ACCREDITED
TESTING LABORATORY
CERTIFICATE # 4821.01

FCC PART 15.407

TEST REPORT

For

Grandstream Networks, Inc.

126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

FCC ID: YZZGWN7660

Report Type:	**Product Type:**
Original Report	802.11ax 2×2:2 Wi-Fi 6 Access Point

Report Number:	RSZ201228006-00B
Report Date:	2021-02-26
Reviewed By:	Jacob Kong RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	802.11ax 2×2:2 Wi-Fi 6 Access Point
Tested Model	GWN7660
Frequency Range	5G Wi-Fi: 5150-5250MHz; 5725-5850MHz
Maximum Conducted Ave.erage Ouput Power	5150-5250 MHz: 21.3dBm (802.11a), 21.0dBm(802.11n20), 21.9dBm(802.11n40) 21.0dBm (802.11ac20), 22.1dBm(802.11 ac40), 21.3dBm(802.11 ac80) 18.9dBm (802.11ax20), 21.6dBm(802.11 ax40), 21.2dBm(802.11 ax80) 5725-5850 MHz: 19.9dBm (802.11a), 19.6dBm(802.11n20), 22.0dBm(802.11n40) 19.5dBm (802.11ac20), 21.9dBm(802.11 ac40), 20.5dBm(802.11 ac80) 19.6dBm (802.11ax20), 20.2dBm(802.11 ax40), 20.1dBm(802.11 ax80)
Modulation Technique	OFDM
Antenna Specification*	4 dBi(It is provided by the applicant)
Voltage Range	DC44-57V from POE
Date of Test	2021-01-11 to 2021-03-10
Sample serial number	RSZ201228006-RF-S1 (Assigned by BACL, Shenzhen)
Received date	2020-12-28
Sample/EUT Status	Good condition
Adapter information	N/A
Applicant	Grandstream Networks, Inc.
Applicant Address	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer	Grandstream Networks, Inc.
Manufacturer Address	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. And KDB789033 D02 General U-NII Test Procedures New Rules v02r01.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.73dB
RF conducted test with spectrum		±1.6dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±1℃
Humidity		±6%
Supply voltages		±0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode, which was provided by manufacturer.

The EUT can operate in 802.11a/n20/n40/ac20/ac40/ac80/ax20/ax40/ax80 modes.

For 5150-5250MHz Band, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
38	5190	46	5230
40	5200	48	5240
42	5210	/	/

For 5725-5850MHz Band, 8 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	157	5785
151	5755	159	5795
153	5765	161	5805
155	5775	165	5825

EUT support SISO and MIMO mode, and for the MIMO mode support Beamforming and Non-beamforming, all those modes share the same power level setting and have same output power in each antenna port, the worst case is MIMO mode with Beamforming was selected to test for compliance.

EUT Exercise Software

"CRT"* was used. Test frequencies and power level were configured as below:

U-NII	Mode	Frequency (MHz)	Data Rate	Power Level*
5150 – 5250MHz	802.11 a	5180	6Mbps	19.5
		5200	6Mbps	19.5
		5240	6Mbps	19.5
	802.11 n20	5180	MCS0	19.5
		5200	MCS0	19.5
		5240	MCS0	19.5
	802.11 n40	5190	MCS0	20
		5230	MCS0	20
	802.11 ac20	5180	MCS0	19.5
		5200	MCS0	19.5
		5240	MCS0	19.5
	802.11 ac40	5190	MCS0	20
		5230	MCS0	20
	802.11 ac80	5210	MCS0	19.5
	802.11 ax20	5180	MCS0	18
		5200	MCS0	18
		5240	MCS0	18
	802.11 ax40	5190	MCS0	20
		5230	MCS0	20
	802.11 ax80	5210	MCS0	19.5

U-NII	Mode	Frequency (MHz)	Data Rate set	Power Level*
5725-5850MHz	802.11 a	5745	6Mbps	Deault
		5785	6Mbps	Deault
		5825	6Mbps	Deault
	802.11 n20	5745	MCS0	Deault
		5785	MCS0	Deault
		5825	MCS0	Deault
	802.11 n40	5755	MCS0	Deault
		5795	MCS0	Deault
	802.11 ac20	5745	MCS0	Deault
		5785	MCS0	Deault
		5825	MCS0	Deault
	802.11 ac40	5755	MCS0	Deault
		5795	MCS0	Deault
	802.11 ac80	5775	MCS0	Deault
	802.11 ax20	5745	MCS0	Deault
		5785	MCS0	Deault
		5825	MCS0	Deault
	802.11 ax40	5755	MCS0	Deault
		5795	MCS0	Deault
	802.11 ax80	5775	MCS0	Deault

The worse-case data rates are determined to be as follows for each mode based upon investigations by measuring the Ave.erage power and PSD across all data rated bandwidths, and modulations.

The software and power level was provided by the applicant.

Duty cycle

Test Result: Pass. Please refer to the Appendix.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

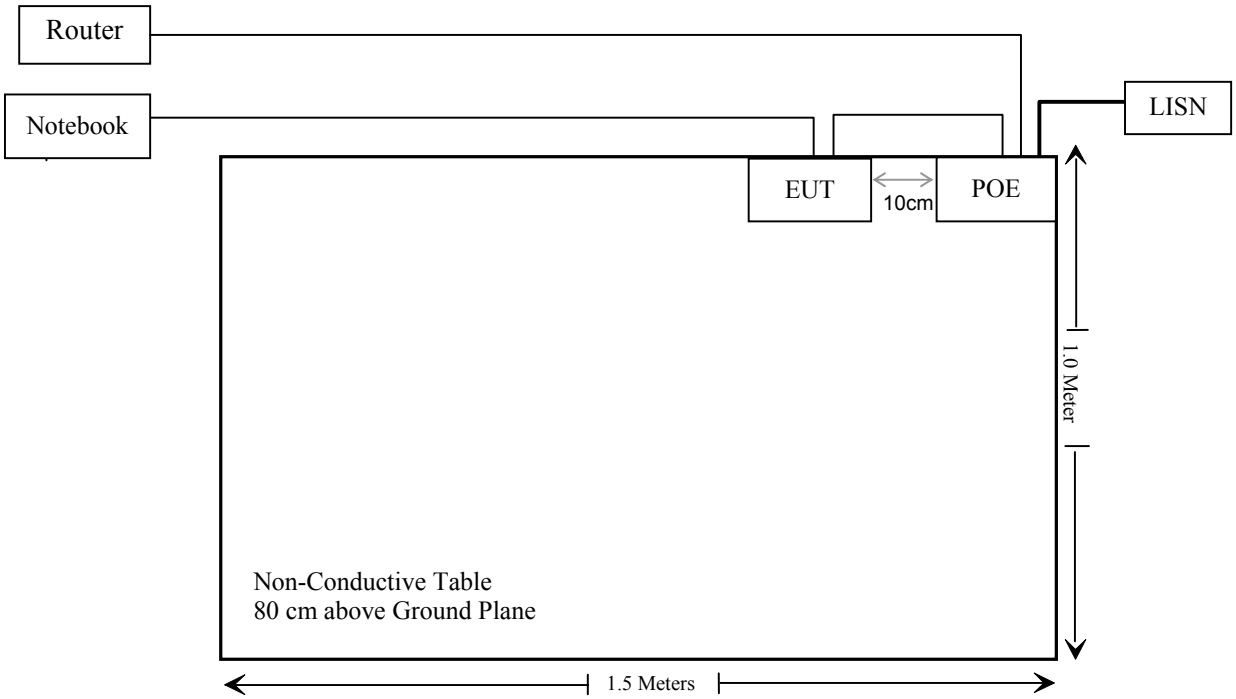
Manufacturer	Description	Model	Serial Number
GOSPELL	POE	G0720-480-050	G0720-480-050
DELL	Notebook	Latitude E6410	11429208685
HIKVISION	Router	DS-3WR03-E	10021642429

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielded Un-detachable AC Cable	1.2	LISN	POE
Un-shielded detachable RJ45 Cable	3.1	POE	EUT
Un-Shielding Detachable RJ45 Cable	3.1	EUT	Notebook
Un-shielded detachable RJ45 Cable	3.1	POE	Router

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1) & §2.1091	MaximuM Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.407(b)(6)& §15.207(a)	Conducted Emissions	Compliance
§15.205& §15.209 &§15.407(b) (1), (2), (3), (4), (6) (7)	Undesirable Emission& Restricted Bands	Compliance
§15.407(a) (1), (5),(e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliance
§15.407(a)(1),(2), (3)	Conducted Transmitter Output Power	Compliance
§15.407 (a)(1), (2), (3)	Power Spectral Density	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conducted test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2020/08/04	2021/08/03
Rohde & Schwarz	LISN	ENV216	101613	2020/08/04	2021/08/03
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2020/11/29	2021/11/28
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2020/11/29	2021/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2020/12/22	2023/12/21
Unknown	Cable 2	RF Cable 2	F-03-EM197	2020/11/29	2021/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2020/11/29	2021/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2020/08/04	2021/08/03
COM-POWER	Pre-amplifier	PA-122	181919	2020/11/29	2021/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2020/11/29	2021/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2020/12/22	2023/12/21
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2020/11/29	2021/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2020/11/29	2021/11/28
Unknown	Signal Cable	RG-214	2	2020/11/29	2021/11/28
SNSD	Band Reject filter	BSF5150-5850MN-0899-004	5G filter	2020/04/20	2021/04/20
Ducommun Technolagies	Horn antenna	ARH-4223-02	1007726-02 1304	2020/12/06	2023/12/05
Ducommun Technolagies	Horn antenna	ARH-2823-02	1007726-02 1302	2020/12/06	2023/12/05
RF Conducted Test					
Tonscend Corporation	RF control Unit	JS0806-2	19D8060154	2020/08/04	2021/08/03
Rohde & Schwarz	Signal and Spectrum Analyzer	FSV40	101473	2020/08/04	2021/08/03
Unknown	RF Cable 2	Unknown	F-03-EM198	2020/11/12	2021/11/12

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations hAve.e been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Ave.eraging Time (Minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wAve.e equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \le 1$$

Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBi)	(numeric)	(dBm)	(mW)			
2412-2462	6	3.98	26.0	398.11	20	0.315	1
5150-5250	7	5.01	22.5	177.83	20	0.177	1
5725-5850	7	5.01	22.5	177.83	20	0.177	1

Note: The 2.4G Wi-Fi and 5G Wi-Fi can transmit at the same time.
The antenna gain is 3dBi for 2.4GHz Wi-Fi and 4dBi for 5G Wi-Fi.
EUT support beamforming
Directional gain = G_{ANT} + Array Gain
*Array Gain=10*log(N_{ant}/N_{ss})* dB
For the worst case, N_{ss}=1, so:
For 2.4GHz Wi-Fi, Directional gain=3dBi+10*log(2/1)dB=6dBi
For 5GHz Wi-Fi, Directional gain=4dBi+10*log(2/1)dB=7dBi

Simultaneous transmitting consideration:

The ratio=MPE_{DTS}/limit+MPE_{NII}/limit =0.315/1+0.177/1=0.492＜1.0

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.407 (a), if the transmitting antennas of directional gain greater than 6dBi are used, the transmit power and power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has two internal antennas arrangement for 5G Wi-Fi, which was permanently attached and the antenna gain is 4.0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

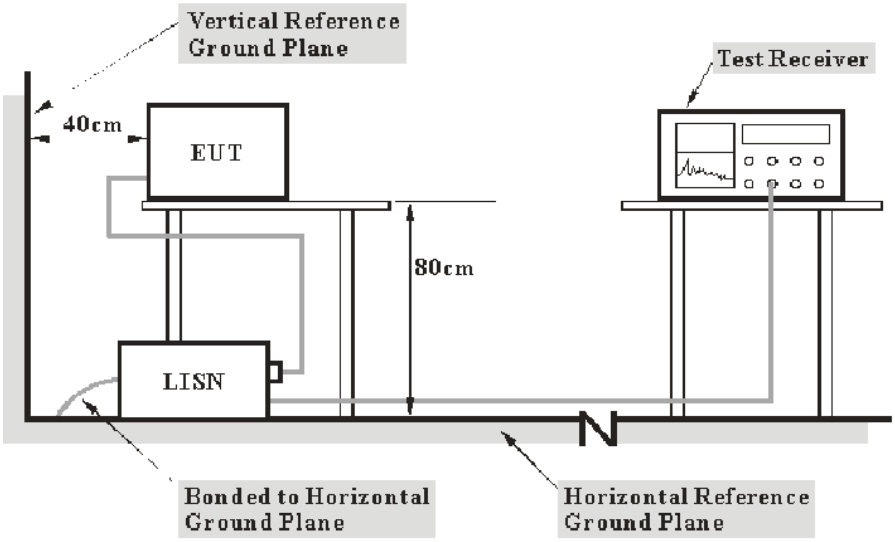
Result: Compliance.

FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207, §15.407(b) (6)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and Ave.erage detection mode.

Test Data

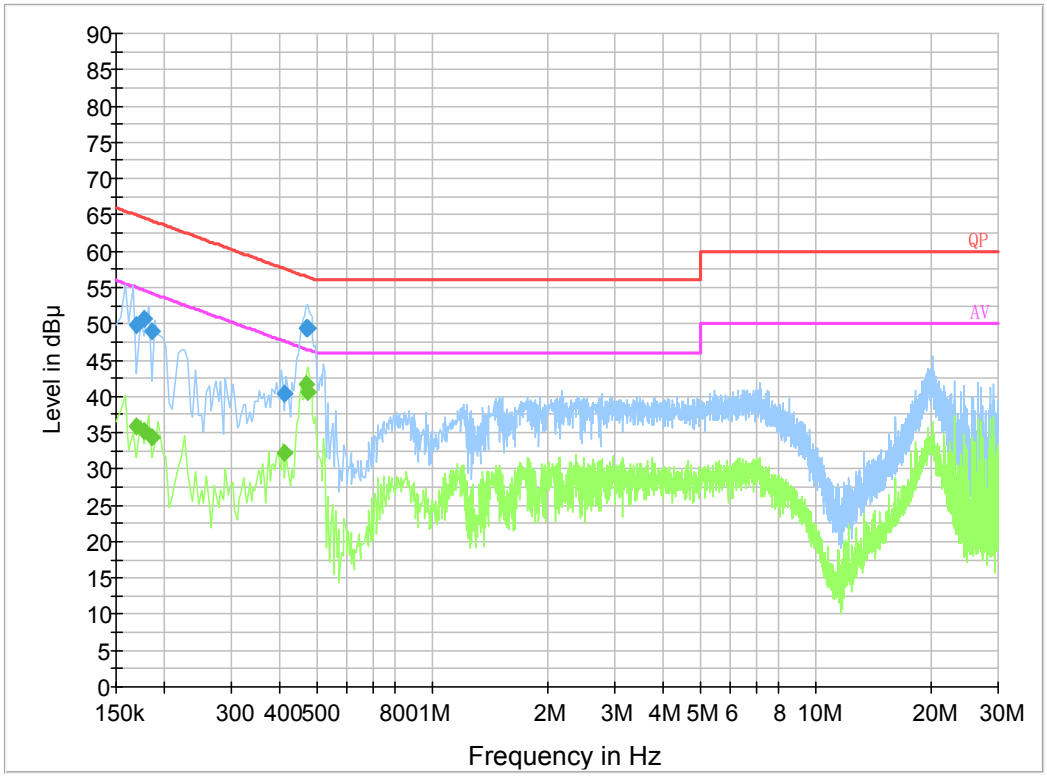
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2021-01-11.

