of all monopole antennas.

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
1.0081	45.6	74.0	28.4	19.0	24.2	0.0	2.4	150	Hor.	Yes
2.412	114.6	-	-	82.1	28.8	0.0	3.7	150	Vert.	-
4.824	68.4	74.0	5.6	55.1	33.7	25.7	5.3	150	Hor.	Yes
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
1.0081	37.6	54.0	16.4	11.0	24.2	0.0	2.4	150	Hor.	Yes
2.412	80.9	-	-	48.4	28.8	0.0	3.7	150	Vert.	-
4.824	38.0	54.0	16.0	24.7	33.7	25.7	5.3	150	Hor.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.437	114.8	-	-	82.3	28.8	0.0	3.7	150	Vert.	-
4.874	68.4	74.0	5.6	55.1	33.8	25.7	5.2	150	Vert.	Yes
14.622	49.7	94.8	45.1	40.1	33.7	26.6	2.5	120	Vert.	No
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
2.437	80.2	-	-	47.7	28.8	0.0	3.7	150	Vert.	-
4.874	40.5	54.0	13.5	27.2	33.8	25.7	5.2	150	Vert.	Yes
14.622	30.6	60.2	29.6	21.0	33.7	26.6	2.5	120	Vert.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F091568E1

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
2.462	114.9	-	-	82.3	28.9	0.0	3.7	150	Vert.	-
4.924	63.7	74.0	10.3	50.1	33.9	25.6	5.3	150	Vert.	Yes
14.772	54.2	94.9	40.7	44.7	33.7	26.7	2.5	100	Vert.	No
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
2.462	79.9	-	-	47.3	28.9	0.0	3.7	150	Vert.	-
4.924	39.9	54.0	14.1	26.3	33.9	25.6	5.3	150	Vert.	Yes
14.772	31.3	59.9	28.6	21.8	33.7	26.7	2.5	100	Vert.	No
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

TEST REPORT REFERENCE: F091568E1

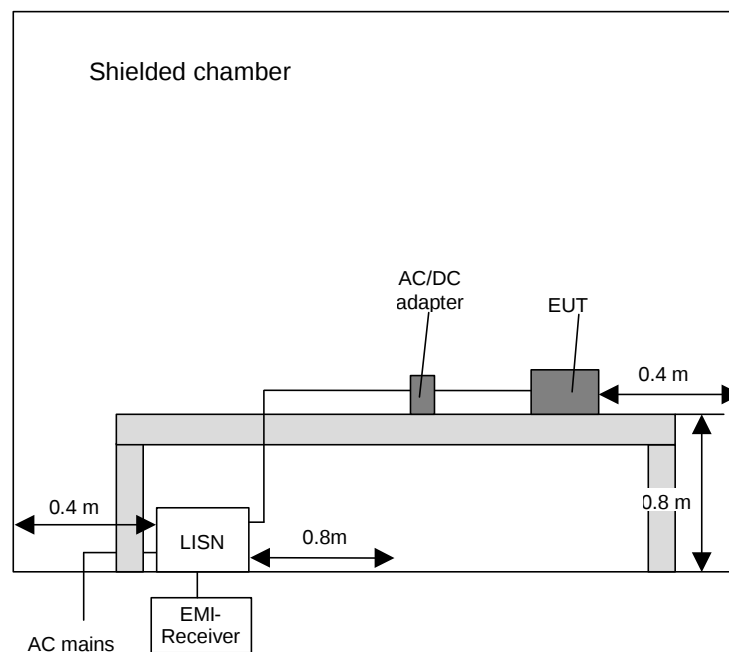
6.6 CONDUCTED EMISSIONS ON POWER SUPPLY LINES (150 kHz to 30 MHz)

6.6.1 METHOD OF MEASUREMENT

This test will be carried out in a shielded chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices will be placed directly on the ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [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 appropriate 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



