PHOENIX TESTLAB
Königswinkel 10
32825 Blomberg
Germany
Phone +49 5235 9500-0
Fax +49 5235 9500-10

TEST REPORT

Test Report Reference: F101171E1

Equipment under Test: Bluetooth transceiver inside Tachymeter

Model name: Focus Bluetooth Module

FCC ID: YK5-TJFBM

IC: 9102A-TJFBM

Serial Number: 870000024

Applicant: Trimble Jena GmbH

Manufacturer: Trimble Jena GmbH

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

Contents: **Page**

1 IDENTIFICATION

1.1 APPLICANT

Name:	Trimble Jena GmbH
Address:	Carl-Zeiss-Promenade 10 07743 Jena
Country:	Germany
Name for contact purposes:	Mr. Eyk TAEGE
Tel:	+49 3641 531 1339
Fax:	+49 3641 531 1310
e-mail address:	Eyk_Taege@Trimble.com

1.2 MANUFACTURER

Name:	Trimble Electronic Products (Shanghai) Co., Ltd.
Address:	311 Fute (M) Road, 3/F; Wai Gaoqiao Free Trade Zone; Pudong, Shanghai 200131
Country:	China
Name for contact purposes:	Mr. Paul ZHANG
Tel:	+86-21504642135
Fax:	+86-2150460636
e-mail address:	Paul_Zhang@Trimble.com

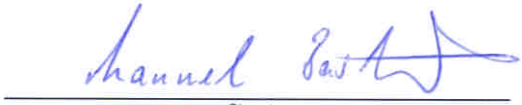
1.3 DATES

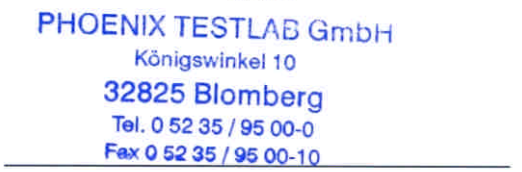
Date of receipt of test sample:	20 May 2010
Start of test:	26 May 2010
End of test:	23 June 2010

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**
Germany **Fax: +49 (0) 52 35 / 95 00-10**

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.

Test engineer:	Manuel BASTERT		23 June 2010
	Name	Signature	Date
Test report checked:	Bernd STEINER		23 June 2010
	Name	Signature	Date



Stamp

1.5 RESERVATION

This test report is only valid in its original form.

Any reproduction of its contents without written permission of the accredited test laboratory PHOENIX TESTLAB GmbH is prohibited.

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

[2] **FCC CFR 47 Part 15 (October 2008)** 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.

2 TECHNICAL DATA OF EQUIPMENT

Equipment under test: *	Bluetooth transceiver inside Tachymeter Focus 30-2"					
Model name: *	Focus Bluetooth Module					
Type of equipment: *	Bluetooth Module for Motorized Total Station for surveying					
FCC ID: *	YK5-TJFBM					
IC: *	9102A-TJFBM					
Fulfills Bluetooth specification: *	2.0 with EDR					
Antenna type: *	P/N 2450AT43A100 by Johanson Technology, Inc.					
Antenna gain: *	2 dBi max.					
Rated output power: *	1.0mW					
Antenna connector: *	None					
Power supply: *	U_{nom}=	11.1 V DC	U_{min}=	8 V DC	U_{max}=	15 V DC
Type of modulation: *	FHSS: GFSK (1 Mbps), π/4-DPQSK (2 Mbps) or 8DPSK (3 Mbps)					
Operating frequency range:*	2402 MHz to 2480 MHz					
Number of channels: *	79					
Temperature range: *	-30 °C to +50 °C					
PCB Number	7S701-461					
Hardware Version	See pcb number					
Software Version	Focus 30 Firmware package T1.0.4					

*: declared by the applicant

Bluetooth operates in the unlicensed ISM band at 2.4 GHz. In North America (USA and Canada) a band with a width of 83.5 MHz is available. In this band 79 RF channels spaced 1 MHz apart are defined. The channel is represented by a pseudo random hopping sequence through the 79 channels. The normally occupancy time of one frequency will be 625 µs. The ordinary hopping rate will be 1600 hops/s. All frequencies will be used equally.

The following external I/O cables were used:

Identification	Connector		Length*
	EUT	Ancillary	
No cables connectable to EUT			
-	-	-	-

*: Length during the test if no other specified.

3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

The EUT is a Tachymeter instrument to be used for measurements in Geodesy. The tachymeter can be controlled and data can be stored by a handheld instrument via Bluetooth.

During the tests the test sample was powered with 11.1 V_{DC} by an internal battery.

The operation modes in the table below could be set directly at the EUT by using test software which was installed on the embedded PC of the EUT. All measurements were carried out with the internal antenna of the EUT.

The following operation modes were used during the tests:

Operation mode	Description of the operation mode	Modulation	Data rate / Mbps
1	Continuous transmitting on 2402 MHz	GFSK	1
1a		π/4-DQPSK	2
1b		8DPSK	3
2	Continuous transmitting on 2441 MHz	GFSK	1
2a		π/4-DQPSK	2
2b		8DPSK	3
3	Continuous transmitting on 2480 MHz	GFSK	1
3a		π/4-DQPSK	2
3b		8DPSK	3
4	Transmitter hopping on all channels	GFSK	1
4a		π/4-DQPSK	2
4b		8DPSK	3
5	Continuous receiving on 2441 MHz		

Physical boundary of the EUT

EUT FOCUS 30-2”

The following test modes were adjusted during the tests:

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

Test items	Operation mode
20 dB bandwitdh	1b, 2b, 3b (3 Mbps)
Carrier frequency separation	4b, 4b, 4b (3 Mbps)
Number of hopping channels	4 (1 Mbps)
Dwell time	2, 2a, 2b (1-, 2- and 3 Mbps)
Maximum peak output power	1, 1a, 1b, 2, 2a, 2b, 3, 3a and 3b (1-, 2- and 3 Mbps)
Conducted emissions (transmitter)	1, 2, 3 (1 Mbps)
Band edge compliance (radiated)	1, 3, 4 (1 Mbps)
Radiated emissions (transmitter)	1, 2, 3 (1 Mbps)
Radiated emissions (receiver)	5

4 LIST OF MEASUREMENTS

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	RSS 210, Issue 7 [4] or RSS-Gen, Issue 2 [5]	Status	Refer page
20 dB bandwitdh	General	15.247 (a) (1)	A8.1 (b) [4]	Passed	10 et seq.
Carrier frequency separation	General	15.247 (a) (1)	A8.1 (b) [4]	Passed	13 et seq.
Number of hopping channels	2400.0 - 2483.5	15.247 (a) (1) (iii)	A8.1 (d) [4]	Passed	16 et seq.
Dwell time	2400.0 - 2483.5	15.247 (a) (1) (iii)	A8.1 (d) [4]	Passed	18 et seq.
Maximum peak output power	2400.0 - 2483.5	15.247 (b) (1)	A8.4 (2) [4]	Passed	25 et seq.
Band edge compliance	2400.0 - 2483.5	15.247 (d)	A8.5 [4]	Passed	28 et seq.
Radiated emissions (transmitter)	0.009 - 25,000	15.205 (a) 15.209 (a)	A8.5 [4] 2.6 [4]	Passed	33 et seq.
Radiated emissions (receiver)	0.009 - 25,000	15.109 (a)	6 [5] 2.6 [4]	Passed	Annex D
Conducted emissions on supply line	0.15 - 30	15.207 (a)	7.2.2 [5]	Not applicable	-

5 TEST RESULTS

5.1 20 dB BANDWIDTH

5.1.1 METHOD OF MEASUREMENT (20 dB BANDWIDTH)

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

The following spectrum analyser settings shall be used:

- Span: App. 2 to 3 times the 20 dB bandwidth, centred on the actual hopping channel.
- Resolution bandwidth: ≥ 1 % of the 20 dB bandwidth.
- Video bandwidth: ≥ the resolution bandwidth.
- Sweep: Auto.
- Detector function: peak.
- Trace mode: Max hold.

After trace stabilisation the marker shall be set on the signal peak. The first display line has to be set on this value. The second display line has to be set 20 dB below the first line (or the peak marker). The frequency lines shall be set on the intersection points between the second display line and the measured curve.

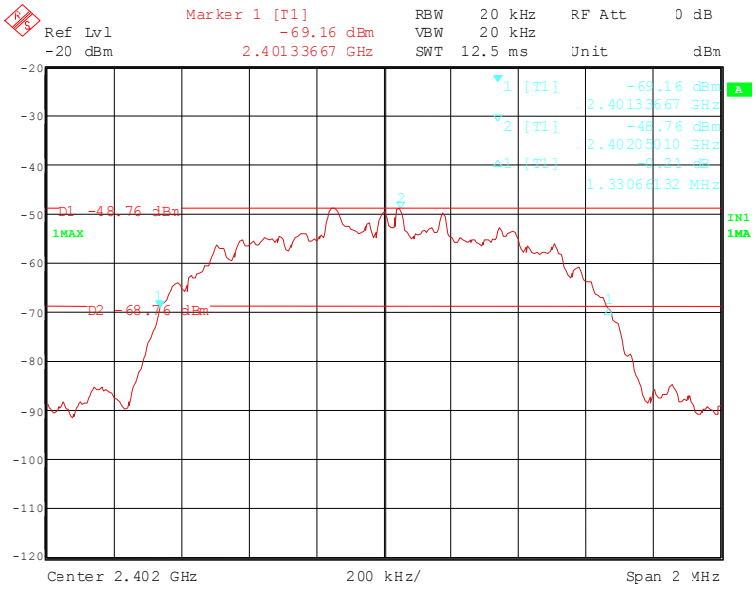
The measurement will be performed at the upper, the lower end and the middle of the assigned frequency band.

Test set-up:

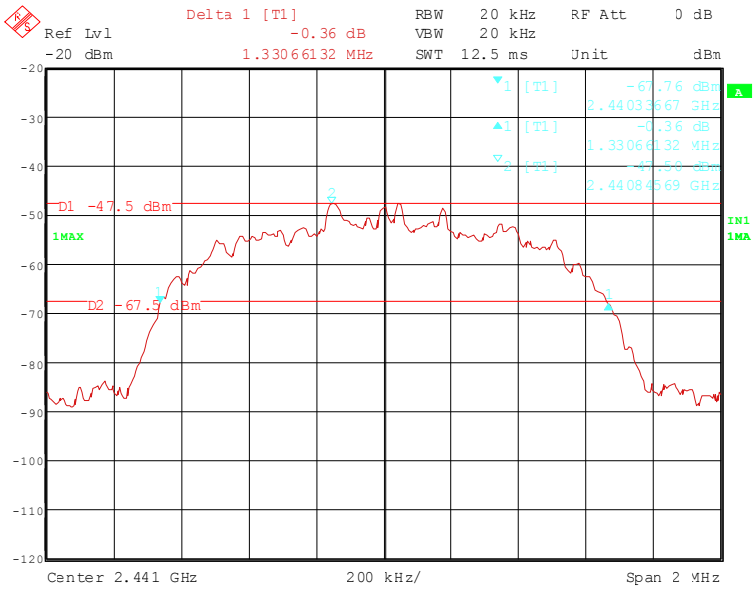
5.1.2 TEST RESULTS (20 dB BANDWIDTH)

Ambient temperature	21 °C	Relative humidity	50 %

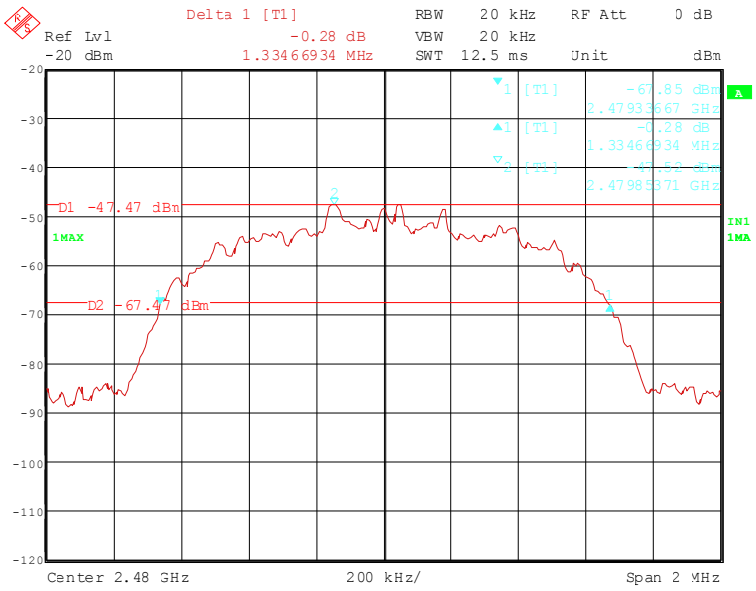
101171_31.wmf: 20 dB bandwidth at the lower end of the assigned frequency band (operation mode 1b):



