

TEST REPORT

Equipment under Test: SEW860221

Serial Number: None

FCC ID: WSP860221

IC: 7994A-860221

Applicant: Hermann Sewerin GmbH

Manufacturer: Höft & Wessel AG

**Test Laboratory
(CAB)**

**accredited by DATech in der TGA GmbH
in compliance with DIN EN ISO/IEC 17025
under the Reg. No. DAT-P-105/99-21,**

**recognized by Bundesnetzagentur
under the Reg.-No. BNetzA-CAB-02/21-104/1,**

CAB Designation Number DE0004,

**listed by
FCC 31040/SIT1300F2**

**FCC Test site registration number 90877
Industry Canada Test site registration IC3469A-1**

TEST REPORT REFERENCE: F082707E01

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1 IDENTIFICATION

1.1 APPLICANT

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	33334 Gütersloh
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e-mail address:	Bastian.ruppert@sewerin.de

1.2 MANUFACTURER

Name:	Höft & Wessel AG
Address:	Rotenburger Straße 20
	30659 Hannover
Country:	Germany
Name for contact purposes:	-
Tel:	+ 49 511 61 02 - 0
Fax:	+ 49 511 61 02 - 411
e-mail address:	info@hoeft-wessel.de

1.3 DATES

Date of receipt of test sample:	11 November 2008
Start of test:	11 November 2008
End of test:	19 November 2008

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1.4 TEST LABORATORY

The tests were carried out at:

PHOENIX TESTLAB GmbH
Königswinkel 10
D-32825 Blomberg
Germany

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

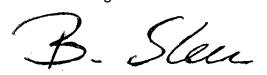
accredited by DATech in der TGA GmbH in compliance with DIN EN ISO/IEC 17025 under the Reg. No. DAT-P-105/99-21, FCC Test site registration number 90877 and Industry Canada Test site registration IC3469A-1.

Test engineer: Thomas KÜHN
Name


Signature

25 November 2008
Date

Test report checked: Bernd STEINER
Name


Signature

25 November 2008
Date

PHOENIX TESTLAB GmbH
Königswinkel 10
32825 Blomberg
Tel. 0 52 35 / 95 00-0
Fax 0 52 35 / 95 00-10

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

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

2.1 DEVICE UNDER TEST

Type / model name: *	SEW860221					
Type of equipment: *	Radio transceiver module using low power frequency hopping spread spectrum communication					
FCC ID: *	WSP860221					
IC: *	7994A-860221					
Rated RF output power: *	100 mW					
Antenna type: *	External monopole antenna					
Antenna gain: *	Refer table below					
Antenna connector: *	UFL					
Channel spacing: *	1.728 MHz					
Alignment range: *	2403.648 MHz to 2479.68 MHz					
Number of channels: *	44					
Adaptive frequency hopping: *	No					
Modulation: *	GFSK					
Supply Voltage (RF-unit): *	$U_{\text{nom}} =$	3.8 V DC	$U_{\text{min}} =$	3.0 V DC	$U_{\text{max}} =$	4.6 V DC
Temperature range: *	-20 °C to +60 °C					
Lowest internal frequency: *	10.368 MHz					
Hardware designation: *	HW86022					
Software version: *	37003					
Ancillary equipment used during the test: *	During all tests the EUT was powered by an external AC / DC adaptor type HW 1208 was used.					

* declared by the applicant.

Used antennas:

Model name*	Antenna type	Rated Antenna gain*
17015.7RSMA	External monopole	7.0 dBi
17013.RSMA	External monopole	5.0 dBi
W1038	External monopole	4.9 dBi

The following external I/O cables were used:

Identification	Connector		Length
	EUT	Ancillary	
DC in	3 pole FRIWO plug	-	2 m *
-	-	-	-

*: Length during the test if no other specified.

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3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

Because the EUT is a module, which will be implemented in a final application, it was mounted on a carrier board to change the operation modes of the EUT from a Laptop with test software. The tests were carried out with an unmodified sample with an UFL antenna connector. This connector is regarded to be a unique antenna connector.

During the tests the test sample was powered by an external power supply via the carrier board with 12.0 V DC.

If stated, an AC/DC adaptor type HW 1208, which was connected to an AC mains network with 120 V DC / 60 Hz was used.

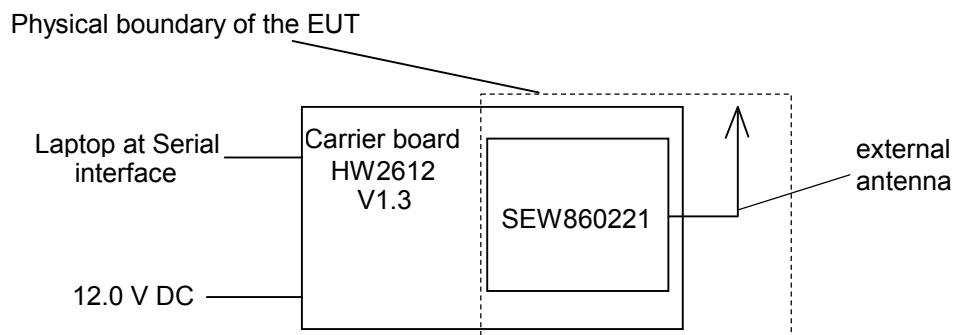
If not otherwise stated, for modulating the transmitter, a pseudo random bit sequence was used. For selecting an operation mode, a personal computer with a test-software delivered by the applicant was connected to the carrier board. After adjusting the operating mode, the personal computer was removed. To do this the test-engineer was instructed by the applicant.

Because the EUT is a handheld equipment, the radiated measurements were carried out in three orthogonal directions, which were defined as follows:

Position	Definition
1	EUT standing vertically on the table
2	EUT lying horizontally on the table
3	EUT lying on its lefthand side on the table

The following operation modes were used during the tests:

Operation mode	Description of the operation mode
1	Continuous transmitting on 2403.648 MHz
2	Continuous transmitting on 2441.664 MHz
3	Continuous transmitting on 2479.680 MHz
4	Transmitter hopping on all channels
5	Receiver receiving on 2403.648 MHz
6	Receiver receiving on 2441.664 MHz
7	Receiver receiving on 2479.680 MHz



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4 LIST OF MEASUREMENTS

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section	RSS 210, Issue 7 [4] or RSS-Gen, Issue 2 [5]	Status	Refer page
20 dB bandwitzth	General	15.247 (a) (1)	A8.1 (b) [4]	Passed	8 et seq.
Carrier frequency separation	General	15.247 (a) (1)	A8.1 (b) [4]	Passed	11 et seq.
Number of hopping channels	2400.0 - 2483.5	15.247 (a) (1) (iii)	A8.1 (d) [4]	Passed	14 et seq.
Dwell time	2400.0 - 2483.5	15.247 (a) (1) (iii)	A8.1 (d) [4]	Passed	16 et seq.
Maximum peak output power	2400.0 – 2483.5	15.247 (b) (1)	A8.4 (2) [4]	Passed	18 et seq..
Band edge compliance (radiated)	2400.0 – 2483.5	15.247 (d)	A8.5 [4]	Passed	21 et seq.
Radiated emissions (transmitter)	0.009 - 25,000	15.205 (a) 15.209 (a)	A8.5 [4] 2.6 [4]	Passed	26 et seq.
Conducted emissions on supply line	0.15 - 30	15.207 (a)	7.2.2 [5]	Passed	46 et seq.
Radiated emissions (receiver)	0.009 - 25,000	15.109 (a)	6 [5] 2.6 [4]	Passed	1 et seq. of F082707E01 Annex D

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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 disabled, the transmitter shall work with its maximum data rate.

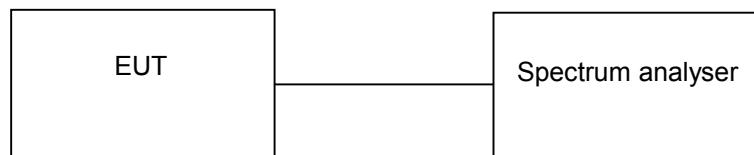
The following spectrum analyser settings shall be used:

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



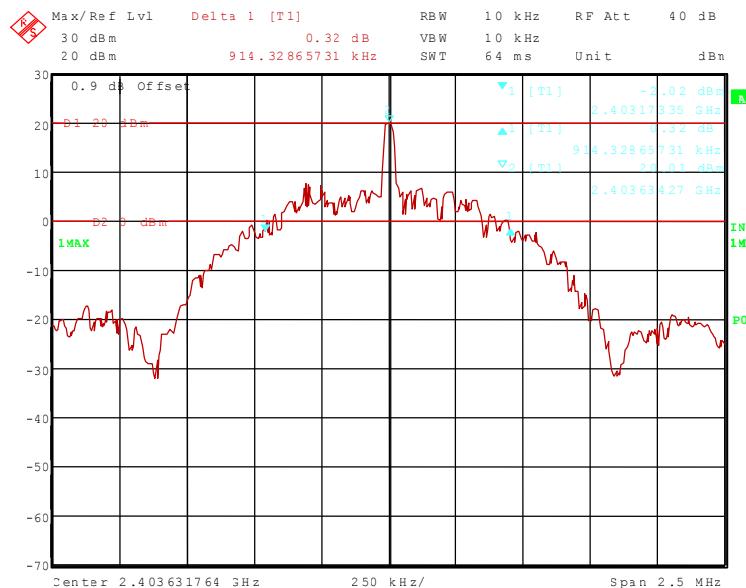
TEST REPORT REFERENCE: F082707E01

5.1.2 TEST RESULTS (20 dB BANDWIDTH)

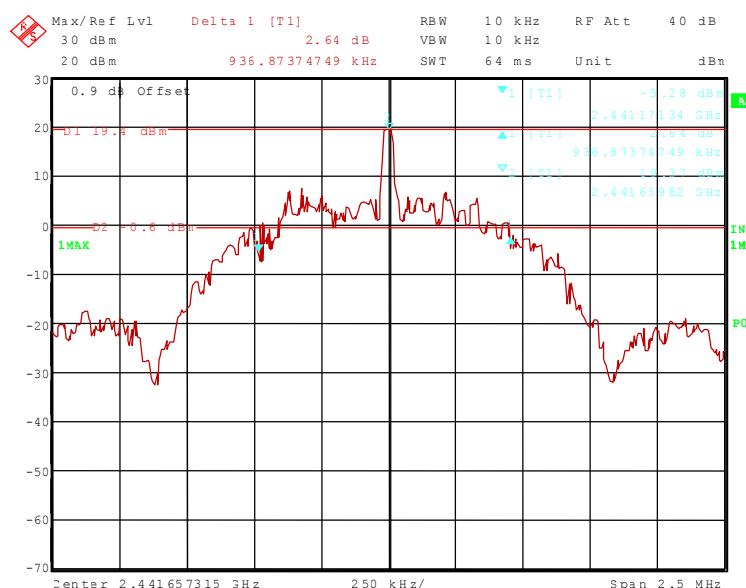
Ambient temperature	20 °C
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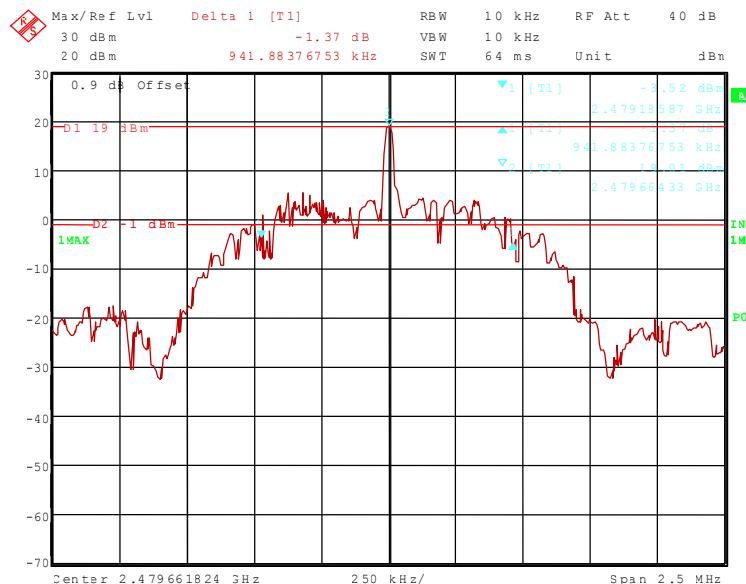
Relative humidity	45 %
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82707_30.wmf: (20 dB bandwidth at the lower end of the assigned frequency band):



