FCC / IC Test Report

FOR:

Virscient Limited

Model Name:
Trimble Comm board Tornado

Product Description:
WIFI/BT Module

FCC ID: YK5-73350047
IC ID: ----------

Applied Rules and Standards:
47 CFR Part 15.407 (UNII)

REPORT #: EMC_VIRSC_003_15.407_UNII_2A&C

DATE: 2019-03-05

A2LA Accredited

IC recognized #
3462B-2

***CETECOM* Inc.**
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

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1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.407 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

No deviations were ascertained.

Company	Description	Model #
Virscient Limited	WIFI/BT Module	V0009F

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2019-03-05	Compliance	Cindy Li (EMC Lab Manager)	Cindy Li Digitally signed by Cindy Li DN: cn=Cindy Li, o=Cetecom Inc., ou=EMC, email=cindy.li@cetecom.com, c=US Date: 2019.03.05 20:52:21 -08'00'

Responsible for the Report:

Date	Section	Name	Signature
2019-03-05	Compliance	Kevin Wang (Senior EMC Engineer)	Kevin Wang Digitally signed by: Kevin Wang DN: CN = Kevin Wang email = kevin.wang@cetecom.com C = US O = Cetecom Inc. Date: 2019.03.05 10:42:22 -08'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Compliance Manager:	Cindy Li
Responsible Project Leader:	Kris Lazarov

2.2 Identification of the Client

Applicant's Name:	Virscient Limited
Street Address:	Ruakura Research Centre, 10 Bisley Road
City/Zip Code	Hamilton/3214
Country	New Zealand

2.3 Identification of the Manufacturer

Manufacturer's Name:	Trimble Jena GmbH
Manufacturers Address:	Carl-Zeiss-Promenade 10
City/Zip Code	Jena/07745
Country	Germany

3 Equipment Under Test (EUT)

3.1 EUT Specifications

<table>
<tr><td>Model No:</td><td>Trimble Comm board Tornado</td></tr>
<tr><td>HW Version :</td><td>F</td></tr>
<tr><td>SW Version :</td><td>v4.5.10.016.DFS</td></tr>
<tr><td>FCC-ID :</td><td>YK5-73350047</td></tr>
<tr><td>IC-ID:</td><td>--------</td></tr>
<tr><td>FWIN:</td><td>--------</td></tr>
<tr><td>HVIN:</td><td>--------</td></tr>
<tr><td>PMN:</td><td>--------</td></tr>
<tr><td>Product Description:</td><td>WIFI/BT Module</td></tr>
<tr><td>Frequency Range / number of channels:</td><td>
<table>
<tr><td>Frequency Range (MHz)</td><td>Channel Number</td></tr>
<tr><td>5250-5350</td><td>52-64[4]</td></tr>
<tr><td>5470-5725</td><td>100-144 [12]</td></tr>
</table>
</td></tr>
<tr><td>Modes of Operation / Channel Bandwidths:</td><td>
<table>
<tr><td>IEEE Std. 802.11(xxxx)</td><td>Data Rate / MCS</td></tr>
<tr><td>a</td><td>6-54 Mbps</td></tr>
<tr><td>n: HT20 & HT40</td><td>MCS 0-7; MCS 8-15</td></tr>
</table>
</td></tr>
<tr><td>Transmit Chains(N_{TX})</td><td>1 & 2</td></tr>
<tr><td>Type(s) of Modulation:</td><td>BPSK, QPSK, 16-QAM, 64QAM</td></tr>
<tr><td>Antenna Information as declared:</td><td>Pulse W3334B0150, 2.4G 4dBi 5G 5.5dBi</td></tr>
<tr><td>Max. Output Power:</td><td>17.26dBm</td></tr>
<tr><td>Power Supply/ Rated Operating Voltage Range:</td><td>Vmin: 4.75 VDC/ Vnom: 5 VDC / Vmax: 5.5 VDC</td></tr>
<tr><td>Operating Temperature Range</td><td>-20 ºC to 70 ºC</td></tr>
<tr><td>Other Radios included in the device:</td><td>Bluetooth BR / EDR
WIFI 802.11b/g/n/ac</td></tr>
<tr><td>Sample Revision</td><td>Prototype Unit; ■Production Unit; ☐Pre-Production</td></tr>
</table>

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	311	F	V4.5.10.016.DFS	Radiated Emissions
2	351	F	V4.5.10.016.DFS	Conducted RF

3.3 Accessory Equipment (AE) details

AE #	Type	Manufacturer	Model	Serial Number
1	Laptop	Dell	Latitude 3440	CB1P2Z1
2	Laptop	Dell	Latitude E6230	C2RNTY1
3	Wi-Fi module	Compex	WLE600V5-27	104336146

3.4 Test Sample Configuration

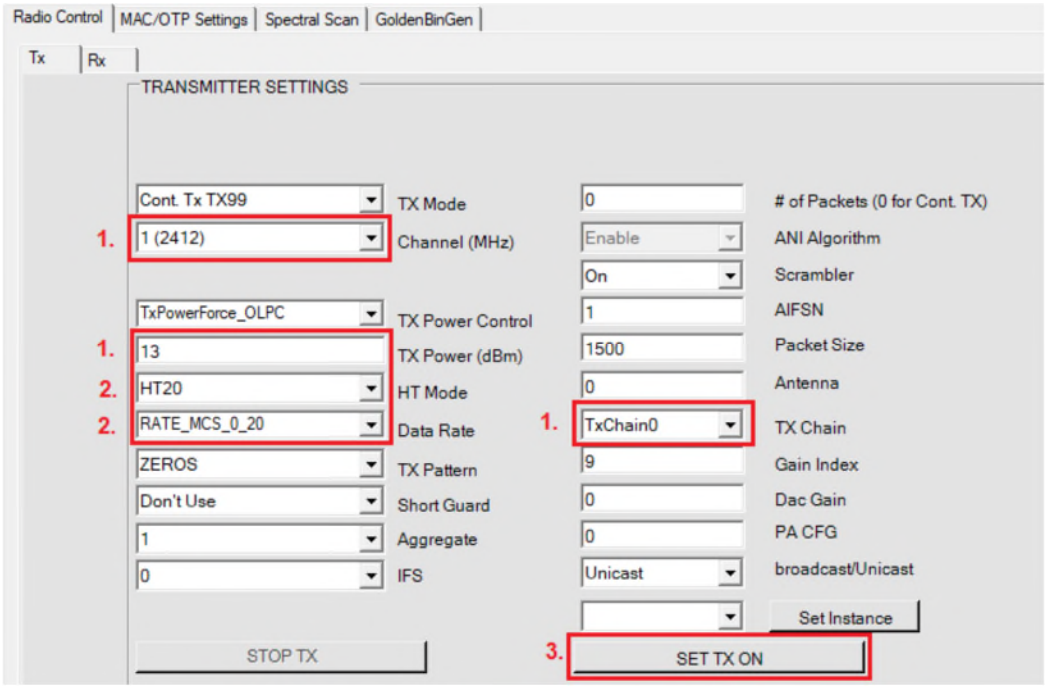
EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#2 + AE#1 + AE#2	The radio of the EUT was configured to a fixed channel transmission with highest possible duty cycle using software “QRCT” provided by client that is not available to the end user. The measurement equipment was connected to the 50 ohm RF port of the EUT.
2	EUT#1 + AE#1	The radio of the EUT was configured to a fixed channel with highest possible duty cycle using software “QRCT” provided by client that is not available to the end user. The external antenna “Pulse W3334B0150” provided by client was used for radiated testing.

3.5 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low, mid and high channels, and highest possible duty cycle. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

The EUT were configured by "QRCT" provided by client (not available to the end user).

QRCT Tool:



The target power index in below table was set in QRCT provided by client

802.11a:

Test Frequency	6 – 24 Mbps	36 Mbps	48 Mbps	54 Mbps
5180	7	7	7	7
5220	13	13	12	12
5320	7	7	7	7
5500	11	11	11	11
5600	13	13	11	11
5725	4	4	4	4
5745	4	4	4	4
5765	3	3	3	3
5785	3	3	3	3
5805	3	3	3	3
5825	3	3	3	3

802.11n HT20 1SS:

Test Frequency (MHz)	MCS0		MCS1 MCS2		MCS3 MCS4		MCS5		MCS6		MCS7	
Chain	0	1	0	1	0	1	0	1	0	1	0	1
5180	8	7	8	7	8	7	8	7	8	7	8	7
5220	13	14	13	14	12	12	11	12	10	11	8	9
5320	9	7	9	7	9	7	9	7	9	7	9	7
5500	13	11	13	11	13	10	12	10	11	9	10	8
5600	13	12	13	12	12	10	11	10	11	10	9	8
5725	4	5	4	5	4	5	4	5	4	5	4	5
5745	4	5	4	5	4	5	4	5	4	5	4	5
5765	3	6	3	6	3	6	3	6	3	6	3	6
5785	3	7	3	7	3	7	3	7	3	7	3	7
5805	3	7	3	7	3	7	3	7	3	7	3	7
5825	3	6	3	6	3	6	3	6	3	6	3	6

802.11n HT20 2SS:

Test Frequency (MHz)	MCS8		MCS9 MCS10		MCS11 MCS12		MCS13		MCS14		MCS15	
Chain	0	1	0	1	0	1	0	1	0	1	0	1
5180	8	7	8	7	8	7	8	7	8	7	8	7
5220	13	14	13	14	12	12	11	12	10	11	8	9
5320	9	7	9	7	9	7	9	7	9	7	9	7
5500	13	11	13	11	13	10	12	10	11	9	10	8
5600	13	12	13	12	12	10	11	10	11	10	9	8
5725	4	5	4	5	4	5	4	5	4	5	4	5
5745	4	5	4	5	4	5	4	5	4	5	4	5
5765	3	6	3	6	3	6	3	6	3	6	3	6
5785	3	7	3	7	3	7	3	7	3	7	3	7
5805	3	7	3	7	3	7	3	7	3	7	3	7
5825	3	6	3	6	3	6	3	6	3	6	3	6

802.11n HT40 1SS:

Test Frequency (MHz)	MCS0		MCS1 MCS2		MCS3 MCS4		MCS5		MCS6		MCS7	
Chain	0	1	0	1	0	1	0	1	0	1	0	1
5180	7	7	7	7	7	7	7	7	7	7	7	7
5220	13	12	13	12	11	10	10	9	10	9	9	8
5320	8	7	8	7	8	7	8	7	8	7	8	7
5500	10	8	10	8	10	8	10	8	10	8	10	8
5600	12	13	11	12	10	11	10	11	9	10	7	8
5725	5	6	5	6	5	6	5	6	5	6	5	6
5745	5	6	5	6	5	6	5	6	5	6	5	6
5765	4	5	4	5	4	5	4	5	4	5	4	5
5785	4	4	4	4	4	4	4	4	4	4	4	4
5805	4	4	4	4	4	4	4	4	4	4	4	4
5825	4	4	4	4	4	4	4	4	4	4	4	4

802.11n HT40 2SS:

Test Frequency (MHz)	MCS8		MCS9 MCS10		MCS11 MCS12		MCS13		MCS14		MCS15	
Chain	0	1	0	1	0	1	0	1	0	1	0	1
5180	7	7	7	7	7	7	7	7	7	7	7	7
5220	13	12	13	12	11	10	10	9	10	9	9	8
5320	8	7	8	7	8	7	8	7	8	7	8	7
5500	10	8	10	8	10	8	10	8	10	8	10	8
5600	12	13	11	12	10	11	10	11	9	10	7	8
5725	5	6	5	6	5	6	5	6	5	6	5	6
5745	5	6	5	6	5	6	5	6	5	6	5	6
5765	4	5	4	5	4	5	4	5	4	5	4	5
5785	4	4	4	4	4	4	4	4	4	4	4	4
5805	4	4	4	4	4	4	4	4	4	4	4	4
5825	4	4	4	4	4	4	4	4	4	4	4	4

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.407 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 of ISED Canada.

This test report is to support a request for new equipment authorization under the FCC ID: YK5-73350047 IC ID: ----------

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.407(e) RSS-247 6.2.4.1	Emission Bandwidth	Nominal	802.11a/ n20/n40	■	☐	☐	Complies
§15.407(a) RSS-247 6	Power Spectral Density	Nominal	802.11a/ n20/n40	■	☐	☐	Complies
§15.407(a) RSS-247 6	Maximum Output Power	Nominal	802.11a/ n20/n40	■	☐	☐	Complies
§15.407; 15.205 RSS-247 6; RSS-Gen 8.10	Band Edge Compliance	Nominal	802.11a/ n20/n40	■	☐	☐	Complies
§15.407(b); §15.209; 15.205 RSS-247 6; RSS-Gen 8.9; 8.10	Radiated TX Spurious Emissions	Nominal	802.11a/ n20/n40	■	☐	☐	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	802.11a/ n20/n40	■	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.

6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

Radiated measurement

9 kHz to 30 MHz	±2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	±2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	±2.3 dB (Horn Antenna)

Conducted measurement

150 kHz to 30 MHz	±0.7 dB (LISN)
RF conducted measurement	±0.5 dB

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: http://physics.nist.gov/cuu/Uncertainty/typeb.html. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

6.1 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

6.2 Dates of Testing:

11/05/2018 - 11/29/2018

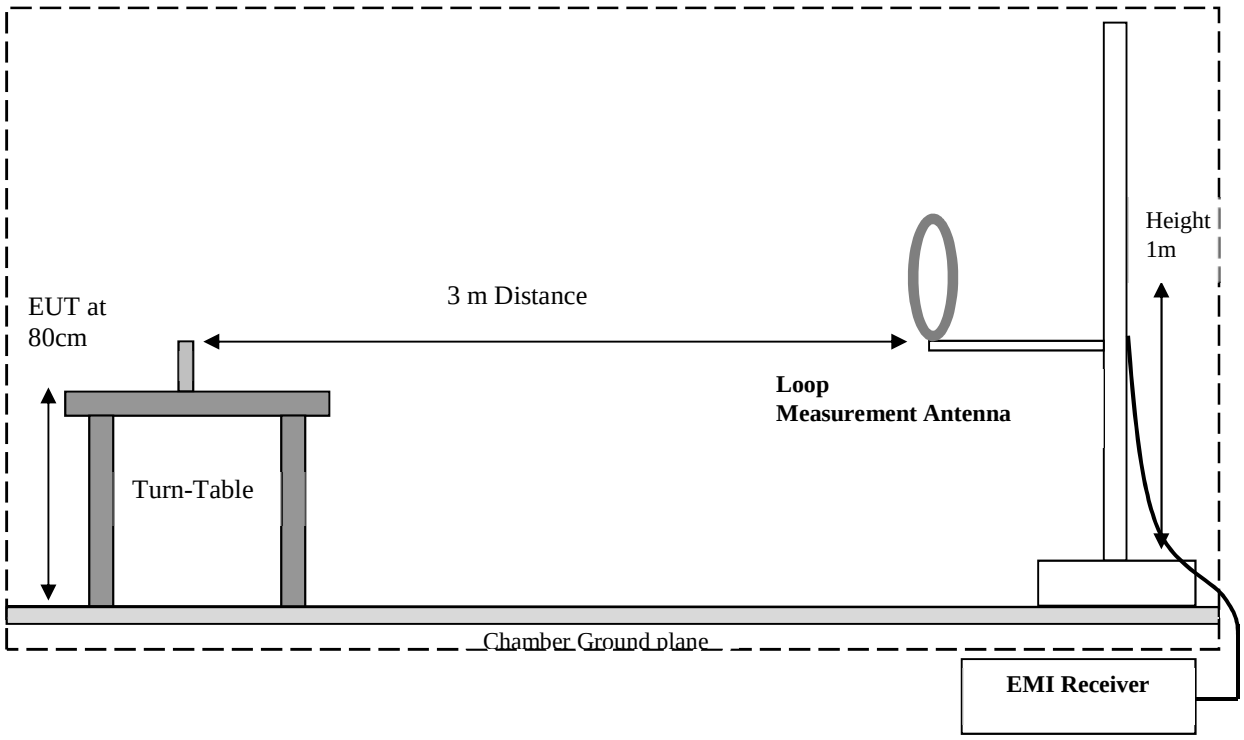
7 Measurement Procedures

7.1 Radiated Measurement

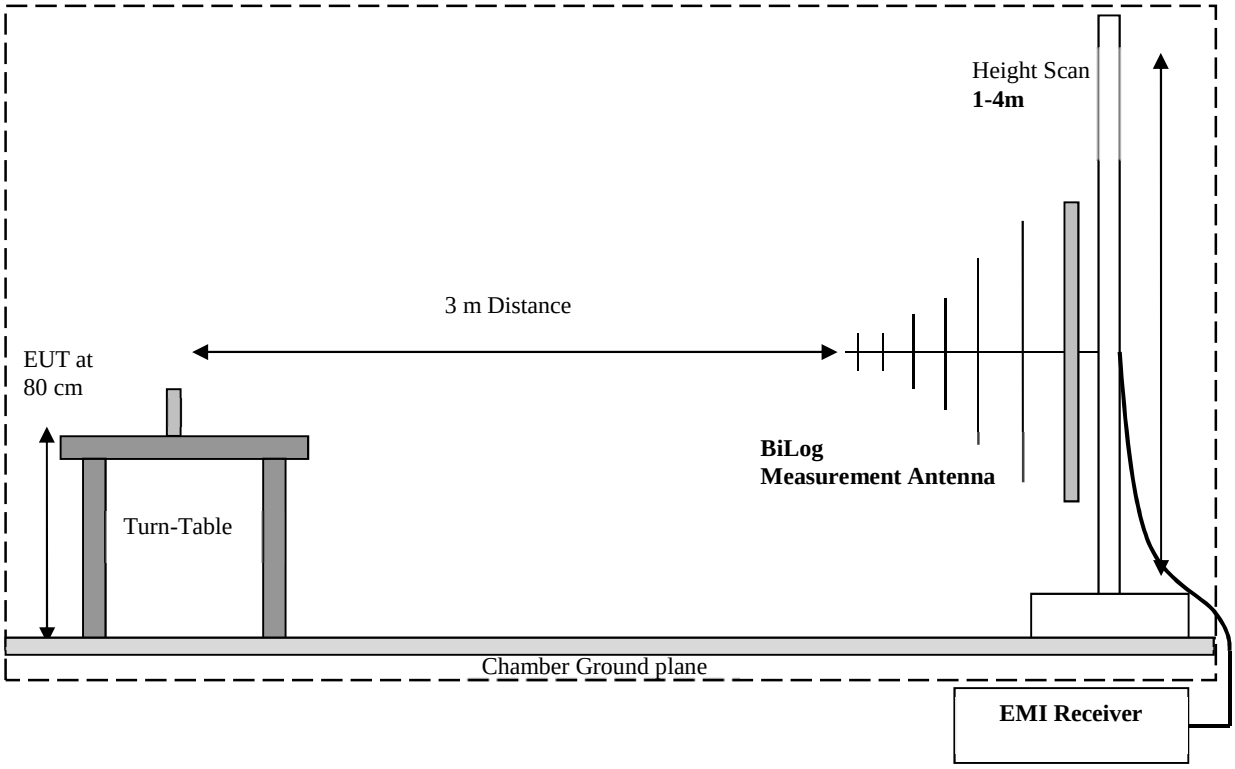
The radiated measurement is performed according to ANSI C63.10 (2013)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.

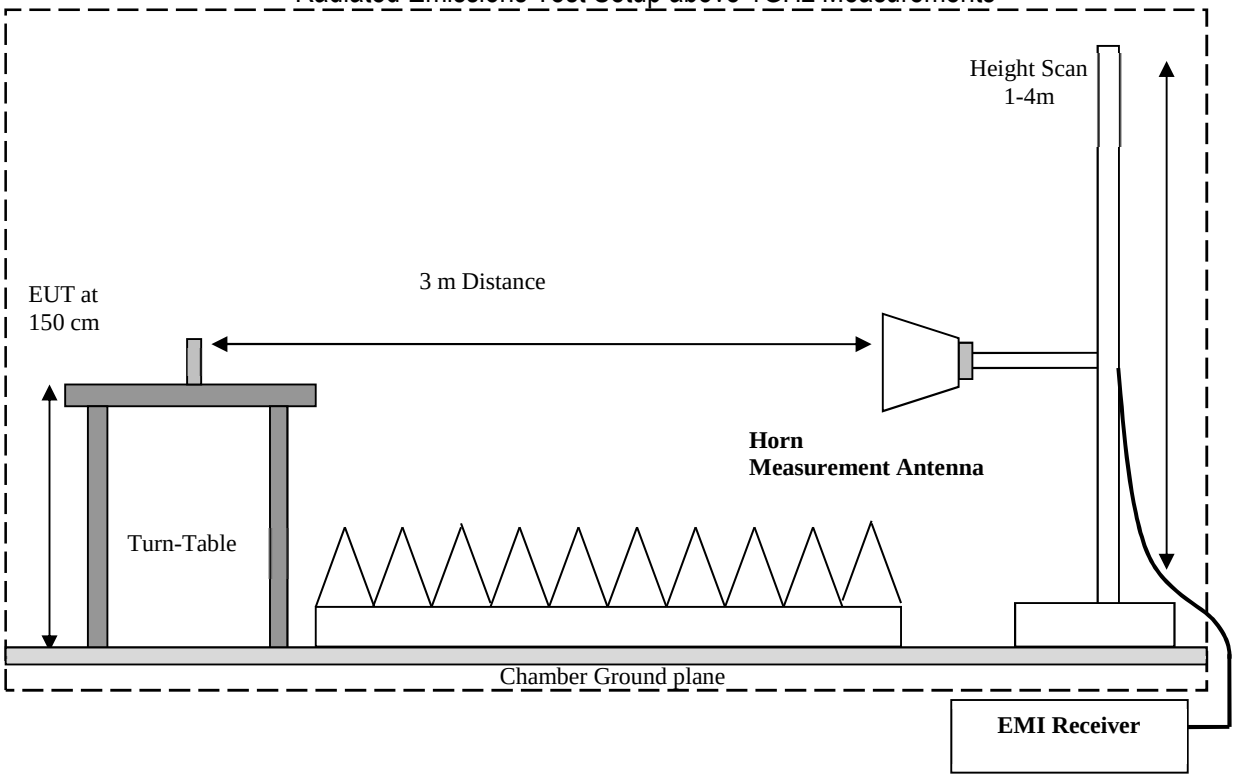
Radiated Emissions Test Setup below 30MHz Measurements



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

FS (dBµV/m) = Measured Value on SA (dBµV)- Cable Loss (dB)+ Antenna Factor (dB/m)

Example:

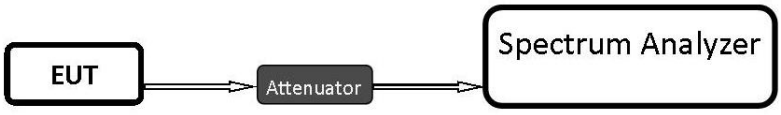
Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

7.2 Power Line Conducted Measurement Procedure

AC Power Line conducted emissions measurements performed according to: ANSI C63.4 (2014)

7.3 RF Conducted Measurement Procedure

Testing procedures are based on 558074 D01 DTS Meas Guidance v04 – "GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247" - April 5, 2017, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.



- Connect the equipment as shown in the above diagram.
- Adjust the settings of the SA (Rohde-Schwarz Spectrum Analyzer) to connect the EUT at the required mode of test.
- Measurements are to be performed with the EUT set to the low, middle and high channels and for worst case modulation schemes.

8 Test Result Data

8.1 Maximum Output Power

8.1.1 Measurement according to FCC 789033 D02 General UNII Test Procedures New Rules v02r01

Spectrum Analyzer settings **for method SA-1:**

- Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- Set RBW = 1 MHz
- Set the VBW ≥ 3 MHz
- Detector = RMS
- Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
- Sweep time = Auto Couple
- Trace mode = Trace average at least 100 traces in power averaging (i.e., RMS mode).
- If transmit duty cycle < 98%, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."
- Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

8.1.2 Limits:

FCC§15.407

Sub-band 5250-5350 MHz and 5470-5725 MHz and

- The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz

RSS-247

Sub-band 5250-5350 MHz

- For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 log10B, dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.
  - Devices, other than devices installed in vehicles, shall comply with the following:
    a) The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less.
    b) b.The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Sub-band 5470-5600 MHz and 5650-5725 MHz

- The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less.
- The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Note: All limits are conducted. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.1.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
22° C	1	a / 6Mbps HT 20 / MCS0 HT 40 / MCS0	5 VDC	5.5 dBi

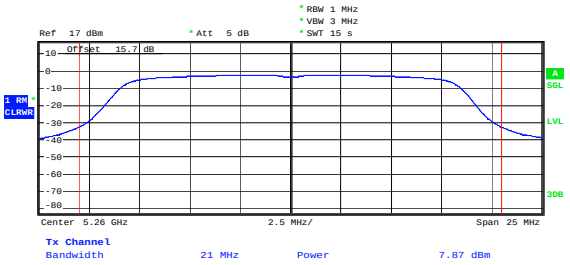
8.1.4 Measurement result:

Mode	Channel	Frequency (MHz)	Maximum Output Power (dBm)		EIRP (dBm)	EIRP with Beamforming (dBm)	Limit	Result
			Chain 0	Chain1				
a / 6Mbps	52	5260	7.87	10.26	18.76	21.76	See Section 8.1.2	Pass
a / 6Mbps	60	5300	7.47	10.44	18.94	21.94	See Section 8.1.2	Pass
a / 6Mbps	64	5320	4.35	7.43	15.93	18.93	See Section 8.1.2	Pass
HT 20 / MCS0	52	5260	10.47	9.57	18.97	21.97	See Section 8.1.2	Pass
HT 20 / MCS0	60	5300	11.46	10.20	19.96	22.96	See Section 8.1.2	Pass
HT 20 / MCS0	64	5320	9.95	7.42	18.45	21.45	See Section 8.1.2	Pass
HT 40 / MCS0	54	5270	8.09	9.24	17.74	20.74	See Section 8.1.2	Pass
HT 40 / MCS0	62	5310	8.00	10.07	18.57	21.57	See Section 8.1.2	Pass

Mode	Channel	Frequency (MHz)	Maximum Output Power (dBm)		EIRP (dBm)	EIRP with Beamforming (dBm)	Limit	Result
			Chain 0	Chain1				
a / 6Mbps	100	5500	8.06	9.86	18.36	21.36	See Section 8.1.2	Pass
a / 6Mbps	124	5620	8.59	10.71	19.21	22.21	See Section 8.1.2	Pass
a / 6Mbps	144	5720	4.54	6.40	14.9	17.9	See Section 8.1.2	Pass
HT 20 / MCS0	100	5500	14.26	11.53	22.76	25.76	See Section 8.1.2	Pass
HT 20 / MCS0	124	5620	13.66	10.95	22.16	25.16	See Section 8.1.2	Pass
HT 20 / MCS0	144	5720	4.21	7.15	15.65	18.65	See Section 8.1.2	Pass
HT 40 / MCS0	102	5510	8.45	9.95	18.45	21.45	See Section 8.1.2	Pass
HT 40 / MCS0	126	5630	9.04	13.10	21.6	24.6	See Section 8.1.2	Pass
HT 40 / MCS0	142	5710	5.68	8.50	17	20	See Section 8.1.2	Pass

8.1.5 Conducted Power Measurement Plot:

Transmit Chain: 0	
Mode: 802.11a	Channel: 52



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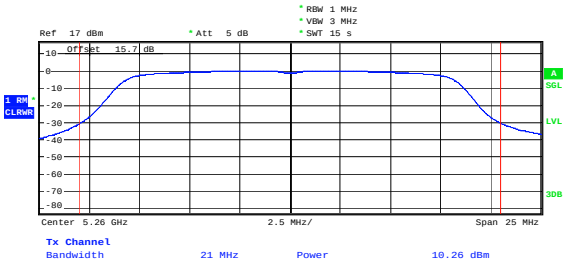
Date: 9.NOV.2018 12:24:40

Transmit Chain: 1	
Mode: 802.11a	Channel: 52



low
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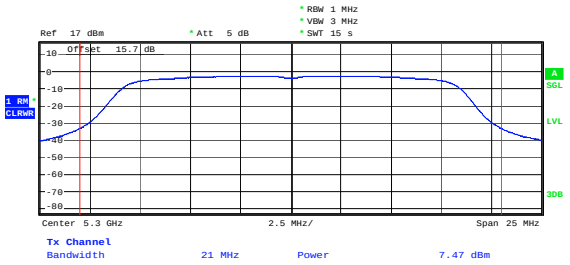
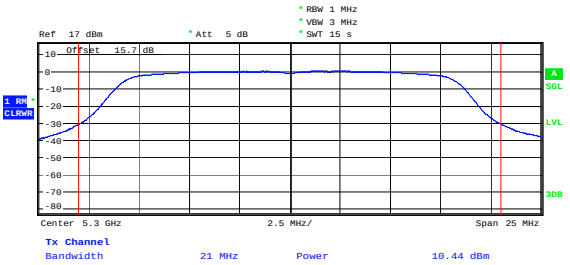
Transmit Chain: 0	
Mode: 802.11a	Channel: 60



