FCC Part 15C

Measurement and Test Report

For

Compex Systems Pte Ltd

135 Joo Seng Road, #08-01 PM Industrial Building Singapore

FCC ID: TK4WLM200N5-26ESD

Report Concerns: Original Report	**Equipment Type:** WIRELESS-A/N 26DBM NETWORK MINIPCI ADAPTER WITH ESD

Model:	WLM200N5-26ESD
Report No.:	STR11048084I
Test Date:	2011-04-10 to 2011-05-11
Issue Date:	2011-05-11
Tested By:	Seven Song / Engineer
Reviewed By:	Lahm Peng / EMC Manager
Approved & Authorized By:	Jandy so / PSQ Manager

Prepared By:

SEM.Test Compliance Service Co., Ltd
3/F, Jinbao Commerce Building, Xin'an Fanshen Road,
Bao'an District, Shenzhen, P.R.C.（518101）
Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by SEM.Test Compliance Service Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Compex Systems Pte Ltd
Address of applicant: 135 Joo Seng Road, #08-01 PM Industrial Building Singapore

Manufacturer: Compex Systems Pte Ltd
Address of manufacturer: 135 Joo Seng Road, #08-01 PM Industrial Building Singapore

General Description of E.U.T

Items	Description
EUT Description:	WIRELESS-A/N 26DBM NETWORK MINIPCI ADAPTER WITH ESD
Trade Name:	COMPEX
Model No.:	WLM200N5-26ESD
Rated Voltage:	DC 3.3V
RF Output Power	Max. 27.88dBm (Conducted Power) for 5.8GHz
Frequency range:	5745~5825MHz for 802.11a/11n(HT20) 5755~5795MHz for 802.11n(HT40)
Antenna Gain:	Max. 2dBi
Type of Antenna:	Unique and Detachable Antenna
Size:	6.0X5.8X0.6cm

Note: The test data is gathered from a production sample, provided by the manufacture.

1.2 Test Standards

The following report is prepared on behalf of the Compex Systems Pte Ltd in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, 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.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted with Low Channel, Middle Channel and High Channel, accordingly in reference to the Operating Instructions.

1.4 Test Facility

- **FCC – Registration No.: 994117**
  SEM.Test Compliance Services Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 994117.

- **Industry Canada (IC) Registration No.: 7673A**
  The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.

1.5 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components.

1.6 Accessories Equipment List and Details

Description	Manufacturer	Model	Serial Number
AP	Compex	AP500	/

1.7 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
Antenna Connect Cable	0.15	Shielded	Without Core
/	/	/	/

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§ 15.203; § 15.247(c)(1)(i)	Antenna Requirement	Compliant
§ 15.207	Conducted Emission	Compliant
§ 15.247(e)	Power Spectral Density	Compliant
§ 15.247(a)(2)	6 dB Bandwidth	Compliant
§ 15.247(b)(3)	Power Output	Compliant
§ 15.209(a)(d)	Radiated Emission	Compliant
§ 15.247(d)	Band edge	Compliant

3. CONDUCTED EMISSIONS

3.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

3.2 Test Equipment List and Details

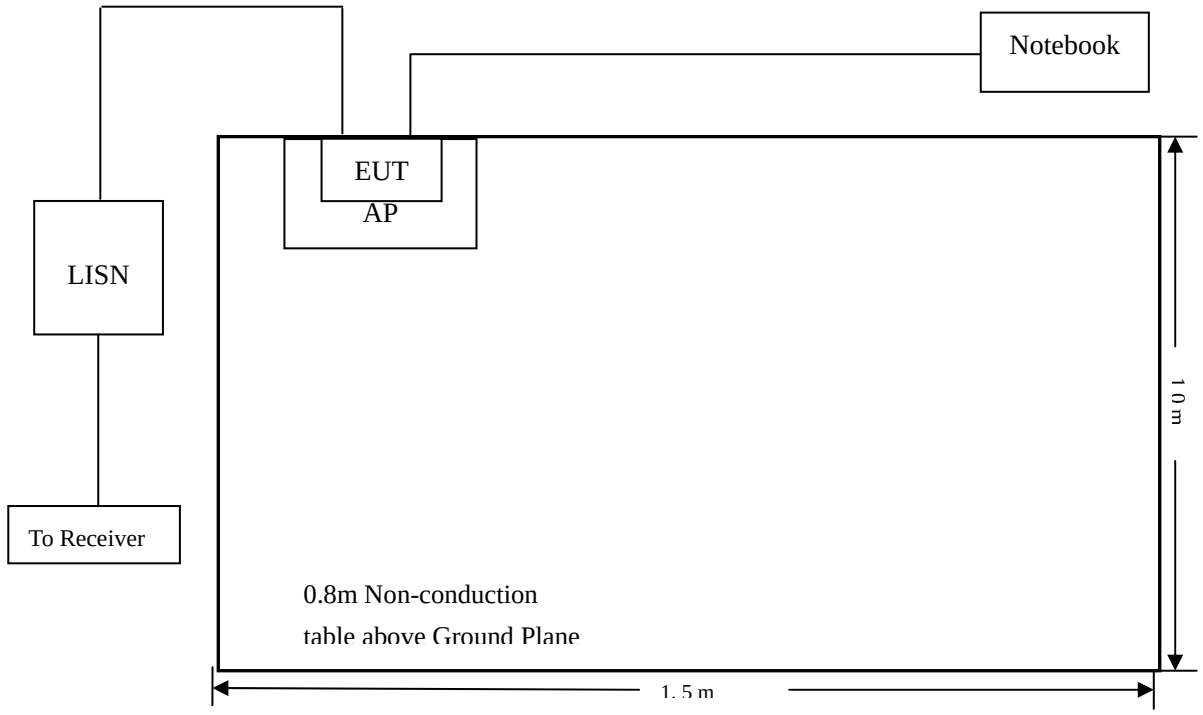
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2010-12-20	2011-12-19
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2010-12-20	2011-12-19
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

3.3 Test Procedure

Test is conducting under the description of ANSI C63.4-2003, 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.

3.4 Basic Test Setup Block Diagram



3.5 Environmental Conditions

Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

3.6 Summary of Test Results/Plots

According to the data in section 3.7, the EUT complied with the FCC 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

-4.5 dBμV at **0.338 MHz** in the **Line, Line** Detector, 0.15-30MHz

3.7 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

Conducted Disturbance

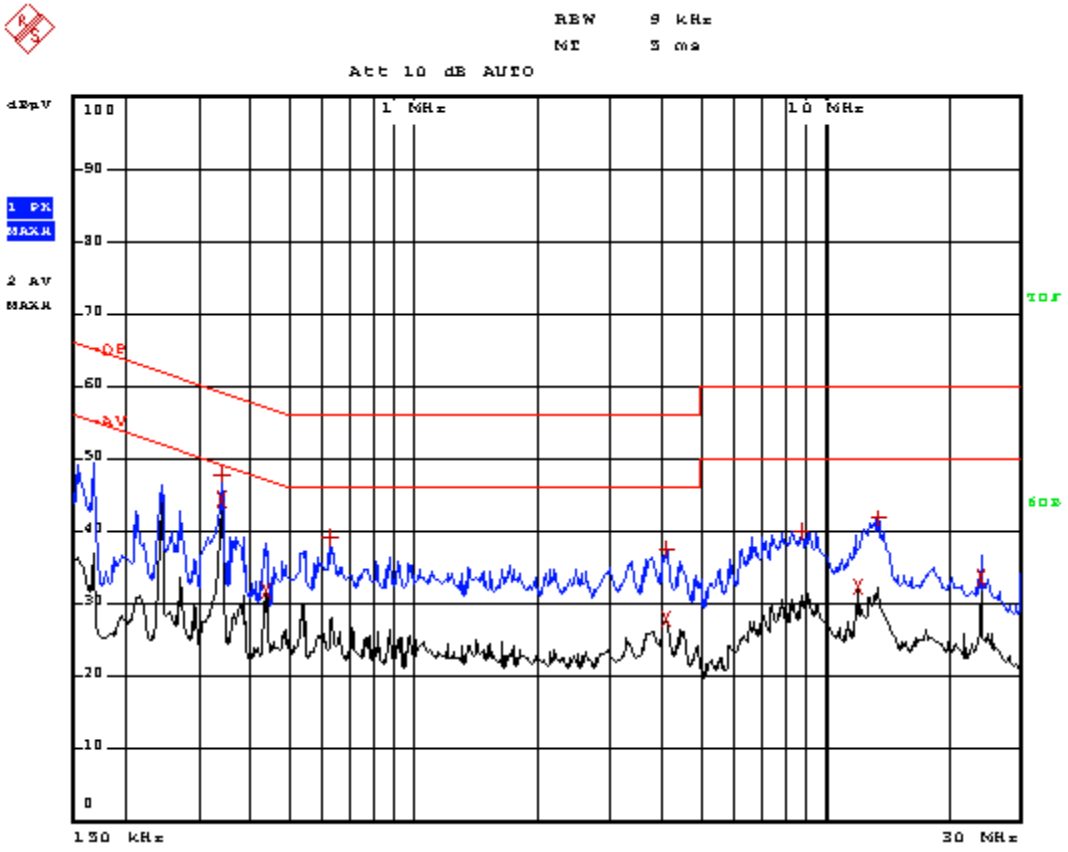
EUT: WIRELESS-A/N 26DBM NETWORK MINIPCI ADAPTER WITH ESD

M/N: WLM200N5-26ESD

Operating Condition: Transmitting

Test Specification: L

Comment: AC 120V/60Hz/DC 3.3V



EDIT PEAK LIST (Prescan Results)			
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Max Peak	338 kHz	47.79	-11.46
2 Average	338 kHz	44.55	-4.70
2 Average	434 kHz	31.83	-15.33
1 Max Peak	626 kHz	39.27	-16.72
2 Average	4.118 MHz	27.97	-18.02
1 Max Peak	4.122 MHz	37.64	-18.35
1 Max Peak	8.734 MHz	40.10	-19.89
2 Average	11.994 MHz	32.36	-17.63
1 Max Peak	13.618 MHz	41.79	-18.20
2 Average	23.986 MHz	33.62	-16.38

Plot of Conducted Emissions Test Data

Conducted Disturbance

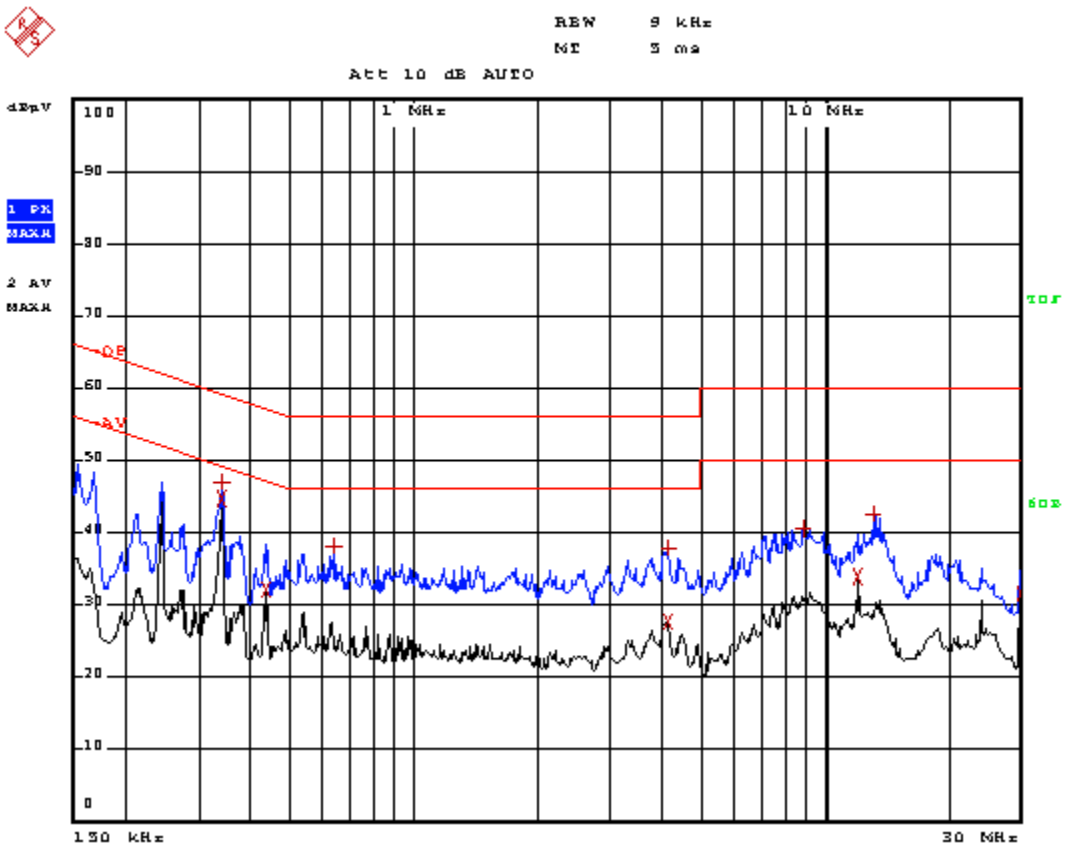
EUT: WIRELESS-A/N 26DBM NETWORK MINIPCI ADAPTER

M/N: WLM200N5-26ESD

Operating Condition: Transmitting

Test Specification: N

Comment: AC 120V/60Hz/DC 3.3V



EDIT PEAK LIST (Prescan Results)			
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Max Peak	338 kHz	47.16	-12.08
2 Average	338 kHz	44.74	-4.50
2 Average	434 kHz	32.25	-14.91
1 Max Peak	634 kHz	38.20	-17.79
1 Max Peak	4.154 MHz	37.88	-18.11
2 Average	4.154 MHz	27.77	-18.22
1 Max Peak	8.874 MHz	40.67	-19.32
2 Average	11.994 MHz	34.06	-15.93
1 Max Peak	13.154 MHz	42.56	-17.43
2 Average	30 MHz	31.51	-18.48

4. §15.203 - ANTENNA REQUIREMENT

4.1 Standard Applicable

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

4.2 Test Result

This product has a unique and detachable antenna, fulfill the requirement of this section.

5. POWER SPECTRAL DENSITY

5.1 Standard Applicable

According to 15.247(a)(1)(iii), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2010-12-20	2011-12-19
Spectrum Analyzer	R&S	FSP	836079/035	2010-12-20	2011-12-19
Attenuator	ATTEN	ATS100-6-20	DC-6GHz	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

5.3 Test Procedure

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer via a RF combiner.
2. Set center frequency of spectrum analyzer = operating frequency.
3. Set the spectrum analyzer as RBW = 3kHz, VBW = 10KHz.
4. Repeat above procedures until all frequency measured was complete.

5.4 Environmental Conditions

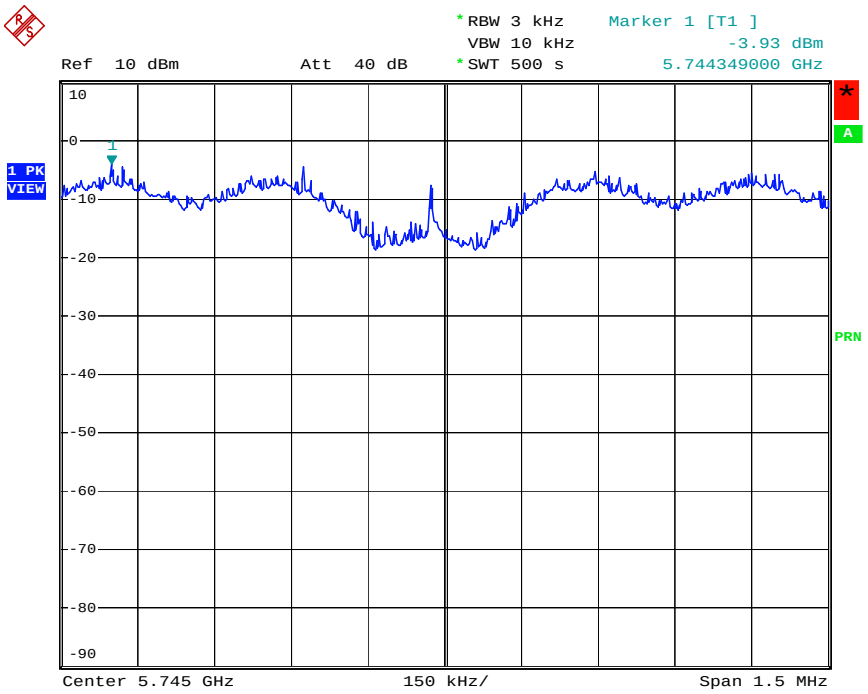
Temperature:	20° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.5 Summary of Test Results/Plots

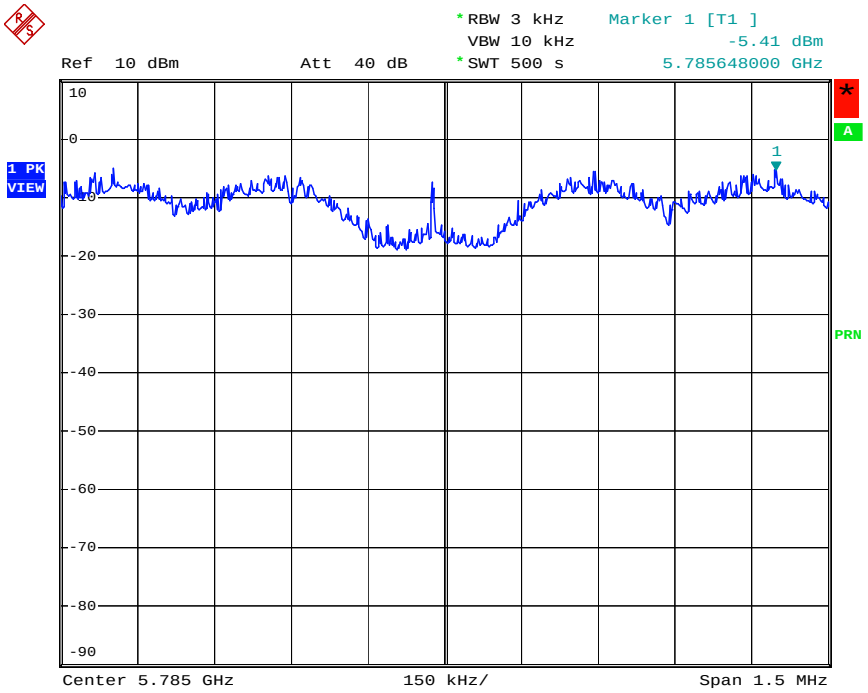
Test mode	Test channel	Chain 0 Reading dBm/3kHz	Chain 1 Reading dBm/3kHz	Corrected dBm/3kHz	Limit dBm/3kHz
802.11a (6M)	Low channel (5745MHz)	-3.93	-4.03	-0.97	8
	Middle channel (5785MHz)	-5.41	-5.00	-2.19	8
	High channel (5825MHz)	-4.57	-5.73	-2.10	8
802.11a (54M)	Low channel (5745MHz)	-5.54	-5.56	-2.54	8
	Middle channel (5785MHz)	-5.15	-5.87	-2.48	8
	High channel (5825MHz)	-5.21	-5.73	-2.45	8
802.11n HT20 (MCS0)	Low channel (5745MHz)	-5.73	-3.91	-1.72	8
	Middle channel (5785MHz)	-5.73	-4.33	-1.96	8
	High channel (5825MHz)	-7.17	-5.71	-3.37	8
802.11n HT20 (MCS15)	Low channel (5745MHz)	-4.02	-4.30	-1.15	8
	Middle channel (5785MHz)	-6.03	-5.80	-2.90	8
	High channel (5825MHz)	-7.10	-7.24	-4.16	8
802.11n HT40 (MCS0)	Low channel (5755MHz)	-9.36	-9.36	-6.35	8
	Middle channel (5775MHz)	-7.85	-10.68	-6.03	8
	High channel (5795MHz)	-9.43	-10.63	-6.98	8
802.11n HT40 (MCS15)	Low channel (5755MHz)	-10.15	-10.16	-7.14	8
	Middle channel (5775MHz)	-10.40	-10.68	-7.53	8
	High channel (5795MHz)	-11.21	-10.63	-7.90	8

For 802.11a (6M) 5.8G Chain 0

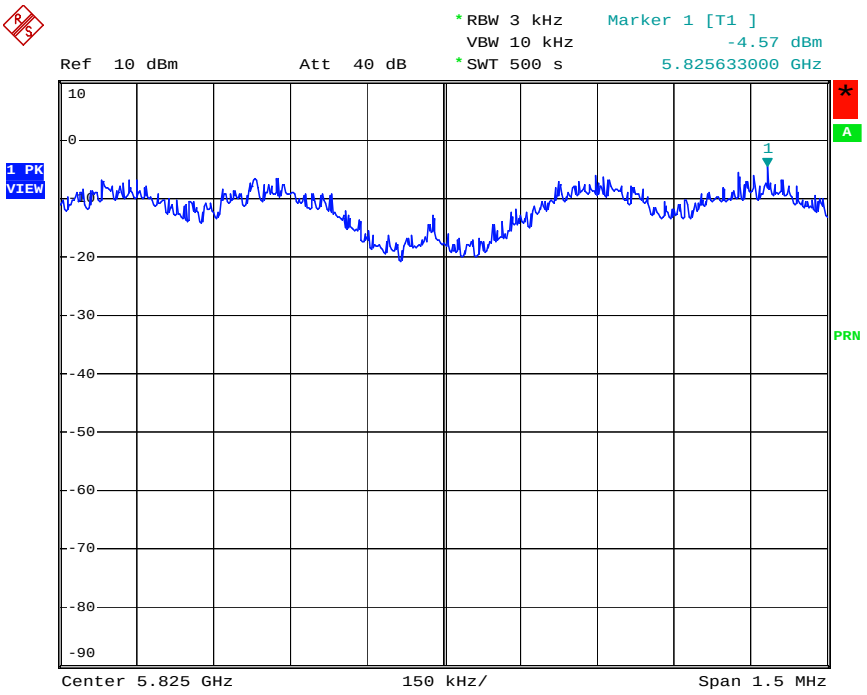
Low Channel:



Middle Channel:

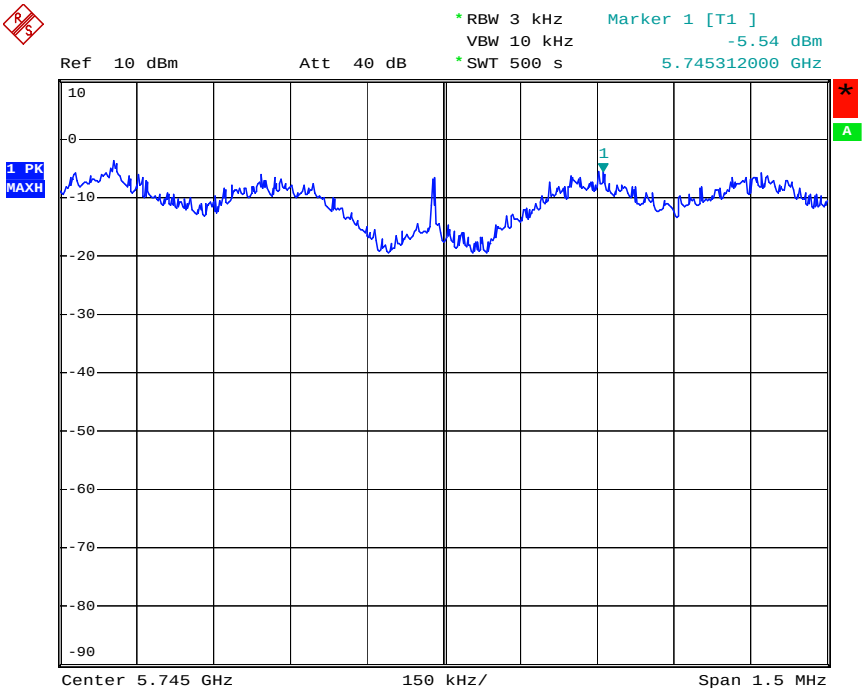


High Channel:

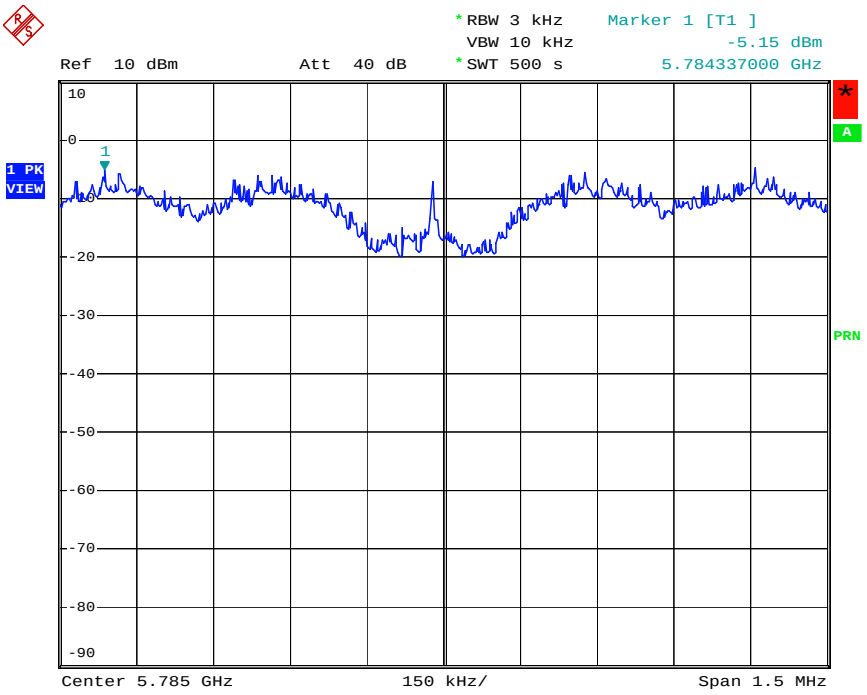


For 802.11a (54M) 5.8G Chain 0

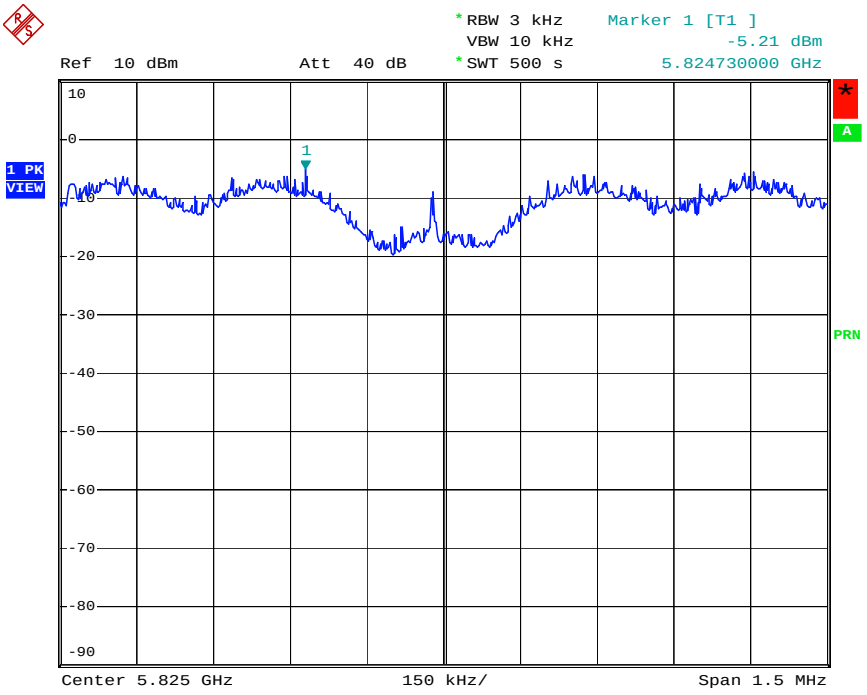
Low Channel:



Middle Channel:

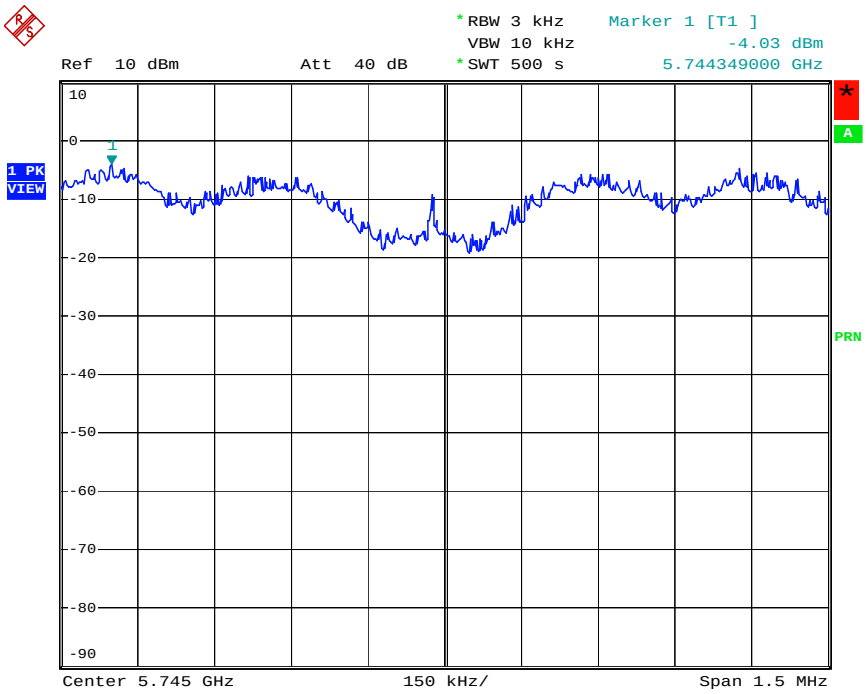


High Channel:

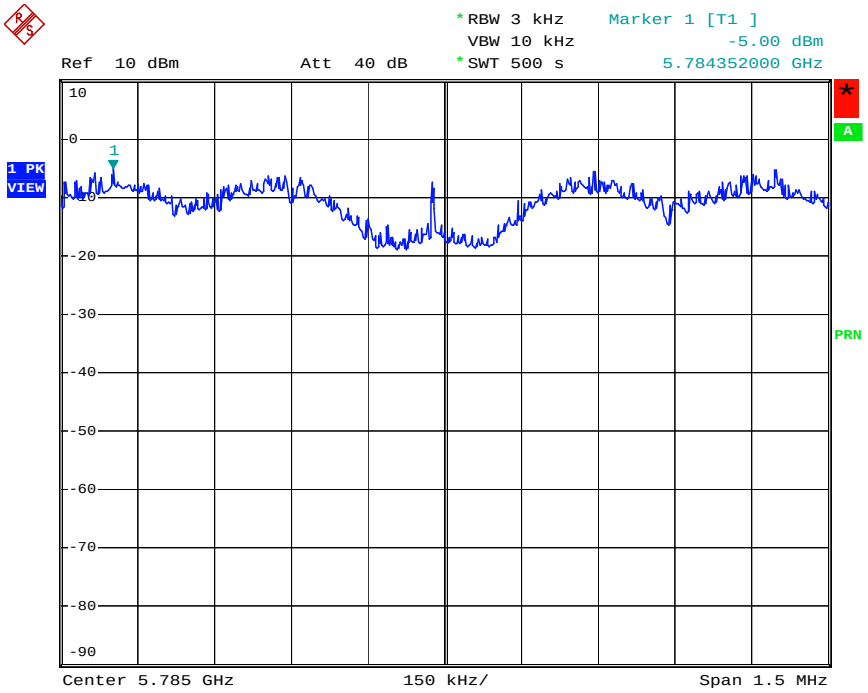


For 802.11a (6M) 5.8G Chain 1

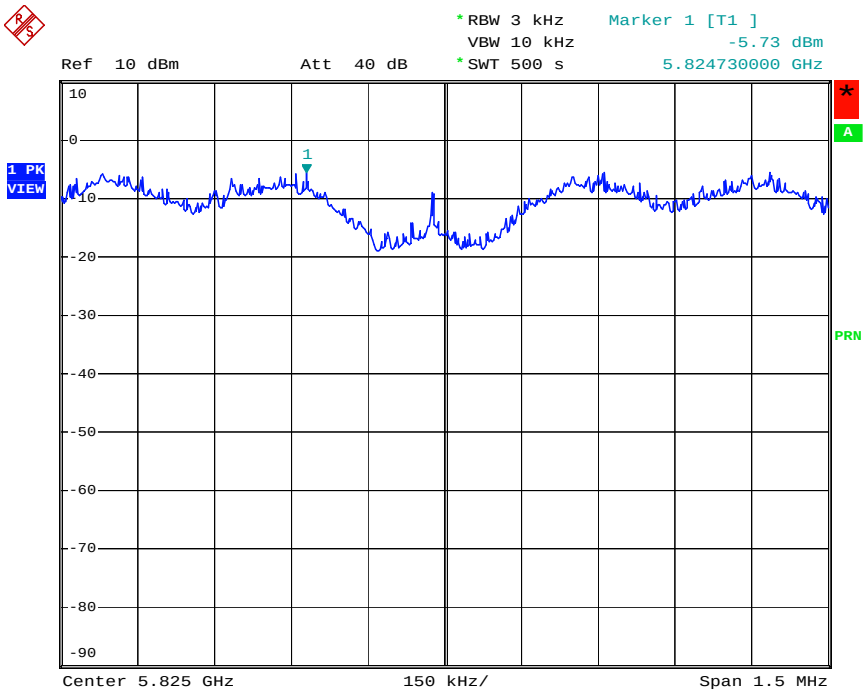
Low Channel:



