

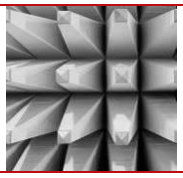

CETECOM™
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consulting - testing - certification

TEST REPORT

Test report no.: 1-0663/15-01-04

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-00

Testing laboratory

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Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-00

Applicant

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Zeyestraße 16-24
24106 Kiel / GERMANY
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Manufacturer

Raytheon Anschütz GmbH
Zeyestraße 16-24
24106 Kiel / GERMANY

Test standard/s

FCC CFR 47 Part 80	Stations in the Maritime Services
FCC CFR 47 Part 15B	Radio Frequency Devices / Unintentional Radiators

For further applied test standards please refer to section 4 of this test report.

Test Item

Kind of test item:	**Shipborne Radar - X-Band Down Mast Pedestal**
Model name:	**NSX X Down + X-Ped**
Type:	**770-002.NG001**
FCC-ID:	**ASLNSX-25D**
Frequency range:	9.3 – 9.5 GHz
Tx power conducted:	25 kW (nominal peak power)
Power Supply:	115/230 V AC
Temperature Range:	-25°C to +55°C

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

Meheza Walla
Lab Manager
Radio Communications & EMC

Test performed:

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Karsten Geraldy
Lab Manager
Radio Communications & EMC

1 Table of contents

2 General information

2.1 Notes and disclaimer

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2.2 Application details

Date of receipt of order:	2015-10-28
Date of receipt of test item:	2015-11-23
Start of test:	2015-11-25
End of test:	2015-12-04
Laboratory reference number:	038.15
Person(s) present during the test:	Mr. Daniel Hamann

3 Test location

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6 - 10
66117 Saarbruecken / GERMANY

4 Test standard/s and Reference/s

Test standard/s	Date	Description
FCC CFR 47 Part 80	2013/2014	Stations in the Maritime Services
FCC CFR 47 Part 15B	2013/2014	Radio Frequency Devices / Unintentional Radiators

Reference/s	Date	Description
ITU-R M.1177-4	2011-04	Techniques for measurement of unwanted emissions of radar systems
ITU-R SM.329-12	2012-09	Unwanted emissions in the spurious domain
ITU-R SM.1541-5	2013-08	Unwanted emissions in the out-of-band domain

5 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{min}	-30 °C
	T_{max}	+55 °C
Relative humidity:		45 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	115/230 V AC

6 Test laboratory/ies sub-contracted

none

7 Test item

7.1 General Description

Kind of test item	Shipborne Radar - X-Band Down Mast Pedestal
Model name	NSX X Down + X-Ped
Type identification	770-002.NG001 consisting of: NSX X Down MTR (770-002.NG010) and X-Ped (770-001.NG010)
S/N serial number	X-Ped: 4006109000105 NSX X Down MTR: 4006107000103
Frequency band	9.3 – 9.5 GHz
TX output power conducted	25 kW (nominal peak power of magnetron)
Type of modulation	sequence of unmodulated pulses
Type of radio transmission	P0N
Power supply	115/230 V AC
Temperature range	-25°C to +55°C

7.2 List of components

NSX X Down + X-Ped equipped with:

- 25 kW magnetron, EEV Magnetron, Type MG5424, S/N 0086619

7.3 Antenna system(s)

Antenna size	Concept	Manufacturer	Type	TX gain dBi (mid)	Polarization	pattern / test report
8 ft	endfed slotted waveguide	Kelvin Hughes	LPR-A25	31.0	horizontal	data sheet / spec. available

7.4 Operating conditions

Operating condition 1: X-Band radar, 25 kW, EEV Magnetron, Type MG5424, S/N 0086619

7.5 Additional information

The indirect test method as described in ITU-R M.1177 was used to perform the measurements.

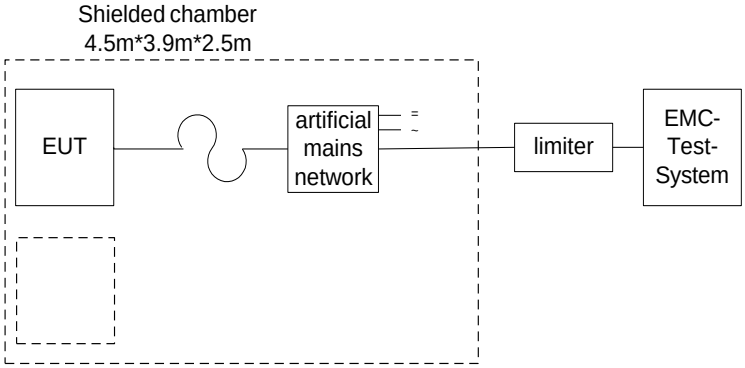
Test setup- and EUT-photos are included in test report: 1-0663_15-01-02_AnnexA (External Photos)
1-0663_15-01-02_AnnexB (Internal Photos)
1-0663_15-01-02_AnnexD (Test Setup)

8 Description of test setup

Following diagrams show possible test setups. They can be considered as applicable in general. Depending on the tests performed and/or depending on the EUT configuration (e.g. amount of different components, setup, ...) the real test setup may vary slightly from the diagrams shown below.

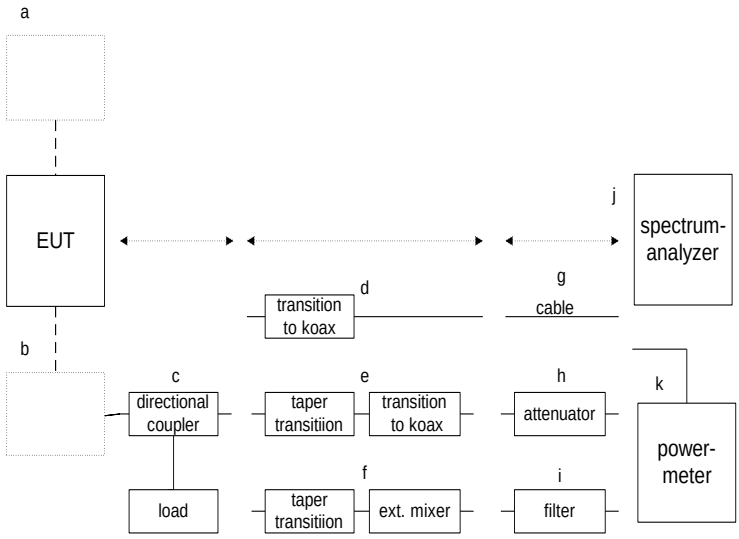
8.1 Conducted measurements

Setup 1.1: AC conducted emissions



Equipment table:
See Annex A

Setup 1.2 x...x: conducted emissions in test lab

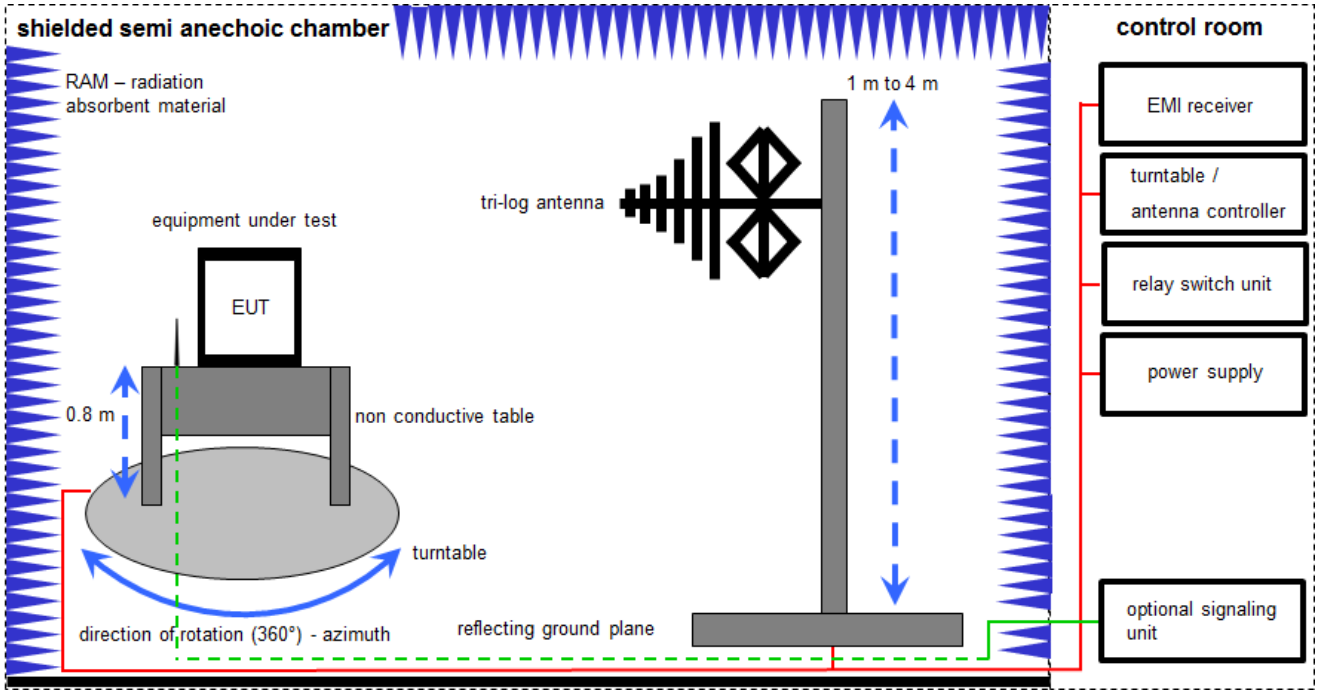


Equipment table:
See Annex A

8.2 Radiated measurements

Setup 2.1: Radiated measurements chamber F

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



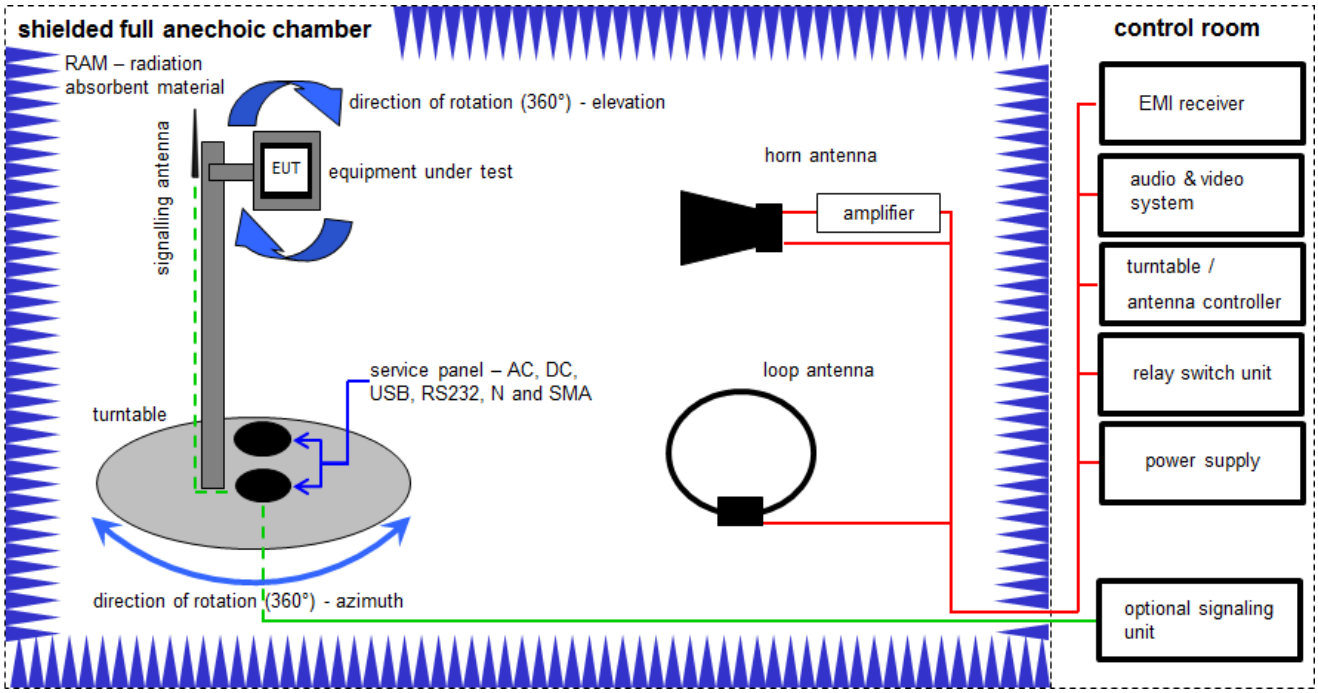
Measurement distance: tri-log antenna 10 meter

FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

Equipment table:
See Annex A

Setup 2.2: Radiated measurements chamber C



Measurement distance: tri-log antenna and horn antenna 3 meter; loop antenna 3 meter / 1 meter

FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

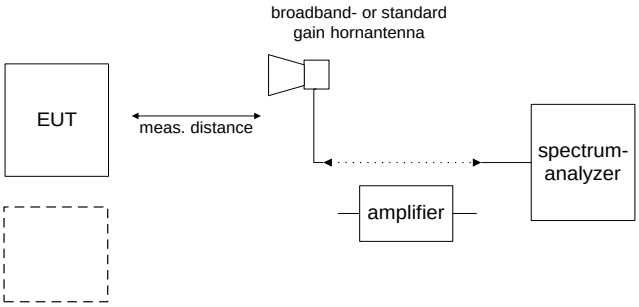
Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

OP = AV + D - G + CA
(OP-radiated output power; AV-analyzer value; D-free field atteuation of measurement distance; G-antenna gain+amplifier gain; CA-loss signal path)

Example calculation:
OP [dBm] = -65.0 [dBm] + 50 [dB] - 20 [dBi] + 5 [dB] = -30 [dBm] (1 µW)

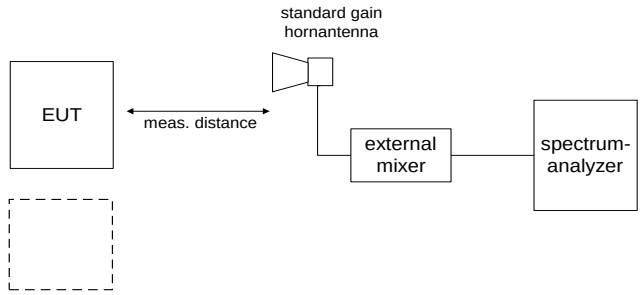
Equipment table:
See Annex A

Setup 2.3: Radiated measurements in test lab up to 50 GHz



Equipment table:
See Annex A

Setup 2.4: Radiated measurements in test lab above 50 GHz



Equipment table:
See Annex A

9 Sequence of testing

9.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.5 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the premeasurement are maximized by the software by rotating the turntable from 0° to 360°. In case of the 2-axis positioner is used the elevation axis is also rotated from 0° to 360°.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

9.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

9.3 Sequence of testing radiated spurious 1 GHz to 12.75 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

9.4 Sequence of testing radiated spurious above 12.75 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet.
- The measurement distance is as appropriate (e.g. 0.5 m).
- The EUT is set into operation.

Premeasurement

- The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.

Final measurement

- The final measurement is performed at the position and antenna orientation causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement and the limit is stored.

9.5 Test environment

The environment conditions are documented with each test (see annex(e) with measurement results).

9.6 Measurement uncertainties

The measurement and test setup is in accordance to the specification and schematically shown in 8. The reference to each test is shown in annex(e) with measurement results.

Measurement uncertainties: Potential error sources/effects in that setup:
- mismatch HF Cable - RF Input of Analyzer
- mismatch Waveguide Adaptor - HF Cable
- mismatch Waveguide Adaptor - Directional Coupler
- mismatch Pedestal Flange - Directional Coupler
- Spectrum Analyzer frequency response
- Spectrum Analyzer IF gain uncertainty
- HF-Cable frequency response calibration uncertainty
- HF-Cable frequency response data conversion uncertainty
- Directional Coupler frequency response calibration uncertainty
- Directional Coupler frequency response data conversion uncertainty
- Attenuator frequency response calibration uncertainty
- Attenuator frequency response data conversion uncertainty

Our total uncertainty for above listed factors with a 95% confidence level (acc. UKAS, ETSI) is $\leq \pm 1.5$dB.

10 Test results

10.1 Summary

☒	**No deviations from the technical specifications were ascertained**
☐	There were deviations from the technical specifications ascertained

The present test report:

☒	**describes the first test**
☐	describes an additional test
☐	is a verification of documents
☐	is only valid with the test report no.:

TC identifier	Description	Verdict	Date	Remark
RF-Testing	FCC CFR 47 Part 80 / FCC CFR 47 Part 15B	see below	2016-02-05	-/-

Test Specification Clause	Test Case	Pass	Fail	N/A	N/P	Results
§2.1046 / §80.215	Measurements required: RF power output / Transmitter power.	X				pk: 72.3 dBm avg: 40.7 dBm
§2.1047 / §80.213	Measurements required: Modulation characteristics / Modulation requirements	X				complies
§2.1049	Measurements required: Occupied bandwidth (Necessary Bandwidth)	X				max 66.0 MHz max 69.6 MHz
§2.1051 / §80.211	Measurements required: Spurious emissions at antenna terminals / Emission limitations (conducted emissions)	X				complies
§2.1053 / §80.211	Measurements required: Field strength of spurious radiation / Emission limitations (radiated emissions)	X				complies
§2.1055 / §80.209	Measurements required: Frequency stability / Transmitter frequency tolerances	X				+1013 ppm -521 ppm
§15.107	Conducted limits	X				complies
§15.109	Radiated emission limits	X				complies

N/A: Not Applicable
N/P: Not Performed

10.2 Overview

I. Transmitter characteristics / output power

Description / Limit:

§ 80.215
(a) Transmitter power shown on the radio station authorization is the maximum power the licensee is authorized to use. Power is expressed in the following terms:
(3) For P0N and F3N emission: Mean power.

Limit: no limitations

Test setup: no. 1.2

Measurement results:

Mode	T_{pulse} [ns]	T_{rise} [ns]	T_{fall} [ns]	PRF [Hz]	$P_{out\ pulse}$ [dBm]	$P_{out\ mean}$ [dBm]
short pulse	49.0	13.5	36.7	3000	71.4	33.1
medium 1 pulse	267.8	13.2	53.1	2000	72.3	39.6
medium 2 pulse	471.1	11.7	47.7	1000	72.3	39.0
long pulse	913.3	12.3	48.3	750	72.3	40.7

Note:
$P_{out\ mean}$ is calculated based on $P_{out\ pulse}$ and duty cycle of transmitter.
see also Annex B, plots 1 - 8

Result: The **measurement is passed.**

II. Modulation requirements

Description / Limit:

§ 80.213
(a) Transmitters must meet the following modulation requirements:
(g) Radar stations operating in the bands above 2.4 GHz may use any type of modulation consistent with the bandwidth requirements in § 80.209(b).

§ 80.209
(b) When pulse modulation is used in land and ship radar stations operating in the bands above 2.4 GHz the frequency at which maximum emission occurs must be within the authorized bandwidth and must not be closer than 1.5/T MHz to the upper and lower limits of the authorized bandwidth where ‘‘T’’ is the pulse duration in microseconds.

Test setup: no. 1.2

Measurement results:

see page 23, VII Transmitter frequency tolerance

Result: The **measurement is passed.**

III. Occupied bandwidth / Necessary bandwidth / $B_{-40\ dB}$ bandwidth

Description:

§ 2.1049
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

ITU-R SM.1541: Necessary bandwidth
For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions.
ITU-R SM.1541, Annex 8, 2.1 Un-modulated radar pulses
Recommendation ITU-R SM.853 provides guidance for determining the necessary bandwidth (20 dB below the peak envelope value) for rectangular and trapezoidal pulses. For these systems, the necessary bandwidth B_N is the smaller of:

$$B_N = \frac{1.79}{\sqrt{t \cdot tr}} \text{ or } \frac{6.36}{t}$$

where *t* is the pulse duration (at half amplitude) and *tr* is the rise time, both in seconds.

ITU-R SM.1541, Annex 8, 3.1 Formulas for the 40 dB bandwidth
The following formulas for the 40 dB bandwidth (B–40) of primary radar transmitters have been established. For non-FM pulse radars, including spread spectrum or coded pulse radars, the bandwidth is the lesser of:

$$B_{-40dB} = \frac{K}{\sqrt{t \cdot tr}} \text{ or } \frac{64}{t}$$

where the coefficient *K* is 7.6 for lower-power radars (< 100kW) and radars operating in the radionavigation service in the 2 900-3 100 MHz and 9 200-9 500 MHz bands. The latter expression applies if the rise time *tr* is less than about 0.0094t when *K* is 6.2, or about 0.014t when *K* is 7.6.

Limit: no limitations

Measurement results:

Mode	measured occupied bw [MHz]	calculated necessary bw [MHz]	calculated $B_{-40\ dB}$ bandwidth [MHz]	see annex C, plot no.
short pulse	66.0	69.6	295.5	5
medium 1 pulse	23.1	23.7	127.8	6
medium 2 pulse	19.0	13.5	102.4	7
long pulse	12.0	6.96	70.1	8

Note:
see also Annex C, plots 5 – 8

Result: The **measurement is passed.**

IV. Emission limits (RF spectrum mask)

Description / Limit:

§ 80.211
The emissions must be attenuated according to the following schedule:
(f) The mean power when using emissions other than those in paragraphs (a), (b), (c) and (d) of this section:
(1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB;
(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus 10log10 (mean power in watts) dB.

Test setup: no. 1.2

Measurement results:

Mode	see following plots
short pulse	Annex C, plot no. 9
medium 1 pulse	Annex C, plot no.10
medium 2 pulse	Annex C, plot no.11
long pulse	Annex C, plot no.12

Note:
see also Annex C, plots 9 – 12

Result: **The measurement is passed.**

V. Emissions limits (conducted emissions)

Description / Limit:

§ 80.212
The emissions must be attenuated according to the following schedule:
(f) The mean power when using emissions other than those in paragraphs (a), (b), (c) and (d) of this section:
(1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB;
(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus 10log10 (mean power in watts) dB.

Test setup: no. 1.2

Measurement results:

Conducted Spurious Emissions [dBm]								
short pulse			limit line			long pulse		
F [GHz]	Detector	Level [dBm]	Limit [dBm]		Limit [dBm]	F [GHz]	Detector	Level [dBm]
18.84	RMS	-43.0	-13		-13	18.84	RMS	-31.2
28.24	RMS	-67.7	-13		-13	28.26	RMS	-56.9
Measurement uncertainty			± 1.5 dB					

n.f. = nothing found

Note:
see also Annex C, plots 13 – 20

For performing the measurements the indirect test method as described in ITU-R M.1177-4 was used. A directional coupler with dummy load was connected at the transmitter output.

Result: **The measurement is passed.**

VI. Emissions limits (radiated emissions)

Description / Limit:

§ 80.212
The emissions must be attenuated according to the following schedule:
(f) The mean power when using emissions other than those in paragraphs (a), (b), (c) and (d) of this section:
(1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB;
(2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and
(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus 10log10 (mean power in watts) dB.

Test setup: no. 2.2 and 2.3

Measurement results:

Radiated Spurious Emissions [dBm]								
short pulse			limit line			long pulse		
F [GHz]	Detector	Level [dBm]	Limit [dBm]		Limit [dBm]	F [GHz]	Detector	Level [dBm]
11.19	RMS	-63.3	-13		-13	11.19	RMS	-67.2
18.84	RMS	-55.3	-13		-13	18.83	RMS	-42.8
28.26	RMS	-63.7	-13		-13	28.25	RMS	-57.7
Measurement uncertainty			± 3 dB					

n.f. = nothing found
v / h = vertical / horizontal

Note:
see also Annex C, plots 21 – 30

Result: **The measurement is passed.**

VII. Transmitter frequency tolerance

Description:

§ 80.209
(b) When pulse modulation is used in land and ship radar stations operating in the bands above 2.4 GHz the frequency at which maximum emission occurs must be within the authorized bandwidth and must not be closer than 1.5/T MHz to the upper and lower limits of the authorized bandwidth where ‘‘T’’ is the pulse duration in microseconds.

Mode	T_{pulse} [ns]	1.5/T [MHz]	f_{min} [GHz]	f_{max} [GHz]
short pulse	49.0	30.61	9.3306	9.4694
medium 1 pulse	267.8	5.60	9.3056	9.4944
medium 2 pulse	471.1	3.18	9.3032	9.4968
long pulse	913.3	1.64	9.3016	9.4984

Note:
f_{min} and f_{max} are based on 9.3 GHz – 9.5 GHz band.

Test setup: no. 1.2

Measurement results:

Temperature	Voltage	Reference Frequency	Measured Frequency	Deviation [MHz]	Deviation [ppm]
-30	115	9414012500	9423545000	9532500	1013
-20	115	9414012500	9421487500	7475000	794
-10	115	9414012500	9419482500	5470000	581
0	115	9414012500	9417487500	3475000	369
10	115	9414012500	9415642500	1630000	173
20	115	9414012500	9414012500	0	0
20	115	9414012500	9414012500	0	0
20	98	9414012500	9414012500	0	0
30	132	9414012500	9412372500	-1640000	-174
40	115	9414012500	9410842500	-3170000	-337
50	115	9414012500	9409112500	-4900000	-521

Result: **The measurement is passed.**

VIII. AC conducted limits

Description / Limit:

§15.107 / 207
(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of emission [MHz]	Conducted limit [dBµV]	
	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

*Decreases with the logarithm of the frequency.

