
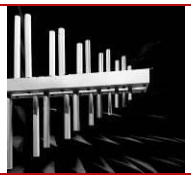
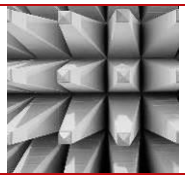

CETECOM™
CETECOM ICT Services
consulting - testing - certification

TEST REPORT

Test report no.: 1-7682/14-01-04-B

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

Testing laboratory

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

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

Applicant

Echostar Technologies
90 Inverness Circle East
Englewood CO 80112 / USA
Phone: -/-
Fax: -/-
Contact: Ian Schroeder
Regulatory Compliance Engineer
e-mail: Ian.schroeder@echostar.com
Phone: +1 303 706-5234

Manufacturer

Echostar Technologies
90 Inverness Circle East
Englewood CO 80112 / USA

Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8	Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

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

Test Item

Kind of test item:	**TV streaming media device**
Model name:	**M1**
FCC ID:	**DKN-L37**
IC:	**1707A-L37**
Frequency:	DTS band 5725 MHz to 5850 MHz (lowest channel 149 – 5745 MHz; highest channel 165 – 5825 MHz)
Technology tested:	WLAN (OFDM / a –; n HT20 & HT40 – mode)
Antenna:	Integrated antenna
Power supply:	110 V AC by mains adapter
Temperature range:	-30°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.

Test report authorised:

cn=Stefan Boes, o=CETECOM ICT Services GmbH, ou=BOE-111011, email=Stefan.Boes@cetecom.com, c=DE
2014.05.27 15:11:47 +02'00'

Stefan Bös
Senior Testing Manager

Test performed:

cn=Marco Bertolino, o=CETECOM ICT Services GmbH, ou=BTL-100826, email=marco.bertolino@cetecom.com, c=DE
2014.05.27 15:49:50 +02'00'

Marco Bertolino
Testing Manager

1 Table of contents

2 General information

2.1 Notes and disclaimer

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

2.2 Application details

Date of receipt of order:	2014-03-24
Date of receipt of test item:	2014-04-22
Start of test:	2014-04-22
End of test:	2014-05-07
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	-/-	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 8	01.12.2010	Spectrum Management and Telecommunications Radio Standards Specification - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

3.1 Measurement guidance

DTS : KDB 558074	2013-04	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

4 Test environment

Temperature:	T_{nom}	+22 °C	during room temperature tests
	T_{max}	+50 °C	during high temperature tests
	T_{min}	-30 °C	during low temperature tests
Relative humidity content:		43 %	
Barometric pressure:		not relevant for this kind of testing	
Power supply:	V_{nom}	110 V	AC by mains adapter
	V_{max}	121 V	
	V_{min}	99 V	

5 Test item

Kind of test item	**:**	**TV streaming media device**
Type identification	**:**	**M1**
S/N serial number	**:**	**No information available!**
HW hardware status	**:**	**1.0.1.**
SW software status	**:**	**Secured: 0.2.272 (No 364 & 383)**
Frequency band [MHz]	**:**	**DTS band 5725 MHz to 5850 MHz (lowest channel 149 – 5745 MHz; highest channel 165 – 5825 MHz)**
Type of radio transmission **Use of frequency spectrum**	**:** **:**	**OFDM**
Type of modulation	**:**	**BPSK, QPSK, 16 – QAM; 64 – QAM and 256 – QAM**
Number of channels	**:**	**5**
Antenna	**:**	**Integrated antenna**
Power supply	**:**	**110 V AC by mains adapter**
Temperature range	**:**	**-30°C to +50 °C**

5.1 Additional information

Test setup- and EUT-photos are included in test report: 1-7682/14-01-01_AnnexA
1-7682/14-01-01_AnnexB
1-7682/14-01-01_AnnexD

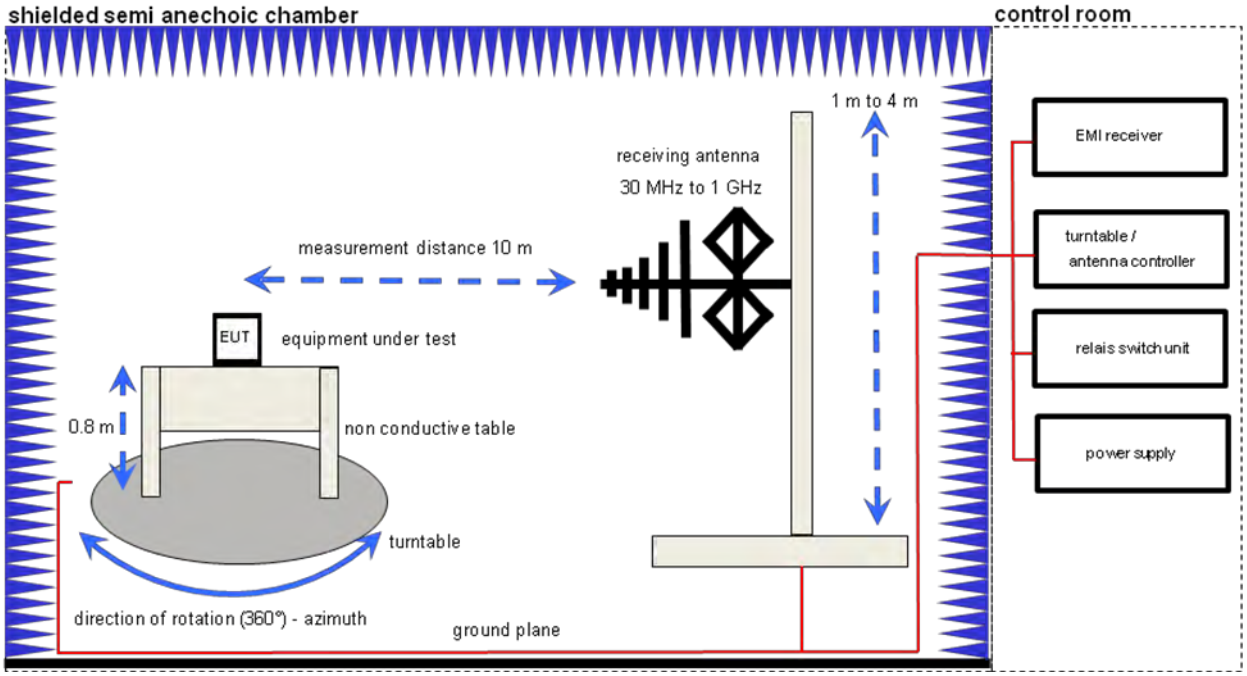
6 Test laboratories sub-contracted

None

7 Description of the test setup

7.1 Radiated measurements chamber F

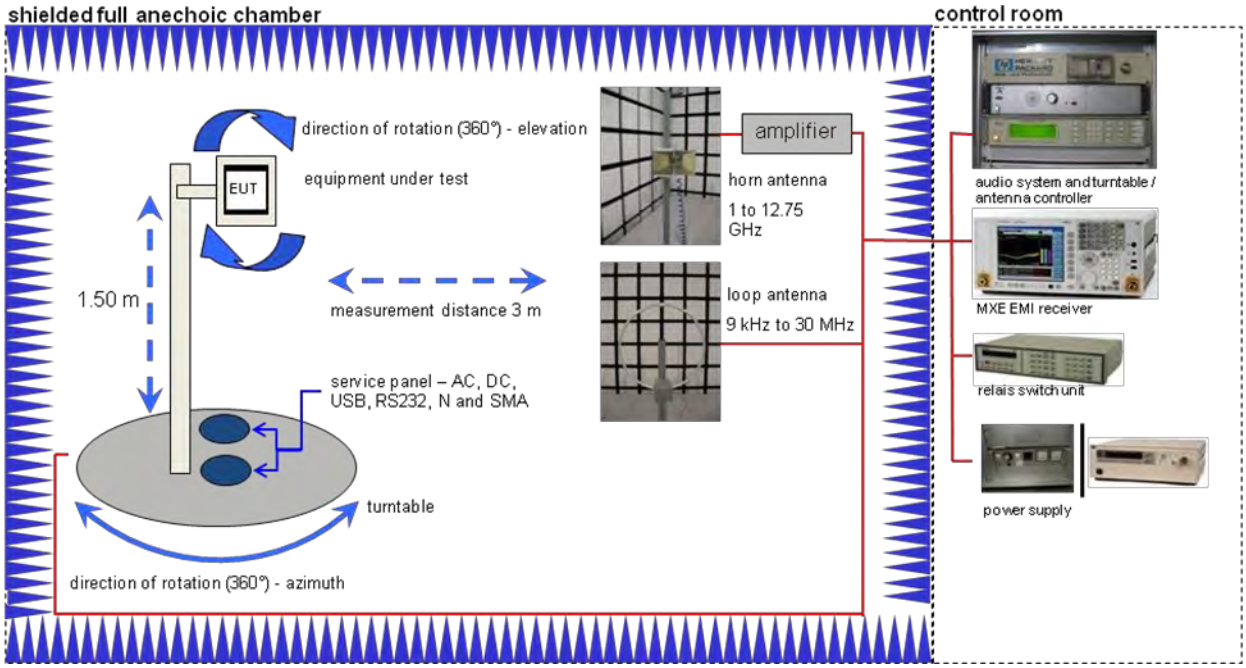
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas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



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368
DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580
EMI Test Receiver	ESCI 3	R&S	100083	300003312
Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379
Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745
Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746
Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747
TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787

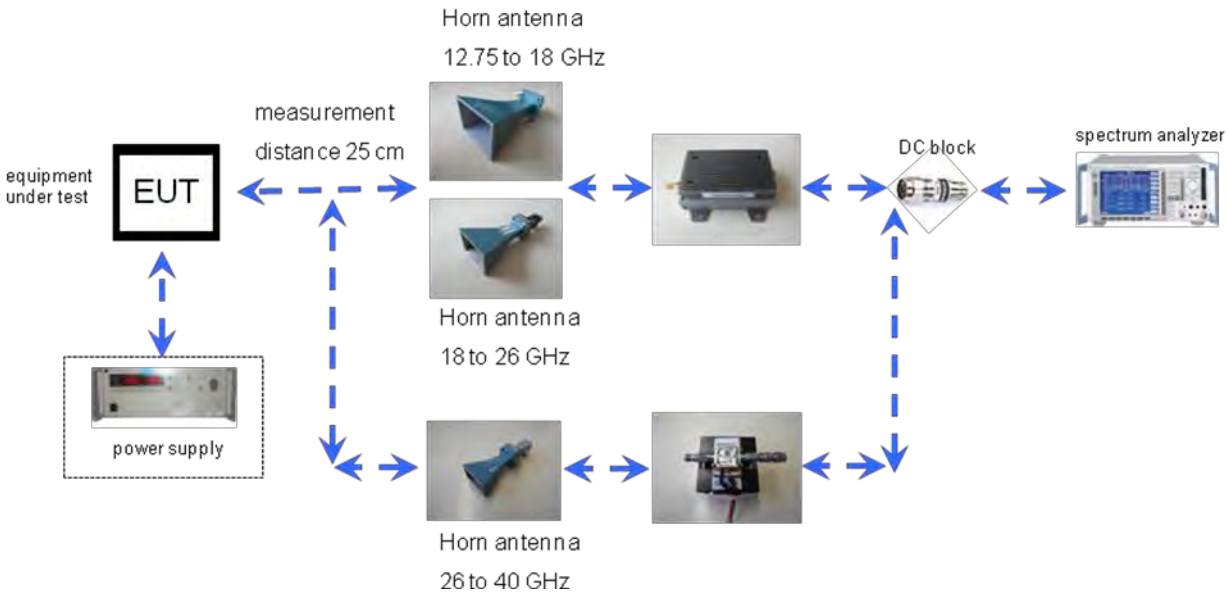
7.2 Radiated measurements chamber C



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789
Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032
Active Loop Antenna	6502	EMCO	8905-2342	300000256
Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156
Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155
Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997
Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143

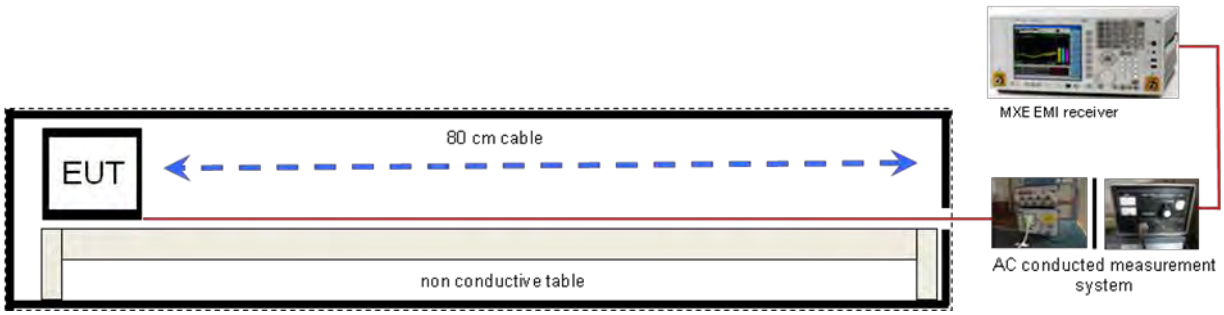
7.3 Radiated measurements 12.75 GHz to 40 GHz



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787
Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442
Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268
Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	7911	300001751
Broadband Low Noise Amplifier 18-50 GHz	CBL18503070-XX	CERNEX	19338	300004273
Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443
Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517

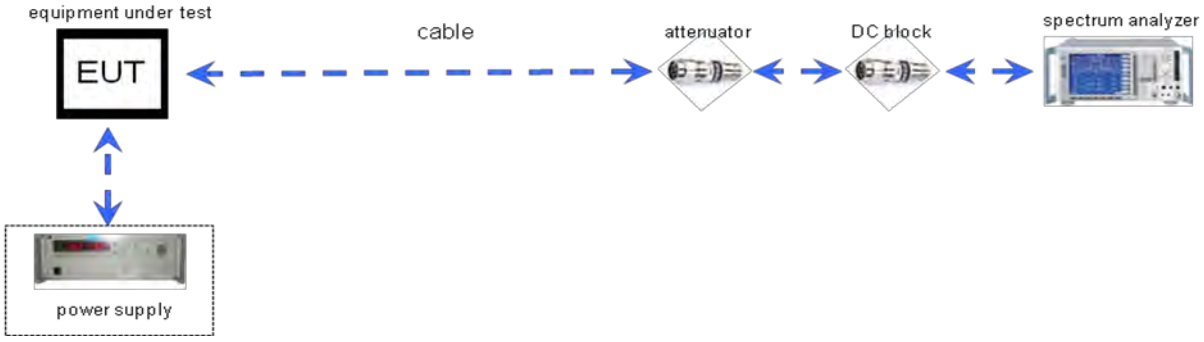
7.4 AC conducted



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405
Isolating Transformer	MPL IEC625 Bus Regeltrenntravo	Erfi	91350	300001155
Switch / Control Unit	3488A	HP Meßtechnik	*	300000199
Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001168
Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210

7.5 Conducted measurements



Equipment table:

Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom
Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517

8 Summary of measurement results

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

☐ There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 210, Issue 8	Passed	2014-05-27	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Mode	Pass	Fail	NA	NP	Remark
§15.247(b)(4) RSS 210 / A8.4(2)	Antenna gain	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies
§15.247(e) RSS 210 / A8.2(b)	Power spectral density DTS clause 10.2	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth - 6dB bandwidth DTS clause 8.2	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth - 20dB bandwidth	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies
§15.247(b)(3) RSS-210 / A8.4(4)	Maximum output power DTS clause 9.1.2	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies
§15.247(d) RSS-210 / A8.5	Band edge compliance conducted DTS clause 13.2.1	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions conducted DTS clause 11.1 & 2	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions radiated	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies
§15.109 RSS-Gen	RX spurious emissions radiated	Nominal	Nominal	-/-	☒	☐	☐	☐	complies
§15.209(a) RSS-Gen	TX spurious emissions radiated < 30 MHz	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies
§15.107(a) §15.207	Conducted emissions < 30 MHz	Nominal	Nominal	OFDM	☒	☐	☐	☐	complies

Note: NA = Not Applicable; NP = Not Performed

9 Additional comments

Reference documents: Customer power table information

Special test descriptions: None

OFDM/a – mode:

Mode	Lowest channel	Middle channel	Highest channel
6-24	16	16	16
36	14	14	14
48	12	11	11
54	11	9	9

OFDM/n HT20 – mode:

Mode	Lowest channel	Middle channel	Highest channel
MCS0	16	16	16
MCS1	14	14	14
MCS2	14	14	14
MCS3	14	14	14
MCS4	14	14	14
MCS5	12	12	11
MCS6	11	11	9
MCS7	9	9	8

OFDM/n HT40 – mode:

Mode	Lowest channel	Middle channel	Highest channel
MCS0	14	14	14
MCS1	13	13	13
MCS2	13	13	13
MCS3	13	13	13
MCS4	13	13	13
MCS5	11	11	11
MCS6	9	9	9
MCS7	8	8	8

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

10 Measurement results

10.1 Identify worst case data rate

Measurement:

All modes of the module will be measured with an average powermeter to identify the maximum transmission power on low, mid and high channel. In the case that only one or two channels are available, only these will be measured.

In further tests only the identified worst case modulation scheme or bandwidth will be measured.
Additional the band edge compliance test will be performed in the lowest and highest modulation scheme.

Measurement parameters:

Average Power Meter

Results:

Modulation	Modulation scheme / bandwidth		
Frequency	5745 MHz	5785 MHz	5825 MHz
OFDM / a – mode	6Mbit/s	6Mbit/s	6Mbit/s
OFDM / n/ac – mode HT20	MCS0	MCS0	MCS0
Frequency	5755 MHz		5795 MHz
OFDM / n/ac – mode HT40	MCS0		MCS0

10.2 Antenna gain

Measurement:

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

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	5 s
Resolution bandwidth:	3 MHz
Video bandwidth:	10 MHz
Trace-Mode:	Max hold

Limits:

FCC	IC
Antenna Gain	
6 dBi	

Results: ANT0

T_{nom}	V_{nom}	lowest channel 5745 MHz	middle channel 5785 MHz	highest channel 5825 MHz
Conducted power [dBm]		12.37	12.97	13.03
Radiated power [dBm]		12.89	14.14	15.87
Gain [dBi] Calculated		+0.52	+1.17	+2.84
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		

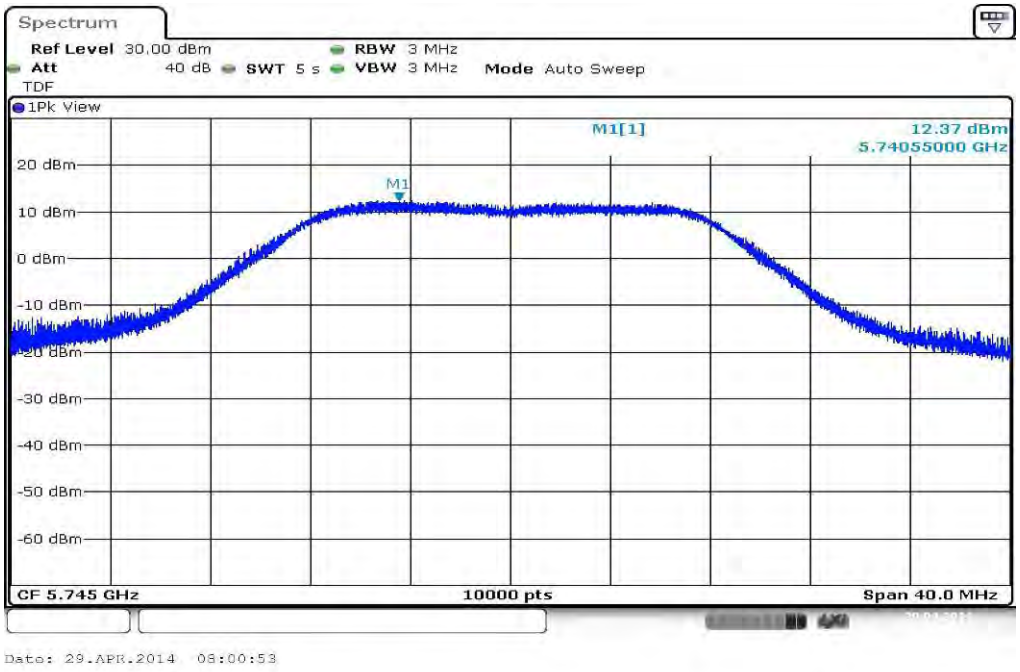
Results: ANT1

T_{nom}	V_{nom}	lowest channel 5745 MHz	middle channel 5785 MHz	highest channel 5825 MHz
Conducted power [dBm]		13.87	14.62	14.75
Radiated power [dBm]		16.36	16.45	17.49
Gain [dBi] Calculated		+2.49	+1.83	+2.74
Measurement uncertainty		± 1.5 dB (cond.) / ± 3 dB (rad.)		

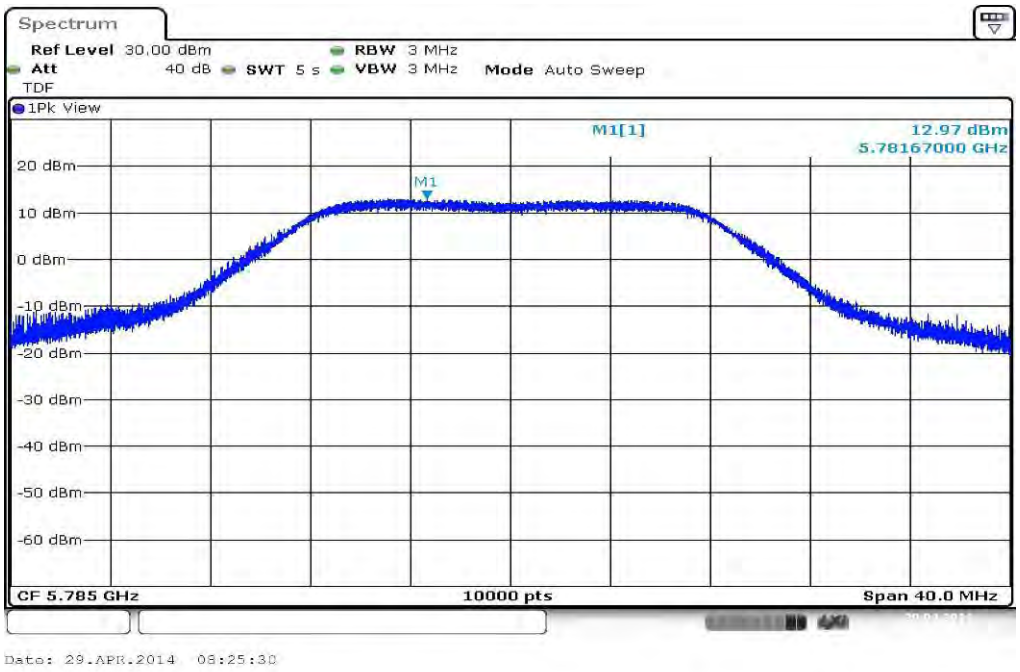
Result: **Passed**

Plots: ANT0

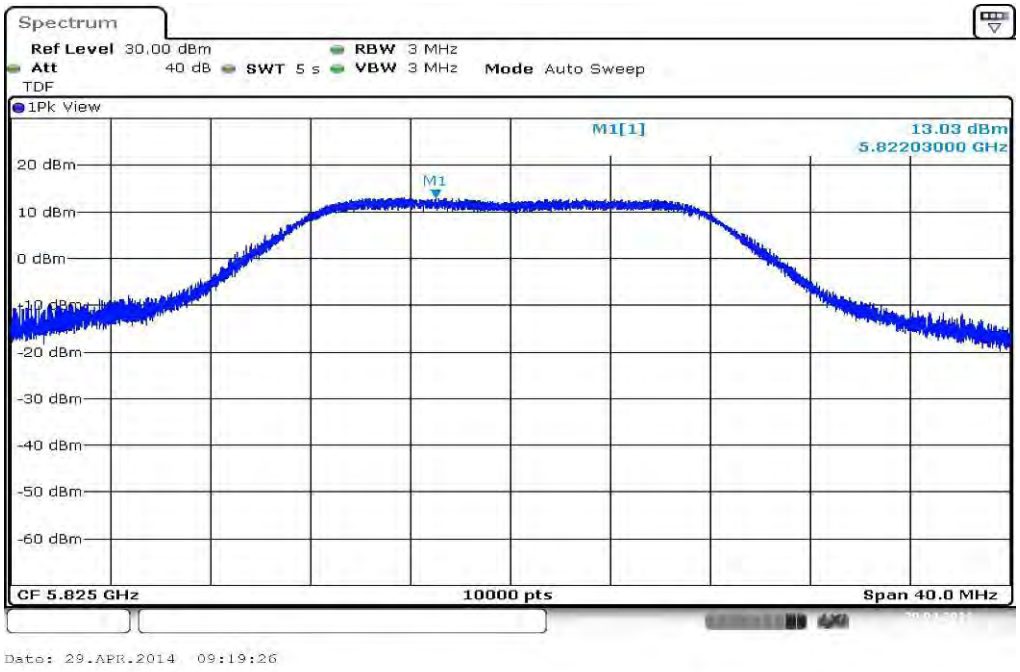
Plot 1: low channel



Plot 2: middle channel

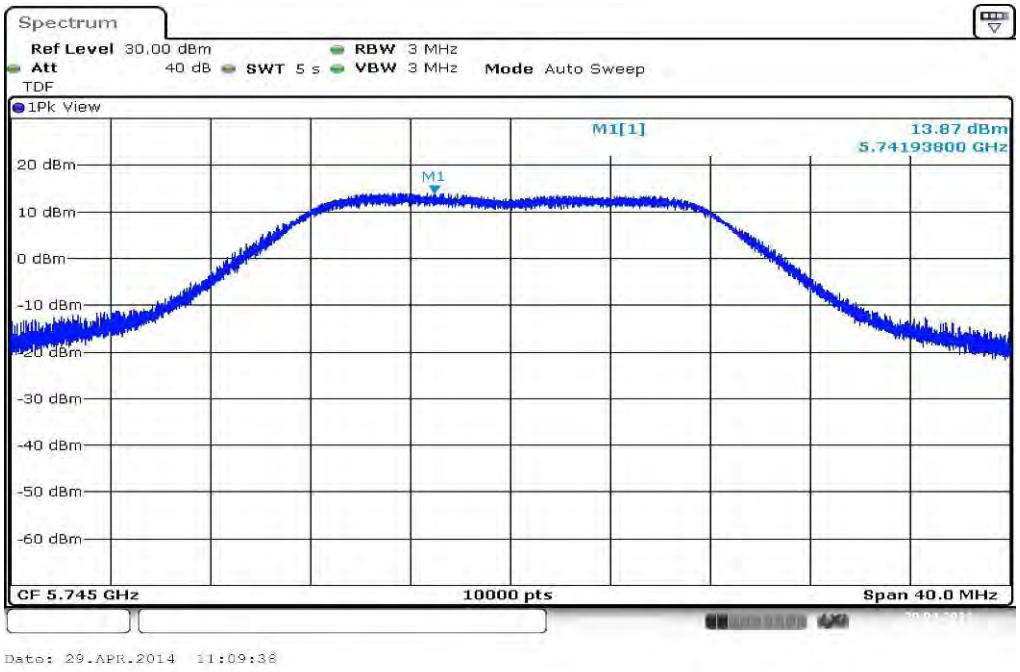


Plot 3: high channel

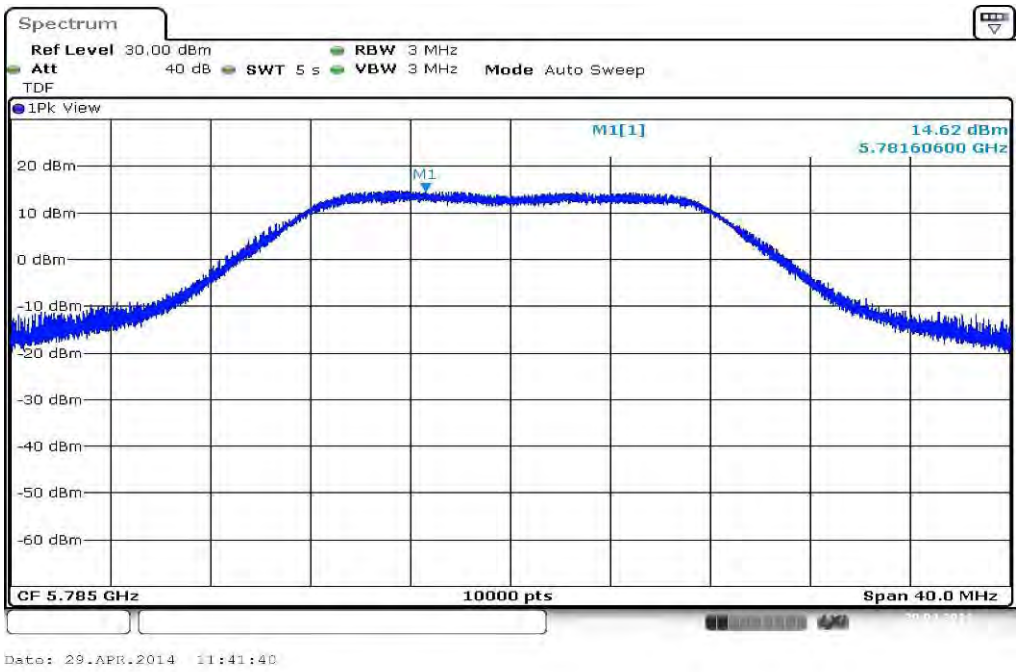


Plots: ANT1

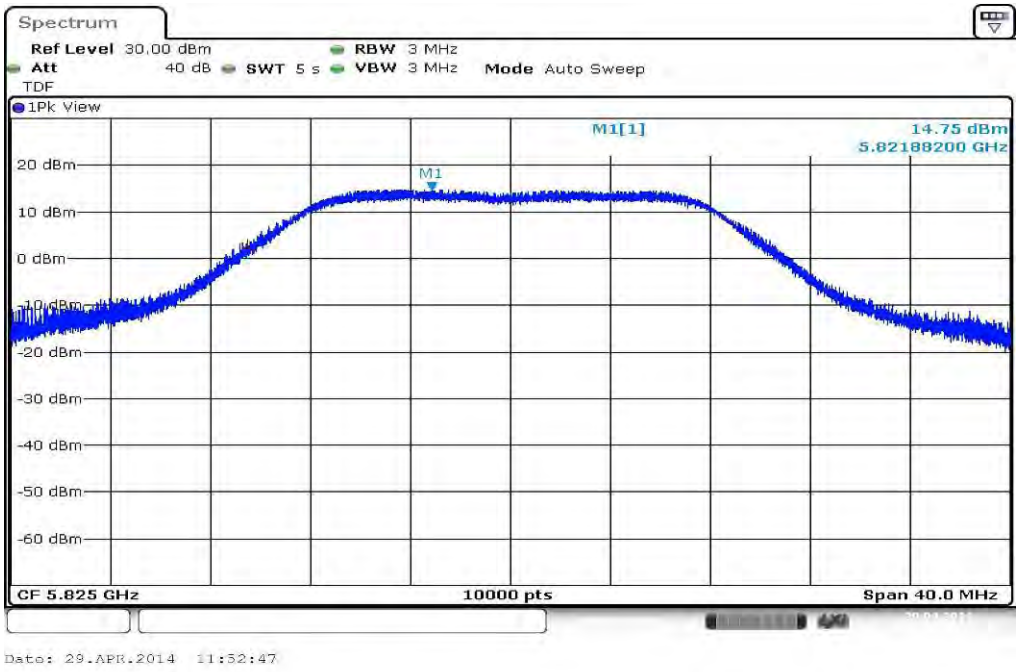
Plot 1: low channel



Plot 2: middle channel



Plot 3: high channel



10.3 Maximum output power

Description:

Measurement of the maximum output power conducted and radiated. The measurements are performed using the data rate producing the highest conducted output power. The determination of these data rates was performed at the beginning of the tests.

Measurement:

Measurement parameter	
According to: DTS clause 9.1.2	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	40 MHz / 80 MHz
Measurement type:	Channel power
Integration bandwidth:	75 % power - bandwidth (DTS BW)
Trace-Mode:	Max hold (allow trace to fully stabilize)

Limits:

FCC
Maximum Output Power
Conducted: 1.0 W – Antenna Gain max. 6 dBi

Results: ANT0

Frequency	Maximum output power conducted [dBm]		
	Low channel	Middle channel	High channel
OFDM / a – mode Peak output power conducted	15.99	16.85	16.93
OFDM / ac HT20 – mode Peak output power conducted	15.53	16.80	16.86
OFDM / ac HT40 – mode Peak output power conducted	14.29	-/-	14.65
Measurement uncertainty	± 1.5 dB (cond.)		

Results: ANT1

Frequency	Maximum output power conducted [dBm]		
	Low channel	Middle channel	High channel
OFDM / a – mode Peak output power conducted	17.40	18.37	18.59
OFDM / ac HT20 – mode Peak output power conducted	17.43	18.22	18.51
OFDM / ac HT40 – mode Peak output power conducted	15.22	-/-	15.81
Measurement uncertainty	± 1.5 dB (cond.)		

