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TEST REPORT

Test report no.: 1-1107/16-02-02



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

Pfreundt GmbH

Robert-Bosch-Str. 5
46354 Südlohn / GERMANY

Phone: +49 2862 9807-0
Fax: -/-
Contact: Stefan Bücker
e-mail: stefan.buecker@pfreundt.de
Phone: +49 2862 9807 -344

Manufacturer

Pfreundt GmbH

Robert-Bosch-Str. 5
46354 Südlohn / 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: Weighing electronic

Model name: WK60-XS

FCC ID: 2AITQWK60XS

IC: 21743-WK60XS

Frequency: DTS band 2400 MHz to 2483.5 MHz

Technology tested: WLAN (DSSS/b-mode; OFDM/g-,n HT20 & HT40-mode)

Antenna: 2 external antennas

Power supply: 12 V – 24 V DC by external power supply

Temperature range: -10°C to +55°C



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

Test report authorized:

p.o.

Andreas Luckenbill
Lab Manager
Radio Communications & EMC

Test performed:

Marco Bertolino
Lab Manager
Radio Communications & EMC

1 Table of contents

1	Table of contents	2
2	General information	3
2.1	Notes and disclaimer	3
2.2	Application details	3
3	Test standard/s and references	3
4	Test environment	5
5	Test item	5
5.1	General description	5
5.2	Additional information	5
6	Test laboratories sub-contracted	5
7	Description of the test setup	6
7.1	Shielded semi anechoic chamber	7
7.2	Shielded fully anechoic chamber	8
7.3	Radiated measurements > 18 GHz	9
7.4	Conducted measurements	10
8	Sequence of testing	11
8.1	Sequence of testing radiated spurious 9 kHz to 30 MHz	11
8.2	Sequence of testing radiated spurious 30 MHz to 1 GHz	12
8.3	Sequence of testing radiated spurious 1 GHz to 18 GHz	13
8.4	Sequence of testing radiated spurious above 18 GHz	14
9	Measurement uncertainty	15
10	Summary of measurement results	16
11	Additional comments	17
12	Measurement results	18
12.1	Antenna gain	18
12.2	Identify worst case data rate	21
12.3	Maximum output power	22
12.4	Duty cycle	23
12.5	Peak power spectral density	24
12.6	6 dB DTS bandwidth	33
12.7	Occupied bandwidth – 99% emission bandwidth	42
12.8	Occupied bandwidth – 20 dB bandwidth	51
12.9	Band edge compliance conducted	60
12.10	Spurious emissions conducted	67
12.11	Spurious emissions radiated below 30 MHz	82
12.12	Spurious emissions radiated 30 MHz to 1 GHz	95
12.13	Spurious emissions radiated above 1 GHz	116
13	Observations	161
Annex A	Document history	161
Annex B	Further information	161
Annex C	Accreditation Certificate	162

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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2.2 Application details

Date of receipt of order:	2016-04-27
Date of receipt of test item:	2016-08-25
Start of test:	2016-08-25
End of test:	2016-08-26
Person(s) present during the test:	-/-

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}	12 V – 24 V DC by external 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	:	Weighing electronic
Type identification	:	WK60-XS
HMN	:	-/-
PMN	:	WK60-XS
HVIN	:	WK60-XS
FVIN	:	-/-
S/N serial number	:	Radiated & conducted unit: 000001
HW hardware status	:	PL4610.0, PL4611.1, PL4612.2
SW software status	:	-/-
Frequency band	:	DTS band 2400 MHz to 2483.5 MHz (lowest channel 2412 MHz; highest channel 2462 MHz)
Type of radio transmission	:	DSSS, OFDM
Use of frequency spectrum	:	
Type of modulation	:	(D)BPSK, (D)QPSK, 16 – QAM, 64 – QAM
Number of channels	:	11 for 20 MHz 9 for 20 MHz
Antenna	:	2 external antennas DelockRP-SMA_88395 – omnidirectional dipole antenna with 2 dBi DelockRP-SMA_88985 – omnidirectional outdoor dipole antenna with 0.6 dBi
Power supply	:	12 V -24 V DC by external power supply
Temperature range	:	-10°C to +55°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: 1-1107/16-02-01_AnnexA
1-1107/16-02-01_AnnexB
1-1107/16-02-01_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).

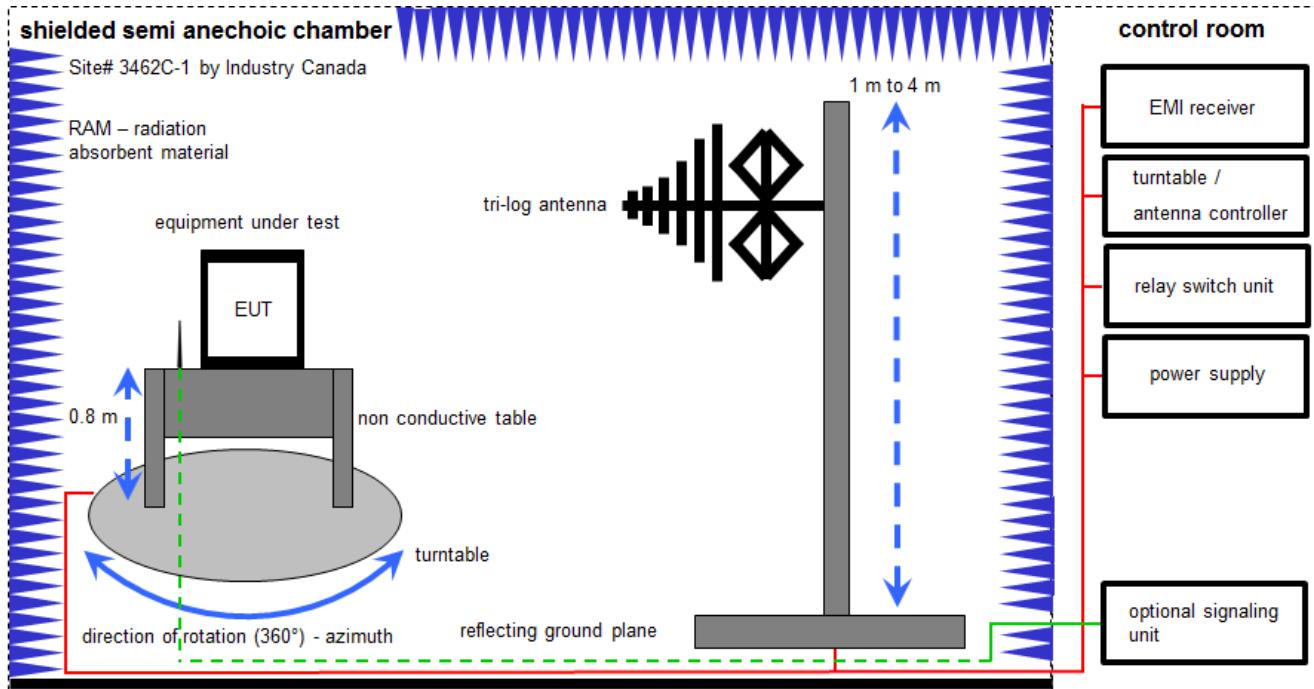
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

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	*	next calibration ordered / currently in progress
NK!	Attention: not calibrated		

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)

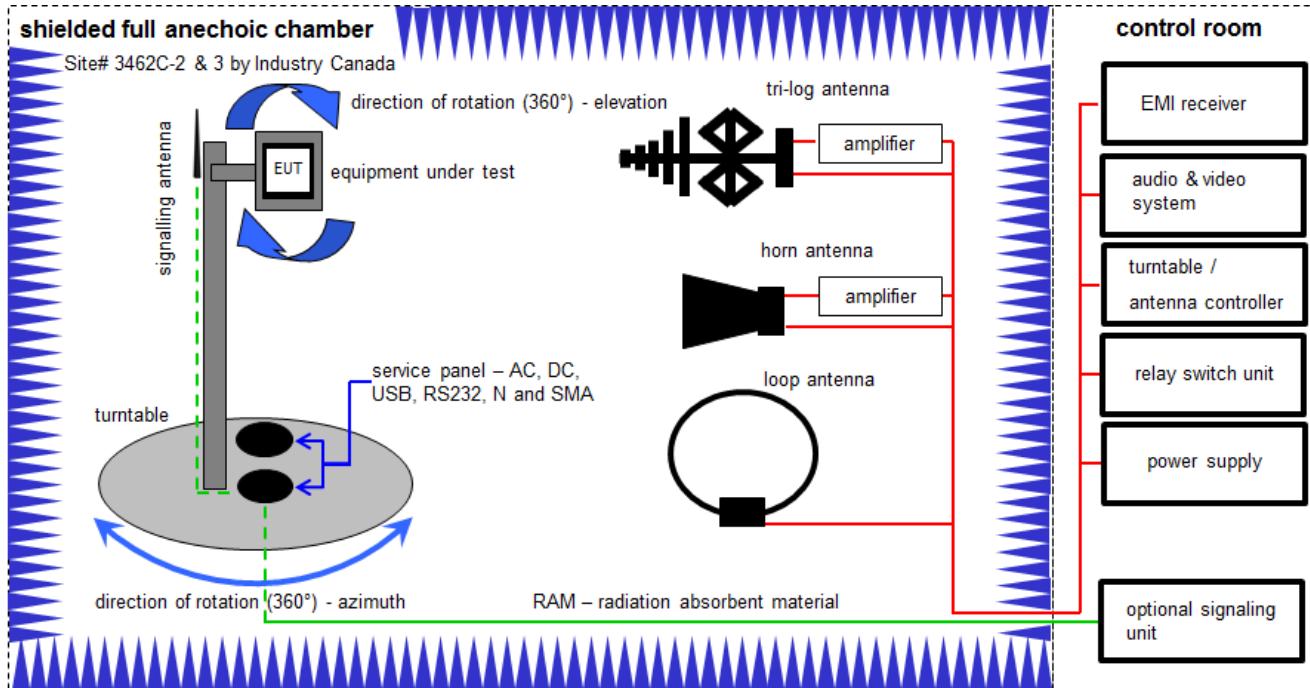
Example calculation:

$$FS [dB\mu V/m] = 12.35 [dB\mu V/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dB\mu V/m] (35.69 \mu V/m)$$

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	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
7	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)

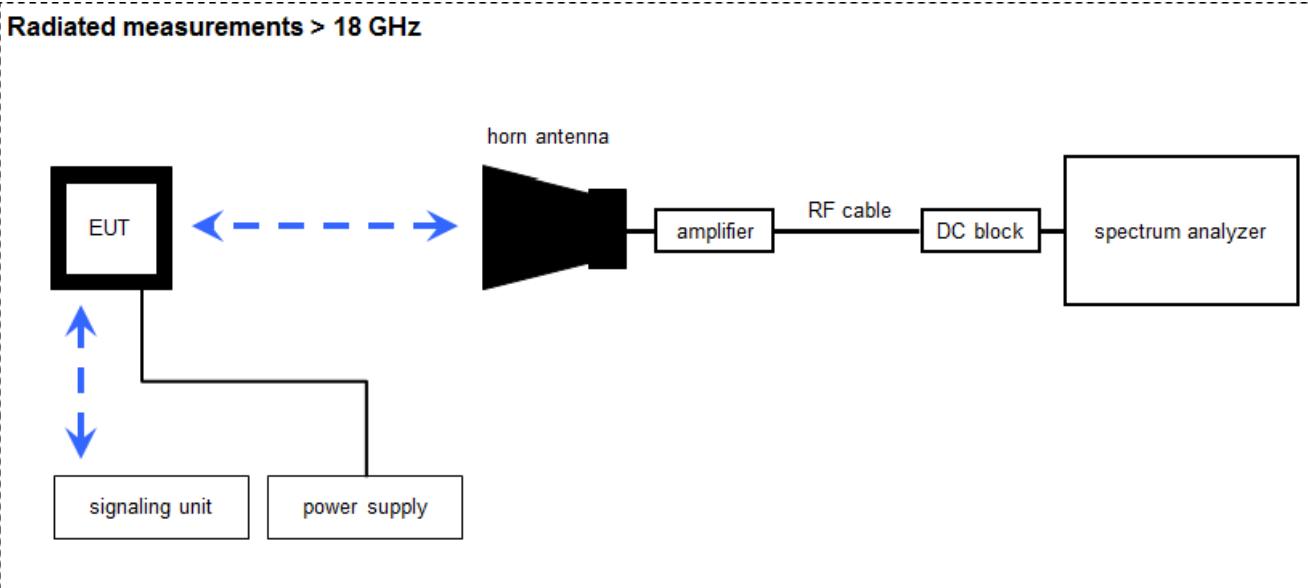
Example calculation:

$$FS [dB\mu V/m] = 40.0 [dB\mu V/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dB\mu V/m] (71.61 \mu V/m)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A, B	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP	2818A03450	300001040	Ve	20.01.2015	20.01.2018
2	B	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	20.05.2015	20.05.2017
3	A, B	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
4	A, B	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
5	A	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
6	B	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne	-/-	-/-
7	B	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev	-/-	-/-
8	B	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne	-/-	-/-
9	A, B	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
10	A, B	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

$$FS = U_R + CA + AF$$

(FS-field strength; U_R -voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:

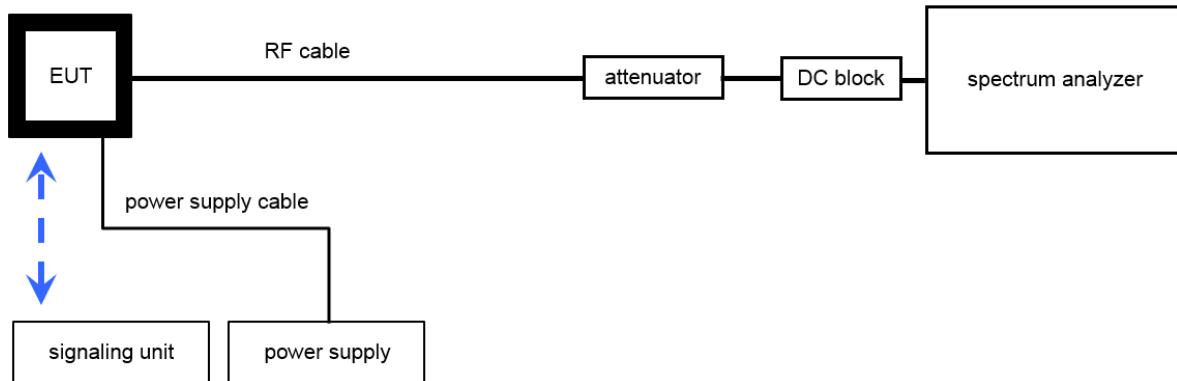
$$FS [dB\mu V/m] = 40.0 [dB\mu V/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dB\mu V/m] (6.79 \mu V/m)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Power Supply 0-20V, 0-5A	6632B	Agilent Technologies	GB42110541	400000562	vIKI!	26.01.2016	26.01.2019
2	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev	-/-	-/-
3	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-
4	A	RF-Cable	ST18/SMAm/SMm/48	Huber & Suhner	Batch no. 127377	400001183	ev	-/-	-/-
5	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	Batch no. 127377	400001185	ev	-/-	-/-
6	A	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda		300000486	k	10.09.2015	10.09.2017
7	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	21.01.2016	21.01.2017

7.4 Conducted measurements

Conducted measurements normal conditions



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

Example calculation:

$$\text{OP [dBm]} = 6.0 \text{ [dBm]} + 11.7 \text{ [dB]} = 17.7 \text{ [dBm]} (58.88 \text{ mW})$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	Batch no. 127377	400001185	ev	-/-	-/-
2	A	Switch / Control Unit	3488A	HP	2719A15013	300000151	ne	-/-	-/-
3	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	21.01.2016	21.01.2017
4	A	PC-WLAN Tester	Intel Core i3 3220/3,3 GHz, Prozessor	Agilent Technologies	2V2403033A45 23	300004589	ne	-/-	-/-
5	A	Teststand	Teststand Custom Sequence Editor	National Instruments GmbH	2V2403033A45 23	300004590	ne	-/-	-/-
6	A	Power Sensor	NRP-Z81	R&S	100010	300003780	k	25.01.2016	25.01.2017
7	A	RF-Cable	ST18/SMAm/SMAm/ 60	Huber & Suhner	Batch no. 606844	400001181	ev	-/-	-/-
8	A	Coax Attenuator 10 dB 2W 0-40 GHz	MCL BW-K10-2W44+	Mini Circuits	Batch no. 606844	400001186	ev	-/-	-/-

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.

Premereasurement

- 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 $\pm 45^\circ$ 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.

Premereasurement

- 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.

Premereasurement

- 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
Power spectral density	± 1.5 dB
DTS bandwidth	± 100 kHz (depends on the used RBW)
Occupied bandwidth	± 100 kHz (depends on the used RBW)
Maximum output power	± 1.5 dB
Detailed spurious emissions @ the band edge - conducted	± 1.5 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

<input checked="" type="checkbox"/>	No deviations from the technical specifications were ascertained
<input type="checkbox"/>	There were deviations from the technical specifications ascertained
<input type="checkbox"/>	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!	2016-10-07	-/-

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)	Antenna gain	-/-	Nominal	Nominal	DSSS			-/-		-/-
RSS - 247 / 6.0	Duty cycle	-/-	Nominal	Nominal	DSSS OFDM			-/-		-/-
§15.247(e) RSS - 247 / 5.2 (2)	Power spectral density	KDB 558074 DTS clause: 10.2	Nominal	Nominal	DSSS OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(a)(2) RSS - 247 / 5.2 (1)	DTS bandwidth	KDB 558074 DTS clause: 8.1	Nominal	Nominal	DSSS OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
RSS Gen clause 4.6.1	Occupied bandwidth	-/-	Nominal	Nominal	DSSS OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(b)(3) RSS - 247 / 5.4 (4)	Maximum output power	KDB 558074 DTS clause: 9.1.2	Nominal	Nominal	DSSS OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(d) RSS - 247 / 5.5	Detailed spurious emissions @ the band edge - conducted	-/-	Nominal	Nominal	DSSS OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.205 RSS - 247 / 5.5 RSS - Gen	Band edge compliance conducted and radiated	KDB 558074 DTS clause: 13.3.2 and clause 12.2.2	Nominal	Nominal	DSSS OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(d) RSS - 247 / 5.5	TX spurious emissions conducted	KDB 558074 DTS clause: 11.1 & 11.2 11.3	Nominal	Nominal	DSSS OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.209(a) RSS-Gen	TX spurious emissions radiated below 30 MHz	-/-	Nominal	Nominal	DSSS OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(d) RSS - 247 / 5.5 RSS-Gen	TX spurious emissions radiated 30 MHz to 1 GHz	-/-	Nominal	Nominal	DSSS OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.247(d) RSS - 247 / 5.5 RSS-Gen	TX spurious emissions radiated above 1 GHz	-/-	Nominal	Nominal	DSSS OFDM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.109 RSS-Gen	RX spurious emissions radiated 30 MHz to 1 GHz	-/-	Nominal	Nominal	RX / idle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.109 RSS-Gen	RX spurious emissions radiated above 1 GHz	-/-	Nominal	Nominal	RX / idle	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.107(a) §15.207	Conducted emissions < 30 MHz	-/-	Nominal	Nominal	DSSS OFDM	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	External powered by battery

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

11 Additional comments

Reference documents: CustomerQuestionnaireCETECOM_WK60XS

DelockRP-SMA_88395

DelockRP-SMA_88985

Kurzanleitung WK60XS Funktests

Special test descriptions: DSSS – mode tested with power setting 18

OFDM – modes tested with power setting 13

Configuration descriptions: None

- Test mode:
- No test mode available.
Iperf was used to ping another device with the largest support packet size
- 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 Antenna gain

Limits:

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

Results: antenna 1 - omnidirectional dipole antenna

T _{nom}	V _{nom}	DTS band 2400 MHz to 2483.5 MHz
Gain [dBi] Declared		2.0

Results: antenna 2 - omnidirectional outdoor dipole antenna with antenna cable

T _{nom}	V _{nom}	DTS band 2400 MHz to 2483.5 MHz
Gain [dBi] Declared		0.6

Datasheet 1: DelockRP-SMA_88395 - antenna 1 - omnidirectional dipole antenna**Delock WLAN 802.11 ac/a/b/g/n Antenne RP-SMA Stecker 2 dBi
omnidirektional mit Kippgelenk schwarz****Kurzbeschreibung**

Diese WLAN Antenne kann an ein WLAN Gerät mit RP-SMA Anschluss angeschlossen werden, um Signale zu empfangen und zu senden.

**Spezifikation**

- Anschlüsse: RP-SMA Stecker
- Frequenzbereich:
2,400 - 2,500 GHz
5,150 - 5,875 GHz
- Antennengewinn: 2 dBi
- Impedanz: 50 Ohm
- Polarisation: linear, vertikal
- VSWR: 2,0
- Betriebstemperatur: -10 °C ~ 55 °C
- Gehäusematerial: ABS
- Farbe: schwarz
- Länge:
ca. 111,70 mm (mit Kippgelenk)
ca. 83,40 mm (ohne Kippgelenk)
- Durchmesser:
ca. 7,80 mm (Spitze)
ca. 10,00 mm (RP-SMA)

Artikel-Nr. 88395

EAN: 4043619883950

Ursprungsland: Taiwan, Republic of China

Verpackung: Retail Box

Systemvoraussetzungen

- Gerät mit einer freien RP-SMA Buchse

Packungsinhalt

- WLAN Antenne

Datasheet 2: DelockRP-SMA_88985 - antenna 2 - omnidirectional outdoor dipole antenna with cable

Delock WLAN Antenne RP-SMA 802.11 ac/a/h/b/g/n 2 dBi omnidirektional weiß Outdoor

Kurzbeschreibung

Diese WLAN Antenne können Sie an Ihr WLAN Gerät mit RP-SMA Anschluss anschließen, um Signale zu senden und zu empfangen.



Spezifikation

- WLAN Antenne extern
- Schraubmontage mit 13 mm Bohrung
- RP-SMA Stecker
- Frequenzbereich:
 - 2.400 ~ 2.500 GHz
 - 5.150 ~ 5.875 GHz
- Antennengewinn:
 - 1.4 dBi @ 2.500GHz
 - 3.0 dBi @ 5.825GHz
- VSWR: 2.0 : 1 ~ 2.5 : 1 max.
- Kabellänge: 1 m
- Kabeltyp: ULA 100 Koax
- Kabdämpfung:
 - 1.40 dB@2,500 GHz
 - 2.30 dB@5,875 GHz
- Betriebstemperaturbereich: -10°C ~ 50°
- Schutzklasse: IP67
- Maße (L): 77 mm
- Durchmesser: 45 mm max.

Artikel-Nr. 88985

EAN: 40436198889853

Ursprungsland: Taiwan, Republic of China

Verpackung: Poly Bag

Systemvoraussetzungen

- Gerät mit RP-SMA Anschluss

Packungsinhalt

- WLAN Antenne
- Befestigungsmutter

12.2 Identify worst case data rate

Measurement:

All modes of the module will be measured with an average power meter or spectrum analyzer to identify the maximum transmission power.

In further tests only the identified worst case modulation scheme or bandwidth will be measured and this mode is used as representative mode for all other modulation schemes.

Additional the band edge compliance test will be performed in the lowest and highest modulation scheme.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 MHz
Video bandwidth:	3 MHz
Trace mode:	Max hold
Test setup:	See sub clause 7.4 – A
Measurement uncertainty:	-/-

Results:

Modulation	Modulation scheme / bandwidth
DSSS / b – mode	1 Mbit/s
OFDM / g – mode	6 Mbit/s
OFDM / n HT20 – mode	MCS0
OFDM / n HT40 – mode	MCS0

12.3 Maximum output power

Description:

Measurement of the maximum output power conducted and radiated. The measurements are performed using the data rate producing the highest conducted output power.

Measurement:

Measurement parameter	
According to DTS clause: 9.1.2	
Peak power meter	
Test setup:	See sub clause 7.4 – A
Measurement uncertainty	See sub clause 9

Limits:

FCC	IC
Conducted: 1.0 W – Antenna gain with max. 6 dBi	

Results:

Frequency	Maximum Output Power [dBm]		
	2412 MHz	2437 MHz	2462 MHz
Output power conducted DSSS / b – mode	18.1	19.7	19.7
Output power conducted OFDM / g – mode	20.8	20.9	20.8
Output power conducted OFDM / n HT20 – mode	20.4	20.3	20.3
Frequency	2422 MHz	2437 MHz	2452 MHz
Output power conducted OFDM / n HT40 – mode	20.4	20.8	20.6

12.4 Duty cycle

Measurement:

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Depends on the signal see plot
Resolution bandwidth:	10 MHz
Video bandwidth:	10 MHz
Trace mode:	Max hold
Test setup:	See sub clause 7.4 – A
Measurement uncertainty:	See sub clause 9

Limits:

FCC	IC
-/-	-/-

Results:

T _{nom}	V _{nom}	lowest channel 2412 MHz	middle channel 2437 MHz	highest channel 2462 MHz
DSSS / b – mode		100 % / 0.00 dB	100 % / 0.00 dB	100 % / 0.00 dB
OFDM / g – mode		100 % / 0.00 dB	100 % / 0.00 dB	100 % / 0.00 dB
OFDM / n HT20 – mode		100 % / 0.00 dB	100 % / 0.00 dB	100 % / 0.00 dB
T _{nom}	V _{nom}	lowest channel 2422 MHz	middle channel 2437 MHz	highest channel 2452 MHz
OFDM / n HT40 – mode		100 % / 0.00 dB	100 % / 0.00 dB	100 % / 0.00 dB

12.5 Peak power spectral density

Description:

Measurement of the power spectral density of a digital modulated system. The measurement is repeated for both modulations at the lowest, middle and highest channel.

Measurement:

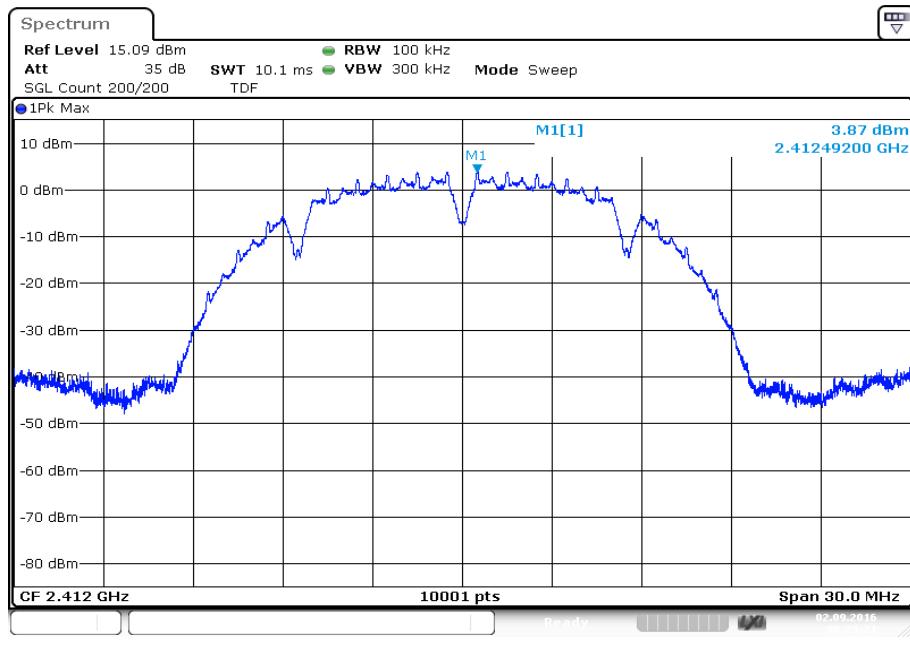
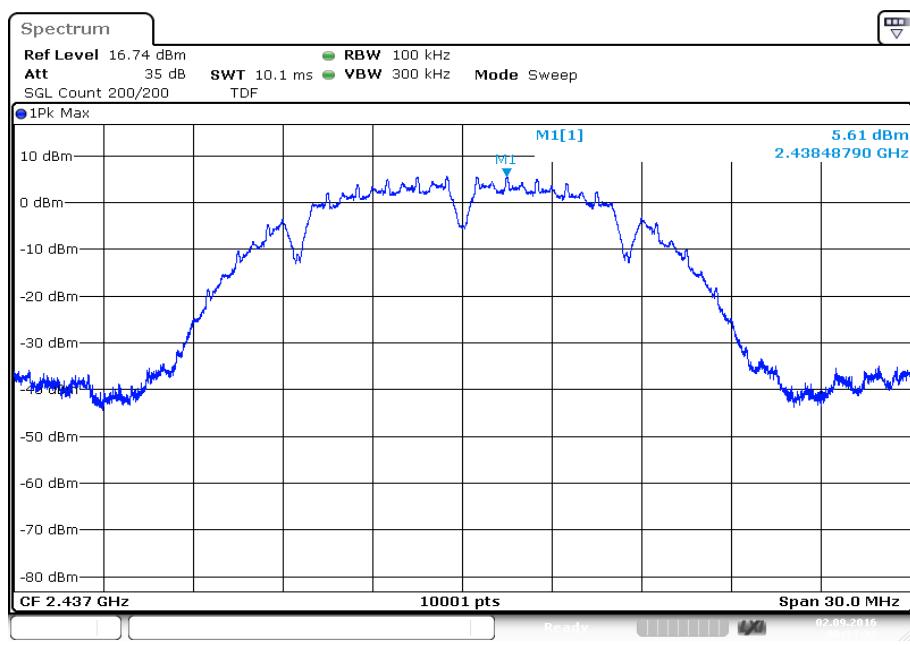
Measurement parameter	
According to DTS clause: 10.2	
Detector:	Positive Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	30 MHz
Trace mode:	Max hold (allow trace to fully stabilize)
Test setup:	See sub clause 7.4 – A
Measurement uncertainty	See sub clause 9

Limits:

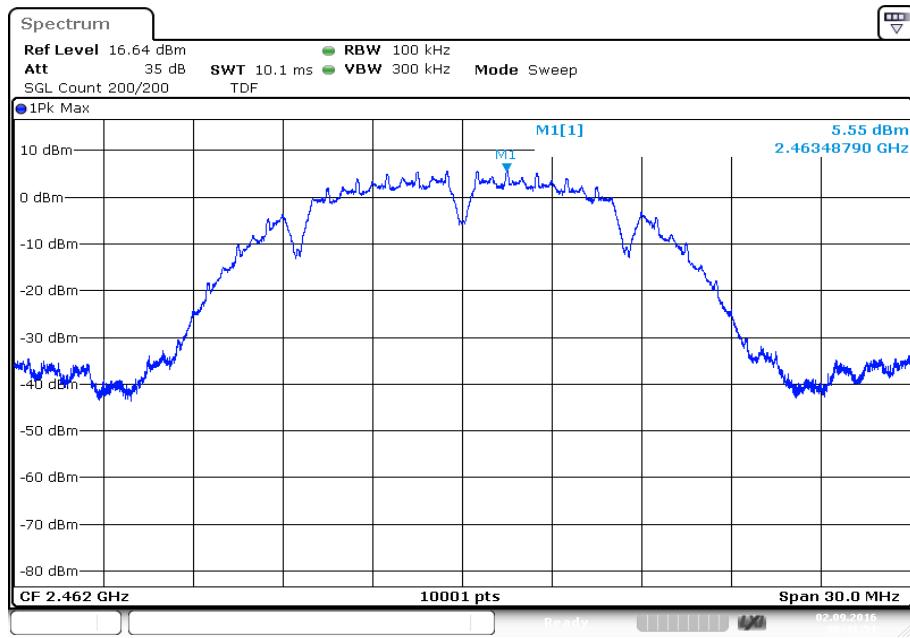
FCC	IC
8 dBm / 3kHz (conducted)	

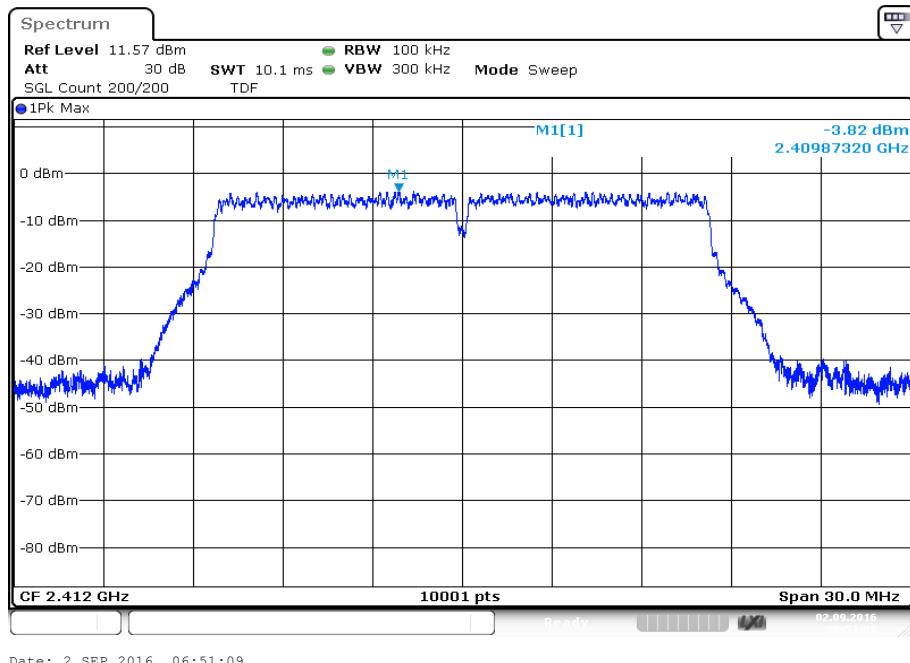
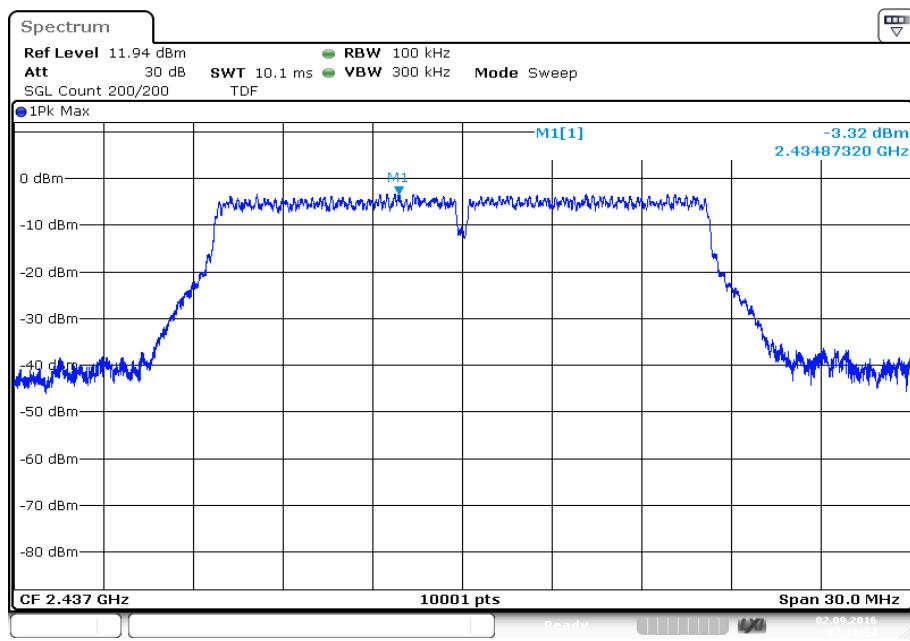
Results:

Modulation	Peak power spectral density [dBm] @ 100 kHz		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	3.87	5.61	5.55
OFDM / g – mode	-3.82	-3.32	-3.12
OFDM / n HT20 – mode	-3.12	-2.95	-2.80
Frequency	2422 MHz	2437 MHz	2452 MHz
OFDM / n HT40 – mode	-7.15	-6.13	-6.28

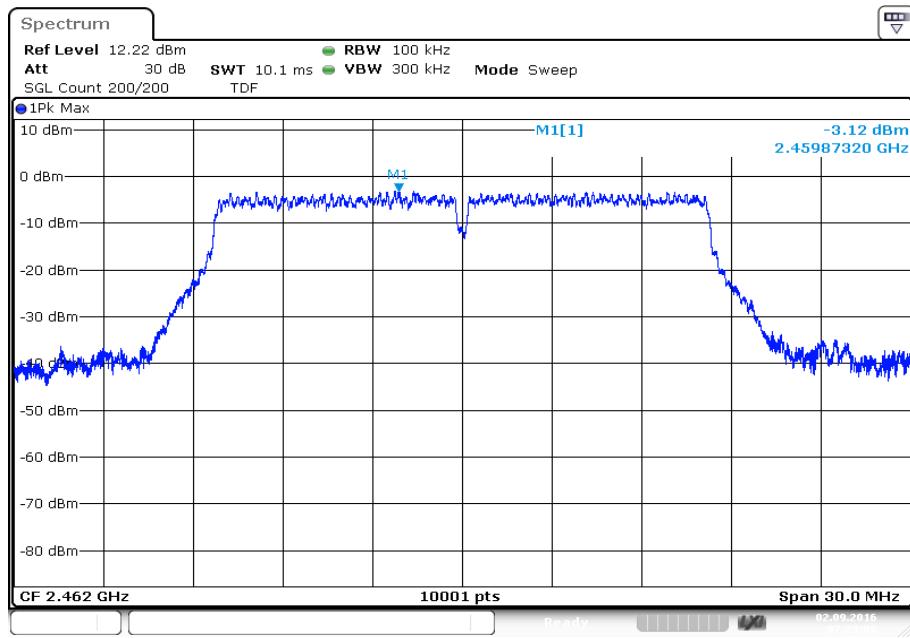
Plots: DSSS / b – mode**Plot 1: Lowest channel****Plot 2: Middle channel**

Plot 3: Highest channel

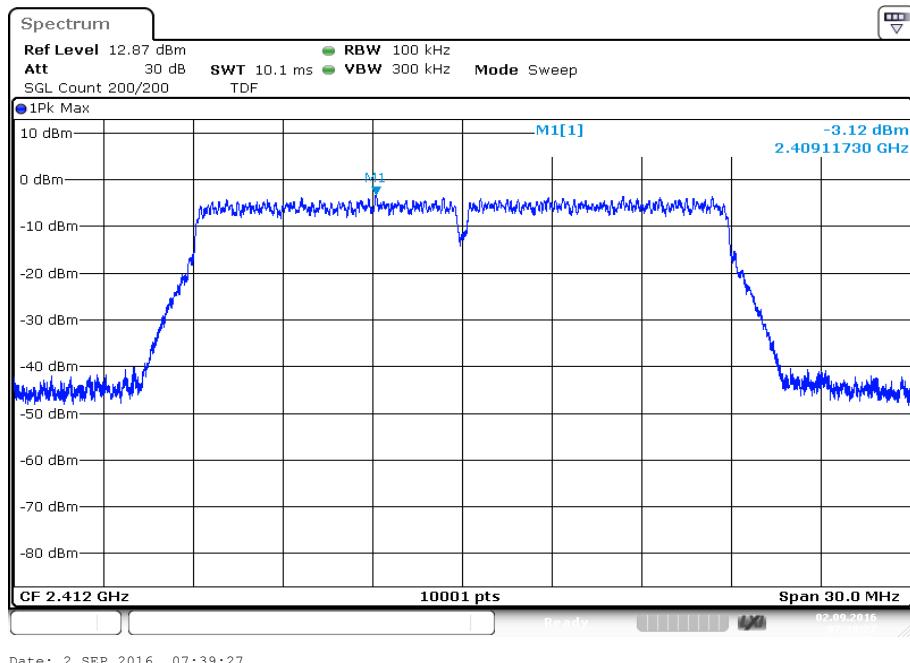
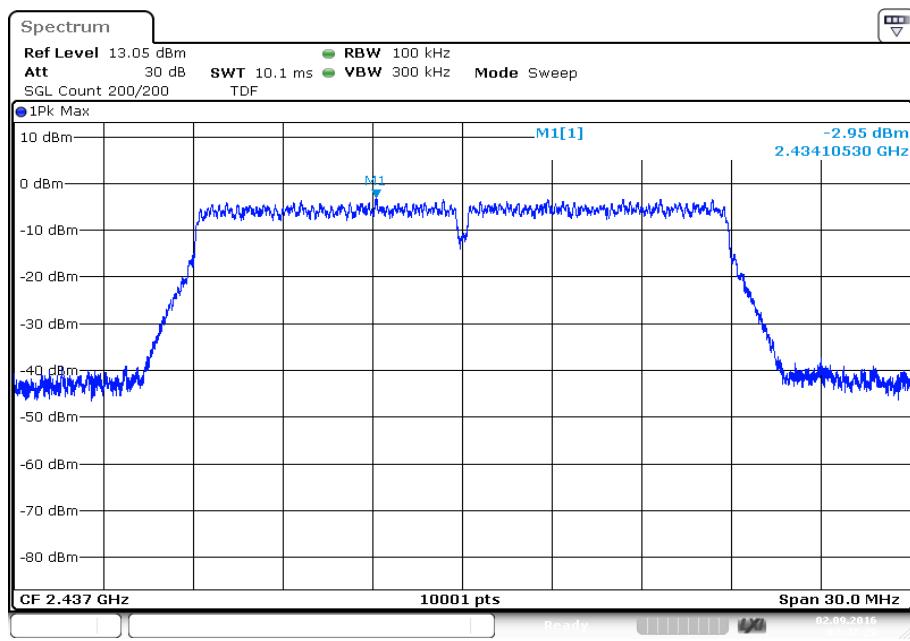


Plots: OFDM / g – mode**Plot 1: Lowest channel****Plot 2: Middle channel**

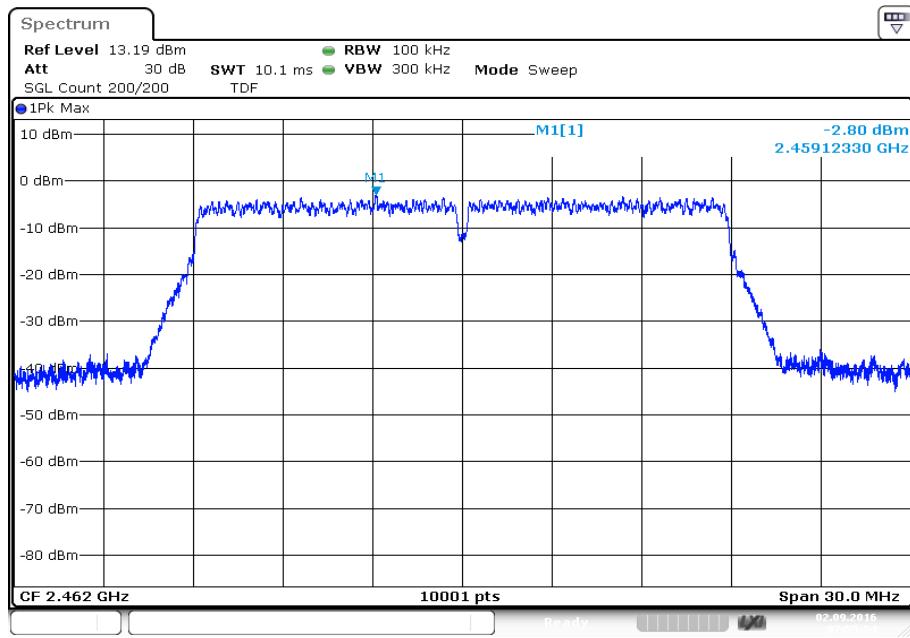
Plot 3: Highest channel

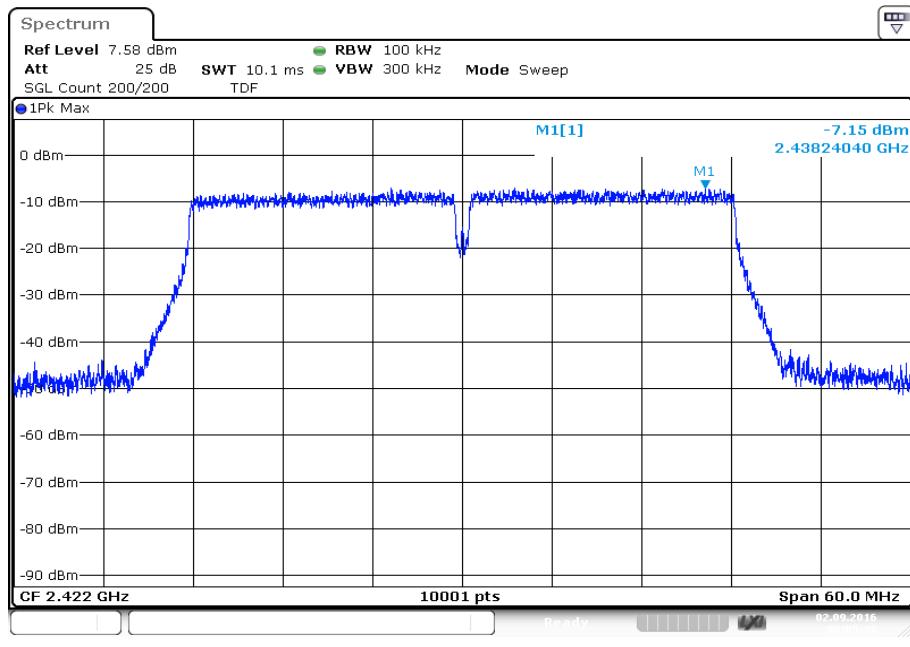
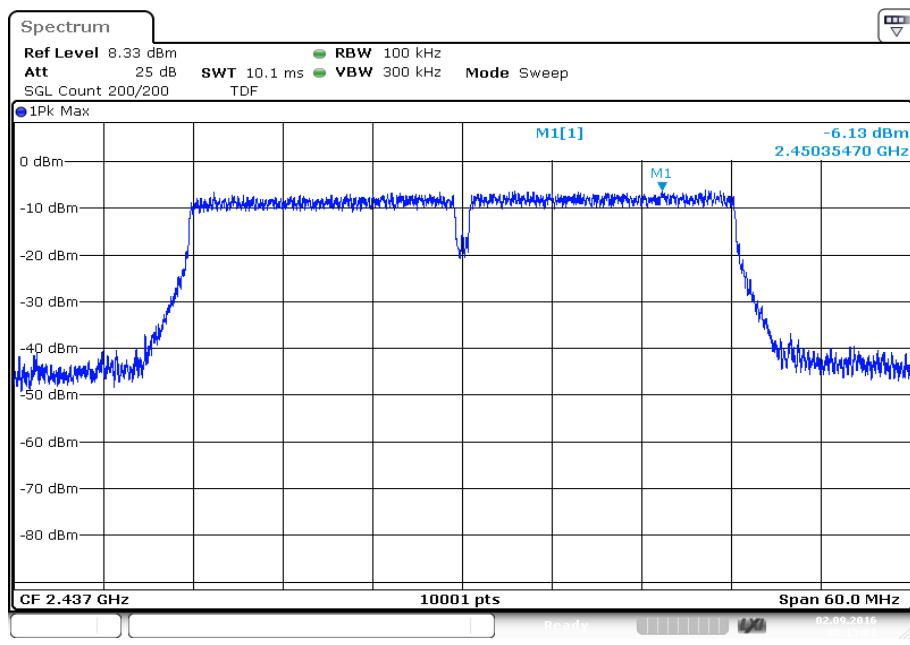


Date: 2.SEP.2016 07:23:08

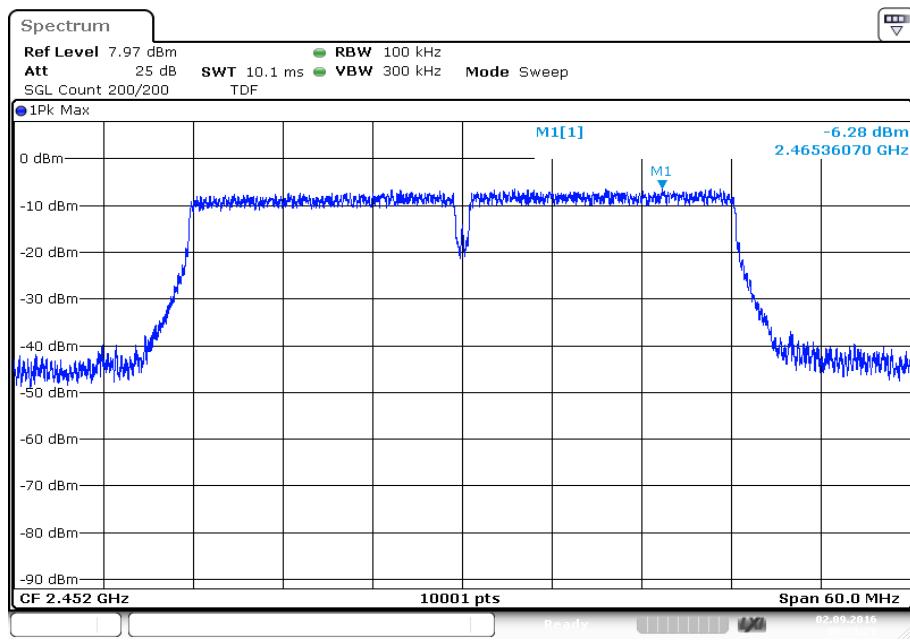
Plots: OFDM / n HT20 – mode**Plot 1: Lowest channel****Plot 2: Middle channel**

Plot 3: Highest channel



Plots: OFDM / n HT40 – mode**Plot 1: Lowest channel****Plot 2: Middle channel**

Plot 3: Highest channel



12.6 6 dB DTS bandwidth

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

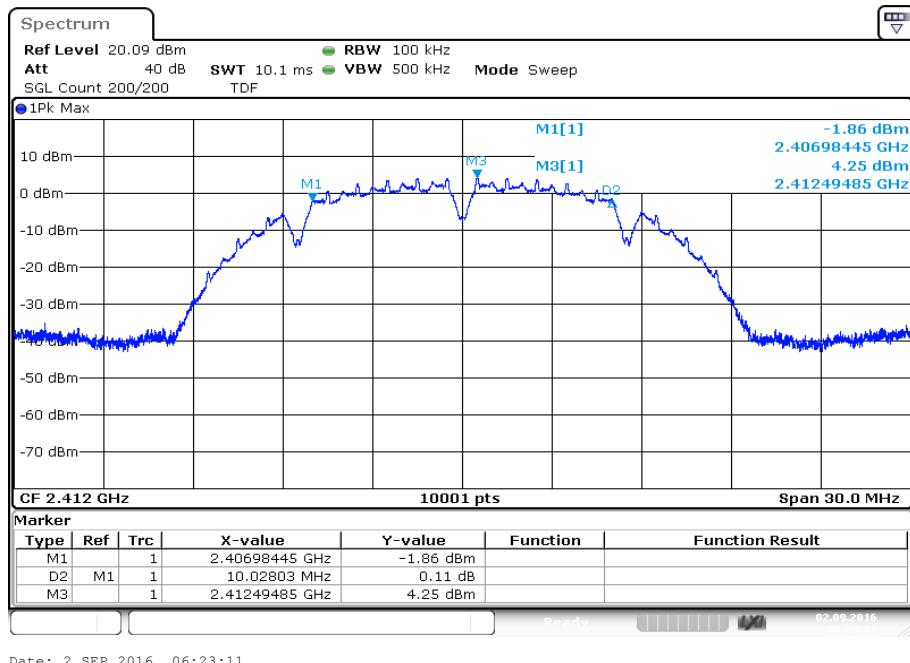
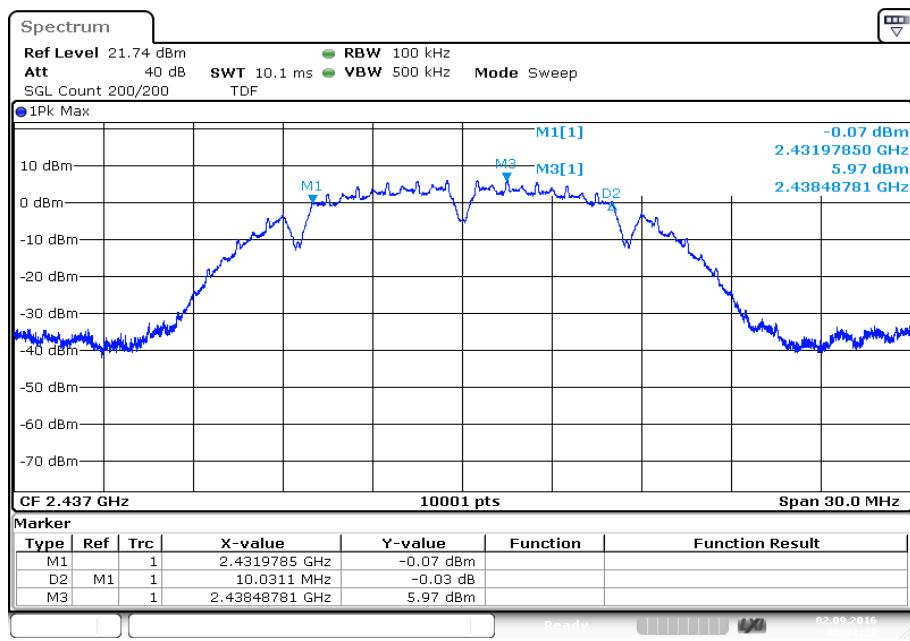
Measurement parameter	
According to DTS clause: 8.1	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	30 MHz / 50 MHz
Measurement procedure:	Measurement of the 75% bandwidth using the integration function of the analyzer
Trace mode:	Single count with 200 counts
Test setup:	See sub clause 7.4 – A
Measurement uncertainty	See sub clause 9

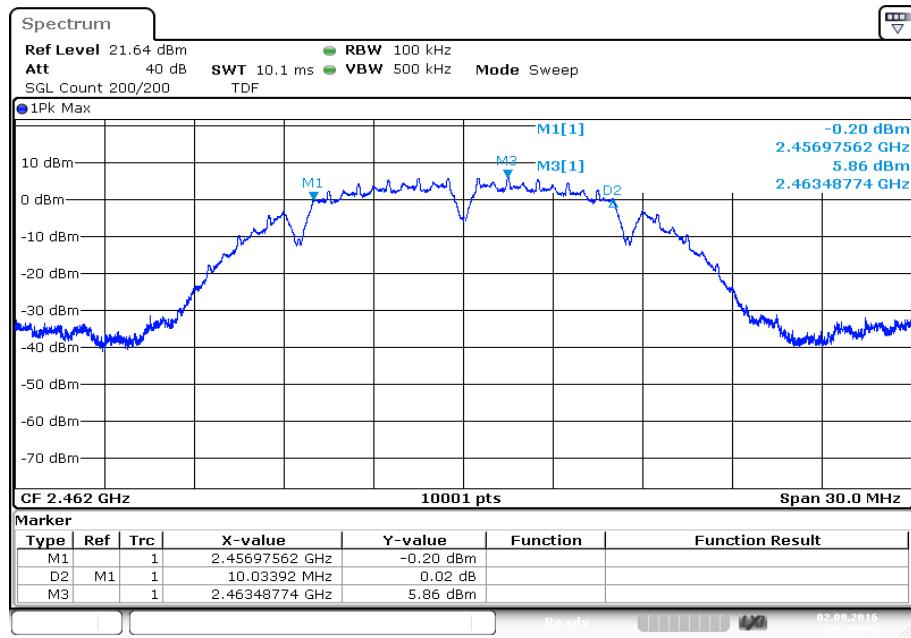
Limits:

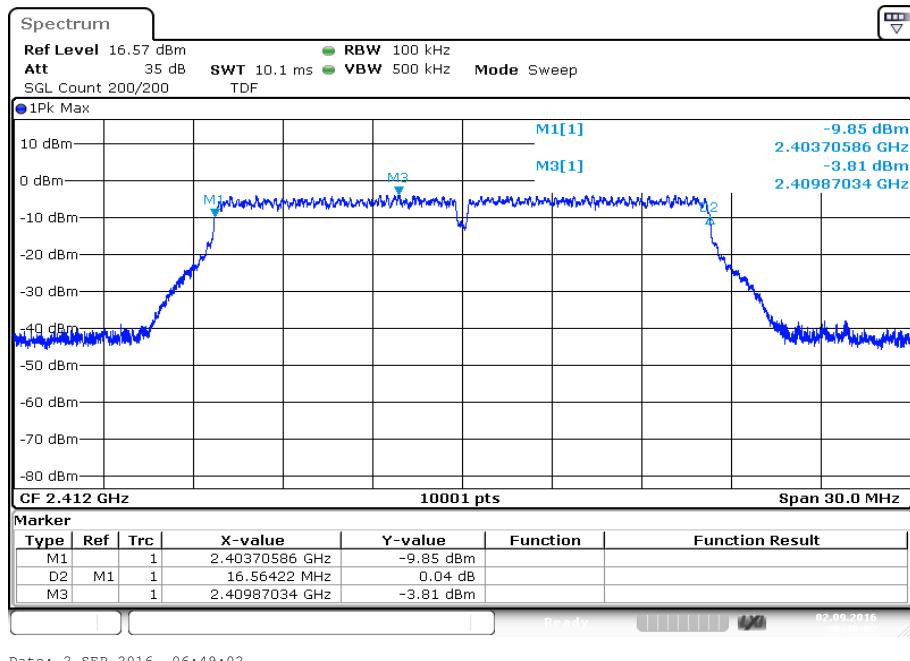
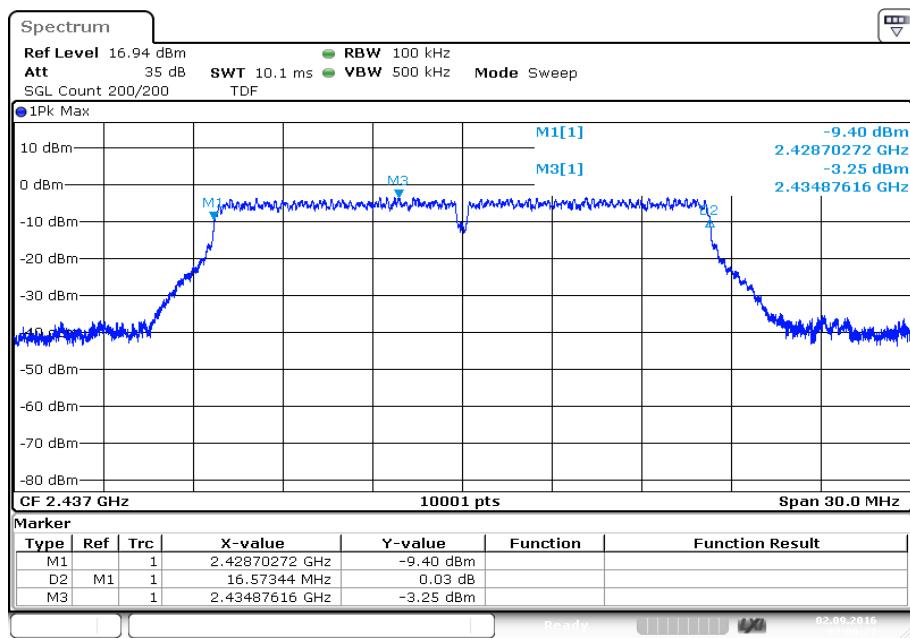
FCC	IC
Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.	

