CETECOM ICT Services
consulting - testing - certification

TEST REPORT

Test report no.: 1-1248/16-01-03-A

Deutsche Akkreditierungsstelle D-PL-12076-01-01

Testing laboratory

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

Applicant

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Phone: +49 5130 600-2621

Manufacturer

Sennheiser electronic GmbH & Co. KG
Am Labor 1
30900 Wedemark / 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

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

Test Item

Kind of test item:	**Wireless conference system**
Model name:	**ADN-W AM-US**
FCC ID:	**DMOADNWA**
IC:	**2099A-ADNWA**
Frequency:	UNII band 5150 MHz to 5850 MHz
Technology tested:	Proprietary wireless audio transmission system
Antenna:	External rod. antennas
Power supply:	52.8 V DC by POE power supply
Temperature range:	+5°C to +45°C

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

Test report authorized:

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Marco Bertolino
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Radio Communications & EMC

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Andreas Luckenbill
Lab Manager
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1 Table of contents

2 General information

2.1 Notes and disclaimer

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This test report replaces the test report with the number 1-1248/16-01-03 and dated 2016-07-21.

2.2 Application details

Date of receipt of order:	2016-04-20
Date of receipt of test item:	2016-05-13
Start of test:	2016-05-13
End of test:	2016-06-16
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

Guidance	Version	Description
UNII: KDB 789033 D02	v01r02	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E
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
KDB 662911 D01	V02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

4 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests +45 °C during high temperature tests +5 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		not relevant for this kind of testing
Power supply	:	V_{nom} V_{max} V_{min}	52.8 V DC by POE power supply 54.0 V 33.0 V

5 Test item

5.1 General description

Kind of test item	:	Wireless conference system
Type identification	:	ADN-W AM-US
HMN	:	-/-
PMN	:	ADN-W AM
HVIN	:	ADN-W AM-US
FVIN	:	1.3.3.2
S/N serial number	:	Rad. 1064100198 Cond. 1064100198
HW hardware status	:	FPGA: 2_8_5_prod2/ AM1.bin
SW software status	:	ADNW_TERMINAL.EXE from 16.11.2012; APP:001120
Frequency band	:	UNII band 5150 MHz to 5850 MHz (lowest channel 5180 MHz; highest channel 5825 MHz)
Type of radio transmission Use of frequency spectrum	: :	OFDM
Type of modulation	:	QPSK with coding rate 1/2
Antenna	:	External rod. antennas
Power supply	:	52.8 V DC by POE power supply
Temperature range	:	+5°C to +45°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: 1-1248/16-01-04_AnnexA
1-1248/16-01-04_AnnexB
1-1248/16-01-04_AnnexD

6 Test laboratories sub-contracted

None

7 Description of the test setup

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

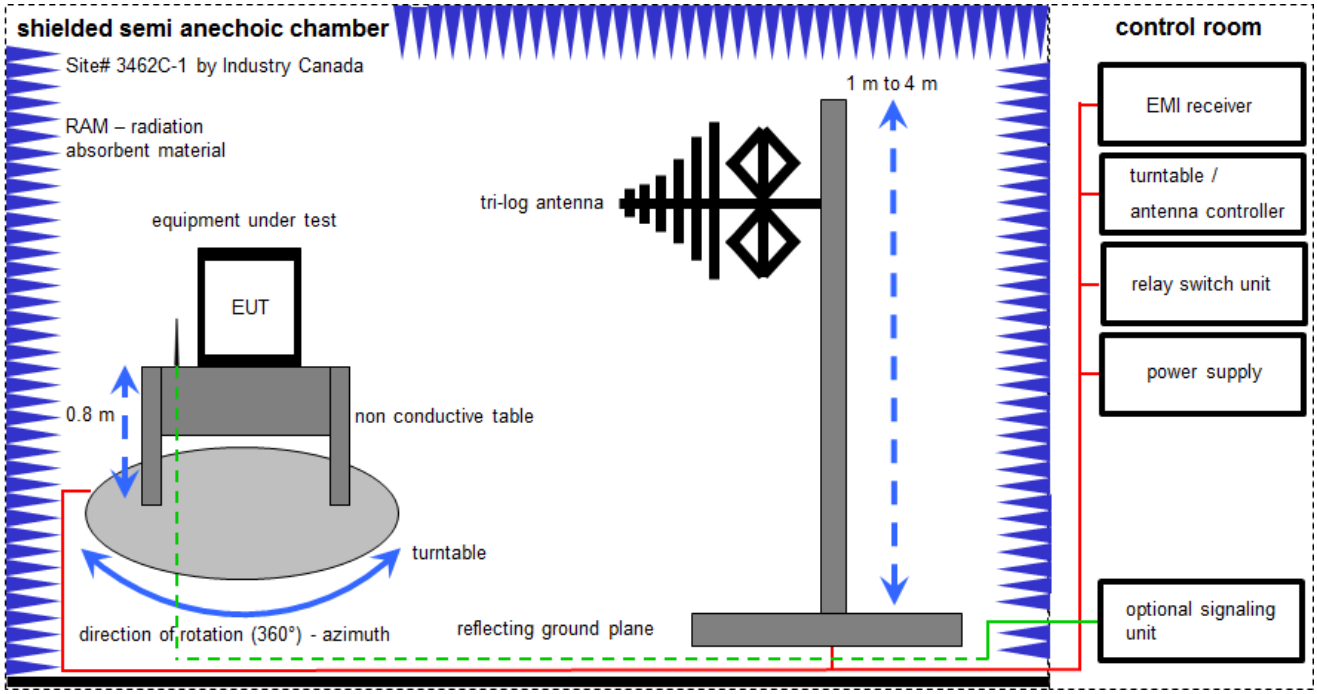
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Agenda: Kind of Calibration

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

7.1 Shielded semi anechoic chamber

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



Measurement distance: tri-log antenna 10 meter

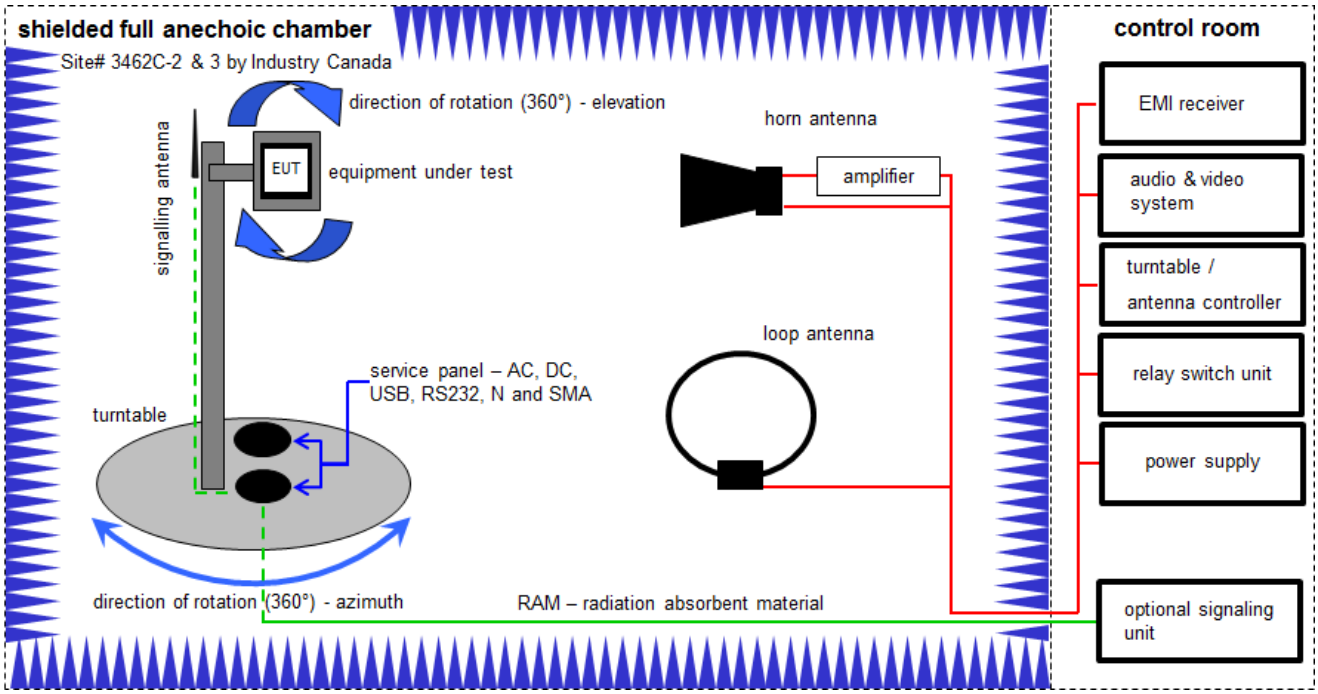
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

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

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	08.03.2016	08.03.2017
3	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
4	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
5	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	25.04.2016	25.04.2018
6	A	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	29.01.2016	29.01.2017

7.2 Shielded fully anechoic chamber



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

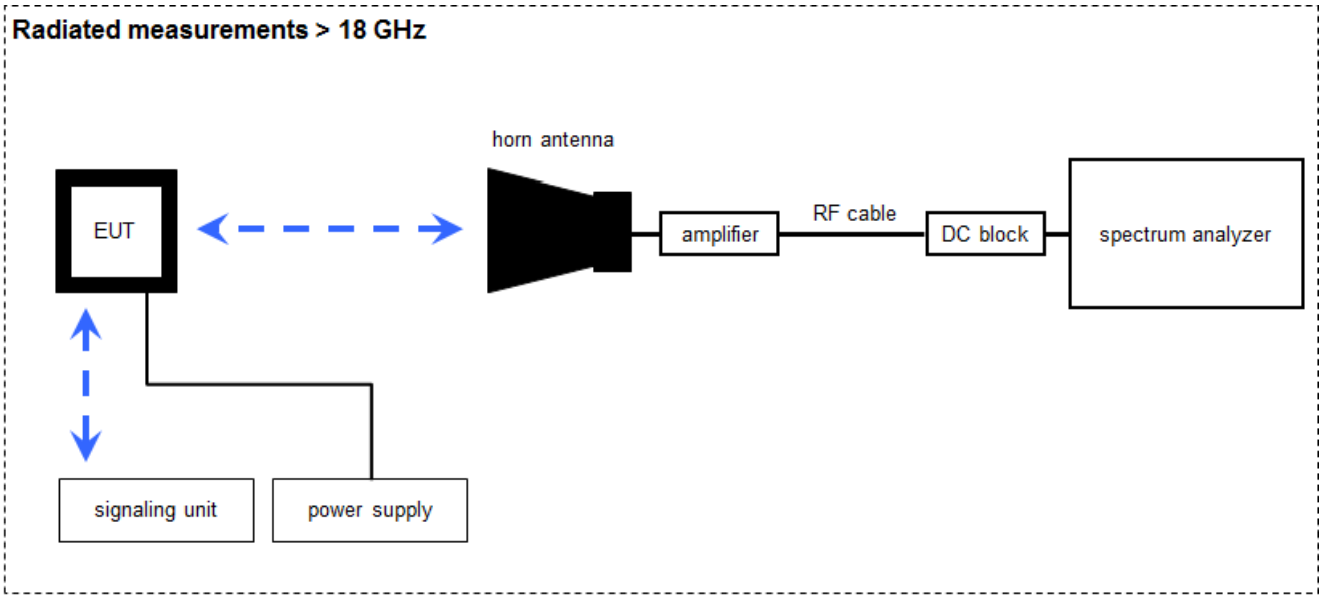
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

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

Equipment table:

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

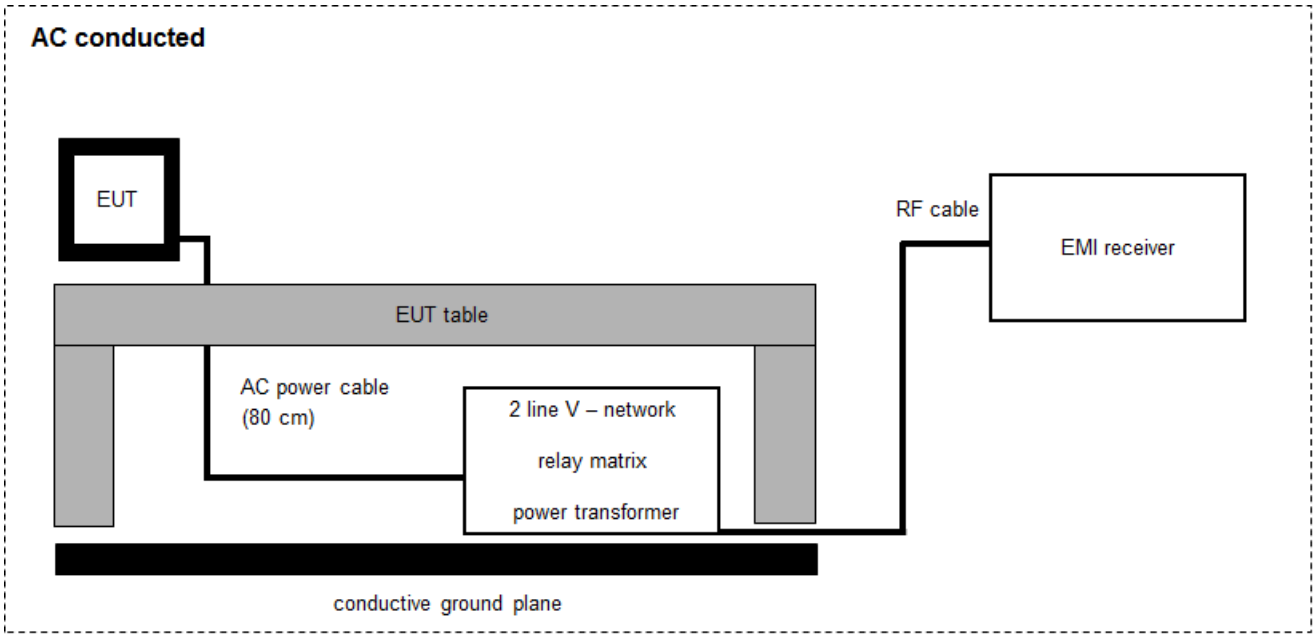
$FS = U_R + CA + AF$
(FS-field strength; U_R-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-60.1) [dB] + 36.74 [dB/m] = 16.64 [dBµV/m] (6.79 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8402	300000486	k	10.09.2015	10.09.2017
2	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev	-/-	-/-
3	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	21.01.2016	21.01.2017
4	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	Batch no. 606844	400001185	ev	-/-	-/-
5	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-
6	A	RF-Cable	ST18/SMAm/SMm/48	Huber & Suhner	Batch no. 127377	400001183	ev	-/-	-/-

7.4 AC conducted



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

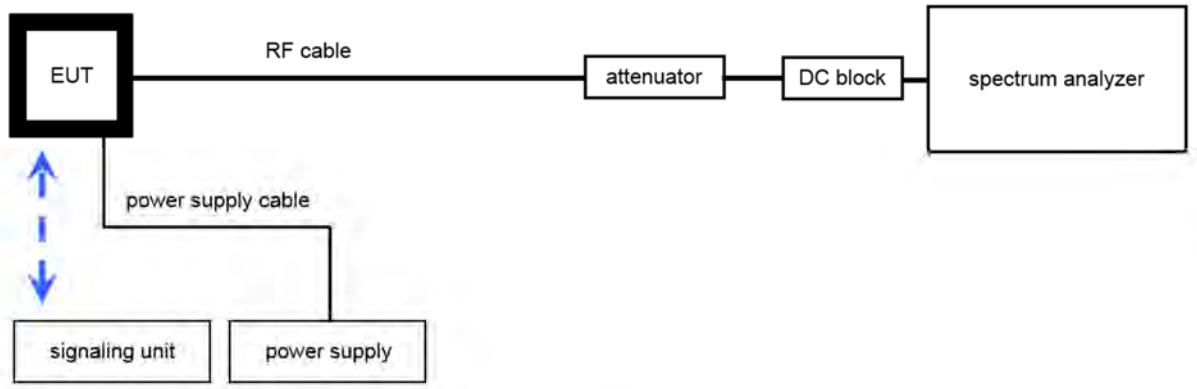
Example calculation:
FS [dBµV/m] = 37.62 [dBµV/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dBµV/m] (244.06 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Two-line V-Network (LISN) 9 kHz to 30 MHz	ESH3-Z5	R&S	892475/017	300002209	k	17.06.2014	17.06.2016
2	A	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	06.03.2015	06.03.2016
3	A	software	SPS_PHE 1.4f	Spitzenberger & Spiess	B5981; 5D1081;B5979	300000210	ne	-/-	-/-

7.5 Conducted measurements

Conducted measurements normal conditions



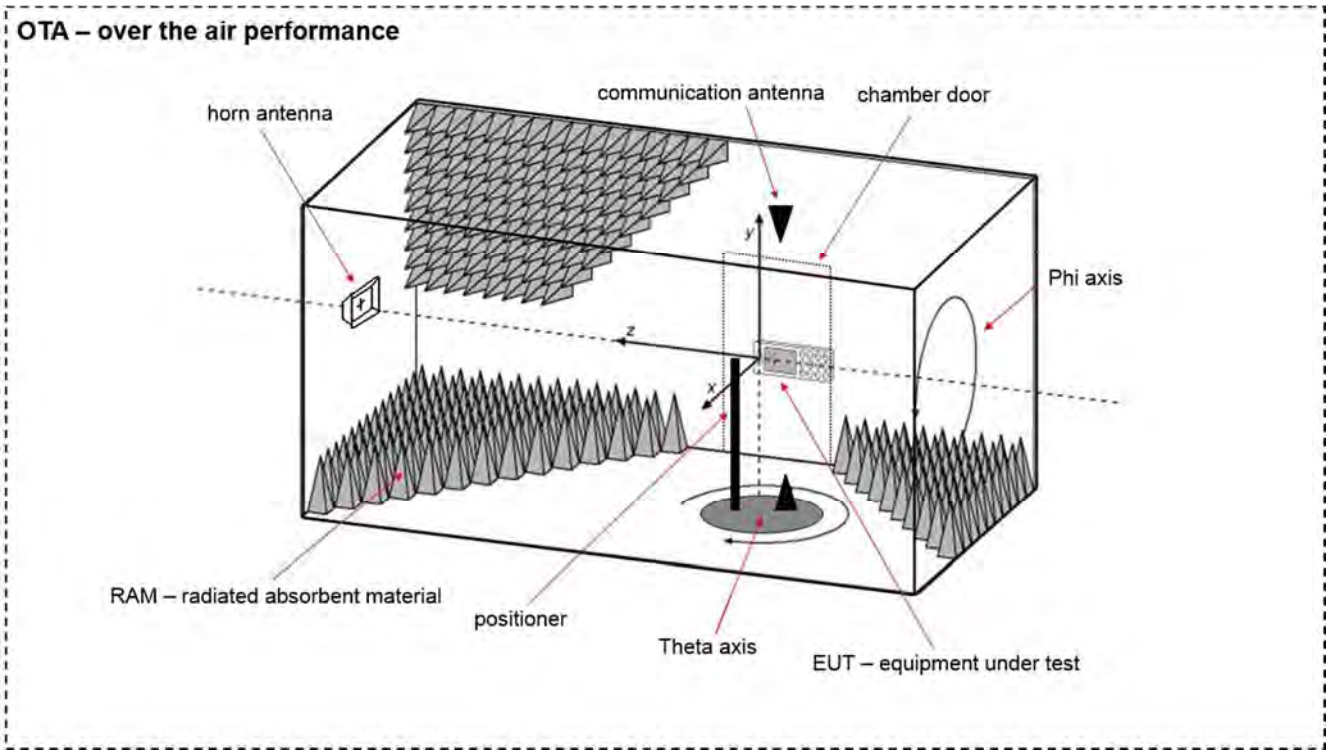
OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

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

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	21.01.2016	21.01.2017
2	A	PC-WLAN Tester	Intel Core i3 3220/3,3 GHz, Prozessor	R&S	2V2403033A4523	300004589	ne	-/-	-/-
3	A	Teststand	Teststand Custom Sequence Editor	National Instruments GmbH	2V2403033A4523	300004590	ne	-/-	-/-
4	A	RF-Cable	ST18/SMAm/SMAm/60	Huber & Suhner	Batch no. 606844	400001181	ev	-/-	-/-
5	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	Batch no. 606844	400001185	ev	-/-	-/-
6	A	Coax Attenuator 10 dB 2W 0-40 GHz	MCL BW-K10-2W44+	Mini Circuits	Batch no. 606844	400001186	ev	-/-	-/-

7.6 Shielded fully anechoic chamber



Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Step Attenuator 0 ...139.9 dB	RSP	R&S	860712002	400000079	NK!	16.01.2013	-/-
2	A	Splitter	15542	Mini Circuits	15542	400000086	ev	-/-	-/-
3	A	Splitter	42000	Anaren	4730	400000085	ev	-/-	-/-
4	A	Switch Unit	TS-RSP	R&S	100155	300003281	ev	-/-	-/-
5	A	HF-Cable	blau kabel - grün am Stecker	Huber & Suhner	diverse	400000083	ne	-/-	-/-
6	A	Hygro-Thermometer	-/-, 5-45 C, 20-100 rF	Thies Clima	-/-	400000089	ev	07.09.2015	07.09.2017
7	A	CTIA-Chamber	CTIA-Chamber AMS 8500	ETS-Lindgren Finnland	-/-	300003327	ne	-/-	-/-
8	A	CTIA-Chamber - Camera System	CTIA-Chamber - Camera System	ETS-Lindgren Finnland	-/-	300003327	ne	-/-	-/-
9	A	CTIA-Chamber - Audio System	CTIA-Chamber - Audio System	ETS-Lindgren Finnland	-/-	300003327	ne	-/-	-/-
10	A	CTIA-Chamber - Feed Through Hatch	CTIA-Chamber - Feed Trough Hatch	ETS-Lindgren Finnland	-/-	300003327	ne	-/-	-/-
11	A	CTIA-Chamber - Positioning Equipment	CTIA-Chamber - Positioning Equipment	EMCO/2	-/-	300003328	ne	-/-	-/-
12	A	CTIA-Chamber - Software	CTIA-Chamber - Software	EMCO/2	-/-	300003328	ne	-/-	-/-
13	A	CTIA-Chamber - Antenna	3164-04	EMCO/2	00041915	300003328	ne	-/-	-/-
14	A	CTIA-Chamber - Systemintegration	CTIA-Chamber - Systemintegration	EMCO/2	00041915	300003328	ne	-/-	-/-
15	A	Cable SMA-Connector 15m	KK-MF141-15	Huber & Suhner	00041915	400000090	ne	-/-	-/-
16	A	Limiting Amplifier (Microwave Amplifier)	LA 02-801	JCA Technology	101	300003341	ne	-/-	-/-
17	A	Spectrum Analyzer 9kHz - 30 GHz	FSP30	R&S	100623	300003464	Ve	29.01.2015	29.01.2017

8 Sequence of testing

8.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

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

Premeasurement

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

Final measurement

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

8.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

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

Premeasurement

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

Final measurement

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

8.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

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

Premeasurement

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

Final measurement

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

8.4 Sequence of testing radiated spurious above 18 GHz

Setup

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

Premeasurement

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

Final measurement

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

9 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Antenna gain	± 3 dB
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

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

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 247, Issue 1	see table	2016-11-16	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	C	NC	NA	NP	Remark
-/-	Gain	Nominal	Nominal	-/-				-/-
U-NII Part 15	Duty cycle	Nominal	Nominal	-/-				-/-
§15.407(a) RSS - 247 (6.2.1) (1) RSS - 247 (6.2.2) (1) RSS - 247 (6.2.3) (1) RSS - 247 (6.2.4) (1)	Maximum output power (conducted & radiated)	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.407(a) RSS - 247 (6.2.1) (1) RSS - 247 (6.2.2) (1) RSS - 247 (6.2.3) (1) RSS - 247 (6.2.4) (1)	Power spectral density	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.407(a)	Spectrum bandwidth 26dB bandwidth	Nominal	Nominal	☒	☐	☐	☐	-/-
RSS Gen clause 6.6	Spectrum bandwidth 99% bandwidth	Nominal	Nominal	☐	☐	☐	☒	-/-
§15.205 RSS - 247 (6.2.1) (2) RSS - 247 (6.2.2) (2) RSS - 247 (6.2.3) (2) RSS - 247 (6.2.4) (2)	Band edge compliance radiated	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.407(b) RSS - 247 (6.2.1) (2) RSS - 247 (6.2.2) (2) RSS - 247 (6.2.3) (2) RSS - 247 (6.2.4) (2)	TX spurious emissions radiated	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.109 RSS-Gen	RX spurious emissions radiated	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.209(a) RSS-Gen	Spurious emissions radiated < 30 MHz	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.107(a) §15.207	Spurious emissions conducted emissions < 30 MHz	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.407 (h)	TPC & DFS	Nominal	Nominal	☐	☐	☐	☒	see CETECOM test report 1-1248/16-01-02

Note: C = Compliant; NC = Not Compliant; NA = Not Applicable; NP = Not Performed

11 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

Test mode:

☐ No test mode available.

☒ 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.

The devices has three identical external antennas. Two TRX antennas and one RX only antenna for DFS detection.

12 Measurement results

12.1 Gain

Description:

Measurement of the maximum output power conduced and radiated

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	5s
Resolution bandwidth:	3 MHz
Video bandwidth:	8 MHz / 10 MHz
Span:	See complete signal!
Trace-Mode:	Max Hold
Test setup:	See chapter 7.2 – A, 7.5 – A, 7.6 – A
Measurement uncertainty:	See chapter 9

Limits:

Antenna Gain
Maximum 6 dBi

Results: band 1

OFDM Band 5150 MHz to 5250 MHz	**Gain**		
Channel	Lowest 5180 MHz	-/-	Highest 5240 MHz
Gain	1.44	-/-	1.95

Results: band 2

OFDM Band 5250 MHz to 5350 MHz	**Gain**		
Channel	Lowest 5260 MHz	-/-	Highest 5320 MHz
Gain	1.45	-/-	1.45

Results: band 3

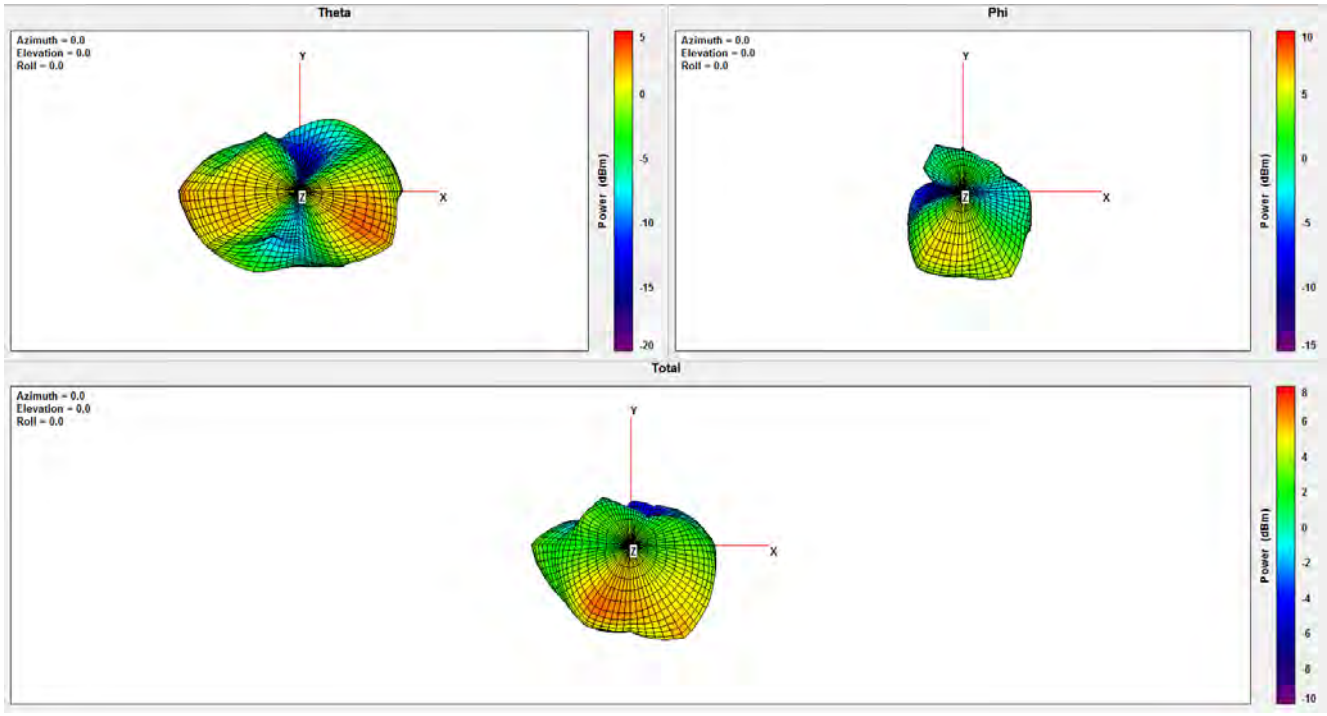
OFDM Band 5470 MHz to 5725 MHz	**Gain**		
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
Gain	1.59	1.83	1.63

Results: band 4

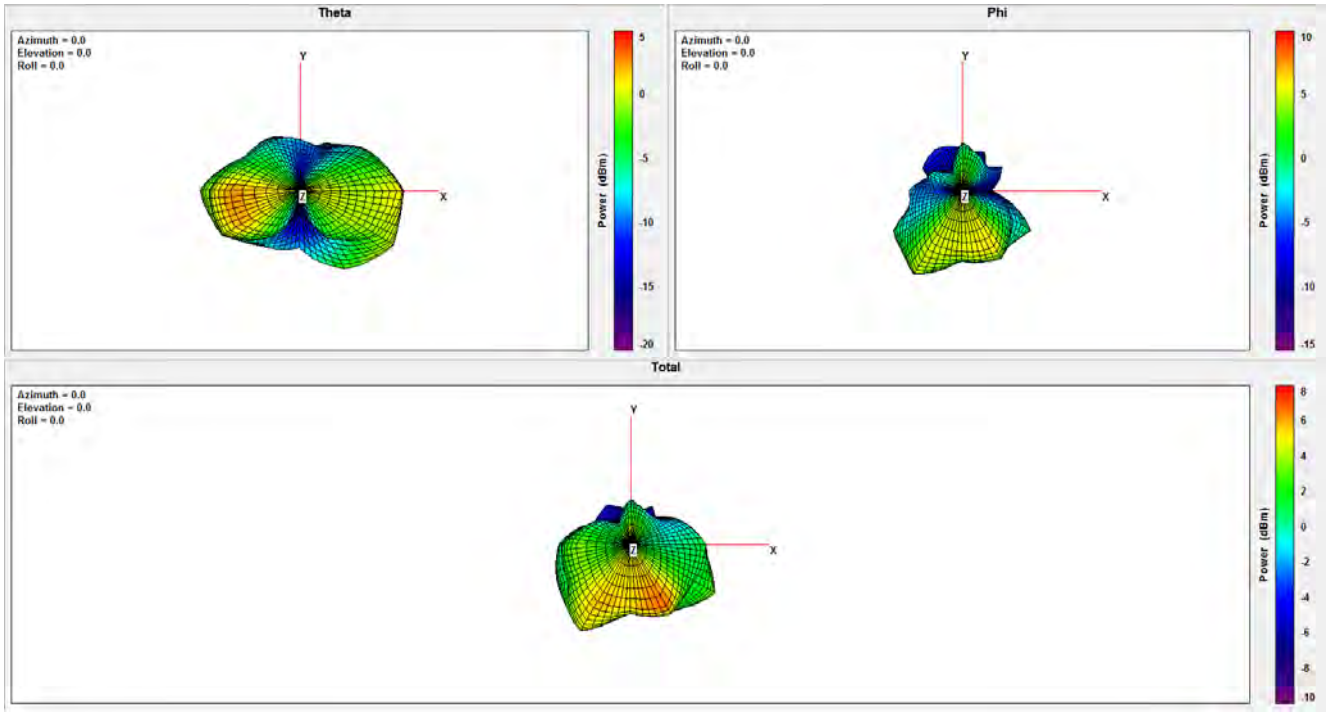
OFDM Band 5725 MHz to 5850 MHz	**Gain**		
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
Gain	2.54	1.95	2.88

Plots: band 1

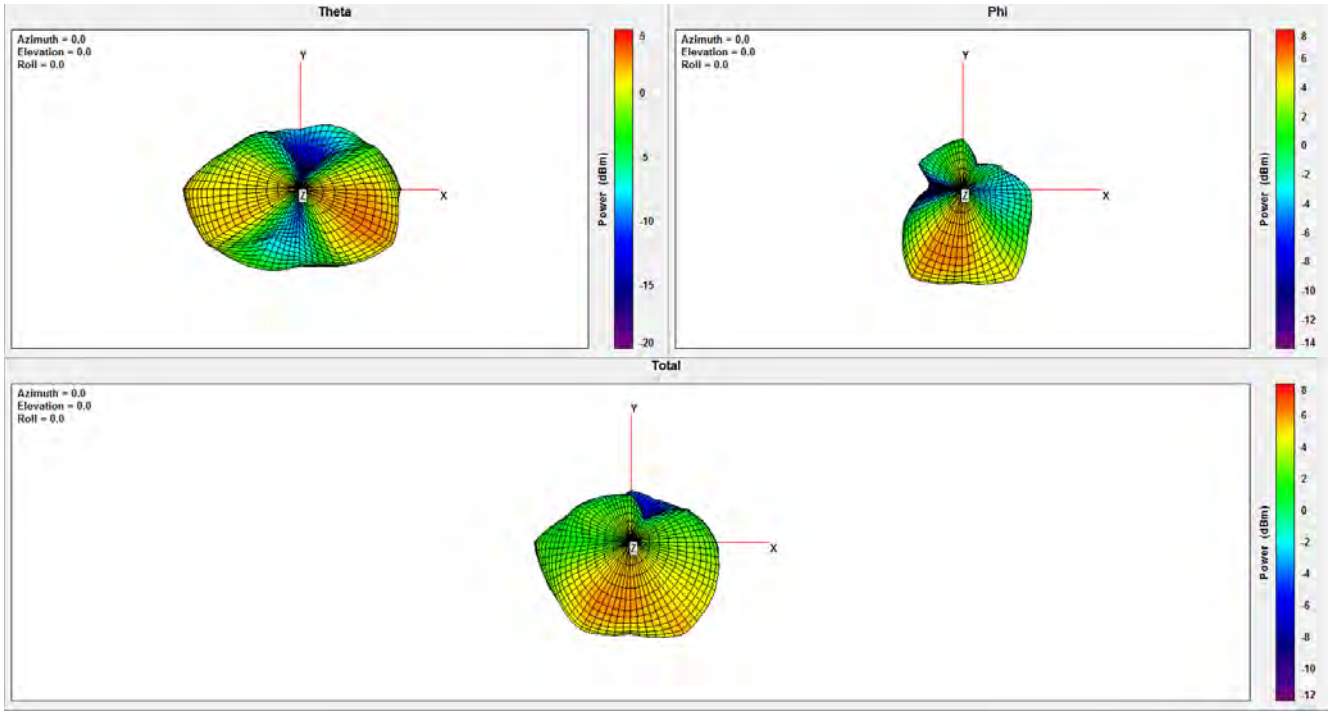
Plot 1: Antenna 1 diagram, 5180 MHz (vertical & horizontal – vectorial summation) – all values are in dBm



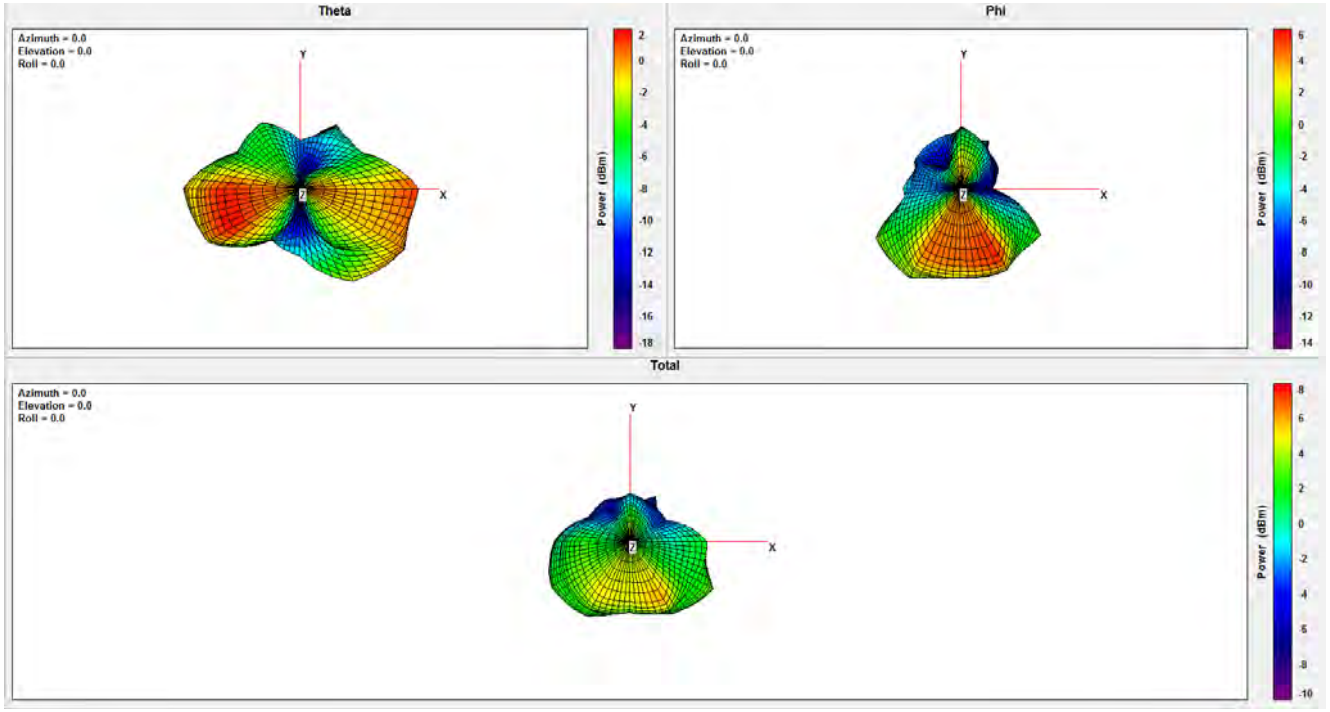
Plot 2: Antenna 2 diagram, 5180 MHz (vertical & horizontal – vectorial summation) – all values are in dBm



Plot 3: Antenna 1 diagram, 5240 MHz (vertical & horizontal – vectorial summation) – all values are in dBm

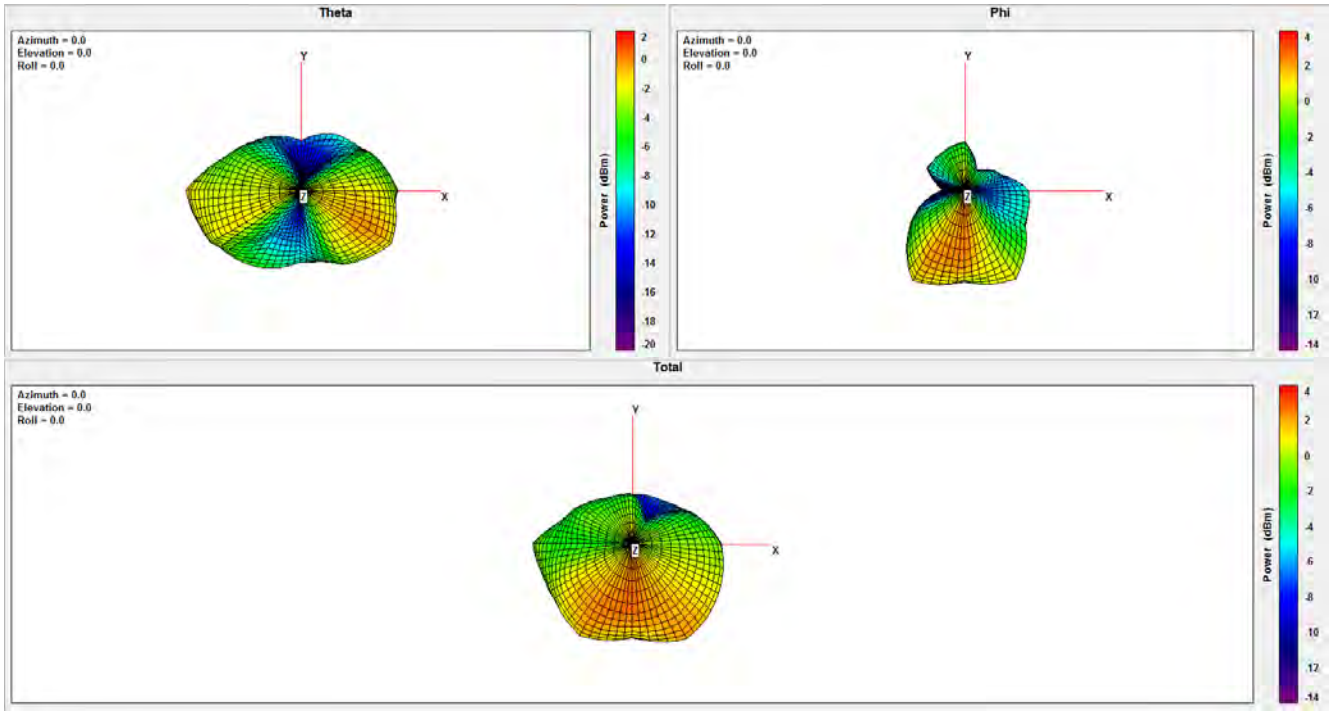


Plot 4: Antenna 2 diagram, 5240 MHz (vertical & horizontal – vectorial summation) – all values are in dBm

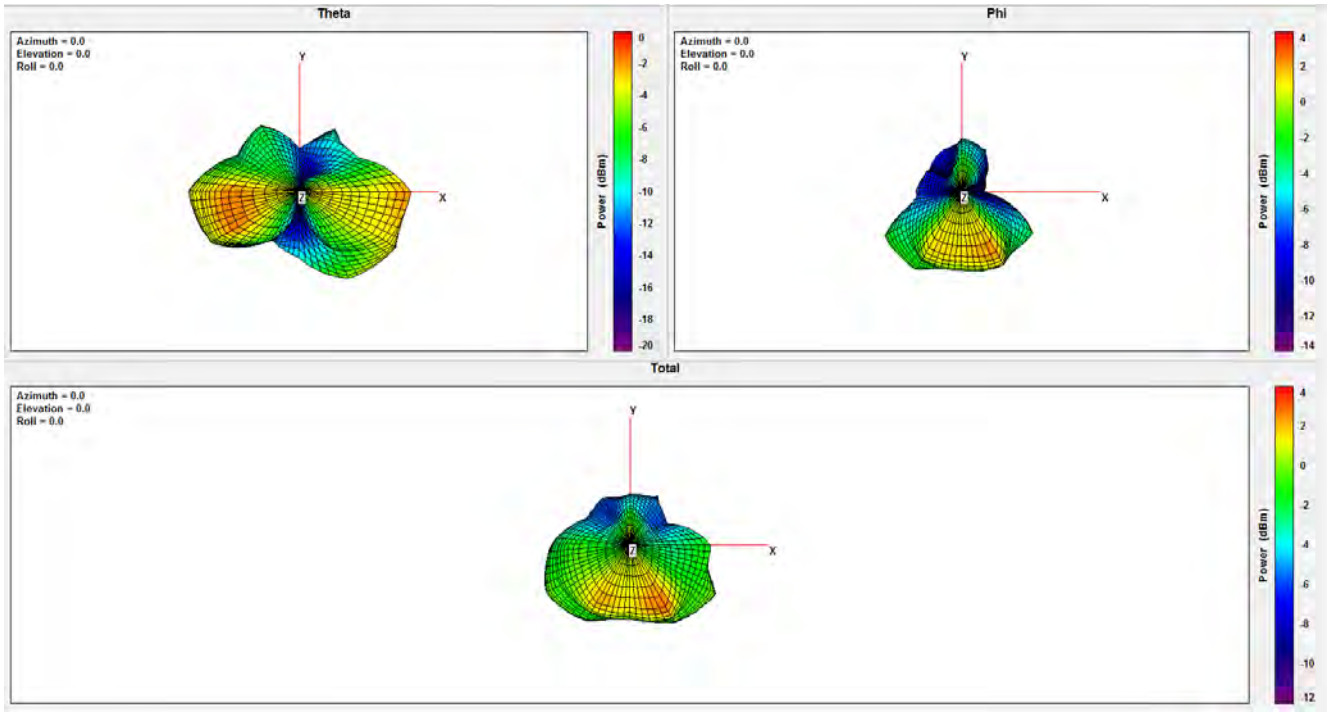


Plots: band 2

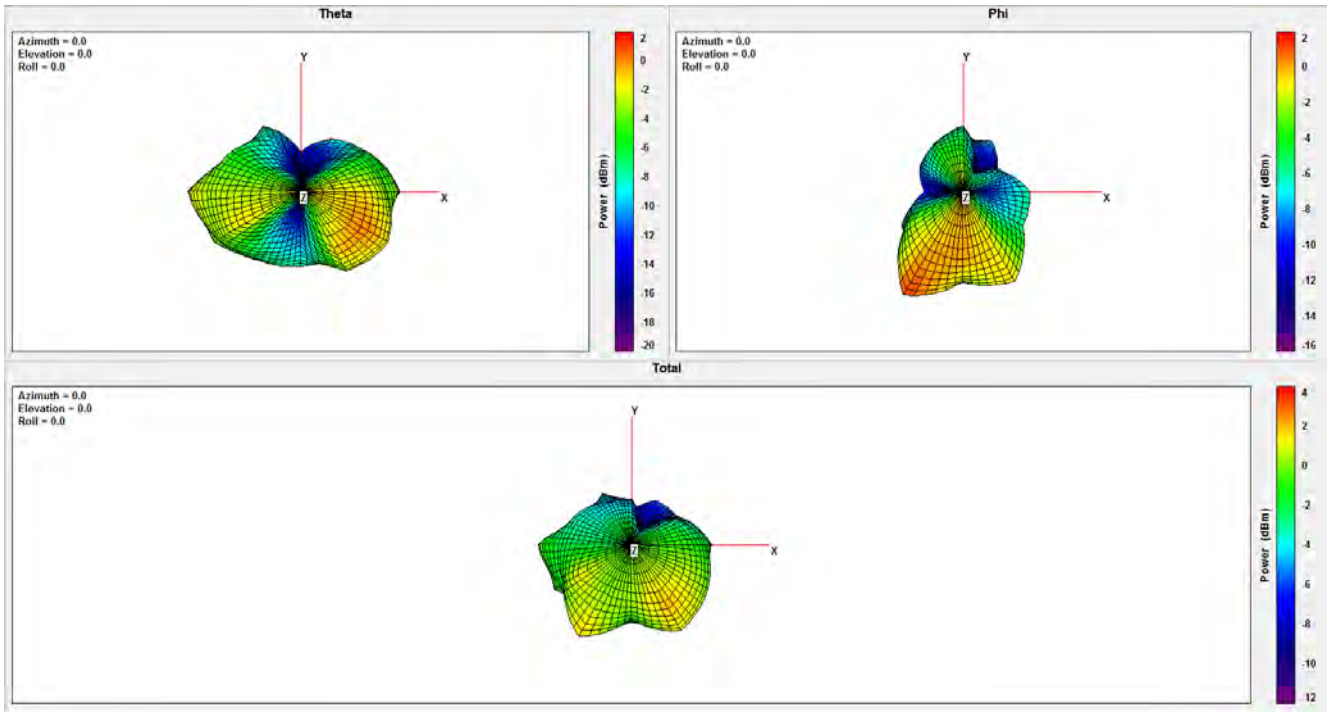
Plot 1: Antenna 1 diagram, 5260 MHz (vertical & horizontal – vectorial summation) – all values are in dBm



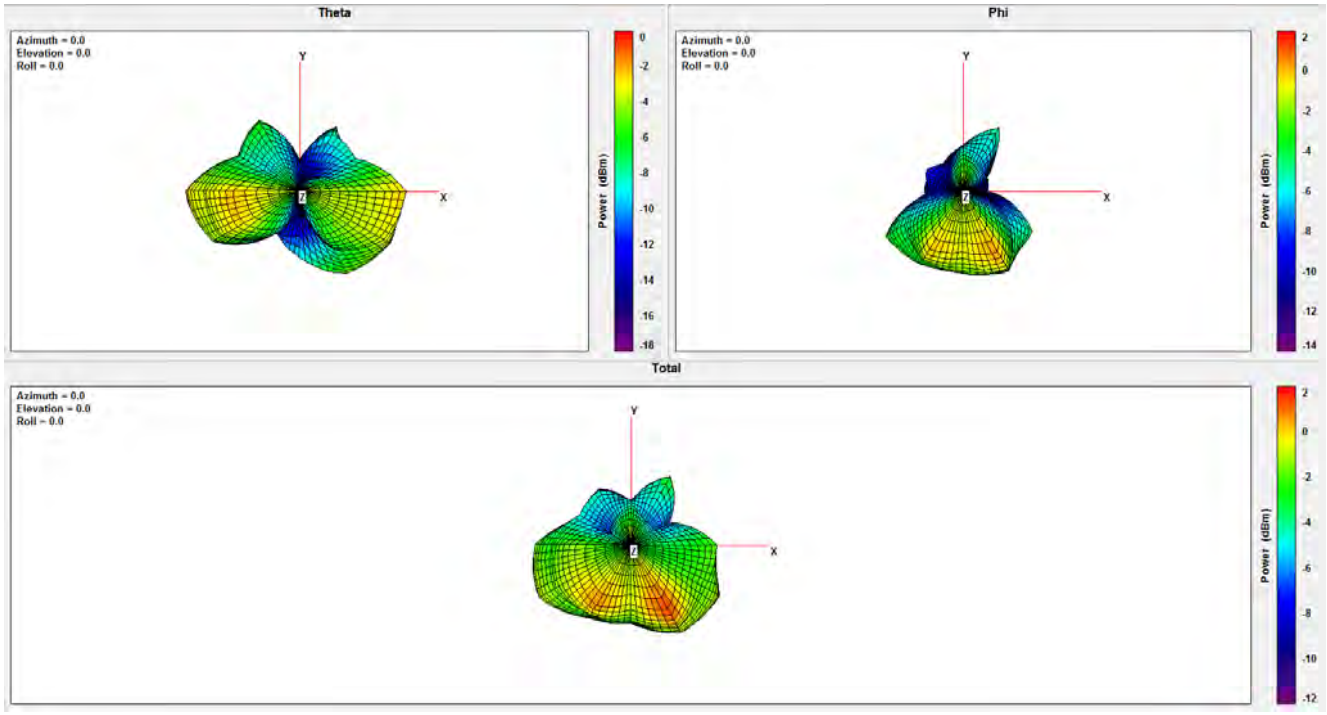
Plot 2: Antenna 2 diagram, 5260 MHz (vertical & horizontal – vectorial summation) – all values are in dBm



Plot 3: Antenna 1 diagram, 5320 MHz (vertical & horizontal – vectorial summation) – all values are in dBm

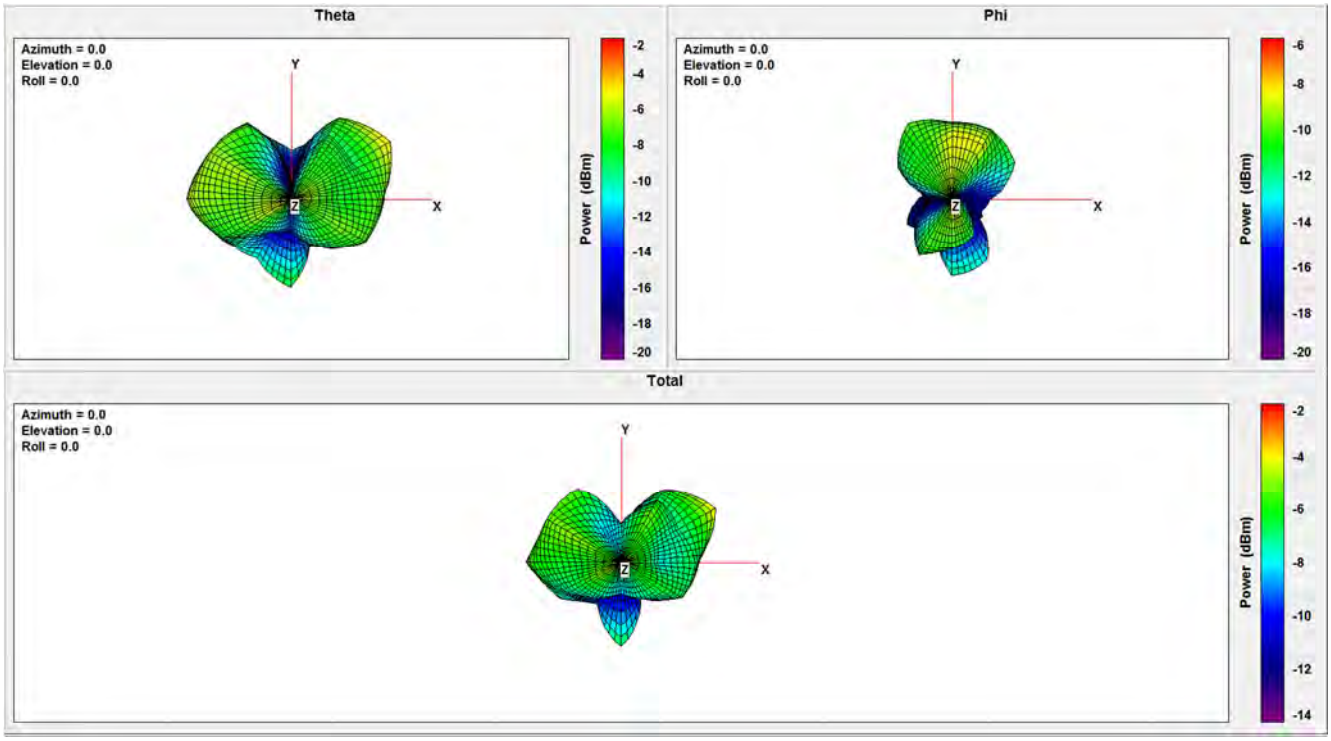


Plot 4: Antenna 2 diagram, 5320 MHz (vertical & horizontal – vectorial summation) – all values are in dBm

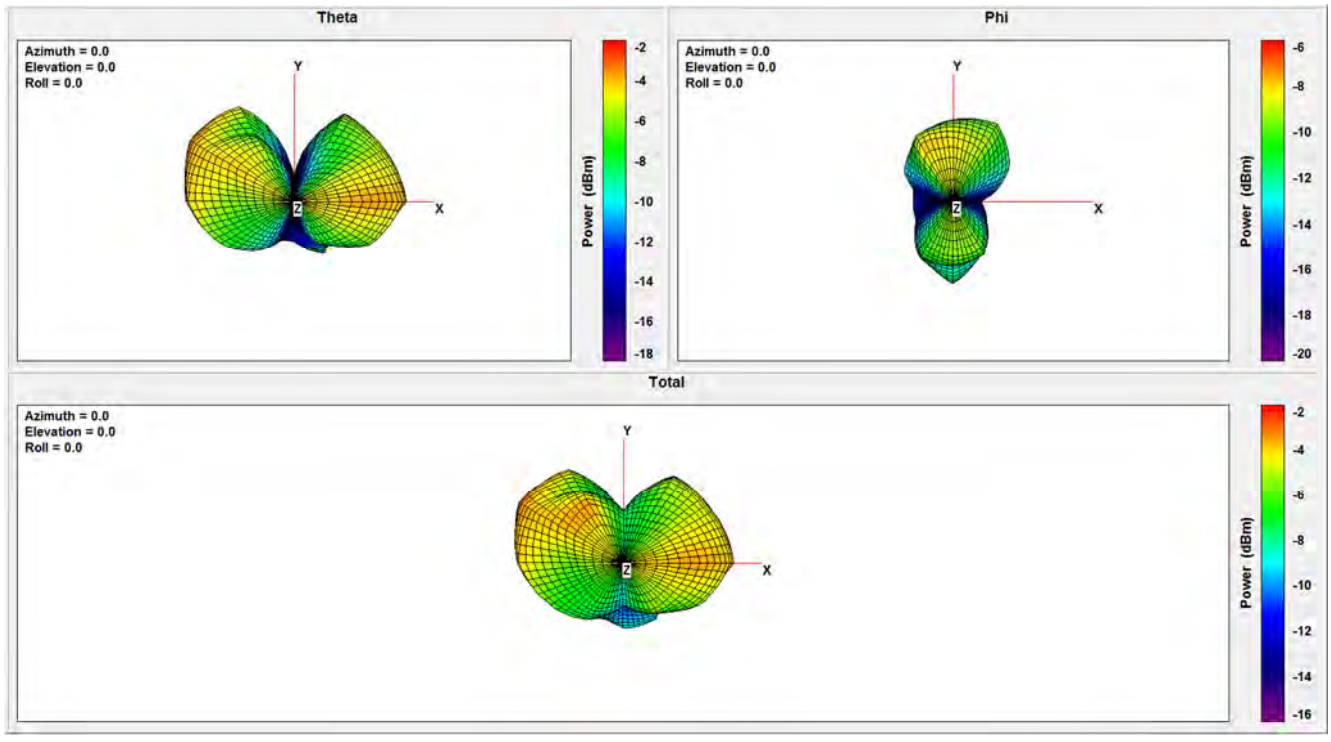


Plots: band 3

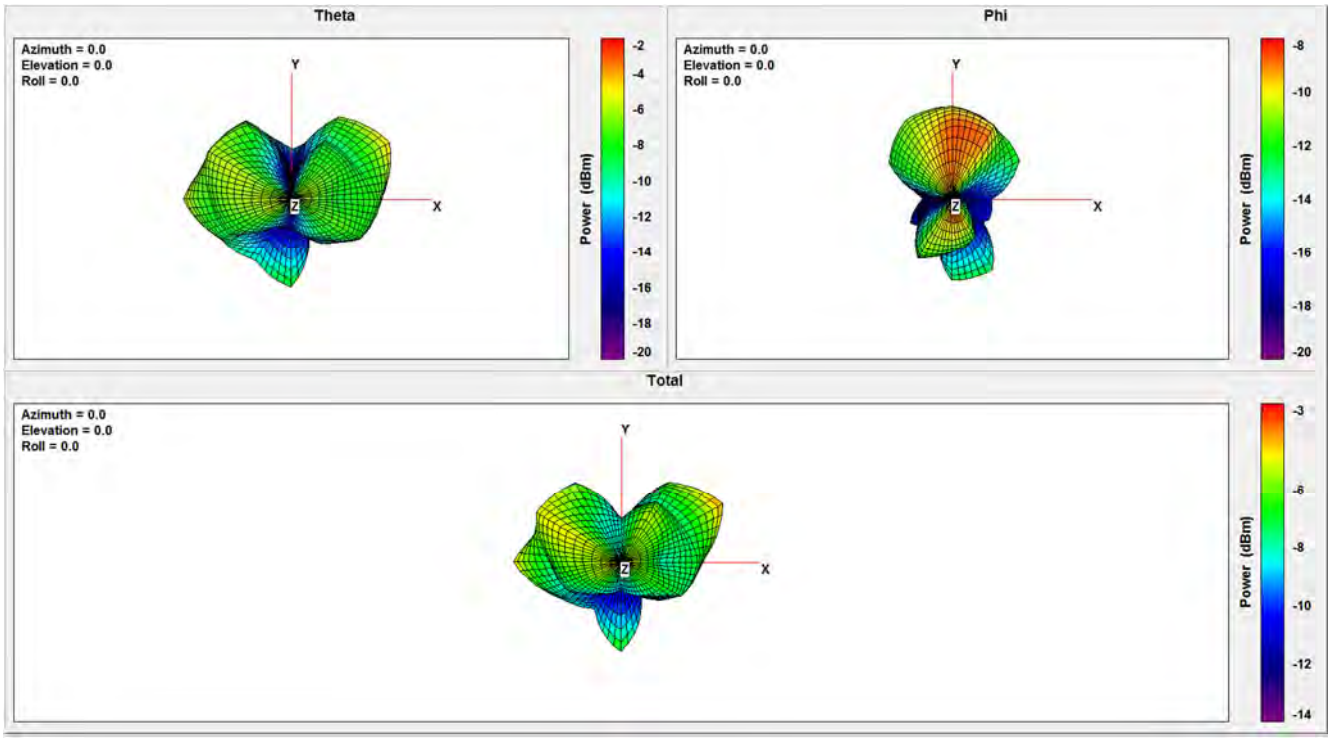
Plot 1: Antenna 1 diagram, 5500 MHz (vertical & horizontal – vectorial summation) – all values are in dBm



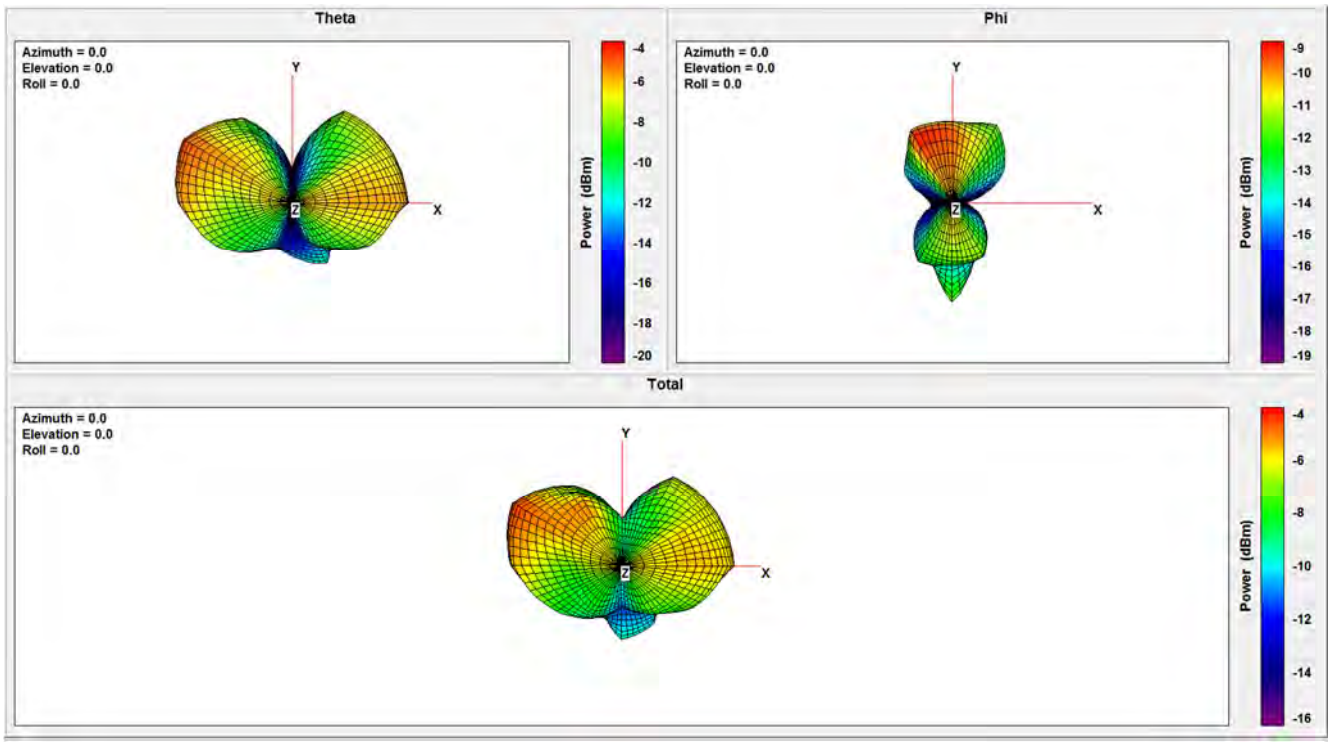
Plot 2: Antenna 2 diagram, 5500 MHz (vertical & horizontal – vectorial summation) – all values are in dBm



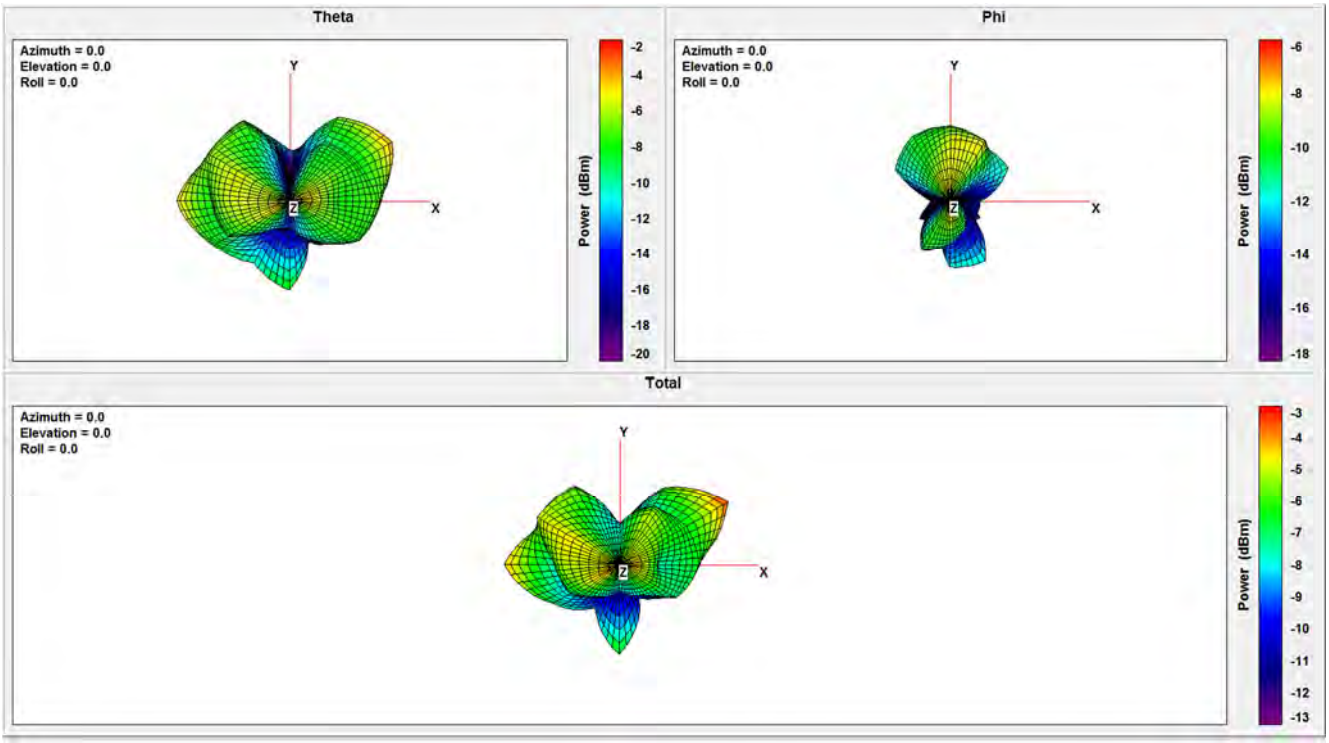
Plot 3: Antenna 1 diagram, 5600 MHz (vertical & horizontal – vectorial summation) – all values are in dBm



