

TEST REPORT

Test Report Reference: F080804E01

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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Address:	Willy-Brandt-Weg 41 48155 Münster
Country:	Germany
Name for contact purposes:	Mr. Torsten DRIESE
Tel:	+49 251 28 56 – 247
Fax:	+49 251 28 56 – 565
e-mail address:	tdriese@vectron.de

1.3 DATES

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

Test engineer: Thomas KÜHN
Name



Signature

02 December 2008

Date

Test report checked: Bernd STEINER
Name



Signature

02 December 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 47 CFR Part 2** General Rules and Regulations
- [3] **FCC 47 CFR Part 15** Radio Frequency Devices (Subpart C)
- [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 of equipment:	Point of sale terminal
Type designation:	POS MobilePro Terminal
Serial No.:	4510002134
FCC ID:	WGC-MOBILEPRO
IC:	8085A-MOBILEPRO
Serial No.:	4510002134
Lowest internal frequency:	32.768 kHz
Highest internal frequency:	18.432 MHz
Antenna type:	Internal
Supply Voltage:	3.6 V DC by the internal battery

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 a 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.

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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.

No variation of the supply voltage was carried out, because the internal battery will always supply the EUT. As additional pretests have shown, no influence of the output signal regarding to the input voltage was noticeable.

If not otherwise stated, the tests were carried out with the EUT powered on in awaiting a transponder card because no influence to the emissions were noticeable in case of using a transponder card.

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.

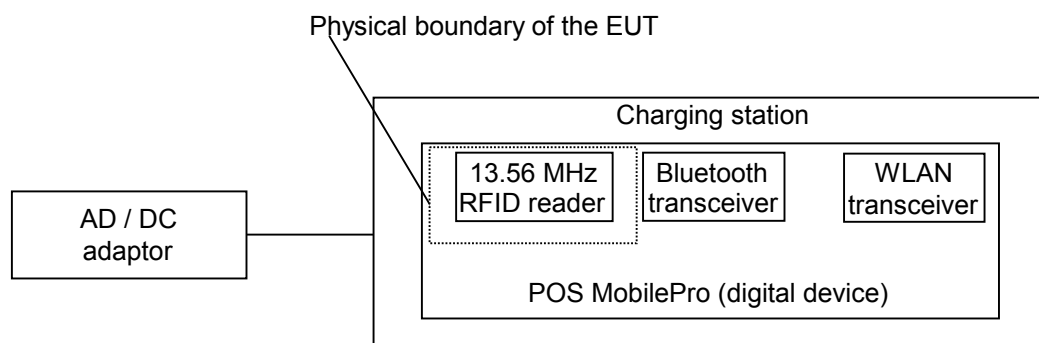
For the whole frequency range a preliminary measurement in a fully anechoic chamber with a measuring distance of 3 m was carried out to determine the frequencies, which were radiated by the EUT.

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 labelled with a FCC / IC - label.

The EUT consists of different parts (13.560 MHz RFID reader, Bluetooth transceiver and WLAN transceiver and digital device) and is regarded as composite device. Object of this test report is the 13.560 MHz RFID reader 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 behaviour is also realised in the final application.

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



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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
Radiated emissions	30 – 1,000	15.205 (a), 15.209 (a)	A2.6 (d) [4], 2.6 [5]	Passed	8 et seq.
Spectrum mask	13.110 to 14.010	15.225 (a) to (c)	A2.6 (a) to (d) [4]	Passed	21 et seq.
Occupied bandwidth	General	15.215 (c)	-	Passed	23 et seq.
Frequency tolerance	13.553 to 13.567	15.225 (e)	A2.6 [4]	Passed	25 et seq.
Conducted emissions on supply line	0.15 – 30	15.207 (a)	7.2.2 [5]	Passed	27 et seq.
99 % bandwidth	General	-	4.6.1 [5]	Passed	1 et seq. of Annex D of this test report

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5 TEST RESULTS

5.1 RADIATED EMISSIONS

5.1.1 METHOD OF MEASUREMENT (RADIATED EMISSIONS)

The radiated emission measurement is subdivided into five stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 9 kHz to 1 GHz.
- A final measurement carried out on an outdoor test 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 preliminary measurement carried out in a fully anechoic chamber with a variable antenna distance and height in the frequency range 1 GHz to 25 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 25 GHz.

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

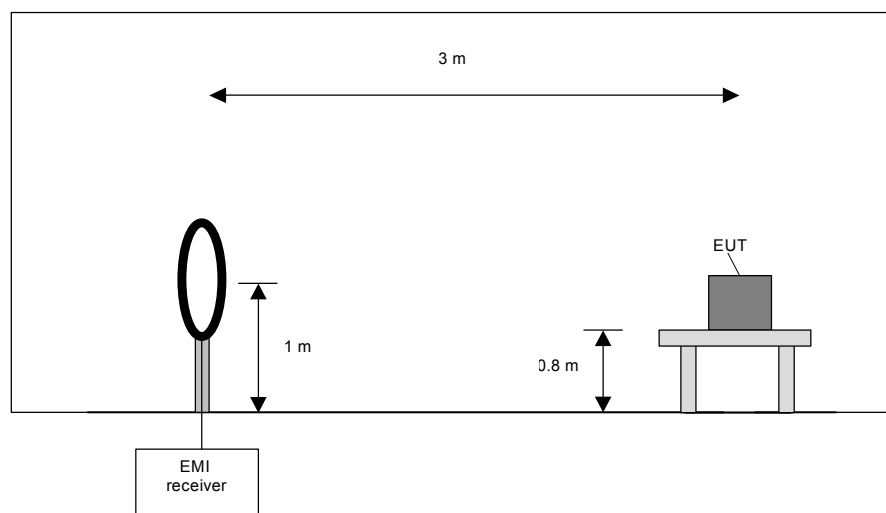
Preliminary measurement (9 kHz to 30 MHz):

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

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

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

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



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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 (if EUT is a handheld equipment).
- 7) Rotate the measuring antenna and repeat steps 1) to 5).

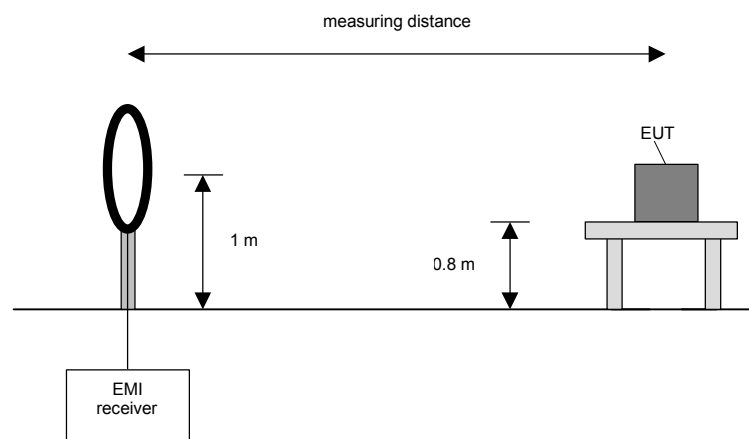
Final measurement (9 kHz to 30 MHz):

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



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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 the EUT is handheld equipment).

