TEST REPORT

Test report no.: 1-1633/16-01-07-B

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

Testing laboratory

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

Applicant

Ingenico Group
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26958 Valence Cedex 9 / FRANCE
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Manufacturer

Flextronics Technology (M) Sdn. Bhd
Plot D26, Jalan DPB/4 Kawasan Zon Perindustrian Bebas, PTP
81560 Gelang Patah, Johor / MALAYSIA

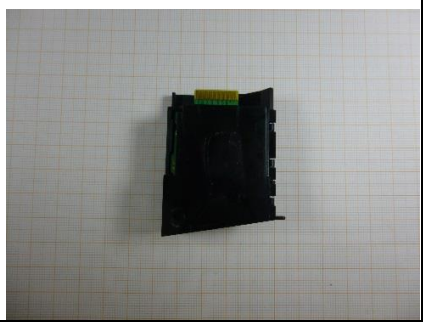
Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 2	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:	**Communication dongle**
Model name:	**Xtra module**
FCC ID:	**XKB-M7002WIBT**
IC:	**2586D-M7002WIBT**
Frequency:	UNII bands 5150 MHz to 5250 MHz; 5250 MHz to 5350 MHz; 5725 MHz to 5850 MHz (lowest channel 5180 MHz; highest channel 5825 MHz)
Technology tested:	WLAN (OFDM/a-; n HT20- & n HT40-mode)
Antenna:	Integrated antenna
Power supply:	115 V AC & 5 V DC by mains adapter / battery
Temperature range:	0°C to +50°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.

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Testing 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 1-1633/16-01-07-A and dated 2017-07-04

2.2 Application details

Date of receipt of order:	2016-06-06
Date of receipt of test item:	2017-03-01
Start of test:	2017-03-03
End of test:	2017-06-21
Person(s) present during the test:	-/-

2.3 Test laboratories sub-contracted

None

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 2	February 2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices
RSS - Gen Issue 4	November 2014	Spectrum Management and Telecommunications Radio Standards Specifications - General Requirements and Information for the Certification of Radio Apparatus

Guidance	Version	Description
UNII: KDB 789033 D02	v01r01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E
UNII: KDB 905462 D02	v01r02	Compliance measurement procedures for unlicensed - national information infrastructure devices operating in the 5250 - 5350 MHz and 5470 - 5725 MHz bands incorporating dynamic frequency selection
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American national standard of procedures for compliance testing of unlicensed wireless devices

4 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests +50 °C during high temperature tests 0 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		1021 hpa
Power supply	:	V_{nom} V_{max} V_{min}	115 V AC & 5 V DC by mains adapter / battery No tests under extreme conditions required No tests under extreme conditions required

5 Test item

5.1 General description

Kind of test item	:	Communication dongle
Type identification	:	Xtra module
HMN	:	-/-
PMN	:	XTRA module
HVIN	:	XTRA module MODU/7002 WiFi/BT
FVIN	:	-/-
S/N serial number	:	Radiated module: 16201341309102380000 1537 Conducted module: 16200341309102380000 1467 Main part: 16179341303102370000 1364
HW hardware status	:	01
SW software status	:	OS 034010 / HTB 0072
Frequency band	:	UNII bands 5150 MHz to 5250 MHz; 5250 MHz to 5350 MHz; 5725 MHz to 5850 MHz (lowest channel 5180 MHz; highest channel 5825 MHz)
Type of radio transmission Use of frequency spectrum	: :	OFDM
Type of modulation	:	BPSK, QPSK, 16 – QAM, 64 – QAM
Number of channels	:	20 MHz channels: 13 40 MHz channels: 6
Antenna	:	Integrated antenna
Power supply	:	115 V AC & 5 V DC by mains adapter / battery
Temperature range	:	0°C to +50°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: 1-1633/16-01-01_AnnexA
1-1633/16-01-01_AnnexB
1-1633/16-01-01_AnnexD

6 Description of the test setup

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

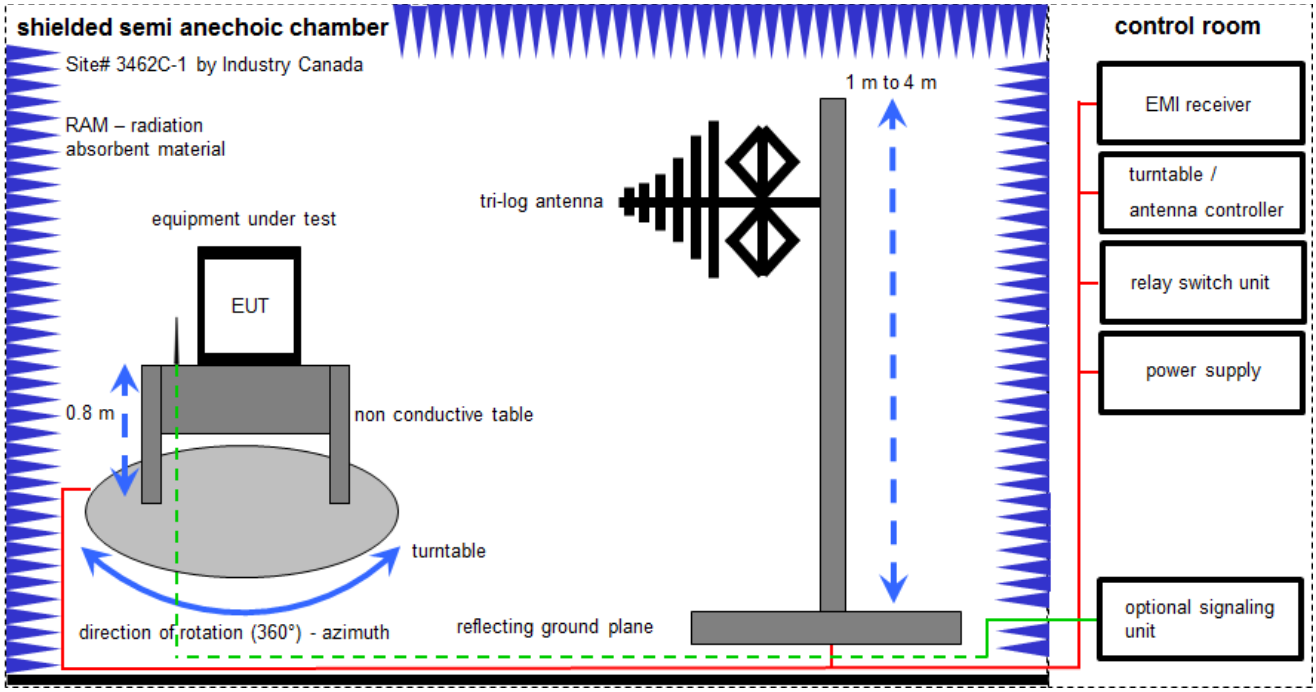
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Agenda: Kind of Calibration

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

6.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform to 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

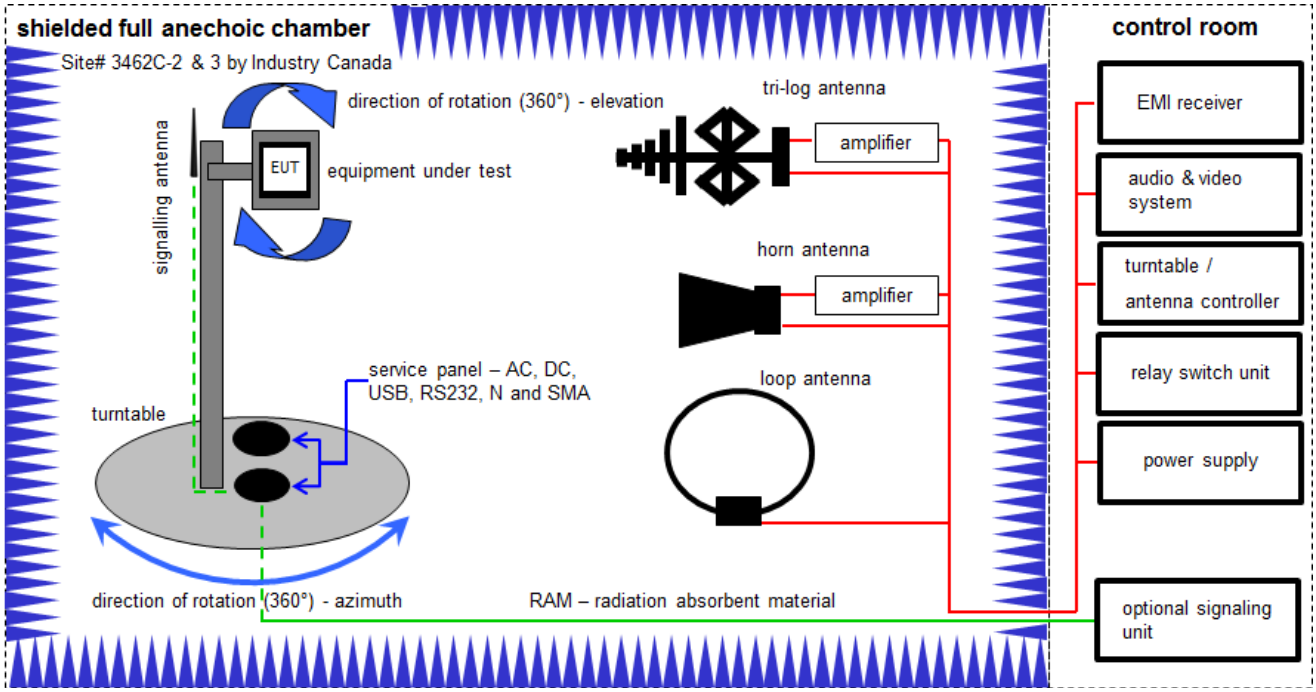
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

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.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	Meßkabine 1	HF-Absorberhalle	MWB AG 300023	101042	300000551	ne	-/-	-/-
3	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	01.02.2017	31.01.2018
4	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	02.02.2016	02.02.2018
5	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
6	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
7	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
8	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	25.04.2016	25.04.2018

6.2 Shielded fully anechoic chamber



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

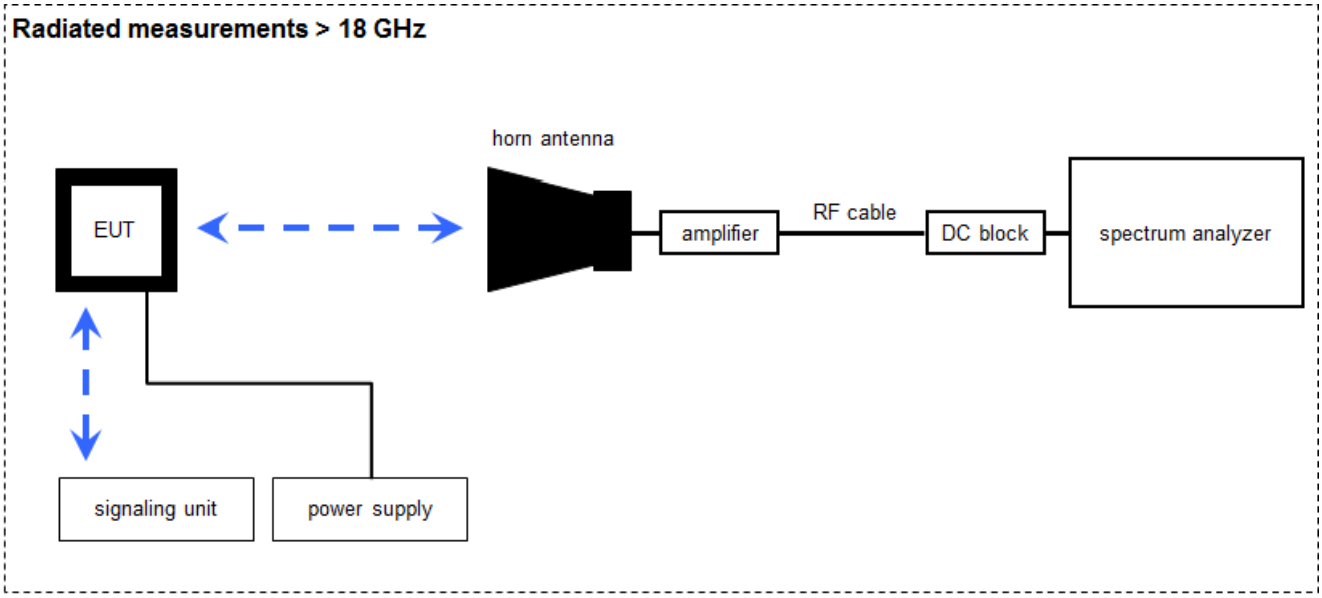
FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

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.	Kind of Calibration	Last Calibration	Next Calibration
1	C	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO	2210	300001015	k	20.05.2017	20.05.2019
2	A	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9709-5290	300000212	k	13.08.2015	13.08.2017
3	A	Highpass Filter	WHK1.1/15G-10SS	Wainwright	37	400000148	ne	-/-	-/-
4	A	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne	-/-	-/-
5	A	Band Reject Filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	26	300003792	ne	-/-	-/-
6	A, B	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	01029	000000000	k	07.04.2017	06.04.2020
7	A	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22051	300004483	ev	-/-	-/-
8	A, B, C	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000032	300004510	ne	-/-	-/-
9	A, B, C	Messrechner und Monitor	Intel Core i3 3220/3,3 GHz, Prozessor	Huber & Suhner	2V2403033A54 21	300004591	ne	-/-	-/-
10	A, B, C	NEXIO EMV-Software	BAT EMC V3.16.0.49	EMCO	Batch no. 14844	300004682	ne	-/-	-/-
11	A, B, C	Anechoic chamber	ESH3-Z5	TDK	893045/004	300003726	ne	-/-	-/-
12	A, B, C	EMI Test Receiver 9kHz-26,5GHz	ESR26	R&S	101376	300005063	vIKI!	13.09.2016	13.03.2018

6.3 Radiated measurements > 18 GHz



Measurement distance: horn antenna 50 cm

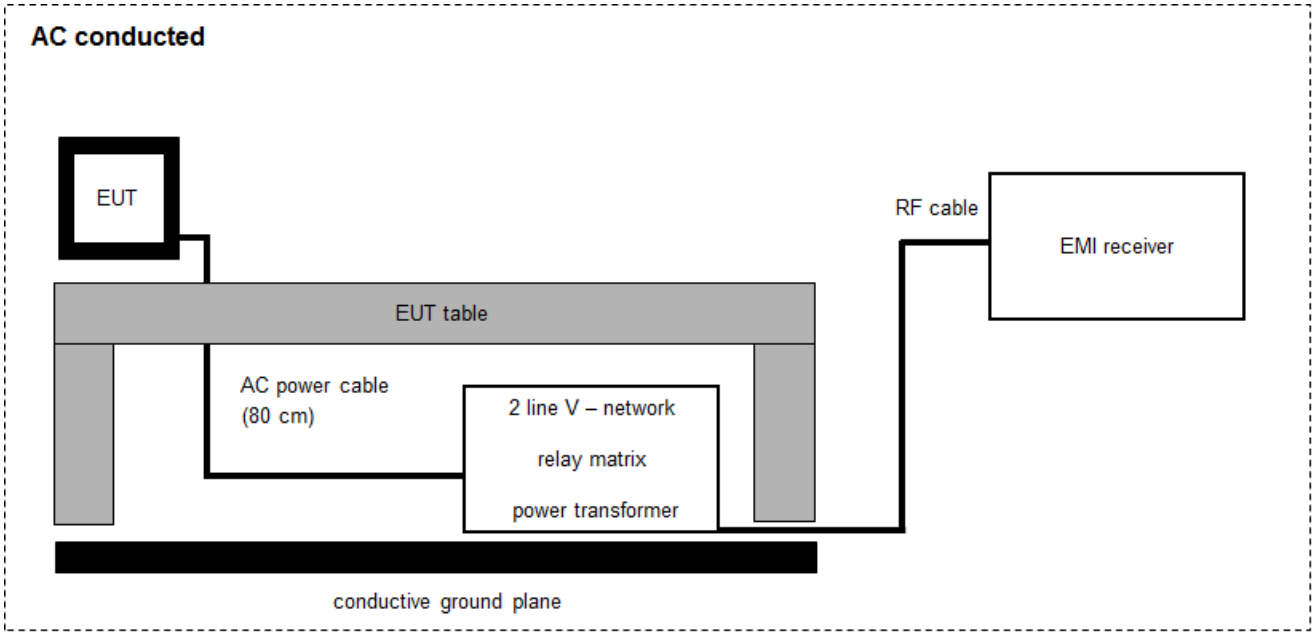
FS = U_R + CA + AF
(FS-field strength; U_R-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

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.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	-/-	300000486	k	10.09.2015	10.09.2017
2	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	27.01.2017	26.01.2018
3	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev	-/-	-/-
4	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-
5	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 127377	400001183	ev	-/-	-/-
6	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	-/-	400001185	ev	-/-	-/-
7	A	Std. Gain Horn Antenna 26.5 to 40.0 GHz	V637	Narda	82-16	300000510	k	14.08.2015	14.08.2017

6.4 AC conducted



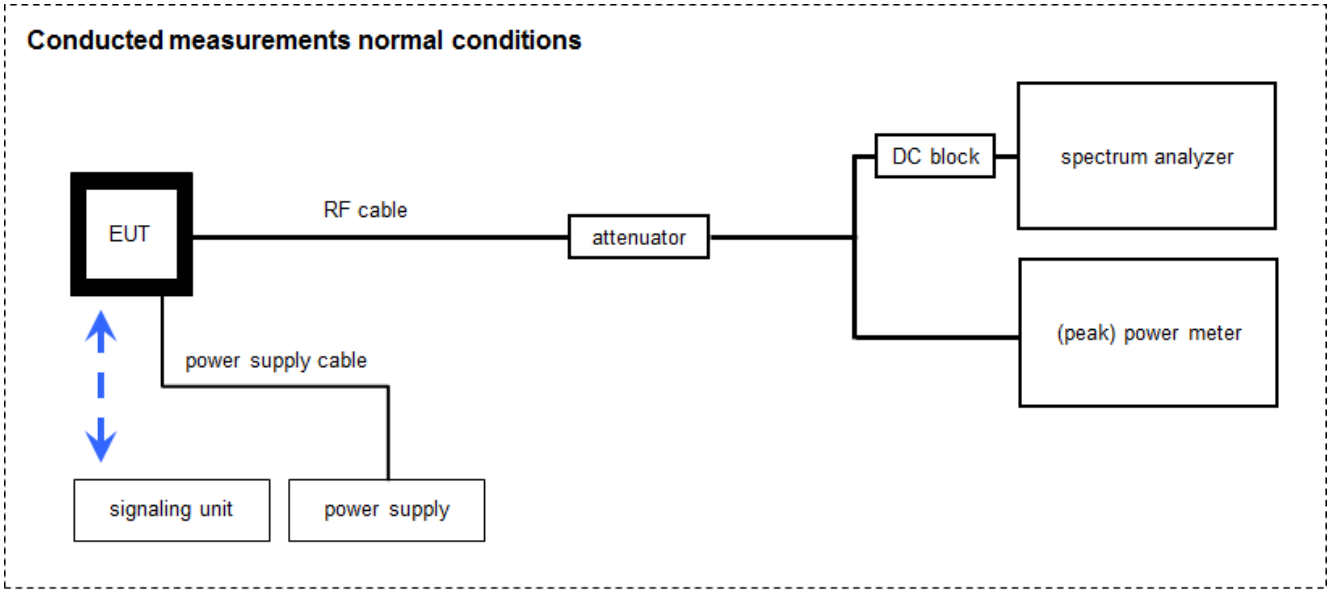
FS = UR + CF + VC
(FS-field strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

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.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Two-line V-Network (LISN) 9 kHz to 30 MHz	ESH3-Z5	R&S	893045/004	300000584	k	31.01.2017	30.01.2018
2	A	RF-Filter-section	85420E	HP	3427A00162	300002214	k	27.11.2006	-/-
3	A	EM-Injection Clamp	FCC-203i	emv	232	300000626	ev	18.05.2001	-/-
4	A	AC-Spannungsquelle variabel	MV2616-V	EM-Test	0397-12	300003259	k	11.12.2015	11.12.2017
5	A	Hochpass 150 kHz	EZ-25	R&S	100010	300003798	ev	08.04.2008	-/-
6	A	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	16.08.2016	16.08.2017

6.5 Conducted measurements with peak power meter & spectrum analyzer



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.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch / Control Unit	3488A	HP	2719A15013	300000151	ne	-/-	-/-
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	PowerSplitter/Combiner 150-6000MHz N-Type	ZB3PD-63-N+	Mini-Circuits	100010	400000451	ev	-/-	-/-
5	A	RF-Cable	ST18/SMAm/SMAm/60	Huber & Suhner	Batch no. 606844	400001181	ev	-/-	-/-
6	A	Coax Attenuator 10 dB 2W 0-40 GHz	MCL BW-K10-2W44+	Mini Circuits	Batch no. 606844	400001186	ev	-/-	-/-
7	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	Batch no. 127377	400001185	ev	-/-	-/-
8	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	27.01.2017	26.01.2018

7 Sequence of testing

7.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

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

Premeasurement

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

Final measurement

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

7.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

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

Premeasurement

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

Final measurement

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

7.3 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

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

Premeasurement

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

Final measurement

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

7.4 Sequence of testing radiated spurious above 18 GHz

Setup

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

Premeasurement

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

Final measurement

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

8 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Antenna gain	± 3 dB
Power spectral density	± 1.5 dB
Spectrum bandwidth	± 100 kHz (depends on the used RBW)
Occupied bandwidth	± 100 kHz (depends on the used RBW)
Maximum output power	± 1.5 dB
Minimum emissions bandwidth	± 100 kHz (depends on the used RBW)
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

9 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 2	see table	2017-07-06	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	C	NC	NA	NP	Remark
-/-	Output power verification (conducted)	Nominal	Nominal	-/-				-/-
-/-	Antenna 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	☒	☐	☐	☐	-/-
RSS - 247 (6.2.4.1)	Spectrum bandwidth 6dB bandwidth	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 RSS - 247 (6.3)	DFS	Nominal	Nominal	-/-				See report 1-1633/16-01-08

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

* Test cases performed under the project number: 1-1633/16-01-08

10 Additional comments

Reference documents: Customer Questionnaire_XTRA module_CETECOM.docx
ICO-OPE-03994 Wifi_labtool_Radio_agreement_procedure.pdf

Special test descriptions: Used power settings for all tests:

Channel	36	40	44	48	52	56	60	64	149	153	157	161	165
11a	10	14	14	14	14	14	14	13	14	14	14	14	14
11n-20	10	13	13	13	13	13	13	13	13	13	13	13	13
Channel	38		42			54		62		151		159	
11n-40	3		11			11		3		11		11	

Configuration descriptions: None

Test mode:

☐ No test mode available.
Iperf was used to ping another device with the largest support packet size

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

Antennas and transmit operating modes:

☒ Operating mode 1 (single antenna)

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

☐ Operating mode 2 (multiple antennas, no beamforming)

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

☐ Operating mode 3 (multiple antennas, with beamforming)

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

11 Measurement results

11.1 Identify worst case data rate

Measurement:

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

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

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

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 MHz
Video bandwidth:	3 MHz
Trace mode:	Max hold
Used test setup:	See chapter 6.5 – A
Measurement uncertainty:	see chapter 8

Results:

Modulation	Modulation scheme / bandwidth					
Frequency	5180 MHz	5240 MHz	5260 MHz	5320 MHz	5745 MHz	5825 MHz
OFDM / a – mode	6 Mbit/s	6 Mbit/s	6 Mbit/s	6 Mbit/s	6 Mbit/s	6 Mbit/s
OFDM / n/ac HT20 – mode	MCS0	MCS0	MCS0	MCS0	MCS0	MCS0
Frequency	5190 MHz	5310 MHz	5755 MHz	5815 MHz		
OFDM / n/ac HT40 – mode	MCS0	MCS0	MCS0	MCS0		

11.2 Gain

Description:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module @ 3 MHz RBW.

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 MHz
Video bandwidth:	3 MHz
Trace mode:	Max hold
Test setup:	See chapter 6.2 – B See chapter 6.5 – A
Measurement uncertainty:	See chapter 8

Limits:

Antenna Gain
6 dBi / > 6 dBi output power and power density reduction required

Results:

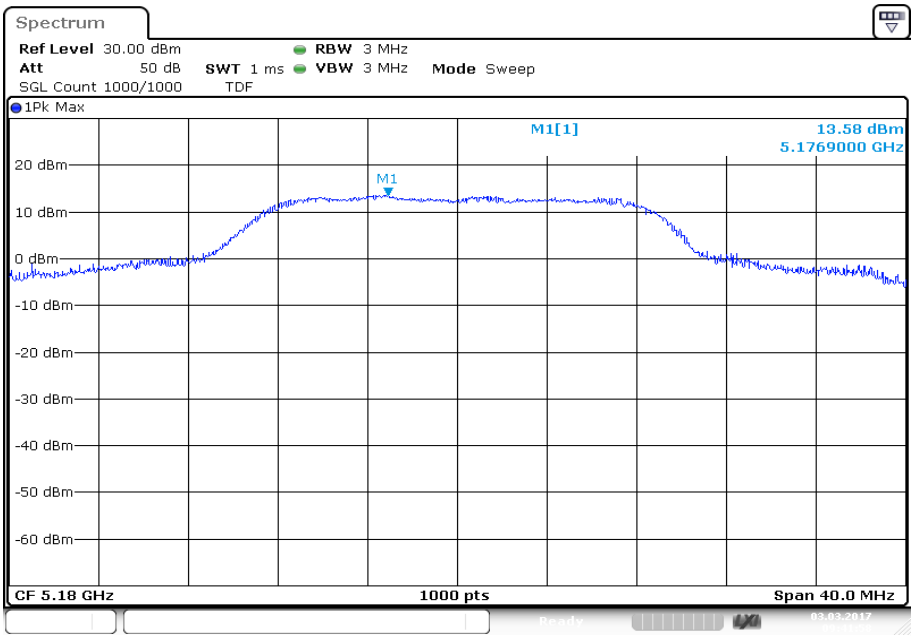
OFDM Band 5150 MHz to 5250 MHz Channel	Antenna gain	
	Lowest 5180 MHz	Highest 5240 MHz
Radiated power for gain calculation	14.4	13.7
Conducted power for gain calculation	13.6	12.9
Gain	0.8	0.8

OFDM Band 5250 MHz to 5350 MHz Channel	Antenna gain	
	Lowest 5260 MHz	Highest 5320 MHz
Radiated power for gain calculation	12.0	11.9
Conducted power for gain calculation	13.7	13.5
Gain	-1.7	-1.6

OFDM Band 5725 MHz to 5850 MHz Channel	Antenna gain		
	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz
Radiated power for gain calculation	17.1	17.3	14.8
Conducted power for gain calculation	14.0	14.4	14.3
Gain	3.1	2.9	0.5

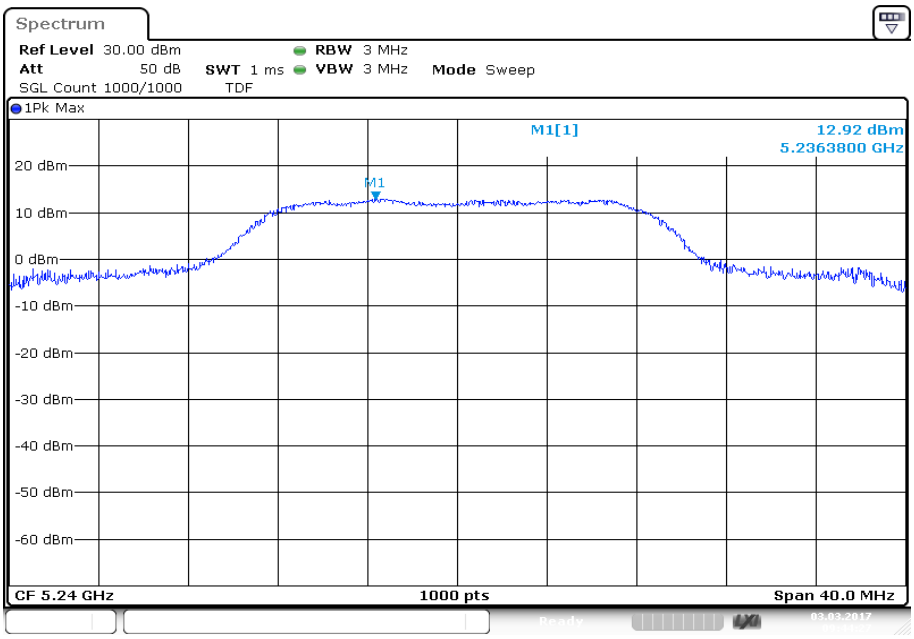
Plots:

Plot 1: 5180 MHz



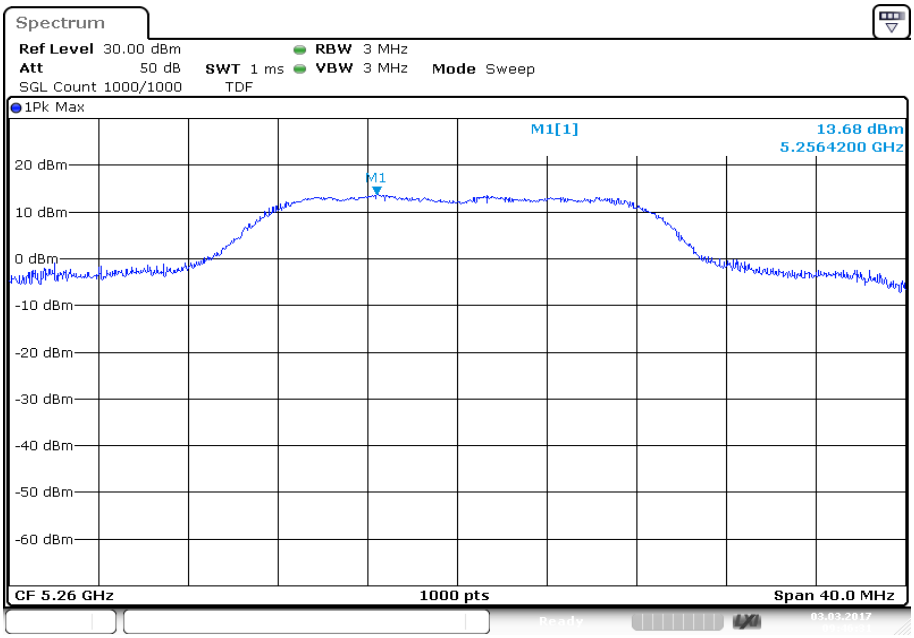
Date: 3.MAR.2017 09:41:59

Plot 2: 5240 MHz



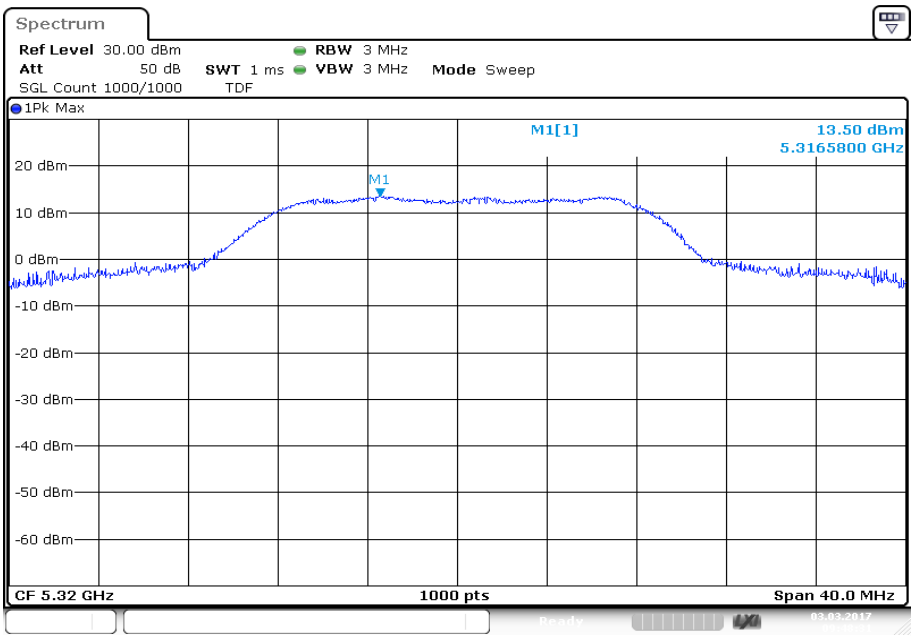
Date: 3.MAR.2017 09:44:27

Plot 3: 5260 MHz



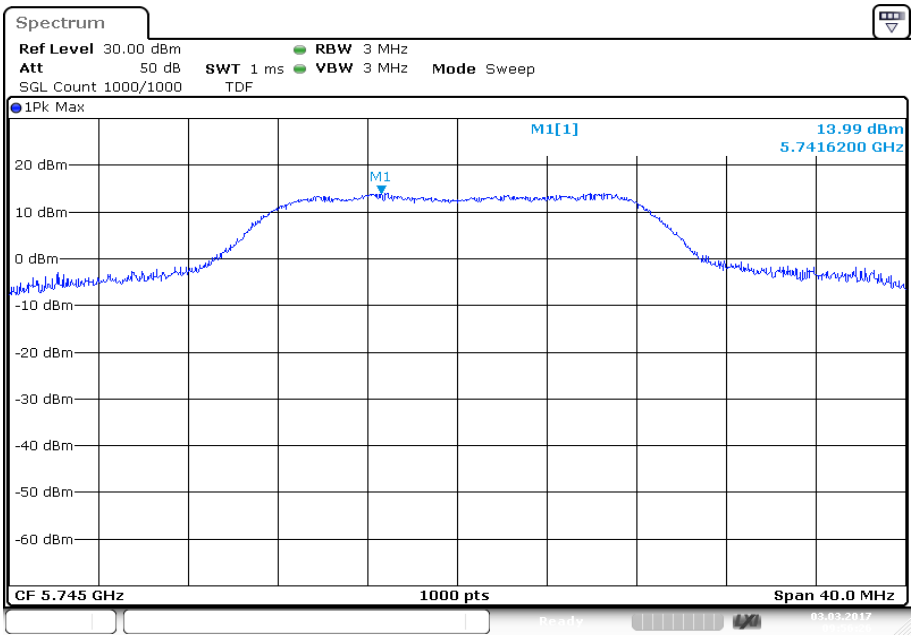
Date: 3.MAR.2017 09:46:31

Plot 4: 5320 MHz



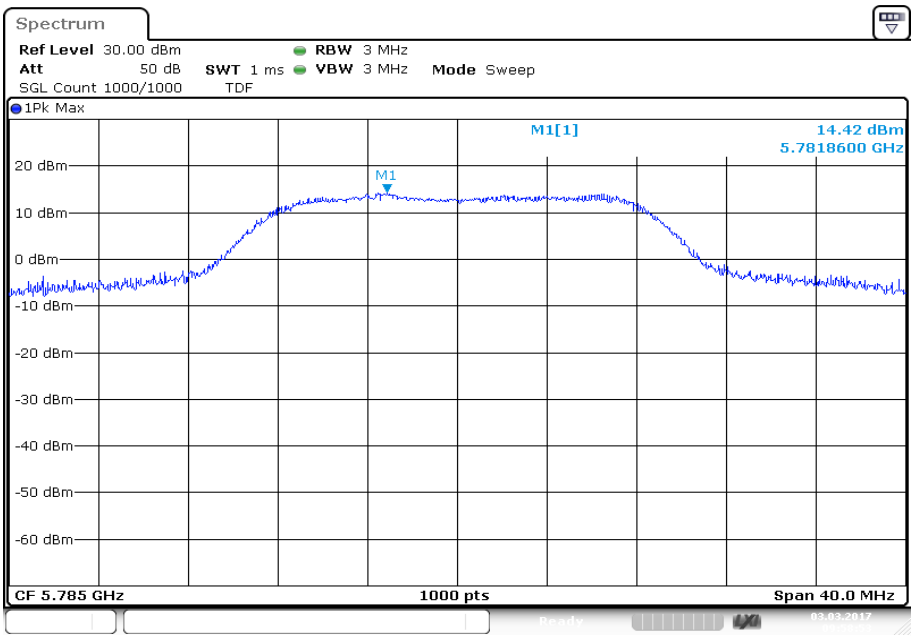
Date: 3.MAR.2017 09:48:31

Plot 5: 5745 MHz



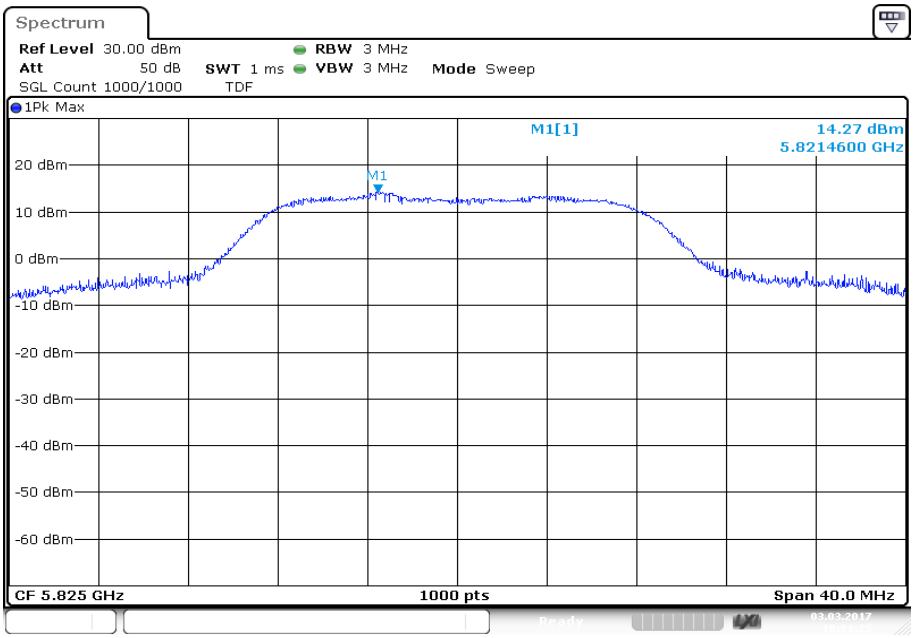
Date: 3.MAR.2017 09:56:27

Plot 6: 5785 MHz



Date: 3.MAR.2017 09:58:53

Plot 7: 5825 MHz



Date: 3.MAR.2017 10:01:25

11.3 Duty cycle

Description:

The duty cycle is necessary to compute the maximum power during an actual transmission. The shown plots and values are to show an example of the measurement procedure. The real value is measured direct during the power measurement or power density measurement. The correction value is shown in each plot of these measurements.

Measurement:

Measurement parameter	
According to: KDB789033 D02, B.	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	10 MHz
Video bandwidth:	10 MHz
Span:	Zero
Trace mode:	Video trigger / view / single sweep
Used test setup:	See chapter 6.5 – A
Measurement uncertainty:	See chapter 8

Results:

Duty cycle and correction factor:

OFDM / a – mode:	100 % duty cycle	=>	0.00 dB
OFDM / n/ac HT20 – mode:	100 % duty cycle	=>	0.00 dB
OFDM / n/ac HT40 – mode:	100 % duty cycle	=>	0.00 dB

11.4 Maximum output power

11.4.1 Maximum output power conducted – for FCC requirements

Description:

Measurement of the maximum output power conduced

Measurement:

Measurement parameter	
According to: KDB789033 D02, E.2.e.	
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
Used test setup:	See chapter 6.5 – A
Measurement uncertainty:	See chapter 8

Limits:

Radiated output power	Conducted output power for mobile equipment
Conducted power + 6 dBi 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 / a – mode

OFDM / a – mode	Maximum output power conducted [dBm]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
	9.23	12.01	12.60	11.2
Channel	5745 MHz	5785 MHz	5825 MHz	
	12.35	12.31	12.12	

Result: OFDM / n/ac HT20 – mode

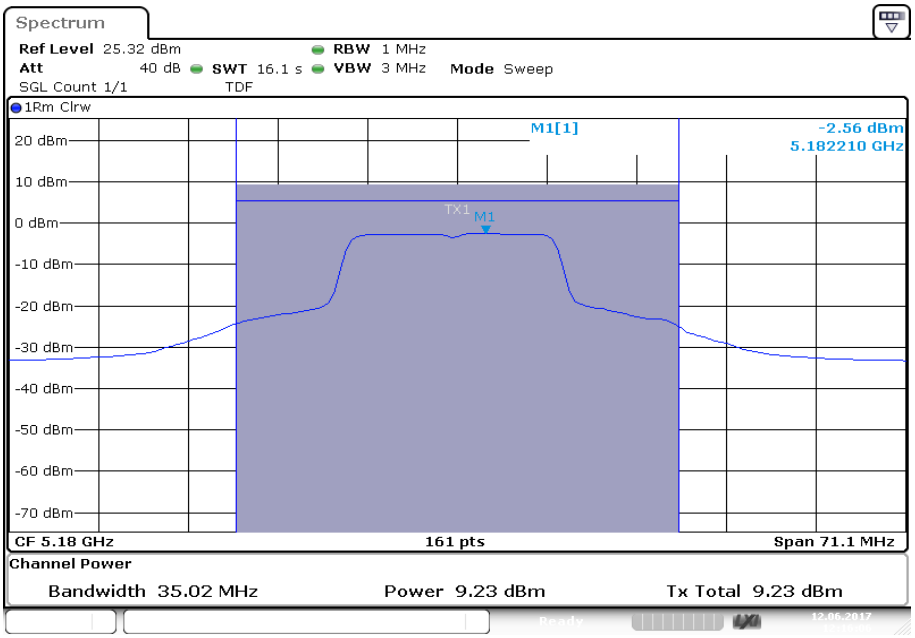
OFDM / n/ac HT20 – mode	Maximum output power conducted [dBm]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
	12.13	11.32	11.88	11.17
Channel	5745 MHz	5785 MHz	5825 MHz	
	12.07	11.26	11.01	

Result: OFDM / n/ac HT40 – mode

OFDM / n/ac HT40 – mode	Maximum output power conducted [dBm]			
Channel	5190 MHz	5230 MHz	5270 MHz	5310 MHz
	7.02	9.95	9.82	7.28
Channel	5755 MHz	5795 MHz		
	10.46	9.65		