EUT operation mode: Transmitting

AC 120V/60 Hz, Line:



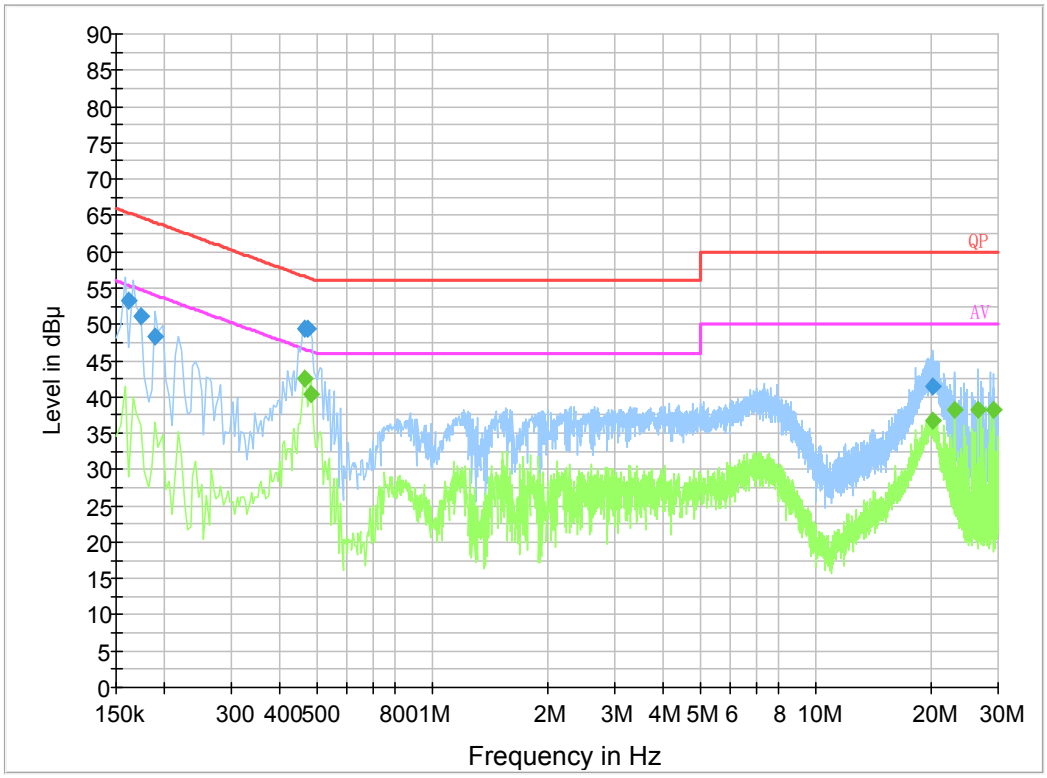
Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.169500	49.9	9.000	L1	19.9	15.1	65.0
0.177500	50.7	9.000	L1	19.9	13.9	64.6
0.185500	49.0	9.000	L1	19.8	15.2	64.2
0.411910	40.3	9.000	L1	19.9	17.3	57.6
0.470890	49.5	9.000	L1	19.8	7.0	56.5
0.474770	49.4	9.000	L1	19.8	7.0	56.4

Final Result 2

Frequency (MHz)	Ave.erage	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.169500	35.9	9.000	L1	19.9	19.1	55.0
0.177500	35.2	9.000	L1	19.9	19.4	54.6
0.185500	34.5	9.000	L1	19.8	19.7	54.2
0.411910	32.2	9.000	L1	19.9	15.4	47.6
0.470890	41.8	9.000	L1	19.8	4.7	46.5
0.474770	40.6	9.000	L1	19.8	5.8	46.4

AC 120V/60 Hz, Neutral:



Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.161500	53.2	9.000	N	19.8	12.2	65.4
0.173500	51.0	9.000	N	19.8	13.8	64.8
0.189500	48.4	9.000	N	19.8	15.7	64.1
0.466890	49.3	9.000	N	19.8	7.3	56.6
0.474770	49.4	9.000	N	19.8	7.0	56.4
20.262130	41.5	9.000	N	20.4	18.5	60.0

Final Result 2

Frequency (MHz)	Ave.erage	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.466000	42.5	9.000	N	19.8	4.1	46.6
0.482000	40.3	9.000	N	19.8	6.0	46.3
20.318000	36.7	9.000	N	20.4	13.3	50.0
23.130000	38.3	9.000	N	20.3	11.7	50.0
26.610000	38.2	9.000	N	20.2	11.8	50.0
29.234000	38.3	9.000	N	20.1	11.7	50.0

§15.205 & §15.209 & §15.407(B) (1), (2), (3), (4),(6),(7) – UNDESIRABLE EMISSION

Applicable Standard

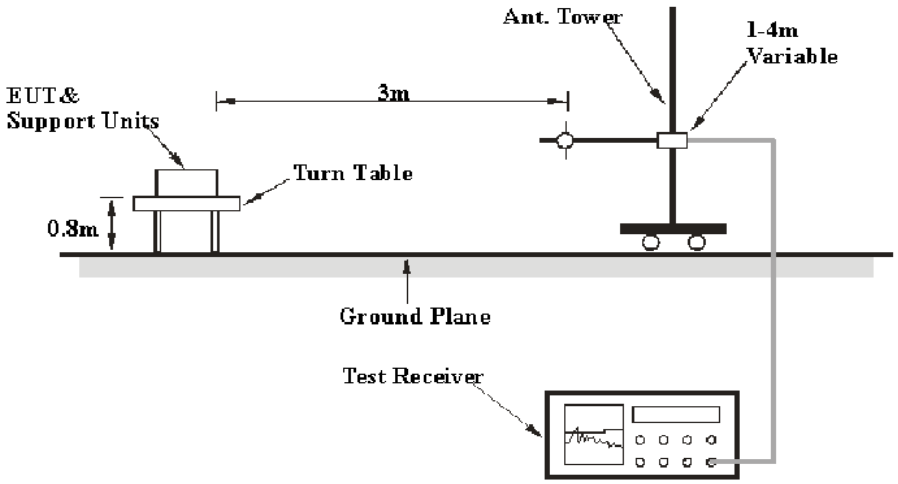
FCC §15.407 (b) (1), (2), (3), (4), (6), (7); §15.209; §15.205;

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:
(1) For transmitters operating in the 5.15-5.25 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.
(2) 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.
(3) 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.
(4) For transmitters operating in the 5.725-5.85 GHz band:
(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

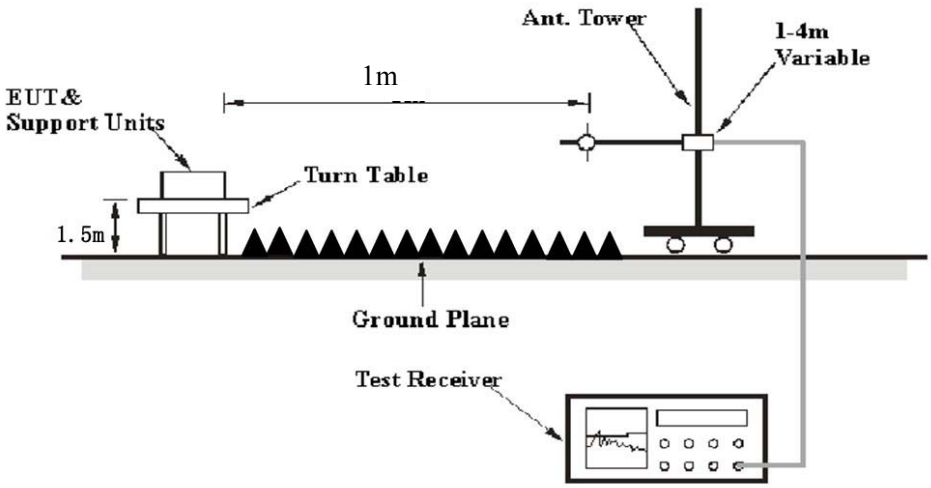
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC 15.209 and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1MHz	10 Hz Note 1	/	Ave.erage
	1MHz	＞1/T Note 2	/	Ave.erage

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

Test Procedure

Radiated Spurious Emission

During the radiated emission test, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all the installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz, peak and Ave.erage detection modes for frequencies above 1GHz.

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Data

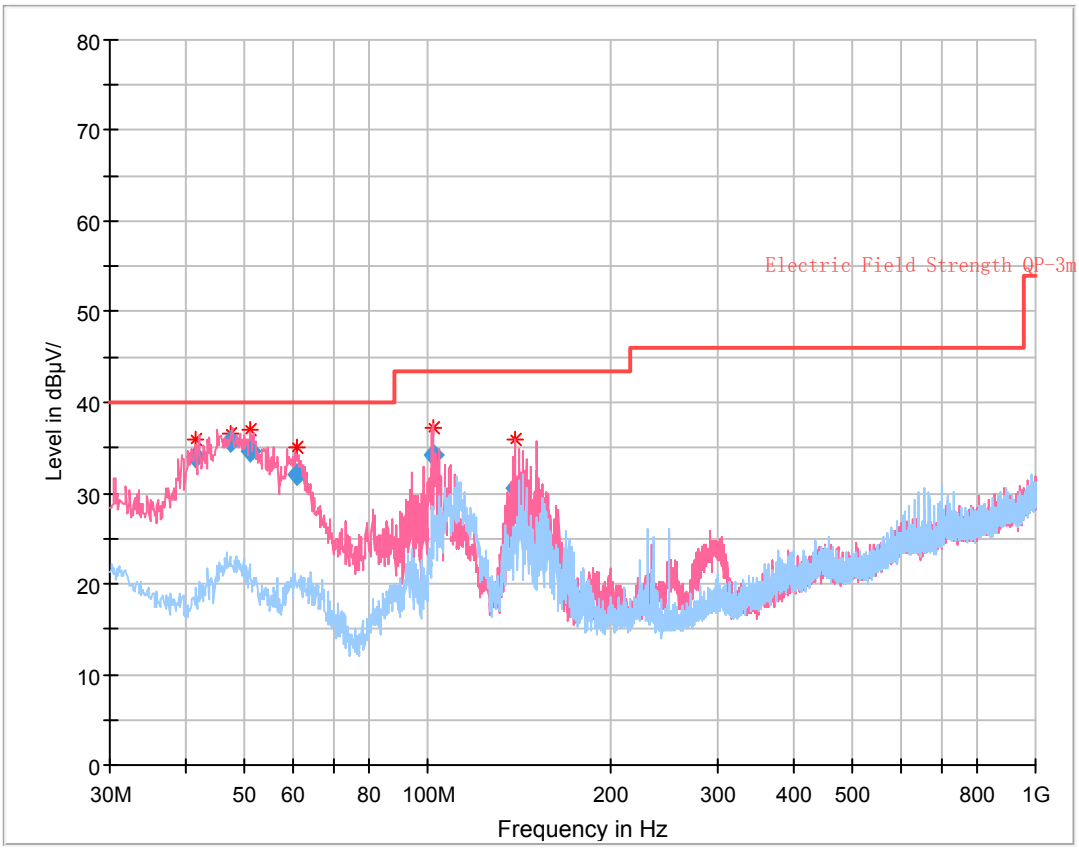
Environmental Conditions

Temperature:	21.7~24 ℃
Relative Humidity:	44~51%
ATM Pressure:	100.9~101.0 kPa

The testing was performed by Holland Yang on 2021-01-12 for below 1GHz and by Leven Gan on 2021-02-02 for above 1GHz.

EUT operation mode: Transmitting

30 MHz – 1 GHz: *(worst case is 802.11ac40 mode 5230 MHz)*



Final_Result

Frequency (MHz)	QuasiPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
41.604375	34.08	40.00	5.92	101.0	V	163.0	-11.7
47.496125	35.61	40.00	4.39	104.0	V	61.0	-15.3
51.216500	34.66	40.00	5.34	103.0	V	0.0	-16.6
60.779375	32.02	40.00	7.98	108.0	V	26.0	-17.1
101.898500	34.21	43.50	9.29	113.0	V	77.0	-13.6
139.254750	30.46	43.50	13.04	101.0	V	142.0	-11.1

1 ~ 40 GHz:

Note: The test distance is 1m, so the correct factor from 3m to 1m is 20log(3/1)=9.5dB which was added into the final limit.