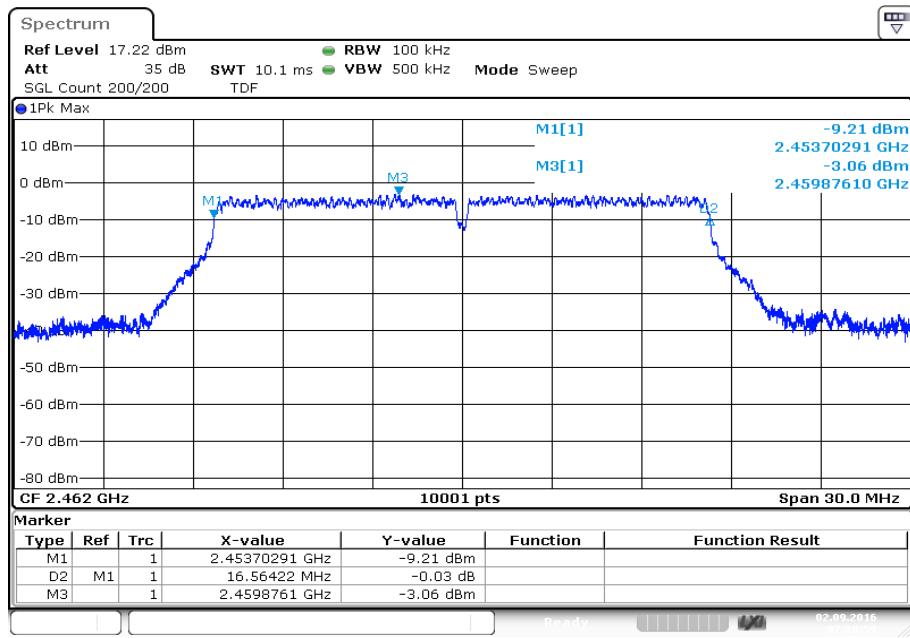
Results:

Frequency	6 dB DTS bandwidth [kHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	10028	10031	10034
OFDM / g – mode	16564	16573	16564
OFDM / n HT20 – mode	17800	17800	17803
Frequency	2422 MHz	2437 MHz	2452 MHz
OFDM / n HT40 – mode	36554	36518	36.548

Plots: DSSS / b – mode**Plot 1: Lowest channel****Plot 2: Middle channel**

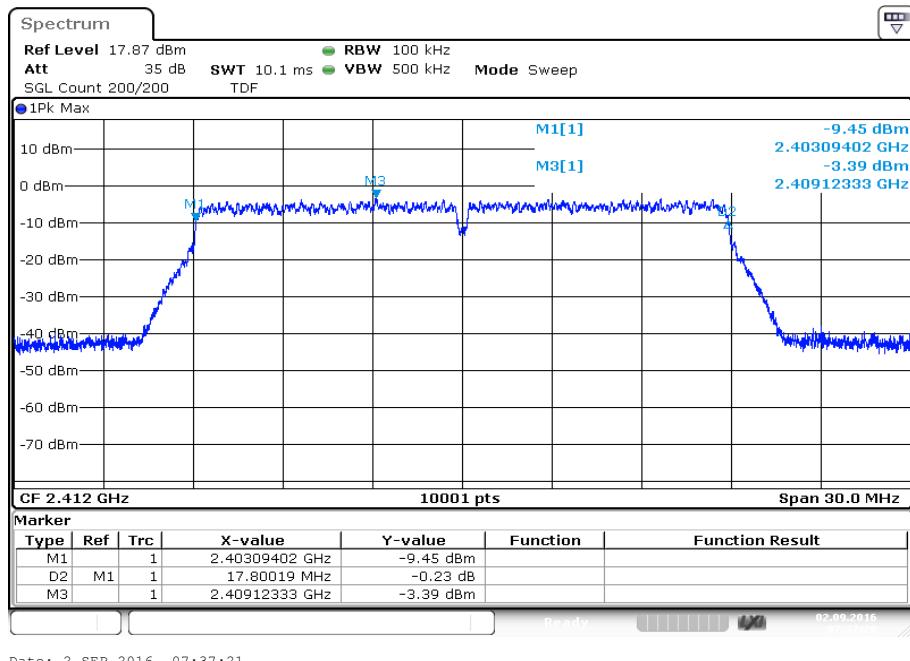
Plot 3: Highest channel

Plots: OFDM / g – mode**Plot 1: Lowest channel****Plot 2: Middle channel**

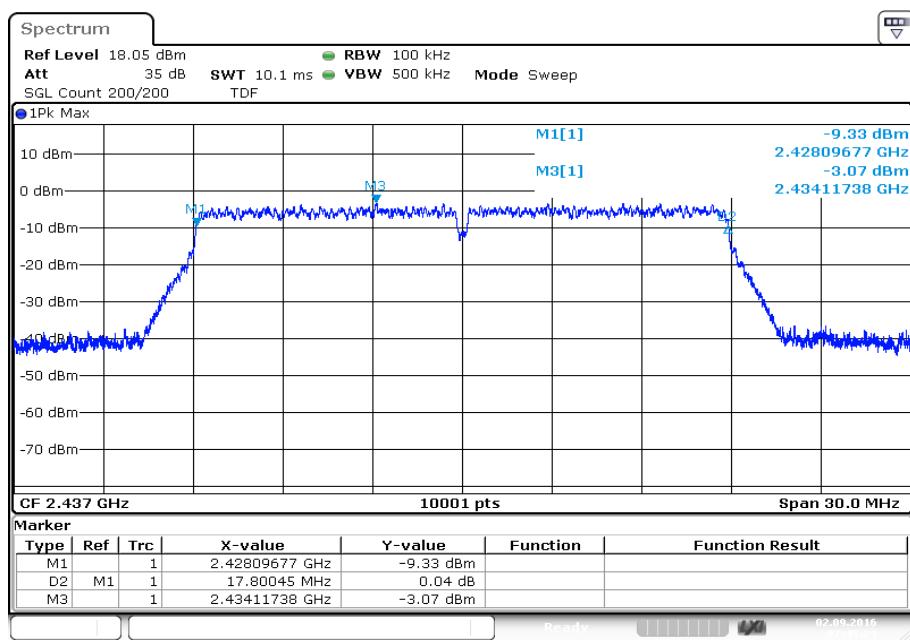
Plot 3: Highest channel

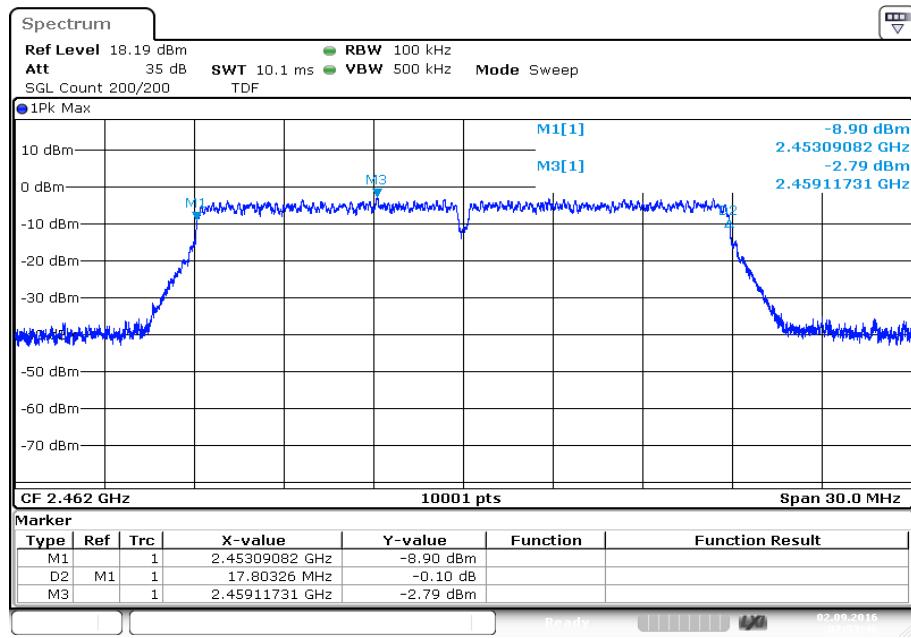
Plots: OFDM / n HT20 – mode

Plot 1: Lowest channel



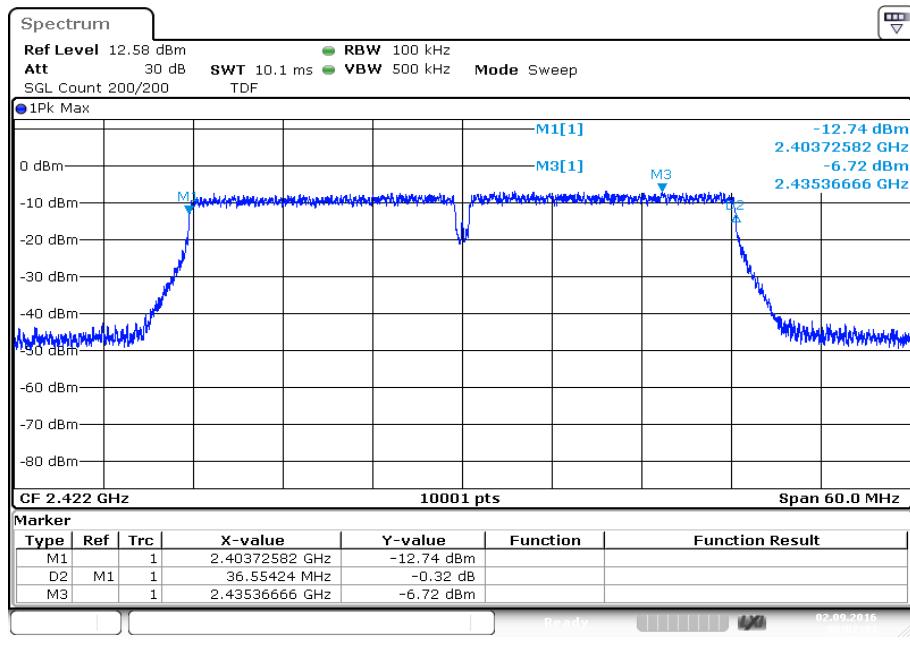
Plot 2: Middle channel



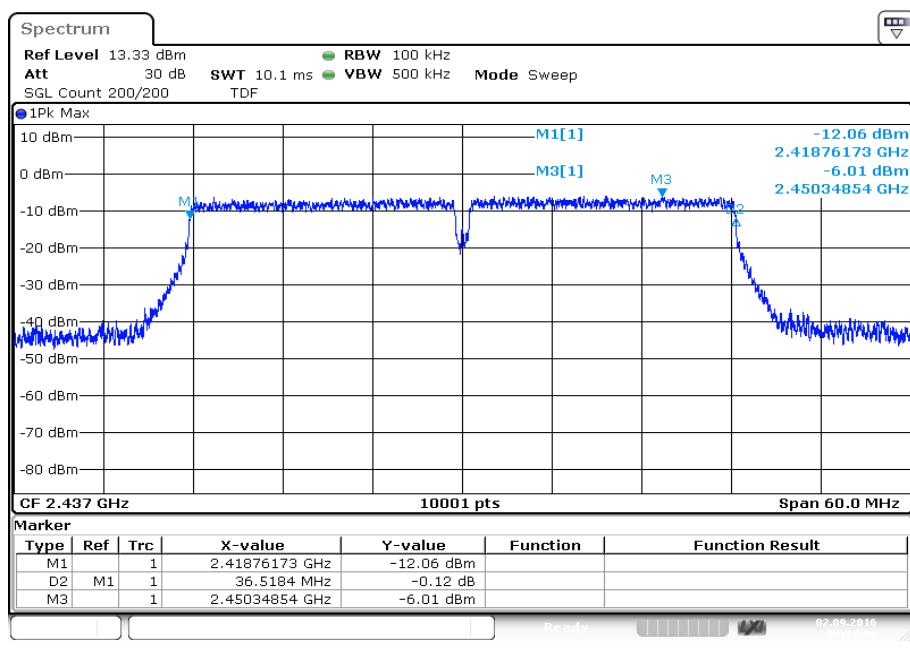
Plot 3: Highest channel

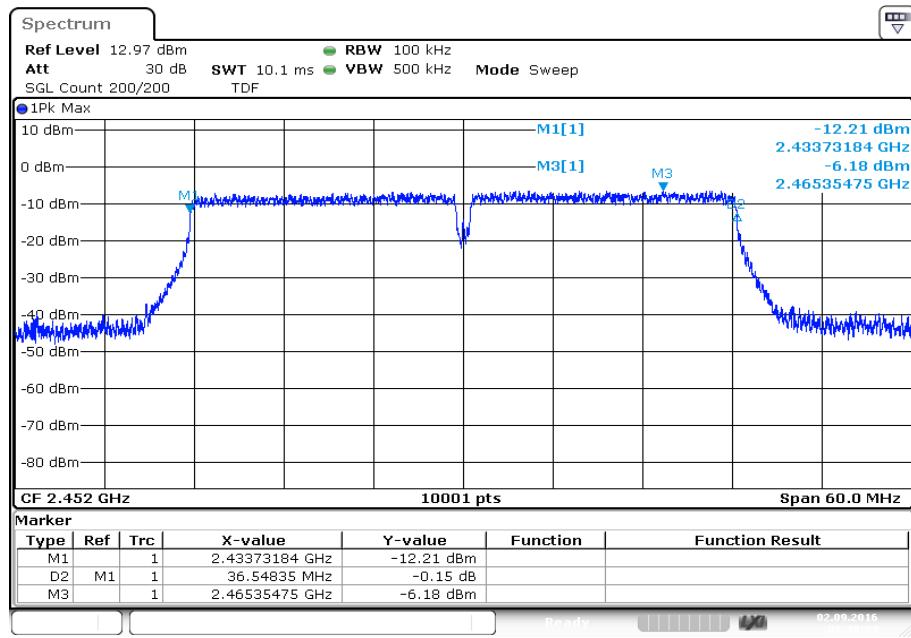
Plots: OFDM / n HT40 – mode

Plot 1: Lowest channel



Plot 2: Middle channel



Plot 3: Highest channel

12.7 Occupied bandwidth – 99% emission bandwidth

Description:

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

Measurement:

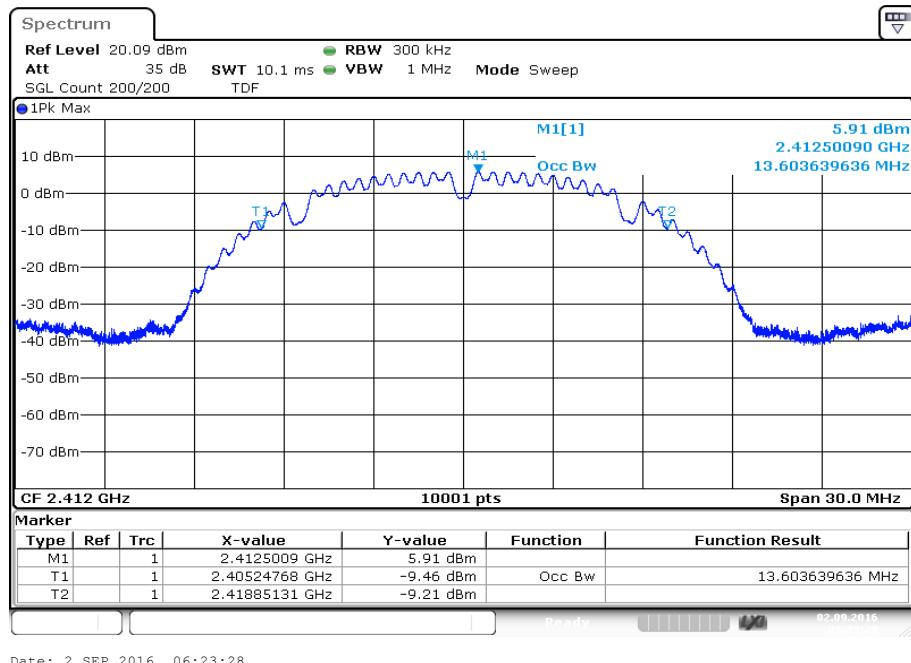
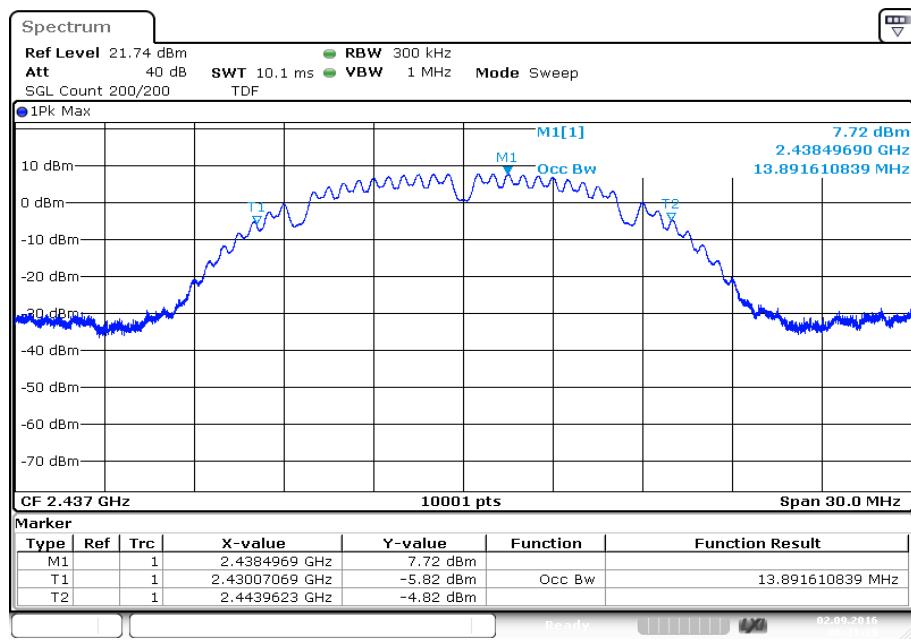
Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	300 kHz
Video bandwidth:	1 MHz
Span:	30 MHz / 50 MHz
Measurement procedure:	Measurement of the 99% bandwidth using the integration function of the analyzer
Trace mode:	Single count with 200 counts
Test setup:	See sub clause 7.4 – A
Measurement uncertainty	See sub clause 9

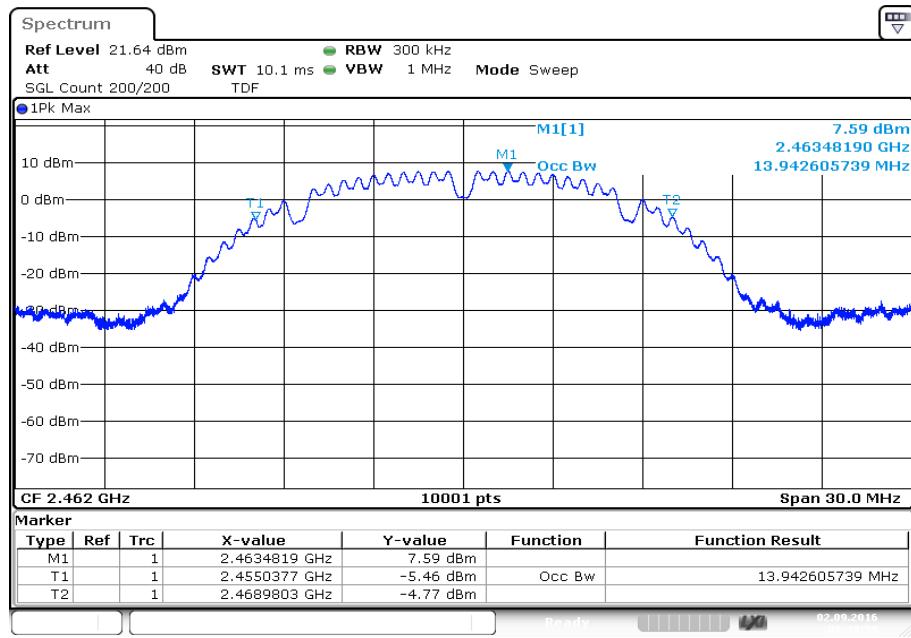
Usage:

-/-	IC
OBW is necessary for Emission Designator	

Results:

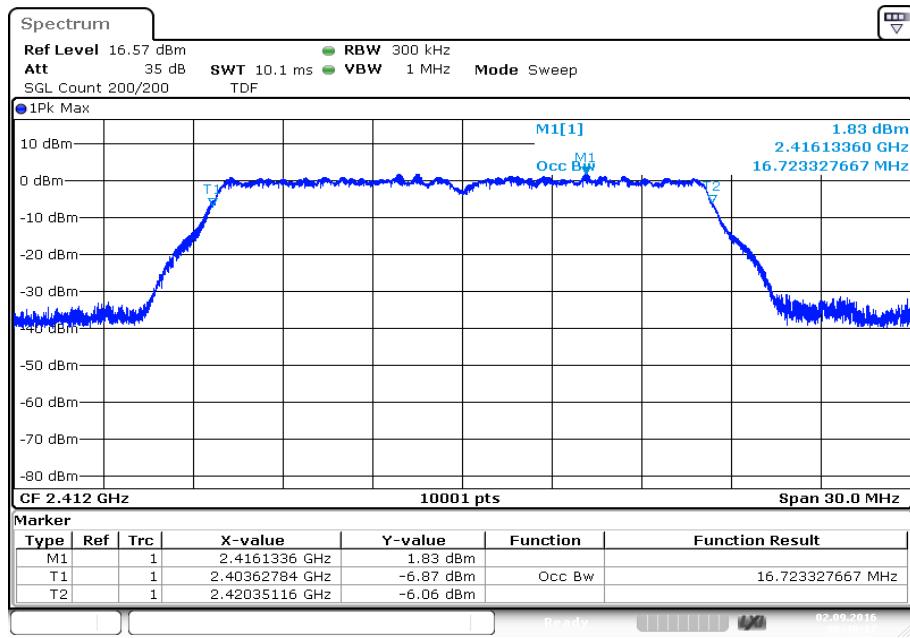
Modulation	99% bandwidth [kHz]		
	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode	13604	13892	13943
OFDM / g – mode	16723	16732	16732
OFDM / n HT20 – mode	17848	17848	17854
Frequency	2422 MHz	2437 MHz	2452 MHz
OFDM / n HT40 – mode	36746	36770	36752

Plots: DSSS / b – mode**Plot 1: Lowest channel****Plot 2: Middle channel**

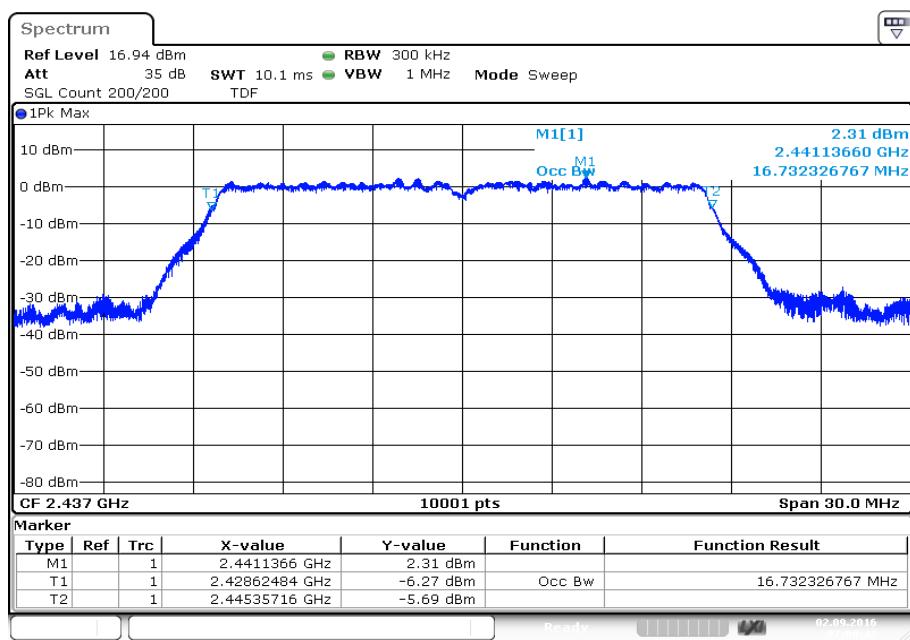
Plot 3: Highest channel

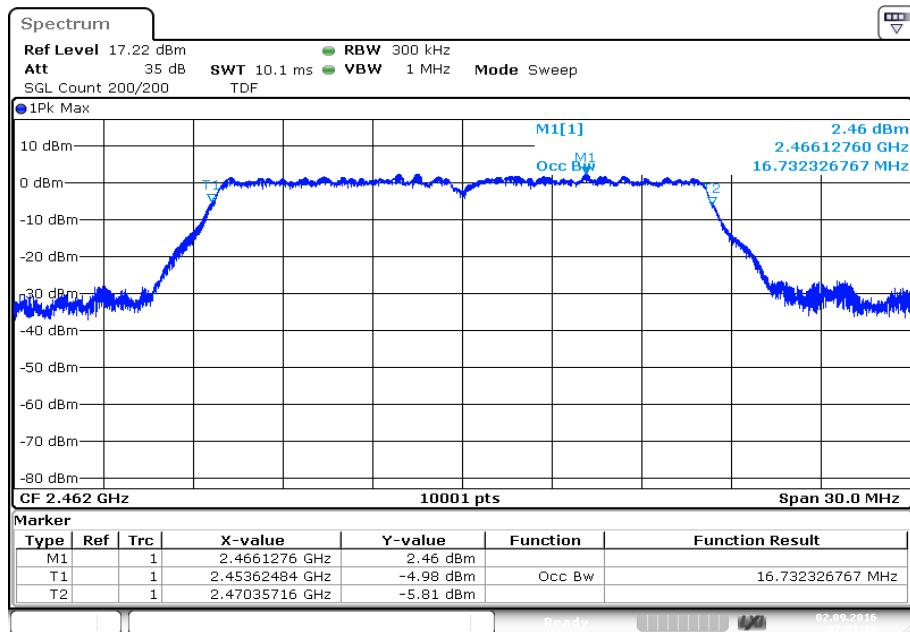
Plots: OFDM / g – mode

Plot 1: Lowest channel



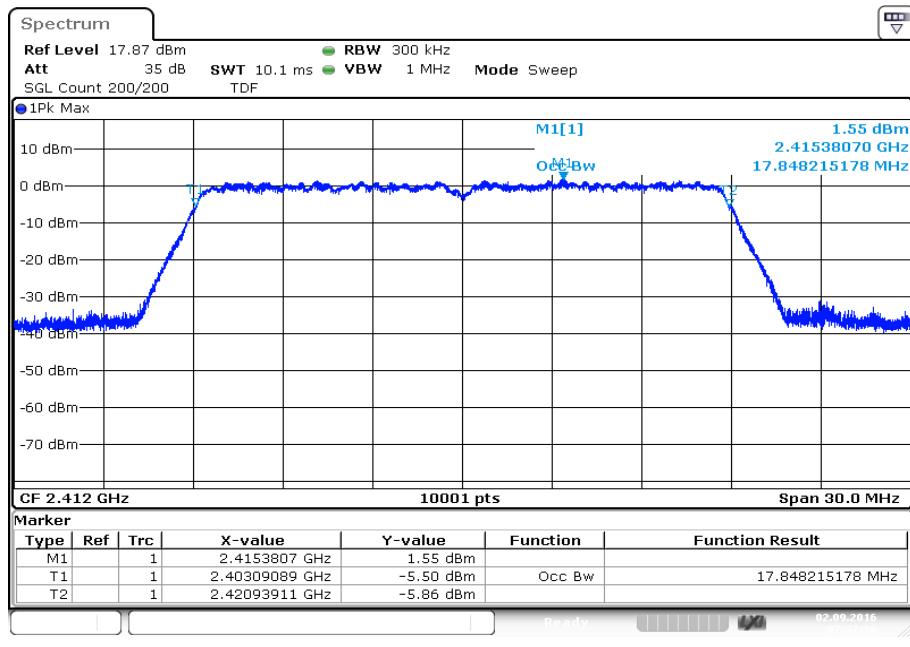
Plot 2: Middle channel



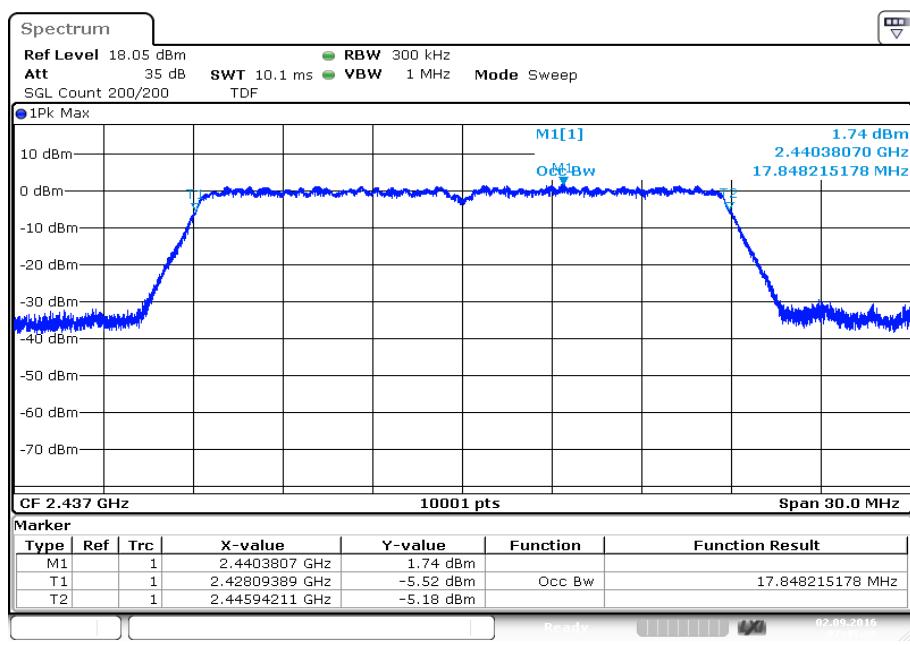
Plot 3: Highest channel

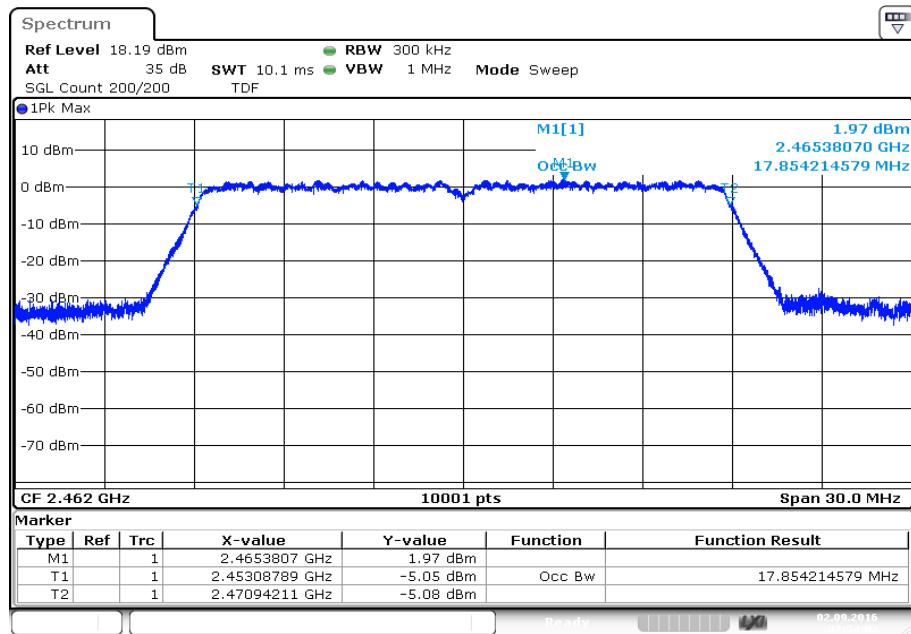
Plots: OFDM / n HT20 – mode

Plot 1: Lowest channel

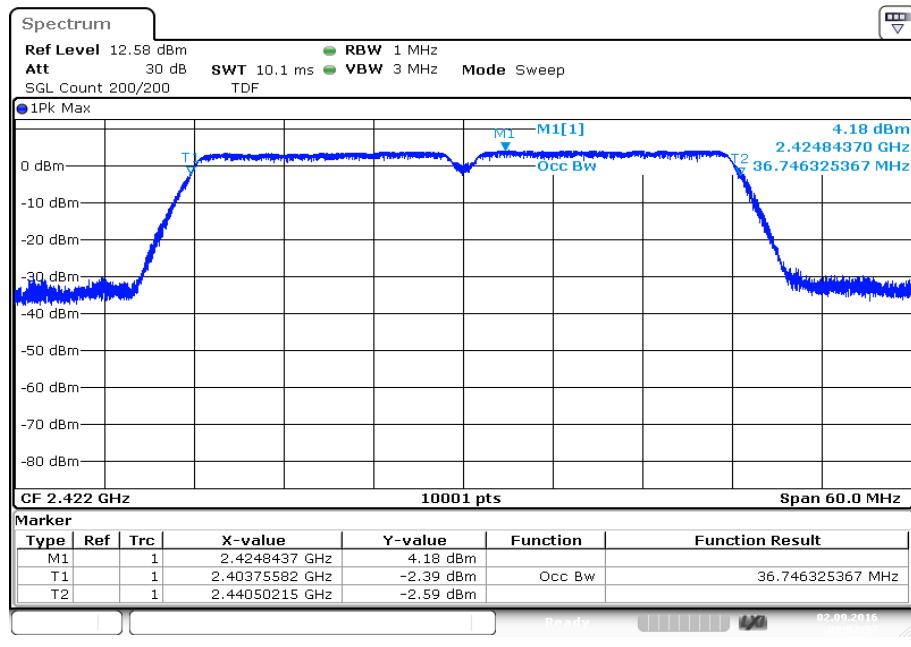
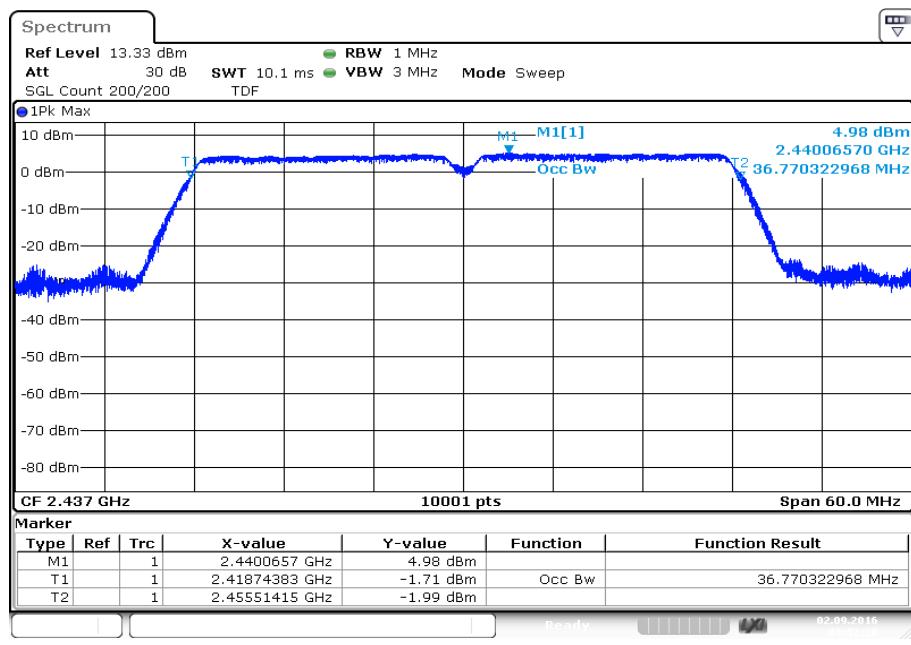


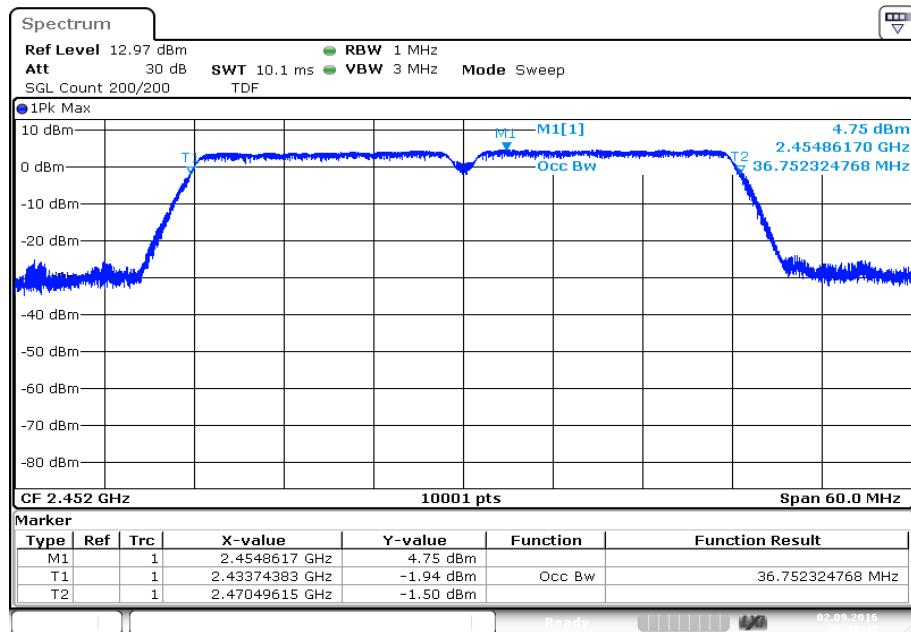
Plot 2: Middle channel



Plot 3: Highest channel

Plots: OFDM / n HT40 – mode

Plot 1: Lowest channel

Plot 2: Middle channel


Plot 3: Highest channel

12.8 Occupied bandwidth – 20 dB bandwidth

Description:

Measurement of the 20 dB bandwidth of the modulated carrier.

Measurement:

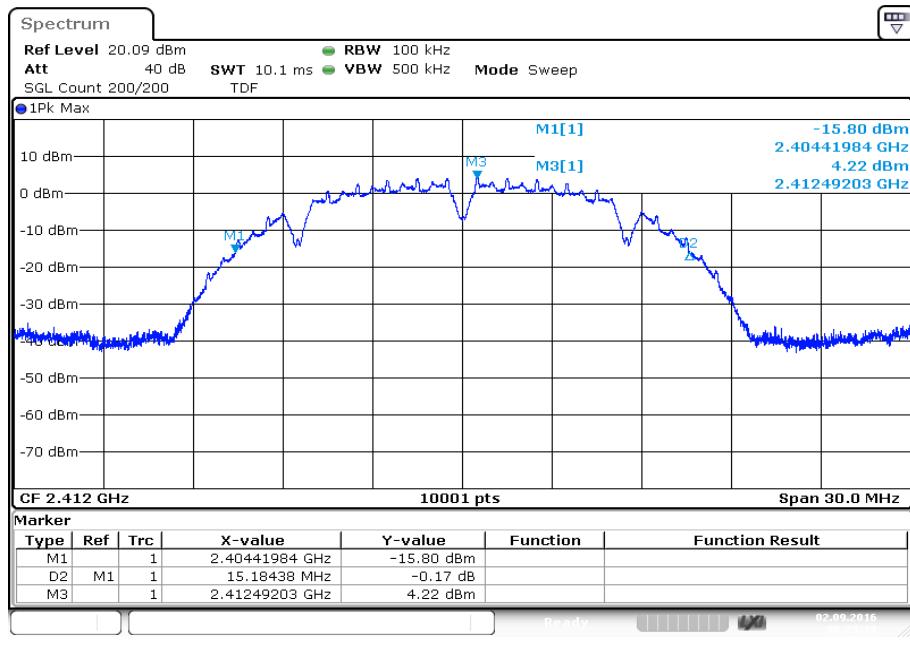
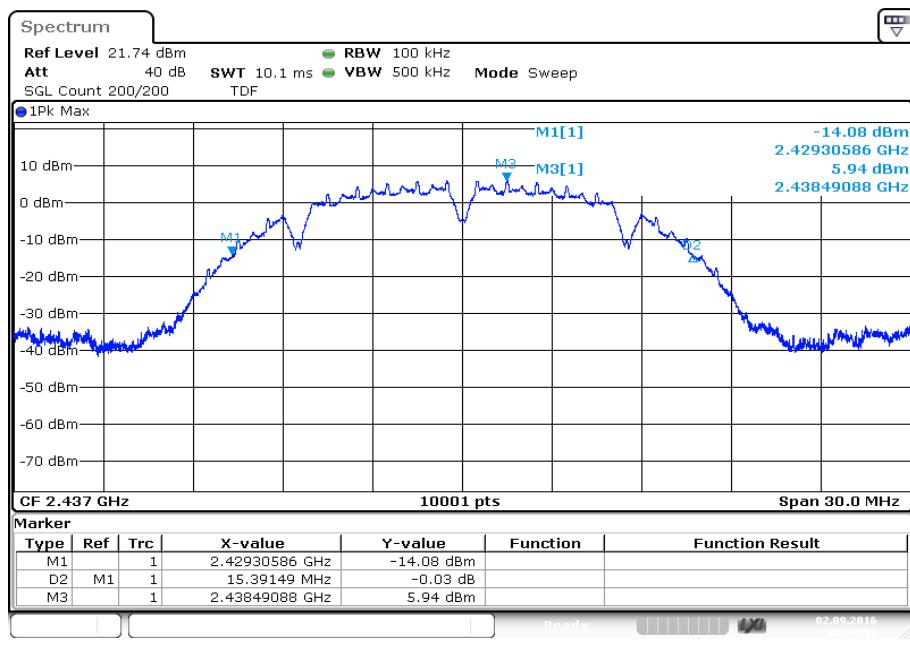
Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	30 MHz / 50 MHz
Trace mode:	Single count with min. 200 counts
Test setup:	See sub clause 7.4 – A
Measurement uncertainty	See sub clause 9

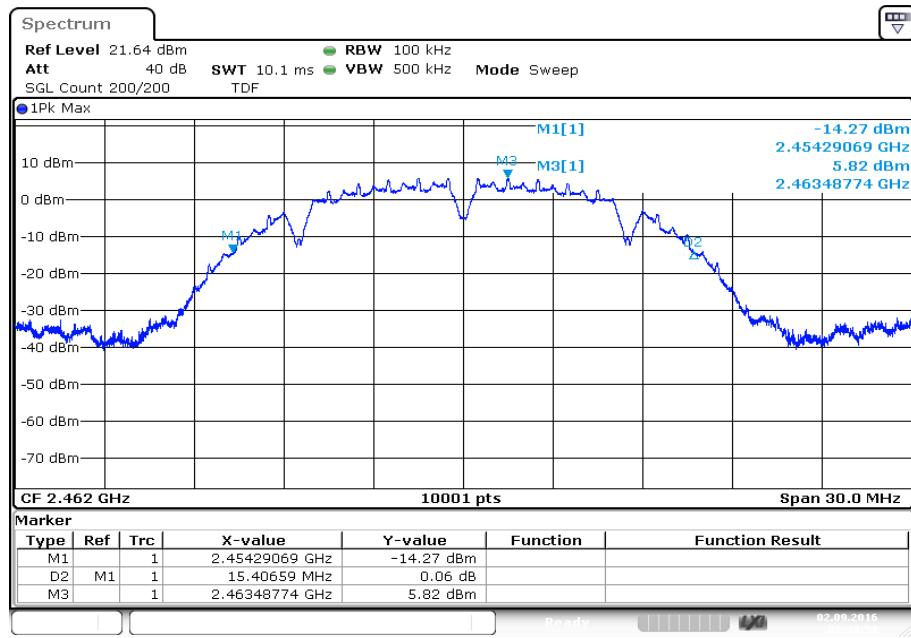
Usage:

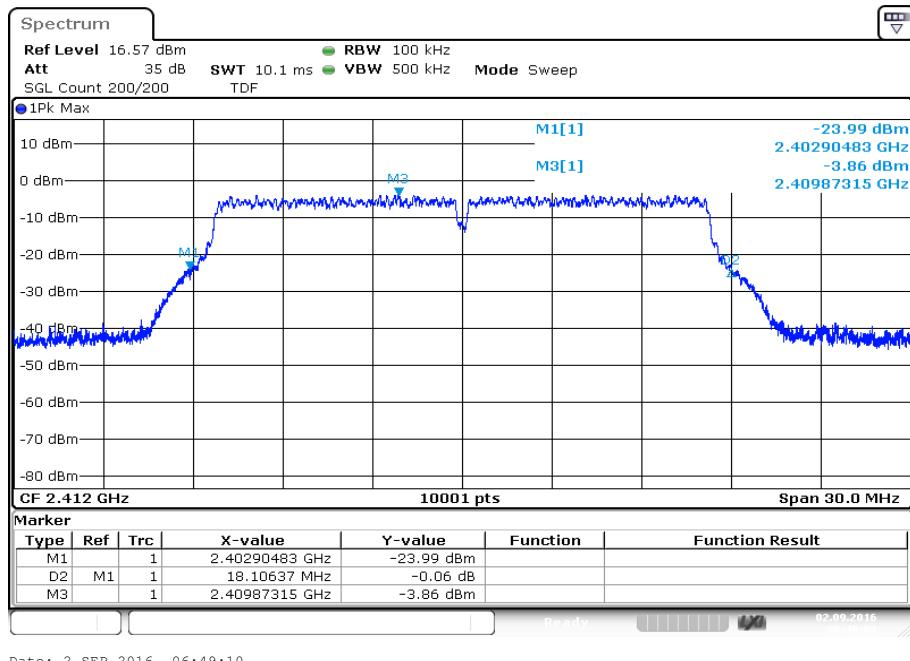
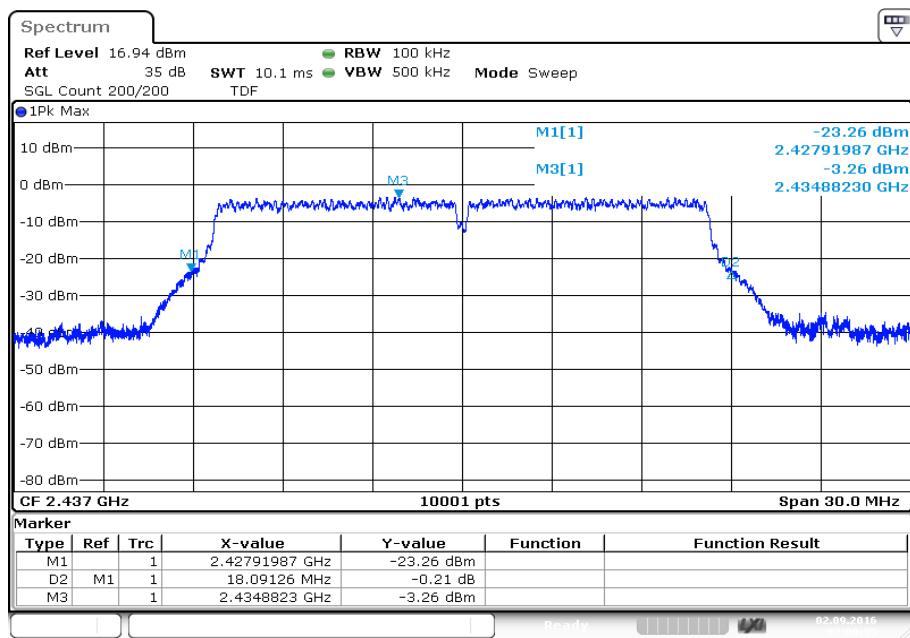
--	IC
Within the used band!	

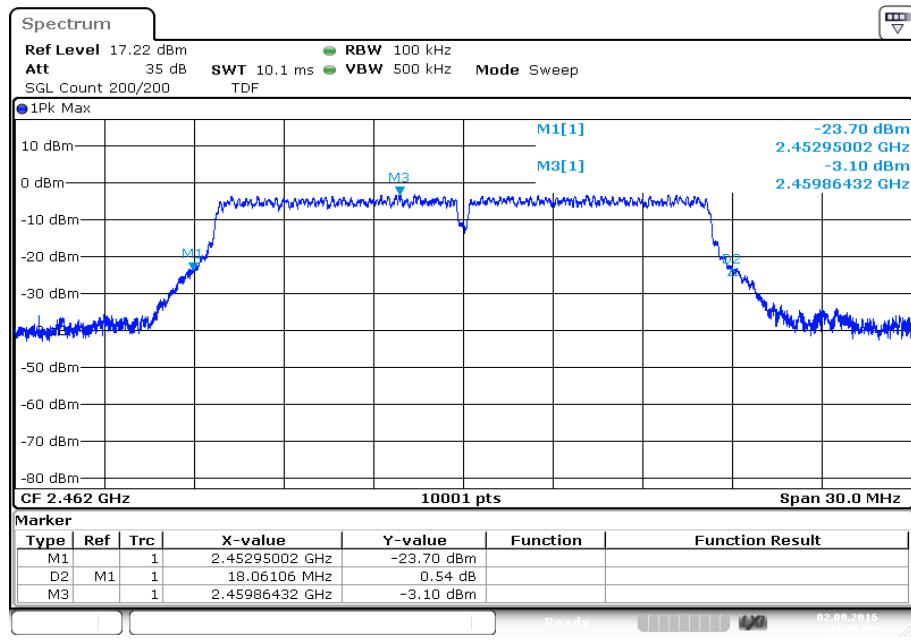
Results:

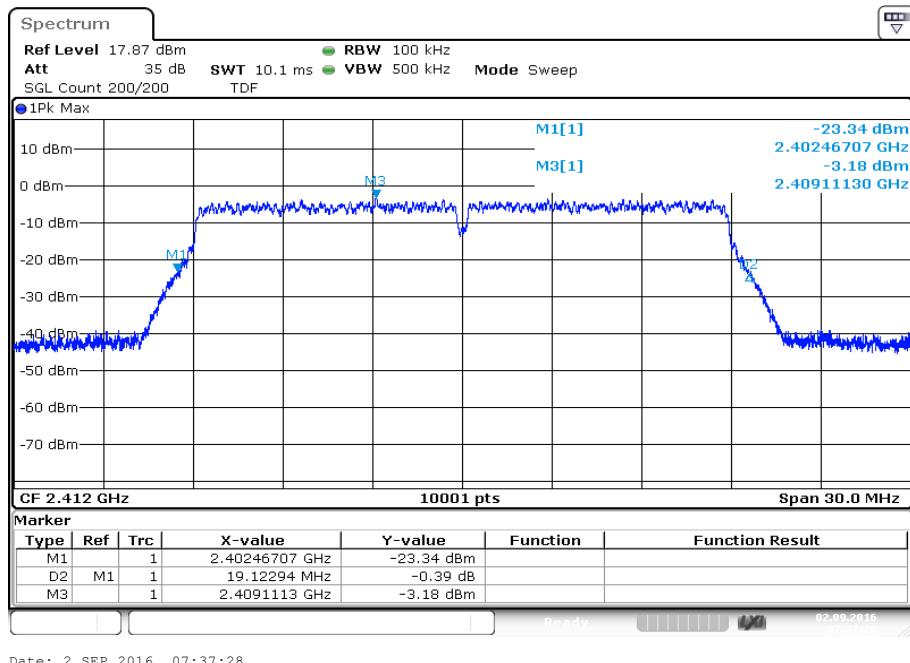
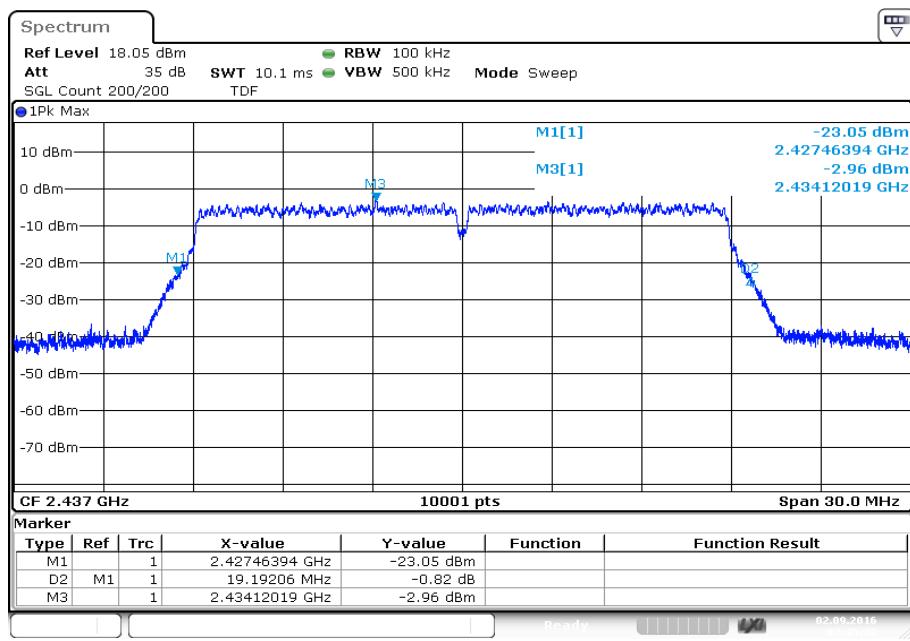
Modulation	20 dB bandwidth [MHz]			
	Frequency	2412 MHz	2437 MHz	2462 MHz
DSSS / b – mode		15.18	15.39	15.41
OFDM / g – mode		18.11	18.09	18.06
OFDM / n HT20 – mode		19.12	19.19	19.13
Frequency	2422 MHz	2437 MHz	2452 MHz	
OFDM / n HT40 – mode	38.26	38.31	38.29	

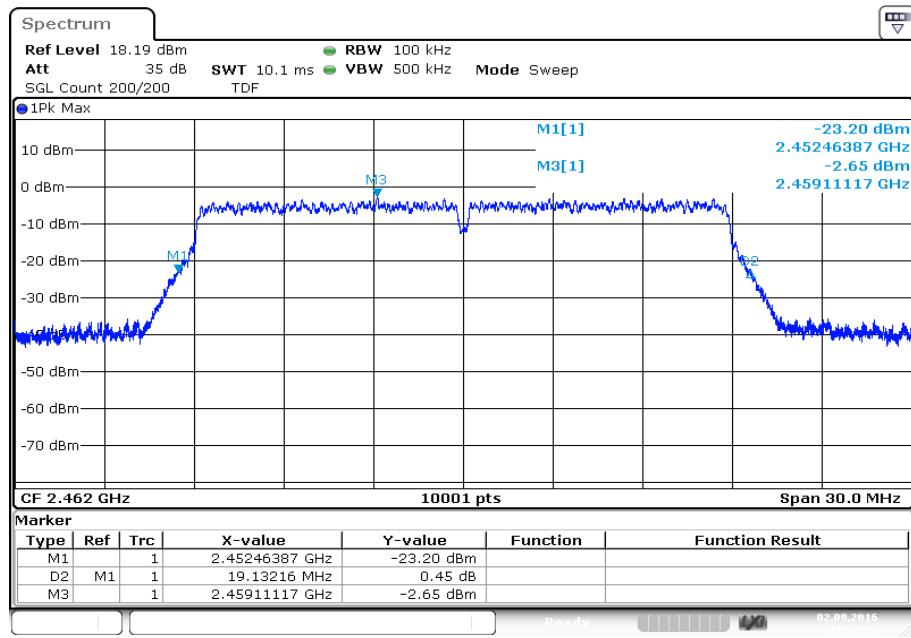
Plots: DSSS / b – mode**Plot 1: Lowest channel****Plot 2: Middle channel**

Plot 3: Highest channel

Plots: OFDM / g – mode**Plot 1: Lowest channel****Plot 2: Middle channel**

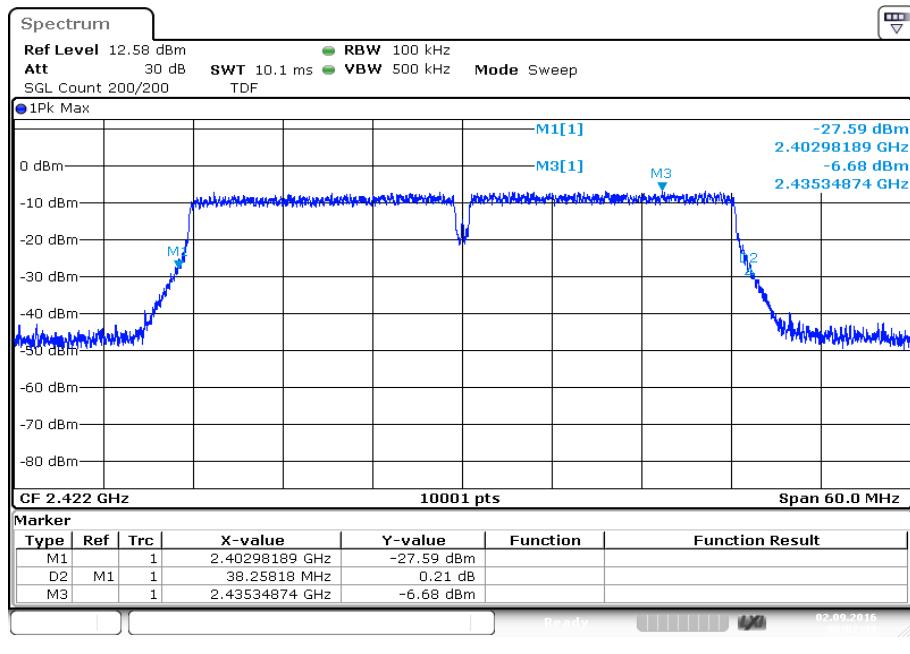
Plot 3: Highest channel

Plots: OFDM / n HT20 – mode**Plot 1: Lowest channel****Plot 2: Middle channel**

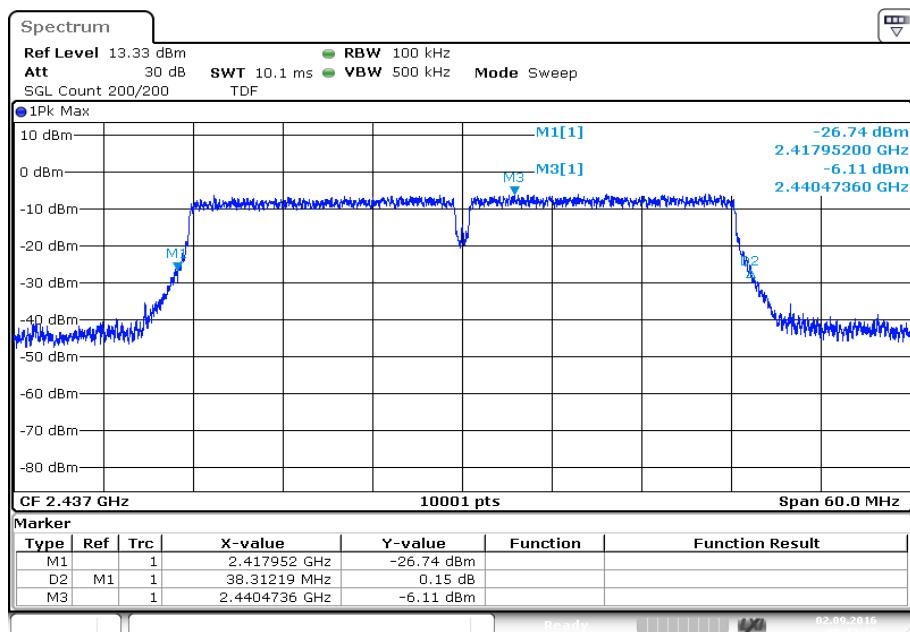
Plot 3: Highest channel

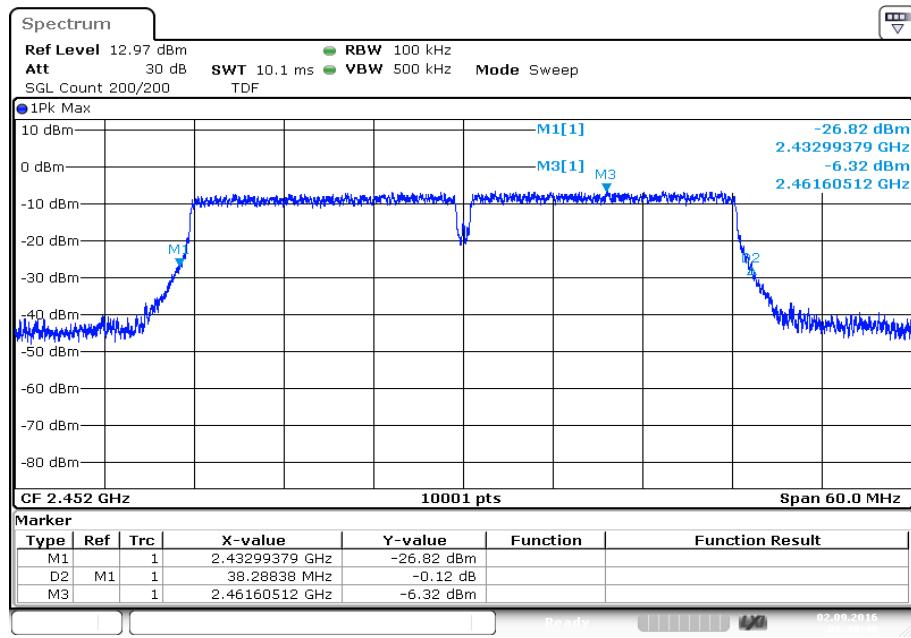
Plots: OFDM / n HT40 – mode

Plot 1: Lowest channel



Plot 2: Middle channel



Plot 3: Highest channel

12.9 Band edge compliance conducted

Description:

Measurement of the radiated band edge compliance with a conducted test setup.