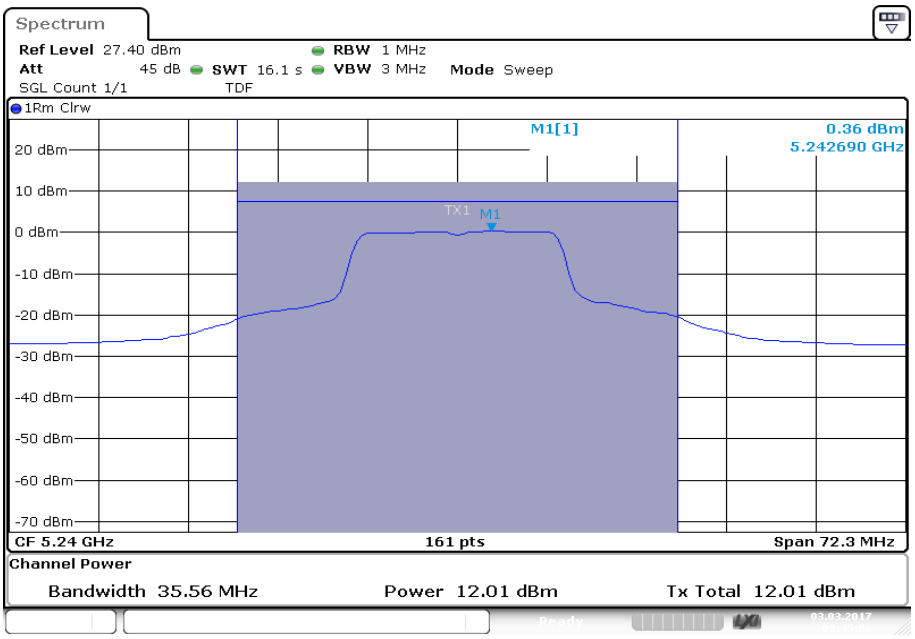
Plots: OFDM / a – mode

Plot 1: 5180 MHz



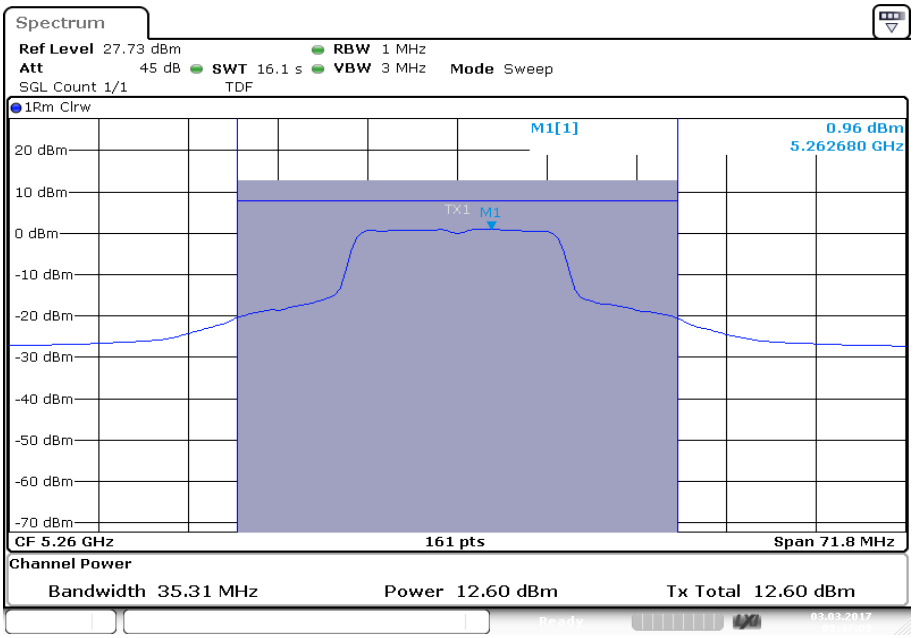
Date: 12.JUN.2017 12:16:07

Plot 2: 5240 MHz



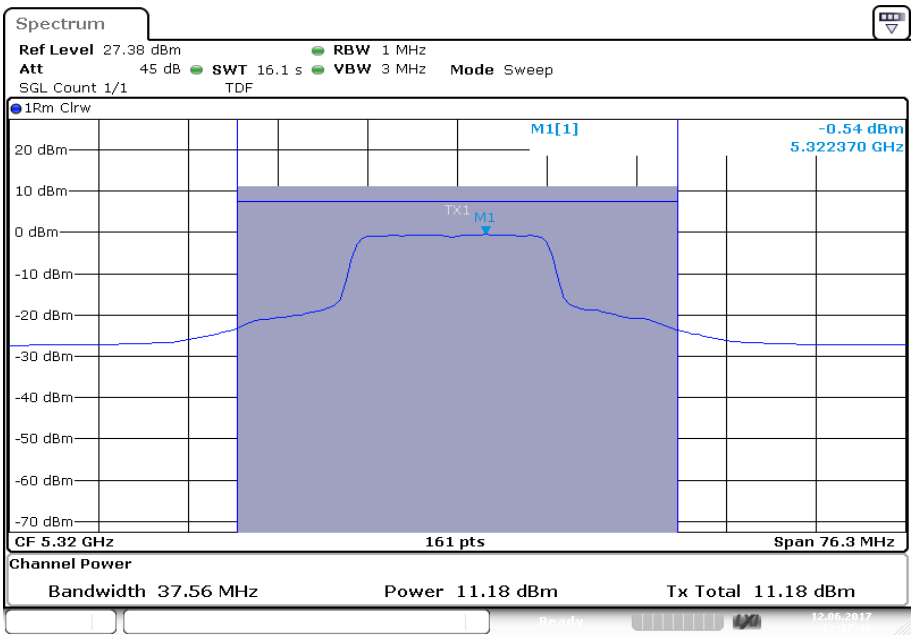
Date: 3.MAR.2017 09:45:06

Plot 3: 5260 MHz



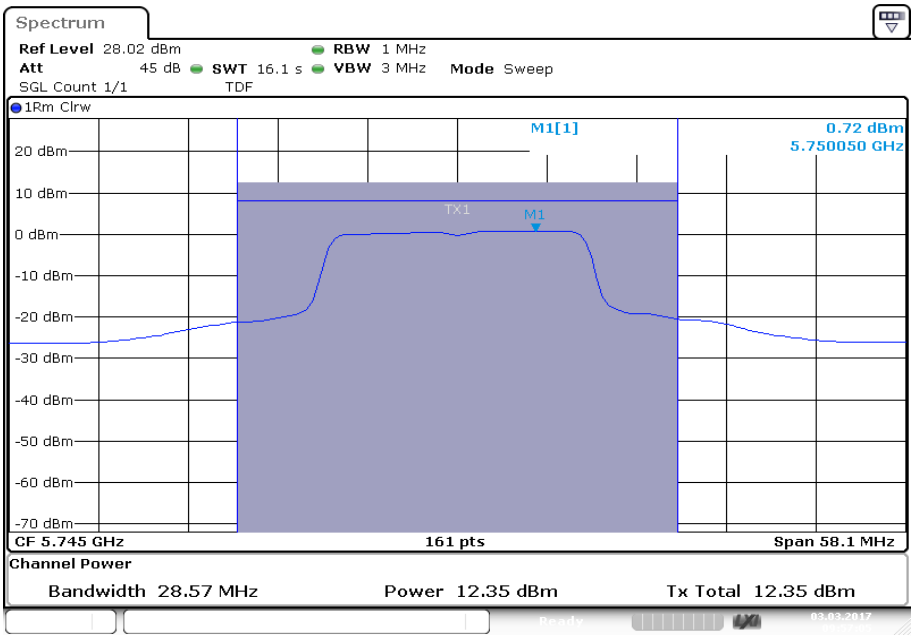
Date: 3.MAR.2017 09:47:10

Plot 4: 5320 MHz



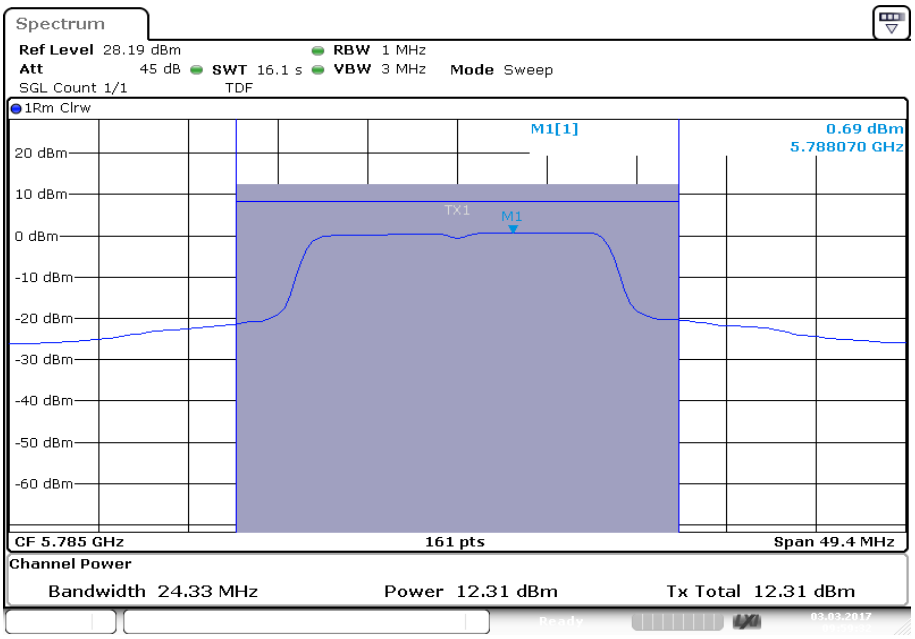
Date: 12.JUN.2017 12:17:50

Plot 5: 5745 MHz



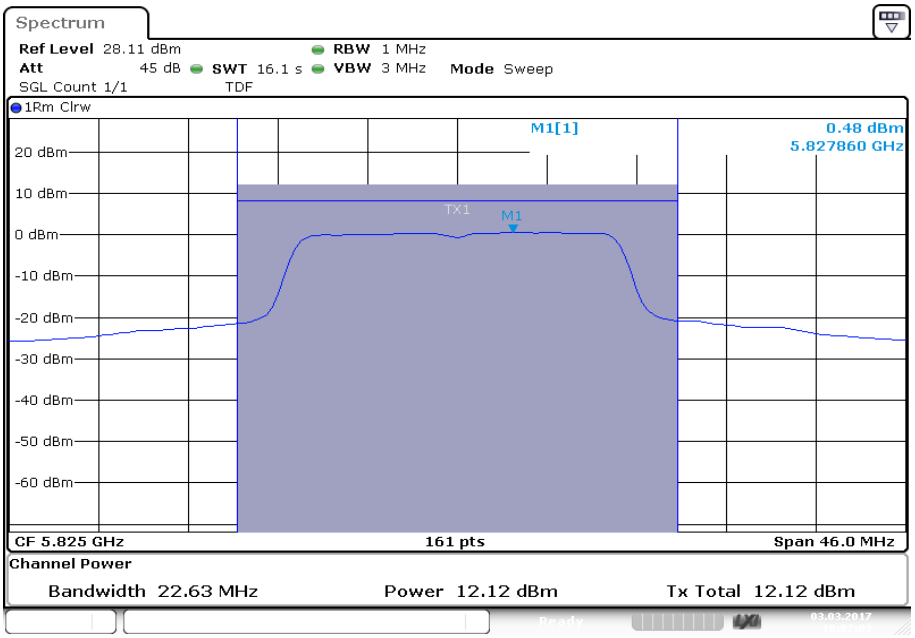
Date: 3.MAR.2017 09:57:06

Plot 6: 5785 MHz



Date: 3.MAR.2017 09:59:32

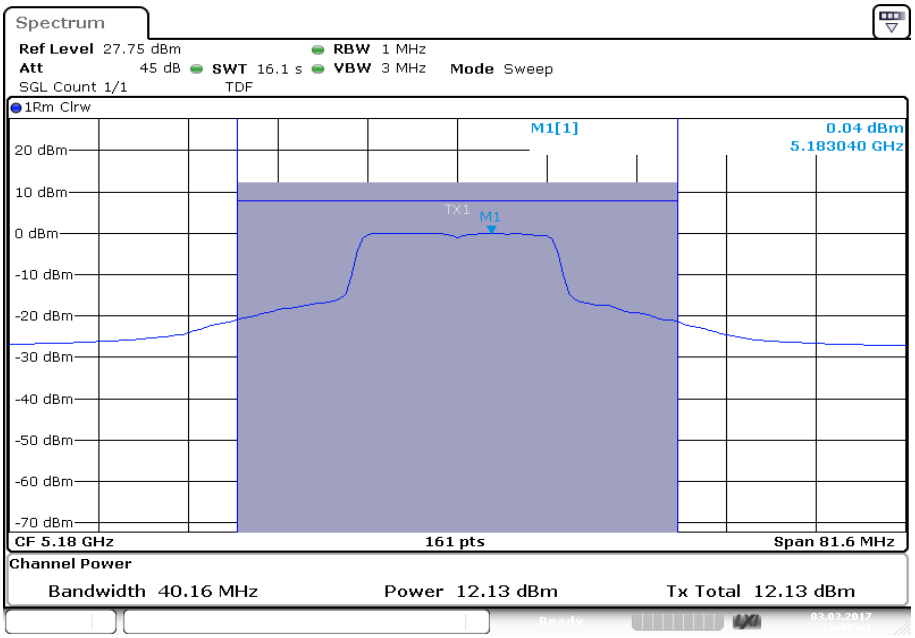
Plot 7: 5825 MHz



Date: 3.MAR.2017 10:02:04

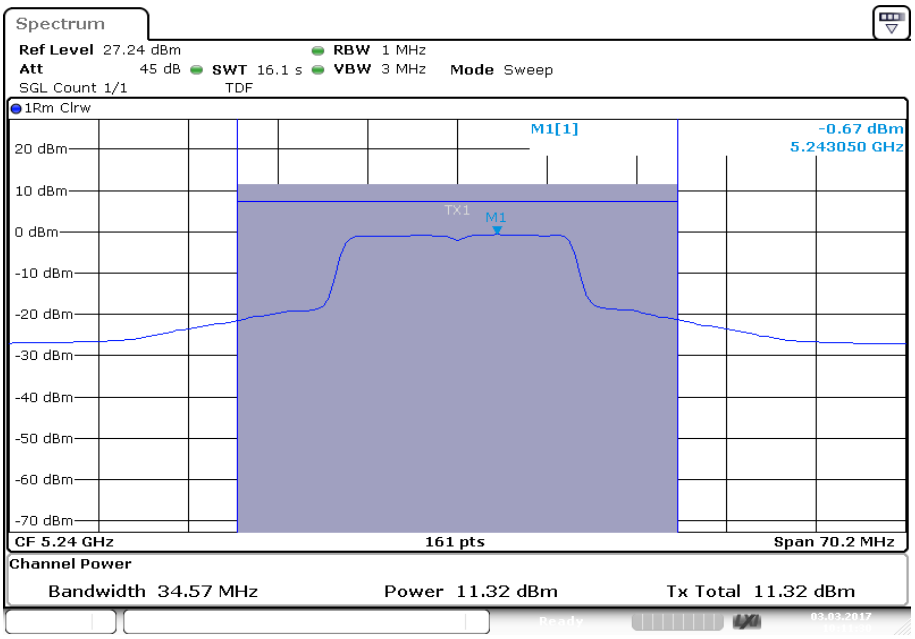
Plots: OFDM / n/ac HT20 – mode

Plot 1: 5180 MHz



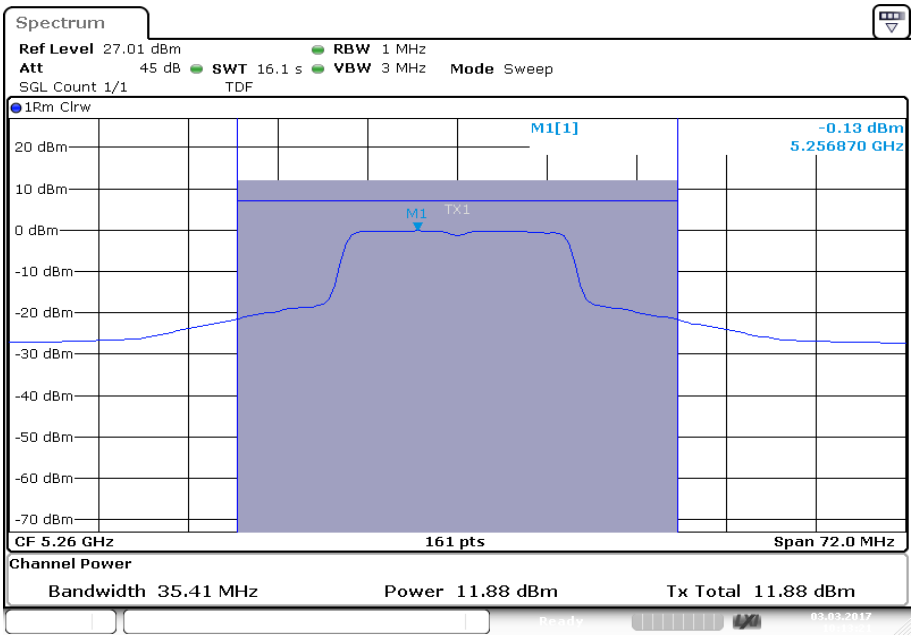
Date: 3.MAR.2017 10:05:01

Plot 2: 5240 MHz



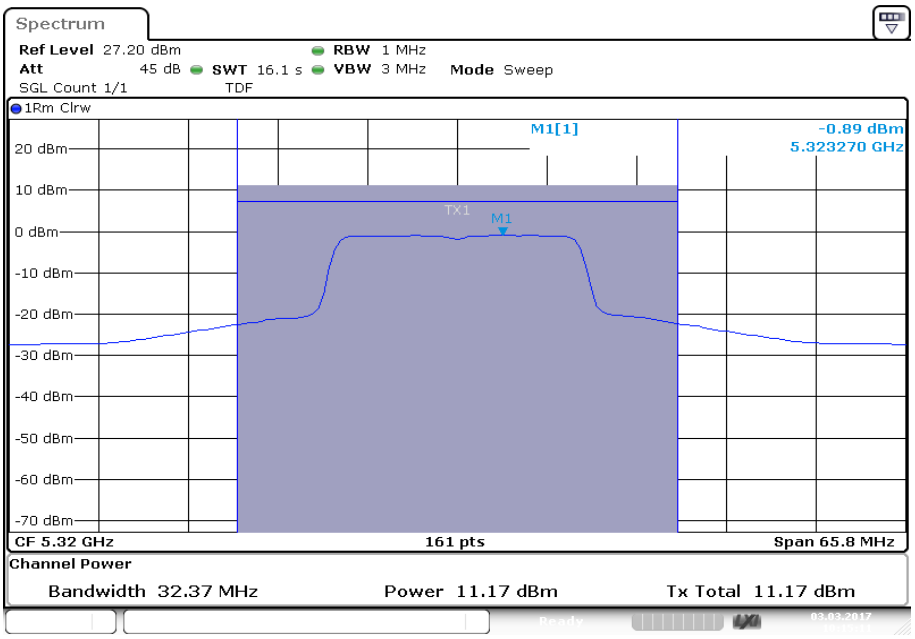
Date: 3.MAR.2017 10:11:30

Plot 3: 5260 MHz



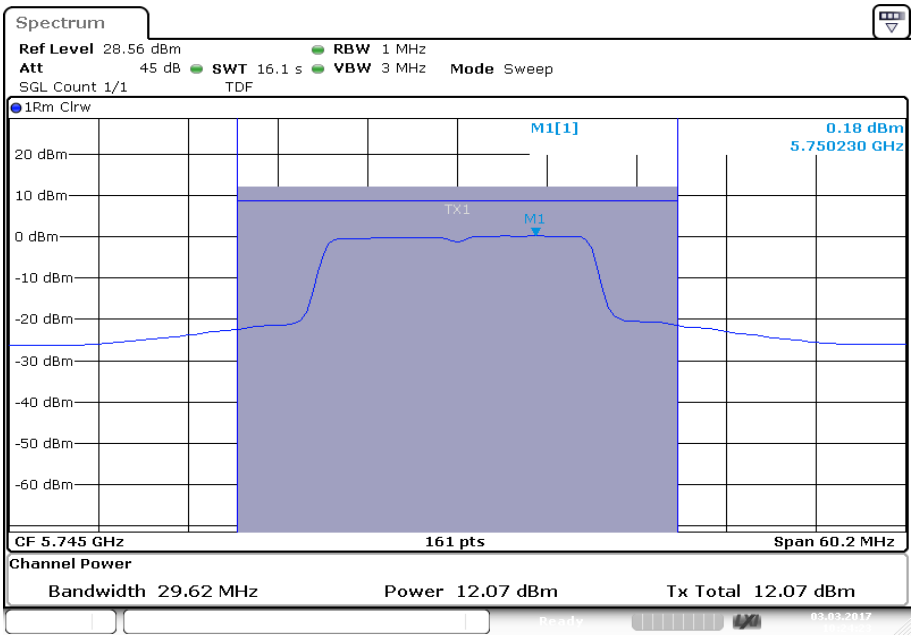
Date: 3.MAR.2017 10:13:22

Plot 4: 5320 MHz



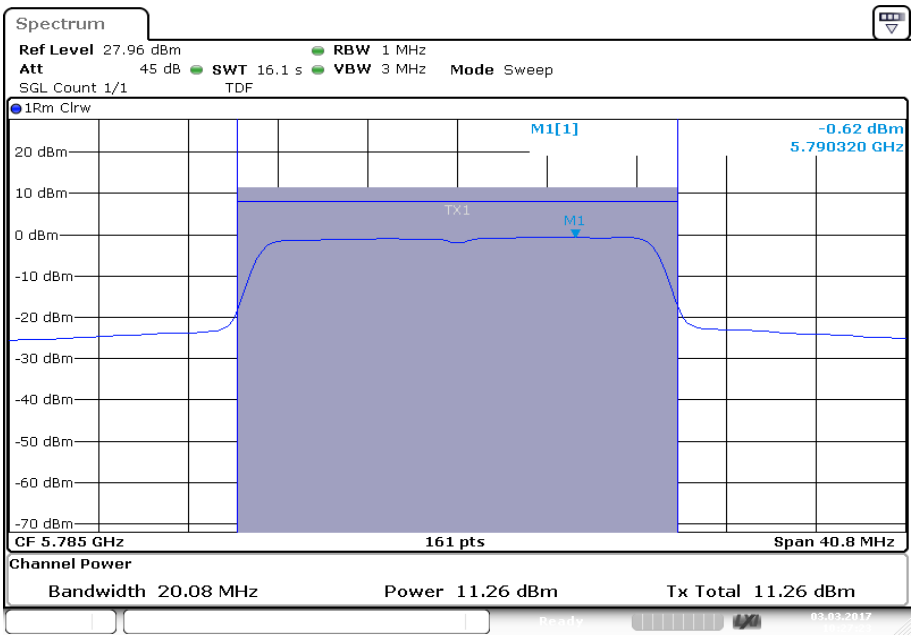
Date: 3.MAR.2017 10:15:12

Plot 5: 5745 MHz



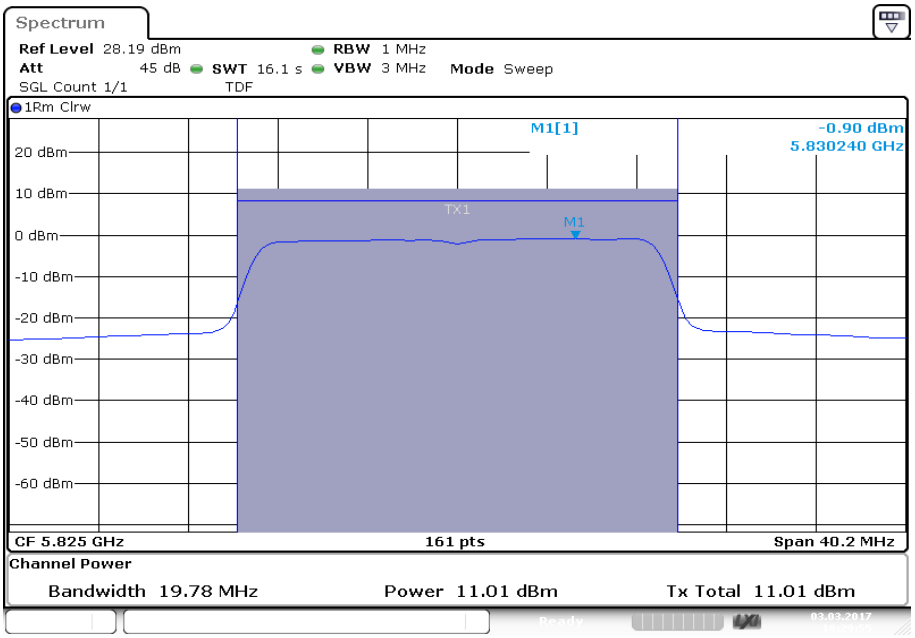
Date: 3.MAR.2017 10:24:24

Plot 6: 5785 MHz



Date: 3.MAR.2017 10:27:24

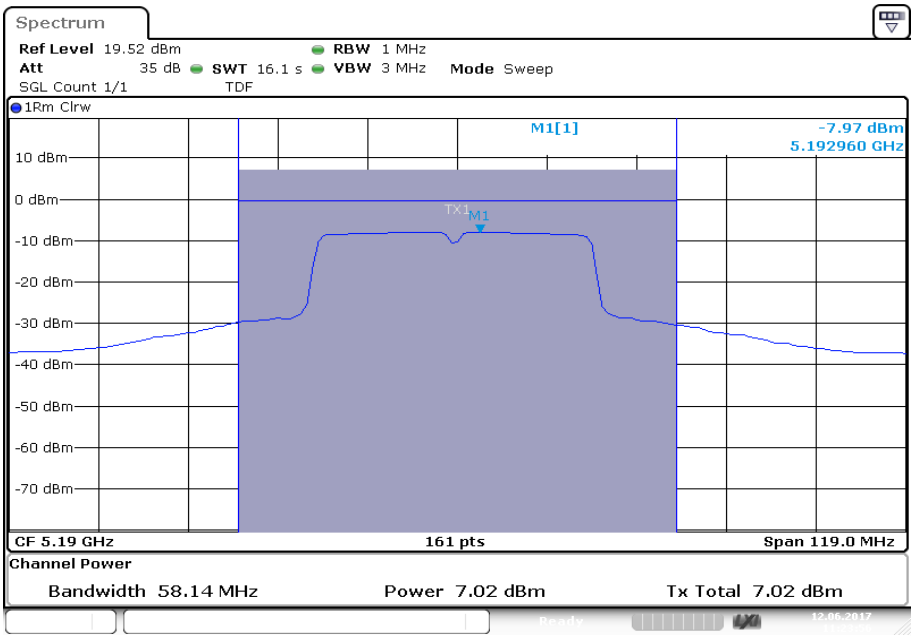
Plot 7: 5825 MHz



Date: 3.MAR.2017 10:29:56

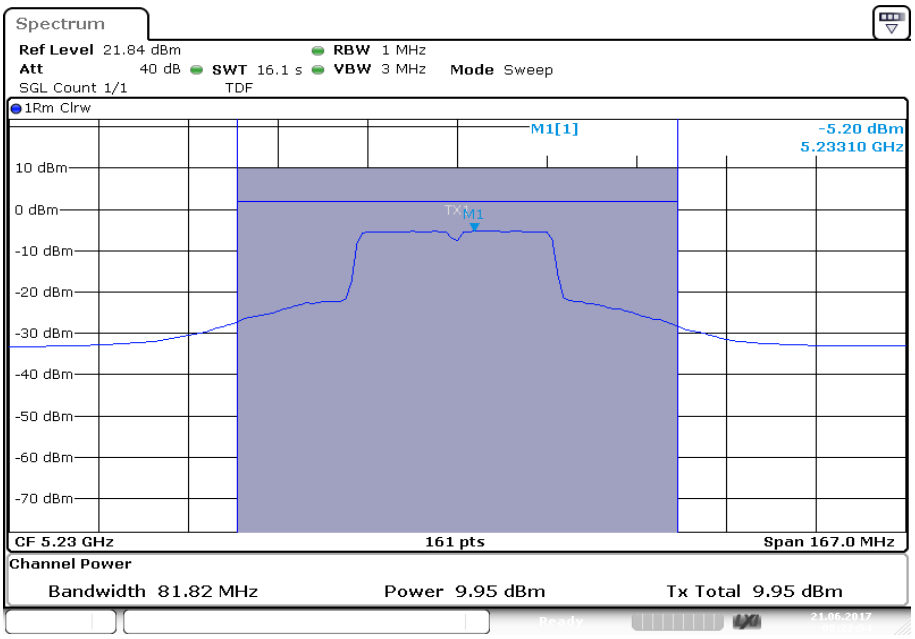
Plots: OFDM / n/ac HT40 – mode

Plot 1: 5190 MHz



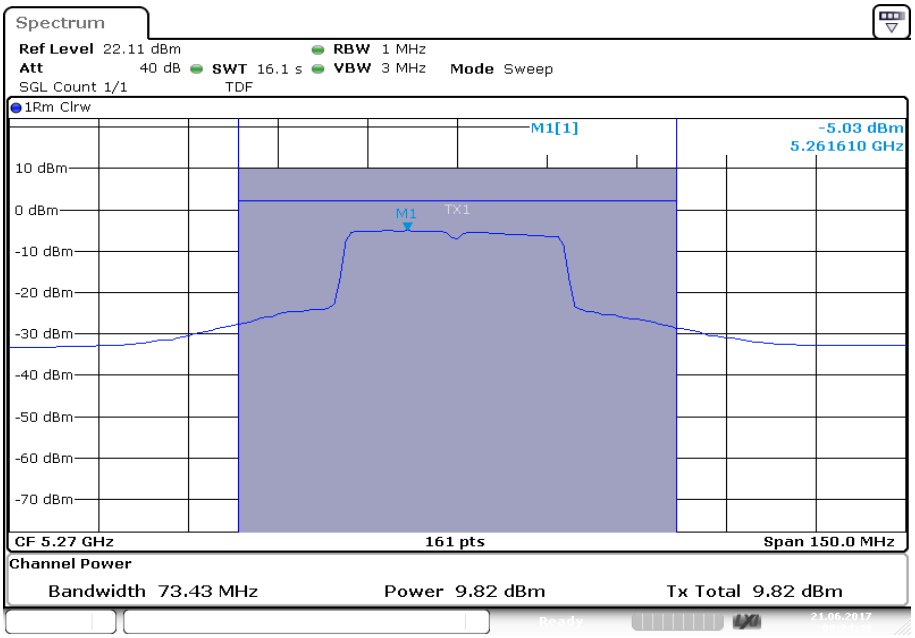
Date: 12.JUN.2017 11:23:56

Plot 2: 5230 MHz



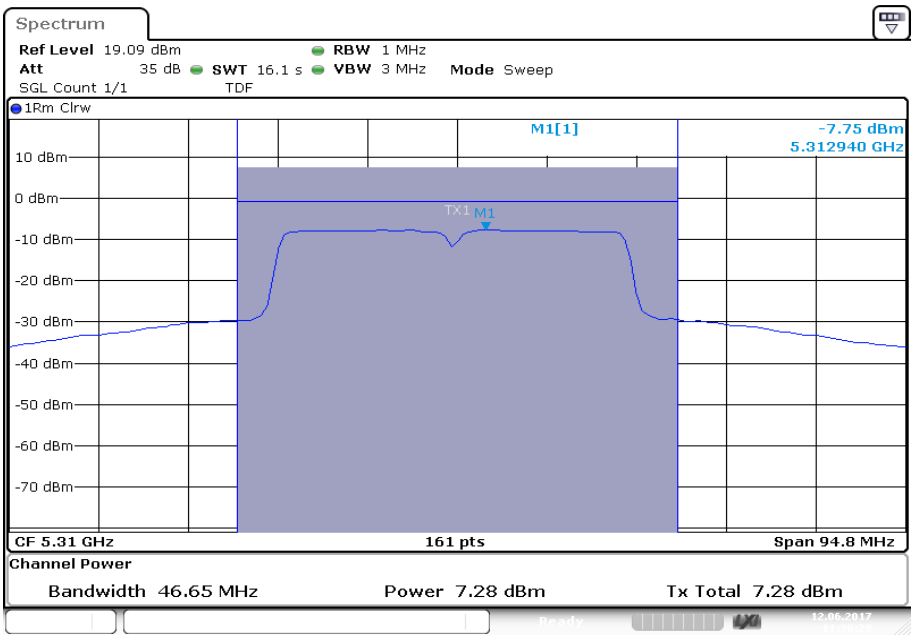
Date: 21.JUN.2017 08:22:55

Plot 3: 5270 MHz



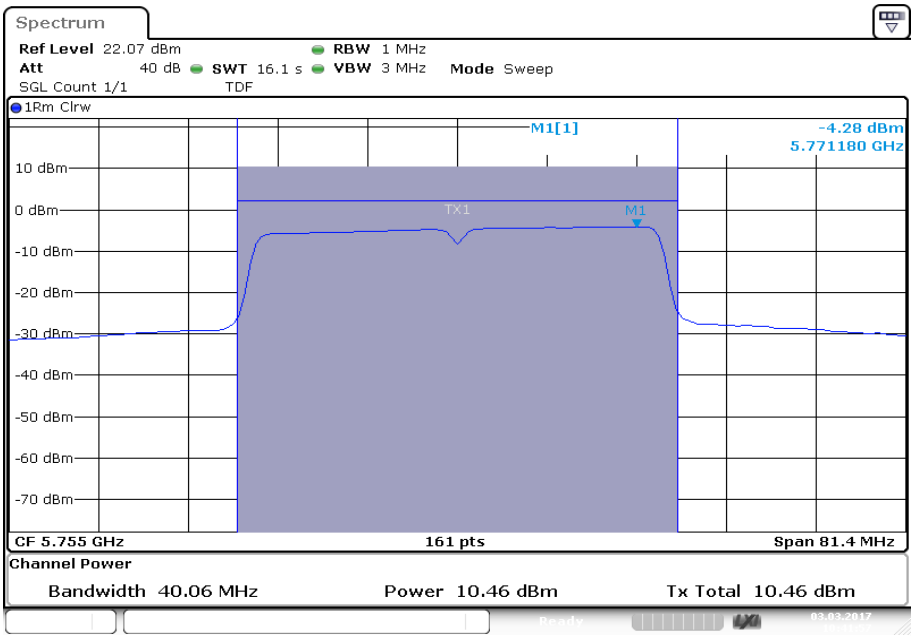
Date: 21.JUN.2017 08:24:48

Plot 4: 5310 MHz



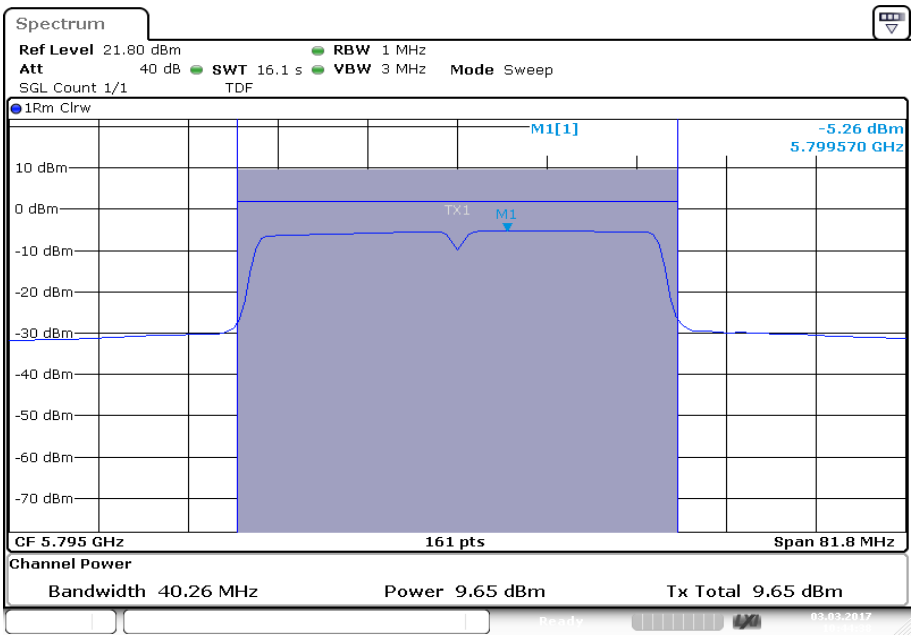
Date: 12.JUN.2017 11:36:30

Plot 5: 5755 MHz



Date: 3.MAR.2017 10:41:57

Plot 6: 5795 MHz



Date: 3.MAR.2017 10:44:38

11.4.2 Maximum output power – for IC requirements

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
Used test setup:	See chapter 6.5 – A
Measurement uncertainty:	See chapter 8

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 / a – mode

OFDM / a – mode	Maximum output power [dBm]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
Including duty cycle correction factor	9.17	12.01	12.57	11.10
Channel	5745 MHz	5785 MHz	5825 MHz	
Including duty cycle correction factor	12.31	12.30	12.09	

Result: OFDM / n/ac HT20 – mode

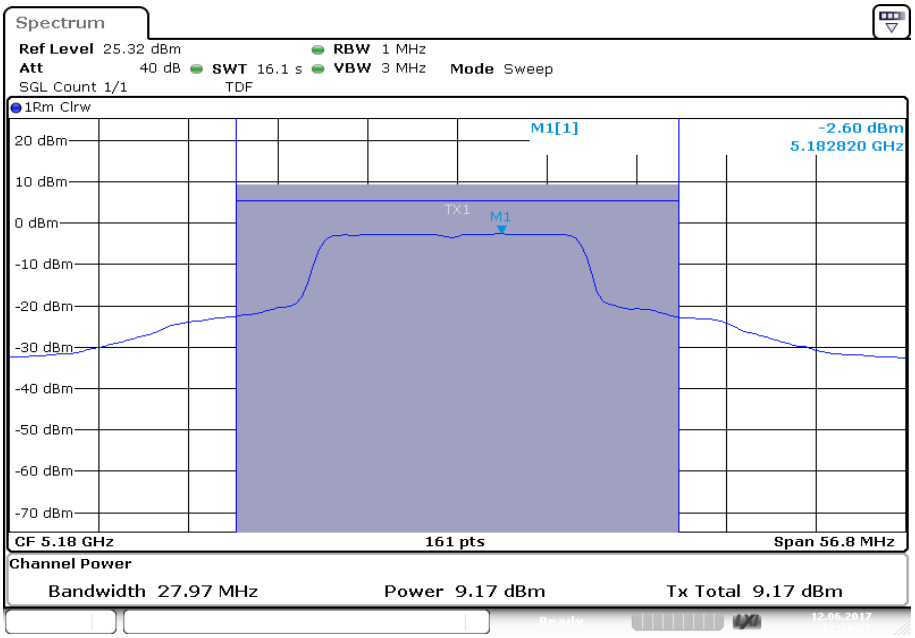
OFDM / n/ac HT20 – mode	Maximum output power [dBm]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
Including duty cycle correction factor	12.11	11.29	11.85	11.15
Channel	5745 MHz	5785 MHz	5825 MHz	
Including duty cycle correction factor	12.03	11.21	10.95	

Result: OFDM / n/ac HT40 – mode

OFDM / n/ac HT40 – mode	Maximum output power [dBm]			
Channel	5190 MHz	5230 MHz	5270 MHz	5310 MHz
Including duty cycle correction factor	6.99	9.83	9.73	7.31
Channel	5755 MHz	5795 MHz		
Including duty cycle correction factor	10.41	9.61		

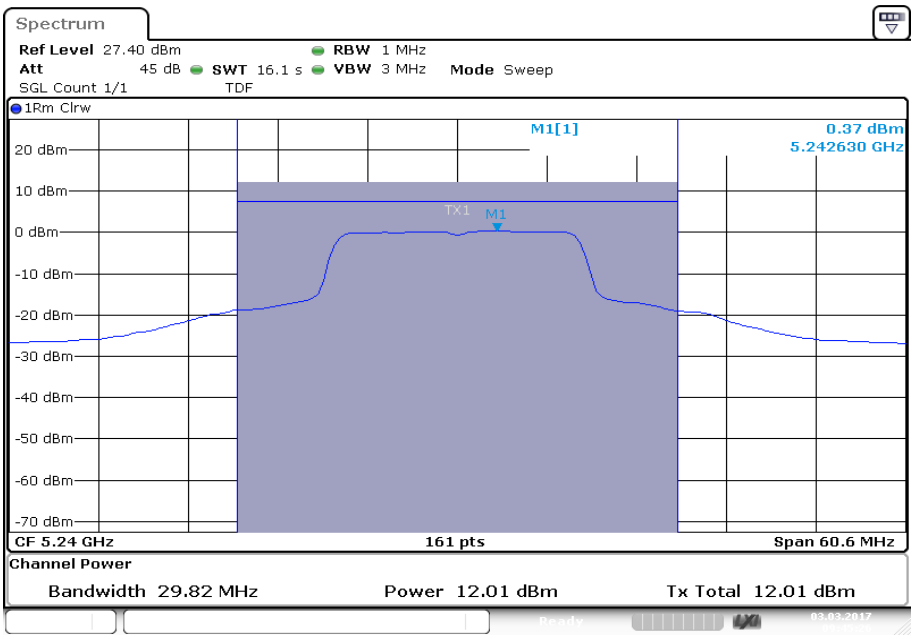
Plots: OFDM / a – mode

Plot 1: 5180 MHz



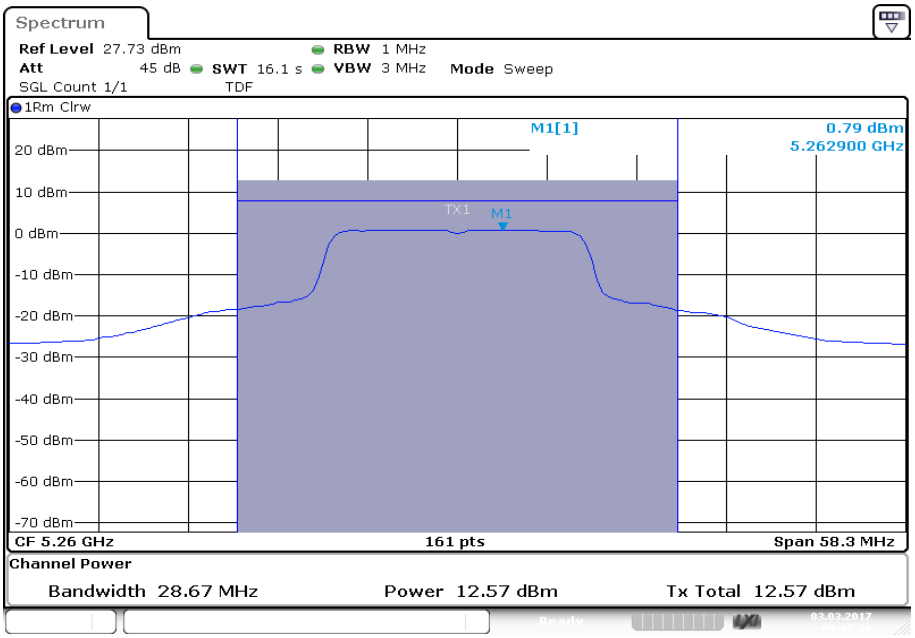
Date: 12.JUN.2017 12:16:27

Plot 2: 5240 MHz



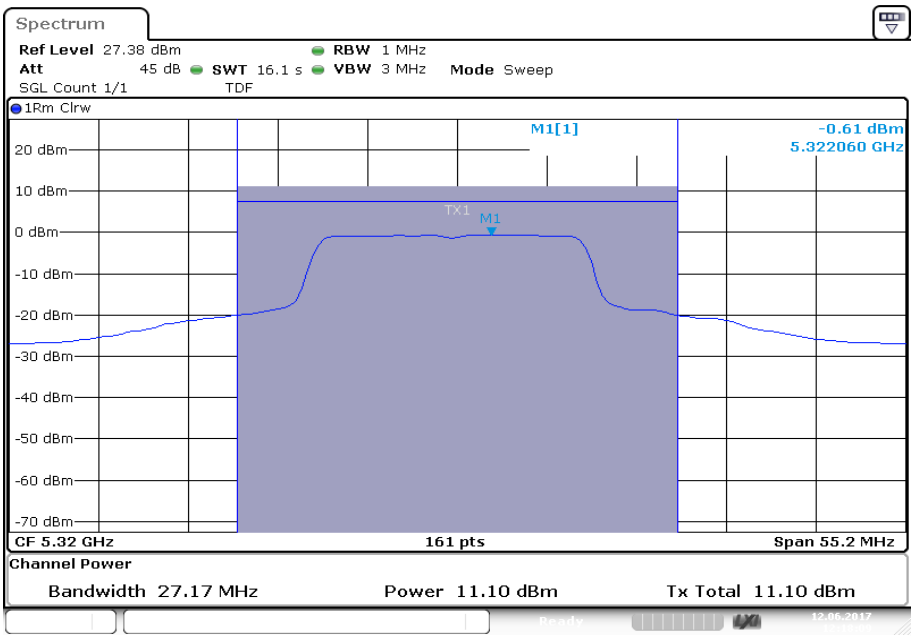
Date: 3.MAR.2017 09:45:27

Plot 3: 5260 MHz



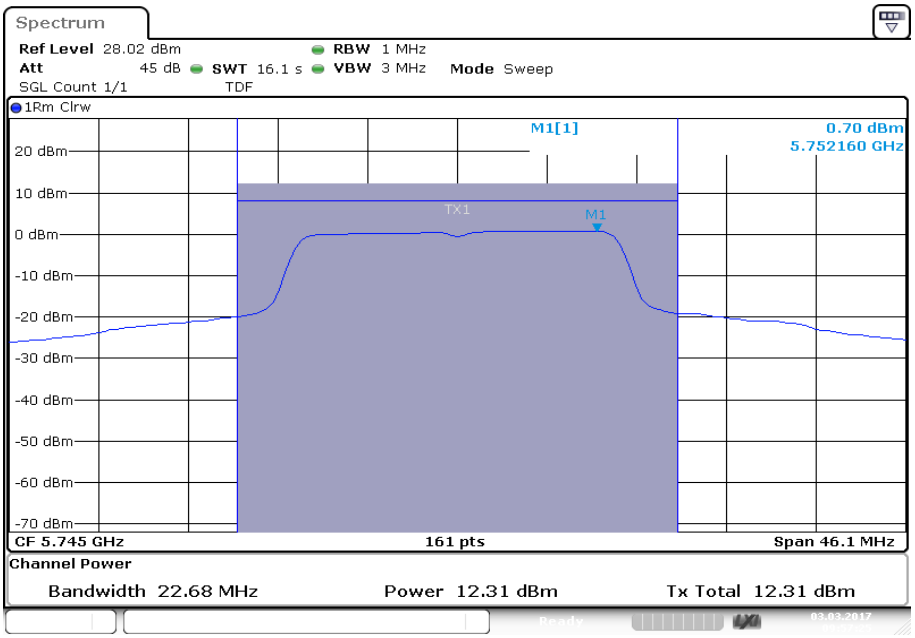
Date: 3.MAR.2017 09:47:31

Plot 4: 5320 MHz



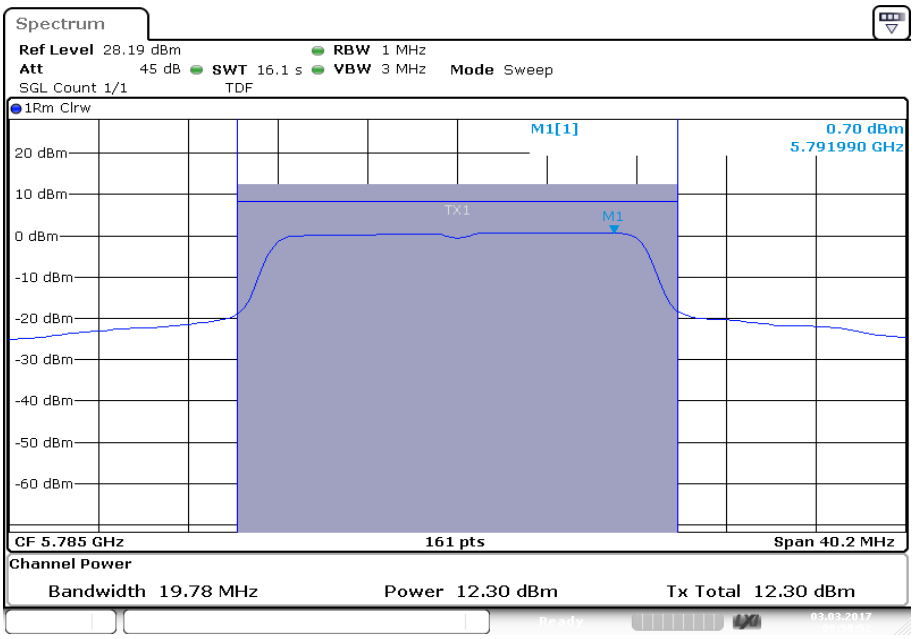
Date: 12.JUN.2017 12:18:10

Plot 5: 5745 MHz



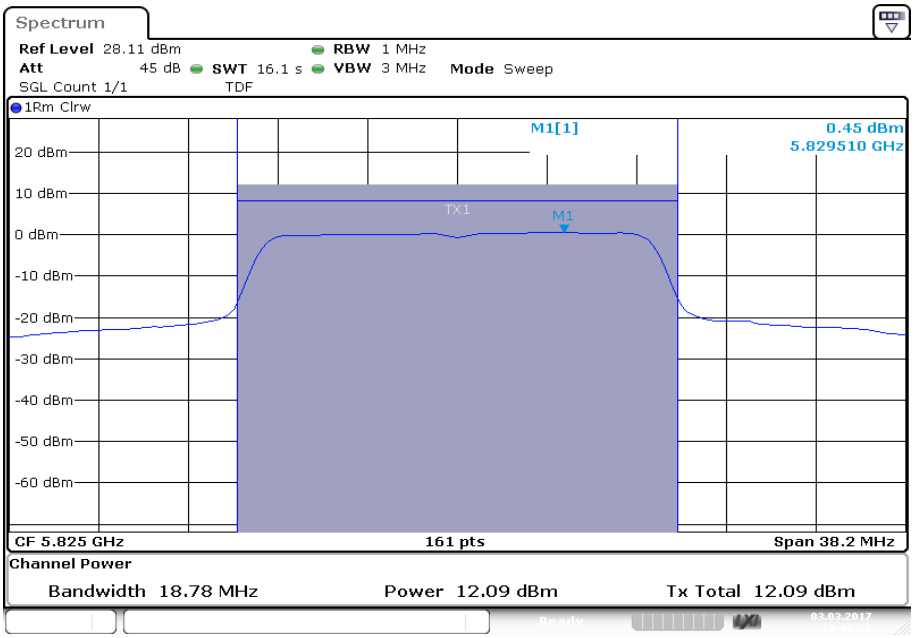
Date: 3.MAR.2017 09:57:26

Plot 6: 5785 MHz



Date: 3.MAR.2017 09:59:52

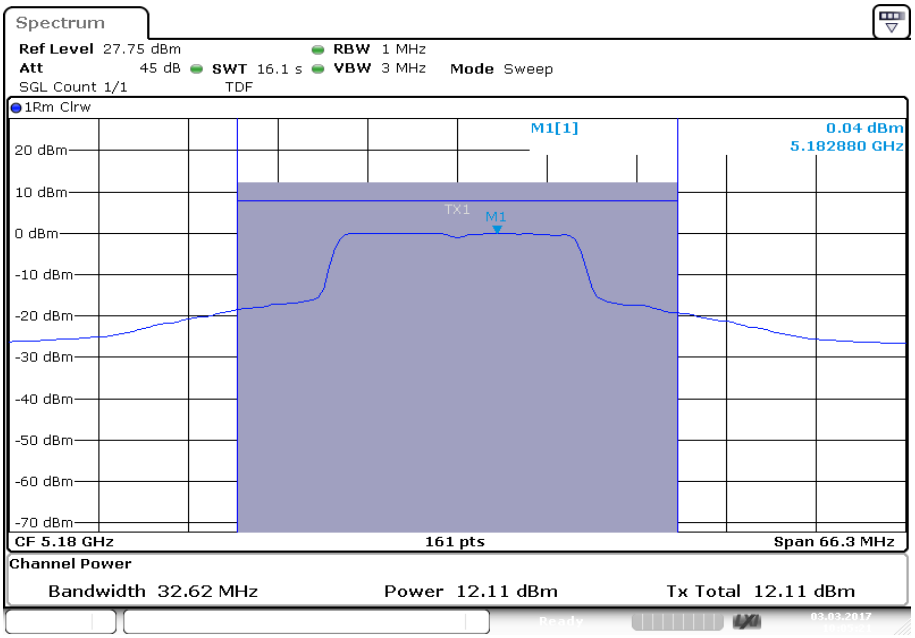
Plot 7: 5825 MHz



Date: 3.MAR.2017 10:02:24

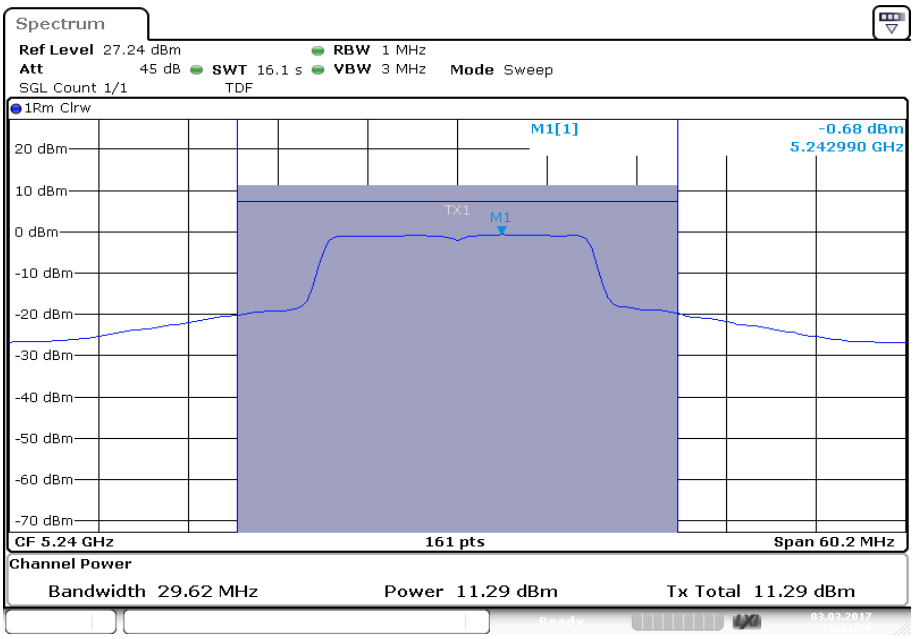
Plots: OFDM / n/ac HT20 – mode

Plot 1: 5180 MHz



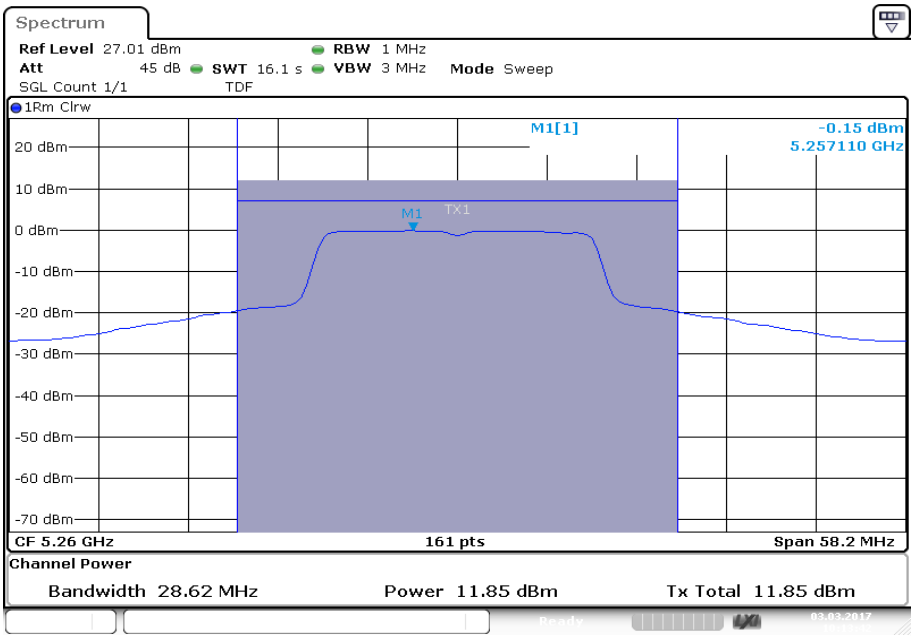
Date: 3.MAR.2017 10:05:22

Plot 2: 5240 MHz



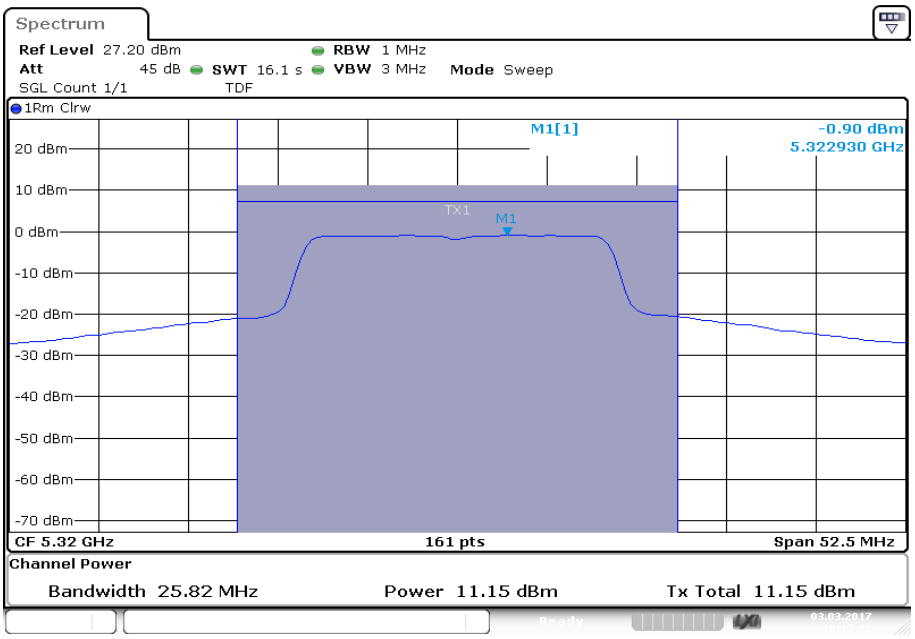
Date: 3.MAR.2017 10:11:51

Plot 3: 5260 MHz



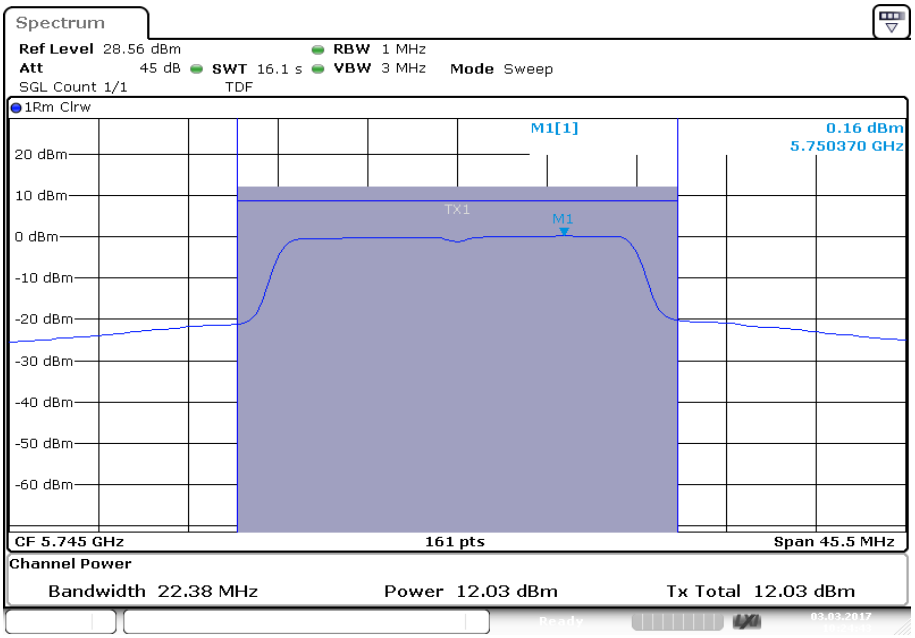
Date: 3.MAR.2017 10:13:42

Plot 4: 5320 MHz



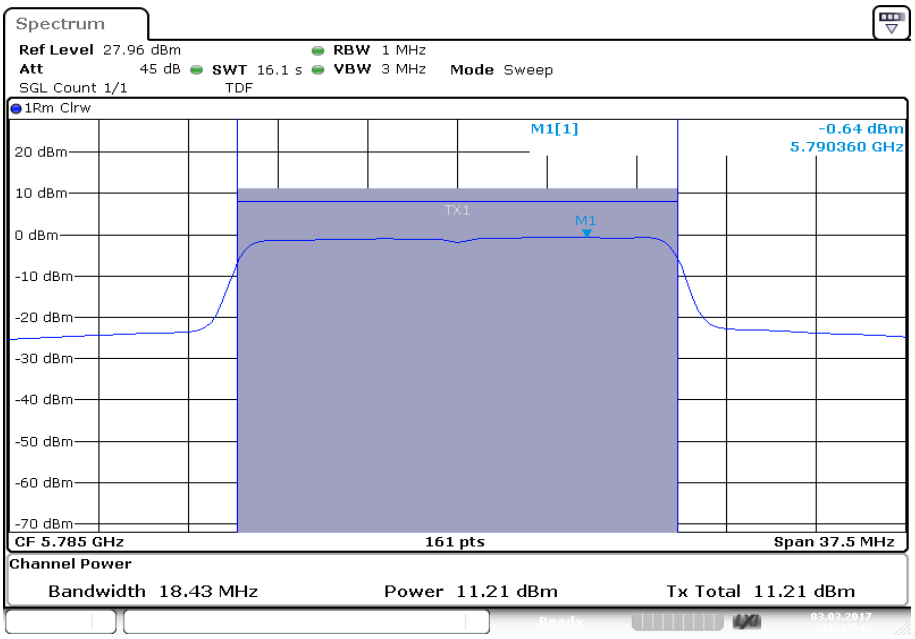
Date: 3.MAR.2017 10:15:32

Plot 5: 5745 MHz



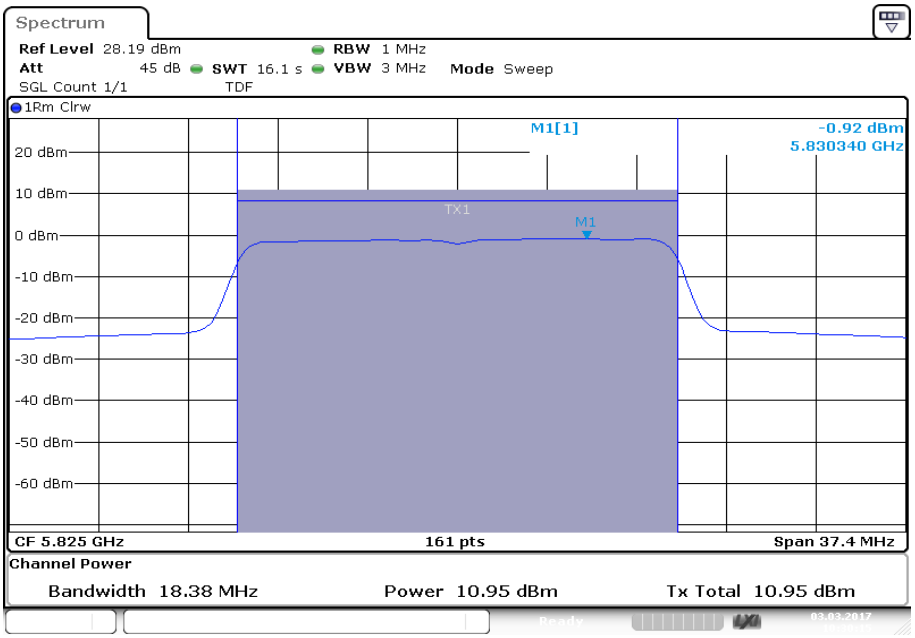
Date: 3.MAR.2017 10:24:44

Plot 6: 5785 MHz



Date: 3.MAR.2017 10:27:44

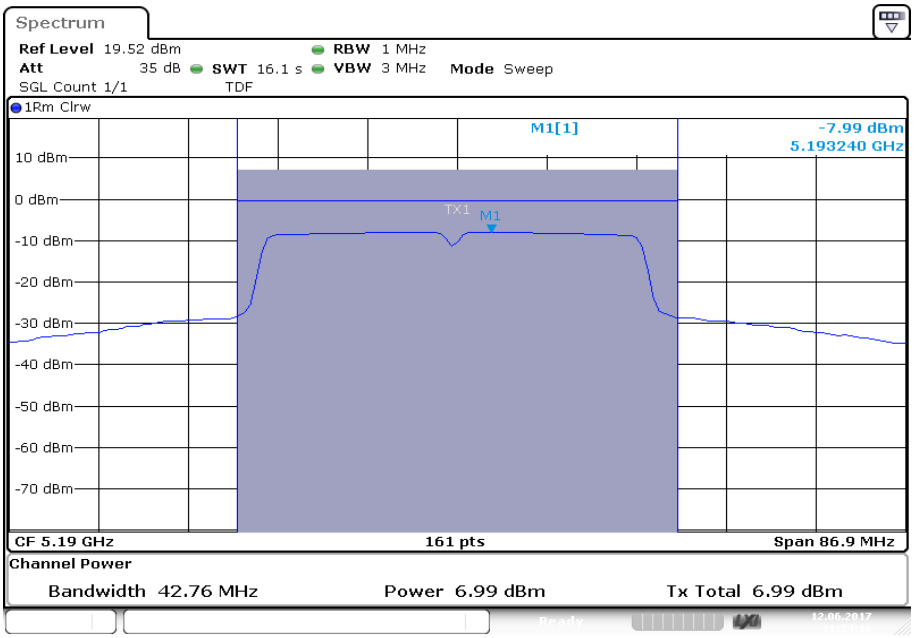
Plot 7: 5825 MHz



Date: 3.MAR.2017 10:30:16

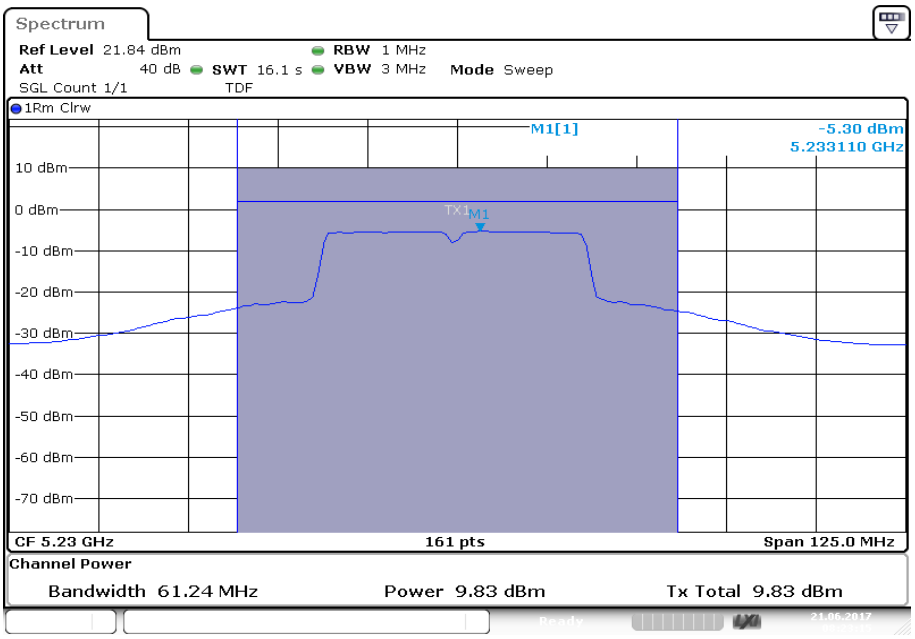
Plots: OFDM / n/ac HT40 – mode

Plot 1: 5190 MHz



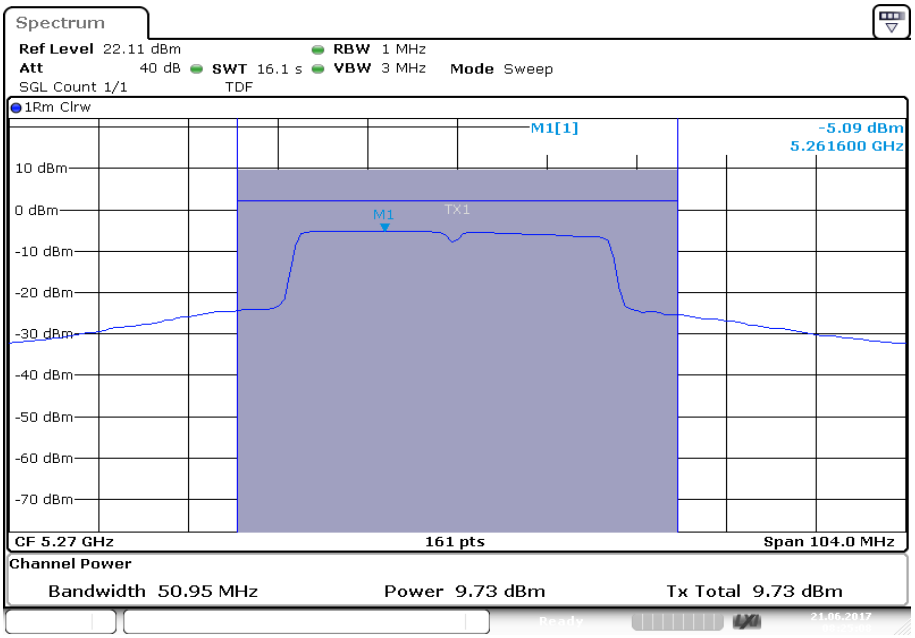
Date: 12.JUN.2017 11:24:17

Plot 2: 5230 MHz



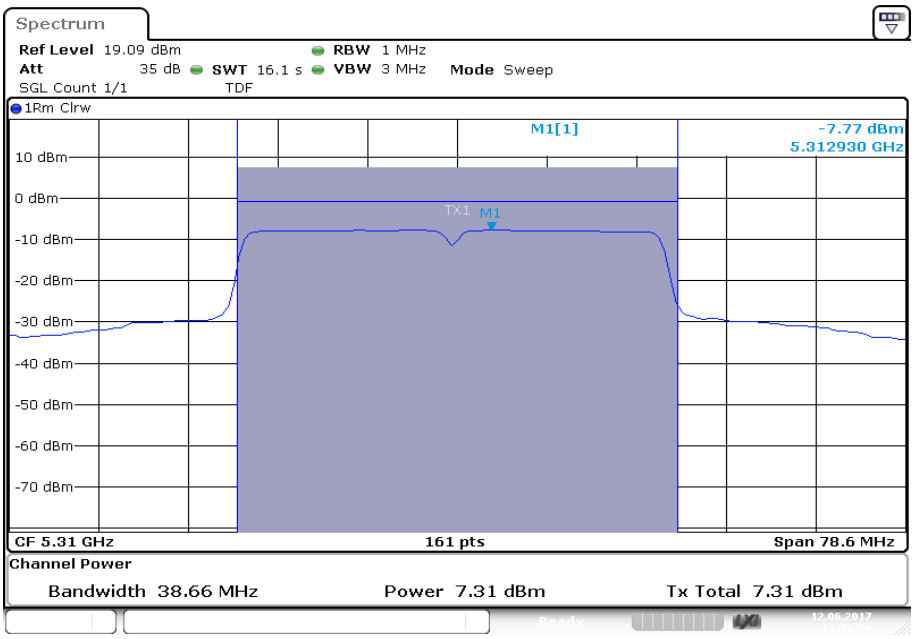
Date: 21.JUN.2017 08:23:16

Plot 3: 5270 MHz



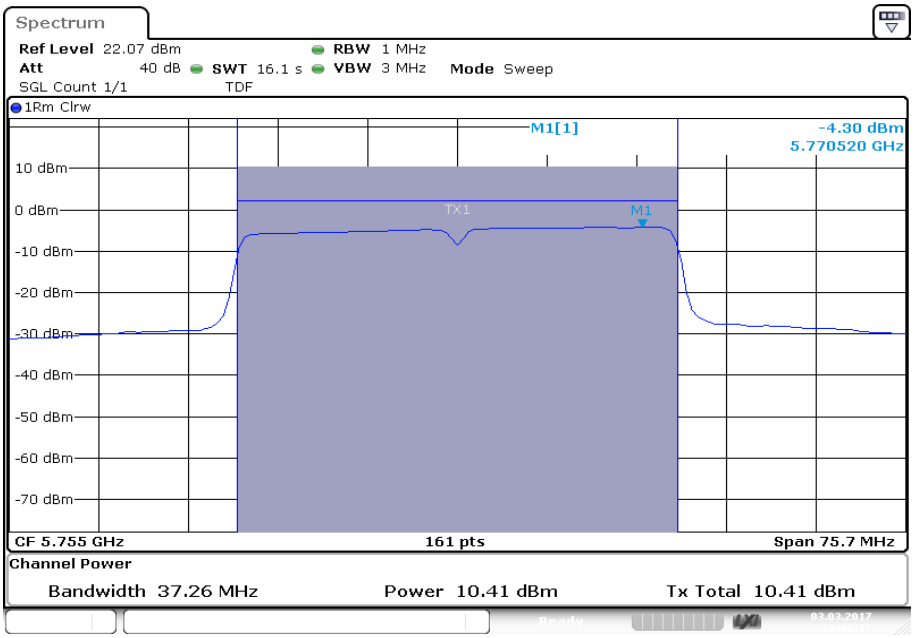
Date: 21.JUN.2017 08:25:09

Plot 4: 5310 MHz



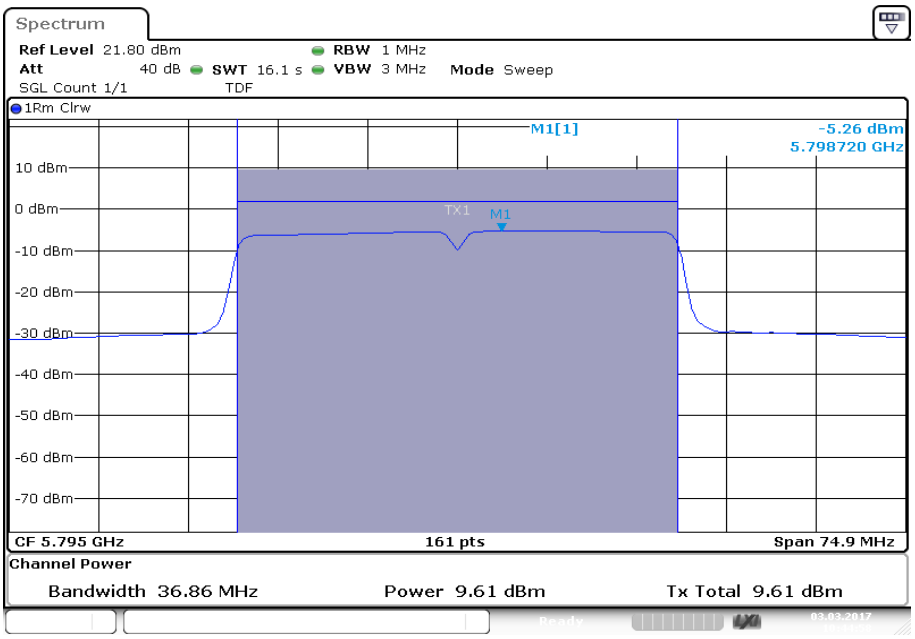
Date: 12.JUN.2017 11:36:50

Plot 5: 5755 MHz



Date: 3.MAR.2017 10:42:18

Plot 6: 5795 MHz



Date: 3.MAR.2017 10:44:58

11.5 Power spectral density

11.5.1 Power spectral density – for FCC requirements

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	
According to: KDB789033 D02, F.	
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
Used test setup:	See chapter 6.5 – A
Measurement uncertainty:	See chapter 8

