TEST REPORT

Test report no.: 1-2758/16-01-03

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

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-12076-01-01

Applicant

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Manufacturer

InnoSenT GmbH
Am Rödertor 30
97499 Donnersdorf / GERMANY

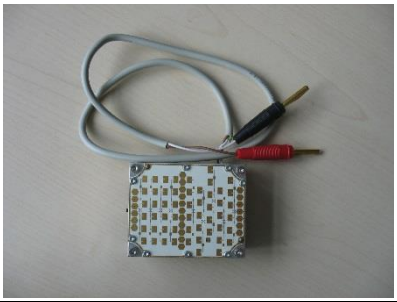
Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**3D-MIMO-RADAR**
Model name:	**iSYS-5010**
FCC ID:	**UXS-ISYS5010**
Frequency:	24.05 GHz to 24.25 GHz
Antenna:	Integrated patch antenna
Power supply:	6.10 V to 6.40 V DC
Temperature range:	-40°C to +85°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:

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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:	2016-10-05
Date of receipt of test item:	2016-11-03
Start of test:	2016-11-03
End of test:	2016-11-09
Person(s) present during the test:	Mr. Martin Maidhoff Mr. Benjamin Mai

2.3 Test laboratories sub-contracted

None

3 Test standard/s and references

Test standard	Date	Description
47 CFR Part 15	2016	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

Guidance	Version	Description
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American national standard of procedures for compliance testing of unlicensed wireless devices

4 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests +85 °C during high temperature tests -40 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		not relevant for this kind of testing
Power supply	:	V_{nom} V_{max} V_{min}	6.25 V DC 6.40 V 6.10 V

5 Test item

5.1 General description

Kind of test item	:	3D-MIMO-RADAR
Type identification	:	iSYS-5010
S/N serial number	:	00001009
HW hardware status	:	REV2_01
SW software status	:	1.0
Frequency band	:	24.05 GHz to 24.25 GHz
Type of modulation	:	FMCW Mode 1: sweeping up Mode 2: sweeping down
Number of channels	:	1
Antenna	:	Integrated patch antenna
Power supply	:	6.10 V to 6.40 V DC
Temperature range	:	-40°C to +85°C

5.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report: 1-2758/16-01-01_AnnexA
1-2758/16-01-01_AnnexB
1-2758/16-01-01_AnnexD

6 Description of the test setup

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).

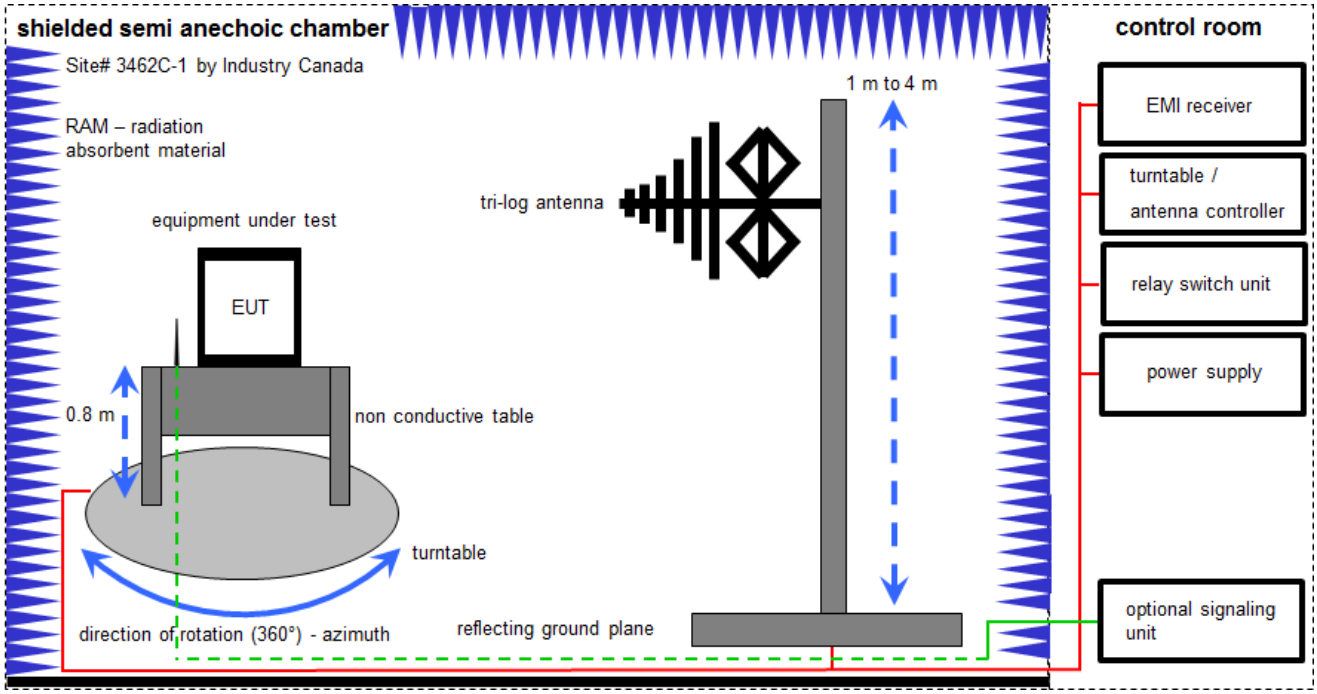
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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

6.1 Shielded semi anechoic chamber

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. 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

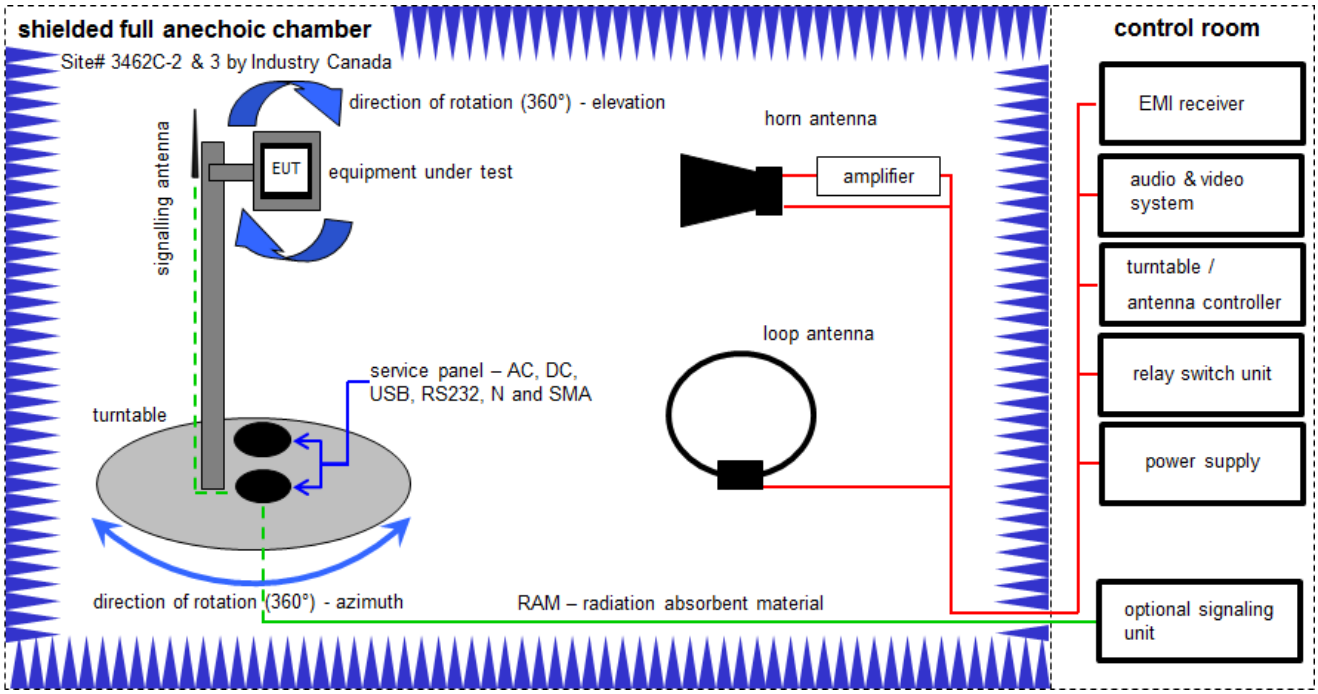
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

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:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP	2719A14505	300000368	ev		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne		
3	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	08.03.2016	08.03.2017
4	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	02.02.2016	02.02.2018
5	n. a.	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw		
6	n. a.	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw		
7	n. a.	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw		
8	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	25.04.2016	25.04.2018
9	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	29.01.2016	29.01.2017
10	n. a.	Double Ridge Broadband Horn Antenna 1-10 GHz	BBHA9120 B	Schwarzbeck	188	300003896	k	20.05.2015	20.05.2017

6.2 Shielded fully anechoic chamber



Measurement distance: horn antenna 3 meter; loop antenna 3 meter / 1 meter

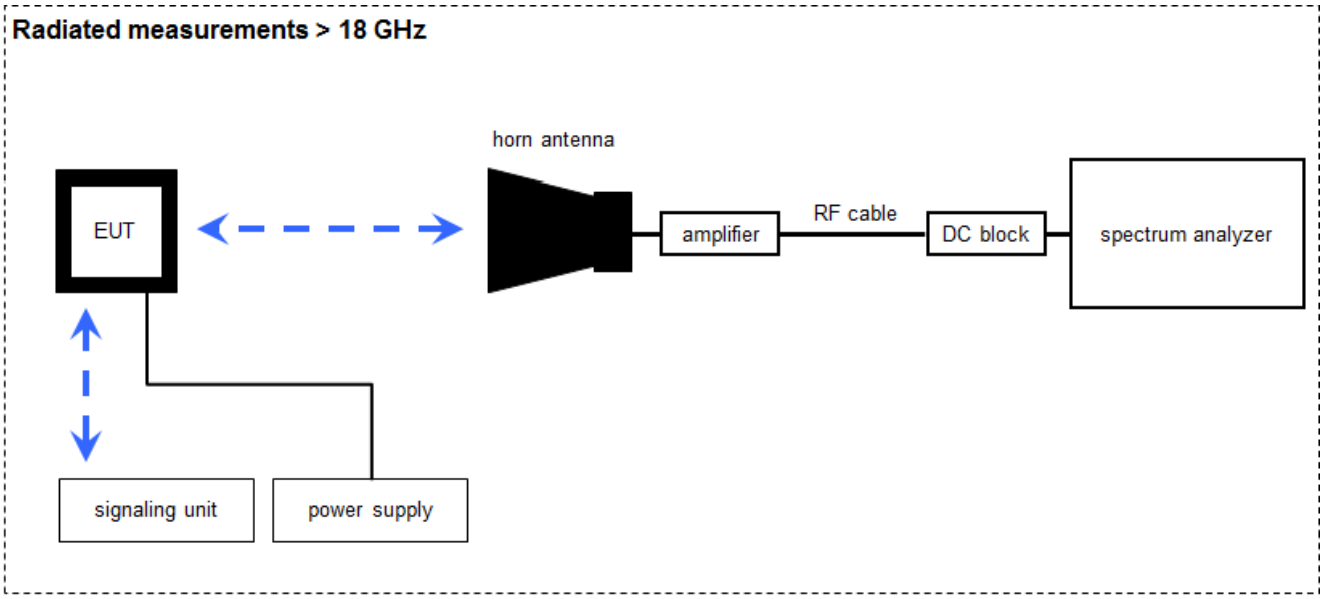
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

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

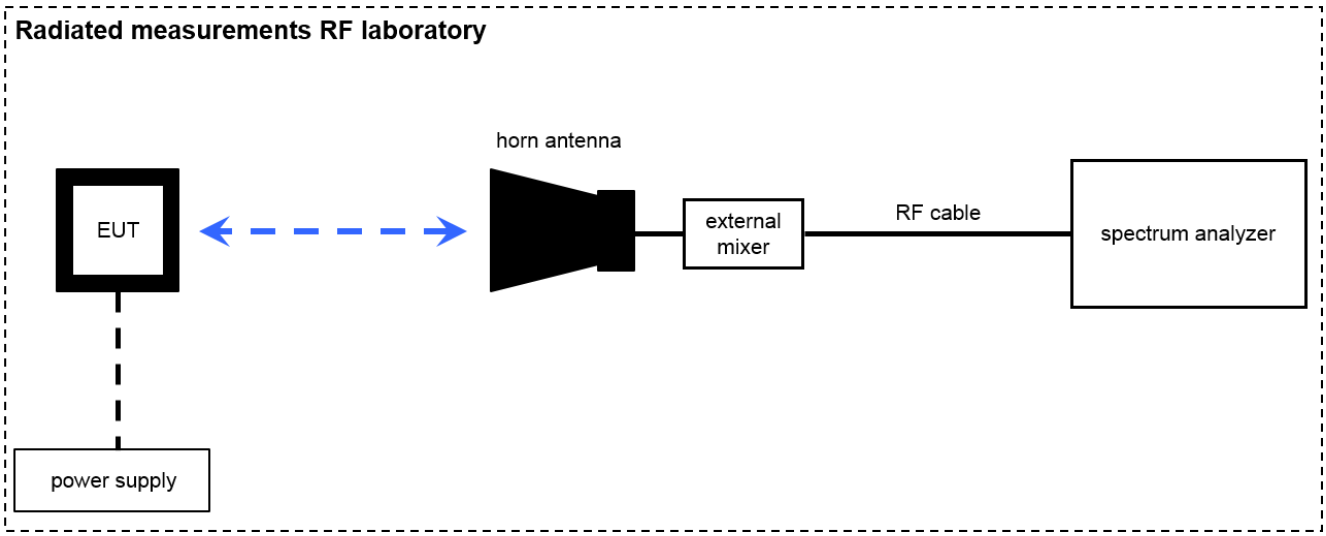
Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	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	vIKl!	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	90	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
6	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
7	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
8	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKl!	29.10.2014	29.10.2017
9	n. a.	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev		
10	n. a.	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne		
11	n. a.	EMI Test Receiver 9kHz-26,5GHz	ESR26	R&S	101376	300005063	vIKl!	13.09.2016	13.03.2018