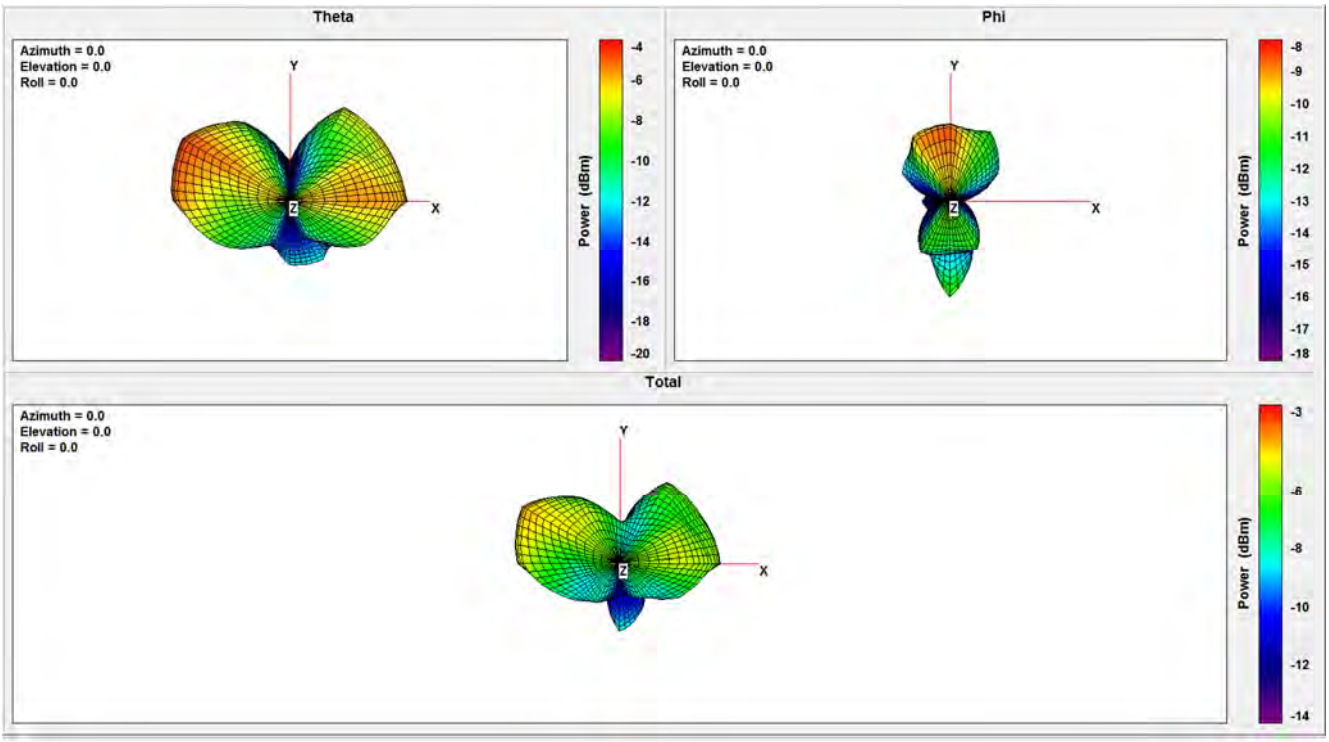
Plot 4: Antenna 2 diagram, 5600 MHz (vertical & horizontal – vectorial summation) – all values are in dBm



Plot 5: Antenna 1 diagram, 5700 MHz (vertical & horizontal – vectorial summation) – all values are in dBm



Plot 6: Antenna 2 diagram, 5700 MHz (vertical & horizontal – vectorial summation) – all values are in dBm

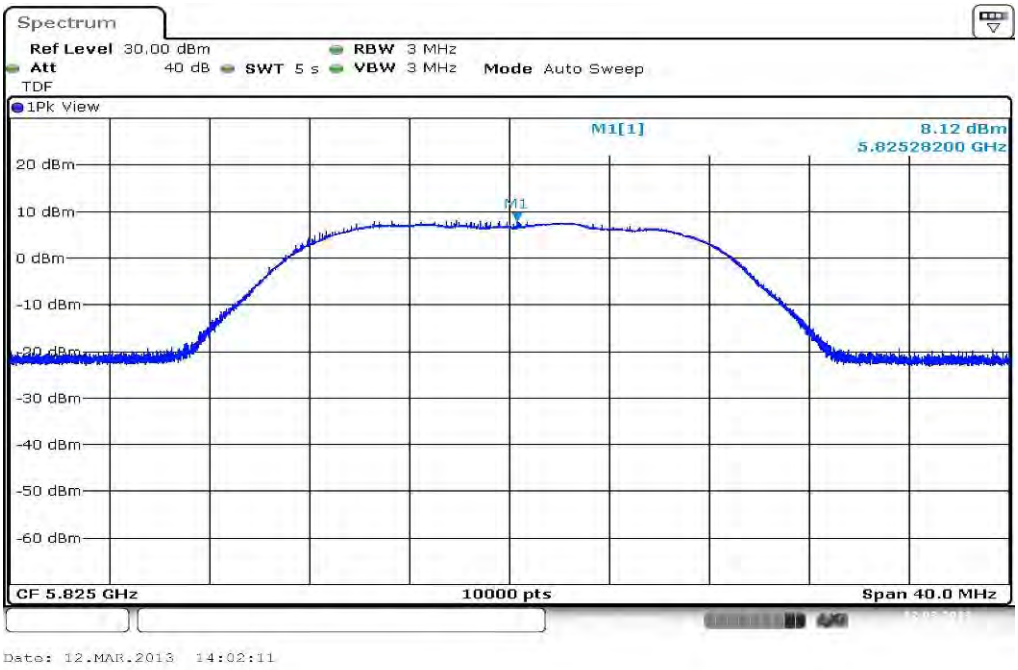


Plots: band 4 OFDM

Plot 1: TX mode, 5745 MHz

Plot 2: TX mode, 5785 MHz

Plot 3: TX mode, 5825 MHz



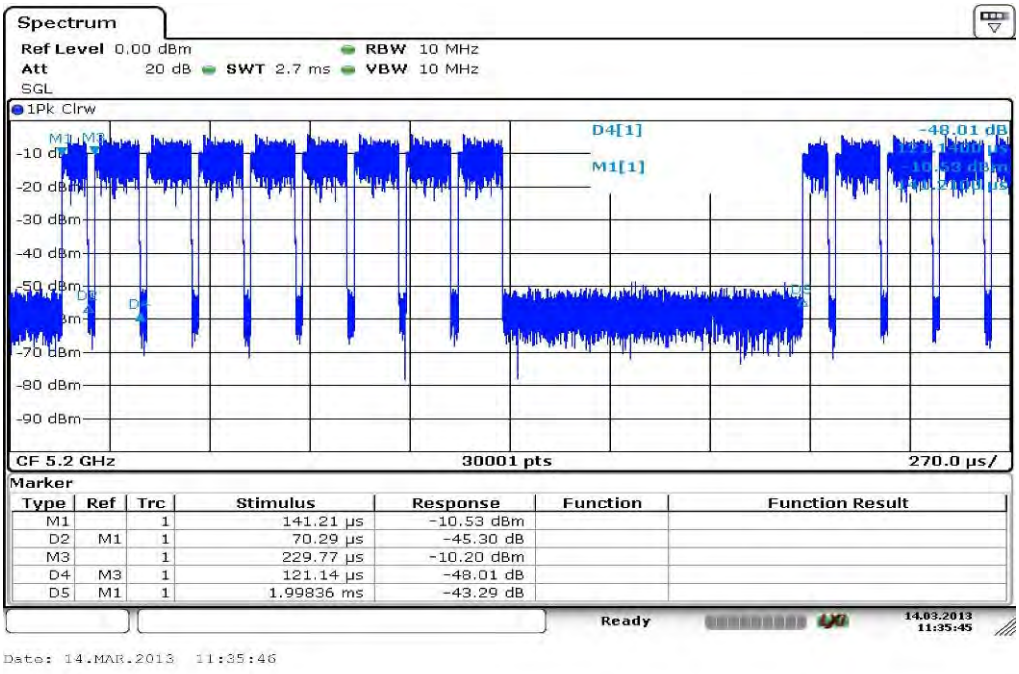
12.2 Duty cycle

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	10 MHz
Video bandwidth:	10 MHz
Span:	Zero
Trace-Mode:	Video trigger / view / single sweep
Test setup:	See chapter 7.5 – A
Measurement uncertainty:	See chapter 9

Plots:

Plot 1: duty cycle of the transmitter – OFDM



Results:

Burst No. 1 = 70 µs

Burst No. 2 = 121.14 µs → 8 burst @ 121.14 µs = 969.12 µs

$T_{on\ time}$ = 969.12 µs + 70 µs = 1.03912 ms

$T_{complete\ time}$ = 1.99836 ms

Duty cycle = 52 % → 2.84 dB (duty cycle correction factor)

12.3 Maximum output power

12.3.1 Maximum output power conducted - FCC

Description:

Measurement of the maximum output power conduced

Measurement:

Measurement parameter	
Detector:	RMS
Sweep time:	≥10*(swp points)*(total on/off time)
Resolution bandwidth:	1 MHz
Video bandwidth:	≥ 3 MHz
Span:	> EBW
Trace-Mode:	Max hold
Analyzer function	Band power / channel power Interval > 26 dB EBW
Test setup:	See chapter 7.5 – A
Measurement uncertainty:	See chapter 9

Limits:

Radiated output power	Conducted output power for mobile equipment
Conducted power + 6dBi antenna gain	250mW 5.150-5.250 GHz The lesser one of 250mW or 11 dBm + 10 log Bandwidth 5.250-5.350 GHz 250mW or 11 dBm + 10 log Bandwidth 5.470-5.725 GHz (where Bandwidth is the 26dB Bandwidth [MHz]) 1W 5.725-5.85 GHz

Result: OFDM / ANT1

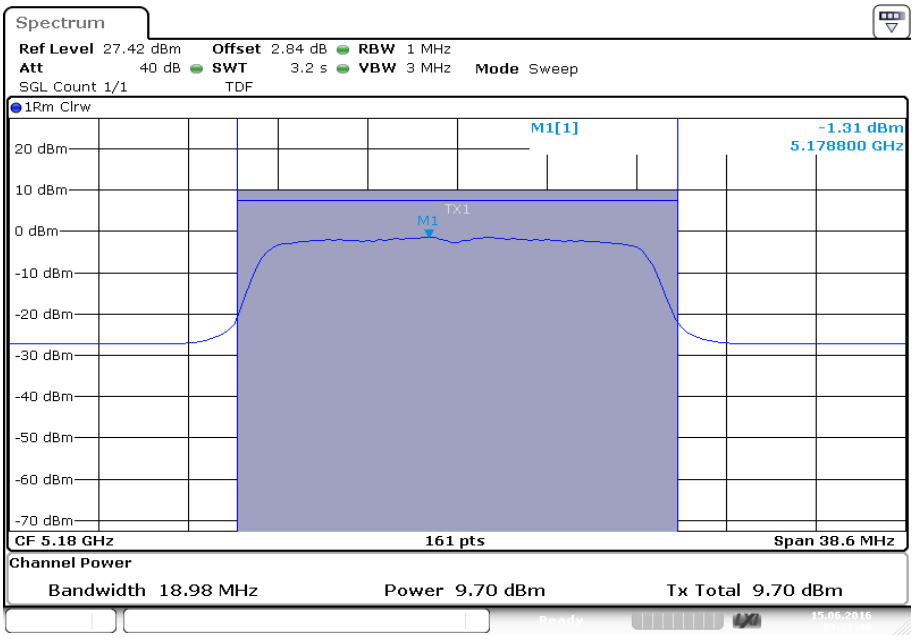
OFDM / ANT1	Maximum output power conducted [dBm]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
including duty cycle correction	9.7	-/-	9.4
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
including duty cycle correction	10.1	10.5	9.8
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
including duty cycle correction	9.1	10.0	9.3

Result: OFDM / ANT2

OFDM / ANT2	Maximum output power conducted [dBm]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
including duty cycle correction	8.5	-/-	9.0
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
including duty cycle correction	10.6	10.8	9.8
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
including duty cycle correction	8.9	9.6	9.1

Plots: OFDM / ANT1

Plot 1: 5180 MHz



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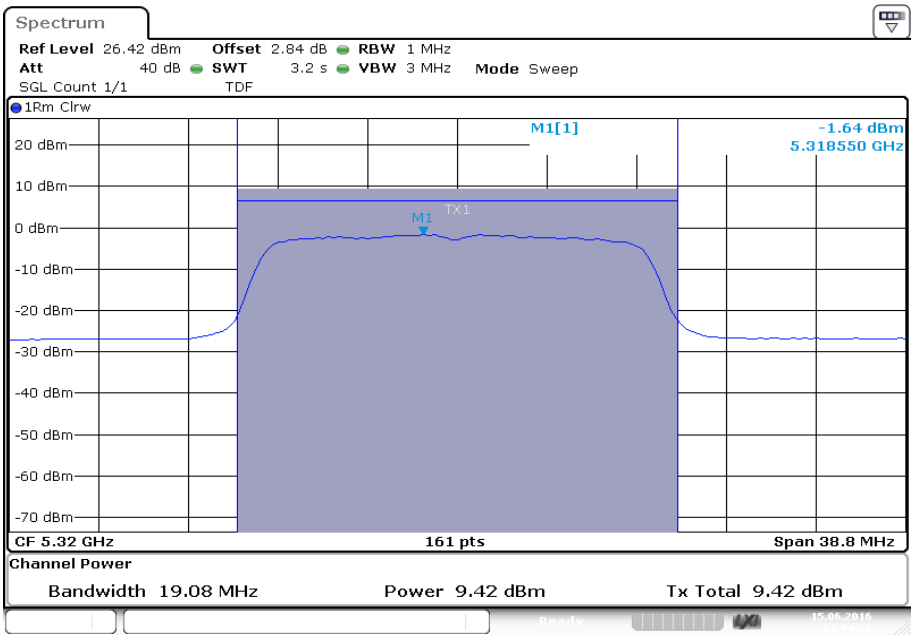
Plot 2: 5320 MHz



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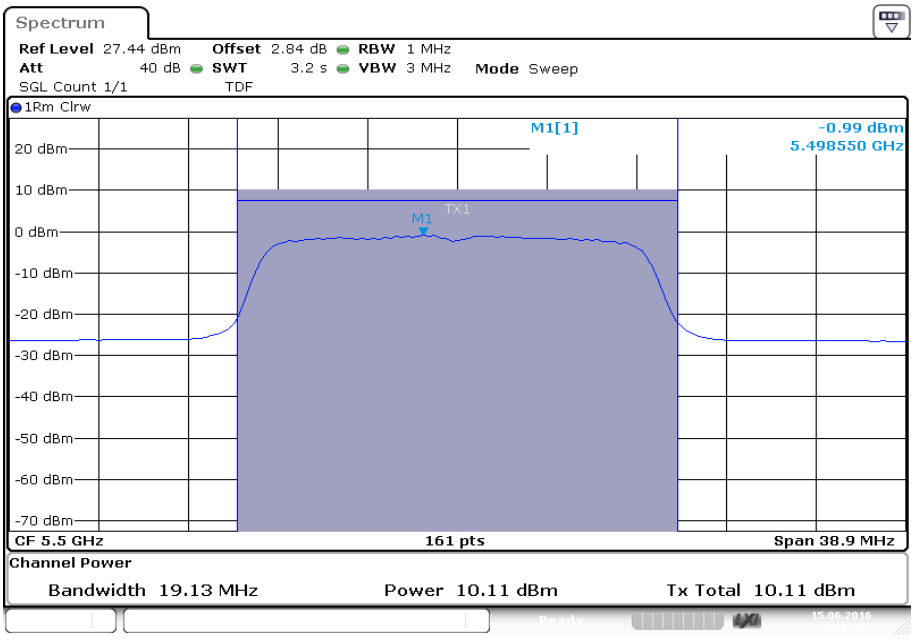
Plot 3: 5500 MHz



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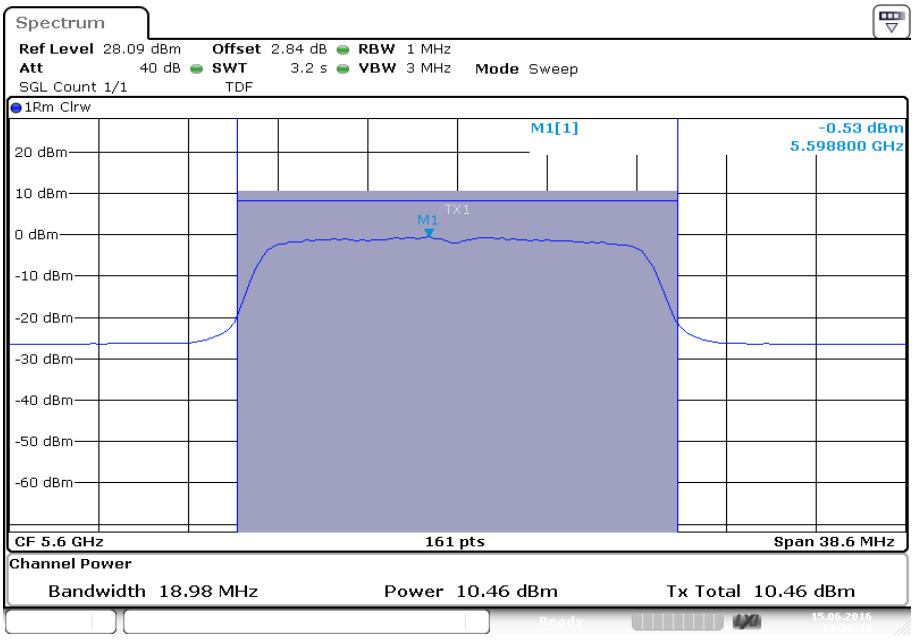
Plot 4: 5600 MHz



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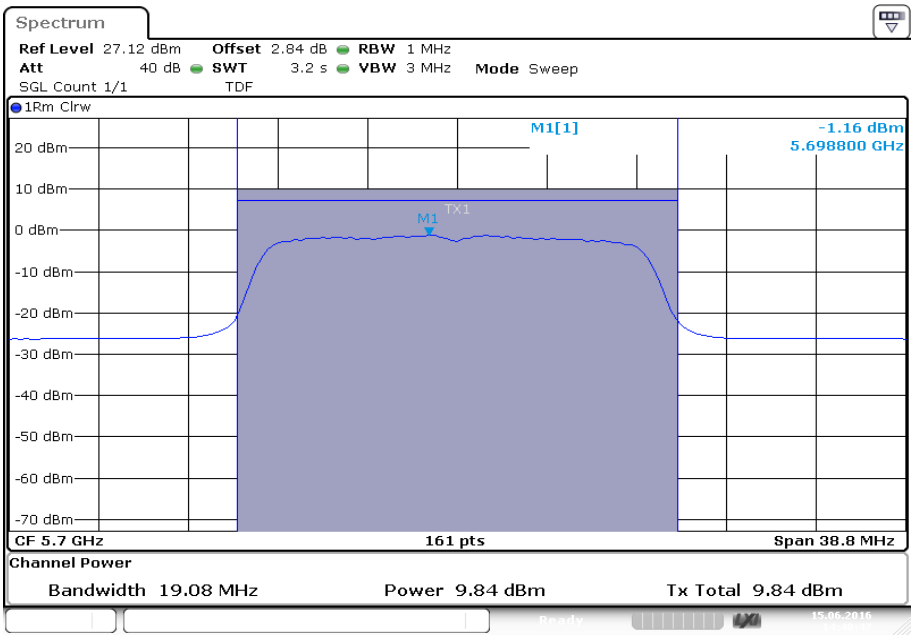
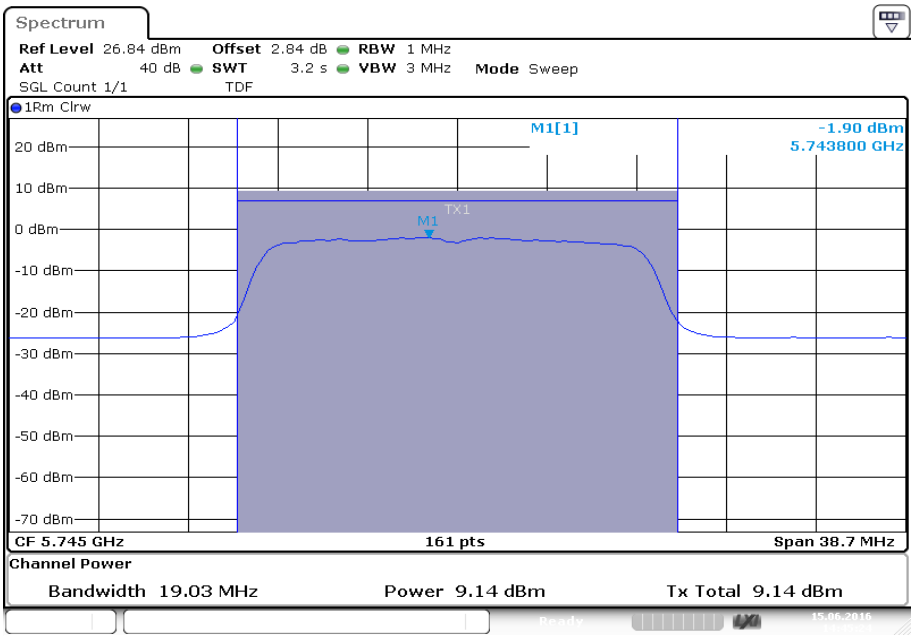
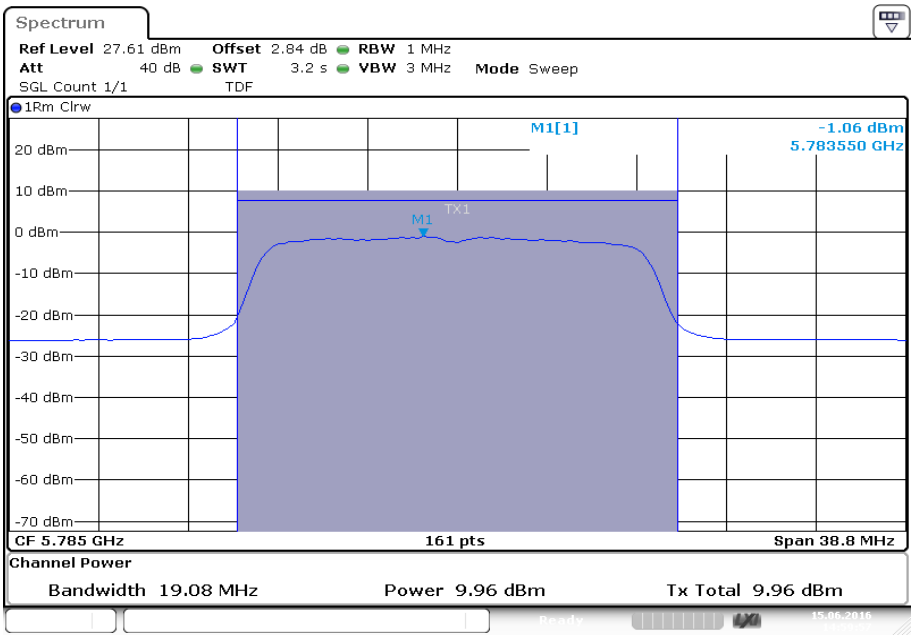
Plot 5: 5700 MHz



Plot 6: 5745 MHz



Plot 7: 5785 MHz



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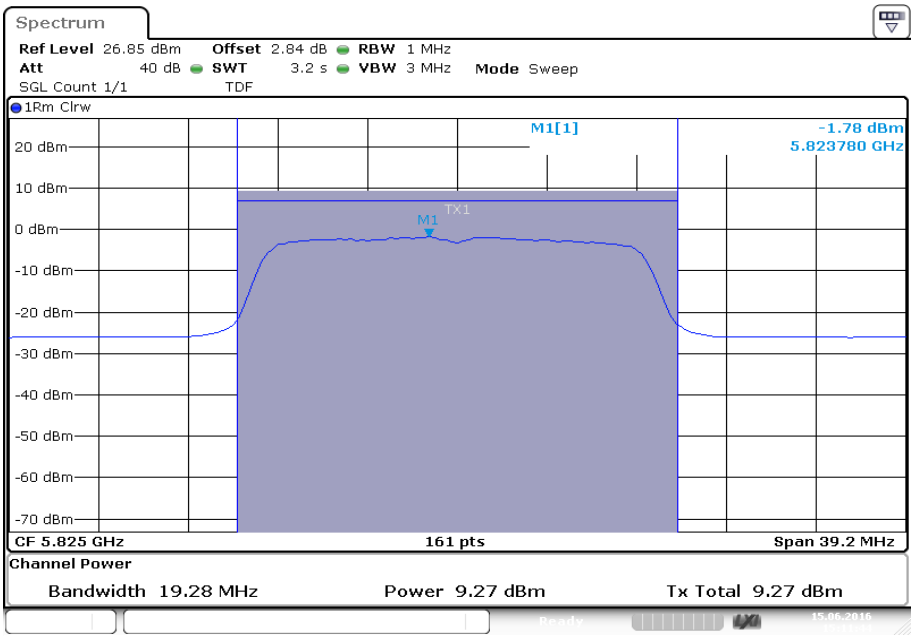
Plot 8: 5825 MHz



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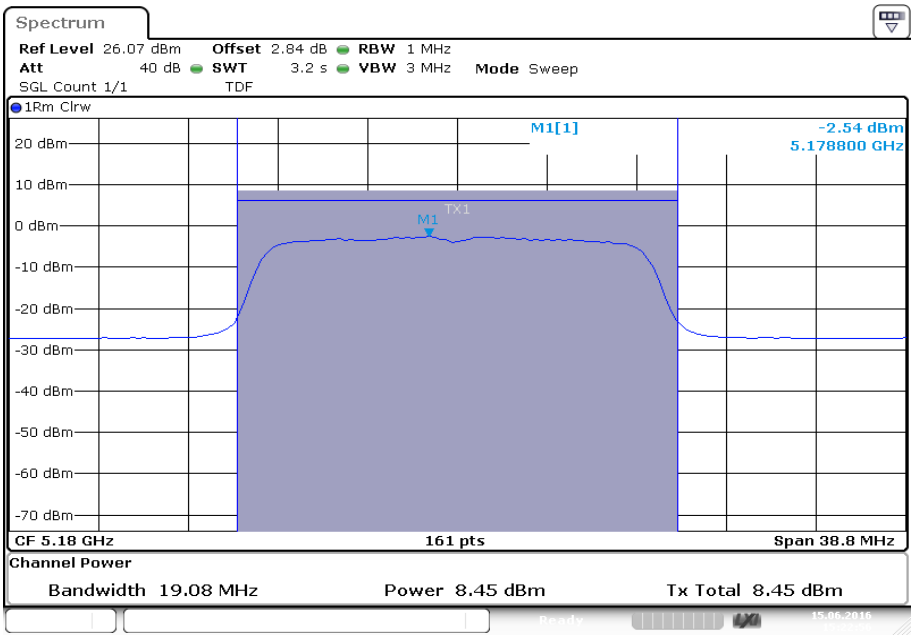
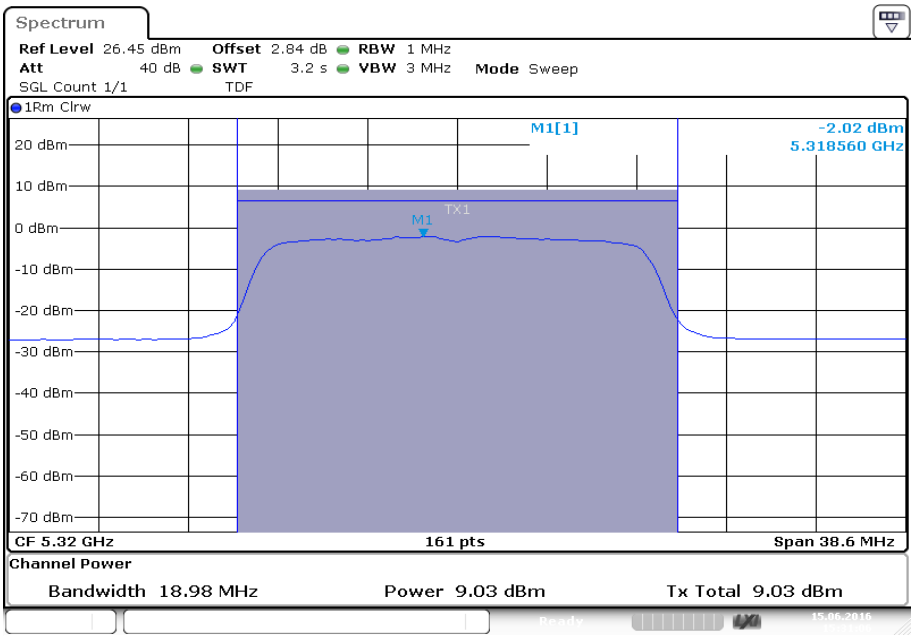
Plots: OFDM / ANT2

Plot 1: 5180 MHz



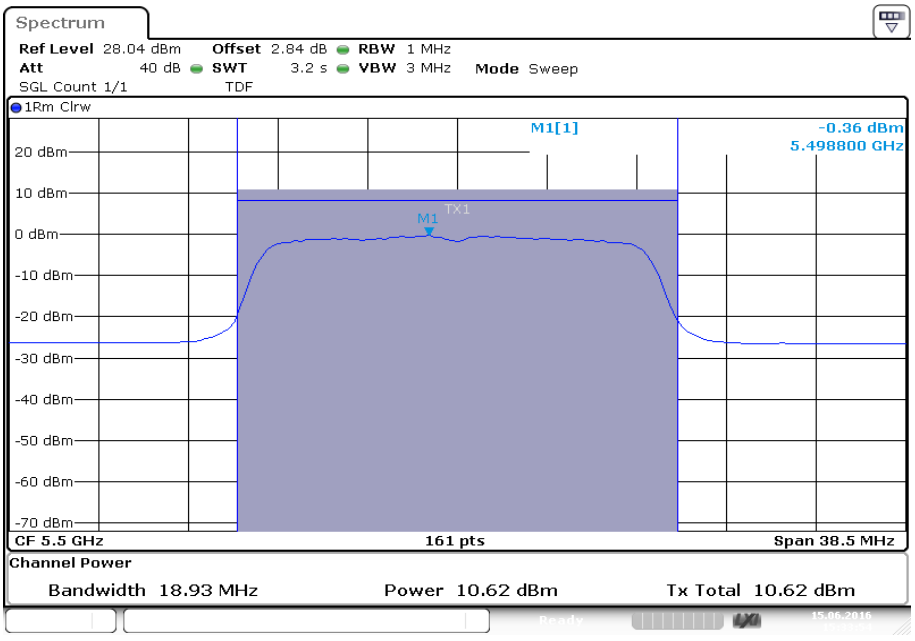
Date: 15.JUN.2016 15:22:57

Plot 2: 5320 MHz

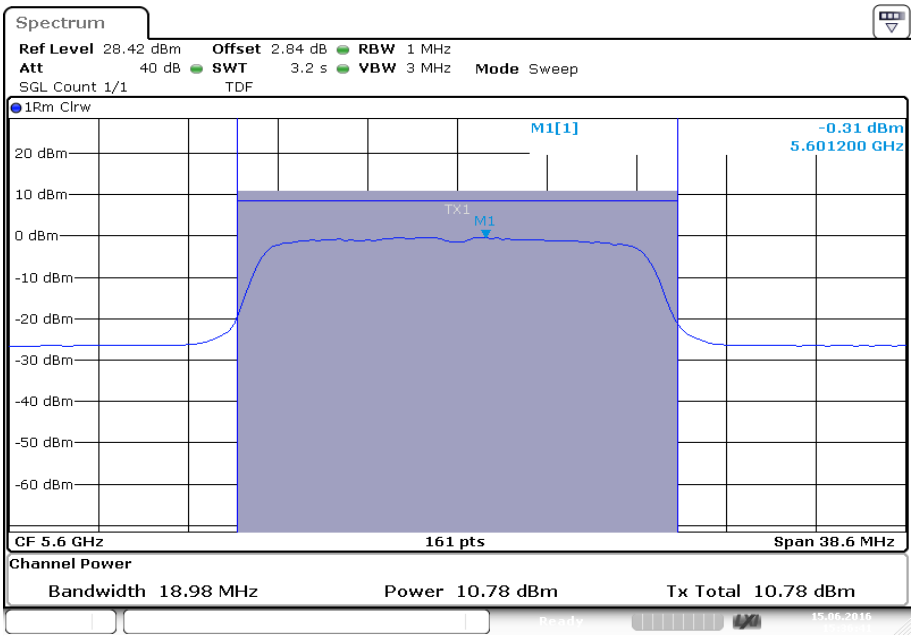


Date: 15.JUN.2016 15:31:07

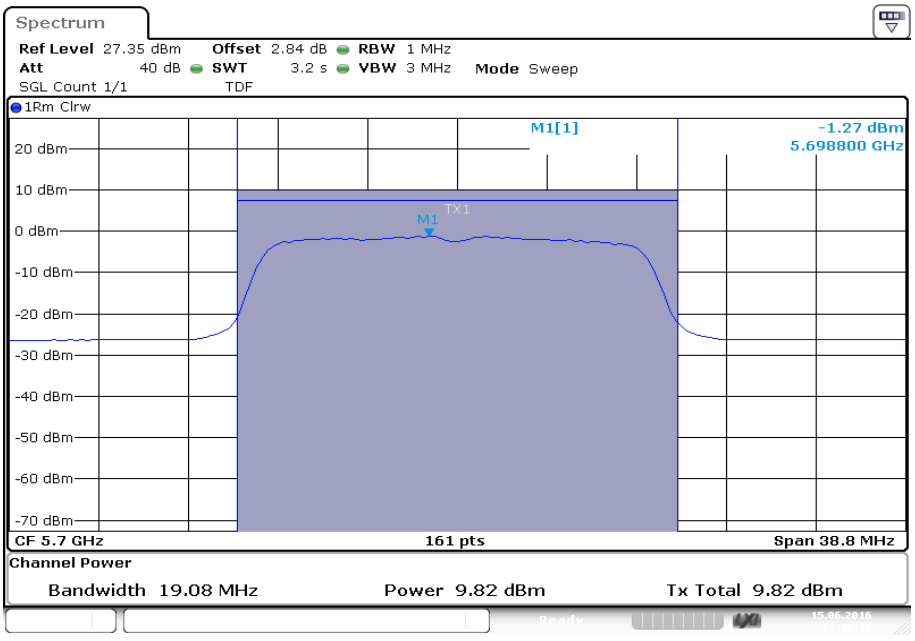
Plot 3: 5500 MHz



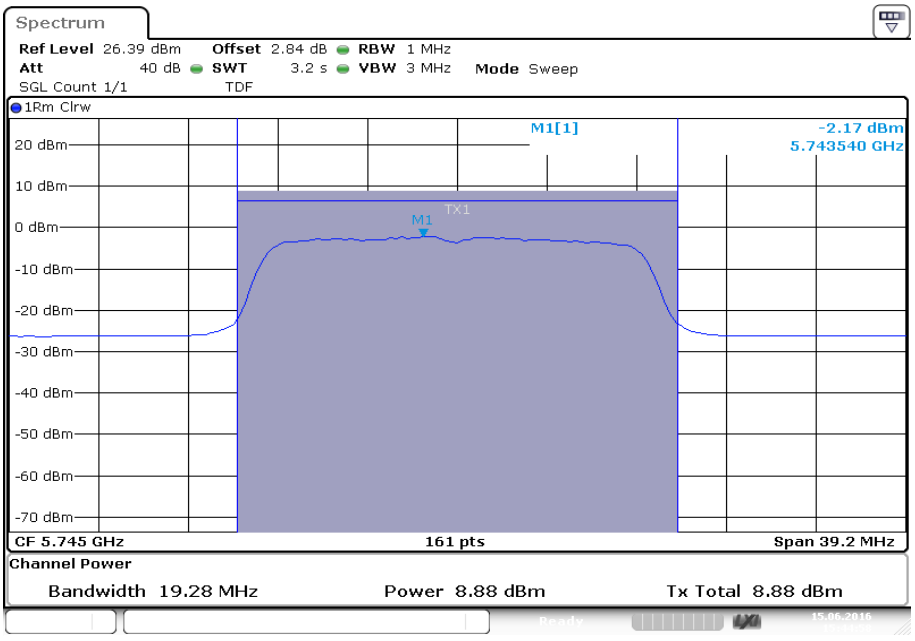
Plot 4: 5600 MHz



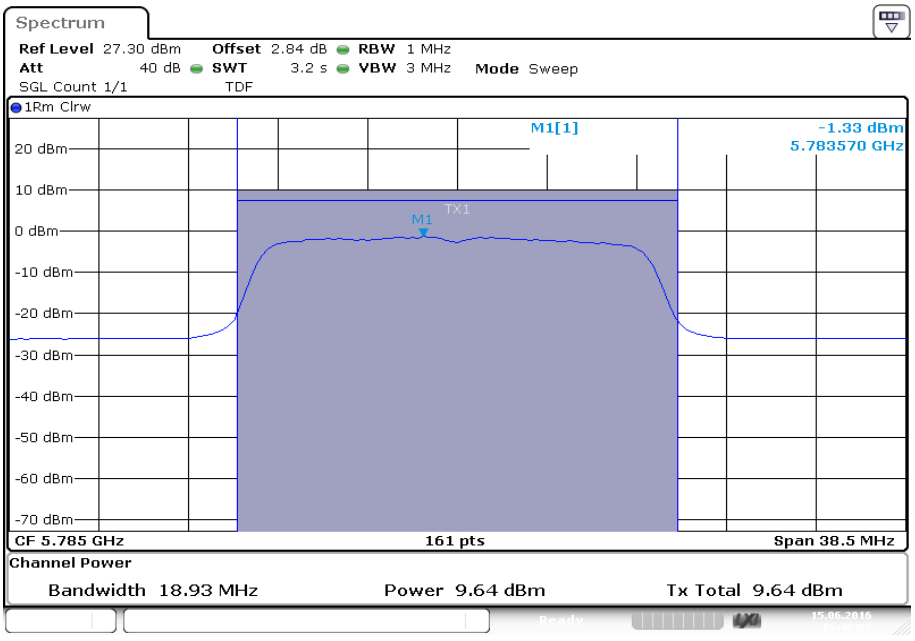
Plot 5: 5700 MHz



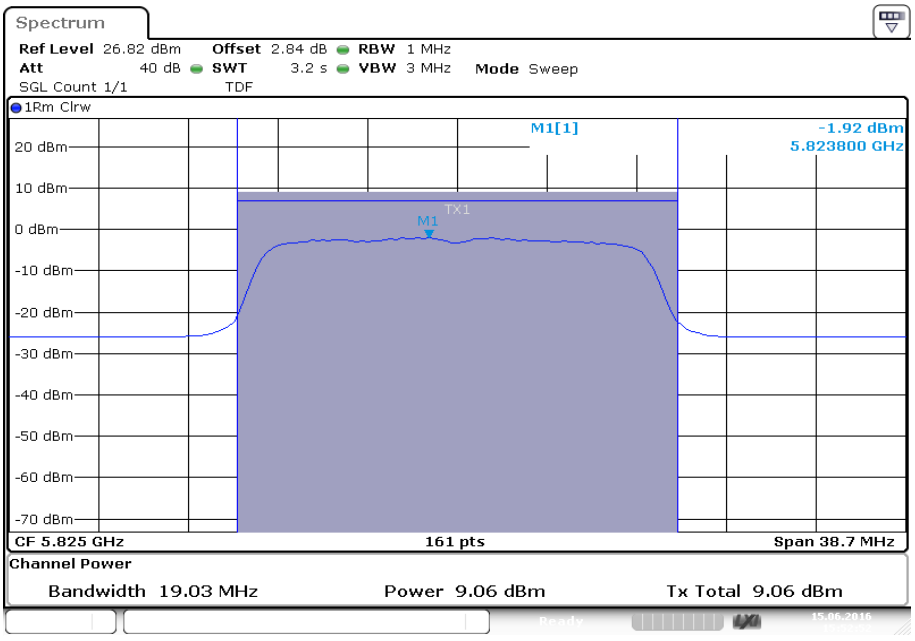
Plot 6: 5745 MHz



Plot 7: 5785 MHz



Plot 8: 5825 MHz



12.3.2 Maximum output power conducted - IC

Description:

Measurement of the maximum output power conduced + radiated

Measurement:

Measurement parameter	
Detector:	RMS
Sweep time:	≥10*(swp points)*(total on/off time)
Resolution bandwidth:	1 MHz
Video bandwidth:	≥ 3 MHz
Span:	> EBW
Trace-Mode:	Max hold
Analyzer function	Band power / channel power Interval > 99% OBW
Test setup:	See chapter 7.5 – A
Measurement uncertainty:	See chapter 9

Limits:

Radiated output power	Conducted output power for mobile equipment
The lesser one of 200 mW or 10 dBm + 10 log Bandwidth 5.150-5.250 GHz 1 W or 17 dBm + 10 log Bandwidth 5.250-5.350 GHz 1 W or 17 dBm + 10 log Bandwidth 5.470-5.725 GHz (where Bandwidth is the 99% Bandwidth [MHz]) Conducted power + 6dBi antenna gain 5.725-5.825 GHz	The lesser one of 250mW or 11 dBm + 10 log Bandwidth 5.250-5.350 GHz 250mW or 11 dBm + 10 log Bandwidth 5.470-5.725 GHz (where Bandwidth is the 99% Bandwidth [MHz]) 1W 5.725-5.825 GHz

Result: OFDM / ANT1

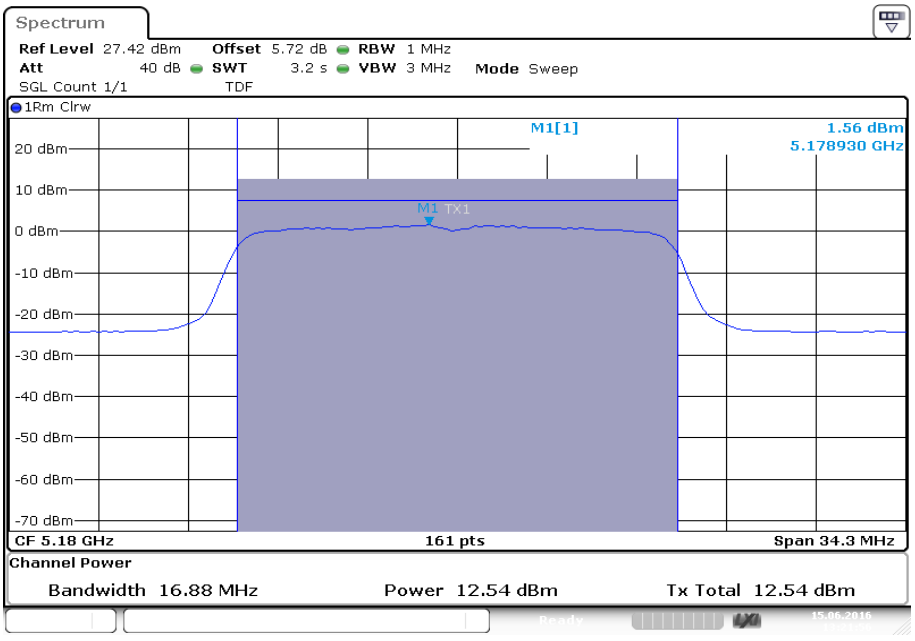
OFDM / ANT1	Maximum output power conducted [dBm]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
including duty cycle correction	12.5	-/-	9.4
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
including duty cycle correction	10.1	10.4	9.8
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
including duty cycle correction	9.1	9.9	9.2

Result: OFDM / ANT2

OFDM / ANT2	Maximum output power conducted [dBm]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
including duty cycle correction	11.3	-/-	9.0
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
including duty cycle correction	10.6	10.7	9.8
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
including duty cycle correction	8.8	9.6	9.0

Plots: OFDM / ANT1

Plot 1: 5180 MHz



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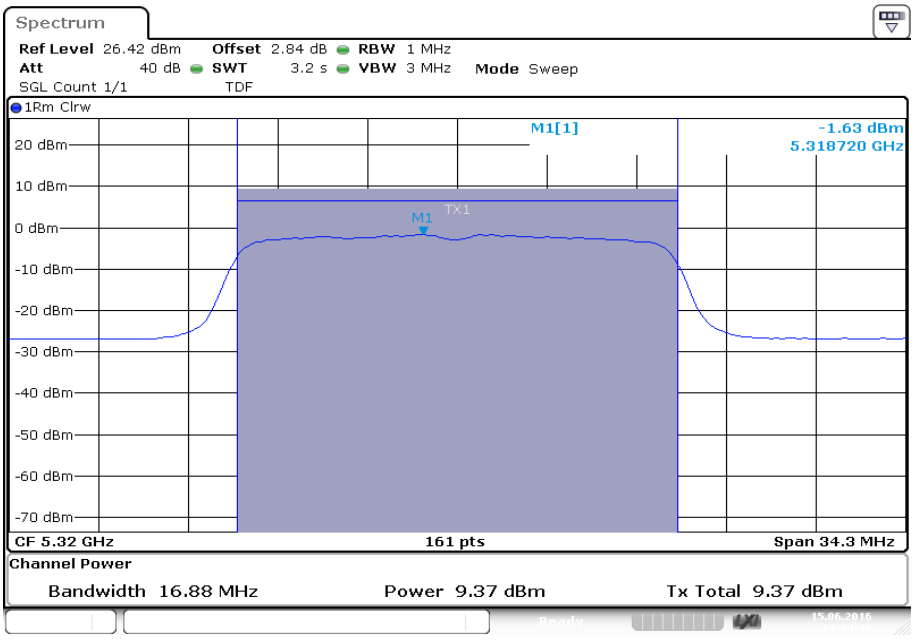
Plot 2: 5320 MHz



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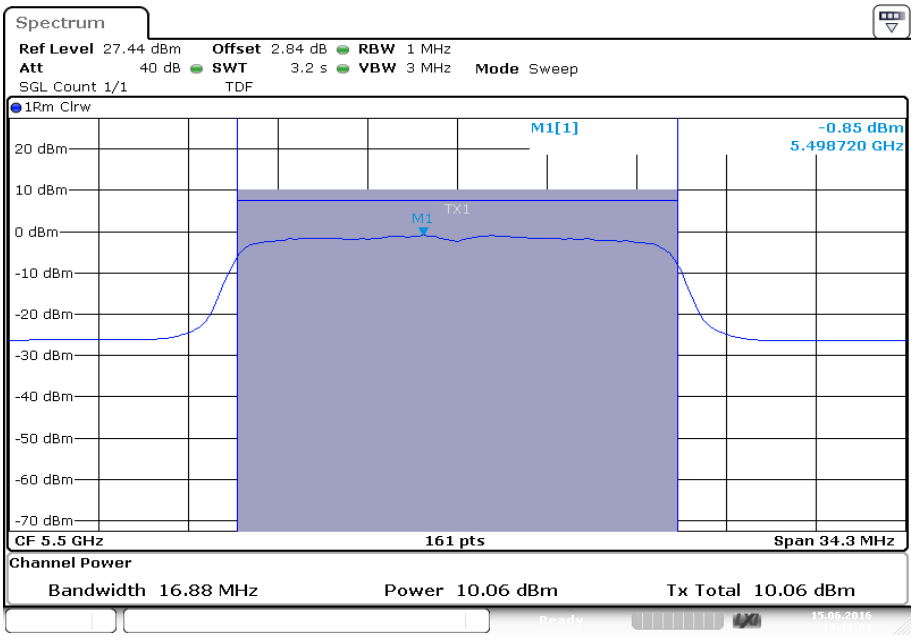
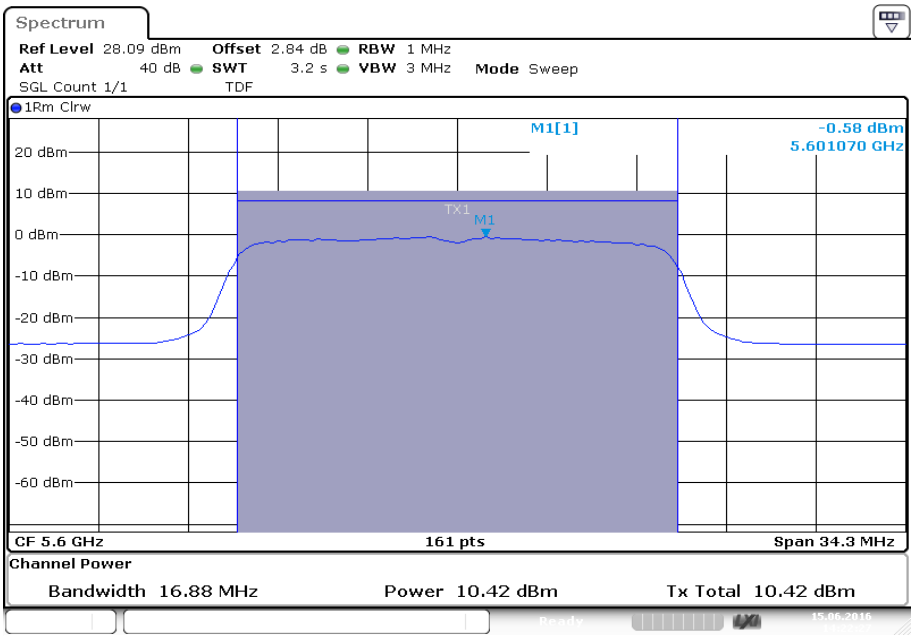
Plot 3: 5500 MHz



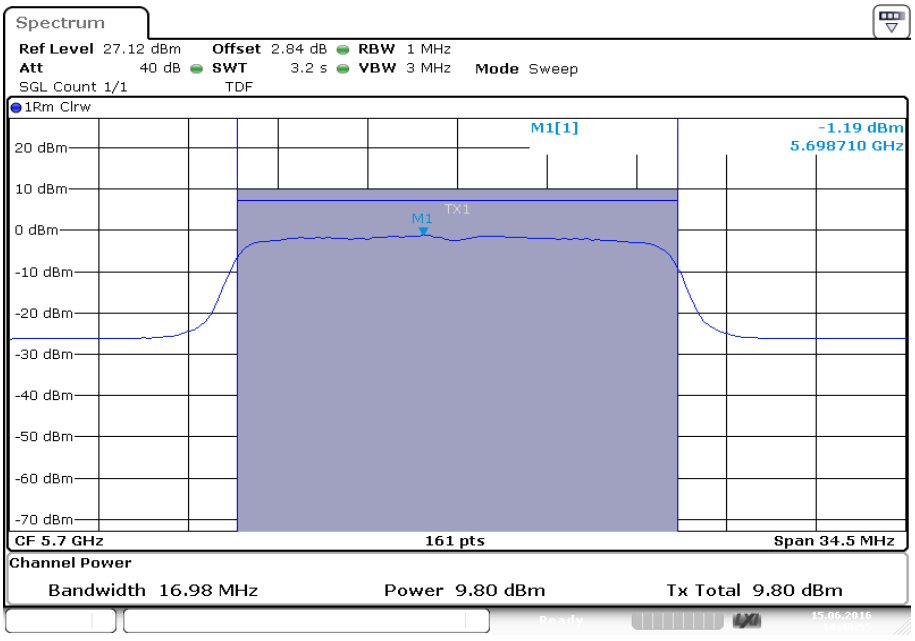
Date: 15.JUN.2016 14:13:01

Plot 4: 5600 MHz



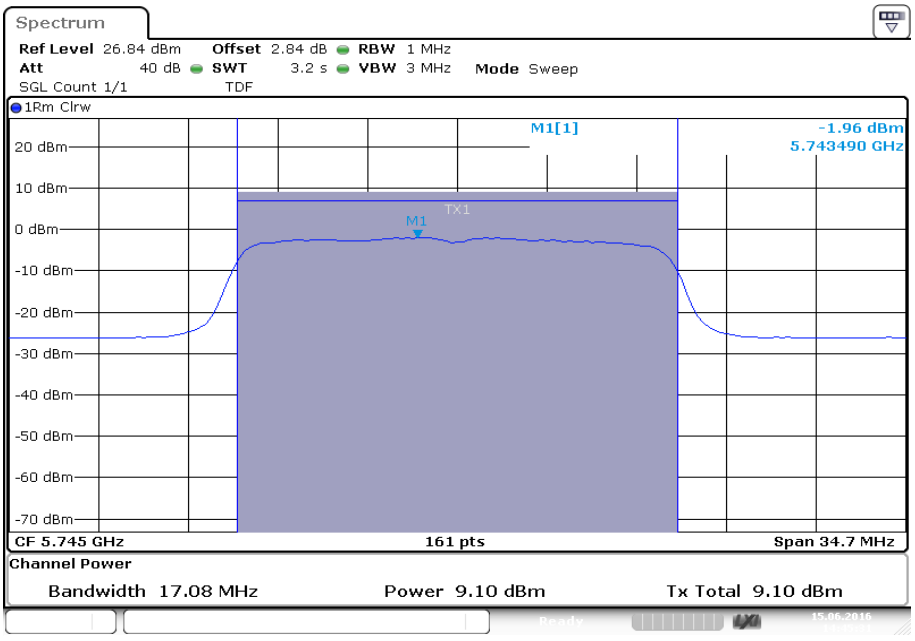
Date: 15.JUN.2016 14:22:27

Plot 5: 5700 MHz



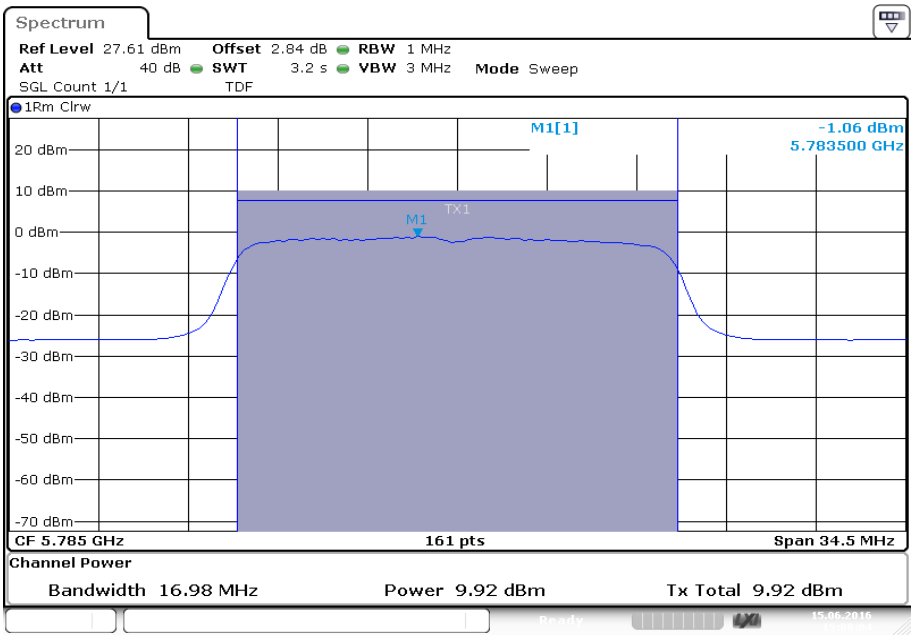
Date: 15.JUN.2016 14:40:55

Plot 6: 5745 MHz

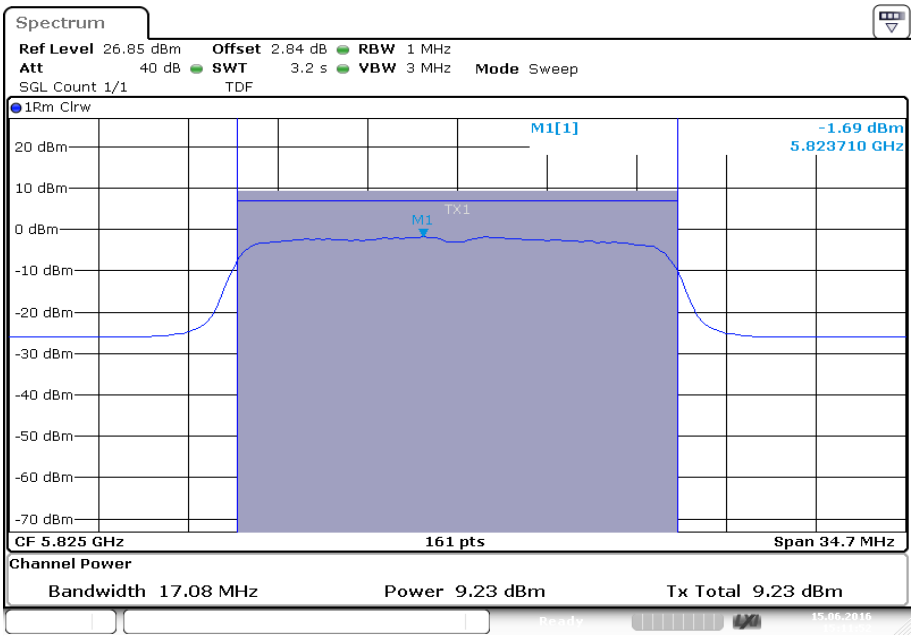


Date: 15.JUN.2016 14:45:32

Plot 7: 5785 MHz

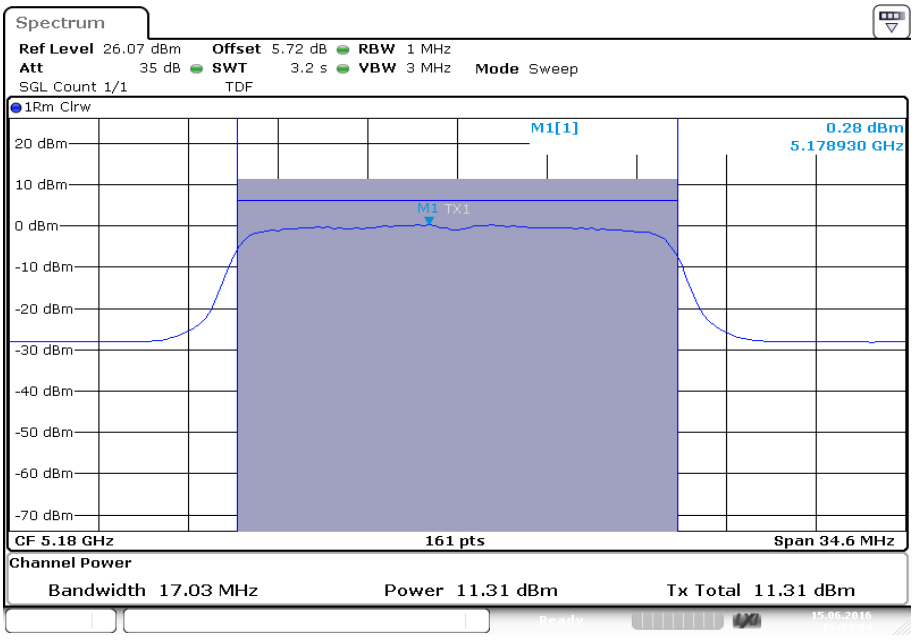


Plot 8: 5825 MHz



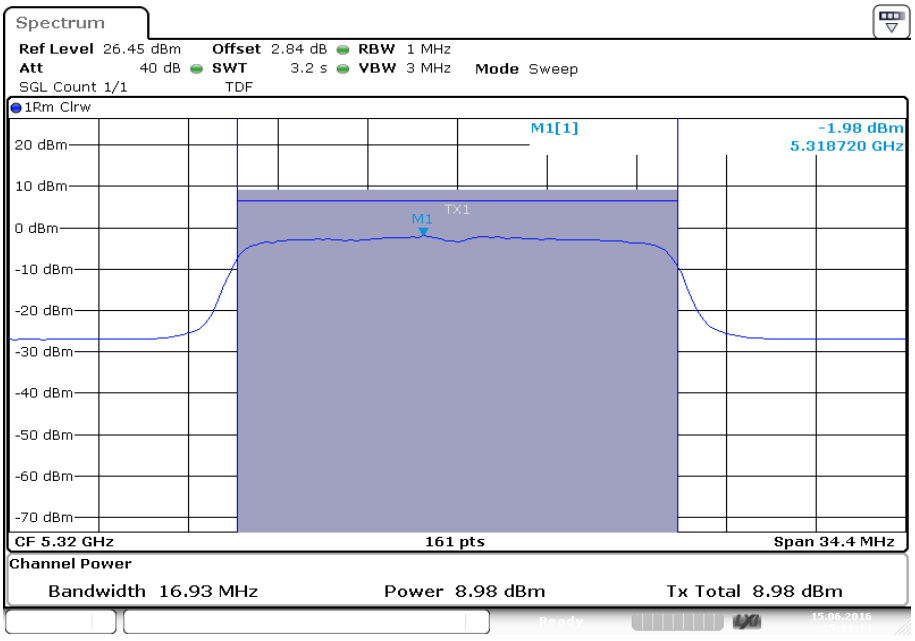
Plots: OFDM / ANT2

Plot 1: 5180 MHz



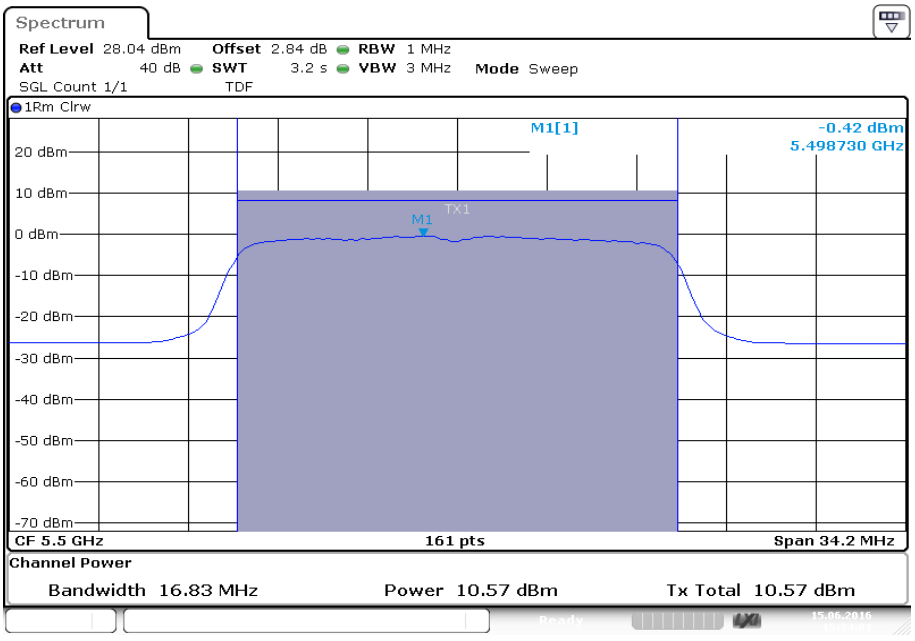
Date: 15.JUN.2016 15:23:05

Plot 2: 5320 MHz



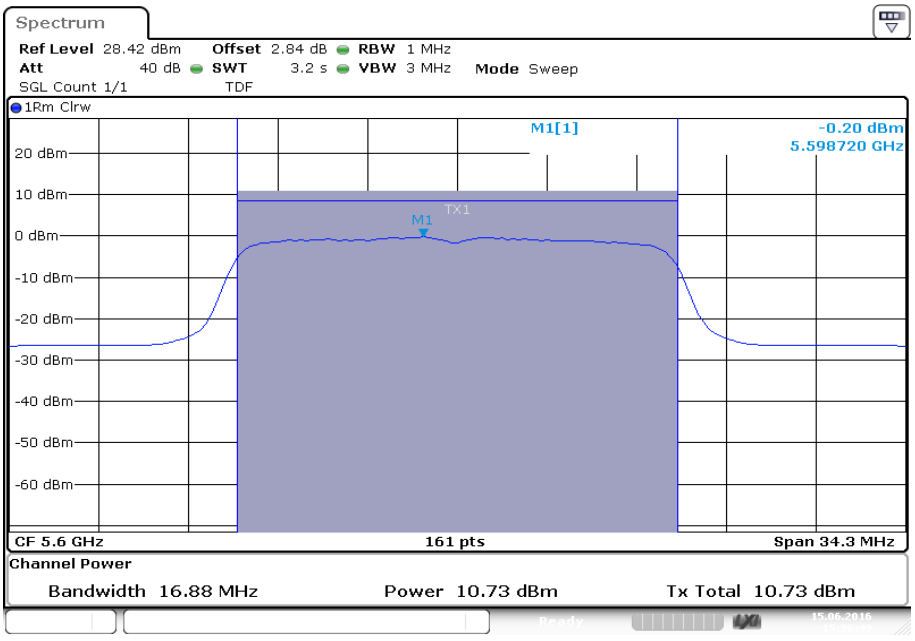
Date: 15.JUN.2016 15:31:14

Plot 3: 5500 MHz



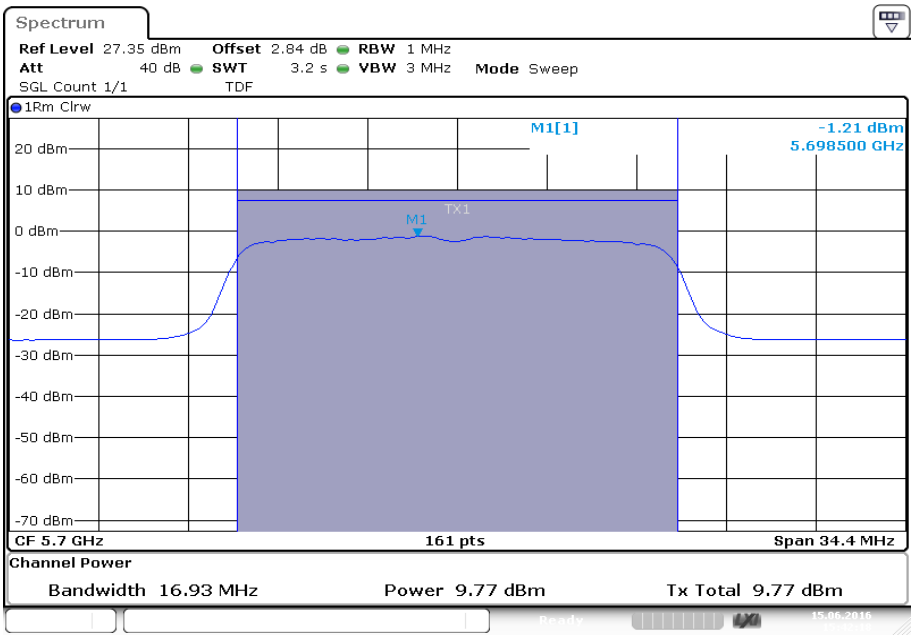
Date: 15.JUN.2016 15:34:02

Plot 4: 5600 MHz



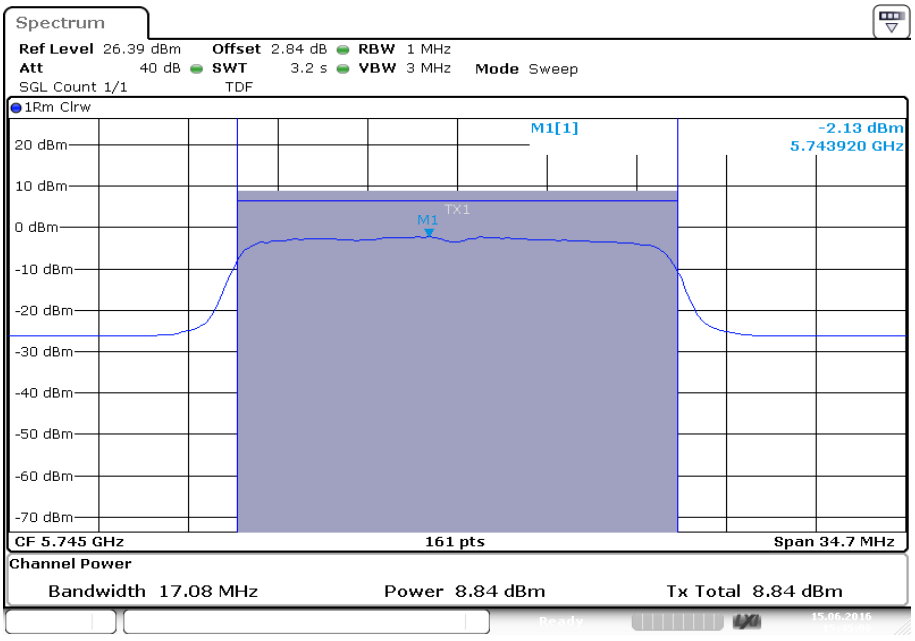
Date: 15.JUN.2016 15:36:50

Plot 5: 5700 MHz



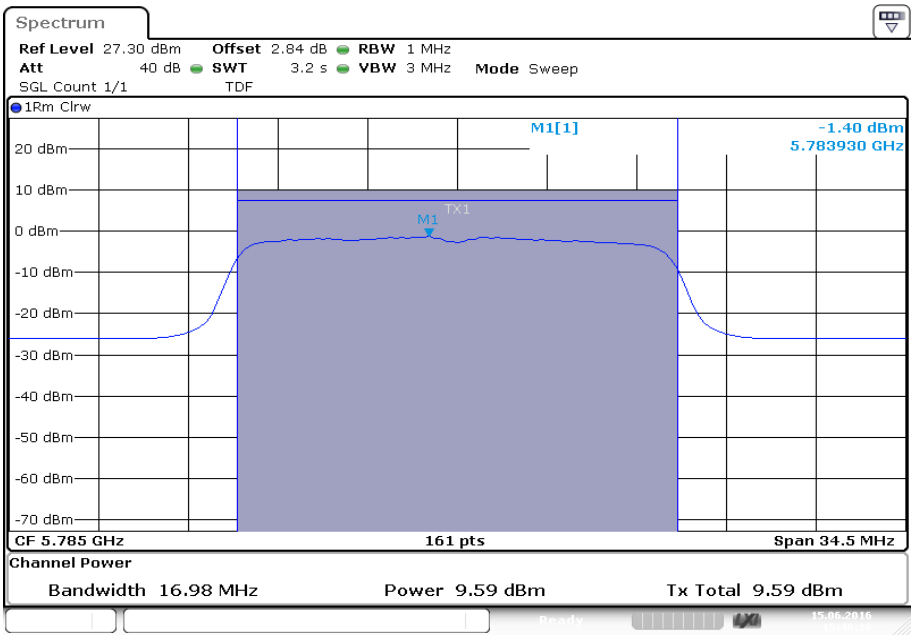
Date: 15.JUN.2016 15:42:18

Plot 6: 5745 MHz



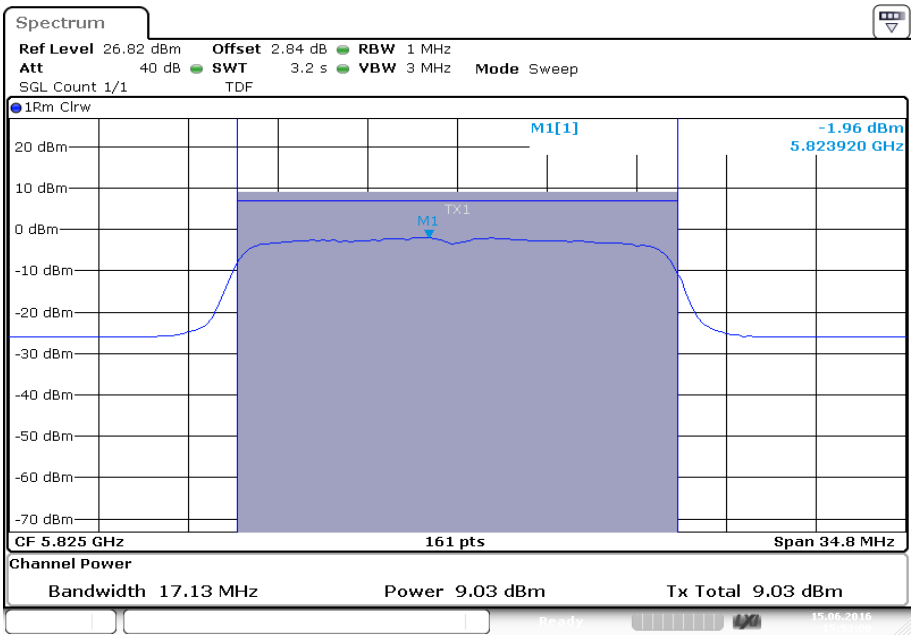
Date: 15.JUN.2016 15:45:07

Plot 7: 5785 MHz



Date: 15.JUN.2016 15:48:17

Plot 8: 5825 MHz



Date: 15.JUN.2016 15:53:00

12.4 Power spectral density

12.4.1 Power spectral density - FCC

Description:

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

Measurement:

Measurement parameter	
Detector:	RMS
Sweep time:	≥10*(swp points)*(total on/off time)
Resolution bandwidth:	1 MHz (500 kHz for 5.8 GHz band)
Video bandwidth:	≥ 3xRBW
Span:	> EBW
Trace-Mode:	Max hold
Test setup:	See chapter 7.5 – A
Measurement uncertainty:	See chapter 9

Limits:

Power Spectral Density
power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5150 – 5250 MHz)
power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5250 – 5350 MHz) power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5470 – 5725 MHz)
power spectral density conducted ≤ 30 dBm in any 500 kHz band (band 5725 – 5850 MHz)

Result: OFDM / ANT1

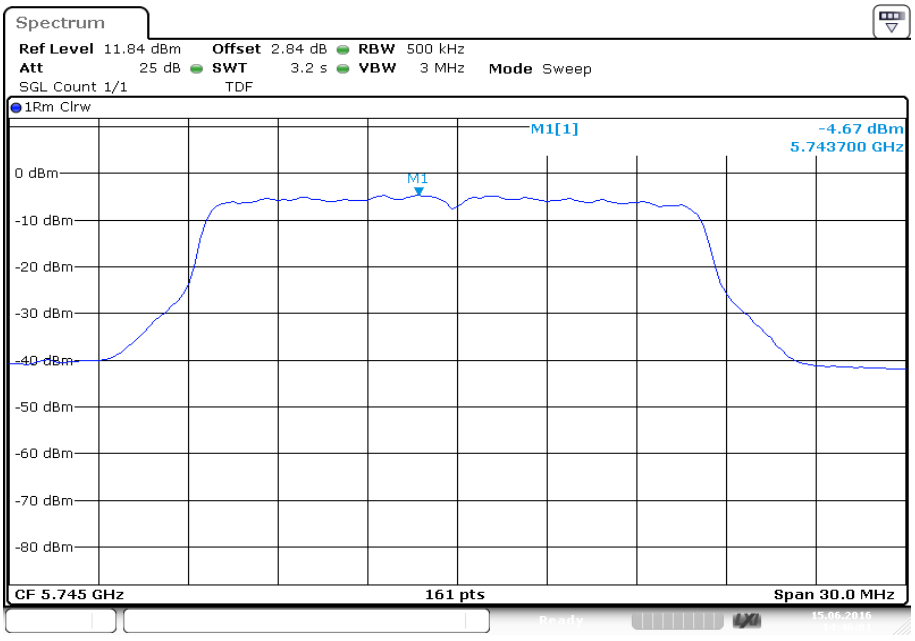
OFDM / ANT1	Power Spectral density [dBm/MHz]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
including duty cycle correction	-1.31	-/-	-1.64
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
including duty cycle correction	-0.99	-0.53	-1.16
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
including duty cycle correction	-4.67	-3.88	-4.55

Result: OFDM / ANT2

OFDM / ANT2	Power Spectral density [dBm/MHz]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
including duty cycle correction	-2.54	-/-	-2.02
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
including duty cycle correction	-0.36	-0.31	-1.27
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
including duty cycle correction	-4.91	-4.17	-4.79

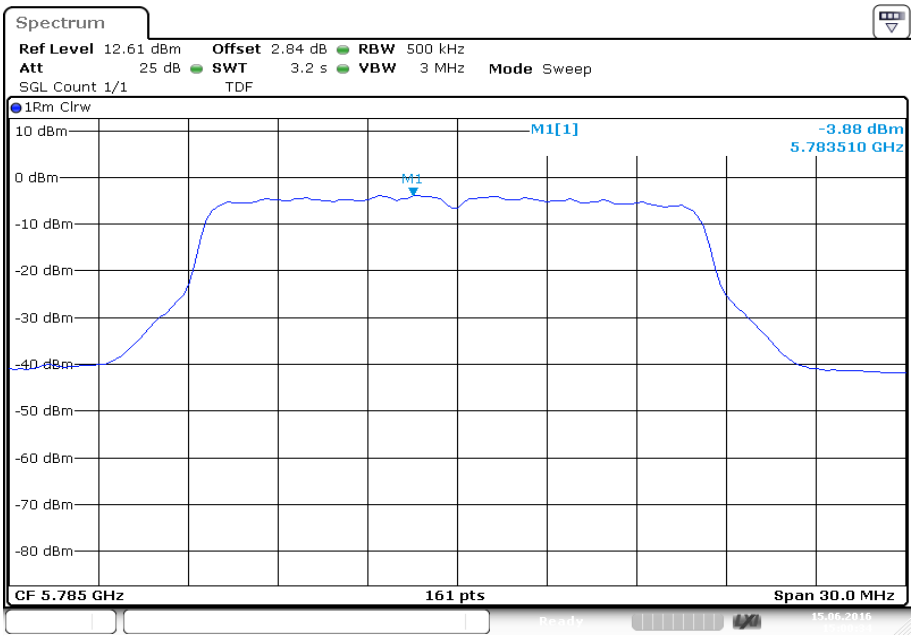
Plots: OFDM / ANT1

Plot 1: 5745 MHz



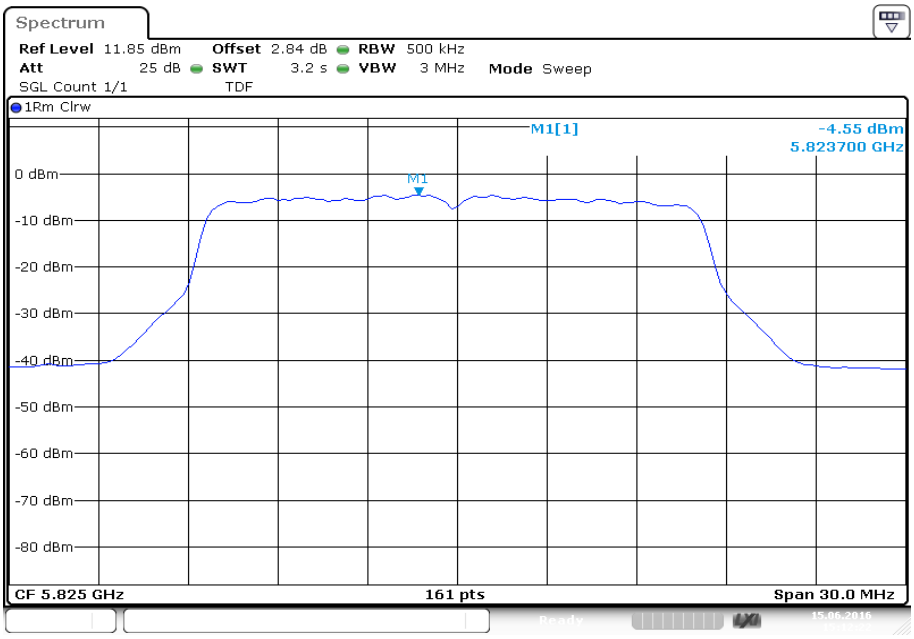
Date: 15.JUN.2016 14:46:02

Plot 2: 5785 MHz



Date: 15.JUN.2016 15:00:35

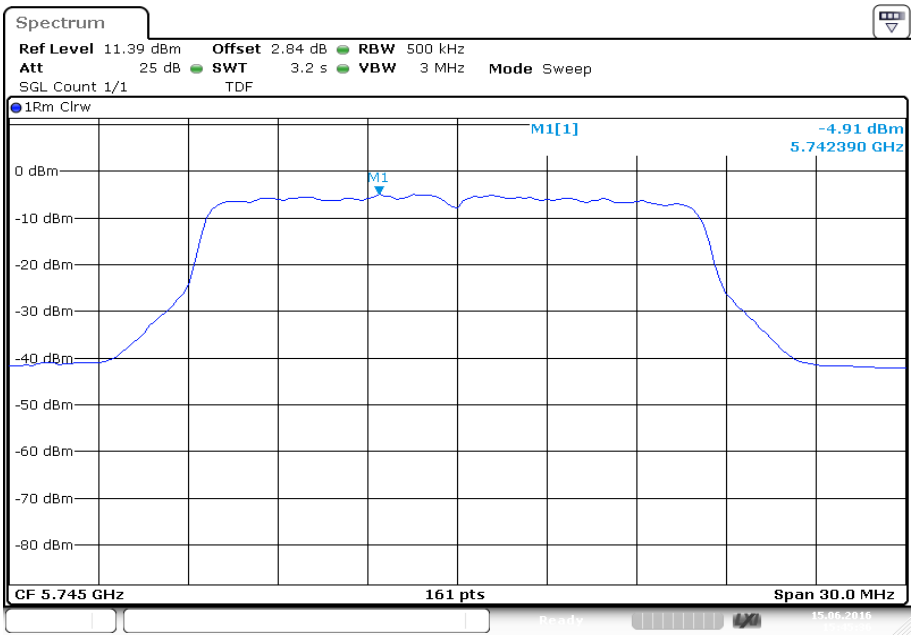
Plot 3: 5825 MHz



Date: 15.JUN.2016 15:12:22

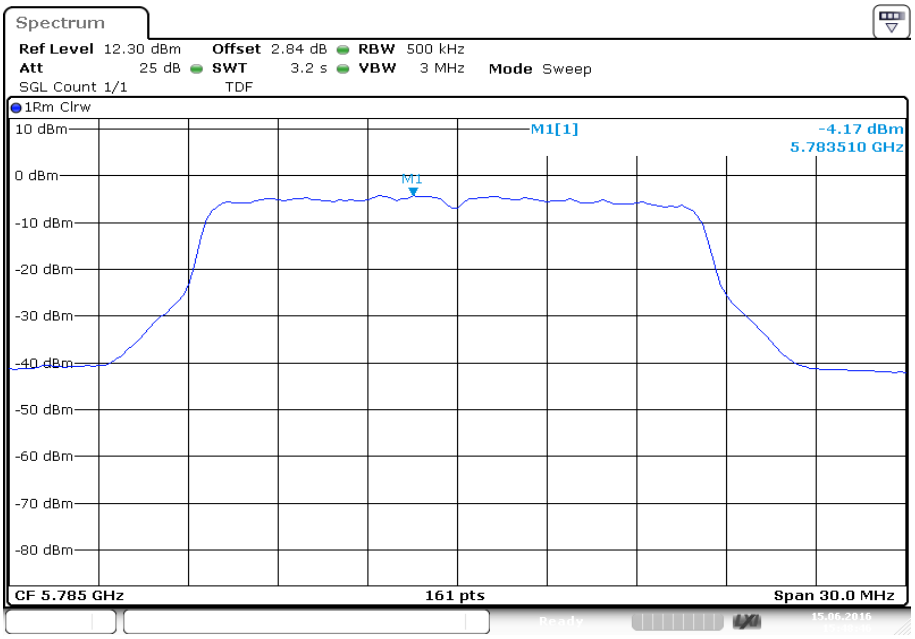
Plots: OFDM / ANT2

Plot 1: 5745 MHz



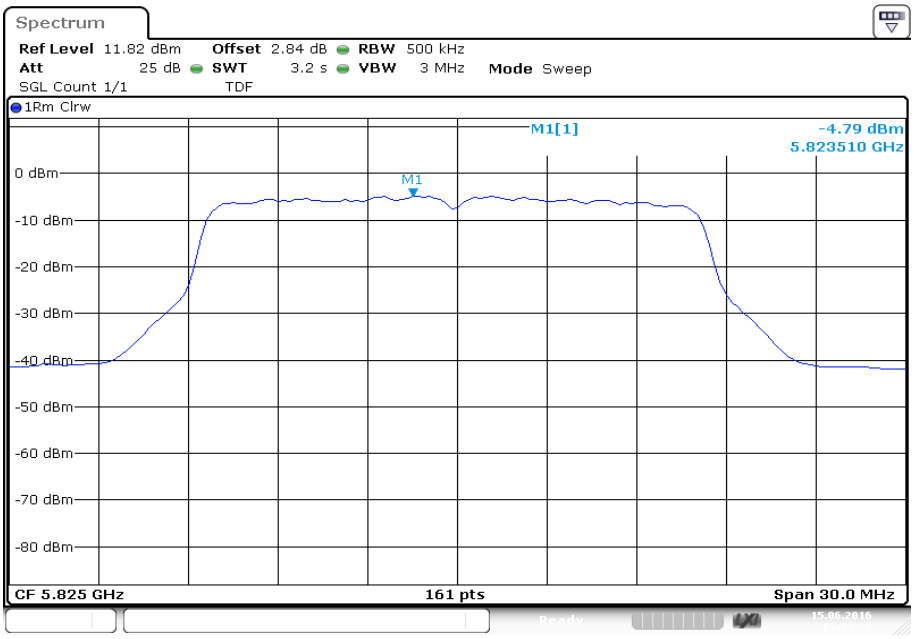
Date: 15.JUN.2016 15:45:36

Plot 2: 5785 MHz



Date: 15.JUN.2016 15:48:47

Plot 3: 5825 MHz



Date: 15.JUN.2016 15:53:30

12.4.2 Power spectral density - IC

Description:

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

Measurement:

Measurement parameter	
Detector:	RMS
Sweep time:	≥10*(swp points)*(total on/off time)
Resolution bandwidth:	1 MHz (500 kHz for 5.8 GHz band)
Video bandwidth:	≥ 3xRBW
Span:	> EBW
Trace-Mode:	Max hold
Test setup:	See chapter 7.5 – A
Measurement uncertainty:	See chapter 9

Limits:

Power Spectral Density
power spectral density e.i.r.p. ≤ 10 dBm in any 1 MHz band (band 5150 – 5250 MHz) power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5250 – 5350 MHz) power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5470 – 5725 MHz) power spectral density conducted ≤ 30 dBm in any 500 kHz band (band 5725 – 5850 MHz)

Result: OFDM / ANT1

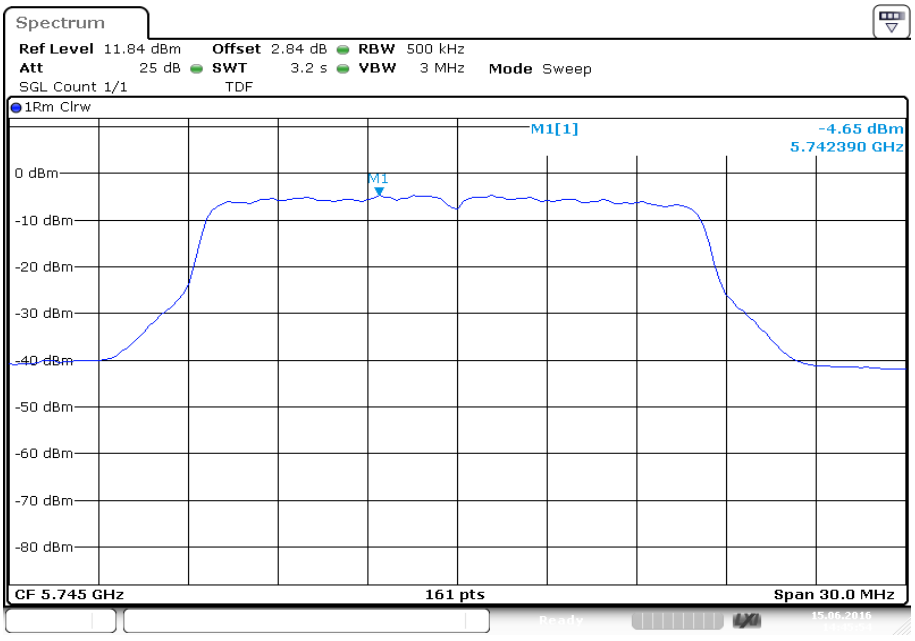
OFDM / ANT1	Power Spectral density [dBm/MHz]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
including duty cycle correction	1.56	-/-	-1.63
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
including duty cycle correction	-0.85	-0.58	-1.19
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
including duty cycle correction	-4.65	-3.85	-4.57

Result: OFDM / ANT2

OFDM / ANT2	Power Spectral density [dBm/MHz]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
including duty cycle correction	0.28	-/-	-1.98
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
including duty cycle correction	-0.42	-0.20	-1.21
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
including duty cycle correction	-4.85	-4.16	-4.76

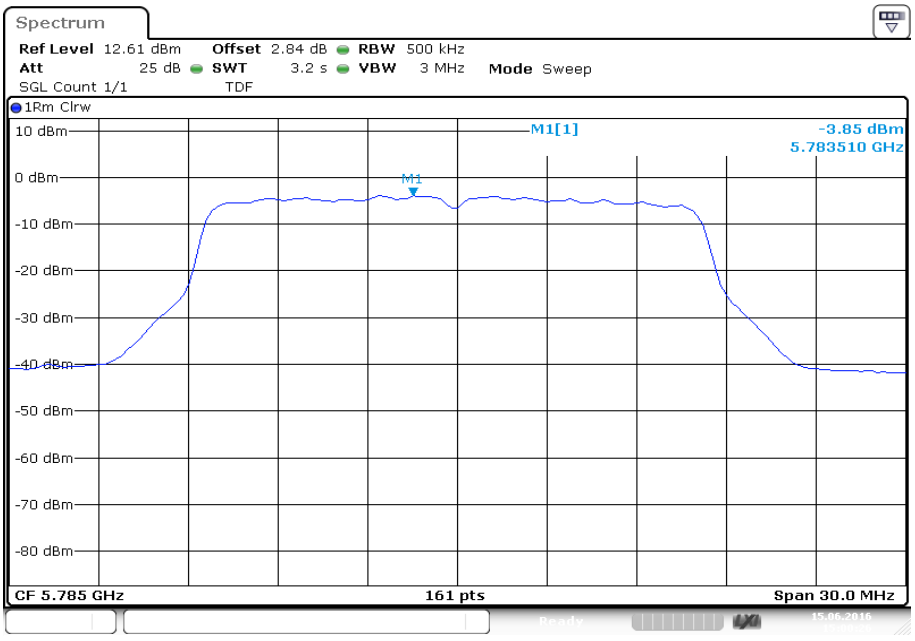
Plots: OFDM / ANT1

Plot 1: 5745 MHz



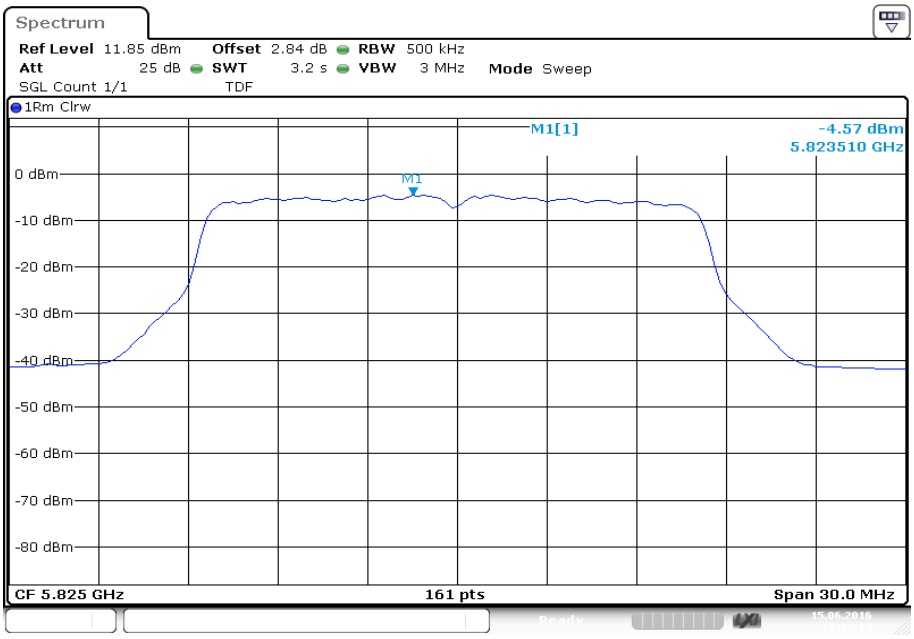
Date: 15.JUN.2016 14:45:54

Plot 2: 5785 MHz



Date: 15.JUN.2016 15:00:27

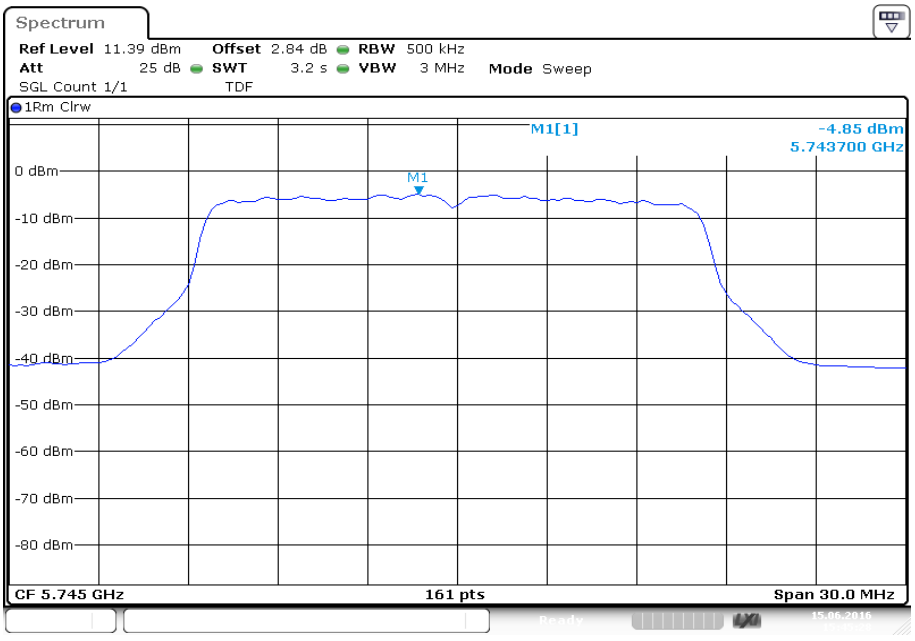
Plot 3: 5825 MHz



Date: 15.JUN.2016 15:12:15

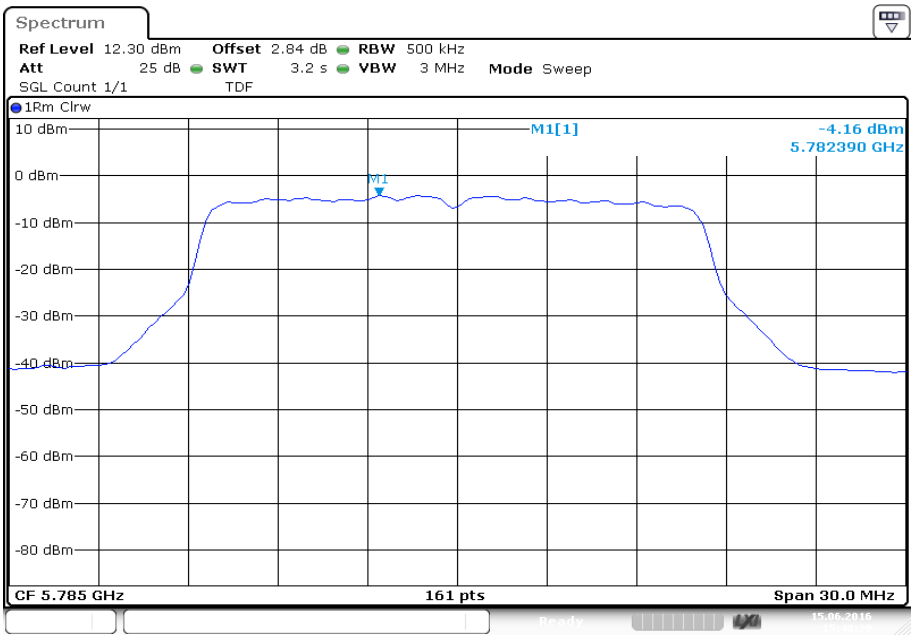
Plots: OFDM / ANT2

Plot 1: 5745 MHz



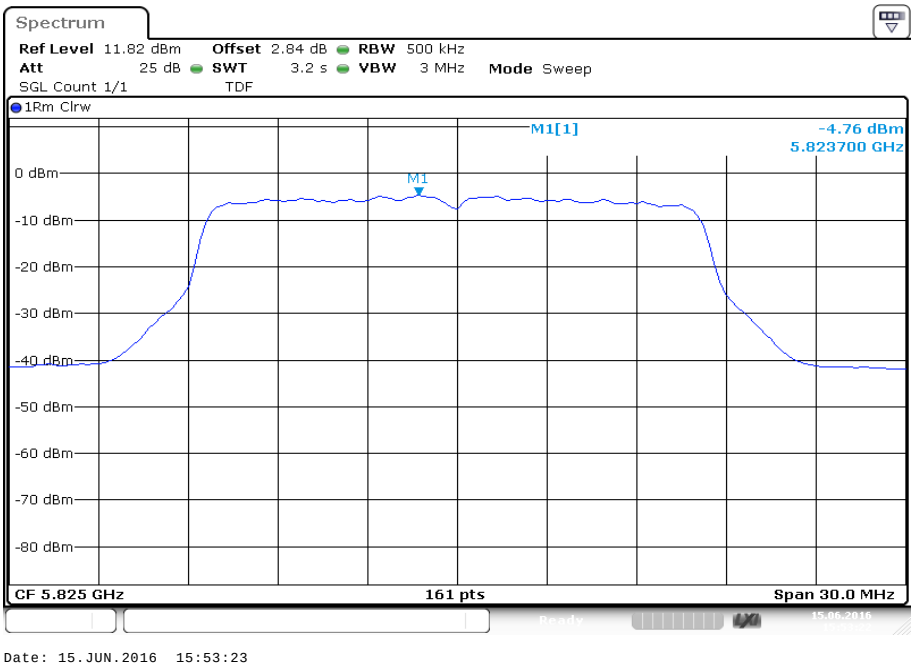
Date: 15.JUN.2016 15:45:29

Plot 2: 5785 MHz



Date: 15.JUN.2016 15:48:39

Plot 3: 5825 MHz



Date: 15.JUN.2016 15:53:23

12.5 Spectrum bandwidth – 26 dB bandwidth

Description:

Measurement of the 26 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1% EBW
Video bandwidth:	≥ RBW
Span:	> complete signal!
Trace-Mode:	Max hold
Test setup:	See chapter 7.5 – A
Measurement uncertainty:	See chapter 9

Limits:

Spectrum Bandwidth – 26 dB Bandwidth
-/-

Result: OFDM / ANT 1

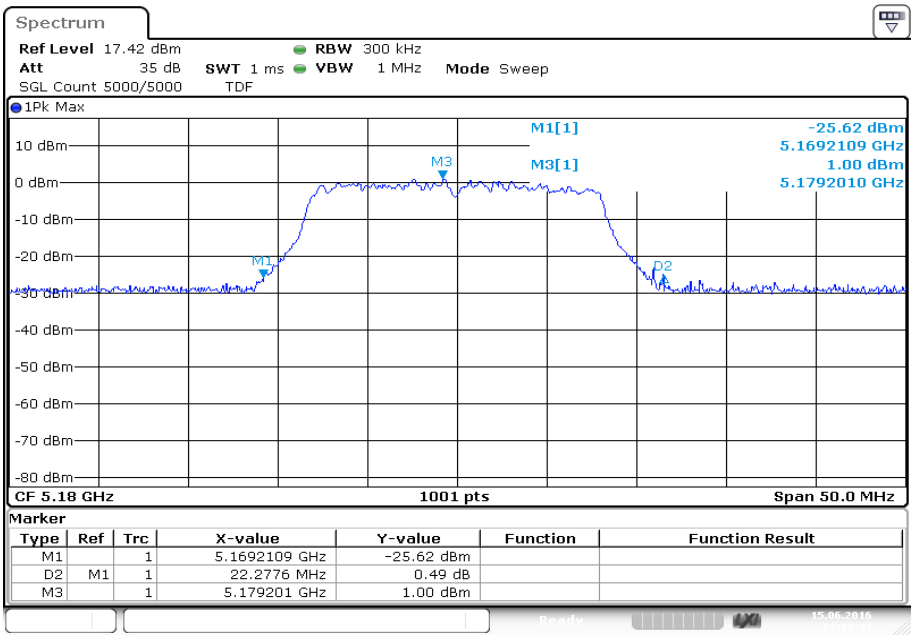
OFDM / ANT1	26 dB BANDWIDTH [MHz]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
	22.3	-/-	23.0
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
	21.4	23.1	20.8
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
	22.1	21.2	21.8

Result: OFDM / ANT 2

OFDM / ANT2	26 dB BANDWIDTH [MHz]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
	21.9	-/-	21.9
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
	22.3	22.6	21.2
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
	22.6	22.1	22.3

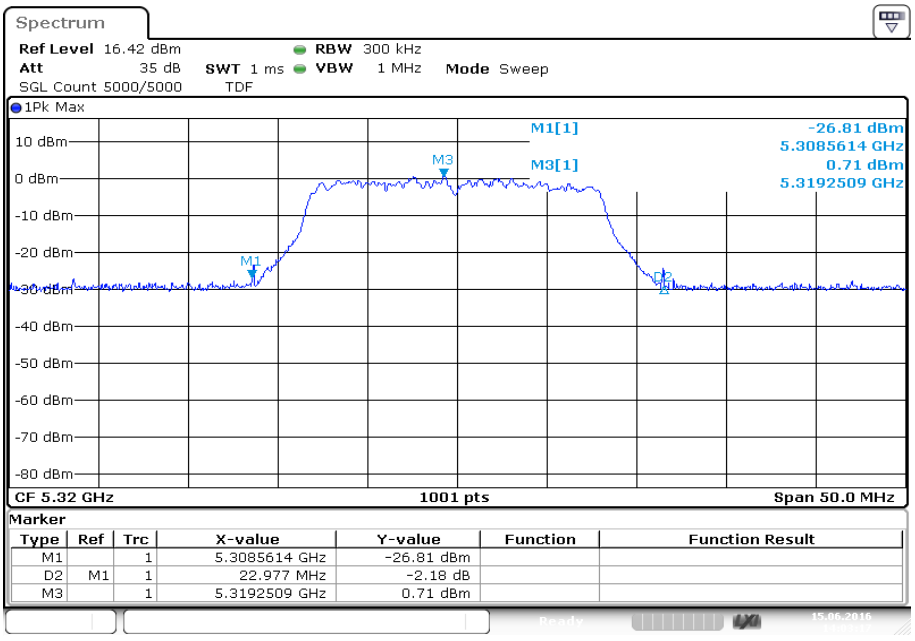
Plots: OFDM / ANT 1

Plot 1: 5180 MHz



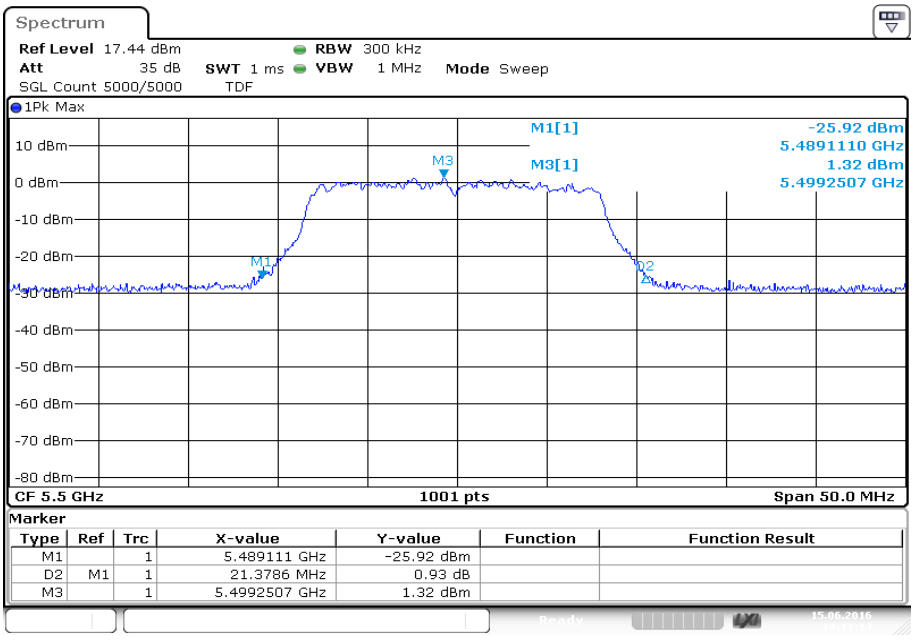
Date: 15.JUN.2016 13:19:44

Plot 2: 5320 MHz



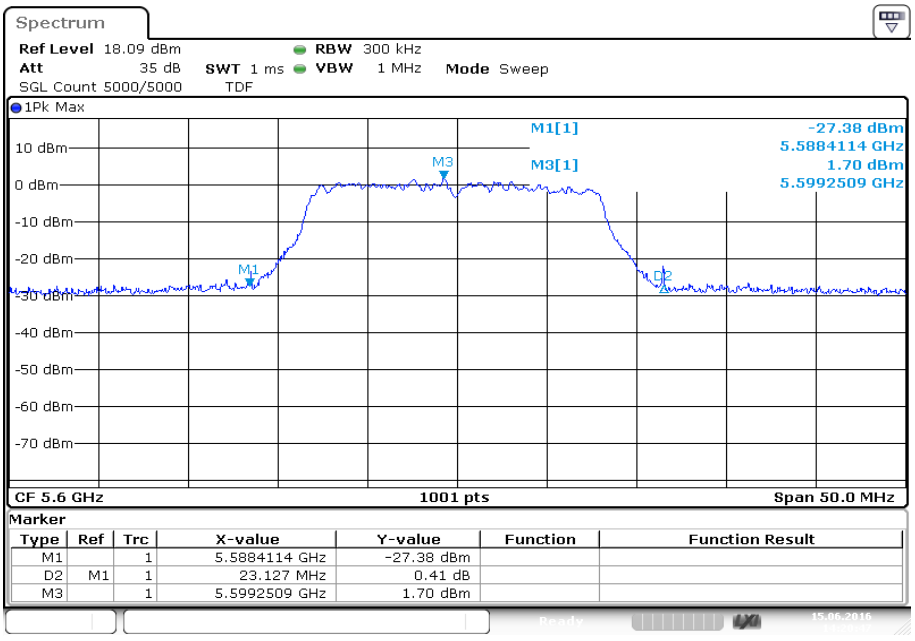
Date: 15.JUN.2016 14:03:17

Plot 3: 5500 MHz



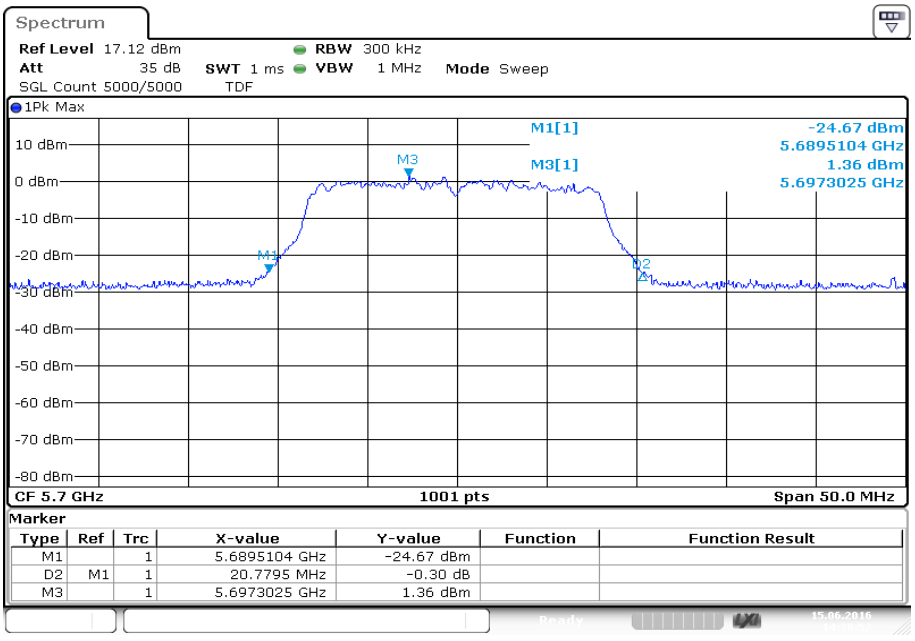
Date: 15.JUN.2016 14:11:14

Plot 4: 5600 MHz



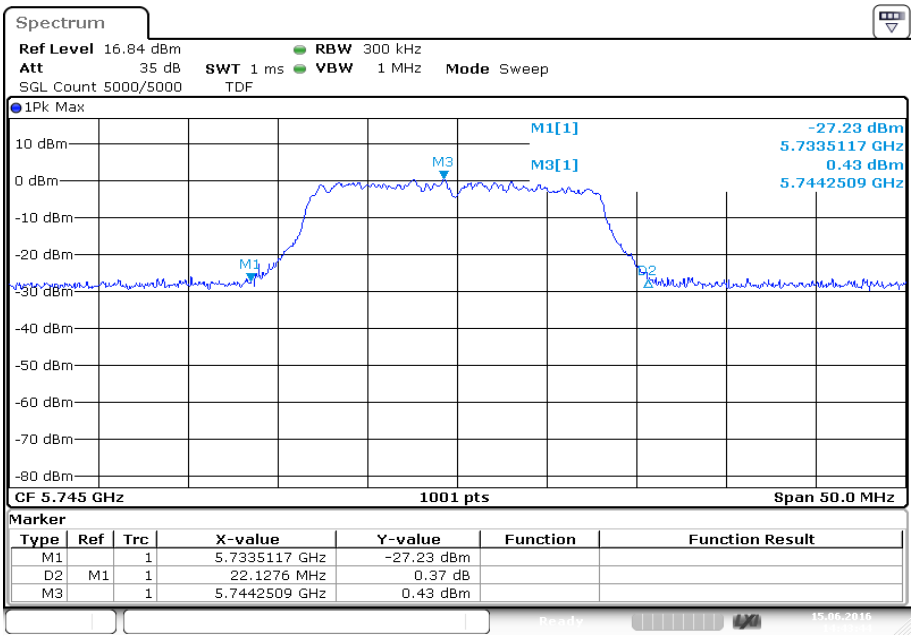
Date: 15.JUN.2016 14:20:48

Plot 5: 5700 MHz



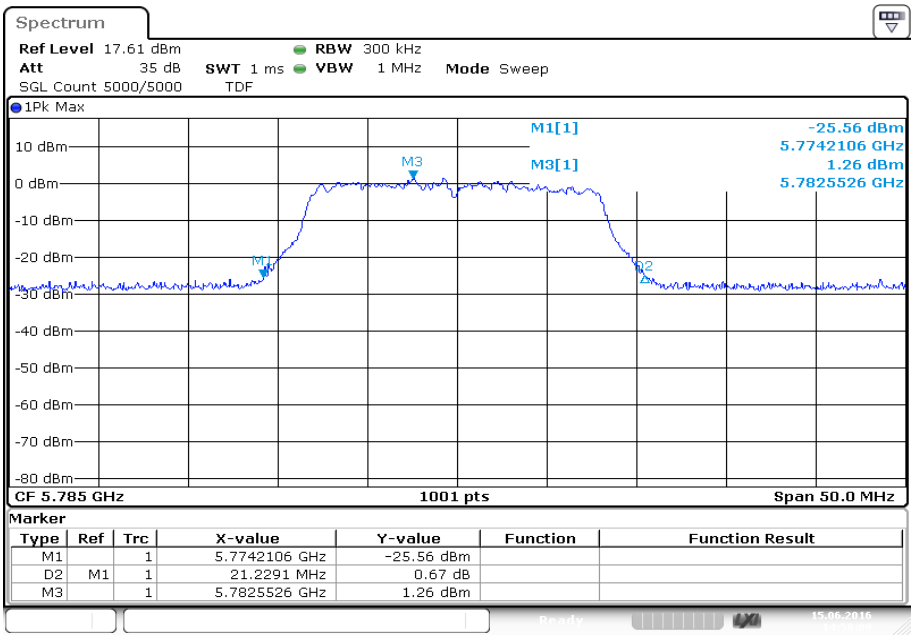
Date: 15.JUN.2016 14:38:52

Plot 6: 5745 MHz



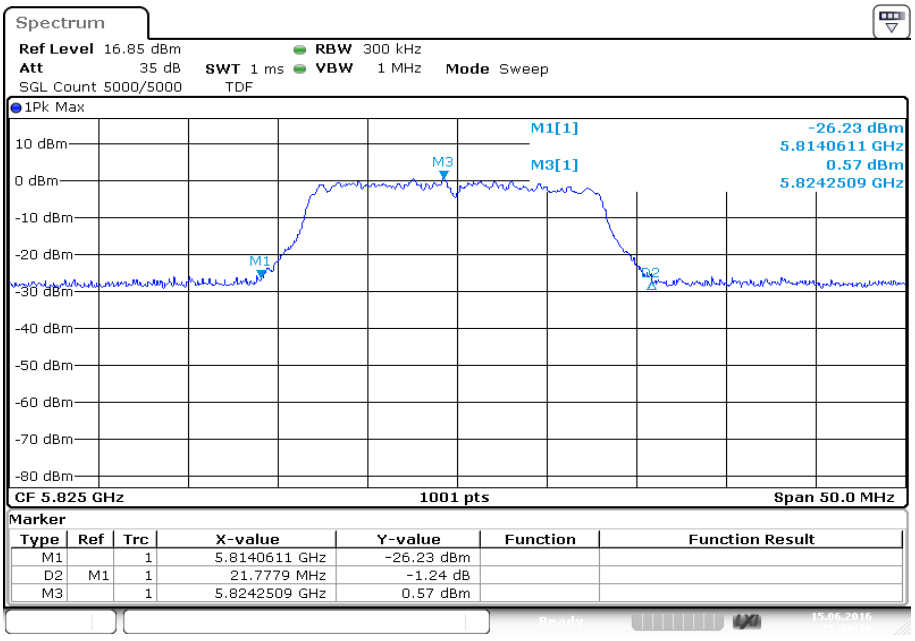
Date: 15.JUN.2016 14:43:45

Plot 7: 5785 MHz



Date: 15.JUN.2016 14:58:10

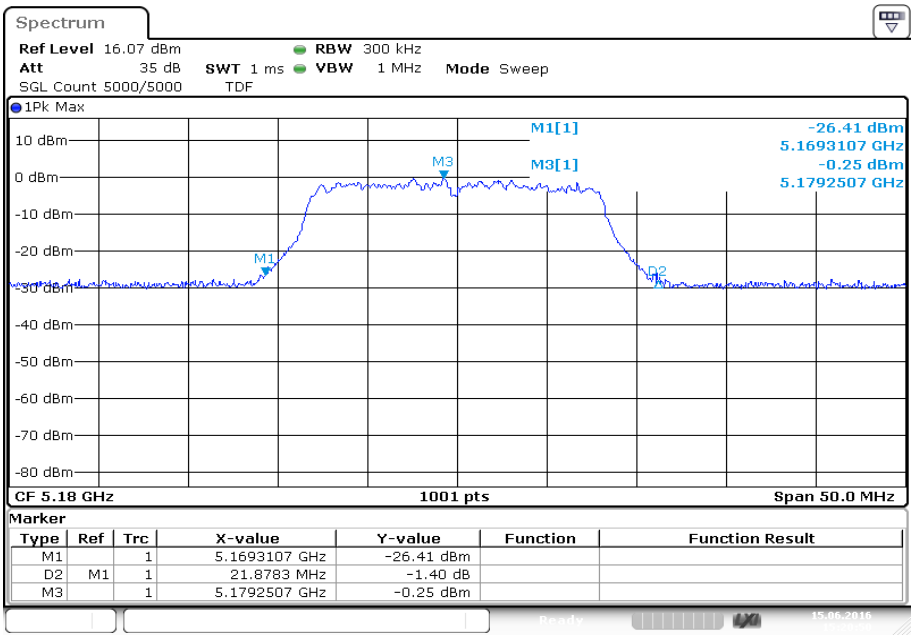
Plot 8: 5825 MHz



Date: 15.JUN.2016 15:10:11

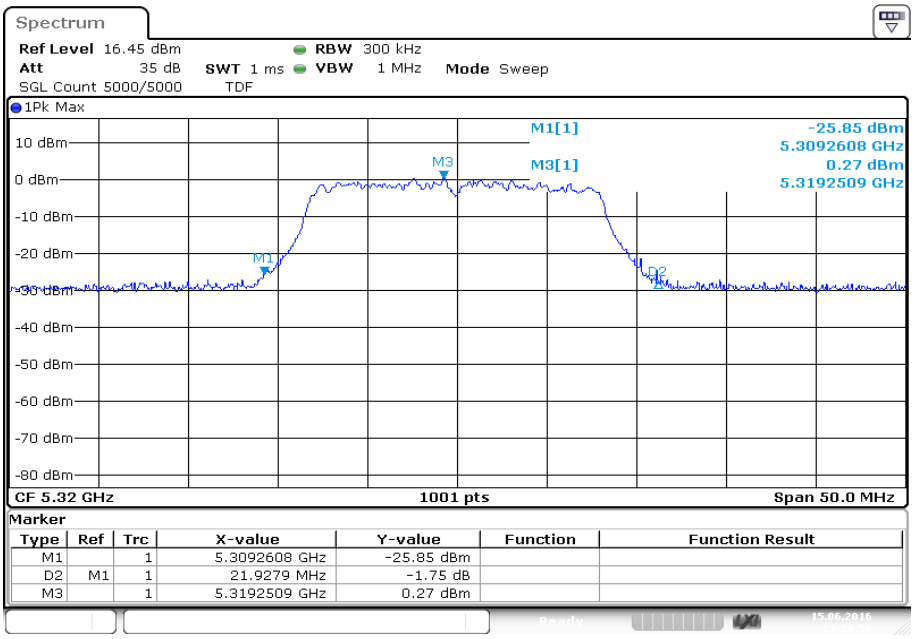
Plots: OFDM / ANT 2

Plot 1: 5180 MHz



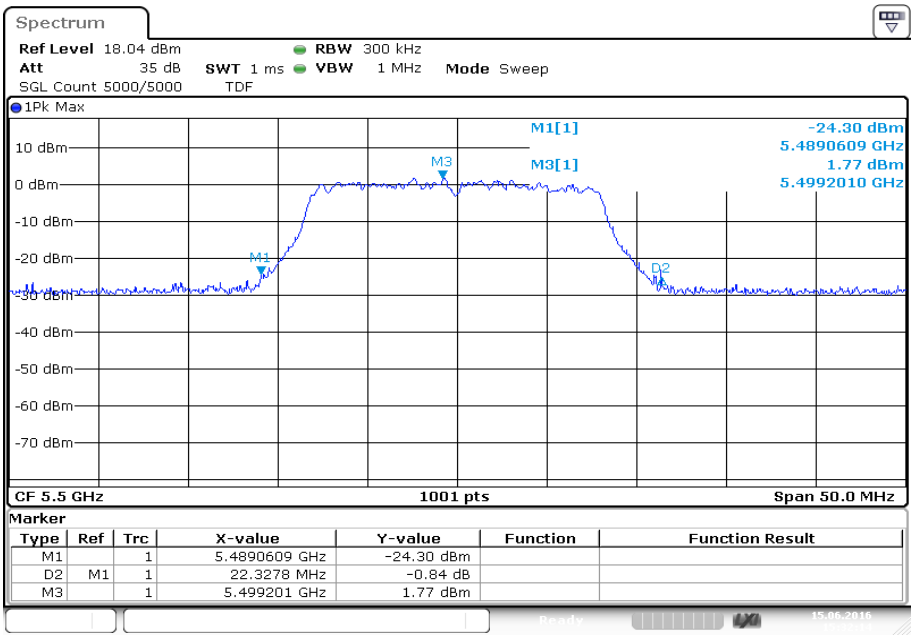
Date: 15.JUN.2016 15:20:51

Plot 2: 5320 MHz



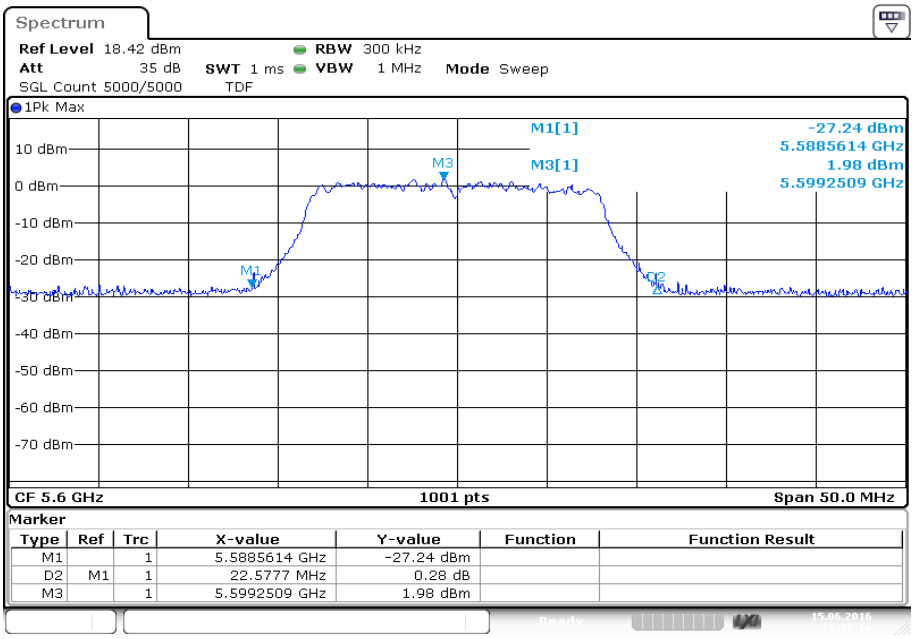
Date: 15.JUN.2016 15:29:51

Plot 3: 5500 MHz



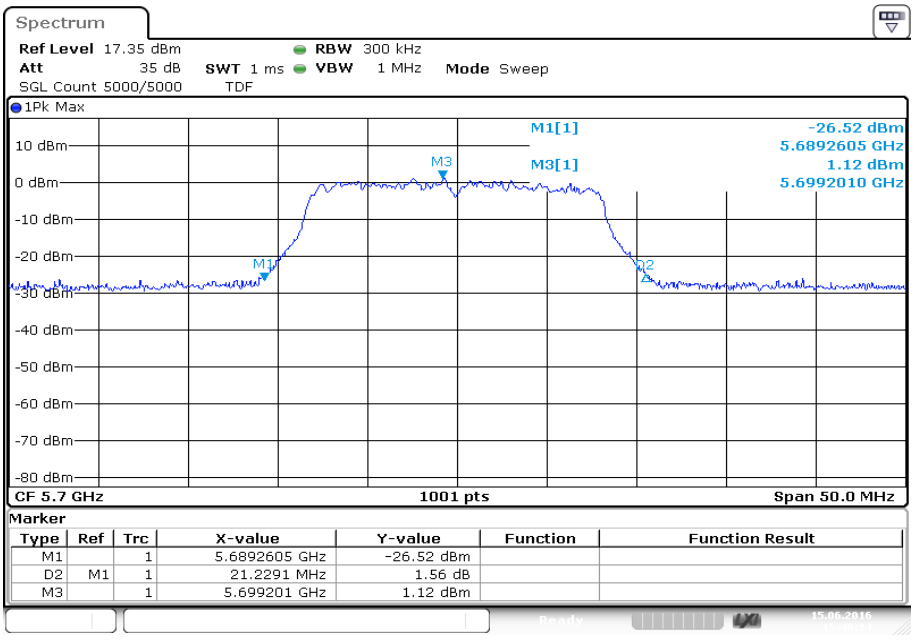
Date: 15.JUN.2016 15:32:15

Plot 4: 5600 MHz



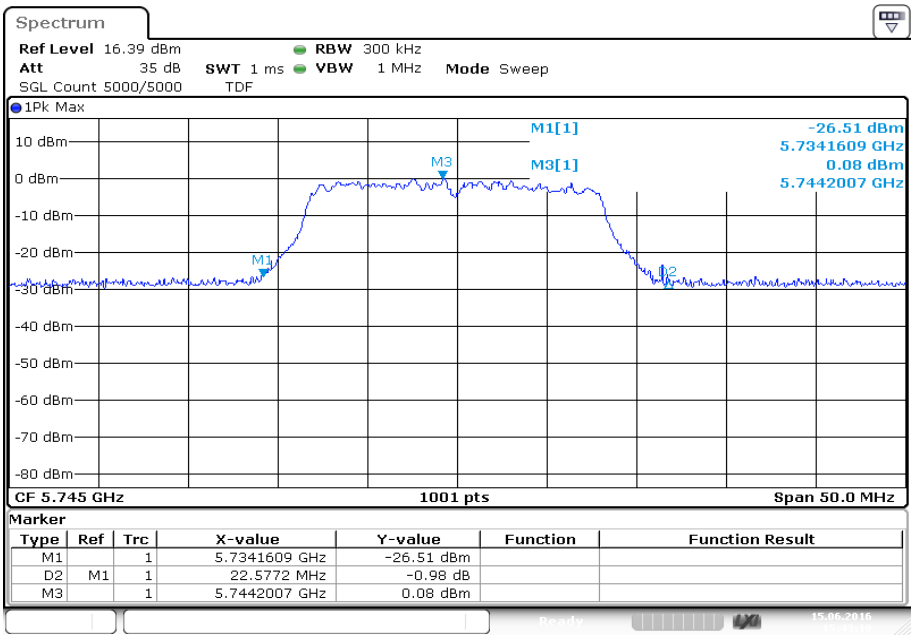
Date: 15.JUN.2016 15:35:10

Plot 5: 5700 MHz



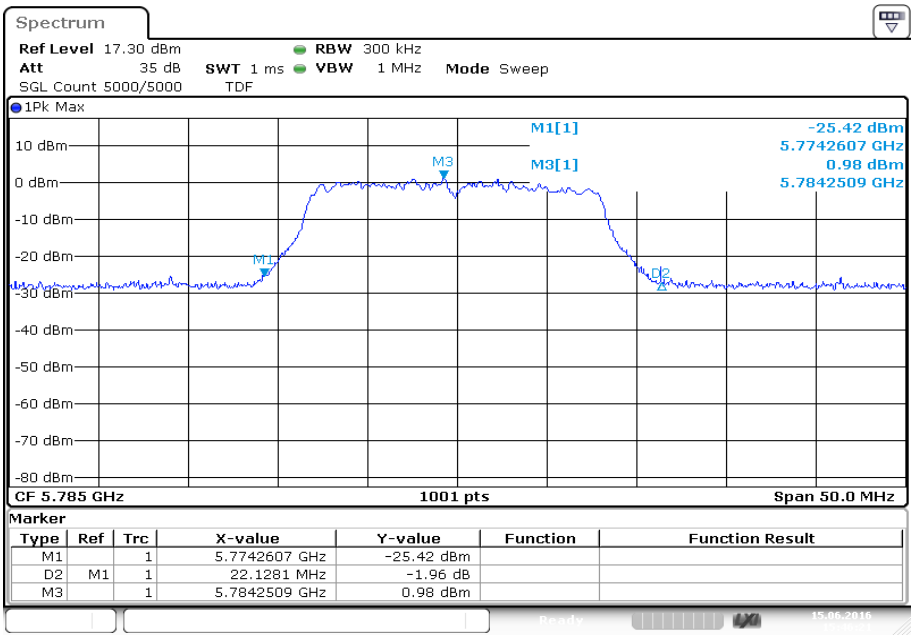
Date: 15.JUN.2016 15:40:15

Plot 6: 5745 MHz



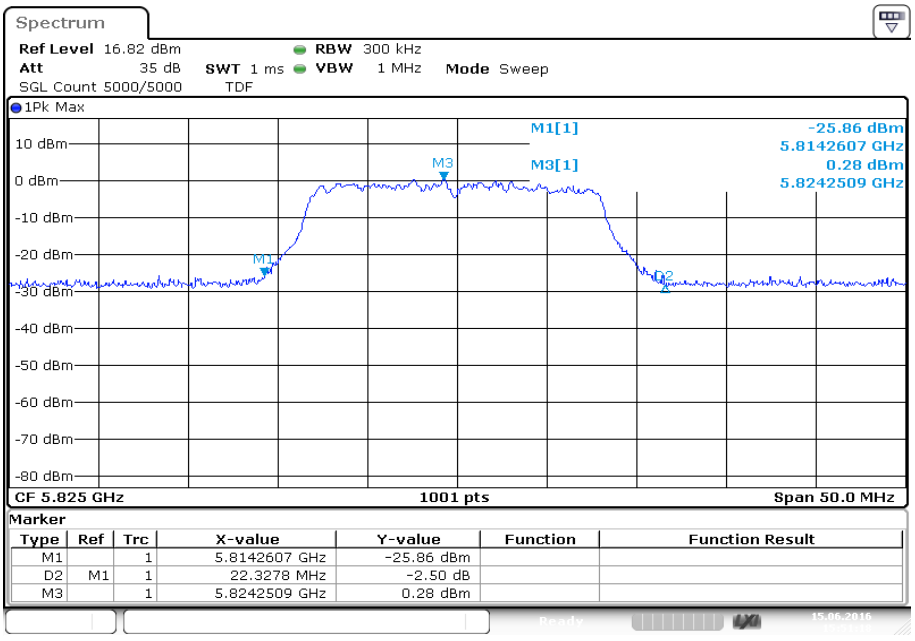
Date: 15.JUN.2016 15:43:20

Plot 7: 5785 MHz



Date: 15.JUN.2016 15:46:22

Plot 8: 5825 MHz



Date: 15.JUN.2016 15:51:19

12.6 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:	50 MHz
Measurement procedure:	Measurement of the 99% bandwidth using the integration function of the analyzer
Trace-Mode:	Max hold (allow trace to stabilize)
Test setup:	See chapter 7.5 – A
Measurement uncertainty:	See chapter 9

Usage:

-/-	IC
Occupied Bandwidth – 99% emission bandwidth	
OBW is necessary for Emission Designator	

Result: OFDM / ANT 1

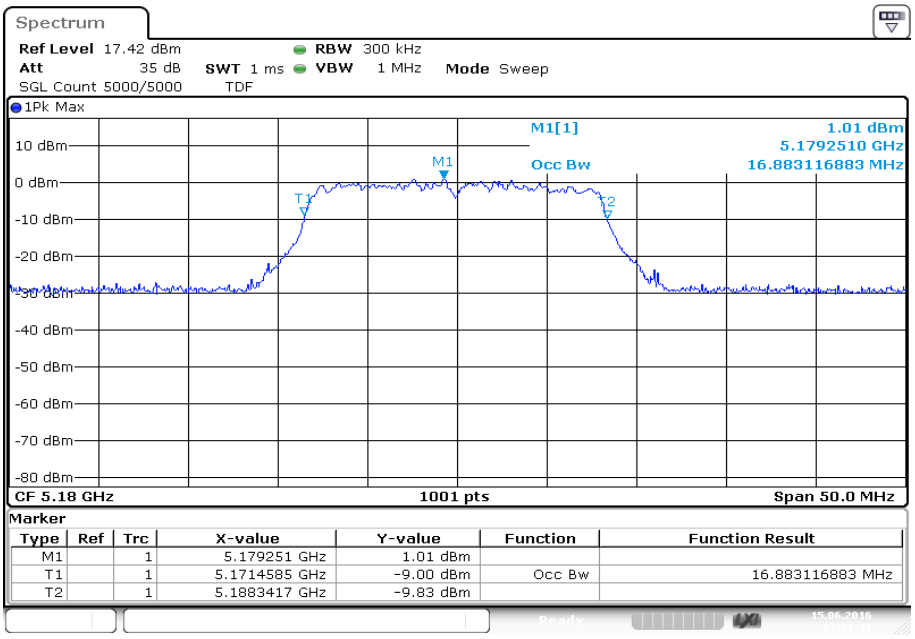
OFDM / ANT1	99% BANDWIDTH [kHz]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
	16883	-/-	16883
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
	16883	16883	16983
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
	17083	16983	17083