82707_1.wmf: (20 dB bandwidth at the middle of the assigned frequency band):



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82707_31.wmf: (20 dB bandwidth at the upper end of the assigned frequency band):


Channel number	Channel frequency [MHz]	20 dB bandwidth [kHz]
0	2403.648	914.329 kHz
22	2441.664	936.874 kHz
44	2479.680	941.884 kHz
Measurement uncertainty		<10 ⁻⁷

TEST EQUIPMENT USED FOR THE TEST:

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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: $\geq 1\%$ of the span.
- Video bandwidth: \geq 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:

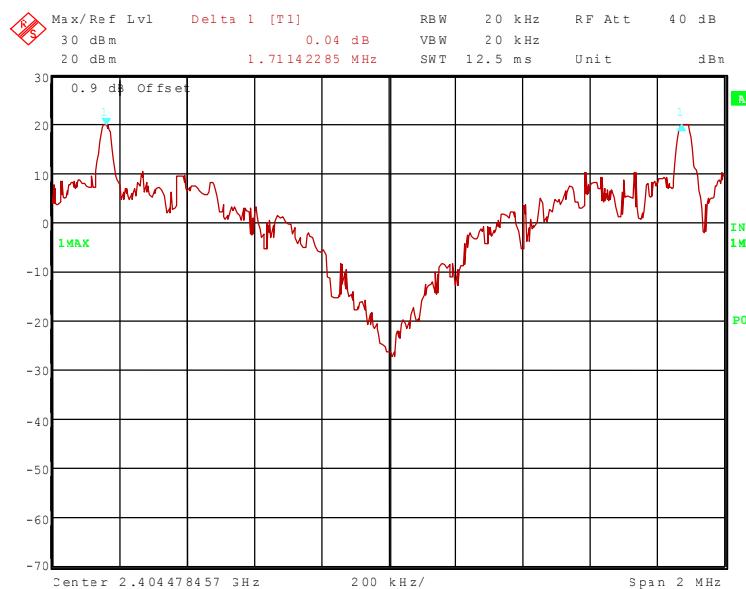


TEST REPORT REFERENCE: F082707E01

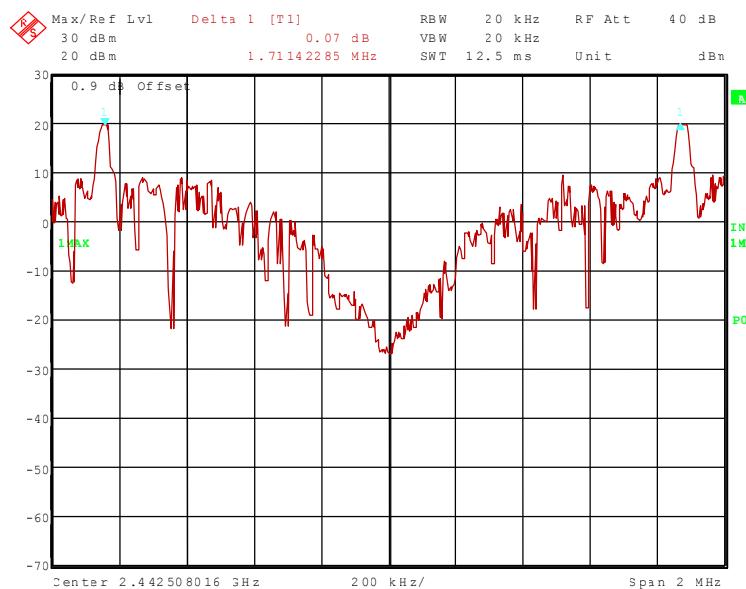
5.2.2 TEST RESULTS (CARRIER FREQUENCY SEPARATION)

Ambient temperature	20 °C	Relative humidity	45 %
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82707_32.wmf: (channel separation at the lower end of the assigned frequency band):

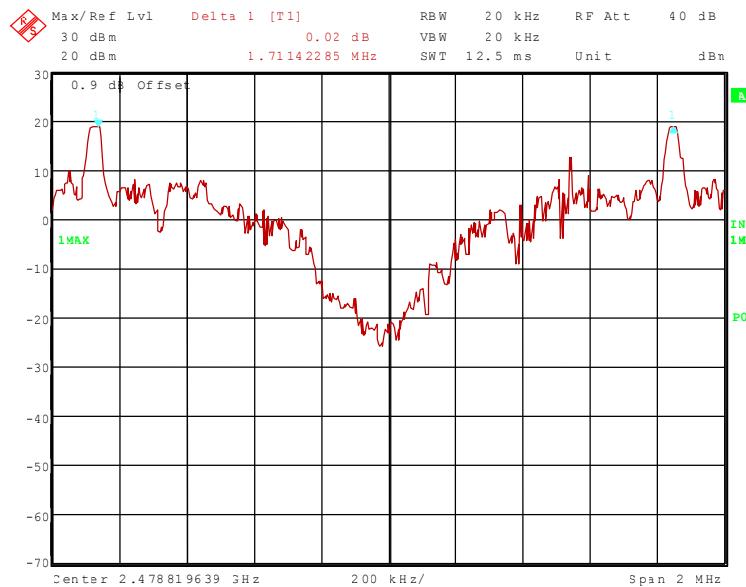


82707_33.wmf: (channel separation at the middle of the assigned frequency band):



TEST REPORT REFERENCE: F082707E01

82707_34.wmf: (channel separation at the upper end of the assigned frequency band):



Channel number	Channel frequency [MHz]	Channel separation [kHz]	Minimum limit [kHz]
0	2403.648	1711.423	914.329 kHz (20 dB bandwidth)
22	2441.664	1711.423	936.874 kHz (20 dB bandwidth)
45	2479.680	1711.423	941.884 kHz (20 dB bandwidth)
Measurement uncertainty			<10 ⁻⁷

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

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TEST REPORT REFERENCE: F082707E01

5.3 NUMBER OF HOPPING FREQUENCIES

5.3.1 METHOD OF MEASUREMENT (NUMBER OF HOPPING FREQUENCIES)

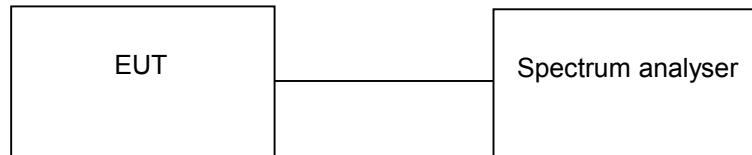
The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT 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: $\geq 1\%$ of the span.
- Video bandwidth: \geq 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:

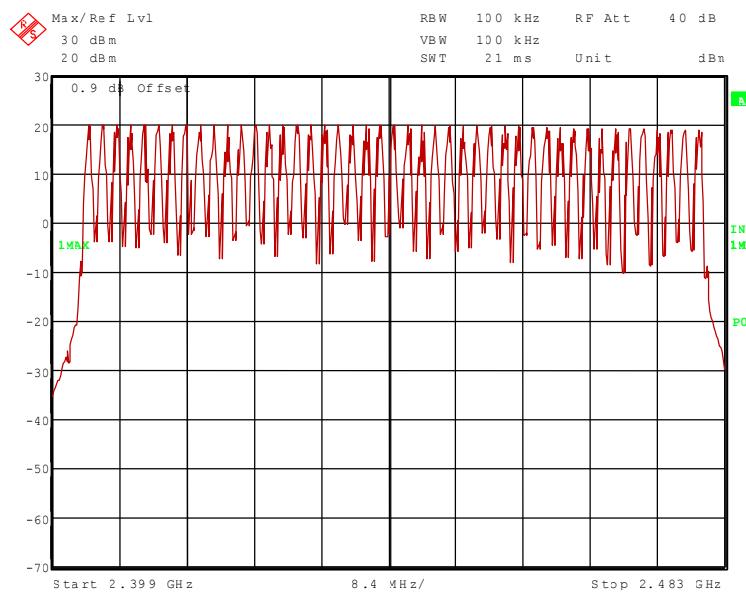


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5.3.2 TEST RESULTS (NUMBER OF HOPPING FREQUENCIES)

Ambient temperature	20 °C	Relative humidity	45 %
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82707_35.wmf (number of hopping channels):



Number of hopping channels	Limit
45	At least 15

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

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TEST REPORT REFERENCE: F082707E01

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:

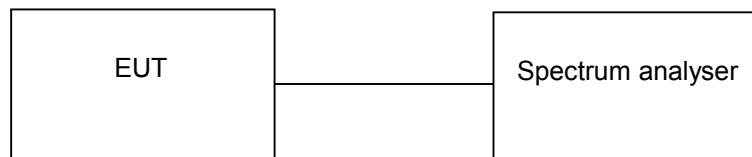
- Span: Zero, centred on a hopping channel.
- Resolution bandwidth: 1 MHz.
- Video bandwidth: \geq the resolution bandwidth.
- Sweep: As necessary to capture the entire dwell time per hopping channel.
- Detector function: peak.
- Trace mode: Max hold.

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:

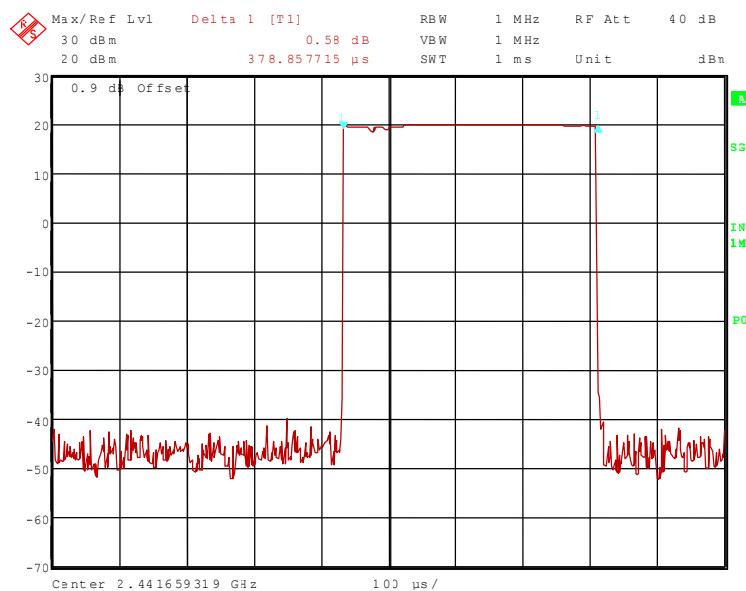


TEST REPORT REFERENCE: F082707E01

5.4.2 TEST RESULTS (DWELL TIME)

Ambient temperature	20 °C	Relative humidity	45 %
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82707_36.wmf: Dwell time at the middle of the assigned frequency band)



The dwell time is calculated with the following formula:

$$\text{Dwell time} = t_{\text{pulse}} \times n_{\text{hops}} / \text{number of hopping channels} \times 18.0 \text{ (equal to } 0.4 \text{ s} \times \text{number of hopping channels})$$

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 100 hops per second and the system uses 45 channels. For this reason one time slot has a length of 10 ms.