Middle Channel:

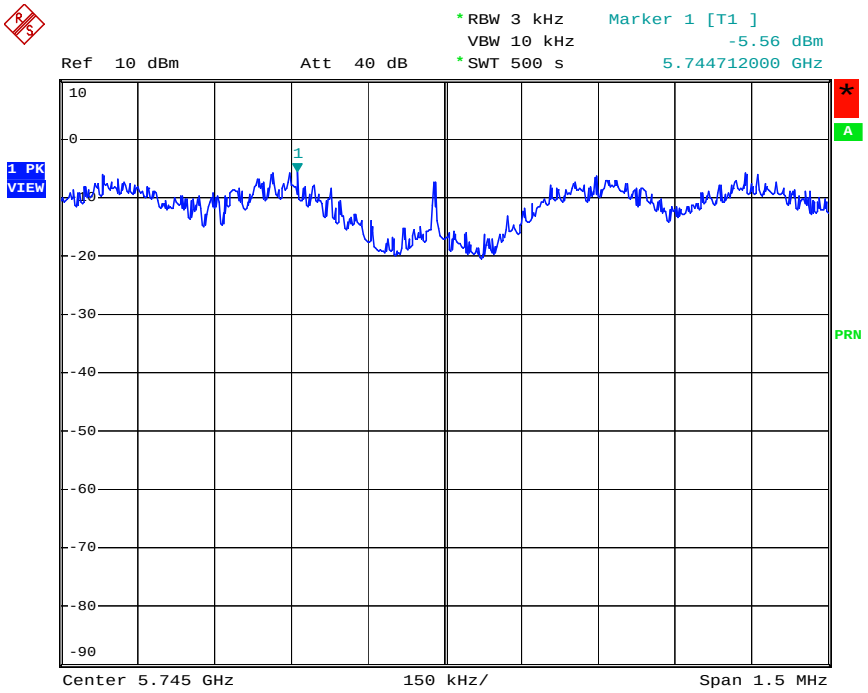


High Channel:

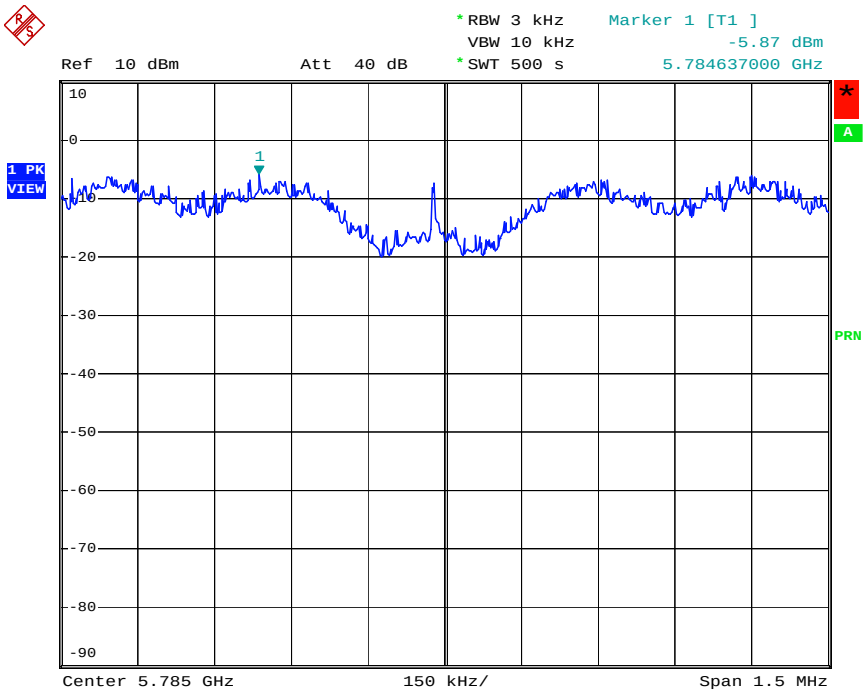


For 802.11a (54M) 5.8G Chain 1

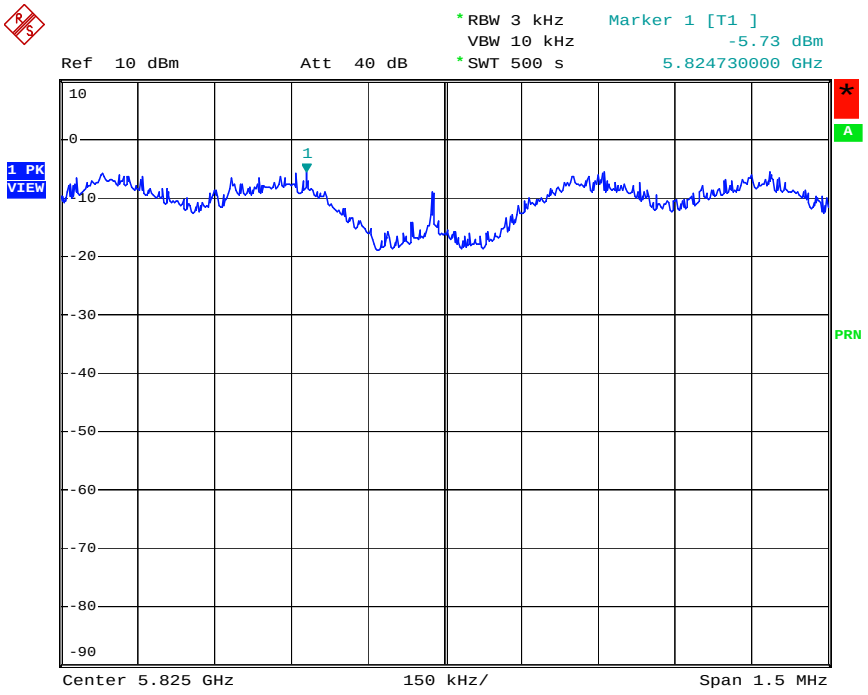
Low Channel:



Middle Channel:

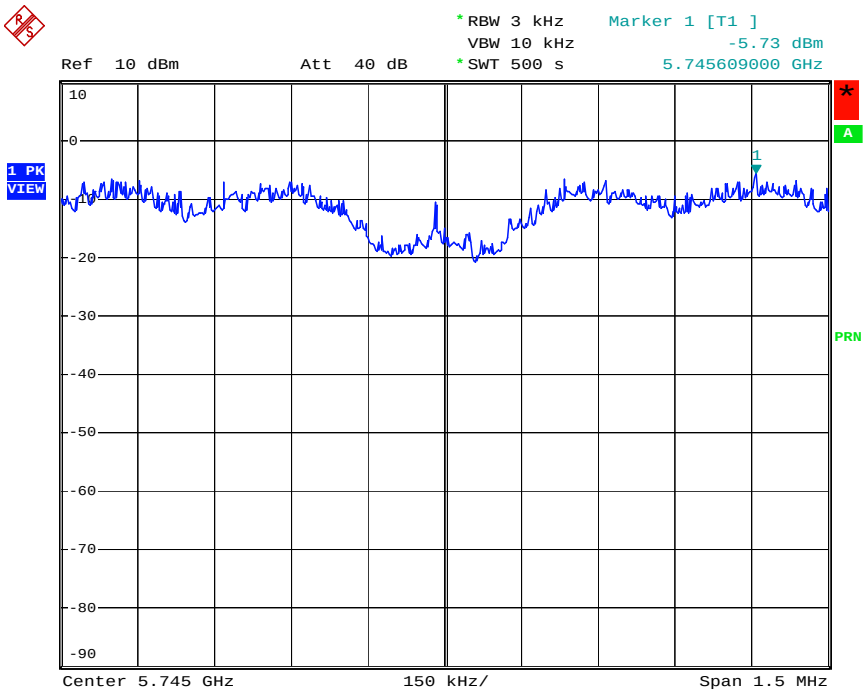


High Channel:

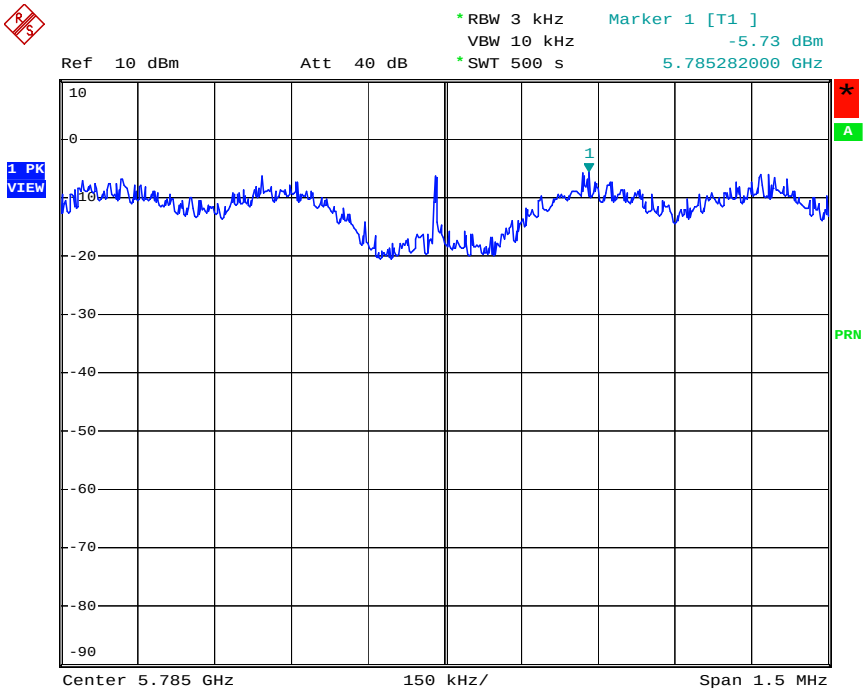


For 802.11n HT20 (MCS=0) 5.8G Chain 0

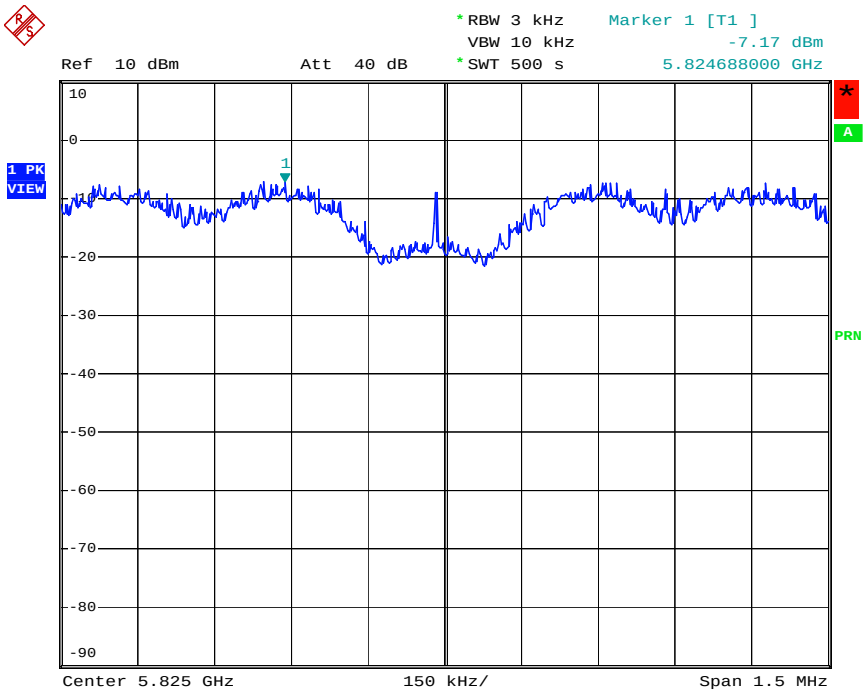
Low Channel:



Middle Channel:

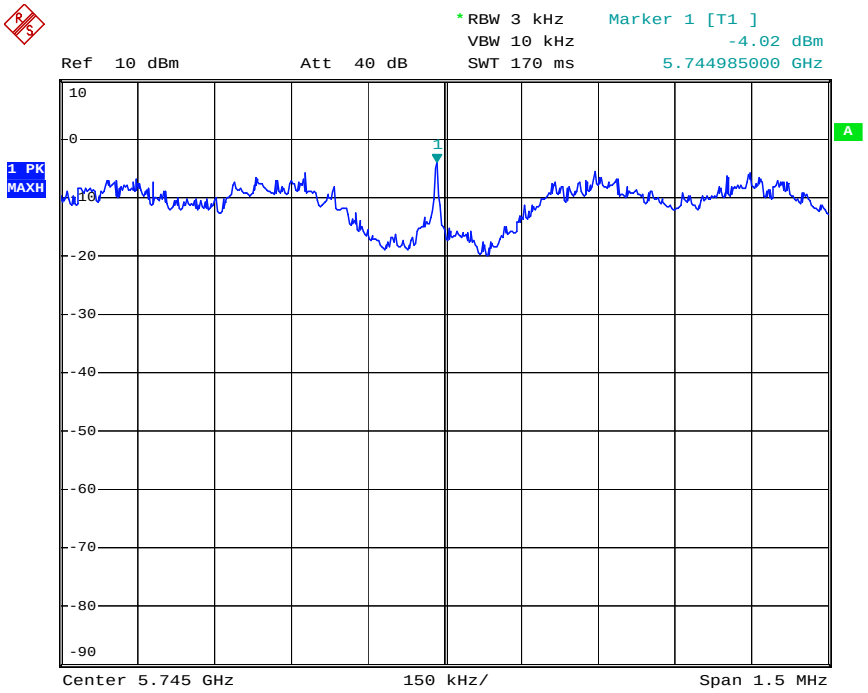


High Channel:

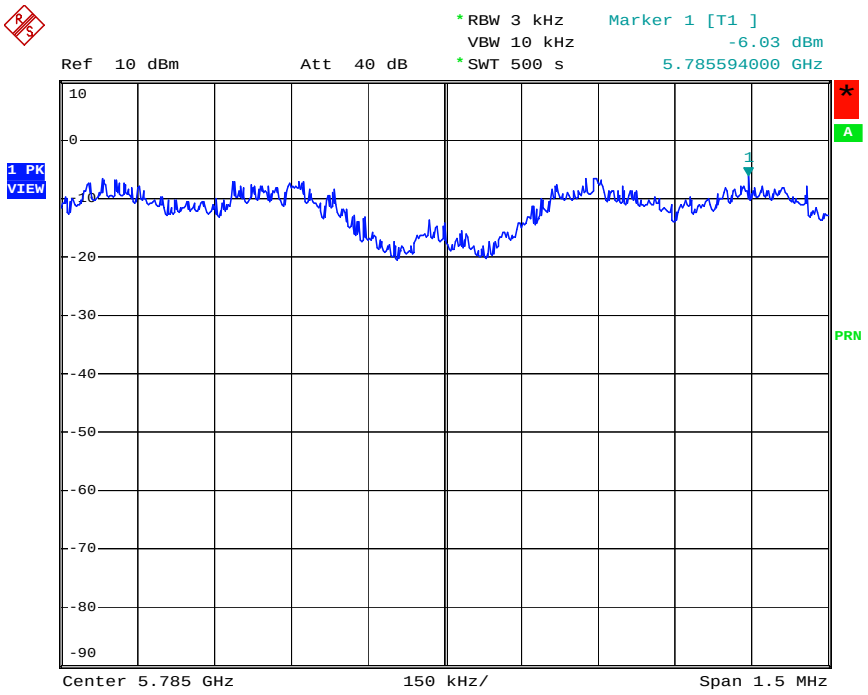


For 802.11n HT20 (MCS=15) 5.8G Chain 1

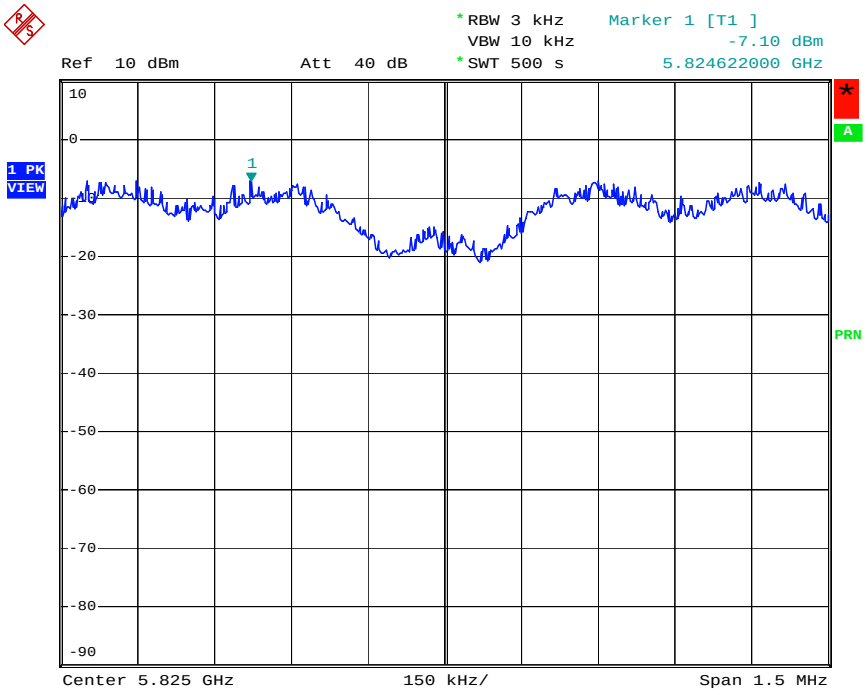
Low Channel:



Middle Channel:

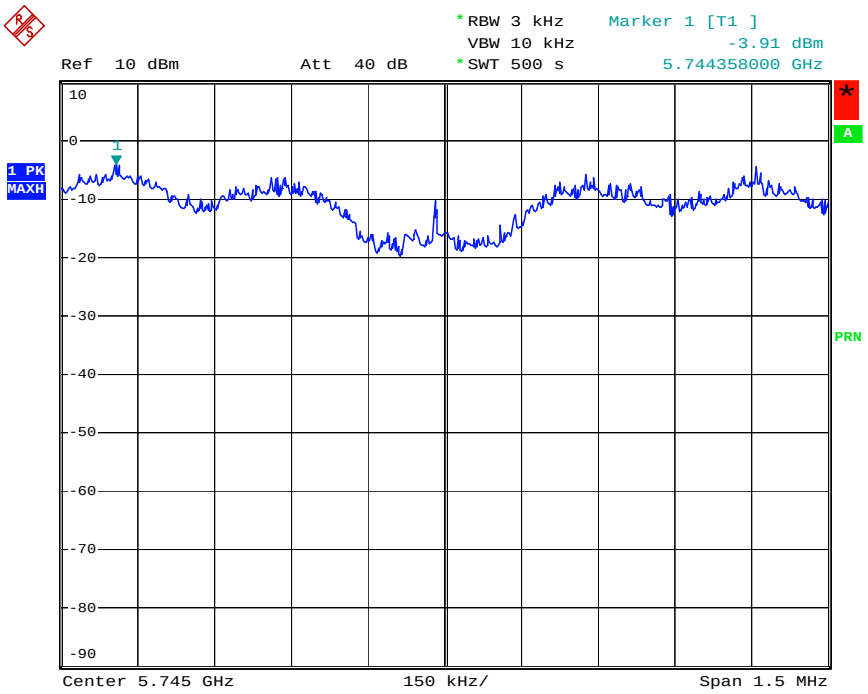


High Channel:

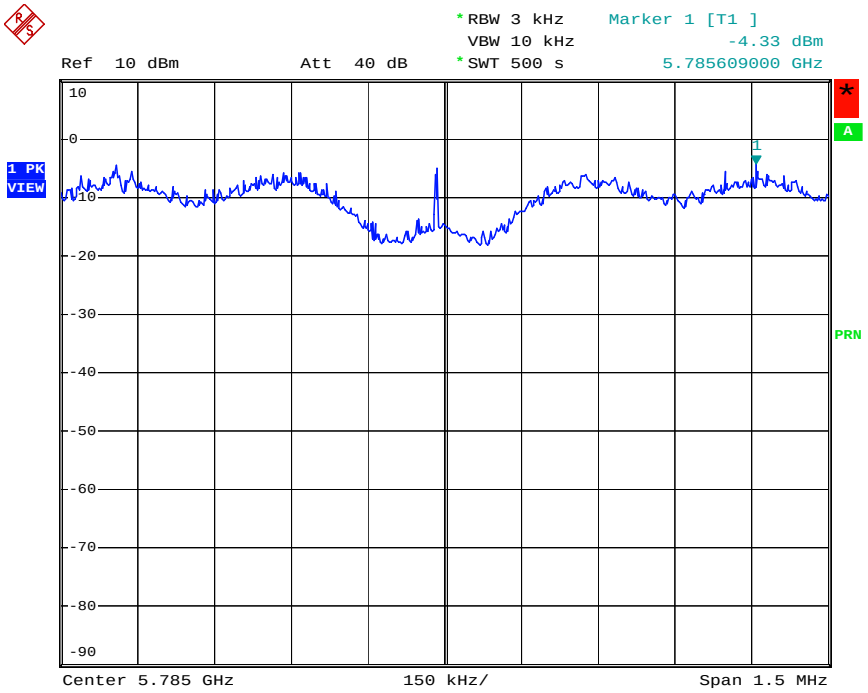


For 802.11n HT20 (MCS=0) 5.8G Chain 1

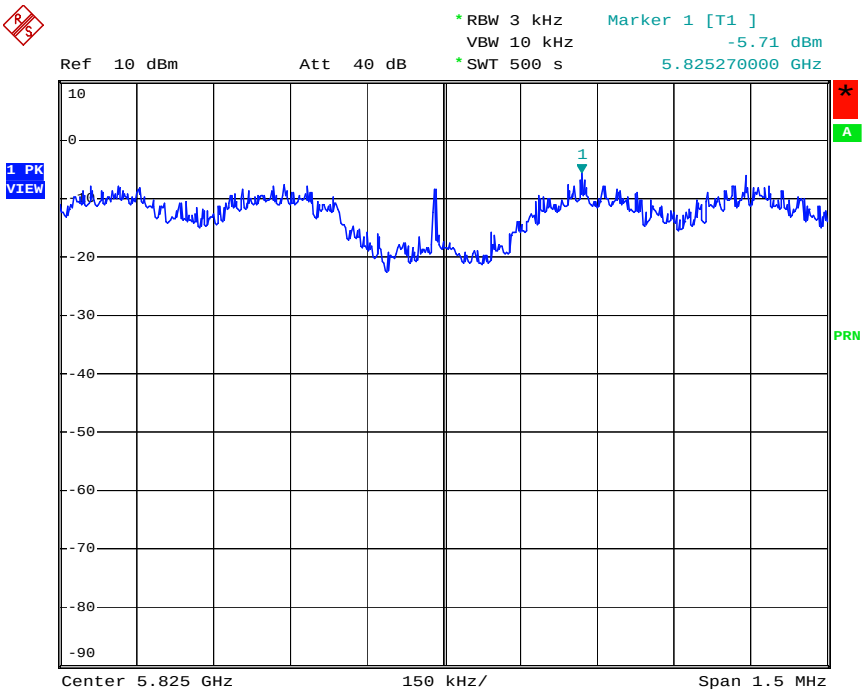
Low Channel:



Middle Channel:

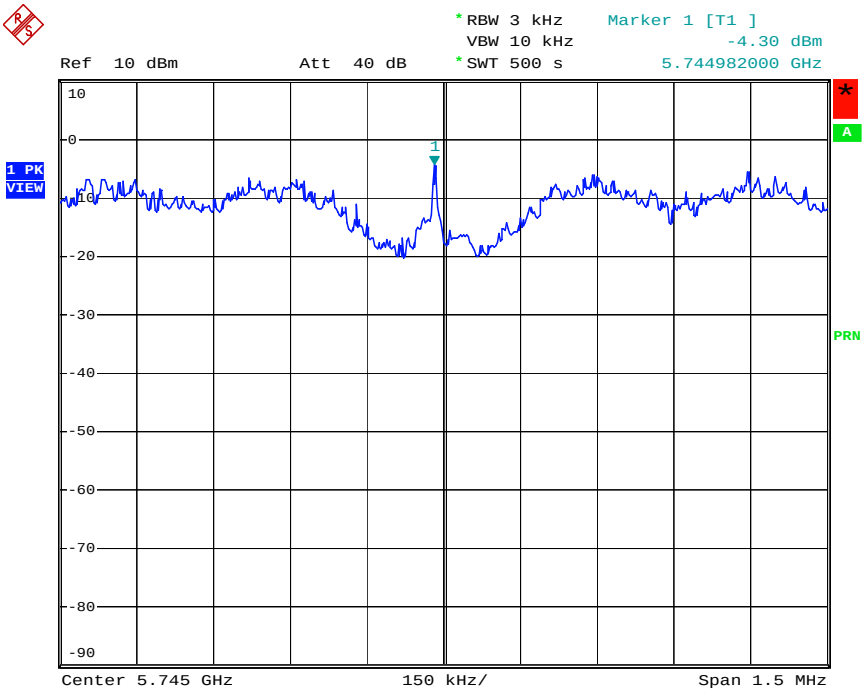


High Channel:

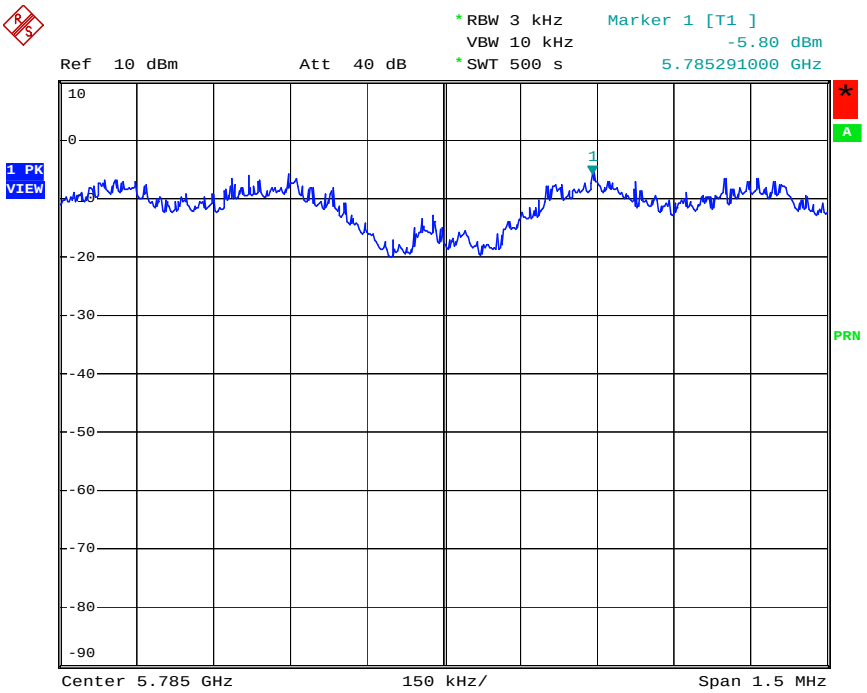


For 802.11n HT20 (MCS=15) 5.8G Chain 0

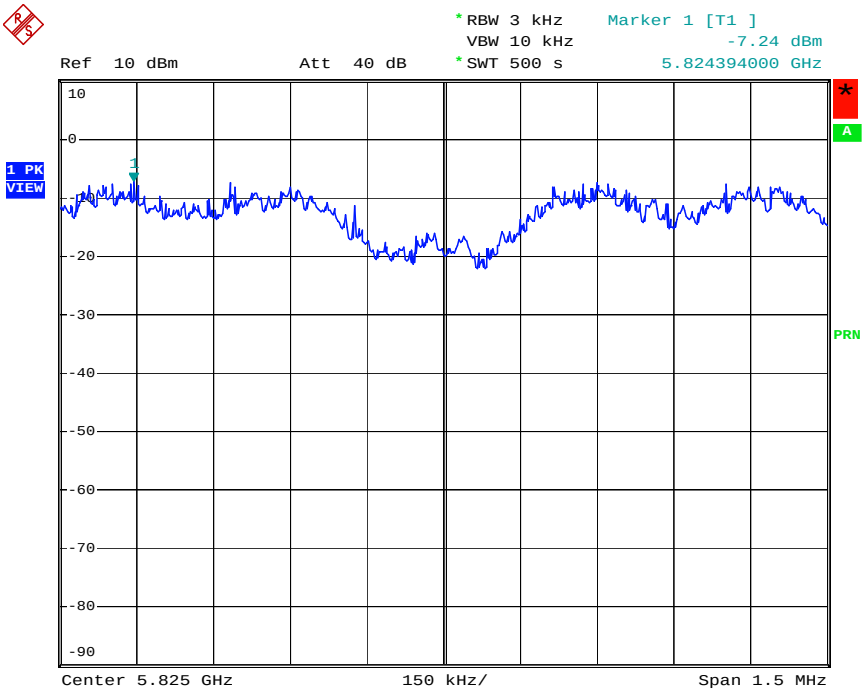
Low Channel:



Middle Channel:

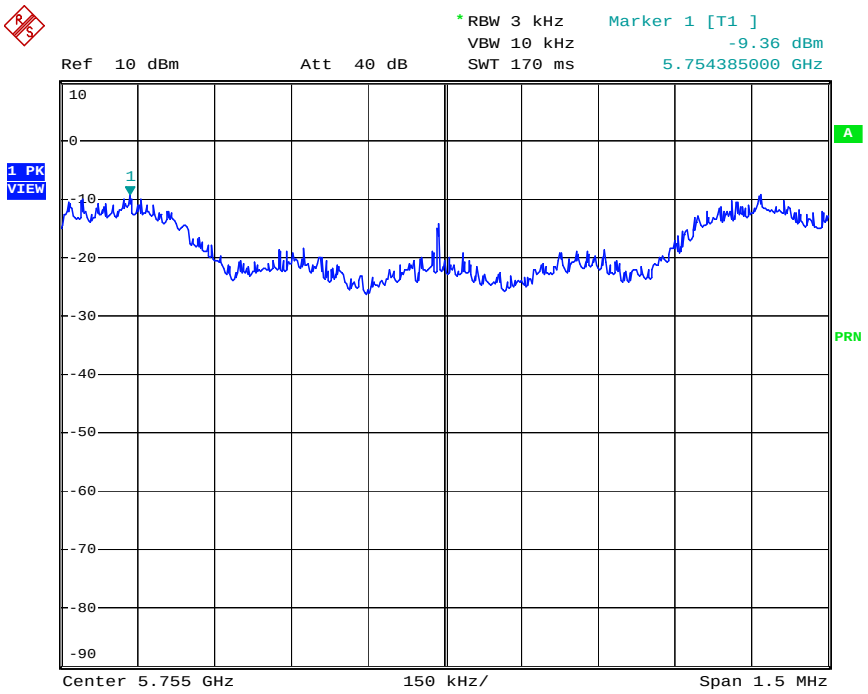


High Channel:

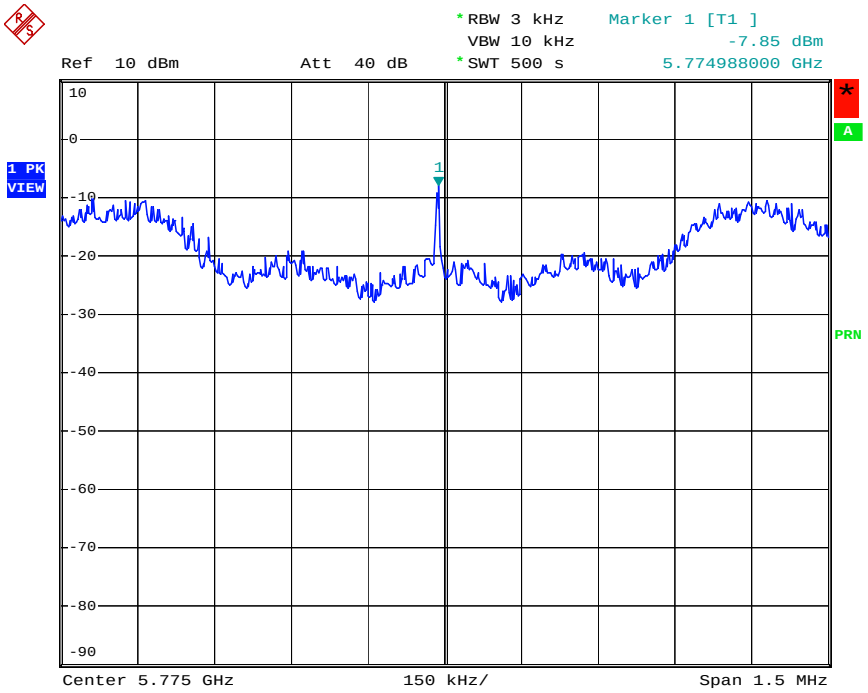


For 802.11n HT40 (MCS=0) 5.8G Chain 0

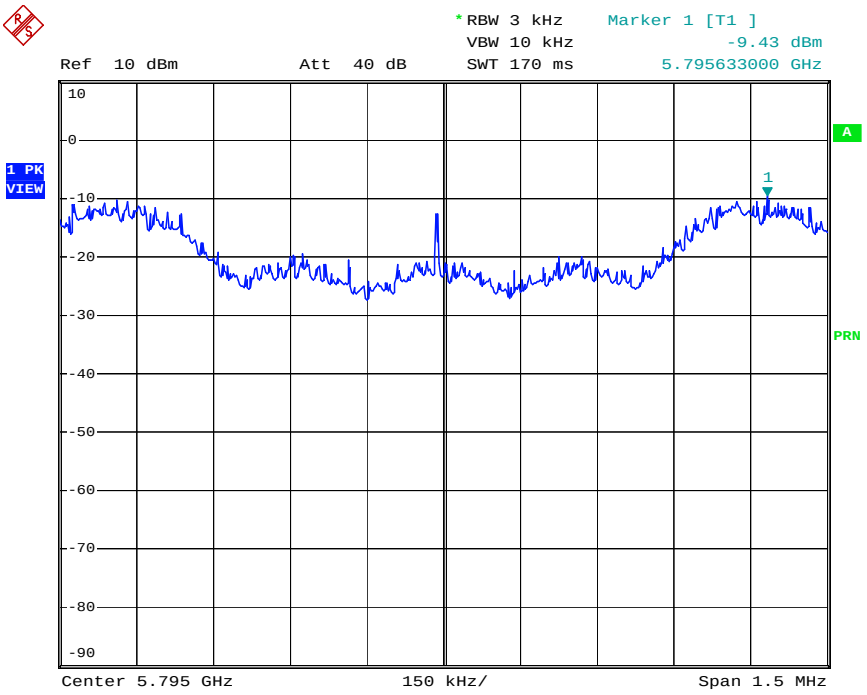
Low Channel:



Middle Channel:

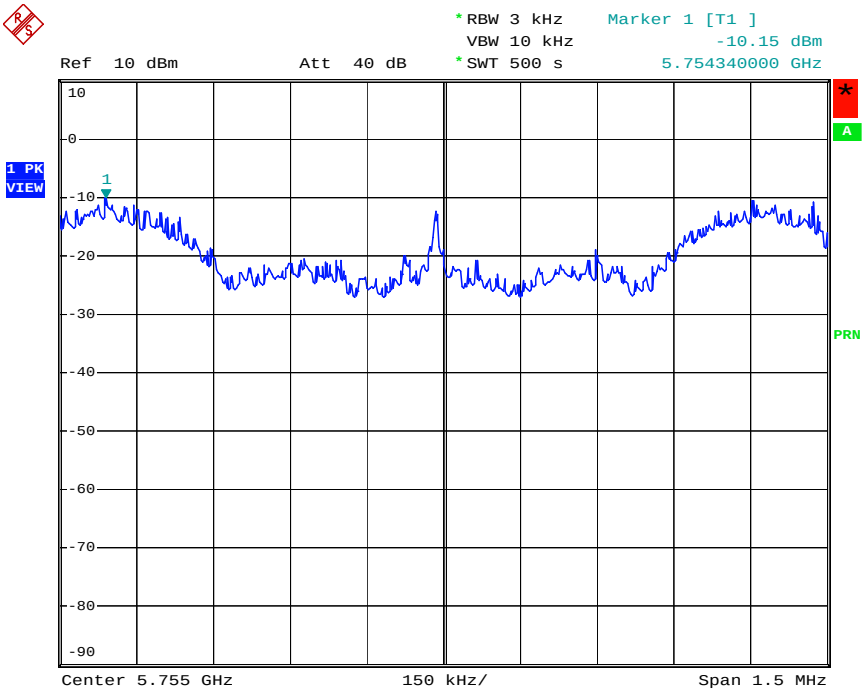


High Channel:

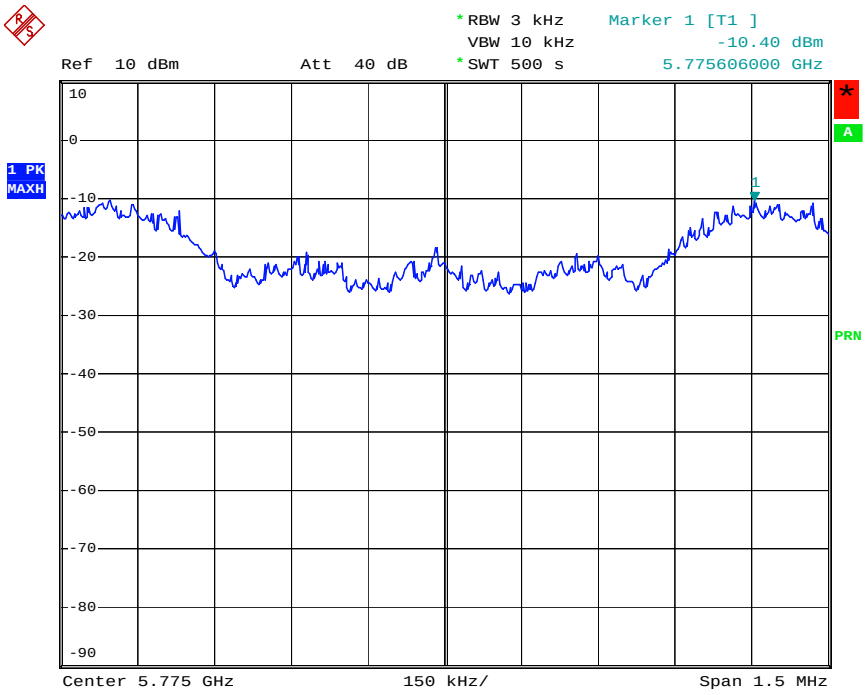


For 802.11n HT40 (MCS=15) 5.8G Chain 0

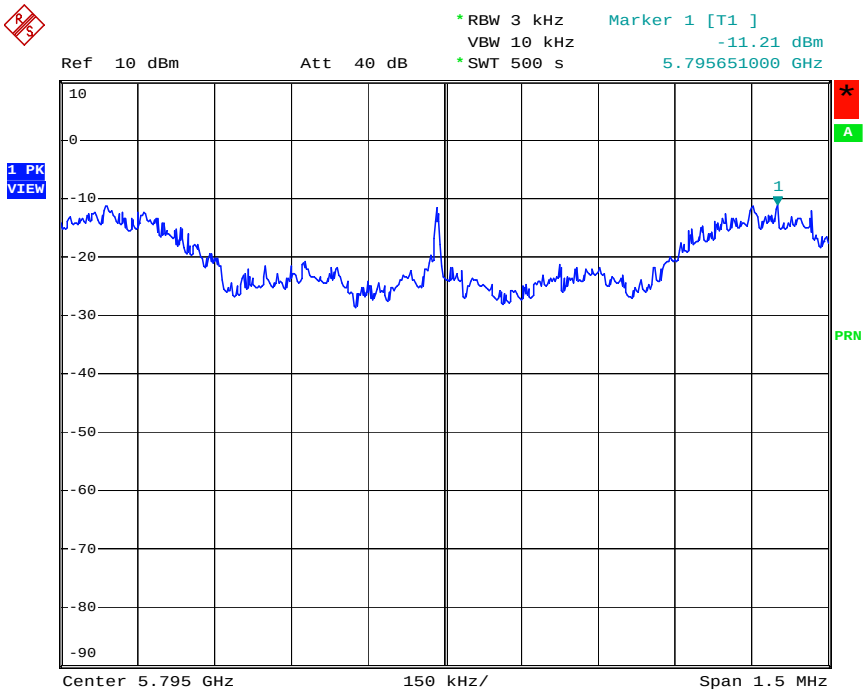
Low Channel:



Middle Channel:

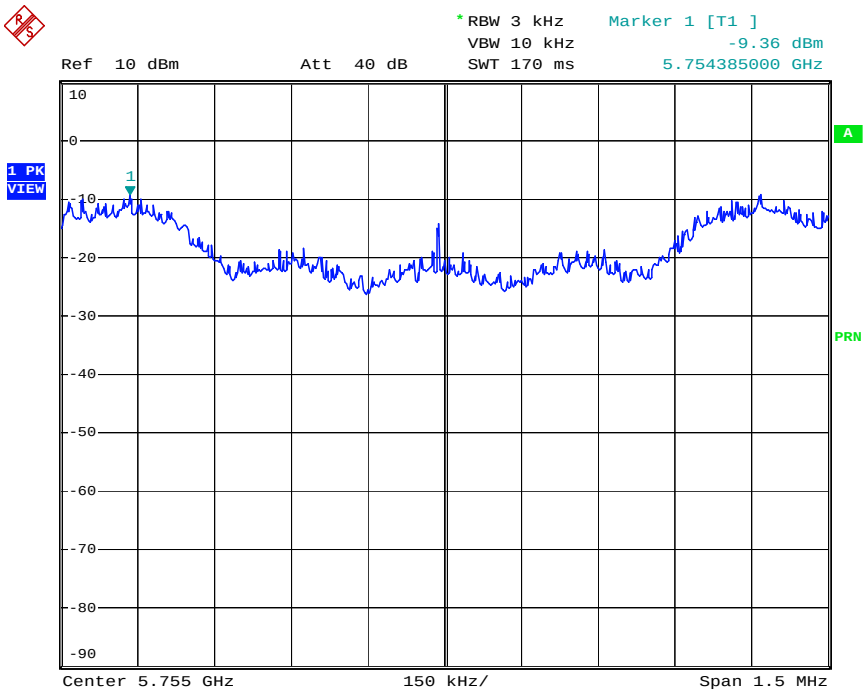


High Channel:

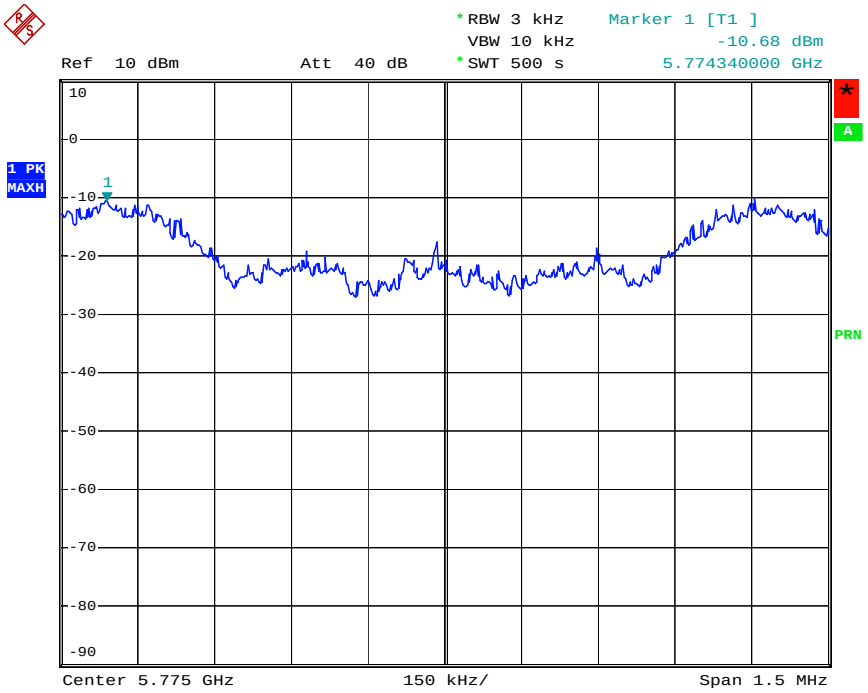


For 802.11n HT40 (MCS=0) 5.8G Chain 1

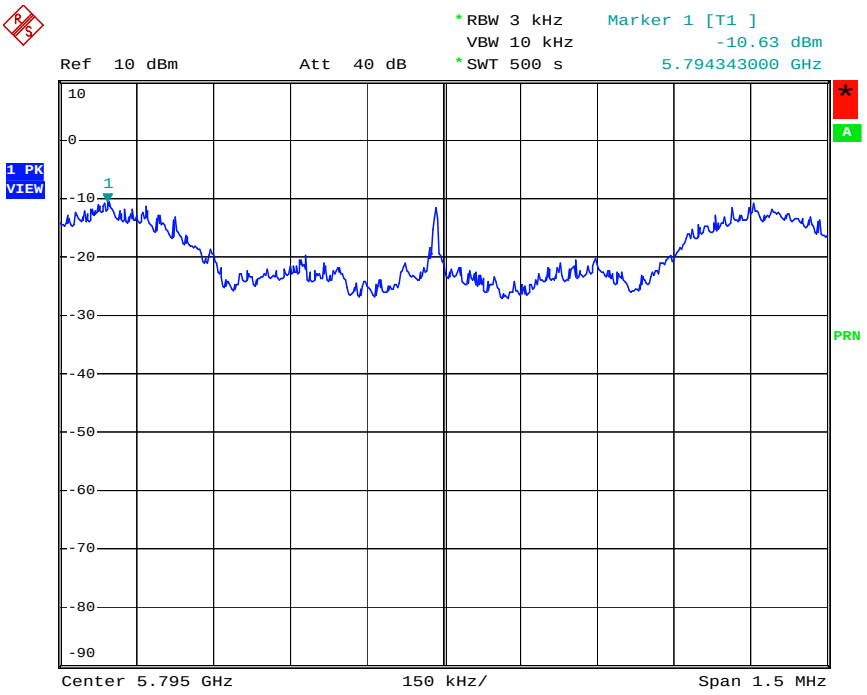
Low Channel:



Middle Channel:

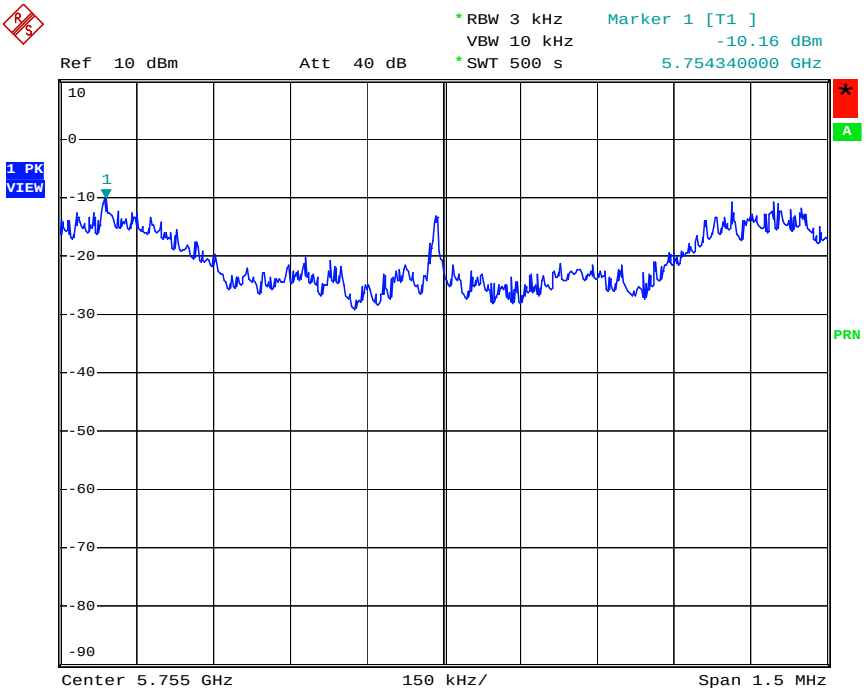


High Channel:

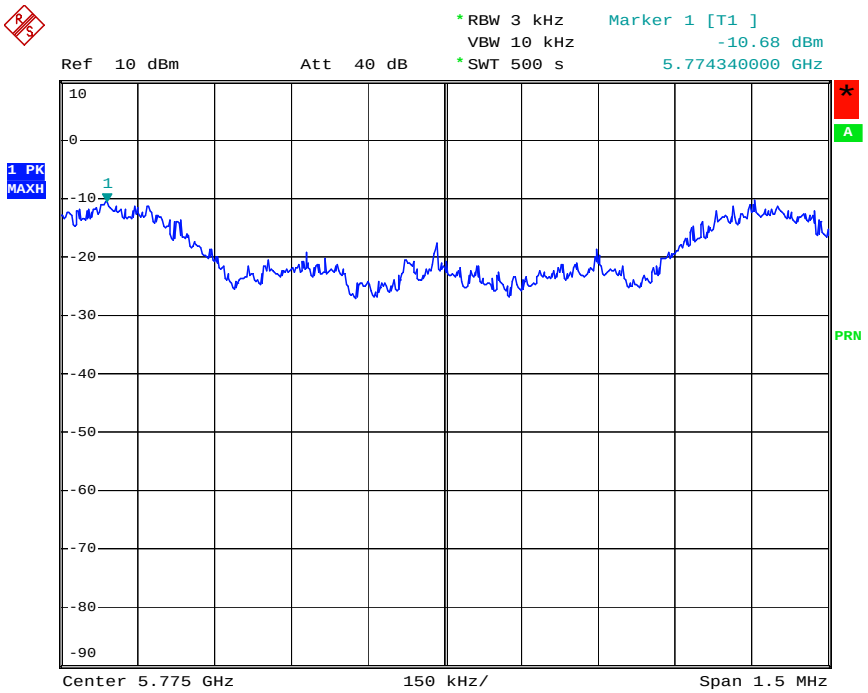


For 802.11n HT40 (MCS=15) 5.8G Chain 1

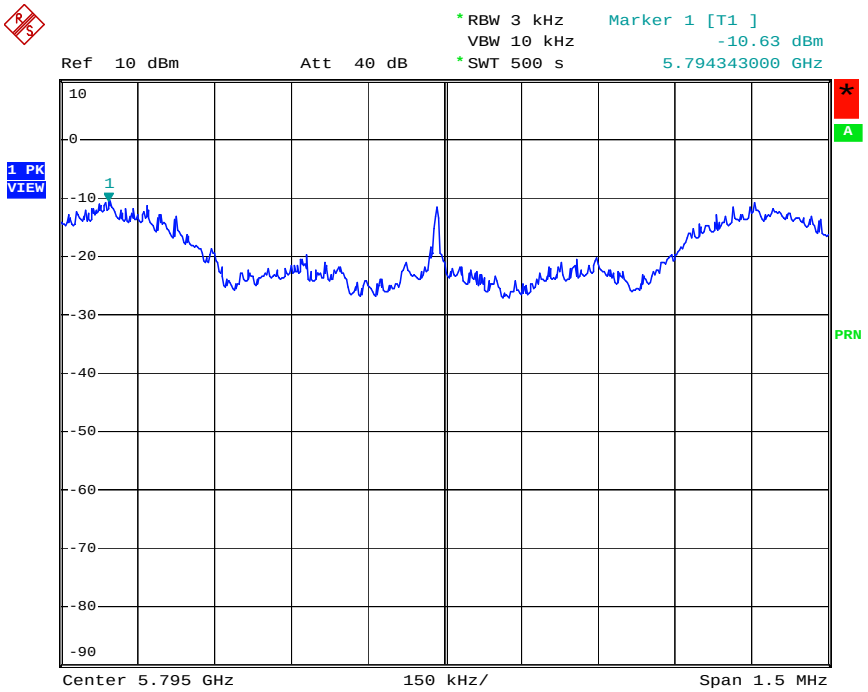
Low Channel:



Middle Channel:



High Channel:



6. 6-dB BANDWIDTH

6.1 Standard Applicable

According to 15.247(a)(2). Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2010-12-20	2011-12-19
Spectrum Analyzer	R&S	FSP	836079/035	2010-12-20	2011-12-19
Attenuator	ATTEN	ATS100-6-20	DC-6GHz	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

6.3 Test Procedure

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set center frequency of spectrum analyzer = operating frequency.
3. The spectrum analyzer as RBW=100KHz (1 % of Bandwidth.), Sweep=auto
4. Mark the peak frequency and –6dB (upper and lower) frequency.

6.4 Environmental Conditions

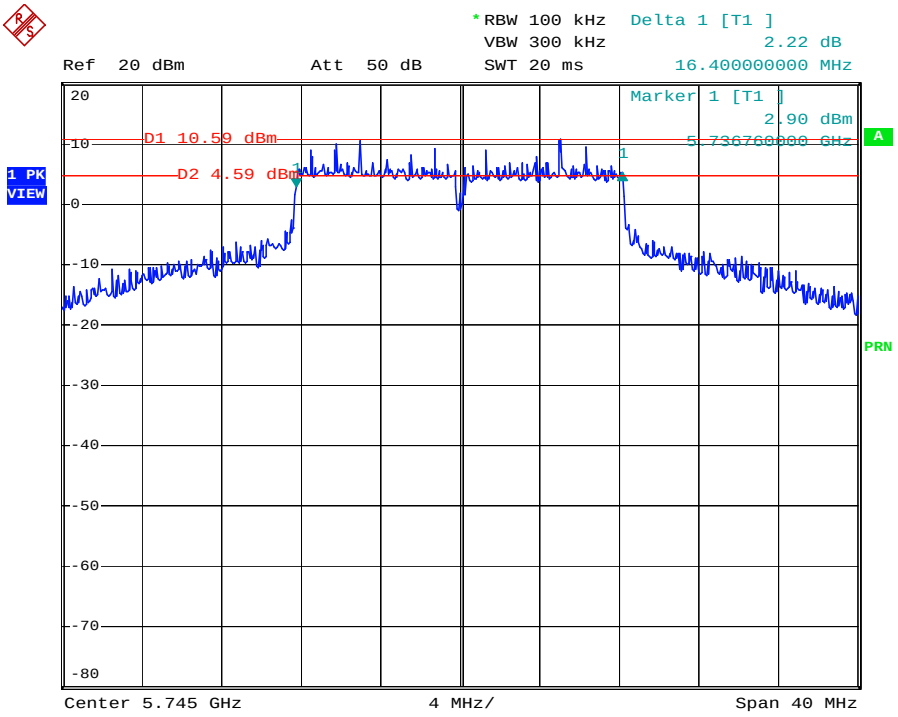
Temperature:	24° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.5 Summary of Test Results/Plots

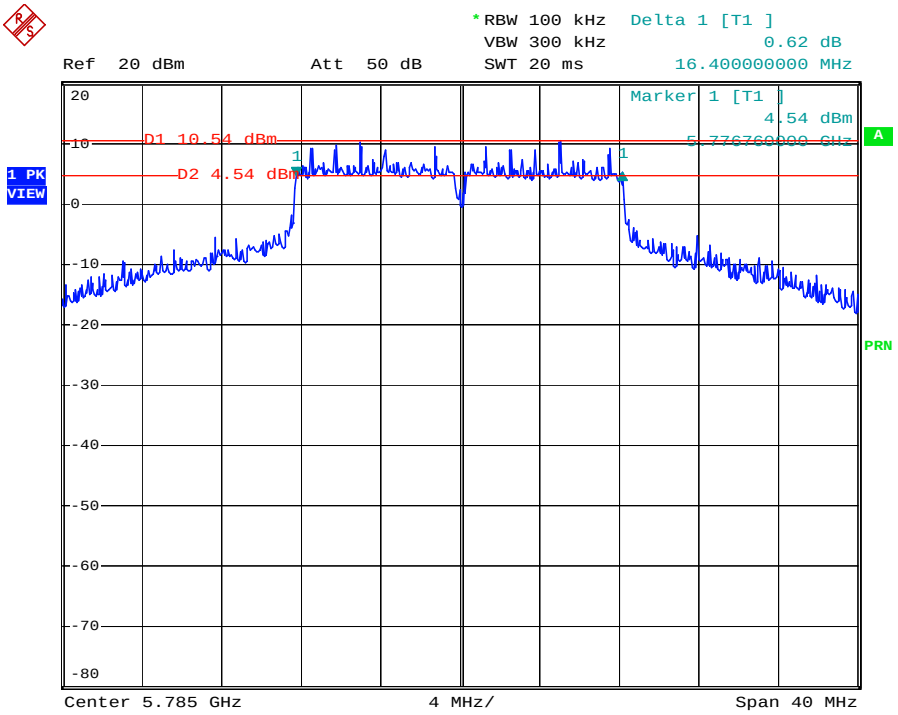
Test mode	Frequency MHz	6 dB Bandwidth Chain 0 (kHz)	6 dB Bandwidth Chain 1 (kHz)	Limit kHz
802.11a(6M)	5745	16400	16400	500
	5785	16400	16480	500
	5825	16480	16480	500
802.11a(54M)	5745	17760	16480	500
	5785	16480	16480	500
	5825	16480	16560	500
802.11nHT20 (MCS=0)	5745	17760	16480	500
	5785	17760	16480	500
	5825	16480	16480	500
802.11nHT20 (MCS=15)	5745	17760	16480	500
	5785	17680	16480	500
	5825	16400	16480	500
802.11nHT40 (MCS=0)	5755	36500	36600	500
	5775	36200	36600	500
	5795	36500	36600	500
802.11nHT40 (MCS=15)	5755	36500	36500	500
	5775	36600	36600	500
	5795	36400	36500	500

For 802.11a(6M) 5.8G Chain0

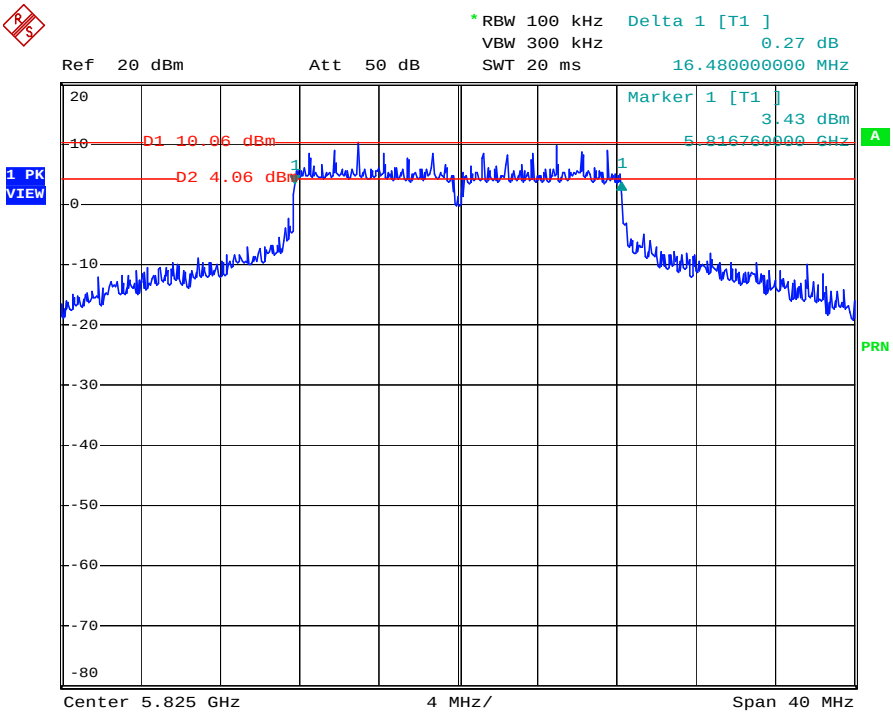
Low Channel:



Mid Channel:

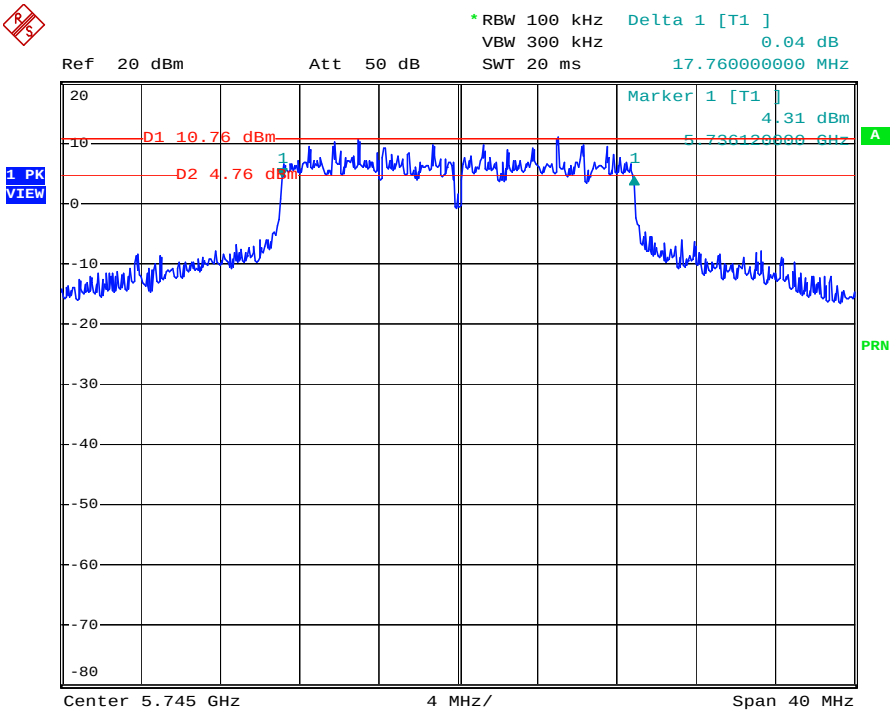


High Channel:

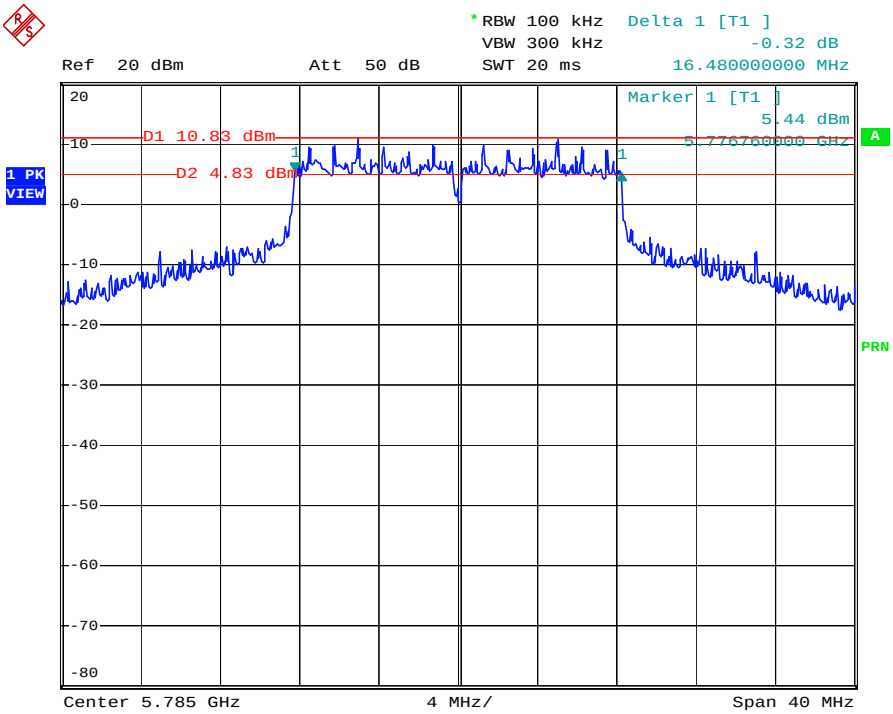


For 802.11a(54M) 5.8G Chain0

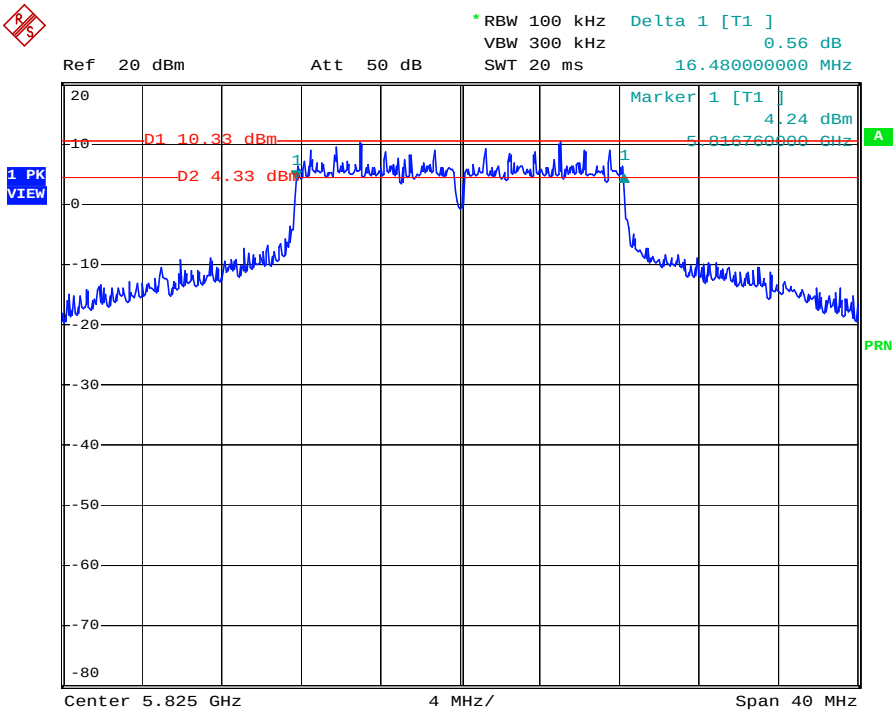
Low Channel:



Mid Channel:

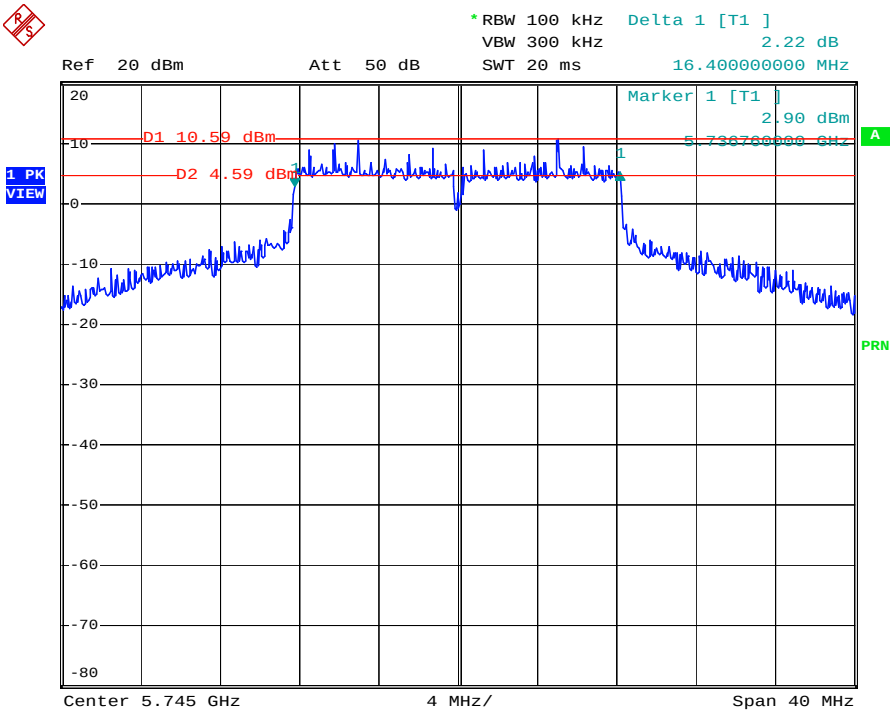


High Channel:

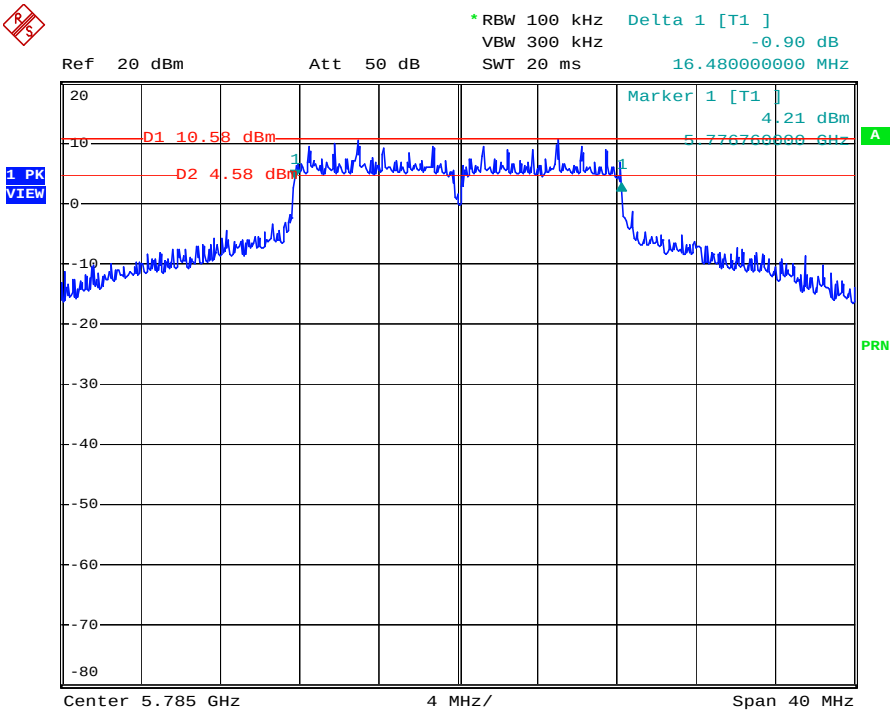


For 802.11a(6M) 5.8G Chain1

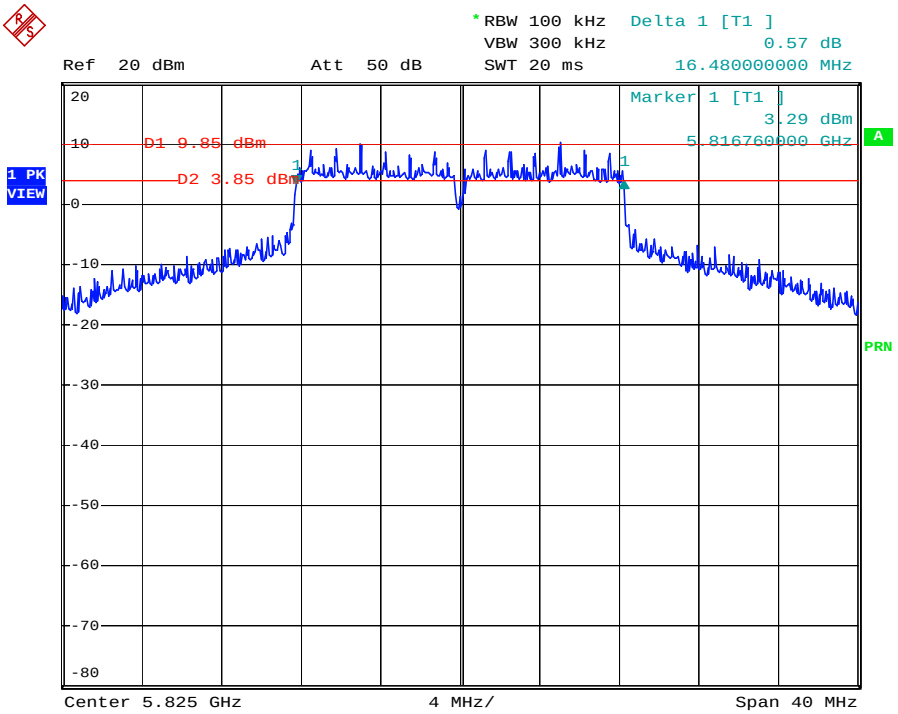
Low Channel:



Mid Channel:

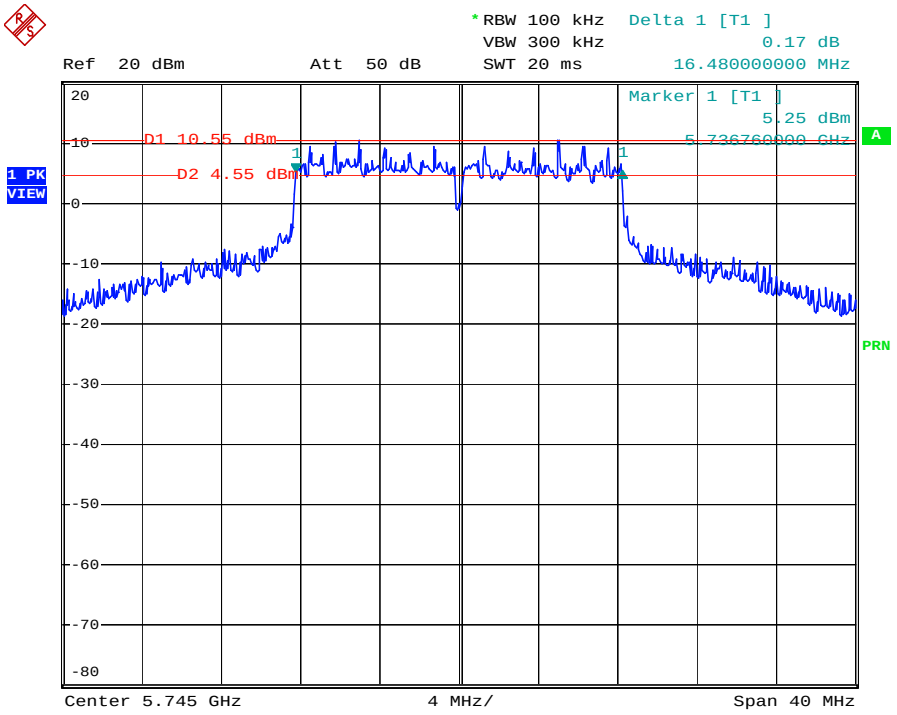


High Channel:

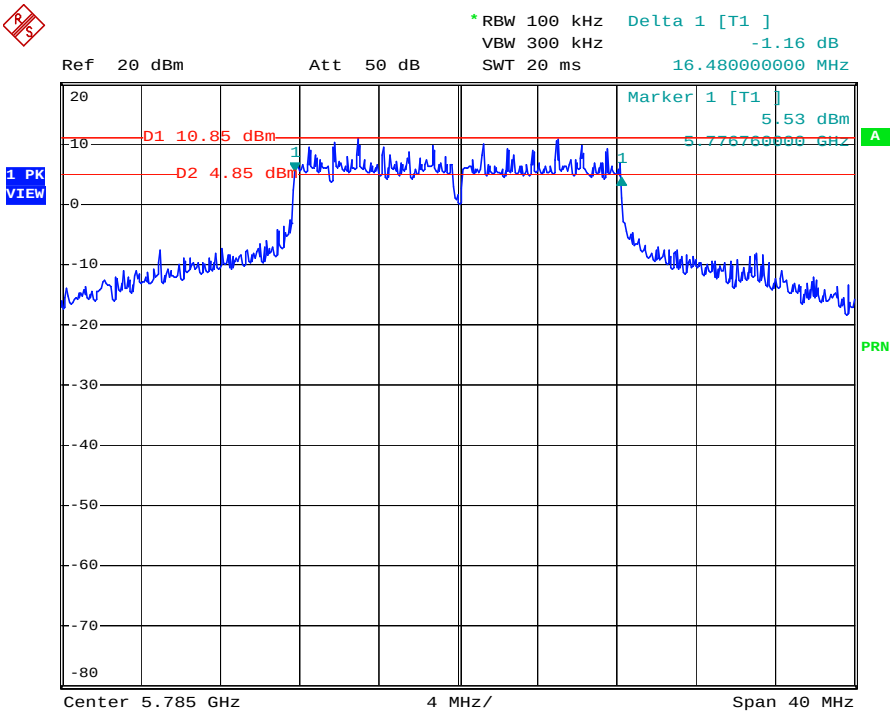


For 802.11a(54M) 5.8G Chain1

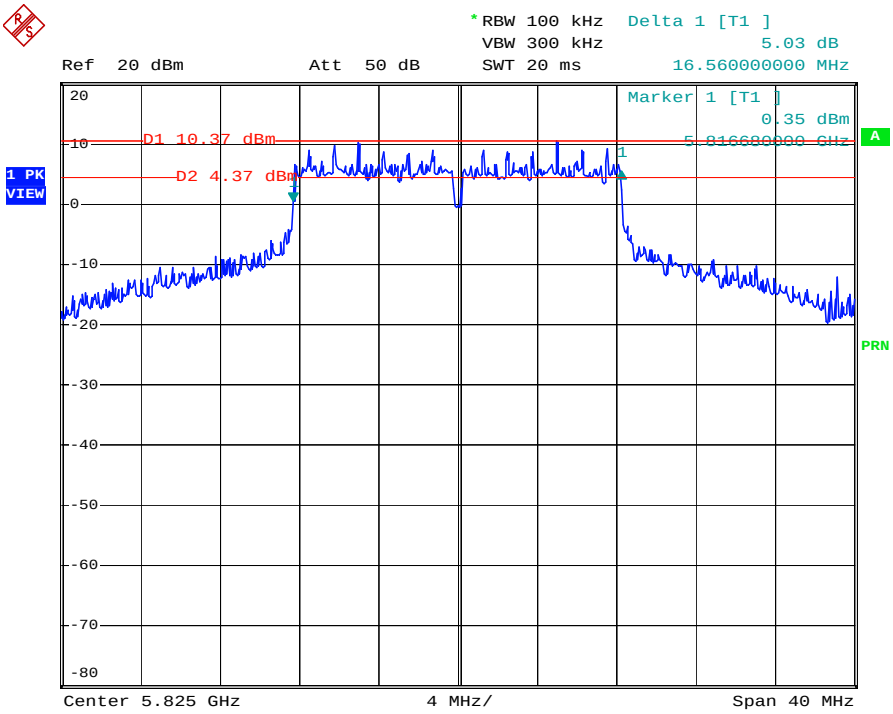
Low Channel:



Mid Channel:

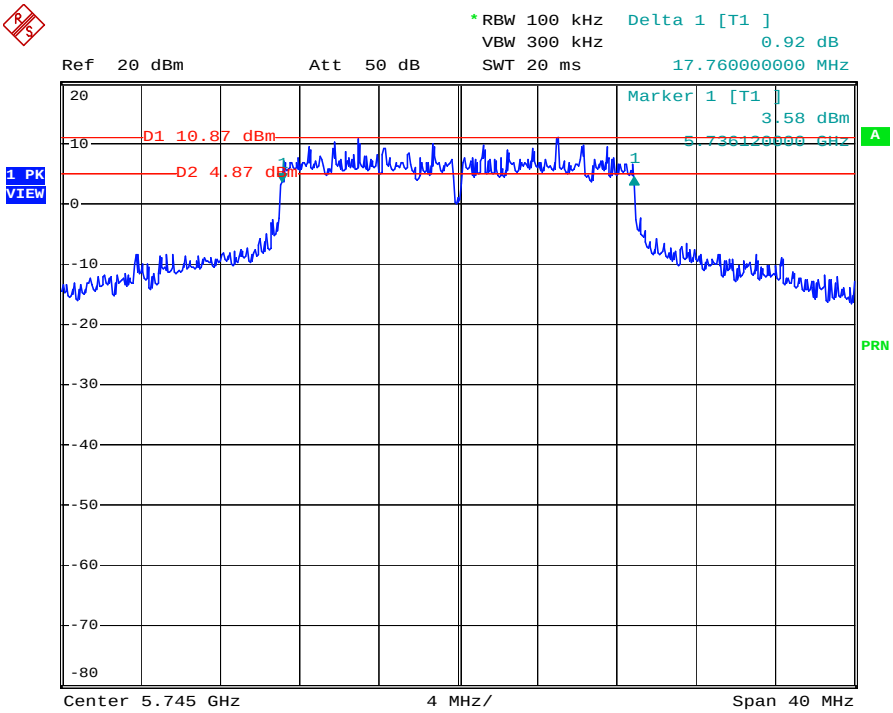


High Channel:

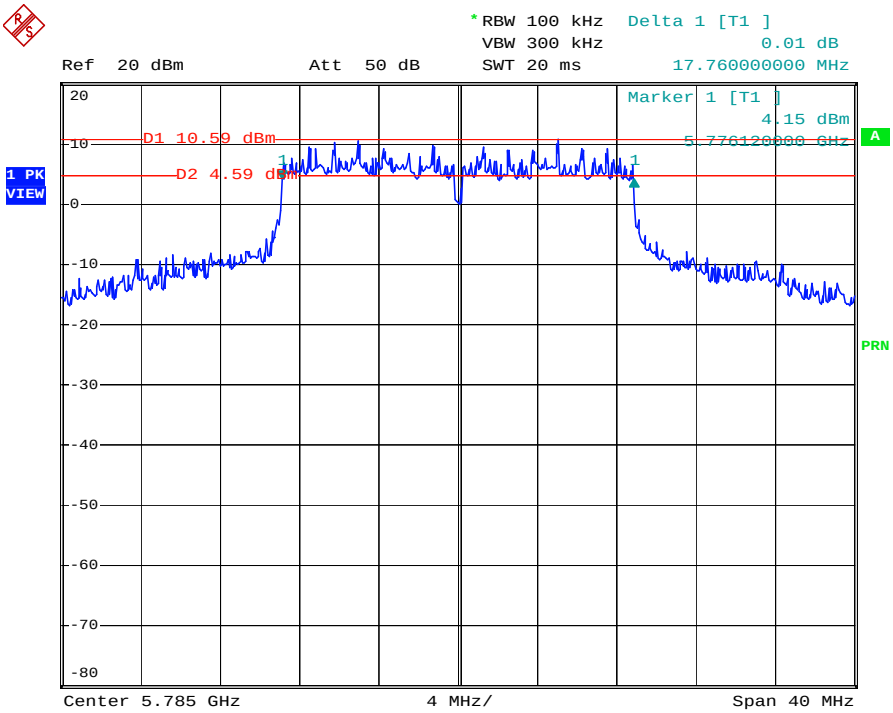


For 802.11n HT20 (MCS=0) 5.8G Chain 0

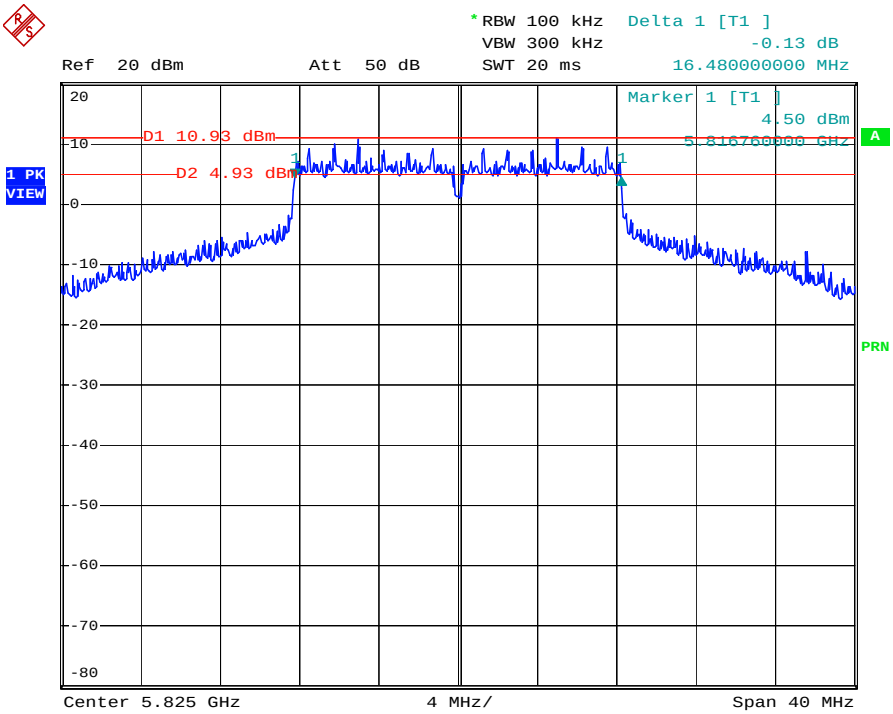
Low Channel:



Mid Channel:

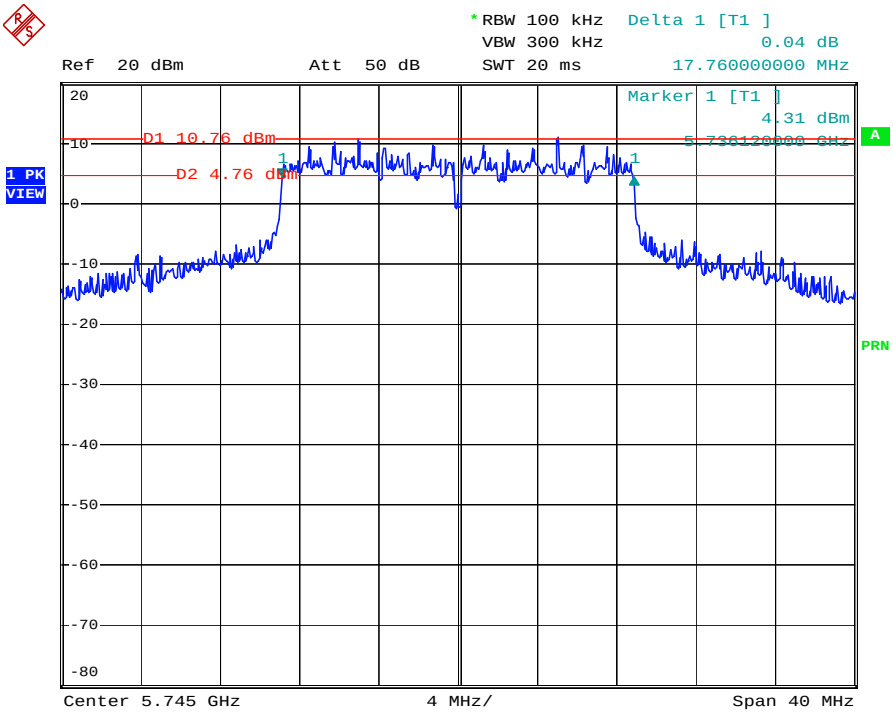


High Channel:

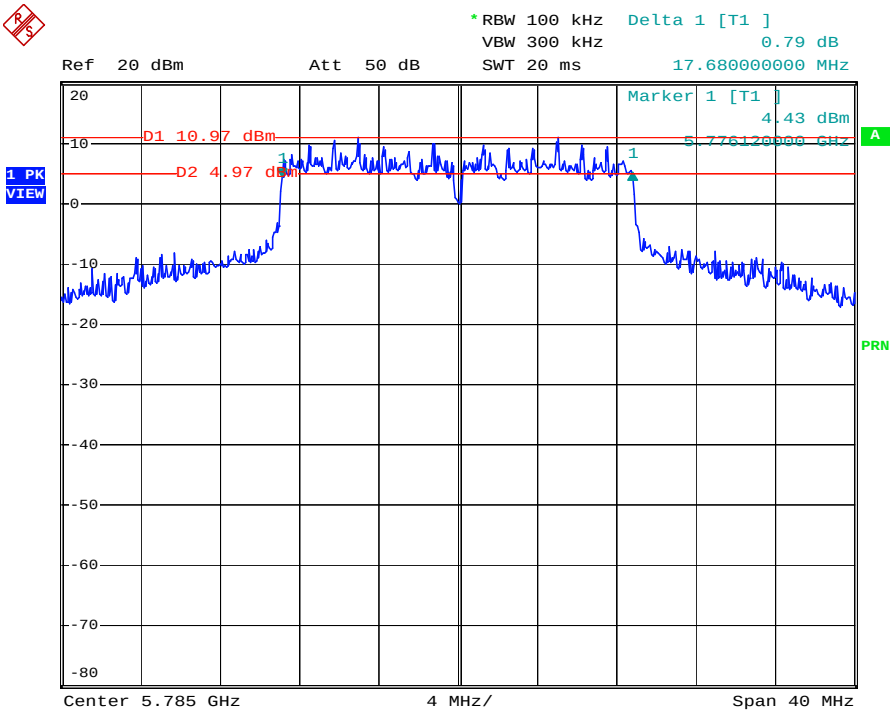


For 802.11n HT20 (MCS=15) 5.8G Chain 0

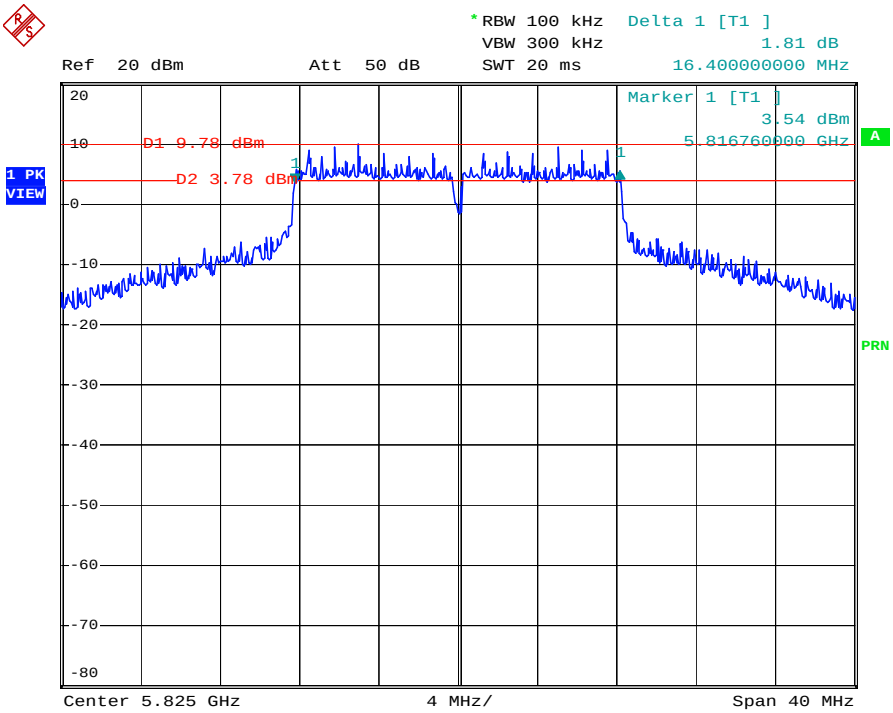
Low Channel:



Mid Channel:

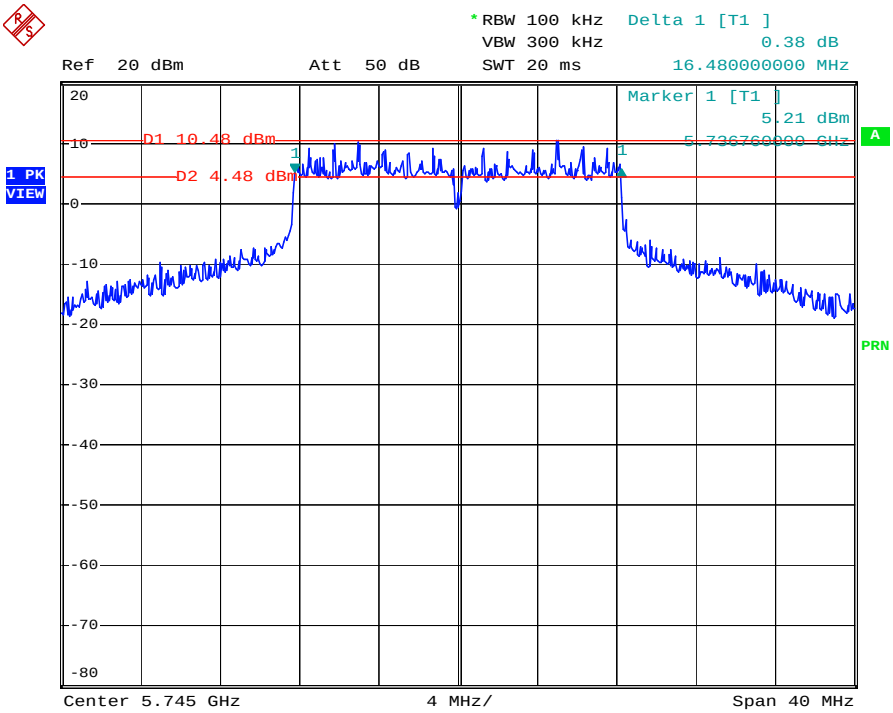


High Channel:

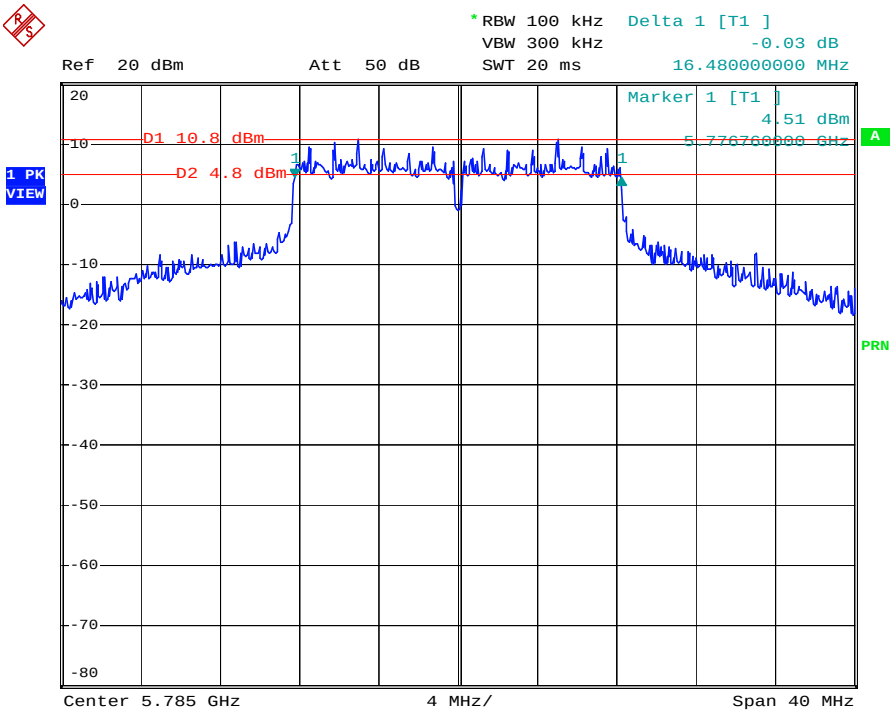


For 802.11n HT20 (MCS=0) 5.8G Chain 1

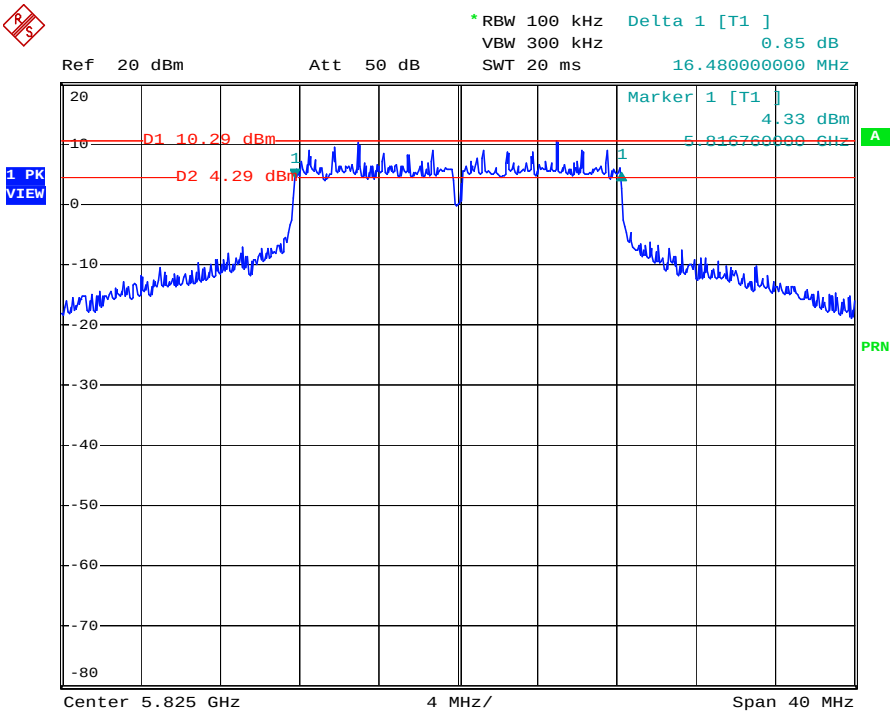
Low Channel:



Mid Channel:

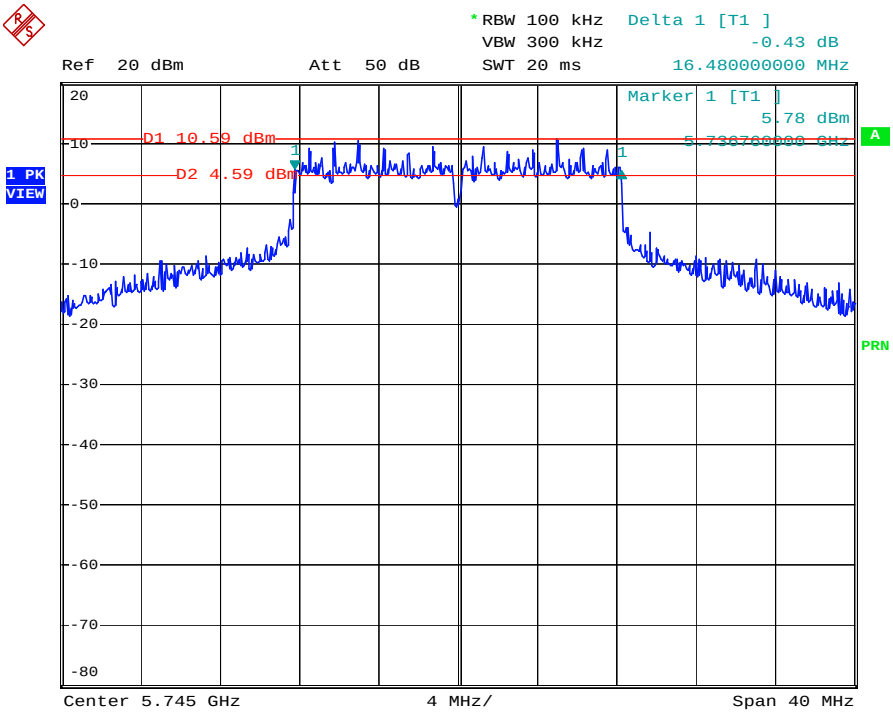


High Channel:

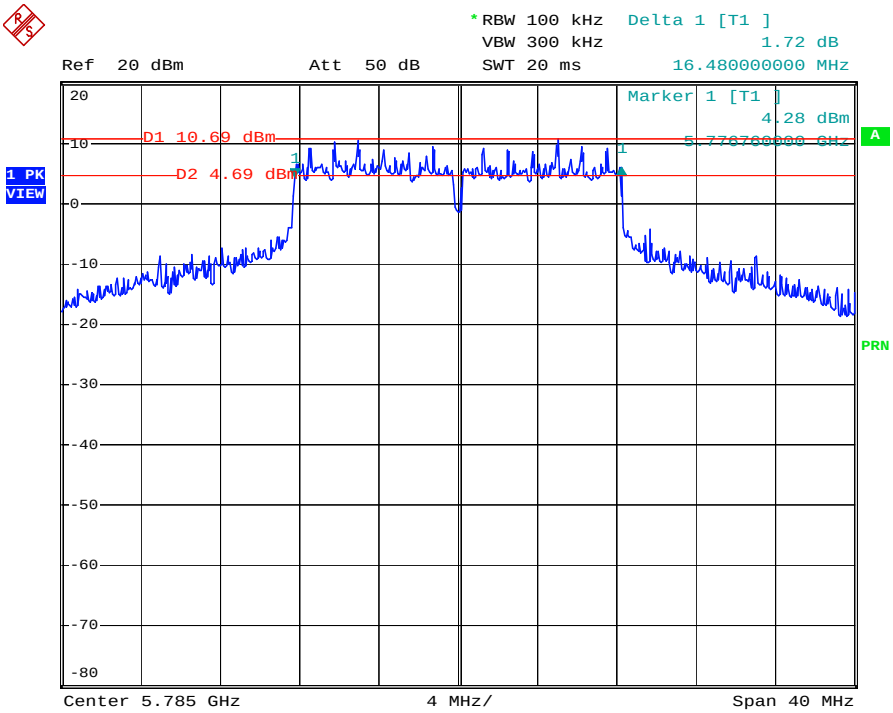


For 802.11n HT20 (MCS=15) 5.8G Chain 1

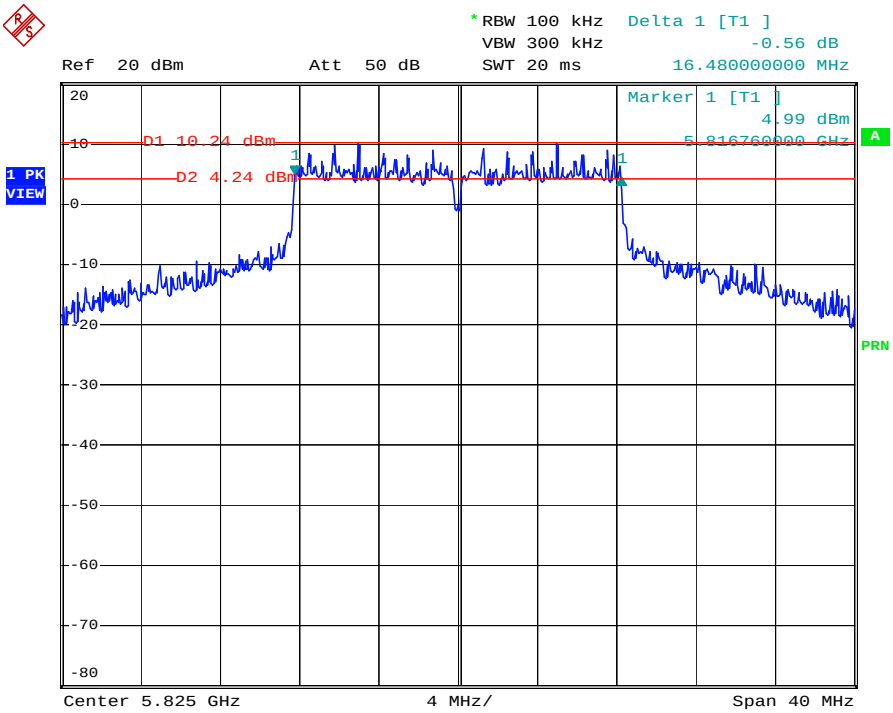
Low Channel:



Mid Channel:

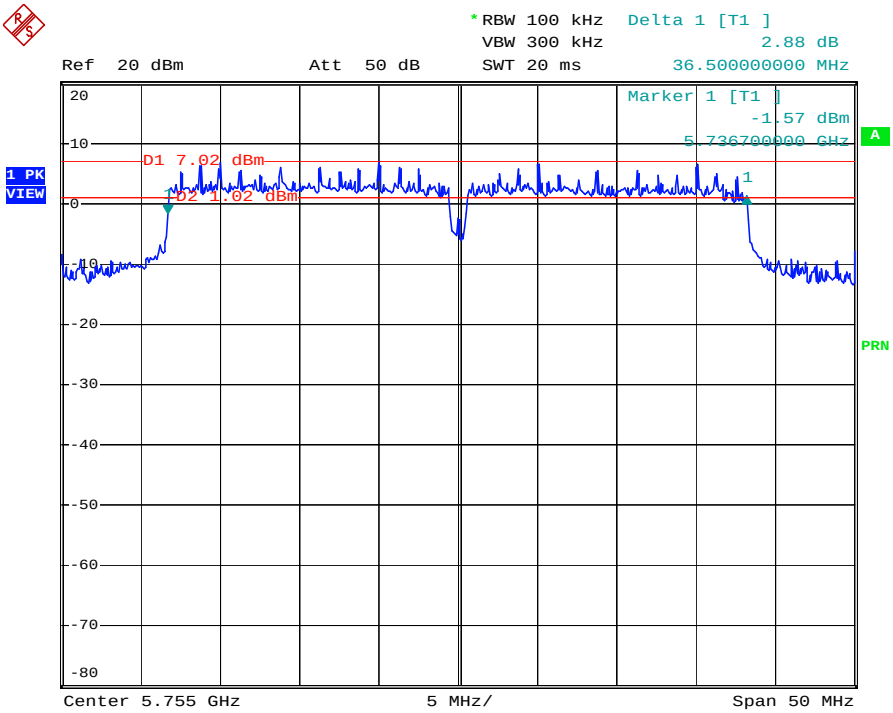


High Channel:

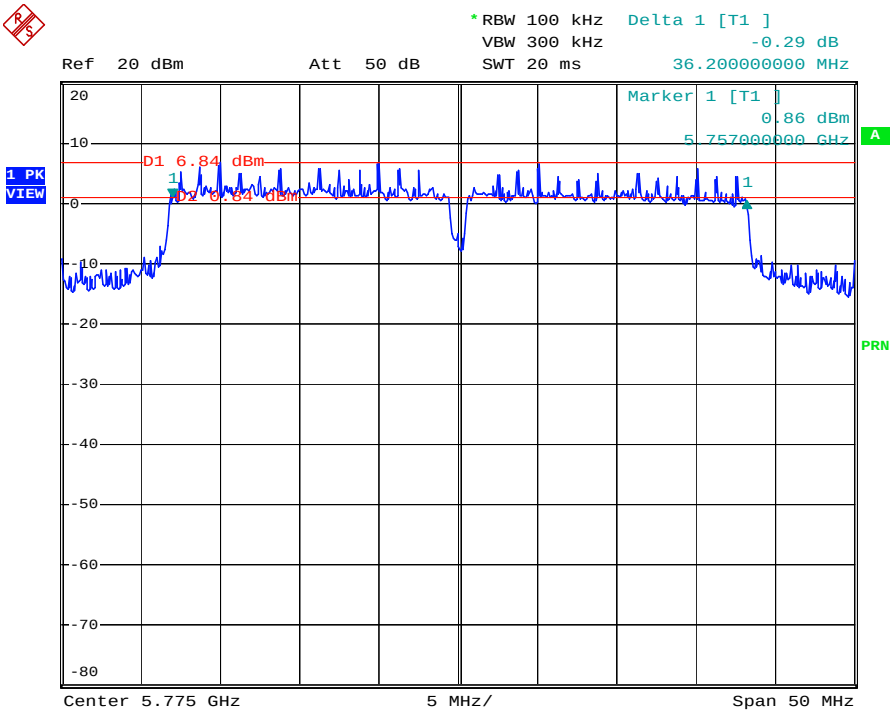


For 802.11n HT40 (MCS=0) 5.8G Chain 0

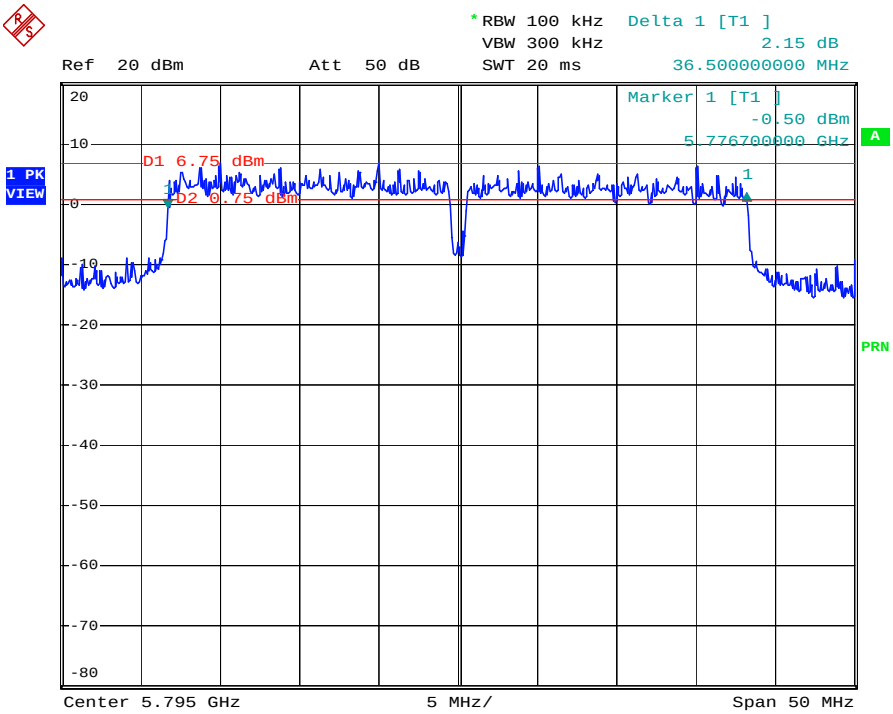
Low Channel:



Mid Channel:

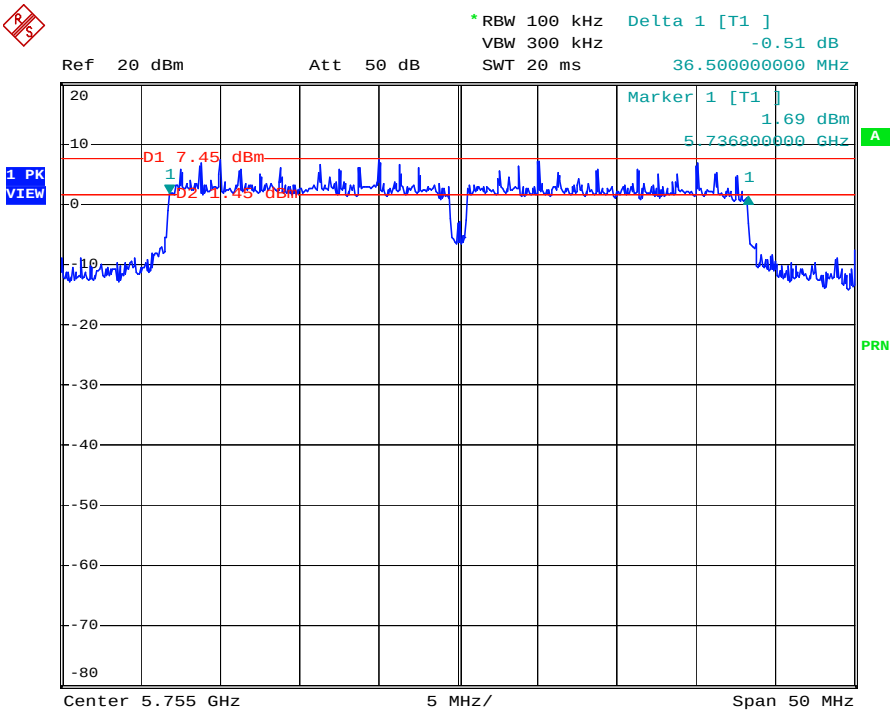


High Channel:

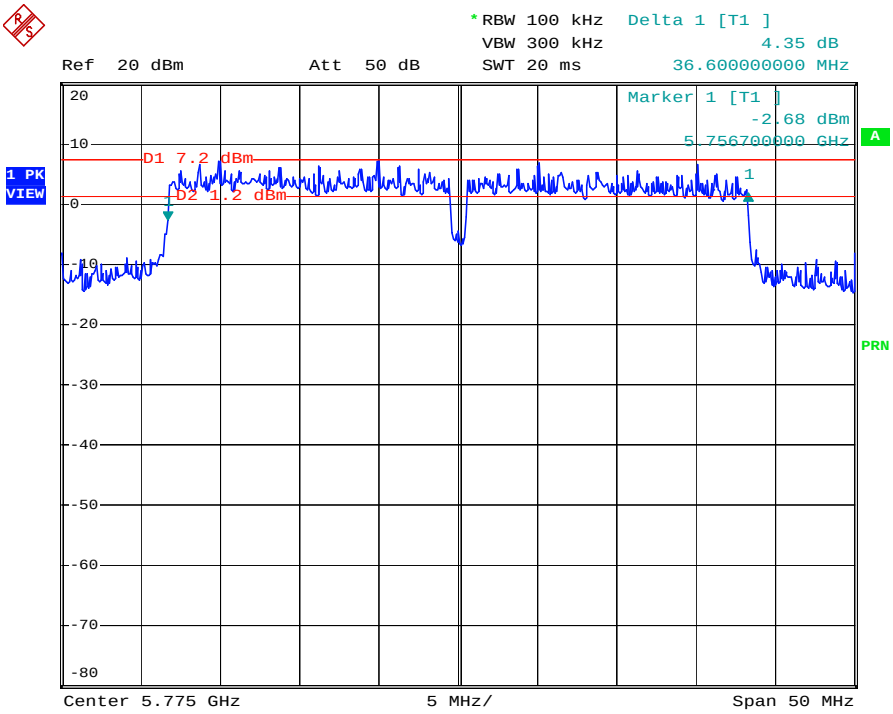


For 802.11n HT40 (MCS=15) 5.8G Chain 0

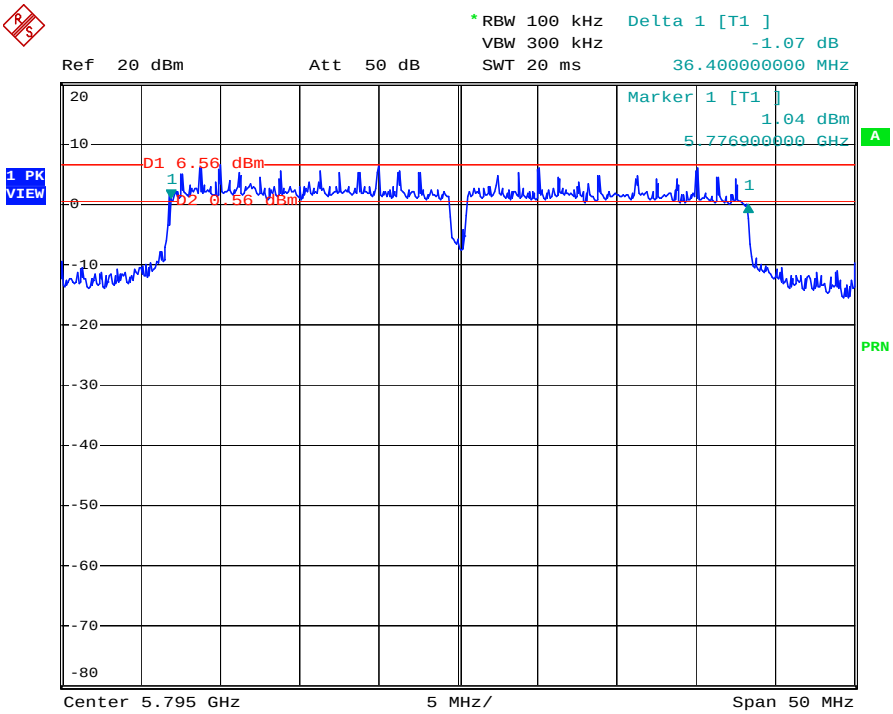
Low Channel:



Mid Channel:

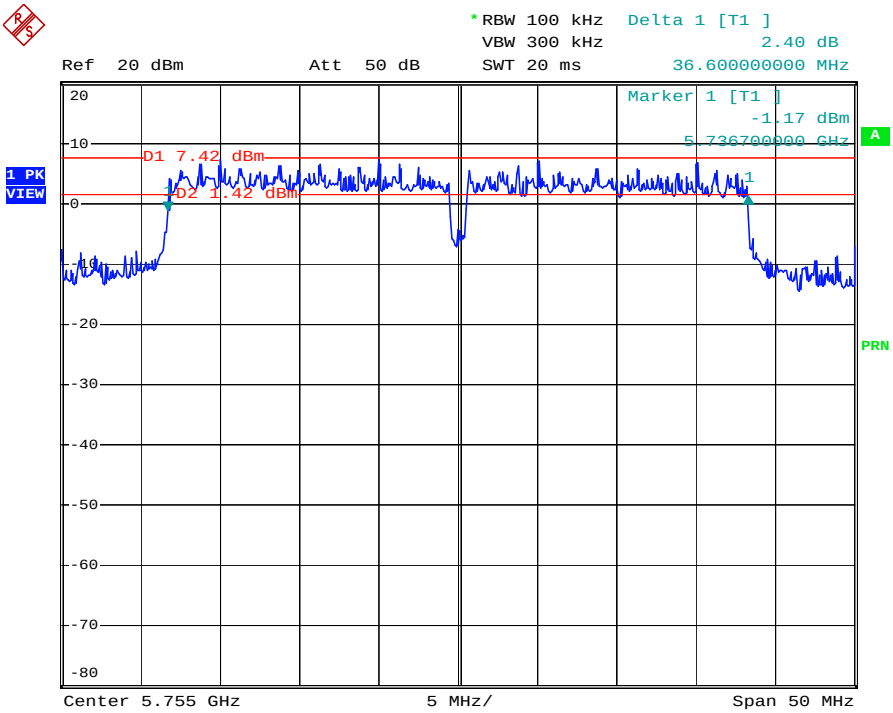


High Channel:

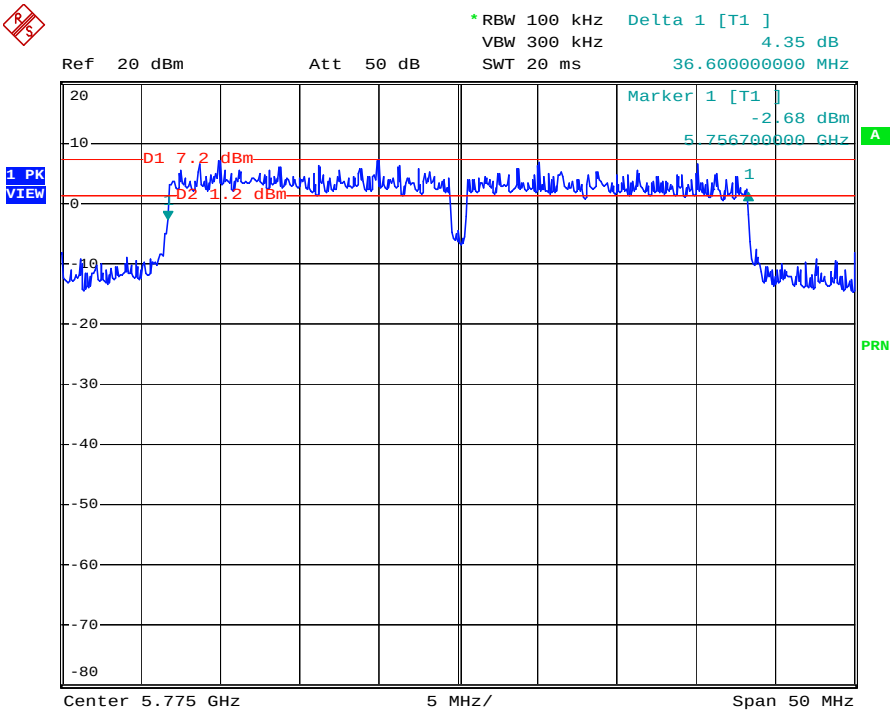


For 802.11n HT40 (MCS=0) 5.8G Chain 1

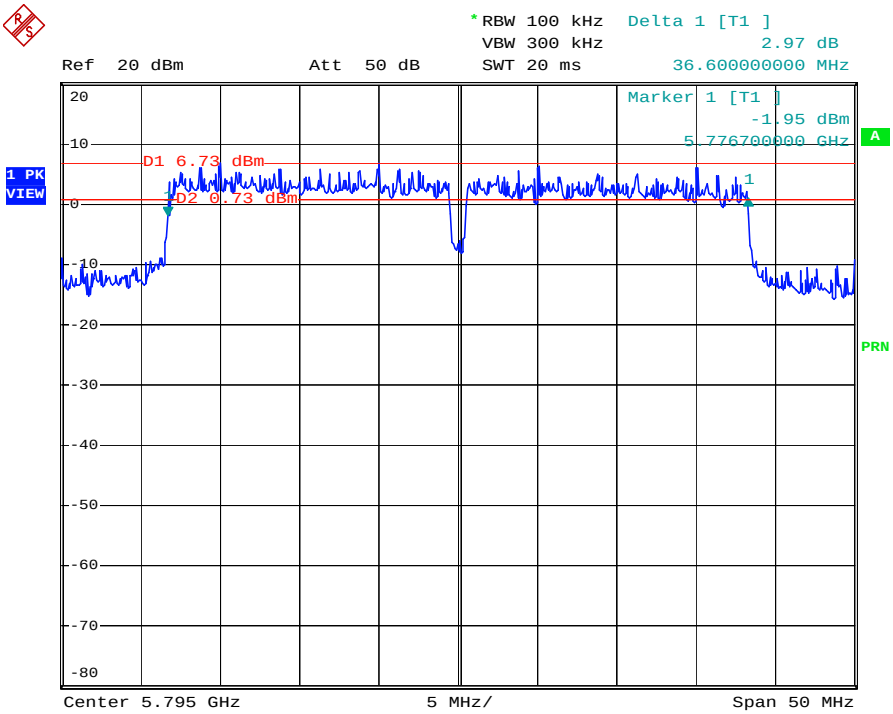
Low Channel:



Mid Channel:

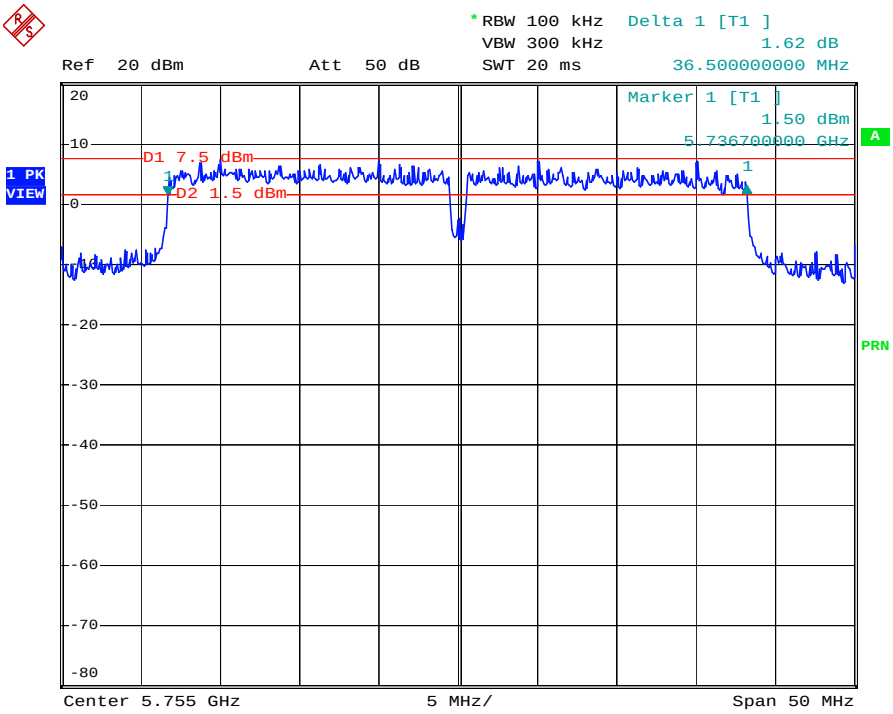


High Channel:

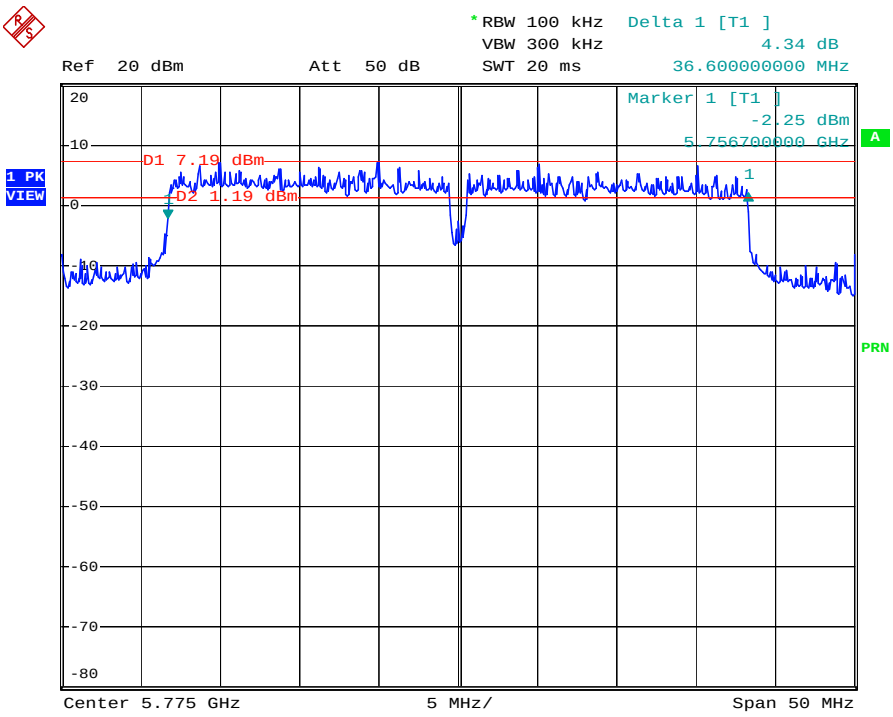


For 802.11n HT40 (MCS=15) 5.8G Chain 1

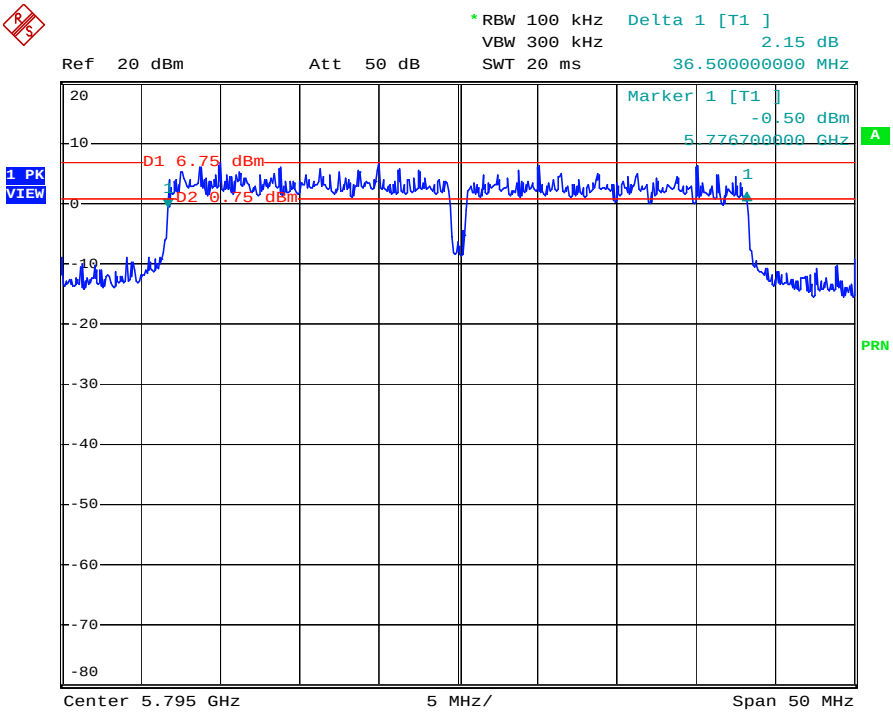
Low Channel:



Mid Channel:



High Channel:



7. POWER OUTPUT

7.1 Standard Applicable

According to 15.247(b)(3). For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

7.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2010-12-20	2011-12-19
Spectrum Analyzer	R&S	FSP	836079/035	2010-12-20	2011-12-19
Attenuator	ATTEN	ATS100-6-20	DC-6GHz	2010-12-20	2011-12-19

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

7.3 Test Procedure

According to section 15.247(b)-power output of the KDB-558074 (2005), the method #1 of the power output option2 was used, the following is the measurement procedure.

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.

2. Set RBW = 1 MHz, Set VBW ⩾ 3 MHz.

4. Use sample detector mode if bin width (i.e., span/number of points in spectrum display) < 0.5 RBW. Otherwise use peak detector mode.

5. Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to “free run”.

6. Trace average 100 traces in power averaging mode.

7. Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer’s band power measurement function with band limits set equal to the EBW band edges.