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 / a – mode

OFDM / a – mode	Power spectral density [dBm/MHz]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
	-2.56	0.36	0.96	-0.54
Channel	5745 MHz	5785 MHz	5825 MHz	
	-2.21	-2.22	-2.44	

Result: OFDM / n/ac HT20 – mode

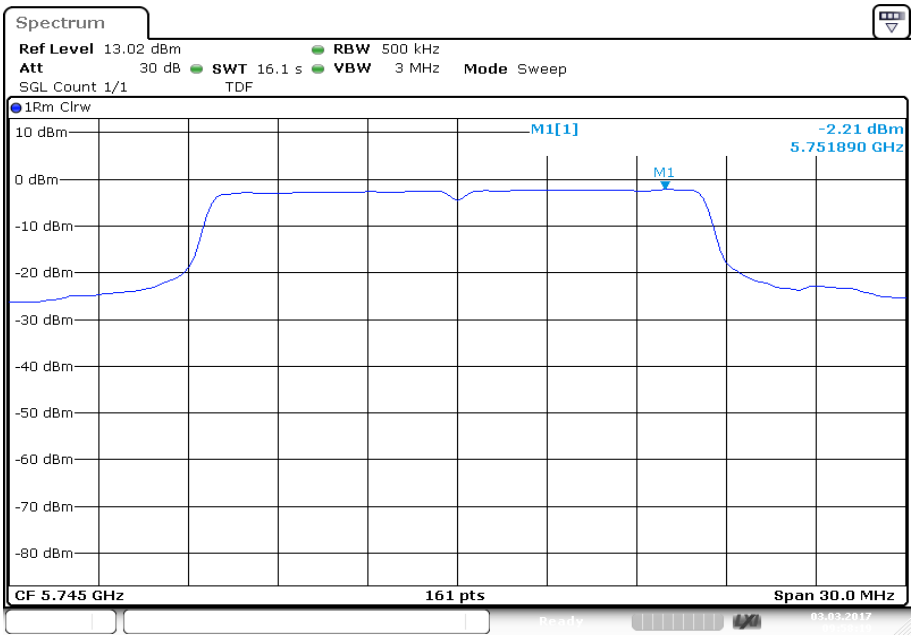
OFDM / n/ac HT20 – mode	Power spectral density [dBm/MHz]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
	0.04	-0.67	-0.13	-0.89
Channel	5745 MHz	5785 MHz	5825 MHz	
	-2.72	-3.50	-3.77	

Result: OFDM / n/ac HT40 – mode

OFDM / n/ac HT40 – mode	Power spectral density [dBm/MHz]			
Channel	5190 MHz	5230 MHz	5270 MHz	5310 MHz
	-7.97	-5.20	-5.03	-7.75
Channel	5755 MHz	5795 MHz		
	-7.39	-8.34		

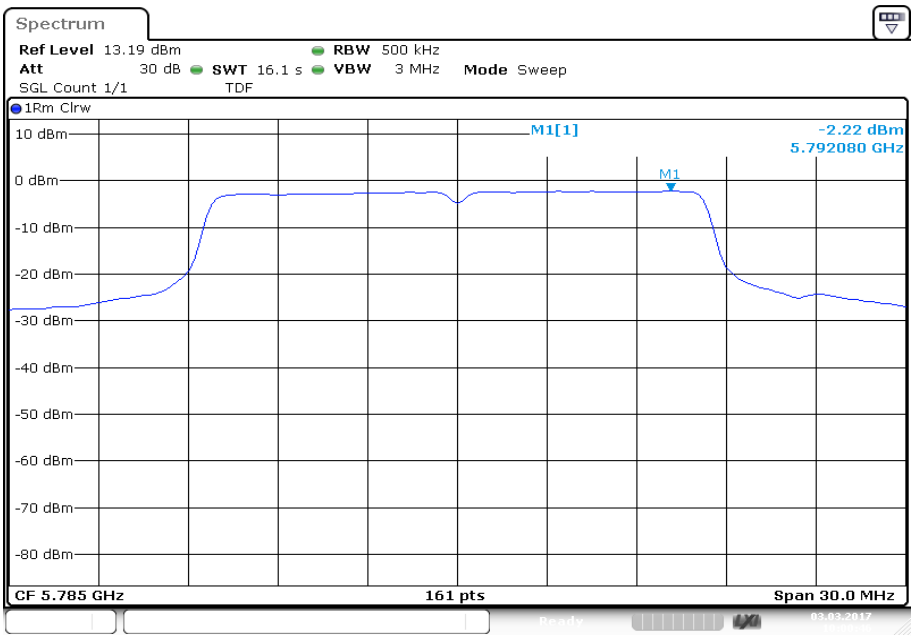
Plots: OFDM / a – mode

Plot 1: 5745 MHz



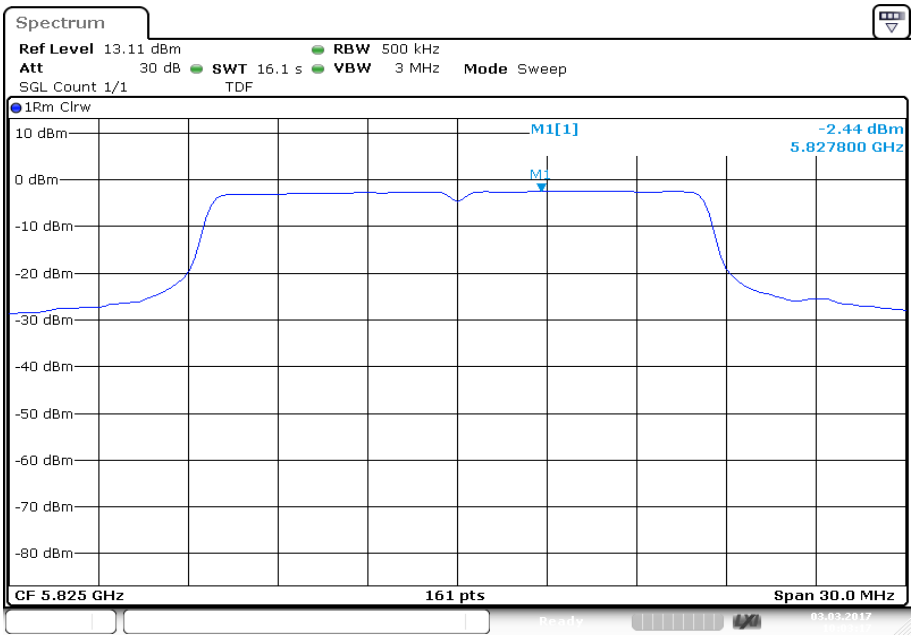
Date: 3.MAR.2017 09:58:20

Plot 2: 5785 MHz



Date: 3.MAR.2017 10:00:46

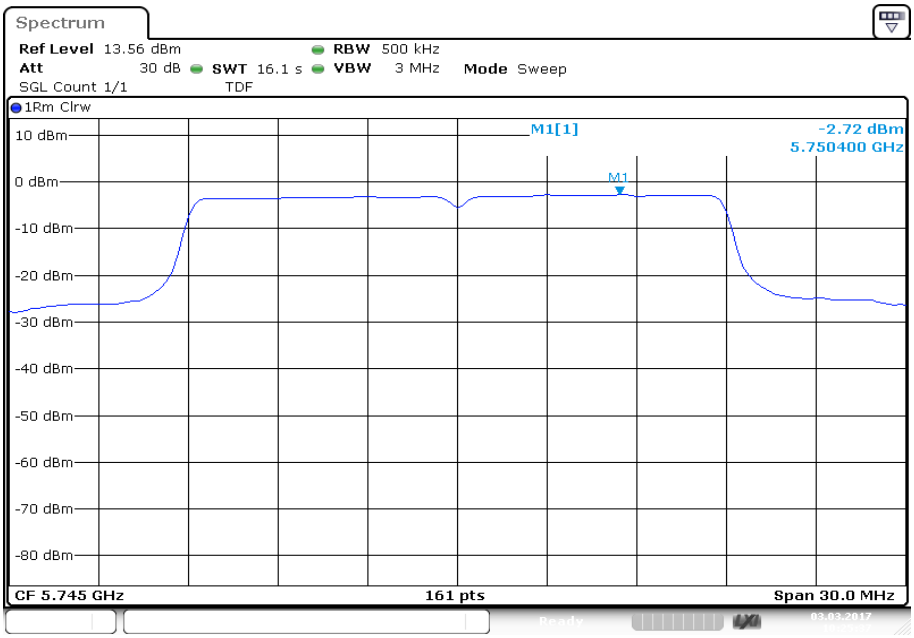
Plot 3: 5825 MHz



Date: 3.MAR.2017 10:03:18

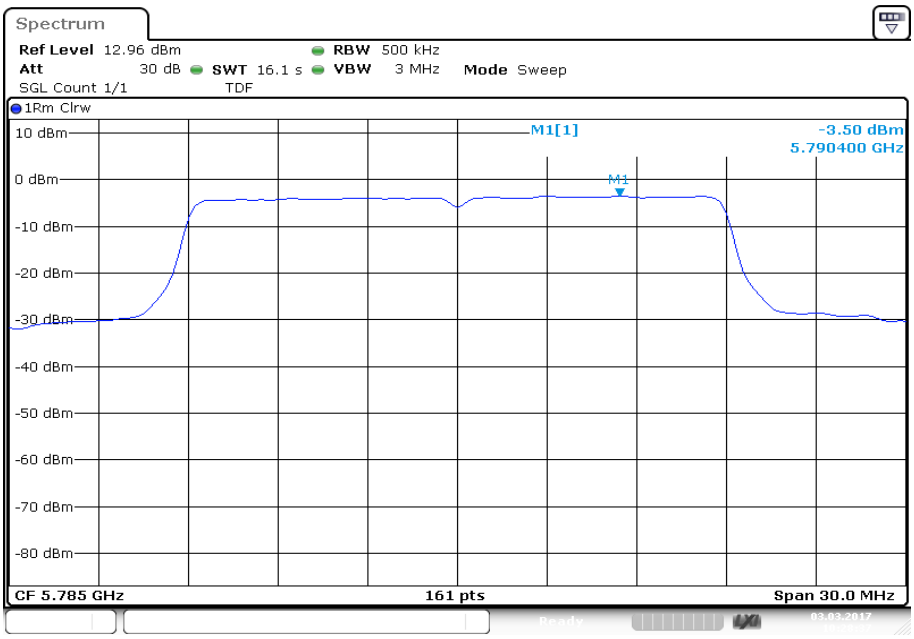
Plots: OFDM / n/ac HT20 – mode

Plot 1: 5745 MHz



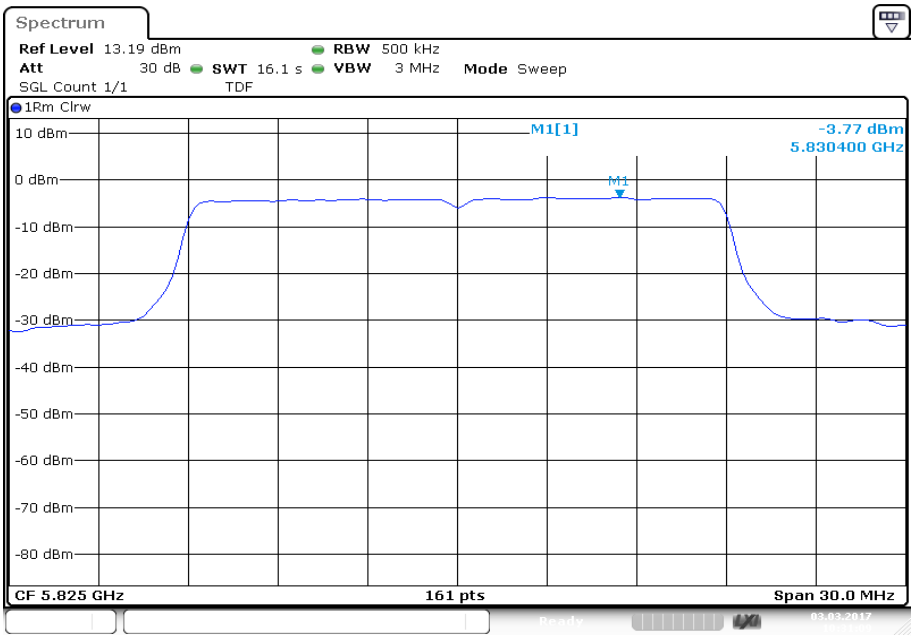
Date: 3.MAR.2017 10:25:38

Plot 2: 5785 MHz



Date: 3.MAR.2017 10:28:38

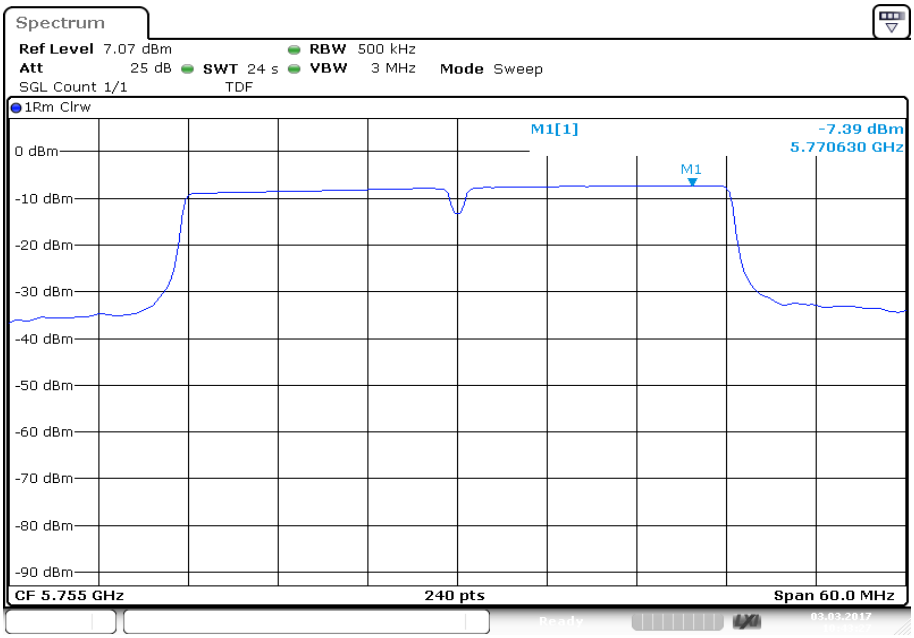
Plot 3: 5825 MHz



Date: 3.MAR.2017 10:31:10

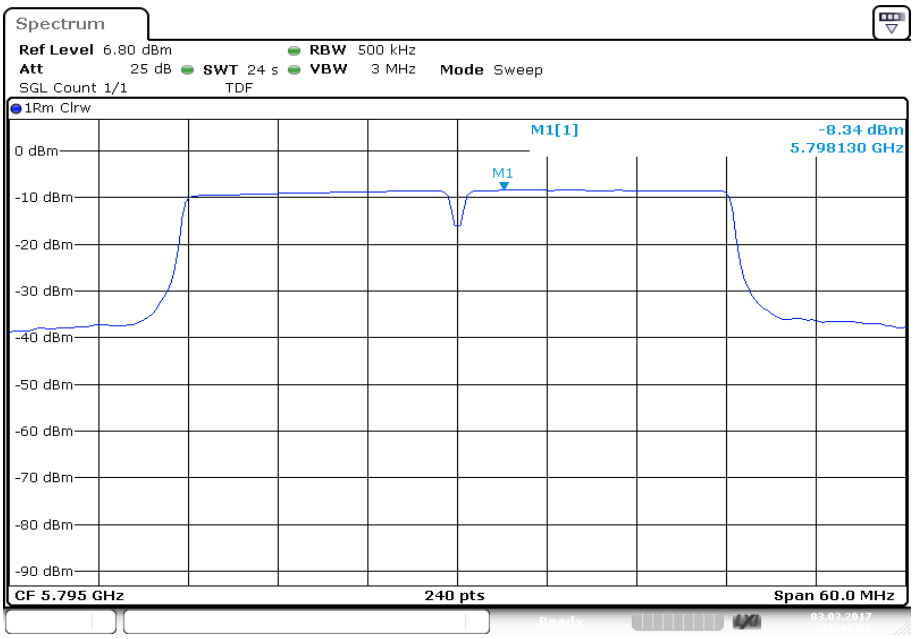
Plots: OFDM / n/ac HT40 – mode

Plot 1: 5755 MHz



Date: 3.MAR.2017 10:43:28

Plot 2: 5795 MHz



Date: 3.MAR.2017 10:46:09

11.5.2 Power spectral density – for IC requirements

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
Used test setup:	See chapter 6.5 – A
Measurement uncertainty:	See chapter 8

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 / a – mode

OFDM / a – mode	Power spectral density [dBm/MHz]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
	-1.80	1.17	0.79	0.19
Channel	5745 MHz	5785 MHz	5825 MHz	
	-2.25	-2.22	-2.47	

Result: OFDM / n/ac HT20 – mode

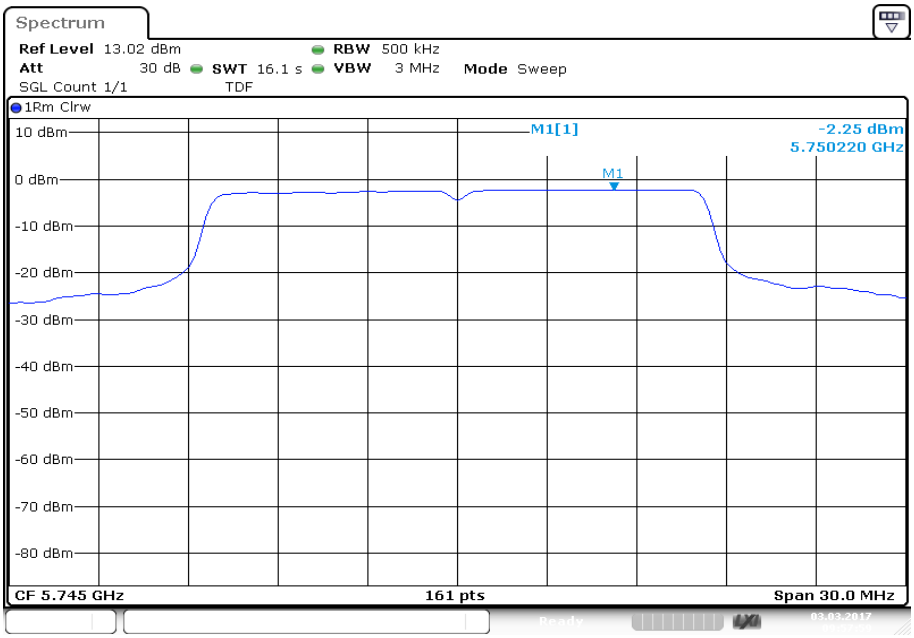
OFDM / n/ac HT20 – mode	Power spectral density [dBm/MHz]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
	0.84 c	0.12 c	-0.15	-0.90
Channel	5745 MHz	5785 MHz	5825 MHz	
	-2.71	-3.49	-3.76	

Result: OFDM / n/ac HT40 – mode

OFDM / n/ac HT40 – mode	Power spectral density [dBm/MHz]			
Channel	5190 MHz	5230 MHz	5270 MHz	5310 MHz
	-7.19	-5.30	-5.09	-6.97
Channel	5755 MHz	5795 MHz		
	-7.37	-8.33		

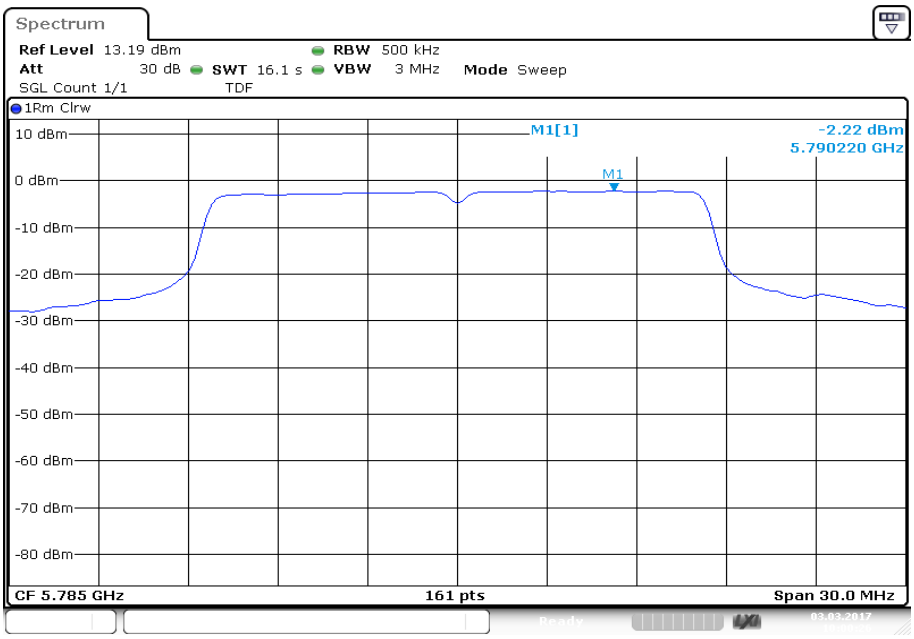
Plots: OFDM / a – mode

Plot 1: 5745 MHz



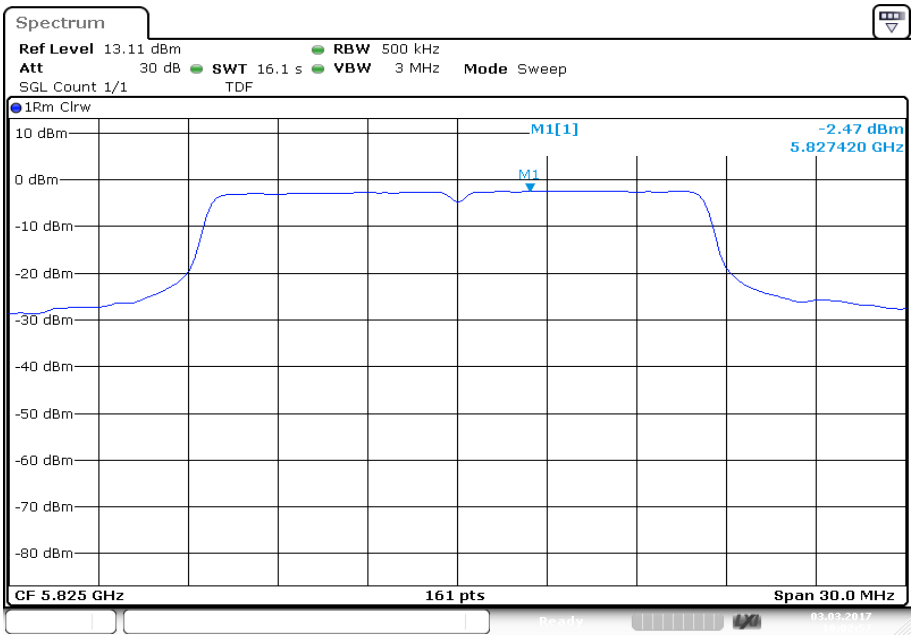
Date: 3.MAR.2017 09:58:00

Plot 2: 5785 MHz



Date: 3.MAR.2017 10:00:26

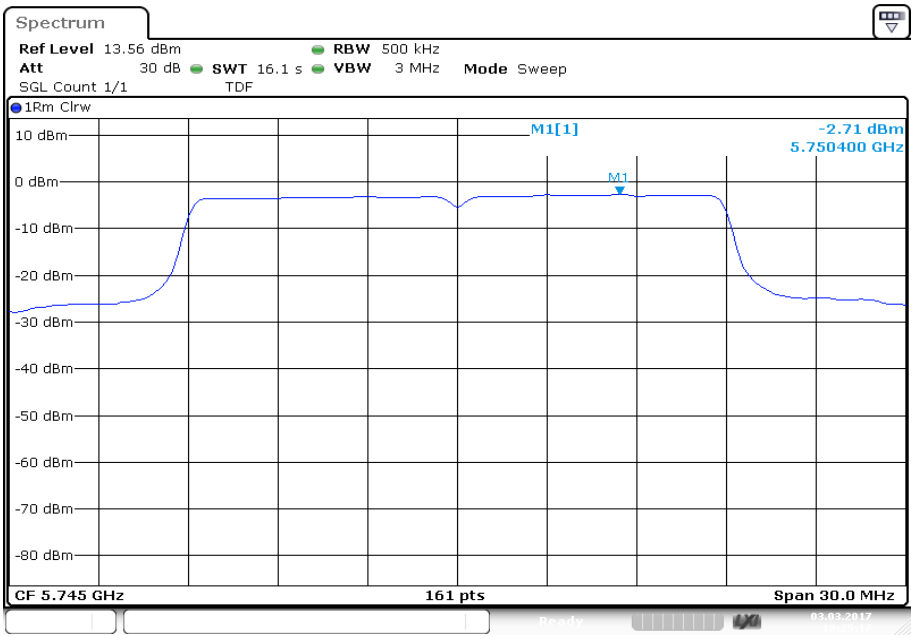
Plot 3: 5825 MHz



Date: 3.MAR.2017 10:02:58

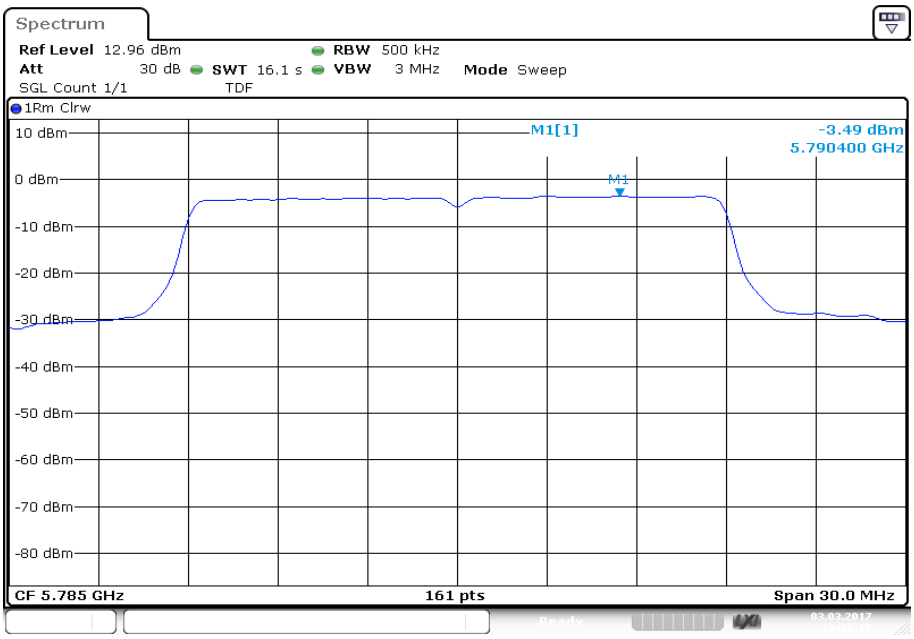
Plots: OFDM / n/ac HT20 – mode

Plot 1: 5745 MHz



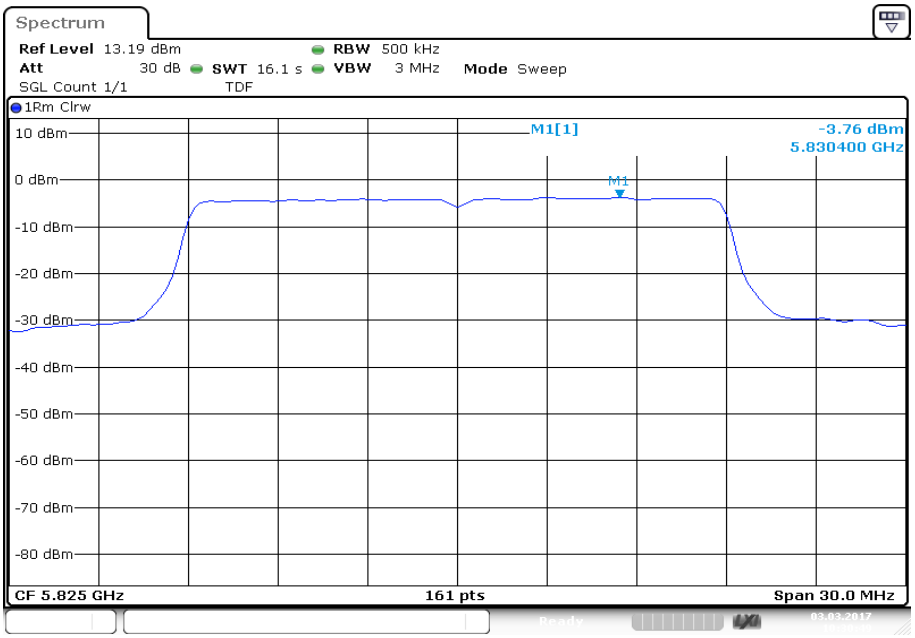
Date: 3.MAR.2017 10:25:18

Plot 2: 5785 MHz



Date: 3.MAR.2017 10:28:18

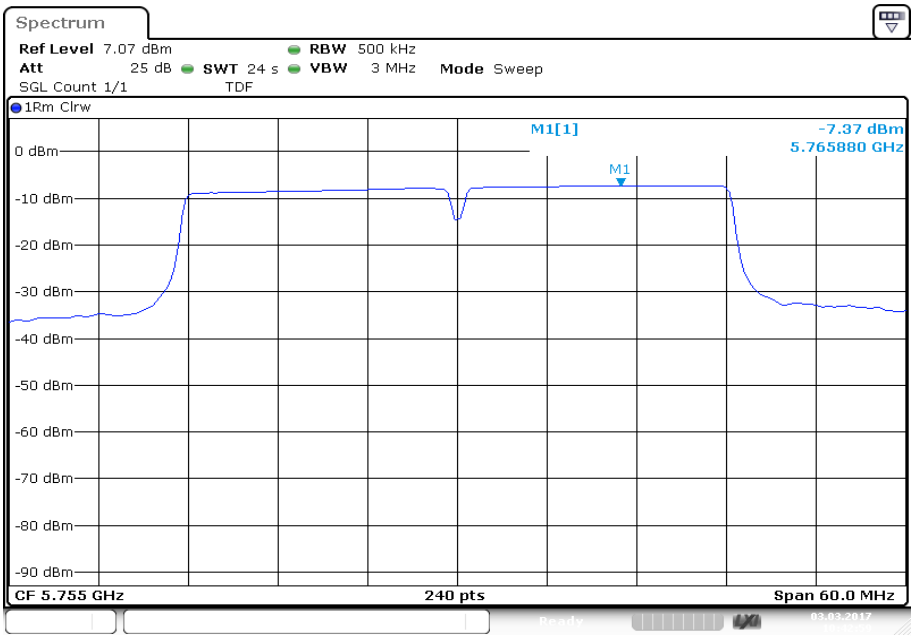
Plot 3: 5825 MHz



Date: 3.MAR.2017 10:30:50

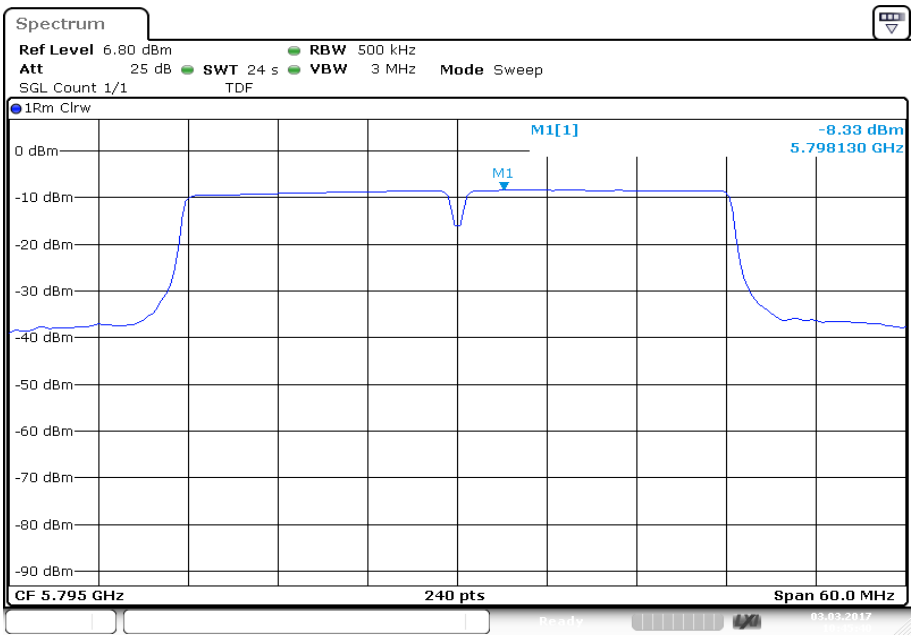
Plots: OFDM / n/ac HT40 – mode

Plot 1: 5755 MHz



Date: 3.MAR.2017 10:43:00

Plot 2: 5795 MHz



Date: 3.MAR.2017 10:45:41

11.6 Minimum emission bandwidth for the band 5.725-5.85 GHz

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
According to: KDB789033 D02, C.2.	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	40 MHz
Measurement procedure:	Using marker to find -6dBc frequencies
Trace mode:	Max hold (allow trace to stabilize)
Used test setup:	See chapter 6.5 – A
Measurement uncertainty:	See chapter 8

Limits:

FCC	IC
Minimum Emission Bandwidth for the band 5.725-5.85 GHz	
The minimum 6 dB bandwidth shall be at least 500 kHz.	

Result:

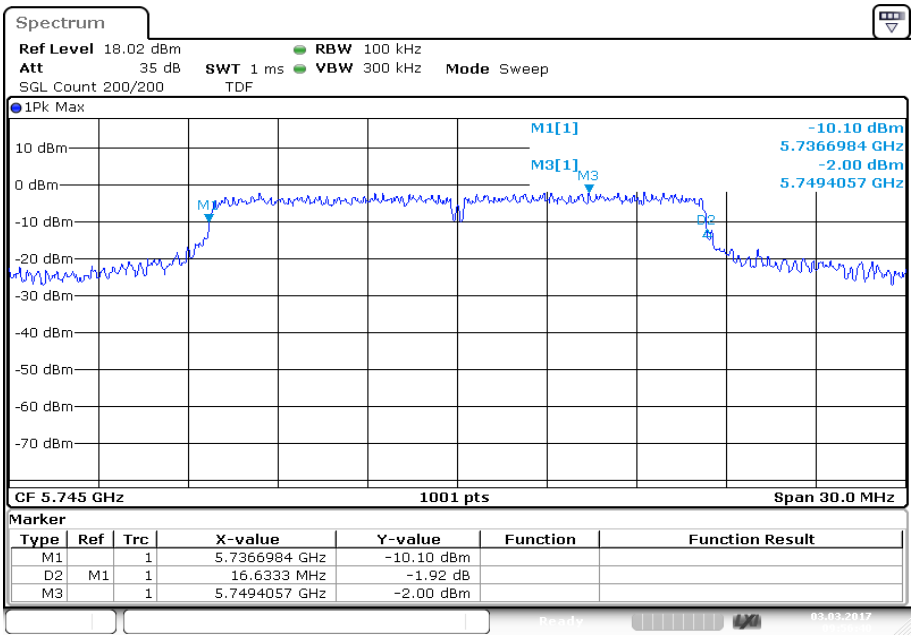
OFDM / a – mode	6 dB bandwidth [MHz]		
Channel	5745 MHz	5785 MHz	5825 MHz
	16.63	16.57	16.57

OFDM / n/ac HT20 – mode	6 dB bandwidth [MHz]		
Channel	5745 MHz	5785 MHz	5825 MHz
	17.89	17.89	17.89

OFDM / n/ac HT40 – mode	6 dB bandwidth [MHz]	
Channel	5755 MHz	5795 MHz
	36.56	36.62

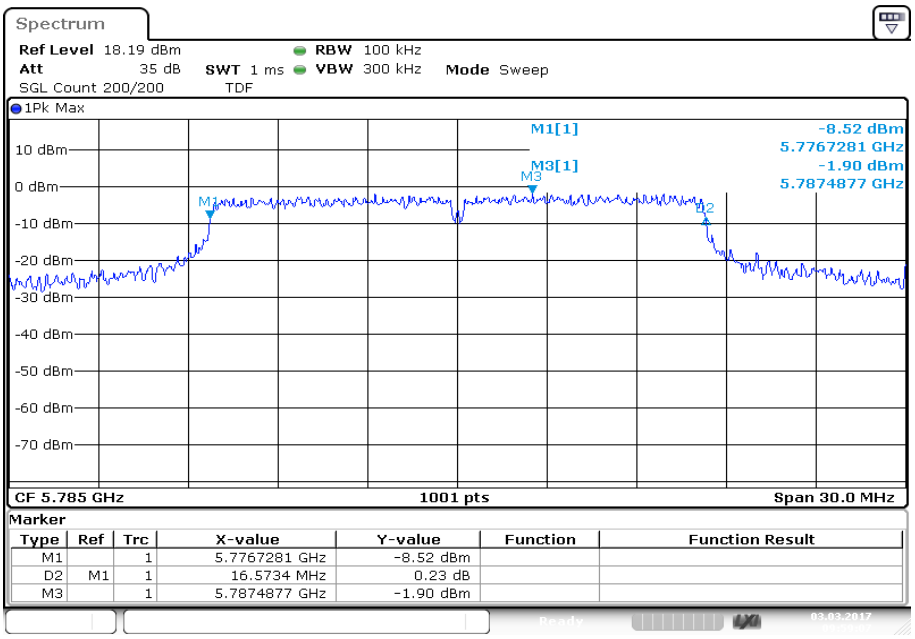
Plots: OFDM / a – mode

Plot 1: 5745 MHz



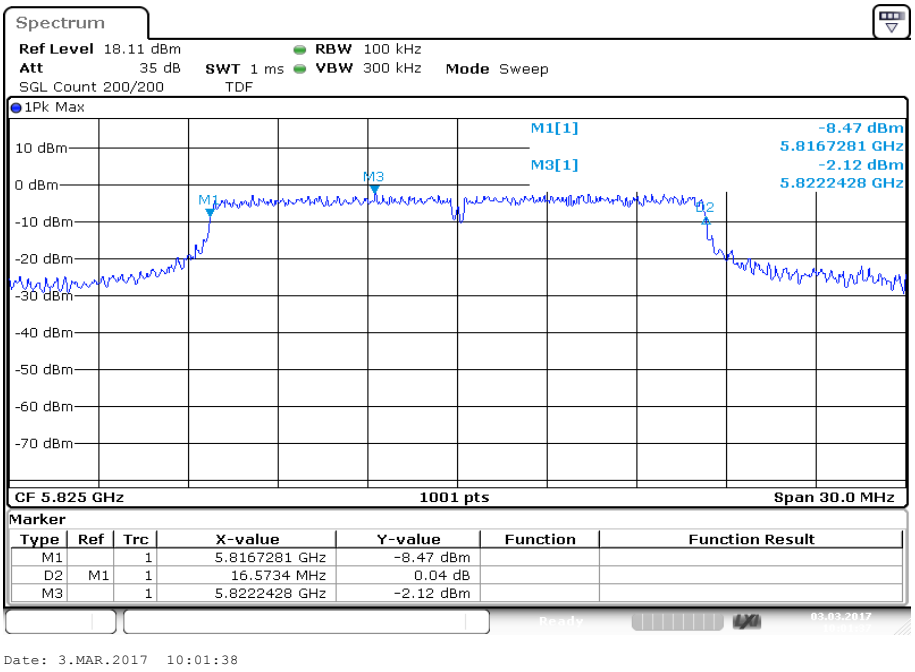
Date: 3.MAR.2017 09:56:40

Plot 2: 5785 MHz



Date: 3.MAR.2017 09:59:07

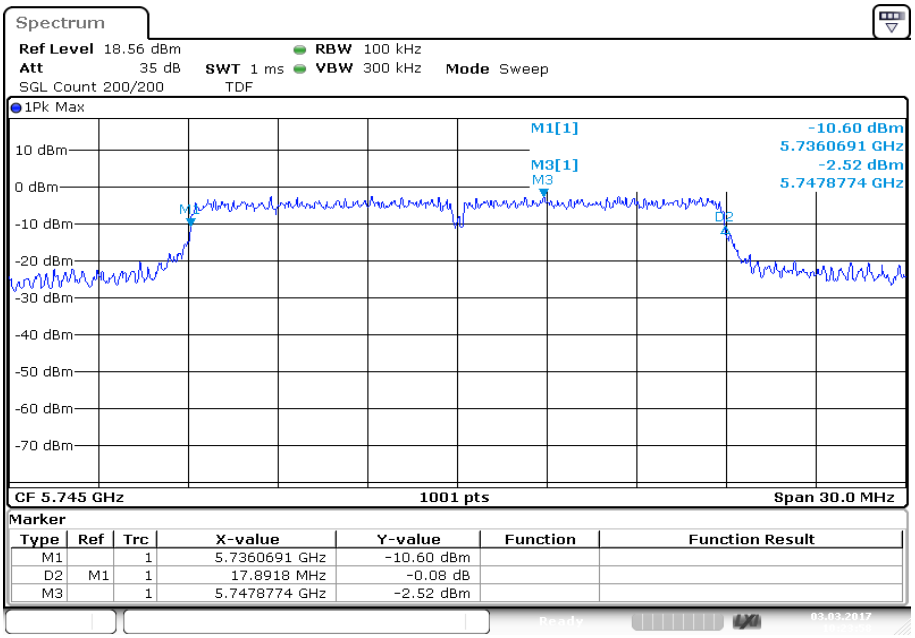
Plot 3: 5825 MHz



Date: 3.MAR.2017 10:01:38

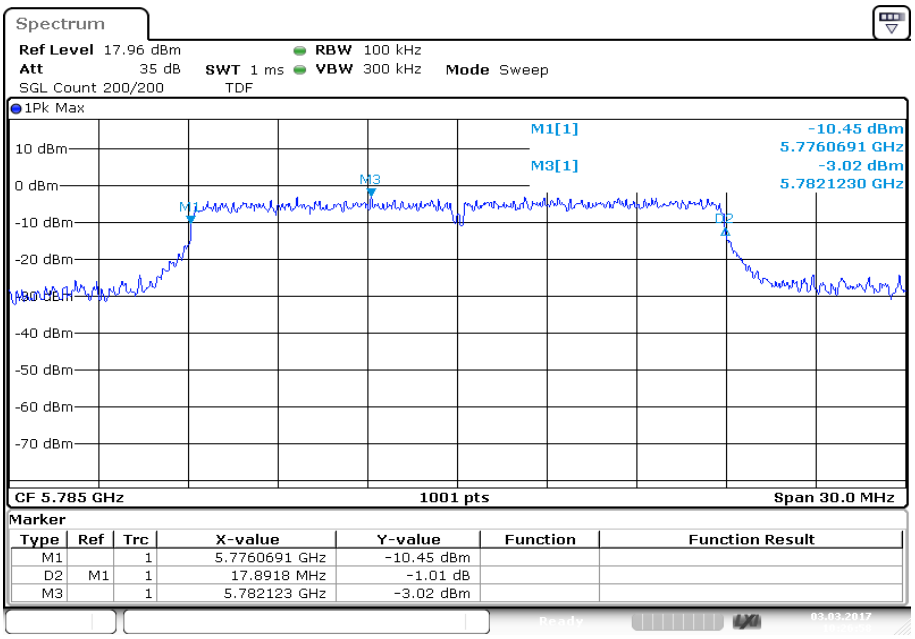
Plots: OFDM / n/ac HT20 – mode

Plot 1: 5745 MHz



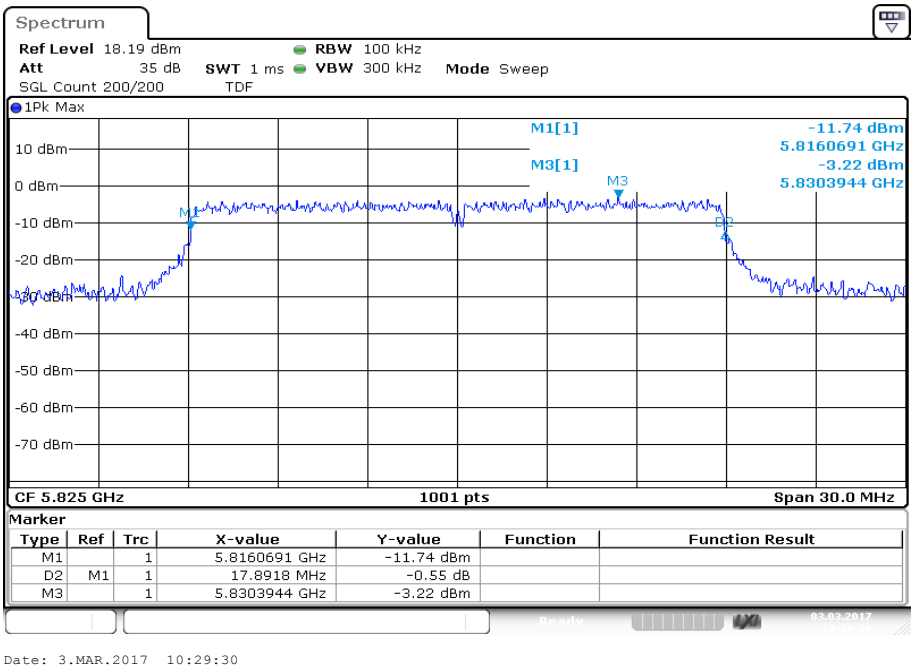
Date: 3.MAR.2017 10:23:59

Plot 2: 5785 MHz



Date: 3.MAR.2017 10:26:58

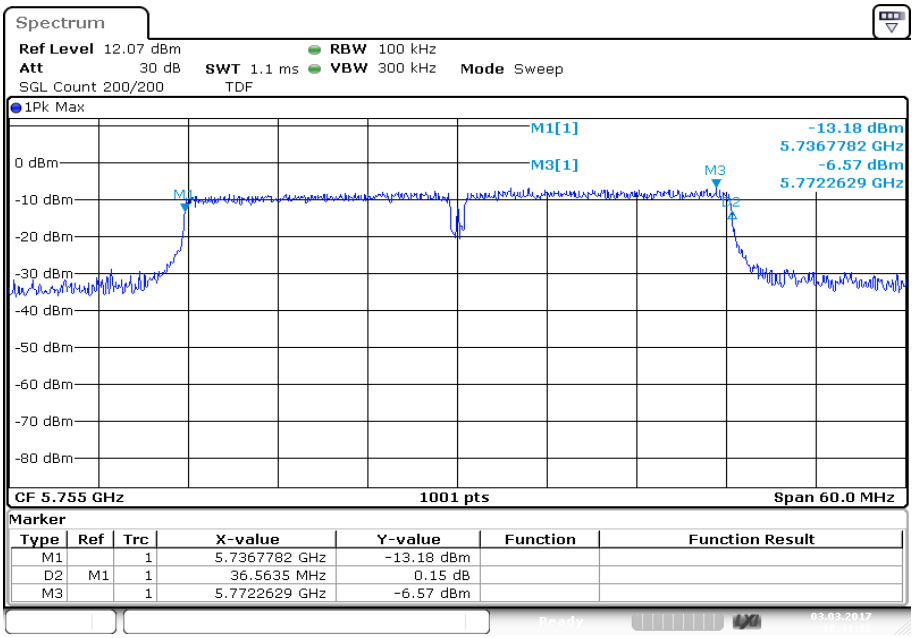
Plot 3: 5825 MHz



Date: 3.MAR.2017 10:29:30

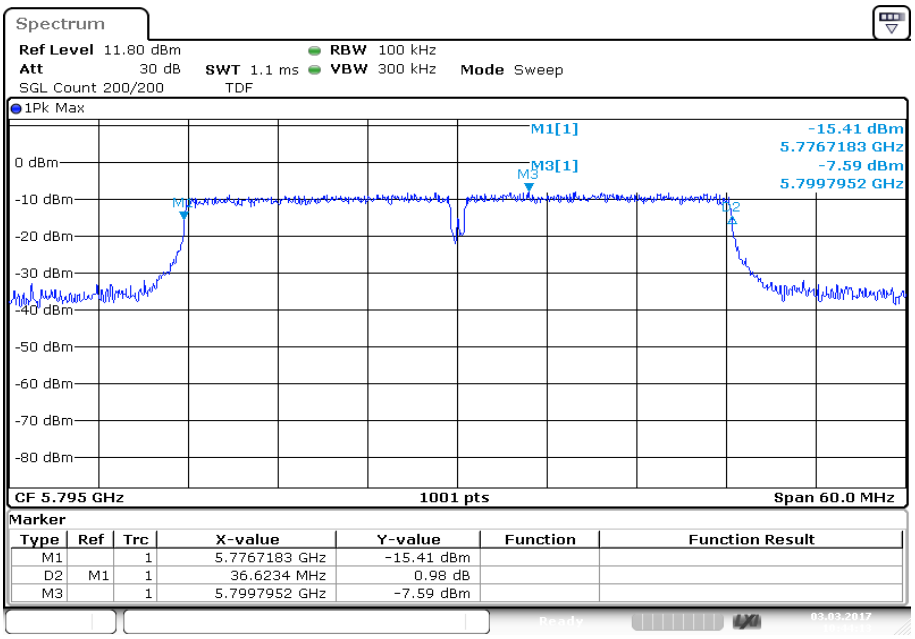
Plots: OFDM / n/ac HT40 – mode

Plot 1: 5755 MHz



Date: 3.MAR.2017 10:41:32

Plot 2: 5795 MHz



Date: 3.MAR.2017 10:44:13

11.7 Spectrum bandwidth – 26 dB bandwidth

Description:

Measurement of the 26 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
According to: KDB789033 D02, C.1.	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1% EBW
Video bandwidth:	≥ RBW
Span:	> complete signal!
Trace-Mode:	Max hold
Used test setup:	see chapter 6.5 – A
Measurement uncertainty:	see chapter 8

Limits:

Spectrum Bandwidth – 26 dB Bandwidth
-/-

Result:

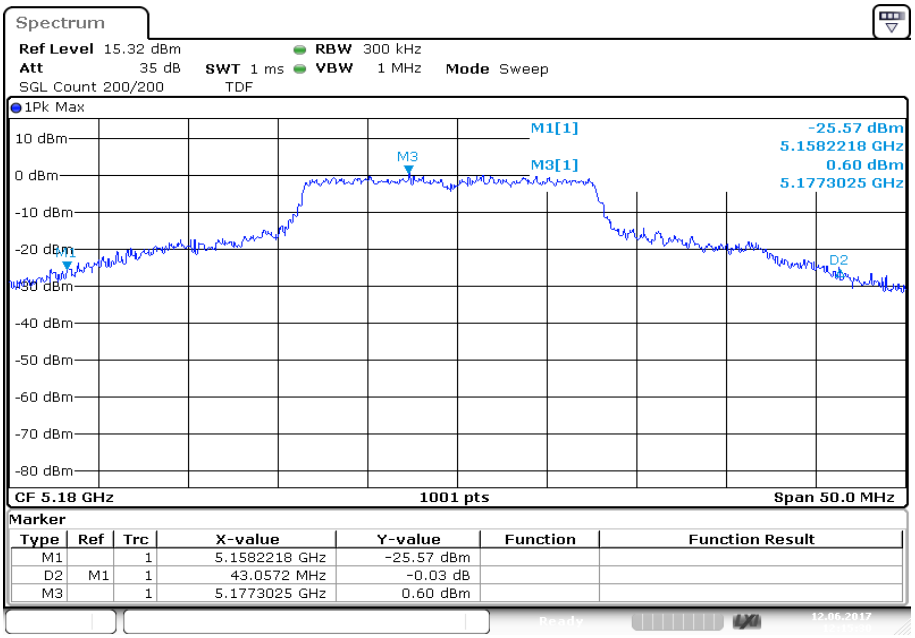
OFDM / a – mode	26 dB bandwidth [MHz]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
	43.06	44.81	42.76	45.55
Channel	5745 MHz	5785 MHz	5825 MHz	-/-
	39.11	37.76	36.96	-/-