Channel number	Channel frequency [MHz]	t_{pulse} [μs]	Dwell time [ms]	Limit [ms]
22	2441.664	378.858	15.154	400
Measurement uncertainty			<10 ⁻⁷	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

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TEST REPORT REFERENCE: F082707E01

5.5 MAXIMUM PEAK OUTPUT POWER

5.5.1 METHOD OF MEASUREMENT (MAXIMUM PEAK OUTPUT POWER)

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

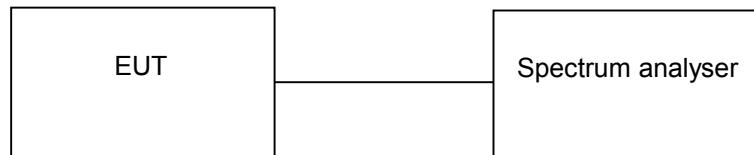
The following spectrum analyser settings shall be used:

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

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

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

Test set-up:

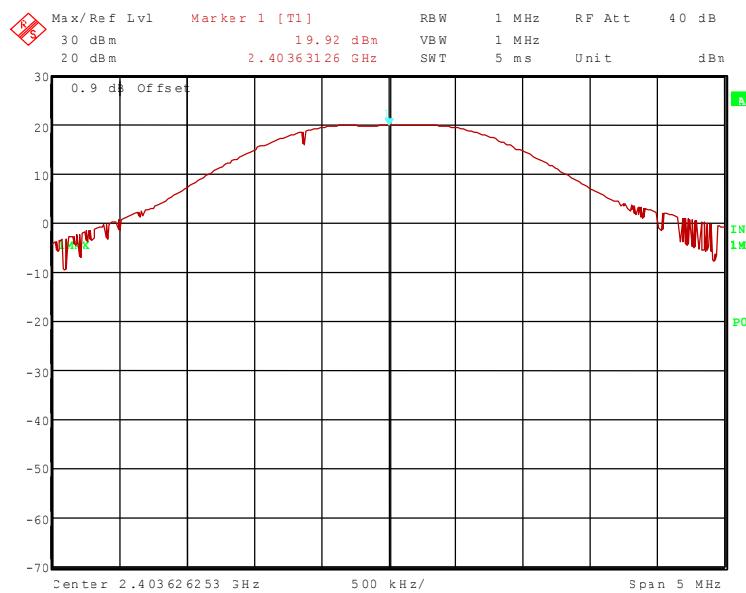


TEST REPORT REFERENCE: F082707E01

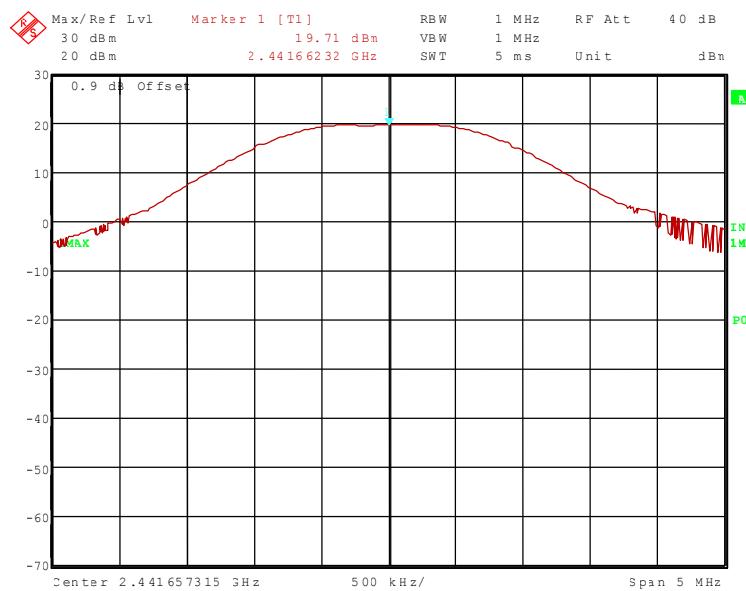
5.5.2 TEST RESULTS (MAXIMUM PEAK OUTPUT POWER)

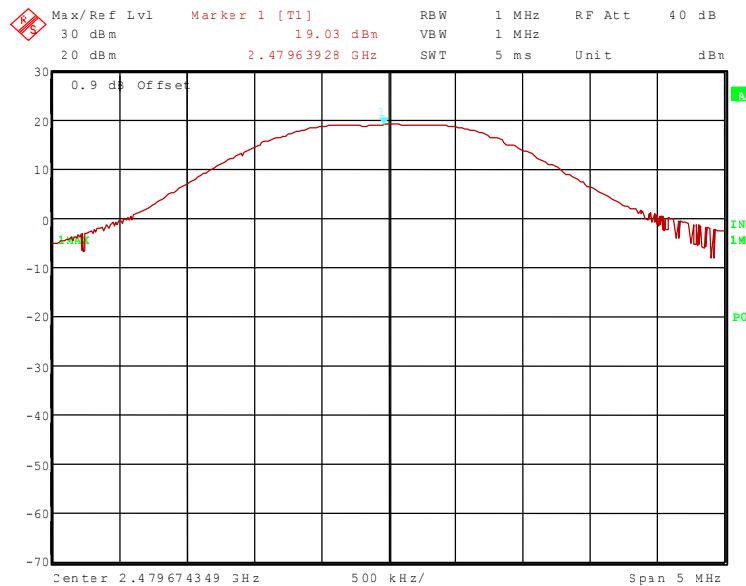
Ambient temperature	20 °C	Relative humidity	45 %
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82707_3.wmf (maximum peak output power at the lower end of the assigned frequency band):



82707_2.wmf (maximum peak output power at the middle of the assigned frequency band):



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82707_4.wmf (maximum peak output power at the upper end of the assigned frequency band):


Channel number	Channel frequency [MHz]	Maximum peak output power [dBm]	Antenna gain [dBi]	Peak power limit [dBm]
0	2403.648	19.9	7.0	20.0 *
22	2441.664	19.7	7.0	20.0 *
44	2479.680	19.0	7.0	20.0 *
Measurement uncertainty				+0.66 dB / -0.72 dB

*: Because the antenna gain exceed 6 dBi the limit is increased by the amount of this exceedance.

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

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5.6 BAND-EDGE COMPLIANCE

5.6.1 METHOD OF MEASUREMENT (BAND-EDGE COMPLIANCE)

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

After trace stabilisation the marker shall be set on the signal peak. The first display line has to be set on this value. The second display line has to be set 20 dB below the first line (or the peak marker). The frequency line shall be set on the edge of the assigned frequency band. Set the second marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is higher than that at the band-edge. This frequency shall be measured with the EMI receiver as described in subclause 5.7.1 of this test report, but 100 kHz resolution bandwidth shall be used.

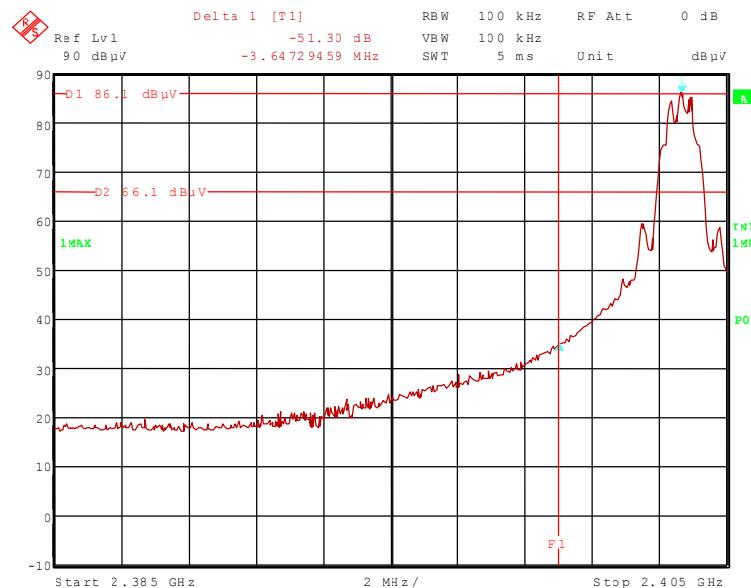
The measurement will be performed at the upper end of the assigned frequency band.

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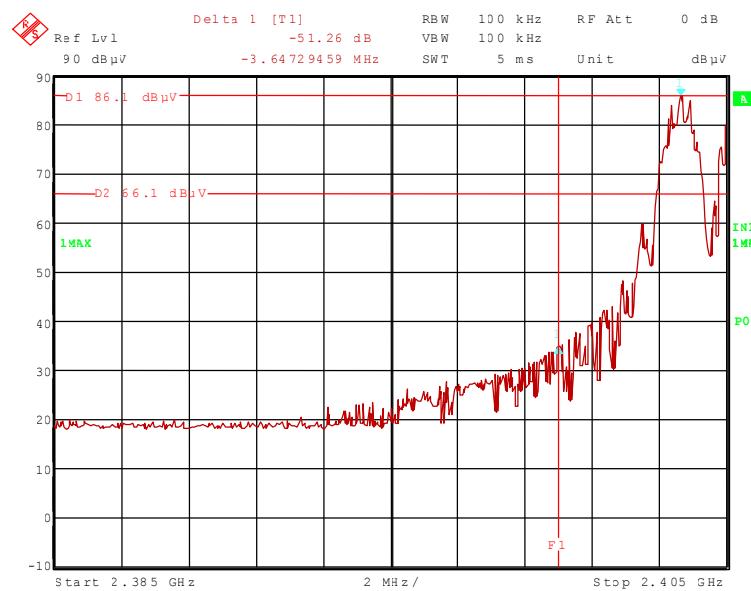
5.6.2 TEST RESULT (BAND-EDGE COMPLIANCE)

Ambient temperature	20 °C	Relative humidity	47 %
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82707_6.wmf (band-edge compliance, lower band edge, hopping off):



82707_7.wmf (band-edge compliance, lower band edge, hopping on):