6.3 Radiated measurements > 18 GHz



6.4 Radiated measurements > 50 GHz



OP = AV + D - G
(OP-rad. output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain)

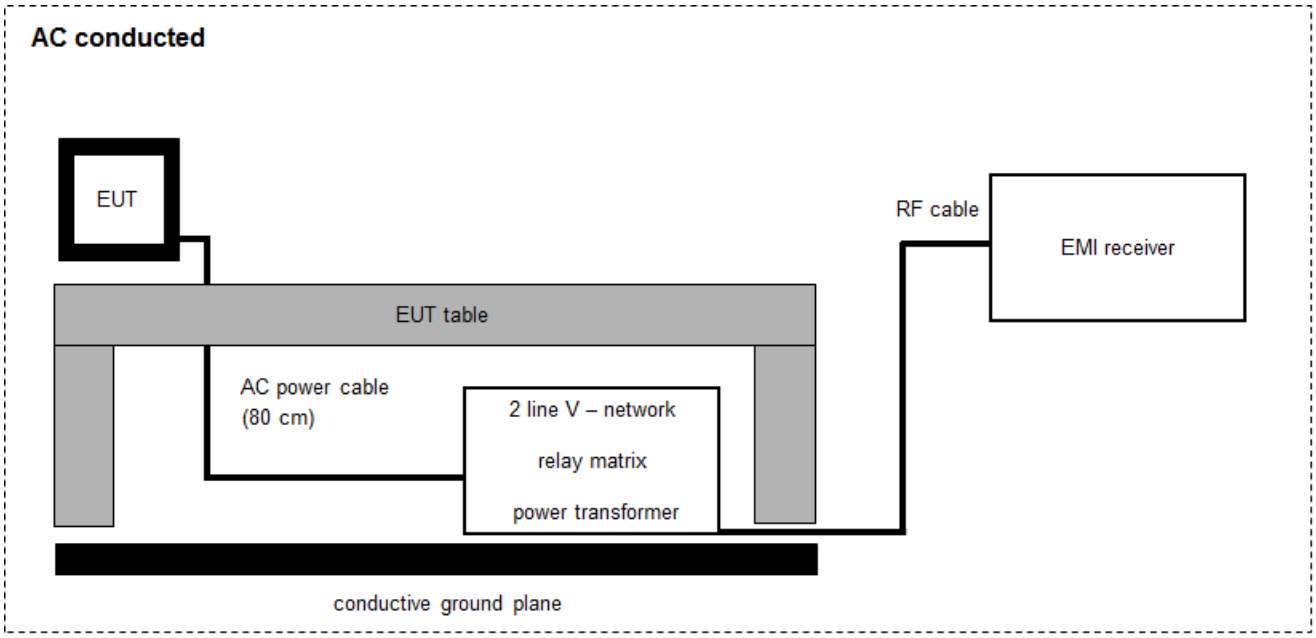
Example calculation:
OP [dBm] = -54.0 [dBm] + 64.0 [dB] - 20.0 [dBi] = -10 [dBm] (100 µW)

Note: conversion loss of mixer is already included in analyzer value.

Equipment table for radiated measurements from 18 GHz to 110 GHz:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	14.08.2015	14.08.2017
2	A030	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8402	300000487	ne	-/-	-/-
3	A031	Std. Gain Horn Antenna 26.5 to 40.0 GHz	V637	Narda	82-16	300000510	k	14.08.2015	14.08.2017
4	n. a.	Std. Gain Horn Antenna 33.0-50.1 GHz	2324-20	Flann	57	400000683	ne	-/-	-/-
5	n. a.	Broadband LNA 18-50 GHz	CBL18503070PN	CERNEX	25240	300004948	ev	-/-	-/-
6	A025	Std. Gain Horn Antenna 49.9-75.8 GHz	2524-20	Flann	*	300001983	ne	-/-	-/-
7	A028	Std. Gain Horn Antenna 73.8-112 GHz	2724-20	Flann	*	300001991	ne	-/-	-/-
8	n. a.	PXA Spectrum Analyzer 3Hz to 50GHz	N9030A PXA Signal Analyzer	Agilent Technologies	US51350267	300004338	k	09.02.2016	09.02.2017
9	n. a.	Waveguide Harmonic Mixer, 75-110 GHz	M1970W	KEYSIGHT	MY51430848	300005115	k	25.02.2016	25.02.2018
10	n. a.	Waveguide Harmonic Mixer, 50-80 GHz	M1970V	KEYSIGHT	MY51390914	300005116	k	05.02.2016	05.02.2018

6.5 AC conducted



FS = UR + CF + VC
(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:
FS [dBµV/m] = 37.62 [dBµV/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dBµV/m] (244.06 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	101	Two-line V-Network (LISN) 9 kHz to 30 MHz	ESH3-Z5	R&S	893045/004	300000584	k	02.02.2016	02.02.2017
2	67	RF-Filter-section	85420E	HP	3427A00162	300002214	k	27.11.2006	
3	n. a.	Magnetfeldantenne	MS 100	EM-Test	-----	300002659	ev	24.04.2000	
4	n. a.	AC-Spannungsquelle variabel	MV2616-V	EM-Test	0397-12	300003259	k	11.12.2015	11.12.2017
5	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	02.02.2016	02.02.2018
6	n. a.	Hochpass 150 kHz	EZ-25	R&S	100010	300003798	ev	08.04.2008	

7 Sequence of testing

7.1 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.

7.2 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.

7.3 Sequence of testing radiated spurious 1 GHz to 18 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.

7.4 Sequence of testing radiated spurious above 18 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.

7.5 Sequence of testing radiated spurious above 50 GHz with external mixers

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 for far field (e.g. 0.25 m).
- The EUT is set into operation.

Premeasurement

- The test antenna with external mixer is handheld and moved carefully over the EUT to cover the EUT's whole sphere and different polarizations of the antenna.
- Caution is taken to reduce the possible overloading of the external mixer.

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).
- As external mixers may generate false images care is taken to ensure that any emission measured by the spectrum analyzer does indeed originate in the EUT. Signal identification feature of spectrum analyzer is used to eliminate false mixer images (i.e., it is not the fundamental emission or a harmonic falling precisely at the measured frequency).
- 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.

8 Summary of measurement results

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

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	FCC 47 CFR Part 15 / IC RSS-310	Passed	2016-11-24	-/-

Test specification clause	Test case	Temperature conditions	Power supply	Pass	Fail	NA	NP	Results (max.)
§15.249(a) / RSS-310, 3.10	Field strength of emissions (wanted signal)	Nominal	Nominal	☒	☐	☐	☐	PK: 112.8 dBµV/m RMS: 95.0 dBµV/m @ 3m
§2.1049	Occupied bandwidth (99% bandwidth)	Nominal	Nominal	☒	☐	☐	☐	191.8 MHz
§15.209(a) / §15.249(d) / RSS-310, 3.10	Field strength of emissions (spurious & harmonics)	Nominal	Nominal	☒	☐	☐	☐	complies

Note: NA = Not Applicable; NP = Not Performed

9 Measurement results

9.1 Field strength of emissions (wanted signal)

Description:

Measurement of the maximum radiated field strength of the wanted signal.

Measurement:

Measurement parameter	
Detector:	Pos-Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	≥ RBW
Span:	250 MHz
Trace-Mode:	Max Hold

Limits:

FCC / IC		
47 CFR Part 15.249(a) / RSS-310, 3.10		
Field strength of emissions		
The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:		
Frequency [GHz]	Field Strength [dBµV/m]	Measurement distance
24.00 – 24.25	108	3

(e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Measurement results:

Peak-Measurement:

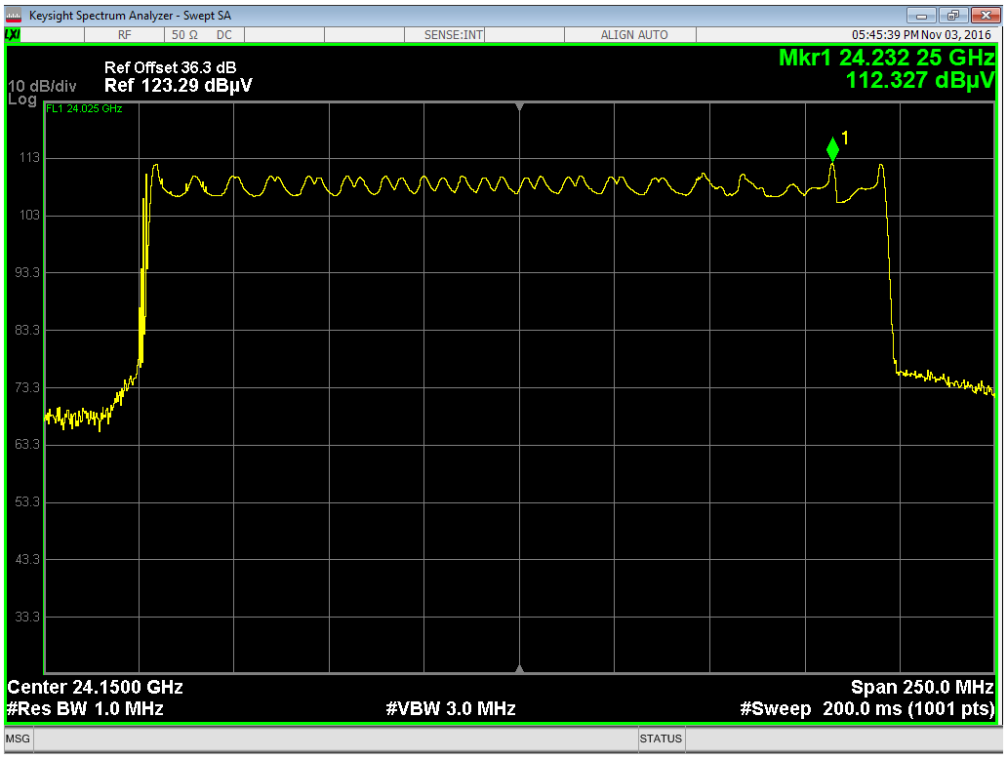
Test condition t = 22 °C	Frequency [GHz]	Maximum field strength (Peak) measured values [dBµV/m] @ 3 m
Mode 1	24.23225	112.3
Mode 2	24.24450	112.8
stopped mode 1, low frequency	24.05950	111.9
stopped mode 1, mid frequency	24.15100	112.1
stopped mode 1, high frequency	24.24225	112.6
stopped mode 2, low frequency	24.05700	112.0
stopped mode 2, mid frequency	24.14825	112.0
stopped mode 2, high frequency	24.23950	112.4
Measurement uncertainty	± 3 dB	

Average-Measurement:

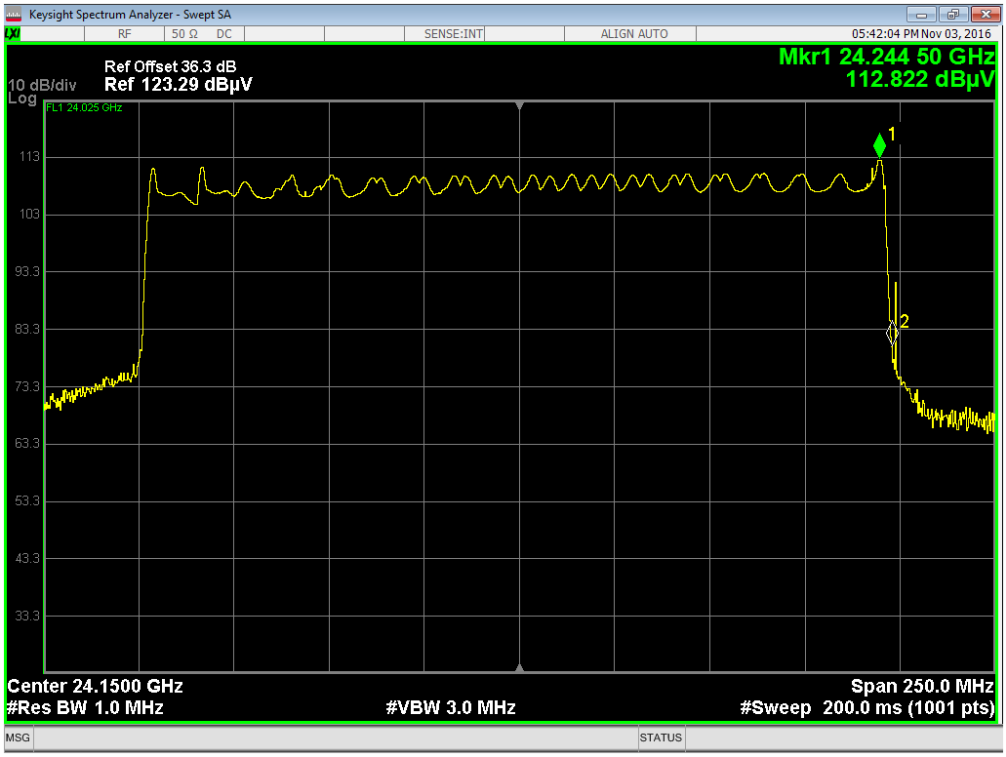
Test condition t = 22 °C	Frequency [GHz]	Maximum field strength (Peak) measured values [dBµV/m] @ 3 m
Mode 1	24.05500	94.3
Mode 2	24.24425	95.0
Measurement uncertainty	± 3 dB	

