
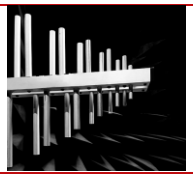
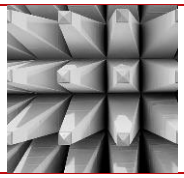

CETECOM™
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consulting - testing - certification

TEST REPORT

Test report no.: 1-1825/16-01-02-A

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

Testing laboratory

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.cetecom.com
e-mail: ict@cetecom.com

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

Endress+Hauser Process Solutions AG
Christoph Merian-Ring 12
4153 Reinach / SWITZERLAND
Phone: -/-
Fax: -/-
Contact: Marc Fiedler
e-mail: marc.fiedler@solutions.endress.com
Phone: +41 6 17 15 73 83

Manufacturer

Endress+Hauser GmbH+Co. KG
Hauptstraße 1
79689 Maulburg / Germany

Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 1	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices
RSS - Gen Issue 4	Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus

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

Test Item

Kind of test item:	**WirelessHART Adapter(Ex & non-Ex)**
Model name:	**SWA70**
FCC ID:	**2AIKP-SWA70A**
IC:	**21533-SWA70A**
Frequency:	DTS band 2400 MHz to 2483.5 MHz
Technology tested:	WirelessHART
Antenna:	External dipole antenna
Power supply:	7.2 V DC by battery or 115 V AC by mains power supply
Temperature range:	-40°C to +80°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:

cn=Marco Bertolino, o=CETECOM ICT Services GmbH, ou=BTL-150828, email=marco.bertolino@cetecom.com, c=DE
2016.09.02 13:20:28 +02'00'

Marco Bertolino
Lab Manager
Radio Communications & EMC

Test performed:

cn=Mihail Dorongovskij, o=CETECOM ICT Services GmbH, ou=DOG-151008, email=Michael.Dorongovski@cetecom.com, c=DE
2016.09.02 11:20:07 +02'00'

Mihail Dorongovskij
Testing Manager
Radio Communications & EMC

1 Table of contents

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

This test report replaces the test report with the number 1-1825/16-01-02 and dated 2016-07-06

2.2 Application details

Date of receipt of order:	2016-06-15
Date of receipt of test item:	2016-06-21
Start of test:	2016-06-21
End of test:	2016-06-22
Person(s) present during the test:	Mr. Marc Fiedler

3 Test standard/s and references

Test standard	Date	Description
47 CFR Part 15	-/-	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 1	May 2015	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices
RSS - Gen Issue 4	November 2014	Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus

Guidance	Version	Description
DTS: KDB 558074 D01	v03r05	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
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 No tests under extreme conditions required. No tests under extreme conditions required.
Relative humidity content	:		55 %
Barometric pressure	:		not relevant for this kind of testing
Power supply	:	V_{nom} V_{max} V_{min}	7.2 V DC by battery or 115 V AC by mains power supply No tests under extreme conditions required. No tests under extreme conditions required.

5 Test item

5.1 General description

Kind of test item	:	WirelessHART Adapter(Ex & non-Ex)
Type identification	:	SWA70
HMN	:	-/-
PMN	:	SWA70
HVIN	:	SWA70
FVIN	:	-/-
S/N serial number	:	Not available
HW hardware status	:	HW rev. 4
SW software status	:	FW version SWA70: 02.40.XX-YYYY FW version WirelessHART LTC5800: 01.01.02-00010
Frequency band	:	DTS band 2400 MHz to 2483.5 MHz (lowest channel 2405 MHz; highest channel 2475 MHz)
Type of radio transmission Use of frequency spectrum	: :	DSSS
Type of modulation	:	O-QPSK
Number of channels	:	15
Antenna	:	External dipole antenna
Power supply	:	7.2 V DC by battery or 115 V AC by mains power supply
Temperature range	:	-40°C to +80°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: 1-1825/16-01-01-A_AnnexA
1-1825/16-01-01-A_AnnexB
1-1825/16-01-01-A_AnnexD

6 Test laboratories sub-contracted

None

7 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).

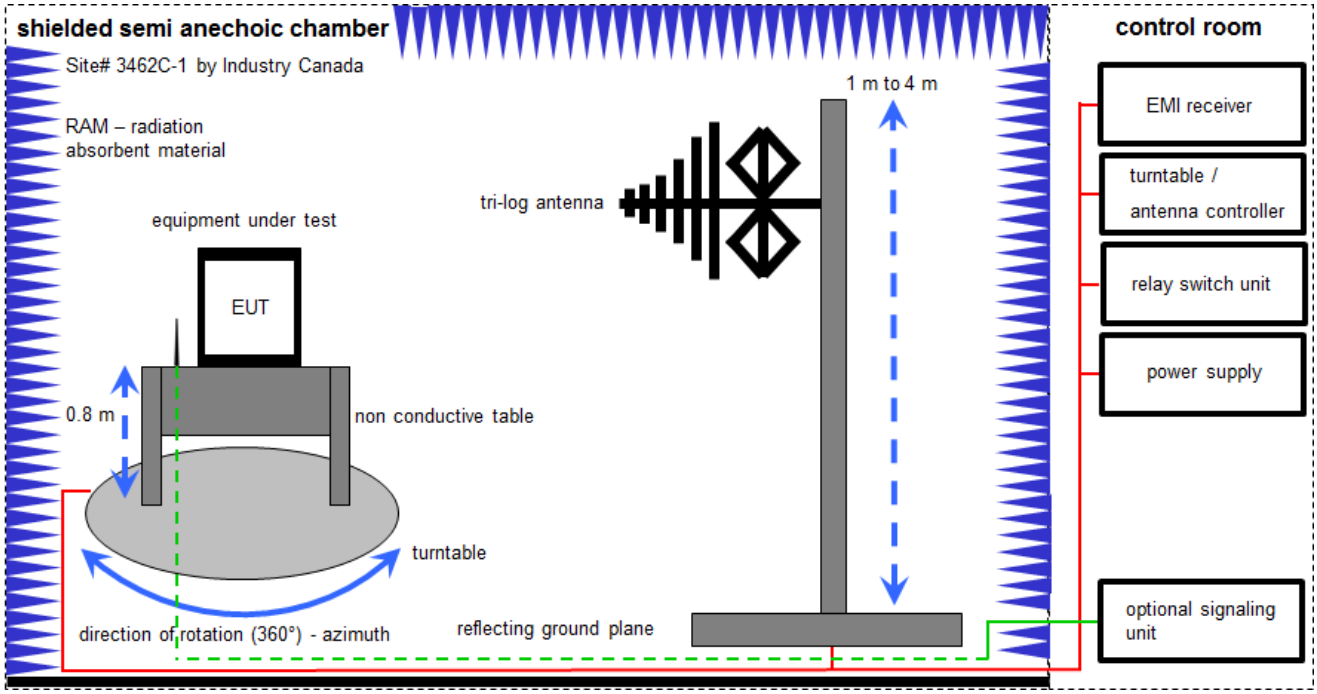
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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

7.1 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

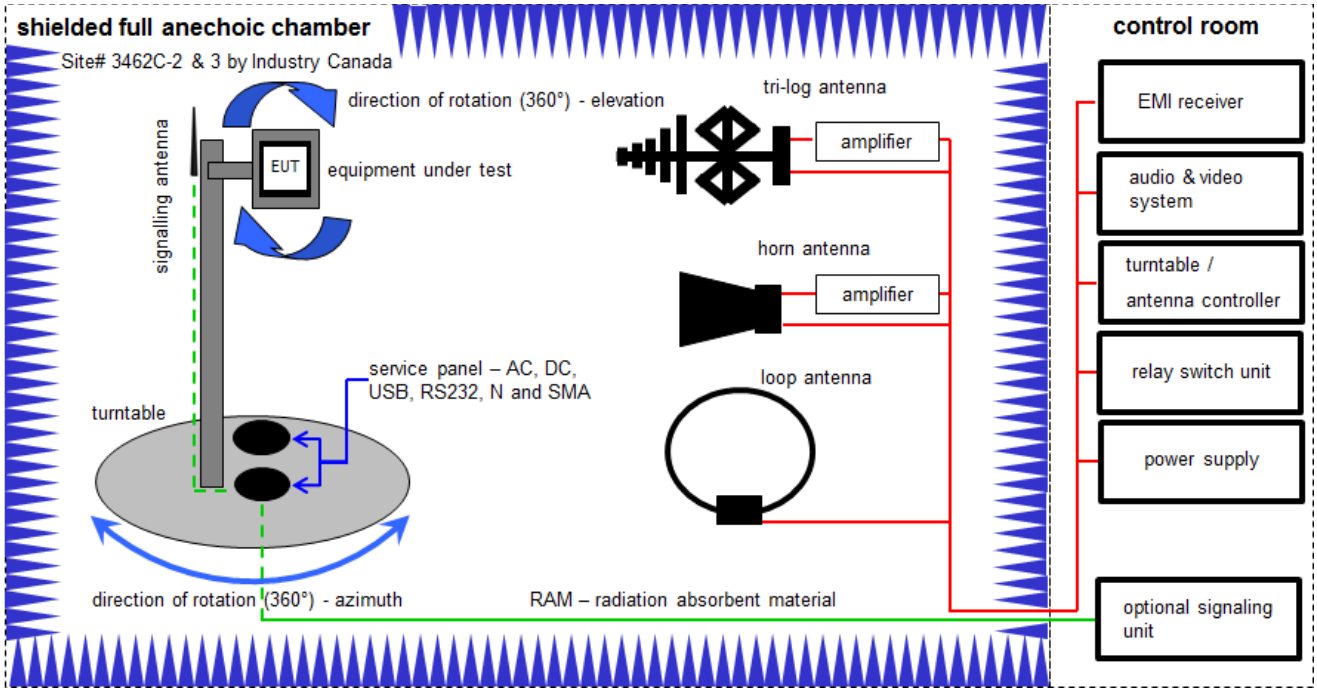
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

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	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2920A04466	300000580	ne	-/-	-/-
3	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	08.03.2016	08.03.2017
4	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
5	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
6	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	25.04.2016	25.04.2018

7.2 Shielded fully anechoic chamber



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

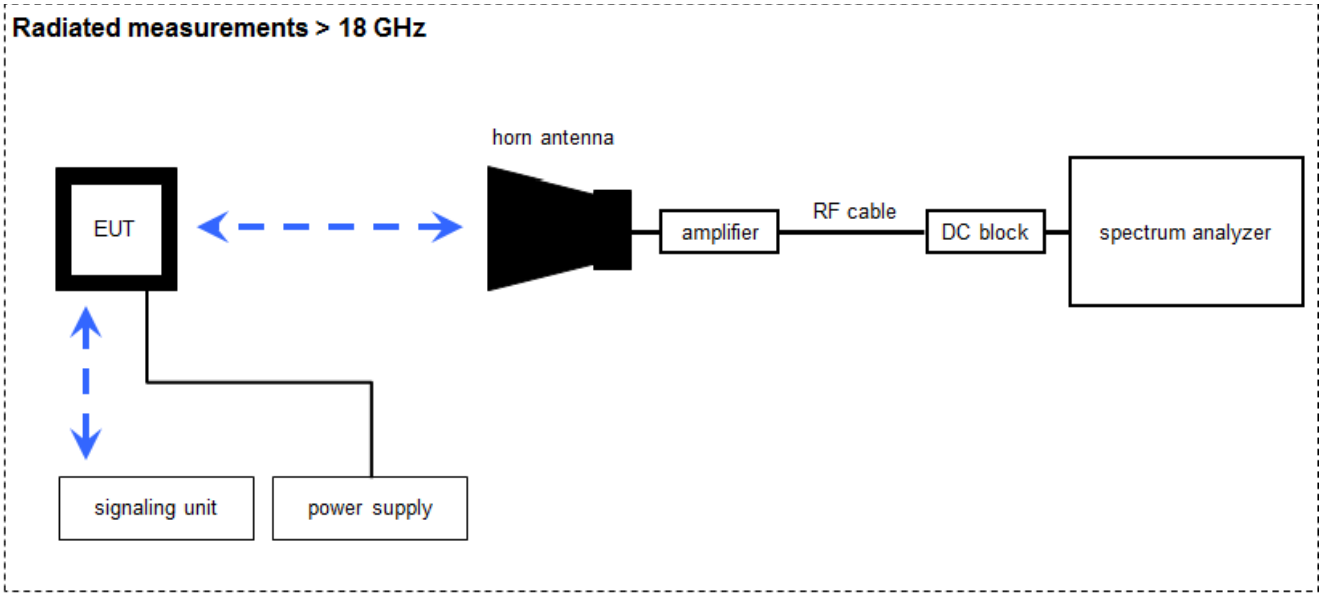
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

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

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	20.05.2015	20.05.2017
2	A, B, C	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	A, B, C	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
4	C	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
5	A	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne	-/-	-/-
6	A	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev	-/-	-/-
7	A	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne	-/-	-/-
8	A, B	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vIKI!	29.10.2014	29.10.2017
9	A, B, C	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
10	A, B, C	EMI Test Receiver 9kHz-26,5GHz	ESR26	R&S	101376	300005063	k	04.09.2015	04.09.2016

7.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna 50 cm

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

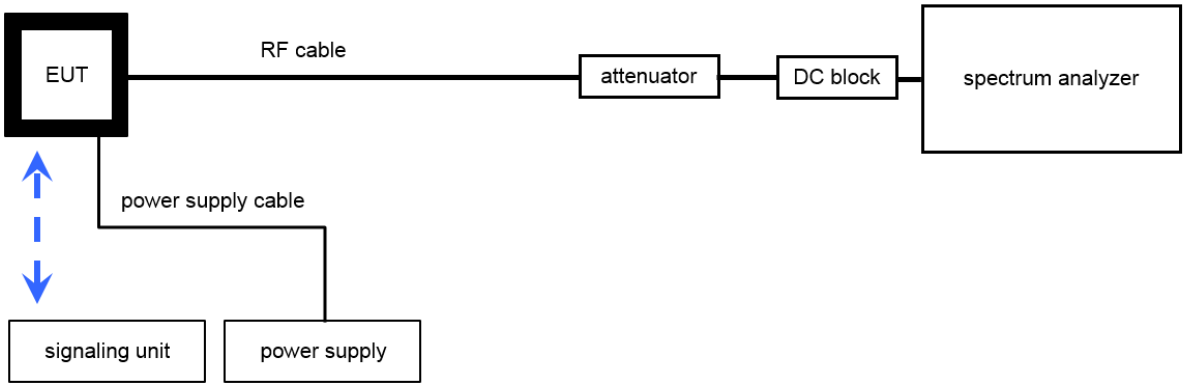
Example calculation:
OP [dBm] = -65.0 [dBm] + 50.0 [dB] - 20.0 [dBi] + 5.0 [dB] = -30 [dBm] (1 µW)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	-/-	300000486	k	10.09.2015	10.09.2017
2	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	21.01.2016	21.01.2017
3	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev	-/-	-/-
4	A	DC Power Supply 0 – 32V	1108-32	Heiden Elektronik	001802	300001383	Ve	29.01.2014	29.01.2017
5	A	RF-Cable	ST18/SMAm/SMAm/60	Huber & Suhner	Batch no. 606844	400001181	ev	-/-	-/-
6	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-

7.4 Conducted measurements

Conducted measurements normal conditions



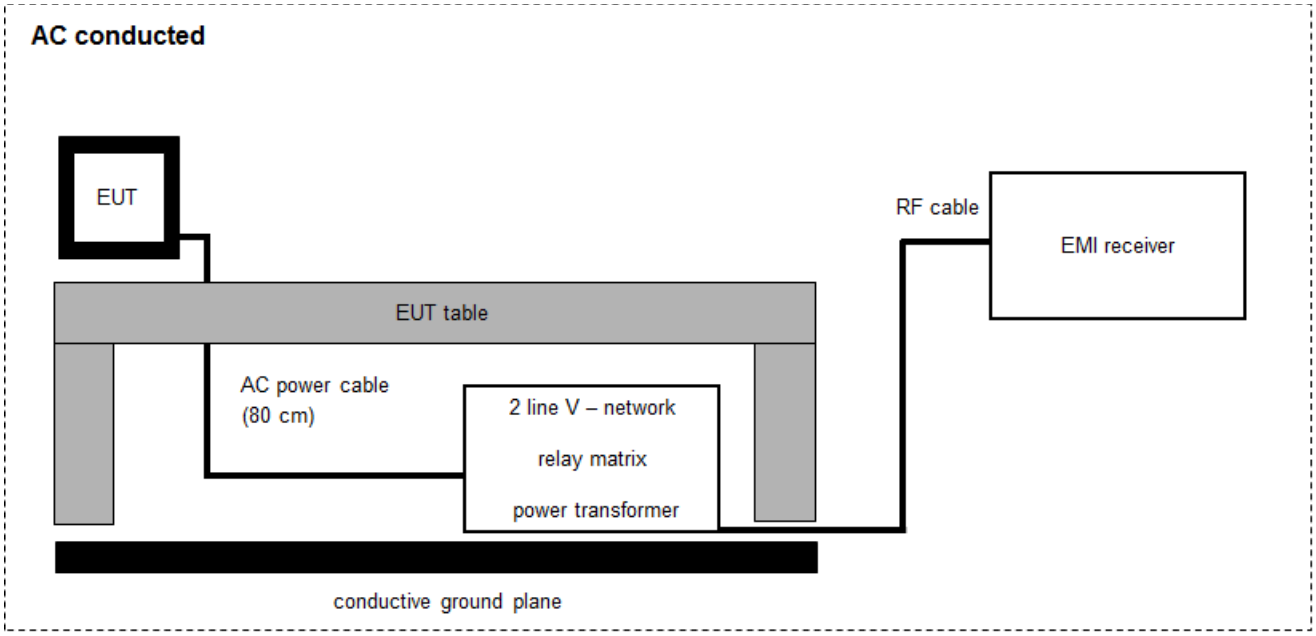
OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

Example calculation:
OP [dBm] = 6.0 [dBm] + 11.7 [dB] = 17.7 [dBm] (58.88 mW)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch / Control Unit	3488A	HP		300001691	ne	-/-	-/-
2	A	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSIQ26	R&S	835540/018	300002681	k	28.01.2016	28.01.2018
3	A	Frequency Standard (Rubidium Frequency Standard)	MFS (Rubidium)	R&S (Datum)	002	300002681	Ve	29.01.2015	29.01.2017
4	A	Directional Coupler	101020010	Krytar	70215	300002840	ev	-/-	-/-
5	A	DC-Blocker	8143	Inmet Corp.	none	300002842	ne	-/-	-/-
6	A	Powersplitter	6005-3	Inmet Corp.	none	300002841	ev	-/-	-/-
7	A	RF-Cable	ST18/SMAm/SMAm/ 72	Huber & Suhner	Batch no. 605505	400001187	ev	-/-	-/-
8	A	RF-Cable	Sucoflex 104	Huber & Suhner	147636/4	400001188	ev	-/-	-/-

7.5 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	A	Two-line V-Network (LISN) 9 kHz to 30 MHz	ESH3-Z5	R&S	892475/017	300002209	k	17.06.2016	17.06.2018
2	A	RF-Filter-section	85420E	HP	3427A00162	300002214	k	27.11.2006	-/-
3	A	AC-Spannungsquelle variabel	MV2616-V	EM-Test	0397-12	300003259	k	11.12.2015	11.12.2017
4	A	Power Supply	NGSM 32/10	R&S	3939	400000192	vIKI!	22.01.2015	22.01.2017
5	A	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	04.02.2016	04.02.2017

8 Sequence of testing

8.1 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.

8.2 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.

8.3 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.

8.4 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.

9 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Antenna gain	± 3 dB
Spectrum bandwidth	± 21.5 kHz absolute; ± 15.0 kHz relative
Maximum output power	± 1 dB
Detailed conducted spurious emissions @ the band edge	± 1 dB
Band edge compliance radiated	± 3 dB
Spurious emissions conducted	± 3 dB
Spurious emissions radiated below 30 MHz	± 3 dB
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB
Spurious emissions radiated above 12.75 GHz	± 4.5 dB
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB

10 Summary of measurement results

☒	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☐	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS - 247, Issue 1	See table!	2016-09-02	-/-

Test specification clause	Test case	Guideline	Temperature conditions	Power source voltages	Mode	C	NC	NA	NP	Remark
§15.247(b)(4) RSS - 247 / 5.4 (4)	System gain	-/-	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	-/-
§15.247(e) RSS - 247 / 5.2 (2)	Power spectral density	KDB 558074 DTS clause: 10.6	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	-/-
§15.247(a)(2) RSS - 247 / 5.2 (1)	DTS bandwidth – 6 dB bandwidth	KDB 558074 DTS clause: 8.1	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	-/-
RSS Gen clause 4.6.1	Occupied bandwidth	-/-	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	-/-
§15.247(b)(3) RSS - 247 / 5.4 (4)	Maximum output power	KDB 558074 DTS clause: 9.1.1	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	-/-
§15.247(d) RSS - 247 / 5.5	Detailed spurious emissions @ the band edge - conducted	-/-	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	-/-
§15.205 RSS - 247 / 5.5 RSS - Gen	Band edge compliance radiated	KDB 558074 DTS clause: 13.3.2	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	-/-
§15.247(d) RSS - 247 / 5.5	TX spurious emissions conducted	KDB 558074 DTS clause: 11.1 & 11.2 11.3	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	-/-
§15.209(a) RSS - Gen	Spurious emissions radiated below 30 MHz	-/-	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	)*
15.247(d) RSS - 247 / 5.5 §15.109 RSS - Gen	Spurious emissions radiated 30 MHz to 1 GHz	-/-	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	)*
§15.247(d) RSS - 247 / 5.5 §15.109 RSS - Gen	Spurious emissions radiated above 1 GHz	-/-	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	)*
§15.107(a) §15.207	Conducted emissions below 30 MHz (AC conducted)	-/-	Nominal	Nominal	O-QPSK	☒	☐	☐	☐	-/-

)* The measurements were performed with two different housings and two EUT versions Ex and non-Ex.

Note: C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

11 Additional comments

Reference documents: None

Special test descriptions: During the test mode the EUT transmits for a maximum time of 20 minutes. After this period, the EUT should be reset manually to the RF test mode.

Configuration descriptions: All radiated measurements were performed with a metal aluminum housing and a plastic housing and two EUT versions Ex and non-Ex.

Test mode:

☒ Special software is used.
EUT is transmitting pseudo random data by itself

Antennas and transmit operating modes:

☒ Operating mode 1 (single antenna)

- *Equipment with 1 antenna,*
- *Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,*
- *Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)*

☐ Operating mode 2 (multiple antennas, no beamforming)

- *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.*

☐ Operating mode 3 (multiple antennas, with beamforming)

- *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.*
  In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.

12 Measurement results

12.1 System gain

Measurement:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	3 MHz
Video bandwidth	3 MHz
Span	5 MHz
Trace mode	Max hold
Test setup	See sub clause 7.2 B (radiated) See sub clause 7.4 A (conducted)
Measurement uncertainty	See sub clause 9

Limits:

FCC	IC
6 dBi / > 6 dBi output power and power density reduction required	

Results:

T_{nom}	V_{nom}	2405 MHz	2440 MHz	2475 MHz
Conducted power [dBm] Measured with O-QPSK modulation		5.3	5.2	4.2
Radiated power [dBm] Measured with O-QPSK modulation		9.0	9.8	8.7
Gain [dBi] Calculated		3.7	4.6	4.5

12.2 Power spectral density

Description:

Measurement of the power spectral density of a digital modulated system.

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	3 kHz
Video bandwidth	10 kHz
Span	≥ EBW
Trace mode	Max hold
Test setup	See sub clause 7.4 A
Measurement uncertainty	See sub clause 9

Limits:

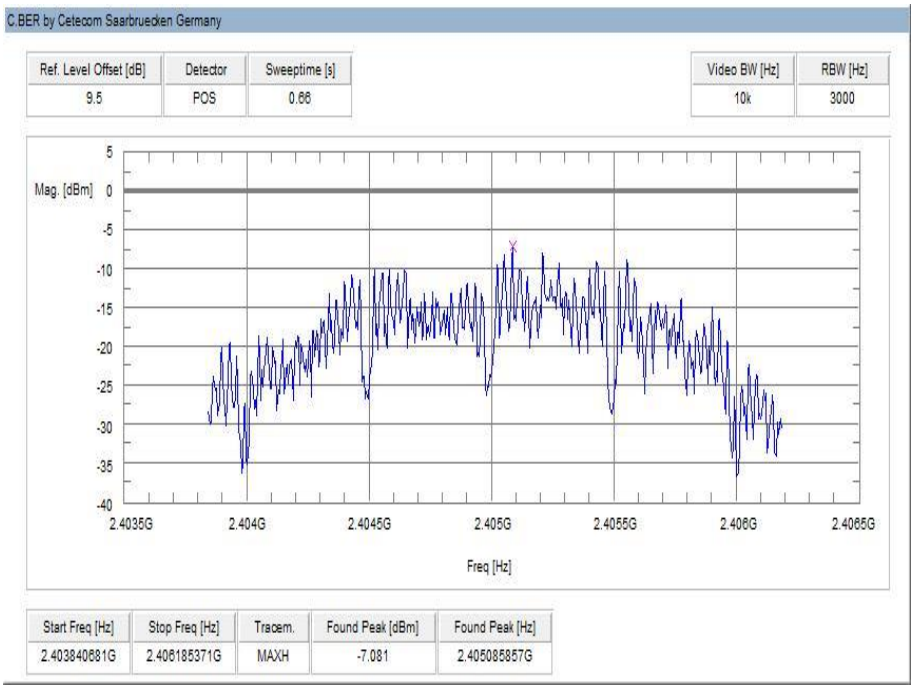
FCC	IC
Power spectral density	
For digitally modulated systems the transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0-second duration.	

Results:

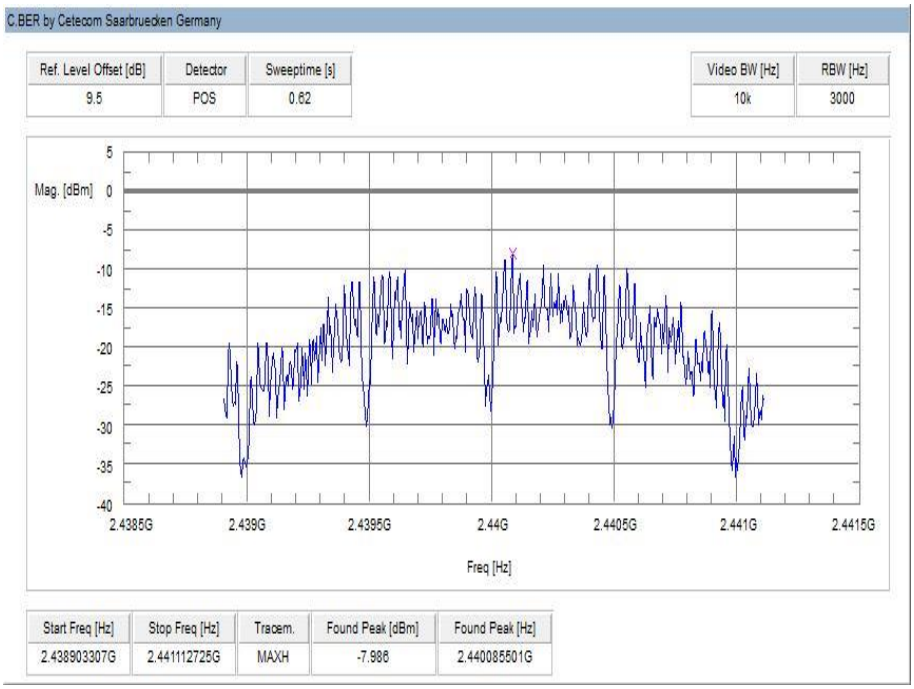
	Frequency		
	2405 MHz	2440 MHz	2475 MHz
Power spectral density [dBm / 3kHz]	-7.1	-8.0	-8.6

Plots:

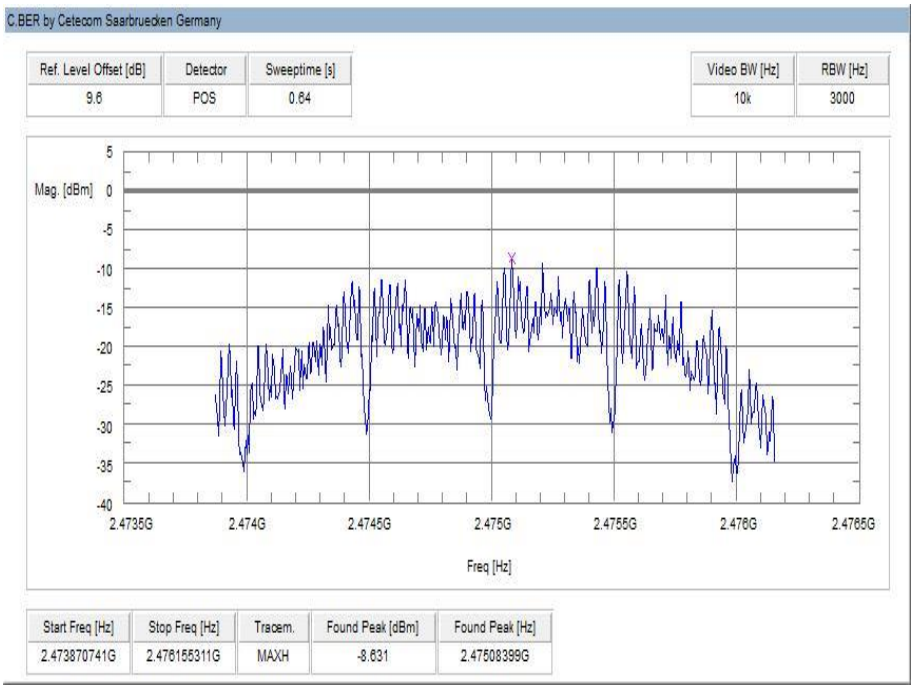
Plot 1: lowest channel



Plot 2: mid channel



Plot 3: highest channel



12.3 DTS bandwidth – 6 dB bandwidth

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement parameters	
According to DTS clause: 8.1	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	100 kHz
Video bandwidth	300 kHz
Span	5 MHz
Measurement procedure	Using 3 marker (max + 2x-6dB)
Trace mode	Max hold (allow trace to stabilize)
Test setup	See sub clause 7.4 A
Measurement uncertainty	See sub clause 9

Limits:

FCC	IC
DTS bandwidth – 6 dB bandwidth	
Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.	

Results:

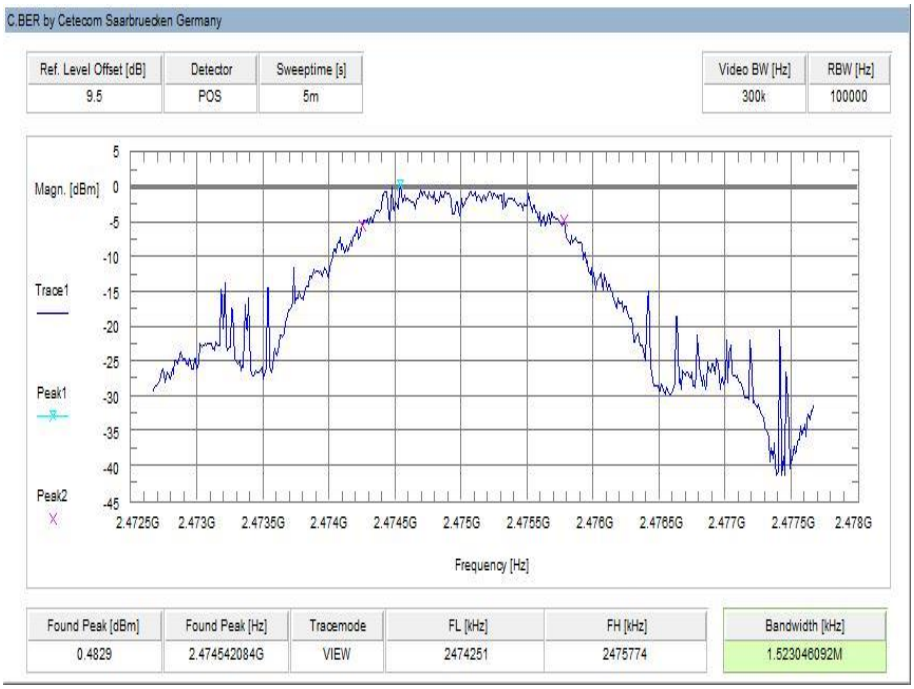
	Frequency		
	2405 MHz	2440 MHz	2475 MHz
6 dB bandwidth [kHz]	1563	1473	1523

Plots:

Plot 1: lowest channel

Plot 2: mid channel

Plot 3: highest channel



12.4 Occupied bandwidth – 99% emission bandwidth

Description:

Measurement of the 99% bandwidth of the modulated signal acc. RSS-GEN.

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	30 kHz
Video bandwidth	100 kHz
Span	5 MHz
Measurement procedure	Measurement of the 99% bandwidth using the integration function of the analyzer
Trace mode	Max hold (allow trace to stabilize)
Test setup	See sub clause 7.4 A
Measurement uncertainty	See sub clause 9

Usage:

-/-	IC
Occupied bandwidth – 99% emission bandwidth	
OBW is necessary for emission designator	

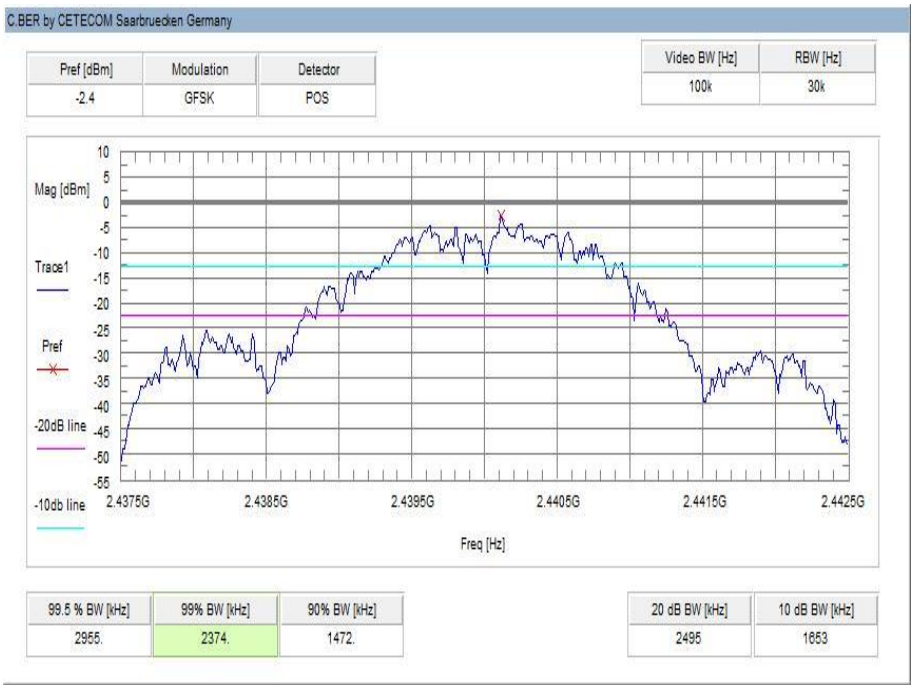
Results:

	Frequency		
	2405 MHz	2440 MHz	2475 MHz
99% bandwidth [kHz]	2364	2374	2404

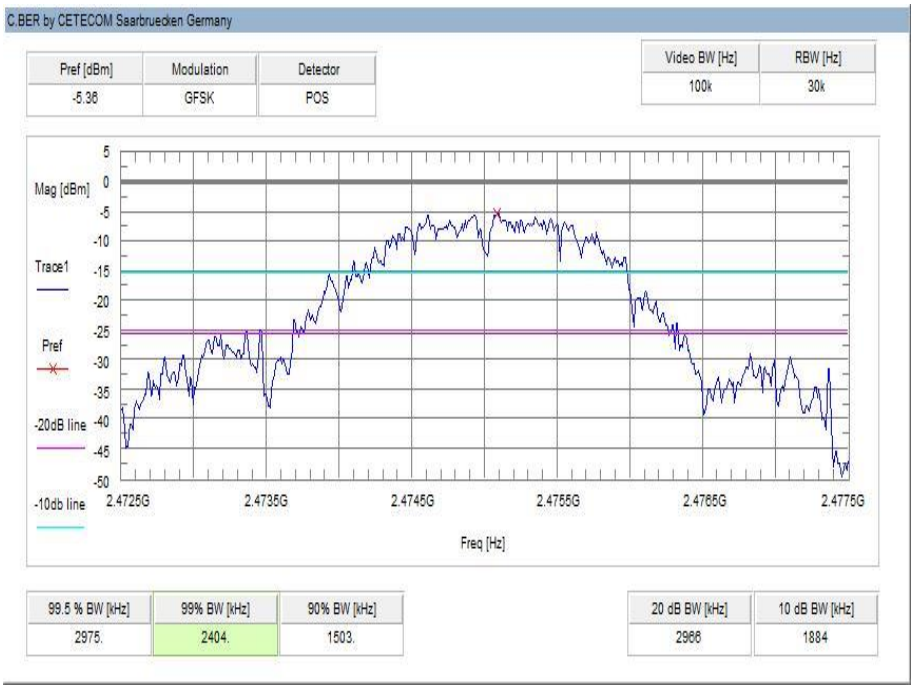
Plots:

Plot 1: lowest channel

Plot 2: mid channel



Plot 3: highest channel



12.5 Maximum output power

Description:

Measurement of the maximum output power conducted and radiated. EUT in single channel mode.

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	3 MHz
Video bandwidth	10 MHz
Span	10 MHz
Trace mode	Max hold
Test setup	See sub clause 7.4 A
Measurement uncertainty	See sub clause 9

Limits:

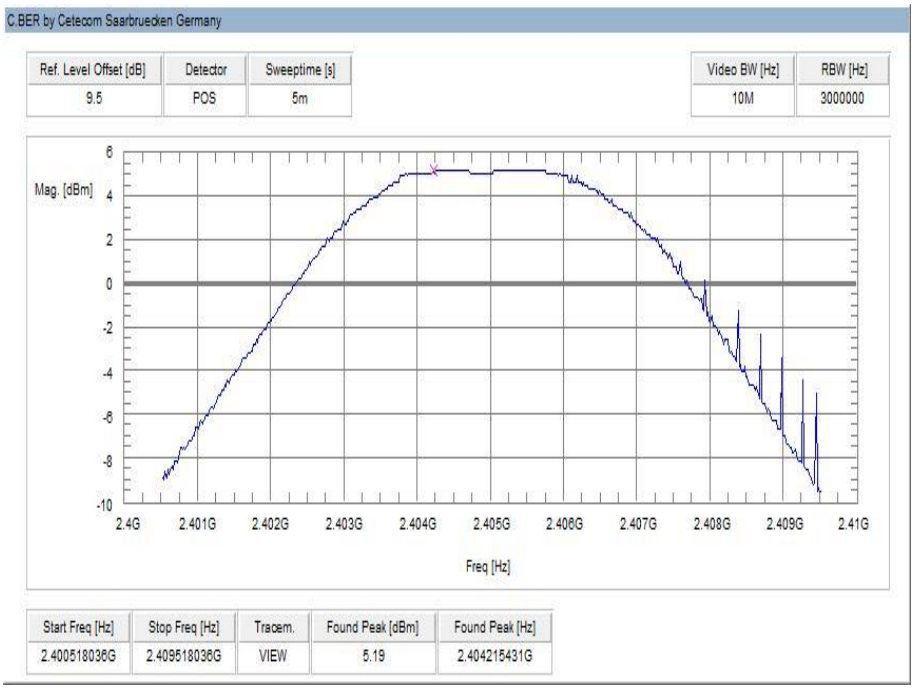
FCC	IC
Maximum output power	
[Conducted: 0.125 W – antenna gain max. 6 dBi] Systems using more than 75 hopping channels: Conducted: 1.0 W – antenna gain max. 6 dBi	

Results:

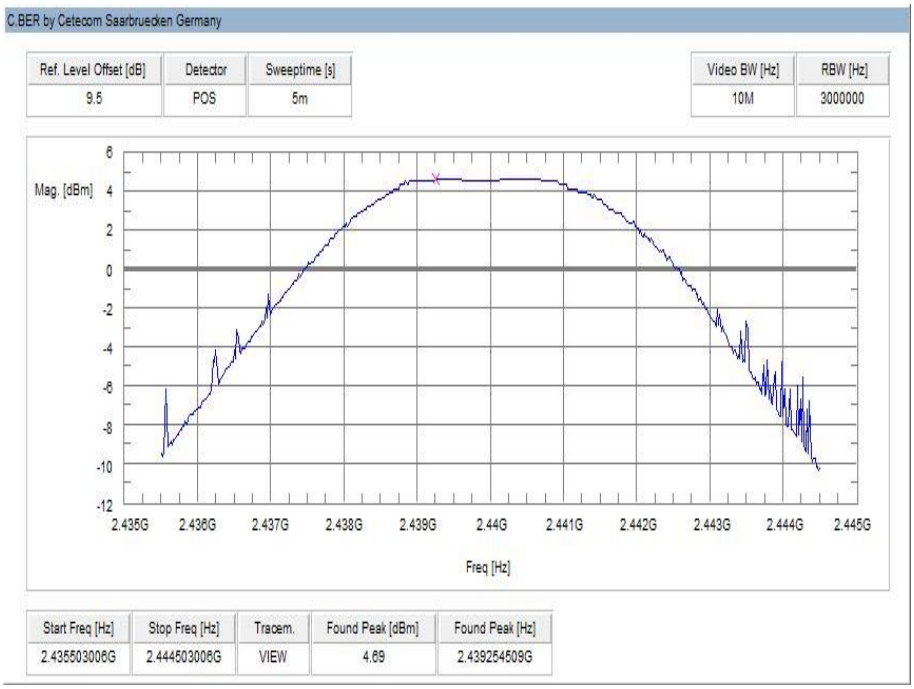
	Frequency		
	2405 MHz	2440 MHz	2475 MHz
Maximum output power conducted [dBm]	5.2	4.7	4.3

Plots:

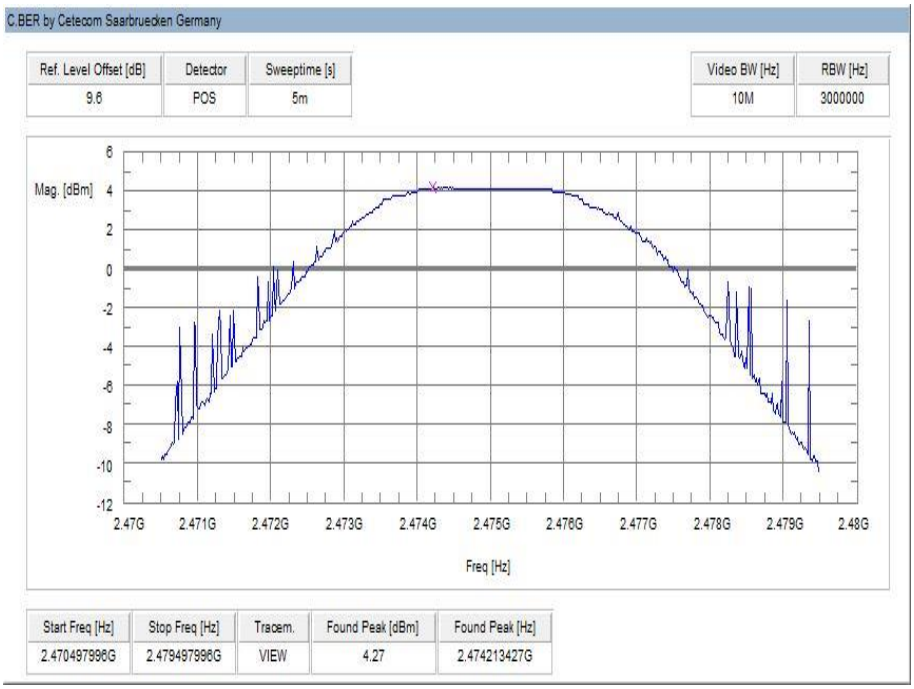
Plot 1: lowest channel



Plot 2: mid channel



Plot 3: highest channel



12.6 Detailed spurious emissions @ the band edge - conducted

Description:

Measurement of the conducted band edge compliance. EUT is measured at the lower and upper band edge in single channel.