101171_32.wmf: 20 dB bandwidth at the middle of the assigned frequency band (operation mode 2b):



101171_33.wmf: 20 dB bandwidth at the upper end of the assigned frequency band (operation mode 3b):



Channel number	Channel frequency [MHz]	20 dB bandwidth [kHz]
Operation mode 1b, 2b, 3b		
0	2402	1330.661
39	2441	1330.661
78	2480	1334.669
Measurement uncertainty		+0.66 dB / -0.72 dB

TEST EQUIPMENT USED FOR THE TEST:
31

5.2 CARRIER FREQUENCY SEPARATION

5.2.1 METHOD OF MEASUREMENT (CARRIER FREQUENCY SEPARATION)

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

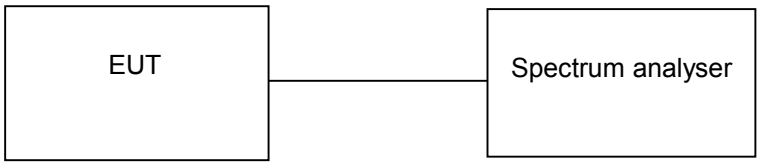
The following spectrum analyser settings shall be used:

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

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

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

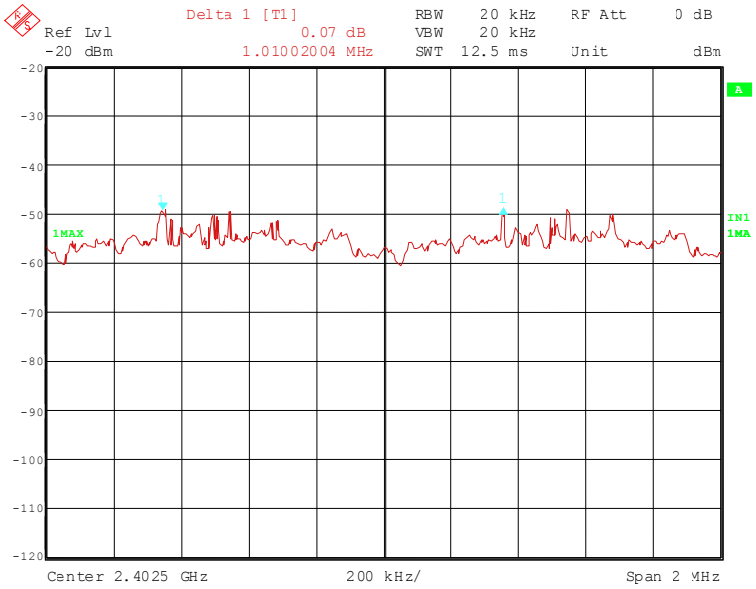
Test set-up:



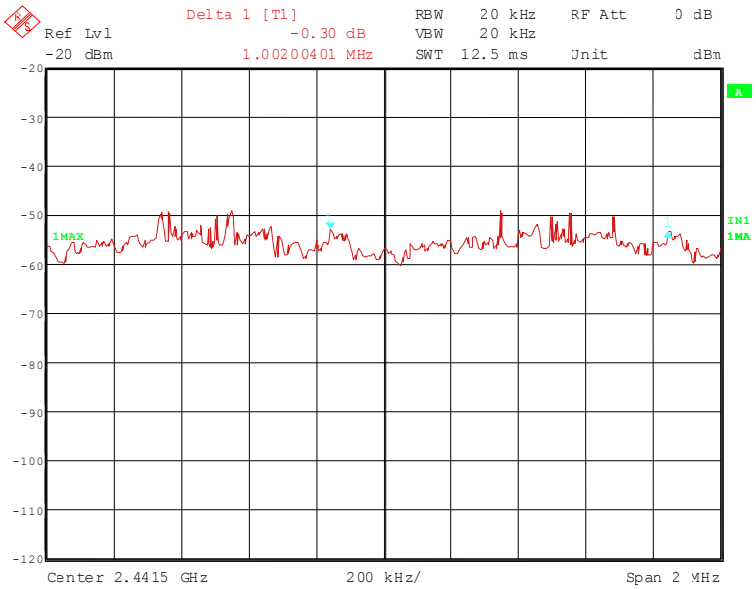
5.2.2 TEST RESULTS (CARRIER FREQUENCY SEPARATION)

Ambient temperature	21 °C	Relative humidity	50 %

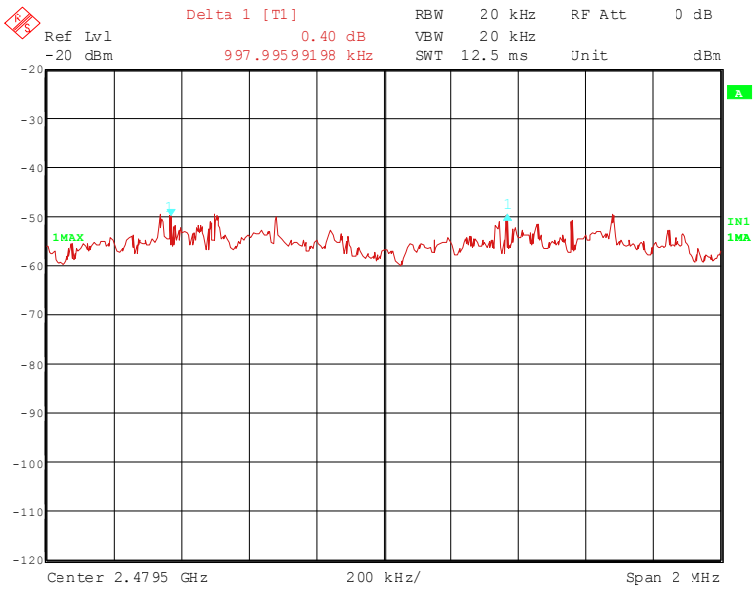
101171_27.wmf: Channel separation at the lower end of the assigned frequency band (operation mode 4b):



101171_28.wmf: Channel separation at the middle of the assigned frequency band (operation mode 4b):



101171_29.wmf: Channel separation at the upper end of the assigned frequency band (operation mode 4b):



Channel number	Channel frequency [MHz]	Channel separation [kHz]	Minimum limit [kHz]
Operation mode 4b			
0	2402	1010	897.795 ($^2/_3$ of the 20 dB bandwidth)
39	2441	1002	897.795 ($^2/_3$ of the 20 dB bandwidth)
78	2480	998	897.795 ($^2/_3$ of the 20 dB bandwidth)
Measurement uncertainty			$<10^{-7}$

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
31

5.3 NUMBER OF HOPPING FREQUENCIES

5.3.1 METHOD OF MEASUREMENT (NUMBER OF HOPPING FREQUENCIES)

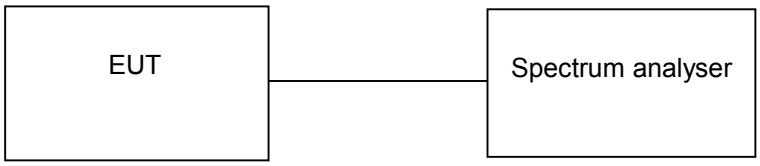
The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT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

The following spectrum analyser settings shall be used:

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

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

Test set-up:

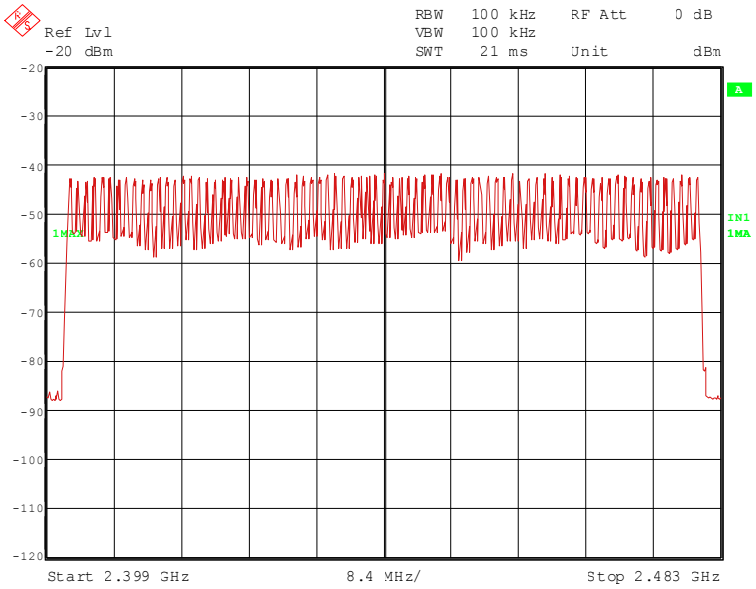


5.3.2 TEST RESULTS (NUMBER OF HOPPING FREQUENCIES)

Ambient temperature	21 °C

Relative humidity	50 %

101171_30.wmf: Number of hopping channels (operation mode 4):



Number of hopping channels	Limit
79	At least 15

TEST EQUIPMENT USED FOR THE TEST:
31

5.4 DWELL TIME

5.4.1 METHOD OF MEASUREMENT (DWELL TIME)

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

The following spectrum analyser settings shall be used:

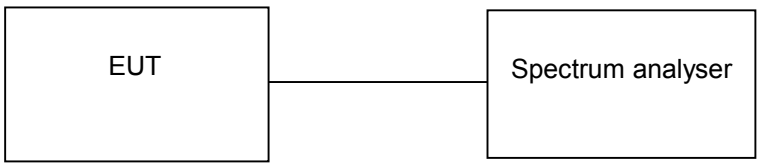
- Span: Zero, centred on a hopping channel.
- Resolution bandwidth: 1 MHz.
- Video bandwidth: ≥ the resolution bandwidth.
- Sweep: As necessary to capture the entire dwell time per hopping channel.
- Detector function: peak.
- Trace mode: Max hold.

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

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

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

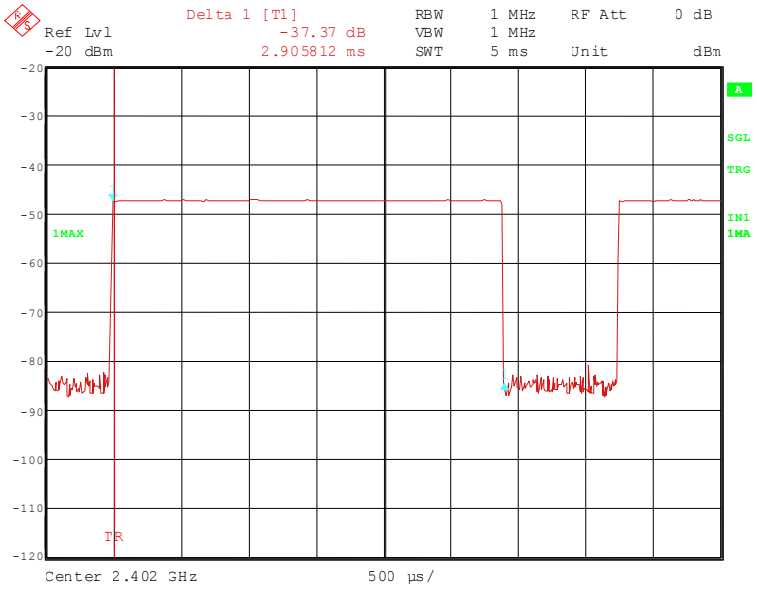
Test set-up:



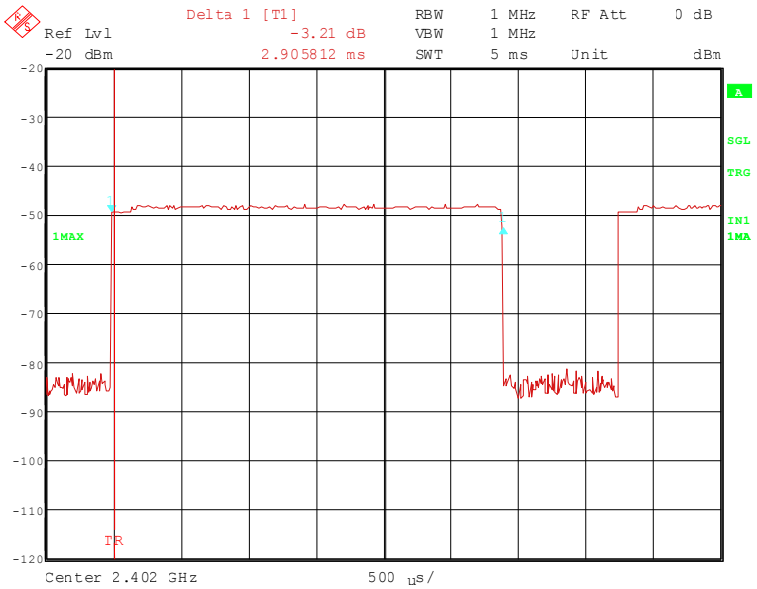
5.4.2 TEST RESULTS (DWELL TIME)