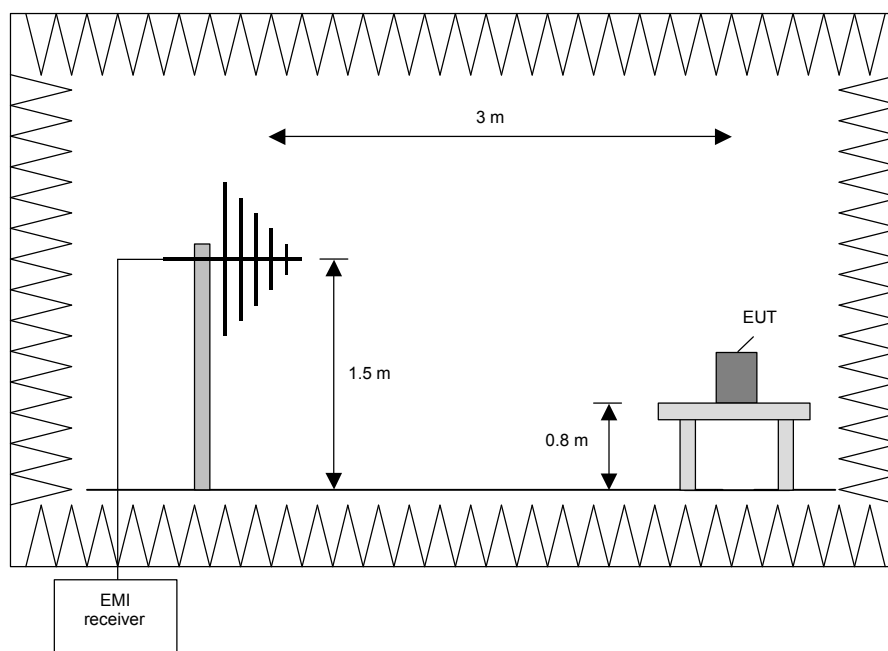
Preliminary measurement (30 MHz to 1 GHz)

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



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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:

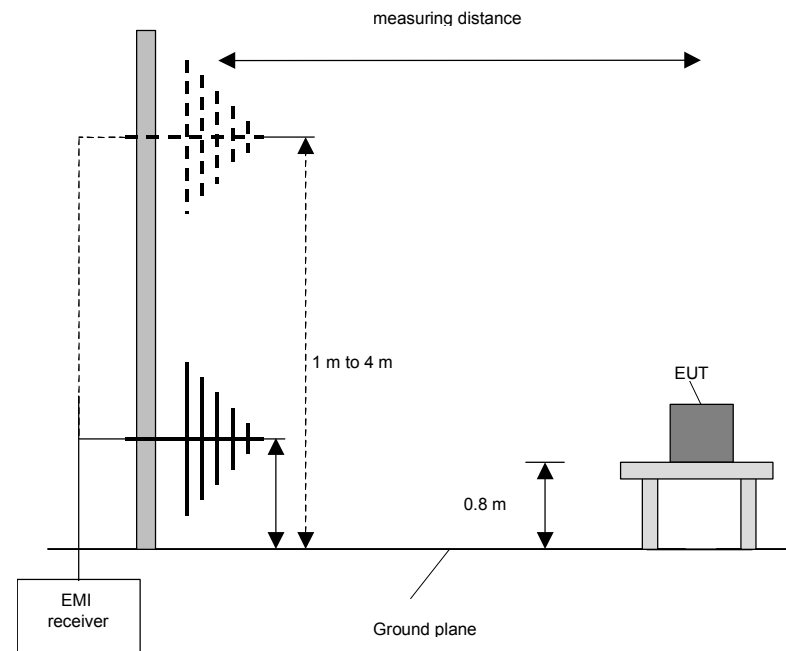
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the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



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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 the EUT is handheld equipment).

Preliminary and final measurement (1 GHz to 25 GHz)

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

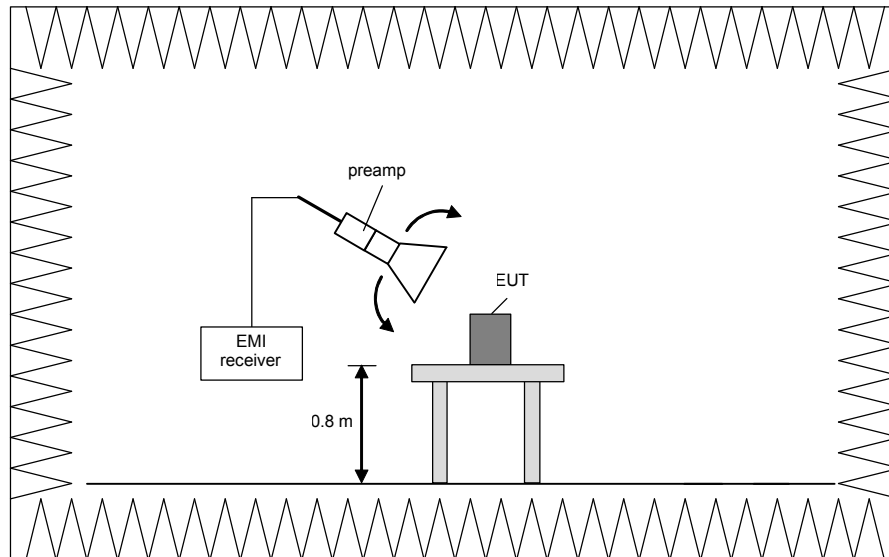
Preliminary measurement (1 GHz to 25 GHz)

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

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

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

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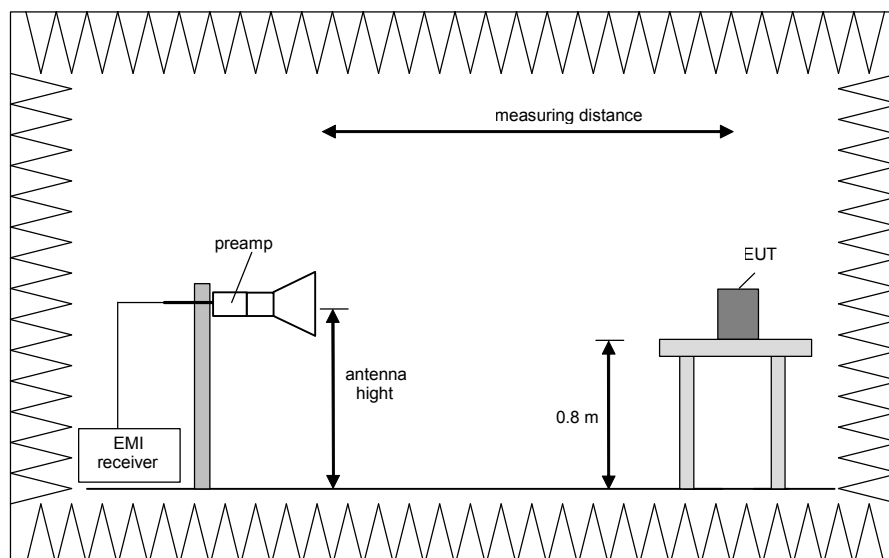


Final measurement (1 GHz to 25 GHz)

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: F080804E01

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.