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	100 kHz
Video bandwidth	300 kHz / 500 kHz
Span	Lower Band Edge: 2395 – 2405 MHz Upper Band Edge: 2478 – 2489 MHz
Trace mode	Max hold
Test setup	See sub clause 7.4 A
Measurement uncertainty	See sub clause 9

Limits:

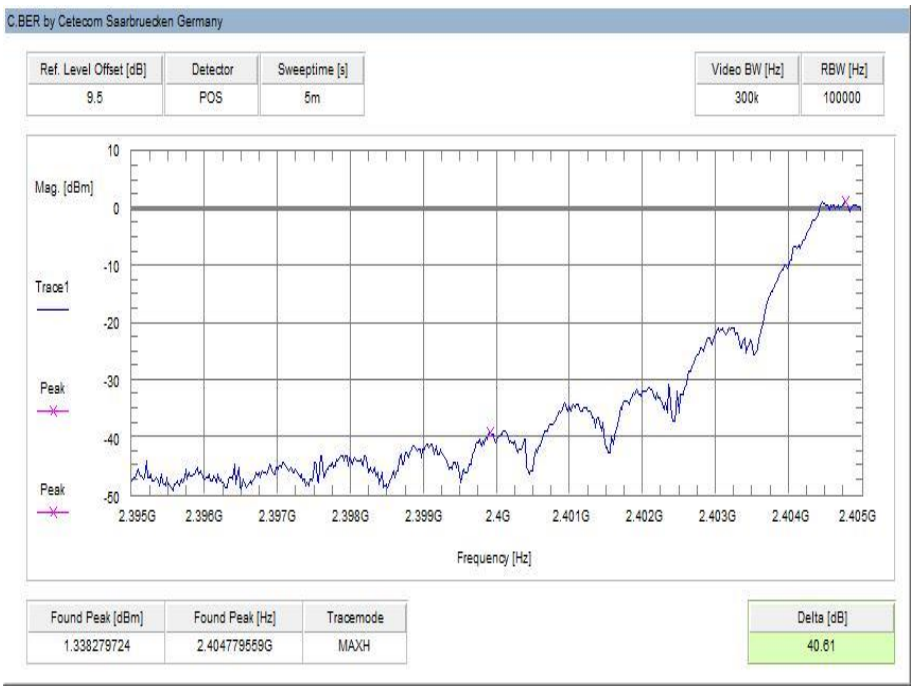
FCC	IC
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.	

Result:

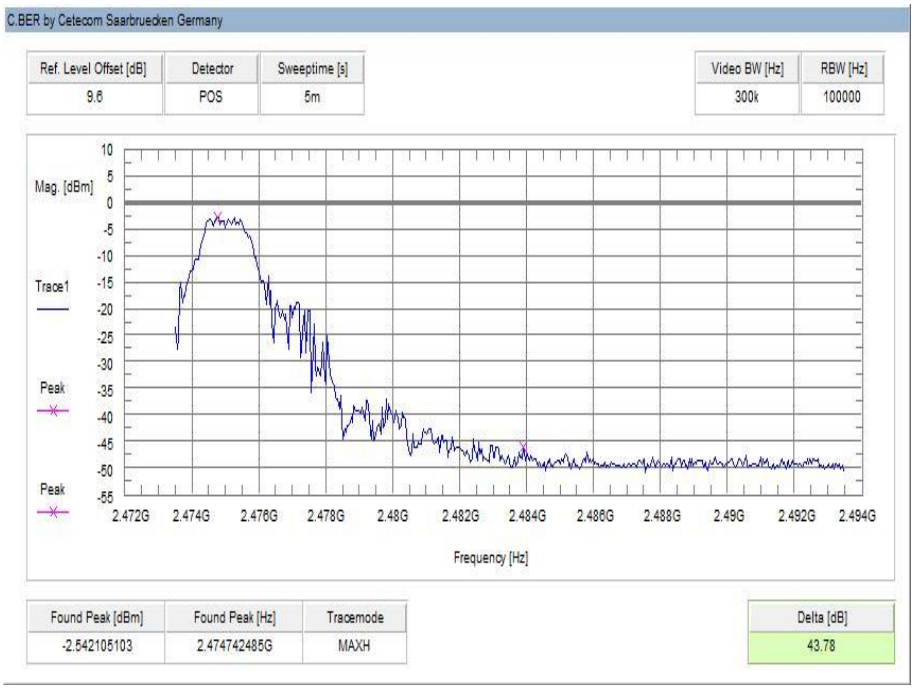
Scenario	Spurious band edge conducted [dB]
Modulation	O-QPSK
Lower band edge – hopping off	> 20 dB
Upper band edge – hopping off	> 20 dB

Plots:

Plot 1: Lower band edge



Plot 2: Upper band edge



12.7 Band edge compliance radiated

Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to lowest channel for the lower restricted band and to highest channel for the upper restricted band. The measurement is repeated for all modulations (if applicable). Measurement distance is 3 m.

Measurement:

Measurement parameter for peak measurements	
Detector:	Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	See plot!
Trace mode:	Max Hold
Test setup:	See sub clause 7.2 – B
Measurement uncertainty	See sub clause 9

Measurement parameter for average measurements	
According to DTS clause: 13.3.2	
Detector:	RMS
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	2 MHz
Trace mode:	RMS Average over 101 sweeps
Test setup:	See sub clause 7.2 – B
Measurement uncertainty	See sub clause 9

Limits:

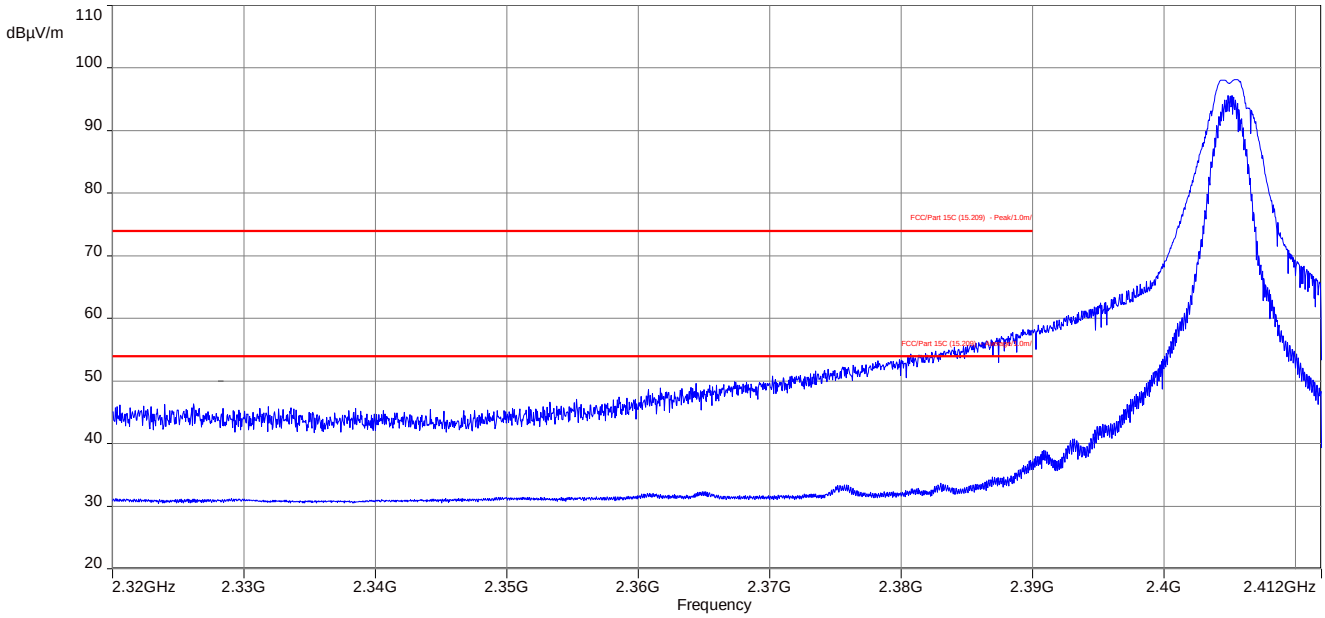
FCC	IC
Band edge compliance radiated	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).	
54 dBµV/m AVG 74 dBµV/m Peak	

Result:

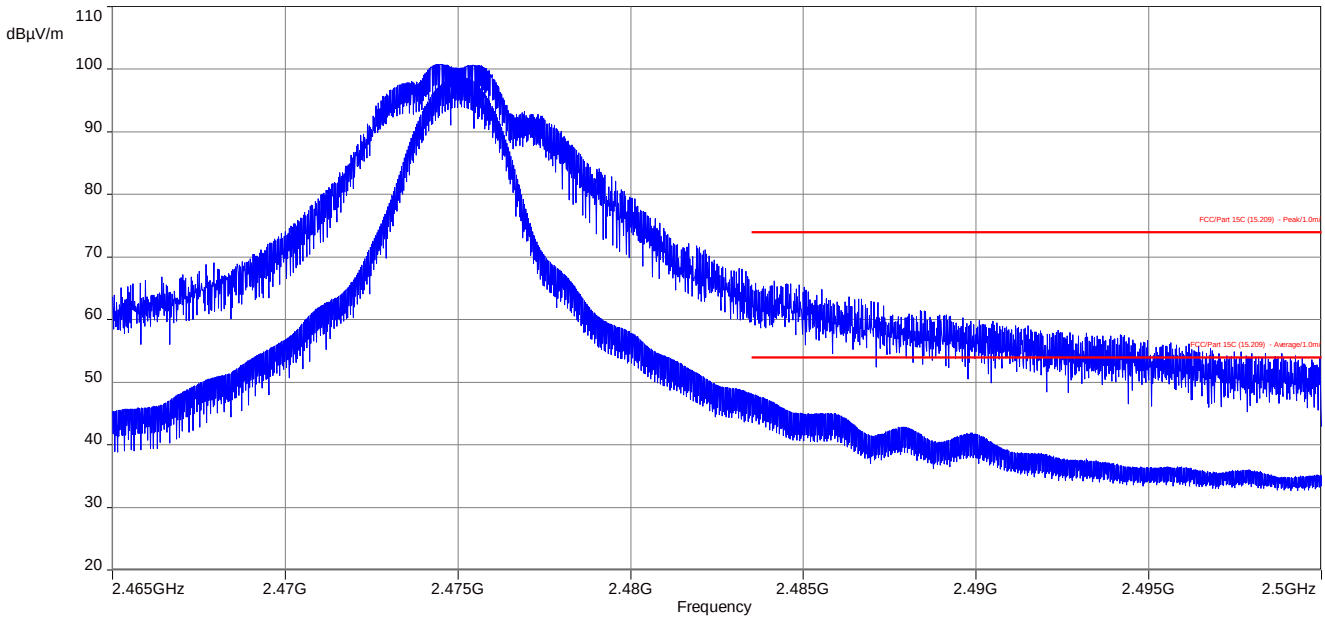
Scenario	Band edge compliance radiated [dBµV/m]
Modulation	O-QPSK
Lower restricted band	< 54 AVG / < 74 PP
Upper restricted band	< 54 AVG / < 74 PP

Plots:

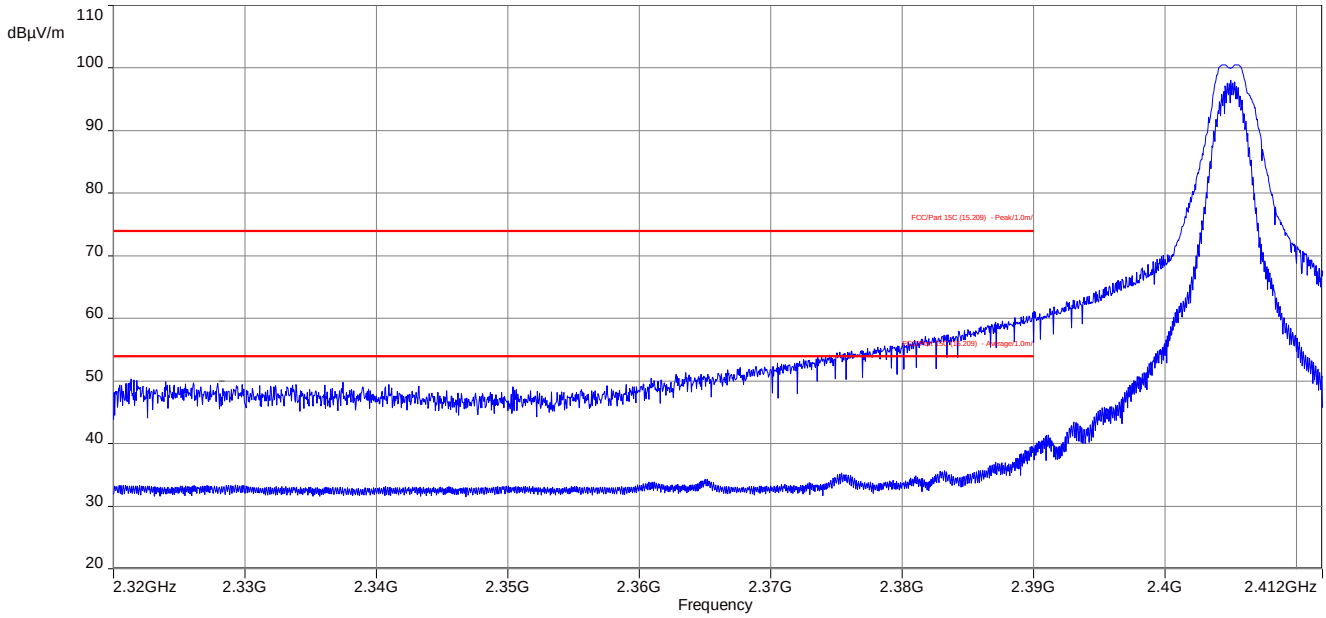
Plot 1: Lower restricted band, plastic housing, adapter (Ex – version)



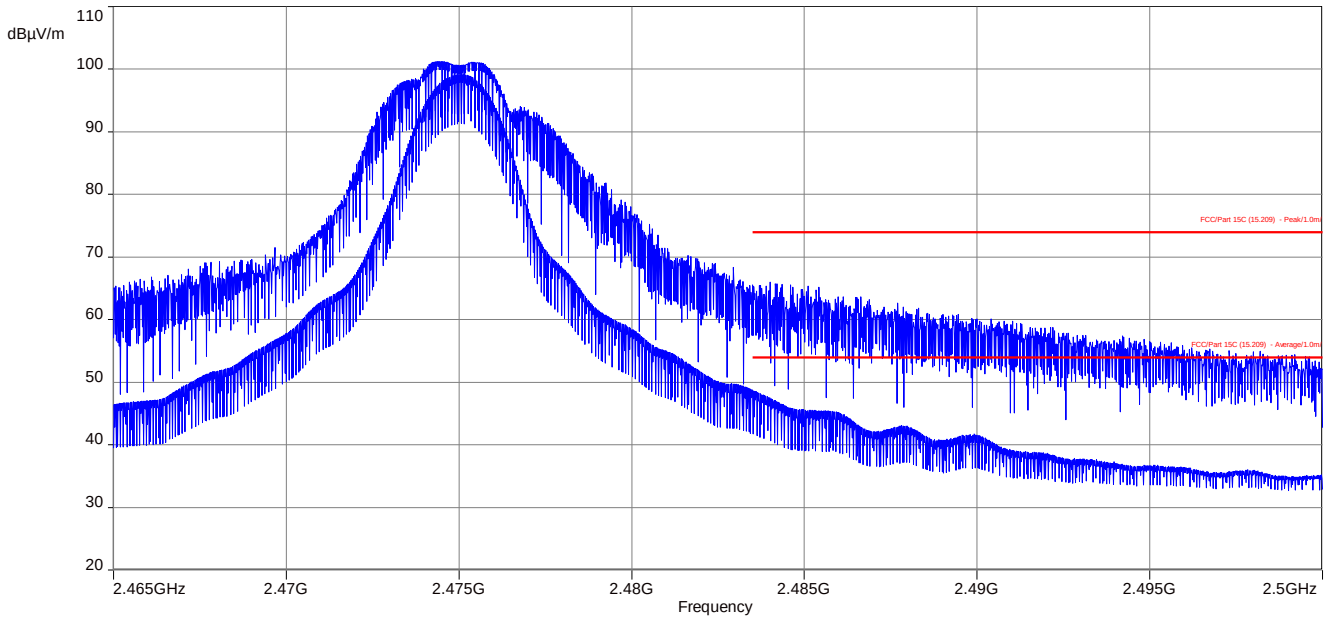
Plot 2: Upper restricted band, plastic housing, adapter (Ex – version)



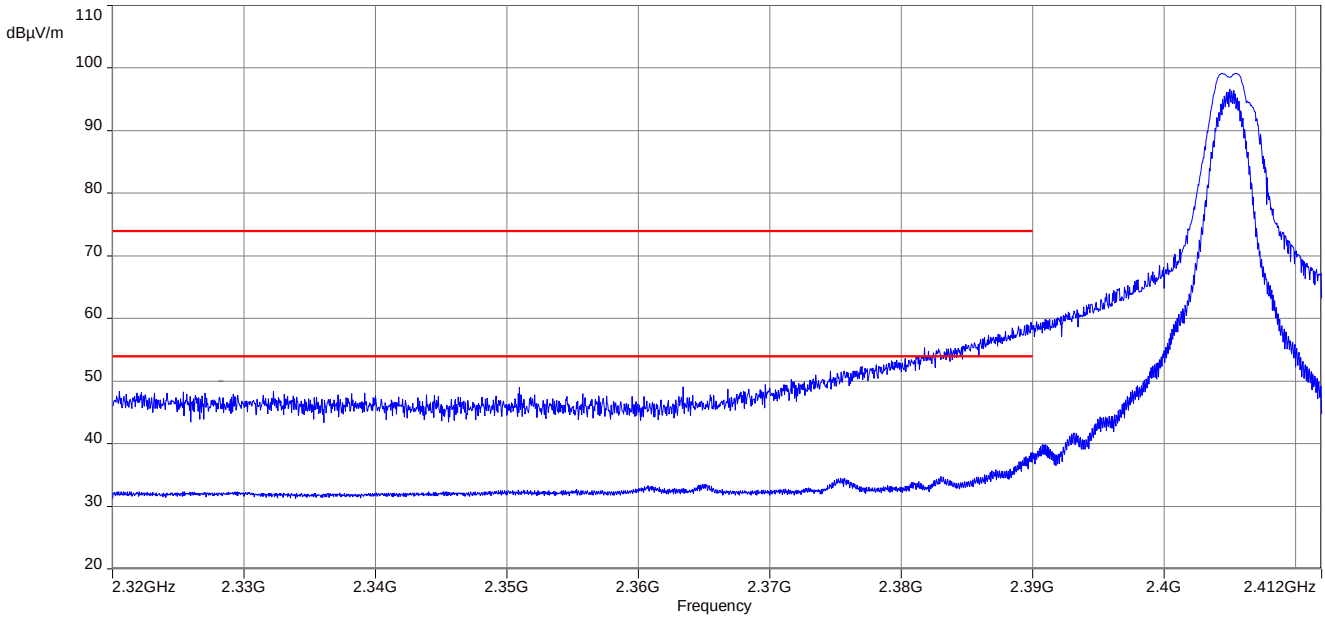
Plot 3: Lower restricted band, metal housing, adapter (Ex – version)



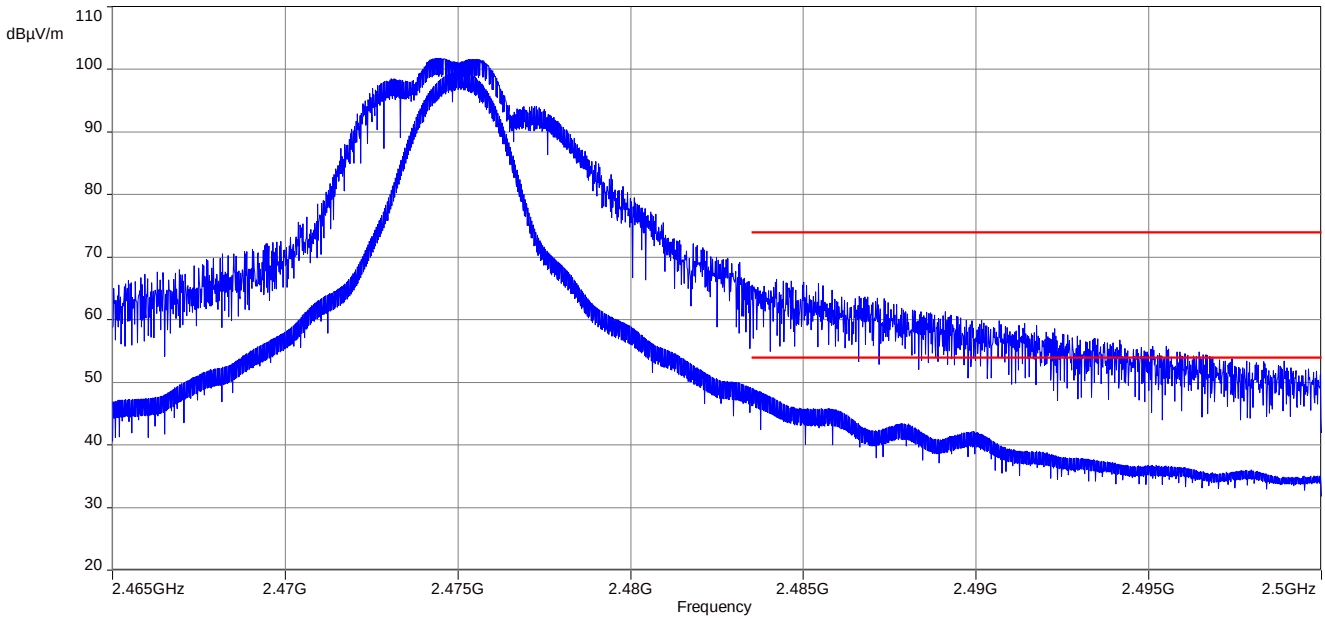
Plot 4: Upper restricted band, metal housing, adapter (Ex – version)



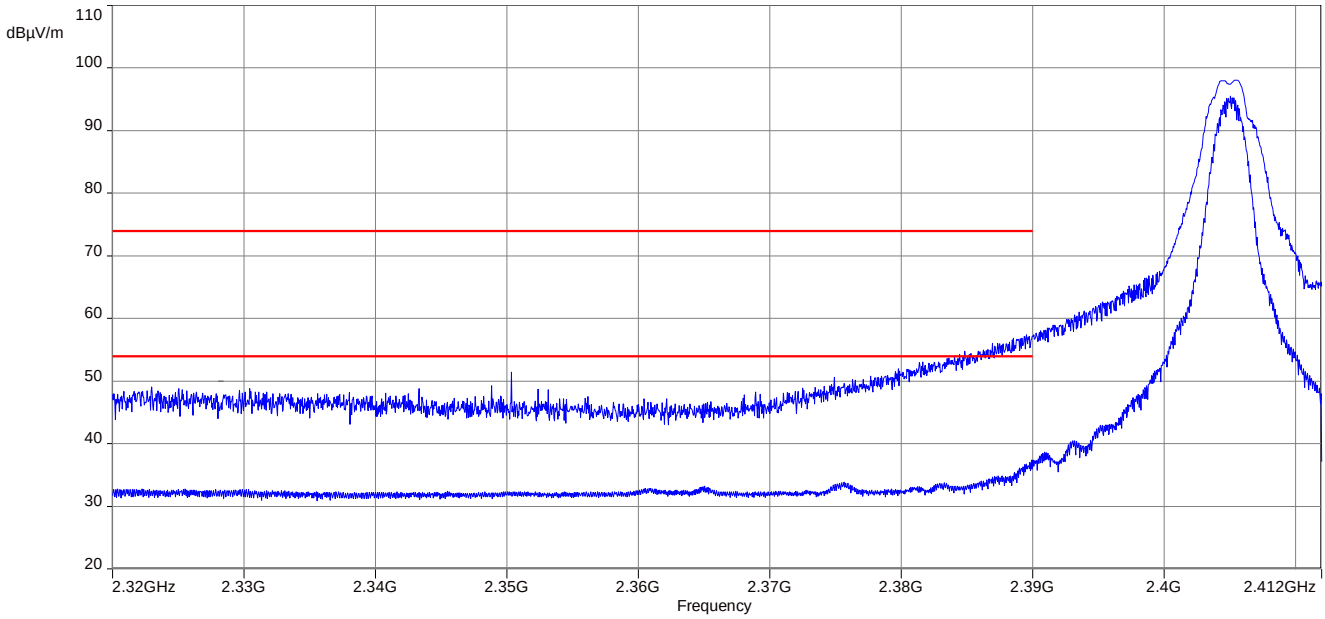
Plot 5: Lower restricted band, metal housing, adapter (non-Ex – version)



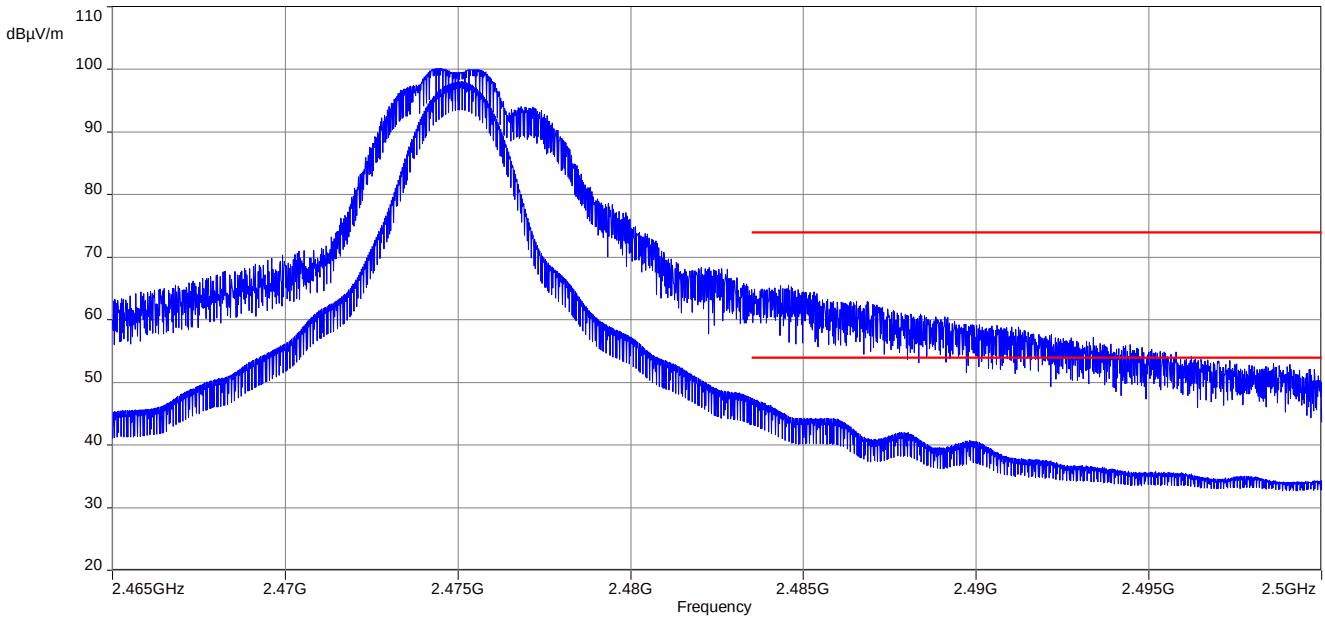
Plot 6: Upper restricted band, metal housing, adapter (non-Ex – version)



Plot 7: Lower restricted band, plastic housing, adapter (non-Ex – version)



Plot 8: Upper restricted band, plastic housing, adapter (non-Ex – version)



12.8 TX spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The EUT is set to single channel mode.

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	100 kHz
Video bandwidth	300 kHz or 500 kHz
Span	9 kHz to 25 GHz
Trace mode	Max hold
Test setup	See sub clause 7.4 A
Measurement uncertainty	See sub clause 9

Limits:

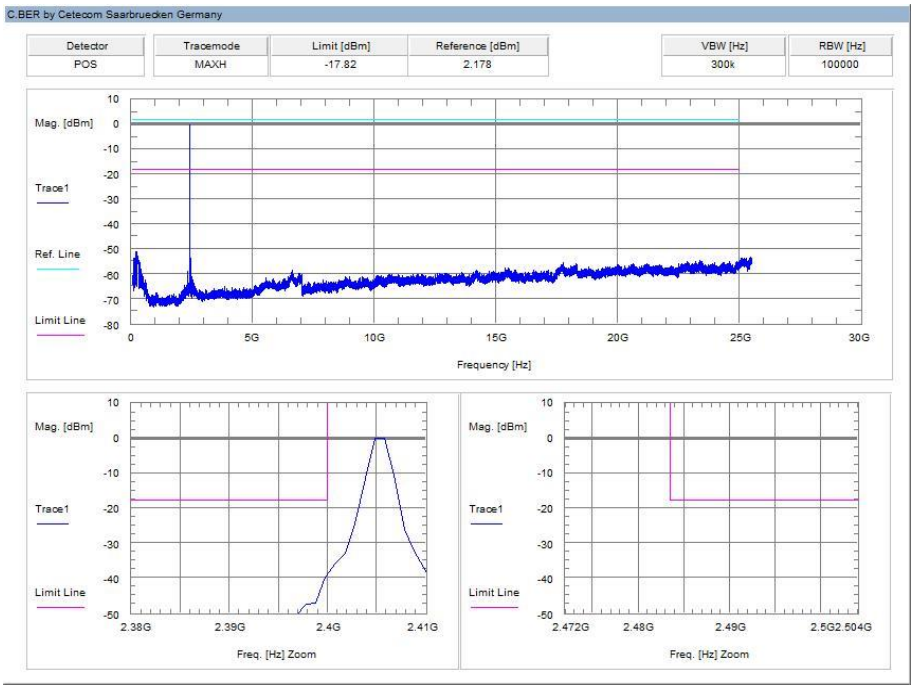
FCC	IC
TX spurious emissions conducted	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required	

Results:

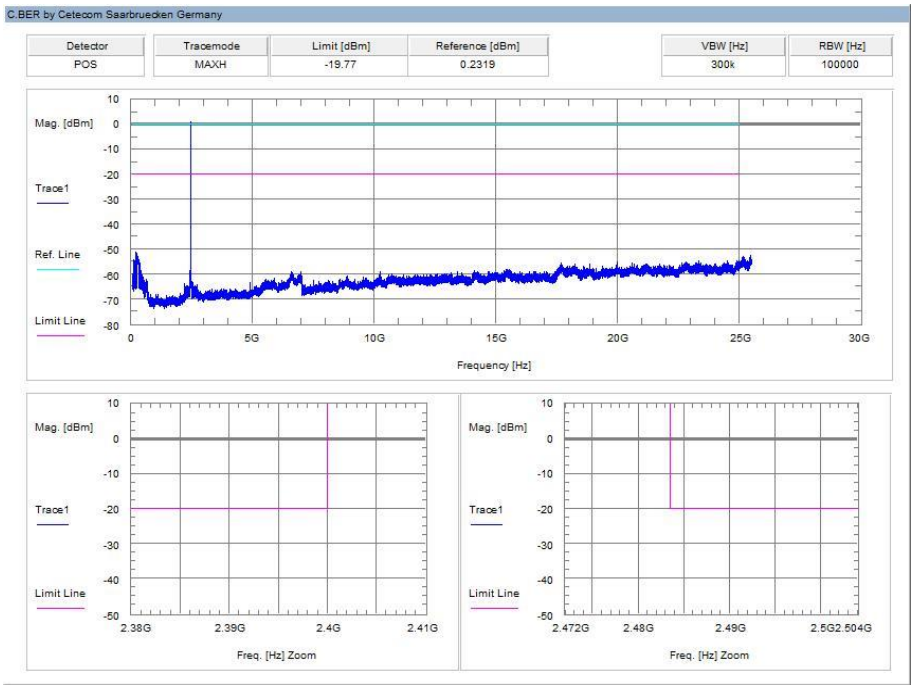
TX spurious emissions conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2405		2.2	30 dBm		Operating frequency
All detected emissions are compliant with the -20 dBc limit!			-20 dBc		compliant
2440		0.2	30 dBm		Operating frequency
All detected emissions are compliant with the -20 dBc limit!			-20 dBc		compliant
2475		0.4	30 dBm		Operating frequency
All detected emissions are compliant with the -20 dBc limit!			-20 dBc		compliant

Plots:

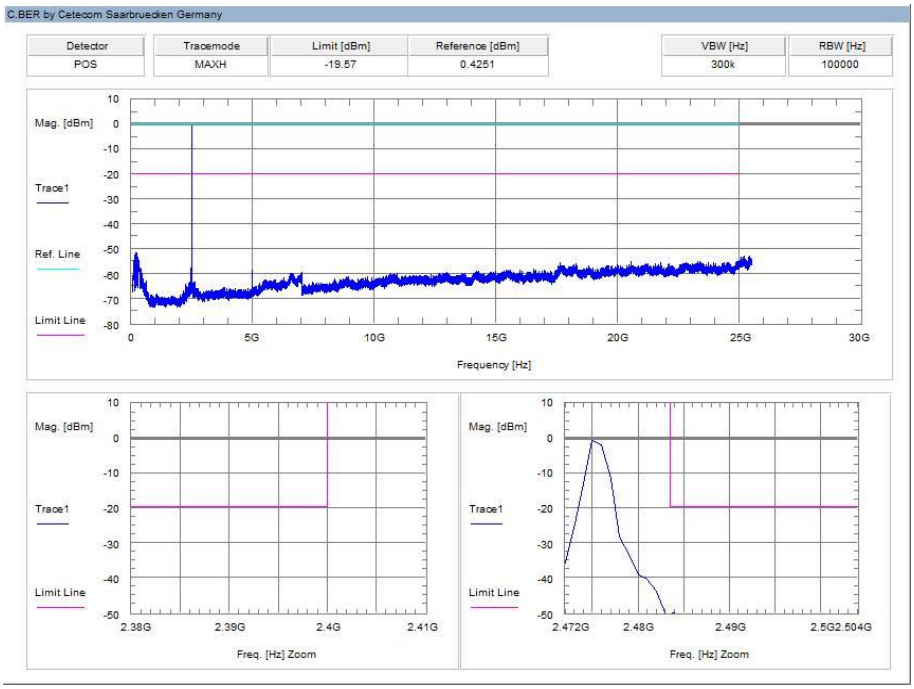
Plot 1: lowest channel



Plot 2: mid channel



Plot 3: highest channel



12.9 Spurious emissions radiated below 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement parameters	
Detector	Peak / Quasi peak
Sweep time	Auto
Resolution bandwidth	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Video bandwidth	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Span	9 kHz to 30 MHz
Trace mode	Max hold
Test setup	See sub clause 7.2 C
Measurement uncertainty	See sub clause 9

Limits:

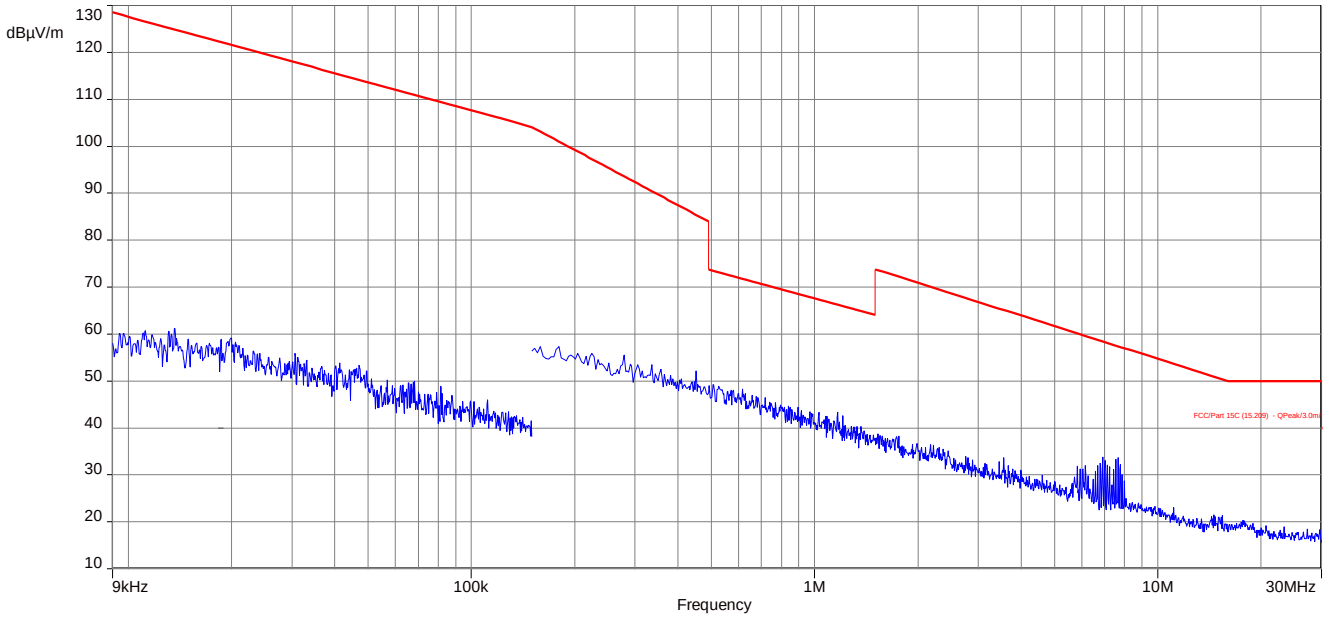
FCC		IC
TX spurious emissions radiated below 30 MHz		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results:

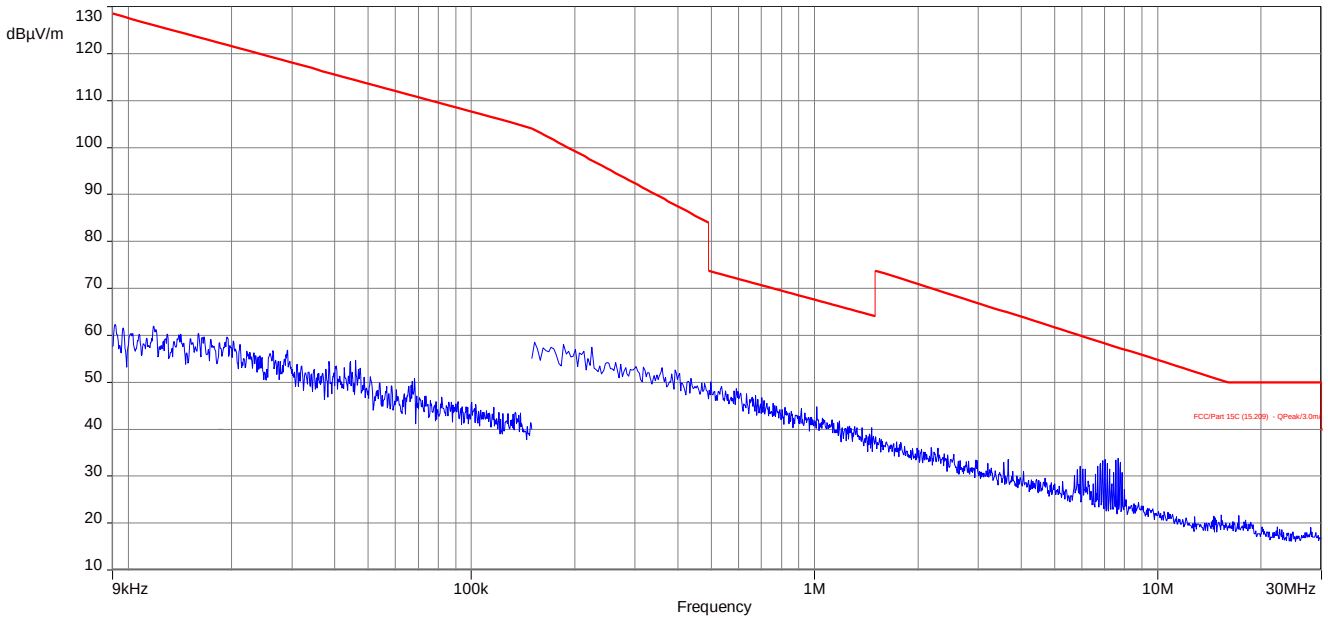
TX spurious emissions radiated below 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.		