Result: Passed

10.4 Power spectral density

Description:

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

Measurement:

Measurement parameter	
According to: DTS clause 10.2	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	3 kHz
Video bandwidth:	10 kHz
Span:	40 MHz / 80 MHz
Trace-Mode:	Max hold (allow trace to fully stabilize)

Limits:

FCC	IC
Power Spectral Density	
8 dBm (conducted)	

Results: ANT0

Modulation	Power Spectral density [dBm]		
Frequency	5745 MHz	5785 MHz	5825 MHz
OFDM / a – mode	-14.27	-13.25	-13.11
OFDM / n/ac – mode HT20	-15.32	-13.87	-13.99
Frequency	5755 MHz		5795 MHz
OFDM / n/ac – mode HT40	-19.95		-19.57
Measurement uncertainty	± 1.5 dB		

Results: ANT1

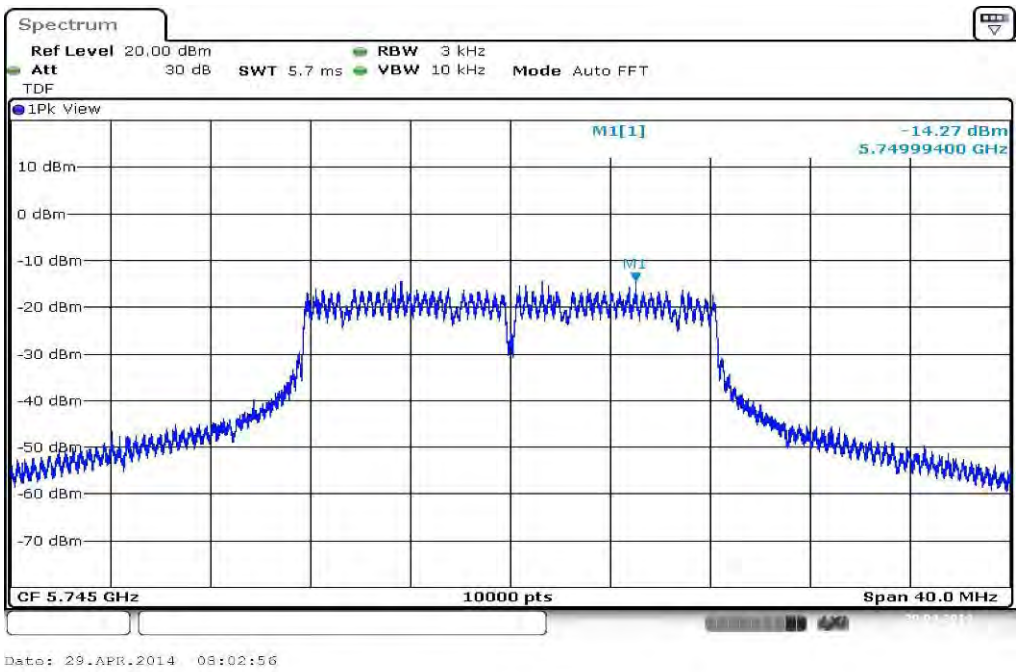
Modulation	Power Spectral density [dBm]		
Frequency	5745 MHz	5785 MHz	5825 MHz
OFDM / a – mode	-13.05	-11.67	-11.49
OFDM / n/ac – mode HT20	-13.81	-12.89	-12.21
Frequency	5755 MHz		5795 MHz
OFDM / n/ac – mode HT40	-19.20		-18.46
Measurement uncertainty	± 1.5 dB		

Result: Passed

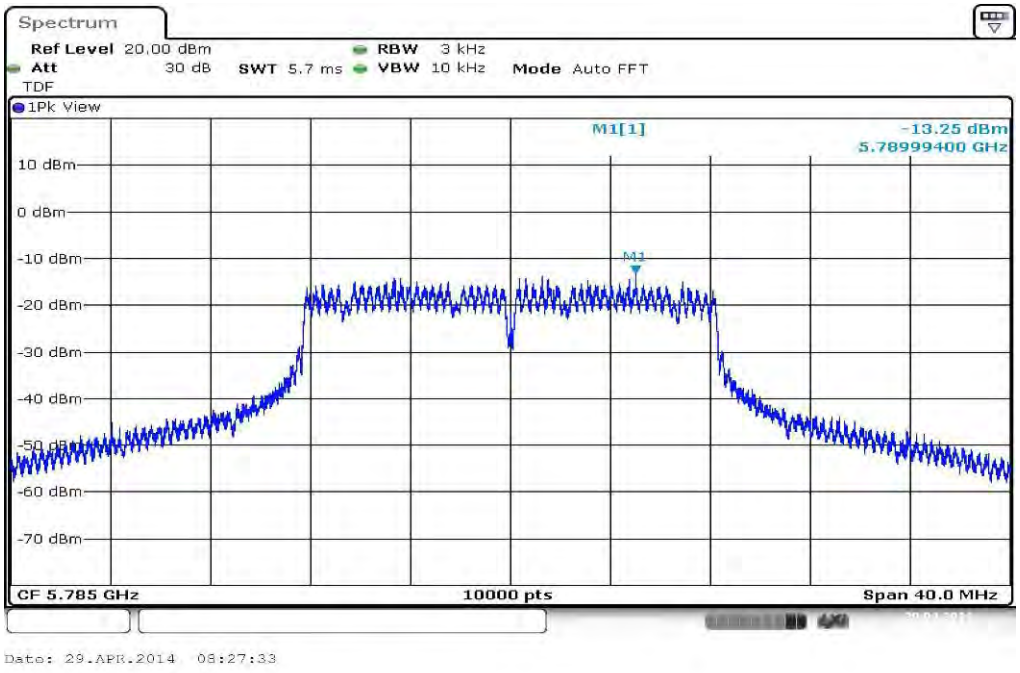
Plots: ANT0

Plots: OFDM / a – mode

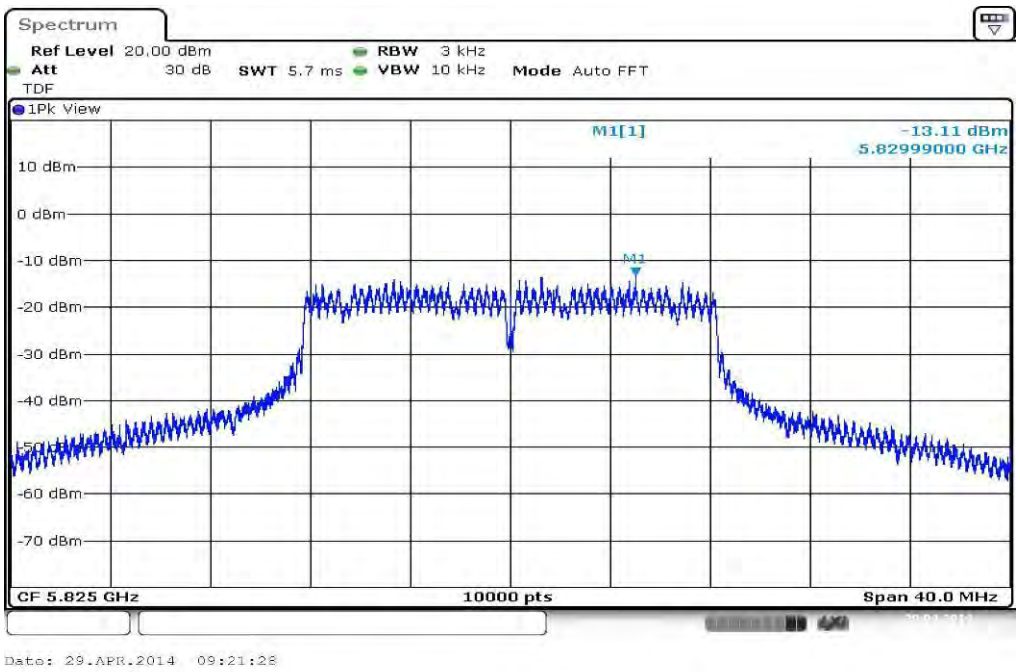
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel

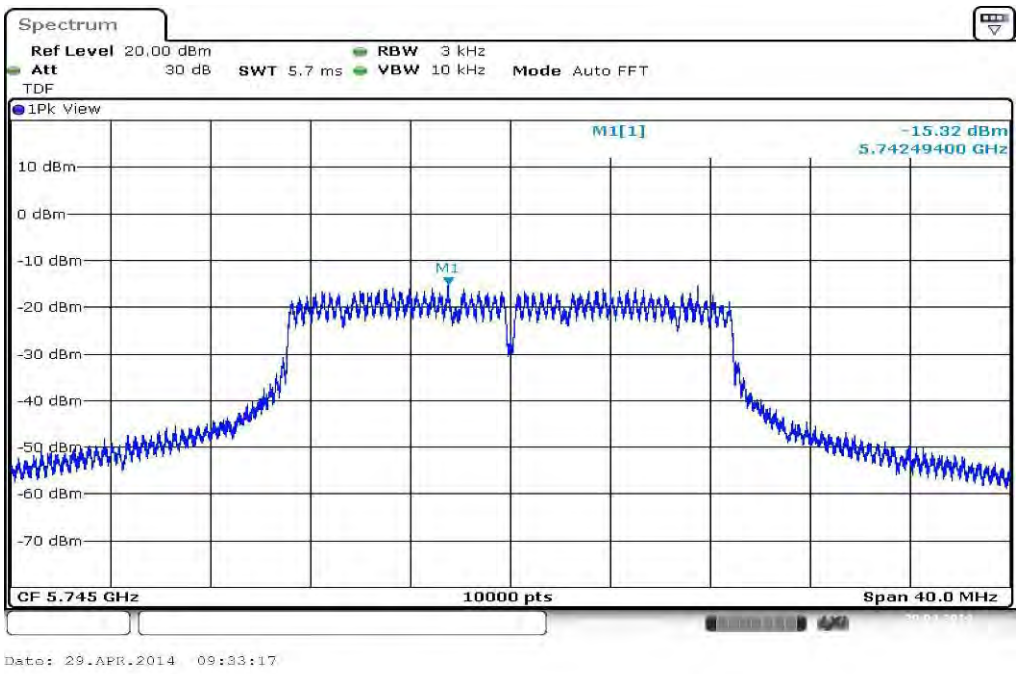


Plot 3: TX mode, highest channel

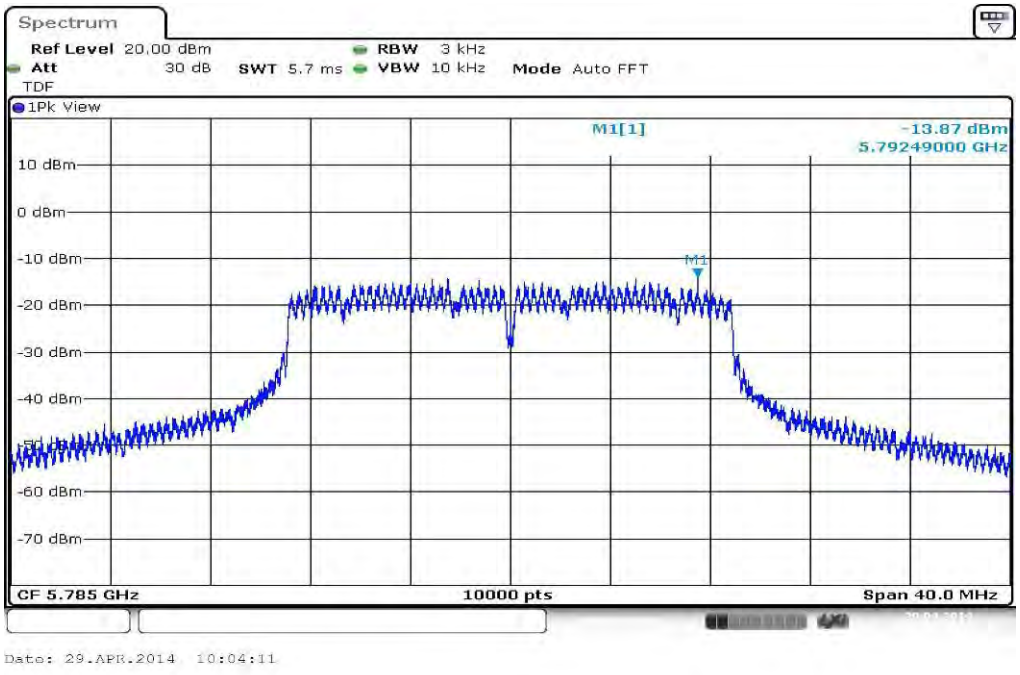


Plots: OFDM / n/ac – mode HT20

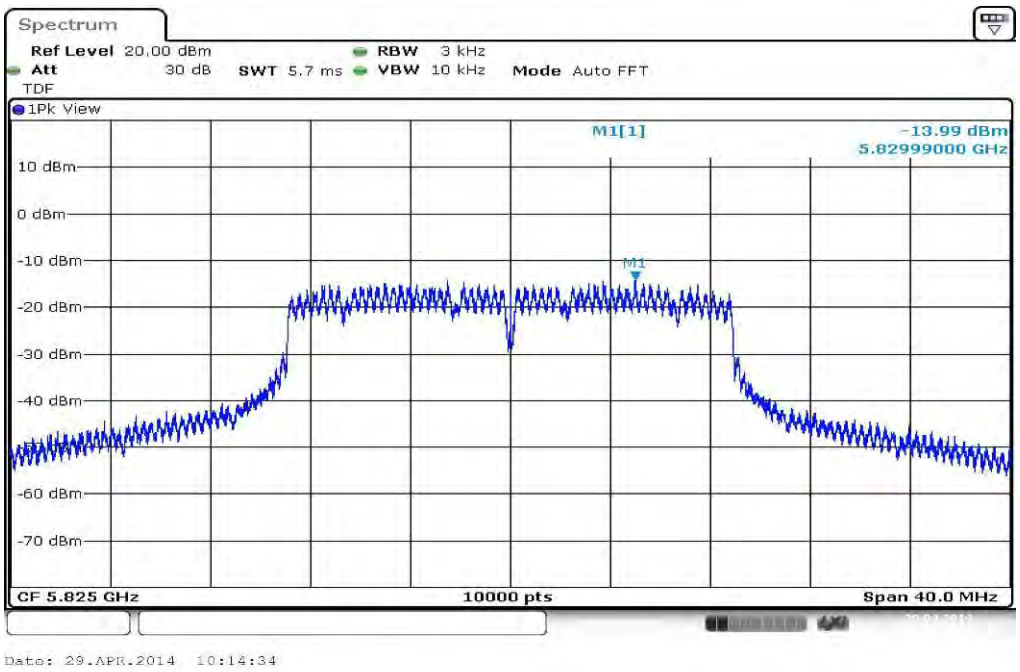
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel

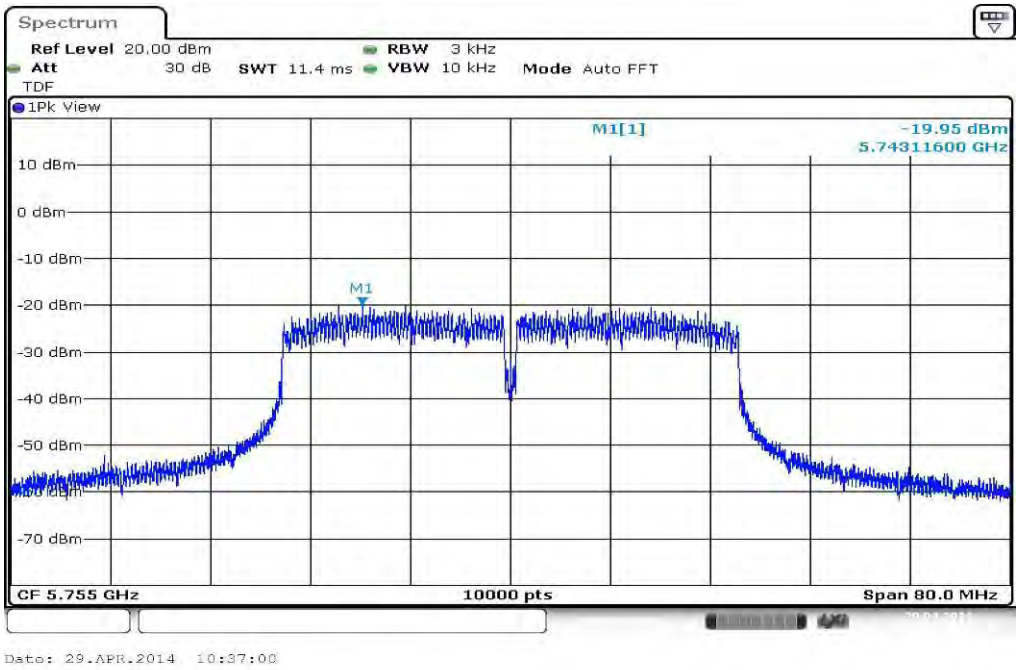


Plot 3: TX mode, highest channel

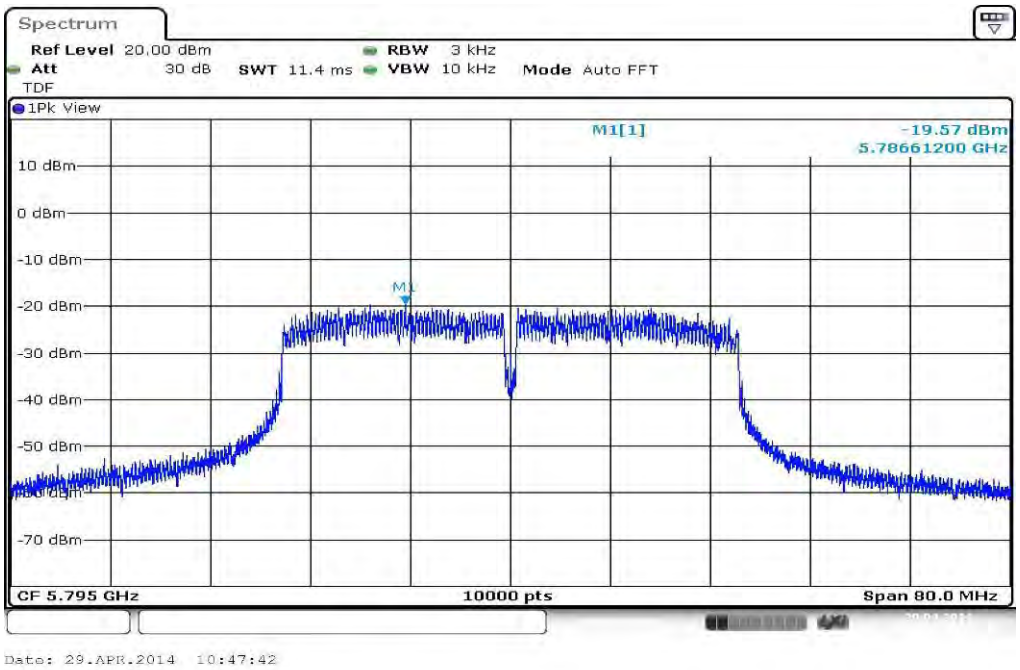


Plots: OFDM / n/ac – mode HT40

Plot 1: TX mode, lowest channel



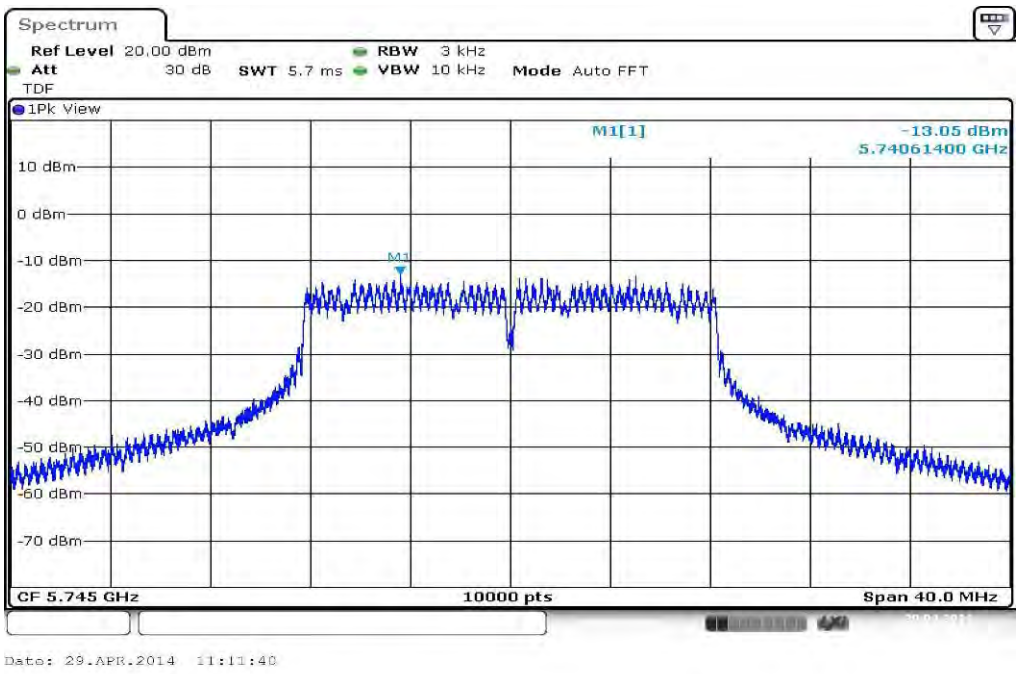
Plot 2: TX mode, highest channel



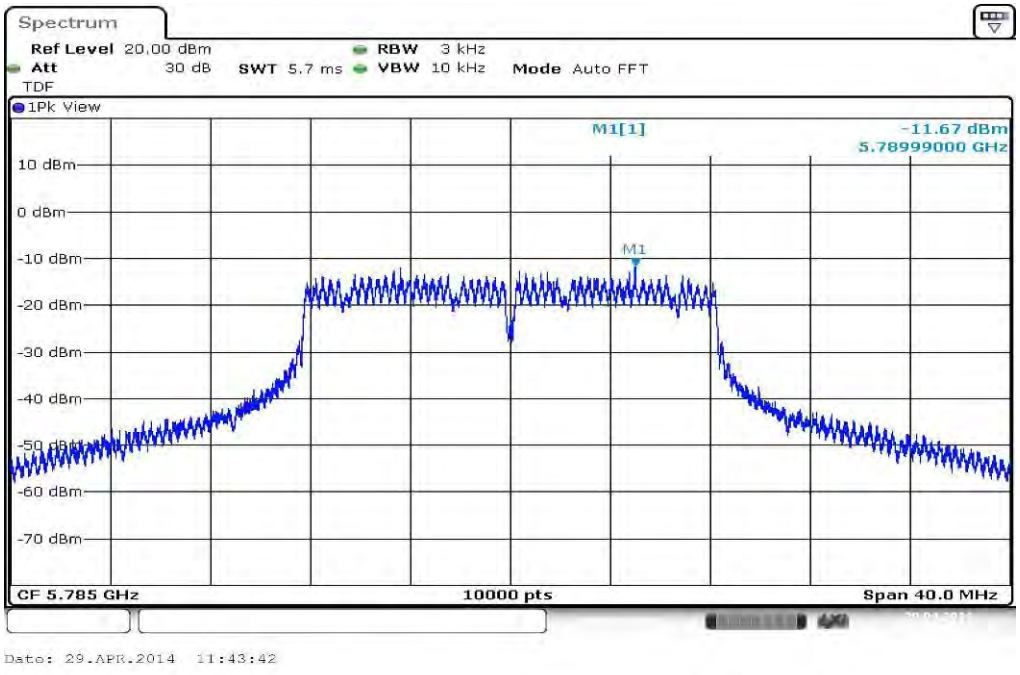
Plots: ANT1

Plots: OFDM / a – mode

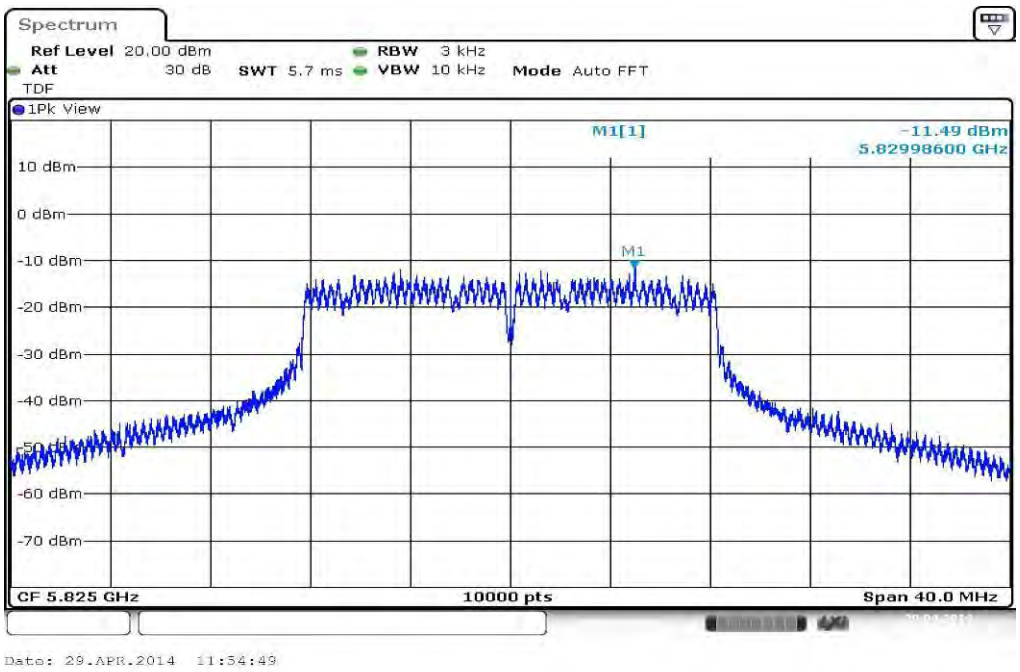
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel

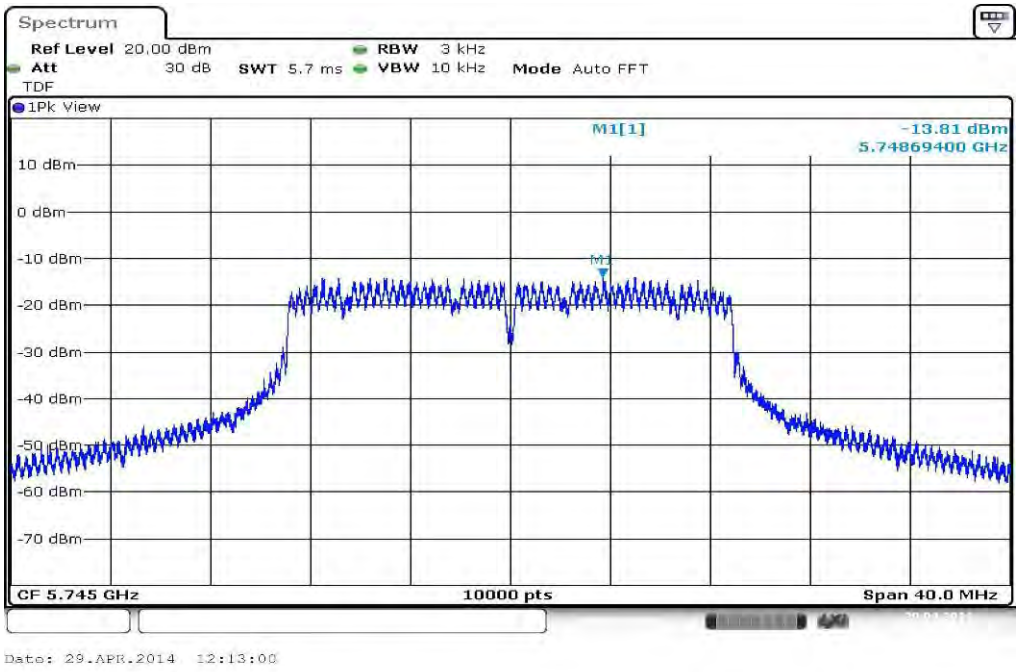


Plot 3: TX mode, highest channel

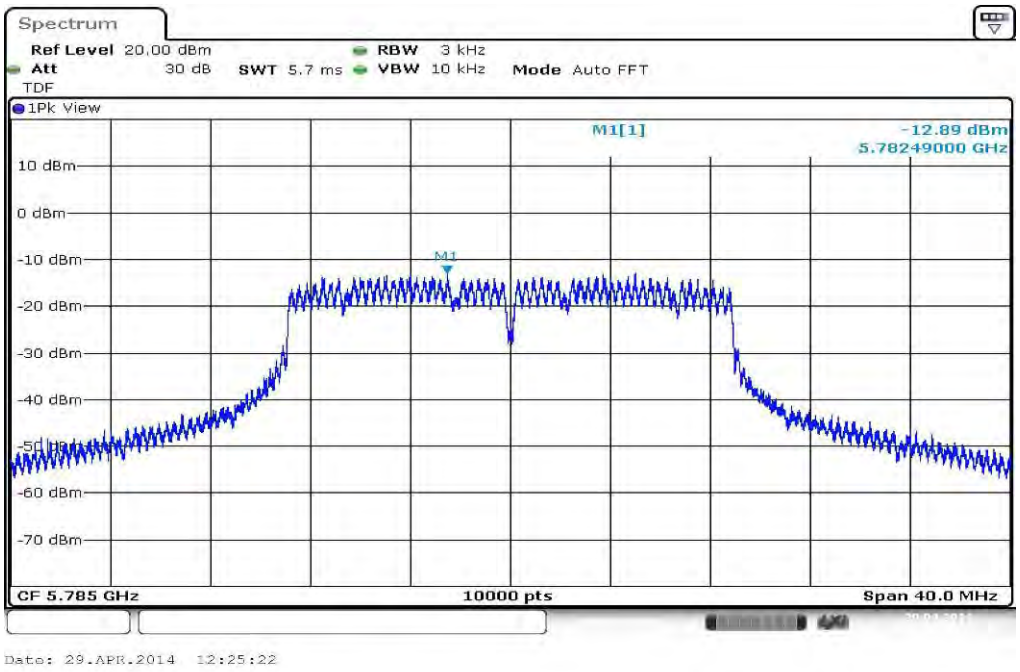


Plots: OFDM / n/ac – mode HT20

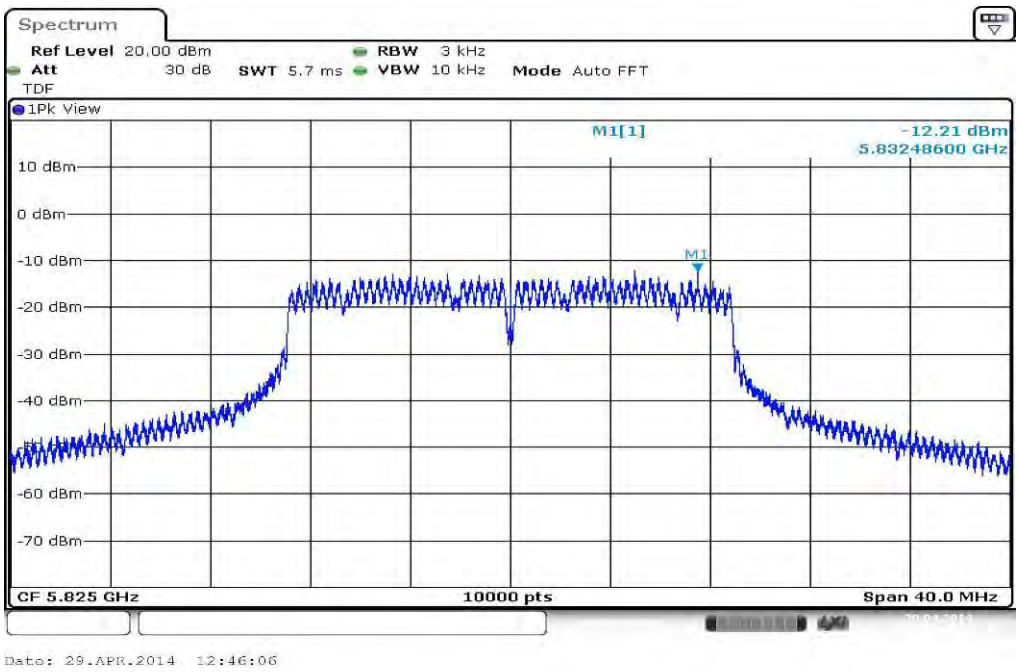
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel

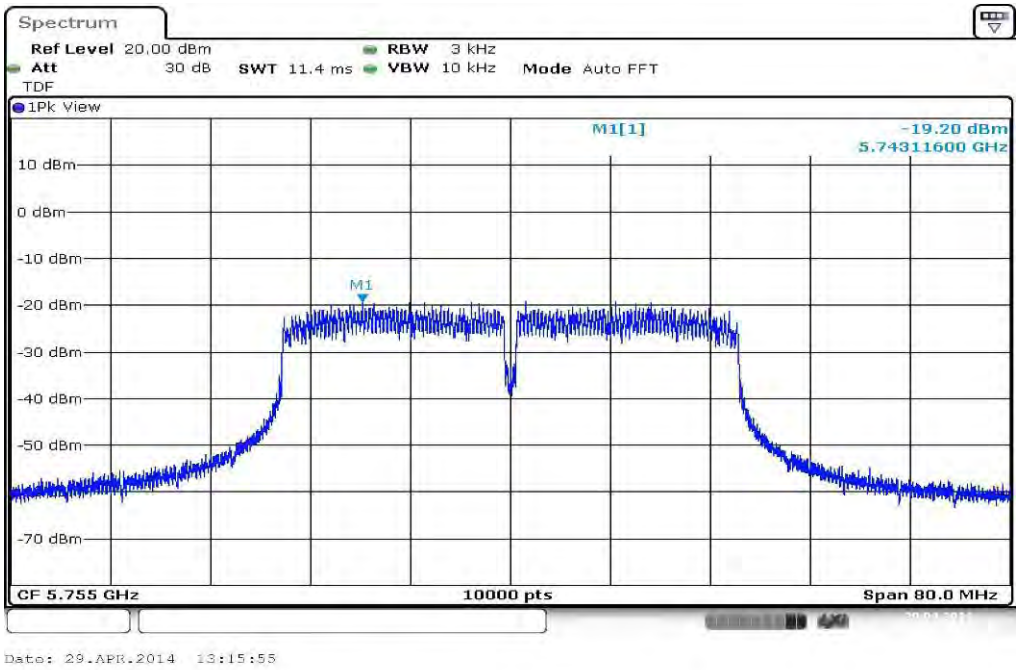


Plot 3: TX mode, highest channel

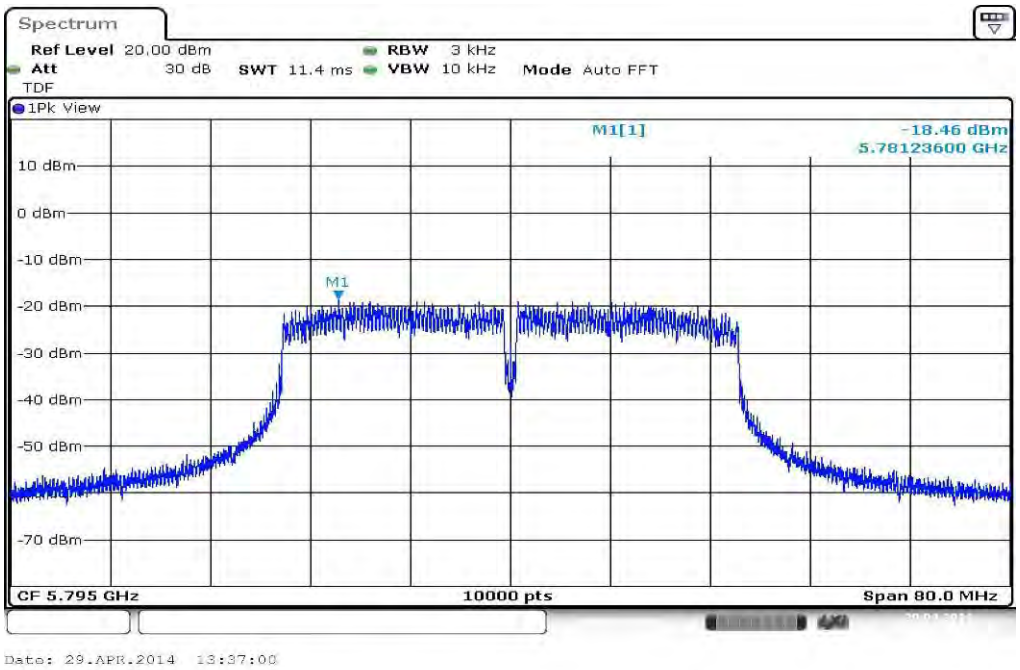


Plots: OFDM / n/ac – mode HT40

Plot 1: TX mode, lowest channel



Plot 2: TX mode, highest channel



10.5 Spectrum bandwidth – 6 dB

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
According to: DTS clause 8.2	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	2x nominal bandwidth
Measurement procedure:	Measurement of the 75% bandwidth using the integration function of the analyzer
Trace-Mode:	Max hold (allow trace to stabilize)

Limits:

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

Results: ANT0

Modulation / Frequency	6 dB bandwidth [MHz]		
	Lowest channel	Middle channel	Highest channel
OFDM / a – mode	11.95	11.83	11.86
OFDM / ac – mode HT20	12.41	12.40	12.39
OFDM / ac – mode HT40	26.36		25.92
Measurement uncertainty	± RBW		

Results: ANT1

Modulation / Frequency	6 dB bandwidth [MHz]		
	Lowest channel	Middle channel	Highest channel
OFDM / a – mode	11.85	11.82	11.87
OFDM / ac – mode HT20	12.42	12.37	12.41
OFDM / ac – mode HT40	26.26		26.01
Measurement uncertainty	± RBW		

Result: Passed

10.6 Spectrum bandwidth – 20 dB

Description:

Measurement of the 20 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 - 5% of the DTS BW but not exceed 100 kHz
Video bandwidth:	≥ 3 x RBW
Span:	Complete signal
Measurement procedure:	Measurement of the 99% bandwidth using the integration function of the analyzer
Trace-Mode:	Max hold (allow trace to stabilize)

Limits:

-/-	IC
Spectrum Bandwidth – 20 dB	
Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.	