Result: OFDM / ANT 2

OFDM / ANT2	99% BANDWIDTH [kHz]		
Channel	Lowest 5180 MHz	-/-	Highest 5320 MHz
	17033	-/-	16933
Channel	Lowest 5500 MHz	Middle 5600 MHz	Highest 5700 MHz
	16833	16883	16933
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
	17083	16983	17133

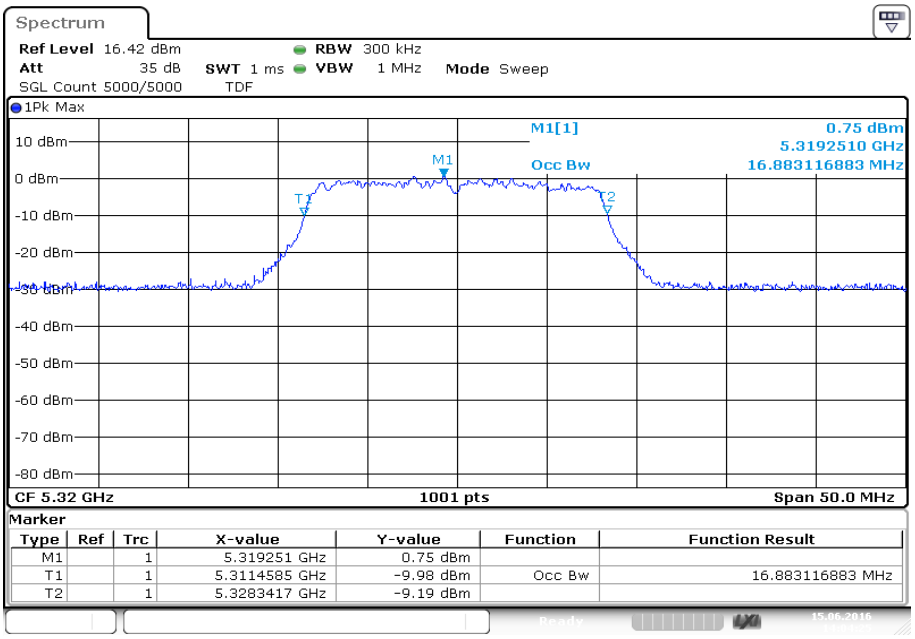
Plots: OFDM / ANT 1

Plot 1: 5180 MHz



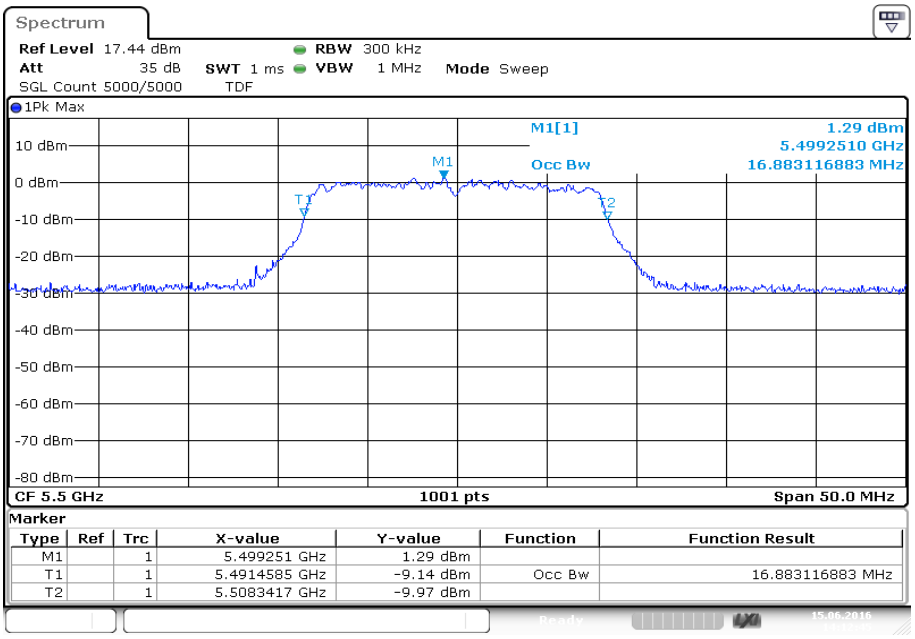
Date: 15.JUN.2016 13:21:42

Plot 2: 5320 MHz

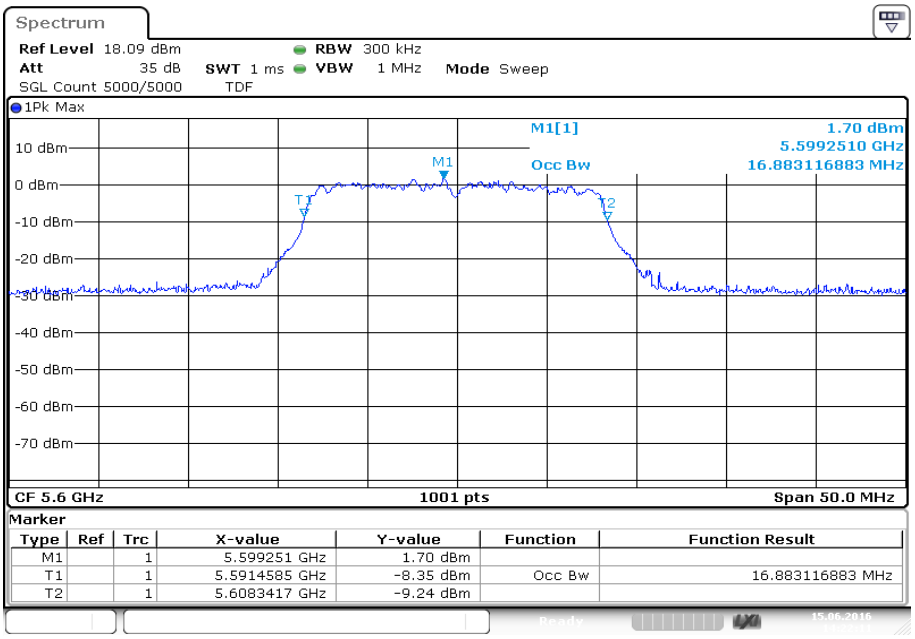


Date: 15.JUN.2016 14:04:25

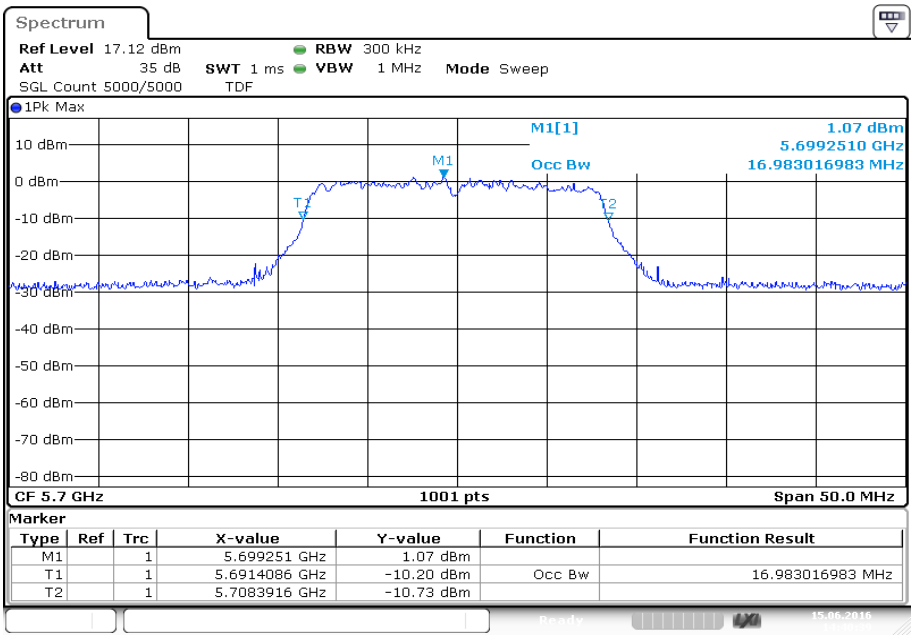
Plot 3: 5500 MHz



Plot 4: 5600 MHz

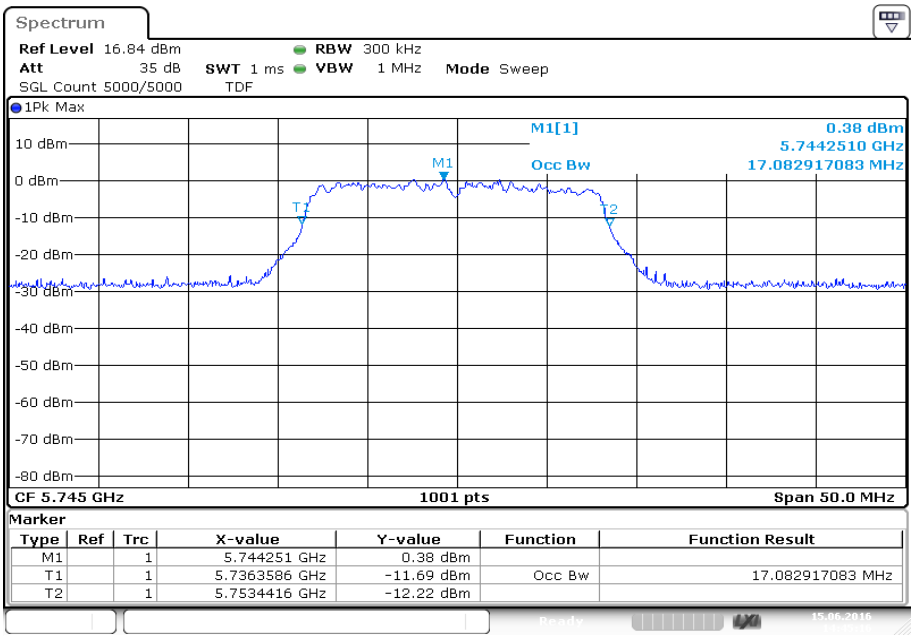


Plot 5: 5700 MHz



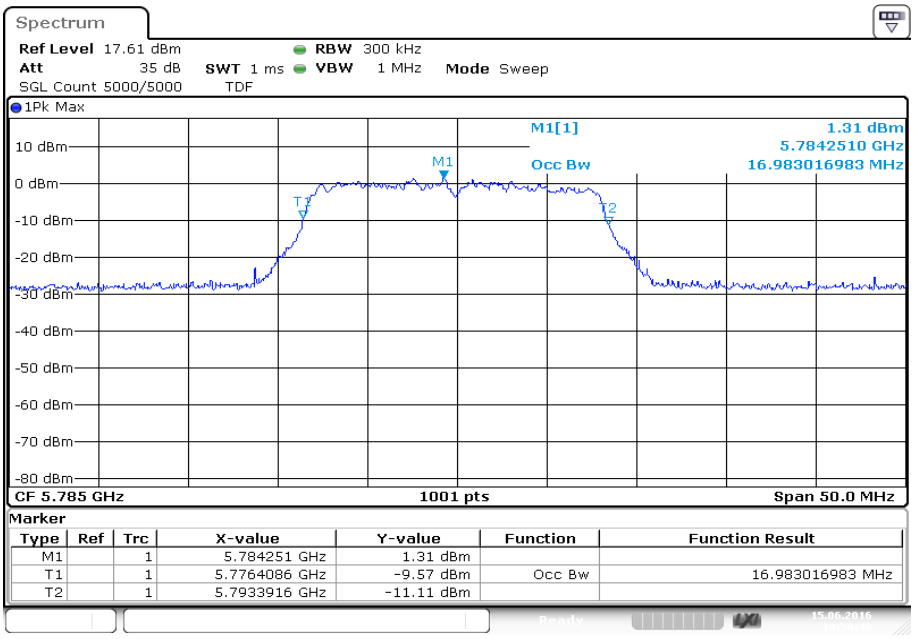
Date: 15.JUN.2016 14:40:40

Plot 6: 5745 MHz

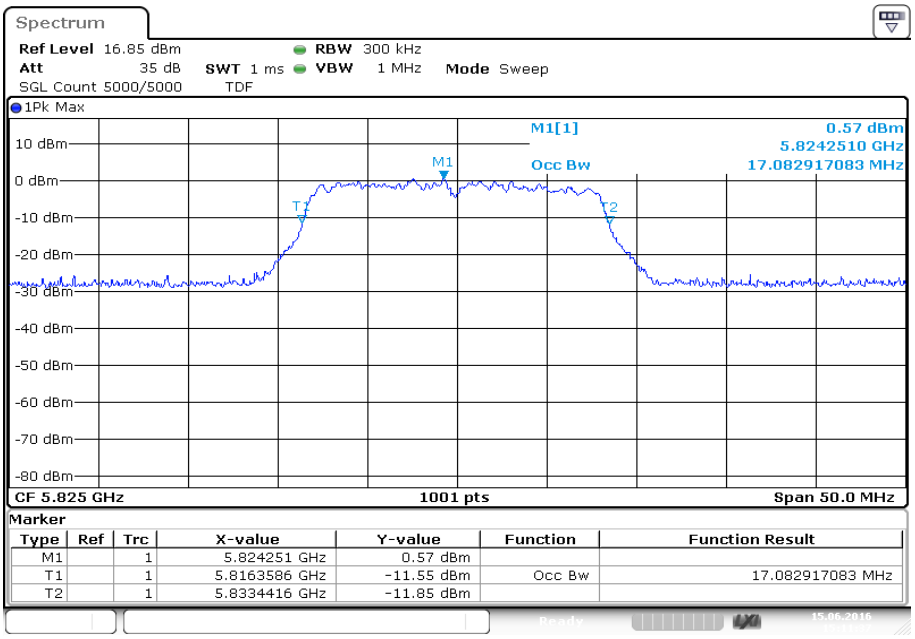


Date: 15.JUN.2016 14:45:16

Plot 7: 5785 MHz

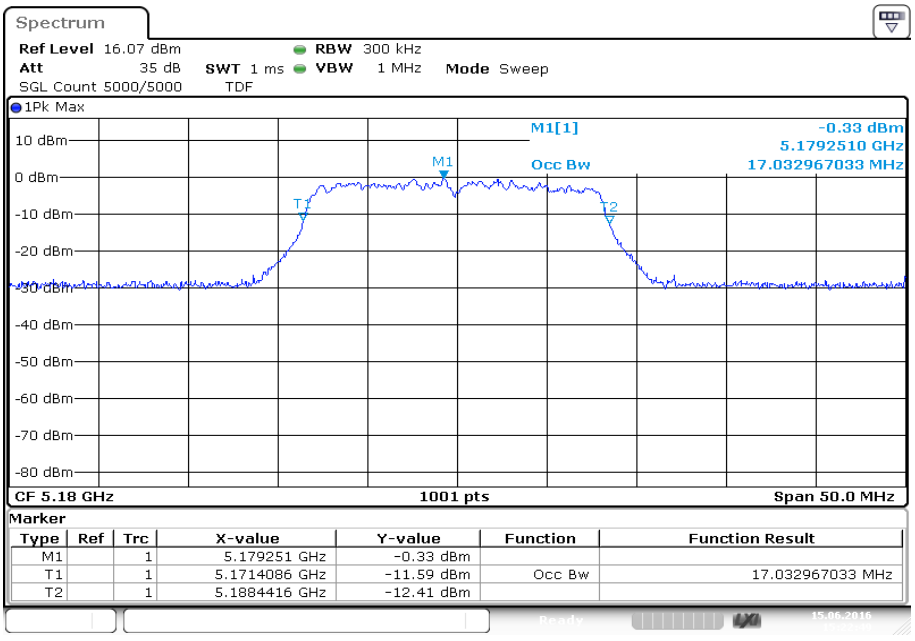


Plot 8: 5825 MHz



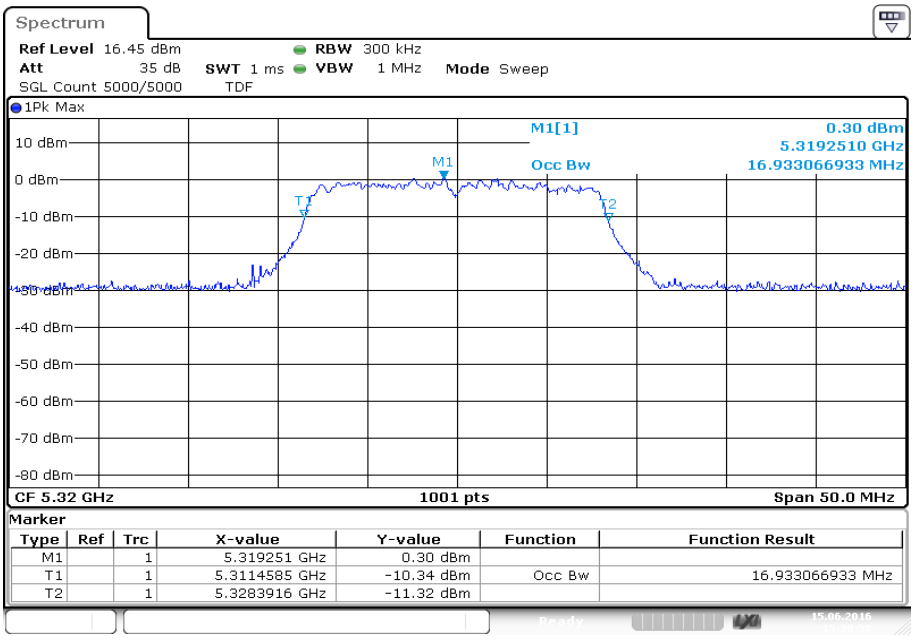
Plots: OFDM / ANT 2

Plot 1: 5180 MHz



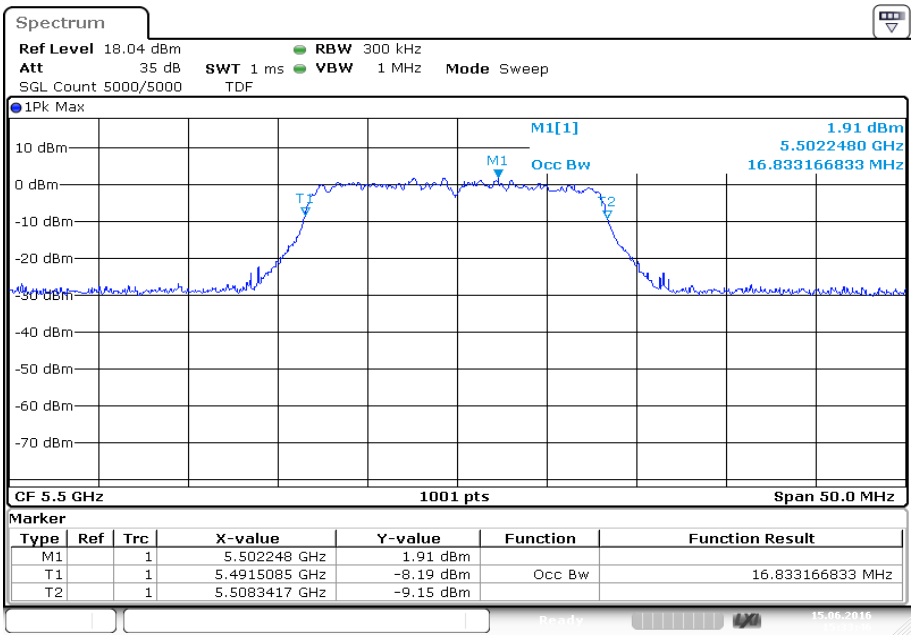
Date: 15.JUN.2016 15:22:49

Plot 2: 5320 MHz



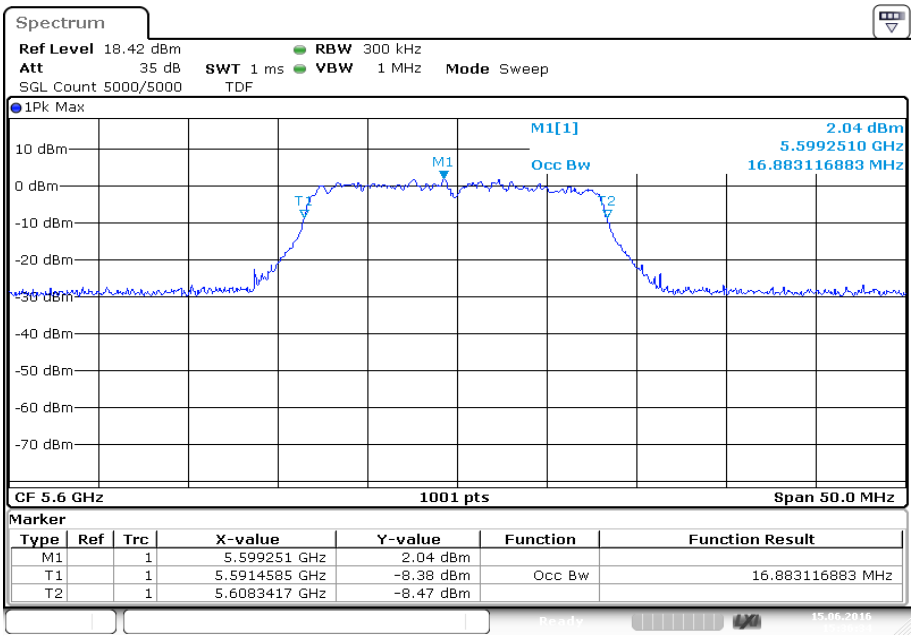
Date: 15.JUN.2016 15:30:59

Plot 3: 5500 MHz



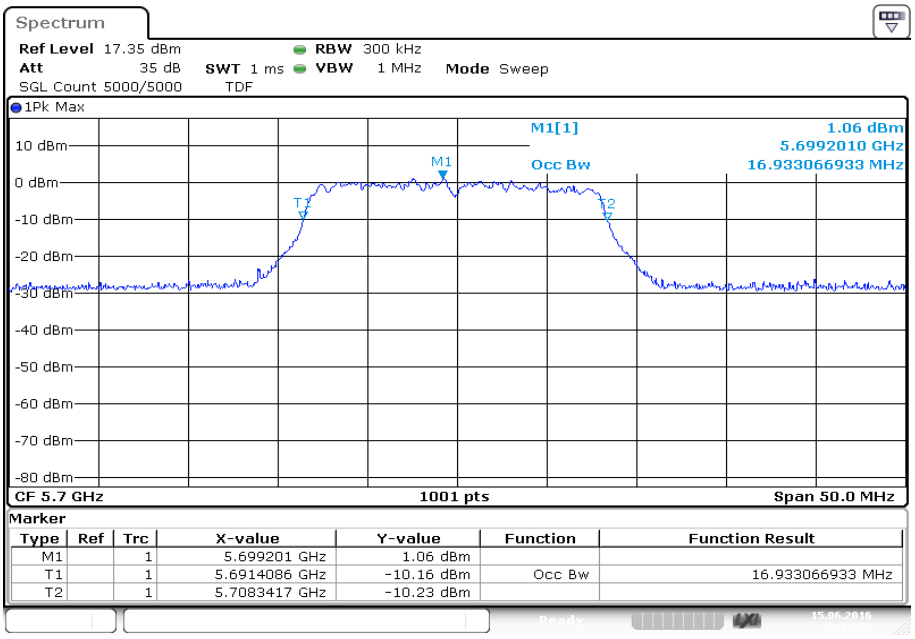
Date: 15.JUN.2016 15:33:46

Plot 4: 5600 MHz

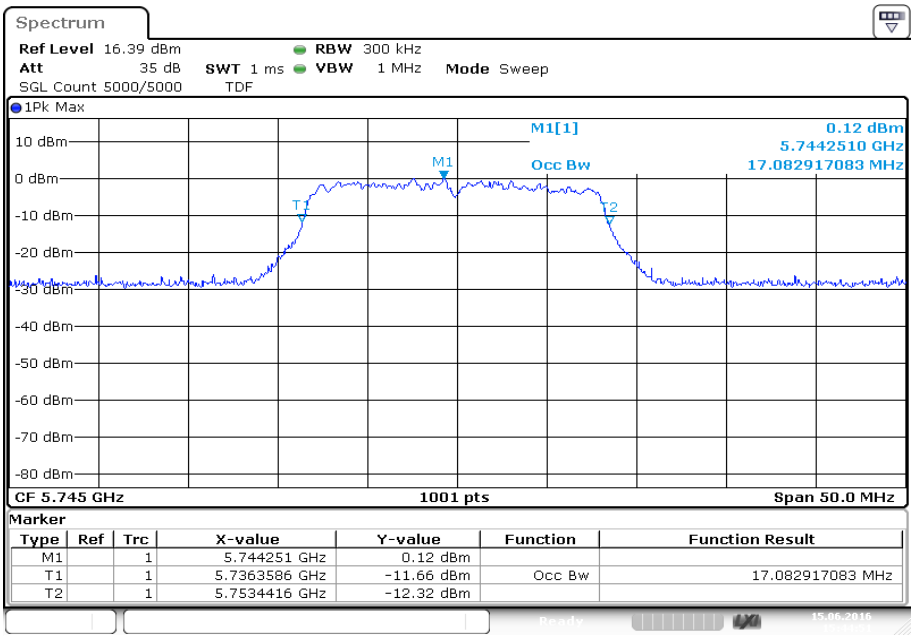


Date: 15.JUN.2016 15:36:34

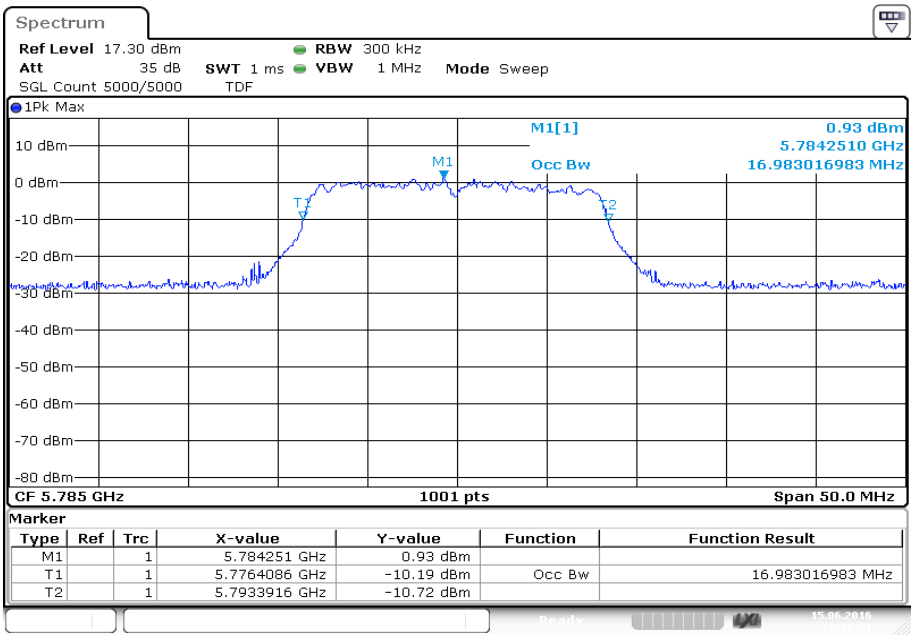
Plot 5: 5700 MHz



Plot 6: 5745 MHz

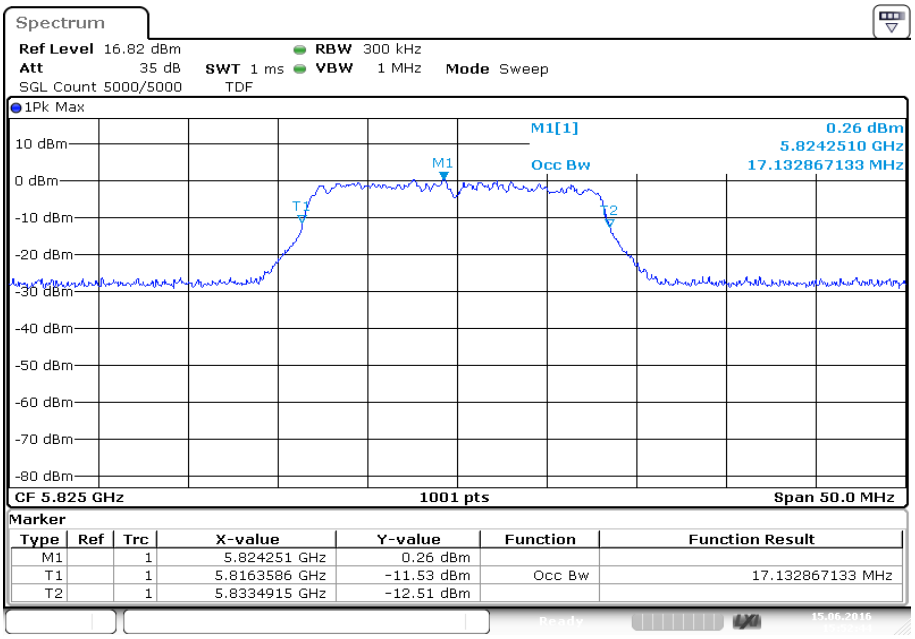


Plot 7: 5785 MHz



Date: 15.JUN.2016 15:48:02

Plot 8: 5825 MHz



Date: 15.JUN.2016 15:52:45

12.7 Band edge compliance radiated

Description:

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

Measurement:

Measurement parameter	
Detector:	Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	10 Hz / 1 MHz
Span:	See plots!
Trace-Mode:	Max Hold
Test setup:	See chapter 7.2 – A
Measurement uncertainty:	See chapter 9

Limits:

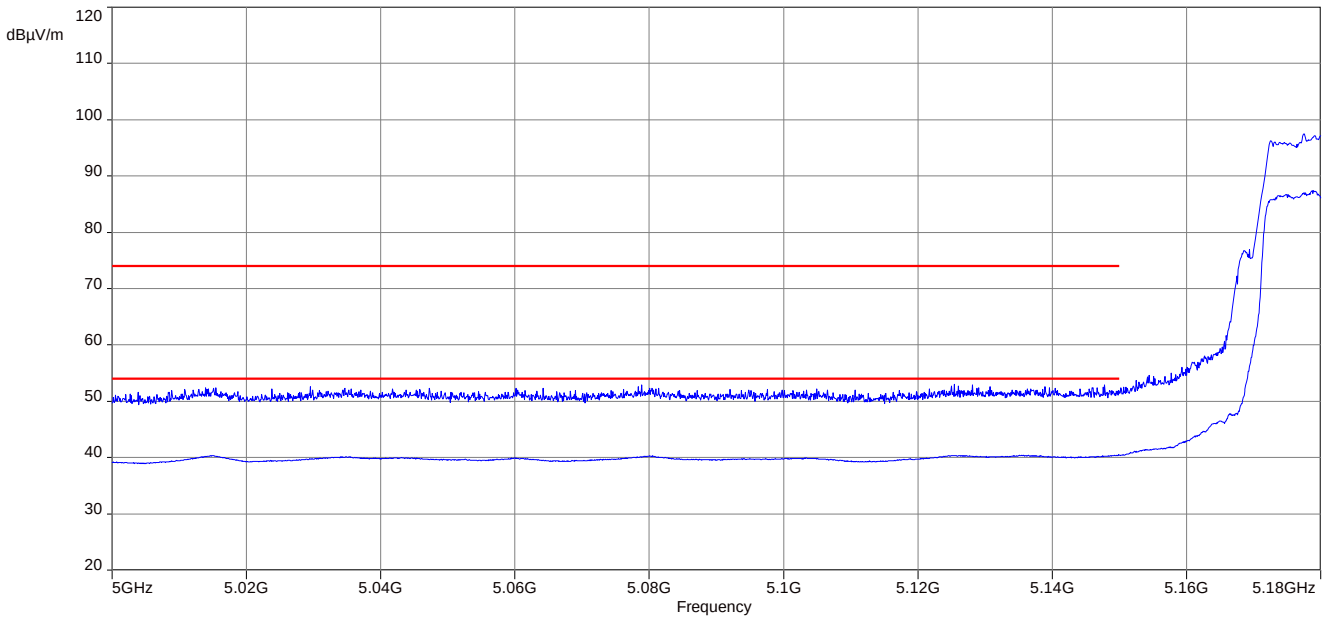
Band Edge Compliance Radiated
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within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

Result:

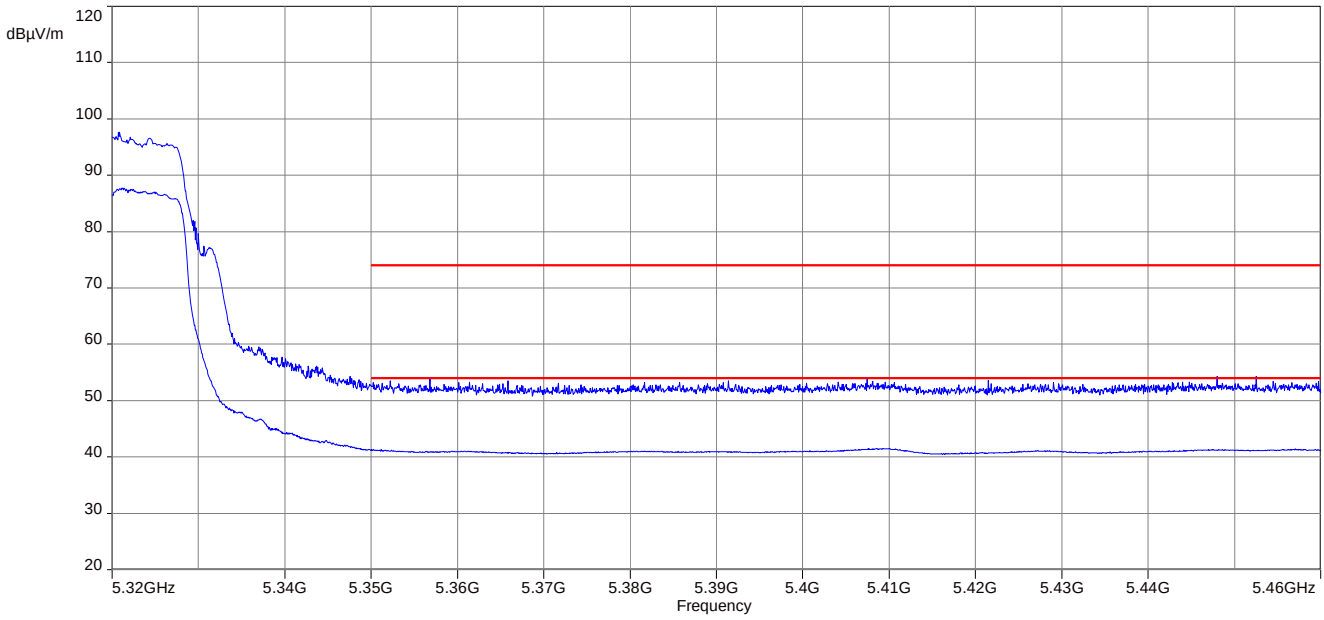
Scenario	Band Edge Compliance Radiated [dBµV/m]
band edge	< 74 dBµV/m (Peak) < 54 dBµV/m (AVG)

Plots:

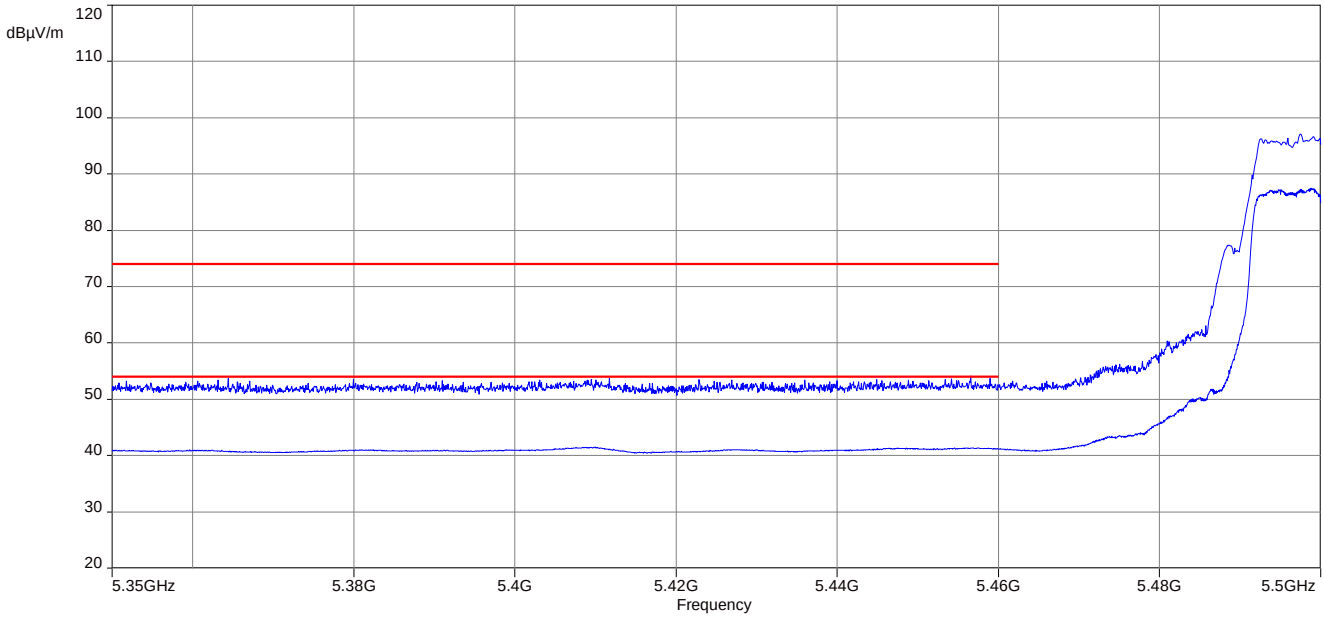
Plot 1: lower band edge, vertical & horizontal polarization (ANT1), channel 36



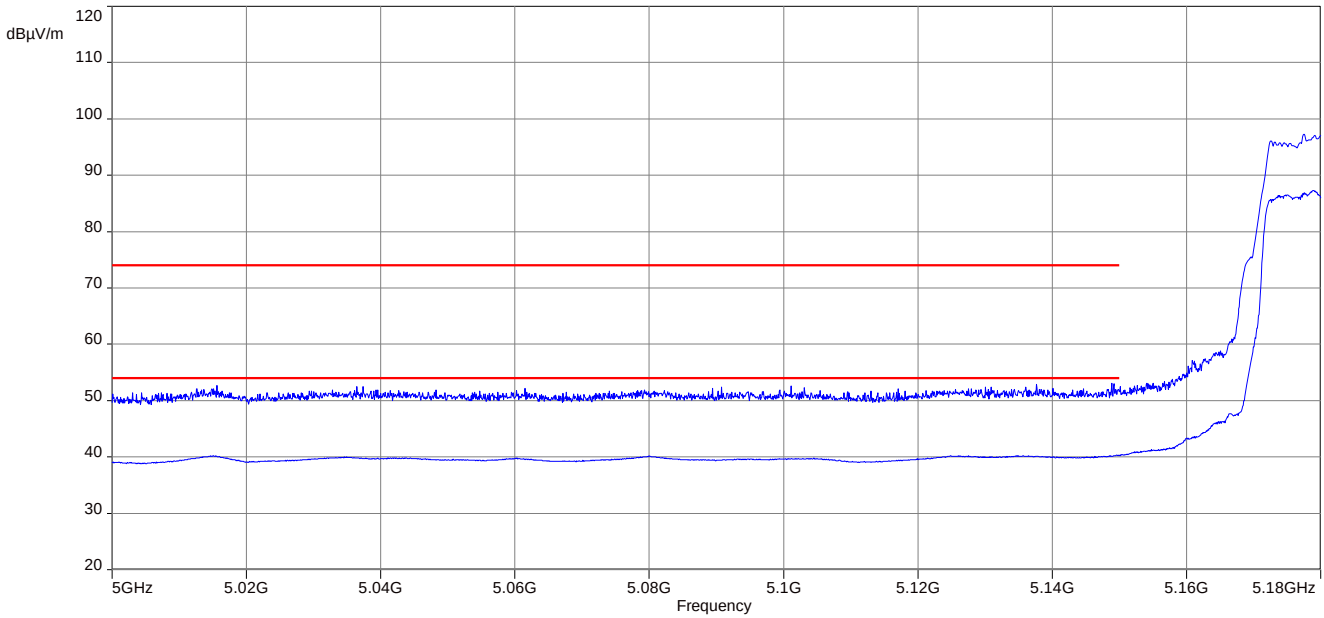
Plot 2: upper band edge, vertical & horizontal polarization (ANT1), channel 64



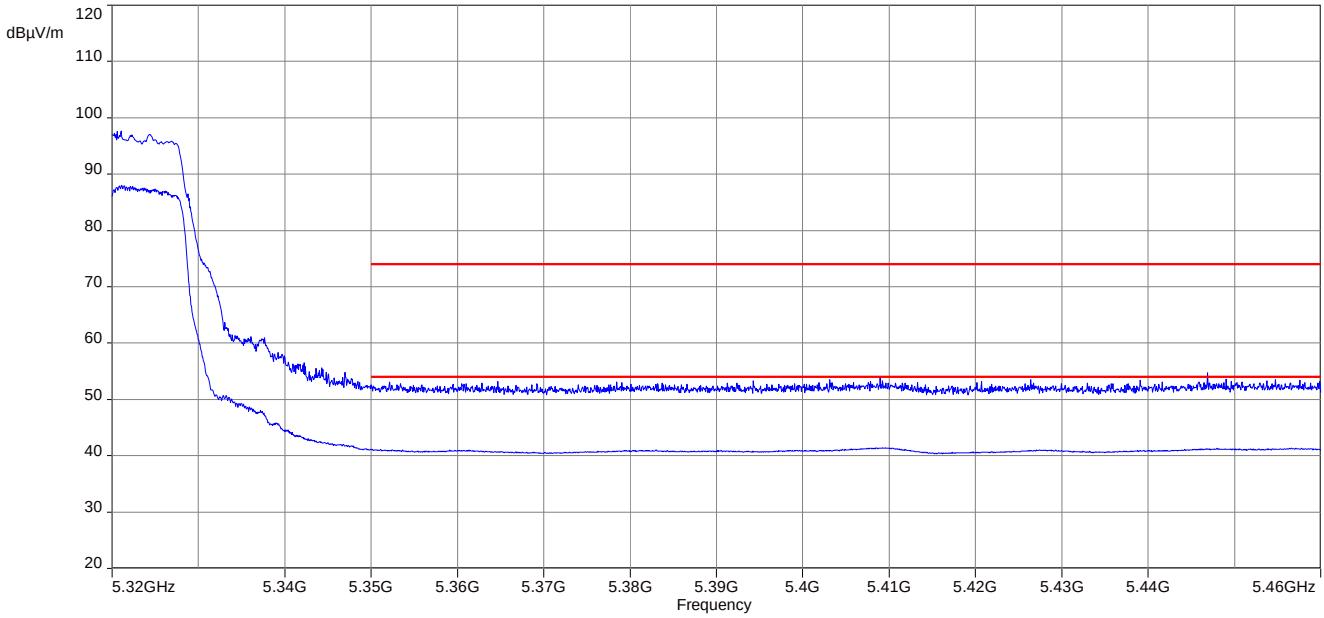
Plot 3: lower band edge, vertical & horizontal polarization (ANT1), channel 100



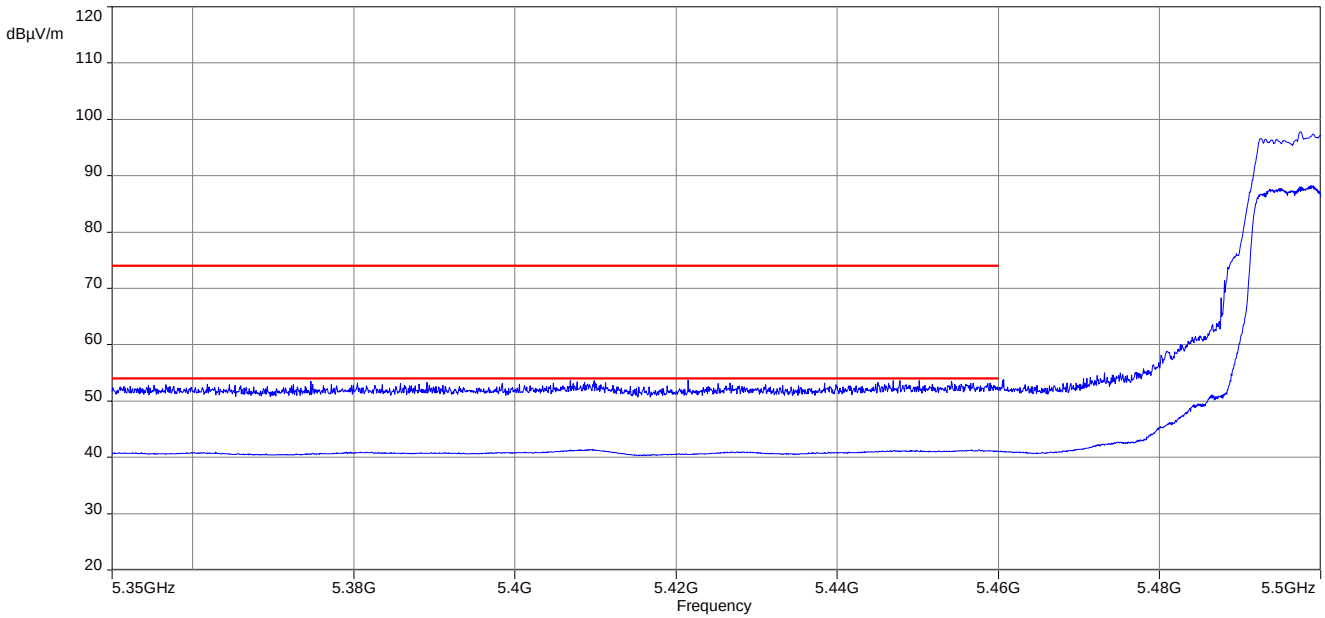
Plot 4: lower band edge, vertical & horizontal polarization (ANT2), channel 36



Plot 5: upper band edge, vertical & horizontal polarization (ANT2), channel 64



Plot 6: lower band edge, vertical & horizontal polarization (ANT2), channel 100



12.8 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at lowest, middle and highest channel.

Measurement:

Measurement parameter	
Detector:	Quasi Peak below 1 GHz (alternative Peak) Peak above 1 GHz / RMS
Sweep time:	Auto
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Video bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: ≥ 3 MHz / 1 MHz
Span:	30 MHz to 40 GHz
Trace-Mode:	Max Hold / Average with 100 counts + 20 log (1 / X) for duty cycle lower than 100 %
Test setup:	See chapter 7.1 – A, 7.2 – A, 7.3 - A
Measurement uncertainty:	See chapter 9

Limits:

TX Spurious Emissions Radiated		
§15.209		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3
§15.407		
Outside the restricted bands!	-27 dBm / MHz	

Results: OFDM / ANT 1

TX Spurious Emissions Radiated [dBµV/m] / dBm								
OFDM ANT 1								
Lowest 5180 MHz			-/-			Highest 5320 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.		

TX Spurious Emissions Radiated [dBµV/m] / dBm								
OFDM ANT 1								
Lowest 5500 MHz			Middle 5600 MHz			Highest 5700 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.		

TX Spurious Emissions Radiated [dBµV/m] / dBm								
OFDM ANT 1								
Lowest 5745 MHz			Middle 5785 MHz			Highest 5825 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.		

Results: OFDM / ANT 2

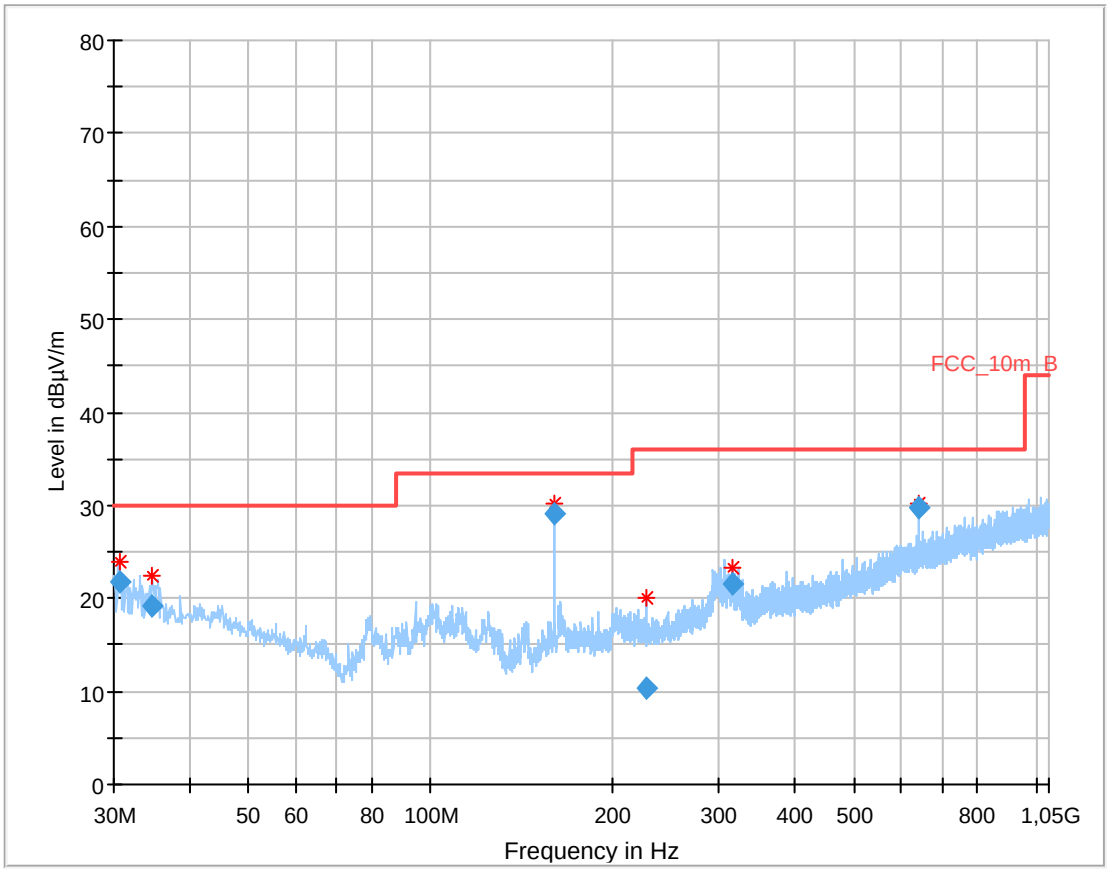
TX Spurious Emissions Radiated [dBµV/m] / dBm								
OFDM ANT 2								
Lowest 5180 MHz			-/-			Highest 5320 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.		

TX Spurious Emissions Radiated [dBµV/m] / dBm								
OFDM ANT 2								
Lowest 5500 MHz			Middle 5600 MHz			Highest 5700 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.		

TX Spurious Emissions Radiated [dBµV/m] / dBm								
OFDM ANT 2								
Lowest 5745 MHz			Middle 5785 MHz			Highest 5825 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.			All detected emissions are more than 10 dB below the limit.		

Plots: OFDM / ANT 1

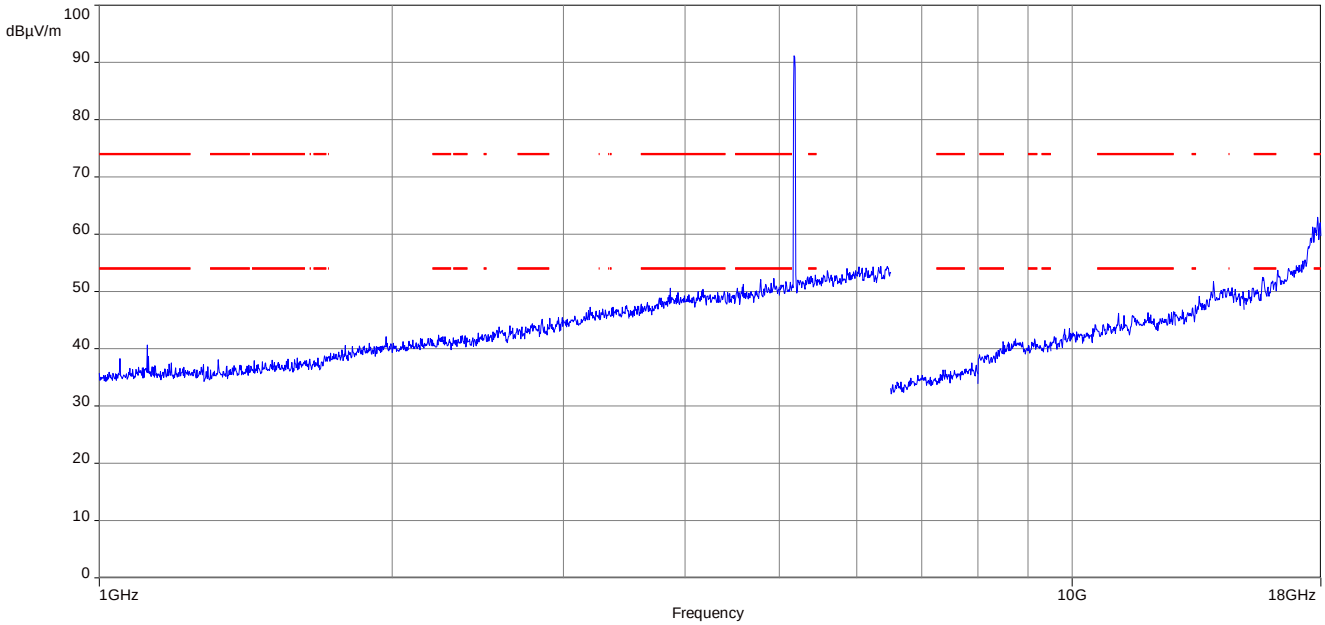
Plot 1: 30 MHz to 1 GHz, 5180 MHz, vertical & horizontal polarization



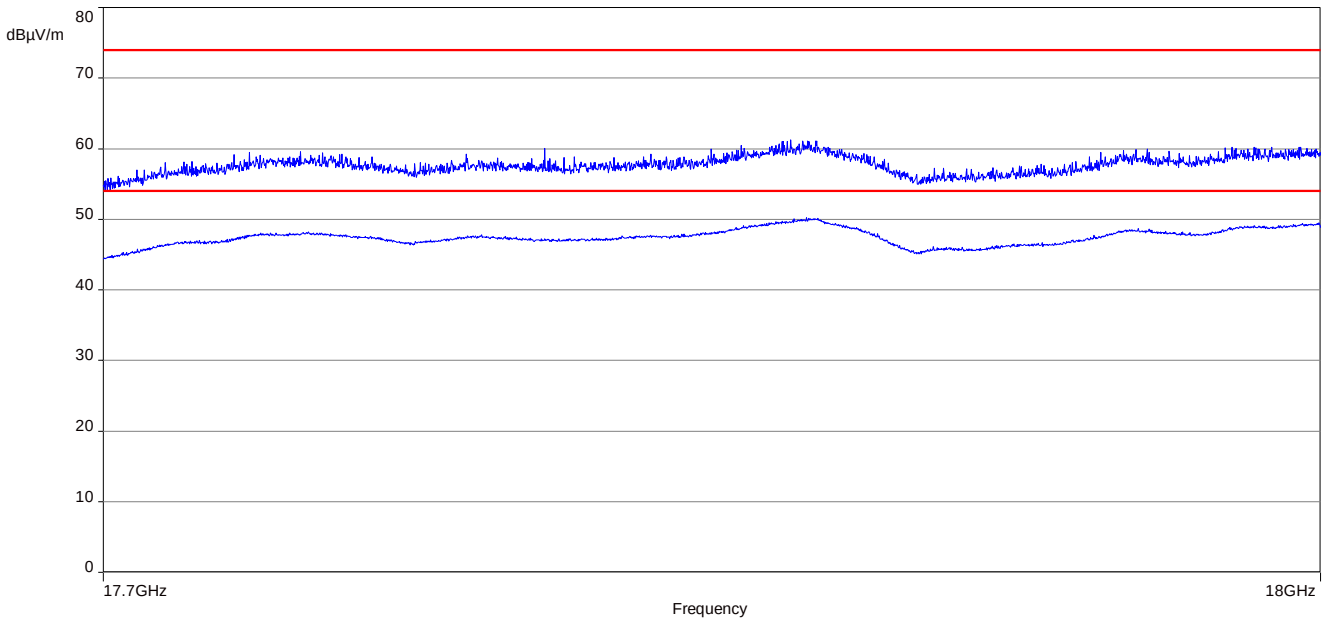
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.611332	21.74	30.00	8.26	1000.0	120.000	101.0	V	314.0	13.4
34.675950	19.24	30.00	10.76	1000.0	120.000	185.0	V	337.0	13.8
160.006800	29.19	33.50	4.31	1000.0	120.000	98.0	V	240.0	9.1
227.151150	10.44	36.00	25.56	1000.0	120.000	101.0	V	16.0	12.6
316.143450	21.56	36.00	14.44	1000.0	120.000	185.0	H	53.0	15.0
639.999450	29.80	36.00	6.20	1000.0	120.000	179.0	H	289.0	21.0

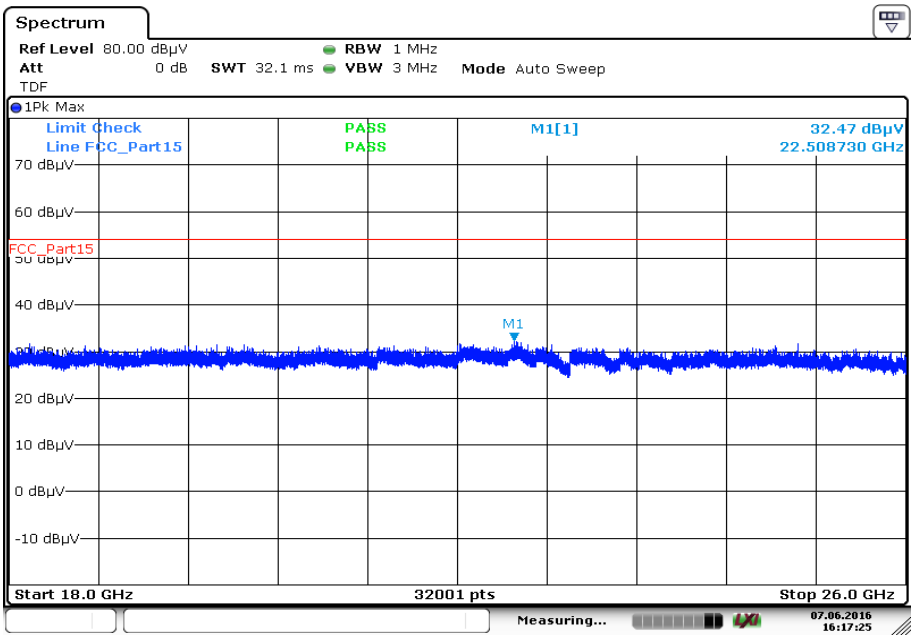
Plot 2: 1 GHz to 18 GHz, 5180 MHz, vertical & horizontal polarization



Plot 3: 17.7 GHz to 18 GHz, 5180 MHz, zoomed

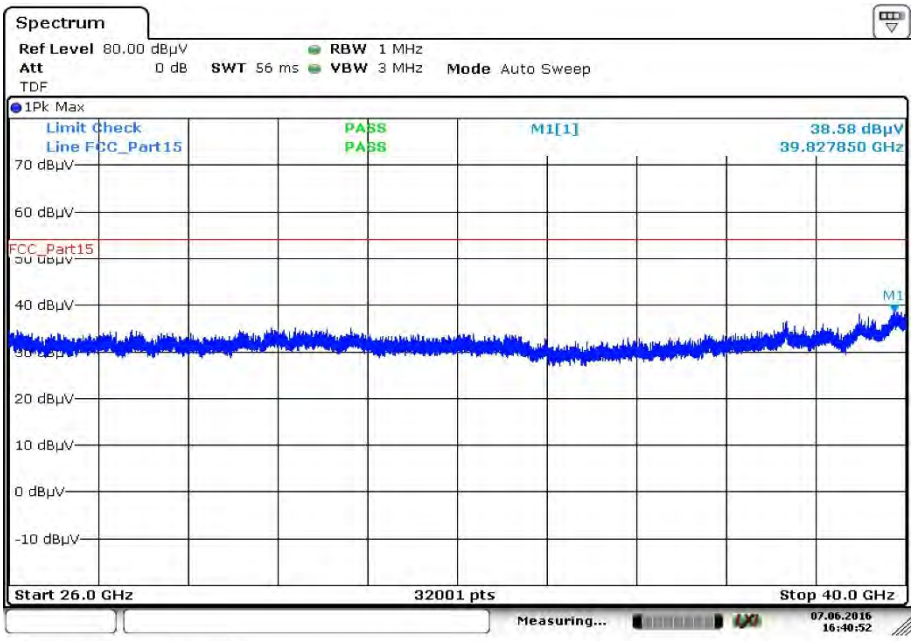


Plot 4: 18 GHz to 26 GHz, 5180 MHz, vertical & horizontal polarization



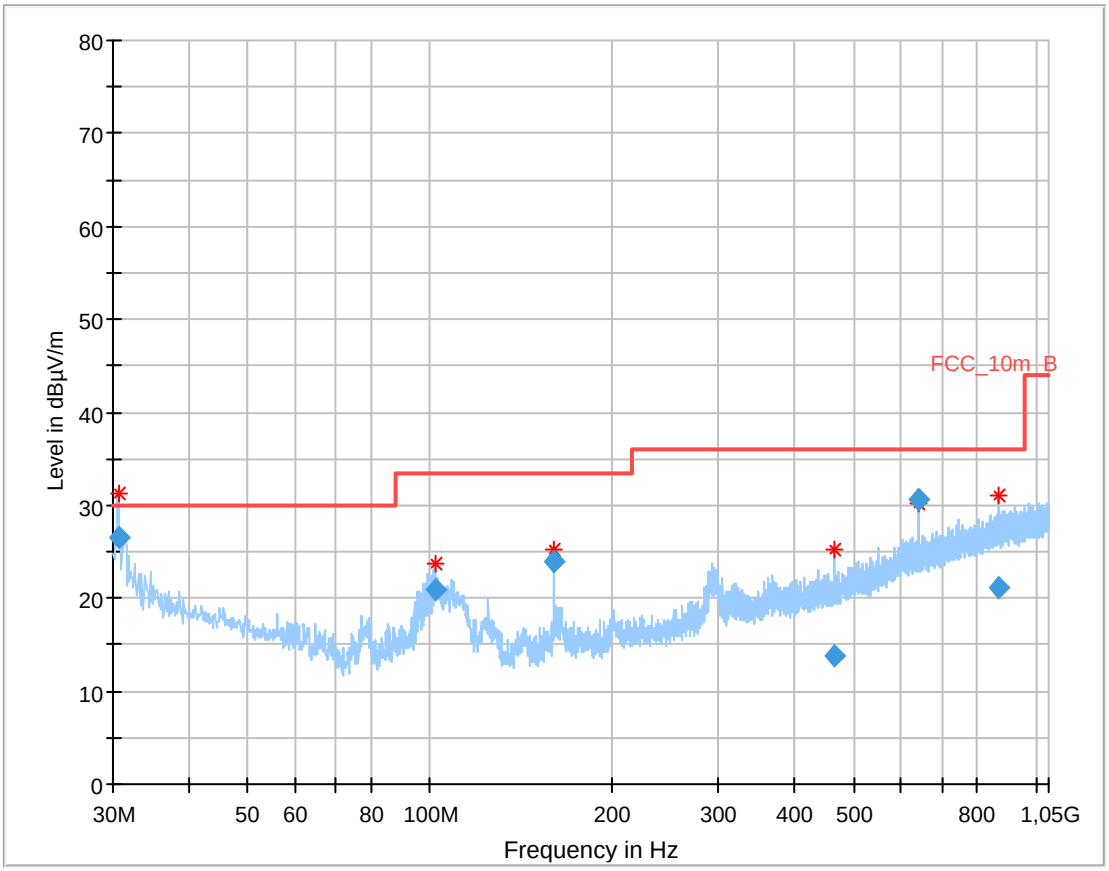
Date: 7.JUN.2016 16:17:25

Plot 5: 26 GHz to 40 GHz, 5180 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:40:52