Measurement:

Measurement parameter for measurements	
According to DTS clause: 13.3.2 and clause 12.2.2	
Detector:	RMS
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	Lower band edge: 2388 MHz to 2390 MHz (2 MHz) Upper band edge: 2483.5 MHz to 2485.5 MHz (2 MHz)
Trace mode:	Trace average with 200 counts
Test setup:	See sub clause 7.4 – A
Measurement uncertainty	See sub clause 9

Limits:

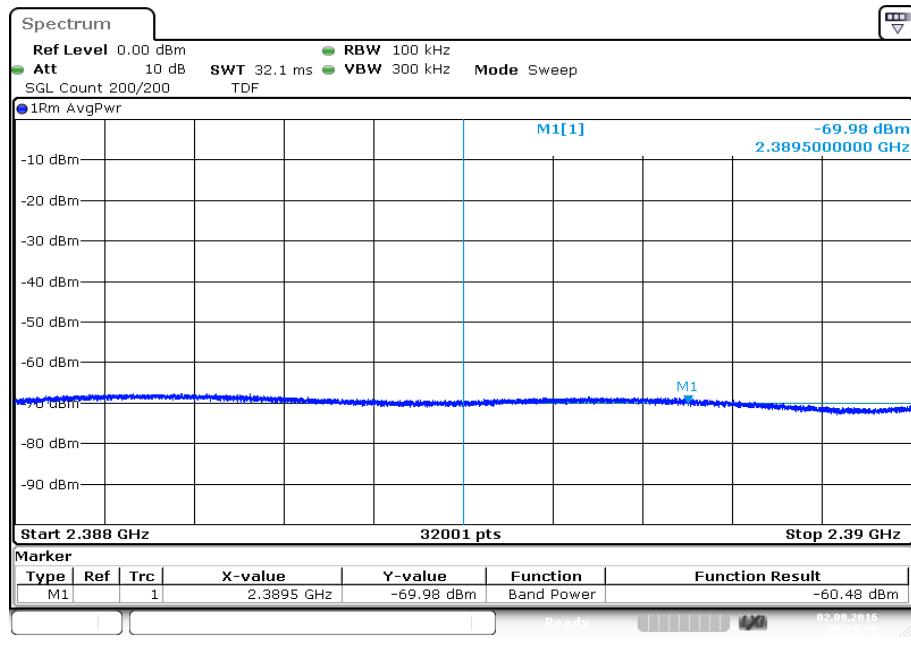
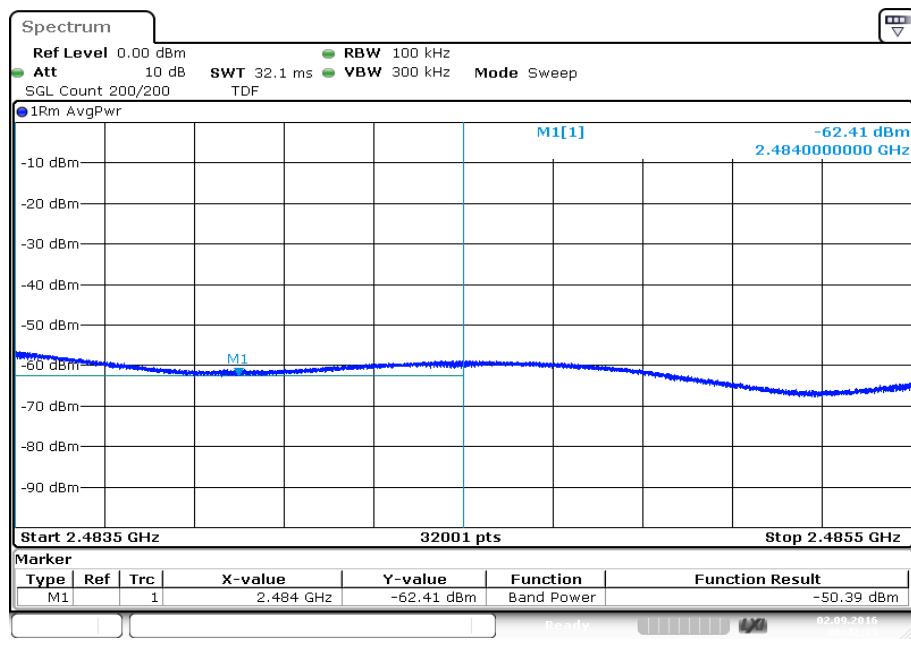
FCC	IC
-41.26 dBm	

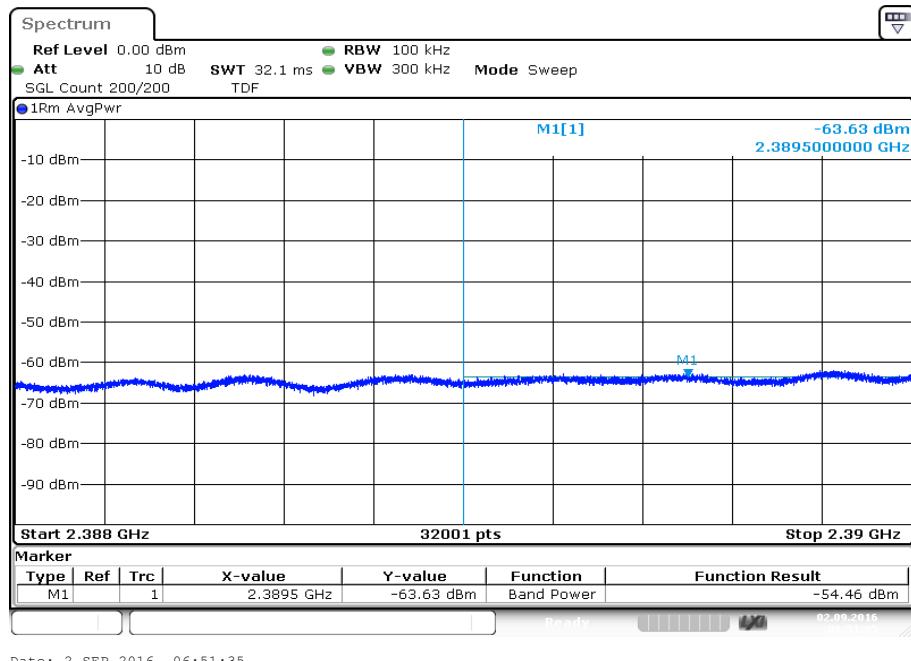
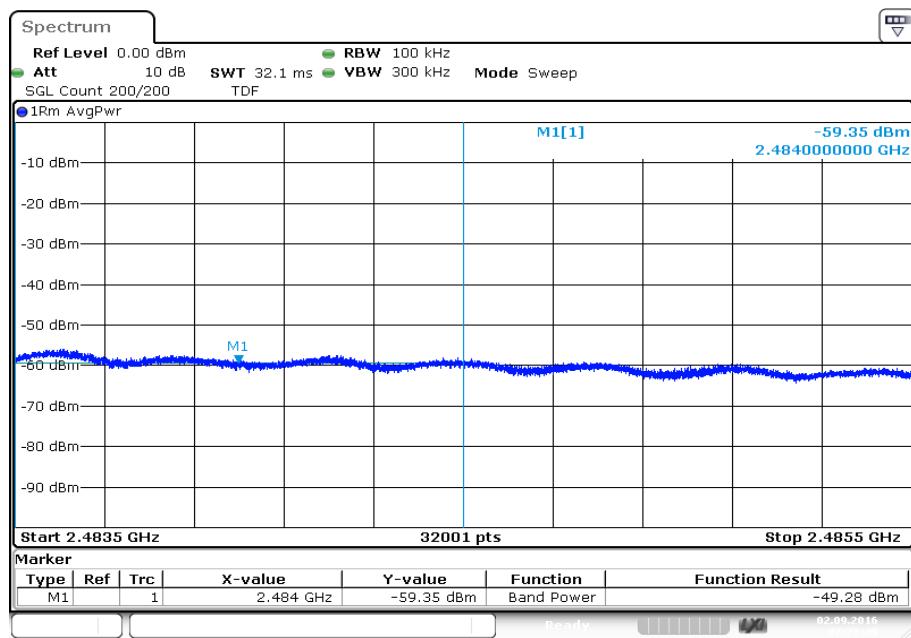
Results: antenna 1 - omnidirectional dipole antenna

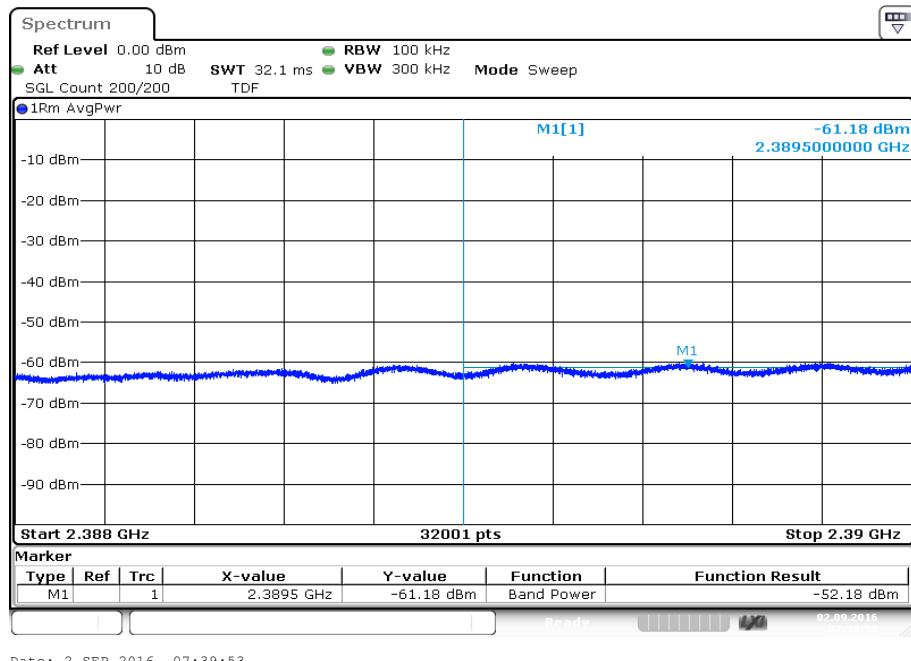
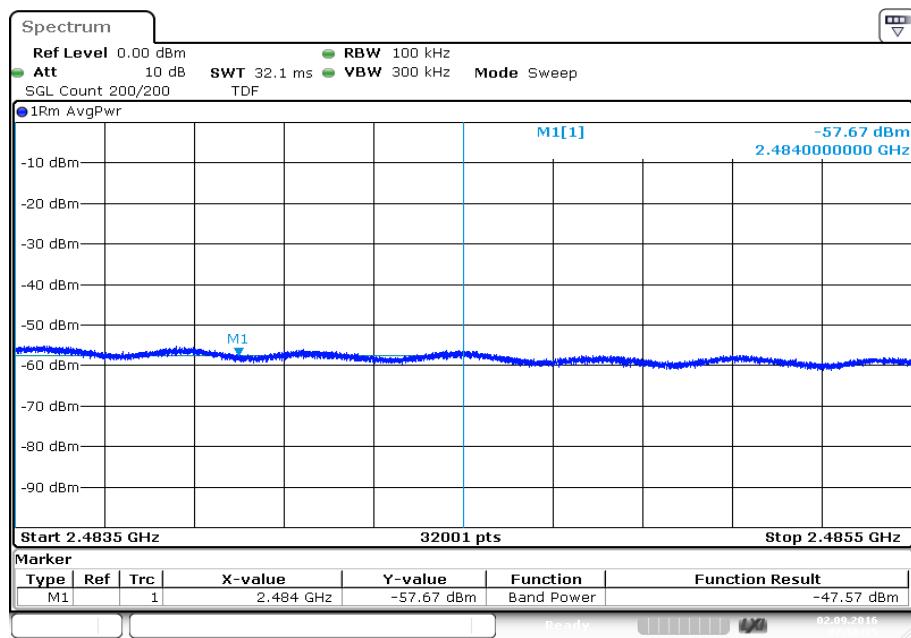
Scenario	Band edge compliance [dBm] (gain calculation)			
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode	OFDM / n HT40 – mode
Max. lower band edge power conducted	-60.48	-54.46	-52.18	-49.63
Antenna gain	2.0			
Max. lower band edge power radiated	-58.48	-52.46	-50.18	-47.63
Max. upper band edge power conducted	-50.39	-49.28	-47.57	-44.44
Antenna gain	2.0			
Max. upper band edge power radiated	-48.39	-47.28	-45.57	-42.44

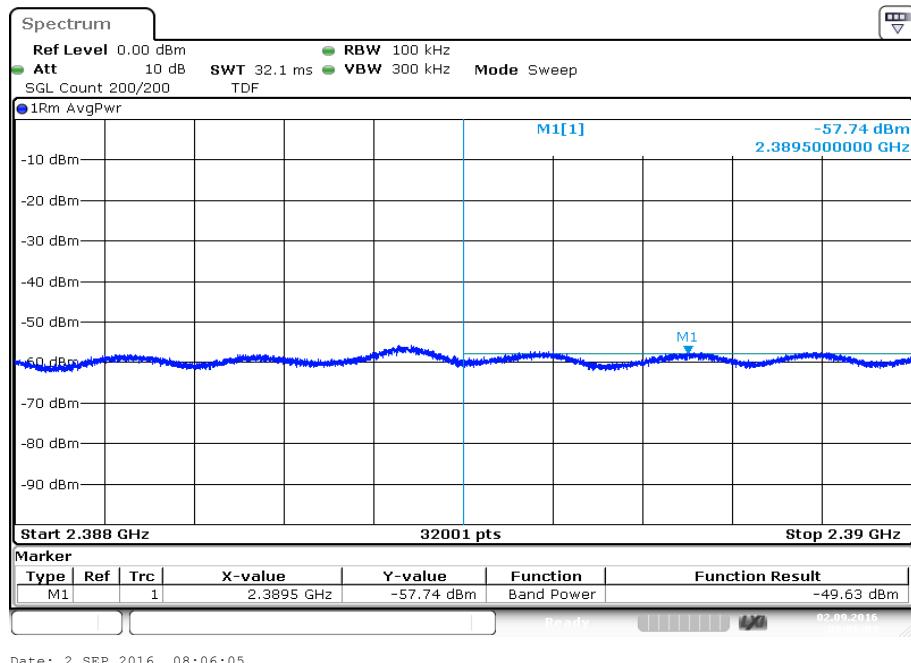
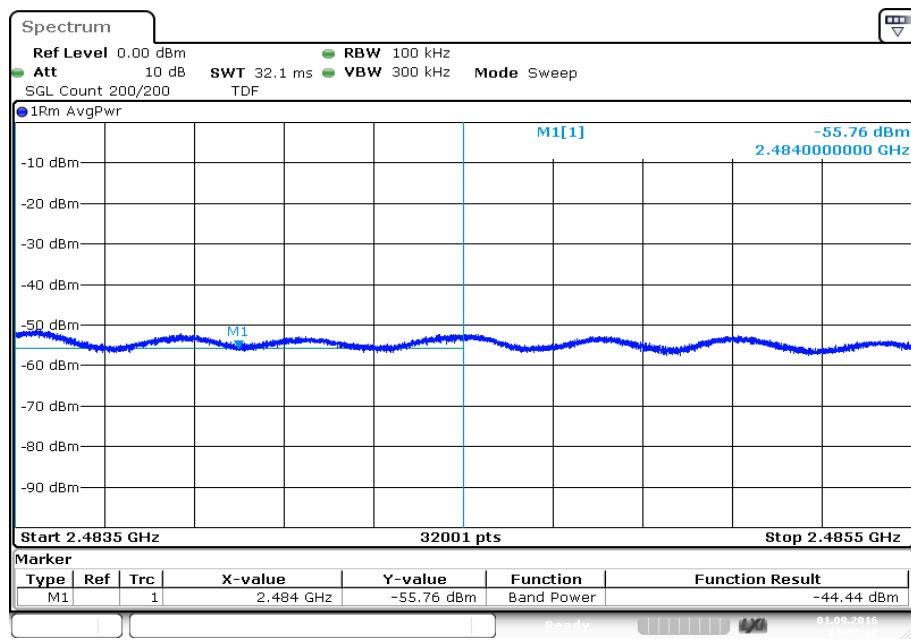
Results: antenna 2 - omnidirectional outdoor dipole antenna with antenna cable

Scenario	Band edge compliance [dBm] (gain calculation)			
	DSSS / b – mode	OFDM / g – mode	OFDM / n HT20 – mode	OFDM / n HT40 – mode
Max. lower band edge power conducted	-60.48	-54.46	-52.18	-49.63
Antenna gain	0.6			
Max. lower band edge power radiated	-59.88	-53.86	-51.58	-49.03
Max. upper band edge power conducted	-50.39	-49.28	-47.57	-44.44
Antenna gain	0.6			
Max. upper band edge power radiated	-49.79	-48.68	-46.97	-43.84

Plots: DSSS / b – mode**Plot 1: Lower band edge****Plot 2: Upper band edge**

Plots: OFDM / g – mode**Plot 1: Lower band edge****Plot 2: Upper band edge**

Plots: OFDM / n HT20 – mode**Plot 1: Lower band edge****Plot 2: Upper band edge**

Plots: OFDM / n HT40 – mode**Plot 1: Lower band edge****Plot 2: Upper band edge**

12.10 Spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The measurement is performed at channel 1, 6 and 11. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	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
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 30 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: DSSS / b – mode

TX Spurious Emissions Conducted					
DSSS / b – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		3.95	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant
2437		5.82	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant
2462		5.61	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant

Results: OFDM / g – mode

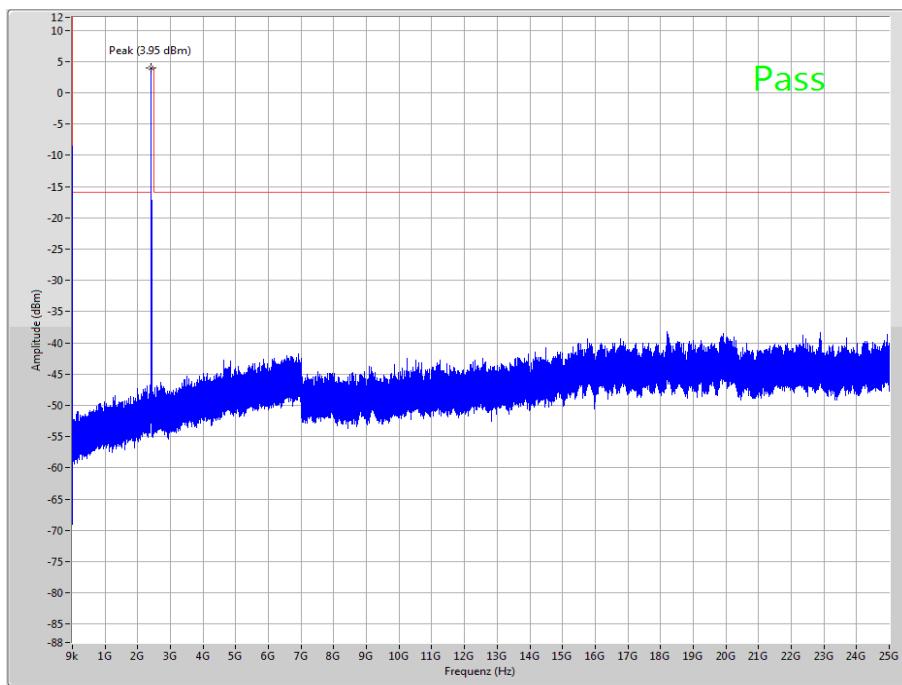
TX Spurious Emissions Conducted					
OFDM / g – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-4.01	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant
2437		-3.50	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant
2462		-3.07	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant

Results: OFDM / n HT20 – mode

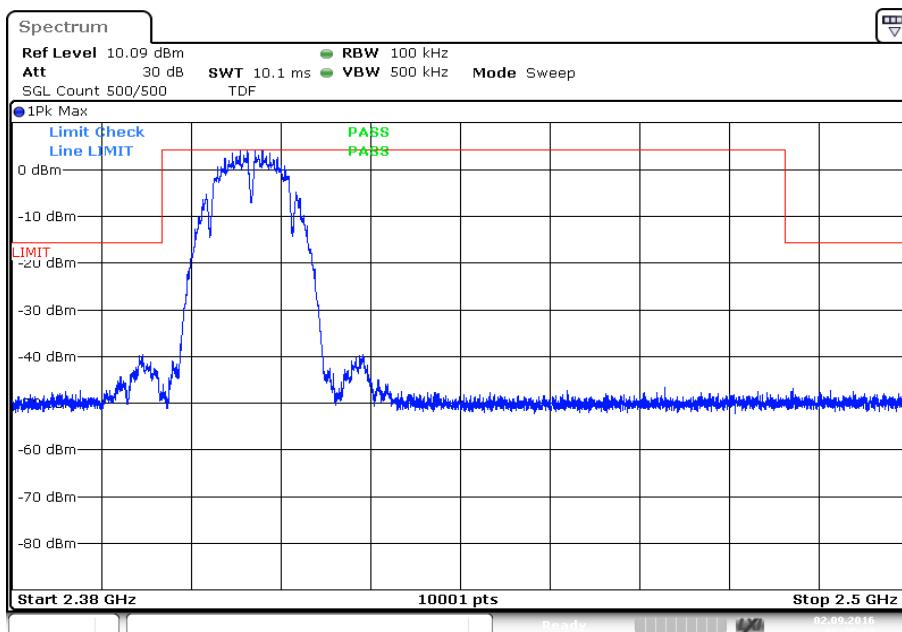
TX Spurious Emissions Conducted					
OFDM / n HT20 – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412		-3.63	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant
2437		-3.66	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant
2462		-2.95	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant

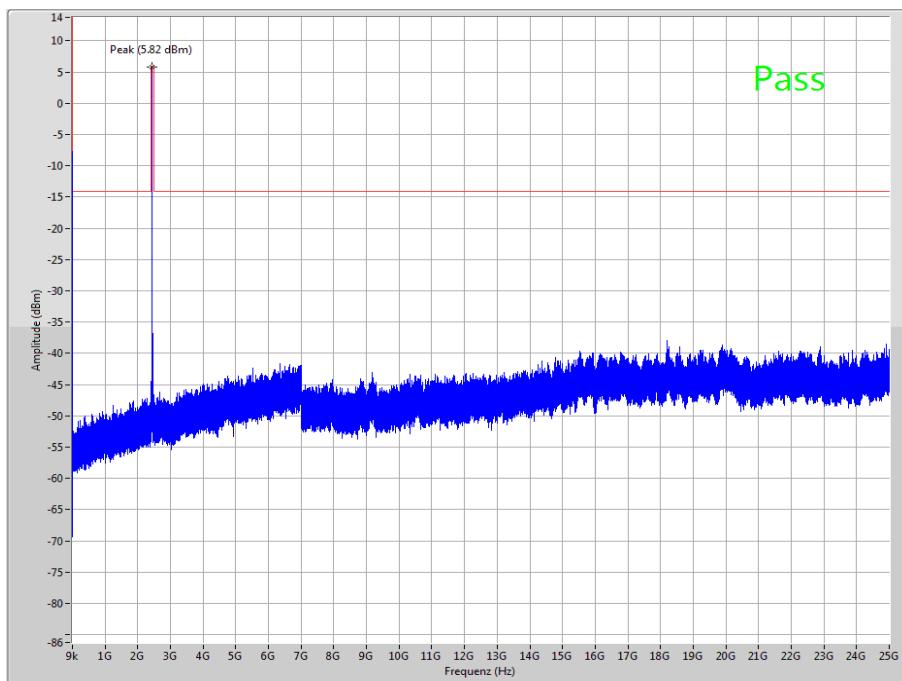
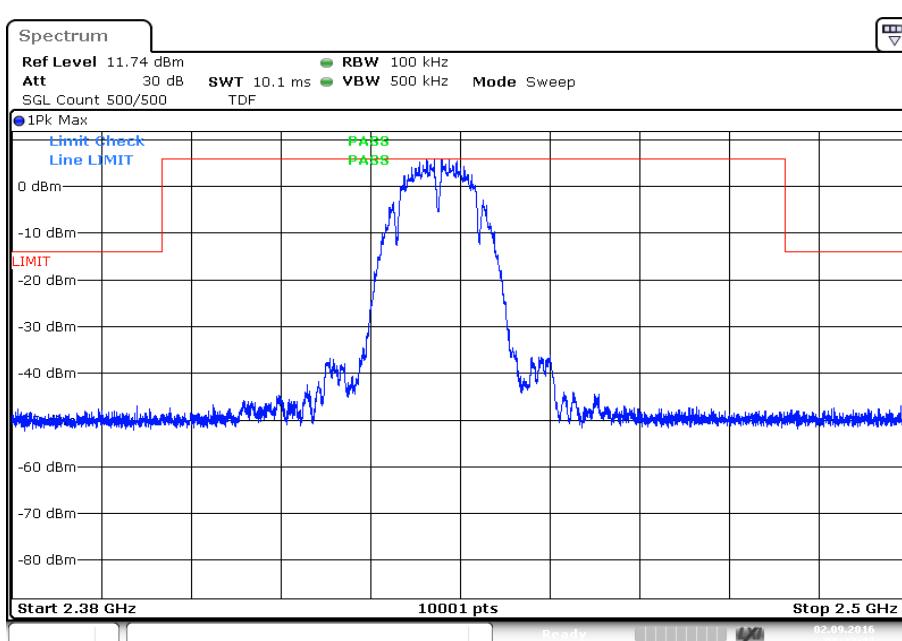
Results: OFDM / n HT40 – mode

TX Spurious Emissions Conducted					
OFDM / n HT40 – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2422		-7.30	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant
2437		-6.35	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant
2452		-6.37	30 dBm		Operating frequency
	No peaks detected.		-20 dBc (peak) -30 dBc (average)		compliant

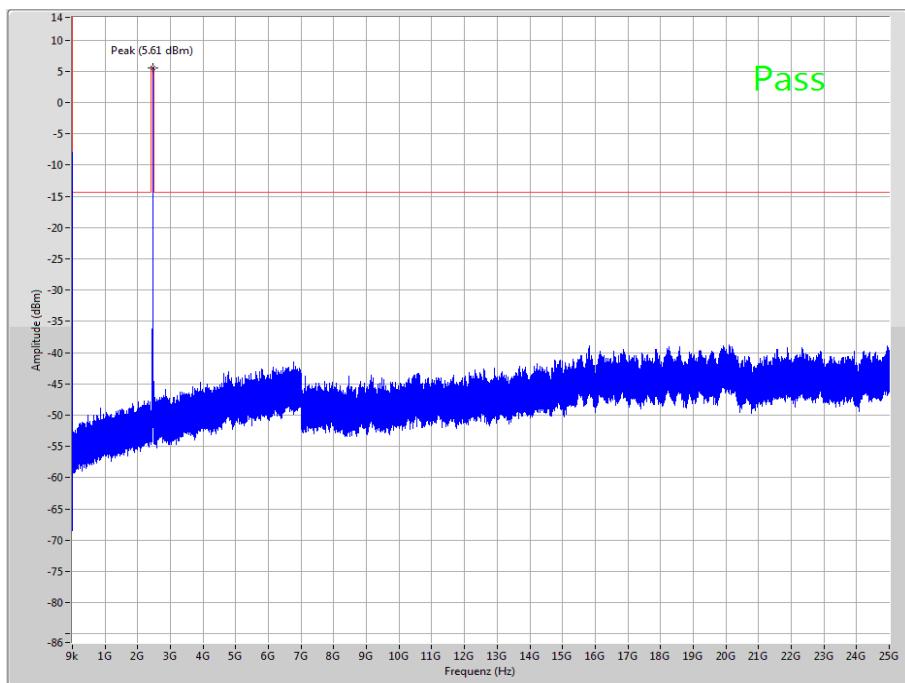
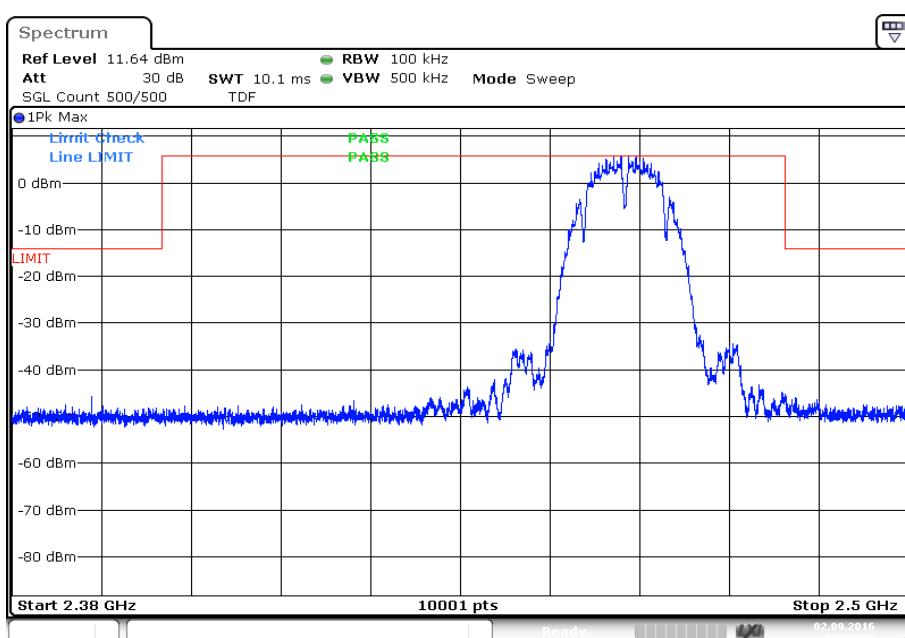
Plots: DSSS / b – mode**Plot 1:** Lowest channel, up to 25 GHz

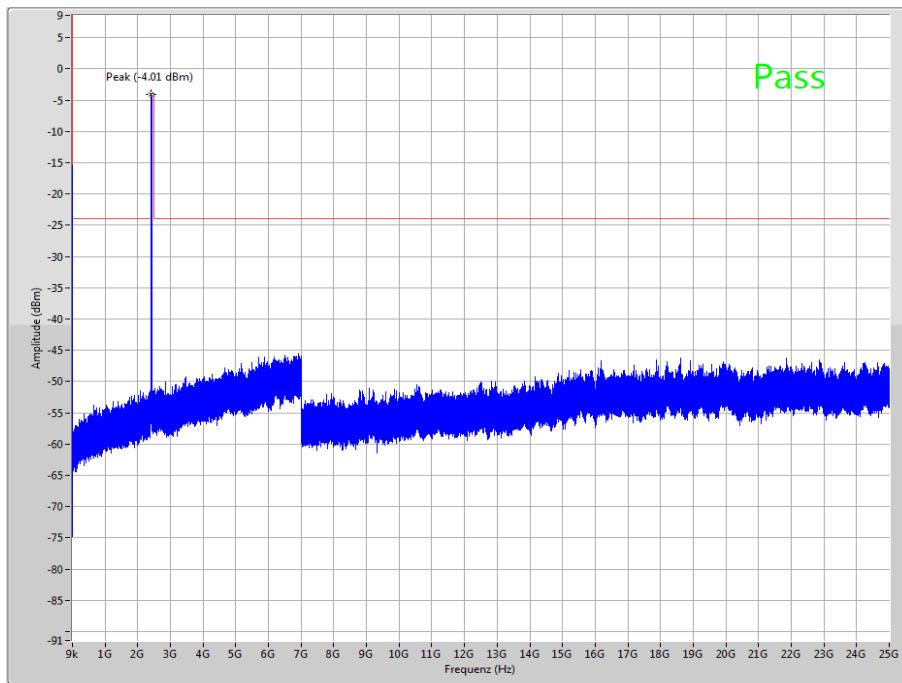
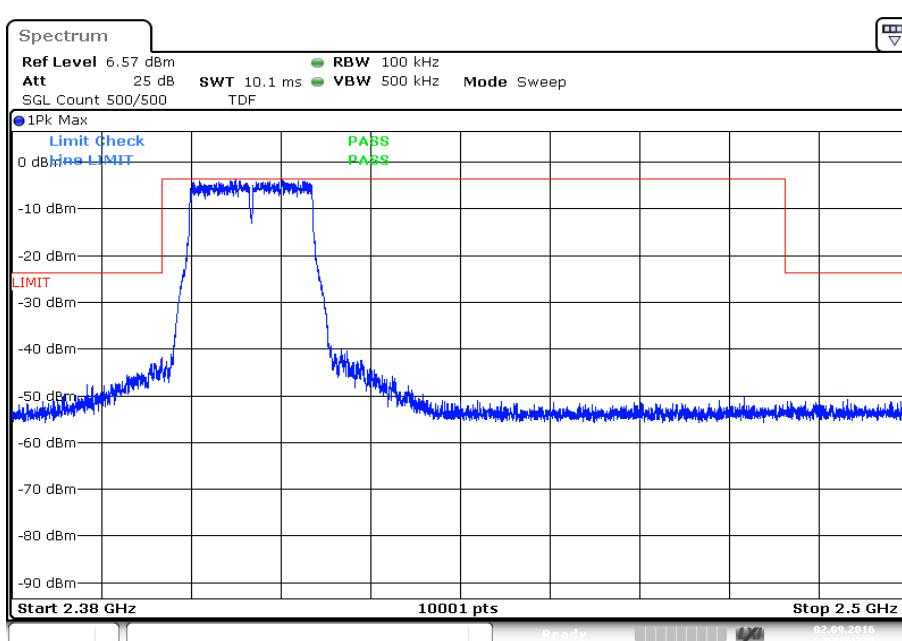
The peak at the beginning of the plot is the LO from the SA.

Plot 2: Lowest channel, zoomed carrier

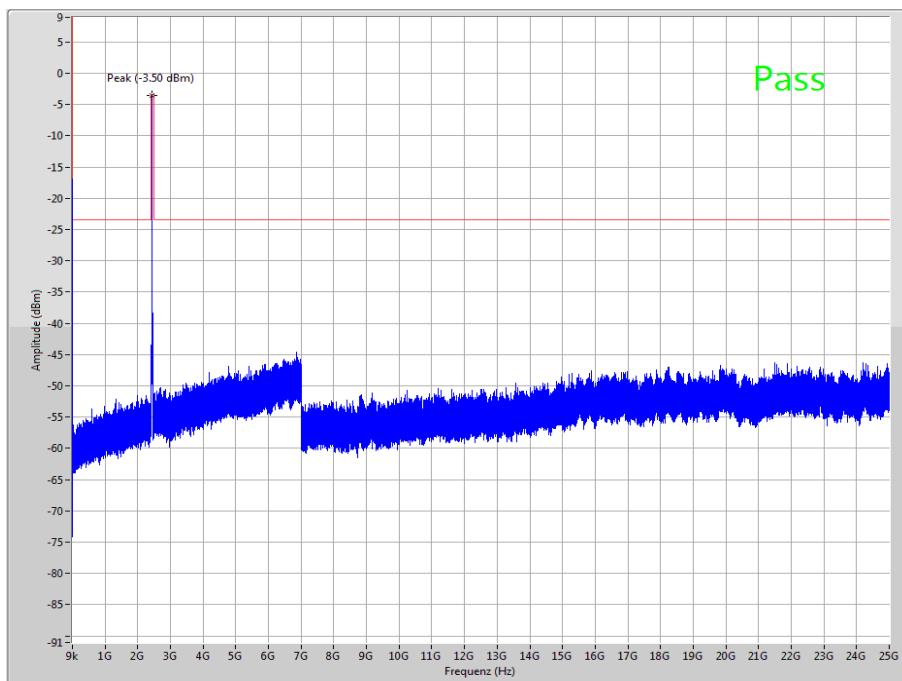
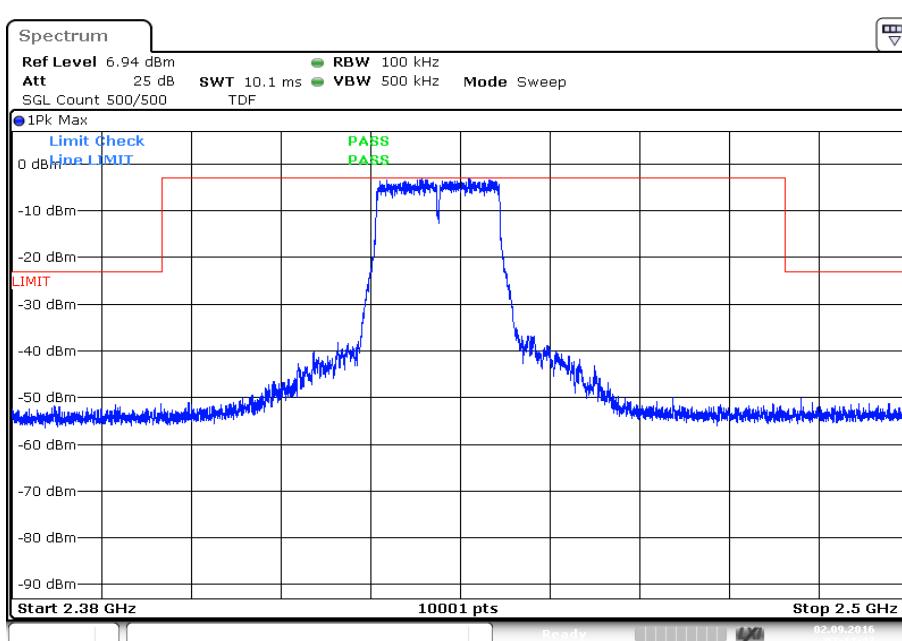
Plot 3: Middle channel, up to 25 GHz**Plot 4:** Middle channel, zoomed carrier

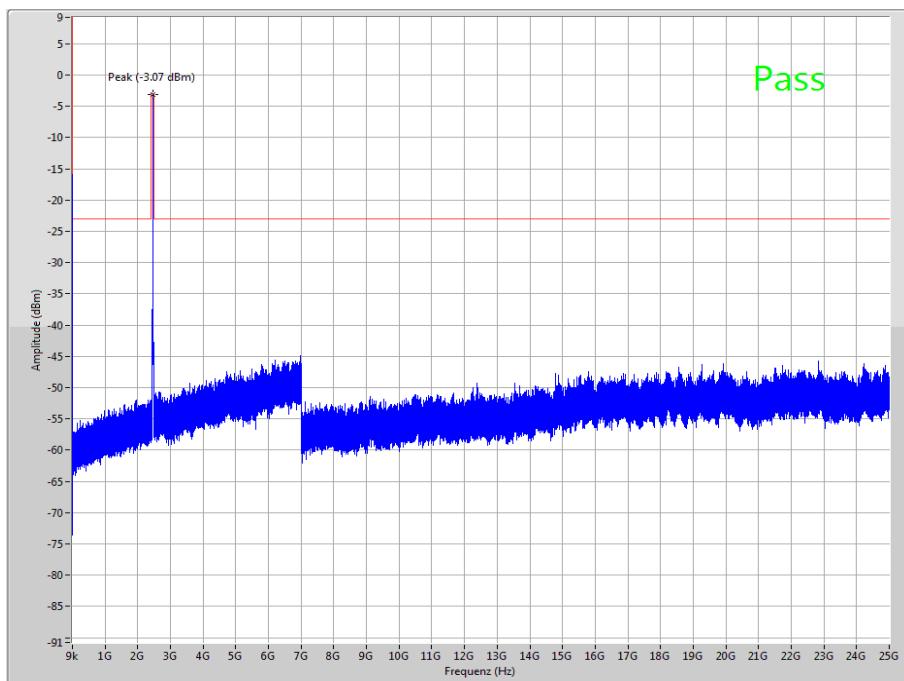
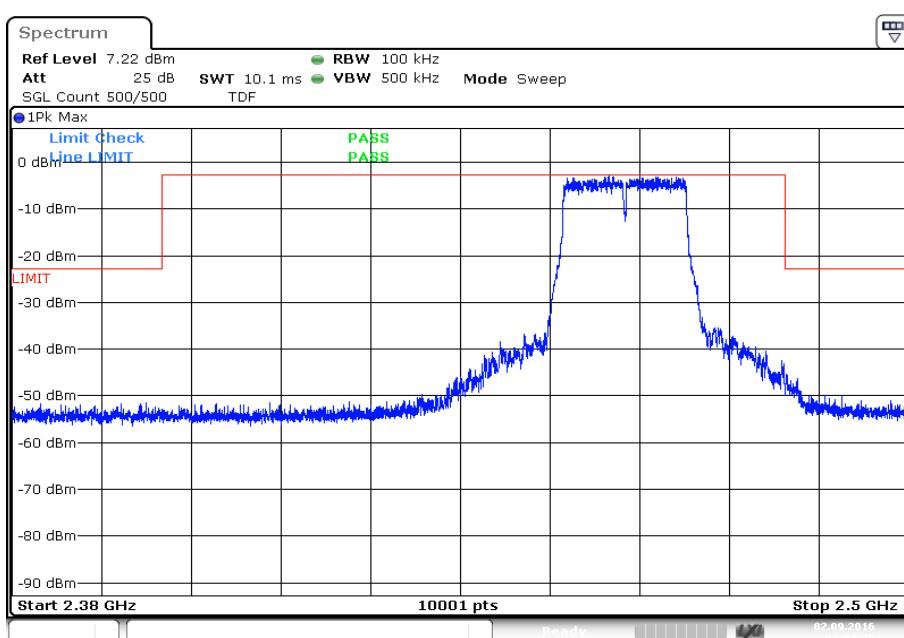
Date: 2.SEP.2016 06:33:44

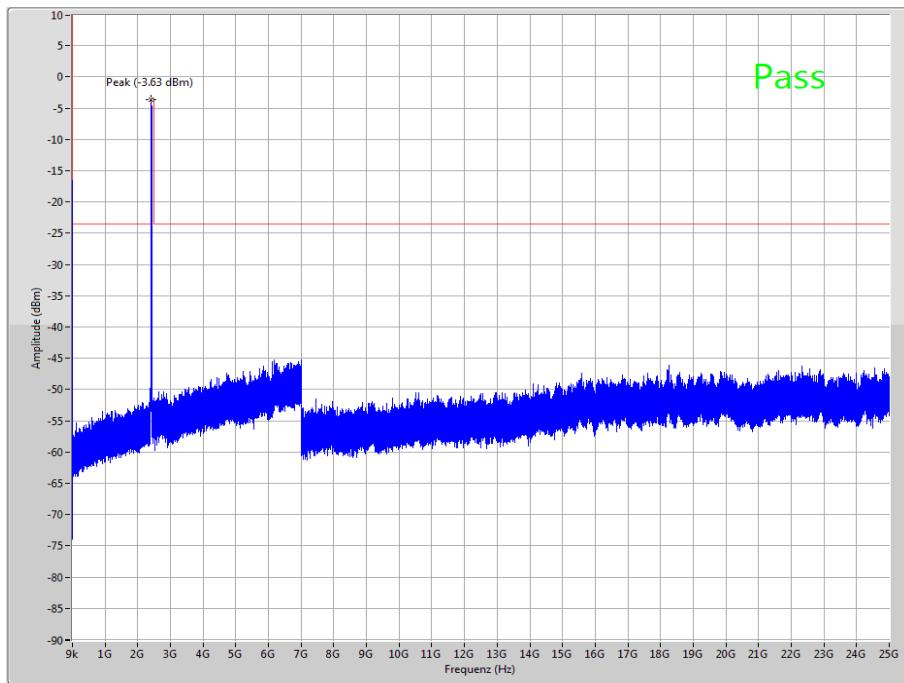
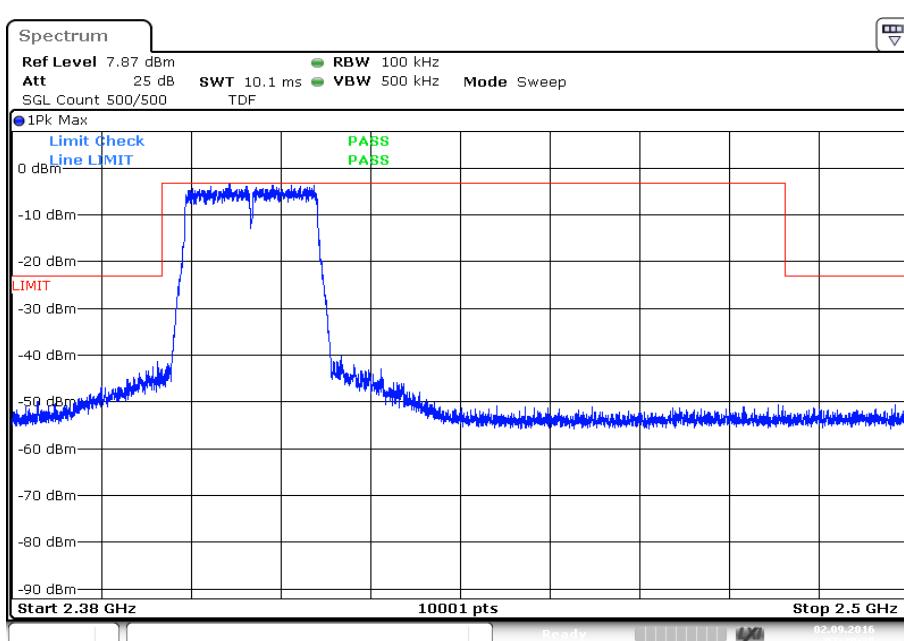
Plot 5: Highest channel, up to 25 GHz**Plot 6:** Highest channel, zoomed carrier

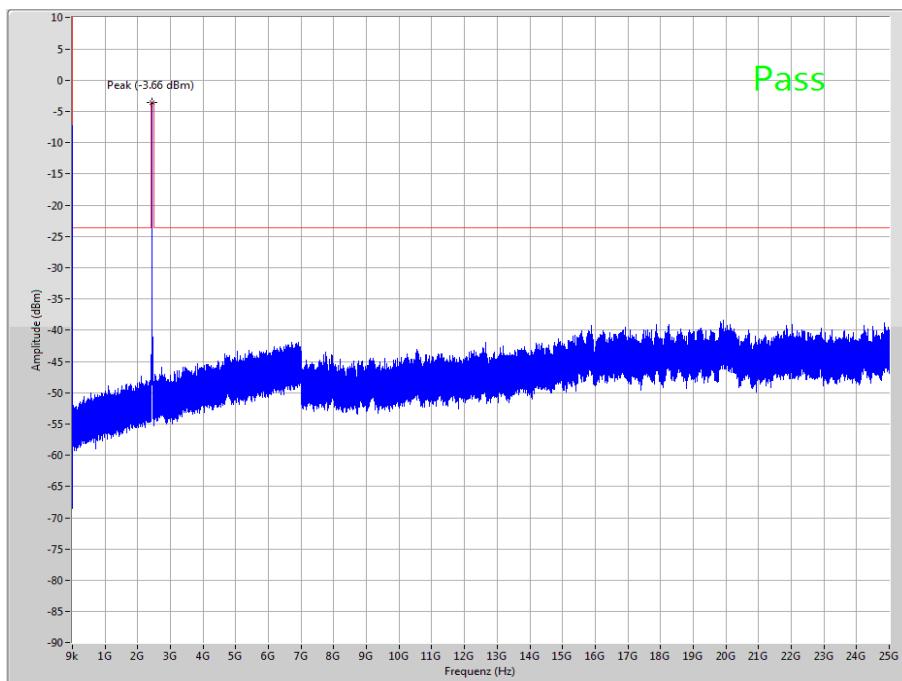
Plots: OFDM / g – mode**Plot 1:** Lowest channel, up to 25 GHz**Plot 2:** Lowest channel, zoomed carrier

Date: 2.SEP.2016 06:51:20

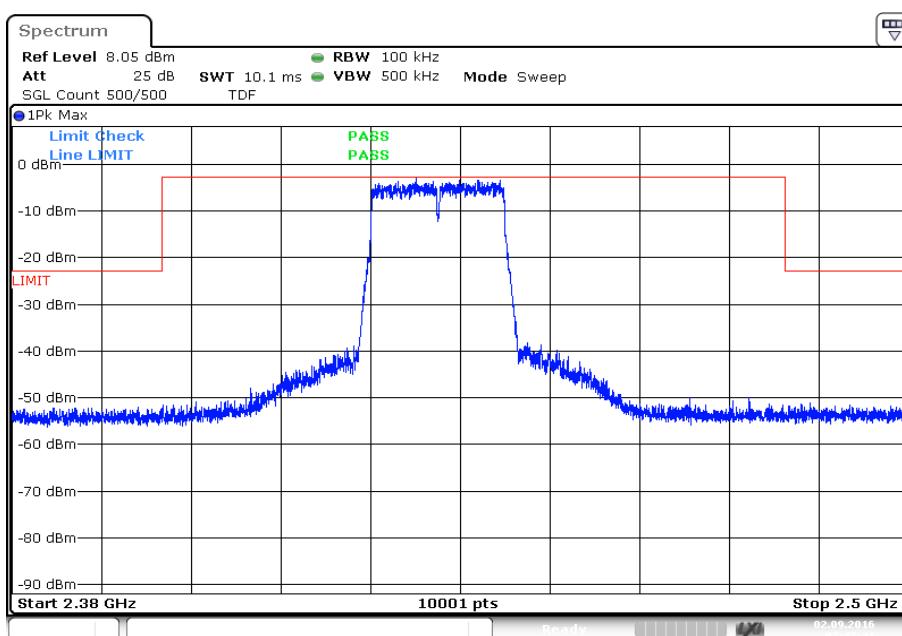
Plot 3: Middle channel, up to 25 GHz**Plot 4:** Middle channel, zoomed carrier

Plot 5: Highest channel, up to 25 GHz**Plot 6:** Highest channel, zoomed carrier

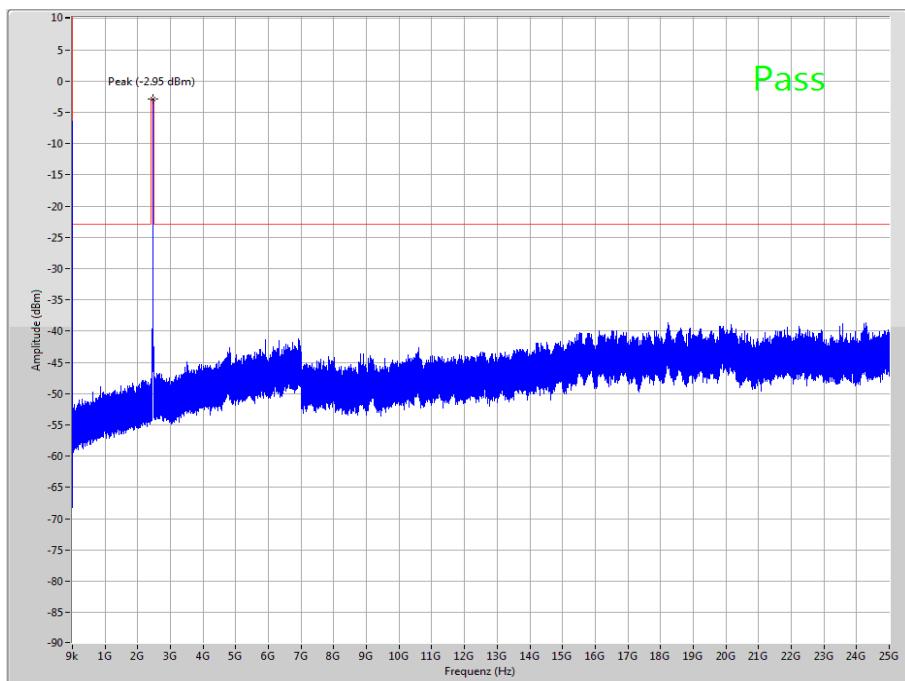
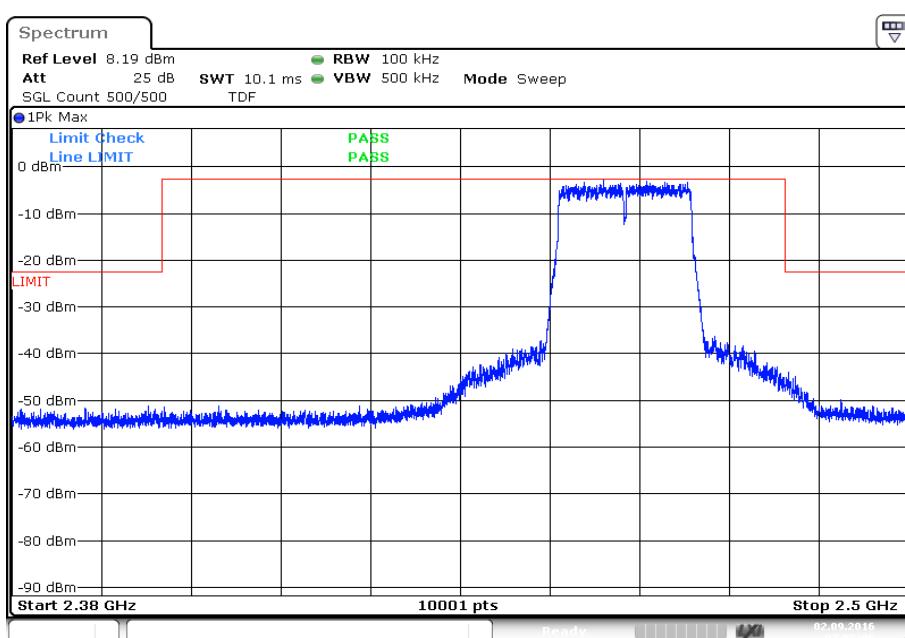
Plots: OFDM / n HT 20 – mode**Plot 1:** Lowest channel, up to 25 GHz**Plot 2:** Lowest channel, zoomed carrier

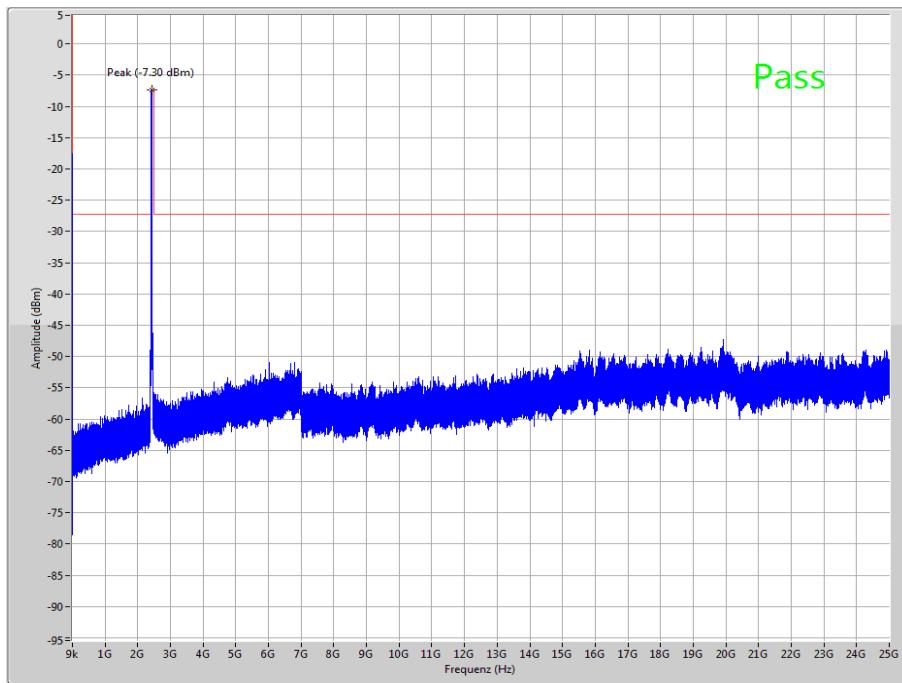
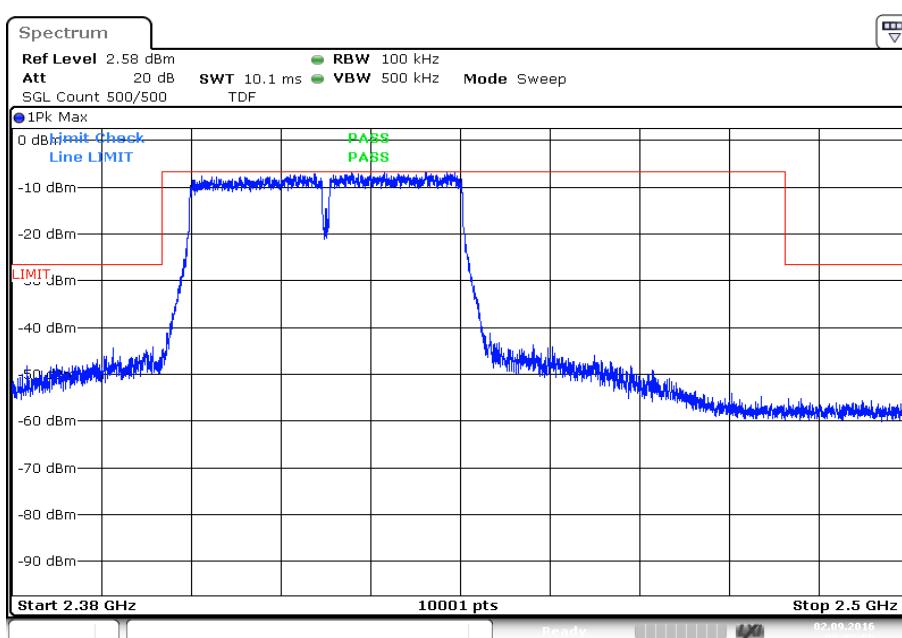
Plot 3: Middle channel, up to 25 GHz

The peak at the beginning of the plot is the LO from the SA.