Plots:

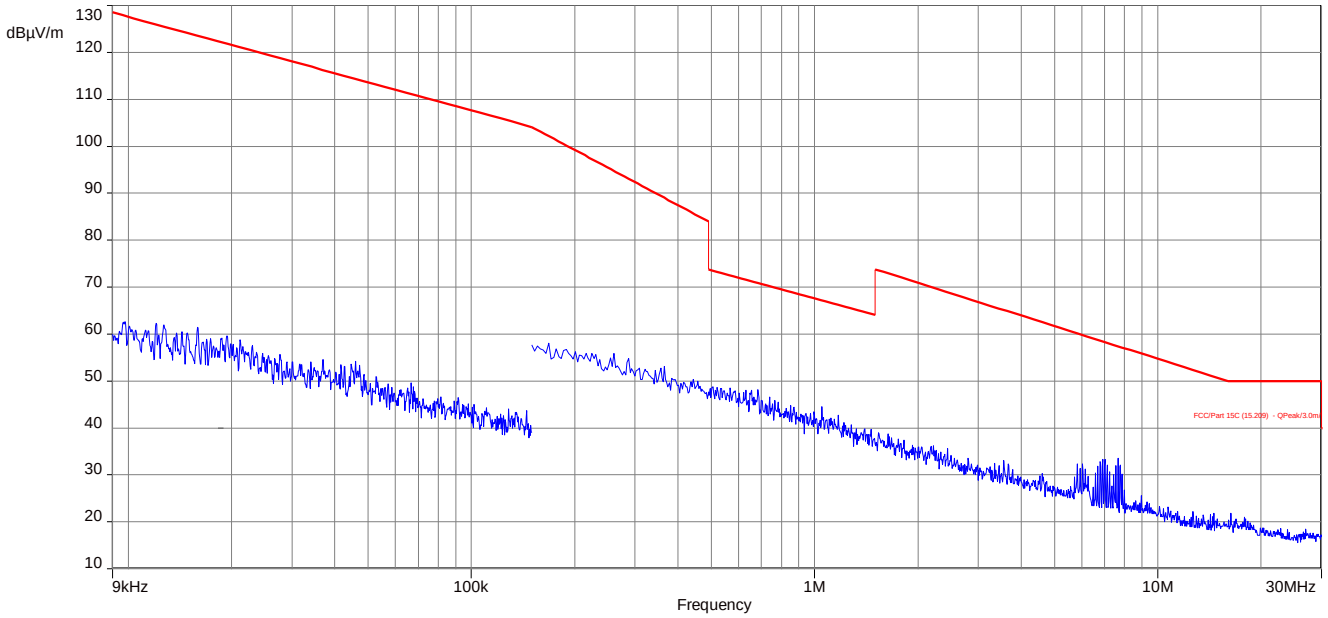
Plot 1: 9 kHz to 30 MHz, channel 00, transmit mode, metal housing, adapter (Ex – version)



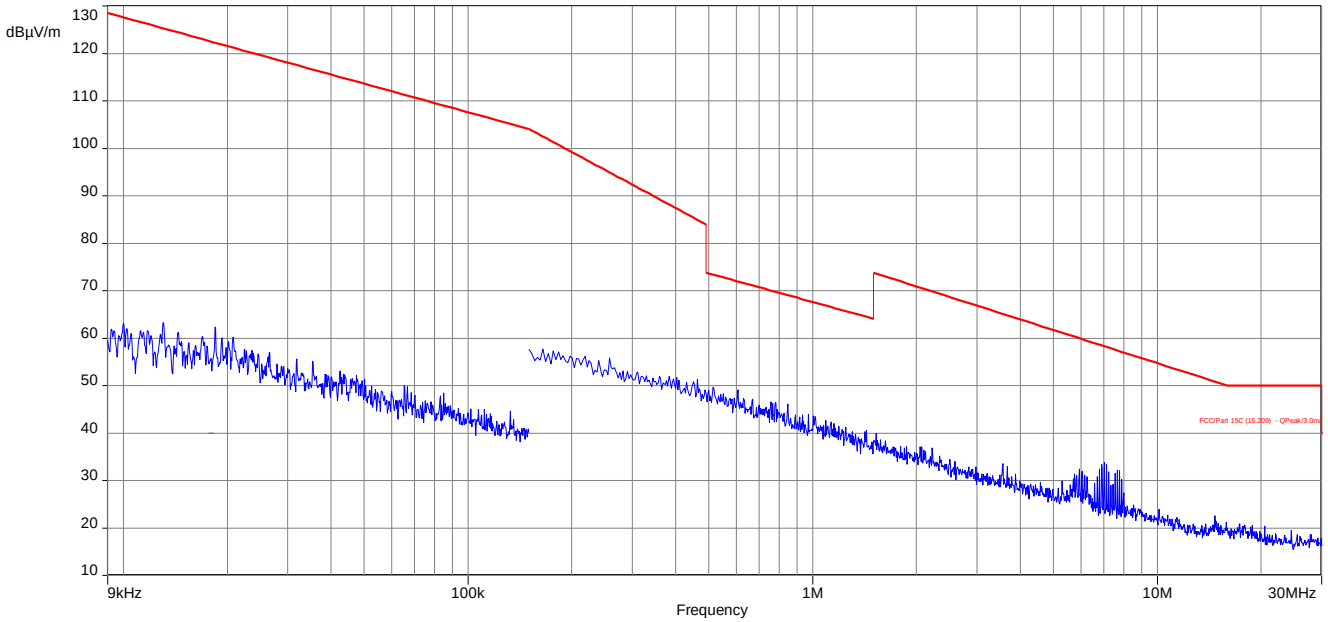
Plot 2: 9 kHz to 30 MHz, channel 19, transmit mode, metal housing, adapter (Ex – version)



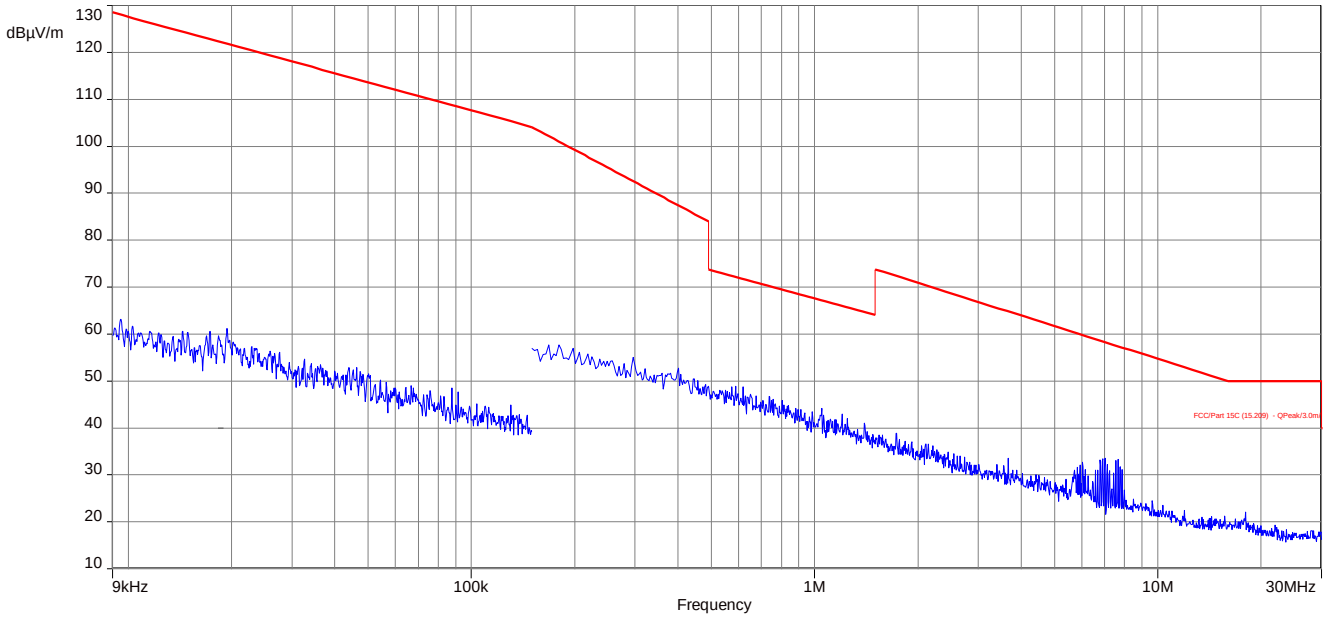
Plot 3: 9 kHz to 30 MHz, channel 39, transmit mode, metal housing, adapter (Ex – version)



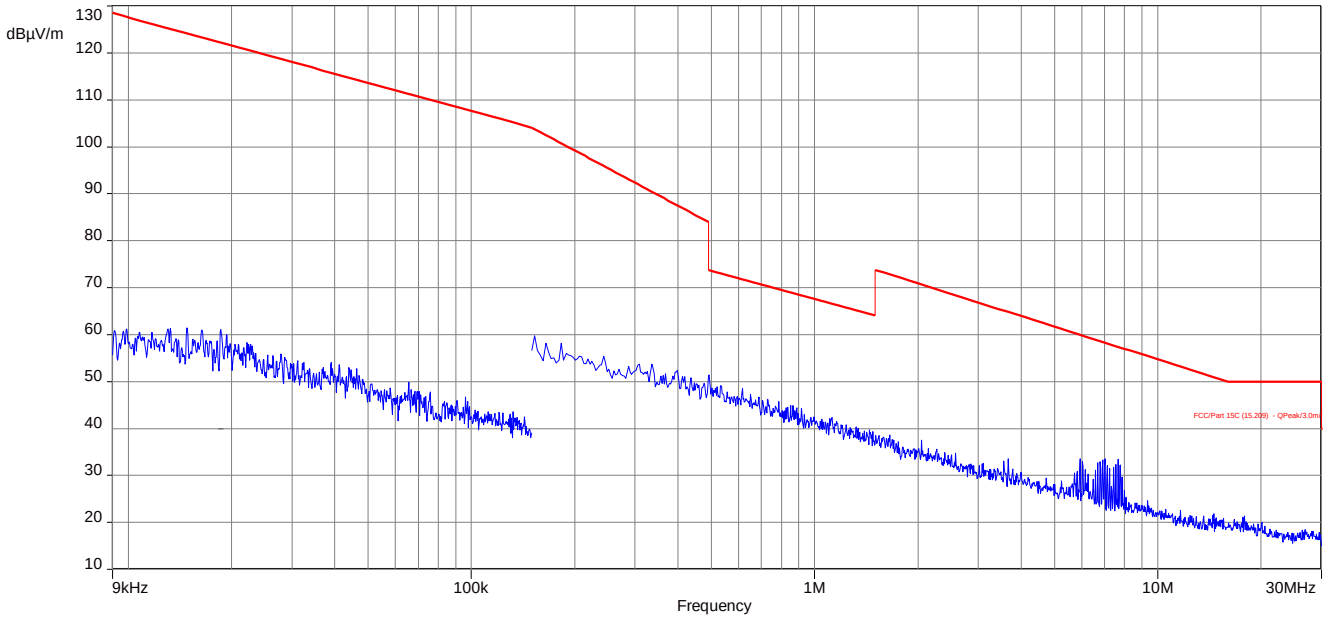
Plot 4: 9 kHz to 30 MHz, channel 00, transmit mode, plastic housing, adapter (Ex – version)



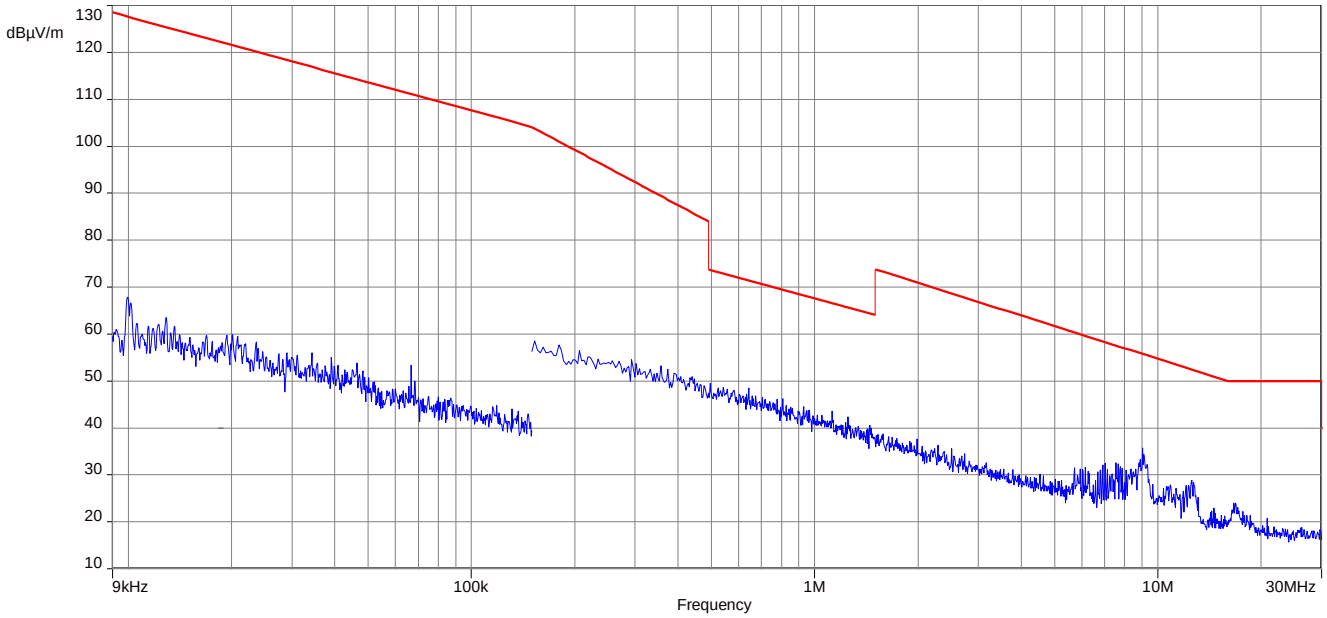
Plot 5: 9 kHz to 30 MHz, channel 19, transmit mode, plastic housing, adapter (Ex – version)



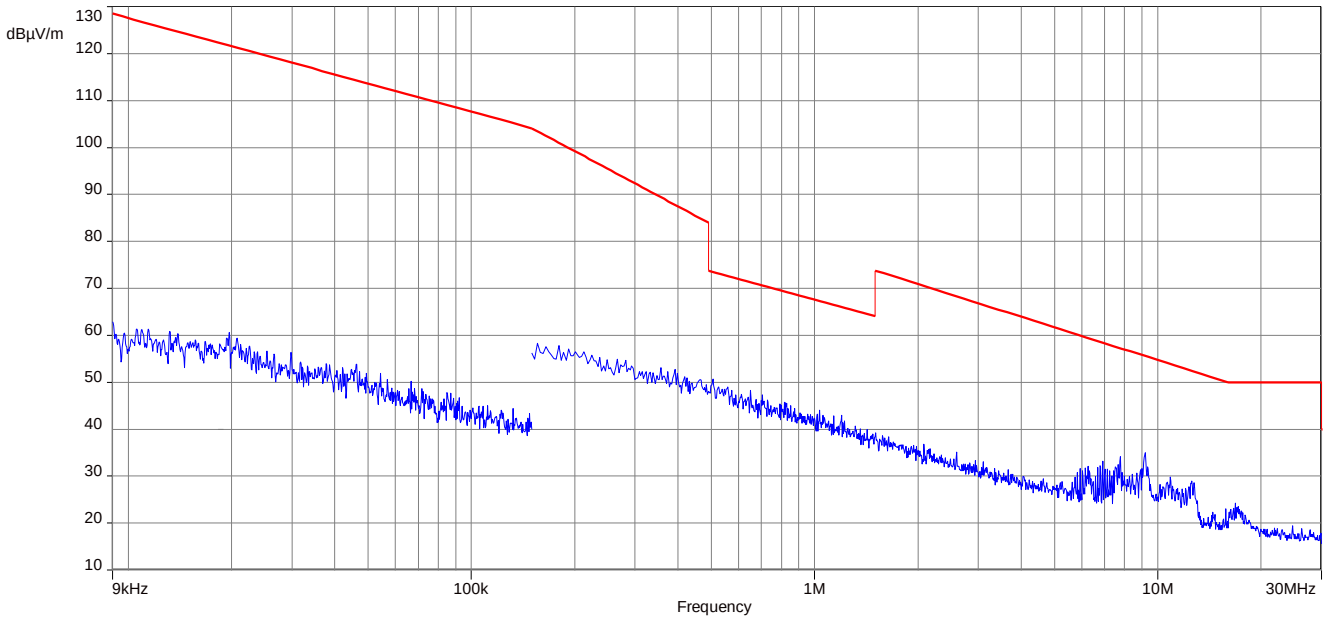
Plot 6: 9 kHz to 30 MHz, channel 39, transmit mode, plastic housing, adapter (Ex – version)



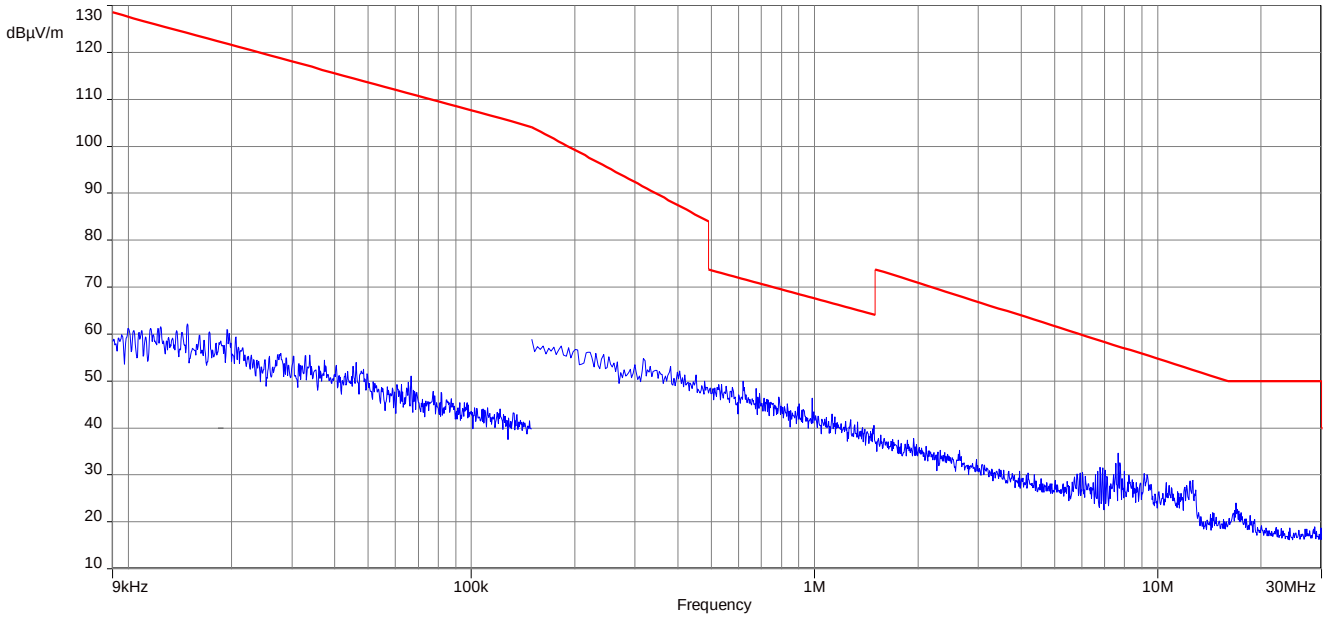
Plot 7: 9 kHz to 30 MHz, lowest channel, transmit mode, metal housing, adapter (non-Ex – version)



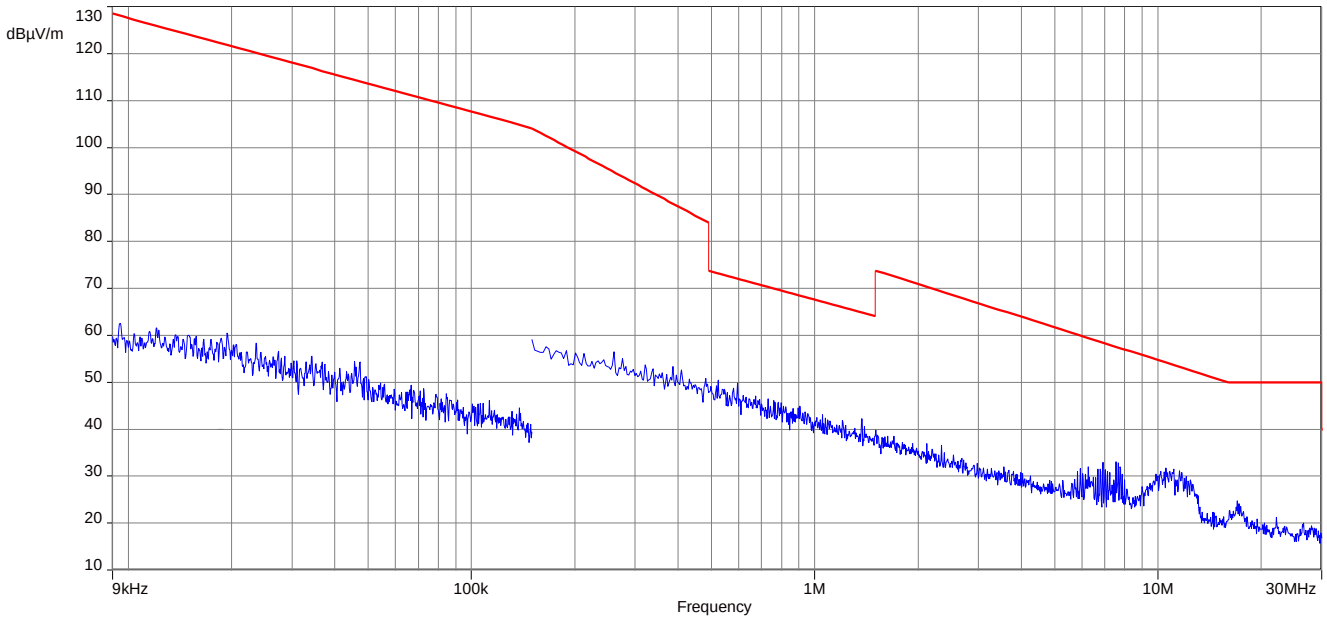
Plot 8: 9 kHz to 30 MHz, middle channel, transmit mode, metal housing, adapter (non-Ex – version)



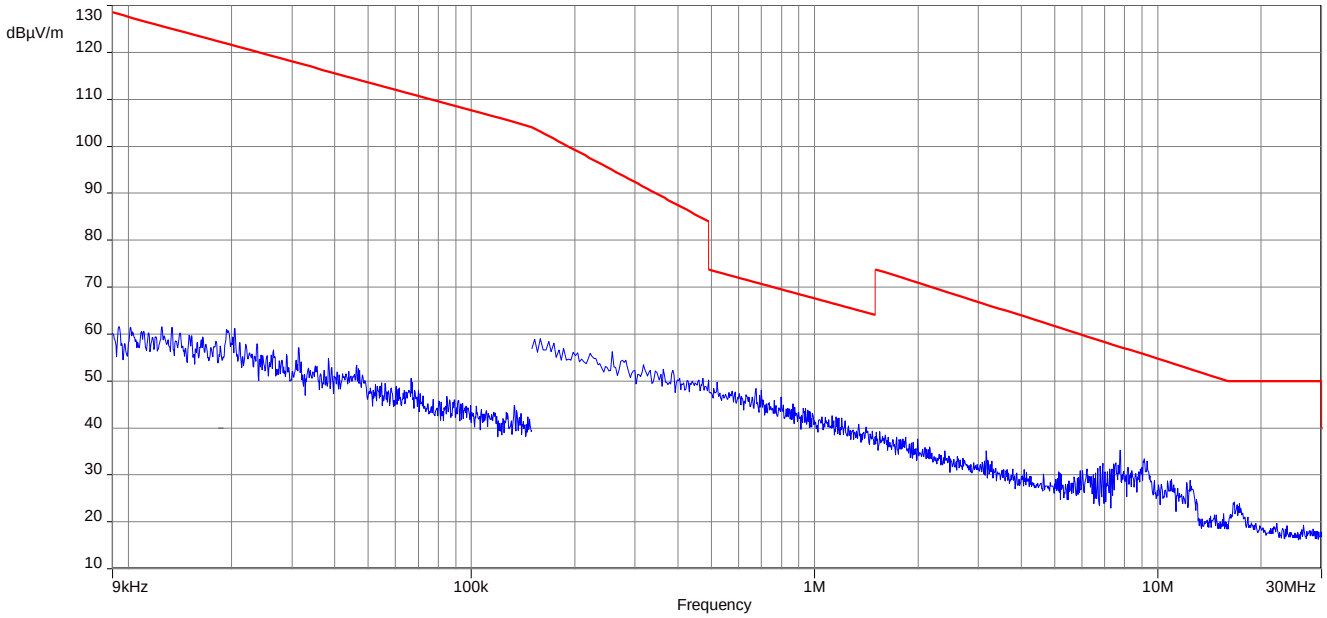
Plot 9: 9 kHz to 30 MHz, highest channel, transmit mode, metal housing, adapter (non-Ex – version)



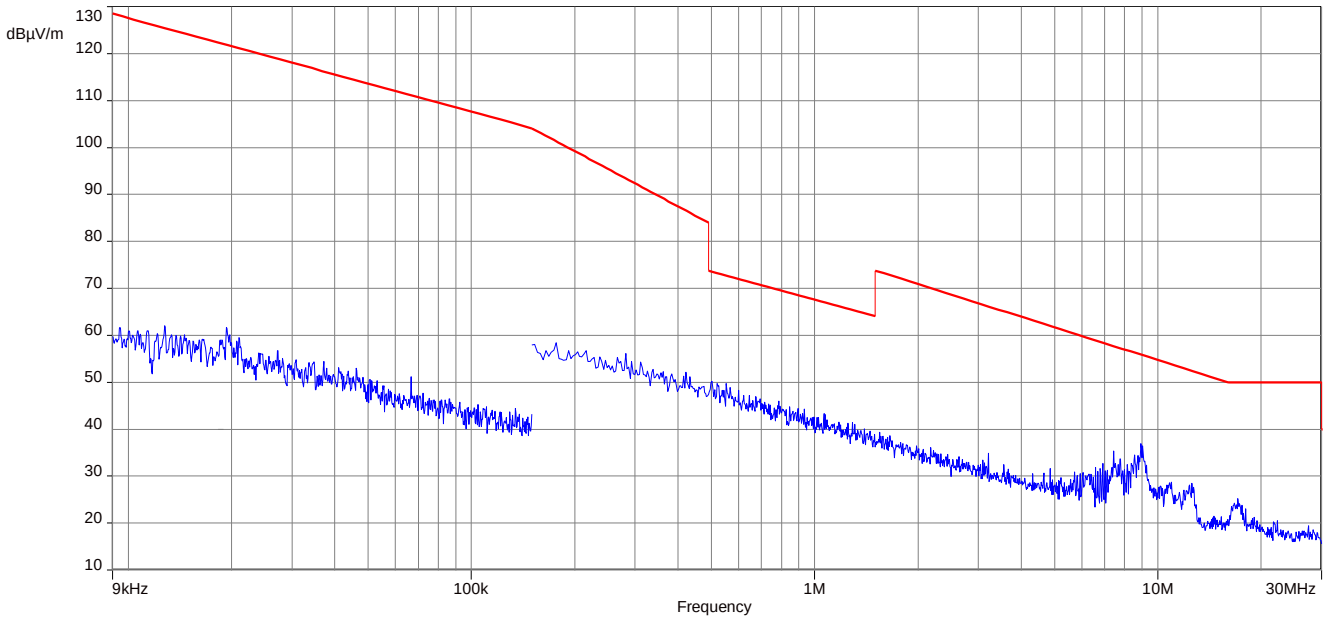
Plot 10: 9 kHz to 30 MHz, lowest channel, transmit mode, plastic housing, adapter (non-Ex – version)



Plot 11: 9 kHz to 30 MHz, middle channel, transmit mode, plastic housing, adapter (non-Ex – version)



Plot 12: 9 kHz to 30 MHz, highest channel, transmit mode, plastic housing, adapter (non-Ex – version)



12.10 Spurious emissions radiated 30 MHz to 1 GHz

Description:

Measurement of the radiated spurious emissions and cabinet radiations below 1 GHz.

Measurement parameters	
Detector	Peak / Quasi Peak
Sweep time	Auto
Resolution bandwidth	120 kHz
Video bandwidth	3 x RBW
Span	30 MHz to 1 GHz
Trace mode	Max hold
Measured modulation	O-QPSK
Test setup	See sub clause 7.1 A
Measurement uncertainty	See sub clause 9

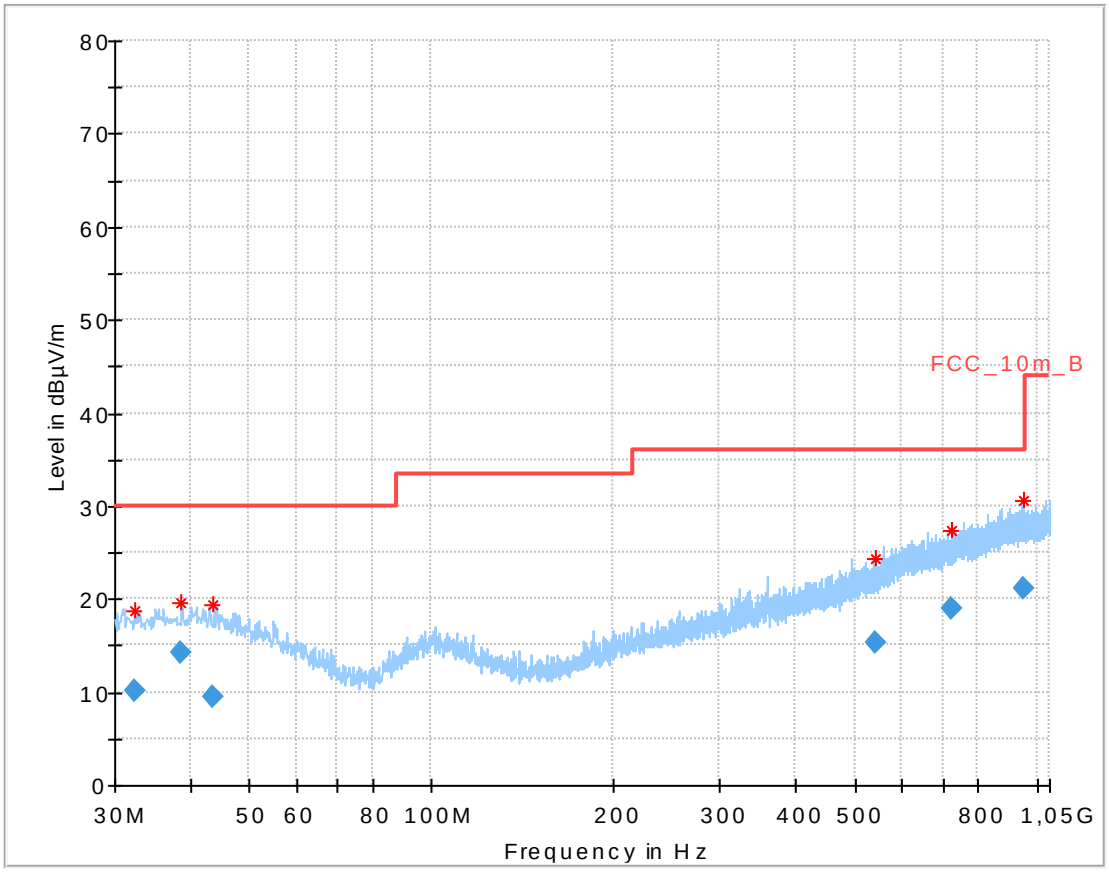
The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

FCC		IC
TX spurious emissions radiated		
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
§15.209		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	44.0	10

Plots: Transmit mode

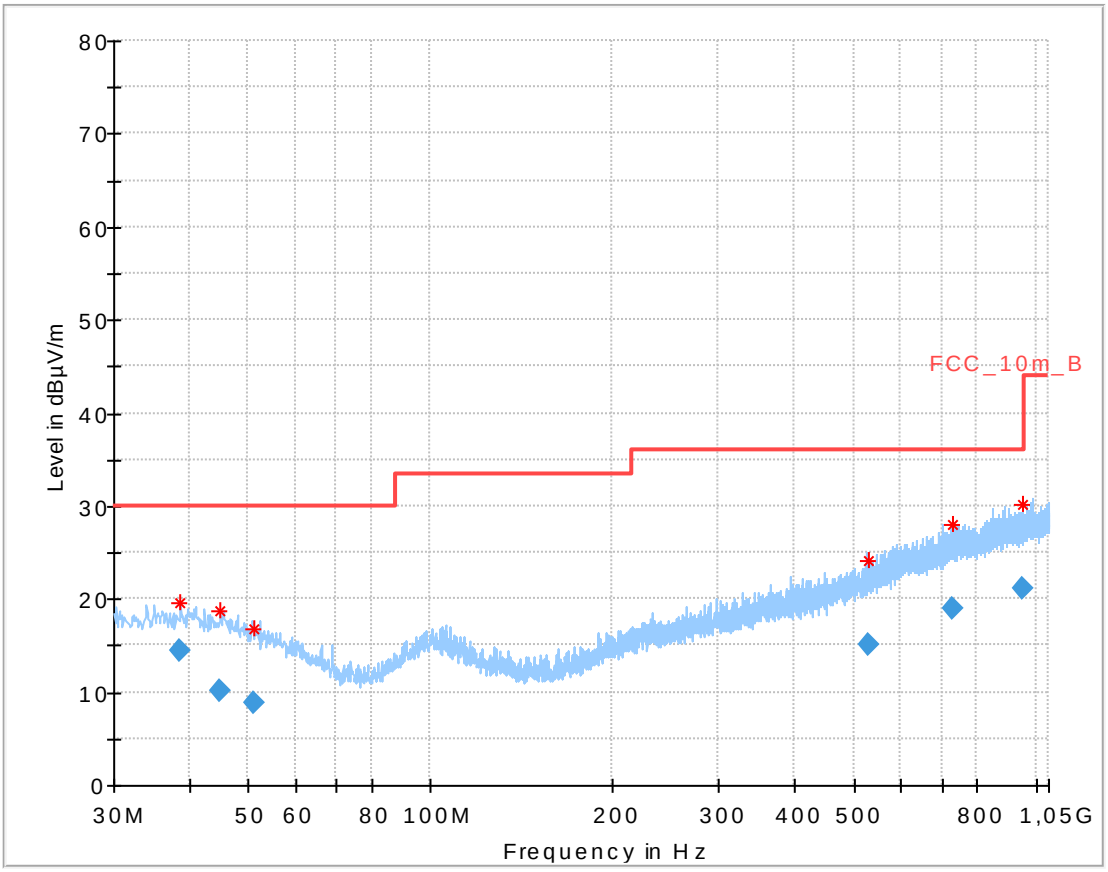
Plot 1: 30 MHz to 1 GHz, TX mode, channel 00, vertical & horizontal polarization, metal housing, adapter (Ex – version)



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.374650	10.10	30.00	19.90	1000.0	120.000	179.0	V	161.0	13.6
38.676300	14.23	30.00	15.77	1000.0	120.000	101.0	V	30.0	14.0
43.631550	9.49	30.00	20.51	1000.0	120.000	179.0	V	332.0	13.9
541.290600	15.38	36.00	20.62	1000.0	120.000	185.0	V	134.0	19.2
720.719400	18.96	36.00	17.04	1000.0	120.000	178.0	V	310.0	22.0
950.944200	21.10	36.00	14.90	1000.0	120.000	179.0	H	4.0	24.3

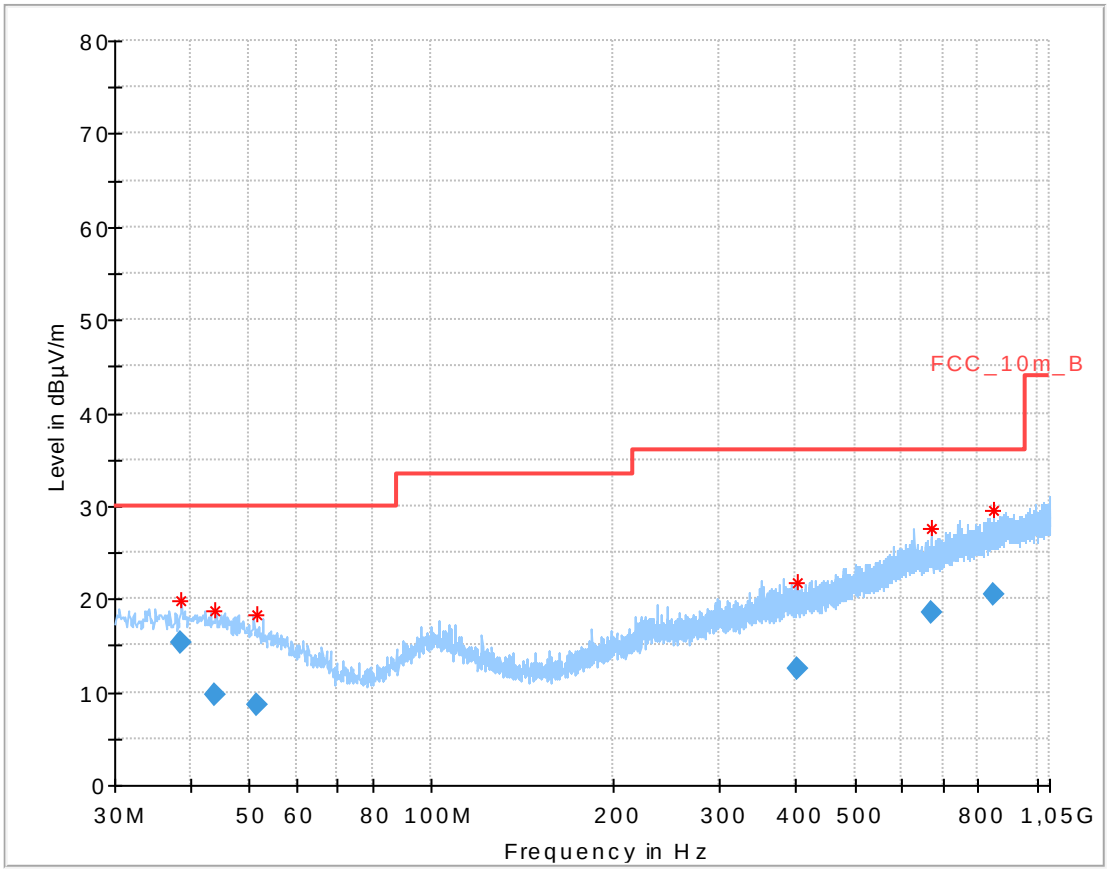
Plot 2: 30 MHz to 1 GHz, TX mode, channel 19, vertical & horizontal polarization, metal housing, adapter (Ex – version)



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.711550	14.45	30.00	15.55	1000.0	120.000	180.0	V	331.0	14.0
45.037200	10.23	30.00	19.77	1000.0	120.000	179.0	H	101.0	13.8
51.153450	8.75	30.00	21.25	1000.0	120.000	101.0	H	251.0	12.5
530.023650	15.20	36.00	20.80	1000.0	120.000	179.0	V	52.0	19.1
725.998050	19.08	36.00	16.92	1000.0	120.000	185.0	H	140.0	22.1
949.274850	21.18	36.00	14.82	1000.0	120.000	101.0	V	116.0	24.3

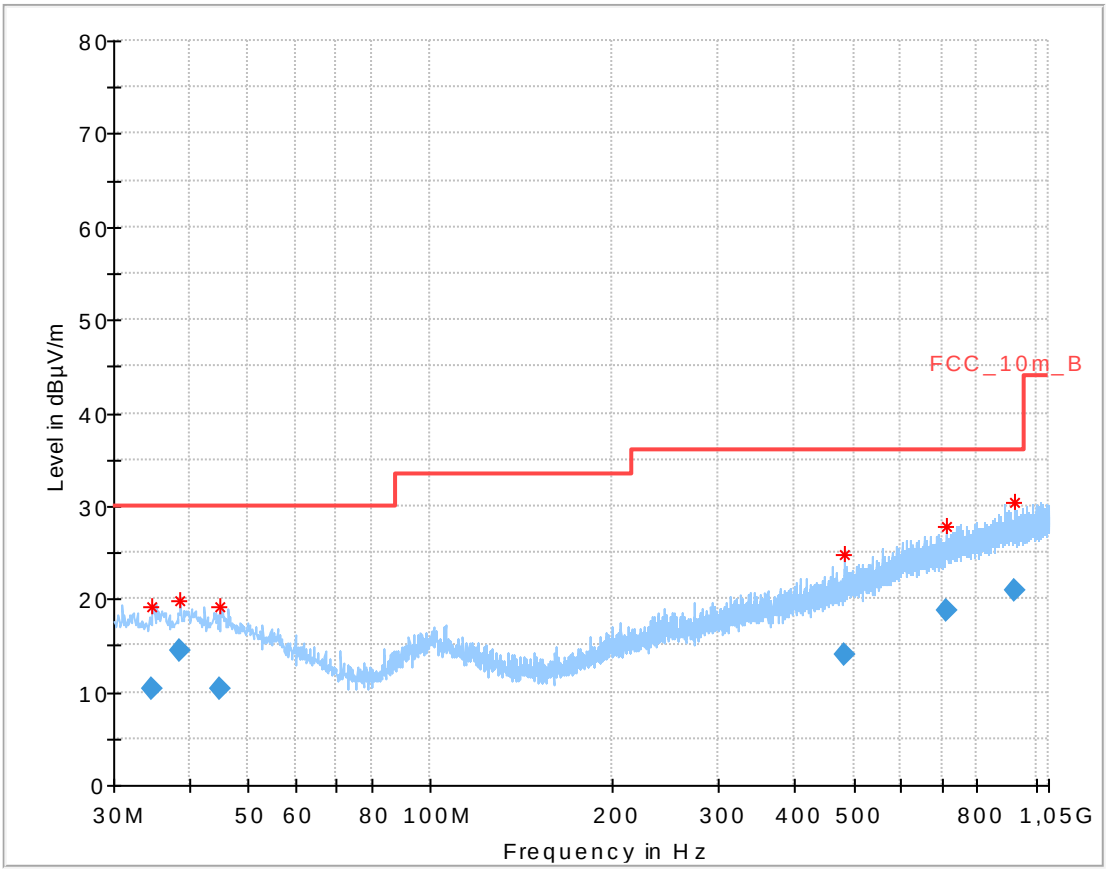
Plot 3: 30 MHz to 1 GHz, TX mode, channel 39, vertical & horizontal polarization, metal housing, adapter (Ex – version)



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.701800	15.22	30.00	14.78	1000.0	120.000	101.0	V	53.0	14.0
43.874700	9.65	30.00	20.35	1000.0	120.000	185.0	V	25.0	13.9
51.471900	8.67	30.00	21.33	1000.0	120.000	185.0	V	25.0	12.4
403.319700	12.56	36.00	23.44	1000.0	120.000	179.0	H	38.0	16.9
672.021300	18.44	36.00	17.56	1000.0	120.000	98.0	H	216.0	21.3
849.955200	20.40	36.00	15.60	1000.0	120.000	185.0	H	149.0	23.5

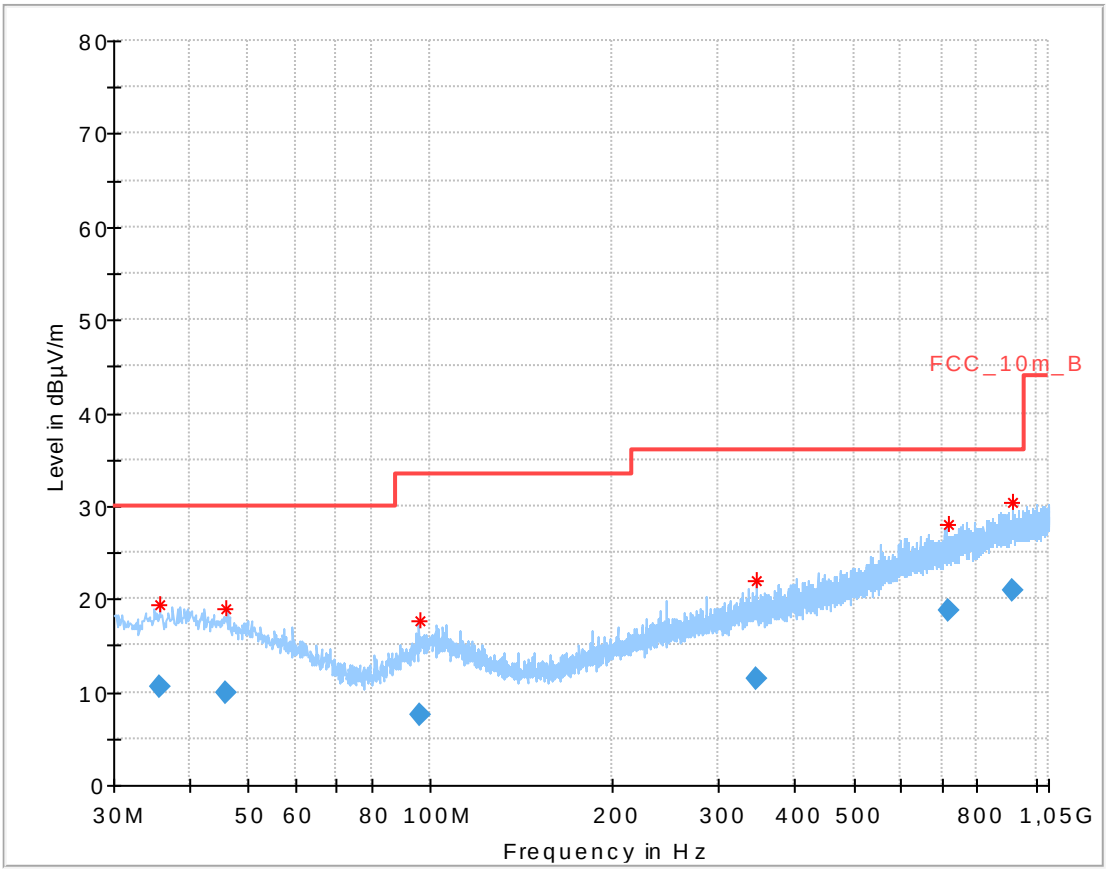
Plot 4: 30 MHz to 1 GHz, TX mode, channel 00, vertical & horizontal polarization, plastic housing, adapter (Ex – version)



