

Test Report

Report Number: F131992E1

Applicant:

SICK AG

Manufacturer:

SICK AG

Equipment under Test (EUT):

RFU620

Laboratory (CAB) accredited by
Deutsche Akkreditierungsstelle GmbH (DAkkS)
in compliance with DIN EN ISO/IEC 17025
under the Reg. No. D-PL-17186-01-02,
FCC Test site registration number 90877 and
Industry Canada Test site registration IC3469A-1


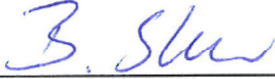
REFERENCES

- [1] **ANSI C63.4-2009** 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 (May 2013)** Radio Frequency Devices
- [3] **FCC Public Notice DA 00-705 (March 2000)**
- [4] **RSS-210 Issue 8 (December 2010)** Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
- [5] **RSS-Gen Issue 3 (December 2010)** General Requirements and Information for the Certification of Radio Apparatus

TEST RESULT

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test.

The complete test results are presented in the following.

Test engineer:	Thomas KÜHN		20 June 2013
	_____	_____	_____
	Name	Signature	Date
Authorized reviewer:	Bernd STEINER		20 June 2013
	_____	_____	_____
	Name	Signature	Date

RESERVATION

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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 NUMBER.

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1 IDENTIFICATION

1.1 Applicant

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eMail Address:	Christian.muenter@sick.de
Applicant represented during the test by the following person:	-

1.2 Manufacturer

Name:	SICK AG
Address:	Merkurring 20 22143 Hamburg
Country:	Germany
Name for contact purposes:	Mr. Christian MÜNTER
Phone:	+ 49 40 61 16 80 - 243
Fax:	+ 49 40 61 16 80 - 201
eMail Address:	Christian.muenter@sick.de
Manufacturer represented during the test by the following person:	-

1.3 Test laboratory

The tests were carried out at: **PHOENIX TESTLAB GmbH**
Königswinkel 10
32825 Blomberg
Germany

accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-02, FCC Test site registration number 90877 and Industry Canada Test site registration IC3469A-1.

1.4 EUT (Equipment Under Test)

Test object: *	UHF RFID read/write device
Model name: *	RFU620-10101, RFU620-10501 (refer also clause 3 of this test report)
FCC ID: *	WRMRFU620
IC: *	10066A-RFU620
PCB identifier: *	EK-System (2068797 (RFU620-10101) or 2066914 (RFU620-10501)), EK-Koppler (2069685), LPL-Antenne (4076914)
Serial number: *	PT203 (RFU620-10101), PoE02 (RFU620-10501)
Hardware version: *	Prototyp
Software version: *	T1.36c
Lowest / highest internal frequency: *	1 MHz / transmit frequency

1.5 Technical data of equipment

Channel 0	RX:	902.75 MHz	TX:	902.75 MHz
Channel 24	RX:	914.75 MHz	TX:	914.75 MHz
Channel 49	RX:	927.25 MHz	TX:	927.25 MHz

Rated RF output power: *	25 dBm (conducted)				
Antenna type: *	Internal				
Channel spacing: *	500 kHz				
Antenna gain: *	Max. 2.4 dBi				
Adaptive frequency agility: *	Yes				
Modulation: *	FHSS (PR-ASK)				
Supply Voltage: *	U _{nom} =	24.0 V DC	U _{min} =	10.0 V DC	U _{max} = 30.0 V DC
Temperature range: *	-20 °C to +50 °C				
Ancillary used for test:	A switchbox typ CDB620-001 was used to connect the EUT to the power supply, the digital input/output and via CAN to a second CDB620-001 with a CLV622-0120 (RFU620-10101). A PoE-power injector type FL PSE 2TX or type PHIHONG POE36U-1AT-R was used to connect the EUT to the Ethernet power supply (RFU620-10501).				

* declared by the applicant.

The following external I/O cables were used:

Identification	Connector		Length *
	EUT	Ancillary	
Ethernet (RFU620-10101)	4-pin M12-connector	RJ45	3.0 m
System line (RFU620-10101)	17-pin M12-connector	SubD 15pin (CDB620-001)	3.0 m
System line (RFU620-10501)	8-pin M12-connector	RJ45-connector	2.0 m

*: Length during the test if no other specified.

1.6 Dates

Date of receipt of test sample:	24 May 2013
Start of test:	28 May 2013
End of test:	29 May 2013

2 OPERATIONAL STATES

All tests were carried out with unmodified samples with integral antenna. During all tests the RFU620-10101 was powered by an external power supply with 24.0 V DC. The RFU620-10501 was powered by the PoE-injector with 48 V DC.

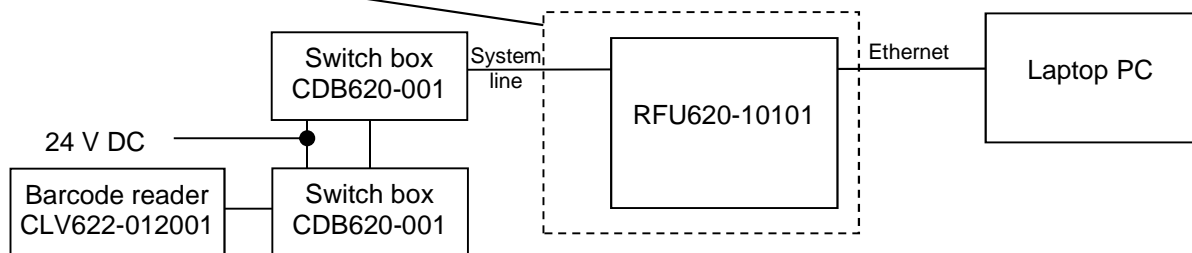
The operation mode could be chosen with the help of a laptop computer with a test-software, which communicates with the EUT via the Ethernet line. The Ethernet connection between the laptop PC and the EUT was maintained during all tests. The conducted measurements were carried out at the internal antenna connector of the EUT. For all measurements the output power of the EUT was set to 25 dBm (maximum value).

The tested samples were not labelled.

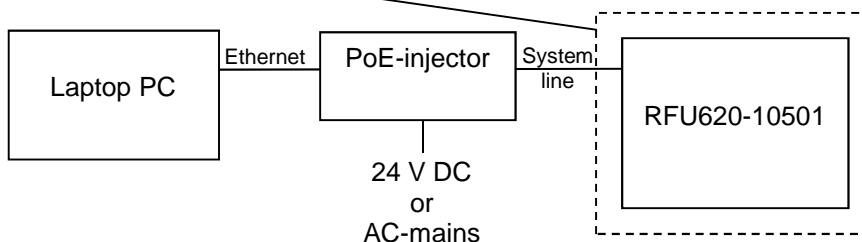
The following operation modes were used during the tests:

Operation mode	Description of the operation mode
1	Transmit on 902.750 MHz (channel 0)
2	Transmit on 914.750 MHz (channel 24)
3	Transmit on 927.250 MHz (channel 49)
4	Transmit on all channels (hopping enabled)

Physical boundary of the EUT (RFU620-10101)



Physical boundary of the EUT (RFU620-10501)



3 Additional Information

The RFU620 is available in the three different variants:

- RFU620-10101: Is equipped with two external connectors (4-pin M12 and 17-pin M12).
- RFU620-10401: Is equipped with a connection cable instead of the external connectors. As declared by the applicant it is identical in hard- and software to the RFU620-10101.
- RFU620-10501: Is equipped with one 8-pin M12 connector and is powered over Ethernet (PoE). As declared by the applicant this RF-part of this variant is identical to the RFU620-10101 and RFU620-10401.

All documented measurements were carried out with the RFU620-10101. Because the applicant declares that the RF-part of the RFU620-10501 is identical, the following measurements were carried out with the RFU620-10501 additionally:

- Maximum peak output power.
- Radiated emissions (in operation mode 2 only).
- Conducted emissions on power supply lines.

The measurements of the RFU620-10501 were carried out under the PHOENIX TESTLAB GmbH order confirmation number 13-11191.

4 OVERVIEW

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	RSS 210, Issue 8 [4] or RSS-Gen, Issue 3 [5]	Status	Refer page
20 dB bandwidth	General	15.247 (a) (1) (i)	A8.1 (c) [4]	Passed	8 et seq.
Carrier frequency separation	General	15.247 (a) (1) (i)	-	Passed	11 et seq.
Number of hopping channels	902.0 – 928.0	15.247 (a) (1) (i)	A8.1 (c) [4]	Passed	14 et seq.
Dwell time	902.0 – 928.0	15.247 (a) (1) (i)	A8.1 (c) [4]	Passed	16 et seq.
Maximum peak output power	902.0 – 928.0	15.247 (b) (2)	A8.4 (1) [4]	Passed	18 et seq.
Radiated emissions (transmitter)	0.009 - 10,000	15.247 (d) 15.205 (a) 15.209 (a)	A8.5 [4] 2.5 [4] 7.2.2 [5]	Passed	23 et seq.
Conducted emissions on supply line	0.15 - 30	15.207 (a)	7.2.4 [5]	Passed	43 et seq.

5 TEST RESULTS

5.1 20 dB bandwidth

5.1.1 Method of measurement (20 dB bandwidth)

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

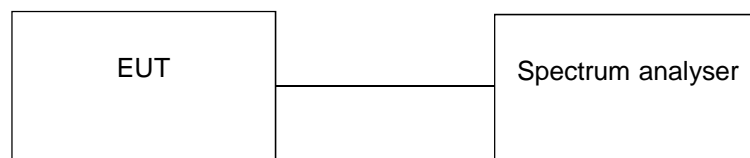
The following spectrum analyser settings shall be used:

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

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

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

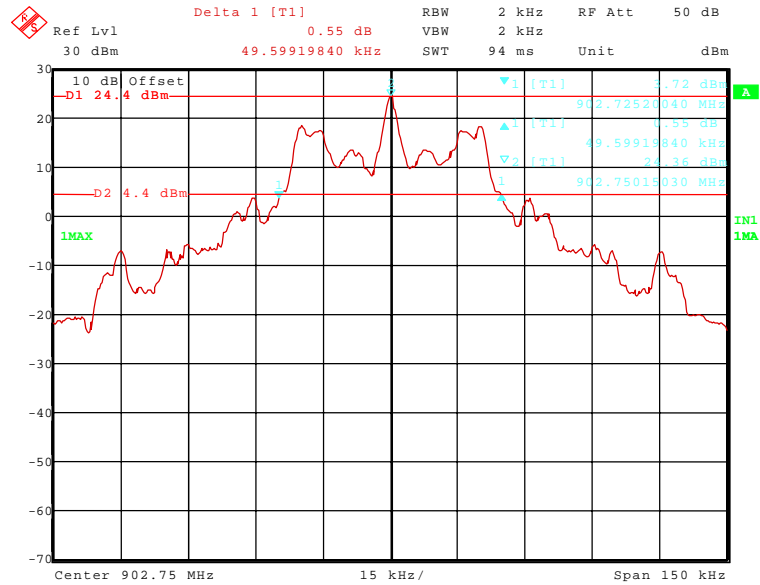
Test set-up:



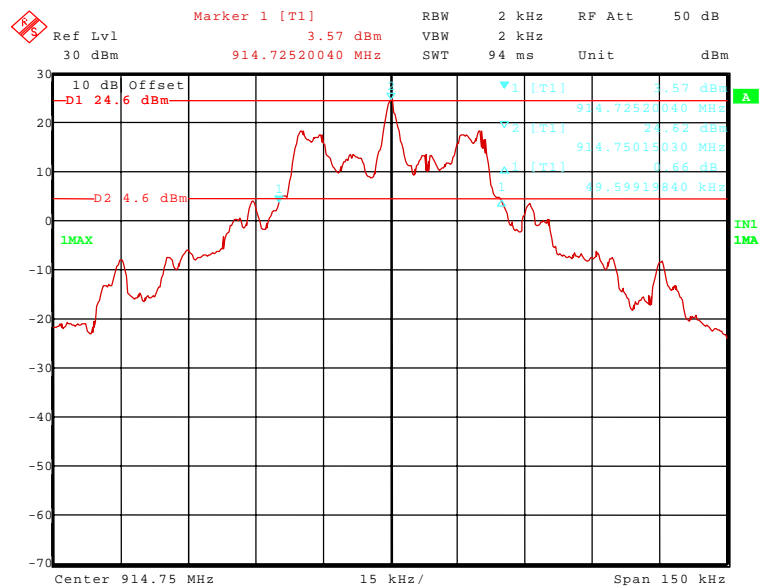
5.1.2 Test results (20 dB bandwidth)

Ambient temperature	21 °C	Relative humidity	49 %
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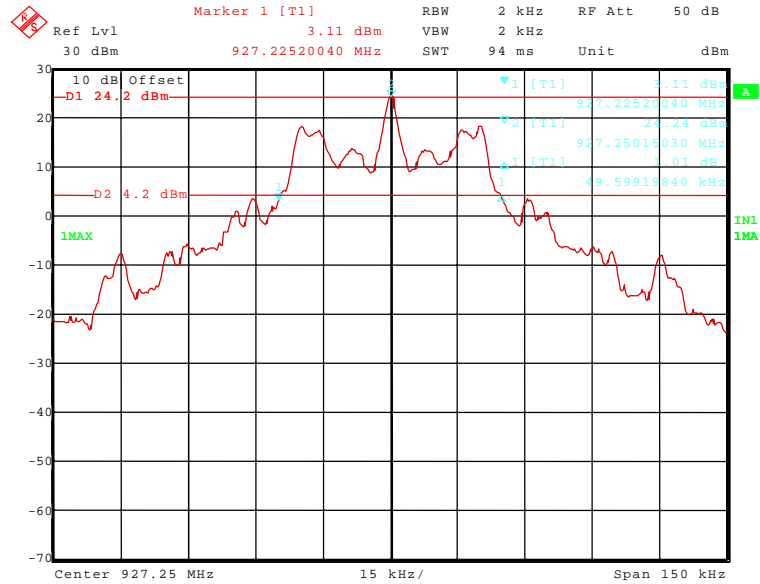
131992_44.wmf: 20 dB bandwidth at the lower end of the assigned frequency band:



131992_45.wmf: 20 dB bandwidth at the middle of the assigned frequency band:



131992_46.wmf: 20 dB bandwidth at the upper end of the assigned frequency band:



Channel number	Channel frequency [MHz]	20 dB bandwidth [kHz]
0	902.750	49.599198
24	914.750	49.599198
49	927.250	49.599198
Measurement uncertainty		+0.66 dB / -0.72 dB

TEST EQUIPMENT USED FOR THE TEST:

31

5.2 Carrier frequency separation

5.2.1 Method of measurement (carrier frequency separation)

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

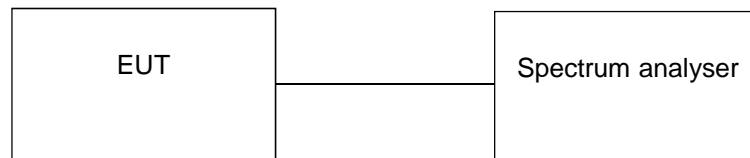
The following spectrum analyser settings shall be used:

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

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

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

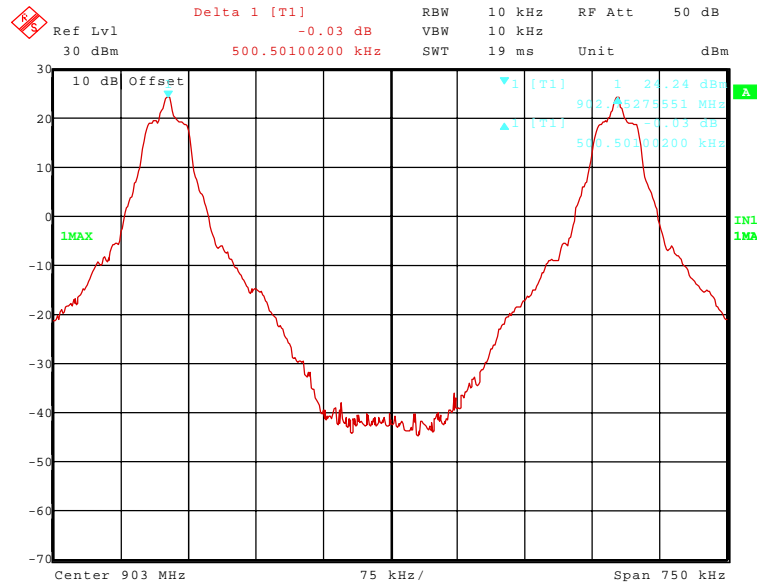
Test set-up:



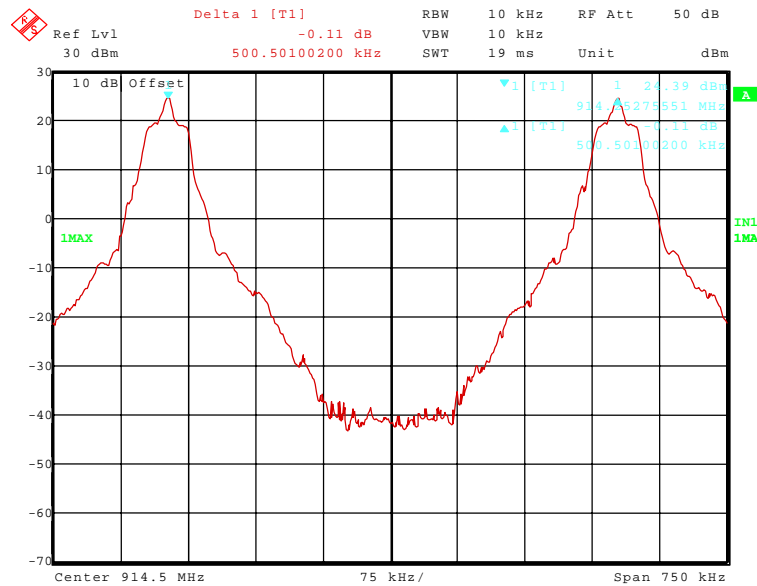
5.2.2 Test results (carrier frequency separation)

Ambient temperature	21 °C	Relative humidity	49 %
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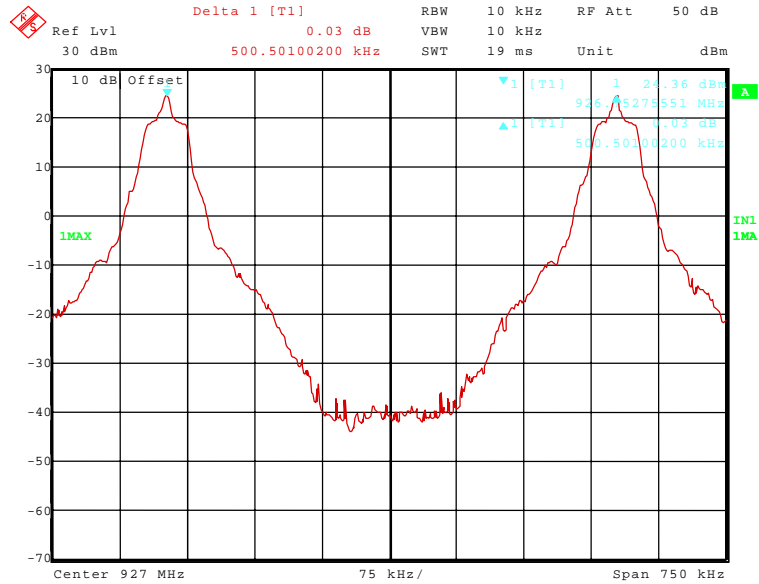
131992_47.wmf: Channel separation at the lower end of the assigned frequency band:



131992_48.wmf: Channel separation at the middle of the assigned frequency band:



131992_49.wmf: Channel separation at the upper end of the assigned frequency band:



Channel number	Channel frequency [MHz]	Channel separation [kHz]	Minimum limit [kHz]
0	902.750	500.501	49.599 (the 20 dB bandwidth)
24	914.750	500.501	49.599 (the 20 dB bandwidth)
49	927.250	500.501	49.599 (the 20 dB bandwidth)
Measurement uncertainty			$<10^{-7}$

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

31

5.3 Number of hopping frequencies

5.3.1 Method of measurement (number of hopping frequencies)

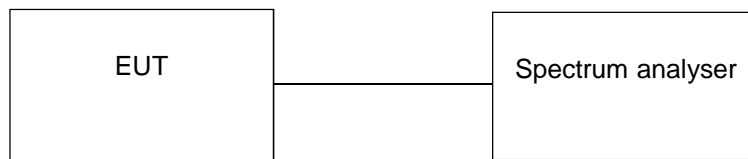
The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT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

The following spectrum analyser settings shall be used:

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

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

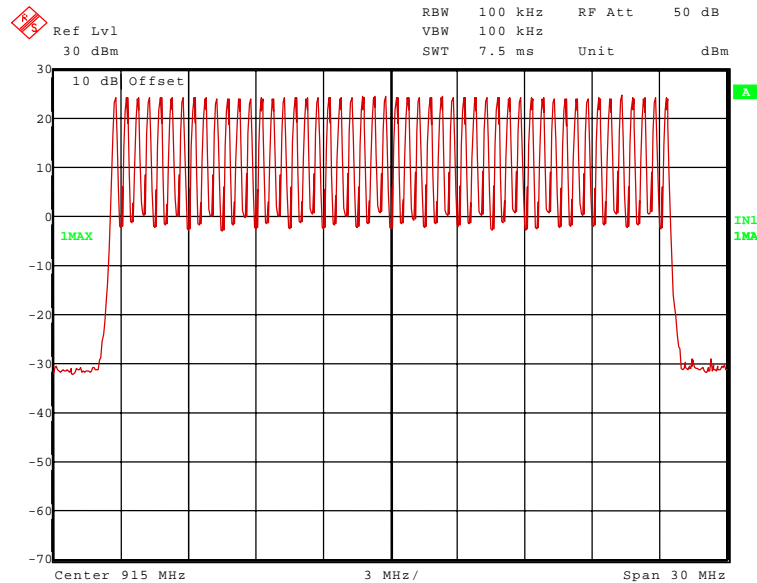
Test set-up:



5.3.2 Test results (number of hopping frequencies)

Ambient temperature	21 °C	Relative humidity	49 %
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131992_50.wmf: Number of hopping channels:



Remark: A smaller Resolution bandwidth was used in order to receive a better optical separation of the signal peaks.

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

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
31

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:

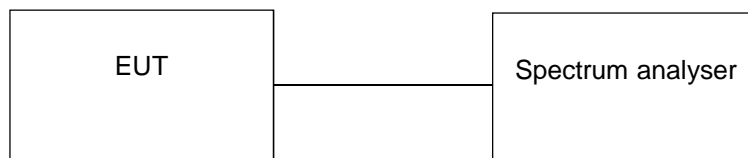
- Span: Zero, centred on a hopping channel.
- Resolution bandwidth: 1 MHz.
- Video bandwidth: \geq the resolution bandwidth.
- Sweep: As necessary to capture the entire dwell time per hopping channel.
- Detector function: peak.
- Trace mode: Max hold.

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 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:

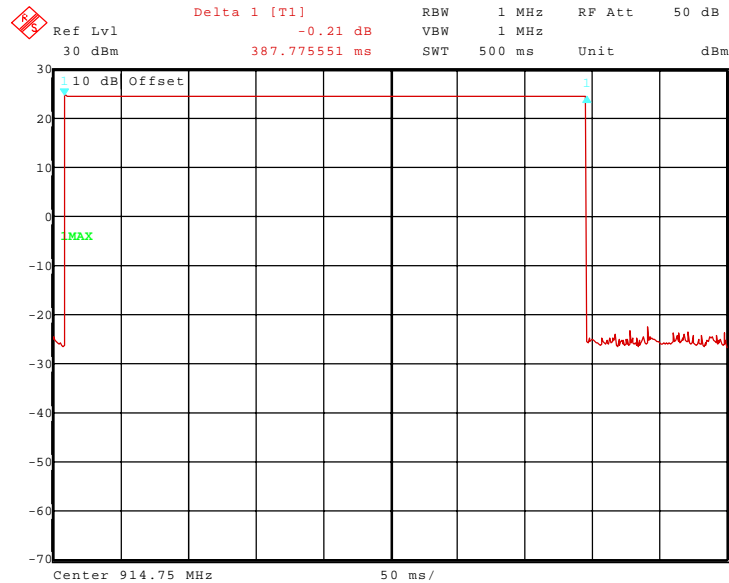


5.4.2 Test results (dwell time)

Ambient temperature	21 °C
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Relative humidity	49 %
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131992_51.wmf: Dwell time at the middle of the assigned frequency band:



The dwell time is calculated with the following formula:

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

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.

Channel number	Channel frequency [MHz]	t_{pulse} [ms]	Dwell time [ms]	Limit [ms]
24	914.750	387.776	387.776	400
Measurement uncertainty			$<10^{-7}$	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
31

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 disenabled.

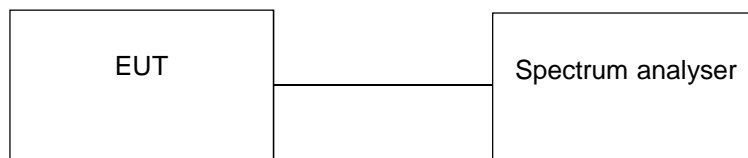
The following spectrum analyser settings shall be used:

- 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.