Result: **The measurement is passed.**

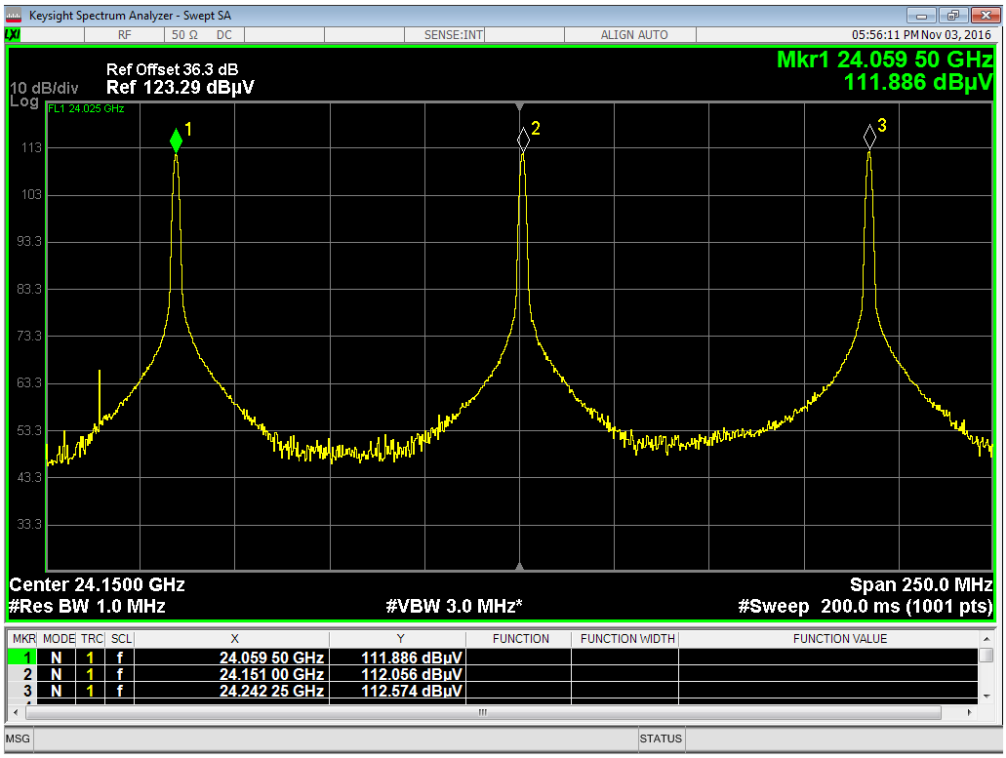
Plot No. 1: Peak measurement, Mode 1



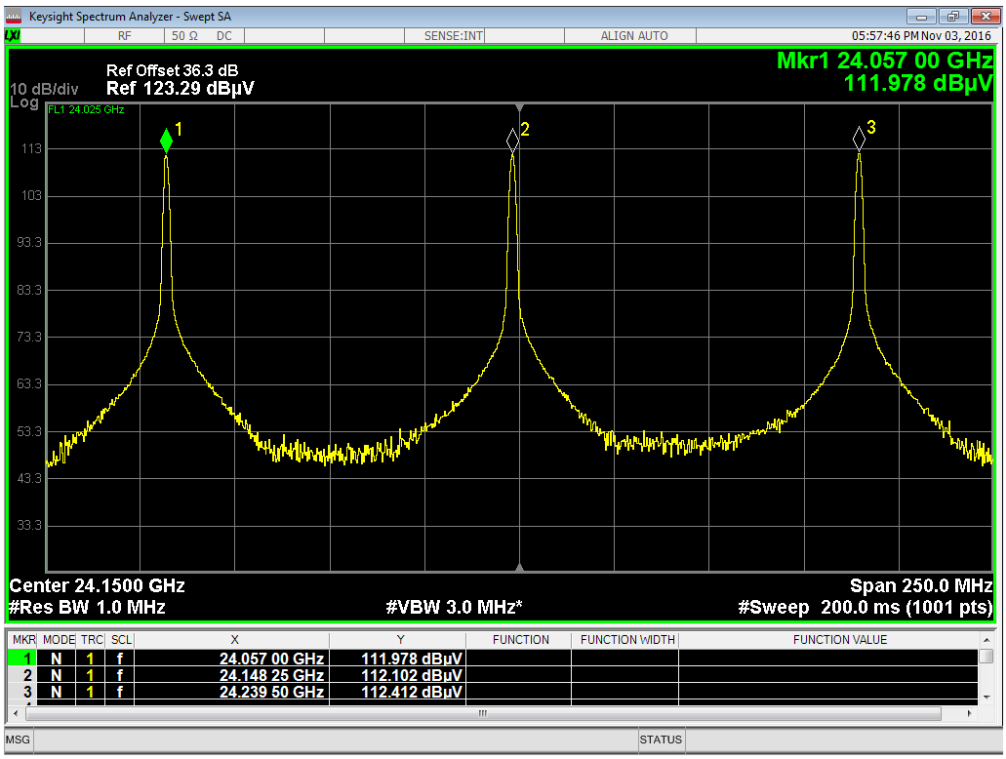
Plot No. 2: Peak measurement, Mode 2



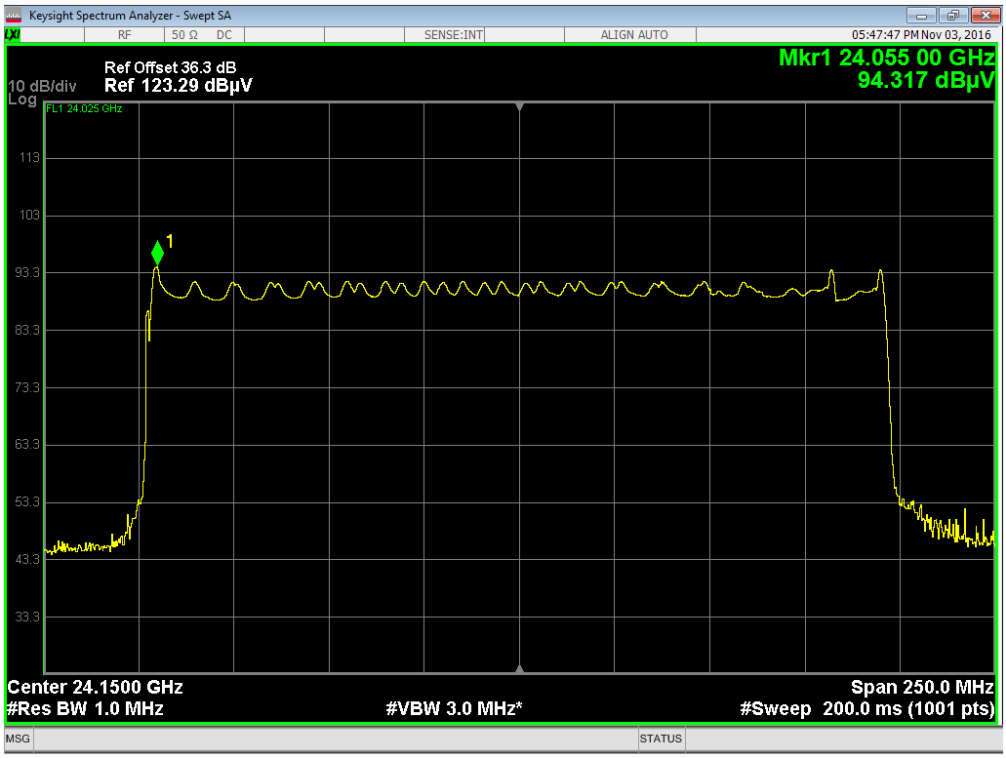
Plot No. 3: Peak measurement, stopped mode, Mode 1, low/mid/high frequency



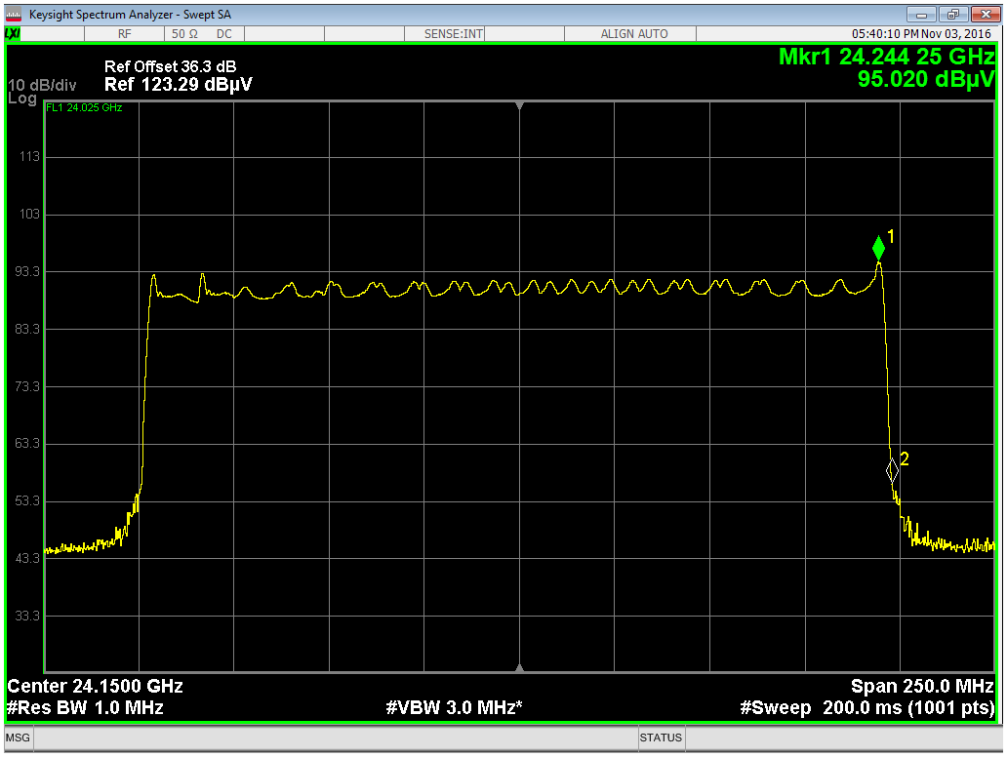
Plot No. 4: Peak measurement, stopped mode, Mode 2, low/mid/high frequency



Plot No. 5: Average measurement, Mode 1



Plot No. 6: Average measurement, Mode 2



9.2 Occupied bandwidth (99% bandwidth)

Description:

Measurement of the 99% bandwidth of the wanted signal.

Measurement:

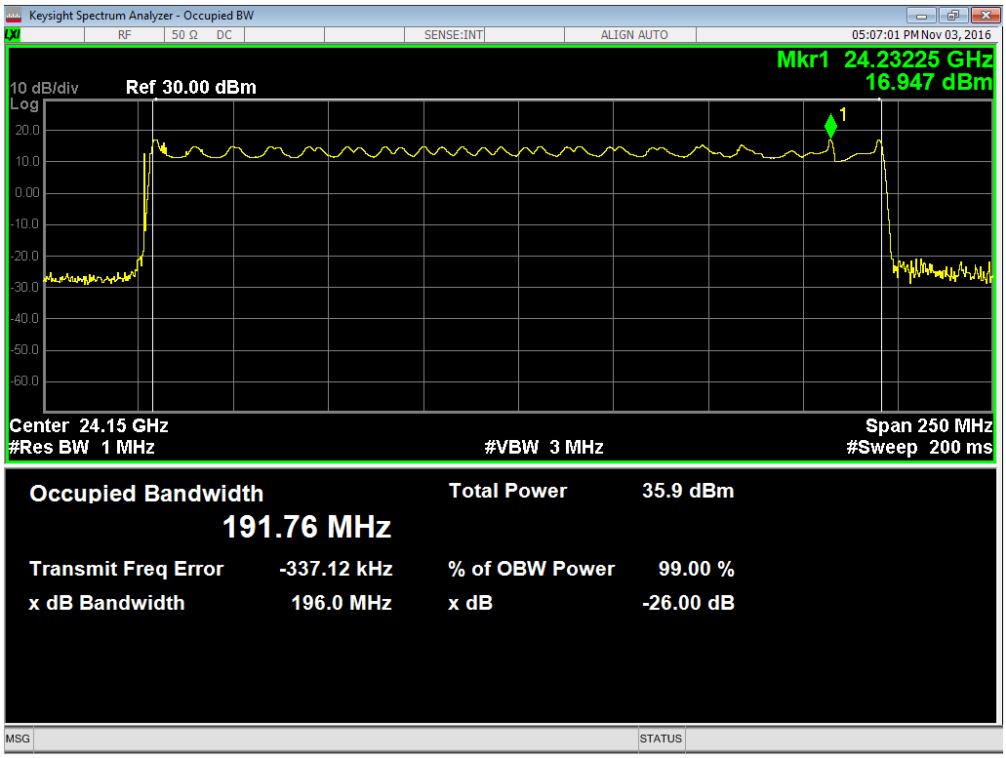
Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	≥ RBW
Span:	250 MHz
Trace-Mode:	Max Hold

Measurement results:

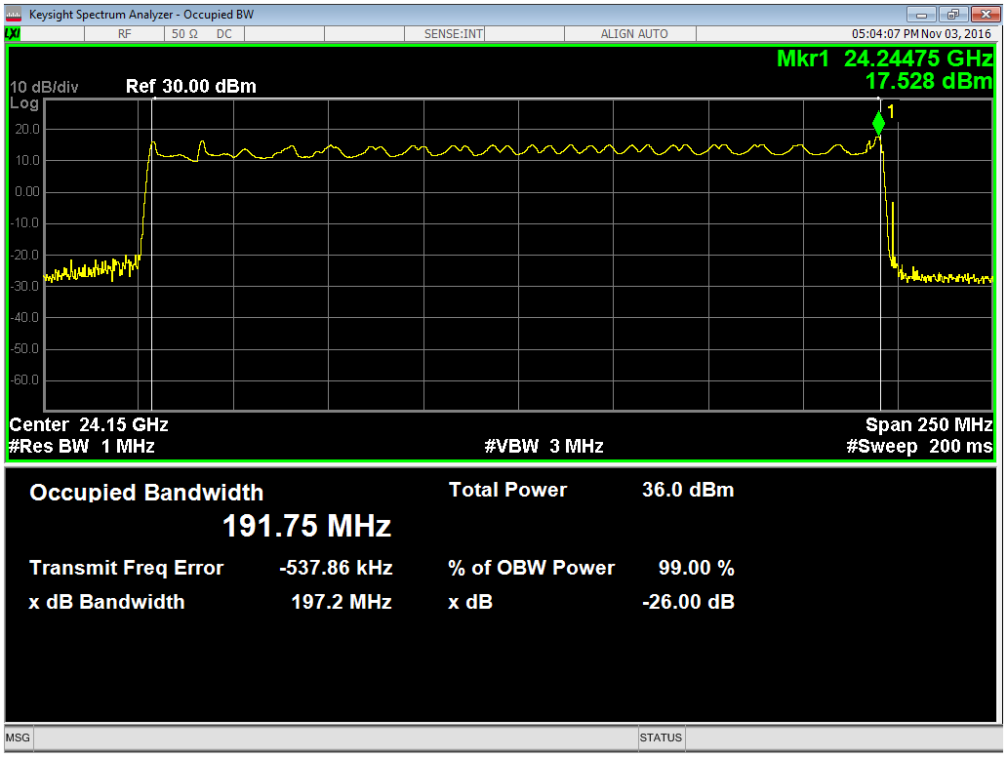
Test condition t = 22 °C	Occupied bandwidth [MHz]
Mode 1 U_{DC} = 6.25 V	191.8
Mode 2 U_{DC} = 6.25 V	191.8
Measurement uncertainty	± span/1000