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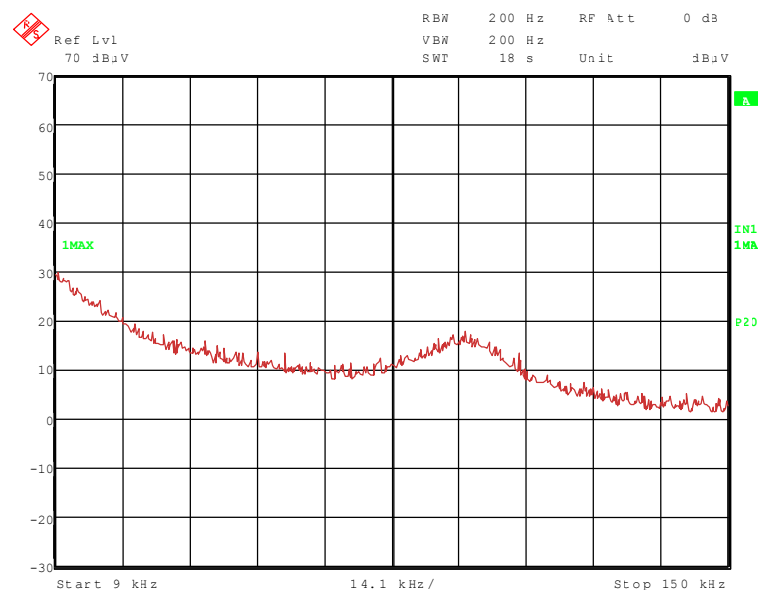
5.1.2 TEST RESULTS (RADIATED EMISSIONS)

5.1.2.1 PRELIMINARY MEASUREMENT (9 kHz to 1 GHz)

Ambient temperature:	21 °C	Relative humidity:	43 %
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Position of EUT:	The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.
Cable guide:	The 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 of the EUT (without reading a TAG). All results are shown in the following.
Supply voltage:	The EUT was supplied with 3.6 V DC by the internal battery.

80804_22.wmf: Spurious emissions from 9 kHz to 150 kHz:

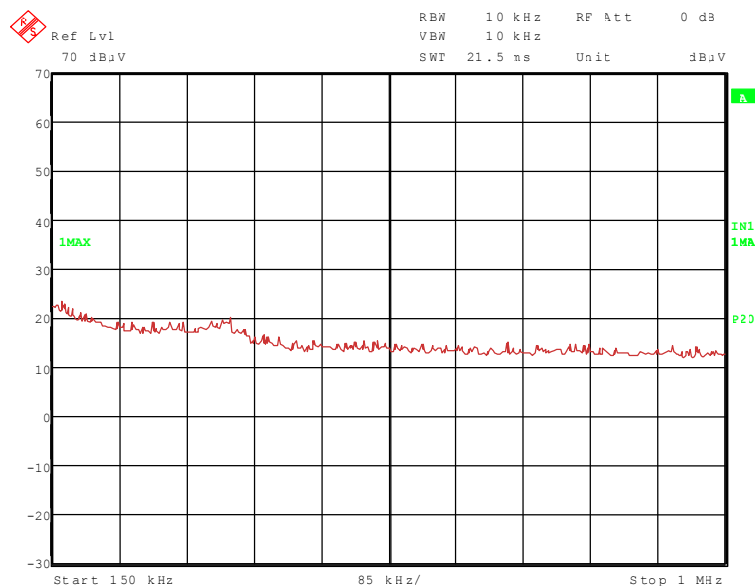


TEST EQUIPMENT USED FOR THE TEST:

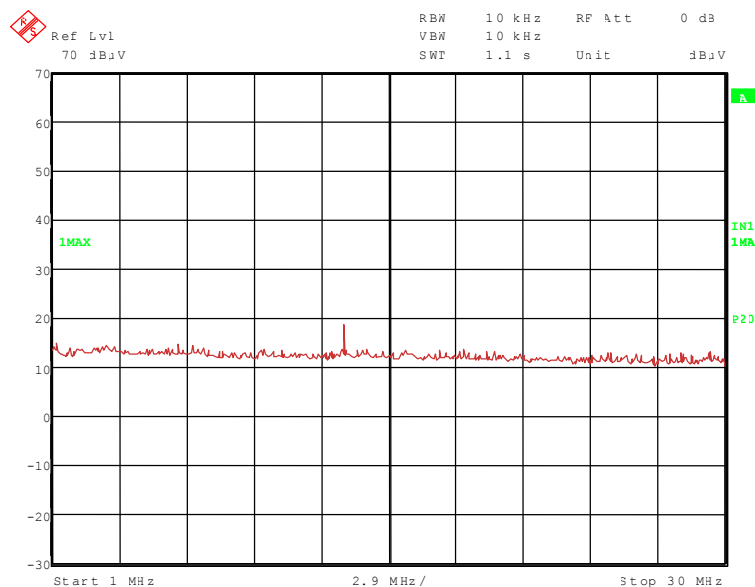
29, 31 – 35, 43, 62

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80804_21.wmf: Spurious emissions from 150 kHz to 1 MHz:



80804_20.wmf: Spurious emissions from 1 MHz to 30 MHz:



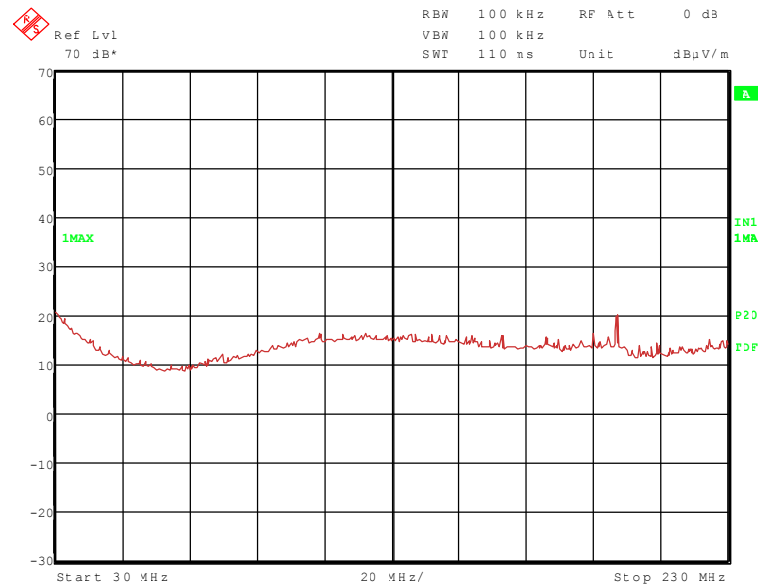
The following frequency was found inside the 13.533 to 13.567 MHz band according to FCC 47 CFR Part 15 section 15.225 [2]:

13.560 MHz.

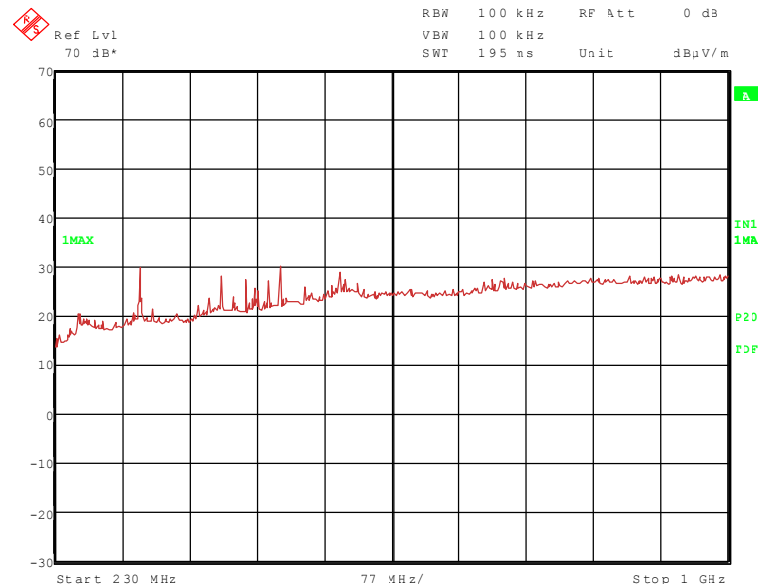
This frequency has to be measured on the outdoor test site. The result of this final measurement is shown in subclause 5.1.2.2 of this test report.

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80804_18.wmf: Spurious emissions from 30 MHz to 230 MHz:



80804_19.wmf: Spurious emissions from 230 MHz to 1 GHz:



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

196.592 MHz, 420.360 MHz, 488.160 MHz and 555.960 MHz

These frequencies have to be measured on the open area test site. The results of this final measurement are shown in subclause 5.1.2.3 of this test report.

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5.1.2.2 FINAL RADIATED EMISSION TEST (9 kHz to 30 MHz)

Ambient temperature:	15 °C	Relative humidity:	53 %
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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, 10 m and 30 m.

Cable guide: No cable were connectable to the EUT. For further information of the set-up refer to the pictures in annex A of this test report.

Test record: The test was carried out in normal operation mode of the EUT (without reading a TAG). All results are shown in the following.

Supply voltage: The EUT was supplied with 3.6 V DC by the internal battery.

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

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

Results with measuring distance of 3 m						
Frequency	Result dB μ V/m	Limit dB μ V/m	Margin dB	Detector	Readings dB μ V	Antenna factor * dB/m
13.561 MHz	43.4	124.0	80.6	QP	23.4	20.0
Results with measuring distance of 10 m						
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Detector	Readings dB μ V	Antenna factor * dB/m
13.561 MHz	Signal was below the noise floor of the system					
Measurement uncertainty				+2.2 dB / -3.6 dB		

*: Cable loss included

Test result: Passed

TEST EQUIPMENT USED FOR THE TEST:
55, 57, 62

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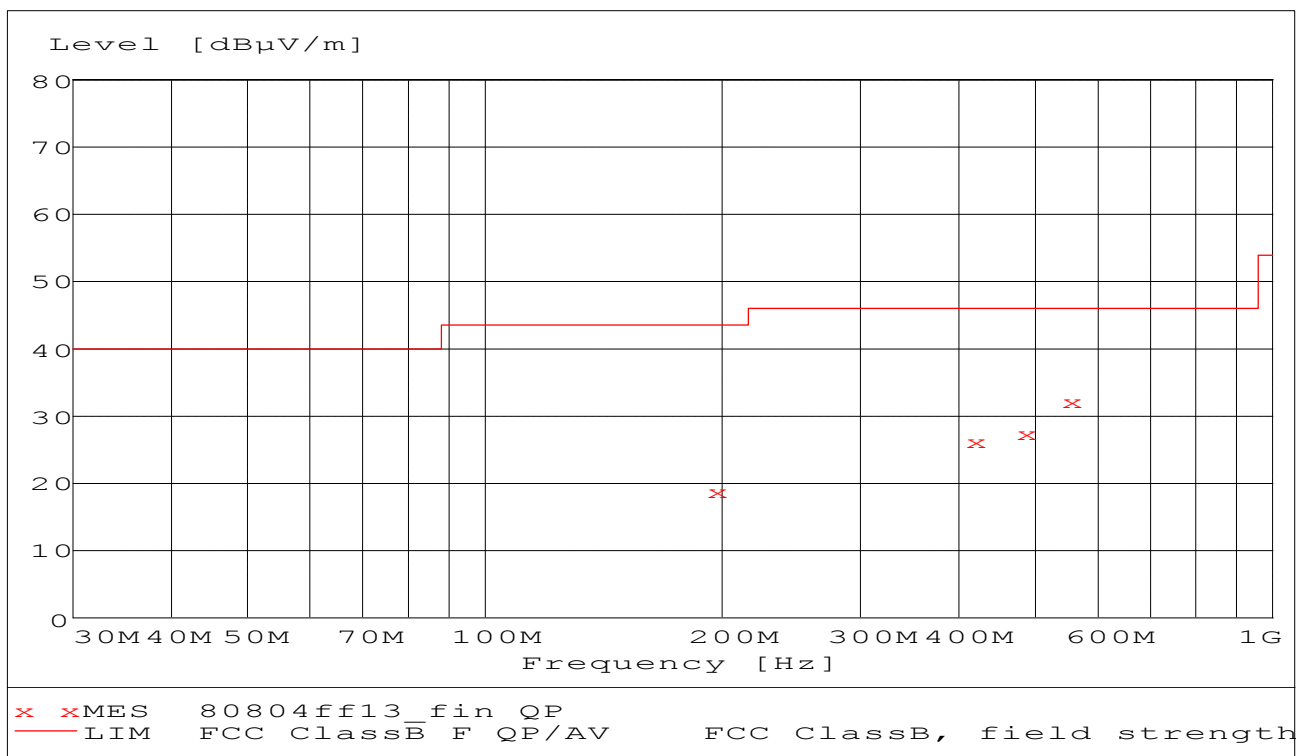
5.1.2.3 FINAL RADIATED EMISSION TEST (30 MHz to 1 GHz)

Ambient temperature:	15 °C	Relative humidity:	52 %
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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 of the EUT (without reading a TAG). All results are shown in the following.
- Supply voltage:** The EUT was supplied with 3.6 V DC by the internal battery.
- Test results:** The test results were calculated with the following formula:

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

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



Data record name: 80804ff13

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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.