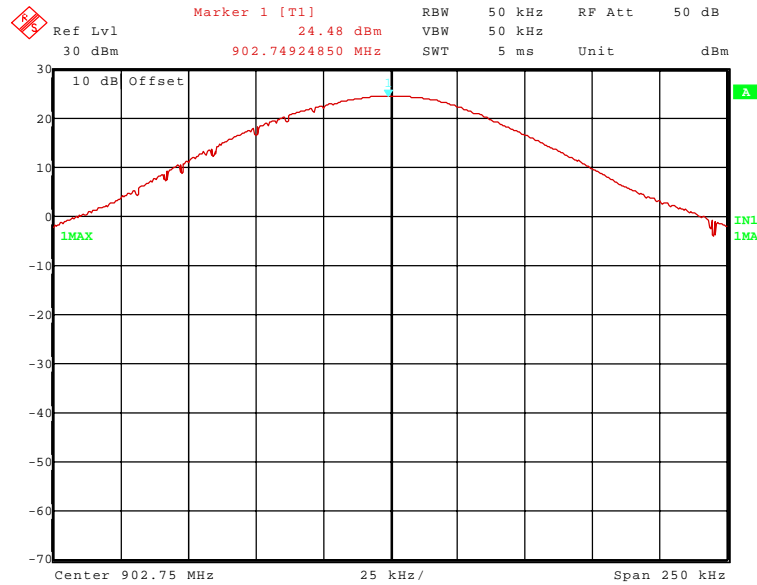
Test set-up:



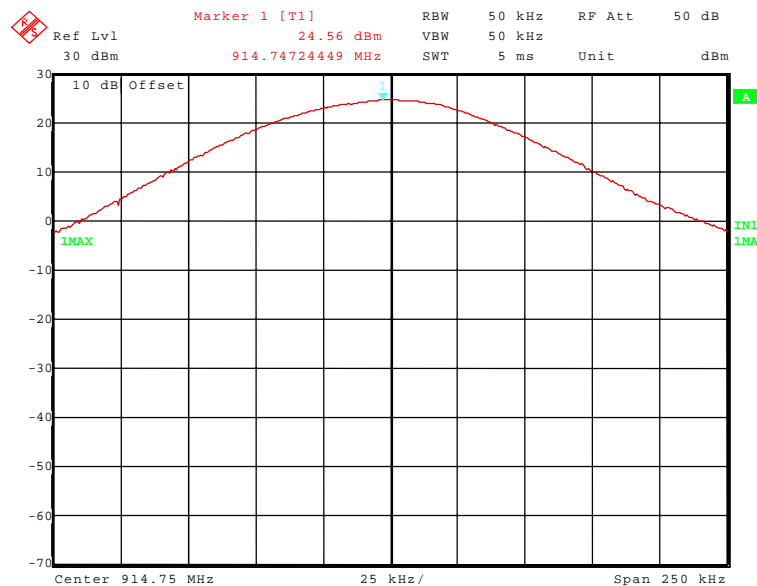
5.5.2 Test results (maximum peak output power) of RFU620-10101

Ambient temperature	21 °C	Relative humidity	49 %
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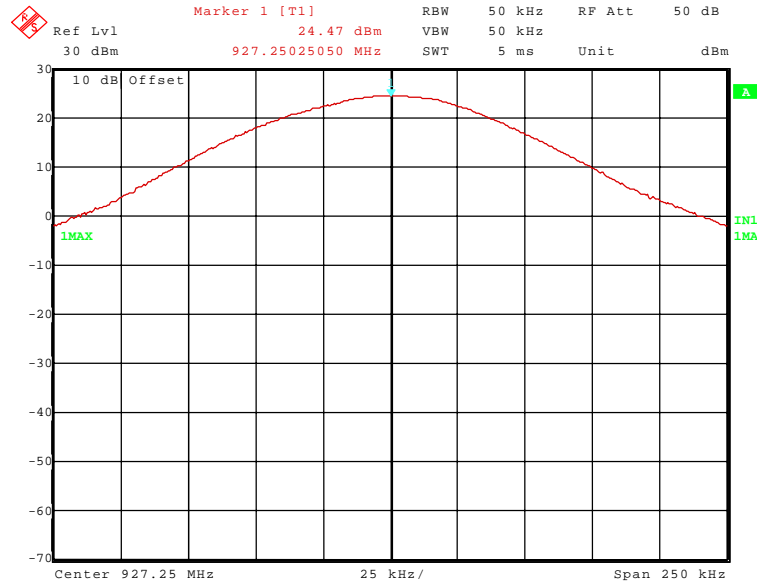
131992_52.wmf: Maximum peak output power at the lower end of the assigned frequency band:



131992_53.wmf: Maximum peak output power at the middle of the assigned frequency band:



131992_54.wmf: Maximum peak output power at the upper end of the assigned frequency band:



Operation mode	Channel number	Channel frequency [MHz]	Maximum peak output power [dBm]	Antenna gain [dBi]	Peak power limit [dBm]
1	0	902.750	24.5	2.4	30.0
2	24	914.750	24.6	2.4	30.0
3	49	927.250	24.5	2.4	30.0
Measurement uncertainty				+0.66 dB / -0.72 dB	

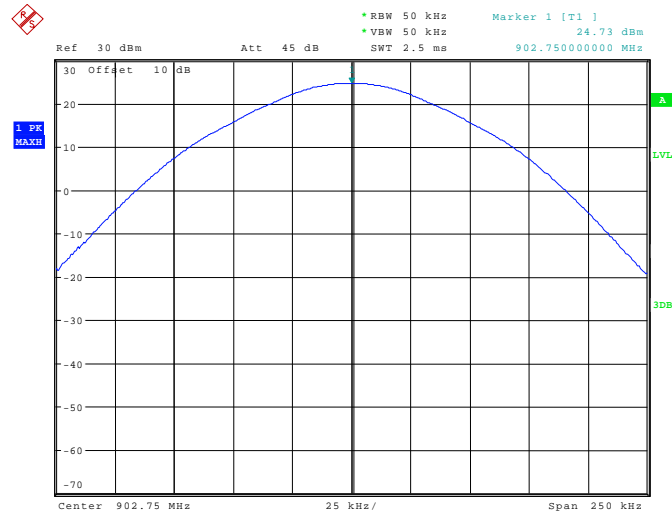
Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
31

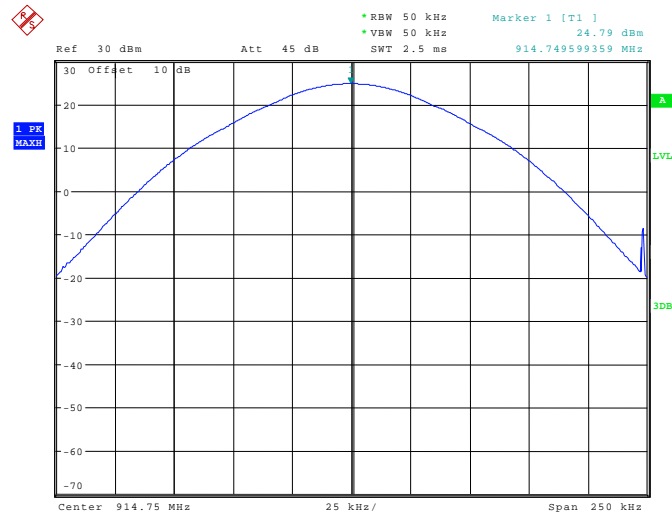
5.5.3 Test results (maximum peak output power) of RFU620-10501

Ambient temperature	21 °C	Relative humidity	49 %
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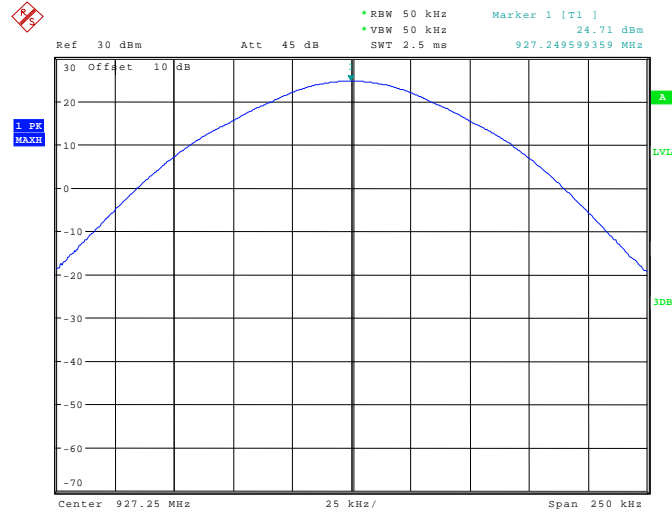
131991_1.wmf: Maximum peak output power at the lower end of the assigned frequency band:



131991_2.wmf: Maximum peak output power at the middle of the assigned frequency band:



131991_3.wmf: Maximum peak output power at the upper end of the assigned frequency band:



Operation mode	Channel number	Channel frequency [MHz]	Maximum peak output power [dBm]	Antenna gain [dBi]	Peak power limit [dBm]
1	0	902.750	24.7	2.4	30.0
2	24	914.750	24.8	2.4	30.0
3	49	927.250	24.7	2.4	30.0
Measurement uncertainty				+0.66 dB / -0.72 dB	

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
6

5.6 Radiated emissions

5.6.1 Method of measurement (radiated emissions)

The radiated emission measurement is subdivided into four stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 30 MHz to 1 GHz.
- 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 of the assigned frequency band.

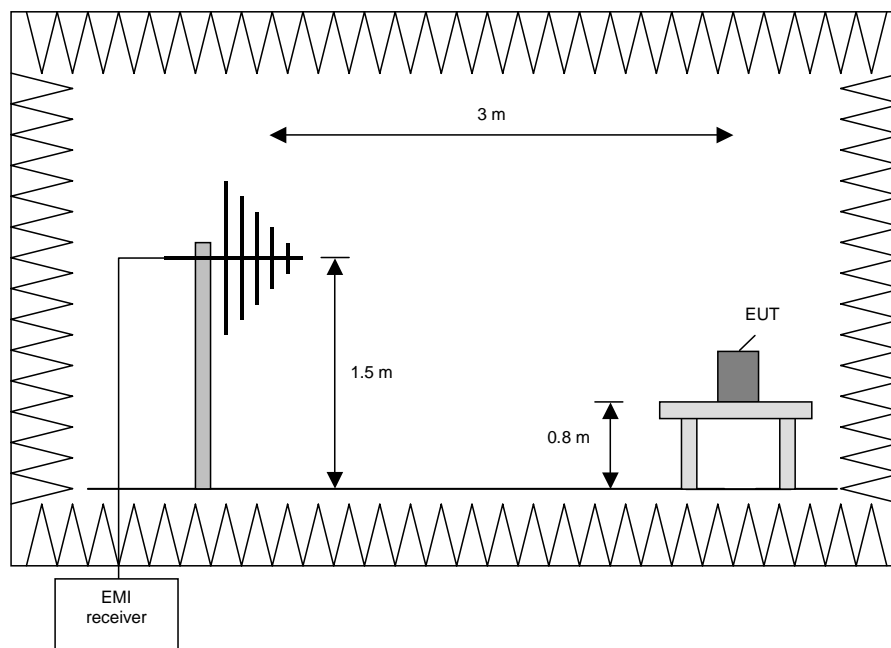
Preliminary measurement (30 MHz to 1 GHz)

In the first stage a preliminary measurement will be performed in a fully anechoic chamber with a measuring distance of 3 meter. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The setup of the Equipment under test will be in accordance to ANSI C63.4-2009 [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 200 MHz	100 kHz
200 MHz to 1 GHz	100 kHz



Procedure preliminary measurement:

Prescans were performed in the frequency range 30 MHz to 200 MHz and 200 MHz to 1 GHz.
The following procedure will be used:

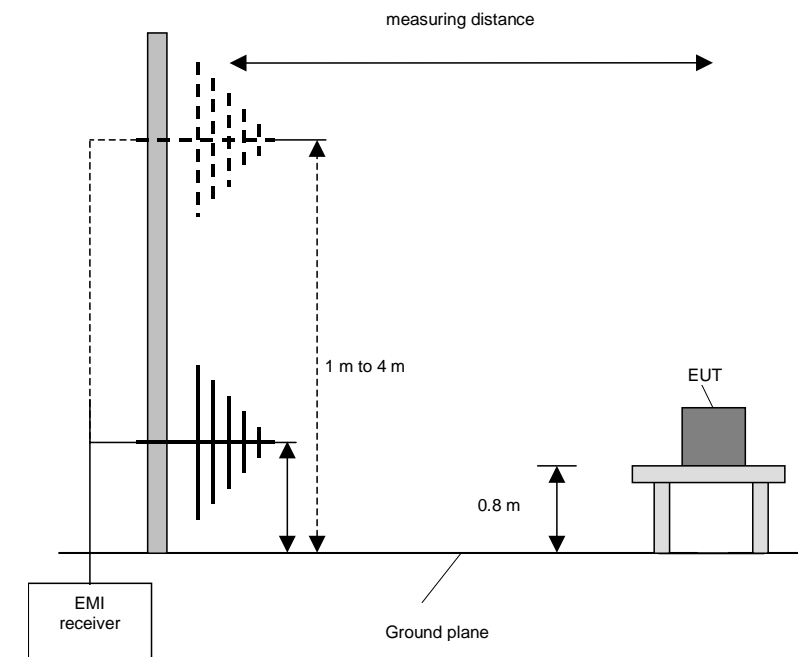
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
6. Repeat 1) to 4) with the other orthogonal axes of the EUT (because of EUT is a module and might be used in a handheld equipment application).
7. Repeat 1) to 5) with the vertical polarisation of the measuring antenna.

Final measurement (30 MHz to 1 GHz)

A final measurement on an open area test site will be performed on selected frequencies found in the preliminary measurement. During this test the EUT will be rotated in the range of 0 ° to 360 °, the measuring antenna will be set to horizontal and vertical polarisation and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

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

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	120 kHz



Procedure final measurement:

The following procedure will be used:

- 1) Measure on the selected frequencies at an antenna height of 1 m and a EUT azimuth of 23 °.
- 2) Move the antenna from 1 m to 4 m and note the maximum value at each frequency.
- 3) Rotate the EUT by 45 ° and repeat 2) until an azimuth of 337 ° is reached.
- 4) Repeat 1) to 3) for the other orthogonal antenna polarization.
- 5) Move the antenna and the turntable to the position where the maximum value is detected.
- 6) Measure while moving the antenna slowly +/- 1 m.
- 7) Set the antenna to the position where the maximum value is found.
- 8) Measure while moving the turntable +/- 45 °.
- 9) Set the turntable to the azimuth where the maximum value is found.
- 10) Measure with Final detector (QP and AV) and note the value.
- 11) Repeat 5) to 10) for each frequency.
- 12) Repeat 1) to 11) for each orthogonal axes of the EUT (because of EUT is a module and might be used in a handheld equipment application).