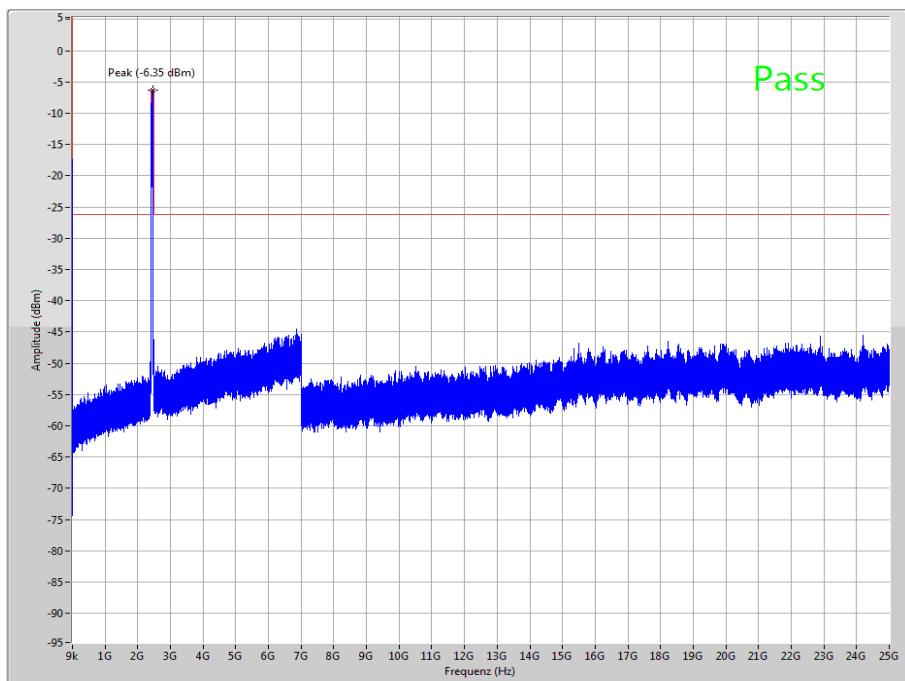
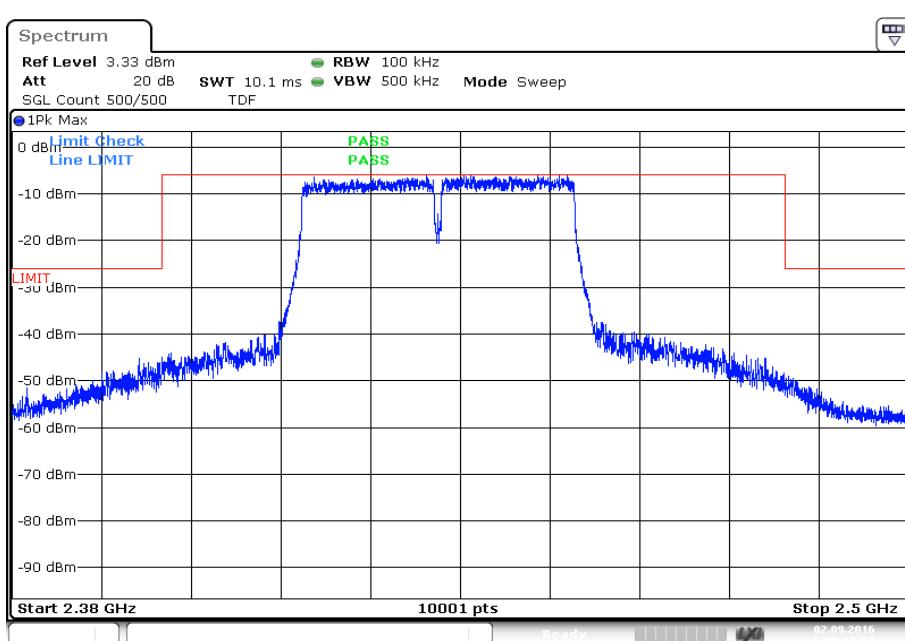
Plot 4: Middle channel, zoomed carrier

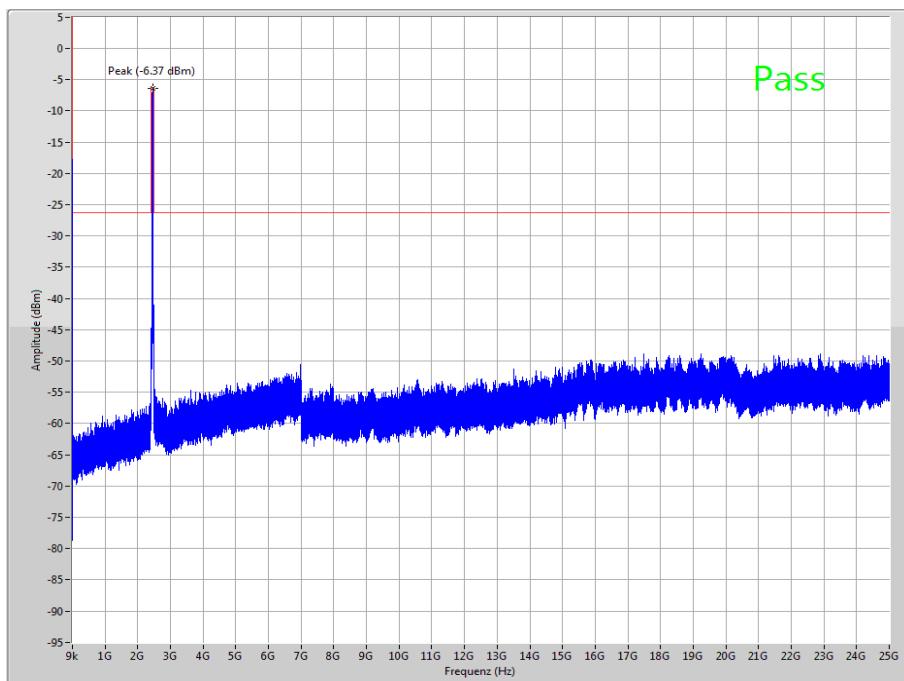
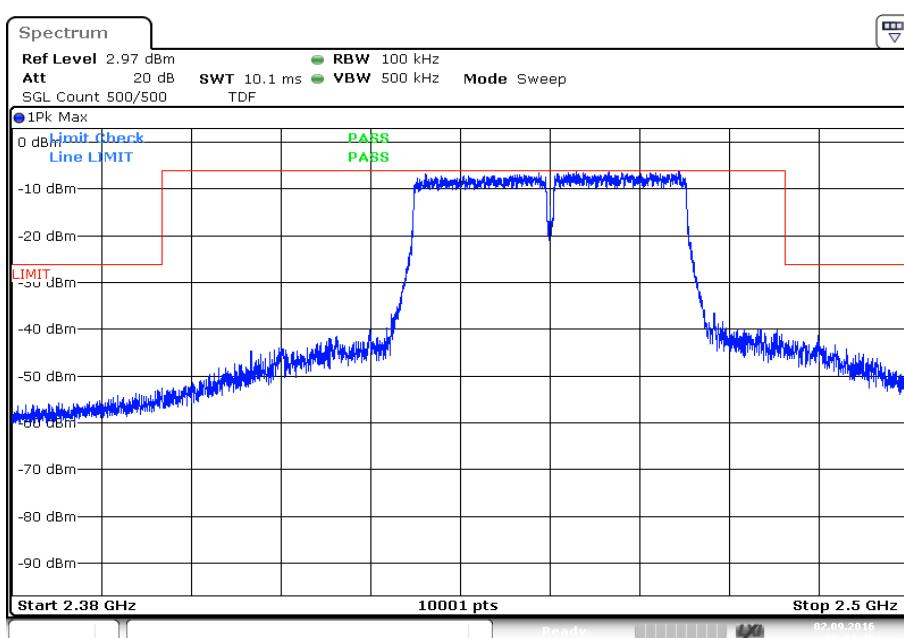
Date: 2.SEP.2016 07:47:41

Plot 5: Highest channel, up to 25 GHz**Plot 6:** Highest channel, zoomed carrier

Plots: OFDM / n HT 40 – mode**Plot 1:** Lowest channel, up to 25 GHz**Plot 2:** Lowest channel, zoomed carrier

Date: 2.SEP.2016 08:05:50

Plot 3: Middle channel, up to 25 GHz**Plot 4:** Middle channel, zoomed carrier

Plot 5: Highest channel, up to 25 GHz**Plot 6:** Highest channel, zoomed carrier

12.11 Spurious emissions radiated below 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 6. This measurement is representative for all channels and modes. 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. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
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
Measured modulation	<input checked="" type="checkbox"/> DSSS b – mode <input checked="" type="checkbox"/> OFDM g – mode <input type="checkbox"/> OFDM n HT20 – mode <input checked="" type="checkbox"/> OFDM n HT40 – mode
Test setup:	See sub clause 7.2 - A
Measurement uncertainty	See sub clause 9

Limits:

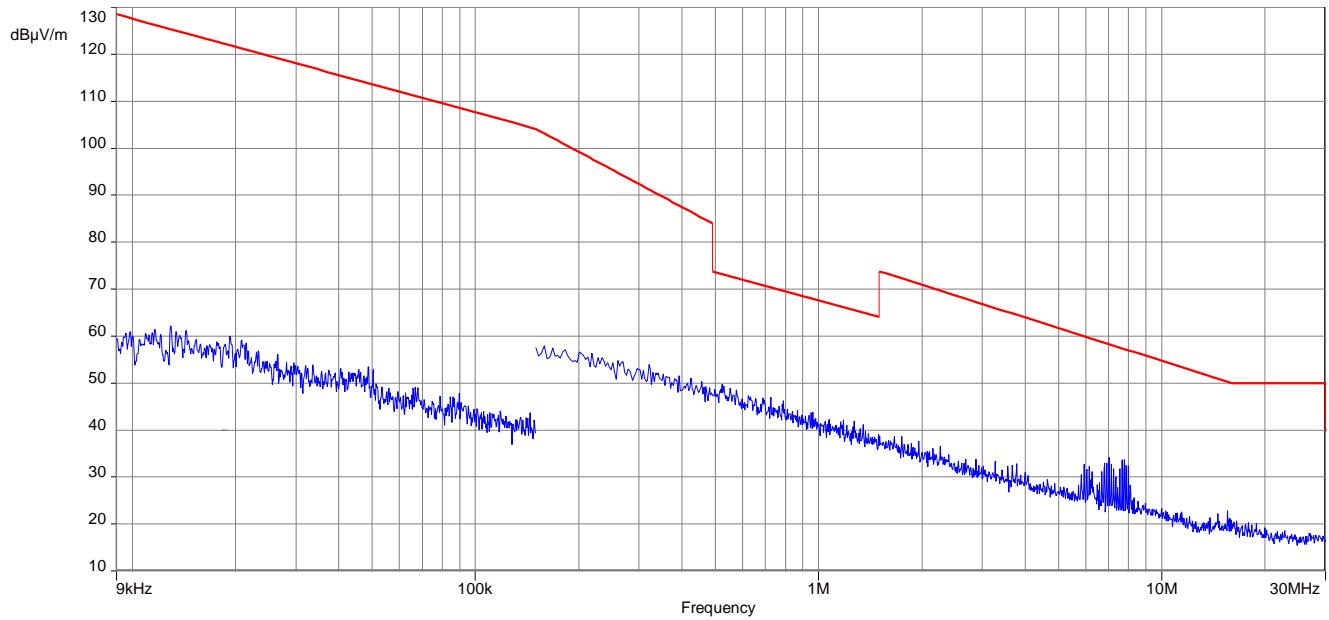
FCC		IC
Frequency (MHz)	Field Strength (dB μ V/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results:

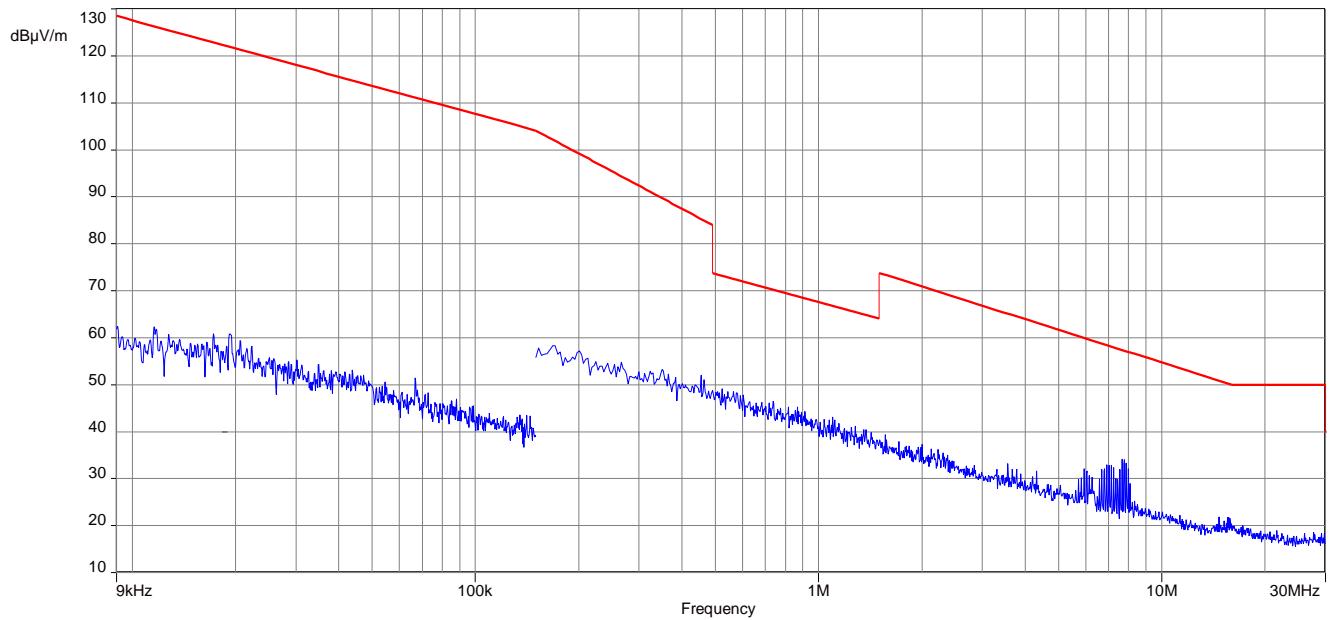
TX Spurious Emissions Radiated < 30 MHz [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
All detected peaks are more than 20 dB below the limit.		

Plots: DSSS, antenna 1

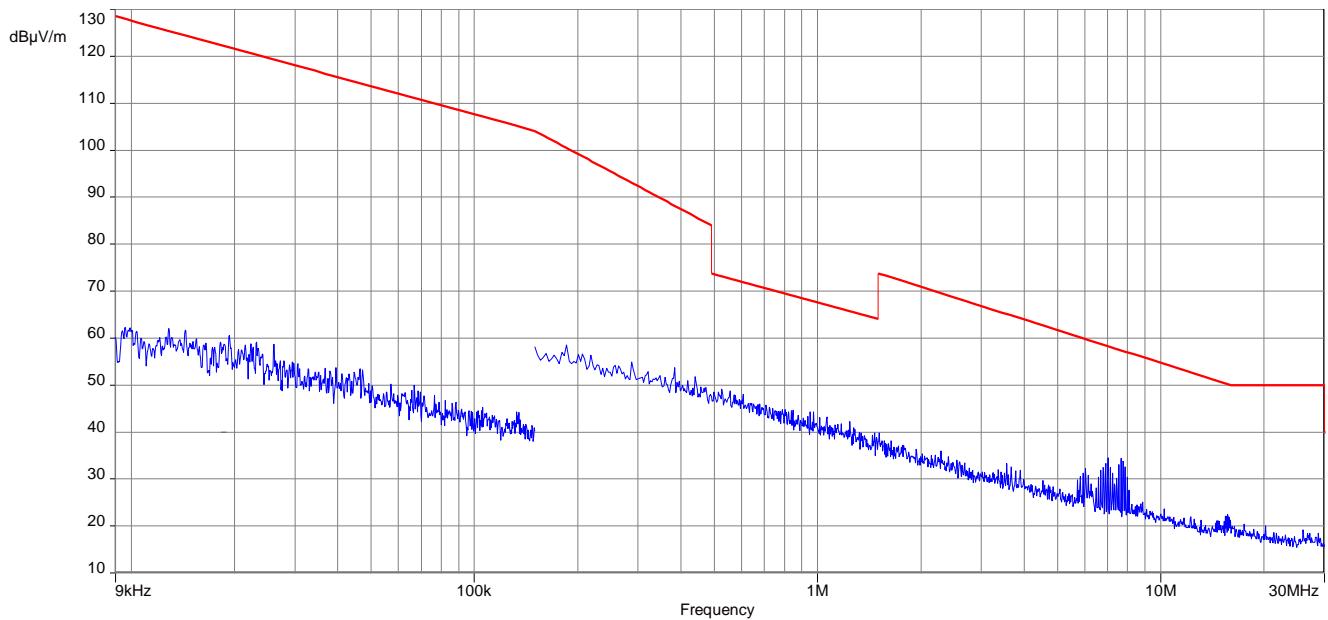
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

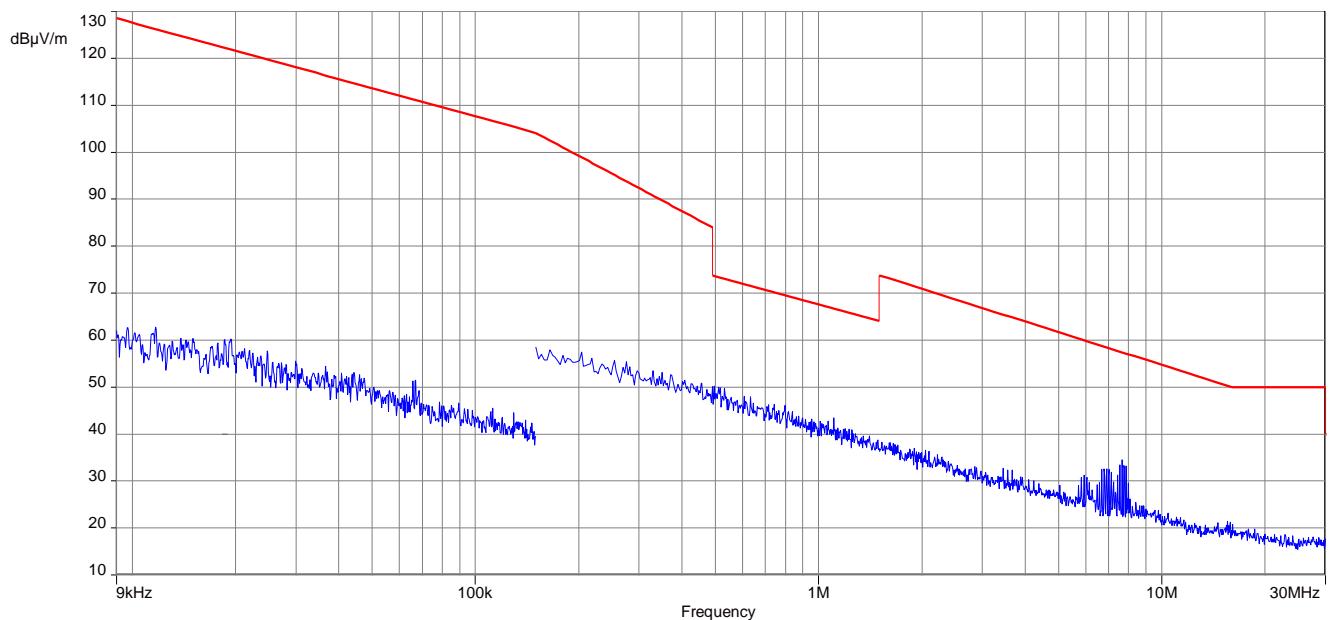


Plot 3: 9 kHz to 30 MHz, high channel

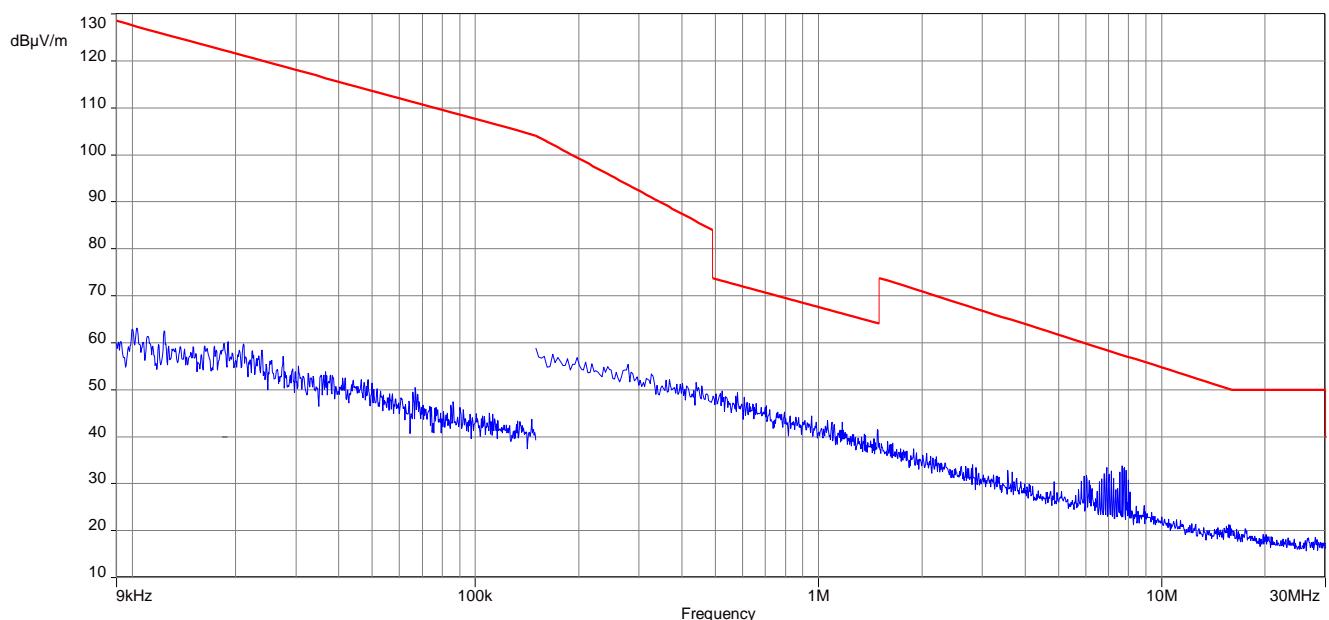


Plots: OFDM (20 MHz bandwidth), antenna 1

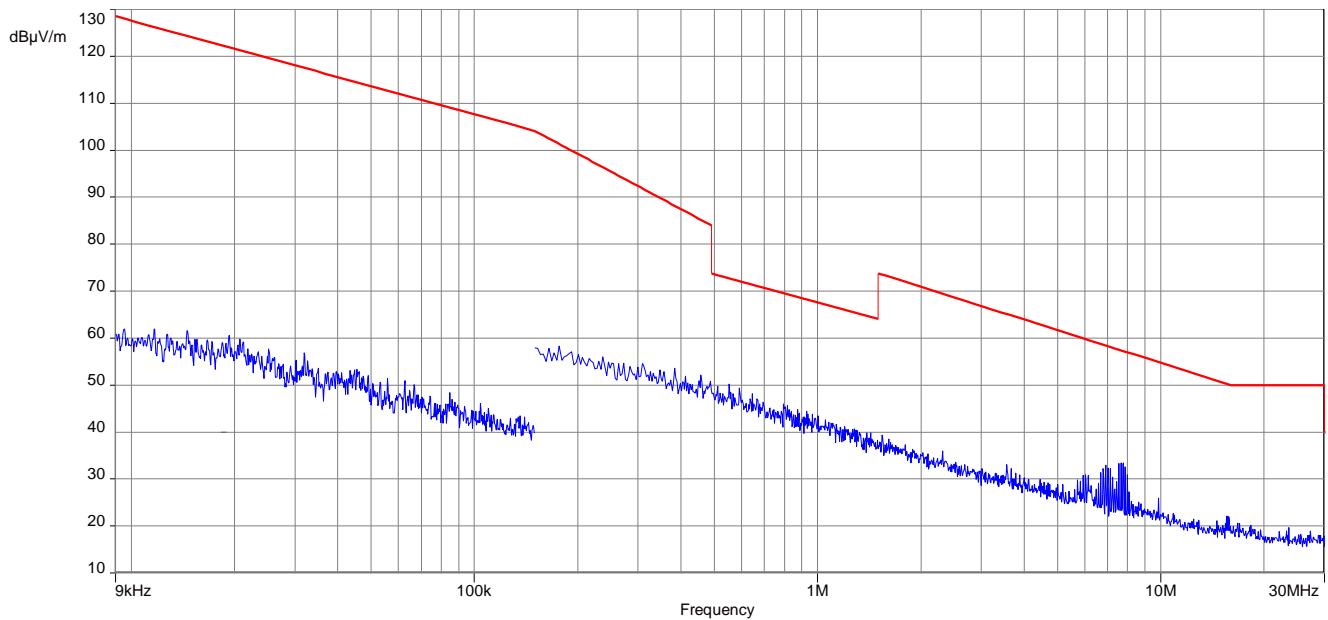
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

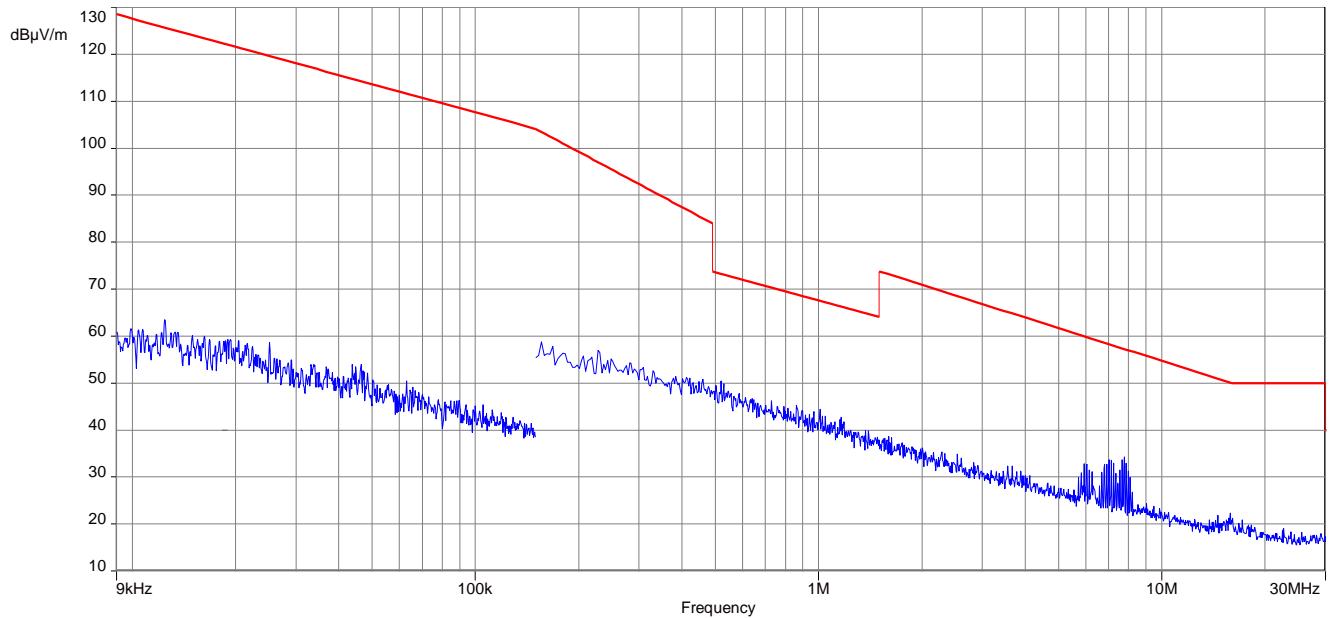


Plot 3: 9 kHz to 30 MHz, high channel

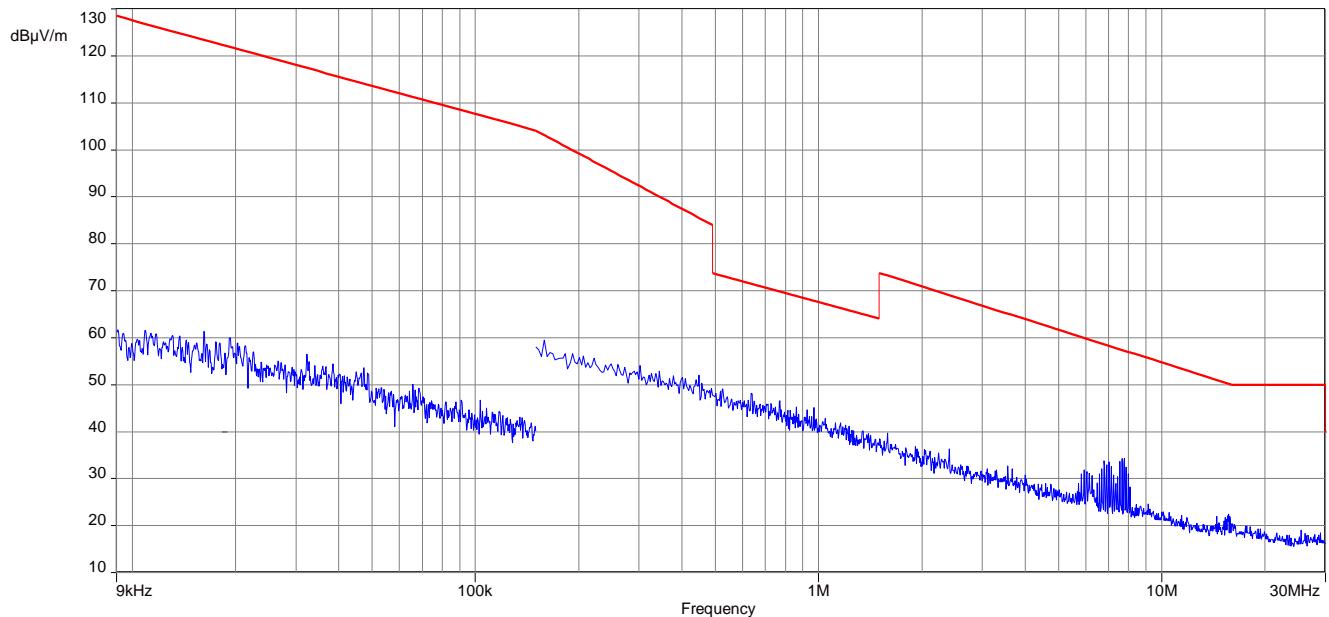


Plots: OFDM (40 MHz bandwidth), antenna 1

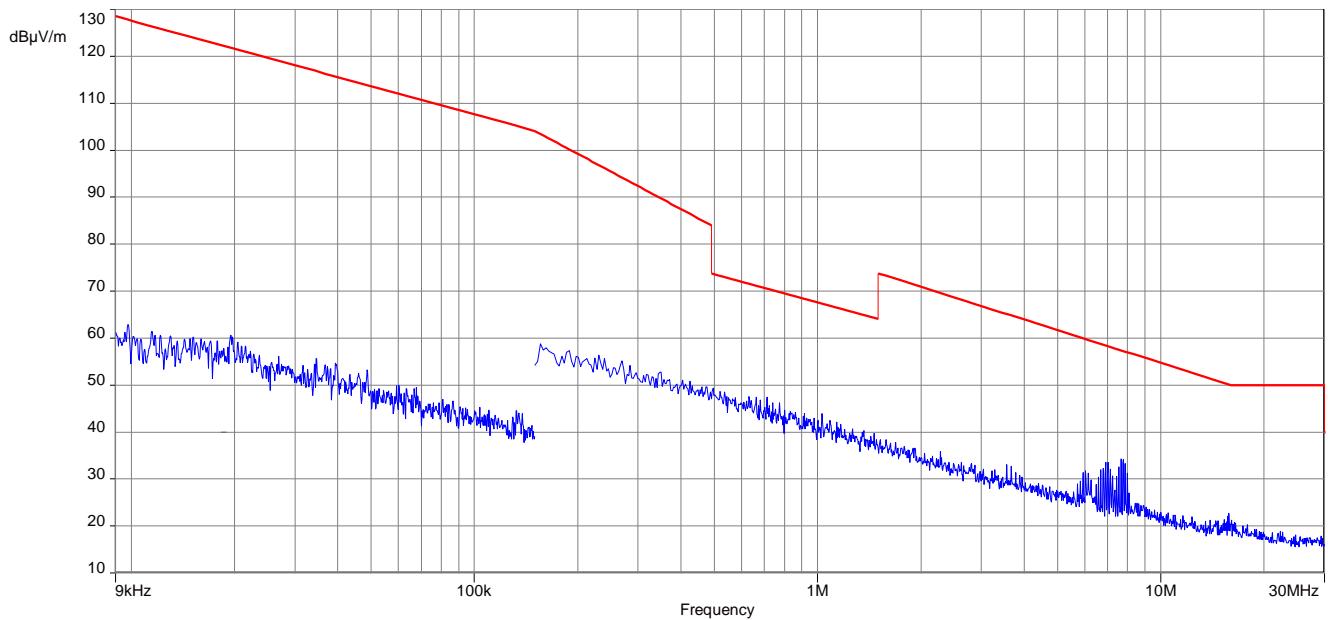
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

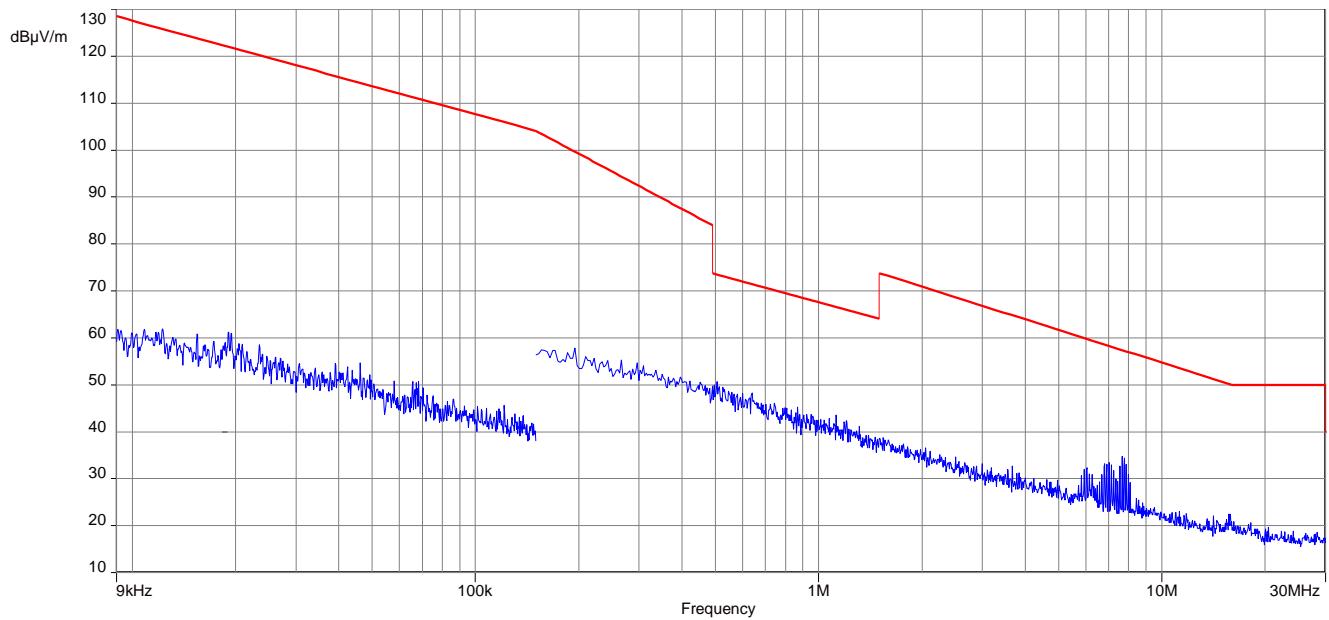


Plot 3: 9 kHz to 30 MHz, high channel

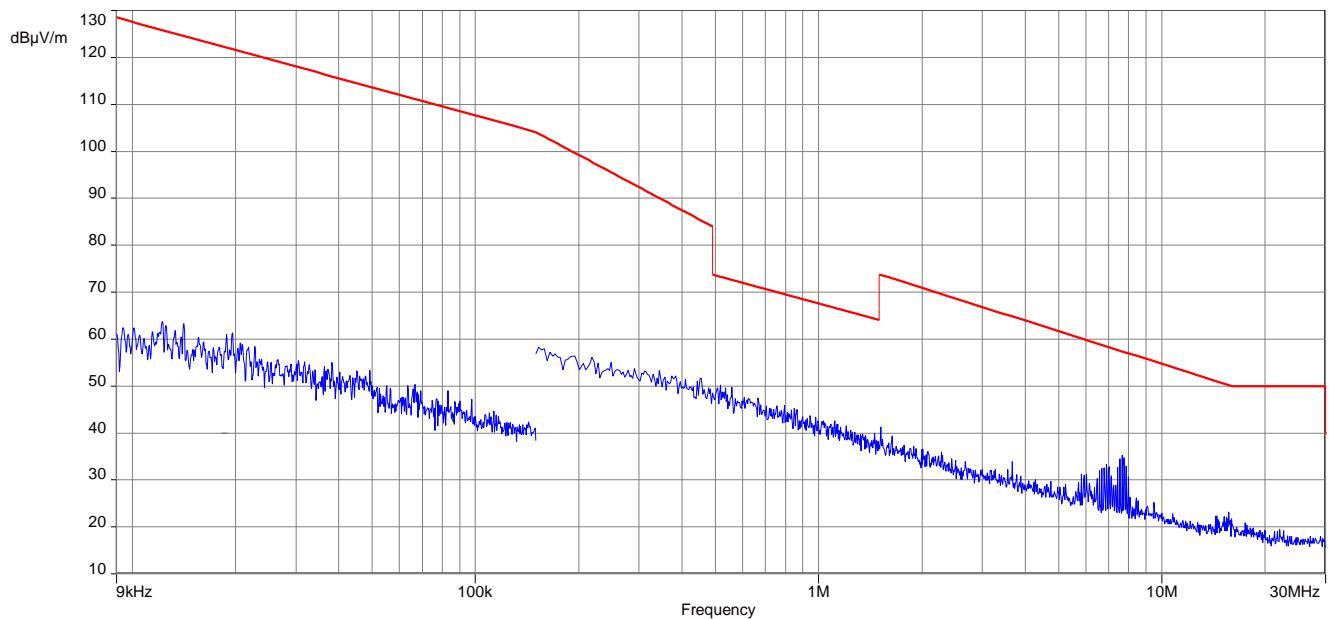


Plots: DSSS, antenna 2

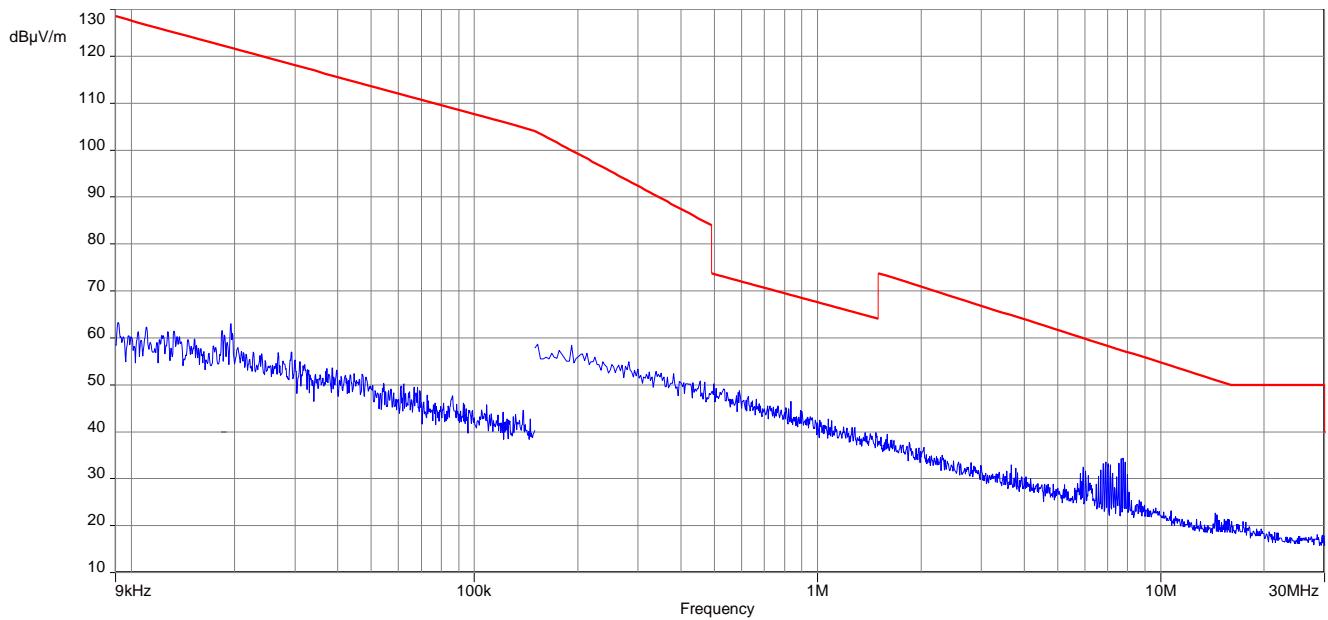
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

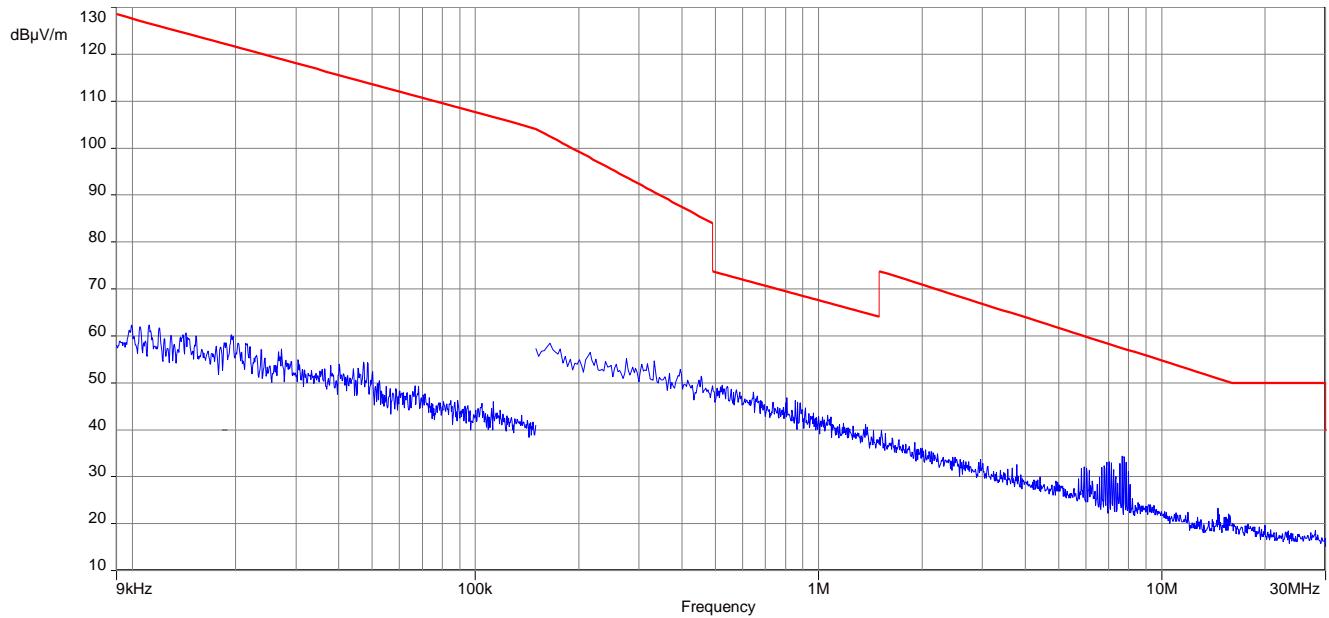


Plot 3: 9 kHz to 30 MHz, high channel

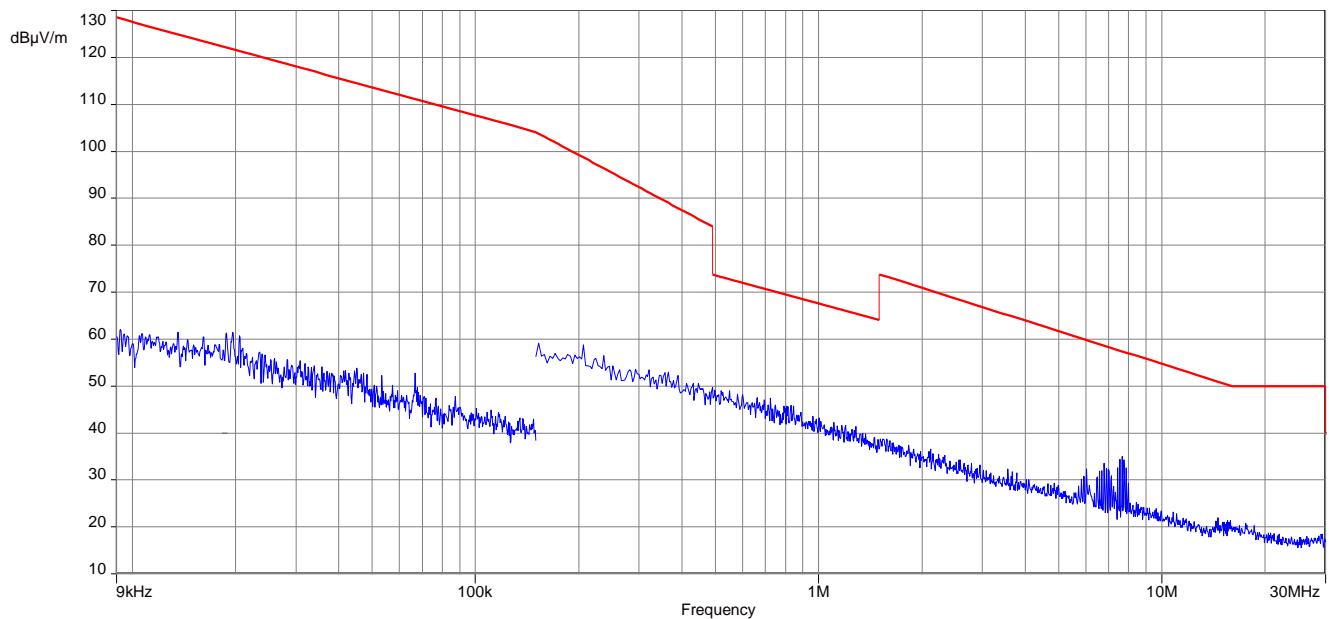


Plots: OFDM (20 MHz bandwidth), antenna 2

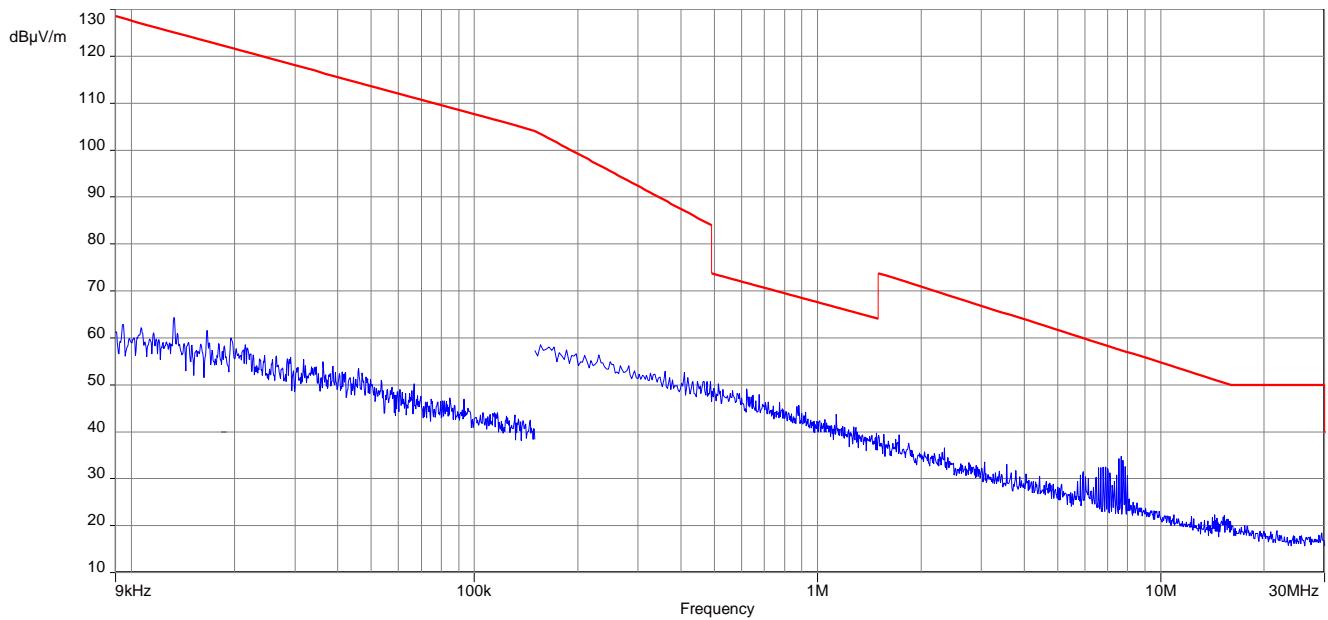
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel

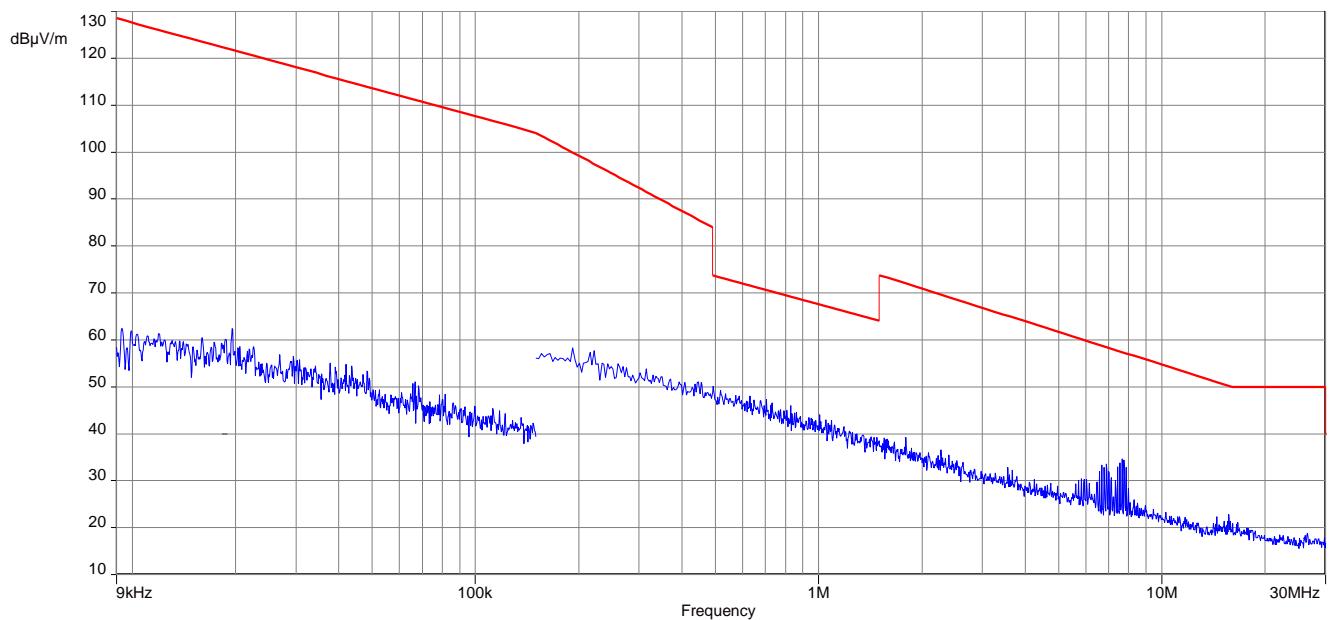


Plot 3: 9 kHz to 30 MHz, high channel

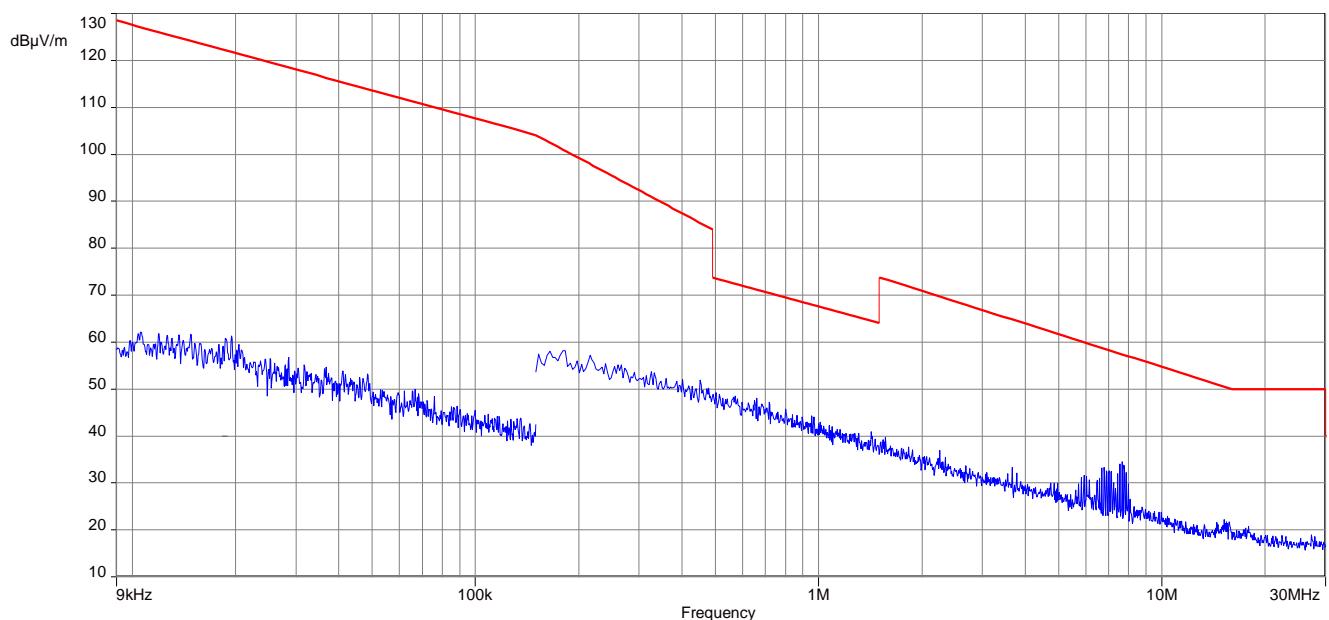


Plots: OFDM (40 MHz bandwidth), antenna 2

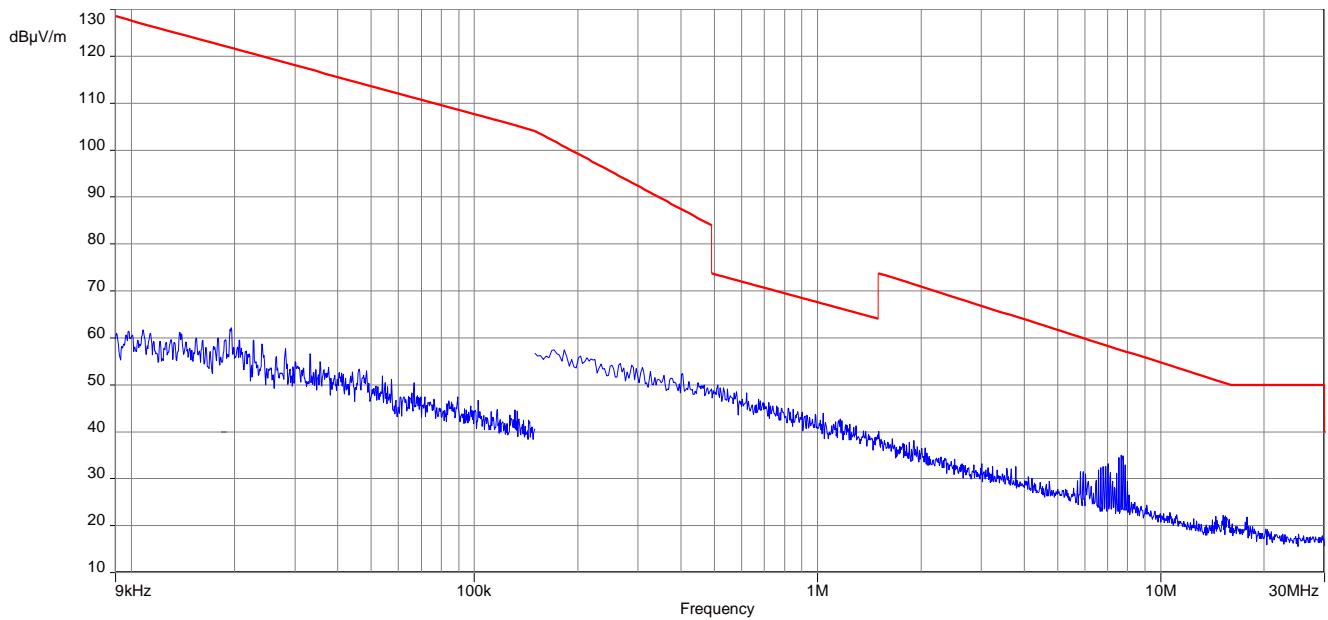
Plot 1: 9 kHz to 30 MHz, low channel



Plot 2: 9 kHz to 30 MHz, mid channel



Plot 3: 9 kHz to 30 MHz, high channel



12.12 Spurious emissions radiated 30 MHz to 1 GHz

Description:

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

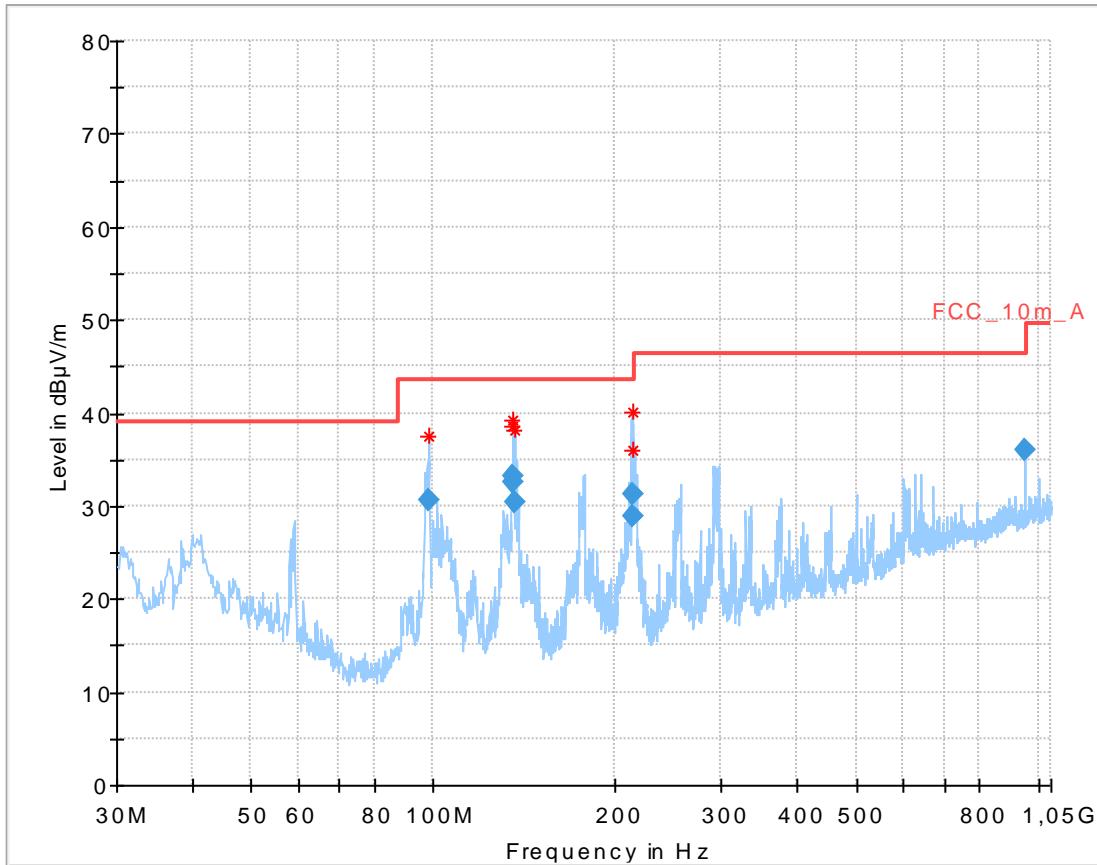
Measurement:

Measurement parameter	
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	<input checked="" type="checkbox"/> DSSS b – mode <input checked="" type="checkbox"/> OFDM g – mode <input type="checkbox"/> OFDM n HT20 – mode <input checked="" type="checkbox"/> OFDM n HT40 – mode <input checked="" type="checkbox"/> RX / Idle – mode
Test setup:	See sub clause 7.1 - A
Measurement uncertainty	See sub clause 9

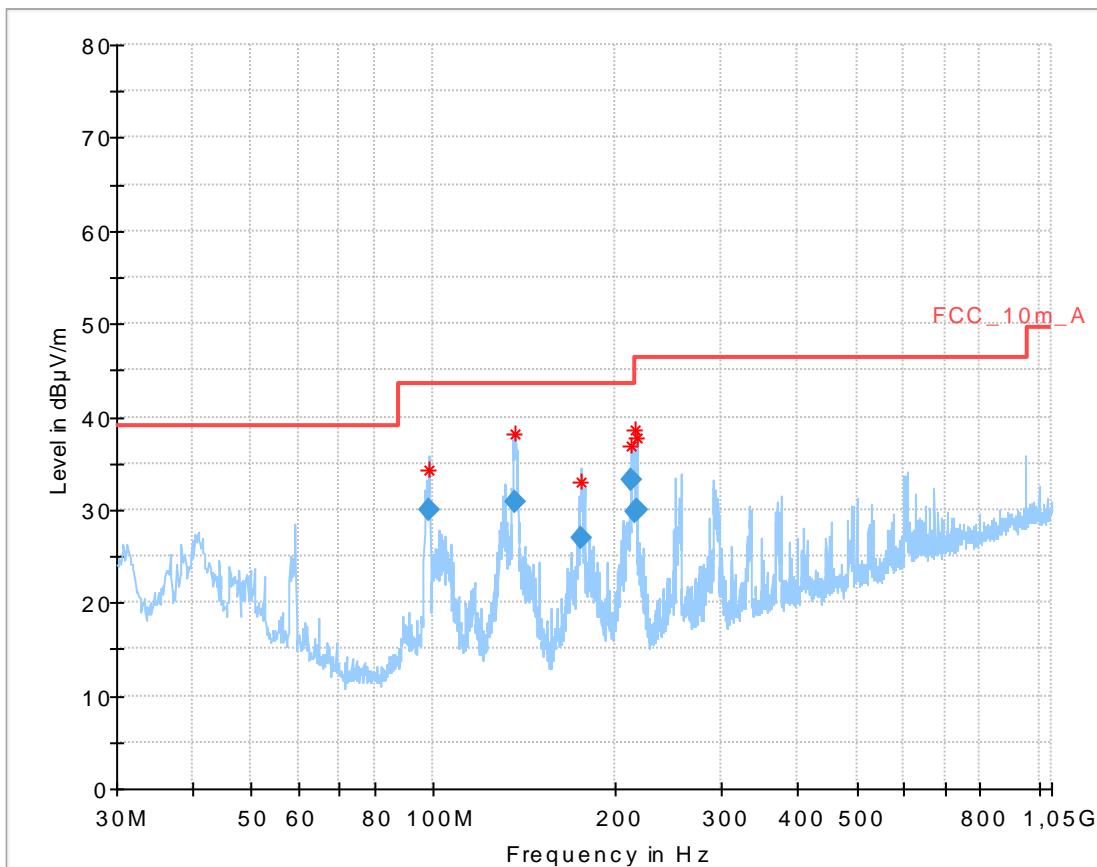
The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