Ambient temperature	21 °C	Relative humidity	50 %

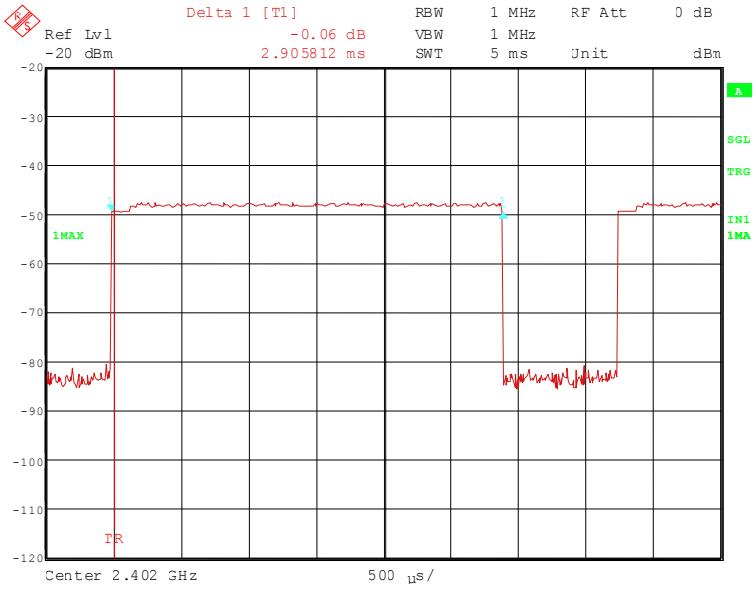
101171_37.wmf: Dwell time at the lower end of the assigned frequency band (operation mode 1):



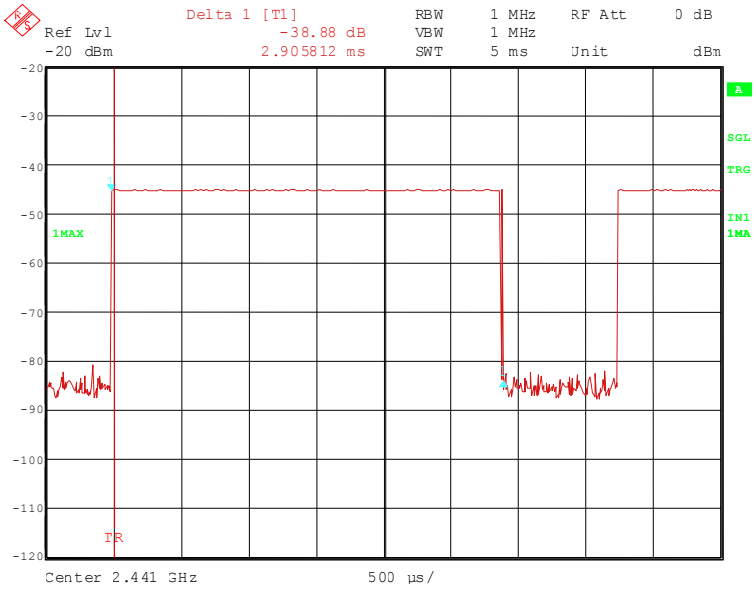
101171_38.wmf: Dwell time at the lower end of the assigned frequency band (operation mode 1a):



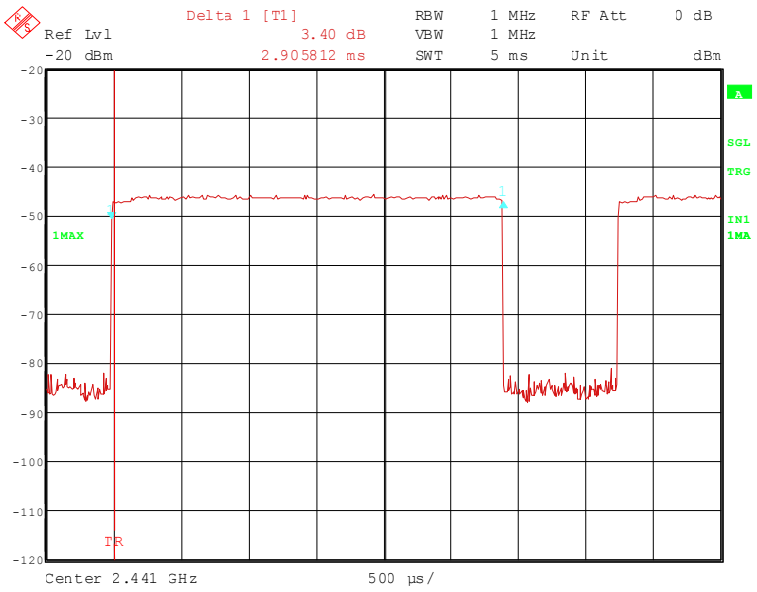
101171_39.wmf: Dwell time at the lower end of the assigned frequency band (operation mode 1b):



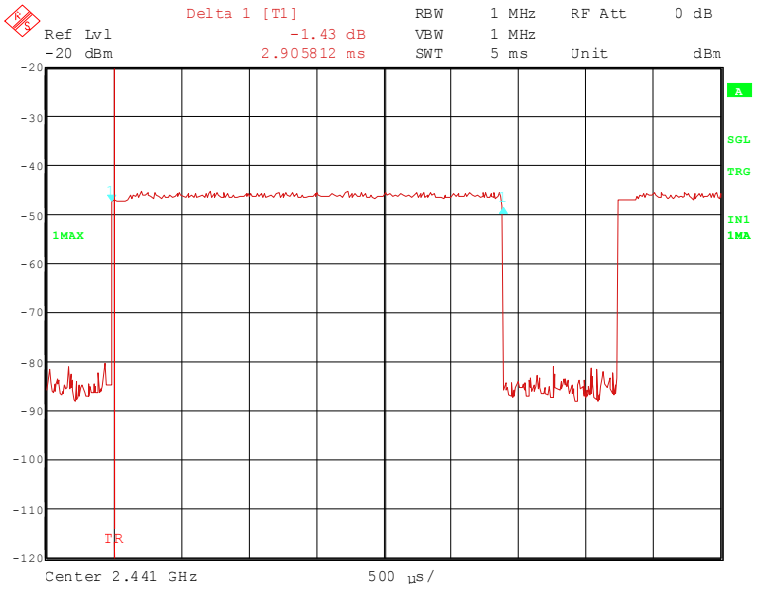
101171_40.wmf: Dwell time at the lower end of the assigned frequency band (operation mode 2):



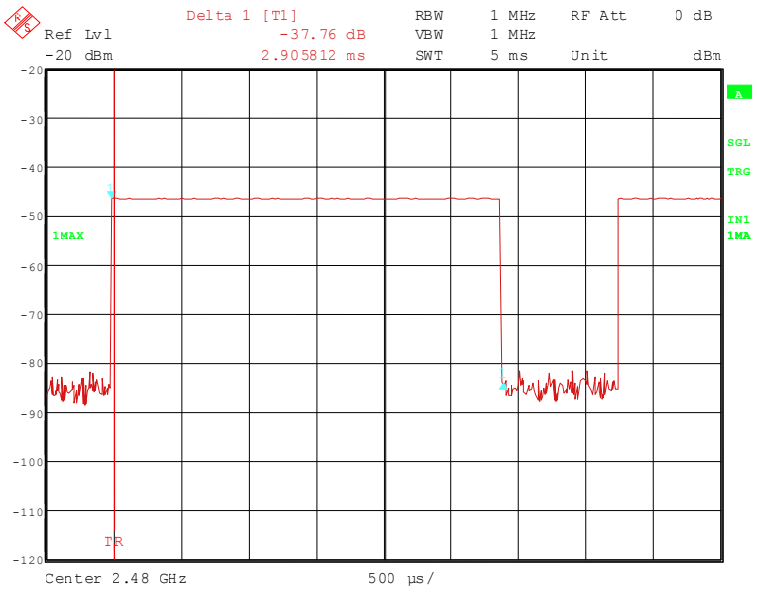
101171_41.wmf: Dwell time at the lower end of the assigned frequency band (operation mode 2a):



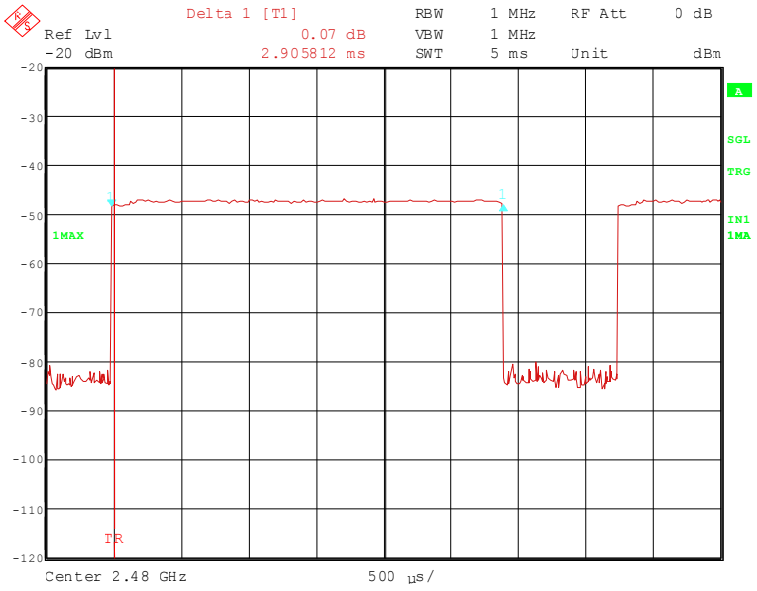
101171_42.wmf: Dwell time at the middle of the assigned frequency band (operation mode 2b):



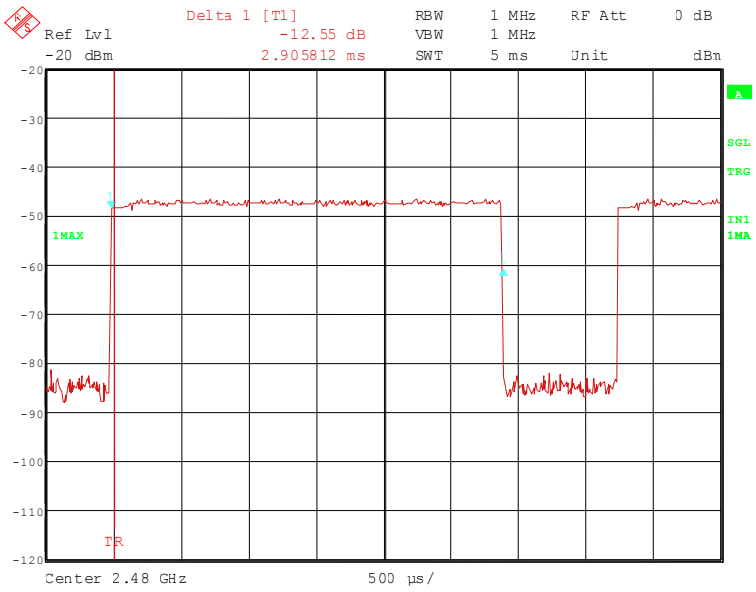
101171_43.wmf: Dwell time at the upper end of the assigned frequency band (operation mode 3):



101171_44.wmf: Dwell time at the upper end of the assigned frequency band (operation mode 3a):



101171_45.wmf: Dwell time at the upper end of the assigned frequency band (operation mode 3b):



The dwell time is calculated with the following formula:

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

Where:

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

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

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

Operation mode 1; 2; 3				
Channel number	Channel frequency [MHz]	t_{pulse} [µs]	Dwell time [ms]	Limit [ms]
1	2402	2905.812	309.953	400
39	2441	2905.812	309.953	400
78	2480	2905.812	309.953	400
Operation mode 1a; 2a; 3a				
Channel number	Channel frequency [MHz]	t_{pulse} [µs]	Dwell time [ms]	Limit [ms]
1	2402	2905.812	309.953	400
39	2441	2905.812	309.953	400
78	2480	2905.812	309.953	400
Operation mode 1b; 2b; 3b				
Channel number	Channel frequency [MHz]	t_{pulse} [µs]	Dwell time [ms]	Limit [ms]
1	2402	2905.812	309.953	400
39	2441	2905.812	309.953	400
78	2480	2905.812	309.953	400
Measurement uncertainty			$<10^{-7}$	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
29, 31, 34, 36, 43, 46

5.5 MAXIMUM PEAK OUTPUT POWER

5.5.1 METHOD OF MEASUREMENT (MAXIMUM PEAK OUTPUT POWER)

The same test set-up as used for the final radiated emission measurement shall be used (refer also subclause 5.7.1 of this test report).

The following spectrum analyser settings shall be used:

- Span: Approx. 5 times the 20 dB bandwidth, centred on a hopping channel.
- Resolution bandwidth: > the 20 dB bandwidth of the emission being measured.
- Video bandwidth: ≥ the resolution bandwidth.
- Sweep: Auto.
- Detector function: peak.
- Trace mode: Max hold.

