

TEST REPORT

Test Report Reference: F093202E1

Equipment under Test: UDL120

FCC ID: IXLUDL120

IC: 1893B-UDL120

Serial Number: 7152201003

Applicant: deister electronic GmbH

Manufacturer: deister electronic GmbH

**Test Laboratory
(CAB)
accredited by
Deutsche Gesellschaft für Akkreditierung mbH (DGA)
in compliance with DIN EN ISO/IEC 17025
under the
Reg. No. DGA-PL-105/99-22,
FCC Test site registration number 90877
and
Industry Canada Test site registration IC3469A-1 and
FCC Test site registration number 90877**

TEST REPORT REFERENCE: F093202E1

Contents:	Page
1 IDENTIFICATION	3
1.1 APPLICANT	3
1.2 MANUFACTURER	3
1.3 DATES	3
1.4 TEST LABORATORY	4
1.5 RESERVATION	4
1.6 NORMATIVE REFERENCES	4
1.7 TEST RESULTS	4
2 TECHNICAL DATA OF EQUIPMENT	5
2.1 PERIPHERY DEVICES	5
3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES	6
4 LIST OF MEASUREMENTS	7
5 TEST RESULTS	8
5.1 20 dB BANDWIDTH	8
5.1.1 METHOD OF MEASUREMENT (20 dB BANDWIDTH)	8
5.1.2 TEST RESULTS (20 dB BANDWIDTH)	9
5.2 CARRIER FREQUENCY SEPARATION	11
5.2.1 METHOD OF MEASUREMENT (CARRIER FREQUENCY SEPARATION)	11
5.2.2 TEST RESULTS (CARRIER FREQUENCY SEPARATION)	12
5.3 NUMBER OF HOPPING FREQUENCIES	14
5.3.1 METHOD OF MEASUREMENT (NUMBER OF HOPPING FREQUENCIES)	14
5.3.2 TEST RESULTS (NUMBER OF HOPPING FREQUENCIES)	15
5.4 DWELL TIME	16
5.4.1 METHOD OF MEASUREMENT (DWELL TIME)	16
5.4.2 TEST RESULTS (DWELL TIME)	17
5.5 MAXIMUM PEAK OUTPUT POWER	19
5.5.1 METHOD OF MEASUREMENT (MAXIMUM PEAK OUTPUT POWER)	19
5.5.2 TEST RESULTS (MAXIMUM PEAK OUTPUT POWER)	20
5.6 RADIATED EMISSIONS	22
5.6.1 METHOD OF MEASUREMENT (RADIATED EMISSIONS)	22
5.6.2 TEST RESULTS (RADIATED EMISSIONS)	29
5.6.2.1 PRELIMINARY MEASUREMENT (9 kHz to 1 GHz)	29
5.6.2.2 FINAL RADIATED EMISSION TEST (30 MHz to 1 GHz)	37
5.6.2.3 PRELIMINARY MEASUREMENT (1 GHz to 10 GHz)	42
5.6.2.4 FINAL MEASUREMENT (1 GHz to 10 GHz)	46
5.7 CONDUCTED EMISSIONS ON POWER SUPPLY LINES (150 kHz to 30 MHz)	49
5.7.1 METHOD OF MEASUREMENT	49
5.7.2 TEST RESULTS (CONDUCTED EMISSIONS ON POWER SUPPLY LINES)	50
6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS	52
7 LIST OF ANNEXES	54

TEST REPORT REFERENCE: F093202E1

1 IDENTIFICATION

1.1 APPLICANT

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Country:	Germany
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Tel:	+49 51 05 516-129
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e-mail address:	eichler@deister-gmbh.de

1.2 MANUFACTURER

Name:	deister electronic GmbH
Address:	Hermann-Bahlsen-Straße 11 – 13 30890 Barsinghausen
Country:	Germany
Name for contact purposes:	Mr. Stefan Eichler
Tel:	+49 51 05 516-129
Fax:	+49 51 05 516-266
e-mail address:	eichler@deister-gmbh.de

1.3 DATES

Date of receipt of test sample:	13 Novmeber 2009
Start of test:	16 November 2009
End of test:	9 December 2009

TEST REPORT REFERENCE: F093202E1

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**

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Test engineer: Thomas KÜHN
Name



Signature

29 January 2010

Date

Test report checked: Bernd STEINER
Name



Signature

29 January 2010

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.

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

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT REFERENCE.

1.6 NORMATIVE REFERENCES

- [1] **ANSI C63.4-2003** 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 (October 2009)** Radio Frequency Devices
- [3] **FCC Public Notice DA 00-705 (March 2000)**
- [4] **RSS-210 Issue 7 (June 2007)** Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment
- [5] **RSS-Gen Issue 2 (June 2007)** General Requirements and Information for the Certification of Radiocommunication Equipment

1.7 TEST RESULTS

The requirements of this test document are fulfilled by the equipment under test. The complete test results are presented in the following.

TEST REPORT REFERENCE: F093202E1

2 TECHNICAL DATA OF EQUIPMENT

Channel 1	902.750 MHz	Channel 25	914.750 MHz
Channel 50	927.250 MHz	-	-

Type / model designation: *	UDL120				
Type of equipment: *	UHF RFID reader				
FCC ID: *	IXLUDL120				
IC: *	1893B-UDL120				
Rated RF output power: *	30 dBm (ERP)				
Antenna type: *	Integral				
Antenna gain: *	2.0 dBi				
Antenna connector: *	None (no external antenna connectable)				
Adaptive frequency agility: *	Yes				
Modulation: *	FHSS (GFSK)				
Operation frequency range: *	902.750 to 927.25 MHz				
Number of channels: *	50 (with 500 kHz spacing)				
Supply Voltage: *	U _{nom} =	16.0 V DC	U _{min} =	12.0 V DC	U _{max} = 24.0 V DC
Temperature range: *	-20 °C to +50 °C				
Hard- / Software Version: *	1.02 / 1.23				
Lowest internal frequency: *	240 kHz (Nominal frequency of the ultrasonic sensor)				

* declared by the applicant.

Identification	Connector		Length *
	EUT	Ancillary	
Power / RS485	4-pin M8-connector	-	2.0 m
-	-	-	-
-	-	-	-

*: Length during the test if no other specified.

2.1 PERIPHERY DEVICES

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

- A personal computer with a terminal-software was used, connected to the EUT via the RS485 bus, for setting the equipment into the necessary operation mode. During the measurements the personal computer was connected to the RS485 bus.
- An AC / DC adaptor type FW 3288 was used to power the EUT during conducted emission measurement on the power supply line.

TEST REPORT REFERENCE: F093202E1

3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

All tests were carried out with an unmodified sample with integral antenna.

During the all tests the UDL150 was powered by an external 16.0 V DC power supply, for measurements under extreme conditions EUT with 12.0 V DC to 24 V DC.

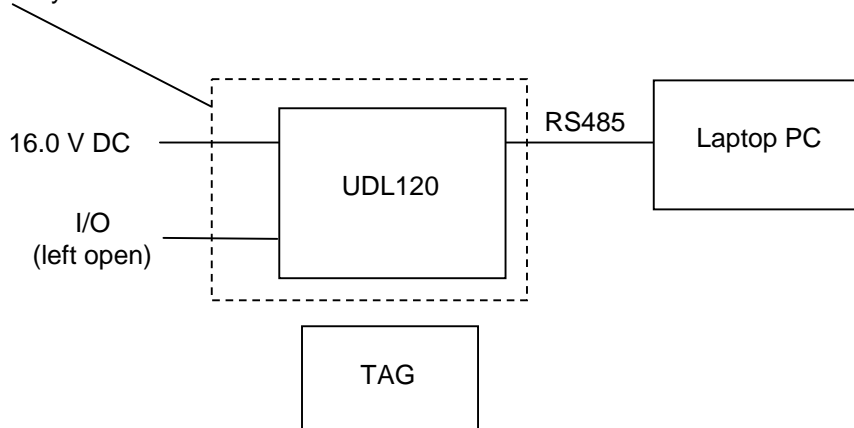
The operation mode of the UHF reader could be chosen with the help of a laptop computer with a test-software, communicates with the EUT via the RS485 bus. The ultrasonic sensor was active during all tests.

During the tests the EUT was not labelled with an FCC / IC label.

The following operation modes were used during the tests:

Operation mode	Description of the operation mode
1	Transmit on 902.750 MHz (channel 1)
2	Transmit on 914.750 MHz (channel 25)
3	Transmit on 927.250 MHz (channel 50)
4	Transmit on all channels (normal hopping mode)

Physical boundary of the EUT



TEST REPORT REFERENCE: F093202E1

4 LIST OF MEASUREMENTS

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	RSS 210, Issue 7 [4] or RSS-Gen, Issue 2 [5]	Status	Refer page
20 dB bandwidth	General	15.247 (a) (1)	A8.1 (b) [4]	Passed	8 et seq.
Carrier frequency separation	General	15.247 (a) (1)	A8.1 (b) [4]	Passed	11 et seq.
Number of hopping channels	902 – 928	15.247 (a) (1) (iii)	A8.1 (d) [4]	Passed	14 et seq.
Dwell time	902 – 928	15.247 (a) (1) (iii)	A8.1 (d) [4]	Passed	16 et seq.
Maximum peak output power	902 – 928	15.247 (b) (1)	A8.4 (2) [4]	Passed	19 et seq.
Radiated emissions (transmitter)	0.15 - 10,000	15.205 (a) 15.209 (a)	A8.5 [4] 2.6 [4]	Passed	22 et seq.
Conducted emissions on supply line	0.15 - 30	15.207 (a)	7.2.2 [5]	Passed	49 et seq.
Radiated emissions (receiver)	0.009 - 5,000	15.109 (a)	6 [5] 2.6 [4]	*1	-

*1: Not carried out, because the colocated transmitter of the EUT is permanently in operation.

TEST REPORT REFERENCE: F093202E1

5 TEST RESULTS

5.1 20 dB BANDWIDTH

5.1.1 METHOD OF MEASUREMENT (20 dB BANDWIDTH)

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

The following spectrum analyser settings shall be used:

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

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

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

Test set-up:

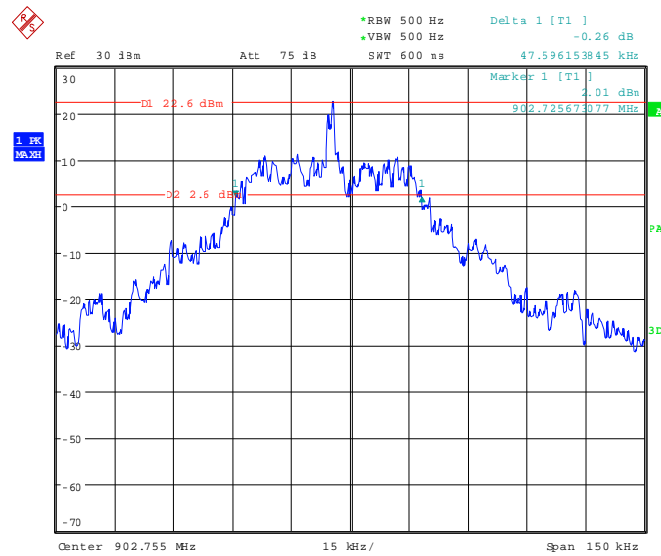


TEST REPORT REFERENCE: F093202E1

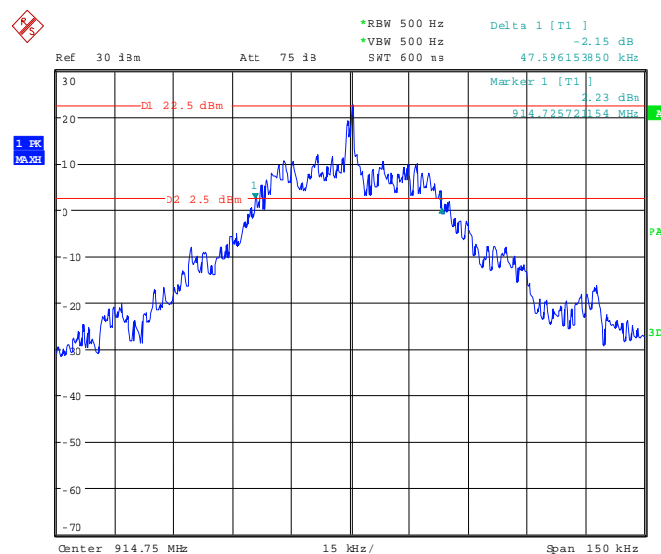
5.1.2 TEST RESULTS (20 dB BANDWIDTH)