TEST REPORT REFERENCE: F091568E1

6.6.2 TEST RESULTS (CONDUCTED EMISSIONS ON POWER SUPPLY LINES)

Ambient temperature	21 °C	Relative humidity	62 %
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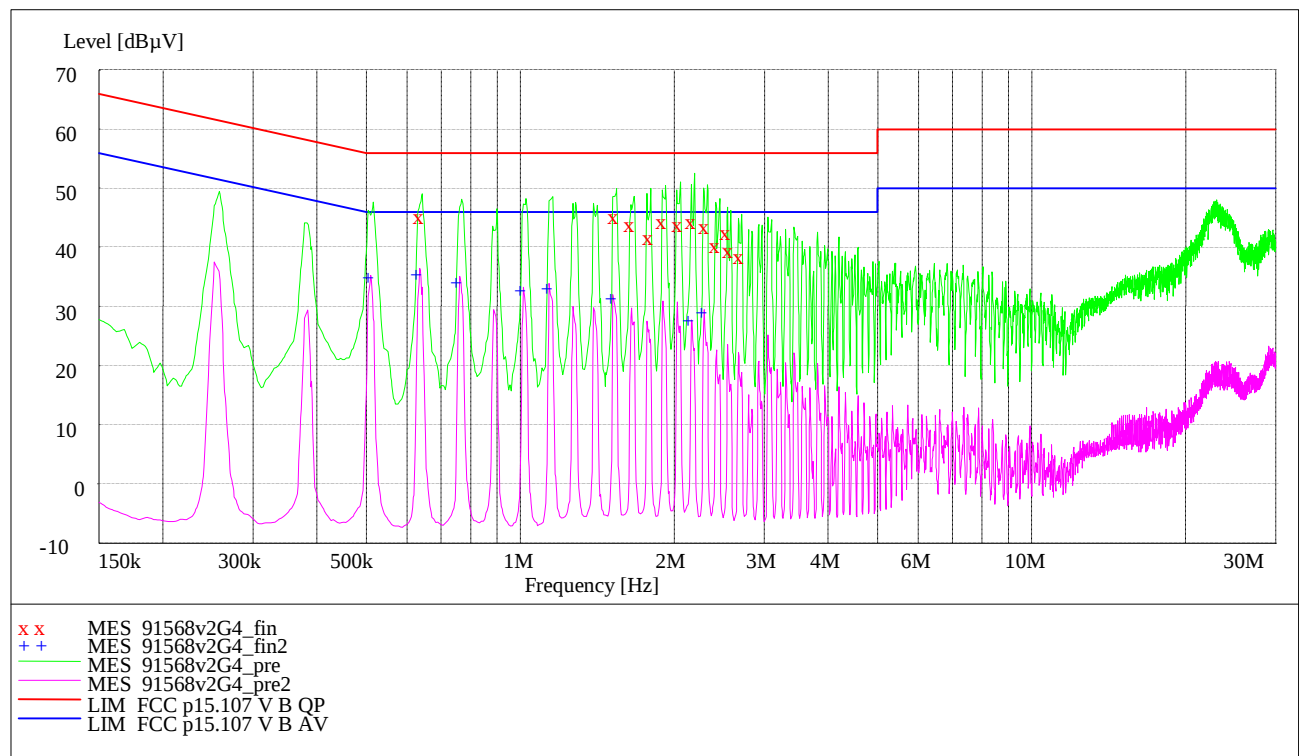
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.

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: All results are shown in the following.

Supply voltage: During the measurement the EUT was supplied 5.0 V DC by an AC / DC adaptor Mascot type 2121. The EUT transmits in g-mode with 54 Mbps, because there was no difference to the other test modes.

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: 91568v2G4

TEST REPORT REFERENCE: F091568E1

Result measured with the peak detector:

(These values are marked in the diagram by an +)

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
0.6423	45.8	0.1	56.0	10.2	L1	GND
1.5423	46.0	0.3	56.0	10.0	L1	FLO
1.6719	44.6	0.2	56.0	11.4	L1	GND
1.7988	42.3	0.3	56.0	13.7	L1	GND
1.9266	45.2	0.4	56.0	10.8	L1	FLO
2.0553	44.8	0.4	56.0	11.2	L1	FLO
2.1993	45.0	0.5	56.0	11.0	L1	FLO
2.3271	44.1	0.5	56.0	11.9	L1	FLO
2.4576	40.9	0.5	56.0	15.1	L1	FLO
2.5467	43.3	0.5	56.0	12.7	L1	GND
2.5872	40.3	0.5	56.0	15.7	L1	GND
2.7159	39.3	0.6	56.0	16.7	L1	GND
Measurement uncertainty				+3.6 dB / -4.5 dB		

Data record name: 91568v2G4_fin

Result measured with the average detector:

(These values are marked in the diagram by an +)

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
0.5100	35.8	0.2	46.0	10.2	L1	FLO
0.6369	36.3	0.1	46.0	9.7	L1	FLO
0.7638	34.9	0.1	46.0	11.1	L1	GND
1.0158	33.4	0.1	46.0	12.6	L1	FLO
1.1436	33.7	0.1	46.0	12.3	L1	FLO
1.5225	32.0	0.3	46.0	14.0	L1	FLO
2.1687	28.5	0.5	46.0	17.5	L1	FLO
2.2947	29.9	0.5	46.0	16.1	L1	GND
Measurement uncertainty				+3.6 dB / -4.5 dB		