Result measured with the quasipeak detector:

(These values are marked in the above diagram by 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.
196.592	19	43.5	24.5	8.6	8.9	1.5	196	193	Vert.
420.360	26.3	46.0	19.7	8.0	16.0	2.3	125	4	Vert.
488.160	27.7	46.0	18.3	8.0	17.2	2.5	119	358	Vert.
555.960	32.5	46.0	13.5	10.0	19.8	2.7	100	286	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.
-	-	-	-	-	-	-	-	-	-
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 result: Passed

TEST EQUIPMENT USED FOR THE TEST:

14 – 20

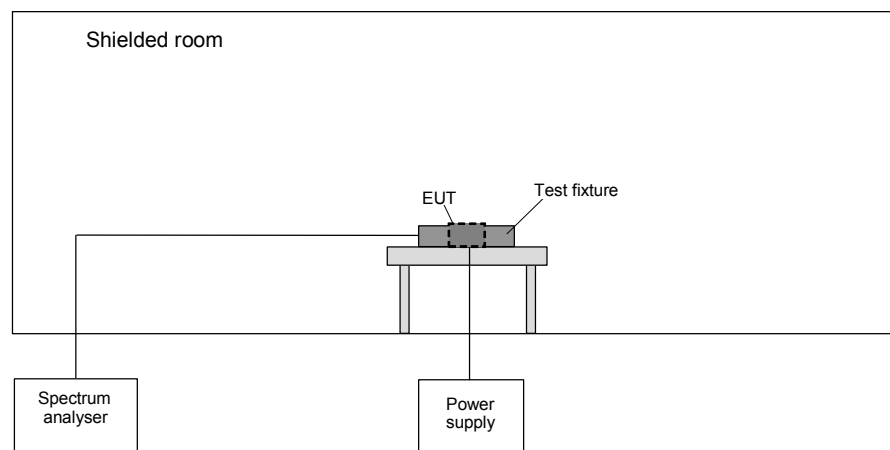
TEST REPORT REFERENCE: F080804E01

5.2 SPECTRUM MASK

5.2.1 METHOD OF MEASUREMENT (SPECTRUM MASK)

The following procedure will be used for the spectrum mask measurement:

- 1) Place the EUT in the test fixture and switch it on.
- 2) Use the following spectrum analyser settings: RWB = VBW = 1 kHz, Span = wide enough to capture the whole 13 MHz band including the frequency ranges where the 15.209 limit applies, Trace mode = MaxHold, select the limit line 15225spc
- 3) After trace stabilisation, set the marker to the signal peak.
- 4) The Reference level will be calculated by the amount of the margin of the wanted signal to its 30 m emission limit plus the marker value.
- 5) The whole signal trace has to be below the limit line.



The following procedure will be used for the occupied bandwidth measurement:

- 1) Place the EUT in the test fixture and switch it on.
- 2) Use the following spectrum analyser settings: RWB = VBW = 10 kHz, Span = wide enough to capture app. 1.5 times the 20 dB bandwidth, Trace mode = MaxHold.
- 3) After trace stabilisation, set the first marker and the first display line to the signal peak. Set the second display line 20 dB below the first display line. The second marker and its delta marker shall be set to cross points of the spectrum line and the second display line and note these frequencies.
- 4) Alternatively the 20 dB down function of the analyser could be used, if this function will be applicable to the displayed spectrum.

TEST REPORT REFERENCE: F080804E01

5.2.2 TEST RESULTS (SPECTRUM MASK)

Ambient temperature:	21 °C	Relative humidity:	40 %
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Supply voltage: The EUT was supplied with 3.6 V DC by the internal battery.

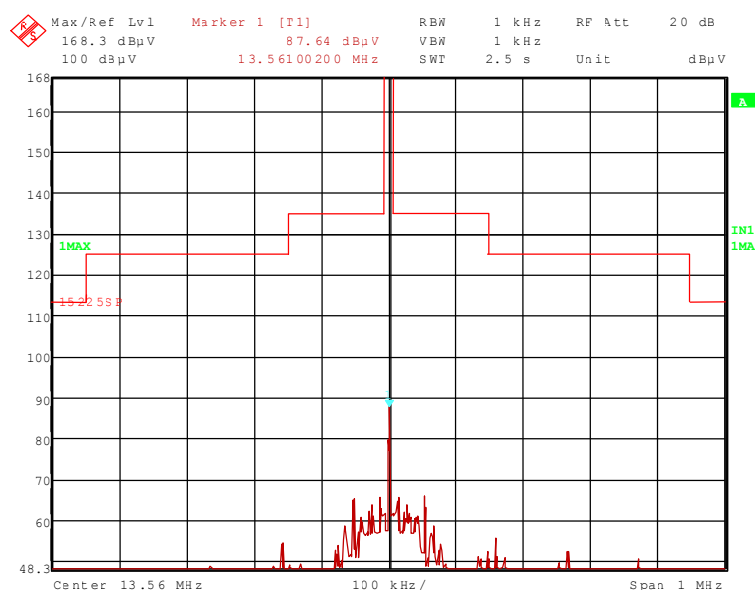
Test record: The test was carried out while the EUT was reading a TAG.

The Reference level in the plot below was calculated with the following formular:

$$\text{Reflevel} = (\text{Limit}_{\text{OATS}} - \text{Level}_{\text{OATS}}) + \text{Marker value}$$

Where $\text{Limit}_{\text{OATS}} = 84.0 \text{ dB}\mu\text{V/m}$, $\text{Level}_{\text{OATS}} = 28.3 \text{ dB}\mu\text{V/m}$ and Marker value = 91.3 dB μV .

80804 92.wmf: Spectrum mask at 13.560 MHz:



Test result: Passed

TEST EQUIPMENT USED THE TEST:

31, 56

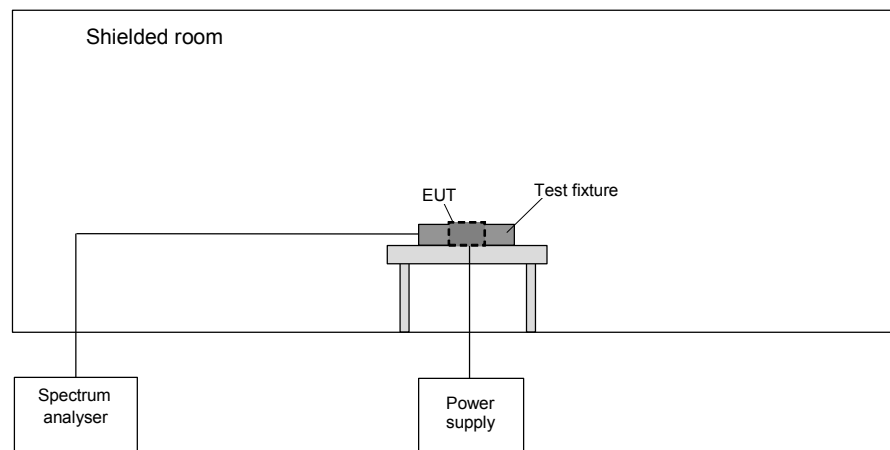
TEST REPORT REFERENCE: F080804E01

5.3 OCCUPIED BANDWIDTH

5.3.1 METHOD OF MEASUREMENT (OCCUPIED BANDWIDTH)

The following procedure will be used for the occupied bandwidth measurement:

- 5) Place the EUT in the test fixture and switch it on.
- 6) Use the following spectrum analyser settings: RWB = VBW = 10 kHz, Span = wide enough to capture app. 1.5 times the 20 dB bandwidth, Trace mode = MaxHold.
- 7) After trace stabilisation, set the first marker and the first display line to the signal peak. Set the second display line 20 dB below the first display line. The second marker and its delta marker shall be set to cross points of the spectrum line and the second display line and note these frequencies.
- 8) Alternatively the 20 dB down function of the analyser could be used, if this function will be applicable to the displayed spectrum.



TEST REPORT REFERENCE: F080804E01

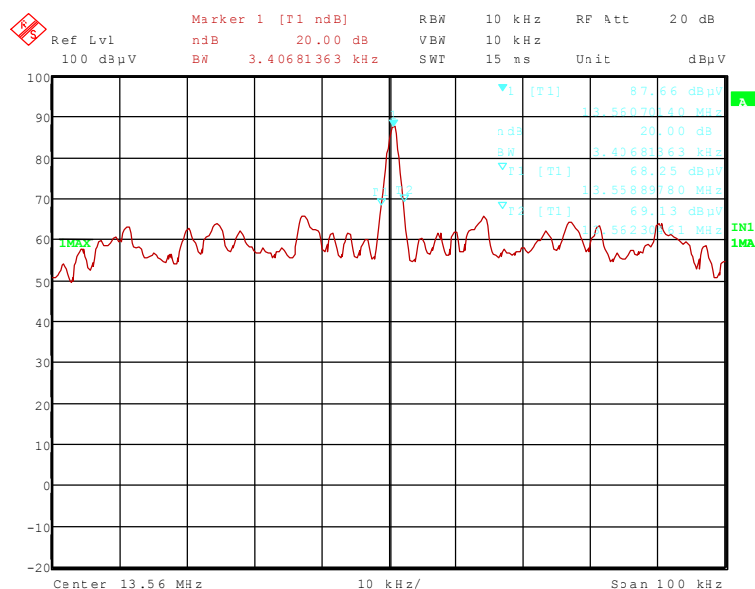
5.3.2 TEST RESULTS (OCCUPIED BANDWIDTH)

Ambient temperature:	21 °C	Relative humidity:	40 %
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Supply voltage: The EUT was supplied with 3.6 V DC by the internal battery.

Test record: The test was carried out while the EUT was reading a TAG.

80804_93.wmf: Occupied bandwidth at 13.560 MHz:



F_L	F_U	BW ($F_U - F_L$)
13.558898 MHz	13.562305 MHz	3.407 kHz
Measurement uncertainty		$< \pm 1 \cdot 10^{-7}$

Test result: Passed

TEST EQUIPMENT USED THE TEST:
31, 56

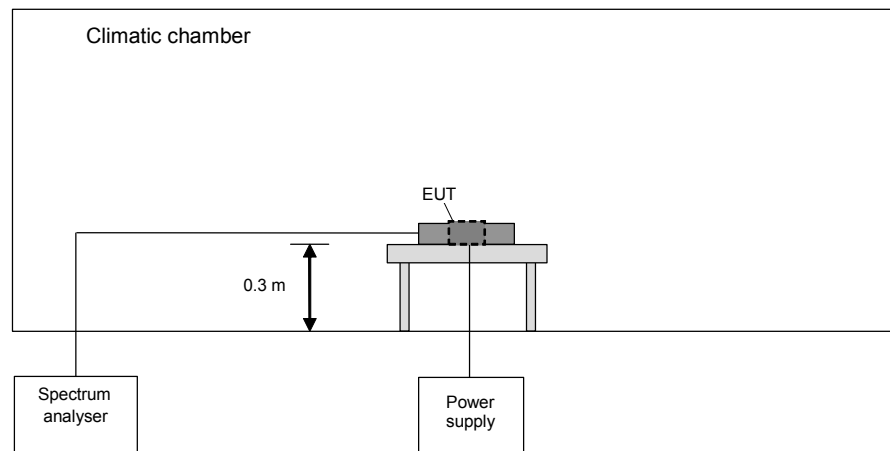
TEST REPORT REFERENCE: F080804E01

5.4 FREQUENCY TOLERANCE

5.4.1 METHOD OF MEASUREMENT (FREQUENCY TOLERANCE)

The following procedure will be used:

- 1) Place the EUT in the climatic chamber.
- 2) Switch on the EUT and check the correct function and the settings of the spectrum analyser.
- 3) Switch off the EUT and tune the climatic chamber to a temperature of 50 °C. Wait until the thermal balance is obtained.
- 4) Switch the EUT on and record the frequencies at start-up and 2, 5 and 10 minutes after powering on.
- 5) Repeat 4) with the minimum and the maximum of the supply voltage.
- 6) Switch off the EUT and tune the climatic chamber to a temperature range of 50 °C to –20 °C to in ten-degree steps. Wait until the thermal balance is obtained for every step.
- 7) Switch the EUT on and record the frequencies at start-up and 2, 5 and 10 minutes after powering on.
- 8) Repeat 7) with the minimum and the maximum of the supply voltage at 20 °C.
- 9) Repeat 6) with the next temperature step until –20 °C were reached.



TEST REPORT REFERENCE: F080804E01

5.4.2 TEST RESULTS (FREQUENCY TOLERANCE)

Ambient temperature:	21 °C	Relative humidity:	52 %
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Test set-up: For this test the EUT was fixed on a wooden table inside the climatic chamber.

Cable guide: For further information of the cable guide refer to the pictures in annex A of this test report.