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.783050	10.25	30.00	19.75	1000.0	120.000	101.0	H	126.0	13.8
38.687100	14.38	30.00	15.62	1000.0	120.000	101.0	V	134.0	14.0
44.951700	10.26	30.00	19.74	1000.0	120.000	101.0	V	316.0	13.9
482.849700	14.07	36.00	21.93	1000.0	120.000	98.0	V	193.0	18.3
713.774700	18.77	36.00	17.23	1000.0	120.000	185.0	H	48.0	21.9
925.379100	20.99	36.00	15.01	1000.0	120.000	185.0	V	339.0	24.2

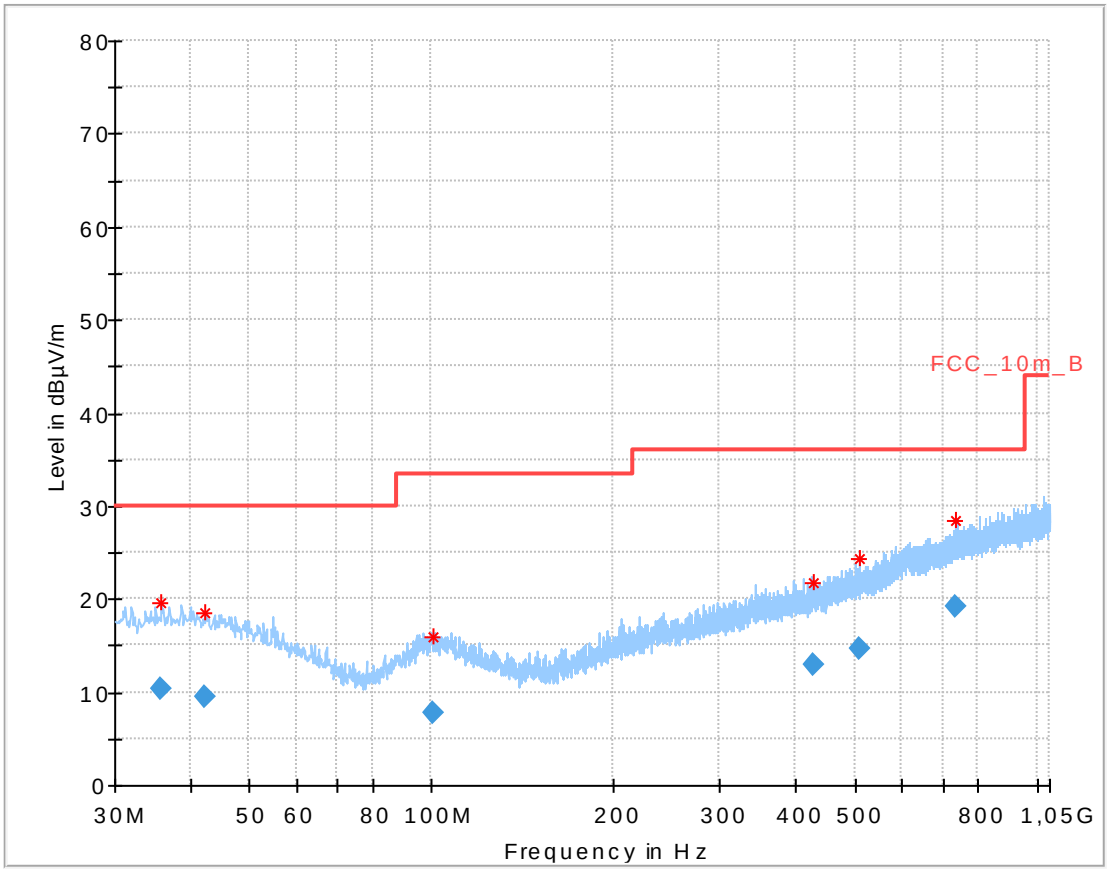
Plot 5: 30 MHz to 1 GHz, TX mode, channel 19, vertical & horizontal polarization, plastic housing, adapter (Ex – version)



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.692500	10.49	30.00	19.51	1000.0	120.000	179.0	H	280.0	13.8
45.914250	9.84	30.00	20.16	1000.0	120.000	101.0	H	257.0	13.6
96.330450	7.57	33.50	25.93	1000.0	120.000	100.0	V	280.0	11.6
344.489400	11.52	36.00	24.48	1000.0	120.000	185.0	V	235.0	15.9
714.985050	18.86	36.00	17.14	1000.0	120.000	185.0	H	340.0	21.9
915.509550	20.95	36.00	15.05	1000.0	120.000	180.0	H	340.0	24.2

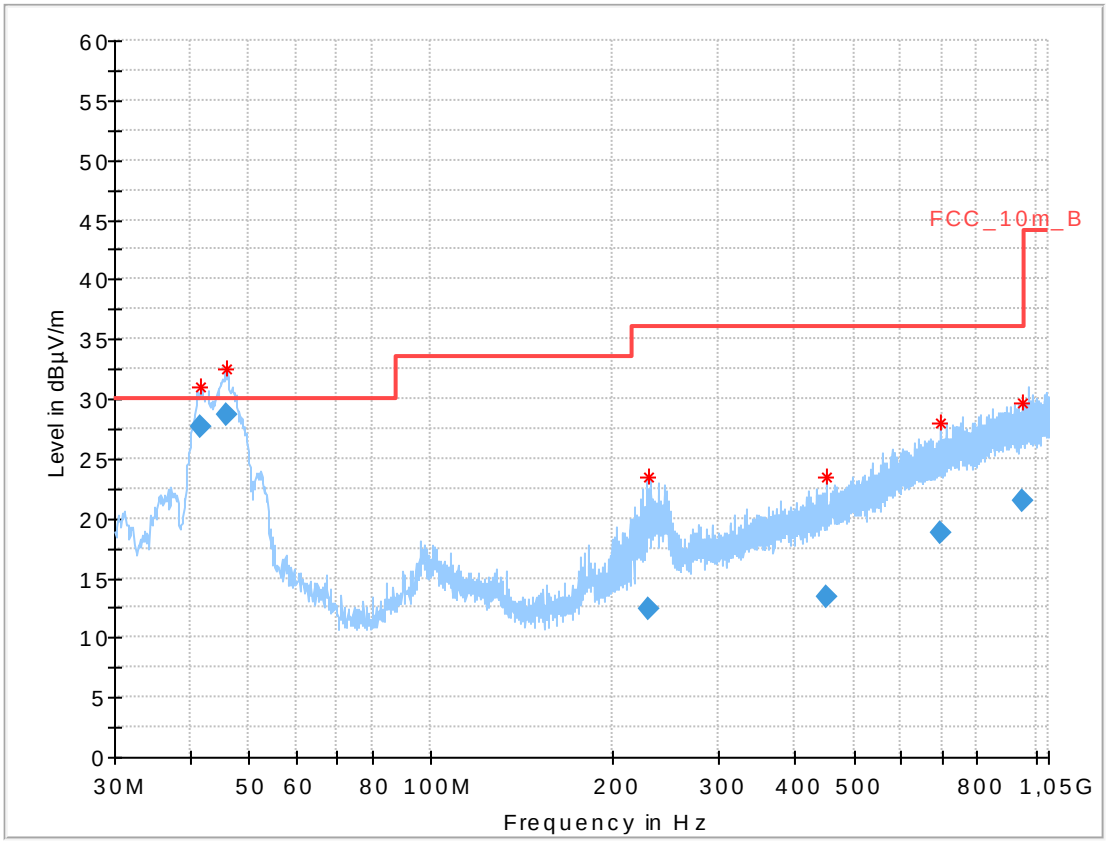
Plot 6: 30 MHz to 1 GHz, TX mode, channel 39, vertical & horizontal polarization, plastic housing, adapter (Ex – version)



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.860800	10.42	30.00	19.58	1000.0	120.000	101.0	H	256.0	13.8
42.160200	9.56	30.00	20.44	1000.0	120.000	101.0	H	267.0	14.0
100.373850	7.87	33.50	25.63	1000.0	120.000	101.0	H	81.0	12.1
428.169300	12.86	36.00	23.14	1000.0	120.000	185.0	V	204.0	17.3
510.844650	14.74	36.00	21.26	1000.0	120.000	185.0	V	153.0	18.8
733.665900	19.20	36.00	16.80	1000.0	120.000	179.0	V	267.0	22.3

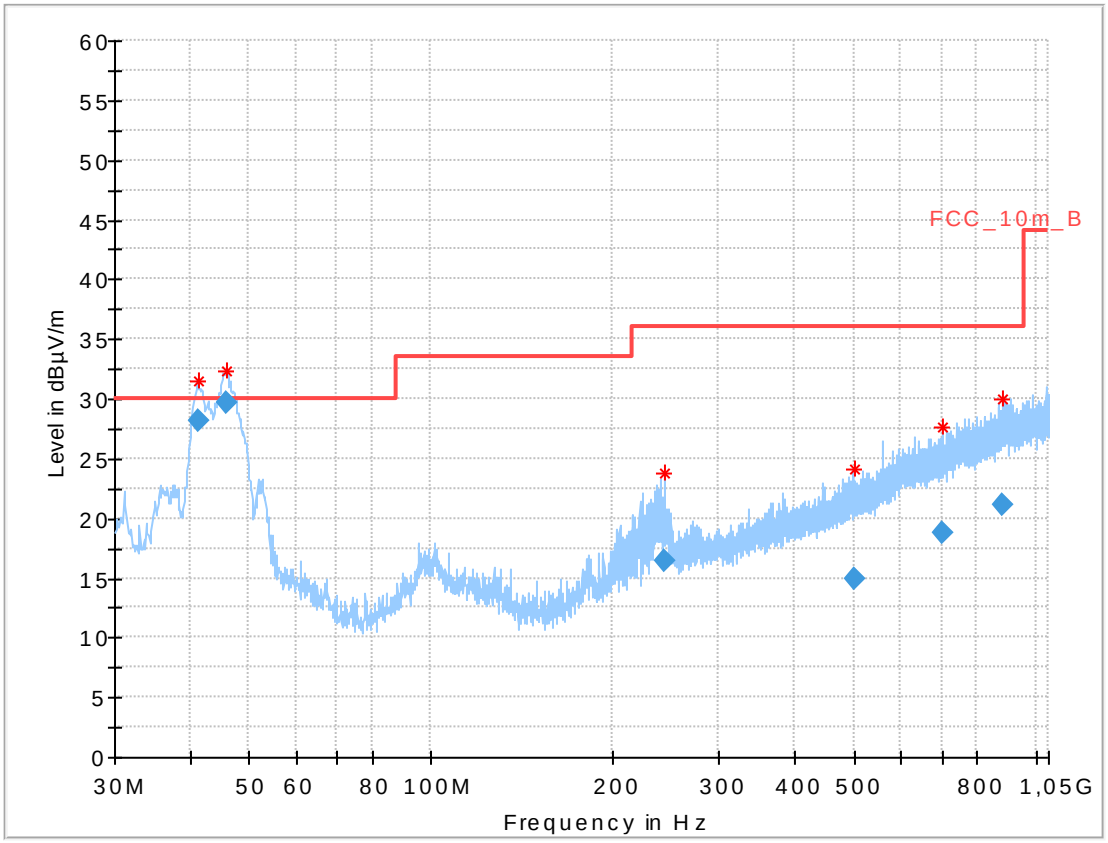
Plot 7: 30 MHz to 1 GHz, TX mode, lowest channel, vertical & horizontal polarization, metal housing, adapter (non-Ex – version)



Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
41.473050	27.61	30.00	2.39	1000.0	120.000	103.0	V	52.0	14.0
45.888750	28.59	30.00	1.41	1000.0	120.000	100.0	V	28.0	13.6
228.407250	12.34	36.00	23.66	1000.0	120.000	100.0	V	85.0	12.7
451.044750	13.47	36.00	22.53	1000.0	120.000	400.0	V	52.0	17.6
697.222050	18.70	36.00	17.30	1000.0	120.000	200.0	H	230.0	21.5
949.719300	21.39	36.00	14.61	1000.0	120.000	101.0	H	144.0	24.3

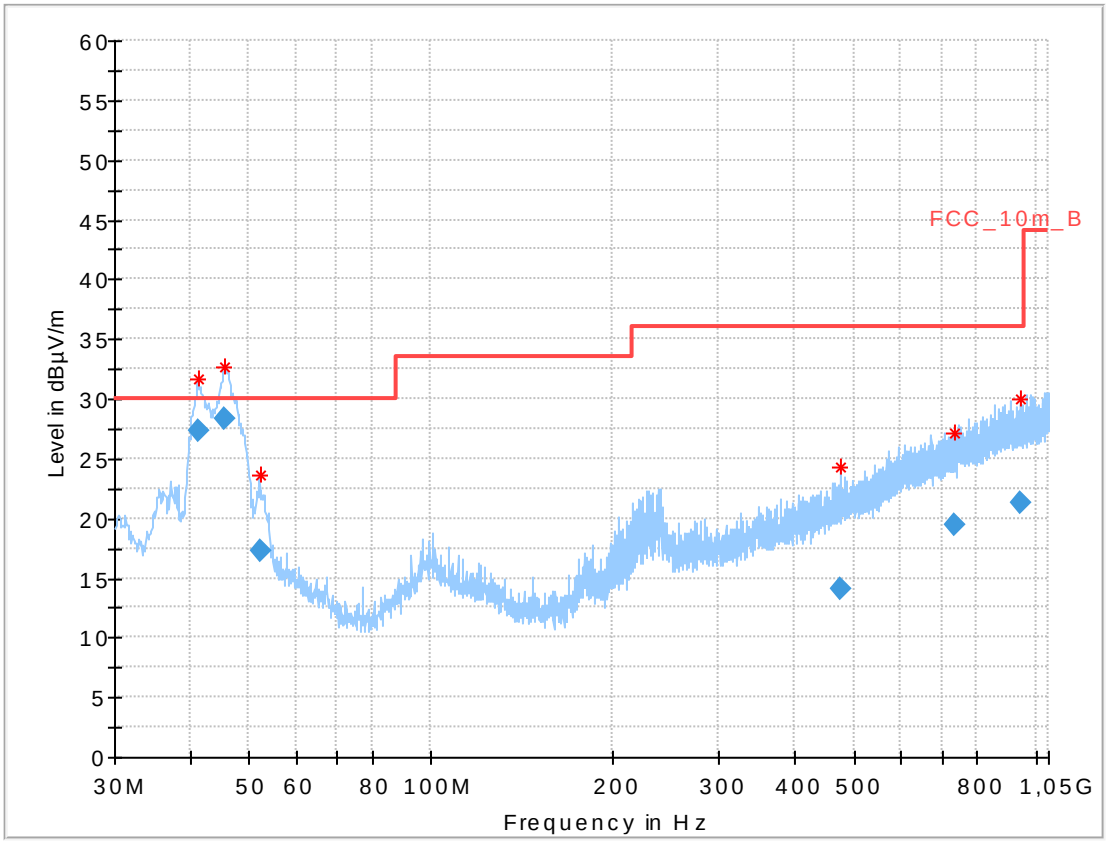
Plot 8: 30 MHz to 1 GHz, TX mode, middle channel, vertical & horizontal polarization, metal housing, adapter (non-Ex – version)



Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
41.292450	28.22	30.00	1.78	1000.0	120.000	100.0	V	254.0	14.0
45.784800	29.60	30.00	0.40	1000.0	120.000	100.0	V	266.0	13.7
243.196950	16.43	36.00	19.57	1000.0	120.000	100.0	V	257.0	13.1
500.233650	14.91	36.00	21.09	1000.0	120.000	100.0	V	50.0	18.7
700.337100	18.70	36.00	17.30	1000.0	120.000	200.0	V	95.0	21.5
881.577600	21.17	36.00	14.83	1000.0	120.000	200.0	V	2.0	23.9

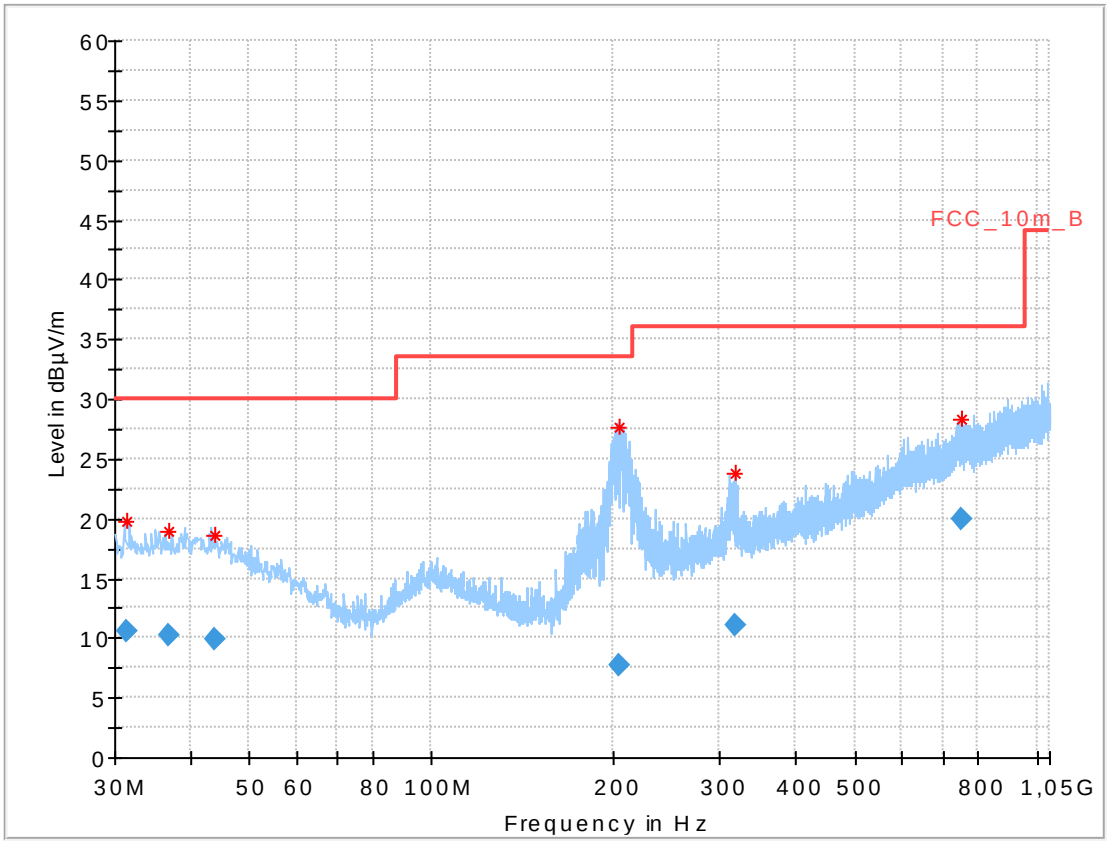
Plot 9: 30 MHz to 1 GHz, TX mode, highest channel, vertical & horizontal polarization, metal housing, adapter (non-Ex – version)



Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
41.244900	27.27	30.00	2.73	1000.0	120.000	200.0	V	231.0	14.0
45.568050	28.32	30.00	1.68	1000.0	120.000	100.0	V	5.0	13.7
52.476600	17.24	30.00	12.76	1000.0	120.000	200.0	V	72.0	12.2
475.348650	14.16	36.00	21.84	1000.0	120.000	400.0	V	2.0	18.2
732.244050	19.41	36.00	16.59	1000.0	120.000	200.0	H	231.0	22.3
941.793150	21.32	36.00	14.68	1000.0	120.000	272.0	V	265.0	24.2

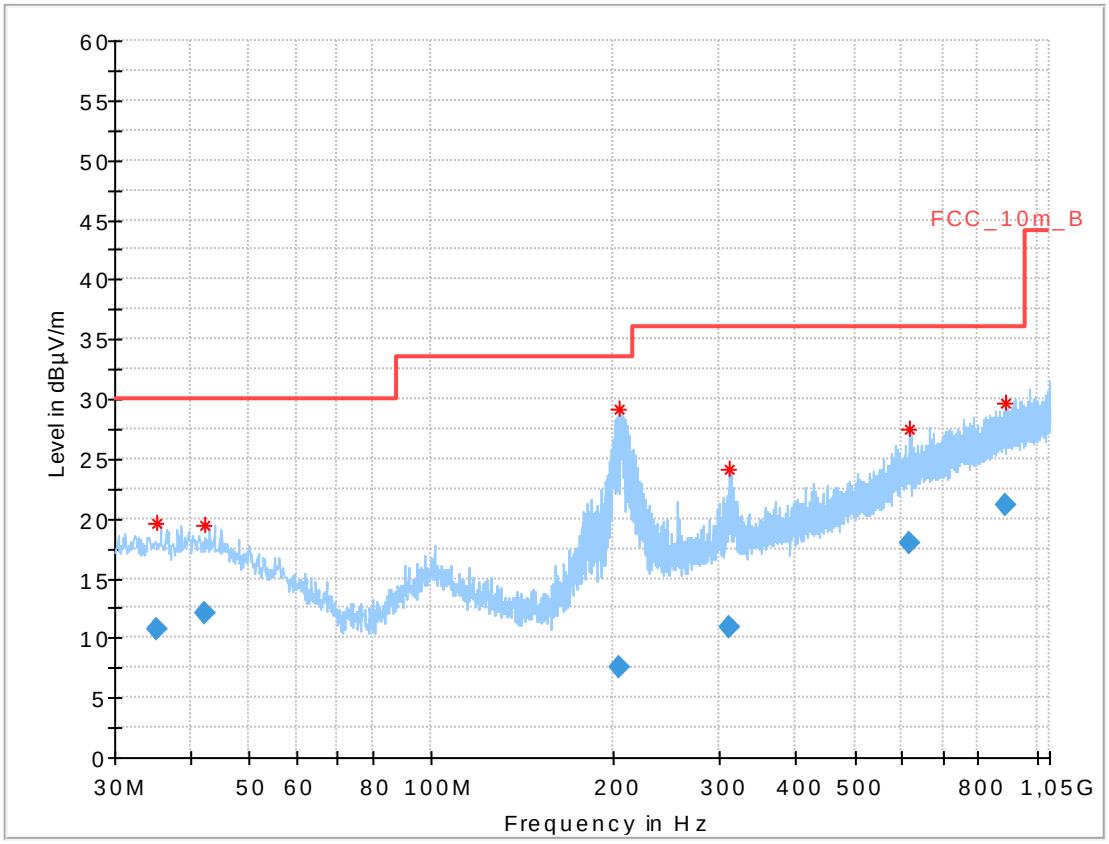
Plot 10: 30 MHz to 1 GHz, TX mode, lowest channel, vertical & horizontal polarization, plastic housing, adapter (non-Ex – version)



Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.456650	10.57	30.00	19.43	1000.0	120.000	102.0	V	28.0	13.5
36.744000	10.21	30.00	19.79	1000.0	120.000	273.0	H	266.0	13.9
43.834800	9.90	30.00	20.10	1000.0	120.000	173.0	V	257.0	13.9
204.223650	7.63	33.50	25.87	1000.0	120.000	100.0	V	233.0	11.8
317.558250	11.04	36.00	24.96	1000.0	120.000	200.0	V	275.0	15.0
751.176000	19.87	36.00	16.13	1000.0	120.000	174.0	V	275.0	22.7

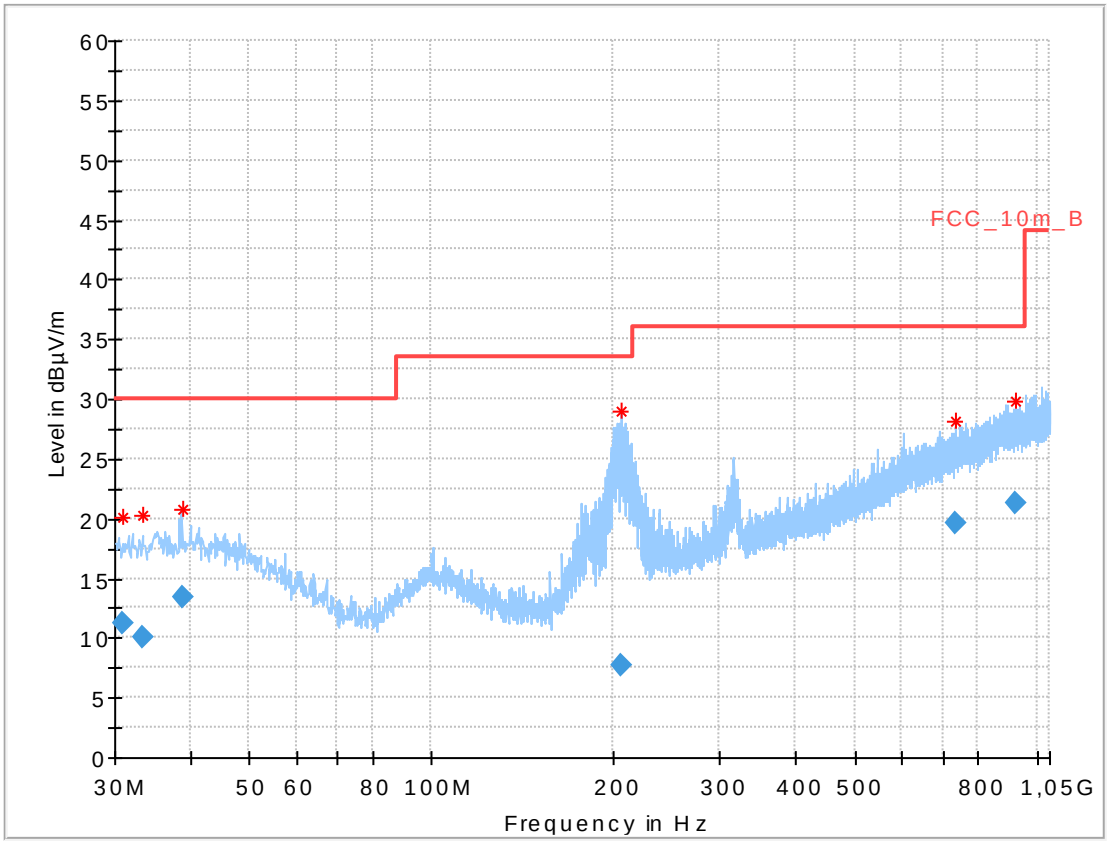
Plot 11: 30 MHz to 1 GHz, TX mode, middle channel, vertical & horizontal polarization, plastic housing, adapter (non-Ex – version)



Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.334300	10.73	30.00	19.27	1000.0	120.000	349.0	H	161.0	13.8
42.406650	12.07	30.00	17.93	1000.0	120.000	100.0	V	-5.0	14.0
204.232350	7.61	33.50	25.89	1000.0	120.000	172.0	V	187.0	11.8
311.012100	10.89	36.00	25.11	1000.0	120.000	103.0	V	275.0	14.8
616.205400	17.94	36.00	18.06	1000.0	120.000	200.0	V	185.0	20.8
890.459250	21.13	36.00	14.87	1000.0	120.000	200.0	H	167.0	24.0

Plot 12: 30 MHz to 1 GHz, TX mode, highest channel, vertical & horizontal polarization, plastic housing, adapter (non-Ex – version)

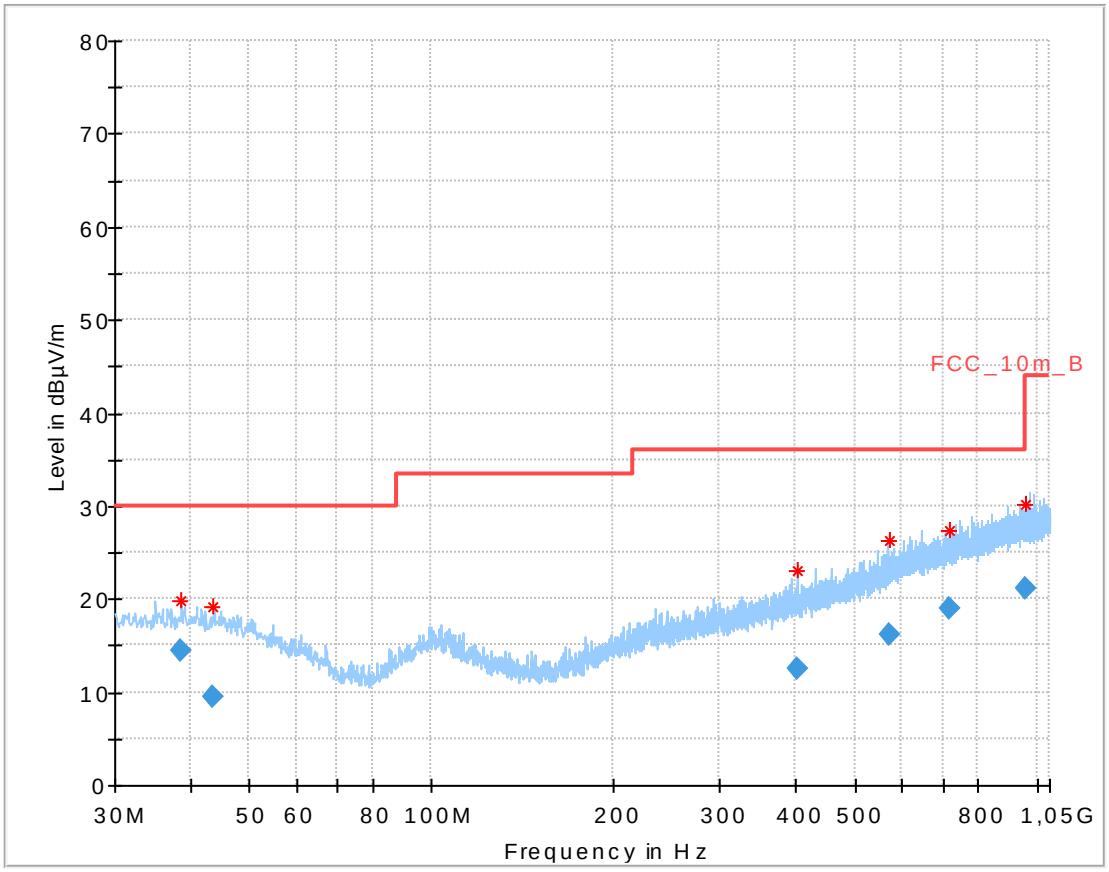


Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.986550	11.22	30.00	18.78	1000.0	120.000	103.0	V	2.0	13.4
33.293250	10.05	30.00	19.95	1000.0	120.000	200.0	V	297.0	13.6
38.739150	13.42	30.00	16.58	1000.0	120.000	103.0	V	265.0	14.0
205.326600	7.66	33.50	25.84	1000.0	120.000	200.0	V	122.0	11.9
734.701800	19.61	36.00	16.39	1000.0	120.000	271.0	V	141.0	22.3
919.546800	21.24	36.00	14.76	1000.0	120.000	200.0	V	185.0	24.2

Plots: Receiver mode

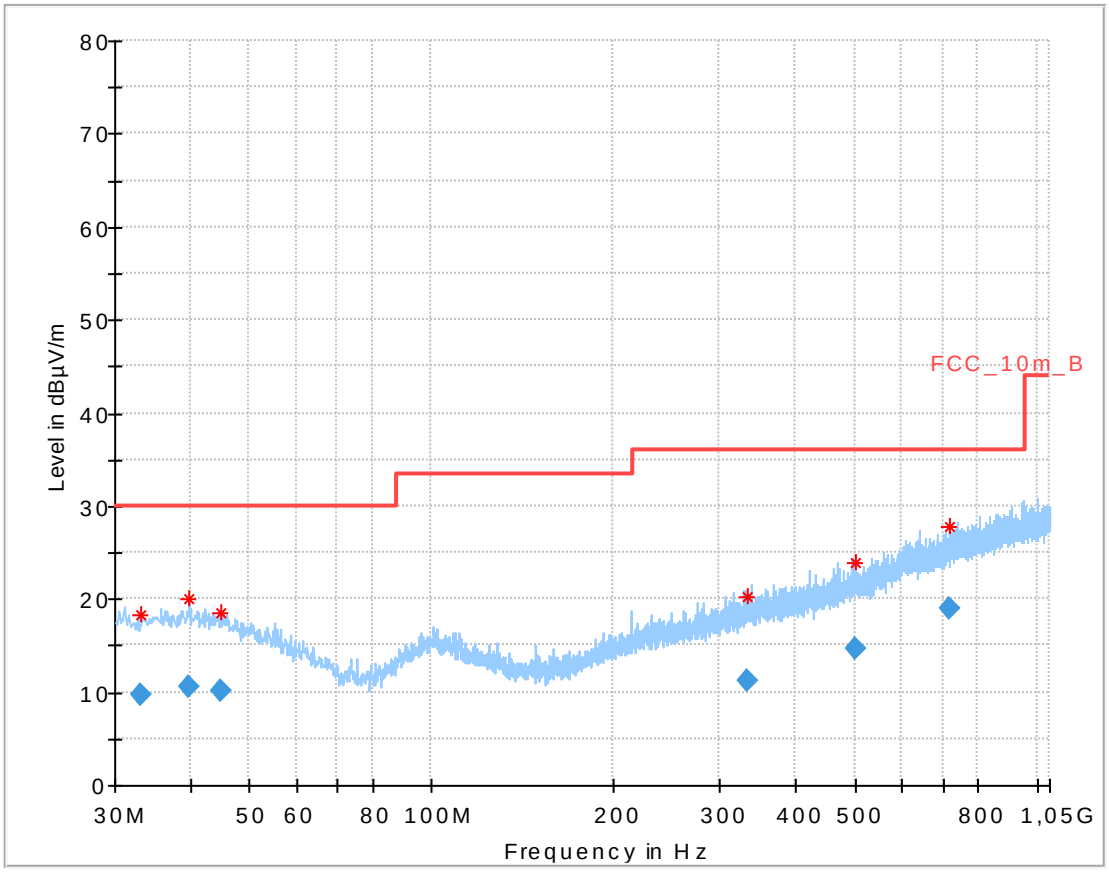
Plot 1: 30 MHz to 1 GHz, RX / idle – mode, vertical & horizontal polarization, metal housing, adapter (Ex – version)



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.710350	14.40	30.00	15.60	1000.0	120.000	179.0	V	321.0	14.0
43.689900	9.48	30.00	20.52	1000.0	120.000	101.0	H	43.0	13.9
401.632650	12.44	36.00	23.56	1000.0	120.000	185.0	V	146.0	16.9
568.974750	16.08	36.00	19.92	1000.0	120.000	179.0	V	241.0	19.8
717.347700	18.93	36.00	17.07	1000.0	120.000	185.0	H	161.0	21.9
959.370450	21.14	36.00	14.86	1000.0	120.000	180.0	H	223.0	24.4

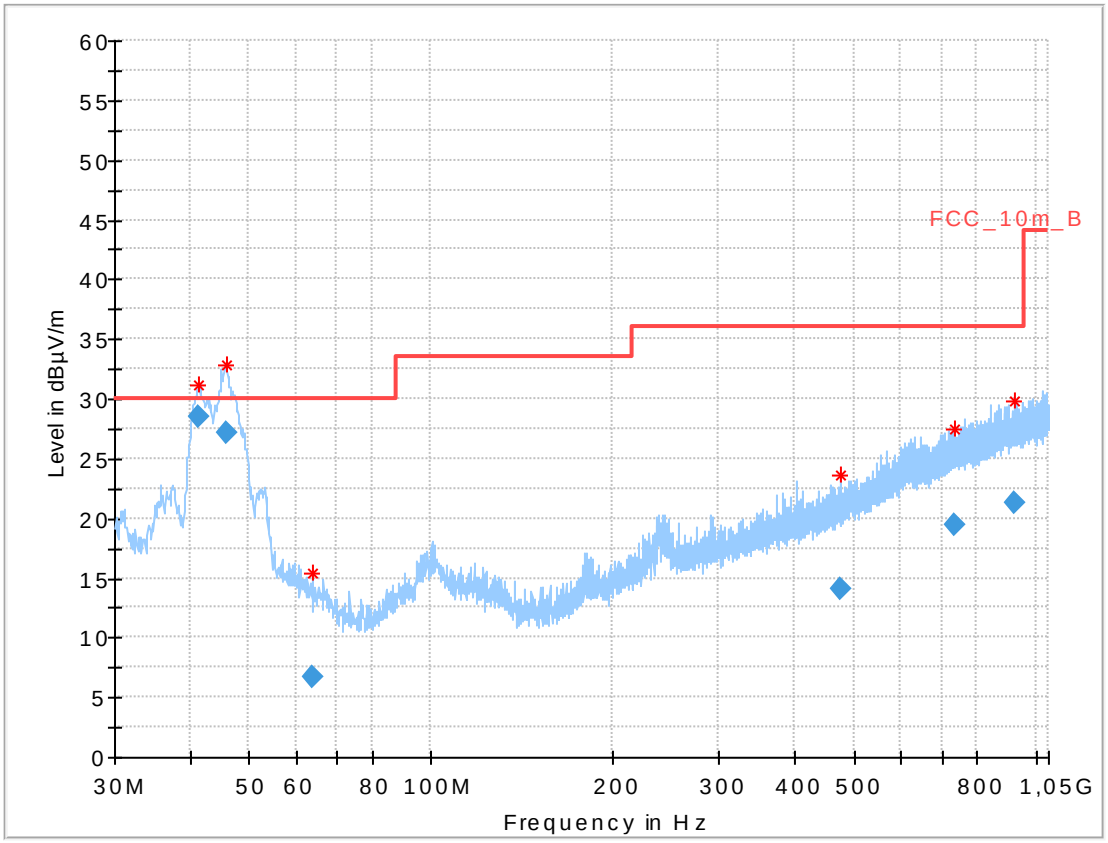
Plot 2: 30 MHz to 1 GHz, RX / idle – mode, vertical & horizontal polarization, plastic housing, adapter (Ex – version)



Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
33.002700	9.77	30.00	20.23	1000.0	120.000	179.0	H	42.0	13.6
39.634500	10.46	30.00	19.54	1000.0	120.000	101.0	V	243.0	14.0
44.902950	10.18	30.00	19.82	1000.0	120.000	98.0	H	117.0	13.9
333.793950	11.25	36.00	24.75	1000.0	120.000	185.0	H	62.0	15.5
500.764050	14.59	36.00	21.41	1000.0	120.000	180.0	H	62.0	18.7
718.251300	18.95	36.00	17.05	1000.0	120.000	185.0	V	51.0	22.0

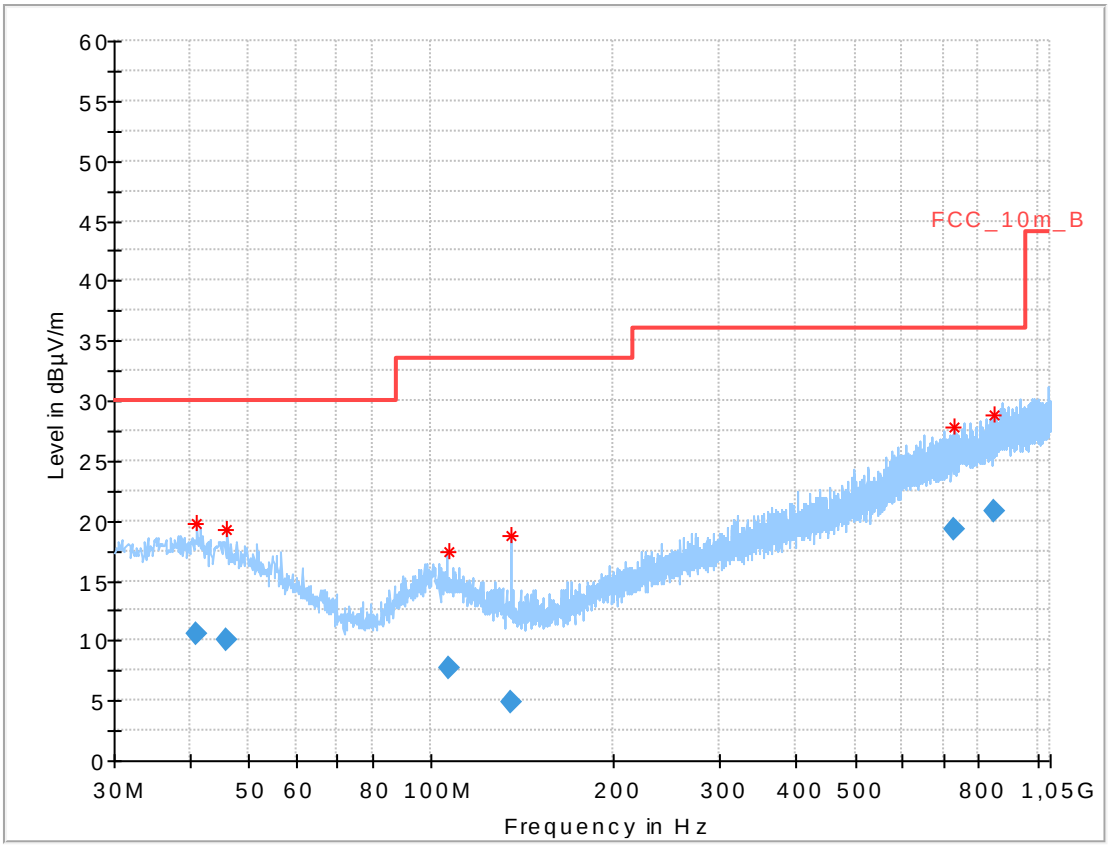
Plot 3: 30 MHz to 1 GHz, RX / idle – mode, vertical & horizontal polarization, metal housing, adapter (non-Ex – version)



Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
41.264250	28.48	30.00	1.52	1000.0	120.000	98.0	V	212.0	14.0
46.043100	27.22	30.00	2.78	1000.0	120.000	200.0	V	5.0	13.6
63.669450	6.66	30.00	23.34	1000.0	120.000	272.0	V	97.0	9.7
476.707950	14.11	36.00	21.89	1000.0	120.000	103.0	H	130.0	18.2
732.616200	19.42	36.00	16.58	1000.0	120.000	200.0	H	266.0	22.3
920.100600	21.26	36.00	14.74	1000.0	120.000	276.0	H	50.0	24.2

Plot 4: 30 MHz to 1 GHz, RX / idle – mode, vertical & horizontal polarization, plastic housing, adapter (non-Ex – version)



Final_Result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
41.045100	10.50	30.00	19.50	1000.0	120.000	103.0	H	185.0	14.0
46.073700	10.13	30.00	19.87	1000.0	120.000	352.0	H	265.0	13.6
106.800750	7.71	33.50	25.79	1000.0	120.000	200.0	V	95.0	11.4
135.364500	4.94	33.50	28.56	1000.0	120.000	100.0	H	320.0	9.0
726.806100	19.33	36.00	16.67	1000.0	120.000	400.0	H	277.0	22.2
850.825350	20.71	36.00	15.29	1000.0	120.000	274.0	H	163.0	23.5

12.11 Spurious emissions radiated above 1 GHz

Description:

Measurement of the radiated spurious emissions above 1 GHz in transmit mode and receiver / idle mode.