Results: ANT0

Modulation / Frequency	20 dB bandwidth [MHz]		
	Lowest channel	Middle channel	Highest channel
OFDM / a – mode	17.64	17.82	18.03
OFDM / n/ac – mode HT20	18.87	18.57	18.77
OFDM / n/ac – mode HT40	37.02		36.97
Measurement uncertainty	± RBW		

Results: ANT1

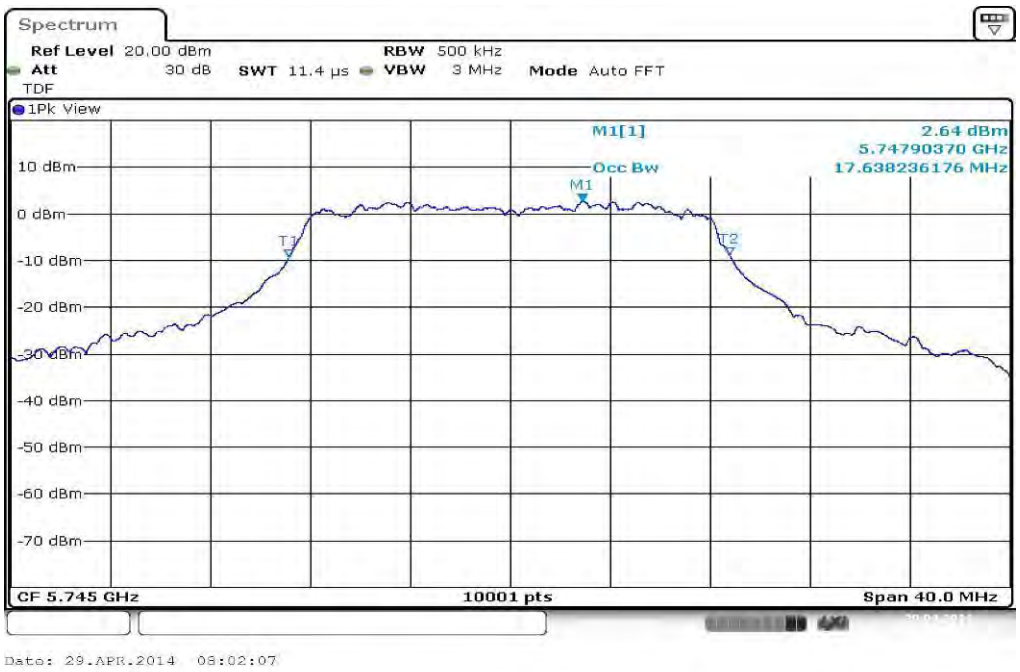
Modulation / Frequency	20 dB bandwidth [MHz]		
	Lowest channel	Middle channel	Highest channel
OFDM / a – mode	17.53	17.63	17.66
OFDM / n/ac – mode HT20	18.41	18.64	18.73
OFDM / n/ac – mode HT40	36.83		36.94
Measurement uncertainty	± RBW		

Result: **Passed**

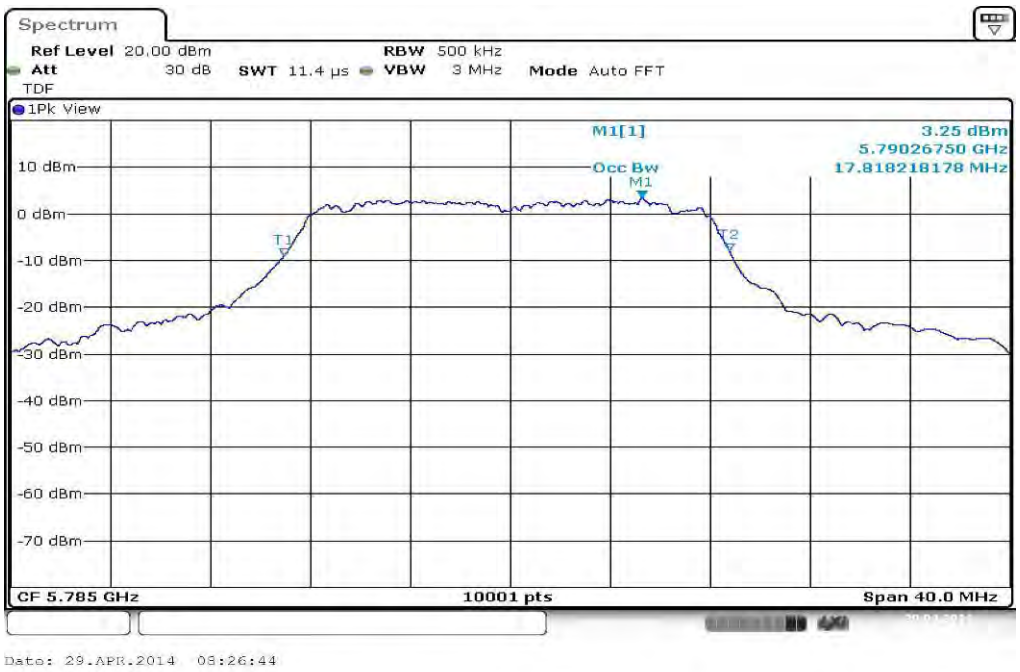
Plots: ANT0

Plots: OFDM / a – mode

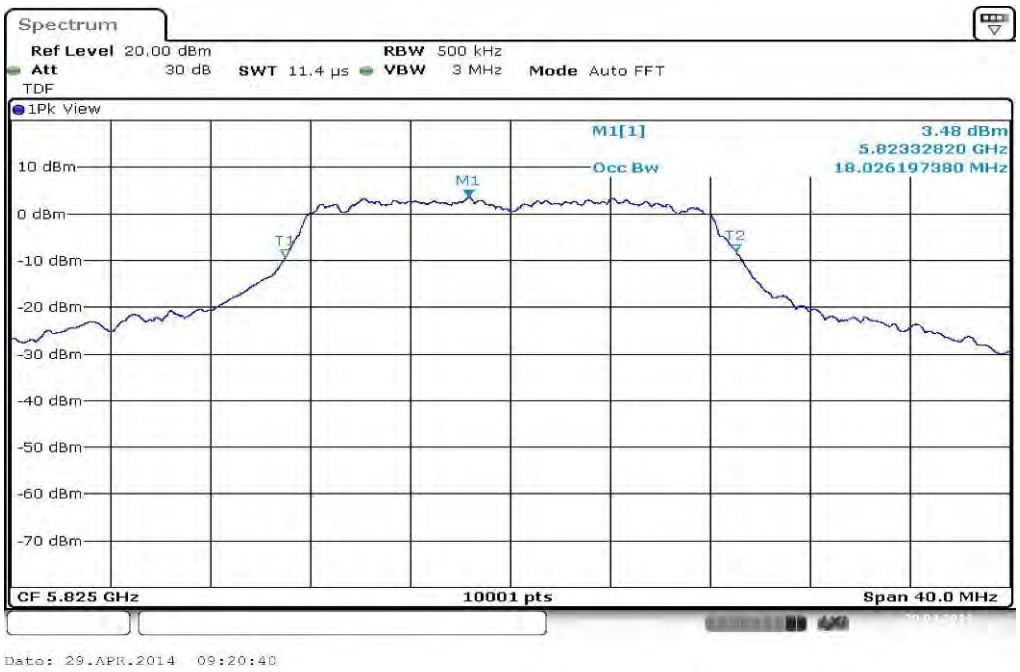
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel

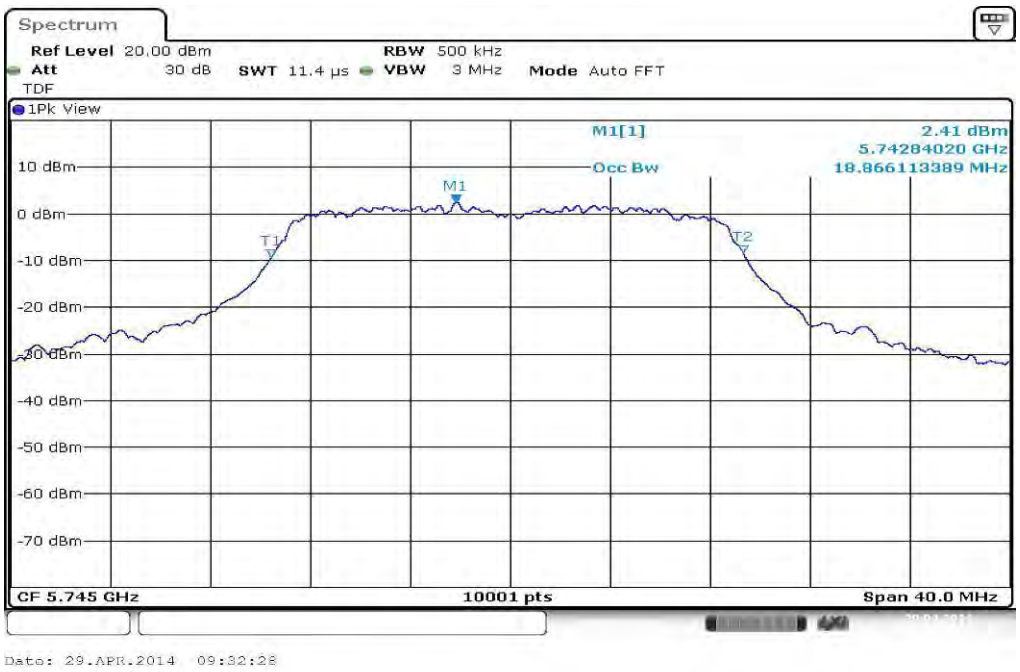


Plot 3: TX mode, highest channel

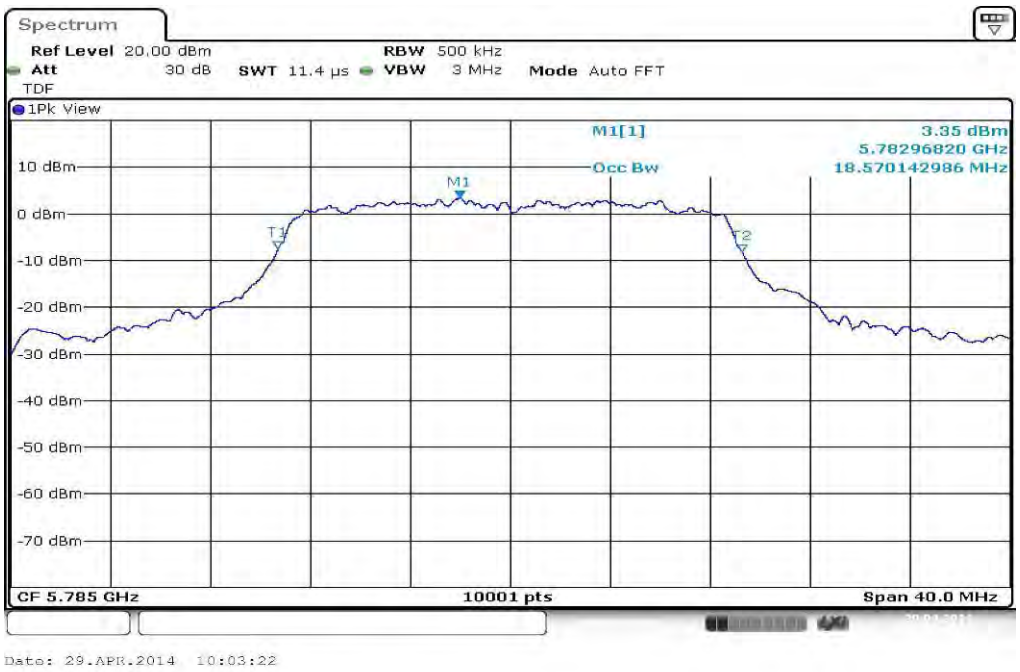


Plots: OFDM / n/ac – mode HT20

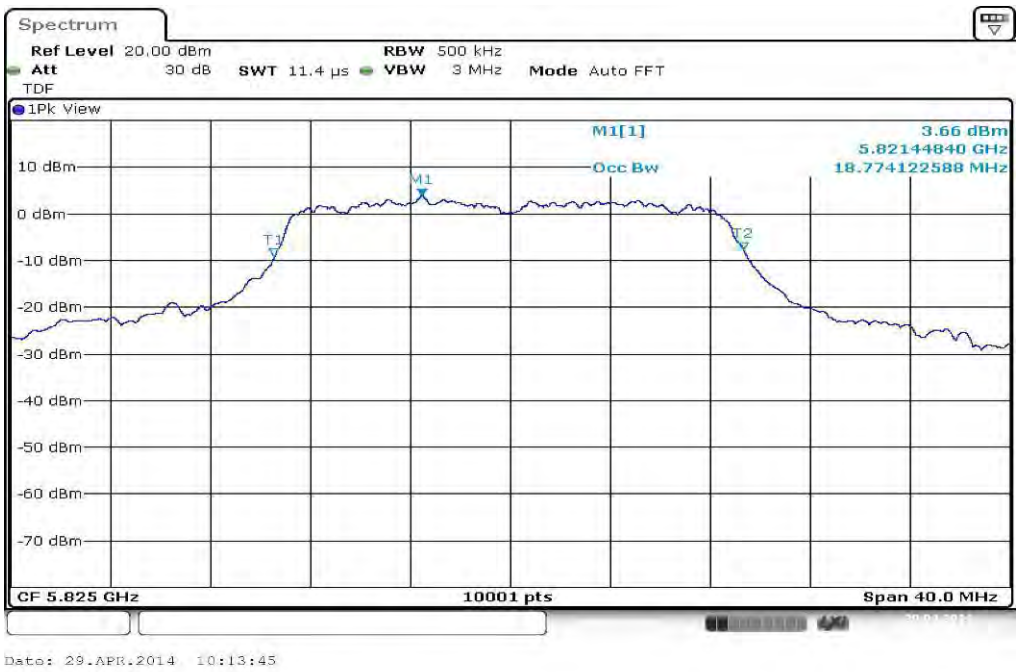
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel

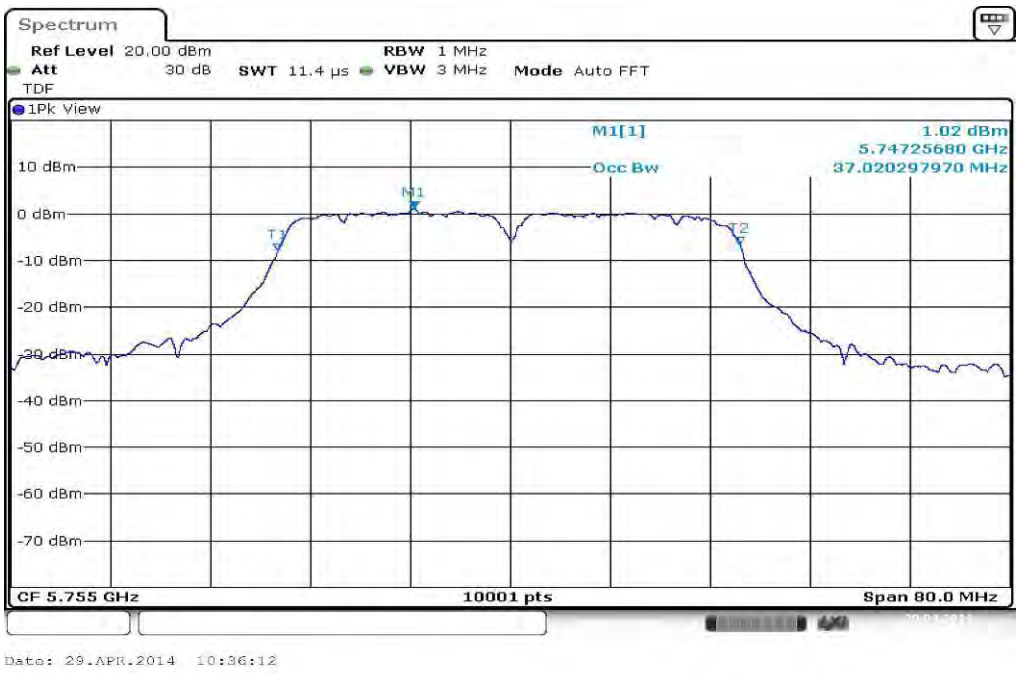


Plot 3: TX mode, highest channel

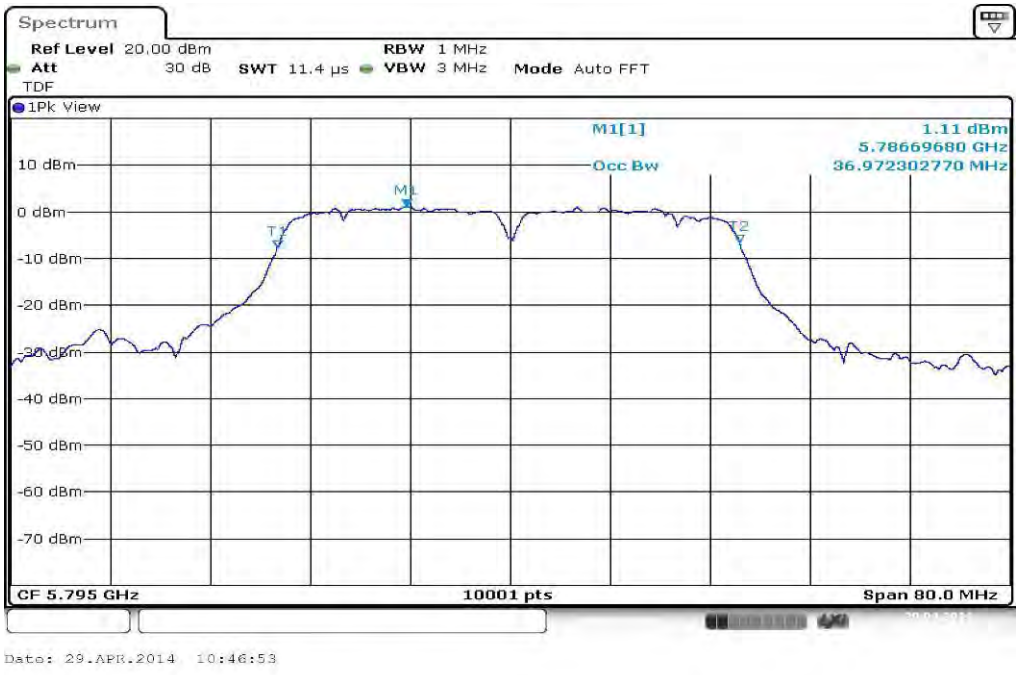


Plots: OFDM / n/ac – mode HT40

Plot 1: TX mode, lowest channel



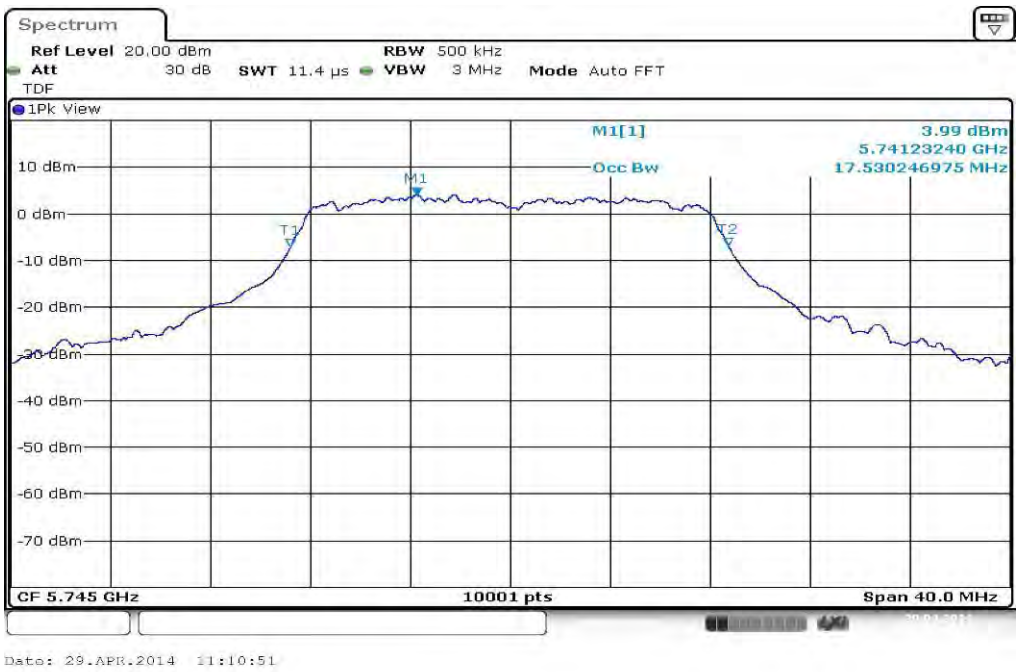
Plot 2: TX mode, highest channel



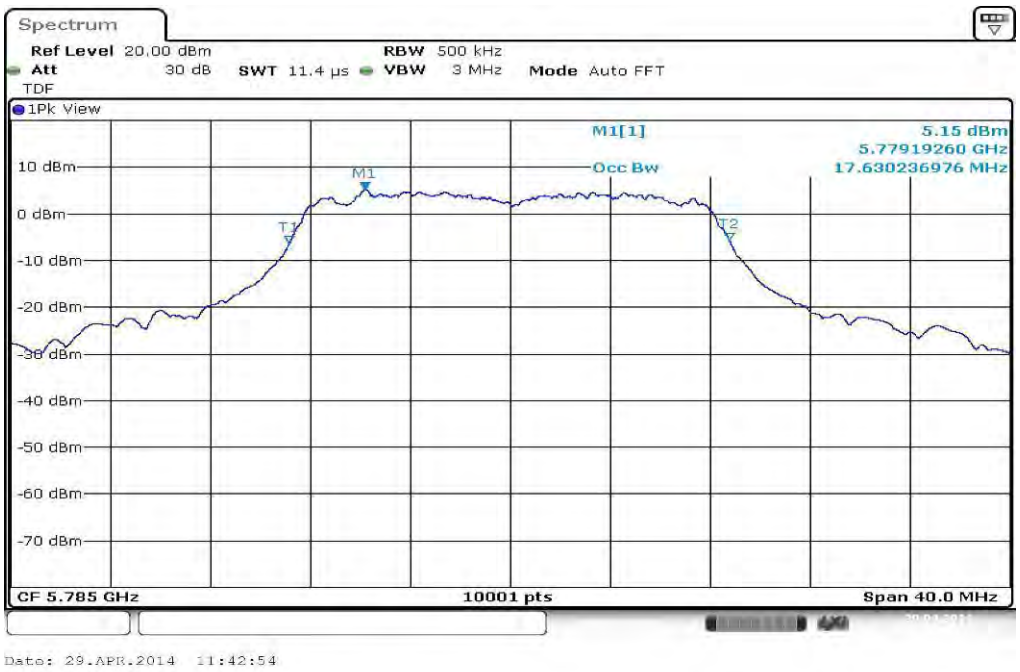
Plots: ANT1

Plots: OFDM / a – mode

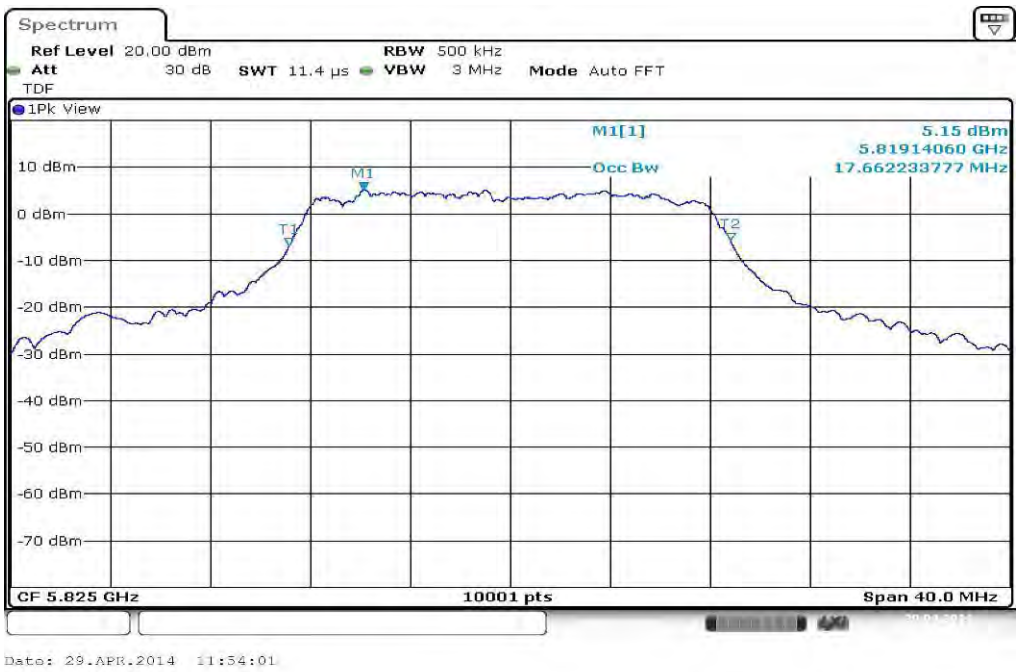
Plot 1: TX mode, lowest channel



Plot 2: TX mode, middle channel



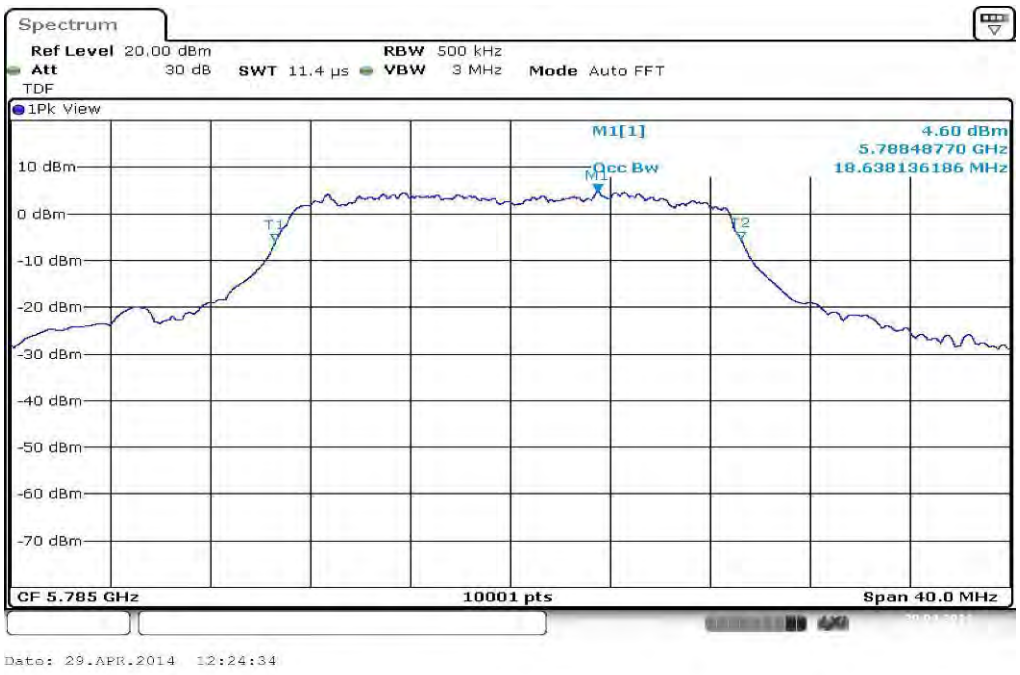
Plot 3: TX mode, highest channel



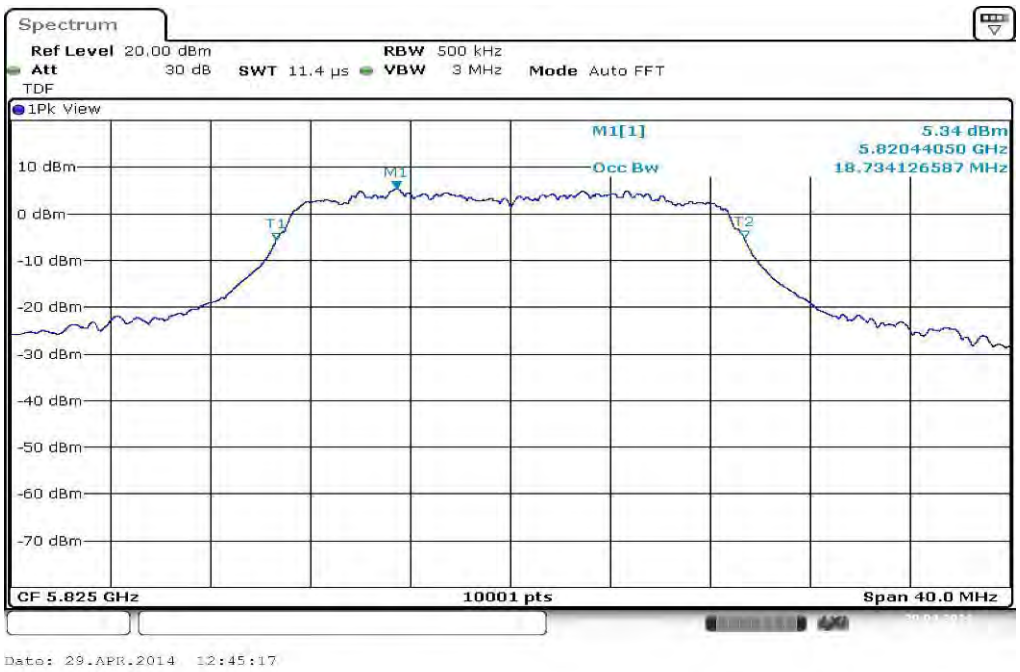
Plots: OFDM / n/ac – mode HT20

Plot 1: TX mode, lowest channel

Plot 2: TX mode, middle channel



Plot 3: TX mode, highest channel



Plots: OFDM / n/ac – mode HT40

Plot 1: TX mode, lowest channel

Plot 2: TX mode, highest channel

10.7 Band edge compliance conducted

Description:

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

Measurement:

Measurement parameter	
According to: DTS clause 13.2.1	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	Lower Band Edge: 5625 – 5725 MHz Upper Band Edge: 5850 – 5950 MHz
Trace-Mode:	Max hold

Limits:

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

Results: ANT0

Scenario Modulation	Band Edge Compliance Conducted [dB]		
	OFDM / a – mode	OFDM / n – mode HT20	OFDM / n – mode HT40
Lower Band Edge – Channel 149	> 20 dB	> 20 dB	> 20 dB
Upper Band Edge – Channel 165	> 20 dB	> 20 dB	> 20 dB
Measurement uncertainty	± 1.5 dB		

Results: ANT1

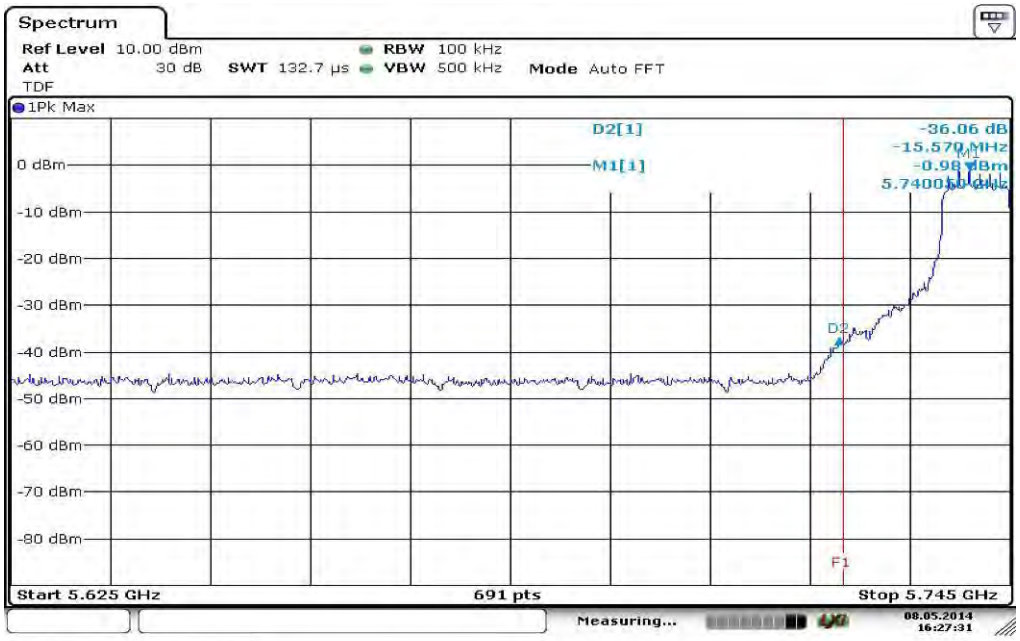
Scenario Modulation	Band Edge Compliance Conducted [dB]		
	OFDM / a – mode	OFDM / n – mode HT20	OFDM / n – mode HT40
Lower Band Edge – Channel 149	> 20 dB	> 20 dB	> 20 dB
Upper Band Edge – Channel 165	> 20 dB	> 20 dB	> 20 dB
Measurement uncertainty	± 1.5 dB		