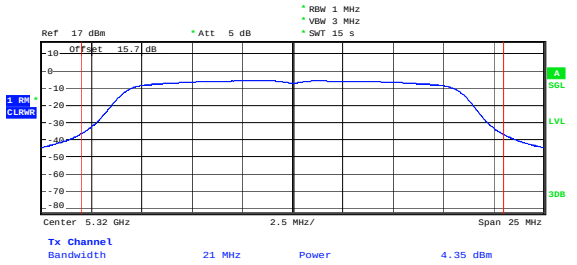
low
Date: 9.NOV.2018 12:27:57

Transmit Chain: 1	
Mode: 802.11a	Channel: 60



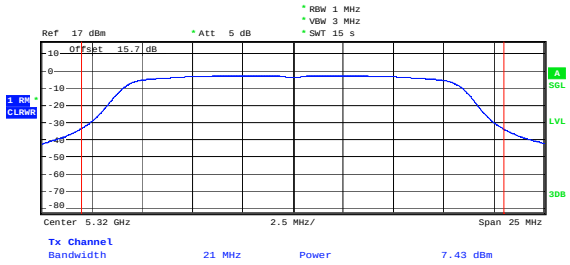
low
Date: 9.NOV.2018 12:41:44

Transmit Chain: 0	
Mode: 802.11a	**Channel: 64**



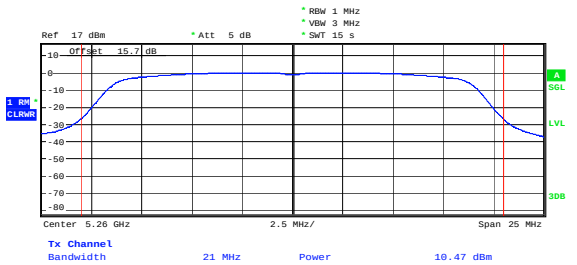
low
Date: 9.NOV.2018 12:29:15

Transmit Chain: 1	
Mode: 802.11a	**Channel: 64**



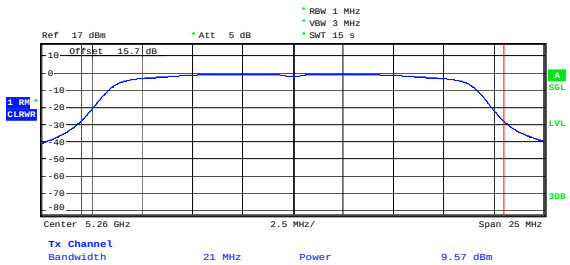
low
Date: 9.NOV.2018 12:40:30

Transmit Chain: 0	
Mode: 802.11n20	**Channel: 52**



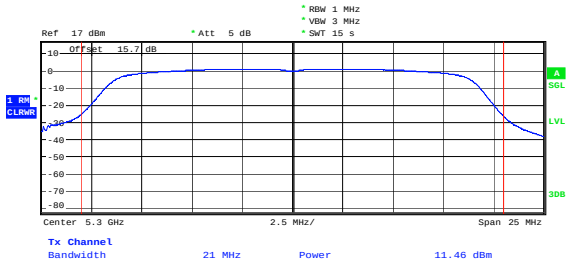
low
Date: 9.NOV.2018 12:26:22

Transmit Chain: 1	
Mode: 802.11n20	**Channel: 52**



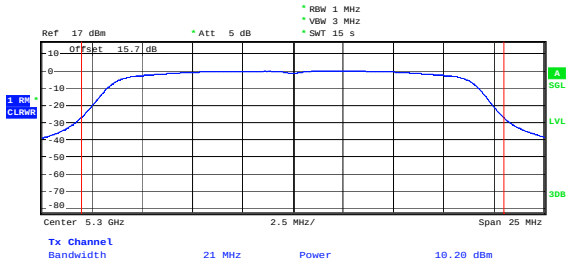
low
Date: 9.NOV.2018 11:59:47

Transmit Chain: 0	
Mode: 802.11n20	**Channel: 60**



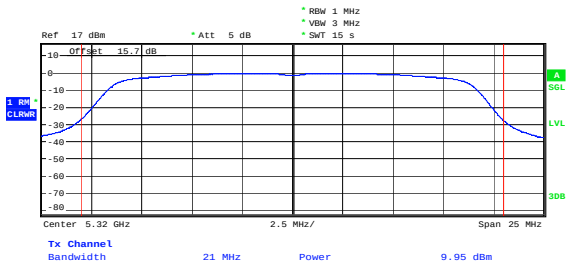
low
Date: 9.NOV.2018 12:20:37

Transmit Chain: 1	
Mode: 802.11n20	**Channel: 60**



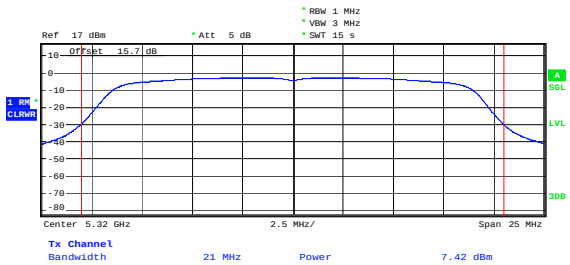
low
Date: 9.NOV.2018 12:01:30

Transmit Chain: 0	
Mode: 802.11n20	**Channel: 64**



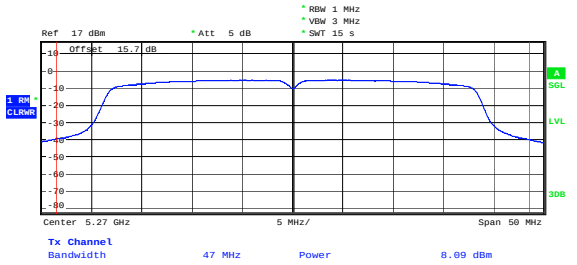
low
Date: 9.NOV.2018 12:18:55

Transmit Chain: 1	
Mode: 802.11n20	**Channel: 64**



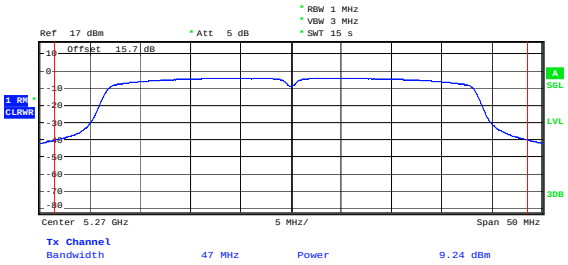
low
Date: 9.NOV.2018 12:02:30

Transmit Chain: 0	
Mode: 802.11n40	Channel: 54



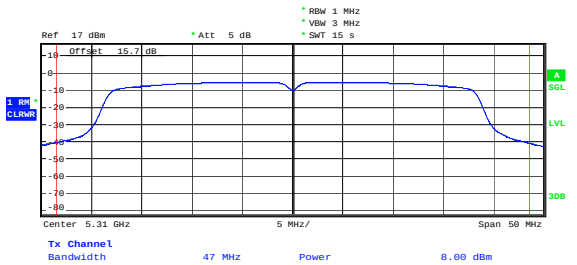
low
Date: 9.NOV.2018 11:45:21

Transmit Chain: 1	
Mode: 802.11n40	Channel: 54



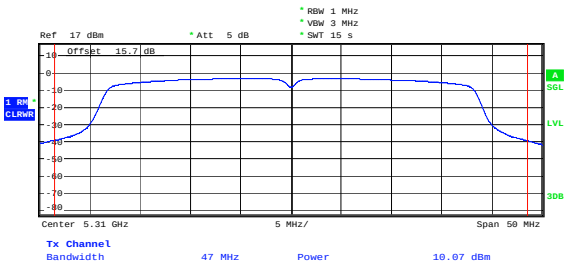
low
Date: 9.NOV.2018 11:50:01

Transmit Chain: 0	
Mode: 802.11n40	Channel: 62



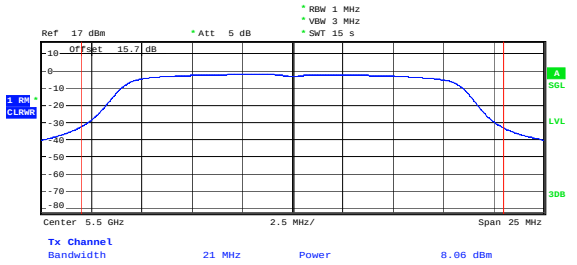
low
Date: 9.NOV.2018 11:43:54

Transmit Chain: 1	
Mode: 802.11n40	Channel: 62



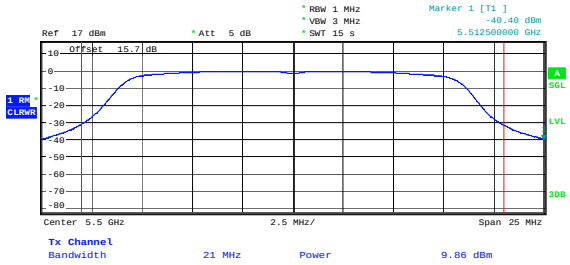
low
Date: 9.NOV.2018 11:49:02

Transmit Chain: 0	
Mode: 802.11a	Channel: 100



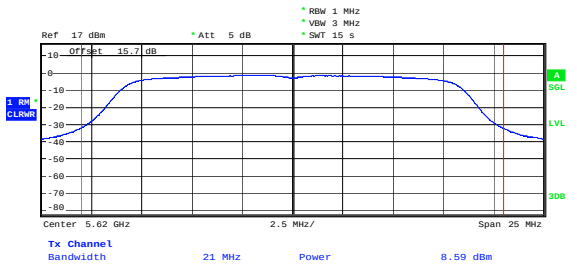
low
Date: 9.NOV.2018 12:31:29

Transmit Chain: 1	
Mode: 802.11a	Channel: 100



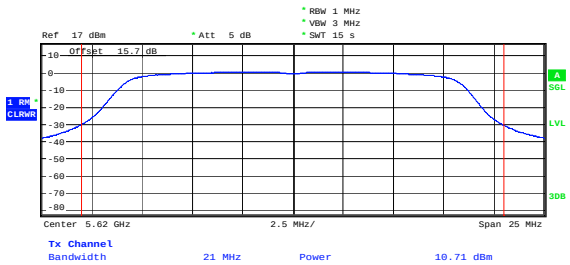
low
Date: 9.NOV.2018 19:38:14

Transmit Chain: 0	
Mode: 802.11a	Channel: 124



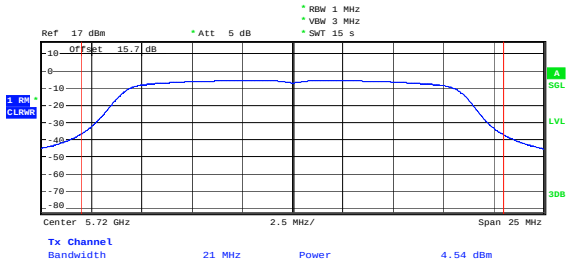
low
Date: 9.NOV.2018 12:32:47

Transmit Chain: 1	
Mode: 802.11a	Channel: 124



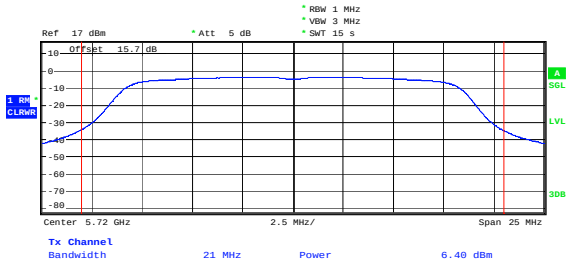
low
Date: 9.NOV.2018 12:38:00

Transmit Chain: 0	
Mode: 802.11a	**Channel: 144**



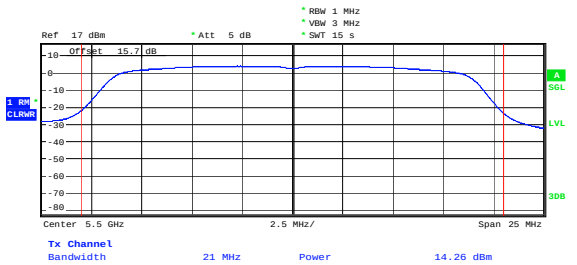
low
Date: 9.NOV.2018 12:33:56

Transmit Chain: 1	
Mode: 802.11a	**Channel: 144**



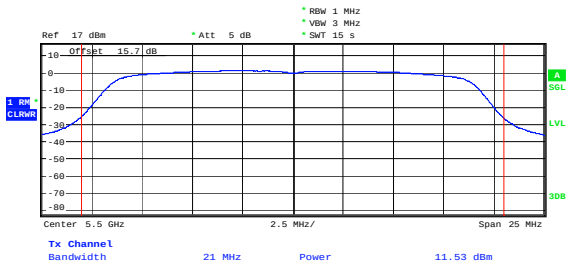
low
Date: 9.NOV.2018 12:34:55

Transmit Chain: 0	
Mode: 802.11n20	**Channel: 100**



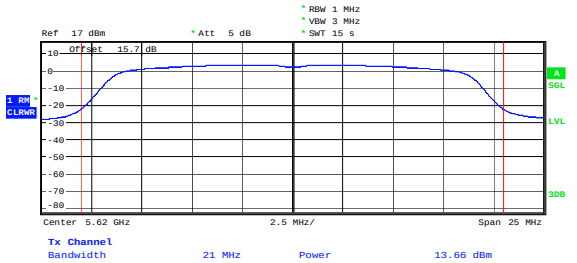
low
Date: 9.NOV.2018 12:15:44

Transmit Chain: 1	
Mode: 802.11n20	**Channel: 100**



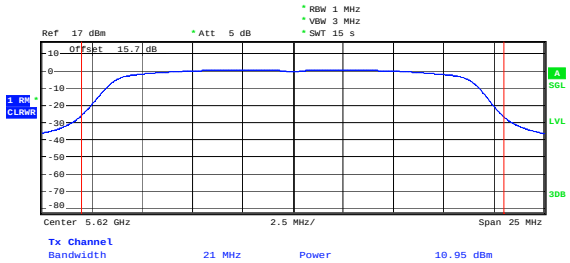
low
Date: 9.NOV.2018 12:05:02

Transmit Chain: 0	
Mode: 802.11n20	Channel: 124



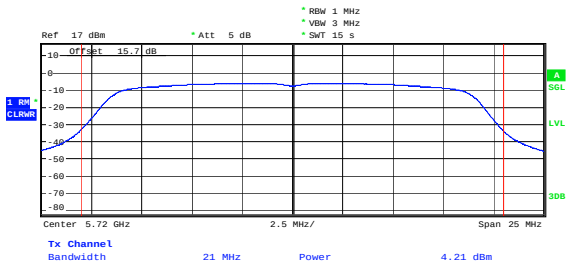
low
Date: 9.NOV.2018 12:16:49

Transmit Chain: 1	
Mode: 802.11n20	Channel: 124



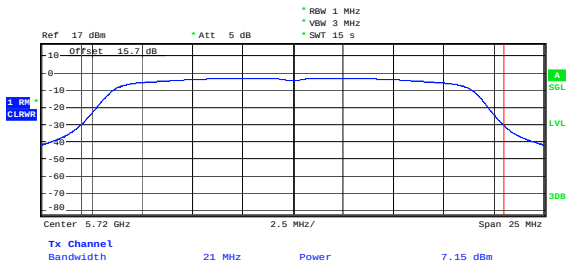
low
Date: 9.NOV.2018 12:08:08

Transmit Chain: 0	
Mode: 802.11n20	Channel: 144



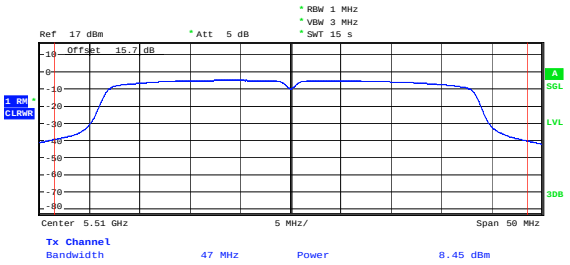
low
Date: 9.NOV.2018 12:17:50

Transmit Chain: 1	
Mode: 802.11n20	Channel: 144



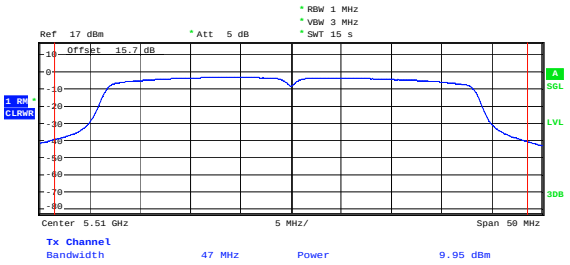
low
Date: 9.NOV.2018 12:09:21

Transmit Chain: 0	
Mode: 802.11n40	**Channel: 102**



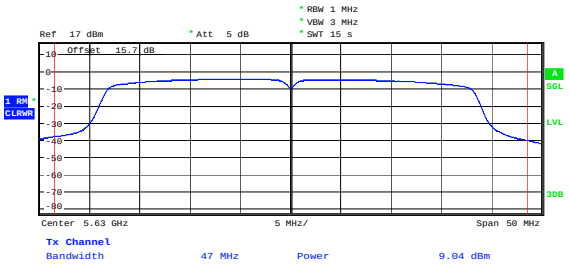
low
Date: 9.NOV.2018 11:41:35

Transmit Chain: 1	
Mode: 802.11n40	**Channel: 102**



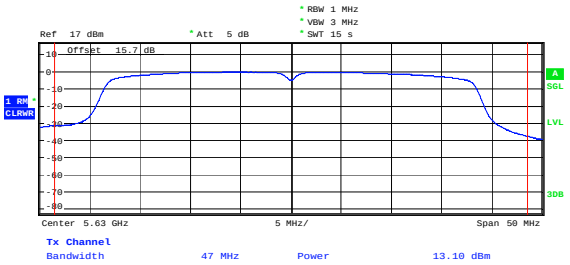
low
Date: 9.NOV.2018 11:51:48

Transmit Chain: 0	
Mode: 802.11n40	**Channel: 126**



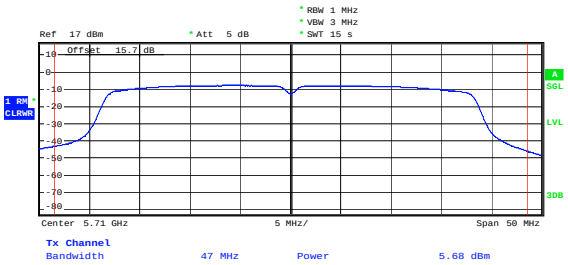
low
Date: 9.NOV.2018 11:40:21

Transmit Chain: 1	
Mode: 802.11n40	**Channel: 126**



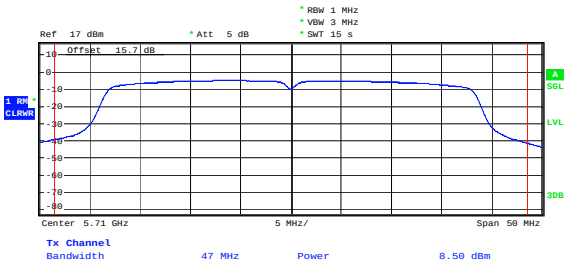
low
Date: 9.NOV.2018 11:54:06

Transmit Chain: 0	
Mode: 802.11n40	**Channel: 142**



low
Date: 9.NOV.2018 11:38:57

Transmit Chain: 1	
Mode: 802.11n40	**Channel: 142**



low
Date: 9.NOV.2018 11:55:24

8.2 Power Spectral Density

8.2.1 Measurement according to FCC 789033 D02 General UNII Test Procedures New Rules v02r01

Spectrum Analyzer Settings for Peak PSD in 1 MHz Band with Method SA-1:

- Use the settings in section 8.1.1
- Use the peak marker function to determine the maximum amplitude level within the RBW. The result is the Maximum PSD over 1 MHz reference bandwidth

Spectrum Analyzer Settings for Peak PSD in 500 kHz Band with Method SA-1:

- Set RBW 500 kHz
- Set VBW ≥ 3 RBW.
- Measure the Maximum PSD in 500 kHz reference bandwidth for sub-band 5725-5850 MHz

8.2.2 Limits:

FCC§15.407

Sub-band 5150-5250 MHz

- For AP the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band
- For Client Devices the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band

Sub-band 5250-5350 MHz and 5470-5725 MHz and

- The maximum power spectral density shall not exceed 11 dBm in any 1 MHz band

Sub-band 5725-5850 MHz

- The maximum power spectral density shall not exceed 30 dBm in any 500 kHz band

RSS-247

Sub-band 5150-5250 MHz

- PSD shall be less than 10 dBm in any 1 MHz band- EIRP

Sub-band 5250-5350 MHz

- PSD shall be less than 11 dBm in any 1 MHz band

Sub-band 5470-5600 MHz and 5650-5725 MHz

- PSD shall be less than 11 dBm in any 1 MHz band

Sub-band 5725-5850 MHz

- PSD shall be less than 30 dBm in any 500 kHz band

Note: All limits are conducted. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.2.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
22° C	1	a / 6Mbps HT 20 / MCS0 HT 40 / MCS0	5 VDC	5.5 dBi

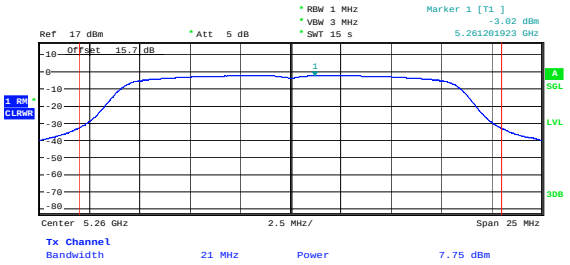
8.2.4 Measurement result:

Mode	Channel	Frequency (MHz)	Maximum Power Spectral Density (dBm/MHz)		Limit	Result
			Chain 0	Chain1		
a / 6Mbps	52	5260	-3.02	-0.83	See Section 8.2.2	Pass
a / 6Mbps	60	5300	-3.28	-0.34	See Section 8.2.2	Pass
a / 6Mbps	64	5320	-6.29	-3.30	See Section 8.2.2	Pass
HT 20 / MCS0	52	5260	-0.31	-1.18	See Section 8.2.2	Pass
HT 20 / MCS0	60	5300	0.92	-0.71	See Section 8.2.2	Pass
HT 20 / MCS0	64	5320	-1.08	-3.64	See Section 8.2.2	Pass
HT 40 / MCS0	54	5270	-6.39	-5.50	See Section 8.2.2	Pass
HT 40 / MCS0	62	5310	-6.28	-4.38	See Section 8.2.2	Pass

Mode	Channel	Frequency (MHz)	Maximum Power Spectral Density (dBm/MHz)		Limit	Result
			Chain 0	Chain1		
a / 6Mbps	100	5500	-2.69	-0.3	See Section 8.2.2	Pass
a / 6Mbps	124	5620	-2.46	0.43	See Section 8.2.2	Pass
a / 6Mbps	144	5720	-6.97	-4.04	See Section 8.2.2	Pass
HT 20 / MCS0	100	5500	-1.38	-0.91	See Section 8.2.2	Pass
HT 20 / MCS0	124	5620	2.59	-0.34	See Section 8.2.2	Pass
HT 20 / MCS0	144	5720	-6.94	-3.74	See Section 8.2.2	Pass
HT 40 / MCS0	102	5510	-5.81	-4.46	See Section 8.2.2	Pass
HT 40 / MCS0	126	5630	-4.69	-1.53	See Section 8.2.2	Pass
HT 40 / MCS0	142	5710	-8.55	-5.84	See Section 8.2.2	Pass

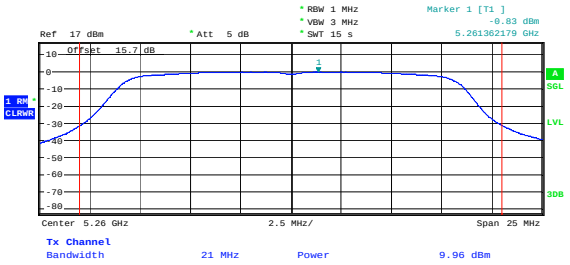
8.2.5 Highest PSD Measurement Plots:

Transmit Chain: 0	
Mode: 802.11a	Channel: 52



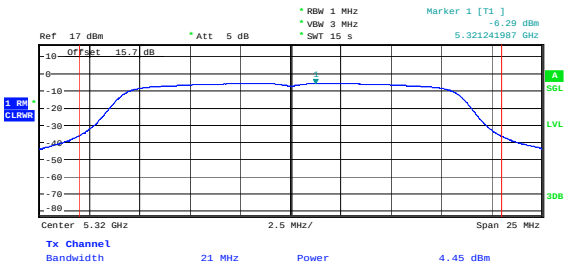
low
Date: 12.NOV.2018 16:34:19

Transmit Chain: 1	
Mode: 802.11a	Channel: 52



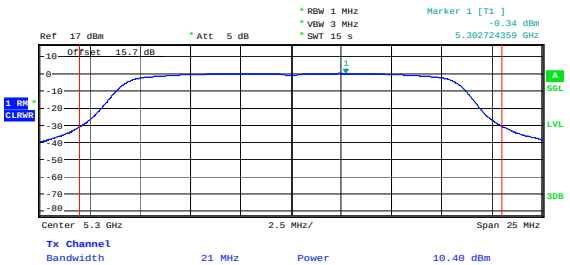
low
Date: 12.NOV.2018 16:14:45

Transmit Chain: 0	
Mode: 802.11a	Channel: 60



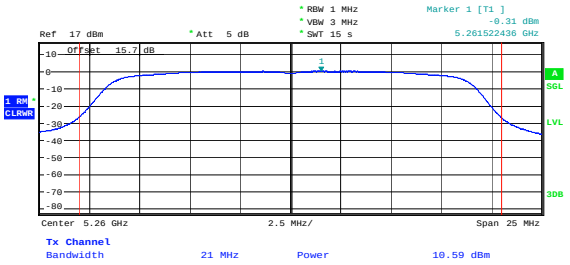
low
Date: 12.NOV.2018 16:37:43

Transmit Chain: 1	
Mode: 802.11a	Channel: 60



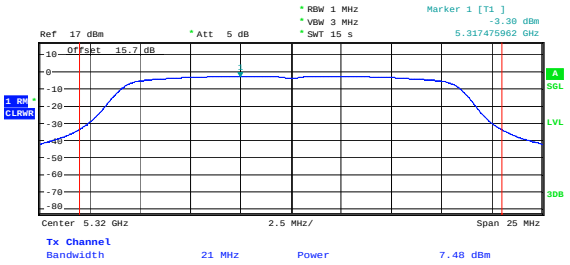
low
Date: 12.NOV.2018 16:16:08

Transmit Chain: 0	
Mode: 802.11a	**Channel: 64**



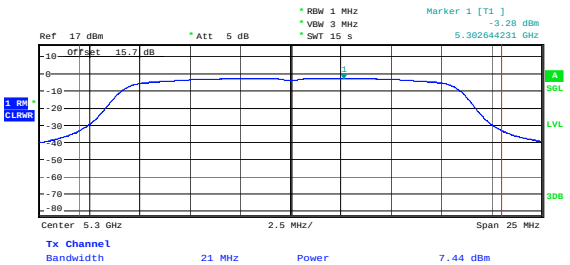
low
Date: 12.NOV.2018 16:50:08

Transmit Chain: 1	
Mode: 802.11a	**Channel: 64**



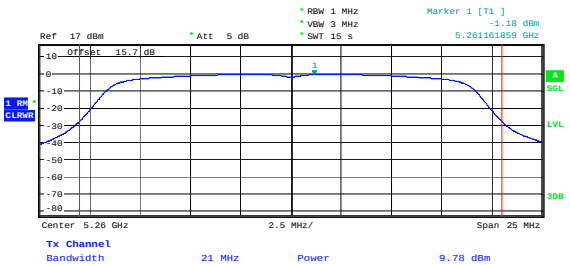
low
Date: 12.NOV.2018 16:19:30

Transmit Chain: 0	
Mode: 802.11n20	**Channel: 52**



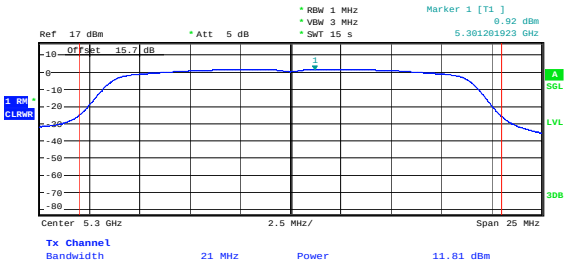
low
Date: 12.NOV.2018 16:35:47

Transmit Chain: 1	
Mode: 802.11n20	**Channel: 52**



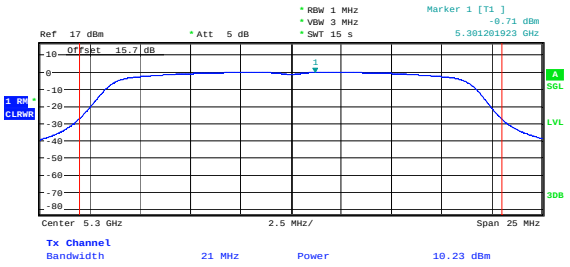
low
Date: 12.NOV.2018 16:30:23

Transmit Chain: 0	
Mode: 802.11n20	**Channel: 60**



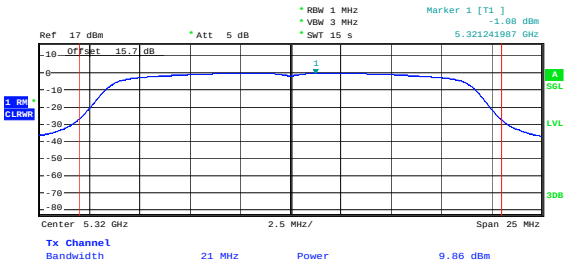
low
Date: 12.NOV.2018 16:49:14

Transmit Chain: 1	
Mode: 802.11n20	**Channel: 60**



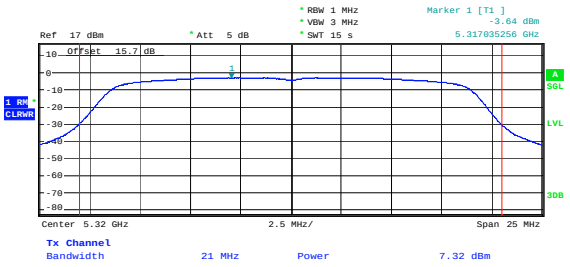
low
Date: 12.NOV.2018 16:29:19

Transmit Chain: 0	
Mode: 802.11n20	**Channel: 64**



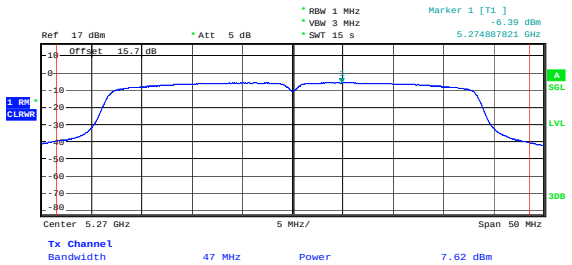
low
Date: 12.NOV.2018 16:47:59

Transmit Chain: 1	
Mode: 802.11n20	**Channel: 64**



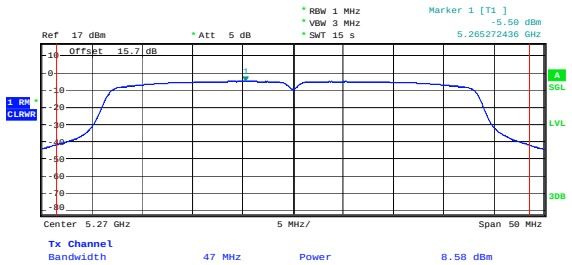
low
Date: 12.NOV.2018 16:28:04

Transmit Chain: 0	
Mode: 802.11n40	Channel: 54



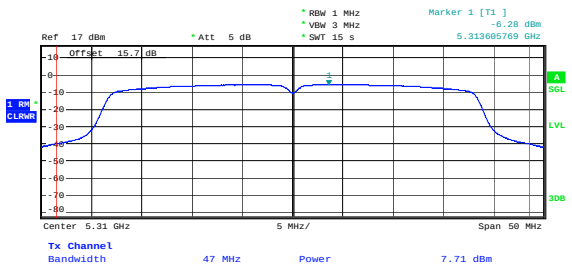
low
Date: 12.NOV.2018 17:05:37

Transmit Chain: 1	
Mode: 802.11n40	Channel: 54



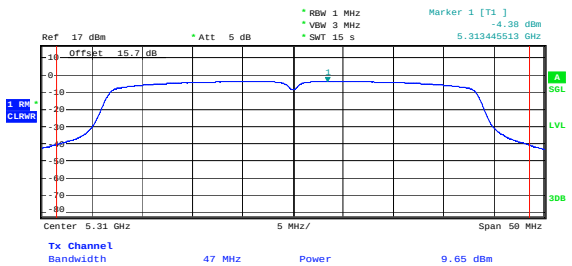
low
Date: 12.NOV.2018 17:33:51

Transmit Chain: 0	
Mode: 802.11n40	Channel: 62



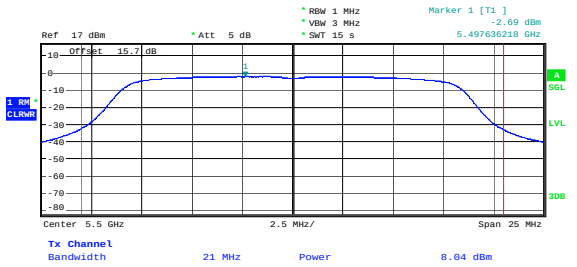
low
Date: 12.NOV.2018 17:06:49

Transmit Chain: 1	
Mode: 802.11n40	Channel: 62



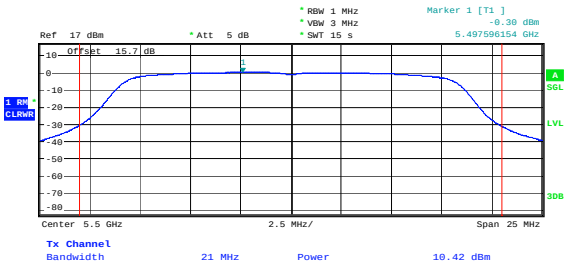
low
Date: 12.NOV.2018 17:32:41

Transmit Chain: 0	
Mode: 802.11a	Channel: 100



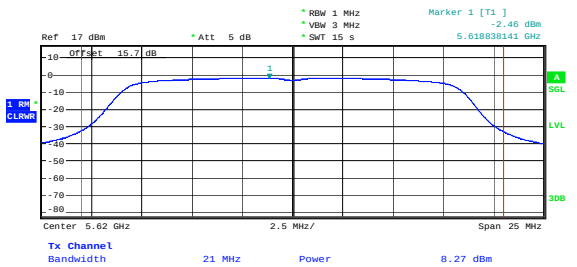
low
Date: 12.NOV.2018 16:39:30

Transmit Chain: 1	
Mode: 802.11a	Channel: 100



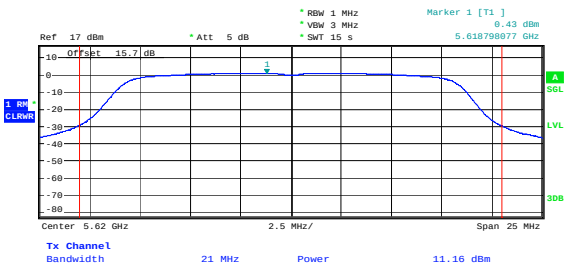
low
Date: 12.NOV.2018 14:49:17

Transmit Chain: 0	
Mode: 802.11a	Channel: 124



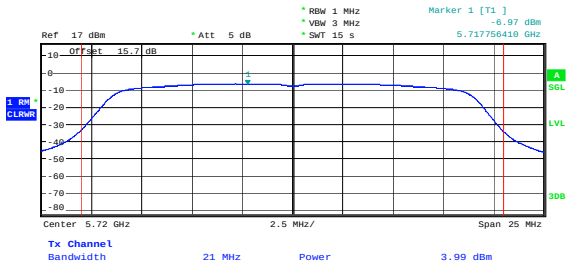
low
Date: 12.NOV.2018 16:41:02

Transmit Chain: 1	
Mode: 802.11a	Channel: 124



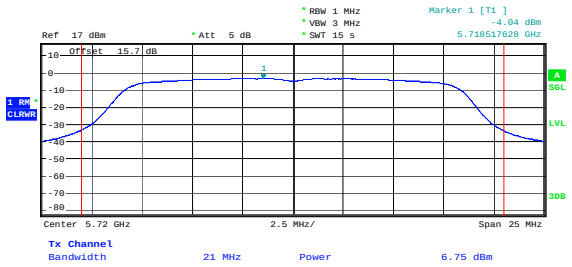
low
Date: 12.NOV.2018 16:21:20

Transmit Chain: 0	
Mode: 802.11a	**Channel: 144**



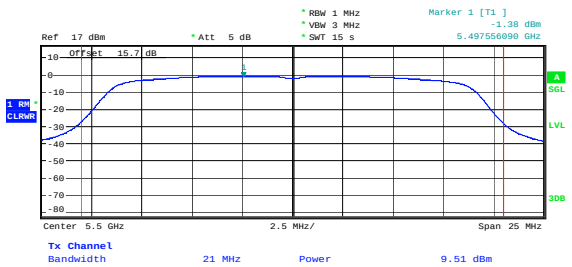
low
Date: 12.NOV.2018 16:43:43

Transmit Chain: 1	
Mode: 802.11a	**Channel: 144**



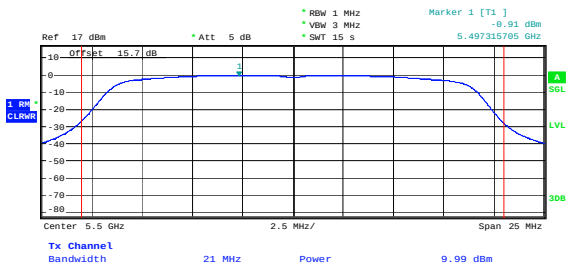
low
Date: 12.NOV.2018 16:23:54

Transmit Chain: 0	
Mode: 802.11n20	**Channel: 100**



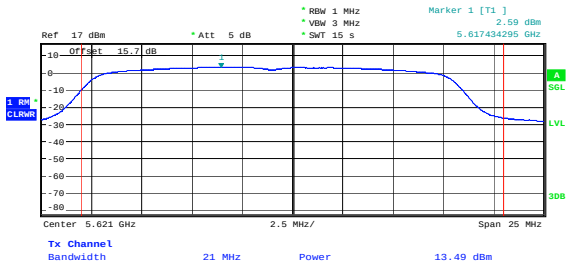
low
Date: 12.NOV.2018 16:46:49

Transmit Chain: 1	
Mode: 802.11n20	**Channel: 100**



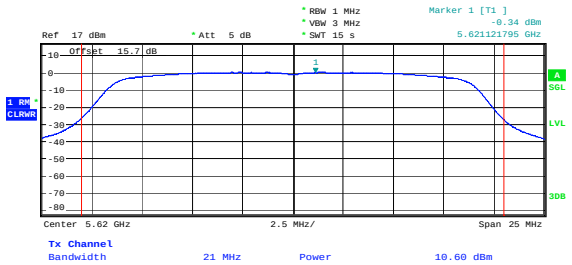
low
Date: 12.NOV.2018 14:51:50

Transmit Chain: 0	
Mode: 802.11n20	Channel: 124



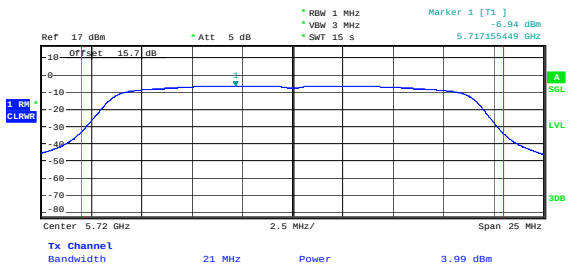
low
Date: 12.NOV.2018 16:45:26

Transmit Chain: 1	
Mode: 802.11n20	Channel: 124



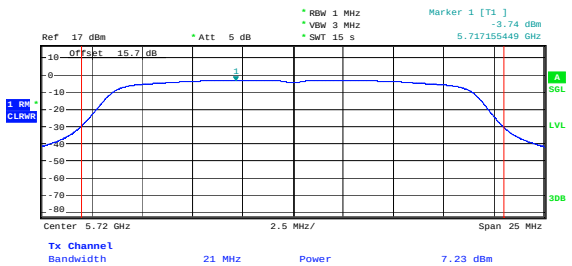
low
Date: 12.NOV.2018 16:26:28

Transmit Chain: 0	
Mode: 802.11n20	Channel: 144



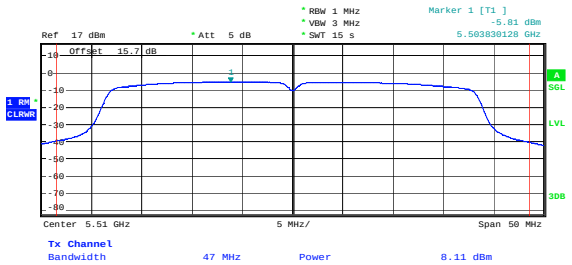
low
Date: 12.NOV.2018 16:43:52

Transmit Chain: 1	
Mode: 802.11n20	Channel: 144



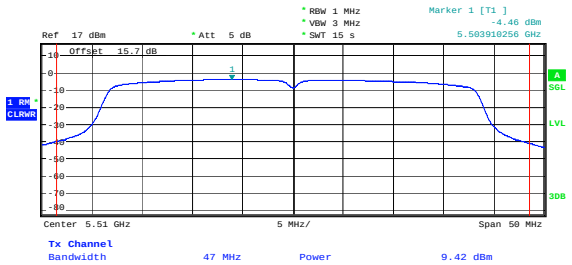
low
Date: 12.NOV.2018 16:25:10

Transmit Chain: 0	
Mode: 802.11n40	Channel: 102



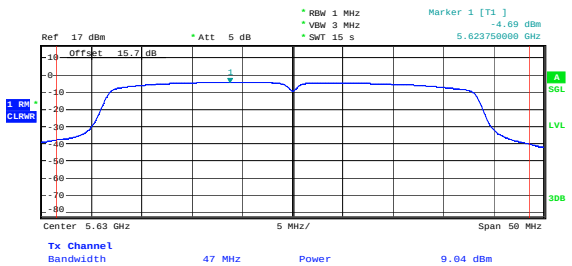
low
Date: 12.NOV.2018 17:08:18

Transmit Chain: 1	
Mode: 802.11n40	Channel: 102



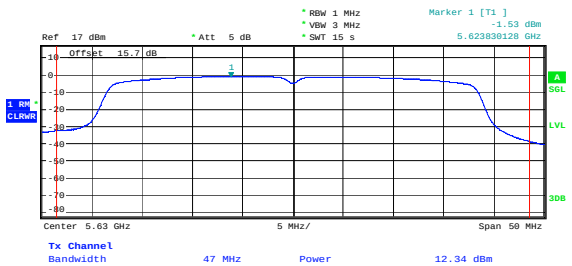
low
Date: 12.NOV.2018 17:30:32

Transmit Chain: 0	
Mode: 802.11n40	Channel: 126



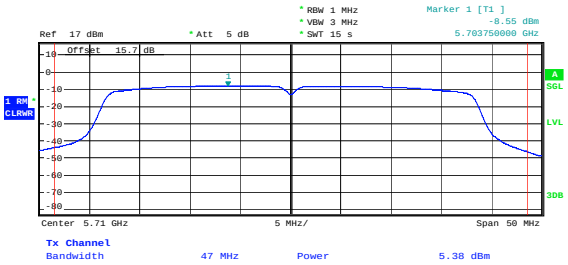
low
Date: 12.NOV.2018 17:09:25

Transmit Chain: 1	
Mode: 802.11n40	Channel: 126



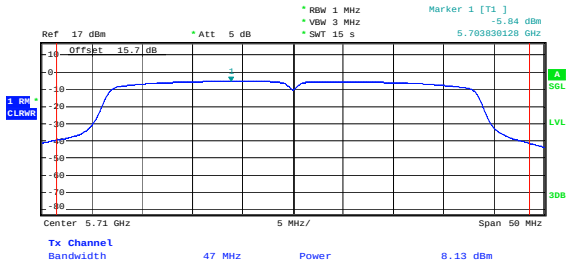
low
Date: 12.NOV.2018 17:29:01

Transmit Chain: 0	
Mode: 802.11n40	**Channel: 142**



low
Date: 12.NOV.2018 17:11:02

Transmit Chain: 1	
Mode: 802.11n40	**Channel: 142**



low
Date: 12.NOV.2018 17:13:08

8.3 Band Edge Compliance

8.3.1 Measurement according to FCC 789033 D02 General UNII Test Procedures New Rules v02r01 and ANSI 63.10

Non Restricted Band Edge and Restricted Band Edge Peak Measurement Spectrum Analyzer Settings:

- Set the center frequency and span to encompass frequency range to be measured
- RBW = 100 kHz
- VBW ≥ 3 x RBW
- Sweep Time: Auto couple
- Detector = Peak
- Trace = Max hold
- Allow trace to fully stabilize
- Use the peak marker function to determine the maximum amplitude level
- Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge

Restricted Band Edge Average Measurement Spectrum Analyzer Settings:

- Set the center frequency and span to encompass frequency range to be measured
- RBW = 100 kHz
- VBW ≥ 3 x RBW
- Sweep Time: Auto couple
- Detector = RMS (Power Averaging)
- Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
- Perform band-power integration across the 1 MHz bandwidth in which the band-edge emission level is to be measured

8.3.2 Limits non restricted band:

FCC§15.407 (b); RSS-247 6

- For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

- For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

8.3.3 Limits for restricted band §15.407/15.209/15.205 and RSS-Gen 8.9/8.10

- *PEAK LIMIT= 74 dBµV/m @3m =-21.23 dBm

- *AVG. LIMIT= 54 dBµV/m @3m =-41.23 dBm
- Start frequency & stop frequency according to frequency range specified in the restricted band table in FCC section 15.205 & RSS-Gen 8.10

Only spurious emissions are permitted in any of the frequency bands listed below			
MHz	**MHz**	**MHz**	**GHz**
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

8.3.4 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
22° C	1	802.11a/n	5 VDC	5.5 dBi

8.3.5 Measurement result:

Plot #	EUT operating mode	Tx Chain	CH #	Frequency (MHz)	Band Edge	Measured Peak Value (dBm)	Corrected by duty cycle (dBm)	Corrected by Antenna Gain (dBm)	Limit (dBm)	Result
1	802.11a	0	52	5260	Lower Restricted peak	-57.93	-57.75	-52.25	-21.23 Peak	Pass
2	802.11a	0	52	5260	Lower Restricted Average	-70.81	-70.63	-65.13	-41.23 AVG	Pass
3	802.11n_HT20	0	52	5260	Lower Restricted peak	-54.52	-54.34	-48.84	-21.23 Peak	Pass
4	802.11n_HT20	0	52	5260	Lower Restricted Average	-66.54	-66.36	-60.86	-41.23 AVG	Pass
5	802.11n_HT40	0	54	5270	Lower Restricted peak	-42.2	-41.84	-36.34	-21.23 Peak	Pass
6	802.11n_HT40	0	54	5270	Lower Restricted Average	-66	-65.64	-60.14	-41.23 AVG	Pass

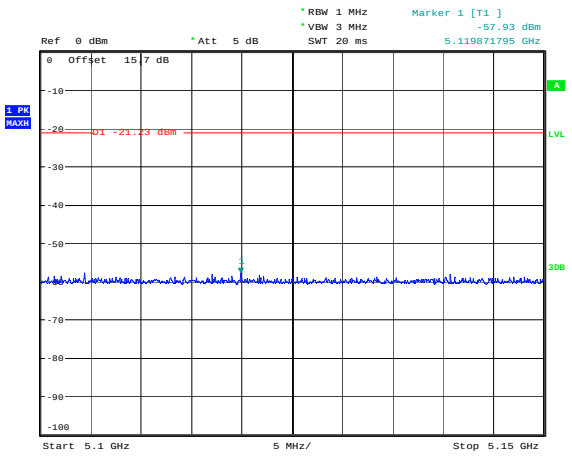
7	802.11a	0	64	5320	Upper Restricted peak	-34.19	-34.01	-28.51	-21.23 Peak	Pass
8	802.11a	0	64	5320	Upper Restricted Average	-54.3	-54.12	-48.62	-41.23 AVG	Pass
9	802.11n_HT20	0	64	5320	Upper Restricted peak	-28.66	-28.48	-22.98	-21.23 Peak	Pass
10	802.11n_HT20	0	64	5320	Upper Restricted Average	-53.51	-53.33	-47.83	-41.23 AVG	Pass
11	802.11n_HT40	0	62	5310	Upper Restricted peak	-27.14	-26.78	-21.28	-21.23 Peak	Pass
12	802.11n_HT40	0	62	5310	Upper Restricted Average	-49.83	-49.47	-43.97	-41.23 AVG	Pass
13	802.11a	0	100	5500	Lower Restricted peak	-33.77	-33.59	-28.09	-21.23 Peak	Pass
14	802.11a	0	100	5500	Lower Restricted Average	-54.58	-54.4	-48.9	-41.23 AVG	Pass
15	802.11n_HT20	0	100	5500	Lower Restricted peak	-27.07	-26.89	-21.39	-21.23 Peak	Pass
16	802.11n_HT20	0	100	5500	Lower Restricted Average	-54.5	-54.32	-48.82	-41.23 AVG	Pass
17	802.11n_HT40	0	102	5510	Lower Restricted peak	-29.62	-29.26	-23.76	-21.23 Peak	Pass
18	802.11n_HT40	0	102	5510	Lower Restricted Average	-53.8	-53.44	-47.94	-41.23 AVG	Pass
19	802.11a	0	144	5720	Upper, Non-restricted	-55.93	-55.75	-50.25	-27	Pass
20	802.11n_HT20	0	144	5720	Upper, Non-restricted	-56.15	-55.97	-50.47	-27	Pass
21	802.11n_HT40	0	142	5710	Upper, Non-restricted	-47.1	-46.74	-41.24	-27	Pass

Plot #	EUT operating mode	Tx Chain	CH #	Frequency (MHz)	Band Edge	Measured Peak Value (dBm)	Corrected by duty cycle (dBm)	Corrected by Antenna Gain (dBm)	Limit (dBm)	Result
22	802.11a	1	52	5260	Lower Restricted peak	-53.13	-52.95	-47.45	-21.23 Peak	Pass
23	802.11a	1	52	5260	Lower Restricted Average	-65.09	-64.91	-59.41	-41.23 AVG	Pass
24	802.11n_HT20	1	52	5260	Lower Restricted peak	-52.98	-52.8	-47.3	-21.23 Peak	Pass
25	802.11n_HT20	1	52	5260	Lower Restricted Average	-65.1	-64.92	-59.42	-41.23 AVG	Pass
26	802.11n_HT40	1	54	5270	Lower Restricted peak	-40.77	-40.41	-34.91	-21.23 Peak	Pass
27	802.11n_HT40	1	54	5270	Lower Restricted Average	-64.64	-64.28	-58.78	-41.23 AVG	Pass
28	802.11a	1	64	5320	Upper Restricted peak	-30.46	-30.28	-24.78	-21.23 Peak	Pass
29	802.11a	1	64	5320	Upper Restricted Average	-50.92	-50.74	-45.24	-41.23 AVG	Pass

30	802.11n_HT20	1	64	5320	Upper Restricted peak	-30.48	-30.3	-24.8	-21.23 Peak	Pass
31	802.11n_HT20	1	64	5320	Upper Restricted Average	-52.99	-52.81	-47.31	-41.23 AVG	Pass
32	802.11n_HT40	1	62	5310	Upper Restricted peak	-28.31	-27.95	-22.45	-21.23 Peak	Pass
33	802.11n_HT40	1	62	5310	Upper Restricted Average	-50.06	-49.7	-44.2	-41.23 AVG	Pass
34	802.11a	1	100	5500	Lower Restricted peak	-31.66	-31.48	-25.98	-21.23 Peak	Pass
35	802.11a	1	100	5500	Lower Restricted Average	-53.1	-52.92	-47.42	-41.23 AVG	Pass
36	802.11n_HT20	1	100	5500	Lower Restricted peak	-31.12	-30.94	-25.44	-21.23 Peak	Pass
37	802.11n_HT20	1	100	5500	Lower Restricted Average	-52.74	-52.56	-47.06	-41.23 AVG	Pass
38	802.11n_HT40	1	102	5510	Lower Restricted peak	-30	-29.64	-24.14	-21.23 Peak	Pass
39	802.11n_HT40	1	102	5510	Lower Restricted Average	-52.32	-51.96	-46.46	-41.23 AVG	Pass
40	802.11a	1	144	5720	Upper, Non-restricted	-54.76	-54.58	-49.08	-27	Pass
41	802.11n_HT20	1	144	5720	Upper, Non-restricted	-55.21	-55.03	-49.53	-27	Pass
42	802.11n_HT40	1	142	5710	Upper, Non-restricted	-43.74	-43.38	-37.88	-27	Pass

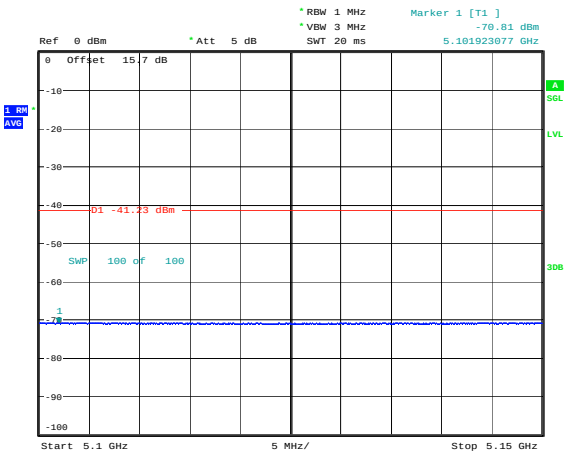
8.3.6 Measurement Plots:

Plot # 1		
a	Chain 0	CH# 52



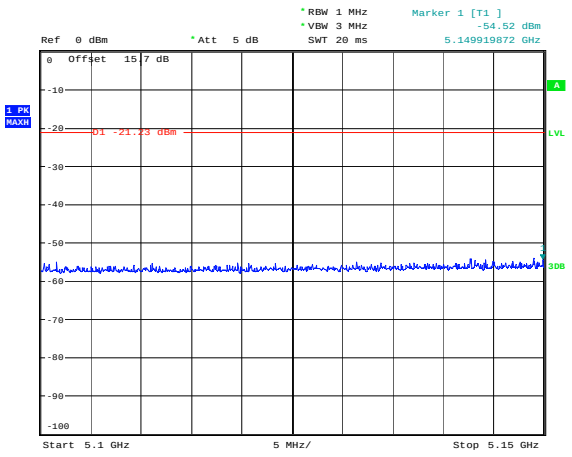
low
Date: 9.NOV.2018 19:01:42

Plot # 2		
a	Chain 0	CH# 52



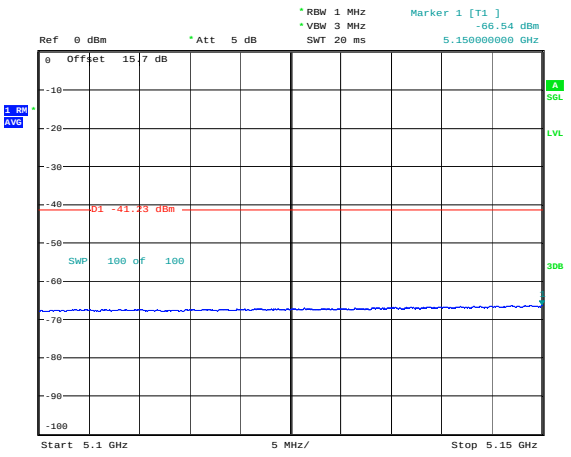
low
Date: 9.NOV.2018 19:00:20

Plot # 3		
HT20	Chain 0	CH# 52



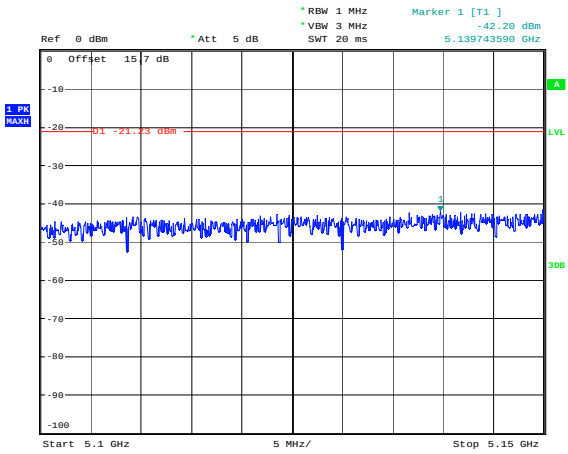
low
Date: 9.NOV.2018 19:02:45

Plot # 4		
HT20	Chain 0	CH# 52



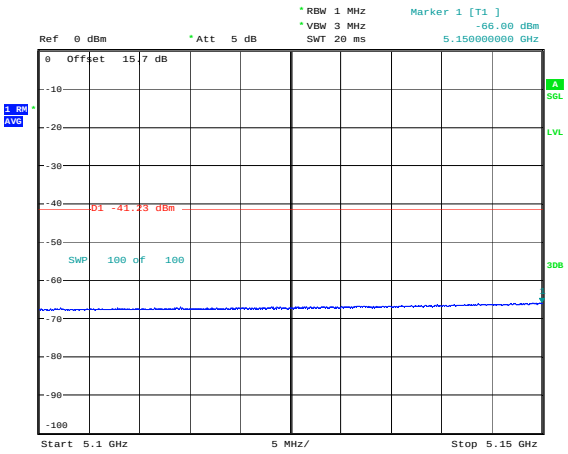
low
Date: 9.NOV.2018 18:59:03

Plot # 5		
HT40	Chain 0	CH# 54



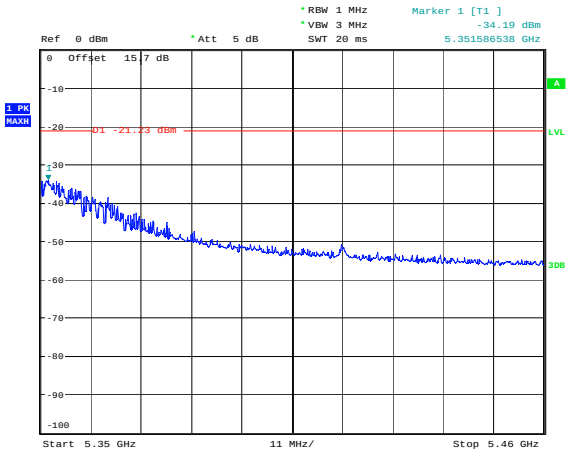
low
Date: 9.NOV.2018 18:54:17

Plot # 6		
HT40	Chain 0	CH# 54



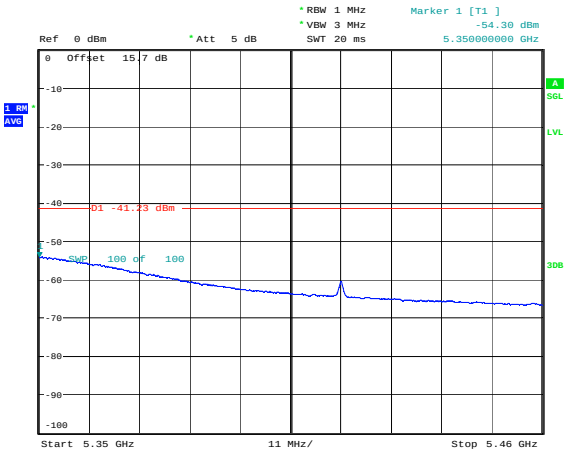
low
Date: 9.NOV.2018 18:57:26

Plot # 7		
a	Chain 0	CH# 64



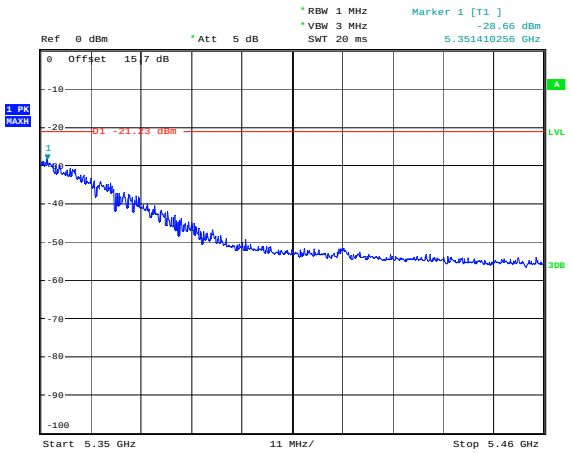
low
Date: 9.NOV.2018 18:14:32

Plot # 8		
a	Chain 0	CH# 64



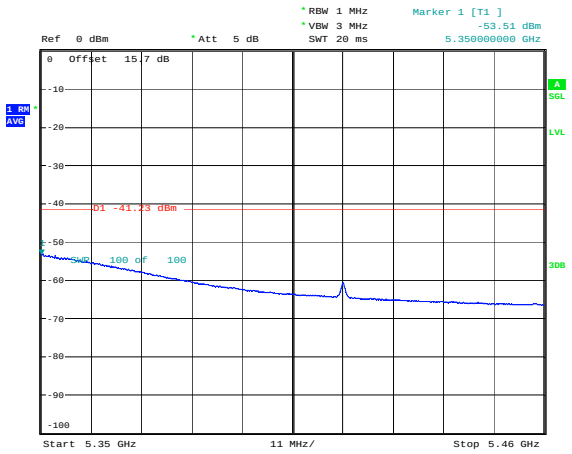
low
Date: 9.NOV.2018 17:53:32

Plot # 9		
HT20	Chain 0	CH# 64



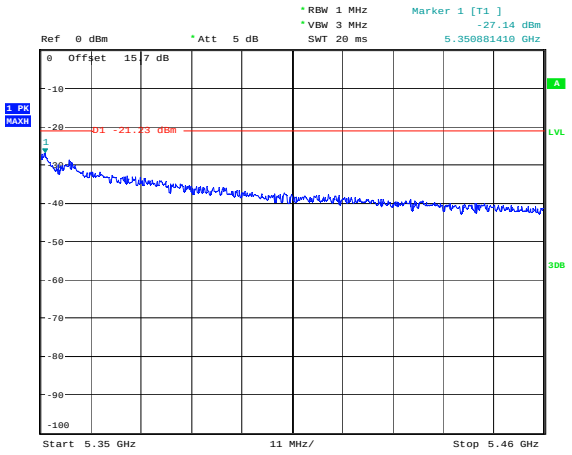
low
Date: 9.NOV.2018 18:22:48

Plot # 10		
HT20	Chain 0	CH# 64



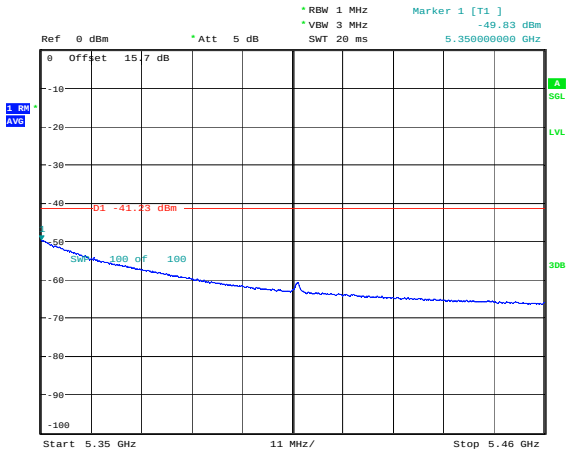
low
Date: 9.NOV.2018 17:52:11

Plot # 11		
HT40	Chain 0	CH# 62



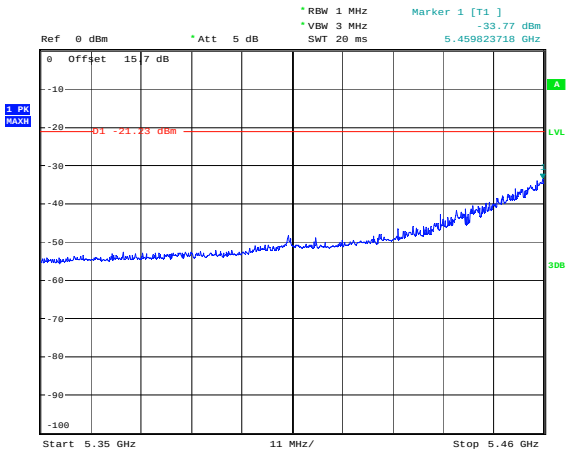
low
Date: 9.NOV.2018 18:32:45

Plot # 12		
HT40	Chain 0	CH# 62



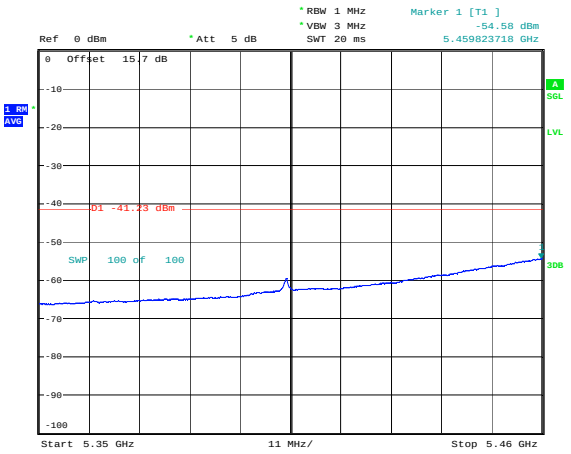
low
Date: 9.NOV.2018 17:49:47

Plot # 13		
a	Chain 0	CH# 100



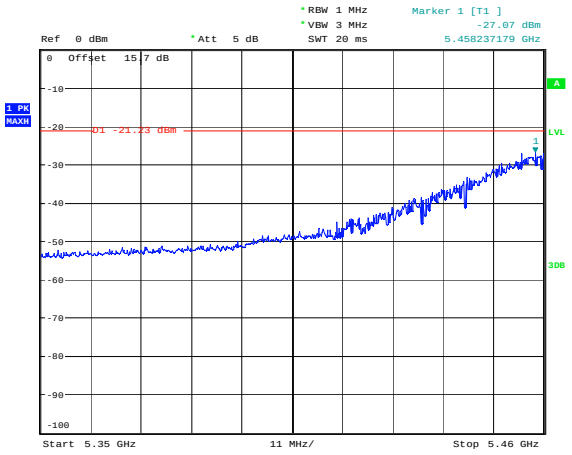
low
Date: 9.NOV.2018 16:22:31

Plot # 14		
a	Chain 0	CH# 100



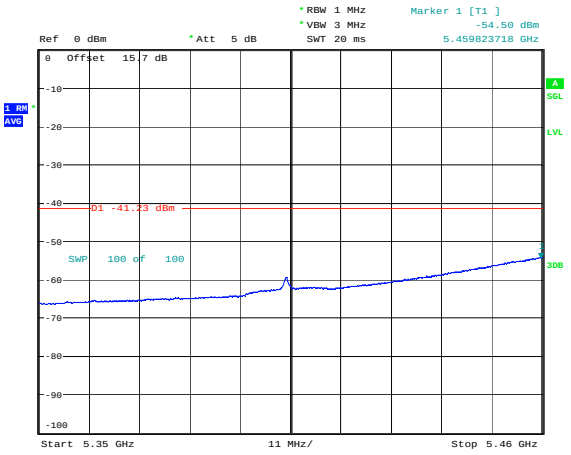
low
Date: 9.NOV.2018 17:04:15

Plot # 15		
HT20	Chain 0	CH# 100



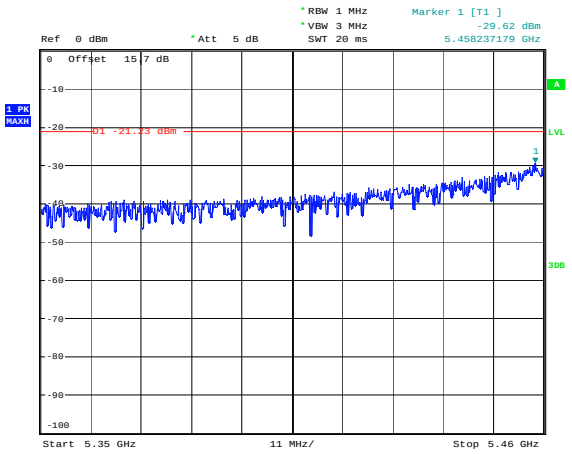
low
Date: 9.NOV.2018 13:21:46

Plot # 16		
HT20	Chain 0	CH# 100



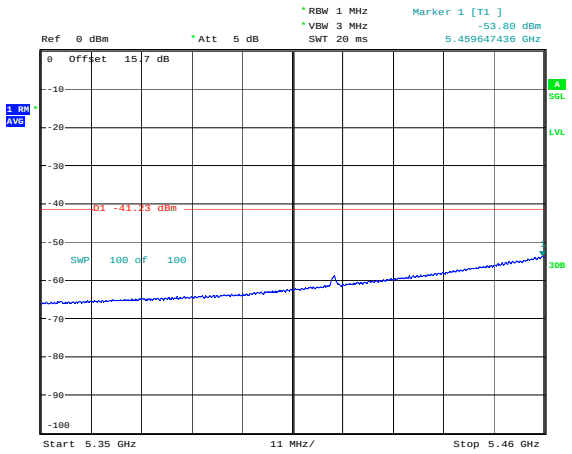
low
Date: 9.NOV.2018 17:01:41

Plot # 17		
HT40	Chain 0	CH# 102



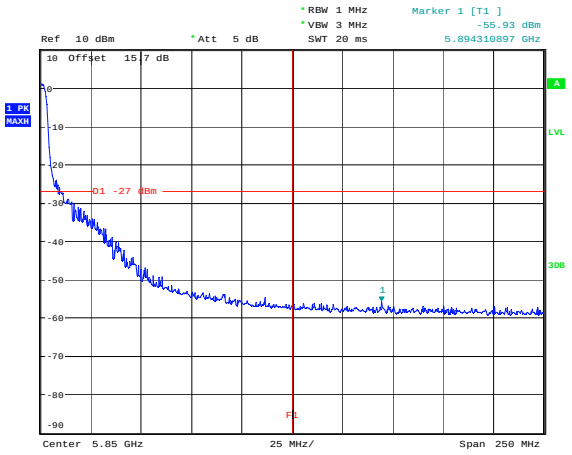
low
Date: 9.NOV.2018 16:30:40

Plot # 18		
HT40	Chain 0	CH# 102



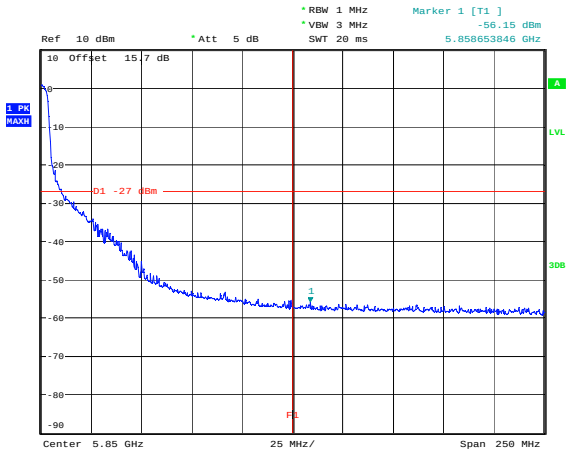
low
Date: 9.NOV.2018 16:58:13

Plot # 19		
a	Chain 0	CH# 144



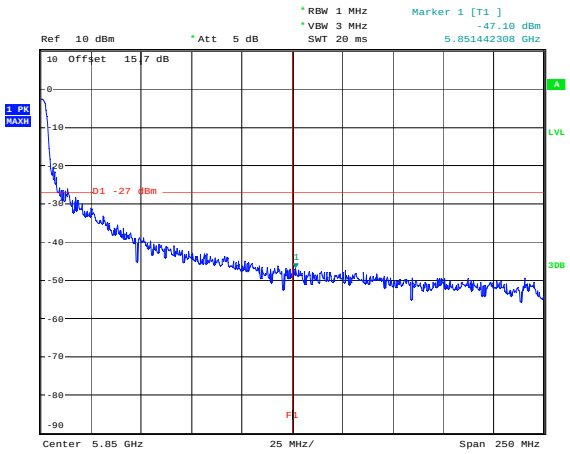
low
Date: 9.NOV.2018 19:28:43

Plot # 20		
HT20	Chain 0	CH# 144



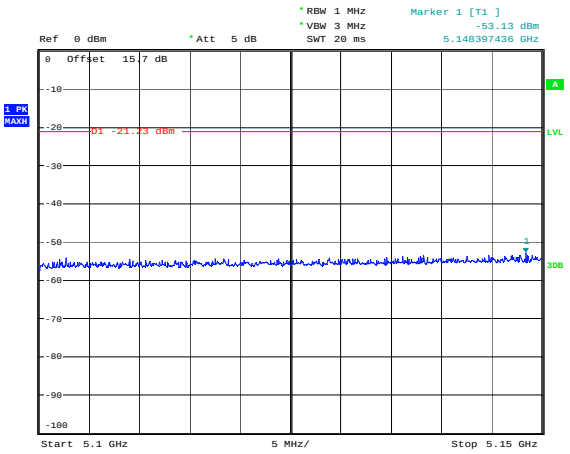
low
Date: 9.NOV.2018 19:27:30

Plot # 21		
HT40	Chain 0	CH# 142



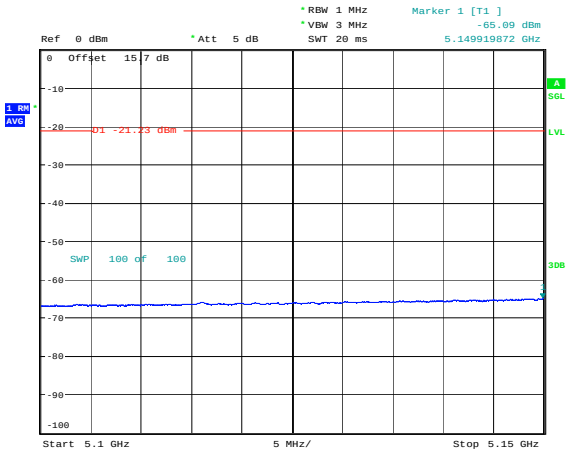
low
Date: 9.NOV.2018 19:24:53

Plot # 22		
a	Chain 1	CH# 52



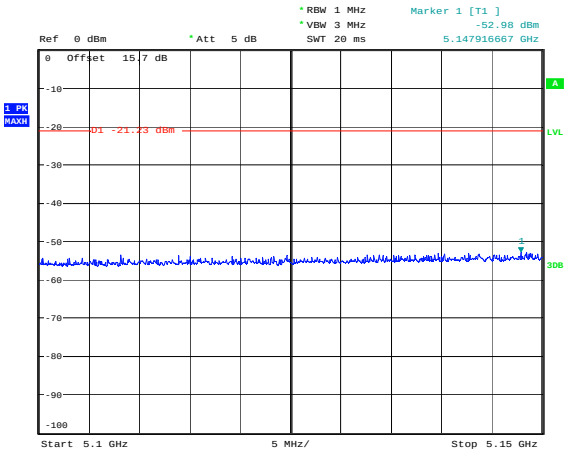
low
Date: 9.NOV.2018 19:07:09

Plot # 23		
a	Chain 1	CH# 52



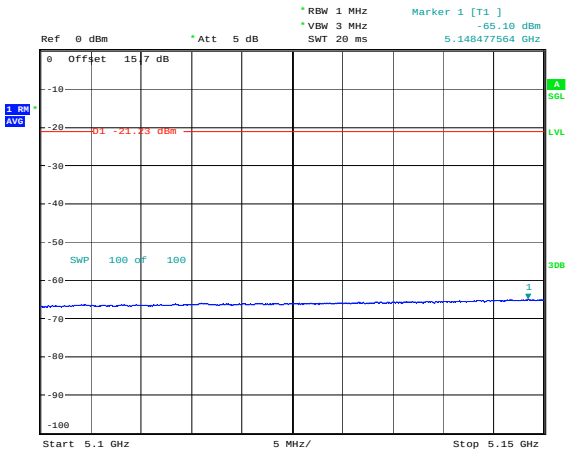
low
Date: 9.NOV.2018 19:11:41

Plot # 24		
HT20	Chain 1	CH# 52



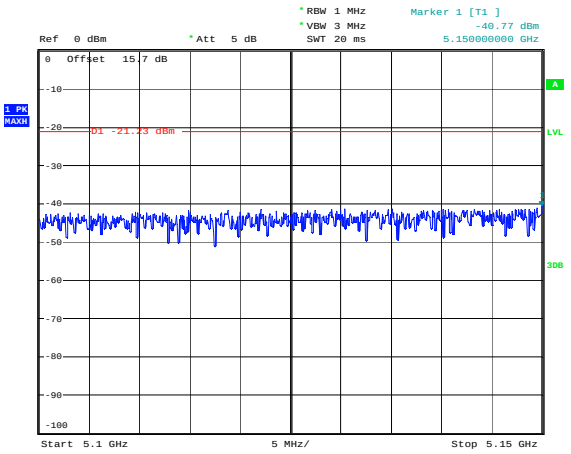
low
Date: 9.NOV.2018 19:06:19

Plot # 25		
HT20	Chain 1	CH# 52



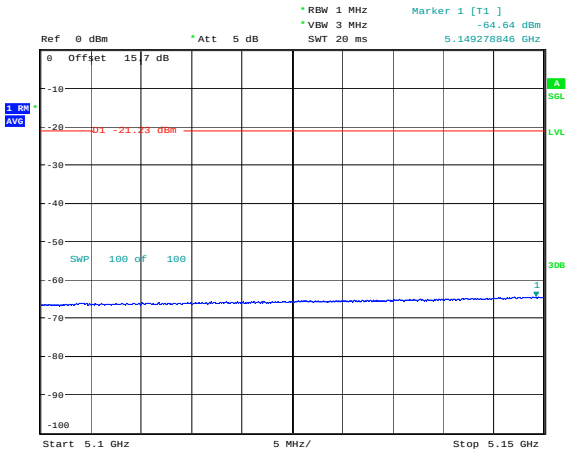
low
Date: 9.NOV.2018 19:10:52

Plot # 26		
HT40	Chain 1	CH# 54



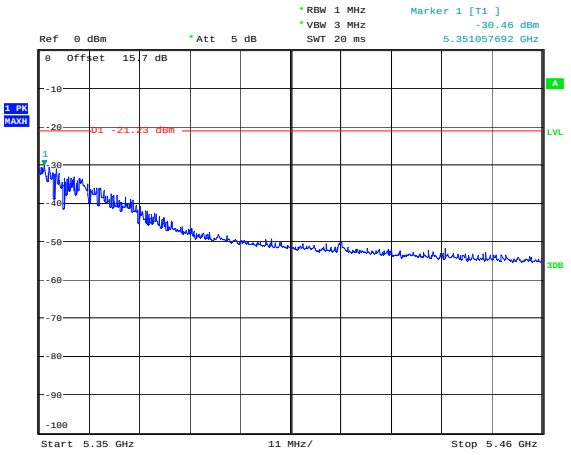
low
Date: 9.NOV.2018 19:08:11

Plot # 27		
HT40	Chain 1	CH# 54



low
Date: 9.NOV.2018 19:09:41

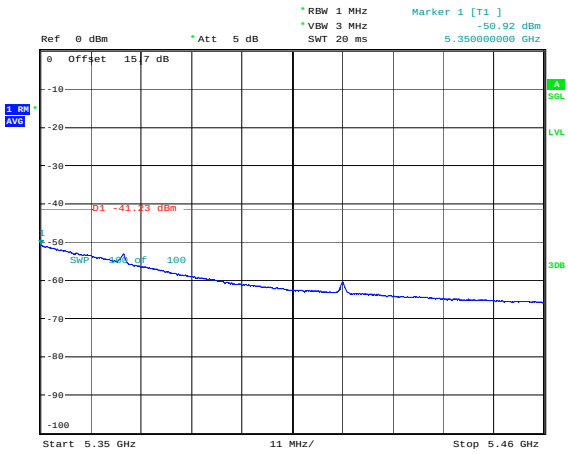
Plot # 28		
a	Chain 1	CH# 64



low
Date: 9.NOV.2018 18:12:21

Plot # 29

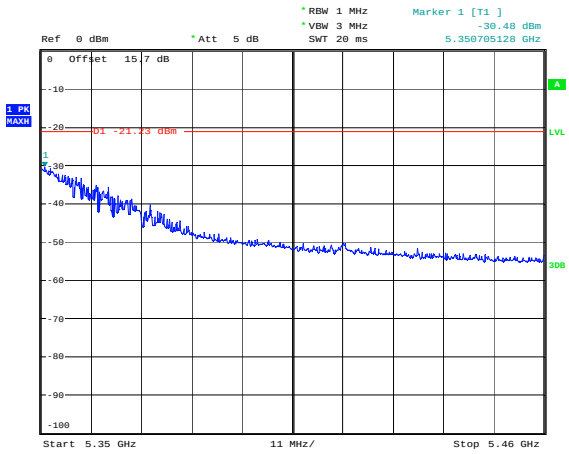
a	Chain 1	CH# 64



low
Date: 9.NOV.2018 17:55:08

Plot # 30

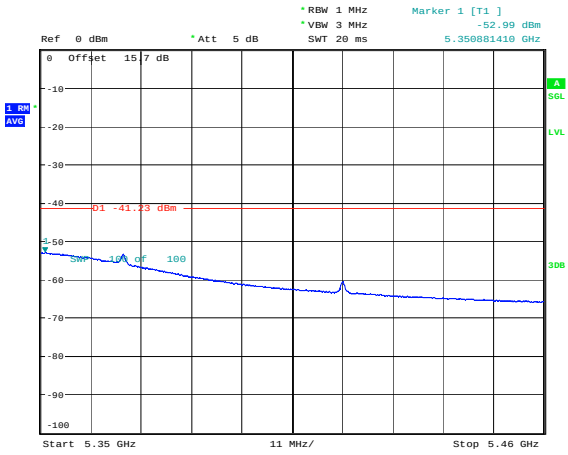
HT20	Chain 1	CH# 64



low
Date: 9.NOV.2018 18:10:43

Plot # 31

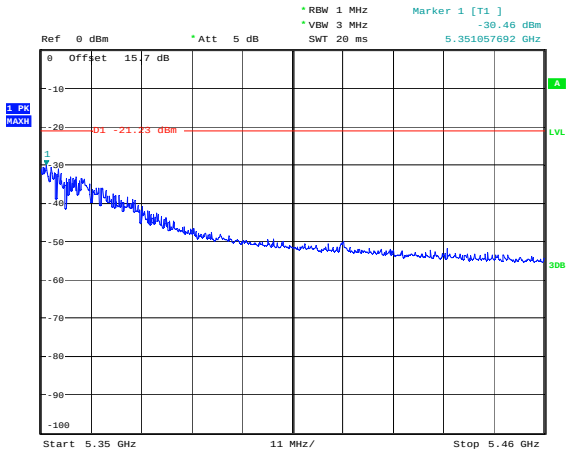
HT20	Chain 1	CH# 64



low
Date: 9.NOV.2018 17:56:33

Plot # 32

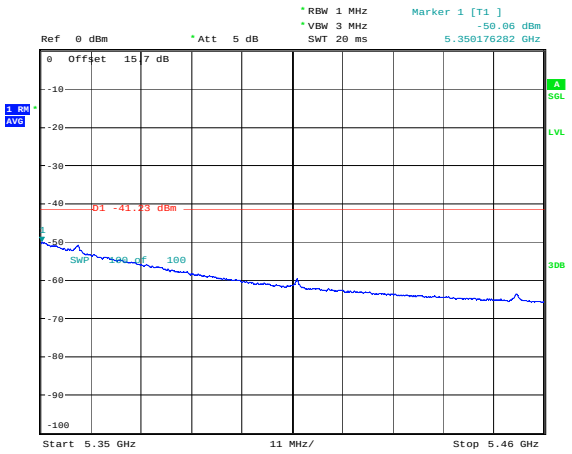
HT40	Chain 1	CH# 62



low
Date: 9.NOV.2018 18:12:21

Plot # 33

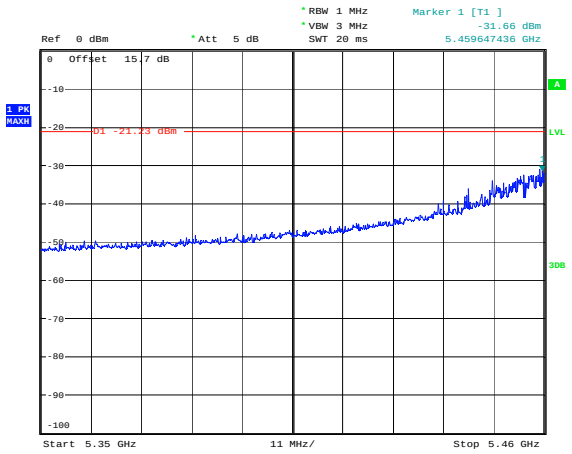
HT40	Chain 1	CH# 62



low
Date: 9.NOV.2018 17:58:02

Plot # 34

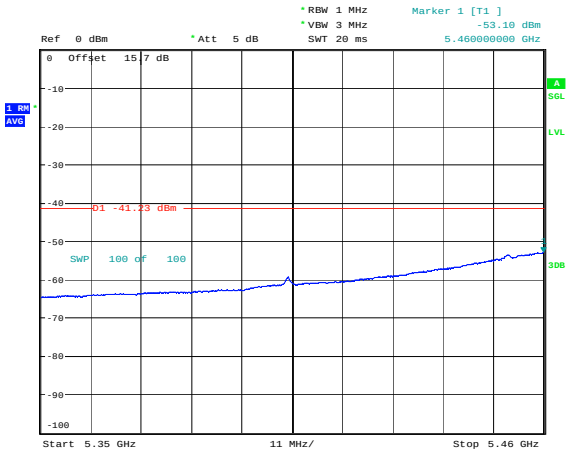
a	Chain 1	CH# 100



low
Date: 9.NOV.2018 16:35:07

Plot # 35

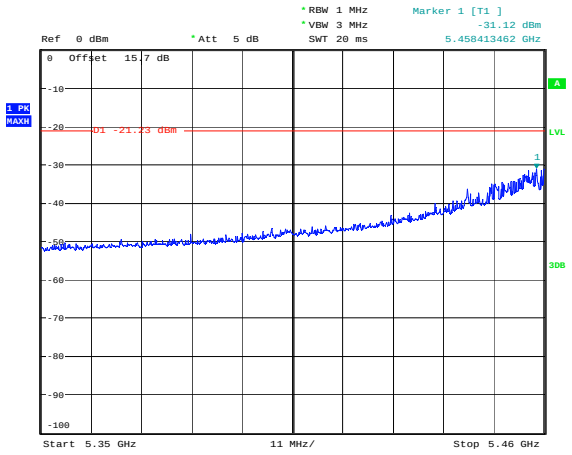
a	Chain 1	CH# 100



low
Date: 9.NOV.2018 16:51:55

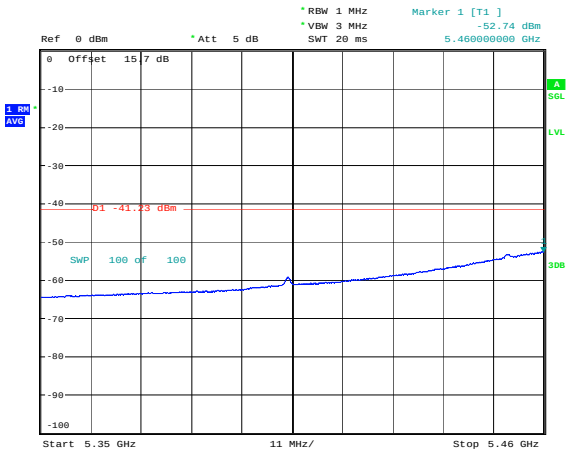
Plot # 36

HT20	Chain 1	CH# 100



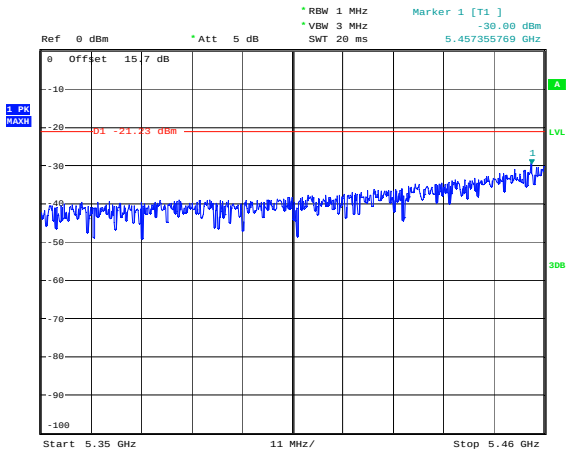
low
Date: 9.NOV.2018 16:34:07

Plot # 37		
HT20	Chain 1	CH# 100



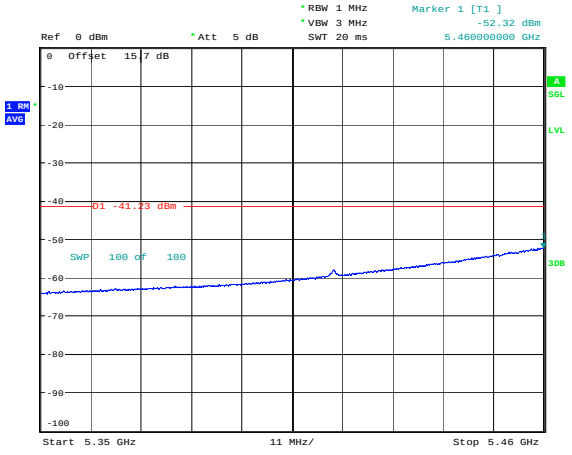
low
Date: 9.NOV.2018 16:55:00

Plot # 38		
HT40	Chain 1	CH# 102



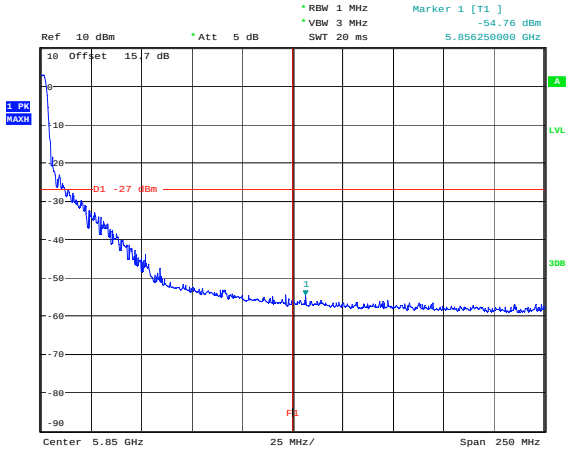
low
Date: 9.NOV.2018 16:33:01

Plot # 39		
HT40	Chain 1	CH# 102



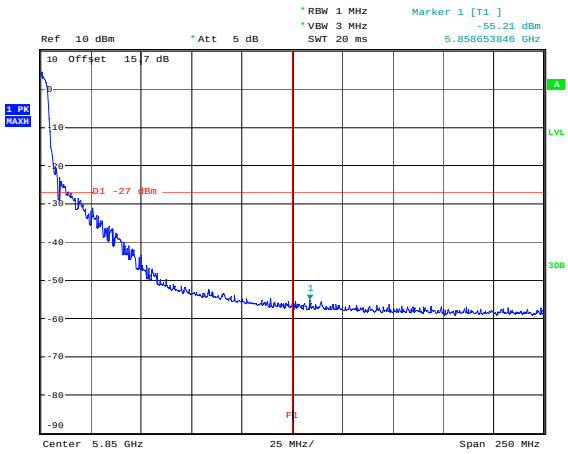
low
Date: 9.NOV.2018 16:56:51

Plot # 40		
a	Chain 1	CH# 144



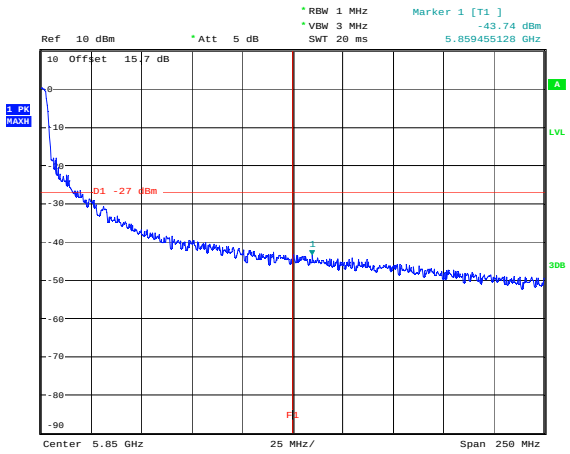
low
Date: 9.NOV.2018 19:16:30

Plot # 41		
HT20	Chain 1	CH# 144



low
Date: 9.NOV.2018 19:19:56

Plot # 42		
HT40	Chain 1	CH# 142



low
Date: 9.NOV.2018 19:21:23

8.4 Emission Bandwidth 26 dB, and 99%

8.4.1 Measurement according to FCC 789033 D02 General UNII Test Procedures New Rules v02r01

- For the bands 5.250-5.350 GHz and 5.470-5.725 GHz the 26 dB and 99% EBW is measured for informative purposes

Spectrum Analyzer Settings for 26 dB EBW:

- Set RBW = approximately 1% of the emission bandwidth
- Set the VBW > RBW
- Detector = Peak
- Trace mode = Max Hold
- Sweep = Auto Couple
- Allow the trace to stabilize
- Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%

Spectrum Analyzer Settings for 99% Occupied Bandwidth

- Set center frequency to the nominal EUT channel center frequency
- Set span = 1.5 times to 5.0 times the OBW
- Set RBW = 1% to 5% of the OBW
- Set VBW ≥ 3 x RBW
- Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used
- Use the 99% power bandwidth function of the instrument (if available)
- If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies

8.4.2 Limits:

FCC §15.407 and RSS-247

8.4.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22° C	1	802.11 a/n	5 VDC

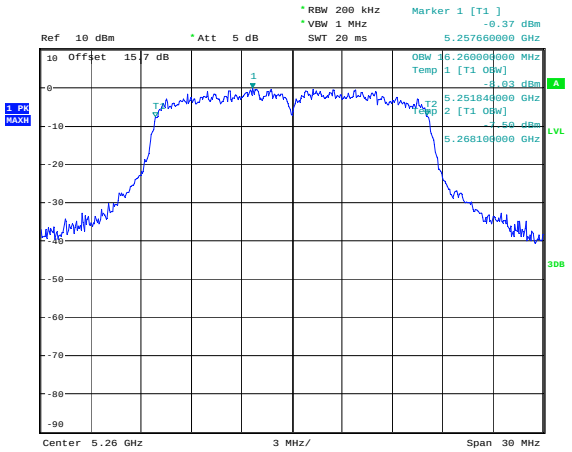
8.4.4 Measurement result:

Plot #	Mode	Channel	Frequency (MHz)	99% Emissions Bandwidth (MHz)
1	a / 6Mbps	52	5260	16.26
2	a / 6Mbps	60	5300	16.32
3	a / 6Mbps	64	5320	16.26
4	HT 20 / MCS0	52	5260	17.4
5	HT 20 / MCS0	60	5300	17.4
6	HT 20 / MCS0	64	5320	17.4
7	HT 40 / MCS0	54	5270	36.12
8	HT 40 / MCS0	62	5310	36.12
9	a / 6Mbps	100	5500	16.26
10	a / 6Mbps	124	5620	16.26
11	a / 6Mbps	144	5720	16.26
12	HT 20 / MCS0	100	5500	17.46
13	HT 20 / MCS0	124	5620	17.46
14	HT 20 / MCS0	144	5720	17.34
15	HT 40 / MCS0	102	5510	36.12
16	HT 40 / MCS0	126	5630	36.12
17	HT 40 / MCS0	142	5710	36.12

Plot #	Mode	Channel	Frequency (MHz)	26 dB Emissions Bandwidth (MHz)
18	a / 6Mbps	52	5260	20.047
19	a / 6Mbps	60	5300	20.047
20	a / 6Mbps	64	5320	19.604
21	HT 20 / MCS0	52	5260	20.806
22	HT 20 / MCS0	60	5300	20.257
23	HT 20 / MCS0	64	5320	20.614
24	HT 40 / MCS0	54	5270	46.411
25	HT 40 / MCS0	62	5310	46.005
26	a / 6Mbps	100	5500	19.908
27	a / 6Mbps	124	5620	19.364
28	a / 6Mbps	144	5720	19.182
29	HT 20 / MCS0	100	5500	20.47
30	HT 20 / MCS0	124	5620	20.797
31	HT 20 / MCS0	144	5720	20.143
32	HT 40 / MCS0	102	5510	46.694
33	HT 40 / MCS0	126	5630	46.706
34	HT 40 / MCS0	142	5710	45.065