Result: **The measurement is passed.**

Plot No. 7: OBW, Mode 1



Plot No. 8: OBW, Mode 2



9.3 Field strength of emissions (radiated spurious)

Description:

Measurement of the radiated spurious emissions in transmit mode.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Video bandwidth:	Auto
Frequency range:	30 MHz to 100 GHz
Trace-Mode:	Max Hold

Limits:

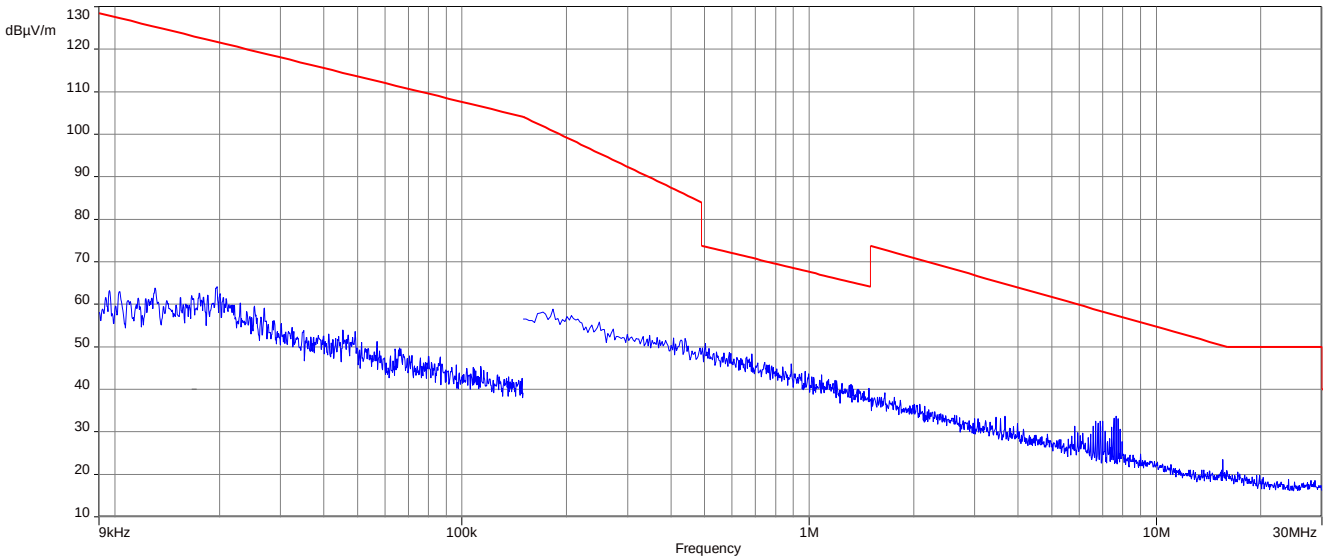
FCC / IC		
CFR Part 15.209(a) / RSS-310, 3.10 / RSS-Gen		
Radiated Spurious Emissions		
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Measurement results:

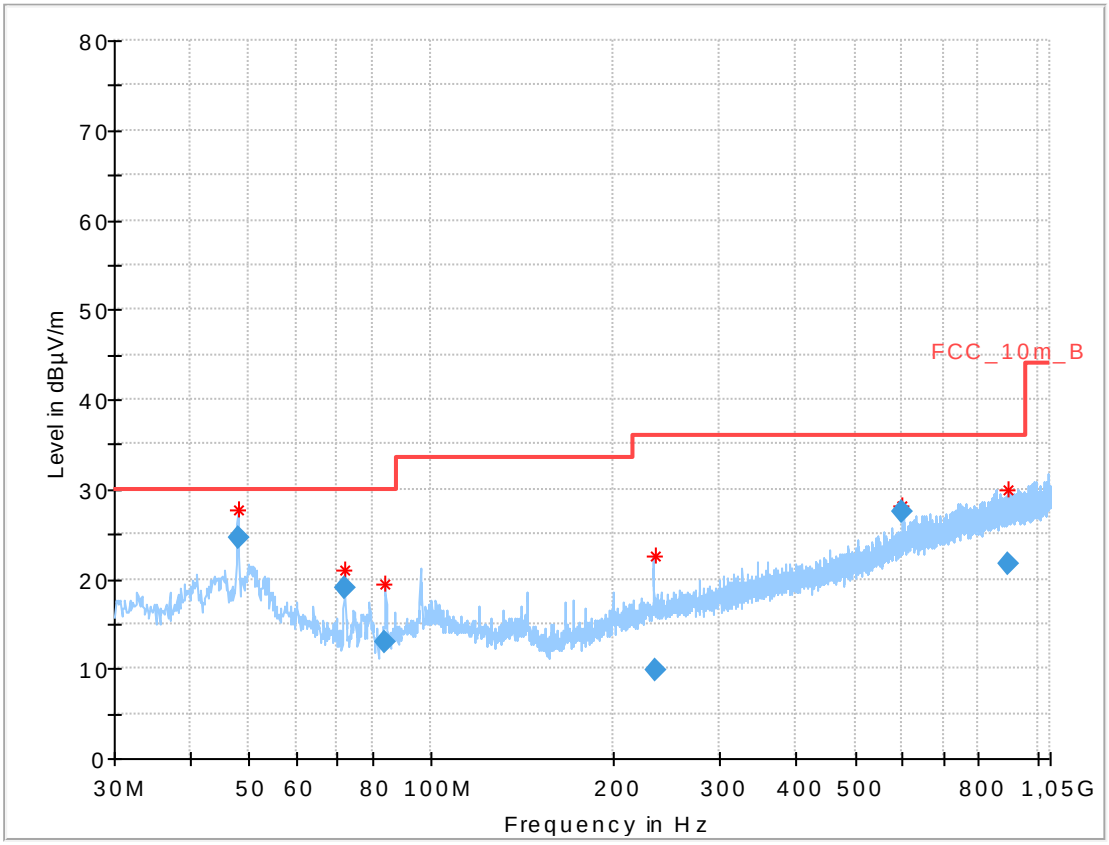
TX Spurious Emissions Radiated [dBµV/m]								
			Low / Middle / High					
F [GHz]	Detector	Level [dBµV/m]	F [GHz]	Detector	Level [dBµV/m]	F [GHz]	Detector	Level [dBµV/m]
No critical peaks found			No critical peaks found			No critical peaks found		
			22.7	RMS	39.3			
			48.1	RMS	45.1			
Measurement uncertainty			± 3 dB					

Result: **The measurement is passed.**

Plot No. 9: 9 kHz to 30 MHz, magnetic, low/mid/high frequency



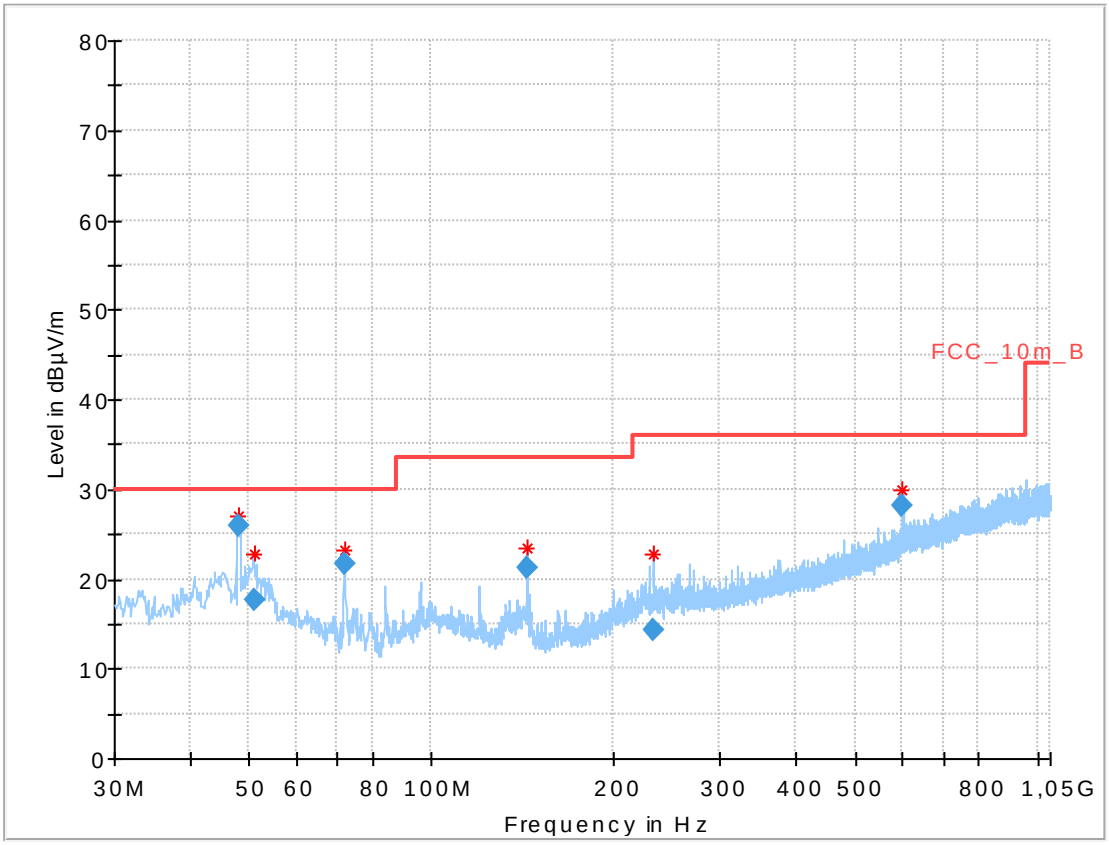
Plot No. 10: 30 MHz to 1 GHz, horizontal/vertical polarization, low frequency



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.027300	24.63	30.00	5.37	1000.	120.000	101.0	V	254.0	13.3
71.982300	18.91	30.00	11.09	1000.	120.000	179.0	V	0.0	8.4
84.007500	12.98	30.00	17.02	1000.	120.000	185.0	V	138.0	9.1
233.773350	9.78	36.00	26.22	1000.	120.000	178.0	V	159.0	12.9
600.003300	27.48	36.00	8.52	1000.	120.000	98.0	V	198.0	20.7
893.579250	21.61	36.00	14.39	1000.	120.000	185.0	H	73.0	24.0

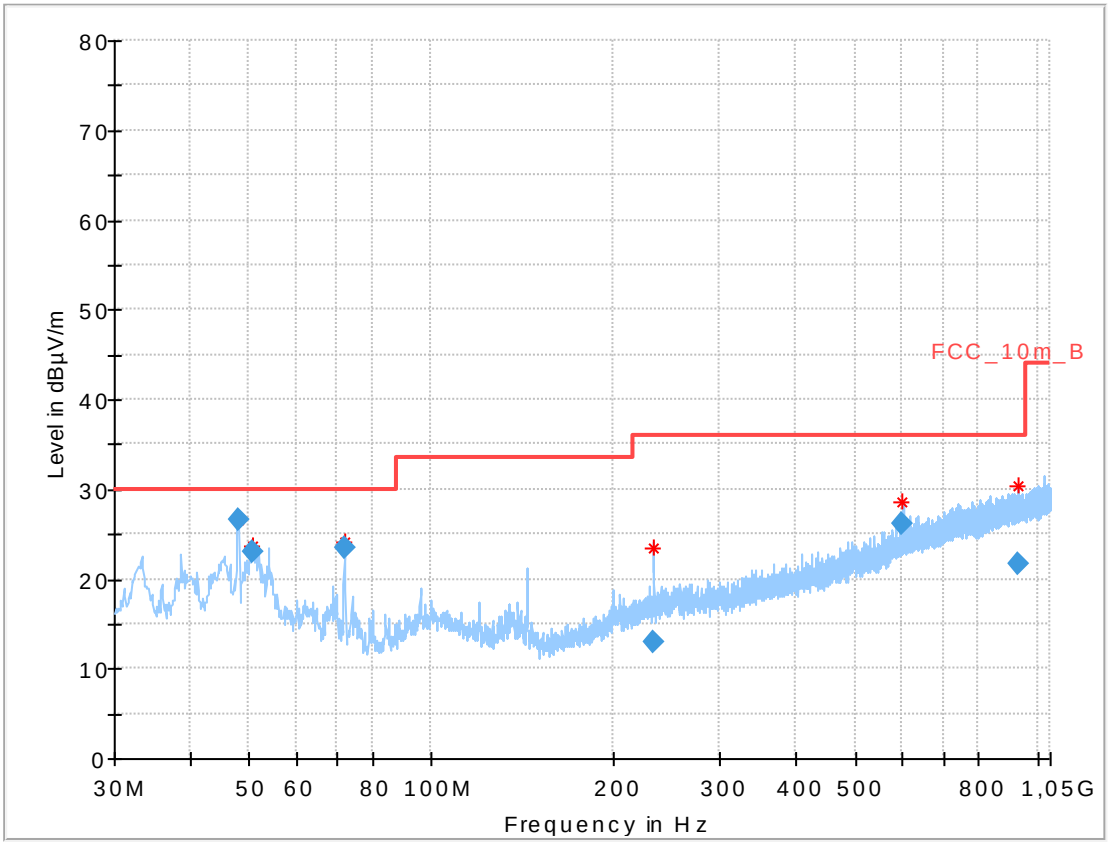
Plot No. 11: 30 MHz to 1 GHz, horizontal/vertical polarization, mid frequency