5150-5250 MHz:

Frequency (MHz)	Receiver		Turn-Table	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part15.407	
	Reading (dBμV)	Detector (PK/QP/Ave.)	Angle Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11A									
5180 MHz									
5149.30	37.64	PK	344	1.5	V	38.36	76.00	83.5	7.50
5149.30	23.26	Ave.	344	1.5	V	38.36	61.62	63.5	1.88
5352.24	32.14	PK	41	1.5	V	39.09	71.23	83.5	12.27
5352.24	17.61	Ave.	41	1.5	V	39.09	56.7	63.5	6.80
10360.00	49.80	PK	150	2.4	V	17.42	67.22	77.7	10.48
5200 MHz									
10400.00	49.72	PK	241	2.3	V	17.52	67.24	77.7	10.46
5240 MHz									
5147.43	32.08	PK	76	1.3	V	38.36	70.44	83.5	13.06
5147.43	17.59	Ave.	76	1.3	V	38.36	55.95	63.5	7.55
5353.26	31.96	PK	185	2.1	V	39.09	71.05	83.5	12.45
5353.26	17.63	Ave.	185	2.1	V	39.09	56.72	63.5	6.78
10480.00	49.64	PK	110	1.9	V	17.25	66.89	77.7	10.81
802.11n20									
5180 MHz									
5145.32	37.36	PK	43	2.4	V	38.36	75.72	83.5	7.78
5145.32	22.51	Ave.	43	2.4	V	38.36	60.87	63.5	2.63
5352.28	32.14	PK	300	1.7	V	39.09	71.23	83.5	12.27
5352.28	17.54	Ave.	300	1.7	V	39.09	56.63	63.5	6.87
10360.00	49.78	PK	8	1.5	V	17.42	67.20	77.7	10.50
5200 MHz									
10400.00	49.64	PK	73	1.7	V	17.52	67.16	77.7	10.54
5240 MHz									
5148.27	32.14	PK	194	1.8	V	38.36	70.50	83.5	13.00
5148.27	18.15	Ave.	194	1.8	V	38.36	56.51	63.5	6.99
5352.36	31.96	PK	154	1.5	V	39.09	71.05	83.5	12.45
5352.36	18.24	Ave.	154	1.5	V	39.09	57.33	63.5	6.17
10480.00	49.94	PK	297	2.4	V	17.25	67.19	77.7	10.51

Frequency (MHz)	Receiver		Turn-Table	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part15.407	
	Reading (dBμV)	Detector (PK/QP/Ave.)	Angle Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11N40									
5190 MHz									
5147.63	43.99	PK	312	1.4	V	38.36	82.35	83.5	1.15
5147.63	22.88	Ave.	312	1.4	V	38.36	61.24	63.5	2.26
5352.12	32.61	PK	110	2.1	V	39.09	71.70	83.5	11.80
5352.12	18.31	Ave.	110	2.1	V	39.09	57.40	63.5	6.10
10380.00	48.89	PK	8	2.2	V	17.42	66.31	77.7	11.39
5230 MHz									
5148.41	31.86	PK	134	1.6	V	38.36	70.22	83.5	13.28
5148.41	18.19	Ave.	134	1.6	V	38.36	56.55	63.5	6.95
5353.26	31.94	PK	153	2.4	V	39.09	71.03	83.5	12.47
5353.26	18.23	Ave.	153	2.4	V	39.09	57.32	63.5	6.18
10460.00	49.17	PK	320	2.2	V	17.15	66.32	77.7	11.38
802.11AC20									
5180 MHz									
5148.27	32.14	PK	162	2.3	V	38.36	70.50	83.5	13.00
5148.27	23.03	Ave.	162	2.3	V	38.36	61.39	63.5	2.11
5353.12	31.96	PK	18	1.2	V	39.09	71.05	83.5	12.45
5353.12	18.14	Ave.	18	1.2	V	39.09	57.23	63.5	6.27
10360.00	50.48	PK	122	1.1	V	17.42	67.90	77.7	9.80
5200 MHz									
10400.00	49.64	PK	233	1.4	V	17.52	67.16	77.7	10.54
5240 MHz									
5147.63	32.24	PK	233	1.5	V	38.36	70.60	83.5	12.90
5147.63	18.25	Ave.	233	1.5	V	38.36	56.61	63.5	6.89
5354.75	32.14	PK	209	2.4	V	39.09	71.23	83.5	12.27
5354.75	18.27	Ave.	209	2.4	V	39.09	57.36	63.5	6.14
10480.00	49.78	PK	57	2.1	V	17.25	67.03	77.7	10.67

Frequency (MHz)	Receiver		Turn-Table	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part15.407	
	Reading (dBμV)	Detector (PK/QP/Ave.)	Angle Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11AC40									
5190 MHz									
5149.63	44.15	PK	319	1.6	V	38.36	82.51	83.5	0.99
5149.63	23.21	Ave.	319	1.6	V	38.36	61.57	63.5	1.93
5352.10	32.45	PK	179	1.2	V	39.09	71.54	83.5	11.96
5352.10	18.33	Ave.	179	1.2	V	39.09	57.42	63.5	6.08
10380.00	49.35	PK	141	1.1	V	17.42	66.77	77.7	10.93
5230 MHz									
5149.52	31.96	PK	213	2.2	V	38.36	70.32	83.5	13.18
5149.52	18.18	Ave.	213	2.2	V	38.36	56.54	63.5	6.96
5352.24	32.47	PK	245	2.4	V	39.09	71.56	83.5	11.94
5352.24	18.34	Ave.	245	2.4	V	39.09	57.43	63.5	6.07
10460.00	48.98	PK	139	2.1	V	17.15	66.13	77.7	11.57
802.11AC80									
5210MHz									
5149.52	44.13	PK	289	1.9	V	38.36	82.49	83.5	1.01
5149.52	22.87	Ave.	289	1.9	V	38.36	61.23	63.5	2.27
5353.42	35.33	PK	257	2.5	V	39.09	74.42	83.5	9.08
5353.42	19.31	Ave.	257	2.5	V	39.09	58.40	63.5	5.10
10420.00	49.36	PK	124	2.3	V	17.52	66.88	77.7	10.82
802.11AX20									
5180 MHz									
5148.18	39.12	PK	46	2.1	V	38.36	77.48	83.5	6.02
5148.18	22.83	Ave.	46	2.1	V	38.36	61.19	63.5	2.31
5357.62	32.21	PK	28	1.1	V	39.09	71.30	83.5	12.20
5357.62	18.26	Ave.	28	1.1	V	39.09	57.35	63.5	6.15
10360.00	50.35	PK	358	1.5	V	17.42	67.77	77.7	9.93
5200 MHz									
10400.00	50.27	PK	211	2.0	V	17.52	67.79	77.7	9.91
5240 MHz									
5145.42	32.55	PK	143	2.5	V	38.36	70.91	83.5	12.59
5145.42	18.24	Ave.	143	2.5	V	38.36	56.60	63.5	6.90
5352.64	32.27	PK	270	1.9	V	39.09	71.36	83.5	12.14
5352.64	18.19	Ave.	270	1.9	V	39.09	57.28	63.5	6.22
10480.00	50.12	PK	283	2.4	V	17.25	67.37	77.7	10.33

Frequency (MHz)	Receiver		Turn-Table	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part15.407	
	Reading (dBμV)	Detector (PK/QP/Ave.)	Angle Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11AX40									
5190 MHz									
5149.60	44.24	PK	123	1.2	V	38.36	82.60	83.5	0.90
5149.60	23.51	Ave.	123	1.2	V	38.36	61.87	63.5	1.63
5352.17	32.48	PK	74	1.8	V	39.09	71.57	83.5	11.93
5352.17	18.29	Ave.	74	1.8	V	39.09	57.38	63.5	6.12
10380.00	49.23	PK	107	2.1	V	17.42	66.65	77.7	11.05
5230 MHz									
5148.33	31.99	PK	82	1.2	V	38.36	70.35	83.5	13.15
5148.33	18.30	Ave.	82	1.2	V	38.36	56.66	63.5	6.84
5353.26	32.71	PK	171	1.6	V	39.09	71.80	83.5	11.70
5353.26	18.34	Ave.	171	1.6	V	39.09	57.43	63.5	6.07
10460.00	49.38	PK	256	1.9	V	17.15	66.53	77.7	11.17
802.11AX80									
5210MHz									
5143.64	43.95	PK	173	1.3	V	38.36	82.31	83.5	1.19
5143.64	22.93	Ave.	173	1.3	V	38.36	61.29	63.5	2.21
5353.42	35.71	PK	221	2.2	V	39.09	74.80	83.5	8.70
5353.42	19.37	Ave.	221	2.2	V	39.09	58.46	63.5	5.04
10420.00	49.23	PK	18	1.8	V	17.52	66.75	77.7	10.95

5725-5850 MHz:

Frequency (MHz)	Receiver		Turn-Table	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part15.407	
	Reading (dBµV)	Detector (PK/QP/Ave.)	Angle Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
802.11A									
5745 MHz									
5637.37	33.29	PK	15	1.6	V	39.46	72.75	77.7	4.95
5698.23	37.62	PK	186	2.0	V	39.49	77.11	114.4	37.29
5716.57	30.71	PK	187	1.4	V	39.49	70.20	119.34	49.14
5722.25	32.81	PK	348	1.8	V	39.49	72.30	125.43	53.13
11490.00	50.74	PK	350	1.4	V	17.47	68.21	83.5	15.29
11490.00	44.88	Ave.	350	1.4	V	17.47	62.35	63.5	1.15
5785 MHz									
11570.00	51.03	PK	91	2.2	H	17.51	68.54	83.5	14.96
11570.00	44.95	Ave.	91	2.2	H	17.51	62.46	63.5	1.04
5825 MHz									
5854.92	36.30	PK	306	2.5	V	39.87	76.17	120.48	44.31
5863.25	34.36	PK	211	2.0	V	39.87	74.23	117.99	43.76
5877.35	35.56	PK	61	2.3	V	39.87	75.43	112.96	37.53
5932.56	34.22	PK	116	2.0	V	39.97	74.19	77.7	3.51
11650.00	51.19	PK	169	2.4	V	16.18	67.37	83.5	16.13
11650.00	45.94	Ave.	169	2.4	V	16.18	62.12	63.5	1.38
802.11N20									
5745 MHz									
5637.37	33.29	PK	92	1.5	V	39.46	72.75	77.7	4.95
5661.76	34.55	PK	328	1.7	V	39.49	74.04	86.4	12.36
5708.15	33.94	PK	269	2.4	V	39.49	73.43	116.98	43.55
5724.84	34.82	PK	293	1.8	V	39.49	74.31	131.34	57.03
11490.00	50.91	PK	288	1.7	V	17.47	68.38	83.5	15.12
11490.00	44.82	Ave.	288	1.7	V	17.47	62.29	63.5	1.21
5785 MHz									
11570.00	50.86	PK	187	1.4	V	17.51	68.37	83.5	15.13
11570.00	44.93	Ave.	187	1.4	V	17.51	62.44	63.5	1.06
5825 MHz									
5851.72	38.99	PK	69	2.5	V	39.87	78.86	127.78	48.92
5874.88	36.09	PK	184	2.5	V	39.87	75.96	114.73	38.77
5878.37	35.42	PK	208	1.1	V	39.87	75.29	112.21	36.92
5973.66	34.59	PK	183	2.0	V	39.84	74.43	77.7	3.27
11650.00	51.32	PK	180	2.1	V	16.18	67.50	83.5	16.00
11650.00	46.05	Ave.	180	2.1	V	16.18	62.23	63.5	1.27

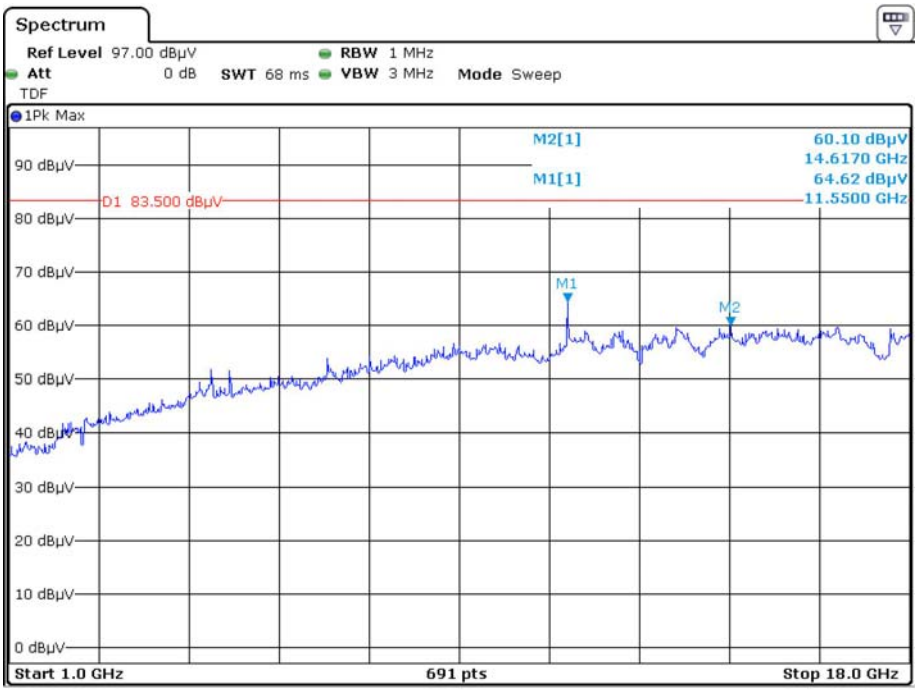
Frequency (MHz)	Receiver		Turn-Table	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part15.407	
	Reading (dBμV)	Detector (PK/QP/Ave.)	Angle Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11N40									
5755 MHz									
5644.25	32.92	PK	42	1.4	V	39.46	72.38	77.7	5.32
5683.25	36.26	PK	187	1.8	V	39.49	75.75	102.3	26.55
5719.67	33.89	PK	144	2.0	V	39.49	73.38	120.21	46.83
5721.01	32.96	PK	250	1.3	V	39.49	72.45	122.61	50.16
11510.00	50.87	PK	171	1.1	V	17.47	68.34	83.5	15.16
11510.00	44.96	Ave.	171	1.1	V	17.47	62.43	63.5	1.07
5795 MHz									
5851.63	38.05	PK	161	1.9	V	39.87	77.92	127.98	50.06
5856.65	36.45	PK	308	1.1	V	39.87	76.32	119.84	43.52
5910.78	34.39	PK	259	1.9	V	39.87	74.26	88.22	13.96
5945.95	34.49	PK	151	1.4	V	39.97	74.46	77.7	3.24
11590.00	50.59	PK	289	1.5	V	17.51	68.10	83.5	15.40
11590.00	44.59	Ave.	289	1.5	V	17.51	62.10	63.5	1.40
802.11AC20									
5745 MHz									
5643.74	32.43	PK	156	1.3	V	39.46	71.89	77.7	5.81
5697.65	37.33	PK	40	1.7	V	39.49	76.82	112.96	36.14
5713.65	33.34	PK	240	2.0	V	39.49	72.83	118.52	45.69
5723.41	34.76	PK	105	1.2	V	39.49	74.25	128.05	53.80
11490.00	50.47	PK	186	1.2	V	17.47	67.94	83.5	15.56
11490.00	44.71	Ave.	186	1.2	V	17.47	62.18	63.5	1.32
5785 MHz									
11570.00	50.64	PK	141	2.1	V	17.51	68.15	83.5	15.35
11570.00	44.93	Ave.	141	2.1	V	17.51	62.44	63.5	1.06
5825 MHz									
5852.05	36.89	PK	228	2.3	V	39.87	76.76	127.03	50.27
5856.13	34.02	PK	338	1.6	V	39.87	73.89	119.98	46.09
5878.22	36.11	PK	293	1.2	V	39.87	75.98	112.32	36.34
5933.58	33.23	PK	299	1.7	V	39.97	73.20	77.7	4.50
11650.00	50.77	PK	71	1.7	V	16.18	66.95	83.5	16.55
11650.00	46.05	Ave.	71	1.7	V	16.18	62.23	63.5	1.27

