PHOENIX TESTLAB
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32825 Blomberg
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TEST REPORT

Test Report Reference: R61336 Edition 1

Equipment under Test: cB-0901-0301

Serial Number: none

FCC ID: PVH090103S

Applicant: connectBlue AB

Manufacturer: connectBlue AB

Test Laboratory
(CAB)
accredited by
DATech e.V.
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 IC3469

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1 IDENTIFICATION

1.1 APPLICANT

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

1.2 MANUFACTURER

Name:	connectBlue AB
Address:	Norra Vallgatan 64 3V
	Malmö SE-211 19
Country:	Sweden
Name for contact purposes:	Mr. Martin Engdahl
Tel:	+ 46 40 63 07 100
Fax:	+ 46 40 23 71 37
e-mail address:	martin.engdahl@connectblue.se

1.3 DATES

Date of receipt of test sample:	04 July 2006
Start of test:	12 July 2006
End of test:	12 July 2006

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 DATech e.V. in compliance with DIN EN ISO/IEC 17025 under Reg. No. DAT-P-105/99-21, FCC Test site registration number 90877 and Industry Canada Test site registration IC3469

Test engineer:	Thomas KÜHN		13 July 2006
	Name	Signature	Date
Test report checked:	Bernd STEINER		13 July 2006
	Name	Signature	Date

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

1.5 RESERVATION

This test report is only valid in its original form.

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 (February 2006)** Radio Frequency Devices

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

[4] **RSS-210 Issue 6 September 2005** Low power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

[5] **RSS-Gen Issue 1 September 2005** 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.

2 TECHNICAL DATA OF EQUIPMENT

2.1 DEVICE UNDER TEST

Type of equipment: *	Bluetooth module
Type designation: *	cB-0901-0301
FCC ID: *	PVH090103S
Antenna type: *	Internal or external
Antenna gain: *	Refer table below
Antenna connector: *	With internal antenna, no antenna connector is mounted. Using an external antenna, a UFL connector is used.
Power supply: *	3.0 V DC to 6.0 V DC
Type of modulation: *	FHSS (GFSK)
Operating frequency range:*	2.402 to 2.480 GHz
Number of channels: *	79
Temperature range: *	-30 °C to +85 °C

*: 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.

Used antennas:

model name*	Antenna type	Rated Antenna gain*
MicroBlue CAP24235	external	+2.0 dBi

*: declared by the applicant

The following external I/O cables were used:

Cable	Length	Shielding	Connector
DC in	2 m *	No	6.3 mm jack plug
-	-	-	-

*: Length during the test if no other specified.

2.2 PERIPHERY DEVICES

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

- The Bluetooth module was connected to a carrier board (cB-0903-02), which was delivered by the applicant. The carrier board was supplied via an external power supply with 5.0 V DC.
- A personal computer with a terminal-software was used, connected temporary to the carrier board, for setting the equipment into the necessary operation mode. During the measurement procedures the personal computer was disconnected.

3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

The EUT is intended to be used in several bluetooth applications. Because the cB-0901-0301 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 one unmodified sample with an antenna connector (sample marked with “14”) and the additional external antenna type MicroBlue CAP24235.

During the tests the test sample was powered by an external power supply via the carrier board with 5.0 V DC.

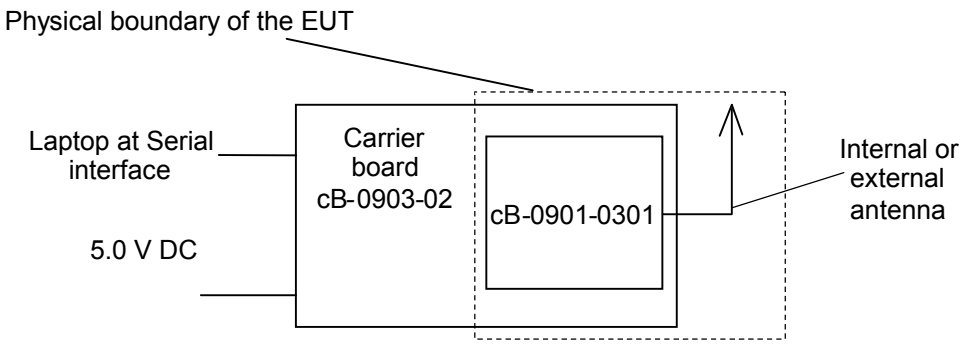
If not otherwise stated, for modulating the transmitter, a pseudo random bit sequence with a length of 27 byte and with a pattern type DH5 was used.

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

During the tests, the EUT was not labelled with a FCC-label.

The following operation modes were used during the tests:

Operation mode	Description of the operation mode
1	Continuous transmitting on 2402 MHz
2	Continuous transmitting on 2441 MHz
3	Continuous transmitting on 2480 MHz
4	Continuous receiving on 2441 MHz



4 ADDITIONAL INFORMATION

The cB-0901-0301 is already tested under PHOENIX-TESTLAB test report reference R51145_A. The reason for this report is the additional antenna MicroBlue CAP24235, which should be listed in combination with the cB-0901-0301. With this antenna the radiated spurious emission measurement was carried out to show the compliance with the requirements. The measurements were carried out with the same test sample than the measurements, which were carried out under R51145_A.

5 LIST OF MEASUREMENTS

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section	RSS 210, Issue 6 [4] or RSS-Gen, Issue 1 [5]	Status	Refer page
20 dB bandwitdh	General	15.247 (a) (1)	A8.1 (2) [4]	Reported under R51145_A	9 et seq. (R51145_A)
Carrier frequency separation	General	15.247 (a) (1)	A8.1 (2) [4]	Reported under R51145_A	13 et seq. (R51145_A)
Number of hopping channels	2400.0 - 2483.5	15.247 (a) (1) (iii)	A8.1 (4) [4]	Reported under R51145_A	16 et seq. (R51145_A)
Dwell time	2400.0 - 2483.5	15.247 (a) (1) (iii)	A8.1 (4) [4]	Reported under R51145_A	18 et seq. (R51145_A)
Maximum peak output power	2400.0 - 2483.5	15.247 (b) (1)	A8.4 (2) [4]	Reported under R51145_A	21 et seq. (R51145_A)
Power spectral density	2441	15.247 (e)	A8.2 (2) [4]	Reported under R51145_A	25 et seq. (R51145_A)
Band edge compliance	2400.0 - 2483.5	15.247 (d)	A8.5 [4]	Reported under R51145_A	28 et seq. (R51145_A)
Conducted emissions (transmitter)	0.009 - 25,000	15.247 (d)	A8.5 [4]	Reported under R51145_A	32 et seq. (R51145_A)
Radiated emissions (transmitter)	0.009 - 25,000	15.205 (a) 15.209 (a)	A8.5 [4] 2.6 [4]	Passed	8 et seq. (this report)
Conducted emissions on supply line	0.15 - 30	15.207 (a)	7.2.2 [5]	Reported under R51145_A	67 et seq. (R51145_A)
Radiated emissions (receiver)	0.009 - 25,000	15.109 (a)	7.2.3 [5] 2.6 [4]	Passed	26 et seq. (this report)

6 TEST RESULTS

6.1 RADIATED EMISSIONS (TRANSMITTER)

6.1.1 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 side without reflecting ground plane and a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A final measurement carried out on an open area test side with reflecting ground plane and various antenna height in the frequency range 30 MHz to 1 GHz.
- A 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 disenabled.

