PHOENIX TESTLAB
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TEST REPORT

Test Report Reference: F080804E02

Equipment under Test: POS MobilePro

FCC ID: WGC-MOBILEPRO

IC: 8085A-MOBILEPRO

Serial Number: 4510002134

Applicant: Vectron systems AG

Manufacturer: Vectron systems 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

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1 IDENTIFICATION

1.1 APPLICANT

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1.2 MANUFACTURER

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Country:	Germany
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1.3 DATES

Date of receipt of test sample:	26 August 2008
Start of test:	15 September 2008
End of test:	23 September 2008

1.4 TEST LABORATORY

The tests were carried out at: **PHOENIX TESTLAB GmbH**
Königswinkel 10
D-32825 Blomberg **Phone:** **+49 (0) 52 35 / 95 00-0**
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accredited by DATech GmbH in compliance with DIN EN ISO/IEC 17025 under Reg. No. DAT-P-105/99-21 and FCC Test site registration number 90877

Test engineer:	Thomas KÜHN		04 December 2008
	Name	Signature	Date
Test report checked:	Bernd STEINER		04 December 2008
	Name		Date

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Stamp

1.5 RESERVATION

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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 KDB Publication No. 55807 (March 2005)** Measurement of Digital Transmission Systems Operating under Section 15.247

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: *	Point of sale terminal
Type designation: *	POS MobilePro Terminal
Serial No.: *	4510002134
FCC ID: *	WGC-MOBILEPRO
IC: *	8085A-MOBILEPRO
Antenna type: *	Internal (Centurion NanoBlade)
Antenna gain: *	3.8 dBi
Antenna connector: *	No antenna connector, internal antenna only.
Supply Voltage: *	3.6 V DC by the internal battery
Type of modulation: *	DSSS (CCK and DQPSK, depends on data-rate)
Operating frequency range:*	2.412 to 2.462 GHz (11 channels with 5 MHz channel separation)
Data rate:*	1, 2, 5.5, 11 and 22 MBit/s
Number of channels: *	11
Lowest internal frequency: *	32.768 kHz

*: declared by the applicant

The following external I/O cables were used:

Cable	Length	Shielding	Connector
-	No cables are connectable to the EUT		-
-			-
-	-	-	-

*: Length during the test

2.2 PERIPHERY DEVICES

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

If stated a charging station Rev. 1.01 was used in combination with an AC / DC adaptor type FW7362 /24 was used.

2.3 SPECIAL EMC MEASURES

The following EMC measures were necessary to reach the documented results:

A ferrite choke type Würth 742 7140 with three turns was used at the DC input of the charging station.

3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

During all tests except the conducted emission measurement on AC-mains the EUT was supplied by the internal battery with 3.6 V DC. Because the transmission occurs in case of charging the EUT at the charging station a conducted emission measurement on AC-mains was carried out while the EUT was charged on the charging station. For this measurement an AC / DC adaptor type FW 7362 / 24 was connected to the charging station and supplied with 120 V AC / 60 Hz.

The EUT is classified as handheld equipment. As pretests have shown, only at one position the emissions caused by the EUT were significant above the noise floor of the measuring system. Therefore all measurements were carried out with the EUT standing on its charging contacts.

The EUT consists of different parts (13.560 MHz RFID reader, Bluetooth transceiver, WLAN transceiver and digital device) and is regarded as composite device. Object of this test report is the WLAN transceiver part of the EUT. The other test results of the other parts will be documented in a separate test report for every device part. For the tests on WLAN and Bluetooth, test modes were implemented by the applicant to choose the required operational state. The tested sample was able to transmit on one frequency at time (either 13.56 MHz, or 2.4 GHz Bluetooth or 2.4 GHz WLAN). It was stated by the applicant, this behavior is also realized in the final application.

If not otherwise stated, for modulating the transmitter, a pseudo random bit sequence with a data rate of 22 MBit/s was used because pretests have shown that this is the operation mode, which causes the highest spurious emissions and occupies the largest bandwidth.

For selecting an operation mode, a test mode has to be entered. As declared by the applicant this test mode is not part of the final application.

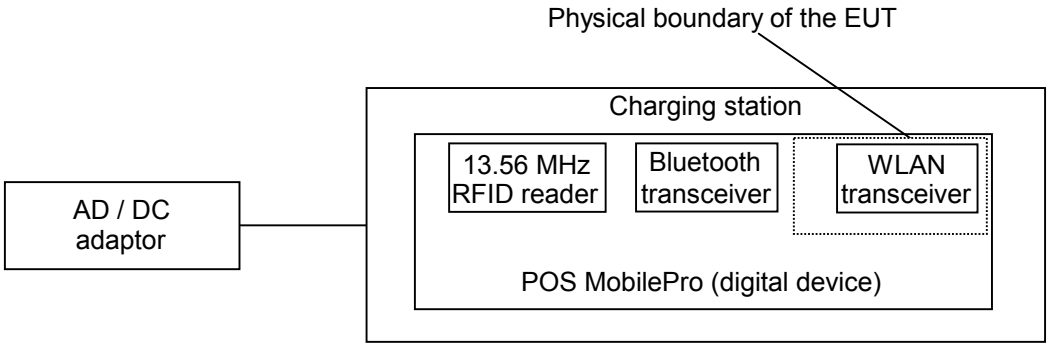
For the whole frequency range a preliminary measurement in a fully anechoic chamber with a measuring distance of 3 m was carried out to determine the frequencies, which were radiated by the EUT.
The final measurements on the detected frequencies were carried out on an outdoor test site without ground plane (for the frequency range 9 kHz to 30 MHz) and on an open area test site with ground plane (for the frequency range 30 MHz to 1 GHz).

During the tests, the EUT was not sealed or labeled with a FCC / IC - label.

The following operation modes were used during the tests:

Operation mode	Description of the operation mode
1	Continuous transmitting on 2412 MHz
2	Continuous transmitting on 2437 MHz
3	Continuous transmitting on 2462 MHz
4	Continuous receiving on 2412 MHz
5	Continuous receiving on 2437 MHz
6	Continuous receiving on 2462 MHz

The physical boundaries of the Equipment Under Test are shown below.



4 APPLICATION OVERVIEW

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section	RSS 210, Issue 7 [4] or RSS-Gen, Issue 2 [5]	Status	Refer page
6 dB bandwidth	General	15.247 (a) (2)	A8.2 (1) [2]	Passed	8 et seq.
Maximum peak output power	2400.0 – 2483.5	15.247 (b) (3), (4)	A8.4 (4) [2], 7.1.4 [3]	Passed	11 et seq.
Power spectral density	2400.0 – 2483.5	15.247 (e)	A8.2 (2) [2]	Passed	13 et seq.
Band edge compliance	2400.0 – 2483.5	15.247 (d)	A8.5 [2]	Passed	16 et seq.
Radiated emissions (transmitter)	30 – 25,000	15.205 (a), 15.209 (a)	A8.5 [2], 4.7 [3]	Passed	19 et seq.
Conducted emissions on supply line	0.15 – 30	15.207 (a)	7.2.2 [3]	Passed	37 et seq.
Radiated emissions (receiver)	30 – 12,500	15.109	2.6 [2], 7.2.3 [3]	Passed	1 et seq of Annex D of this test report

5 TEST RESULTS

5.1 6 dB BANDWIDTH

5.1.1 METHOD OF MEASUREMENT (BANDWIDTH)

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

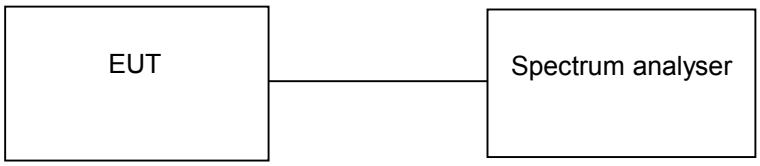
The following spectrum analyser settings shall be used:

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

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

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

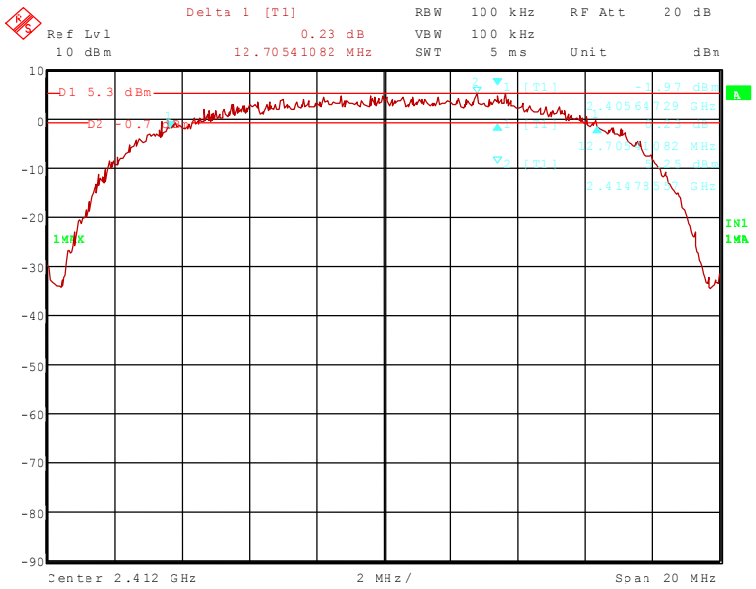
Test set-up:



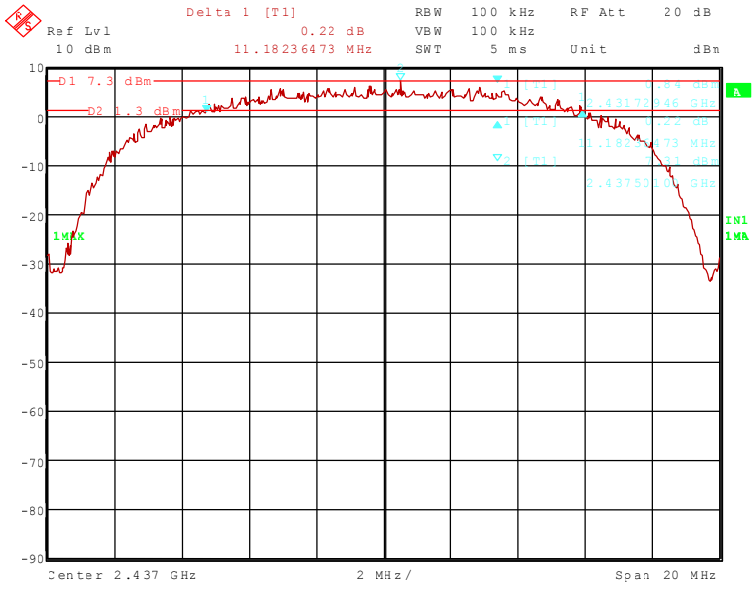
5.1.2 TEST RESULTS (BANDWIDTH)

Ambient temperature	21 °C	Relative humidity	46 %

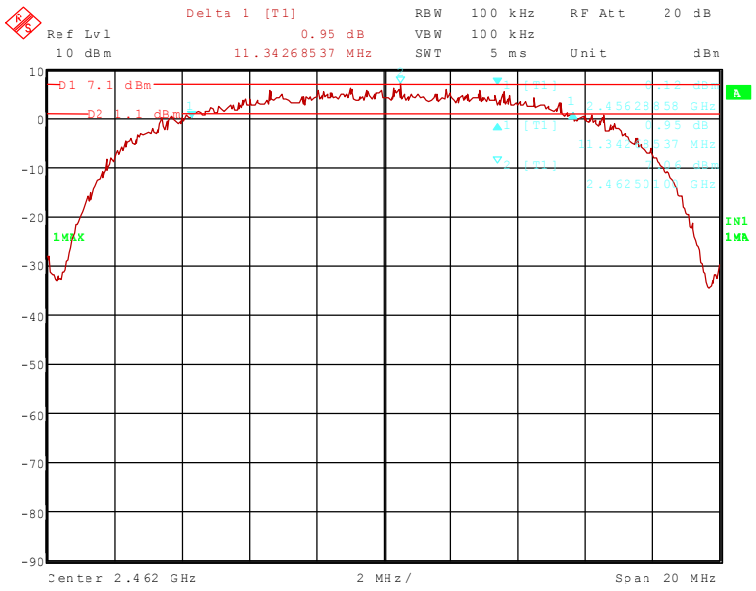
80804_86.wmf: (6 dB bandwidth at the lower end of the assigned frequency band):



80804_87.wmf: (6 dB bandwidth at the middle of the assigned frequency band):



80804_88.wmf: (6 dB bandwidth at the upper end of the assigned frequency band):



Channel number	Channel frequency [MHz]	6dB bandwidth [MHz]
1	2.412	12.705
6	2437	11.182
11	2462	11.343
Measurement uncertainty		$< \pm 1*10^{-7}$

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

31, 46, 54

5.2 MAXIMUM PEAK OUTPUT POWER

5.2.1 METHOD OF MEASUREMENT (MAXIMUM PEAK OUTPUT POWER)

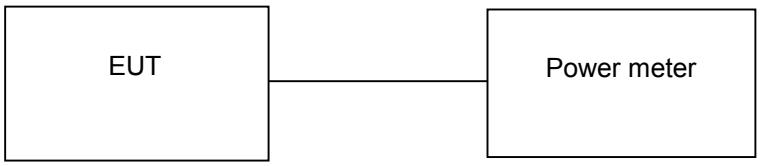
The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT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

The following power meter settings shall be used:

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

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

Test set-up:



5.2.2 TEST RESULTS (MAXIMUM PEAK OUTPUT POWER)

Ambient temperature	21 °C	Relative humidity	46 %

Channel number	Channel frequency [MHz]	Maximum peak output power [dBm]	Antenna gain [dBi]	Peak power limit [dBm]
1	2412	15.3	3.8	30.0
6	2437	16.4	3.8	30.0
11	2462	17.2	3.8	30.0
Measurement uncertainty			+0.66 dB / -0.72 dB	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

46, 54, 67, 69

5.3 POWER SPECTRAL DENSITY

5.3.1 METHOD OF MEASUREMENT (POWER SPECTRAL DENSITY)

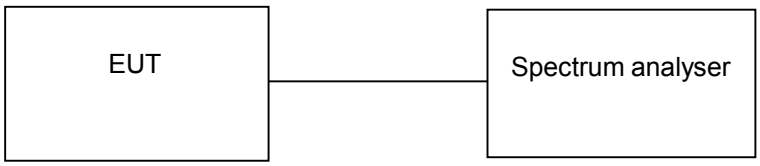
The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed.

The following spectrum analyser settings shall be used:

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

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

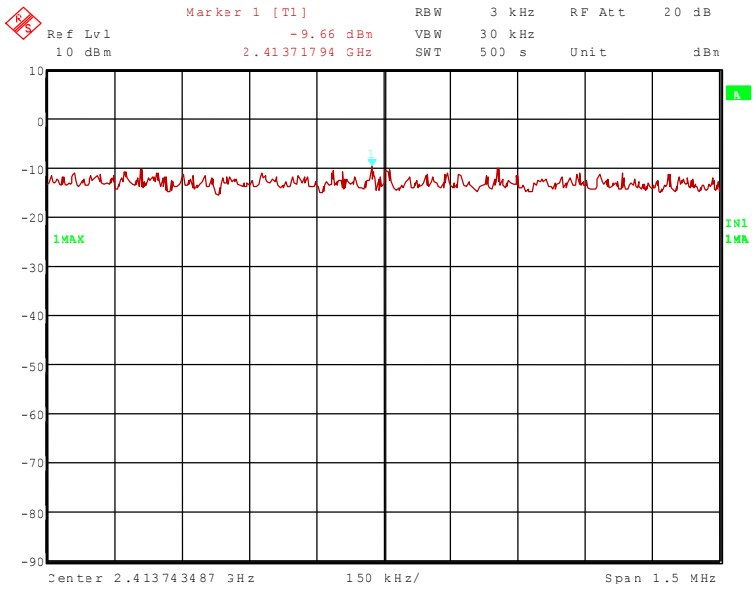
Test set-up:



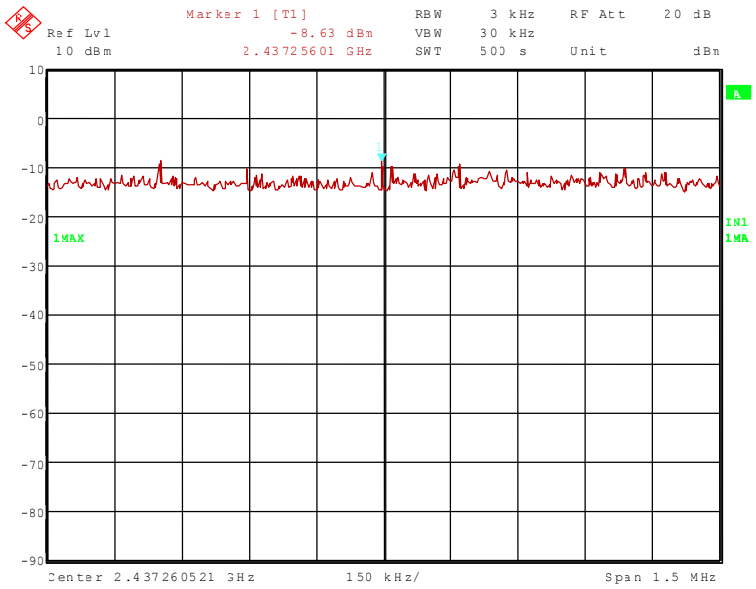
5.3.2 TEST RESULTS (POWER SPECTRAL DENSITY)

Ambient temperature	21 °C	Relative humidity	46 %

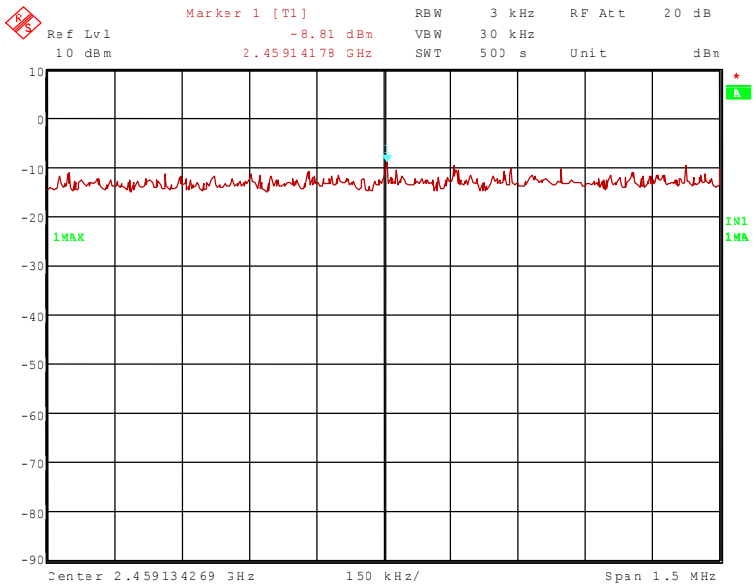
80804_90.wmf (power spectral density (transmit on channel 1)):