After trace stabilisation the marker shall be set on the signal peak. The indicated level is the peak output power, which has to be corrected with the value of the cable loss and an external attenuation (if necessary).

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

5.5.2 ALTERNATIVE TEST PROCEDURE

If antenna conducted tests cannot be performed on this device, radiated tests to show compliance with the peak output power limit specified in Section 15.247(b) and the spurious RF conducted emission limit specified in Section 15.247(c) are acceptable. As stated previously, a pre-amp, and, in the latter case, a high pass filter, are required for the following measurements.

1) Calculate the transmitter's peak power using the following equation:

$$E = \frac{\sqrt{30 \cdot P \cdot G}}{d}$$

Where: E is the measured maximum fundamental field strength in V/m, utilizing a RBW ≥ the 20 dB bandwidth of the emission, VBW > RBW, peak detector function. Follow the procedures in C63.4-1992 with respect to maximizing the emission.

G is the numeric gain of the transmitting antenna with reference to an isotropic radiator.
d is the distance in meters from which the field strength was measured.
P is the power in watts for which you are solving:

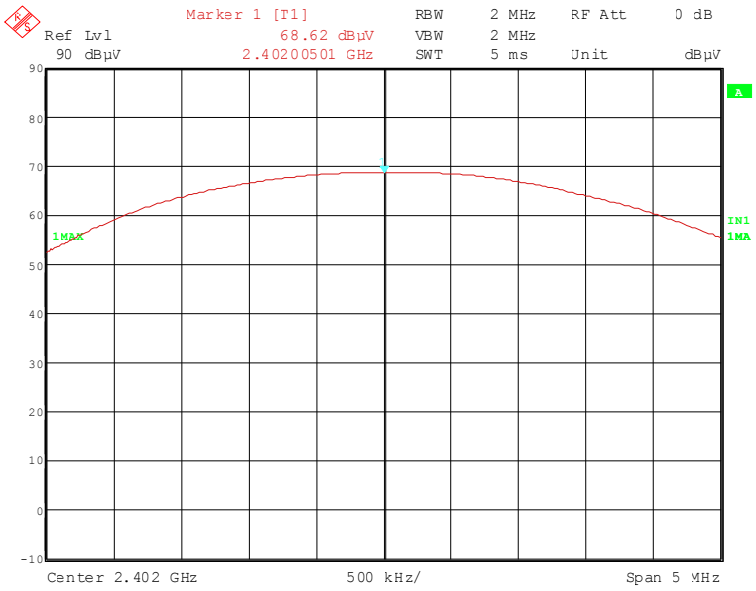
$$P = \frac{(E \cdot d)^2}{30 \cdot G}$$

5.5.3 TEST RESULTS (MAXIMUM PEAK OUTPUT POWER)

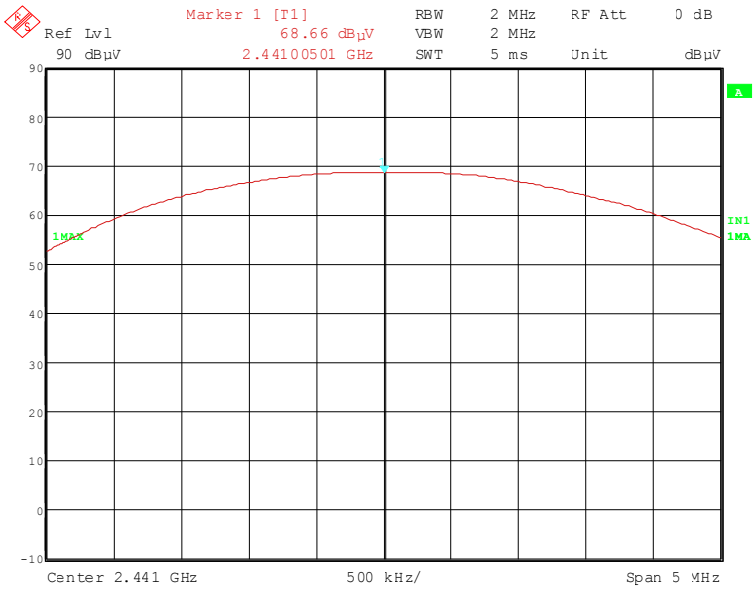
Ambient temperature	21 °C

Relative humidity	50 %

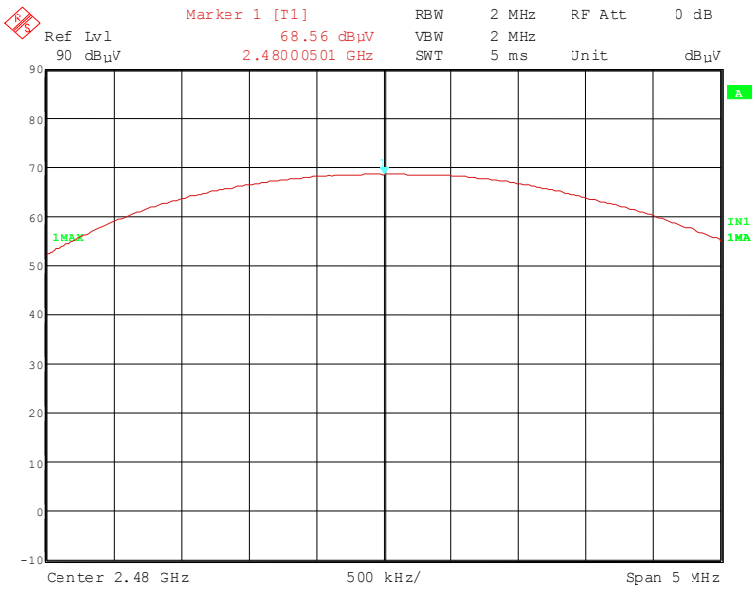
101171_34.wmf: Maximum peak output power at the lower end of the assigned frequency band (operation mode 1):



101171_35.wmf: Maximum peak output power at the middle of the assigned frequency band (operation mode 2):



101171_36.wmf: Maximum peak output power at the upper end of the assigned frequency band (operation mode 3):



Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	101.1	-	-	68.6	28.8	0.0	3.7	150	Hor.	No
2.441	101.3	-	-	68.7	28.9	0.0	3.7	150	Hor.	No
2.480	101.4	-	-	68.6	29.0	0.0	3.8	150	Hor.	No
Measurement uncertainty: +2.2 dB / -3.6 dB										

Maximum peak output power calculated with equation $P = \frac{(E \cdot d)^2}{30 \cdot G}$

Operation mode	Channel number	Channel frequency [MHz]	Maximum peak output power [dBm]	Antenna gain [dBi]	Peak power limit [dBm]
1	0	2402	3.9	2.0	30.0
2	39	2441	4.1	2.0	30.0
3	78	2480	4.2	2.0	30.0

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
29, 31, 34, 36, 43, 46

5.6 BAND-EDGE COMPLIANCE

5.6.1 METHOD OF MEASUREMENT (BAND-EDGE COMPLIANCE (RADIATED))

The same test set-up as used for the final radiated emission measurement shall be used (refer also subclause 5.8.1 of this test report). The measurements shall be carried out with using a resolution bandwidth of 100 kHz.

The following spectrum analyser settings shall be used:

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

After trace stabilisation the marker shall be set on the signal peak. The first display line has to be set on this value. The second display line has to be set 20 dB below the first line (or the peak marker). The frequency line shall be set on the edge of the assigned frequency band. Set the second marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is higher than that at the band-edge. This frequency shall be measured with the EMI receiver as described in subclause 5.8.1 of this test report, but 100 kHz resolution bandwidth shall be used.

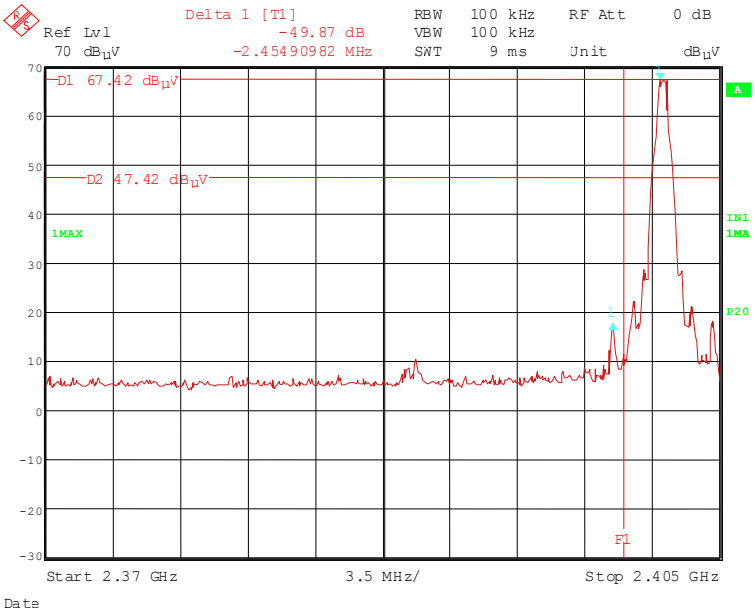
The measurement will be performed at the upper end of the assigned frequency band and with hopping on and off.

5.6.2 TEST RESULT (BAND-EDGE COMPLIANCE (RADIATED))

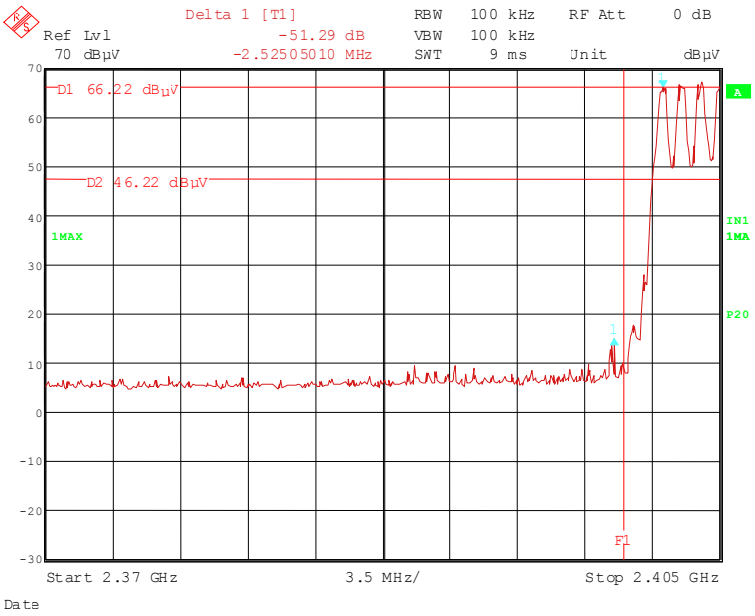
Ambient temperature	21 °C

Relative humidity	60 %

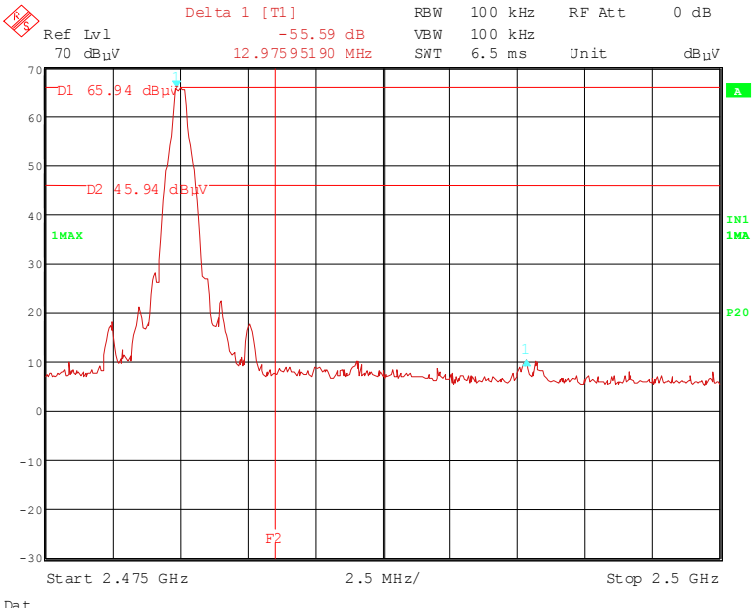
101171_12.wmf: Radiated band-edge compliance, lower band edge, hopping off (operation mode 1):