Preliminary and final measurement (1 GHz to 110 GHz)

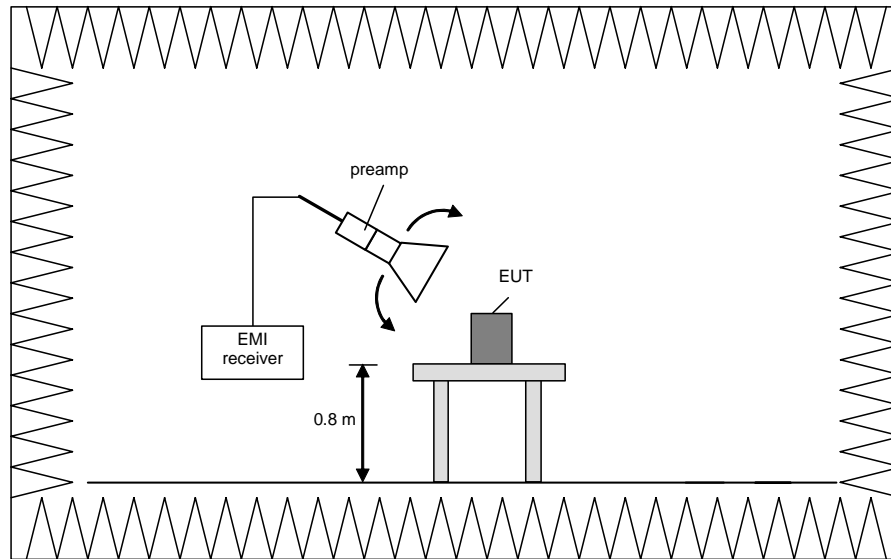
This measurement will be performed in a fully anechoic chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The setup of the Equipment under test will be in accordance to ANSI C63.4-2009 [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

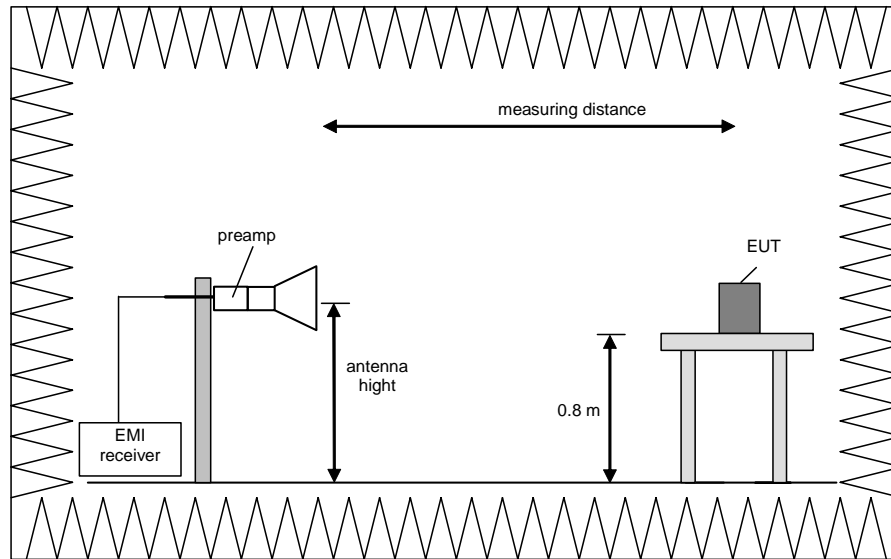


Final measurement (1 GHz to 110 GHz)

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



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.

5.6.2 Test results (radiated emissions)

5.6.2.1 Preliminary radiated emission measurement of RFU620-10101

Ambient temperature	21 °C	Relative humidity	50 %
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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.

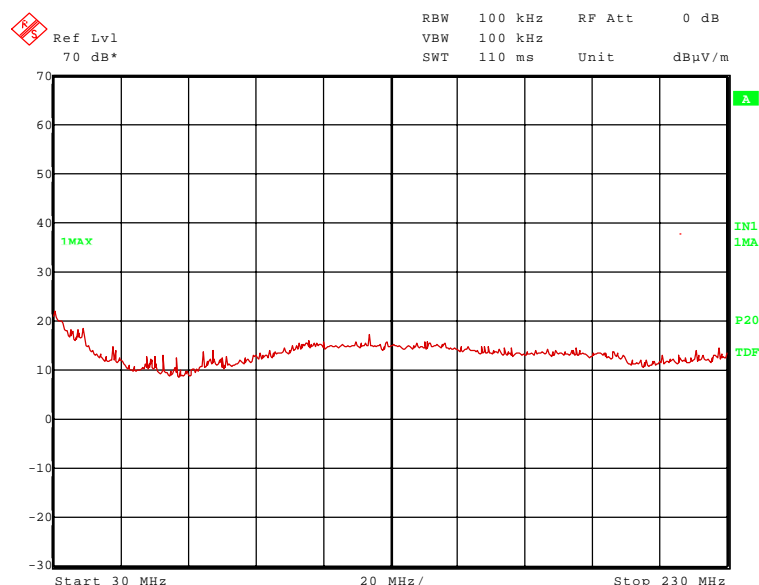
Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 24.0 V DC by an external power supply.

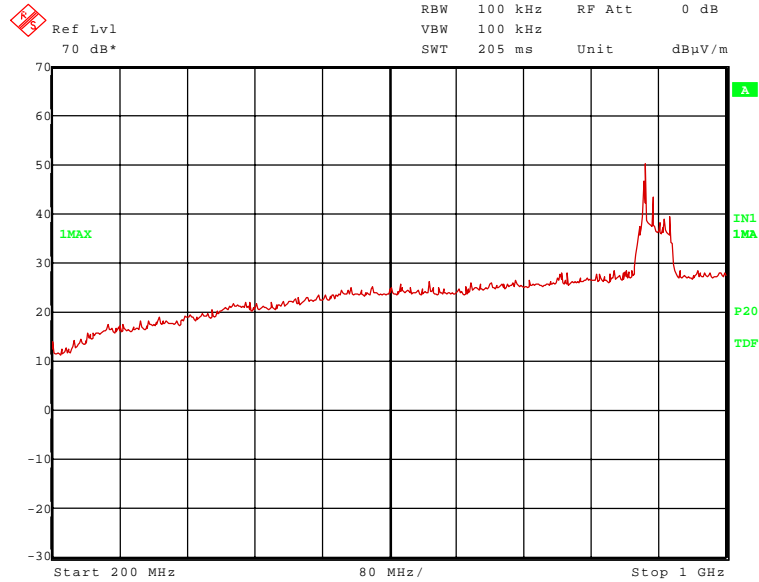
Remark: As pre-tests have shown, the emissions in the frequency range 1 MHz to 30 MHz are not depending on the transmitter operation mode. Therefore the emissions in this frequency range were measured only with the transmitter operates in operation mode 2.

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

131992_30.wmf: Spurious emissions from 30 MHz to 200 MHz (operation mode 1):



131992_31.wmf: Spurious emissions from 200 MHz to 1 GHz (operation mode 1, carrier notched):



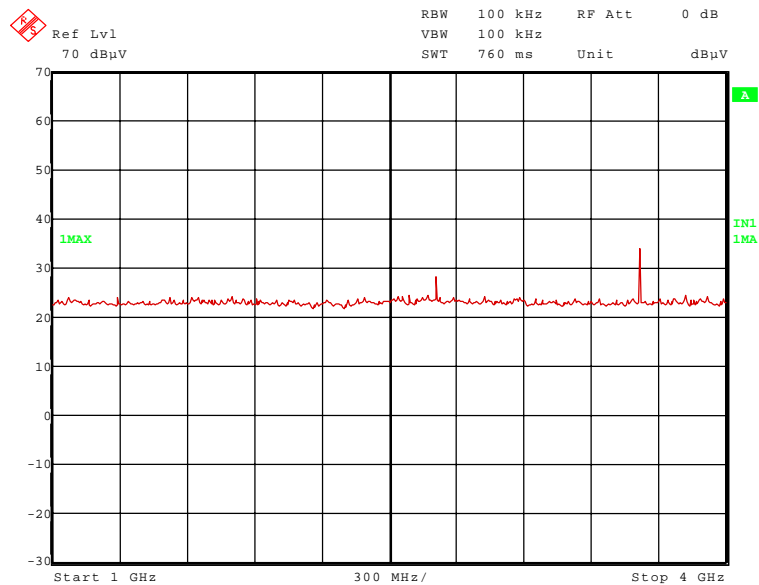
The following frequencies were found outside the restricted bands during the preliminary radiated emission measurement:

- 38.945 MHz, 48.471 MHz, 902.750 MHz, 912.000 MHz, 924.000 MHz and 932.084 MHz

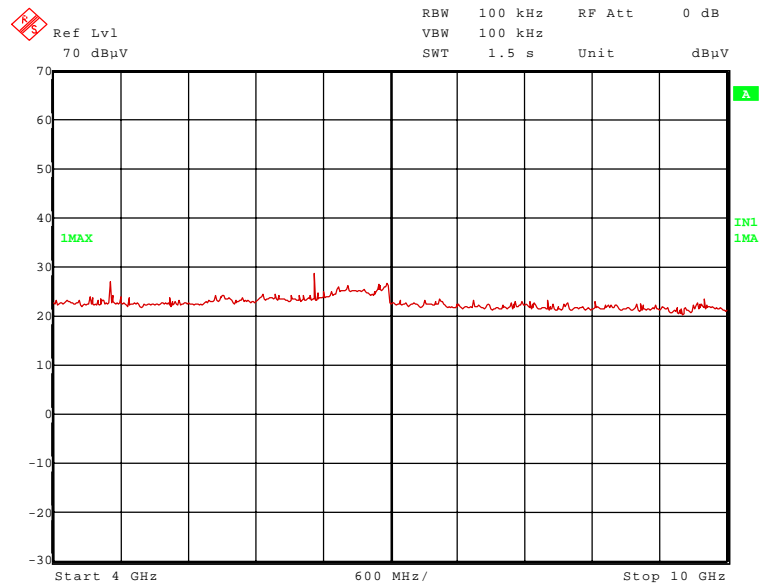
No frequency was found inside the restricted bands during the preliminary radiated emission measurement.

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

131992_40.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 1):



131992_41.wmf: Spurious emissions from 4 GHz to 10 GHz (operation mode 1):



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

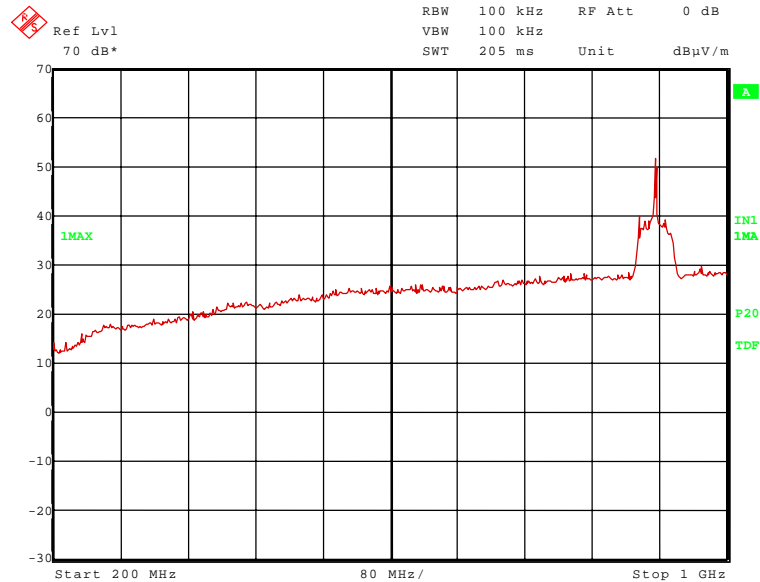
- 2.70825 GHz, 3.61100 GHz and 5.41650 GHz.

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

- 6.31925 GHz.

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

131992_32.wmf: Spurious emissions from 200 MHz to 1 GHz (operation mode 2, carrier notched):



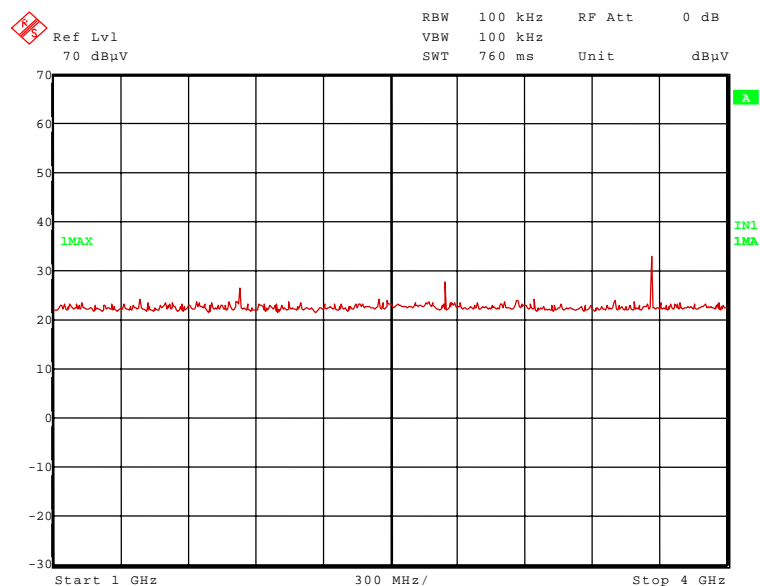
The following frequencies were found outside the restricted bands during the preliminary radiated emission measurement:

- 38.945 MHz, 60.227 MHz, 897.233 MHz, 901.000 MHz, 914.750 MHz and 924.000 MHz.