7.4 Environmental Conditions

Temperature:	21° C
Relative Humidity:	55%
ATM Pressure:	1011 mbar

7.5 Summary of Test Results/Plots

Test mode	Frequency MHz	Chain 0 dBm	Chain 1 dBm	Total Power dBm	Total Power mW	Limit mW
802.11a(6M)	5745	24.77	24.86	27.83	606.11	1000
	5785	24.99	24.75	27.88	614.04	1000
	5825	24.46	24.61	27.55	568.32	1000
802.11a(54M)	5745	22.74	22.76	25.76	376.73	1000
	5785	22.64	22.54	25.60	363.13	1000
	5825	22.70	22.15	25.44	350.27	1000
802.11n HT20 (MCS=0)	5745	24.50	24.65	27.59	573.58	1000
	5785	24.82	24.77	27.81	603.31	1000
	5825	24.79	24.85	27.83	606.79	1000
802.11n HT20 (MCS=15)	5745	20.37	20.31	23.35	216.29	1000
	5785	20.12	20.11	23.13	205.37	1000
	5825	20.61	20.00	23.33	215.08	1000
802.11n HT40 (MCS=0)	5755	21.98	22.04	25.02	317.72	1000
	5775	21.77	22.36	25.09	322.50	1000
	5795	22.53	22.54	25.55	358.53	1000
802.11n HT40 (MCS=15)	5755	18.76	18.52	21.65	146.28	1000
	5775	18.55	18.61	21.59	144.22	1000
	5795	18.25	18.44	21.36	136.66	1000

8. FIELD STRENGTH OF SPURIOUS EMISSIONS

8.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ±5.10 dB.

8.2 Standard Applicable

According to §15.247(c), 15.205 15.209(b) &15.35 (b), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Section 15.209:
30 - 88 MHz 40 dBuV/m @3M
88 -216 MHz 43.5 dBuV/m @3M
216 -960 MHz 46 dBuV/m @3M
Above 960 MHz 54dBuV/m @3M

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

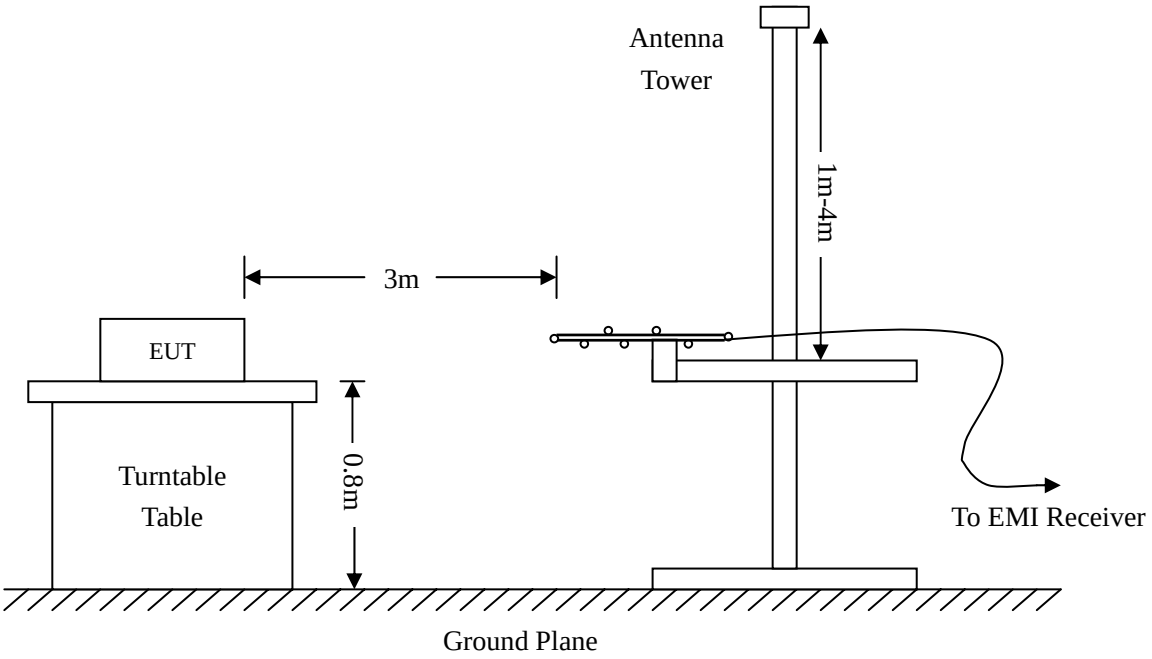
Emissions that fall in the restricted bands (15.205) must be less than 54dBuV/m otherwise the spurious and harmonics must be attenuated by at least 20dB.

8.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-12-20	2011-12-19
EMI Test Receiver	R&S	ESVB	825471/005	2010-12-20	2011-12-19
Positioning Controller	C&C	CC-C-1F	N/A	2010-12-20	2011-12-19
RF Switch	EM	EMSW18	SW060023	2010-12-20	2011-12-19
Pre-amplifier	Agilent	8447F	3113A06717	2010-12-20	2011-12-19
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-12-20	2011-12-19
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2011-01-09	2012-01-08
Horn Antenna	ETS	3117	00086197	2011-01-09	2012-01-08

8.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.
The spacing between the peripherals was 10 cm.



8.5 Test Receiver Setup

During the radiated emission test for above 1GHz, the test receiver was set with the following configurations:

For peak detector:
RBW = 1000kHz, VBW = 3000kHz, Sweep Time = Auto

For average detector:
RBW = 1000kHz, VBW = 10Hz, Sweep Time = Auto

8.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15 Limit

8.7 Environmental Conditions

Temperature:	22° C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

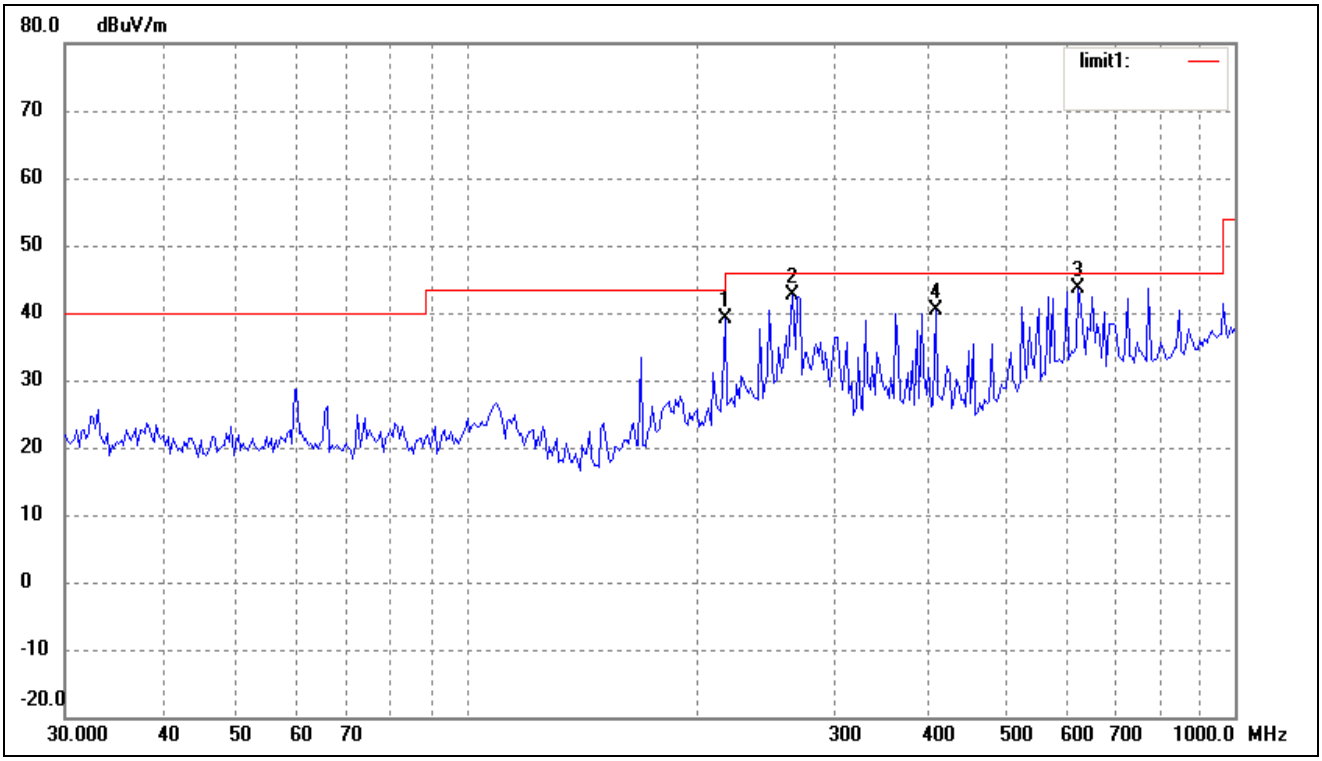
8.8 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst margin of:

-3.9 dBµV at **11570.0 MHz** in the **Vertical** polarization, **Average** detector, **Transmitting 802.11a Middle Channel** test mode, **30 MHz to 25 GHz, 3Meters**

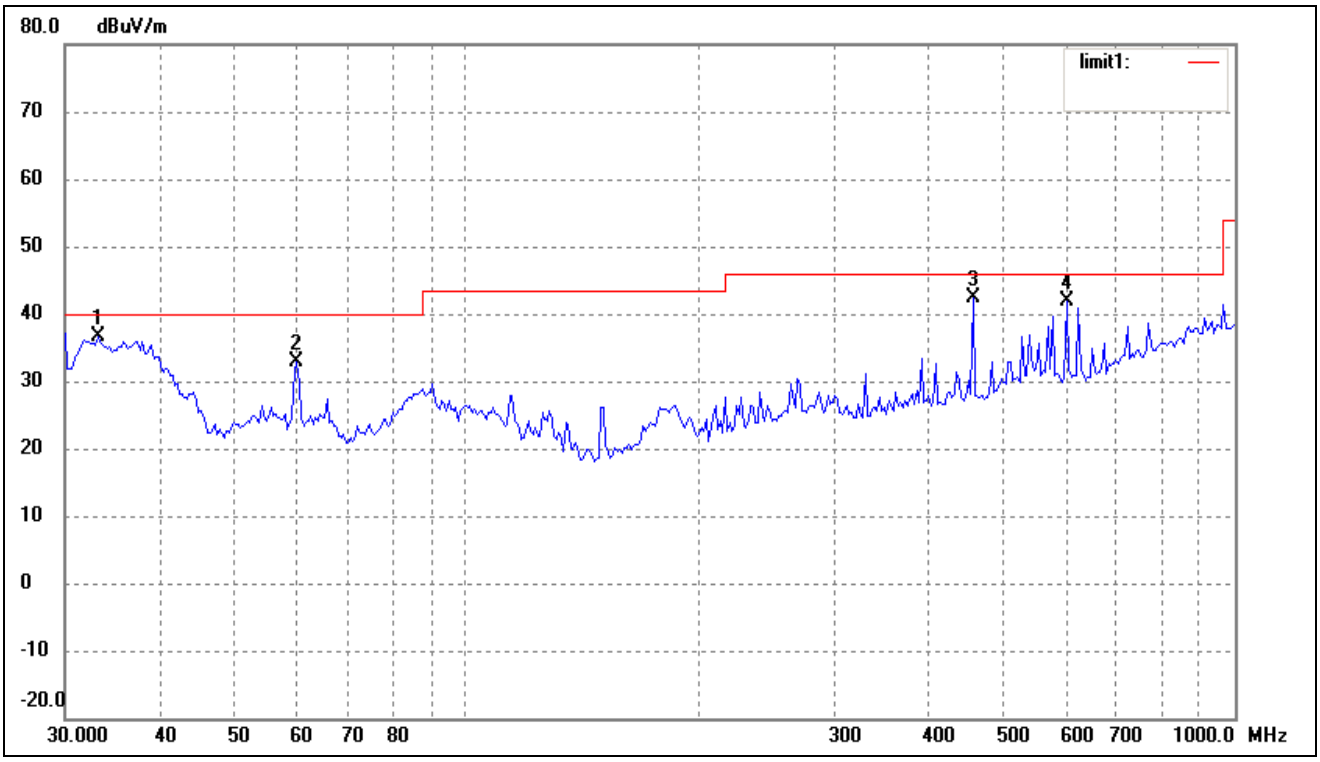
Note: *this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

Spurious Emission From 30 MHz to 1 GHz
Test mode: Transmitting (802.11a5.8GHz) Low Channel
Comment:
Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	216.7828	31.92	7.17	39.09	46.00	-6.91	360	100	peak
2	265.6757	33.63	9.11	42.74	46.00	-3.26	203	152	QP
3	625.0780	26.82	16.88	43.70	46.00	-2.30	225	116	QP
4	407.5145	29.02	11.39	40.41	46.00	-5.59	130	205	QP

Vertical



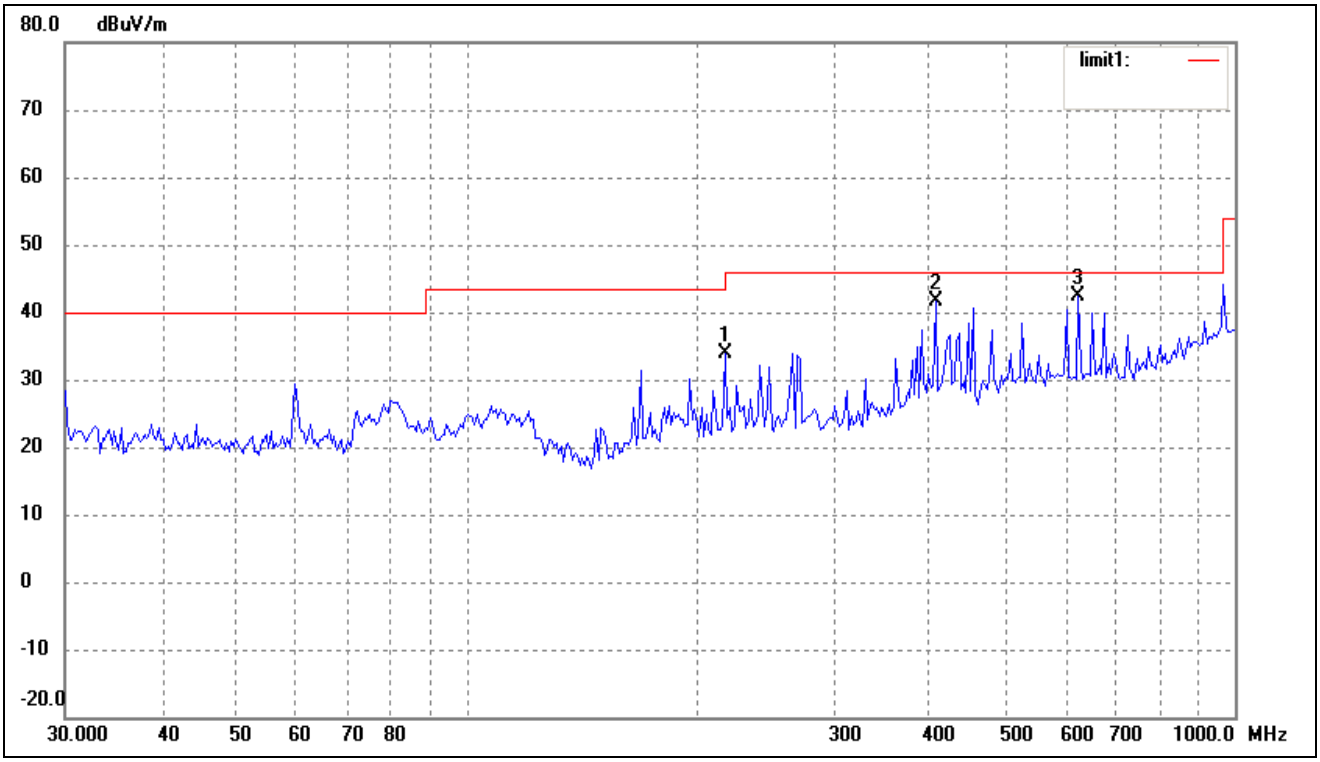
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	33.0950	29.75	6.77	36.52	40.00	-3.48	209	209	QP
2	60.0691	25.46	7.50	32.96	40.00	-7.04	360	100	peak
3	455.9058	30.45	11.84	42.29	46.00	-3.71	224	115	QP
4	603.5392	25.23	16.70	41.93	46.00	-4.07	125	120	QP

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11a5.8GHz) Middle Channel

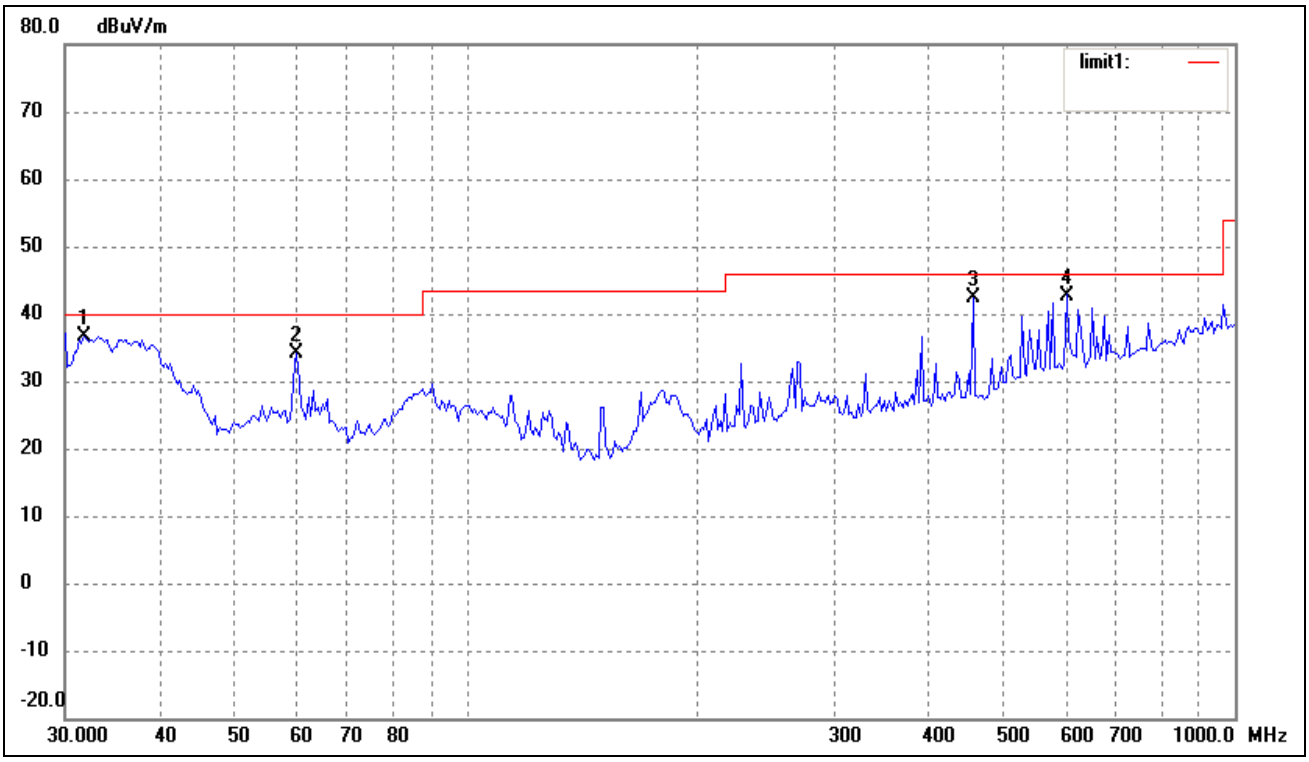
Comment:

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	216.7828	26.82	7.17	33.99	46.00	-12.01	360	200	peak
2	407.5145	30.32	11.39	41.71	46.00	-4.29	203	153	QP
3	625.0780	25.52	16.88	42.40	46.00	-3.60	226	214	QP

Vertical



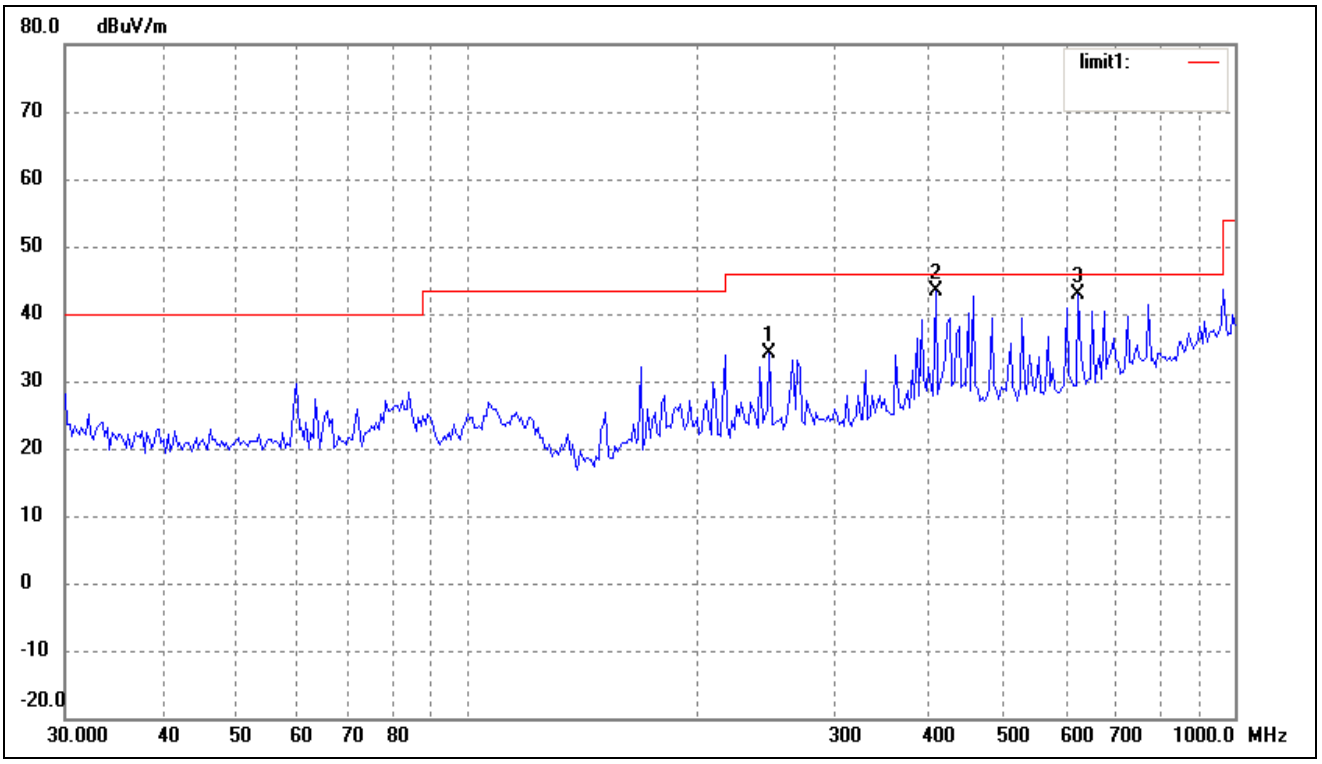
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	31.7313	29.97	6.77	36.74	40.00	-3.26	228	119	QP
2	60.0691	26.54	7.50	34.04	40.00	-5.96	126	132	QP
3	455.9058	30.45	11.84	42.29	46.00	-3.71	115	215	QP
4	603.5392	26.05	16.70	42.75	46.00	-3.25	216	200	QP

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11a5.8GHz) High Channel

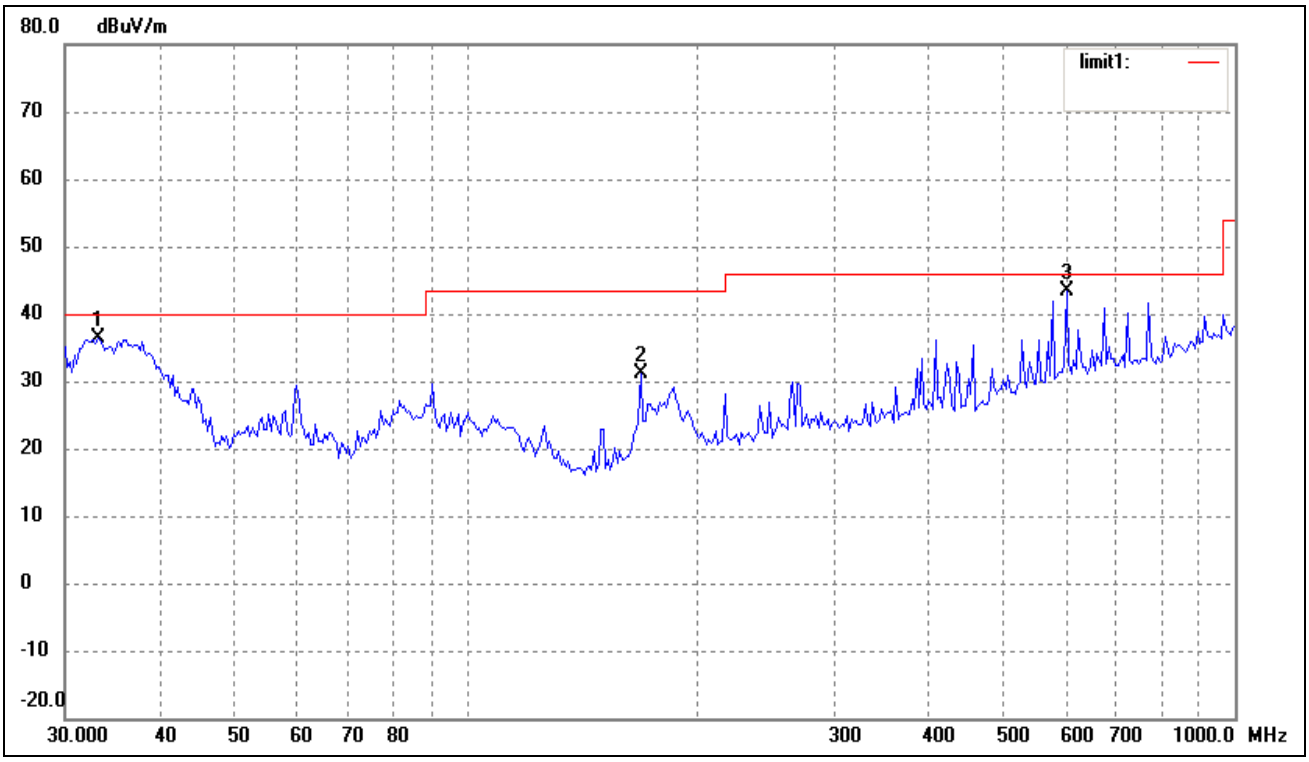
Comment:

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	247.6819	25.40	8.63	34.03	46.00	-11.97	360	200	peak
2	407.5145	32.08	11.39	43.47	46.00	-2.53	206	115	QP
3	625.0780	26.00	16.88	42.88	46.00	-3.12	223	106	QP

Vertical



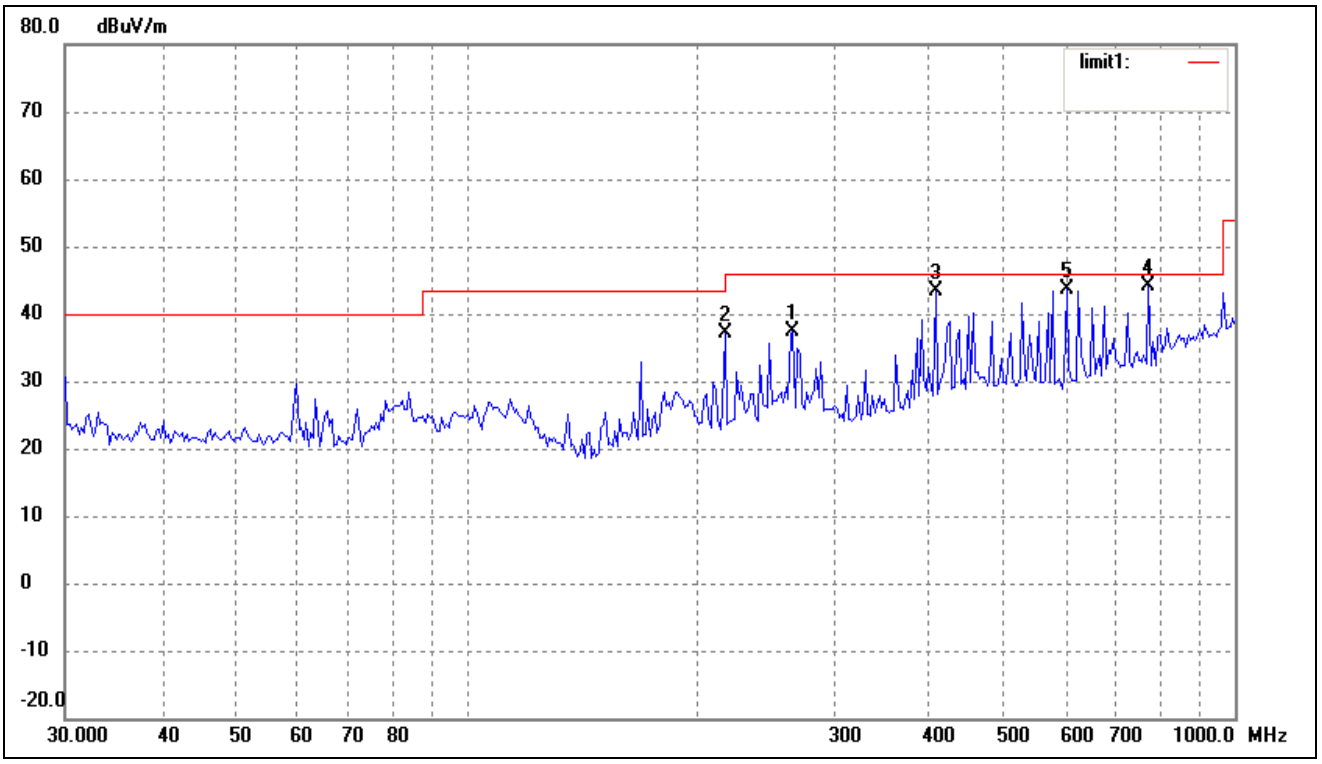
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	33.0950	29.59	6.77	36.36	40.00	-3.64	236	213	QP
2	168.4138	26.35	4.84	31.19	43.50	-12.31	360	200	peak
3	603.5392	26.64	16.70	43.34	46.00	-2.66	221	151	QP

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11n HT20 5.8GHz) Low Channel

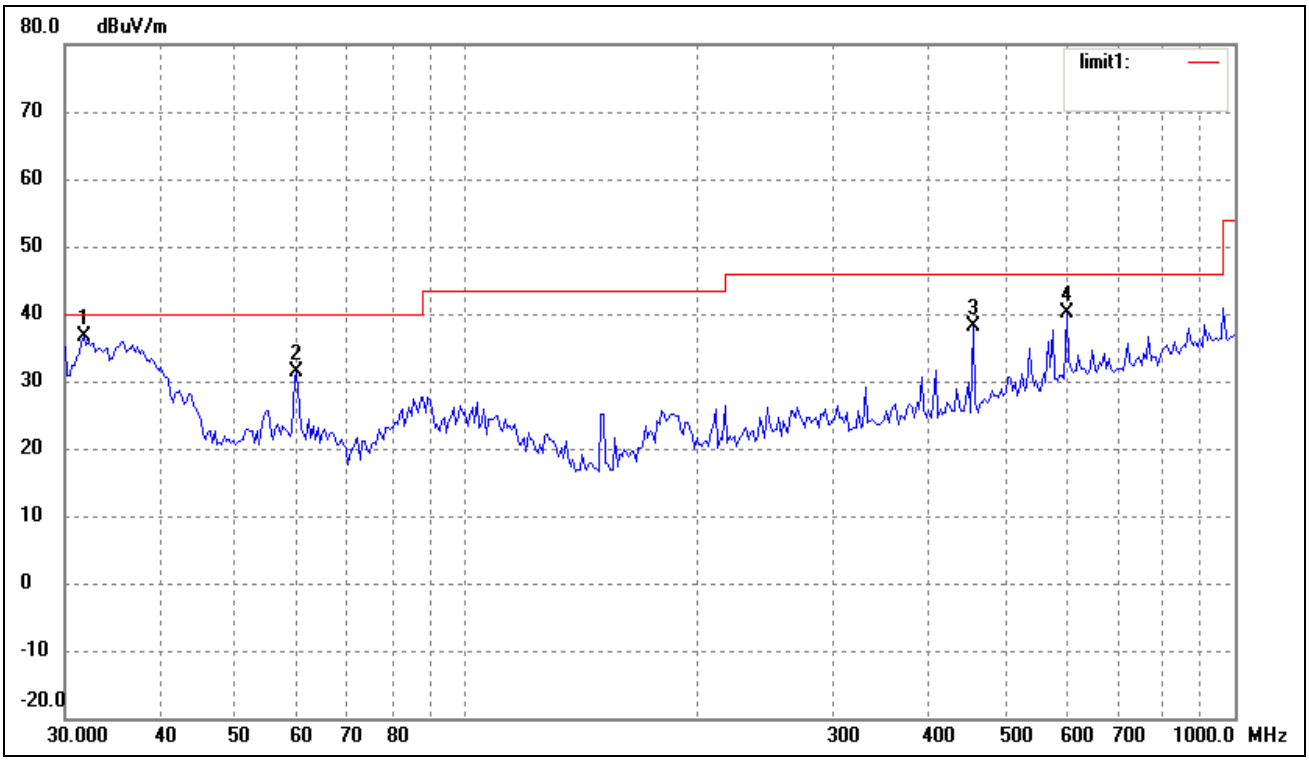
Comment:

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	265.6757	28.26	9.11	37.37	46.00	-8.63	360	200	peak
2	216.7828	29.85	7.17	37.02	46.00	-8.98	360	100	peak
3	407.5145	32.08	11.39	43.47	46.00	-2.53	203	120	QP
4	771.4486	25.48	18.57	44.05	46.00	-1.95	225	114	QP
5	603.5392	26.82	16.70	43.52	46.00	-2.48	136	105	QP

Vertical



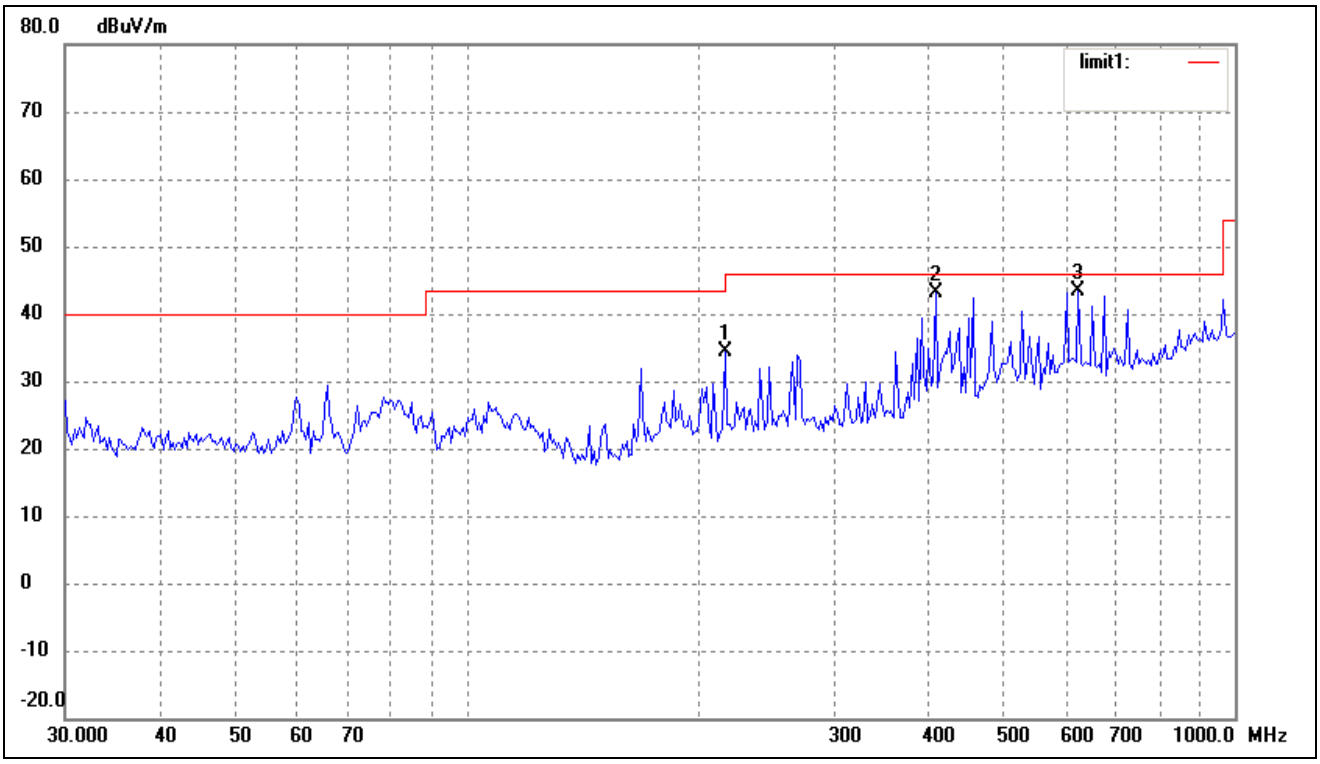
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	31.7313	29.78	6.77	36.55	40.00	-3.45	206	105	QP
2	60.0691	23.82	7.50	31.32	40.00	-8.68	360	200	peak
3	455.9058	26.35	11.84	38.19	46.00	-7.81	0	100	peak
4	603.5392	23.48	16.70	40.18	46.00	-5.82	224	122	QP

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11n HT20 5.8GHz) Middle Channel

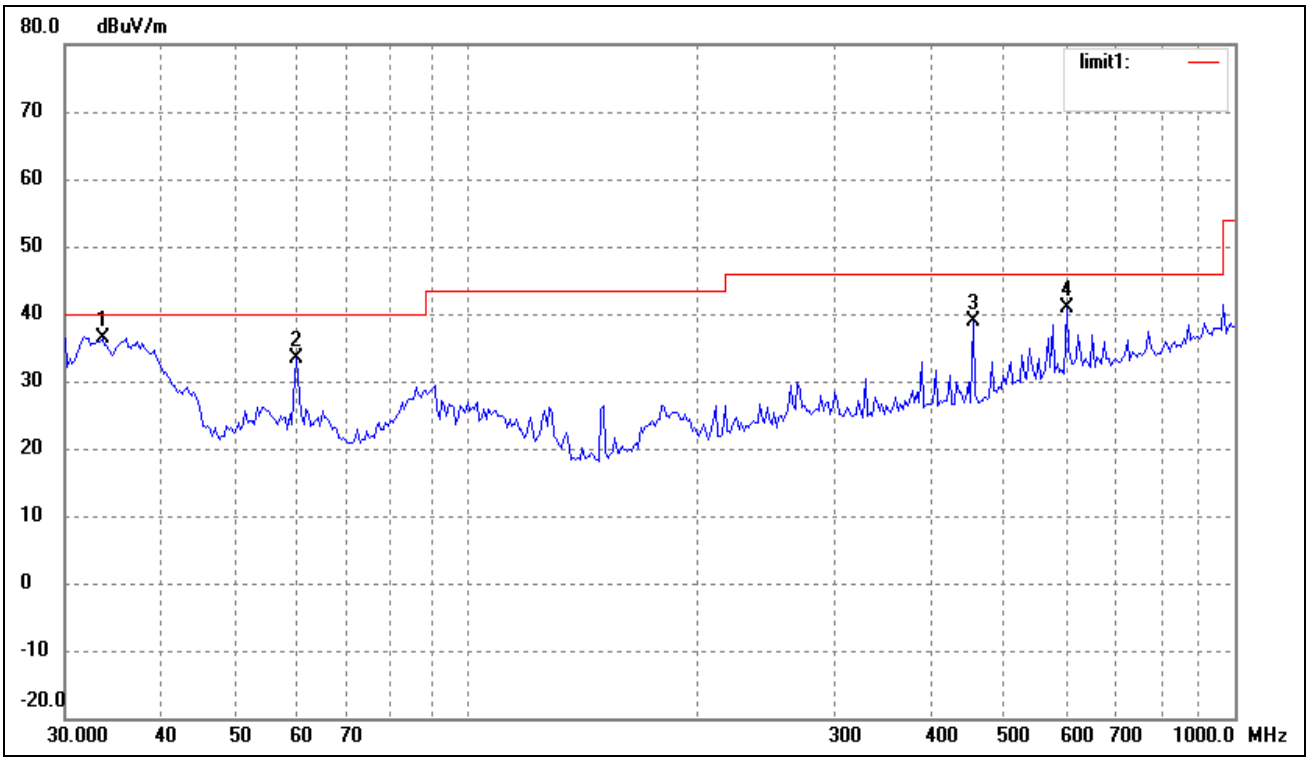
Comment:

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	216.7828	27.09	7.17	34.26	46.00	-11.74	0	100	peak
2	407.5145	31.70	11.39	43.09	46.00	-2.91	206	164	QP
3	625.0780	26.43	16.88	43.31	46.00	-2.69	231	210	QP

Vertical



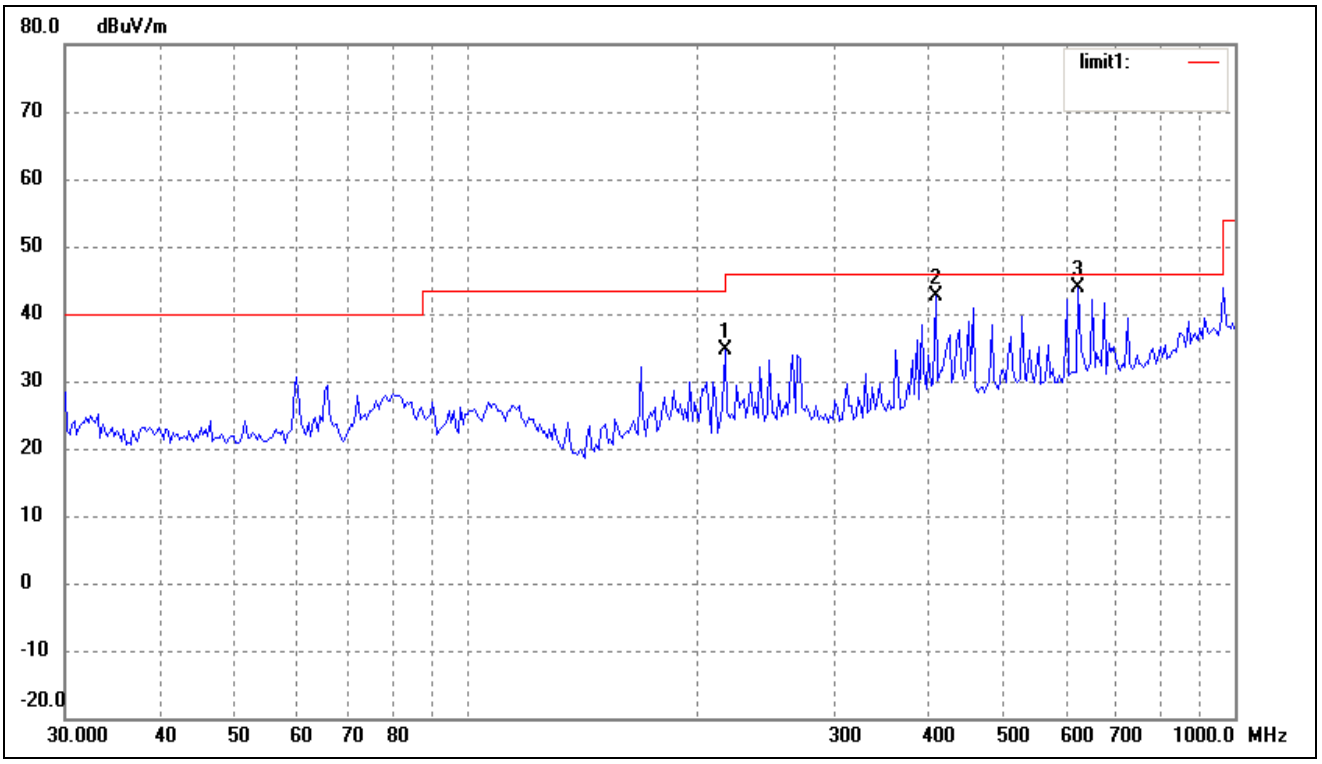
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	33.5624	29.50	6.77	36.27	40.00	-3.73	209	129	QP
2	60.0691	25.95	7.50	33.45	40.00	-6.55	360	200	peak
3	455.9058	27.00	11.84	38.84	46.00	-7.16	0	100	peak
4	603.5392	24.10	16.70	40.80	46.00	-5.20	113	205	QP

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11n HT20 5.8GHz) High Channel

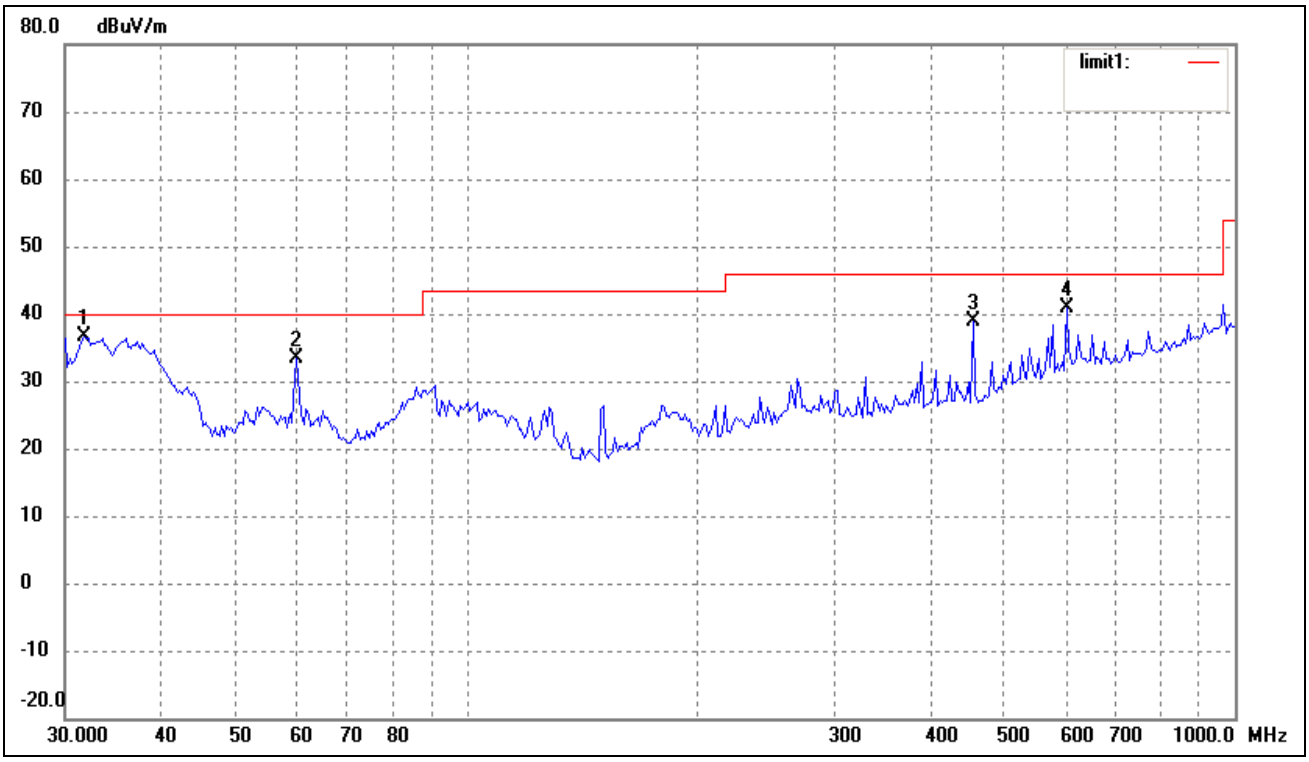
Comment:

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	216.7828	27.48	7.17	34.65	46.00	-11.35	0	100	peak
2	407.5145	31.17	11.39	42.56	46.00	-3.44	206	106	QP
3	625.0780	26.93	16.88	43.81	46.00	-2.19	223	125	QP

Vertical



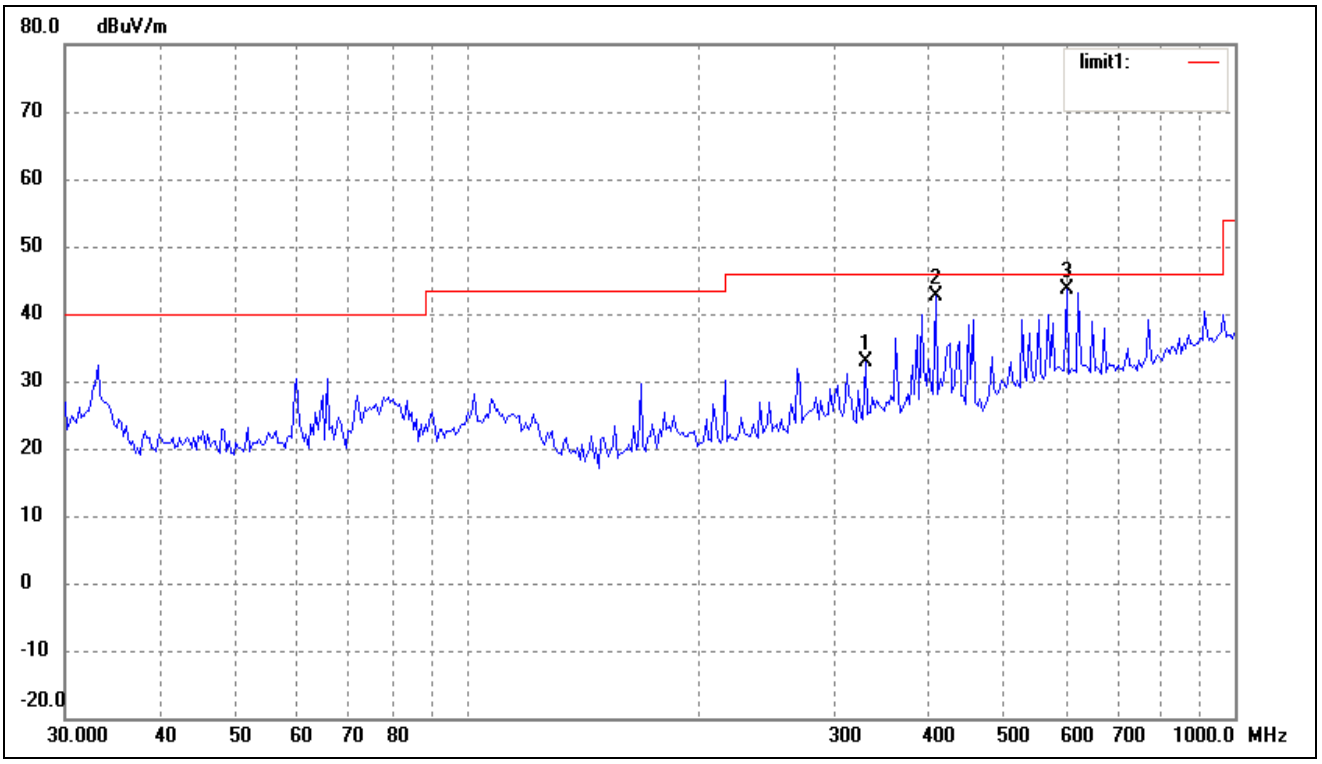
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	31.7313	29.78	6.77	36.55	40.00	-3.45	209	205	QP
2	60.0691	25.95	7.50	33.45	40.00	-6.55	360	100	peak
3	455.9058	27.00	11.84	38.84	46.00	-7.16	0	100	peak
4	603.5392	24.10	16.70	40.80	46.00	-5.20	116	200	QP

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11n HT40 5.8GHz) Low Channel

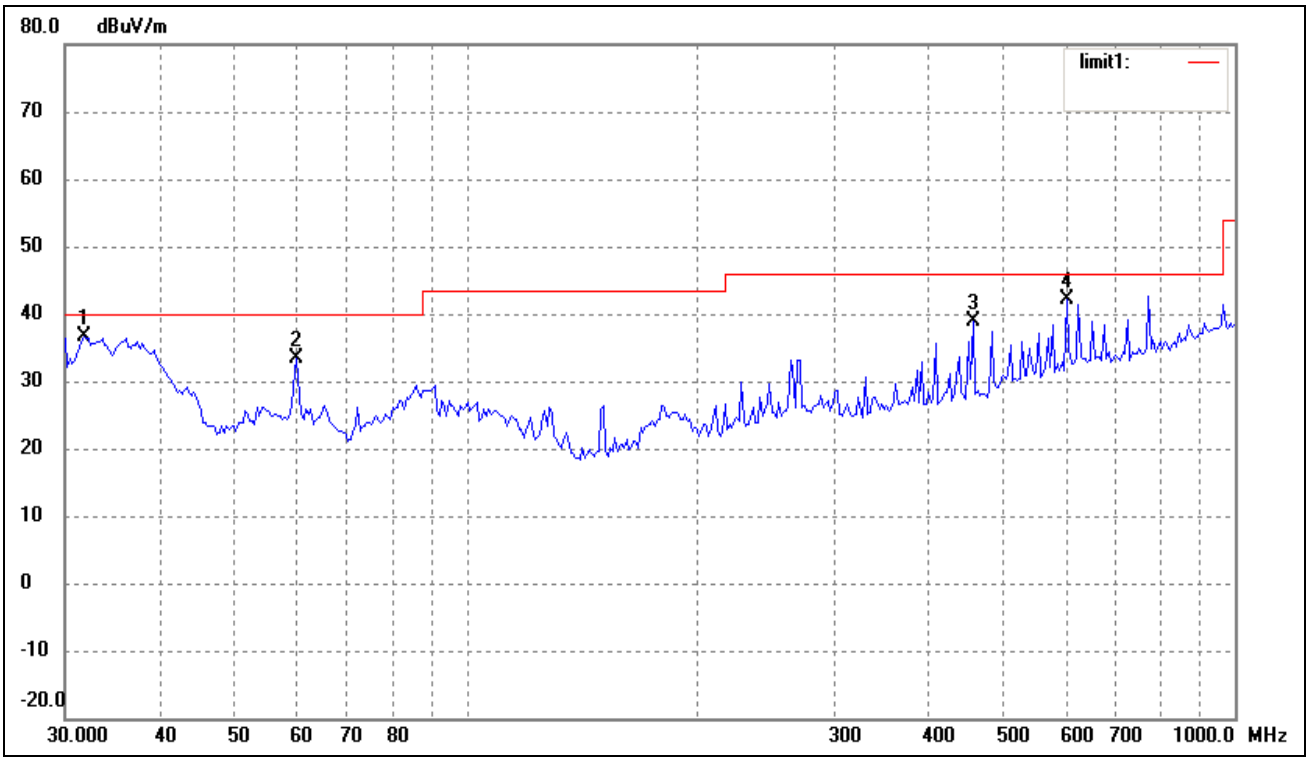
Comment:

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	330.1949	22.77	10.22	32.99	46.00	-13.01	360	100	peak
2	407.5145	31.22	11.39	42.61	46.00	-3.39	209	112	QP
3	603.5392	27.04	16.70	43.74	46.00	-2.26	223	108	QP

Vertical



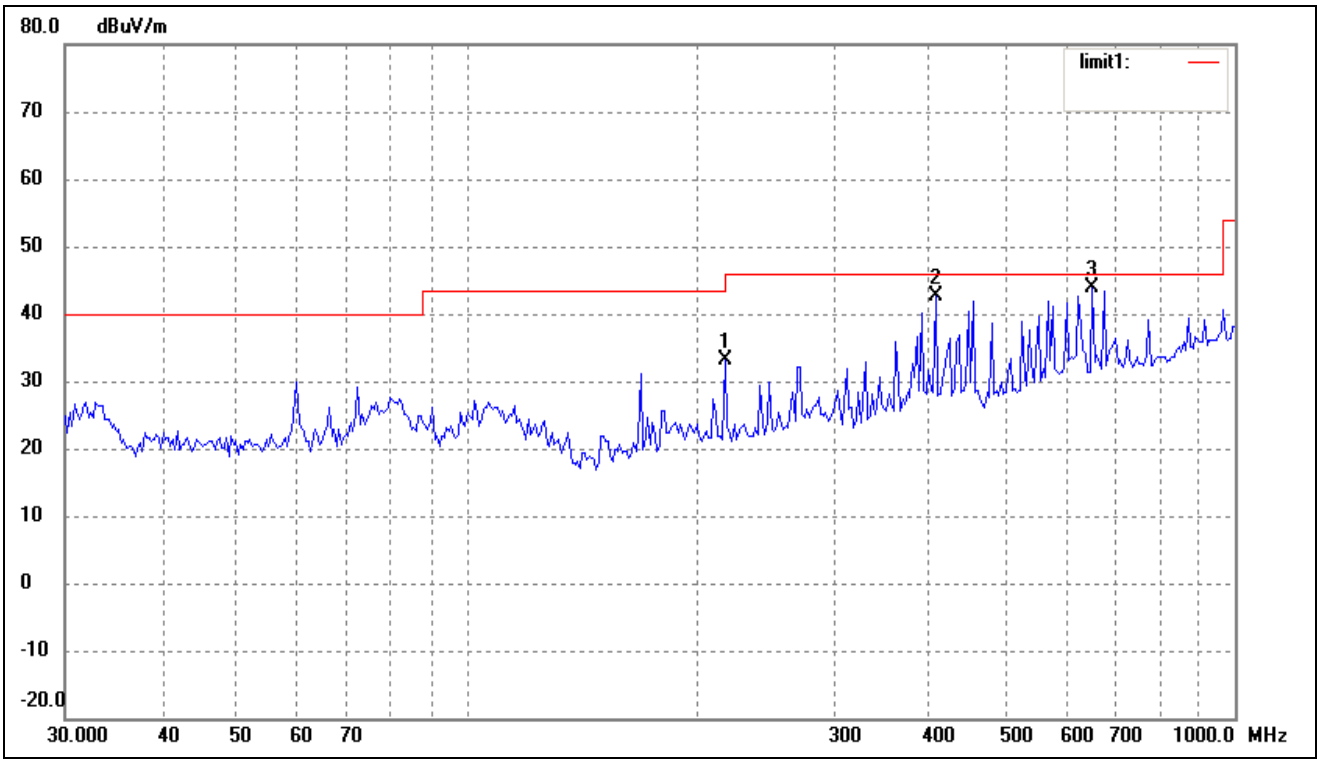
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	31.7313	29.78	6.77	36.55	40.00	-3.45	226	125	QP
2	60.0691	25.95	7.50	33.45	40.00	-6.55	360	100	peak
3	455.9058	27.00	11.84	38.84	46.00	-7.16	0	200	peak
4	603.5392	25.43	16.70	42.13	46.00	-3.87	106	203	QP

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11n HT40 5.8GHz) Middle Channel

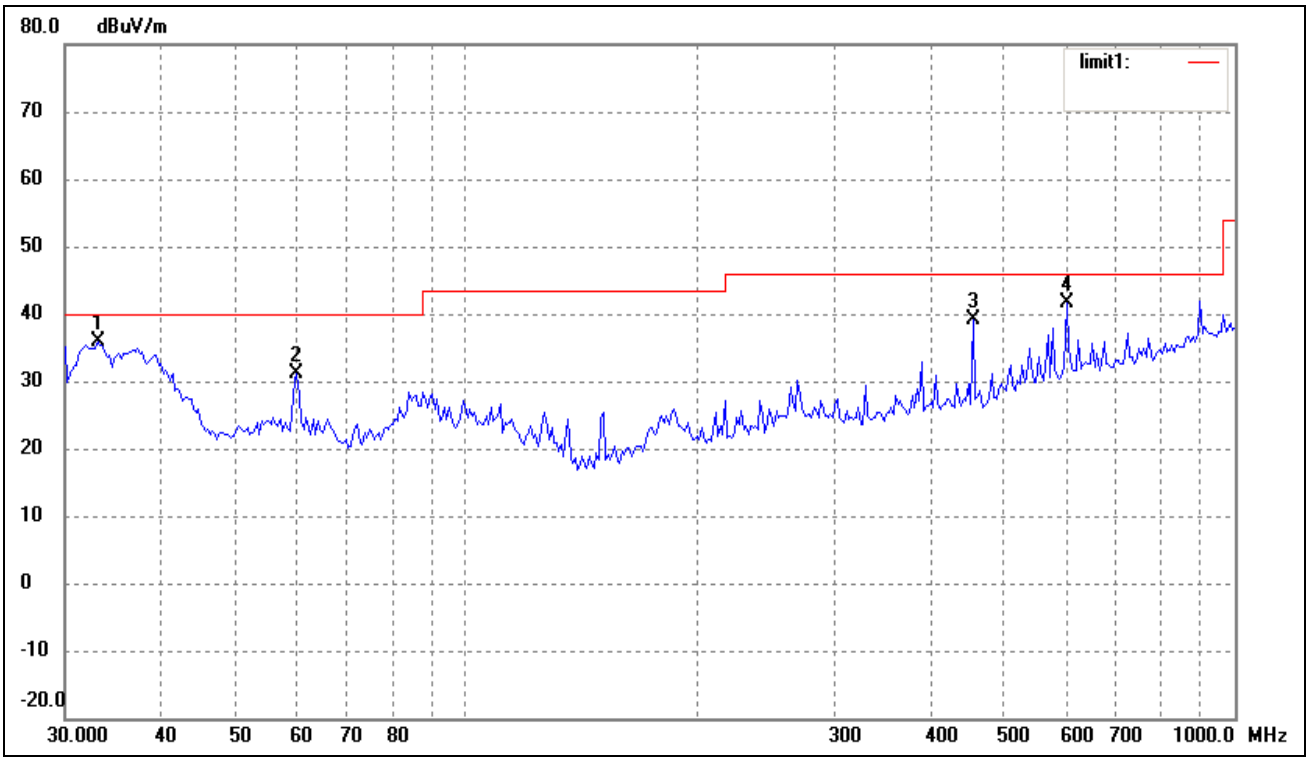
Comment:

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	216.7828	25.92	7.17	33.09	46.00	-12.91	360	200	peak
2	407.5145	31.15	11.39	42.54	46.00	-3.46	209	114	QP
3	651.9417	26.81	17.11	43.92	46.00	-2.08	223	120	QP

Vertical



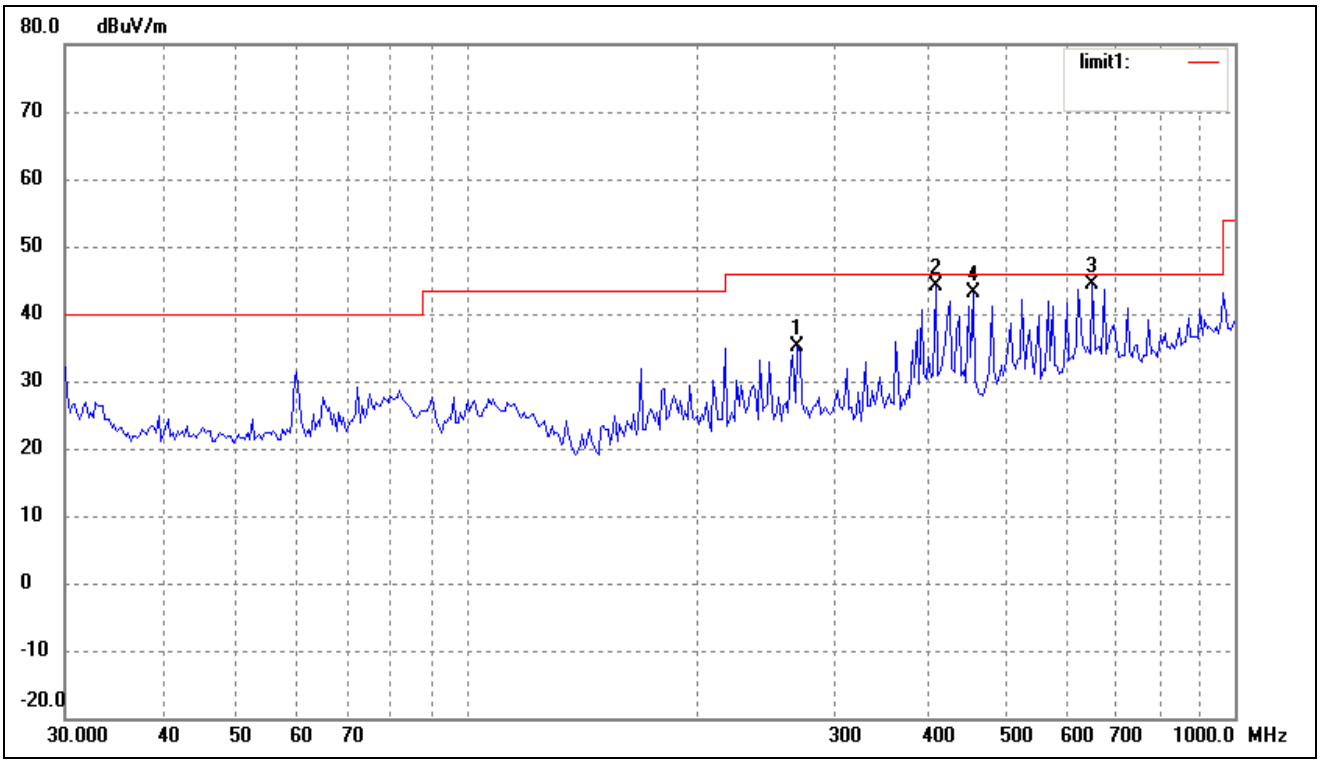
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	33.0950	29.13	6.77	35.90	40.00	-4.10	236	125	QP
2	60.0691	23.59	7.50	31.09	40.00	-8.91	360	100	peak
3	455.9058	27.38	11.84	39.22	46.00	-6.78	0	200	peak
4	603.5392	24.82	16.70	41.52	46.00	-4.48	116	205	QP