Frequency (MHz)	Receiver		Turn-Table	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part15.407	
	Reading (dBμV)	Detector (PK/QP/Ave.)	Angle Degree	Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
802.11AC40									
5755 MHz									
5648.16	33.38	PK	94	1.6	V	39.46	72.84	77.7	4.86
5696.56	37.67	PK	122	1.8	V	39.49	77.16	112.15	34.99
5707.54	34.04	PK	162	2.4	V	39.49	73.53	116.81	43.28
5724.87	33.03	PK	312	1.2	V	39.49	72.52	131.41	58.89
11510.00	50.84	PK	79	1.5	V	17.47	68.31	83.5	15.19
11510.00	44.87	Ave.	79	1.5	V	17.47	62.34	63.5	1.16
5795 MHz									
5853.06	39.18	PK	352	1.3	V	39.87	79.05	124.72	45.67
5856.48	36.54	PK	37	2.0	V	39.87	76.41	119.89	43.48
5875.33	34.35	PK	180	2.1	V	39.87	74.22	114.46	40.24
5935.53	34.13	PK	127	1.4	V	39.97	74.10	77.7	3.60
11590.00	50.76	PK	81	1.1	V	17.51	68.27	83.5	15.23
11590.00	44.96	Ave.	81	1.1	V	17.51	62.47	63.5	1.03
802.11AC80									
5775 MHz									
5636.72	32.98	PK	180	1.4	V	39.46	72.44	77.7	5.26
5689.54	36.78	PK	133	2.0	V	39.49	76.27	106.96	30.69
5714.11	38.76	PK	11	1.2	V	39.49	78.25	125.14	46.89
5720.24	35.31	PK	142	1.3	V	39.49	74.80	120.85	46.05
5853.35	37.14	PK	11	2.1	V	39.87	77.01	124.06	47.05
5869.08	40.28	PK	308	1.1	V	39.87	80.15	116.35	36.20
5877.57	37.45	PK	338	1.1	V	39.87	77.32	112.81	35.49
5955.86	34.83	PK	330	1.5	V	39.84	74.67	77.7	3.03
11550.00	51.16	PK	9	1.3	V	17.51	68.67	83.5	14.83
11550.00	45.05	Ave.	9	1.3	V	17.51	62.56	63.5	0.94
802.11AX20									
5745 MHz									
5647.36	32.18	PK	66	1.7	V	39.46	71.64	77.7	6.06
5699.39	35.15	PK	13	1.5	V	39.49	74.64	114.25	39.61
5709.51	32.41	PK	209	2.1	V	39.49	71.90	117.36	45.46
5724.32	34.49	PK	179	2.0	V	39.49	73.98	130.15	56.17
11490.00	50.87	PK	127	2.0	V	17.47	68.34	83.5	15.16
11490.00	44.79	Ave.	127	2.0	V	17.47	62.26	63.5	1.24

Frequency (MHz)	Receiver		Turn-Table	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part15.407	
	Reading (dBµV)	Detector (PK/QP/Ave.)	Angle Degree	Height (m)	Polar (H / V)			Limit (dBµV/m)	Margin (dB)
5785 MHz									
11570.00	50.78	PK	249	2.2	V	17.51	68.29	83.5	15.21
11570.00	44.98	Ave.	249	2.2	V	17.51	62.49	63.5	1.01
5825 MHz									
5851.42	39.01	PK	51	2.1	V	39.87	78.88	128.46	49.58
5859.95	35.61	PK	57	1.6	V	39.87	75.48	118.91	43.43
5883.72	35.33	PK	267	1.5	V	39.87	75.20	108.25	33.05
5926.85	34.59	PK	349	2.3	V	39.97	74.56	77.7	3.14
11650.00	50.84	PK	348	2.1	V	16.18	67.02	83.5	16.48
11650.00	45.93	Ave.	348	2.1	V	16.18	62.11	63.5	1.39
802.11AX40									
5755 MHz									
5618.20	33.31	PK	293	1.8	V	39.46	72.77	77.7	4.93
5695.84	36.97	PK	143	2.3	V	39.49	76.46	111.62	35.16
5710.38	33.91	PK	115	2.3	V	39.49	73.40	117.61	44.21
5724.95	33.27	PK	127	1.1	V	39.49	72.76	131.59	58.83
11510.00	50.86	PK	157	1.6	V	17.47	68.33	83.5	15.17
11510.00	44.91	Ave.	157	1.6	V	17.47	62.38	63.5	1.12
5795 MHz									
5850.81	36.28	PK	114	2.3	V	39.87	76.15	129.85	53.70
5856.13	34.29	PK	334	1.8	V	39.87	74.16	119.98	45.82
5876.77	34.65	PK	7	2.3	V	39.87	74.52	113.39	38.87
5930.39	34.68	PK	254	1.3	V	39.97	74.65	77.7	3.05
11590.00	51.1	PK	316	1.5	V	17.51	68.61	83.5	14.89
11590.00	44.95	Ave.	316	1.5	V	17.51	62.46	63.5	1.04
802.11AX80									
5775 MHz									
5644.89	32.18	PK	306	1.1	V	39.46	71.64	77.7	6.06
5679.05	37.63	PK	180	2.2	V	39.49	77.12	99.2	22.08
5714.43	37.66	PK	254	2.5	V	39.49	77.15	118.74	41.59
5722.46	39.65	PK	161	1.7	V	39.49	79.14	125.91	46.77
5854.39	41.11	PK	148	1.6	V	39.87	80.98	121.69	40.71
5872.67	37.61	PK	285	1.1	V	39.87	77.48	115.35	37.87
5875.11	38.47	PK	238	1.8	V	39.87	78.34	114.62	36.28
5934.43	33.85	PK	207	1.8	V	39.97	73.82	77.7	3.88
11550.00	51.36	PK	47	1.9	V	17.51	68.87	83.5	14.63
11550.00	45.02	Ave.	47	1.9	V	17.51	62.53	63.5	0.97

Note:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor
Margin = Limit- Corr. Amplitude
All other spurious emissions are 20 dB below the limit or are on the system noise floor level.

Peak
Pre-scan with 802.11ac80 5775MHz
Horizontal



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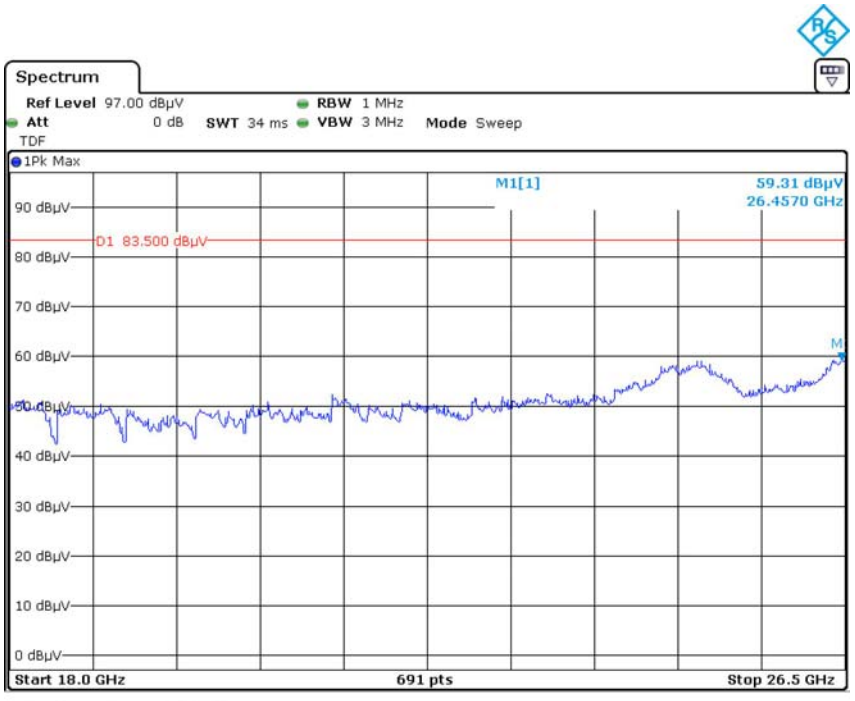

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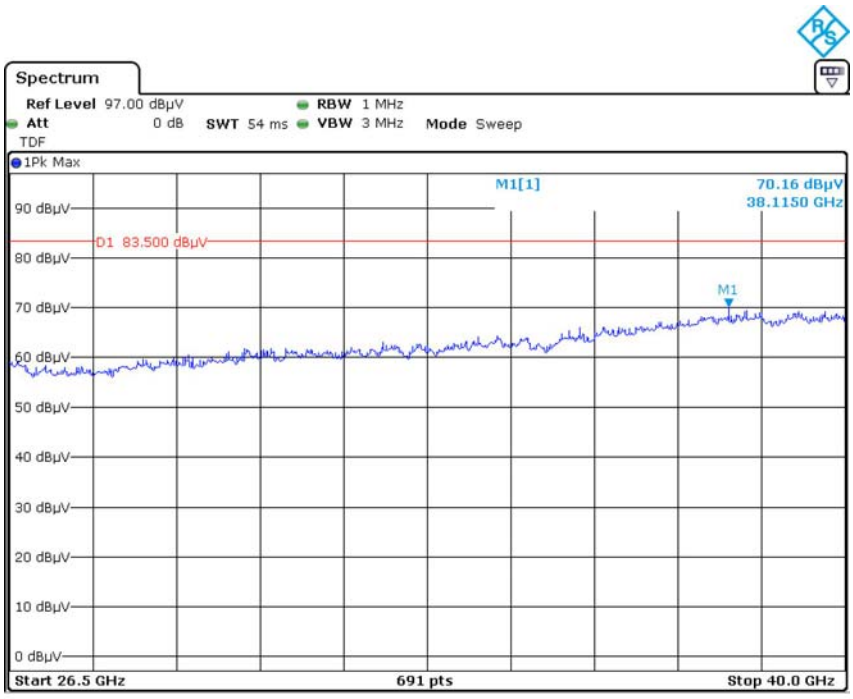
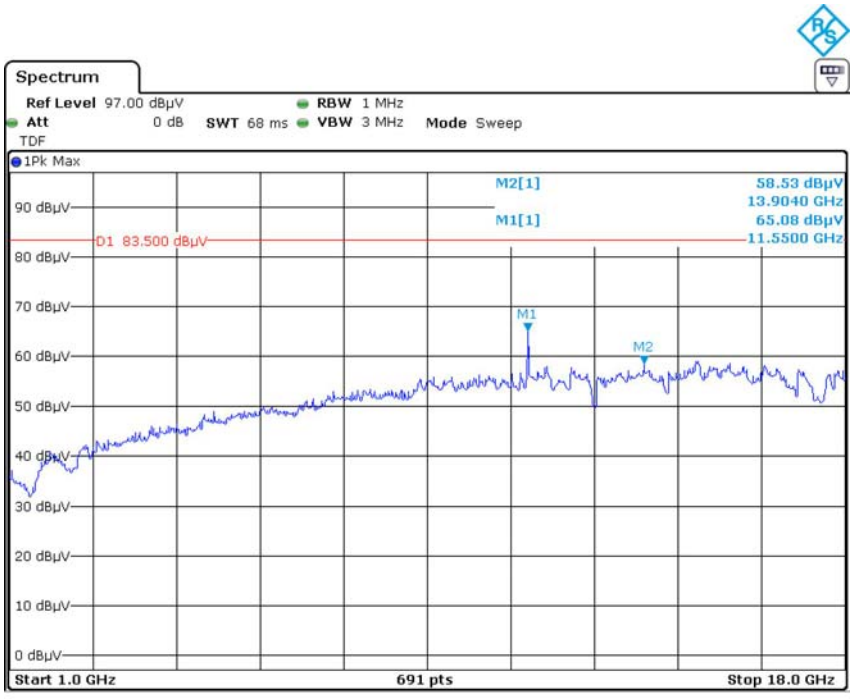


Date: 2.FEB.2021 09:20:54

Vertical



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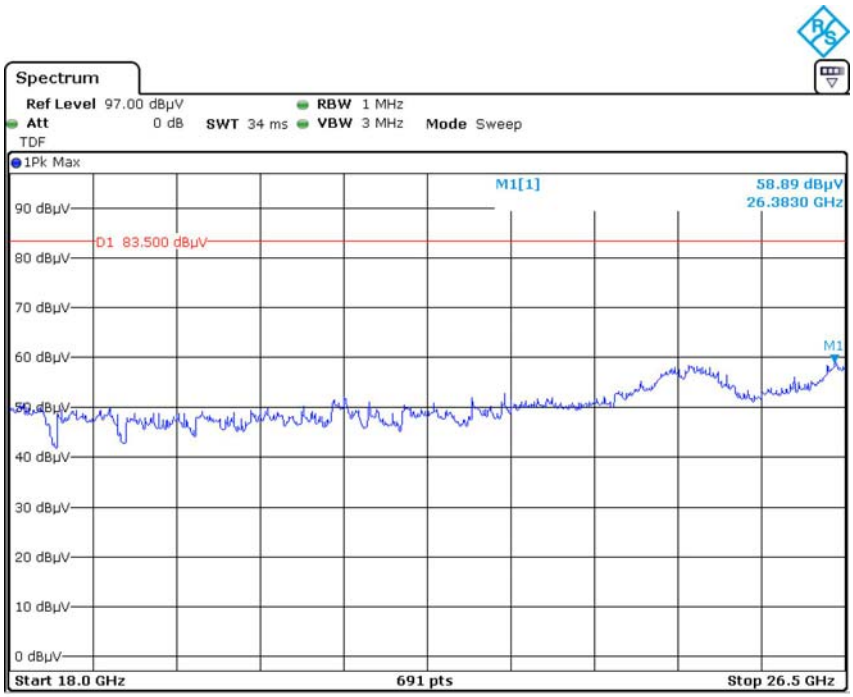