Ambient temperature	21 °C	Relative humidity	38 %
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93202_16.wmf: 20 dB bandwidth at the lower end of the assigned frequency band (operation mode 1):



93202_17.wmf: 20 dB bandwidth at the middle of the assigned frequency band (operation mode 2):



TEST REPORT REFERENCE: F093202E1

93202_18.wmf: 20 dB bandwidth at the upper end of the assigned frequency band (operation mode 3):



Operation mode 1, 2, 3		
Channel number	Channel frequency [MHz]	20 dB bandwidth [kHz]
1	902.750	47.596
25	914.750	47.596
50	927.250	48.798
Measurement uncertainty		+0.66 dB / -0.72 dB

TEST EQUIPMENT USED FOR THE TEST:

30

TEST REPORT REFERENCE: F093202E1

5.2 CARRIER FREQUENCY SEPARATION

5.2.1 METHOD OF MEASUREMENT (CARRIER FREQUENCY SEPARATION)

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

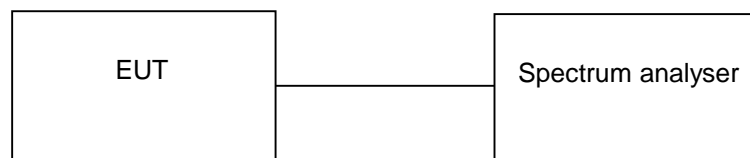
The following spectrum analyser settings shall be used:

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

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

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

Test set-up:

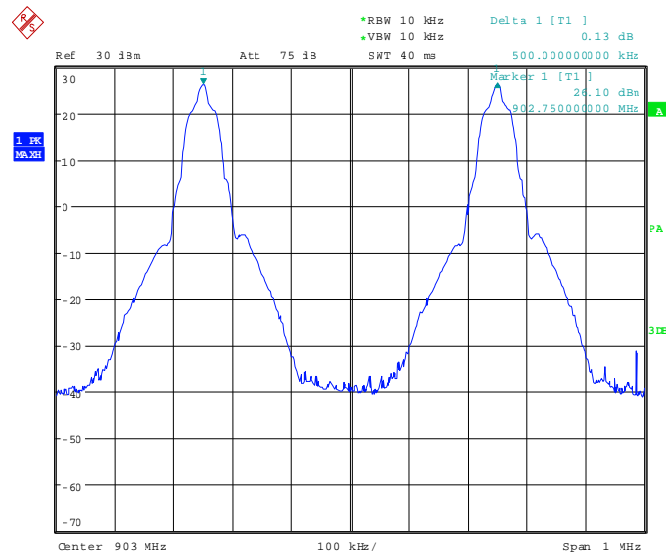


TEST REPORT REFERENCE: F093202E1

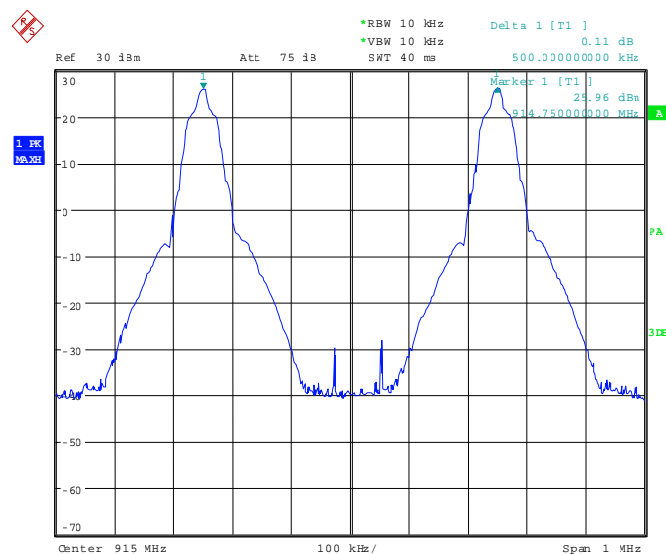
5.2.2 TEST RESULTS (CARRIER FREQUENCY SEPARATION)

Ambient temperature	21 °C	Relative humidity	38 %
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93202_19.wmf: Channel separation at the lower end of the assigned frequency band (operation mode 1):

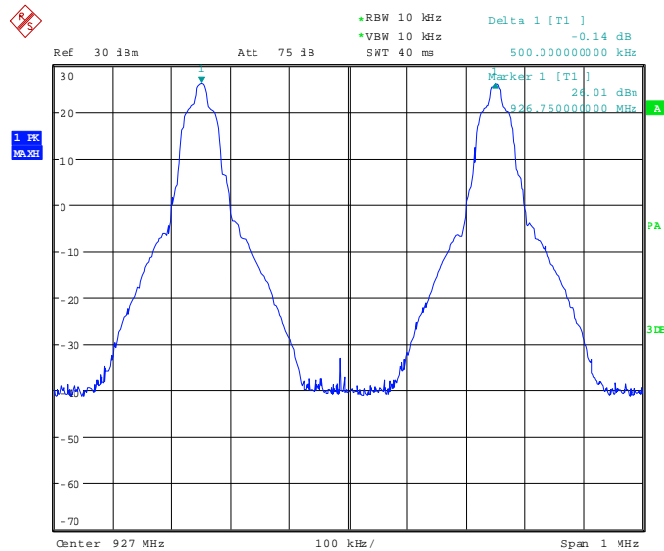


93202_20.wmf: Channel separation at the middle of the assigned frequency band (operation mode 2):



TEST REPORT REFERENCE: F093202E1

93202_21.wmf: Channel separation at the upper end of the assigned frequency band (operation mode 3):



Operation mode 1, 2, 3			
Channel number	Channel frequency [MHz]	Channel separation [kHz]	Minimum limit [kHz]
1	902.750	500.000	250.000
25	914.750	500.000	250.000
50	927.250	500.000	250.000
Measurement uncertainty			$<10^{-7}$

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
30

TEST REPORT REFERENCE: F093202E1

5.3 NUMBER OF HOPPING FREQUENCIES

5.3.1 METHOD OF MEASUREMENT (NUMBER OF HOPPING FREQUENCIES)

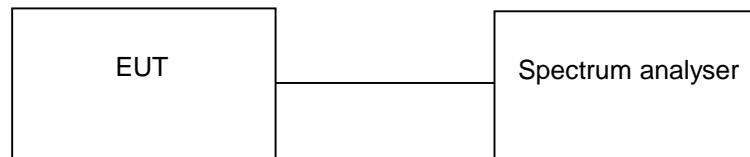
The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT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

The following spectrum analyser settings shall be used:

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

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

Test set-up:

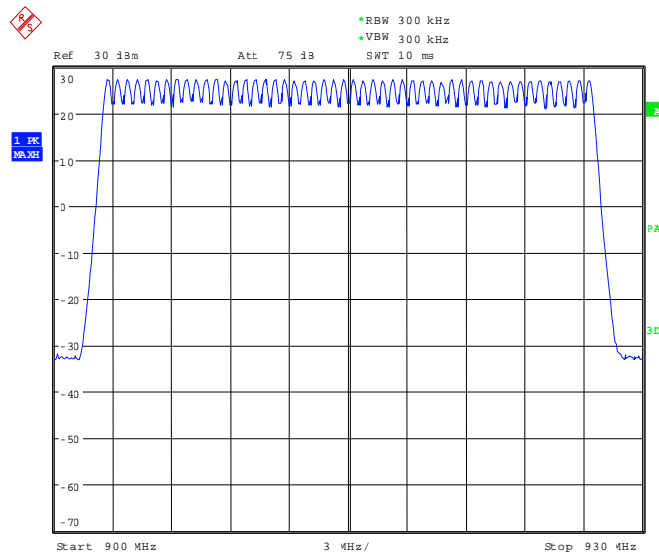


TEST REPORT REFERENCE: F093202E1

5.3.2 TEST RESULTS (NUMBER OF HOPPING FREQUENCIES)

Ambient temperature	21 °C	Relative humidity	38 %
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93202_22.wmf: Number of hopping channels (operation mode 4):



Operation mode 4	
Number of hopping channels	Limit
50	At least 50

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
30

TEST REPORT REFERENCE: F093202E1

5.4 DWELL TIME

5.4.1 METHOD OF MEASUREMENT (DWELL TIME)

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

The following spectrum analyser settings shall be used:

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

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

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

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

Test set-up:



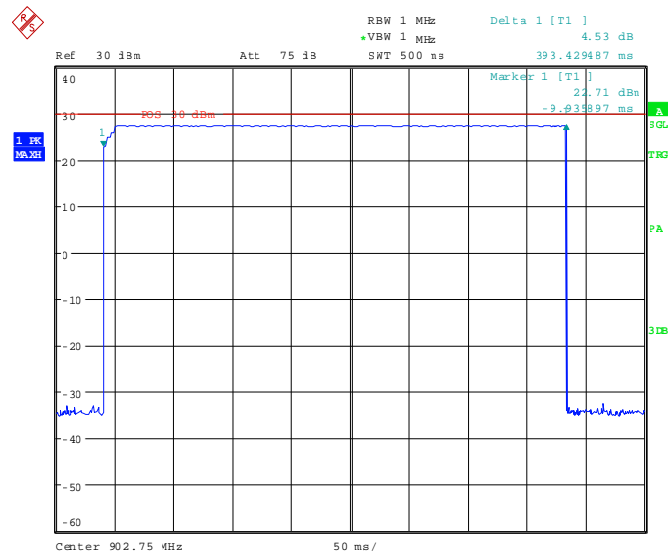
TEST REPORT REFERENCE: F093202E1

5.4.2 TEST RESULTS (DWELL TIME)

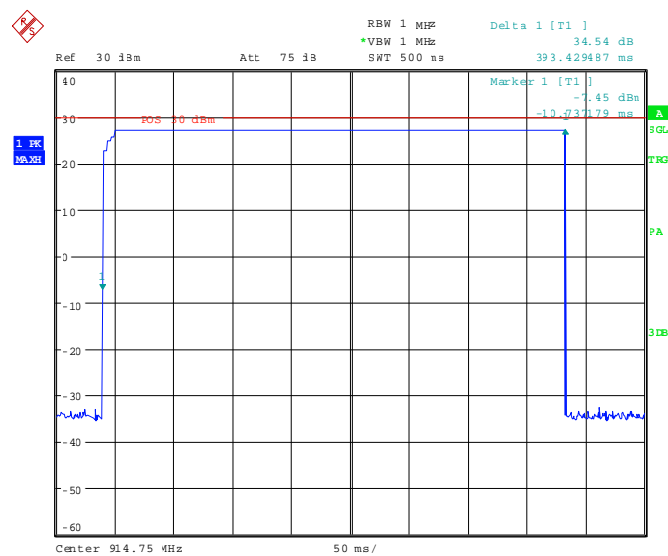
Ambient temperature	21 °C
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Relative humidity	38 %
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93202_23.wmf: Dwell time at the lower end of the assigned frequency band (operation mode 1):