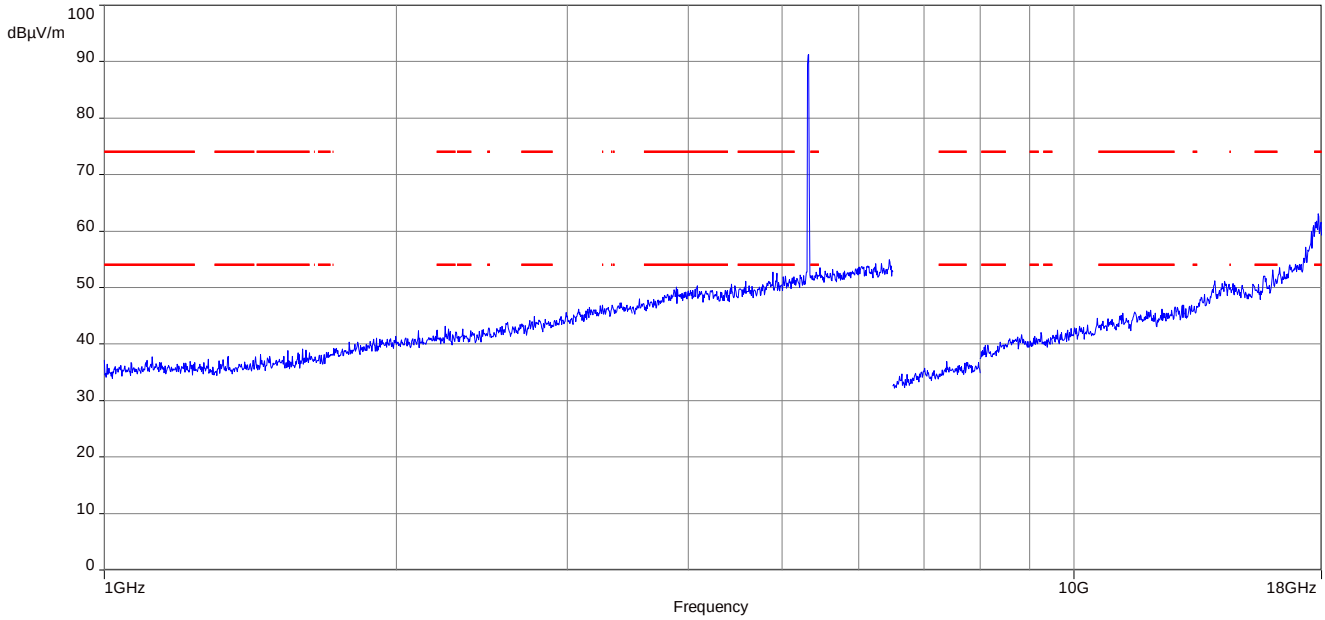
Plot 6: 30 MHz to 1 GHz, 5320 MHz, vertical & horizontal polarization



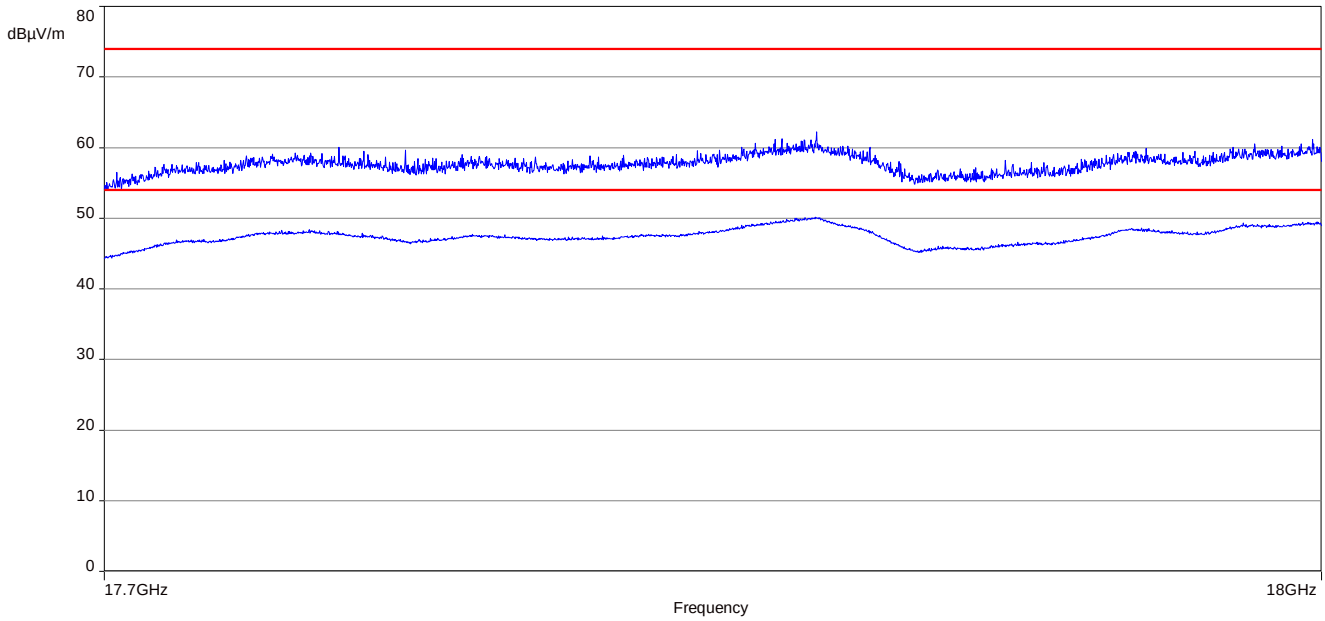
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.598984	26.50	30.00	3.50	1000.0	120.000	179.0	V	272.0	13.4
101.889900	20.89	33.50	12.61	1000.0	120.000	98.0	V	272.0	12.0
160.015650	24.00	33.50	9.50	1000.0	120.000	98.0	V	183.0	9.1
465.033750	13.82	36.00	22.18	1000.0	120.000	101.0	V	87.0	17.9
639.991950	30.72	36.00	5.28	1000.0	120.000	185.0	V	260.0	21.0
869.709450	21.10	36.00	14.90	1000.0	120.000	101.0	V	114.0	23.7

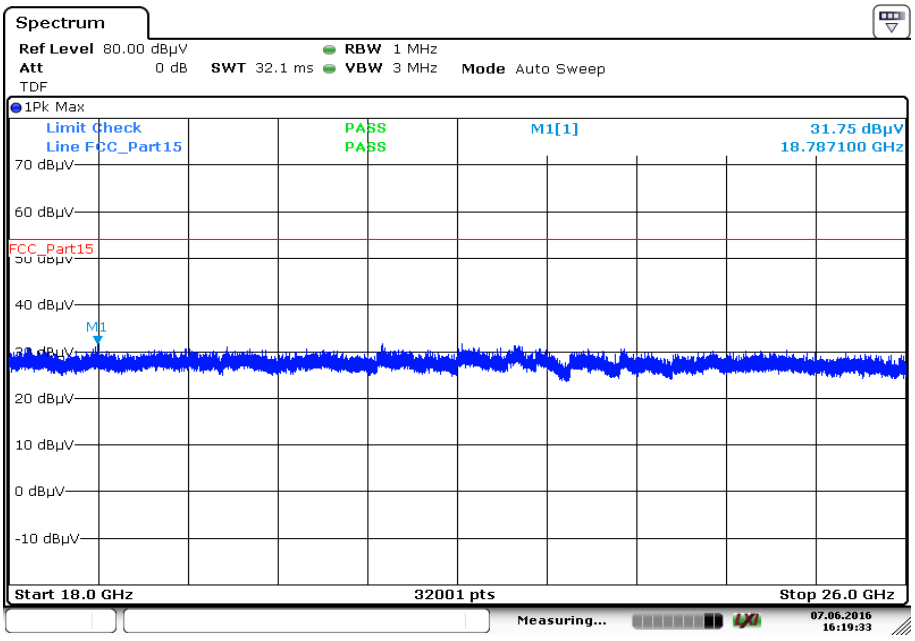
Plot 7: 1 GHz to 18 GHz, 5320 MHz, vertical & horizontal polarization



Plot 8: 17.7 GHz to 18 GHz, 5320 MHz, zoomed

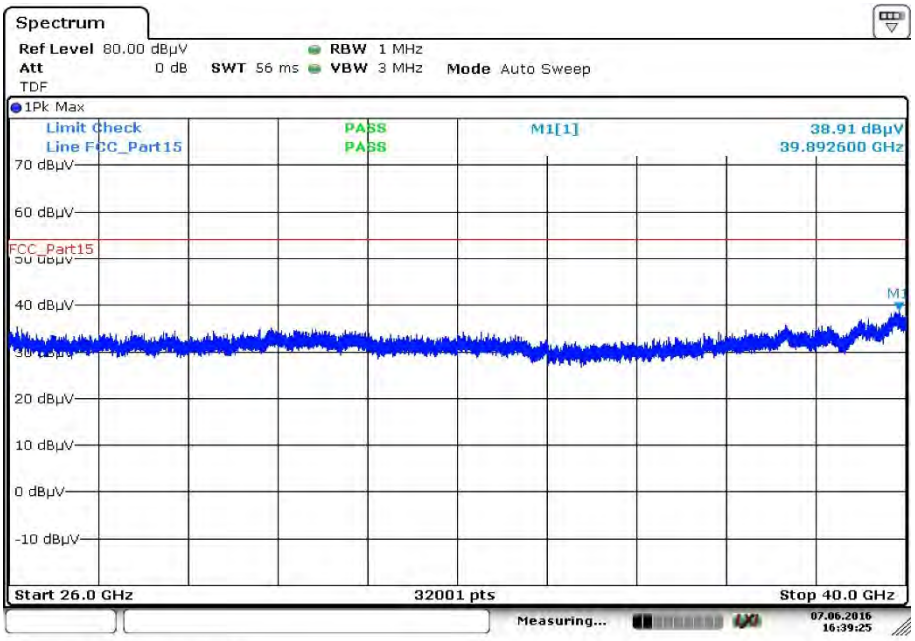


Plot 9: 18 GHz to 26 GHz, 5320 MHz, vertical & horizontal polarization



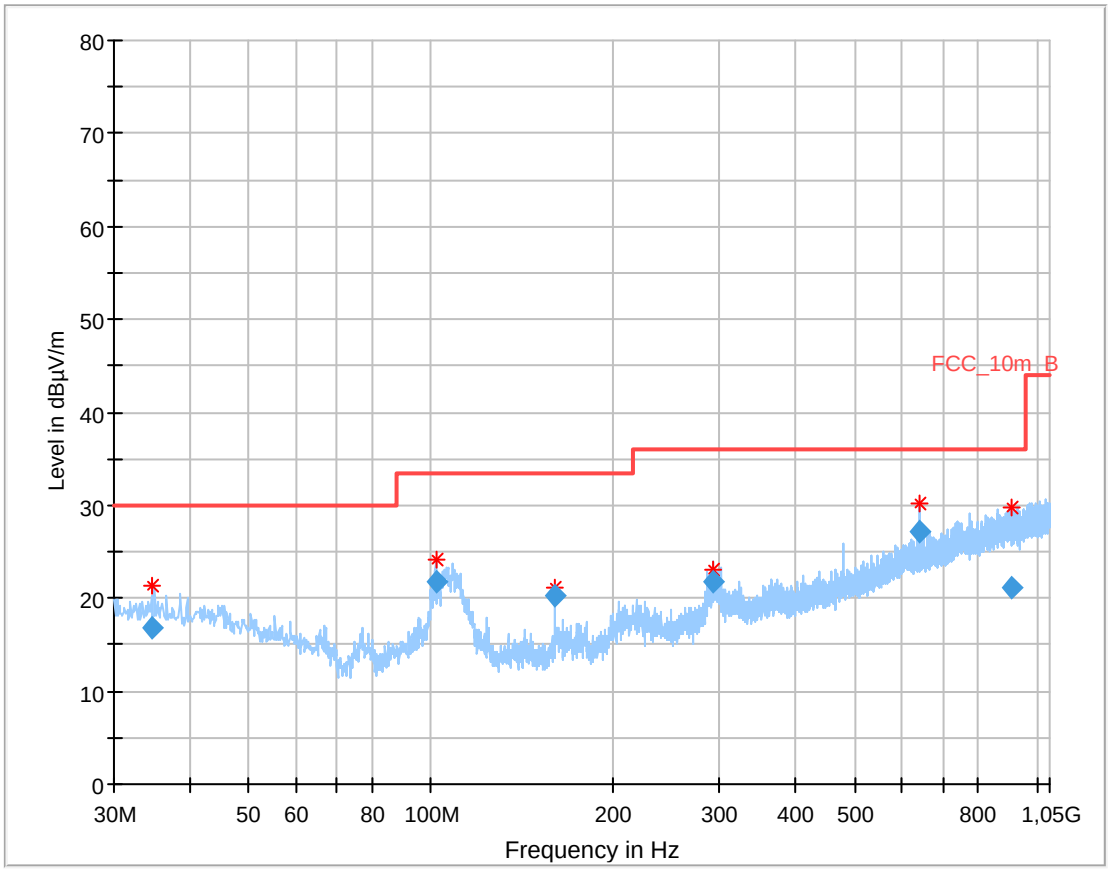
Date: 7.JUN.2016 16:19:33

Plot 10: 26 GHz to 40 GHz, 5320 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:39:26

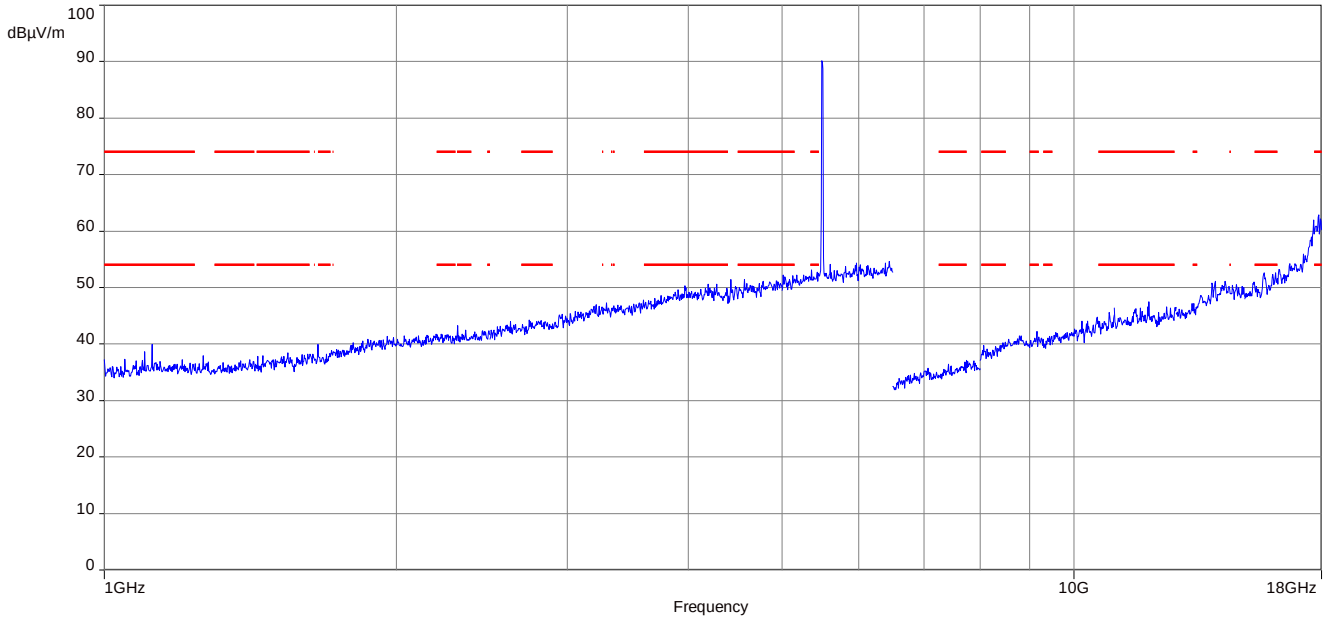
Plot 11: 30 MHz to 1 GHz, 5500 MHz, vertical & horizontal polarization



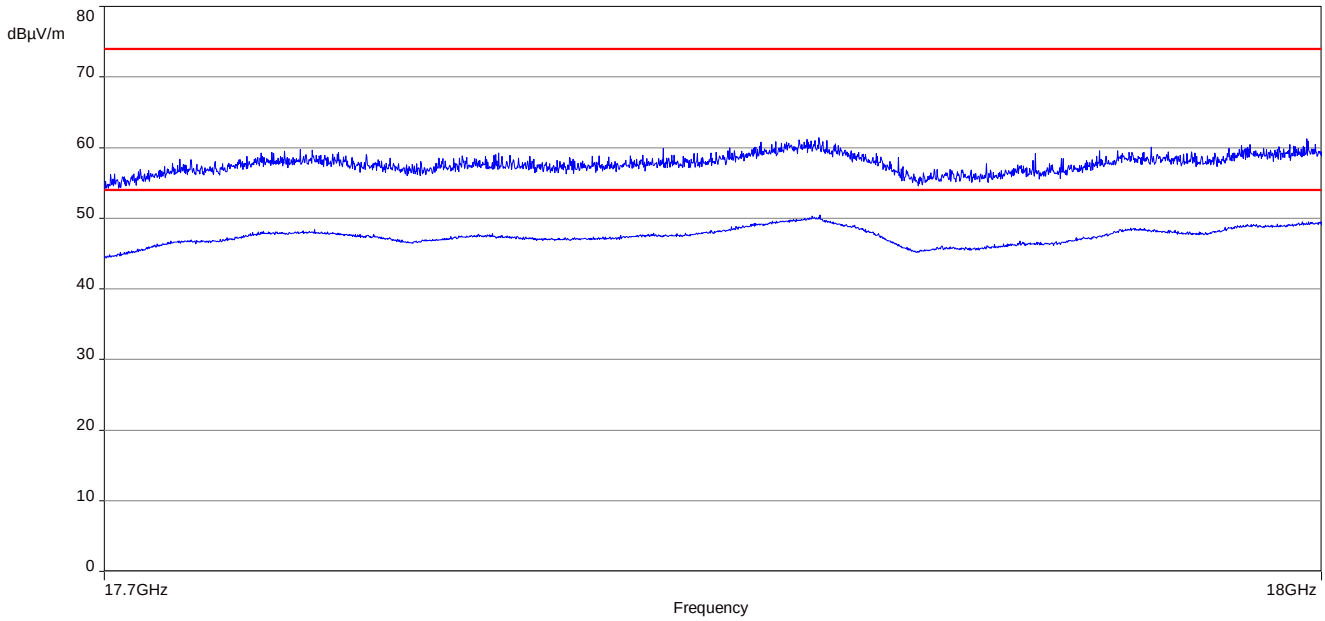
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.648800	16.87	30.00	13.13	1000.0	120.000	101.0	V	28.0	13.8
101.871000	21.77	33.50	11.73	1000.0	120.000	98.0	V	178.0	12.0
159.985800	20.27	33.50	13.23	1000.0	120.000	98.0	V	225.0	9.1
293.097150	21.80	36.00	14.20	1000.0	120.000	98.0	V	202.0	14.3
639.994350	27.17	36.00	8.83	1000.0	120.000	101.0	H	297.0	21.0
905.599350	21.03	36.00	14.97	1000.0	120.000	98.0	V	194.0	24.1

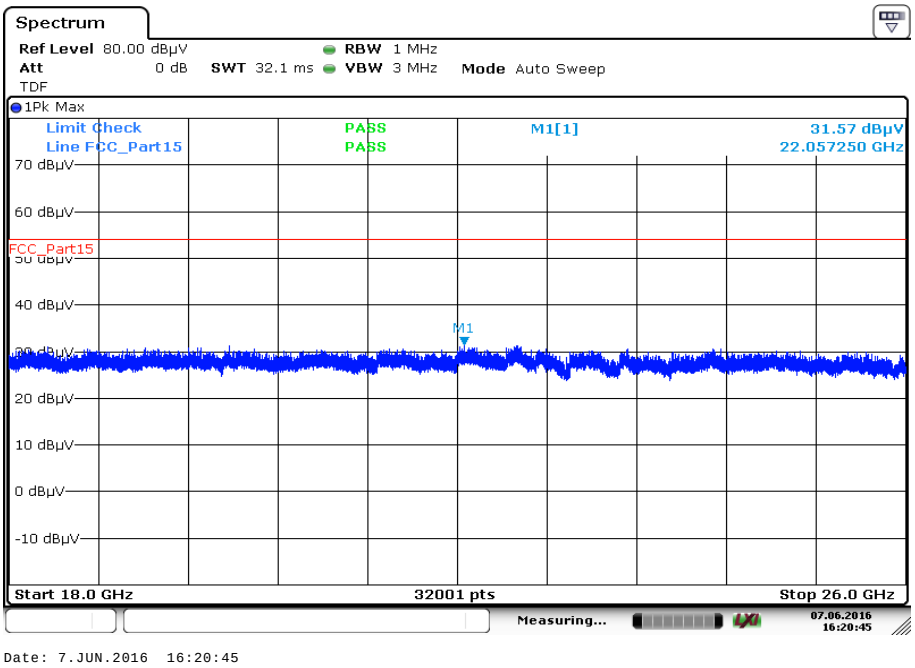
Plot 12: 1 GHz to 18 GHz, 5500 MHz, vertical & horizontal polarization



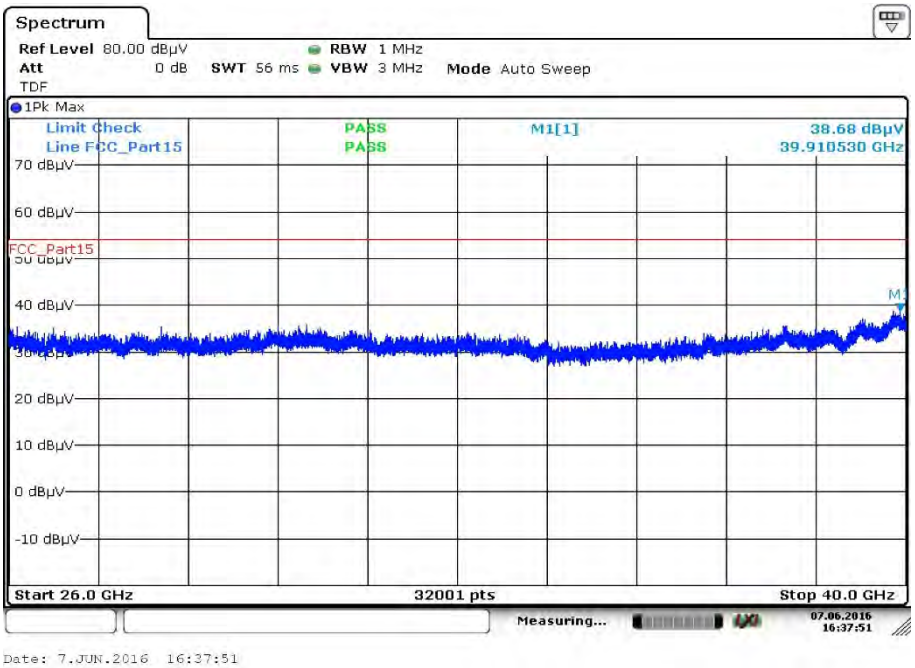
Plot 13: 17.7 GHz to 18 GHz, 5500 MHz, zoomed



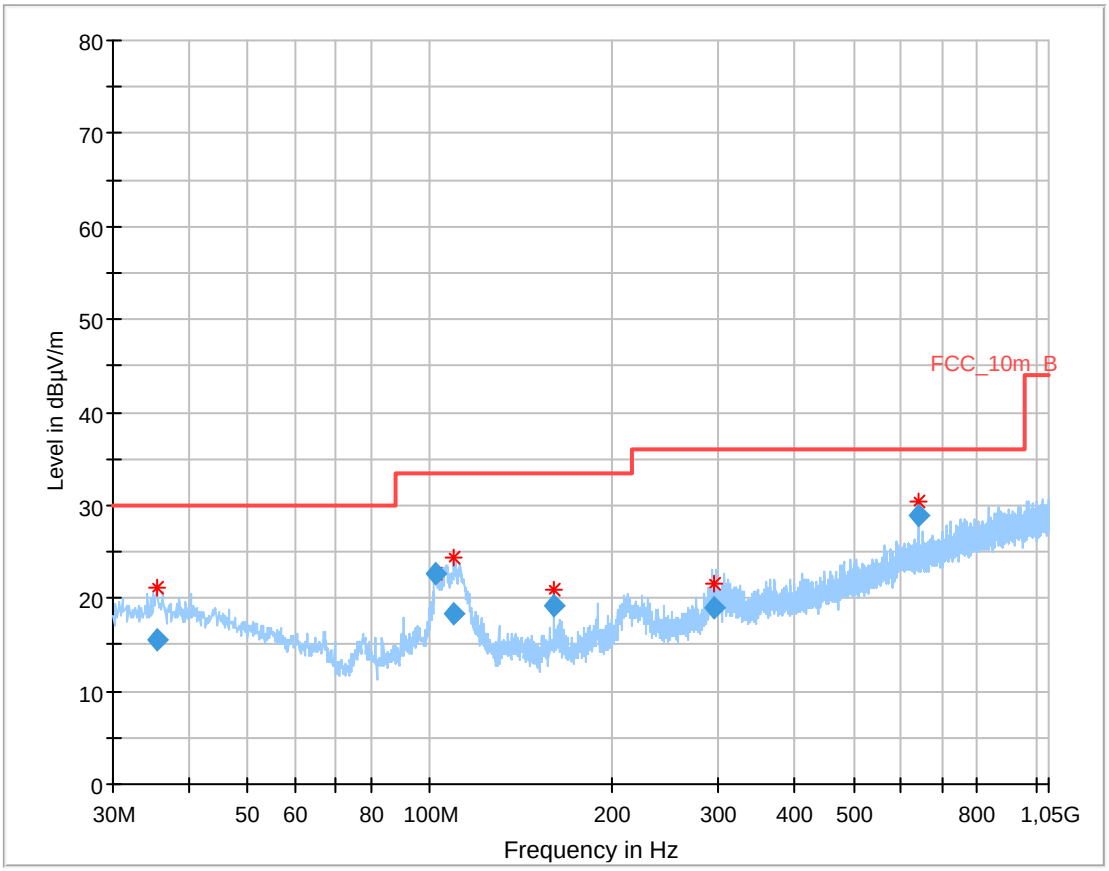
Plot 14: 18 GHz to 26 GHz, 5500 MHz, vertical & horizontal polarization



Plot 15: 26 GHz to 40 GHz, 5500 MHz, vertical & horizontal polarization



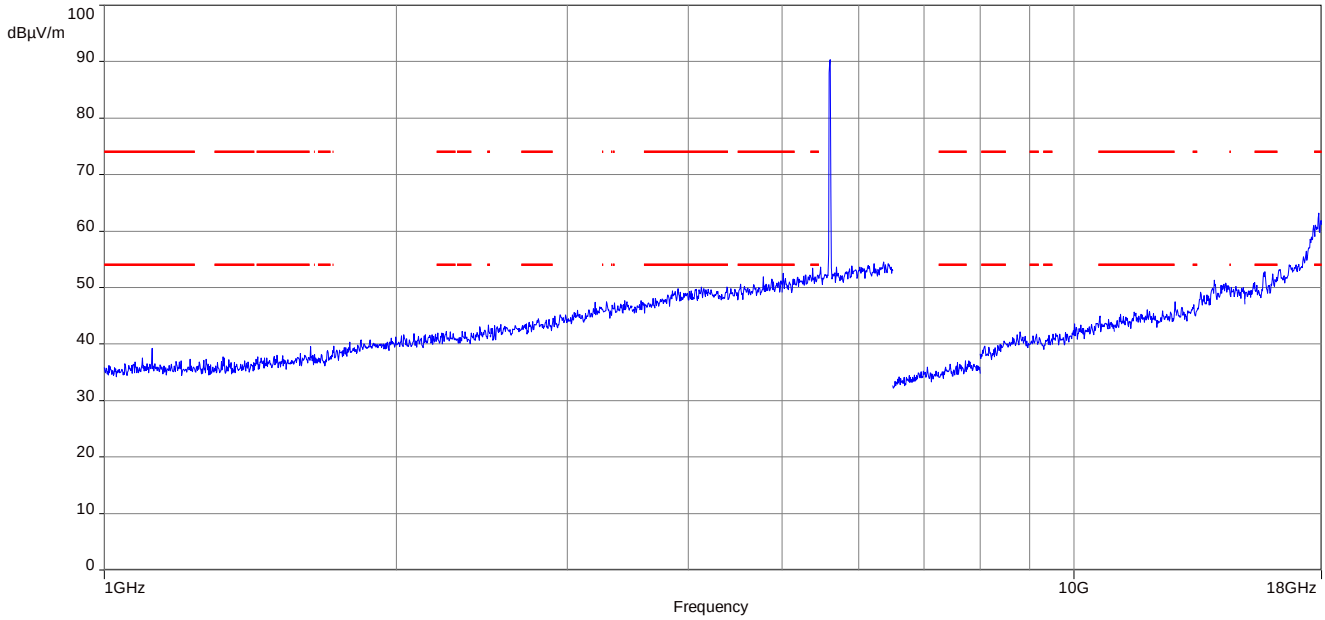
Plot 16: 30 MHz to 1 GHz, 5600 MHz, vertical & horizontal polarization



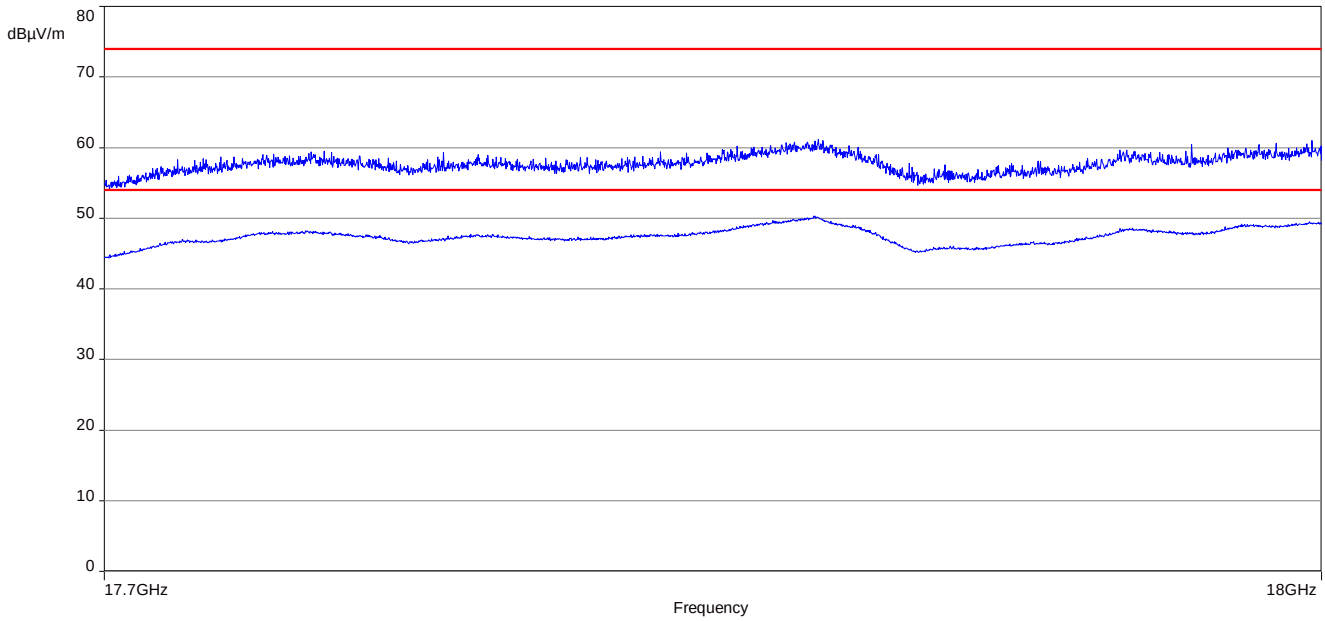
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.410500	15.52	30.00	14.48	1000.0	120.000	179.0	V	137.0	13.8
101.919600	22.65	33.50	10.85	1000.0	120.000	98.0	V	15.0	12.0
109.690350	18.32	33.50	15.18	1000.0	120.000	98.0	V	344.0	11.2
159.971550	19.17	33.50	14.33	1000.0	120.000	98.0	V	244.0	9.1
294.710700	18.96	36.00	17.04	1000.0	120.000	185.0	H	73.0	14.3
639.975600	28.84	36.00	7.16	1000.0	120.000	179.0	H	27.0	21.0

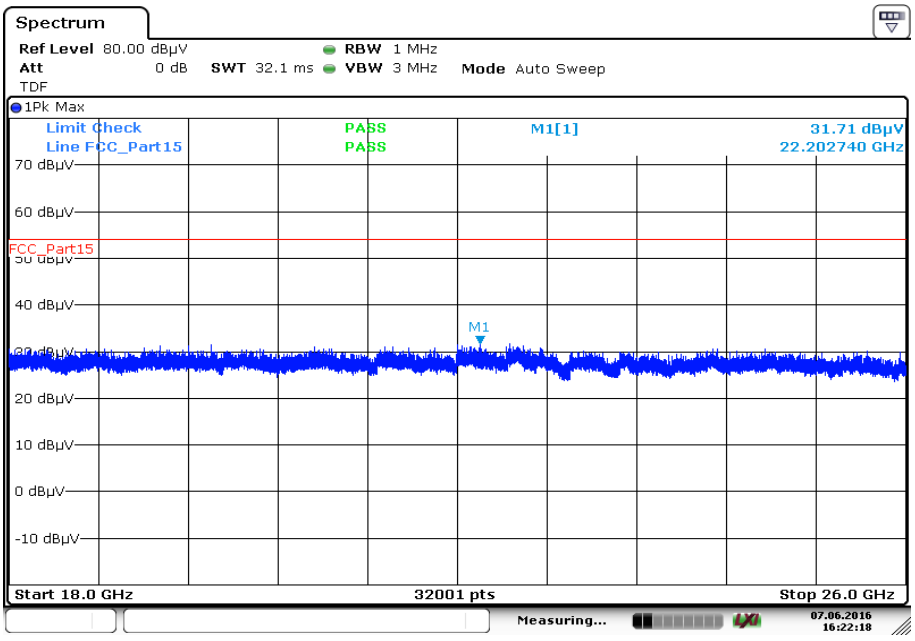
Plot 17: 1 GHz to 18 GHz, 5600 MHz, vertical & horizontal polarization



Plot 18: 17.7 GHz to 18 GHz, 5600 MHz, zoomed



Plot 19: 18 GHz to 26 GHz, 5600 MHz, vertical & horizontal polarization



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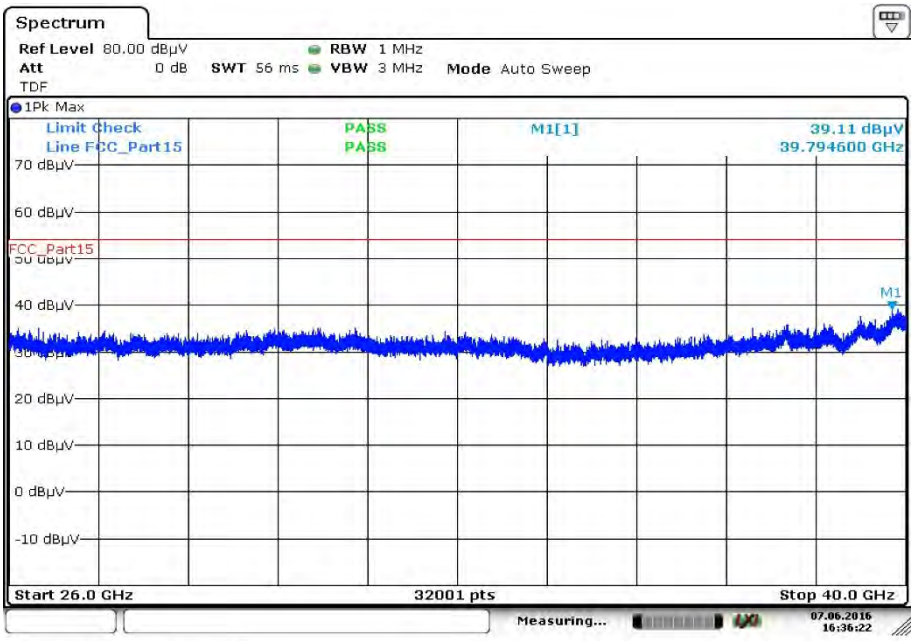
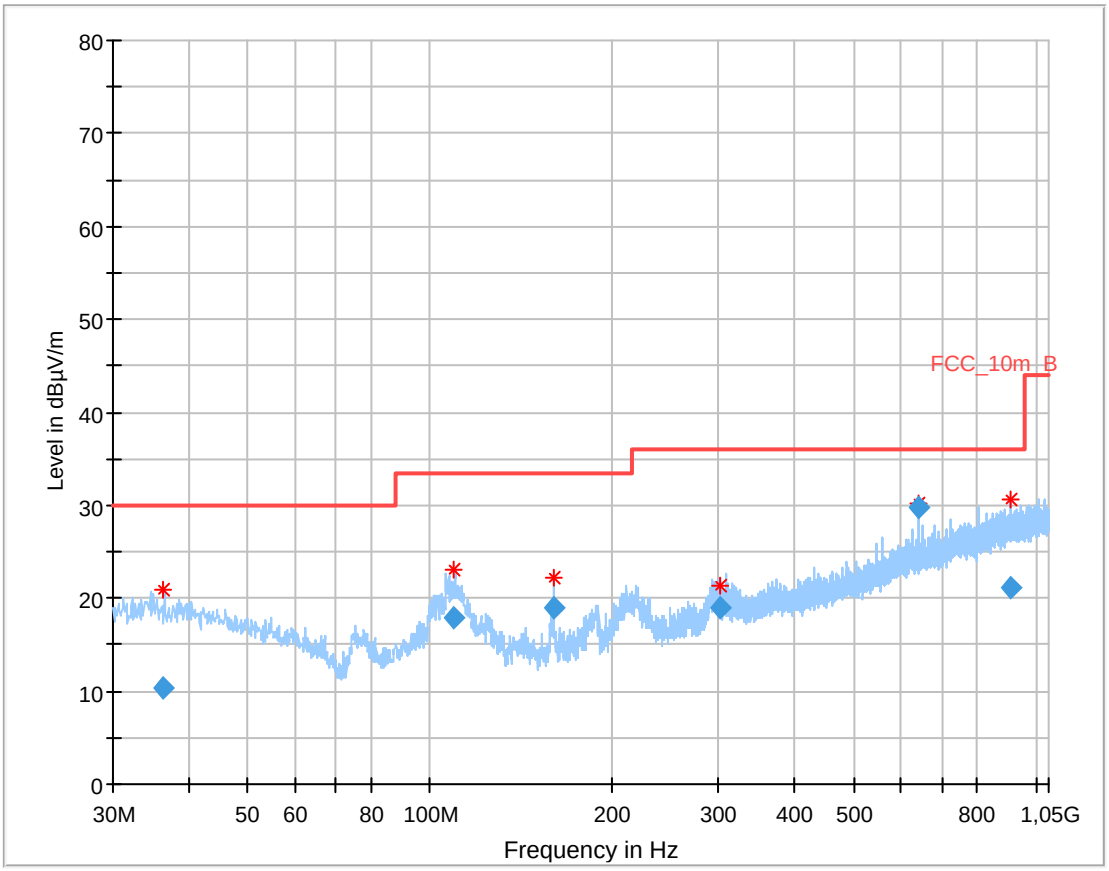
Plot 20: 26 GHz to 40 GHz, 5600 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:36:23

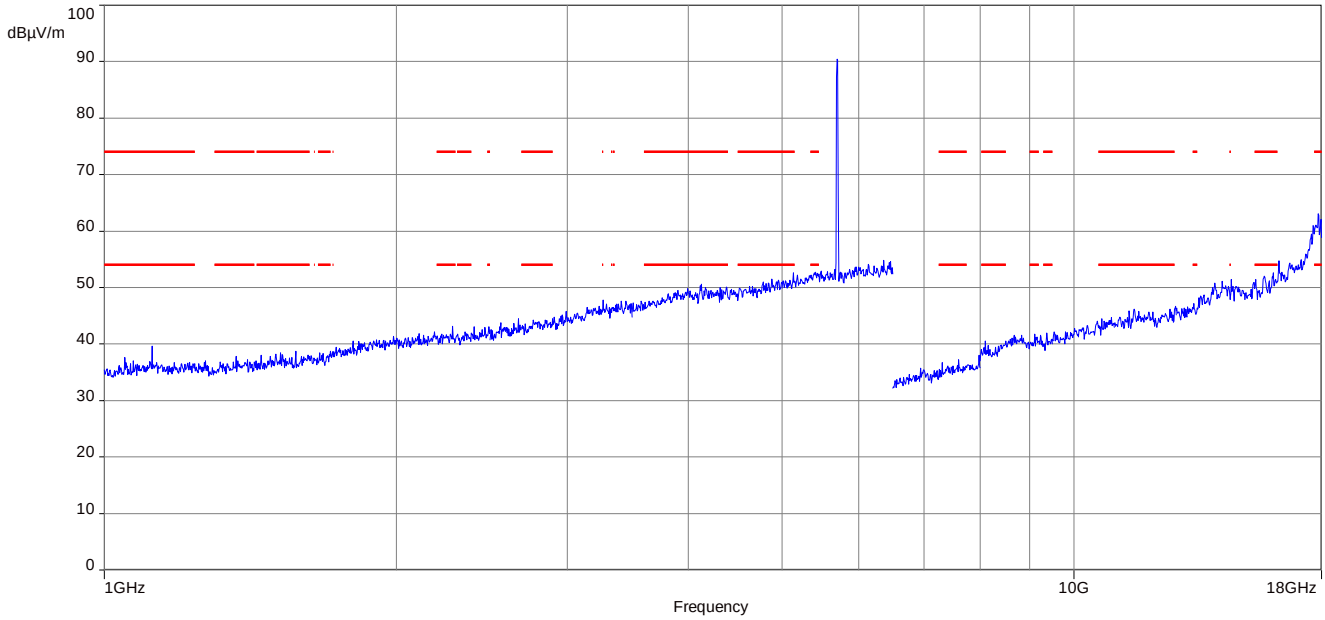
Plot 21: 30 MHz to 1 GHz, 5700 MHz, vertical & horizontal polarization



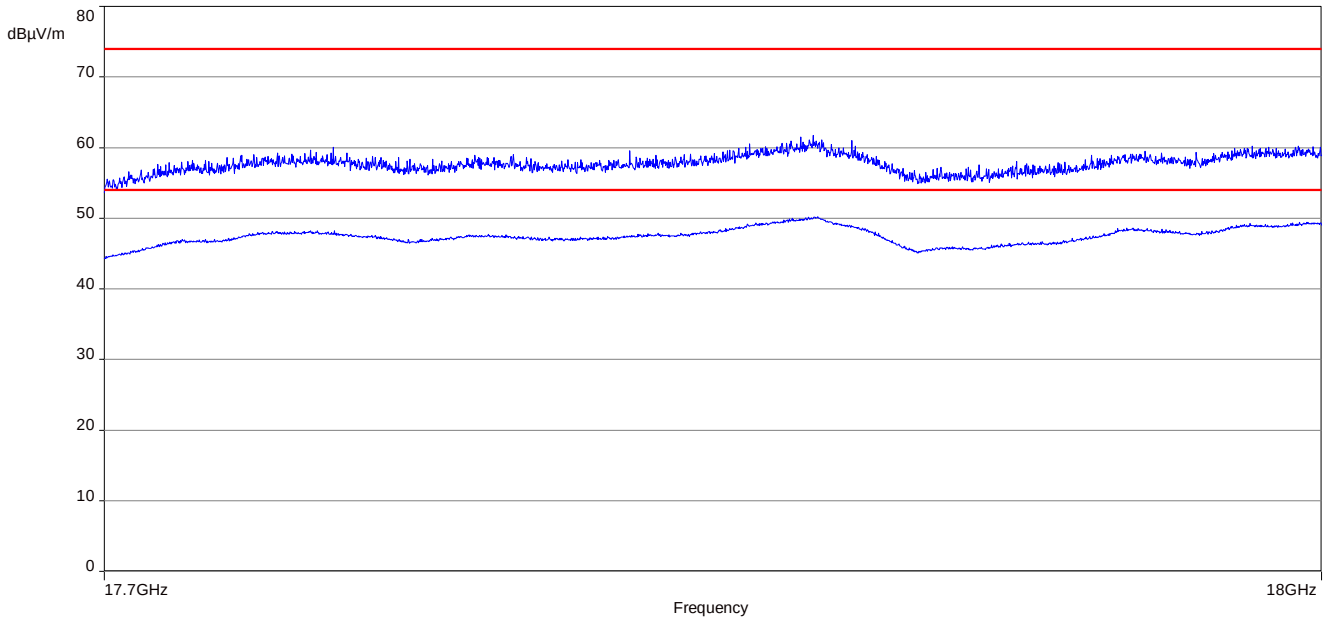
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.318600	10.38	30.00	19.62	1000.0	120.000	98.0	H	244.0	13.9
109.582350	17.95	33.50	15.55	1000.0	120.000	101.0	V	16.0	11.2
159.975600	19.04	33.50	14.46	1000.0	120.000	98.0	V	346.0	9.1
302.030700	18.89	36.00	17.11	1000.0	120.000	179.0	H	68.0	14.5
639.986400	29.70	36.00	6.30	1000.0	120.000	98.0	V	320.0	21.0
907.268250	21.22	36.00	14.78	1000.0	120.000	179.0	V	346.0	24.1

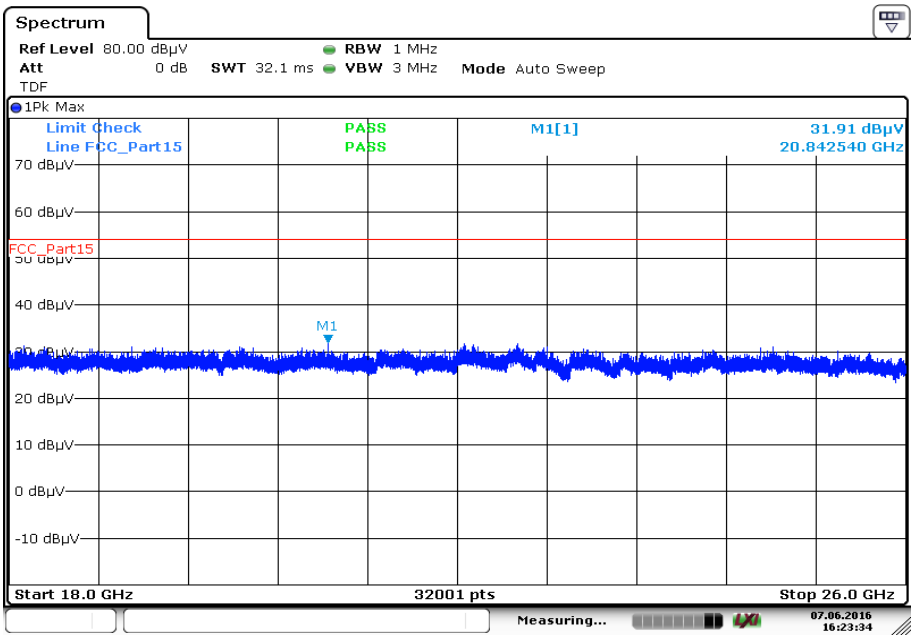
Plot 22: 1 GHz to 18 GHz, 5700 MHz, vertical & horizontal polarization



Plot 23: 17.7 GHz to 18 GHz, 5700 MHz, zoomed

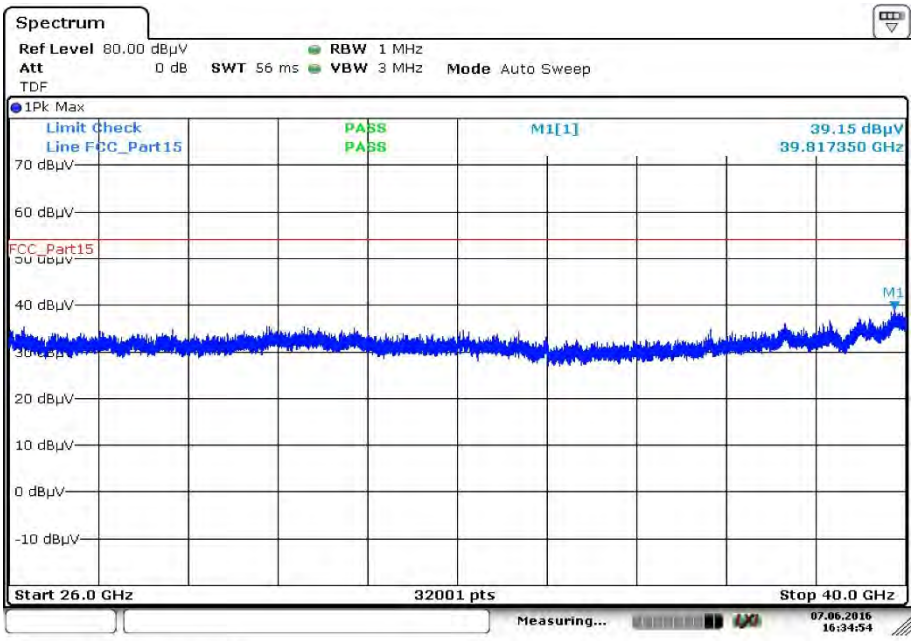


Plot 24: 18 GHz to 26 GHz, 5700 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:23:35

Plot 25: 26 GHz to 40 GHz, 5700 MHz, vertical & horizontal polarization



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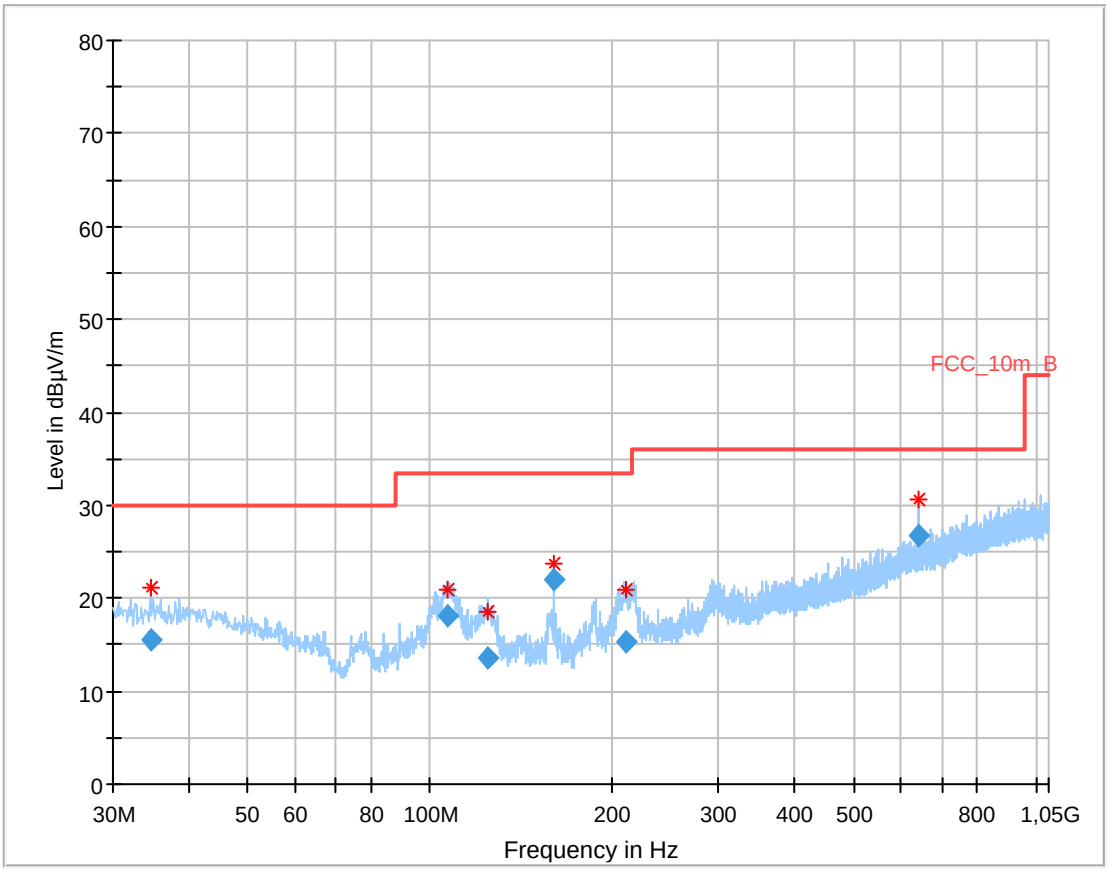
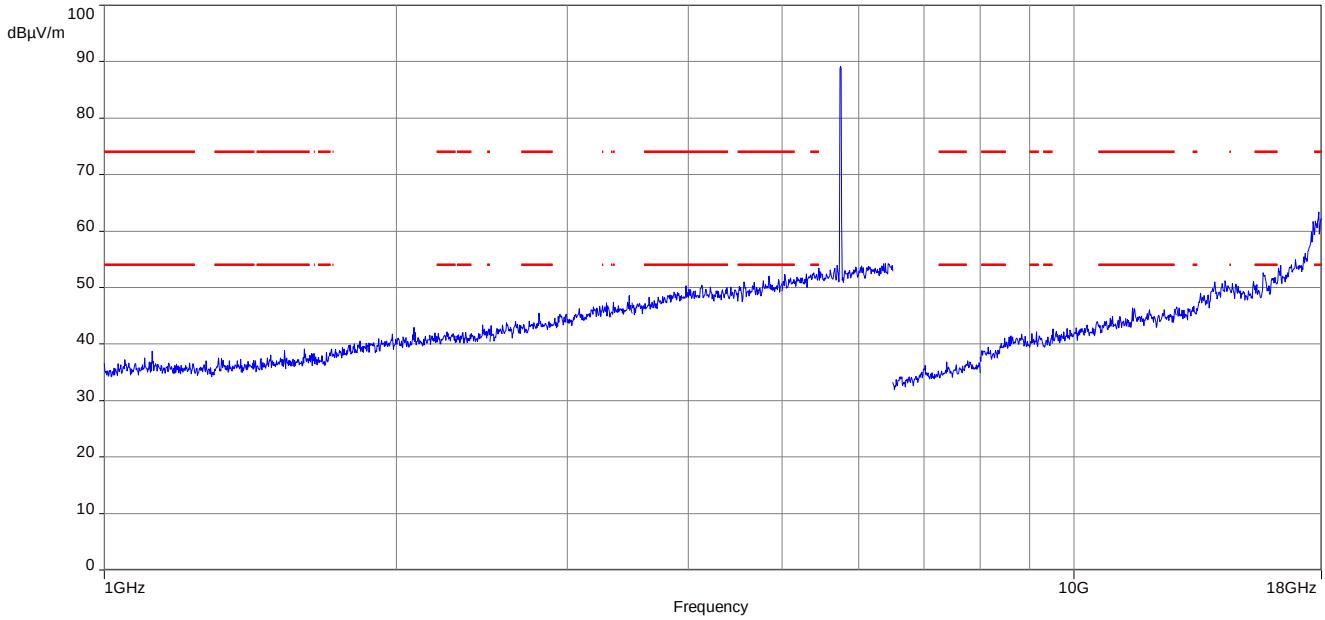
Plot 26: 30 MHz to 1 GHz, 5745 MHz, vertical & horizontal polarization



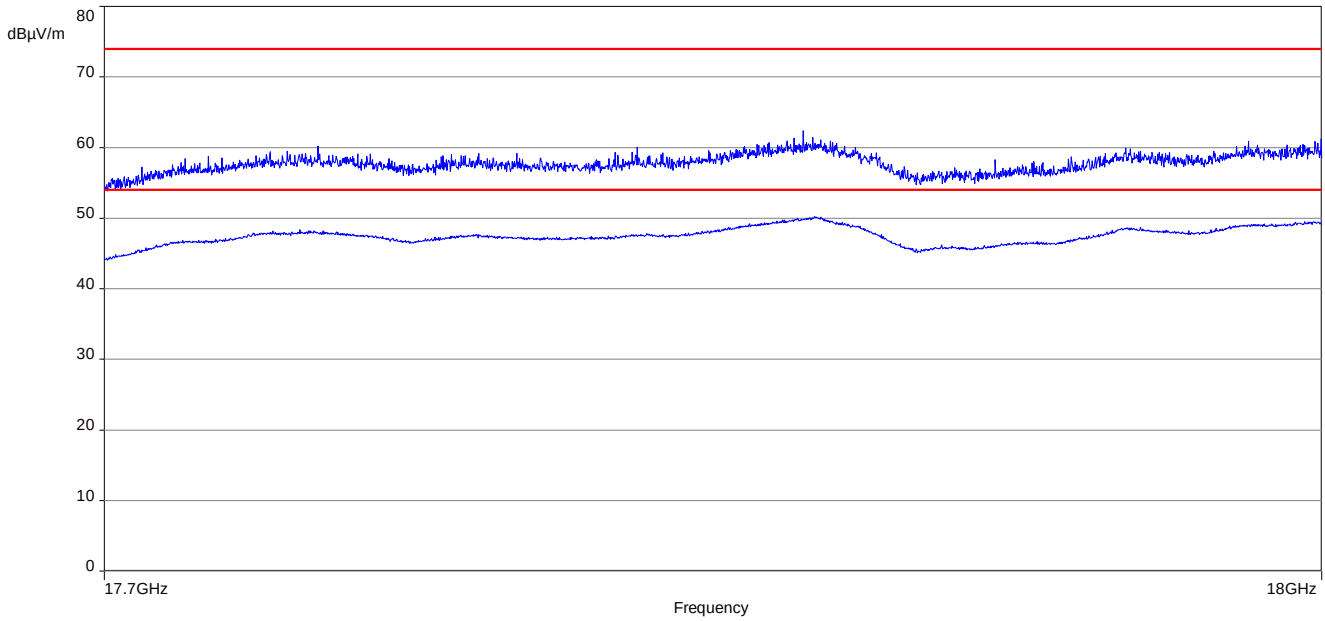
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.626750	15.53	30.00	14.47	1000.0	120.000	179.0	V	272.0	13.8
106.707000	18.12	33.50	15.38	1000.0	120.000	185.0	V	9.0	11.5
124.141050	13.68	33.50	19.82	1000.0	120.000	98.0	V	24.0	9.8
160.018950	22.08	33.50	11.42	1000.0	120.000	98.0	V	348.0	9.1
210.146700	15.25	33.50	18.25	1000.0	120.000	98.0	V	40.0	12.1
639.985500	26.76	36.00	9.24	1000.0	120.000	100.0	H	262.0	21.0

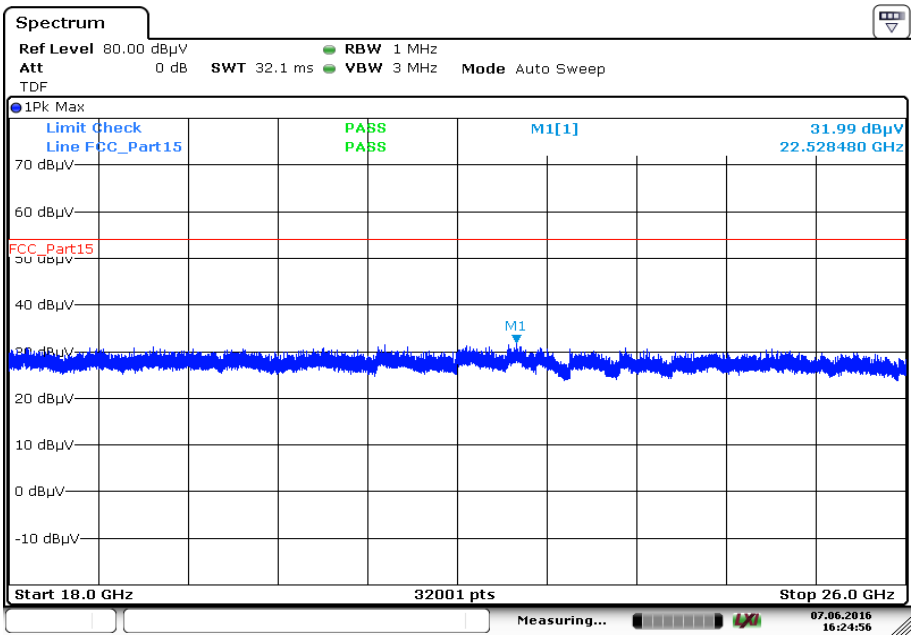
Plot 27: 1 GHz to 18 GHz, 5745 MHz, vertical & horizontal polarization



Plot 28: 17.7 GHz to 18 GHz, 5745 MHz, zoomed

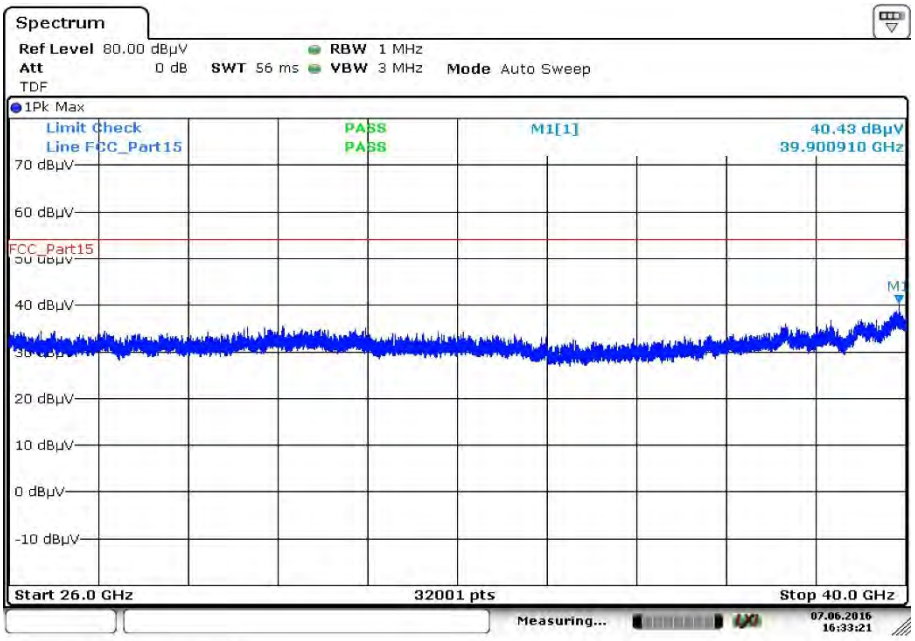


Plot 29: 18 GHz to 26 GHz, 5745 MHz, vertical & horizontal polarization



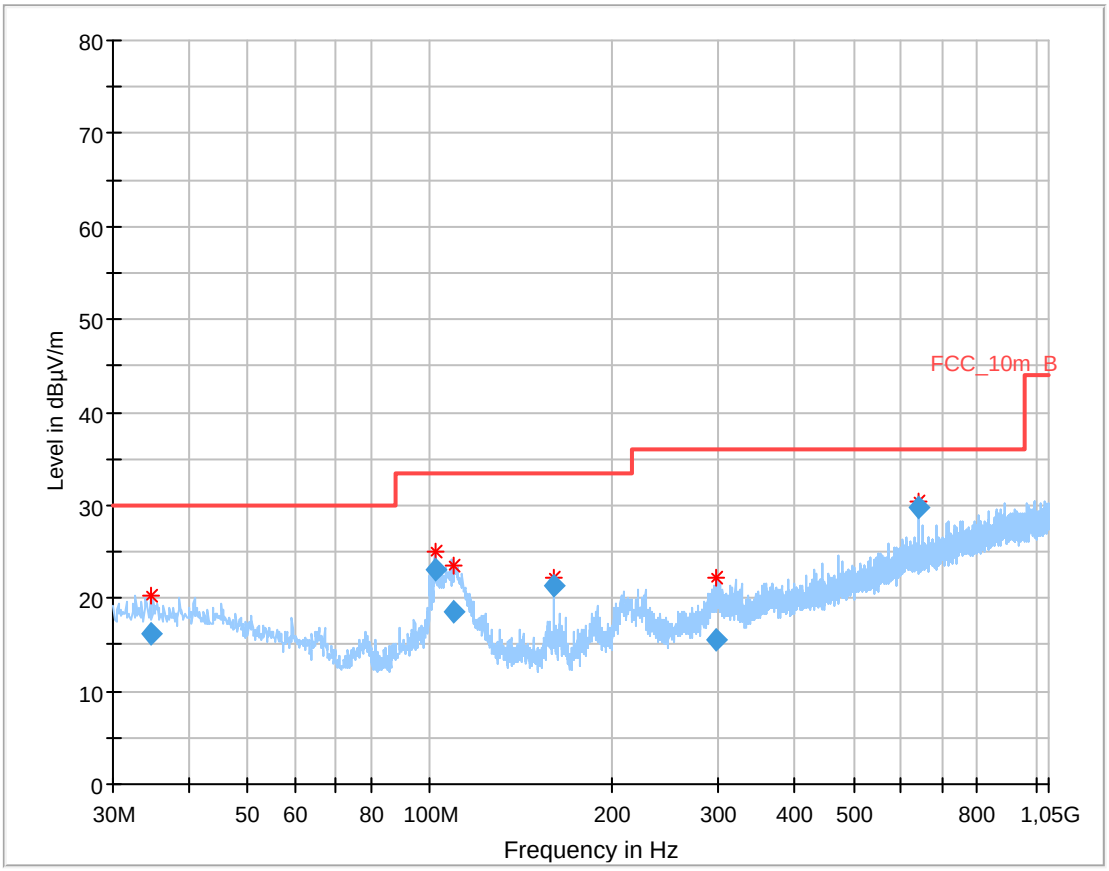
Date: 7.JUN.2016 16:24:56

Plot 30: 26 GHz to 40 GHz, 5745 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:33:22

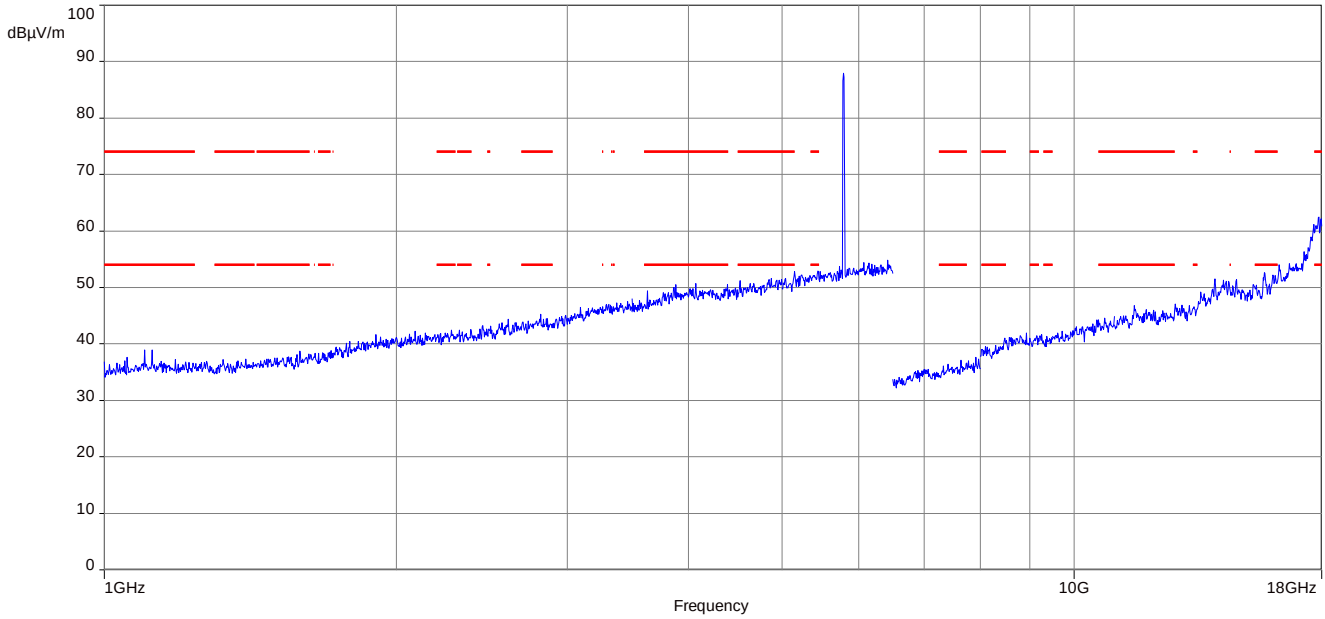
Plot 31: 30 MHz to 1 GHz, 5785 MHz, vertical & horizontal polarization