Measurement parameters	
Detector	Peak / RMS
Sweep time	Auto
Resolution bandwidth	1 MHz
Video bandwidth	3 x RBW
Span	1 GHz to 26 GHz
Trace mode	Max hold
Measured modulation	O-QPSK
Test setup	See sub clause 7.2 A (1 GHz - 18 GHz) See sub clause 7.3 A (18 GHz - 26 GHz)
Measurement uncertainty	See sub clause 9

The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

FCC		IC
TX spurious emissions radiated		
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
§15.209		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance
Above 960	54.0 (Average)	3
Above 960	74.0 (Peak)	3

Results: Transmitter mode, metal housing, adapter (Ex – version)

TX spurious emissions radiated [dBµV/m]								
2405 MHz			2440 MHz			2475 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.								
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: Transmitter mode, plastic housing, adapter (Ex – version)

TX spurious emissions radiated [dBµV/m]								
2405 MHz			2440 MHz			2475 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
	Peak			Peak		4950	Peak	58.1
	AVG			AVG			AVG	50.8
	Peak			Peak			Peak	
	AVG			AVG			AVG	
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: Receiver mode, metal housing, adapter (Ex – version)

RX spurious emissions radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.		
	Peak	
	AVG	

Results: Receiver mode, plastic housing, adapter (Ex – version)

RX spurious emissions radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.		
	Peak	
	AVG	

Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

Results: Transmitter mode, metal housing, adapter (non-Ex – version)

TX spurious emissions radiated [dBµV/m]								
2405 MHz			2440 MHz			2475 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.								
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-

Results: Transmitter mode, plastic housing, adapter (non-Ex – version)

TX spurious emissions radiated [dBµV/m]								
2405 MHz			2440 MHz			2475 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
4810	Peak	53.9	7322	Peak	45.9	2796	Peak	49.1
	AVG	44.3		AVG	-/-		AVG	-/-
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-
-/-	Peak	-/-	-/-	Peak	-/-	-/-	Peak	-/-
	AVG	-/-		AVG	-/-		AVG	-/-

Results: Receiver mode, metal housing, adapter (non-Ex – version)

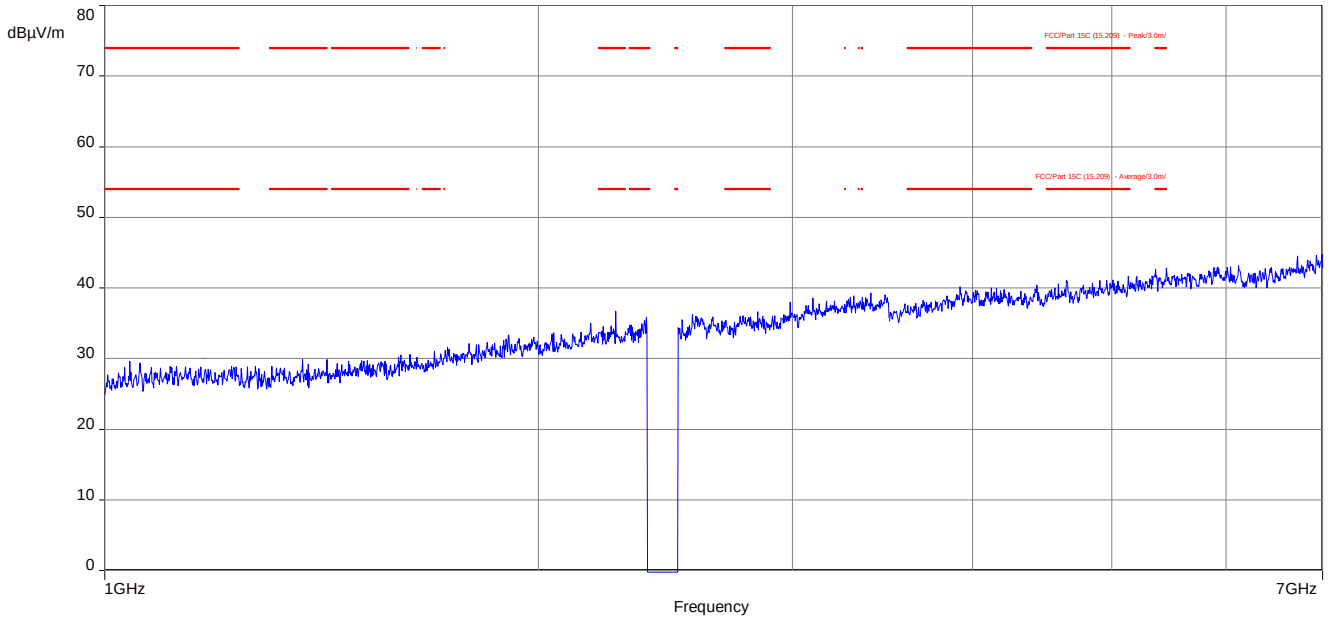
RX spurious emissions radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.		
-/-	Peak	-/-
	AVG	-/-

Results: Receiver mode, plastic housing, adapter (non-Ex – version)

RX spurious emissions radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.		
-/-	Peak	-/-
	AVG	-/-

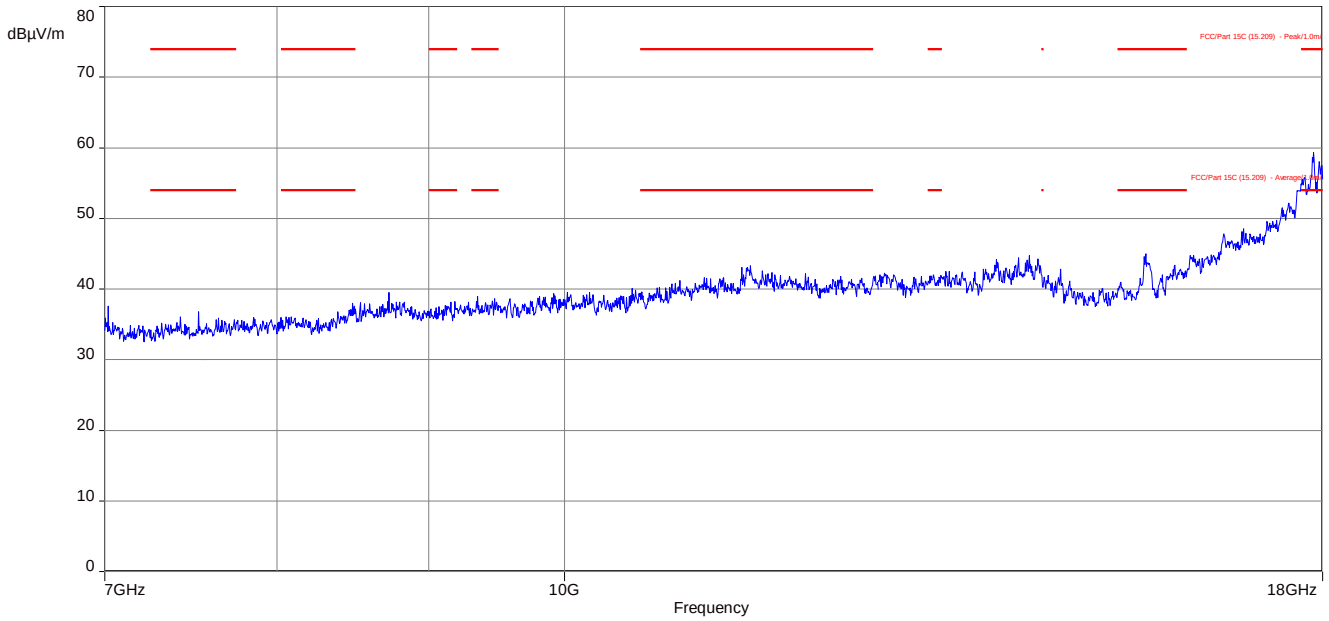
Plots: Transmitter mode, adapter (Ex – version)

Plot 1: 1 GHz to 7 GHz, TX mode, channel 00, vertical & horizontal polarization, metal housing

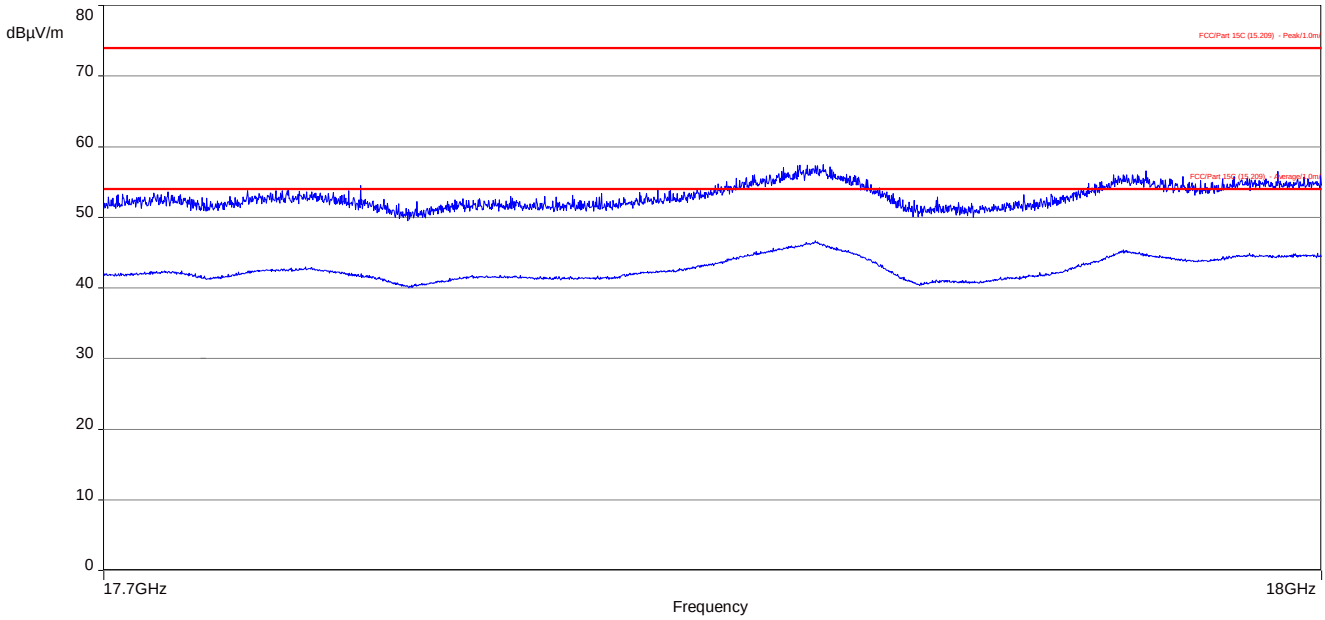


The carrier signal is notched with a 2.4 GHz band rejection filter.

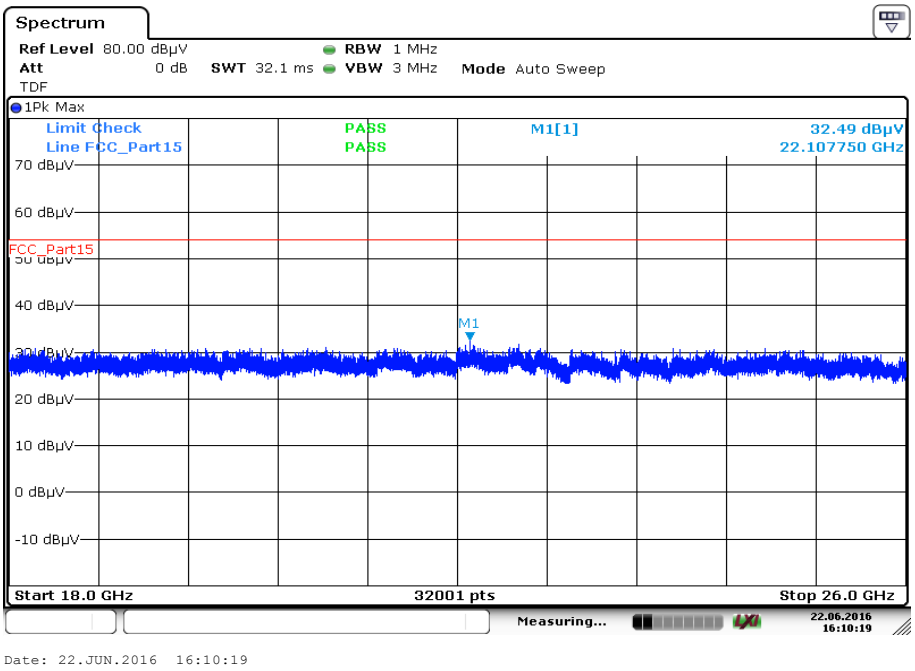
Plot 2: 7 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization, metal housing



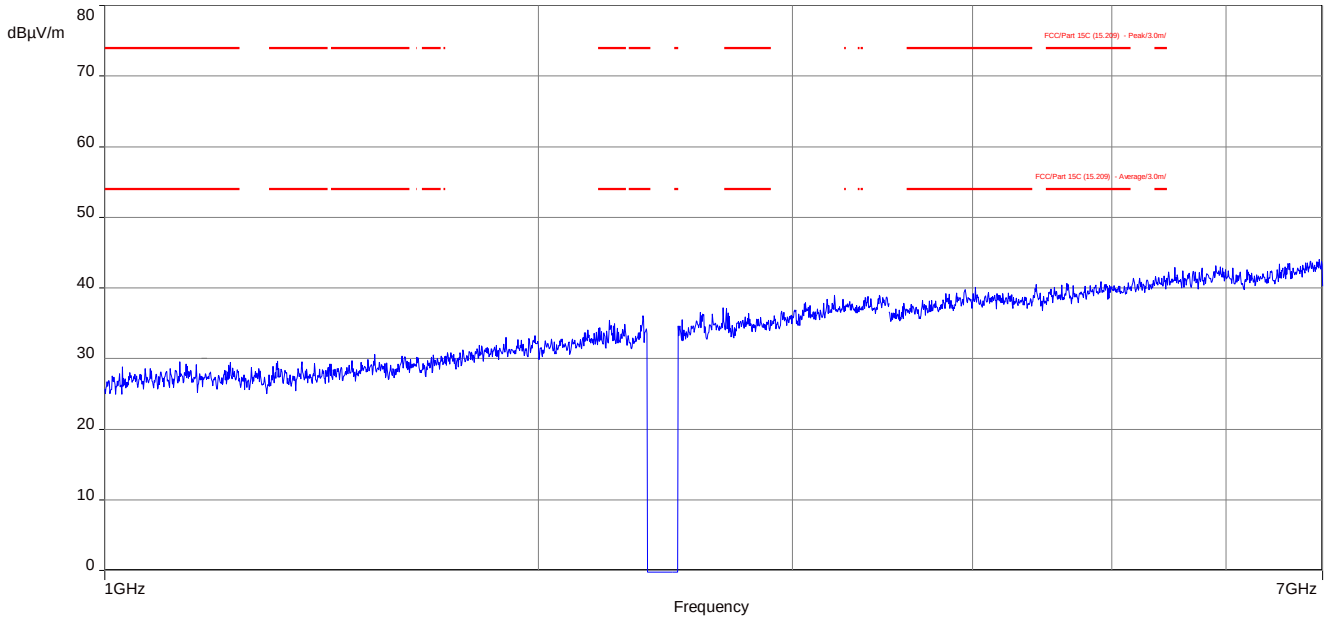
Plot 3: 17.7 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization, metal housing



Plot 4: 18 GHz to 26 GHz, TX mode, channel 00, vertical & horizontal polarization, metal housing

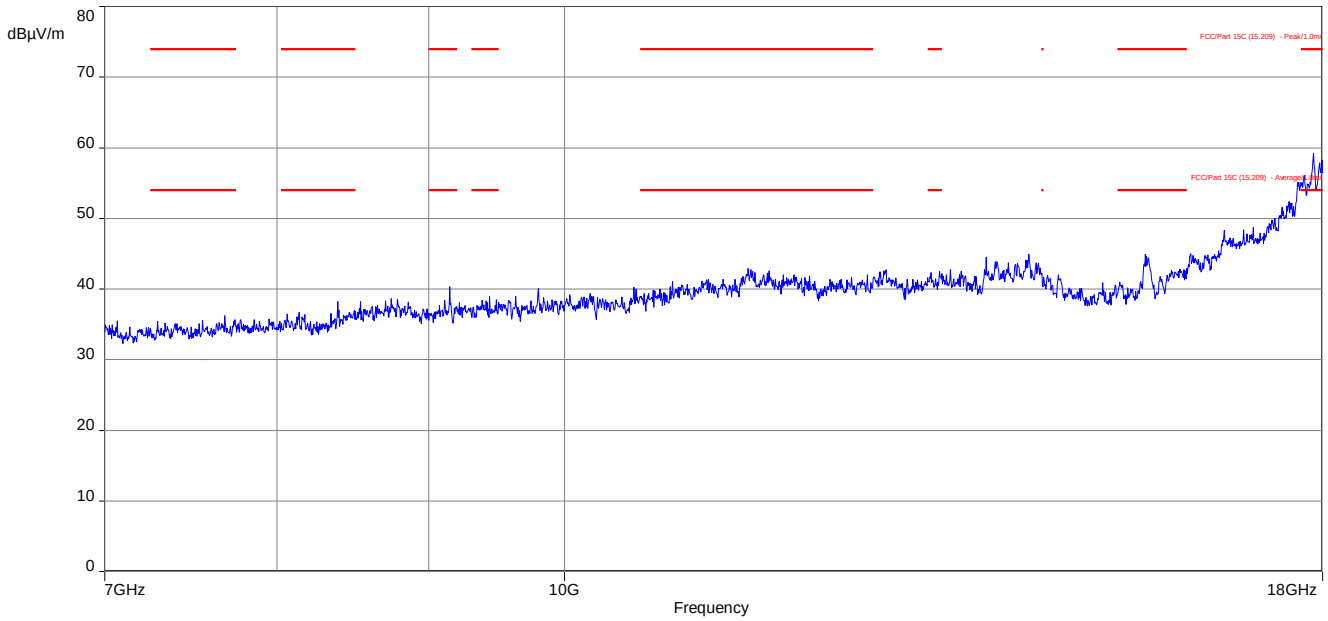


Plot 5: 1 GHz to 7 GHz, TX mode, channel 19, vertical & horizontal polarization, metal housing

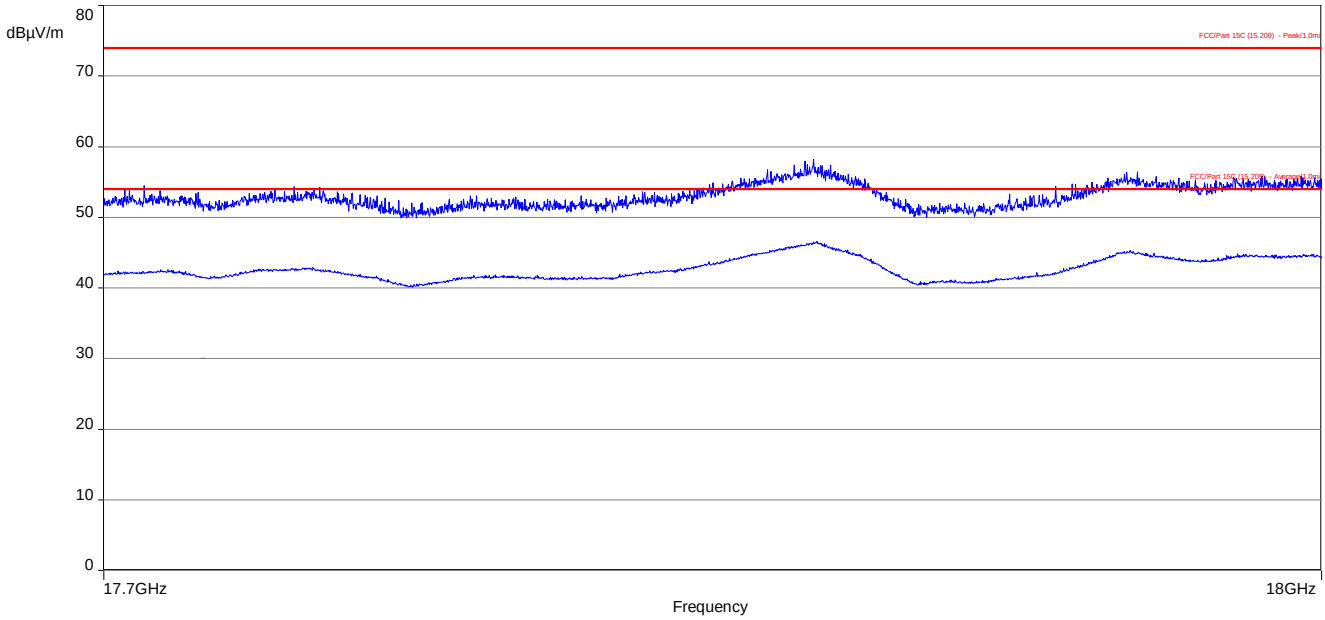


The carrier signal is notched with a 2.4 GHz band rejection filter.

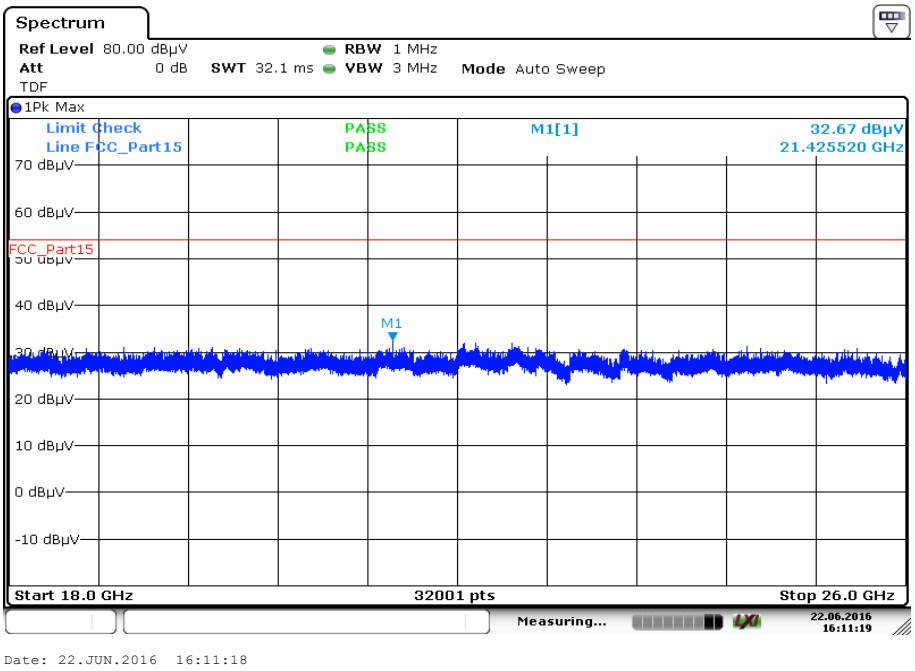
Plot 6: 7 GHz to 18 GHz, TX mode, channel 19, vertical & horizontal polarization, metal housing



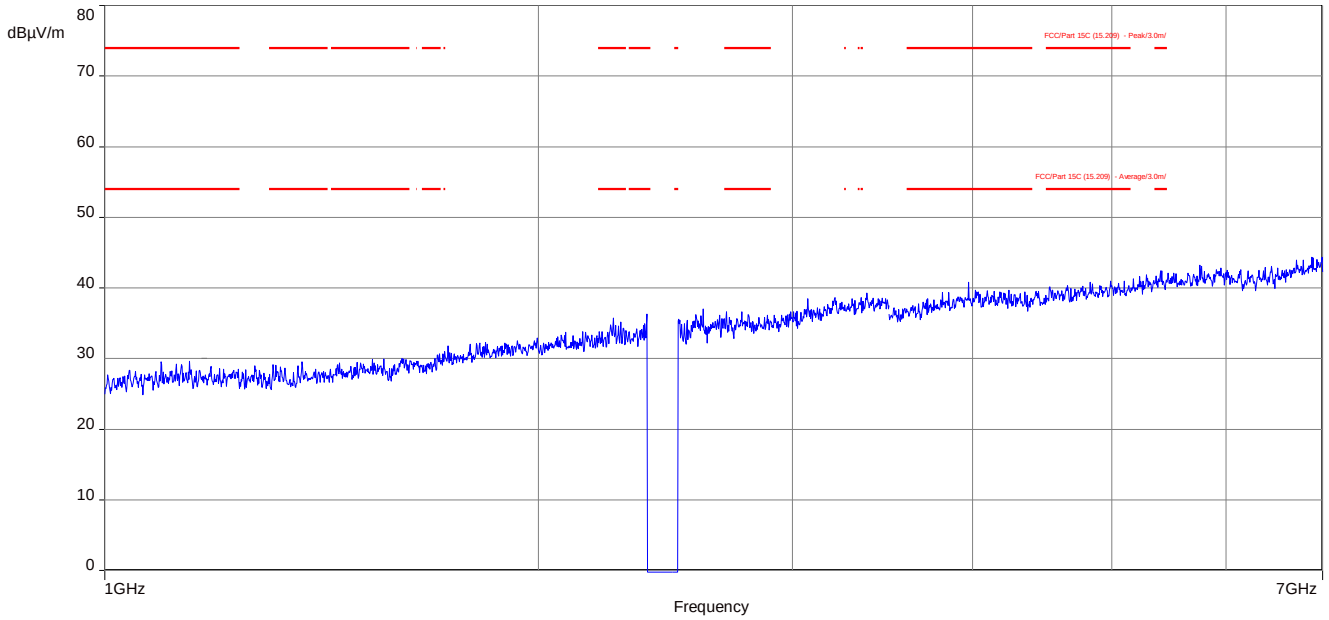
Plot 7: 17.7 GHz to 18 GHz, TX mode, channel 19, vertical & horizontal polarization, metal housing



Plot 8: 18 GHz to 26 GHz, TX mode, channel 19, vertical & horizontal polarization, metal housing

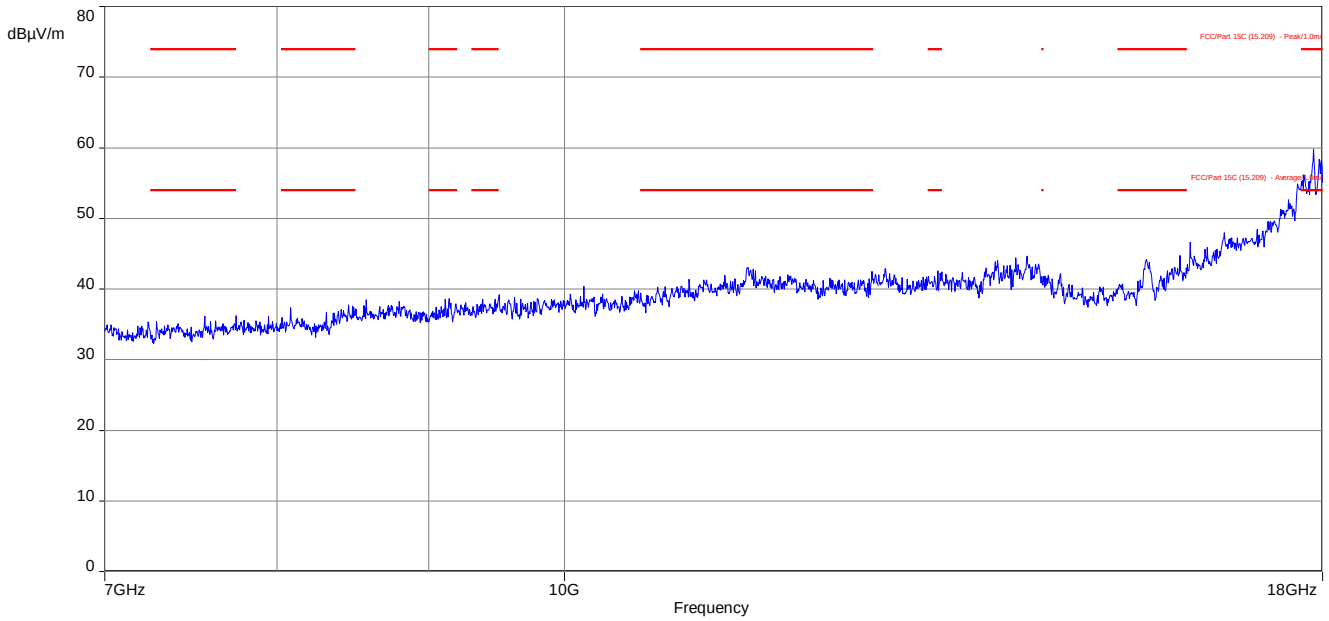


Plot 9: 1 GHz to 7 GHz, TX mode, channel 39, vertical & horizontal polarization, metal housing

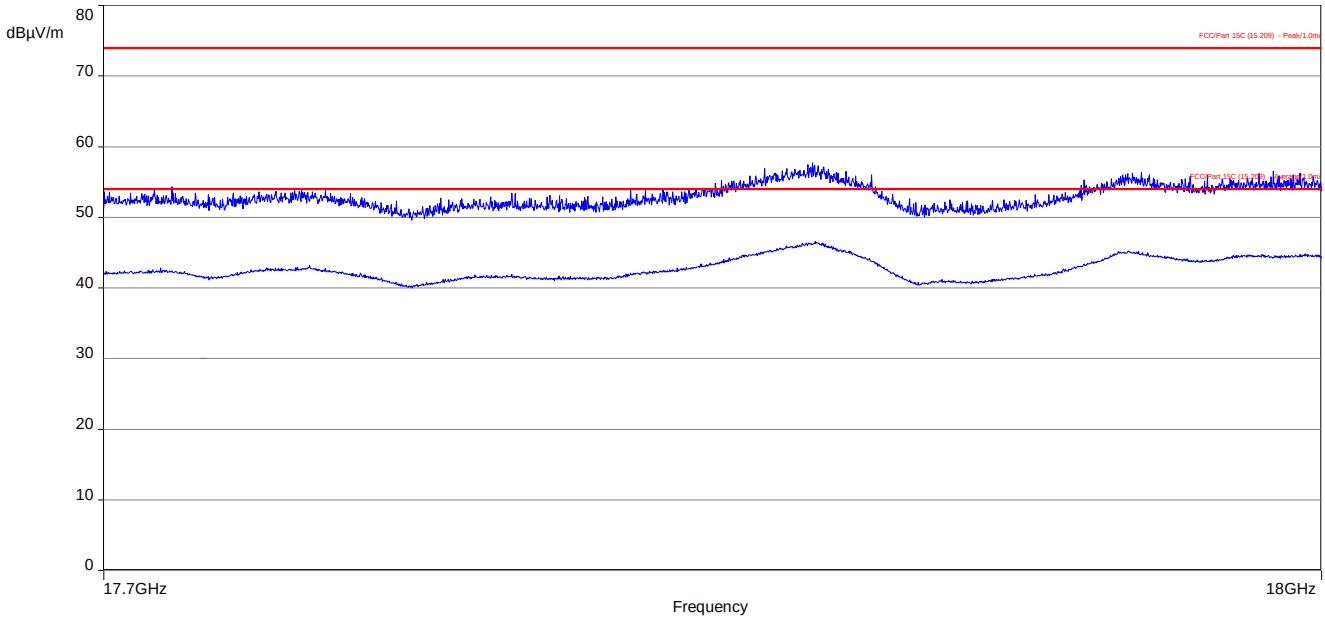


The carrier signal is notched with a 2.4 GHz band rejection filter.

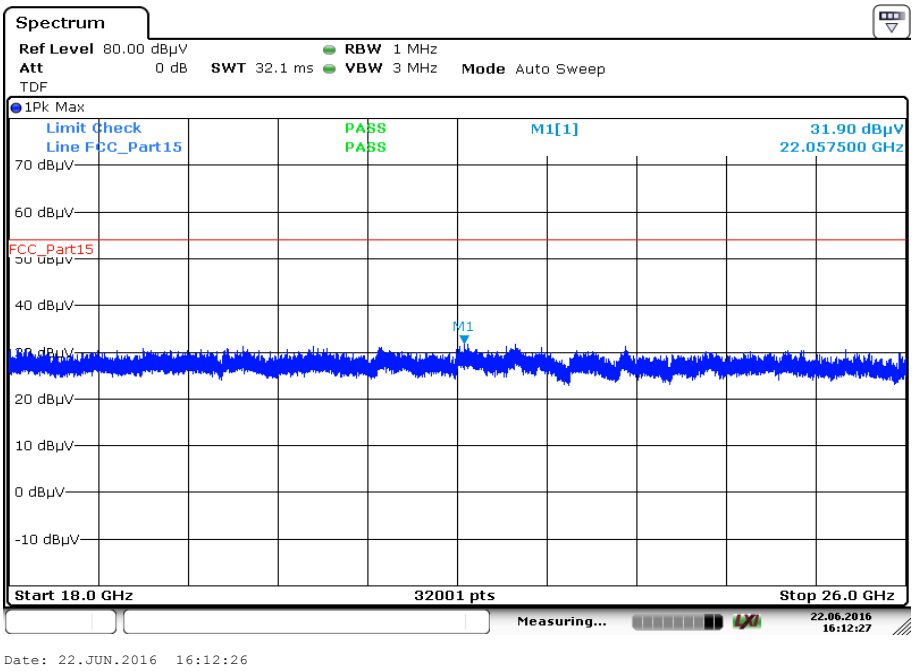
Plot 10: 7 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization, metal housing



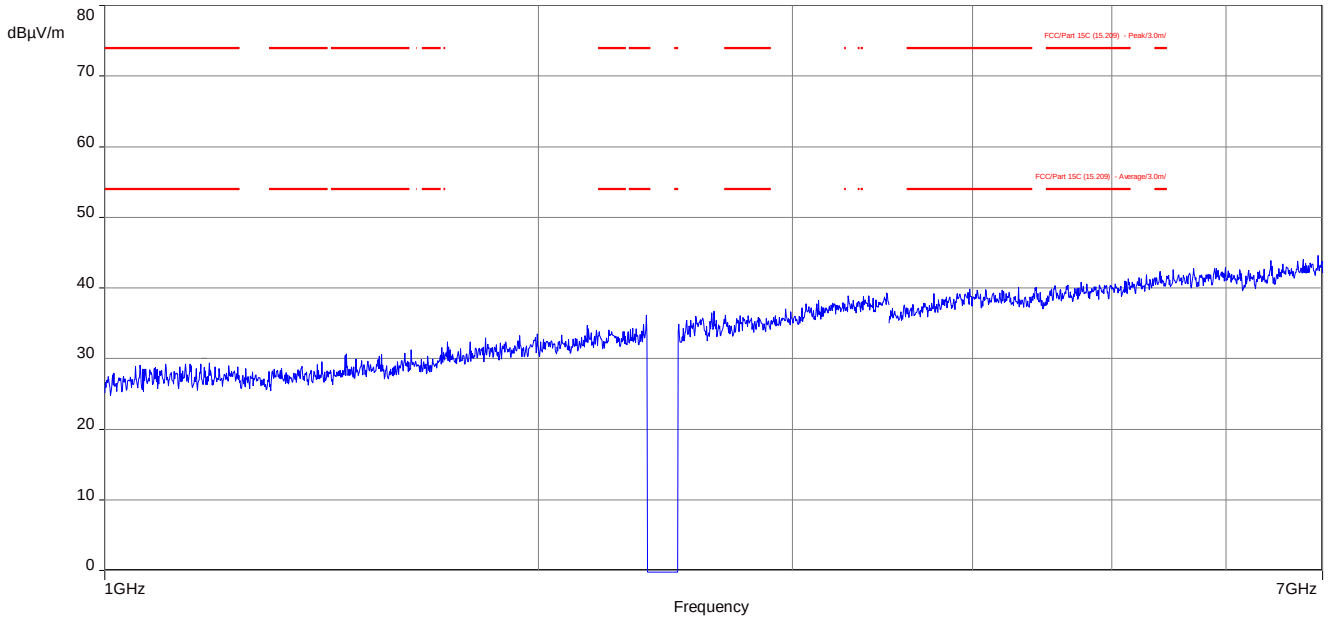
Plot 11: 17.7 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization, metal housing



Plot 12: 18 GHz to 26 GHz, TX mode, channel 39, vertical & horizontal polarization, metal housing

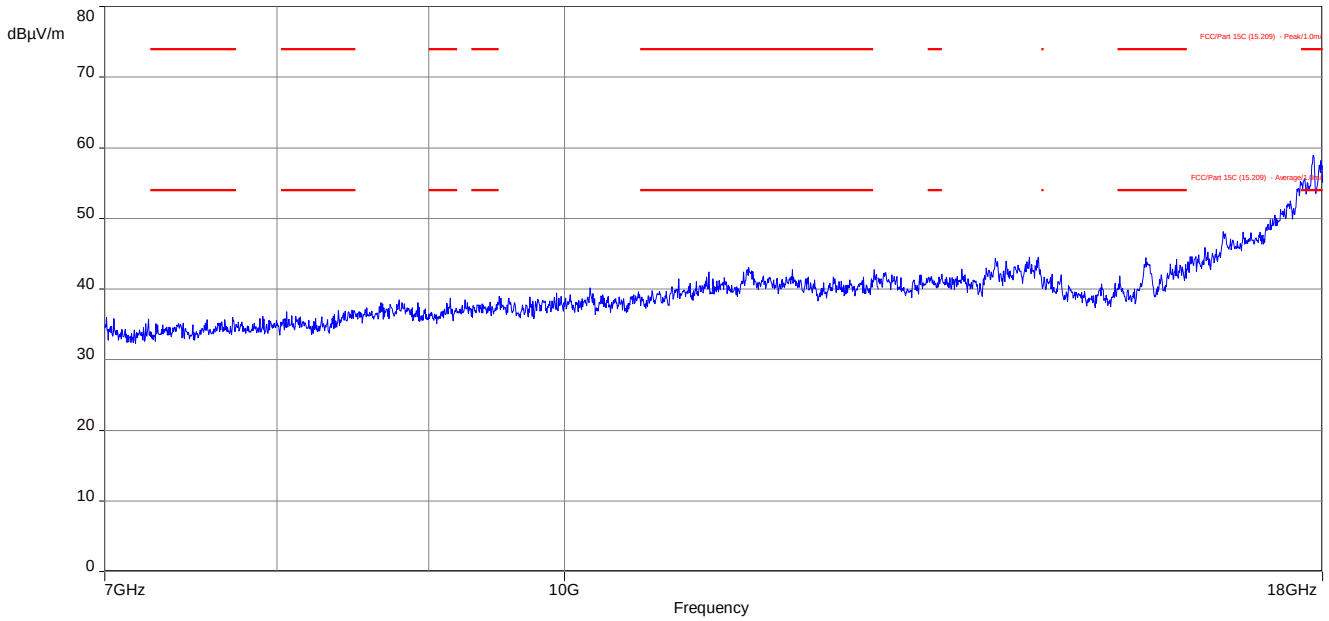


Plot 13: 1 GHz to 7 GHz, TX mode, channel 00, vertical & horizontal polarization, plastic housing

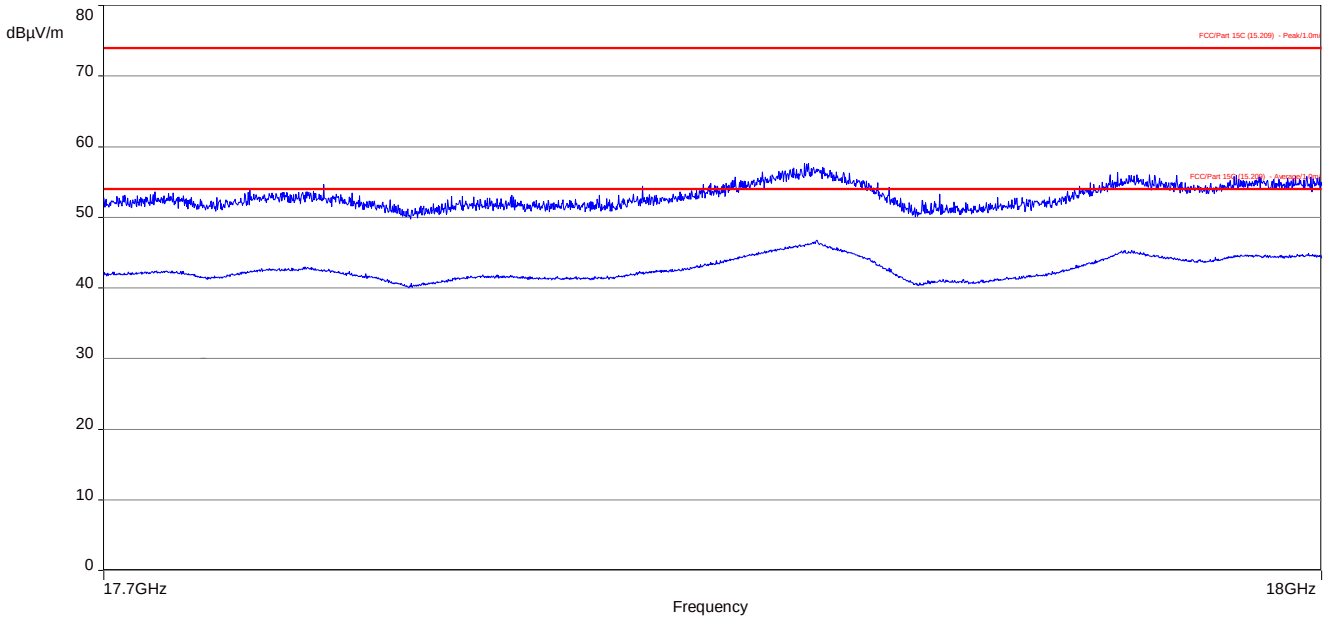


The carrier signal is notched with a 2.4 GHz band rejection filter.