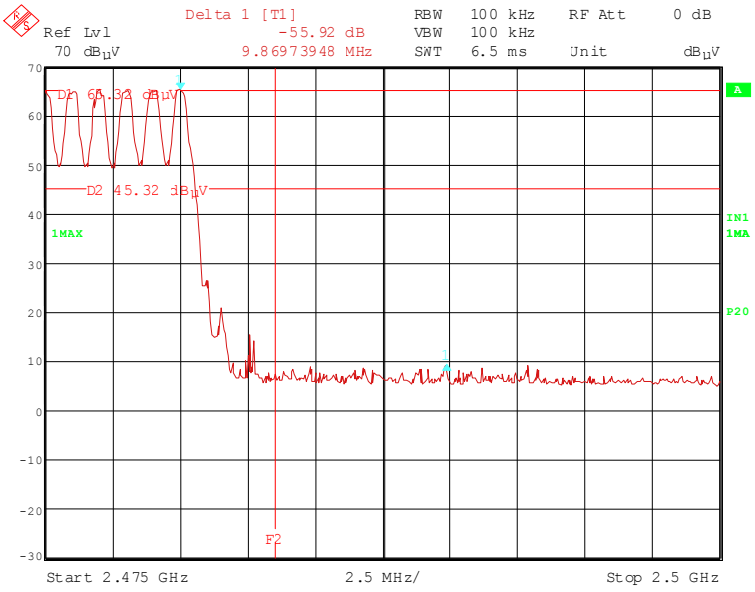
101171_13.wmf: Radiated band-edge compliance, lower band edge, hopping on (operation mode 4):



101171_14.wmf: Radiated band-edge compliance, upper band edge, hopping off (operation mode 3):



101171_15.wmf: Radiated band-edge compliance, upper band edge, hopping on (operation mode 4):



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

Band-edge compliance (lower band edge. hopping disabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	98.2	-	-	65.7	28.8	0.0	3.7	150	Vert.	-
2.39955	61.7	78.2	16.5	29.2	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
2.402	95.1	-	-	62.6	28.8	0.0	3.7	150	Vert.	-
2.39955	47.4	75.1	27.7	14.9	28.8	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (lower band edge. hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	98.4	-	-	65.6	28.8	0.0	3.7	150	Hor.	-
2.399475	60.3	78.4	18.1	27.9	28.7	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
2.402	95.1	-	-	62.6	28.8	0.0	3.7	150	Hor.	-
2.399475	45.7	75.1	29.4	13.3	28.7	0.0	3.7	150	Hor.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (upper band edge. hopping disabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	99.0	-	-	66.2	29.0	0.0	3.8	150	Hor.	-
2.49298	54.8	74.0	15.6	26.6	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
2.480	95.9	-	-	63.1	29.0	0.0	3.8	150	Hor.	-
2.49298	45.7	54.0	8.3	12.9	29.0	0.0	3.8	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (upper band edge. hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	98.8	-	-	66	29.0	0.0	3.8	150	Hor.	-
2.48987	59.4	74.0	14.6	26.6	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
2.480	95.9	-	-	63.1	29.0	0.0	3.8	150	Hor.	-
2.48987	45.8	54.0	8.2	13	29.0	0.0	3.8	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

5.7 RADIATED EMISSIONS

5.7.1 METHOD OF MEASUREMENT (RADIATED EMISSIONS)

The radiated emission measurement is subdivided into four stages.

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

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

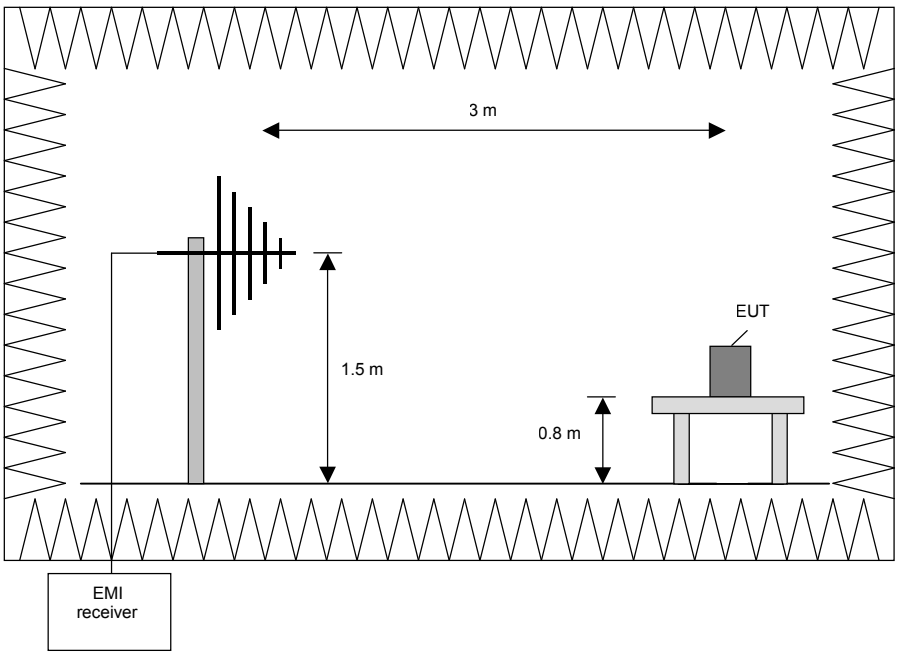
Preliminary measurement (30 MHz to 1 GHz)

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

The frequency range 30 MHz to 1 GHz will be measured with an EMI Receiver set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °.

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

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



Procedure preliminary measurement:

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

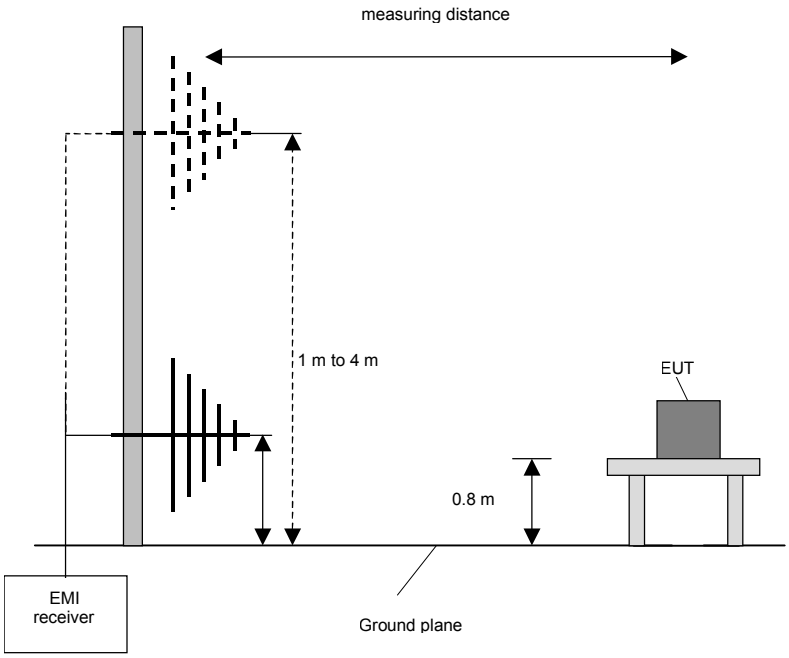
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the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

Final measurement (30 MHz to 1 GHz)

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

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

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	120 kHz



Procedure final measurement:

The following procedure will be used:

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

Preliminary and final measurement (1 GHz to 110 GHz)

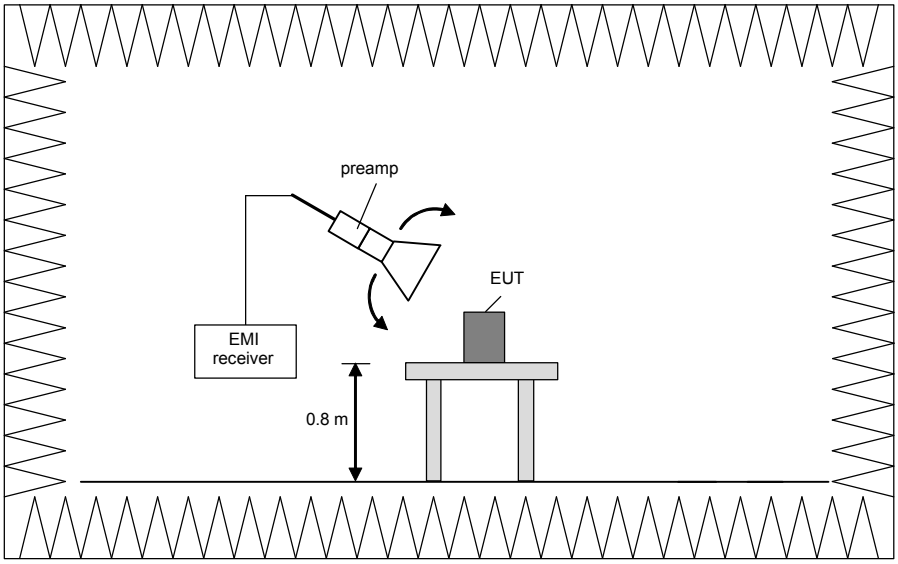
This measurement will be performed in a fully anechoic chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance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

Preliminary measurement (1 GHz to 110 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The spectrum analyser set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna, the antenna close to the EUT and while moving the antenna over all sides of the EUT. With the spectrum analyser in CLEAR / WRITE mode the cone of the emission should be found and than the measuring distance will be set to 3 m with the receiving antenna moving in this cone of emission. At this position the final measurement will be carried out.

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

Frequency range	Resolution bandwidth
1 GHz to 4 GHz	100 kHz
4 GHz to 12 GHz	100 kHz
12 GHz to 18 GHz	100 kHz
18 GHz to 26.5 GHz	100 kHz
26.5 GHz to 40 GHz	100 kHz
40 GHz to 60 GHz	100 kHz
50 GHz to 75 GHz	100 kHz
75 GHz to 110 GHz	100 kHz

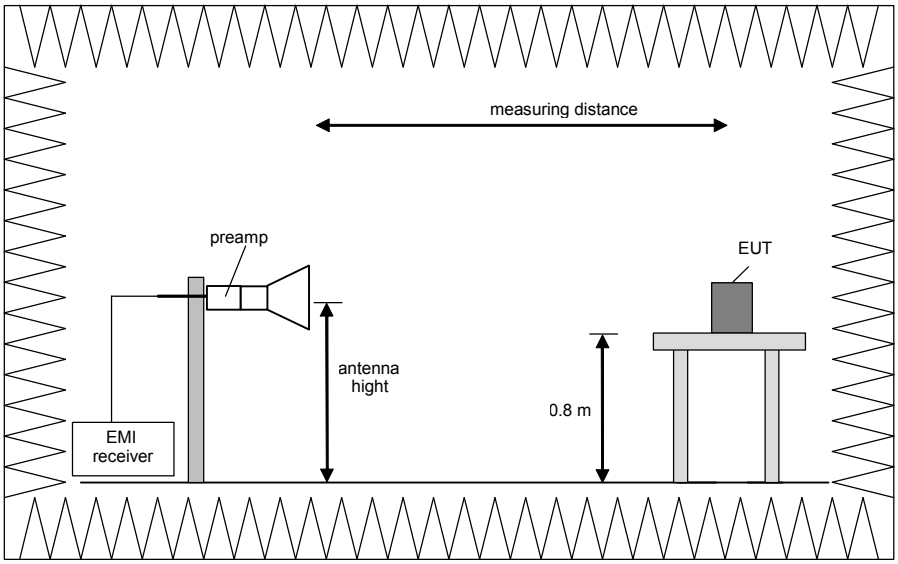


Final measurement (1 GHz to 110 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1 MHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 ° in order to have the antenna inside the cone of radiation.

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

Frequency range	Resolution bandwidth
1 GHz to 4 GHz	1 MHz
4 GHz to 12 GHz	1 MHz
12 GHz to 18 GHz	1 MHz
18 GHz to 26.5 GHz	1 MHz
26.5 GHz to 40 GHz	1 MHz
40 GHz to 60 GHz	1 MHz
50 GHz to 75 GHz	1 MHz
75 GHz to 110 GHz	1 MHz



Procedure of measurement:

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

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

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

5.7.2 TEST RESULTS (RADIATED EMISSIONS)

5.7.2.1 PRELIMINARY MEASUREMENT (9 kHz to 1 GHz)

Ambient temperature	21 °C	Relative humidity	55 %

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

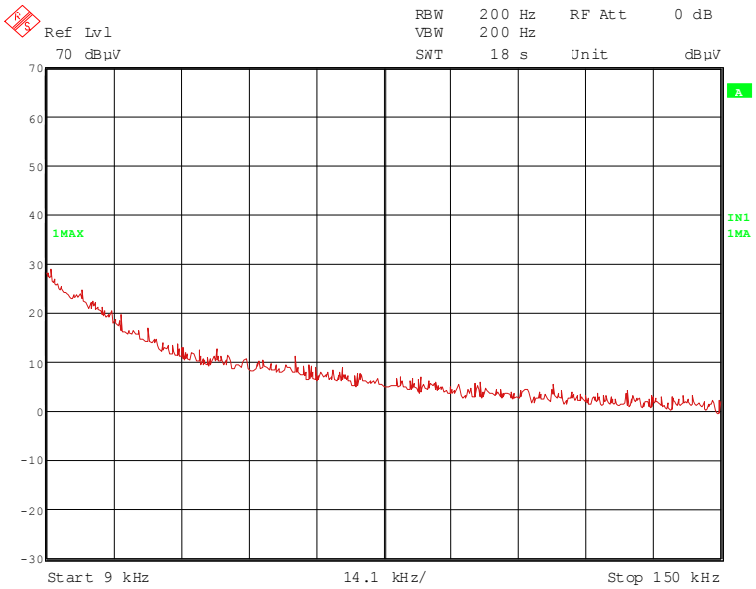
Cable guide: No cables connectable to the EUT.