Test setup: 1.1

Measurement results:

AC conducted emissions < 30 MHz [dBµV/m]		
Frequency [MHz]	Detector	Level [dBµV/m]
No critical peaks detected. All detected peak values are below the average limits.		
Measurement uncertainty	± 3 dB	

Note:
see also Annex D, plot 1 – 2

Result: The **measurement is passed.**

IX. Radiated emission limits

Description / Limit:

§15.109 / 209
(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission [MHz]	Field strength [microvolts/meter]	Field strength [dBµV/meter]	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)		300
0.490 – 1.705	24000/F(kHz)		30
1.705 – 30	30	29.5	30
30 – 88	100	40.0	3
88 – 216	150	43.5	3
216 – 960	200	46.0	3
above 960	500	54.0	3

(c) In the emission tables above, the tighter limit applies at the band edges.

Test setup: 2.1 – 2.3

Measurement results:

Spurious Emissions Radiated [dBµV/m]		
Frequency [GHz]	Detector	Level [dBµV/m]
No critical peaks detected. All detected peak values are below the average limits.		
Measurement uncertainty	± 3 dB	

Note:
see also Annex D, plots 3 – 8

Result: The **measurement is passed.**

Annex A Test equipment and ancillaries used for tests

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Chamber ´G´ / AC conducted emissions:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Netznachbildung	ESH3-Z5	R&S	892475/017	300002209	k	17.06.2014	17.06.2016
2	68	EMI-Receiver	8542E	HP	3617A00170	300000568	k	28.01.2015	28.01.2016
3	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	11.02.2014	11.02.2016

Semi Anechoic Chamber ´F´:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Netznachbildung	ESH3-Z5	R&S	892475/017	300002209	k	17.06.2014	17.06.2016
2	45	Switch-Unit	3488A	HP	2719A14505	300000368	ev		
3	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne		
4	68	EMI-Receiver	8542E	HP	3617A00170	300000568	k	28.01.2015	28.01.2016
5	67	RF-Filter-section	85420E	HP	3427A00162	300002214	k	27.11.2006	

Fully Anechoic Chamber ´C´:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	Ve	20.01.2015	20.01.2018
2	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vlKl!	20.05.2015	20.05.2017
3	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
4	n. a.	Switch / Control Unit	3488A	HP	*	300000199	ne		
5	9	Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155	ne		
6	90	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
7	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
8	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
9	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
10	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
11	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vlKl!	29.10.2014	29.10.2017
12	n. a.	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	06.03.2015	06.03.2016
13	n. a.	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne		
14	n. a.	EMI Test Receiver 9kHz-26,5GHz	ESR26	R&S	101376	300005063	k	04.09.2015	04.09.2016

Test laboratory ´RCE-SYS´:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	U231	Stub Tuner (double)	N300A	Microlab/Fxr	00419	300002042	ev		
2	W240	Directional Coupler RPS90	90-2-N-F-40-SP-SP-C	CMT	900687-002	300001598	ev		
3	C219	HF-Cable	ST18/SMAm/SMAm/72	H&S	-/-	-/-	ev		
4		Dummy Load 250 kW	Model 320B	Narda	-/-	300002371	ev		
5	R001	Spectrum Analyzer 9kHz-50GHz portable spectrum analyzer	8565E	HP Meßtechnik	3515A00283	300000916	Ve	12.02.2015	12.02.2017
6	W241	Waveguide Directional Coupler, 8.2 to 12.4 GHz, 20 dB	X752D	HP	1829A21784	300000484	ev		
7	U214	Attenuator (N-connector)	10 dB / 10 W	Spinner	745379	400000047	ev		
8		RF Peak Power Analyzer+ PPA Sensor	4500B + 58318	Boonton Electronics	12331 + 6276	300003871	k	28.01.2015	28.01.2016
9	11b	Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268	ev		
10	CR 79	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	7911	300001751	ne		
11	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	14.08.2015	14.08.2017
12	A029	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda		300000486	k	10.09.2015	10.09.2017
13		PXA Spectrum Analyzer 3Hz to 50GHz	N9030A PXA Signal Analyzer	Agilent Technologies	US51350267	300004338	k	07.01.2015	07.01.2016
14	BAT	Climatic Chamber	TW-60/3Ex/I	CTS GmbH	094009	300003884	ne		

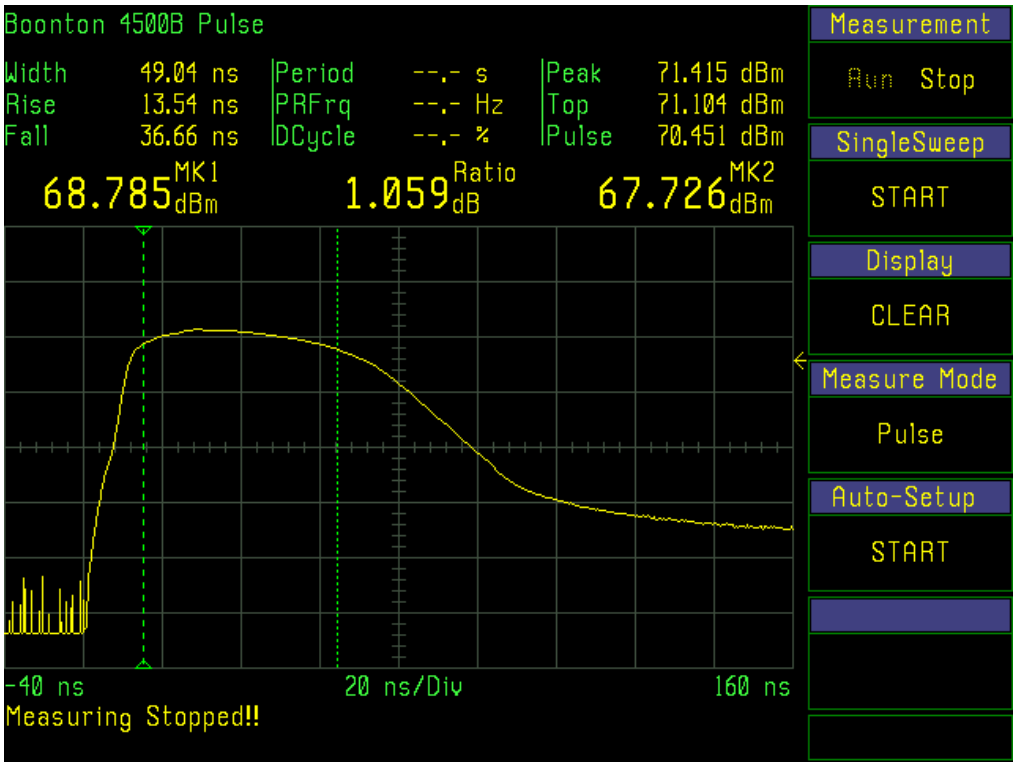
Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

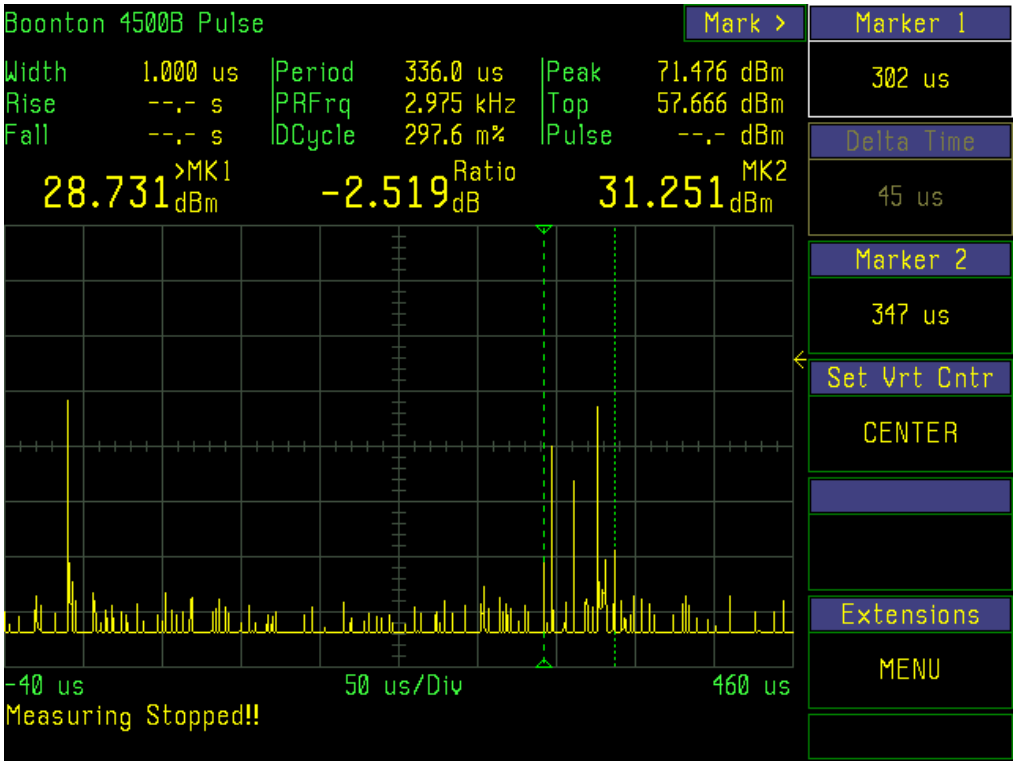
Annex B Measurement results, part 1 (PPA)

This annex consists of 5 pages including this page.

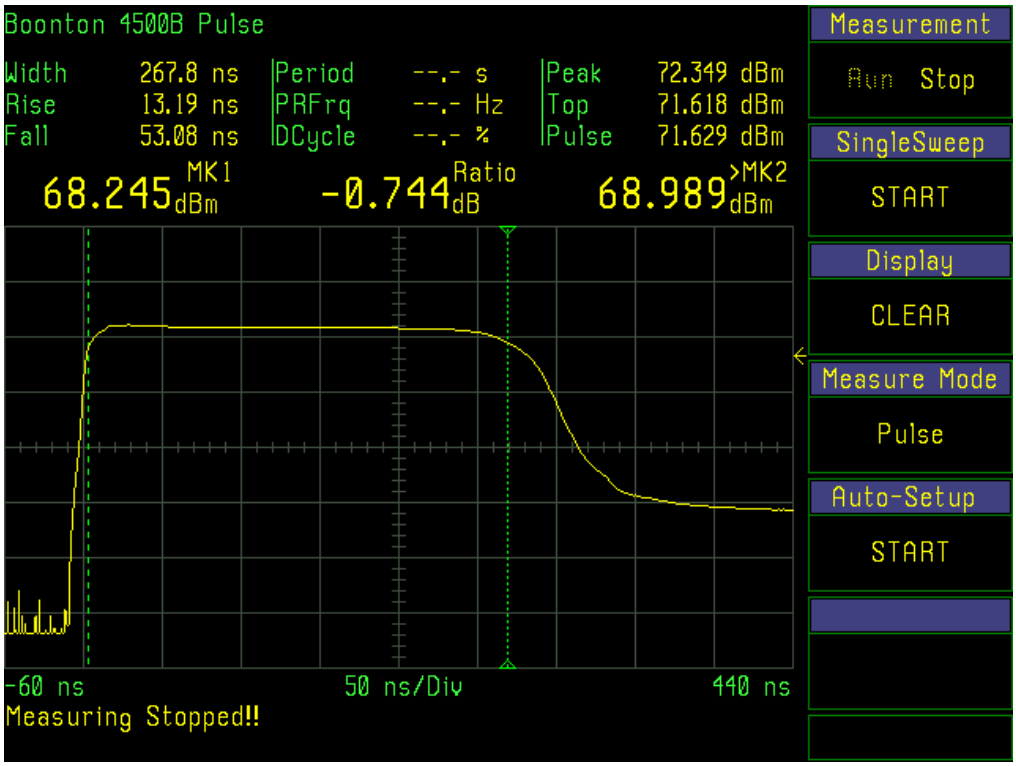
Plot No. 1: short pulse



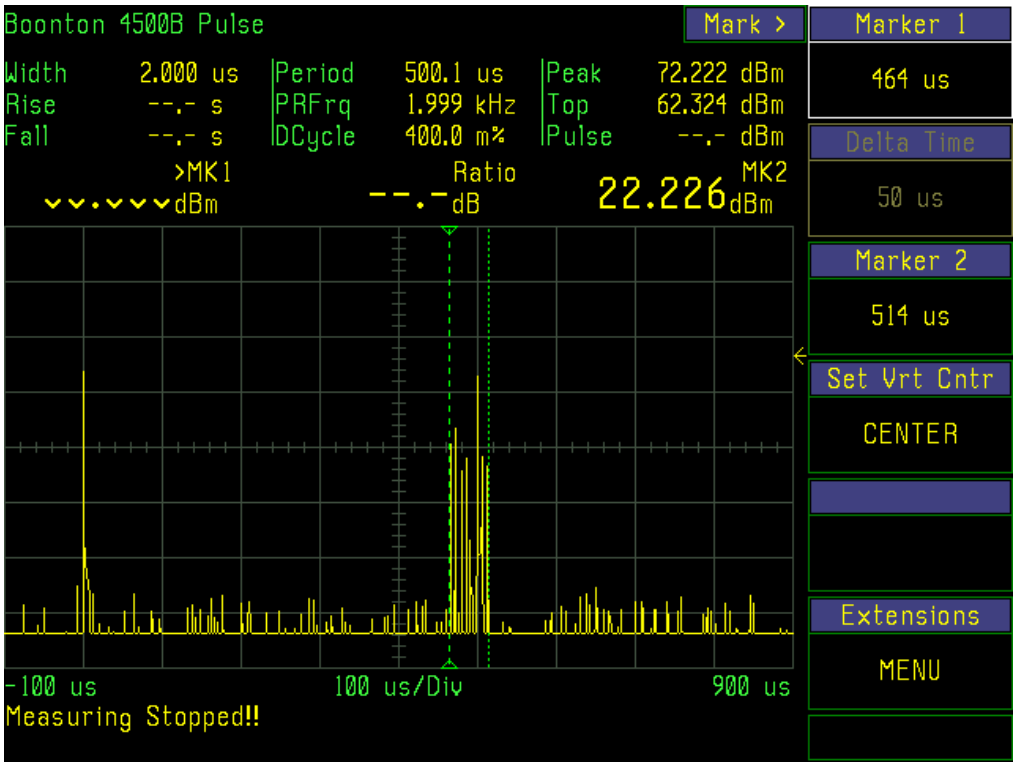
Plot No. 2: short pulse



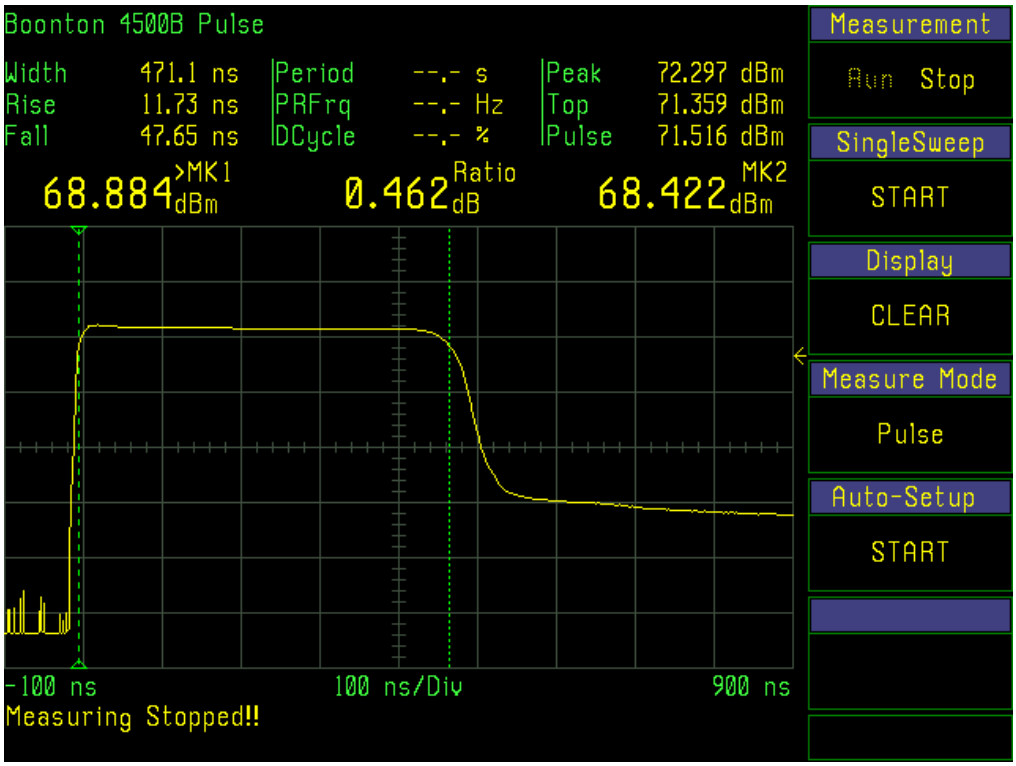
Plot No. 3: medium 1 pulse



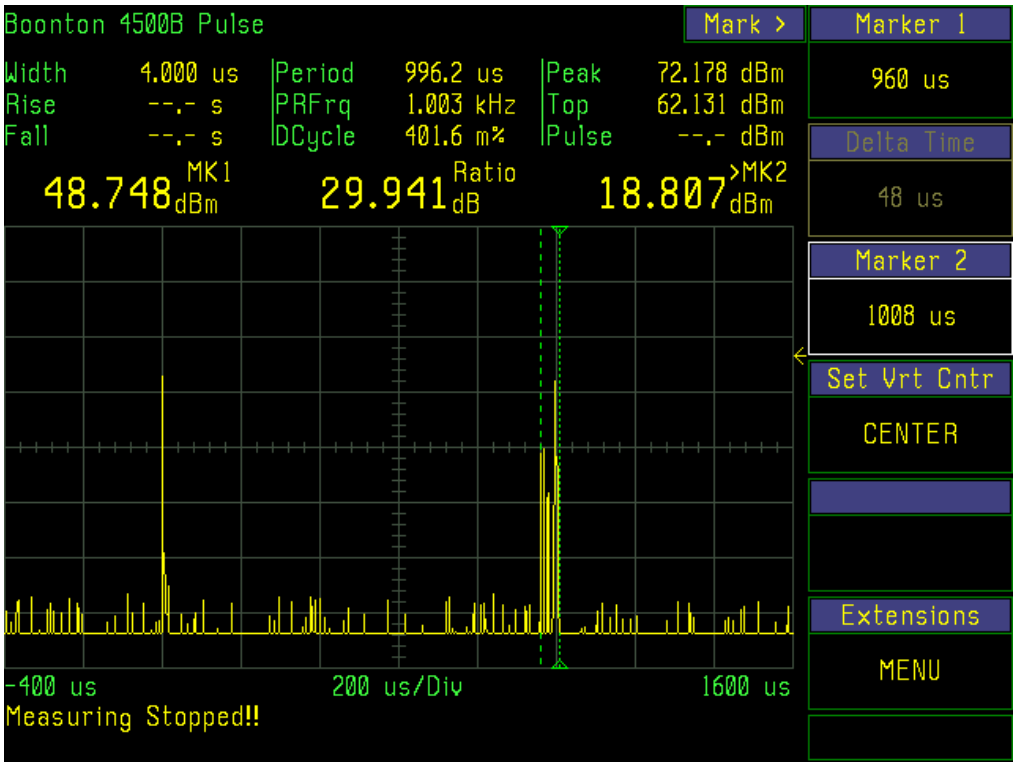
Plot No. 4: medium 1 pulse



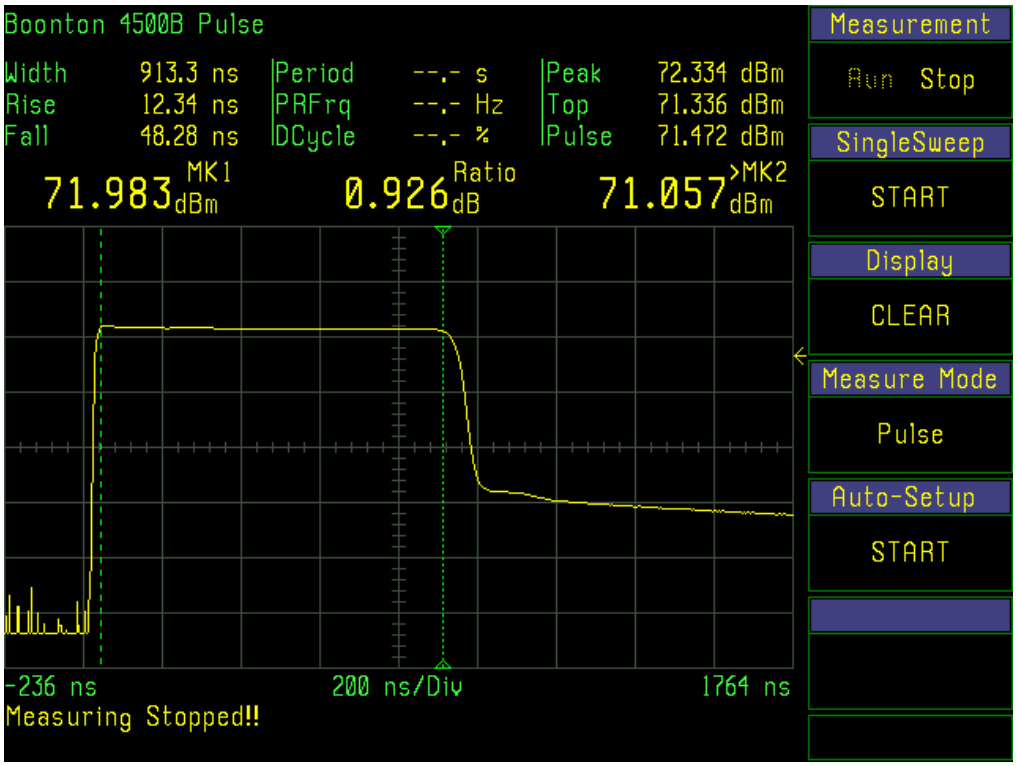
Plot No. 5: medium 2 pulse



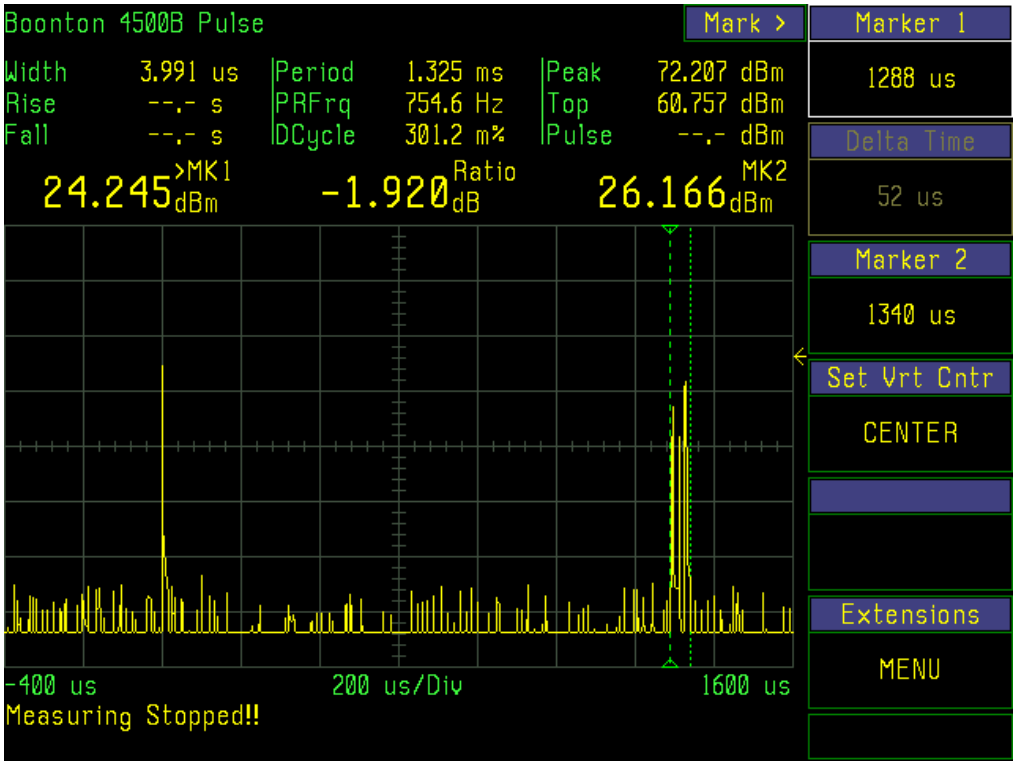
Plot No. 6: medium 2 pulse



Plot No. 7: long pulse



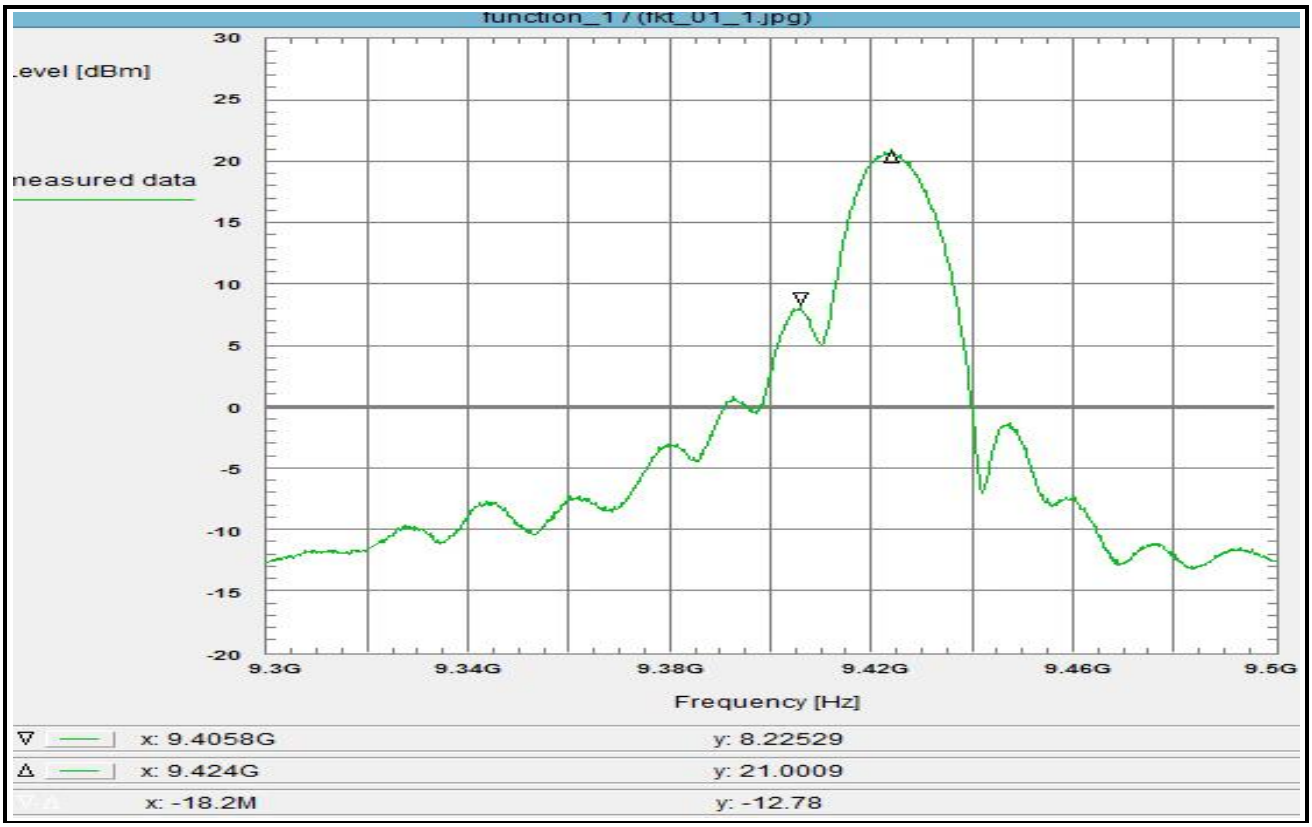
Plot No. 8: long pulse



Annex C Measurement results, part 2 (FCC Part 80)

This annex consists of 31 pages including this page.