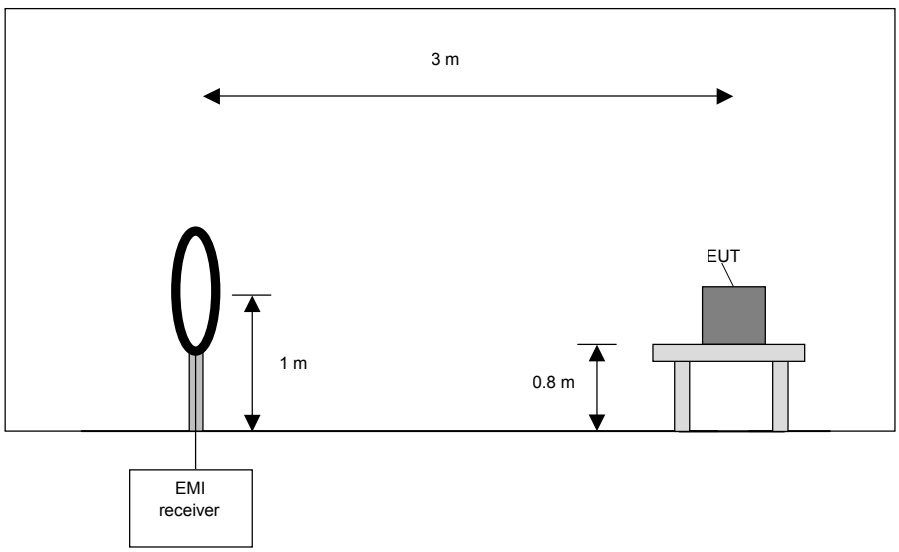
Preliminary measurement (9 kHz to 30 MHz):

In the first stage a preliminary measurement will be performed in a shielded room with a measuring distance of 3 meters. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003 [1].

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

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

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



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 4) with the other orthogonal axes of the EUT.
7) Rotate the measuring antenna and repeat steps 1) to 5).

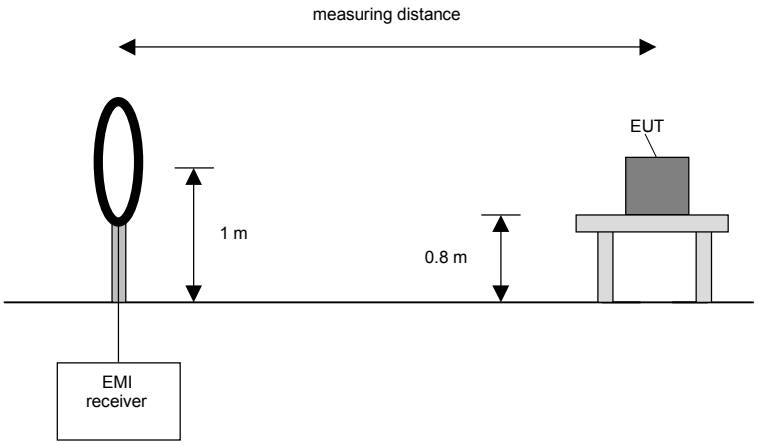
Final measurement (9 kHz to 30 MHz):

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



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 if applicable (handheld equipment).

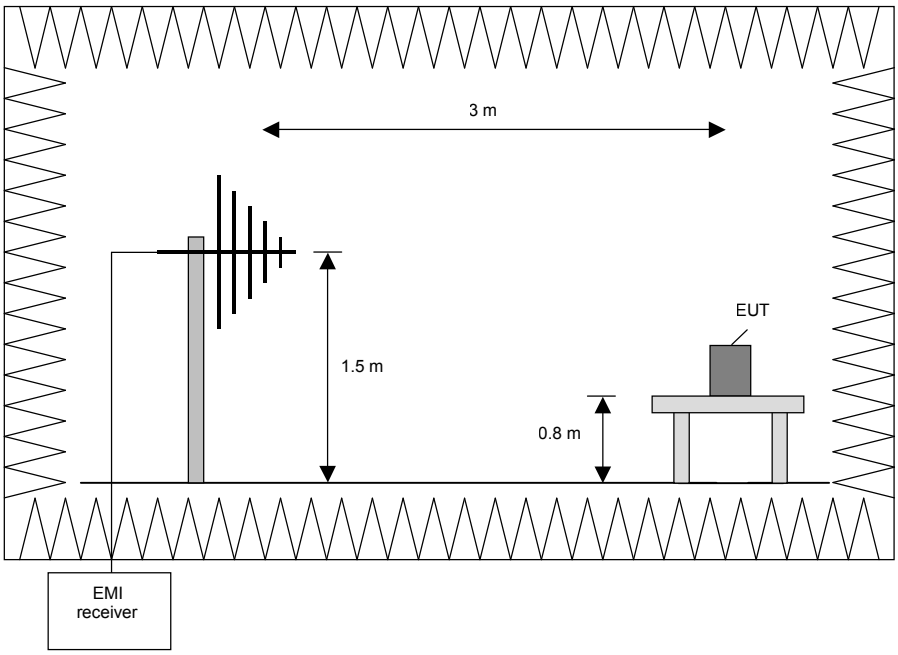
Preliminary measurement (30 MHz to 1 GHz)

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



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:

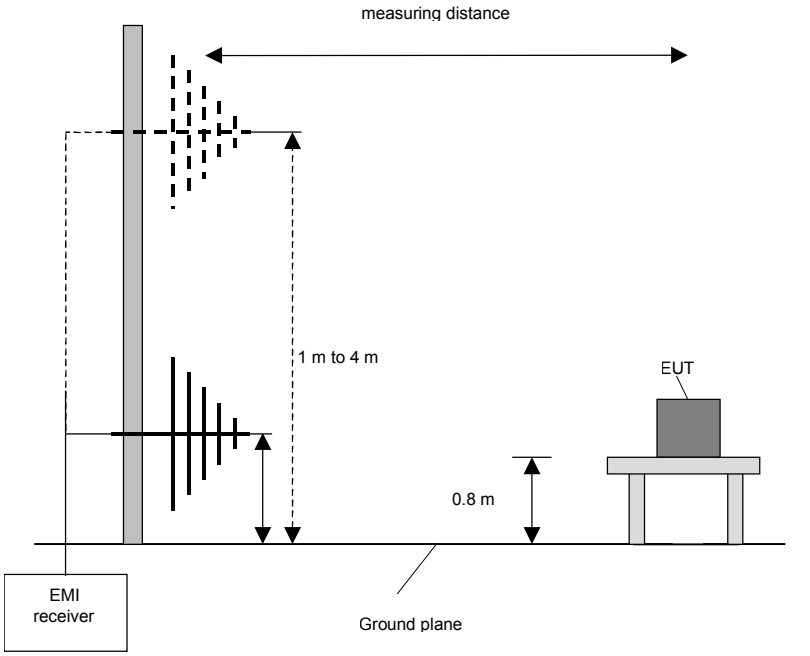
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the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

Final measurement (1 GHz to 25 GHz)

This 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].

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 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 °. If the EUT is larger than the antenna beam width, the antenna will be moved to various positions, to cover the whole surface of the EUT. It might be possible to shorter the measuring distance to higher the measurement sensitivity.

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

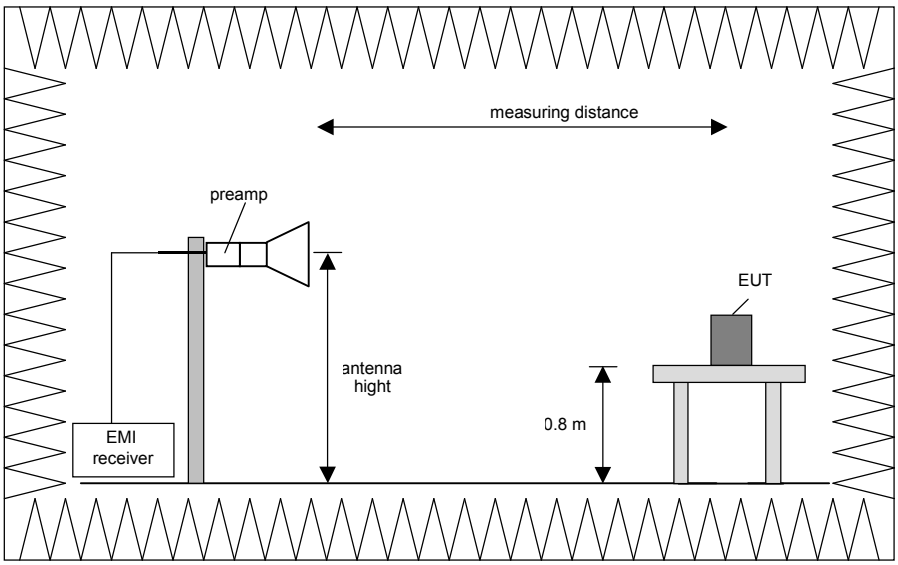
Frequency range	Resolution bandwidth
1 GHz to 4 GHz	100 kHz
4 GHz to 12 GHz	100 kHz
12 GHz to 18 GHz	100 kHz
18 GHz to 25 GHz	100 kHz

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 MAX Hold 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 °. If the EUT is larger than the antenna beam width, the antenna will be moved to various positions, to cover the whole surface of the EUT. It might be possible to shorter the measuring distance to higher the measurement sensitivity.