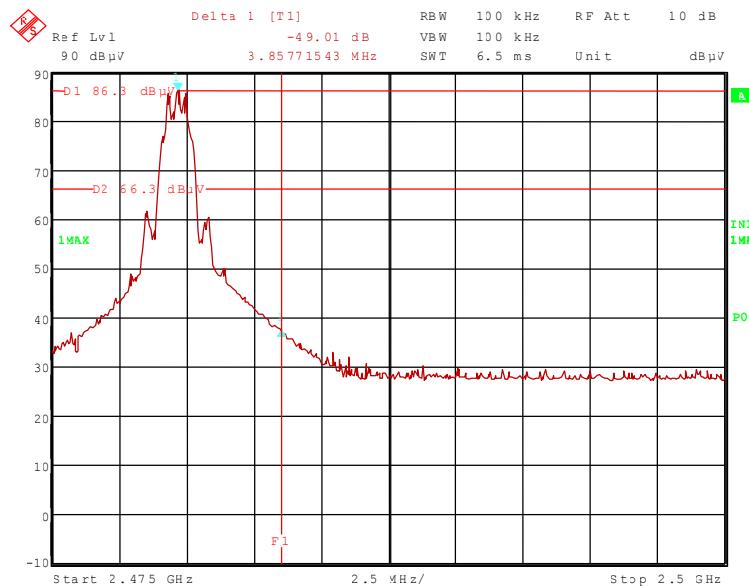
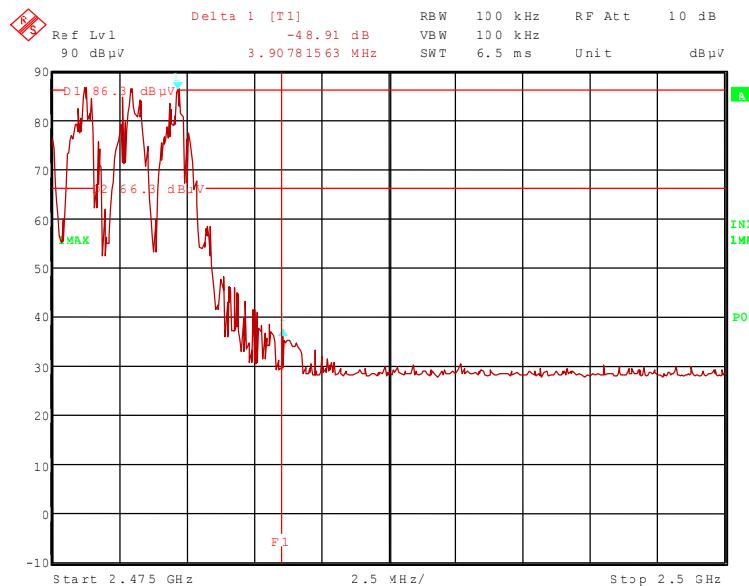


TEST REPORT REFERENCE: F082707E01

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 (hopping disenabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.4036	118.6	-	-	86.1	28.8	0.0	3.7	150	Vert.	-
2.400	67.3	98.6	31.3	34.8	28.8	0.0	3.7	150	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.4036	89.7	-	-	57.2	28.8	0.0	3.7	150	Vert.	-
2.400	38.4	69.7	31.3	5.9	28.8	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.4036	118.6	-	-	86.1	28.8	0.0	3.7	150	Vert.	-
2.400	67.3	98.6	31.3	34.8	28.8	0.0	3.7	150	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.4036	89.7	-	-	57.2	28.8	0.0	3.7	150	Vert.	-
2.400	38.4	69.7	31.3	5.9	28.8	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

TEST REPORT REFERENCE: F082707E01
82707_10.wmf (band-edge compliance, upper band edge, hopping off):

82707_11.wmf (band-edge compliance, upper band edge, hopping on):


TEST REPORT REFERENCE: F082707E01

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 (hopping disenabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.4797	119.5	-	-	86.7	29.0	0.0	3.8	150	Vert.	-
2.4835	70.5	74.0	3.5	37.7	29.0	0.0	3.8	150	Vert.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.4797	87.8	-	-	55.0	29.0	0.0	3.8	150	Vert.	-
2.4835	38.8	54.0	15.2	6.0	29.0	0.0	3.8	150	Vert.	Yes

Measurement uncertainty	+2.2 dB / -3.6 dB
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Band-edge compliance (hopping enabled)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.4797	119.5	-	-	86.7	29.0	0.0	3.8	150	Vert.	-
2.4835	70.6	74.0	3.4	37.8	29.0	0.0	3.8	150	Vert.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.4797	87.8	-	-	55.0	29.0	0.0	3.8	150	Vert.	-
2.4835	38.6	54.0	15.4	6.1	29.0	0.0	3.8	150	Vert.	Yes

Measurement uncertainty	+2.2 dB / -3.6 dB
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TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 34, 36, 44

TEST REPORT REFERENCE: F082707E01

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 9 kHz to 1 GHz.
- A final measurement carried out on an outdoor test site 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 site with reflecting ground plane and various antenna height in the frequency range 30 MHz to 1 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.

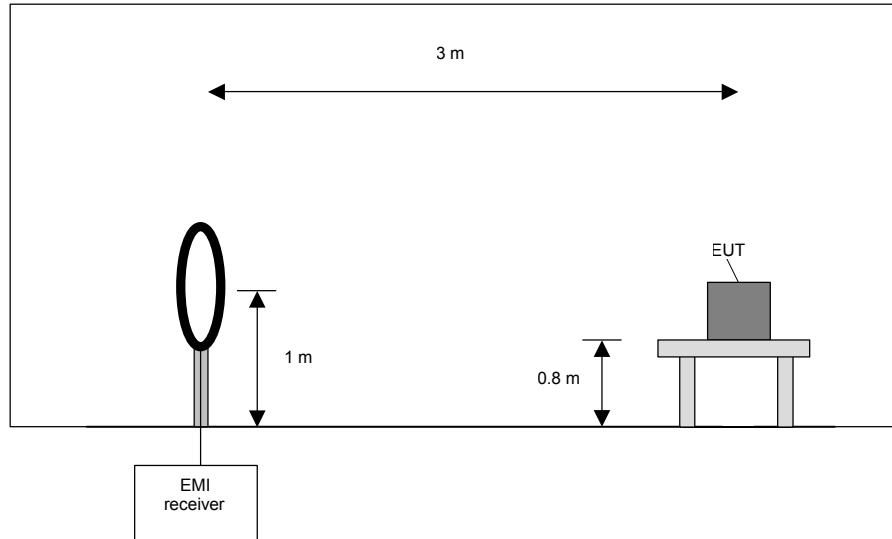
Preliminary measurement (9 kHz to 30 MHz):

In the first stage a preliminary measurement will be performed in a shielded room with a measuring distance of 3 meters. Tabletop devices will be 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 find 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: F082707E01

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).

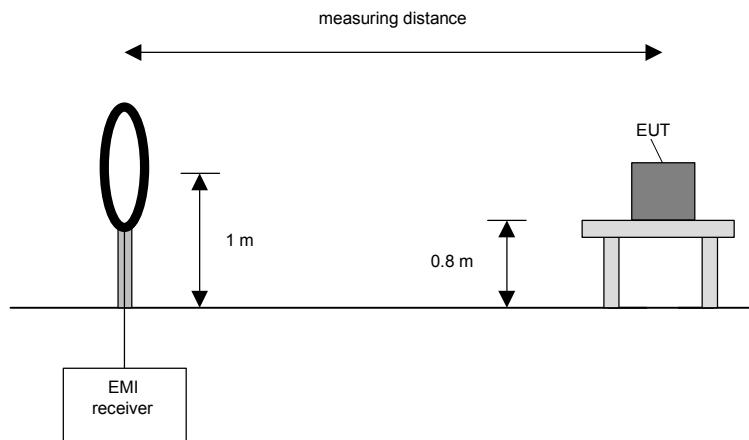
Final measurement (9 kHz to 30 MHz):

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: F082707E01

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).

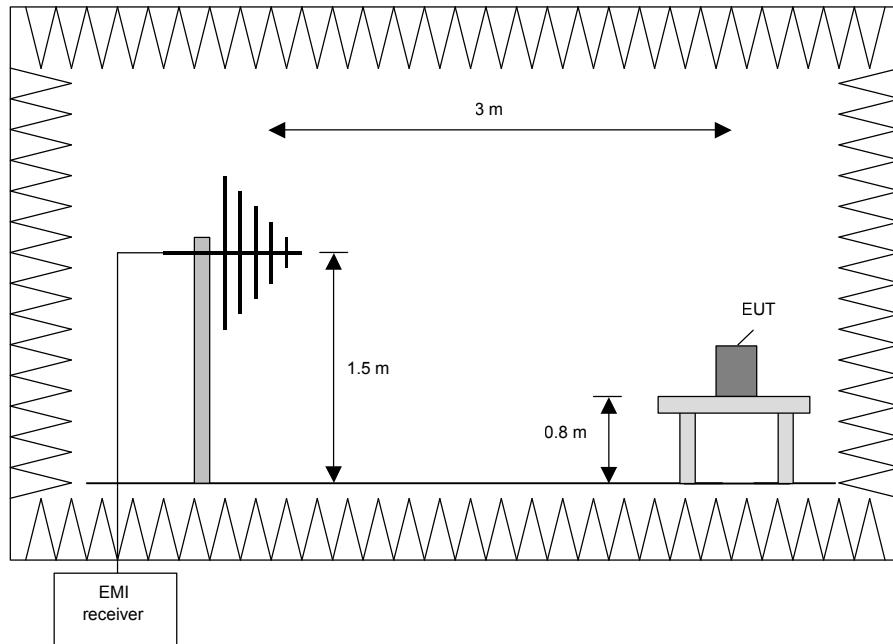
Preliminary measurement (30 MHz to 1 GHz)

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: F082707E01
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:

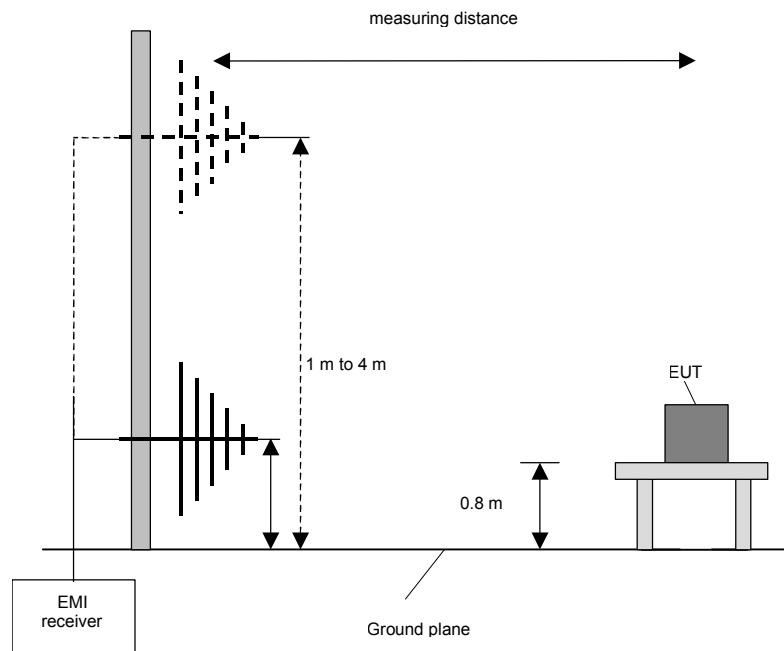
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the 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: F082707E01

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 be 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].