Data record name: 91568v2G4_fin2

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

1 – 3, 5, 6

TEST REPORT REFERENCE: F091568E1

7 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

TEST REPORT REFERENCE: F091568E1

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	ESCS 30	Rohde & Schwarz	834489/011	580007	02/27/2008	EMI Receiver
3	LISN	ESH2-Z5	Rohde & Schwarz	879675/037	580006	06/14/2009	LISN
5	High pass filter	HR 0.13-5ENN	FSY Microwave Inc.	DC 0109 SN 002	480340	Weekly verification (system cal.)	
6	EMI-Software	ES-K1	Rohde & Schwarz	-	480111	Not applicable	
14	Open area test site	-	Phoenix Test-Lab	-	480085	Weekly verification	
15	Measuring receiver	ESIB7	Rohde & Schwarz	100304	480521	02/26/2008	02/2010
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 A	Chase	1643	480147	08/01/2007	08/2012
20	EMI Software	ES-K1	Rohde & Schwarz	-	480111	-	-
29	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303	Weekly verification	
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355	02/25/2008	02/2010
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	10/11/2005	10/2010
36	Antenna	3115 A	EMCO	9609-4918	480183	04/11/2008	11/2013
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. 36	Sucoflex 106B	Huber + Suhner	0522/6B	480571	Weekly verification	
44	RF-cable No. 31	RTK 081	Rosenberger	-	410142	Weekly verification	
46	RF-cable 1m	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	02/19/2008	02/2013
72	4 GHz High Pass Filter	WHKX4.0/18G-8SS	Wainwright Instruments	1	480587	Weekly verification	
166	Power Meter	NRVD	Rohde & Schwarz	833697/030	480589	02/28/2008	02/2010
167	Peak Power Sensor	NRV-Z32	Rohde & Schwarz	849745/016	480551	02/28/2008	02/2010

TEST REPORT REFERENCE: F091568E1

8 LIST OF ANNEXES

ANNEX A	PHOTOGRAPHS OF THE TEST SET-UPS:	9 pages
	cB-0926-02 / cB-0926-03, test set-up fully anechoic chamber, Pos. 1	91568_3.jpg
	cB-0926-02 / cB-0926-03, test set-up fully anechoic chamber, Pos. 2	91568_2.jpg
	cB-0926-02 / cB-0926-03, test set-up fully anechoic chamber, Pos. 3	91568_6.jpg
	cB-0926-02 / cB-0926-03, test set-up fully anechoic chamber, Pos. 1	91568_4.jpg
	cB-0926-02 / cB-0926-03, test set-up fully anechoic chamber	91568_1.jpg
	cB-0926-02 / cB-0926-03, test set-up fully anechoic chamber	91568_5.jpg
	cB-0926-02 / cB-0926-03, test set-up fully anechoic chamber	91568_12.jpg
	cB-0926-02 / cB-0926-03, test set-up open area test-site	91568_23.jpg
	cB-0926-02 / cB-0926-03, test set-up conducted emission measurement	91568_30.jpg
ANNEX B	EXTERNAL PHOTOGRAPHS OF THE TEST SAMPLE:	- pages
	Because the EUT is a module, which will be implemented into a final application, no external photographs were available.	
ANNEX C	INTERNAL PHOTOGRAPHS OF THE TEST SAMPLE:	14 pages
	cB-0926-02, PCB with internal antenna, top view	91568_a.jpg
	cB-0926-02, PCB with internal antenna, top view, cover removed	91568_c.jpg
	cB-0926-02, PCB with antenna connectors, top view	91568_h.jpg
	cB-0926-02, PCB with antenna connectors, top view, cover removed	91568_j.jpg
	cB-0926-02, PCB, bottom view	91568_i.jpg
	cB-0926-03, PCB with internal antenna, top view	91568_d.jpg
	cB-0926-03, PCB with internal antenna, top view, cover removed	91568_f.jpg
	cB-0926-03, PCB with antenna connectors, top view	91568_k.jpg
	cB-0926-0, PCB with antenna connectors, top view, cover removed	91568_m.jpg
	cB-0926-03, PCB, bottom view	91568_l.jpg
	cB-0903-03, carrier board, top view	91568_n.jpg
	cB-0903-03, carrier board, bottom view	91568_o.jpg
	cB-0717-2, adapter board, top view	91568_q.jpg
	cB-0717-02, adapter board, bottom view	91568_p.jpg
ANNEX D	ADDITIONAL RESULTS FOR INDUSTRY CANADA:	21 pages