OFDM / n/ac HT20 – mode	26 dB bandwidth [MHz]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
	49.85	48.40	47.45	45.11
Channel	5745 MHz	5785 MHz	5825 MHz	-/-
	42.06	37.86	35.12	-/-

OFDM / n/ac HT40 – mode	26 dB bandwidth [MHz]			
Channel	5190 MHz	5230 MHz	5270 MHz	5310 MHz
	85.51	97.20	91.51	78.52
Channel	5755 MHz	5795 MHz		
	69.83	60.64		

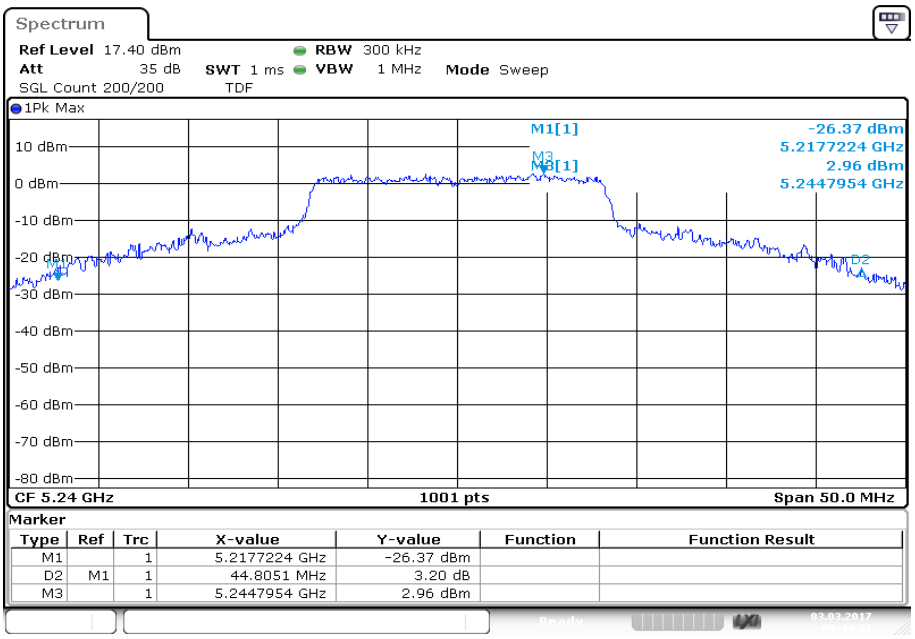
Plots: OFDM / a – mode

Plot 1: 5180 MHz



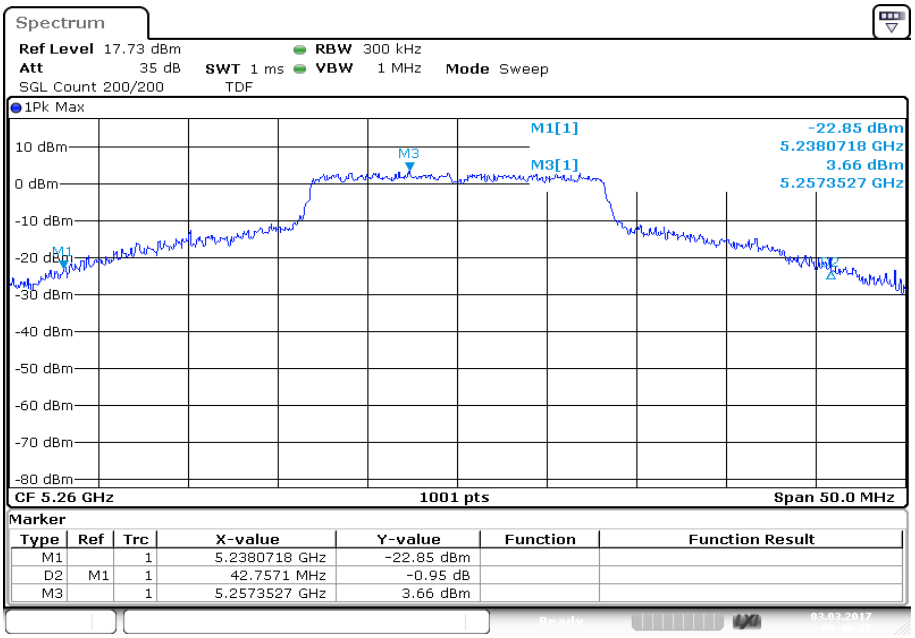
Date: 12.JUN.2017 12:15:31

Plot 2: 5240 MHz



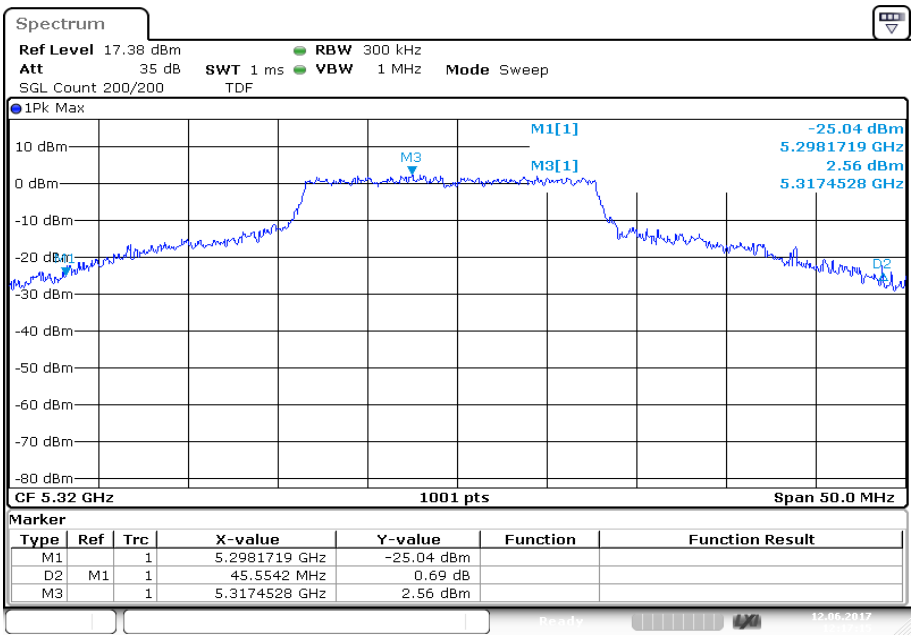
Date: 3.MAR.2017 09:44:31

Plot 3: 5260 MHz



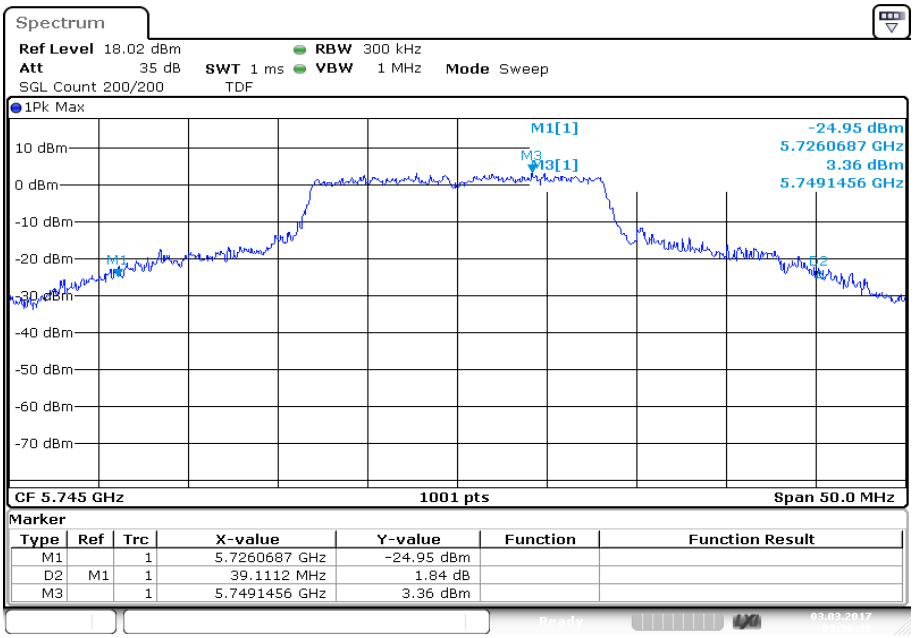
Date: 3.MAR.2017 09:46:35

Plot 4: 5320 MHz



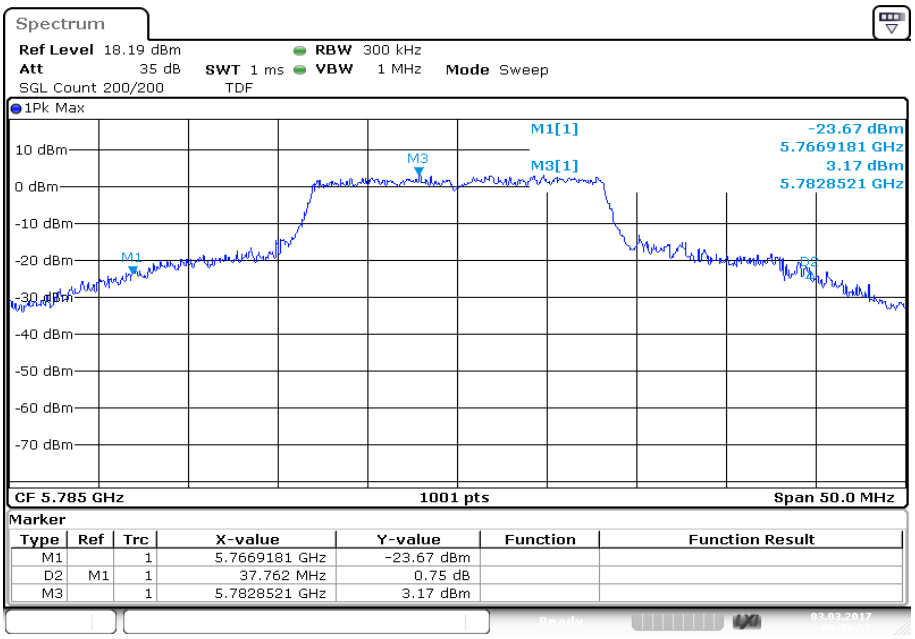
Date: 12.JUN.2017 12:17:16

Plot 5: 5745 MHz



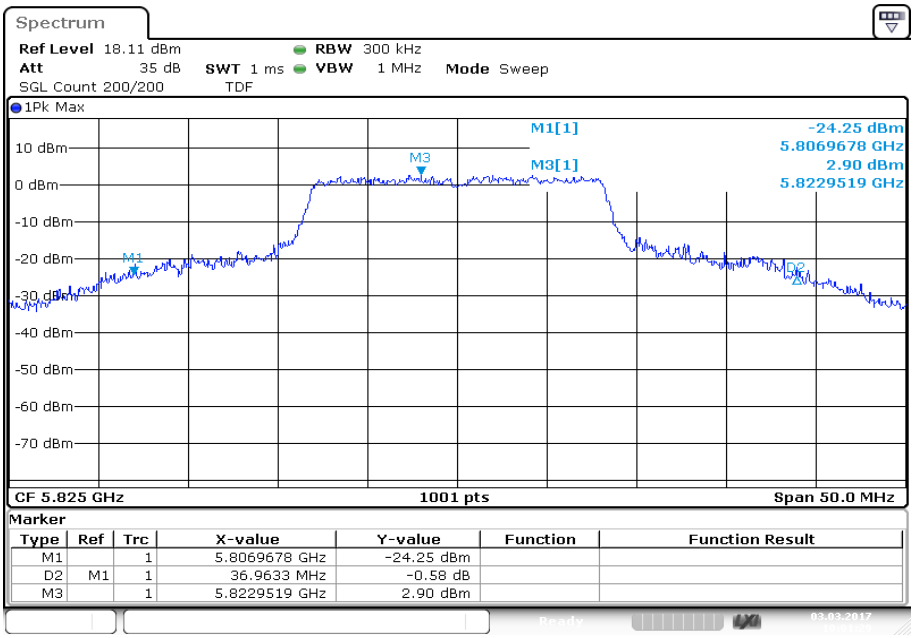
Date: 3.MAR.2017 09:56:31

Plot 6: 5785 MHz



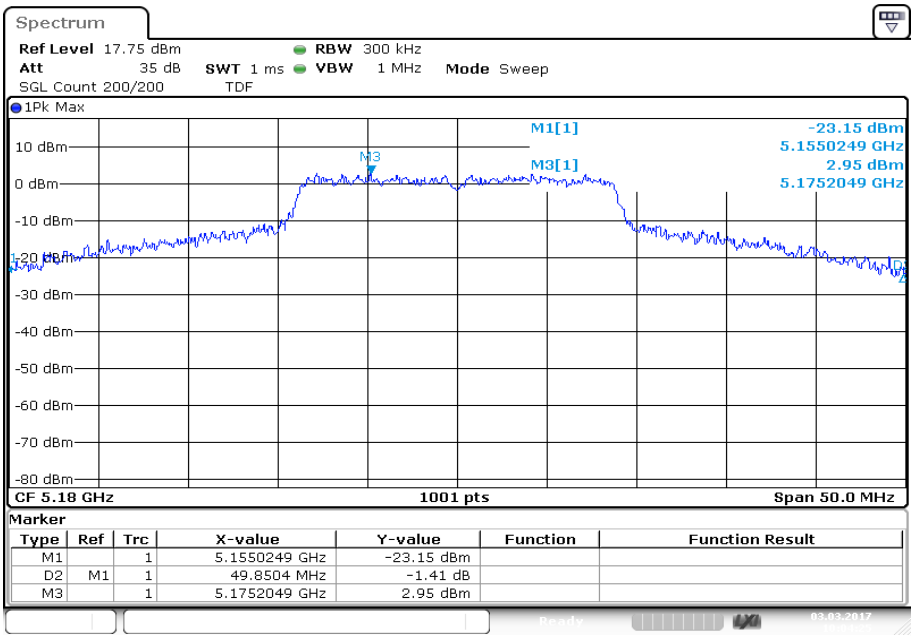
Date: 3.MAR.2017 09:58:57

Plot 7: 5825 MHz



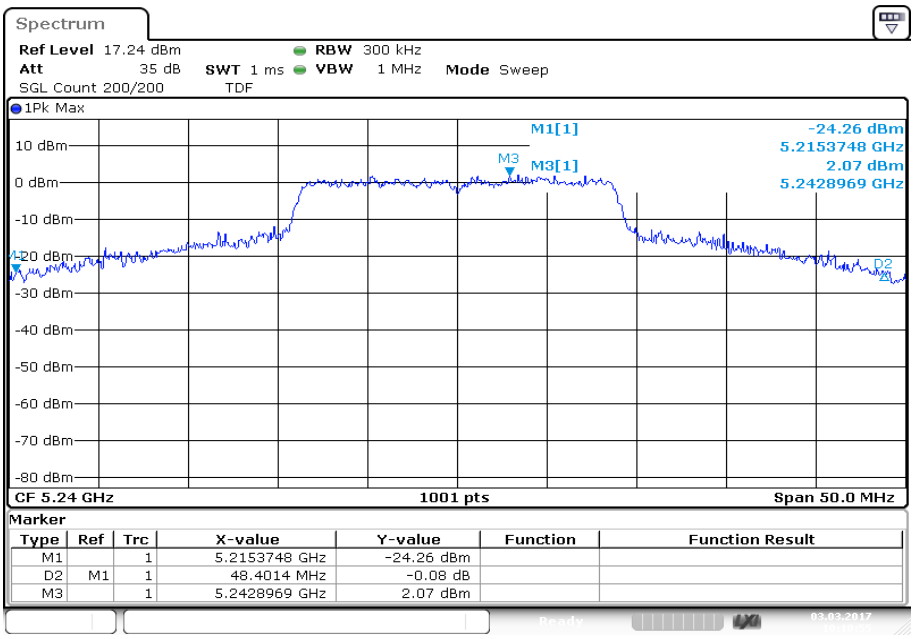
Plots: OFDM / n/ac HT20 – mode

Plot 1: 5180 MHz



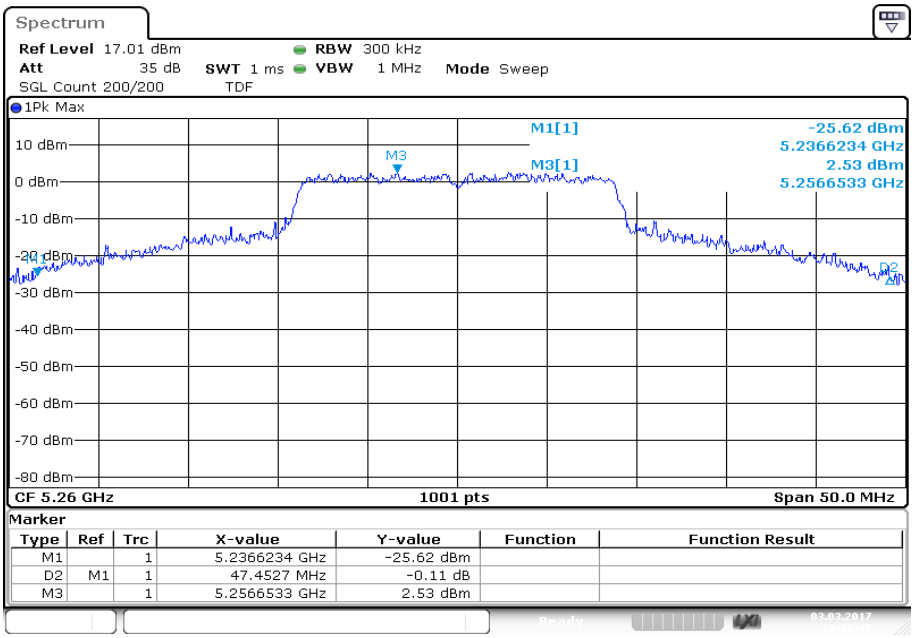
Date: 3.MAR.2017 10:04:26

Plot 2: 5240 MHz



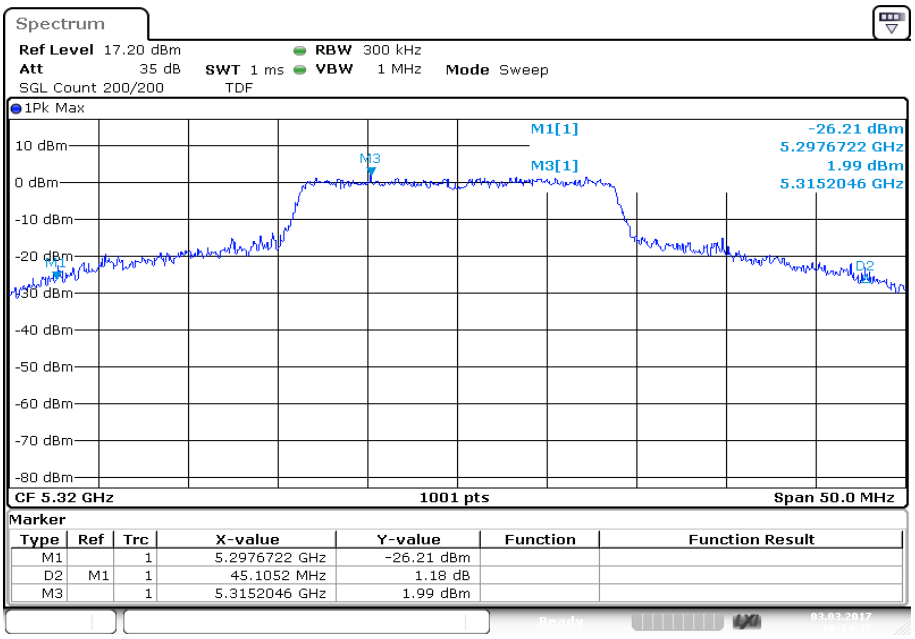
Date: 3.MAR.2017 10:10:56

Plot 3: 5260 MHz



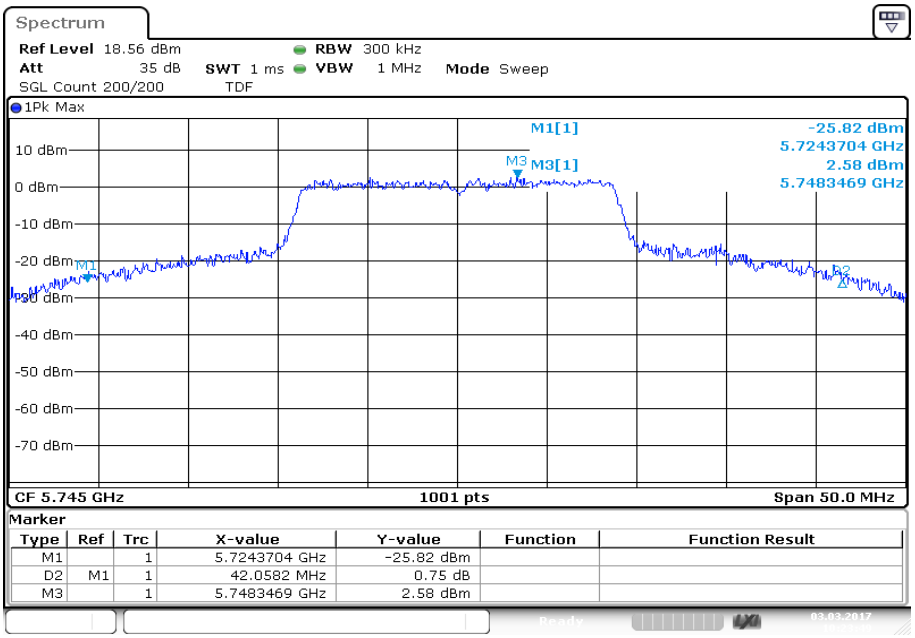
Date: 3.MAR.2017 10:12:47

Plot 4: 5320 MHz



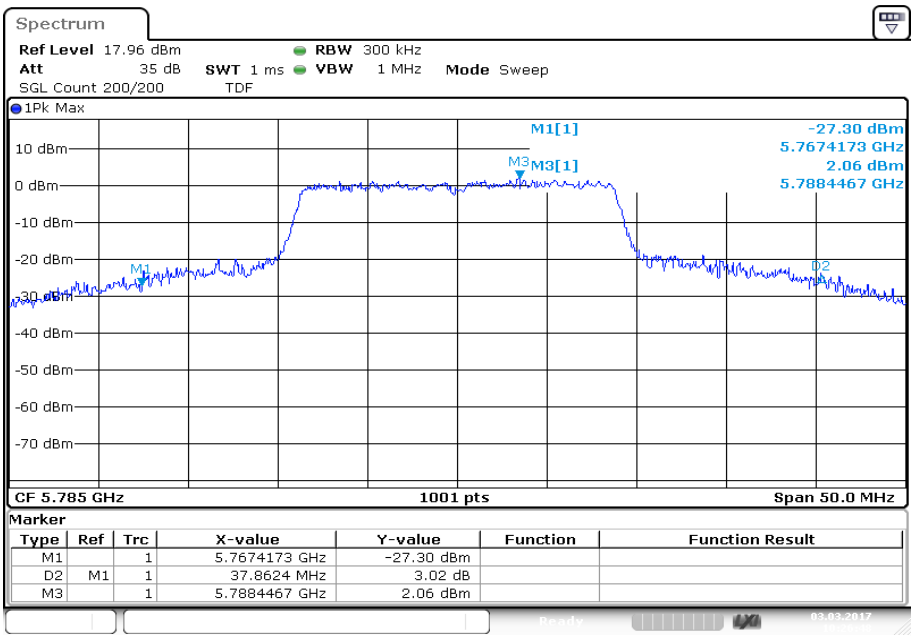
Date: 3.MAR.2017 10:14:38

Plot 5: 5745 MHz



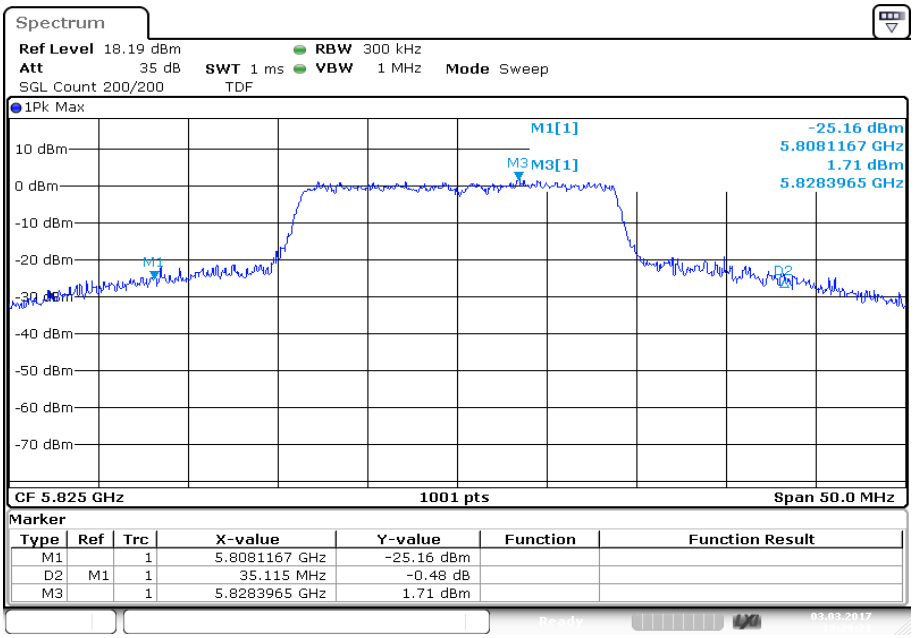
Date: 3.MAR.2017 10:23:49

Plot 6: 5785 MHz



Date: 3.MAR.2017 10:26:48

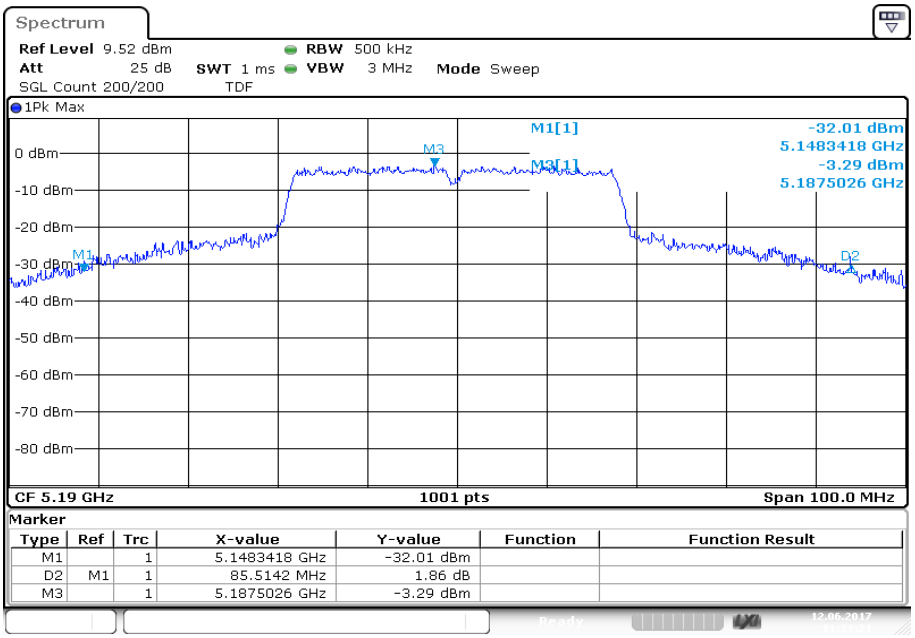
Plot 7: 5825 MHz



Date: 3.MAR.2017 10:29:22

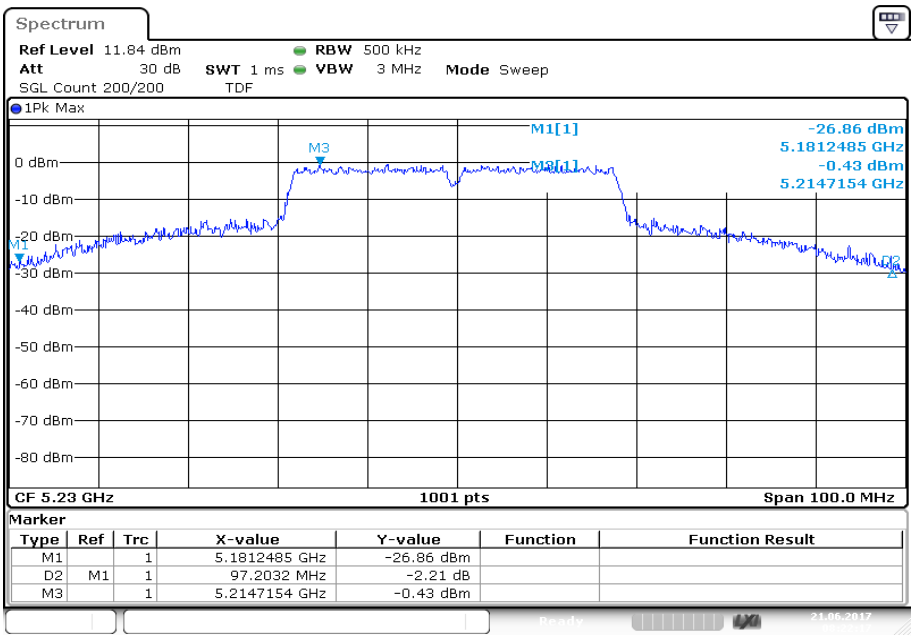
Plots: OFDM / n/ac HT40 – mode

Plot 1: 5190 MHz



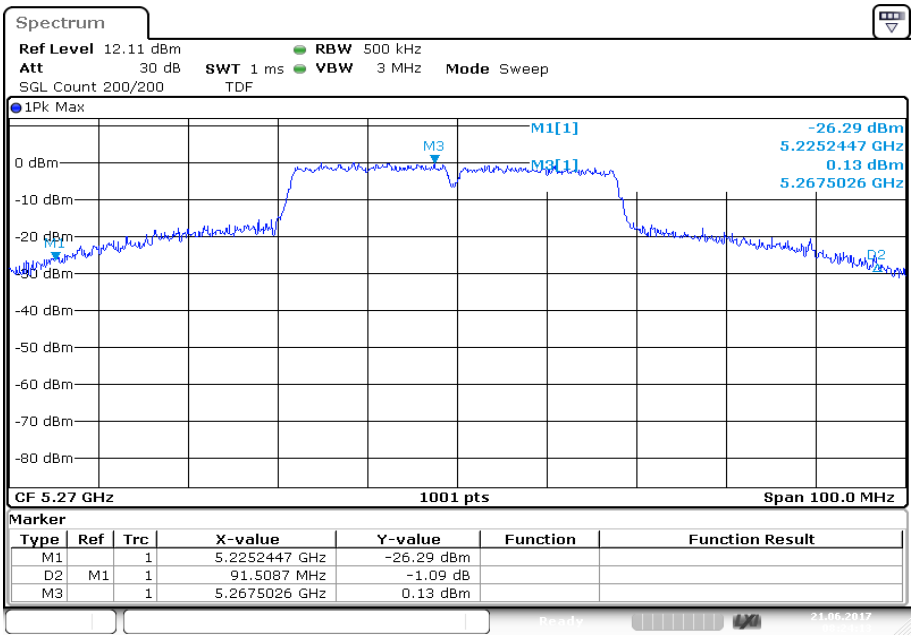
Date: 12.JUN.2017 11:23:22

Plot 2: 5230 MHz



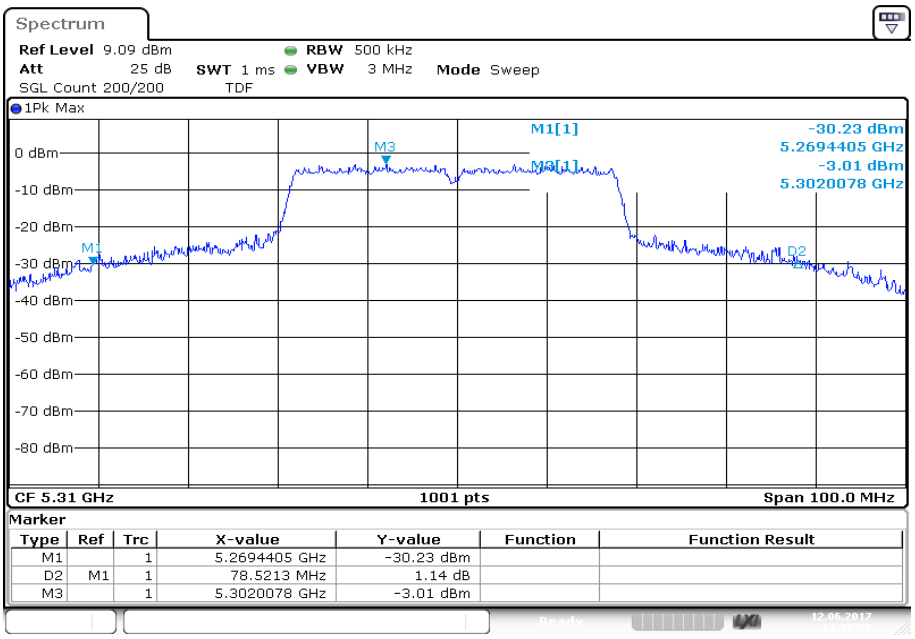
Date: 21.JUN.2017 08:22:18

Plot 3: 5270 MHz



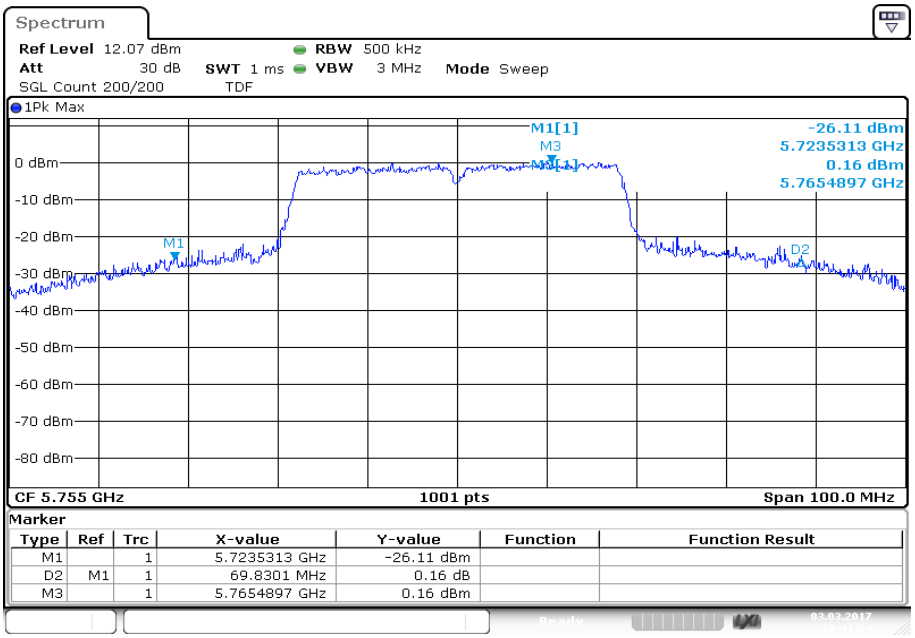
Date: 21.JUN.2017 08:24:13

Plot 4: 5310 MHz



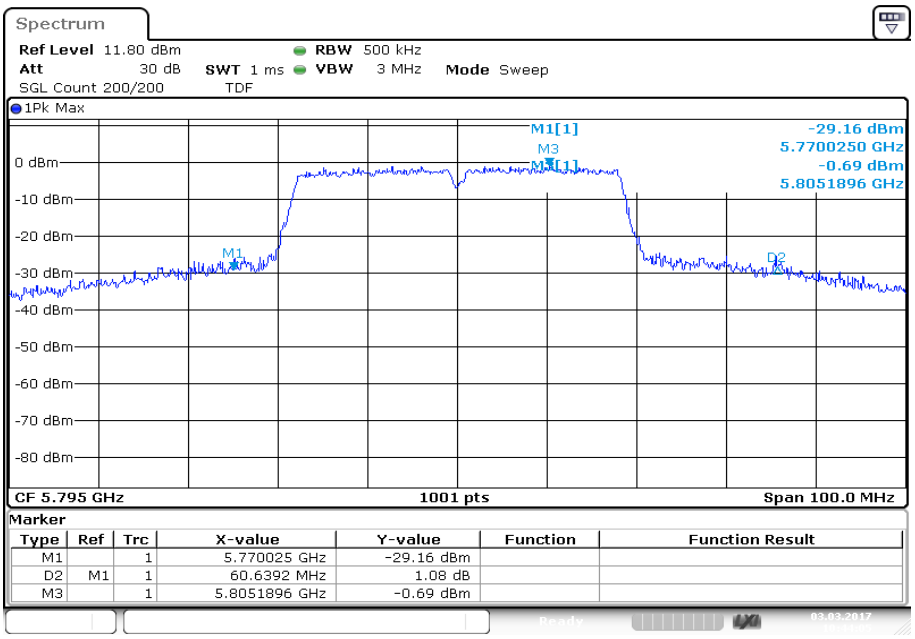
Date: 12.JUN.2017 11:35:56

Plot 5: 5755 MHz



Date: 3.MAR.2017 10:41:25

Plot 6: 5795 MHz



Date: 3.MAR.2017 10:44:05

11.8 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 / 500 kHz
Video bandwidth:	1 MHz / 3 MHz
Span:	50 MHz / 100 MHz
Measurement procedure:	Measurement of the 99% bandwidth using the integration function of the analyzer
Trace – mode:	Max hold (allow trace to stabilize)
Test setup:	See sub clause 6.5 – B
Measurement uncertainty:	See sub clause 8

Usage:

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

Result:

OFDM / a – mode	99% bandwidth [kHz]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
	27972	29820	28671	27173
Channel	5745 MHz	5785 MHz	5825 MHz	-/-
	22677	19780	18781	-/-

Result:

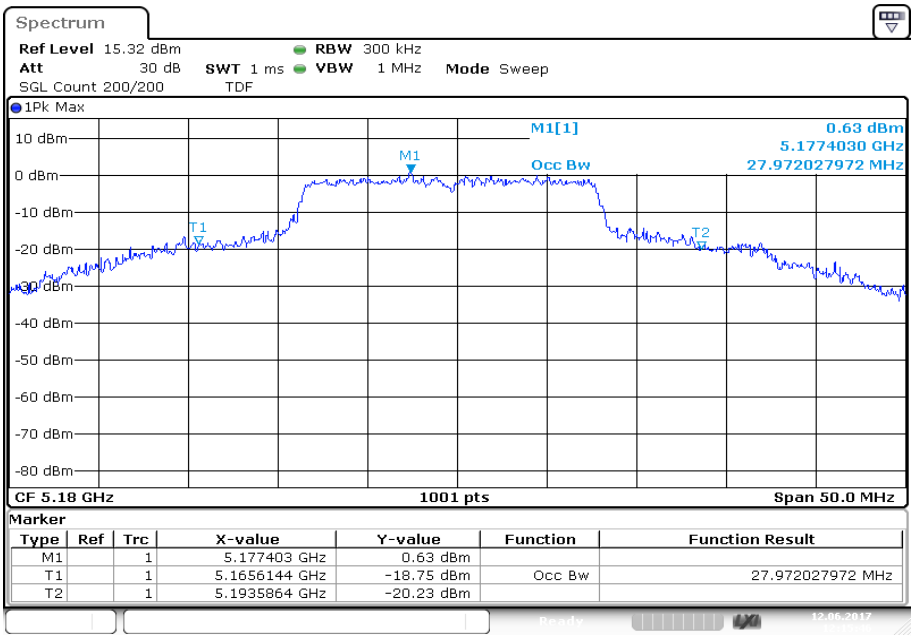
OFDM / n/ac HT20 – mode	99% bandwidth [kHz]			
Channel	5180 MHz	5240 MHz	5260 MHz	5320 MHz
	32617	29620	28621	25824
Channel	5745 MHz	5785 MHz	5825 MHz	-/-
	22378	18432	18382	-/-

Result:

OFDM / n/ac HT40 – mode	99% bandwidth [kHz]			
Channel	5190 MHz	5230 MHz	5270 MHz	5310 MHz
	42757	61239	50949	38661
Channel	5755 MHz	5795 MHz		
	37263	36863		