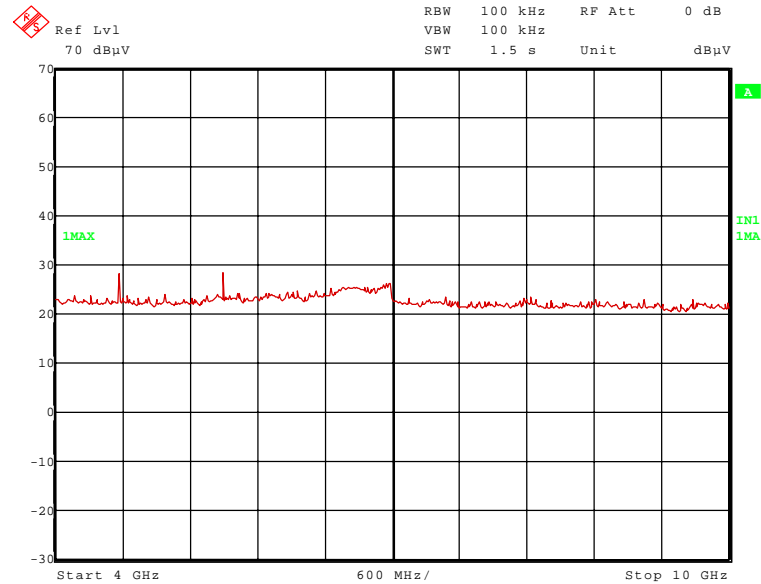
No frequency was found inside the restricted bands during the preliminary radiated emission measurement:

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

131992_39.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 2):



131992_38.wmf: Spurious emissions from 4 GHz to 10 GHz (operation mode 2):



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

- 2.74425 GHz, 3.65900 GHz and 4.57375 GHz.

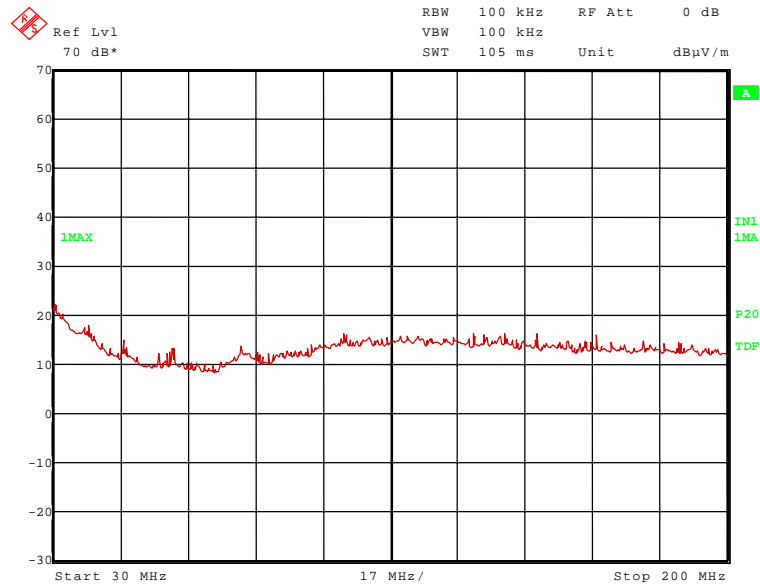
The following frequencies were found outside the restricted bands during the preliminary radiated emission measurement:

- 1.8295 GHz and 5.4885 GHz.

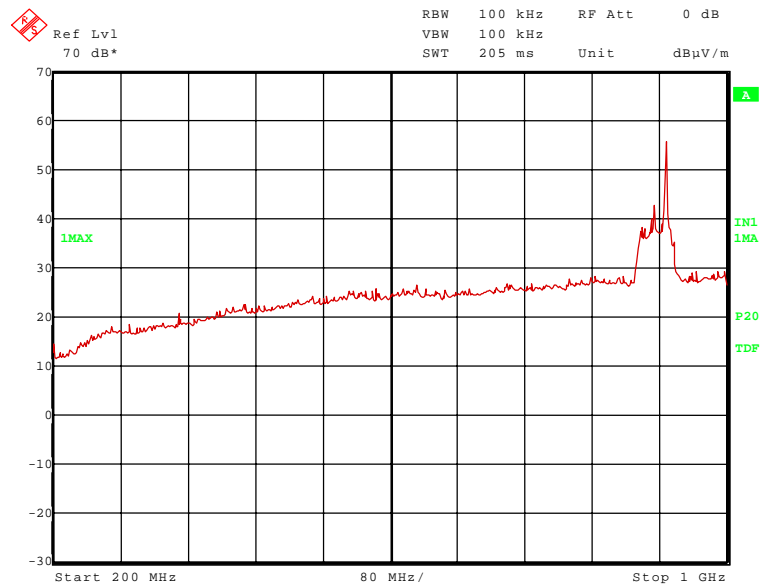
These frequencies have to be measured in a final measurement. The results were presented in the following.

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

131992_34.wmf: Spurious emissions from 30 MHz to 200 MHz (operation mode 3):



131992_35.wmf: Spurious emissions from 200 MHz to 1 GHz (operation mode 3, carrier notched):



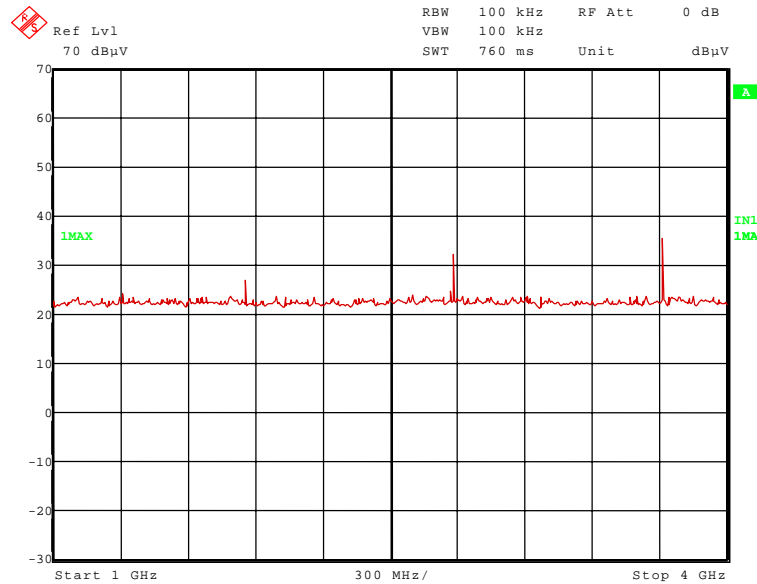
The following frequencies were found outside the restricted bands during the preliminary radiated emission measurement:

- 38.945 MHz, 60.227 MHz, 901.000 MHz, 912.000 MHz, 927.250 MHz and 936.000 MHz.

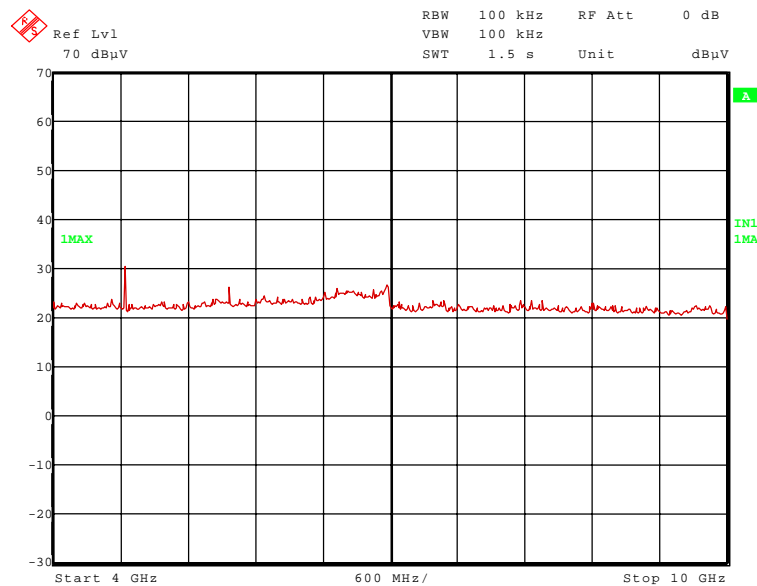
No frequency was found inside the restricted bands during the preliminary radiated emission measurement:

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

131992_36.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 3):



131992_37.wmf: Spurious emissions from 4 GHz to 10 GHz (operation mode 3):



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

- 2.78175 GHz, 4.63625 GHz and 3.70900 GHz.

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

- 1.85450 GHz and 5.56350 GHz.

This frequency has to be measured in a final measurement. The results were presented in the following.

TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 36, 43, 44, 45, 49, 55, 73, 75, 83. 146, 149, 150, 159 – 161, 165

5.6.2.2 Final radiated emission measurement (30 MHz to 1 GHz) of RFU620-10101

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

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 24.0 V DC by an external power supply.

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

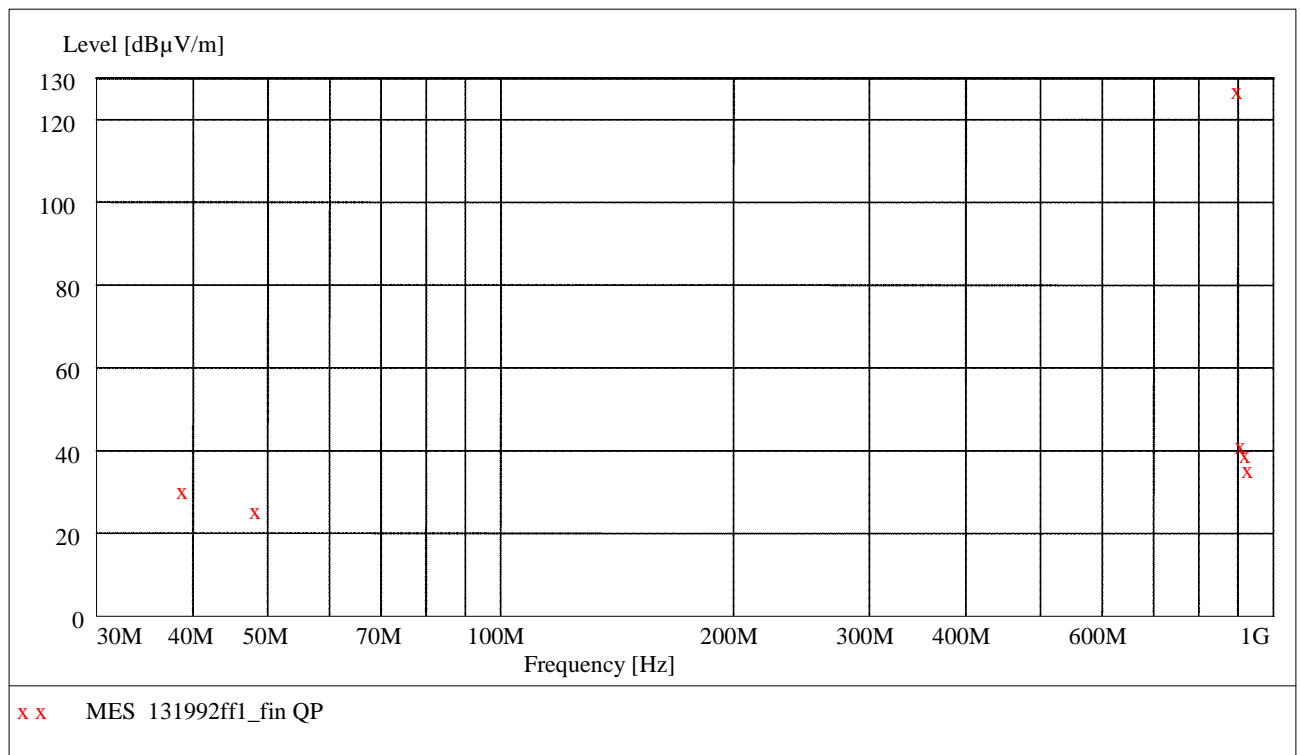
$$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{cable loss [dB]} + \text{antenna factor [dB/m]}$$

The measured points and the limit line in the following diagrams 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.

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.