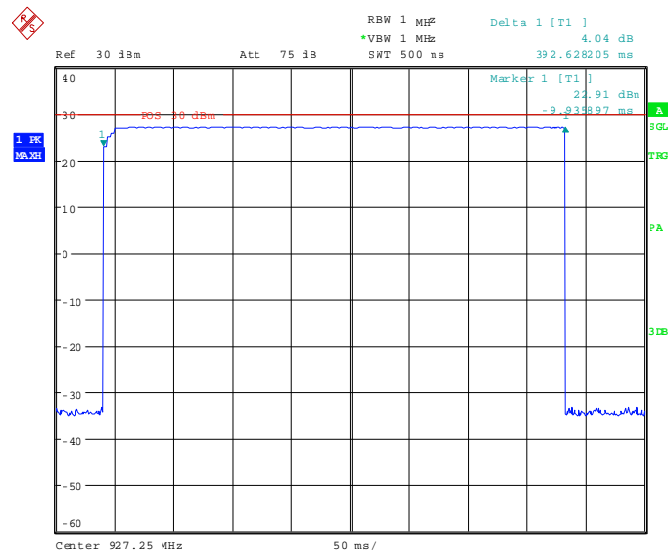


93202_24.wmf: Dwell time at the middle of the assigned frequency band (operation mode 2):



TEST REPORT REFERENCE: F093202E1

93202_25.wmf: Dwell time at the upper end of the assigned frequency band (operation mode 3):



The dwell time is calculated with the following formula:

$$\text{Dwell time} = t_{\text{pulse}} \times n_{\text{hops}} / \text{number of hopping channels} \times 20 \text{ s}$$

Where:

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

The hopping rate of the system is 2.5 hops per second and the system uses 50 channels. For this reason one time slot has a length of 400 ms.

Operation mode 1, 2, 3				
Channel number	Channel frequency [MHz]	t_{pulse} [ms]	Dwell time [ms]	Limit [ms]
1	902.750	393.429	393.429	400
25	914.750	393.429	393.429	400
50	927.250	392.628	392.628	400
Measurement uncertainty			<10 ⁻⁷	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
30

TEST REPORT REFERENCE: F093202E1

5.5 MAXIMUM PEAK OUTPUT POWER

5.5.1 METHOD OF MEASUREMENT (MAXIMUM PEAK OUTPUT POWER)

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

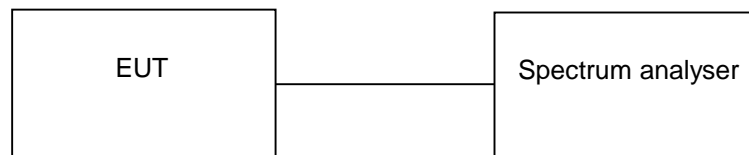
The following spectrum analyser settings shall be used:

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

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

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

Test set-up:

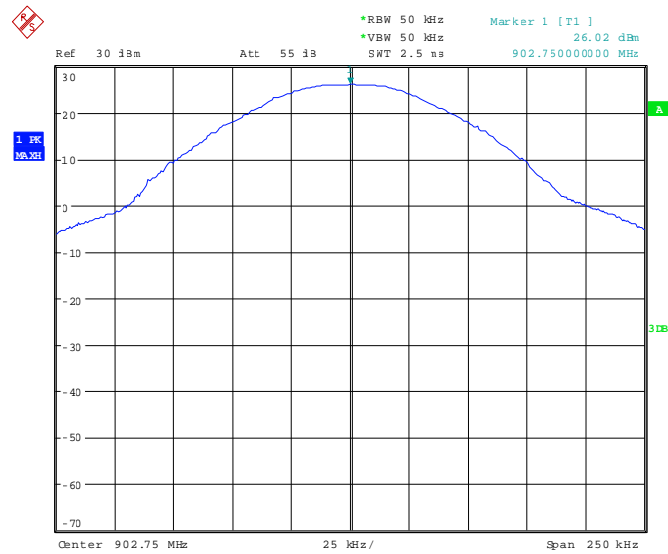


TEST REPORT REFERENCE: F093202E1

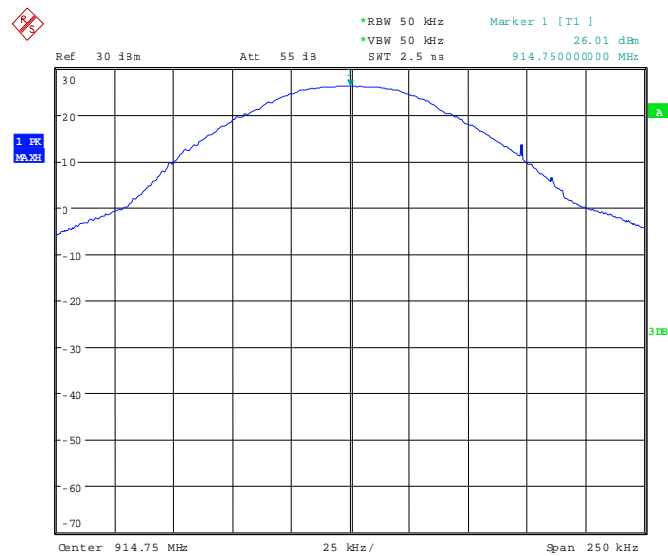
5.5.2 TEST RESULTS (MAXIMUM PEAK OUTPUT POWER)

Ambient temperature	21 °C	Relative humidity	38 %
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93202_26.wmf: Maximum peak output power at the lower end of the assigned frequency band (operation mode 1):

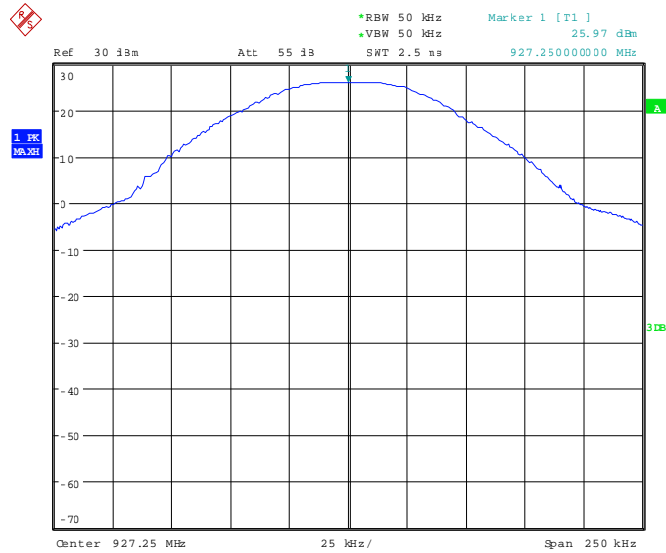


93202_27.wmf: Maximum peak output power at the middle of the assigned frequency band (operation mode 2):



TEST REPORT REFERENCE: F093202E1

93202_28.wmf: Maximum peak output power at the upper end of the assigned frequency band
(operation mode 3):



Operation mode 1, 2, 3				
Channel number	Channel frequency [MHz]	Maximum peak output power [dBm]	Antenna gain [dBi]	Peak power limit [dBm]
1	902.750	26.0	2.0	30.0
25	914.750	26.0	2.0	30.0
50	927.250	26.0	2.0	30.0
Measurement uncertainty			+0.66 dB / -0.72 dB	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
30

TEST REPORT REFERENCE: F093202E1

5.6 RADIATED EMISSIONS

5.6.1 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 110 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 1 GHz to 110 GHz.

All measurements will be carried out with the EUT working on the middle and upper and lower edge of the assigned frequency band (if applicable).

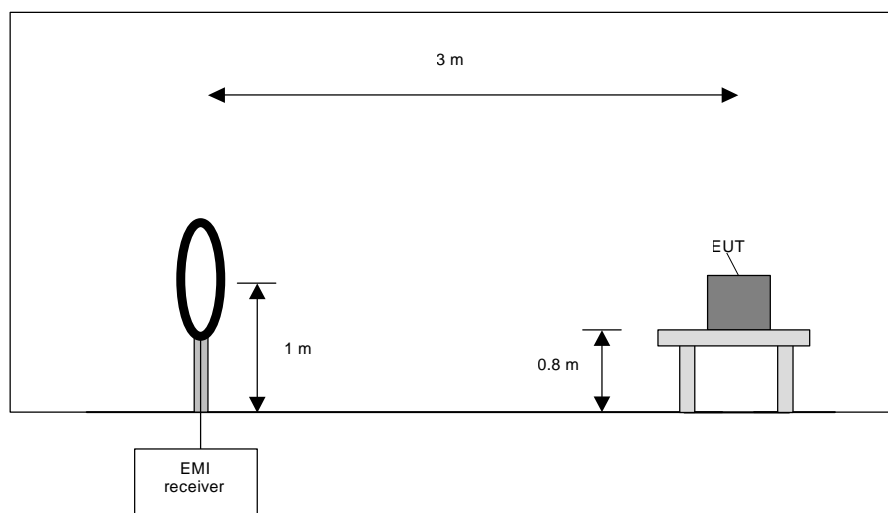
Preliminary measurement (9 kHz to 30 MHz):

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

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

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

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



TEST REPORT REFERENCE: F093202E1

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 (in case of handheld equipment).
- 7) Rotate the measuring antenna and repeat steps 1) to 5).

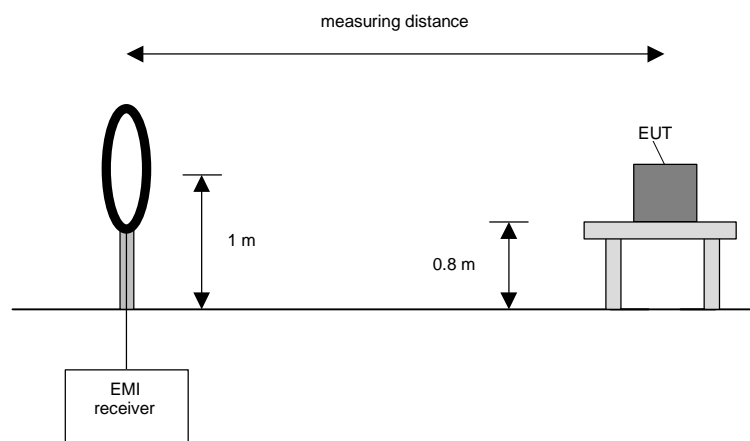
Final measurement (9 kHz to 30 MHz):

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



TEST REPORT REFERENCE: F093202E1

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 (in case of handheld equipment).