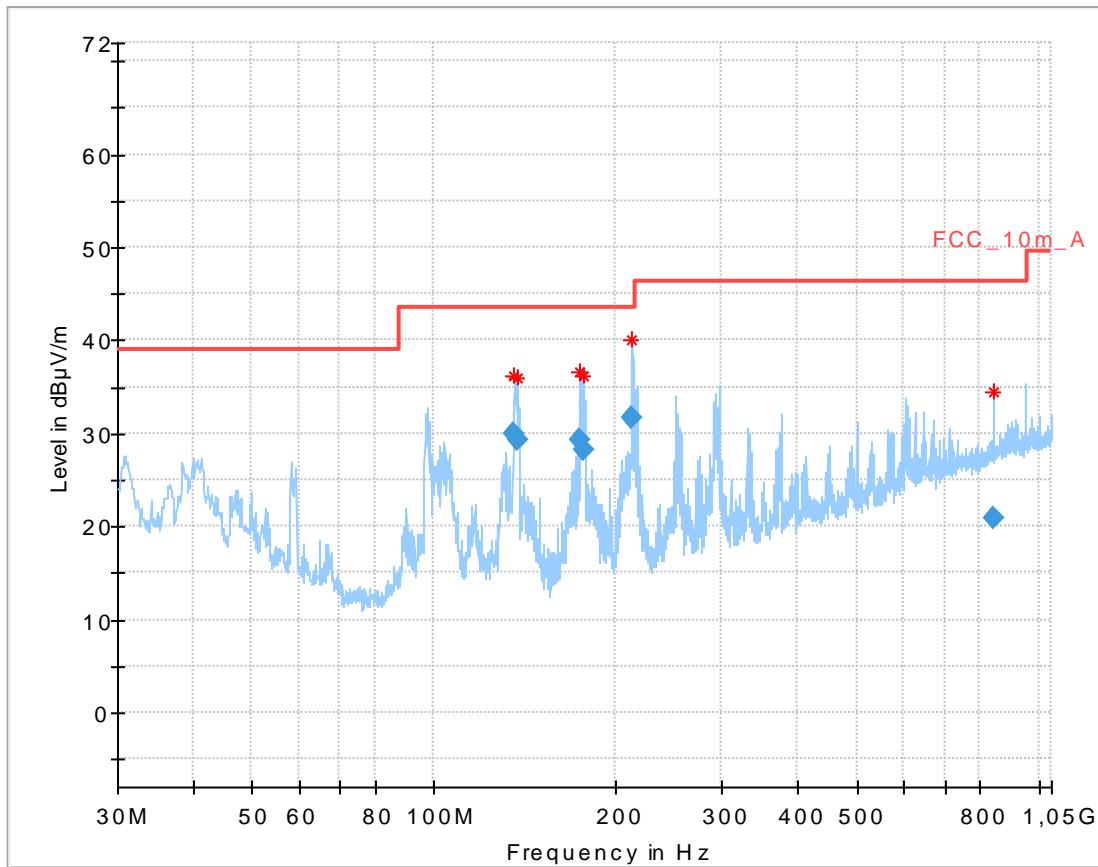
FCC	IC
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains 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)).	
Frequency (MHz)	Field Strength (dB μ V/m)
30 - 88	30.0
88 - 216	33.5
216 - 960	36.0

Plot: DSSS, antenna 1**Plot 1:** 30 MHz to 1 GHz, vertical & horizontal polarization, low channel**Final_Result:**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
98.547600	30.70	43.50	12.80	1000.0	120.000	101.0	V	4.0	11.9
135.510150	33.15	43.50	10.35	1000.0	120.000	98.0	V	75.0	9.0
135.764550	32.52	43.50	10.98	1000.0	120.000	100.0	V	276.0	9.0
136.224600	30.36	43.50	13.14	1000.0	120.000	98.0	V	276.0	9.0
213.233700	31.35	43.50	12.15	1000.0	120.000	98.0	V	122.0	12.2
214.365600	28.80	43.50	14.70	1000.0	120.000	98.0	V	149.0	12.2
949.981200	35.98	46.40	10.42	1000.0	120.000	101.0	H	149.0	24.3

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel**Final_Result:**

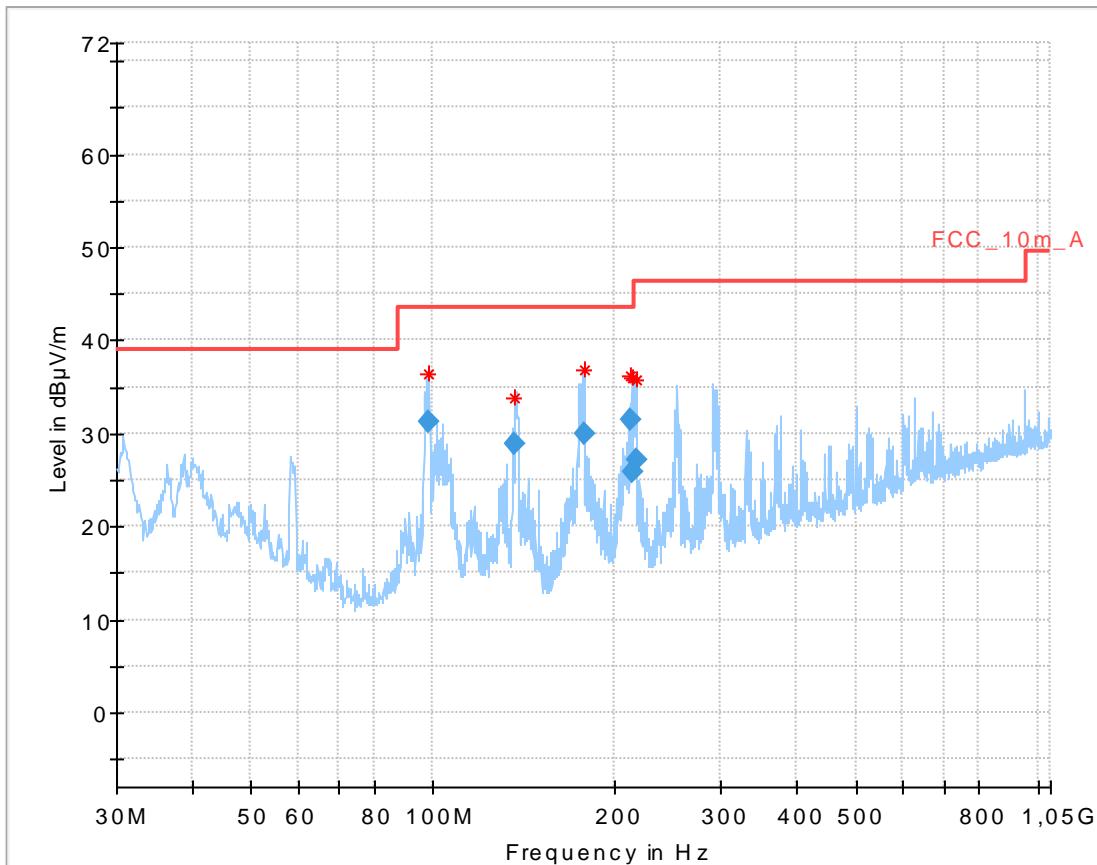
Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
98.543100	29.87	43.50	13.63	1000.0	120.000	100.0	V	324.0	11.9
136.775550	30.90	43.50	12.60	1000.0	120.000	98.0	V	213.0	8.9
175.898100	26.94	43.50	16.56	1000.0	120.000	98.0	V	168.0	10.1
212.934600	33.31	43.50	10.19	1000.0	120.000	98.0	V	206.0	12.2
214.703550	29.69	43.50	13.81	1000.0	120.000	98.0	V	168.0	12.2
216.857100	30.07	46.40	16.33	1000.0	120.000	98.0	V	183.0	12.3

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel**Final_Result:**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
135.588600	29.97	43.50	13.53	1000.0	120.000	98.0	V	131.0	9.0
138.041550	29.36	43.50	14.14	1000.0	120.000	185.0	V	112.0	8.8
174.282750	29.34	43.50	14.16	1000.0	120.000	98.0	V	131.0	10.0
176.328900	28.25	43.50	15.25	1000.0	120.000	98.0	V	241.0	10.1
212.996850	31.65	43.50	11.85	1000.0	120.000	98.0	V	150.0	12.2
841.497150	20.88	36.40	25.52	1000.0	120.000	98.0	V	302.0	23.3

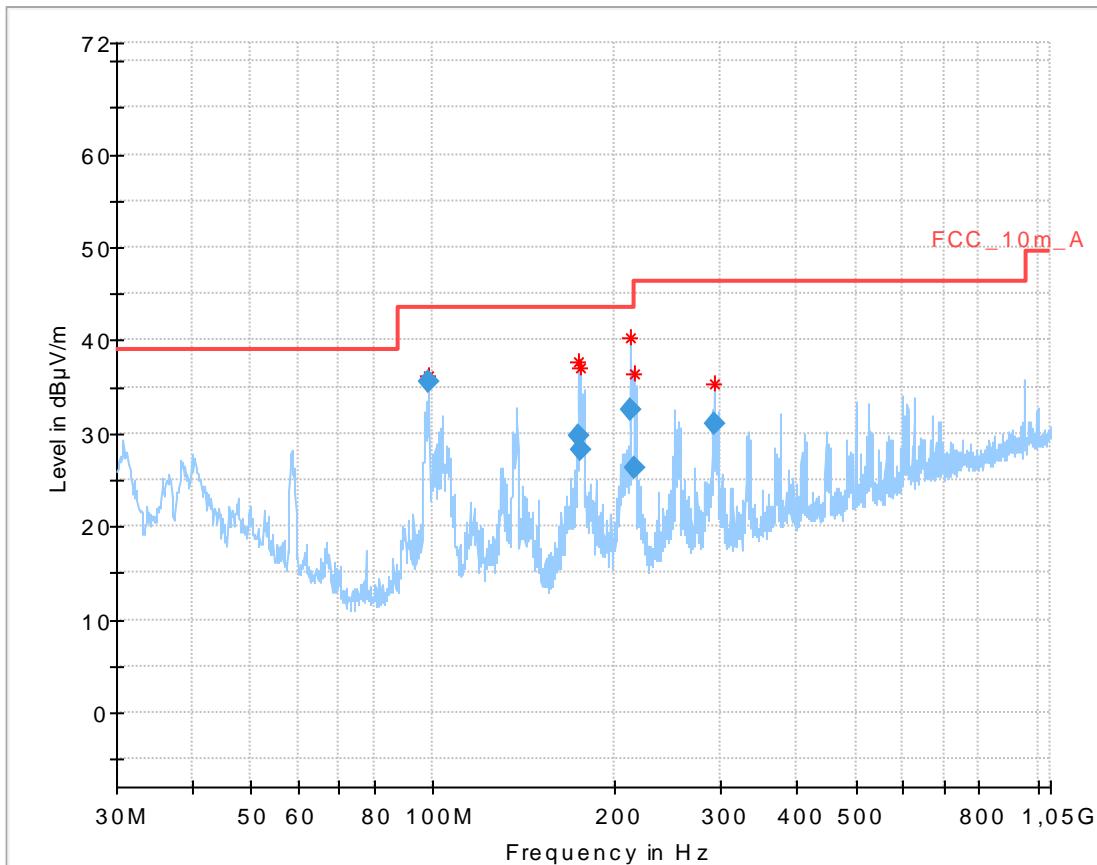
Plot: OFDM (20 MHz bandwidth), antenna 1

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, low channel

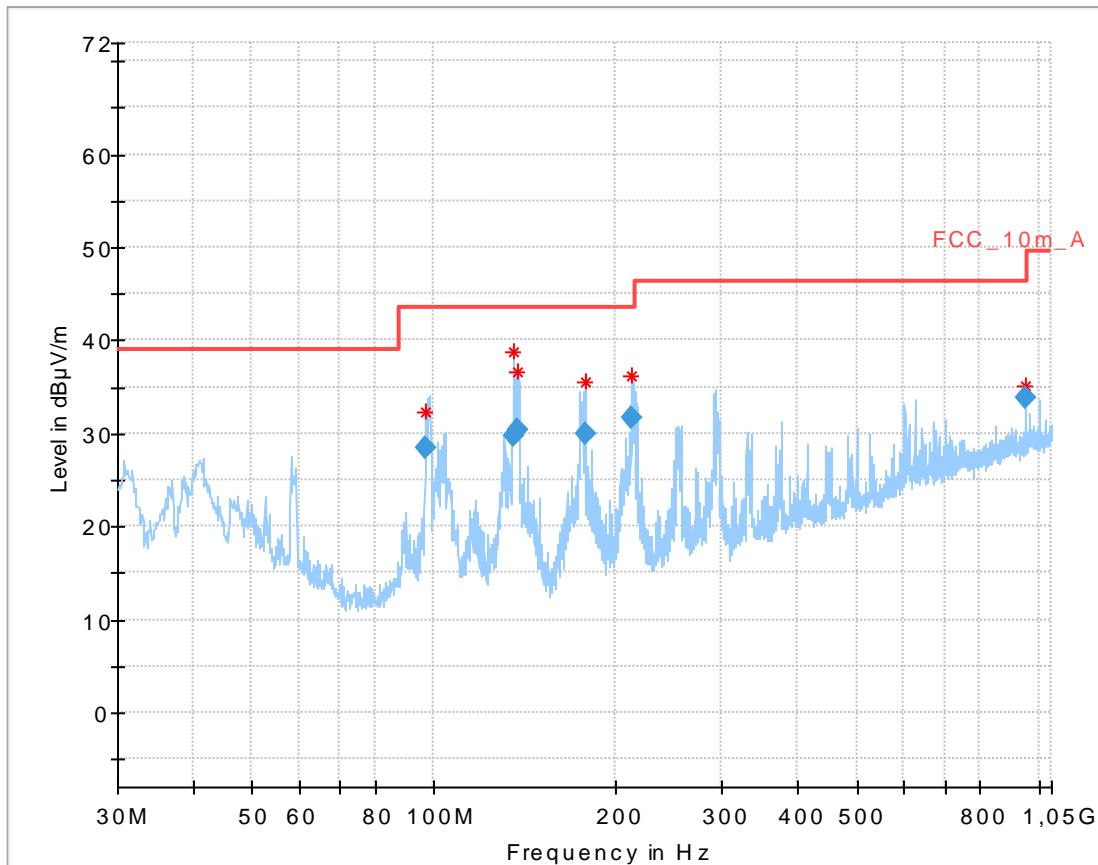


Final_Result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
98.582850	31.34	43.50	12.16	1000.0	120.000	185.0	V	343.0	11.9
136.880250	28.94	43.50	14.56	1000.0	120.000	185.0	V	59.0	8.9
177.525300	29.98	43.50	13.52	1000.0	120.000	98.0	V	275.0	10.2
212.949600	31.36	43.50	12.14	1000.0	120.000	185.0	H	120.0	12.2
214.667100	25.82	43.50	17.68	1000.0	120.000	98.0	V	89.0	12.2
216.843000	27.08	46.40	18.6	1000.0	120.000	98.0	V	154.0	12.3

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel**Final_Result:**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
98.268300	35.58	43.50	7.92	1000.0	120.000	98.0	V	0.0	11.9
174.239550	29.70	43.50	13.8	1000.0	120.000	98.0	V	73.0	10.0
175.821300	28.26	43.50	15.24	1000.0	120.000	98.0	V	221.0	10.1
212.868750	32.49	43.50	11.01	1000.0	120.000	98.0	V	173.0	12.2
214.825650	26.30	43.50	17.2	1000.0	120.000	98.0	V	92.0	12.2
291.488550	30.98	46.40	15.42	1000.0	120.000	185.0	H	73.0	14.3

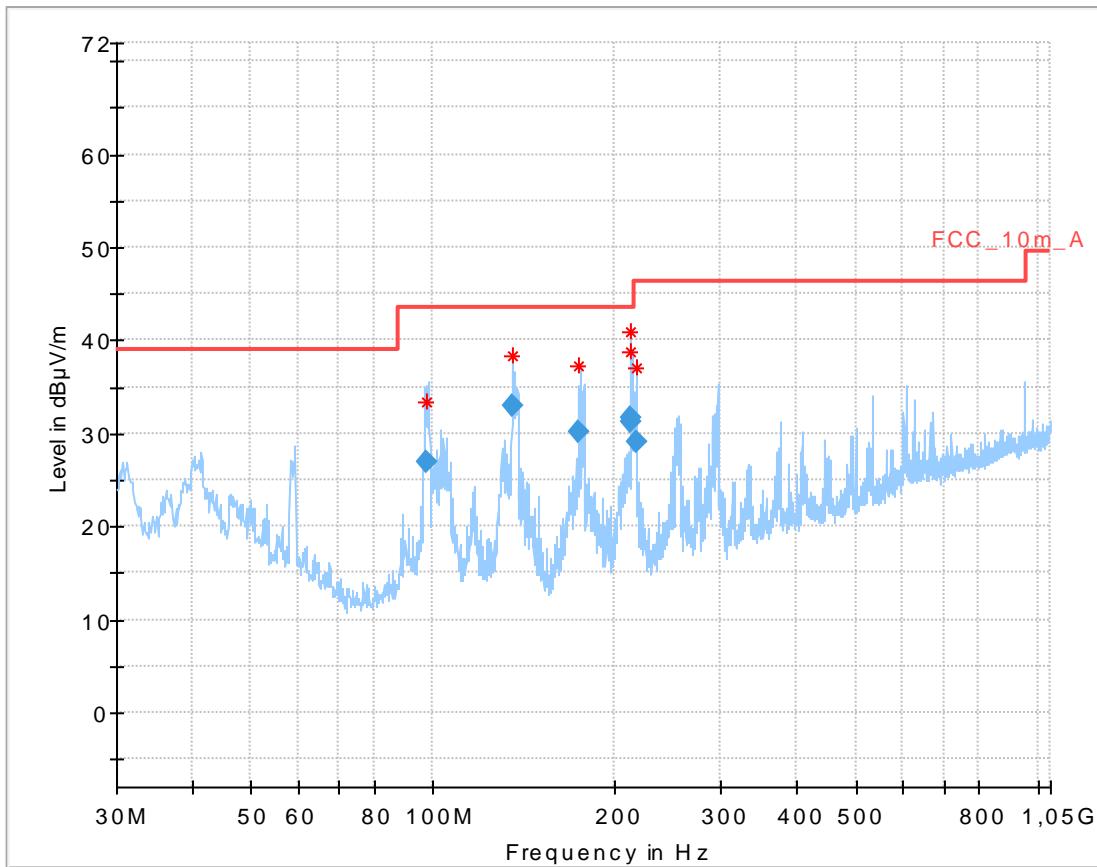
Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel

Final Result:

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
96.830250	28.49	43.50	15.01	1000.0	120.000	100.0	V	353.0	11.6
135.485700	29.80	43.50	13.70	1000.0	120.000	185.0	V	315.0	9.0
137.990550	30.44	43.50	13.06	1000.0	120.000	98.0	V	60.0	8.8
177.515850	29.92	43.50	13.58	1000.0	120.000	101.0	V	276.0	10.2
212.967300	31.67	43.50	11.83	1000.0	120.000	98.0	V	212.0	12.2
950.004300	33.93	46.40	12.47	1000.0	120.000	98.0	H	194.0	24.3

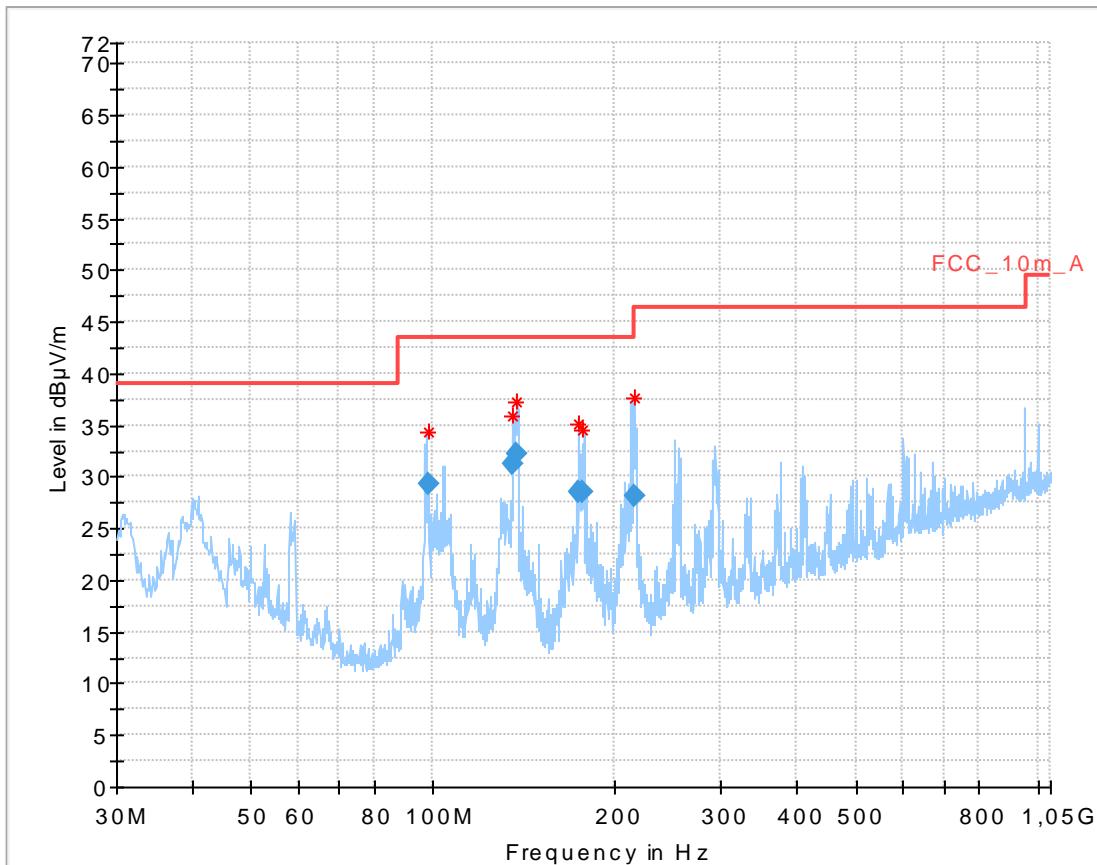
Plot: OFDM (40 MHz bandwidth), antenna 1

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, low channel

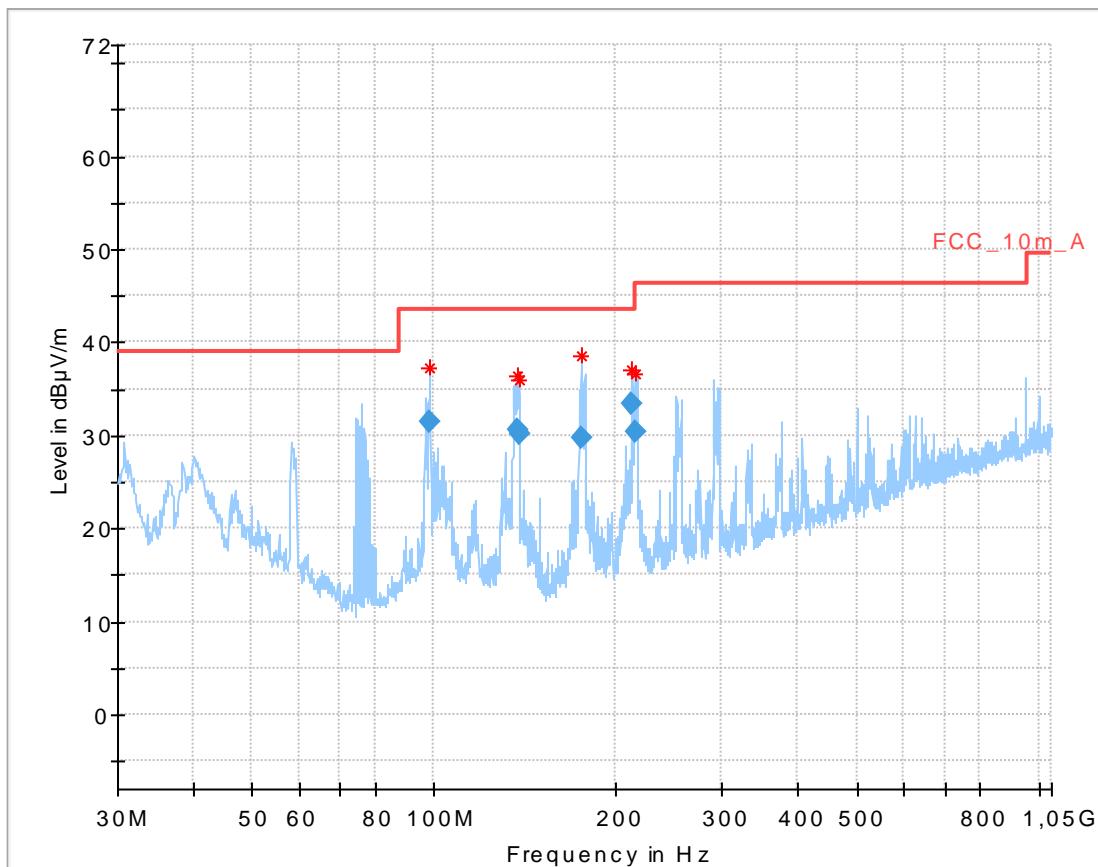


Final_Result:

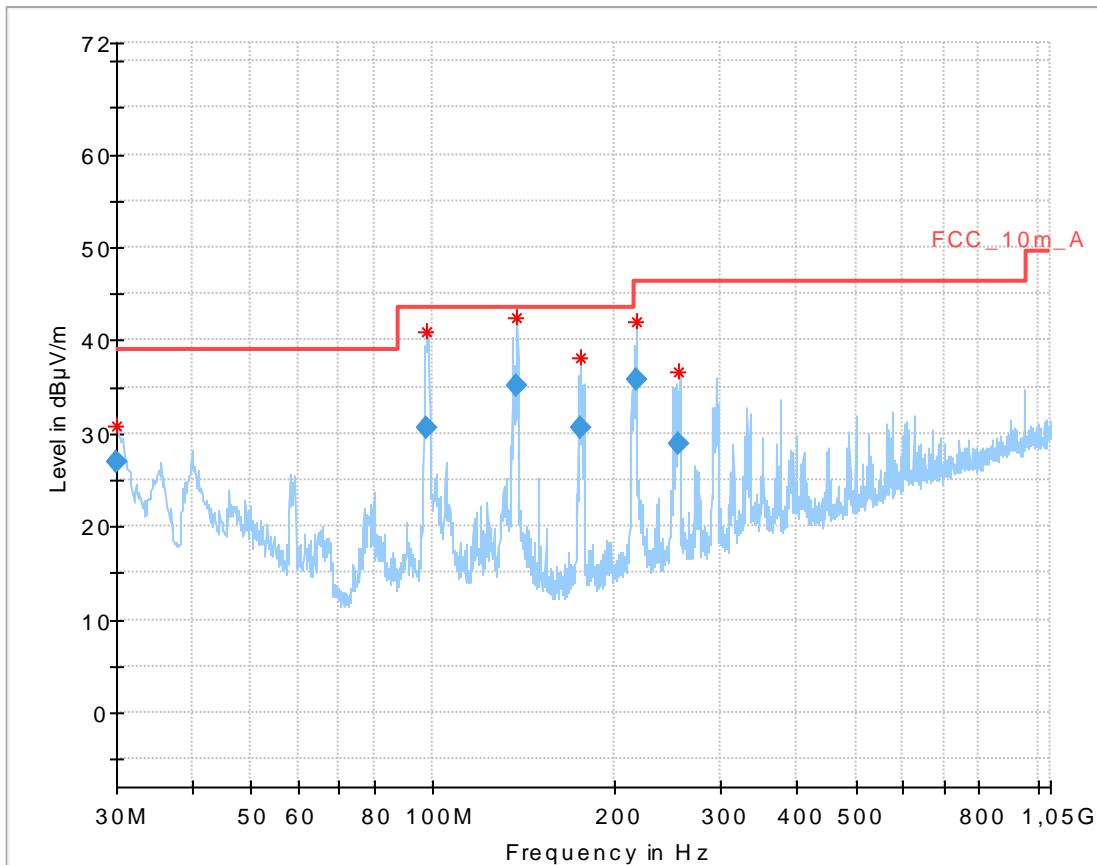
Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
97.647900	26.96	43.50	16.54	1000.0	120.000	101.0	V	307.0	11.8
135.536850	33.07	43.50	10.43	1000.0	120.000	98.0	V	114.0	9.0
174.484650	30.12	43.50	13.38	1000.0	120.000	98.0	V	95.0	10.0
212.971050	31.68	43.50	11.82	1000.0	120.000	98.0	V	174.0	12.2
213.002550	31.30	43.50	12.20	1000.0	120.000	101.0	V	174.0	12.2
216.982500	29.03	46.40	17.37	1000.0	120.000	98.0	V	174.0	12.3

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel**Final_Result:**

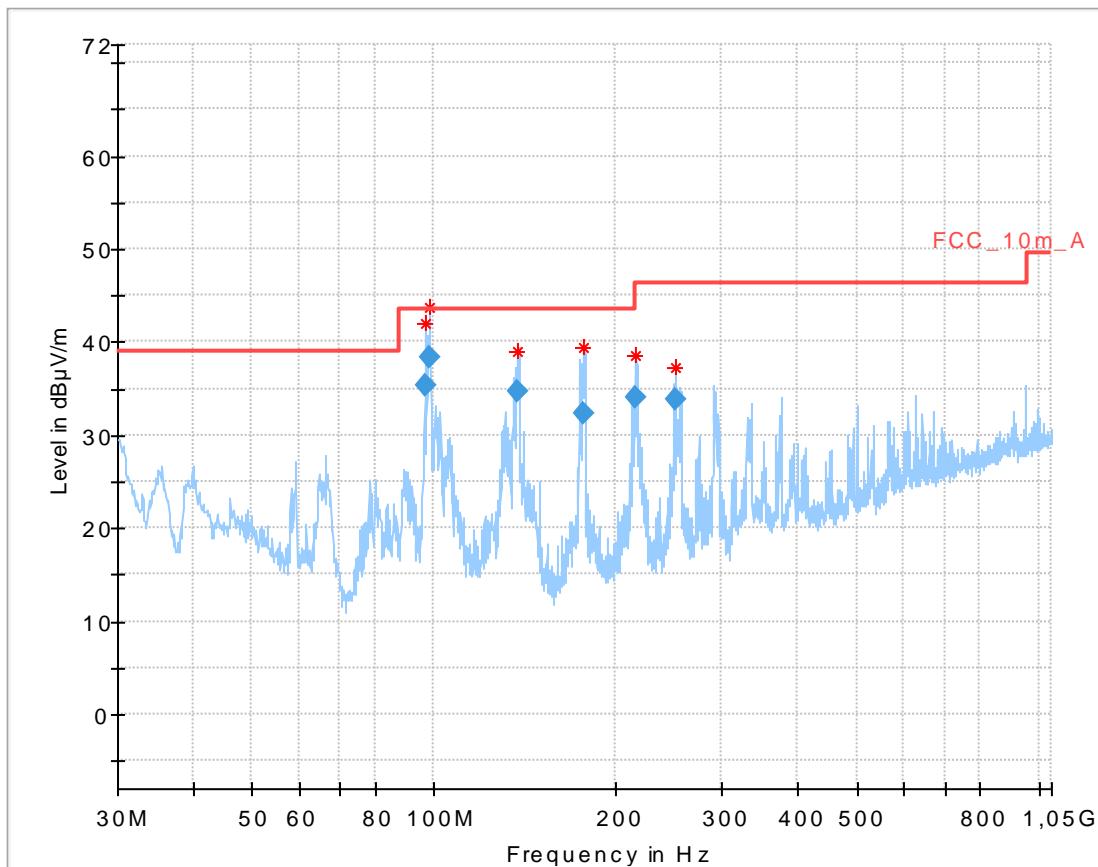
Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
98.068200	29.29	43.50	14.21	1000.0	120.000	101.0	V	348.0	11.9
135.519750	31.17	43.50	12.33	1000.0	120.000	98.0	V	302.0	9.0
137.968500	32.30	43.50	11.20	1000.0	120.000	98.0	V	143.0	8.8
174.251400	28.61	43.50	14.89	1000.0	120.000	98.0	V	63.0	10.0
177.354150	28.48	43.50	15.02	1000.0	120.000	98.0	V	207.0	10.2
214.983000	28.17	43.50	15.33	1000.0	120.000	98.0	V	143.0	12.2

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel**Final_Result:**

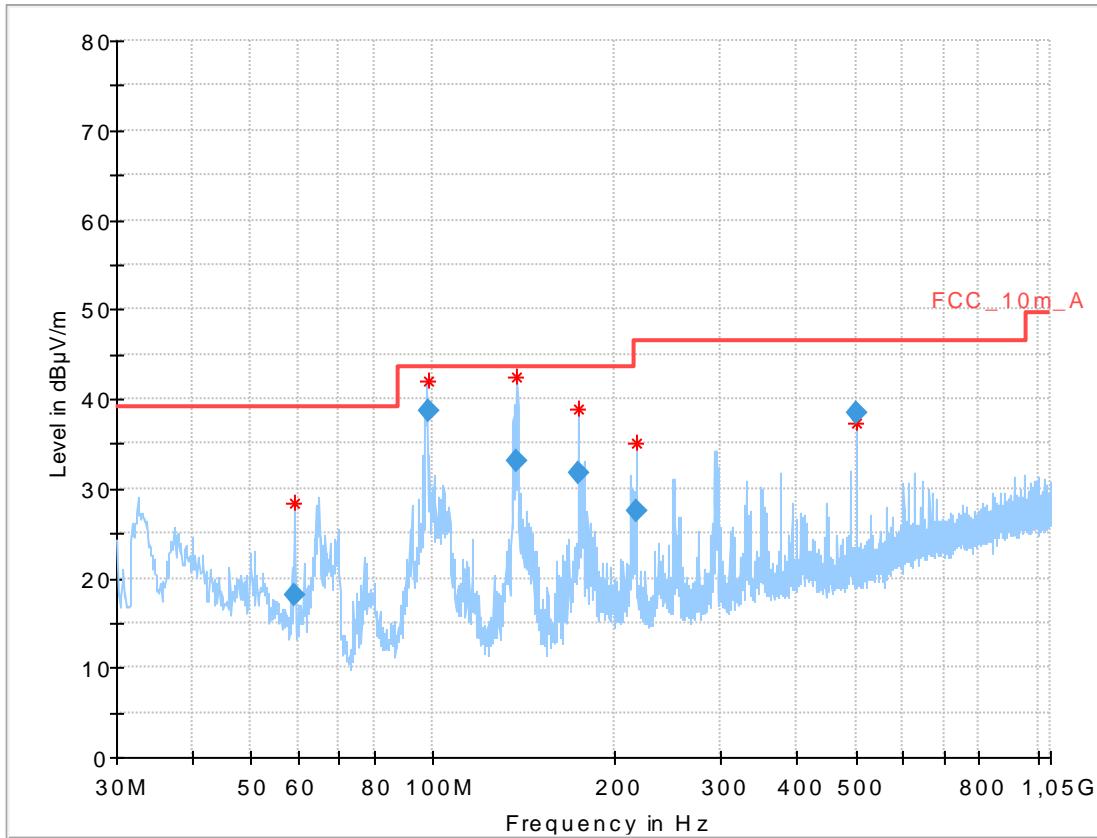
Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
98.521650	31.42	43.50	12.08	1000.0	120.000	98.0	V	333.0	11.9
138.047700	30.60	43.50	12.90	1000.0	120.000	185.0	V	80.0	8.8
138.071400	30.06	43.50	13.44	1000.0	120.000	98.0	V	206.0	8.8
175.764900	29.66	43.50	13.84	1000.0	120.000	98.0	V	118.0	10.1
212.927400	33.41	43.50	10.09	1000.0	120.000	185.0	H	125.0	12.2
214.764000	30.44	43.50	13.06	1000.0	120.000	98.0	V	206.0	12.2

Plot: RX / Idle mode**Plot 1:** 30 MHz to 1 GHz, vertical & horizontal polarization**Final_Result:**

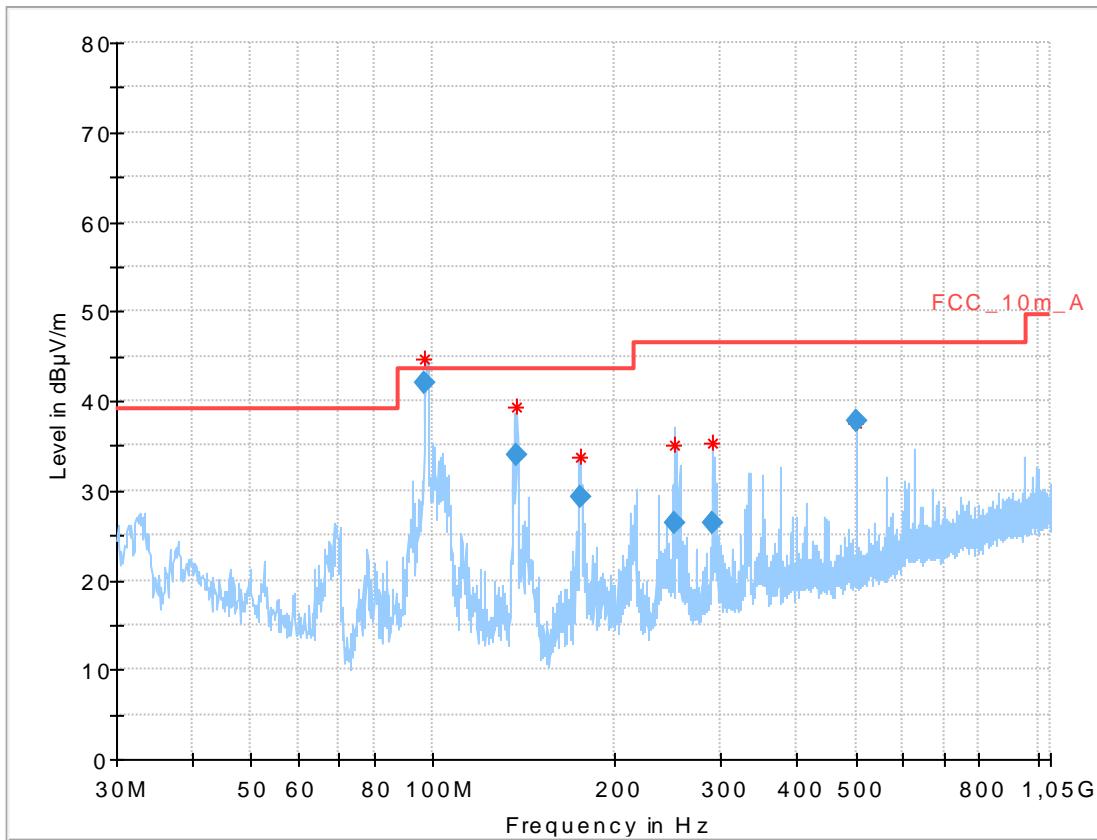
Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.029828	26.88	39.1	12.22	1000.0	120.000	101.0	V	292.0	13.3
97.660950	30.63	43.50	12.87	1000.0	120.000	98.0	V	31.0	11.8
138.037500	35.12	43.50	8.38	1000.0	120.000	98.0	V	124.0	8.8
175.783800	30.55	43.50	12.95	1000.0	120.000	98.0	V	243.0	10.1
216.952050	35.86	46.40	10.54	1000.0	120.000	98.0	V	341.0	12.3
255.415800	28.86	46.40	17.54	1000.0	120.000	98.0	V	54.0	13.5

Plot: DSSS, antenna 2**Plot 1:** 30 MHz to 1 GHz, vertical & horizontal polarization, low channel**Final_Result:**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
96.819750	35.30	43.50	8.20	1000.0	120.000	98.0	V	260.0	11.6
98.535750	38.34	43.50	5.16	1000.0	120.000	98.0	V	275.0	11.9
137.964750	34.80	43.50	8.70	1000.0	120.000	98.0	V	171.0	8.8
177.461700	32.42	43.50	11.08	1000.0	120.000	98.0	V	267.0	10.2
216.045300	33.98	46.40	12.42	1000.0	120.000	98.0	V	351.0	12.3
251.583150	33.94	46.40	12.46	1000.0	120.000	98.0	V	23.0	13.4

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel**Final_Result:**

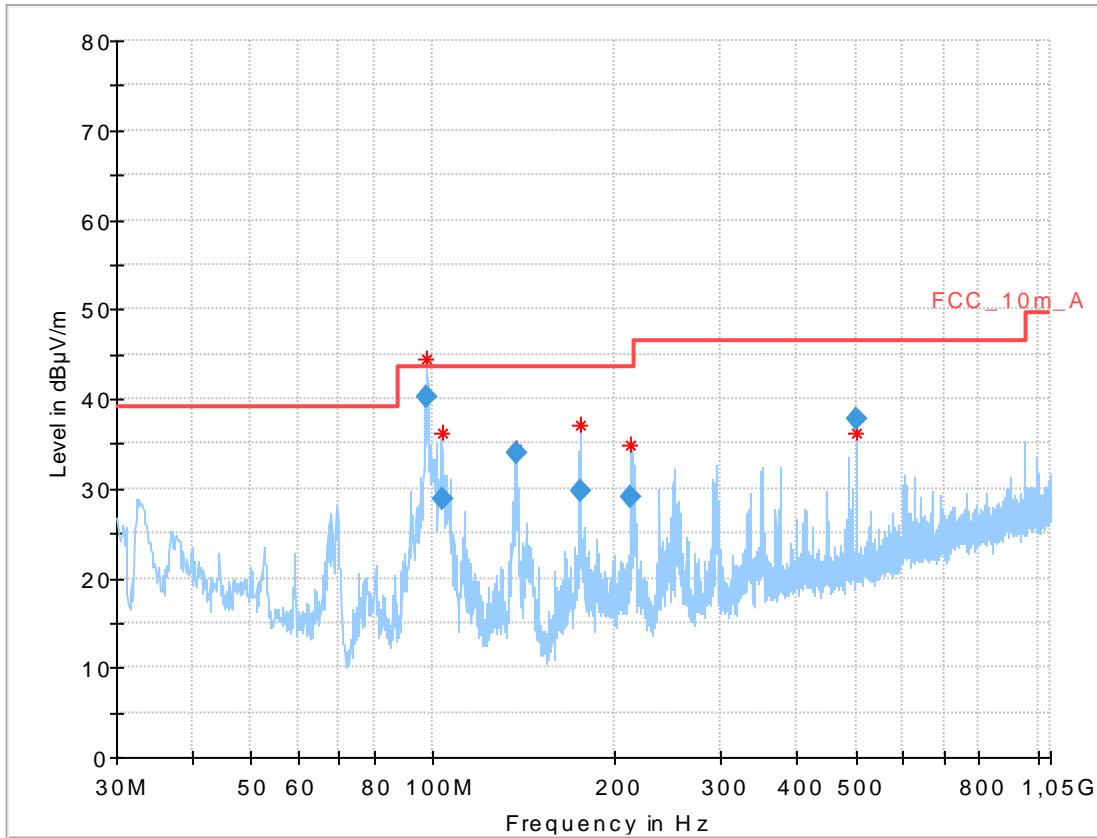
Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
59.112150	18.09	39.10	21.01	1000.0	120.000	101.0	V	-9.0	10.8
98.523000	38.59	43.50	4.91	1000.0	120.000	101.0	V	10.0	11.9
137.944350	33.00	43.50	10.50	1000.0	120.000	101.0	V	260.0	8.8
174.308250	31.84	43.50	11.66	1000.0	120.000	98.0	V	260.0	10.0
216.888450	27.50	46.40	18.90	1000.0	120.000	98.0	V	100.0	12.3
499.992000	38.45	46.40	7.95	1000.0	120.000	170.0	H	280.0	18.7

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel**Final_Result:**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
96.855450	41.92	43.50	1.58	1000.0	120.000	98.0	V	260.0	11.7
137.992200	33.98	43.50	9.52	1000.0	120.000	98.0	V	-10.0	8.8
175.853250	29.25	43.50	14.25	1000.0	120.000	101.0	V	171.0	10.1
251.726250	26.47	46.40	19.93	1000.0	120.000	98.0	V	10.0	13.4
290.342550	26.29	46.40	20.11	1000.0	120.000	170.0	H	100.0	14.2
499.985250	37.72	46.40	8.68	1000.0	120.000	170.0	H	261.0	18.7

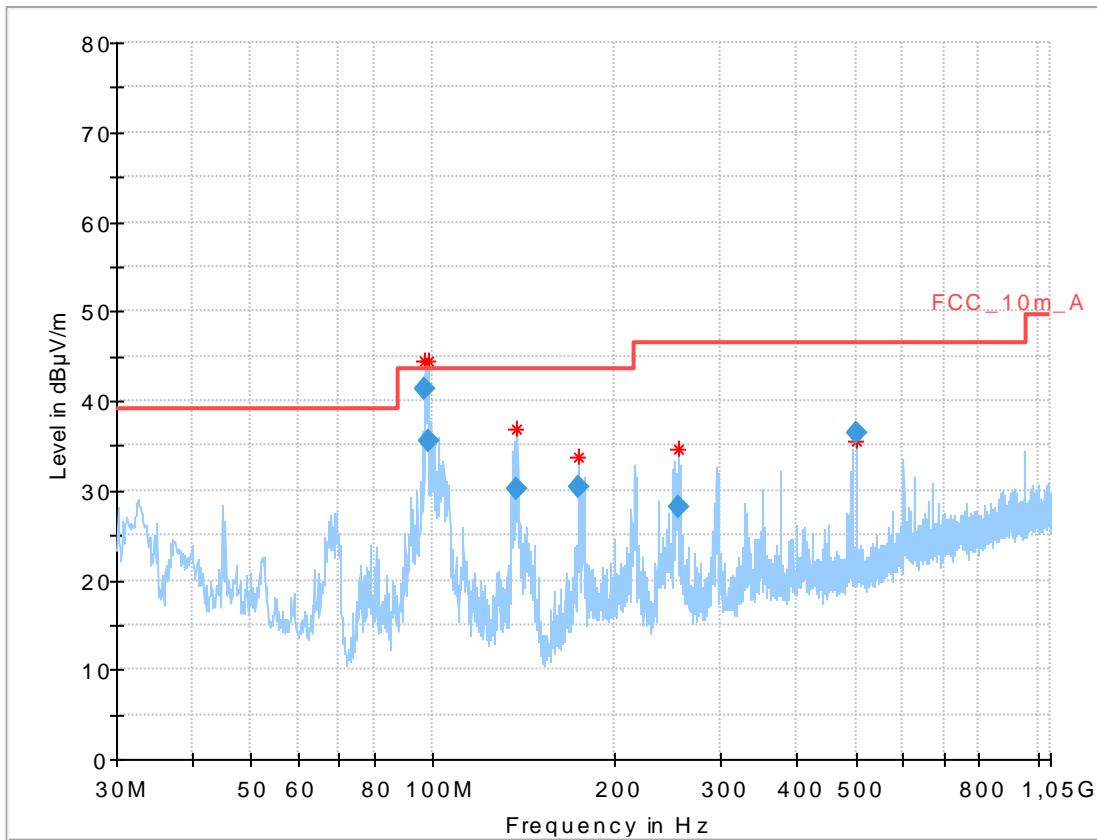
Plot: OFDM (20 MHz bandwidth), antenna 2

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, low channel

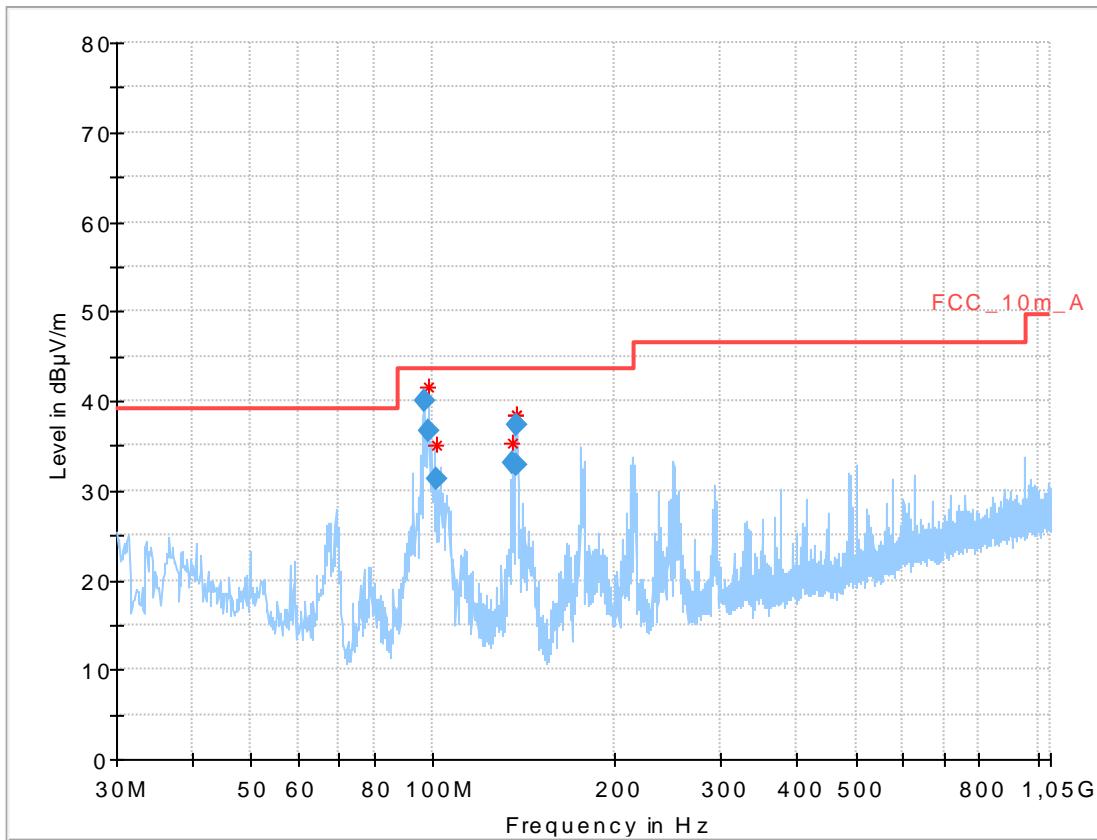


Final_Result:

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
97.651800	40.15	43.50	3.35	1000.0	120.000	101.0	V	260.0	11.8
103.762500	28.89	43.50	14.61	1000.0	120.000	170.0	V	100.0	11.8
137.973900	33.96	43.50	9.54	1000.0	120.000	101.0	V	80.0	8.8
175.831950	29.69	43.50	13.81	1000.0	120.000	98.0	V	260.0	10.1
212.993550	28.94	43.50	14.56	1000.0	120.000	101.0	V	280.0	12.2
499.995450	37.84	46.40	8.56	1000.0	120.000	170.0	H	261.0	18.7

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel**Final_Result:**

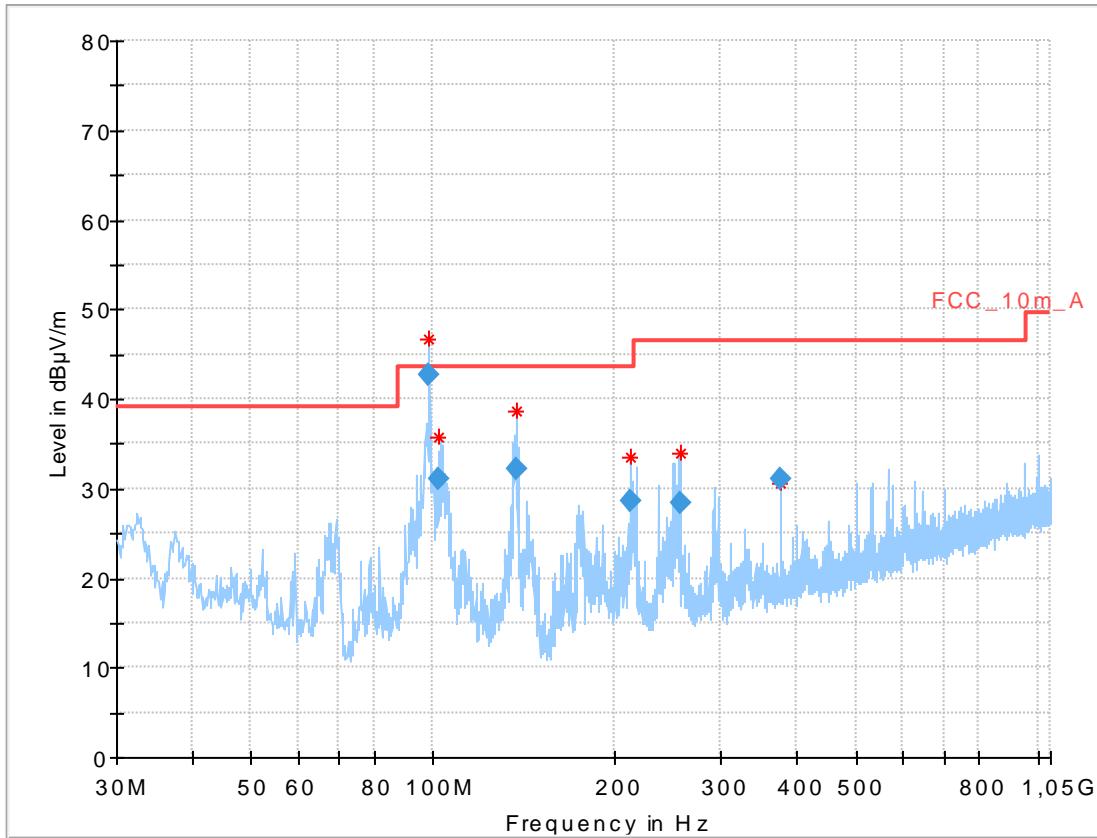
Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
96.836850	41.43	43.50	2.07	1000.0	120.000	98.0	V	260.0	11.6
98.564850	35.42	43.50	8.08	1000.0	120.000	98.0	V	100.0	11.9
138.001200	30.18	43.50	13.32	1000.0	120.000	98.0	V	280.0	8.8
174.225900	30.35	43.50	13.15	1000.0	120.000	98.0	V	260.0	10.0
255.104850	28.25	46.40	18.15	1000.0	120.000	170.0	H	80.0	13.5
499.986900	36.47	46.40	9.93	1000.0	120.000	170.0	H	260.0	18.7

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel**Final_Result:**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
96.792150	40.05	43.50	3.45	1000.0	120.000	98.0	V	190.0	11.6
98.617350	36.57	43.50	6.93	1000.0	120.000	101.0	V	10.0	11.9
101.312550	31.19	43.50	12.31	1000.0	120.000	98.0	V	190.0	12.0
135.518850	33.06	43.50	10.44	1000.0	120.000	98.0	V	-9.0	9.0
138.016050	32.81	43.50	10.69	1000.0	120.000	98.0	V	10.0	8.8
138.021900	37.40	43.50	6.10	1000.0	120.000	101.0	V	-10.0	8.8

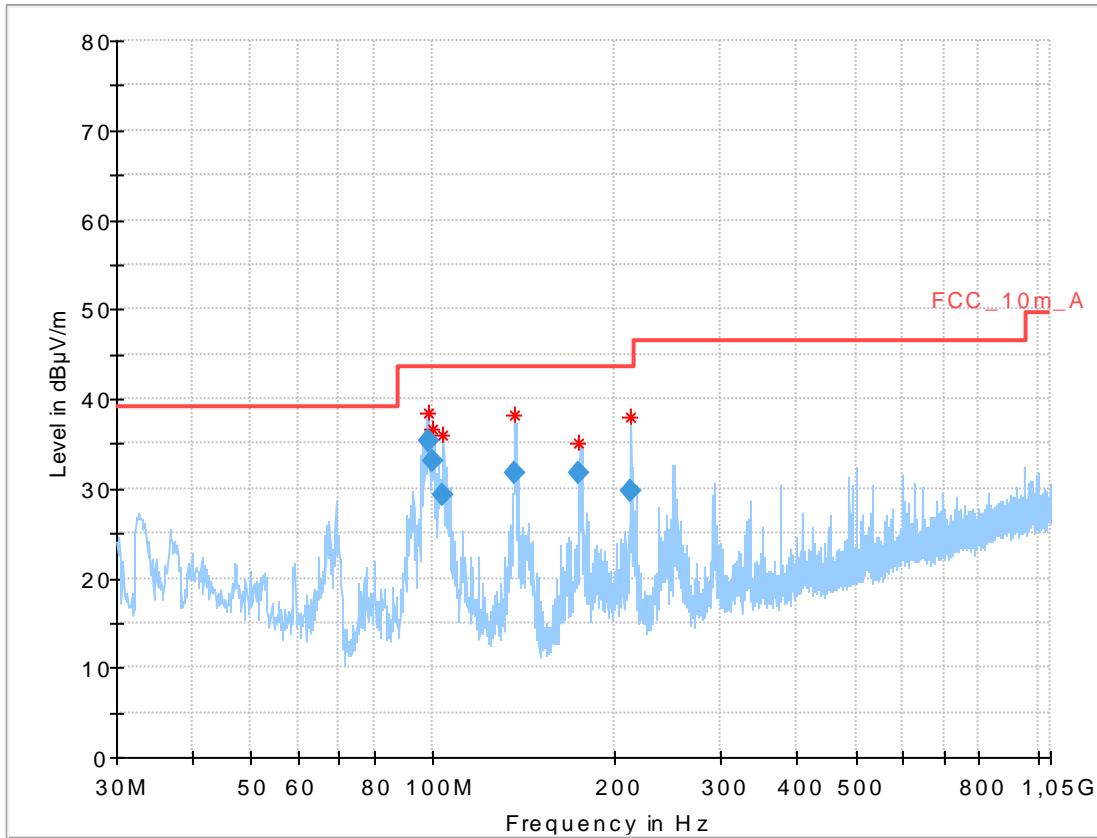
Plot: OFDM (40 MHz bandwidth), antenna 2

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization, low channel

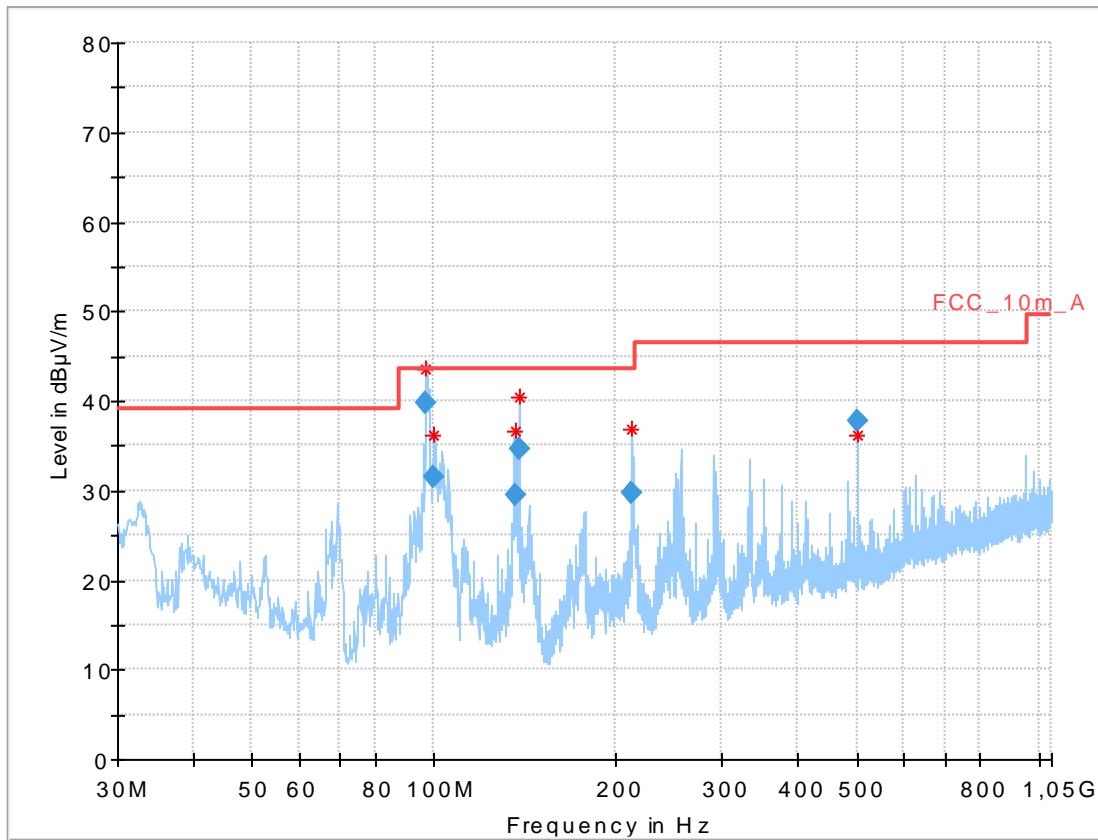


Final_Result:

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
98.604150	42.63	43.50	0.87	1000.0	120.000	98.0	V	260.0	11.9
102.337950	31.03	43.50	12.47	1000.0	120.000	98.0	V	260.0	11.9
137.170500	32.26	43.50	11.24	1000.0	120.000	98.0	V	10.0	8.9
212.950800	28.54	43.50	14.96	1000.0	120.000	98.0	V	280.0	12.2
255.890850	28.43	46.40	17.97	1000.0	120.000	98.0	V	171.0	13.5
374.988000	31.16	46.40	15.24	1000.0	120.000	98.0	V	280.0	16.5

Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization, mid channel**Final_Result:**

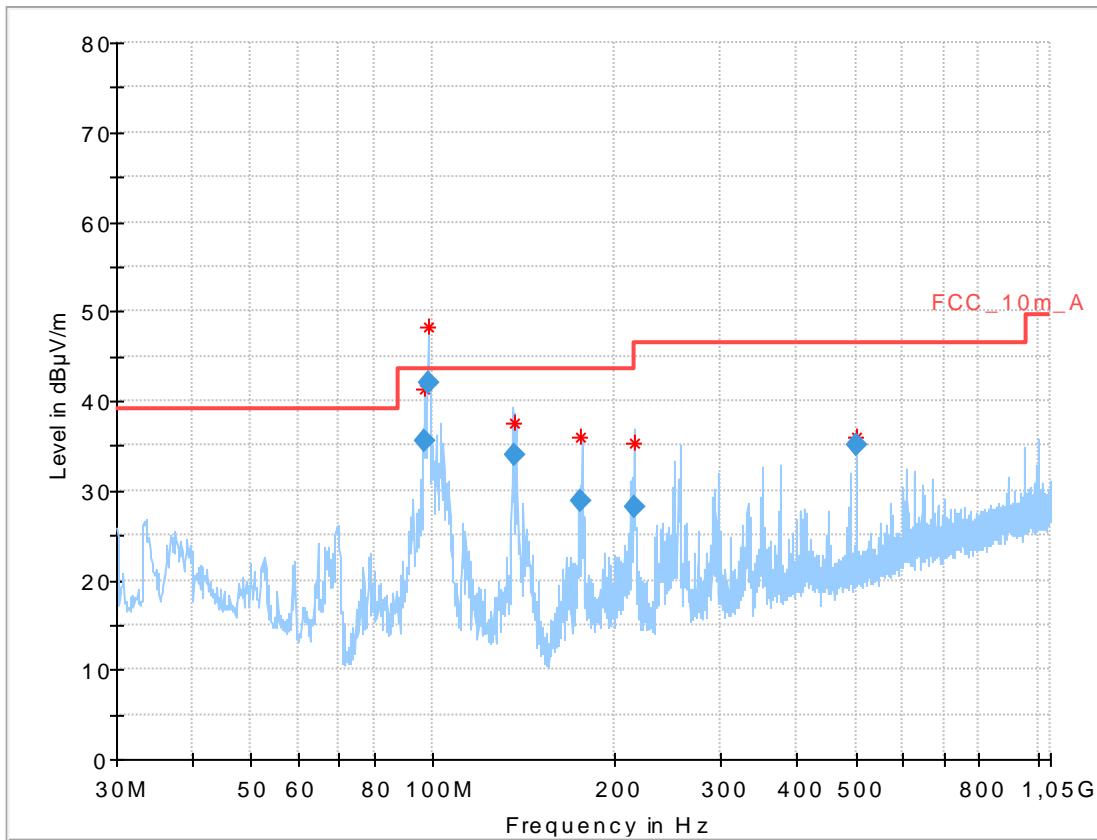
Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
98.037900	35.37	43.50	8.13	1000.0	120.000	101.0	V	10.0	11.9
99.567600	33.03	43.50	10.47	1000.0	120.000	101.0	V	260.0	12.1
103.931850	29.36	43.50	14.14	1000.0	120.000	98.0	V	190.0	11.8
136.730100	31.80	43.50	11.70	1000.0	120.000	98.0	V	-9.0	8.9
174.246900	31.73	43.50	11.77	1000.0	120.000	98.0	V	190.0	10.0
212.977050	29.79	43.50	13.71	1000.0	120.000	98.0	V	280.0	12.2

Plot 3: 30 MHz to 1 GHz, vertical & horizontal polarization, high channel**Final_Result:**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
96.818250	39.74	43.50	3.76	1000.0	120.000	101.0	V	100.0	11.6
99.976200	31.45	43.50	12.05	1000.0	120.000	101.0	V	260.0	12.2
136.745250	29.59	43.50	13.91	1000.0	120.000	98.0	V	280.0	8.9
138.082050	34.67	43.50	8.83	1000.0	120.000	101.0	V	-9.0	8.8
212.932050	29.74	43.50	13.76	1000.0	120.000	101.0	V	280.0	12.2
499.996500	37.70	46.40	8.70	1000.0	120.000	170.0	H	280.0	18.7

Plot: RX / Idle mode

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization

**Final_Result:**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
96.838950	35.58	43.50	7.92	1000.0	120.000	100.0	V	81.0	11.6
98.591250	41.93	43.50	1.57	1000.0	120.000	98.0	V	100.0	11.9
136.706850	34.03	43.50	9.47	1000.0	120.000	98.0	V	-9.0	8.9
175.807050	28.86	43.50	14.64	1000.0	120.000	98.0	V	260.0	10.1
214.909650	28.09	43.50	15.41	1000.0	120.000	98.0	V	170.0	12.2
499.992150	34.99	46.40	11.41	1000.0	120.000	101.0	H	261.0	18.7

12.13 Spurious emissions radiated above 1 GHz

Description:

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

Measurement:

Measurement parameter	
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	<input checked="" type="checkbox"/> DSSS b – mode <input checked="" type="checkbox"/> OFDM g – mode <input type="checkbox"/> OFDM n HT20 – mode <input checked="" type="checkbox"/> OFDM n HT40 – mode <input checked="" type="checkbox"/> RX / Idle – mode
Test setup:	See sub clause 7.2
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 30 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)).	
Frequency (MHz)	Field Strength (dB μ V/m)
Above 960	54.0
	3

Results: DSSS, antenna 1

TX Spurious Emissions Radiated [dB μ V/m]								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
1050	Peak	47.2	1200	Peak	62.0	1200	Peak	62.0
	AVG	-/-		AVG	51.1		AVG	51.8
1200	Peak	61.6	4002	Peak	56.8	7386	Peak	51.5
	AVG	51.5		AVG	43.0		AVG	42.3
1401	Peak	54.1	For emissions above 18 GHz, please look at the plot.			For emissions above 18 GHz, please look at the plot.		
	AVG	41.1						
2794	Peak	57.7						
	AVG	42.1						
For emissions above 18 GHz, please look at the plot.								