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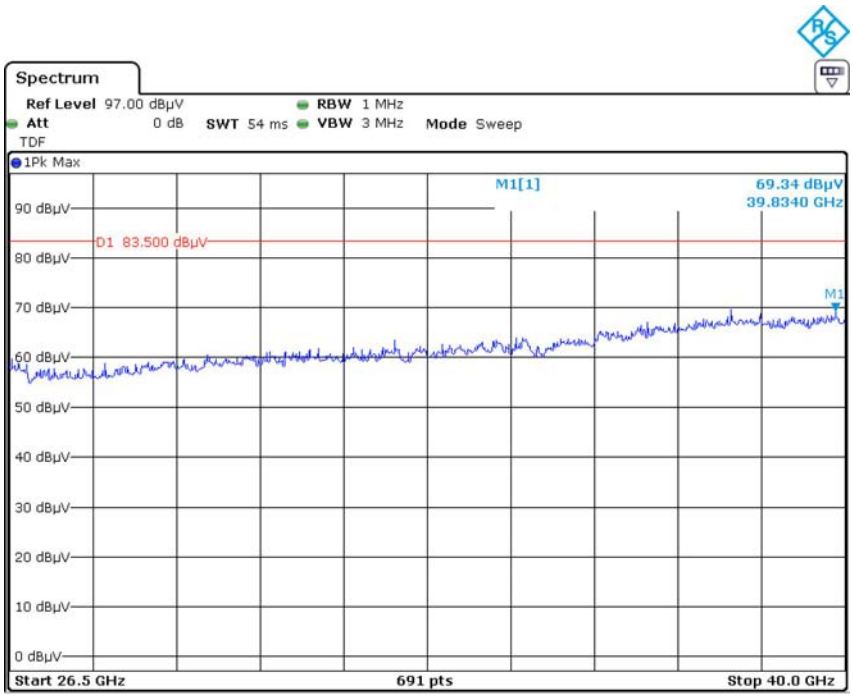
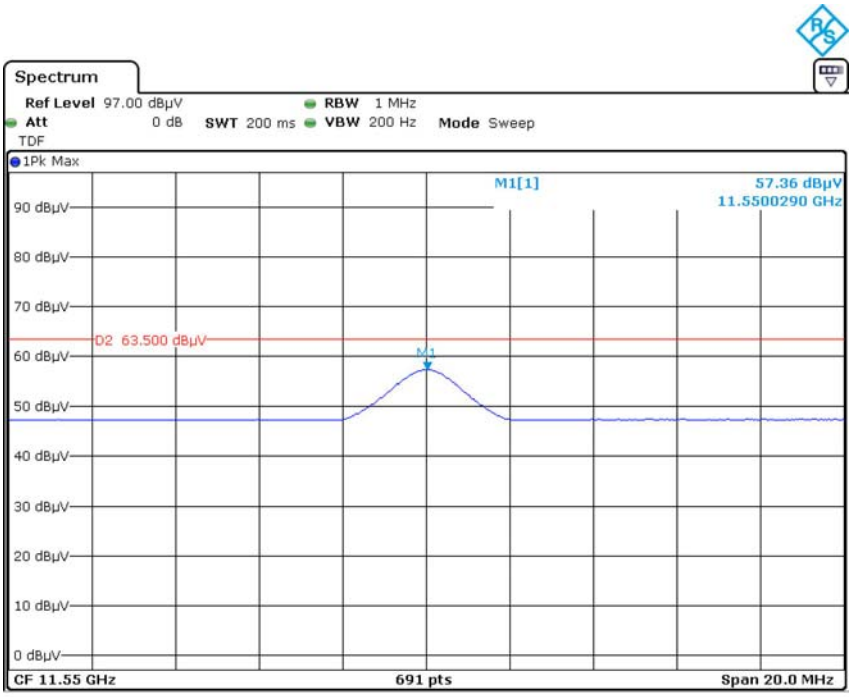
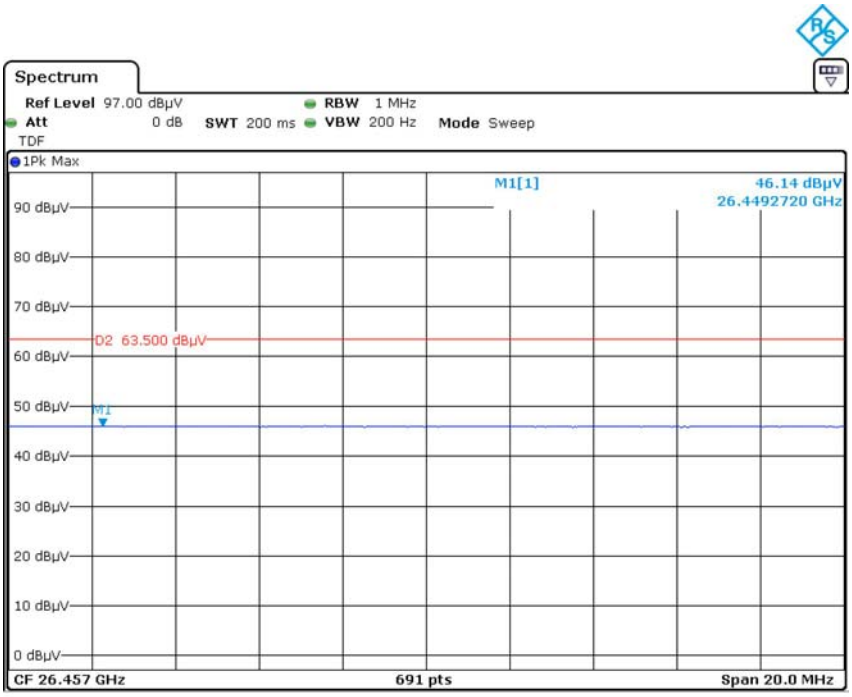
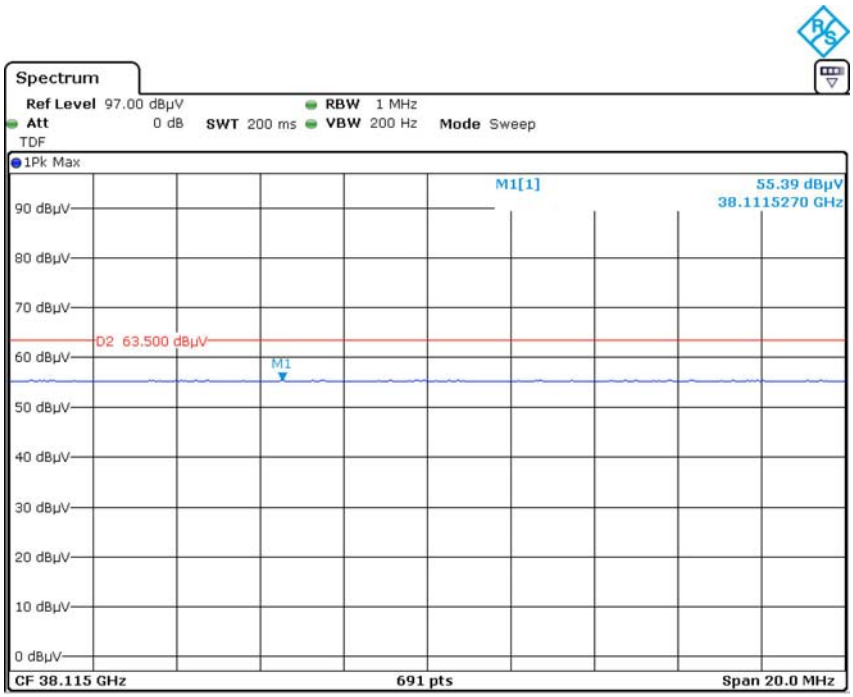


Date: 2.FEB.2021 09:30:11

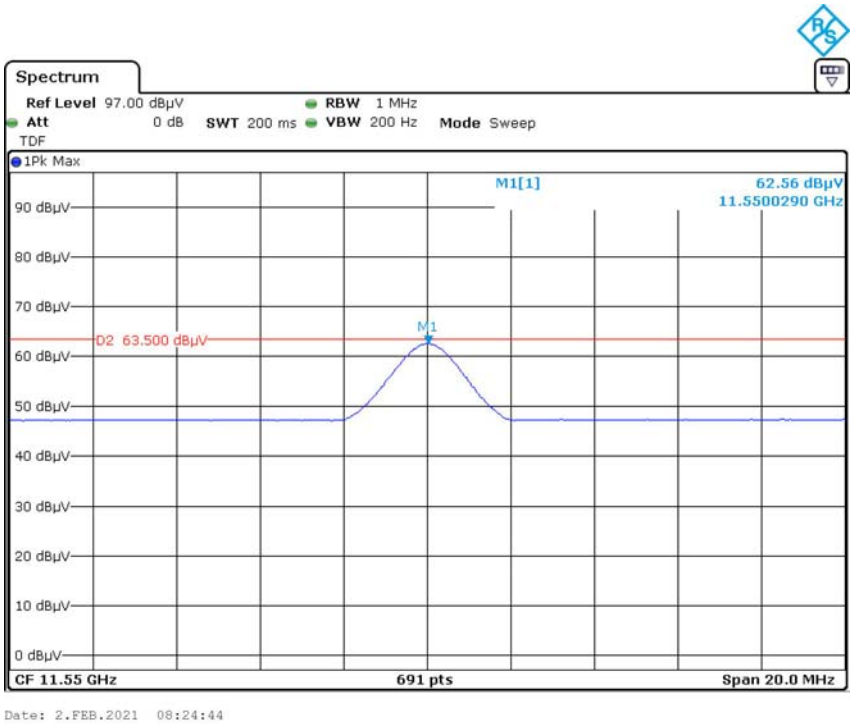
Average
Horizontal

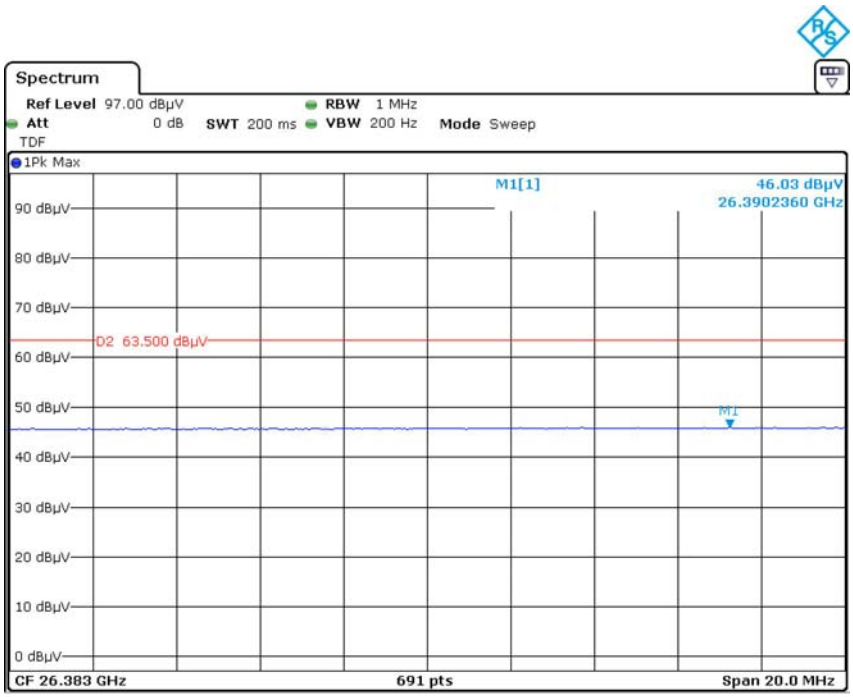


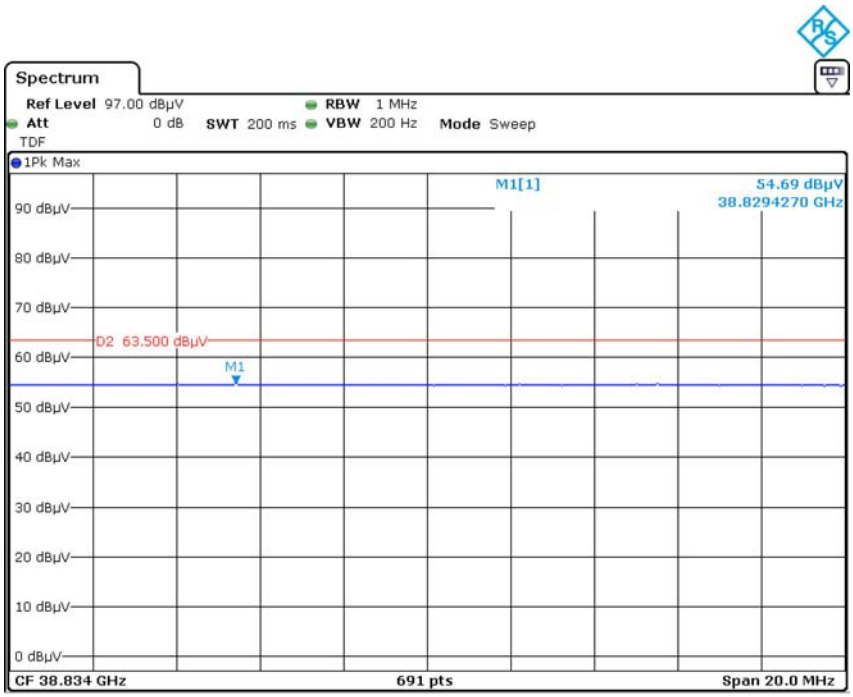



Spectrum
Ref Level 97.00 dBµV
RBW 1 MHz
Att 0 dB
SWT 200 ms
VBW 200 Hz
Mode Sweep
TDF
1Pk Max
M1[1]
55.39 dBµV
38.1115270 GHz
90 dBµV
80 dBµV
70 dBµV
D2 63.500 dBµV
60 dBµV
M1
50 dBµV
40 dBµV
30 dBµV
20 dBµV
10 dBµV
0 dBµV
CF 38.115 GHz
691 pts
Span 20.0 MHz
Date: 2.FEB.2021 09:25:01

Vertical


Spectrum
Ref Level 97.00 dBµV
RBW 1 MHz
Att 0 dB
SWT 200 ms
VBW 200 Hz
Mode Sweep
TDF
1Pk Max
M1[1]
62.56 dBµV
11.5500290 GHz
90 dBµV
80 dBµV
70 dBµV
M1
D2 63.500 dBµV
60 dBµV
50 dBµV
40 dBµV
30 dBµV
20 dBµV
10 dBµV
0 dBµV
CF 11.55 GHz
691 pts
Span 20.0 MHz
Date: 2.FEB.2021 08:24:44


Spectrum
Ref Level 97.00 dBµV
RBW 1 MHz
Att 0 dB
SWT 200 ms
VBW 200 Hz
Mode Sweep
TDF
1Pk Max
M1[1]
46.03 dBµV
26.3902360 GHz
D2 63.500 dBµV
M1
90 dBµV
80 dBµV
70 dBµV
60 dBµV
50 dBµV
40 dBµV
30 dBµV
20 dBµV
10 dBµV
0 dBµV
CF 26.383 GHz
691 pts
Span 20.0 MHz
Date: 2.FEB.2021 09:15:57


Spectrum
Ref Level 97.00 dBµV
RBW 1 MHz
Att 0 dB
SWT 200 ms
VBW 200 Hz
Mode Sweep
TDF
1Pk Max
M1[1]
54.69 dBµV
38.8294270 GHz
D2 63.500 dBµV
M1
90 dBµV
80 dBµV
70 dBµV
60 dBµV
50 dBµV
40 dBµV
30 dBµV
20 dBµV
10 dBµV
0 dBµV
CF 38.834 GHz
691 pts
Span 20.0 MHz
Date: 2.FEB.2021 09:35:37

FCC §15.407(1), (5),(e) – 26 dB & 6dB EMISSION BANDWIDTH

Applicable Standard

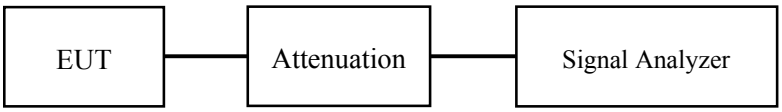
The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure

1. Emission Bandwidth (EBW)
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) 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%.