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.028500	25.96	30.00	4.04	1000.	120.000	98.0	V	324.0	13.3
51.308100	17.63	30.00	12.37	1000.	120.000	101.0	V	309.0	13.2
71.981700	21.67	30.00	8.33	1000.	120.000	185.0	V	298.0	8.4
144.042450	21.19	33.50	12.31	1000.	120.000	101.0	V	336.0	8.8
232.461300	14.32	36.00	21.68	1000.	120.000	98.0	V	168.0	12.8
599.989950	28.13	36.00	7.87	1000.	120.000	98.0	V	199.0	20.7

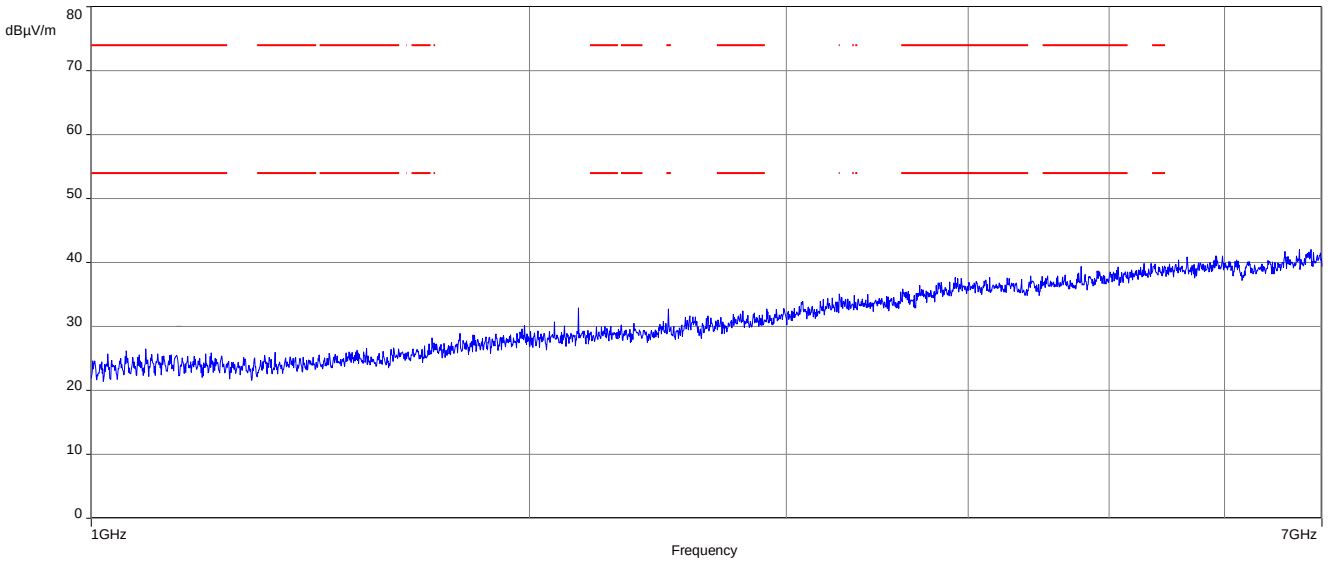
Plot No. 12: 30 MHz to 1 GHz, horizontal/vertical polarization, high frequency



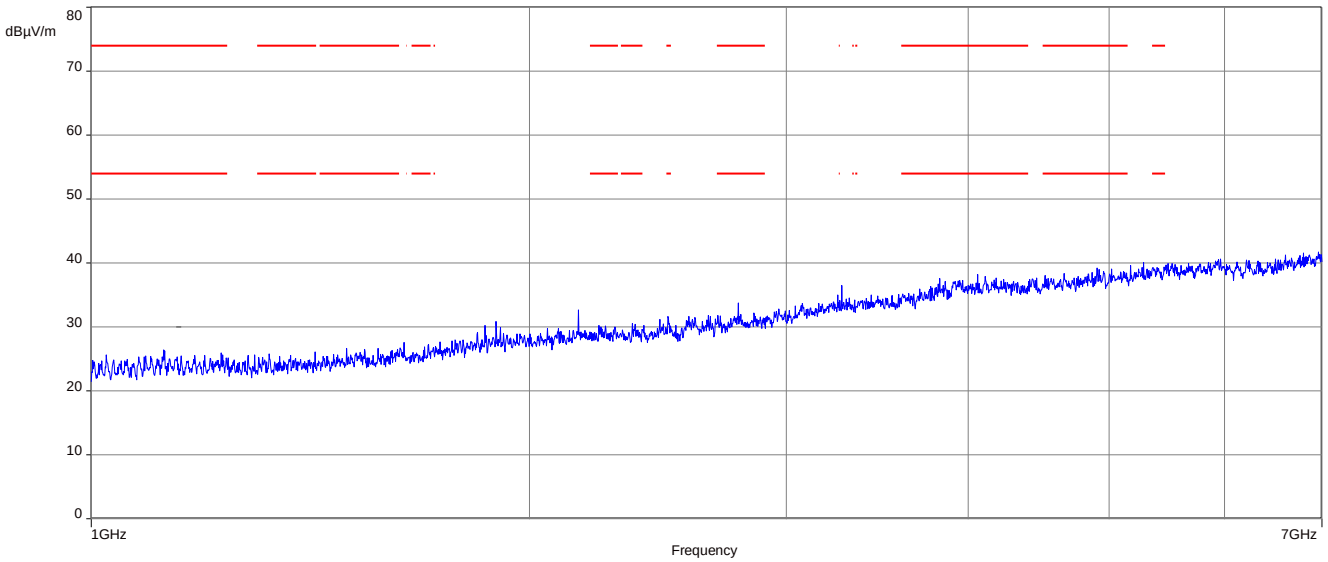
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.015000	26.52	30.00	3.48	1000.	120.000	101.0	V	353.0	13.3
50.880000	23.09	30.00	6.91	1000.	120.000	101.0	V	353.0	13.3
72.034350	23.37	30.00	6.63	1000.	120.000	185.0	V	345.0	8.4
232.737750	12.93	36.00	23.07	1000.	120.000	101.0	V	170.0	12.8
599.974650	26.19	36.00	9.81	1000.	120.000	101.0	V	187.0	20.7
927.633150	21.68	36.00	14.32	1000.	120.000	98.0	V	161.0	24.2

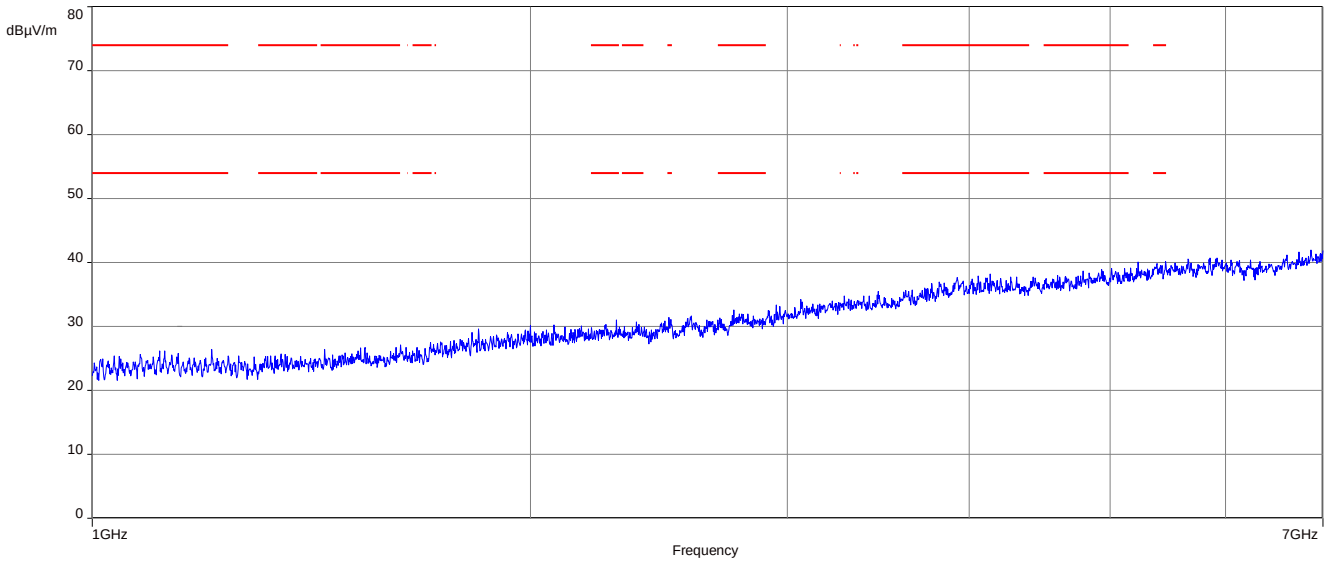
Plot No. 13: 1 GHz to 7 GHz, horizontal polarization, low frequency (Peak)



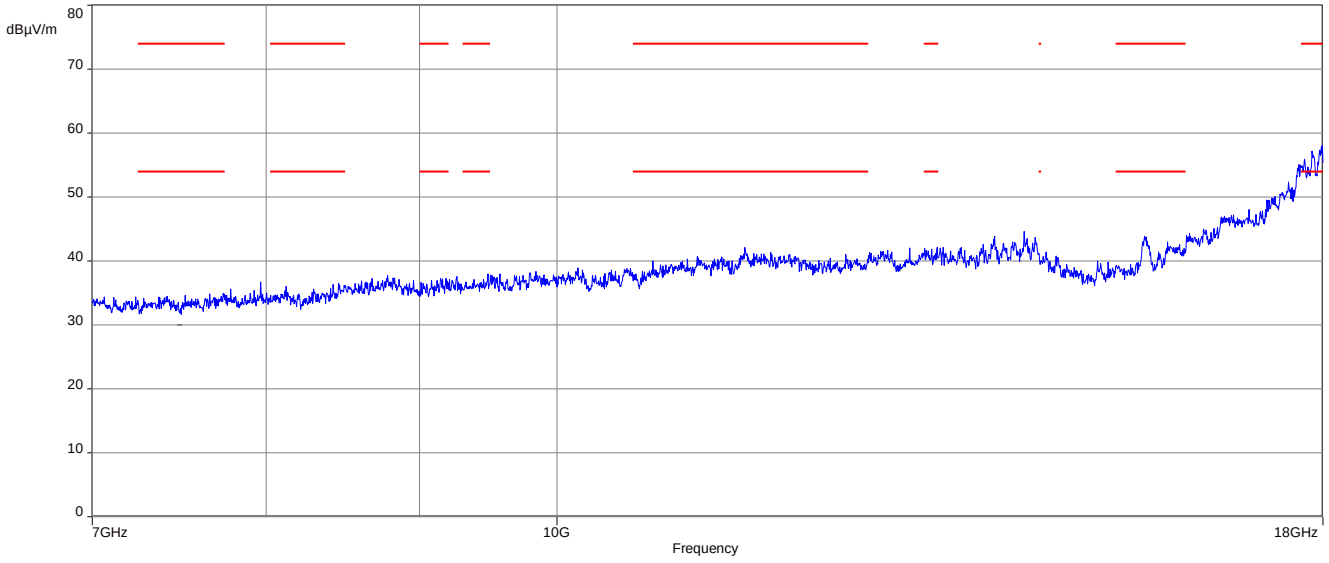
Plot No. 14: 1 GHz to 7GHz, horizontal polarization, mid frequency (Peak)



Plot No. 15: 1 GHz to 7 GHz, horizontal / vertical polarization, high frequency (Peak)

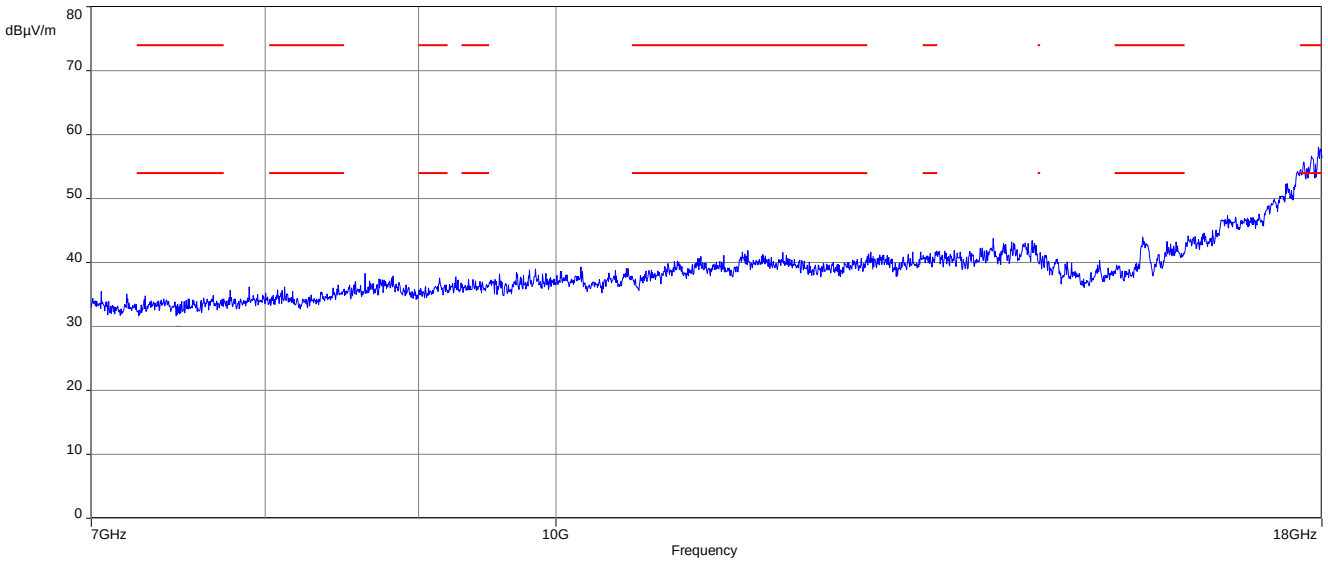


Plot No. 16: 7 GHz to 18 GHz, horizontal / vertical polarization, low frequency (Peak)