Results: OFDM (20 MHz bandwidth), antenna 1

TX Spurious Emissions Radiated [dB μ V/m]								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
1050	Peak	48.6	7314	Peak	45.4	7391	Peak	46.7
	AVG	36.7		AVG	-/-		AVG	-/-
1200	Peak	61.6	For emissions above 18 GHz, please look at the plot.			For emissions above 18 GHz, please look at the plot.		
	AVG	50.8						
2802	Peak	57.1		Peak			Peak	
	AVG	43.9		AVG			AVG	
For emissions above 18 GHz, please look at the plot.				Peak			Peak	
				AVG			AVG	

Results: OFDM (40 MHz bandwidth), antenna 1

TX Spurious Emissions Radiated [dB μ V/m]								
2422 MHz			2437 MHz			2452 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
1200	Peak	61.0	3603	Peak	58.9	1450	Peak	47.6
	AVG	50.4		AVG	44.9		AVG	-/-
1316	Peak	46.6	4661	Peak	51.5	For emissions above 18 GHz, please look at the plot.		
	AVG	-/-		AVG	-/-			
2380	Peak	54.8	For emissions above 18 GHz, please look at the plot.					
	AVG	41.5						
For emissions above 18 GHz, please look at the plot.								

Results: RX / idle – mode, antenna 1

TX Spurious Emissions Radiated [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
1050	Peak	47.2
	AVG	-/-
1200	Peak	61.6
	AVG	51.5
1316	Peak	46.6
	AVG	-/-

For emissions above 18 GHz, please look at the plot.

Results: DSSS, antenna 2

TX Spurious Emissions Radiated [dB μ V/m]								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
All detected emissions are a part of the cabinet radiation; please look at antenna 1 for more information.			All detected emissions are a part of the cabinet radiation; please look at antenna 1 for more information.			All detected emissions are a part of the cabinet radiation; please look at antenna 1 for more information.		
For emissions above 18 GHz, please look at the plot.			For emissions above 18 GHz, please look at the plot.			For emissions above 18 GHz, please look at the plot.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: OFDM (20 MHz bandwidth), antenna 2

TX Spurious Emissions Radiated [dB μ V/m]								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
All detected emissions are a part of the cabinet radiation; please look at antenna 1 for more information.			All detected emissions are a part of the cabinet radiation; please look at antenna 1 for more information.			All detected emissions are a part of the cabinet radiation; please look at antenna 1 for more information.		
For emissions above 18 GHz, please look at the plot.			For emissions above 18 GHz, please look at the plot.			For emissions above 18 GHz, please look at the plot.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: OFDM (40 MHz bandwidth), antenna 2

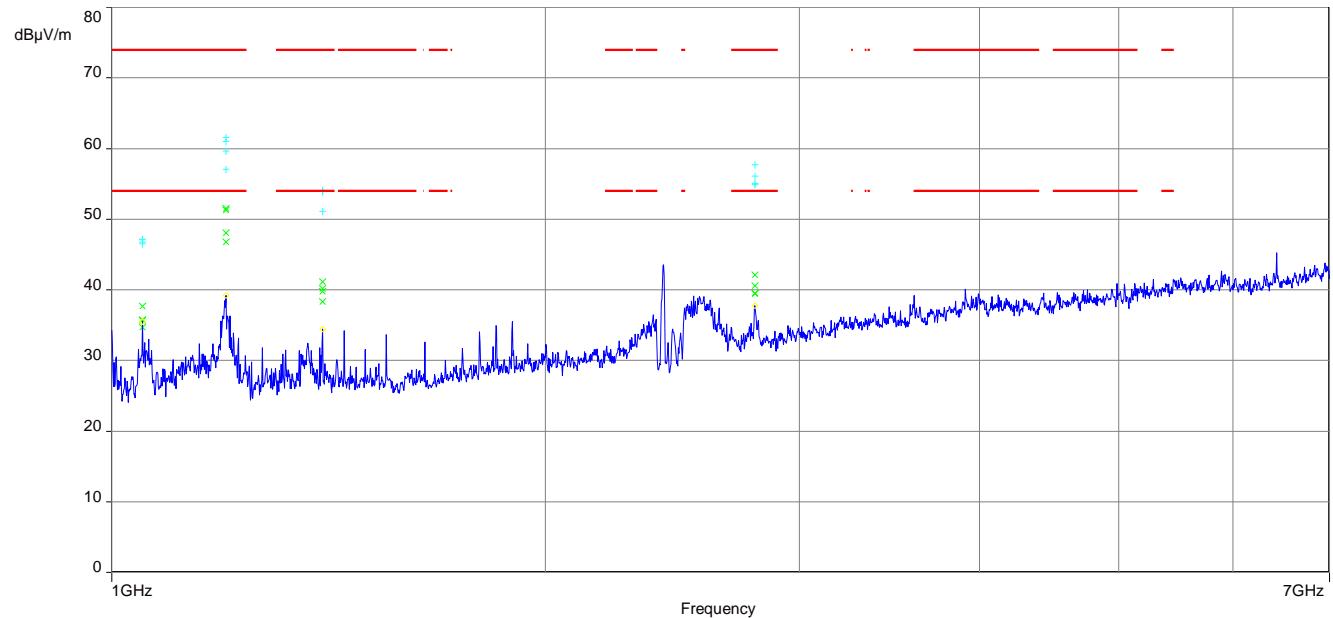
TX Spurious Emissions Radiated [dB μ V/m]								
2422 MHz			2437 MHz			2452 MHz		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
All detected emissions are a part of the cabinet radiation; please look at antenna 1 for more information.			All detected emissions are a part of the cabinet radiation; please look at antenna 1 for more information.			All detected emissions are a part of the cabinet radiation; please look at antenna 1 for more information.		
For emissions above 18 GHz, please look at the plot.			For emissions above 18 GHz, please look at the plot.			For emissions above 18 GHz, please look at the plot.		
	Peak			Peak			Peak	
	AVG			AVG			AVG	

Results: RX / idle – mode, antenna 2

TX Spurious Emissions Radiated [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
All detected emissions are a part of the cabinet radiation; please look at antenna 1 for more information.		
For emissions above 18 GHz, please look at the plot.		
	Peak	
	AVG	

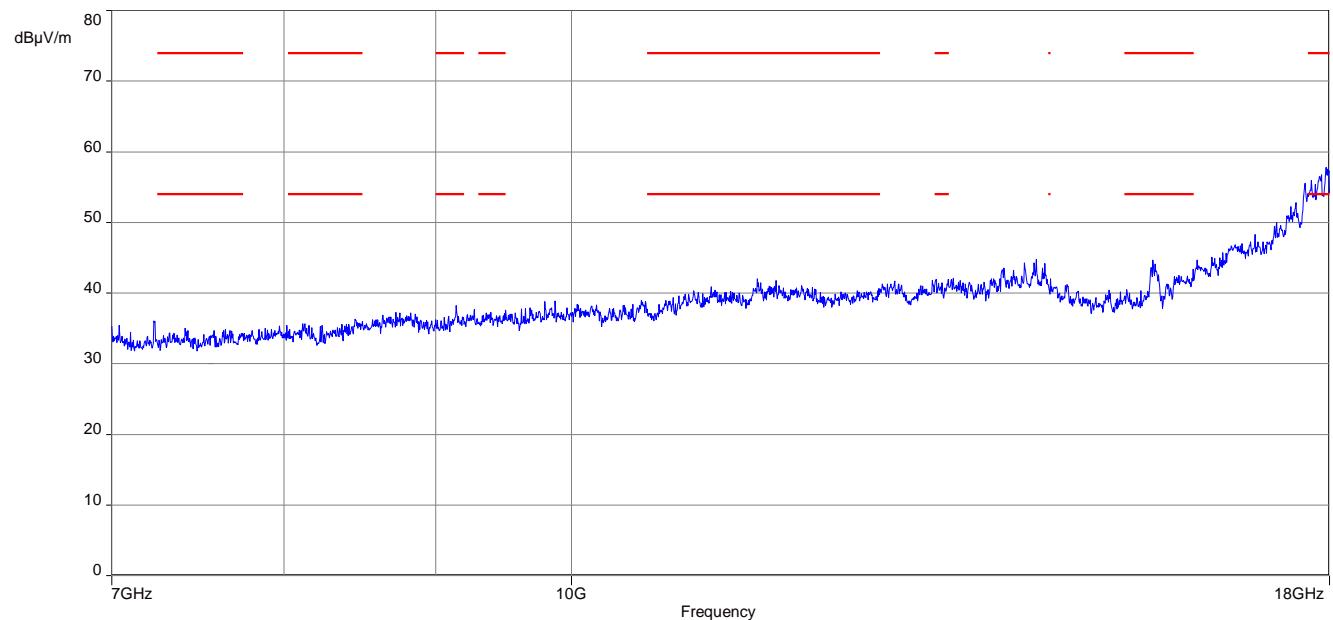
Plots: DSSS, antenna 1

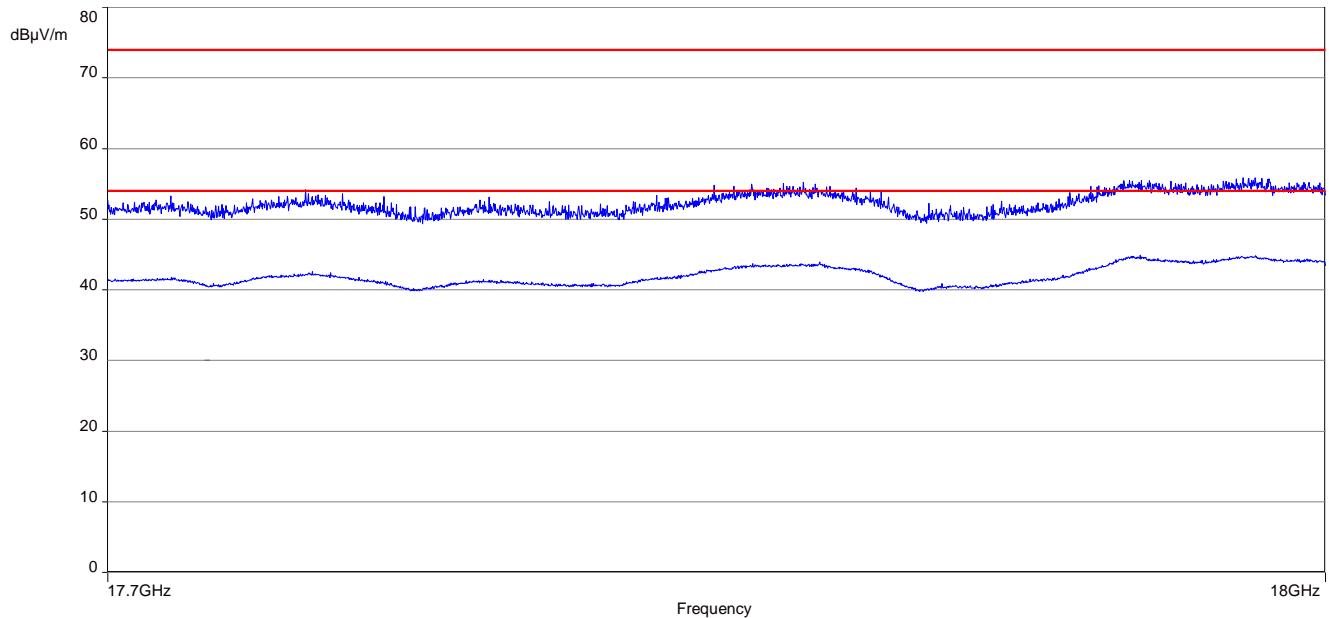
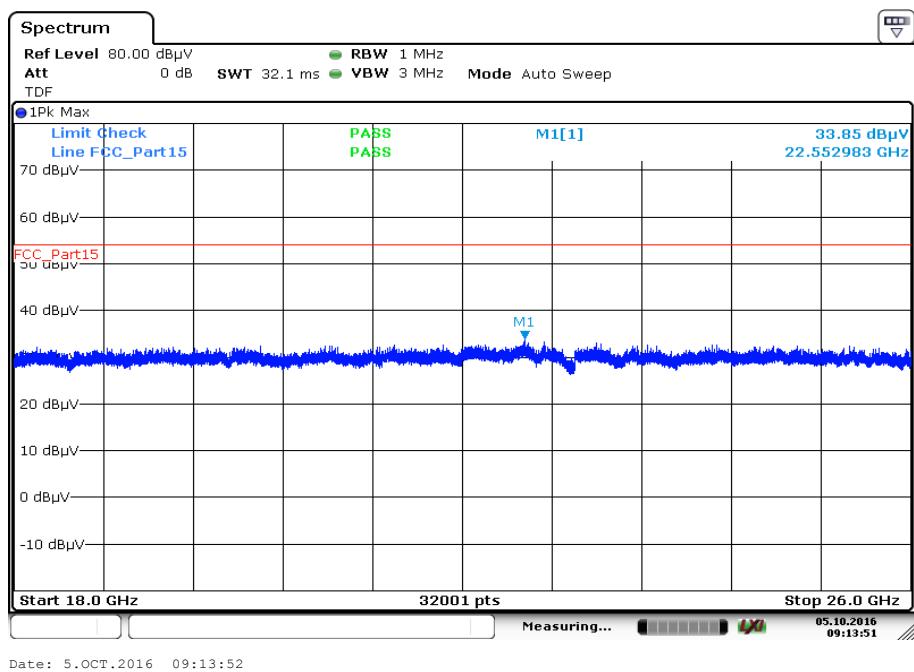
Plot 1: Lowest channel, 1 GHz to 7 GHz, vertical & horizontal polarization



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

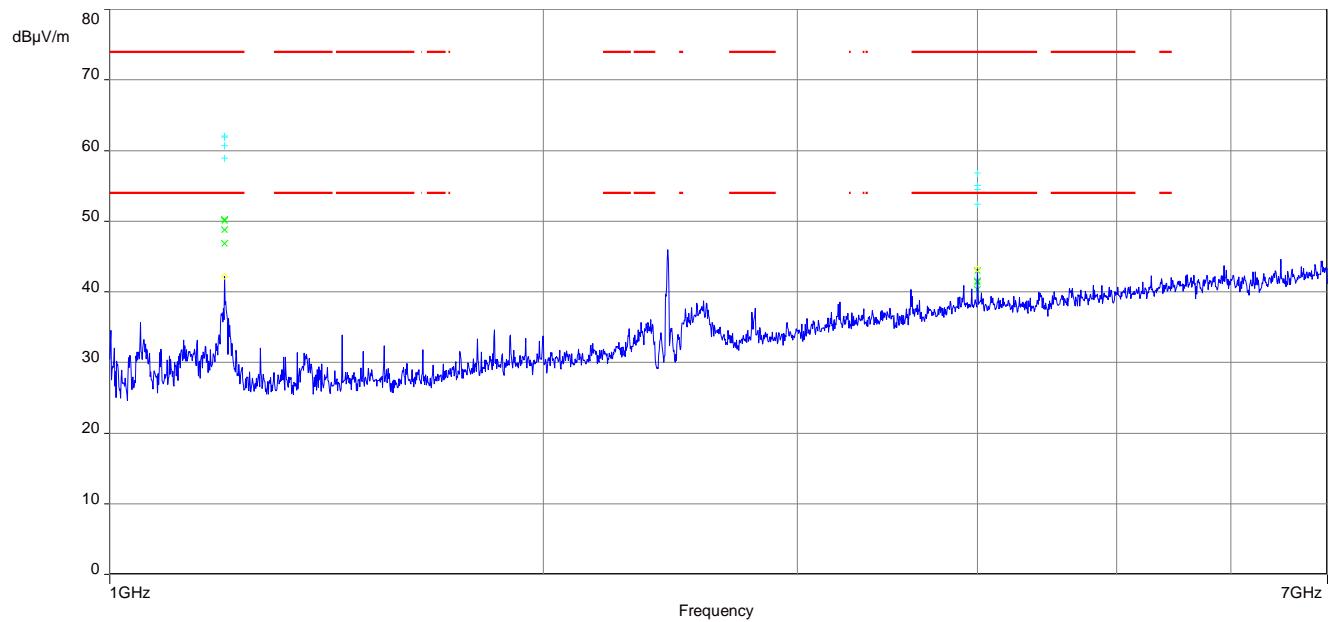
Plot 2: Lowest channel, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 3: Lowest channel, 17.7 GHz to 18 GHz, vertical & horizontal polarization**Plot 4:** Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

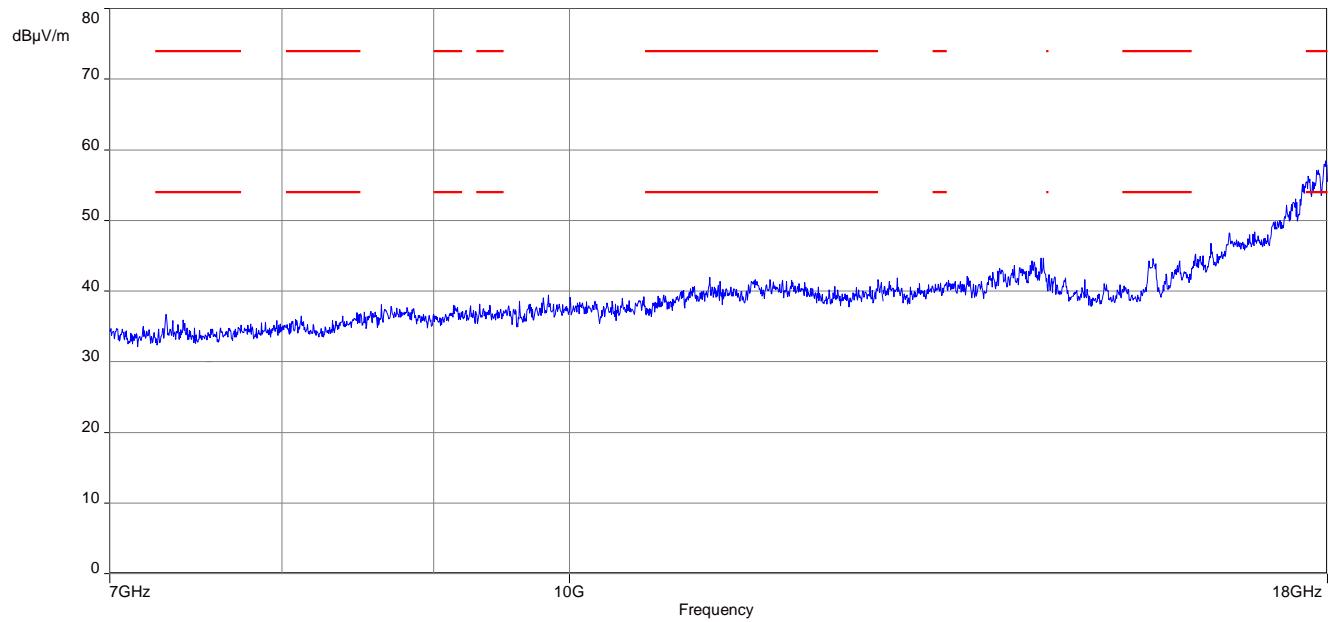
Date: 5.OCT.2016 09:13:52

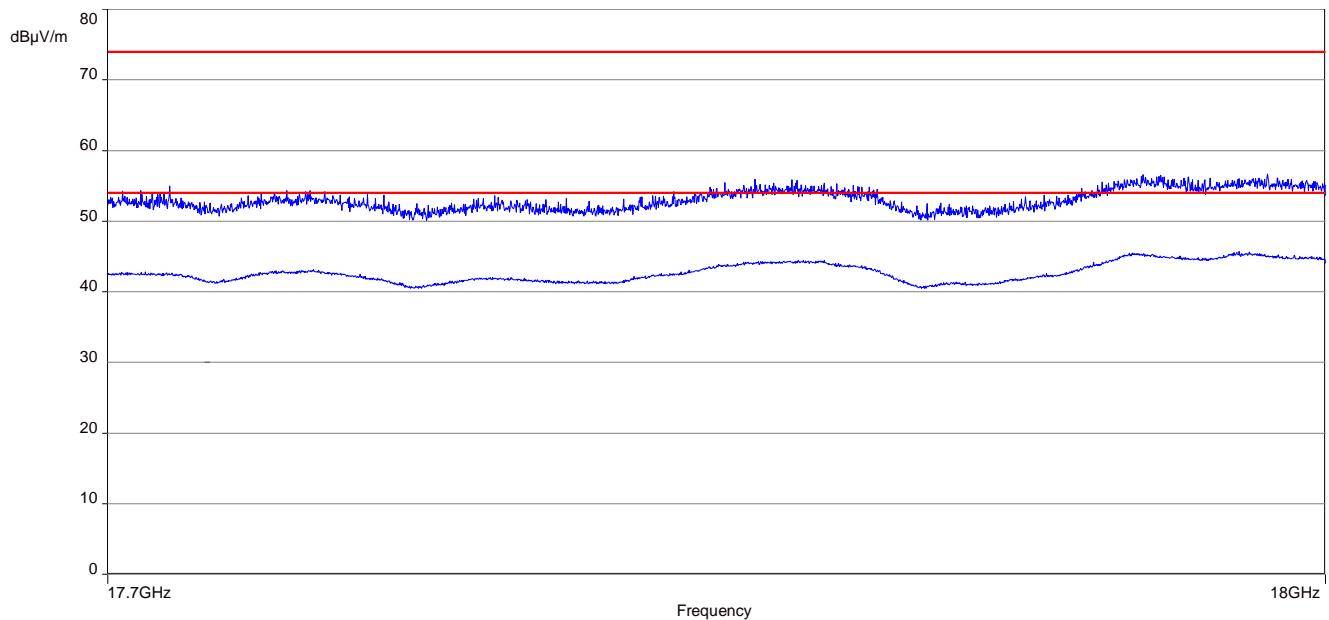
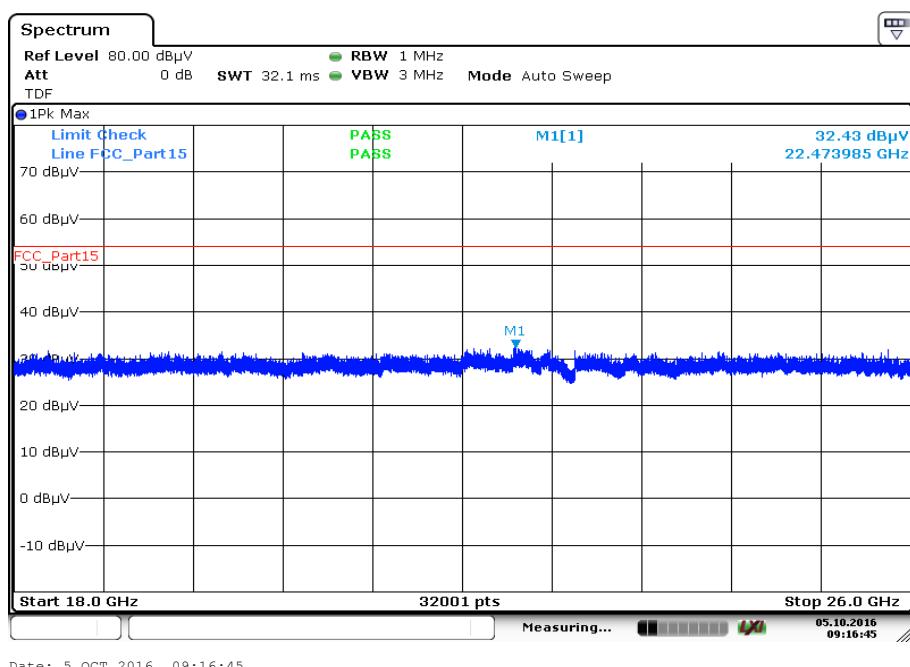
Plot 5: Middle channel, 1 GHz to 7 GHz, vertical & horizontal polarization



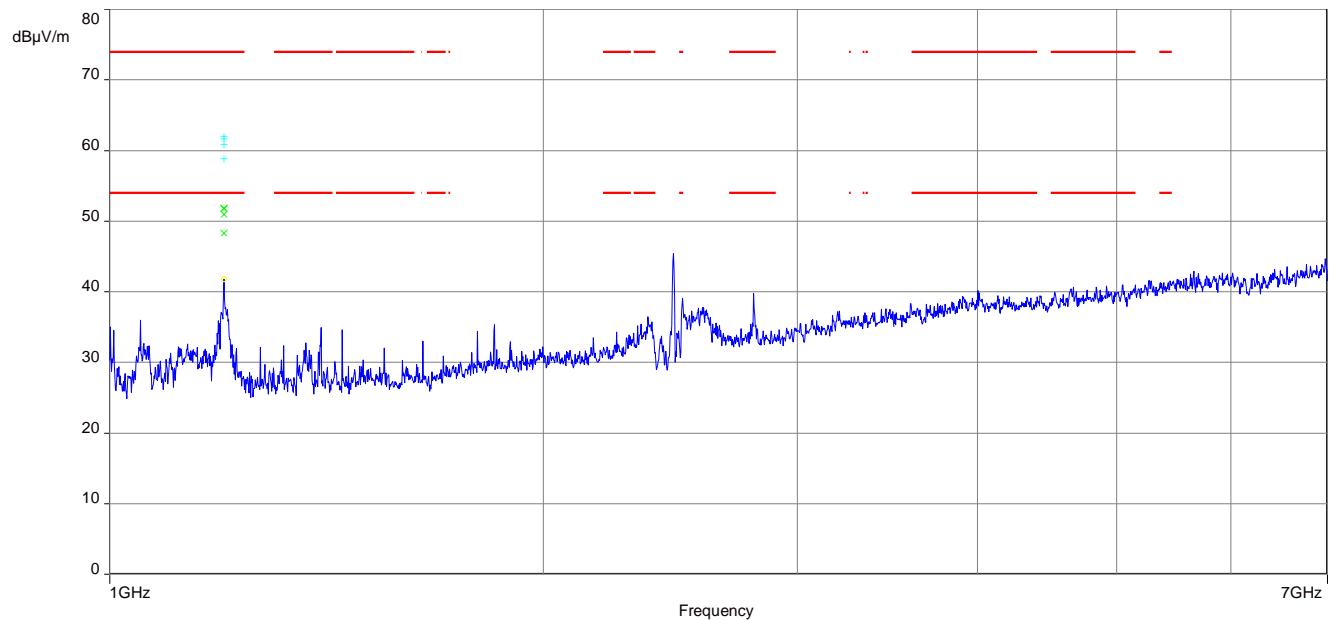
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Middle channel, 7 GHz to 18 GHz, vertical & horizontal polarization



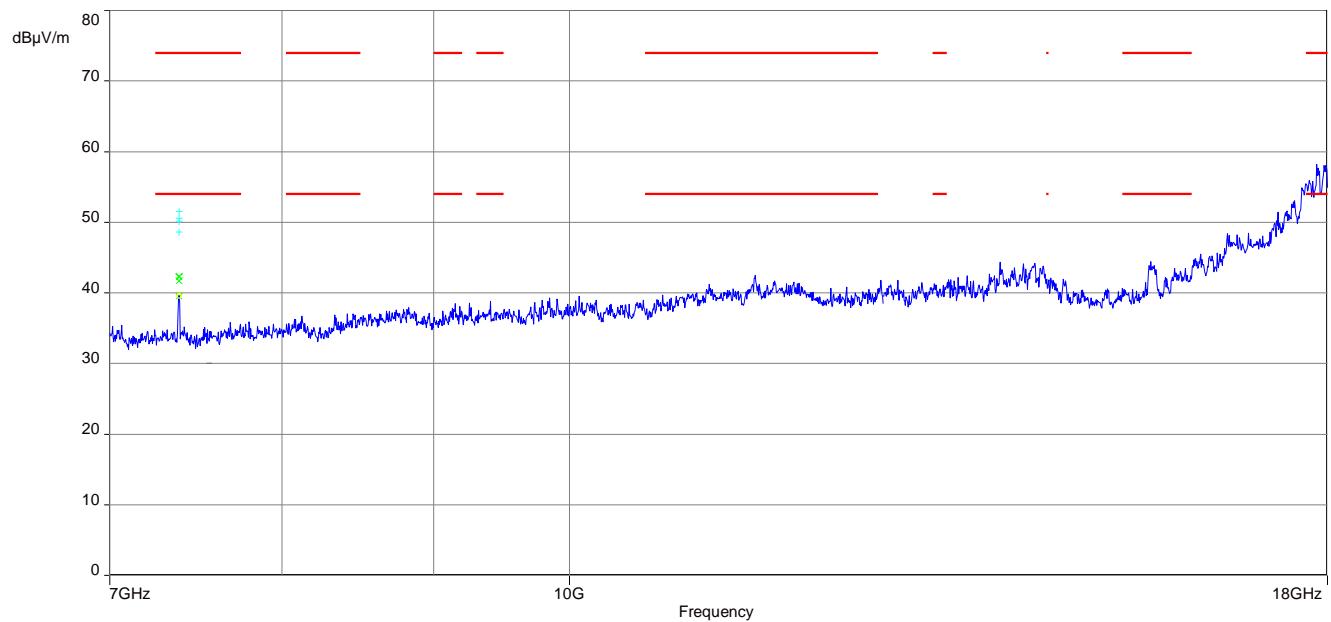
Plot 7: Middle channel, 17.7 GHz to 18 GHz, vertical & horizontal polarization**Plot 8:** Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

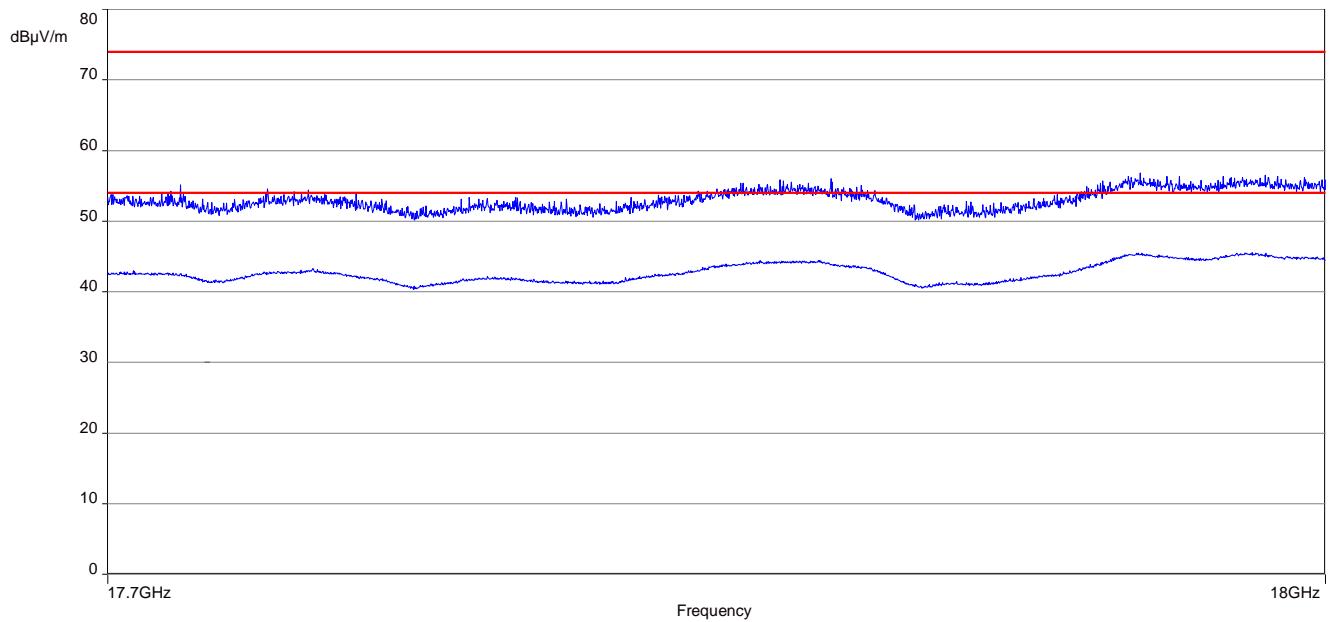
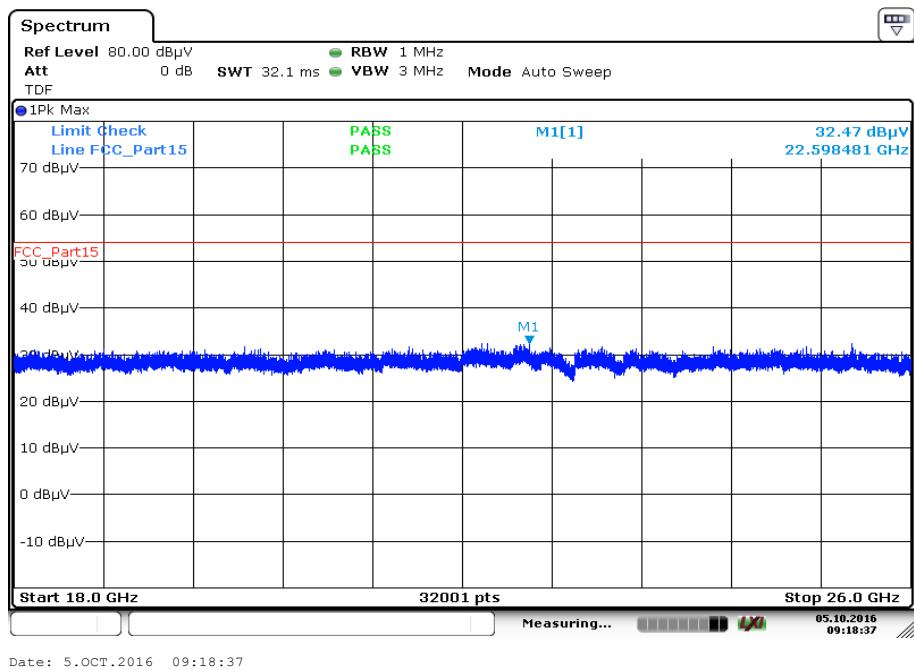
Plot 9: Highest channel, 1 GHz to 7 GHz, vertical & horizontal polarization



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

Plot 10: Highest channel, 7 GHz to 18 GHz, vertical & horizontal polarization

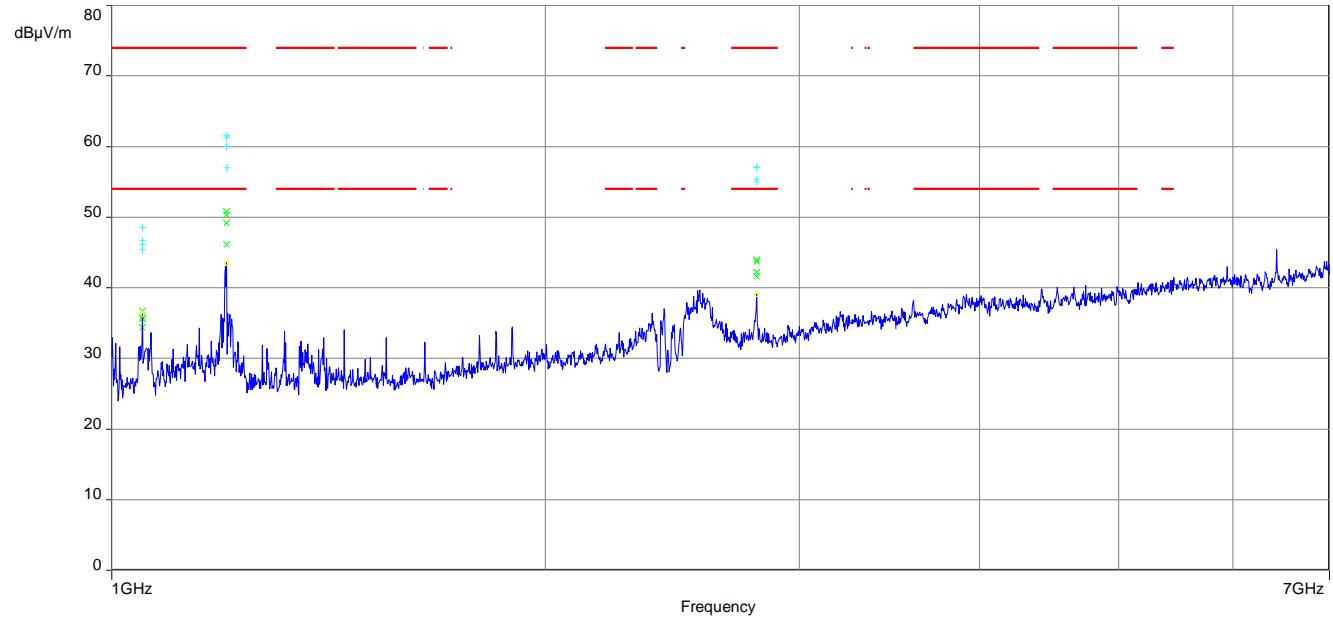


Plot 11: Highest channel, 17.7 GHz to 18 GHz, vertical & horizontal polarization**Plot 12:** Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Date: 5.OCT.2016 09:18:37

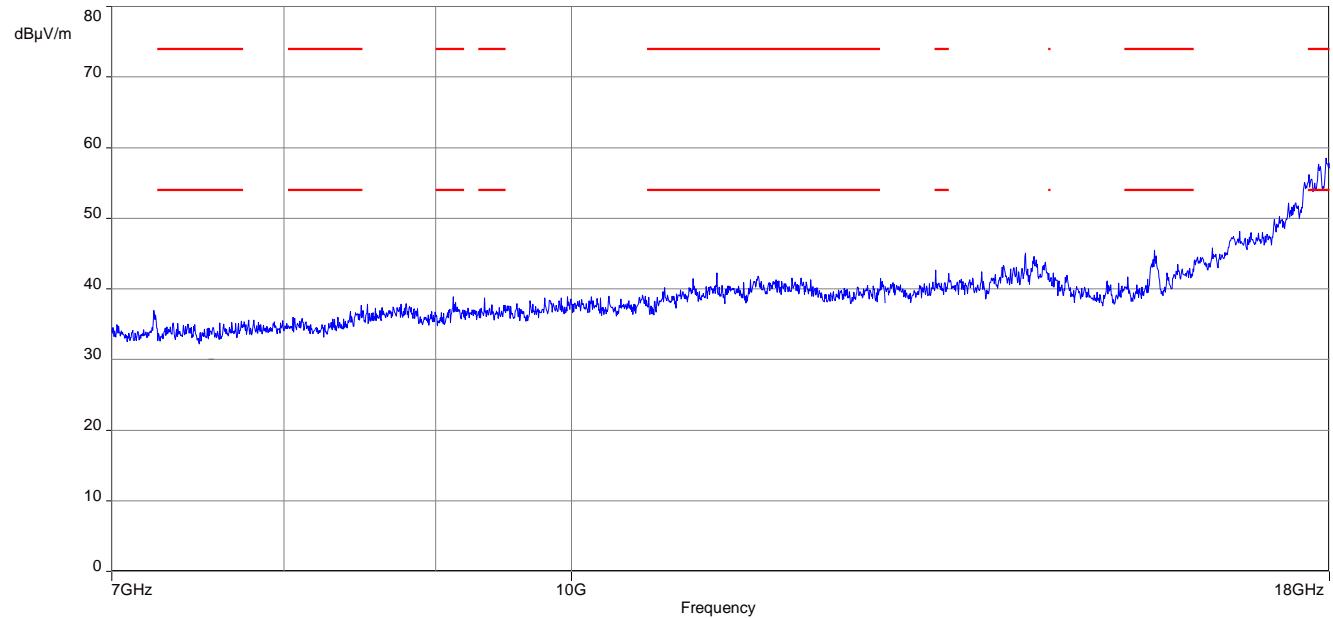
Plots: OFDM (20 MHz bandwidth), antenna 1

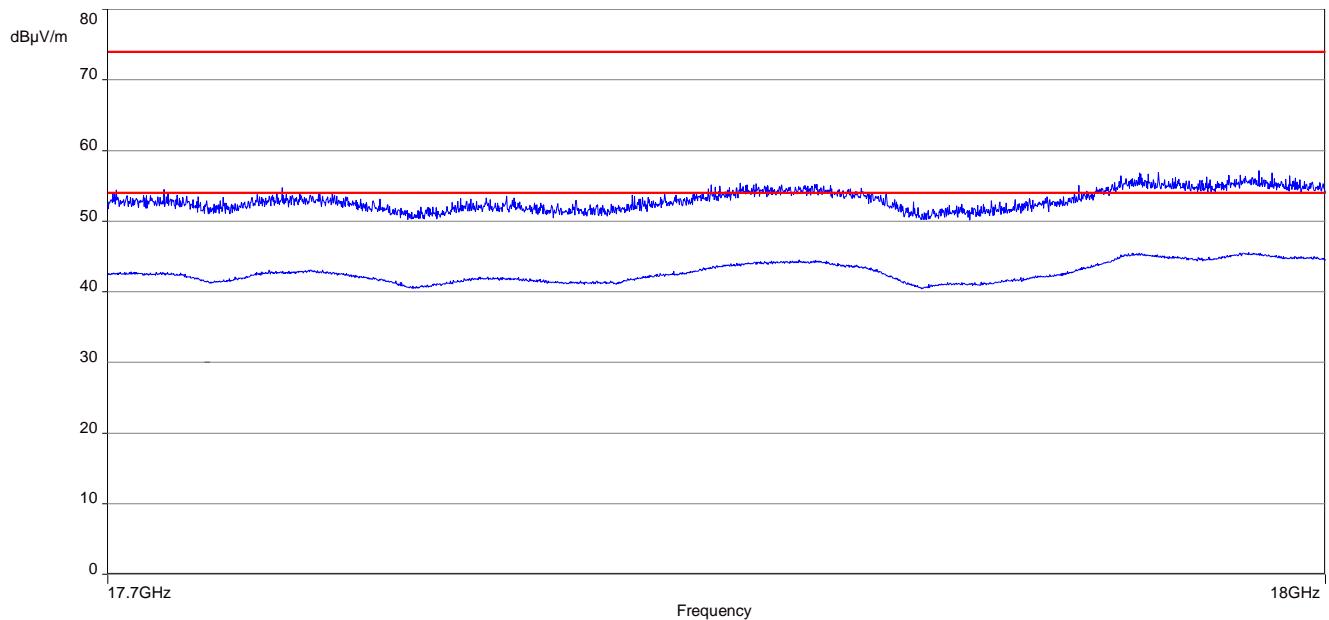
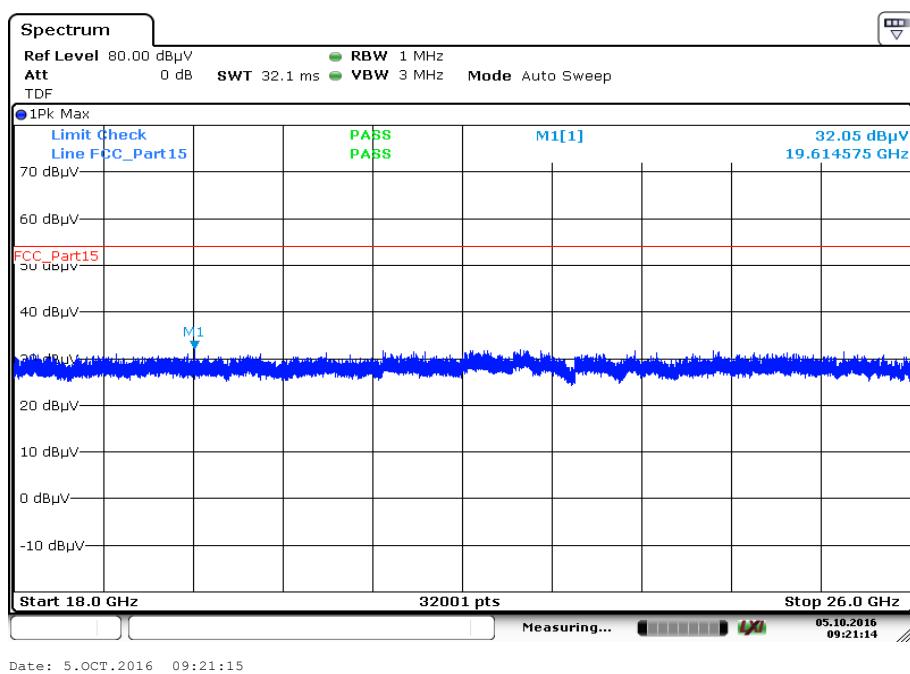
Plot 1: Lowest channel, 1 GHz to 7 GHz, vertical & horizontal polarization



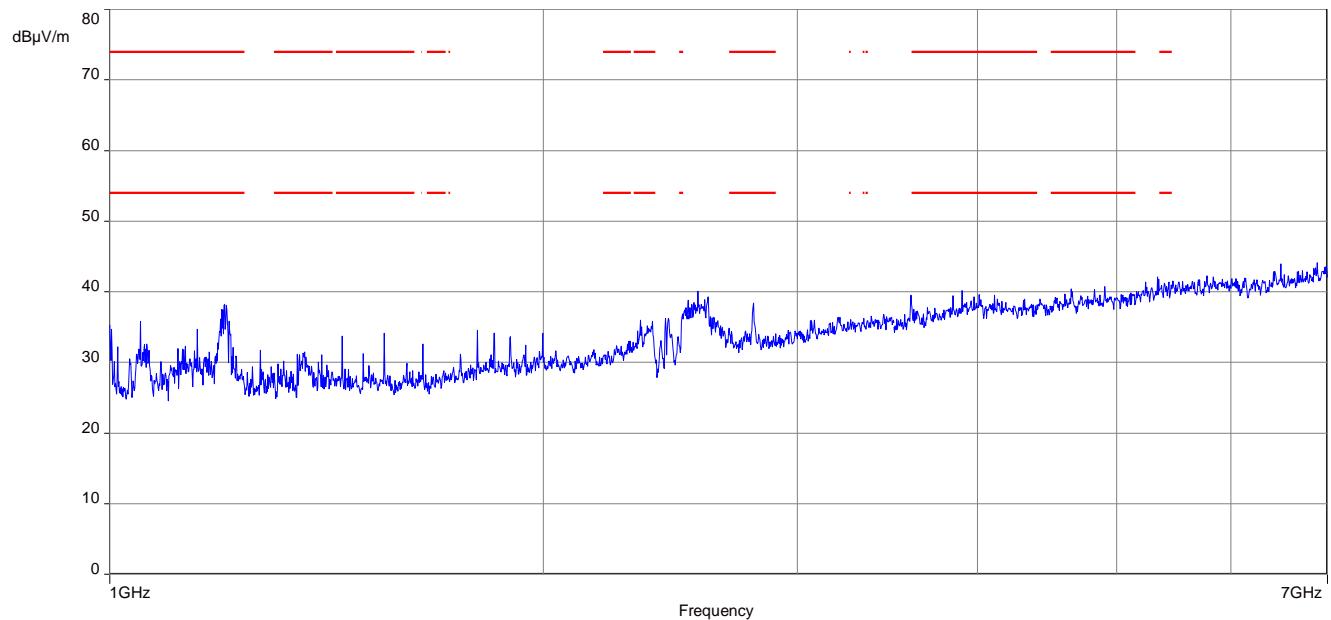
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Lowest channel, 7 GHz to 18 GHz, vertical & horizontal polarization



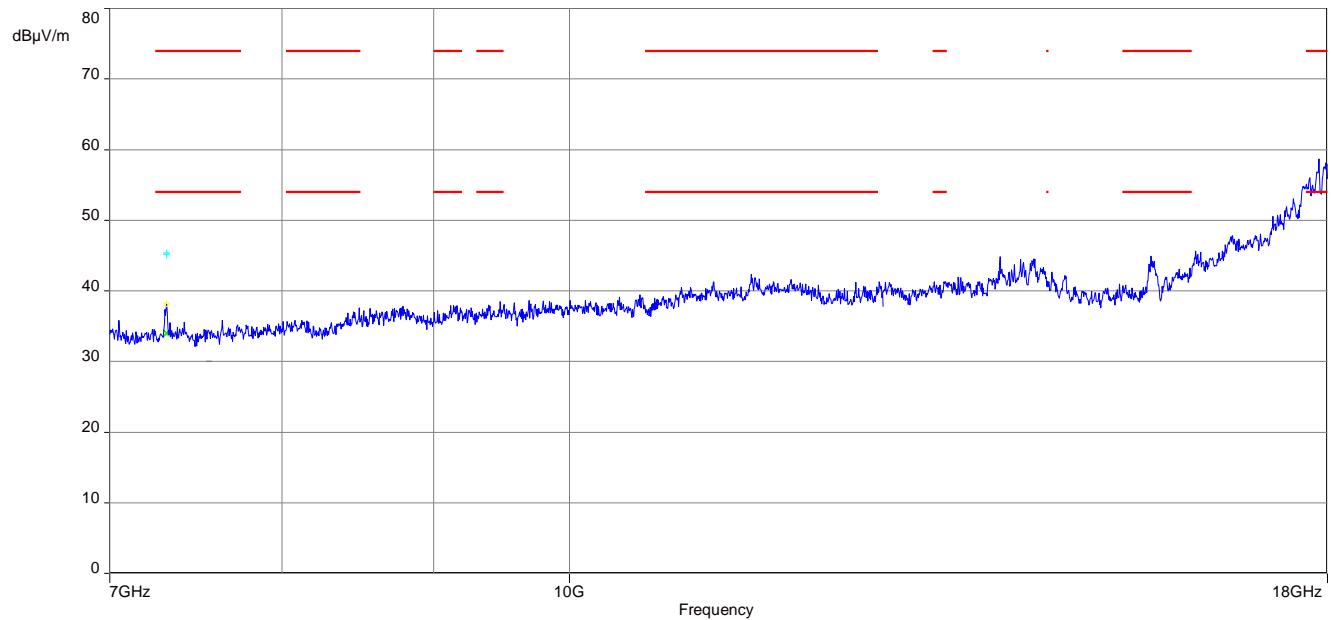
Plot 3: Lowest channel, 17.7 GHz to 18 GHz, vertical & horizontal polarization**Plot 4:** Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

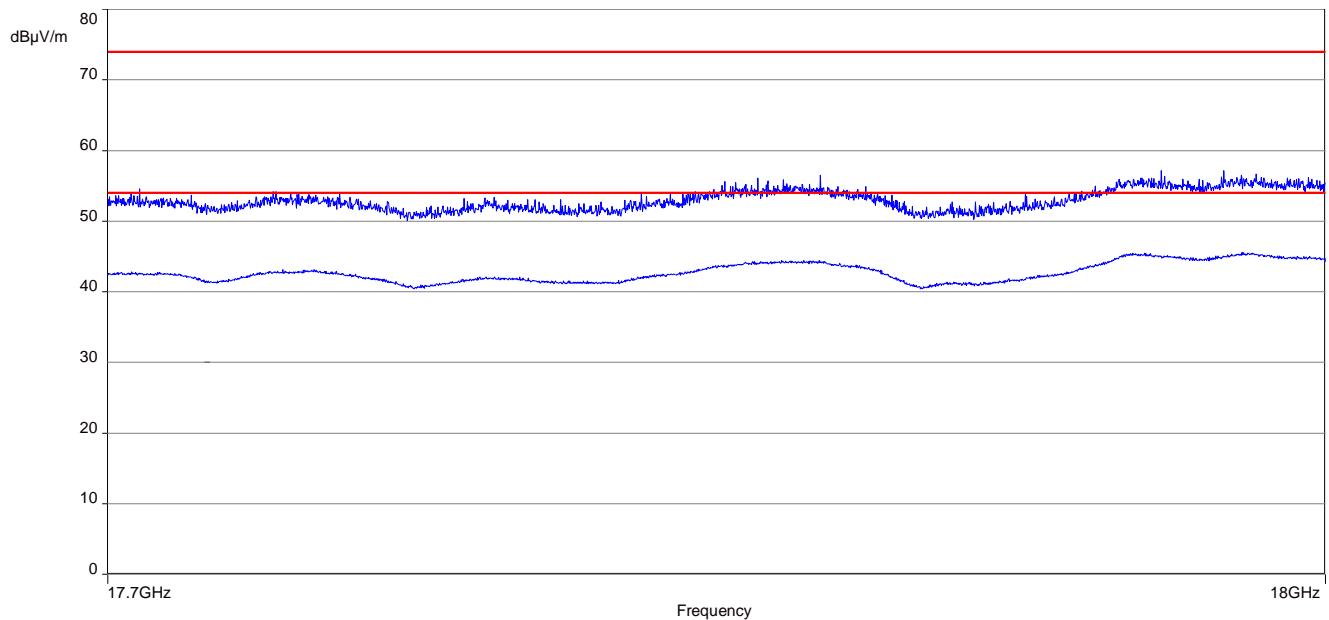
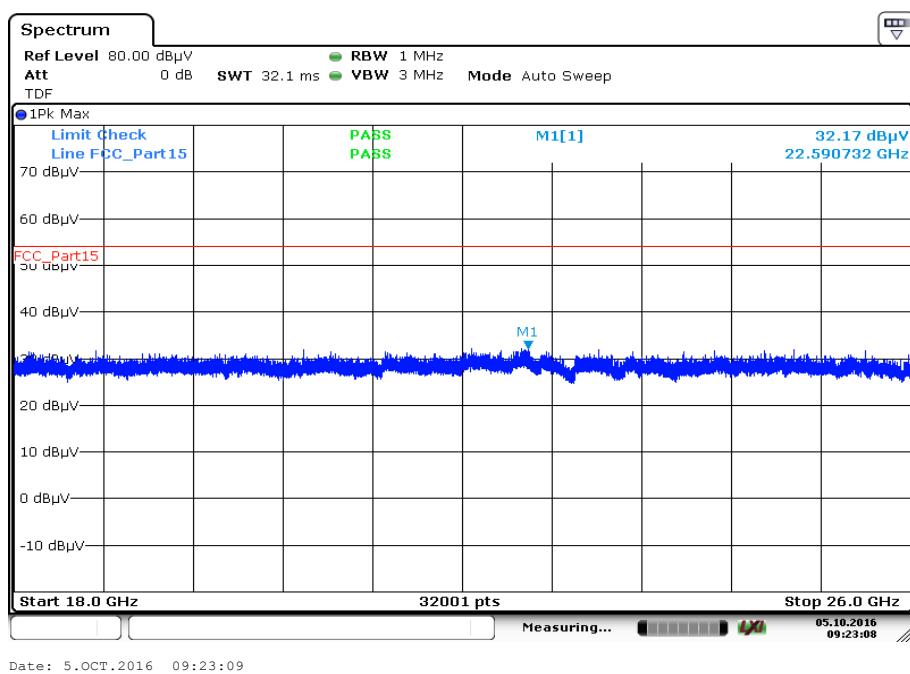
Plot 5: Middle channel, 1 GHz to 7 GHz, vertical & horizontal polarization