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



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 a EUT azimuth of 0 °.
2) Rotate the EUT by 360 ° to maximize the detected signals.
3) Change the antenna polarisation.
4) Rotate the EUT by 360 ° to maximize the detected signals.
5) Make a hardcopy of the spectrum.
6) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
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) with the other orthogonal axes of the EUT if handheld equipment.
9) Repeat steps 1) to 8) for the next antenna spot if the EUT is lager than the antenna beamwidth.

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

6.1.2 TEST RESULTS (RADIATED EMISSIONS)

6.1.2.1 PRELIMINARY MEASUREMENT WITH ADDITIONAL ANTENNA (9 kHz to 25 GHz)

Ambient temperature	22 °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.

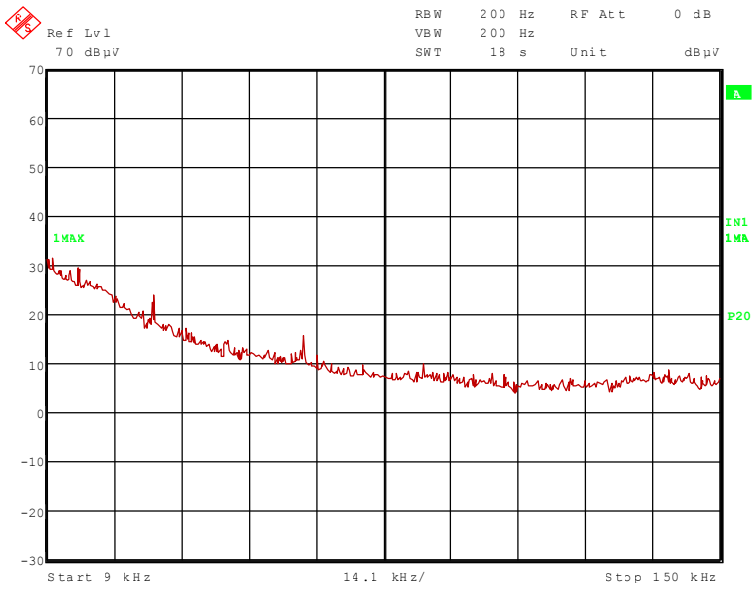
Cable guide: The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

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 5.0 V DC via the carrier board.

Remark: The emissions found around 16 kHz, 32 kHz, 48 and 62 kHz caused by the measuring system and not from the EUT.

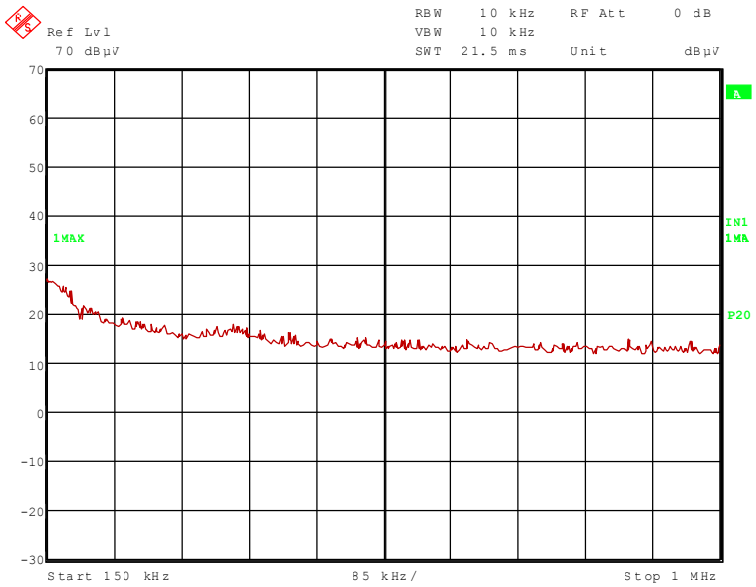
61336_12.wmf: (9 kHz to 150 kHz):



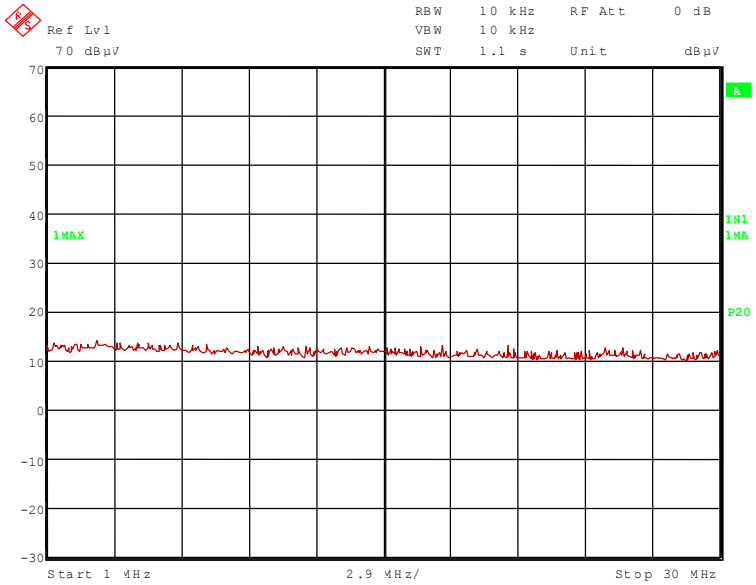
TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 37, 39, 43, 46, 49 – 51, 54

61336_13.wmf: (150 kHz to 1 MHz):

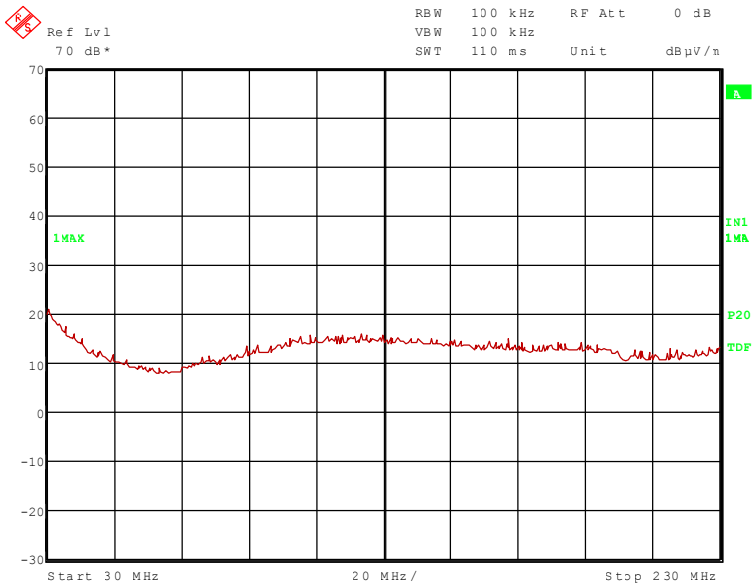


61336_14.wmf: (1 MHz to 30 MHz)

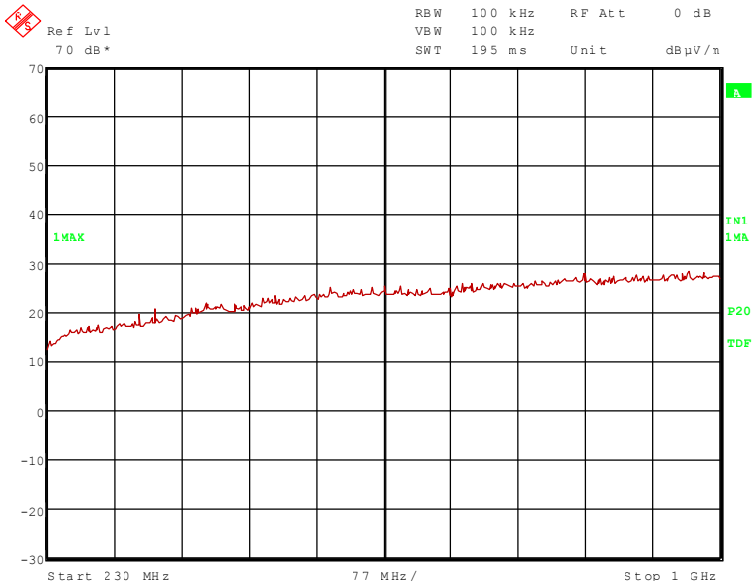


No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no measurements were carried out on the outdoor test site.