Result: **Passed**

Plots: ANT0

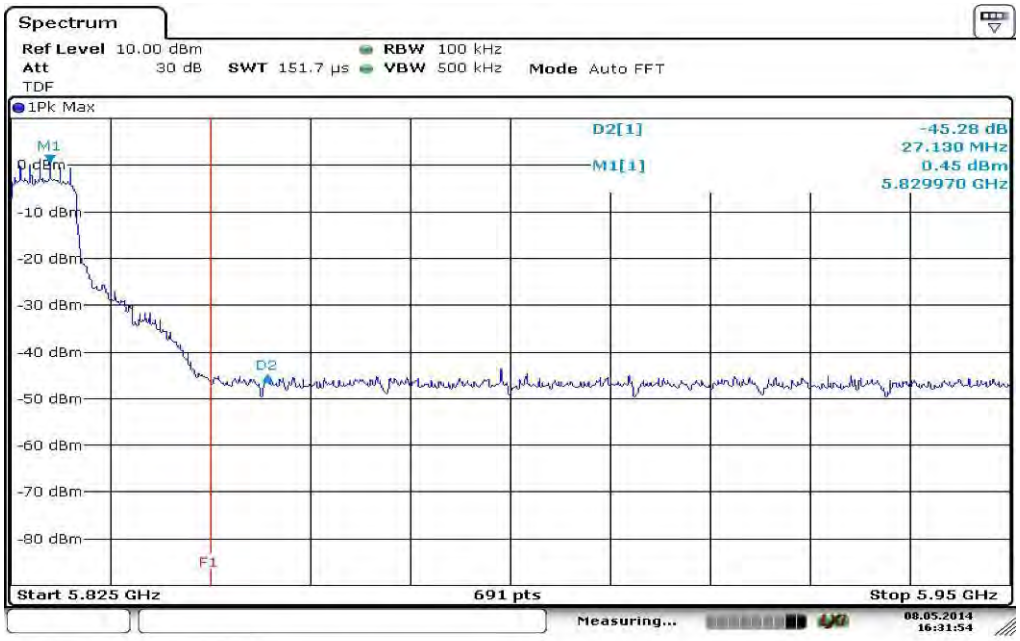
Plots: OFDM / a – mode

Plot 1: TX mode, lower band edge



Date: 8.MAY.2014 16:27:31

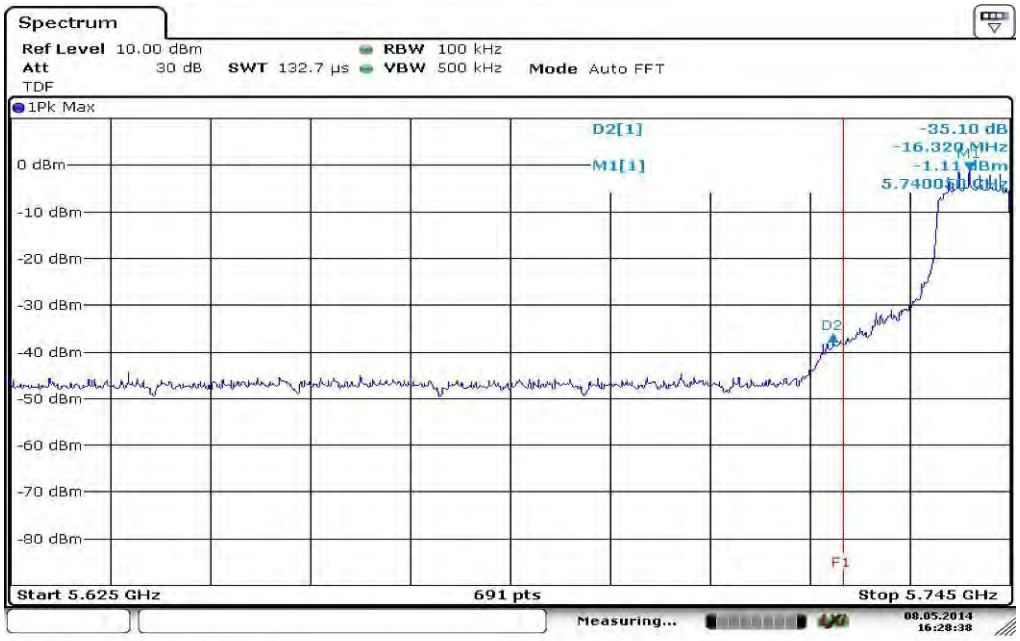
Plot 2: TX mode, upper band edge



Date: 8.MAY.2014 16:31:54

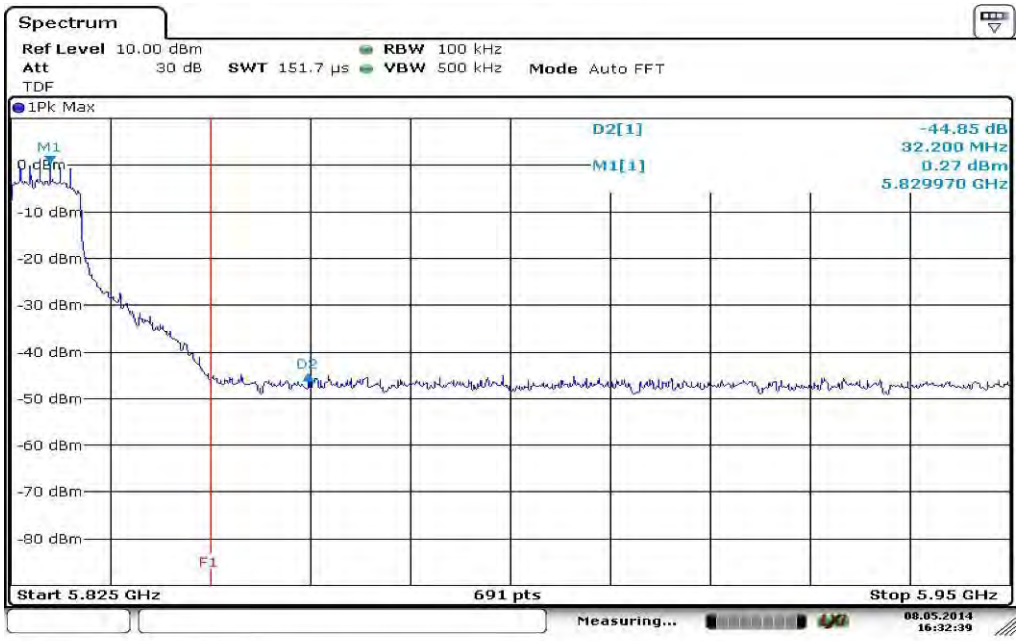
Plots: OFDM / n HT20 – mode

Plot 1: TX mode, lower band edge



Date: 8.MAY.2014 16:28:38

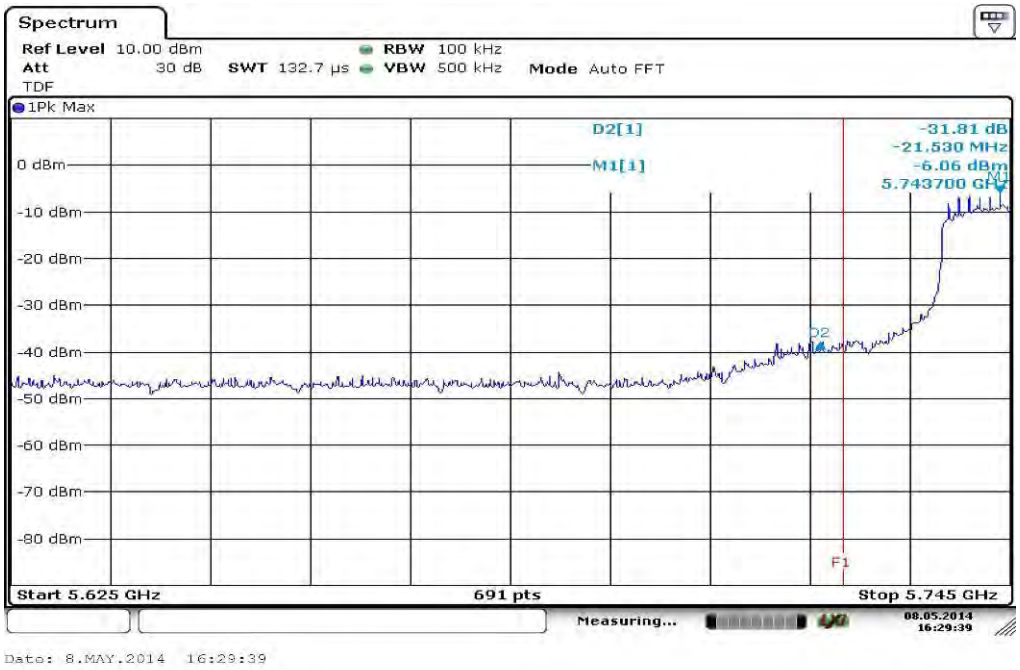
Plot 2: TX mode, upper band edge



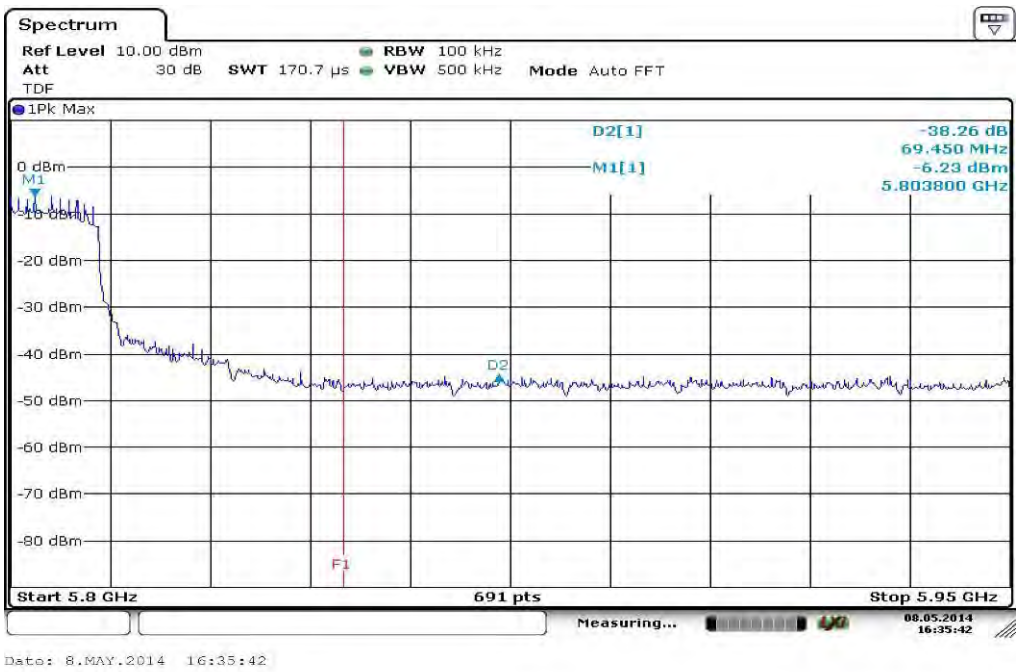
Date: 8.MAY.2014 16:32:39

Plots: OFDM / n HT40 – mode

Plot 1: TX mode, lower band edge



Plot 2: TX mode, upper band edge



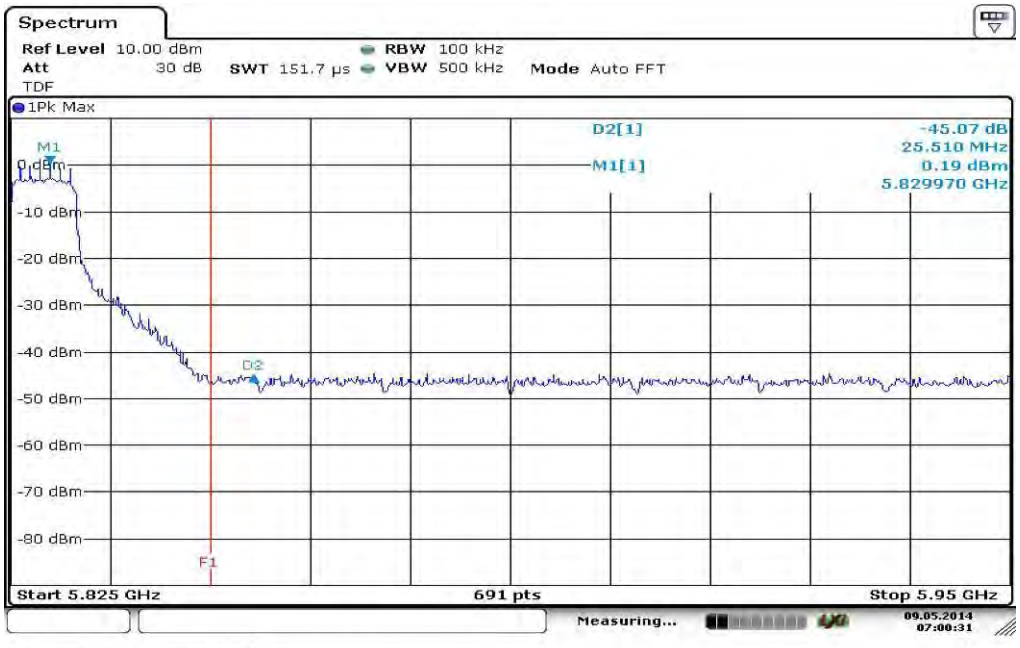
Plots: ANT1

Plots: OFDM / a – mode

Plot 1: TX mode, lower band edge

Date: 9.MAY.2014 06:53:26

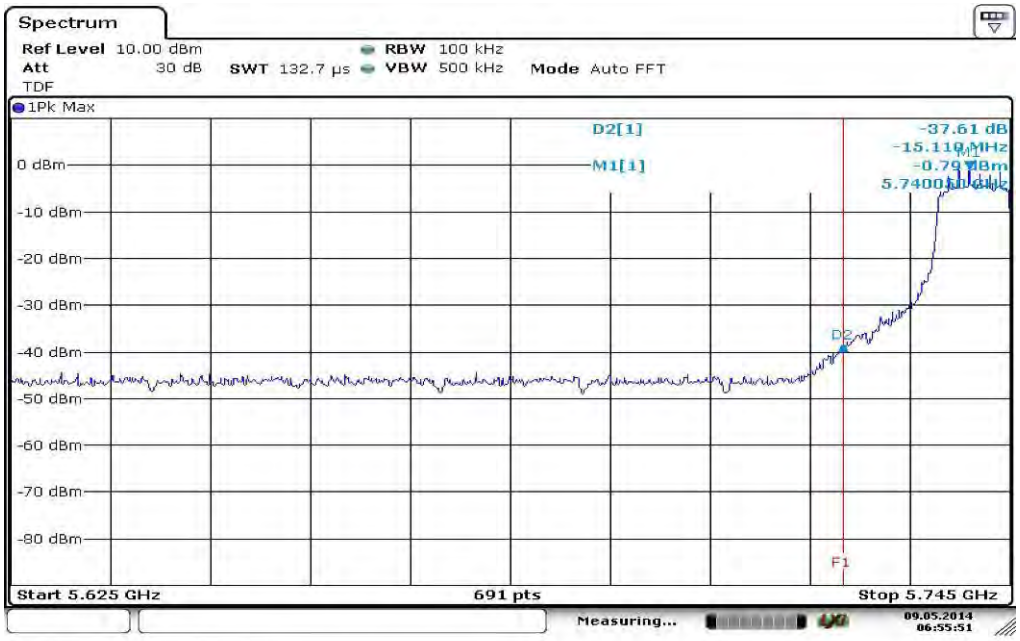
Plot 2: TX mode, upper band edge



Date: 9.MAY.2014 07:00:31

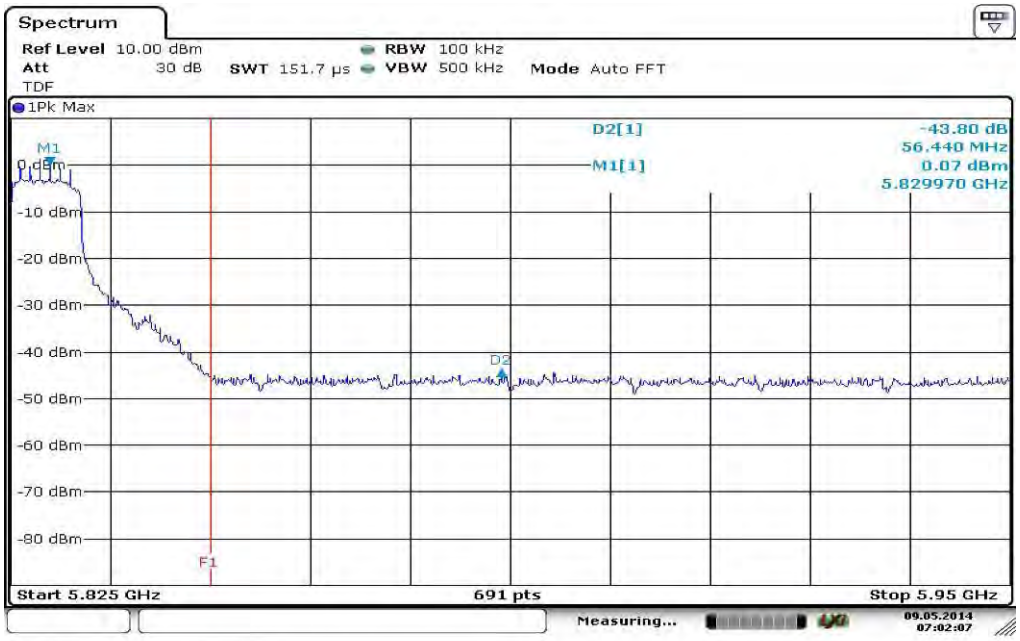
Plots: OFDM / n HT20 – mode

Plot 1: TX mode, lower band edge



Date: 9.MAY.2014 06:55:50

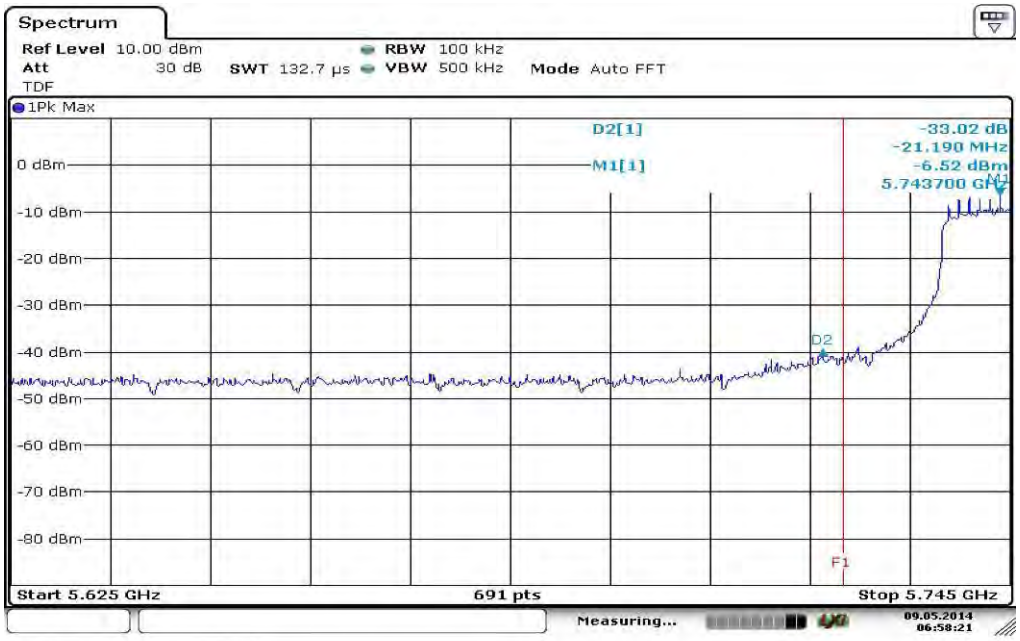
Plot 2: TX mode, upper band edge



Date: 9.MAY.2014 07:02:06

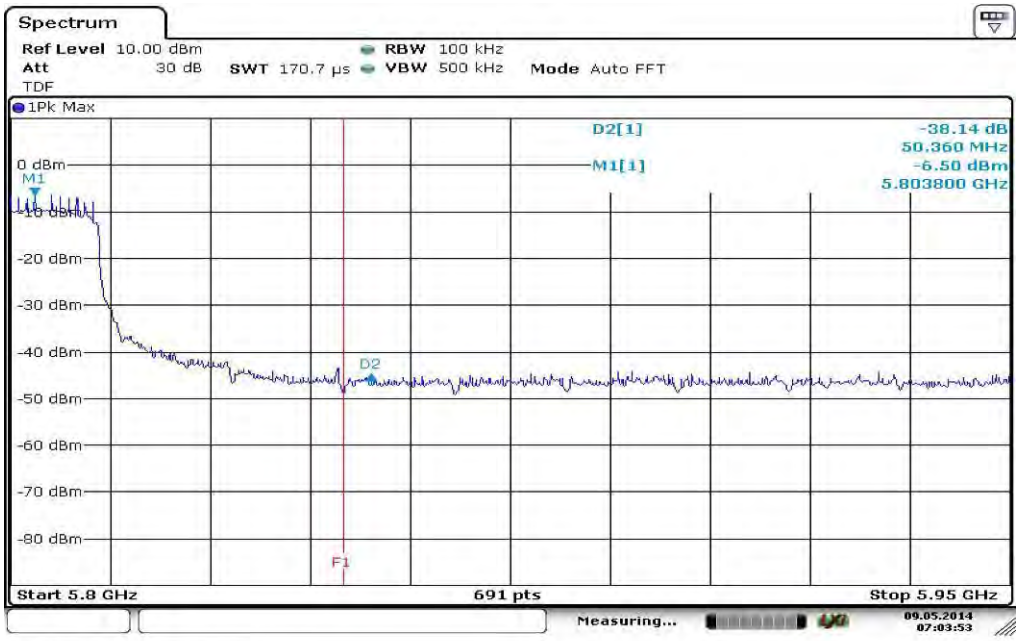
Plots: OFDM / n HT40 – mode

Plot 1: TX mode, lower band edge



Date: 9.MAY.2014 06:58:21

Plot 2: TX mode, upper band edge



Date: 9.MAY.2014 07:03:53

10.8 TX spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode The measurement is performed at the lowest, middle and highest channel. The measurement is repeated for all modulations.

Measurement:

Measurement parameter	
According to: DTS clause 11.1 & 2	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	500 kHz
Span:	9 kHz to 25 GHz
Trace-Mode:	Max Hold

Limits:

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

Results: ANT0

Results: OFDM / a – mode

TX Spurious Emissions Conducted					
OFDM / a – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
5745		-1.61	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
5785		-1.15	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
5825		-1.49	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty		± 3 dB			

Result: **Passed**

Results: OFDM / n/ac – mode HT20

TX Spurious Emissions Conducted					
OFDM / n/ac – mode HT20					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
5745		-2.47	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
5785		-1.29	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
5825		-1.20	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty		± 3 dB			

Result: **Passed**

Results: OFDM / n/ac – mode HT40

TX Spurious Emissions Conducted					
OFDM / n/ac – mode HT40					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
5755		-6.81	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
5785		-6.46	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty		± 3 dB			

Result: Passed

Results: ANT1

Results: OFDM / a – mode

TX Spurious Emissions Conducted					
OFDM / a – mode					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
5745		-0.44	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
5785		0.43	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
5825		0.53	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty		± 3 dB			

Result: **Passed**

Results: OFDM / n/ac – mode HT20

TX Spurious Emissions Conducted					
OFDM / n/ac – mode HT20					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
5745		-0.13	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
5785		0.34	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
5825		0.07	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty		± 3 dB			

Result: **Passed**

Results: OFDM / n/ac – mode HT40

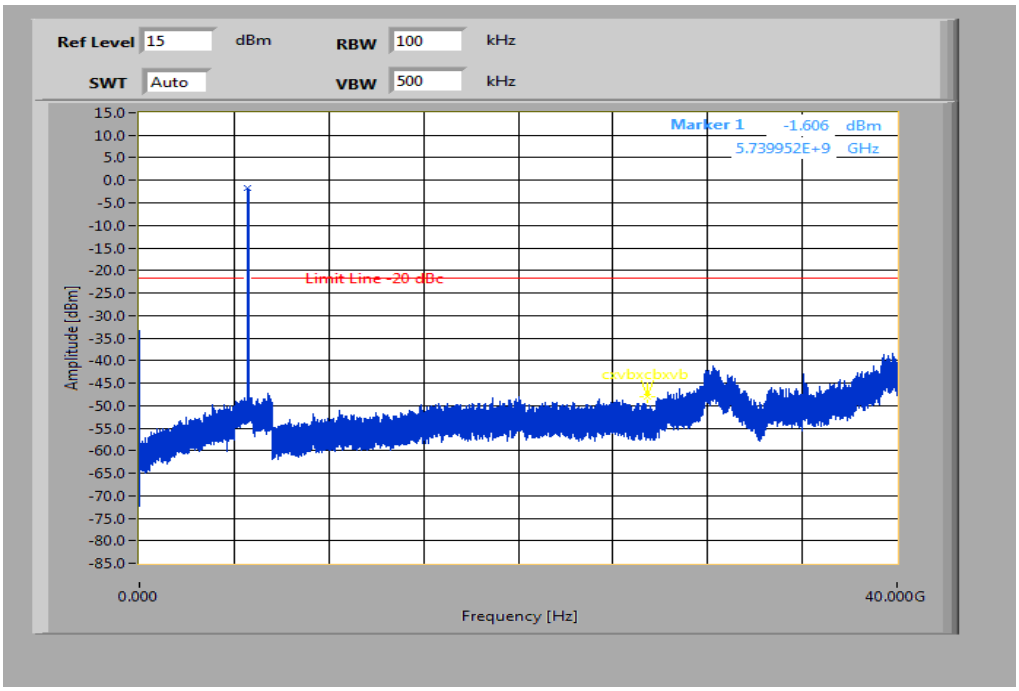
TX Spurious Emissions Conducted					
OFDM / n/ac – mode HT40					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
5755		-6.05	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
5785		-5.32	30 dBm		Operating frequency
No peaks detected. All detected emissions are below the -20 dBc criteria.			-20 dBc (peak) -30 dBc (average)		complies
Measurement uncertainty			± 3 dB		

Result: Passed

Plots: ANT0

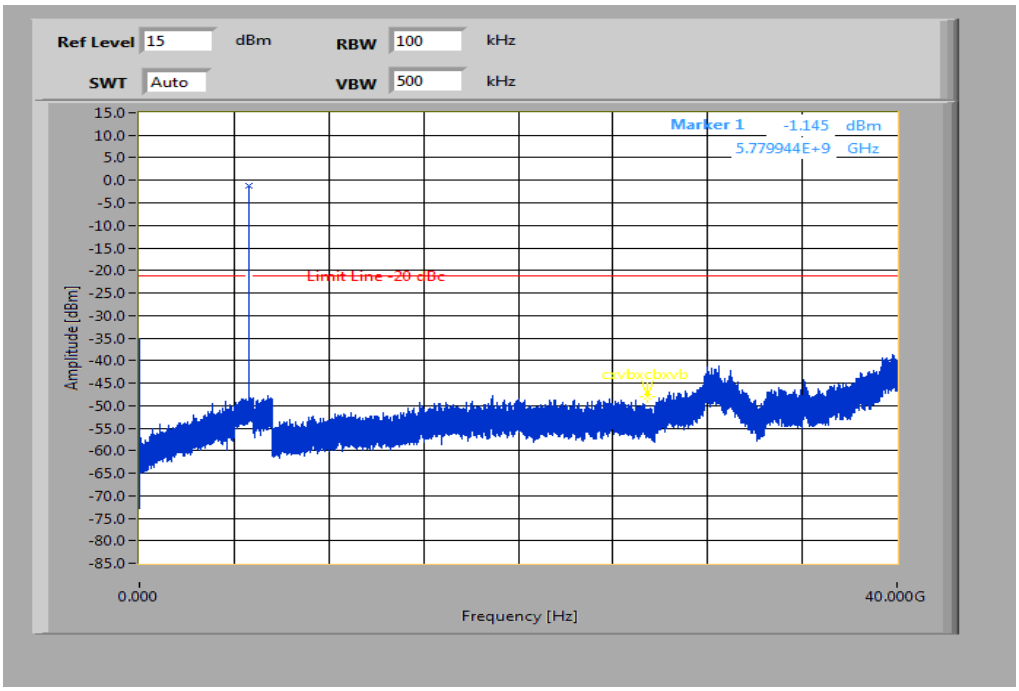
Plots: OFDM / a – mode

Plot 1: TX mode, lowest channel, up to 40 GHz



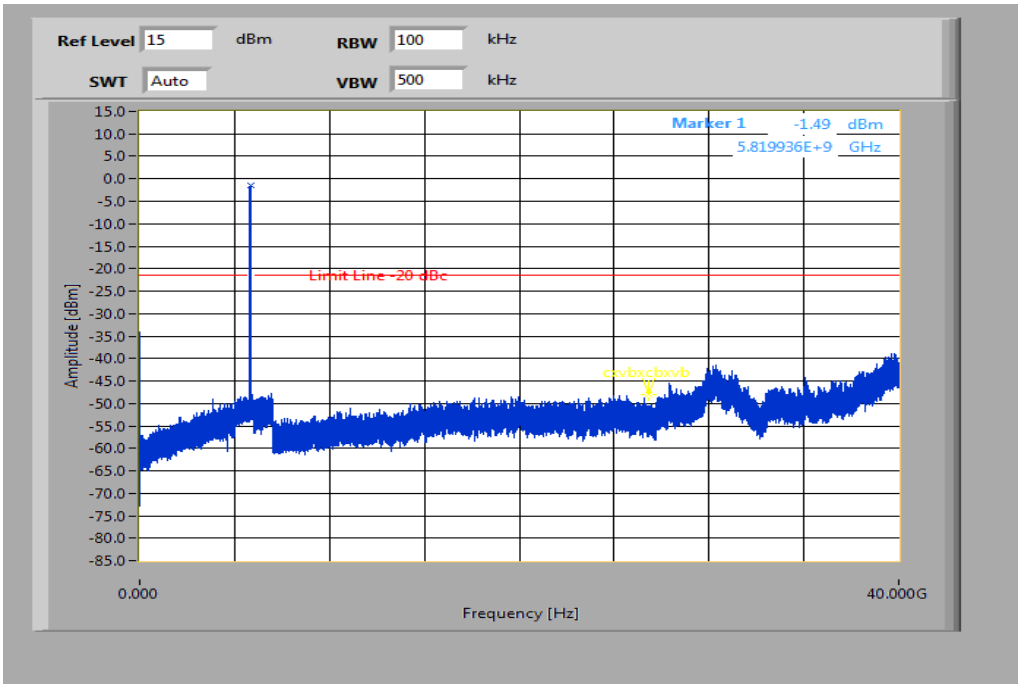
The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, middle channel, up to 40 GHz



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

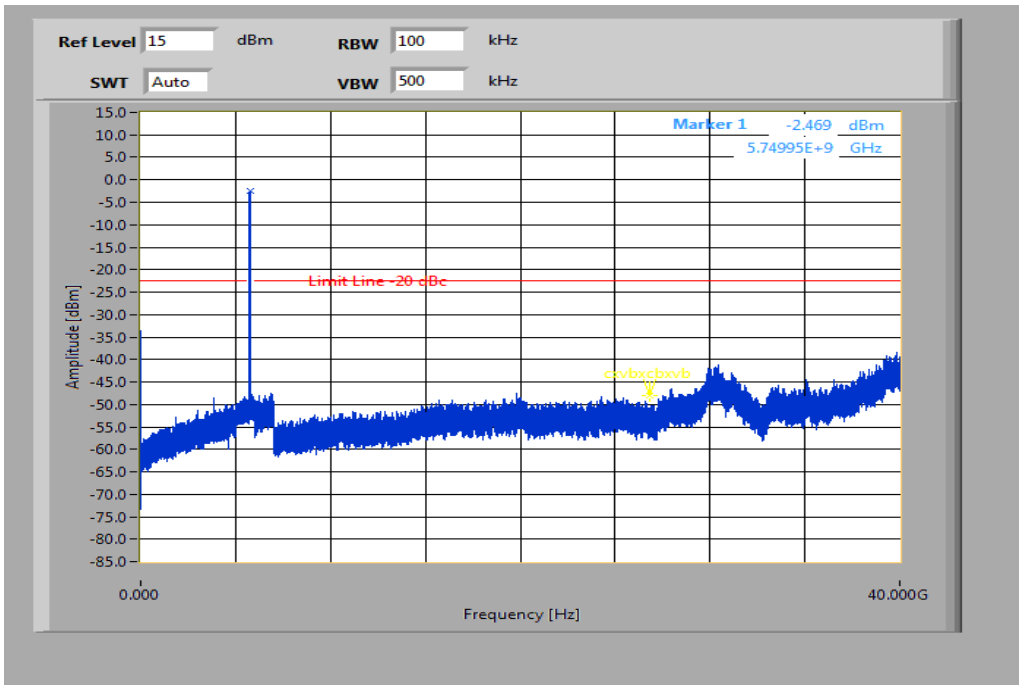
Plot 3: TX mode, highest channel, up to 40 GHz



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

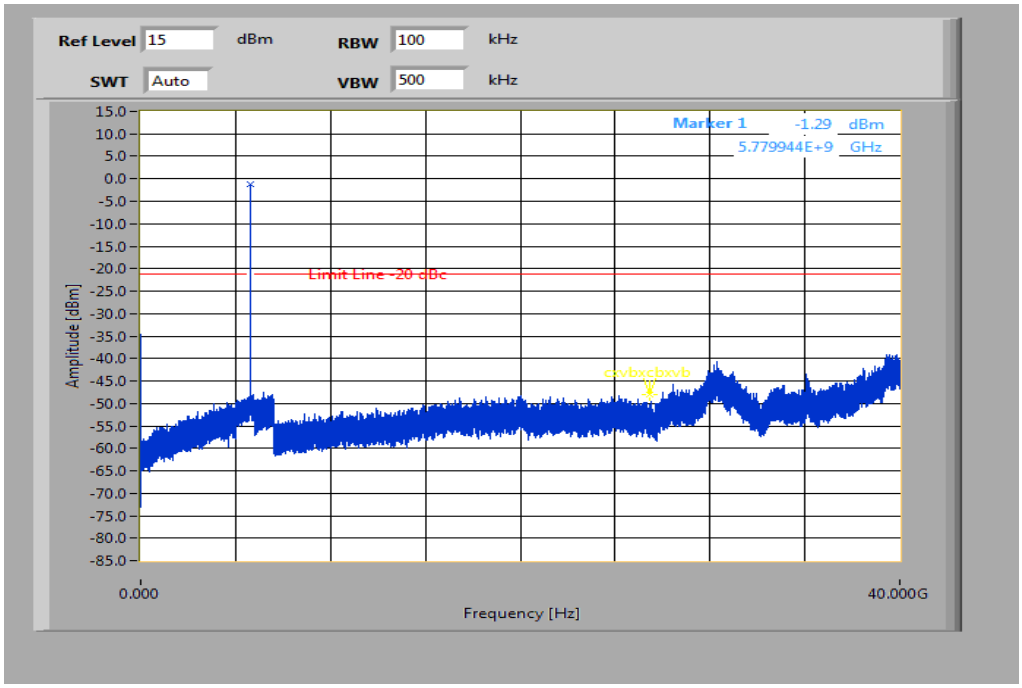
Plots: OFDM / n/ac – mode HT20

Plot 1: TX mode, lowest channel, up to 40 GHz



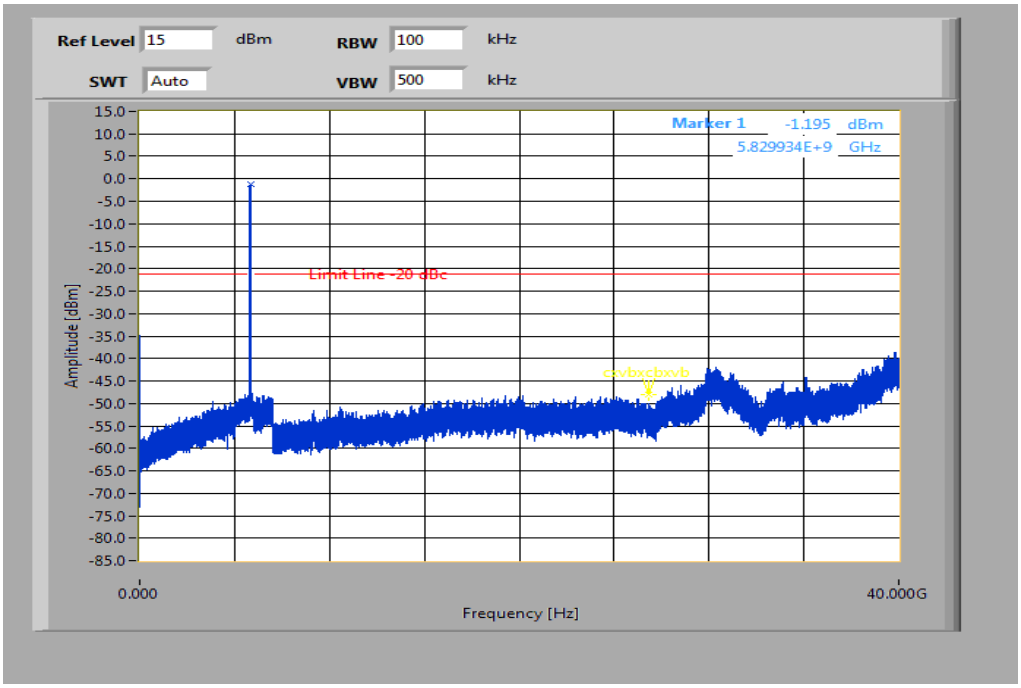
The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, middle channel, up to 40 GHz



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

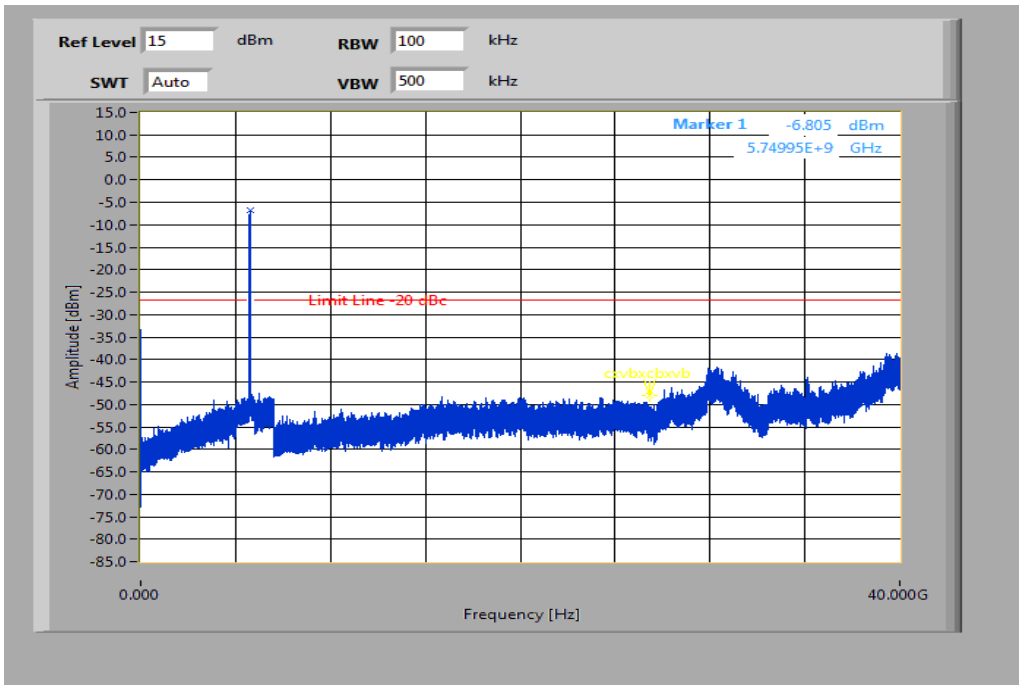
Plot 3: TX mode, highest channel, up to 40 GHz



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

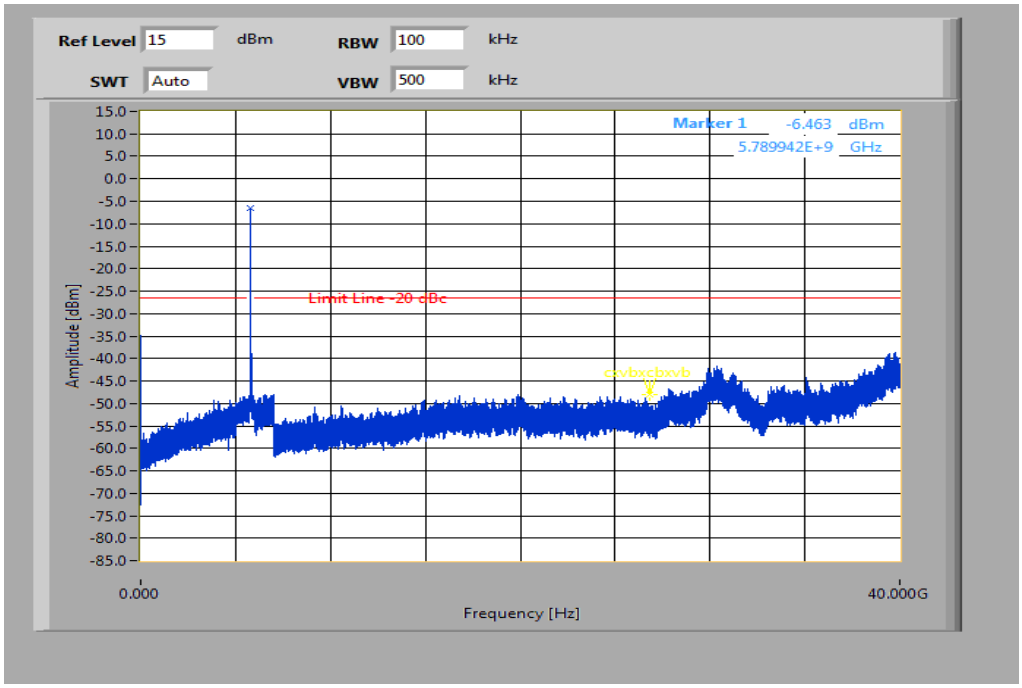
Plots: OFDM / n/ac – mode HT40

Plot 1: TX mode, lowest channel, up to 40 GHz



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

Plot 2: TX mode, highest channel, up to 40 GHz

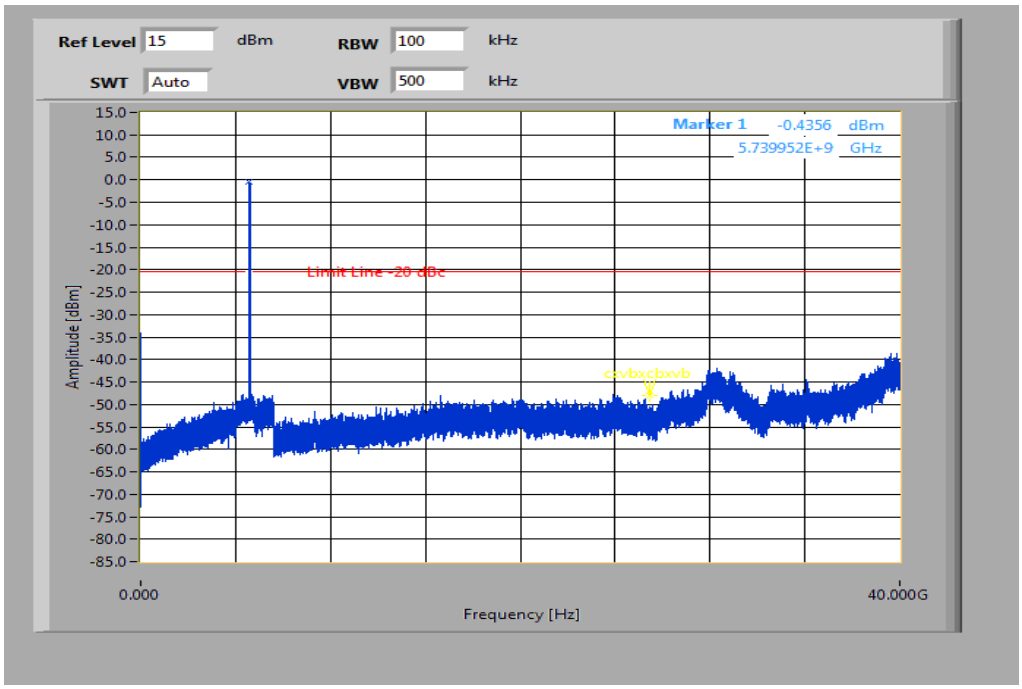


The peak at the beginning of the plot is the LO from the SA.