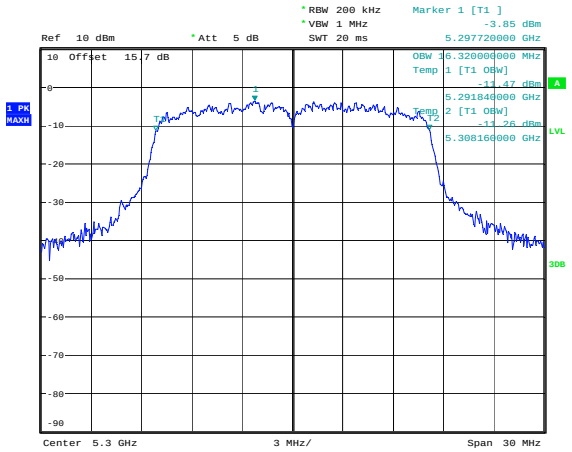
8.4.5 Measurement Plots:

Plot # 1		
a / 6Mbps	CH 52	99%



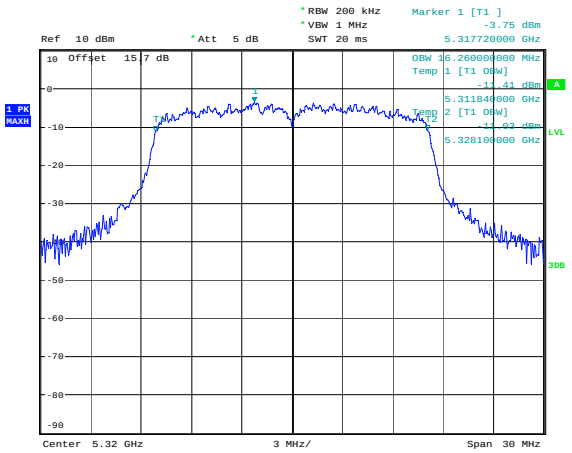
low
Date: 5.NOV.2018 16:11:39

Plot # 2		
a / 6Mbps	CH 60	99%



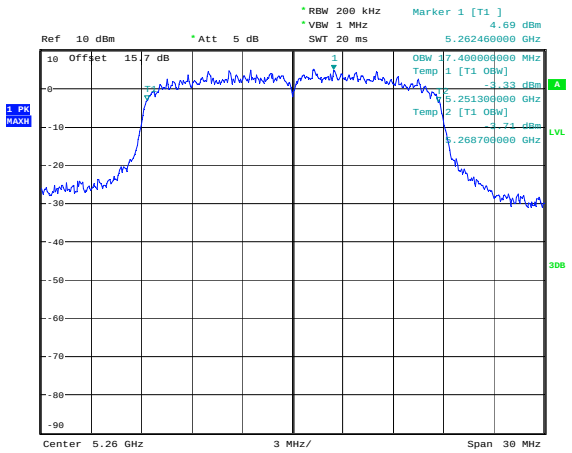
low
Date: 5.NOV.2018 16:17:11

Plot # 3		
a / 6Mbps	CH 64	99%



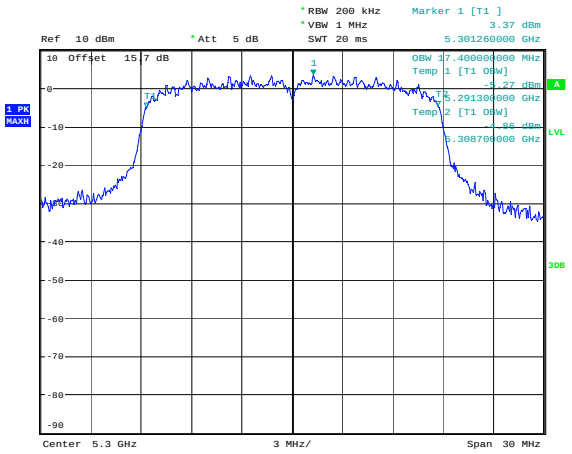
low
Date: 5.NOV.2018 16:20:32

Plot # 4		
HT 20 / MCS0	CH 52	99%



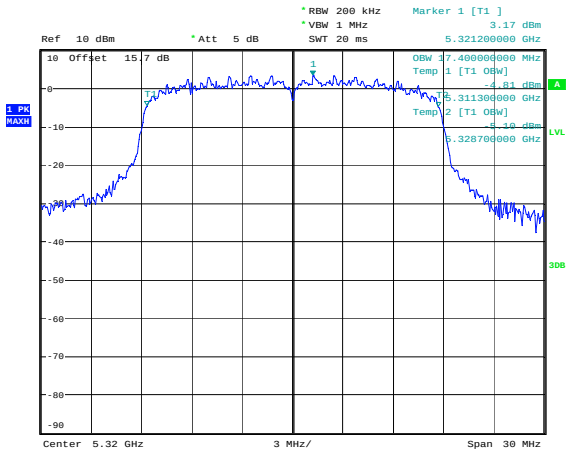
low
Date: 5.NOV.2018 16:35:10

Plot # 5		
HT 20 / MCS0	CH 60	99%



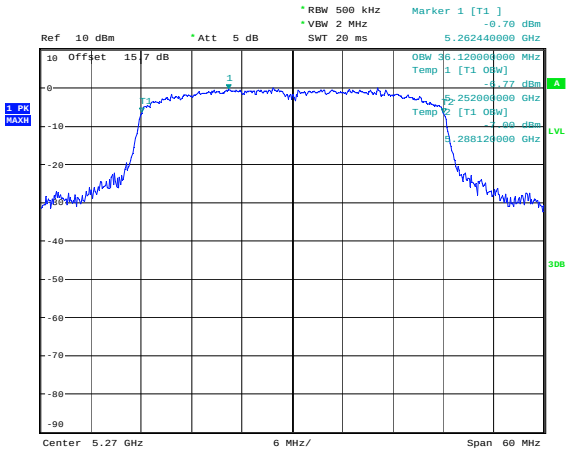
low
Date: 5.NOV.2018 16:34:13

Plot # 6		
HT 20 / MCS0	CH 64	99%



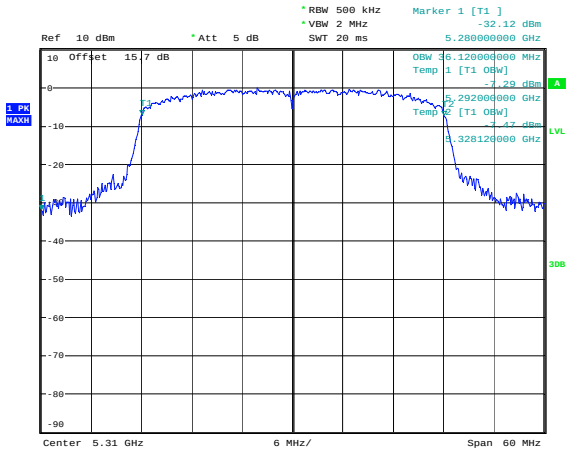
low
Date: 5.NOV.2018 16:29:25

Plot # 7		
HT 40 / MCS0	CH 54	99%



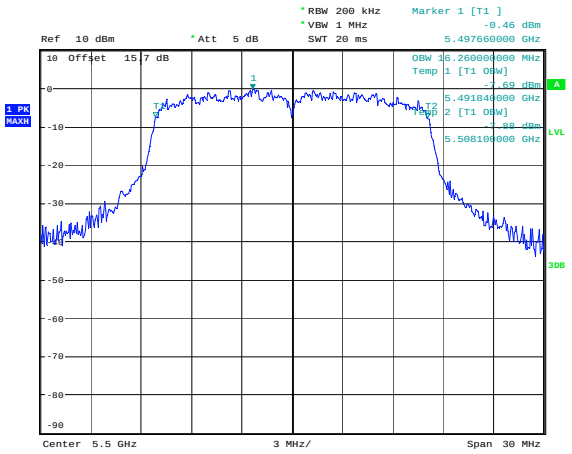
low
Date: 5.NOV.2018 16:42:53

Plot # 8		
HT 40 / MCS0	CH 62	99%



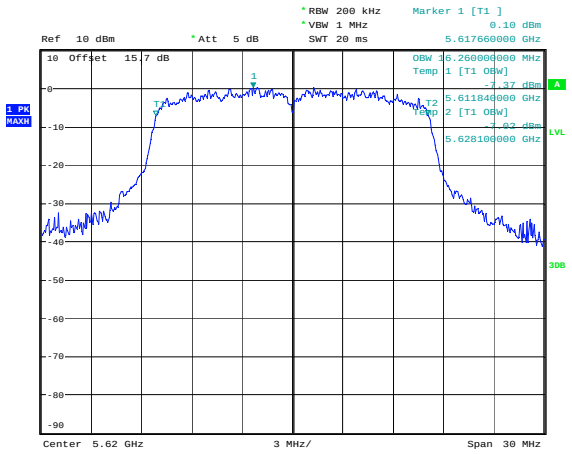
low
Date: 5.NOV.2018 16:44:18

Plot # 9		
a / 6Mbps	CH 100	99%



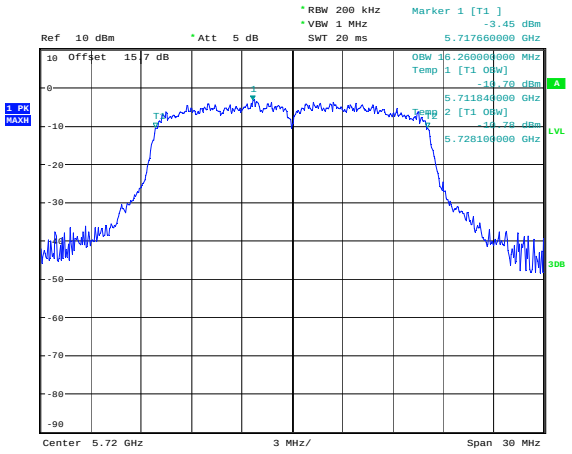
low
Date: 5.NOV.2018 17:25:40

Plot # 10		
a / 6Mbps	CH 124	99%



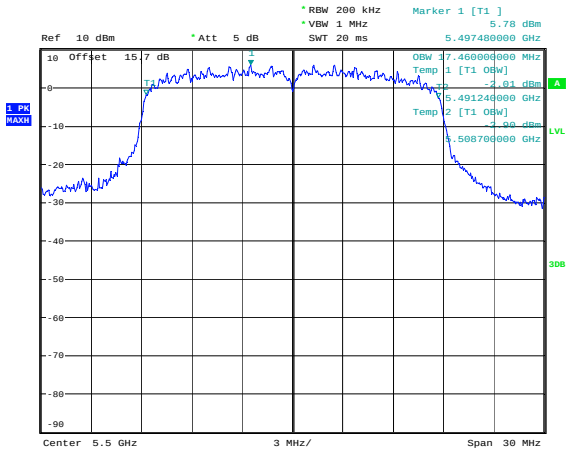
low
Date: 5.NOV.2018 17:28:21

Plot # 11		
a / 6Mbps	CH 144	99%



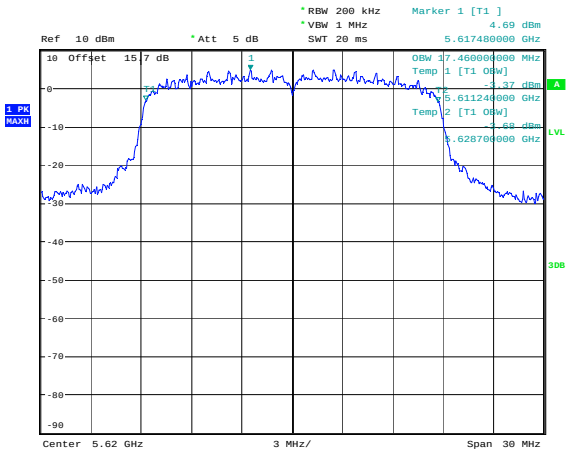
low
Date: 5.NOV.2018 17:30:42

Plot # 12		
HT 20 / MCS0	CH 100	99%



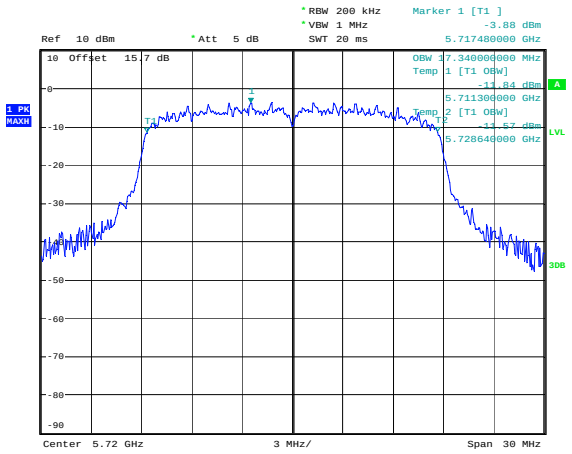
low
Date: 5.NOV.2018 17:17:25

Plot # 13		
HT 20 / MCS0	CH 124	99%



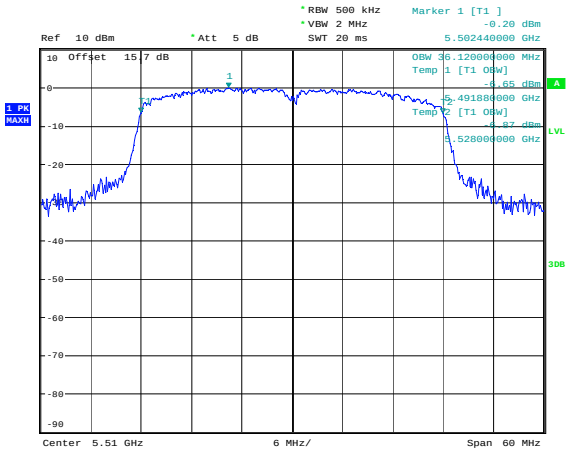
low
Date: 5.NOV.2018 17:20:39

Plot # 14		
HT 20 / MCS0	CH 144	99%



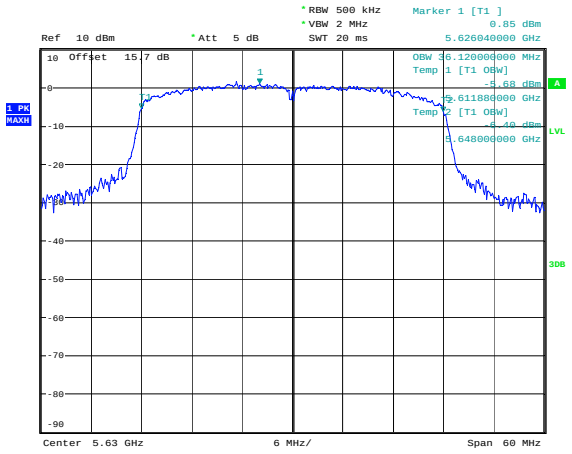
low
Date: 5.NOV.2018 17:22:53

Plot # 15		
HT 40 / MCS0	CH 102	99%



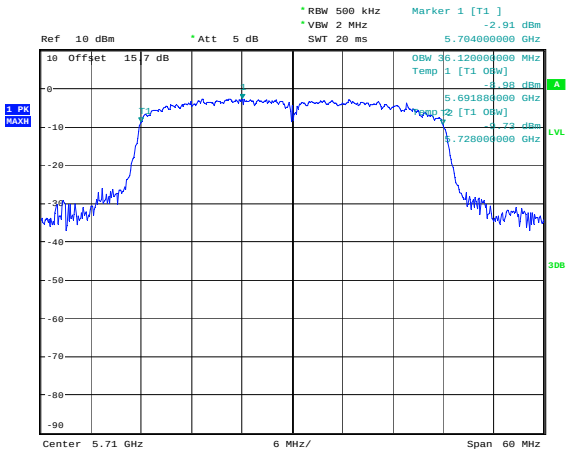
low
Date: 5.NOV.2018 17:06:12

Plot # 16		
HT 40 / MCS0	CH 126	99%



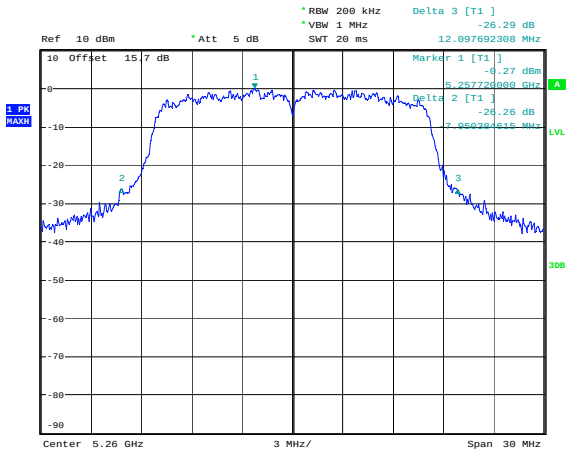
low
Date: 5.NOV.2018 17:10:00

Plot # 17		
HT 40 / MCS0	CH 142	99%



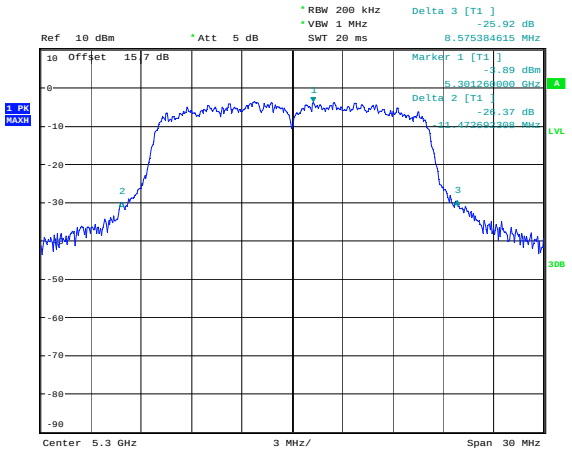
low
Date: 5.NOV.2018 17:13:16

Plot # 18		
a / 6Mbps	CH 52	26dB



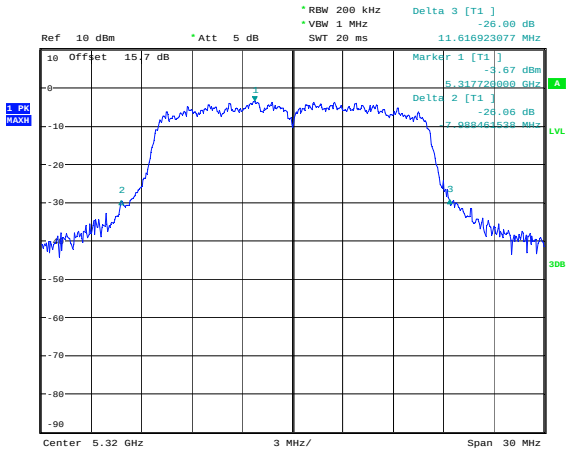
low
Date: 5.NOV.2018 16:13:31

Plot # 19		
a / 6Mbps	CH 60	26dB



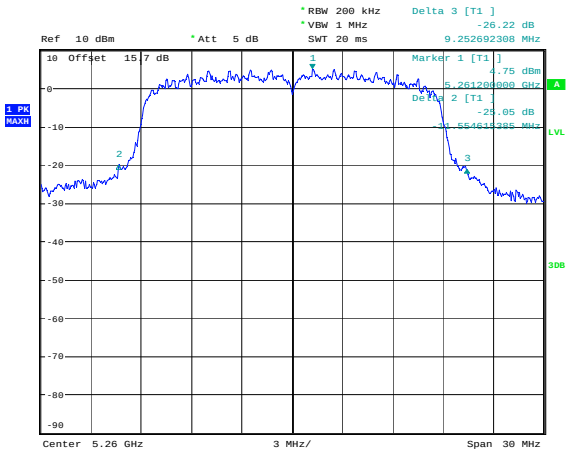
low
Date: 5.NOV.2018 16:18:34

Plot # 20		
a / 6Mbps	CH 64	26dB



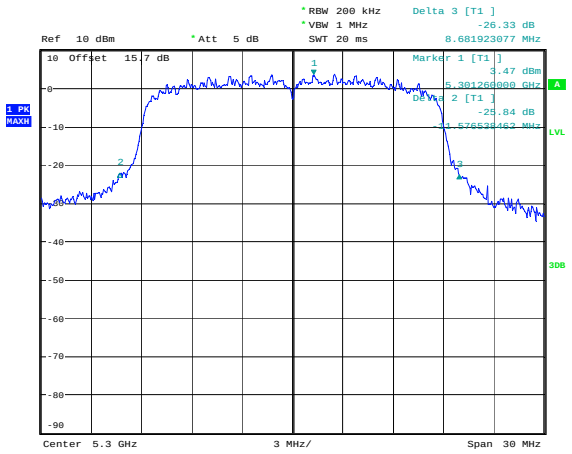
low
Date: 5.NOV.2018 16:21:50

Plot # 21		
HT 20 / MCS0	CH 52	26dB



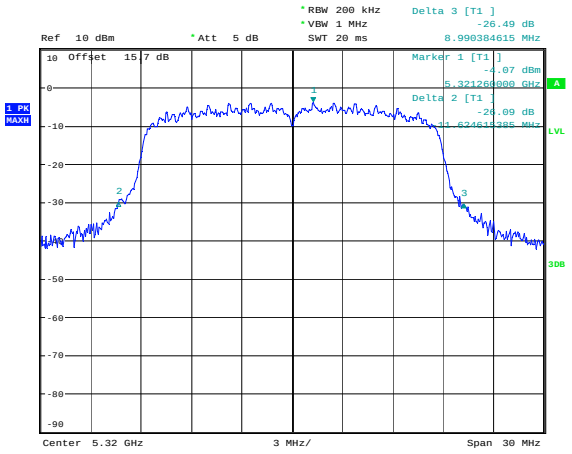
low
Date: 5.NOV.2018 16:36:07

Plot # 22		
HT 20 / MCS0	CH 60	26dB



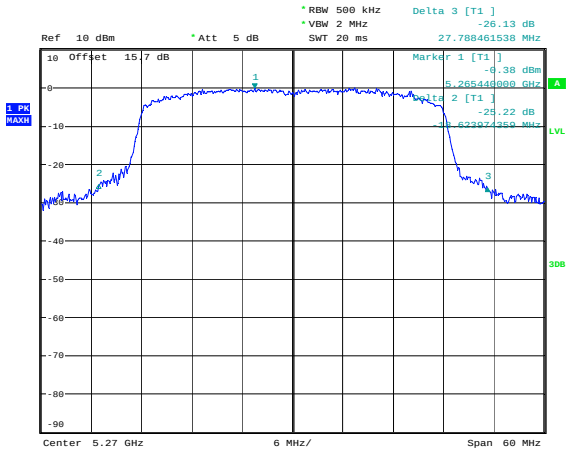
low
Date: 5.NOV.2018 16:32:47

Plot # 23		
HT 20 / MCS0	CH 64	26dB



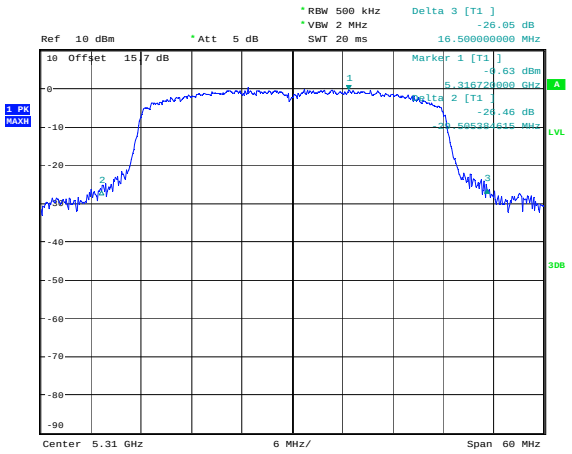
low
Date: 5.NOV.2018 16:25:10

Plot # 24		
HT 40 / MCS0	CH 54	26dB



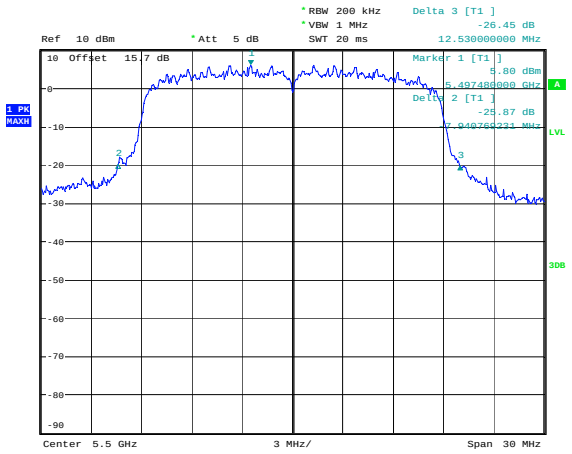
low
Date: 5.NOV.2018 16:41:39

Plot # 25		
HT 40 / MCS0	CH 62	26dB



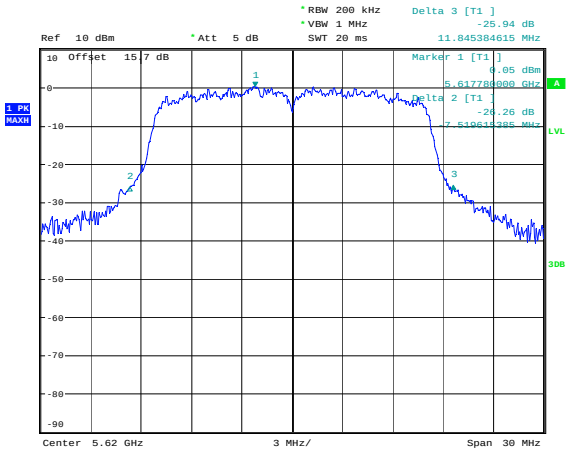
low
Date: 5.NOV.2018 16:45:30

Plot # 26		
a / 6Mbps	CH 100	26dB



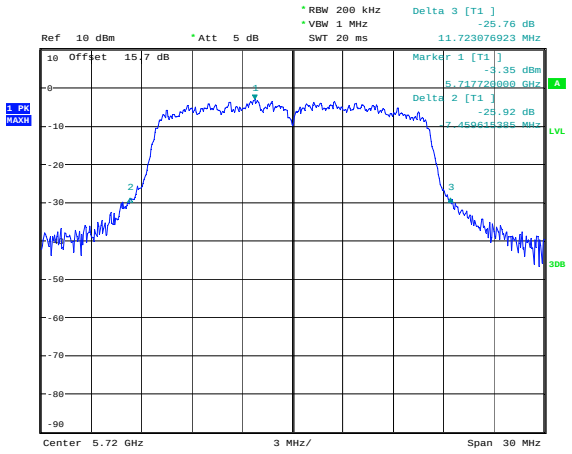
low
Date: 5.NOV.2018 17:18:39

Plot # 27		
a / 6Mbps	CH 124	26dB



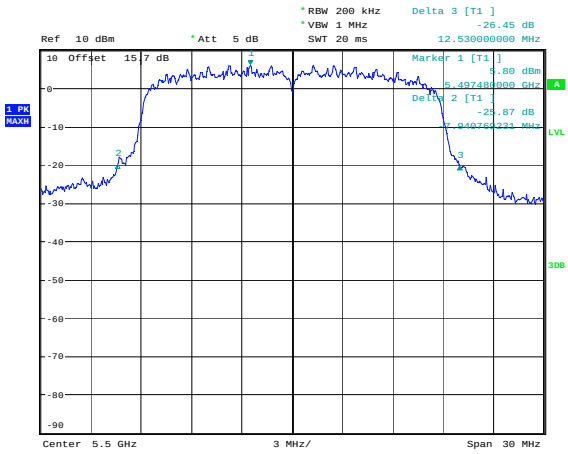
low
Date: 5.NOV.2018 17:29:17

Plot # 28		
a / 6Mbps	CH 144	26dB



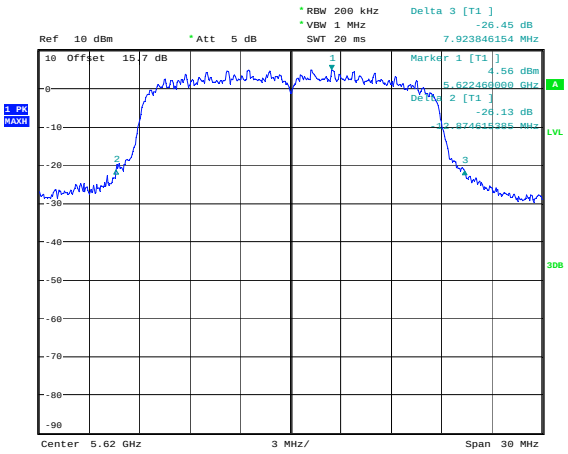
low
Date: 5.NOV.2018 17:31:44

Plot # 29		
HT 20 / MCS0	CH 100	26dB



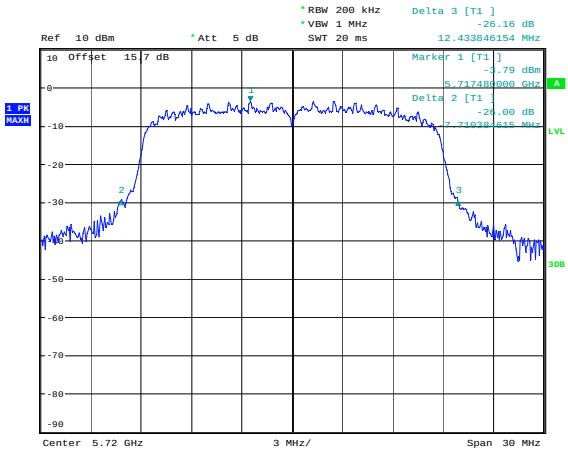
low
Date: 5.NOV.2018 17:18:39

Plot # 30		
HT 20 / MCS0	CH 124	26dB



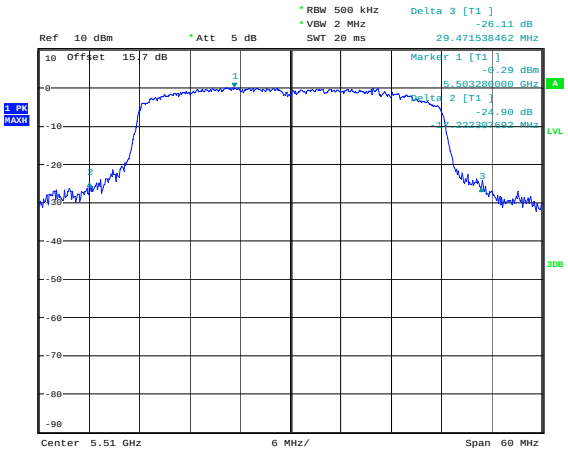
low
Date: 5.NOV.2018 17:21:25

Plot # 31		
HT 20 / MCS0	CH 144	26dB



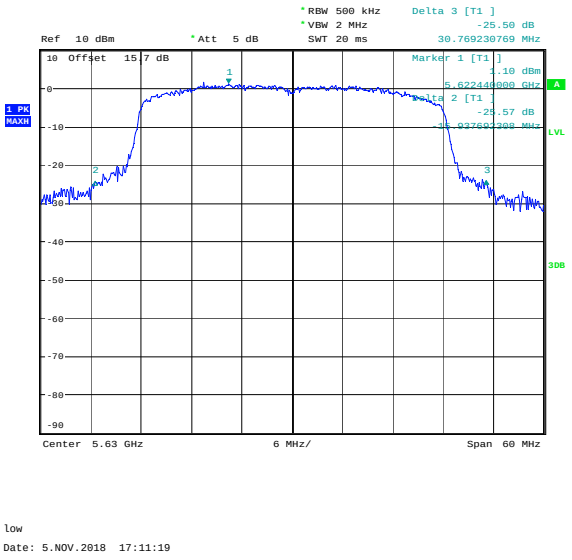
low
Date: 5.NOV.2018 17:23:51

Plot # 32		
HT 40 / MCS0	CH 102	26dB



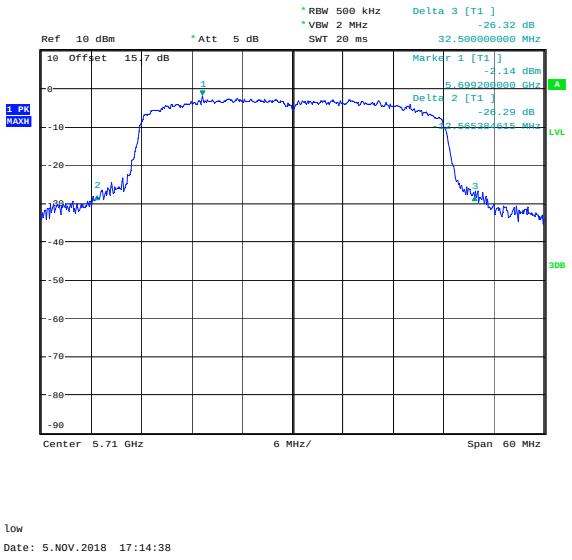
low
Date: 5.NOV.2018 17:07:52

Plot # 33		
HT 40 / MCS0	CH 126	26dB



low
Date: 5.NOV.2018 17:11:19

Plot # 34		
HT 40 / MCS0	CH 142	26dB



low
Date: 5.NOV.2018 17:14:38

8.5 Frequency stability

8.5.1 Measurement Procedure

- The EUT was placed inside temperature chamber
- Set the EUT to the operation mode needed
- Set the chamber to the highest temperature specified
- Allow sufficient time for the temperature of the chamber to stabilize, measure the operating frequency
- Repeat step with the temperature chamber set to lowest temperature

8.5.2 Limits:

FCC §15.407(g)

- Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual

8.5.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
See section 8.5.4	1	802.11 n	5 VDC

8.5.4 Measurement result:

Temp	802.11n_HT20	Measured CF	ACF	Frequency Stability (ppm)
25°C	52	5259.98	5260	3.80
	60	5300.012	5300	2.26
	64	5320.011	5320	2.07
	100	5500.001	5500	0.18
	124	5620.021	5620	3.74
	144	5720.022	5720	3.85
-20°C	52	5260.023	5260	4.37
	60	5300.013	5300	2.45
	64	5320.017	5320	3.20
	100	5500.009	5500	1.64
	124	5620.003	5620	0.53
	144	5720.004	5720	0.70
70°C	52	5260.013	5260	2.47
	60	5300.021	5300	3.96
	64	5320.009	5320	1.69
	100	5500.022	5500	4.00
	124	5620.025	5620	4.45
	144	5720.006	5720	1.05

8.6 Radiated Transmitter Spurious Emissions

8.6.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)

- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz

- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation factor as follow: Conversion factor (CF) = 40 log (D/d) = 40 log (300m / 3m) = 80dB

8.6.2 Limits:

FCC §15.407

- Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.
- The provisions of §15.205 apply to intentional radiators operating under this section.