Plot No. 1 (30)



Subclause: -/- Function test, frequency and power
Short pulse / medium pulse / long pulse
Measurement within the allocated band: 9.3 - 9.5 GHz

Limit:
no limits defined

This test serves to verify the general function of the EUT and to orientate regarding to the spurious emissions which are expected within the band, furthermore for comparison of the measured power with the rated value.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
short pulse

Test setup:
see section 8.1: 1.2cdhgj

Test equipment:
see annex 2: C219, R001, U214, W240, W242

Remark:

Test result: **measurement for orientation**

Environment condition:

Date & Time:	Tue 24/Nov/2015 10:08:38	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

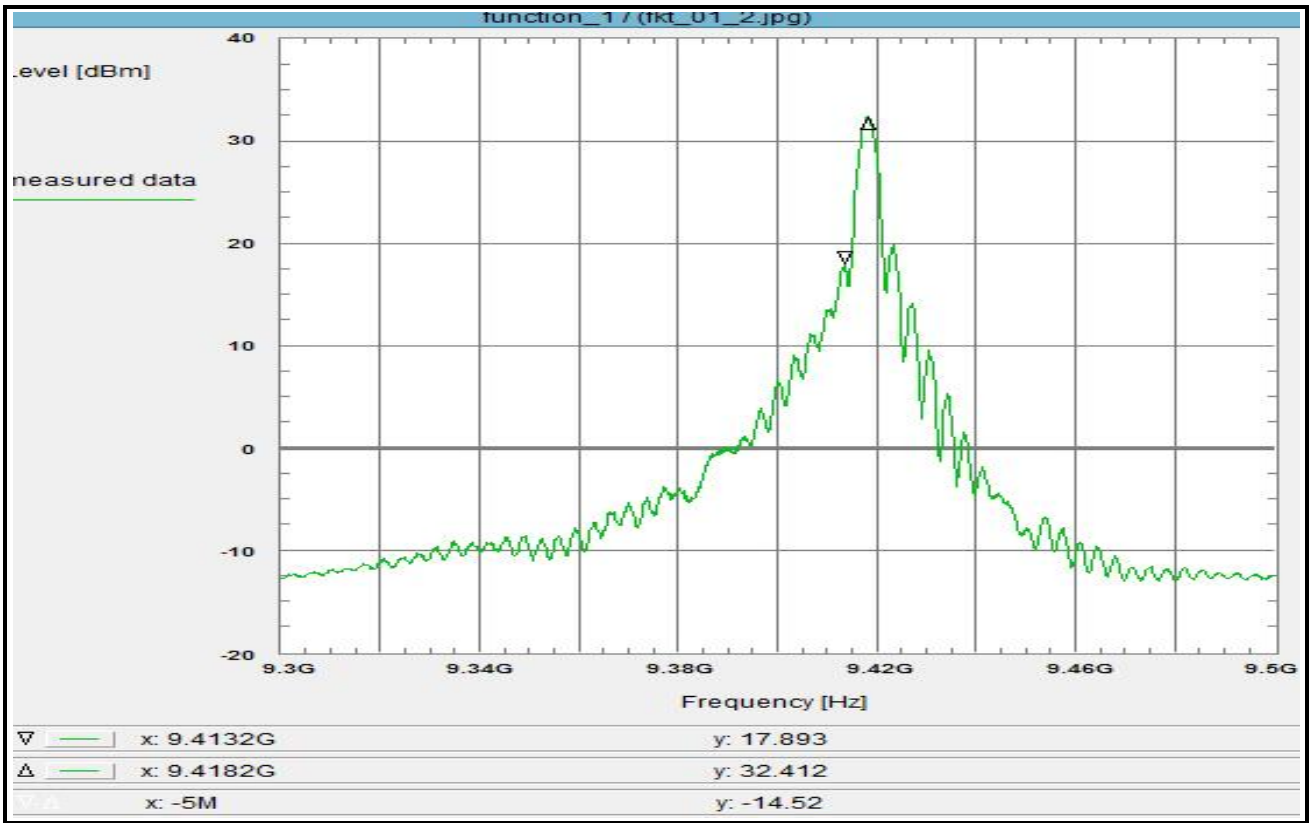
Start frequency:	9.3	GHz
Stop frequency:	9.5	GHz
Center frequency:	9.4	GHz
Frequency span:	200	MHz
Resolution-BW:	1	MHz
Video-BW:	100	kHz
Input attenuation:	20	dB
Trace-Mode:	Clear Write	
Detector-Mode:	AVG	

Correction:

Directional coupler (W240)	+	44.0	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U214)	+	9.5	dB
TOTAL CORRECTION:	+	55.3	dB

Remarks:
Test of general function of the EUT and measurement for orientation

Plot No. 2 (30)



Subclause: -/- Function test, frequency and power
Short pulse / medium pulse / long pulse
Measurement within the allocated band: 9.3 - 9.5 GHz

Limit:
no limits defined

This test serves to verify the general function of the EUT and to orientate regarding to the spurious emissions which are expected within the band, furthermore for comparison of the measured power with the rated value.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
med1 pulse

Test setup:
see section 8.1: 1.2cdhgj

Test equipment:
see annex 2: C219, R001, U214, W240, W242

Remark:

Test result: **measurement for orientation**

Environment condition:

Date & Time:	Tue 24/Nov/2015 10:25:13	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

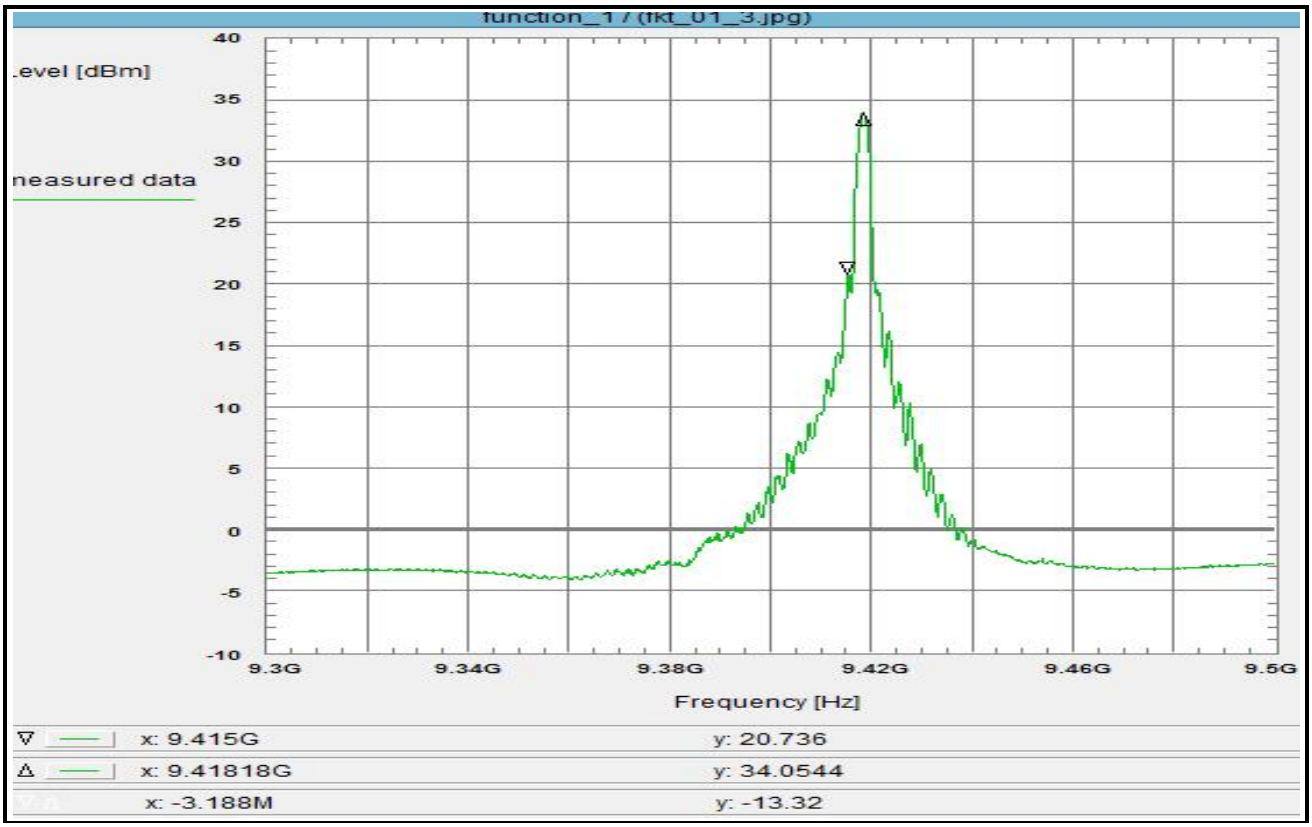
Start frequency:	9.3	GHz
Stop frequency:	9.5	GHz
Center frequency:	9.4	GHz
Frequency span:	200	MHz
Resolution-BW:	1	MHz
Video-BW:	100	kHz
Input attenuation:	20	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

Correction:

Directional coupler (W240)	+	44.0	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U214)	+	9.5	dB
TOTAL CORRECTION:	+	55.3	dB

Remarks:
Test of general function of the EUT and measurement for orientation

Plot No. 3 (30)



Subclause: -/- Function test, frequency and power
Short pulse / medium pulse / long pulse
Measurement within the allocated band: 9.3 - 9.5 GHz

Limit:
no limits defined

This test serves to verify the general function of the EUT and to orientate regarding to the spurious emissions which are expected within the band, furthermore for comparison of the measured power with the rated value.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
med2 pulse

Test setup:
see section 8.1: 1.2cdhgj

Test equipment:
see annex 2: C219, R001, U214, W240, W242

Remark:

Test result: **measurement for orientation**

Environment condition:

Date & Time:	Tue 24/Nov/2015 10:35:12	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

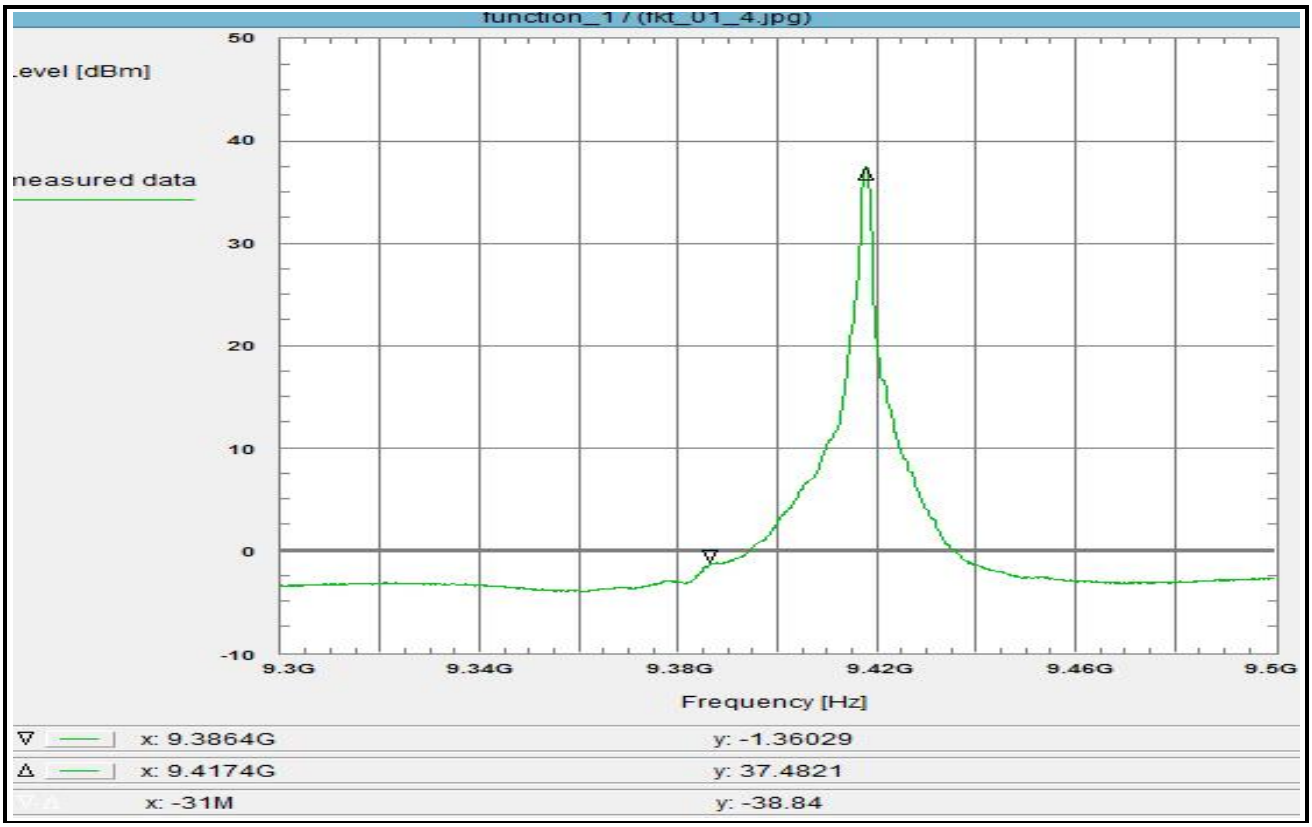
Start frequency:	9.3	GHz
Stop frequency:	9.5	GHz
Center frequency:	9.4	GHz
Frequency span:	200	MHz
Resolution-BW:	1	MHz
Video-BW:	100	kHz
Input attenuation:	30	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

Correction:

Directional coupler (W240)	+	44.0	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U214)	+	9.5	dB
TOTAL CORRECTION:	+	55.3	dB

Remarks:
Test of general function of the EUT and measurement for orientation

Plot No. 4 (30)



Subclause: -/- Function test, frequency and power
Short pulse / medium pulse / long pulse
Measurement within the allocated band: 9.3 - 9.5 GHz

Limit:
no limits defined

This test serves to verify the general function of the EUT and to orientate regarding to the spurious emissions which are expected within the band, furthermore for comparison of the measured power with the rated value.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
long pulse

Test setup:
see section 8.1: 1.2cdhgj

Test equipment:
see annex 2: C219, R001, U214, W240, W242

Remark:

Test result: **measurement for orientation**

Environment condition:

Date & Time:	Tue 24/Nov/2015 10:36:54	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

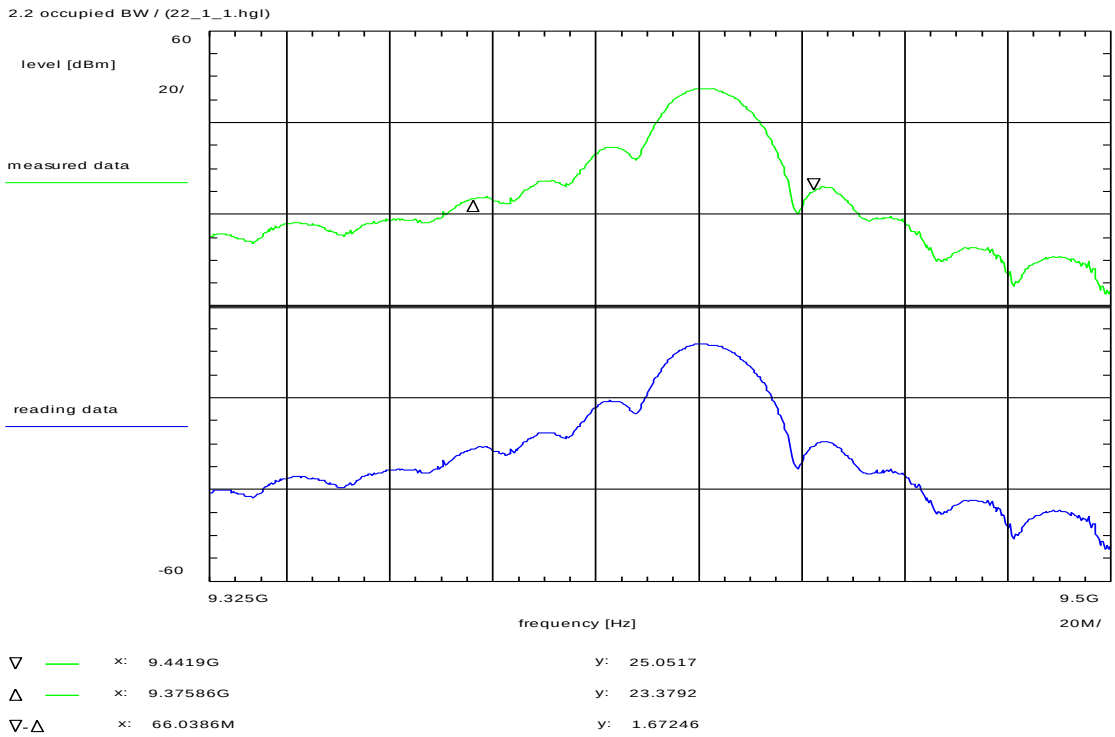
Start frequency:	9.3	GHz
Stop frequency:	9.5	GHz
Center frequency:	9.4	GHz
Frequency span:	200	MHz
Resolution-BW:	1	MHz
Video-BW:	100	kHz
Input attenuation:	30	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

Correction:

Directional coupler (W240)	+	44.0	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U214)	+	9.5	dB
TOTAL CORRECTION:	+	55.3	dB

Remarks:
Test of general function of the EUT and measurement for orientation

Plot No. 5 (30)



Subclause: -/- Verification of the occupied bandwidth (99% bandwidth)
Short pulse / medium pulse / long pulse
Measurement within the allocated band: 9.3 - 9.5 GHz

Limit:
The occupied bandwidth is defined as the width of a frequency band
such that, below the lower and above the upper frequency limits,
the mean powers emitted are each equal to 0.5% of the emitted power.
This is also known as the 99% emission bandwidth.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see section 7.4
short pulse

Test setup:
see section 8.1: 1.2cdgj

Test equipment:
see annex A: C219, R001, U214, W240, W242

Remark:

Test result: **occupied bandwidth**

Environment condition:

Date & Time:	Mon 23/Nov/2015 14:10:35	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

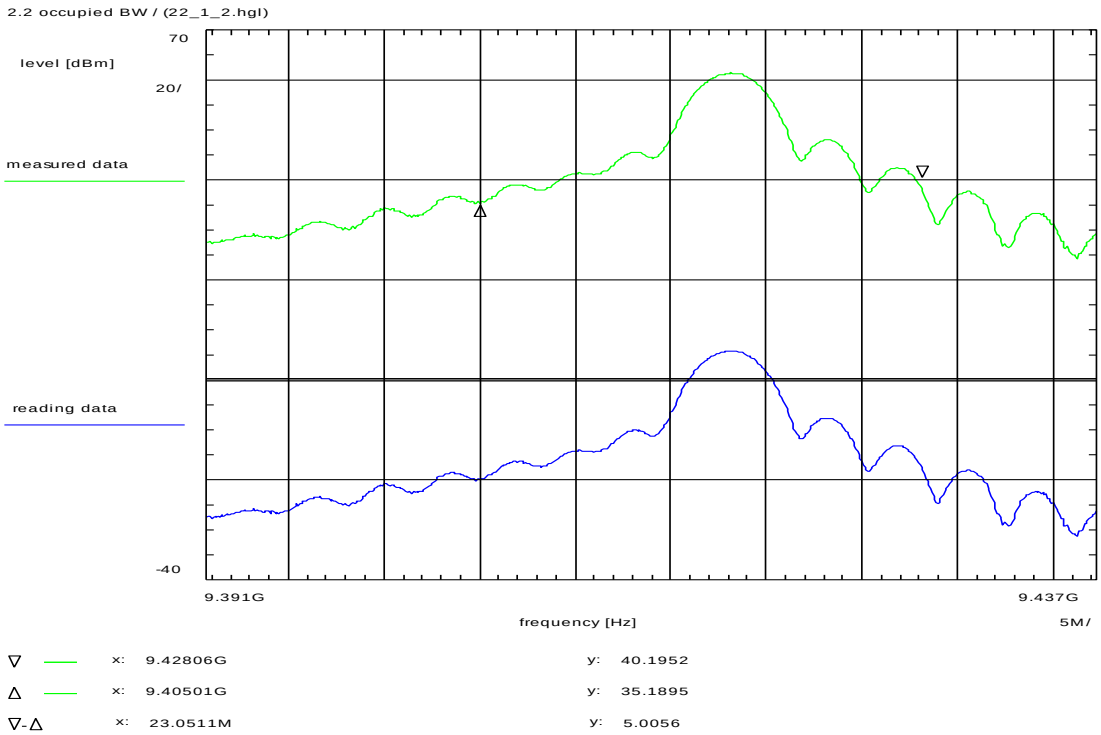
Start frequency:	9.324722764	GHz
Stop frequency:	9.499722764	GHz
Center frequency:	9.412222764	GHz
Frequency span:	175	MHz
Input attenuation:	10	dB
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Video-Average:	1	sweep(s) (>1)
Detector-Mode:	2	Pos Peak (Maximum-Hold)

Correction (average):

Directional coupler (W240)	+	43.9	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield attenuation (U214)	+	9.5	dB
TOTAL CORRECTION:	+	55.2	dB

Remarks:
The measured value is about 66 MHz (delta marker).