61336_11.wmf (30 MHz to 230 MHz):



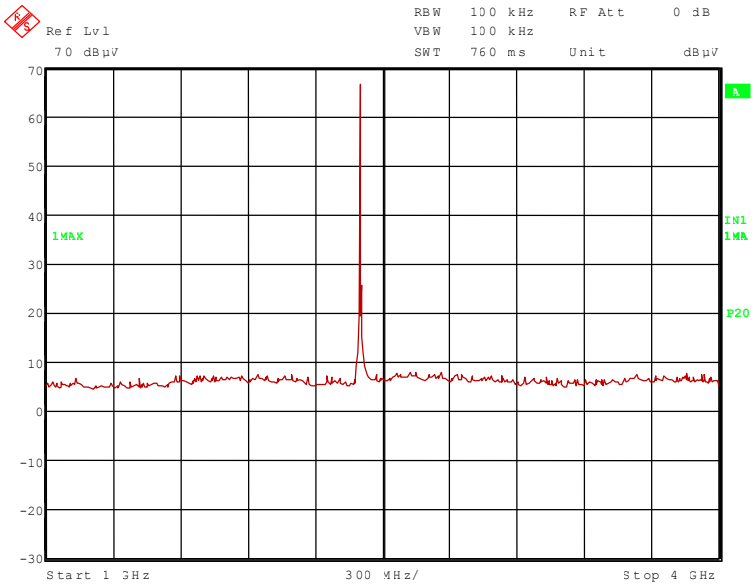
61336_10.wmf (230 MHz to 1 GHz):



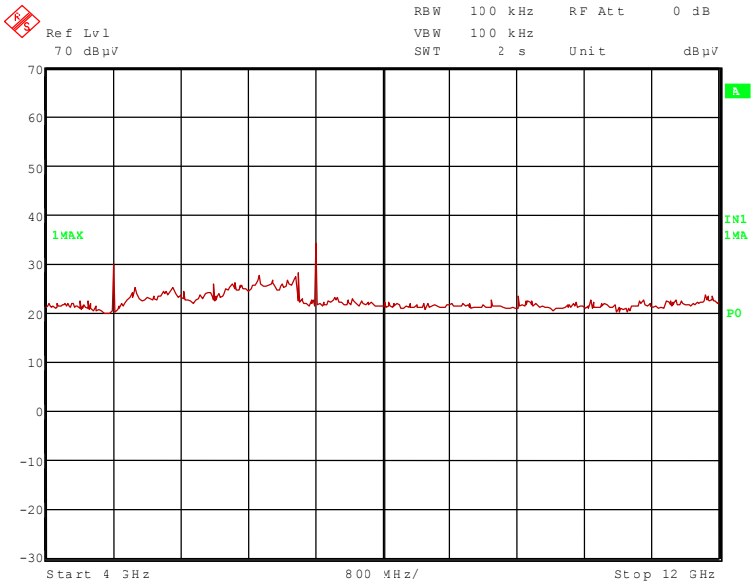
No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no measurements were carried out on the open area test site.

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

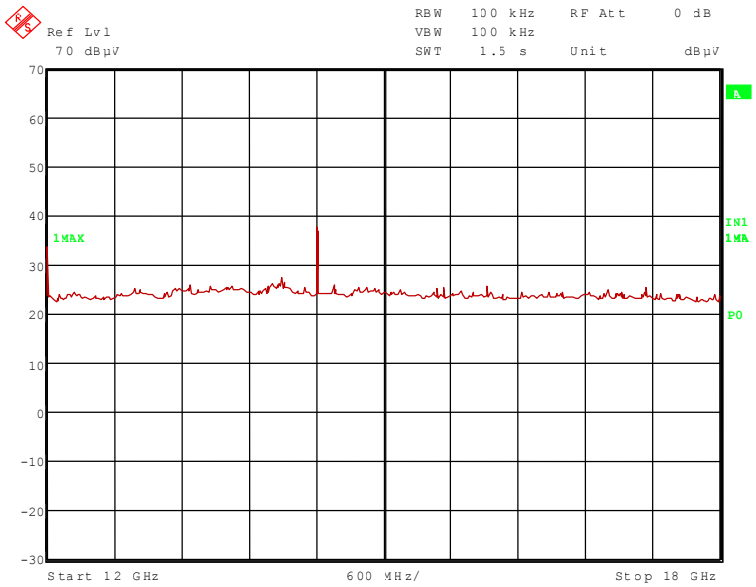
61336_2.wmf (1 GHz to 4 GHz):



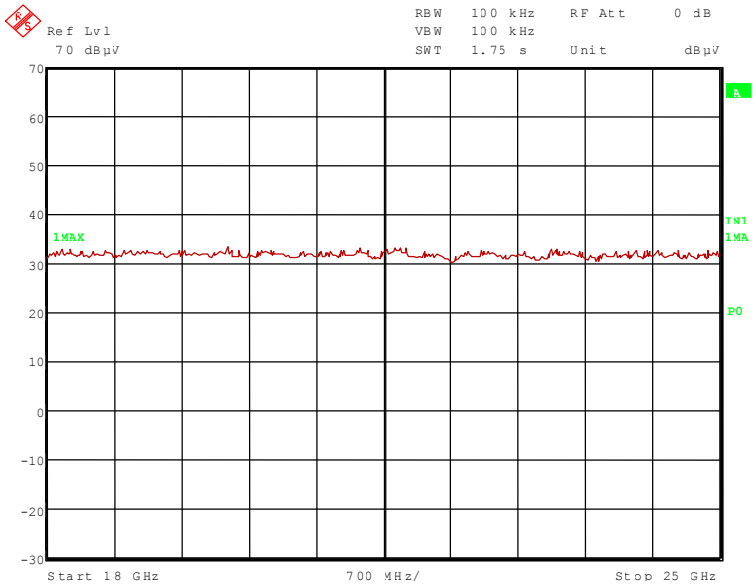
61336_4.wmf (4 GHz to 12 GHz):



61336_23.wmf (12 GHz to 18 GHz):



61336_22.wmf (18 GHz to 25 GHz):



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

- 4.804 GHz, 7.206 GHz and 12.010 GHz.

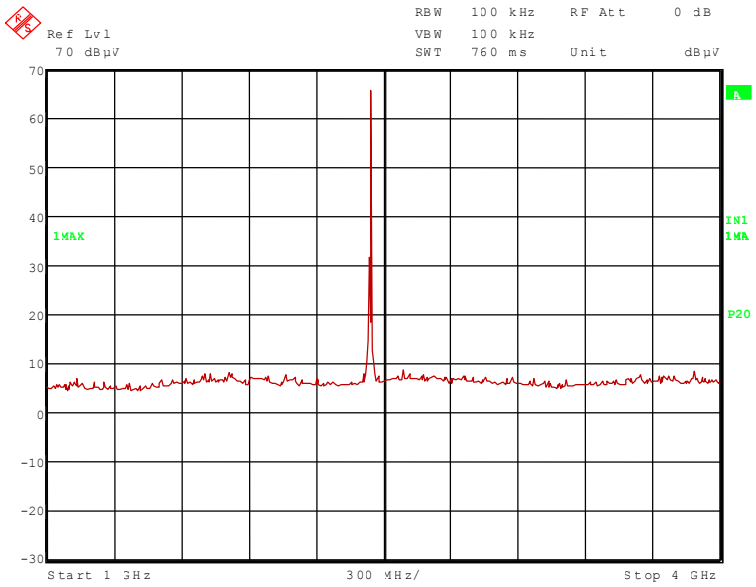
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.402 GHz and 14.412 GHz.