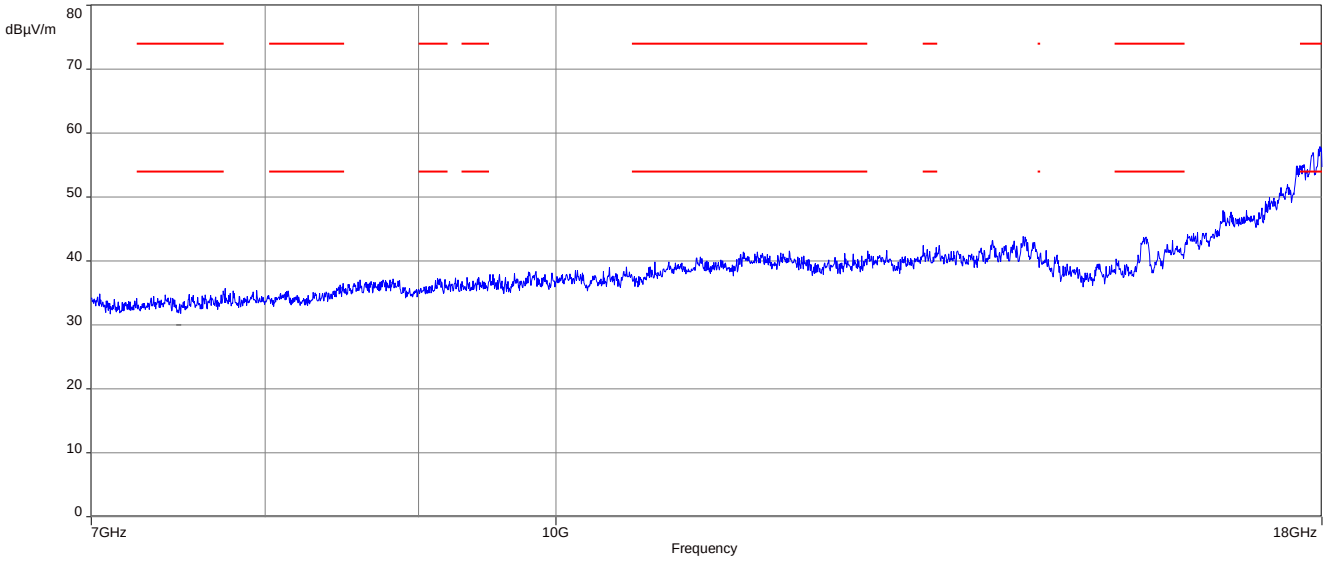


Note: See next plots!

Plot No. 17: 7 GHz to 18 GHz, horizontal / vertical polarization, mid frequency (Peak)

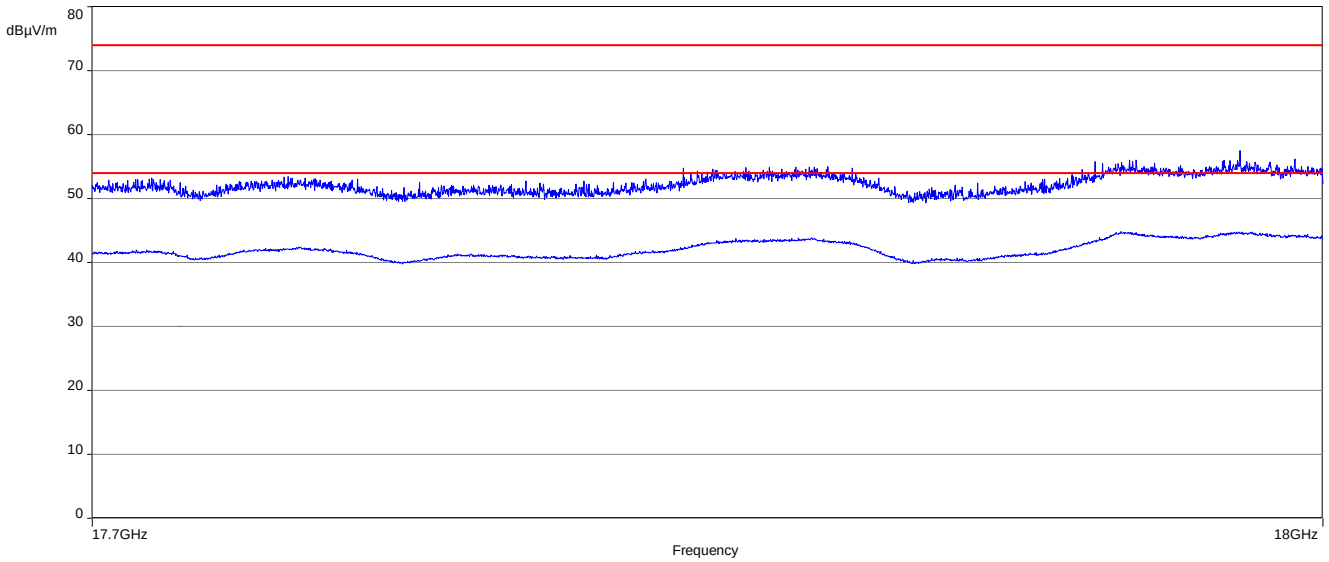


Plot No. 18: 7 GHz to 18 GHz, horizontal / vertical polarization, high frequency (Peak)

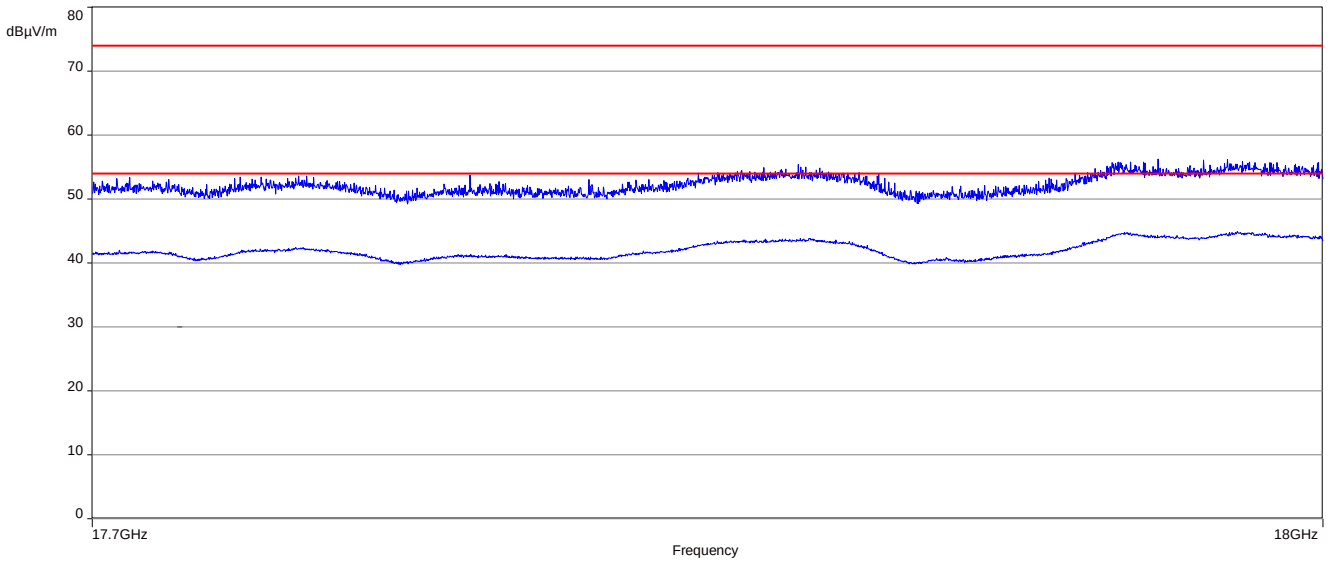


Note: See next plots!

Plot No. 19: 17.7 GHz to 18 GHz, horizontal / vertical polarization, low frequency (Peak and RMS)

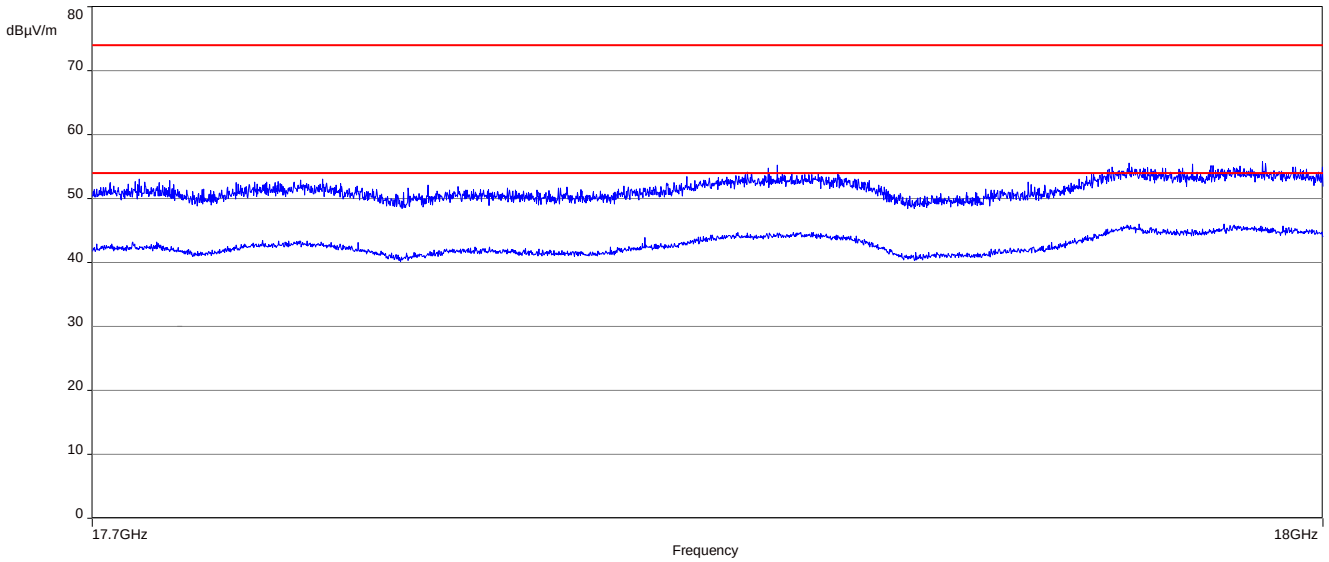


Plot No. 20: 17.7 GHz to 18 GHz, horizontal / vertical polarization, mid frequency (Peak and RMS)



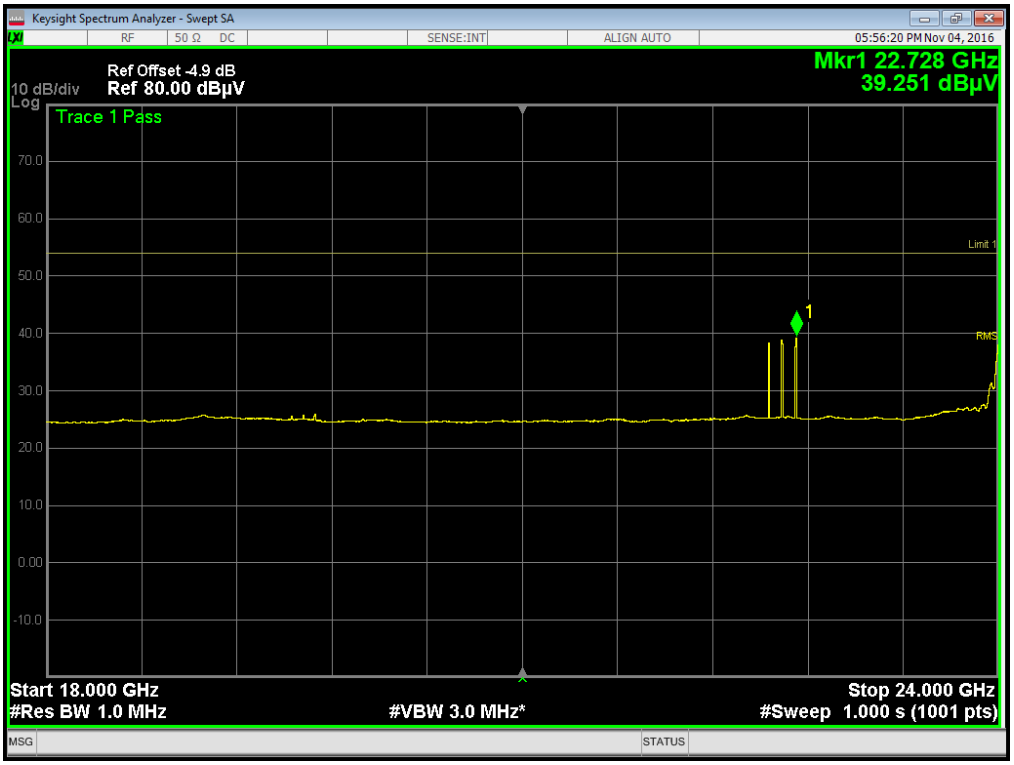
Note:
Upper limit and upper trace show peak limit and peak measurement.
Lower limit and lower trace show average limit and average measurement.