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

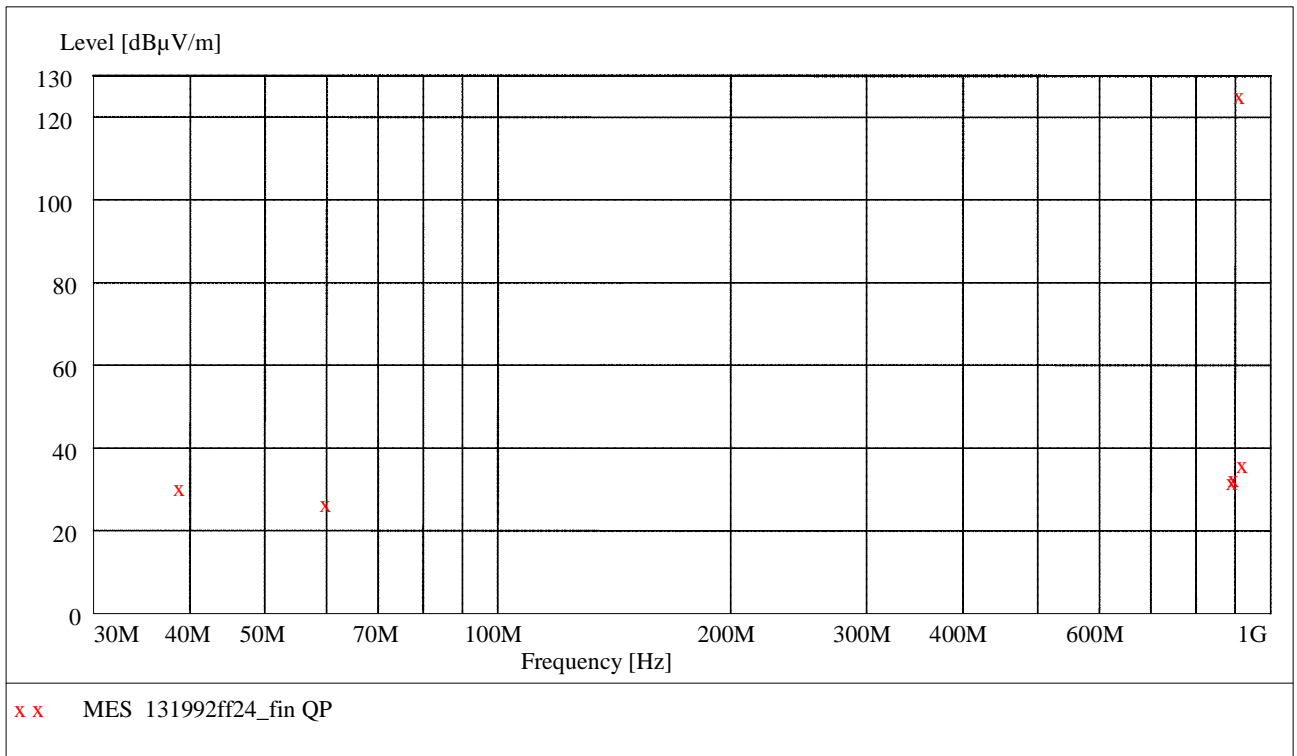


Data record name: 131992ff1

Result measured with the quasi-peak detector:
(These values were marked in the diagrams by an x)

Transmitter operates on the lower end of the assigned frequency band (operation mode 1)									
Spurious emissions outside restricted bands									
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
38.945	31.3	107.6	76.3	15.5	15.1	0.7	100.0	15.0	Vert.
48.471	26.4	107.6	81.2	15.7	10.0	0.7	100.0	179.0	Vert.
902.750	127.6	-	-	101.7	22.5	3.4	175.0	359.0	Hor.
912.000	41.9	107.6	65.7	15.8	22.7	3.4	152.0	346.0	Vert.
924.000	39.8	107.6	67.8	13.1	23.3	3.4	110.0	10.0	Hor.
932.084	36.3	107.6	71.3	9.3	23.6	3.4	149.0	14.0	Vert.
Measurement uncertainty				+2.2 dB / -3.6 dB					

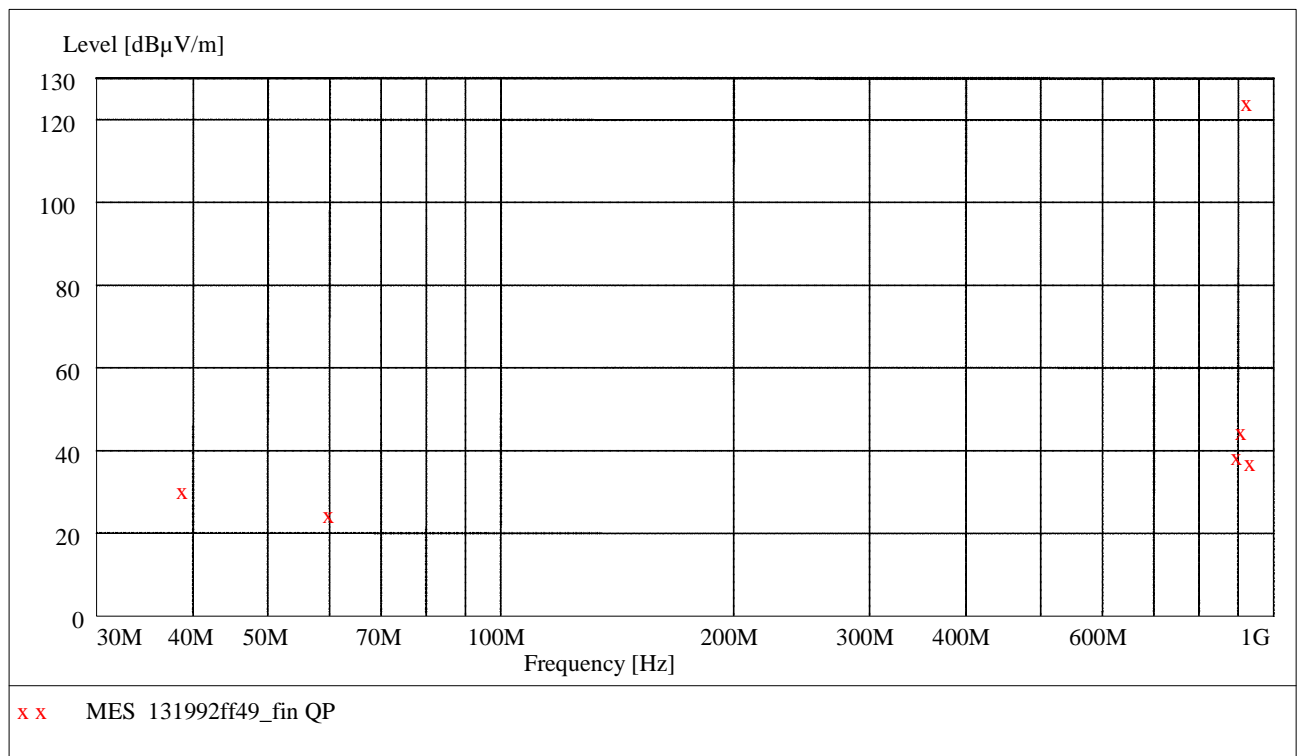
Transmitter operates on the middle of the assigned frequency band (operation mode 2)



Data record name: 131992ff24

Transmitter operates on the middle of the assigned frequency band (operation mode 2)									
Spurious emissions outside restricted bands									
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
38.945	31.3	105.9	74.6	15.5	15.1	0.7	100.0	15.0	Vert.
60.227	27.5	105.9	78.4	20.3	6.3	0.9	189.0	353.0	Vert.
897.233	32.8	105.9	73.1	7.0	22.3	3.5	225.0	359.0	Hor.
901.000	33.6	105.9	72.3	7.7	22.4	3.5	175.0	359.0	Hor.
914.750	125.9	-	-	99.7	22.8	3.4	100.0	0.0	Hor.
924.000	36.9	105.9	69.0	10.2	23.3	3.4	100.0	1.0	Hor.
Measurement uncertainty				+2.2 dB / -3.6 dB					

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



Data record name: 131992ff49

Transmitter operates on the upper end of the assigned frequency band (operation mode 3)									
Spurious emissions outside restricted bands									
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
38.945	31.3	105.0	73.7	15.5	15.1	0.7	100.0	15.0	Vert.
60.227	27.5	105.0	77.5	20.3	6.3	0.9	189.0	353.0	Vert.
901.000	39.4	105.0	65.6	13.5	22.4	3.5	175.0	359.0	Hor.
912.000	45.6	105.0	59.4	19.5	22.7	3.4	112.0	13.0	Hor.
927.250	125.0	-	-	98.2	23.4	3.4	100.0	1.0	Hor.
936.000	37.9	105.0	67.1	10.8	23.7	3.4	358.0	0.0	Vert.
Measurement uncertainty				+2.2 dB / -3.6 dB					

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
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14 - 20

5.6.2.3 Final radiated emission measurement (1 GHz to 10 GHz) of RFU620-10101

Ambient temperature	21 °C	Relative humidity	50 %
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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.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 24.0 V DC by an external power supply.

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

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

Result measured with the peak detector:

Frequency GHz	Corr. Value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.70825	41.8	74.0	32.2	35.2	28.7	26.1	4.0	150	Hor.	Yes
3.61100	48.2	74.0	25.8	38.2	31.3	25.9	4.6	150	Vert.	Yes
5.41650	44.1	74.0	29.9	28.9	33.8	24.4	5.8	150	Hor.	Yes
6.31925	48.7	107.6	58.9	32.4	34.4	24.2	6.1	150	Hor.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Result measured with the average detector:

Frequency GHz	Corr. Value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
2.70825	31.6	54.0	22.4	25.0	28.7	26.1	4.0	150	Hor.	Yes
3.61100	40.6	54.0	13.4	30.6	31.3	25.9	4.6	150	Vert.	Yes
5.41650	31.3	54.0	22.7	16.1	33.8	24.4	5.8	150	Hor.	Yes
6.31925	38.5	107.6	69.1	22.2	34.4	24.2	6.1	150	Hor.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

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

Result measured with the peak detector:

Frequency GHz	Corr. Value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1.82950	37.7	105.9	68.2	33.8	26.7	26.1	3.3	150	Hor.	No
2.74425	42.0	74.0	32.0	34.6	28.9	25.6	4.1	150	Hor.	Yes
3.65900	47.6	74.0	26.4	37.0	31.5	25.4	4.5	150	Vert.	Yes
4.57375	45.7	74.0	28.3	33.7	32.4	25.5	5.1	150	Vert.	Yes
5.48850	48.7	105.9	57.2	33.5	34.0	24.6	5.8	150	Hor.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Result measured with the average detector:

Frequency GHz	Corr. Value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1.82950	27.7	105.9	78.2	23.8	26.7	26.1	3.3	150	Hor.	No
2.74425	31.9	54.0	22.1	24.5	28.9	25.6	4.1	150	Hor.	Yes
3.65900	40.7	54.0	13.3	30.1	31.5	25.4	4.5	150	Vert.	Yes
4.57375	36.2	54.0	17.8	24.2	32.4	25.5	5.1	150	Vert.	Yes
5.48850	39.9	105.9	66.0	24.7	34.0	24.6	5.8	150	Hor.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

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

Result measured with the peak detector:

Frequency GHz	Corr. Value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1.85450	39.0	105.0	66.0	34.1	27.0	25.7	3.6	150	Hor.	No
2.78175	44.8	74.0	29.2	37.8	29.0	26.1	4.1	150	Hor.	Yes
3.70900	49.3	74.0	24.7	38.6	31.8	25.7	4.6	150	Vert.	Yes
4.63625	48.1	74.0	25.9	35.9	32.4	25.4	5.2	150	Vert.	Yes
5.56350	47.2	105.0	57.8	31.9	34.0	24.7	6.0	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Result measured with the average detector:

Frequency GHz	Corr. Value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1.85450	28.8	105.0	76.2	23.9	27.0	25.7	3.6	150	Hor.	No
2.78175	35.9	54.0	18.1	28.9	29.0	26.1	4.1	150	Hor.	Yes
3.70900	42.0	54.0	12.0	31.3	31.8	25.7	4.6	150	Vert.	Yes
4.63625	39.5	54.0	14.5	27.3	32.4	25.4	5.2	150	Vert.	Yes
5.56350	37.0	105.0	68.0	21.7	34.0	24.7	6.0	150	Vert.	No
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

29, 31 - 34, 36, 44, 45, 49, 73, 75, 146, 159, 165

5.6.2.4 Preliminary radiated emission measurement of RFU620-10501

Ambient temperature	21 °C	Relative humidity	50 %
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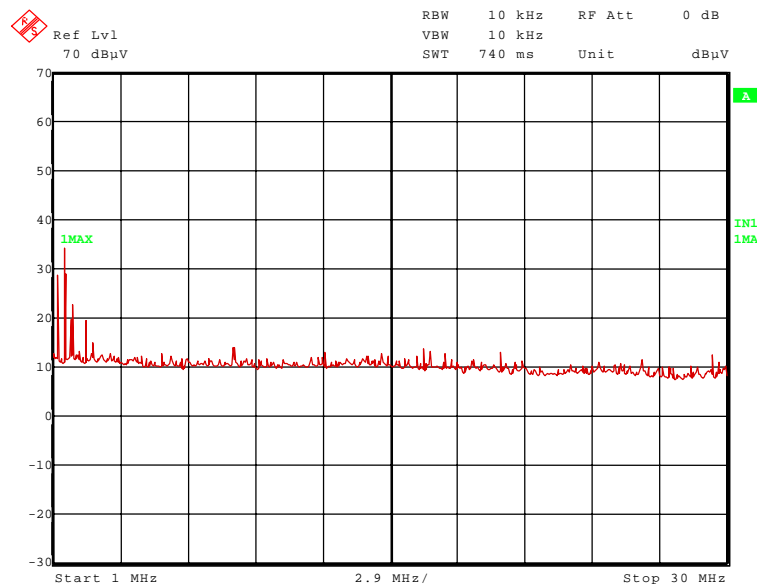
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 48.0 V DC by the PoE injector type FL PSE 2TX.