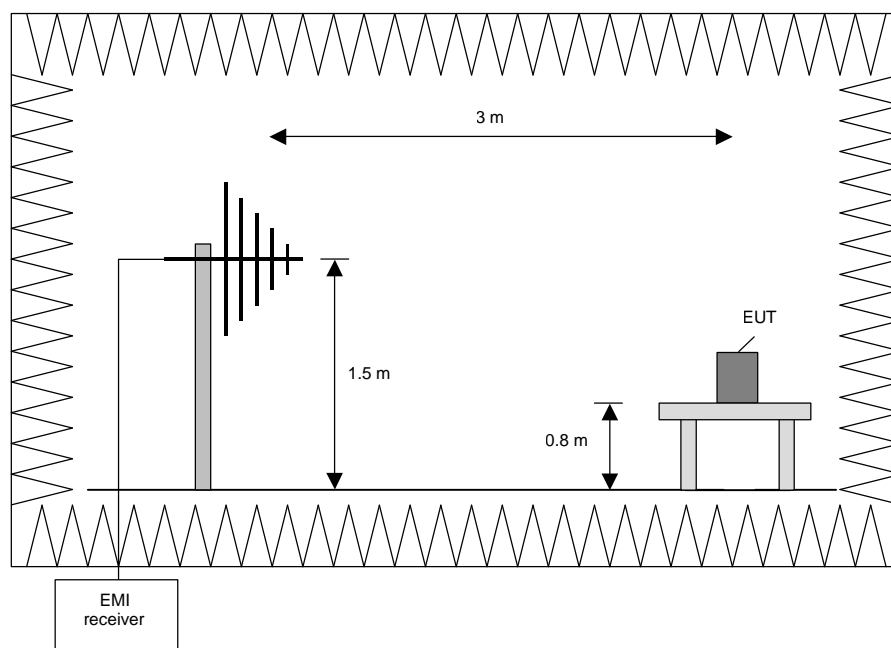
Preliminary measurement (30 MHz to 1 GHz)

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



TEST REPORT REFERENCE: F093202E1

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:

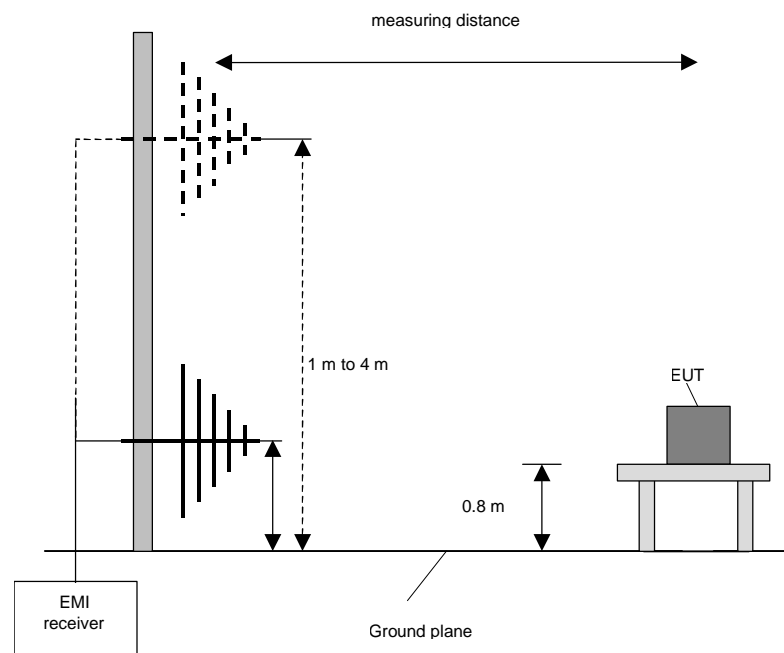
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the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



TEST REPORT REFERENCE: F093202E1

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 (in case of handheld equipment).

Preliminary and final measurement (1 GHz to 110 GHz)

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

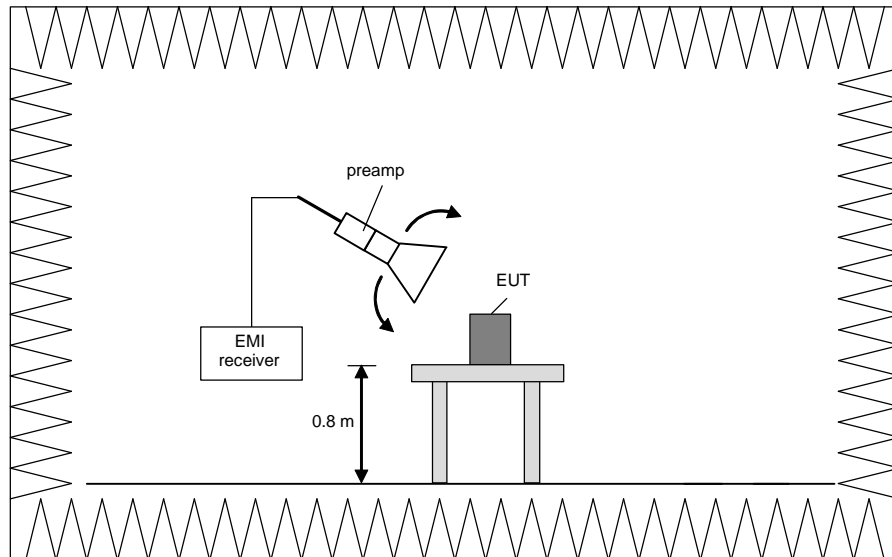
Preliminary measurement (1 GHz to 110 GHz)

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

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

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

TEST REPORT REFERENCE: F093202E1



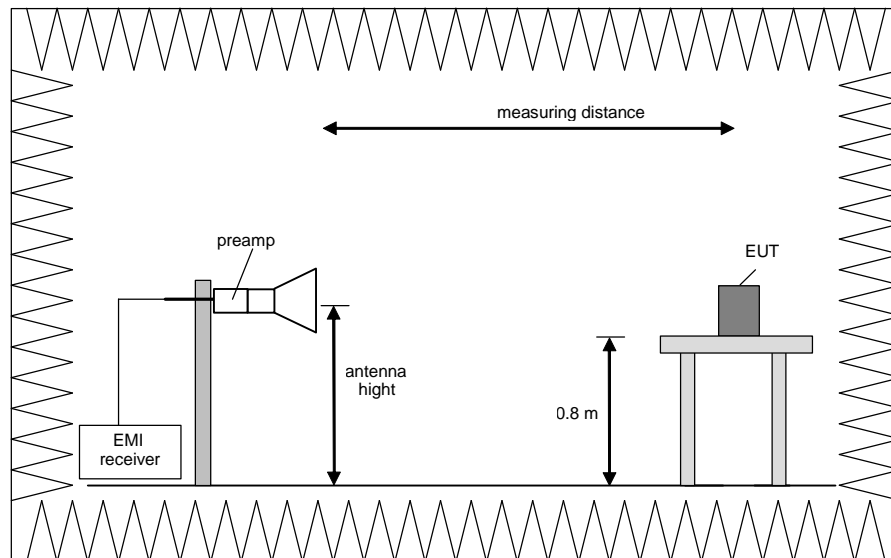
Final measurement (1 GHz to 110 GHz)

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

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

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

TEST REPORT REFERENCE: F093202E1



Procedure of measurement:

The measurements were performed in the frequency range 1 GHz to 4 GHz, 4 GHz to 12 GHz, 12 GHz to 18 GHz, 18 GHz to 26.5 GHz, 26.5 GHz to 40 GHz, 40 GHz to 60 GHz, 60 GHz to 75 GHz and 75 GHz to 110 GHz.

The following procedure will be used:

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

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

TEST REPORT REFERENCE: F093202E1

5.6.2 TEST RESULTS (RADIATED EMISSIONS)

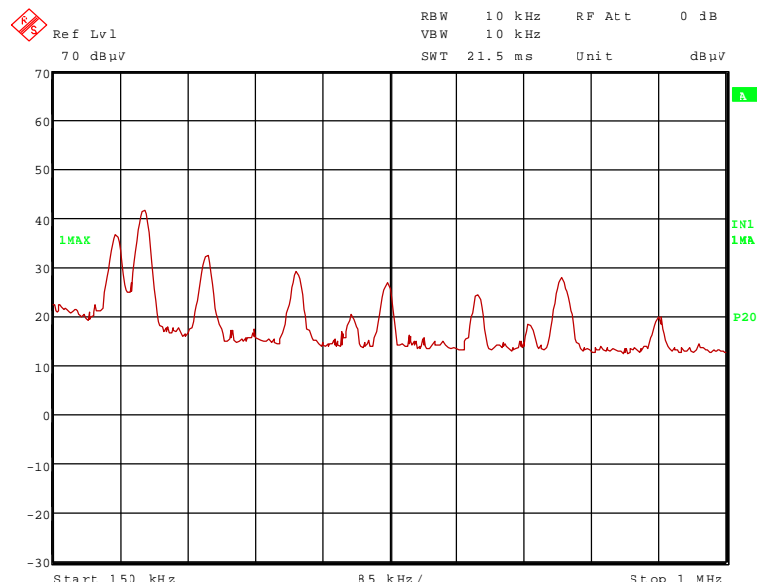
5.6.2.1 PRELIMINARY MEASUREMENT (150 kHz to 30 MHz)

Ambient temperature	20 °C	Relative humidity	30 %
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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 1 m.
- Cable guide: The cables of the EUT were running vertically to the false floor. For detail information of test set-up and 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 with 16.0 V DC, because there was no difference to the minimum and maximum supply voltage.
- Remark: As pretests has shown, no difference was measurable between the operation modes 1 to 3. For this reason this measurement was carried out in operation mode 2.

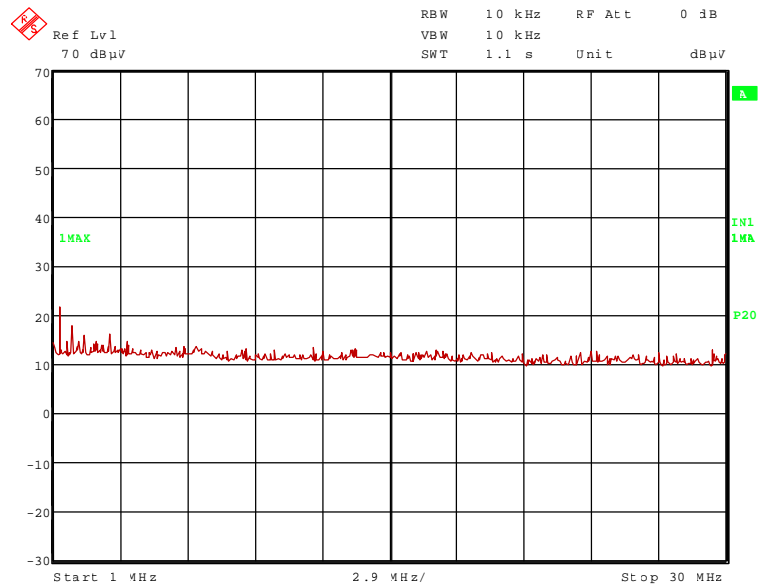
Transmitter operates at the middle of the assigned frequency band (operation mode 2)

93202_29.wmf: Spurious emissions from 150 kHz to 1 MHz (operation mode 2):



TEST REPORT REFERENCE: F093202E1

93202_30.wmf: Spurious emissions from 1 MHz to 30 MHz (operation mode 2):



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

227.997 kHz, 262.875 kHz, 341.963 kHz, 788.654 kHz and 1.314 MHz.