Plot No. 21: 17.7 GHz to 18 GHz, horizontal / vertical polarization, high frequency (Peak and RMS)

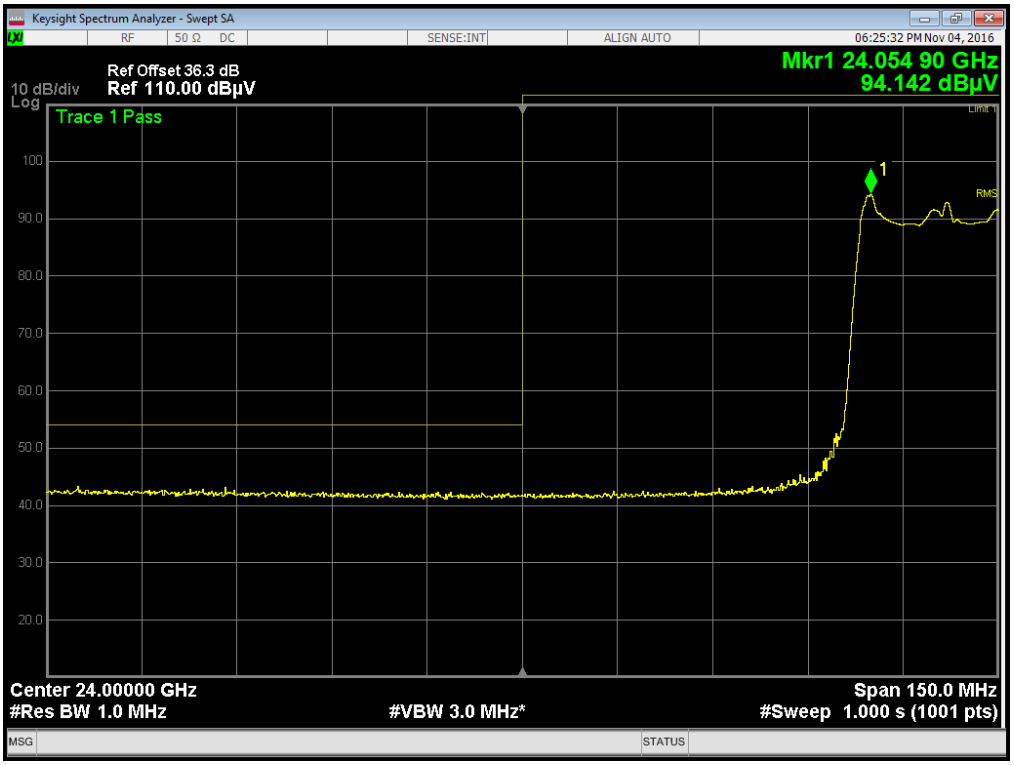


Note:
Upper limit and upper trace show peak limit and peak measurement.
Lower limit and lower trace show average limit and average measurement.

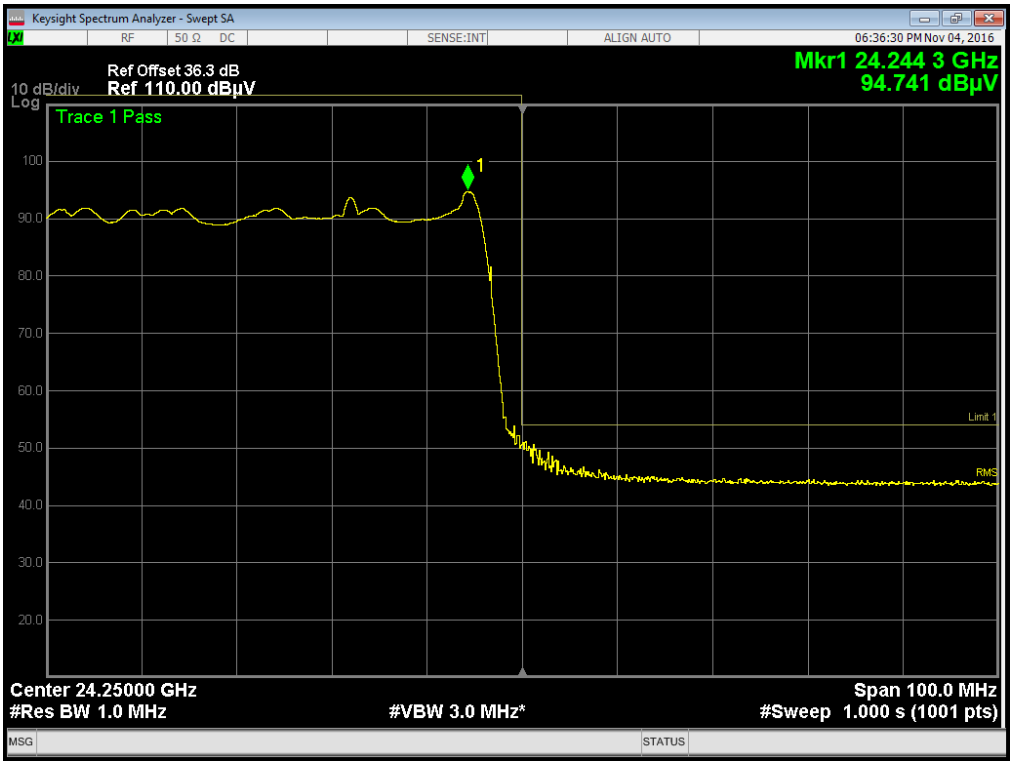
Plot No. 22: 18 GHz to 24 GHz, horizontal / vertical polarization, low/mid/high frequency



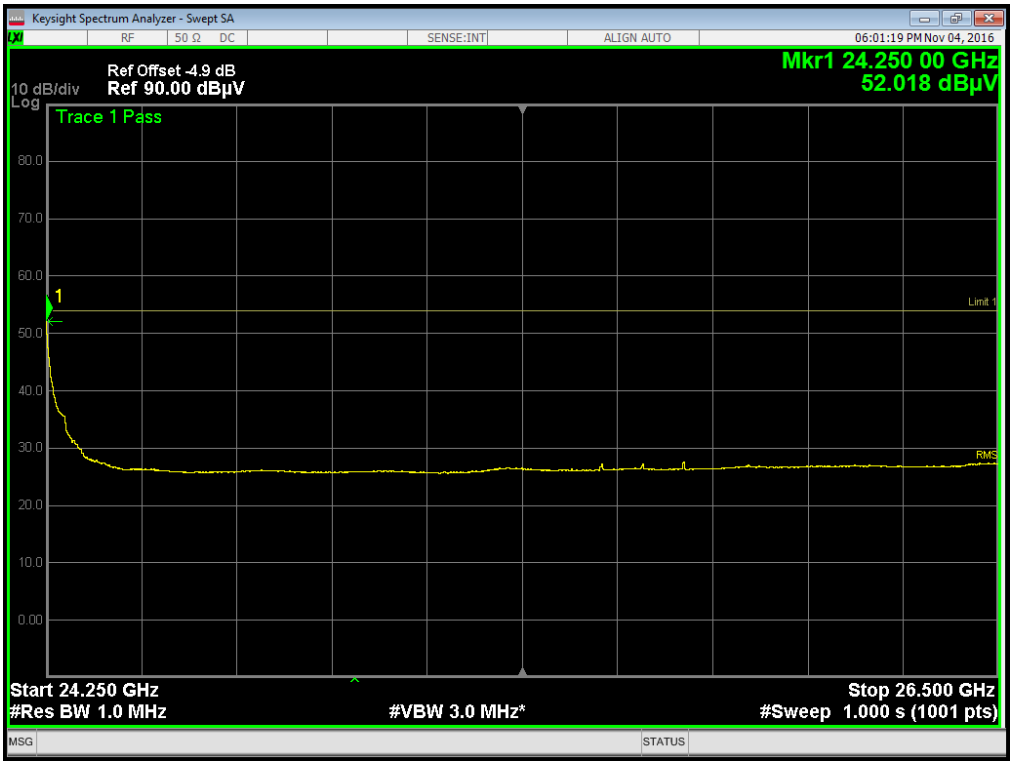
Plot No. 23: lower band edge, horizontal / vertical polarization, Mode 1 and Mode 2



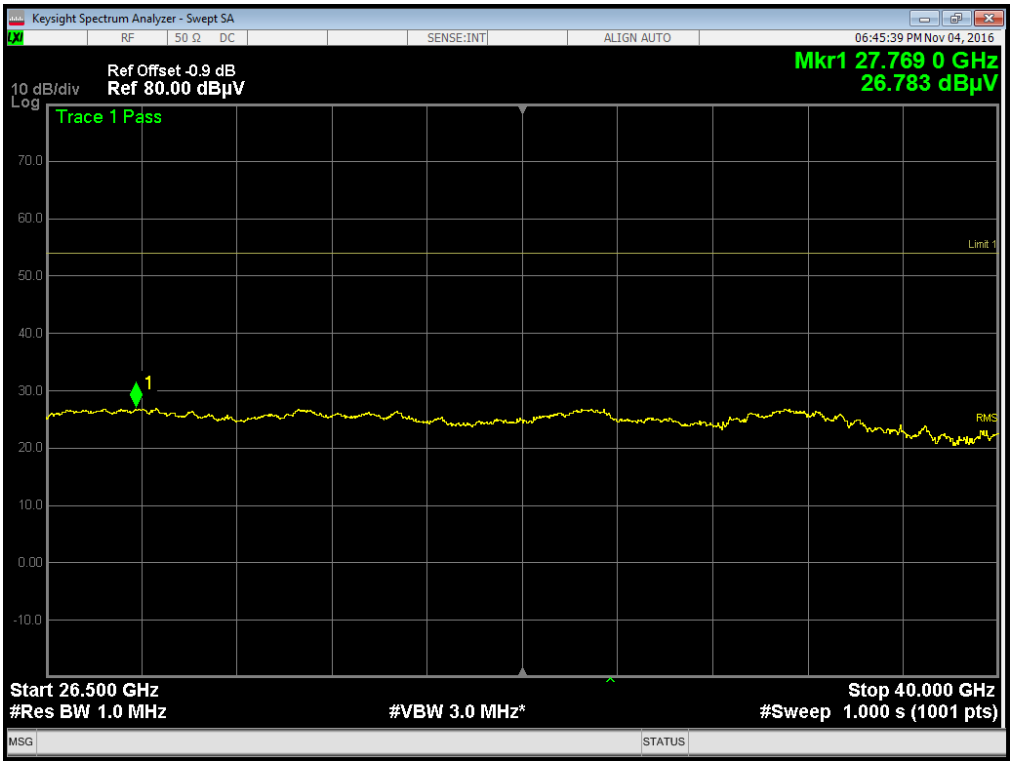
Plot No. 24: upper band edge, horizontal / vertical polarization, Mode 1 and Mode 2



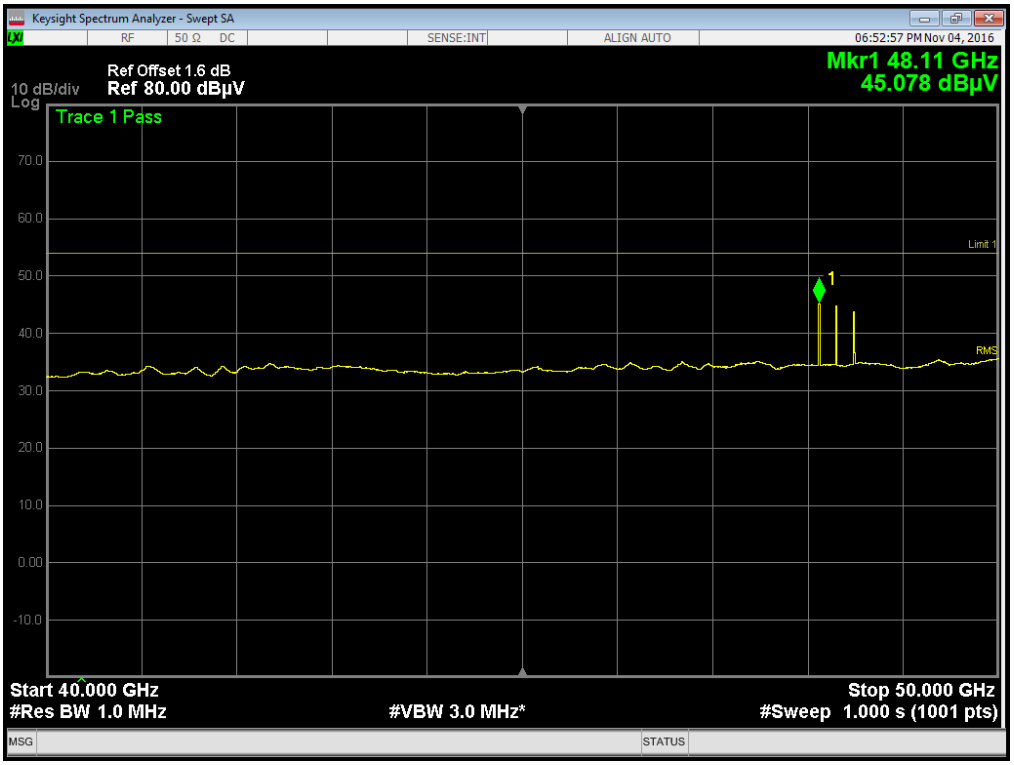
Plot No. 25: 24.25 GHz to 26.5 GHz, horizontal / vertical polarization, low/mid/high frequency