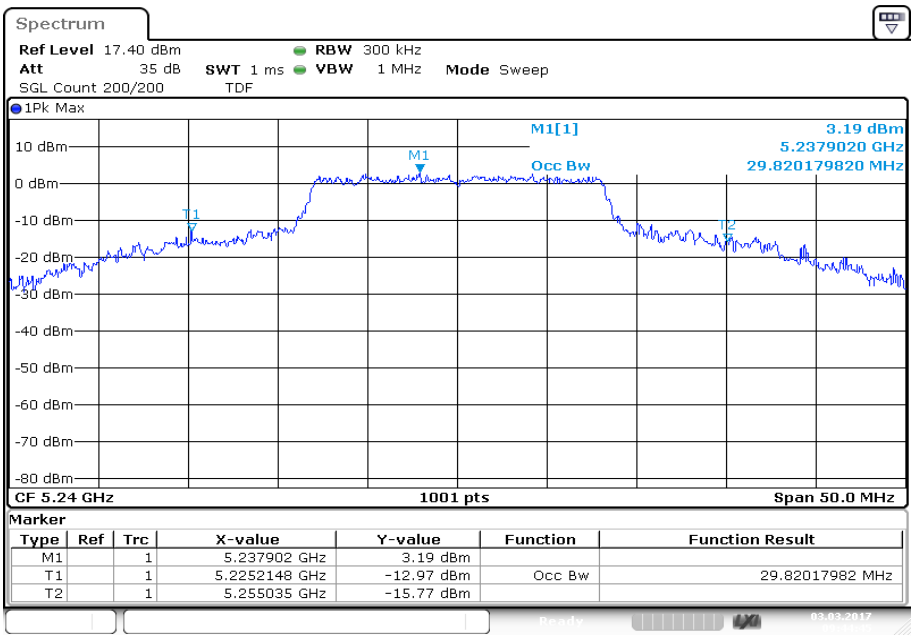
Plots: OFDM / a – mode

Plot 1: 5180 MHz



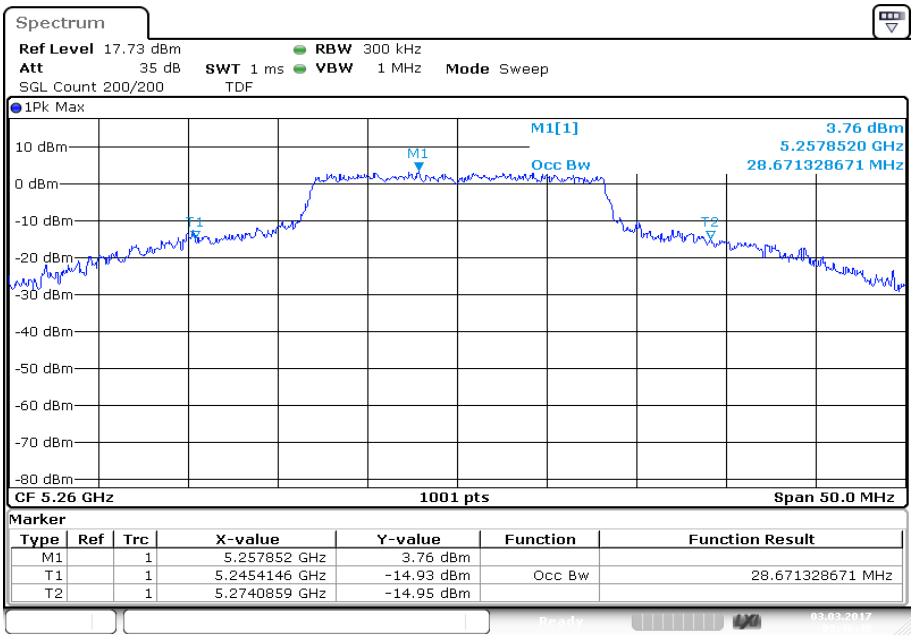
Date: 12.JUN.2017 12:15:46

Plot 2: 5240 MHz



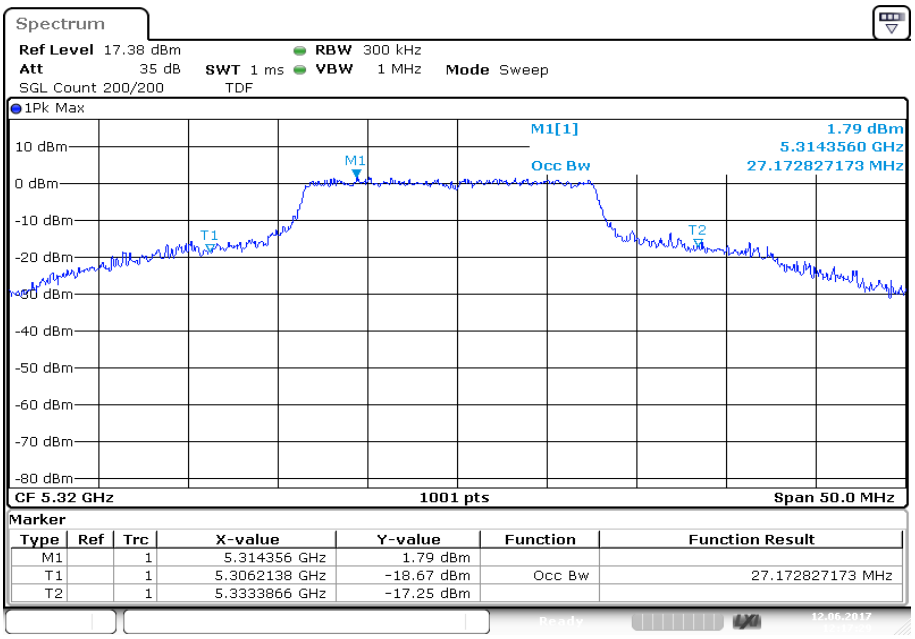
Date: 3.MAR.2017 09:44:45

Plot 3: 5260 MHz



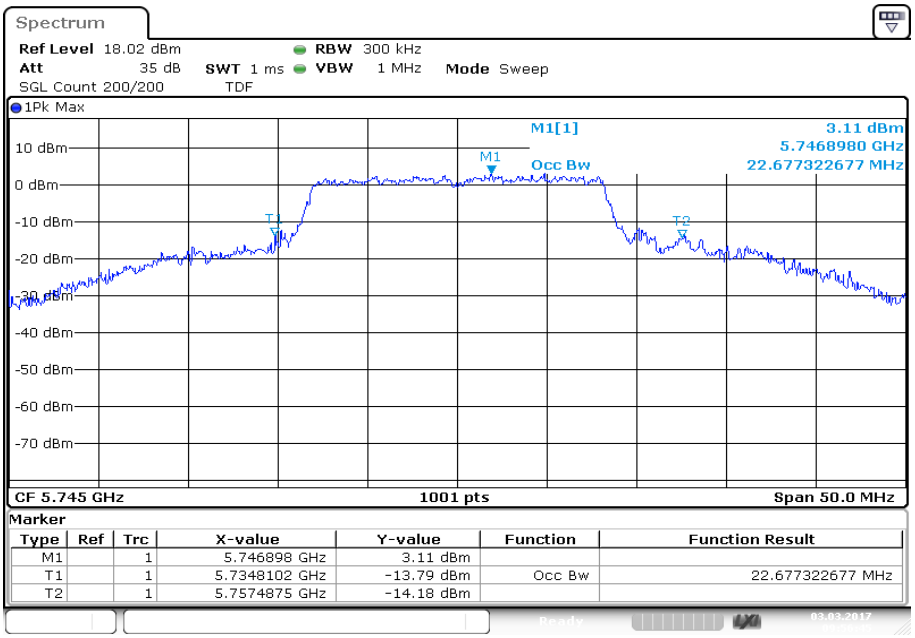
Date: 3.MAR.2017 09:46:49

Plot 4: 5320 MHz



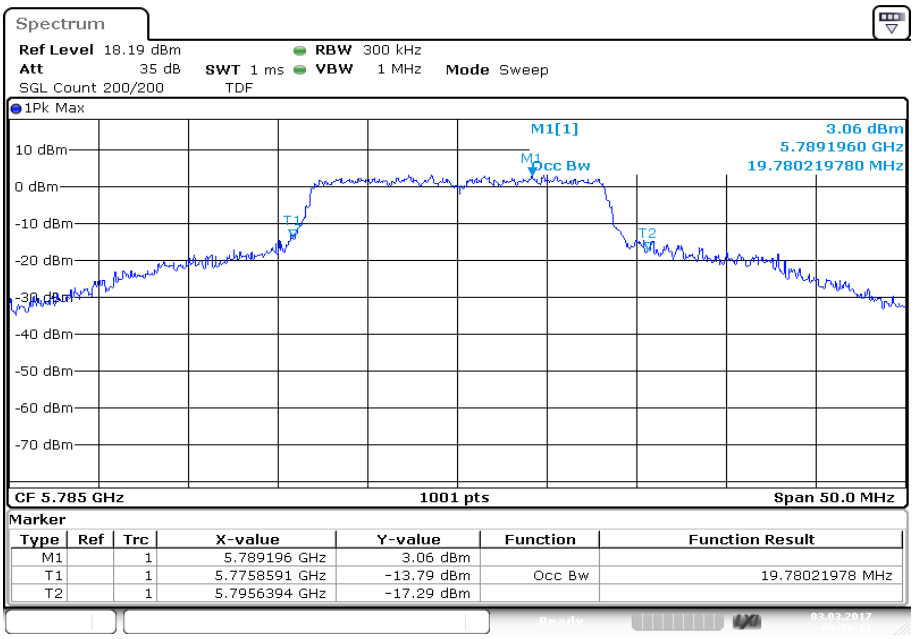
Date: 12.JUN.2017 12:17:29

Plot 5: 5745 MHz



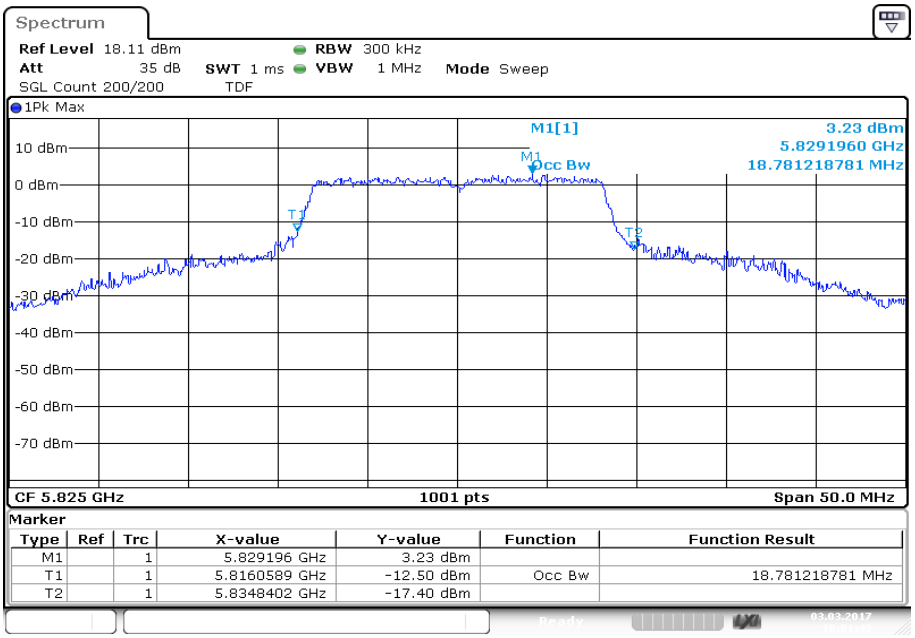
Date: 3.MAR.2017 09:56:45

Plot 6: 5785 MHz



Date: 3.MAR.2017 09:59:12

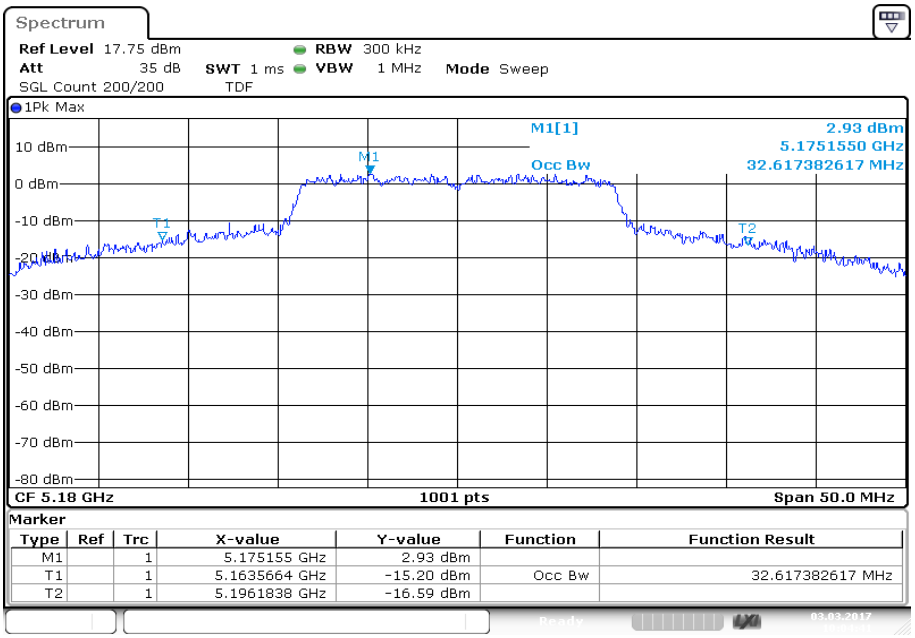
Plot 7: 5825 MHz



Date: 3.MAR.2017 10:01:43

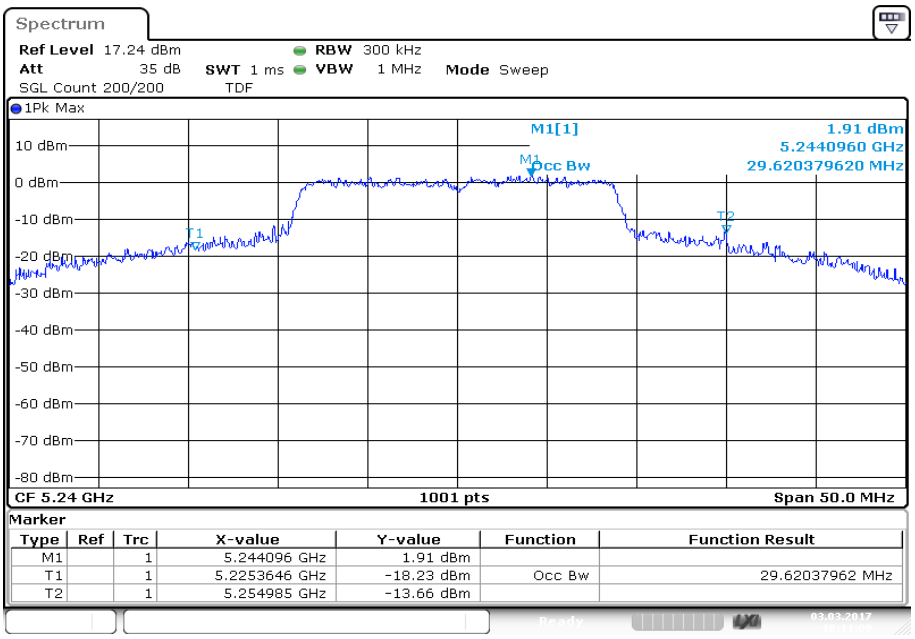
Plots: OFDM / n/ac HT20 – mode

Plot 1: 5180 MHz



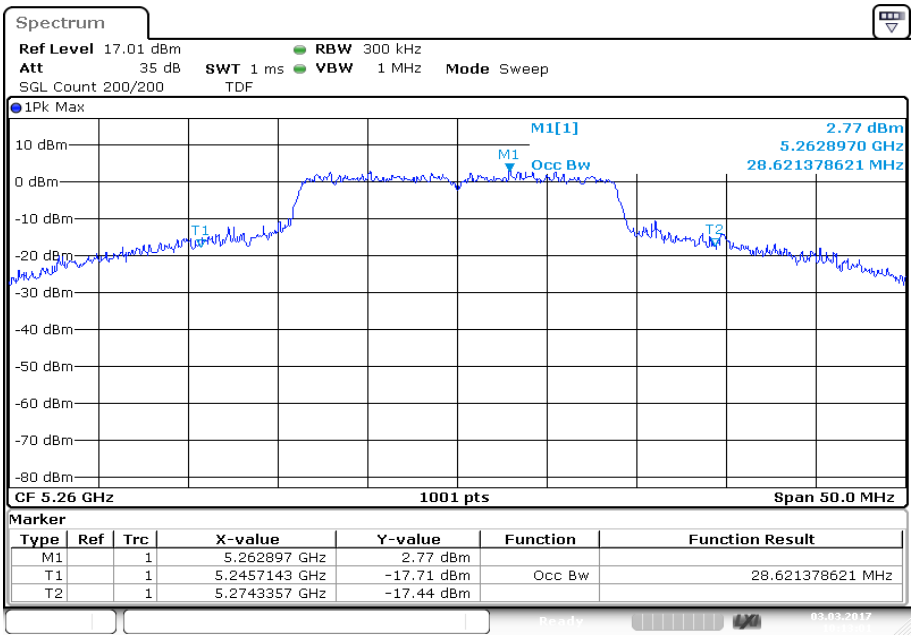
Date: 3.MAR.2017 10:04:41

Plot 2: 5240 MHz



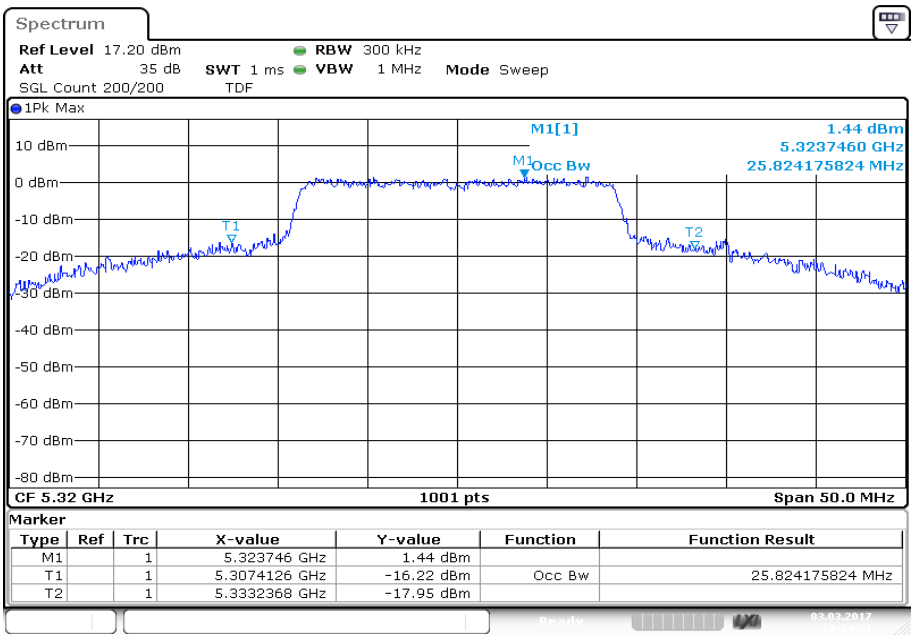
Date: 3.MAR.2017 10:11:10

Plot 3: 5260 MHz



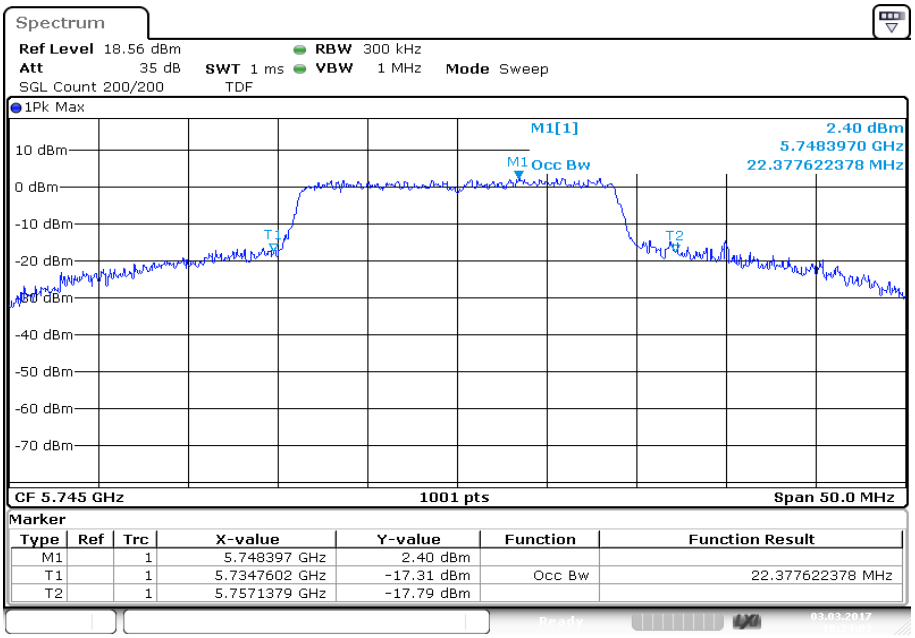
Date: 3.MAR.2017 10:13:01

Plot 4: 5320 MHz



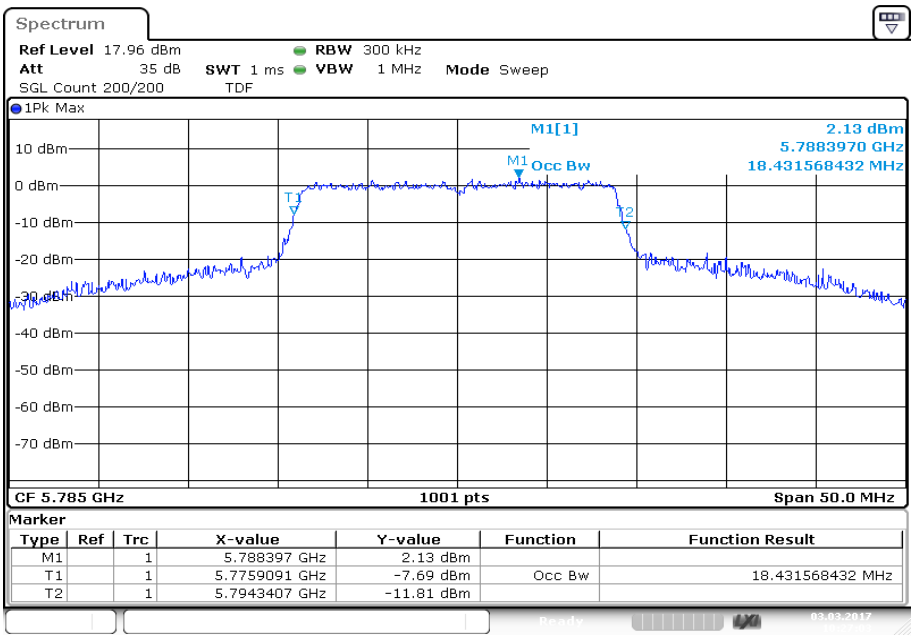
Date: 3.MAR.2017 10:14:51

Plot 5: 5745 MHz



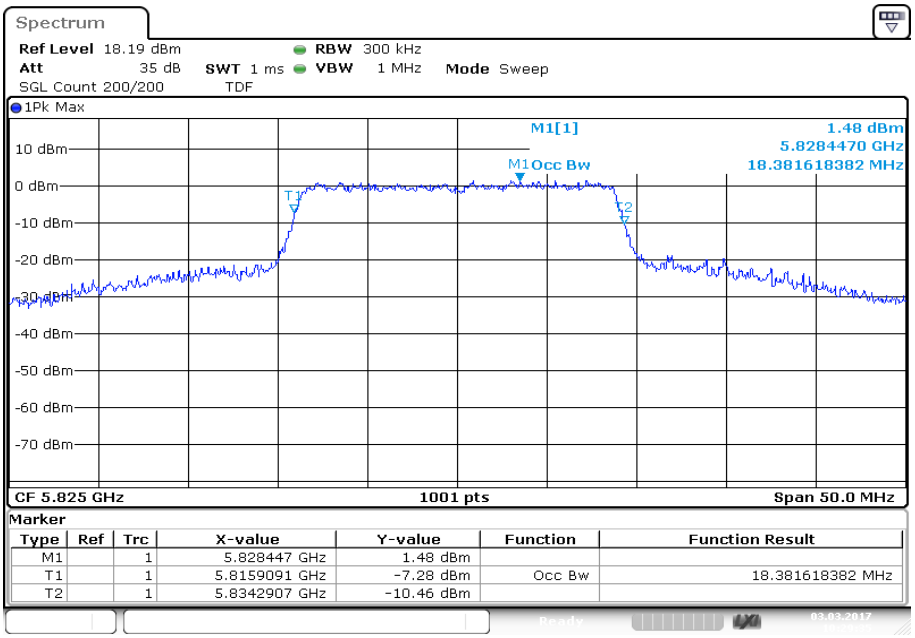
Date: 3.MAR.2017 10:24:04

Plot 6: 5785 MHz



Date: 3.MAR.2017 10:27:03

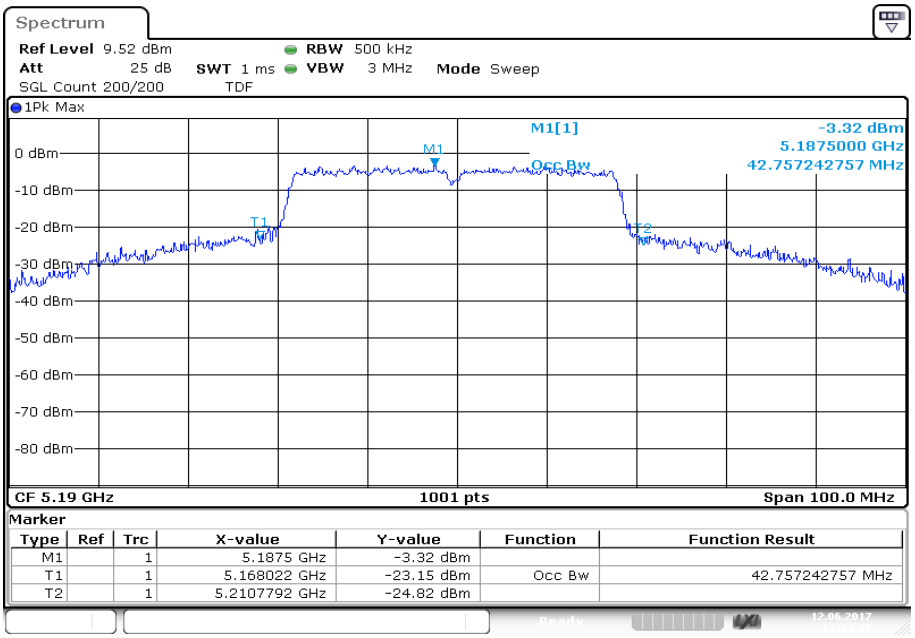
Plot 7: 5825 MHz



Date: 3.MAR.2017 10:29:36

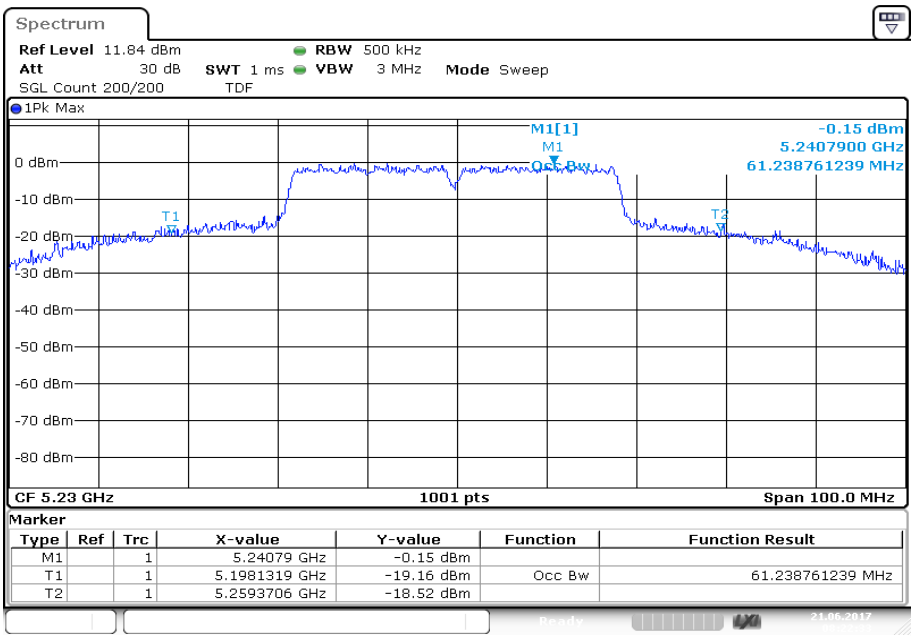
Plots: OFDM / n/ac HT40 – mode

Plot 1: 5190 MHz



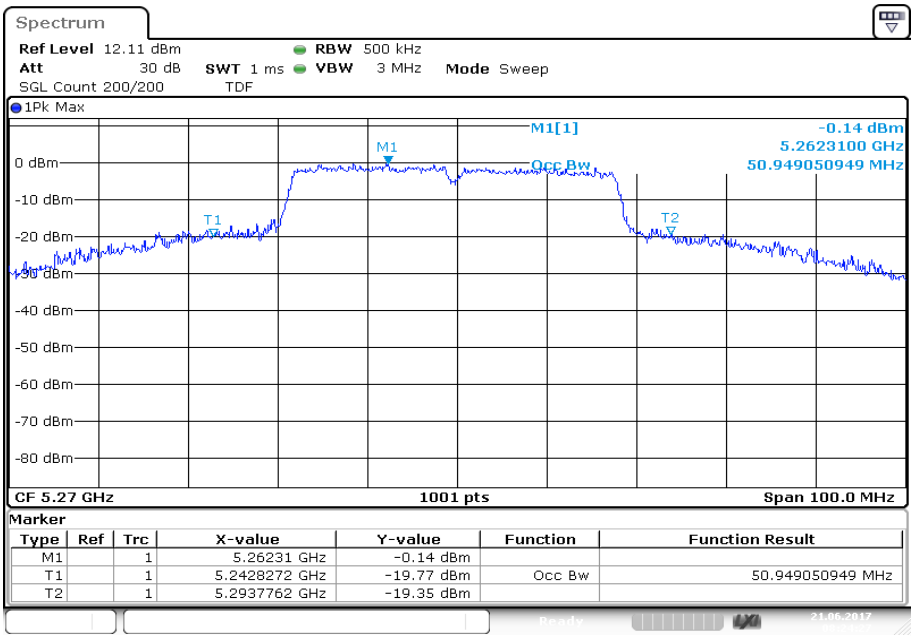
Date: 12.JUN.2017 11:23:36

Plot 2: 5230 MHz



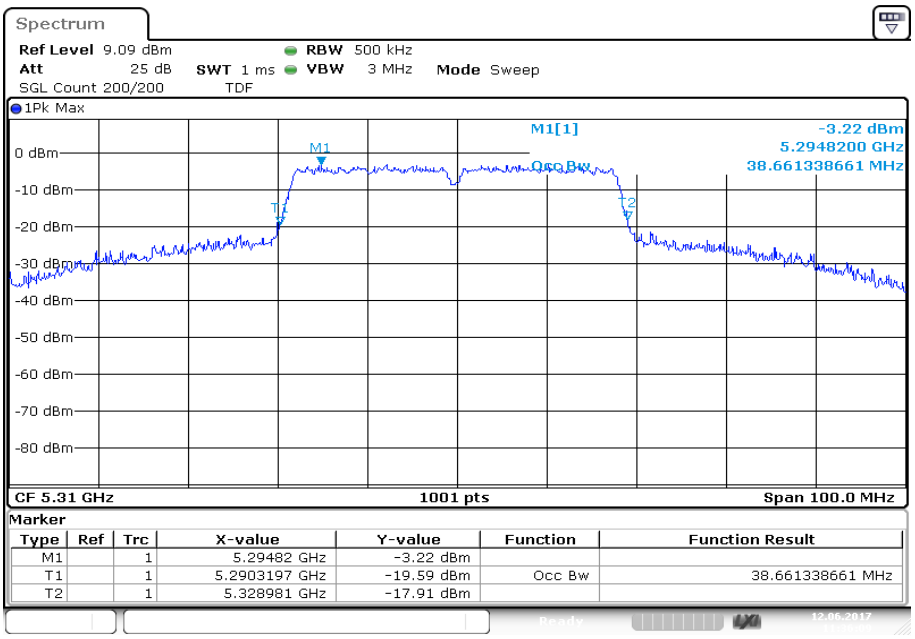
Date: 21.JUN.2017 08:22:33

Plot 3: 5270 MHz



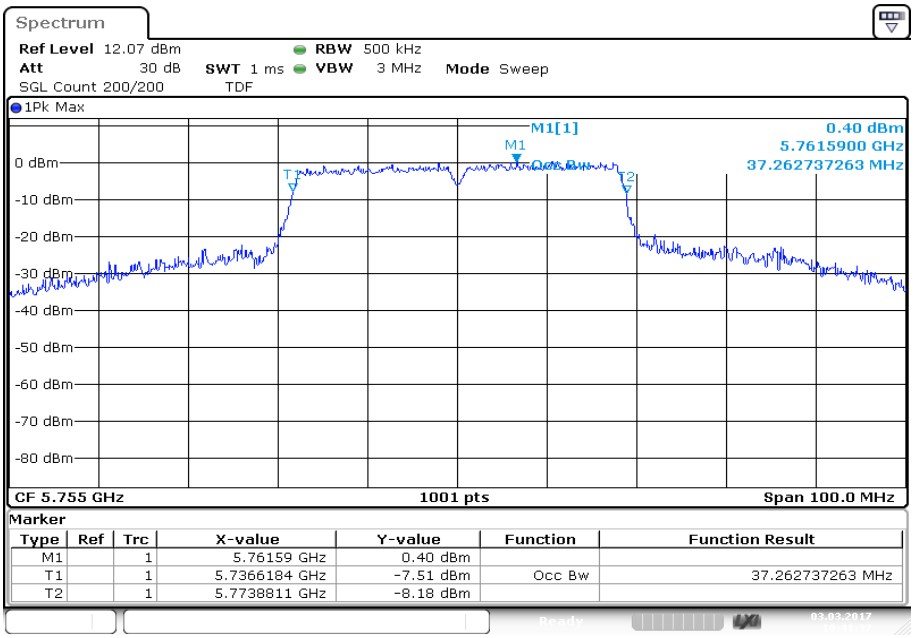
Date: 21.JUN.2017 08:24:28

Plot 4: 5310 MHz



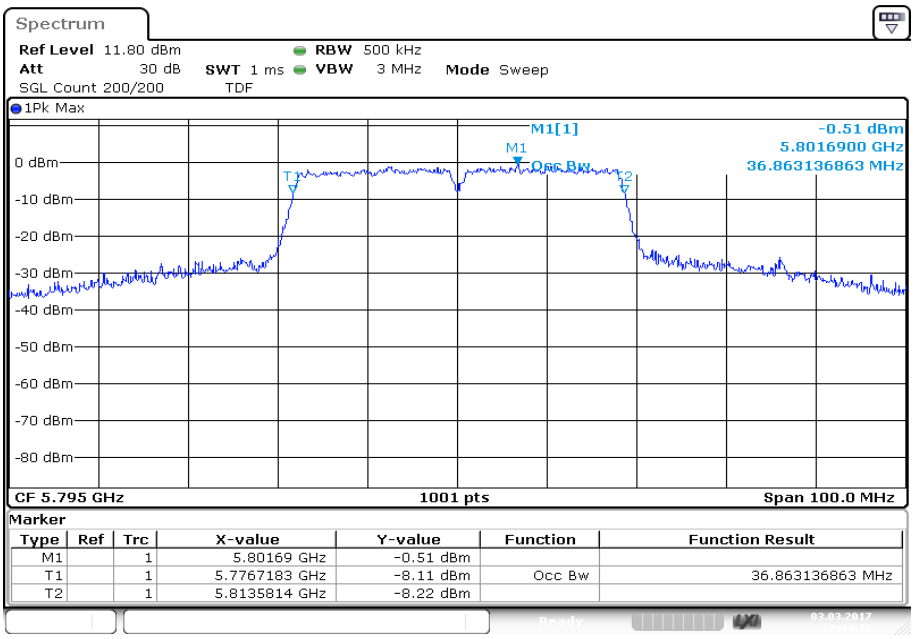
Date: 12.JUN.2017 11:36:09

Plot 5: 5755 MHz



Date: 3.MAR.2017 10:41:37

Plot 6: 5795 MHz



Date: 3.MAR.2017 10:44:18

11.9 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:	≥ 3 x RBW
Span:	See plots!
Trace – mode:	Max Hold
Test setup:	See sub clause 6.2 – A
Measurement uncertainty:	See sub clause 8

Limits:

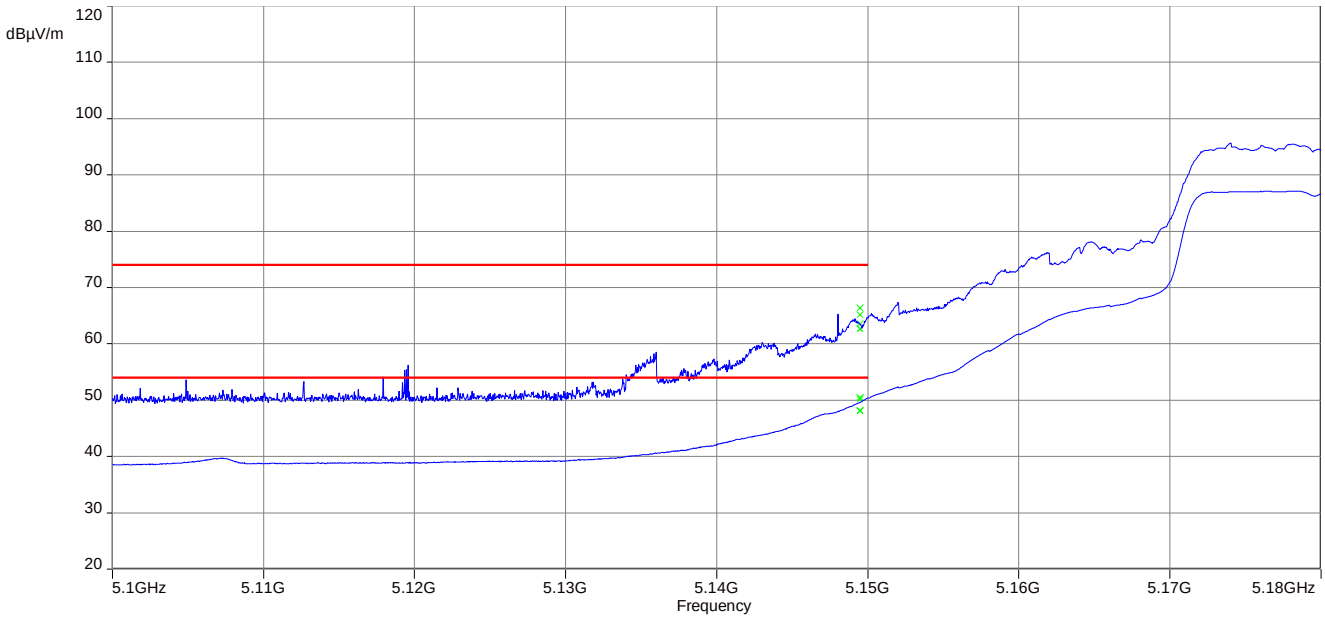
Band Edge Compliance Radiated
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within 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 (average)

Result:

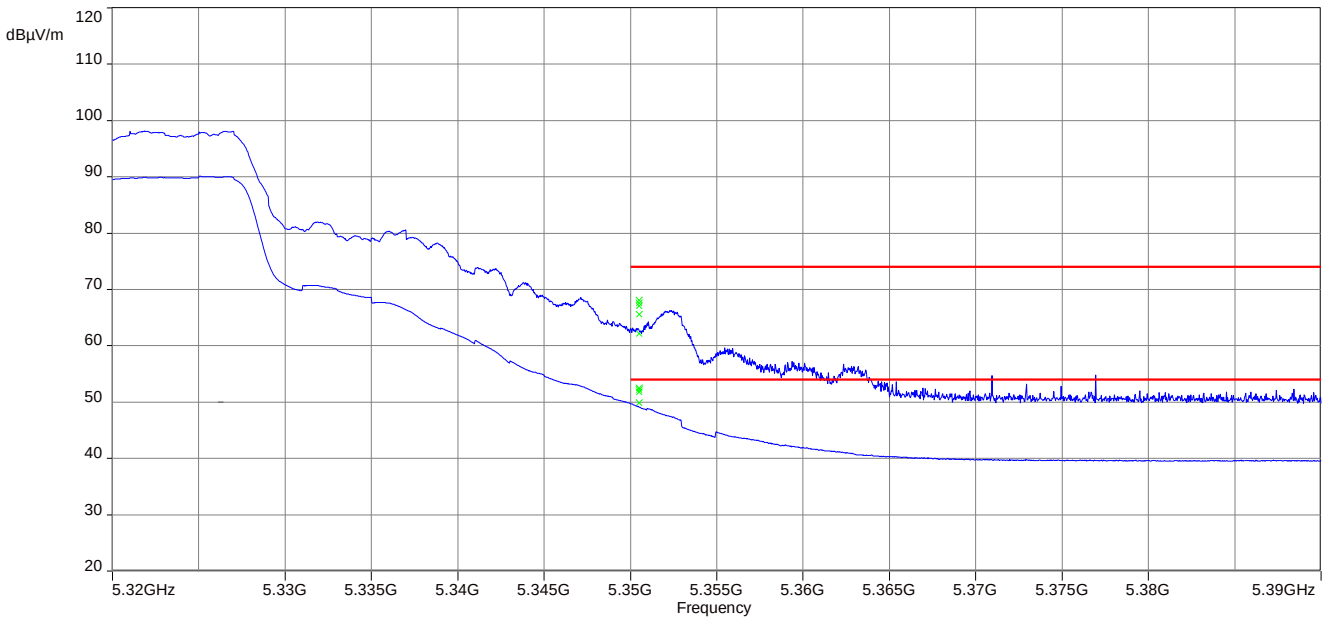
Scenario	Band Edge Compliance Radiated [dBµV/m]
band edge	< 74 dBµV/m (peak) < 54 dBµV/m (average)

Plots:

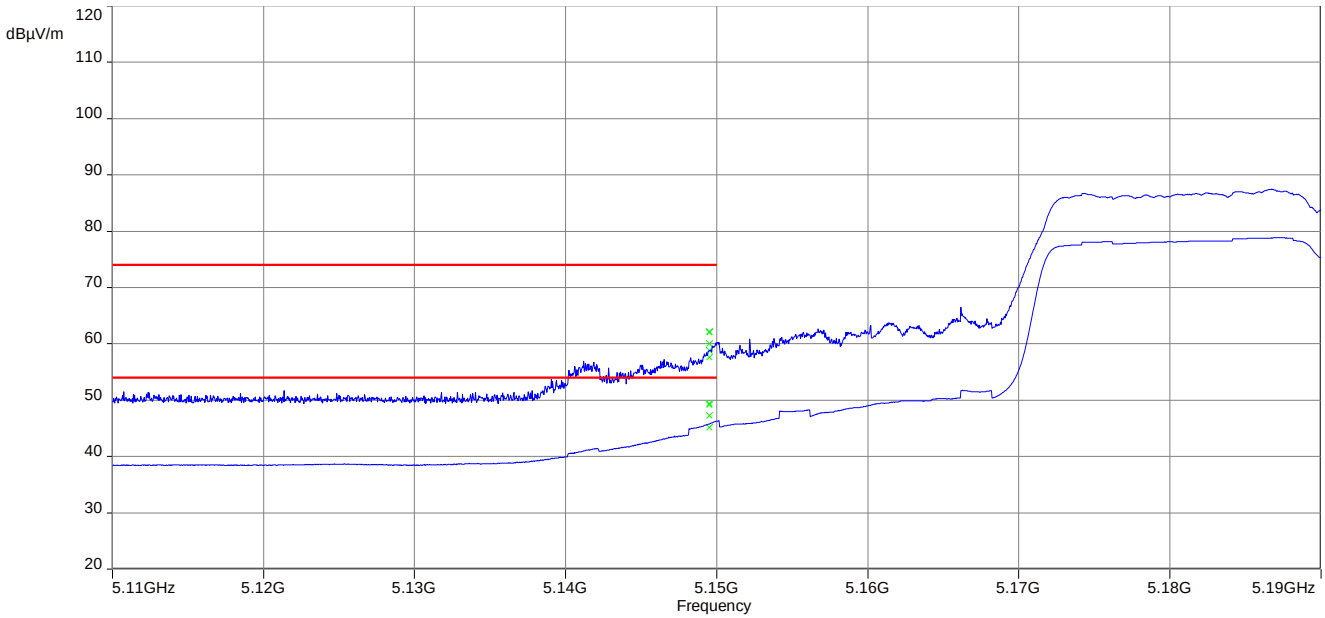
Plot 1: lower band edge, vertical & horizontal polarization – OFDM 20 MHz, 5180 MHz



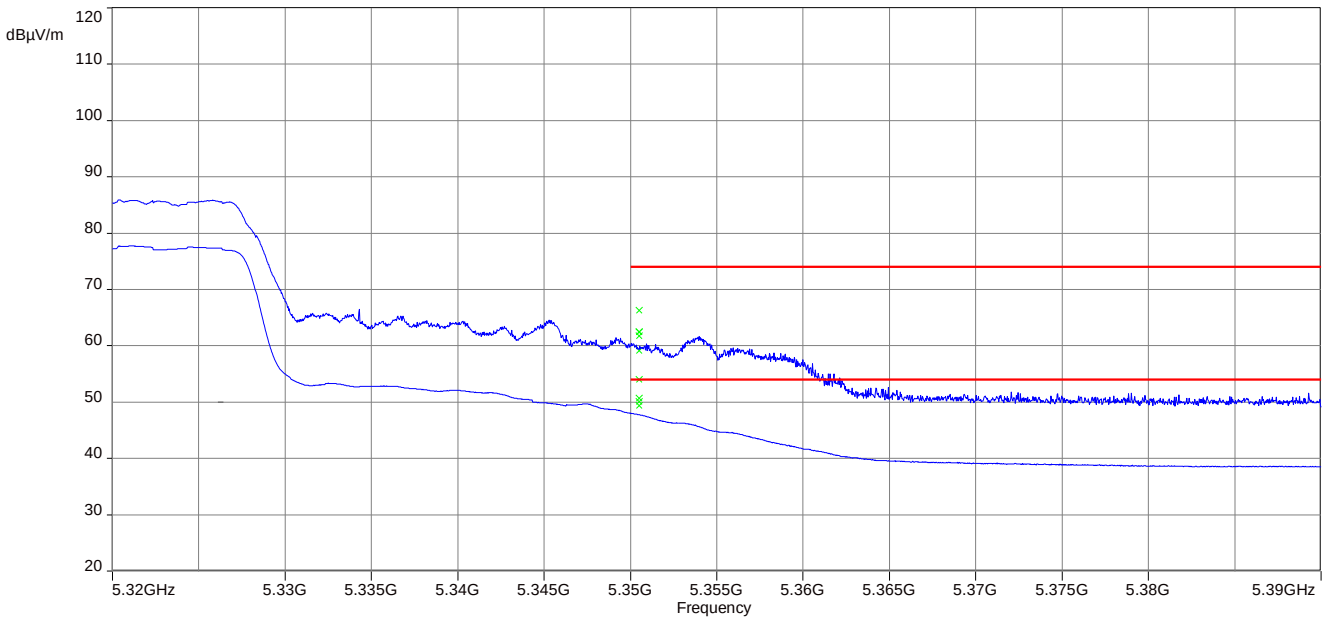
Plot 2: upper band edge, vertical & horizontal polarization – OFDM 20 MHz, 5320 MHz



Plot 3: lower band edge, vertical & horizontal polarization – OFDM 40 MHz, 5190 MHz



Plot 4: upper band edge, vertical & horizontal polarization – OFDM 40 MHz, 5310 MHz



11.10 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 sub clause 6.1 – A See sub clause 6.2 – A See sub clause 6.3 – A
Measurement uncertainty:	See sub clause 8

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 (20 MHz bandwidth)

TX Spurious Emissions Radiated [dBµV/m] / dBm								
5180 MHz			5240 MHz			5260 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
1025	Peak	45.4	1025	Peak	45.4	1025	Peak	45.4
	AVG	41.7		AVG	41.7		AVG	41.7
1075	Peak	41.3	1075	Peak	41.3	1075	Peak	41.3
	AVG	39.0		AVG	39.0		AVG	39.0
1440	Peak	41.5	1440	Peak	41.5	1440	Peak	41.5
	AVG	39.2		AVG	39.2		AVG	39.2
1475	Peak	43.3	1475	Peak	43.3	1475	Peak	43.3
	AVG	41.0		AVG	41.0		AVG	41.0
1500	Peak	45.2	1500	Peak	45.2	1500	Peak	45.2
	AVG	41.5		AVG	41.5		AVG	41.5
1625	Peak	41.5	15725	Peak	56.8	15775	Peak	56.0
	AVG	39.2		AVG	44.9		AVG	38.9
For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.		

TX Spurious Emissions Radiated [dBµV/m] / dBm								
5320 MHz								
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
1025	Peak	45.4		Peak			Peak	
	AVG	41.7		AVG			AVG	
1075	Peak	41.3		Peak			Peak	
	AVG	39.0		AVG			AVG	
1440	Peak	41.5		Peak			Peak	
	AVG	39.2		AVG			AVG	
1475	Peak	43.3		Peak			Peak	
	AVG	41.0		AVG			AVG	
1500	Peak	45.2		Peak			Peak	
	AVG	41.5		AVG			AVG	
10637	Peak	62.9		Peak			Peak	
	AVG	52.3		AVG			AVG	
For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.		

TX Spurious Emissions Radiated [dBµV/m] / dBm								
5745 MHz			5785 MHz			5825 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
1025	Peak	45.4	1025	Peak	45.4	1025	Peak	45.4
	AVG	41.7		AVG	41.7		AVG	41.7
1075	Peak	41.3	1075	Peak	41.3	1075	Peak	41.3
	AVG	39.0		AVG	39.0		AVG	39.0
1440	Peak	41.5	1440	Peak	41.5	1440	Peak	41.5
	AVG	39.2		AVG	39.2		AVG	39.2
1475	Peak	43.3	1475	Peak	43.3	1475	Peak	43.3
	AVG	41.0		AVG	41.0		AVG	41.0
1500	Peak	45.2	1500	Peak	45.2	1500	Peak	45.2
	AVG	41.5		AVG	41.5		AVG	41.5
11490	Peak	56.6	11570	Peak	57.5	1625	Peak	41.5
	AVG	44.9		AVG	46.4		AVG	39.2
For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.		

Results: OFDM (40 MHz bandwidth)

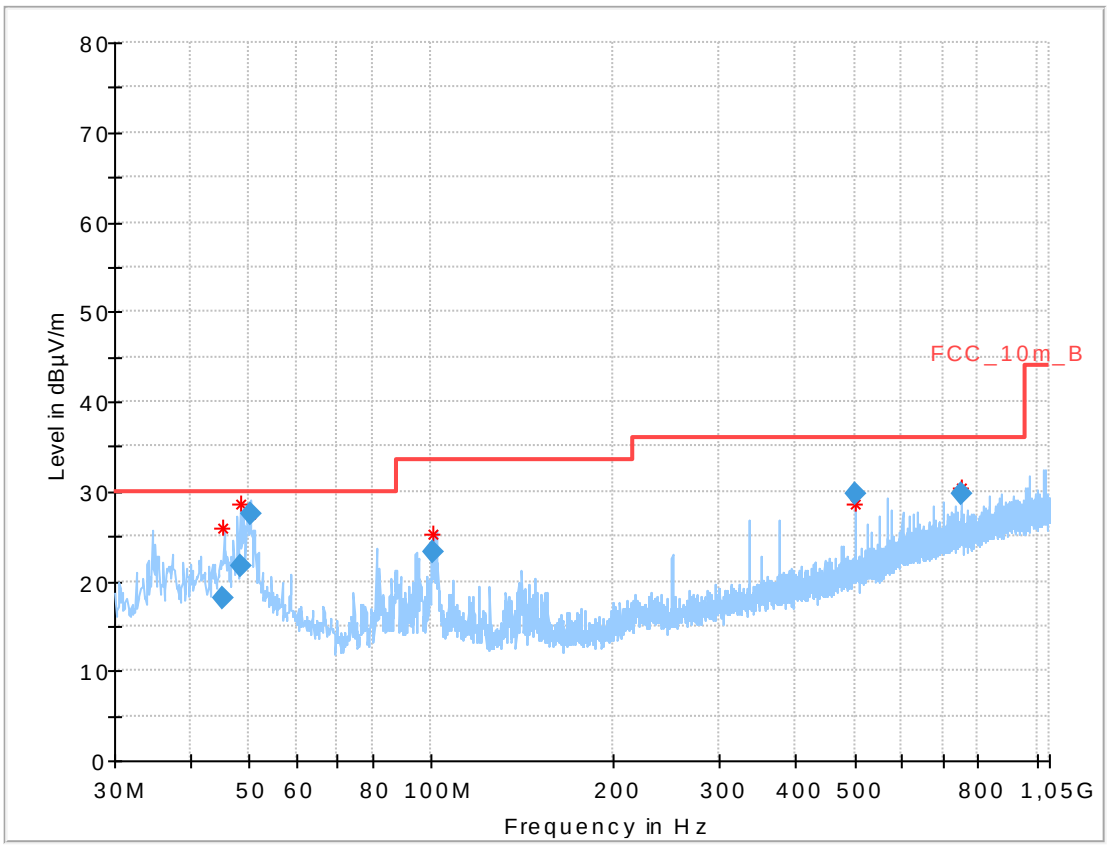
TX Spurious Emissions Radiated [dBµV/m] / dBm								
5190 MHz			5230 MHz			5270 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
1025	Peak	45.4	1025	Peak	45.4	1025	Peak	45.4
	AVG	41.7		AVG	41.7		AVG	41.7
1075	Peak	41.3	1075	Peak	41.3	1075	Peak	41.3
	AVG	39.0		AVG	39.0		AVG	39.0
1440	Peak	41.5	1440	Peak	41.5	1440	Peak	41.5
	AVG	39.2		AVG	39.2		AVG	39.2
1475	Peak	43.3	1475	Peak	43.3	1475	Peak	43.3
	AVG	41.0		AVG	41.0		AVG	41.0
1500	Peak	45.2	1500	Peak	45.2	1500	Peak	45.2
	AVG	41.5		AVG	41.5		AVG	41.5
1625	Peak	41.5	1625	Peak	41.5	1625	Peak	41.5
	AVG	39.2		AVG	39.2		AVG	39.2
For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.		

TX Spurious Emissions Radiated [dBµV/m] / dBm								
5310 MHz								
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
1025	Peak	45.4		Peak			Peak	
	AVG	41.7		AVG			AVG	
1075	Peak	41.3		Peak			Peak	
	AVG	39.0		AVG			AVG	
1440	Peak	41.5		Peak			Peak	
	AVG	39.2		AVG			AVG	
1475	Peak	43.3		Peak			Peak	
	AVG	41.0		AVG			AVG	
1500	Peak	45.2		Peak			Peak	
	AVG	41.5		AVG			AVG	
1625	Peak	41.5		Peak			Peak	
	AVG	39.2		AVG			AVG	
For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.		

TX Spurious Emissions Radiated [dBµV/m] / dBm								
5755 MHz						5795 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
1025	Peak	45.4		Peak		1025	Peak	45.4
	AVG	41.7		AVG			AVG	41.7
1075	Peak	41.3		Peak		1075	Peak	41.3
	AVG	39.0		AVG			AVG	39.0
1440	Peak	41.5		Peak		1440	Peak	41.5
	AVG	39.2		AVG			AVG	39.2
1475	Peak	43.3		Peak		1475	Peak	43.3
	AVG	41.0		AVG			AVG	41.0
1500	Peak	45.2		Peak		1500	Peak	45.2
	AVG	41.5		AVG			AVG	41.5
1625	Peak	41.5		Peak		4725	Peak	47.0
	AVG	39.2		AVG			AVG	40.2
For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.			For emissions above 18 GHz please take look at the plots.		

Plots: OFDM / 20 MHz bandwidth

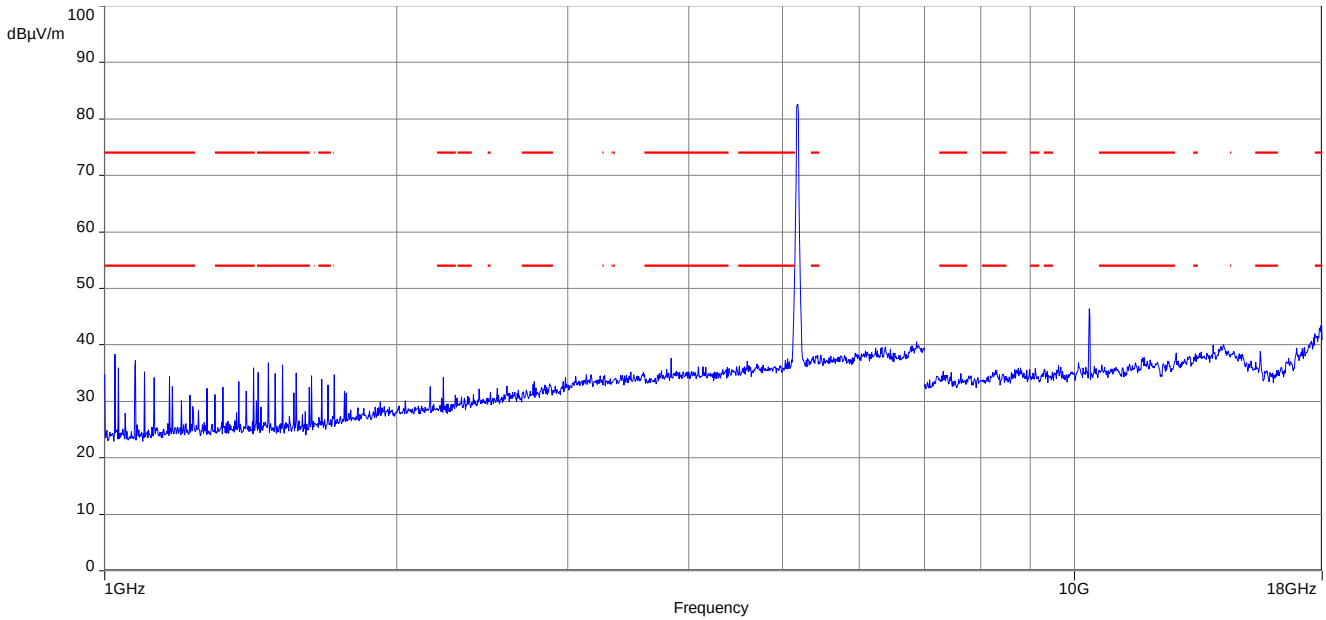
Plot 1: 30 MHz to 1 GHz, 5180 MHz, vertical & horizontal polarization



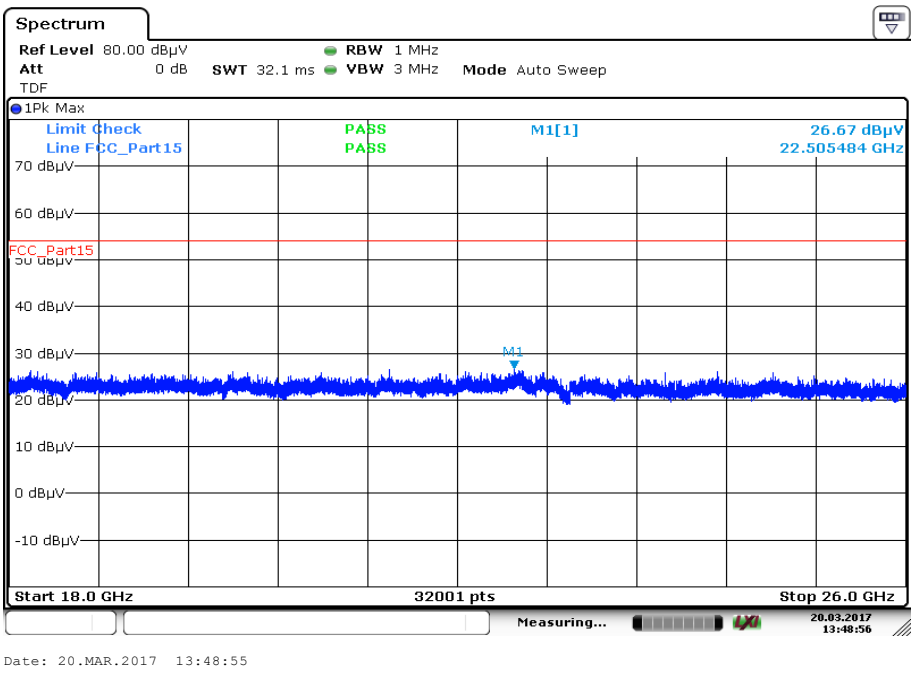
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
45.256200	18.18	30.00	11.82	1000.0	120.000	101.0	V	262.0	13.6
48.474750	21.65	30.00	8.35	1000.0	120.000	101.0	V	100.0	13.7
50.435250	27.41	30.00	2.59	1000.0	120.000	100.0	V	-10.0	13.7
100.655250	23.15	33.50	10.35	1000.0	120.000	101.0	V	10.0	12.1
500.007600	29.81	36.00	6.19	1000.0	120.000	98.0	V	-10.0	18.7
750.022050	29.73	36.00	6.27	1000.0	120.000	98.0	H	260.0	22.7

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



Plot 3: 18 GHz to 26 GHz, 5180 MHz, vertical & horizontal polarization



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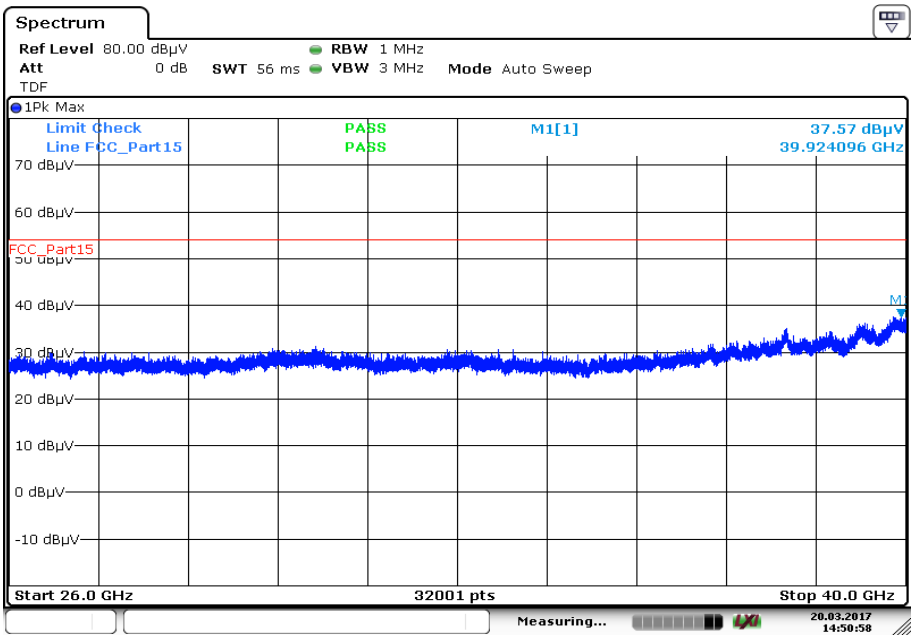
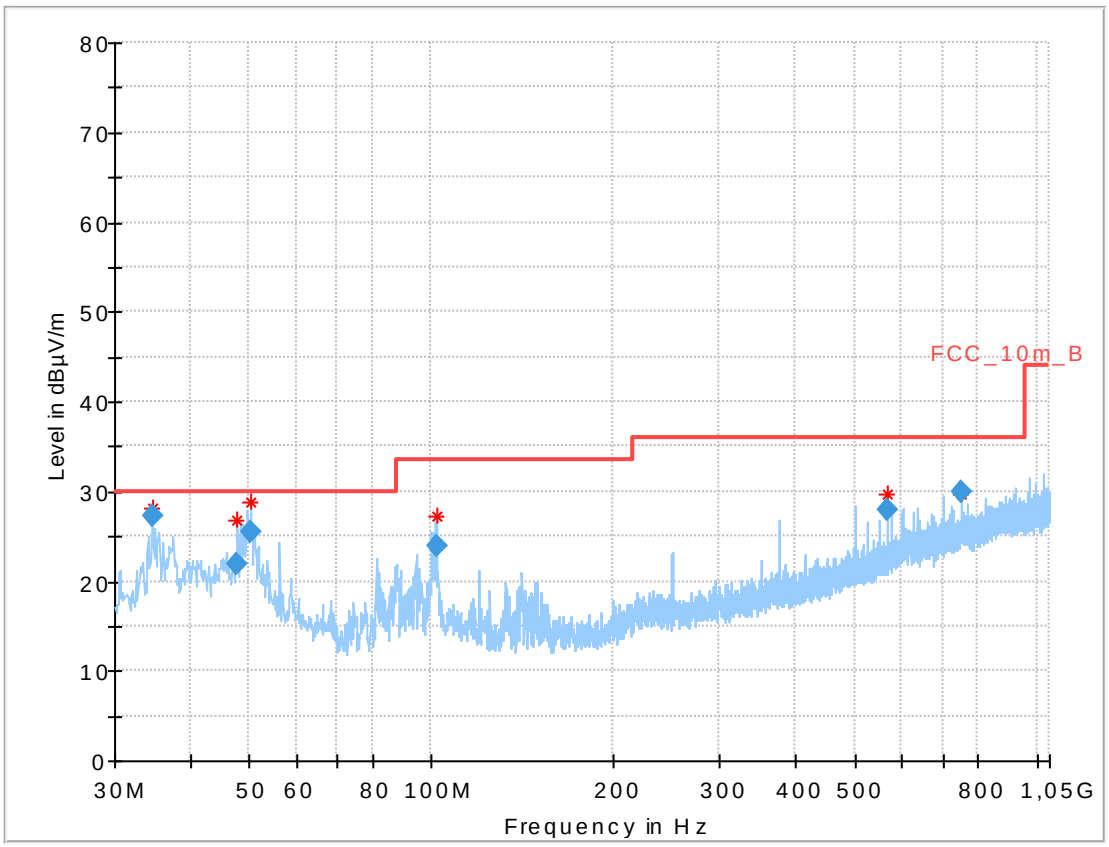
Plot 4: 26 GHz to 40 GHz, 5180 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 14:50:58

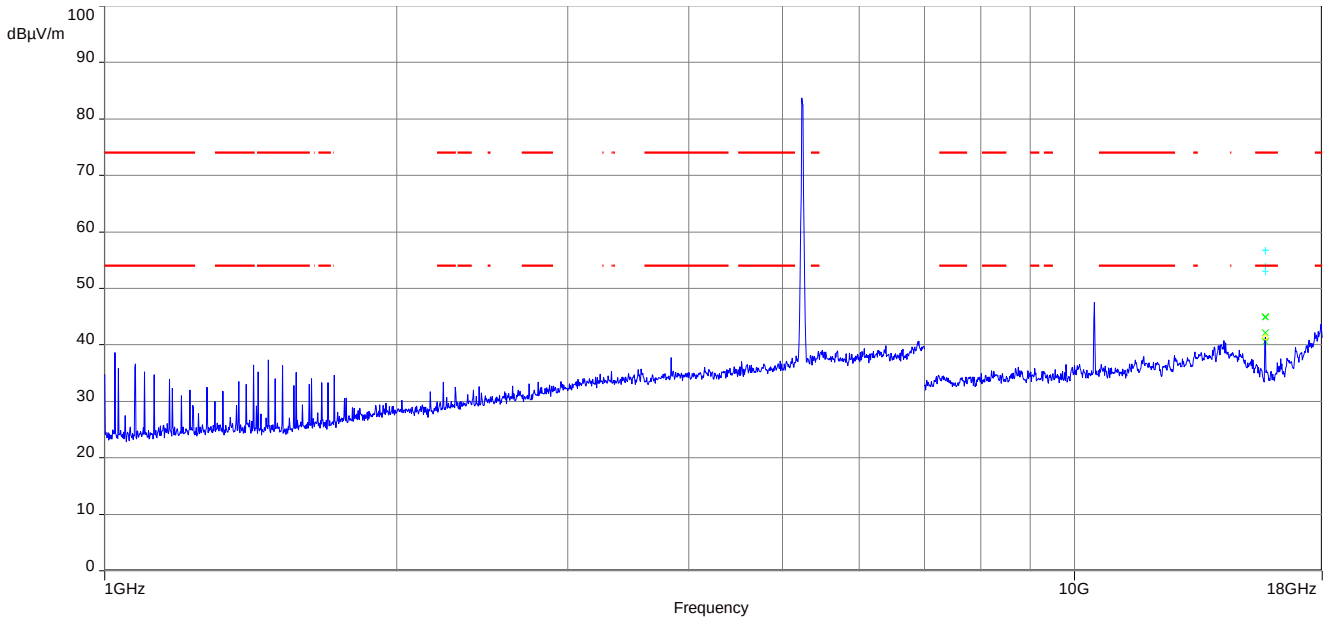
Plot 5: 30 MHz to 1 GHz, 5240 MHz, vertical & horizontal polarization



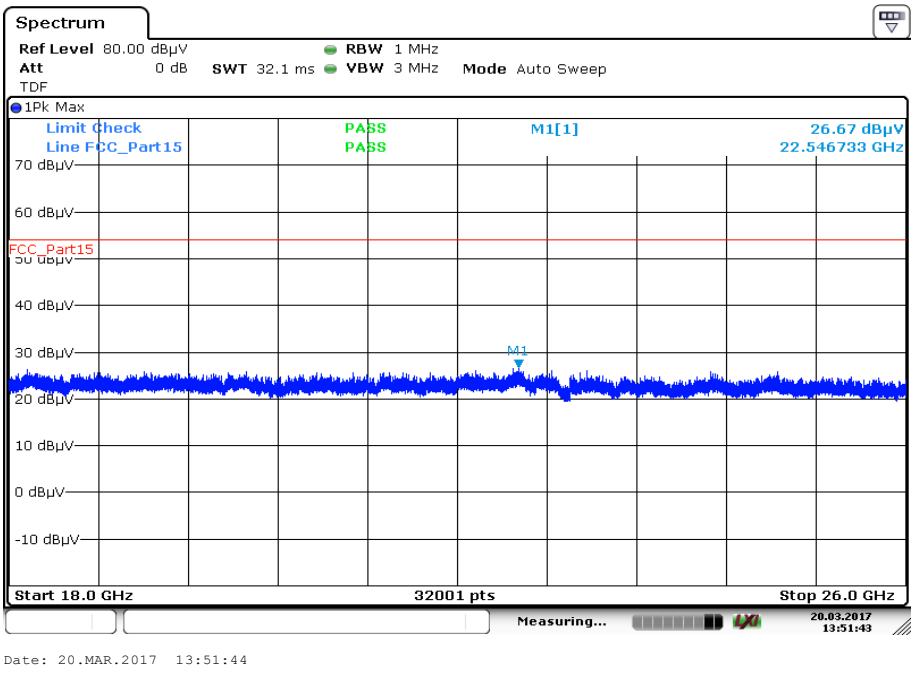
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.632150	27.20	30.00	2.80	1000.0	120.000	101.0	V	10.0	12.6
47.818200	21.87	30.00	8.13	1000.0	120.000	101.0	V	262.0	13.7
50.442900	25.56	30.00	4.44	1000.0	120.000	101.0	V	261.0	13.7
101.890650	24.01	33.50	9.49	1000.0	120.000	101.0	V	-8.0	11.9
566.678100	27.92	36.00	8.08	1000.0	120.000	101.0	H	80.0	19.8
750.014100	29.90	36.00	6.10	1000.0	120.000	98.0	H	260.0	22.7