2. **Minimum Emission Bandwidth for the band 5.725-5.85 GHz**
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.725-5.85 GHz. The following procedure shall be used for measuring this bandwidth:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu on 2021-02-04 to 2021-02-05.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix.

FCC §15.407(a)(1)(2)(3) – CONDUCTED TRANSMITTER OUTPUT POWER

Applicable Standard

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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.

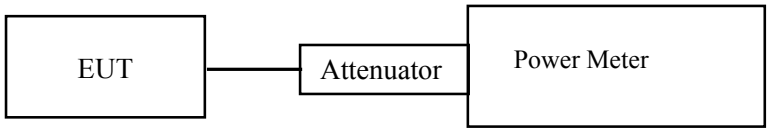
For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting 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.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, 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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. 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.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu on 2021-02-04 to 2021-02-05.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix.

FCC §15.407(a) (1) (2) (3) - POWER SPECTRAL DENSITY

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. 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.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, 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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. 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.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not hAve.e 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW $\geqslant$ 1/T, where T is defined in section II.B.l.a).
b) Set VBW $\geqslant$ 3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Coco Liu on 2021-02-04 to 2021-03-10.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the Appendix.

APPENDIX

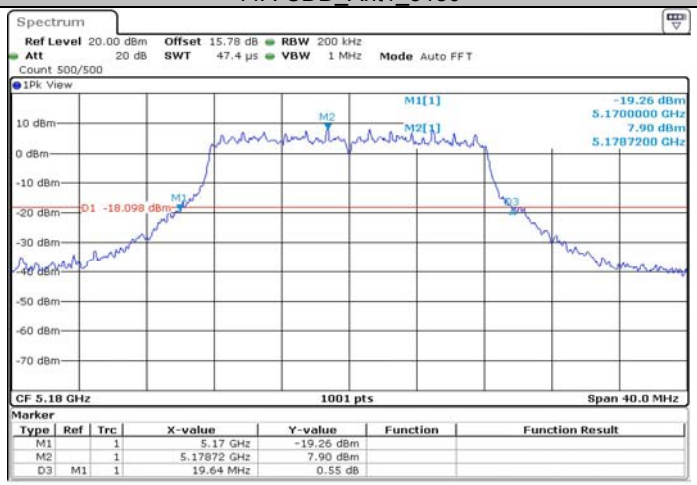
AppendixA1:EmissionBandwidth

Test Result

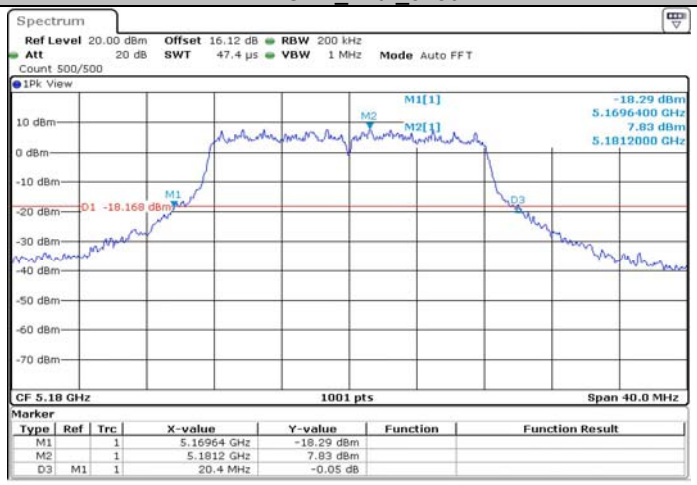
TestMode	Antenna	Channel	26db EBW [MHz]	Limit[MHz]	Verdict
11A-CDD	Ant1	5180	19.640	---	PASS
	Ant2	5180	20.400	---	PASS
	Ant1	5200	20.640	---	PASS
	Ant2	5200	20.720	---	PASS
	Ant1	5240	20.560	---	PASS
	Ant2	5240	20.480	---	PASS
11N20MIMO	Ant1	5180	21.200	---	PASS
	Ant2	5180	20.720	---	PASS
	Ant1	5200	20.720	---	PASS
	Ant2	5200	21.200	---	PASS
	Ant1	5240	20.960	---	PASS
	Ant2	5240	20.920	---	PASS
11N40MIMO	Ant1	5190	41.840	---	PASS
	Ant2	5190	42.720	---	PASS
	Ant1	5230	40.800	---	PASS
	Ant2	5230	46.640	---	PASS
11AC20MIMO	Ant1	5180	20.760	---	PASS
	Ant2	5180	21.760	---	PASS
	Ant1	5200	20.800	---	PASS
	Ant2	5200	21.120	---	PASS
	Ant1	5240	20.520	---	PASS
	Ant2	5240	20.720	---	PASS
11AC40MIMO	Ant1	5190	41.120	---	PASS
	Ant2	5190	42.880	---	PASS
	Ant1	5230	41.310	---	PASS
	Ant2	5230	43.080	---	PASS
11AC80MIMO	Ant1	5210	82.240	---	PASS
	Ant2	5210	98.400	---	PASS
11AX20MIMO	Ant1	5180	20.360	---	PASS
	Ant2	5180	20.480	---	PASS
	Ant1	5200	20.400	---	PASS
	Ant2	5200	20.560	---	PASS
	Ant1	5240	21.240	---	PASS
	Ant2	5240	21.280	---	PASS
11AX40MIMO	Ant1	5190	41.280	---	PASS
	Ant2	5190	42.160	---	PASS
	Ant1	5230	41.600	---	PASS
	Ant2	5230	41.280	---	PASS
11AX80MIMO	Ant1	5210	83.520	---	PASS
	Ant2	5210	84.000	---	PASS

Test Graphs

11A-CDD_Ant1_5180



11A-CDD_Ant2_5180



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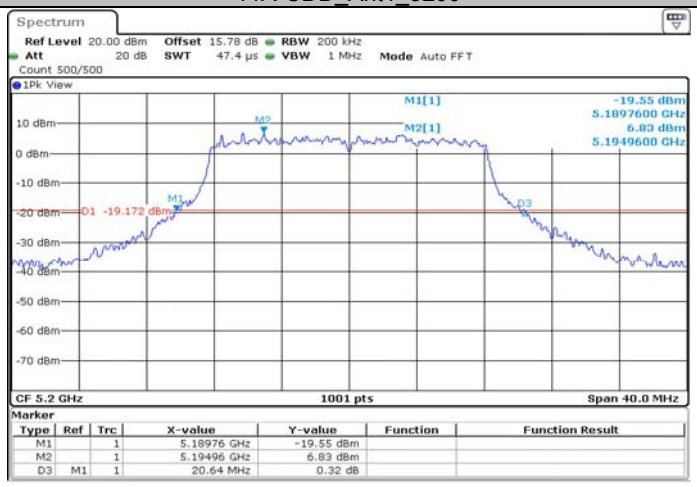
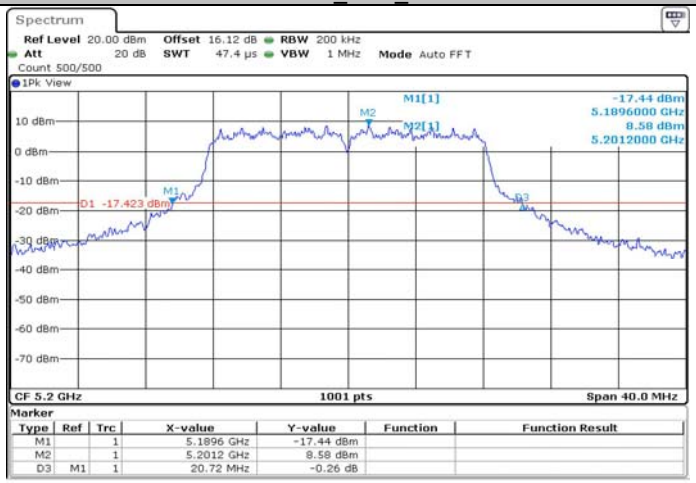
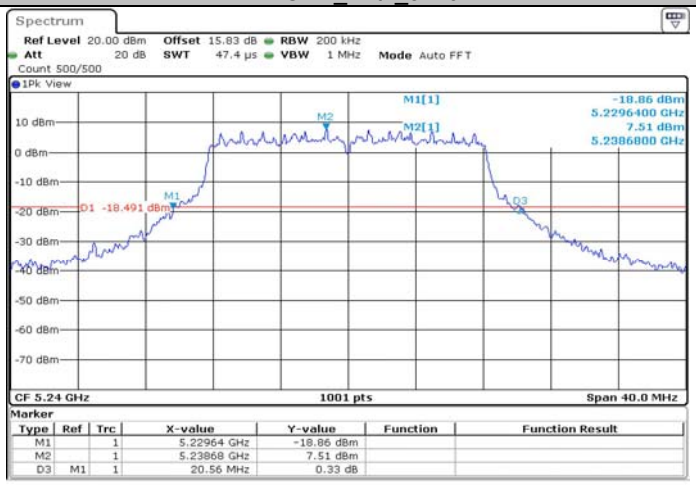


11A-CDD_Ant2_5200



11A-CDD_Ant1_5240



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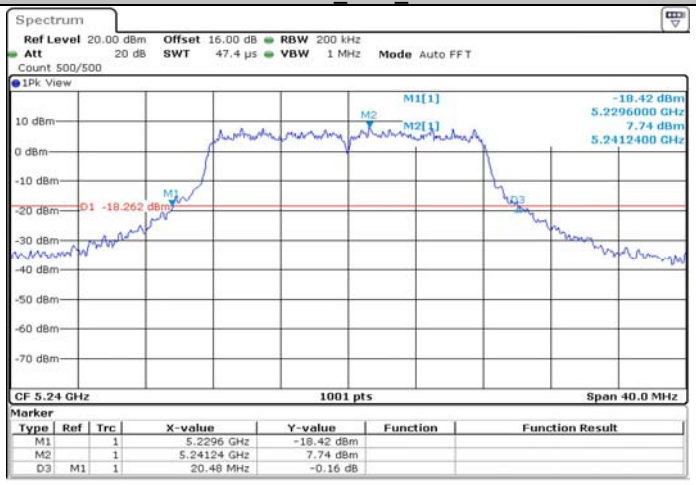

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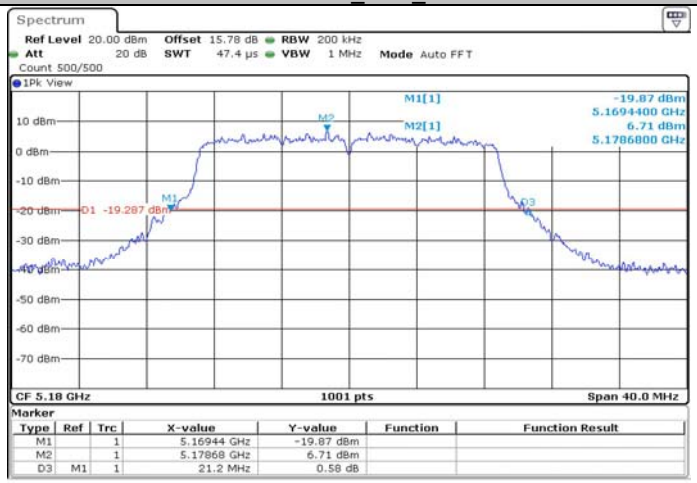
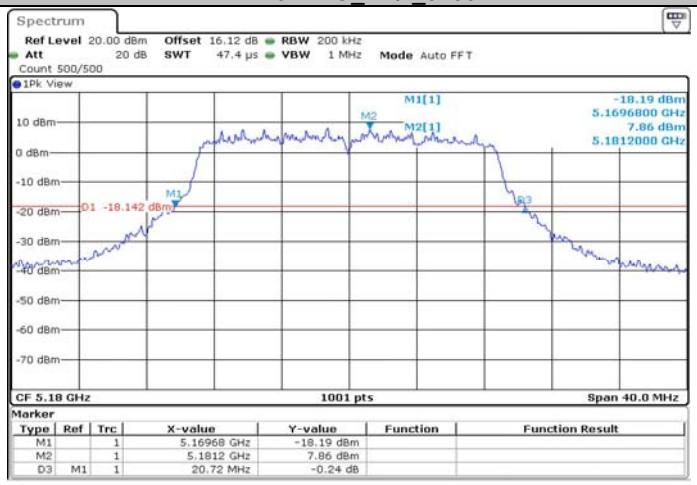
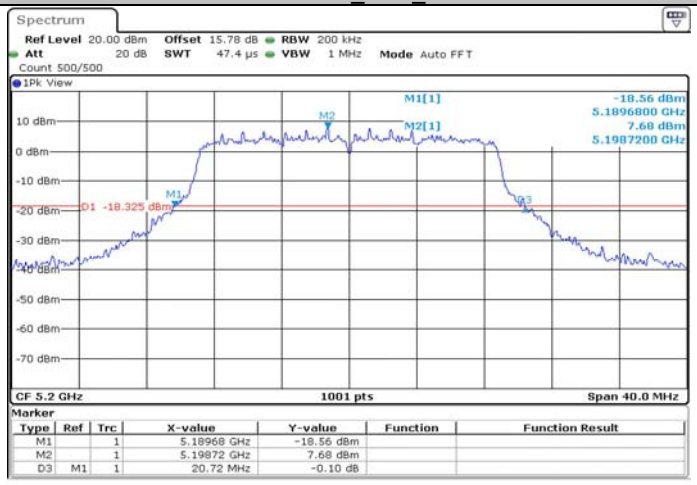