80804_91.wmf (power spectral density (transmit on channel 6)):



80804_89.wmf (power spectral density (transmit on channel 11)):



Operation mode	Power spectral density [dBm / 3 kHz]	Power spectral density limit [dBm / 3 kHz]
Transmit on channel 1	-9.7	8
Transmit on channel 6	-8.6	8
Transmit on channel 11	-8.8	8
Measurement uncertainty		+1.1 dB / -1.5 dB

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

31, 46, 54

5.4 BAND-EDGE COMPLIANCE

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

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

The following spectrum analyser settings shall be used:

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

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

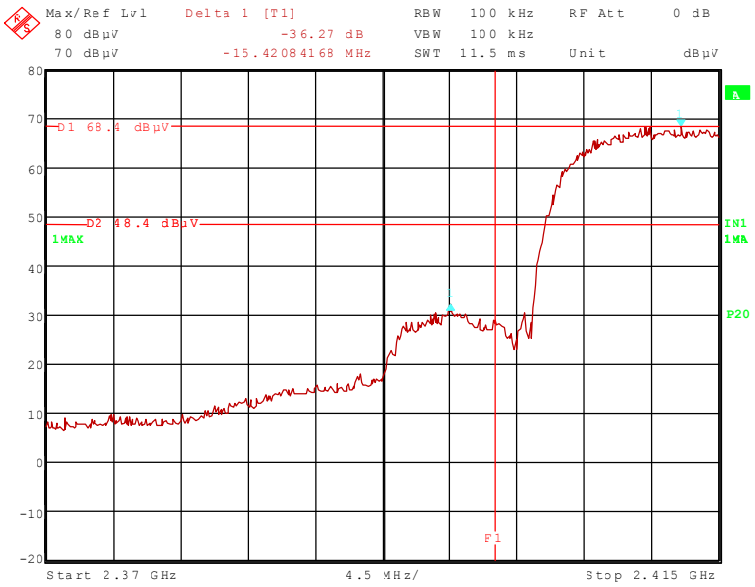
The measurement will be performed at the upper end of the assigned frequency band.

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

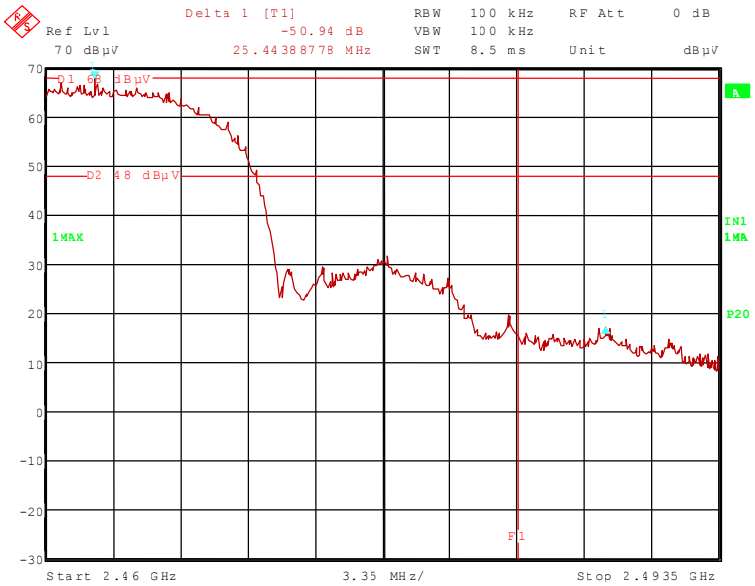
Ambient temperature	21 °C	Relative humidity	43 %

Remark: This test was carried out with a data rate of 22 MBit/s because a pre-test has shown that modulation causes the widest spectrum mask of all data rates in question.

80804_37.wmf (radiated band-edge compliance, lower band edge):



80804_32.wmf (radiated band-edge compliance, upper band edge):



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

Band-edge compliance (lower band edge)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.412	107.0	-	-	74.5	28.8	0.0	3.7	150	Vert.	-
2.3971	70.7	87.0	16.3	38.2	28.8	0.0	3.7	150	Vert.	No
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.412	98.6	-	-	66.1	28.8	0.0	3.7	150	Vert.	-
2.3971	62.3	78.6	16.3	29.8	28.8	0.0	3.7	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Band-edge compliance (upper band edge)										
Result measured with the peak detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.462	108.3	-	-	75.7	28.9	0.0	3.7	150	Vert.	-
2.4879	57.4	74.0	16.6	24.8	28.9	0.0	3.7	150	Vert.	Yes
Result measured with the average detector:										
Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.462	97.4	-	-	64.8	28.9	0.0	3.7	150	Vert.	-
2.4879	46.5	54.0	7.5	13.9	28.9	0.0	3.7	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 37, 39, 43, 46, 49 – 51

5.5 RADIATED EMISSIONS (TRANSMITTER)

5.5.1 METHOD OF MEASUREMENT (RADIATED EMISSIONS)

The radiated emission measurement is subdivided into three stages.

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

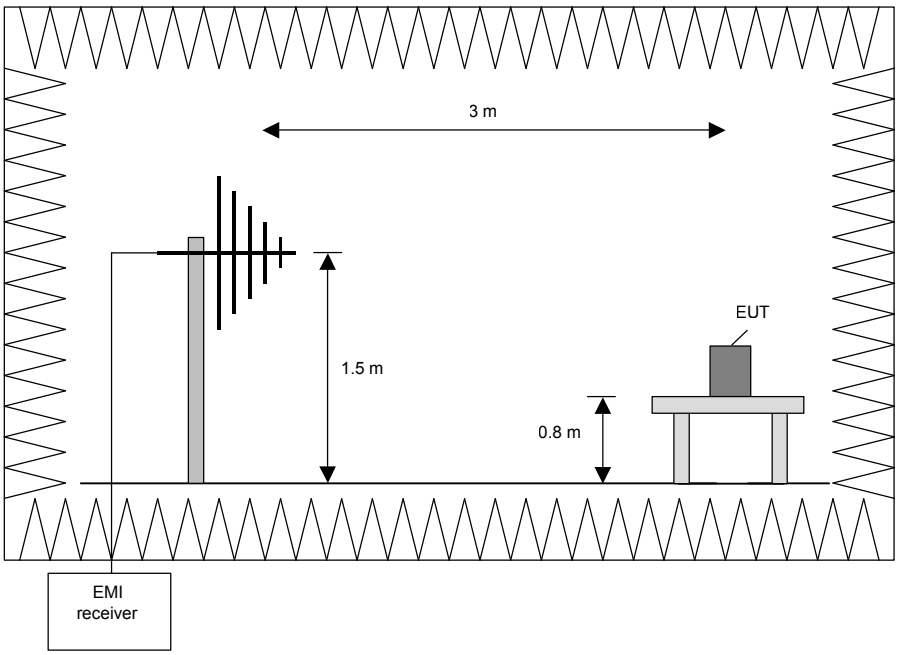
Preliminary measurement (30 MHz to 1 GHz)

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:

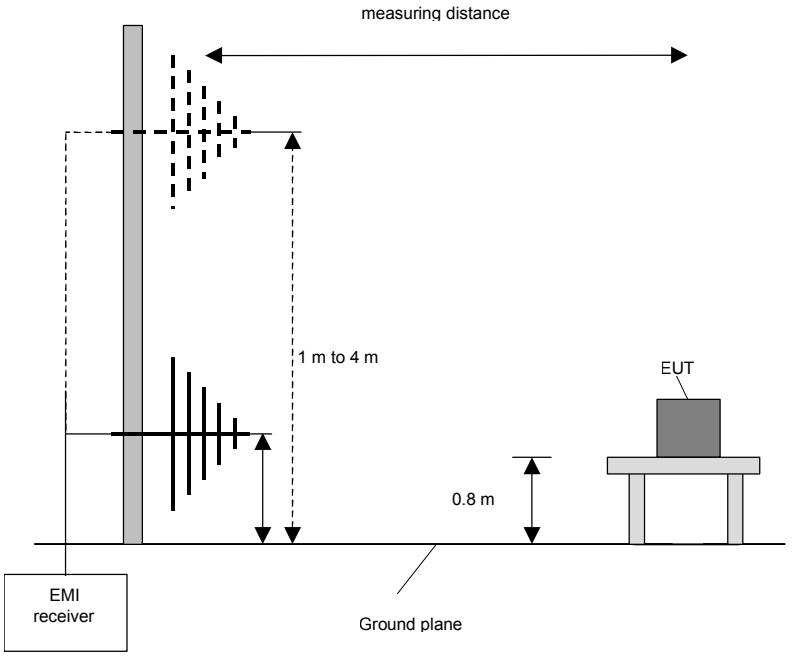
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the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

Preliminary and 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 beamwidth, 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:

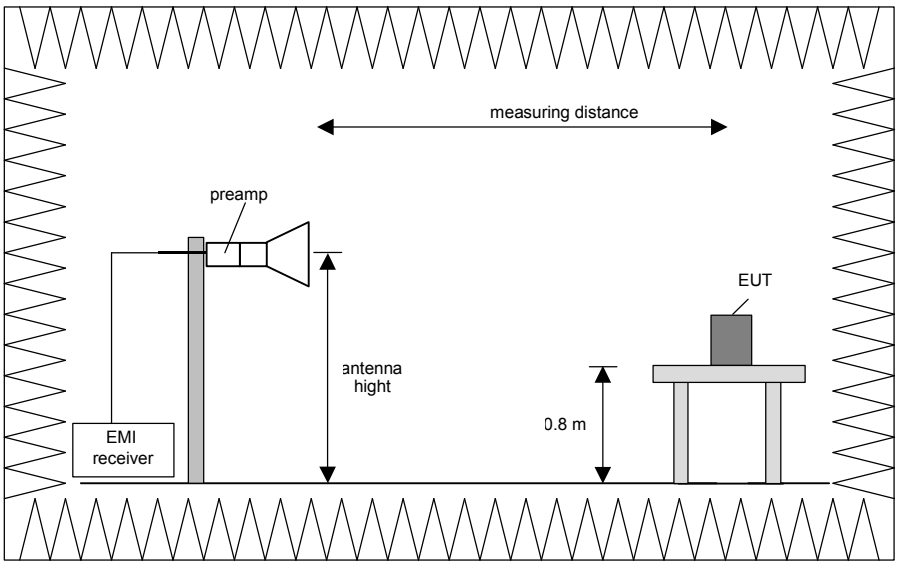
Frequency range	Resolution bandwidth
1 GHz to 4 GHz	100 kHz
4 GHz to 12 GHz	100 kHz
12 GHz to 18 GHz	100 kHz
18 GHz to 25 GHz	100 kHz

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 beamwidth, 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.

5.5.2 TEST RESULTS (RADIATED EMISSIONS)

5.5.2.1 PRELIMINARY MEASUREMENT (9 kHz to 25 GHz)

Ambient temperature	21 °C	Relative humidity	43 %

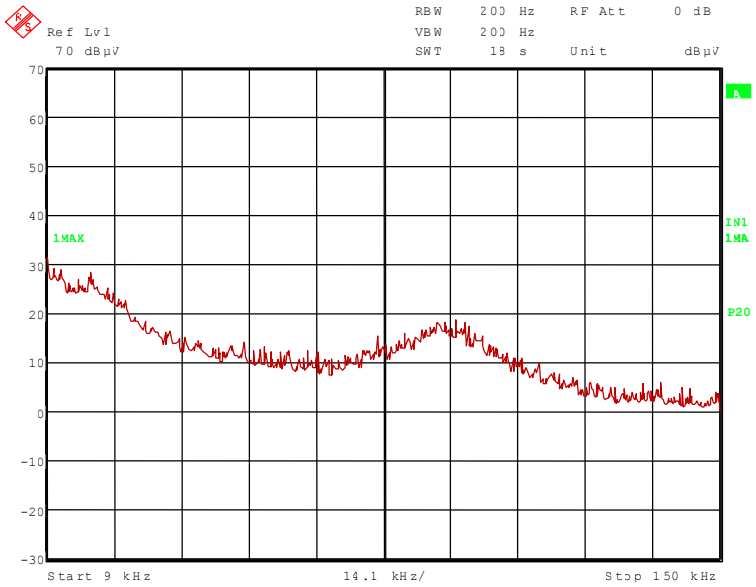
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

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 3.6 V DC by the internal battery.

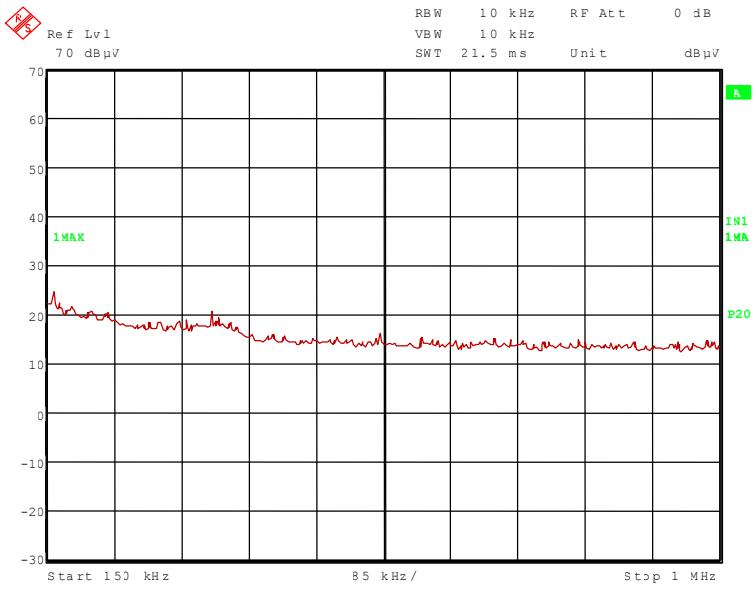
80804_48.wmf (9 kHz to 150 kHz):



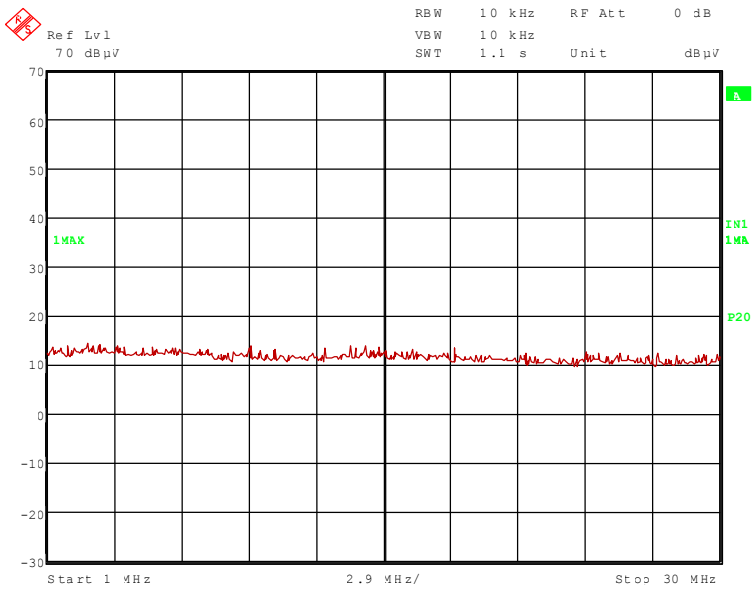
TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 37, 39, 43, 46, 49 – 51, 58

80804_47.wmf (150 kHz to 1 MHz):

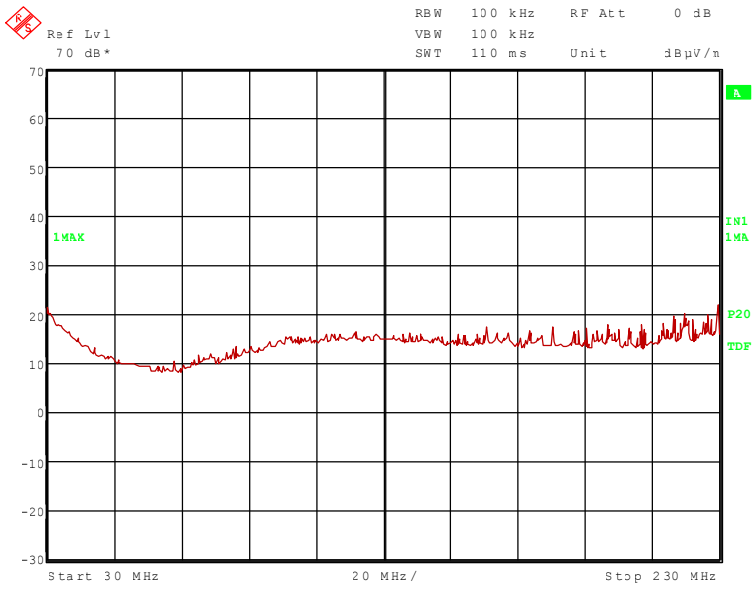


80804_46.wmf (1 MHz to 30 MHz):

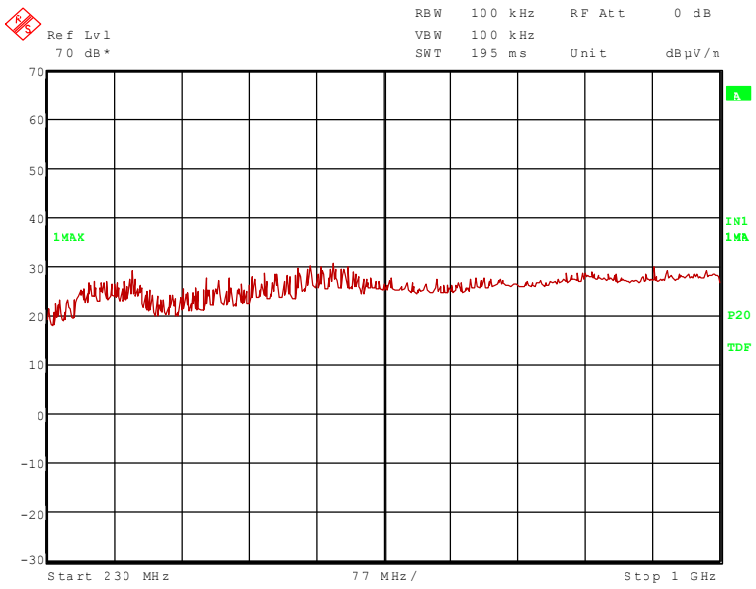


No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no measurements were carried out on the outdoor test site.