Plot 6: 1 GHz to 18 GHz, 5240 MHz, vertical & horizontal polarization



Plot 7: 18 GHz to 26 GHz, 5240 MHz, vertical & horizontal polarization



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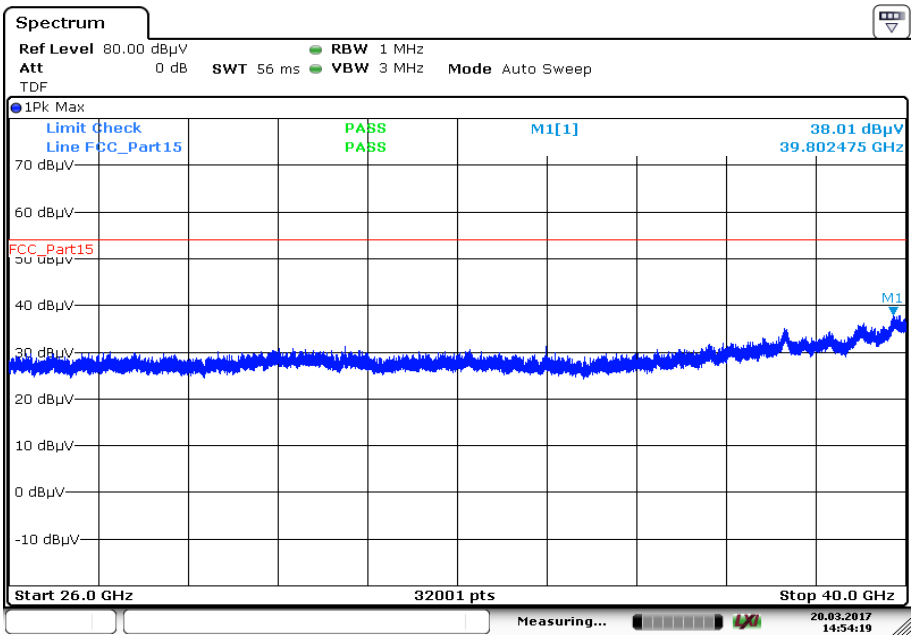
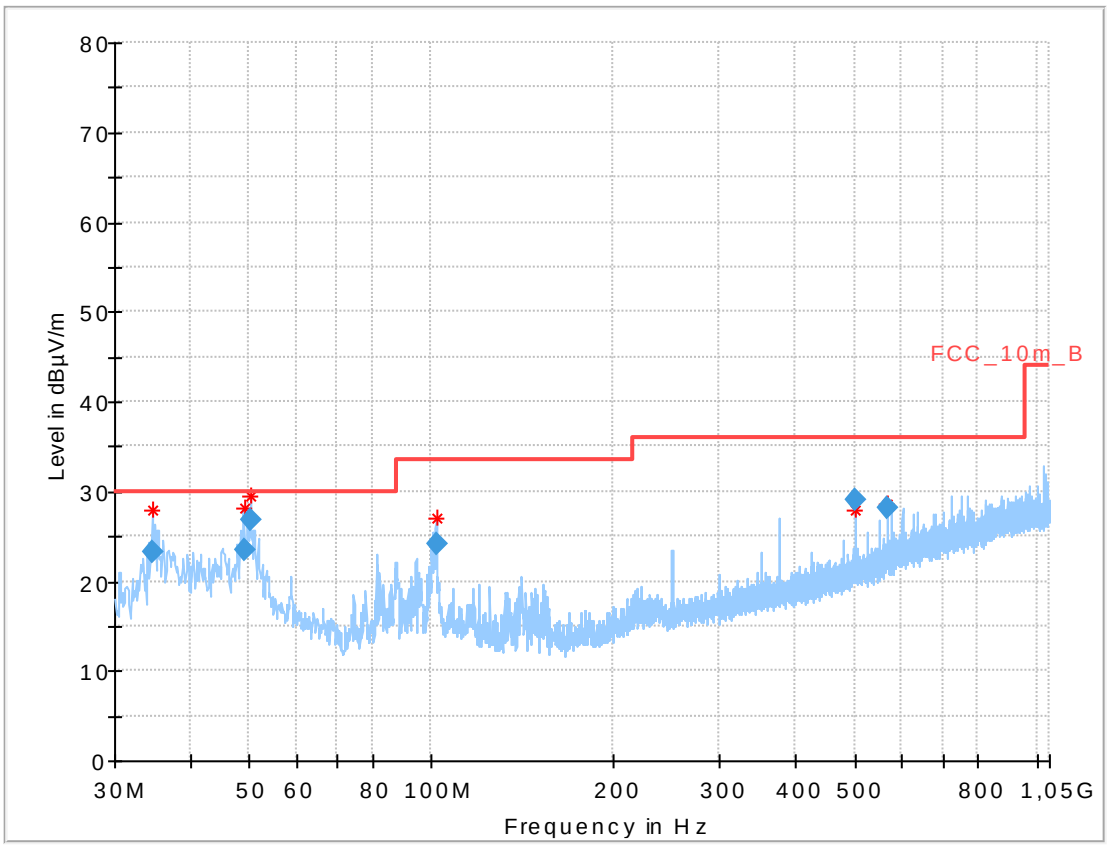
Plot 8: 26 GHz to 40 GHz, 5240 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 14:54:20

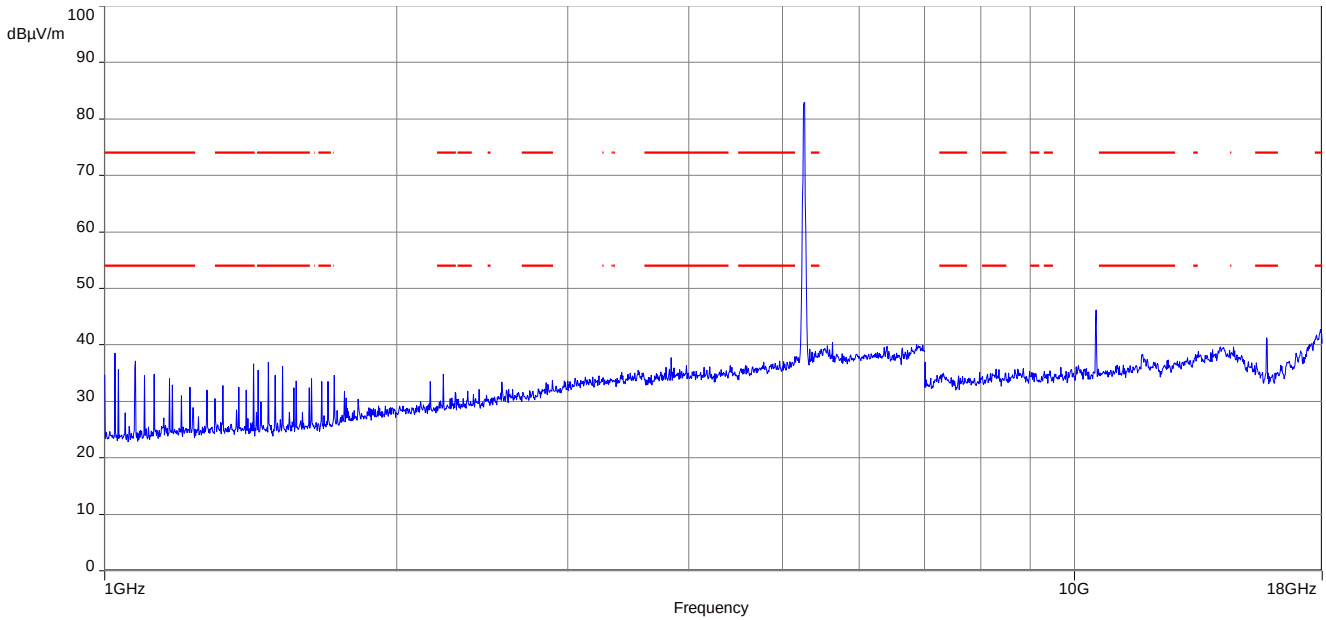
Plot 9: 30 MHz to 1 GHz, 5260 MHz, vertical & horizontal polarization



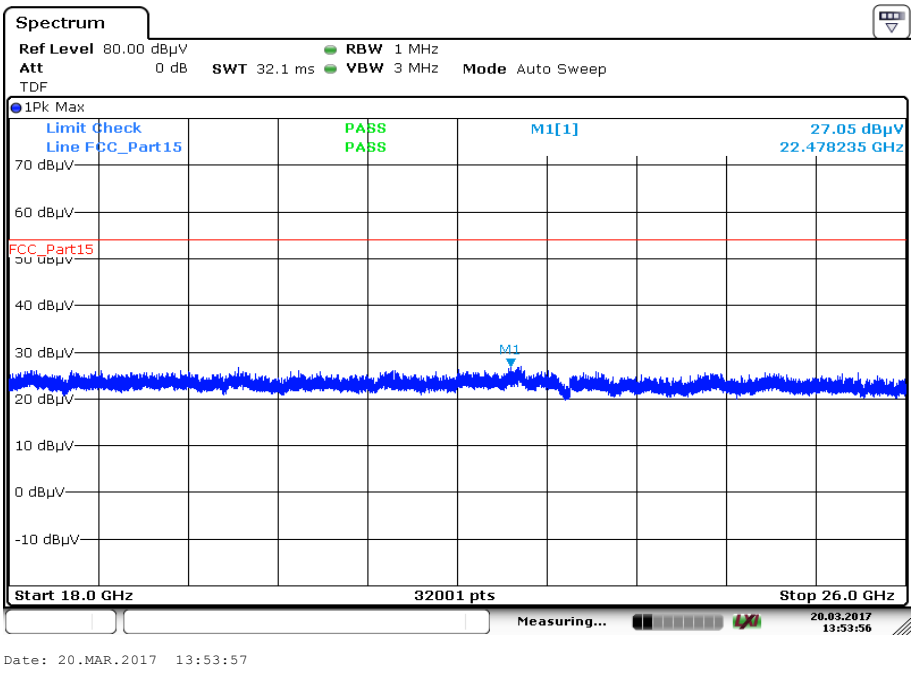
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.663800	23.26	30.00	6.74	1000.0	120.000	101.0	V	-8.0	12.6
49.062450	23.57	30.00	6.43	1000.0	120.000	101.0	V	83.0	13.7
50.436150	26.71	30.00	3.29	1000.0	120.000	101.0	V	81.0	13.7
101.870250	24.21	33.50	9.29	1000.0	120.000	101.0	V	10.0	11.9
500.015550	29.00	36.00	7.00	1000.0	120.000	98.0	V	100.0	18.7
566.665950	28.07	36.00	7.93	1000.0	120.000	101.0	H	80.0	19.8

Plot 10: 1 GHz to 18 GHz, 5260 MHz, vertical & horizontal polarization



Plot 11: 18 GHz to 26 GHz, 5260 MHz, vertical & horizontal polarization



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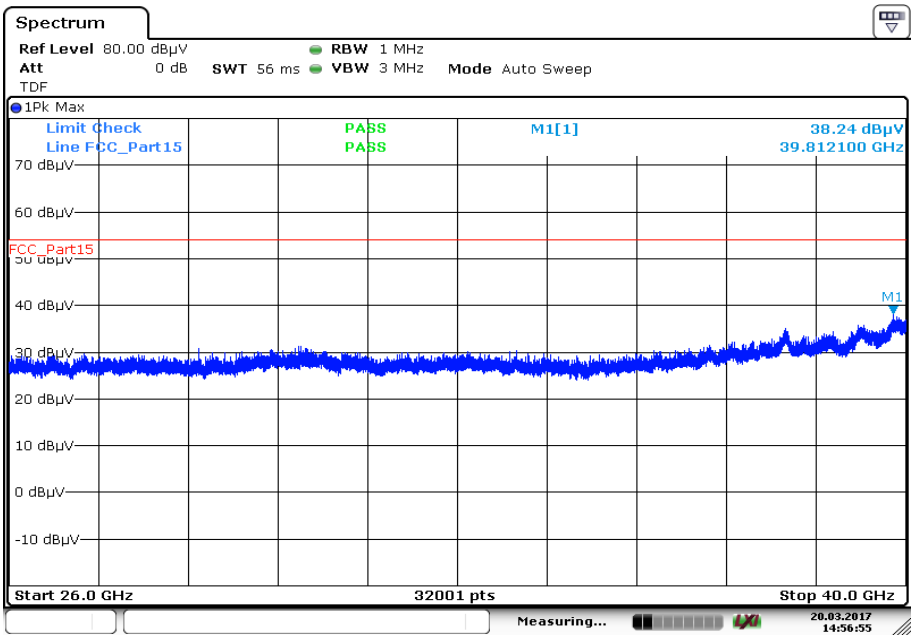
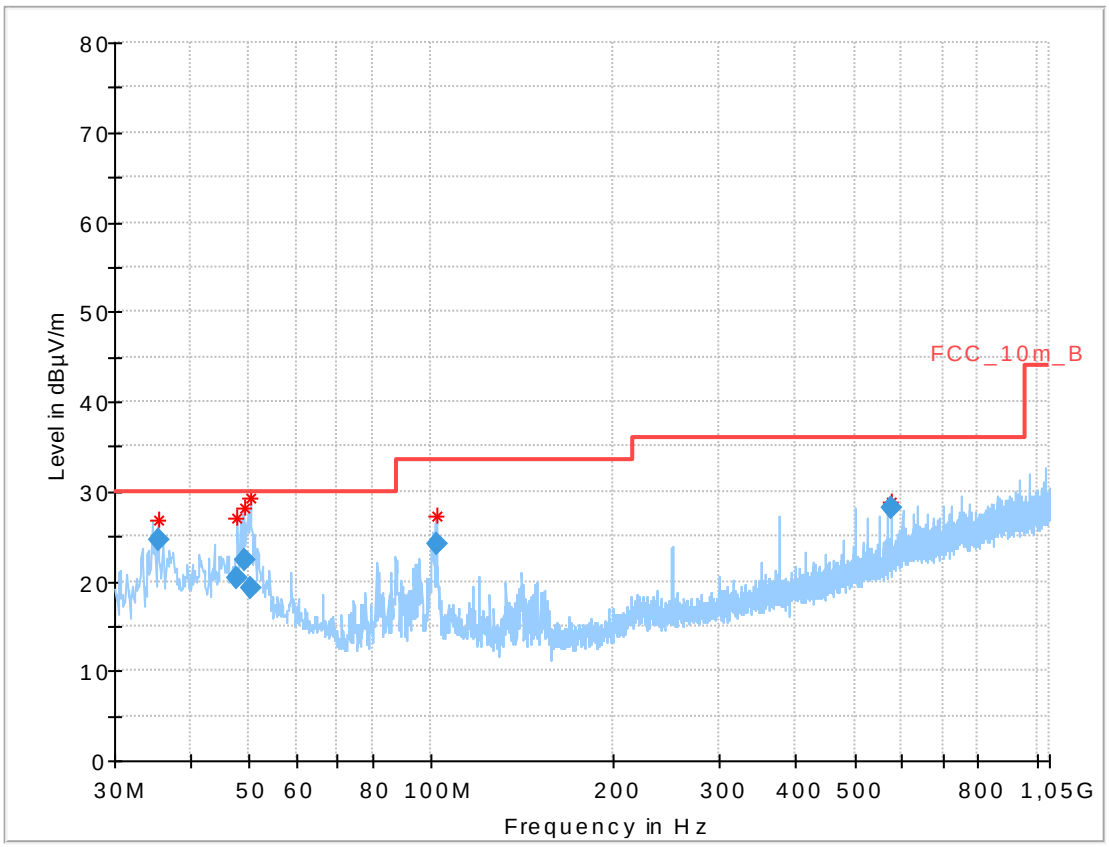
Plot 12: 26 GHz to 40 GHz, 5260 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 14:56:55

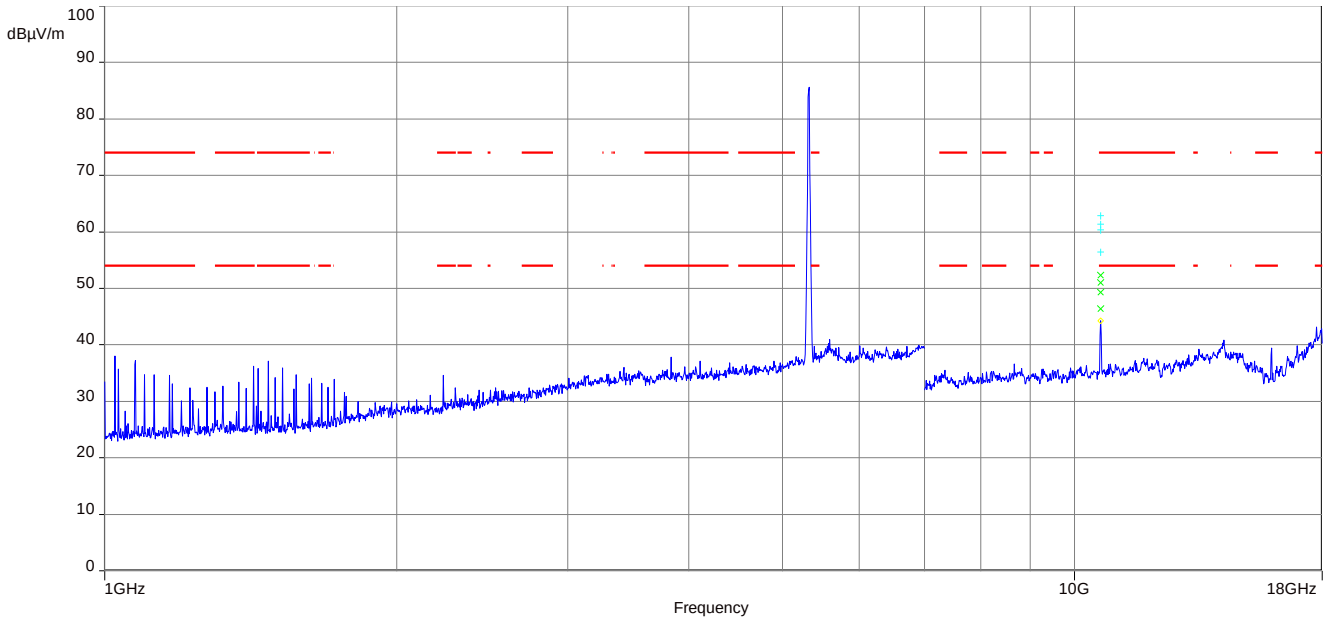
Plot 13: 30 MHz to 1 GHz, 5320 MHz, vertical & horizontal polarization



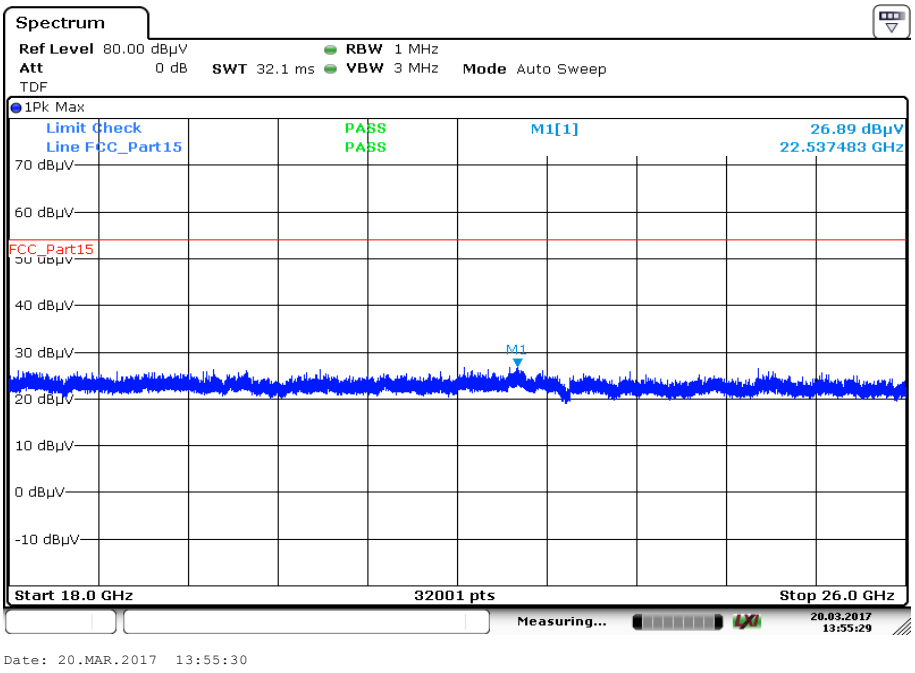
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
35.362350	24.67	30.00	5.33	1000.0	120.000	101.0	V	-10.0	12.7
47.780400	20.41	30.00	9.59	1000.0	120.000	101.0	V	190.0	13.7
49.023450	22.38	30.00	7.62	1000.0	120.000	101.0	V	170.0	13.7
50.191650	19.28	30.00	10.72	1000.0	120.000	101.0	V	170.0	13.7
101.876250	24.13	33.50	9.37	1000.0	120.000	101.0	V	10.0	11.9
575.002800	28.19	36.00	7.81	1000.0	120.000	101.0	H	10.0	20.0

Plot 14: 1 GHz to 18 GHz, 5320 MHz, vertical & horizontal polarization



Plot 15: 18 GHz to 26 GHz, 5320 MHz, vertical & horizontal polarization



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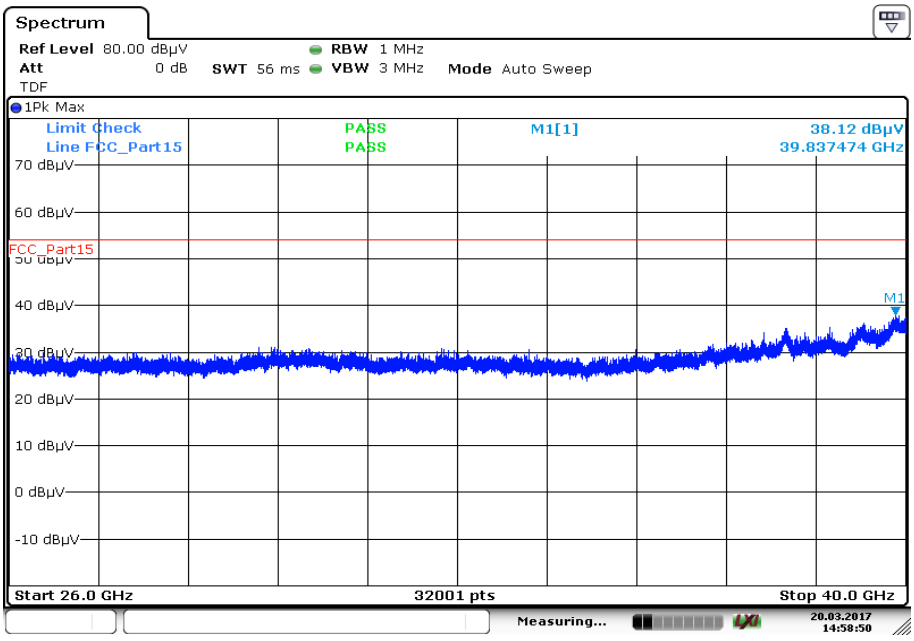
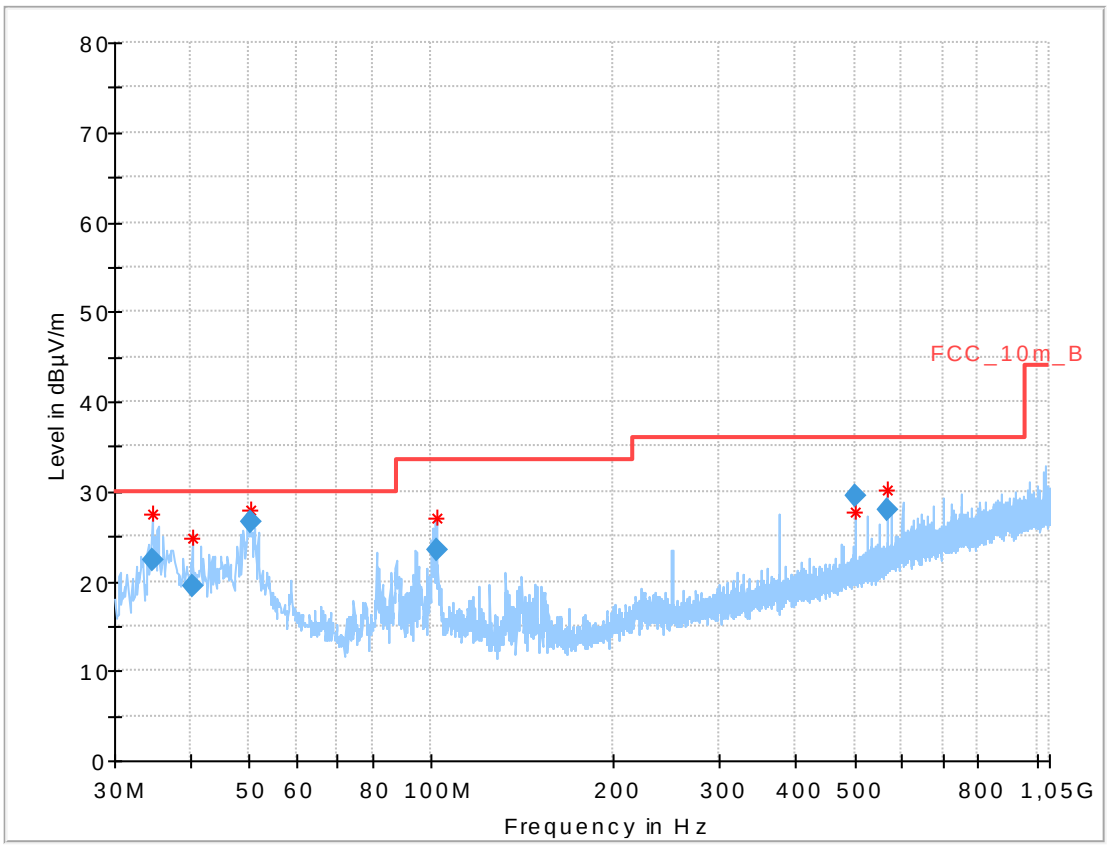
Plot 16: 26 GHz to 40 GHz, 5320 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 14:58:51

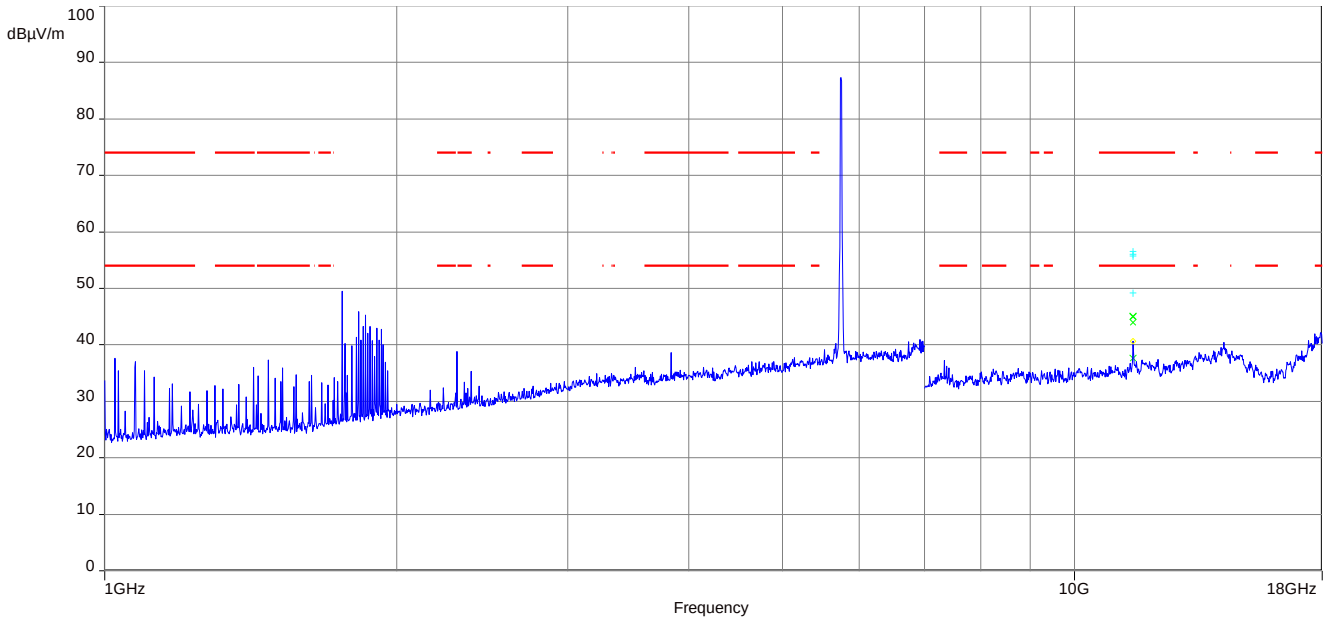
Plot 17: 30 MHz to 1 GHz, 5745 MHz, vertical & horizontal polarization



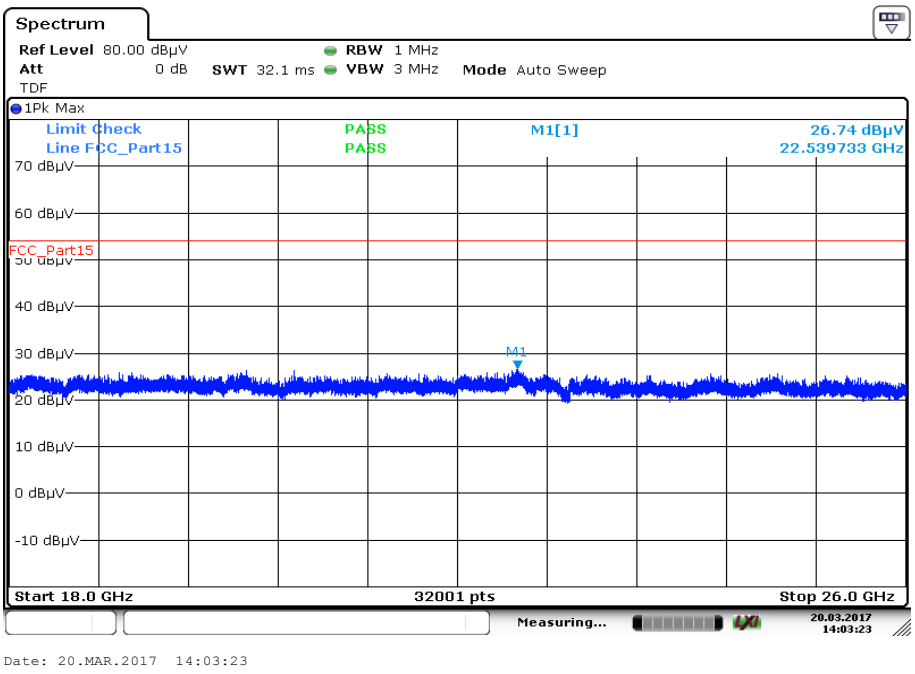
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.618650	22.40	30.00	7.60	1000.0	120.000	101.0	V	-10.0	12.6
40.369500	19.49	30.00	10.51	1000.0	120.000	101.0	V	-10.0	13.2
50.445900	26.61	30.00	3.39	1000.0	120.000	101.0	V	-10.0	13.7
101.903850	23.54	33.50	9.96	1000.0	120.000	101.0	V	10.0	11.9
500.001300	29.60	36.00	6.40	1000.0	120.000	98.0	V	-10.0	18.7
566.667150	27.98	36.00	8.02	1000.0	120.000	100.0	H	80.0	19.8

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



Plot 19: 18 GHz to 26 GHz, 5745 MHz, vertical & horizontal polarization



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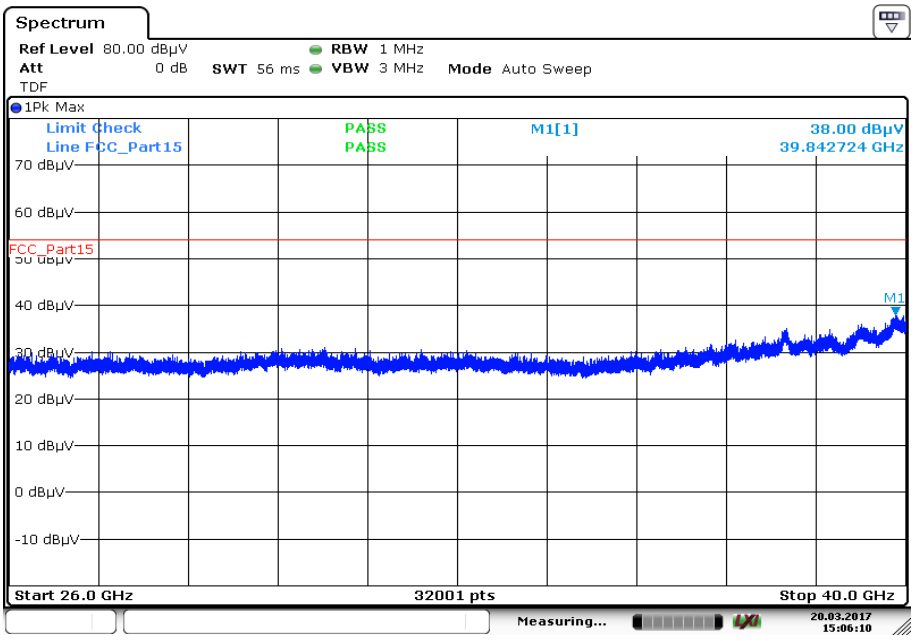
Plot 20: 26 GHz to 40 GHz, 5745 MHz, vertical & horizontal polarization



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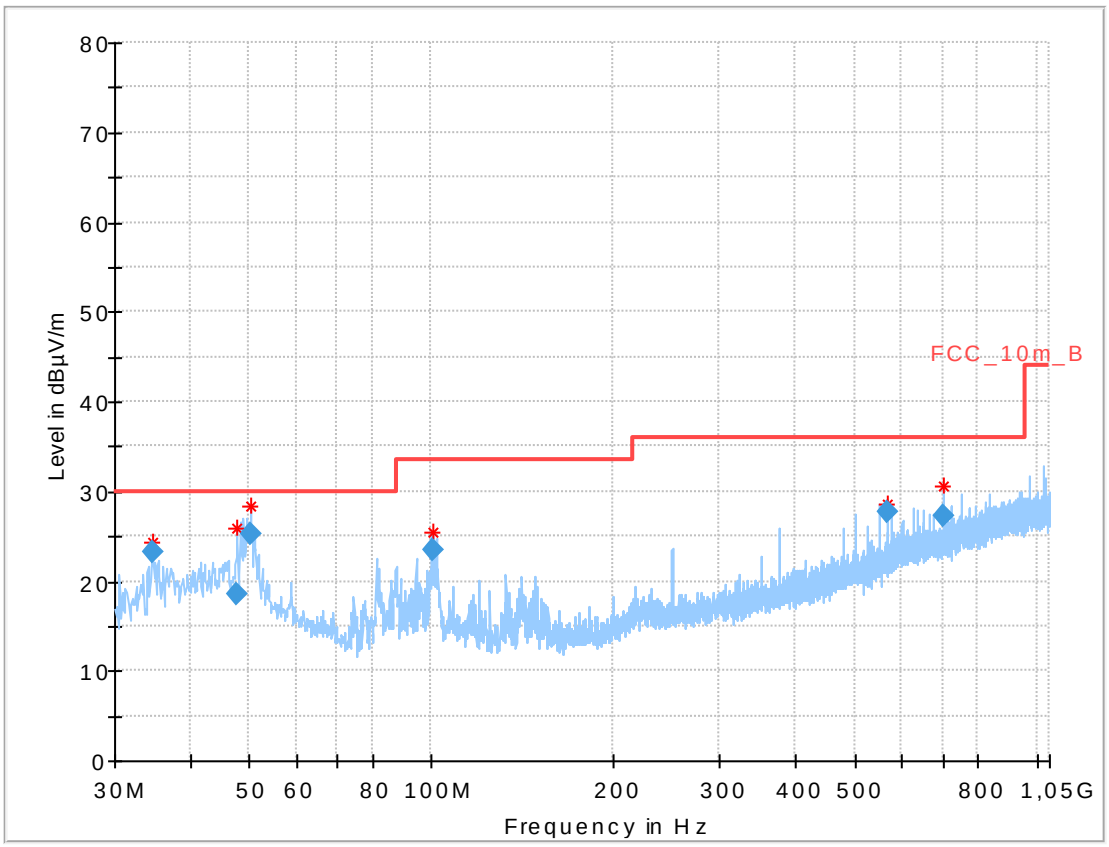
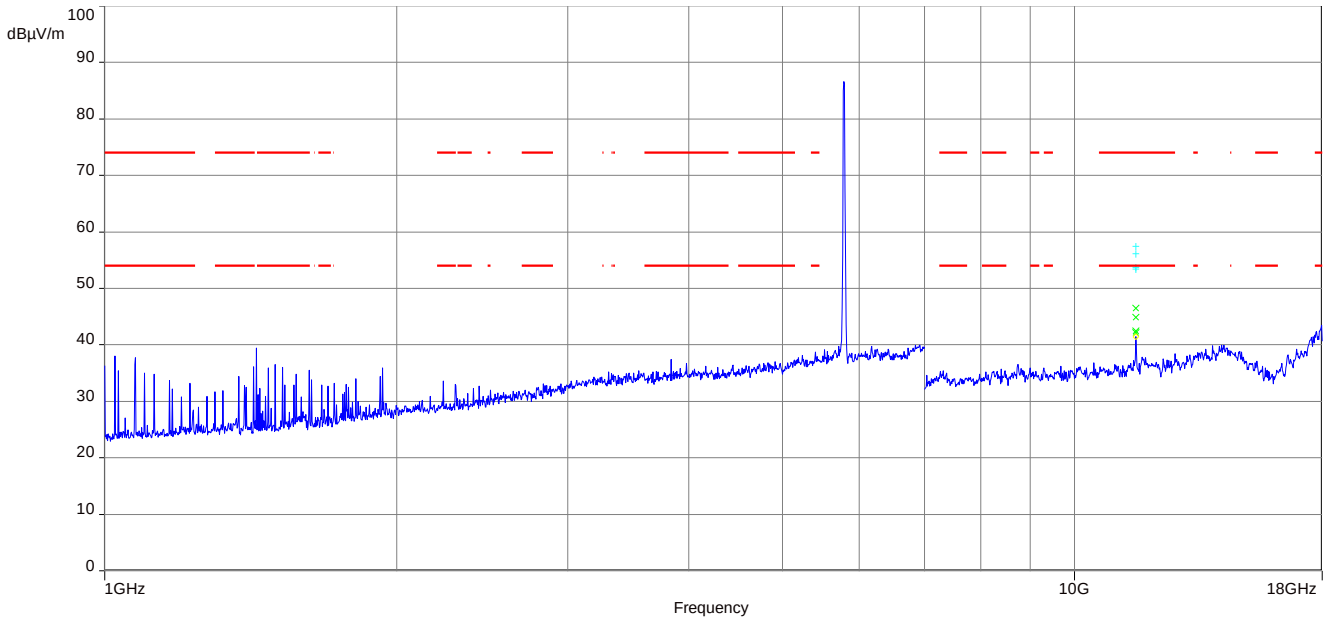
Plot 21: 30 MHz to 1 GHz, 5785 MHz, vertical & horizontal polarization



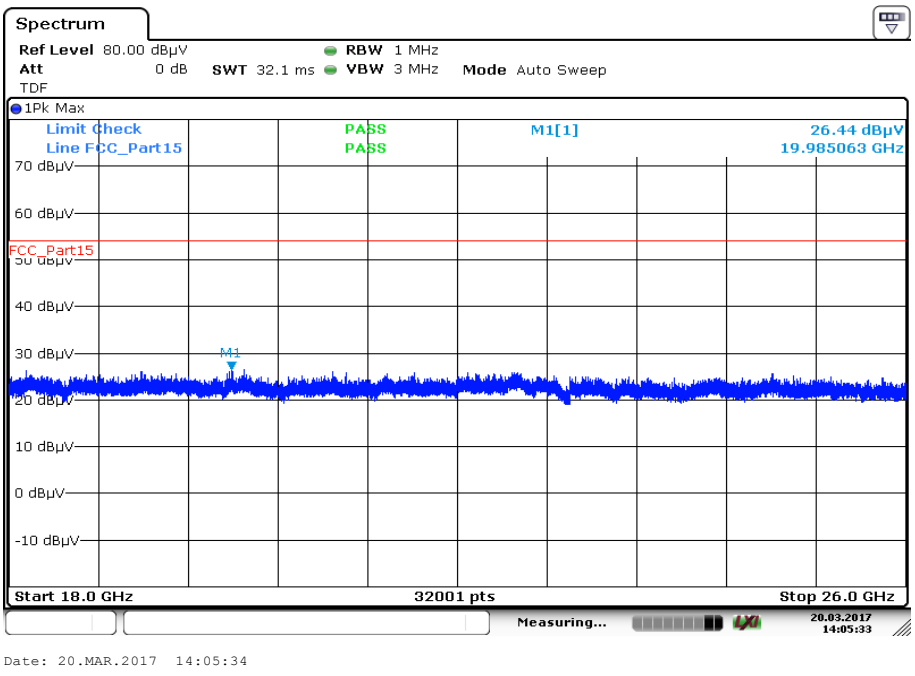
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.634400	23.32	30.00	6.68	1000.0	120.000	101.0	V	10.0	12.6
47.598000	18.44	30.00	11.56	1000.0	120.000	101.0	V	100.0	13.7
50.442150	25.16	30.00	4.84	1000.0	120.000	101.0	V	262.0	13.7
100.668150	23.36	33.50	10.14	1000.0	120.000	170.0	V	-8.0	12.1
566.658150	27.75	36.00	8.25	1000.0	120.000	101.0	H	80.0	19.8
700.035750	27.31	36.00	8.69	1000.0	120.000	101.0	H	190.0	21.6

Plot 22: 1 GHz to 18 GHz, 5785 MHz, vertical & horizontal polarization

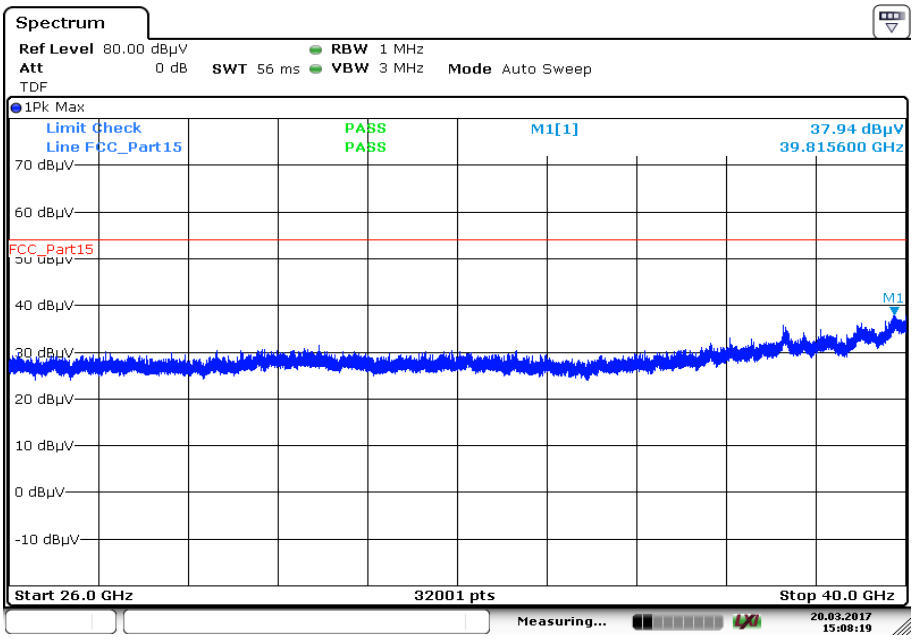


Plot 23: 18 GHz to 26 GHz, 5785 MHz, vertical & horizontal polarization



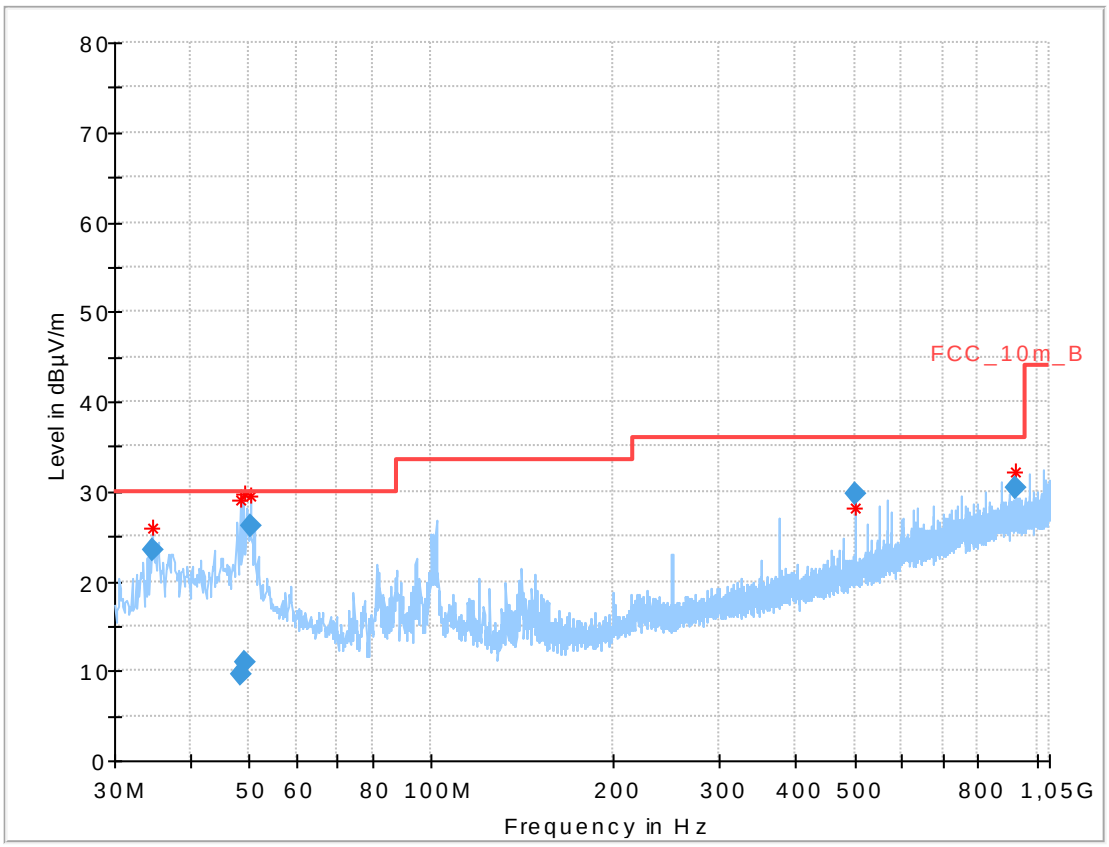
Date: 20.MAR.2017 14:05:34

Plot 24: 26 GHz to 40 GHz, 5785 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 15:08:20

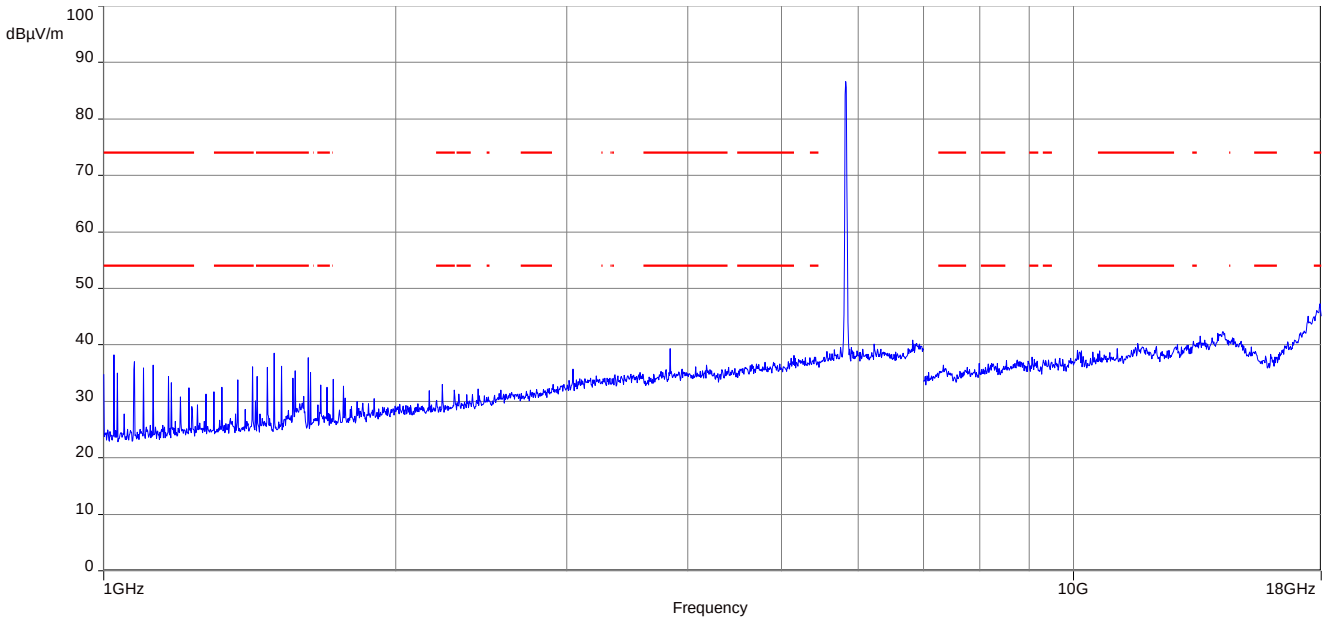
Plot 25: 30 MHz to 1 GHz, 5825 MHz, vertical & horizontal polarization



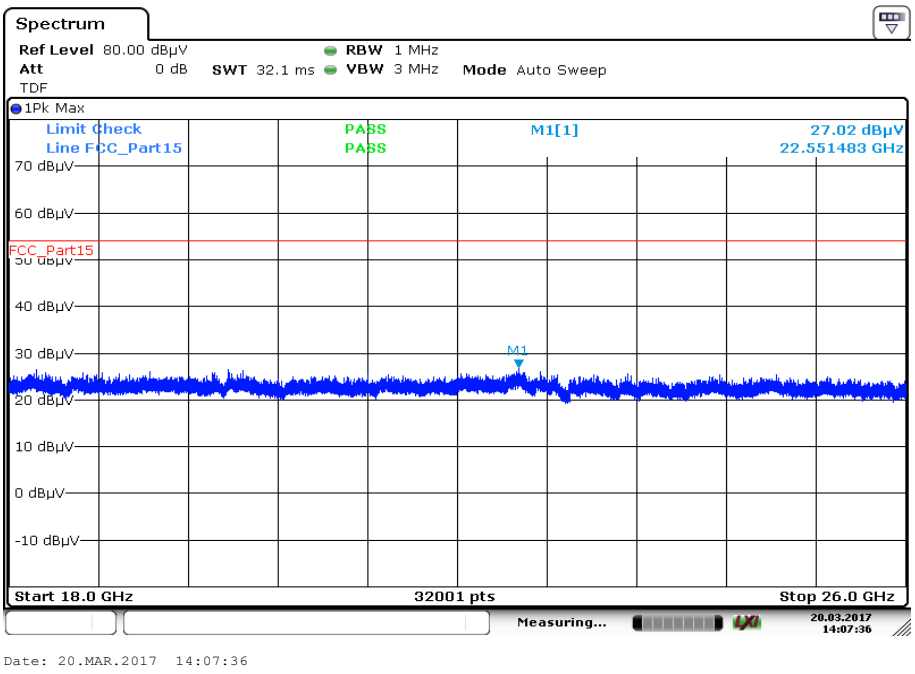
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.634400	23.49	30.00	6.51	1000.0	120.000	101.0	V	171.0	12.6
48.349800	9.50	30.00	20.50	1000.0	120.000	170.0	H	262.0	13.7
49.028550	10.91	30.00	19.09	1000.0	120.000	170.0	H	280.0	13.7
50.449500	26.12	30.00	3.88	1000.0	120.000	101.0	V	100.0	13.7
500.001900	29.61	36.00	6.39	1000.0	120.000	98.0	V	-10.0	18.7
925.007250	30.29	36.00	5.71	1000.0	120.000	98.0	H	-8.0	24.3

Plot 26: 1 GHz to 18 GHz, 5825 MHz, vertical & horizontal polarization

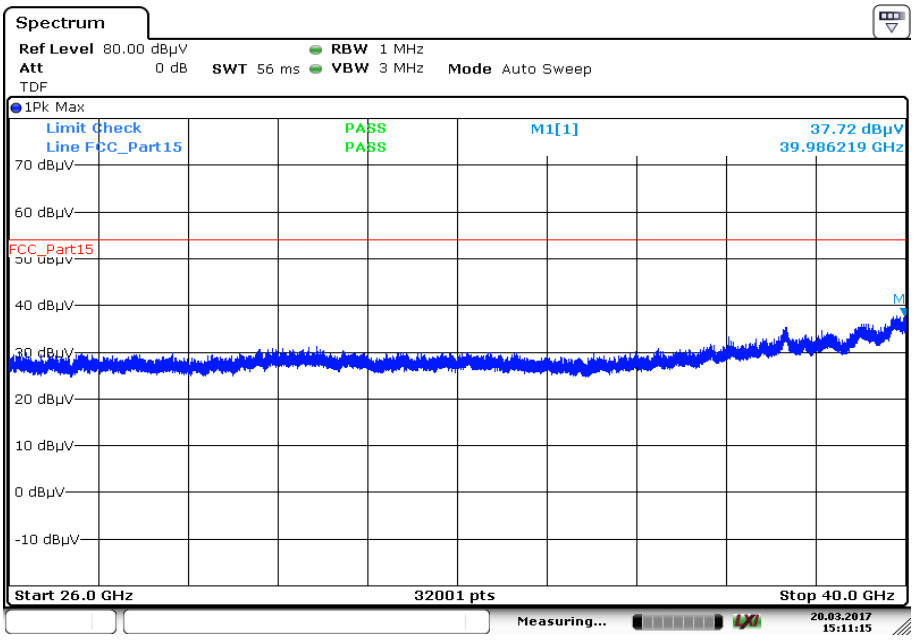


Plot 27: 18 GHz to 26 GHz, 5825 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 14:07:36

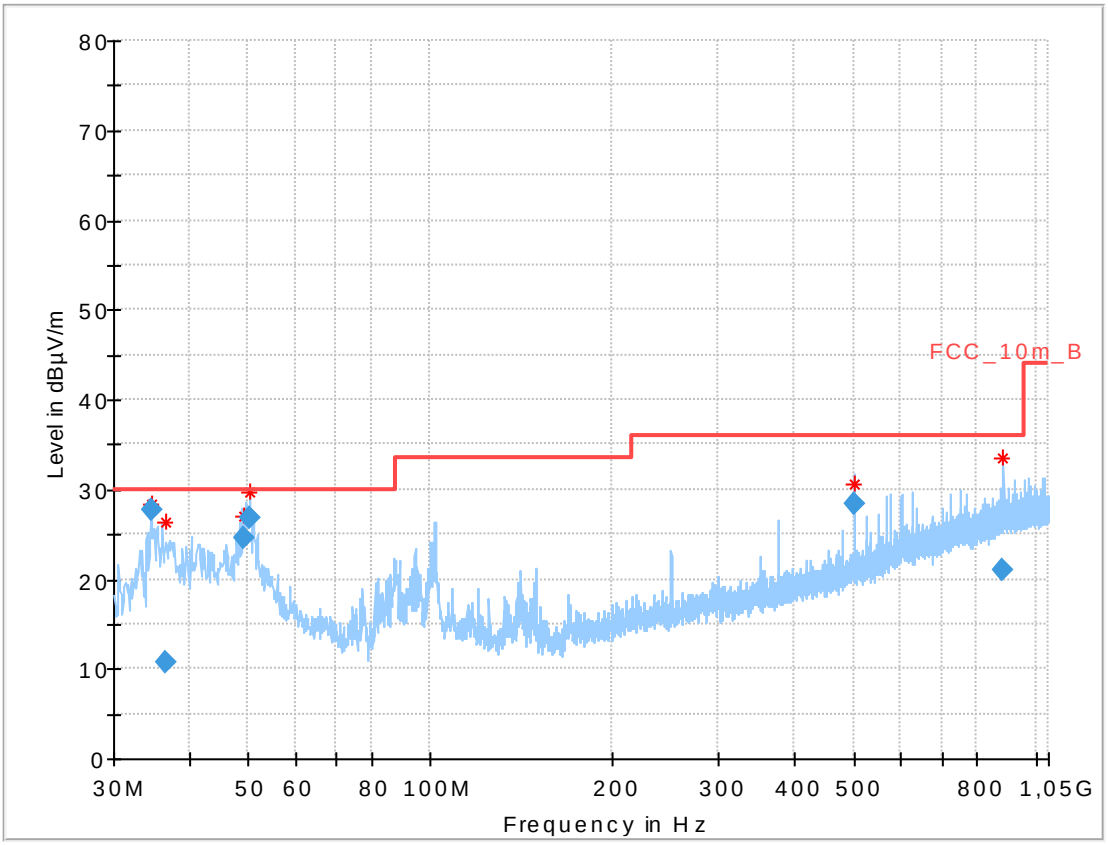
Plot 28: 26 GHz to 40 GHz, 5825 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 15:11:15