Test record: All results are shown in the following.

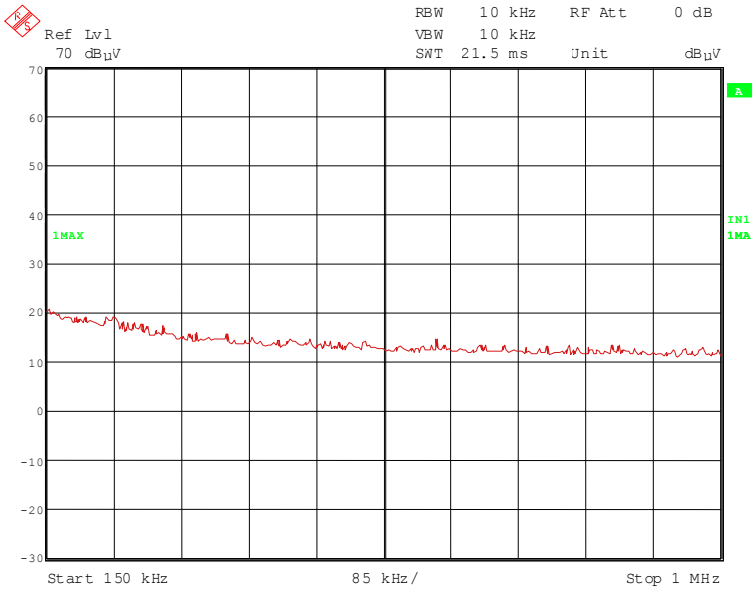
Supply voltage: During all measurements the EUT was battery supplied with 11.1 V_{DC}

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. Therefore the emissions in this frequency range were measured only with the transmitter operates in operation mode 2.

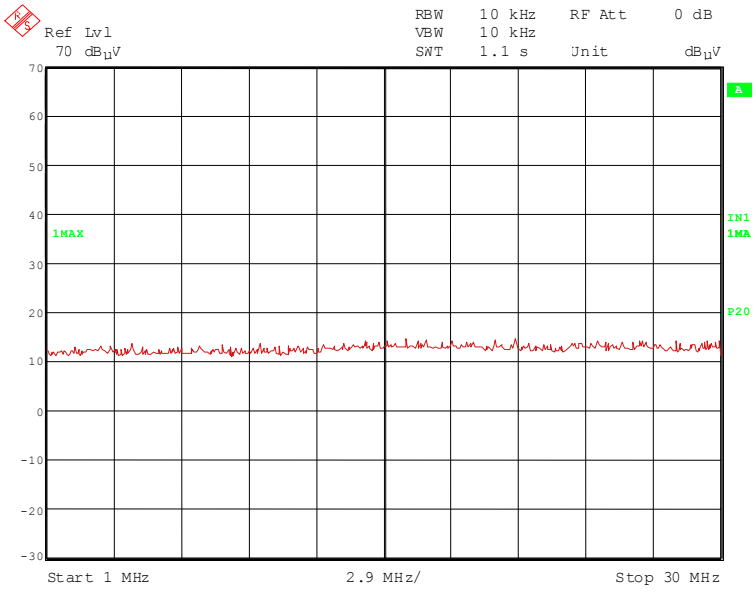
101171_22.wmf: Spurious emissions from 9 kHz to 150 kHz (operation mode 2):



101171_23.wmf: Spurious emissions from 150 kHz to 1 MHz (operation mode 2):



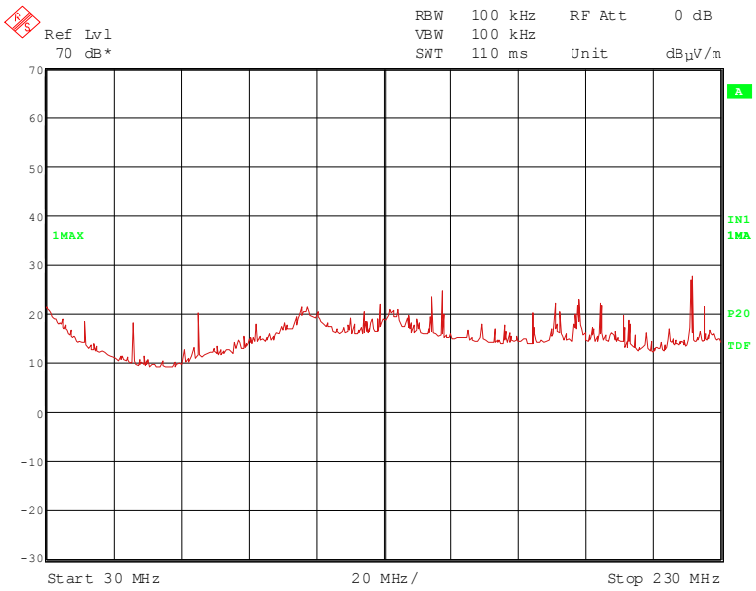
101171_24.wmf: Spurious emissions from 1 MHz to 30 MHz (operation mode 2):



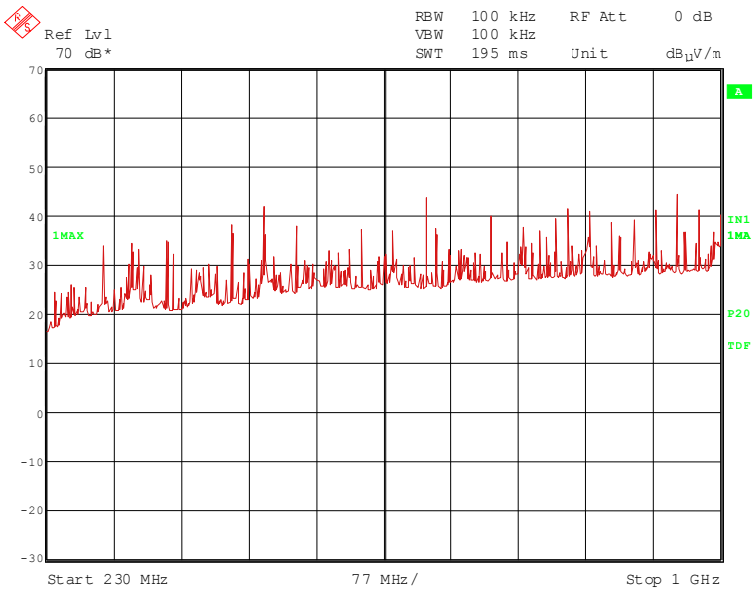
No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no measurements were carried out on the outdoor test site.

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

101171_25.wmf: Spurious emissions from 30 MHz to 230 MHz (operation mode 2):



101171_26.wmf: Spurious emissions from 230 MHz to 1 GHz (operation mode 2):



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

55.000 MHz, 75.000 MHz, 144.230 MHz, 147.465 MHz, 174.275 MHz, 181.102 MHz, 187.634 MHz, 368.870 MHz, 479.200 MHz, 515.470 MHz, 589.530 MHz, 663.600 MHz, 675.000 MHz, 737.670 MHz 825.000 MHz, 850.000 MHz, 875.000 MHz, 925.000 MHz, 950.000 MHz.

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

70.000 MHz and 327.210 MHz.

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

5.7.2.2 FINAL RADIATED EMISSION TEST (30 MHz to 1 GHz)

Ambient temperature	21 °C	Relative humidity	55 %

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

Cable guide: No cables connectable to the EUT.

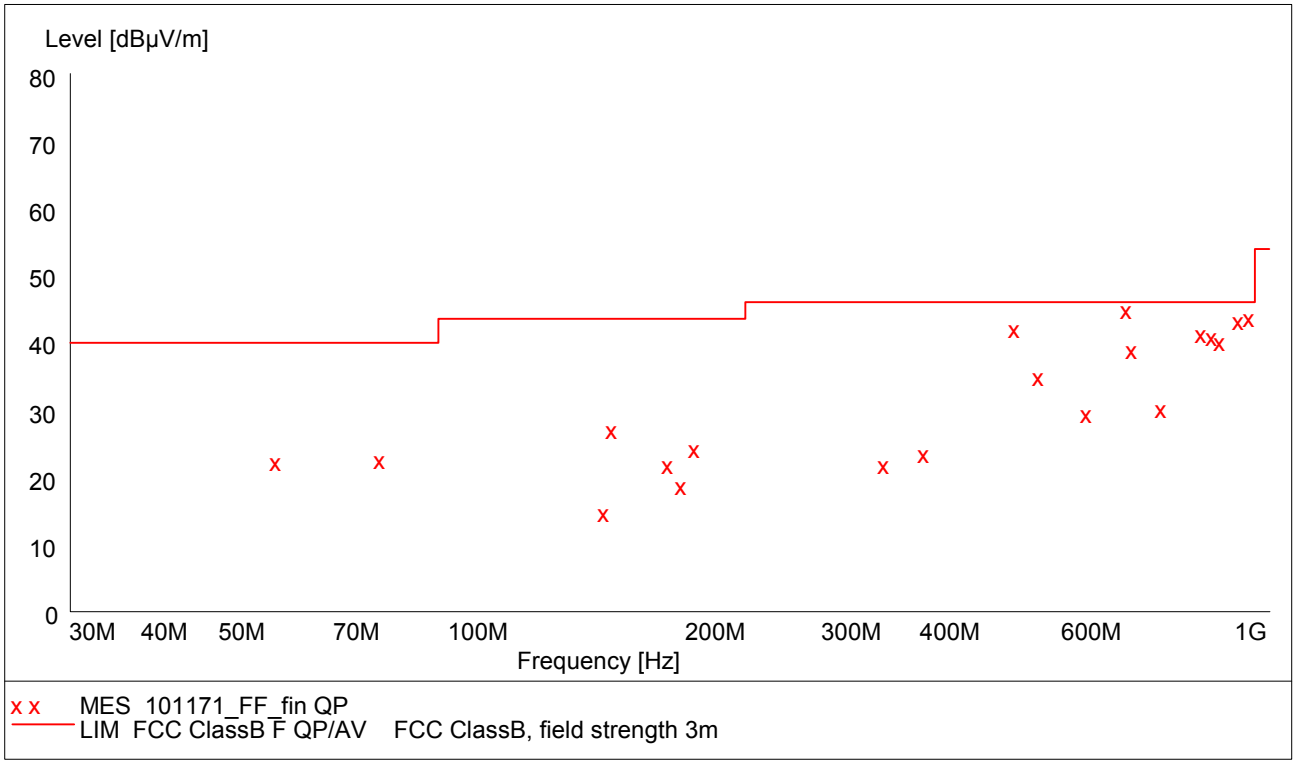
Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was battery supplied with 11.1 V_{DC}.

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

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

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



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 10 m measuring distance.

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

Frequency MHz	Level dBµV/m	Transducer dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
55.000000	22.60	7.9	40.0	17.4	100.0	203.00	VERTICAL
75.000000	23.20	8.8	40.0	16.8	250.0	112.00	HORIZONTAL
144.230000	15.30	14.2	43.5	28.2	100.0	248.00	VERTICAL
147.465000	27.40	14.2	43.5	16.1	200.0	202.00	HORIZONTAL
174.275000	22.40	12.4	43.5	21.1	150.0	157.00	HORIZONTAL
181.102000	19.00	11.9	43.5	24.5	150.0	157.00	HORIZONTAL
187.634000	24.60	11.7	43.5	18.9	100.0	157.00	HORIZONTAL
327.210000	22.30	17.0	46.0	23.7	100.0	337.00	HORIZONTAL
368.870000	23.80	18.2	46.0	22.2	200.0	337.00	HORIZONTAL
479.200000	42.60	21.4	46.0	3.4	200.0	203.00	VERTICAL
515.470000	35.40	22.1	46.0	10.6	200.0	68.00	VERTICAL
589.530000	30.00	23.7	46.0	16.0	100.0	202.00	HORIZONTAL
663.600000	45.30	24.7	46.0	0.7	100.0	247.00	HORIZONTAL
675.000000	39.20	24.8	46.0	6.8	100.0	247.00	HORIZONTAL
737.670000	30.60	26.9	46.0	15.4	150.0	337.00	HORIZONTAL
825.000000	41.90	27.6	46.0	4.1	200.0	247.00	HORIZONTAL
850.000000	41.20	28.1	46.0	4.8	250.0	292.00	HORIZONTAL
875.000000	40.50	28.1	46.0	5.5	100.0	248.00	VERTICAL
925.000000	43.60	29.2	46.0	2.4	200.0	292.00	HORIZONTAL
950.000000	44.30	30.3	46.0	1.7	150.0	293.00	VERTICAL

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
14 – 20

5.7.2.3 PRELIMINARY MEASUREMENT (1 GHz to 25 GHz)

Ambient temperature	21 °C	Relative humidity	60 %

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.