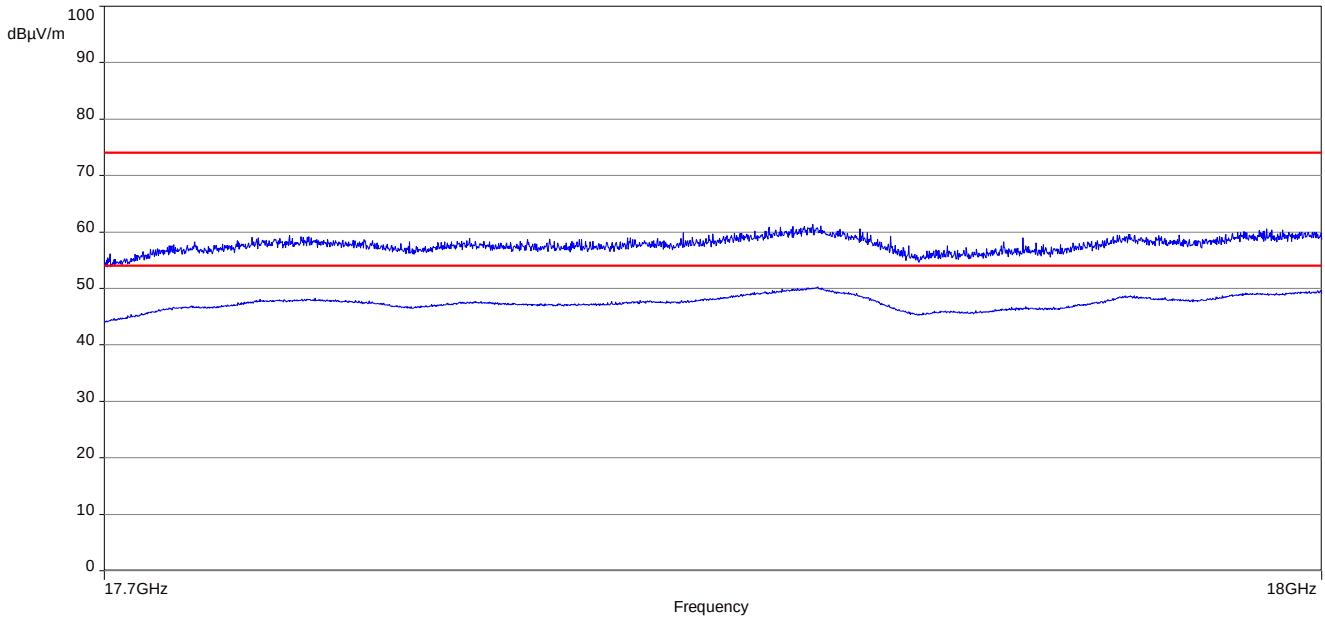
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.645800	16.19	30.00	13.81	1000.0	120.000	185.0	V	6.0	13.8
101.890950	22.97	33.50	10.53	1000.0	120.000	98.0	V	31.0	12.0
109.448850	18.62	33.50	14.88	1000.0	120.000	101.0	V	6.0	11.2
159.982200	21.44	33.50	12.06	1000.0	120.000	98.0	V	265.0	9.1
296.038050	15.46	36.00	20.54	1000.0	120.000	185.0	H	134.0	14.4
639.984750	29.83	36.00	6.17	1000.0	120.000	185.0	H	42.0	21.0

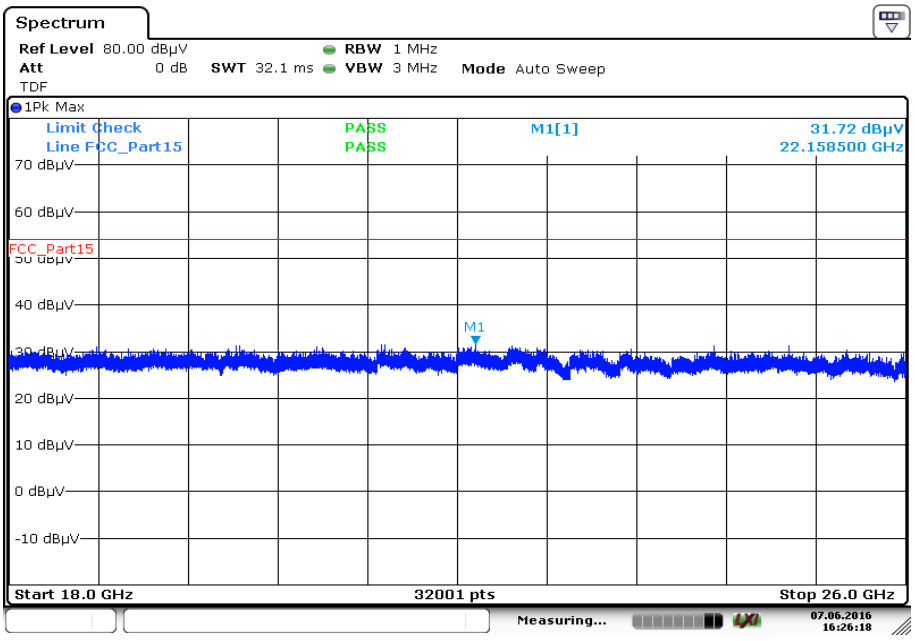
Plot 32: 1 GHz to 18 GHz, 5785 MHz, vertical & horizontal polarization



Plot 33: 17.7 GHz to 18 GHz, 5785 MHz, zoomed

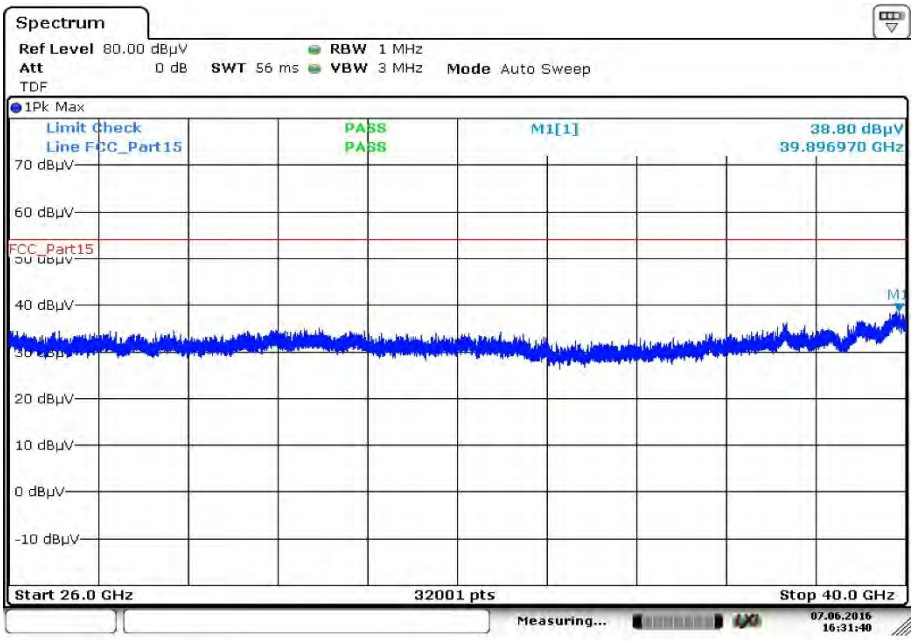


Plot 34: 18 GHz to 26 GHz, 5785 MHz, vertical & horizontal polarization



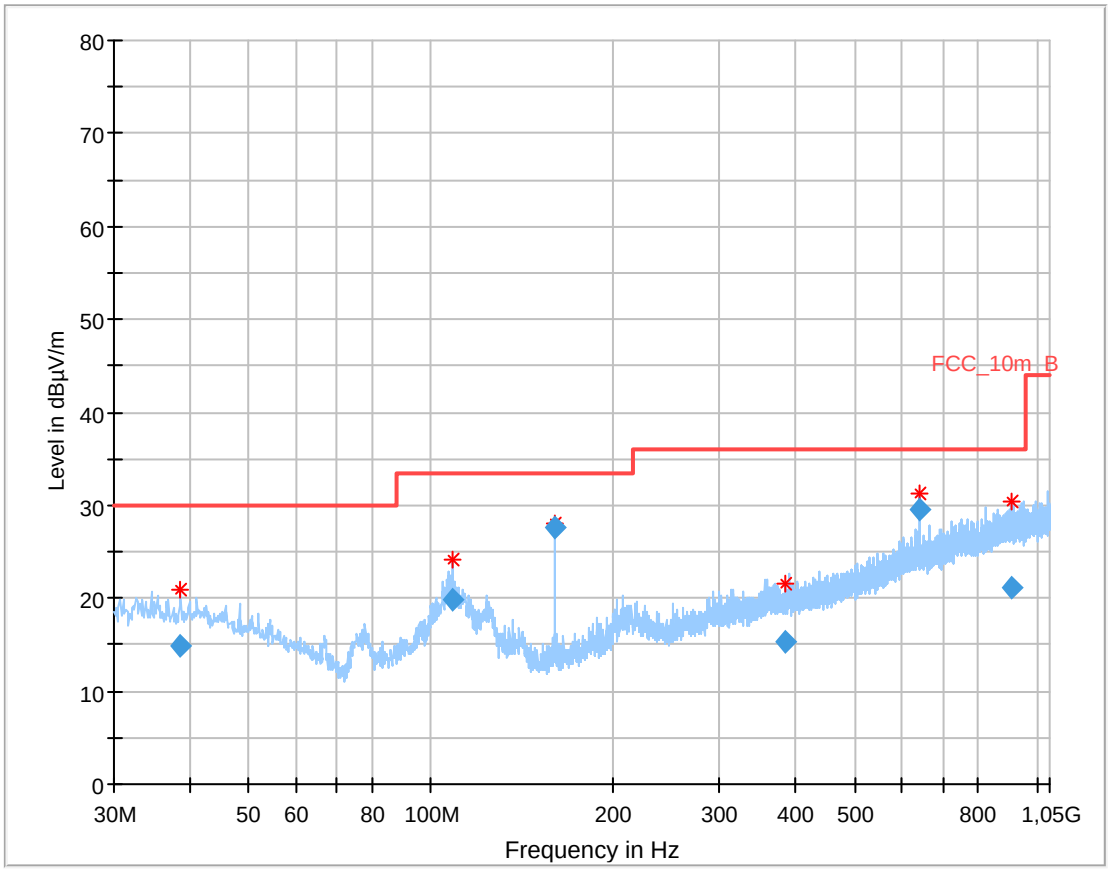
Date: 7.JUN.2016 16:26:19

Plot 35: 26 GHz to 40 GHz, 5785 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:31:40

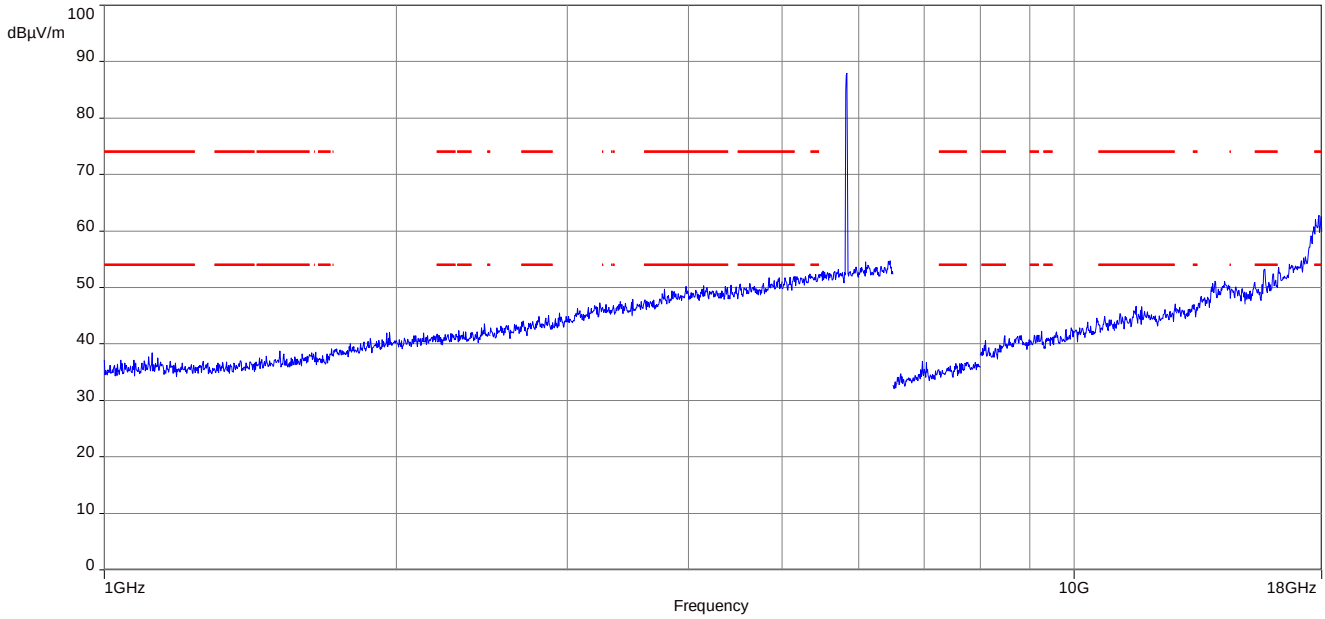
Plot 36: 30 MHz to 1 GHz, 5825 MHz, vertical & horizontal polarization



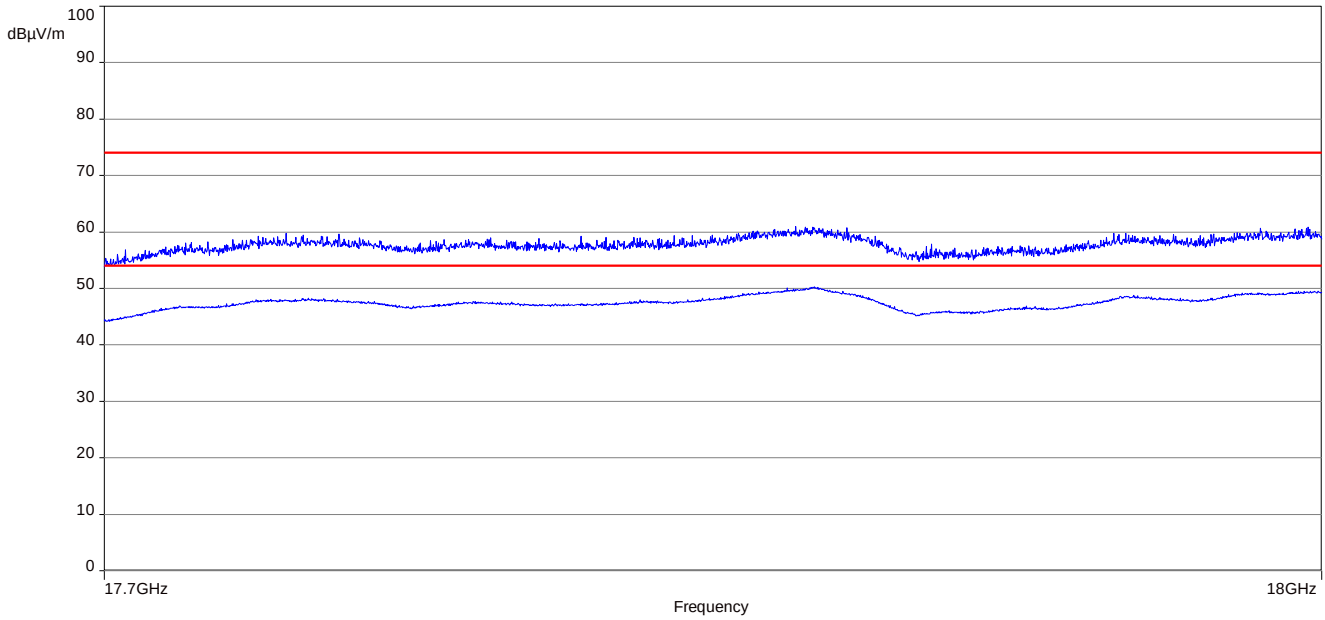
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.684400	14.94	30.00	15.06	1000.0	120.000	185.0	V	100.0	14.0
108.801600	19.78	33.50	13.72	1000.0	120.000	101.0	V	13.0	11.2
160.000800	27.60	33.50	5.90	1000.0	120.000	98.0	V	224.0	9.1
384.022200	15.33	36.00	20.67	1000.0	120.000	178.0	H	305.0	16.6
640.018350	29.46	36.00	6.54	1000.0	120.000	104.0	H	274.0	21.0
905.742150	21.08	36.00	14.92	1000.0	120.000	185.0	V	142.0	24.1

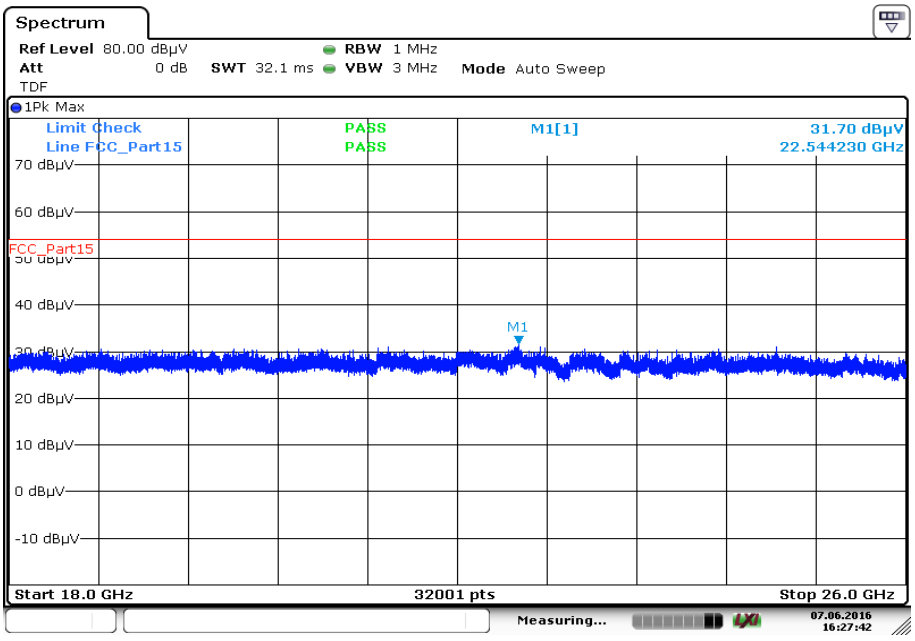
Plot 37: 1 GHz to 18 GHz, 5825 MHz, vertical & horizontal polarization



Plot 38: 17.7 GHz to 18 GHz, 5825 MHz, zoomed

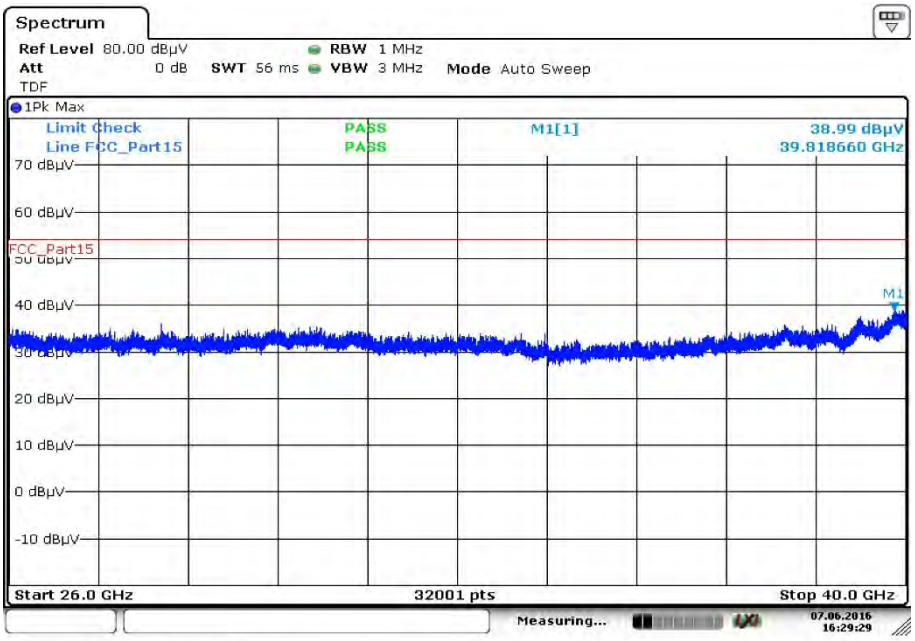


Plot 39: 18 GHz to 26 GHz, 5825 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:27:42

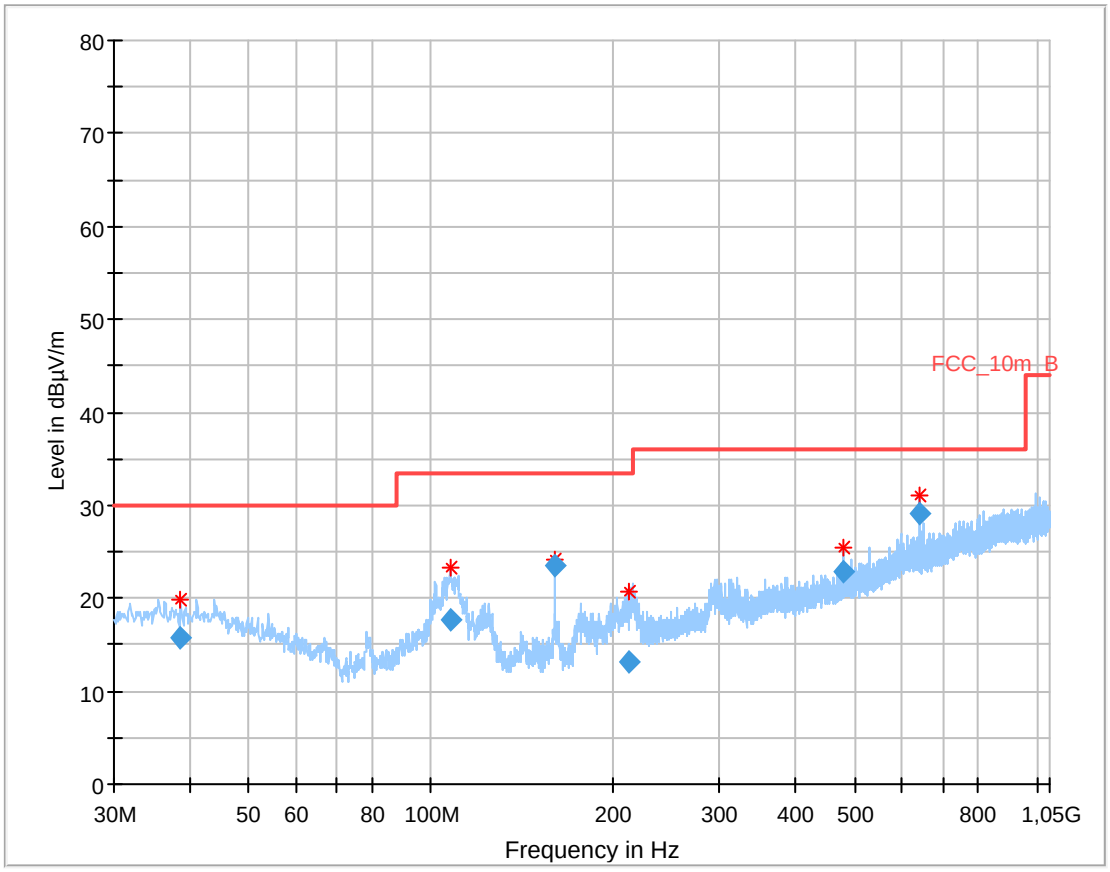
Plot 40: 26 GHz to 40 GHz, 5825 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:29:29

Plots: OFDM / ANT 2

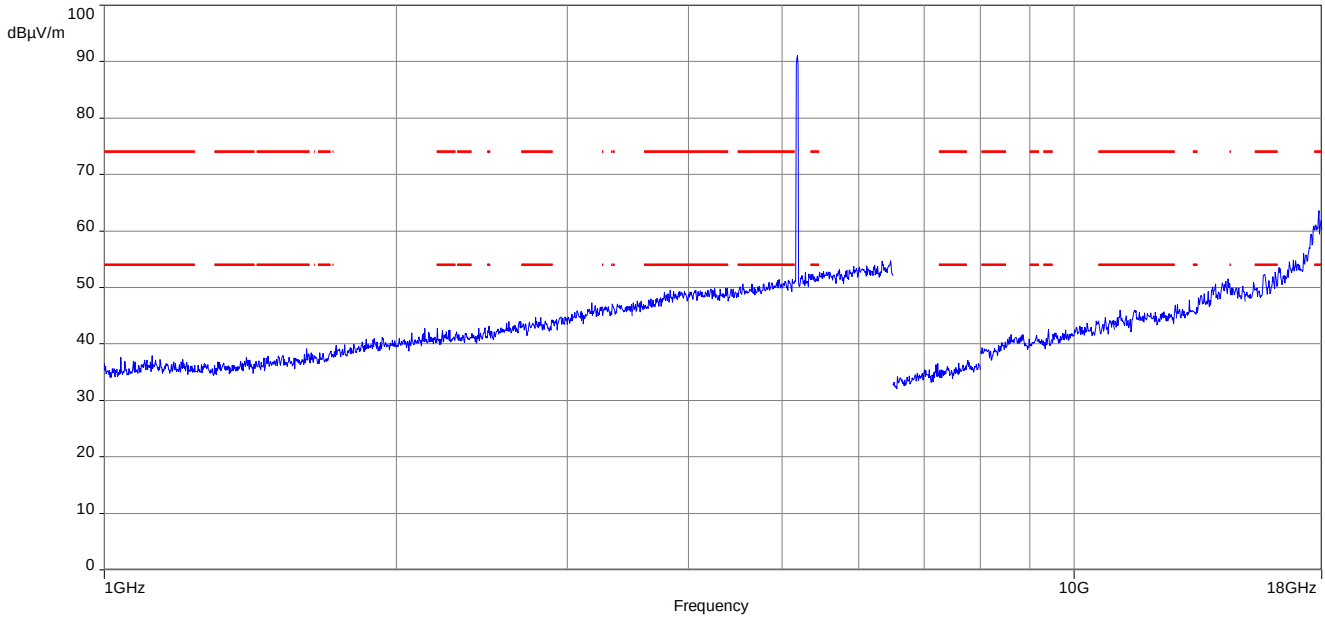
Plot 1: 30 MHz to 1 GHz, 5180 MHz, vertical & horizontal polarization



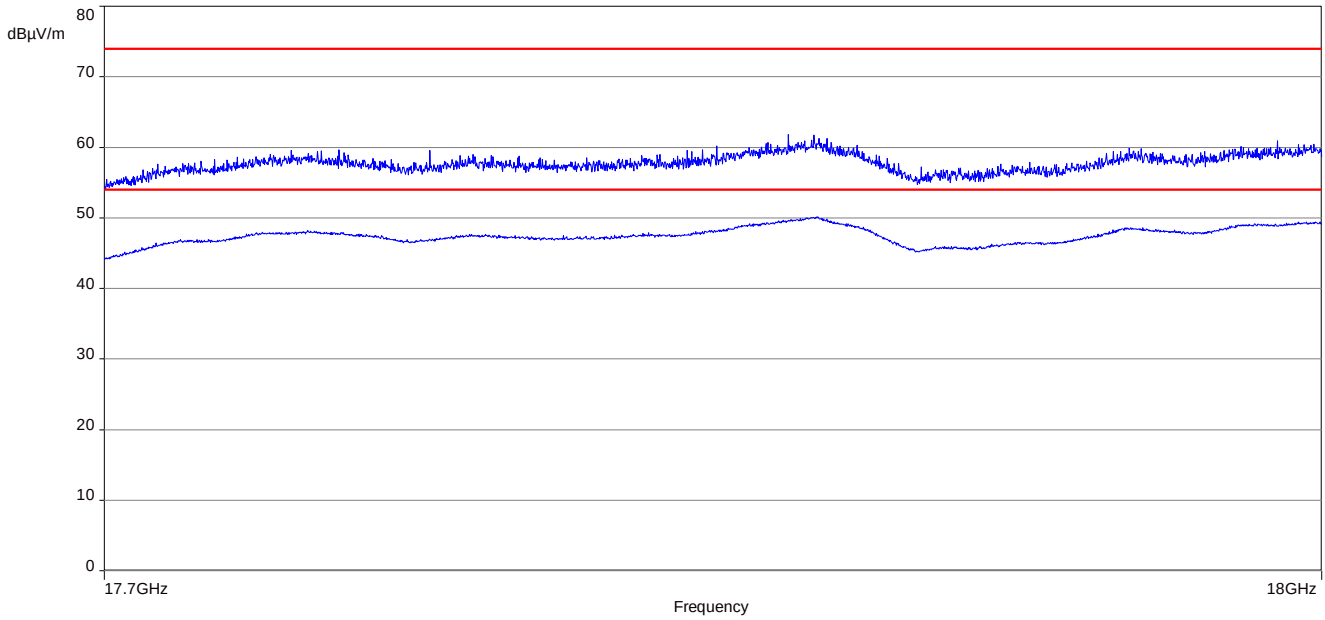
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.682450	15.68	30.00	14.32	1000.0	120.000	101.0	V	353.0	14.0
107.884500	17.65	33.50	15.85	1000.0	120.000	101.0	V	347.0	11.3
160.000800	23.58	33.50	9.92	1000.0	120.000	98.0	V	337.0	9.1
212.954400	13.11	33.50	20.39	1000.0	120.000	98.0	V	53.0	12.2
480.006150	22.93	36.00	13.07	1000.0	120.000	185.0	H	0.0	18.3
639.991500	29.17	36.00	6.83	1000.0	120.000	185.0	H	274.0	21.0

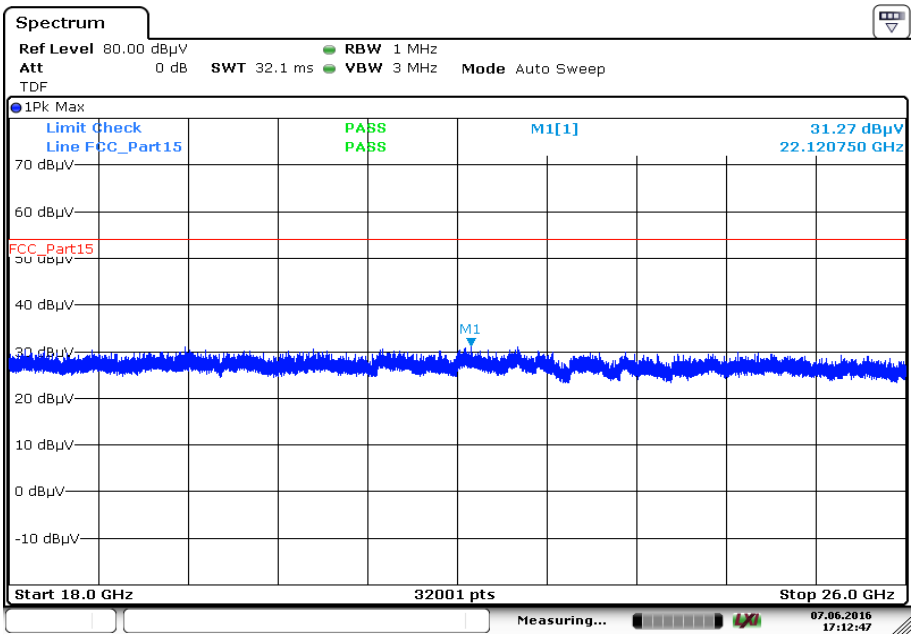
Plot 2: 1 GHz to 18 GHz, 5180 MHz, vertical & horizontal polarization



Plot 3: 17.7 GHz to 18 GHz, 5180 MHz, zoomed

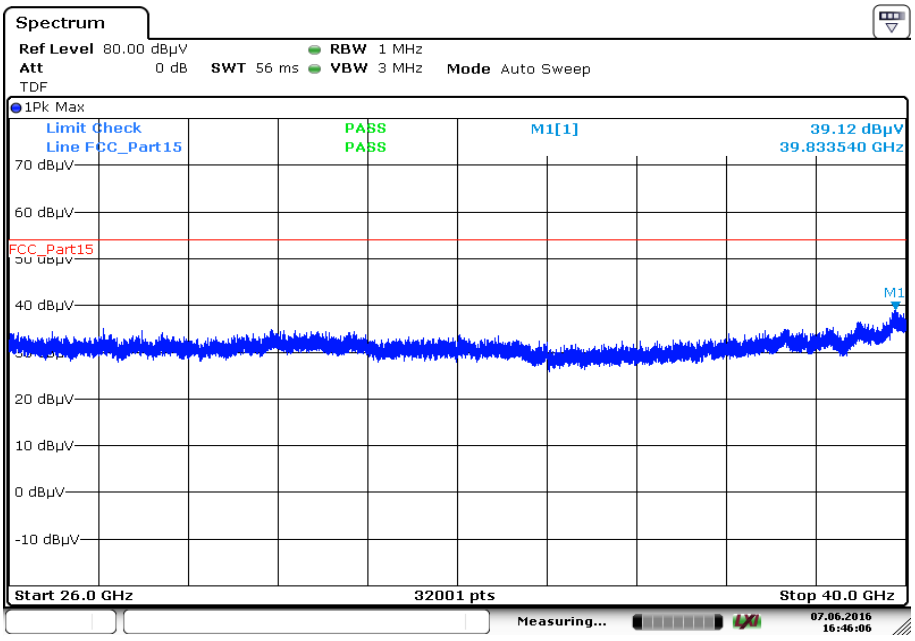


Plot 4: 18 GHz to 26 GHz, 5180 MHz, vertical & horizontal polarization



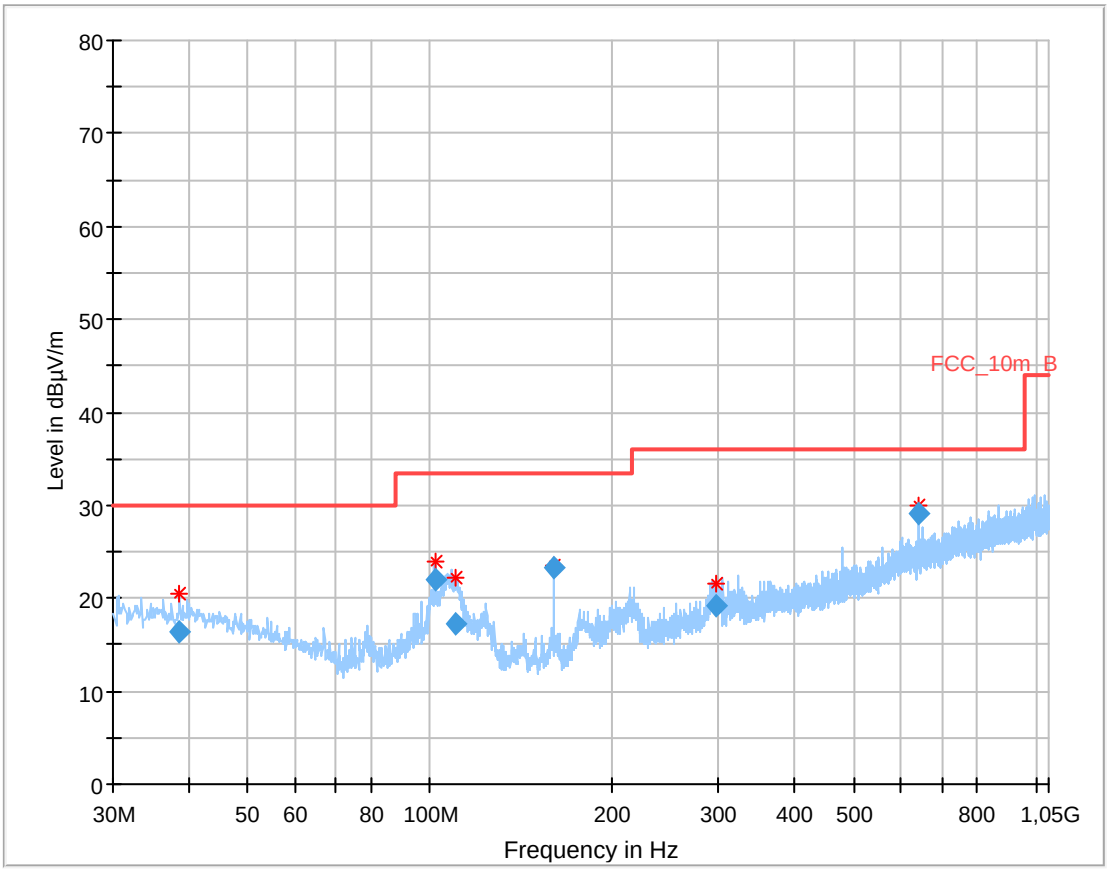
Date: 7.JUN.2016 17:12:47

Plot 5: 26 GHz to 40 GHz, 5180 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:46:06

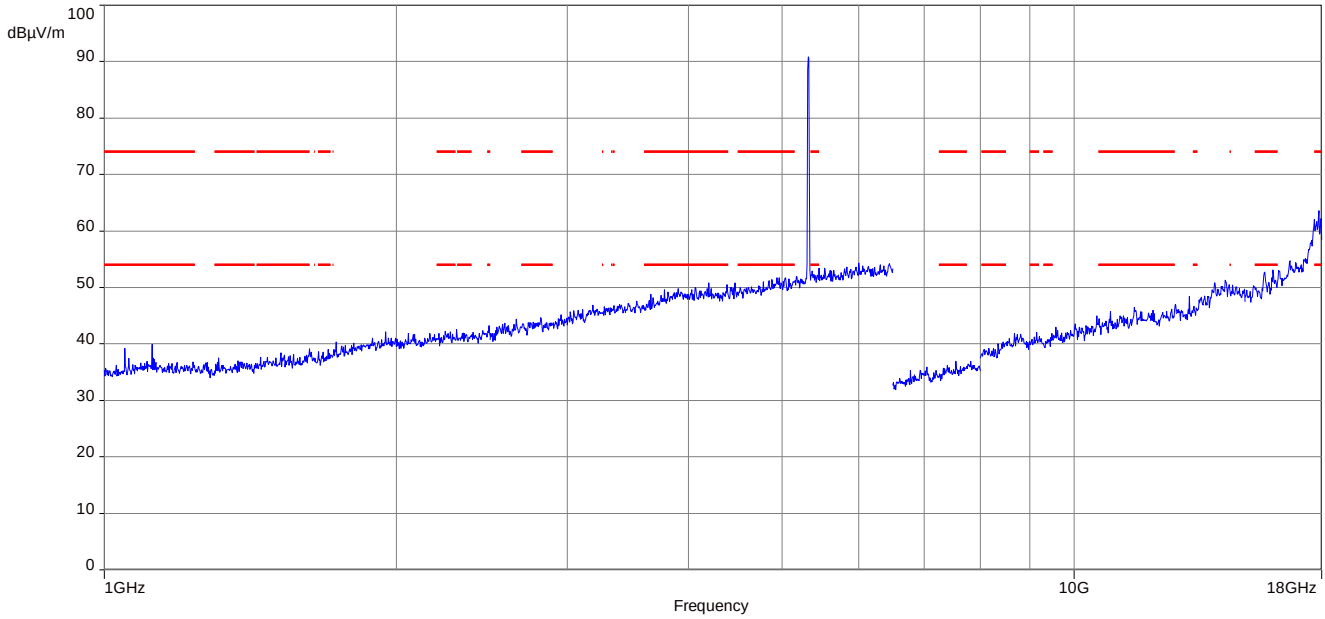
Plot 6: 30 MHz to 1 GHz, 5320 MHz, vertical & horizontal polarization



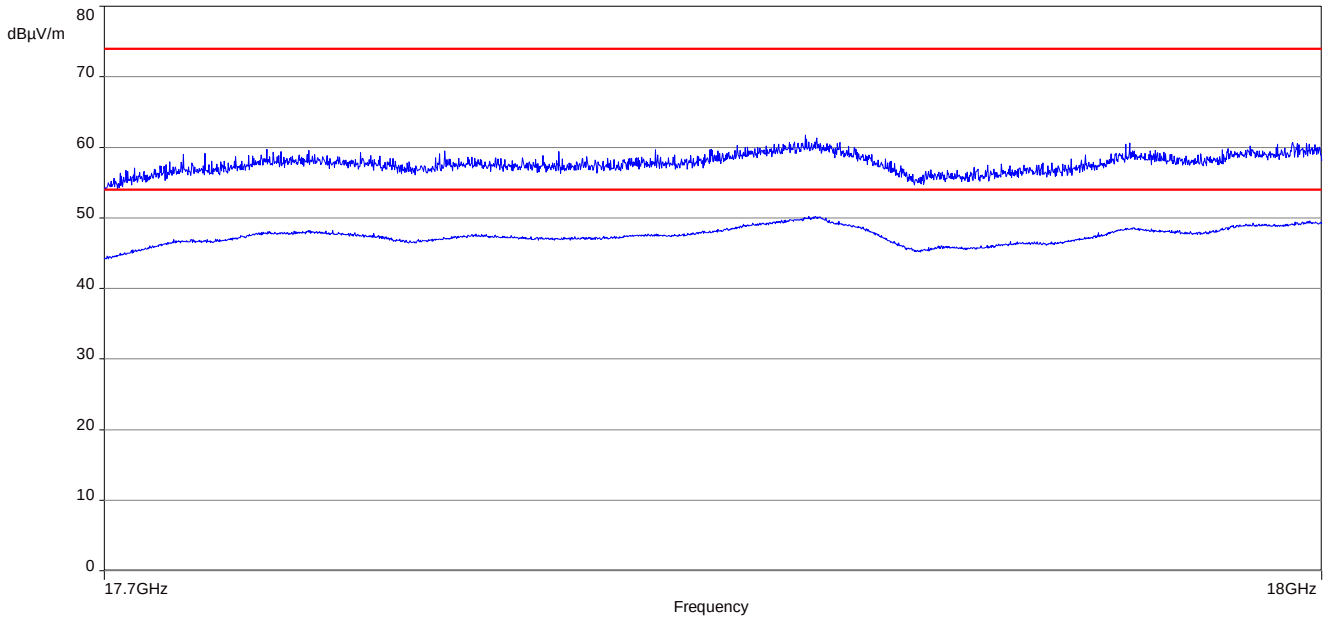
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.697600	16.30	30.00	13.70	1000.0	120.000	98.0	V	334.0	14.0
101.893350	22.05	33.50	11.45	1000.0	120.000	101.0	V	308.0	12.0
110.196150	17.31	33.50	16.19	1000.0	120.000	101.0	V	308.0	11.1
160.008900	23.39	33.50	10.11	1000.0	120.000	98.0	V	353.0	9.1
297.686850	19.27	36.00	16.73	1000.0	120.000	185.0	H	65.0	14.4
639.990750	29.02	36.00	6.98	1000.0	120.000	185.0	H	0.0	21.0

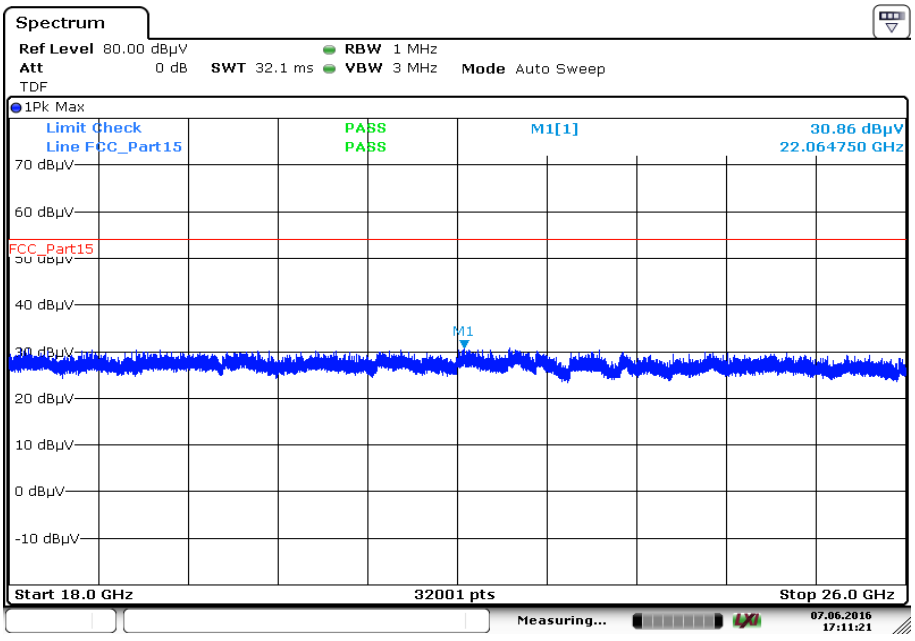
Plot 7: 1 GHz to 18 GHz, 5320 MHz, vertical & horizontal polarization



Plot 8: 17.7 GHz to 18 GHz, 5320 MHz, zoomed

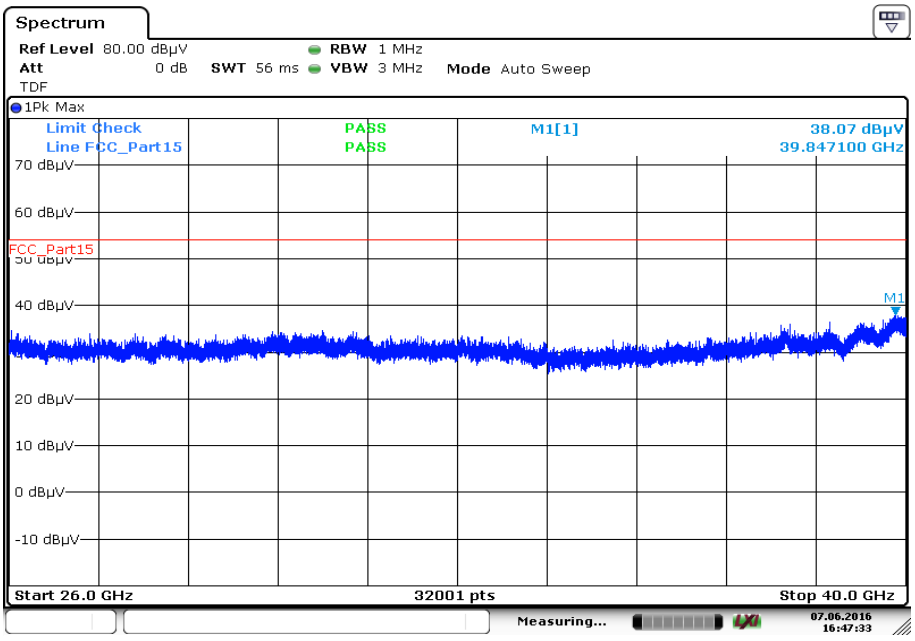


Plot 9: 18 GHz to 26 GHz, 5320 MHz, vertical & horizontal polarization



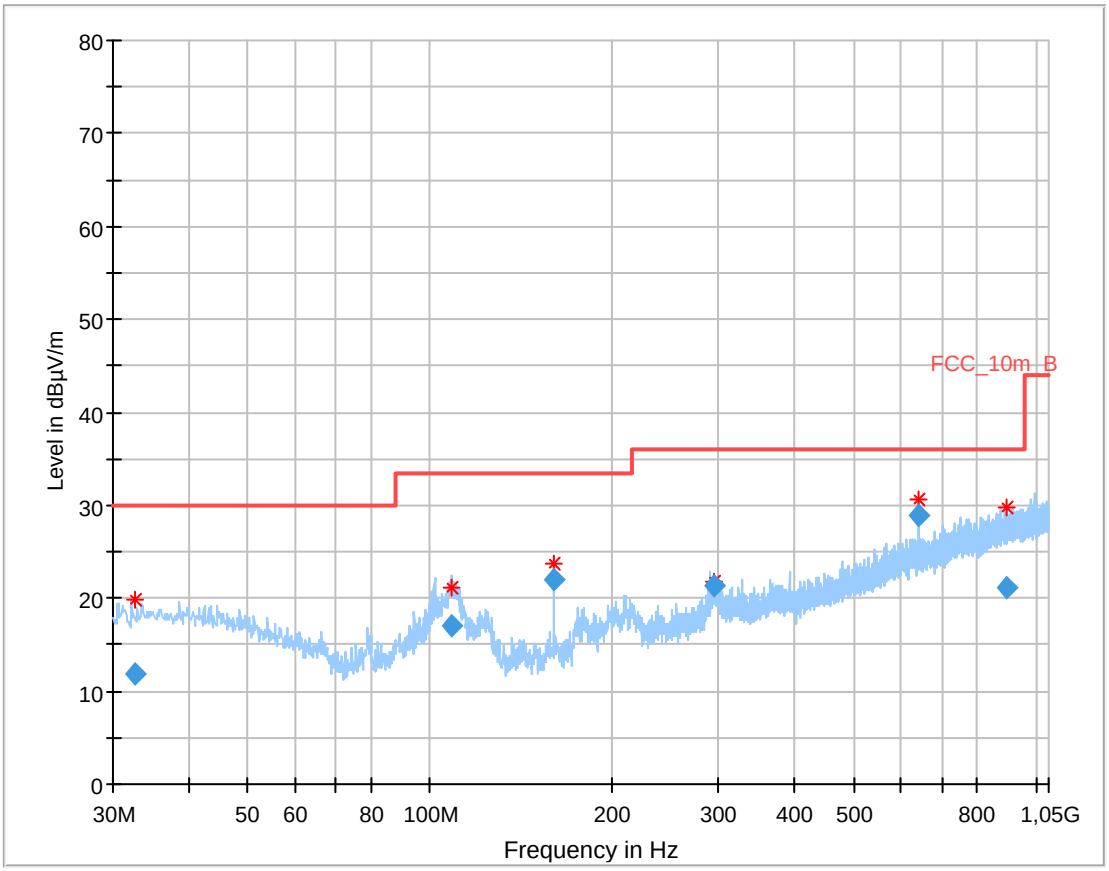
Date: 7.JUN.2016 17:11:22

Plot 10: 26 GHz to 40 GHz, 5320 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:47:34

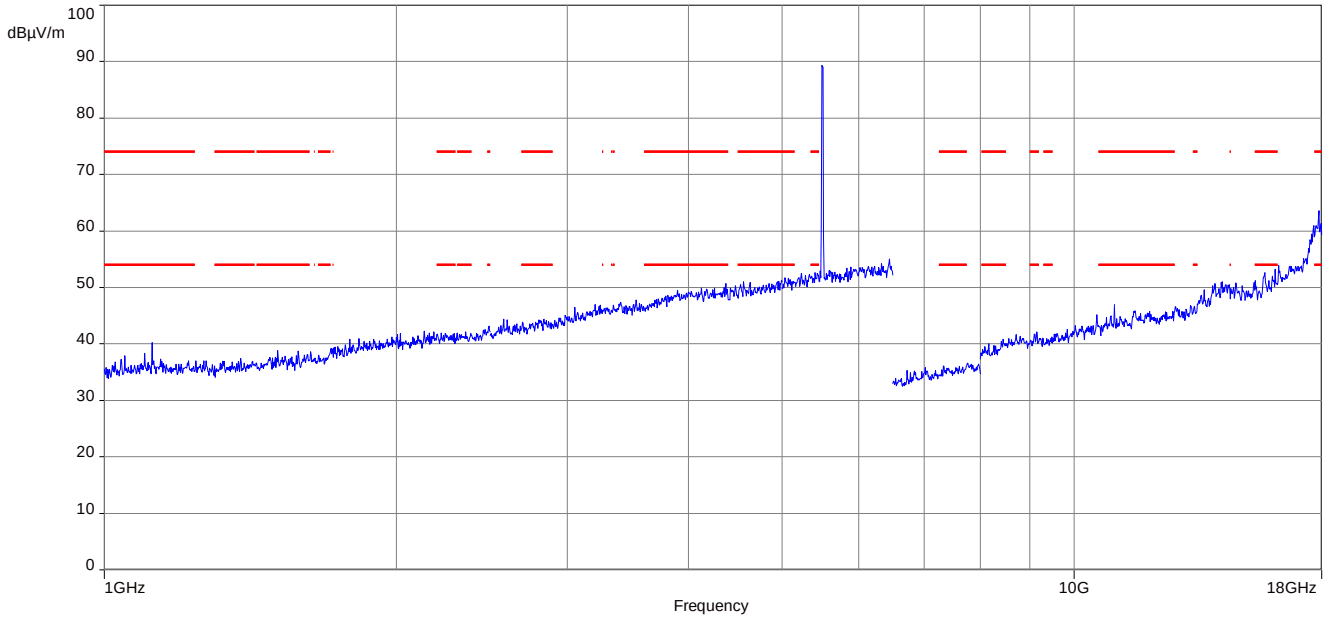
Plot 11: 30 MHz to 1 GHz, 5500 MHz, vertical & horizontal polarization



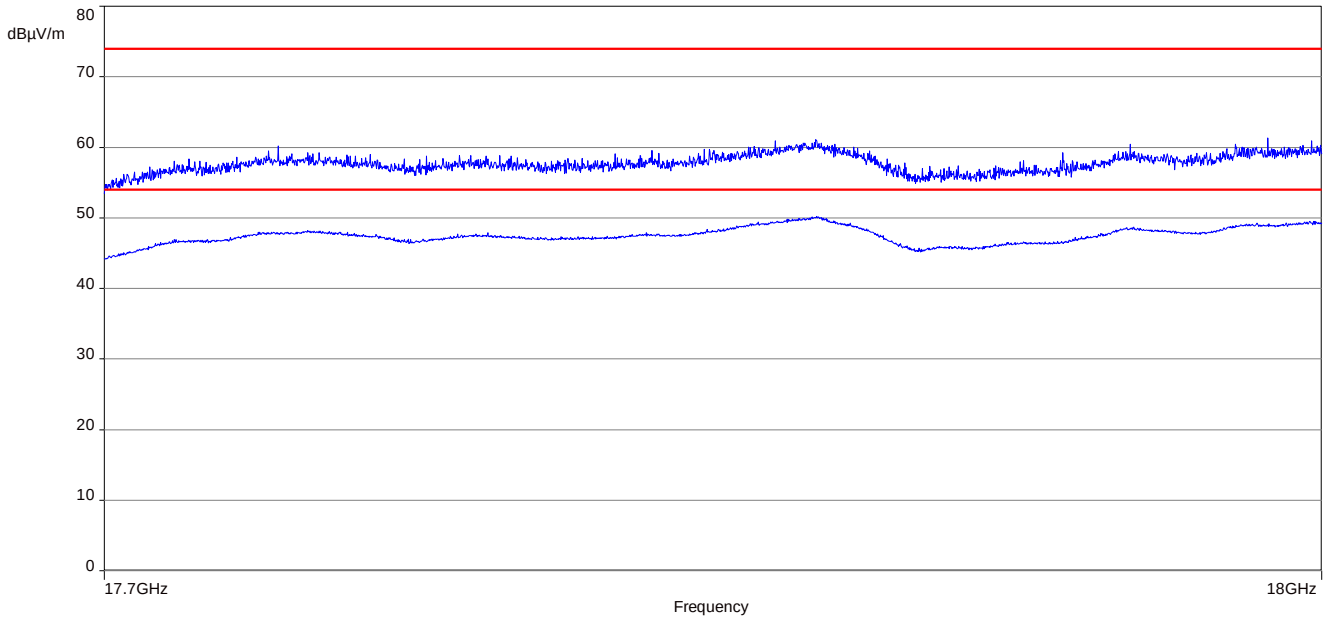
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.613300	11.88	30.00	18.12	1000.0	120.000	185.0	V	55.0	13.6
108.828000	16.99	33.50	16.51	1000.0	120.000	98.0	V	243.0	11.2
159.985350	21.97	33.50	11.53	1000.0	120.000	98.0	V	296.0	9.1
294.594450	21.39	36.00	14.61	1000.0	120.000	185.0	H	55.0	14.3
639.997350	29.00	36.00	7.00	1000.0	120.000	185.0	H	0.0	21.0
892.572900	21.20	36.00	14.80	1000.0	120.000	185.0	V	243.0	24.0

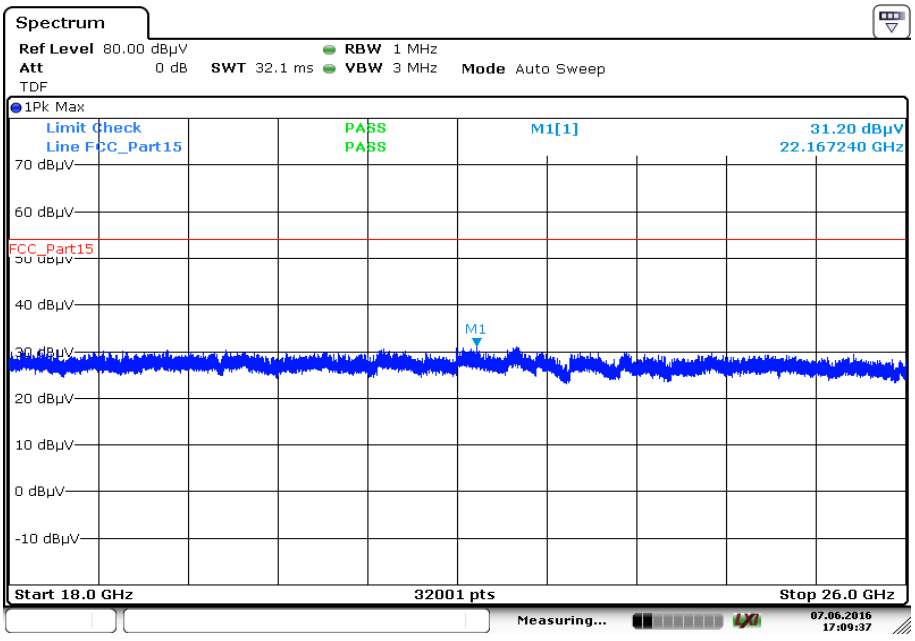
Plot 12: 1 GHz to 18 GHz, 5500 MHz, vertical & horizontal polarization



Plot 13: 17.7 GHz to 18 GHz, 5500 MHz, zoomed

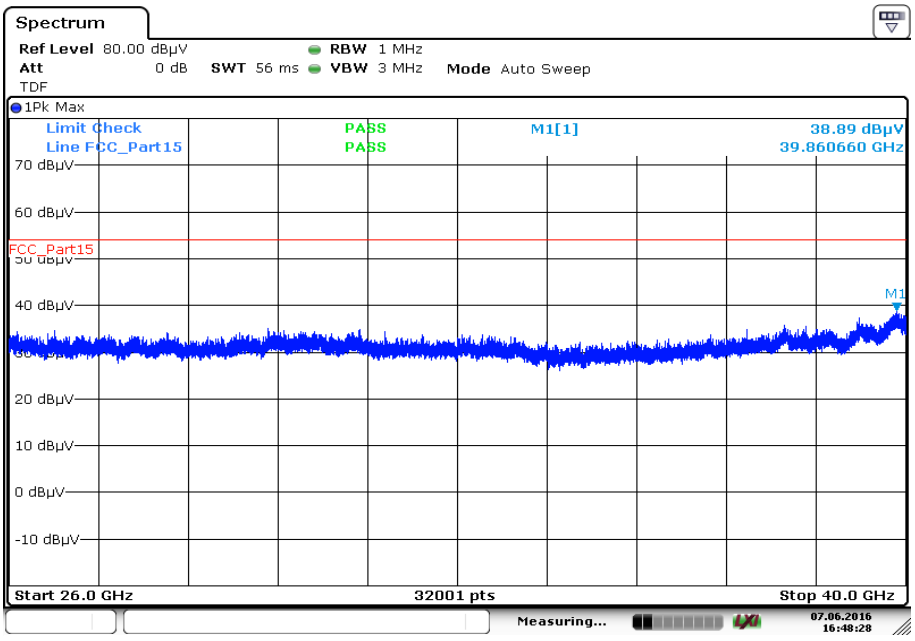


Plot 14: 18 GHz to 26 GHz, 5500 MHz, vertical & horizontal polarization



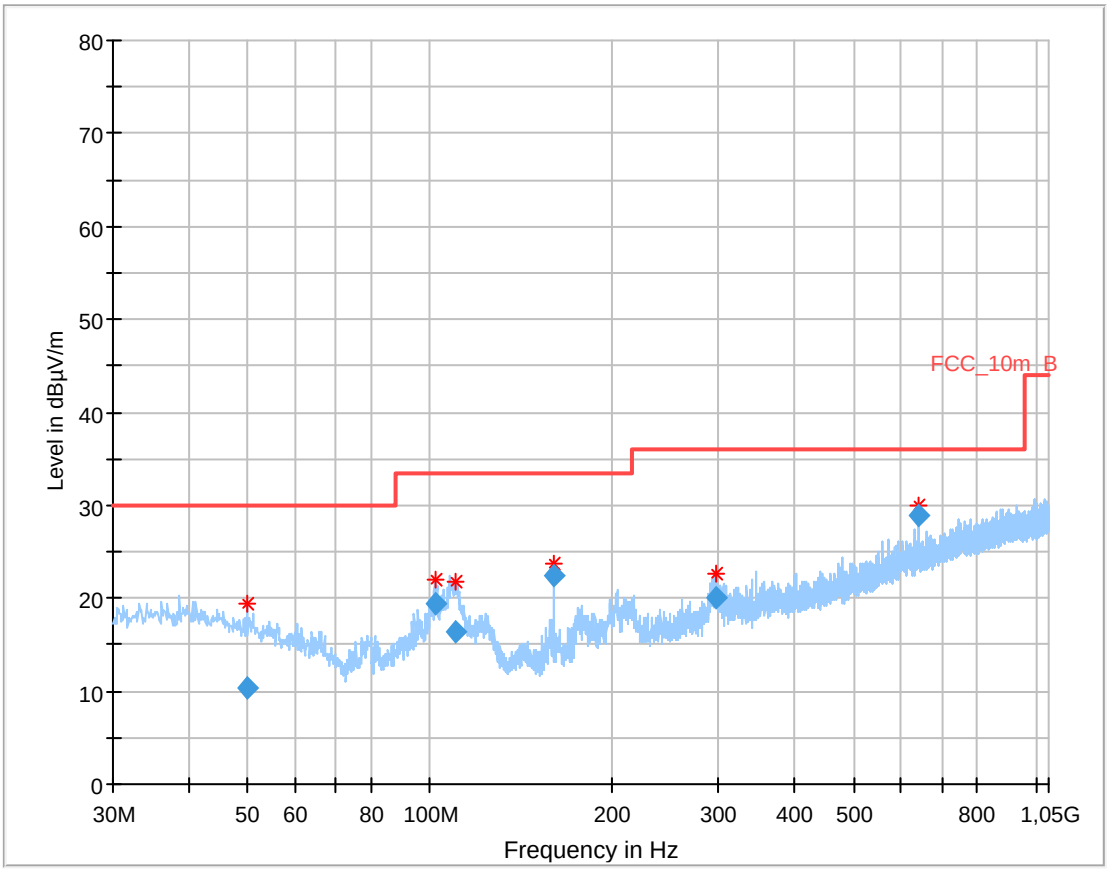
Date: 7.JUN.2016 17:09:38

Plot 15: 26 GHz to 40 GHz, 5500 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:48:29

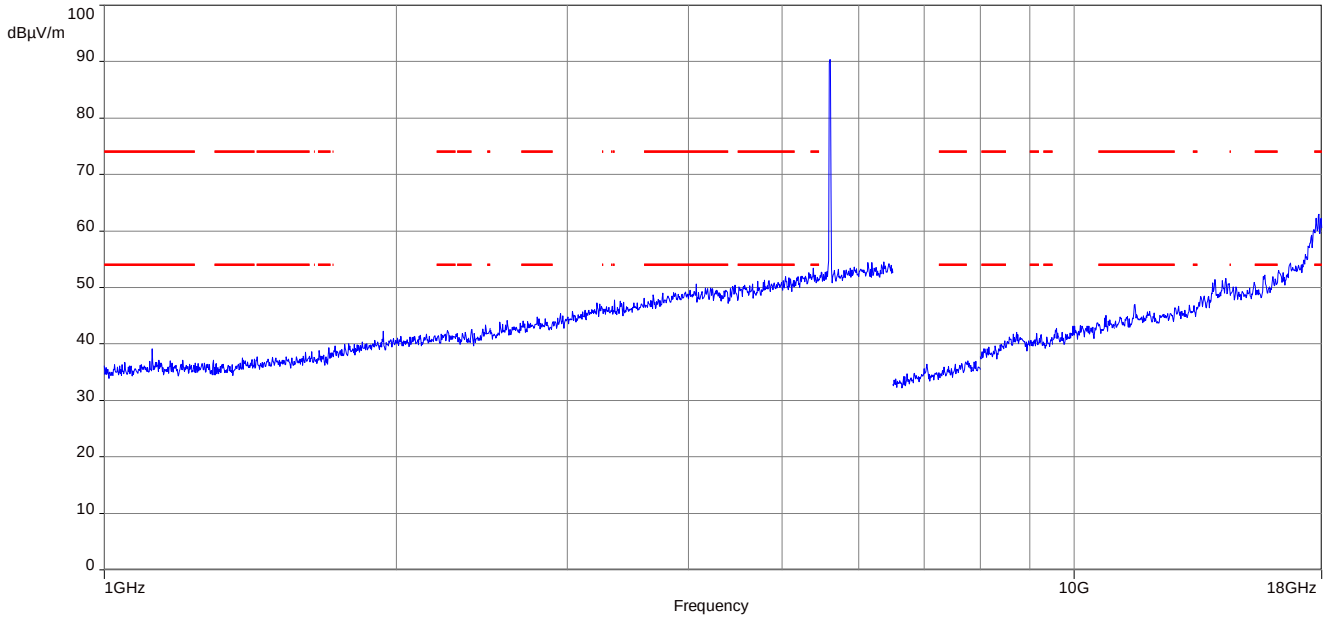
Plot 16: 30 MHz to 1 GHz, 5600 MHz, vertical & horizontal polarization