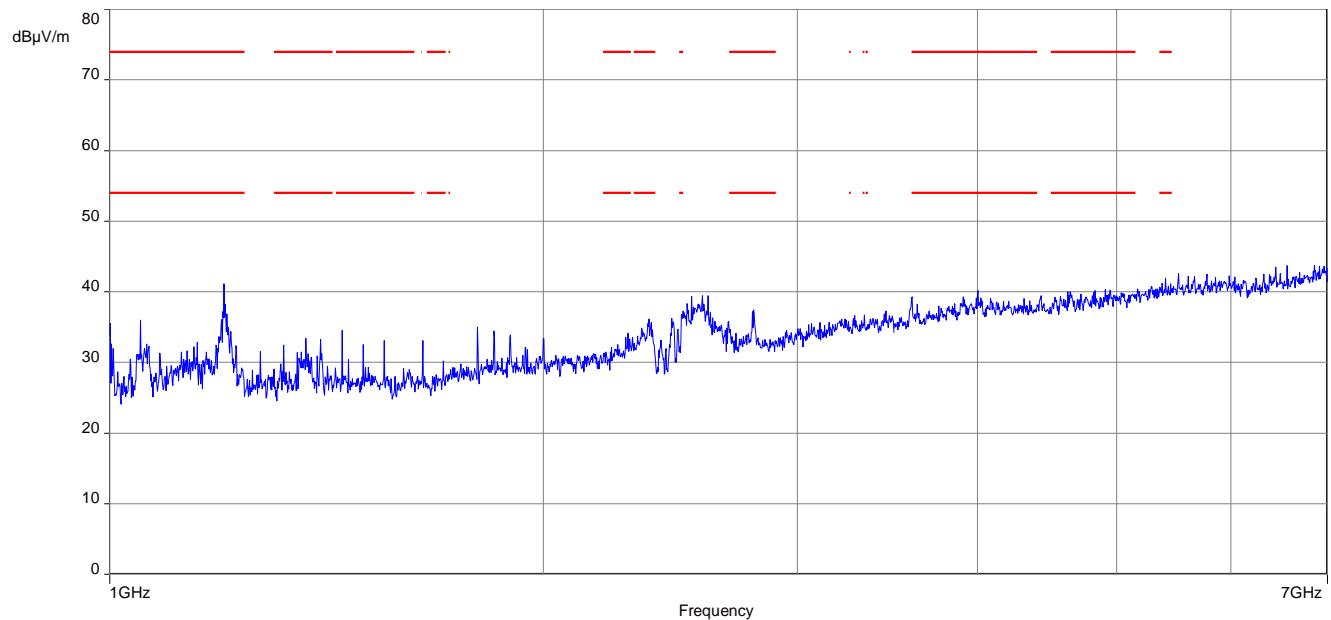
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Middle channel, 7 GHz to 18 GHz, vertical & horizontal polarization



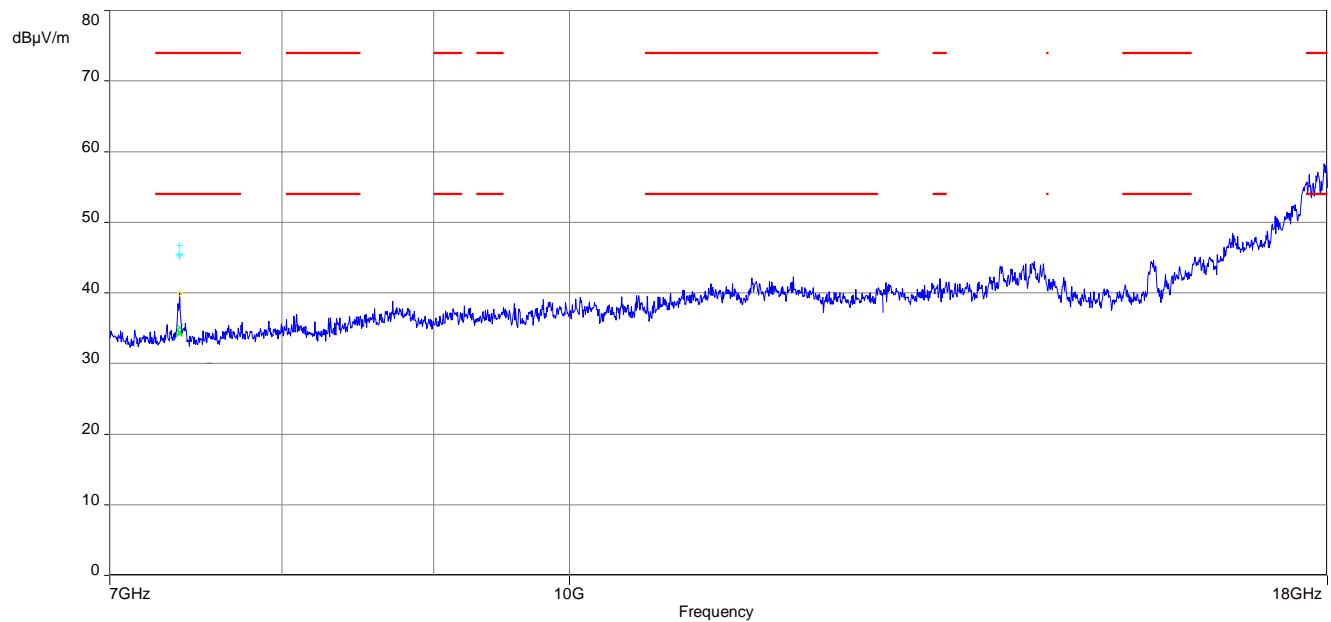
Plot 7: Middle channel, 17.7 GHz to 18 GHz, vertical & horizontal polarization**Plot 8:** Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

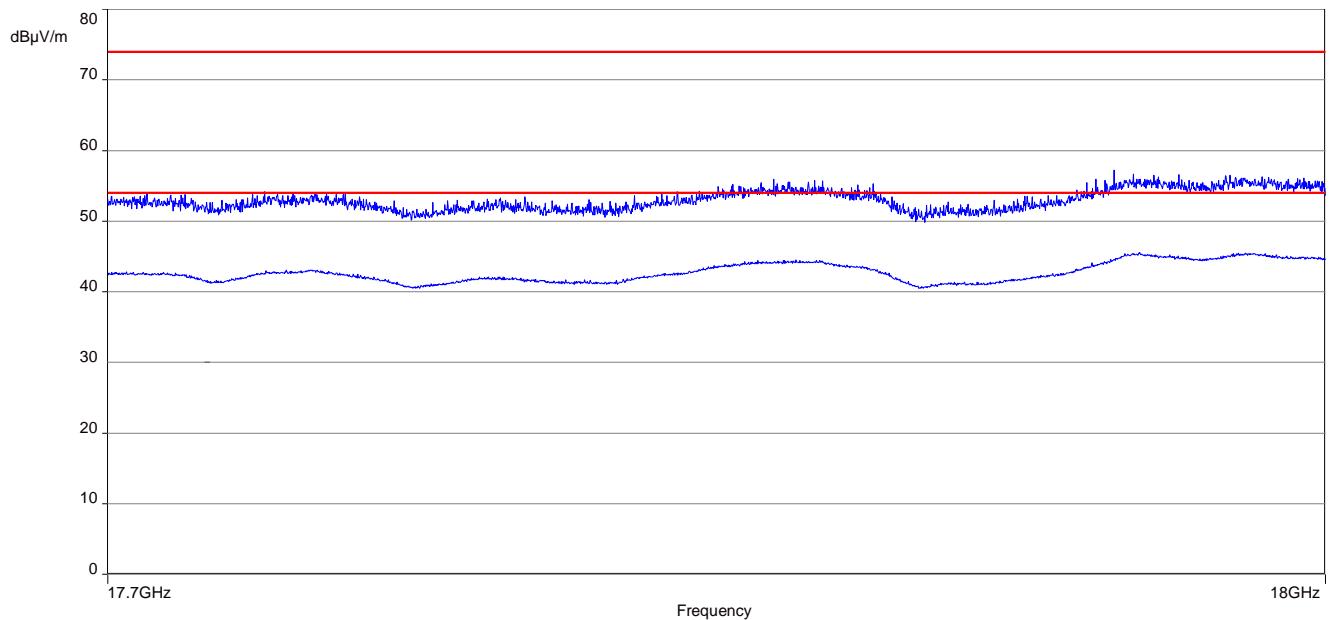
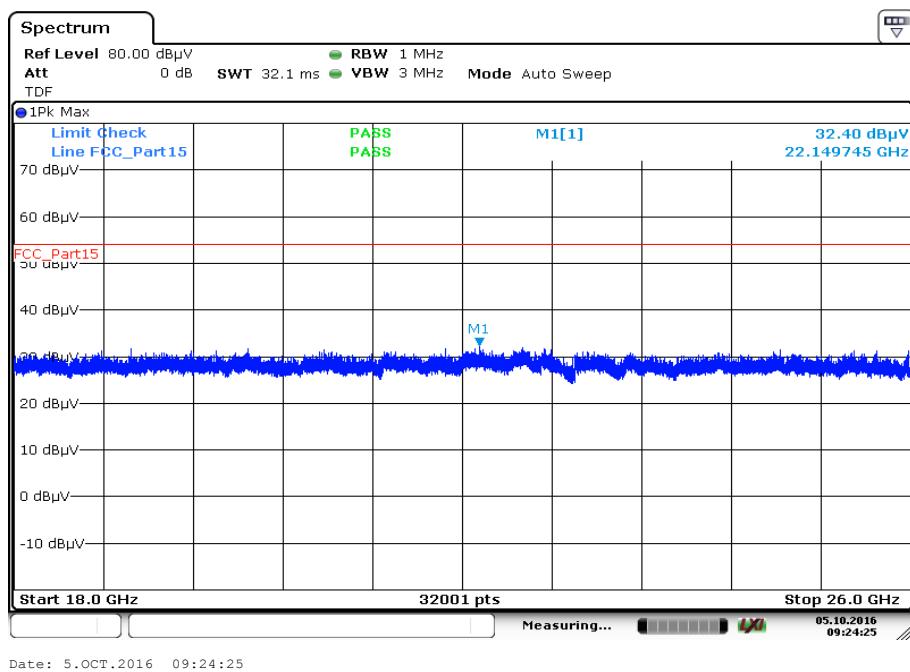
Plot 9: Highest channel, 1 GHz to 7 GHz, vertical & horizontal polarization



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

Plot 10: Highest channel, 7 GHz to 18 GHz, vertical & horizontal polarization

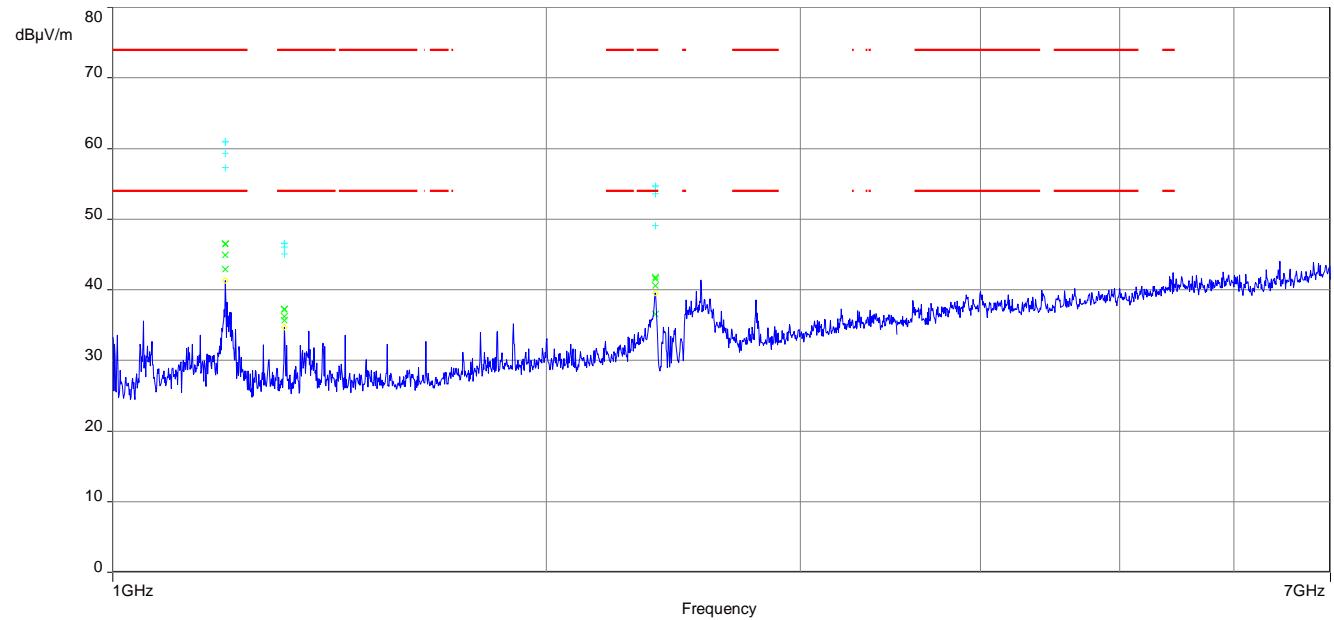


Plot 11: Highest channel, 17.7 GHz to 18 GHz, vertical & horizontal polarization**Plot 12:** Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Date: 5.OCT.2016 09:24:25

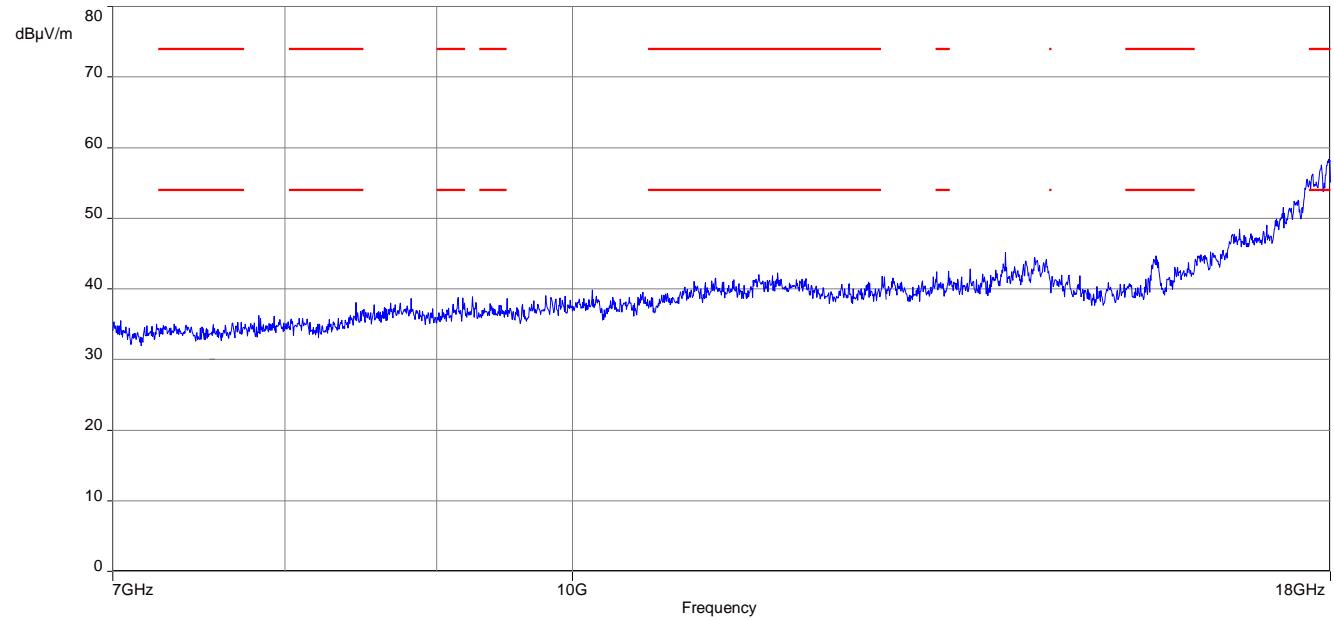
Plots: OFDM (40 MHz bandwidth), antenna 1

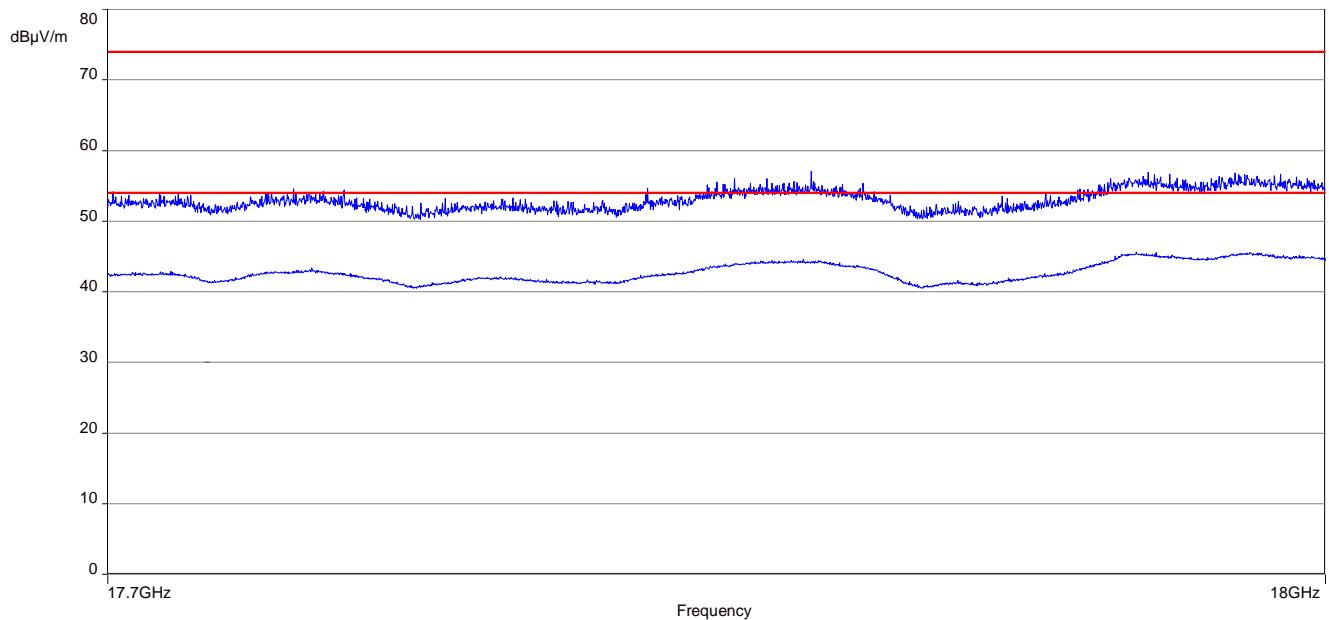
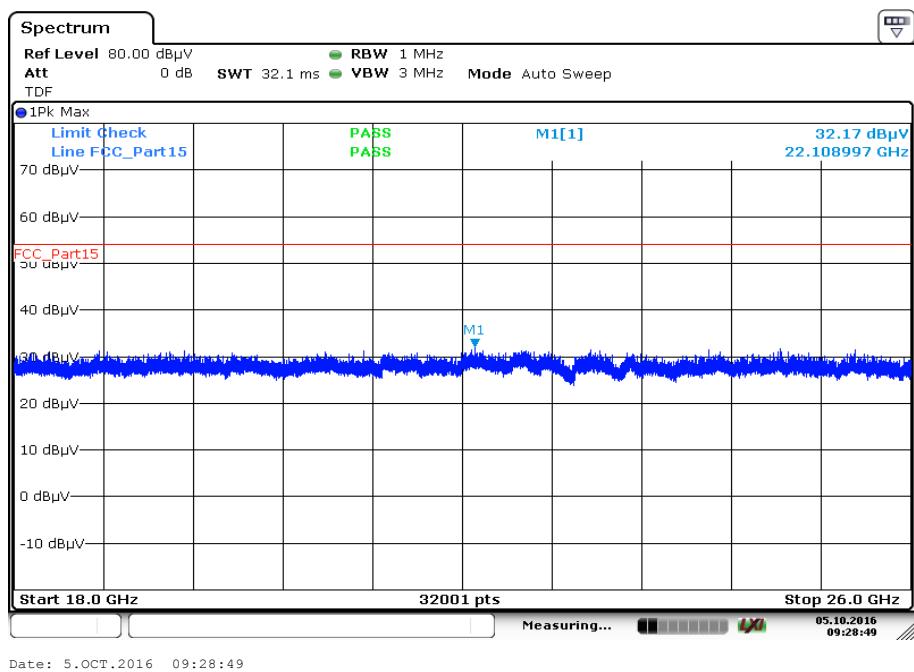
Plot 1: Lowest channel, 1 GHz to 7 GHz, vertical & horizontal polarization



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

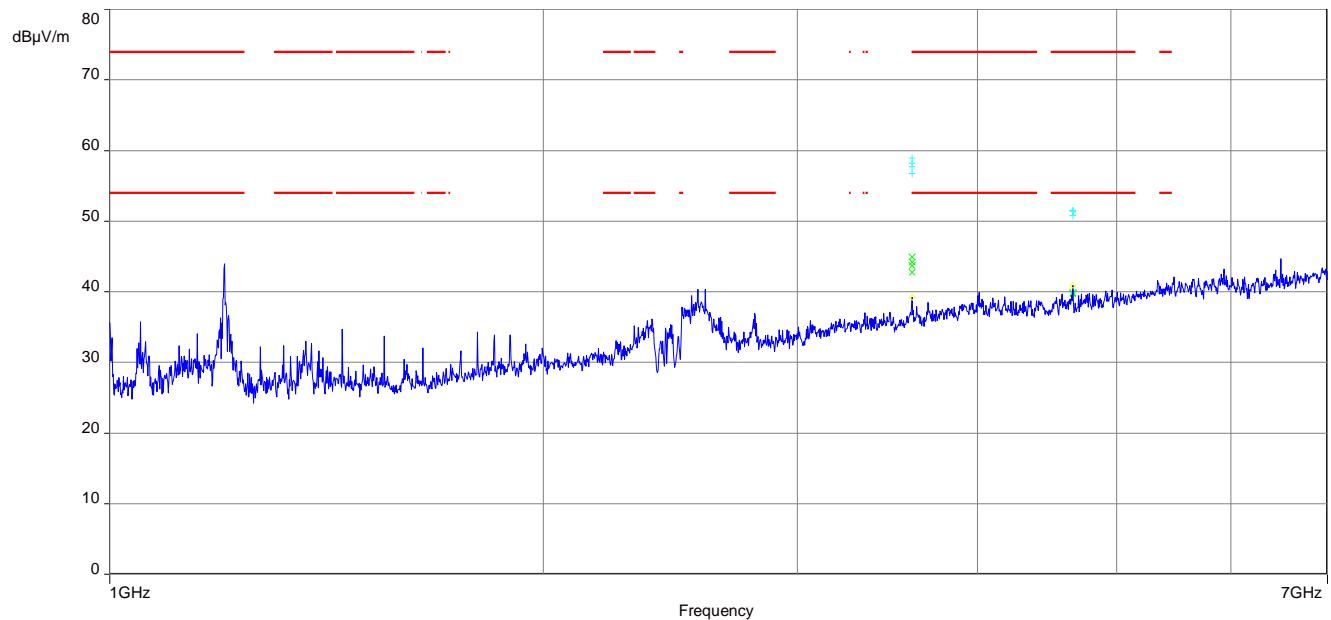
Plot 2: Lowest channel, 7 GHz to 18 GHz, vertical & horizontal polarization



Plot 3: Lowest channel, 17.7 GHz to 18 GHz, vertical & horizontal polarization**Plot 4:** Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

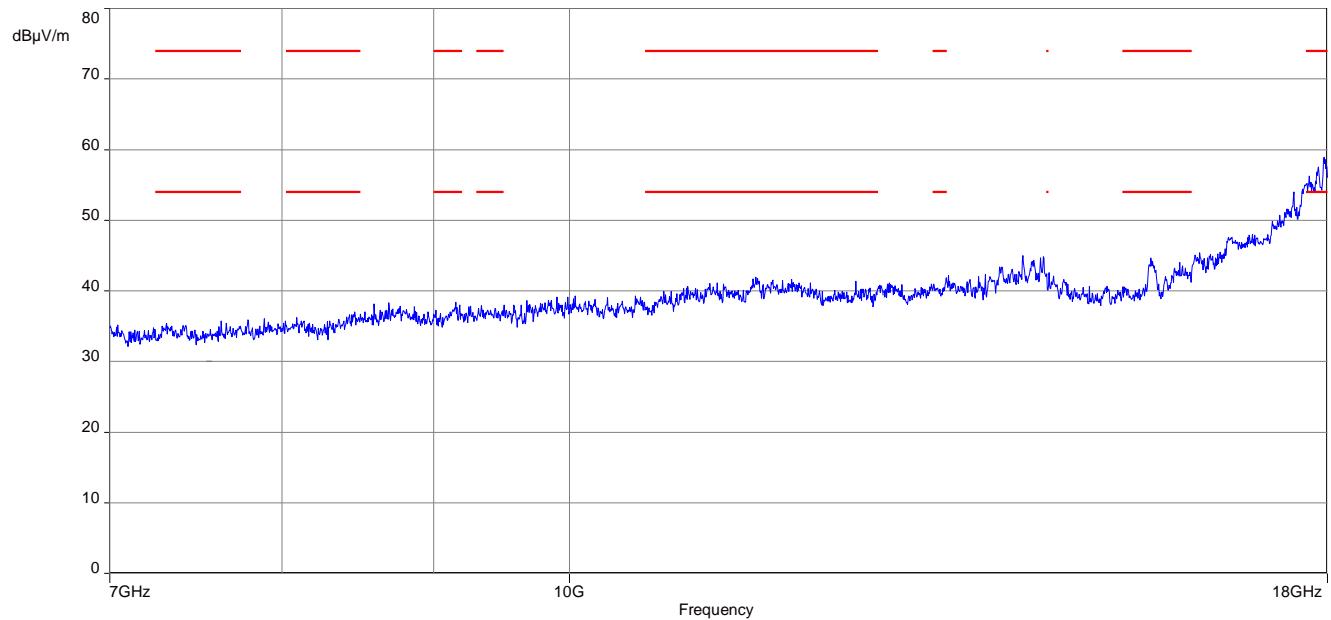
Date: 5.OCT.2016 09:28:49

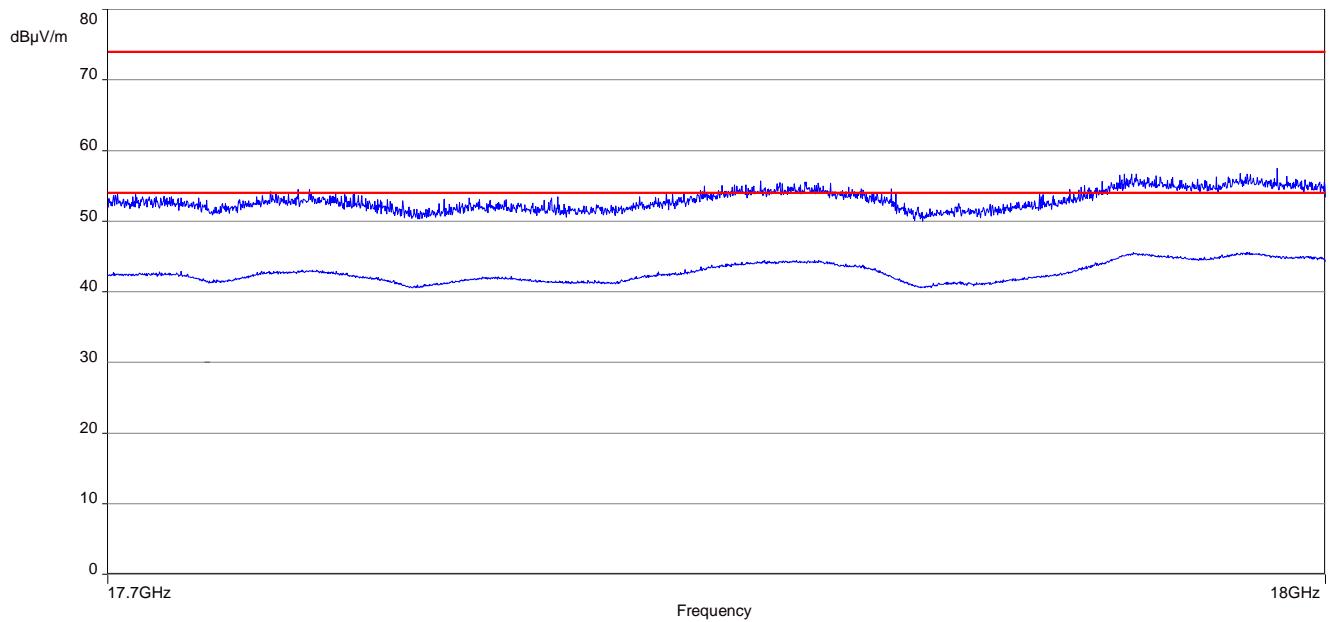
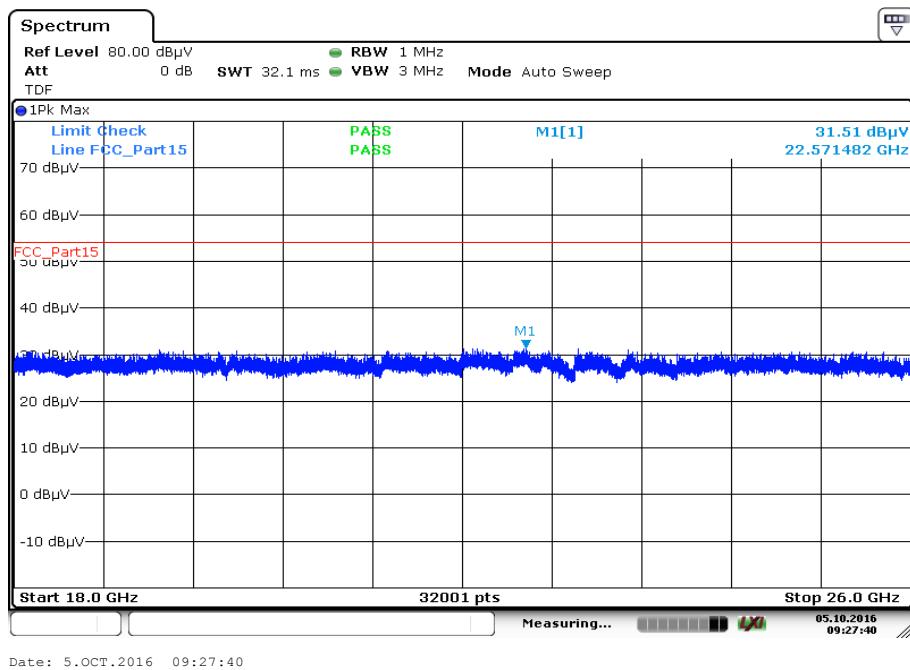
Plot 5: Middle channel, 1 GHz to 7 GHz, vertical & horizontal polarization



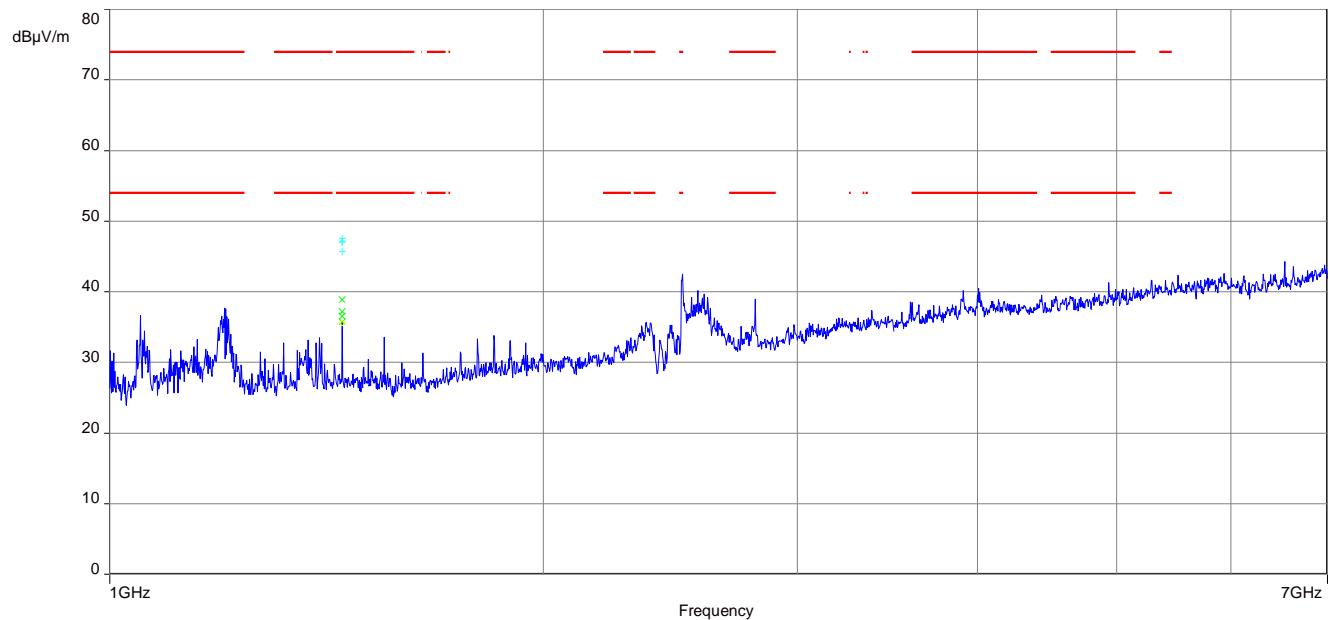
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 6: Middle channel, 7 GHz to 18 GHz, vertical & horizontal polarization



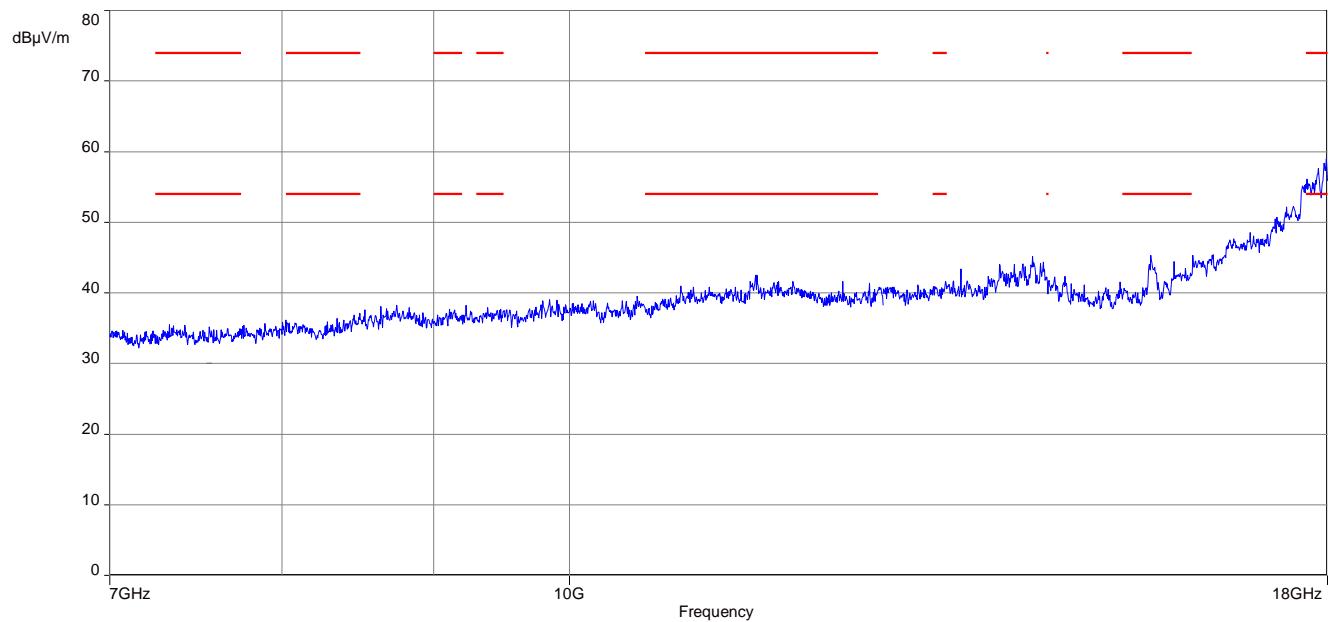
Plot 7: Middle channel, 17.7 GHz to 18 GHz, vertical & horizontal polarization**Plot 8:** Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

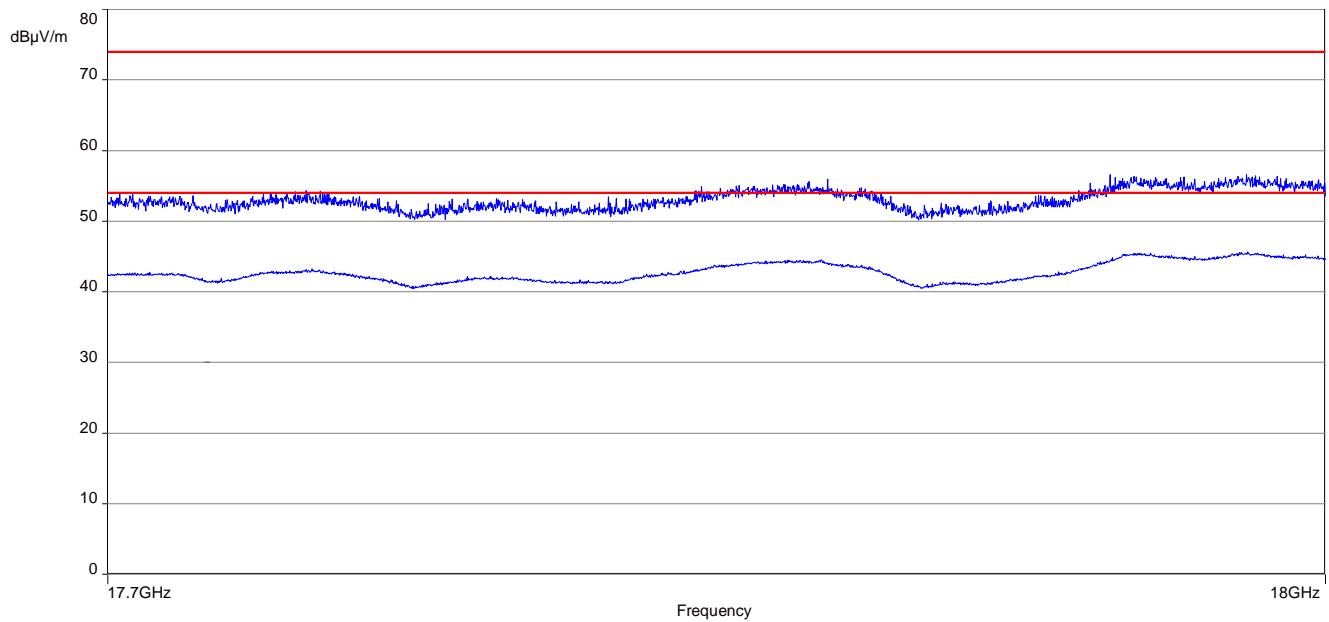
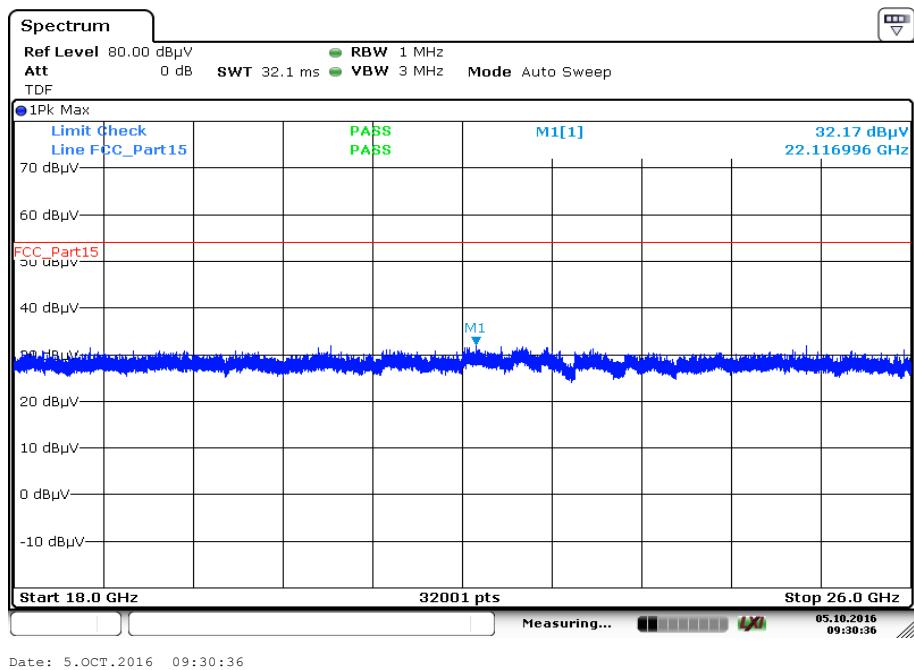
Plot 9: Highest channel, 1 GHz to 7 GHz, vertical & horizontal polarization



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

Plot 10: Highest channel, 7 GHz to 18 GHz, vertical & horizontal polarization



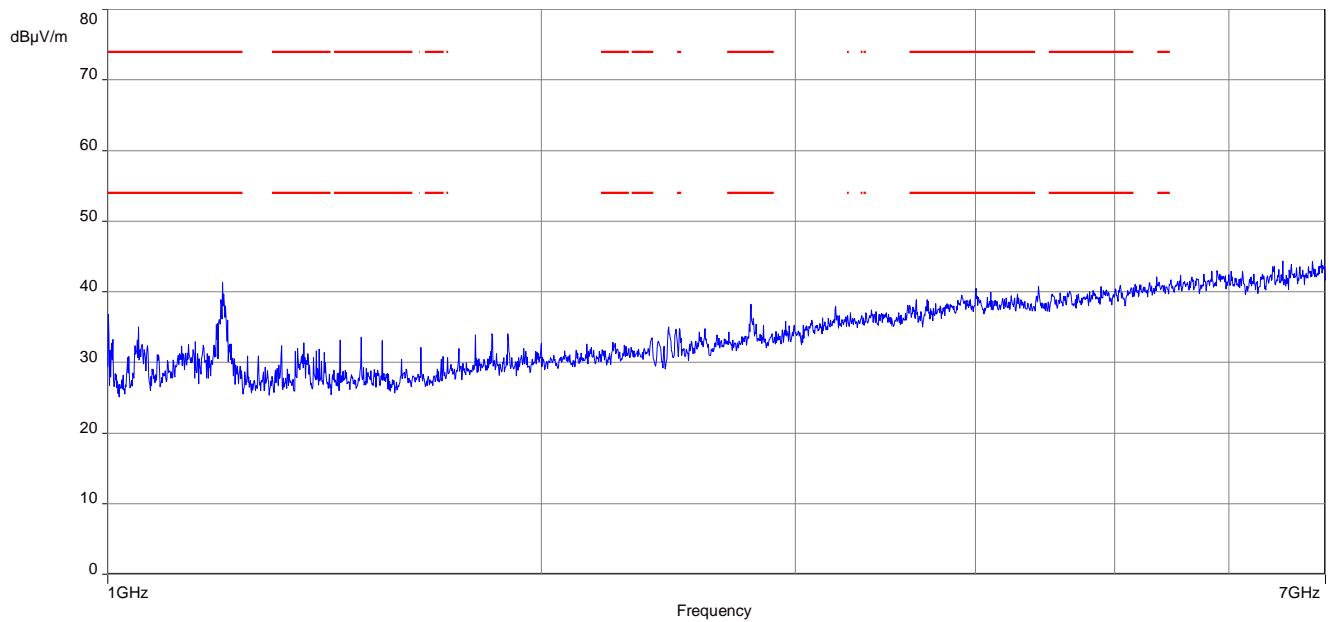
Plot 11: Highest channel, 17.7 GHz to 18 GHz, vertical & horizontal polarization**Plot 12:** Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Date: 5.OCT.2016 09:30:36

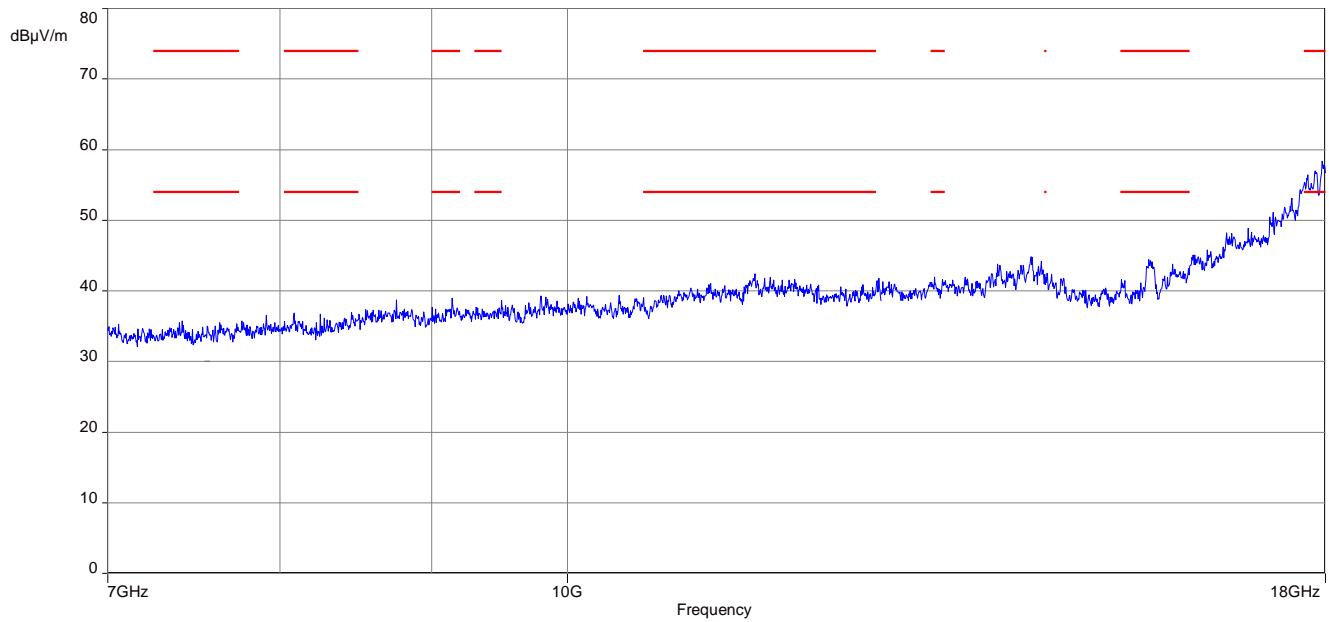
05.10.2016
09:30:36

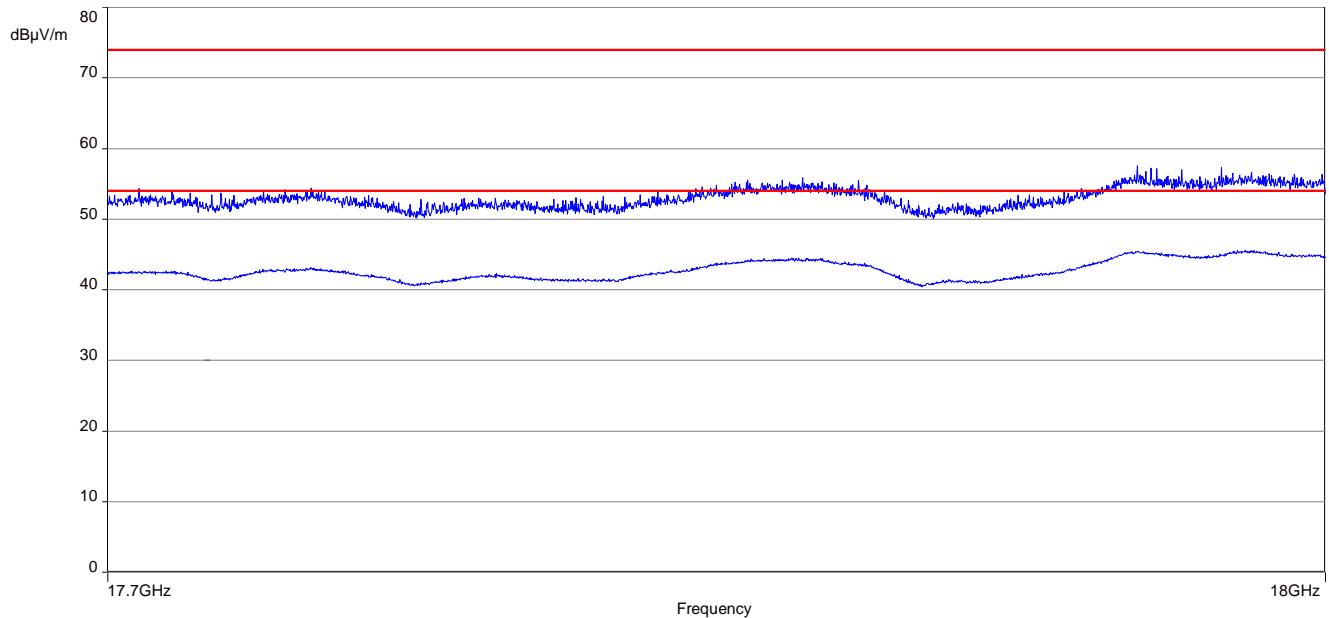
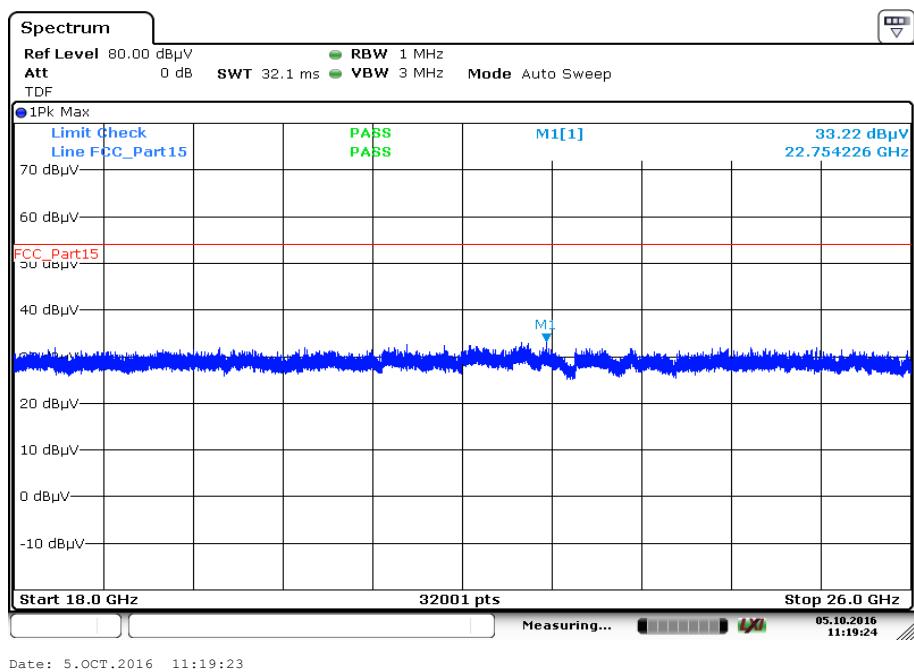
Plots: RX / idle mode, antenna 1

Plot 1: 1 GHz to 7 GHz, vertical & horizontal polarization

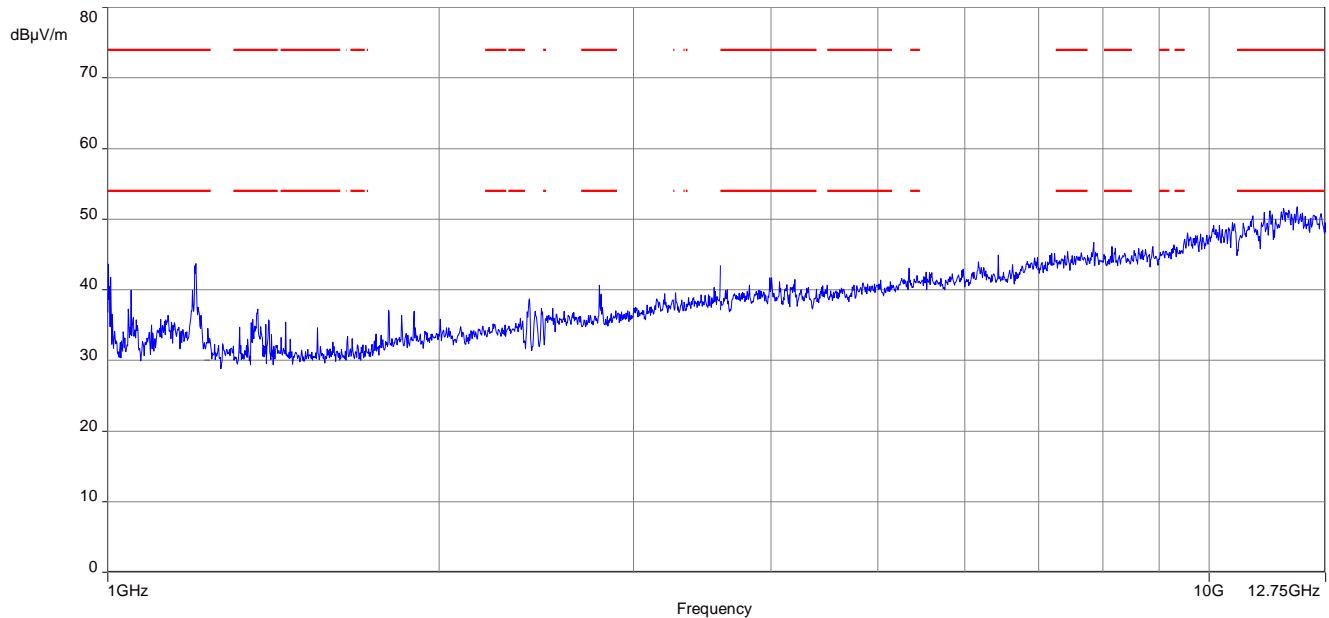


Plot 2: 7 GHz to 18 GHz, vertical & horizontal polarization

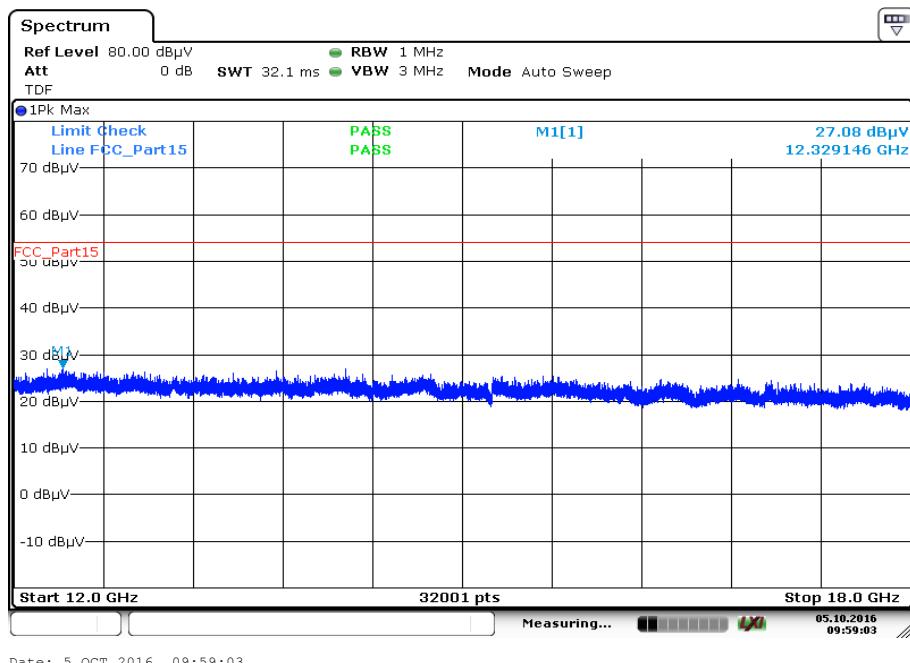


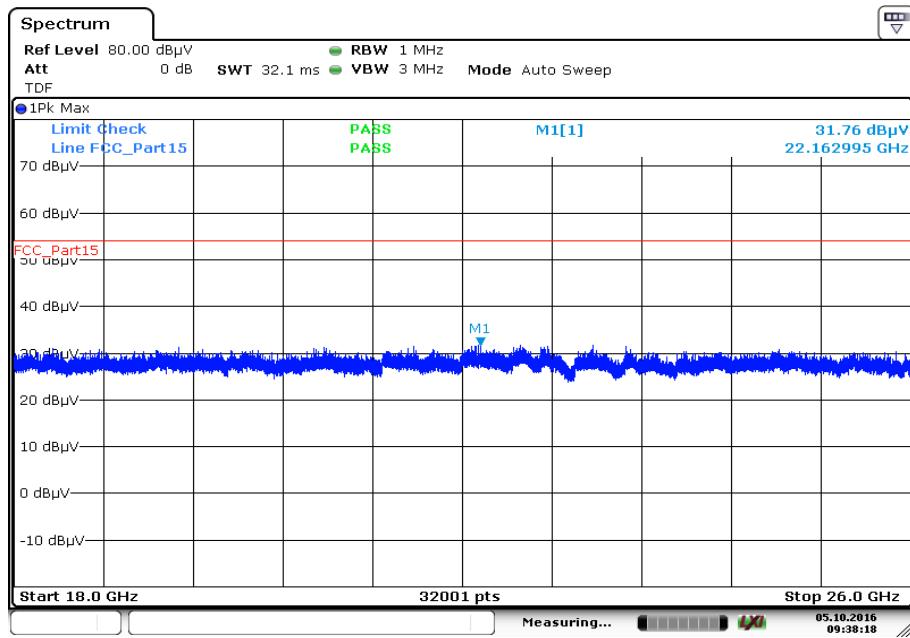
Plot 3: 17.7 GHz to 18 GHz, vertical & horizontal polarization**Plot 4:** 18 GHz to 26 GHz, vertical & horizontal polarization

Date: 5.OCT.2016 11:19:23

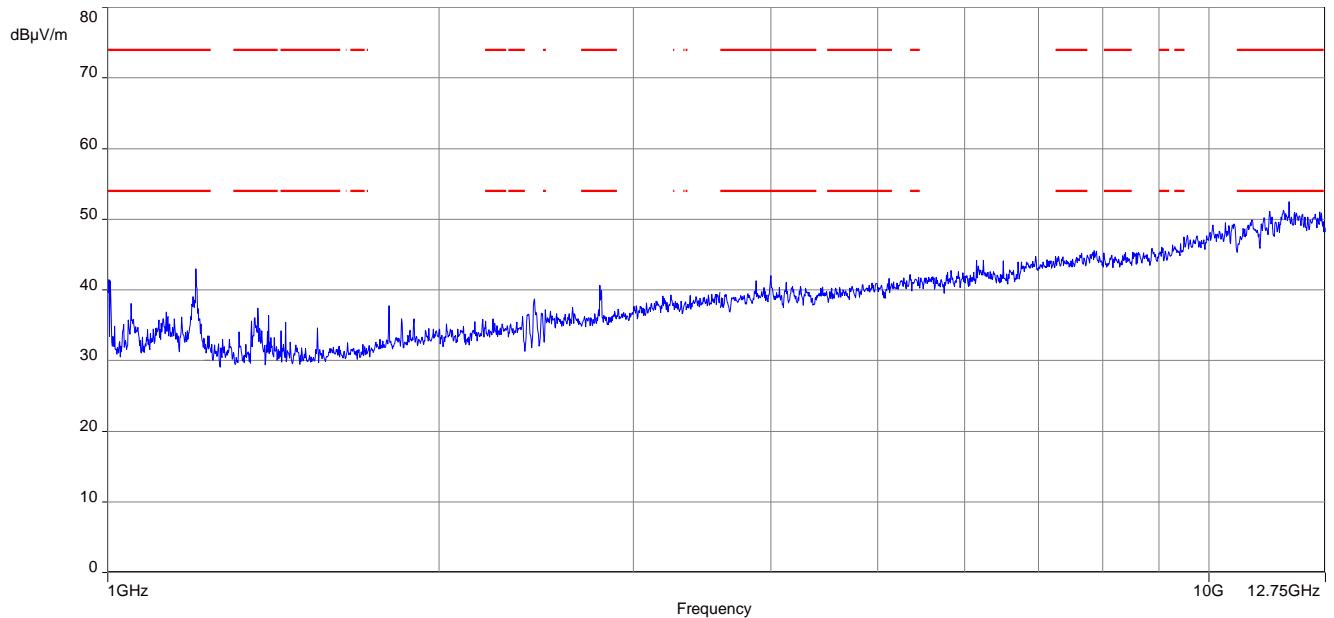
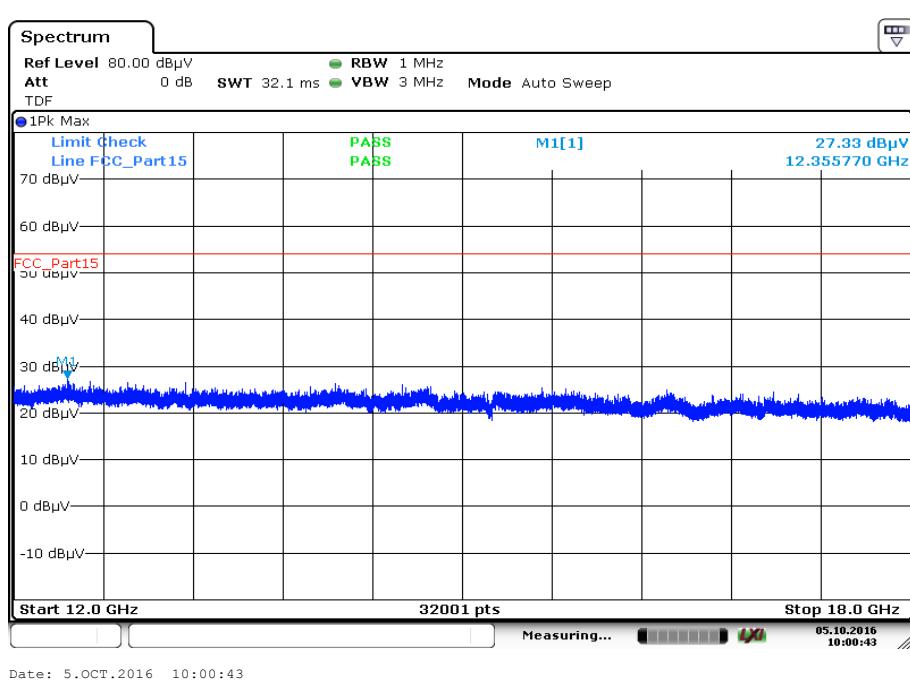
Plots: DSSS, antenna 2**Plot 1:** Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

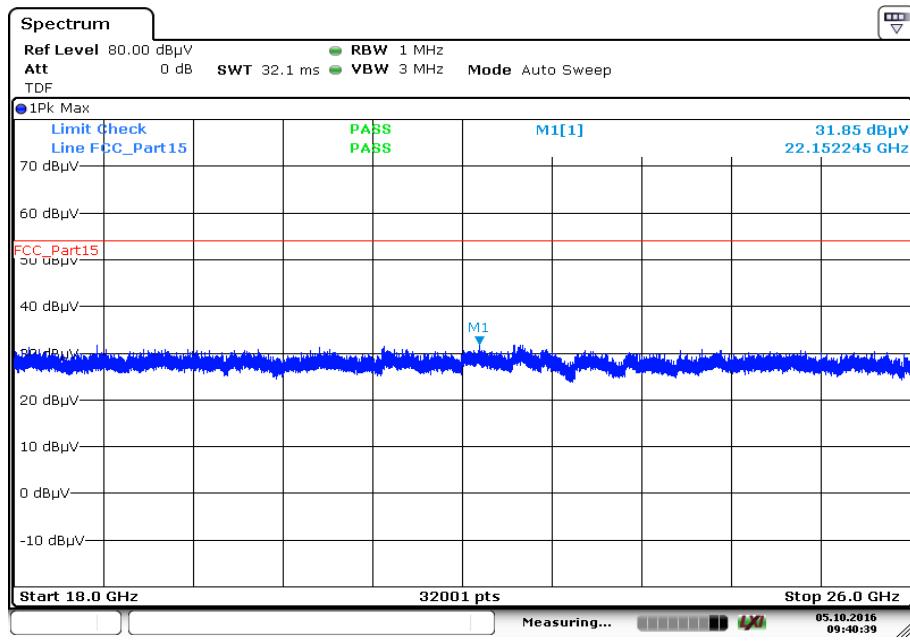
The carrier signal is notched with a 2.4 GHz band rejection filter.