Plot No. 6 (30)



Subclause: -/- Verification of the occupied bandwidth (99% bandwidth)
Short pulse / medium pulse / long pulse
Measurement within the allocated band: 9.3 - 9.5 GHz

Limit:
The occupied bandwidth is defined as the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5% of the emitted power. This is also known as the 99% emission bandwidth.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see section 7.4
medium1 pulse

Test setup:
see section 8.1: 1.2cdgj

Test equipment:
see annex A: C219, R001, U214, W240, W242

Remark:

Test result: **occupied bandwidth**

Environment condition:

Date & Time:	Mon 23/Nov/2015 14:12:29	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

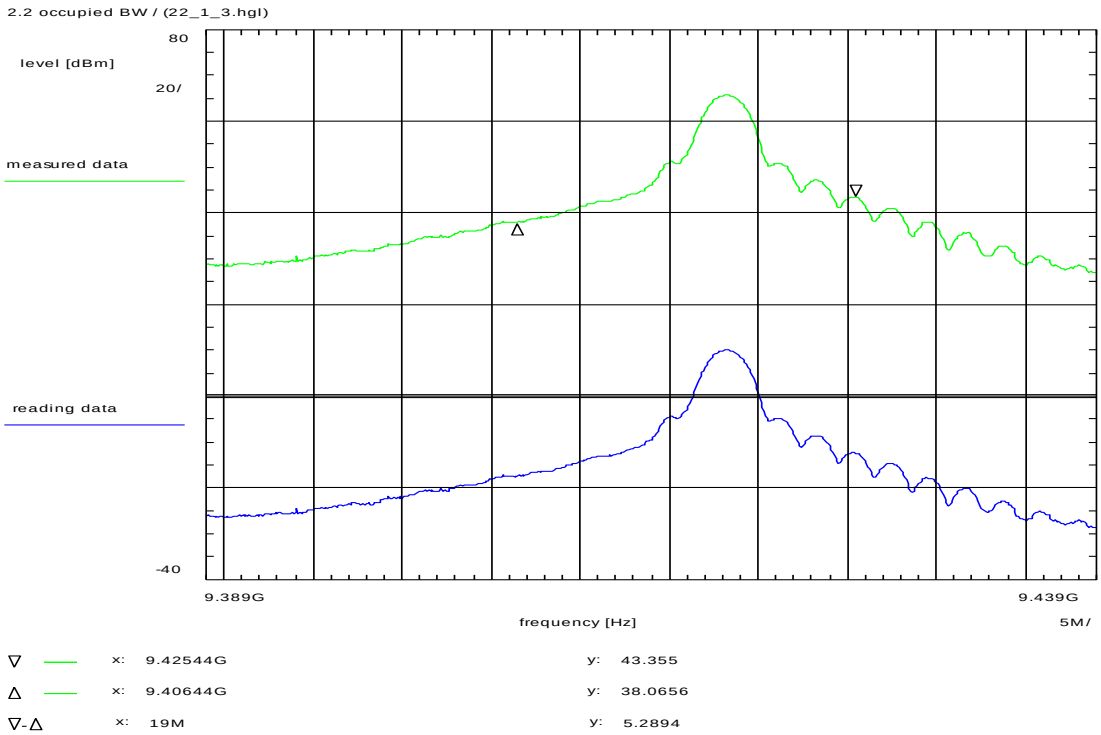
Start frequency:	9.390654872	GHz
Stop frequency:	9.437222766	GHz
Center frequency:	9.413938819	GHz
Frequency span:	46.567894	MHz
Input attenuation:	20	dB
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Video-Average:	1	sweep(s) (>1)
Detector-Mode:	2	Pos Peak (Maximum-Hold)

Correction (average):

Directional coupler (W240)	+	44.1	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield attenuation (U214)	+	9.5	dB
TOTAL CORRECTION:	+	55.4	dB

Remarks:
The measured value is about 23 MHz (delta marker).

Plot No. 7 (30)



Subclause: -/- Verification of the occupied bandwidth (99% bandwidth)
Short pulse / medium pulse / long pulse
Measurement within the allocated band: 9.3 - 9.5 GHz

Limit:
The occupied bandwidth is defined as the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5% of the emitted power. This is also known as the 99% emission bandwidth.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see section 7.4
medium2 pulse

Test setup:
see section 8.1: 1.2cdgj

Test equipment:
see annex A: C219, R001, U214, W240, W242

Remark:

Test result: **occupied bandwidth**

Environment condition:

Date & Time:	Mon 23/Nov/2015 14:15:58	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

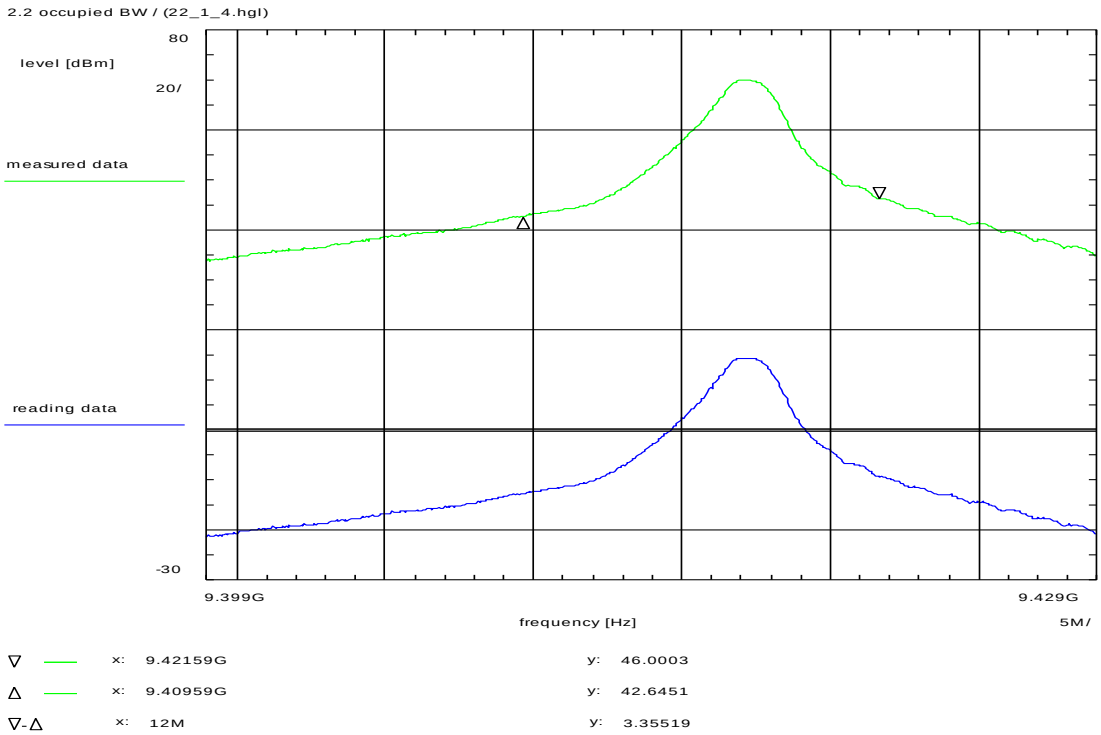
Start frequency:	9.388938819	GHz
Stop frequency:	9.438938819	GHz
Center frequency:	9.413938819	GHz
Frequency span:	50	MHz
Input attenuation:	30	dB
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Video-Average:	1	sweep(s) (>1)
Detector-Mode:	2	Pos Peak (Maximum-Hold)

Correction (average):

Directional coupler (W240)	+	44.0	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield attenuation (U214)	+	9.5	dB
TOTAL CORRECTION:	+	55.3	dB

Remarks:
The measured value is about 19 MHz (delta marker).

Plot No. 8 (30)



Subclause: -/- Verification of the occupied bandwidth (99% bandwidth)
Short pulse / medium pulse / long pulse
Measurement within the allocated band: 9.3 - 9.5 GHz

Limit:
The occupied bandwidth is defined as the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5% of the emitted power. This is also known as the 99% emission bandwidth.

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see section 7.4
long pulse

Test setup:
see section 8.1: 1.2cdgj

Test equipment:
see annex A: C219, R001, U214, W240, W242

Remark:

Test result: **occupied bandwidth**

Environment condition:

Date & Time:	Mon 23/Nov/2015 14:17:54	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

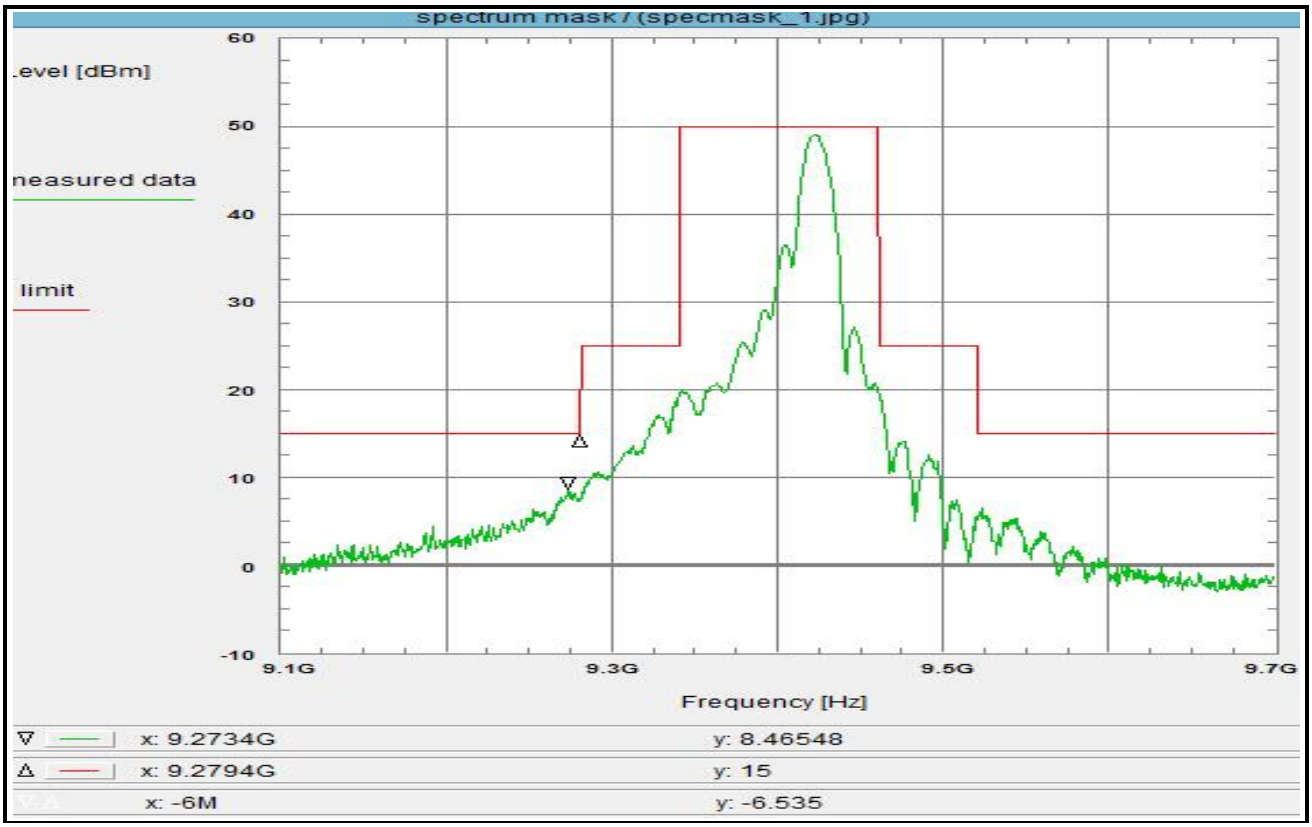
Start frequency:	9.398938819	GHz
Stop frequency:	9.428938819	GHz
Center frequency:	9.413938819	GHz
Frequency span:	30	MHz
Input attenuation:	30	dB
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Video-Average:	1	sweep(s) (>1)
Detector-Mode:	2	Pos Peak (Maximum-Hold)

Correction (average):

Directional coupler (W240)	+	44.1	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield attenuation (U214)	+	9.4	dB
TOTAL CORRECTION:	+	55.3	dB

Remarks:
The measured value is about 12 MHz (delta marker).

Plot No. 9 (30)



Subclause: 80.211(f) Spectrum Mask
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
short pulse

Test setup:
see section 8.1: 1.2cdhgj

Test equipment:
see annex 2: C219, R001, U214, W240, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 10:46:44	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	9.1	GHz
Stop frequency:	9.7	GHz
Center frequency:	9.4	GHz
Frequency span:	600	MHz
Resolution-BW:	1	MHz
Video-BW:	50	MHz
Input attenuation:	20	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	Pos Peak	

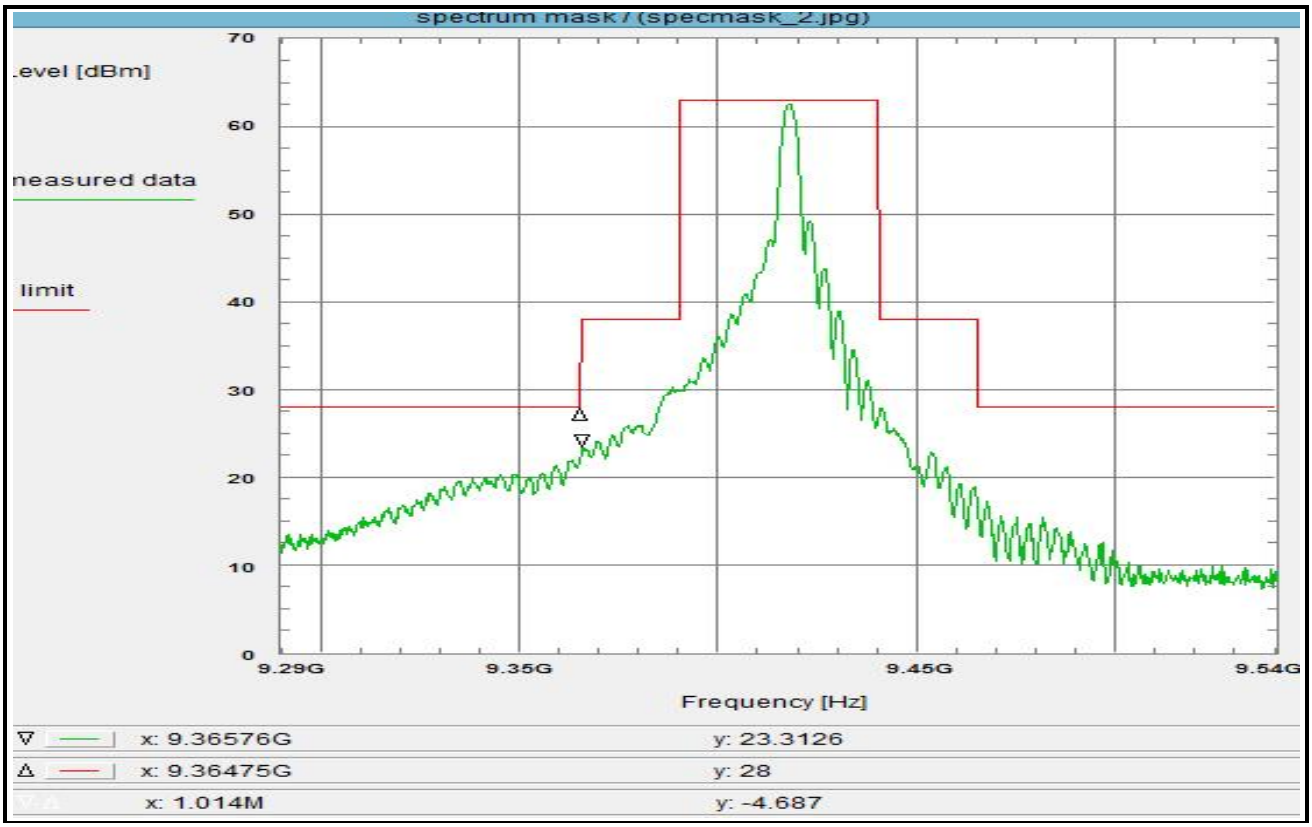
Correction:

Directional coupler (W240)	+	43.9	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U214)	+	9.5	dB
TOTAL CORRECTION:	+	55.2	dB

Remarks:

Spectrum mask based on 120 MHz bandwidth.

Plot No. 10 (30)



Subclause: 80.211(f) Spectrum Mask
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
med1 pulse

Test setup:
see section 8.1: 1.2cdhgj

Test equipment:
see annex 2: C219, R001, U214, W240, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 10:56:34	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	9.29	GHz
Stop frequency:	9.54	GHz
Center frequency:	9.415	GHz
Frequency span:	250	MHz
Resolution-BW:	1	MHz
Video-BW:	50	MHz
Input attenuation:	30	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	Pos Peak	

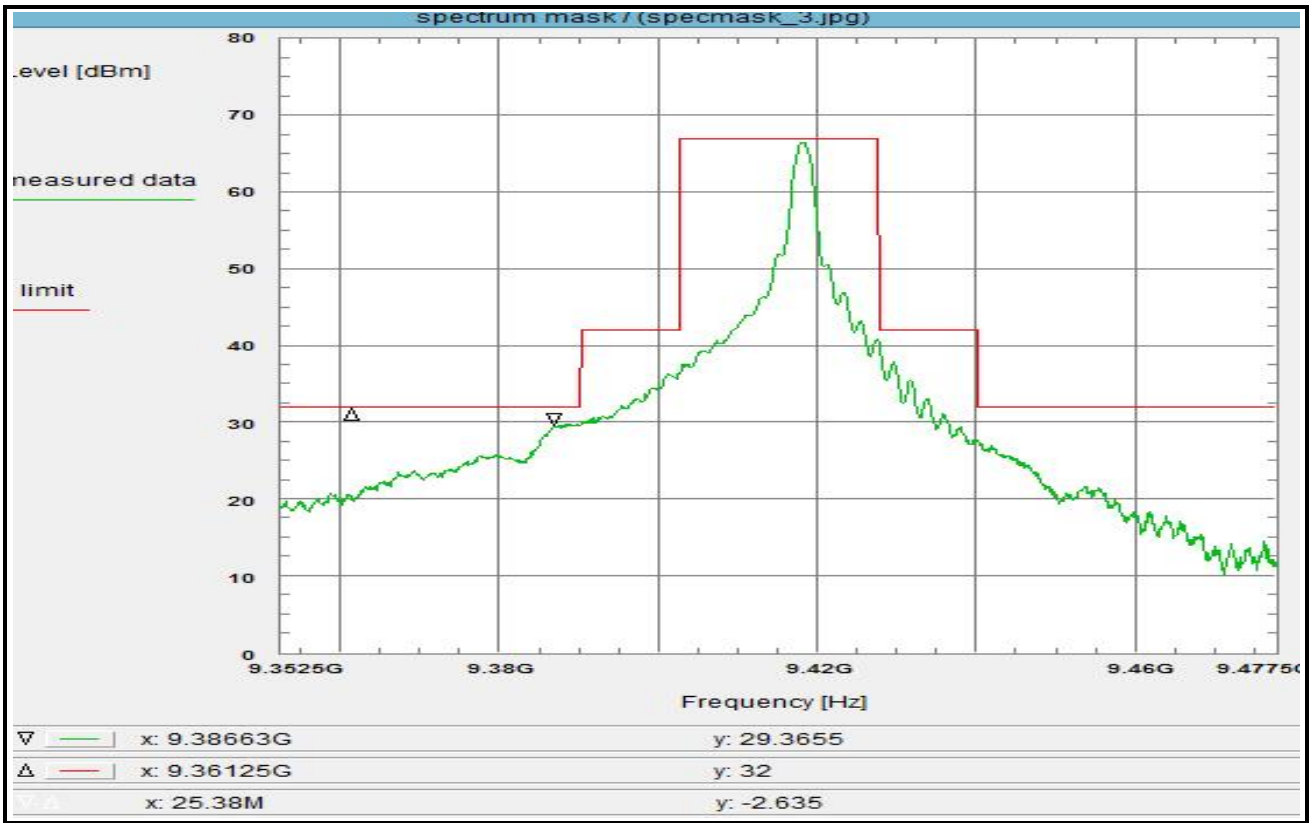
Correction:

Directional coupler (W240)	+	44.0	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U214)	+	9.5	dB
TOTAL CORRECTION:	+	55.3	dB

Remarks:

Spectrum mask based on 50 MHz bandwidth.

Plot No. 11 (30)



Subclause: 80.211(f) Spectrum Mask
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
med2 pulse

Test setup:
see section 8.1: 1.2cdhgj

Test equipment:
see annex 2: C219, R001, U214, W240, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 10:59:32	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	9.3525	GHz
Stop frequency:	9.4775	GHz
Center frequency:	9.415	GHz
Frequency span:	125	MHz
Resolution-BW:	1	MHz
Video-BW:	50	MHz
Input attenuation:	30	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	Pos Peak	

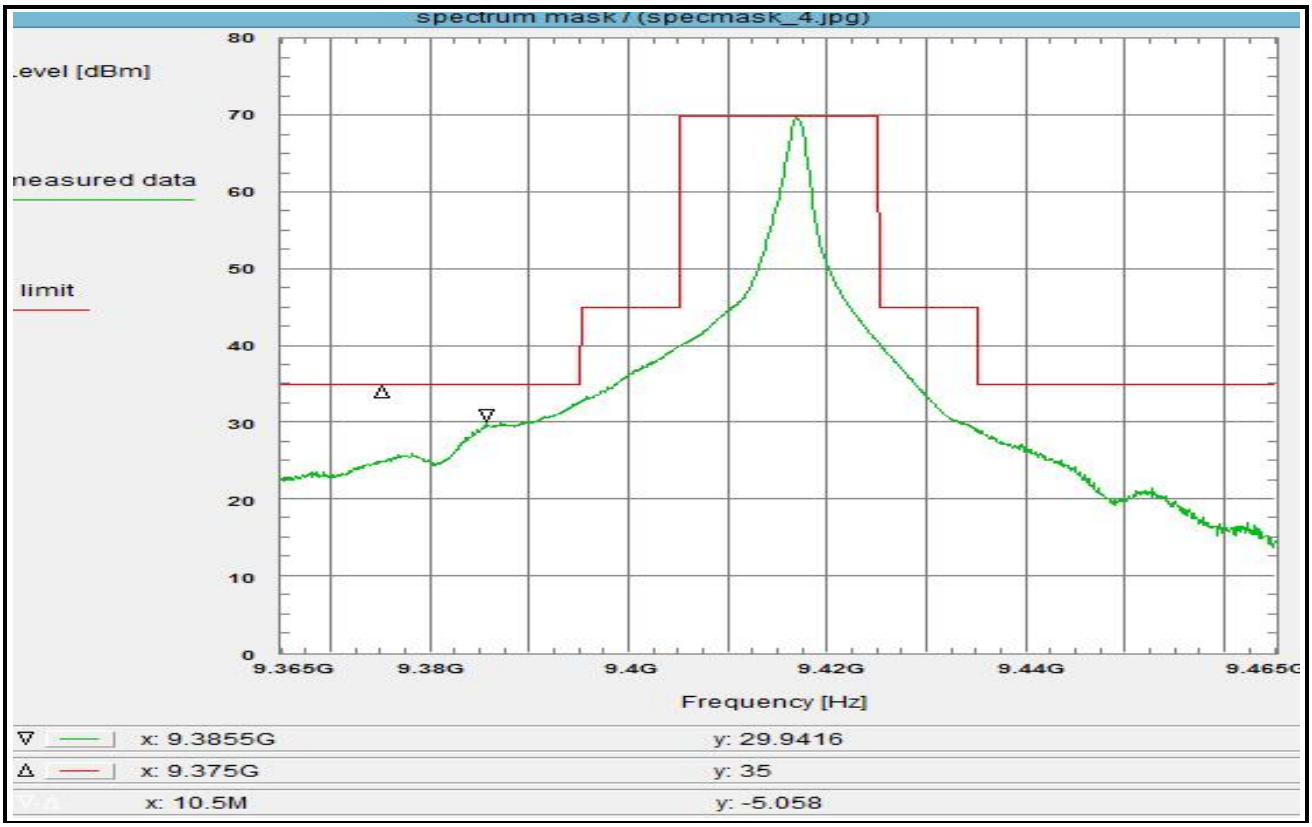
Correction:

Directional coupler (W240)	+	43.8	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U214)	+	9.5	dB
TOTAL CORRECTION:	+	55.1	dB

Remarks:

Spectrum mask based on 25 MHz bandwidth.

Plot No. 12 (30)



Subclause: 80.211(f) Spectrum Mask
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
long pulse

Test setup:
see section 8.1: 1.2cdhgj

Test equipment:
see annex 2: C219, R001, U214, W240, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 11:03:33	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	9.365	GHz
Stop frequency:	9.465	GHz
Center frequency:	9.415	GHz
Frequency span:	100	MHz
Resolution-BW:	1	MHz
Video-BW:	50	MHz
Input attenuation:	30	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	Pos Peak	

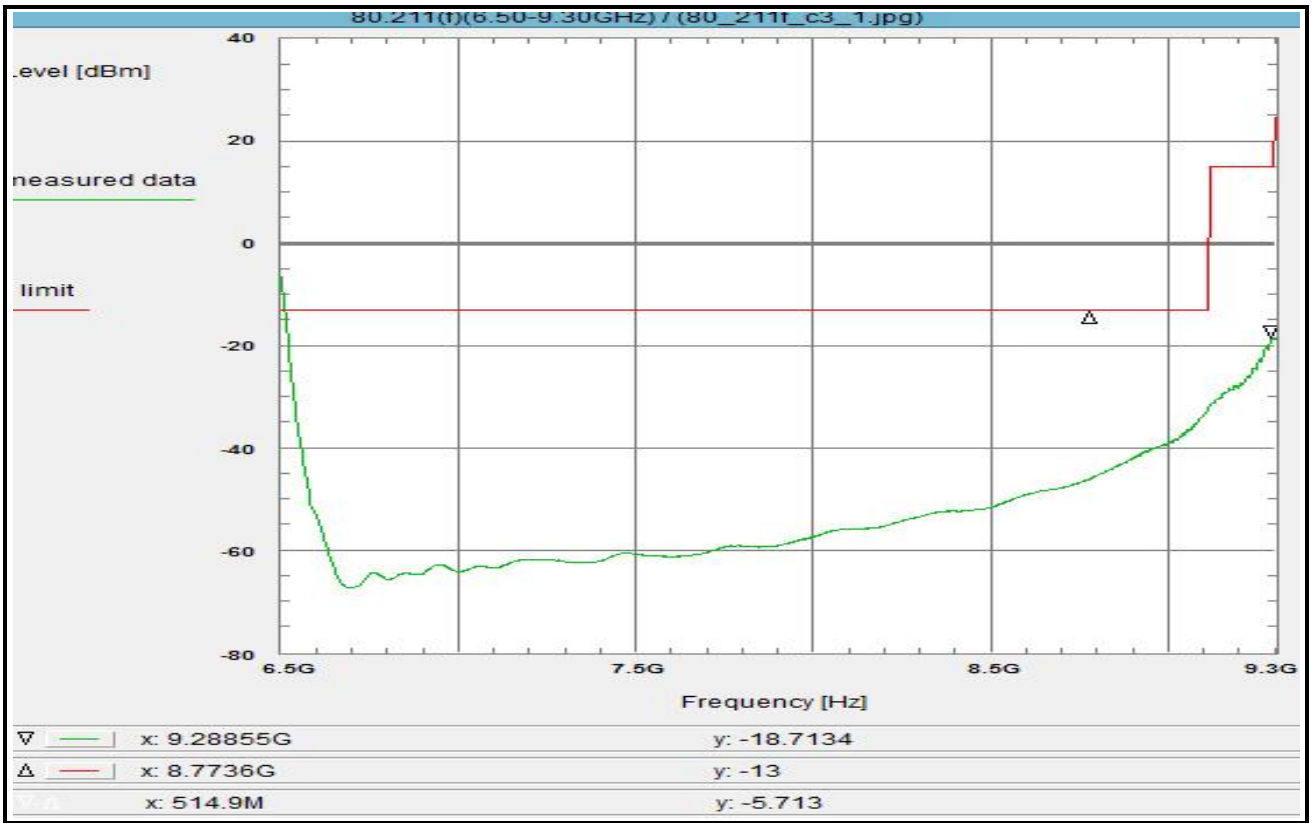
Correction:

Directional coupler (W240)	+	43.9	dB
Coaxial cable (C219)	+	1.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U214)	+	9.5	dB
TOTAL CORRECTION:	+	55.2	dB

Remarks:

Spectrum mask based on 20 MHz bandwidth.