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

TEST REPORT REFERENCE: F093202E1

5.6.3 FINAL RADIATED EMISSION TEST (150 kHz to 30 MHz)

Ambient temperature:	-8.5 °C	Relative humidity:	85 %
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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 and 10 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: The EUT was supplied with 12.0 V DC, because no difference was noticeable with supply voltages from 9.4 +V DC to 24.0 V DC.
- Test results: The test results were calculated with the following formula:

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

Results with measuring distance of 1 m						
Frequency	Result dB μ V/m	Limit dB μ V/m	Margin dB	Detector	Readings dB μ V	Antenna factor * dB/m
227.997 kHz	43.0	120.4	77.4	AV	23.0	20.0
262.875 kHz	42.1	119.2	77.1	AV	22.1	20.0
341.963 kHz	37.8	116.9	79.1	AV	17.8	20.0
788.654 kHz	25.6	89.7	64.1	QP	5.6	20.0
1.314 MHz	23.4	85.2	61.8	QP	3.4	20.0
Results with measuring distance of 3 m						
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Detector	Readings dB μ V	Antenna factor * dB/m
227.997 kHz	Signal was below the noise floor of the system					
262.875 kHz	Signal was below the noise floor of the system					
341.963 kHz	Signal was below the noise floor of the system					
788.654 kHz	Signal was below the noise floor of the system					
1.314 MHz	Signal was below the noise floor of the system					
Measurement uncertainty				+2.2 dB / -3.6 dB		

*: Cable loss included

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
55, 56

TEST REPORT REFERENCE: F093202E1

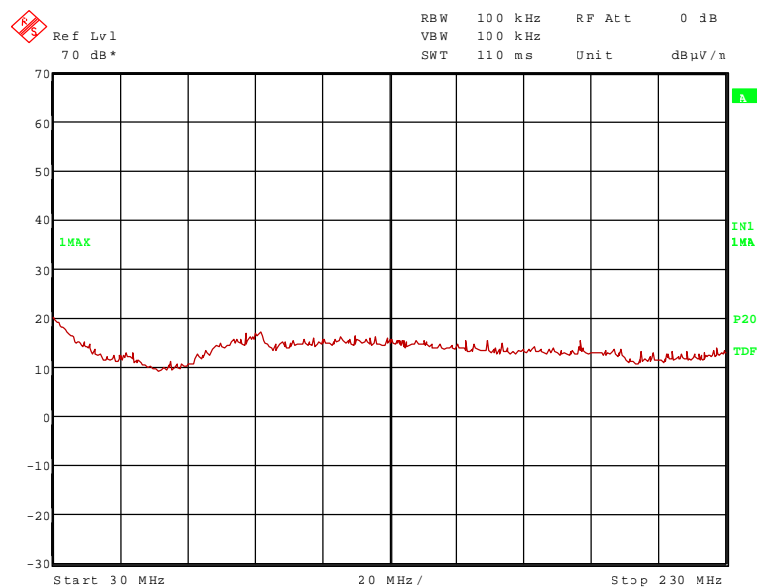
5.6.3.1 PRELIMINARY MEASUREMENT (30 MHz to 1 GHz)

Ambient temperature	20 °C	Relative humidity	30 %
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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 cables of the EUT were running vertically to the false floor. For detail information of test set-up and 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 with 16.0 V DC, because there was no difference to the minimum and maximum supply voltage.

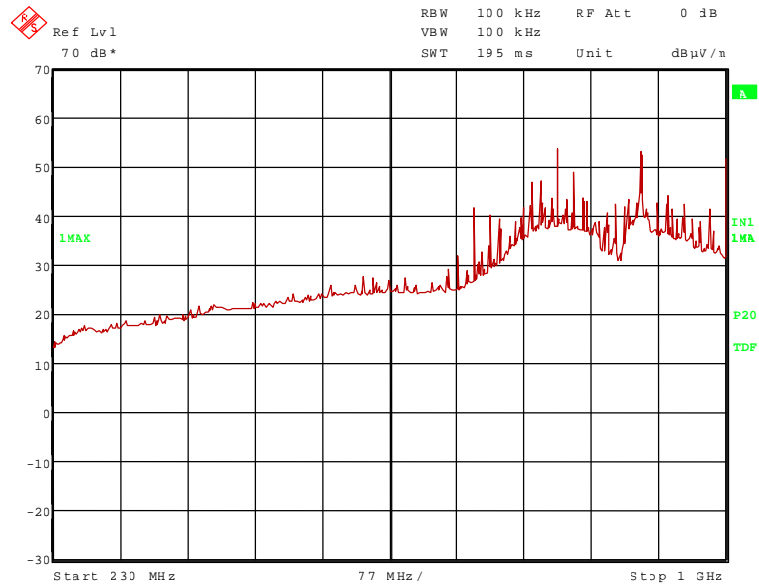
Transmitter operates at the lower end of the assigned frequency band (operation mode 1)

93202_2.wmf: Spurious emissions from 30 MHz to 230 MHz (operation mode 1):



TEST REPORT REFERENCE: F093202E1

93202_1.wmf: Spurious emissions from 230 MHz to 1 GHz (operation mode 1, carrier notched):



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

585.250 MHz, 614.750 MHz, 710.750 MHz, 788.250 MHz, 806.750 MHz, 825.250 MHz, 901.750 MHz, 902.750 MHz, 903.150 MHz and 933.250 MHz.

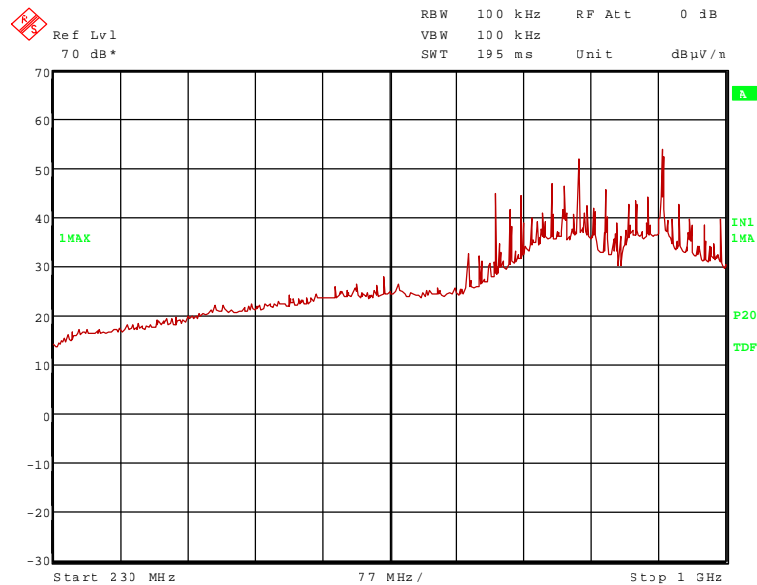
The following frequencies were found inside the restricted bands during the preliminary radiated emission test:

980.250 MHz and 999.750 MHz.

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

TEST REPORT REFERENCE: F093202E1

93202_6.wmf: Spurious emissions from 230 MHz to 1 GHz (operation mode 3, carrier notched):



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

735.250 MHz, 752.750 MHz, 753.750 MHz, 800.750 MHz, 831.250 MHz, 861.750 MHz, 926.250 MHz, 927.250 MHz, 928.250 MHz and 957.750 MHz.

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

608.750 MHz, 975.250 MHz and 992.750 MHz.

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

TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 35, 43, 83

TEST REPORT REFERENCE: F093202E1

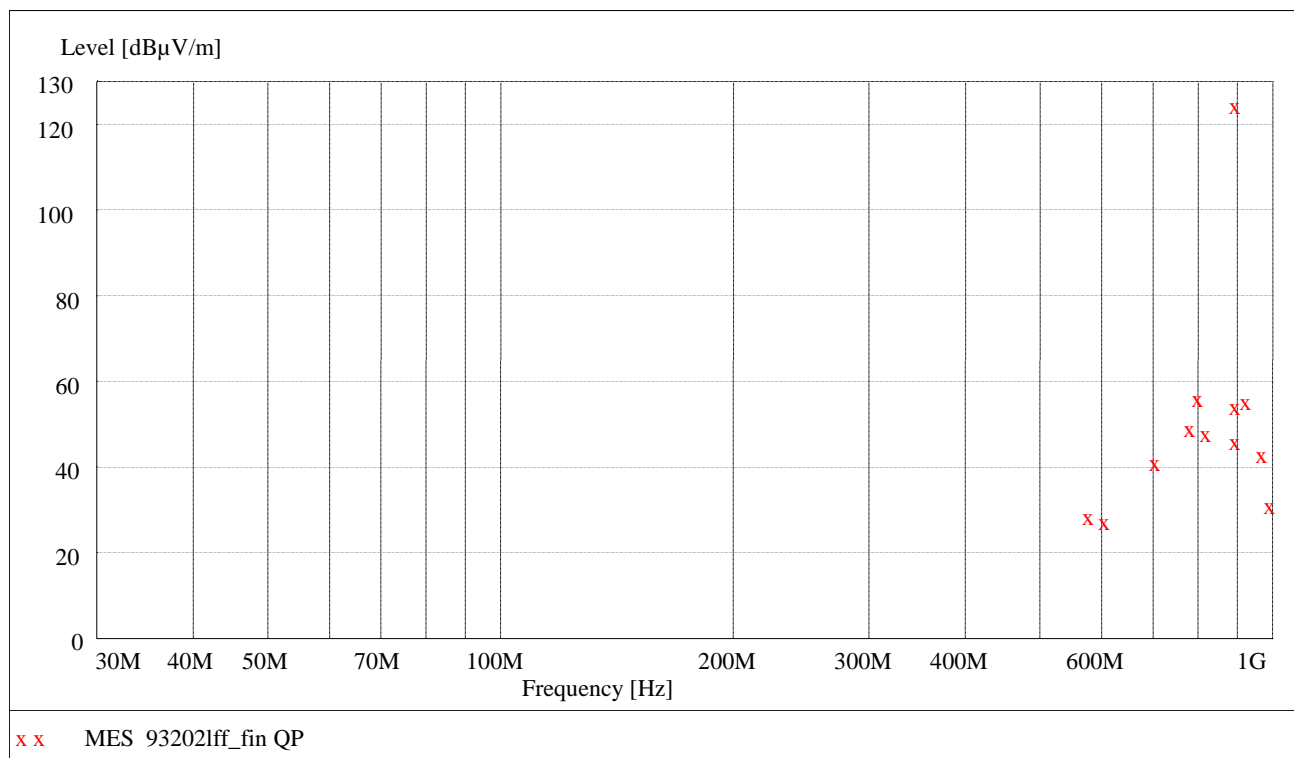
5.6.3.2 FINAL RADIATED EMISSION TEST (30 MHz to 1 GHz)

Ambient temperature	20 °C	Relative humidity	42 %
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- Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.
- Cable guide: The cables of the EUT were running vertically to the false floor. For detail information of test set-up and 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 with 16.0 V DC.
- Test results: The test results were calculated with the following formula:

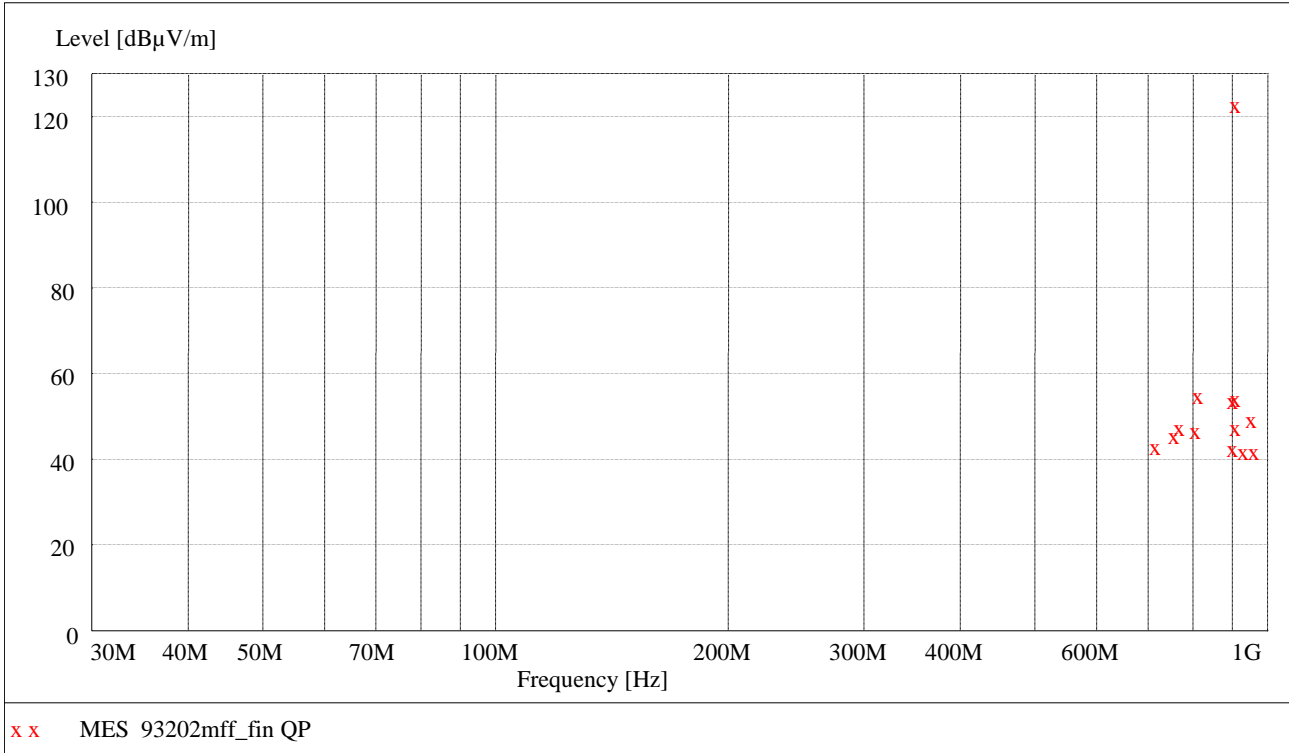
$$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{cable loss [dB]} + \text{antenna factor [dB/m]}$$

The measured 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 final measurement on the open area test site.