80804_44.wmf (30 MHz to 230 MHz):



80804_45.wmf (30 MHz to 230 MHz):



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

- 219.695 MHz, 229.414 MHz, 412.922 MHz and 560.333 MHz.

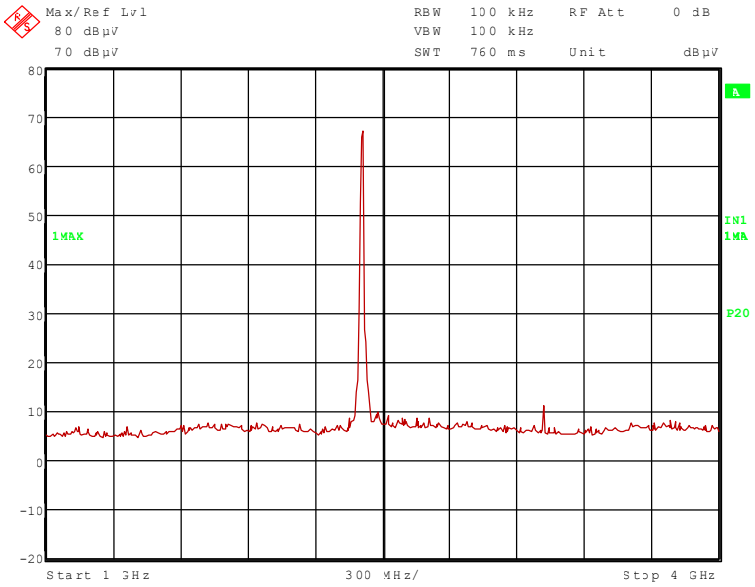
The following frequency was found inside the restricted bands:

- 327.489 MHz.

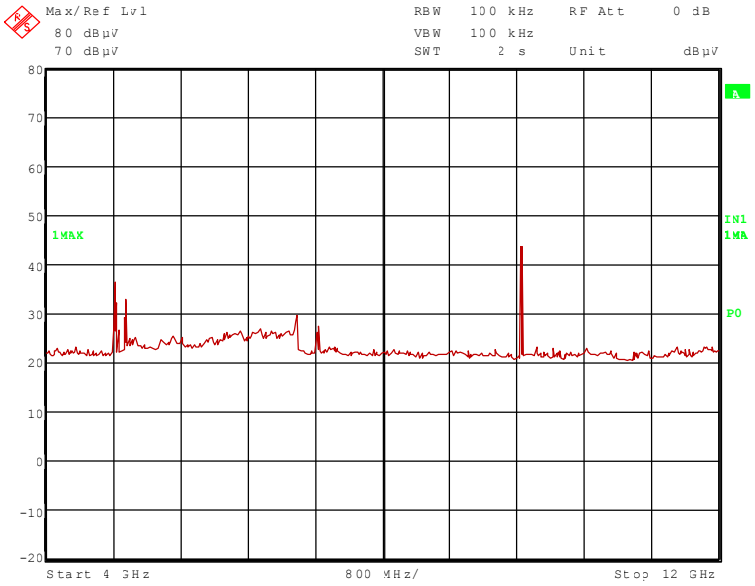
These frequencies have to be measured on the open area test site. The results were presented in the following

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

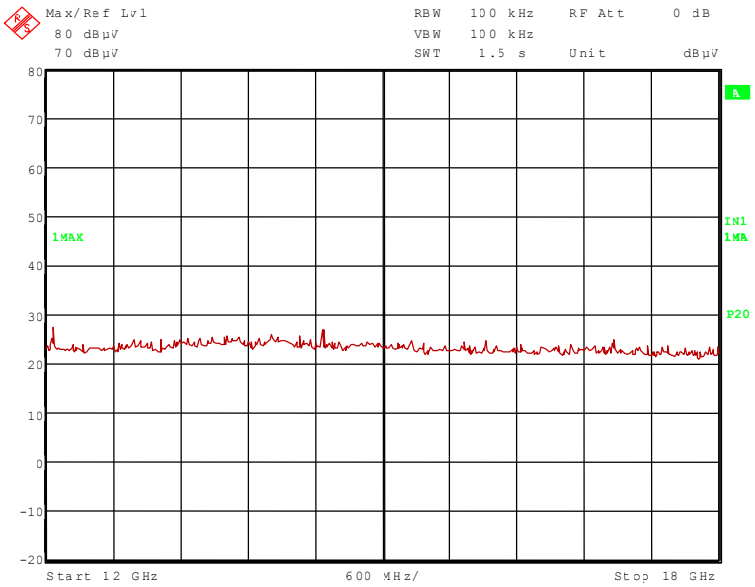
80804_36.wmf (1 GHz to 4 GHz):



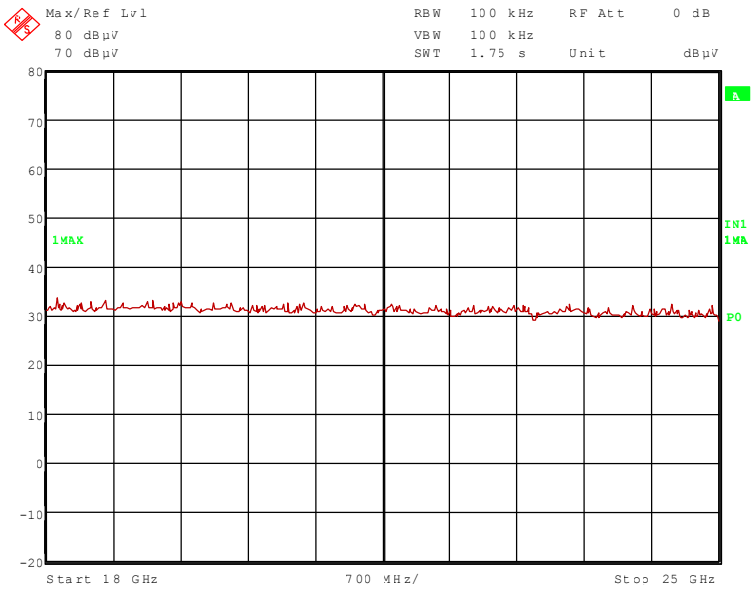
80804_35.wmf (4 GHz to 12 GHz):



80804_38.wmf (12 GHz to 18 GHz):



80804_39.wmf (18 GHz to 25 GHz):



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

- 4.824 GHz, 4.832 GHz, 12.060 GHz and 14.472 GHz.

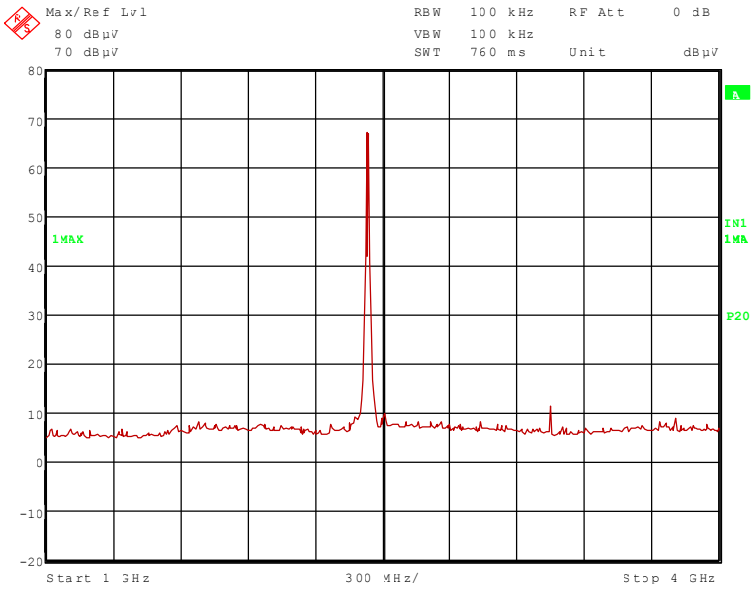
The following frequency was found outside the restricted bands during the preliminary radiated emission test:

- 2.412 GHz, 3.216 GHz, 7.236 GHz and 9.648 GHz.

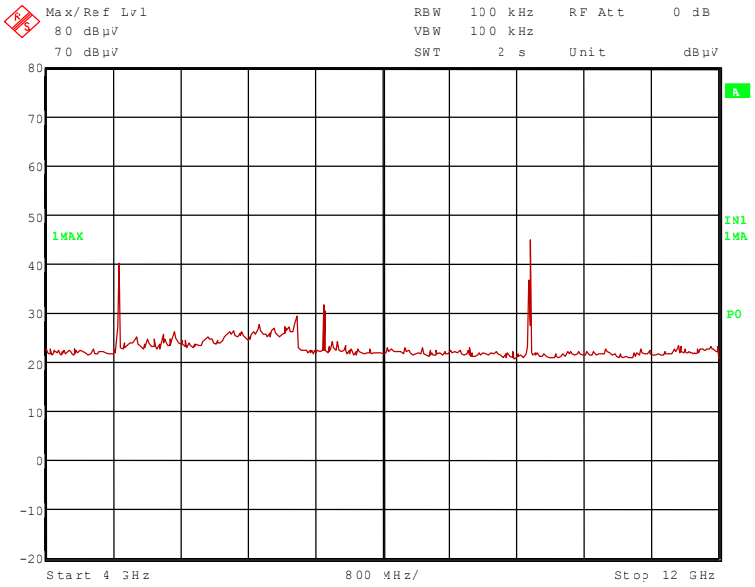
These frequencies have to be measured in a final measurement. The results were presented in the following.