Plot No. 13 (30)



Subclause: 80.211(f) Conducted Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 6.5 - 9.3 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
short pulse

Test setup:
see section 8.1: 1.2cdigj

Test equipment:
see annex 2: C219, R001, U231, W241, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 11:09:59	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	6.5	GHz
Stop frequency:	9.3	GHz
Center frequency:	7.9	GHz
Frequency span:	2.8	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

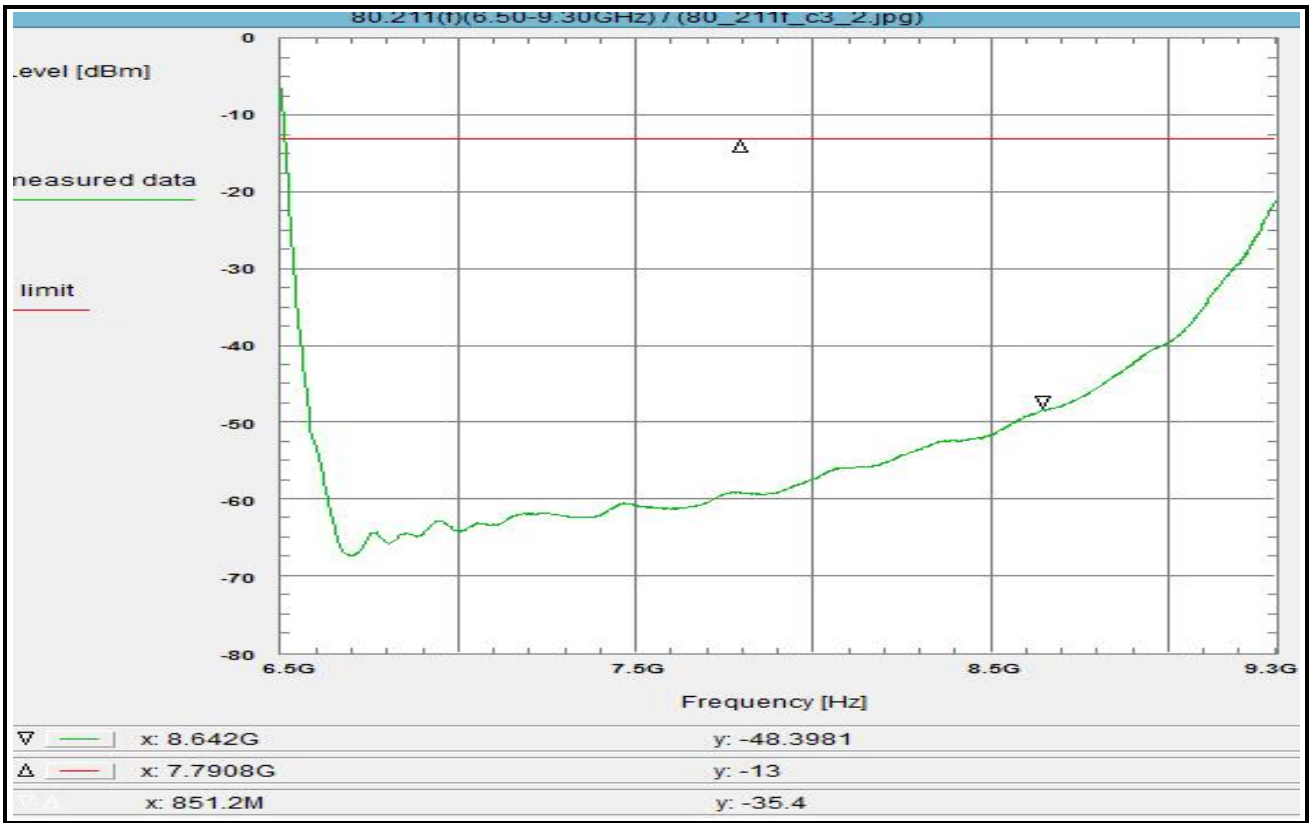
Correction:

Directional coupler (W241)	+	20.0	dB
Coaxial cable (C219)	+	1.7	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U231)	+	7.8	dB
TOTAL CORRECTION:	+	29.5	dB

Remarks:
Max-Hold Mode
Test setup with taper transitions R100-->N and Stub Tuner.

Rather left the plot shows the cut-off frequency of the directional coupler.

Plot No. 14 (30)



Subclause: 80.211(f) Conducted Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 6.5 - 9.3 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
long pulse

Test setup:
see section 8.1: 1.2cdigj

Test equipment:
see annex 2: C219, R001, U231, W241, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 11:15:26	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	6.5	GHz
Stop frequency:	9.3	GHz
Center frequency:	7.9	GHz
Frequency span:	2.8	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

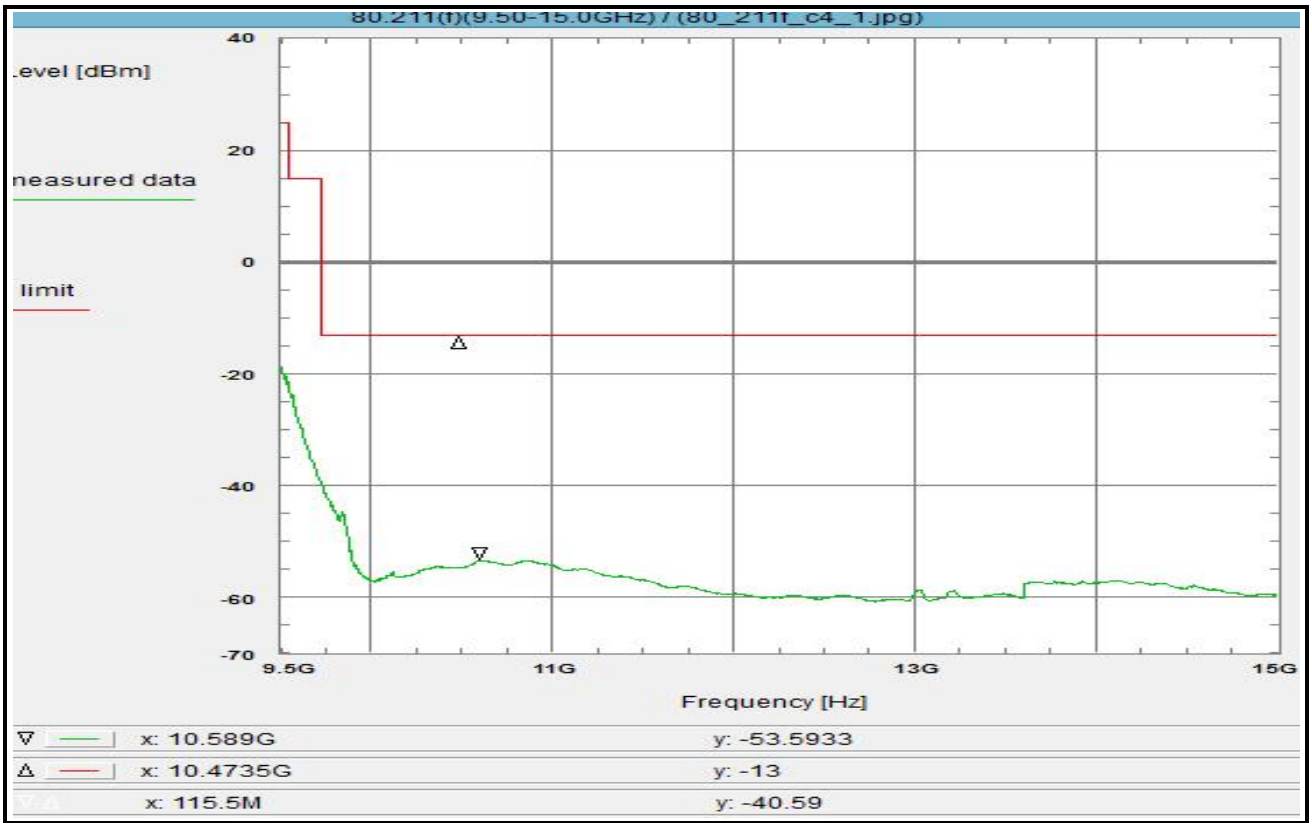
Correction:

Directional coupler (W241)	+	20.0	dB
Coaxial cable (C219)	+	1.7	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U231)	+	7.8	dB
TOTAL CORRECTION:	+	29.5	dB

Remarks:
Max-Hold Mode
Test setup with taper transitions R100-->N and Stub Tuner.

Rather left the plot shows the cut-off frequency of the directional coupler.

Plot No. 15 (30)



Subclause: 80.211(f) Conducted Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 9.5 - 15.0 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
short pulse

Test setup:
see section 8.1: 1.2cdigj

Test equipment:
see annex 2: C219, R001, U231, W241, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 11:10:46	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

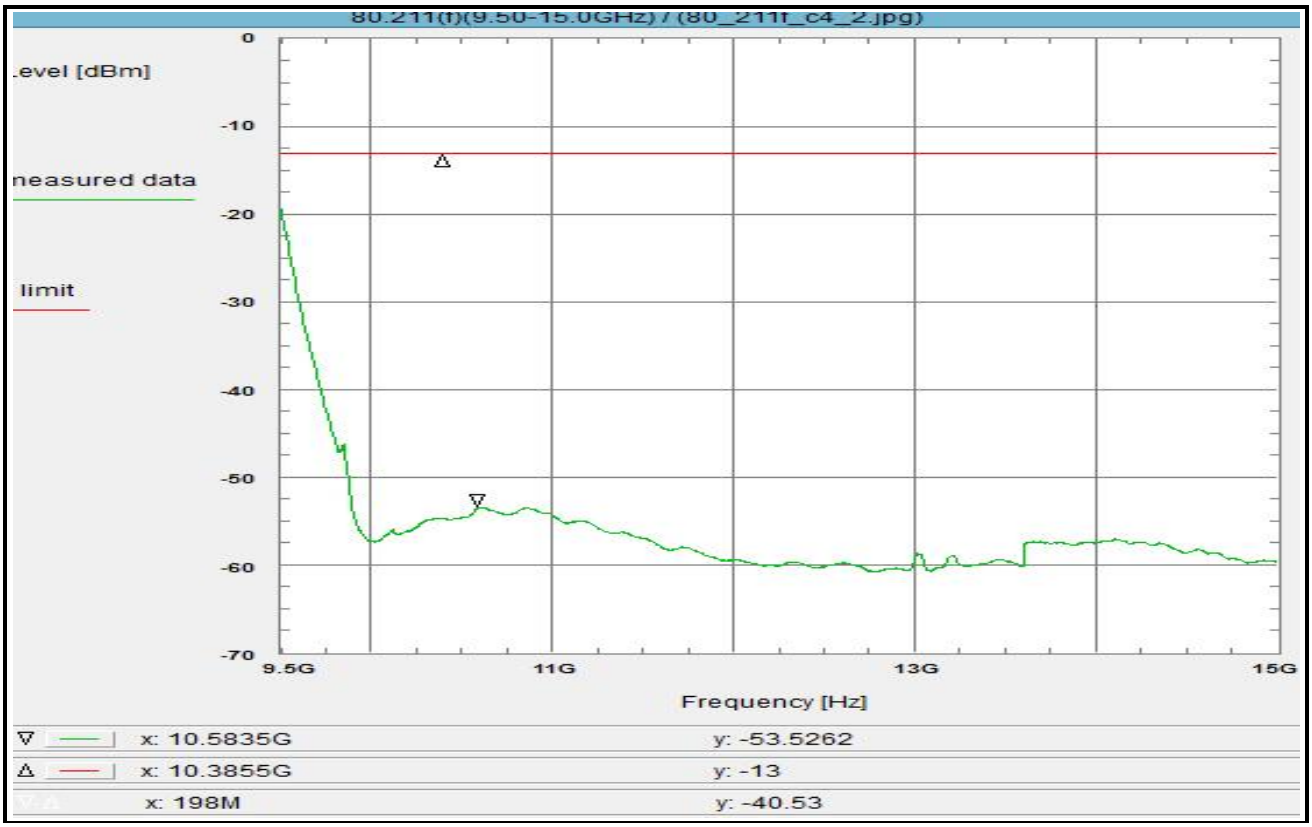
Start frequency:	9.5	GHz
Stop frequency:	15	GHz
Center frequency:	12.25	GHz
Frequency span:	5.5	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

Correction:

Directional coupler (W241)	+	19.8	dB
Coaxial cable (C219)	+	2.1	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U231)	+	3.8	dB
TOTAL CORRECTION:	+	25.7	dB

Remarks:
Max-Hold Mode
Test setup with taper transitions R100-->N and Stub Tuner.

Plot No. 16 (30)



Subclause: 80.211(f) Conducted Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 9.5 - 15.0 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
long pulse

Test setup:
see section 8.1: 1.2cdigj

Test equipment:
see annex 2: C219, R001, U231, W241, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 11:13:25
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat
Temperature:	20 °C
Humidity:	55 %
Voltage:	233 Vac

Setup of measurement equipment:

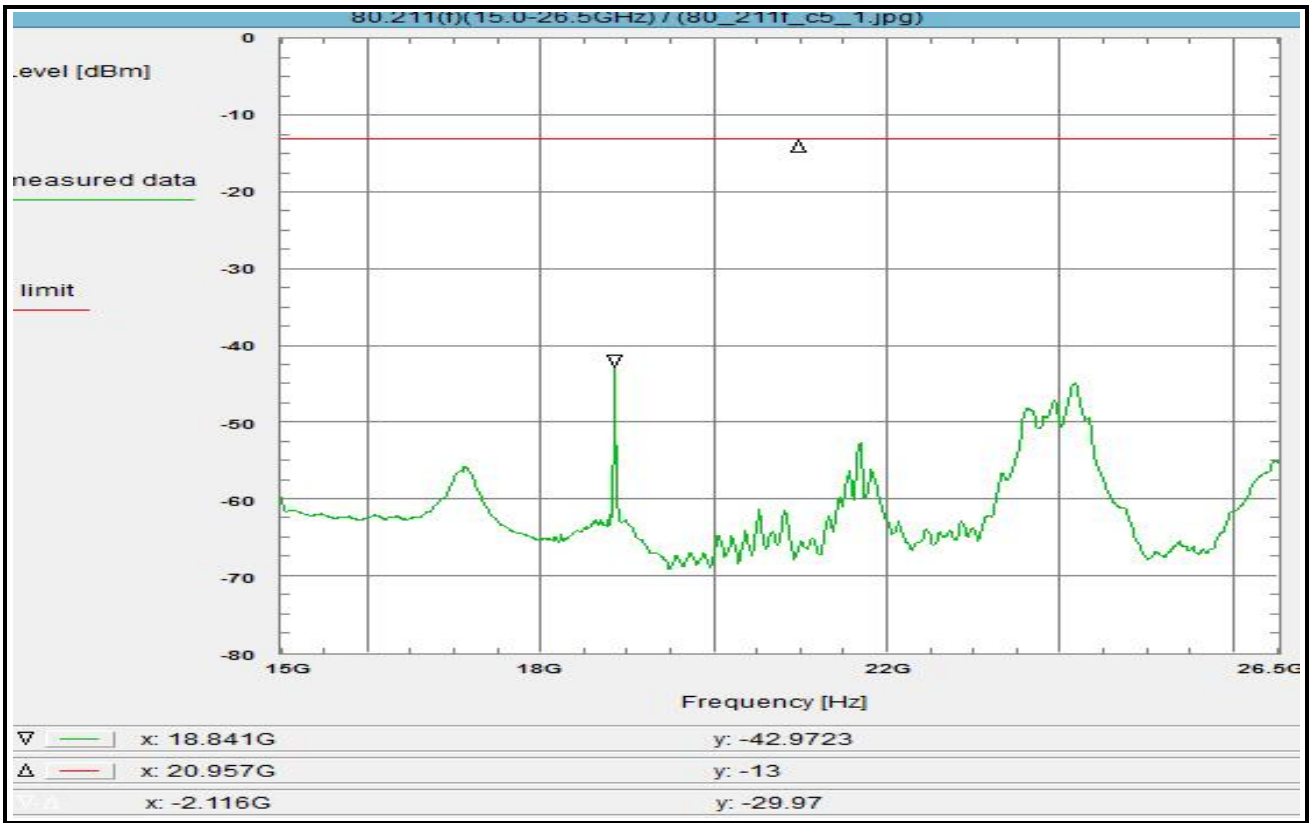
Start frequency:	9.5	GHz
Stop frequency:	15	GHz
Center frequency:	12.25	GHz
Frequency span:	5.5	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

Correction:

Directional coupler (W241)	+	19.8	dB
Coaxial cable (C219)	+	2.1	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation (U231)	+	3.8	dB
TOTAL CORRECTION:	+	25.7	dB

Remarks:
Max-Hold Mode
Test setup with taper transitions R100-->N and Stub Tuner.

Plot No. 17 (30)



Subclause: 80.211(f) Conducted Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 15.0 - 26.5 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
short pulse

Test setup:
see section 8.1: 1.2cegj

Test equipment:
see annex 2: C219, R001, W022, W241, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 11:21:05	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	15	GHz
Stop frequency:	26.5	GHz
Center frequency:	20.75	GHz
Frequency span:	11.5	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

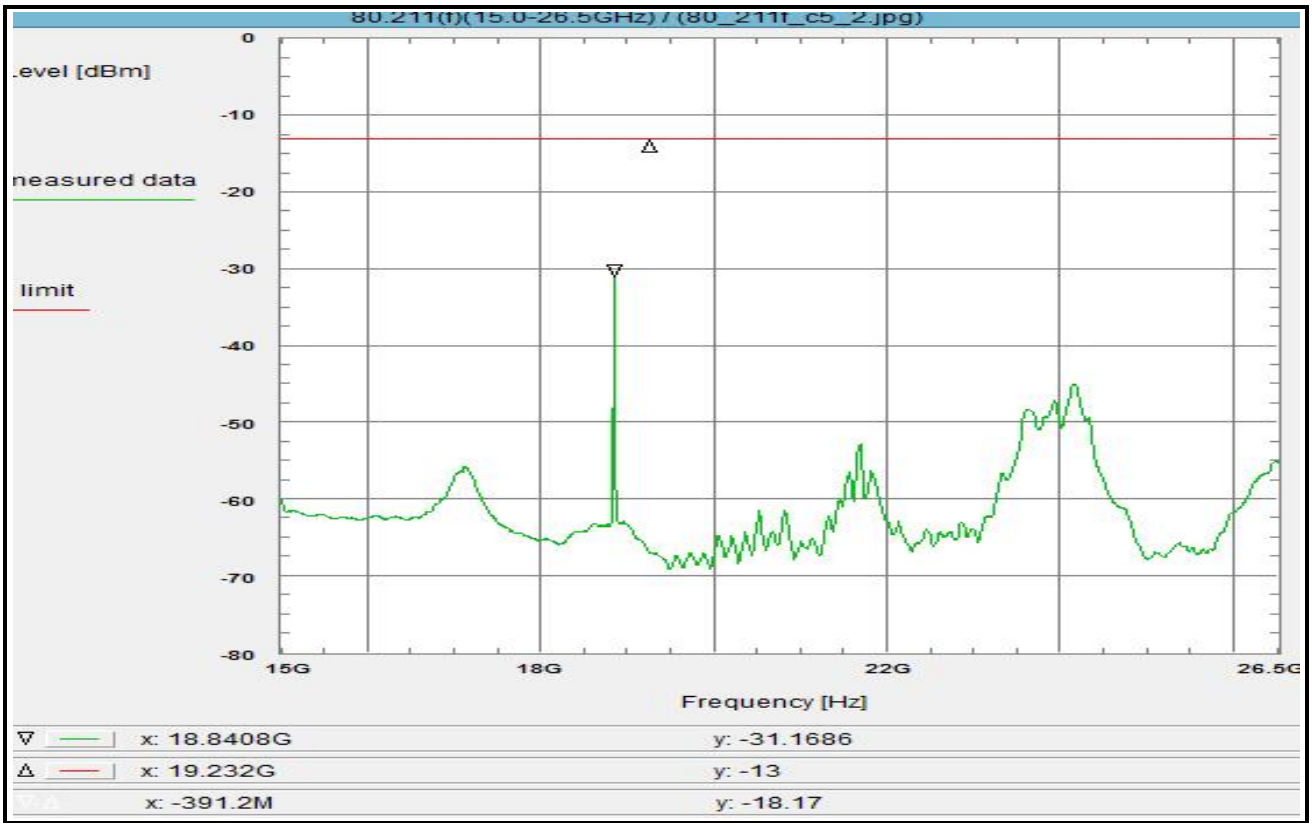
Correction:

Directional coupler (W241)	+	14.4	dB
Coaxial cable (C219)	+	2.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation	+	0.0	dB
TOTAL CORRECTION:	+	17.2	dB

Remarks:
Max-Hold Mode
Test setup with taper transitions R100/R180

marker shows 2nd harmonic.

Plot No. 18 (30)



Subclause: 80.211(f) Conducted Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 15.0 - 26.5 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
long pulse

Test setup:
see section 8.1: 1.2cegj

Test equipment:
see annex 2: C219, R001, W022, W241, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 11:22:58	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	15	GHz
Stop frequency:	26.5	GHz
Center frequency:	20.75	GHz
Frequency span:	11.5	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

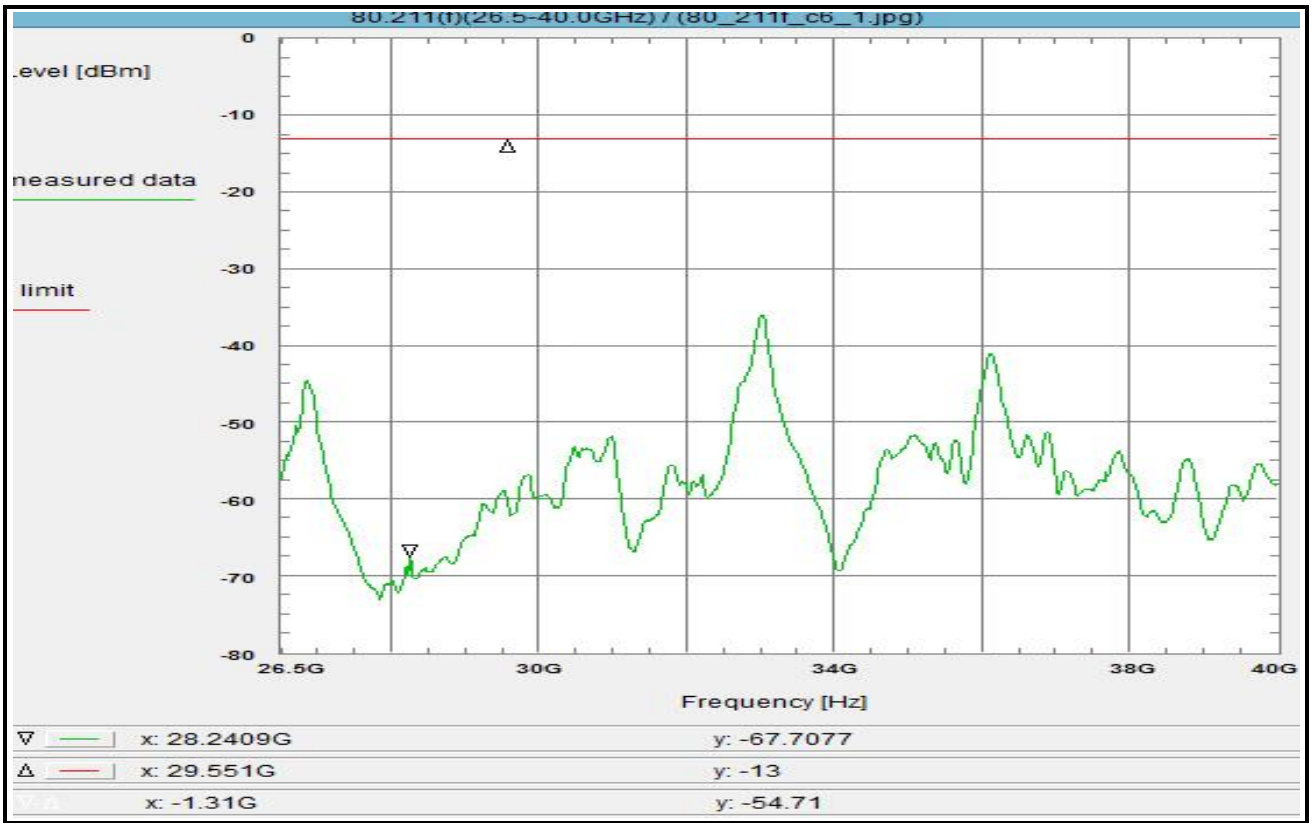
Correction:

Directional coupler (W241)	+	14.4	dB
Coaxial cable (C219)	+	2.8	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation	+	0.0	dB
TOTAL CORRECTION:	+	17.2	dB

Remarks:
Max-Hold Mode
Test setup with taper transitions R100/R180

Marker shows 2nd harmonic.