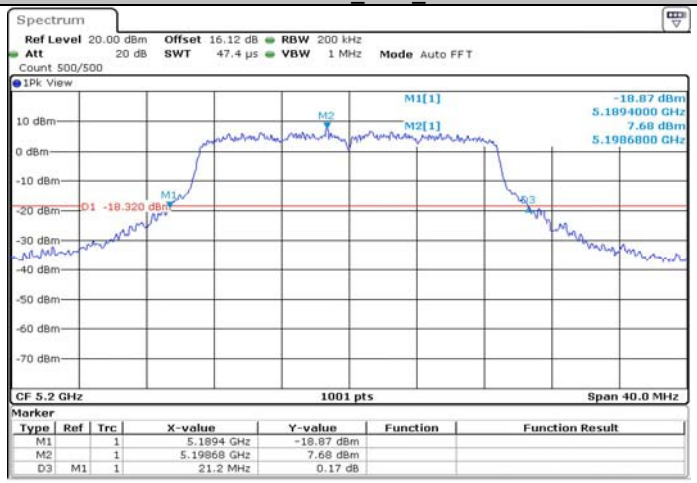
11N20MIMO_Ant2_5180



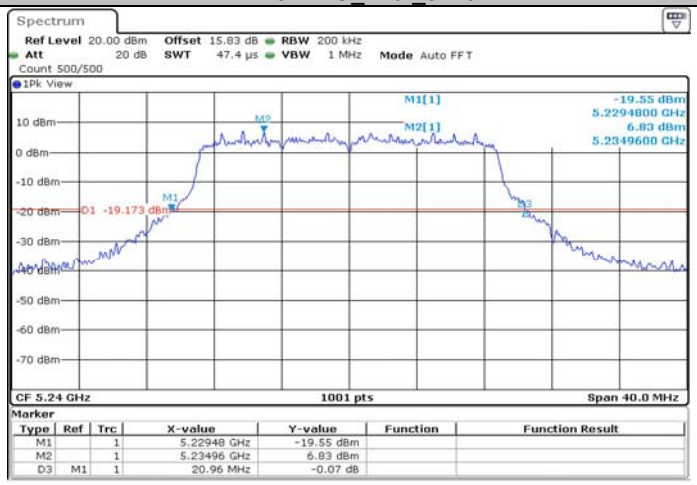
11N20MIMO_Ant1_5200



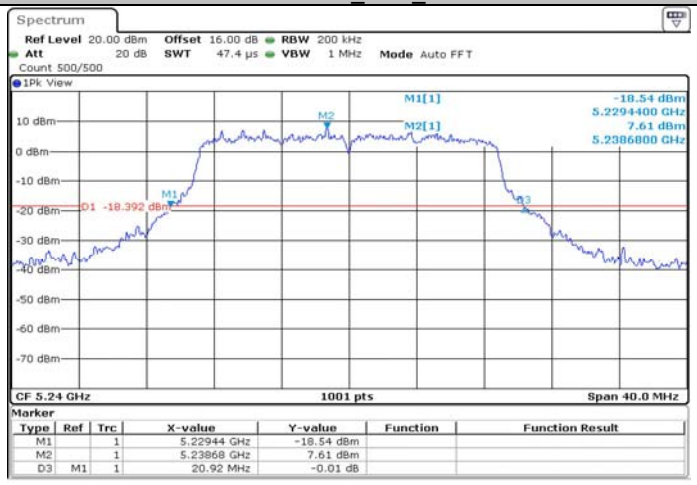
11N20MIMO_Ant2_5200



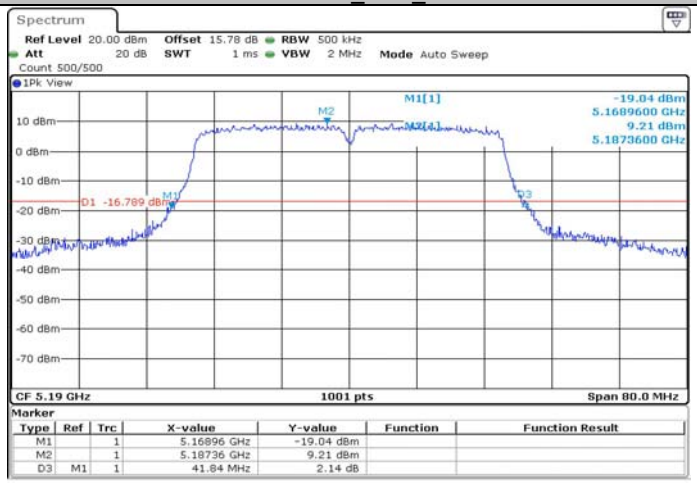
11N20MIMO_Ant1_5240



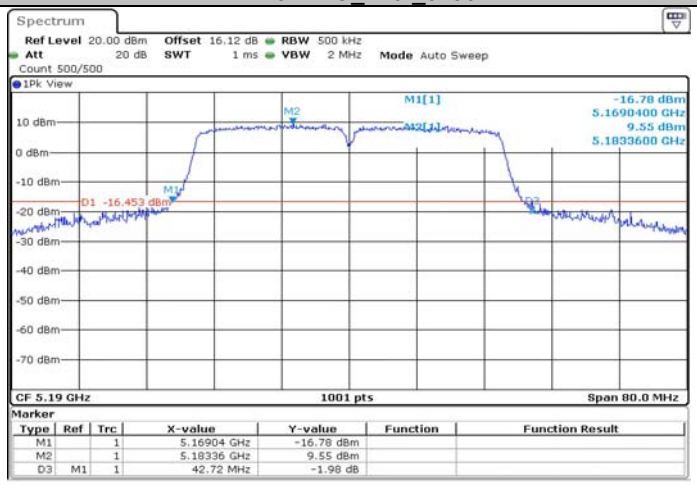
11N20MIMO_Ant2_5240



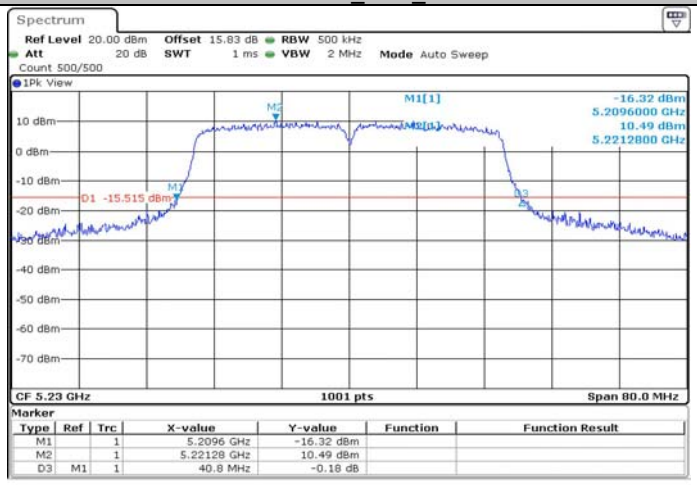
11N40MIMO_Ant1_5190



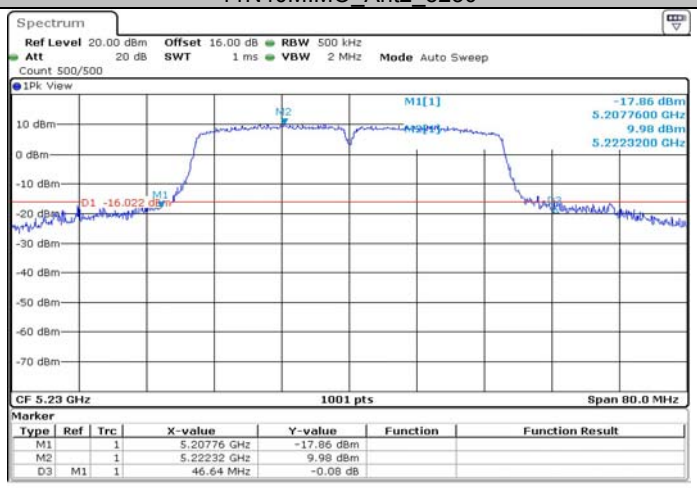
11N40MIMO_Ant2_5190



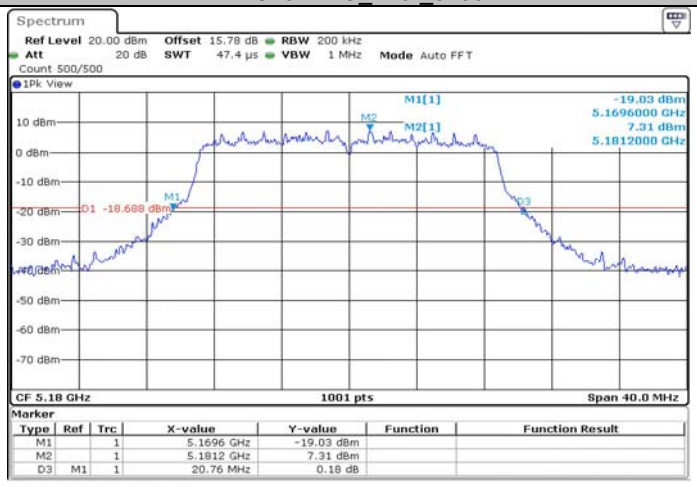
11N40MIMO_Ant1_5230



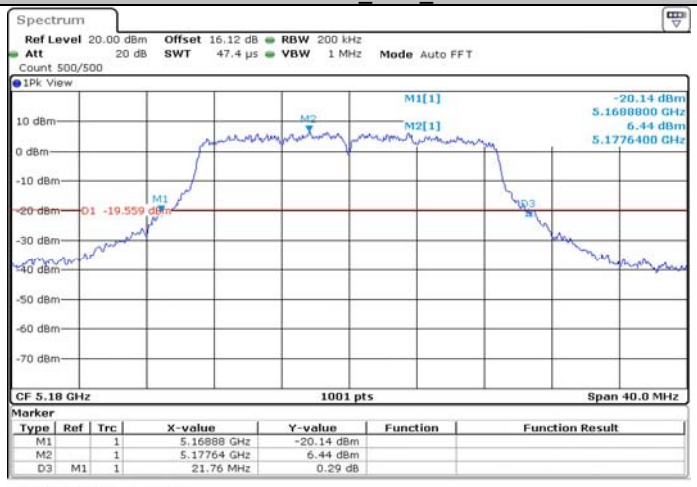
11N40MIMO_Ant2_5230



11AC20MIMO_Ant1_5180



11AC20MIMO_Ant2_5180



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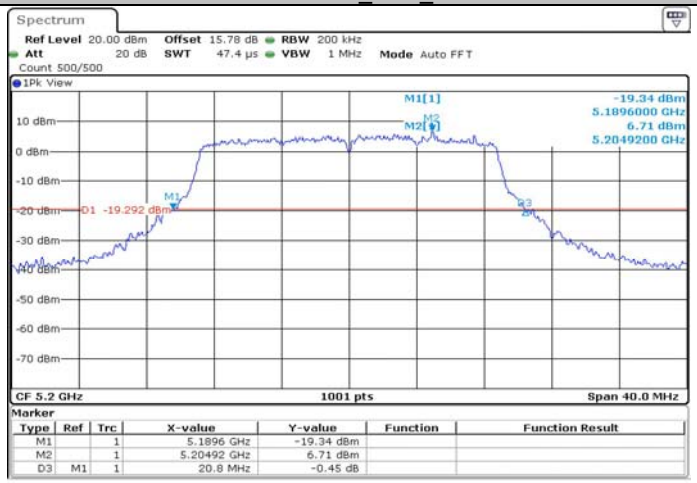
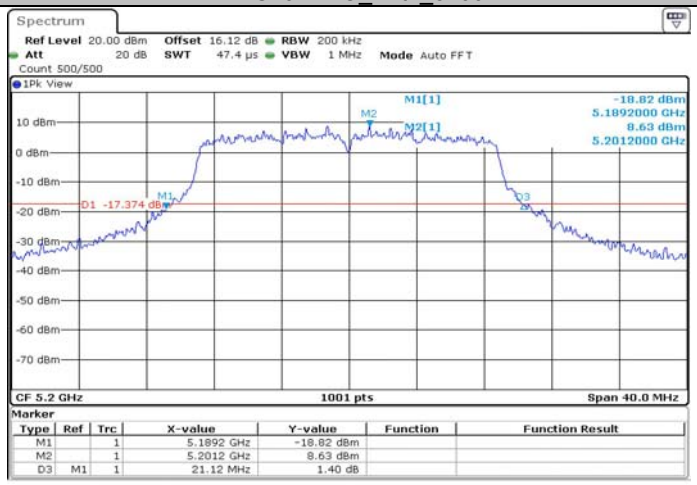
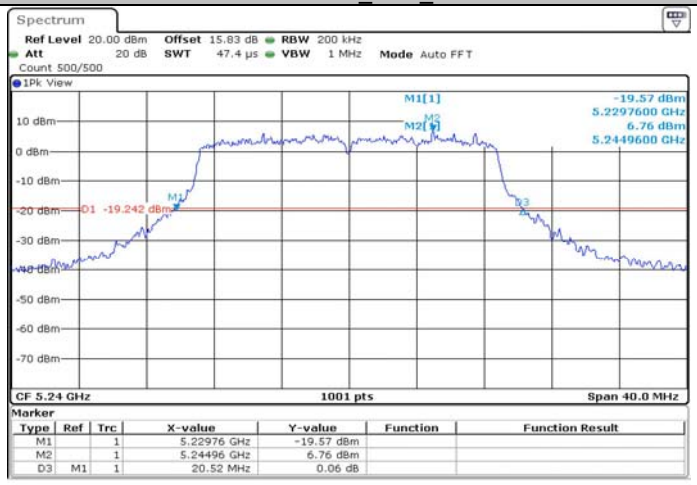