Plots: OFDM / n/ac HT40 – mode

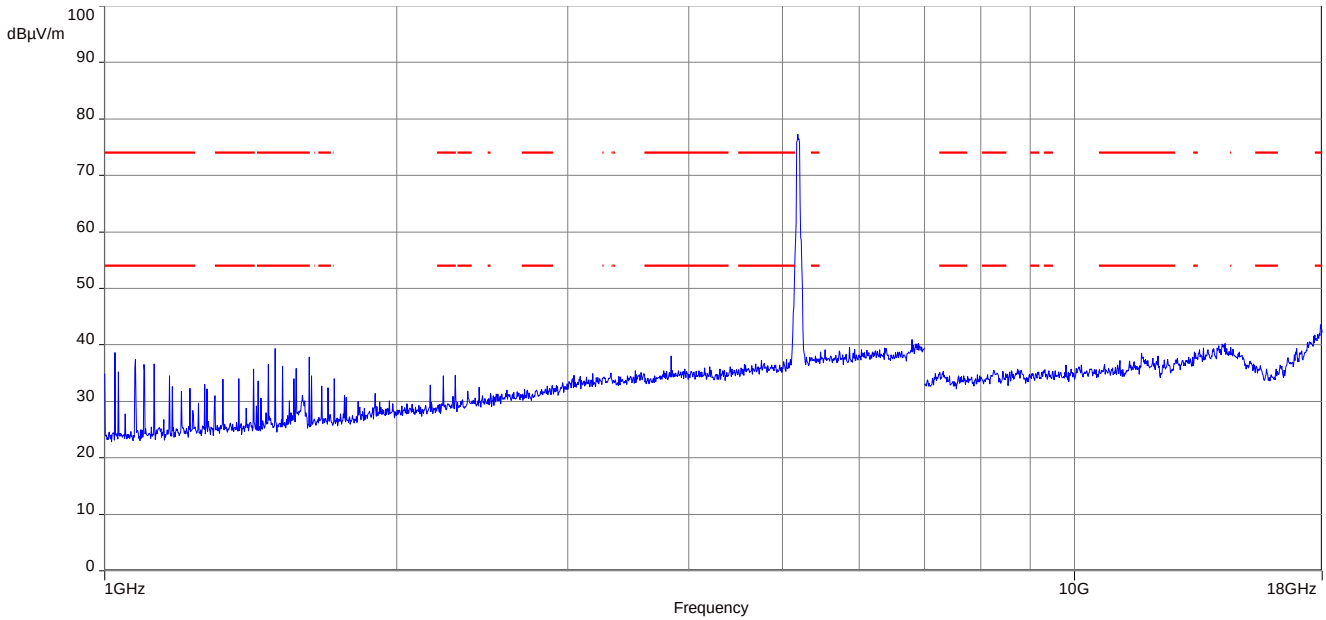
Plot 1: 30 MHz to 1 GHz, 5190 MHz, vertical & horizontal polarization



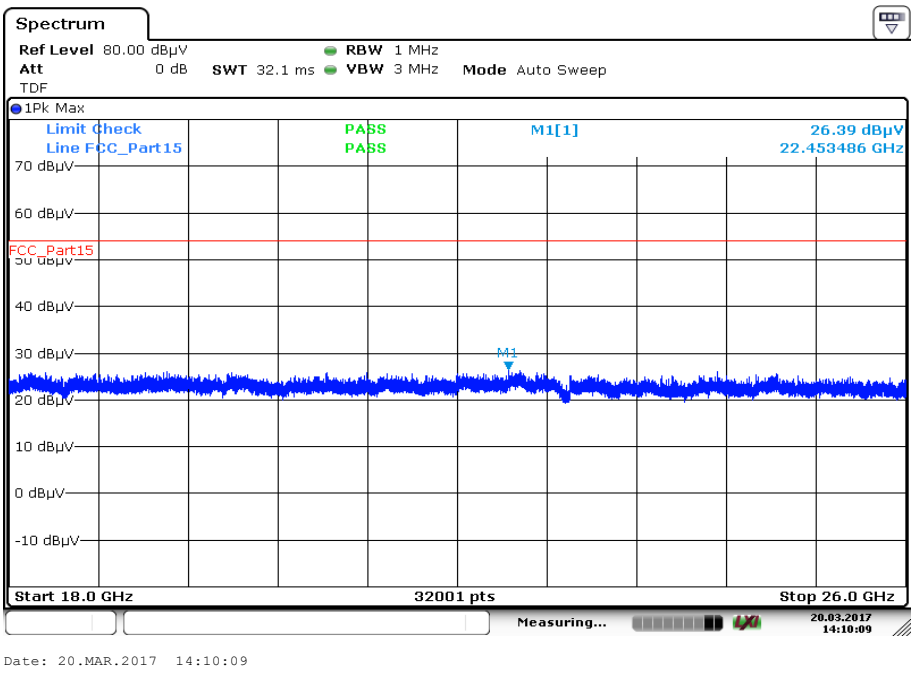
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.627050	27.72	30.00	2.28	1000.0	120.000	100.0	V	-10.0	12.6
36.594000	10.81	30.00	19.19	1000.0	120.000	101.0	V	83.0	12.8
49.058250	24.51	30.00	5.49	1000.0	120.000	105.0	V	280.0	13.7
50.445300	26.83	30.00	3.17	1000.0	120.000	101.0	V	10.0	13.7
500.010150	28.48	36.00	7.52	1000.0	120.000	104.0	H	81.0	18.7
884.120100	21.01	36.00	14.99	1000.0	120.000	98.0	V	190.0	24.0

Plot 2: 1 GHz to 18 GHz, 5190 MHz, vertical & horizontal polarization

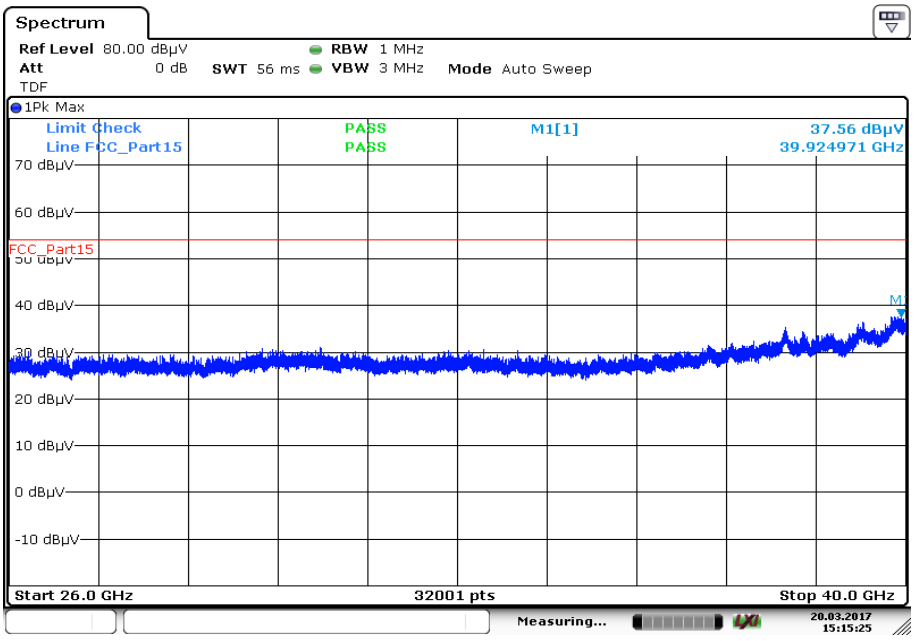


Plot 3: 18 GHz to 26 GHz, 5190 MHz, vertical & horizontal polarization



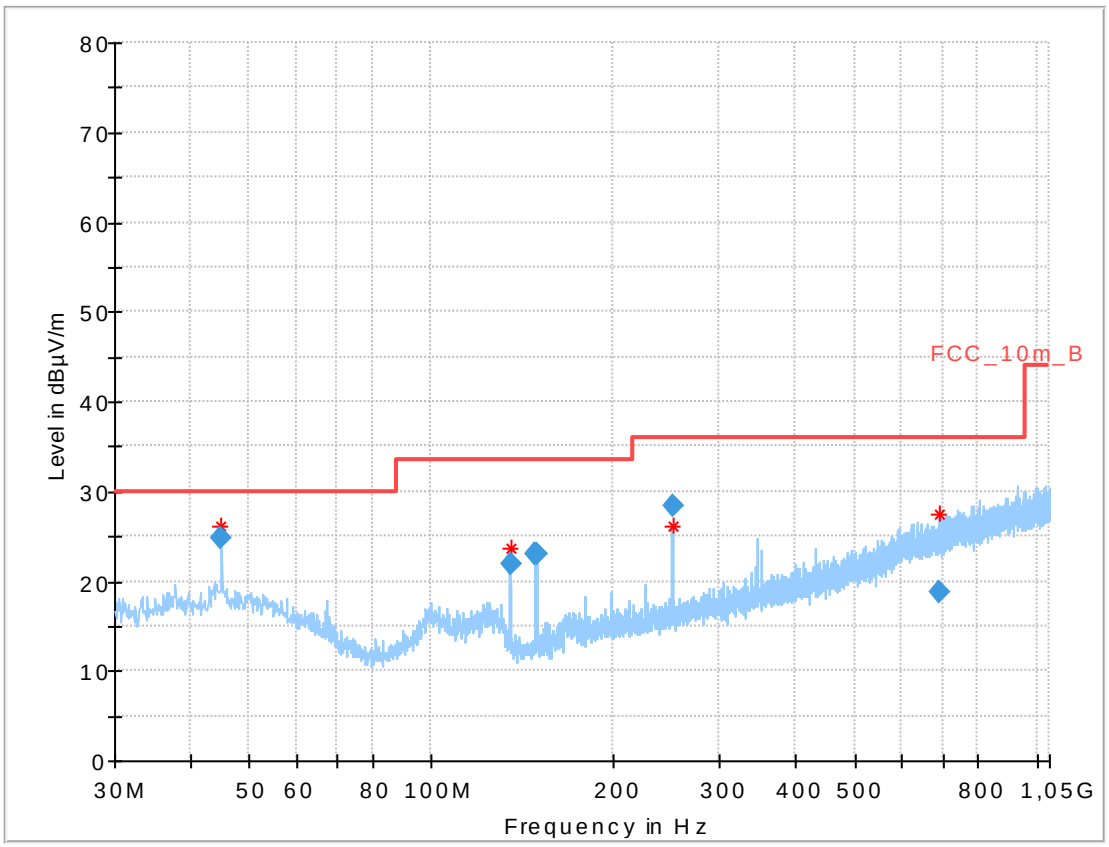
Date: 20.MAR.2017 14:10:09

Plot 4: 26 GHz to 40 GHz, 5190 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 15:15:26

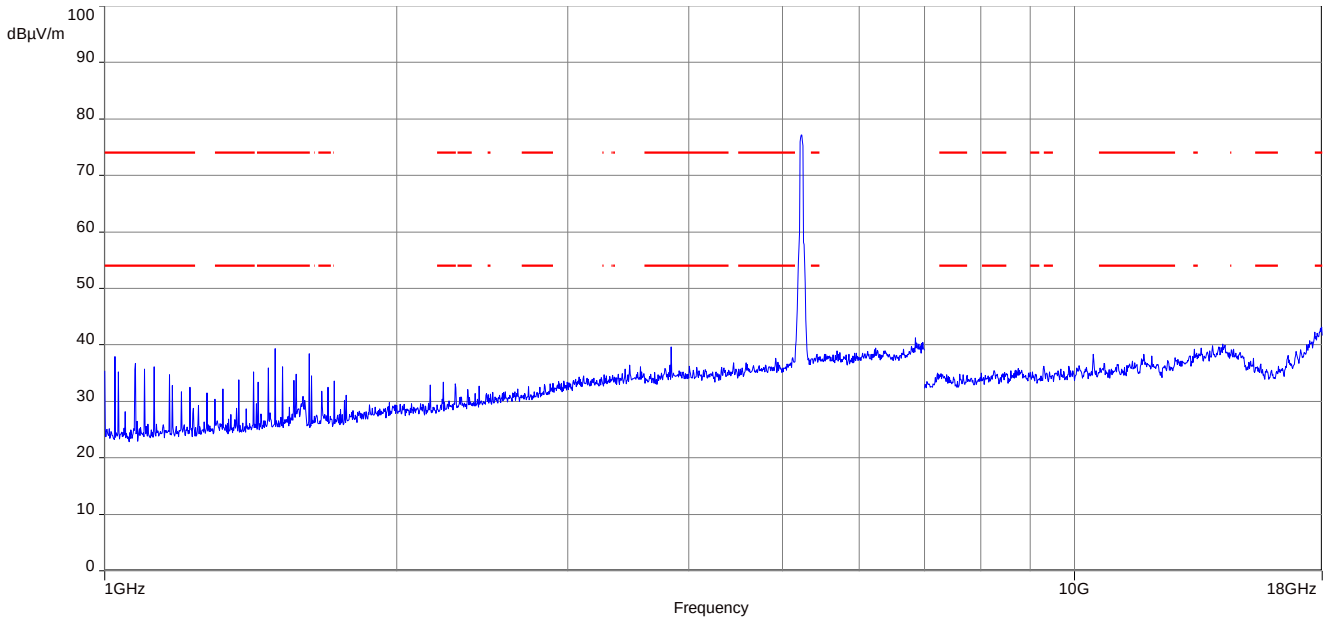
Plot 5: 30 MHz to 1 GHz, 5230 MHz, vertical & horizontal polarization



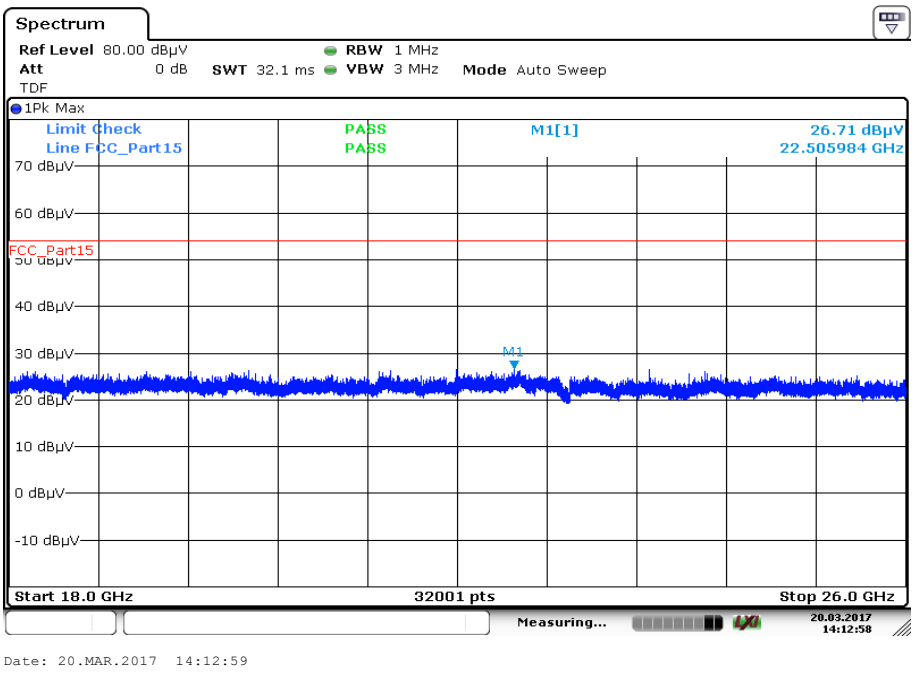
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
44.999250	24.87	30.00	5.13	1000.0	120.000	101.0	V	69.0	13.6
134.992800	21.98	33.50	11.52	1000.0	120.000	101.0	V	305.0	9.2
148.501200	23.07	33.50	10.43	1000.0	120.000	98.0	V	285.0	9.2
150.001650	22.98	33.50	10.52	1000.0	120.000	98.0	V	298.0	9.3
250.005600	28.30	36.00	7.70	1000.0	120.000	101.0	V	192.0	13.4
692.216250	18.78	36.00	17.22	1000.0	120.000	101.0	H	121.0	21.5

Plot 6: 1 GHz to 18 GHz, 5230 MHz, vertical & horizontal polarization

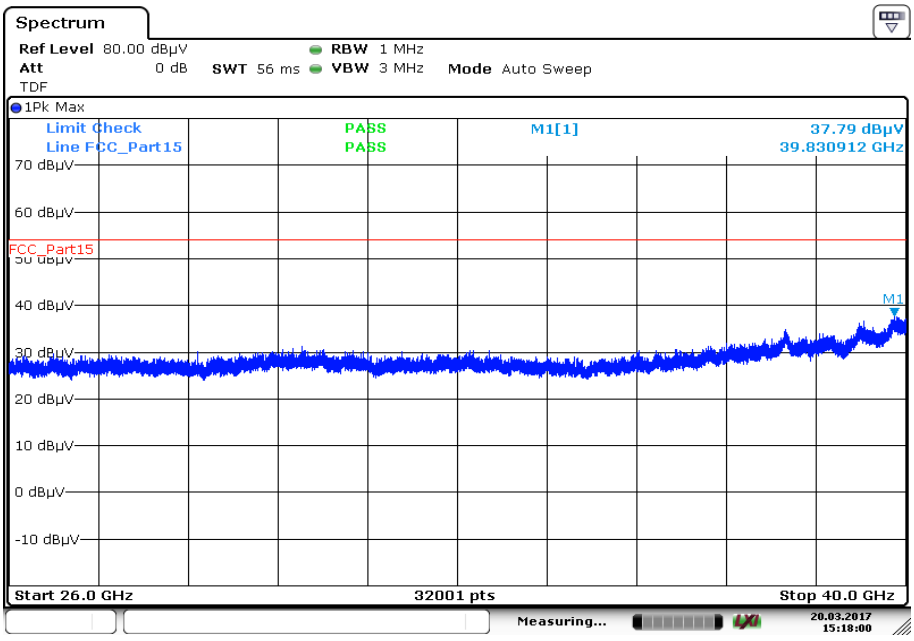


Plot 7: 18 GHz to 26 GHz, 5230 MHz, vertical & horizontal polarization



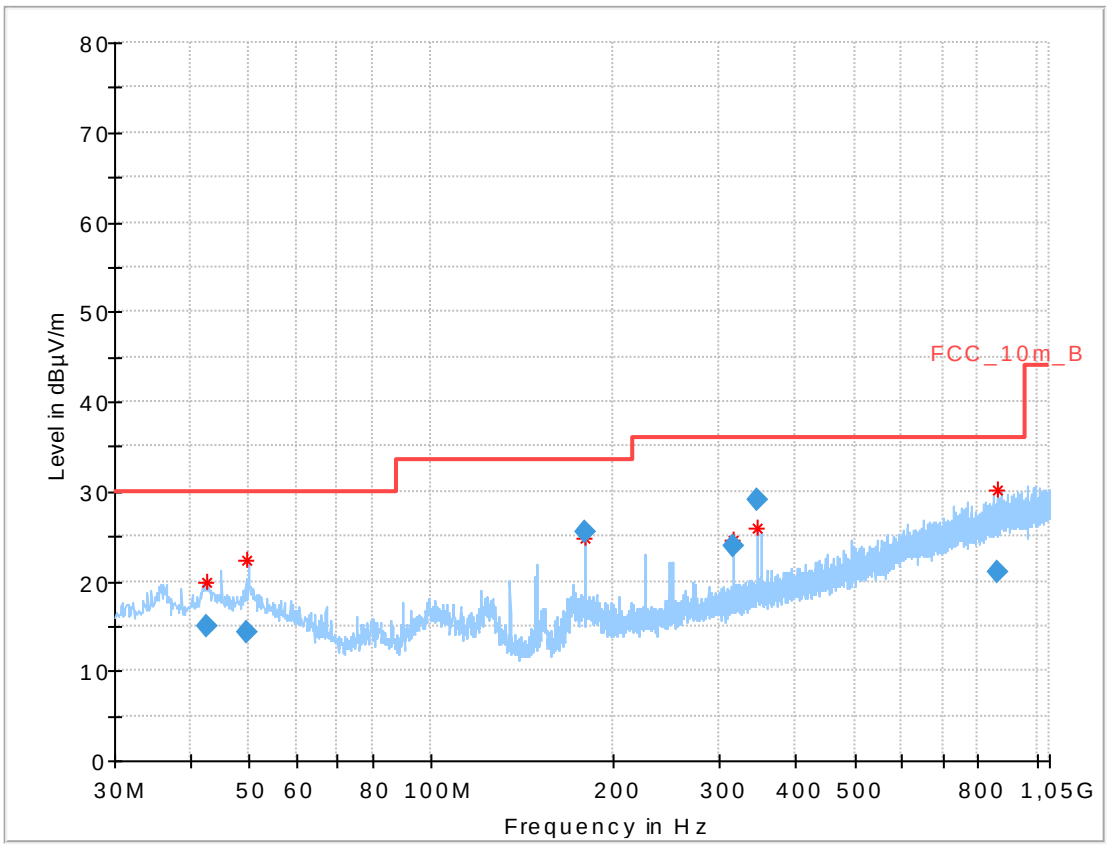
Date: 20.MAR.2017 14:12:59

Plot 8: 26 GHz to 40 GHz, 5230 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 15:18:00

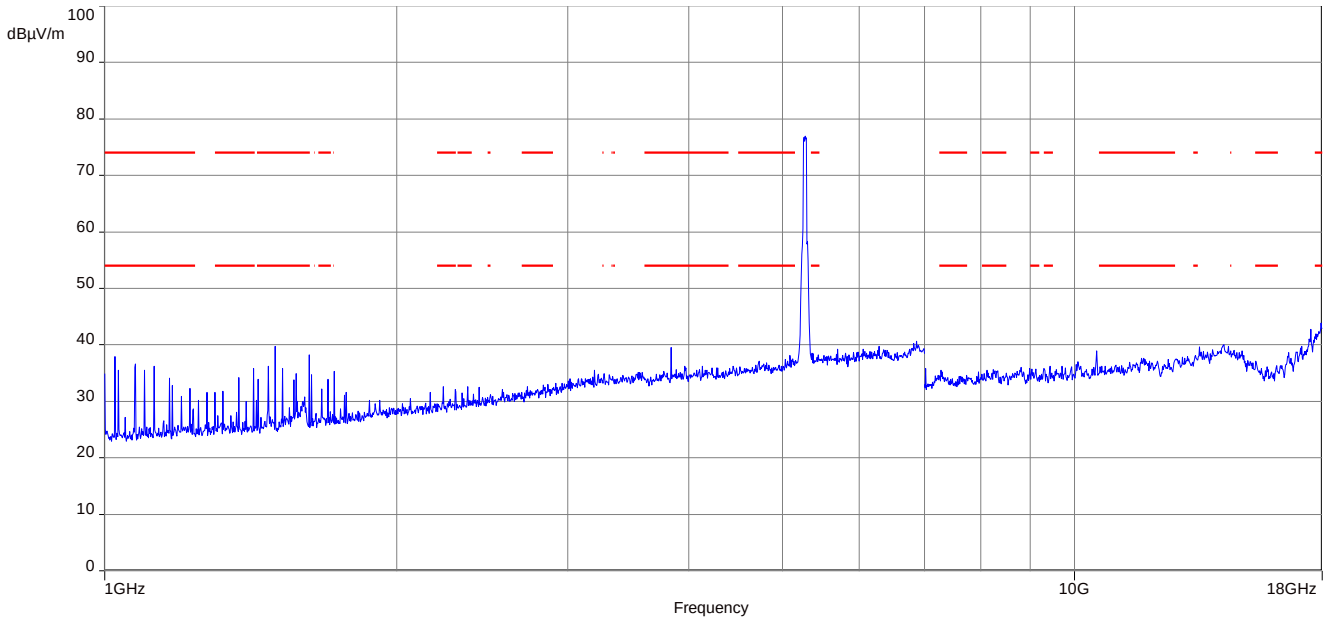
Plot 9: 30 MHz to 1 GHz, 5270 MHz, vertical & horizontal polarization



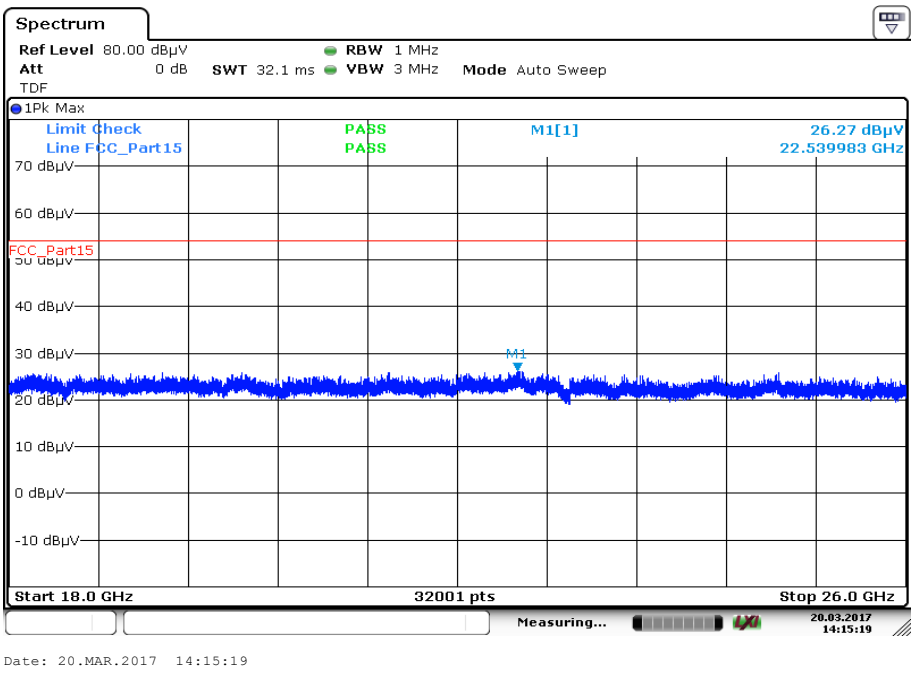
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
42.652800	14.99	30.00	15.01	1000.0	120.000	101.0	V	353.0	13.4
49.540950	14.32	30.00	15.68	1000.0	120.000	100.0	V	143.0	13.7
179.989200	25.51	33.50	7.99	1000.0	120.000	98.0	V	338.0	10.9
314.985900	23.84	36.00	12.16	1000.0	120.000	98.0	V	11.0	14.9
346.494150	29.14	36.00	6.86	1000.0	120.000	185.0	H	67.0	15.9
858.569400	21.07	36.00	14.93	1000.0	120.000	98.0	H	247.0	23.6

Plot 10: 1 GHz to 18 GHz, 5270 MHz, vertical & horizontal polarization

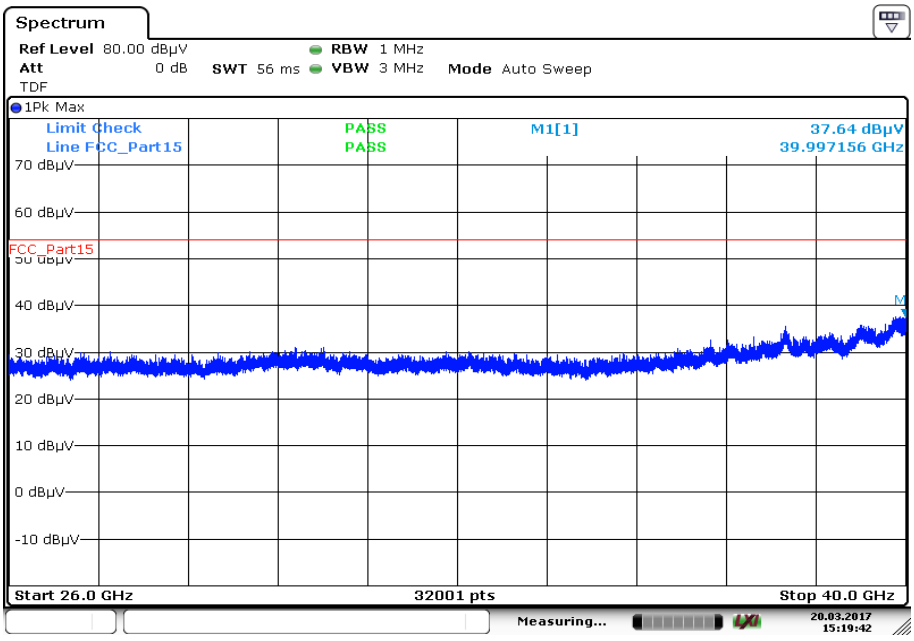


Plot 11: 18 GHz to 26 GHz, 5270 MHz, vertical & horizontal polarization

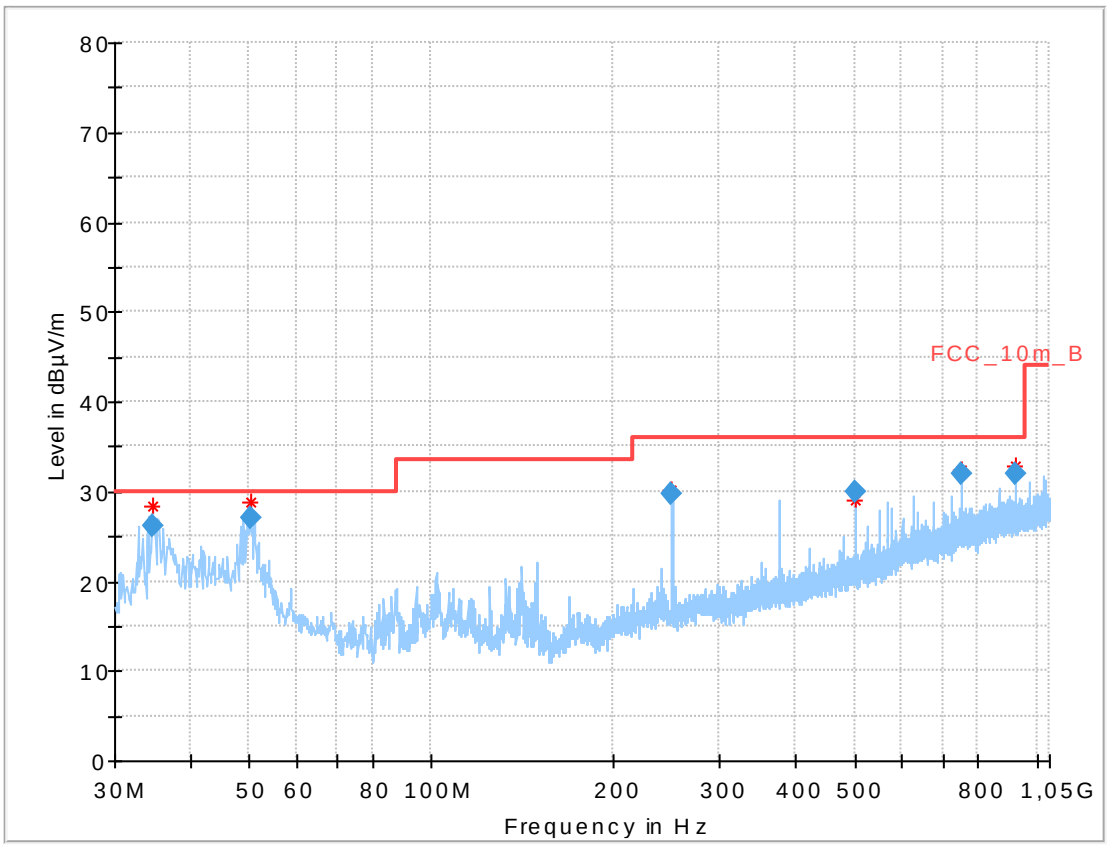


Date: 20.MAR.2017 14:15:19

Plot 12: 26 GHz to 40 GHz, 5270 MHz, vertical & horizontal polarization



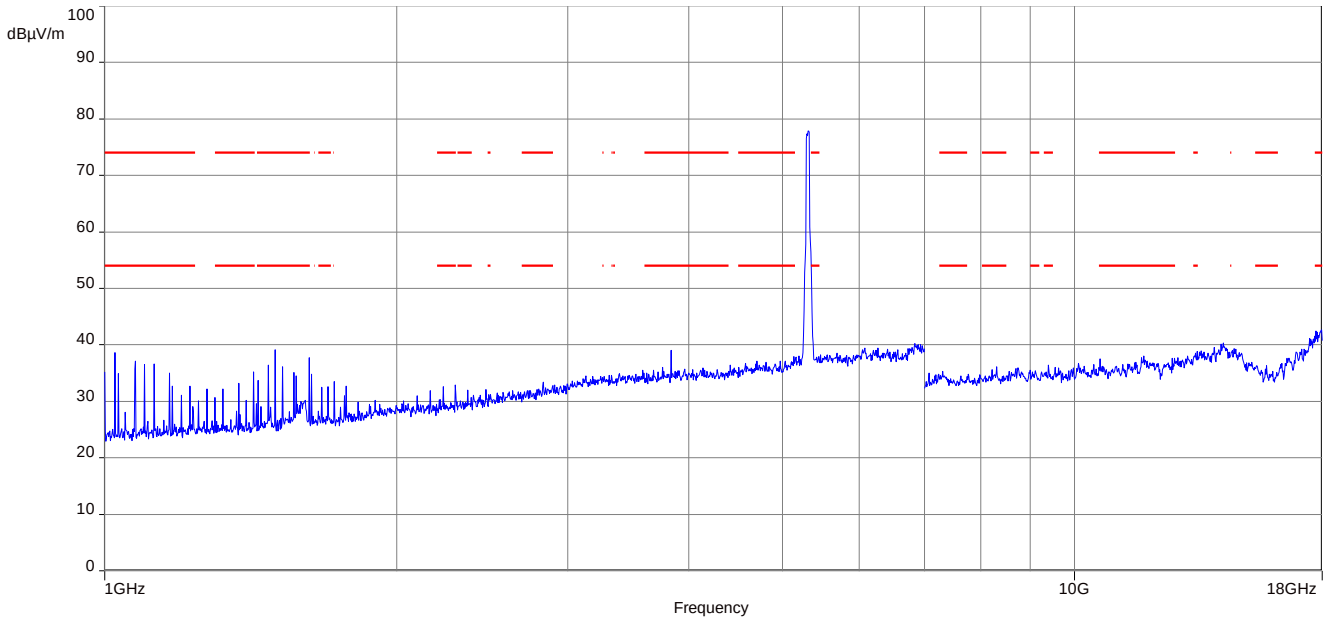
Plot 13: 30 MHz to 1 GHz, 5310 MHz, vertical & horizontal polarization



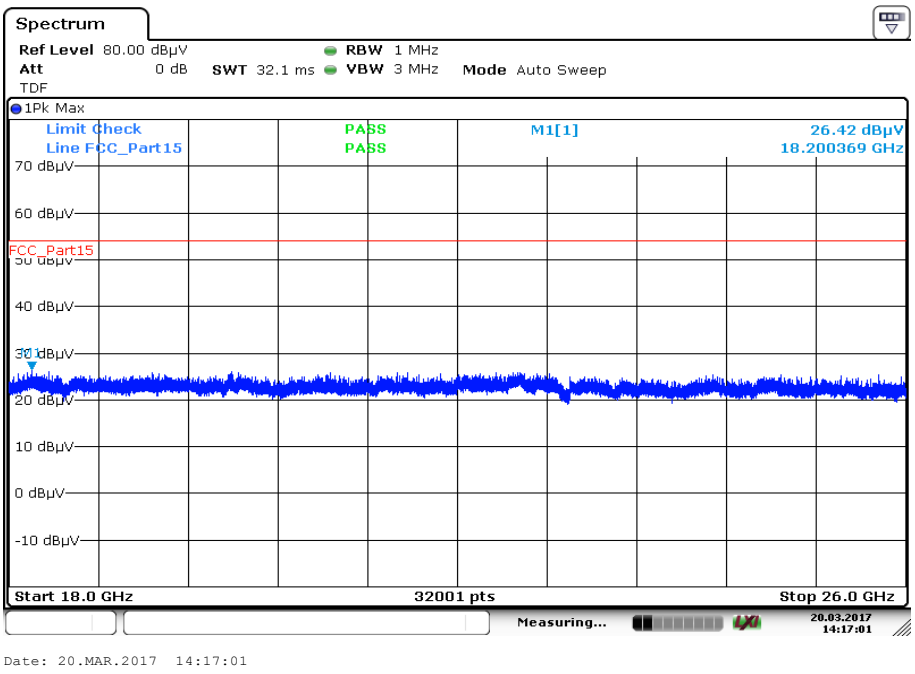
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.642200	26.16	30.00	3.84	1000.0	120.000	170.0	V	10.0	12.6
50.415600	27.04	30.00	2.96	1000.0	120.000	101.0	V	260.0	13.7
249.999450	29.74	36.00	6.26	1000.0	120.000	98.0	V	260.0	13.4
499.986000	29.90	36.00	6.10	1000.0	120.000	170.0	H	80.0	18.7
749.988750	31.95	36.00	4.05	1000.0	120.000	98.0	H	260.0	22.7
925.000800	31.88	36.00	4.12	1000.0	120.000	98.0	H	-8.0	24.3

Plot 14: 1 GHz to 18 GHz, 5310 MHz, vertical & horizontal polarization



Plot 15: 18 GHz to 26 GHz, 5310 MHz, vertical & horizontal polarization



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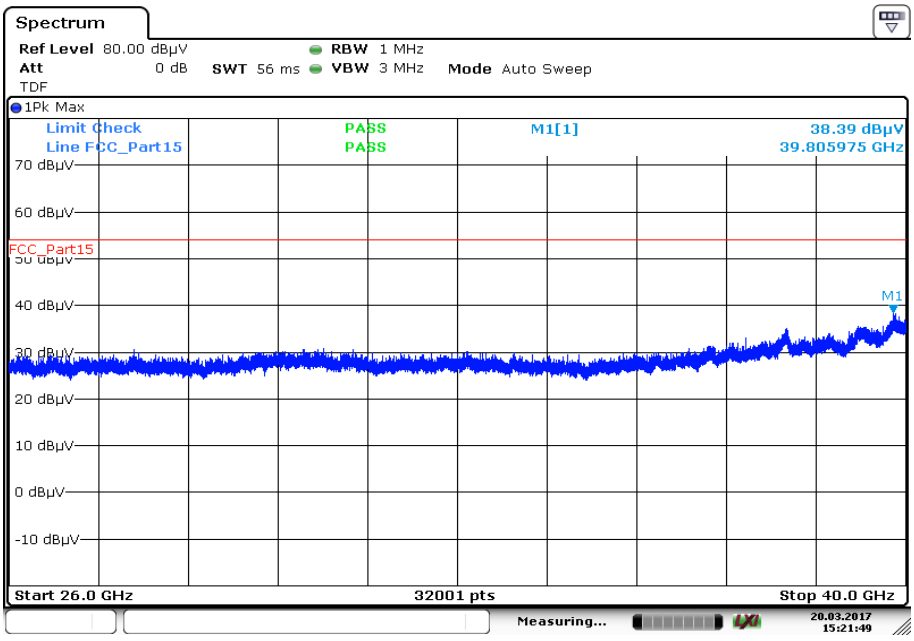
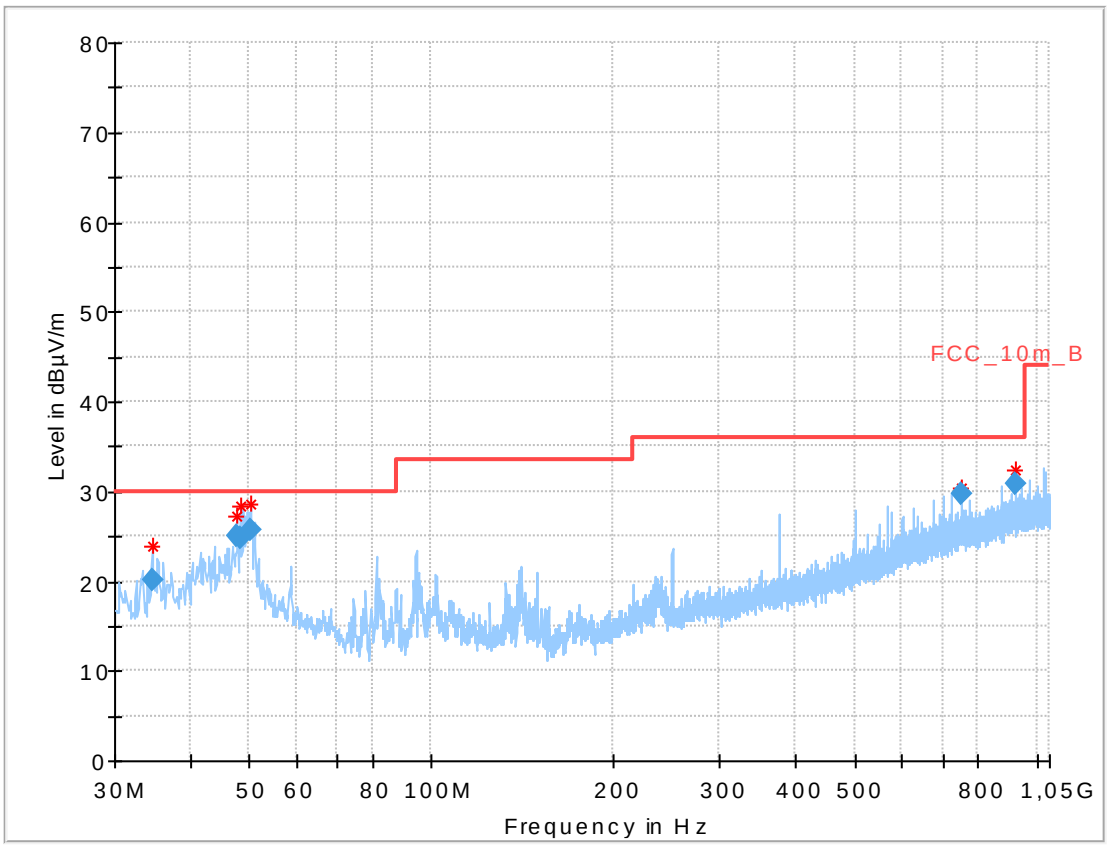
Plot 16: 26 GHz to 40 GHz, 5310 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 15:21:50

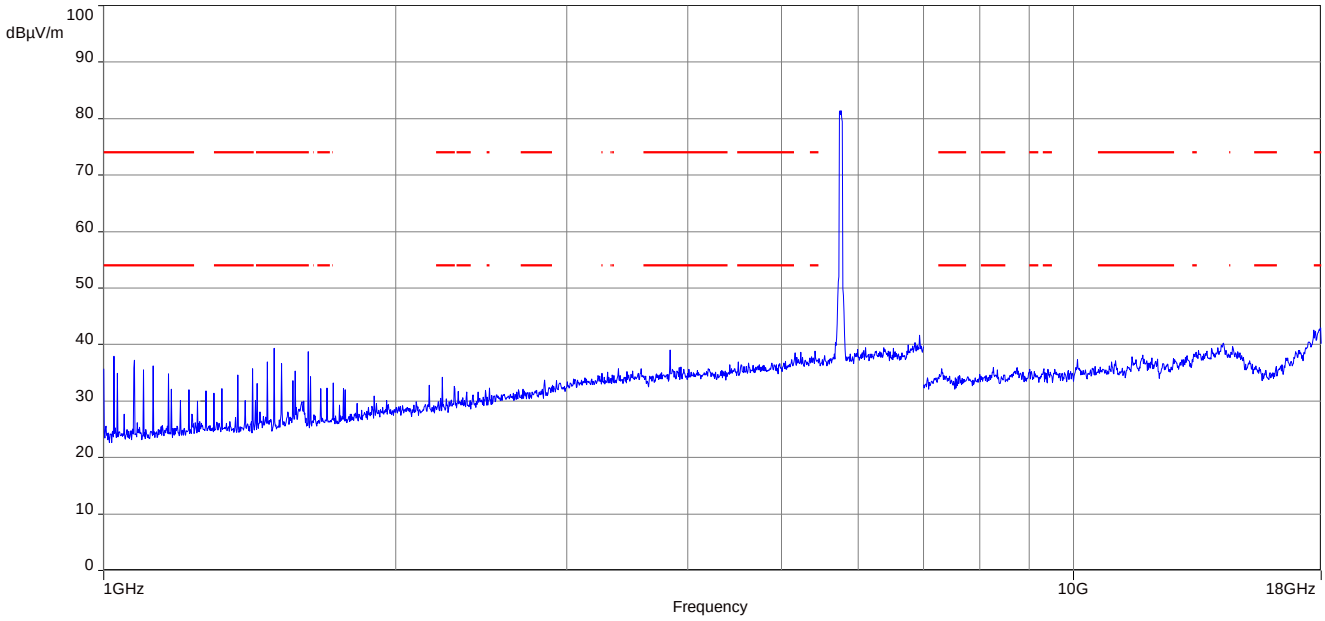
Plot 17: 30 MHz to 1 GHz, 5755 MHz, vertical & horizontal polarization



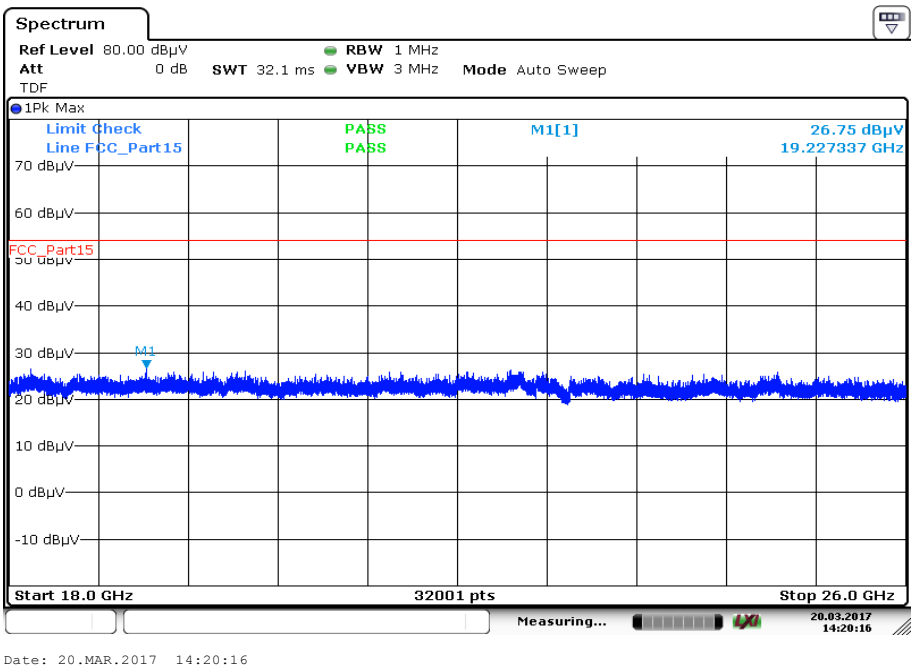
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
34.657050	20.09	30.00	9.91	1000.0	120.000	101.0	V	261.0	12.6
47.803050	24.96	30.00	5.04	1000.0	120.000	170.0	V	190.0	13.7
48.431100	24.91	30.00	5.09	1000.0	120.000	101.0	V	100.0	13.7
50.406150	25.78	30.00	4.22	1000.0	120.000	101.0	V	260.0	13.7
750.012900	29.70	36.00	6.30	1000.0	120.000	98.0	H	260.0	22.7
925.016400	30.89	36.00	5.11	1000.0	120.000	100.0	H	-8.0	24.3

Plot 18: 1 GHz to 18 GHz, 5755 MHz, vertical & horizontal polarization

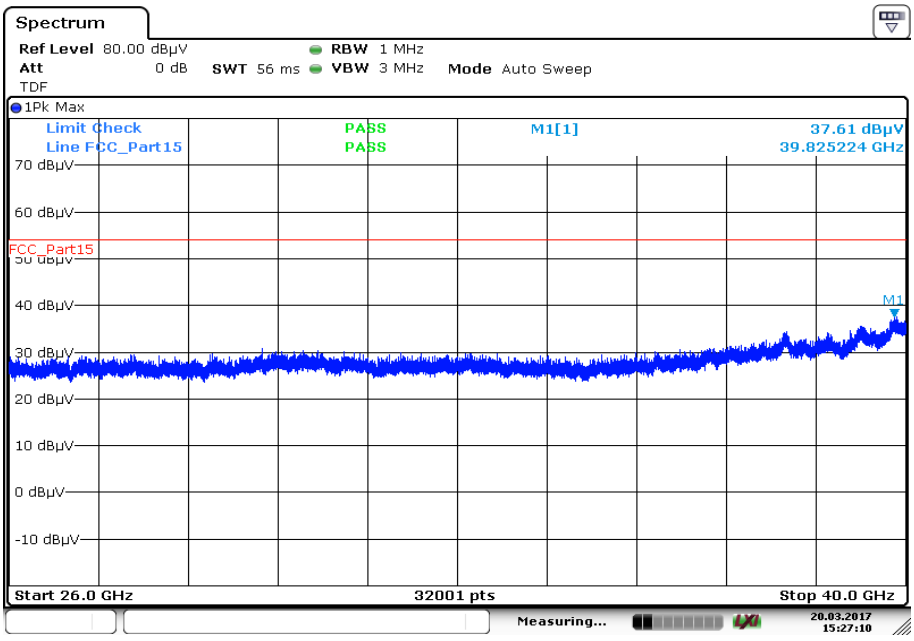


Plot 19: 18 GHz to 26 GHz, 5755 MHz, vertical & horizontal polarization



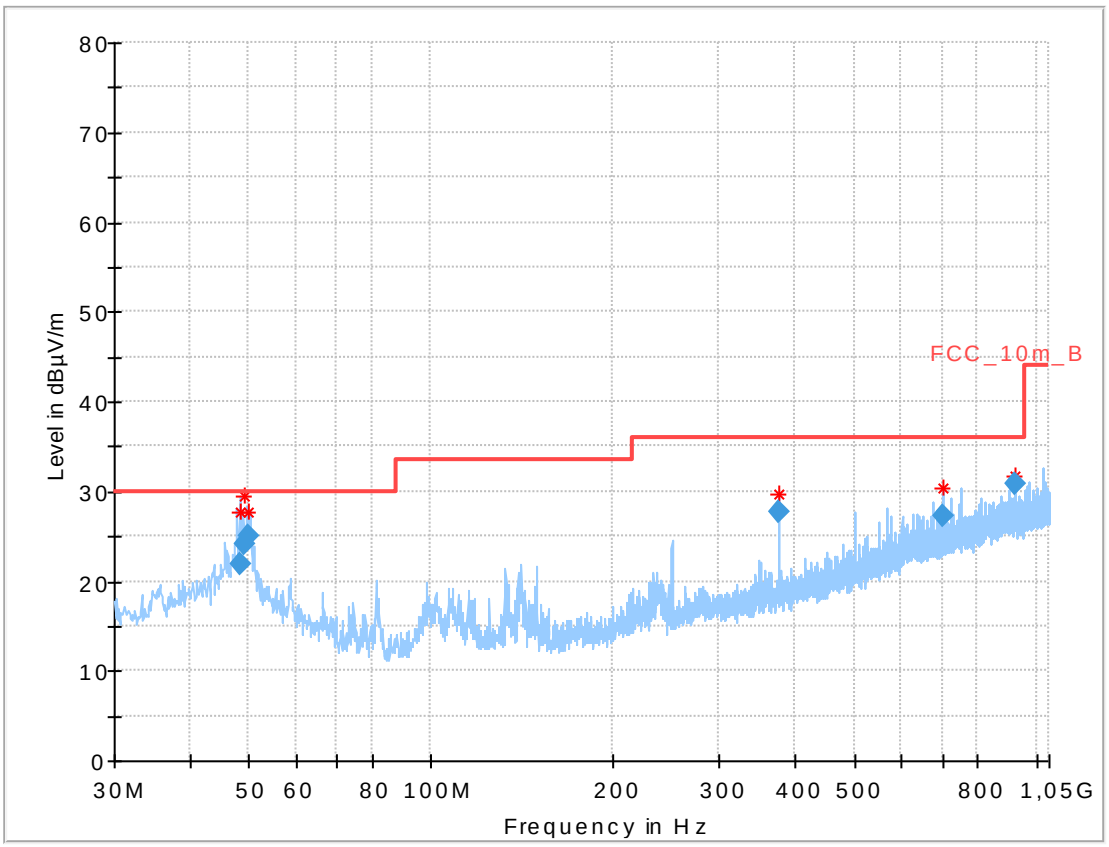
Date: 20.MAR.2017 14:20:16

Plot 20: 26 GHz to 40 GHz, 5755 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 15:27:11

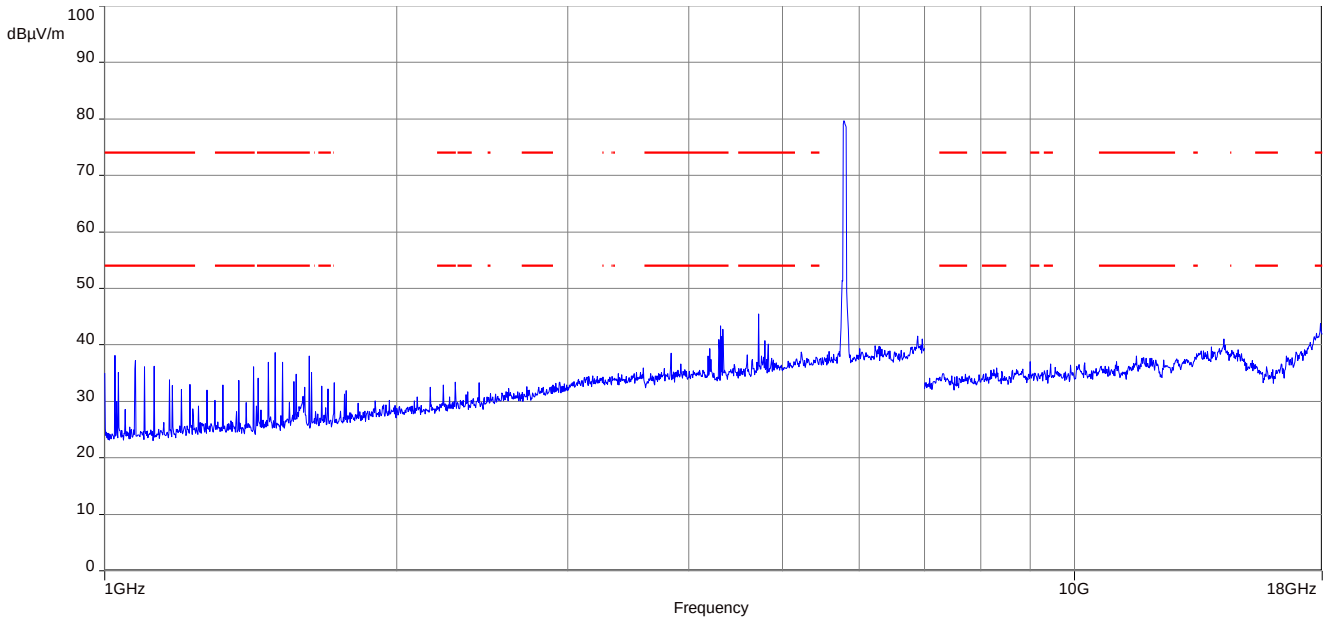
Plot 21: 30 MHz to 1 GHz, 5795 MHz, vertical & horizontal polarization



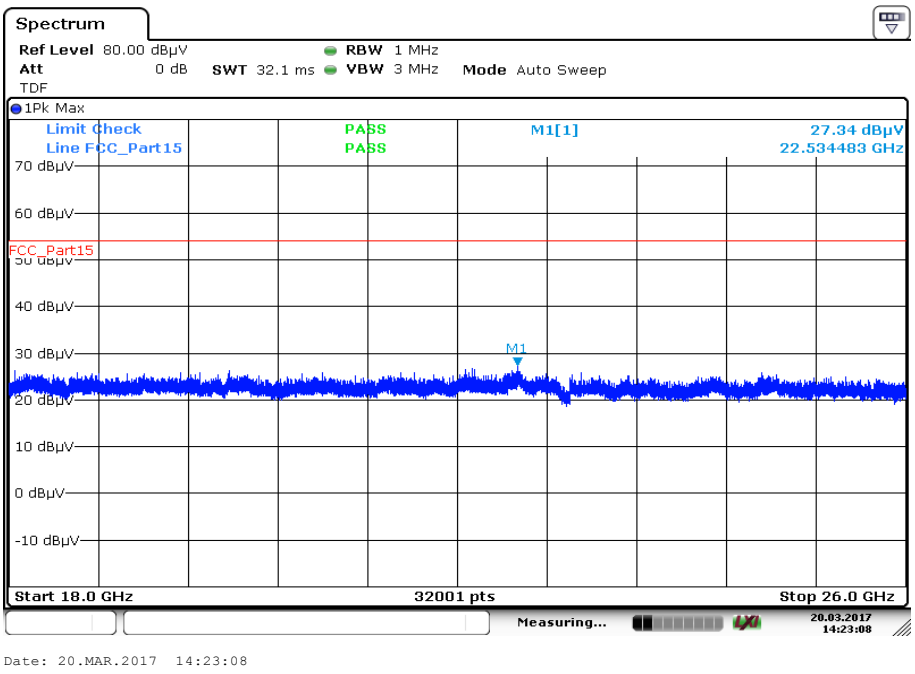
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
48.438750	21.99	30.00	8.01	1000.0	120.000	101.0	V	81.0	13.7
49.030650	24.09	30.00	5.91	1000.0	120.000	101.0	V	262.0	13.7
49.861650	25.02	30.00	4.98	1000.0	120.000	101.0	V	100.0	13.7
374.999700	27.67	36.00	8.33	1000.0	120.000	98.0	V	280.0	16.4
699.990000	27.36	36.00	8.64	1000.0	120.000	98.0	H	280.0	21.5
924.978600	30.93	36.00	5.07	1000.0	120.000	98.0	H	10.0	24.3