Plot No. 19 (30)



Subclause: 80.211(f) Conducted Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 26.5 - 40.0 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
short pulse

Test setup:
see section 8.1: 1.2cegj

Test equipment:
see annex 2: C219, R001, W022, W241, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 11:27:17	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	26.5	GHz
Stop frequency:	40	GHz
Center frequency:	33.25	GHz
Frequency span:	13.5	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

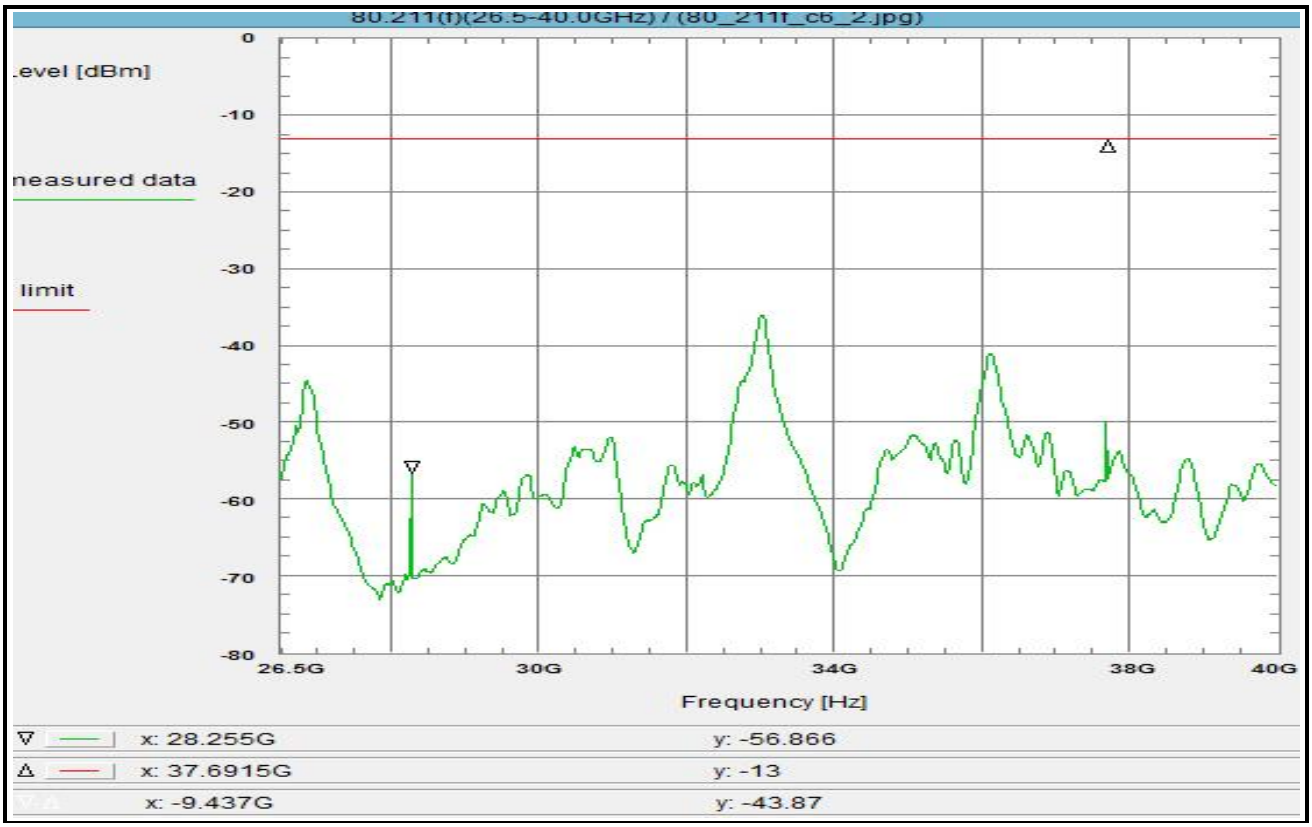
Correction:

Directional coupler (W241)	+	18.9	dB
Coaxial cable (C219)	+	4.0	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation	+	0.0	dB
TOTAL CORRECTION:	+	22.9	dB

Remarks:
Max-Hold Mode
Test setup with taper transitions R100/R320

Plot shows frequency response of WG-directional coupler.
Marker shows 3rd harmonic of DUT.

Plot No. 20 (30)



Subclause: 80.211(f) Conducted Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 26.5 - 40.0 GHz

Limit:
Limit acc. to FCC 47 CFR §80.211(f)

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
long pulse

Test setup:
see section 8.1: 1.2cegj

Test equipment:
see annex 2: C219, R001, W022, W241, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 11:29:09	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	26.5	GHz
Stop frequency:	40	GHz
Center frequency:	33.25	GHz
Frequency span:	13.5	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

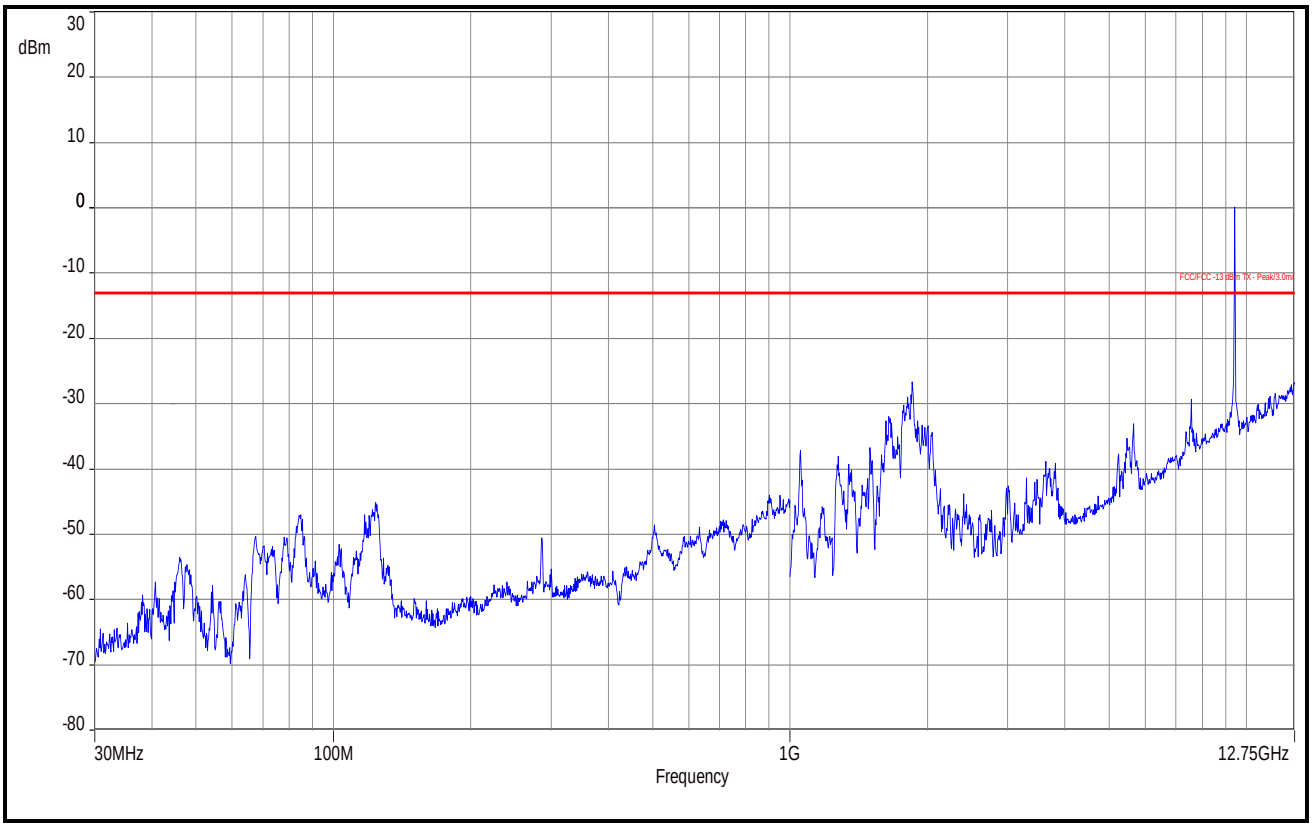
Correction:

Directional coupler (W241)	+	18.9	dB
Coaxial cable (C219)	+	4.0	dB
DUT-Antenna	+	0.0	dBi
Test antenna	+	0.0	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Attenuation	+	0.0	dB
TOTAL CORRECTION:	+	22.9	dB

Remarks:
Max-Hold Mode
Test setup with taper transitions R100/R320

Plot shows frequency response of WG-directional coupler.
Markers show 3rd and 4th harmonic of DUT.

Plot No. 21 (30)



Subclause: 80.211(f) Radiated Spurious Emissions
Pulsed rf-carrier in frequency range 2.9 - 3.1 GHz
Examination of the frequency range 30.0 MHz - 12.75 GHz

Limit:
Limit acc. to 80.211(f): -13 dBm

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
short pulse

Test setup:
see section 8.1: 2.3

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Mon 07/Dec/2015 14:47:38	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	50	%
Voltage:	232	Vac

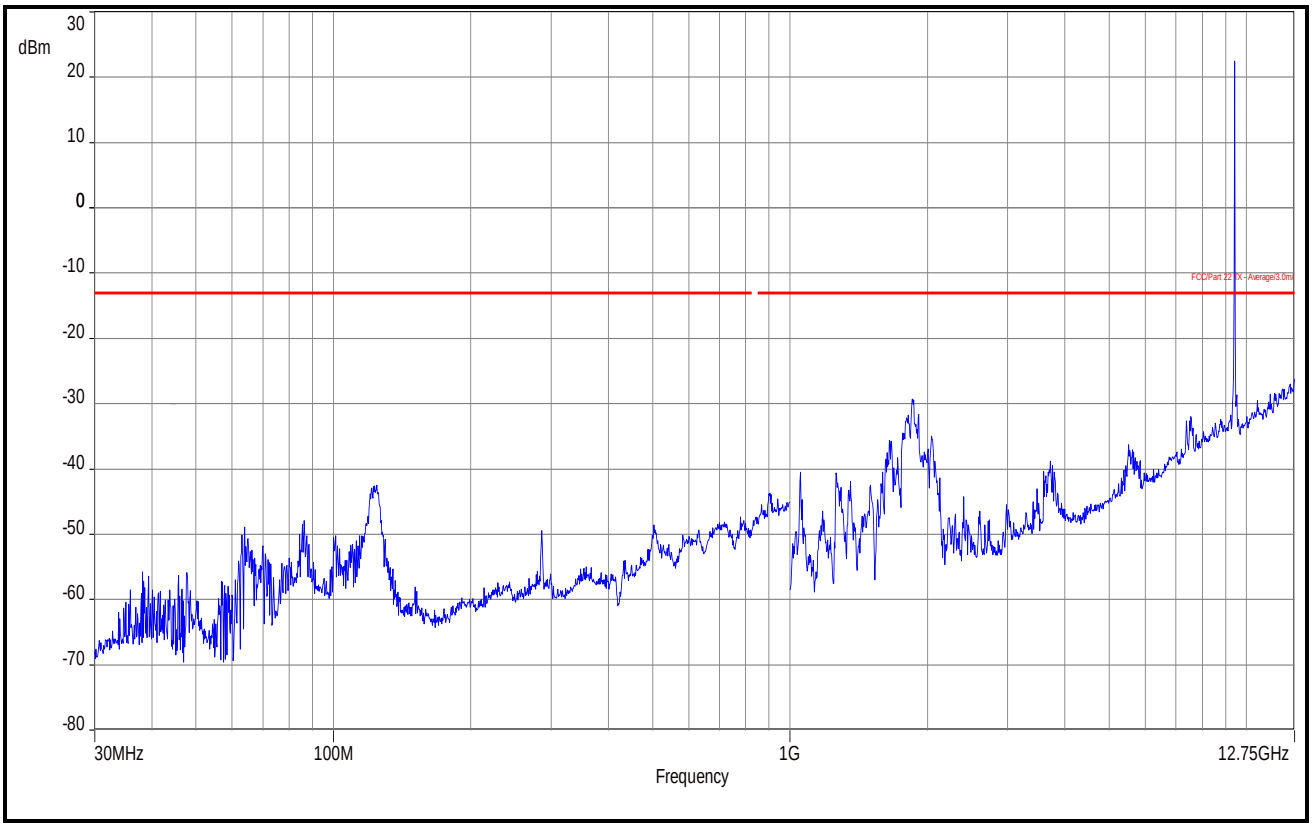
Setup of measurement equipment:

Start frequency:	10	GHz
Stop frequency:	15	GHz
Center frequency:	12.5	GHz
Frequency span:	5	GHz
Resolution-BW:	1	MHz
Video-BW:	50	MHz
Input attenuation:	10	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	Pos Peak	

Remarks:
Max-Hold Mode

Plot shows wanted signal.

Plot No. 22 (30)



Subclause: 80.211(f) Radiated Spurious Emissions
Pulsed rf-carrier in frequency range 2.9 - 3.1 GHz
Examination of the frequency range 30.0 MHz - 12.75 GHz

Limit:
Limit acc. to 80.211(f): -13 dBm

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
long pulse

Test setup:
see section 8.1: 2.3

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Mon 07/Dec/2015 14:47:38	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	50	%
Voltage:	232	Vac

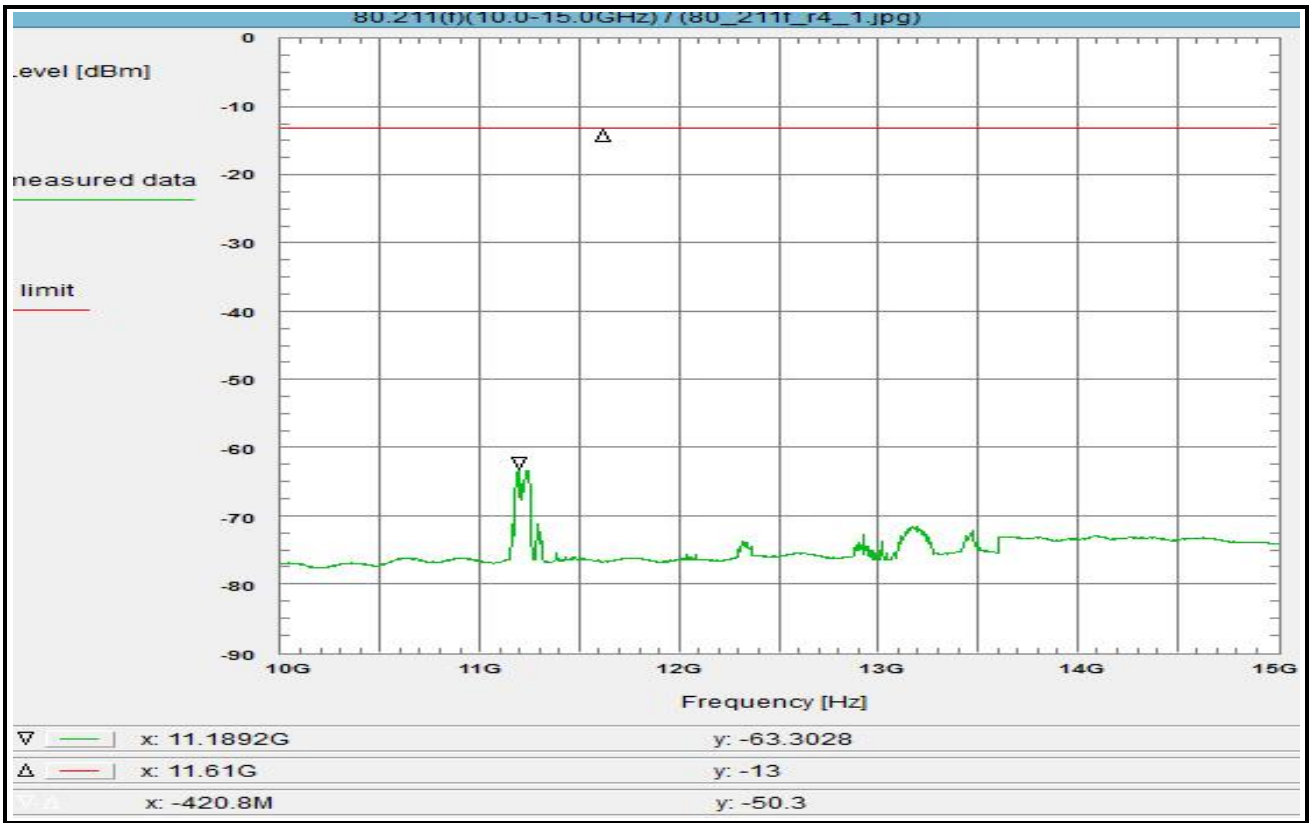
Setup of measurement equipment:

Start frequency:	10	GHz
Stop frequency:	15	GHz
Center frequency:	12.5	GHz
Frequency span:	5	GHz
Resolution-BW:	1	MHz
Video-BW:	50	MHz
Input attenuation:	10	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	Pos Peak	

Remarks:
Max-Hold Mode

Plot shows wanted signal.

Plot No. 23 (30)



Subclause: 80.211(f) Radiated Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 10.0 - 15.0 GHz

Limit:
Limit acc. to 80.211(f): -13 dBm

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
short pulse

Test setup:
see annex 1: 2.3

Test equipment:
see annex 2: A014, C219, R001, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Mon 07/Dec/2015 15:47:00	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	50	%
Voltage:	232	Vac

Setup of measurement equipment:

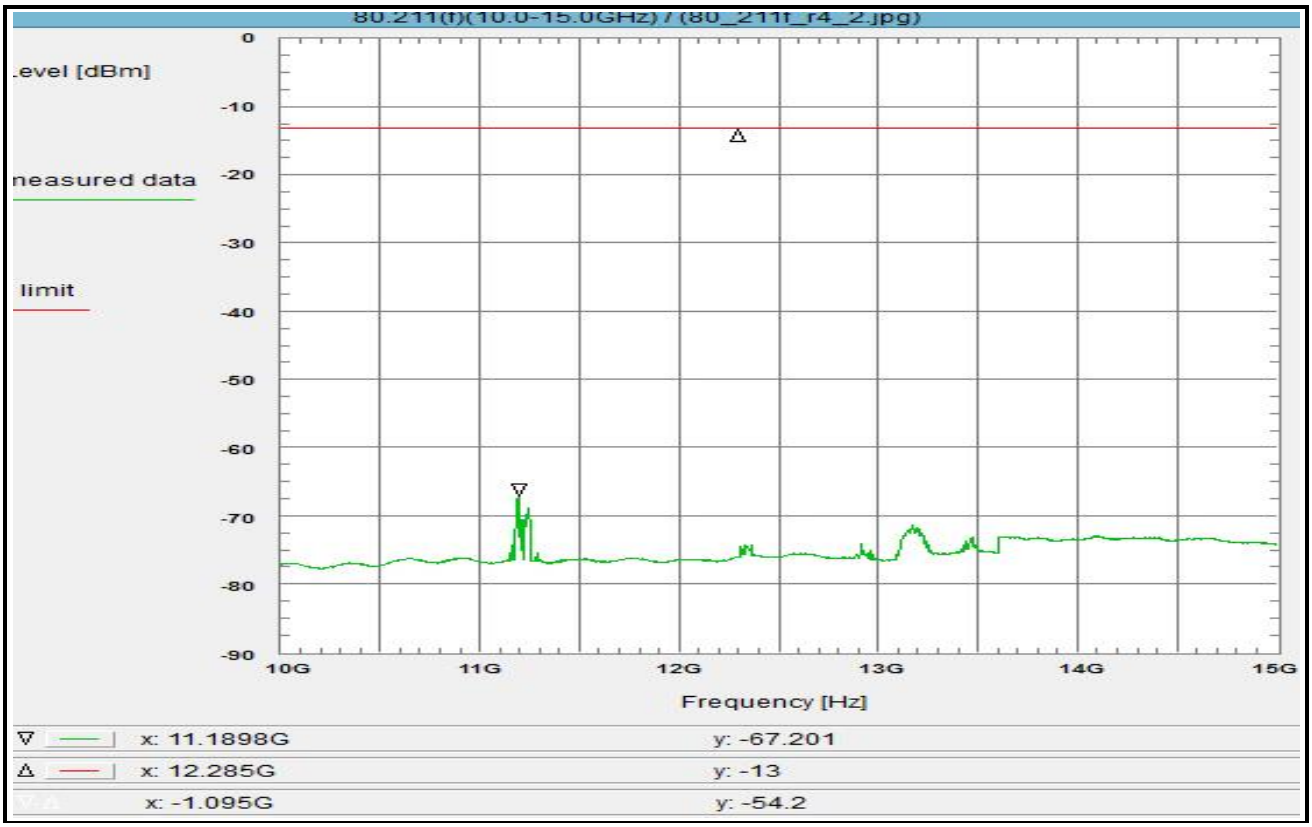
Start frequency:	10	GHz
Stop frequency:	15	GHz
Center frequency:	12.5	GHz
Frequency span:	5	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C219)	+	2.1	dB
DUT-Antenna	+	0.0	dBi
Test antenna (A014)	-	19.7	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield attenuation (12.50GHz, 0.5m)	+	48.4	dB
TOTAL CORRECTION:	+	30.8	dB

Remarks:
Max-Hold Mode

Plot No. 24 (30)



Subclause: 80.211(f) Radiated Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 10.0 - 15.0 GHz

Limit:
Limit acc. to 80.211(f): -13 dBm

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
long pulse

Test setup:
see annex 1: 2.3

Test equipment:
see annex 2: A014, C219, R001, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Mon 07/Dec/2015 15:44:02	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	22	°C
Humidity:	50	%
Voltage:	232	Vac

Setup of measurement equipment:

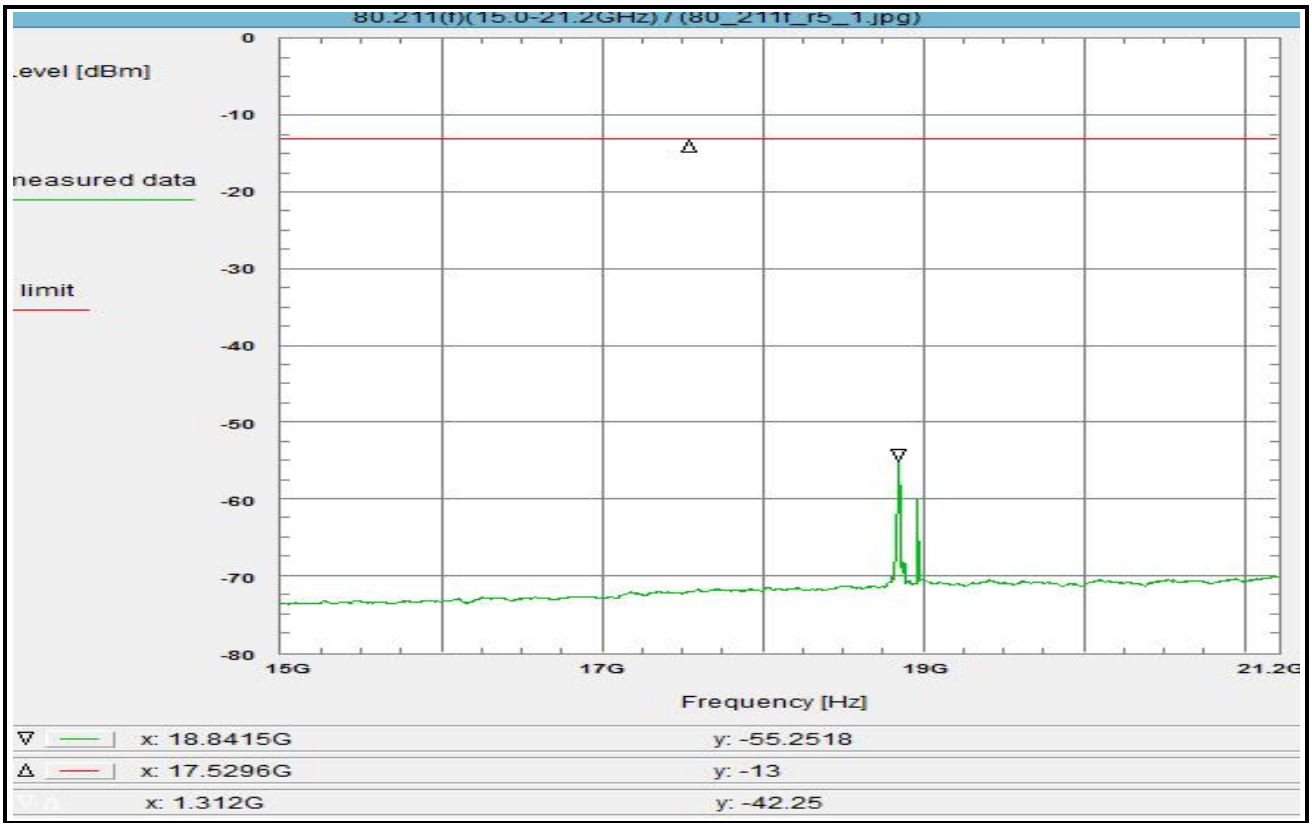
Start frequency:	10	GHz
Stop frequency:	15	GHz
Center frequency:	12.5	GHz
Frequency span:	5	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	0	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C219)	+	2.1	dB
DUT-Antenna	+	0.0	dBi
Test antenna (A014)	-	19.7	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield attenuation (12.50GHz, 0.5m)	+	48.4	dB
TOTAL CORRECTION:	+	30.8	dB