Plots: ANT1

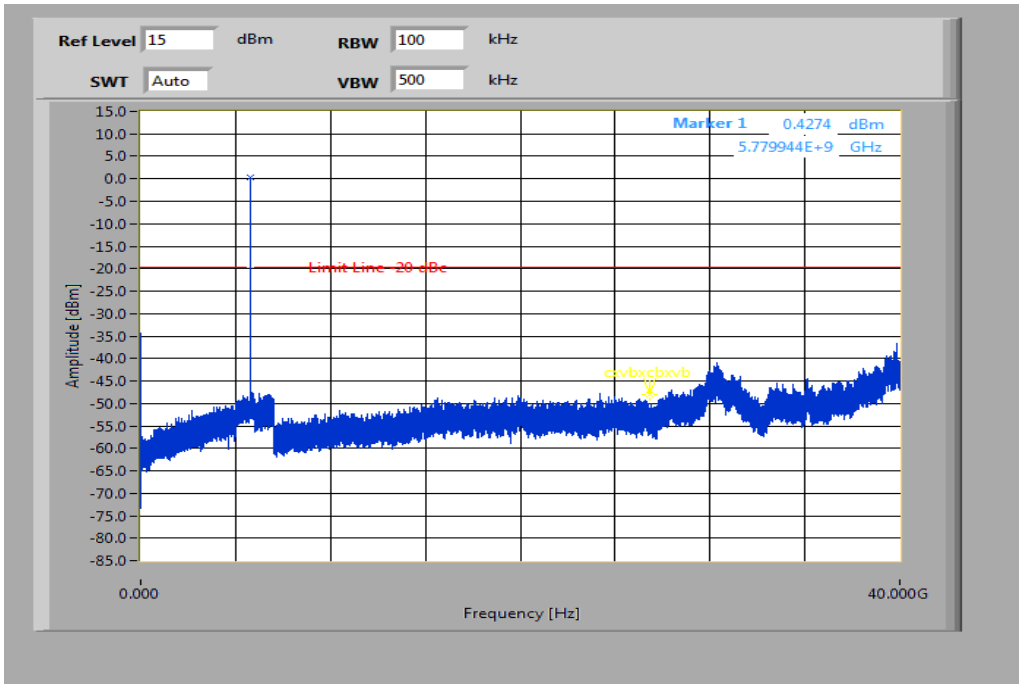
Plots: OFDM / a – mode

Plot 1: TX mode, lowest channel, up to 40 GHz



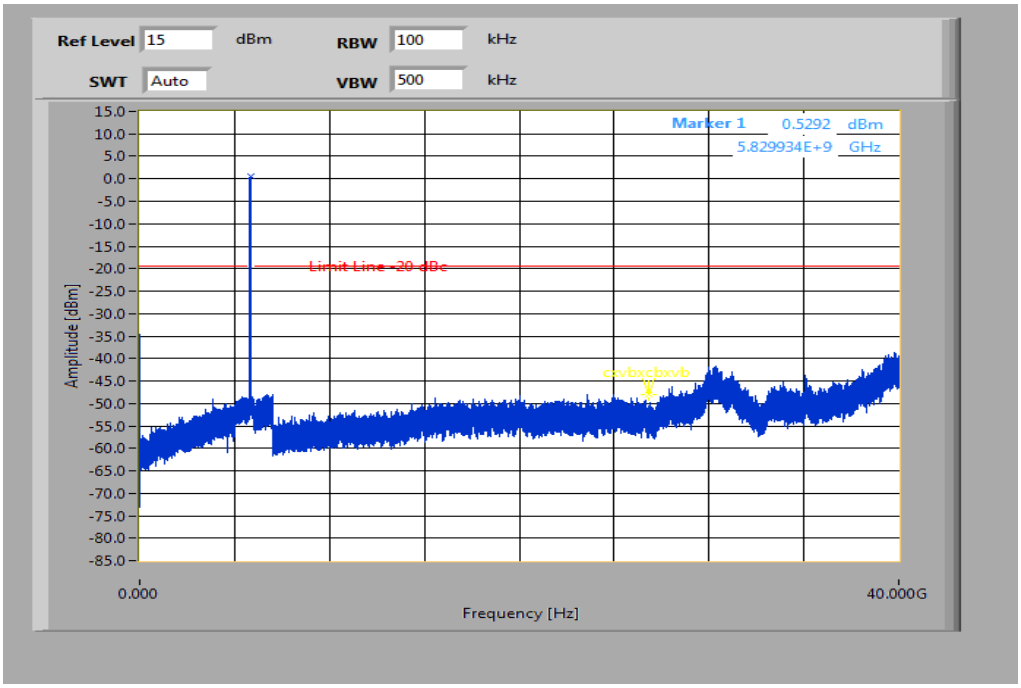
The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, middle channel, up to 40 GHz



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

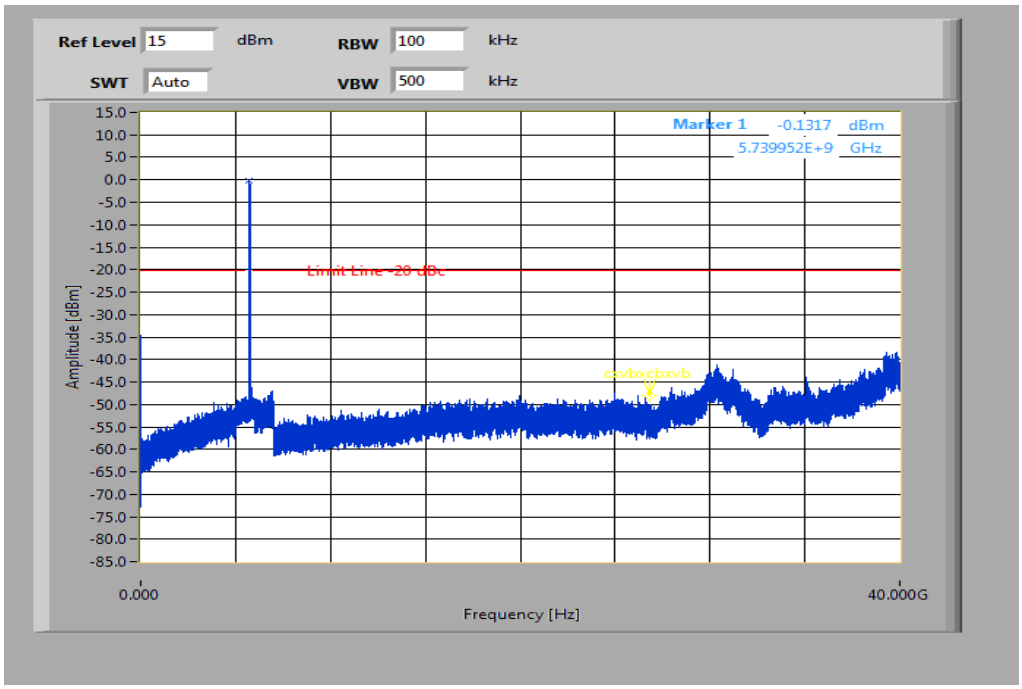
Plot 3: TX mode, highest channel, up to 40 GHz



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

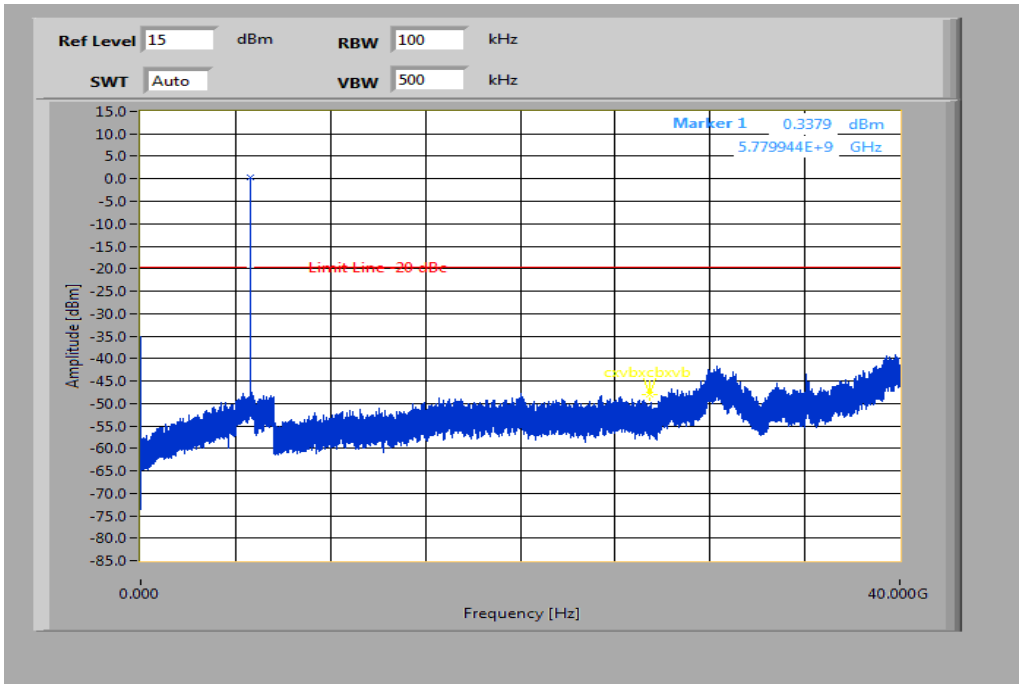
Plots: OFDM / n/ac – mode HT20

Plot 1: TX mode, lowest channel, up to 40 GHz



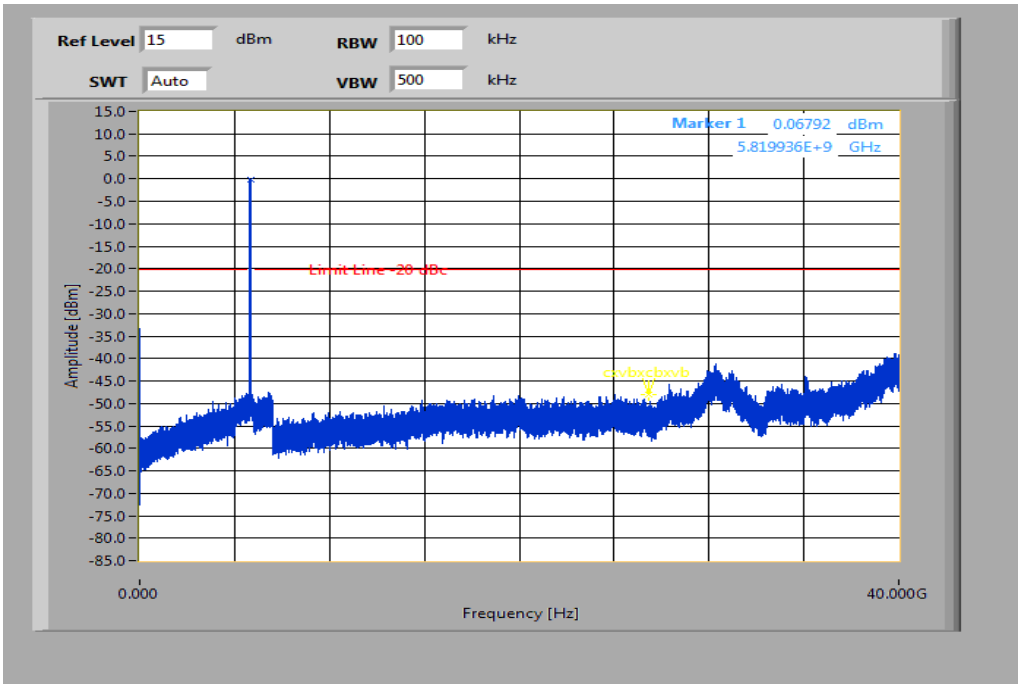
The peak at the beginning of the plot is the LO from the SA.

Plot 2: TX mode, middle channel, up to 40 GHz



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

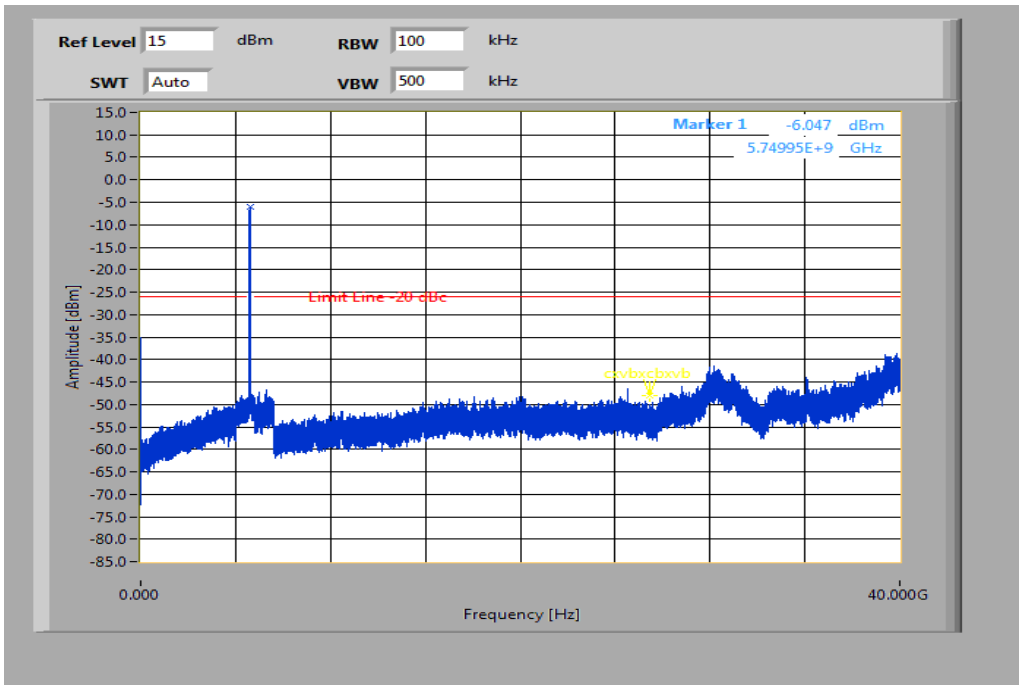
Plot 3: TX mode, highest channel, up to 40 GHz



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

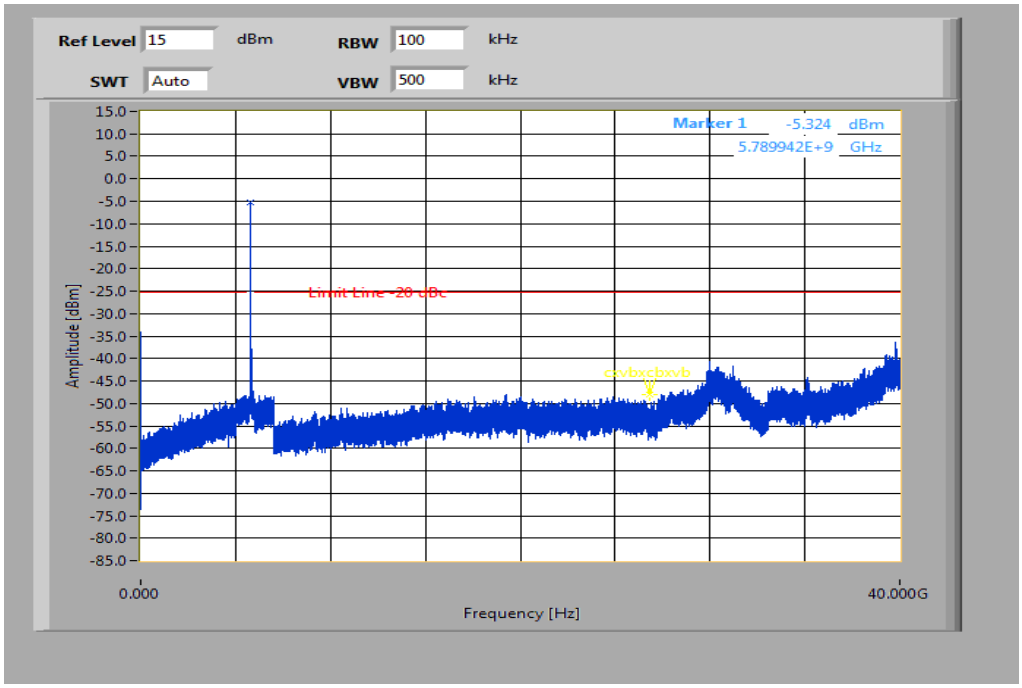
Plots: OFDM / n/ac – mode HT40

Plot 1: TX mode, lowest channel, up to 40 GHz



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

Plot 2: TX mode, highest channel, up to 40 GHz



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

10.9 TX spurious emissions radiated

Description:

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

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	F > 1 GHz: 1 MHz F < 1 GHz: 100 kHz
Video bandwidth:	3 x RBW Remeasurement: 10 Hz / 3 MHz
Span:	30 MHz to 40 GHz
Trace-Mode:	Max Hold
Measured Modulation	☒ OFDM a – mode ☒ OFDM n/ac – mode HT20 ☒ OFDM n/ac – mode HT40 ☒ OFDM ac – mode HT80

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

Limits:

FCC	IC	
TX Spurious Emissions Radiated		
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
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: both antennas are active

Results: OFDM / a – mode

TX Spurious Emissions Radiated [dBµV/m]								
OFDM / a – mode								
5745 MHz			5785 MHz			5825 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
1437	1 MHz PP	45.69	All detected peak emissions are below the average limit!			All detected peak emissions are below the average limit!		
2395	1 MHz PP	42.43						
2874	1 MHz PP	42.96	-/-			-/-		
3353	1 MHz PP	51.13						
Measurement uncertainty			± 3 dB					

Results: OFDM / n/ac – mode HT20

TX Spurious Emissions Radiated [dBµV/m]								
OFDM / n – mode HT20								
5745 MHz			5785 MHz			5825 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
2874	1 MHz PP	42.59	All detected peak emissions are below the average limit!			All detected peak emissions are below the average limit!		
3353	1 MHz PP	50.34						
Measurement uncertainty			± 3 dB					

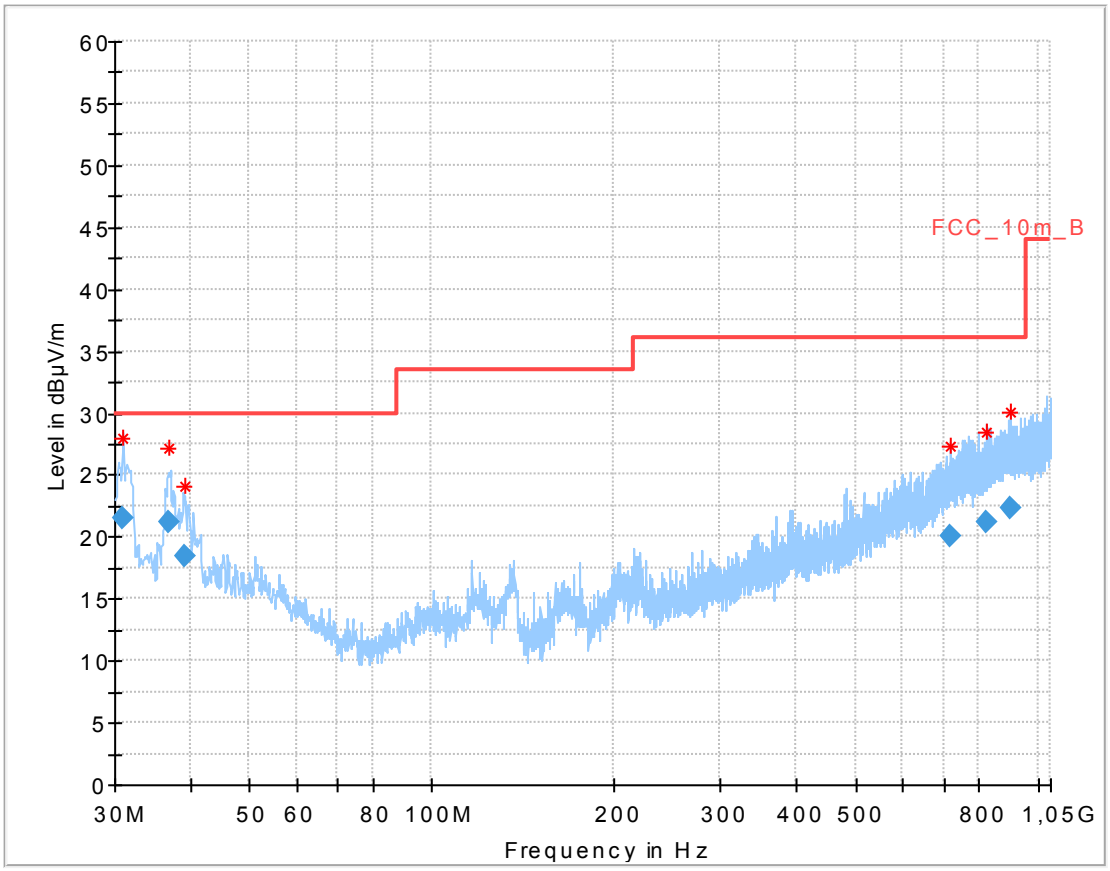
Results: OFDM / n/ac – mode HT40

TX Spurious Emissions Radiated [dBµV/m]					
OFDM / n – mode HT40					
5755 MHz			5795 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.			For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions are below the average limit!			All detected peak emissions are below the average limit!		
Measurement uncertainty		± 3 dB			

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

Plots: OFDM / a – mode

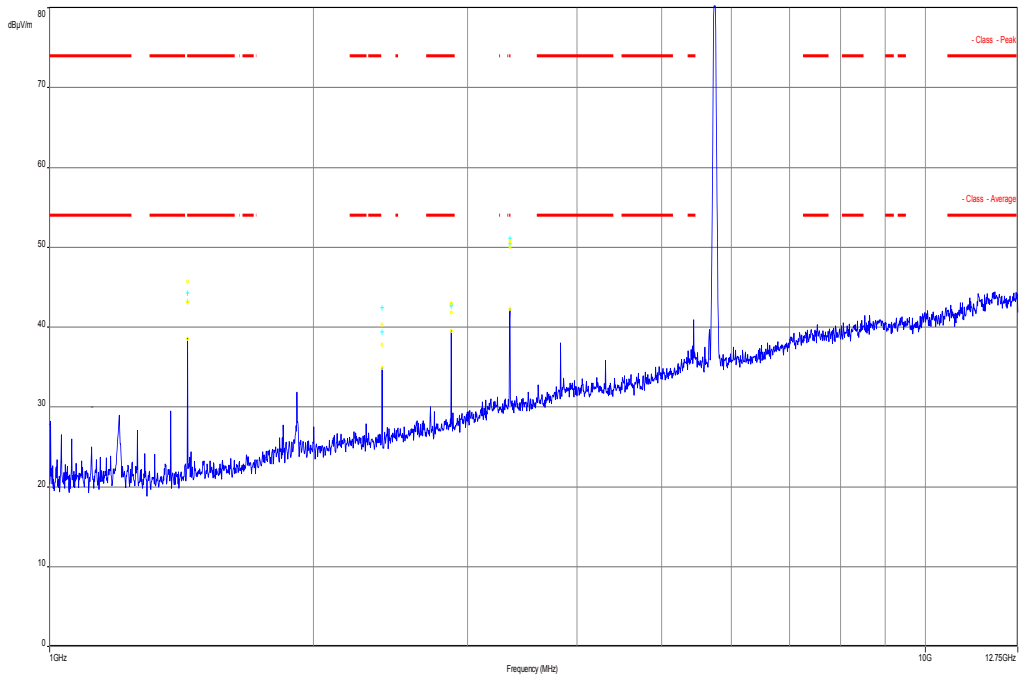
Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization



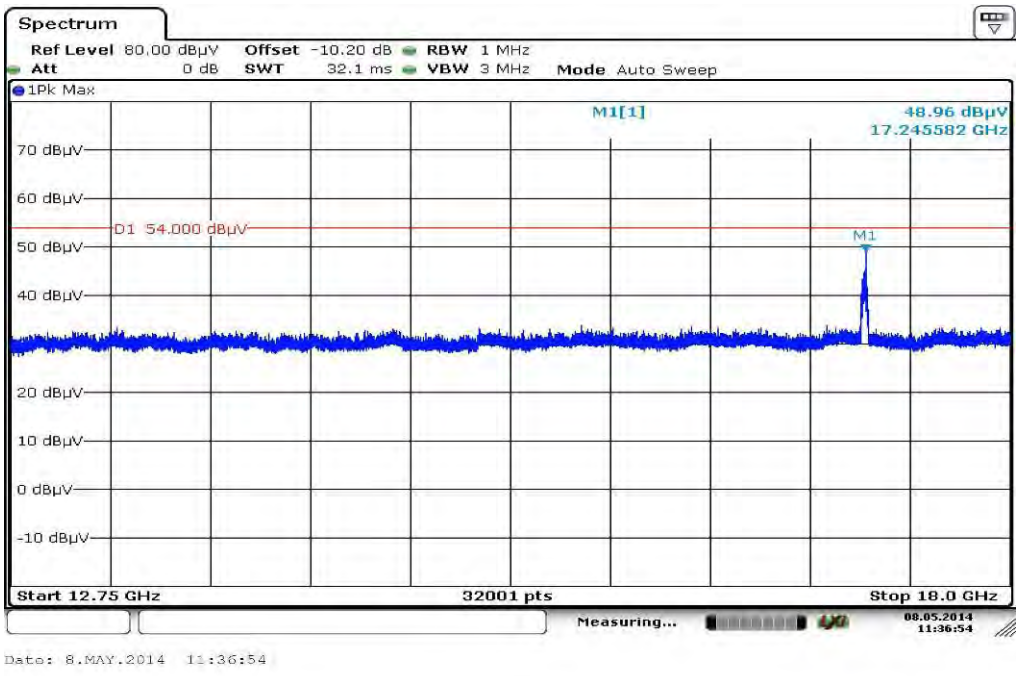
Final results:

Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.901800	21.49	30.00	8.51	1000.0	120.000	101.0	V	-10.0	12.6
36.828450	21.24	30.00	8.76	1000.0	120.000	101.0	V	177.0	13.2
39.170400	18.37	30.00	11.63	1000.0	120.000	101.0	V	280.0	13.4
717.699300	20.10	36.00	15.90	1000.0	120.000	101.0	H	-3.0	22.9
822.269850	21.17	36.00	14.83	1000.0	120.000	170.0	H	85.0	24.1
899.326950	22.26	36.00	13.74	1000.0	120.000	170.0	H	100.0	25.2

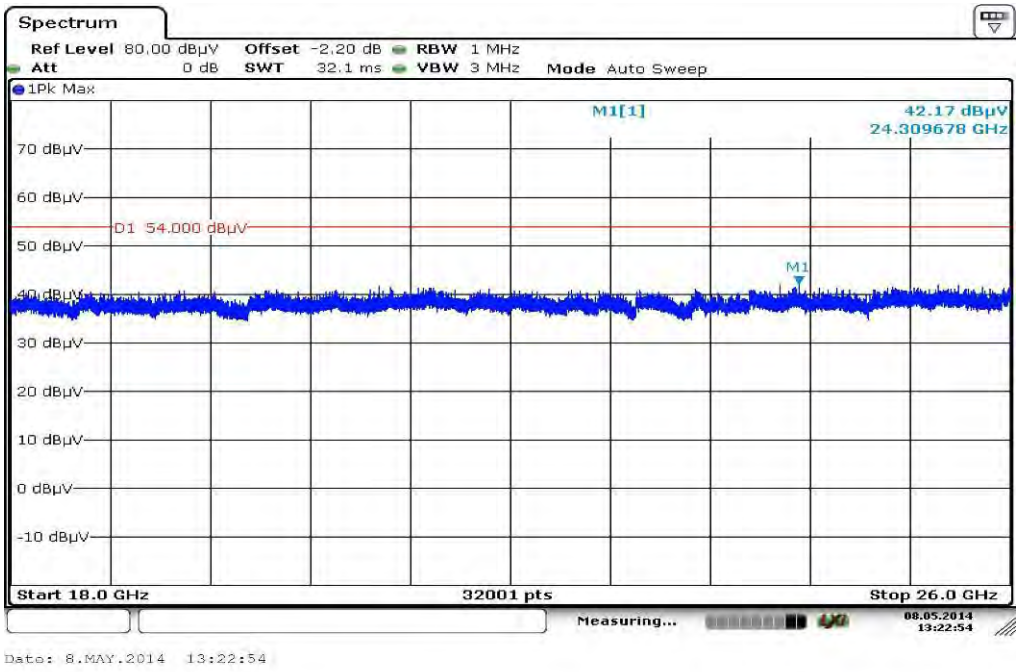
Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



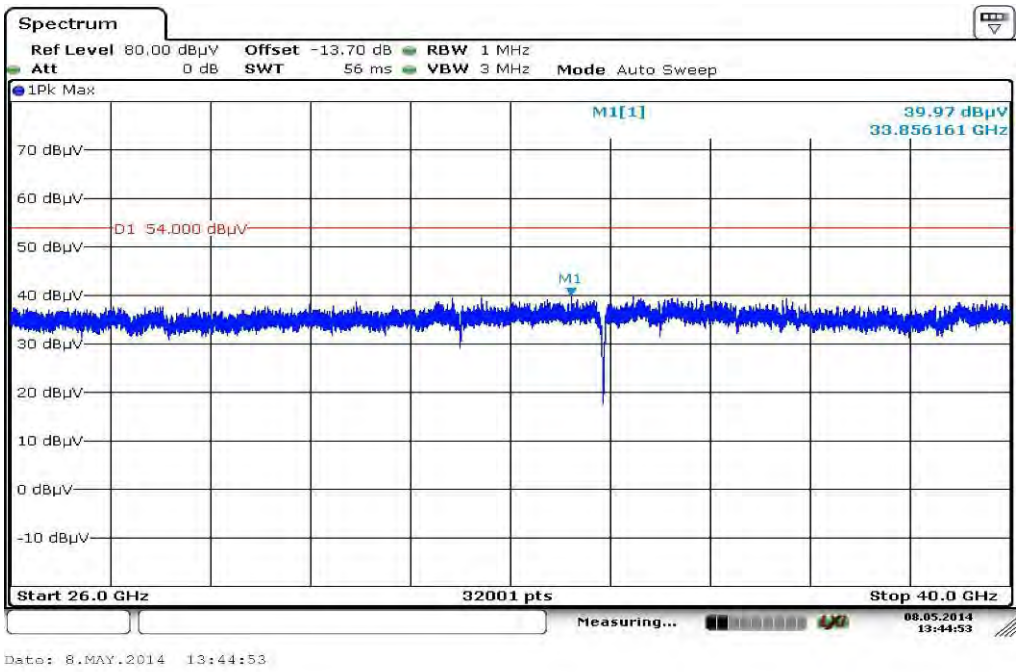
Plot 3: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



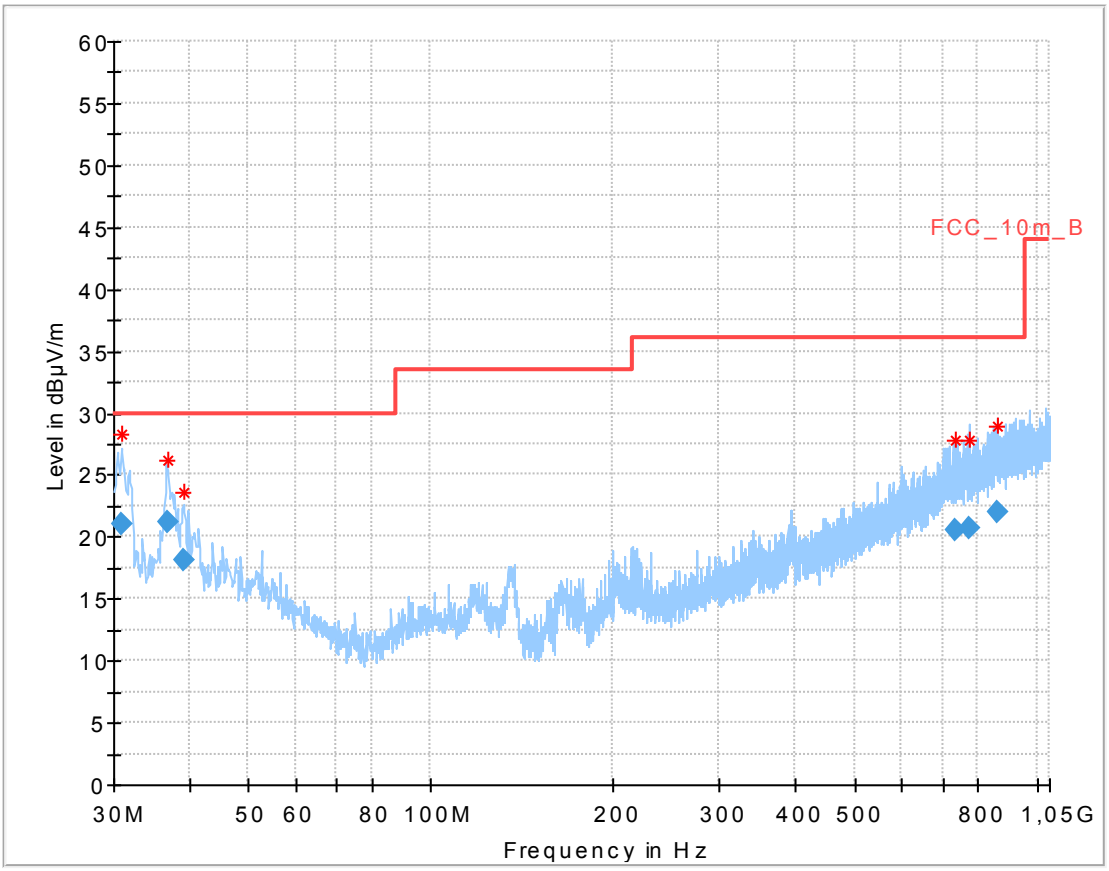
Plot 4: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



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



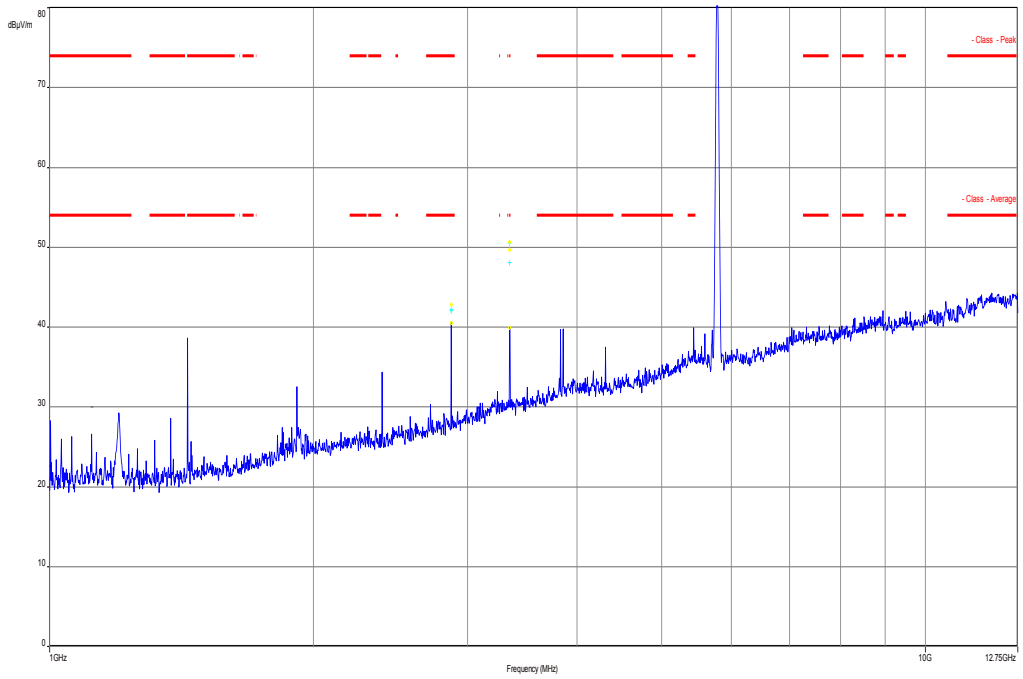
Plot 6: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization



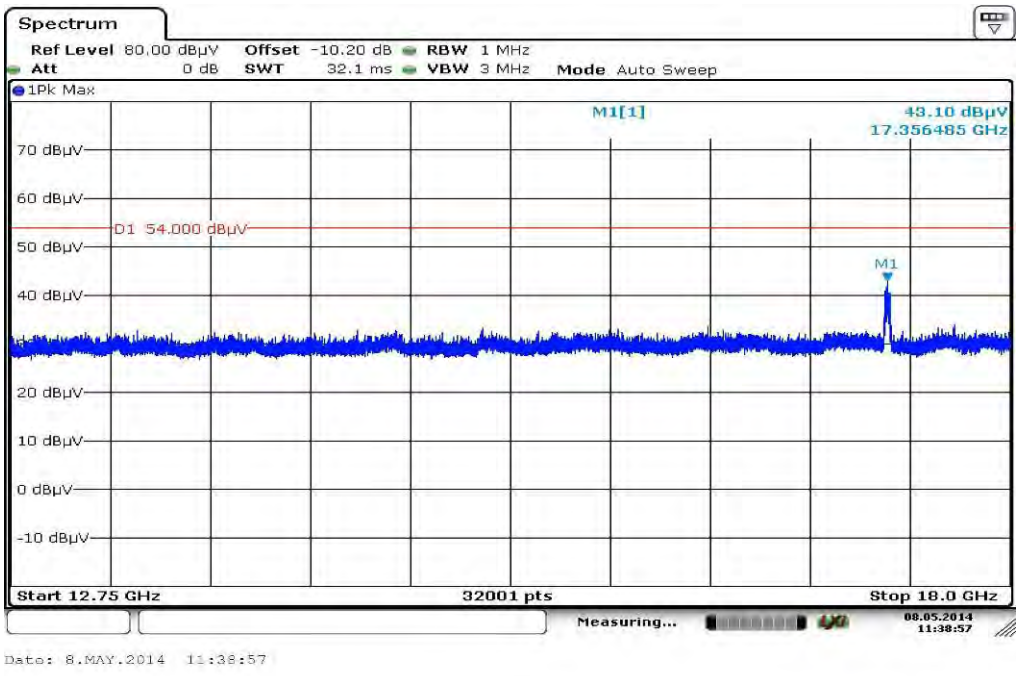
Final results:

Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.987300	21.07	30.00	8.93	1000.0	120.000	155.0	V	190.0	12.6
36.782100	21.26	30.00	8.74	1000.0	120.000	100.0	V	190.0	13.2
39.116250	18.07	30.00	11.93	1000.0	120.000	105.0	V	90.0	13.4
734.788200	20.47	36.00	15.53	1000.0	120.000	170.0	H	175.0	23.3
776.638950	20.70	36.00	15.30	1000.0	120.000	170.0	H	190.0	23.7
864.473400	21.93	36.00	14.07	1000.0	120.000	170.0	V	93.0	24.7