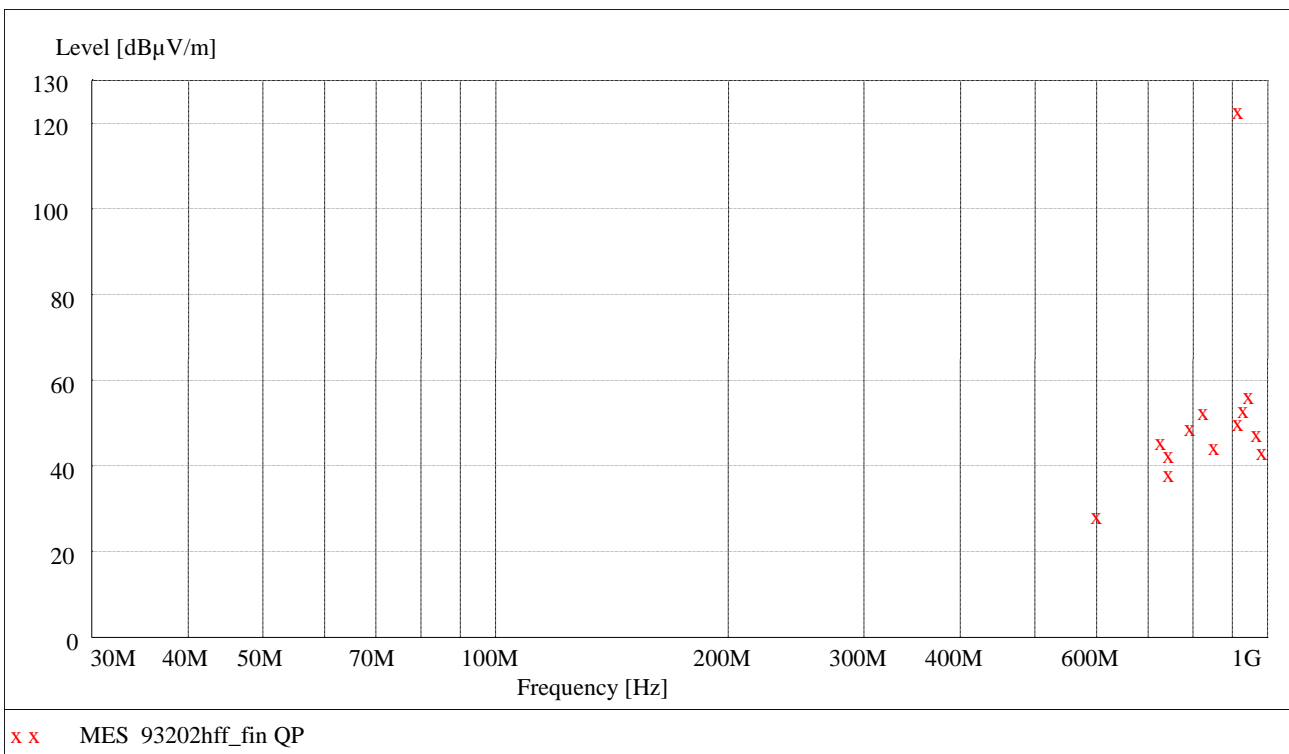


Data record name: 93202lff (operation mode 1)

TEST REPORT REFERENCE: F093202E1



Data record name: 93202mff (operation mode 2)



Data record name: 93202hff (operation mode 3)

TEST REPORT REFERENCE: F093202E1

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 (operation mode 1):
(This value is marked in the diagram 93202Iff by an x)

Spurious emissions outside the restricted bands									
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
585.250	29.2	105.2	76.0	7.3	19.1	2.8	144.0	25.0	Hor.
614.750	27.9	105.2	77.3	5.6	19.5	2.8	131.0	312.0	Hor.
710.750	41.7	105.2	63.5	18.2	20.5	3.0	146.0	356.0	Vert.
788.250	49.9	105.2	55.3	25.3	21.4	3.2	134.0	351.0	Vert.
806.750	56.6	105.2	48.6	32.0	21.4	3.2	132.0	351.0	Vert.
825.250	48.8	105.2	56.4	23.3	22.3	3.2	100.0	338.0	Hor.
901.750	47.0	105.2	58.2	21.1	22.4	3.5	103.0	19.0	Vert.
902.750	125.2	-	carrier	99.3	22.5	3.4	115.0	0.0	Vert.
903.150	55.2	105.2	50.0	29.3	22.5	3.4	112.0	2.0	Vert.
933.250	56.3	105.2	48.9	29.3	23.6	3.4	187.0	295.0	Vert.
Spurious emissions inside the restricted bands									
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
980.250	43.7	54.0	10.3	16.4	23.8	3.5	103.0	1.0	Vert.
999.750	32.2	54.0	21.8	5.0	23.7	3.5	103.0	1.0	Vert.
Measurement uncertainty				+2.2 dB / -3.6 dB					

TEST REPORT REFERENCE: F093202E1

Result measured with the quasipeak detector (operation mode 2):
(This value is marked in the diagram 93202mff by an x)

Spurious emissions outside the restricted bands									
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
722.750	44.1	103.6	59.5	19.9	21.2	3.0	146.0	359.0	Vert.
765.250	46.8	103.6	56.8	22.0	21.6	3.2	136.0	353.0	Vert.
776.250	48.1	103.6	55.5	23.4	21.5	3.2	136.0	350.0	Vert.
813.250	47.8	103.6	55.8	22.9	21.7	3.2	100.0	333.0	Hor.
818.750	56.0	103.6	47.6	30.9	21.9	3.2	129.0	348.0	Vert.
909.250	43.1	103.6	60.5	17.1	22.6	3.4	113.0	3.0	Vert.
914.350	54.7	103.6	48.9	28.5	22.8	3.4	115.0	1.0	Vert.
914.750	123.6	-	carrier	97.4	22.8	3.4	108.0	14.0	Vert.
915.150	55.4	103.6	48.2	29.1	22.9	3.4	113.0	1.0	Vert.
915.750	48.2	103.6	55.4	21.9	22.9	3.4	112.0	1.0	Vert.
937.010	42.5	103.6	61.3	15.4	23.7	3.4	108.0	77.0	Hor.
Spurious emissions inside the restricted bands									
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
962.750	50.4	54.0	3.6	23.1	23.8	3.5	104.0	1.0	Vert.
968.250	42.6	54.0	11.4	15.3	23.8	3.5	104.0	1.0	Vert.
Measurement uncertainty				+2.2 dB / -3.6 dB					

TEST REPORT REFERENCE: F093202E1

Result measured with the quasipeak detector (operation mode 3):
(This value is marked in the diagram 93202hff by an x)

Spurious emissions outside the 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.
735.250	46.6	104.1	57.5	21.8	21.7	3.1	143.0	359.0	Vert.
752.750	43.8	104.1	60.3	19.0	21.7	3.1	144.0	350.0	Vert.
753.750	39.6	104.1	64.5	14.8	21.7	3.1	144.0	349.0	Vert.
800.750	49.9	104.1	54.2	25.4	21.3	3.2	133.0	352.0	Vert.
831.250	53.7	104.1	50.4	28.0	22.5	3.2	100.0	333.0	Hor.
861.750	45.2	104.1	58.9	19.5	22.3	3.4	112.0	19.0	Vert.
927.250	124.1	-	carrier	97.3	23.4	3.4	109.0	10.0	Vert.
928.250	51.2	104.1	52.9	24.4	23.4	3.4	109.0	7.0	Vert.
936.250	54.0	104.1	50.1	26.9	23.7	3.4	100.0	274.0	Hor.
957.750	57.0	104.1	47.1	29.7	23.8	3.5	100.0	314.0	Hor.
Spurious emissions inside the 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.
608.750	29.0	46.0	17.0	6.8	19.4	2.8	131.0	314.0	Hor.
975.250	48.7	54.0	5.3	21.4	23.8	3.5	103.0	1.0	Vert.
992.750	44.5	54.0	9.5	17.2	23.7	3.6	103.0	1.0	Vert.
Measurement uncertainty				+2.2 dB / -3.6 dB					

The test results were calculated with the following formula:

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

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
14 – 20, 83

TEST REPORT REFERENCE: F093202E1

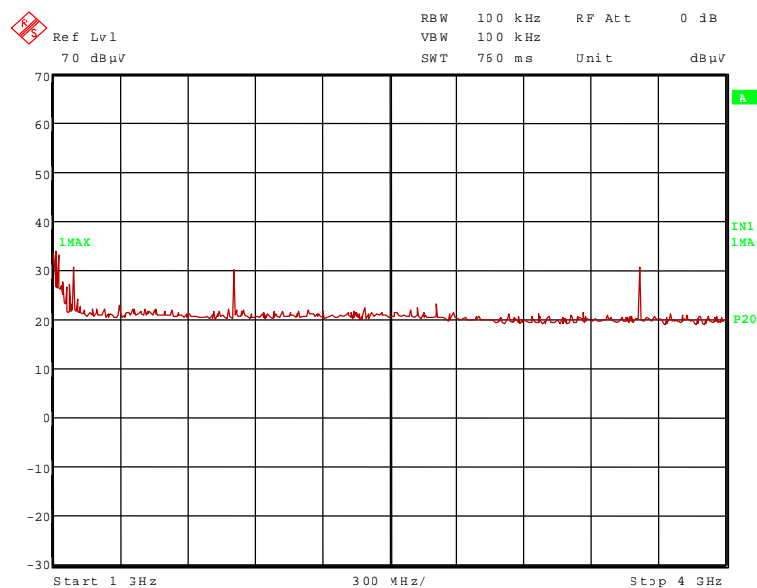
5.6.3.3 PRELIMINARY MEASUREMENT (1 GHz to 10 GHz)

Ambient temperature	20 °C	Relative humidity	30 %
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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 is running vertically to the false floor. For detail information of test set-up and 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 with 16.0 V DC.