Remarks:
Max-Hold Mode

Plot No. 25 (30)



Subclause: 80.211(f) Radiated Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 15.0 - 21.2 GHz

Limit:
Limit acc. to 80.211(f): -13 dBm

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
short pulse

Test setup:
see section 8.1: 2.3

Test equipment:
see annex 2: A016, B11b, C219, R001, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 12:06:28	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	15	GHz
Stop frequency:	21.2	GHz
Center frequency:	18.1	GHz
Frequency span:	6.2	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

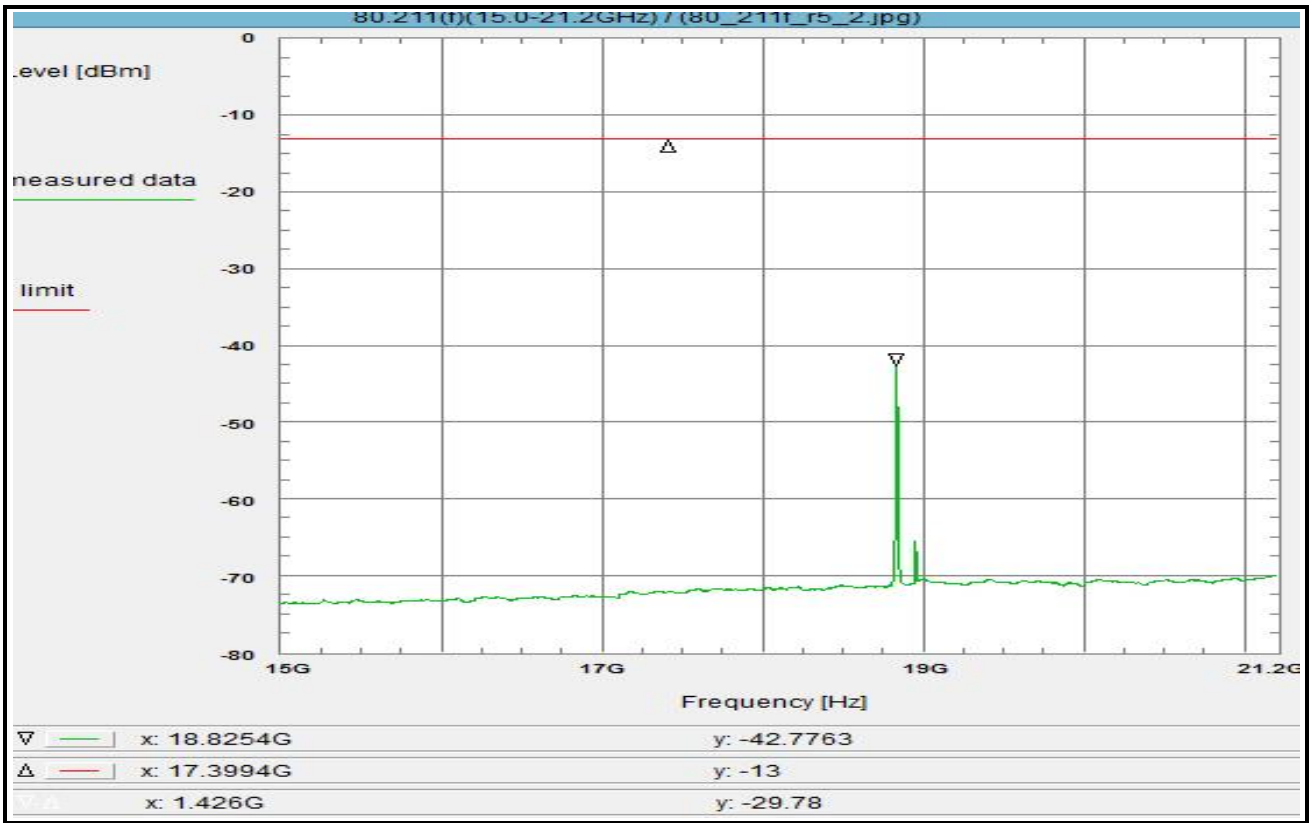
Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C219)	+	2.6	dB
DUT-Antenna	+	0.0	dBi
Test antenna (A016)	-	19.9	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield Attenuation (18.10GHz, 0.5m)	+	51.6	dB
(B11b)	-	31.1	dB
TOTAL CORRECTION:	+	3.2	dB

Remarks:
Max-Hold Mode

Plot shows 2nd harmonic.

Plot No. 26 (30)



Subclause: 80.211(f) Radiated Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 15.0 - 21.2 GHz

Limit:
Limit acc. to 80.211(f): -13 dBm

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
long pulse

Test setup:
see section 8.1: 2.3

Test equipment:
see annex 2: A016, B11b, C219, R001, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 12:03:41	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	15	GHz
Stop frequency:	21.2	GHz
Center frequency:	18.1	GHz
Frequency span:	6.2	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

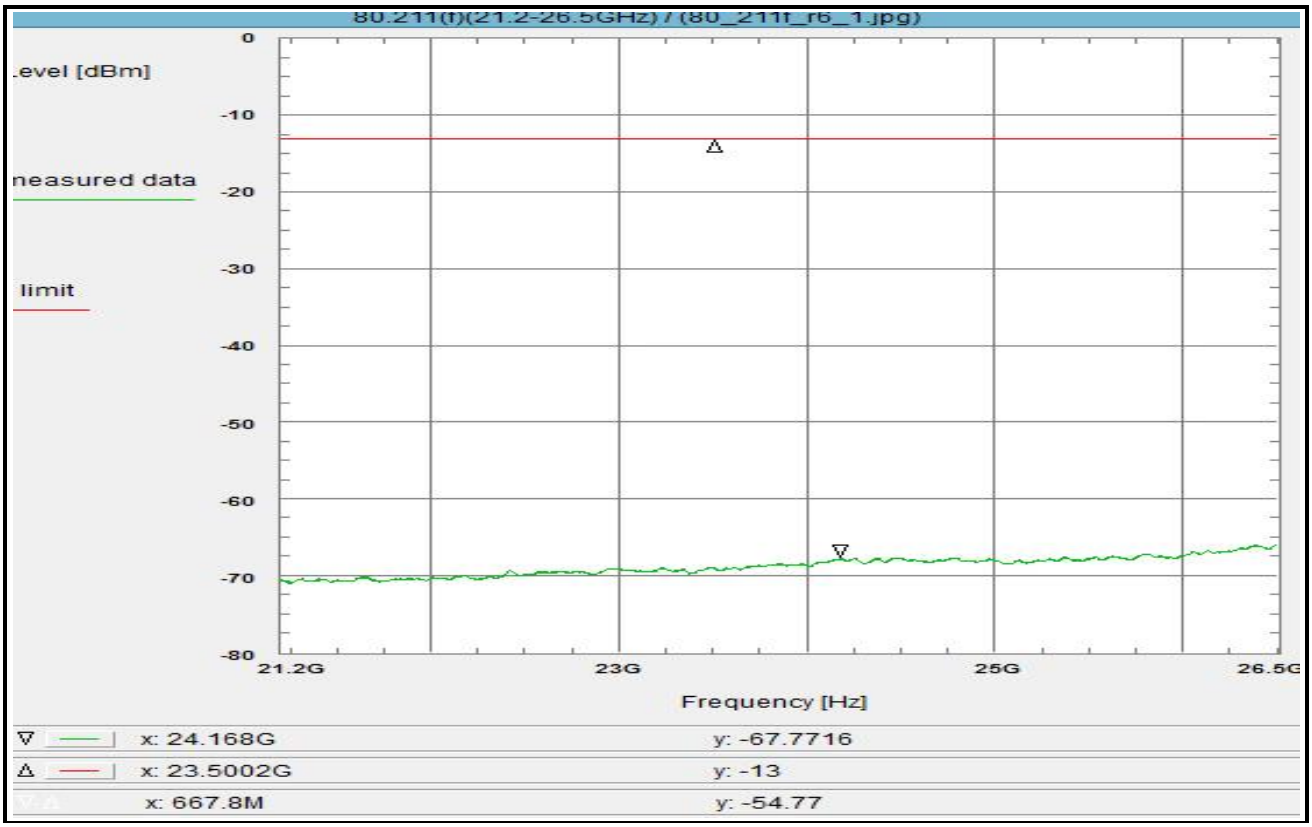
Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C219)	+	2.6	dB
DUT-Antenna	+	0.0	dBi
Test antenna (A016)	-	19.9	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield Attenuation (18.10GHz, 0.5m)	+	51.6	dB
(B11b)	-	31.1	dB
TOTAL CORRECTION:	+	3.2	dB

Remarks:
Max-Hold Mode

Plot shows 2nd harmonic.

Plot No. 27 (30)



Subclause: 80.211(f) Radiated Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 21.2 - 26.5 GHz

Limit:
Limit acc. to 80.211(f): -13 dBm

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
short pulse

Test setup:
see section 8.1: 2.3

Test equipment:
see annex 2: A019, B11b, BCBL, C219, R001, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 13:51:46	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

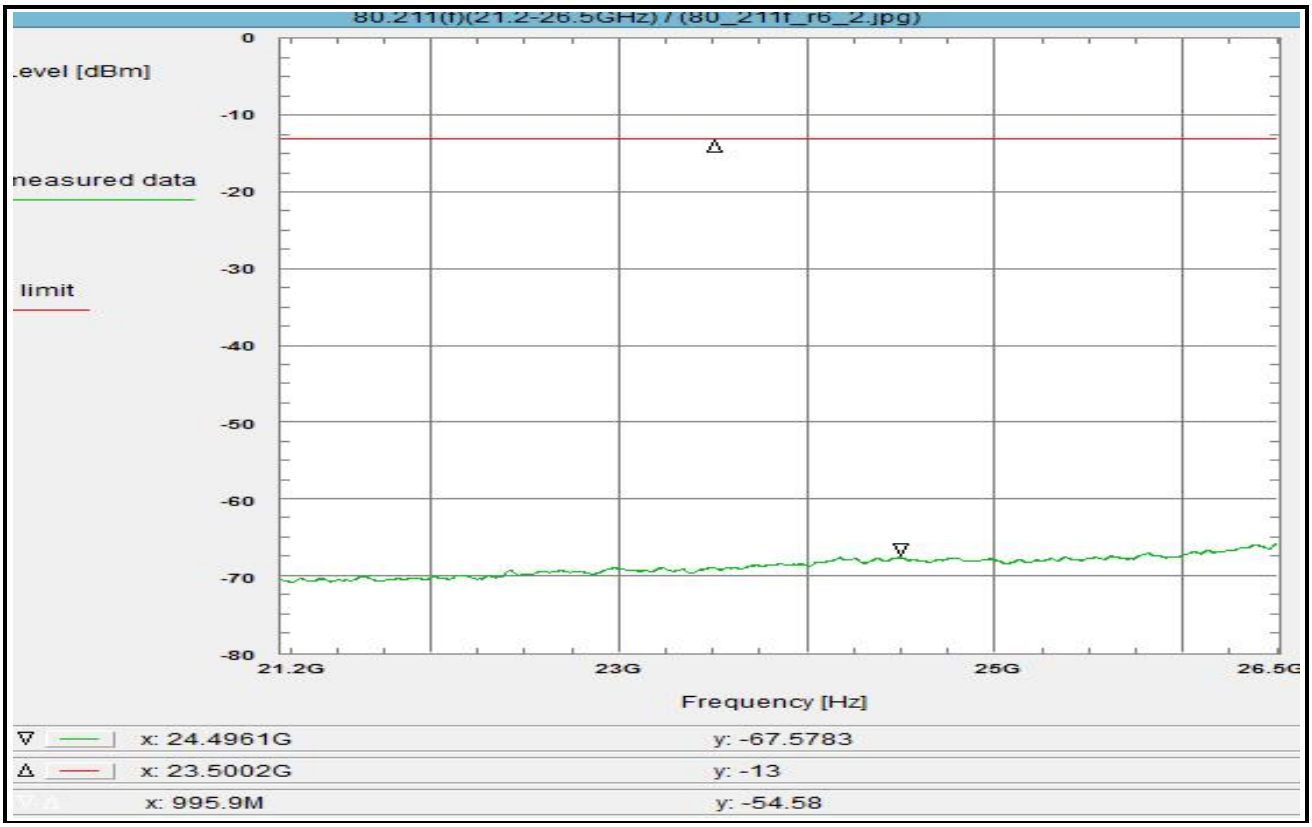
Start frequency:	21.2	GHz
Stop frequency:	26.5	GHz
Center frequency:	23.85	GHz
Frequency span:	5.3	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C219)	+	3.1	dB
DUT-Antenna	+	0.0	dBi
Test antenna (A019)	-	19.8	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield Attenuation (23.85GHz, 0.4m)	+	52.0	dB
(B11b)	-	30.1	dB
TOTAL CORRECTION:	+	5.2	dB

Remarks:
Max-Hold Mode

Plot No. 28 (30)



Subclause: 80.211(f) Radiated Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 21.2 - 26.5 GHz

Limit:
Limit acc. to 80.211(f): -13 dBm

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
long pulse

Test setup:
see section 8.1: 2.3

Test equipment:
see annex 2: A019, B11b, BCBL, C219, R001, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 13:54:57	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

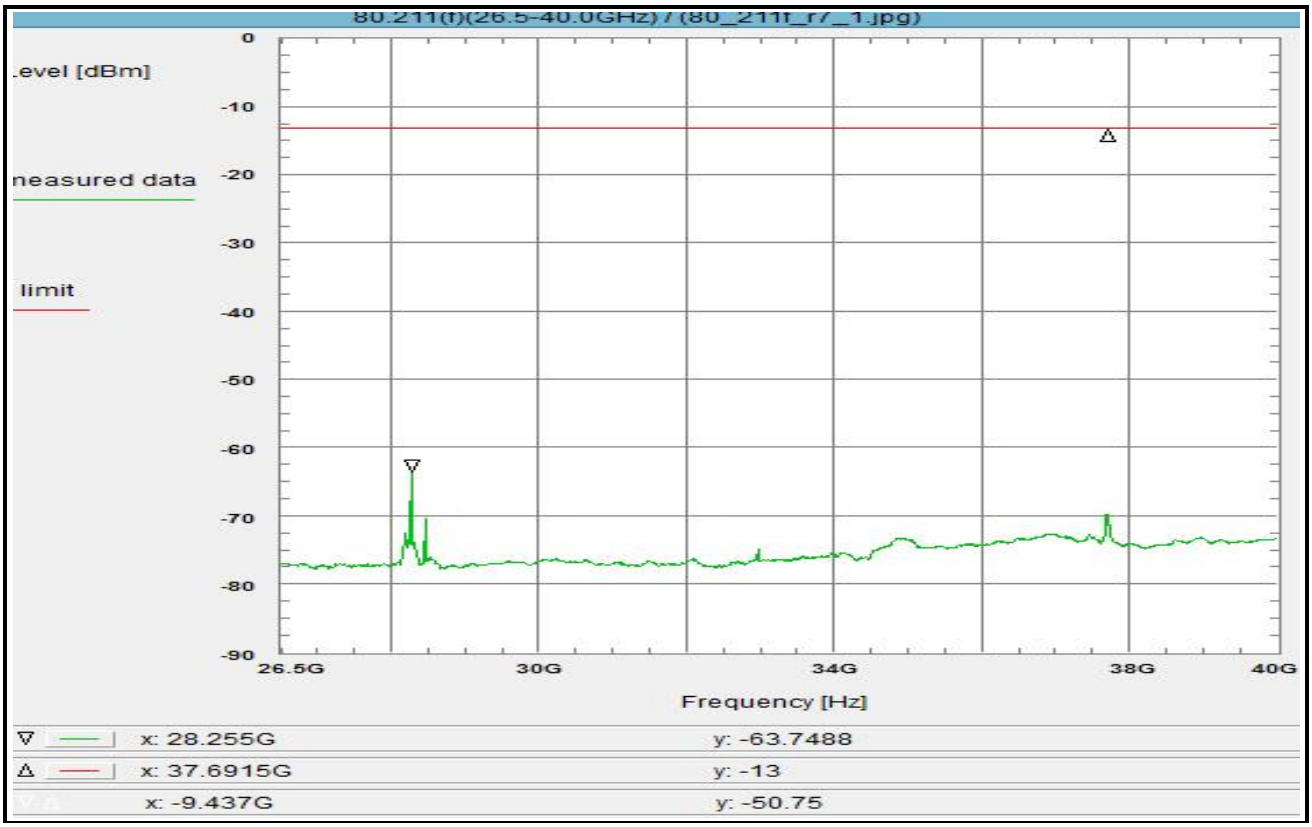
Start frequency:	21.2	GHz
Stop frequency:	26.5	GHz
Center frequency:	23.85	GHz
Frequency span:	5.3	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C219)	+	3.1	dB
DUT-Antenna	+	0.0	dBi
Test antenna (A019)	-	19.8	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield Attenuation (23.85GHz, 0.4m)	+	52.0	dB
(B11b)	-	30.1	dB
TOTAL CORRECTION:	+	5.2	dB

Remarks:
Max-Hold Mode

Plot No. 29 (30)



Subclause: 80.211(f) Radiated Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 26.5 - 40.0 GHz

Limit:
Limit acc. to 80.211(f): -13 dBm

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
short pulse

Test setup:
see section 8.1: 2.3

Test equipment:
see annex 2: A021, C219, R001, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 14:14:24	
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat	
Temperature:	20	°C
Humidity:	55	%
Voltage:	233	Vac

Setup of measurement equipment:

Start frequency:	26.5	GHz
Stop frequency:	40	GHz
Center frequency:	33.25	GHz
Frequency span:	13.5	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

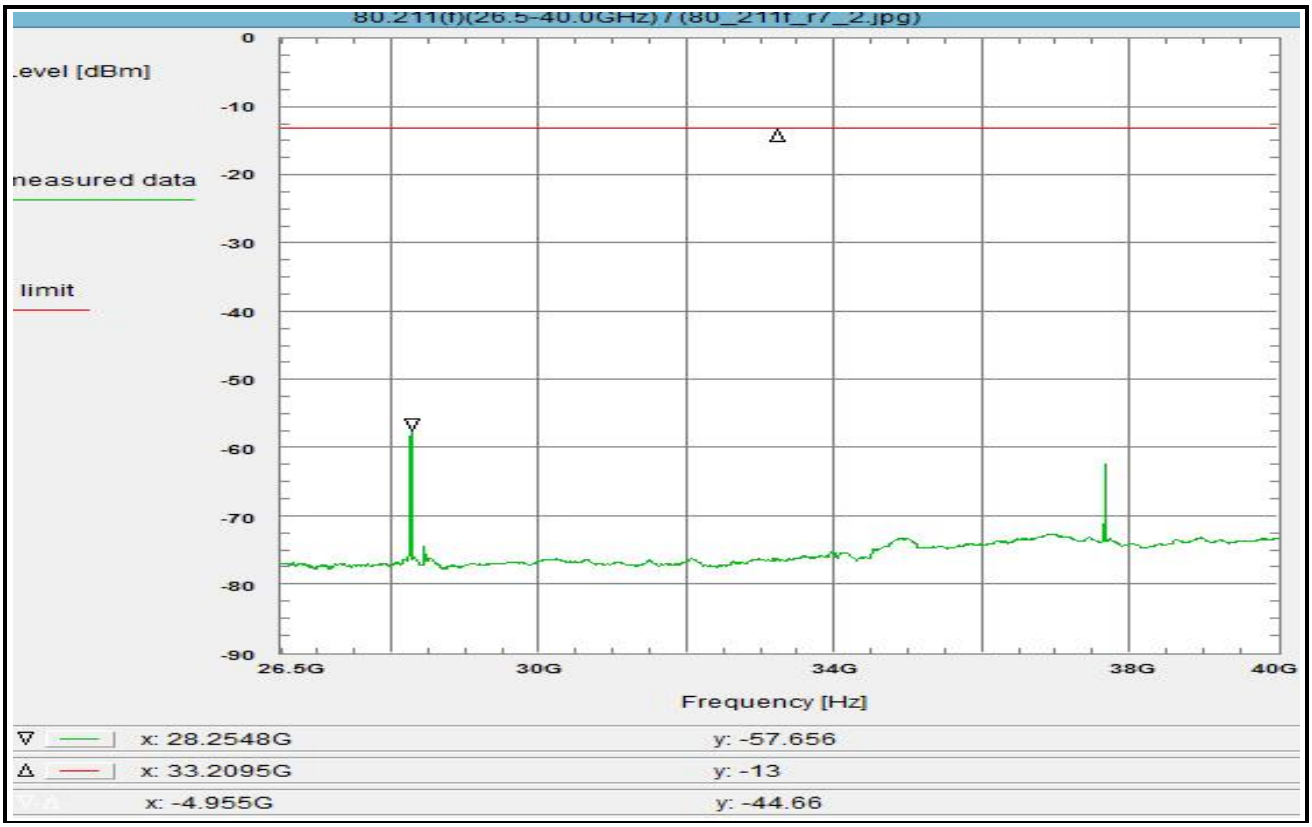
Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C219)	+	4.0	dB
DUT-Antenna	+	0.0	dBi
Test antenna (A021)	-	19.6	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield Attenuation (33.25GHz, 0.2m)	+	48.9	dB
Amp	-	35.2	dB
TOTAL CORRECTION:	-	-1.9	dB

Remarks:
Max-Hold Mode

Plot shows 3rd and 4th harmonic.

Plot No. 30 (30)



Subclause: 80.211(f) Radiated Spurious Emissions
Pulsed rf-carrier in frequency range 9.3 - 9.5 GHz
Examination of the frequency range 26.5 - 40.0 GHz

Limit:
Limit acc. to 80.211(f): -13 dBm

Test results:
see plot (an explicit table was not generated)

Operating condition of DUT:
operating condition 1, see subclause 1.5.2
long pulse

Test setup:
see section 8.1: 2.3

Test equipment:
see annex 2: A021, C219, R001, W242

Remark:

Test result: **Test passed**

Environment condition:

Date & Time:	Tue 24/Nov/2015 14:12:44
Location:	CETECOM ICT Services GmbH, Laboratory RSC-Sat
Temperature:	20 °C
Humidity:	55 %
Voltage:	233 Vac

Setup of measurement equipment:

Start frequency:	26.5	GHz
Stop frequency:	40	GHz
Center frequency:	33.25	GHz
Frequency span:	13.5	GHz
Resolution-BW:	1	MHz
Video-BW:	1	MHz
Input attenuation:	6	dB
Trace-Mode:	Max-Hold	
Detector-Mode:	AVG	

Correction:

Directional coupler	+	0.0	dB
Coaxial cable (C219)	+	4.0	dB
DUT-Antenna	+	0.0	dBi
Test antenna (A021)	-	19.6	dB
BW correction factor	+	0.0	dB
Atten. between HPA and feedhorn	-	0.0	dB
Freefield Attenuation (33.25GHz, 0.2m)	+	48.9	dB
Amp	-	35.2	dB
TOTAL CORRECTION:	-	-1.9	dB

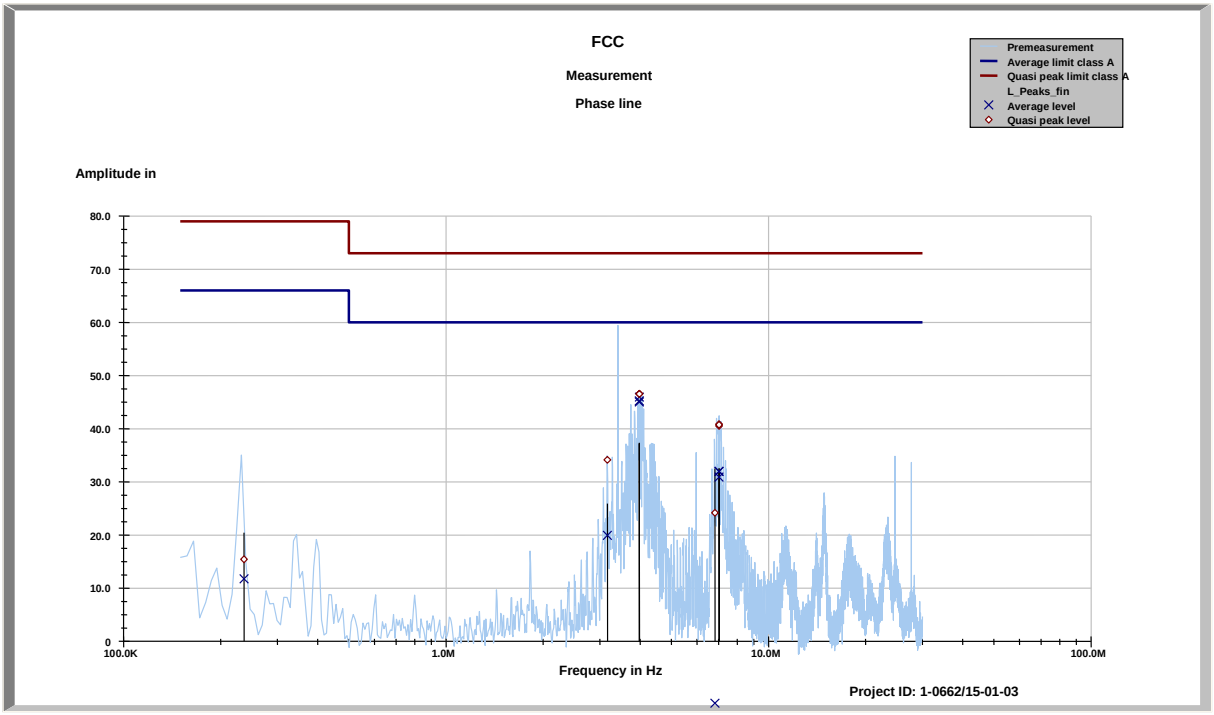
Remarks:
Max-Hold Mode

Plot shows 3rd and 4th harmonic.