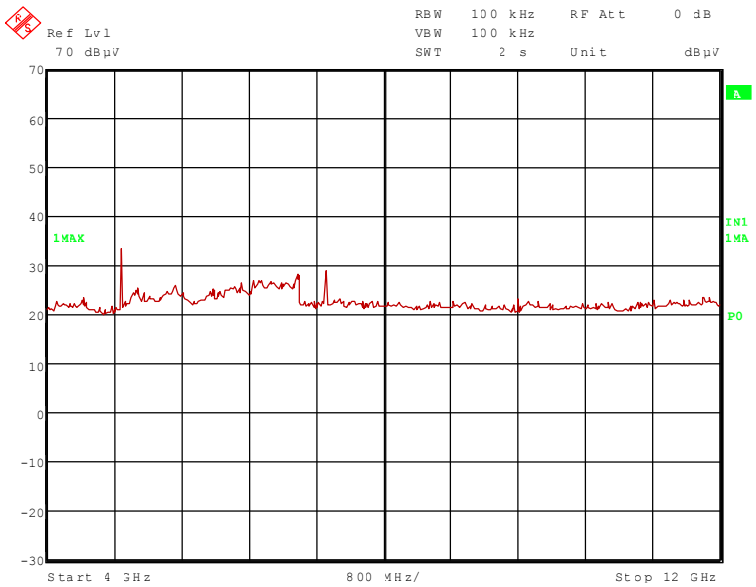
These frequencies have to be measured in a final measurement. The results were presented in the following.

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

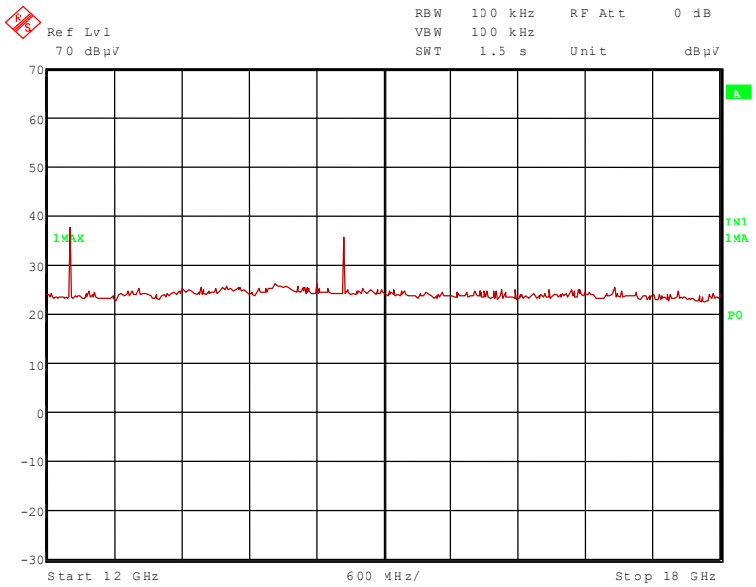
61336_1.wmf (1 GHz to 4 GHz):



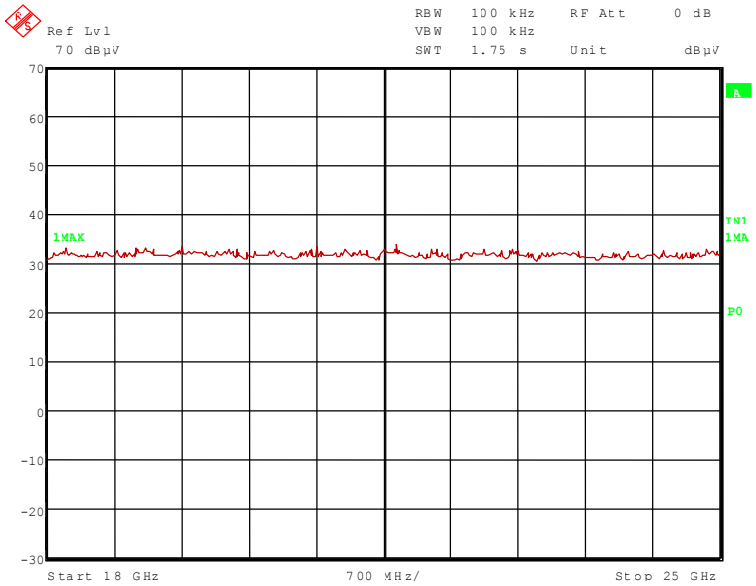
61336_5.wmf (4 GHz to 12 GHz):



61336_24.wmf (12 GHz to 18 GHz):



61336_21.wmf (18 GHz to 25 GHz):



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

- 4.882 GHz, 7.323 GHz and 12.205 GHz.

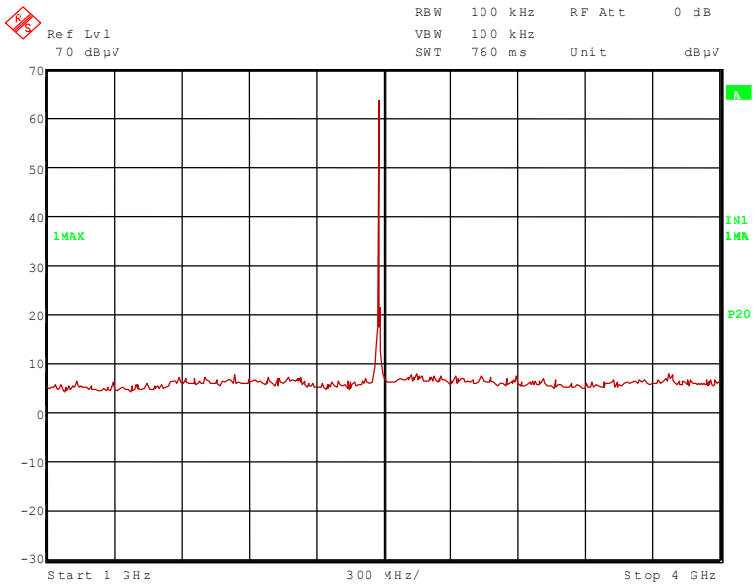
The following frequencies were found outside the restricted bands during the preliminary radiated emission test:

- 2.441 GHz and 14.646 GHz.

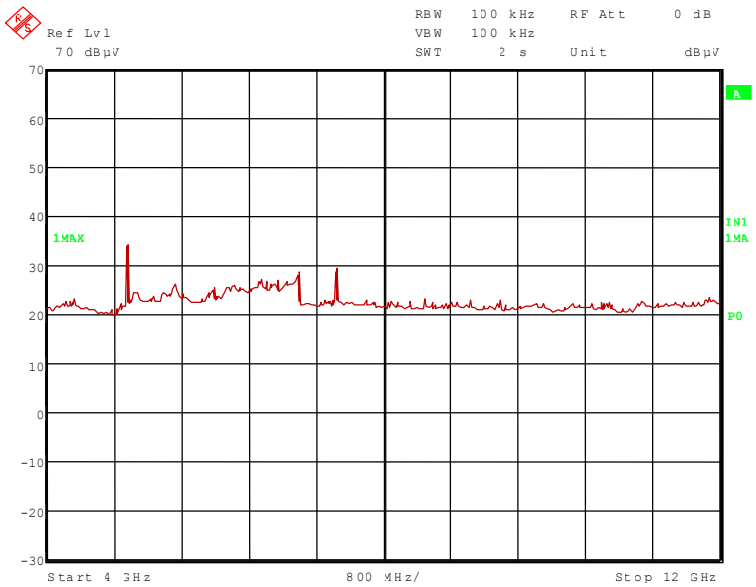
These frequencies have to be measured in a final measurement. The results were presented in the following.