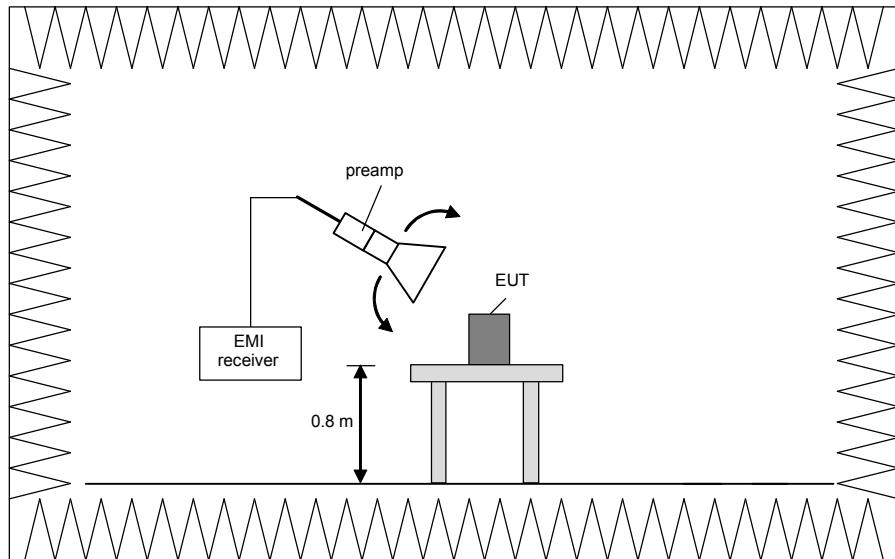
Preliminary measurement (1 GHz to 25 GHz)

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 then 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: F082707E01

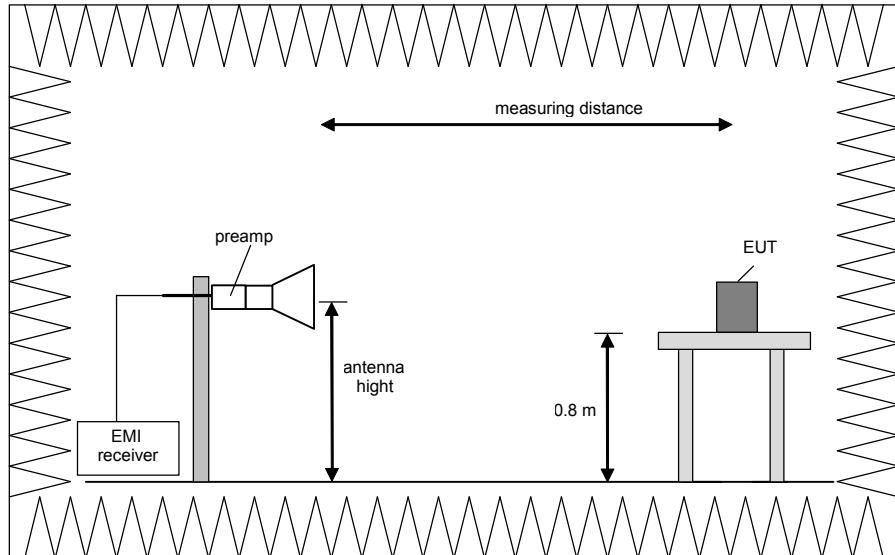


Final measurement (1 GHz to 25 GHz)

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: F082707E01

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: F082707E01

5.7.2 TEST RESULTS (RADIATED EMISSIONS)

5.7.2.1 PRELIMINARY MEASUREMENT (10 MHz to 25 GHz)

Ambient temperature	20 °C	Relative humidity	47 %
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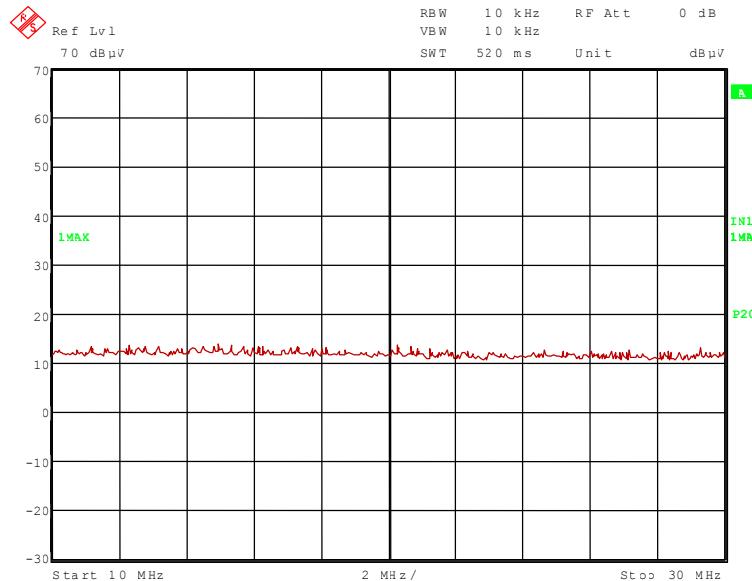
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m in the range 10 MHz to 25 GHz.

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: Where not otherwise stated the test was carried out in test mode 2 of the EUT, because there was no difference to the other test modes. All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 12.0 V DC.

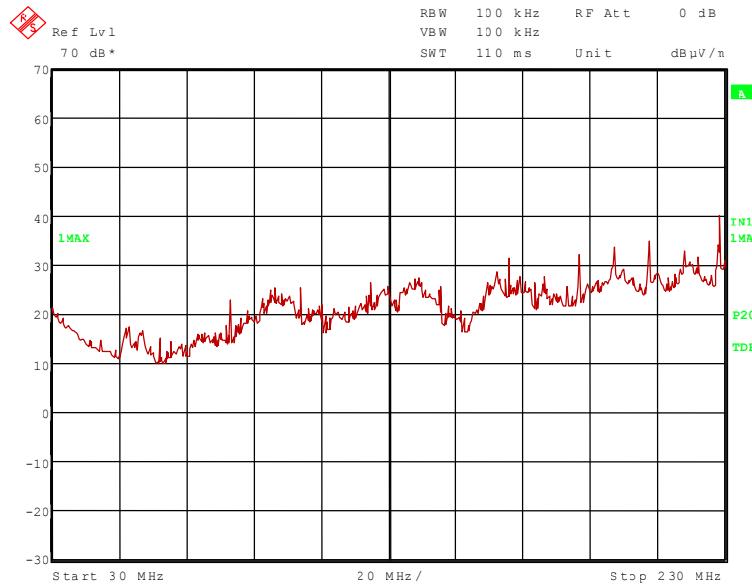
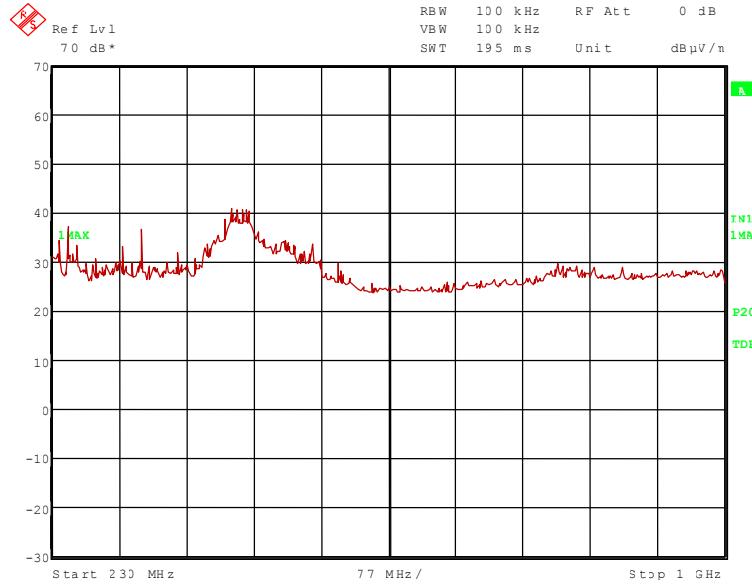
82707_18.wmf: (10 MHz to 30 MHz)



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 – 37, 39, 43, 44, 46, 49 – 51, 54, 58, 67

TEST REPORT REFERENCE: F082707E01
82707_17.wmf (30 MHz to 230 MHz):

82707_16.wmf (230 MHz to 1 GHz):


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

- 82.951 MHz, 186.625 MHz, 196.992 MHz, 207.361 MHz, 228.095 MHz, 238.463 MHz and 435.457 MHz.

The following frequency was found inside the restricted bands:

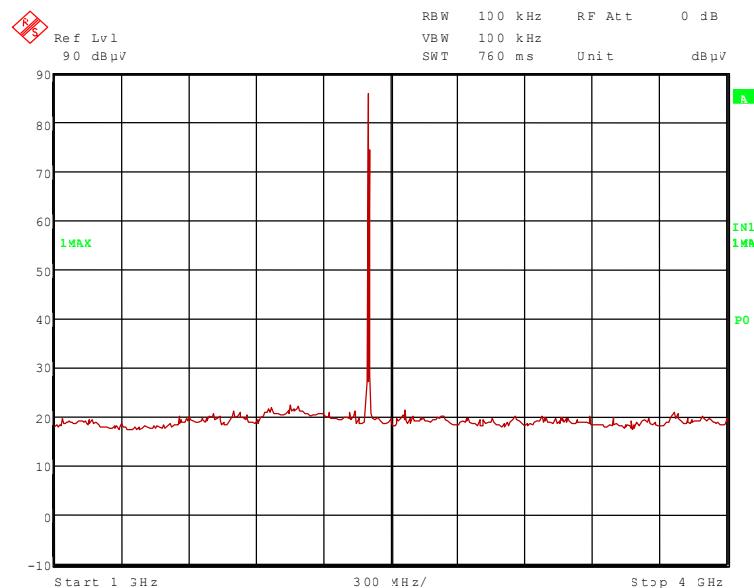
- 165.888 MHz, 248.836 MHz and 331.775 MHz.