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

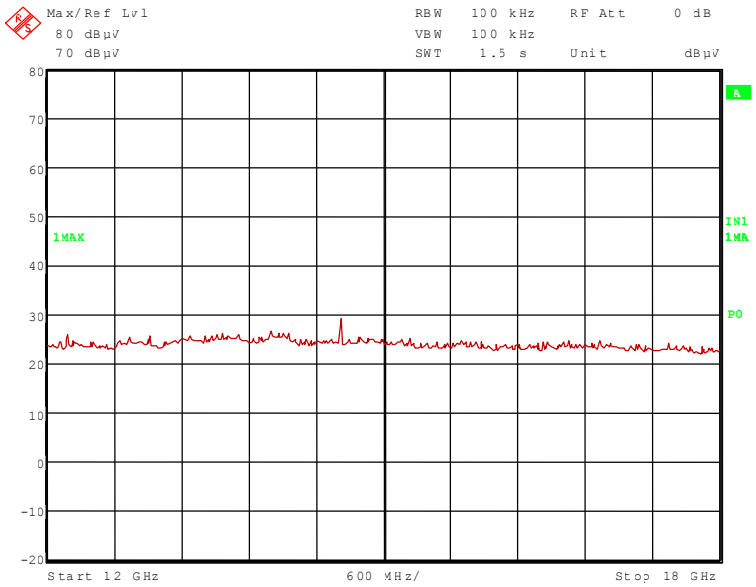
80804_33.wmf (1 GHz to 4 GHz):



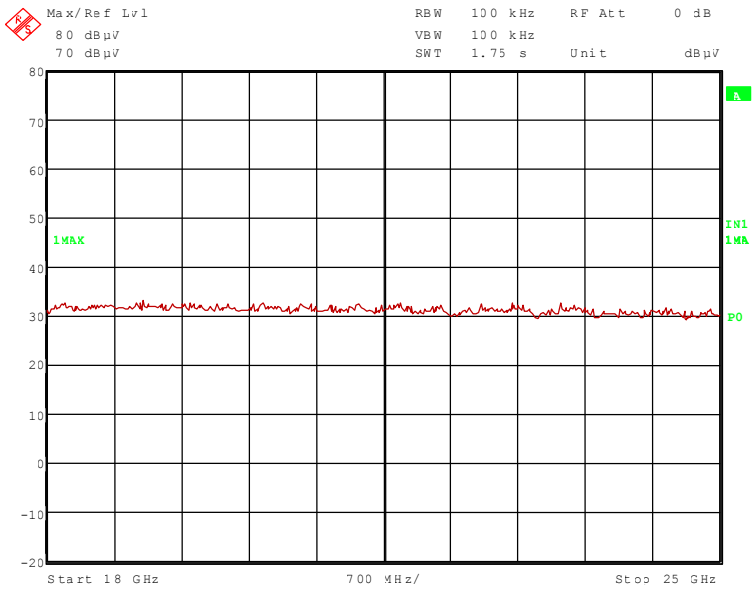
80804_34.wmf (4 GHz to 12 GHz):



80804_40.wmf (12 GHz to 18 GHz):



80804_41.wmf (18 GHz to 25 GHz):



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

- 4.854 GHz, 4.874 GHz and 7.311 GHz.

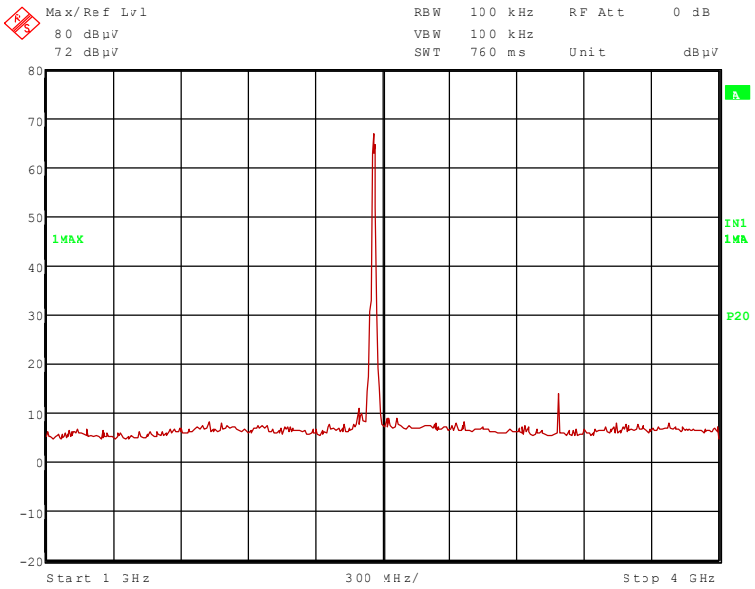
The following frequency was found outside the restricted bands during the preliminary radiated emission test:

- 2.437 GHz, 3.2493 GHz, 9.748 GHz and 14.622 GHz.

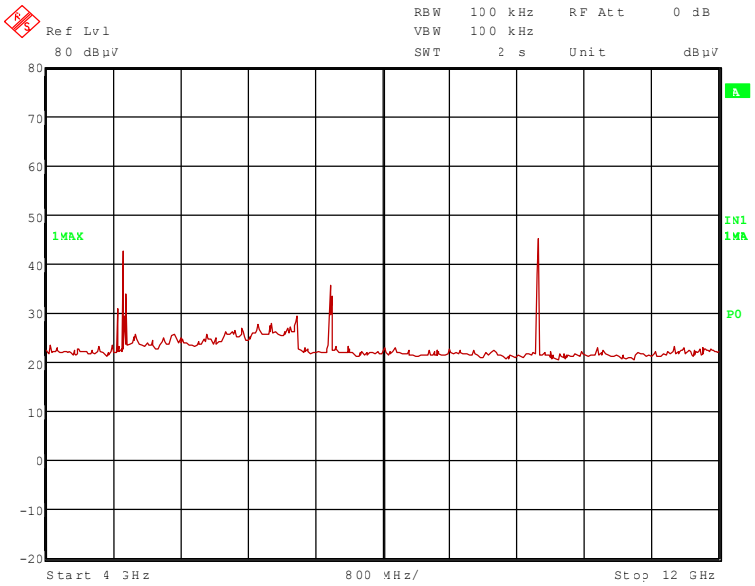
These frequencies have to be measured in a final measurement. The results were presented in the following.

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

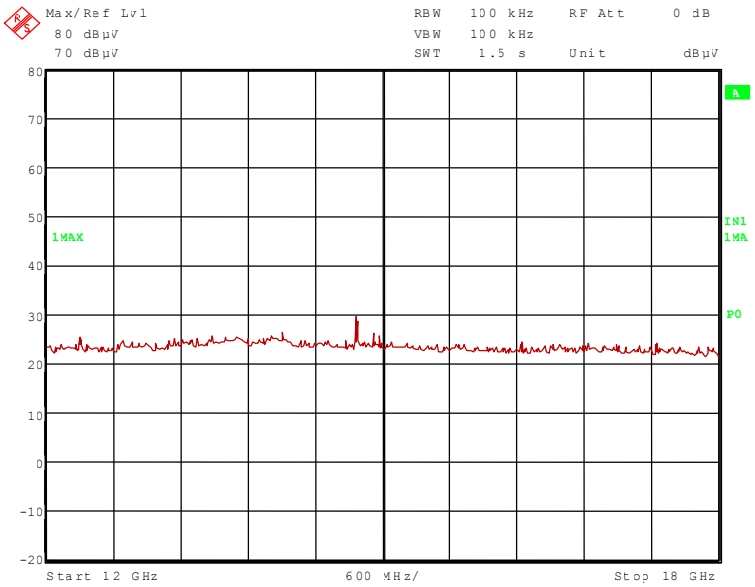
80804_31.wmf (1 GHz to 4 GHz):



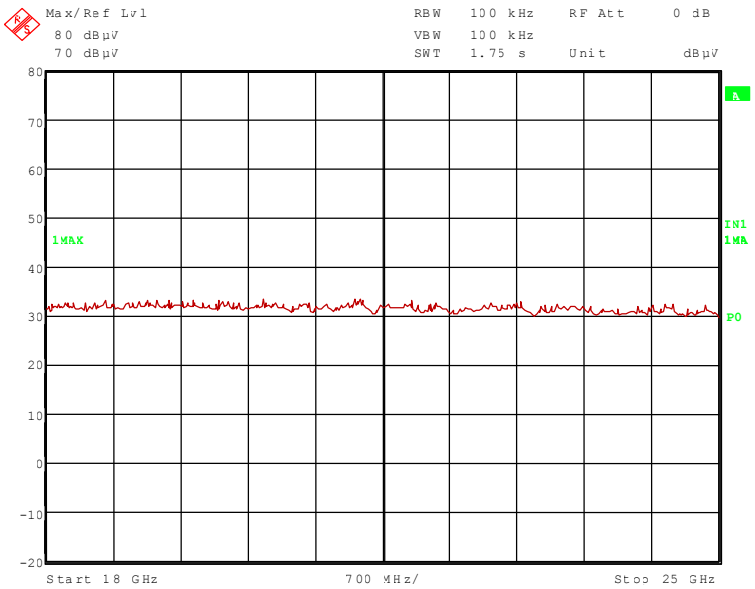
80804_30.wmf (4 GHz to 12 GHz):



80804_42.wmf (12 GHz to 18 GHz):



80804_43.wmf (18 GHz to 25 GHz):



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

- 4.808 GHz, 4.924 GHz and 7.386 GHz.