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

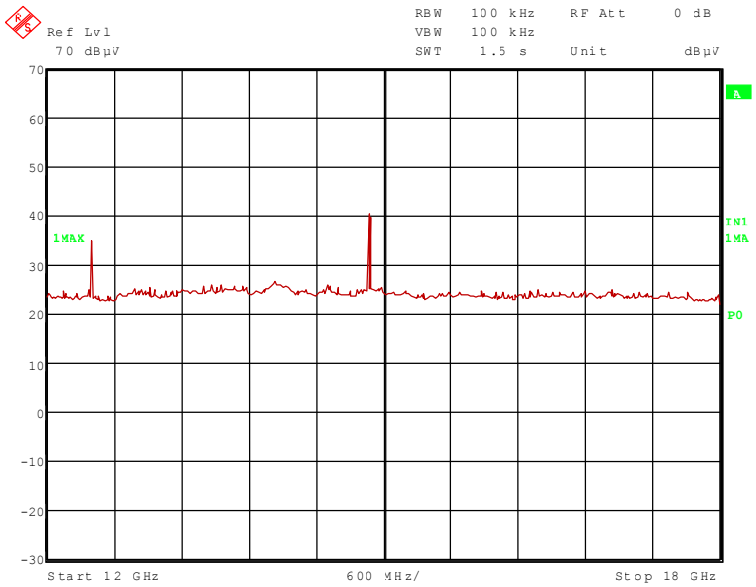
61336_3.wmf (1 GHz to 4 GHz):



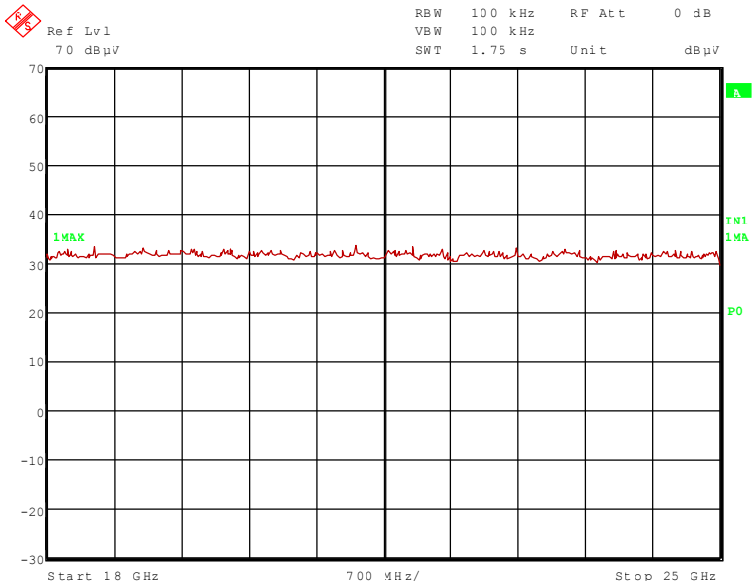
61336_6.wmf (4 GHz to 12 GHz):



61336_25.wmf (12 GHz to 18 GHz):



61336_20.wmf (18 GHz to 25 GHz):



The following frequencies were found inside the restricted bands during the preliminary radiated emission test: 4.960 GHz, 7.440 GHz and 12.400.

The following frequencies were found outside the restricted bands during the preliminary radiated emission test: 2.480 GHz and 14.880 GHz.

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

6.1.2.2 FINAL MEASUREMENT WITH ADDITIONAL ANTENNA (1 GHz to 25 GHz)

Ambient temperature	22 °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: 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 5.0 V DC via the carrier board.

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

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

Result measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	99.5	-	-	68.2	28.5	0.0	2.8	150	Vert.	-
4.804	47.0	74.0	27.0	35.8	33.1	25.7	3.8	150	Vert.	Yes
7.206	55.6	79.5	23.9	39.0	36.3	24.6	4.9	150	Vert.	No
12.010	52.1	74.0	21.9	43.4	33.6	25.9	1.0	100	Hor.	Yes
14.412	50.1	79.5	29.4	41.6	33.6	26.3	1.2	100	Hor.	No

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.402	96.8	-	-	65.5	28.5	0.0	2.8	150	Vert.	-
4.804	39.9	54.0	14.1	28.7	33.1	25.7	3.8	150	Vert.	Yes
7.206	47.0	76.8	29.8	30.4	36.3	24.6	4.9	150	Vert.	No
12.010	41.0	54.0	13.0	32.3	33.6	25.9	1.0	100	Hor.	Yes
14.412	35.3	76.8	41.5	26.8	33.6	26.3	1.2	100	Hor.	No

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	98.4	-	-	66.9	28.7	0.0	2.8	150	Vert.	-
4.882	48.6	74.0	25.4	37.1	33.4	25.7	3.8	150	Vert.	Yes
7.323	52.0	74.0	22.0	35.4	36.3	24.6	4.9	150	Vert.	Yes
12.205	50.1	74.0	23.9	41.6	33.6	25.8	1.0	100	Hor.	Yes
14.646	50.7	78.4	27.5	42.7	33.6	26.6	1.2	100	Hor.	No

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.441	95.7	-	-	64.2	28.7	0.0	2.8	150	Vert.	-
4.882	41.8	54.0	12.2	30.3	33.4	25.7	3.8	150	Vert.	Yes
7.323	41.1	54.0	12.9	24.5	36.3	24.6	4.9	150	Vert.	Yes
12.205	37.0	54.0	17.0	28.5	33.6	25.8	1.0	100	Hor.	Yes
14.646	37.5	75.7	38.2	29.3	33.6	26.6	1.2	100	Hor.	No

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	96.5	-	-	65.0	28.7	0.0	2.8	150	Vert.	-
4.960	50.5	74.0	23.5	38.8	33.5	25.6	3.8	150	Vert.	Yes
7.440	52.3	74.0	21.7	35.5	36.3	24.5	5.0	150	Vert.	Yes
12.400	49.1	74.0	24.9	40.2	33.7	25.8	1.0	100	Hor.	Yes
14.880	53.8	76.5	22.7	45.2	33.7	26.3	1.2	100	Hor.	No

Result measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.480	93.8	-	-	62.3	28.7	0.0	2.8	150	Vert.	-
4.960	43.5	54.0	10.5	31.8	33.5	25.6	3.8	150	Vert.	Yes
7.440	41.6	54.0	12.4	24.8	36.3	24.5	5.0	150	Vert.	Yes
12.400	37.4	54.0	16.6	28.5	33.7	25.8	1.0	100	Hor.	Yes
14.880	43.4	73.8	30.4	34.8	33.7	26.3	1.2	100	Hor.	No

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 37, 39, 43, 46, 49 – 51, 54

6.2 RADIATED EMISSIONS (RECEIVER)

6.2.1 PRELIMINARY MEASUREMENT WITH ADDITIONAL ANTENNA (9 kHz to 25 GHz)

Ambient temperature	22 °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.

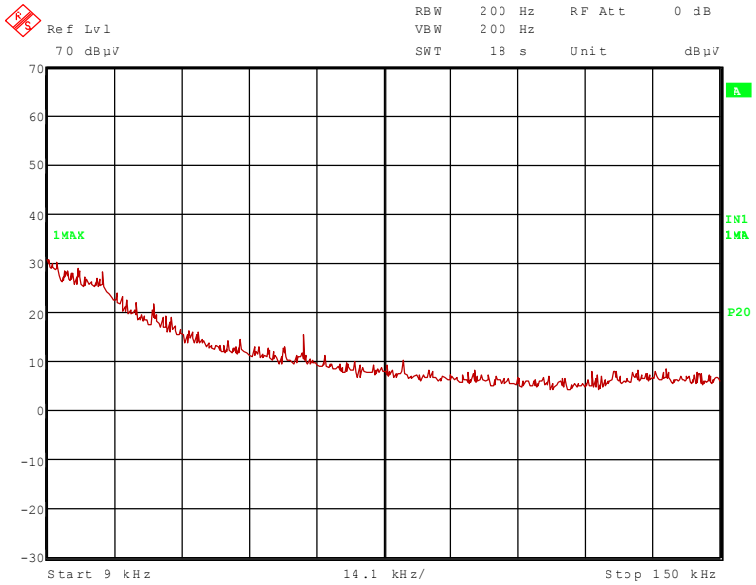
Cable guide: The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following. Where not otherwise stated the test was carried out in test mode 4 of the EUT.