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

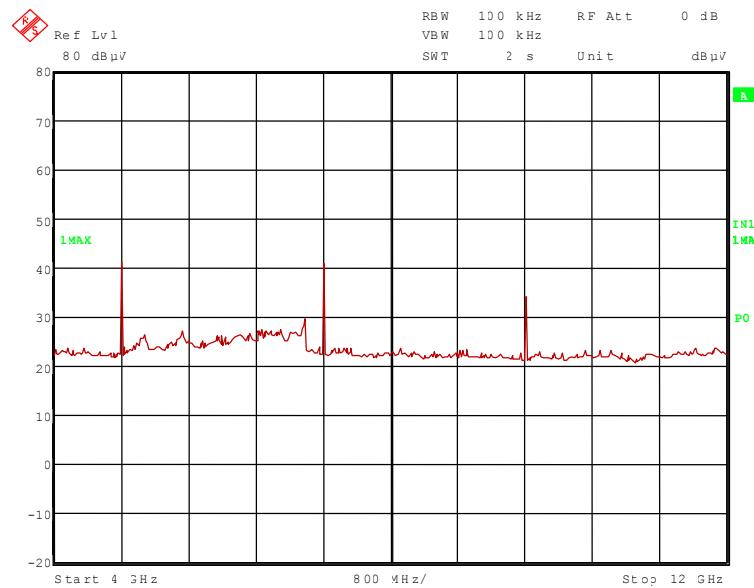
TEST REPORT REFERENCE: F082707E01

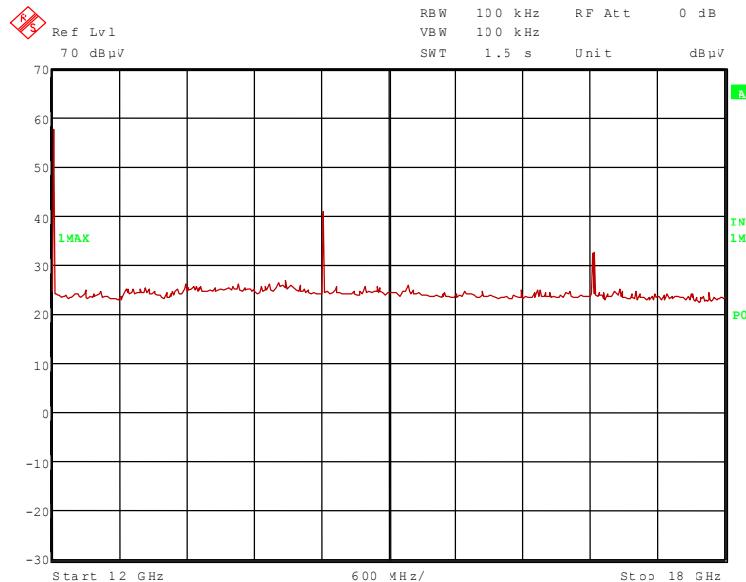
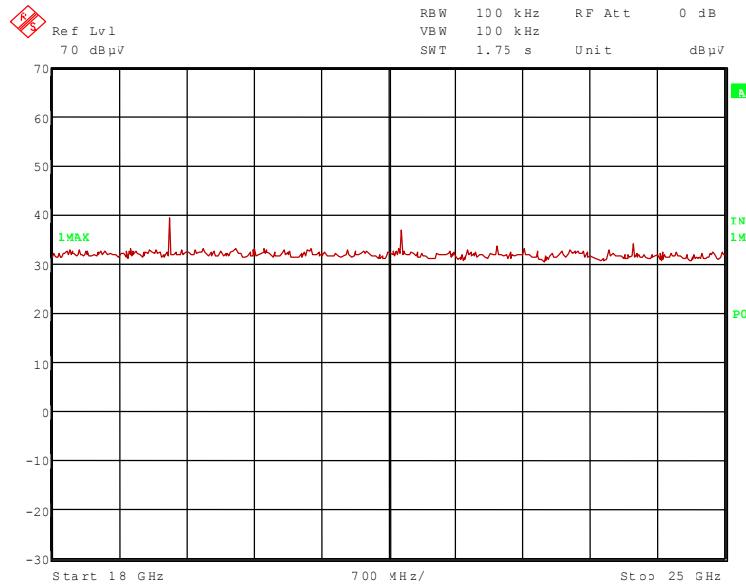
Transmitter operates at the lower end of the assigned frequency band (operation mode 1)

82707_5.wmf (1 GHz to 4 GHz):



82707_14.wmf (4 GHz to 12 GHz):



TEST REPORT REFERENCE: F082707E01
82707_24.wmf (12 GHz to 18 GHz):

82707_25.wmf (18 GHz to 25 GHz):


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

- 4.8072 GHz, 12.0180 GHz and 19.2288 GHz.

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

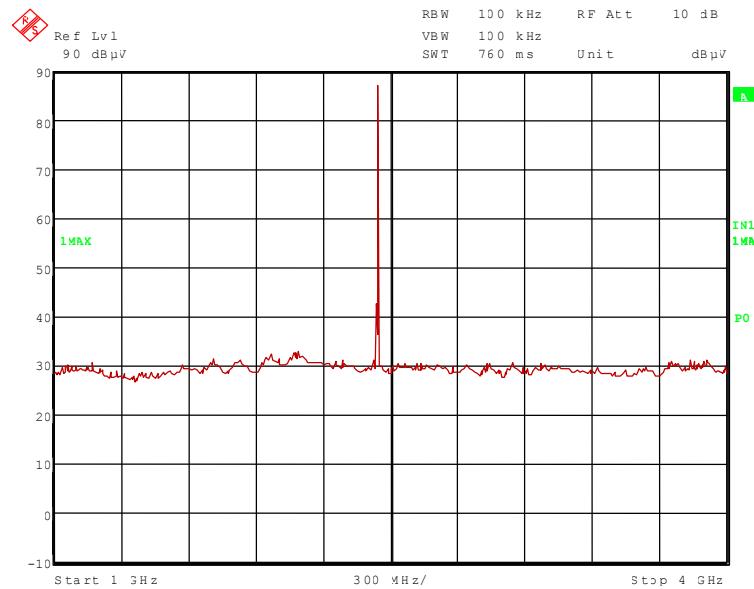
- 2.4036 GHz, 7.2108 GHz, 9.6144 GHz, 14.4216 GHz and 16.8252 GHz.

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

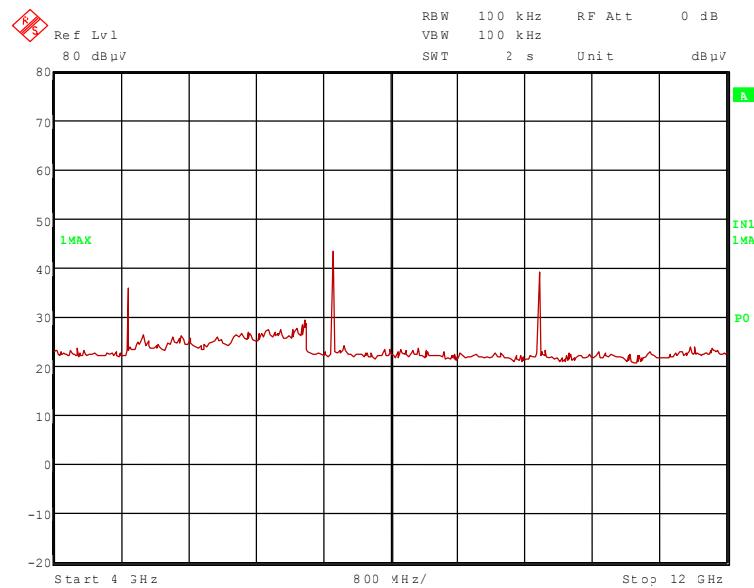
TEST REPORT REFERENCE: F082707E01

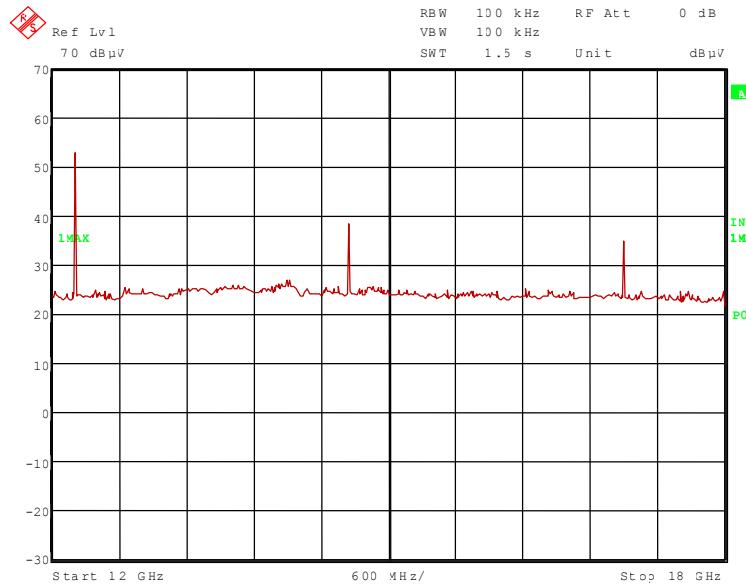
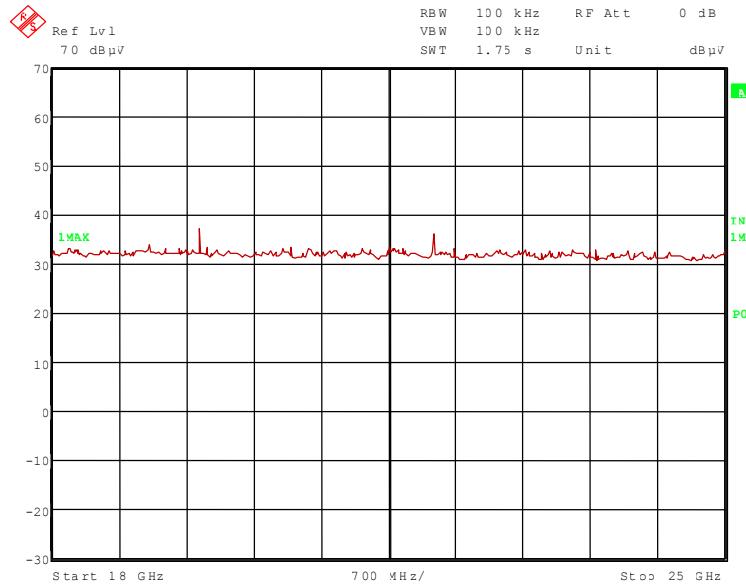
Transmitter operates at the middle of the assigned frequency band (operation mode 2)

82707_12.wmf (1 GHz to 4 GHz):



82707_13.wmf (4 GHz to 12 GHz):



TEST REPORT REFERENCE: F082707E01
82707_27.wmf (12 GHz to 18 GHz):

82707_26.wmf (18 GHz to 25 GHz):


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

- 4.8832 GHz, 7.3248 GHz and 12.2080 GHz

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

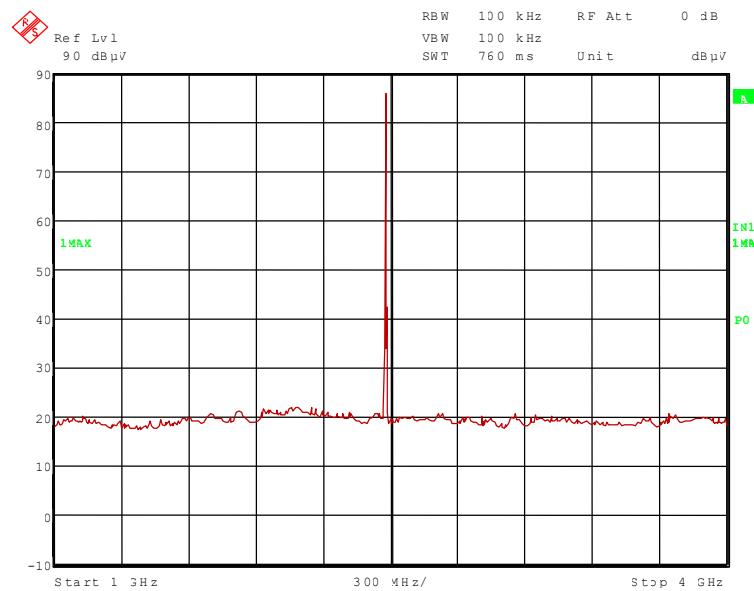
- 2.4416 GHz, 9.7664 GHz, 14.6496 GHz and 17.0912 GHz