FCC §15.209 & RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)	Field strength @ 3m (dBµV/m)
0.009–0.490	2400/F(kHz) / ---------	300	-
0.490–1.705	24000/F(kHz) / --------	30	-
1.705–30.0	30 / (29.5)	30	-
30–88	100	3	40 dBµV/m
88–216	150	3	43.5 dBµV/m
216–960	200	3	46 dBµV/m
Above 960	500	3	54 dBµV/m

FCC §15.205 & RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

- 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)).
  *PEAK LIMIT= 74 dBµV/m
  *AVG. LIMIT= 54 dBµV/m

8.6.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22° C	2	802.11n	5 VDC

8.6.4 Measurement result:

Plot #	Channel #	Scan Frequency	Limit	Result
1-3	UNII-2A Low (52)	30 MHz – 18 GHz	See section 8.5.2	Pass
4-9	UNII-2A Mid (60)	9 kHz – 40 GHz	See section 8.5.2	Pass
10-12	UNII-2A High (64)	30 MHz – 18 GHz	See section 8.5.2	Pass
13-15	UNII-2C Low (100)	30 MHz – 18 GHz	See section 8.5.2	Pass
16-21	UNII-2C Mid (124)	9 kHz – 40 GHz	See section 8.5.2	Pass
22-24	UNII-2C High (144)	30 MHz – 18 GHz	See section 8.5.2	Pass

8.6.5 Measurement Plots:

Plot #1 Radiated Emissions: 30 MHz – 1GHz

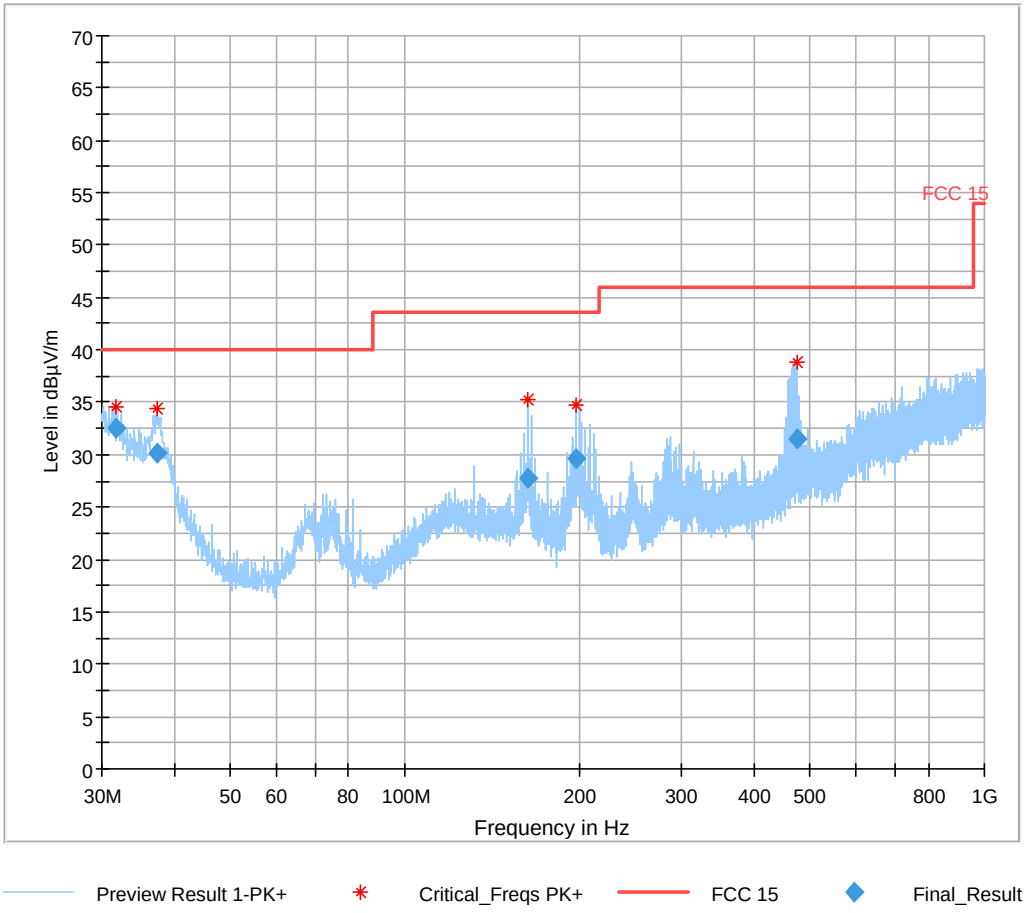
UNII-2A | **Channel: Low(52)**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.861804	32.48	40.00	7.52	200.0	120.000	206.0	H	76.0	30.0
37.375238	30.08	40.00	9.92	200.0	120.000	264.0	H	-68.0	24.8
162.786609	27.83	43.52	15.69	200.0	120.000	244.0	H	114.0	21.5
197.669850	29.57	43.52	13.95	200.0	120.000	325.0	H	67.0	21.8
474.256227	31.50	46.02	14.52	200.0	120.000	242.0	H	210.0	26.3

(continuation of the "Final_Result" table from column 16 ...)

Frequency (MHz)	Comment
31.861804	3:27:30 PM - 11/14/2018
37.375238	3:29:23 PM - 11/14/2018
162.786609	3:31:23 PM - 11/14/2018
197.669850	3:33:06 PM - 11/14/2018
474.256227	3:35:02 PM - 11/14/2018



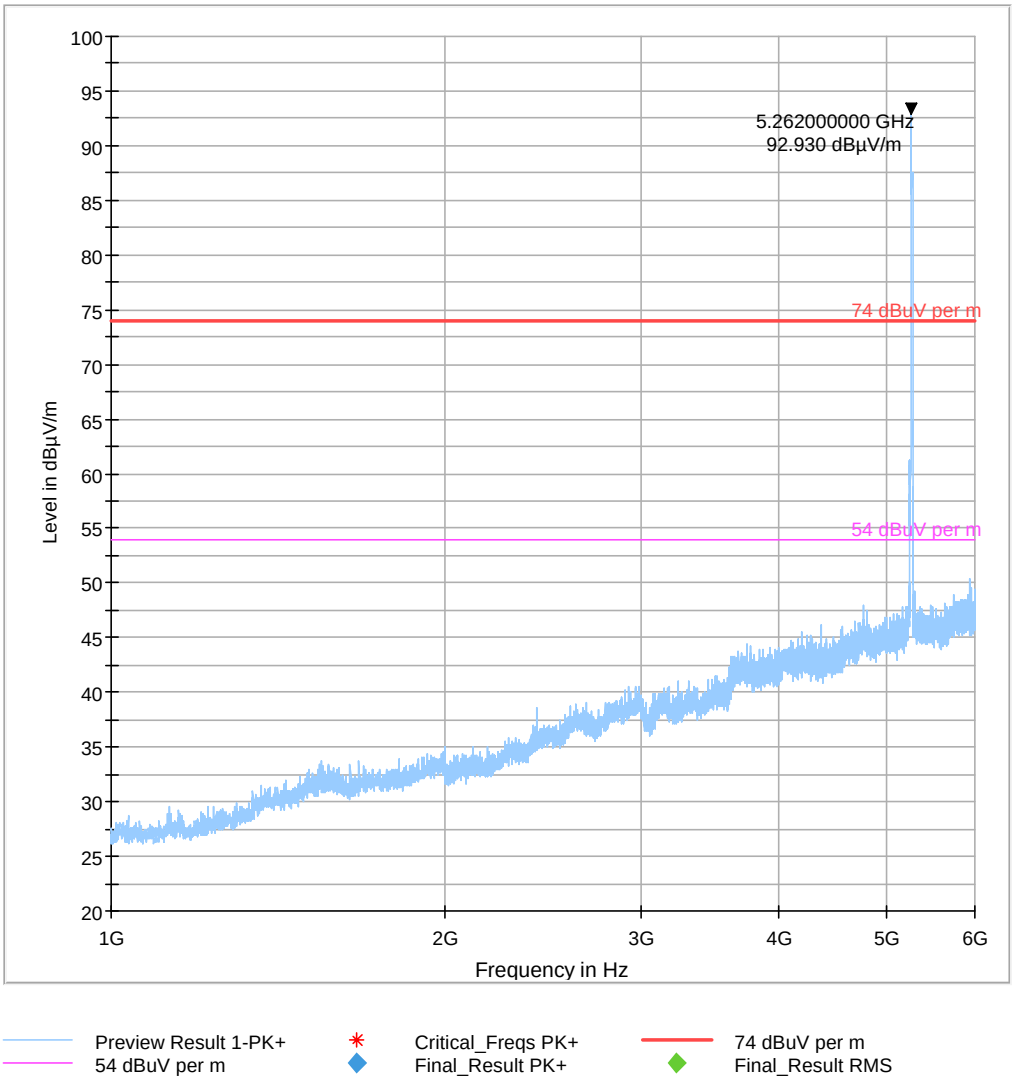
Plot #2 Radiated Emissions: 1 GHz – 6GHz		
UNII-2A	Channel: Low(52)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
---	---	---	---	---	---	---	---		---

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
---	---	



Plot #3 Radiated Emissions: 6 GHz – 18GHz

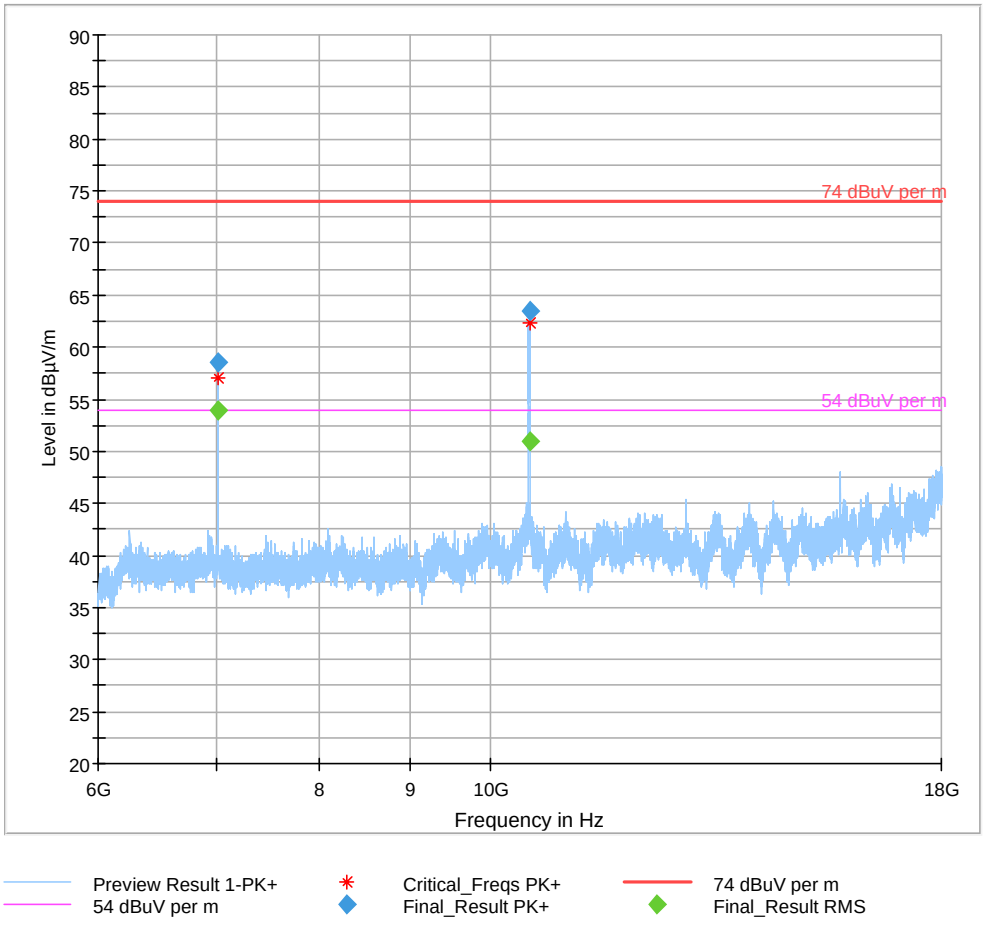
UNII-2A | **Channel: Low(52)**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
7013.200000	---	53.85	54.00	0.15	500.0	1000.000	152.0	H	309.0
7013.200000	58.48	---	74.00	15.52	500.0	1000.000	152.0	H	309.0
10523.700000	---	50.99	54.00	3.01	500.0	1000.000	152.0	H	319.0
10523.700000	63.40	---	74.00	10.60	500.0	1000.000	152.0	H	319.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
7013.200000	0.0	5:46:16 PM - 11/15/2018
7013.200000	0.0	5:46:16 PM - 11/15/2018
10523.700000	2.9	5:48:10 PM - 11/15/2018
10523.700000	2.9	5:48:09 PM - 11/15/2018



Plot #4 Radiated Emissions: 9 kHz – 30MHz

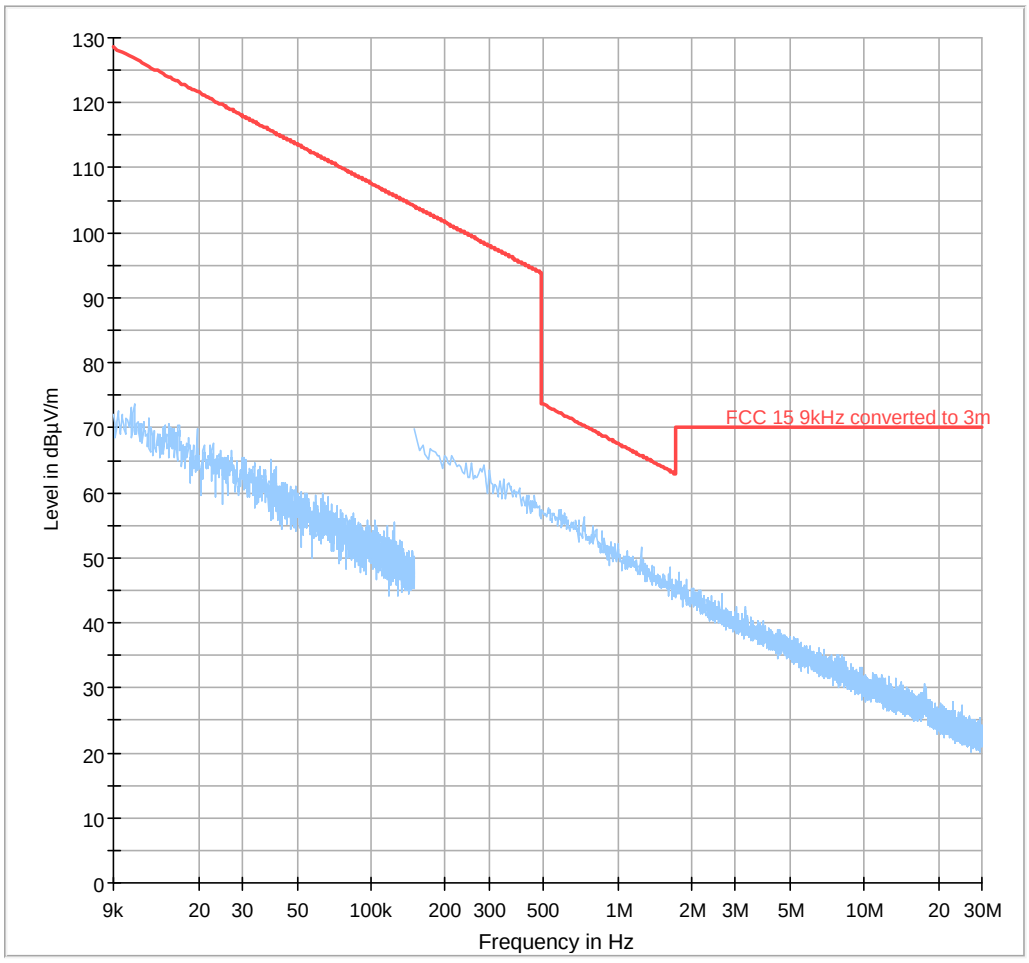
UNII-2A	Channel: Mid(60)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
---	---	---	---	---	---	---	---		---

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
---	---	



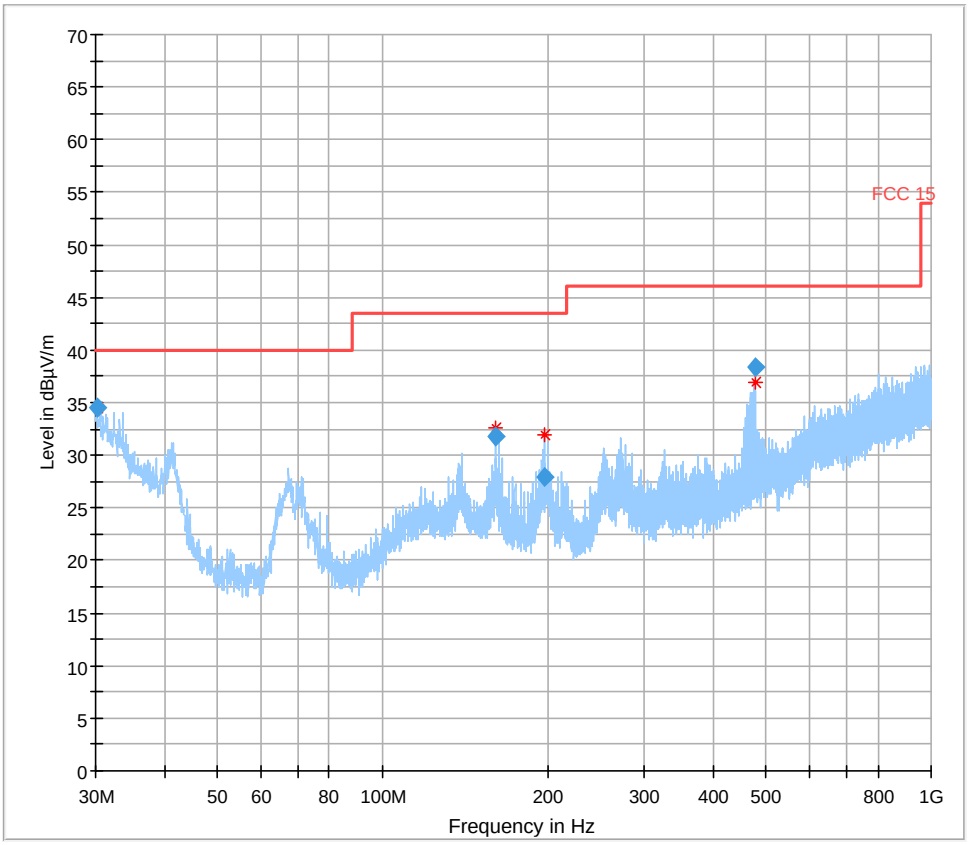
Plot #5 Radiated Emissions: 30 MHz – 1GHz		
UNII-2A	Channel: Mid(60)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.135035	34.51	40.00	5.49	200.0	120.000	157.0	H	152.0	31.6
160.411514	31.71	43.52	11.81	200.0	120.000	273.0	H	114.0	21.6
197.669970	27.92	43.52	15.60	200.0	120.000	274.0	H	80.0	21.8
476.989917	38.36	46.02	7.67	200.0	120.000	205.0	H	221.0	26.4

(continuation of the "Final_Result" table from column 16 ...)

Frequency (MHz)	Comment
30.135035	3:58:31 PM - 11/14/2018
160.411514	4:00:14 PM - 11/14/2018
197.669970	4:02:01 PM - 11/14/2018
476.989917	4:03:59 PM - 11/14/2018



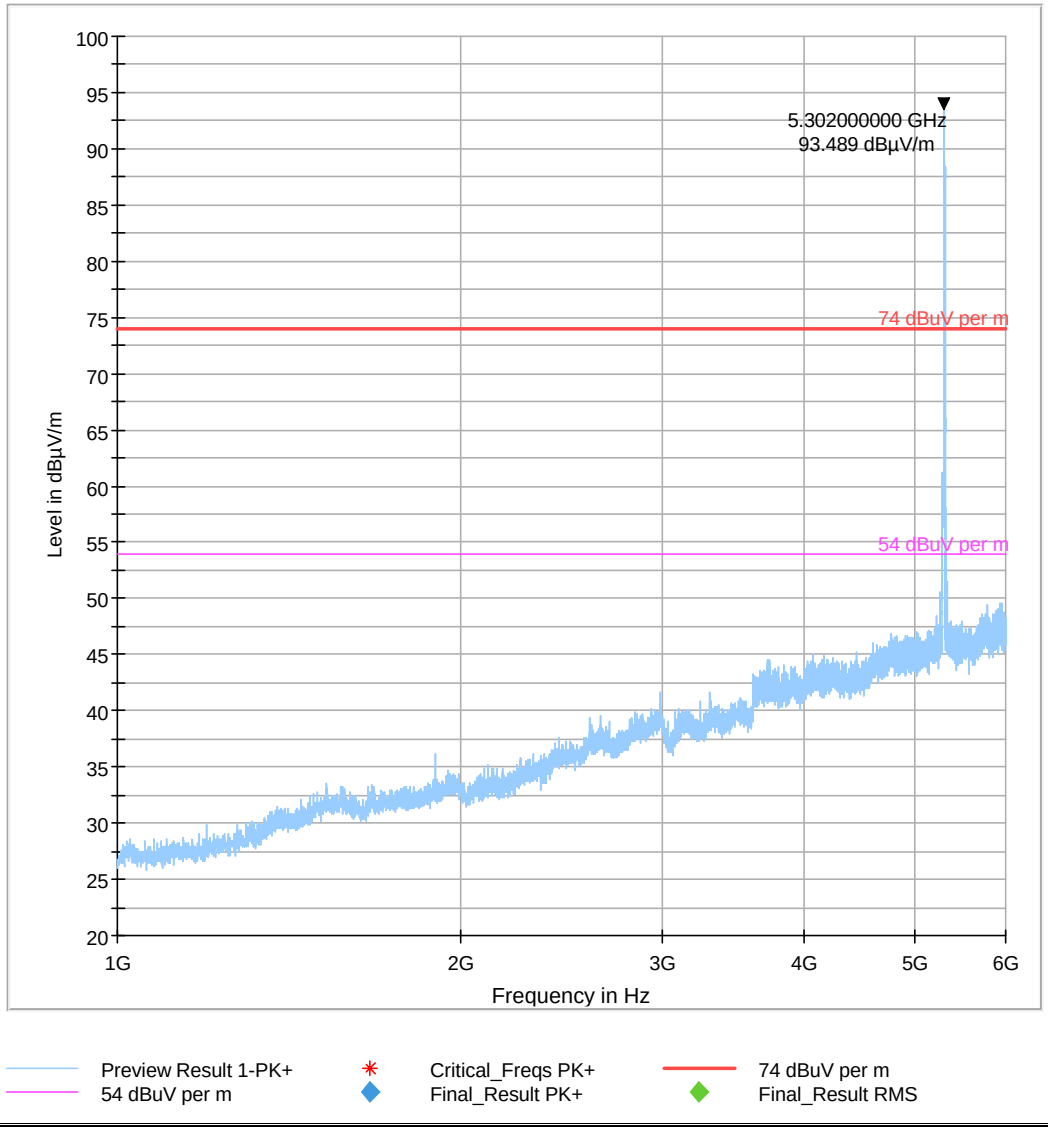
Plot #6 Radiated Emissions: 1 GHz – 6GHz		
UNII-2A	Channel: Mid(60)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
---	---	---	---	---	---	---	---		---

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
---	---	



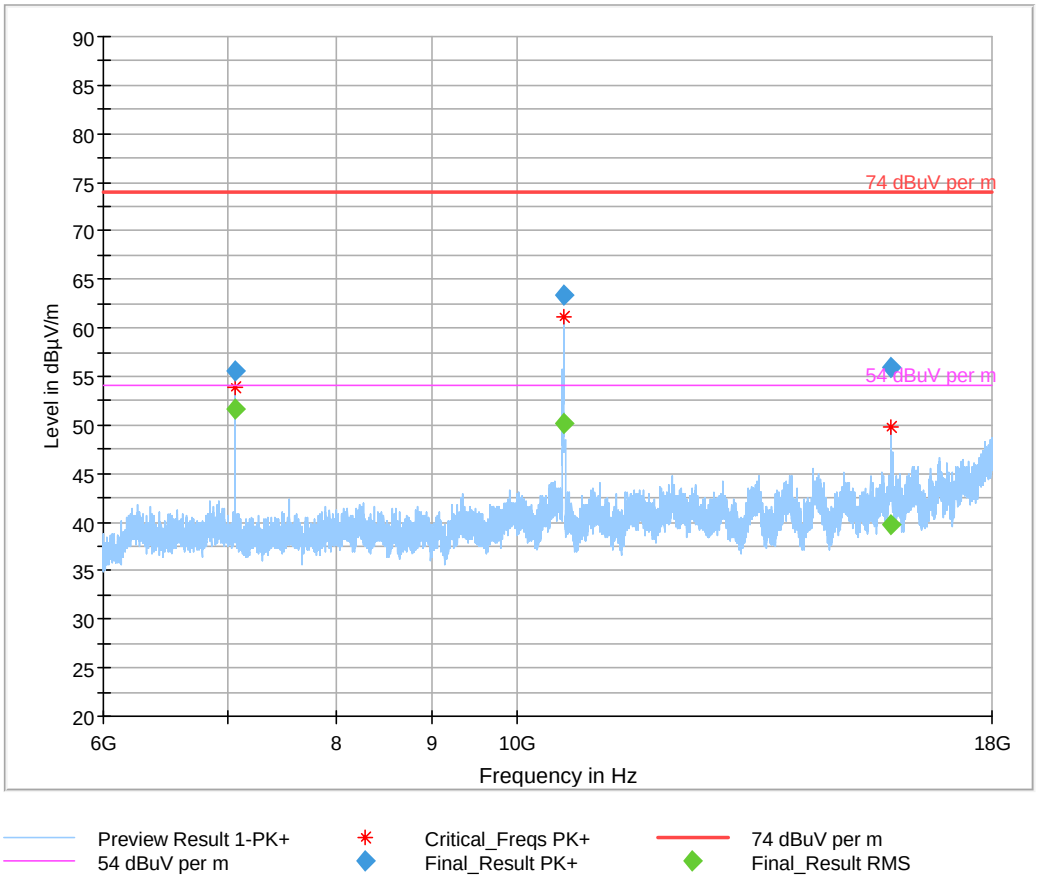
Plot #7 Radiated Emissions: 6 GHz – 18GHz		
UNII-2A	Channel: Mid(60)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
7066.700000	---	51.60	54.00	2.40	500.0	1000.000	160.0	H	312.0
7066.700000	55.64	---	74.00	18.36	500.0	1000.000	160.0	H	312.0
10598.100000	---	50.16	54.00	3.84	500.0	1000.000	140.0	H	141.0
10598.100000	63.39	---	74.00	10.61	500.0	1000.000	140.0	H	141.0
15895.000000	---	39.68	54.00	14.32	500.0	1000.000	159.0	H	24.0
15895.000000	55.93	---	74.00	18.07	500.0	1000.000	159.0	H	24.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
7066.700000	-0.2	5:11:33 PM - 11/15/2018
7066.700000	-0.2	5:11:33 PM - 11/15/2018
10598.100000	2.7	5:13:42 PM - 11/15/2018
10598.100000	2.7	5:13:42 PM - 11/15/2018
15895.000000	7.6	5:15:46 PM - 11/15/2018
15895.000000	7.6	5:15:46 PM - 11/15/2018