Spurious Emission From 30 MHz to 1 GHz

Test mode: Transmitting (802.11n HT40 5.8GHz) High Channel

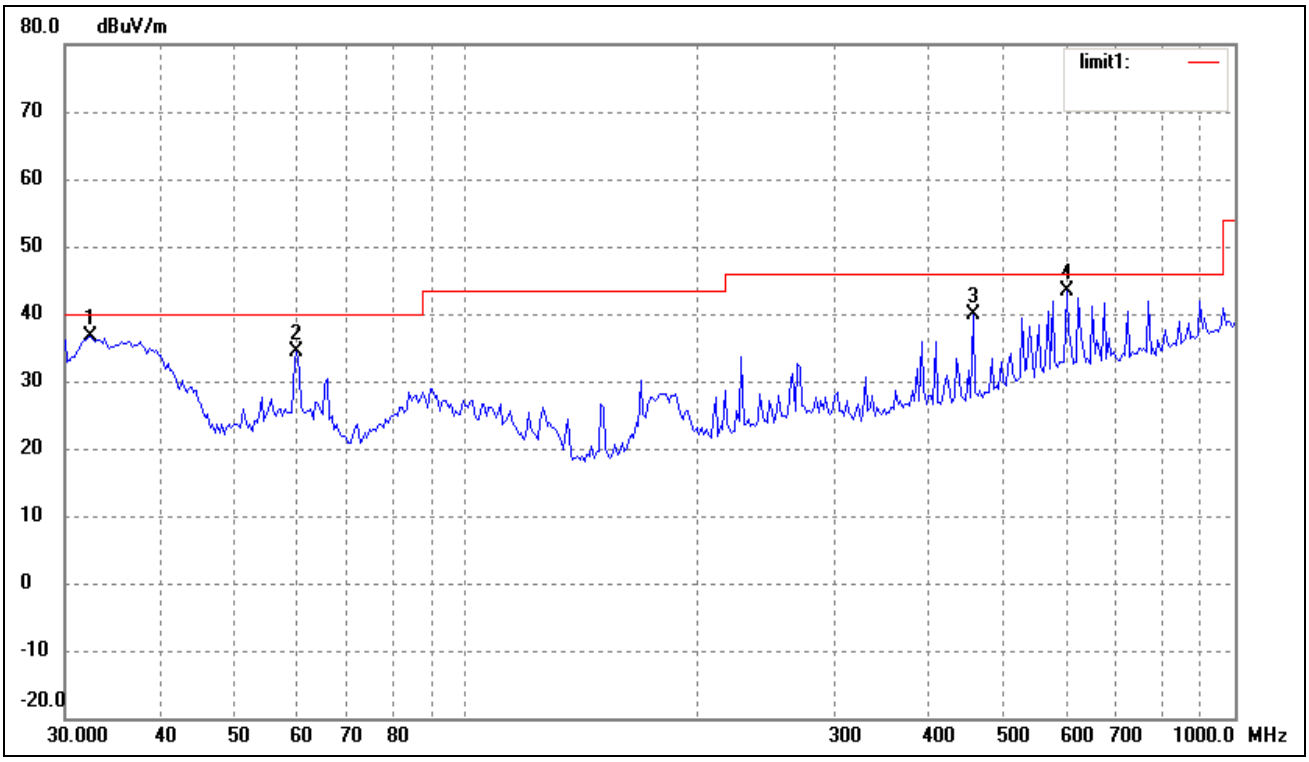
Comment:

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	269.4284	26.02	9.22	35.24	46.00	-10.76	360	200	peak
2	407.5145	32.66	11.39	44.05	46.00	-1.95	203	163	QP
3	651.9417	27.31	17.11	44.42	46.00	-1.58	126	118	QP
4	455.9058	31.28	11.84	43.12	46.00	-2.88	119	106	QP

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	32.4059	29.82	6.77	36.59	40.00	-3.41	209	153	QP
2	60.0691	26.94	7.50	34.44	40.00	-5.56	223	126	QP
3	455.9058	28.06	11.84	39.90	46.00	-6.10	360	200	peak
4	603.5392	26.78	16.70	43.48	46.00	-2.52	128	108	QP

Spurious Emission Above 1GHz

Test Mode: Transmitting (802.11a 5.8G)

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (5745MHz)										
11490	PK	56.60	360	V	39.1	10.2	40.5	65.4	74	-8.6
11490	PK	53.80	360	H	39.1	10.2	40.5	62.6	74	-11.4
11490	AV	40.70	360	V	39.1	10.2	40.5	49.5	54	-4.5
11490	AV	39.50	360	H	39.1	10.2	40.5	48.3	54	-5.7
Middle Channel (5785MHz)										
11570	PK	57.70	360	V	39.1	10.2	40.5	66.5	74	-7.5
11570	PK	55.50	360	H	39.1	10.2	40.5	64.3	74	-9.7
11570	AV	41.30	360	V	39.1	10.2	40.5	50.1	54	-3.9
11570	AV	40.60	360	H	39.1	10.2	40.5	49.4	54	-4.6
High Channel (5825MHz)										
11650	PK	56.20	360	V	39.1	10.2	40.5	65.0	74	-9.0
11650	PK	54.40	360	H	39.1	10.2	40.5	63.2	74	-10.8
11650	AV	41.30	360	V	39.1	10.2	40.5	50.1	54	-3.9
11650	AV	38.90	360	H	39.1	10.2	40.5	47.7	54	-6.3

Test Mode: Transmitting (802.11n HT20 5.8G)

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (5745MHz)										
11490	PK	52.50	360	V	39.1	10.2	40.5	61.3	74	-12.7
11490	PK	51.60	360	H	39.1	10.2	40.5	60.4	74	-13.6
11490	AV	41.00	360	V	39.1	10.2	40.5	49.8	54	-4.2
11490	AV	38.40	360	H	39.1	10.2	40.5	47.2	54	-6.8
Middle Channel (5785MHz)										
11570	PK	53.70	360	V	39.1	10.2	40.5	62.5	74	-11.5
11570	PK	52.30	360	H	39.1	10.2	40.5	61.1	74	-12.9
11570	AV	41.20	360	V	39.1	10.2	40.5	50.0	54	-4.0
11570	AV	37.70	360	H	39.1	10.2	40.5	46.5	54	-7.5
High Channel (5825MHz)										
11650	PK	54.50	360	V	39.1	10.2	40.5	63.3	74	-10.7
11650	PK	51.30	360	H	39.1	10.2	40.5	60.1	74	-13.9
11650	AV	39.70	360	V	39.1	10.2	40.5	48.5	54	-5.5
11650	AV	39.60	360	H	39.1	10.2	40.5	48.4	54	-5.6

Test Mode: Transmitting (802.11n HT40 5.8G)

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (5755MHz)										
11510	PK	50.80	360	V	39.1	10.2	40.5	59.6	74	-14.4
11510	PK	48.60	360	H	39.1	10.2	40.5	57.4	74	-16.6
11510	AV	38.50	360	V	39.1	10.2	40.5	47.3	54	-6.7
11510	AV	37.70	360	H	39.1	10.2	40.5	46.5	54	-7.5
Middle Channel (5775MHz)										
11550	PK	49.90	360	V	39.1	10.2	40.5	58.7	74	-15.3
11550	PK	48.00	360	V	39.1	10.2	40.5	56.8	74	-17.2
11550	AV	39.20	360	H	39.1	10.2	40.5	48.0	54	-6.0
11550	AV	38.20	360	H	39.1	10.2	40.5	47.0	54	-7.0
High Channel (5795MHz)										
11590	PK	51.20	360	V	39.1	10.2	40.5	60.0	74	-14.0
11590	PK	48.50	360	V	39.1	10.2	40.5	57.3	74	-16.7
11590	AV	38.90	360	H	39.1	10.2	40.5	47.7	54	-6.3
11590	AV	37.60	360	H	39.1	10.2	40.5	46.4	54	-7.6

Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics, which above 5th Harmonics is close to the noise base even antenna close up to 1meter distance according the measurement of ANSI C63.4.

9. BANDEDGE EMISSIONS

9.1 Standard Applicable

According to §15.247 (d) 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, provided the transmitter demonstrates compliance with the peak conducted power limits.

9.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-12-20	2011-12-19
EMI Test Receiver	R&S	ESVB	825471/005	2010-12-20	2011-12-19
Positioning Controller	C&C	CC-C-1F	N/A	2010-12-20	2011-12-19
RF Switch	EM	EMSW18	SW060023	2010-12-20	2011-12-19
Pre-amplifier	Agilent	8447F	3113A06717	2010-12-20	2011-12-19
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-12-20	2011-12-19
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2011-01-09	2012-01-08
Horn Antenna	ETS	3117	00086197	2011-01-09	2012-01-08

9.3 Test Procedure

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW, VBW=100KHz, Span=50MHz, Sweep = auto
3. Set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2438.5MHz, then mark the higher-level emission for comparing with the FCC rules.

9.4 Test Receiver Setup

During the radiated emission test for above 1GHz, the test receiver was set with the following configurations:

For peak detector:
RBW = 1000kHz, VBW = 3000kHz, Sweep Time = Auto

For average detector:
RBW = 1000kHz, VBW = 10Hz, Sweep Time = Auto

9.5 Environmental Conditions

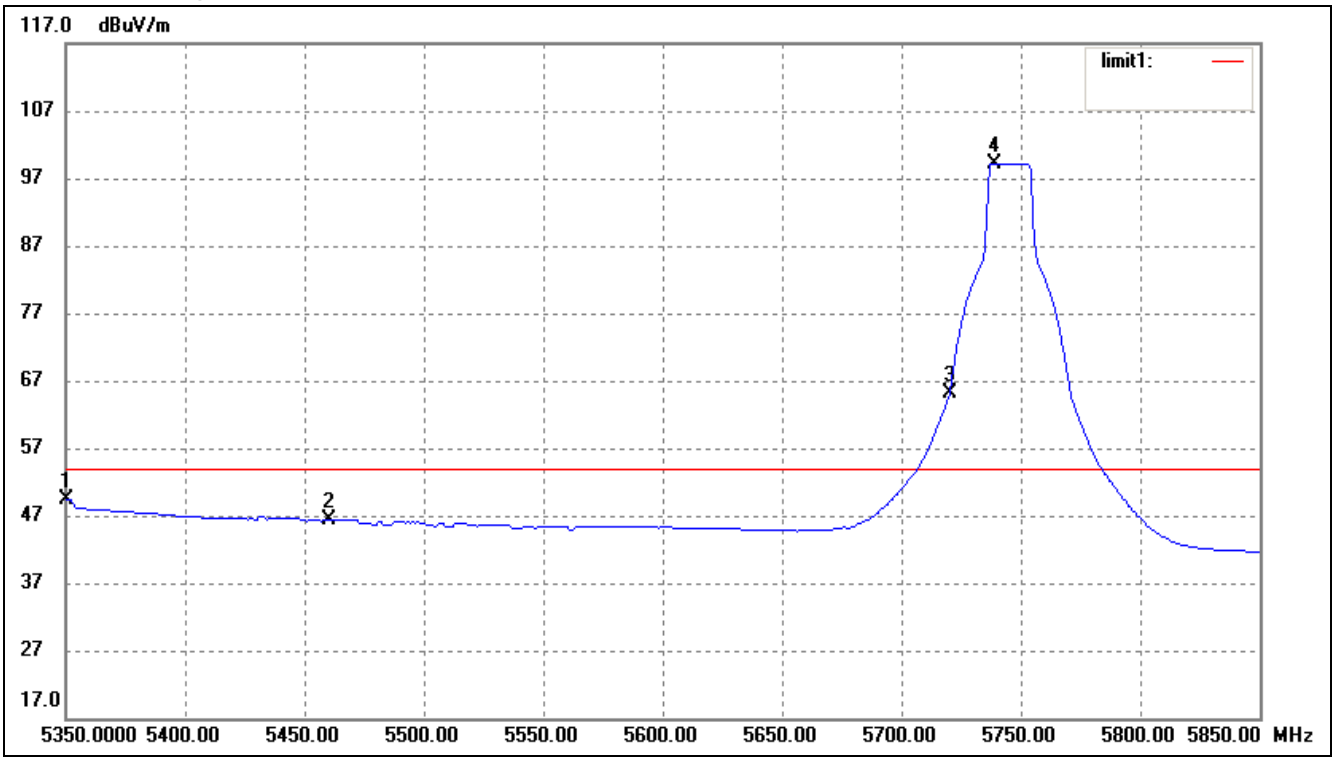
Temperature:	21° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

9.6 Summary of Test Results/Plots

Test mode	Frequency MHz	Limit dBuV /dB	Result
802.11a	5350~5460	<54dBuv	Pass
	5725	>20dB ATT	Pass
	5850	>20dB ATT	Pass
802.11n HT20	5350~5460	<54dBuv	Pass
	5725	>20dB ATT	Pass
	5850	>20dB ATT	Pass
802.11n HT40	5350~5460	<54dBuv	Pass
	5725	>20dB ATT	Pass
	5850	>20dB ATT	Pass

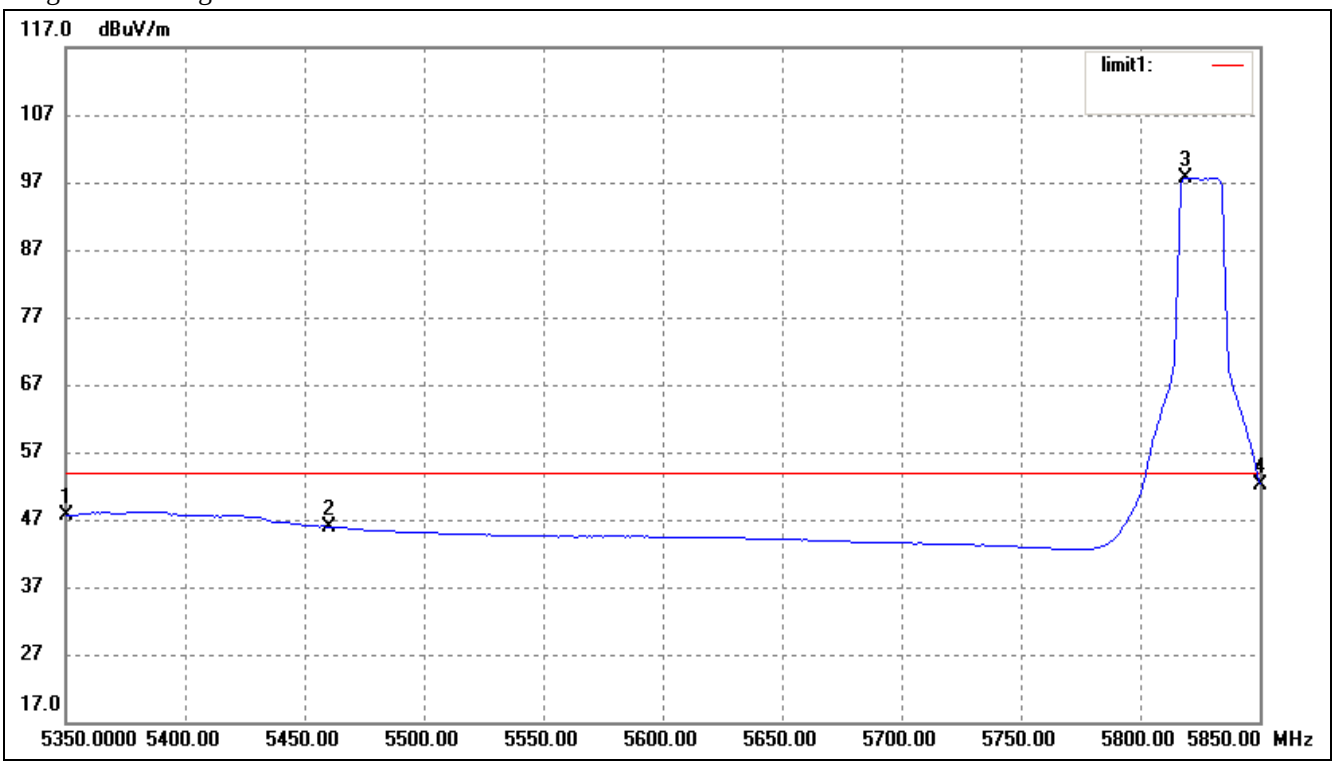
For 802.11a

Lowest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	5350.000	8.24	41.2	49.44	54.00	-4.56	360	100	Ave
	5350.000	21.14	41.2	62.34	74.00	-11.66	360	100	Peak
2	5460.000	4.79	41.6	46.39	54.00	-7.61	360	100	Ave
	5460.000	18.53	41.6	60.13	74.00	-13.87	360	100	Peak
3	5720.000	23.29	41.9	65.19	/	/	360	100	Ave
4	5739.000	57.34	41.9	99.24	/	/	360	100	Ave

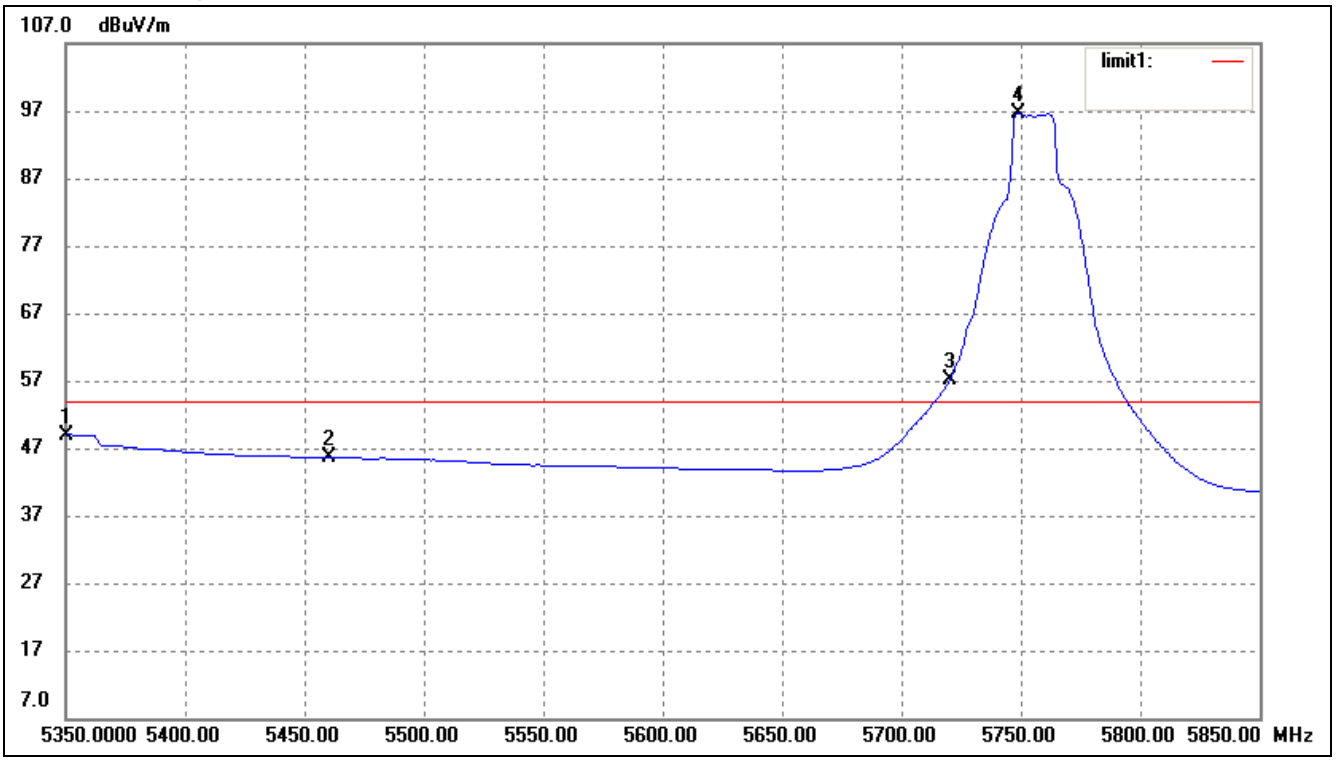
Highest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	5350.000	6.44	41.2	47.64	54.00	-6.36	360	100	Ave
	5350.000	20.05	41.2	61.25	74.00	-12.75	360	100	Peak
2	5460.000	4.34	41.6	45.94	54.00	-8.06	360	100	Ave
	5460.000	18.71	41.6	60.31	74.00	-13.69	360	100	Peak
3	5819.000	55.35	42.3	97.65	/	/	360	100	Ave
4	5850.000	9.83	42.3	52.13	/	/	360	100	Ave

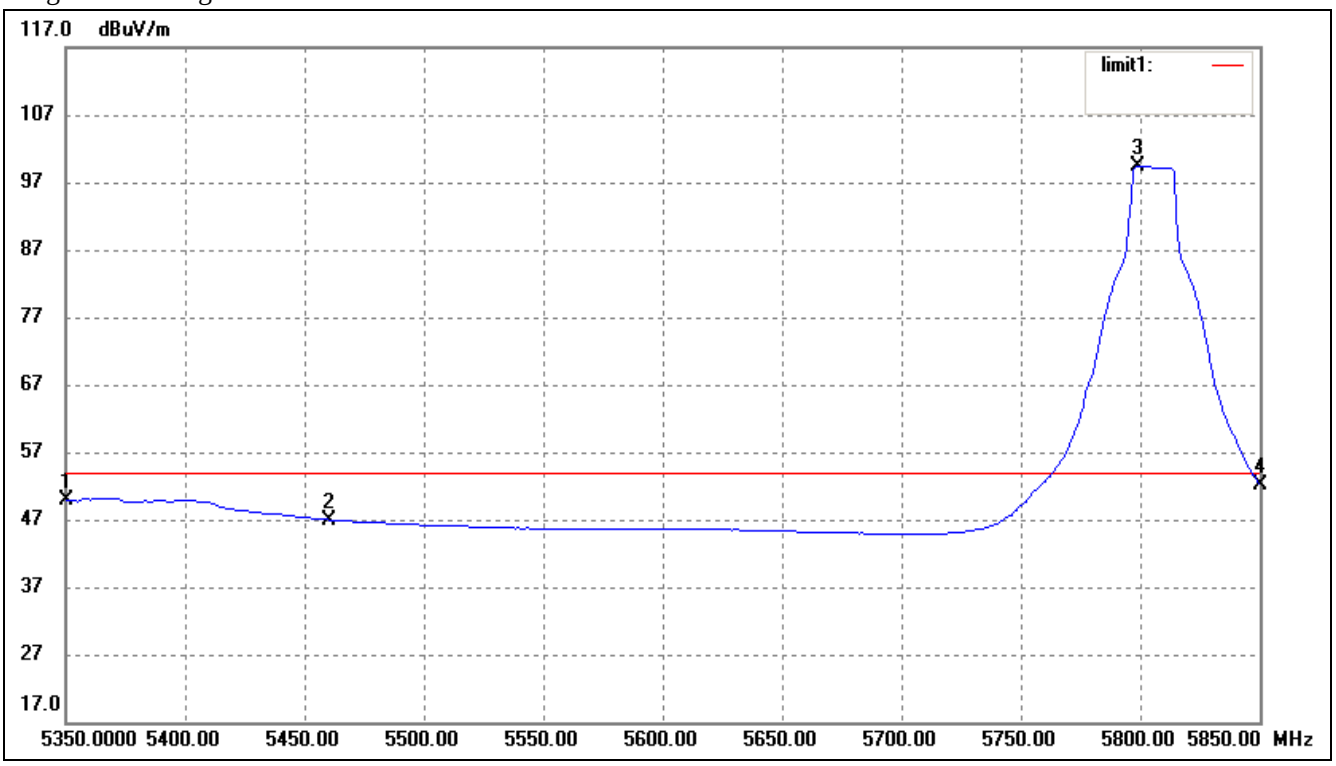
For 802.11nHT20

Lowest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	5350.000	7.79	41.2	48.99	54.00	-5.01	360	100	Ave
	5350.000	20.93	41.2	62.13	74.00	-11.87	360	100	Peak
2	5460.000	4.01	41.6	45.61	54.00	-8.39	360	100	Ave
	5460.000	19.42	41.6	61.02	74.00	-12.98	360	100	Peak
3	5720.000	15.3	41.9	57.20	/	/	360	100	Ave
4	5749.000	54.65	41.9	96.55	/	/	360	100	Ave

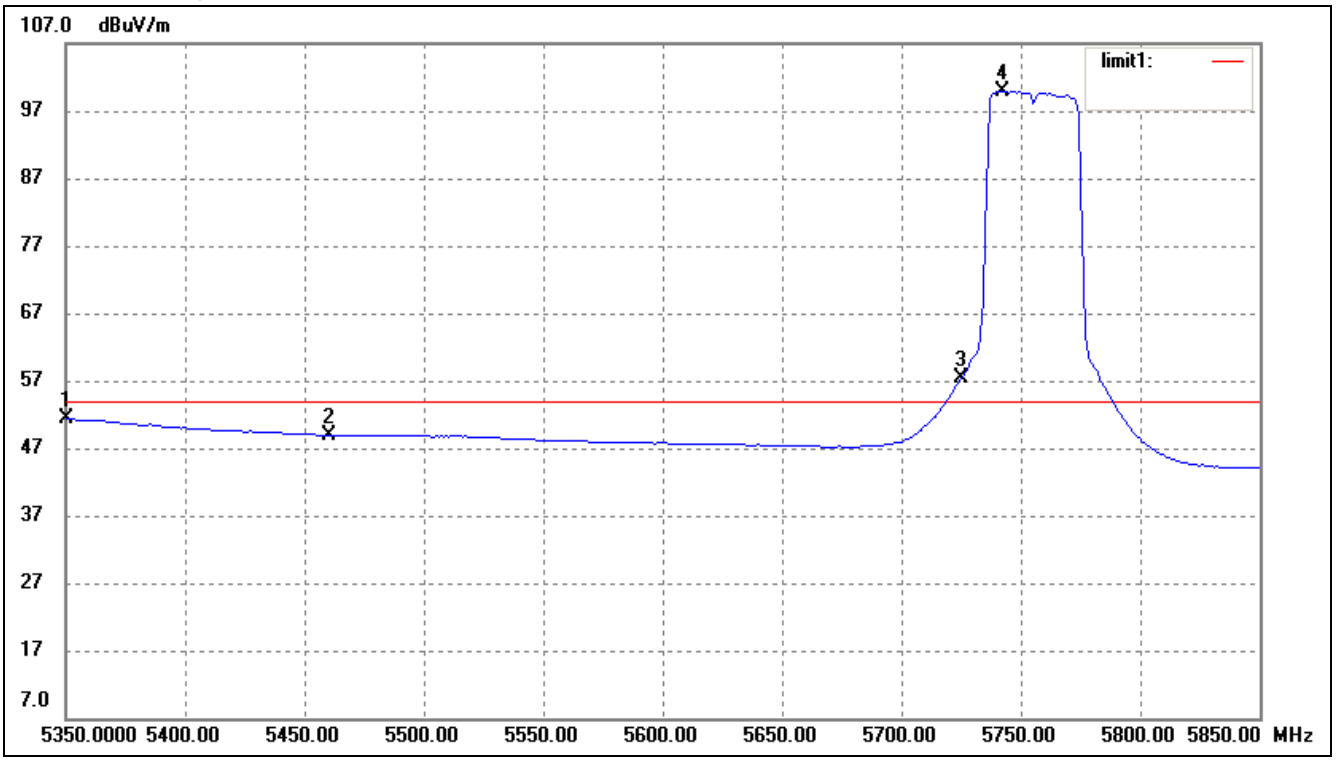
Highest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	5350.000	8.68	41.2	49.88	54.00	-4.12	360	100	Ave
	5350.000	22.29	41.2	63.49	74.00	-10.51	360	100	Peak
2	5460.000	5.38	41.6	46.98	54.00	-7.02	360	100	Ave
	5460.000	19.42	41.6	61.02	74.00	-12.98	360	100	Peak
3	5799.000	56.99	42.3	99.29	/	/	360	100	Ave
4	5850.000	9.93	42.3	52.23	/	/	360	100	Ave

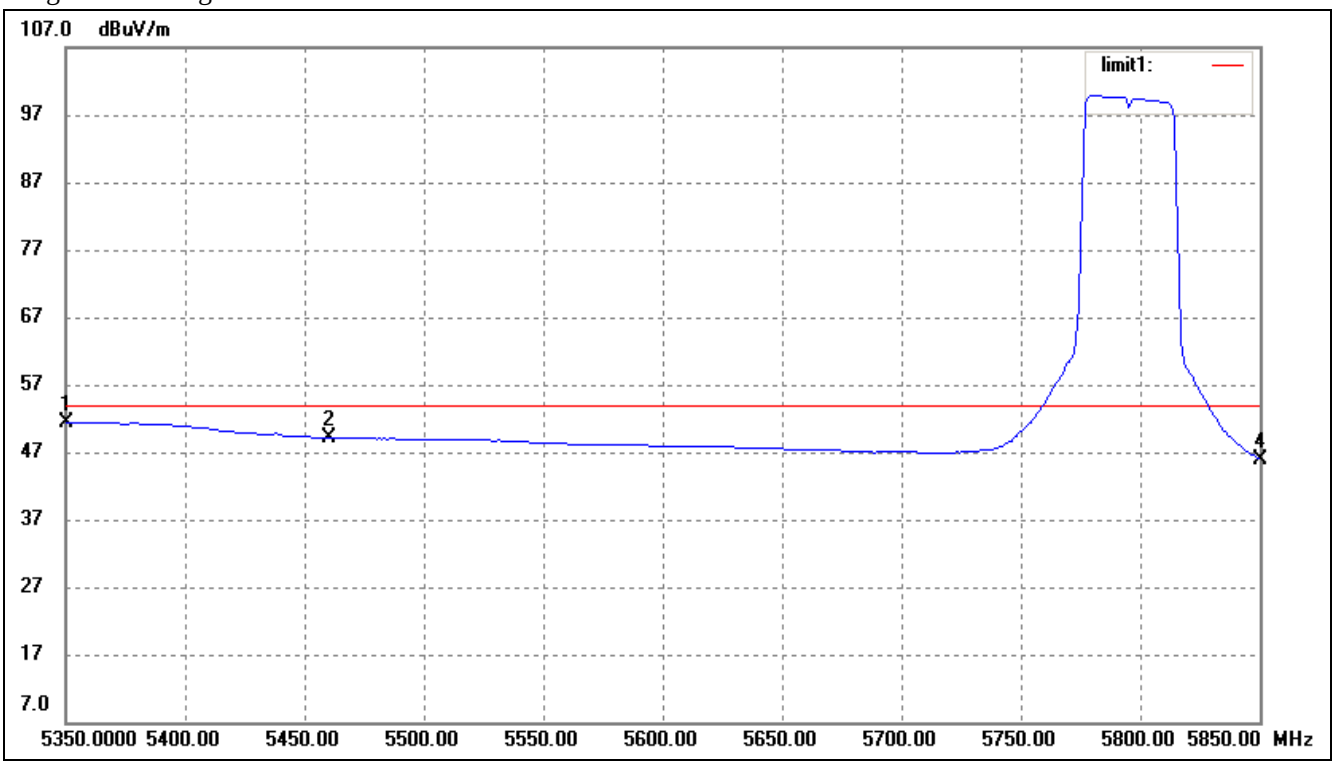
For 802.11n HT40

Lowest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	5350.000	10.14	41.2	51.34	54.00	-2.66	360	100	Ave
	5350.000	24.42	41.2	65.62	74.00	-8.38	360	100	Peak
2	5460.000	7.27	41.6	48.87	54.00	-5.13	360	100	Ave
	5460.000	20.53	41.6	62.13	74.00	-11.87	360	100	Peak
3	5725.000	15.44	41.9	57.34	/	/	360	100	Ave
4	5742.000	58.05	41.9	99.95	/	/	360	100	Ave

Highest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(°)	(cm)	
1	5350.000	10.12	41.2	51.32	54.00	-2.68	360	100	Ave
	5350.000	23.18	41.2	64.38	74.00	-9.62	360	100	Peak
2	5460.000	7.52	41.6	49.12	54.00	-4.88	360	100	Ave
	5460.000	19.63	41.6	61.23	74.00	-12.77	360	100	Peak
3	5782.000	57.96	41.9	99.86	/	/	360	100	Ave
4	5850.000	4.03	41.9	45.93	/	/	360	100	Ave

******* END OF REPORT *******