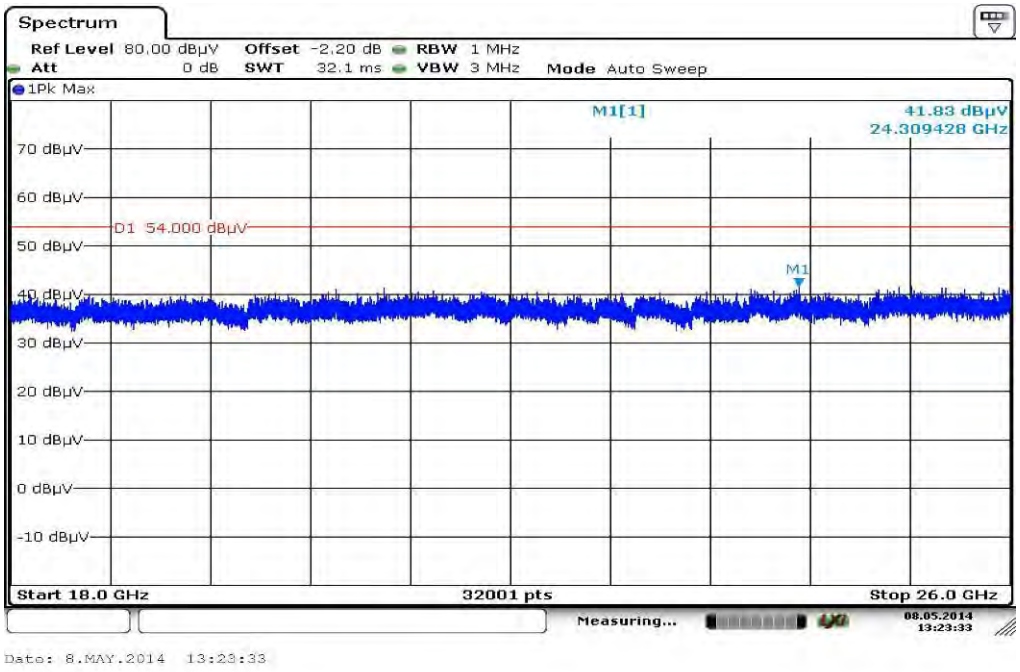
Plot 7: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



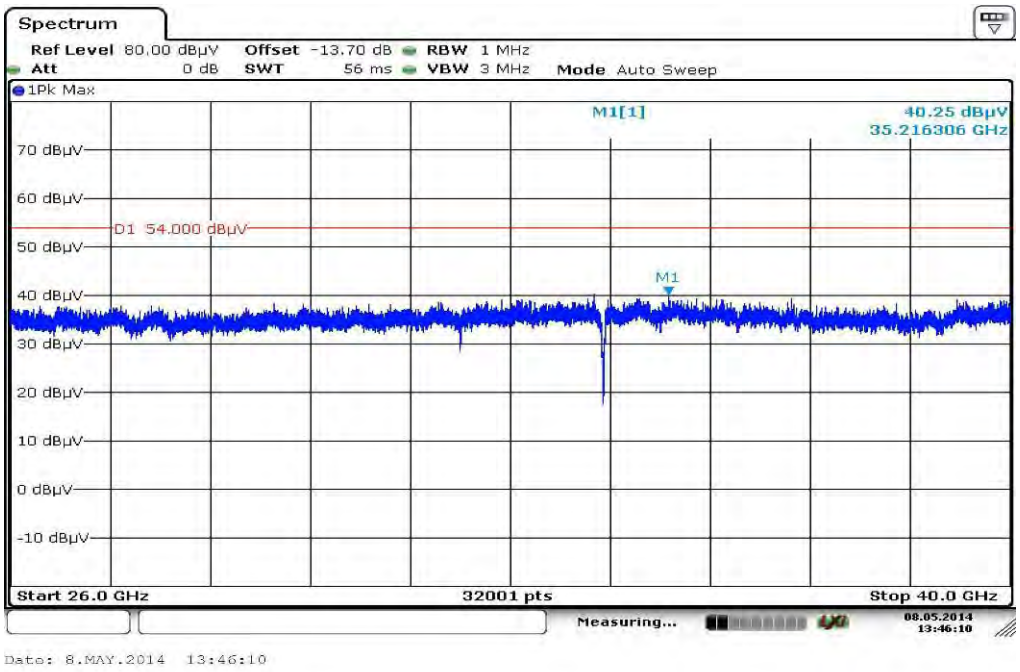
Plot 8: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



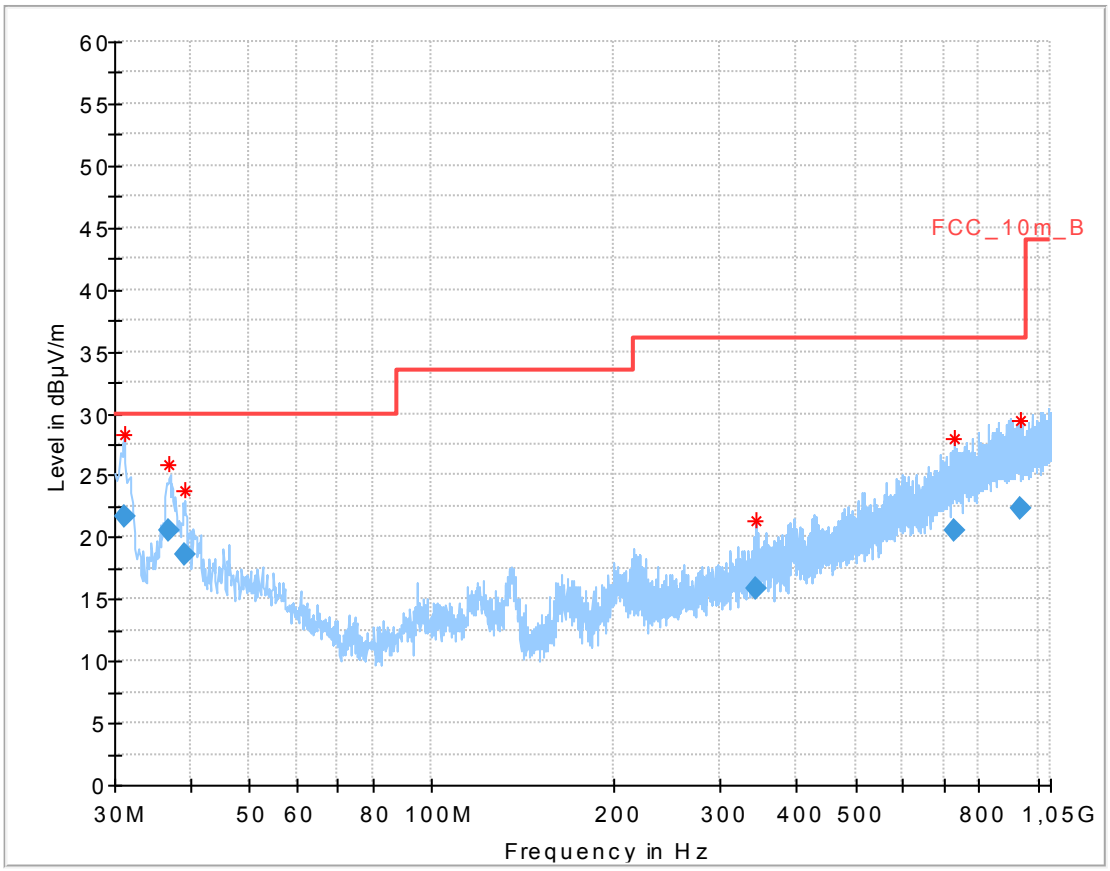
Plot 9: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Plot 10: Middle channel, 26 GHz to 40 GHz, vertical & horizontal polarization



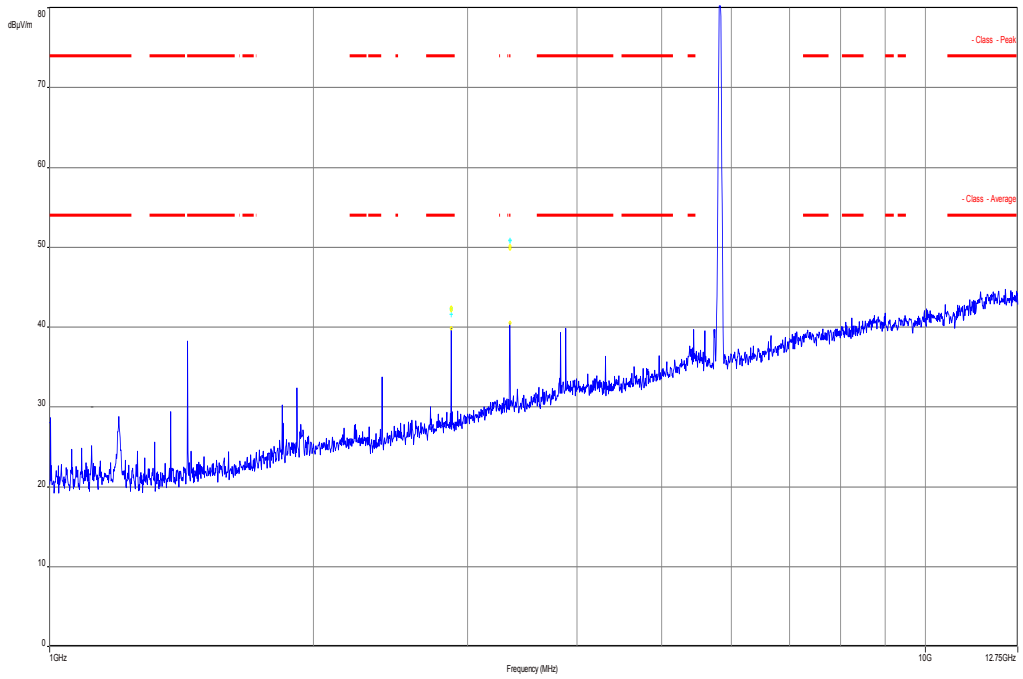
Plot 11: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization



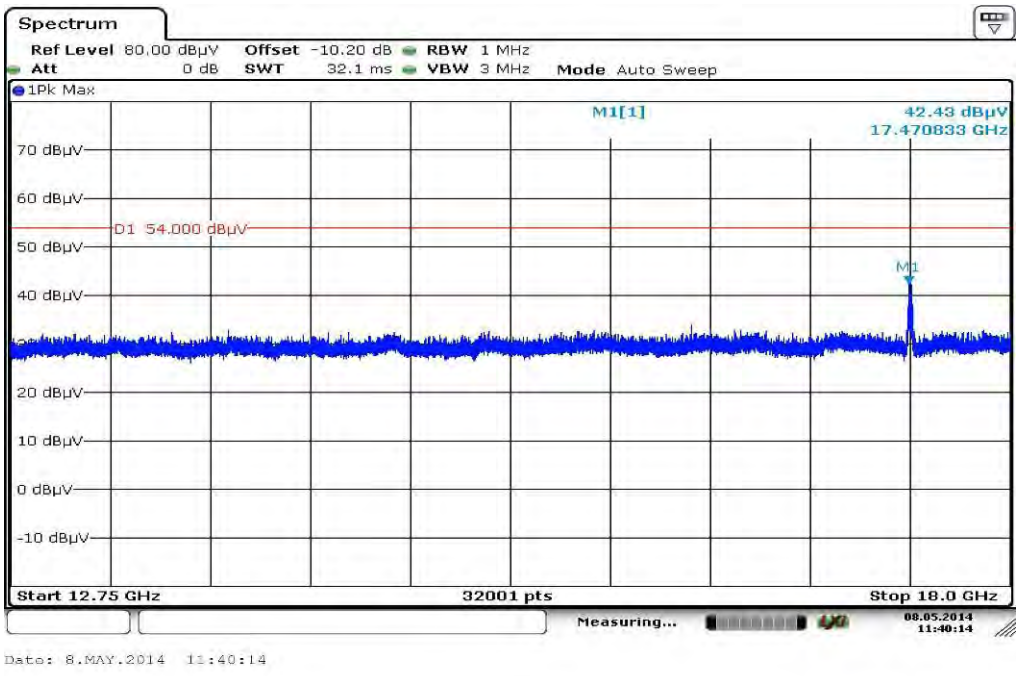
Final results:

Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.106700	21.60	30.00	8.40	1000.0	120.000	101.0	V	-10.0	12.6
36.922500	20.52	30.00	9.48	1000.0	120.000	98.0	V	-9.0	13.2
39.071250	18.67	30.00	11.33	1000.0	120.000	112.0	V	180.0	13.4
342.825600	15.89	36.00	20.11	1000.0	120.000	145.0	V	190.0	15.9
730.225050	20.51	36.00	15.49	1000.0	120.000	170.0	H	175.0	23.2
935.472300	22.37	36.00	13.63	1000.0	120.000	170.0	H	100.0	25.3

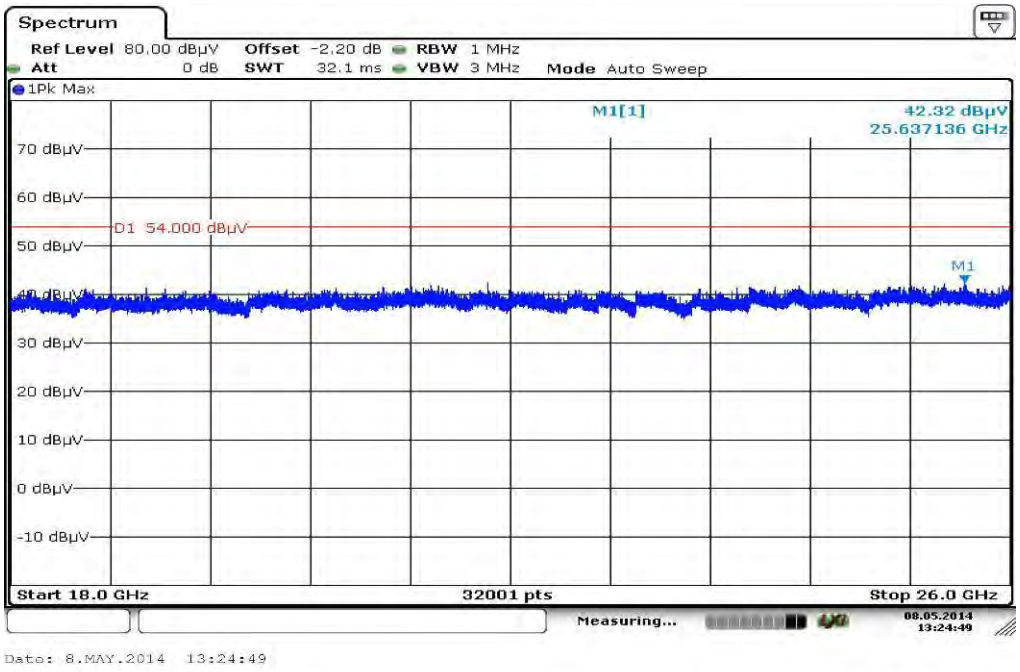
Plot 12: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



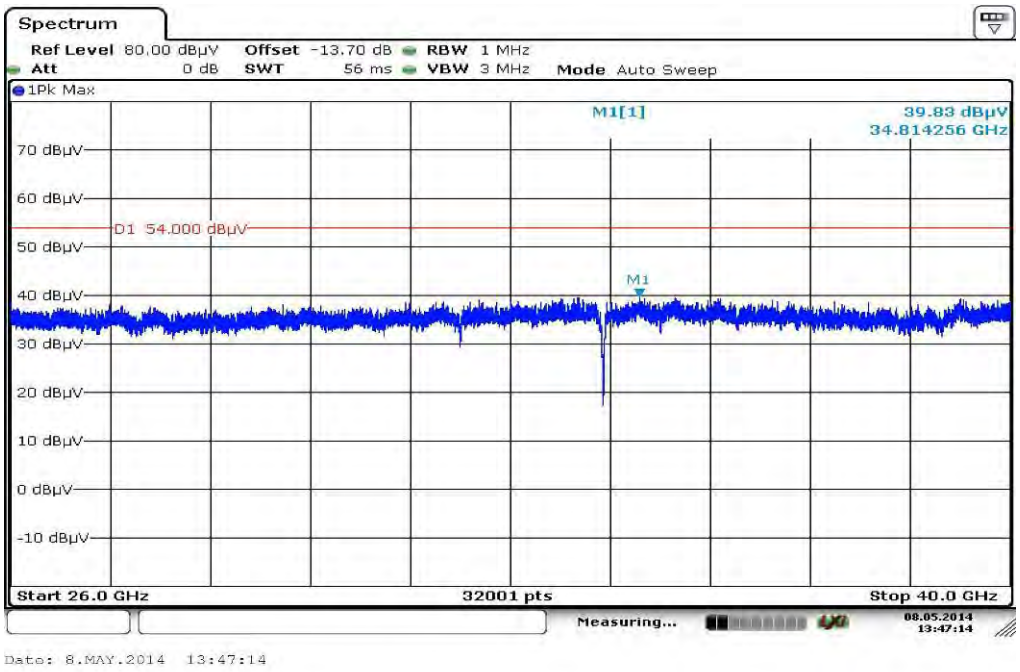
Plot 13: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Plot 14: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

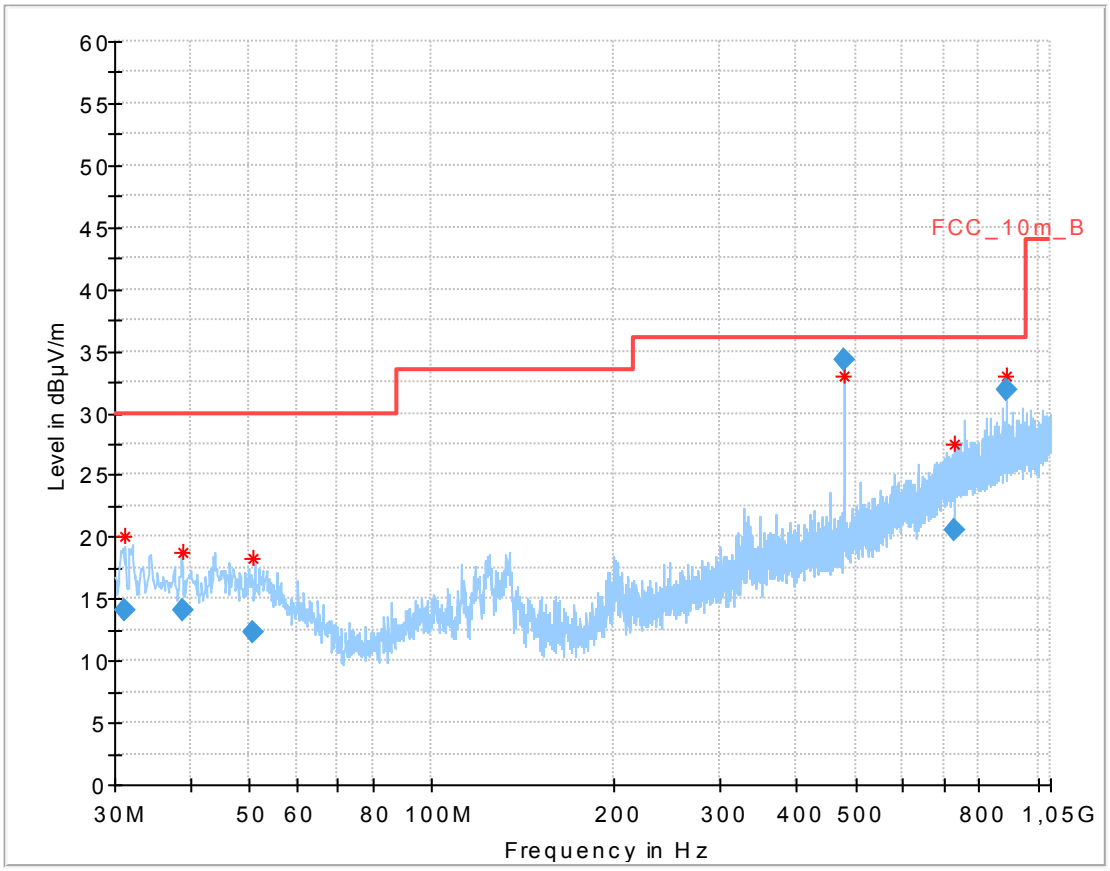


Plot 15: Highest channel, 26 GHz to 40 GHz, vertical & horizontal polarization



Plots: OFDM / n HT20 – mode

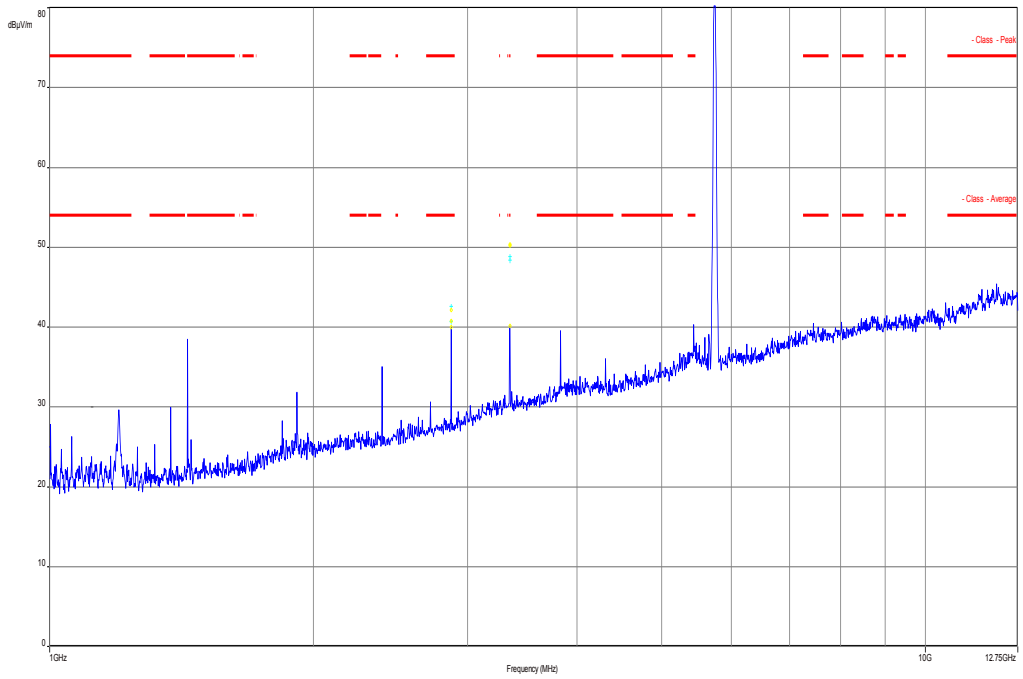
Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization



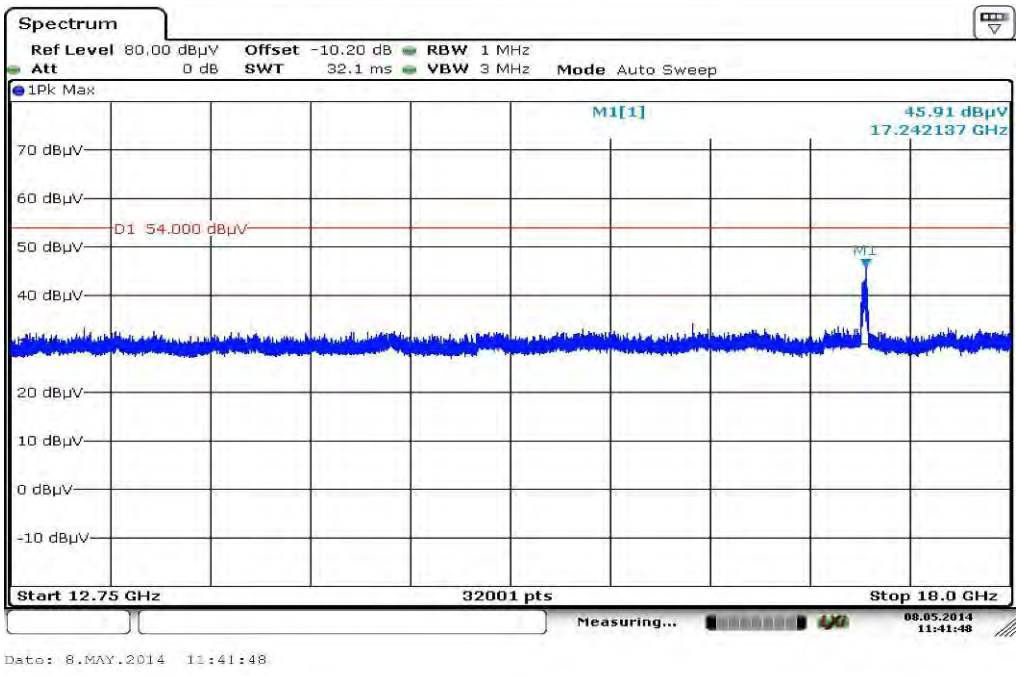
Final results:

Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.161450	14.03	30.00	15.97	1000.0	120.000	146.0	V	81.0	12.6
38.725200	14.07	30.00	15.93	1000.0	120.000	101.0	V	1.0	13.3
50.615700	12.32	30.00	17.68	1000.0	120.000	98.0	V	190.0	13.3
478.989450	34.31	36.00	1.69	1000.0	120.000	131.0	H	10.0	18.3
729.657150	20.57	36.00	15.43	1000.0	120.000	170.0	H	170.0	23.2
887.746950	31.92	36.00	4.08	1000.0	120.000	106.0	H	280.0	25.0

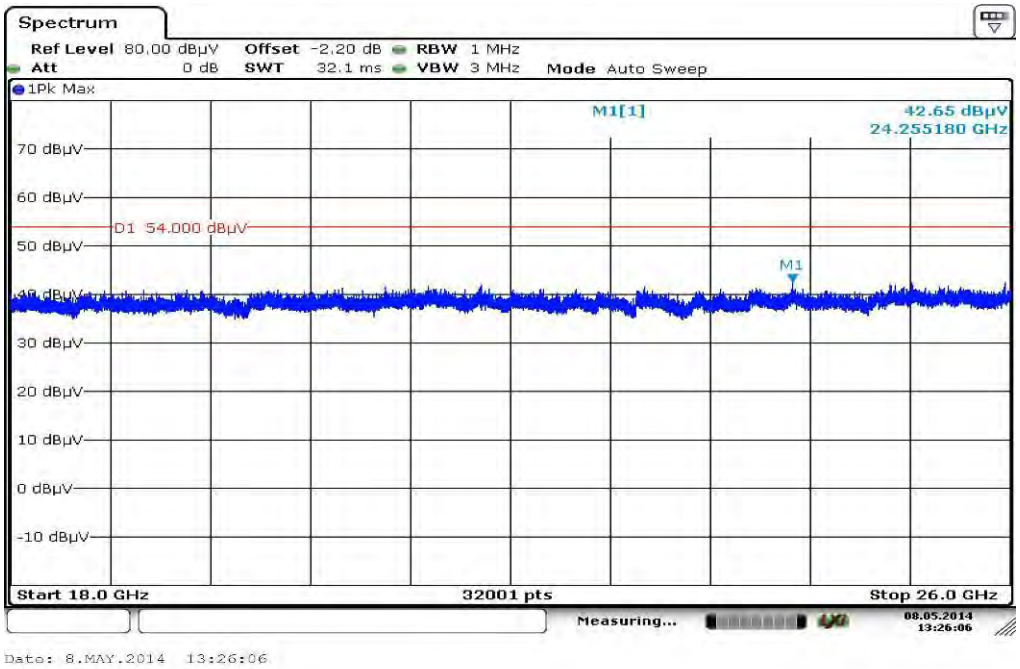
Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



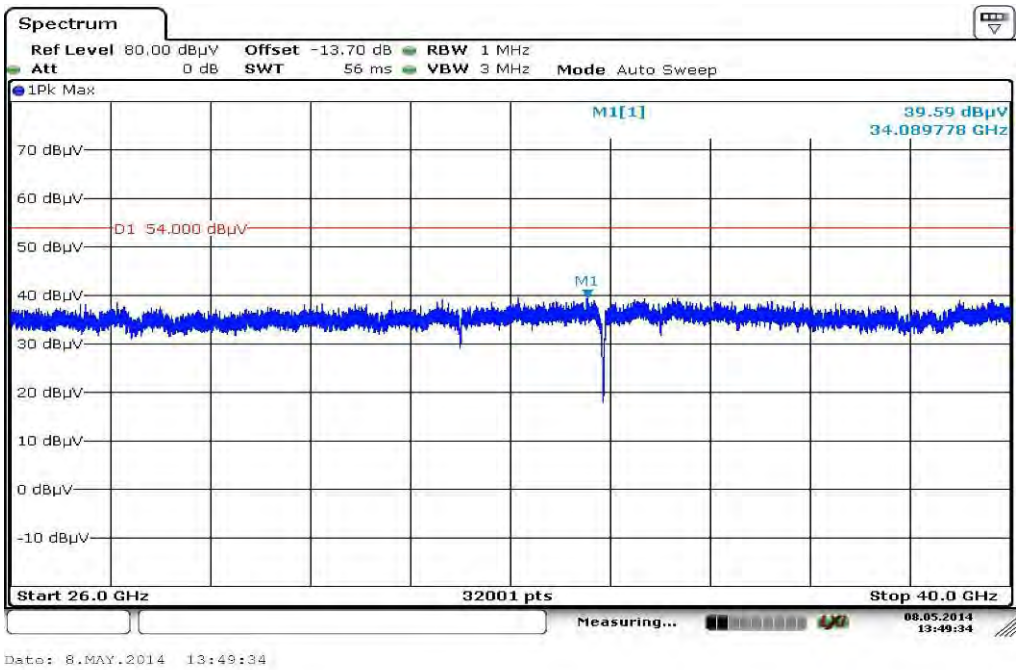
Plot 3: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



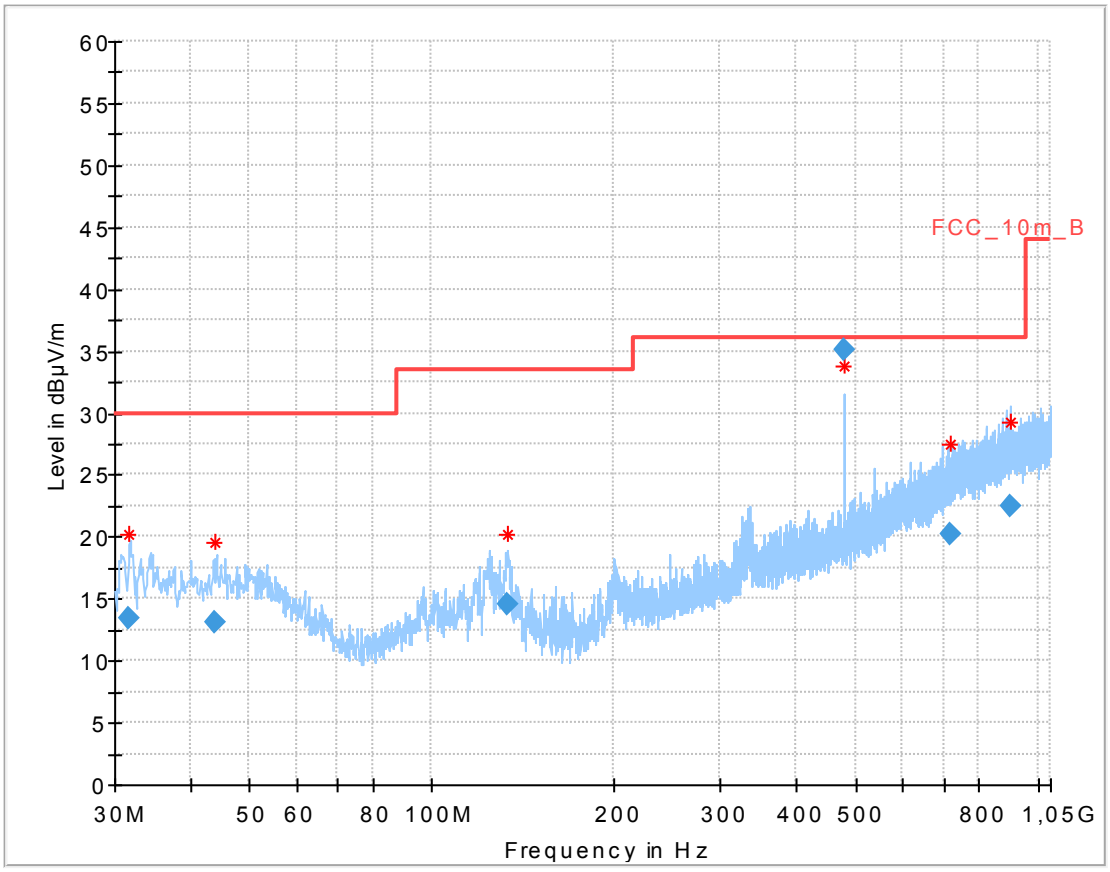
Plot 4: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



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



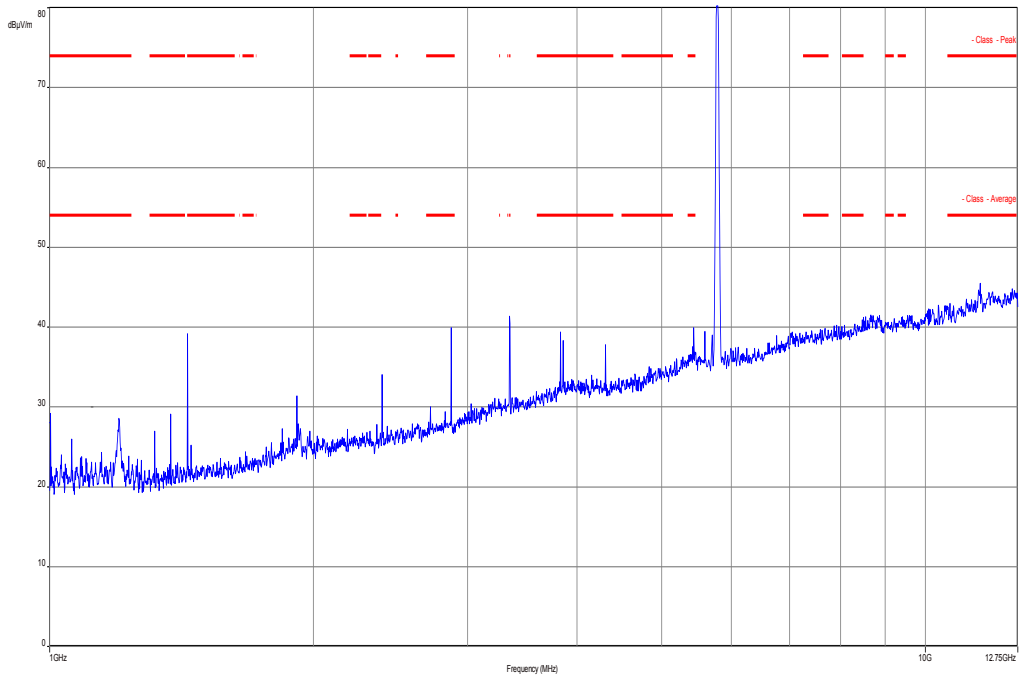
Plot 6: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization



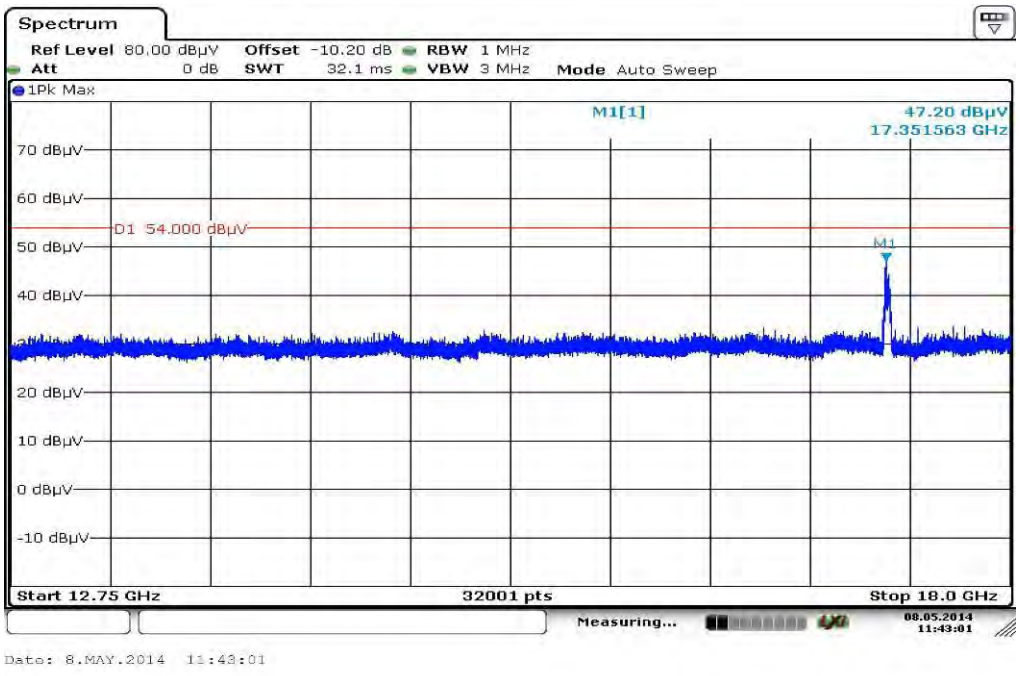
Final results:

Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.710300	13.47	30.00	16.53	1000.0	120.000	101.0	V	176.0	12.7
43.762650	13.13	30.00	16.87	1000.0	120.000	170.0	V	190.0	13.3
133.156800	14.56	33.50	18.94	1000.0	120.000	170.0	V	83.0	9.2
478.985250	35.14	36.00	0.86	1000.0	120.000	129.0	H	10.0	18.3
714.900750	20.26	36.00	15.74	1000.0	120.000	131.0	V	100.0	22.9
904.066050	22.52	36.00	13.48	1000.0	120.000	161.0	V	260.0	25.2