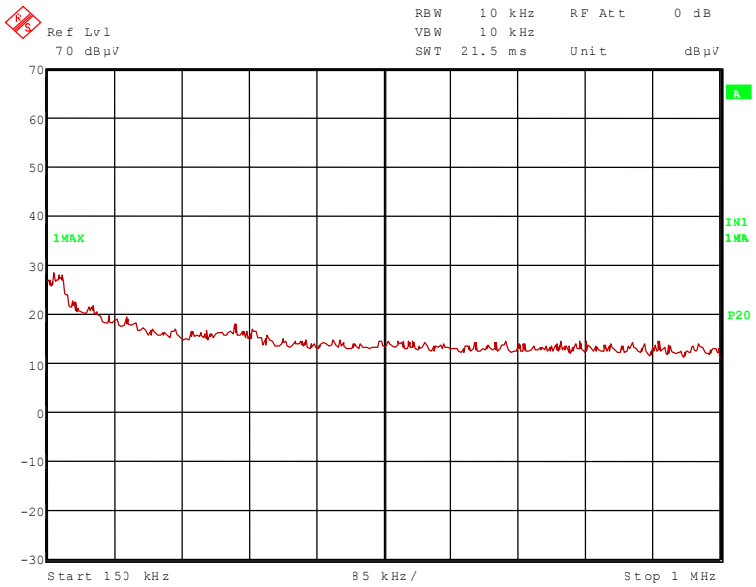
Supply voltage: During all measurements the EUT was supplied with 5.0 V DC via the carrier board.

Remark: The emissions found around 16 kHz, 32 kHz, 48 and 62 kHz caused by the measuring system and not from the EUT.

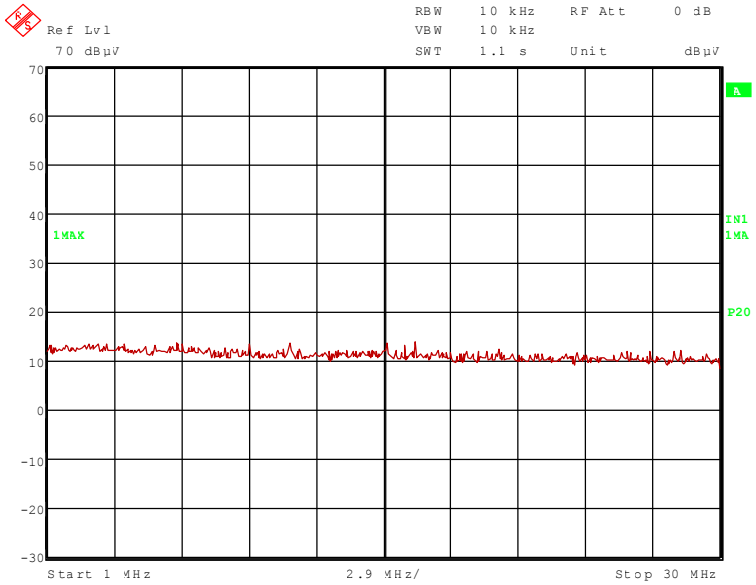
61336_15.wmf: (9 kHz to 150 kHz):



61336_16.wmf: (150 kHz to 1 MHz):

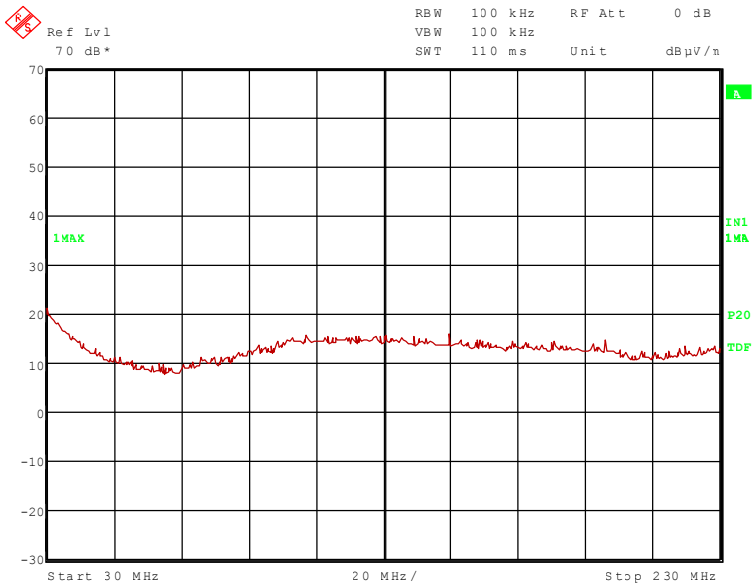


61336_17.wmf: (1 MHz to 30 MHz):

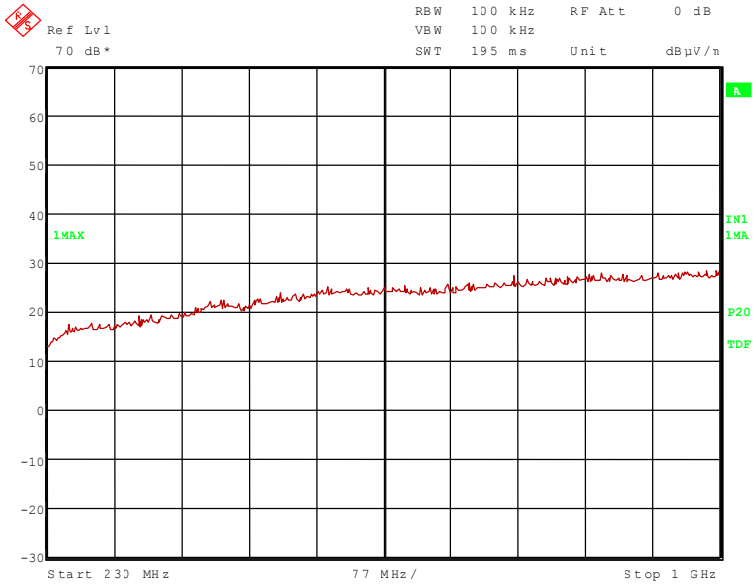


No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no measurements were carried out on the outdoor test site.

61336_8.wmf (30 MHz to 230 MHz):

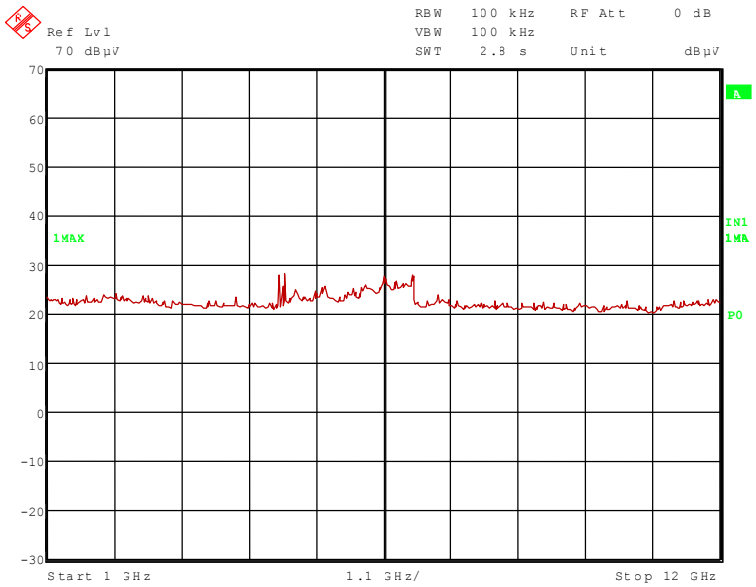


61336_9.wmf (30 MHz to 230 MHz):

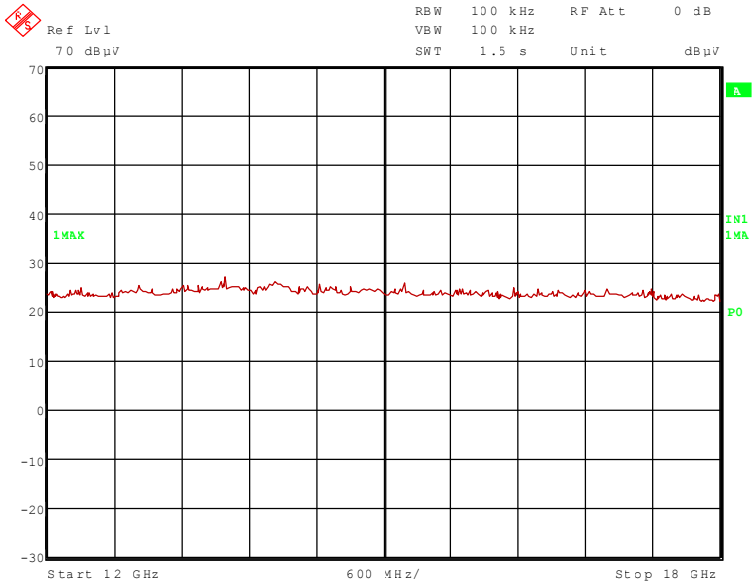


No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no measurements were carried out the open area test site.