Plot #8 Radiated Emissions: 18 GHz – 26GHz

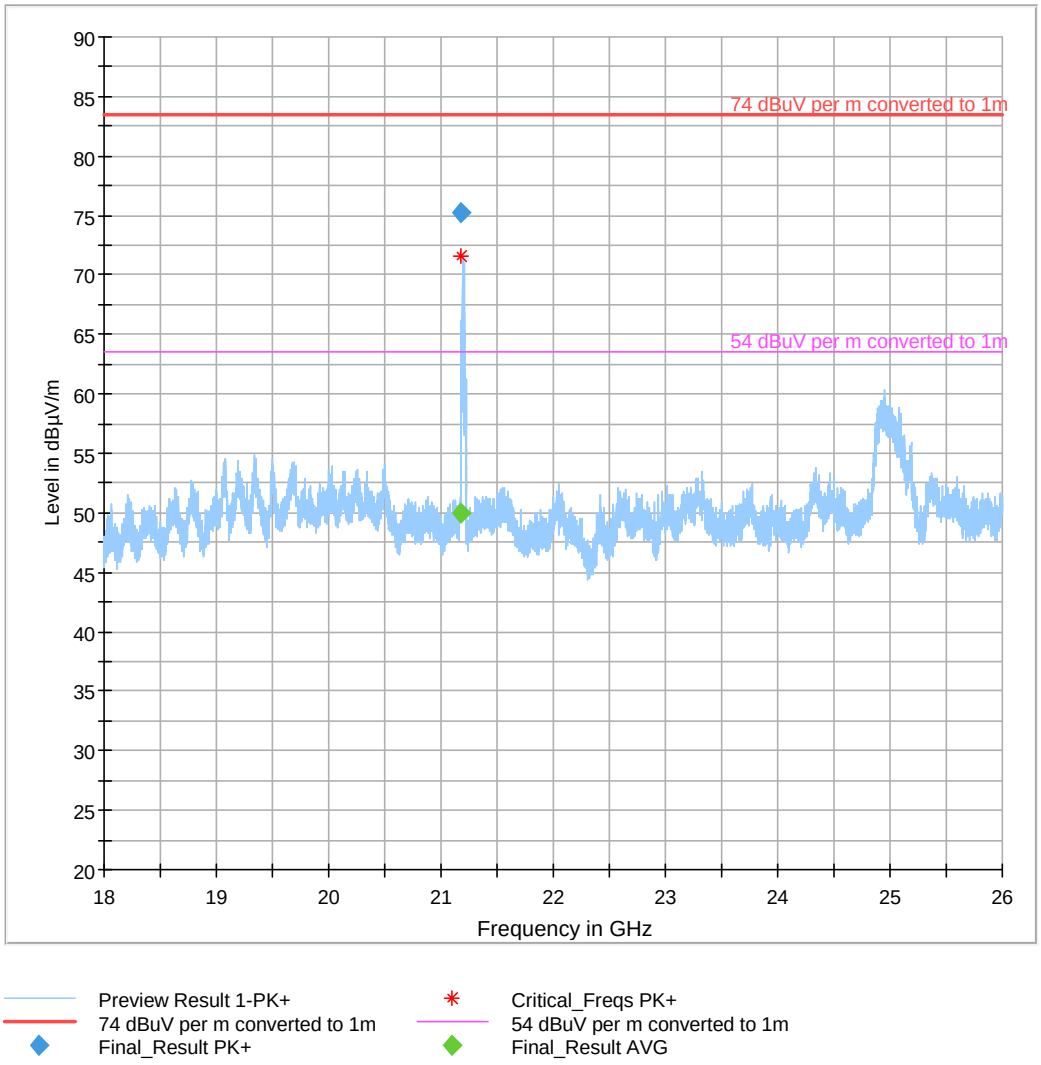
UNII-2A	Channel: Mid(60)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
21184.829375	---	50.05	63.50	13.45	100.0	1000.000	150.0	H	189.0
21184.829375	75.21	---	83.50	8.29	100.0	1000.000	150.0	H	189.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
21184.829375	21.5	10:39:10 AM - 11/16/2018
21184.829375	21.5	10:39:10 AM - 11/16/2018



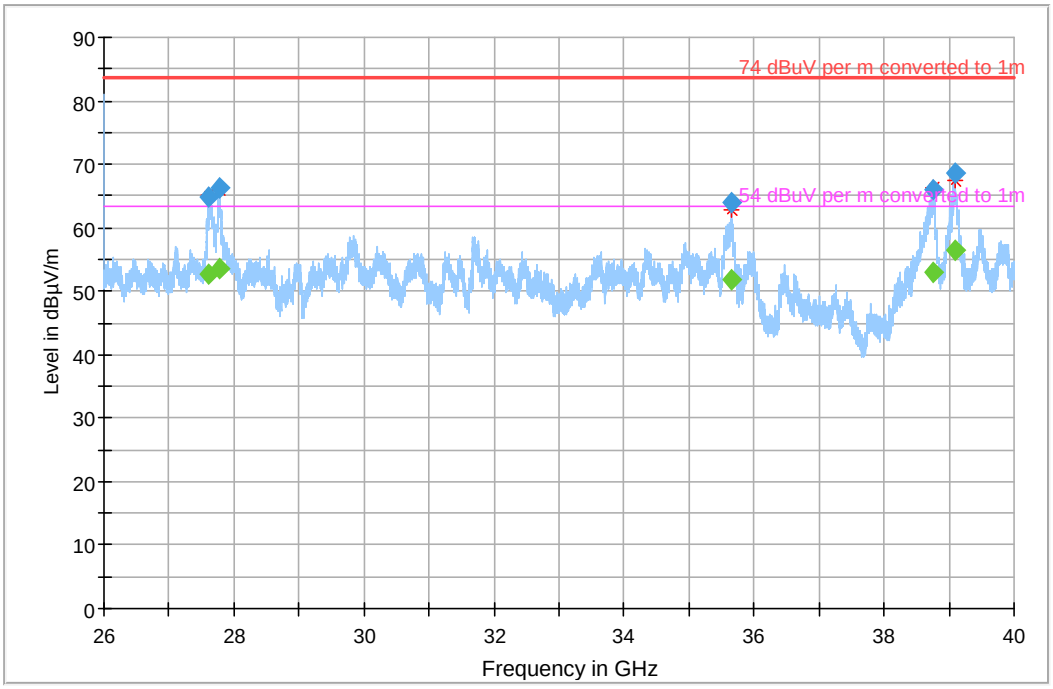
Plot #9 Radiated Emissions: 26 GHz – 40GHz		
UNII-2A	Channel: Mid(60)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
27615.554286	---	52.69	63.50	10.81	100.0	1000.000	150.0	H	206.0
27615.554286	64.87	---	83.50	18.63	100.0	1000.000	150.0	H	206.0
27768.032857	---	53.52	63.50	9.98	100.0	1000.000	150.0	H	27.0
27768.032857	66.35	---	83.50	17.15	100.0	1000.000	150.0	H	27.0
35644.414643	---	51.89	63.50	11.61	100.0	1000.000	150.0	H	19.0
35644.414643	64.02	---	83.50	19.48	100.0	1000.000	150.0	H	19.0
38764.773214	---	53.04	63.50	10.46	100.0	1000.000	150.0	V	39.0
38764.773214	65.99	---	83.50	17.51	100.0	1000.000	150.0	V	39.0
39087.126071	---	56.47	63.50	7.03	100.0	1000.000	150.0	H	219.0
39087.126071	68.70	---	83.50	14.80	100.0	1000.000	150.0	H	219.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
27615.554286	3.6	4:06:52 PM - 3/4/2019
27615.554286	3.6	4:06:52 PM - 3/4/2019
27768.032857	4.5	4:08:30 PM - 3/4/2019
27768.032857	4.5	4:08:30 PM - 3/4/2019
35644.414643	11.7	4:10:47 PM - 3/4/2019
35644.414643	11.7	4:10:47 PM - 3/4/2019
38764.773214	14.8	4:12:37 PM - 3/4/2019
38764.773214	14.8	4:12:37 PM - 3/4/2019
39087.126071	17.4	4:14:43 PM - 3/4/2019
39087.126071	17.4	4:14:43 PM - 3/4/2019



Plot #10 Radiated Emissions: 30 MHz – 1GHz

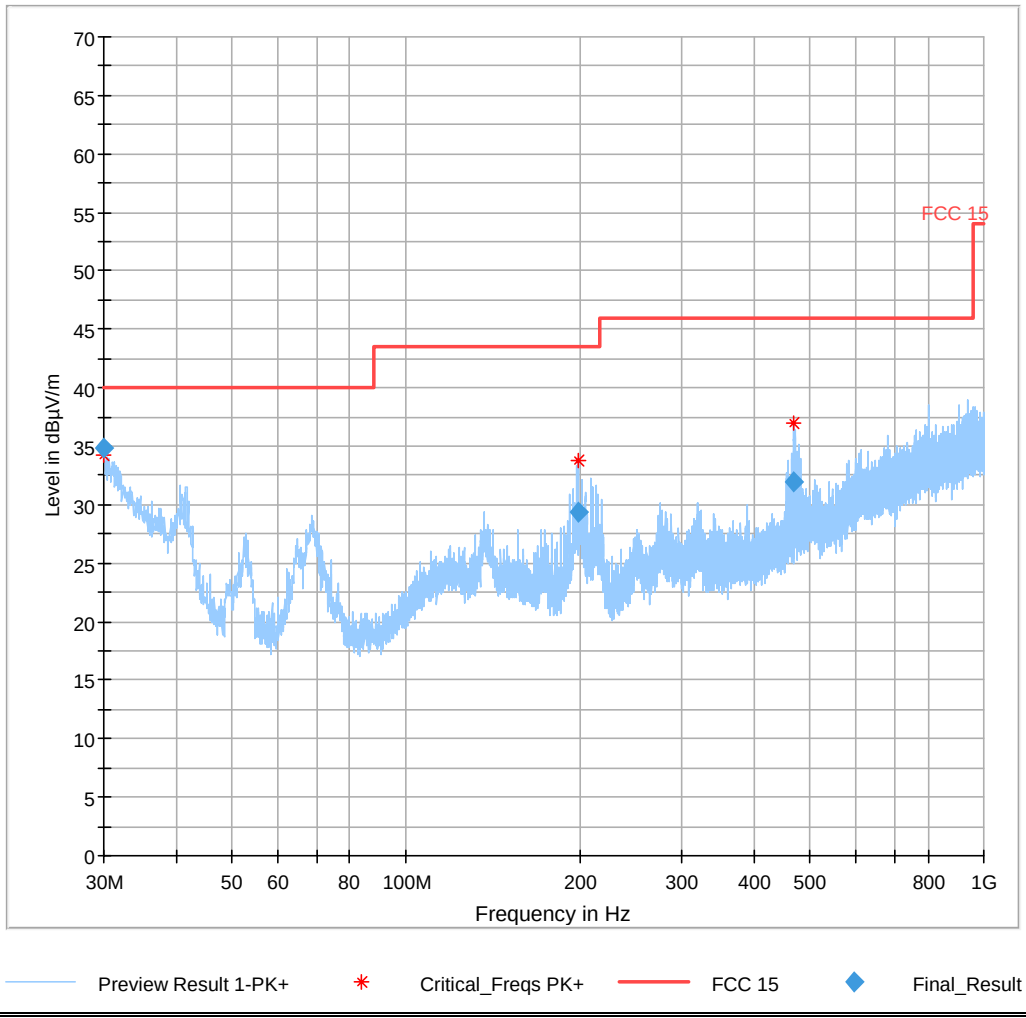
UNII-2A | **Channel: High(64)**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.057702	34.88	40.00	5.12	200.0	120.000	316.0	H	49.0	31.7
199.347565	29.44	43.52	14.08	200.0	120.000	299.0	H	268.0	22.1
468.299620	31.96	46.02	14.06	200.0	120.000	191.0	H	203.0	26.1

(continuation of the "Final_Result" table from column 16 ...)

Frequency (MHz)	Comment
30.057702	5:18:39 PM - 11/14/2018
199.347565	5:20:43 PM - 11/14/2018
468.299620	5:22:36 PM - 11/14/2018



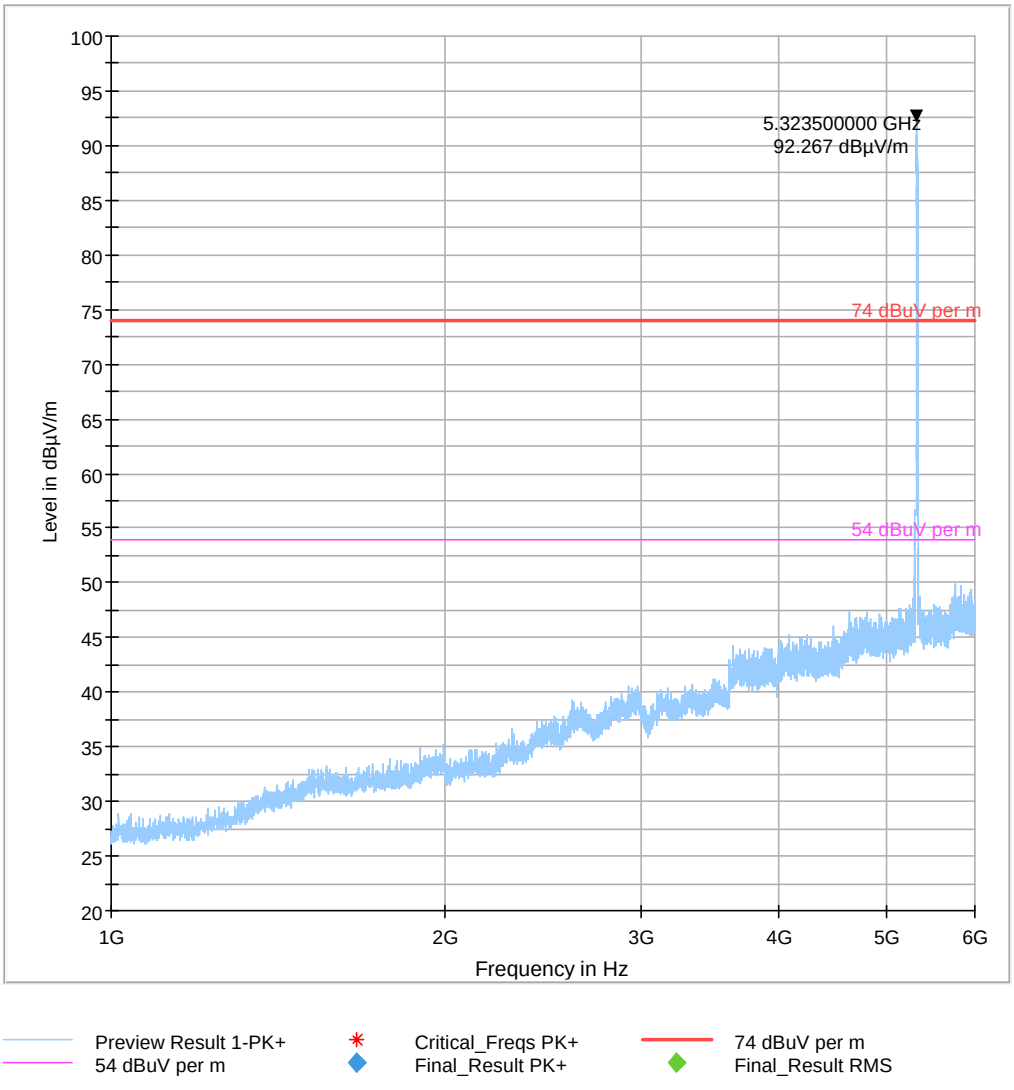
Plot #11 Radiated Emissions: 1 GHz – 6GHz		
UNII-2A	Channel: High(64)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
---	---	---	---	---	---	---	---		---

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
---	---	



Plot #12 Radiated Emissions: 6 GHz – 18GHz

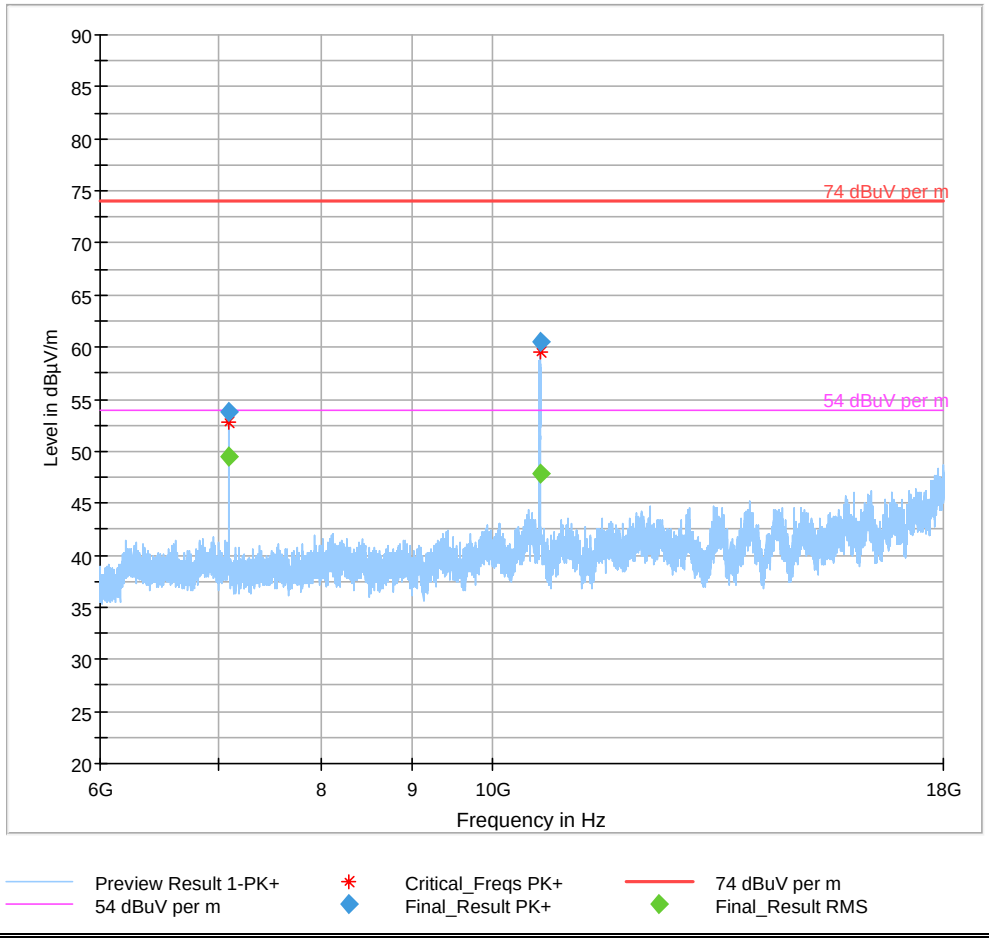
UNII-2A | **Channel: High(64)**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
7093.200000	---	49.55	54.00	4.45	500.0	1000.000	152.0	H	309.0
7093.200000	53.70	---	74.00	20.30	500.0	1000.000	152.0	H	309.0
10643.600000	---	47.83	54.00	6.17	500.0	1000.000	208.0	H	318.0
10643.600000	60.59	---	74.00	13.41	500.0	1000.000	208.0	H	318.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
7093.200000	-0.2	4:57:41 PM - 11/15/2018
7093.200000	-0.2	4:57:41 PM - 11/15/2018
10643.600000	2.5	4:59:33 PM - 11/15/2018
10643.600000	2.5	4:59:33 PM - 11/15/2018



Plot #13 Radiated Emissions: 30 MHz – 1GHz

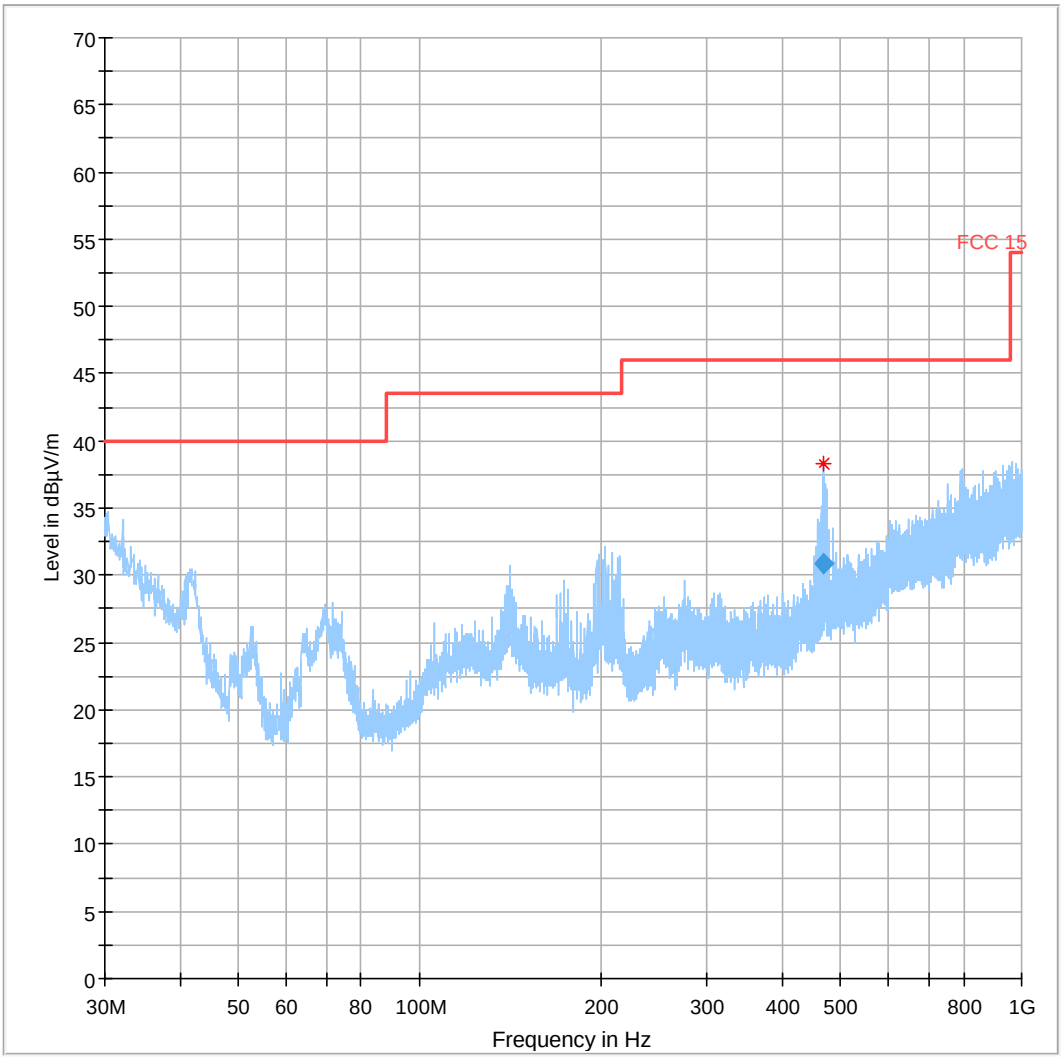
UNII-2C	Channel: Low(100)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
470.032591	30.82	46.02	15.20	200.0	120.000	230.0	H	61.0	26.2

(continuation of the "Final_Result" table from column 16 ...)

Frequency (MHz)	Comment
470.032591	10:24:28 AM - 11/15/2018



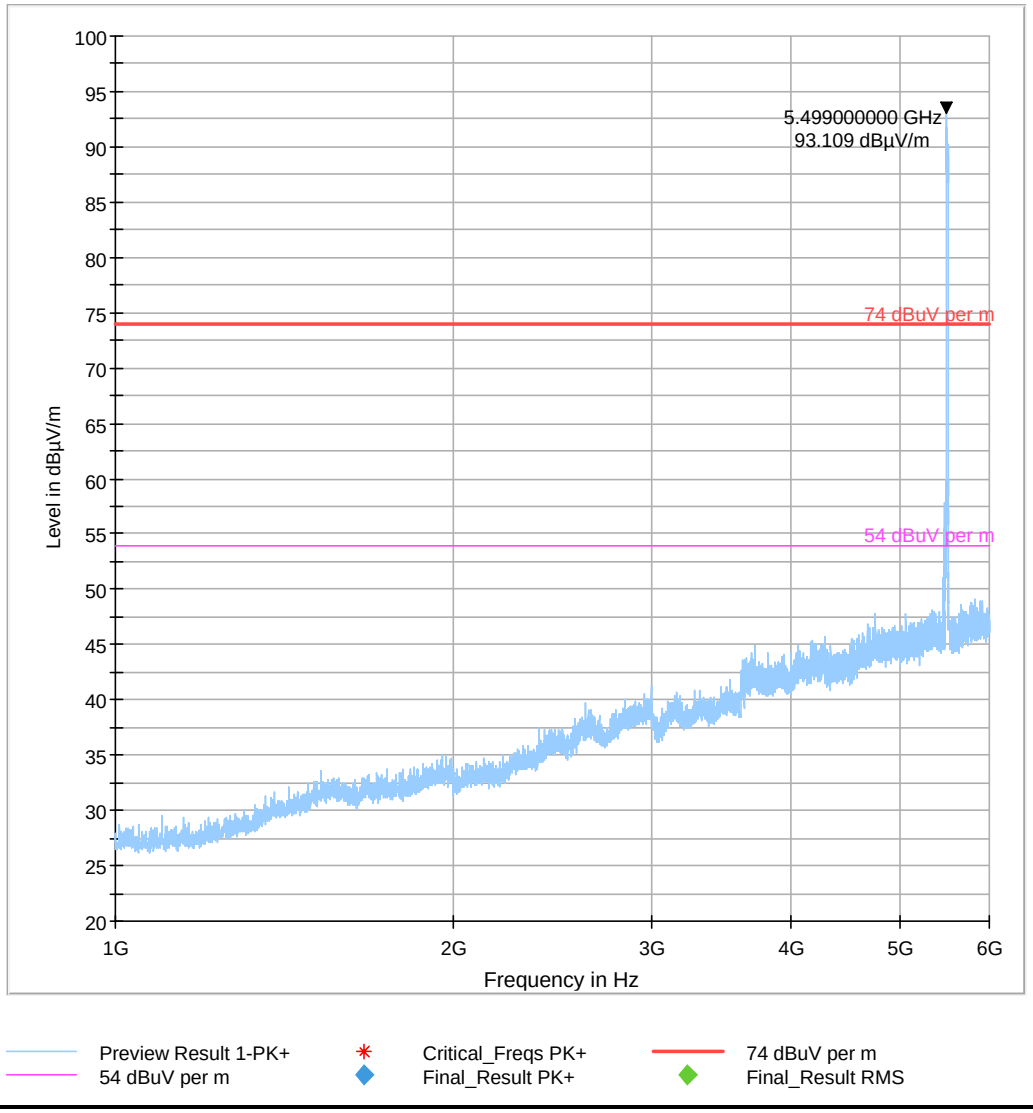
Plot #14 Radiated Emissions: 1 GHz – 6GHz		
UNII-2C	Channel: Low(100)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
---	---	---	---	---	---	---	---		---

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
---	---	



Plot #15 Radiated Emissions: 6 GHz – 18GHz

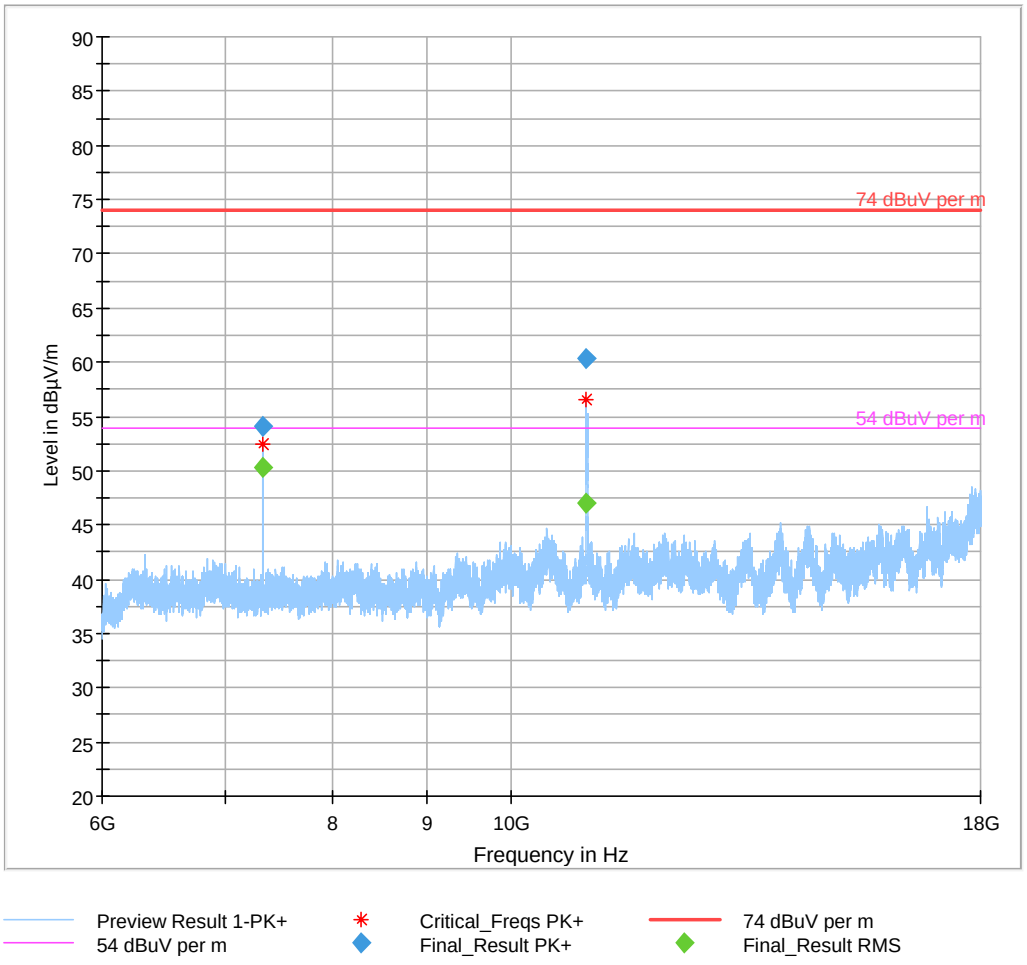
UNII-2C	Channel: Low(100)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
7333.200000	---	50.35	54.00	3.65	500.0	1000.000	140.0	H	313.0
7333.200000	54.16	---	74.00	19.85	500.0	1000.000	140.0	H	313.0
10998.200000	---	47.08	54.00	6.92	500.0	1000.000	140.0	H	176.0
10998.200000	60.29	---	74.00	13.71	500.0	1000.000	140.0	H	176.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
7333.200000	-0.5	4:39:02 PM - 11/15/2018
7333.200000	-0.5	4:39:02 PM - 11/15/2018
10998.200000	2.2	4:41:07 PM - 11/15/2018
10998.200000	2.2	4:41:07 PM - 11/15/2018



Plot #16 Radiated Emissions: 9 kHz – 30MHz

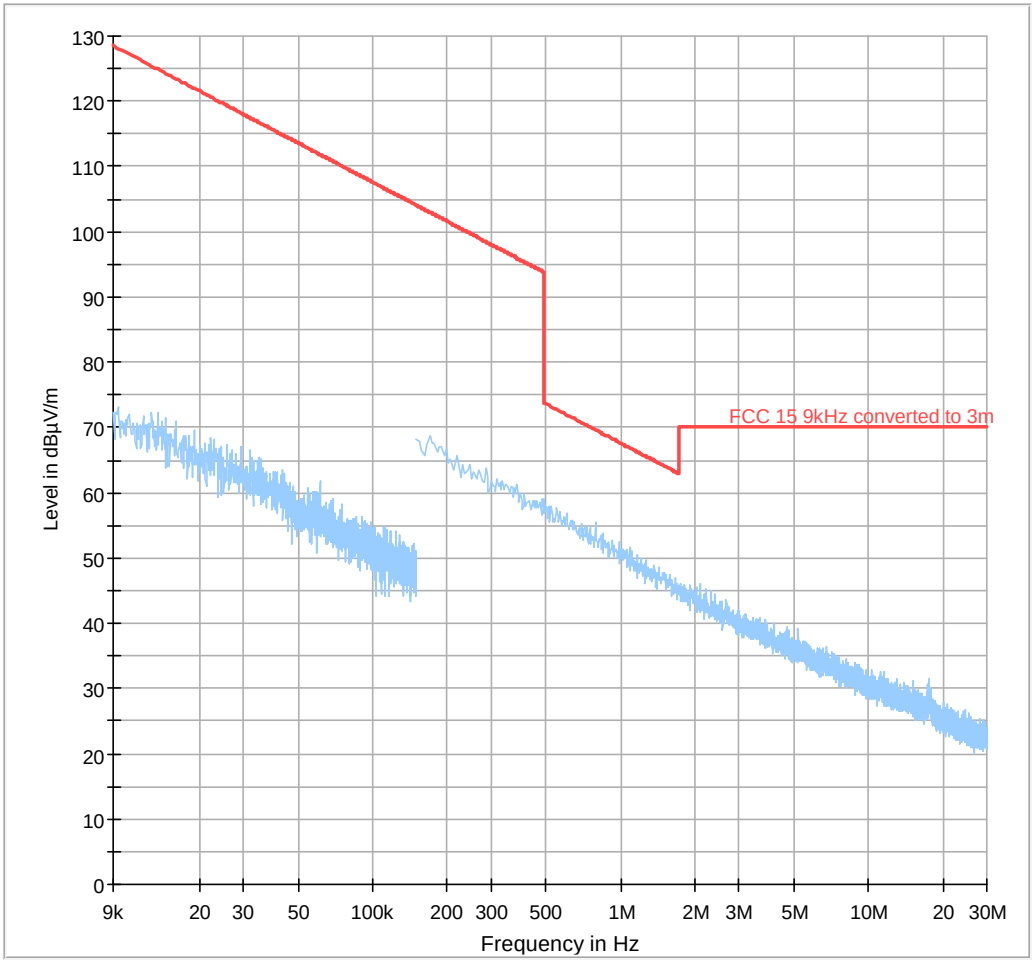
UNII-2C	Channel: Mid(124)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
---	---	---	---	---	---	---	---		---