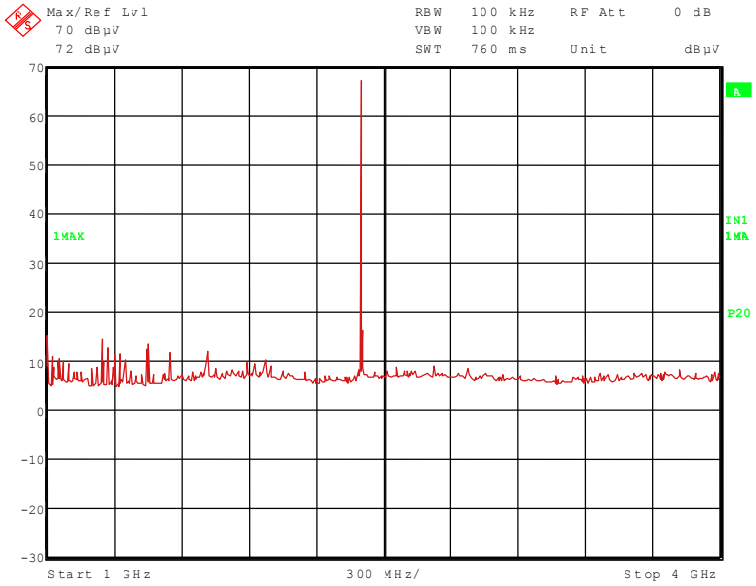
Cable guide: No cables connectable to the EUT.

Test record: All results are shown in the following.

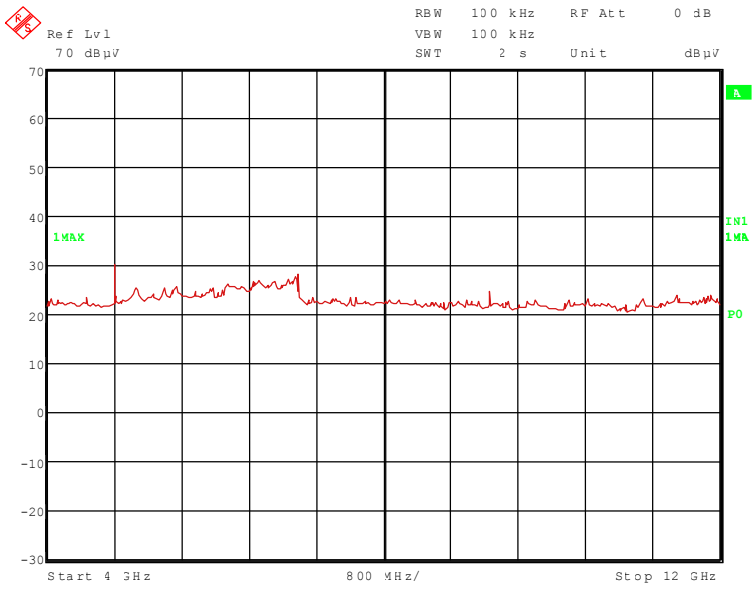
Supply voltage: During all measurements the EUT was battery supplied with 11.1 V_{DC}.

Transmitter operates at the lower end of the assigned frequency band

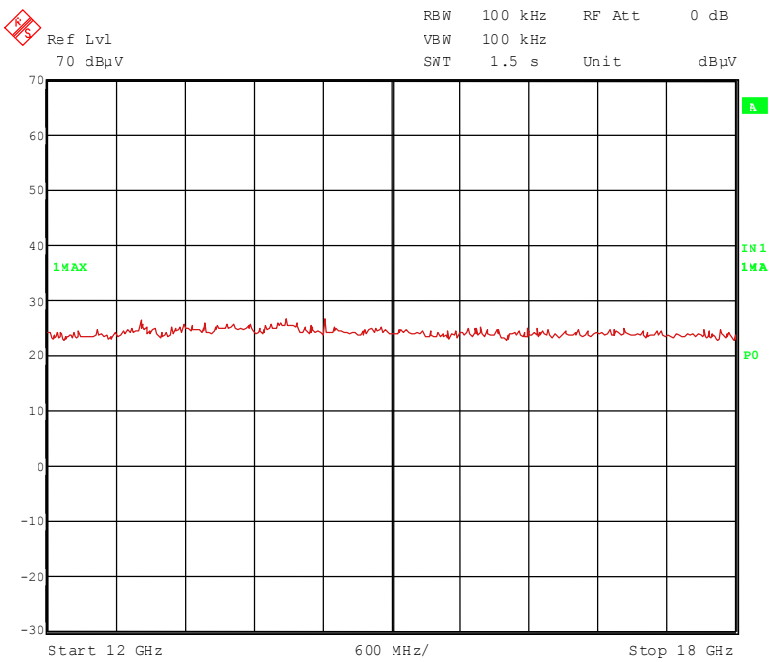
101171_5.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 1):



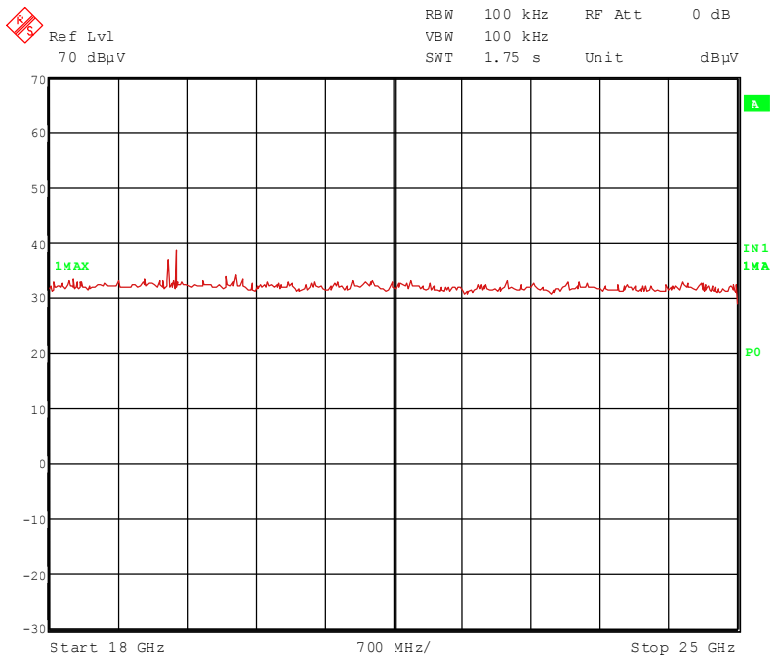
101171_8.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 1):



101171_16.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 1):



101171_19.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 1):



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

- 1.256 GHz, 1.716 GHz, 4.804 GHz, 19.216 GHz and 19.288 GHz.

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

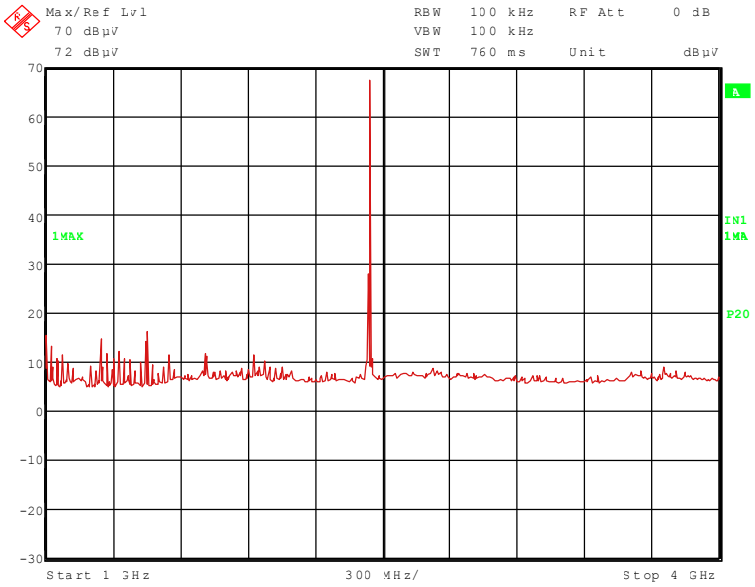
- 1.450 GHz and 2.402 GHz.

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

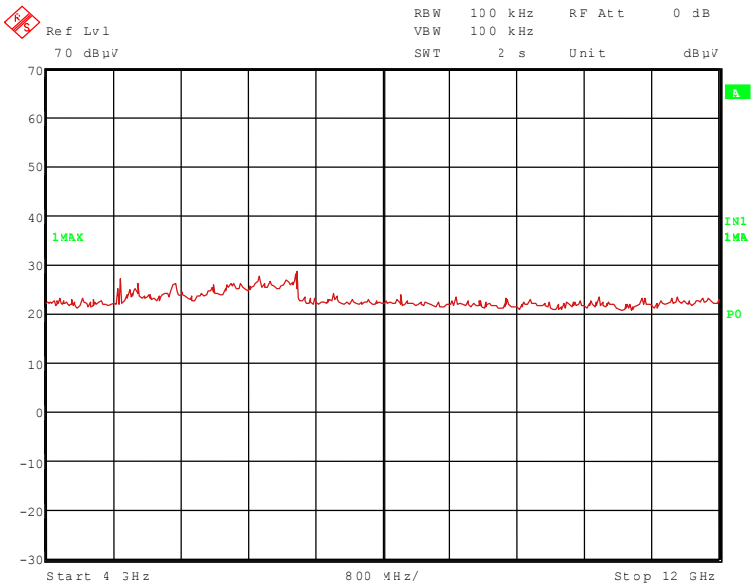
TEST EQUIPMENT USED FOR THE TEST:
29, 31 –34, 36, 37, 39, 44, 46, 49 - 51, 72

Transmitter operates on the middle of the assigned frequency band

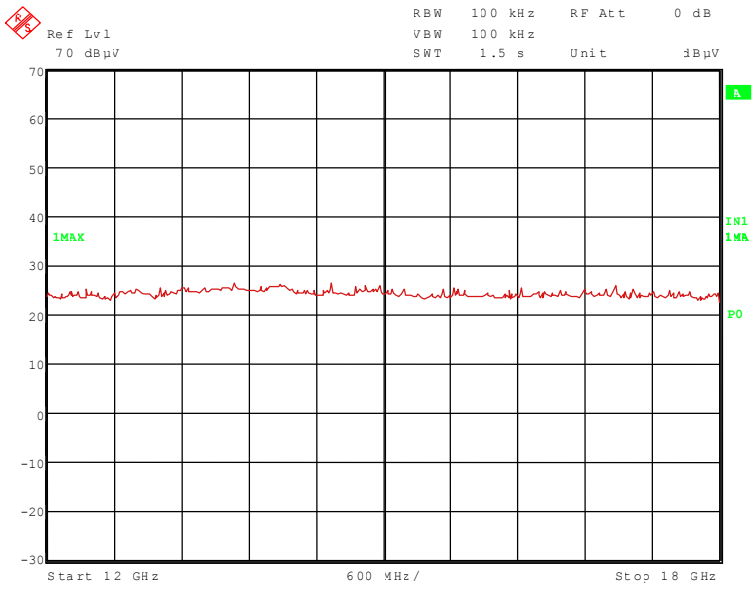
101171_6.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 2):



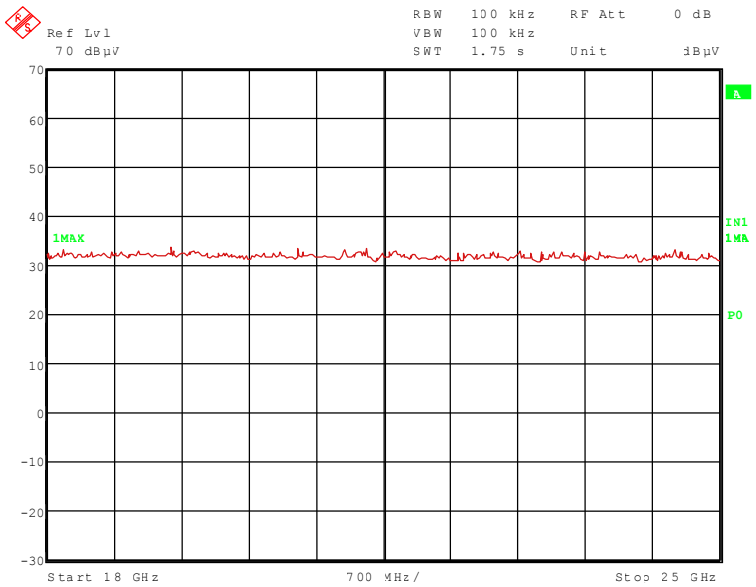
101171_9.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 2):



101171_17.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 2):



101171_20.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 2):



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

- 1.450 GHz and 4.882 GHz.