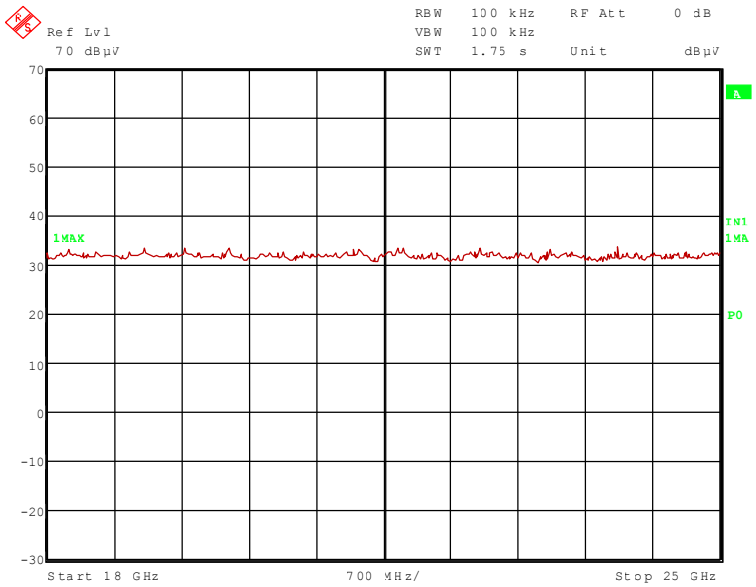
61336_7.wmf (1 GHz to 12 GHz):



61336_18.wmf (12 GHz to 18 GHz):



61336_19.wmf (18 GHz to 25 GHz):



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

- 4.804 GHz and 4.884 GHz.

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

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 37, 39, 43, 46, 49 – 51, 54

6.2.2 FINAL MEASUREMENT WITH ADDITIONAL ANTANNA (1 GHz to 25 GHz)

Ambient temperature	22 °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: The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following. Where not otherwise stated the test was carried out in test mode 4 of the EUT.

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

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

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.
4.884	45.5	74.0	28.5	33.8	33.5	25.6	3.8	150	Hor.
4.804	44.3	74.0	29.7	33.0	33.1	25.6	3.8	150	Hor.

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.
4.884	30.9	54.0	23.1	19.2	33.5	25.6	3.8	150	Hor.
4.804	30.2	54.0	23.8	18.9	33.1	25.6	3.8	150	Hor.

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 37, 39, 43, 46, 49 – 51, 54

7 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

Emission measurement at AC mains and DC in / out ports at M4					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
1	Shielded chamber M4	-	Siemens	B83117S1-X158	480088
2	Measuring receiver	ESAI	Rohde & Schwarz	831953/001 833181/018	480025 480026
3	LISN	NSLK8128	Schwarzbeck	8128155	480058
4	DC-filter	B84266-A21-E13	Siemens	940164525	480099
5	AC-filter	B84299-D87-E3	Siemens	930262292	480097
6	EMI-Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M5					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
7	Fully anechoic chamber M5	-	Siemens	B83177-S1-X156	480073
8	Measuring receiver	ESVS30	Rohde & Schwarz	829673/012	480024
9	Controller	HD100	Deisel	100/324	480067
10	Antenna support	MA240	Deisel	228/314	480069
11	Turntable	DS412	Deisel	412/317	480070
12	Antenna	CBL6112C	Chase	2689	480327
13	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M6					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
14	Open area test site	-	Phoenix Test-Lab	-	480085
15	Measuring receiver	ESVS30	Rohde & Schwarz	829673/012	480024
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
20	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M8					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
21	Fully anechoic chamber M8	-	Siemens	B83117-E7019-T231	480190
22	Measuring receiver	ESMI	Rohde & Schwarz	843977/001 843530/018	480179 480180
23	Measuring receiver	ESCS 30	Rohde & Schwarz	828985/014	480270
24	Controller	HD100	Deisel	100/427	480181
25	Turntable	DS420	Deisel	420/435/97	480186
26	Antenna support	AS615P	Deisel	615/310	480187
27	Antenna	CBL6112 A	Chase	2034	480185
28	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M20					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
29	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303
30	Measuring receiver	ESMI	Rohde & Schwarz	843977/001 843530/018	480179 480180
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355
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
36	Antenna	3115 A	EMCO	9609-4918	480183
37	Standard Gain Horn 11.9GHz – 18GHZ	18240-20	Flann Microwave	483	480294
38	Standard Gain Horn 11.9GHz – 18GHZ	18240-20	Flann Microwave	482	480295
39	Standard Gain Horn 17.9GHz – 26.7GHZ	20240-20	Flann Microwave	411	480297
40	Standard Gain Horn 17.9GHz – 26.7GHZ	20240-20	Flann Microwave	410	480296
41	Standard Gain Horn 26.4GHz – 40.1GHZ	22240-20	Flann Microwave	469	480299

No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
42	Standard Gain Horn 26.4GHz – 40.1GHZ	22240-20	Flann Microwave	468	480298
43	RF-cable No. 30	RTK 081	Rosenberger	-	410141
44	RF-cable No. 31	RTK 081	Rosenberger	-	410142
45	RF-cable 1m	KPS-1533-400-KPS	Insulated Wire	-	480300
46	RF-cable 1m	KPS-1533-400-KPS	Insulated Wire	-	480301
47	RF-cable 2m	KPS-1533-400-KPS	Insulated Wire	-	480302
48	RF-cable No. 5	RTK 081	Rosenberger		410097
49	Preamplifier	JS3-00101200-23-5A	Miteq	681851	480337
50	Preamplifier	JS3-12001800-16-5A	Miteq	571667	480343
51	Preamplifier	JS3-18002600-20-5A	Miteq	658697	480342
52	Preamplifier	JS3-26004000-25-5A	Miteq	563593	480344
53	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Ancillary equipment used for testing					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
54	Power supply	TOE 8852	Toellner	51712	480233
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

All used measurement equipment was calibrated (if necessary). The calibration intervals and the calibration history will be given out on request.

8 LIST OF ANNEXES

Annex A	**Photographs of the test set-ups:**	**5 pages**
	cB-0901-0301 with additional antenna, test set-up fully anechoic chamber	61336_5.jpg
	cB-0901-0301 with additional antenna, test set-up fully anechoic chamber	61336_2.jpg
	cB-0901-0301 with additional antenna, test set-up fully anechoic chamber	61336_4.jpg
	cB-0901-0301 with additional antenna, test set-up fully anechoic chamber	61336_6.jpg
	cB-0901-0301 with additional antenna, test set-up fully anechoic chamber	61336_1.jpg
ANNEX B	**INTERNAL PHOTOGRAPHS OF THE TEST SAMPLE**:	**5 pages**
	cB-0901-0301 on carrier board with additional antenna	61336_d.jpg
	cB-0901-0301 Sample “14”, top view	61336_c.jpg
	cB-0901-0301 bottom view	61336_b.jpg
	cB-0901-02 carrier board, top view	61336_a.jpg
	cB-0901-02 carrier board, bottom view	61336_e.jpg
ANNEX C	**EXTERNAL PHOTOGRAPHS OF THE TEST SAMPLE**:	**- pages**
	Because the EUT is a module, which is intended to be implemented inside a final application, no external photographs were available	