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

131991_8.wmf: Spurious emissions from 1 MHz to 30 MHz (operation mode 2):



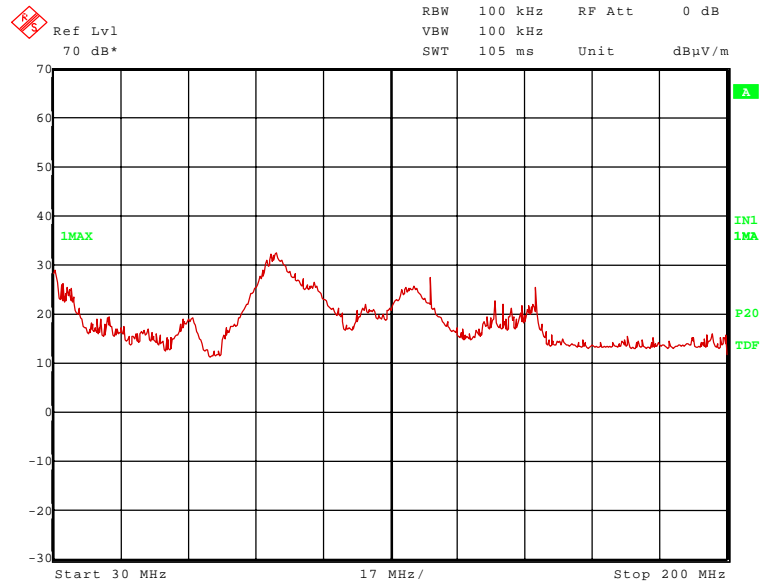
The following frequencies were found during the preliminary radiated emission measurement:

- 1.206 MHz, 1.507 MHz, 1.809 MHz, 2.412 MHz

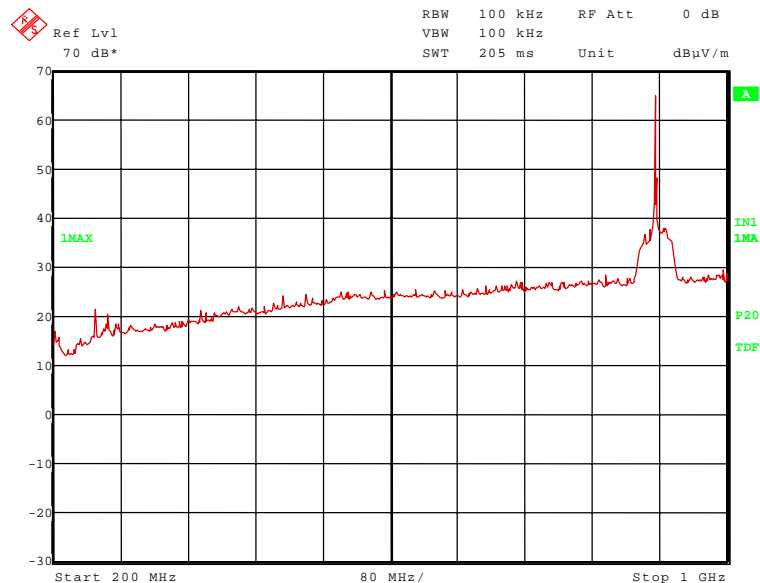
These frequencies were emitted by the used PoE-injector. So no final emission measurement has to be carried out.

TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 36, 43, 44, 45, 49, 55, 73, 75, 83. 146, 149, 150, 159 – 161, 165

131991_5.wmf: Spurious emissions from 30 MHz to 200 MHz (operation mode 2):



131991_4.wmf: Spurious emissions from 200 MHz to 1 GHz (operation mode 2, carrier notched):



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

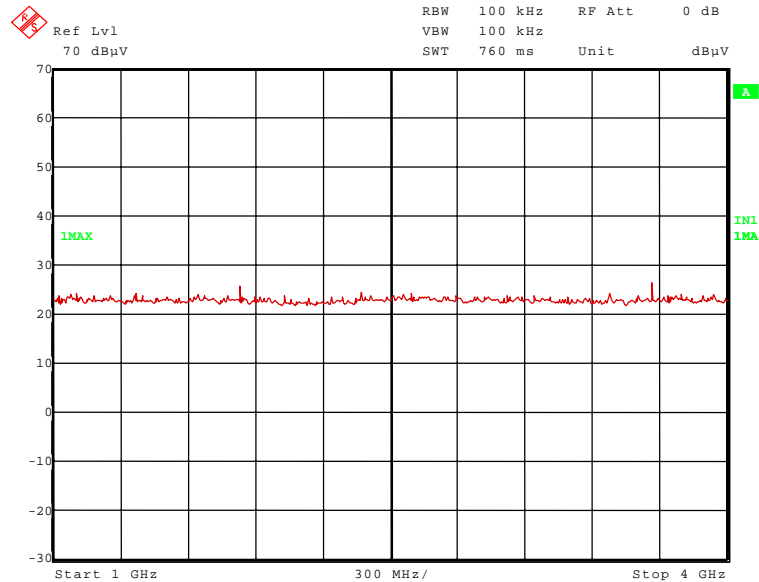
- 125.000 MHz, 250.000 MHz and 264.262 MHz.

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

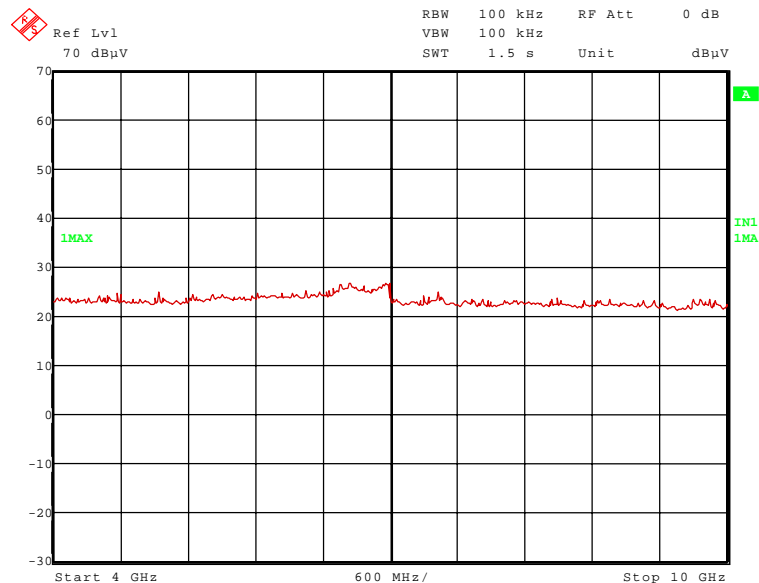
- 30.363 MHz, 64.930 MHz, 85.666 MHz, 151.490 MHz, 912.000 MHz, 914.750 MHz and 924.000 MHz

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

131991_6.wmf: Spurious emissions from 1 GHz to 4 GHz (operation mode 2):



131991_7.wmf: Spurious emissions from 4 GHz to 10 GHz (operation mode 2):



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

- 3.659 GHz.

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

- 1.8295 GHz.

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

5.6.2.5 Final radiated emission measurement (30 MHz to 1 GHz) of RFU620-10501

Ambient temperature	21 °C	Relative humidity	50 %
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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.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 48.0 V DC by the PoE injector type FL PSE 2TX.

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

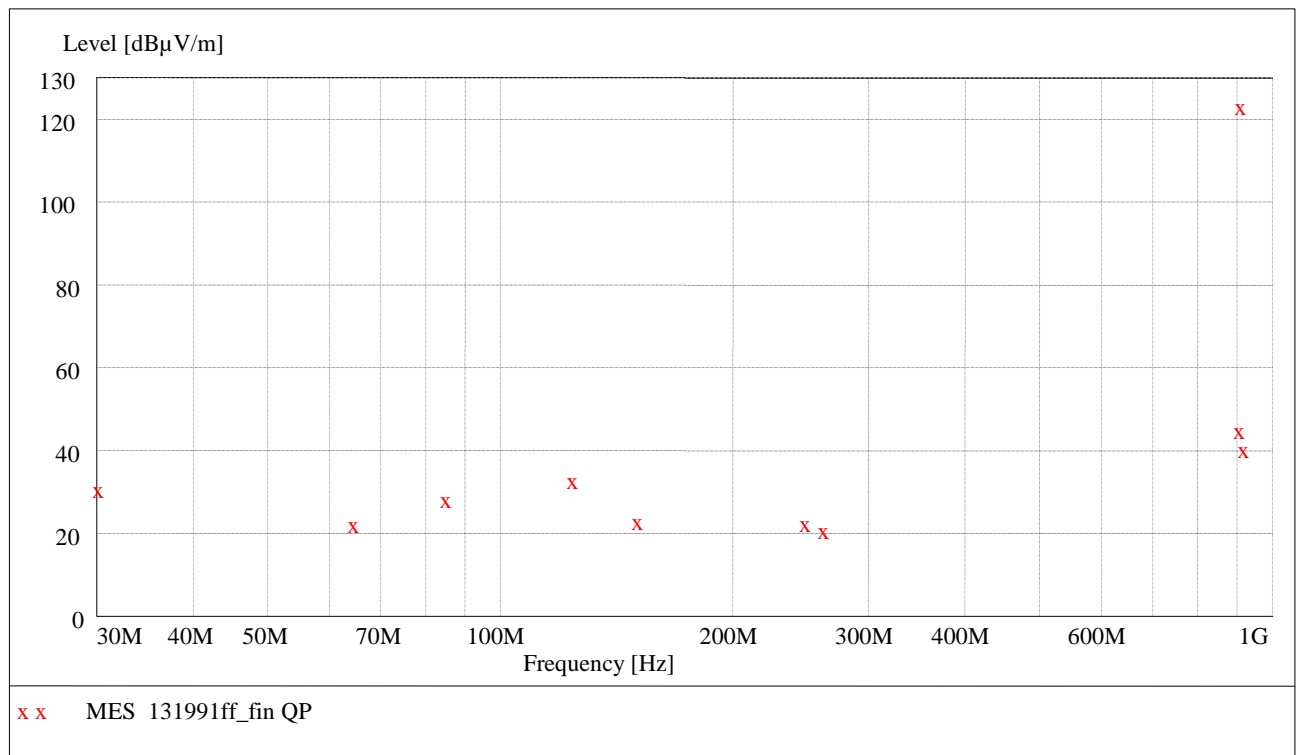
$$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{cable loss [dB]} + \text{antenna factor [dB/m]}$$

The measured points and the limit line in the following diagrams 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.

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.

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



Data record name: 131991ff

Transmitter operates on the middle of the assigned frequency band (operation mode 2)									
Spurious emissions outside restricted bands									
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.
30.363	31.3	103.8	72.5	11.2	19.5	0.6	100.0	298.0	Vert.
64.930	23	103.8	80.8	16.0	6.1	0.9	100.0	37.0	Vert.
85.666	28.9	103.8	74.9	18.8	9.0	1.1	100.0	24.0	Vert.
151.490	23.6	103.8	80.2	10.6	11.7	1.3	109.0	12.0	Vert.
912.000	45.4	103.8	58.4	19.3	22.7	3.4	112.0	7.0	Hor.
914.750	123.8	-	-	97.6	22.8	3.4	111.0	9.0	Hor.
Spurious emissions inside 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.
125.000	33.4	43.5	10.1	19.8	12.4	1.2	120.0	135.0	Vert.
250.000	23.1	46.0	22.9	9.2	12.1	1.8	102.0	328.0	Vert.
264.262	21.5	46.0	24.5	7.5	12.2	1.8	113.0	343.0	Vert.
Measurement uncertainty				+2.2 dB / -3.6 dB					

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

14 - 20

5.6.2.6 Final radiated emission measurement (1 GHz to 10 GHz) of RFU620-10501

Ambient temperature	22 °C	Relative humidity	46 %
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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.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 48.0 V DC by the PoE injector type FL PSE 2TX.