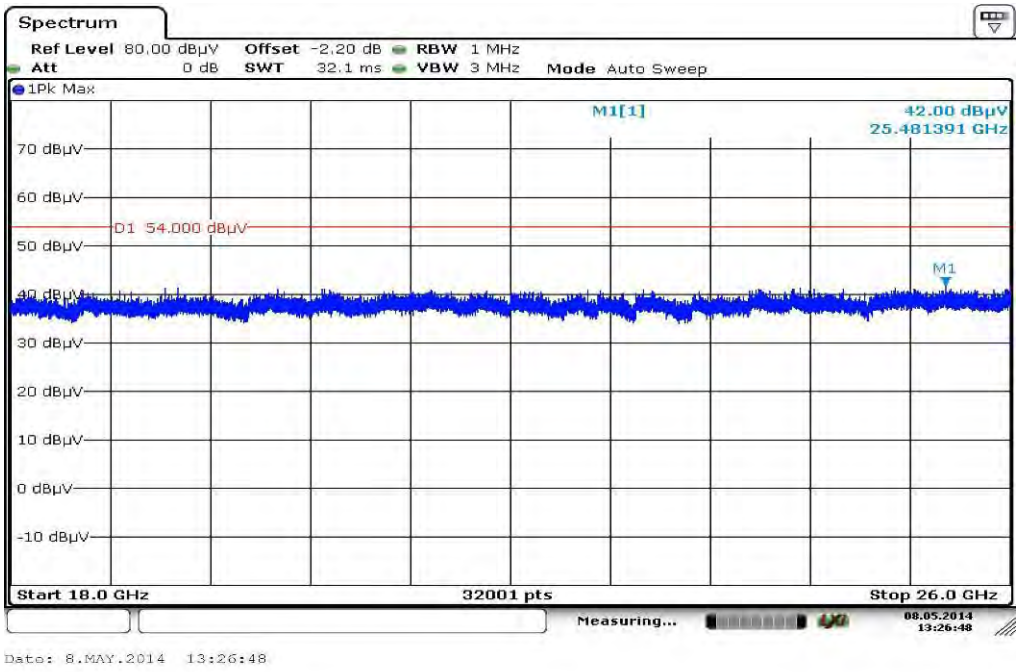
Plot 7: Middle channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



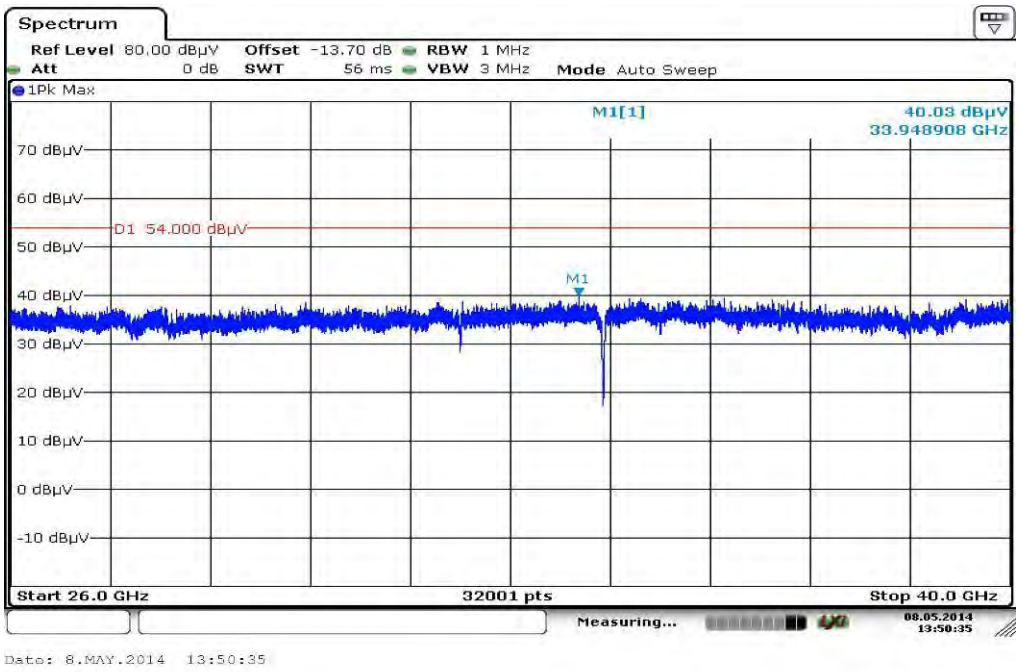
Plot 8: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



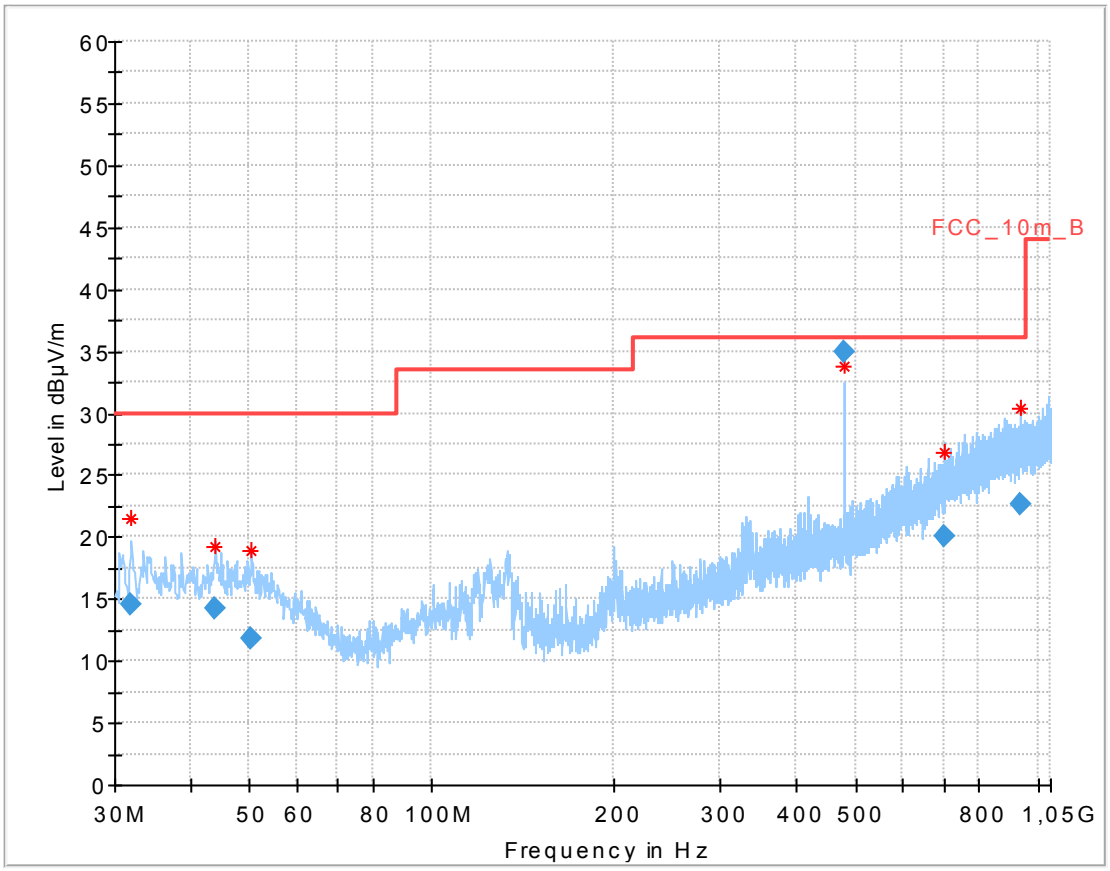
Plot 9: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Plot 10: Middle channel, 26 GHz to 40 GHz, vertical & horizontal polarization



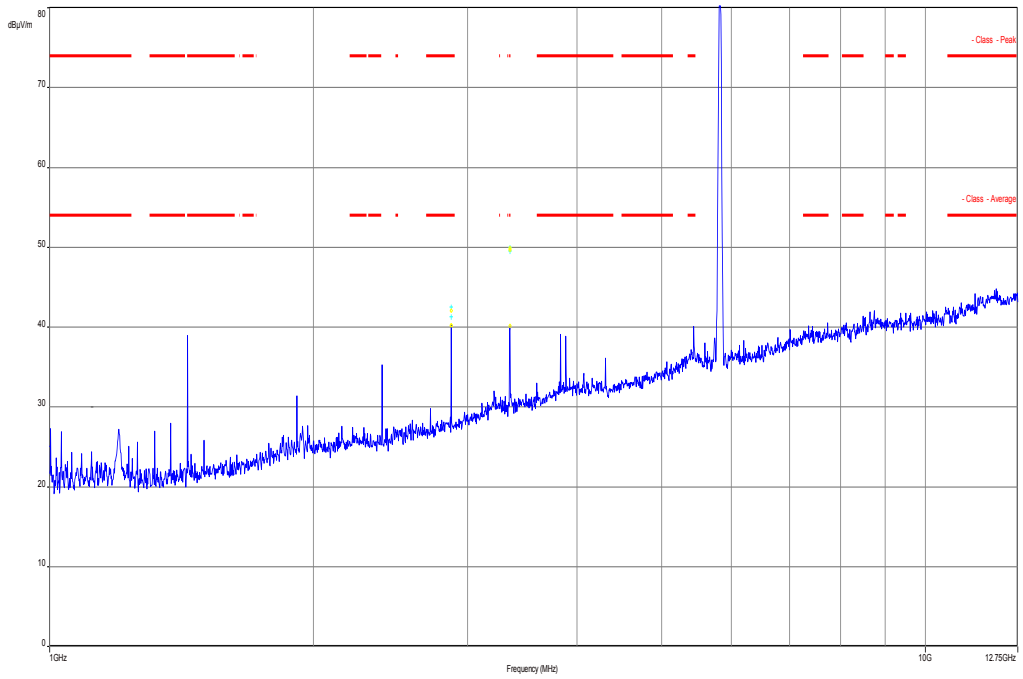
Plot 11: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization



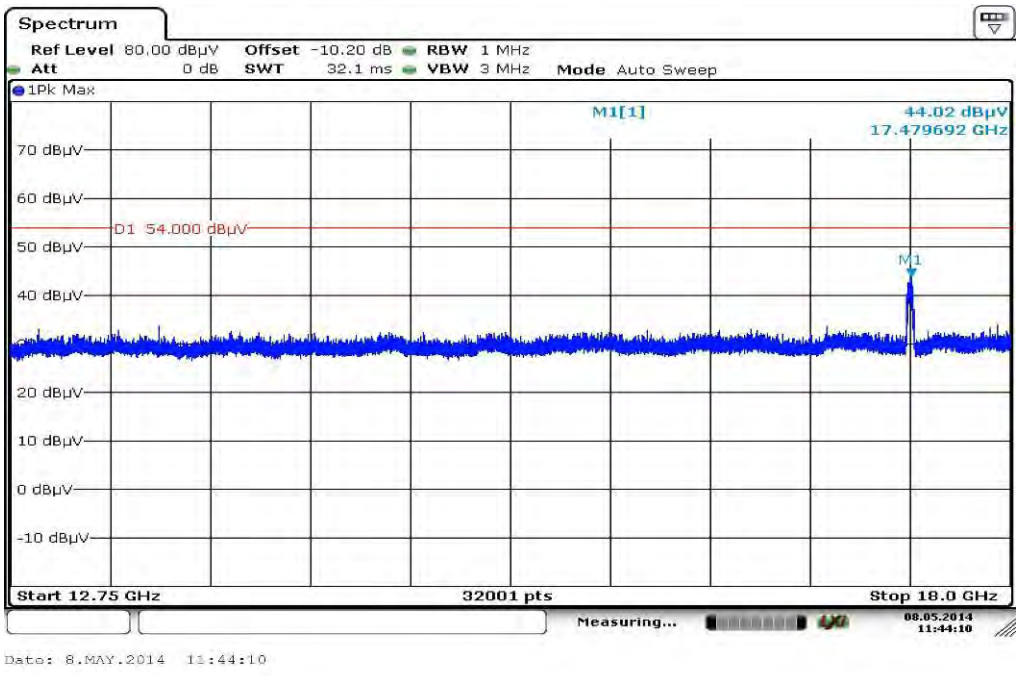
Final results:

Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.995750	14.57	30.00	15.43	1000.0	120.000	151.0	V	81.0	12.7
43.753050	14.29	30.00	15.71	1000.0	120.000	98.0	V	100.0	13.3
50.510700	11.82	30.00	18.18	1000.0	120.000	101.0	V	10.0	13.3
478.996050	34.90	36.00	1.10	1000.0	120.000	163.0	H	10.0	18.3
703.243350	19.99	36.00	16.01	1000.0	120.000	170.0	H	83.0	22.6
940.070250	22.70	36.00	13.30	1000.0	120.000	170.0	V	181.0	25.3

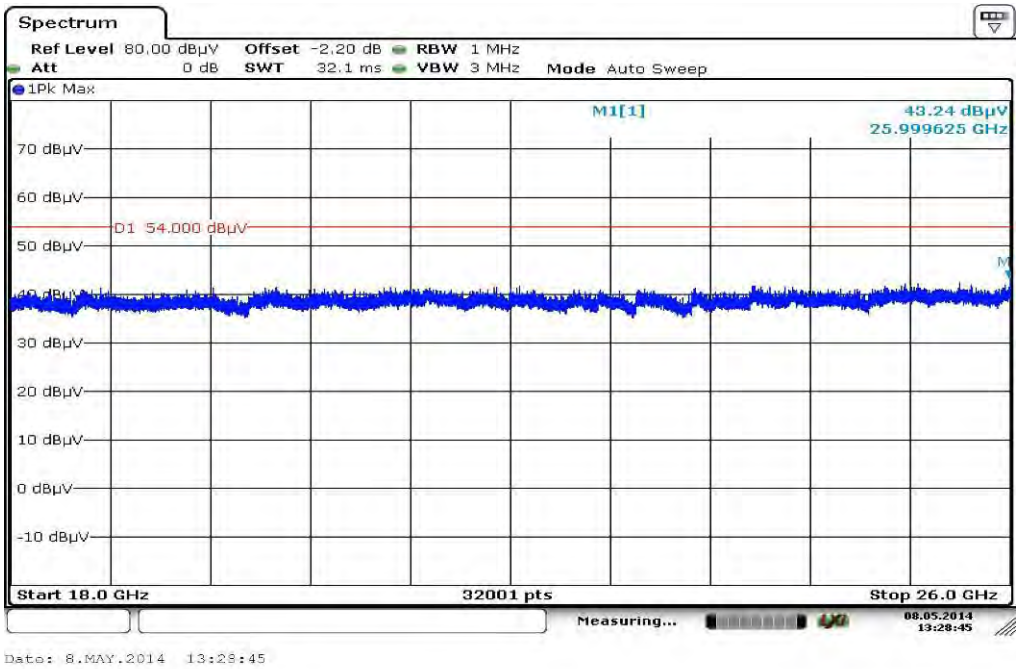
Plot 12: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



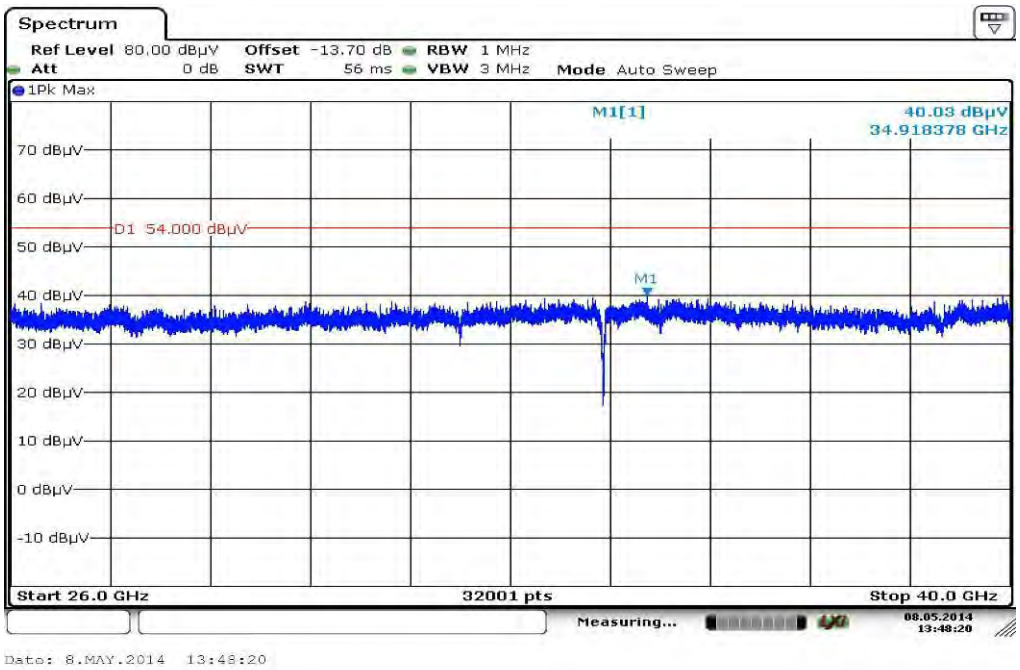
Plot 13: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Plot 14: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization

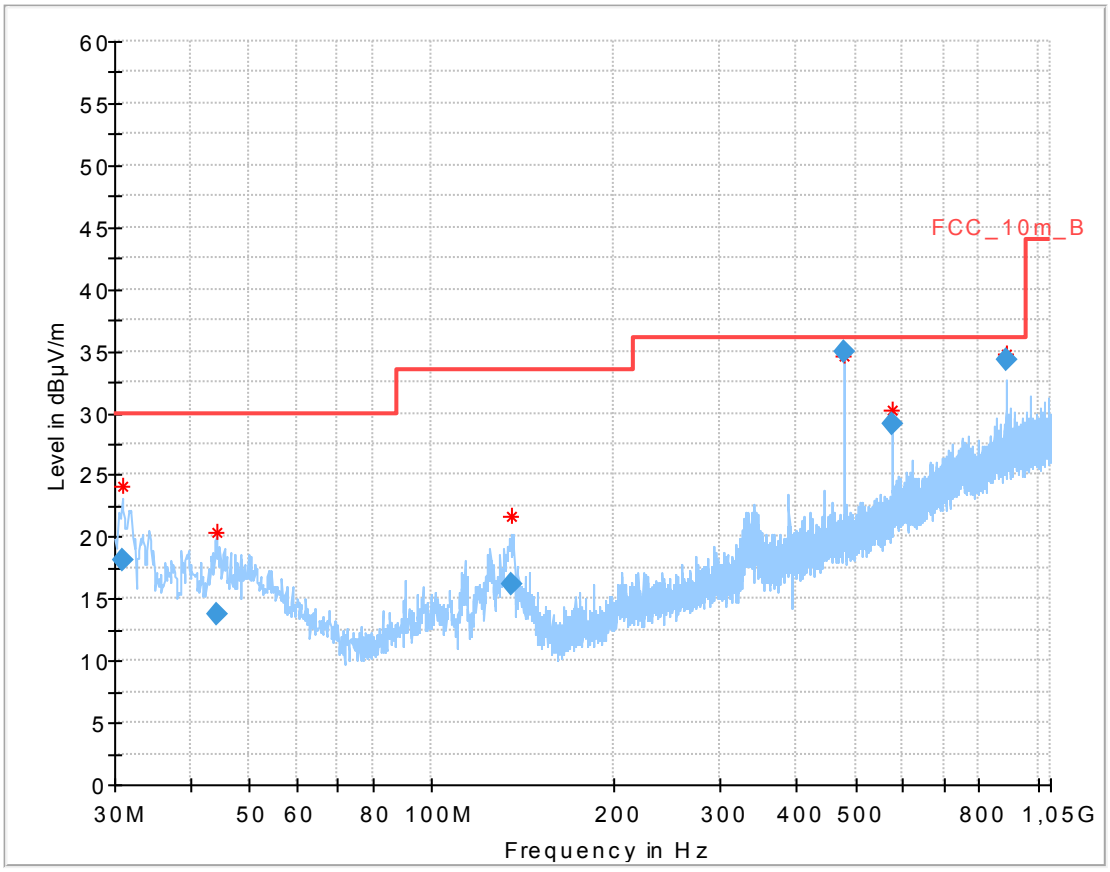


Plot 15: Highest channel, 26 GHz to 40 GHz, vertical & horizontal polarization



Plots: OFDM / n HT40 – mode

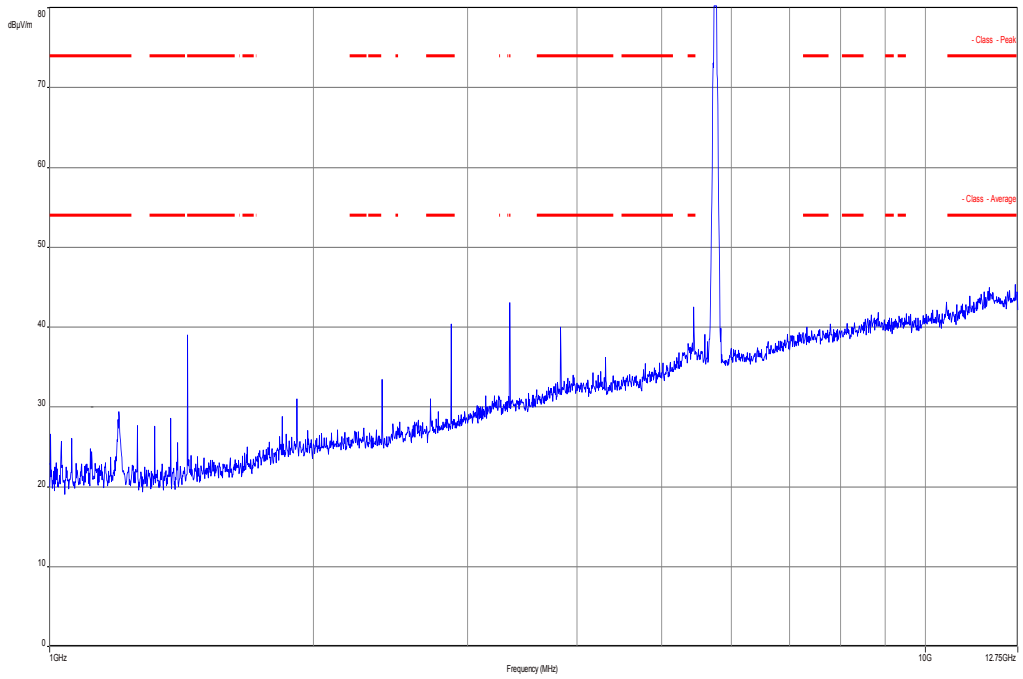
Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization



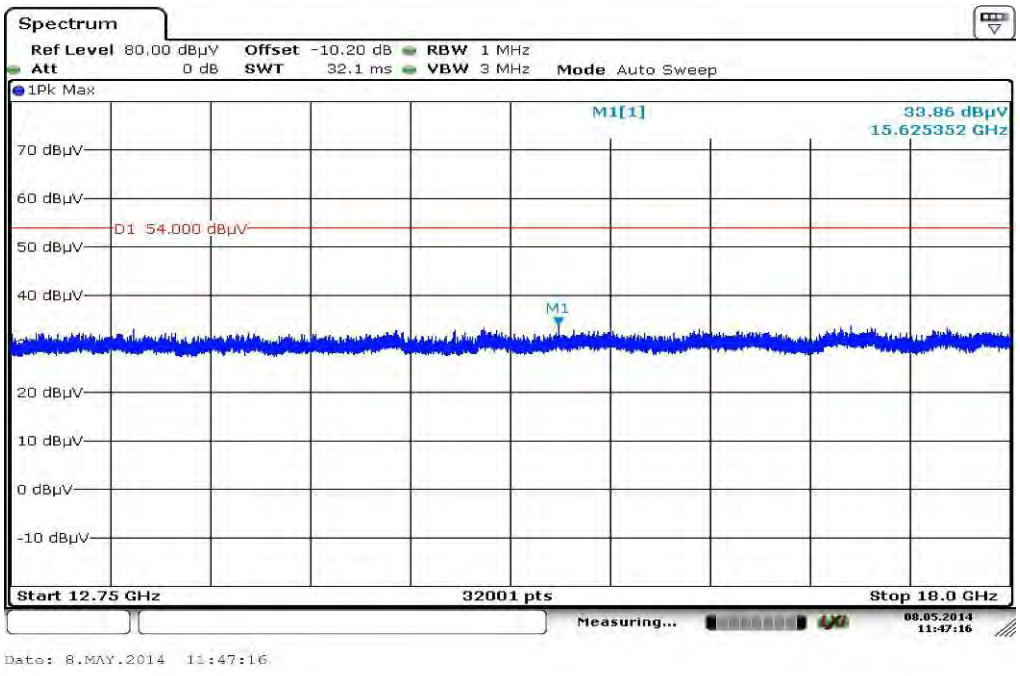
Final results:

Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.867900	18.13	30.00	11.87	1000.0	120.000	101.0	V	261.0	12.6
44.283300	13.70	30.00	16.30	1000.0	120.000	122.0	V	181.0	13.3
135.150900	16.10	33.50	17.40	1000.0	120.000	170.0	V	83.0	9.0
478.983900	34.99	36.00	1.01	1000.0	120.000	170.0	H	-2.0	18.3
574.996800	29.14	36.00	6.86	1000.0	120.000	170.0	H	81.0	20.1
887.757000	34.25	36.00	1.75	1000.0	120.000	118.0	H	190.0	25.0

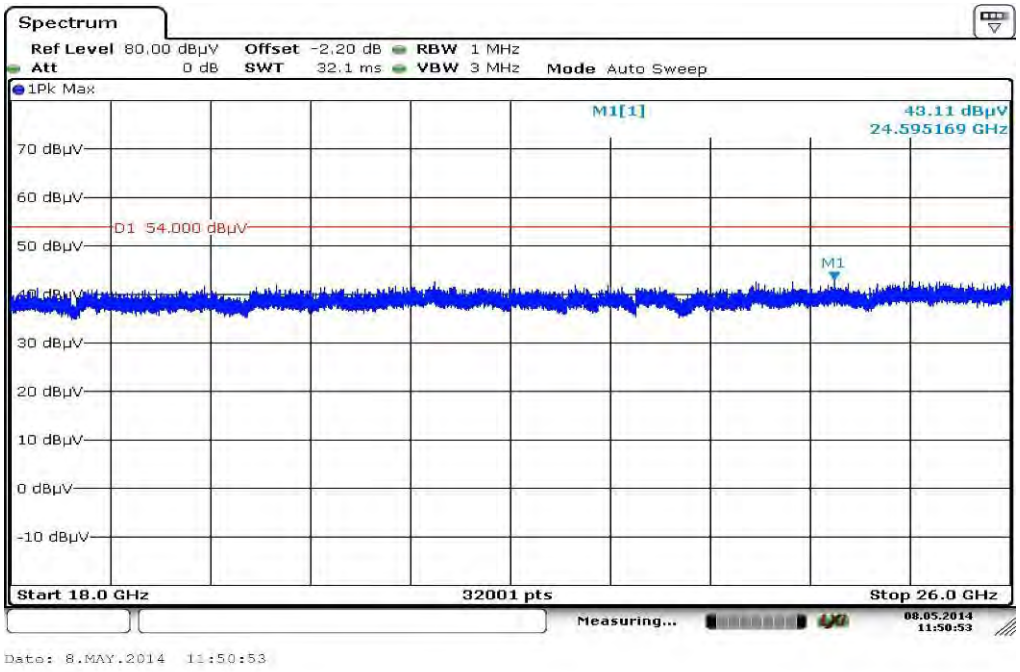
Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



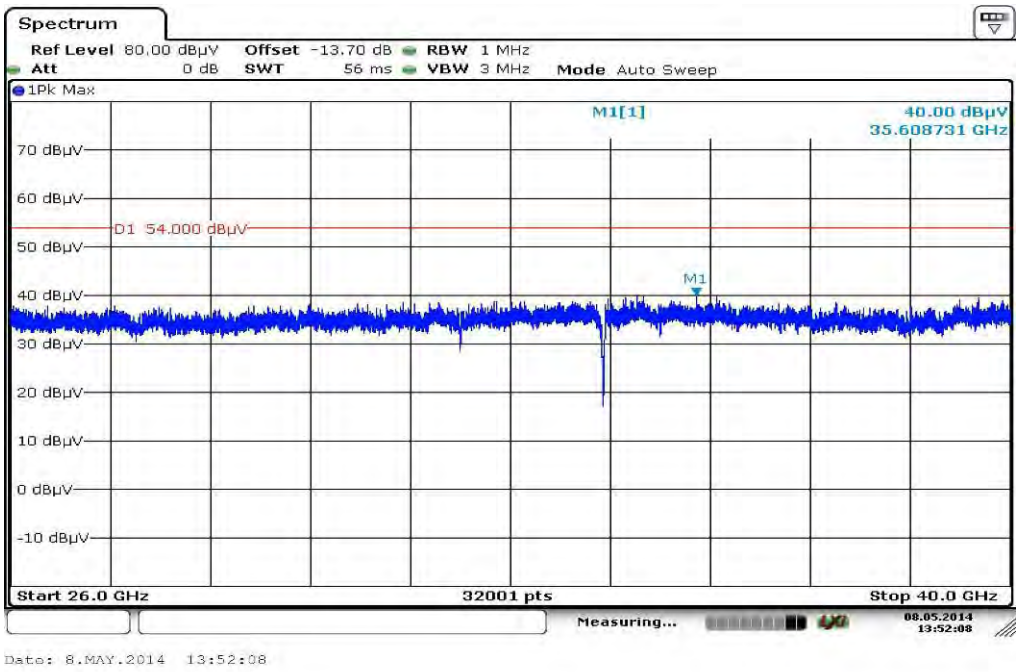
Plot 3: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



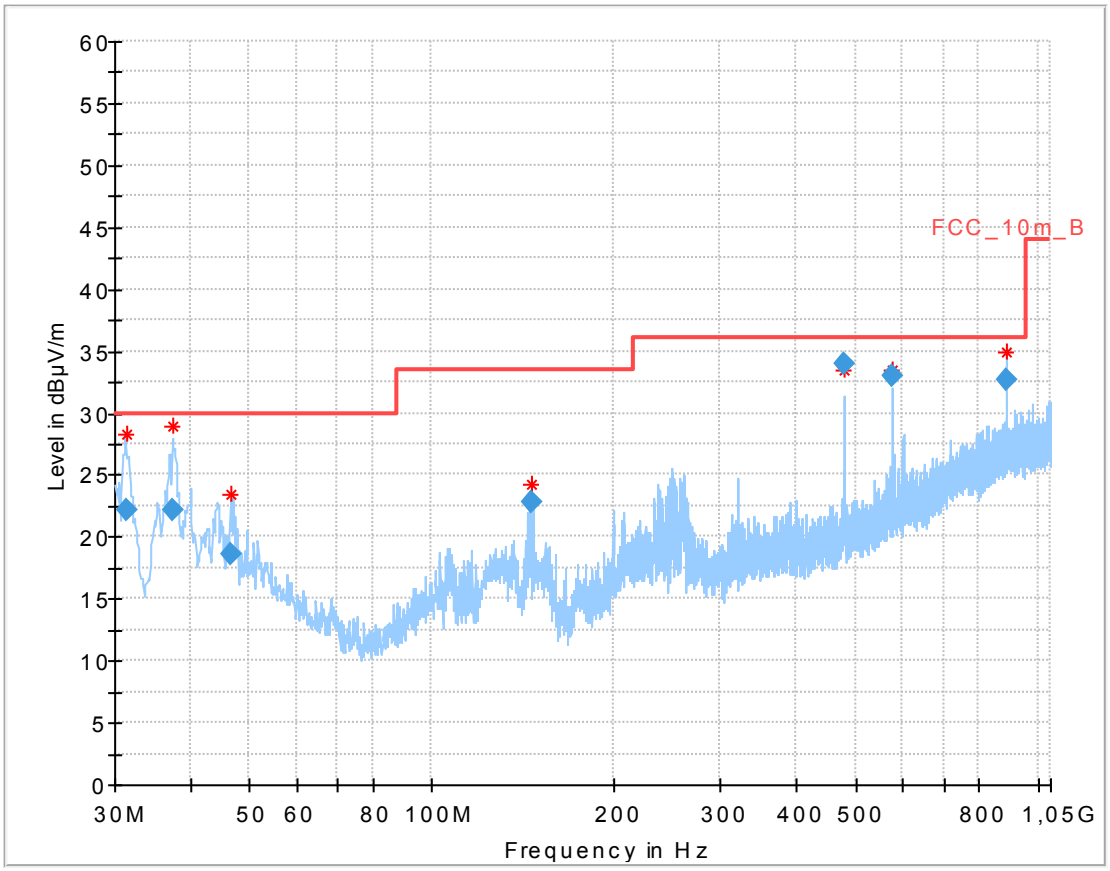
Plot 4: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



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



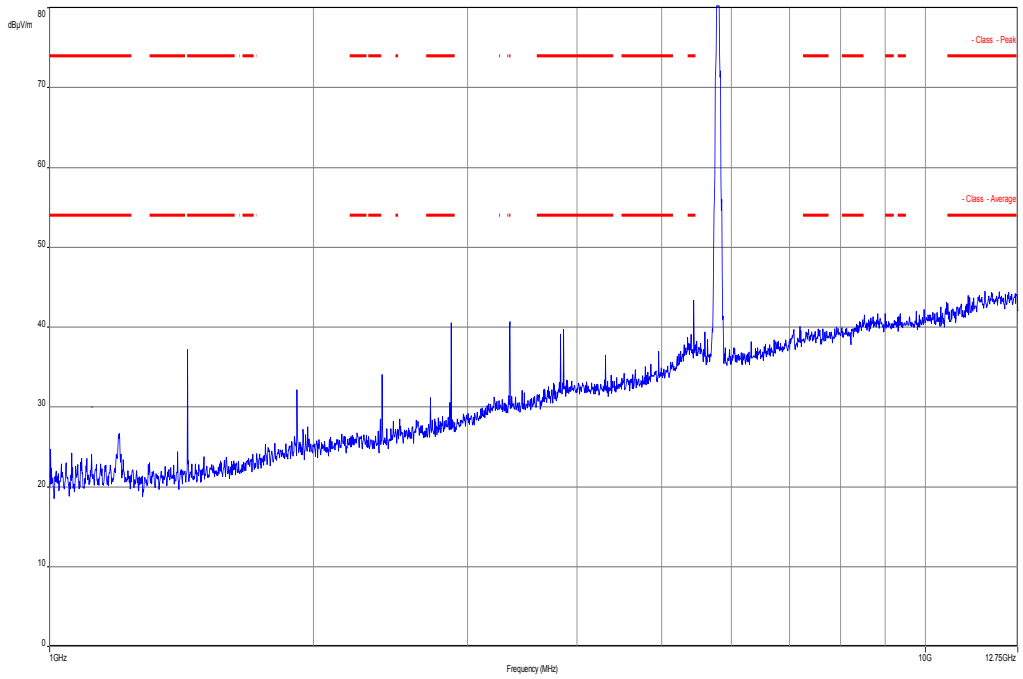
Plot 6: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization



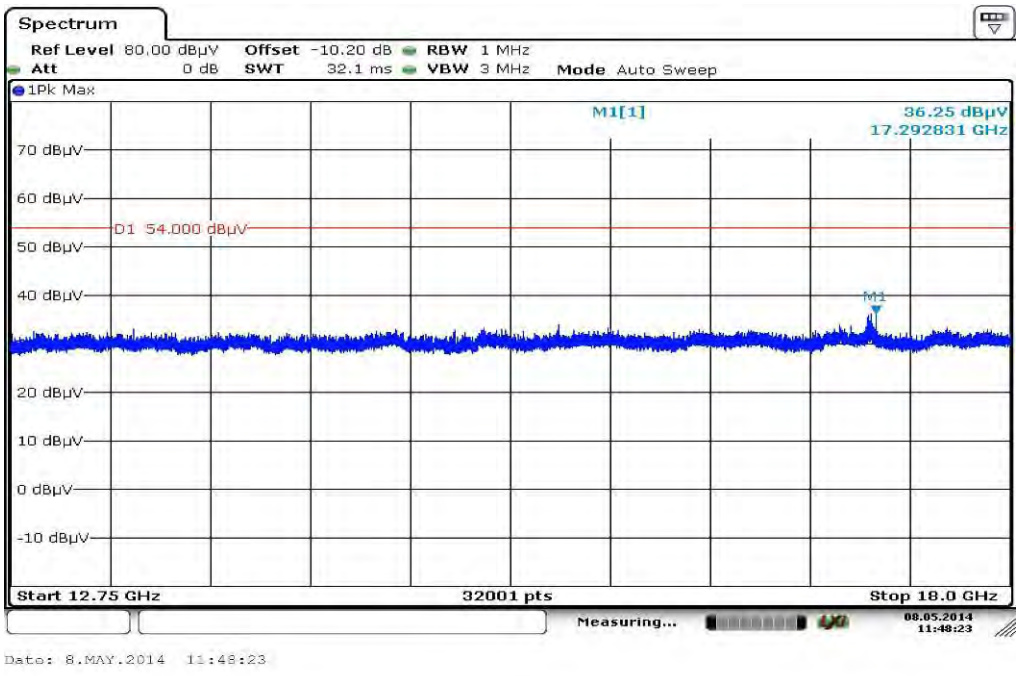
Final results:

Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.442400	22.13	30.00	7.87	1000.0	120.000	117.0	V	10.0	12.7
37.424850	22.18	30.00	7.82	1000.0	120.000	98.0	V	10.0	13.2
46.663800	18.61	30.00	11.39	1000.0	120.000	170.0	V	280.0	13.3
145.931250	22.76	33.50	10.74	1000.0	120.000	115.0	V	100.0	8.8
478.980900	33.99	36.00	2.01	1000.0	120.000	170.0	H	1.0	18.3
574.980300	33.00	36.00	3.00	1000.0	120.000	145.0	H	10.0	20.1
887.753550	32.61	36.00	3.39	1000.0	120.000	112.0	H	88.0	25.0