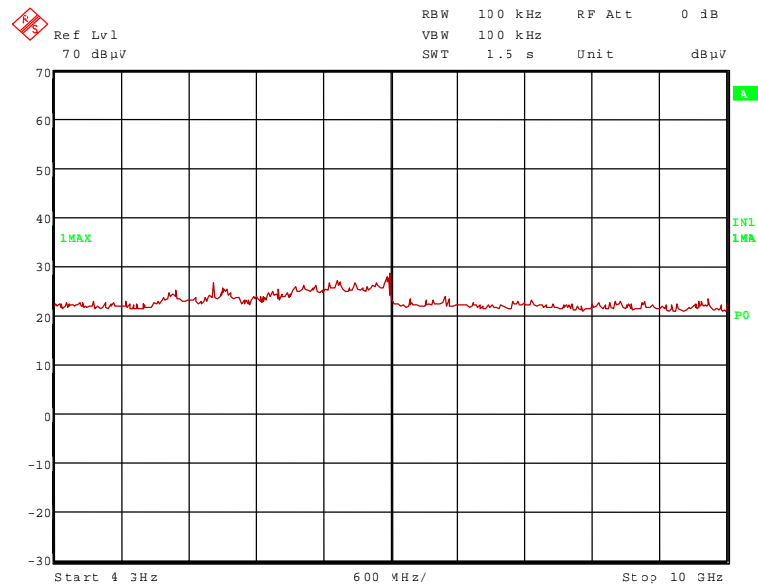
Transmitter operates at the lower end of the assigned frequency band (operation mode 1)

93202_9.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 1):



TEST REPORT REFERENCE: F093202E1

93202_10.wmf: Spurious emissions from 4 GHz to 10 GHz (operation mode 1):



The following frequency was found outside the restricted bands during the preliminary radiated emission test:
1805.500 MHz.

The following frequencies were found inside the restricted bands during the preliminary radiated emission test:
1017.250 MHz, 1028.250 MHz, 2708.250 MHz, 3611.000 MHz and 5416.500 MHz.

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

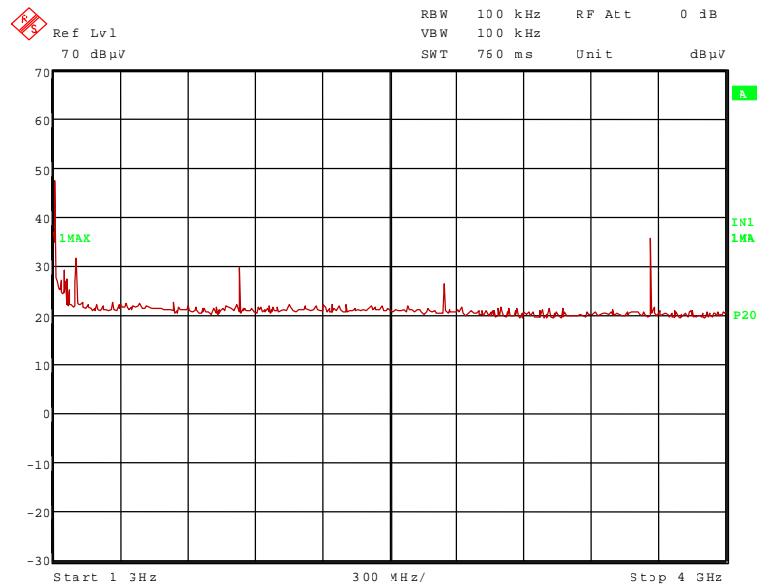
TEST EQUIPMENT USED FOR THE TEST:

29, 31 –34, 36, 44, 49, 73

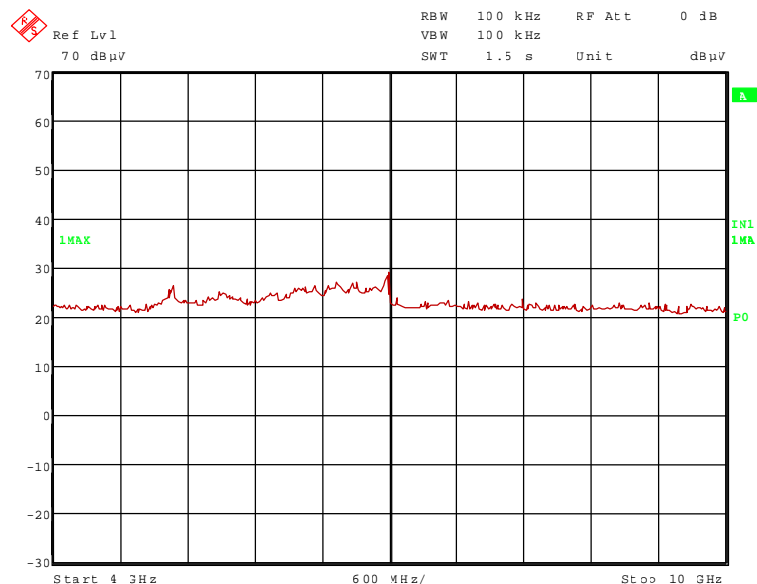
TEST REPORT REFERENCE: F093202E1

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

93202 8.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 2):



93202 11.wmf: Spurious emissions from 4 GHz to 10 GHz (operation mode 2):



The following frequency was found outside the restricted bands during the preliminary radiated emission test:
1829.500 MHz.

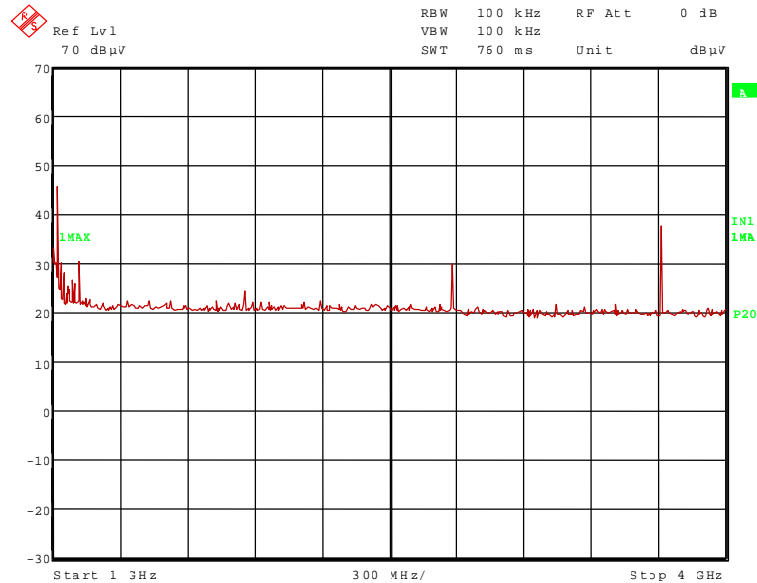
The following frequencies were found inside the restricted bands during the preliminary radiated emission test:
1010.750 MHz, 1106.750 MHz, 2744.250 MHz and 3659.000 MHz.

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

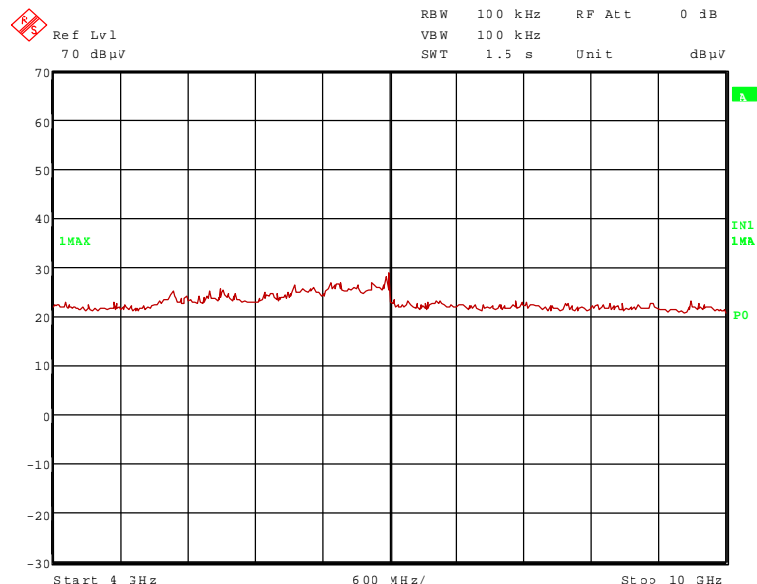
TEST REPORT REFERENCE: F093202E1

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

93202_7.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 3):



93202_12.wmf: Spurious emissions from 4 GHz to 10 GHz (operation mode 3):



The following frequency was found outside the restricted bands during the preliminary radiated emission test:
1854.500 MHz.

The following frequencies were found inside the restricted bands during the preliminary radiated emission test:
1023.250 MHz, 1119.250 MHz, 2781.750 MHz and 3709.000 MHz.

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

TEST REPORT REFERENCE: F093202E1

5.6.3.4 FINAL MEASUREMENT (1 GHz to 10 GHz)

Ambient temperature	20 °C	Relative humidity	30 %
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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 is running vertically to the false floor. For detail information of test set-up and 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 with 16.0 V DC.
- Resolution bandwidth: For all measurements a resolution bandwidth of 1 MHz was used.

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

Result measured with the peak detector:

Frequency MHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1017.250	41.2	74.0	32.8	41.1	24.2	26.5	2.4	150	Vert.	Yes
1028.250	39.3	74.0	34.7	39.2	24.3	26.5	2.3	150	Vert.	Yes
1805.500	39.3	105.2	65.9	35.9	26.9	26.5	3.0	150	Hor.	No
2708.250	40.0	74.0	34.0	32.7	29.7	26.4	4.0	150	Vert.	Yes
3611.000	47.9	74.0	26.1	37.2	32.3	26.2	4.6	150	Vert.	Yes
5416.500	47.1	74.0	26.9	32.0	34.7	25.4	5.8	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Result measured with the average detector:

Frequency MHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1017.250	33.1	54.0	20.9	33.0	24.2	26.5	2.4	150	Vert.	Yes
1028.250	31.8	54.0	22.2	31.7	24.3	26.5	2.3	150	Vert.	Yes
1805.500	33.5	105.2	71.7	30.1	26.9	26.5	3.0	150	Hor.	No
2708.250	28.7	54.0	25.3	21.4	29.7	26.4	4.0	150	Vert.	Yes
3611.000	42.7	54.0	11.3	32.0	32.3	26.2	4.6	150	Vert.	Yes
5416.500	37.6	54.0	16.4	22.5	34.7	25.4	5.8	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

TEST REPORT REFERENCE: F093202E1

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

Result measured with the peak detector:

Frequency MHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1010.750	49.6	74.0	24.4	49.5	24.2	26.5	2.4	150	Vert.	Yes
1106.750	37.2	74.0	36.8	36.7	24.5	26.5	2.5	150	Vert.	Yes
1829.500	39.2	103.6	64.4	35.4	27.0	26.5	3.3	150	Hor.	No
2744.250	40.9	74.0	33.1	33.3	29.9	26.4	4.1	150	Vert.	Yes
3659.000	49.7	74.0	24.3	39.0	32.4	26.2	4.5	150	Vert.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

Result measured with the average detector:

Frequency MHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1010.750	47.0	54.0	7.0	46.9	24.2	26.5	2.4	150	Vert.	Yes
1106.750	30.7	54.0	23.3	30.2	24.5	26.5	2.5	150	Vert.	Yes
1829.500	32.4	103.6	71.2	28.6	27.0	26.5	3.3	150	Hor.	No
2744.250	32.4	54.0	21.6	24.8	29.9	26.4	4.1	150	Vert.	Yes
3659.000	46.3	54.0	7.7	35.6	32.4	26.2	4.5	150	Vert.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

TEST REPORT REFERENCE: F093202E1

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

Result measured with the peak detector:

Frequency MHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1023.250	48.1	74.0	25.9	47.9	24.3	26.5	2.4	150	Vert.	Yes
1119.250	36.2	74.0	37.8	35.7	24.5	26.5	2.5	150	Vert.	Yes
1854.500	37.4	104.1	66.7	33.2	27.1	26.5	3.6	150	Vert.	No
2781.750	44.7	74.0	29.3	37.0	30.0	26.4	4.1	150	Vert.	Yes
3709.000	51.2	74.0	22.8	40.3	32.5	26.2	4.6	150	Vert.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