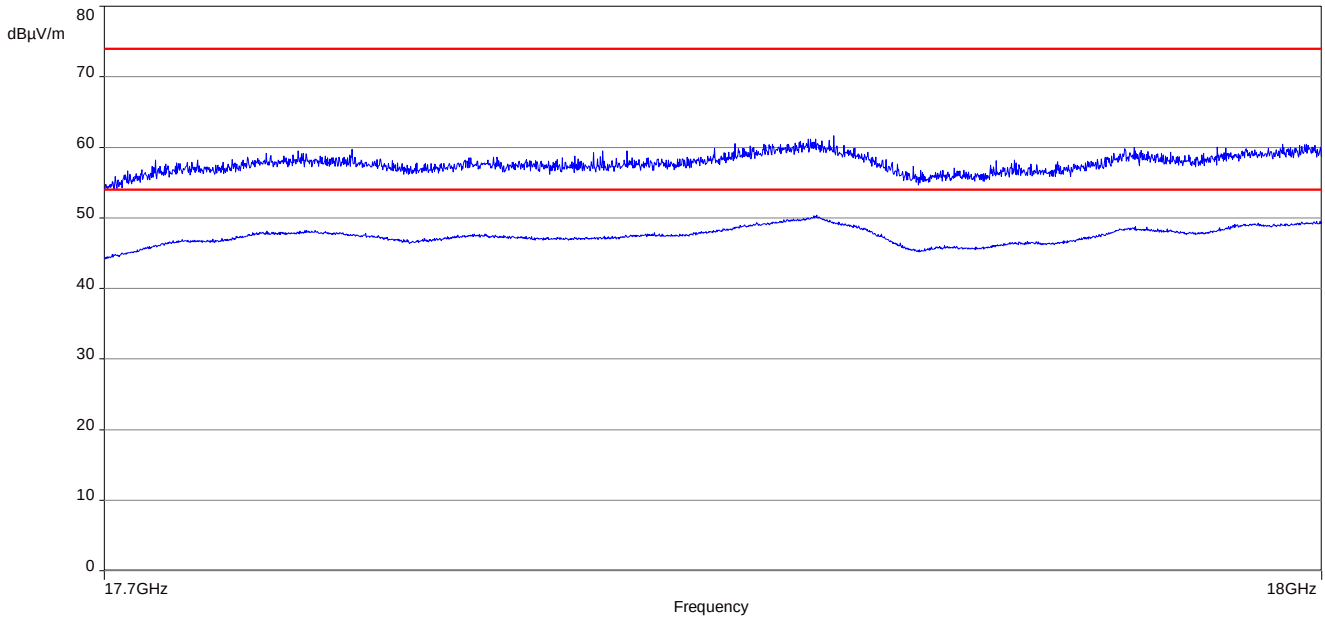
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
50.043000	10.34	30.00	19.66	1000.0	120.000	185.0	V	275.0	12.6
101.899650	19.41	33.50	14.09	1000.0	120.000	101.0	V	275.0	12.0
110.198400	16.40	33.50	17.10	1000.0	120.000	98.0	V	290.0	11.1
160.002600	22.38	33.50	11.12	1000.0	120.000	98.0	V	236.0	9.1
296.380200	20.06	36.00	15.94	1000.0	120.000	185.0	H	58.0	14.4
640.010250	28.82	36.00	7.18	1000.0	120.000	185.0	H	0.0	21.0

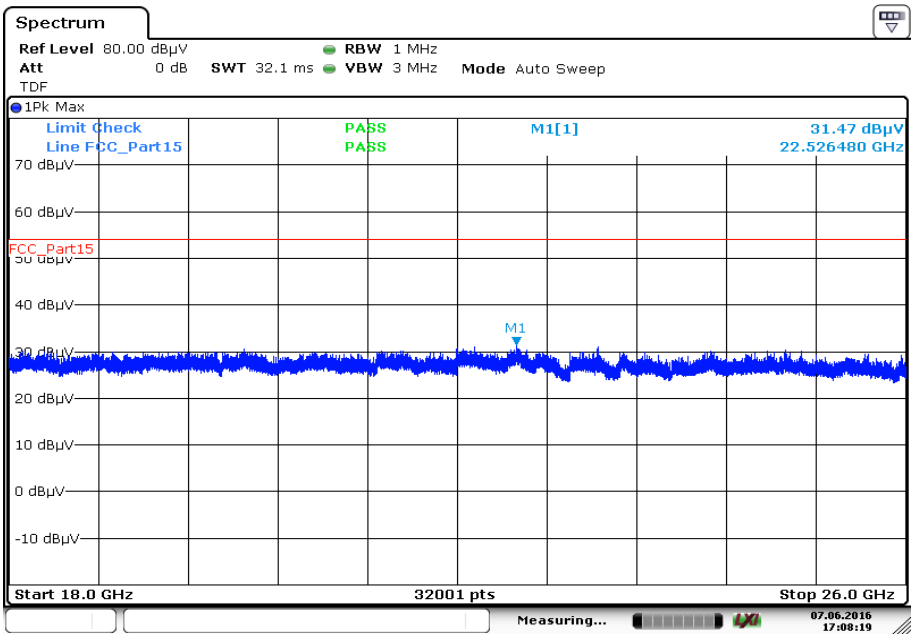
Plot 17: 1 GHz to 18 GHz, 5600 MHz, vertical & horizontal polarization



Plot 18: 17.7 GHz to 18 GHz, 5600 MHz, zoomed

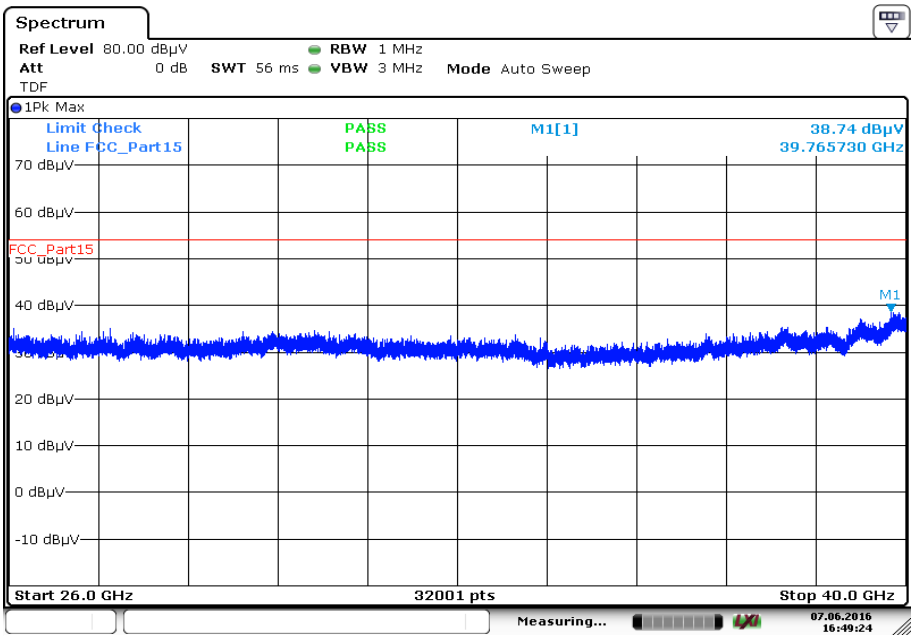


Plot 19: 18 GHz to 26 GHz, 5600 MHz, vertical & horizontal polarization



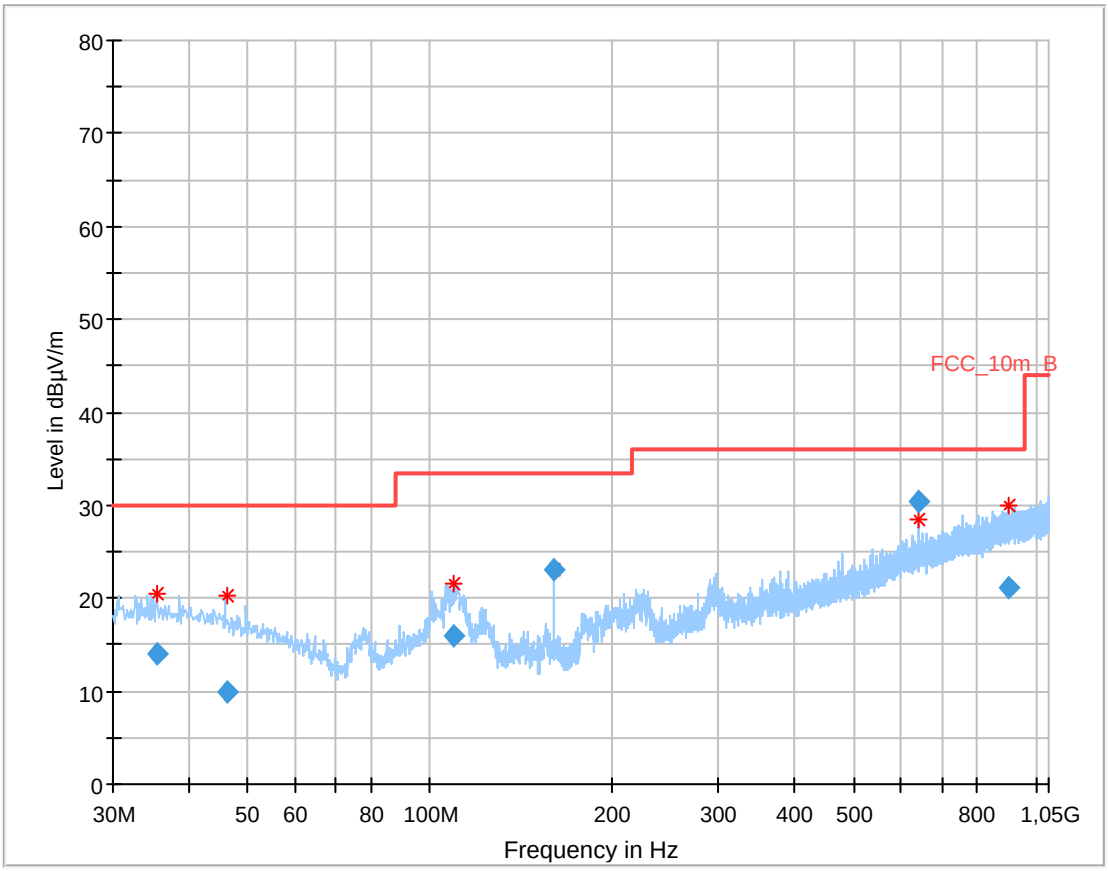
Date: 7.JUN.2016 17:08:19

Plot 20: 26 GHz to 40 GHz, 5600 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:49:24

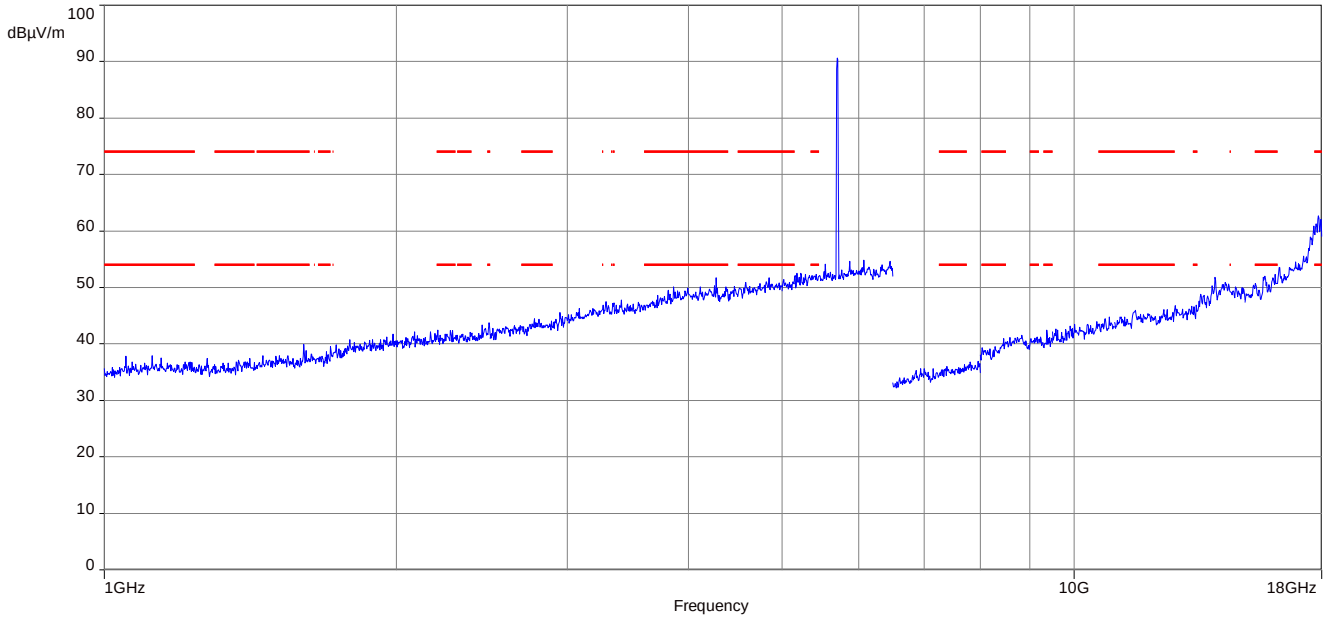
Plot 21: 30 MHz to 1 GHz, 5700 MHz, vertical & horizontal polarization



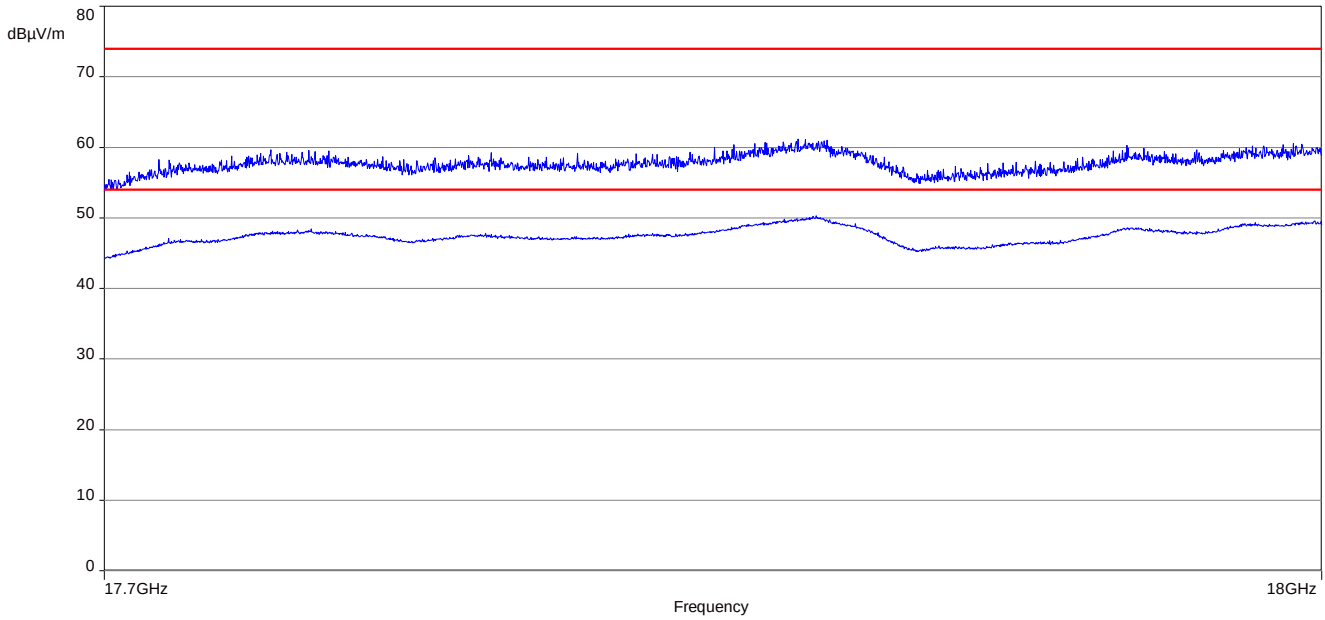
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.372400	14.11	30.00	15.89	1000.0	120.000	179.0	V	353.0	13.8
46.410600	9.93	30.00	20.07	1000.0	120.000	101.0	V	175.0	13.5
109.849500	16.04	33.50	17.46	1000.0	120.000	98.0	V	14.0	11.1
160.012950	23.02	33.50	10.48	1000.0	120.000	98.0	V	342.0	9.1
640.005750	30.31	36.00	5.69	1000.0	120.000	185.0	V	268.0	21.0
900.263850	21.15	36.00	14.85	1000.0	120.000	98.0	V	69.0	24.1

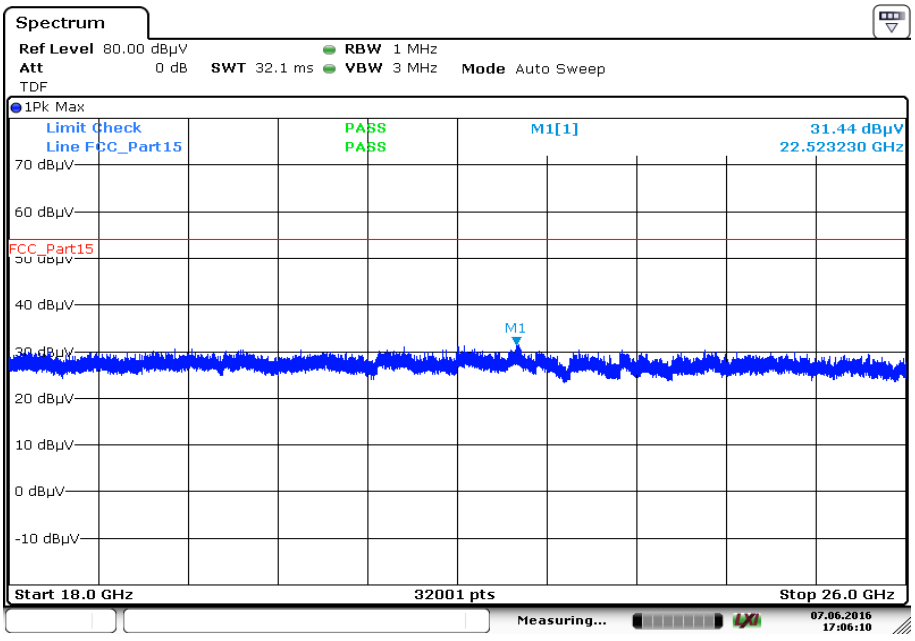
Plot 22: 1 GHz to 18 GHz, 5700 MHz, vertical & horizontal polarization



Plot 23: 17.7 GHz to 18 GHz, 5700 MHz, zoomed

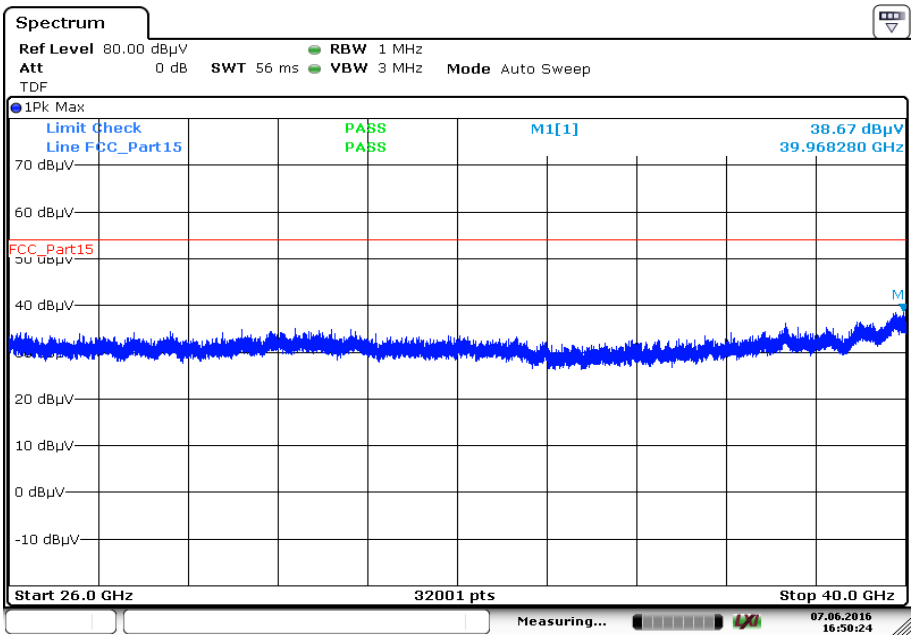


Plot 24: 18 GHz to 26 GHz, 5700 MHz, vertical & horizontal polarization



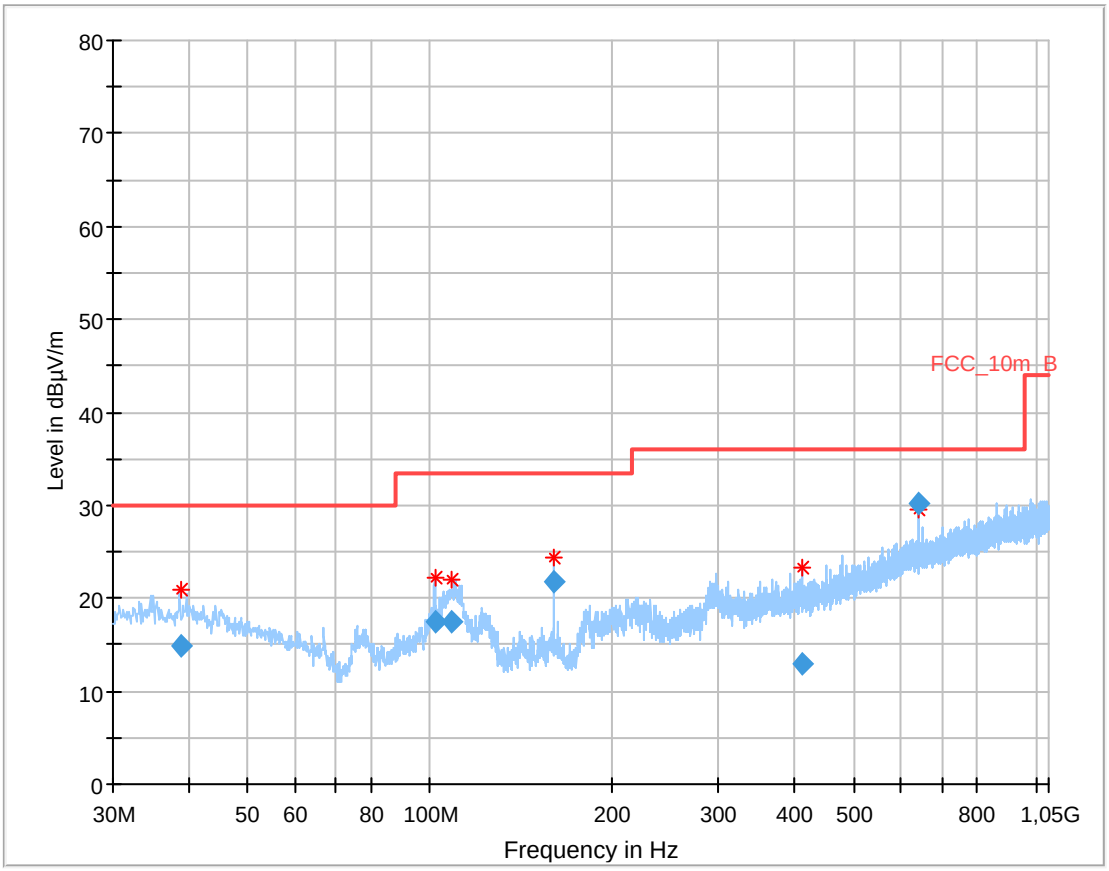
Date: 7.JUN.2016 17:06:10

Plot 25: 26 GHz to 40 GHz, 5700 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:50:25

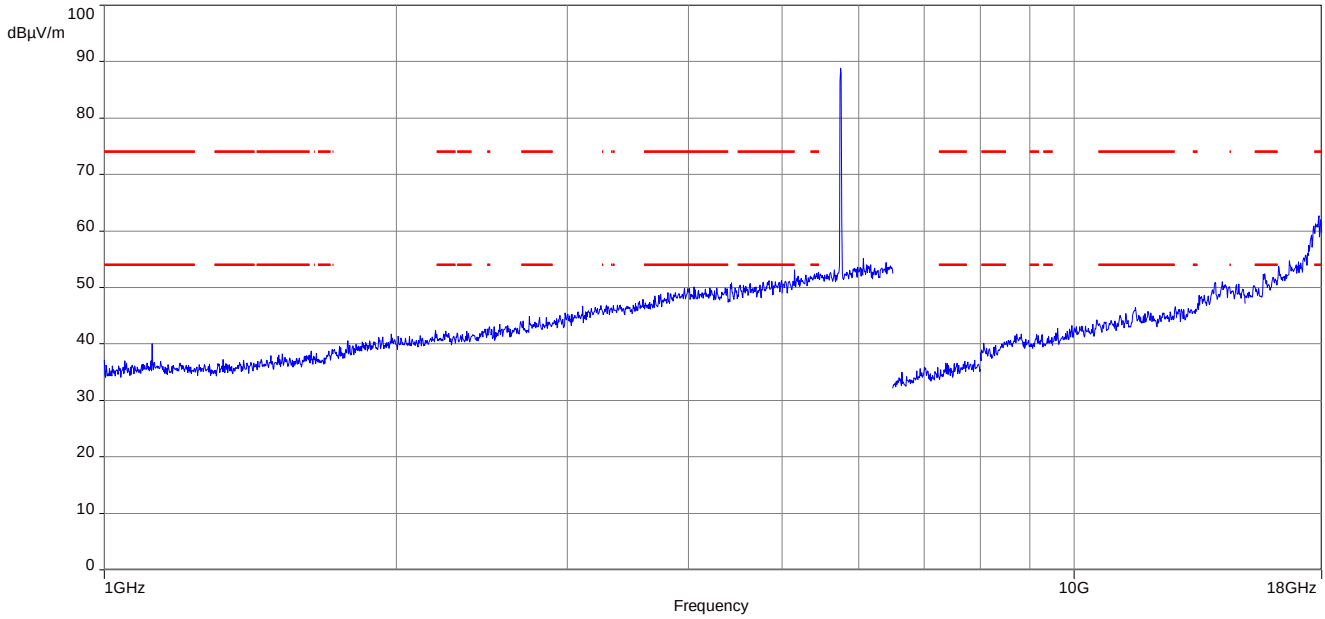
Plot 26: 30 MHz to 1 GHz, 5745 MHz, vertical & horizontal polarization



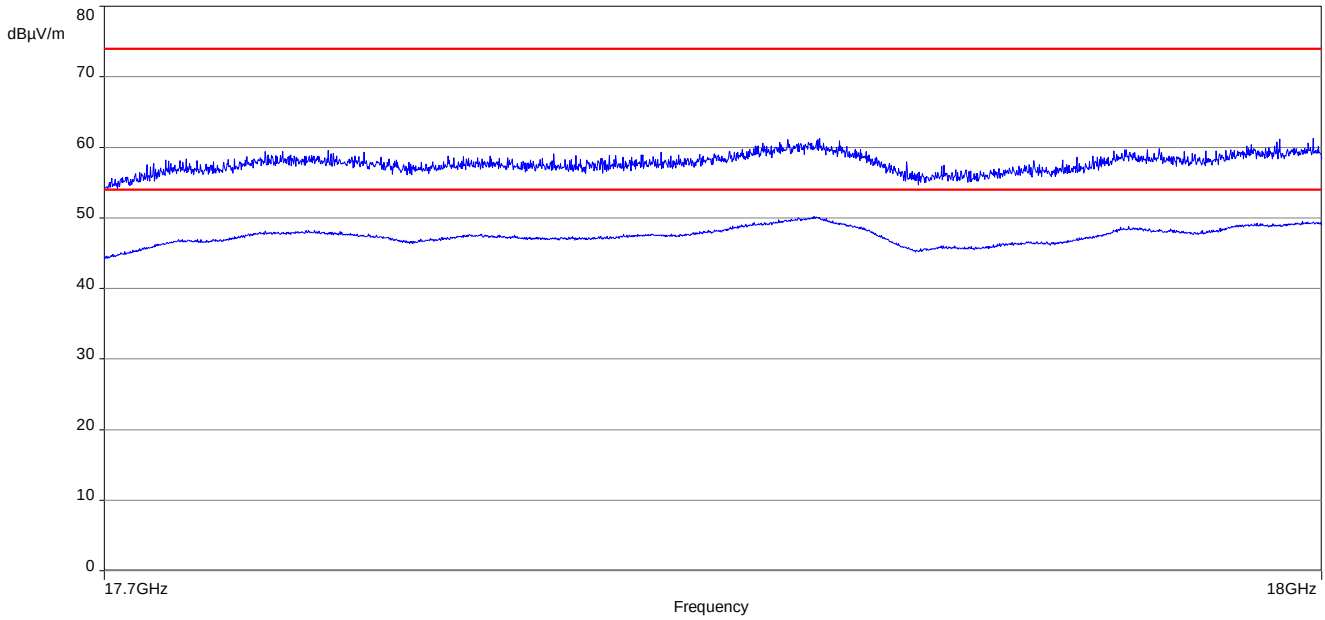
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.727300	14.95	30.00	15.05	1000.0	120.000	179.0	V	190.0	14.0
101.894250	17.47	33.50	16.03	1000.0	120.000	98.0	V	174.0	12.0
108.833850	17.40	33.50	16.10	1000.0	120.000	98.0	V	40.0	11.2
160.030200	21.78	33.50	11.72	1000.0	120.000	98.0	V	9.0	9.1
411.365550	12.88	36.00	23.12	1000.0	120.000	179.0	V	153.0	17.0
640.001700	30.20	36.00	5.80	1000.0	120.000	185.0	V	263.0	21.0

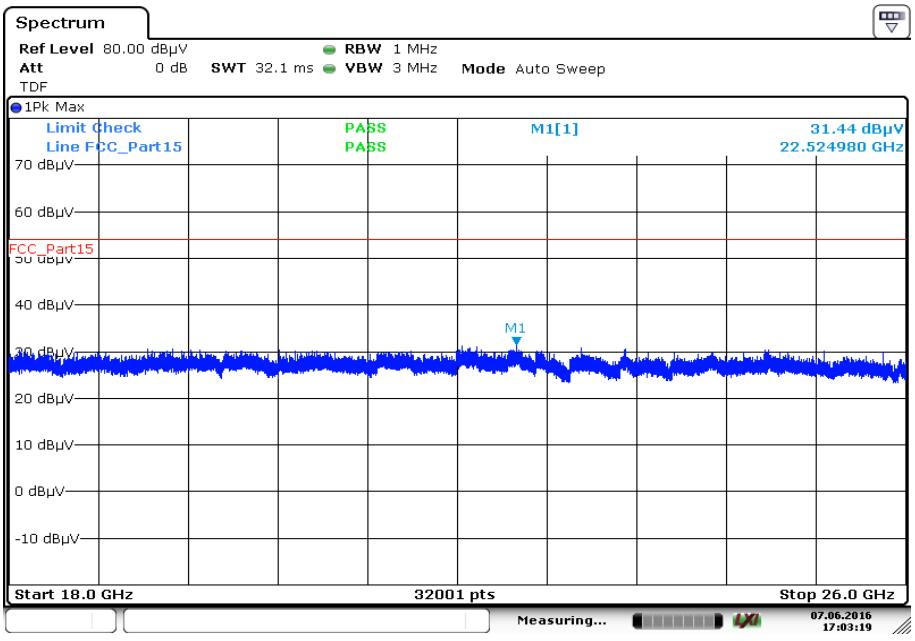
Plot 27: 1 GHz to 18 GHz, 5745 MHz, vertical & horizontal polarization



Plot 28: 17.7 GHz to 18 GHz, 5745 MHz, zoomed

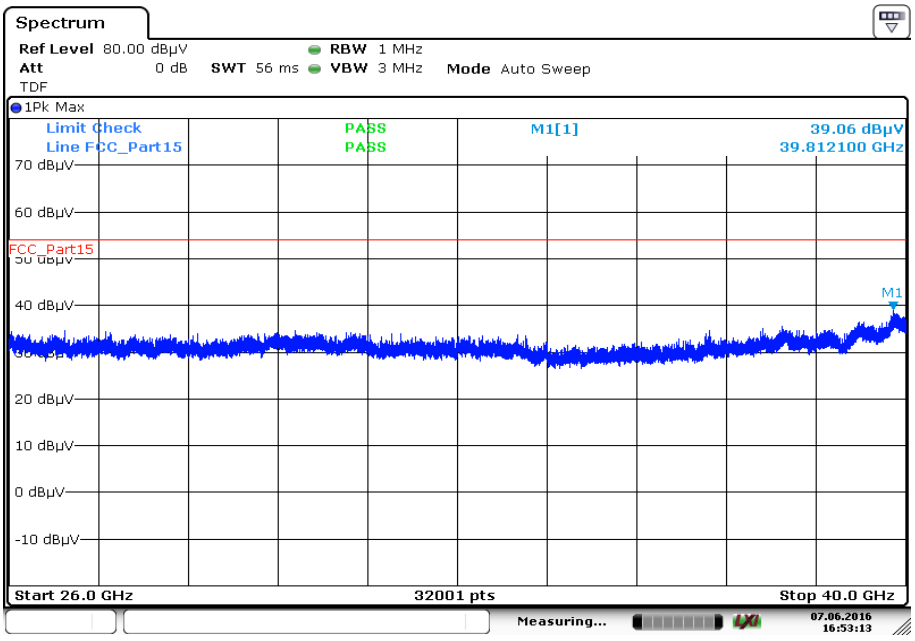


Plot 29: 18 GHz to 26 GHz, 5745 MHz, vertical & horizontal polarization



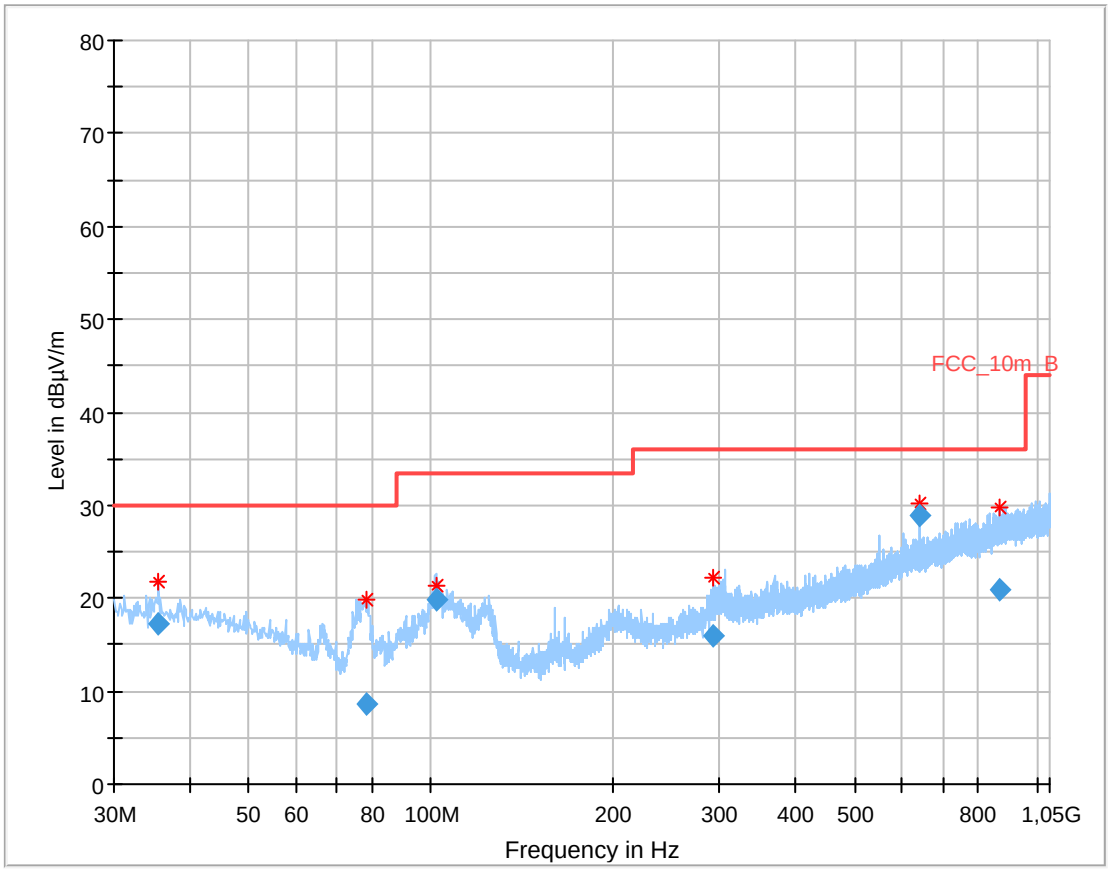
Date: 7.JUN.2016 17:03:19

Plot 30: 26 GHz to 40 GHz, 5745 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:53:14

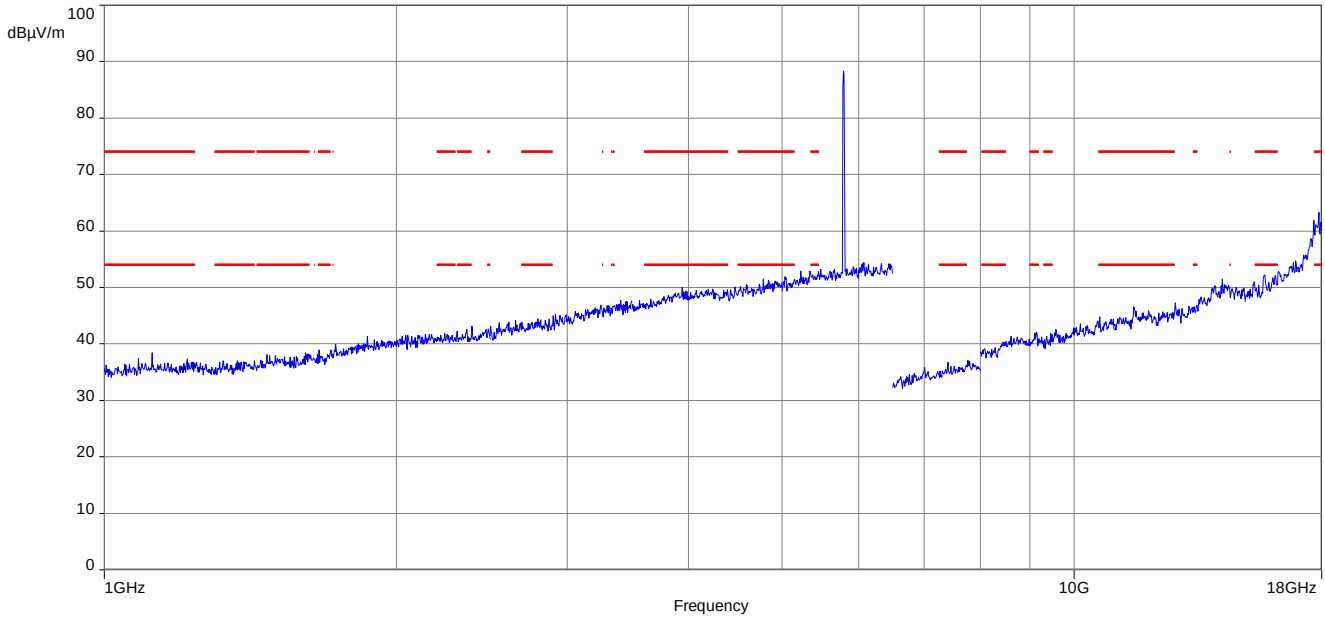
Plot 31: 30 MHz to 1 GHz, 5785 MHz, vertical & horizontal polarization



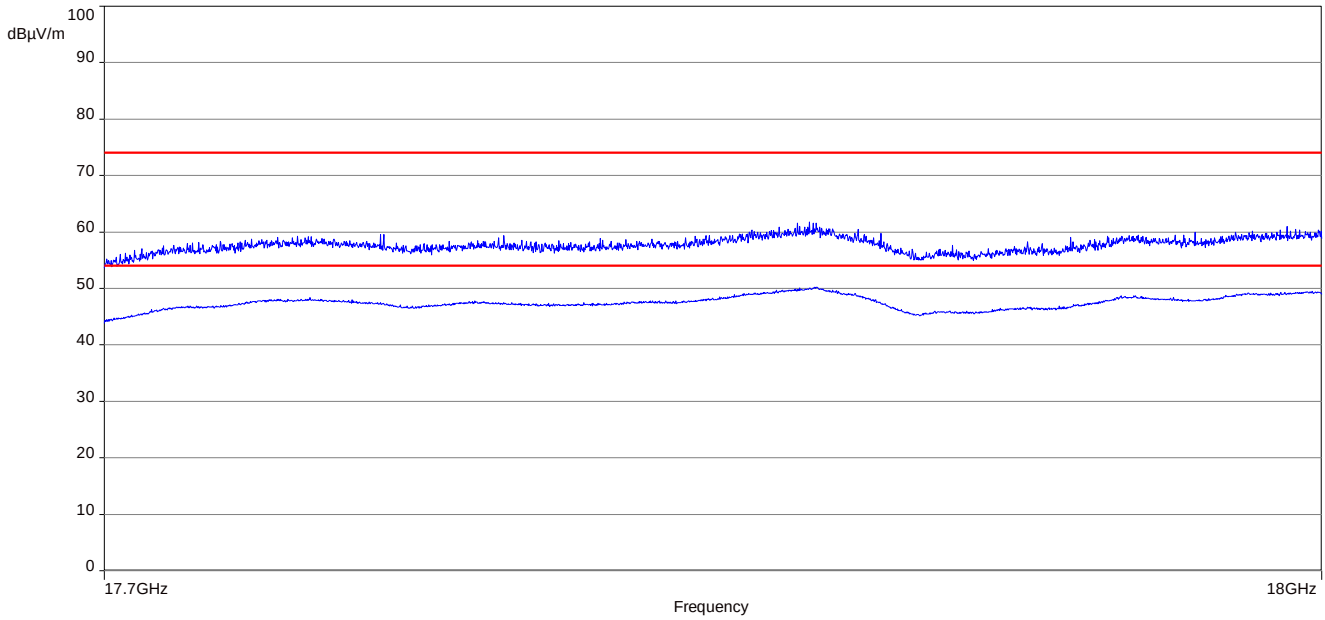
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.484750	17.29	30.00	12.71	1000.0	120.000	101.0	V	302.0	13.8
78.000750	8.66	30.00	21.34	1000.0	120.000	101.0	V	244.0	8.1
101.855850	19.92	33.50	13.58	1000.0	120.000	101.0	V	317.0	12.0
291.951600	16.06	36.00	19.94	1000.0	120.000	98.0	V	209.0	14.3
639.992850	28.89	36.00	7.11	1000.0	120.000	101.0	H	271.0	21.0
865.532850	20.96	36.00	15.04	1000.0	120.000	185.0	V	271.0	23.7

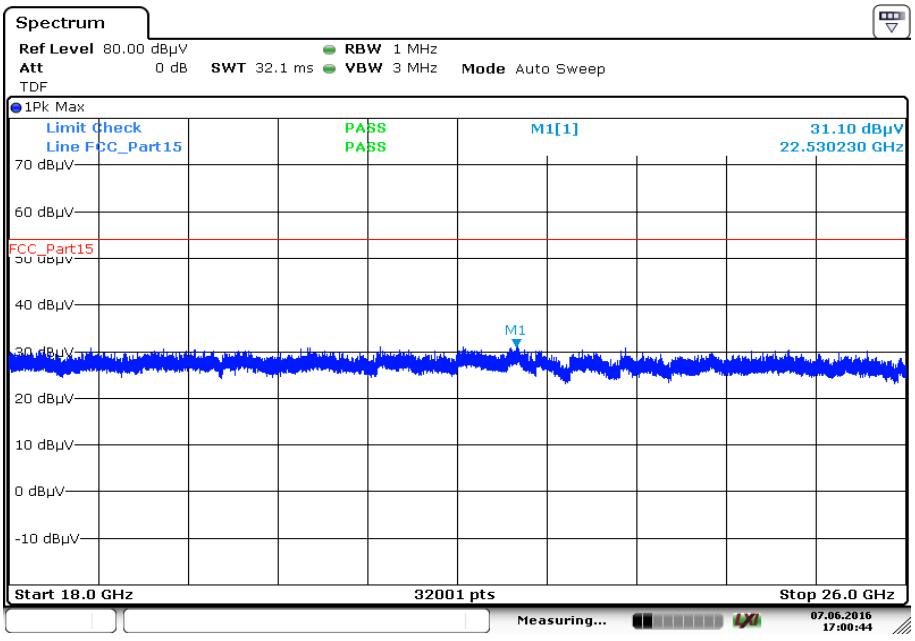
Plot 32: 1 GHz to 18 GHz, 5785 MHz, vertical & horizontal polarization



Plot 33: 17.7 GHz to 18 GHz, 5785 MHz, zoomed

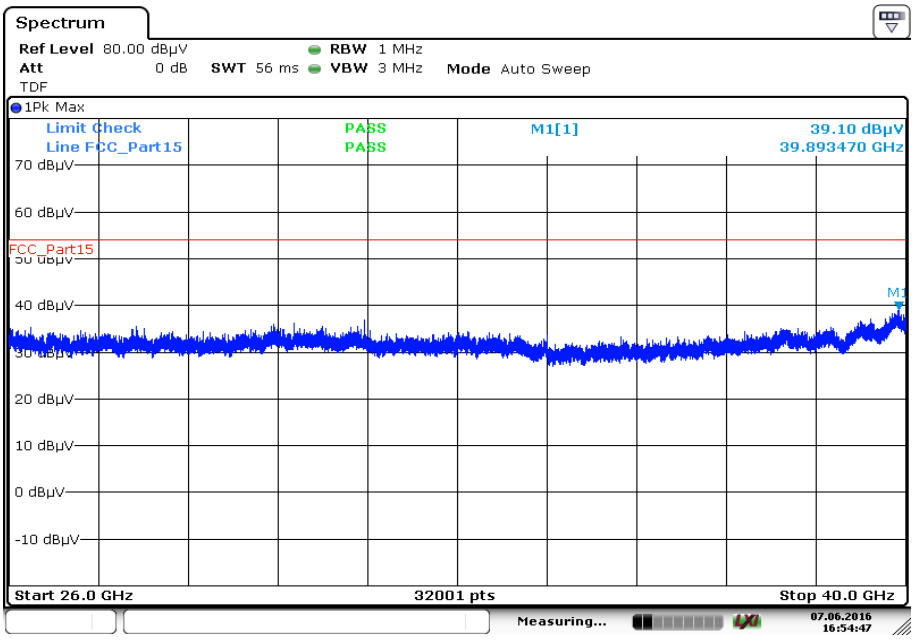


Plot 34: 18 GHz to 26 GHz, 5785 MHz, vertical & horizontal polarization



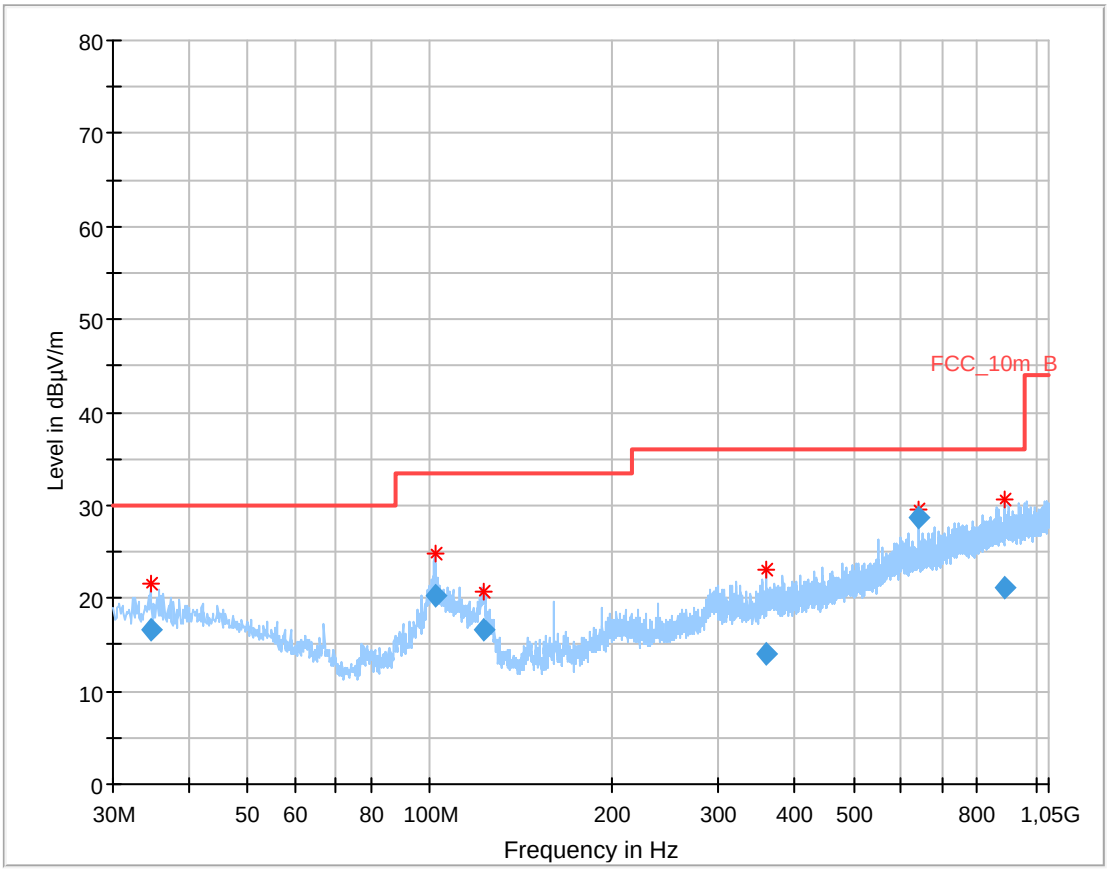
Date: 7.JUN.2016 17:00:44

Plot 35: 26 GHz to 40 GHz, 5785 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:54:47

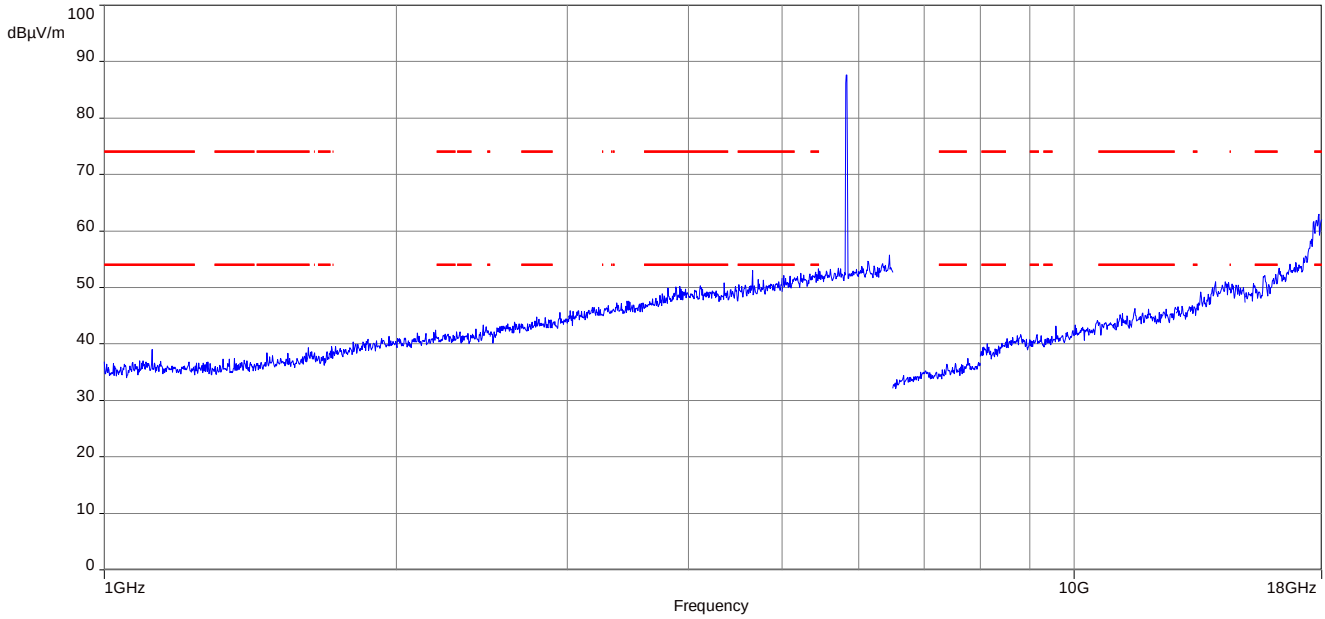
Plot 36: 30 MHz to 1 GHz, 5825 MHz, vertical & horizontal polarization



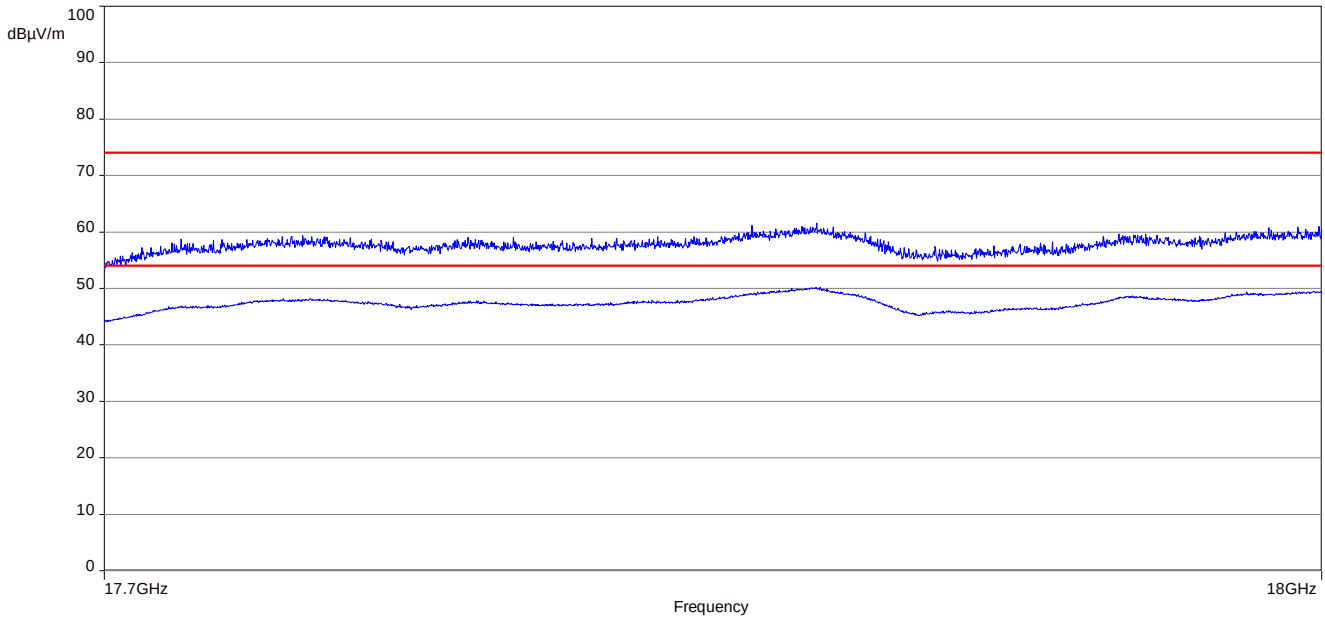
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.665300	16.56	30.00	13.44	1000.0	120.000	101.0	V	323.0	13.8
101.869950	20.27	33.50	13.23	1000.0	120.000	98.0	V	292.0	12.0
122.242200	16.62	33.50	16.88	1000.0	120.000	98.0	V	118.0	10.0
358.278450	14.01	36.00	21.99	1000.0	120.000	98.0	V	165.0	16.2
639.995400	28.62	36.00	7.38	1000.0	120.000	185.0	H	278.0	21.0
889.212750	21.10	36.00	14.90	1000.0	120.000	101.0	H	343.0	24.0

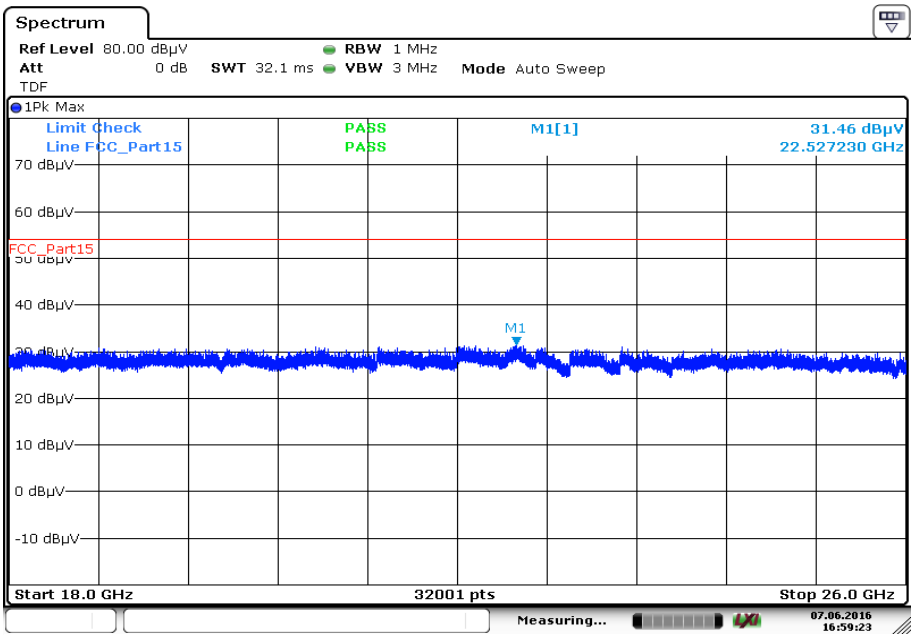
Plot 37: 1 GHz to 18 GHz, 5825 MHz, vertical & horizontal polarization



Plot 38: 17.7 GHz to 18 GHz, 5825 MHz, zoomed

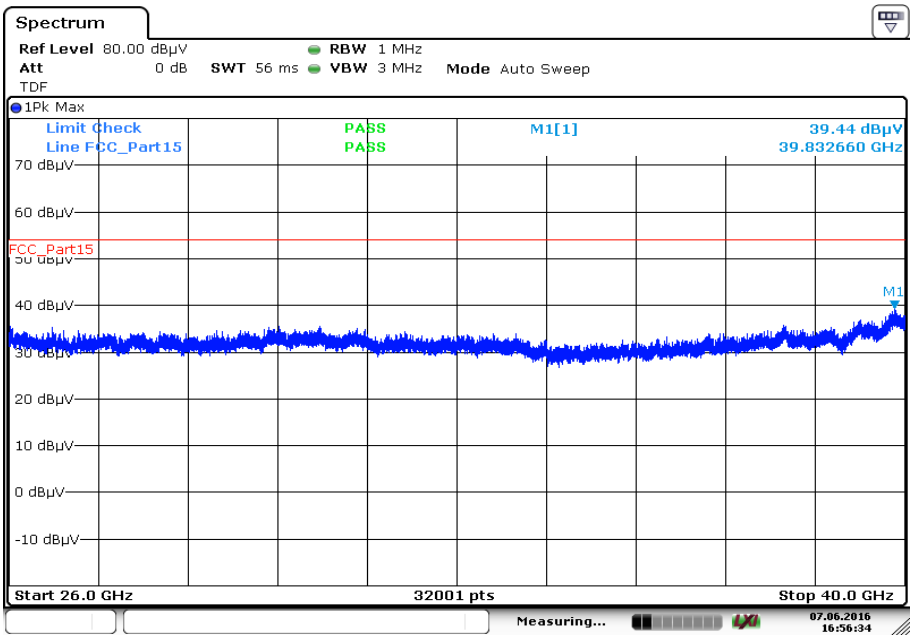


Plot 39: 18 GHz to 26 GHz, 5825 MHz, vertical & horizontal polarization



Date: 7.JUN.2016 16:59:24

Plot 40: 26 GHz to 40 GHz, 5825 MHz, vertical & horizontal polarization



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12.9 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode.

Measurement:

Measurement parameter	
Detector:	Quasi Peak below 1 GHz (alternative Peak) Peak above 1 GHz / RMS
Sweep time:	Auto
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Video bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: ≥ 3 MHz /10 Hz
Span:	30 MHz to 40 GHz
Trace-Mode:	Max Hold / Average with 100 counts + 20 log (1 / X) for duty cycle lower than 100 %
Test setup:	See chapter 7.1 – A, 7.2 – A, 7.3 – A
Measurement uncertainty:	See chapter 9

Limits:

RX Spurious Emissions Radiated		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

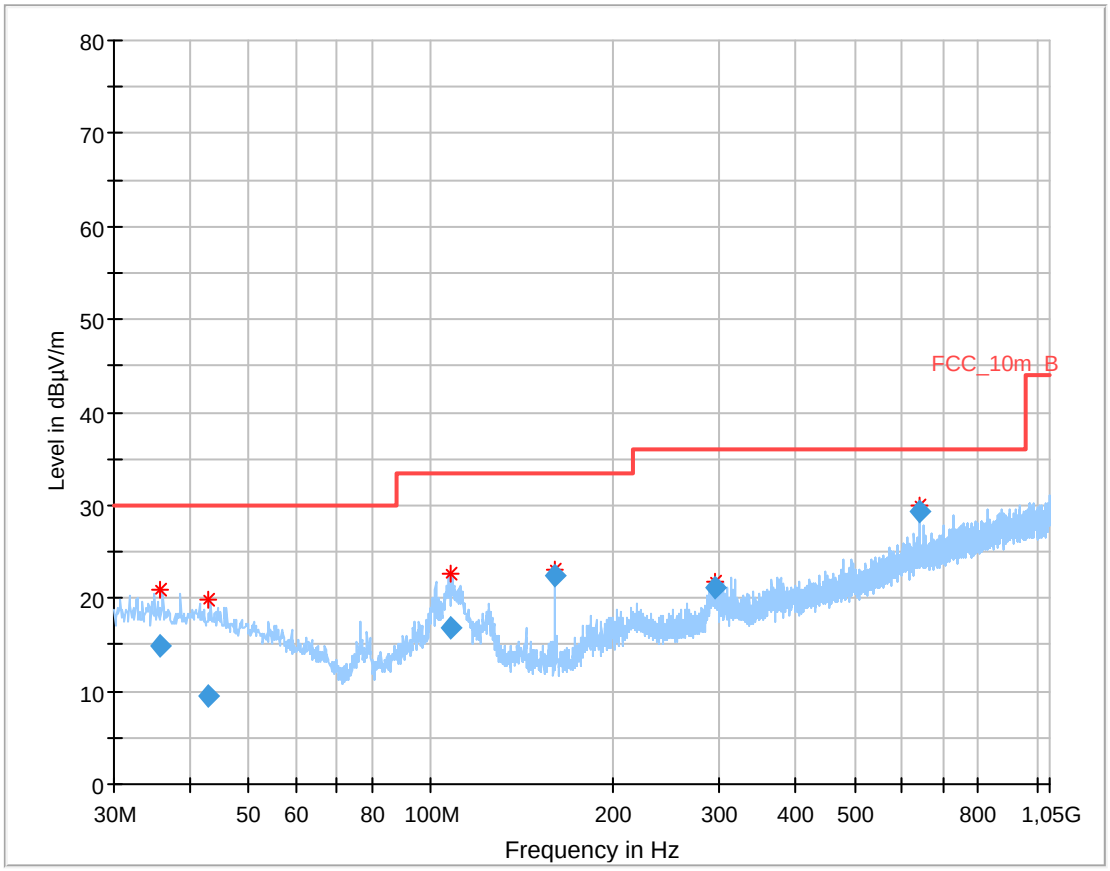
Results:

RX Spurious Emissions Radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 10 dB below the limit.		