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

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

Result measured with the peak detector:

Frequency GHz	Corr. Value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1.8295	37.6	103.8	66.2	33.7	26.7	26.1	3.3	150	Hor.	No
3.659	43.4	74.0	30.6	32.8	31.5	25.4	4.5	150	Vert.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Result measured with the average detector:

Frequency GHz	Corr. Value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp dB	Cable loss dB	Height cm	Pol.	Restr. Band
1.8295	26.9	103.8	76.9	23.0	26.7	26.1	3.3	150	Hor.	No
3.659	31.5	54.0	22.5	20.9	31.5	25.4	4.5	150	Hor.	Yes
Measurement uncertainty							+2.2 dB / -3.6 dB			

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 34, 36, 44, 45, 49, 73, 75, 146, 159, 165

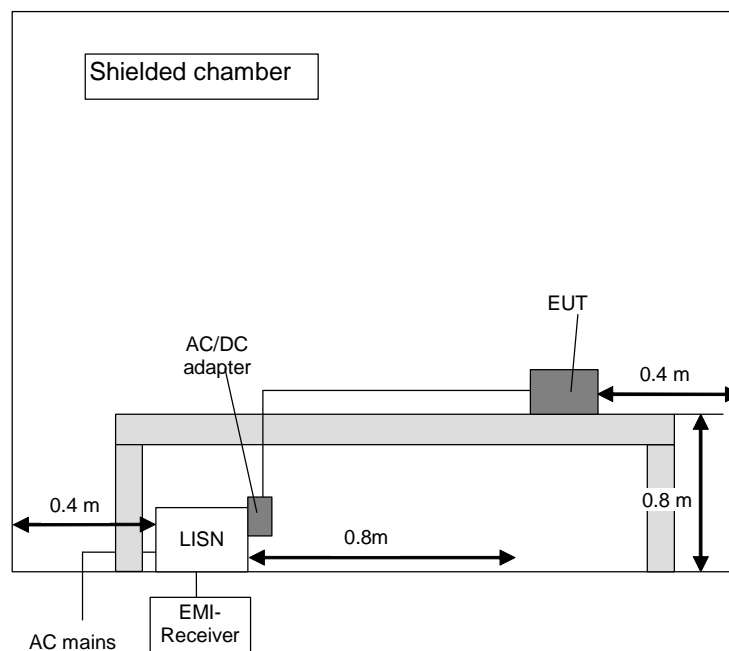
5.7 Conducted emissions on power supply lines (150 kHz to 30 MHz)

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 C63.4-2009 [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



5.7.2 Test results (conducted emissions on power supply lines) of RFU620-10101

Ambient temperature	21 °C	Relative humidity	47 %
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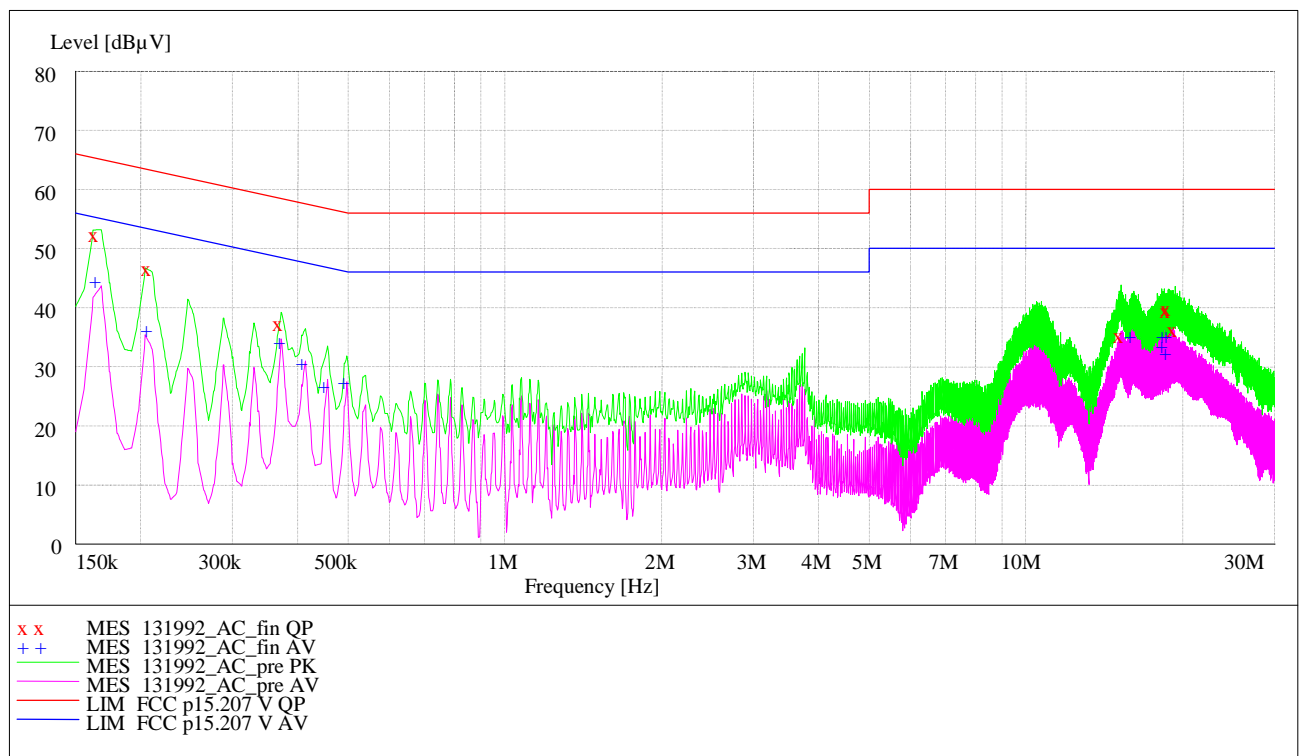
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.

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

Test record: All results are shown in the following. This test was carried out in normal hopping mode of the EUT.

Supply voltage: During all measurements the EUT was supplied with 48.0 V DC by an AC / DC adaptor type Mini PS-100-240AC/24DC/1, which was supplied by 120 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.



Data record name: 131992_AC

Result measured with the quasipeak detector (marked in the diagram by an x):

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
0.164400	52.9	1.4	65.2	12.4	L1	FLO
0.206700	47.2	1.0	63.3	16.2	N	GND
0.371400	37.8	0.9	58.5	20.6	N	FLO
15.240300	35.8	1.8	60.0	24.2	L1	GND
18.745800	40.0	2.3	60.0	20.0	N	GND
18.826800	40.3	2.3	60.0	19.7	N	GND
19.366800	36.9	2.3	60.0	23.1	L1	FLO

Result measured with the average detector (marked in the diagram by a +):

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
0.165300	45.0	1.3	55.2	10.2	L1	GND
0.206700	36.9	1.0	53.3	16.4	L1	GND
0.373200	34.8	0.9	48.4	13.7	N	FLO
0.411900	31.2	0.9	47.6	16.4	N	FLO
0.454200	27.4	0.9	46.8	19.4	L1	FLO
0.495600	28.1	0.8	46.1	17.9	N	FLO
16.019700	35.7	1.9	50.0	14.3	N	GND
18.415500	34.2	2.2	50.0	15.8	N	FLO
18.497400	35.8	2.2	50.0	14.2	N	FLO
18.745800	32.8	2.3	50.0	17.2	N	GND
18.785400	35.7	2.3	50.0	14.3	N	GND

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

1 - 4, 20

5.7.3 Test results (conducted emissions on power supply lines) of RFU620-10501

Ambient temperature	21 °C	Relative humidity	50 %
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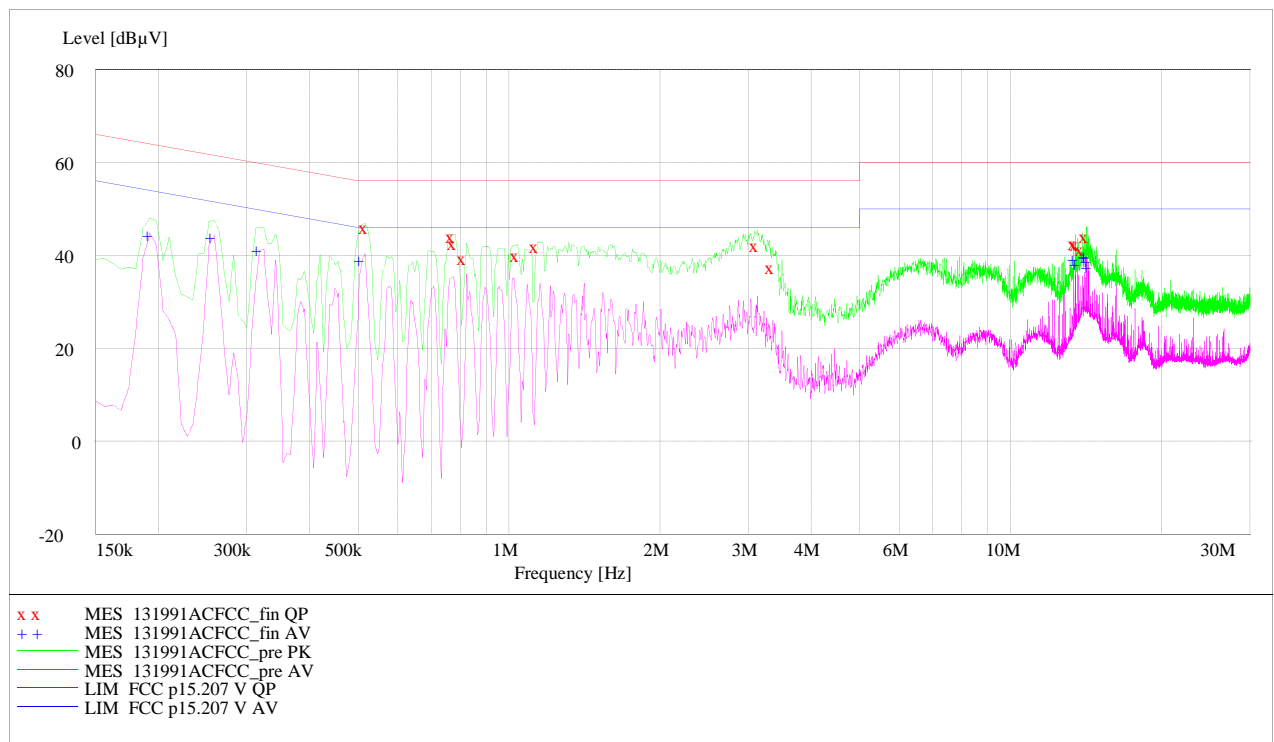
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.

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: All results are shown in the following. This test was carried out in

Supply voltage: During all measurements the EUT was supplied with 56.0 V DC by an PoE-injector type PHIHONG POE36U-1AT-R, which was supplied by 120 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.



Data record name: 131991ACFCC

Result measured with the quasipeak detector (marked in the diagram by an x):

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
0.5190	46.1	0.8	56.0	9.9	N	GND
0.7737	44.2	0.8	56.0	11.8	N	GND
0.7818	42.7	0.8	56.0	13.3	N	GND
0.8169	39.4	0.7	56.0	16.6	N	GND
1.0401	40.1	0.7	56.0	15.9	N	FLO
1.1400	42.0	0.7	56.0	14.0	N	GND
3.1236	42.3	0.7	56.0	13.7	L1	GND
3.3594	37.5	0.7	56.0	18.5	N	GND
13.4790	42.7	1.8	60.0	17.3	N	FLO
13.6023	42.5	1.9	60.0	17.5	L1	GND
13.9083	41.4	1.8	60.0	18.6	N	GND
14.2125	44.2	1.9	60.0	15.8	N	FLO

Result measured with the average detector (marked by a +):

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Line	PE
0.1932	44.7	1.1	53.9	9.2	N	FLO
0.2571	44.2	1.0	51.5	7.3	N	GND
0.3183	41.4	0.9	49.8	8.4	N	GND
0.5091	39.3	0.8	46.0	6.7	N	FLO
13.4799	39.4	1.8	50.0	10.6	N	GND
13.6032	38.4	1.9	50.0	11.6	N	FLO
14.1522	40.1	1.9	50.0	9.9	N	GND
14.2125	39.9	1.9	50.0	10.1	N	FLO
14.2737	39.2	1.9	50.0	10.8	N	GND
14.3358	37.8	1.9	50.0	12.2	N	FLO

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
1 - 4, 20

6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

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	ESIB 26	Rohde & Schwarz	1088.7490	481182	03/09/2012	03/2014
3	LISN	NSLK8128	Schwarzbeck	8128161	480138	12/20/2012	12/2013
4	High pass filter	HR 0.13- 5ENN	FSY Microwave Inc.	DC 0109 SN 002	480340	Weekly verification (system cal.)	
6	Spectrum analyser	FSU	Rohde & Schwarz	200125	480956	02/15/2012	02/2014
14	Open area test site	-	Phoenix Test-Lab	-	480085	Weekly verification (system cal.)	
15	EMI Receiver	ESIB 26	Rohde & Schwarz	1088.7490	481182	03/09/2012	03/2014
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 D	Chase	25761	480894		
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	02/13/2012	02/2014
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	04/21/2011	04/2014
36	Antenna	3115 B	EMCO	9609-4922	480184	09/28/2011	09/2014
146	Standard Gain Horn 11.9 GHz – 18 GHz	18240-20	Flann Microwave	483	480294	Six month verification (system cal.)	
149	Standard Gain Horn 17.9 GHz – 26.7 GHz	20240-20	Flann Microwave	410	480296	Six month verification (system cal.)	
150	Standard Gain Horn 26.4 GHz – 40.1 GHz	22240-20	Flann Microwave	469	480299	Six month verification (system cal.)	
43	RF-cable No. 36	Sucoflex 106B	Suhner	0522/6B	480571	Weekly verification (system cal.)	
44	RF-cable No. 3	Sucoflex 106B	Suhner	0563/6B	480670	Weekly verification (system cal.)	
45	RF-cable No. 40	Sucoflex 106B	Suhner	0708/6B	481330	Weekly verification (system cal.)	
165	RF-cable 1m	KPS-1533- 400-KPS	Insulated Wire	-	480300	Six month verification (system cal.)	
49	Preamplifier	JS3- 00101200- 23-5A	Miteq	681851	480337	Six month verification (system cal.)	
159	Preamplifier	JS3- 12001800- 16-5A	Miteq	571667	480343	04/10/2013	04/2014
160	Preamplifier	JS3- 18002600- 20-5A	Miteq	658697	480342	04/10/2013	04/2014

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. due
161	Preamplifier	JS3-26004000-25-5A	Miteq	563593	480344	04/10/2013	04/2014
55	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059	02/16/2012	02/2014
73	High Pass Filter	WHJS1000C 11/60EF	Wainwright Instruments GmbH	1	480413	Weekly verification (system cal.)	
75	High Pass Filter	WHKX4.0/18 G-8SS	Wainwright Instruments GmbH	1	480587	Weekly verification (system cal.)	
83	Tuneable Notch Filter	WRCA800/90 0-0.2/40-6EEK	Wainwright Instruments GmbH	15	480414	Weekly verification (system cal.)	

7 REPORT HISTORY

Report Number	Date	Comment
F131992E1	20 June 2013	Document created

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