Temperature	Supply voltage	Minutes after switch on	Frequency [MHz]	Allowed tolerance	Measured tolerance	Result
50 °C	3.6 VDC	0	13.560441	±1.356 kHz	0 Hz	Passed
	3.6 VDC	2	13.560466	±1.356 kHz	+25 Hz	Passed
	3.6 VDC	5	13.560475	±1.356 kHz	+34 Hz	Passed
	3.6 VDC	10	13.560488	±1.356 kHz	+47 Hz	Passed
40 °C	3.6 VDC	0	13.560441	±1.356 kHz	0 Hz	Passed
	3.6 VDC	2	13.560455	±1.356 kHz	+14 Hz	Passed
	3.6 VDC	5	13.560461	±1.356 kHz	+20 Hz	Passed
	3.6 VDC	10	13.560462	±1.356 kHz	+21 Hz	Passed
30 °C	3.6 VDC	0	13.560442	±1.356 kHz	+1 Hz	Passed
	3.6 VDC	2	13.560443	±1.356 kHz	+2 Hz	Passed
	3.6 VDC	5	13.560444	±1.356 kHz	+3 Hz	Passed
	3.6 VDC	10	13.560445	±1.356 kHz	+4 Hz	Passed
20 °C	3.3 V DC (U _{min})	0	13.560447	±1.356 kHz	+6 Hz	Passed
	3.6 VDC (U _{nom})		13.560451	±1.356 kHz	+10 Hz	Passed
	4.2 V DC (U _{max})		13.560446	±1.356 kHz	+2 Hz	Passed
	3.3 V DC (U _{min})	2	13.560441	±1.356 kHz	0 Hz	Passed
	3.6 VDC (U _{nom})		13.560442	±1.356 kHz	+1 Hz	Passed
	4.2 V DC (U _{max})		13.560442	±1.356 kHz	+1 Hz	Passed
	3.3 V DC (U _{min})	5	13.560441	±1.356 kHz	0 Hz	Passed
	3.6 VDC (U _{nom})		13.560441	±1.356 kHz	0 Hz	Passed
	4.2 V DC (U _{max})		13.560441	±1.356 kHz	0 Hz	Passed
	3.3 V DC (U _{min})	10	13.560441	±1.356 kHz	0 Hz	Passed
	3.6 VDC (U _{nom})		13.560441	-	-	Reference
	4.2 V DC (U _{max})		13.560441	±1.356 kHz	0 Hz	Passed
10 °C	3.6 VDC	0	13.560453	±1.356 kHz	+12 Hz	Passed
	3.6 VDC	2	13.560446	±1.356 kHz	+5 Hz	Passed
	3.6 VDC	5	13.560446	±1.356 kHz	+5 Hz	Passed
	3.6 VDC	10	13.560446	±1.356 kHz	+5 Hz	Passed
0 °C	3.6 VDC	0	13.560449	±1.356 kHz	+8 Hz	Passed
	3.6 VDC	2	13.560453	±1.356 kHz	+12 Hz	Passed
	3.6 VDC	5	13.560453	±1.356 kHz	+12 Hz	Passed
	3.6 VDC	10	13.560453	±1.356 kHz	+12 Hz	Passed
-10 °C	3.6 VDC	0	13.560433	±1.356 kHz	-8 Hz	Passed
	3.6 VDC	2	13.560452	±1.356 kHz	+11 Hz	Passed
	3.6 VDC	5	13.560453	±1.356 kHz	+12 Hz	Passed
	3.6 VDC	10	13.560453	±1.356 kHz	+12 Hz	Passed
-20 °C	3.6 VDC	0	13.560440	±1.356 kHz	-1 Hz	Passed
	3.6 VDC	2	13.560447	±1.356 kHz	+6 Hz	Passed
	3.6 VDC	5	13.560449	±1.356 kHz	+8 Hz	Passed
	3.6 VDC	10	13.560449	±1.356 kHz	+8 Hz	Passed
Measurement uncertainty				< ± 1*10 ⁻⁷		