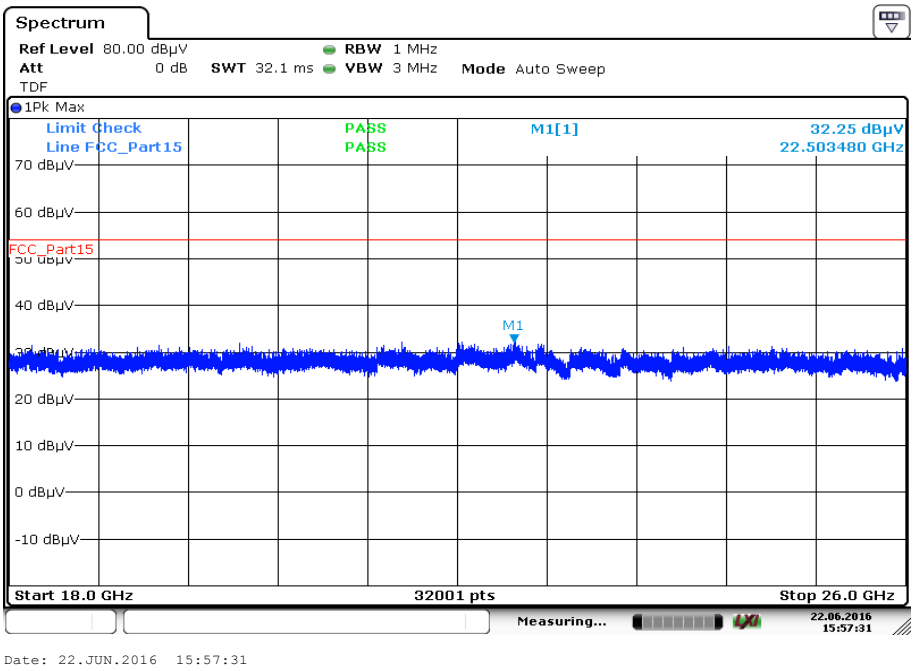
Plot 14: 7 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization, plastic housing



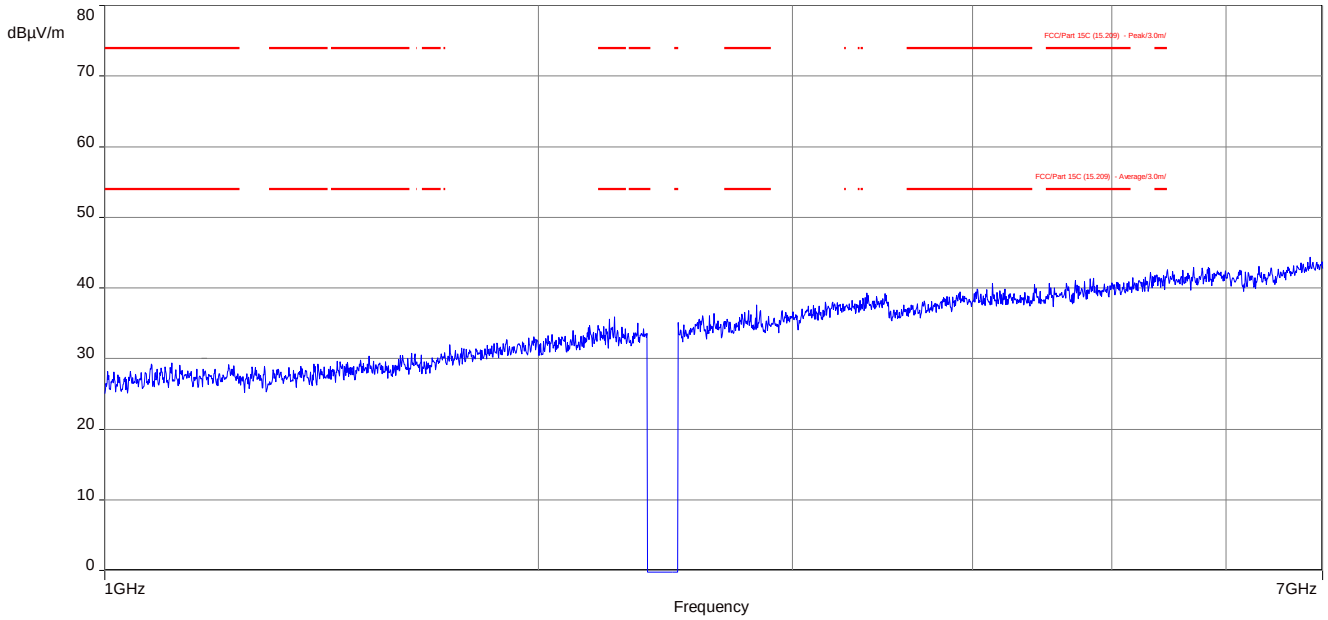
Plot 15: 17.7 GHz to 18 GHz, TX mode, channel 00, vertical & horizontal polarization, plastic housing



Plot 16: 18 GHz to 26 GHz, TX mode, channel 00, vertical & horizontal polarization, plastic housing

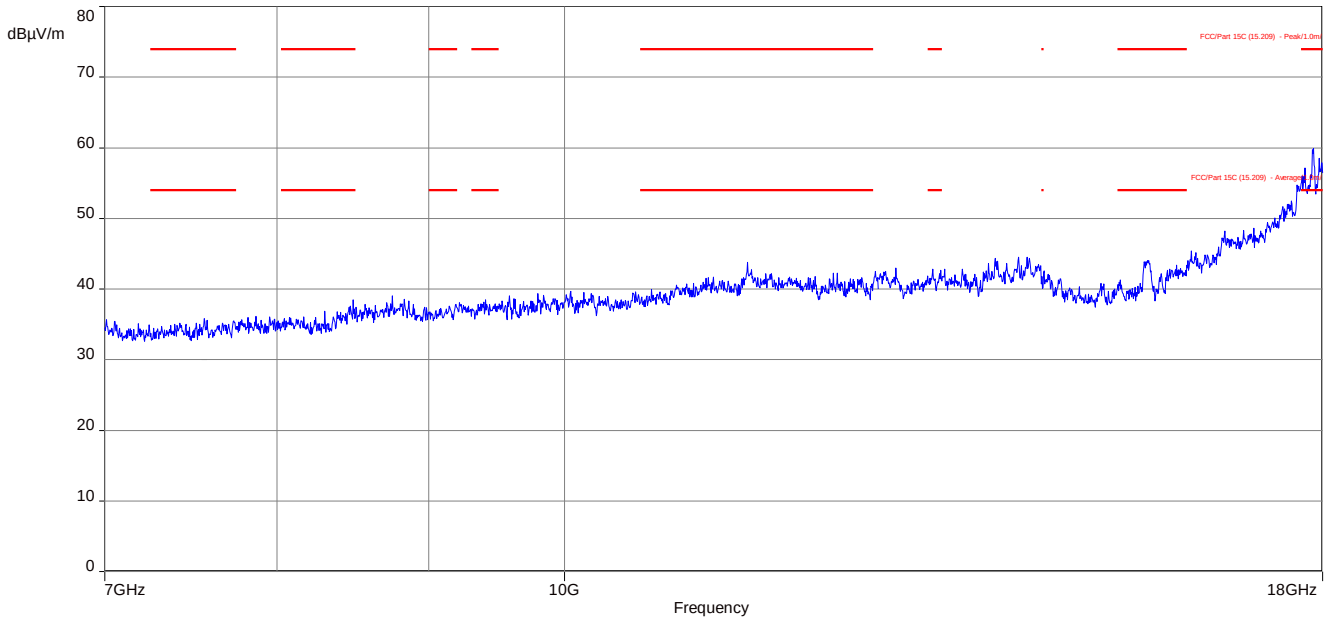


Plot 17: 1 GHz to 7 GHz, TX mode, channel 19, vertical & horizontal polarization, plastic housing

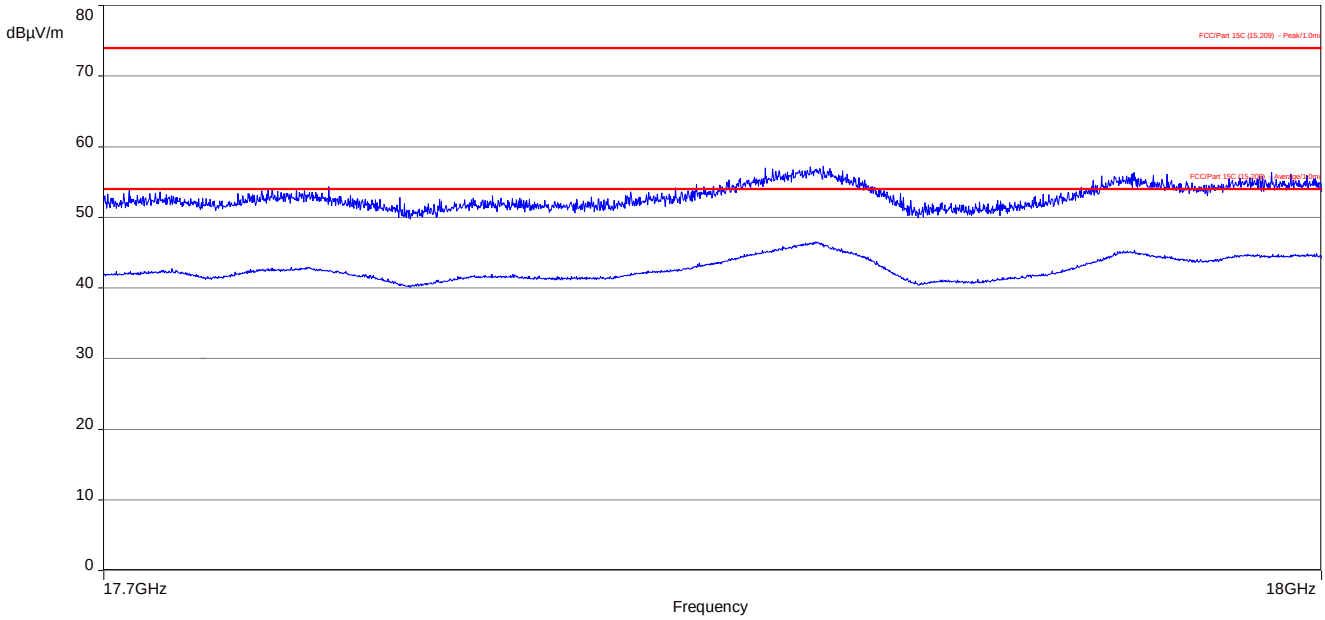


The carrier signal is notched with a 2.4 GHz band rejection filter.

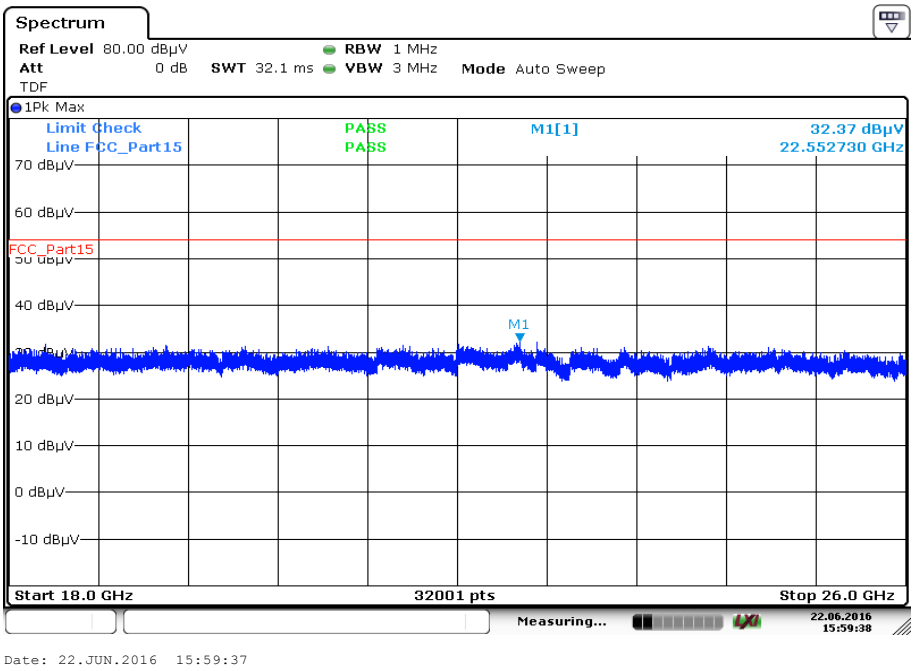
Plot 18: 7 GHz to 18 GHz, TX mode, channel 19, vertical & horizontal polarization, plastic housing



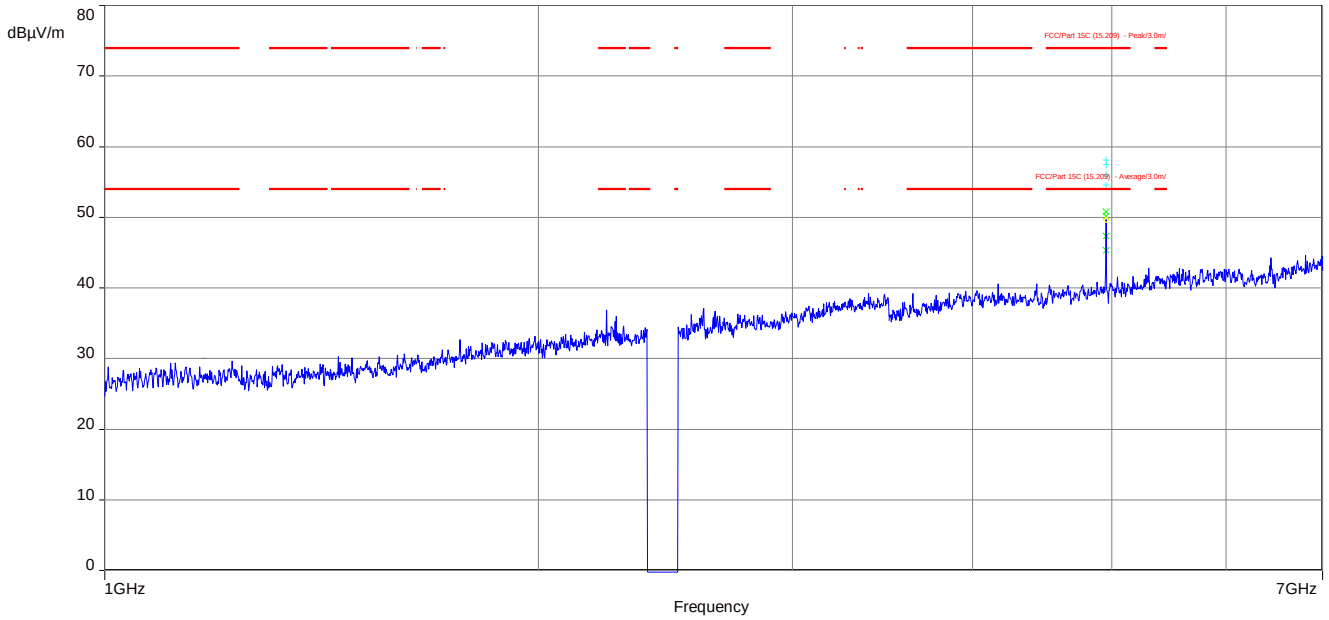
Plot 19: 17.7 GHz to 18 GHz, TX mode, channel 19, vertical & horizontal polarization, plastic housing



Plot 20: 18 GHz to 26 GHz, TX mode, channel 19, vertical & horizontal polarization, plastic housing

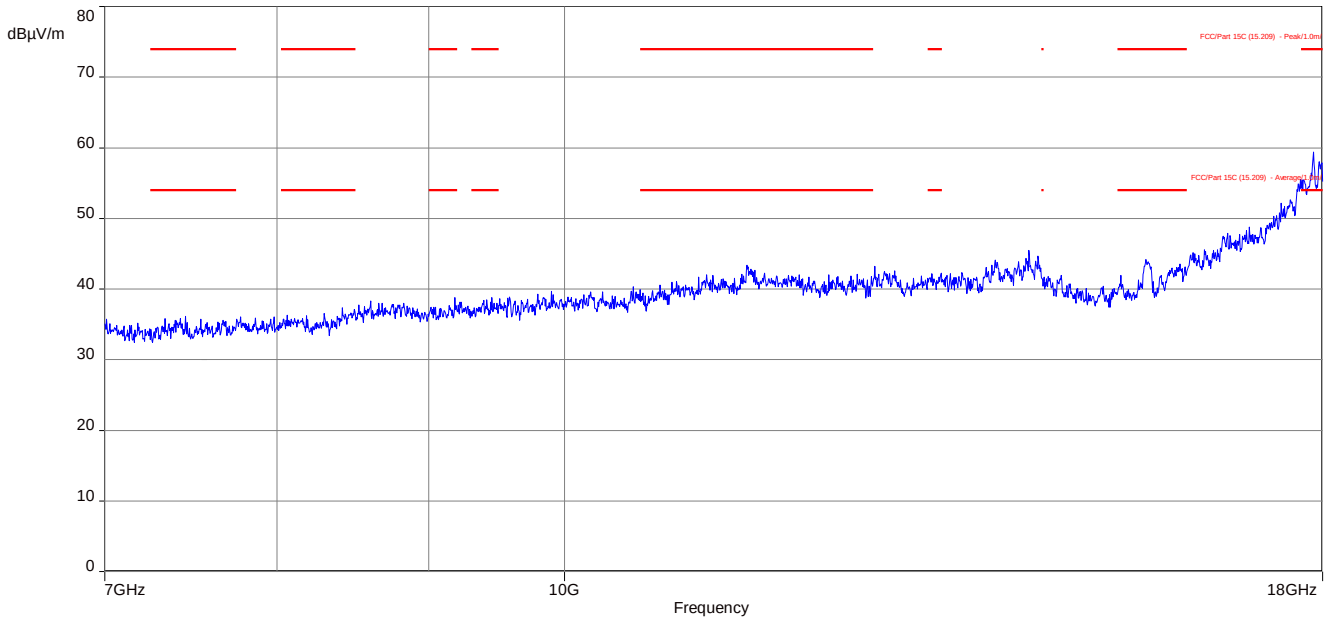


Plot 21: 1 GHz to 7 GHz, TX mode, channel 39, vertical & horizontal polarization, plastic housing

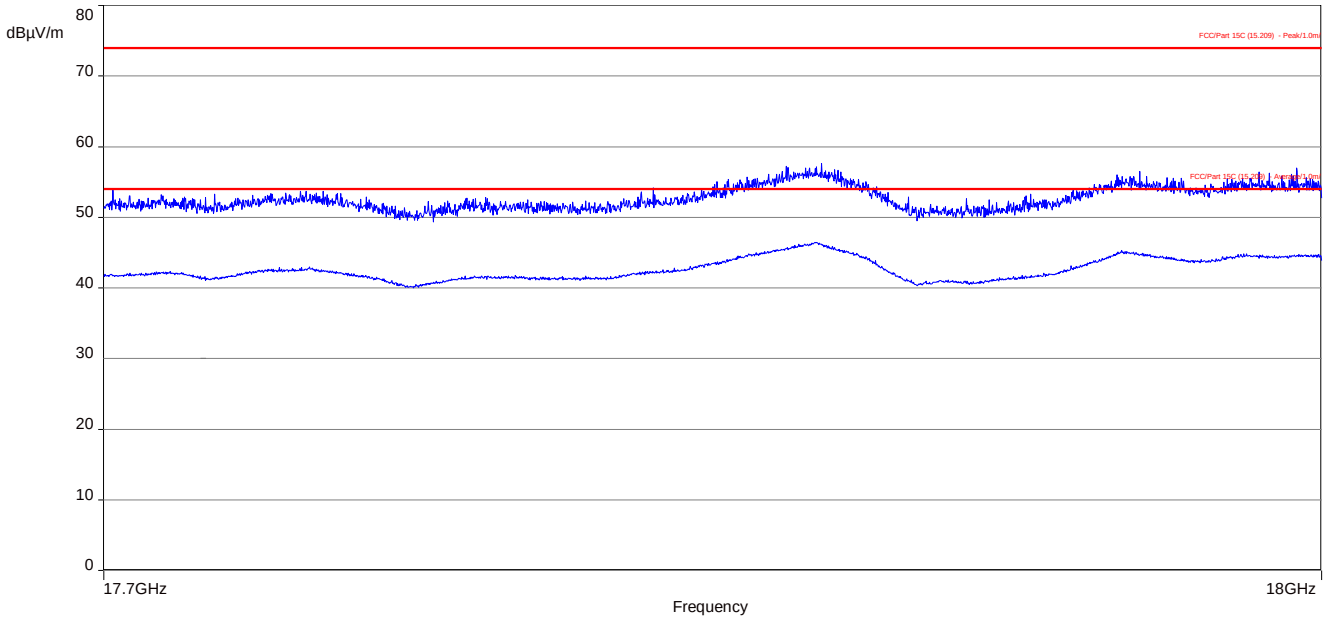


The carrier signal is notched with a 2.4 GHz band rejection filter.

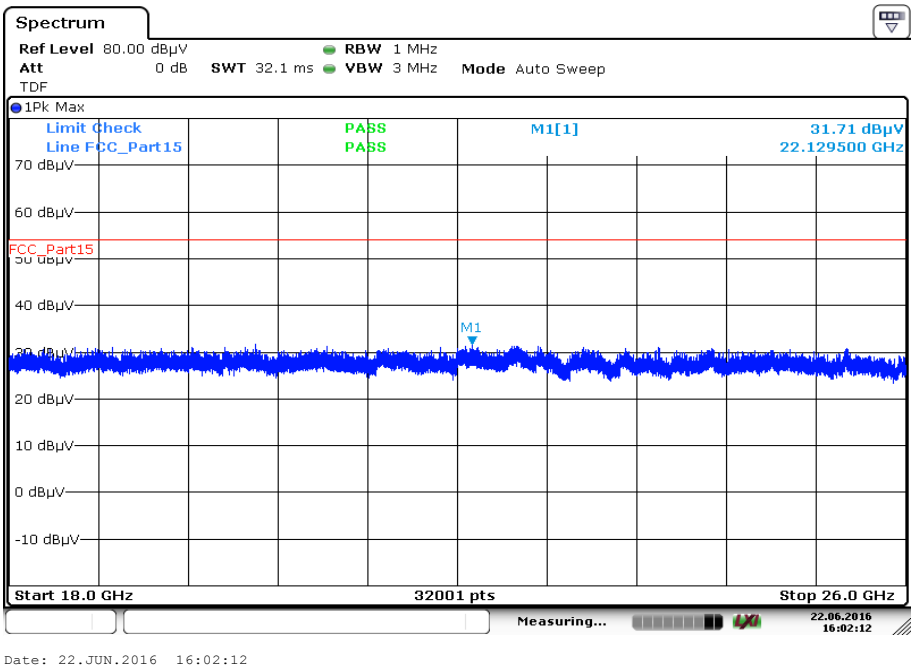
Plot 22: 7 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization, plastic housing



Plot 23: 17.7 GHz to 18 GHz, TX mode, channel 39, vertical & horizontal polarization, plastic housing

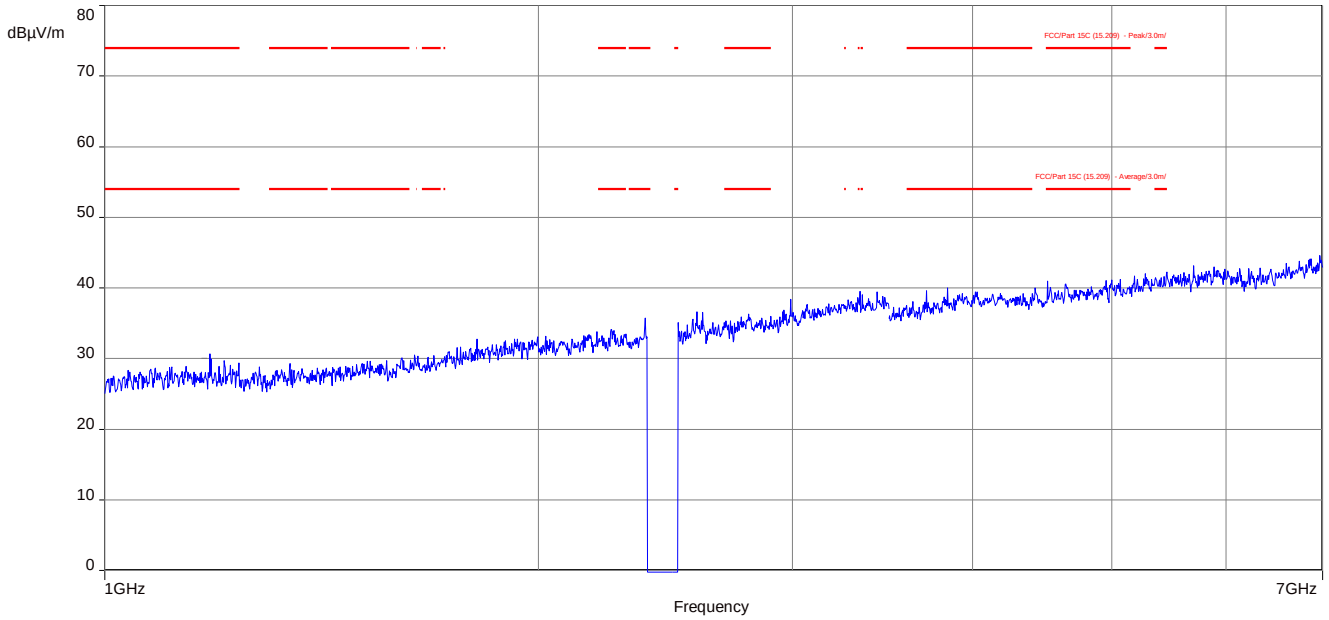


Plot 24: 18 GHz to 26 GHz, TX mode, channel 39, vertical & horizontal polarization, plastic housing

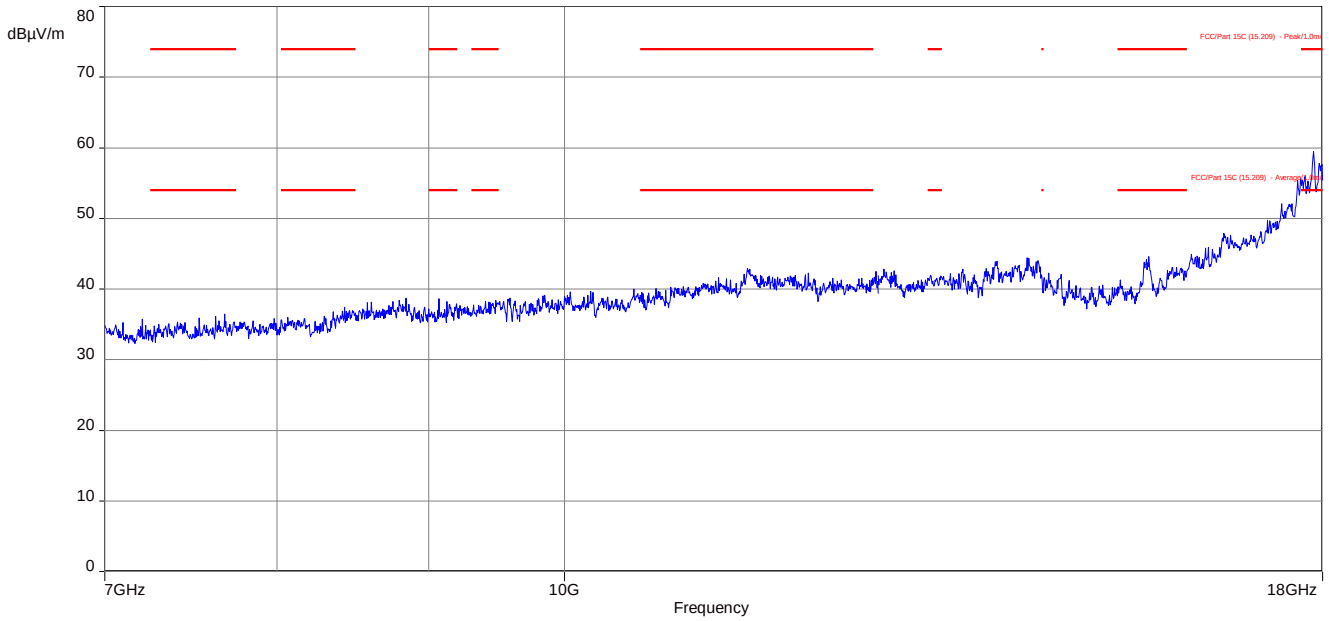


Plots: Receiver mode, adapter (Ex – version)

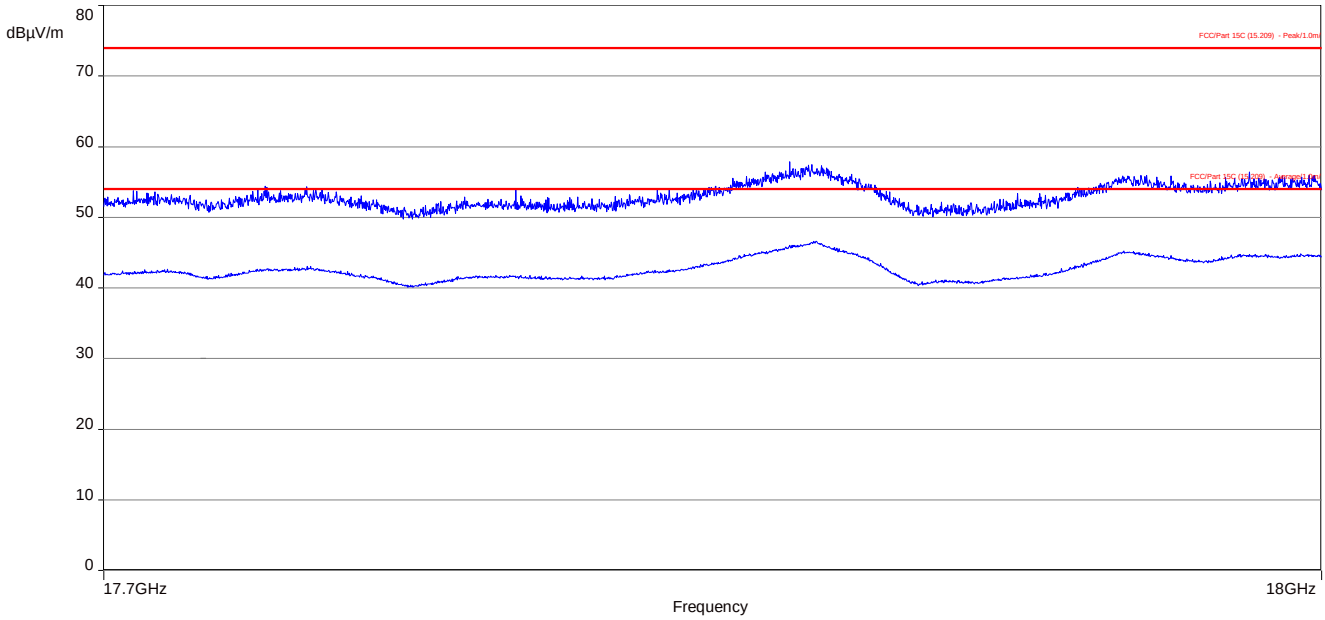
Plot 1: 1 GHz to 7 GHz, RX / idle – mode, vertical & horizontal polarization, metal housing



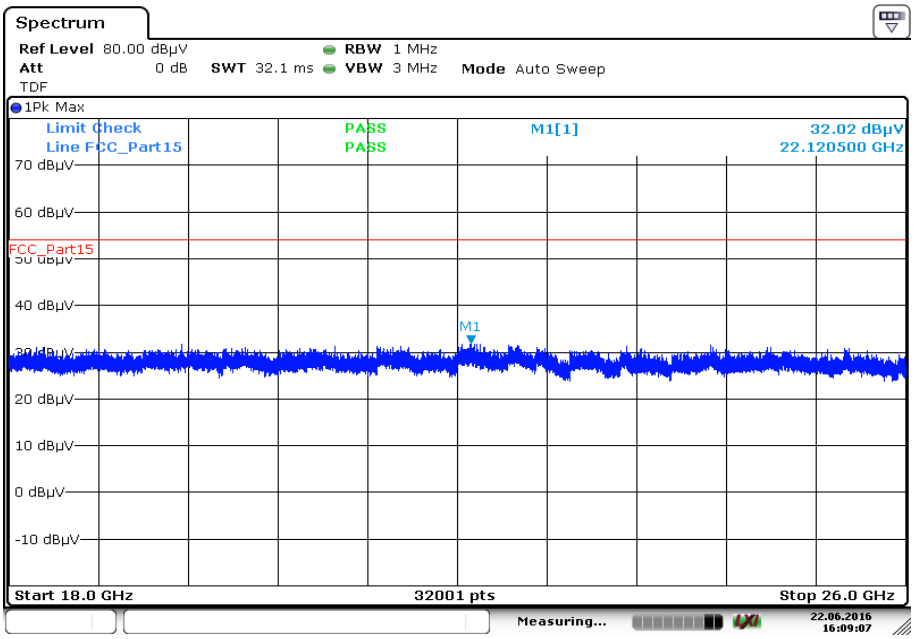
Plot 2: 7 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization, metal housing



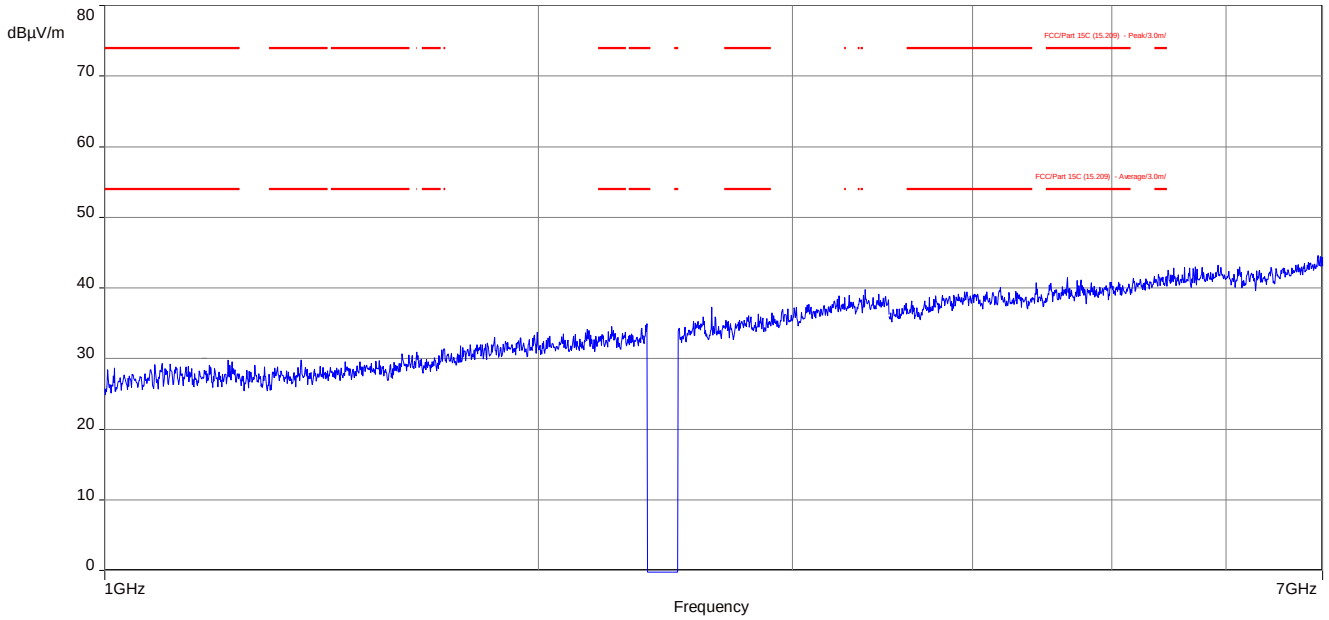
Plot 3: 17.7 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization, metal housing



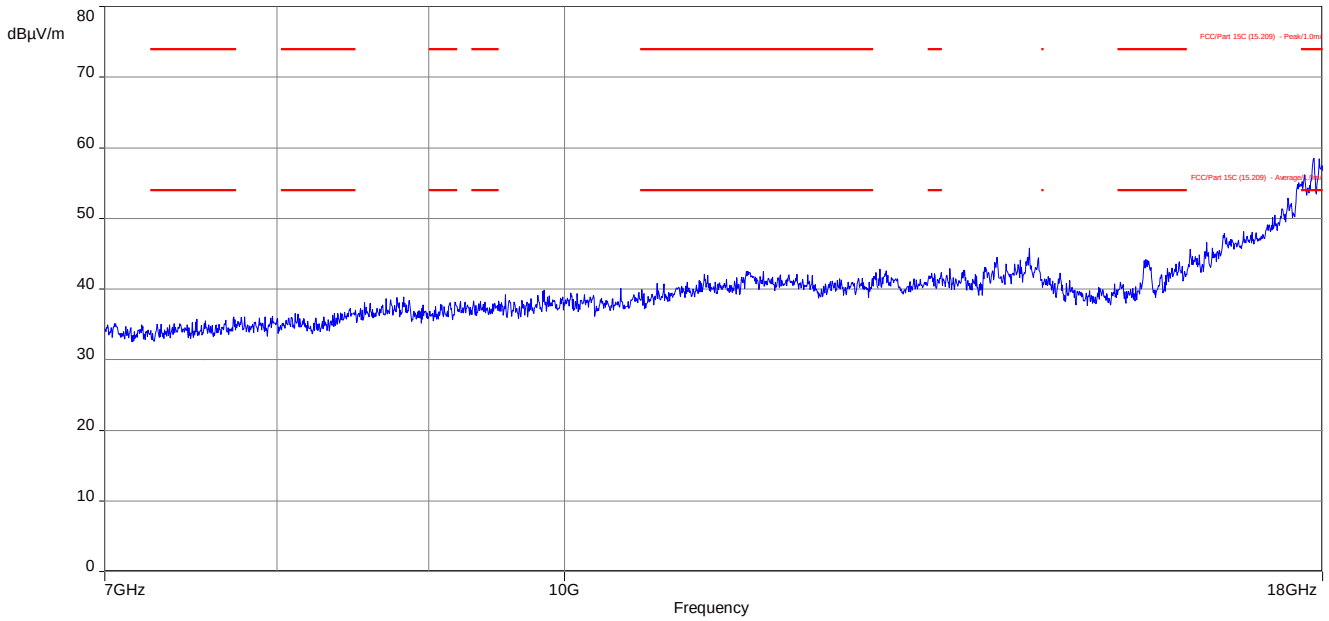
Plot 4: 18 GHz to 26 GHz, RX / idle – mode, vertical & horizontal polarization, metal housing



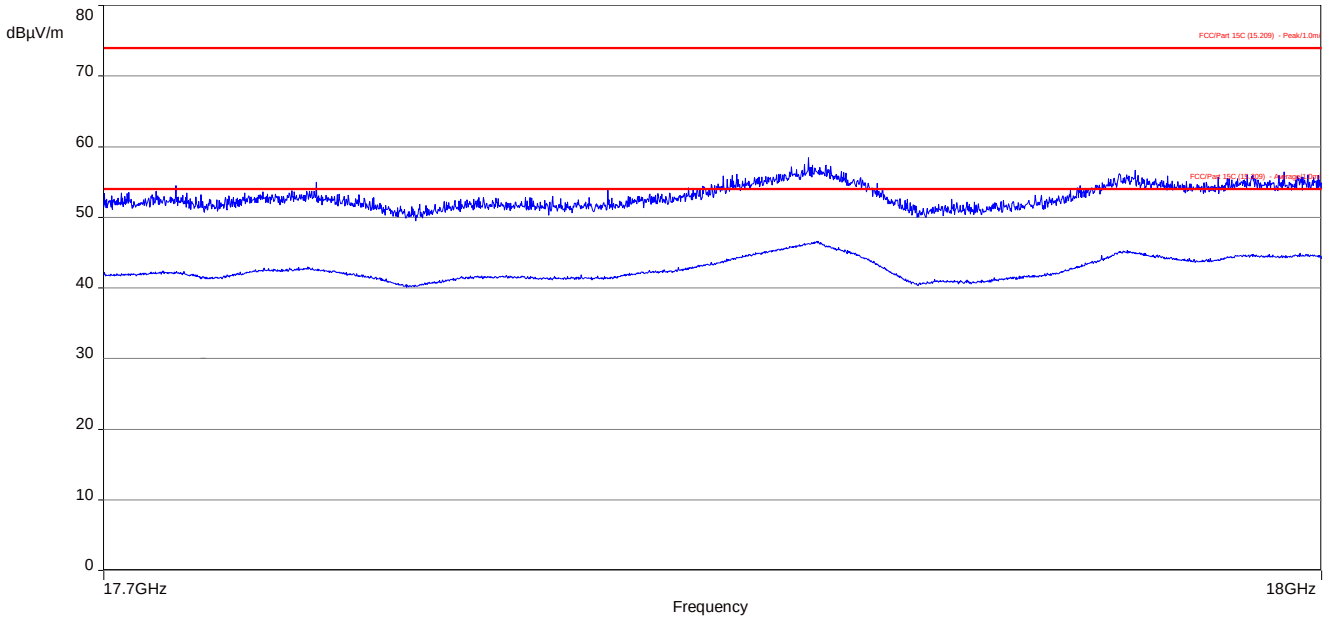
Plot 5: 1 GHz to 7 GHz, RX / idle – mode, vertical & horizontal polarization, plastic housing



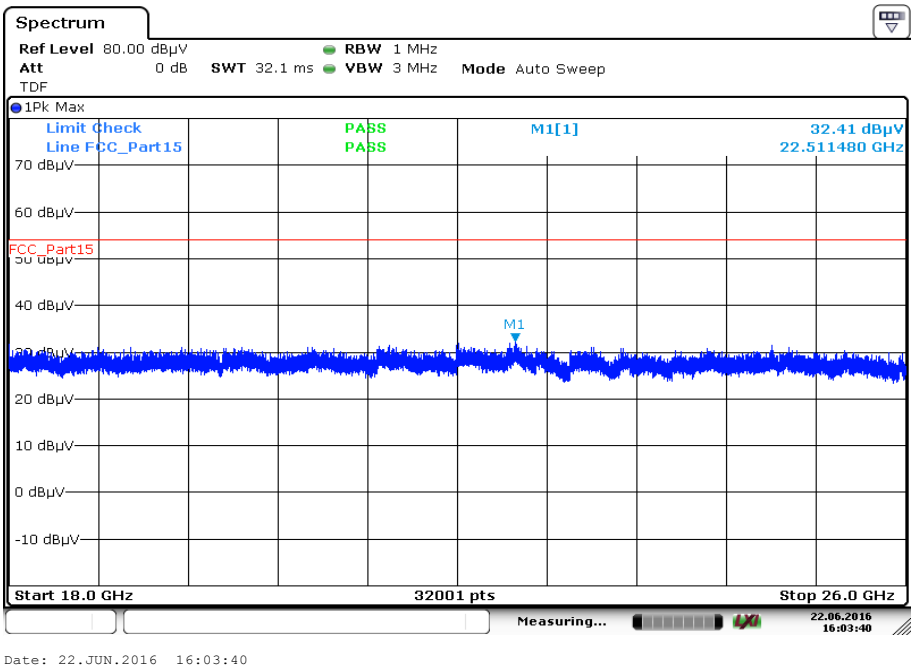
Plot 6: 7 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization, plastic housing



Plot 7: 17.7 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization, plastic housing

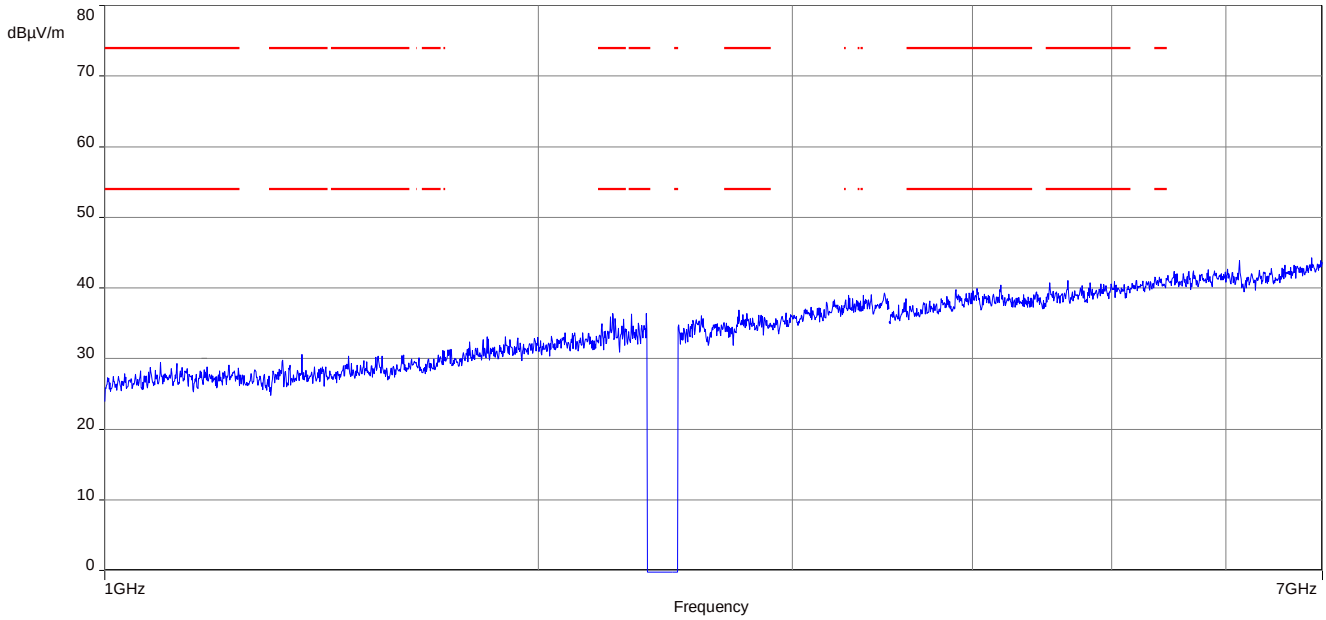


Plot 8: 18 GHz to 26 GHz, RX / idle – mode, vertical & horizontal polarization, plastic housing



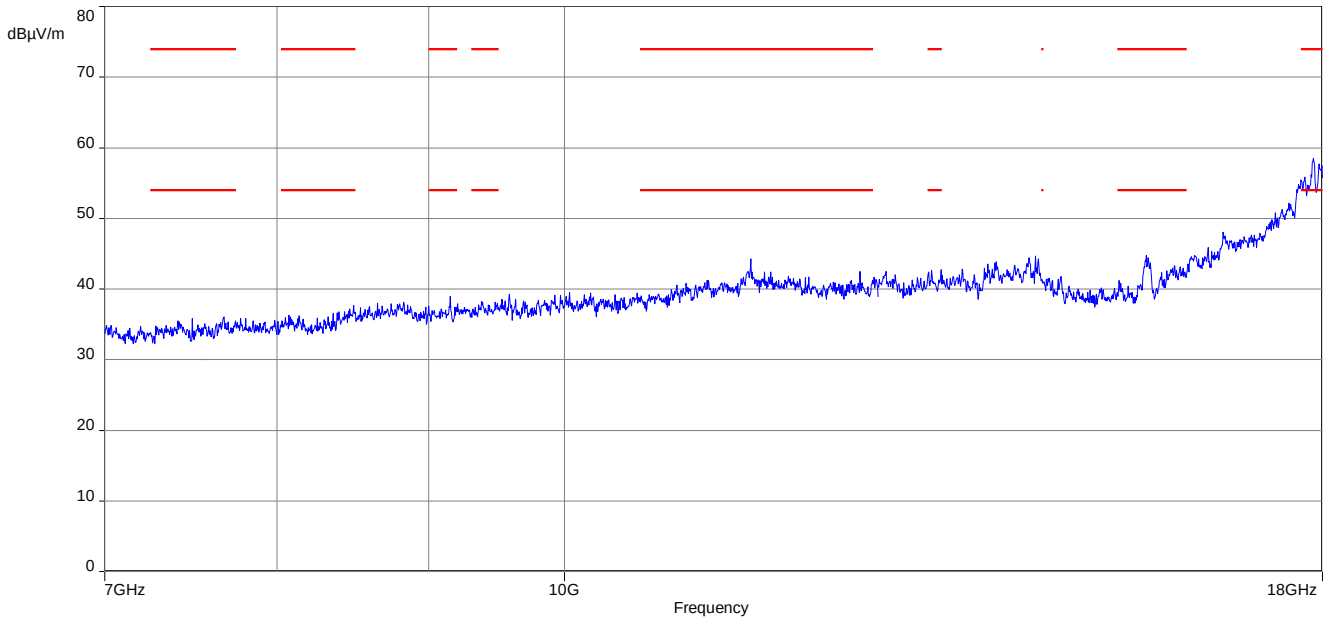
Plots: Transmitter mode, adapter (non-Ex – version)

Plot 1: 1 GHz to 7 GHz, TX mode, lowest channel, vertical & horizontal polarization, metal housing

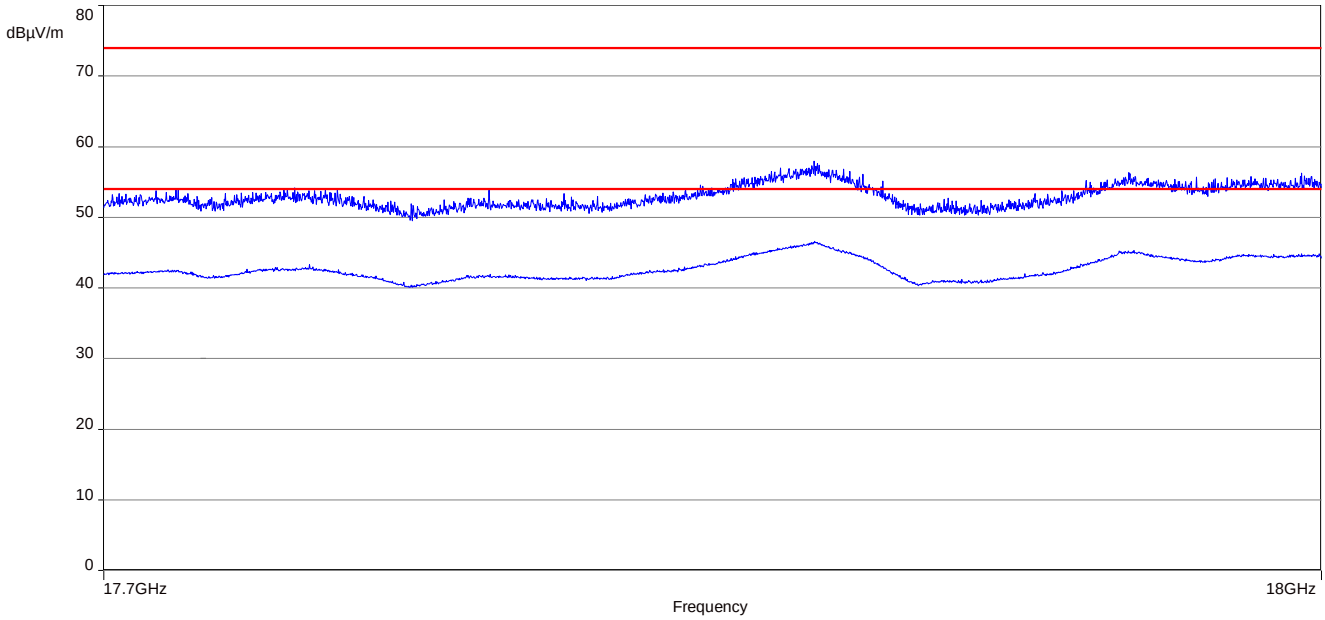


The carrier signal is notched with a 2.4 GHz band rejection filter.