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
---	---	



Plot #17 Radiated Emissions: 30 MHz – 1GHz

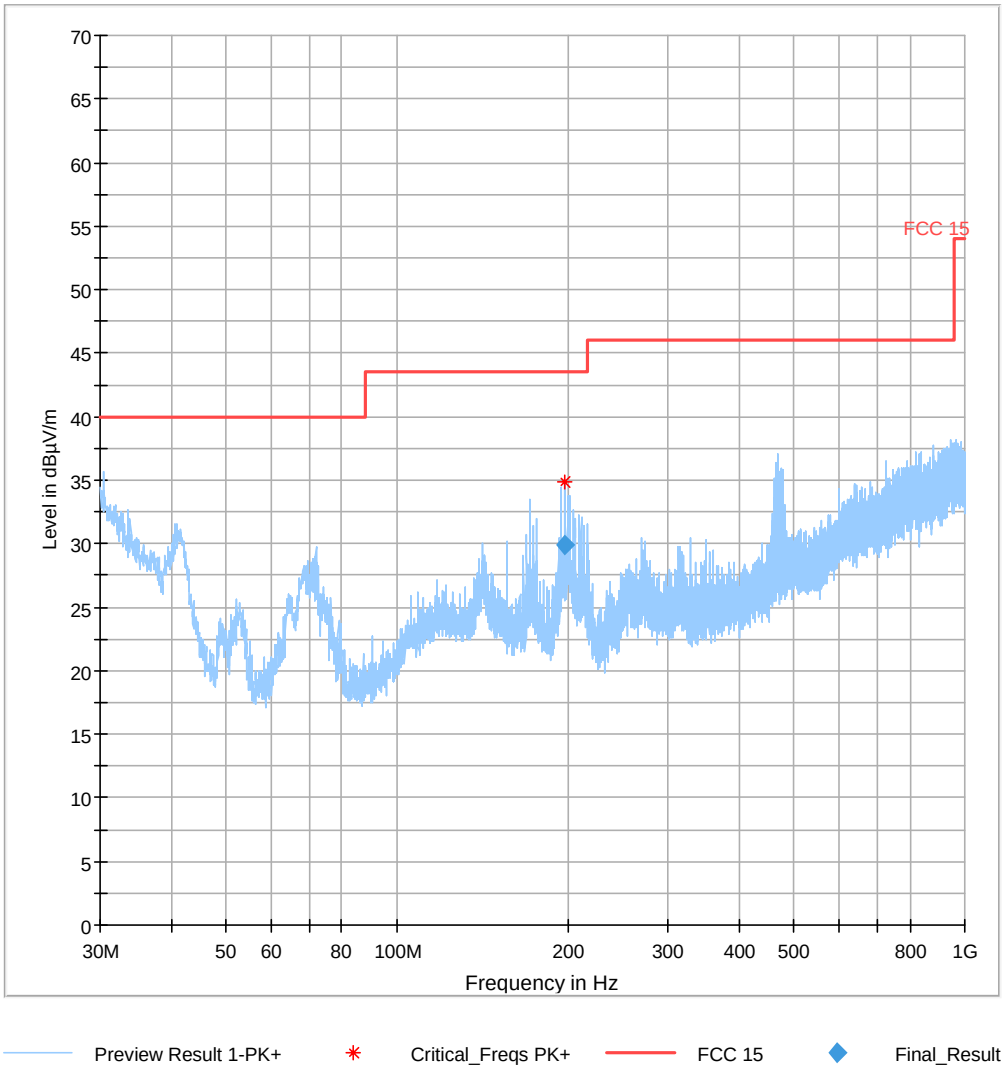
UNII-2C	Channel: Mid(124)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
197.393929	29.87	43.52	13.65	200.0	120.000	266.0	H	251.0	21.7

(continuation of the "Final_Result" table from column 16 ...)

Frequency (MHz)	Comment
197.393929	10:36:40 AM - 11/15/2018



Plot #18 Radiated Emissions: 1 GHz – 6GHz

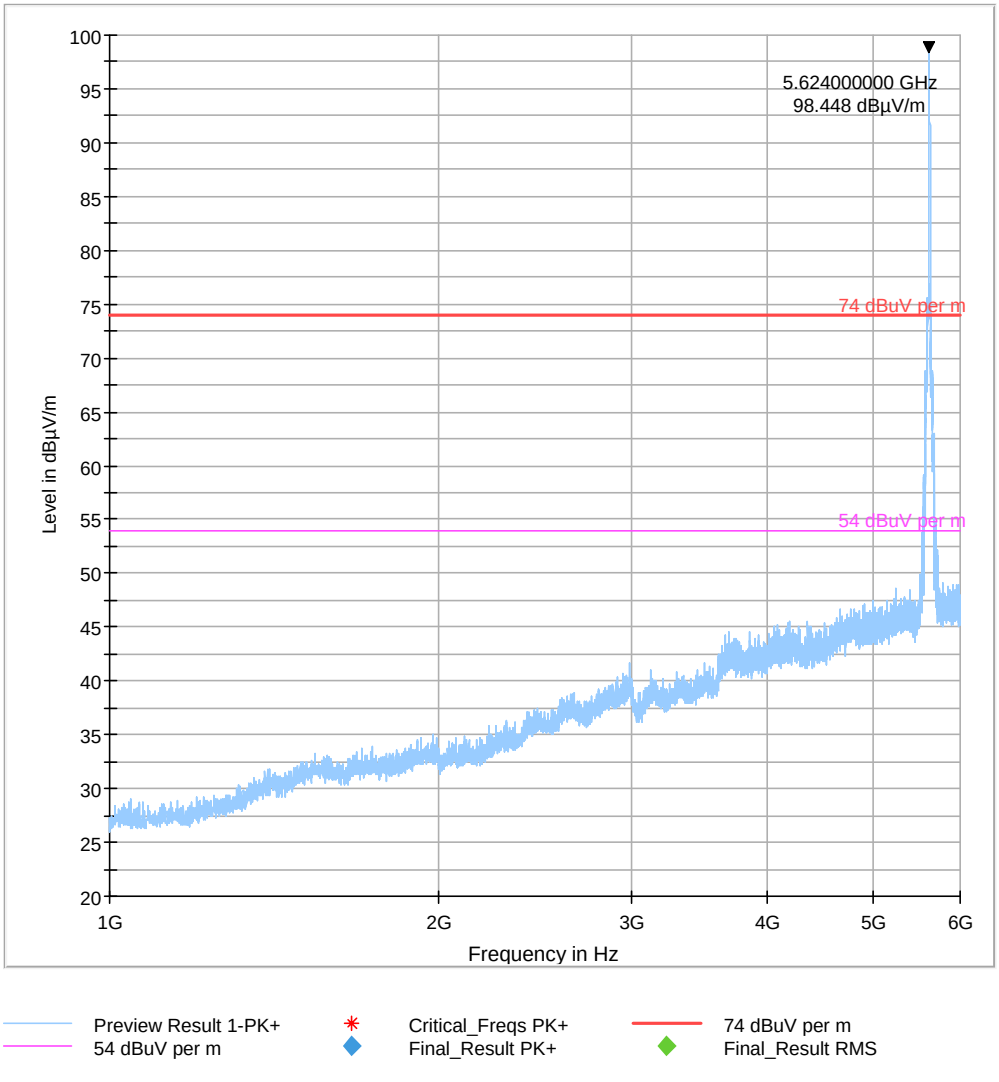
UNII-2C	Channel: Mid(124)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
---	---	---	---	---	---	---	---		---

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
---	---	



Plot #19 Radiated Emissions: 6 GHz – 18GHz

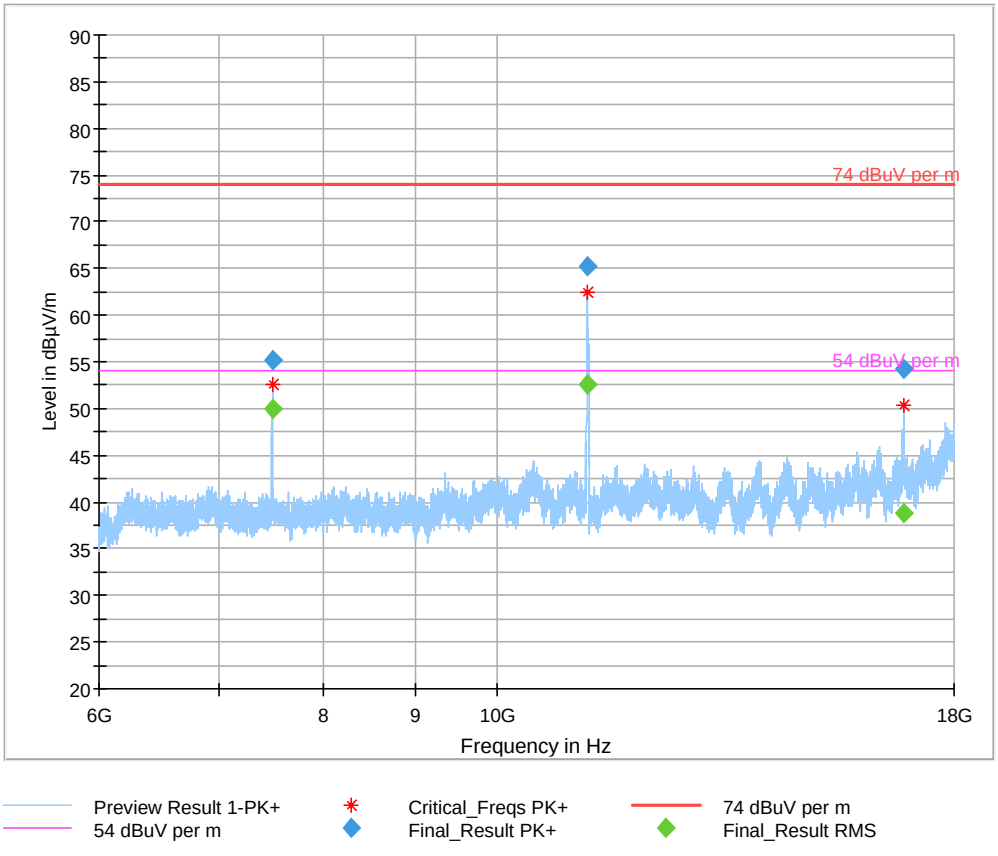
UNII-2C | **Channel: Mid(124)**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
7493.300000	---	49.95	54.00	4.05	500.0	1000.000	140.0	H	312.0
7493.300000	55.18	---	74.00	18.82	500.0	1000.000	140.0	H	312.0
11238.400000	---	52.51	54.00	1.49	500.0	1000.000	140.0	H	174.0
11238.400000	65.20	---	74.00	8.80	500.0	1000.000	140.0	H	174.0
16866.900000	---	38.86	54.00	15.14	500.0	1000.000	258.0	H	142.0
16866.900000	54.34	---	74.00	19.66	500.0	1000.000	258.0	H	142.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
7493.300000	0.0	4:26:35 PM - 11/15/2018
7493.300000	0.0	4:26:35 PM - 11/15/2018
11238.400000	2.8	4:28:39 PM - 11/15/2018
11238.400000	2.8	4:28:39 PM - 11/15/2018
16866.900000	11.1	4:30:39 PM - 11/15/2018
16866.900000	11.1	4:30:39 PM - 11/15/2018



Plot #20 Radiated Emissions: 18 GHz – 26GHz

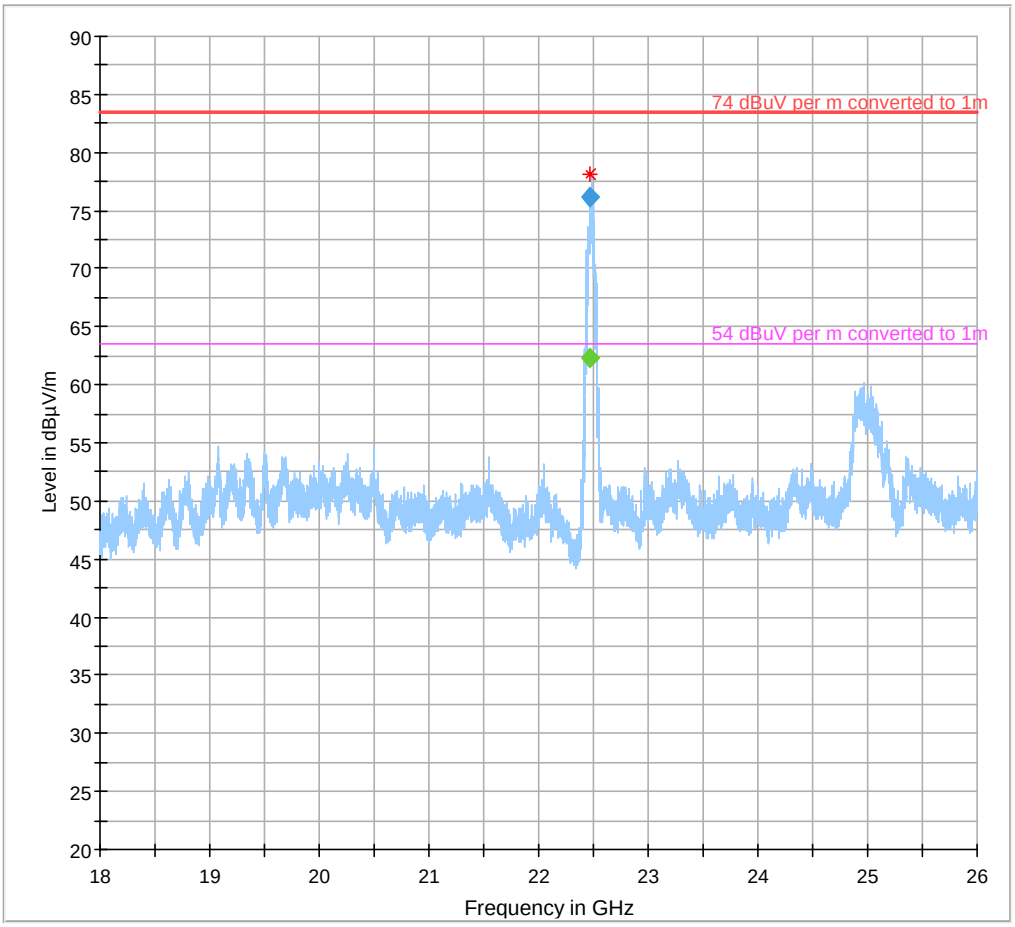
UNII-2C | **Channel: Mid(124)**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
22475.508750	---	62.29	63.50	1.21	100.0	1000.000	150.0	V	143.0
22475.508750	76.14	---	83.50	7.36	100.0	1000.000	150.0	V	143.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
22475.508750	21.1	10:47:32 AM - 11/16/2018
22475.508750	21.1	10:47:32 AM - 11/16/2018



Plot #21 Radiated Emissions: 26 GHz – 40GHz

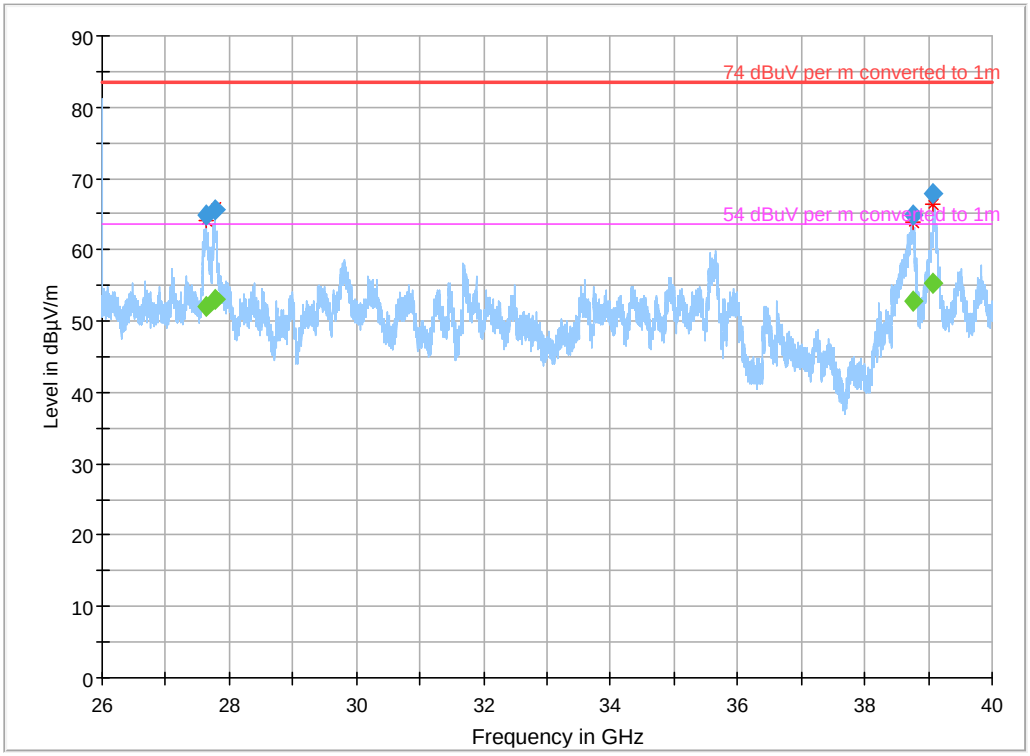
UNII-2C | **Channel: Mid(124)**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
27648.287857	---	52.15	63.50	11.35	100.0	1000.000	150.0	H	34.0
27648.287857	64.78	---	83.50	18.72	100.0	1000.000	150.0	H	34.0
27775.533929	---	53.13	63.50	10.37	100.0	1000.000	150.0	H	67.0
27775.533929	65.52	---	83.50	17.98	100.0	1000.000	150.0	H	67.0
38752.700357	---	52.87	63.50	10.63	100.0	1000.000	150.0	H	134.0
38752.700357	64.85	---	83.50	18.65	100.0	1000.000	150.0	H	134.0
39073.231786	---	55.42	63.50	8.08	100.0	1000.000	150.0	H	202.0
39073.231786	67.85	---	83.50	15.65	100.0	1000.000	150.0	H	202.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
27648.287857	3.5	4:25:56 PM - 3/4/2019
27648.287857	3.5	4:25:56 PM - 3/4/2019
27775.533929	4.3	4:27:36 PM - 3/4/2019
27775.533929	4.3	4:27:36 PM - 3/4/2019
38752.700357	14.8	4:29:11 PM - 3/4/2019
38752.700357	14.8	4:29:11 PM - 3/4/2019
39073.231786	16.9	4:30:44 PM - 3/4/2019
39073.231786	16.9	4:30:43 PM - 3/4/2019



Plot #22 Radiated Emissions: 30 MHz – 1GHz

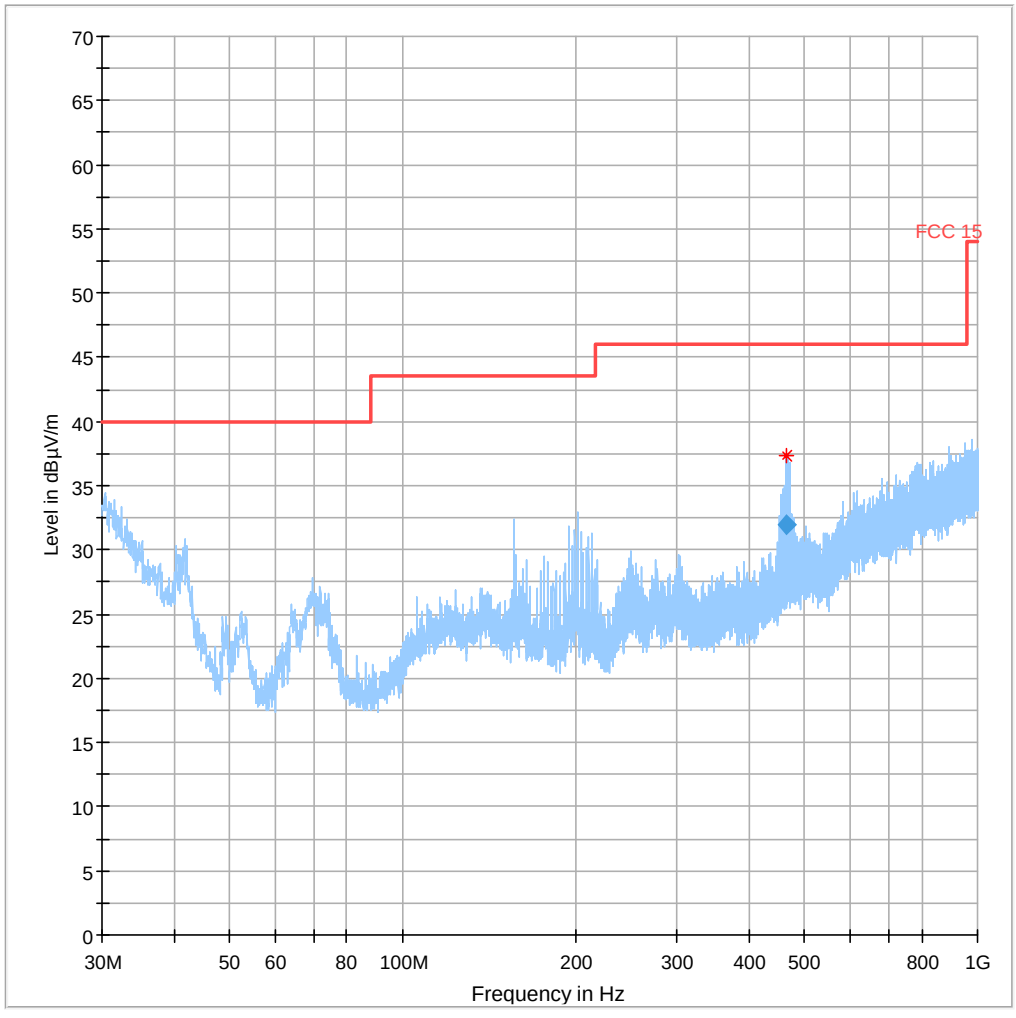
UNII-2C	Channel: High(144)	

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
466.265333	31.94	46.02	14.08	200.0	120.000	203.0	H	215.0	26.1

(continuation of the "Final_Result" table from column 16 ...)

Frequency (MHz)	Comment
466.265333	10:54:08 AM - 11/15/2018



Plot #23 Radiated Emissions: 1 GHz – 6GHz

UNII-2C | **Channel: High(144)**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
---	---	---	---	---	---	---	---		---

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
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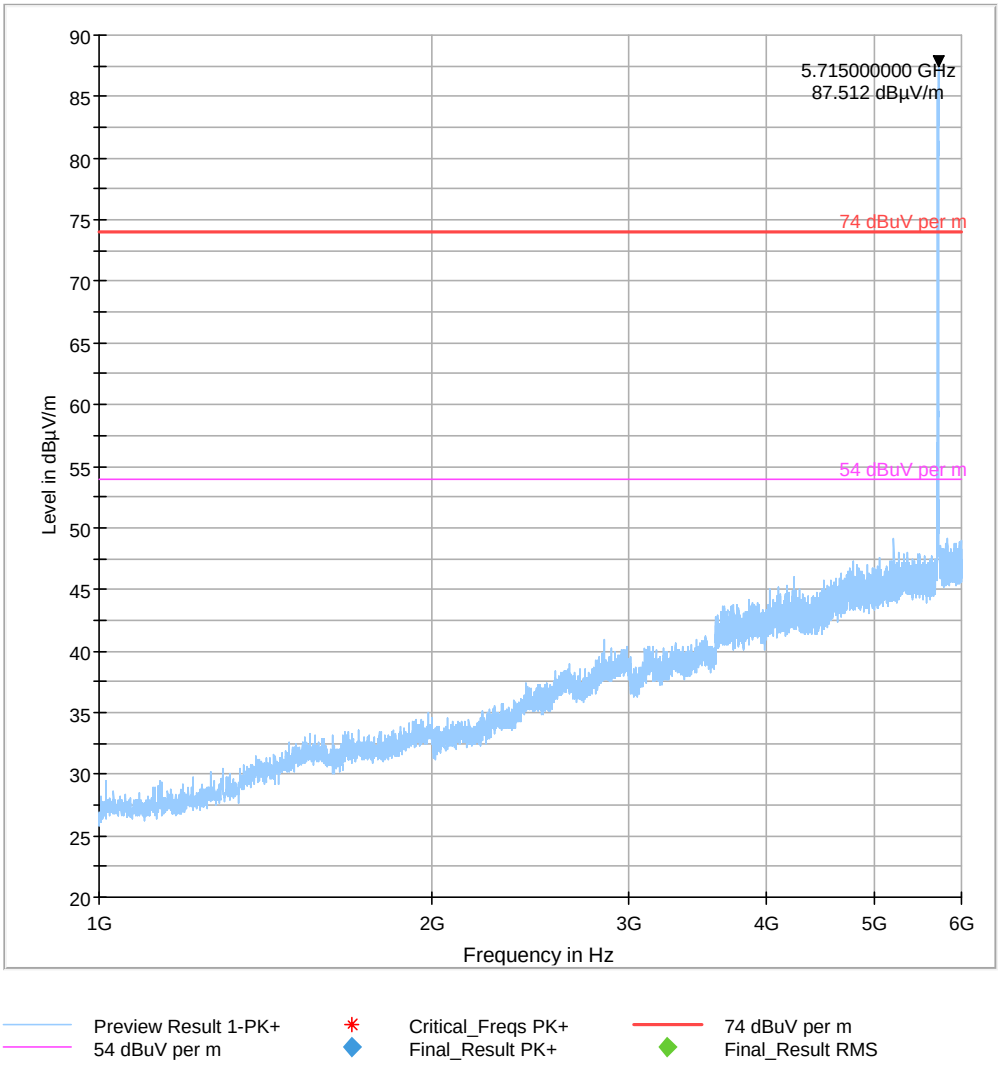


Plot #24 Radiated Emissions: 6 GHz – 18GHz

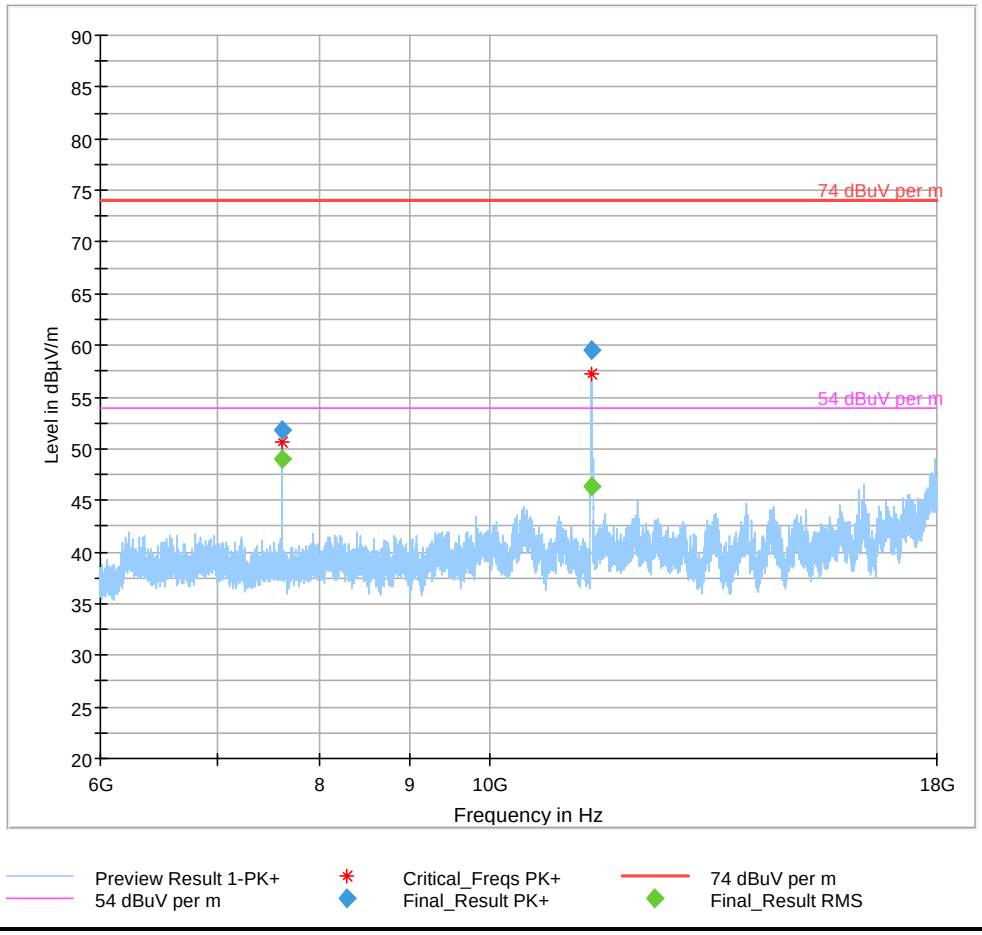
UNII-2C | **Channel: High(144)**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
7626.700000	---	48.98	54.00	5.02	500.0	1000.000	140.0	H	297.0
7626.700000	51.75	---	74.00	22.25	500.0	1000.000	140.0	H	297.0
11442.600000	---	46.37	54.00	7.63	500.0	1000.000	180.0	H	17.0
11442.600000	59.59	---	74.00	14.41	500.0	1000.000	180.0	H	17.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB)	Comment
7626.700000	0.0	2:58:08 PM - 11/15/2018
7626.700000	0.0	2:58:08 PM - 11/15/2018
11442.600000	2.3	3:00:22 PM - 11/15/2018
11442.600000	2.3	3:00:22 PM - 11/15/2018



9 Test setup photos

Setup photos are included in supporting file name: "EMC_VIRSC_001_17001_15.247_Setup_Photos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Biconlog Antenna	EMCO	3142E	166067	3 years	6/28/2017
Loop Antenna	ETS Lindgren	6507	161344	3 years	10/26/2017
Horn Antenna	EMCO	3115	35111	3 years	11/17/2015
Horn Antenna	ETS Lindgren	3117 PA	169547	3 years	8/8/2017
Compact Digital Barometer	Control Company	35519-055	91119547	2 Years	6/20/2017
Spectrum Analyzer	R&S	FSU26	200065	3 years	7/3/2017
Spectrum Analyzer	R&S	FSV40	101022	3 years	7/5/2017
Thermometer Humidity	Dickson	TM320	5280063	1 Year	11/2/2017

Note:

1. Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

11 History

Date	Report Name	Changes to report	Report prepared by
2019-02-05	EMC_VIRSC_003 _15.407_UNII	Initial version	Kevin Wang
2019-03-05	EMC_VIRSC_003 _15.407_UNII_2A&C	Update the report name, max output power data, frequency stability data, radiated spurious emission data	Kevin Wang