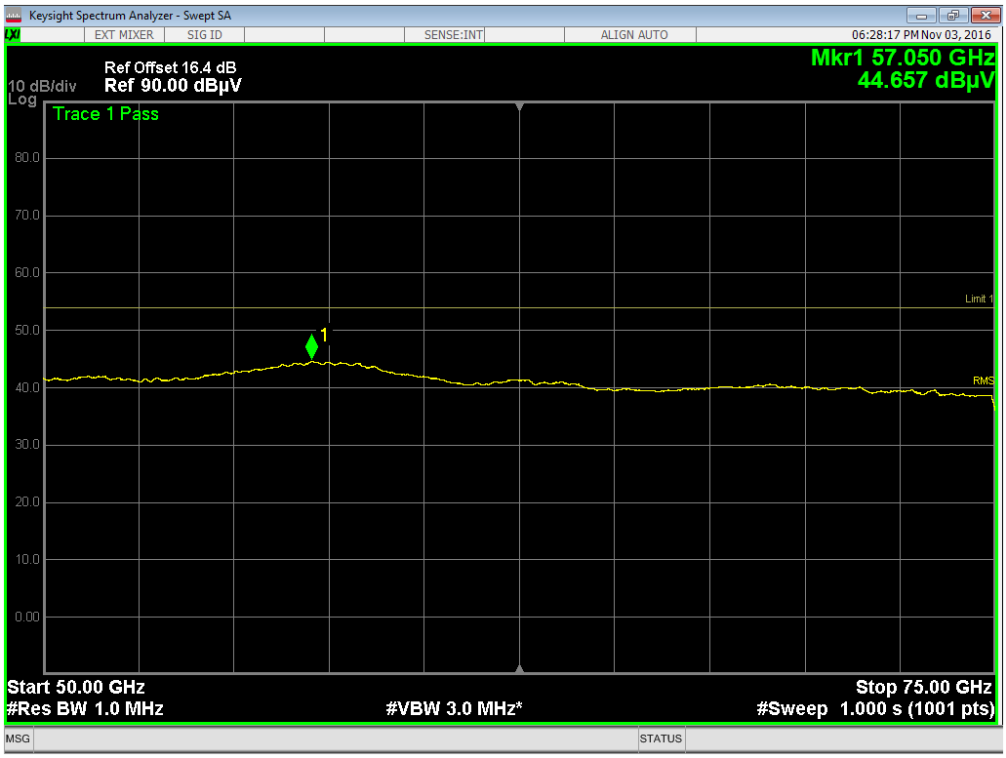
Plot No. 26: 26.5 GHz to 40 GHz, horizontal / vertical polarization, low/mid/high frequency



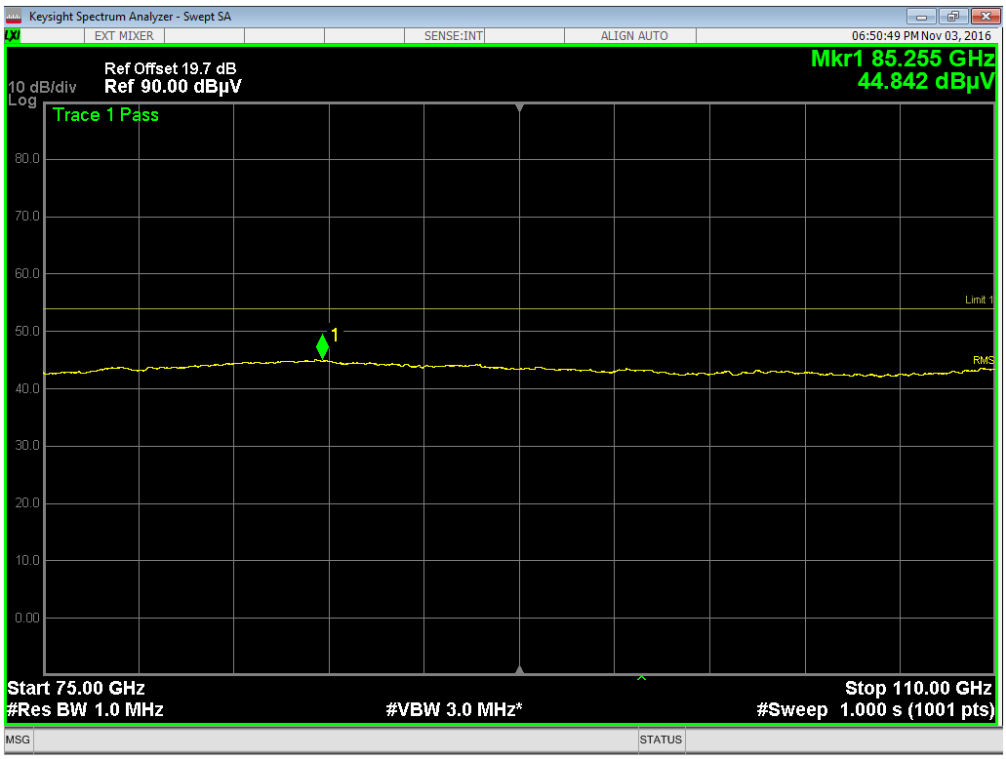
Plot No. 27: 40 GHz to 50 GHz, horizontal / vertical polarization, low/mid/high frequency



Plot No. 28: 50 GHz to 75 GHz, horizontal / vertical polarization, low/mid/high frequency



Plot No. 29: 75 GHz to 110 GHz, horizontal / vertical polarization, low/mid/high frequency



9.1 Spurious emissions conducted below 30 MHz (AC conducted)

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 6. This measurement is repeated for DSSS and OFDM modulation. If peaks are found channel 1 and channel 11 will be measured too. The measurement is performed with the data rate producing the highest output power. Both power lines, phase and neutral line, are measured. Found peaks are re-measured with average and quasi peak detection to show compliance to the limits.

Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace mode:	Max Hold

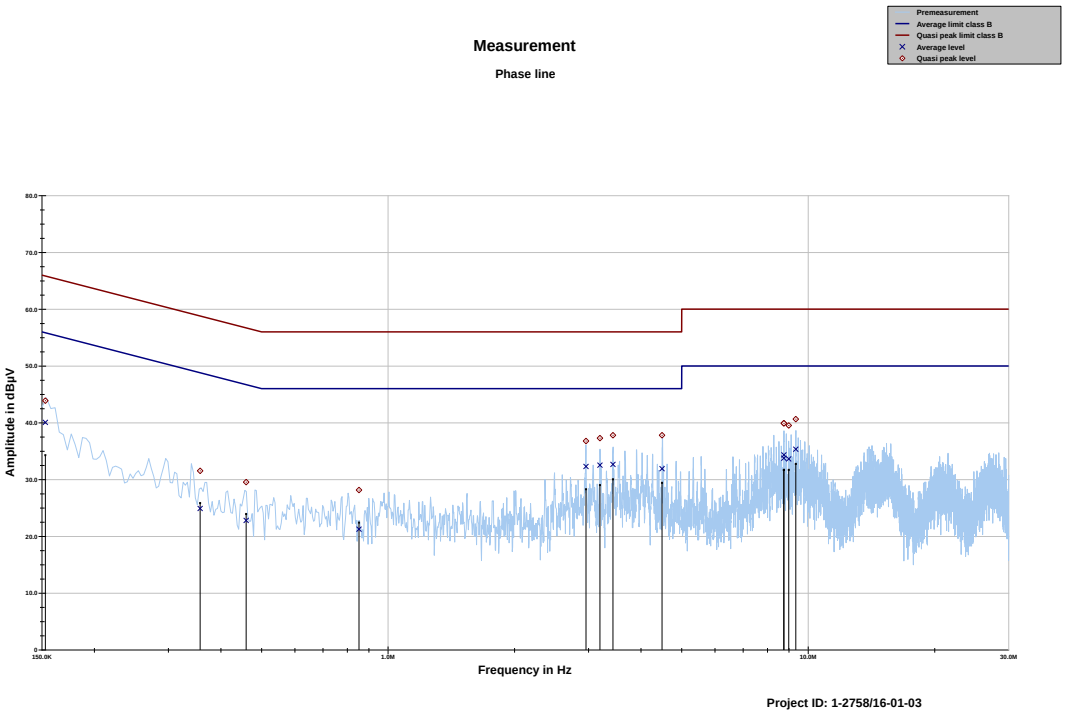
Limits:

FCC		IC
Frequency (MHz)	Quasi-Peak (dBµV/m)	Average (dBµV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

*Decreases with the logarithm of the frequency

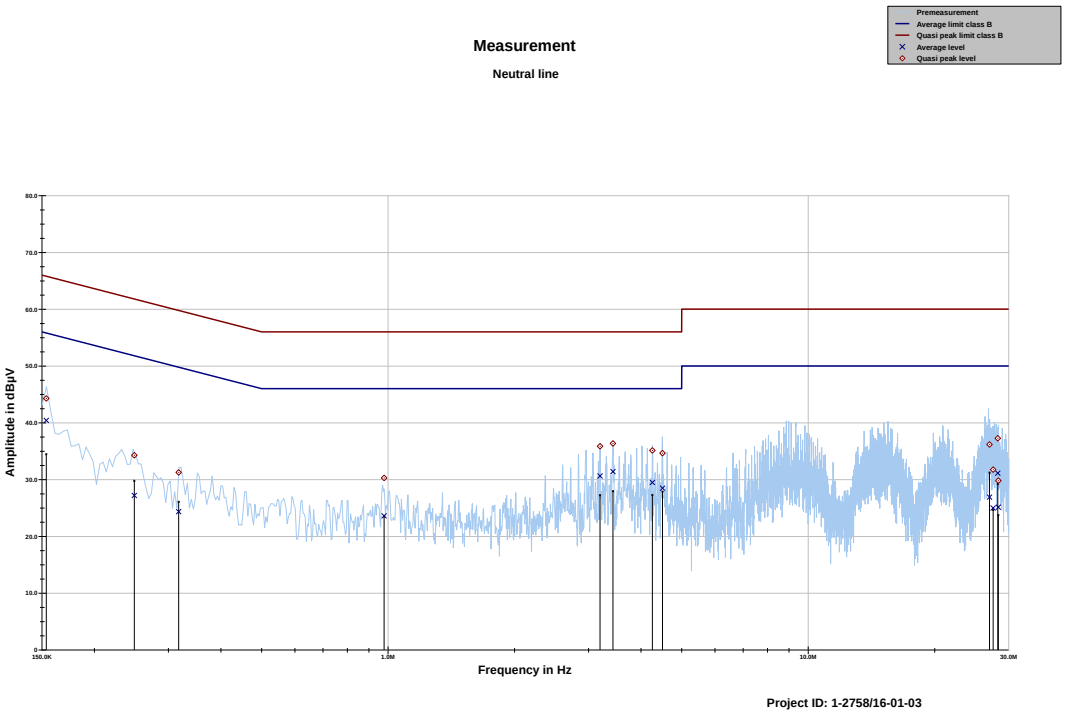
Result: **The measurement is passed.**

Plot 30: 150 kHz to 30 MHz, phase line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.152929	43.89	21.95	65.839	40.07	15.85	55.916
0.357023	31.53	27.26	58.797	24.91	25.18	50.085
0.459488	29.55	27.15	56.702	22.81	24.35	47.157
0.853070	28.14	27.86	56.000	21.26	24.74	46.000
2.958824	36.79	19.21	56.000	32.30	13.70	46.000
3.194955	37.29	18.71	56.000	32.54	13.46	46.000
3.429964	37.80	18.20	56.000	32.66	13.34	46.000
4.490329	37.80	18.20	56.000	31.91	14.09	46.000
8.748106	39.91	20.09	60.000	33.76	16.24	50.000
8.756012	39.91	20.09	60.000	34.34	15.66	50.000
8.990749	39.53	20.47	60.000	33.63	16.37	50.000
9.343603	40.64	19.36	60.000	35.34	14.66	50.000

Plot 31: 150 kHz to 30 MHz, neutral line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.153664	44.29	21.51	65.800	40.41	15.48	55.895
0.248980	34.27	27.52	61.791	27.20	25.98	53.172
0.317412	31.25	28.52	59.774	24.35	26.87	51.217
0.978834	30.28	25.72	56.000	23.61	22.39	46.000
3.196287	35.86	20.14	56.000	30.64	15.36	46.000
3.431172	36.35	19.65	56.000	31.41	14.59	46.000
4.257680	35.13	20.87	56.000	29.49	16.51	46.000
4.500096	34.65	21.35	56.000	28.48	17.52	46.000
27.019430	36.17	23.83	60.000	26.90	23.10	50.000
27.554570	31.75	28.25	60.000	24.98	25.02	50.000
28.270124	37.26	22.74	60.000	31.13	18.87	50.000
28.361298	29.81	30.19	60.000	25.13	24.87	50.000

Annex A Document history

Version	Applied changes	Date of release
	Initial release - DRAFT	2016-11-18
	Editorial changes based on applicant's remarks	2016-11-24

Annex B 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
PMN	-	Product marketing name
HMN	-	Host marketing name
HVIN	-	Hardware version identification number
FVIN	-	Firmware version identification number
OBW		Occupied Bandwidth
OC		Operating Channel
OCW		Operating Channel Bandwidth
OOB		Out Of Band

Annex C 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
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung

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:

Funk
Mobilfunk (GSM / DCS) + OTA
Elektromagnetische Verträglichkeit (EMV)
Produktsicherheit
SAR / EMF
Umwelt
Smart Card Technology
Bluetooth®
Automotive
Wi-Fi-Services
Kanadische Anforderungen
US-Anforderungen
Akustik
Near Field Communication (NFC)

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 04.05.2016 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig bis 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 63 Seiten.

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

Frankfurt, 04.05.2016

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

Siehe Hinweise auf der Rückseite

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Die auszugsweise Veröffentlichung der Akkreditierungsurkunde bedarf der vorherigen schriftlichen Zustimmung der Deutsche Akkreditierungsstelle GmbH (DAkkS). Ausgenommen davon ist die separate Weiterverbreitung des Deckblattes durch die umseitig genannte Konformitätsbewertungsstelle in unveränderter Form.

Es darf nicht der Anschein erweckt werden, dass sich die Akkreditierung auch auf Bereiche erstreckt, die über den durch die DAkkS bestätigten Akkreditierungsbereich hinausgehen.

Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstelle (AkkStelleG) vom 31. Juli 2009 (BGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung im Zusammenhang mit der Vermarktung von Produkten (Abl. L 218 vom 9. Juli 2008, S. 30).
Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der European co-operation for Accreditation (EA), des International Accreditation Forum (IAF) und der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen erkennen ihre Akkreditierungen gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

Note:
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