Test result: Passed

TEST EQUIPMENT USED FOR THE TEST:
31, 54, 56, 64

TEST REPORT REFERENCE: F080804E01

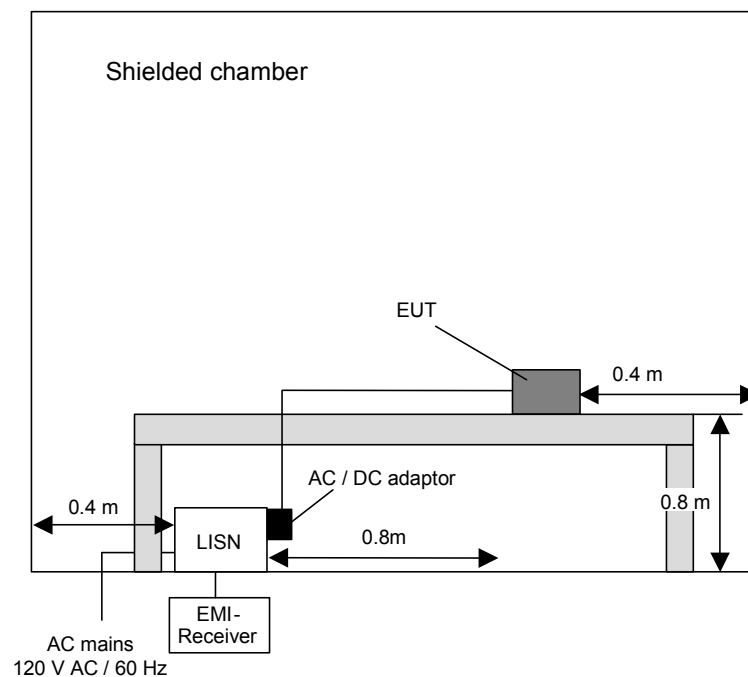
5.5 CONDUCTED EMISSION MEASUREMENT POWER SUPPLY LINES

5.5.1 METHOD OF MEASUREMENT (CONDUCTED EMISSIONS ON POWER SUPPLY LINES)

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

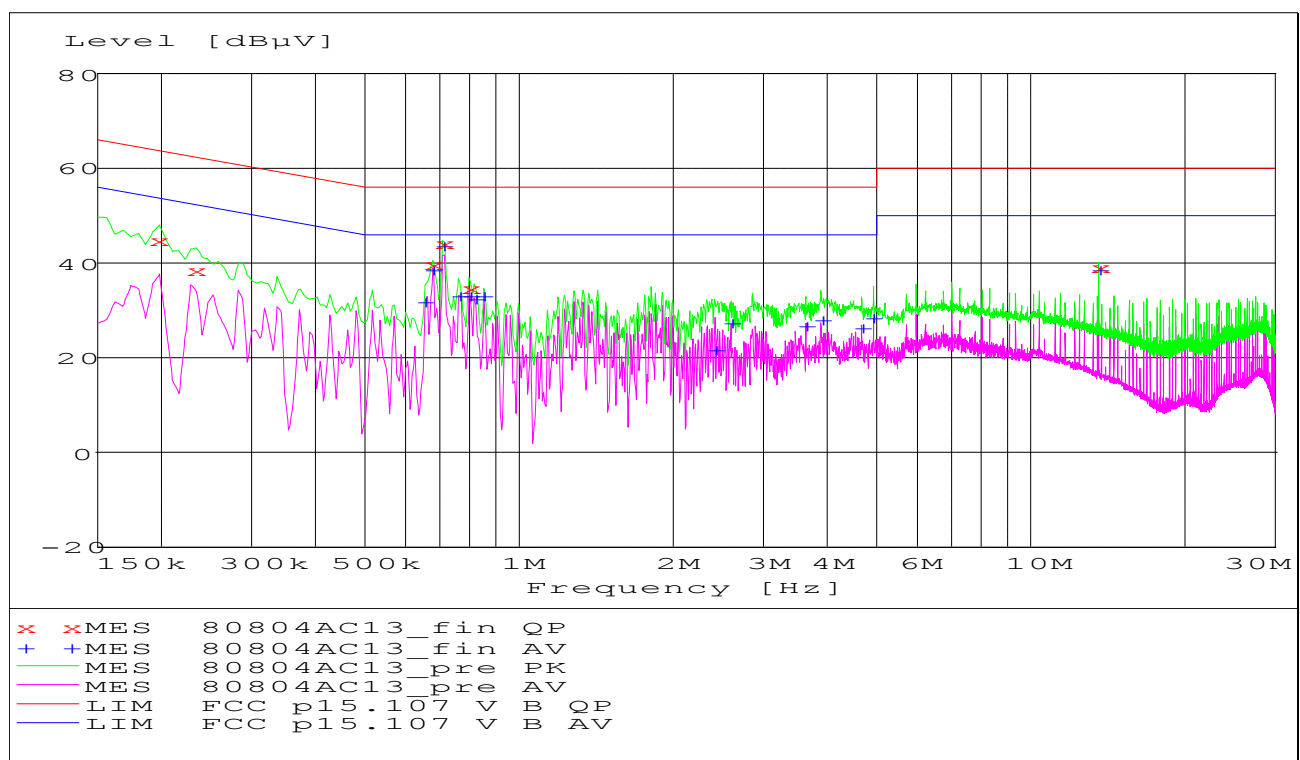


TEST REPORT REFERENCE: F080804E01

5.5.2 TEST RESULTS (CONDUCTED EMISSIONS ON POWER SUPPLY LINES)

Ambient temperature:	21 °C	Relative humidity:	52 %
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Position of EUT:	The EUT was set-up on a wooden table of a height of 0.8 m.
Cable guide:	All cable of the EUT was fixed on the wooden 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 of the EUT (without reading a TAG) while the EUT was positioned inside the charging station. All results are shown in the following.
Power supply:	During this test the EUT was powered by charging station, which was powered by an AC/DC adaptor type FW 7362 / 24.



Data record name: 80804AC13

TEST REPORT REFERENCE: F080804E01

Result measured with the quasipeak detector:

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

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
0.196530	44.90	1.0	63.8	18.8	N	FLO
0.232260	38.80	1.0	62.4	23.5	N	FLO
0.682350	39.60	0.8	56.0	16.4	N	FLO
0.711150	44.40	0.8	56.0	11.6	N	FLO
0.798720	35.00	0.7	56.0	21.0	L1	FLO
13.560810	39.10	1.8	60.0	20.9	N	FLO

Data record name: 80804AC13_fin QP

Result measured with the average detector:

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

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
0.656070	32.20	0.8	46.0	13.8	L1	FLO
0.677400	38.80	0.8	46.0	7.2	L1	FLO
0.710160	44.00	0.8	46.0	2.0	N	FLO
0.763800	33.20	0.8	46.0	12.8	L1	FLO
0.798540	33.30	0.7	46.0	12.7	L1	FLO
0.819510	32.30	0.7	46.0	13.7	L1	FLO
0.852000	32.90	0.8	46.0	13.1	L1	FLO
2.413410	21.70	0.7	46.0	24.3	L1	FLO
2.593950	27.50	0.7	46.0	18.5	N	FLO
3.631290	27.20	0.7	46.0	18.8	N	FLO
3.891030	27.90	0.7	46.0	18.2	N	FLO
4.667820	26.40	0.9	46.0	19.6	N	FLO
4.928010	28.60	0.9	46.0	17.4	N	FLO
13.560360	38.60	1.8	50.0	11.4	N	FLO

Data record name: 80804AC13_fin AV

Test result: Passed

TEST EQUIPMENT USED:

1 - 3, 5, 6

TEST REPORT REFERENCE: F080804E01

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	02/27/2008	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	-	-
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
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	MCU	Maturo GmbH	MCU/043/971107	480832	-	-
33	Turntable	DS420HE	Deisel	420/620/80	480315	-	-
34	Antenna support	AS615P	Deisel	615/310	480187	-	-
35	Antenna	CBL6112 B	Chase	2688	480328	10/11/2005	10/2010
36	Antenna	3115 B	EMCO	9609-4918	480184	09/11/2008	09/2013
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.)	
49	Preamplifier	JS3-00101200-23-5A	Miteq	681851	480337	Six month verification (system cal.)	
54	Power supply	TOE 8752-32	Toellner	31566	480010	06/19/2007	06/2009
55	Outdoor test site	-	Phoenix Test-Lab	-	480293	Monthly verification (system cal.)	
56	Test fixture	-	Phoenix Test-Lab	-	410160	-	-
57	EMI test receiver	ESPC	Rohde & Schwarz	843756/006	480150	02/28/2008	02/2010
58	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	02/19/2008	02/2013
64	Climatic chamber	MK 240	BINDER	05-79022	480462	01/22/2008	07/2009

TEST REPORT REFERENCE: F080804E01

7 LIST OF ANNEXES

ANNEX A	PHOTOGRAPHS OF THE TEST SET-UPS:	7 pages
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	POS MobilePro, test set-up fully anechoic chamber	80804_8.jpg
	POS MobilePro, test set-up fully anechoic chamber	80804_7.jpg
	POS MobilePro, test set-up outdoor test-site	80804_9.jpg
	POS MobilePro, test set-up open area test-site	80804_18.jpg
	POS MobilePro, test set-up conducted emission measurement	80804_17.jpg
	POS MobilePro, test set-up climatic chamber	80804_15.jpg
ANNEX B	EXTERNAL PHOTOGRAPHS OF THE TEST SAMPLE:	7 pages
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	POS MobilePro, 3-D view 2	80804_c.jpg
	POS MobilePro, detail view to type plate (battery cover removed)	80804_g.jpg
	POS MobilePro charging station, 3-D-view 1	80804_a2.jpg
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ANNEX C	INTERNAL PHOTOGRAPHS OF THE TEST SAMPLE:	20 pages
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	POS MobilePro, internal view, WLAN unit removed	80804_j.jpg
	POS MobilePro, internal view, main PCB removed	80804_k.jpg
	POS MobilePro, main PCB, top view	80804_z.jpg
	POS MobilePro, main PCB, bottom view	80804_m.jpg
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	POS MobilePro charging station, internal view	80804_d2.jpg
	POS MobilePro charging station, internal view, metal plate removed	80804_e2.jpg
	POS MobilePro charging station, PCB, top view	80804_g2.jpg
	POS MobilePro charging station, PCB bottom view	80804_k.jpg
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