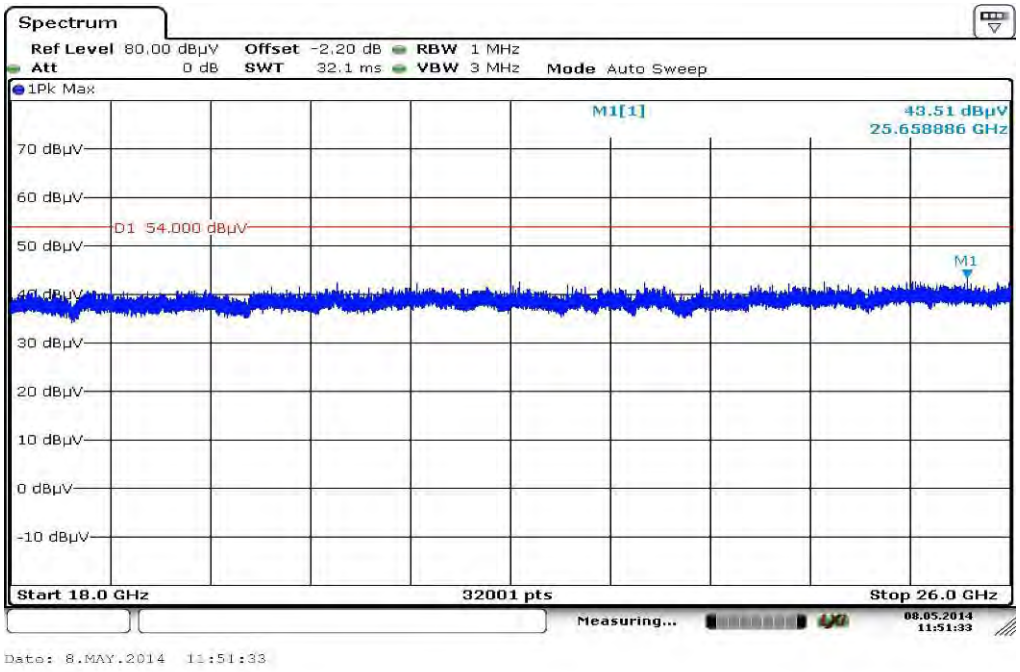
Plot 7: Highest channel, 1 GHz to 12.75 GHz, vertical & horizontal polarization



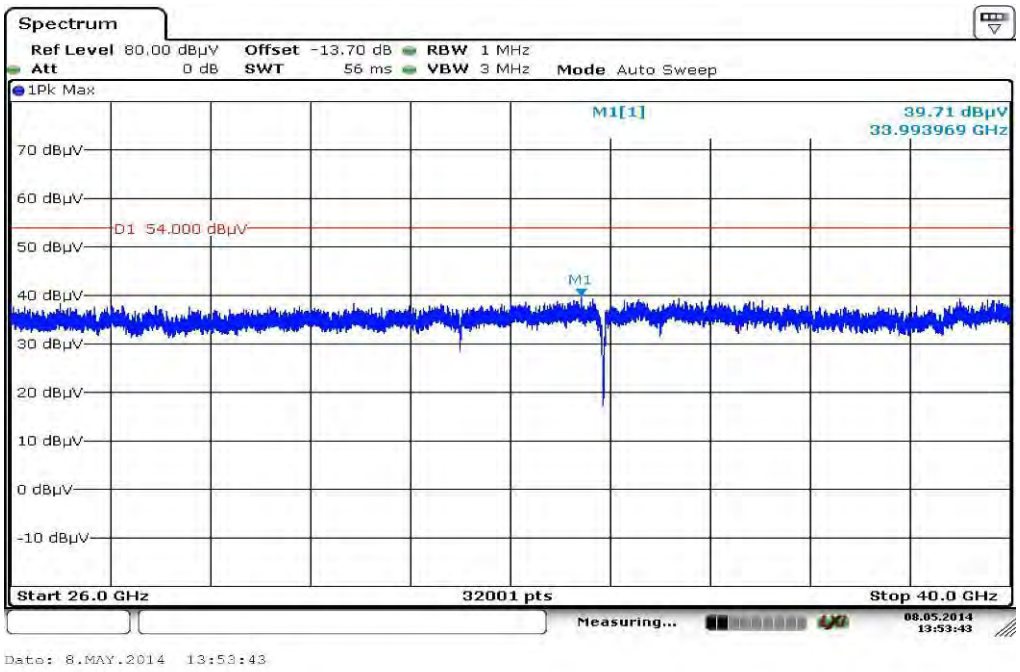
Plot 8: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



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



Plot 10: Highest channel, 26 GHz to 40 GHz, vertical & horizontal polarization



10.10 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode. The results are valid for both modes.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	F > 1 GHz: 1 MHz F < 1 GHz: 100 kHz
Video bandwidth:	3 x RBW Remeasurement: 10 Hz / 3 MHz
Span:	30 MHz to 40 GHz
Trace-Mode:	Max Hold

Limits:

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

Results:

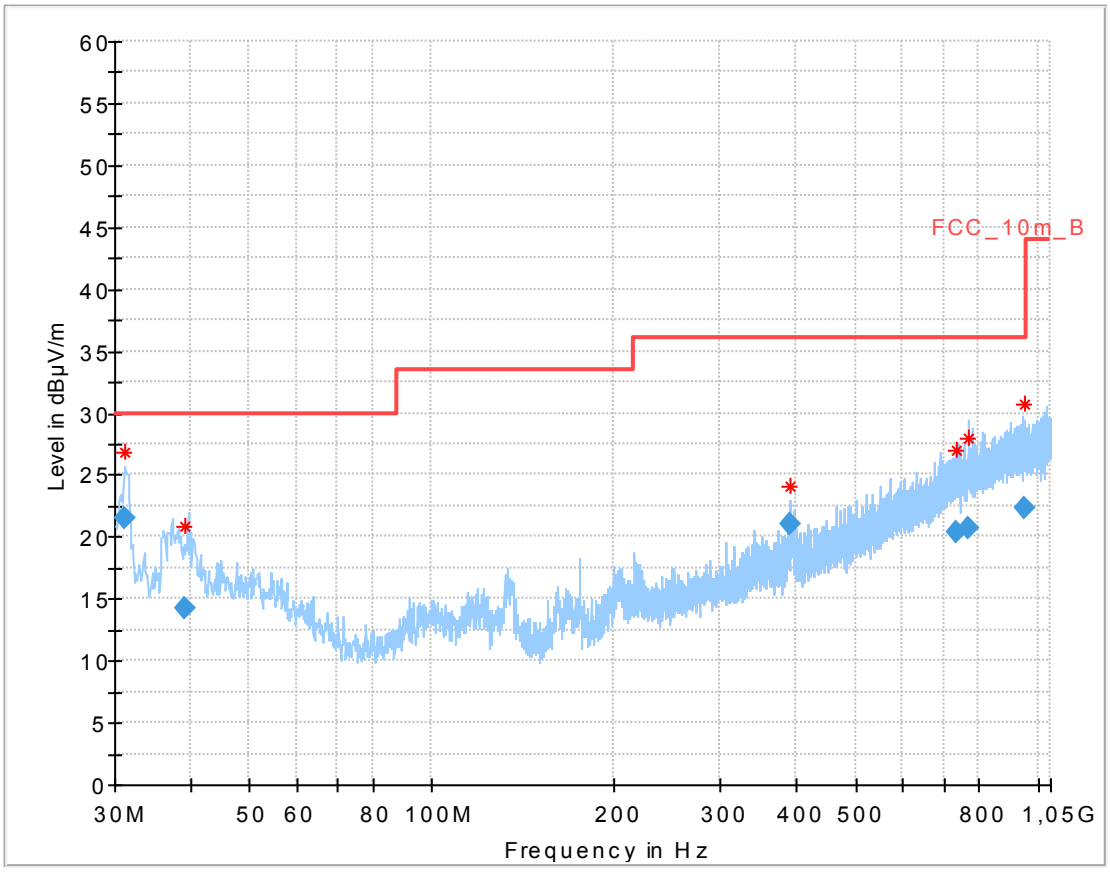
RX Spurious Emissions Radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
For emissions below 1 GHz, please take a look at the table below the 1 GHz plot.		
All detected peak emissions are below the average limit.		
Measurement uncertainty	± 3 dB	

Result: Passed.

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

Plots: RX / Idle – mode

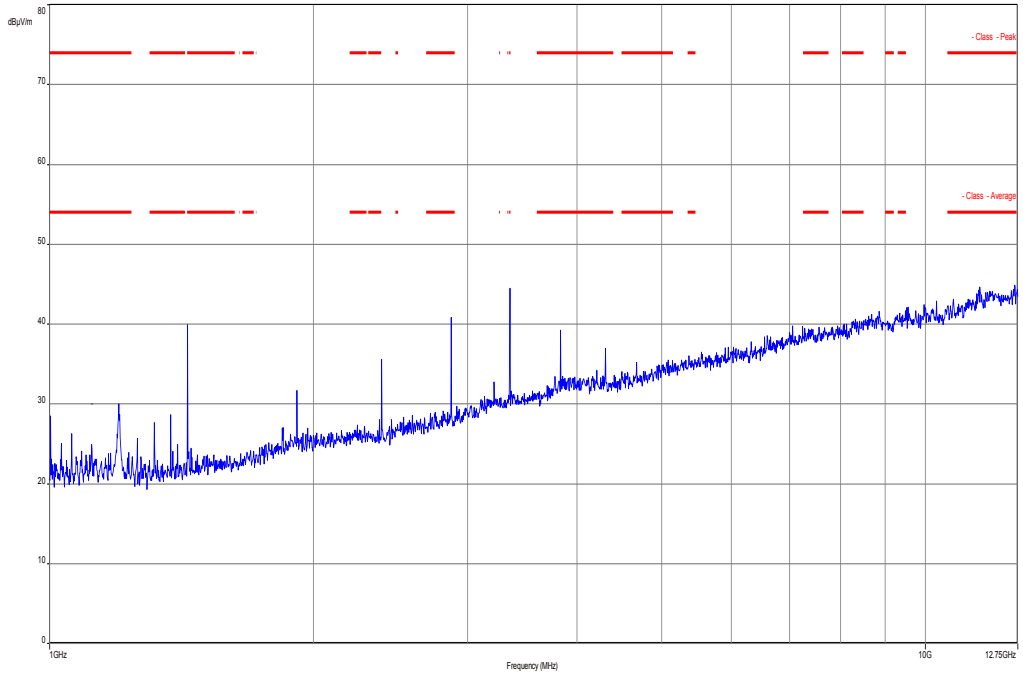
Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization



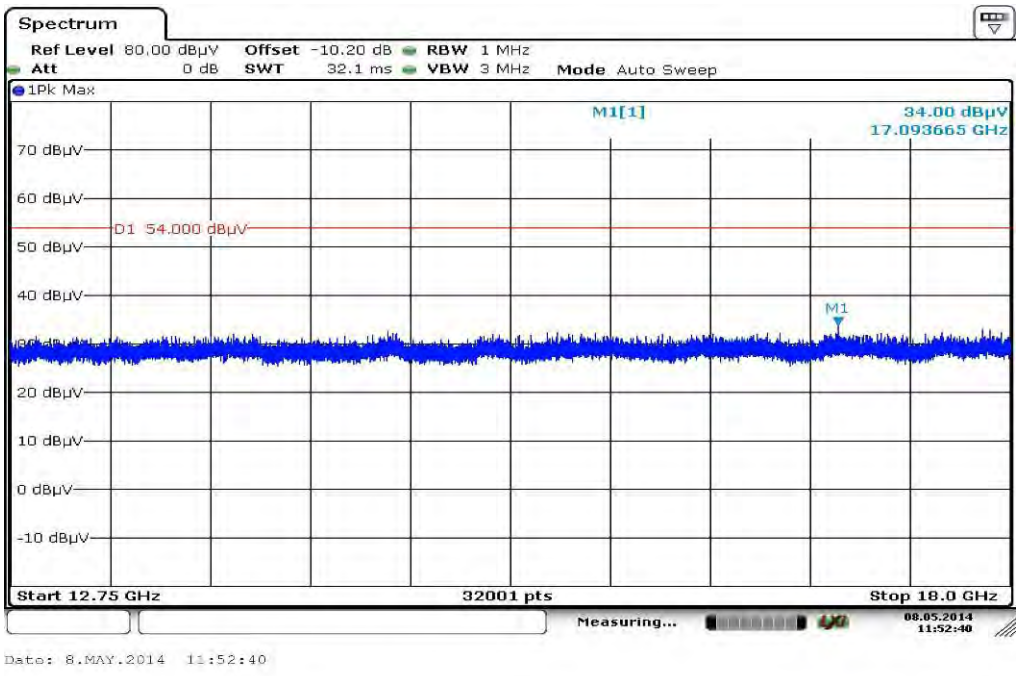
Final results:

Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.179450	21.48	30.00	8.52	1000.0	120.000	101.0	V	10.0	12.6
39.225900	14.25	30.00	15.75	1000.0	120.000	98.0	V	10.0	13.4
391.199700	20.98	36.00	15.02	1000.0	120.000	170.0	H	180.0	16.8
732.138750	20.33	36.00	15.67	1000.0	120.000	170.0	V	-10.0	23.2
769.060350	20.65	36.00	15.35	1000.0	120.000	114.0	H	80.0	23.7
947.718600	22.33	36.00	13.67	1000.0	120.000	170.0	V	-5.0	25.3

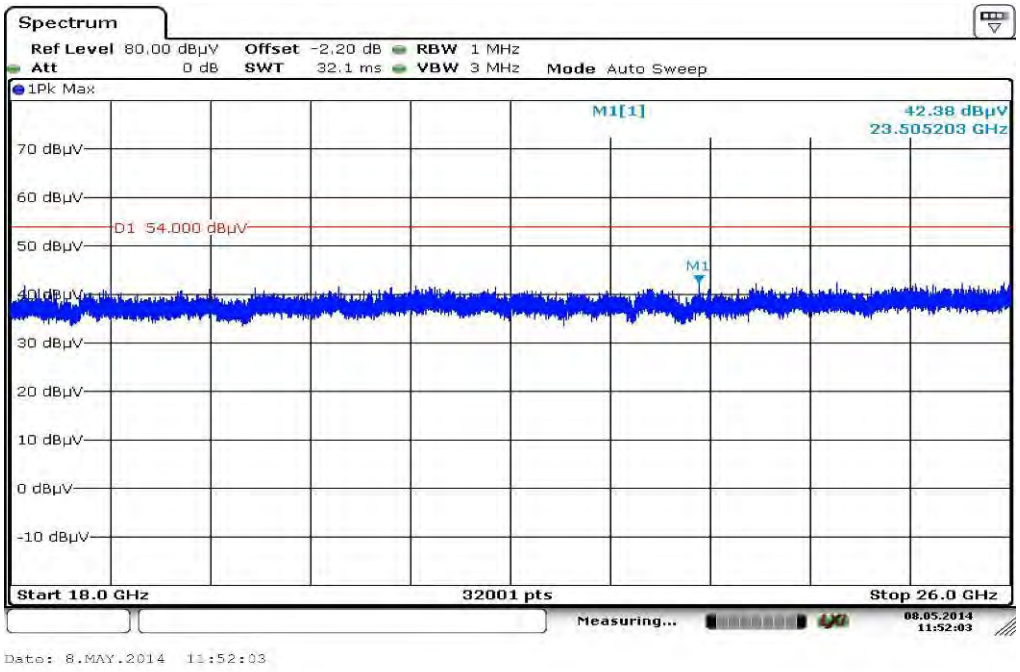
Plot 2: 1 GHz to 12.75 GHz, vertical & horizontal polarization



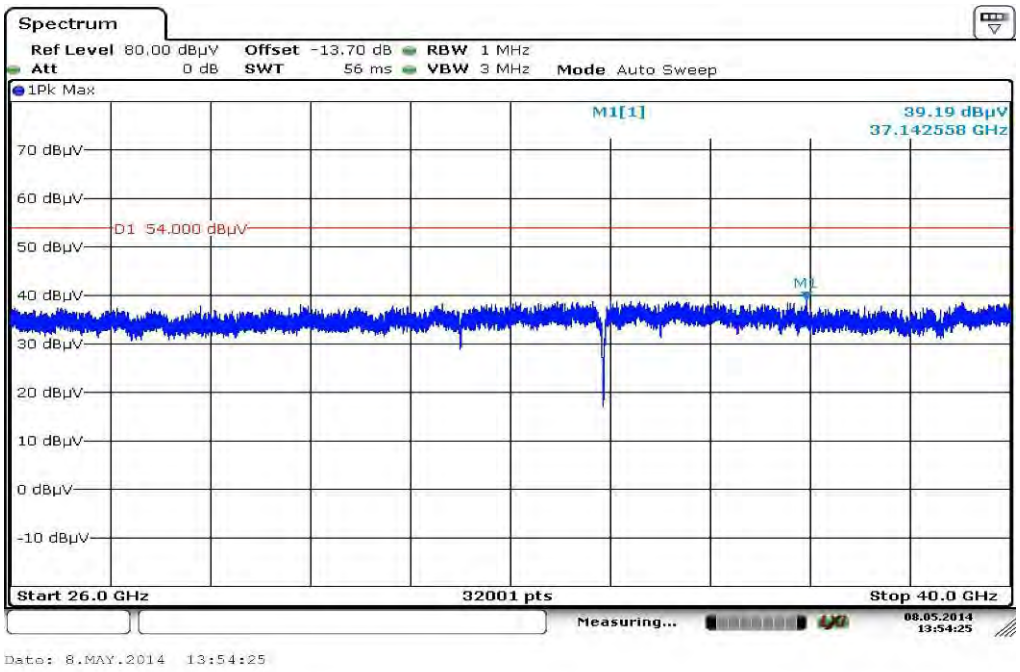
Plot 3: 12.75 GHz to 18 GHz, vertical & horizontal polarization



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



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



10.11 Spurious emissions radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to mid channel. This measurement is representative for all channels and modes. If peaks are found the lowest channel and the highest channel will be measured too. The measurement is performed with the data rate producing the highest output power. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
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

Limits:

FCC		IC
TX 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

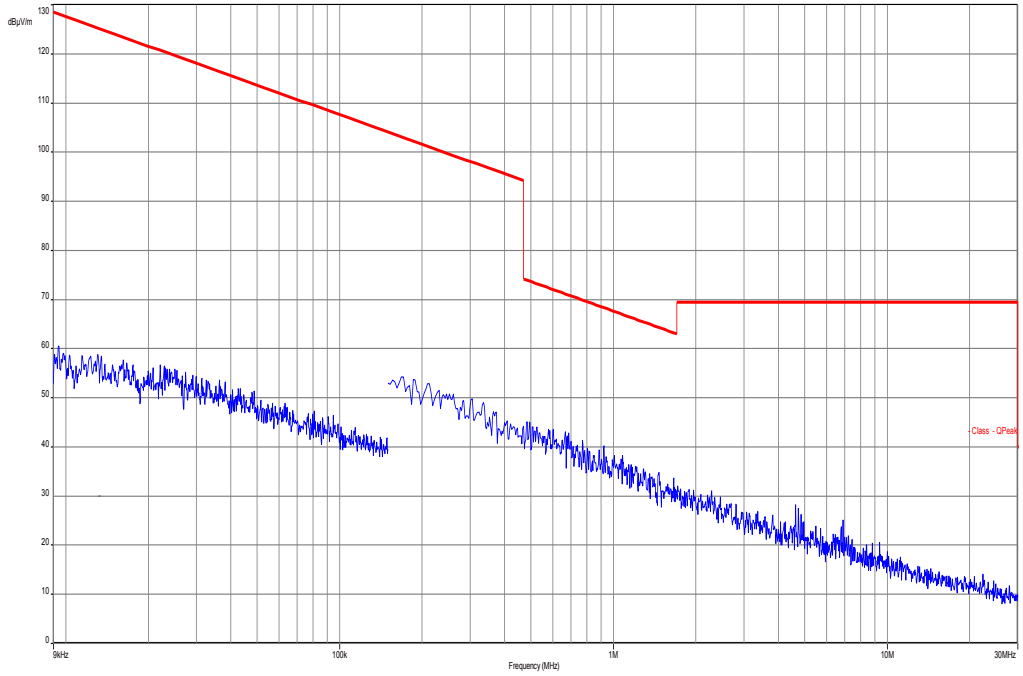
Results:

TX Spurious Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No peaks detected.		
Measurement uncertainty	± 3 dB	

Result: Passed

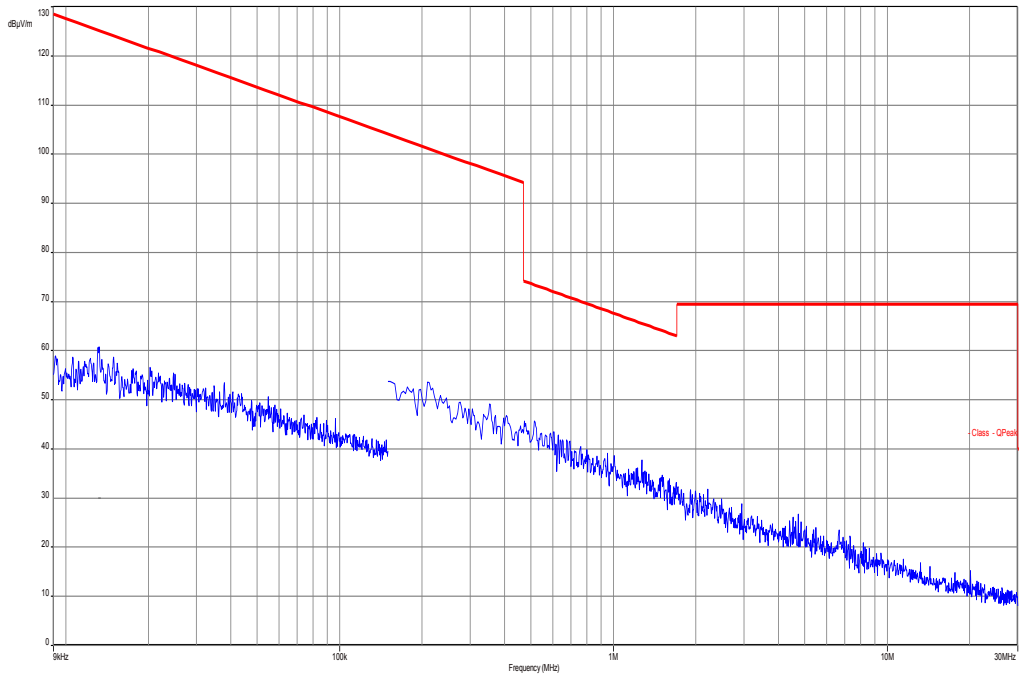
Plots: TX mode

Plot 1: 9 kHz to 30 MHz



Plots: RX / Idle – mode

Plot 1: 9 kHz to 30 MHz



10.12 Spurious emissions conducted < 30 MHz

Description:

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

Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
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

Limits:

FCC		IC
TX 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

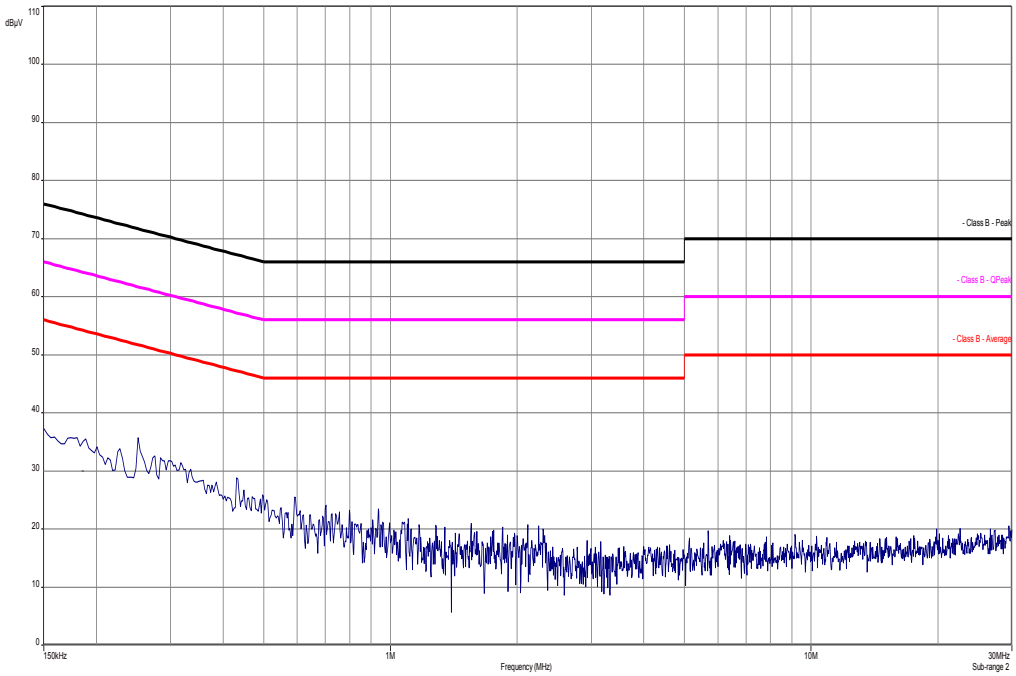
Results:

TX Spurious Emissions Conducted < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No peaks detected.		
Measurement uncertainty	± 3 dB	

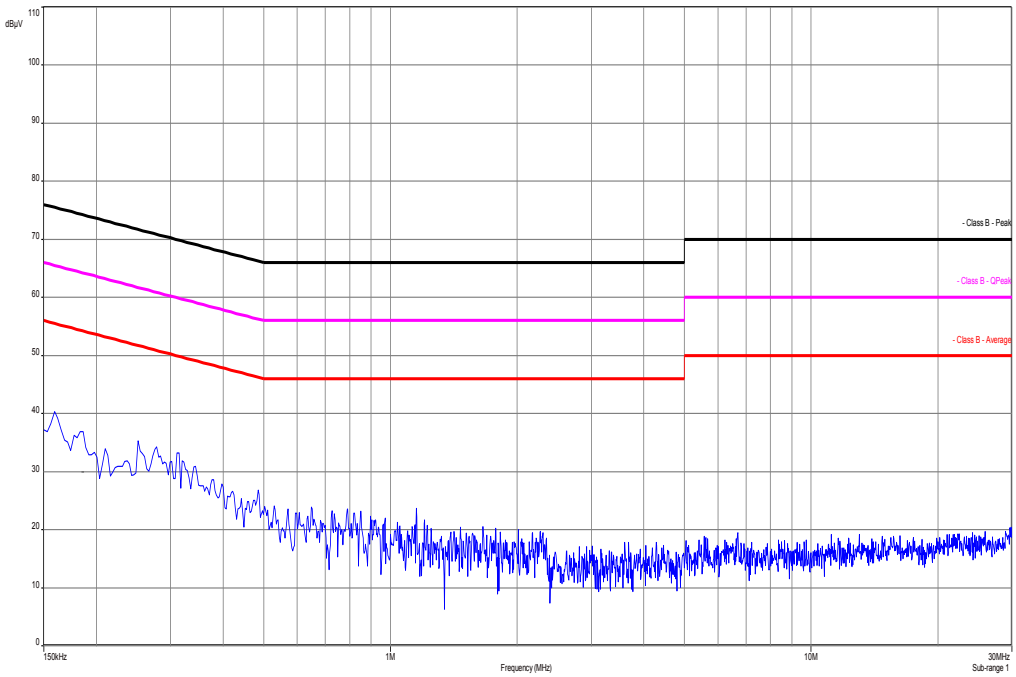
Result: Passed

Plots:

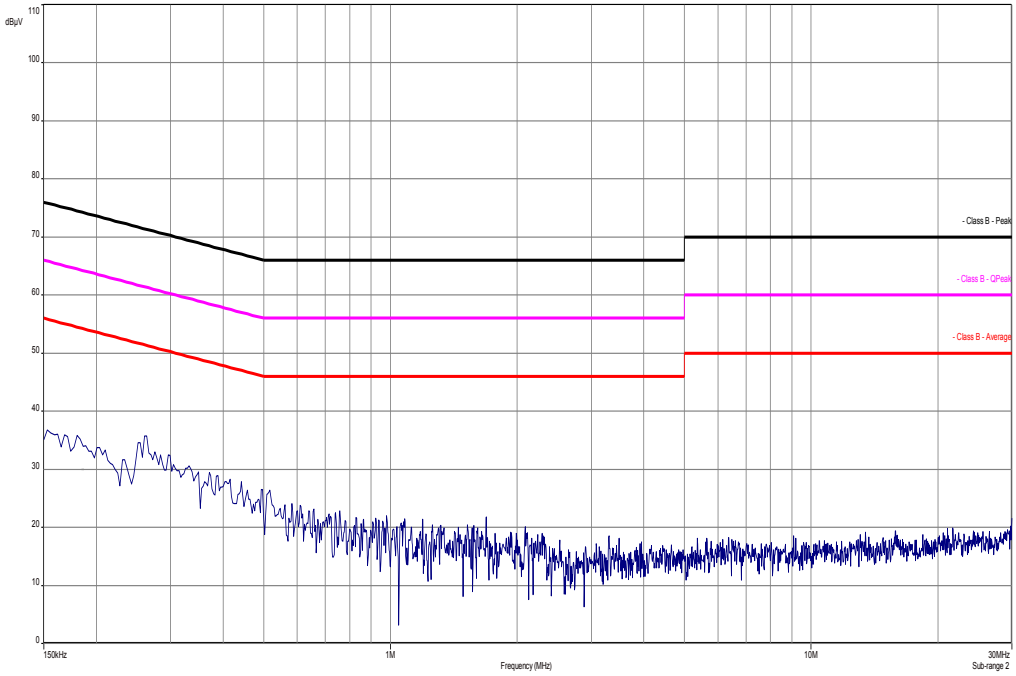
Plot 1: TX mode, 150 kHz to 30 MHz, phase line



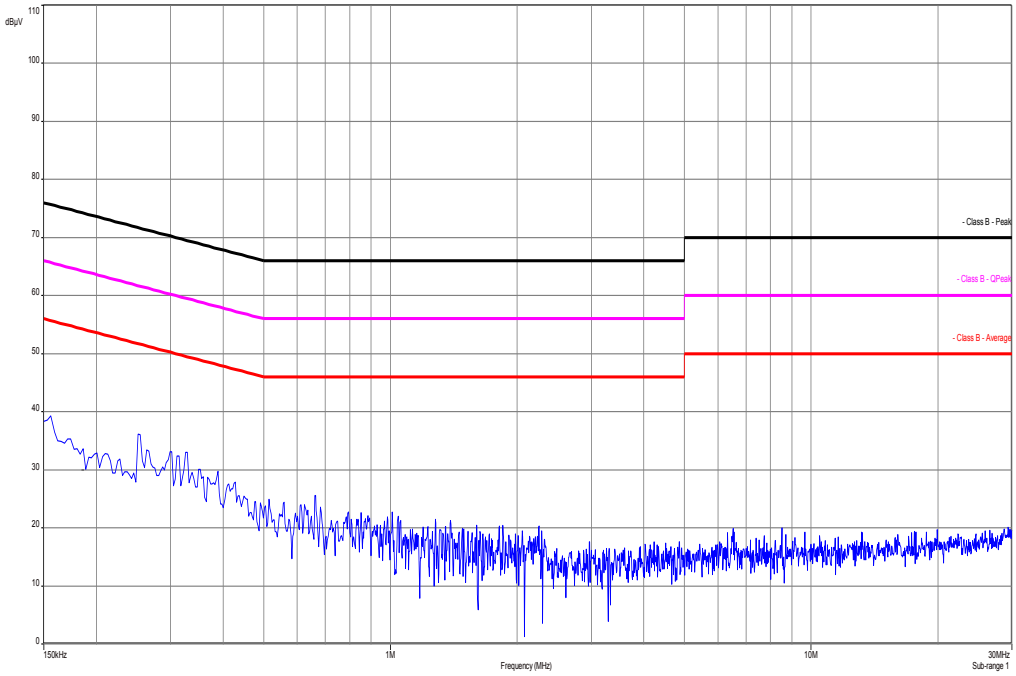
Plot 2: TX mode, 150 kHz to 30 MHz, neutral line



Plot 3: RX / Idle – mode, 150 kHz to 30 MHz, phase line



Plot 4: RX / Idle – mode, 150 kHz to 30 MHz, neutral line



11 Test equipment and ancillaries used for tests

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 signalling 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).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
3	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	27.01.2014	27.01.2015
4	n. a.	Funkstörmesse mpfänger 20Hz-26,5GHz	ESU26	R&S	100037	300003555	k	28.02.2014	28.02.2015
5	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
6	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
7	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
8	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016
9	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	12.01.2012	12.01.2015
10	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vlKl!	08.05.2013	08.05.2015
11	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
12	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
13	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156	ne		
14	9	Isolating Transformer	MPL IEC625 Bus Regeltrennt ravo	Erfi	91350	300001155	ne		
15	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
16	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
17	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
18	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vlKl!	14.10.2011	14.10.2014
19	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	13.03.2014	13.03.2015
20	11b	Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268	ev		
21	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	22.07.2013	22.07.2015
22	A029	Std. Gain Horn Antenna 18.0 to	638	Narda	8205	300002442	k	19.07.2013	19.07.2015

		26.5 GHz							
23	A031	Std. Gain Horn Antenna 26.5 to 40.0 GHz	637	Narda		300000510	k	19.07.2013	19.07.2015
24	n. a.	Broadband Low Noise Amplifier 18-50 GHz	CBL18503 070-XX	CERNEX	19338	300004273	ne		
25	n. a.	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	21.01.2014	21.01.2015

Agenda: Kind of Calibration

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

12 Observations

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

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2014-05-09
A	New applicant information added (page 1)	2014-05-15
B	New EUT name; added hardware and software version	2014-05-27

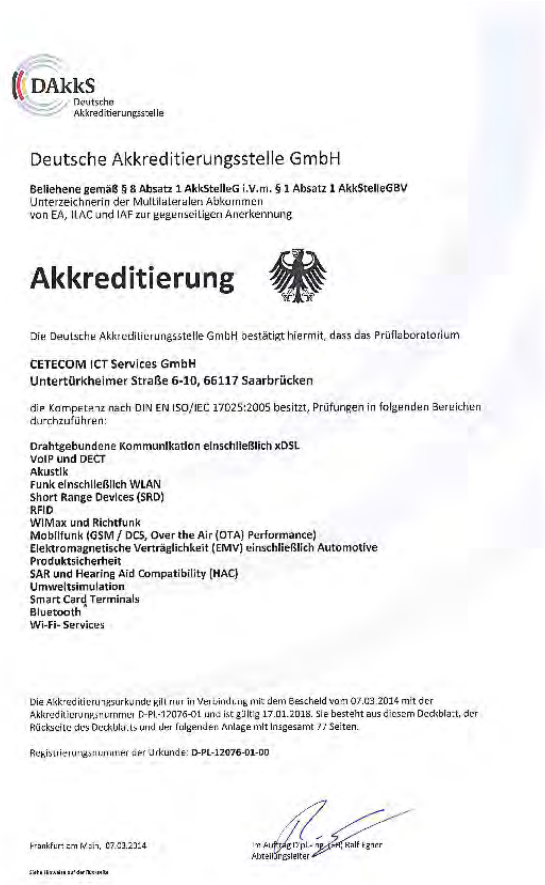
Annex B Further information

Glossary

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

Annex C Accreditation Certificate

Front side of certificate



DAkkS
Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

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

Akkreditierung

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

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

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

Drahtgebundene Kommunikation einschließlich xDSL
VoIP und DECT
Akustik
Funk einschließlich WLAN
Short Range Devices (SRD)
RFID
WiMax und Richtfunk
Mobilfunk (GSM / DCS, Over the Air (OTA) Performance)
Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
Produktsicherheit
SAR und Hearing Aid Compatibility (HAC)
Umweltsimulation
Smart Card Terminals
Bluetooth
Wi-Fi- Services

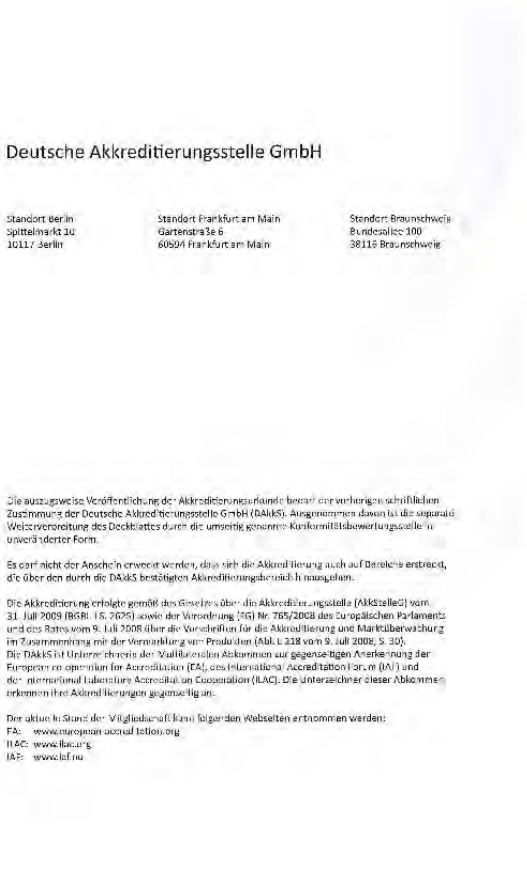
Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 77 Seiten.

Registrierungsnummer der Urkunde: **D-PL-12076-01-00**

Frankfurt am Main, 07.03.2014

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

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

Standort Berlin
Spittelmarkt 10
10117 Berlin

Standort Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Standort Braunschweig
Bundesallee 100
38116 Braunschweig

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

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

Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

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