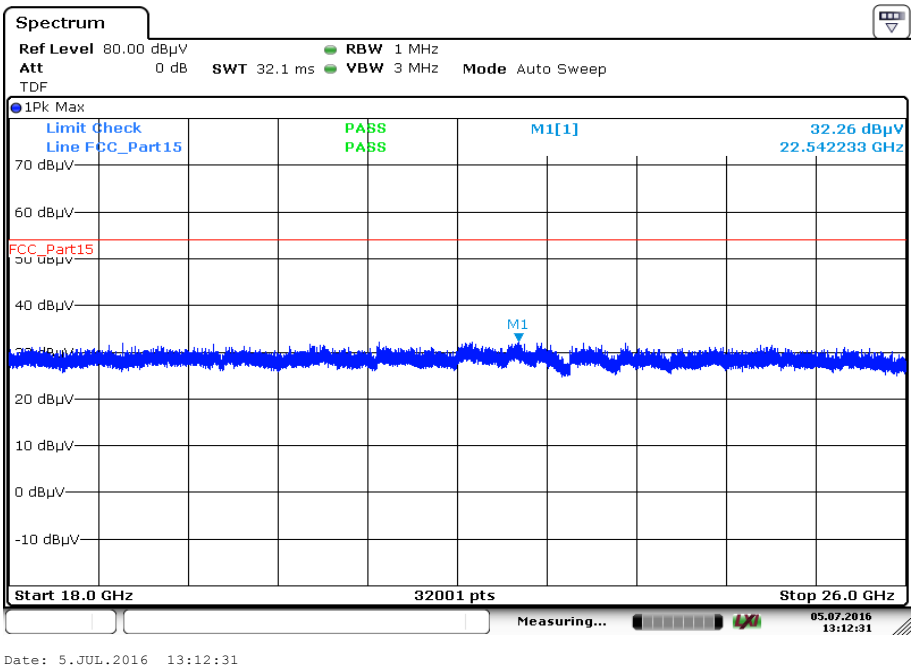
Plot 2: 7 GHz to 18 GHz, TX mode, lowest channel, vertical & horizontal polarization, metal housing



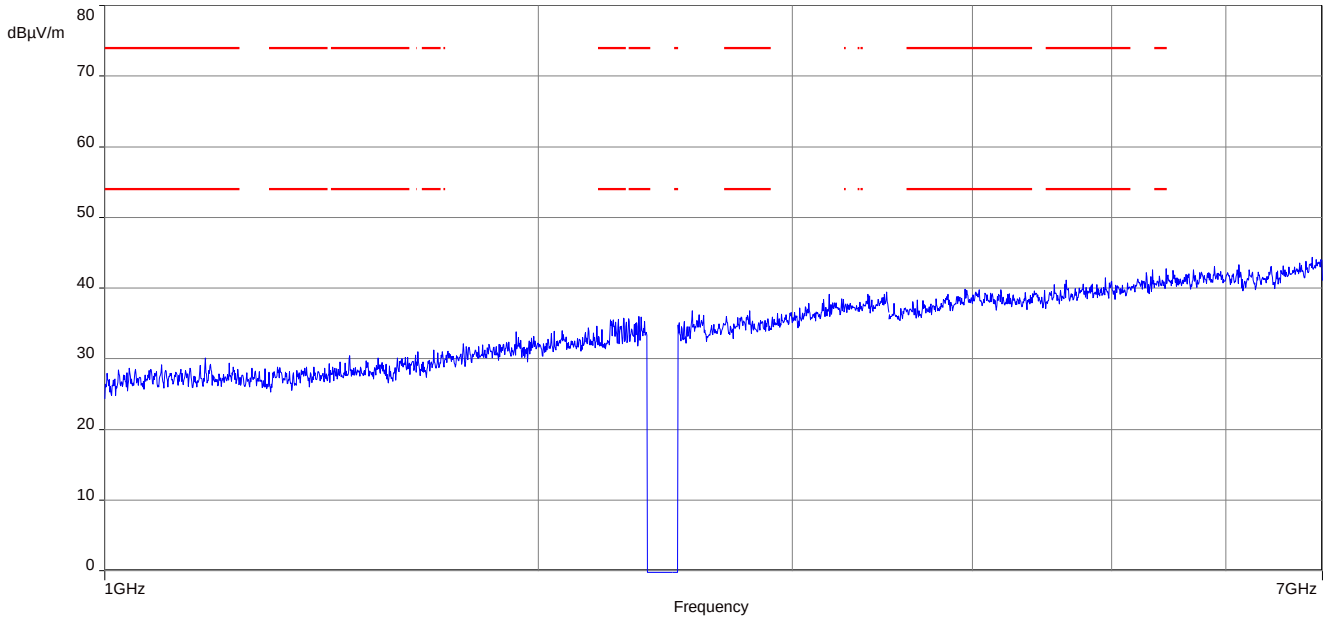
Plot 3: 17.7 GHz to 18 GHz, TX mode, lowest channel, vertical & horizontal polarization, metal housing



Plot 4: 18 GHz to 26 GHz, TX mode, lowest channel, vertical & horizontal polarization, metal housing

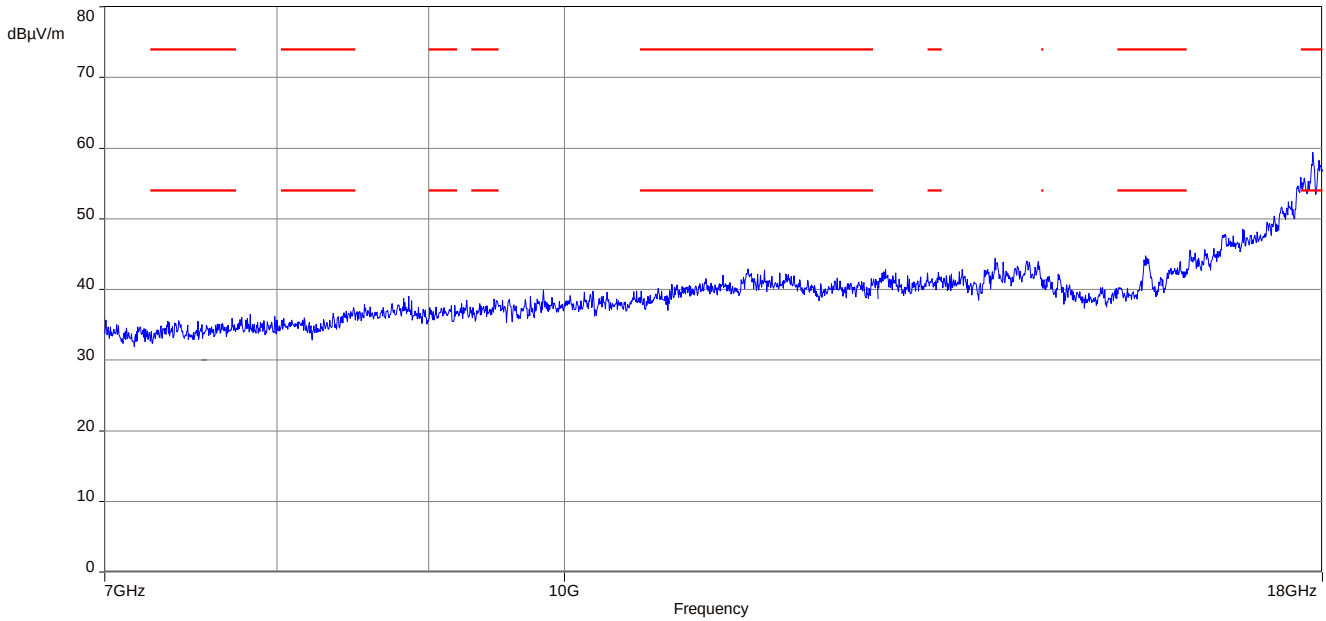


Plot 5: 1 GHz to 7 GHz, TX mode, middle channel, vertical & horizontal polarization, metal housing

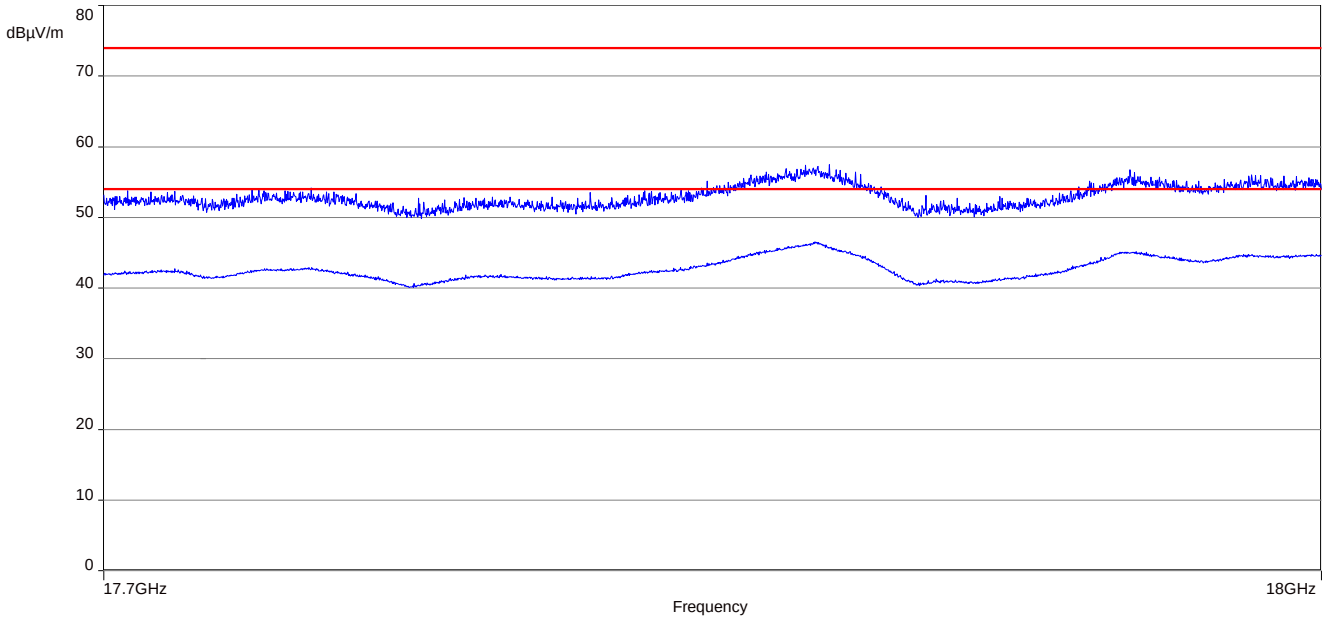


The carrier signal is notched with a 2.4 GHz band rejection filter.

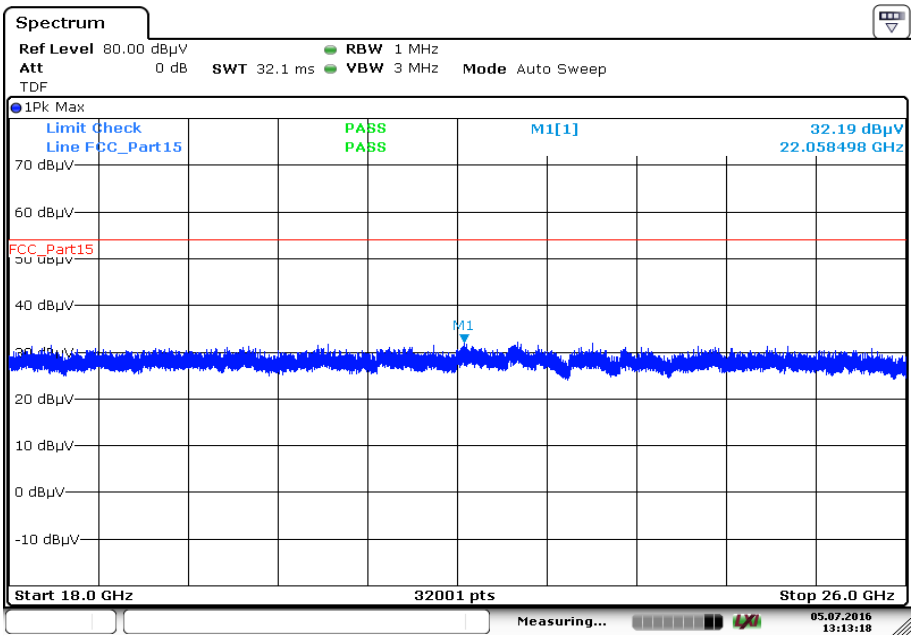
Plot 6: 7 GHz to 18 GHz, TX mode, middle channel, vertical & horizontal polarization, metal housing



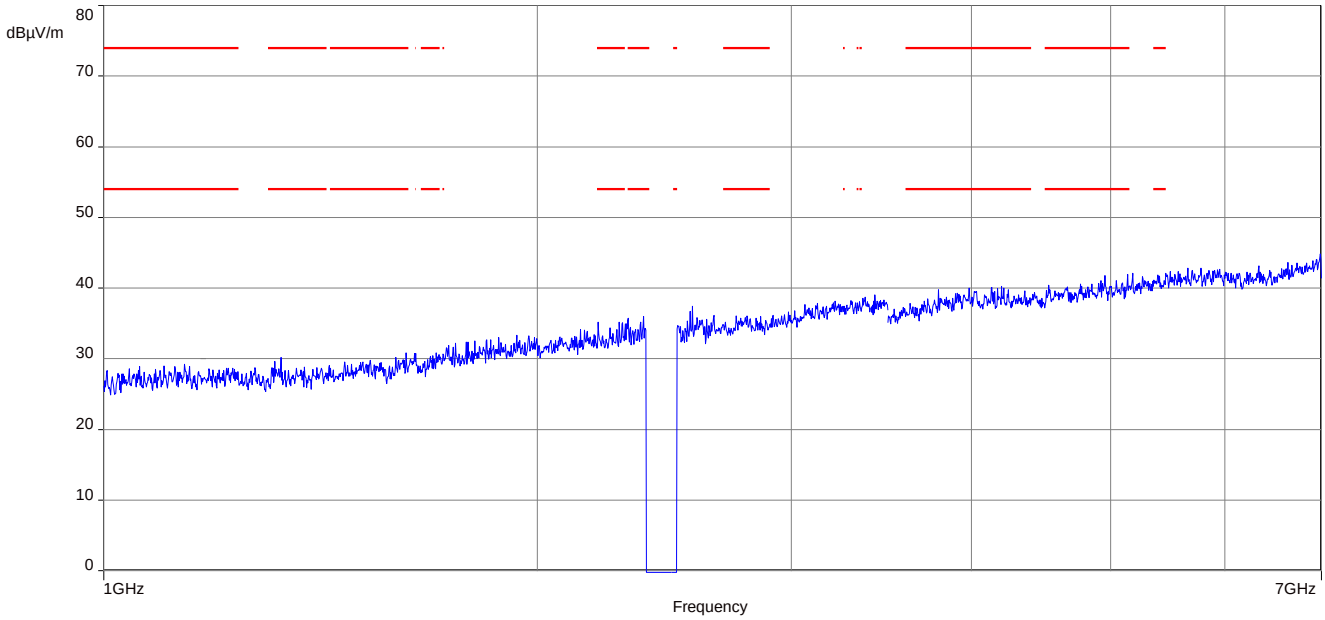
Plot 7: 17.7 GHz to 18 GHz, TX mode, middle channel, vertical & horizontal polarization, metal housing



Plot 8: 18 GHz to 26 GHz, TX mode, middle channel, vertical & horizontal polarization, metal housing

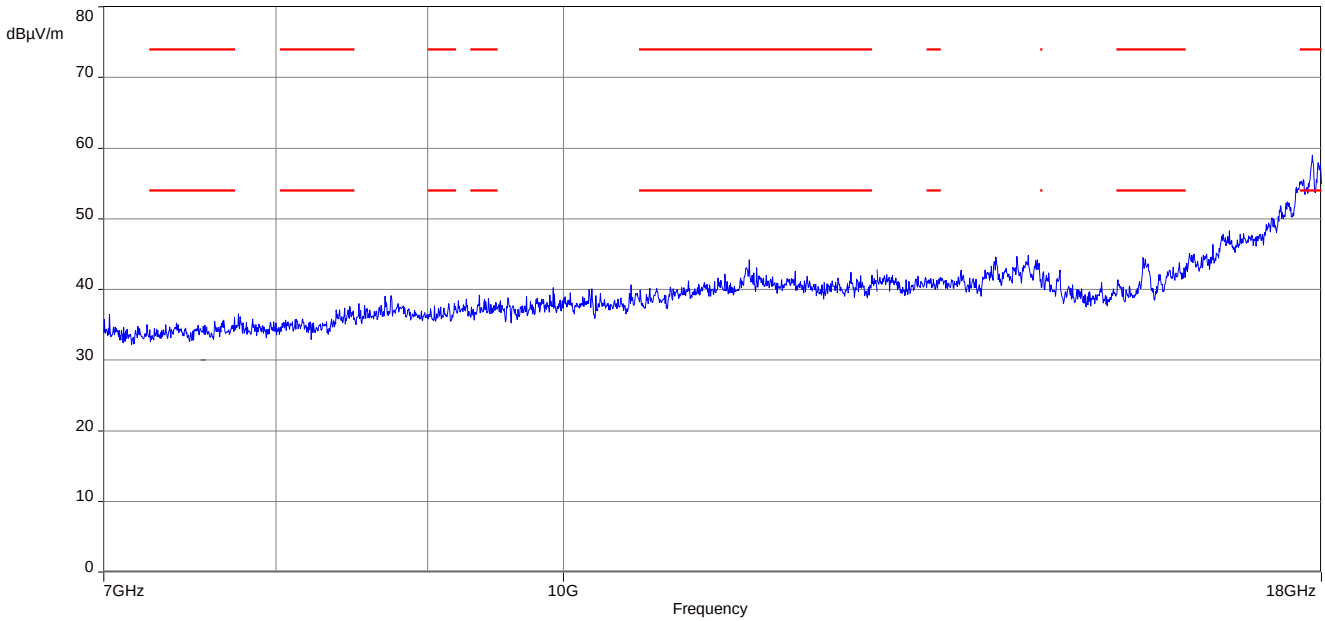


Plot 9: 1 GHz to 7 GHz, TX mode, highest channel, vertical & horizontal polarization, metal housing

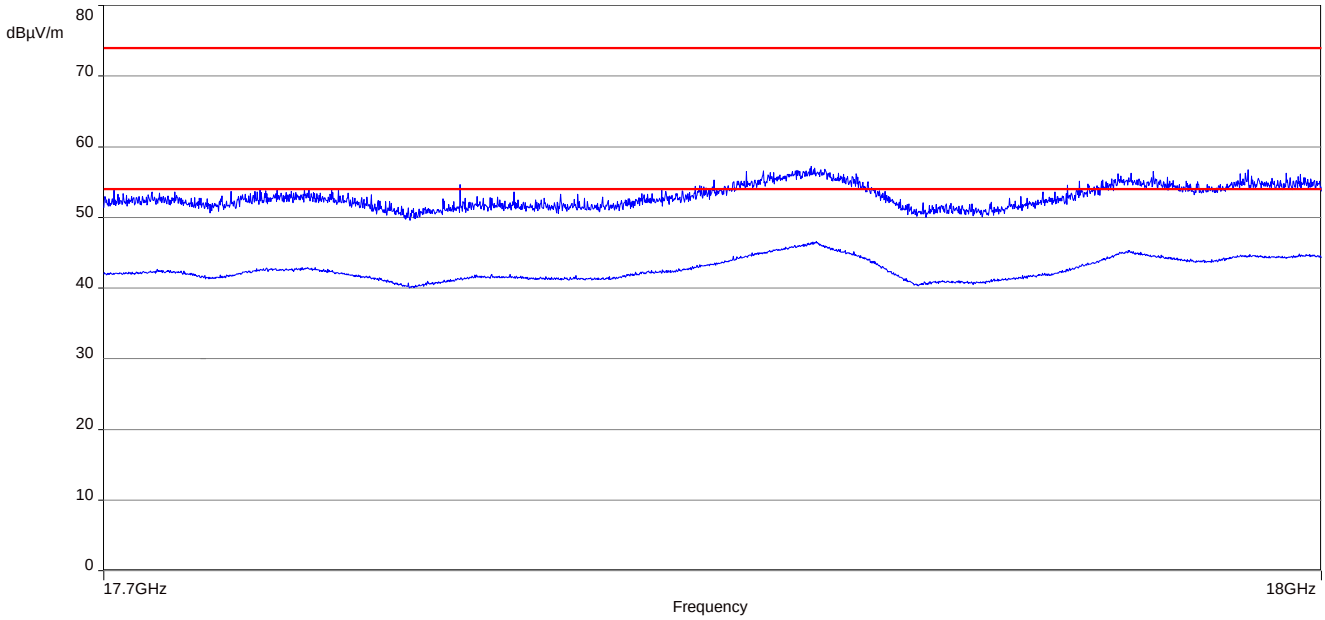


The carrier signal is notched with a 2.4 GHz band rejection filter.

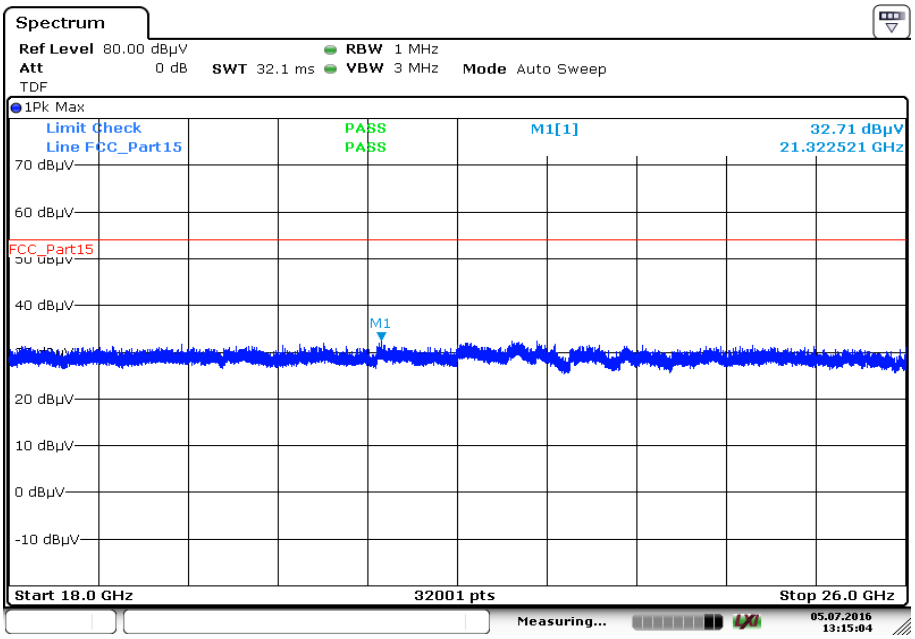
Plot 10: 7 GHz to 18 GHz, TX mode, highest channel, vertical & horizontal polarization, metal housing



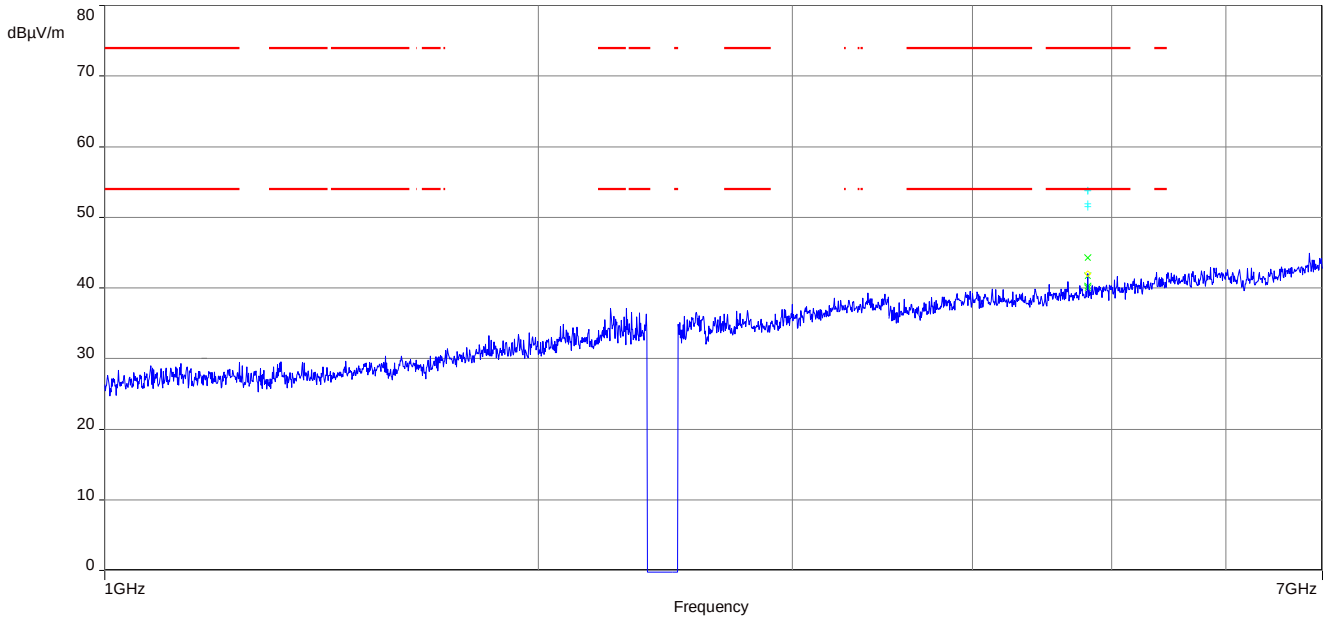
Plot 11: 17.7 GHz to 18 GHz, TX mode, highest channel, vertical & horizontal polarization, metal housing



Plot 12: 18 GHz to 26 GHz, TX mode, highest channel, vertical & horizontal polarization, metal housing

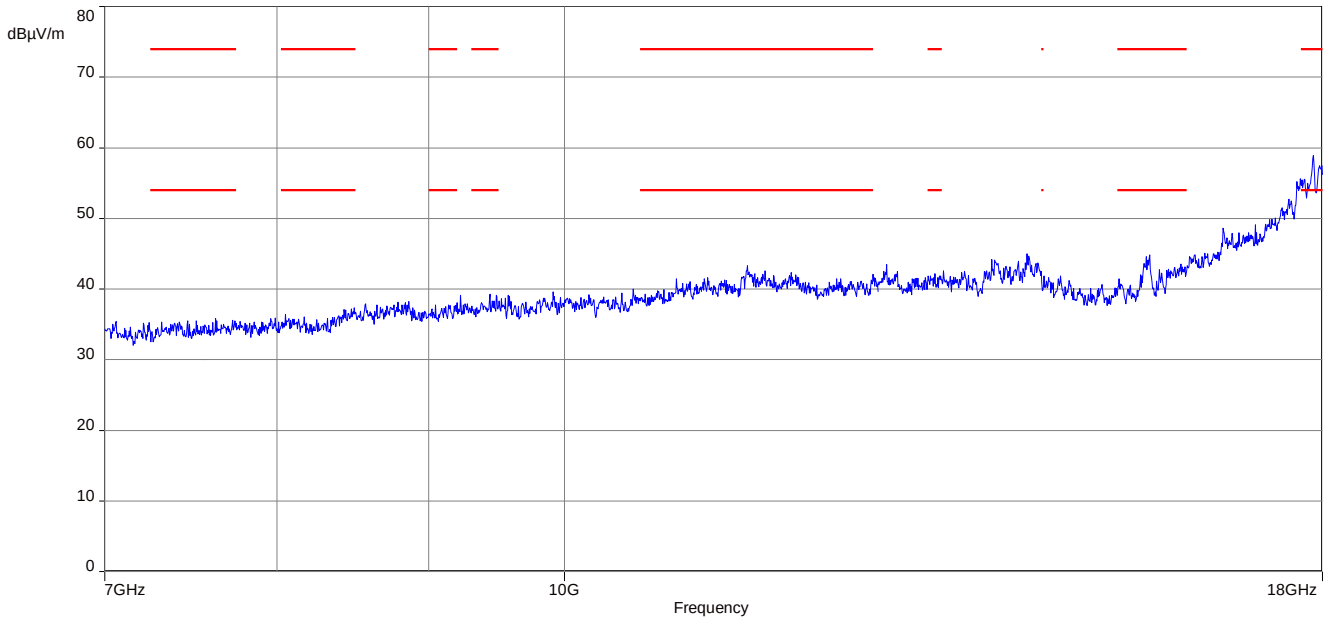


Plot 13: 1 GHz to 7 GHz, TX mode, lowest channel, vertical & horizontal polarization, plastic housing

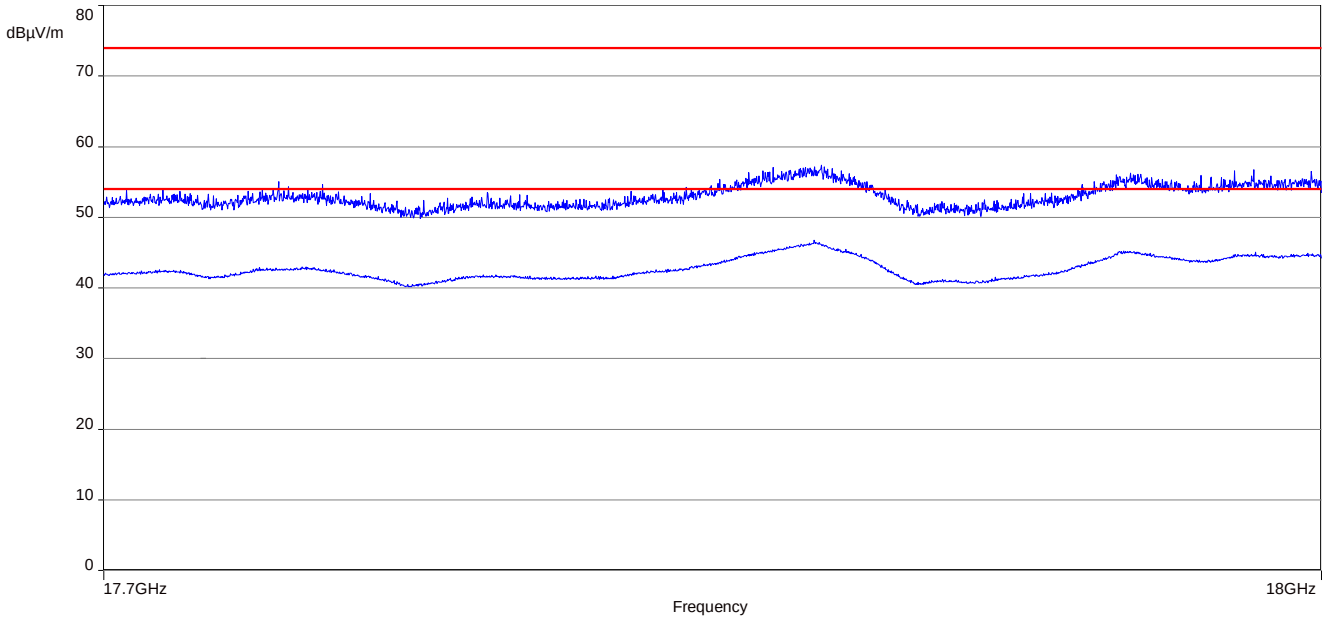


The carrier signal is notched with a 2.4 GHz band rejection filter.

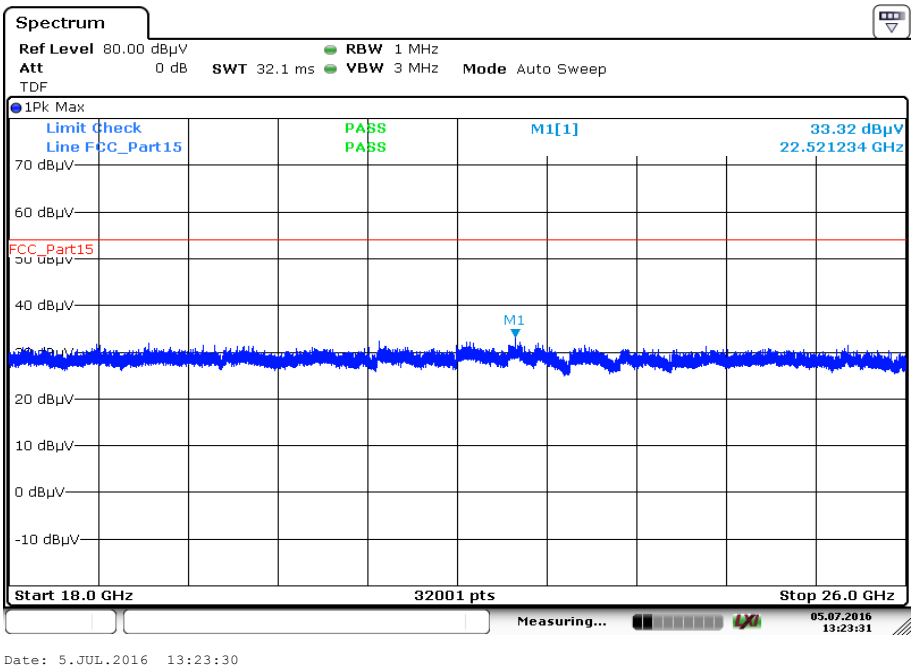
Plot 14: 7 GHz to 18 GHz, TX mode, lowest channel, vertical & horizontal polarization, plastic housing



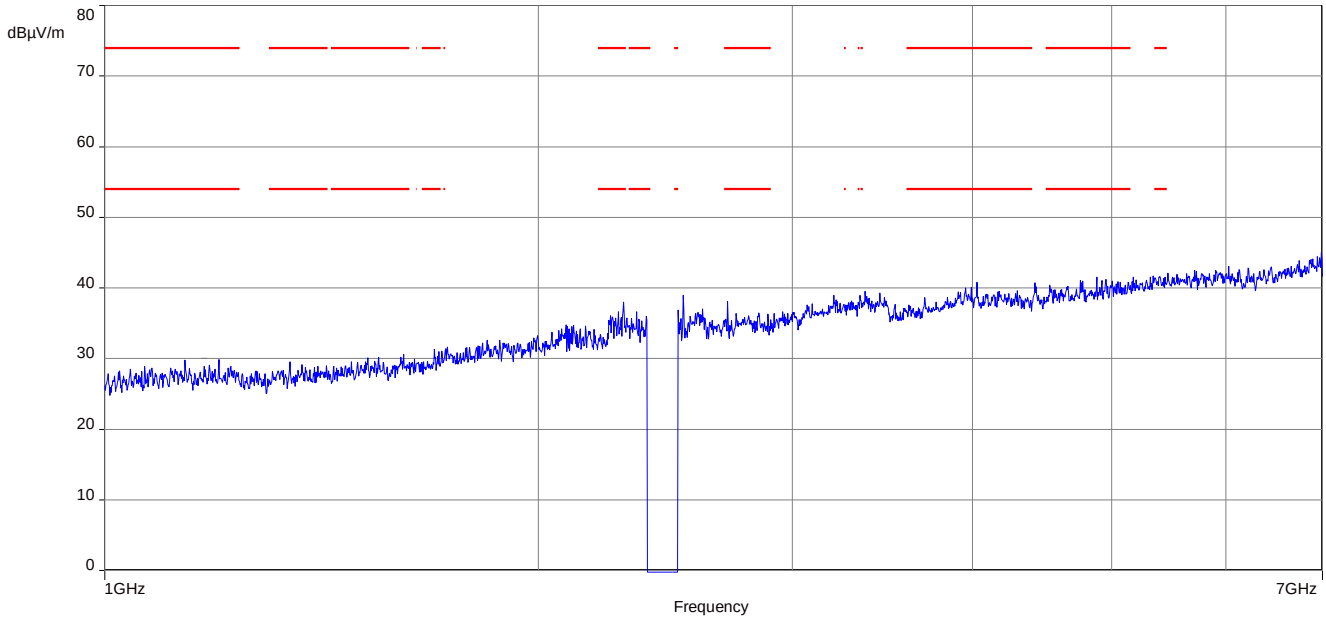
Plot 15: 17.7 GHz to 18 GHz, TX mode, lowest channel, vertical & horizontal polarization, plastic housing



Plot 16: 18 GHz to 26 GHz, TX mode, lowest channel, vertical & horizontal polarization, plastic housing

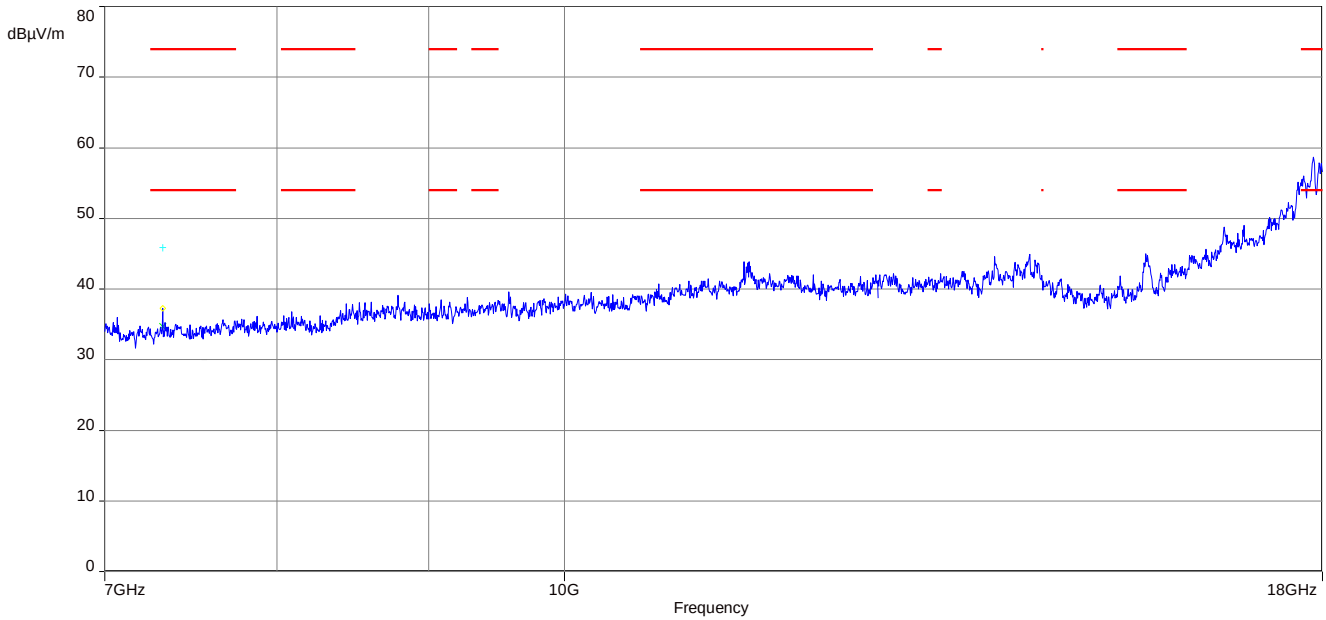


Plot 17: 1 GHz to 7 GHz, TX mode, middle channel, vertical & horizontal polarization, plastic housing

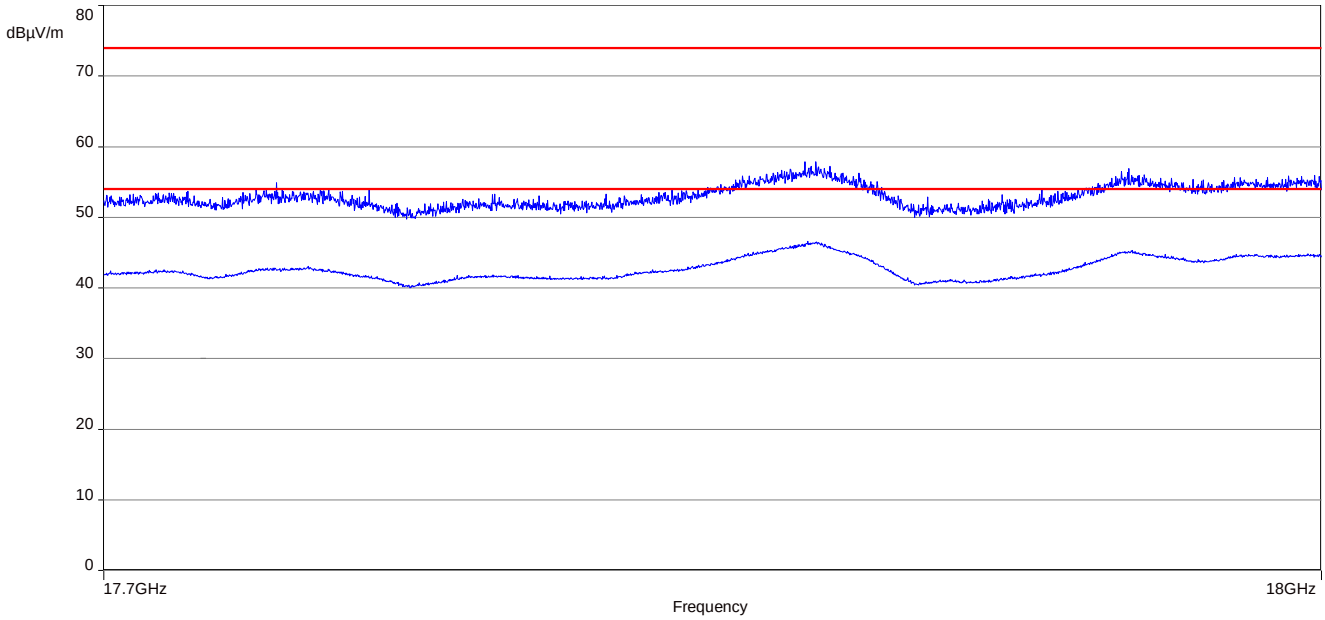


The carrier signal is notched with a 2.4 GHz band rejection filter.