Result measured with the average detector:

Frequency MHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1023.250	45.4	54.0	8.6	45.2	24.3	26.5	2.4	150	Vert.	Yes
1119.250	29.7	54.0	24.3	29.2	24.5	26.5	2.5	150	Vert.	Yes
1854.500	27.0	104.1	77.1	22.8	27.1	26.5	3.6	150	Vert.	No
2781.750	37.7	54.0	16.3	30.0	30.0	26.4	4.1	150	Vert.	Yes
3709.000	48.1	54.0	5.9	37.2	32.5	26.2	4.6	150	Vert.	Yes
Measurement uncertainty						+2.2 dB / -3.6 dB				

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

29, 31 –34, 36, 44, 49, 73

TEST REPORT REFERENCE: F093202E1

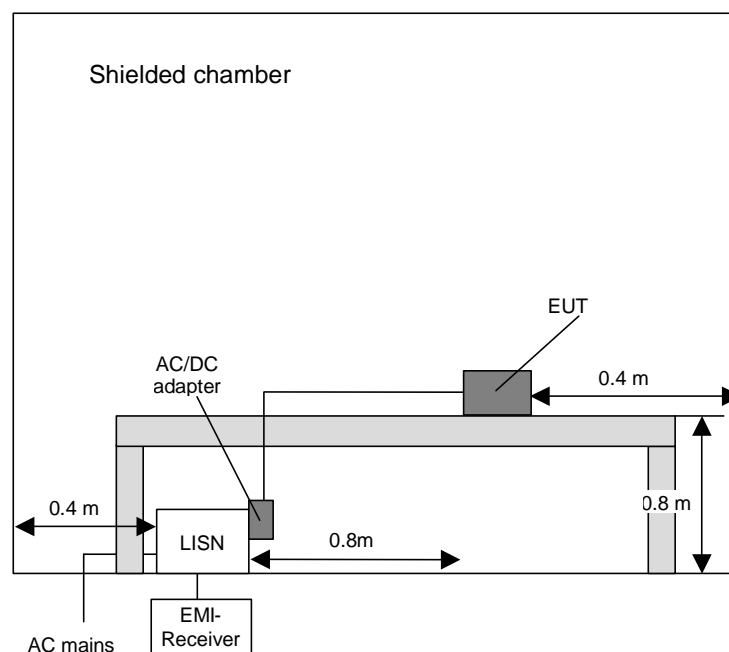
5.7 CONDUCTED EMISSIONS ON POWER SUPPLY LINES (150 kHz to 30 MHz)

5.7.1 METHOD OF MEASUREMENT

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

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

Frequency range	Resolution bandwidth
150 kHz to 30 MHz	9 kHz



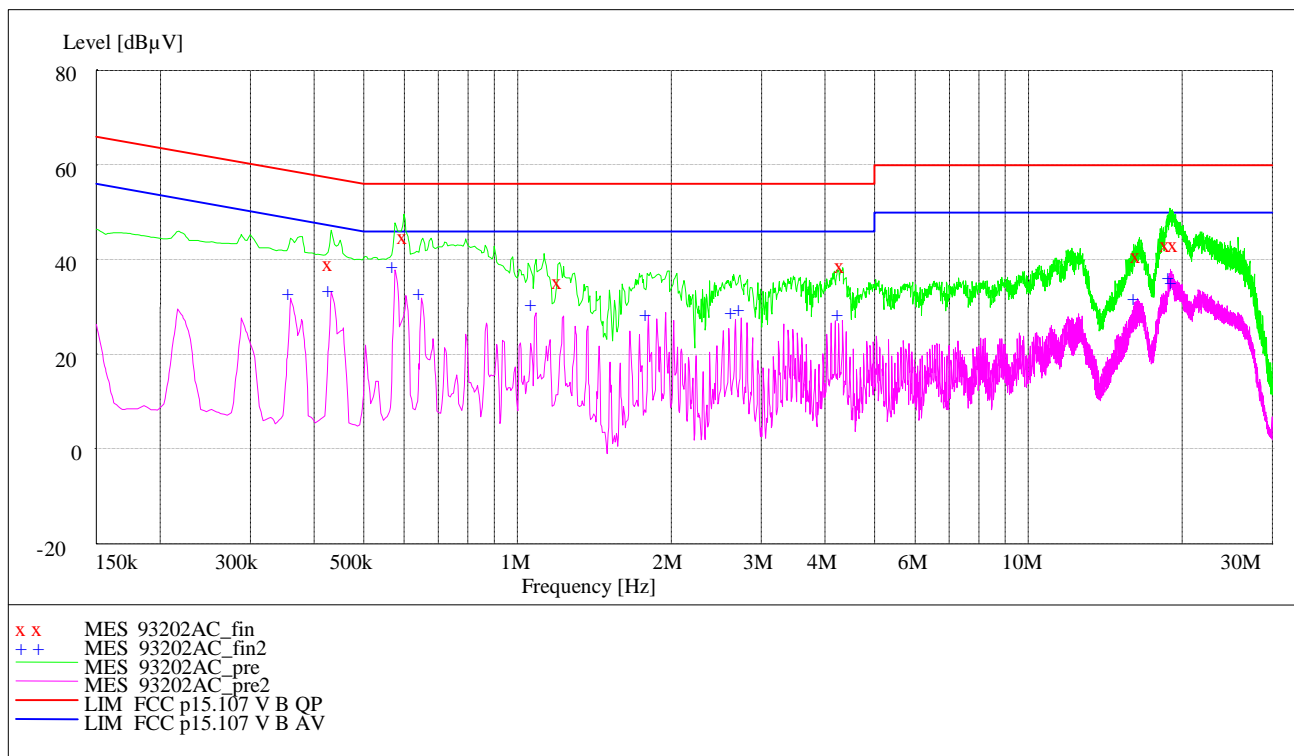
TEST REPORT REFERENCE: F093202E1

5.7.2 TEST RESULTS (CONDUCTED EMISSIONS ON POWER SUPPLY LINES)

Ambient temperature	20 °C	Relative humidity	35 %
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- Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.
- Cable guide: The 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: The EUT operates in operation mode 4. All results are shown in the following.
- Supply voltage: During the measurement the EUT was supplied 12.0 V DC by an AC / DC adaptor type FW 3288, which was supplied by 115 V AC / 60 Hz.

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: 93202AC

TEST REPORT REFERENCE: F093202E1

Result measured with the quasipeak detector:

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

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
0.4335	40.0	0.2	57.0	17.2	N	FLO
0.6090	45.6	0.1	56.0	10.4	N	GND
1.2201	36.1	0.1	56.0	19.9	L1	GND
4.3386	39.3	0.7	56.0	16.7	N	FLO
16.5282	41.8	3.0	60.0	18.2	N	GND
18.9114	44.1	3.4	60.0	15.9	L1	FLO
19.4163	44.2	3.5	60.0	15.8	L1	FLO
Measurement uncertainty				+3.6 dB / -4.5 dB		

Data record name: 91187AC_fin

Result measured with the average detector:

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

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
0.3615	33.8	0.2	49.0	14.9	N	FLO
0.4344	34.6	0.2	47.0	12.6	N	FLO
0.5775	39.3	0.2	46.0	6.7	N	FLO
0.6495	34.1	0.1	46.0	11.9	N	FLO
1.0824	31.6	0.1	46.0	14.4	N	GND
1.8033	29.6	0.3	46.0	16.4	N	FLO
2.6673	30.2	0.5	46.0	15.8	N	GND
2.7402	30.4	0.6	46.0	15.6	N	GND
4.3242	29.1	0.7	46.0	16.9	N	FLO
16.3599	32.7	2.9	50.0	17.3	N	GND
18.9555	37.3	3.5	50.0	12.7	L1	GND
19.3137	36.1	3.5	50.0	13.9	L1	GND
Measurement uncertainty				+3.6 dB / -4.5 dB		

Data record name: 91187AC_fin2

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

1 – 4, 20

TEST REPORT REFERENCE: F093202E1

6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

TEST REPORT REFERENCE: F093202E1

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. due
1	Shielded chamber M47	-	Albatross Projects	B83117-C6439-T262 -	480662	Weekly verification (system cal.)	
2	EMI Receiver	ESCS 30	Rohde & Schwarz	828985/014	480270	02/27/2008	02/2010
3	LISN	ESH2-Z5	Rohde & Schwarz	879675/037	580006	06/14/2009	06/2010
4	High pass filter	HR 0.13- 5ENN	FSY Microwave Inc.	DC 0109 SN 002	480340	Weekly verification (system cal.)	
14	Open area test site	-	Phoenix Test-Lab	-	480085	Weekly verification (system cal.)	
15	Measuring receiver	ESIB7	Rohde & Schwarz	100304	480521	02/26/2008	02/2010
16	Controller	HD100	Deisel	100/670	480139	-	-
17	Turntable	DS420HE	Deisel	420/620/80	480087	-	-
18	Antenna support	AS615P	Deisel	615/310	480086	-	-
19	Antenna	CBL6111 A	Chase	1643	480147	08/01/2007	08/2012
20	EMI Software	ES-K1	Rohde & Schwarz	-	480111	-	-
29	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303	Weekly verification (system cal.)	
30	Spectrum analyser	FSU	Rohde & Schwarz	200125	480956	02/04/2009	02/2011
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355	02/25/2008	02/2010
32	Controller	MCU	Maturo	MCU/043/971107	480832	-	-
33	Turntable	DS420HE	Deisel	420/620/80	480315	-	-
34	Antenna support	AS615P	Deisel	615/310	480187	-	-
35	Antenna	CBL6112 B	Chase	2688	480328	10/11/2005	10/2010
36	Antenna	3115 A	EMCO	9609-4918	480183	04/11/2008	11/2013
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.)	
55	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	02/19/2008	02/2013
73	High Pass Filter	WHJS1000C 11/60EF	Wainwright Instruments GmbH	1	480413	Six month verification (system cal.)	
83	Tuneable Notch Filter	WRCA800/90 0-0.2/40- 6EEK	Wainwright Instruments GmbH	15	480414	Six month verification (system cal.)	

TEST REPORT REFERENCE: F093202E1

7 LIST OF ANNEXES

ANNEX A	PHOTOGRAPHS OF THE TEST SET-UPS:	7 pages
	UDL120, test set-up fully anechoic chamber	93202_7.jpg
	UDL120, test setup fully anechoic chamber	93202_12.jpg
	UDL120, test setup fully anechoic chamber	93202_5.jpg
	UDL120, test setup fully anechoic chamber	93202_8.jpg
	UDL120, test setup outdoor test site	93202_13.jpg
	UDL120, test setup open area test site	93202_9.jpg
	UDL120, test setup shielded chamber	93202_10.jpg
ANNEX B	INTERNAL PHOTOGRAPHS OF THE TEST SAMPLE:	8 pages
	UDL120, internal top view	93202_e.jpg
	UDL120, internal bottom view	93202_l.jpg
	UDL120, main PCB, top view	93202_i.jpg
	UDL120, main PCB, bottom view	93202_l.jpg
	UDL120, antenna, bottom view	93202_k.jpg
	UDL120, rf-PCB, top view	93202_g.jpg
	UDL120, rf-PCB (housing removed), top view	93202_h.jpg
	UDL120, rf-PCB (housing removed), bottom view	93202_f.jpg
ANNEX C	EXTERNAL PHOTOGRAPHS OF THE TEST SAMPLE:	4 pages
	UDL120, 3-D view 1	93202_a.jpg
	UDL120, 3-D view 2	93202_b.jpg
	UDL120, rear view	93202_c.jpg
	UDL120, front view	93202_d.jpg