Plot 22: 1 GHz to 18 GHz, 5795 MHz, vertical & horizontal polarization

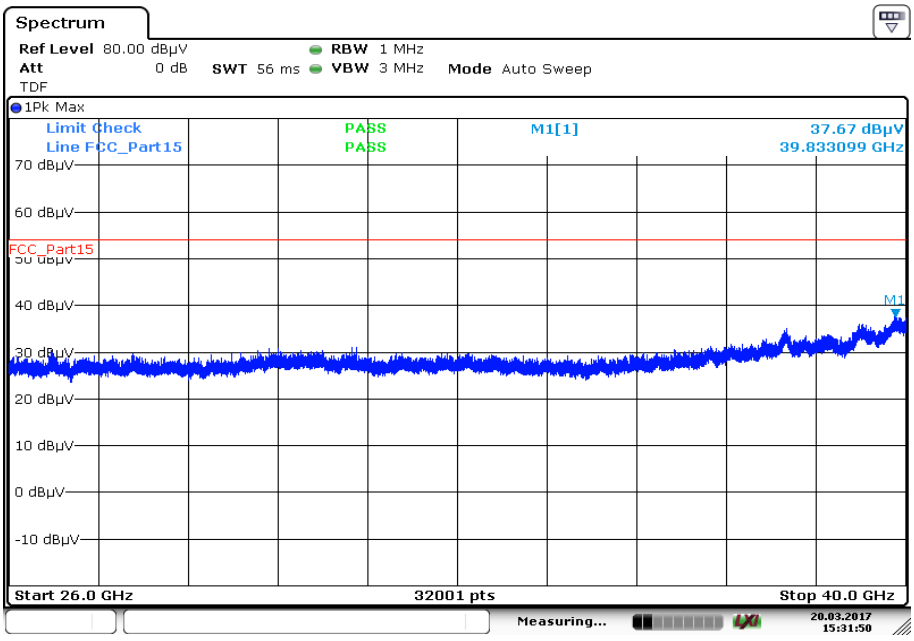


Plot 23: 18 GHz to 26 GHz, 5795 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 14:23:08

Plot 24: 26 GHz to 40 GHz, 5795 MHz, vertical & horizontal polarization



Date: 20.MAR.2017 15:31:51

11.11 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
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 sub clause 6.1 – A See sub clause 6.2 – A See sub clause 6.3 – A
Measurement uncertainty:	See sub clause 8

Limits:

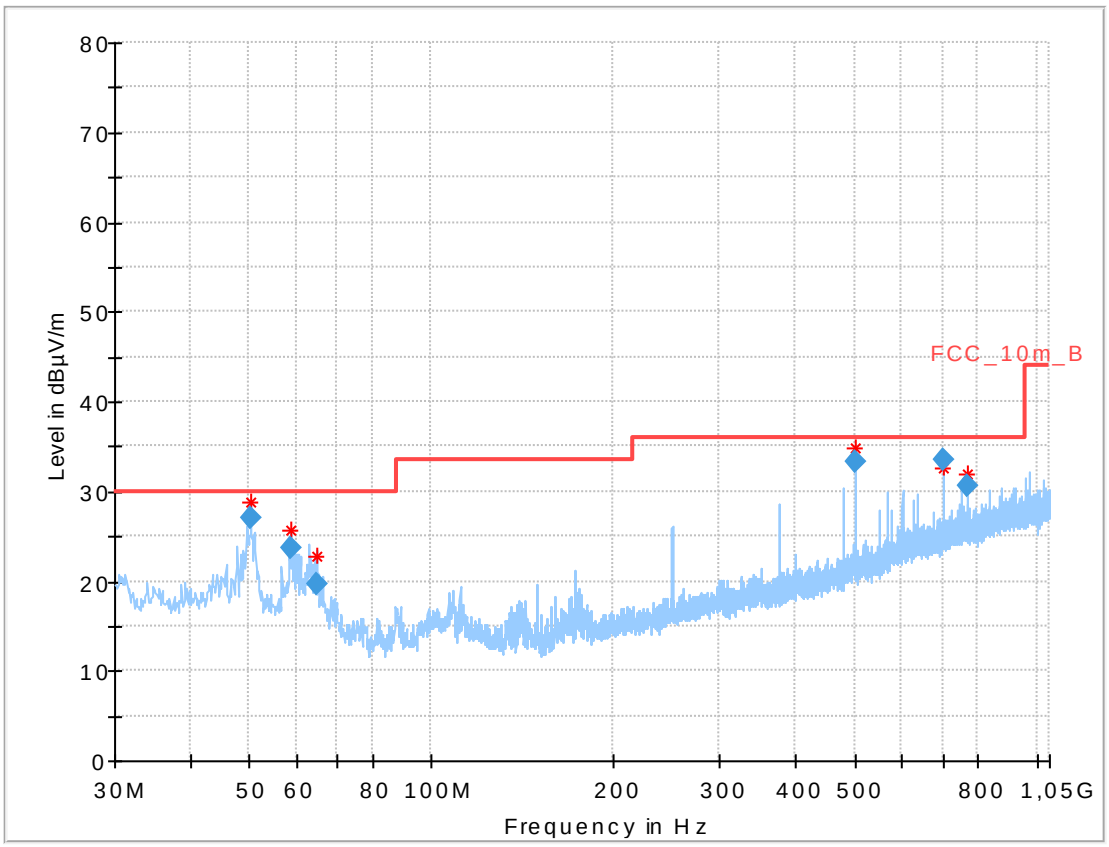
RX Spurious Emissions Radiated		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

TX Spurious Emissions Radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
1025	Peak	45.4
	AVG	41.7
1075	Peak	41.3
	AVG	39.0
1440	Peak	41.5
	AVG	39.2
1475	Peak	43.3
	AVG	41.0
1500	Peak	45.2
	AVG	41.5
1625	Peak	41.5
	AVG	39.2

Plots:

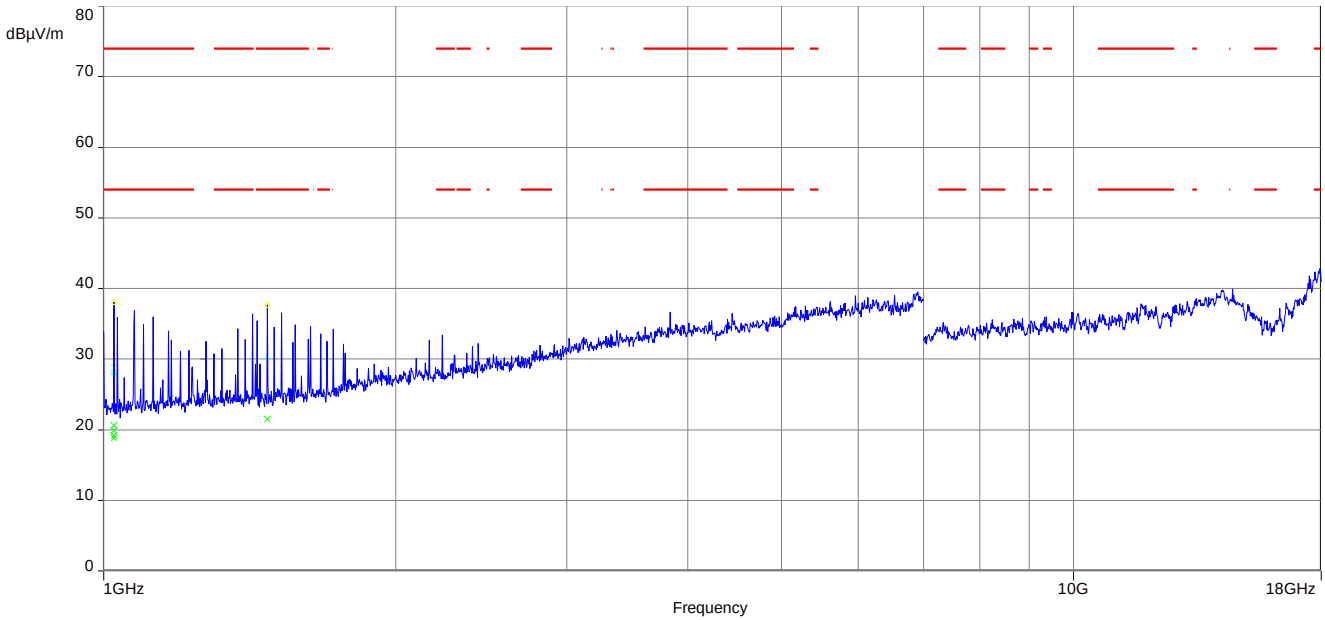
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization



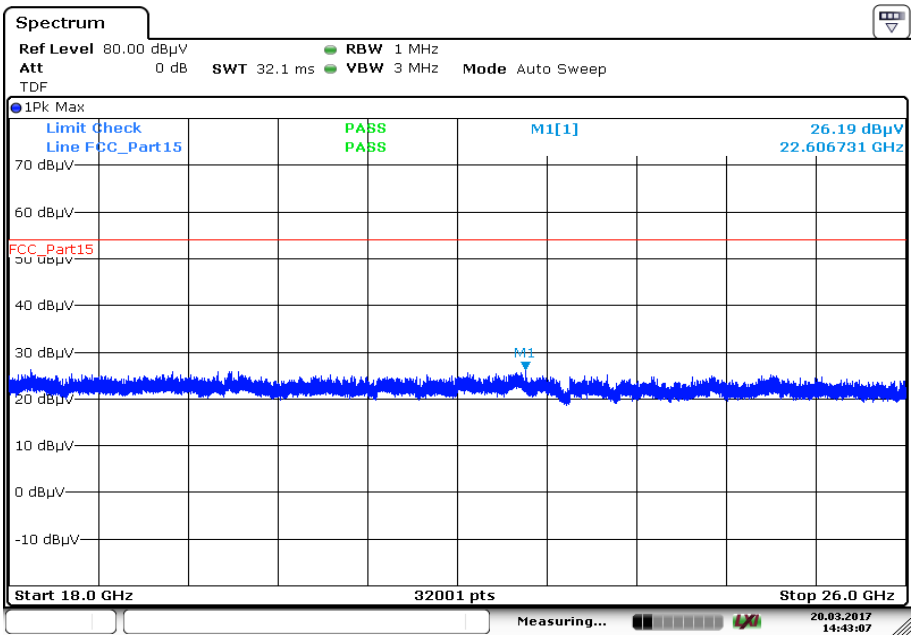
Final results:

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
50.456700	27.14	30.00	2.86	1000.0	120.000	98.0	V	248.0	13.7
58.720050	23.76	30.00	6.24	1000.0	120.000	98.0	V	237.0	12.2
64.769400	19.77	30.00	10.23	1000.0	120.000	100.0	V	187.0	10.8
500.019750	33.21	36.00	2.79	1000.0	120.000	100.0	H	111.0	18.7
700.004550	33.49	36.00	2.51	1000.0	120.000	101.0	H	111.0	21.6
766.673700	30.56	36.00	5.44	1000.0	120.000	98.0	H	154.0	22.7

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

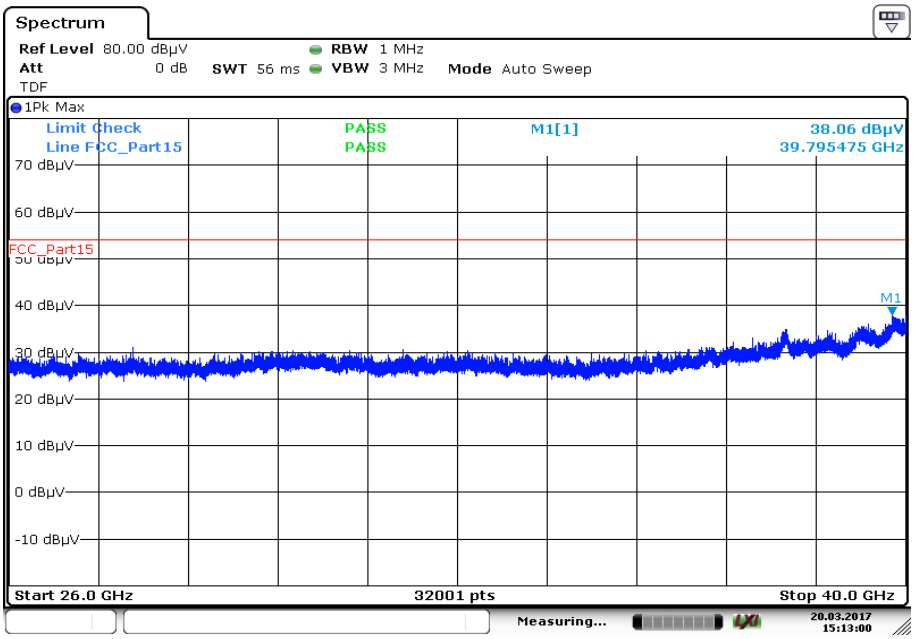


Plot 3: 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 20.MAR.2017 14:43:08

Plot 4: 26 GHz to 40 GHz, vertical & horizontal polarization



Date: 20.MAR.2017 15:13:00

11.12 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 sub clause 7.2 – C
Measurement uncertainty:	See sub clause 8

Limits:

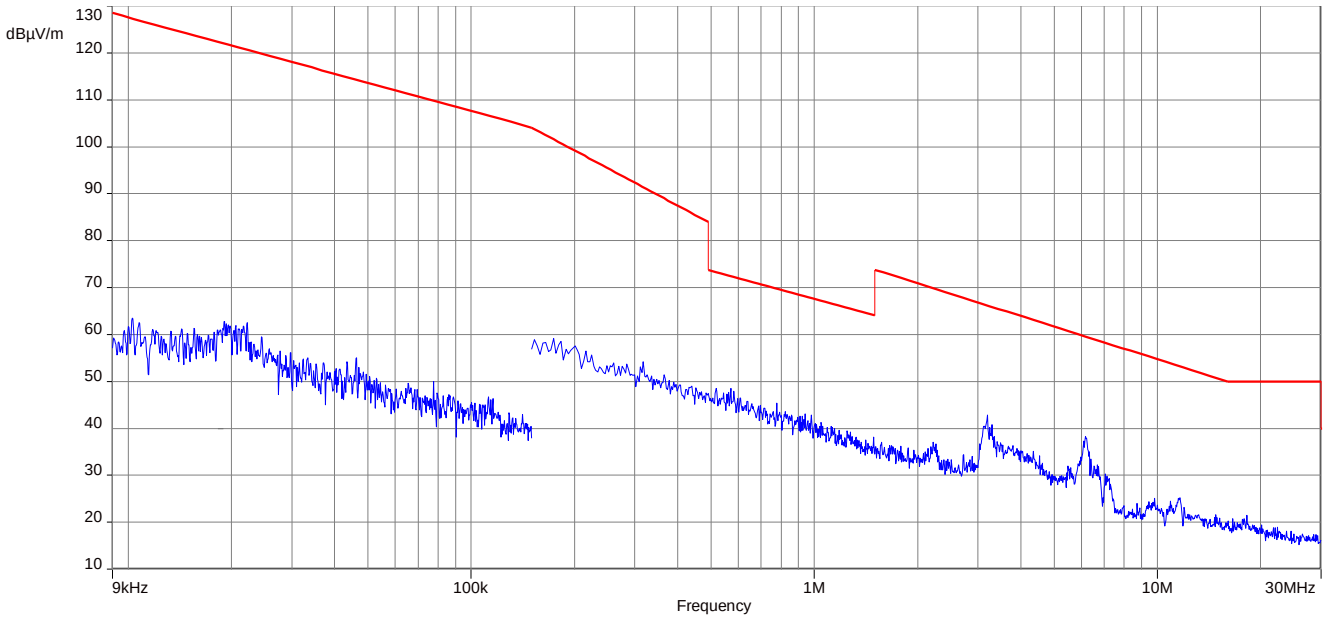
Spurious Emissions Radiated < 30 MHz		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results:

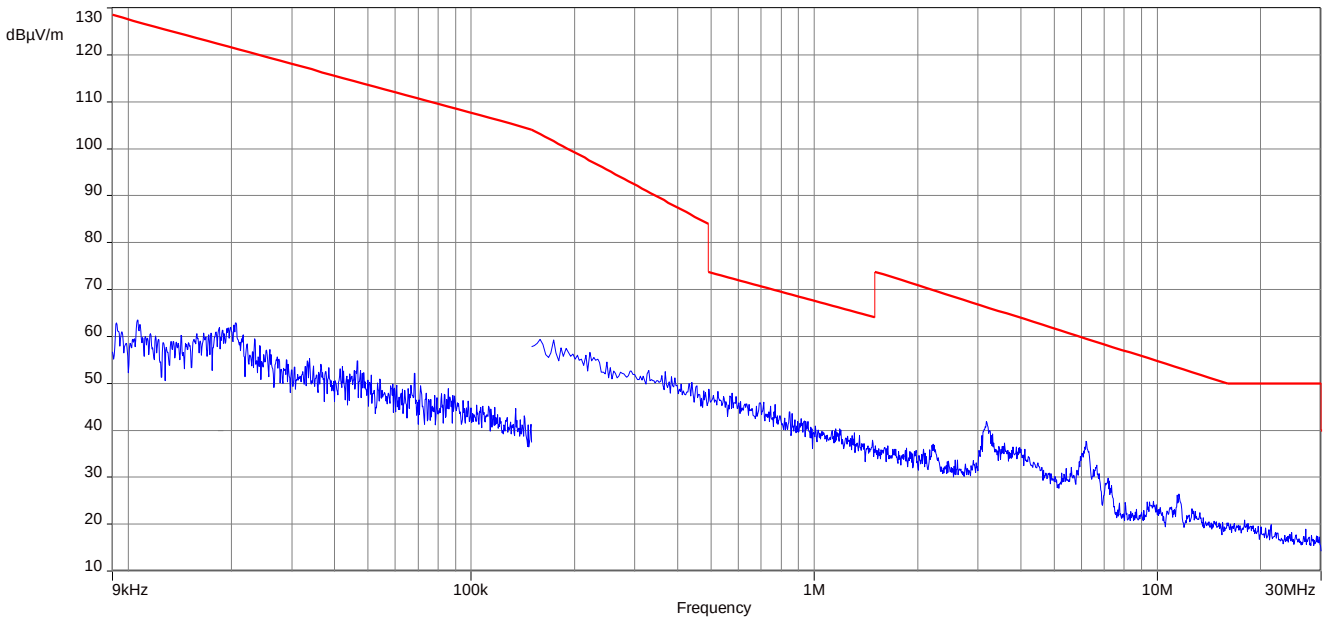
Spurious Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.		

Plots:

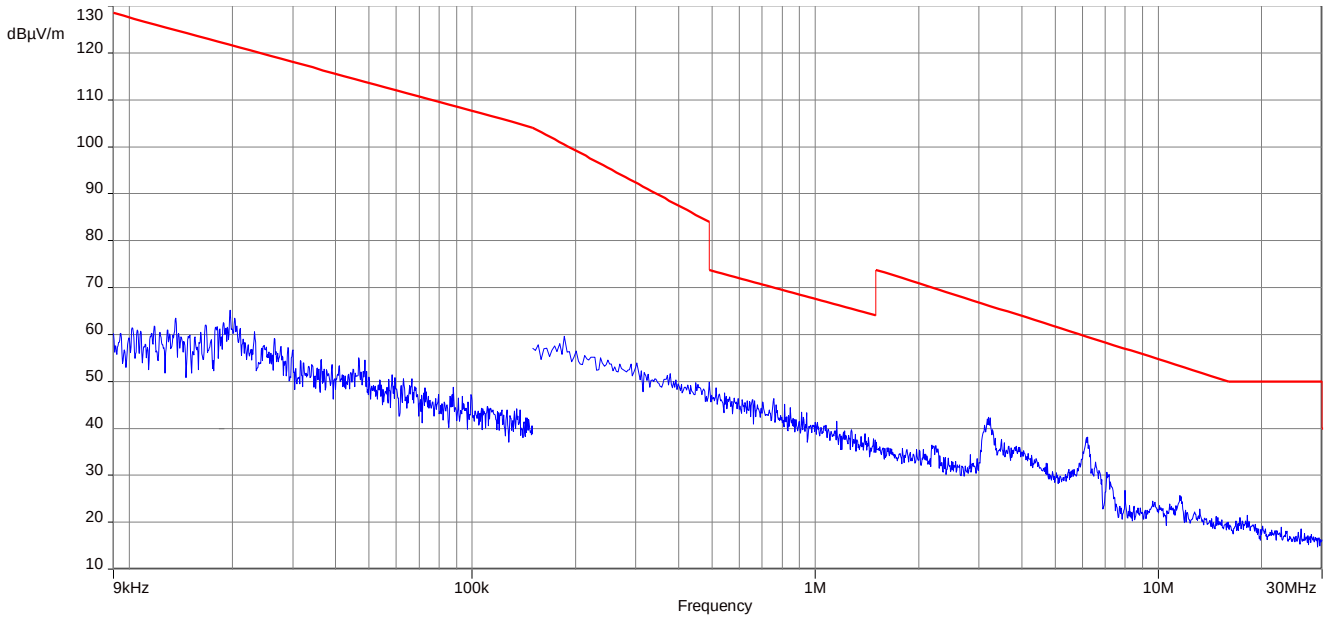
Plot 1: 9 kHz to 30 MHz, OFDM 20 MHz, 5180 MHz



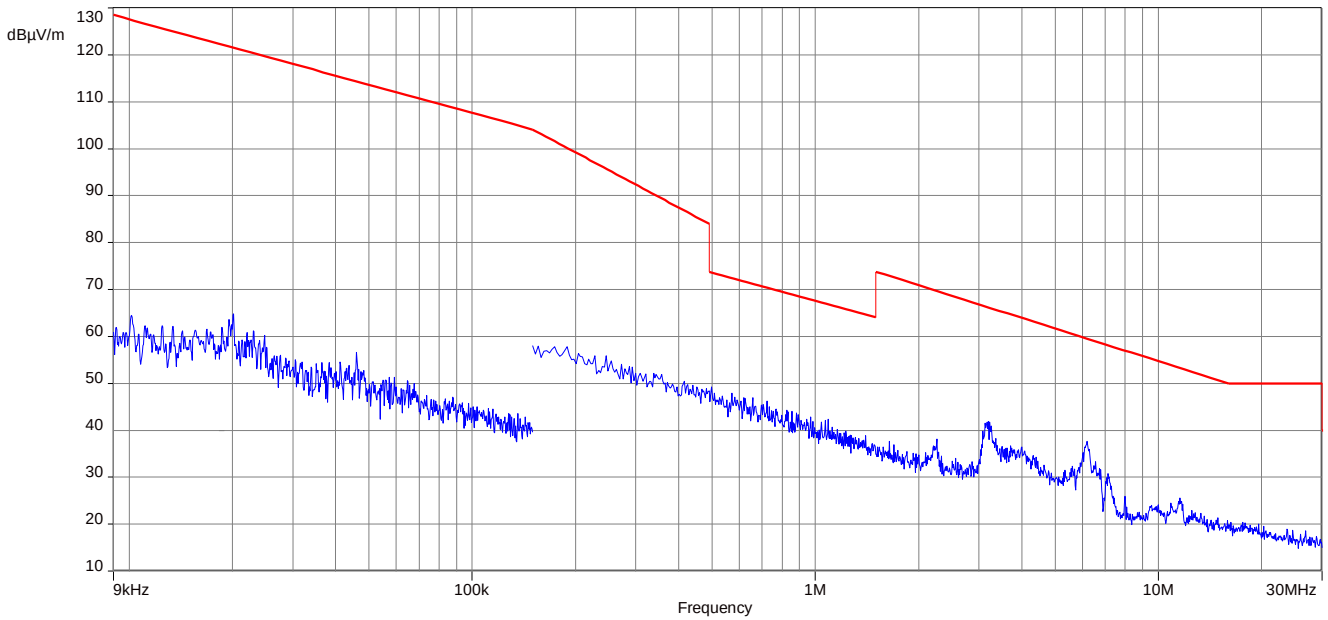
Plot 2: 9 kHz to 30 MHz, OFDM 20 MHz, 5240 MHz



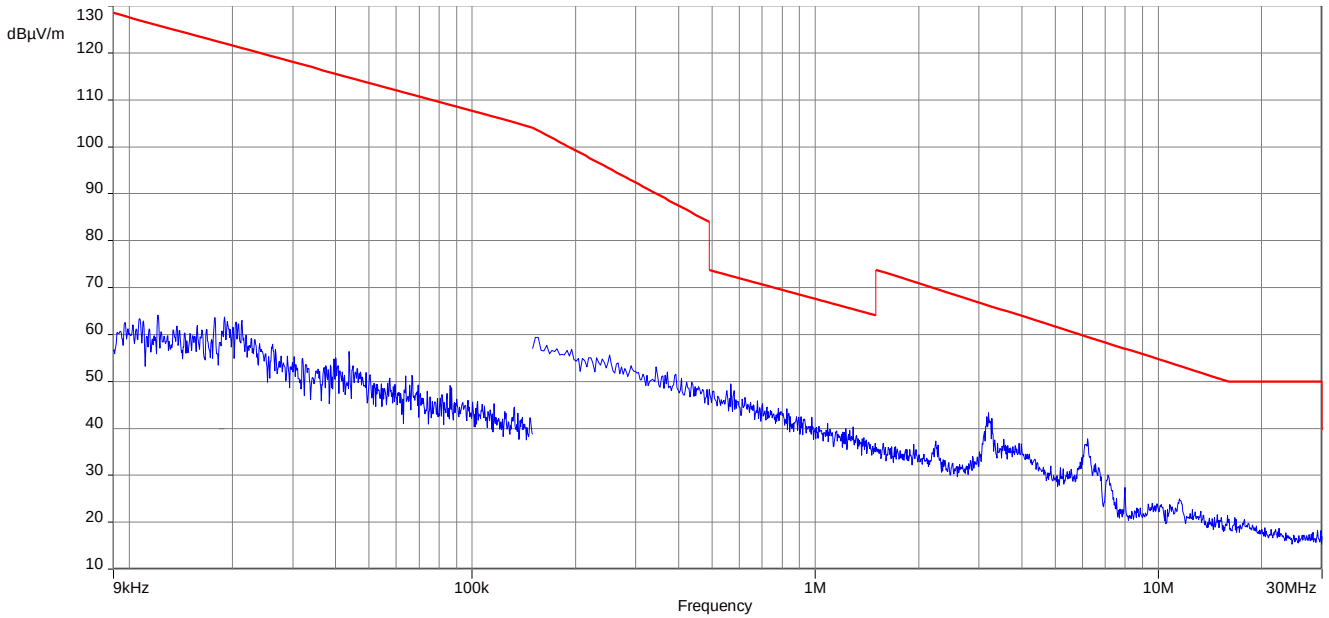
Plot 3: 9 kHz to 30 MHz, OFDM 20 MHz, 5260 MHz



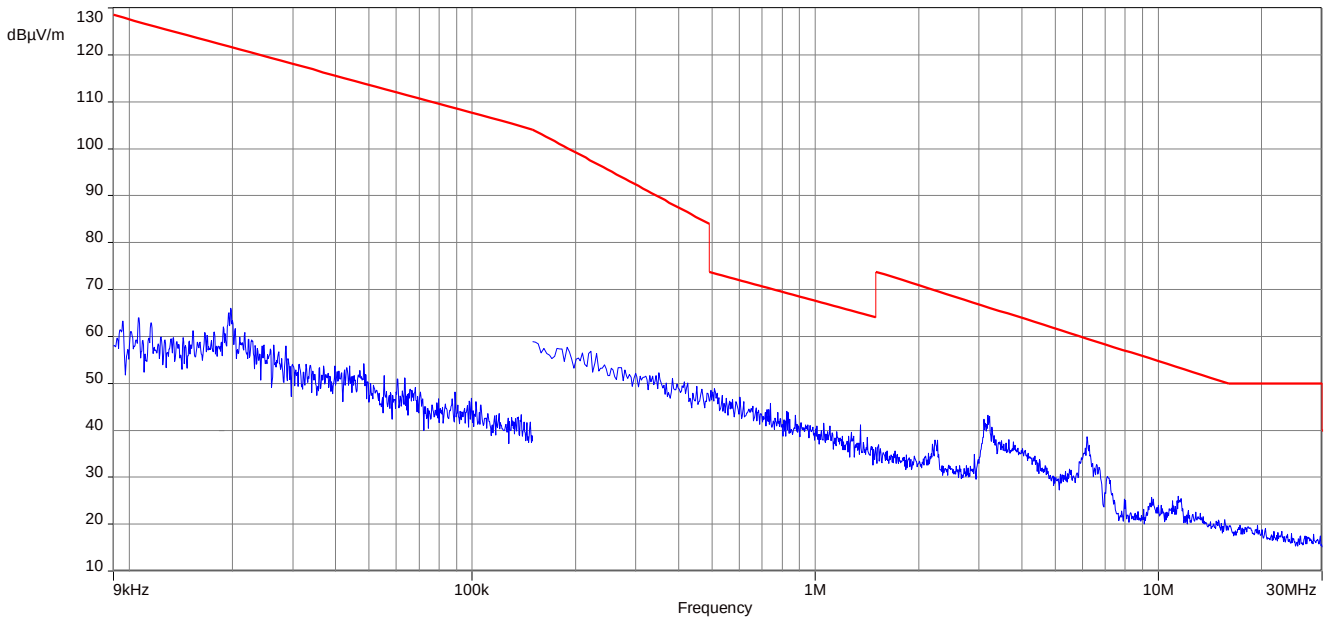
Plot 4: 9 kHz to 30 MHz, OFDM 20 MHz, 5320 MHz



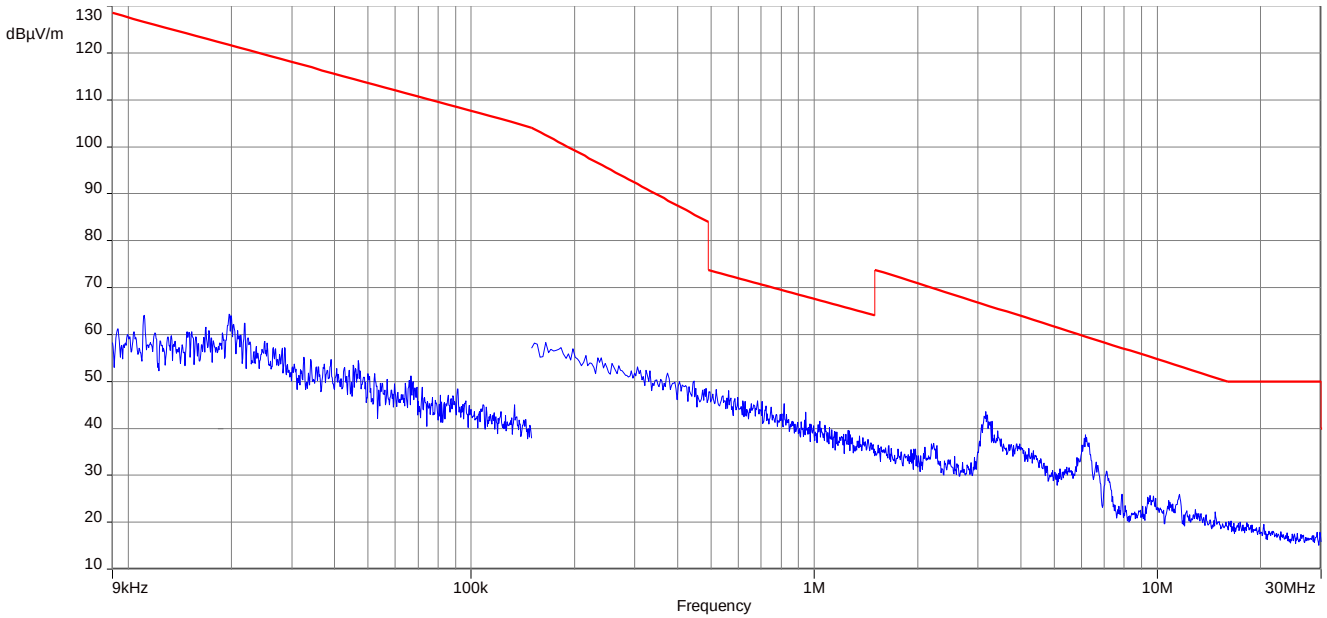
Plot 5: 9 kHz to 30 MHz, OFDM 20 MHz, 5745 MHz



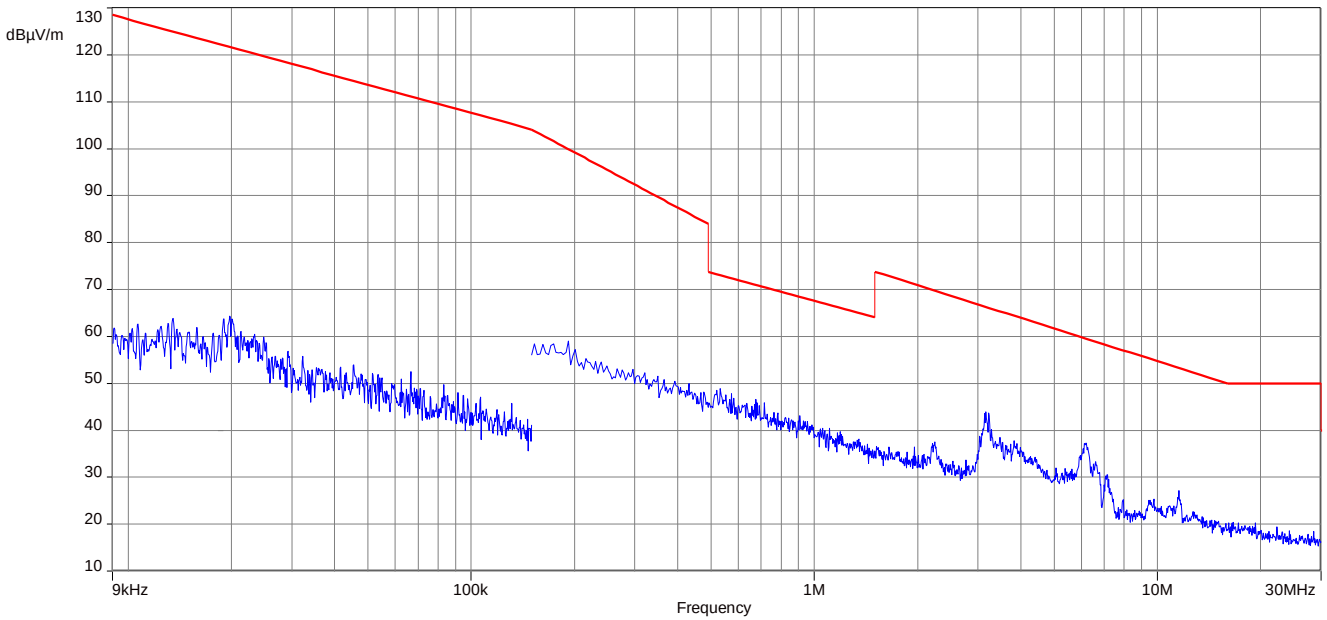
Plot 6: 9 kHz to 30 MHz, OFDM 20 MHz, 5785 MHz



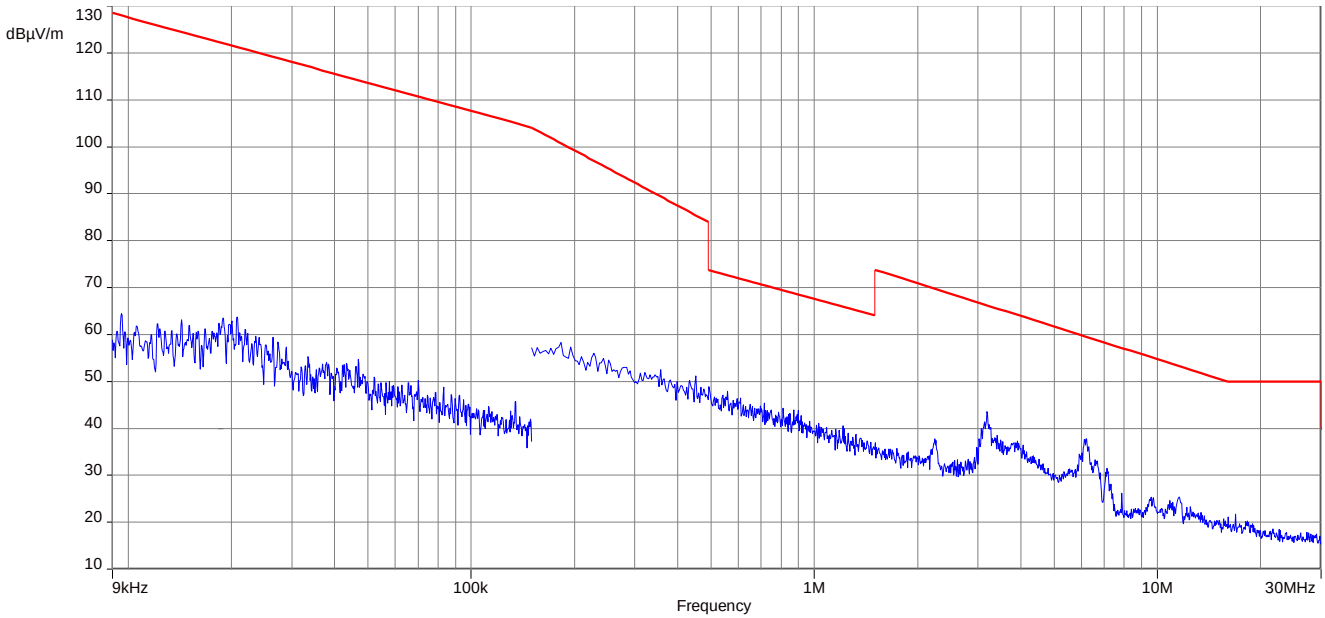
Plot 7: 9 kHz to 30 MHz, OFDM 20 MHz, 5825 MHz



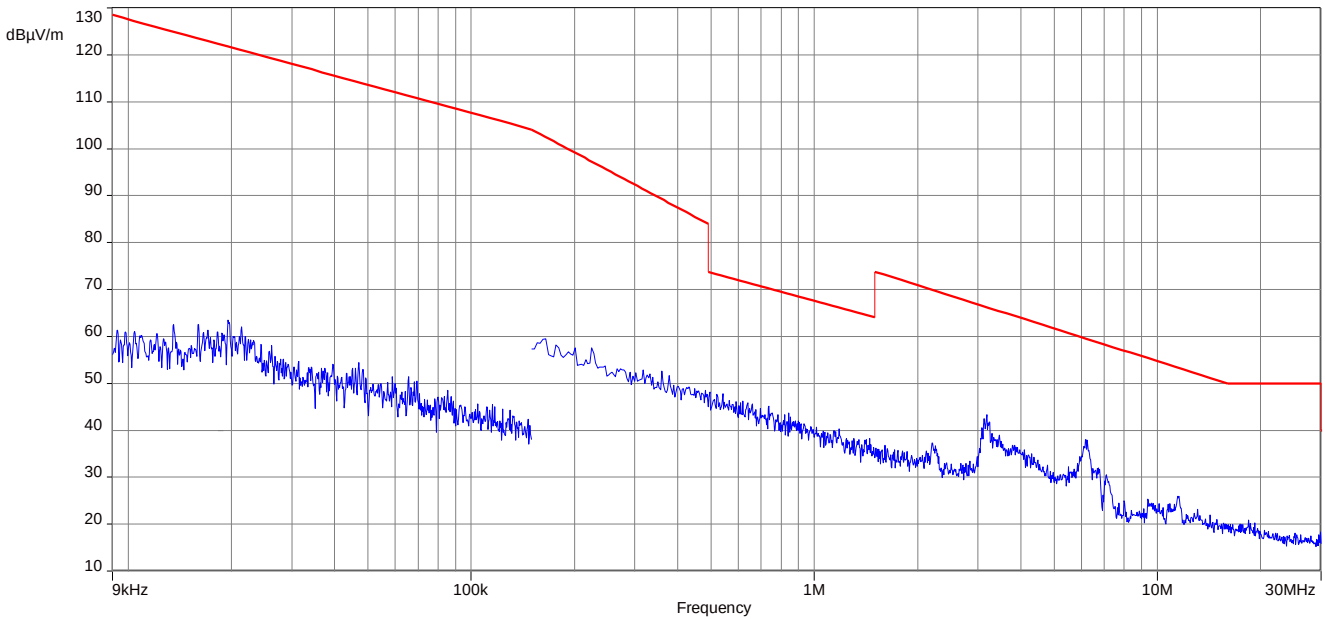
Plot 8: 9 kHz to 30 MHz, OFDM 40 MHz, 5190 MHz



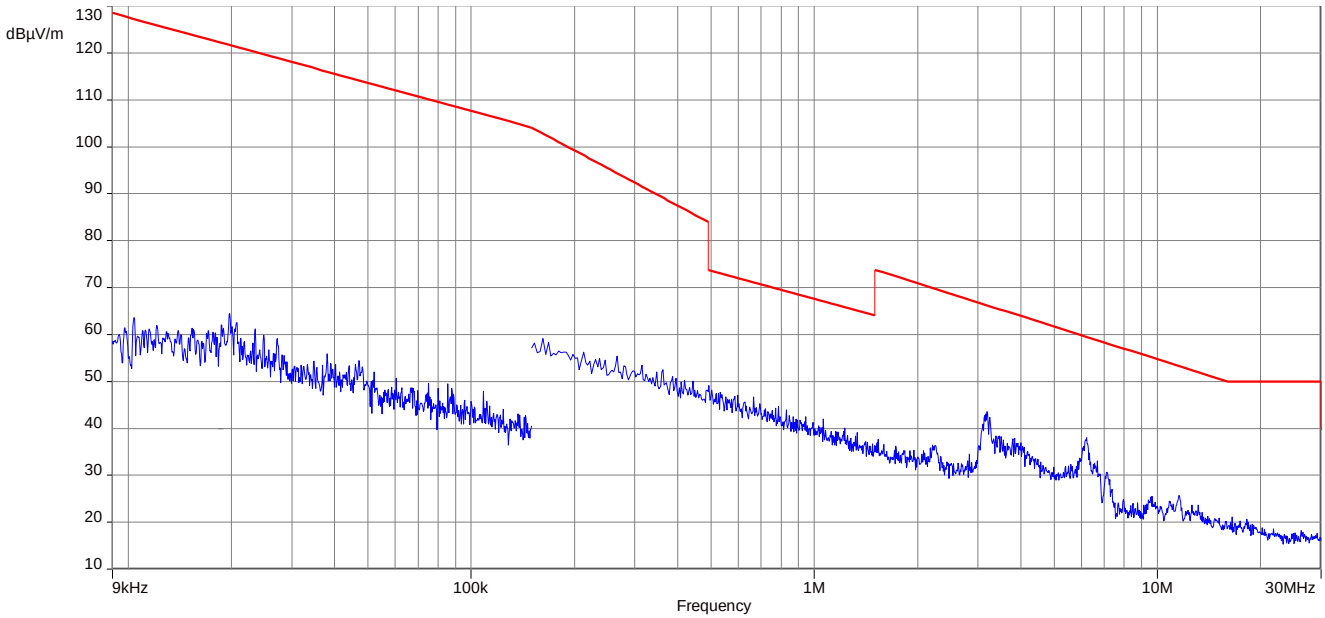
Plot 9: 9 kHz to 30 MHz, OFDM 40 MHz, 5230 MHz



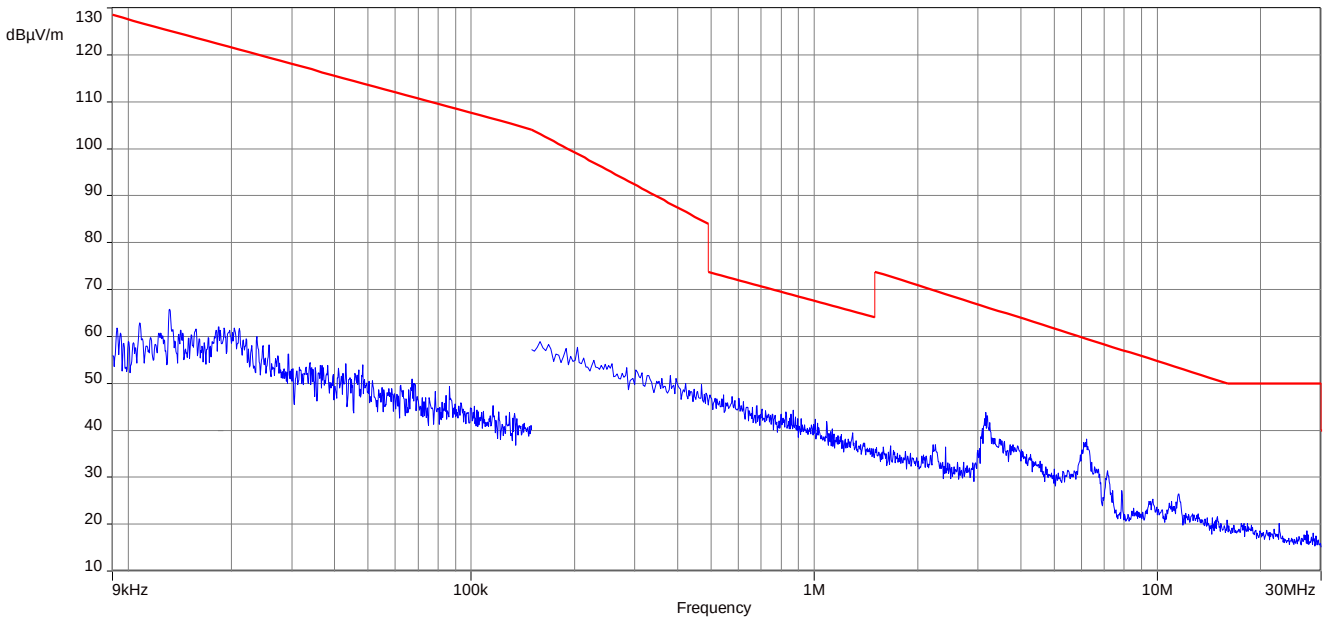
Plot 10: 9 kHz to 30 MHz, OFDM 40 MHz, 5270 MHz



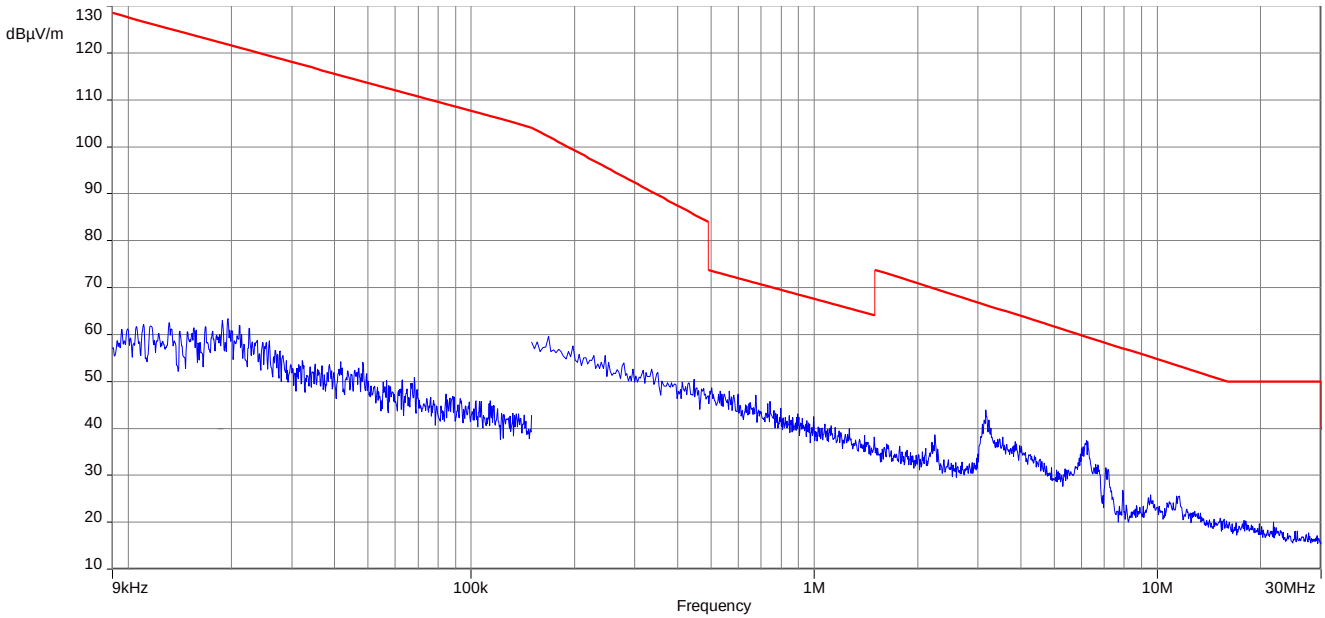
Plot 11: 9 kHz to 30 MHz, OFDM 40 MHz, 5310 MHz



Plot 12: 9 kHz to 30 MHz, OFDM 40 MHz, 5755 MHz



Plot 13: 9 kHz to 30 MHz, OFDM 40 MHz, 5795 MHz



11.13 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 re-measured with average and quasi peak detection to show compliance to the limits.

Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Video bandwidth:	9 kHz
Resolution bandwidth:	100 kHz
Span:	150 kHz to 30 MHz
Trace – mode:	Max Hold
Test setup:	See sub clause 7.4 – A
Measurement uncertainty:	See sub clause 8

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

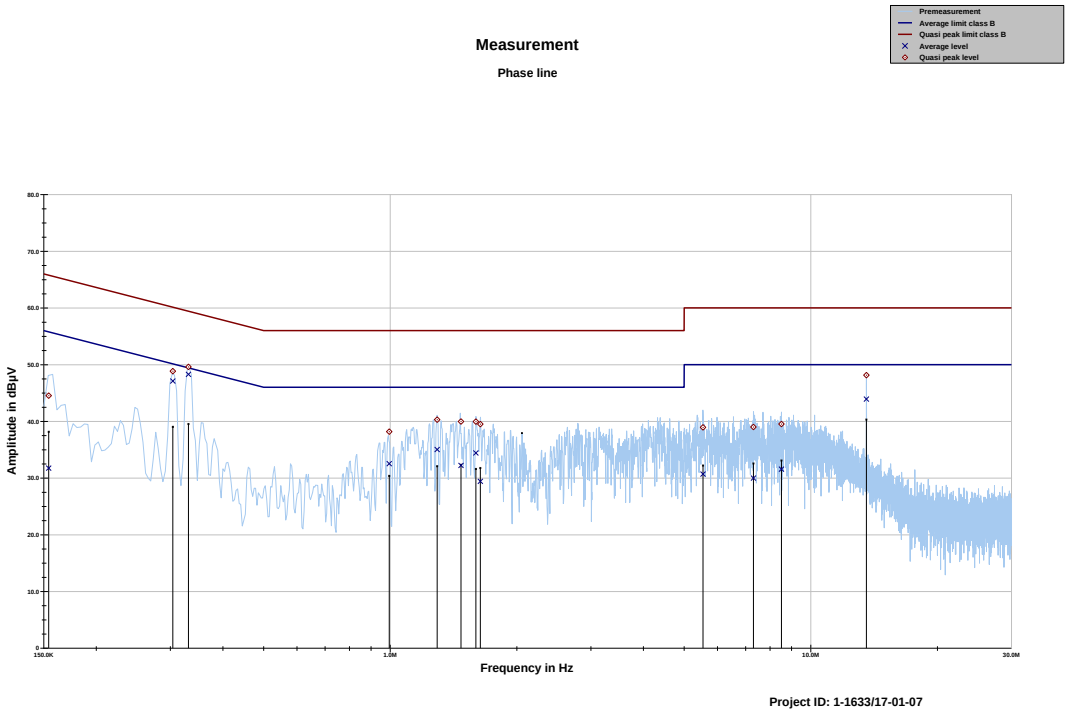
*Decreases with the logarithm of the frequency

Results:

Spurious Emissions Conducted < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected emissions are more than 20 dB below the limit.		

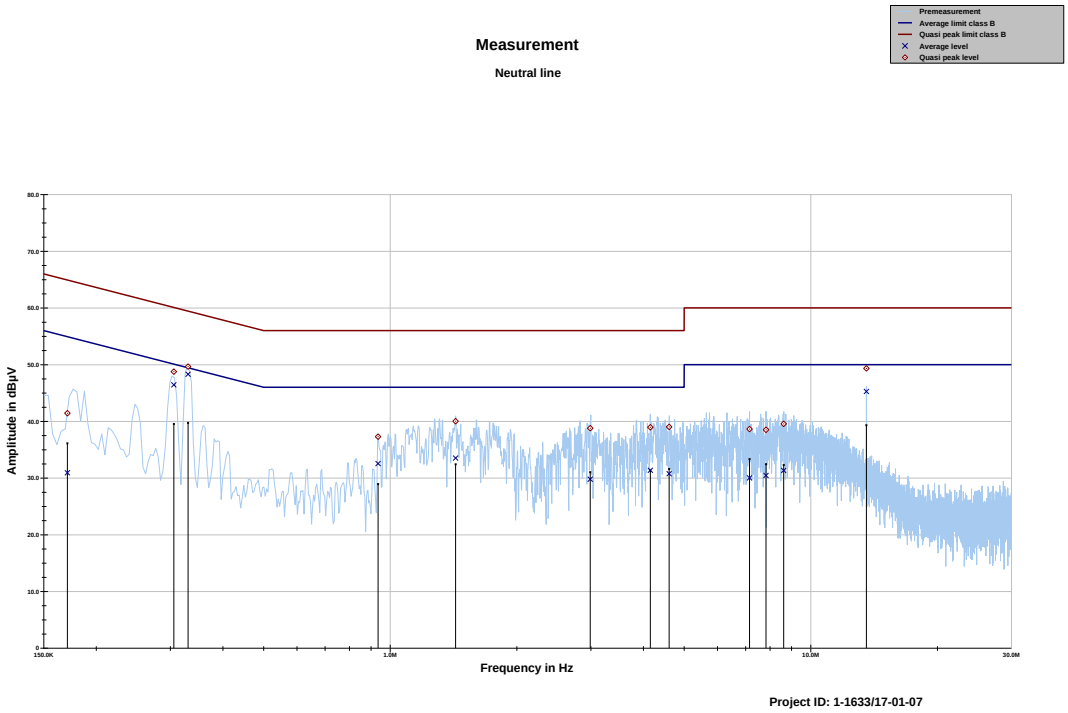
Plots:

Plot 1: 150 kHz to 30 MHz, phase line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.154129	44.54	21.24	65.774	31.75	24.14	55.882
0.304107	48.84	11.29	60.130	47.10	4.49	51.597
0.331349	49.59	9.82	59.417	48.28	2.54	50.819
0.994879	38.17	17.83	56.000	32.53	13.47	46.000
1.293271	40.30	15.70	56.000	35.03	10.97	46.000
1.472988	39.97	16.03	56.000	32.23	13.77	46.000
1.598100	39.95	16.05	56.000	34.41	11.59	46.000
1.637919	39.51	16.49	56.000	29.42	16.58	46.000
5.544170	38.94	21.06	60.000	30.70	19.30	50.000
7.305081	39.00	21.00	60.000	29.99	20.01	50.000
8.516063	39.52	20.48	60.000	31.57	18.43	50.000
13.558354	48.14	11.86	60.000	43.93	6.07	50.000

Plot 2: 150 kHz to 30 MHz, neutral line



Frequency	Quasi peak level	Margin quasi peak	Limit QP	Average level	Margin average	Limit AV
MHz	dBµV	dB	dBµV	dBµV	dB	dBµV
0.170746	41.43	23.49	64.924	30.93	24.48	55.407
0.305845	48.77	11.31	60.083	46.43	5.12	51.547
0.330706	49.65	9.78	59.433	48.30	2.53	50.837
0.935903	37.30	18.70	56.000	32.54	13.46	46.000
1.430211	40.01	15.99	56.000	33.51	12.49	46.000
2.988888	38.78	17.22	56.000	29.79	16.21	46.000
4.155235	38.95	17.05	56.000	31.37	14.63	46.000
4.606045	39.01	16.99	56.000	30.76	15.24	46.000
7.152471	38.63	21.37	60.000	30.03	19.97	50.000
7.827667	38.51	21.49	60.000	30.44	19.56	50.000
8.621695	39.56	20.44	60.000	31.33	18.67	50.000
13.560184	49.33	10.67	60.000	45.28	4.72	50.000

12 Observations

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

Annex A Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
ETSI	European Telecommunications Standard Institute
EN	European Standard
FCC	Federal Communication Commission
FCC ID	Company Identifier at FCC
IC	Industry Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
NOP	Non occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Clean wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum

Annex B Document history

Version	Applied changes	Date of release
-/-	Initial release	2017-06-21
A	EUT photo changed	2017-07-04
B	FCC-ID, IC number, PMN and HVIN changed	2017-07-06

Annex C Accreditation Certificate

first page	last page

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

CTC advanced 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 25.11.2016 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig bis 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 63 Seiten.

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

Frankfurt, 25.11.2016

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

Siehe Hinweise auf der Rückseite

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http://www.dakks.de/as/ast/d/D-PL-12076-01-01.pdf

http://www.dakks.de/as/ast/d/D-PL-12076-01-02.pdf