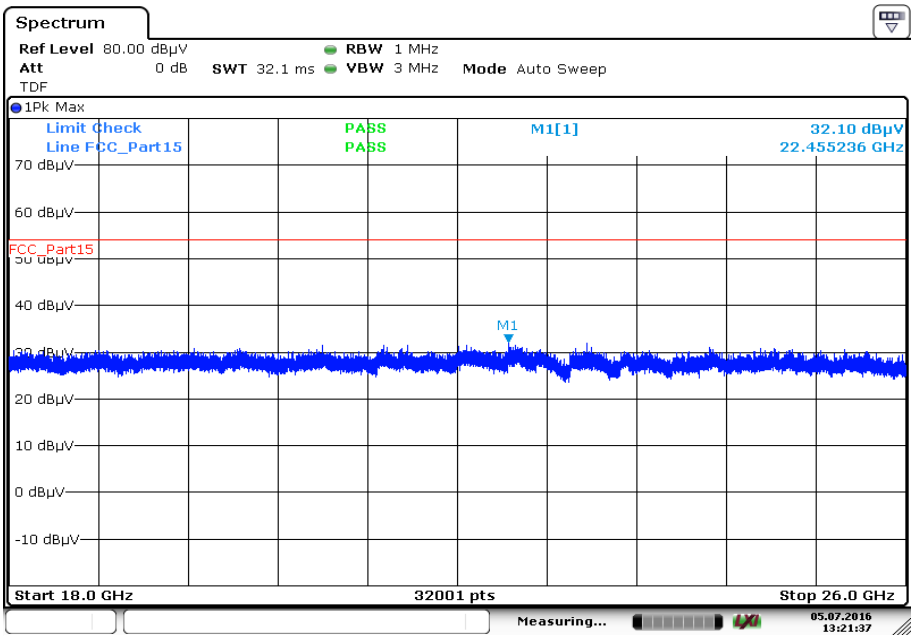
Plot 18: 7 GHz to 18 GHz, TX mode, middle channel, vertical & horizontal polarization, plastic housing



Plot 19: 17.7 GHz to 18 GHz, TX mode, middle channel, vertical & horizontal polarization, plastic housing

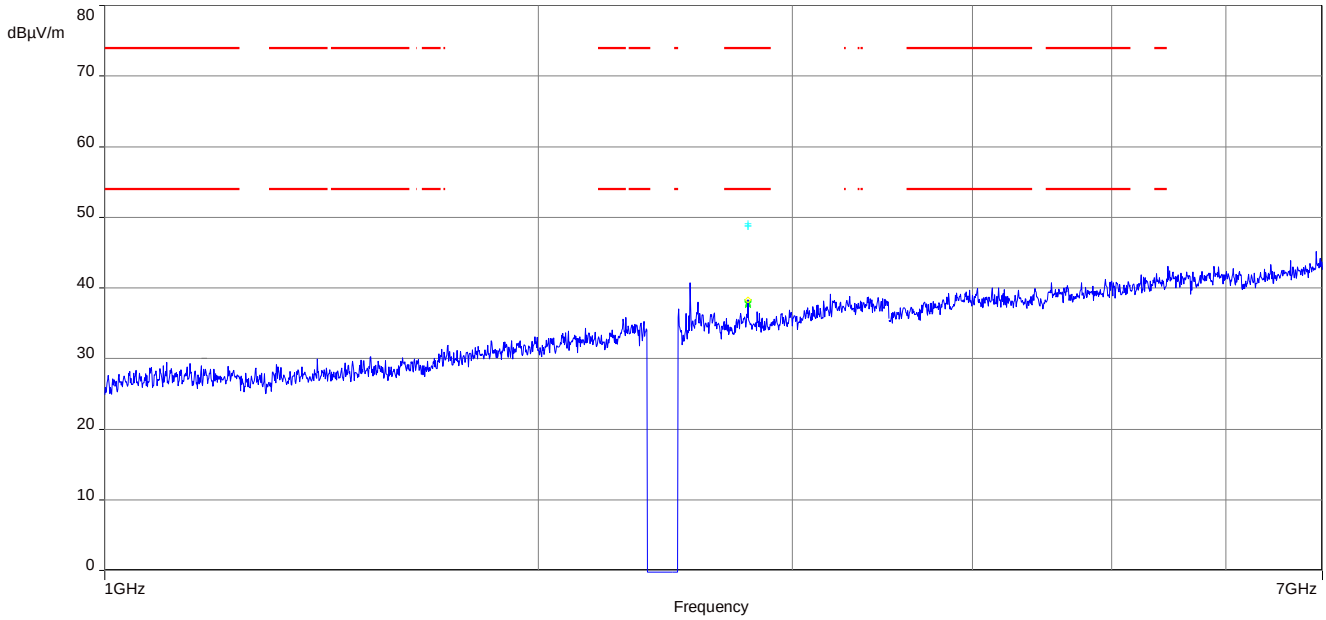


Plot 20: 18 GHz to 26 GHz, TX mode, middle channel, vertical & horizontal polarization, plastic housing



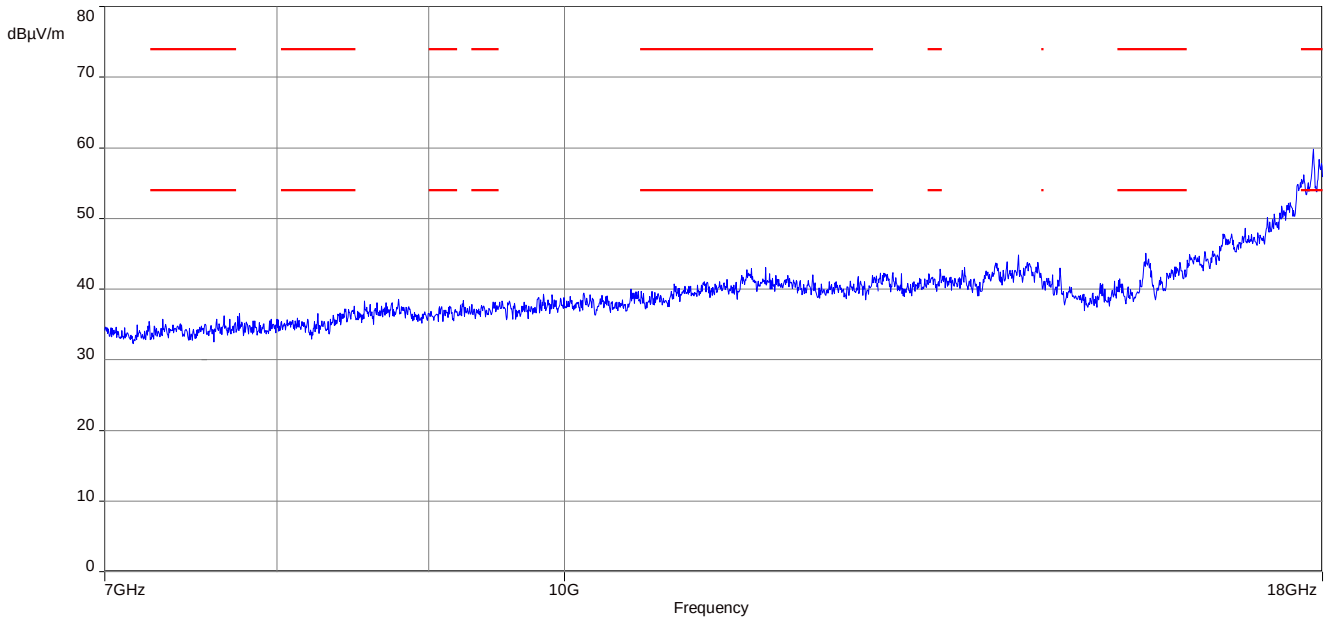
Date: 5.JUL.2016 13:21:37

Plot 21: 1 GHz to 7 GHz, TX mode, highest channel, vertical & horizontal polarization, plastic housing

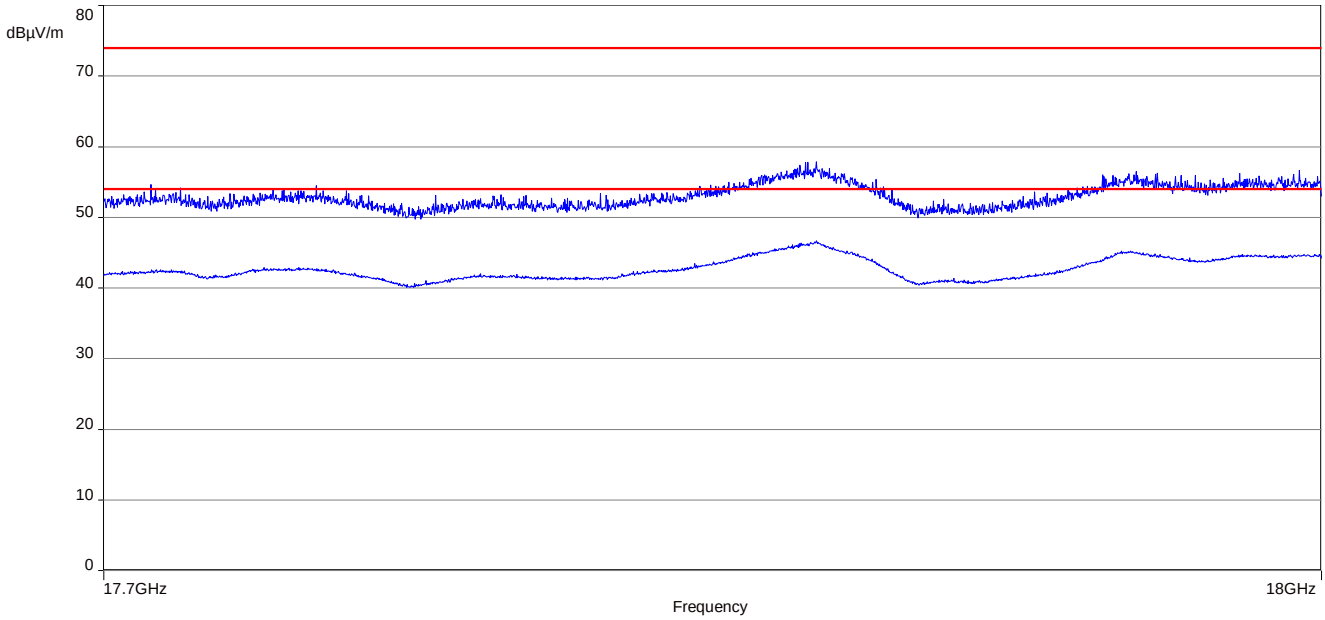


The carrier signal is notched with a 2.4 GHz band rejection filter.

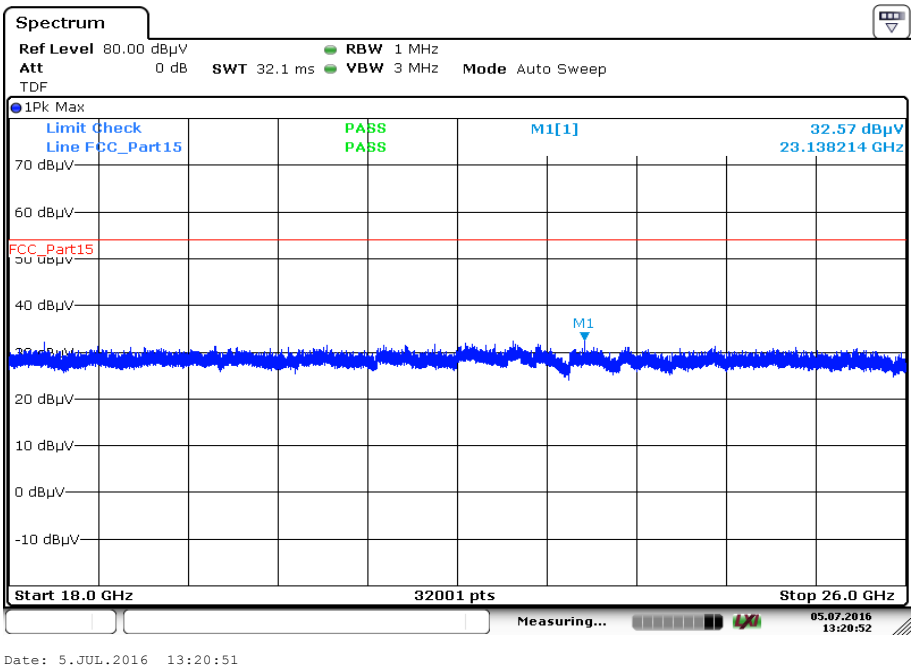
Plot 22: 7 GHz to 18 GHz, TX mode, highest channel, vertical & horizontal polarization, plastic housing



Plot 23: 17.7 GHz to 18 GHz, TX mode, highest channel, vertical & horizontal polarization, plastic housing

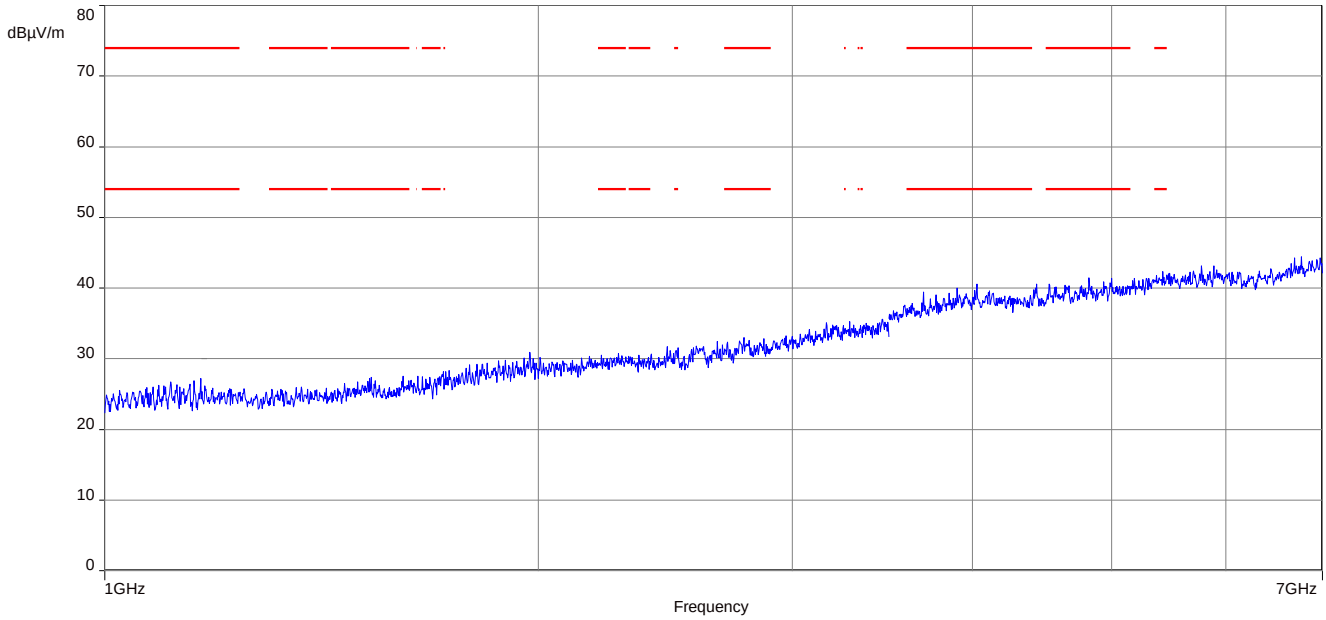


Plot 24: 18 GHz to 26 GHz, TX mode, highest channel, vertical & horizontal polarization, plastic housing

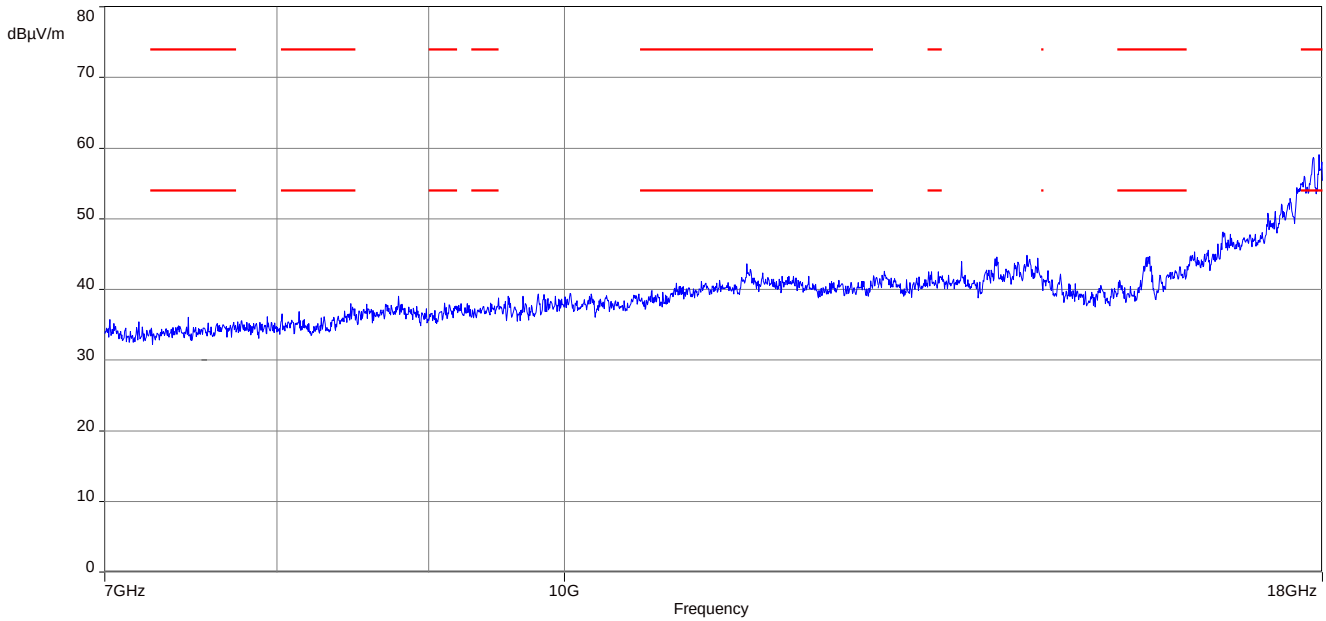


Plots: Receiver mode, adapter (non-Ex – version)

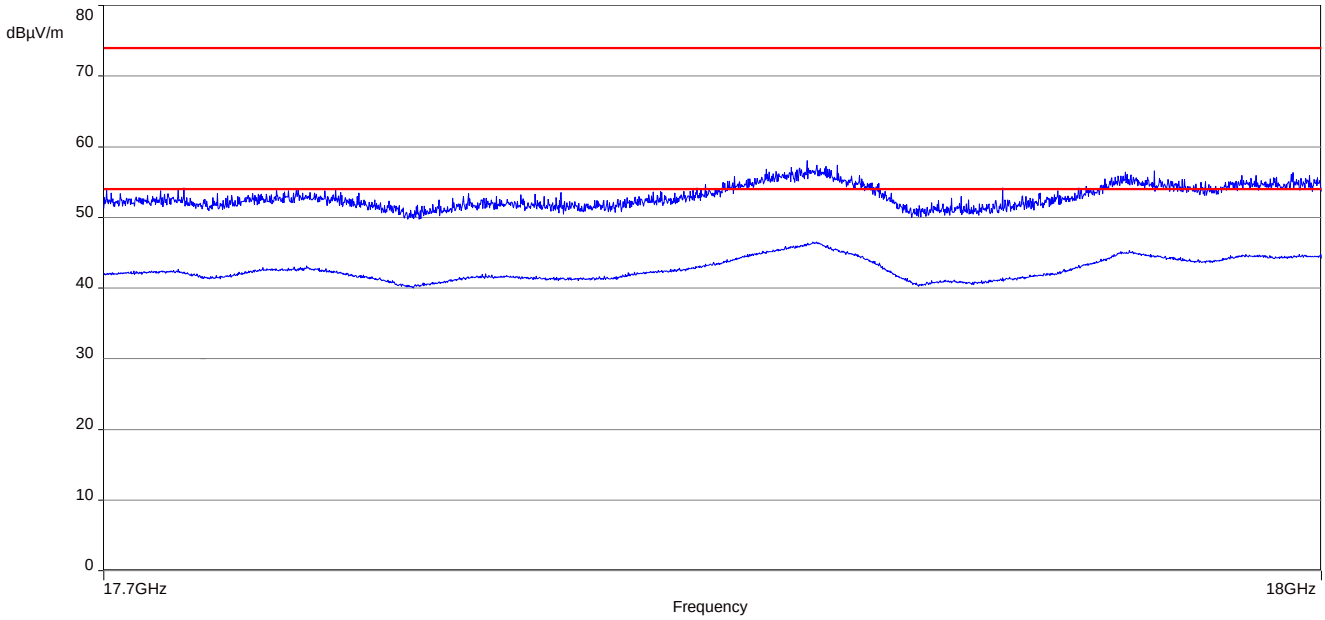
Plot 1: 1 GHz to 7 GHz, RX / idle – mode, vertical & horizontal polarization, metal housing



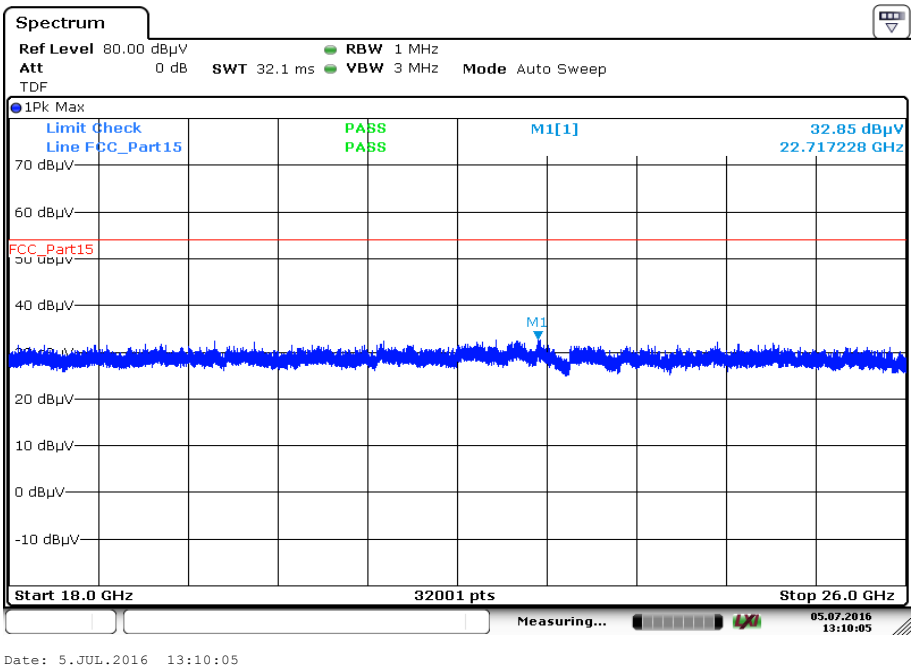
Plot 2: 7 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization, metal housing



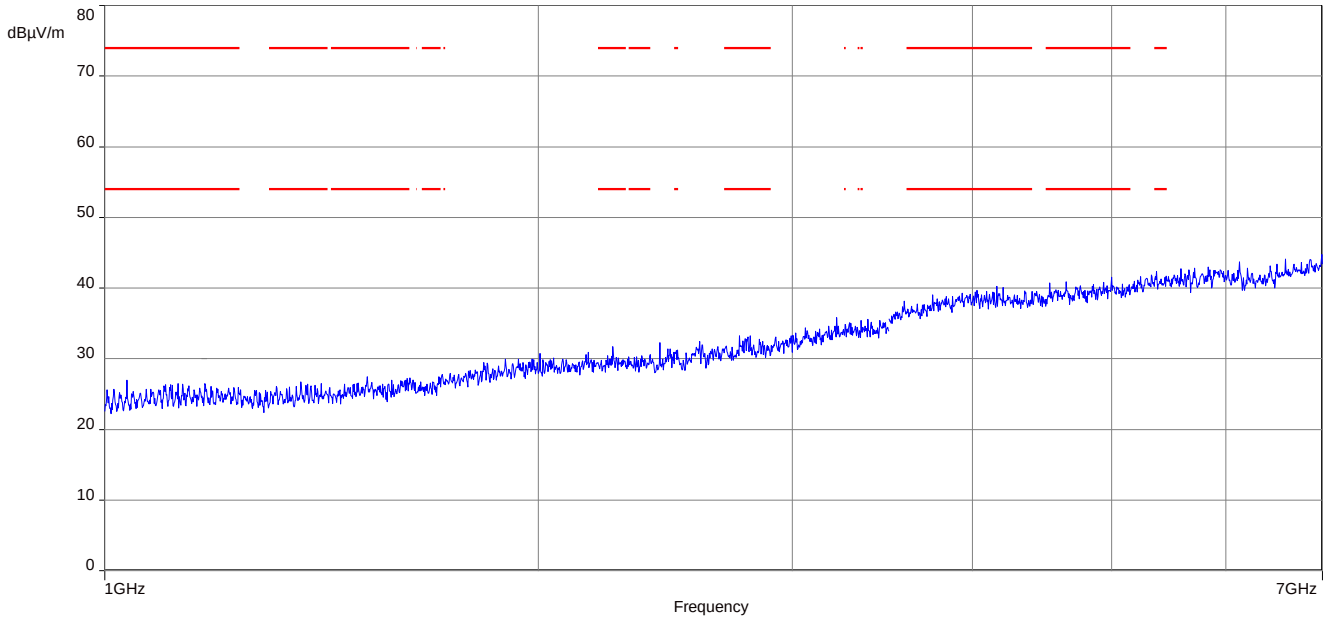
Plot 3: 17.7 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization, metal housing



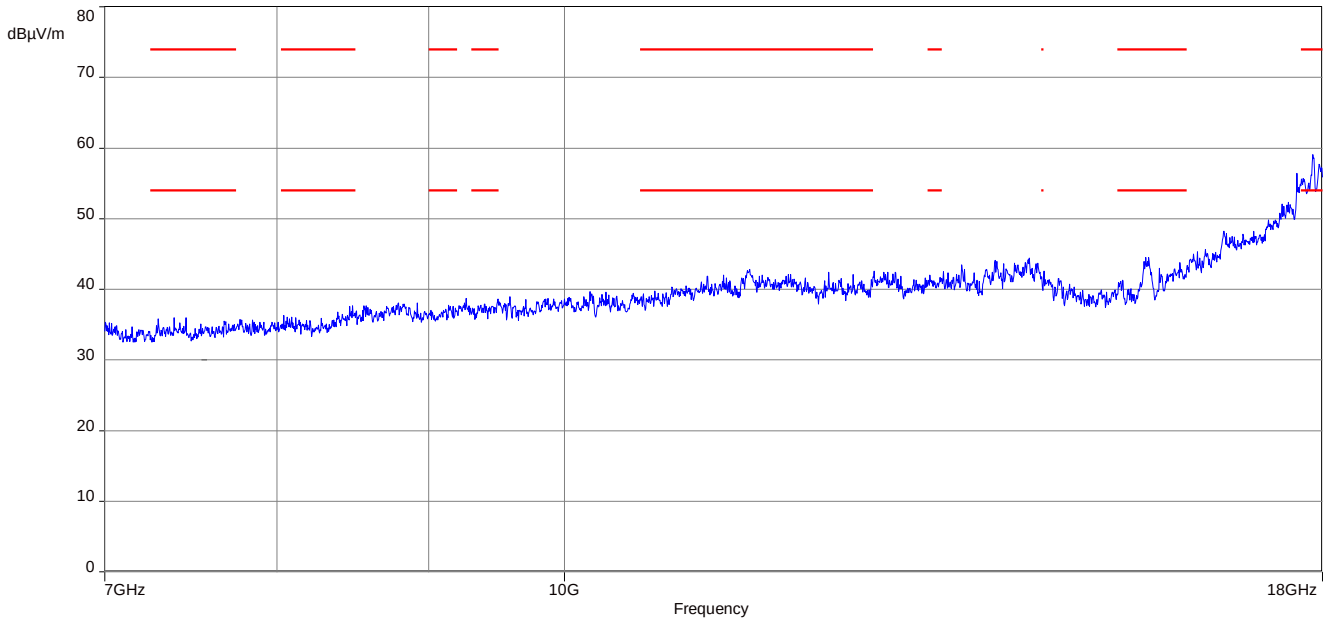
Plot 4: 18 GHz to 26 GHz, RX / idle – mode, vertical & horizontal polarization, metal housing



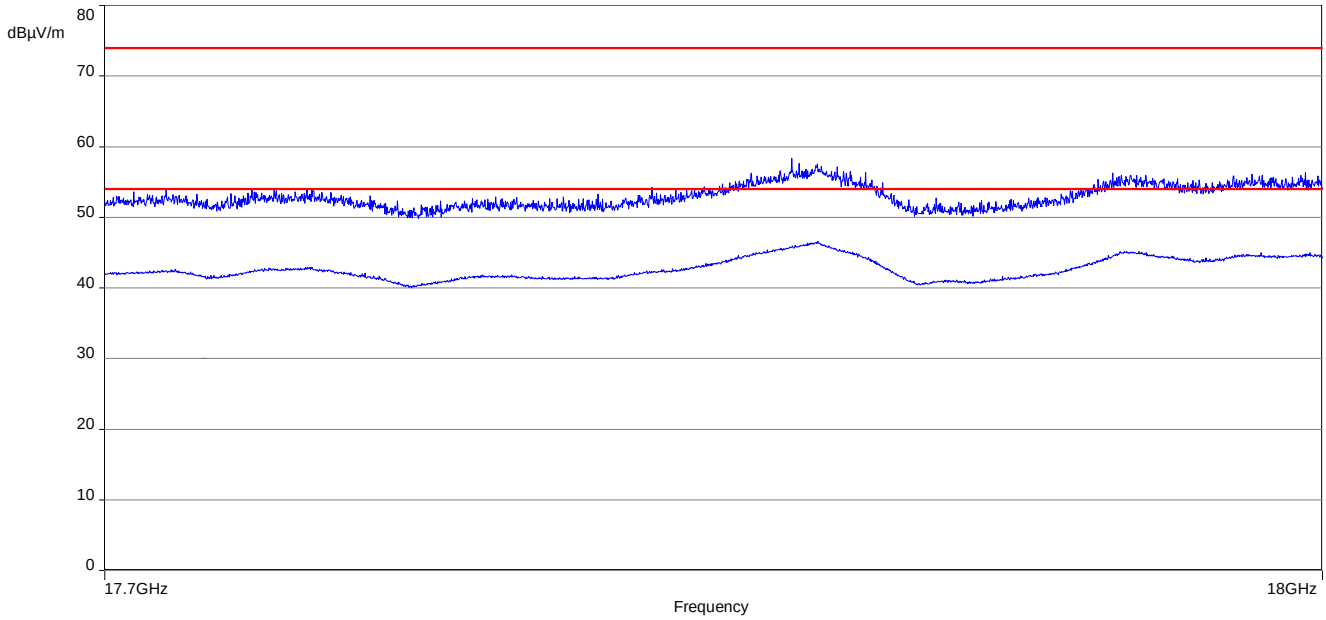
Plot 5: 1 GHz to 7 GHz, RX / idle – mode, vertical & horizontal polarization, plastic housing



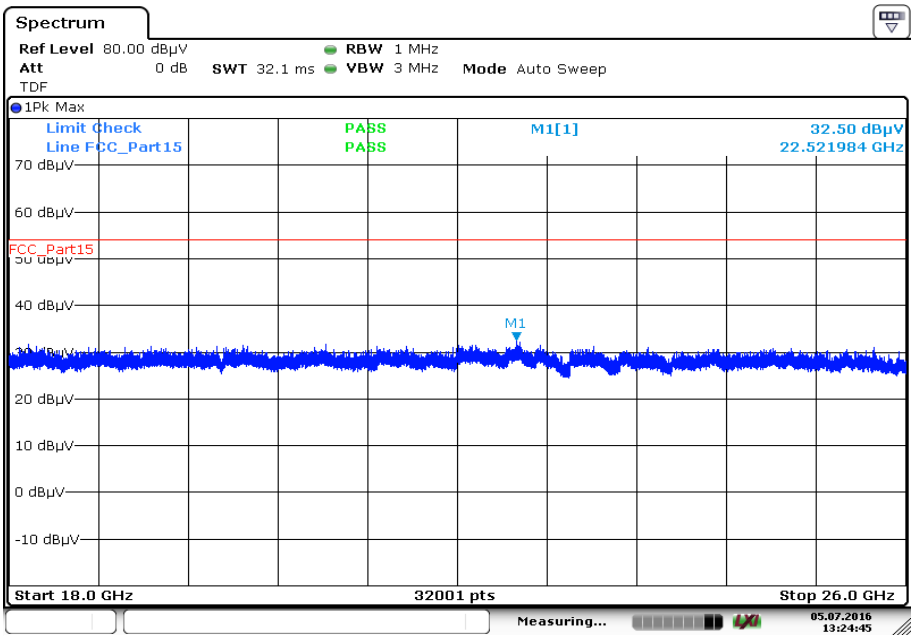
Plot 6: 7 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization, plastic housing



Plot 7: 17.7 GHz to 18 GHz, RX / idle – mode, vertical & horizontal polarization, plastic housing



Plot 8: 18 GHz to 26 GHz, RX / idle – mode, vertical & horizontal polarization, plastic housing



12.12 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
Test setup:	See sub clause 7.5 – A
Measurement uncertainty:	See sub clause 9

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

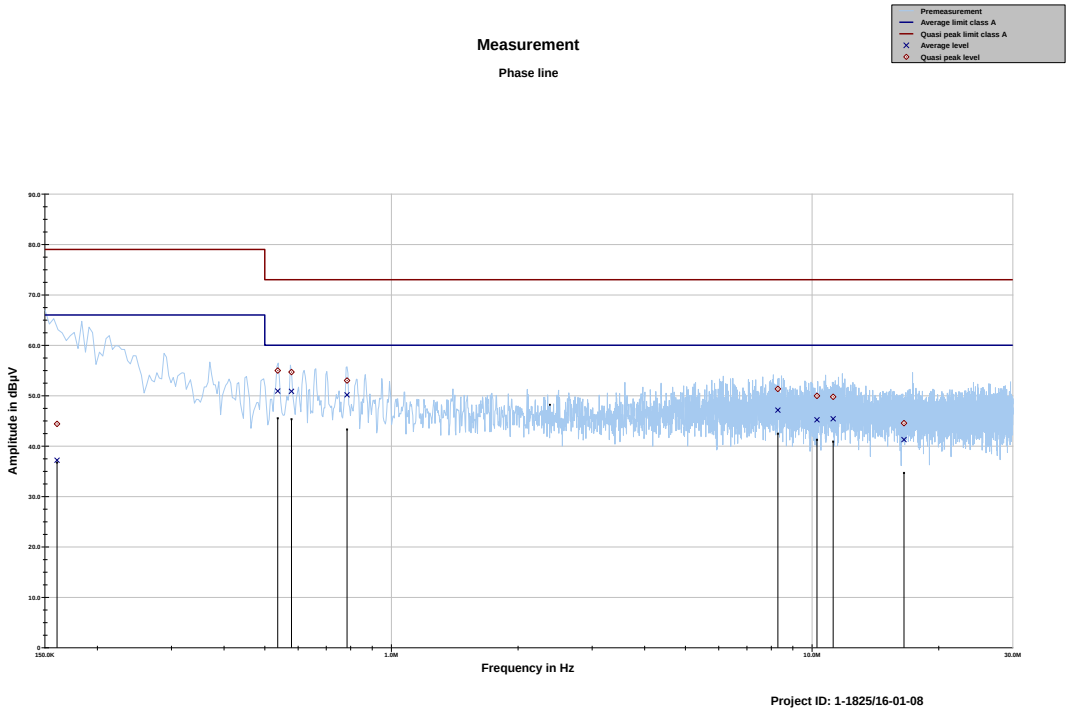
*Decreases with the logarithm of the frequency

Results:

TX Spurious Emissions Conducted < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
See table below the plots.		

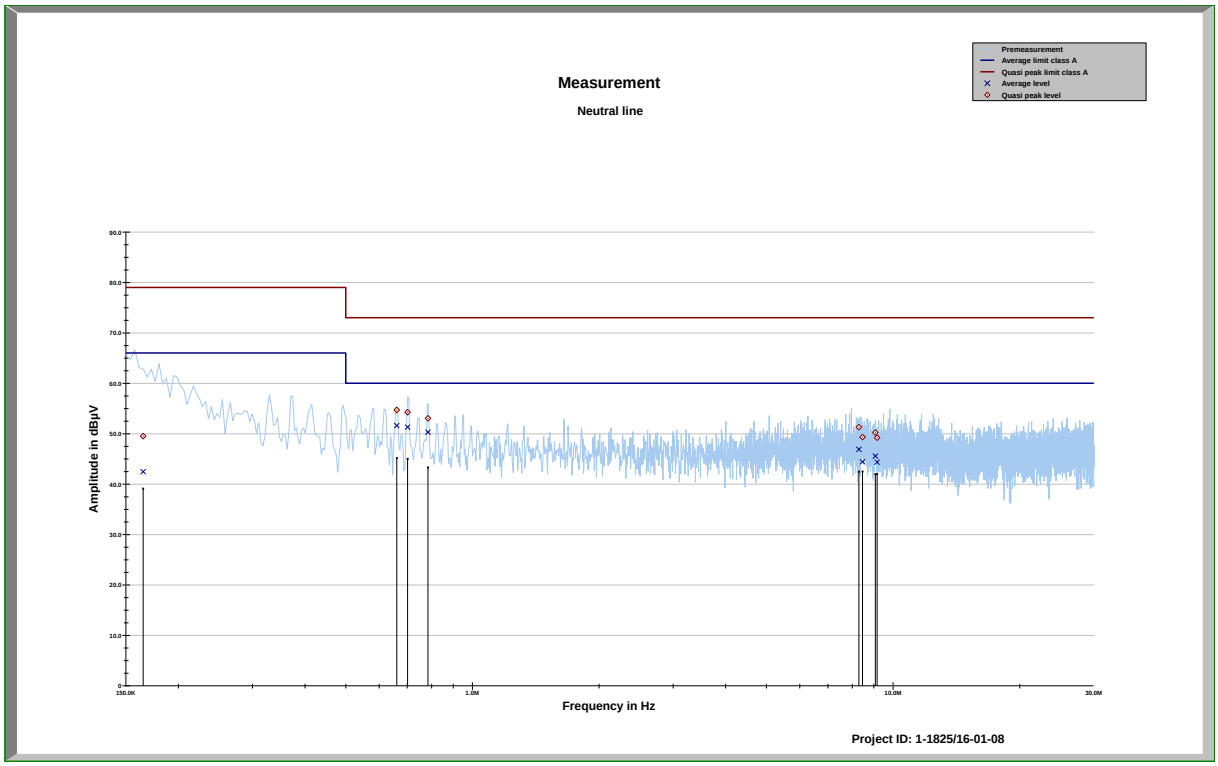
Plots:

Plot 1: 150 kHz to 30 MHz, phase line, metal housing & plastic housing



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.160369	44.40	34.60	79.000	37.20	28.80	66.000
0.536849	54.99	18.01	73.000	50.92	9.08	60.000
0.578691	54.69	18.31	73.000	50.86	9.14	60.000
0.784546	53.01	19.99	73.000	50.16	9.84	60.000
8.293414	51.33	21.67	73.000	47.13	12.87	60.000
10.274128	49.95	23.05	73.000	45.22	14.78	60.000
11.223476	49.78	23.22	73.000	45.41	14.59	60.000
16.545118	44.54	28.46	73.000	41.27	18.73	60.000

Plot 2: 150 kHz to 30 MHz, neutral line, metal housing & plastic housing



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin Average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.164987	49.50	29.50	79.000	42.46	23.54	66.000
0.660988	54.70	18.30	73.000	51.60	8.40	60.000
0.701480	54.25	18.75	73.000	51.30	8.70	60.000
0.784130	53.04	19.96	73.000	50.29	9.71	60.000
8.295138	51.29	21.71	73.000	46.89	13.11	60.000
8.462532	49.31	23.69	73.000	44.42	15.58	60.000
9.078941	50.22	22.78	73.000	45.54	14.46	60.000
9.163431	49.19	23.81	73.000	44.34	15.66	60.000

13 Observations

No observations except those reported with the single test cases have been made.

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2016-07-06
A	New model name / added measurement results from non-EX adapter	2016-09-02

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

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

Back side of certificate

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