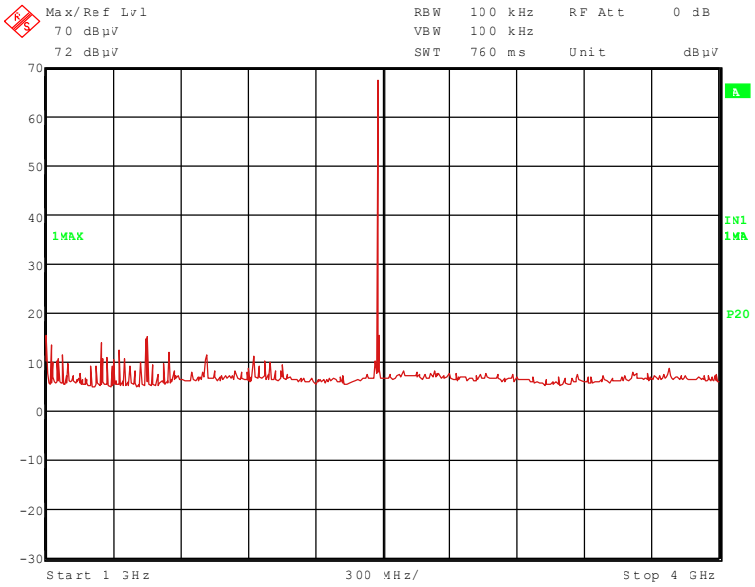
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 1.256 GHz and 2.441 GHz.

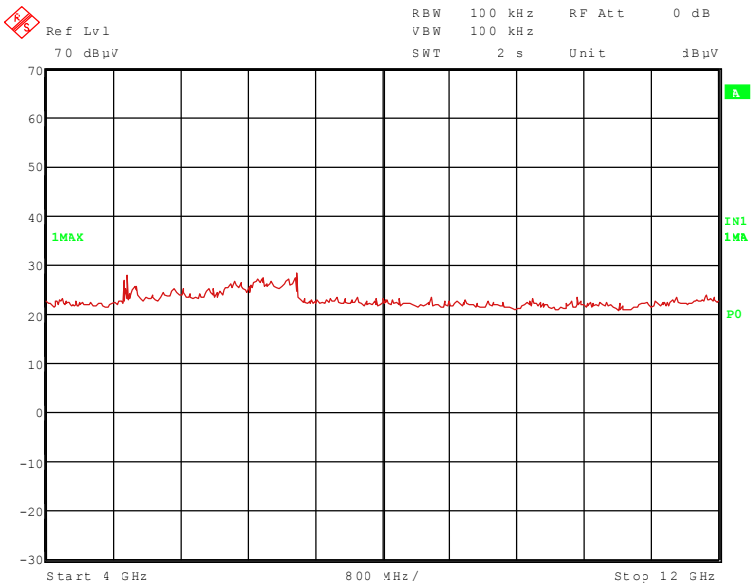
These frequencies have to be measured in a final measurement. The results were presented in the following.

Transmitter operates on the upper end of the assigned frequency

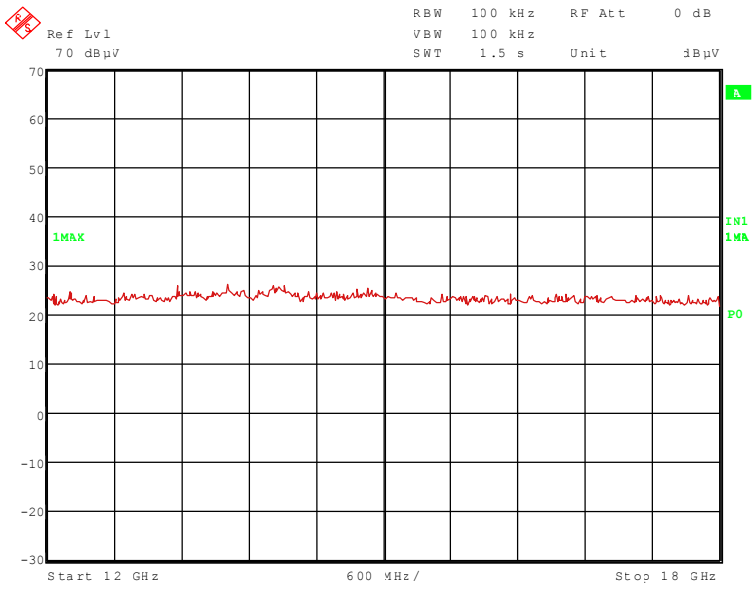
101171_7.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 3):



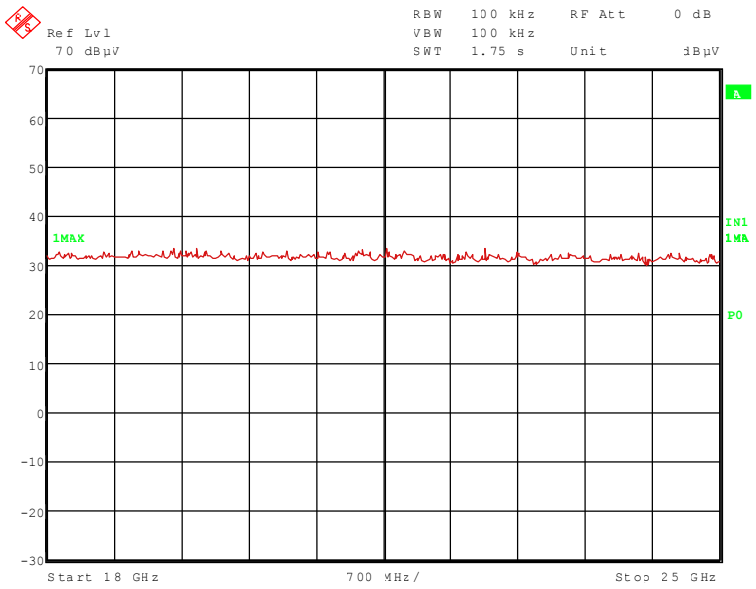
101171_10.wmf: Spurious emissions from 4 GHz to 12 GHz (operation mode 3):



101171_18.wmf: Spurious emissions from 12 GHz to 18 GHz (operation mode 3):



101171_21.wmf: Spurious emissions from 18 GHz to 25 GHz (operation mode 3):



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

- 1.450 GHz, 4.938 GHz and 4.960 GHz.

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

- 1.256 GHz and 2.480 GHz.

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

5.7.2.4 FINAL MEASUREMENT (1 GHz to 25 GHz)

Ambient temperature	21 °C	Relative humidity	60 %

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: No cables connectable to the EUT.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was battery supplied with 11.1 V_{DC}.

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

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

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	98.4	-	-	65.9	28.8	0.0	3.7	150	Hor.	-
1.256	41.7	78.4	36.7	14.1	24.9	0.0	2.7	150	Ver.	No
1.450	48.3	74.0	25.7	20.0	25.4	0.0	2.9	150	Hor.	Yes
1.716	47.8	78.4	30.6	18.1	26.5	0.0	3.2	150	Ver.	No
4.804	49.6	74.0	24.4	36.3	33.7	25.7	5.3	150	Hor.	Yes
19.216	46.2	74.0	27.8	44.8	37.1	38.2	2.5	150	Hor.	Yes
19.288	45.8	74.0	28.2	44.4	37.1	38.2	2.5	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
2.402	92.6	-	-	60.1	28.8	0.0	3.7	150	Hor.	-
1.256	29.0	72.6	43.6	1.4	24.9	0.0	2.7	150	Ver.	No
1.450	42.5	54.0	11.6	14.2	25.4	0.0	2.9	150	Hor.	Yes
1.716	39.0	72.6	33.6	9.3	26.5	0.0	3.2	150	Ver.	No
4.804	39.1	54.0	14.9	25.8	33.7	25.7	5.3	150	Hor.	Yes
19.216	35.3	54.0	18.7	33.9	37.1	38.2	2.5	150	Hor.	Yes
19.288	31.9	54.0	22.1	30.5	37.1	38.2	2.5	150	Hor.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

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

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height Cm	Pol.	Restr. Band
2.441	94.2	-	-	61.6	28.9	0.0	3.7	150	Hor.	-
1.256	41.6	74.2	32.6	14.0	24.9	0.0	2.7	150	Ver.	No
1.450	48.3	74.0	25.7	20.0	25.4	0.0	2.9	150	Hor.	Yes
4.882	48.8	74.0	25.2	35.4	33.8	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
2.441	91.2	-	-	58.6	28.9	0.0	3.7	150	Hor.	-
1.256	29.1	71.2	42.1	1.5	24.9	0.0	2.7	150	Ver.	No
1.450	42.3	54.0	11.7	14.0	25.4	0.0	2.9	150	Hor.	Yes
4.882	38.4	54.0	15.6	25.0	33.8	25.7	5.3	150	Hor.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

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

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	95.0	-	-	62.2	29.0	0.0	3.8	150	Hor.	-
1.256	41.7	74.8	33.1	14.1	24.9	0.0	2.7	150	Ver.	No
1.450	48.2	74.0	25.8	19.9	25.4	0.0	2.9	150	Hor.	Yes
4.938	47.9	74.0	26.1	34.2	34.0	25.6	5.3	150	Hor.	Yes
4.960	48.3	74.0	25.7	34.6	34.0	25.6	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
2.480	92.0	-	-	59.2	29.0	0.0	3.8	150	Hor.	-
1.256	29.1	71.8	42.7	1.5	24.9	0.0	2.7	150	Ver.	No
1.450	42.3	54.0	11.7	14.0	25.4	0.0	2.9	150	Hor.	Yes
4.938	32.7	54.0	21.3	19.0	34.0	25.6	5.3	150	Hor.	Yes
4.960	38.0	54.0	16.1	24.3	34.0	25.6	5.3	150	Hor.	Yes
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

6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. due
1	Shielded chamber M47	-	Albatross Projects	B83117-C6439-T262 -	480662	Weekly verification (system cal.)	
2	EMI Receiver	ESCS 30	Rohde & Schwarz	834489/011	580007	02/08/2010	02/2012
3	LISN	ESH2-Z5	Rohde & Schwarz	879675/037	580006	08/07/2009	08/2010
4	High pass filter	HR 0.13-5ENN	FSY Microwave Inc.	DC 0109 SN 002	480340	Weekly verification (system cal.)	
14	Open area test site	-	Phoenix Test-Lab	-	480085	Weekly verification (system cal.)	
15	Measuring receiver	ESIB7	Rohde & Schwarz	100304	480521	03/15/2010	03/2012
16	Controller	HD100	Deisel	100/670	480139	-	-
17	Turntable	DS420HE	Deisel	420/620/80	480087	-	-
18	Antenna support	AS615P	Deisel	615/310	480086	-	-
19	Antenna	CBL6111 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 (system cal.)	
30	Spectrum analyser	FSU	Rohde & Schwarz	200125	480956	02/04/2009	02/2011
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355	03/17/2010	03/2012
32	Controller	MCU	Maturo	MCU/043/971107	480832	-	-
33	Turntable	DS420HE	Deisel	420/620/80	480315	-	-
34	Antenna support	AS615P	Deisel	615/310	480187	-	-
35	Antenna	CBL6112 B	Chase	2688	480328	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. 30	RTK 081	Rosenberger	-	410141	Weekly verification (system cal.)	
44	RF-cable No. 31	RTK 081	Rosenberger	-	410142	Weekly verification (system cal.)	
46	RF-cable 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	WHKX4.0/18 G-8SS	Wainwright Instruments	1	480587	Weekly verification (system cal.)	

7 LIST OF ANNEXES

ANNEX A	**PHOTOGRAPHS OF THE TEST SET-UPS**:	**7 pages**
	FOCUS 30-2“, test set-up fully anechoic chamber	101171_3.jpg
	FOCUS 30-2“, test set-up fully anechoic chamber	101171_8.jpg
	FOCUS 30-2“, test set-up fully anechoic chamber	101171_9.jpg
	FOCUS 30-2“, test set-up open area test site	101171_10.jpg
	FOCUS 30-2“, test set-up fully anechoic chamber	101171_4.jpg
	FOCUS 30-2“, test set-up fully anechoic chamber	101171_6.jpg
	FOCUS 30-2“, test set-up fully anechoic chamber	101171_7.jpg
ANNEX B	**INTERNAL PHOTOGRAPHS OF THE TEST SAMPLE**:	**3 pages**
	Focus Bluetooth Module, PCB, top view	101171_14.jpg
	Focus Bluetooth Module, PCB, bottom view	101171_15.jpg
	FOCUS 30-2“, housing of Focus Bluetooth Module PCB	101171_13.jpg
ANNEX C	**EXTERNAL PHOTOGRAPHS OF THE TEST SAMPLE**:	**2 pages**
	FOCUS 30-2“, front view	101171_20.jpg
	FOCUS 30-2“, rear view	101171_21.jpg
	FOCUS 30-2“, right hand side view	101171_22.jpg
	FOCUS 30-2“, left hand side view	101171_23.jpg
ANNEX D	**ADDITIONAL RESULTS FOR INDUSTRY CANADA**:	**7 pages**