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

- 2.462 GHz, 3.2827 GHz, 9.848 GHz and 14.772 GHz.

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

5.5.2.2 FINAL MEASUREMENT (30 MHz to 1 GHz)

Ambient temperature	18 °C	Relative humidity	34 %

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

Cable guide: No cables were connectable to the EUT. For further information of the setup refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 3.6 V DC by the internal battery.

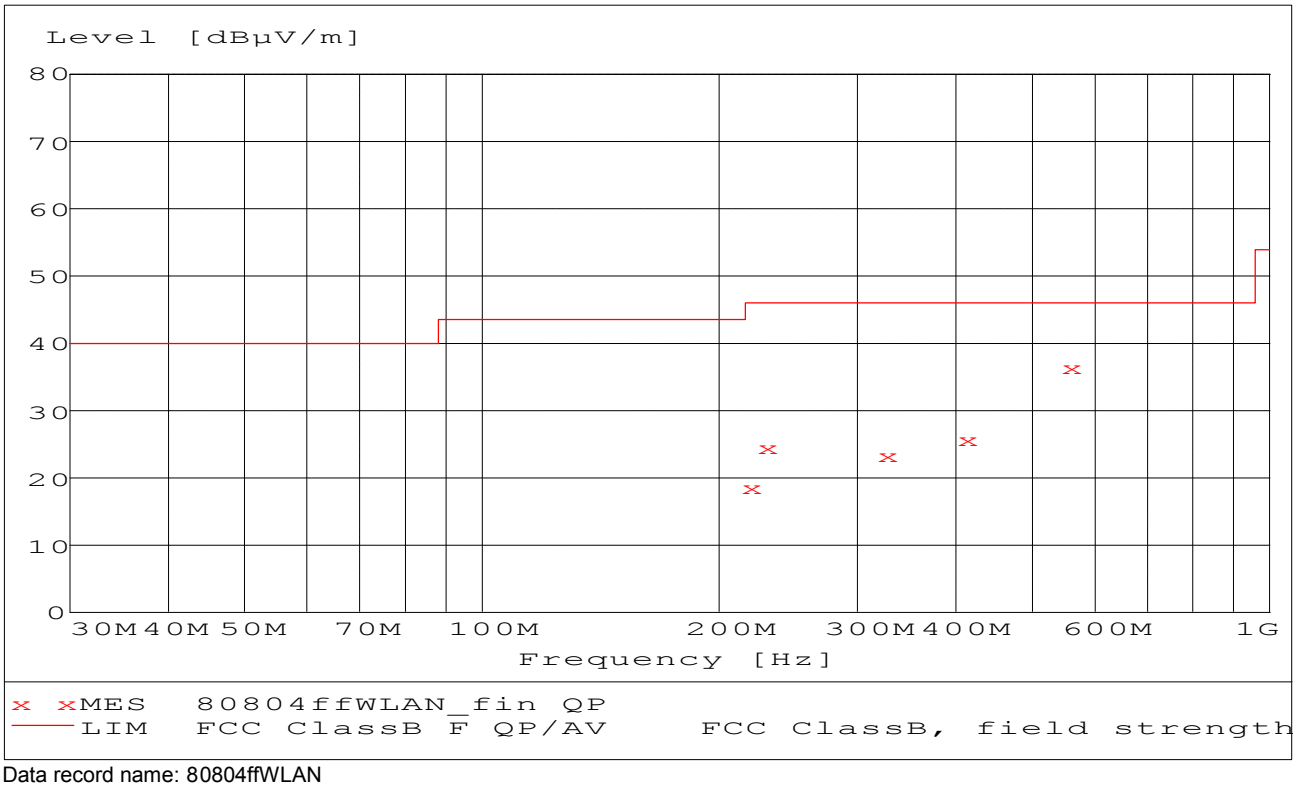
Test record: The test was carried out in test mode 2 of the EUT, because there was no difference to the other test modes.

Resolution bandwidth: For all measurements a resolution bandwidth of 120 kHz was used.

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

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

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



Data record name: 80804ffWLAN

The results of the standard subsequent measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

The measurement time with the quasi-peak measuring detector is 1 second.

Result measured with the quasipeak detector:

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

Spurious emissions outside restricted bands									
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
219.695	18.6	46.0	27.4	7.2	9.8	1.6	125	137	Hor.
229.414	24.7	46.0	21.3	12.8	10.3	1.6	100	157	Vert.
412.922	25.9	46.0	20.1	7.6	16.0	2.3	107	67	Vert.
560.333	36.6	46.0	9.4	13.9	19.9	2.8	344	202	Vert.
Spurious emissions in restricted bands									
Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
327.489	23.5	46.0	22.5	8.0	13.6	1.9	100	161	Hor.
Measurement uncertainty				+2.2 dB / -3.6 dB					

The test results were calculated with the following formula:

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

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
14 – 20

5.5.2.3 FINAL MEASUREMENT (1 GHz to 25 GHz)

Ambient temperature	21 °C	Relative humidity	43 %

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

Cable guide: No cables were connectable to the EUT. For further information of the setup refer to the pictures in annex A of this test report.

Supply voltage: During all measurements the EUT was supplied with 3.6 V DC by the internal battery.

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)

Results measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.412	107.0	-	-	74.5	28.8	0.0	3.7	150	Vert.	-
3.216	62.9	87.0	24.1	27.3	31.3	0.0	4.3	150	Hor.	No
4.824	55.9	74.0	18.1	42.6	33.7	25.7	5.3	150	Vert.	Yes
4.832	48.6	74.0	25.4	35.4	33.7	25.7	5.2	150	Hor.	Yes
7.236	58.0	87.0	29.0	38.9	36.9	24.6	6.8	150	Hor.	No
9.648	70.5	87.0	16.5	48.1	38.4	23.9	7.9	150	Hor.	No
12.060	46.7	74.0	27.3	36.5	33.6	25.9	2.5	150	Hor.	Yes
14.472	46.6	74.0	27.4	36.3	33.7	25.9	2.5	150	Hor.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

Results measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.412	98.6	-	-	66.1	28.8	0.0	3.7	150	Vert.	-
3.216	50.1	78.6	28.5	14.5	31.3	0.0	4.3	150	Hor.	No
4.824	42.9	54.0	11.1	29.6	33.7	25.7	5.3	150	Vert.	Yes
4.832	36.9	54.0	17.1	23.7	33.7	25.7	5.2	150	Hor.	Yes
7.236	46.9	78.6	31.7	27.8	36.9	24.6	6.8	150	Hor.	No
9.648	67.6	78.6	11.0	45.2	38.4	23.9	7.9	150	Hor.	No
12.060	33.0	54.0	21.0	22.8	33.6	25.9	2.5	150	Hor.	Yes
14.472	32.7	54.0	21.3	22.4	33.7	25.9	2.5	150	Hor.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

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

Results measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.437	106.5	-	-	74.0	28.8	0.0	3.7	150	Vert.	-
3.2493	54.2	86.5	32.3	18.5	31.4	0.0	4.3	150	Hor.	No
4.854	43.8	74.0	30.2	30.5	33.8	25.7	5.2	150	Vert.	Yes
4.874	56.9	74.0	17.1	43.6	33.8	25.7	5.2	150	Vert.	Yes
7.311	60.4	74.0	13.6	41.1	37.1	24.6	6.8	150	Hor.	Yes
9.748	70.7	86.5	15.8	48.3	38.4	23.9	7.9	150	Hor.	No
14.622	45.5	86.5	41.0	35.9	33.7	26.6	2.5	150	Hor.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

Results measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.437	98.0	-	-	65.5	28.8	0.0	3.7	150	Vert.	-
3.2493	45.7	78.0	32.3	10.0	31.4	0.0	4.3	150	Hor.	No
4.854	30.6	54.0	23.4	17.3	33.8	25.7	5.2	150	Vert.	Yes
4.874	43.8	54.0	10.2	30.5	33.8	25.7	5.2	150	Vert.	Yes
7.311	49.0	54.0	5.0	29.7	37.1	24.6	6.8	150	Hor.	Yes
9.748	67.6	78.0	10.4	45.2	38.4	23.9	7.9	150	Hor.	No
14.622	32.0	78.0	46.0	22.4	33.7	26.6	2.5	150	Hor.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

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

Results measured with the peak detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.462	108.3	-	-	75.7	28.9	0.0	3.7	150	Vert.	-
3.2827	55.5	88.3	32.8	19.7	31.5	0.0	4.3	150	Hor.	No
4.808	42.2	74.0	31.8	28.9	33.7	25.7	5.3	150	Hor.	Yes
4.924	56.8	74.0	17.2	43.2	33.9	25.6	5.3	150	Hor.	Yes
7.386	44.9	74.0	29.1	25.4	37.2	24.5	6.8	150	Hor.	Yes
9.848	51.3	88.3	37.0	28.7	38.4	23.9	8.1	150	Hor.	No
14.772	46.1	88.3	42.2	36.6	33.7	26.7	2.5	150	Hor.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