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

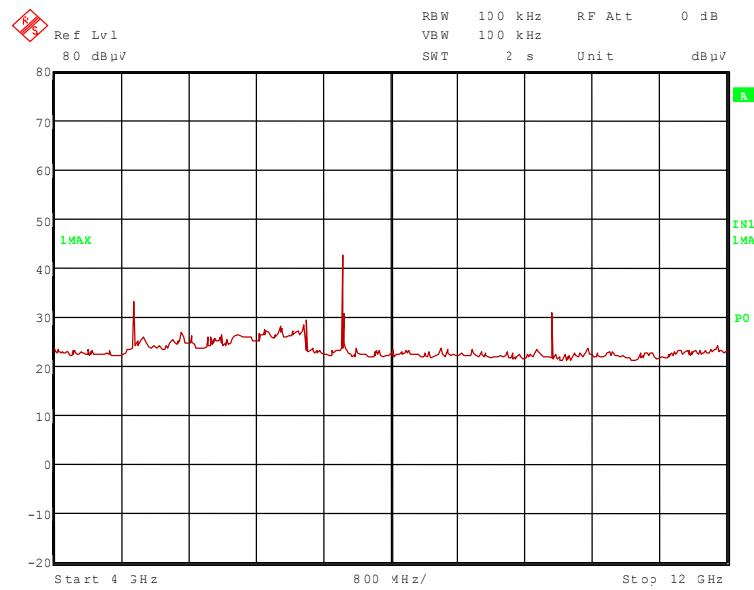
TEST REPORT REFERENCE: F082707E01

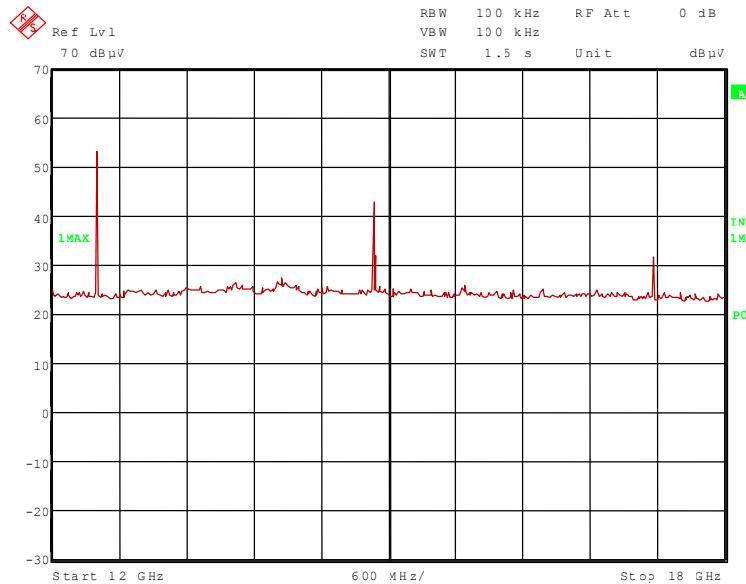
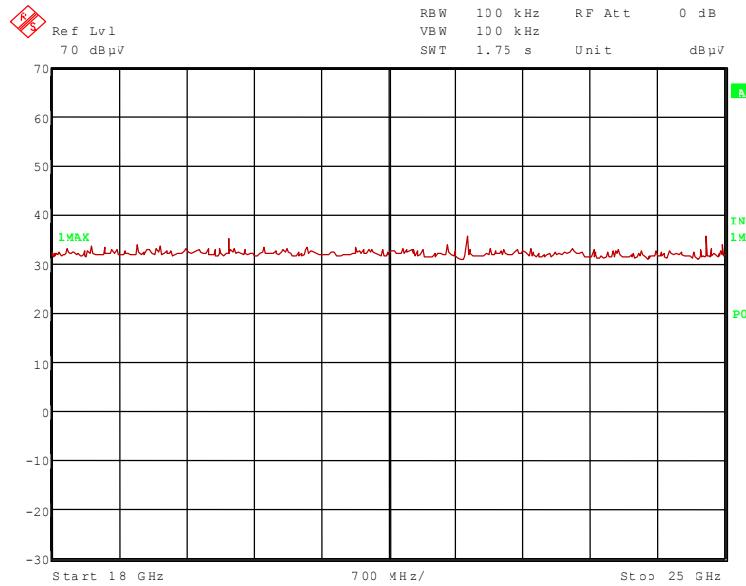
Transmitter operates at the upper end of the assigned frequency band (operation mode 3)

82707_8.wmf (1 GHz to 4 GHz):



82707_15.wmf (4 GHz to 12 GHz):



TEST REPORT REFERENCE: F082707E01
82707_28.wmf (12 GHz to 18 GHz):

82707_29.wmf (18 GHz to 25 GHz):


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

- 4.9594 GHz, 7.4390 GHz and 12.3984 GHz.

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

- 2.4797 GHz, 9.9187 GHz, 14.8781 GHz and 17.3578 GHz.

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

TEST REPORT REFERENCE: F082707E01

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

Ambient temperature	20 °C	Relative humidity	47 %
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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.

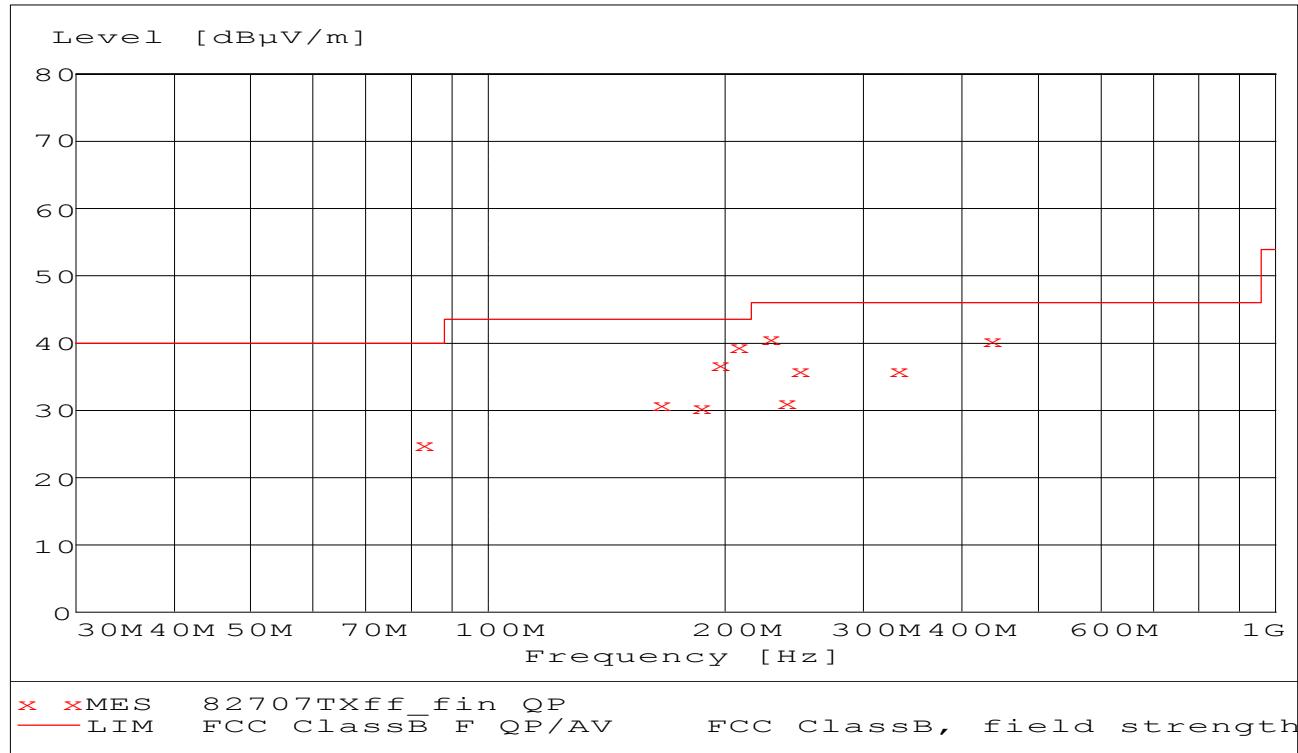
Test record: The test was carried out in normal operation mode 2 of the EUT. All results are shown in the following.

Supply voltage: The EUT was supplied with 12.0 V DC.

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 point in the following diagram refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured point marked with x is the measured result of the standard final measurement on the open area test site.



Data record name: 82707TXff

TEST REPORT REFERENCE: F082707E01

The results of the standard final 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.

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.	Pos.
82.951	25	40.0	15.0	15.4	8.6	1.0	160.0	22.0	Vert.	2
186.625	30.5	43.5	13.0	19.9	9.1	1.5	124.0	115.0	Vert.	2
196.992	36.9	43.5	6.6	26.5	8.9	1.5	100.0	9.0	Vert.	2
207.361	39.5	43.5	4.0	28.8	9.2	1.5	154.0	247.0	Hor.	2
228.095	40.8	46.0	5.2	29.0	10.2	1.6	100.0	67.0	Vert.	2
238.463	31.3	46.0	14.7	18.6	11.0	1.7	144.0	262.0	Hor.	2
435.457	40.6	46.0	5.4	21.8	16.4	2.4	209.0	155.0	Hor.	2
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.	Pos.
165.888	30.9	43.5	12.6	18.8	10.7	1.4	217.0	292.0	Hor.	2
248.836	36.3	46.0	9.7	22.6	12.0	1.7	133.0	339.0	Hor.	2
331.775	36.2	46.0	9.8	20.4	13.8	2.0	125.0	202.0	Vert.	2
Measurement uncertainty				+2.2 dB / -3.6 dB						

The test results were calculated with the following formula:

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

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

14 – 20

TEST REPORT REFERENCE: F082707E01

5.7.2.3 FINAL MEASUREMENT (1 GHz to 25 GHz)

Ambient temperature	20 °C	Relative humidity	47 %
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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.

Supply voltage: During all measurements the EUT was supplied with 12.0 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 dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Pos.	Restr. Band
2.4036	118.6	-	-	86.1	28.8	0.0	3.7	150	Vert.	2	-
4.8072	57.5	74.0	16.5	44.2	33.7	25.7	5.3	150	Vert.	2	Yes
7.2108	62.9	98.6	35.7	43.8	36.9	24.6	6.8	150	Vert.	2	No
9.6144	60.2	98.6	38.4	38.0	38.3	23.9	7.8	150	Vert.	2	No
12.0180	70.5	74.0	3.5	60.3	33.6	25.9	2.5	150	Vert.	2	Yes
14.4216	56.9	98.6	41.7	47.2	33.7	26.5	2.5	150	Vert.	2	No
16.8252	50.9	98.6	47.7	42.1	33.8	27.5	2.5	150	Vert.	2	No
19.2288	48.0	74.0	26.0	46.6	37.1	38.2	2.5	150	Vert.	2	Yes
Measurement uncertainty								+2.2 dB / -3.6 dB			

Result measured with the average detector:

Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Pos.	Restr. Band
2.4036	89.7	-	-	57.2	28.8	0.0	3.7	150	Vert.	2	-
4.8072	34.8	54.0	19.2	21.5	33.7	25.7	5.3	150	Vert.	2	Yes
7.2108	40.6	69.7	29.1	21.5	36.9	24.6	6.8	150	Vert.	2	No
9.6144	41.0	69.7	28.7	18.8	38.3	23.9	7.8	150	Vert.	2	No
12.0180	44.5	54.0	9.5	34.3	33.6	25.9	2.5	150	Vert.	2	Yes
14.4216	38.8	69.7	30.9	29.1	33.7	26.5	2.5	150	Vert.	2	No
16.8252	36.1	69.7	33.6	27.3	33.8	27.5	2.5	150	Vert.	2	No
19.2288	30.7	54.0	23.3	29.3	37.1	38.2	2.5	150	Vert.	2	Yes
Measurement uncertainty								+2.2 dB / -3.6 dB			

TEST REPORT REFERENCE: F082707E01

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

Result measured with the peak detector:

Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Pos.	Restr. Band
2.4416	121.0	-	-	88.4	28.9	0.0	3.7	150	Vert.	2	-
4.8832	56.0	74.0	18.0	42.6	33.8	25.7	5.3	150	Vert.	2	Yes
7.3248	65.6	74.0	8.4	46.3	37.1	24.6	6.8	150	Vert.	2	Yes
9.7664	64.6	101.0	36.4	42.2	38.4	23.9	7.9	150	Vert.	2	No
12.2080	67.0	74.0	7.0	56.8	33.6	25.9	2.5	150	Vert.	2	Yes
14.6496	58.8	101.0	42.2	49.2	33.7	26.6	2.5	150	Vert.	2	No
17.0912	46.9	101.0	54.1	38.0	33.8	27.4	2.5	150	Vert.	2	No
Measurement uncertainty							+2.2 dB / -3.6 dB				

Result measured with the average detector:

Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Pos.	Restr. Band
2.4416	91.9	-	-	59.3	28.9	0.0	3.7	150	Vert.	2	-
4.8832	34.4	54.0	19.6	21	33.8	25.7	5.3	150	Vert.	2	Yes
7.3248	41.9	54.0	12.1	22.6	37.1	24.6	6.8	150	Vert.	2	Yes
9.7664	42.8	71.9	29.1	20.4	38.4	23.9	7.9	150	Vert.	2	No
12.2080	39.4	54.0	14.6	29.2	33.6	25.9	2.5	150	Vert.	2	Yes
14.6496	34.6	71.9	37.3	25.0	33.7	26.6	2.5	150	Vert.	2	No
17.0912	29.6	71.9	42.3	20.7	33.8	27.4	2.5	150	Vert.	2	No
Measurement uncertainty							+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F082707E01

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

Result measured with the peak detector:

Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Pos.	Restr. Band
2.4797	119.5	-	-	86.7	29.0	0.0	3.8	150	Vert.	2	-
4.9594	52.1	74.0	21.9	38.4	34.0	25.6	5.3	150	Vert.	2	Yes
7.4390	64.9	74.0	9.1	45.3	37.3	24.5	6.8	150	Vert.	2	Yes
9.9187	62.7	99.5	36.8	40.2	38.5	23.9	7.9	150	Vert.	2	No
12.3984	66.4	74.0	7.6	56.1	33.7	25.9	2.5	150	Vert.	2	Yes
14.8781	61.8	99.5	37.7	52.3	33.7	26.7	2.5	150	Vert.	2	No
17.3578	48.8	99.5	50.7	39.6	33.9	27.2	2.5	150	Vert.	2	No
Measurement uncertainty							+2.2 dB / -3.6 dB				

Result measured with the average detector:

Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Pos.	Restr. Band
2.4797	87.8	-	-	55.0	29.0	0.0	3.8	150	Vert.	2	-
4.9594	32.5	54.0	21.5	18.8	34.0	25.6	5.3	150	Vert.	2	Yes
7.4390	39.3	54.0	14.7	19.7	37.3	24.5	6.8	150	Vert.	2	Yes
9.9187	41.8	67.8	26.0	19.3	38.5	23.9	7.9	150	Vert.	2	No
12.3984	37.8	54.0	16.2	27.5	33.7	25.9	2.5	150	Vert.	2	Yes
14.8781	36.5	67.8	31.3	27.0	33.7	26.7	2.5	150	Vert.	2	No
17.3578	30.8	67.8	37.0	21.6	33.9	27.2	2.5	150	Vert.	2	No
Measurement uncertainty							+2.2 dB / -3.6 dB				

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 34, 36, 37, 44, 46, 49, 50, 67

TEST REPORT REFERENCE: F082707E01

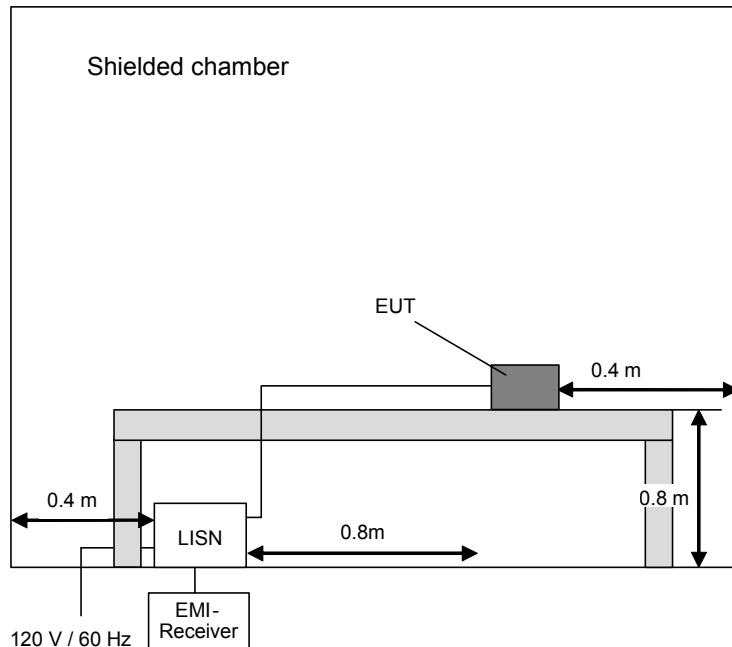
5.8 CONDUCTED EMISSIONS ON POWER SUPPLY LINES (150 KHZ TO 30 MHZ)

5.8.1 METHOD OF MEASUREMENT

This test will be carried out in a shielded chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices will be placed directly on the ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [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: F082707E01

5.8.2 TEST RESULTS (CONDUCTED EMISSIONS ON POWER SUPPLY LINES)

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.

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.

Title: Mains terminal disturbance voltage measurement with protective ground conductor simulation

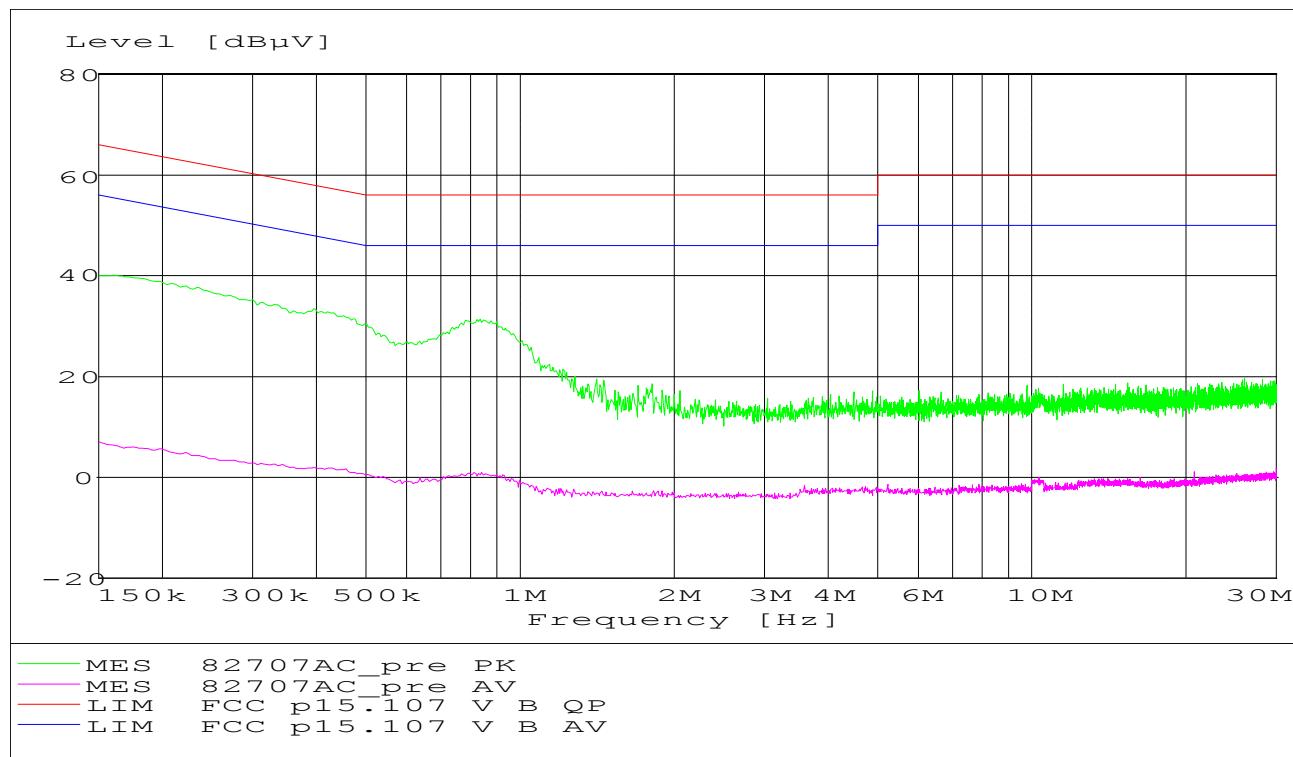
EUT: Dect module HW86022

Manufacturer: Höft & Wessel

Operating Condition: Transmit on low channel

Test site: PHOENIX TESTLAB Blomberg M4

Operator: Th. KÜHN



Data record name: 82707AC

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

1 – 3, 5, 6

TEST REPORT REFERENCE: F082707E01

6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

TEST REPORT REFERENCE: F082707E01

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. due
1	Shielded chamber M4	-	Siemens	B83117S1-X158	480088	Weekly verification (system cal.)	
2	Measuring receiver	ESAI	Rohde & Schwarz	831953/001 833181/018	480025 480026	02/26/2008 02/26/2008	02/2010 02/2010
3	LISN	NSLK8128	Schwarzbeck	8128155	480058	01/09/2008	01/2009
5	AC-filter	B84299-D87-E3	Siemens	930262292	480097	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 (system cal.)	
15	Measuring receiver	ESCS30	Rohde & Schwarz	828985/014	480270	02/27/2008	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 (system cal.)	
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355	02/25/2008	02/2010
32	Controller	HD100	Deisel	100/670	480326	-	
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	09/11/2008	09/2013
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.)	
54	Power supply	TOE 8852	Toellner	51712	480233	11/27/2006	11/2008
58	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	02/19/2008	02/2013
67	High Pass Filter	WHJS1000C11/60EF	Wainwright Instruments GmbH	1	480413	-	-

TEST REPORT REFERENCE: F082707E01

7 LIST OF ANNEXES

ANNEX A	PHOTOGRAPHS OF THE TEST SET-UPS:	6 pages
	SEW860221, test setup fully anechoic chamber (pos. 1)	82707_a.jpg
	SEW860221, test setup fully anechoic chamber (pos. 2)	82707_d.jpg
	SEW860221, test setup fully anechoic chamber (pos. 2)	82707_c.jpg
	SEW860221, test setup fully anechoic chamber (pos. 2)	82707_g.jpg
	SEW860221, test setup open area test site (pos. 2)	82707_d.jpg
	SEW860221, test setup shielded chamber	82707_i.jpg
ANNEX B	EXTERNAL PHOTOGRAPHS OF THE TEST SAMPLE:	- pages
	Because the EUT is a module that will be implemented into a final application no external photographs were available.	
ANNEX C	INTERNAL PHOTOGRAPHS OF THE TEST SAMPLE:	7 pages
	SEW860221, mounted on carrier board, 3-D view	82707_1.jpg
	SEW860221, mounted on carrier board	82707_4.jpg
	SEW860221, top view	82707_9.jpg
	SEW860221, top view, shielding removed	82707_10.jpg
	SEW860221, bottom view	82707_e.jpg
	HW8612 (carrier board), PCB, top view	82707_7.jpg
	HW8612 (carrier board), PCB, bottom view	82707_8.jpg
ANNEX D	ADDITIONAL RESULTS FOR INDUSTRY CANADA	5 pages