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

Plots: RX / Idle – mode

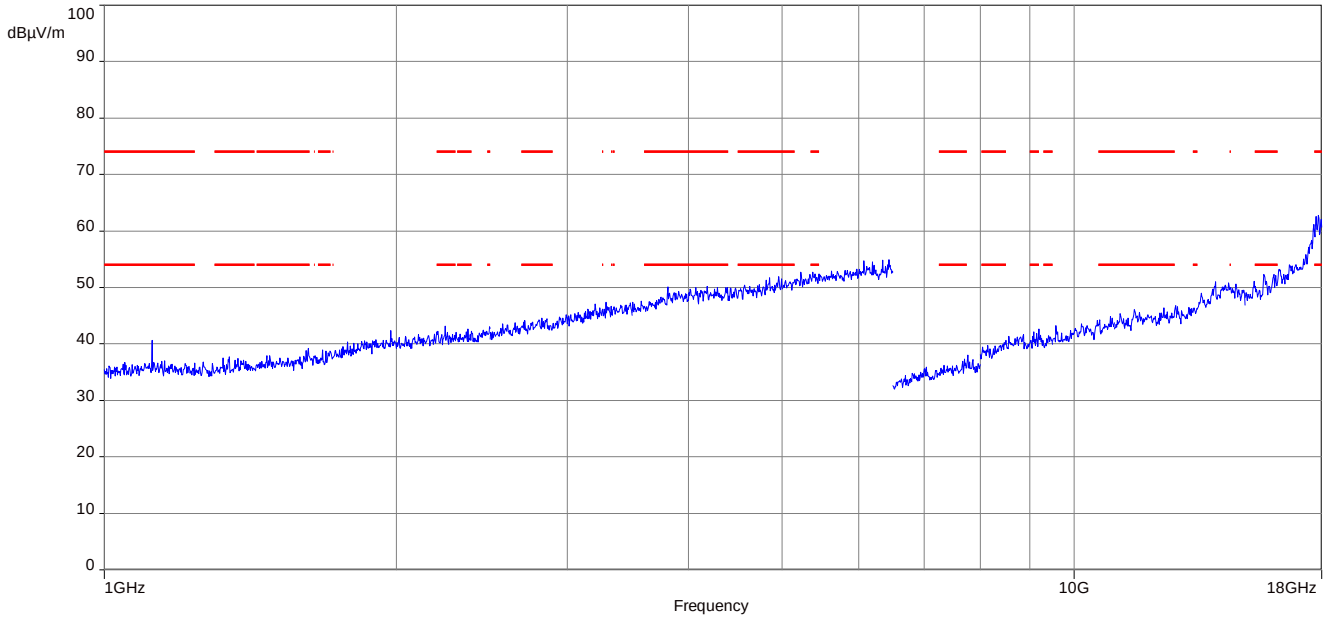
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization



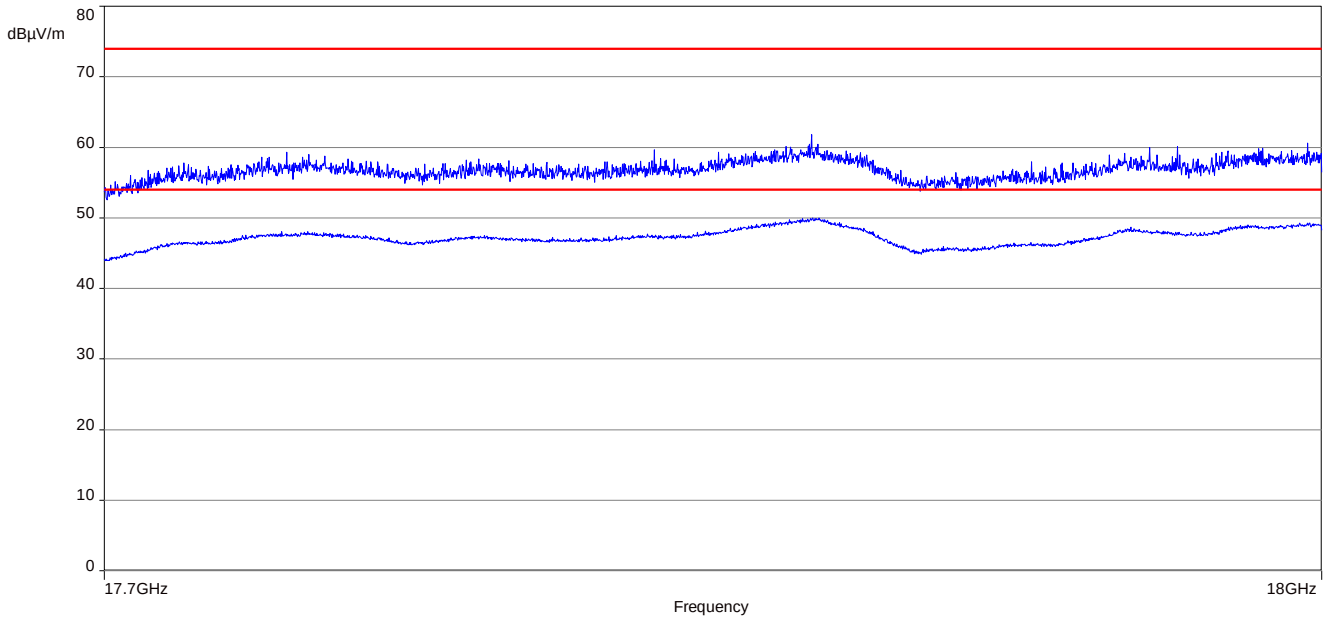
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.795550	14.82	30.00	15.18	1000.0	120.000	101.0	V	326.0	13.8
43.025400	9.53	30.00	20.47	1000.0	120.000	98.0	H	313.0	13.9
107.568150	16.85	33.50	16.65	1000.0	120.000	101.0	V	6.0	11.4
160.000950	22.37	33.50	11.13	1000.0	120.000	98.0	V	319.0	9.1
294.902400	21.13	36.00	14.87	1000.0	120.000	185.0	H	290.0	14.3
639.994050	29.30	36.00	6.70	1000.0	120.000	98.0	V	353.0	21.0

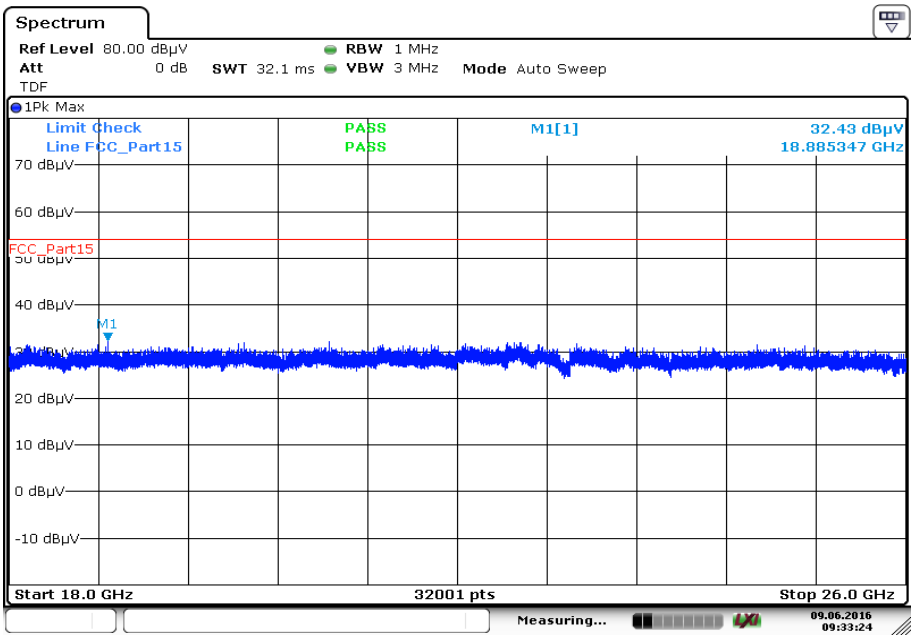
Plot 2: 1 GHz to 18 GHz, vertical & horizontal polarization



Plot 3: 17.7 GHz to 18 GHz, 5825 MHz, zoomed



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



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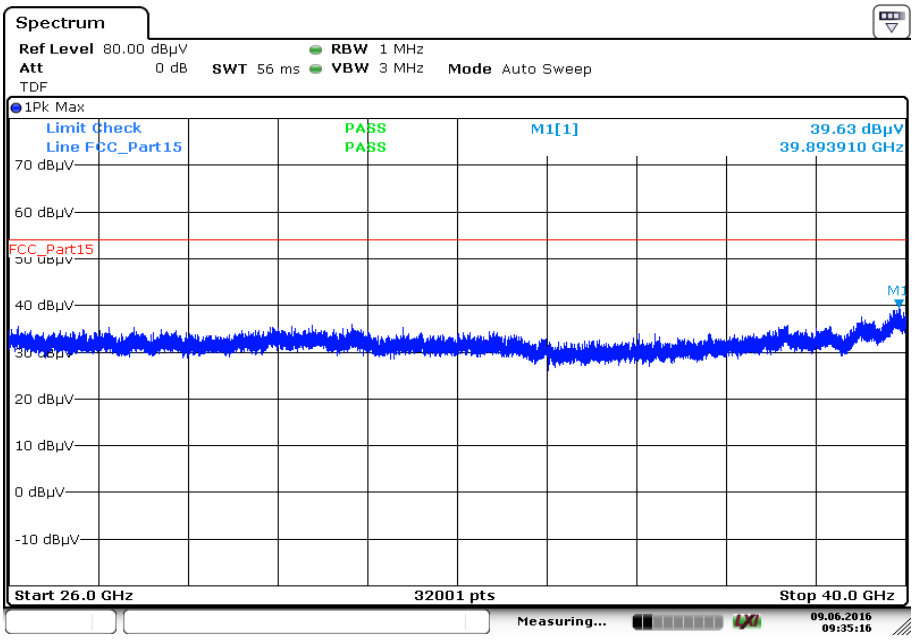
Plot 5: 26 GHz to 40 GHz, vertical & horizontal polarization



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12.10 Spurious emissions radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode and receive mode below 30 MHz. The EUT is set first to middle channel. This measurement is representative for all channels and modes. If critical peaks are found the lowest channel and the highest channel will be measured too. Then the EUT is set to receive or idle mode. 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
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold
Test setup:	See chapter 7.2 – B
Measurement uncertainty:	See chapter 9

Limits:

Spurious Emissions Radiated < 30 MHz		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

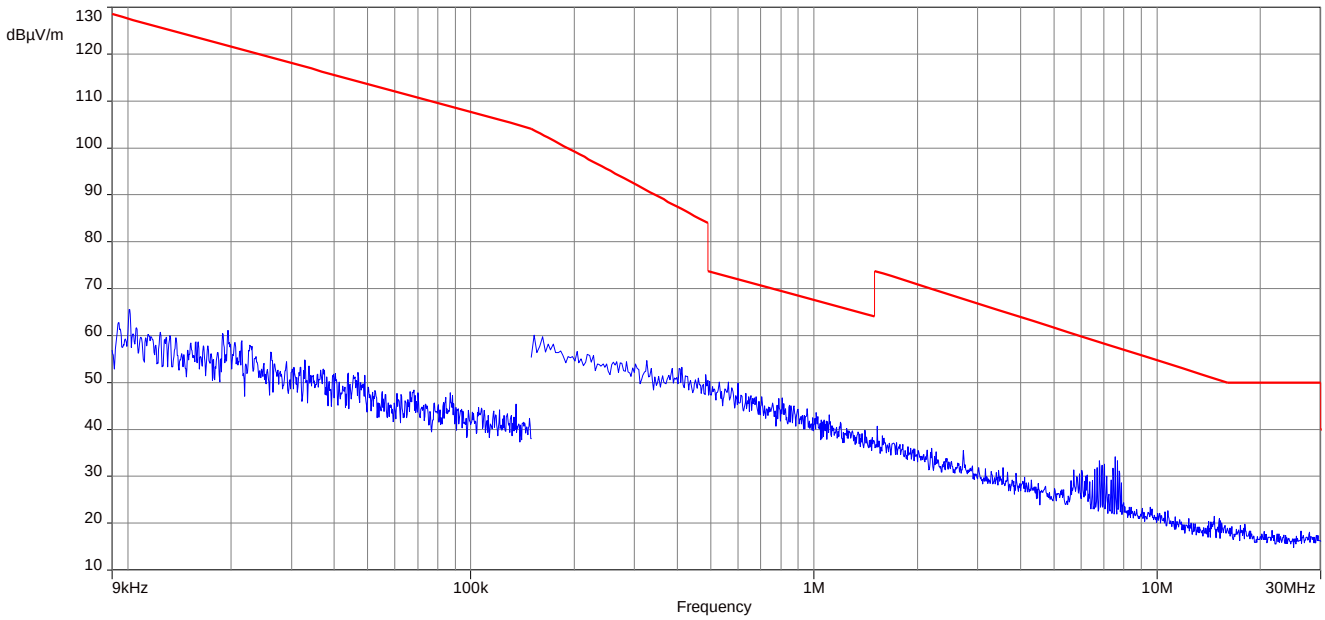
Results:

Spurious Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 10 dB below the limit.		

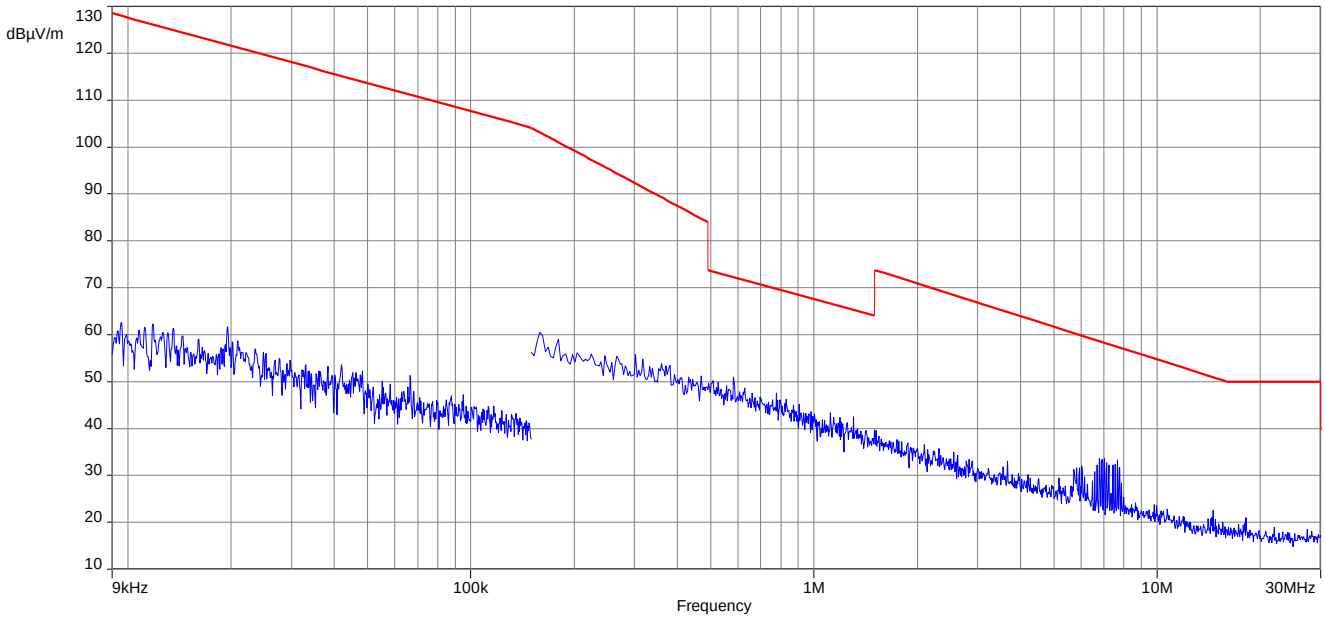
Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

Plots: ODFM / ANT1

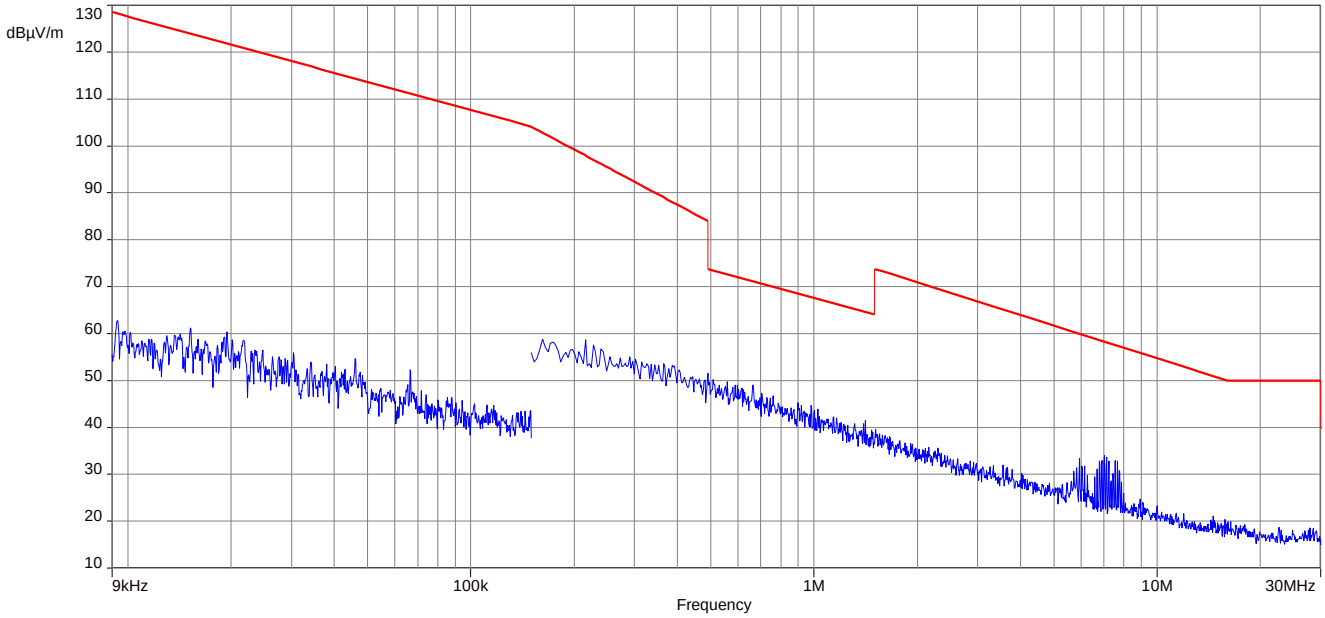
Plot 1: 9 kHz to 30 MHz, 5180 MHz, TX mode



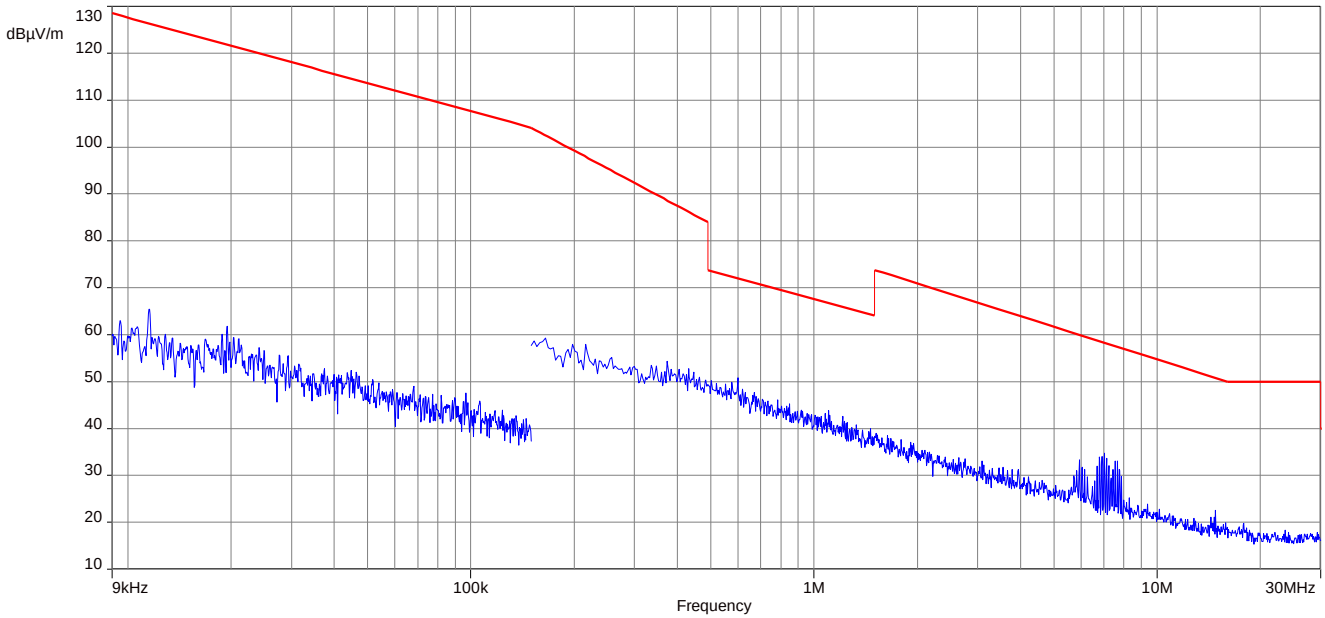
Plot 2: 9 kHz to 30 MHz, 5320 MHz, TX mode



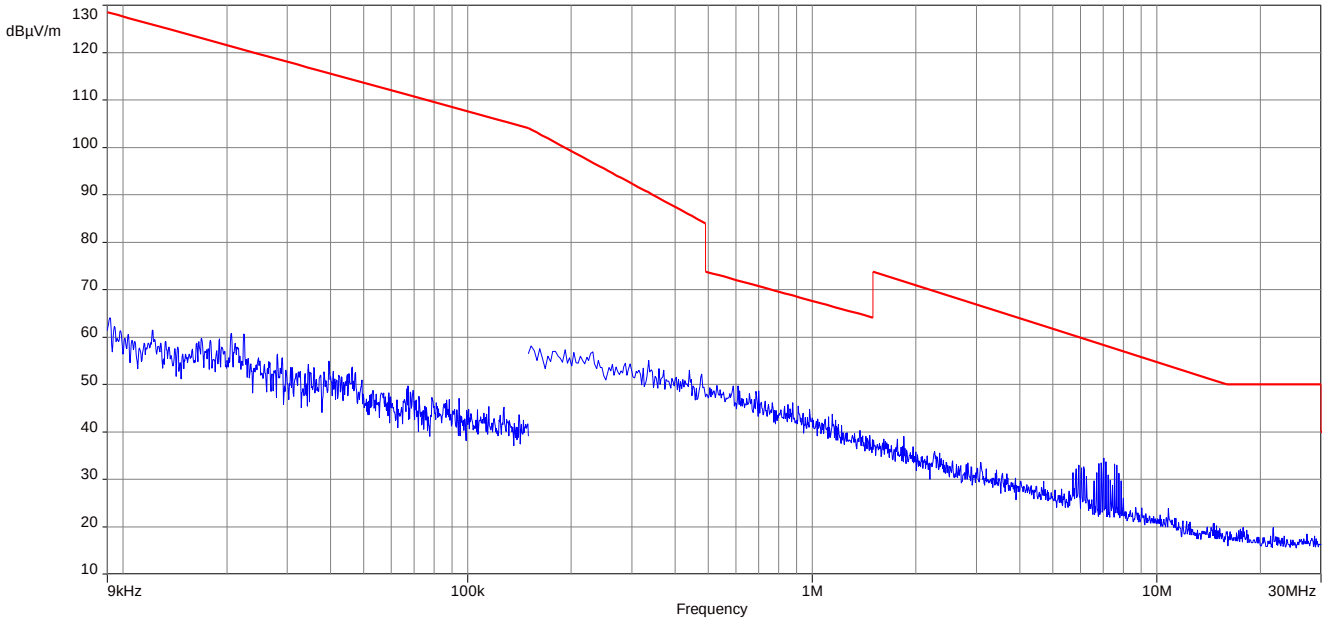
Plot 3: 9 kHz to 30 MHz, 5500 MHz, TX mode



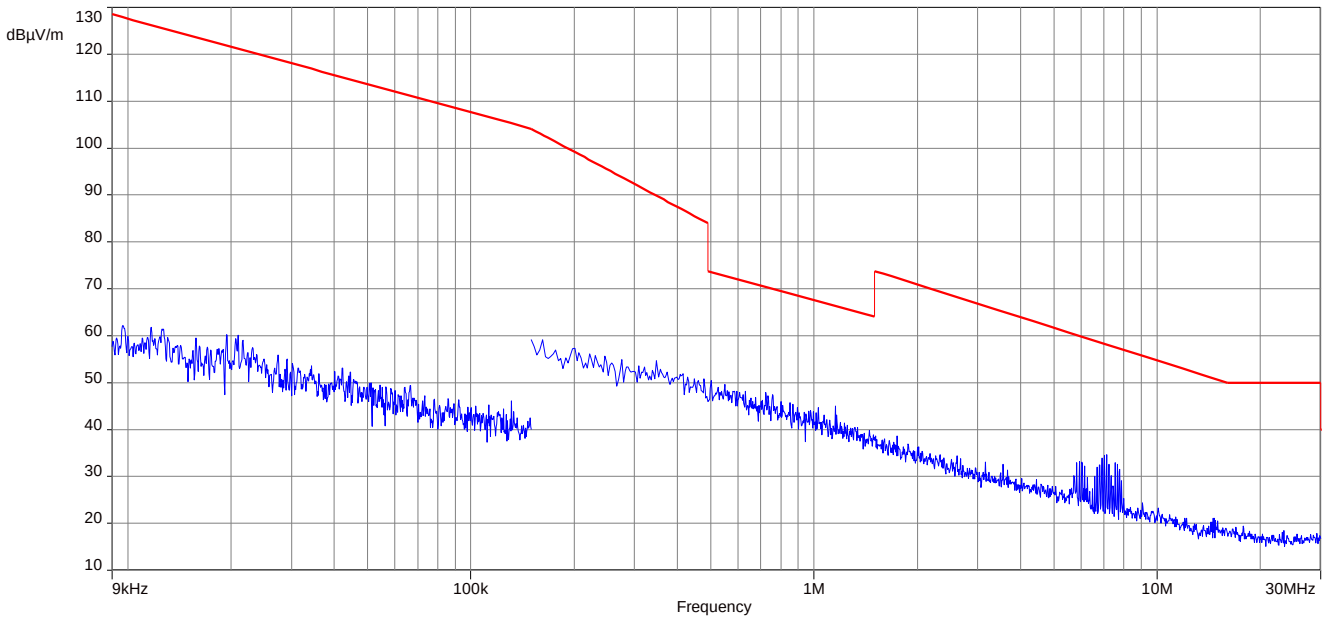
Plot 4: 9 kHz to 30 MHz, 5600 MHz, TX mode



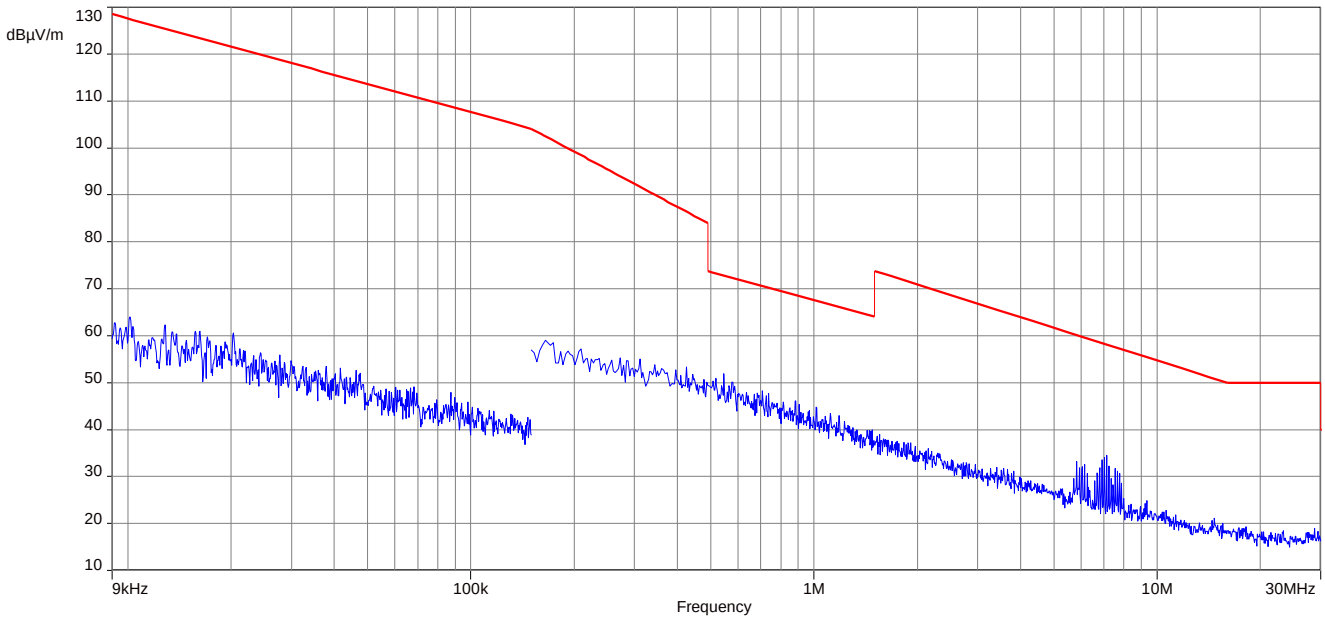
Plot 5: 9 kHz to 30 MHz, 5700 MHz, TX mode



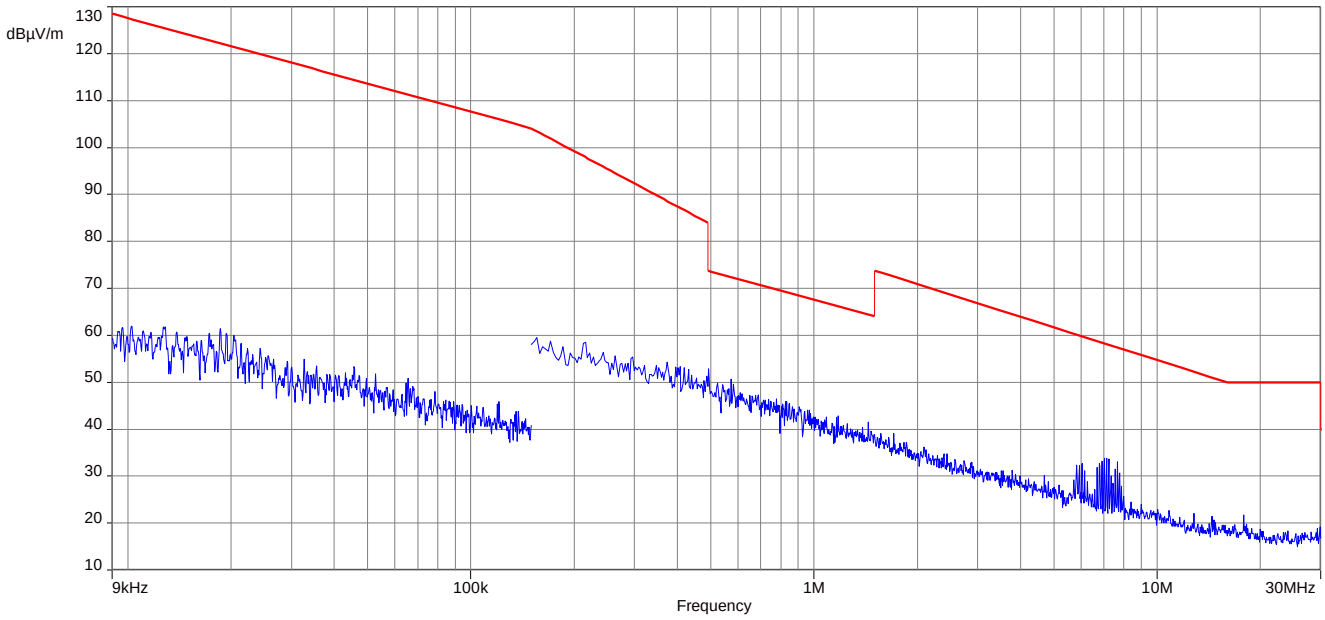
Plot 6: 9 kHz to 30 MHz, 5745 MHz, TX mode



Plot 7: 9 kHz to 30 MHz, 5785 MHz, TX mode

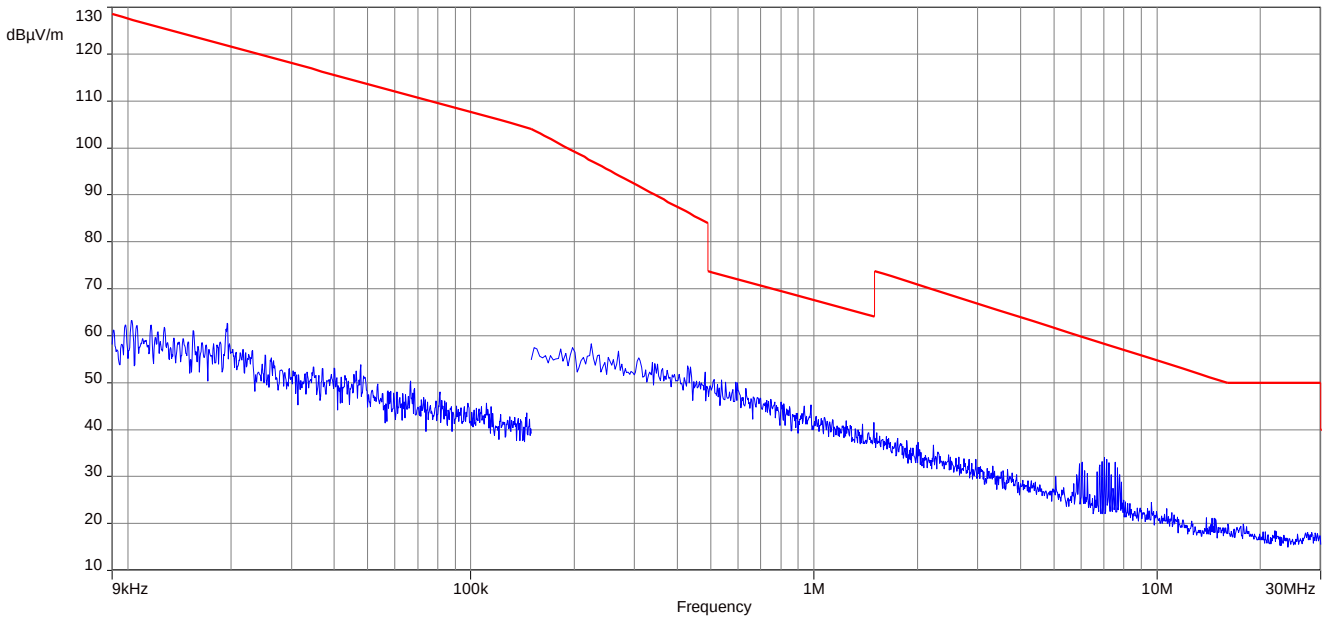


Plot 8: 9 kHz to 30 MHz, 5825 MHz, TX mode

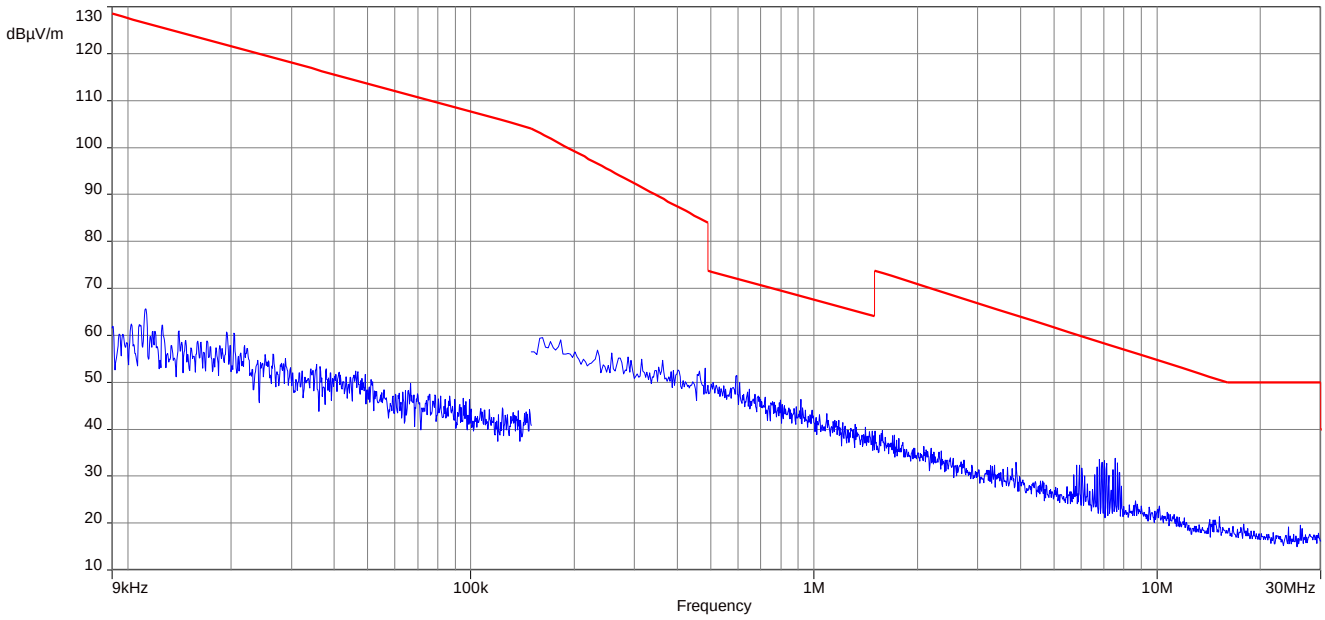


Plots: ODFM / ANT2

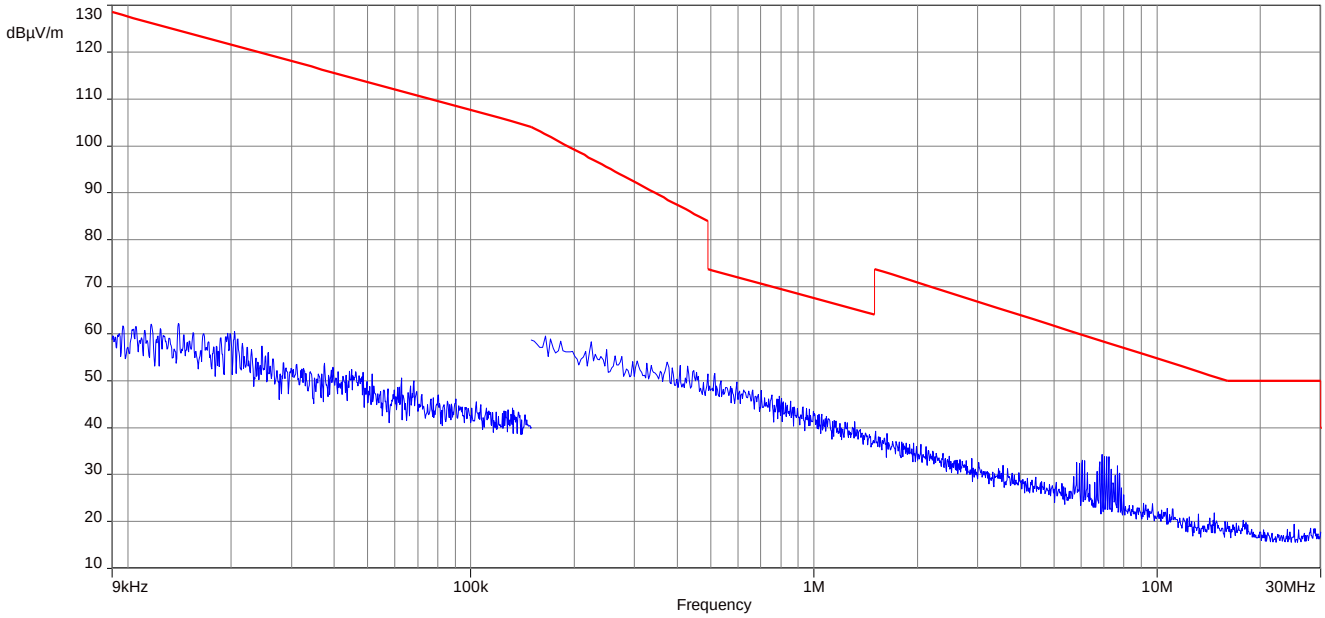
Plot 1: 9 kHz to 30 MHz, 5180 MHz, TX mode



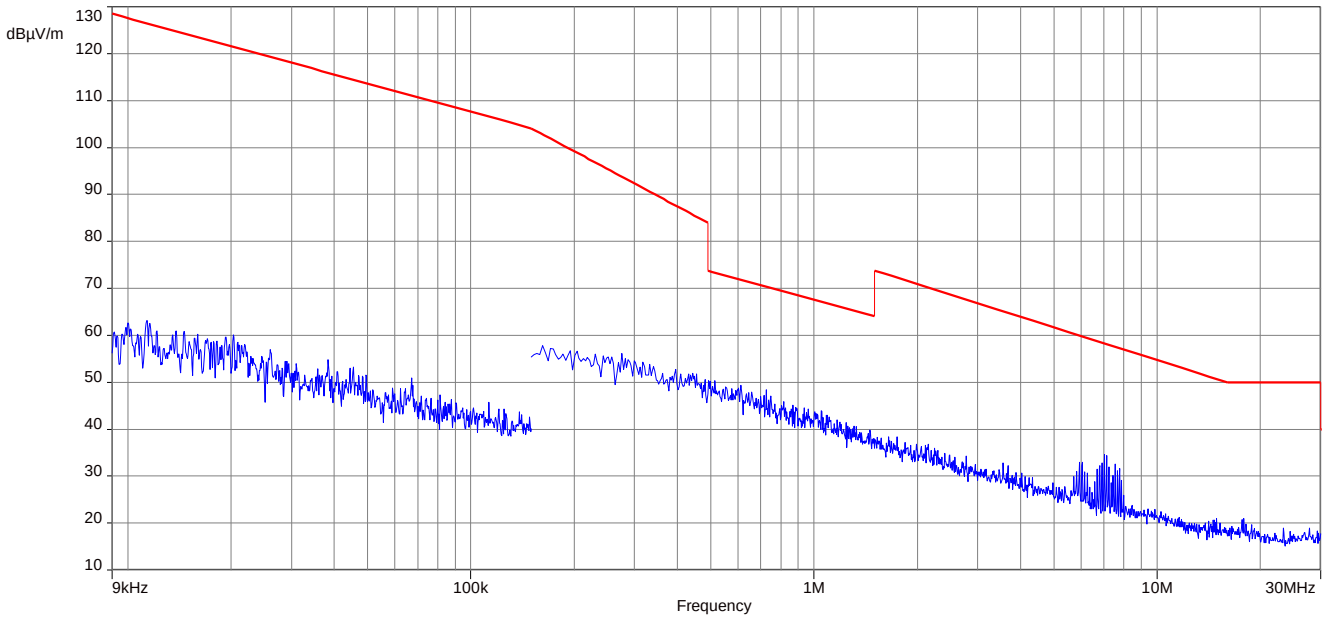
Plot 2: 9 kHz to 30 MHz, 5320 MHz, TX mode



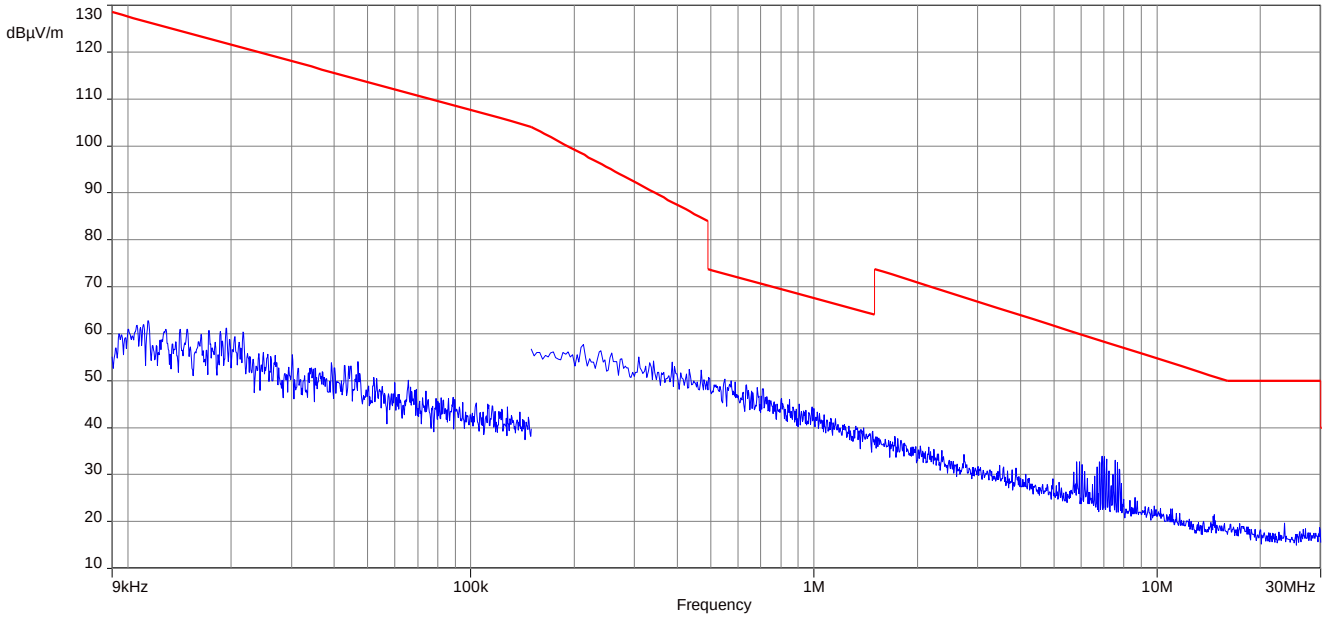
Plot 3: 9 kHz to 30 MHz, 5500 MHz, TX mode



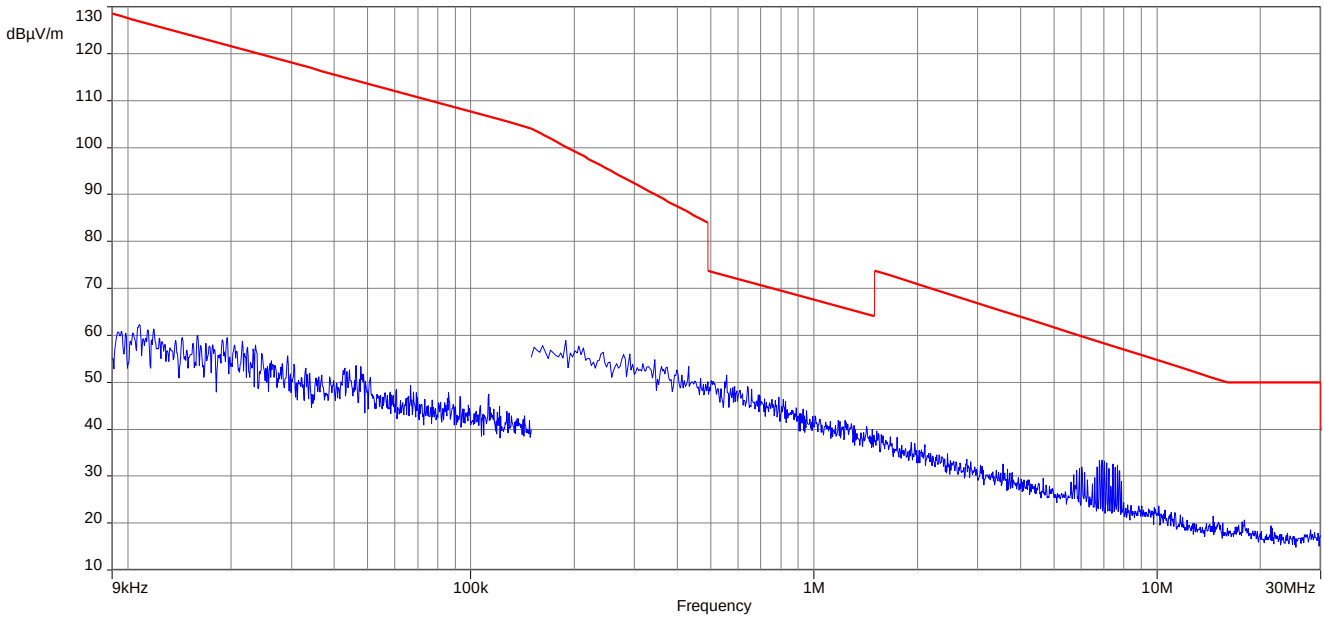
Plot 4: 9 kHz to 30 MHz, 5600 MHz, TX mode



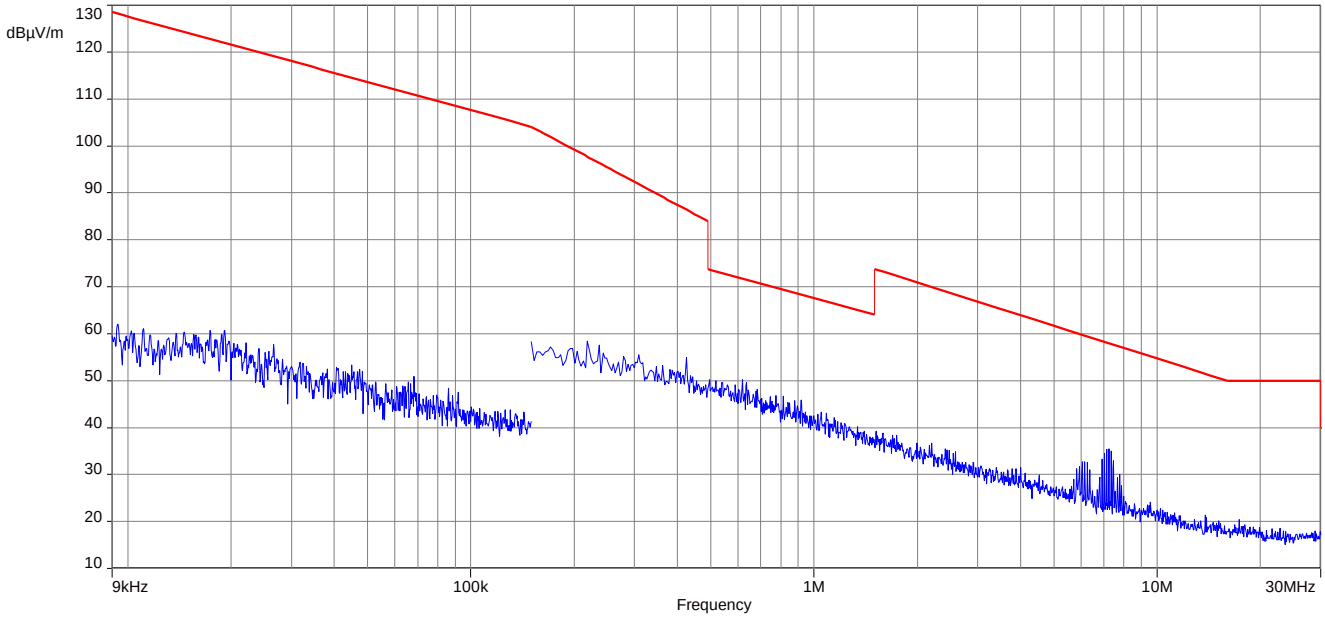
Plot 5: 9 kHz to 30 MHz, 5700 MHz, TX mode



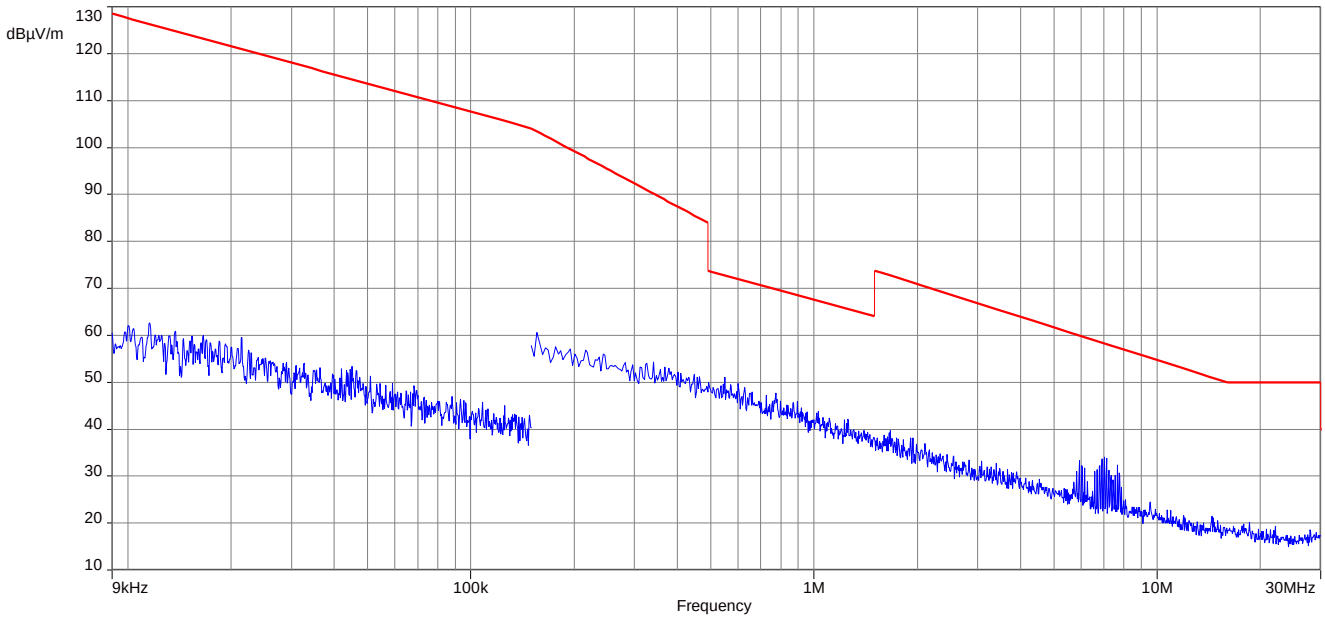
Plot 6: 9 kHz to 30 MHz, 5745 MHz, TX mode



Plot 7: 9 kHz to 30 MHz, 5785 MHz, TX mode



Plot 8: 9 kHz to 30 MHz, 5825 MHz, TX mode



12.11 Spurious emissions conducted < 30 MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to middle channel. If critical peaks are found the lowest channel and the highest channel will be measured too. Both power lines, phase and neutral line, are measured. Found peaks are remeasured with average and quasi peak detection to show compliance to the limits.

Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Video bandwidth:	F > 150 kHz: 9 kHz
Resolution bandwidth:	F > 150 kHz: 100 kHz
Span:	150 kHz to 30 MHz
Trace-Mode:	Max Hold
Test setup:	See chapter 7.4 – A
Measurement uncertainty:	See chapter 9

Limits:

Spurious Emissions Conducted < 30 MHz		
Frequency (MHz)	Quasi-Peak (dBµV/m)	Average (dBµV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

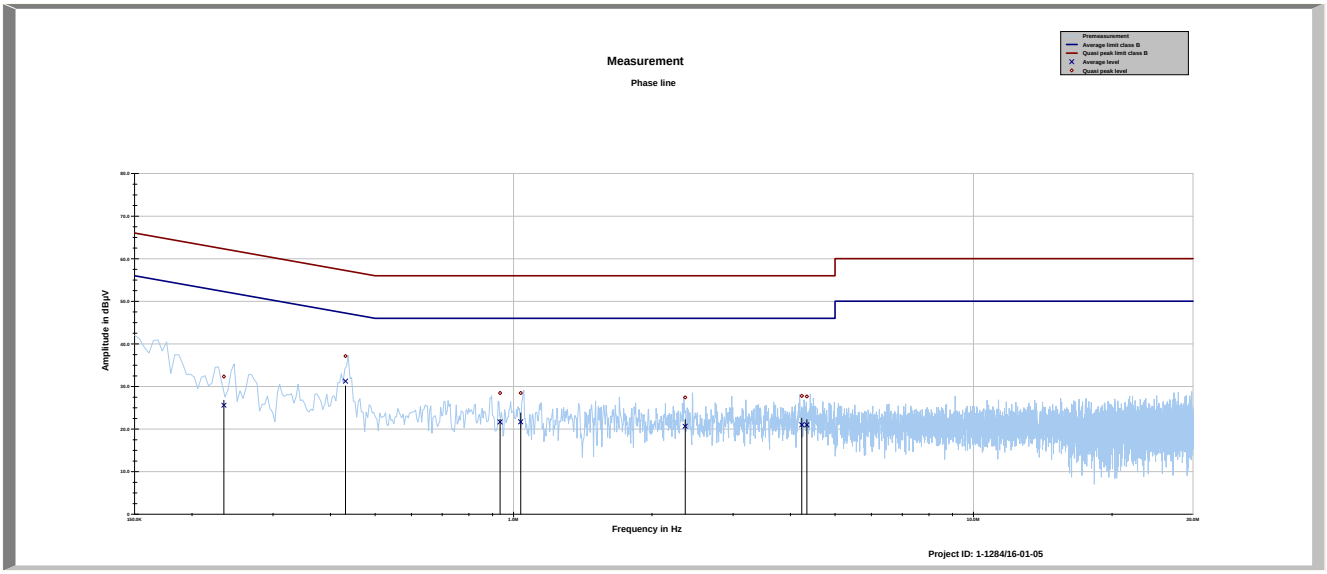
*Decreases with the logarithm of the frequency

Results:

Spurious Emissions Conducted < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 10 dB below the limit.		

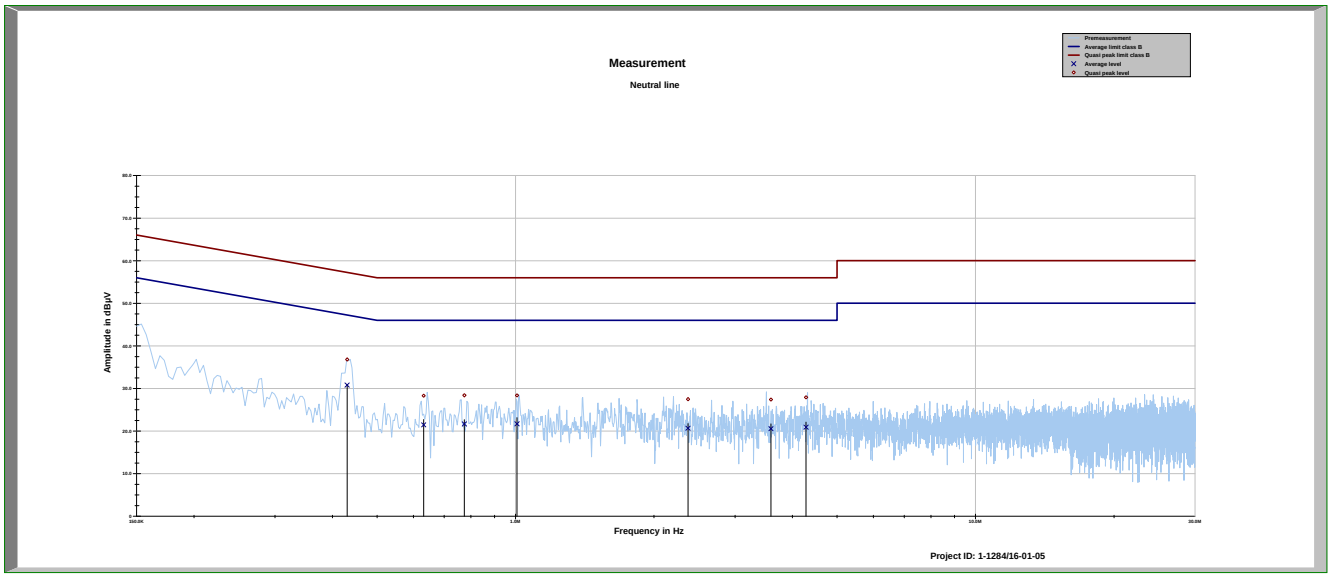
Plots:

Plot 1: 150 kHz to 30 MHz / phase Line, TX mode, power supply NT 12-50C



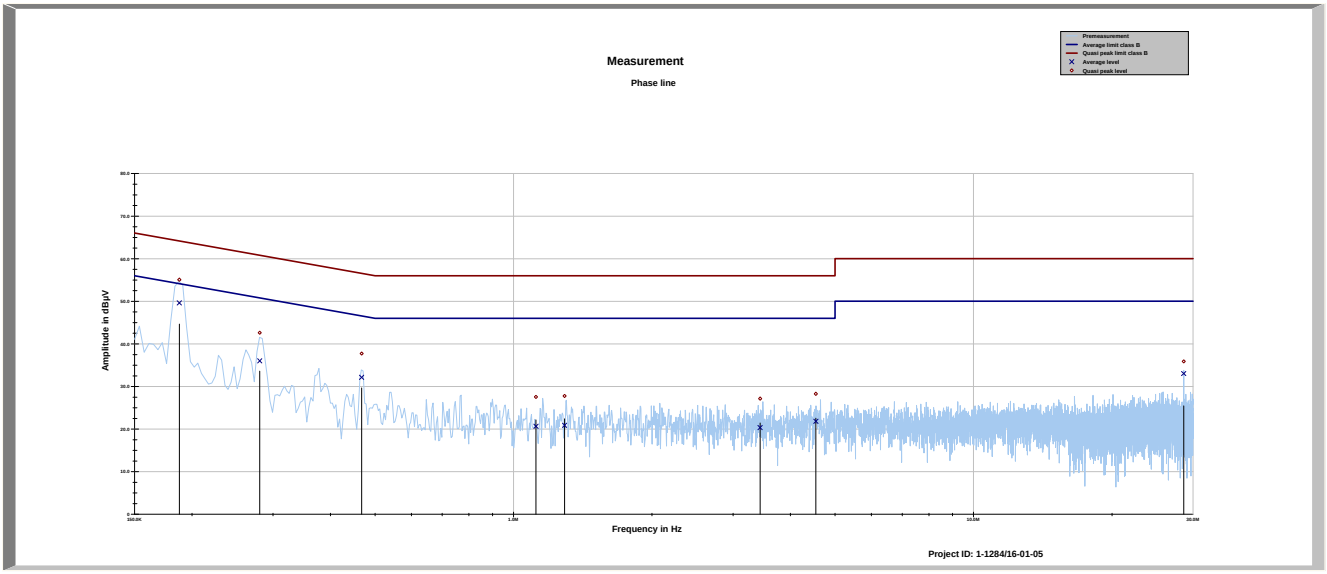
Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.234663	32.32	29.96	62.283	25.58	28.00	53.581
0.431418	37.11	20.12	57.225	31.23	16.72	47.959
0.934820	28.46	27.54	56.000	21.67	24.33	46.000
1.036446	28.46	27.54	56.000	21.69	24.31	46.000
2.361884	27.44	28.56	56.000	20.66	25.34	46.000
4.234912	27.79	28.21	56.000	20.98	25.02	46.000
4.340649	27.65	28.35	56.000	20.97	25.03	46.000

Plot 2: 150 kHz to 30 MHz / neutral Line, TX mode, power supply NT 12-50C



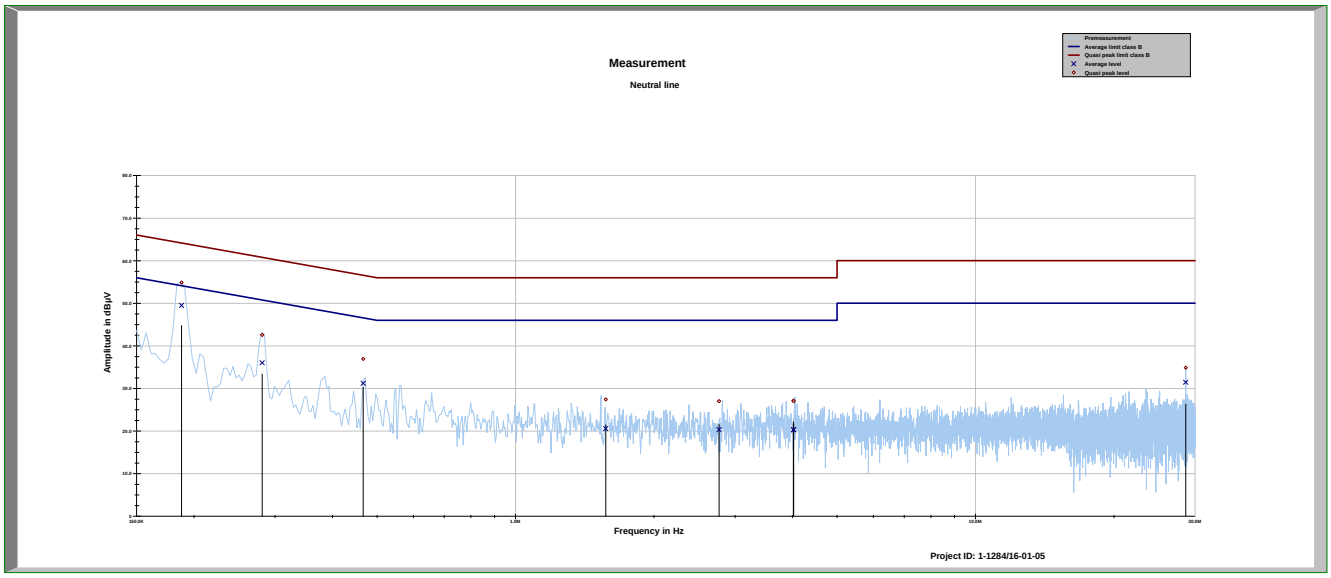
Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.430487	36.79	20.45	57.243	30.81	17.18	47.986
0.631517	28.28	27.72	56.000	21.46	24.54	46.000
0.774184	28.39	27.61	56.000	21.68	24.32	46.000
1.007409	28.35	27.65	56.000	21.70	24.30	46.000
2.370989	27.49	28.51	56.000	20.67	25.33	46.000
3.591380	27.39	28.61	56.000	20.55	25.45	46.000
4.281686	27.90	28.10	56.000	20.91	25.09	46.000

Plot 3: 150 kHz to 30 MHz / phase Line, TX mode, ADN CU1



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.187746	55.06	9.08	64.136	49.61	5.31	54.922
0.280750	42.60	18.19	60.794	36.02	16.25	52.264
0.467516	37.73	18.83	56.558	32.13	14.79	46.928
1.118701	27.55	28.45	56.000	20.64	25.36	46.000
1.291087	27.77	28.23	56.000	20.89	25.11	46.000
3.436070	27.15	28.85	56.000	20.33	25.67	46.000
4.542959	28.27	27.73	56.000	21.82	24.18	46.000
28.639532	35.88	24.12	60.000	33.03	16.97	50.000

Plot 4: 150 kHz to 30 MHz / neutral Line, TX mode, ADN CU1



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.187974	54.88	9.25	64.126	49.50	5.42	54.915
0.281335	42.55	18.22	60.776	36.04	16.21	52.248
0.466481	36.95	19.63	56.576	31.20	15.76	46.958
1.571177	27.42	28.58	56.000	20.57	25.43	46.000
2.770108	27.03	28.97	56.000	20.32	25.68	46.000
4.018432	27.13	28.87	56.000	20.31	25.69	46.000
4.023983	27.02	28.98	56.000	20.31	25.69	46.000
28.638961	34.85	25.15	60.000	31.43	18.57	50.000

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2016-07-21
-A	Editorial changes (FCC ID / IC ID / HVIN / PMN)	2016-11-16

Annex B Further information

Glossary

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

Annex C Accreditation Certificate

Front side of certificate

DAkkS
Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Beliehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

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

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

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

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

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

Frankfurt, 04.05.2016

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

Back side of certificate

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Standort Braunschweig
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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 urkundlich genannte Konformitätsbewertungsstelle in unveränderter Form.

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

Note:
The current certificate including annex may be received from CETECOM ICT Services GmbH on request.