Results measured with the average detector:

Frequency GHz	Corr. value dBµV/m	Limit dBµV/m	Margin dB	Readings dBµV	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.462	97.4	-	-	64.8	28.9	0.0	3.7	150	Vert.	-
3.2827	48.6	77.4	28.8	12.8	31.5	0.0	4.3	150	Hor.	No
4.808	29.0	54.0	25.0	15.7	33.7	25.7	5.3	150	Hor.	Yes
4.924	43.6	54.0	10.4	30.0	33.9	25.6	5.3	150	Hor.	Yes
7.386	33.8	54.0	20.2	14.3	37.2	24.5	6.8	150	Hor.	Yes
9.848	48.2	77.4	29.2	25.6	38.4	23.9	8.1	150	Hor.	No
14.772	32.2	77.4	45.2	22.7	33.7	26.7	2.5	150	Hor.	No
Measurement uncertainty						+2.2 dB / -3.6 dB				

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 37, 39, 43, 46, 49 – 51, 54

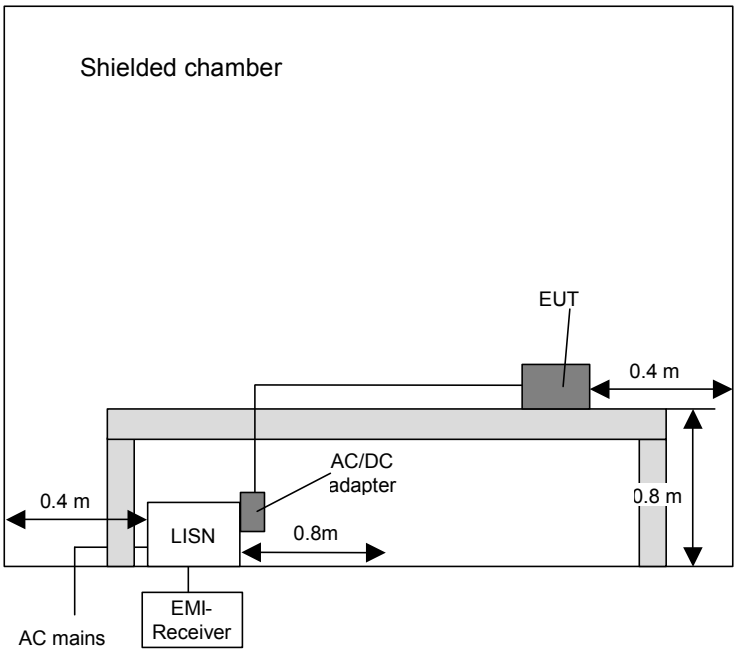
5.6 CONDUCTED EMISSIONS ON POWER SUPPLY LINES (150 kHz to 30 MHz)

5.6.1 METHOD OF MEASUREMENT

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

The frequency range 150 kHz to 30 MHz will be measured with an EMI Receiver set to MAX Hold mode with peak and average detector and a resolution bandwidth of 9 kHz. A scan will be carried out on the phase (or plus pole in case of DC powered devices) of the AC mains network. If levels detected 10 dB below the appropriable limit, this emission will be measured with the average and quasi-peak detector on all lines.

Frequency range	Resolution bandwidth
150 kHz to 30 MHz	9 kHz



5.6.2 TEST RESULTS (CONDUCTED EMISSIONS ON POWER SUPPLY LINES)

Ambient temperature	20 °C	Relative humidity	34 %

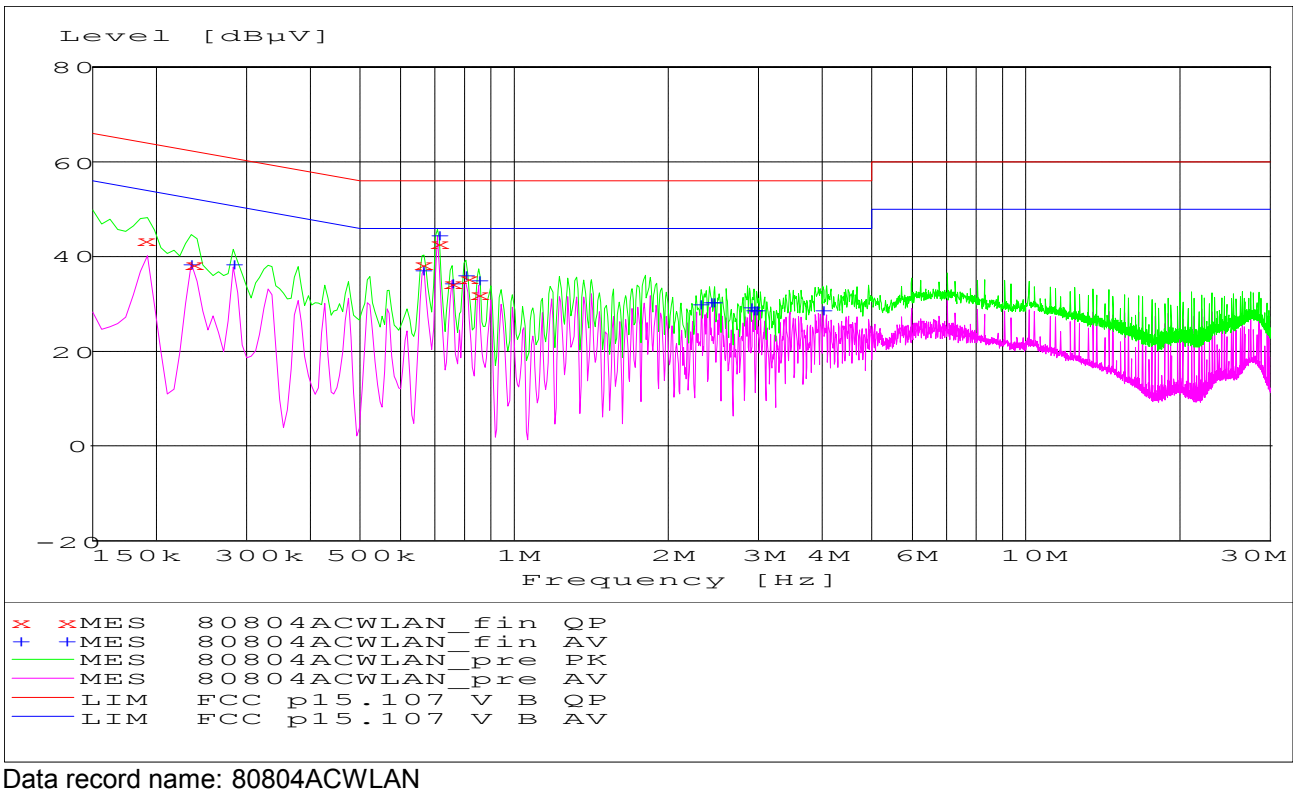
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.

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

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied via the charging station and the AC / DC adaptor type FW7362 / 24.

The curves in the diagram only represent for each frequency point the maximum measured value of all preliminary measurements which were made for each power supply line. The top measured curve represents the peak measurement and the bottom measured curve the average measurement. The quasi-peak measured points are marked by an x and the average measured points by an +.



Data record name: 80804ACWLAN

Result measured with the quasipeak detector:

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

Frequency MHz	Level dBµV	Transducer dB	Limit dBµV	Margin dB	Line	PE
0.189870	43.60	1.1	64.0	20.5	L1	FLO
0.236310	38.80	1.0	62.2	23.4	L1	FLO
0.663900	38.40	0.8	56.0	17.6	N	FLO
0.712230	43.10	0.8	56.0	12.9	N	FLO
0.753360	34.30	0.8	56.0	21.7	L1	FLO
0.807720	35.90	0.7	56.0	20.1	L1	FLO
0.856230	32.10	0.8	56.0	23.9	L1	FLO
Measurement uncertainty				+3.6 dB / -4.5 dB		

Data record name: 80804ACWLAN_fin QP

Result measured with the average detector:

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

Frequency MHz	Level dBµV	Transducer dB	Limit dBµV	Margin dB	Line	PE
0.234240	38.30	1.0	52.3	14.0	L1	FLO
0.283290	38.30	0.9	50.7	12.4	L1	FLO
0.665880	37.70	0.8	46.0	8.3	N	FLO
0.707910	44.60	0.8	46.0	1.4	N	FLO
0.757320	34.70	0.8	46.0	11.3	L1	FLO
0.800070	36.30	0.7	46.0	9.7	L1	FLO
0.849300	35.40	0.8	46.0	10.6	L1	FLO
2.320170	30.30	0.7	46.0	15.7	L1	FLO
2.409270	30.80	0.7	46.0	15.2	L1	FLO
2.461560	30.70	0.7	46.0	15.3	L1	FLO
2.886630	29.70	0.9	46.0	16.3	L1	FLO
2.939820	28.90	0.8	46.0	17.1	L1	FLO
2.975910	28.90	0.7	46.0	17.1	L1	FLO
4.019730	29.00	0.7	46.0	17.0	L1	FLO
Measurement uncertainty				+3.6 dB / -4.5 dB		

Data record name: 80804ACWLAN_fin AV

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

1 – 3, 5, 6

6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

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	Not applicable	
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	Power Meter	NRVD	Rohde & Schwarz	833697/030	480589	02/28/2008	02/2010
69	Peak Power Sensor	NRV-Z32	Rohde & Schwarz	849745/016	480551	02/28/2008	02/2010

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