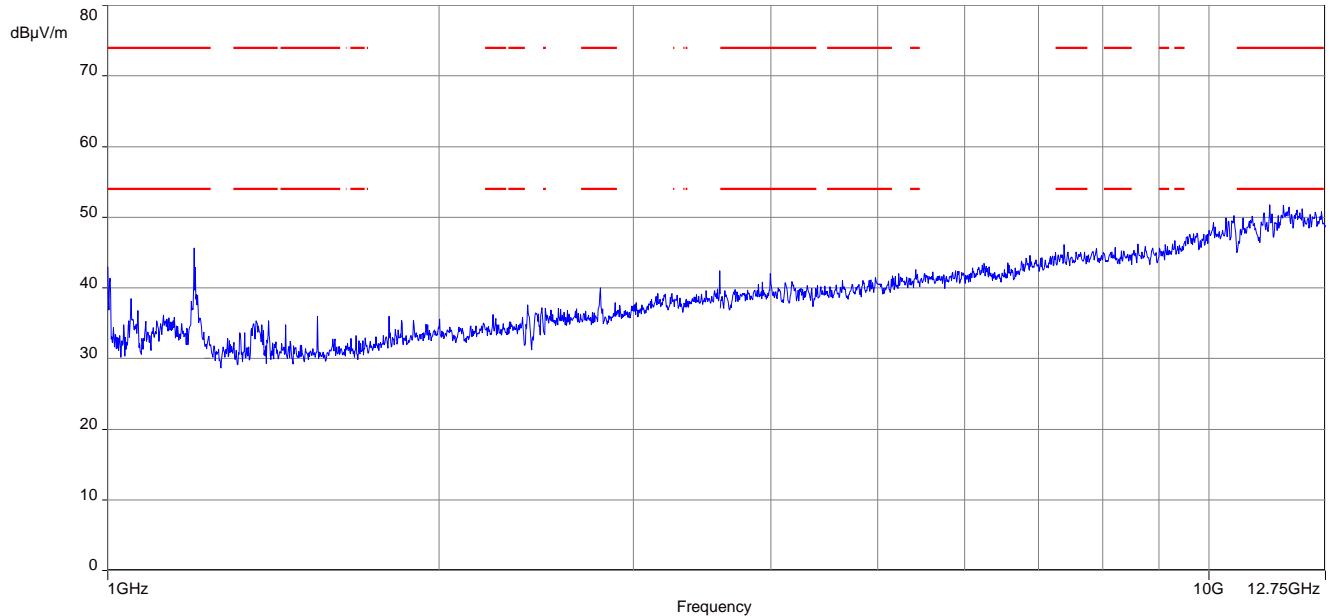
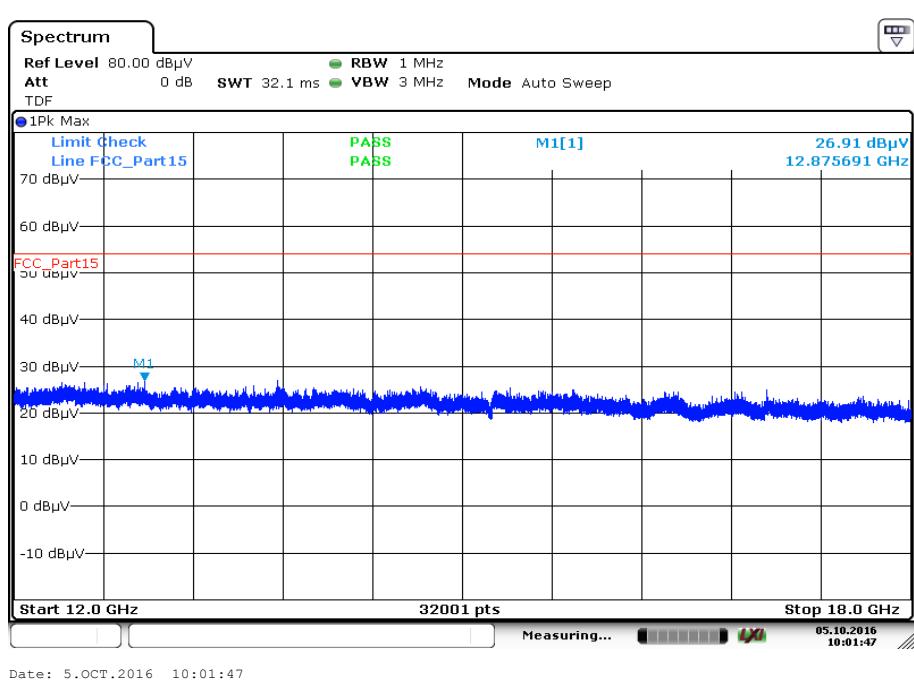
Plot 2: Lowest channel, 12 GHz to 18 GHz, vertical & horizontal polarization

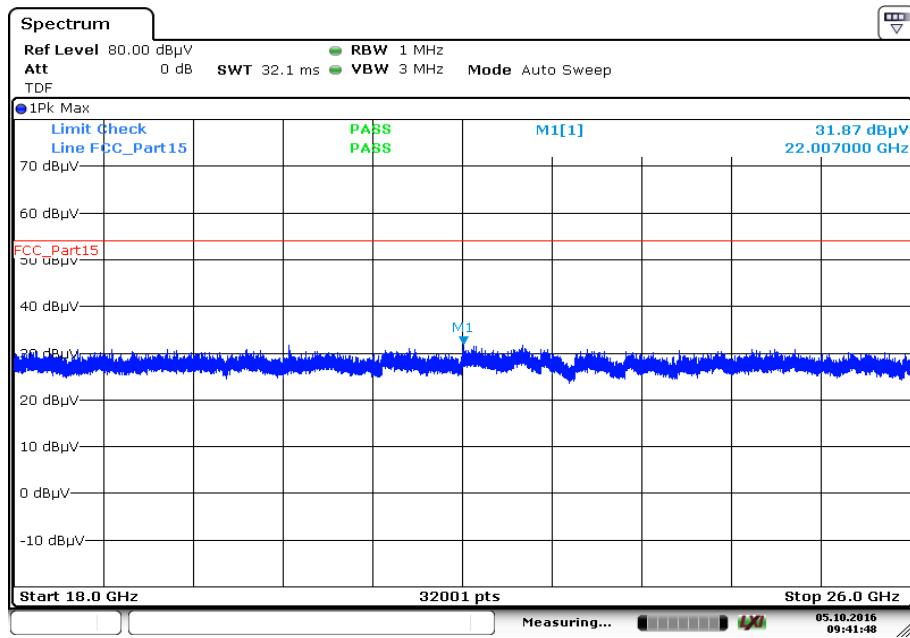
Plot 3: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Date: 5.OCT.2016 09:38:18

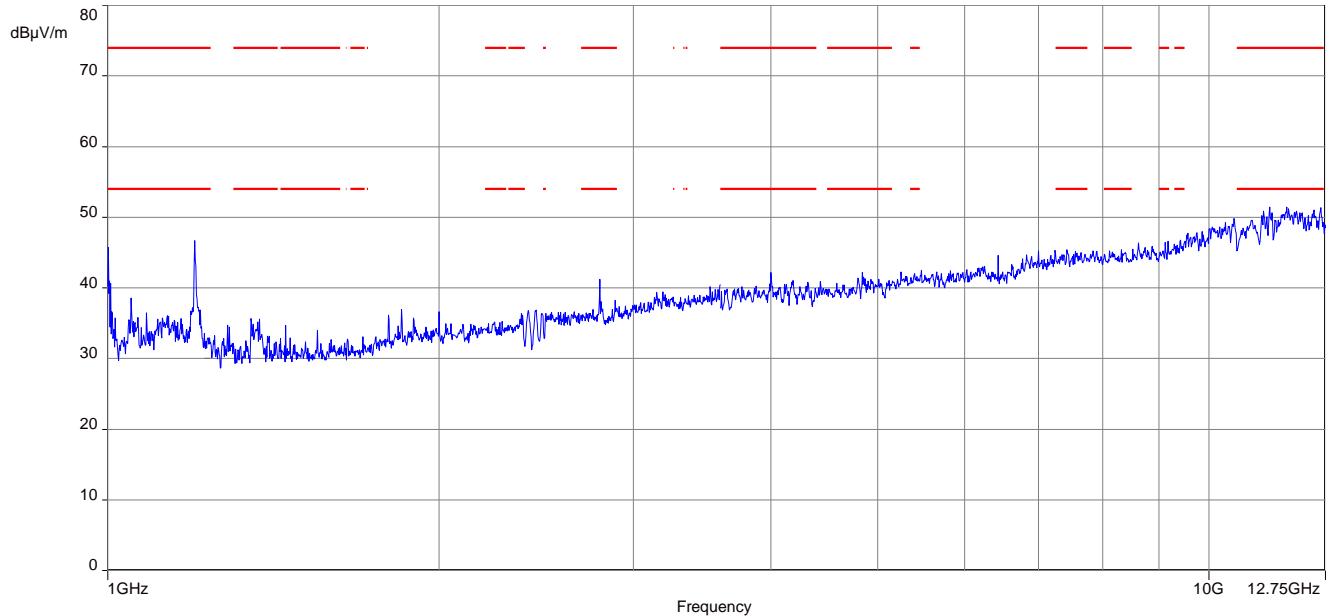
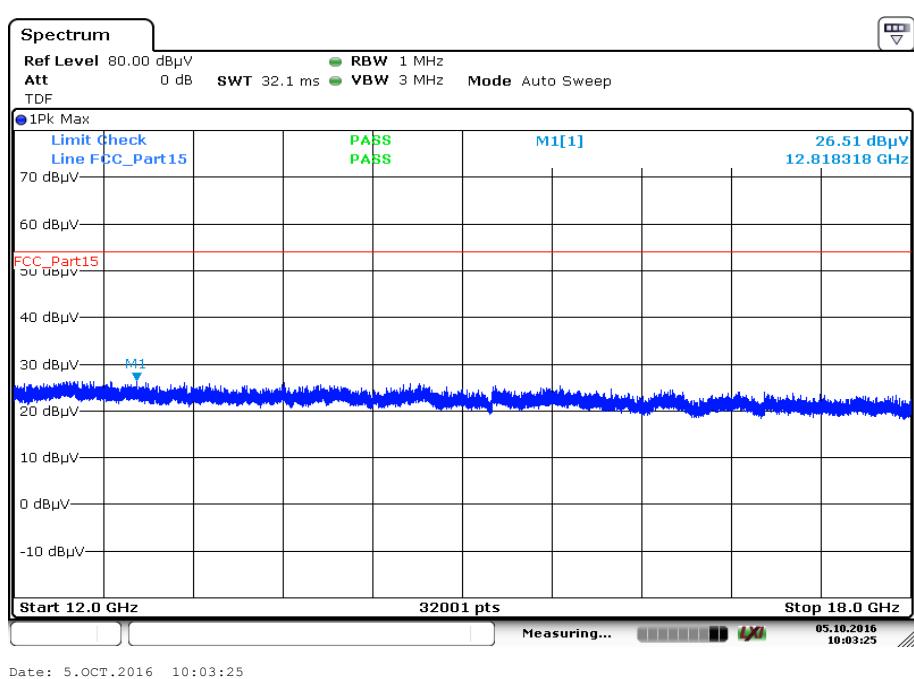
Plot 4: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 5:** Middle channel, 12 GHz to 18 GHz, vertical & horizontal polarization

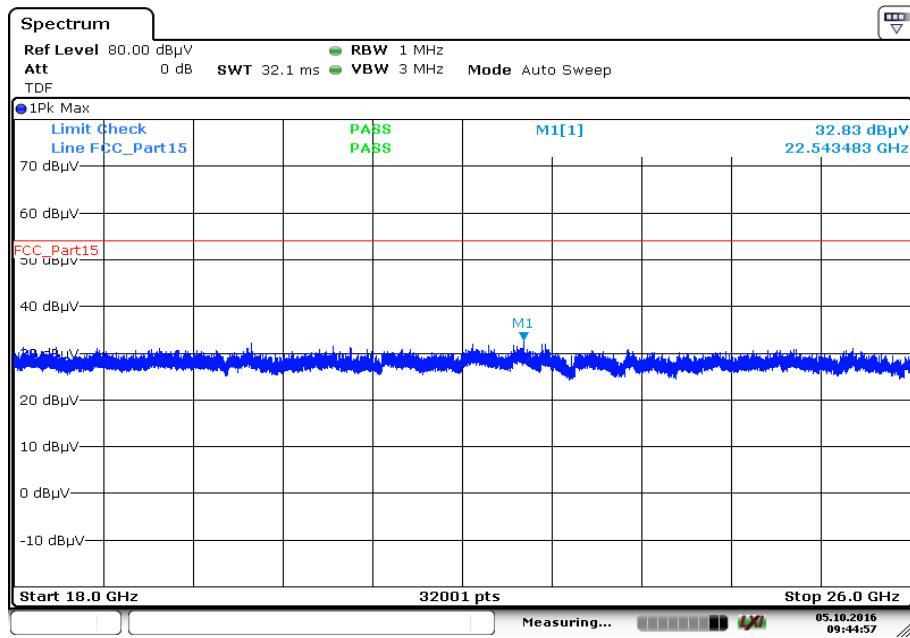
Plot 6: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

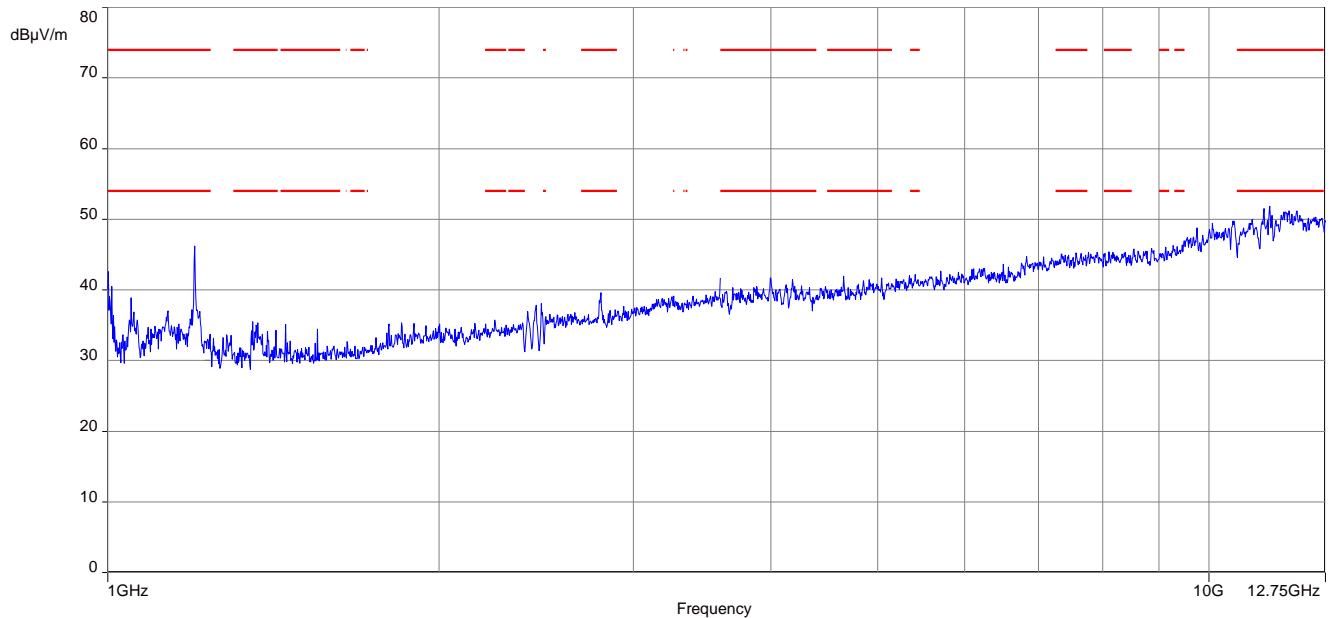
Plot 7: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 9:** Highest channel, 12 GHz to 18 GHz, vertical & horizontal polarization

Plot 12: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

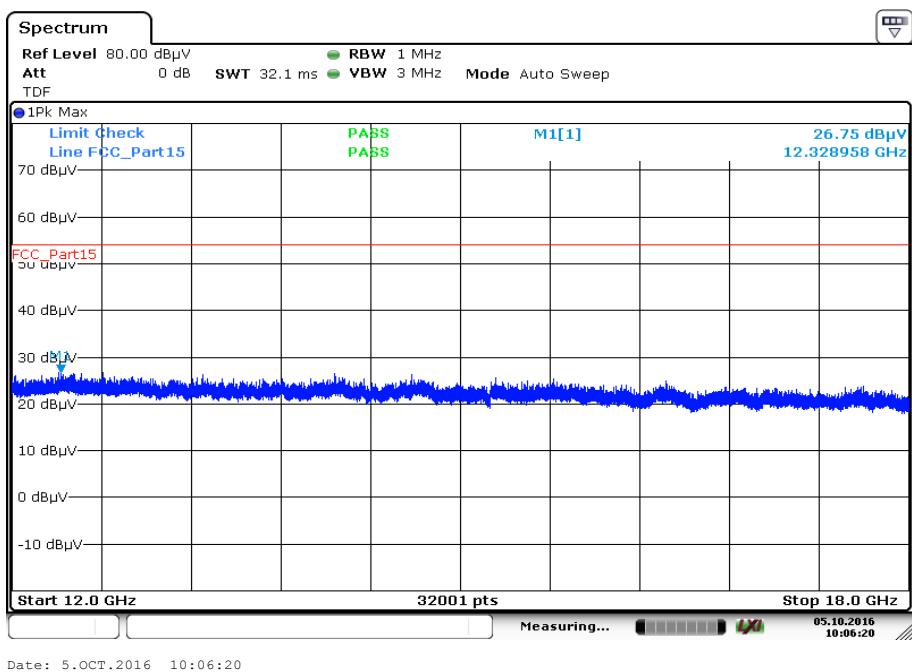
Date: 5.OCT.2016 09:41:48

Plots: OFDM (20 MHz bandwidth), antenna 2**Plot 1:** Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 2:** Lowest channel, 12 GHz to 18 GHz, vertical & horizontal polarization

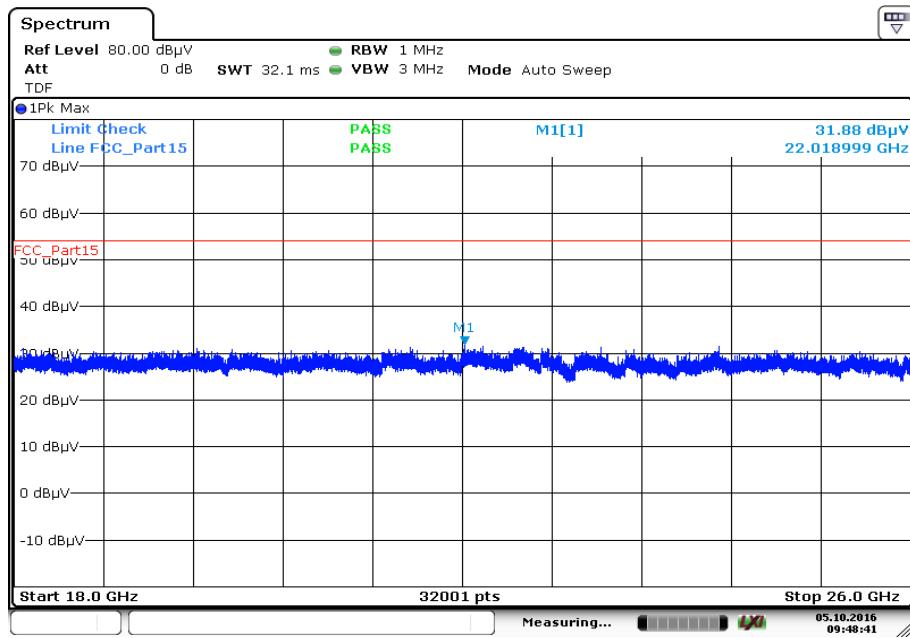
Plot 3: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plot 4: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

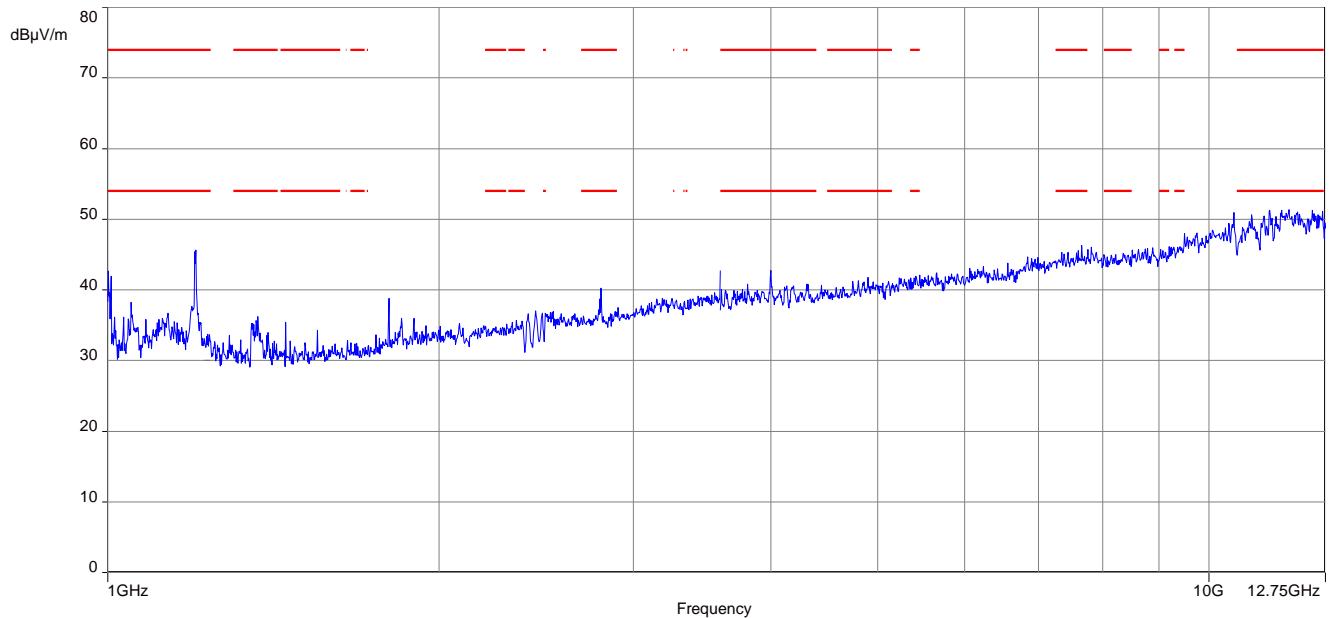
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 5: Middle channel, 12 GHz to 18 GHz, vertical & horizontal polarization

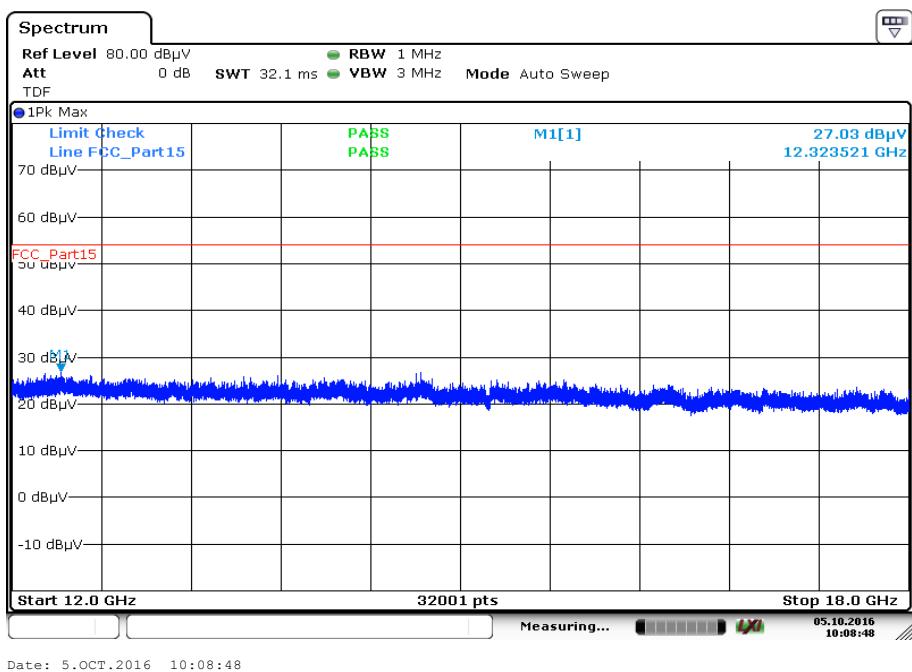
Date: 5.OCT.2016 10:06:20

Plot 6: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

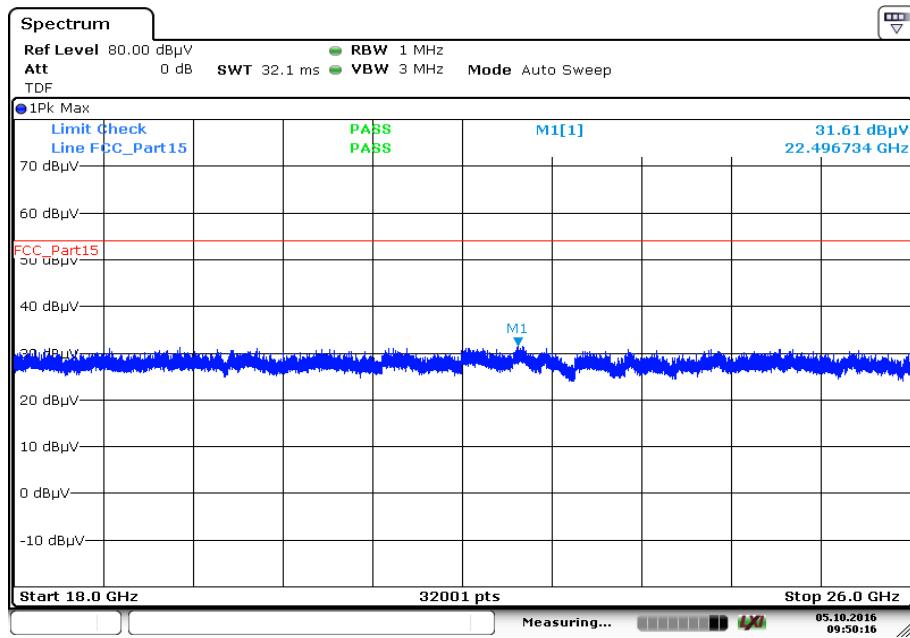
Date: 5.OCT.2016 09:48:41

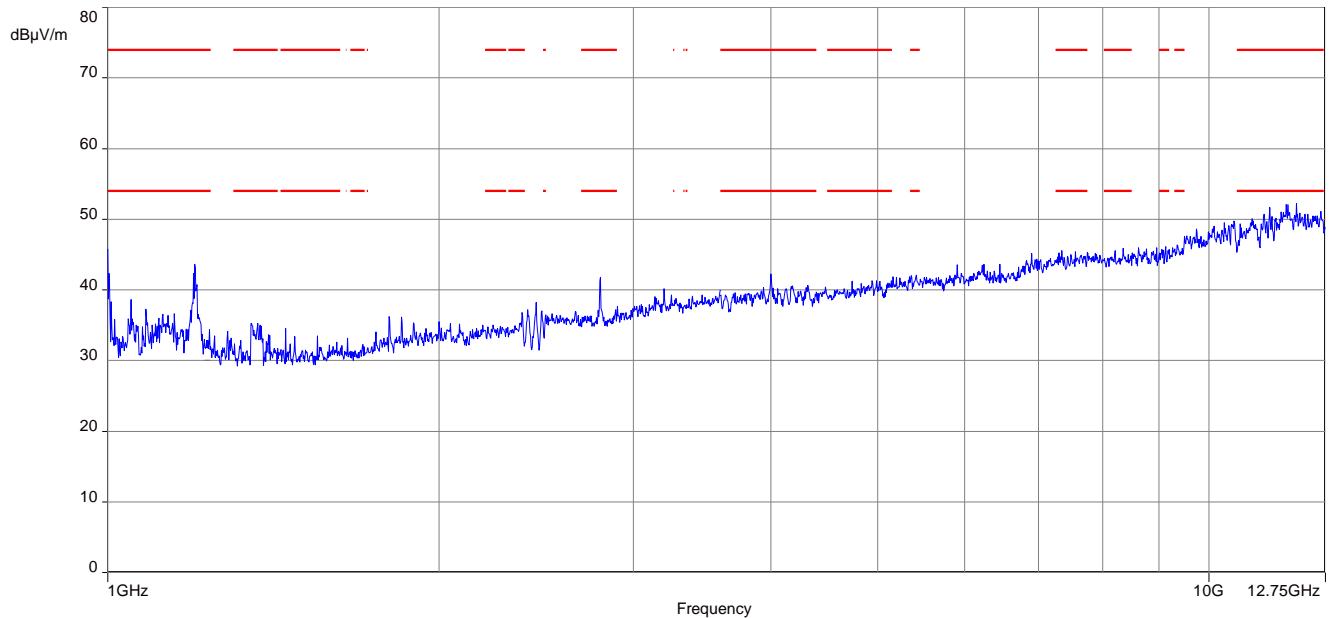
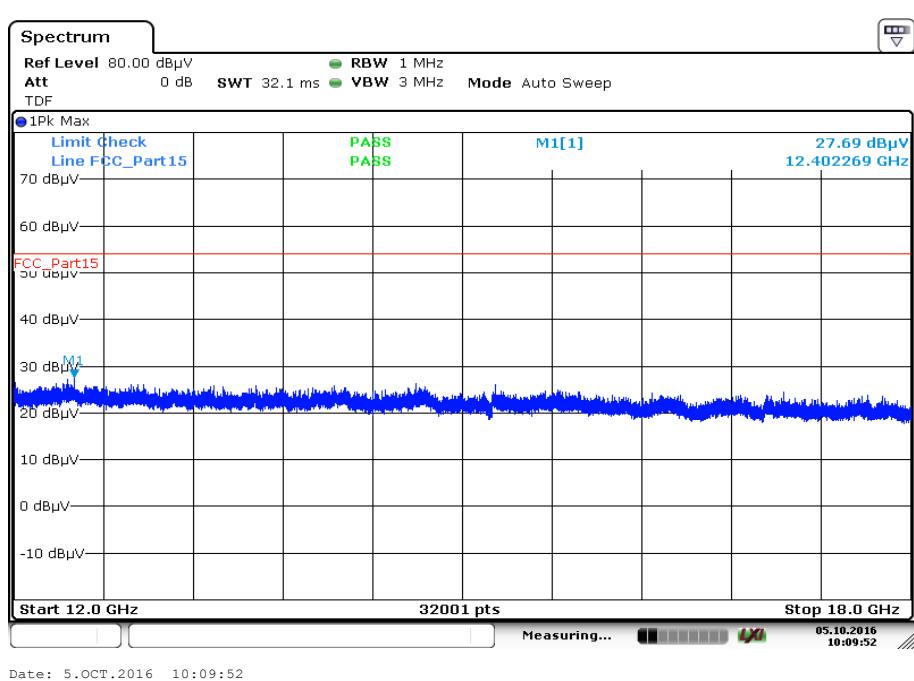
Plot 7: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

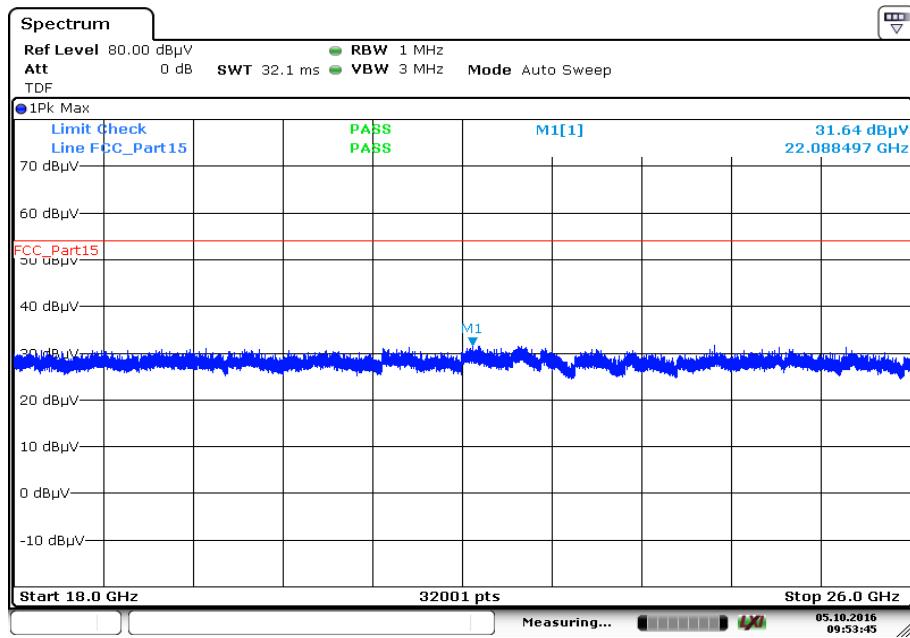
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 8: Highest channel, 12 GHz to 18 GHz, vertical & horizontal polarization

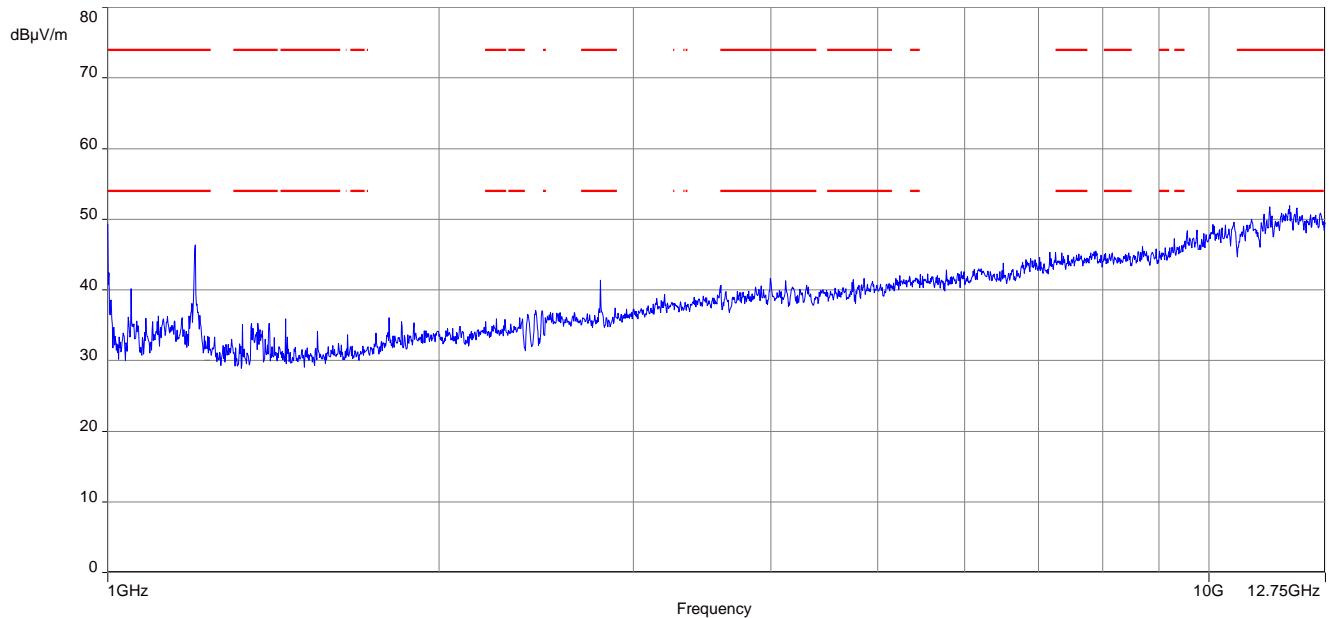
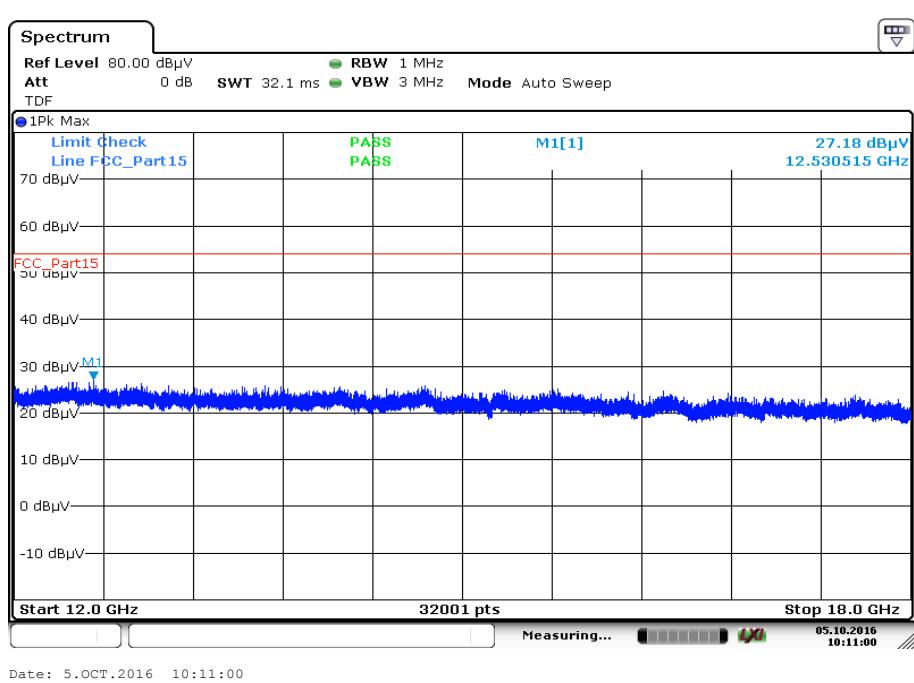
Date: 5.OCT.2016 10:08:48

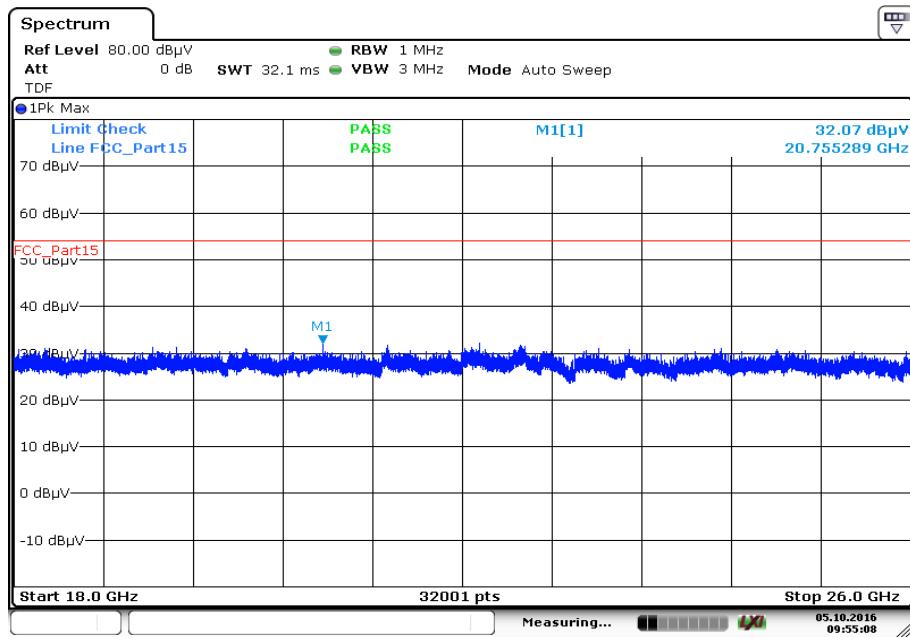
Plot 9: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Plots: OFDM (40 MHz bandwidth), antenna 2**Plot 1:** Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 2:** Lowest channel, 12 GHz to 18 GHz, vertical & horizontal polarization

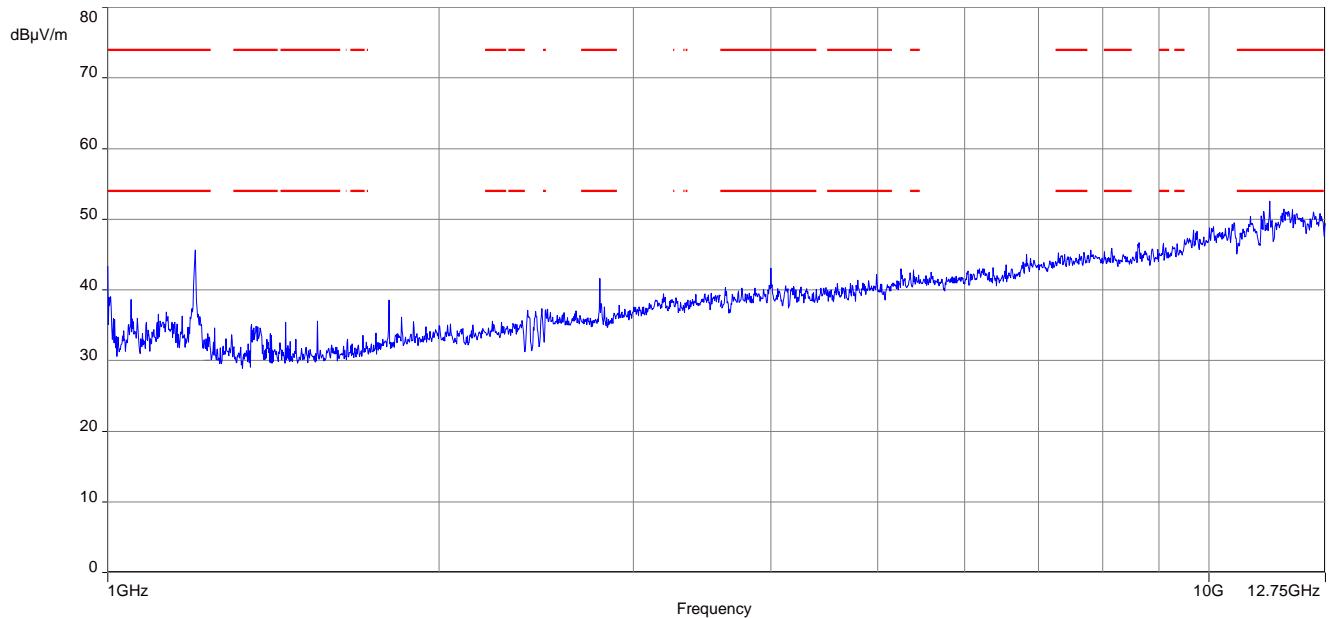
Plot 3: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Date: 5.OCT.2016 09:53:45

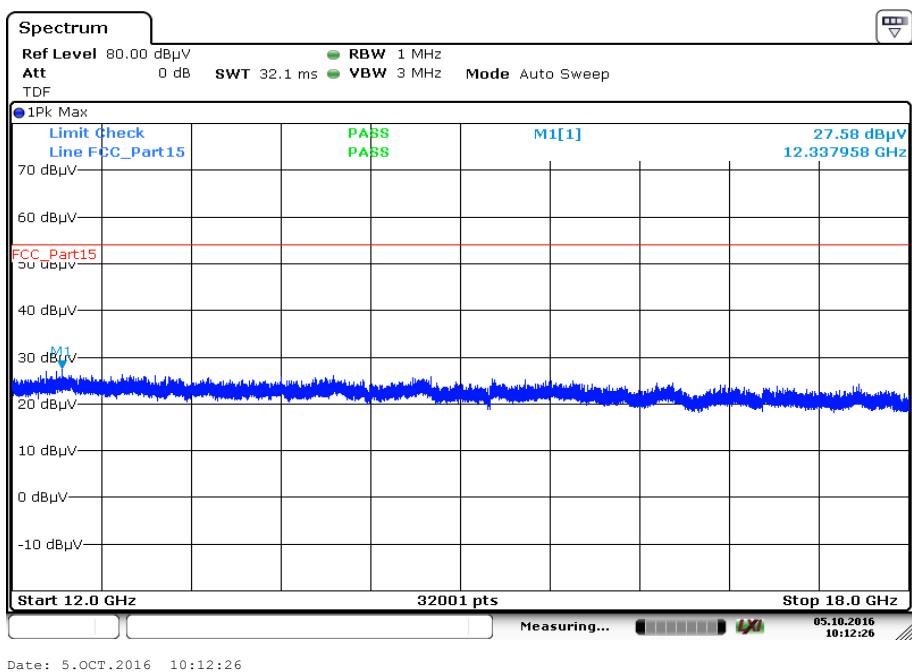
Plot 4: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 5:** Middle channel, 12 GHz to 18 GHz, vertical & horizontal polarization

Plot 6: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization

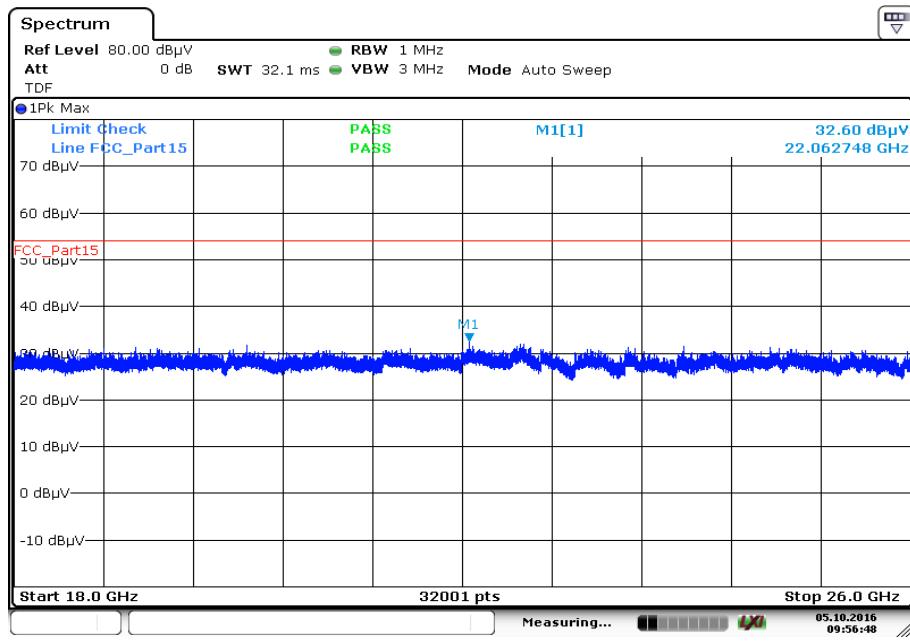
Date: 5.OCT.2016 09:55:08

Plot 7: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization

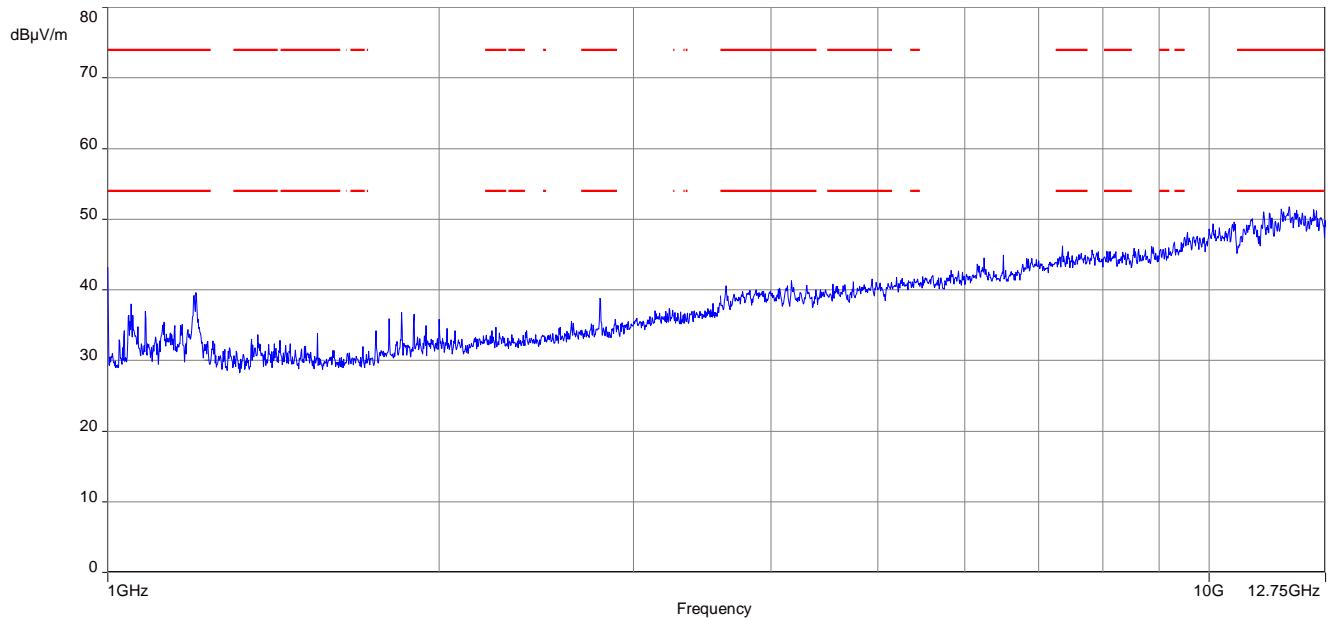
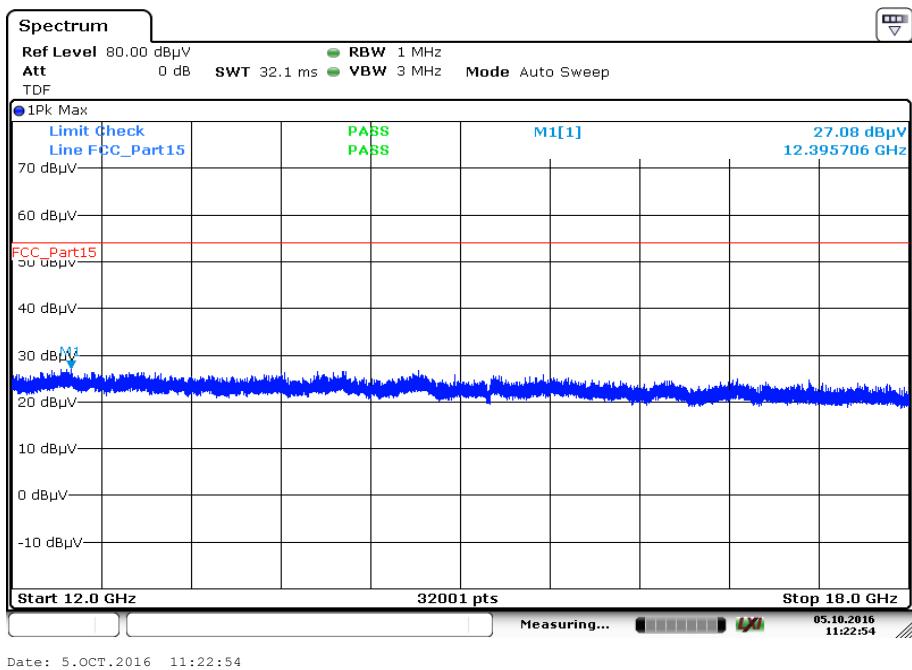
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 8: Highest channel, 12 GHz to 18 GHz, vertical & horizontal polarization

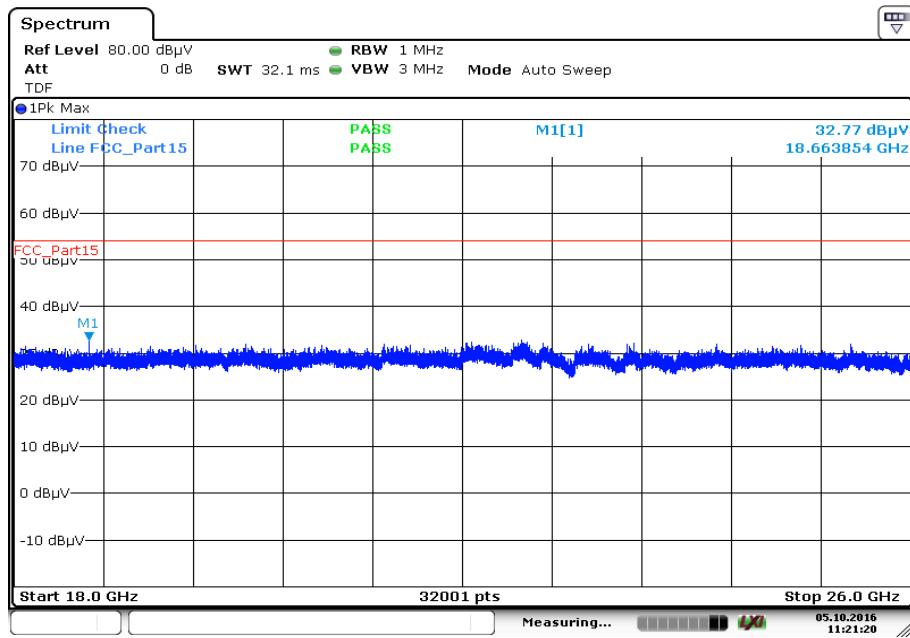
Date: 5.OCT.2016 10:12:26

Plot 9: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

Date: 5.OCT.2016 09:56:49

Plots: RX / idle mode, antenna 2**Plot 1:** 1 GHz to 12.75 GHz, vertical & horizontal polarization**Plot 2:** 12 GHz to 18 GHz, vertical & horizontal polarization

Date: 5.OCT.2016 11:22:54

Plot 3: 18 GHz to 26 GHz, vertical & horizontal polarization

Date: 5.OCT.2016 11:21:20

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	2016-10-07

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



Deutsche Akkreditierungsstelle GmbH

Befähigte 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-12076-01-01

Frankfurt, 04.05.2016

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

Abteilungsleiter

Sehe Hinweise auf der Rückseite

Back side of certificate

Deutsche Akkreditierungsstelle GmbH

Standort Berlin
Spittelmarkt 10
10117 Berlin

Standort Frankfurt am Main
Europa-Allee 52
60327 Frankfurt am Main

Standort Braunschweig
Bundesallee 100
38116 Braunschweig

Die auszugsweise Veröffentlichung der Akkreditierungsurkunde bedarf der vorherigen schriftlichen
Zustimmung der Deutsche Akkreditierungsstelle GmbH (DAkkS). Ausgenommen davon ist die separate
Weiterverbreitung des Deckblattes durch die umseitig genannte Konformitätsbewertungsstelle in
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Es darf nicht der Anschein erweckt werden, dass sich die Akkreditierung auch auf Bereiche erstreckt,
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Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstelle (AkkStelleG) vom
31. Juli 2009 (BGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments
und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung
im Zusammenhang mit der Vermarktung von Produkten (Abl. L 218 vom 9. Juli 2008, S. 30).
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der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen
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EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

Note:

The current certificate including annex can be received from CETECOM ICT Services GmbH on request.