Annex D Measurement results, part 3 (FCC Part 15B)

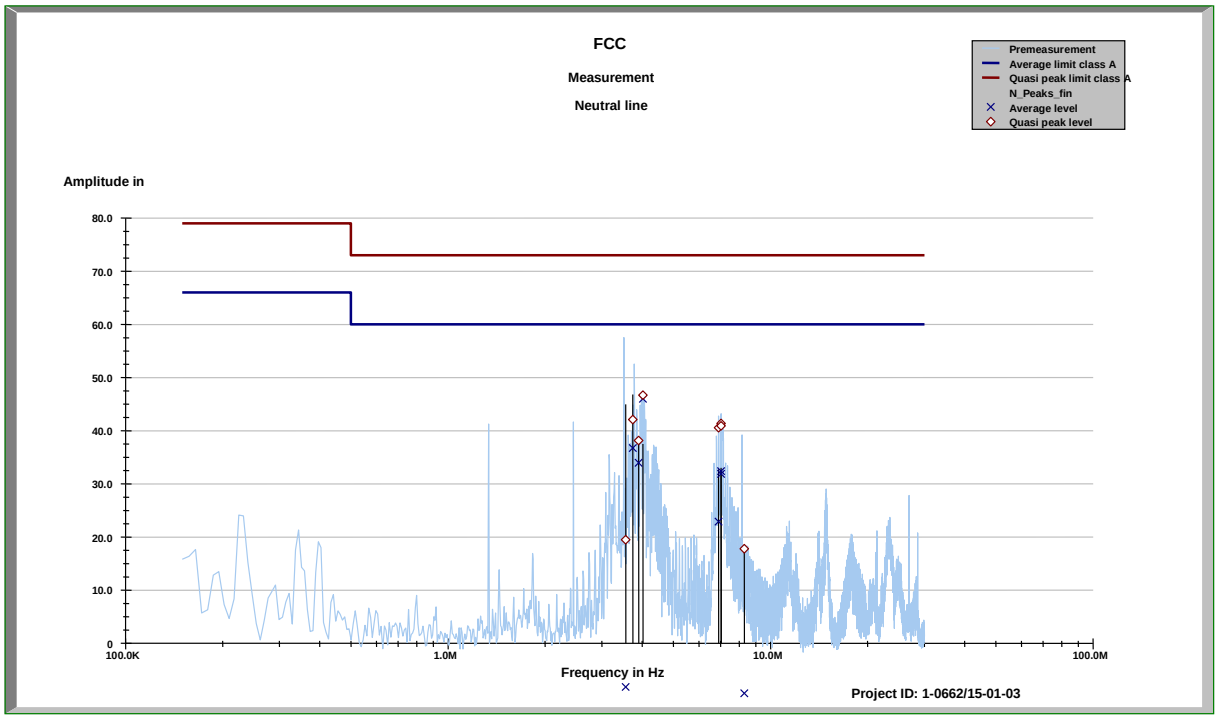
This annex consists of 7 pages including this page.

Plot No. 1: AC conducted



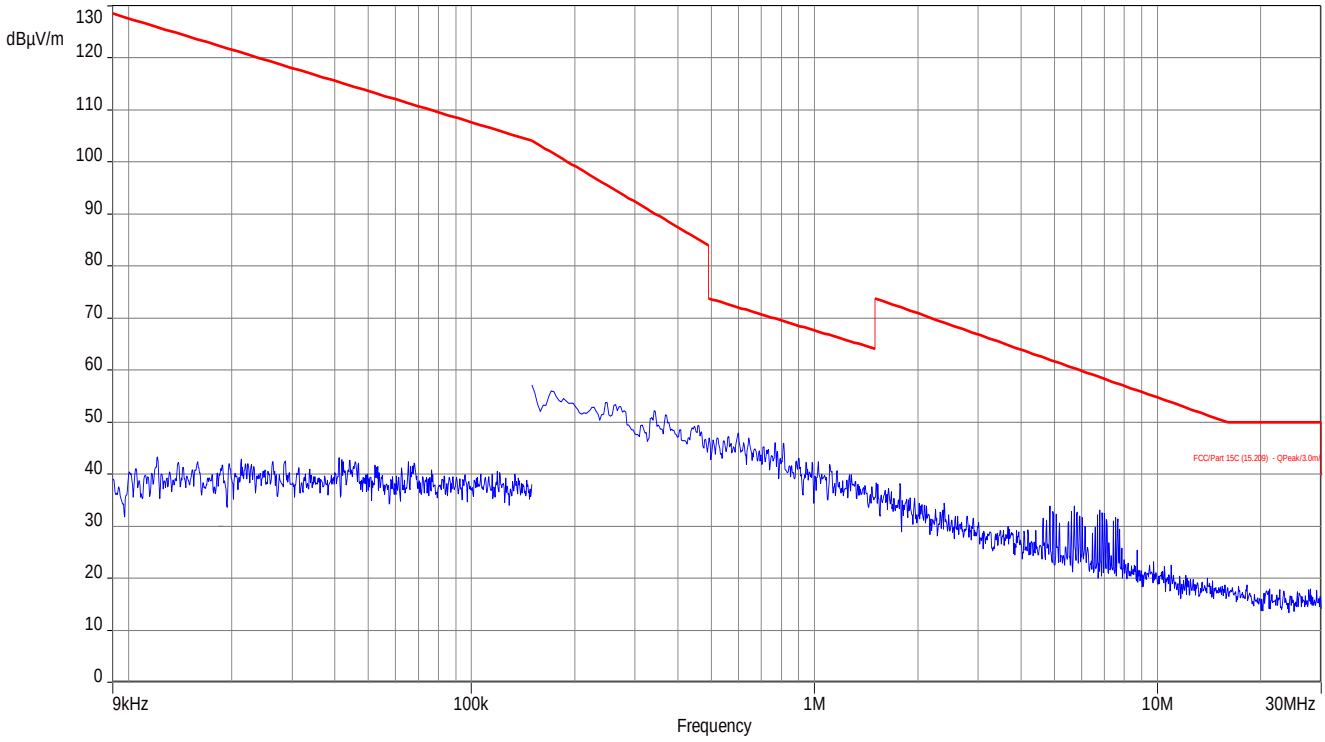
Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.23642	15.41	63.59	11.74	54.26
3.1633	34.13	38.87	19.92	40.08
3.9734	46.57	26.43	45.03	14.97
3.9738	46.55	26.45	45.22	14.78
3.9759	46.53	26.47	45.94	14.06
6.818	24.17	48.83	-11.65	71.65
7.0174	40.51	32.49	30.90	29.10
7.0202	40.85	32.15	31.99	28.01
7.0211	40.72	32.28	31.94	28.06

Plot No. 2: AC conducted

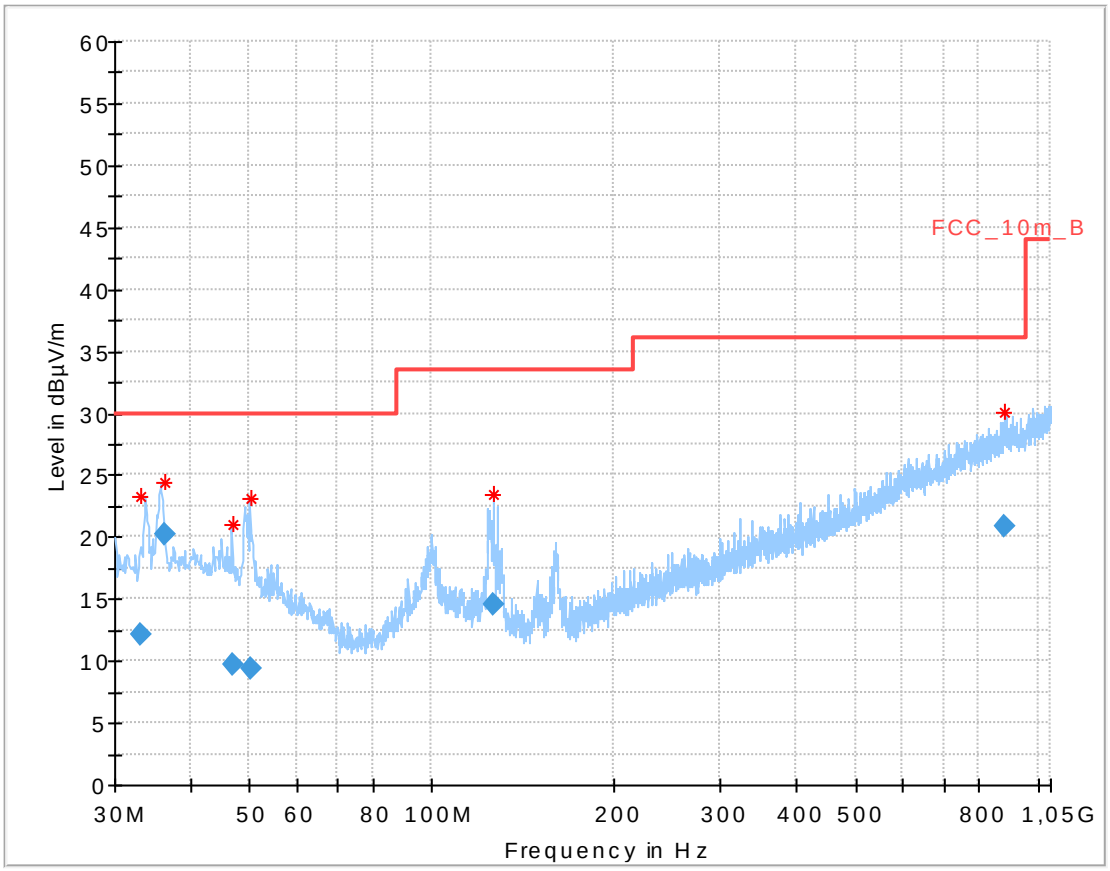


Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.23642	15.41	63.59	11.74	54.26
3.1633	34.13	38.87	19.92	40.08
3.9734	46.57	26.43	45.03	14.97
3.9738	46.55	26.45	45.22	14.78
3.9759	46.53	26.47	45.94	14.06
6.818	24.17	48.83	-11.65	71.65
7.0174	40.51	32.49	30.90	29.10
7.0202	40.85	32.15	31.99	28.01
7.0211	40.72	32.28	31.94	28.06

Plot No. 3: magnetic



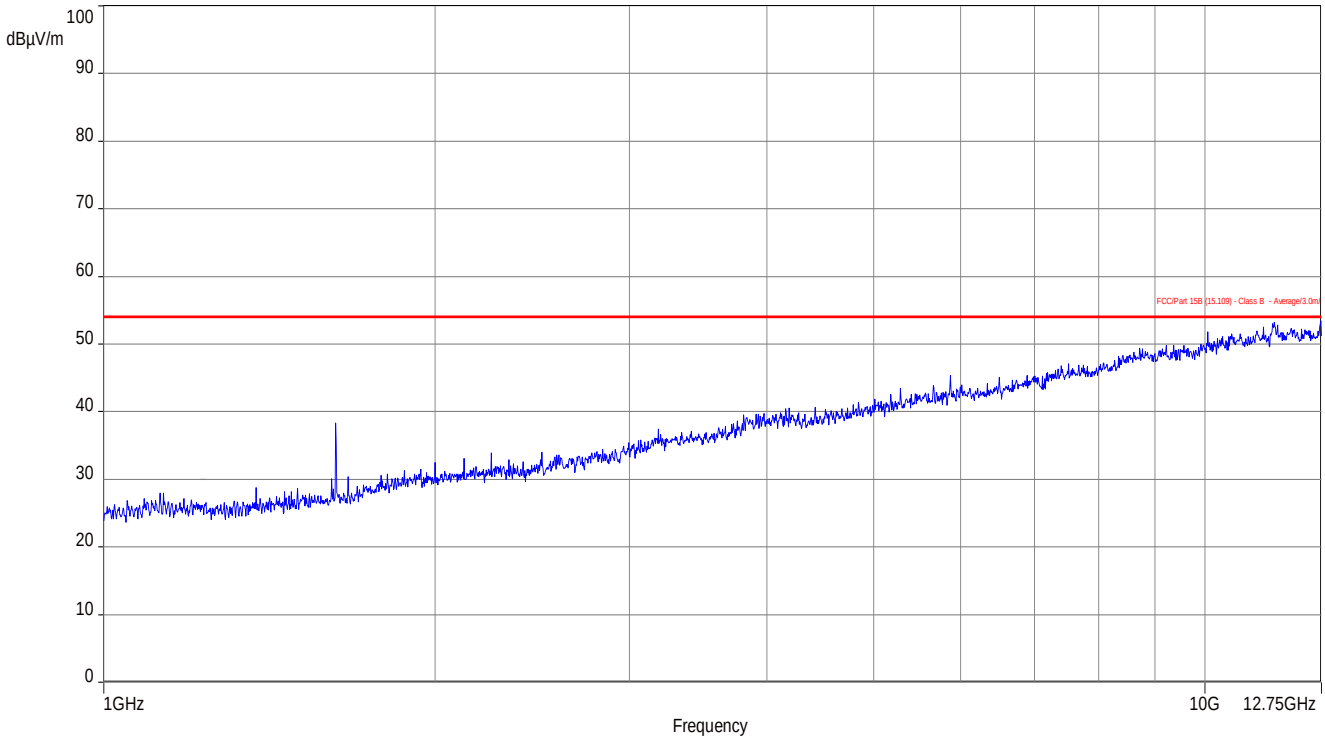
Plot No. 4: 30 MHz – 1 GHz



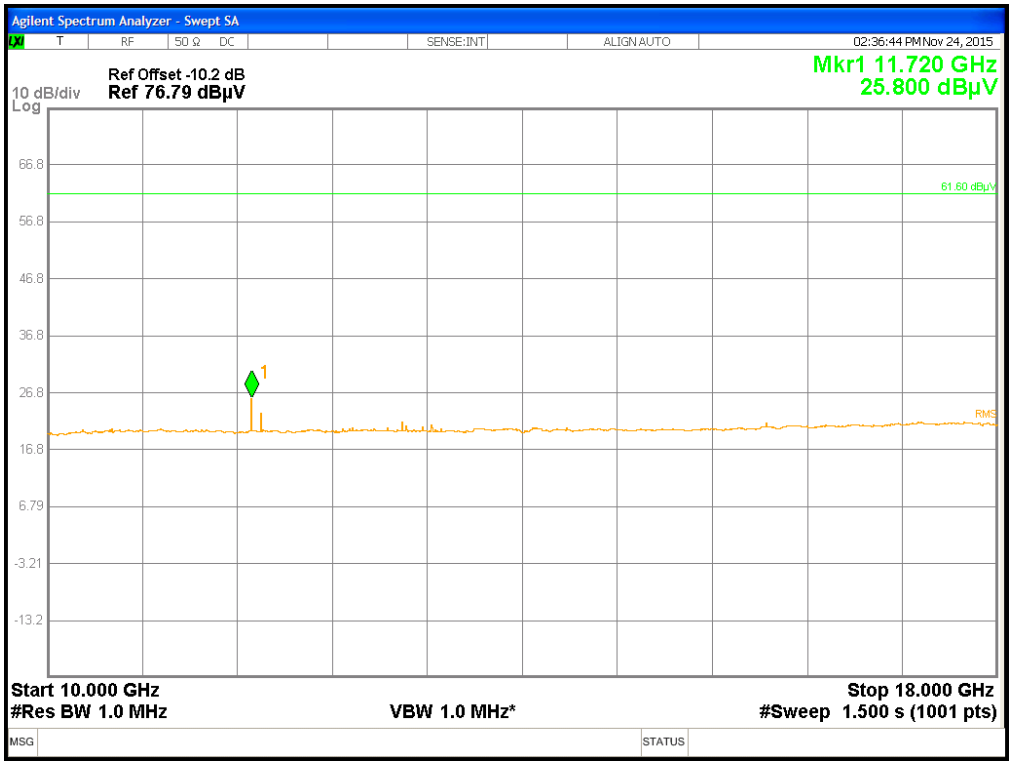
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
33.123600	12.07	30.00	17.93	1000.0	120.000	172.0	V	282	13.6
36.180000	20.21	30.00	9.79	1000.0	120.000	103.0	V	265	13.9
47.078250	9.64	30.00	20.36	1000.0	120.000	200.0	V	5	13.3
50.299800	9.33	30.00	20.67	1000.0	120.000	200.0	V	5	12.6
126.155850	14.62	33.50	18.88	1000.0	120.000	100.0	V	53	9.7
884.496600	20.88	36.00	15.12	1000.0	120.000	200.0	H	232	23.9

Plot No. 5: 1 GHz – 12.75 GHz

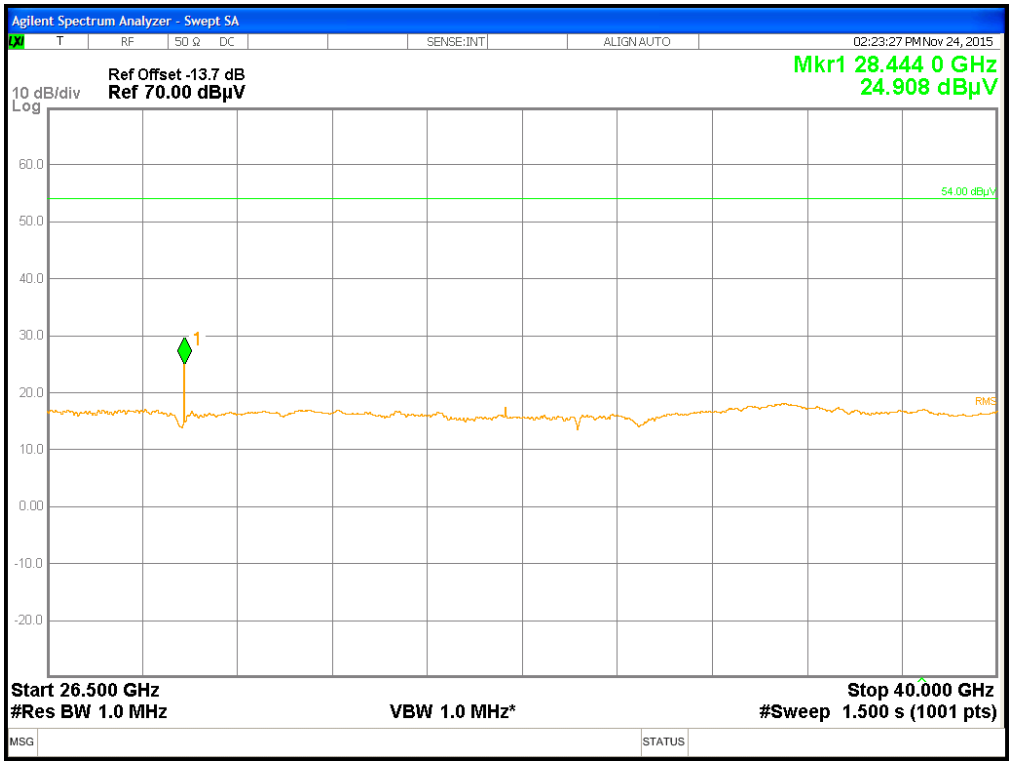


Plot No. 6: 10 – 18 GHz



Plot No. 7: 18 – 26.5 GHz

Plot No. 8: 26.5 GHz – 40 GHz



Annex E Document history

Version	Applied changes	Date of release
DRAFT	Initial release - DRAFT	2016-01-25
	minor changes based on manufacturer's information	2016-02-05

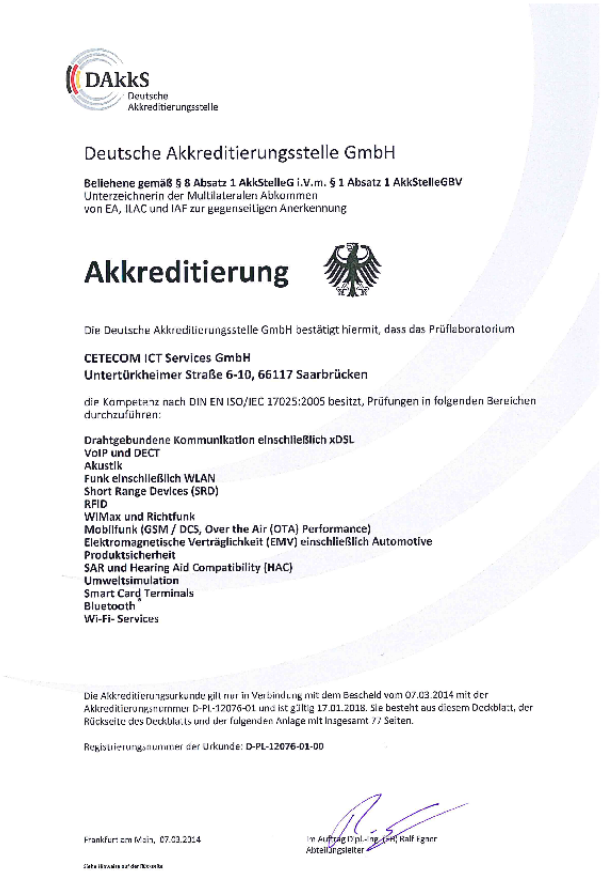
Annex F Further information

Glossary

AVG - Average
DUT - Device under test
EMC - Electromagnetic Compatibility
EN - European Standard
EUT - Equipment under test
ETSI - European Telecommunications Standard Institute
FCC - Federal Communication Commission
FCC ID - Company Identifier at FCC
HW - Hardware
IC - Industry Canada
Inv. No. - Inventory number
N/A - Not applicable
PP - Positive peak
QP - Quasi peak
S/N - Serial number
SW - Software

Annex G Accreditation Certificate

Front side of certificate



DAkkS
Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Beliehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichnerin der Multilateralen Abkommen
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Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

Drahtgebundene Kommunikation einschließlich xDSL
VoIP und DECT
Akustik
Funk einschließlich WLAN
Short Range Devices (SRD)
RFID
WiMax und Richtfunk
Mobilfunk (GSM / DCS, Over the Air (OTA) Performance)
Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
Produktsicherheit
SAR und Hearing Aid Compatibility (HAC)
Umweltsimulation
Smart Card Terminals
Bluetooth
Wi-Fi- Services

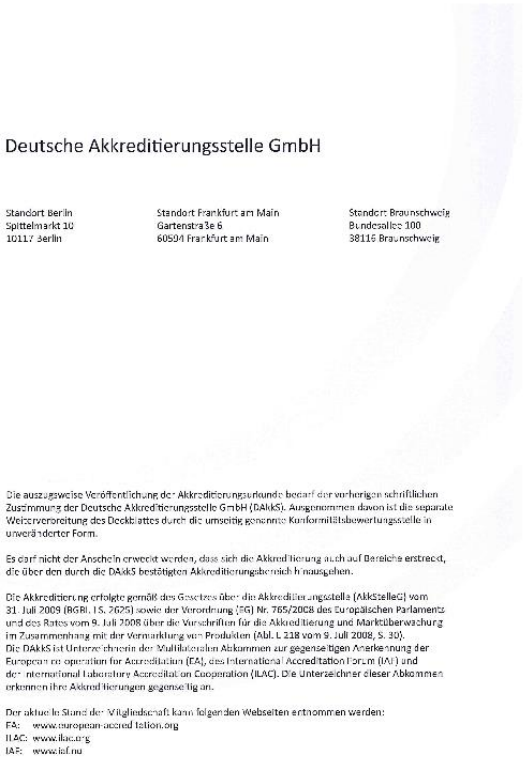
Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 77 Seiten.

Registrierungsnummer der Urkunde: **D-PL-12076-01-00**

Frankfurt am Main, 07.03.2014

Im Auftrag Dipl.-Ing. (FH) Ralf Egner
Abteilungsleiter

Back side of certificate



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ILAC: www.ilac.org
IAF: www.iaf.nu

Note:

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