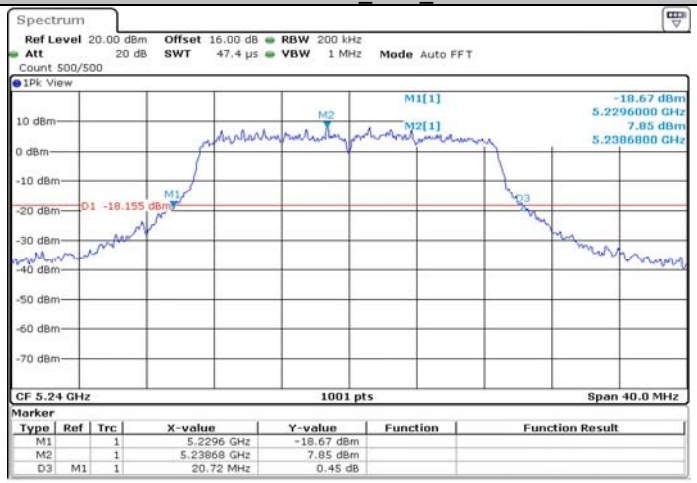
11AC20MIMO_Ant2_5200



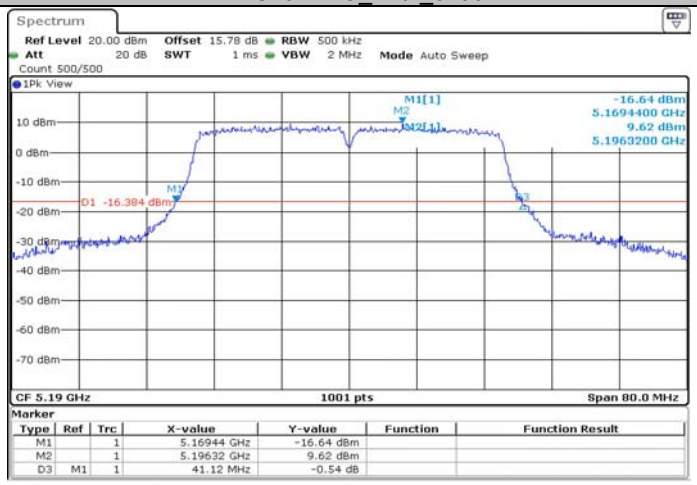
11AC20MIMO_Ant1_5240



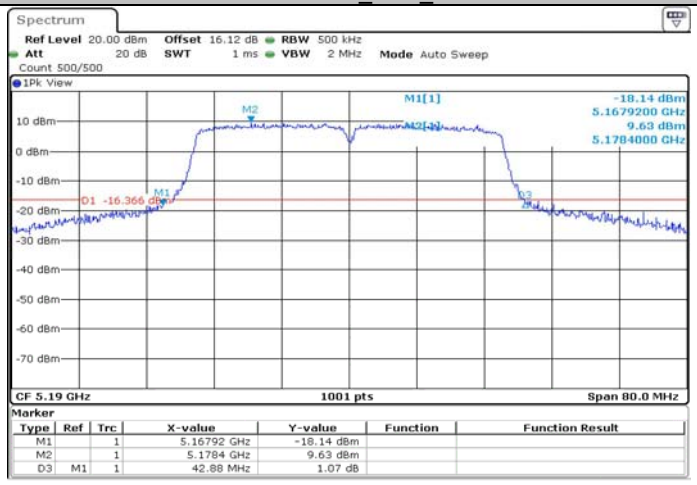
11AC20MIMO_Ant2_5240



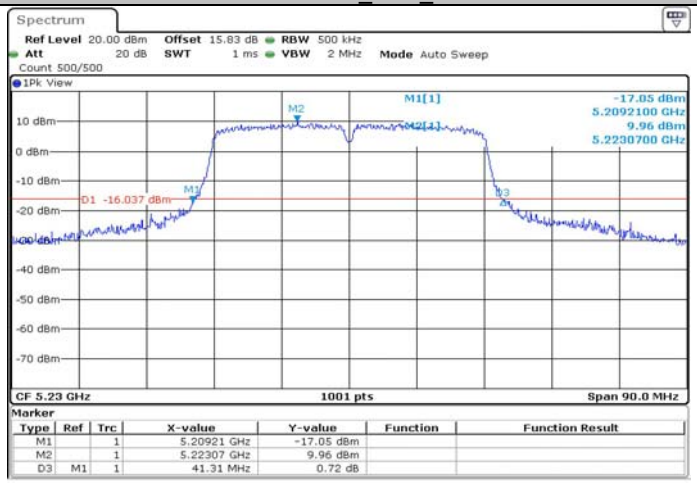
11AC40MIMO_Ant1_5190



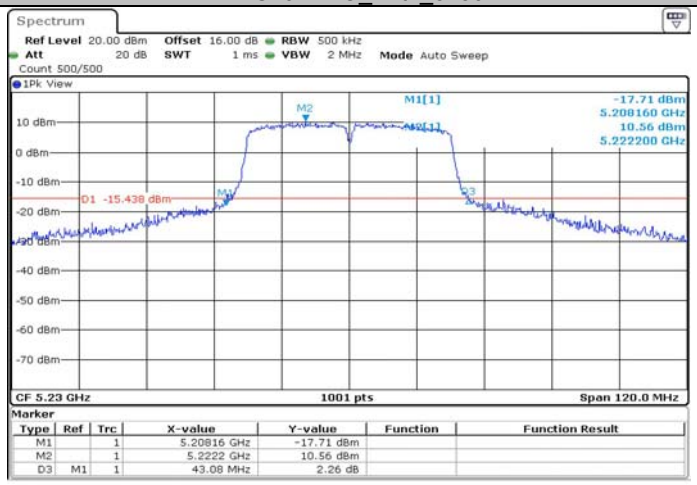
11AC40MIMO_Ant2_5190



11AC40MIMO_Ant1_5230

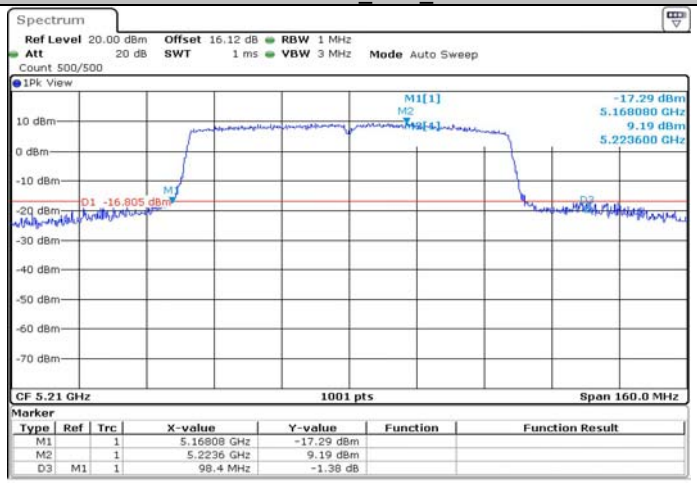


11AC40MIMO_Ant2_5230

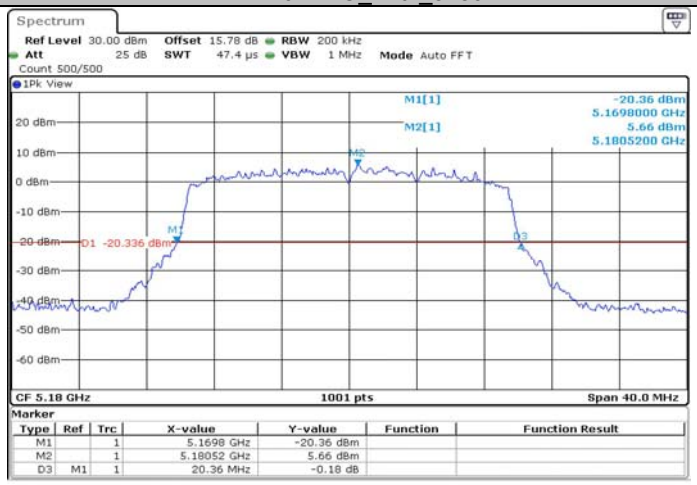


11AC80MIMO_Ant1_5210

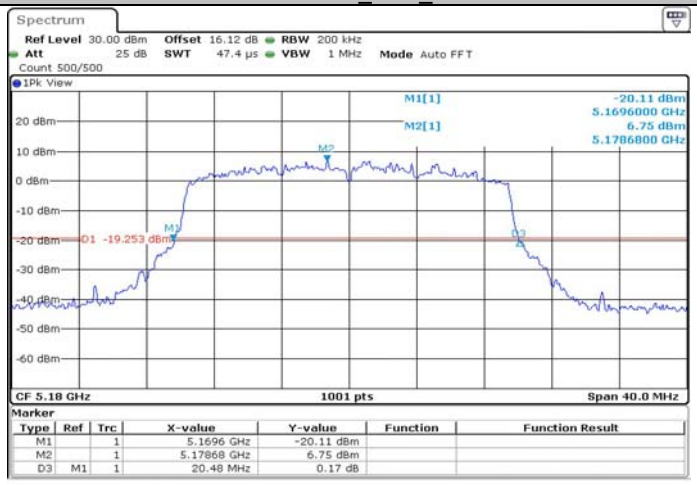
11AC80MIMO_Ant2_5210



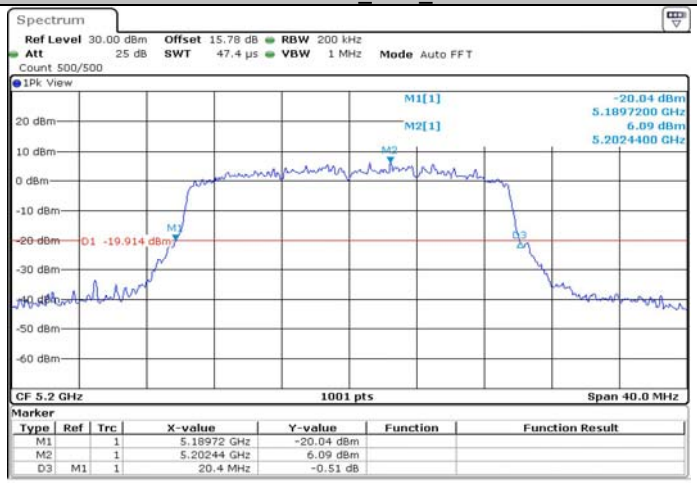
11AX20MIMO_Ant1_5180



11AX20MIMO_Ant2_5180

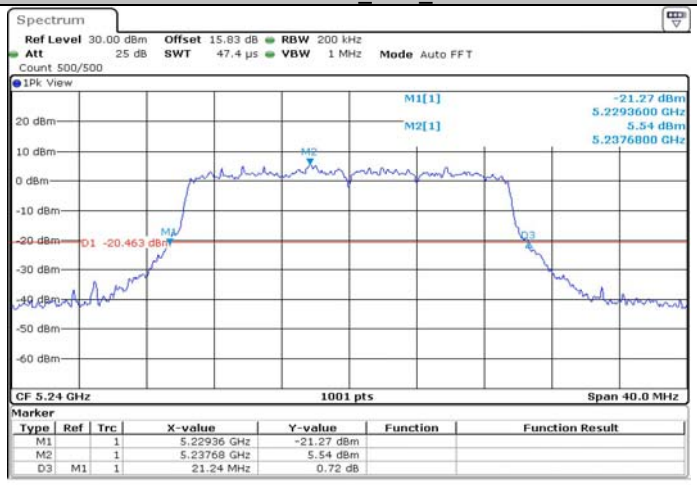


11AX20MIMO_Ant1_5200

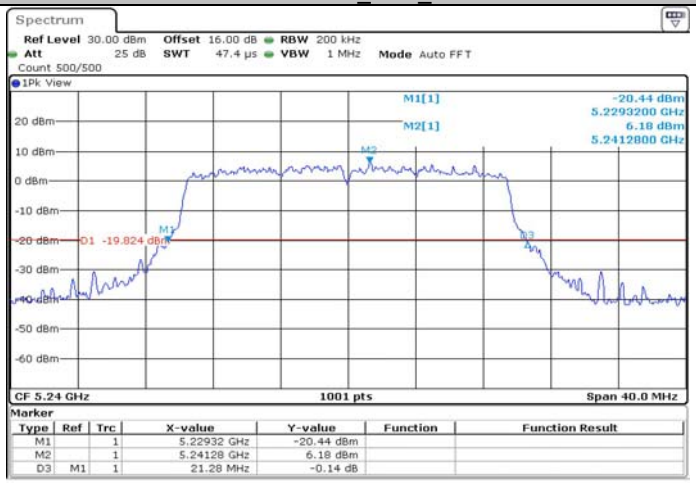


11AX20MIMO_Ant2_5200

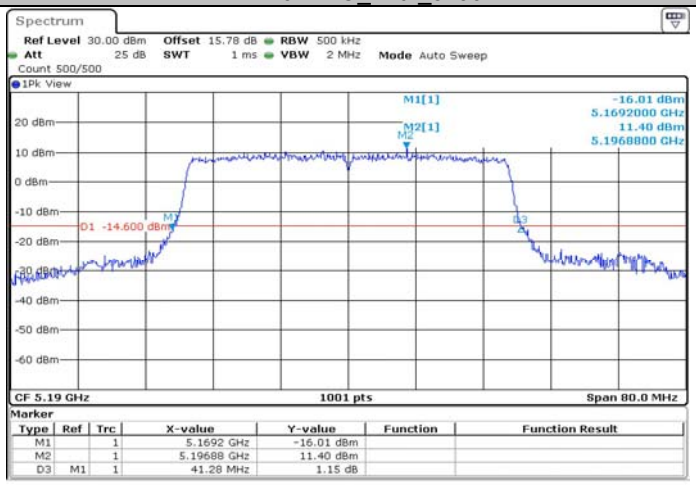
11AX20MIMO_Ant1_5240



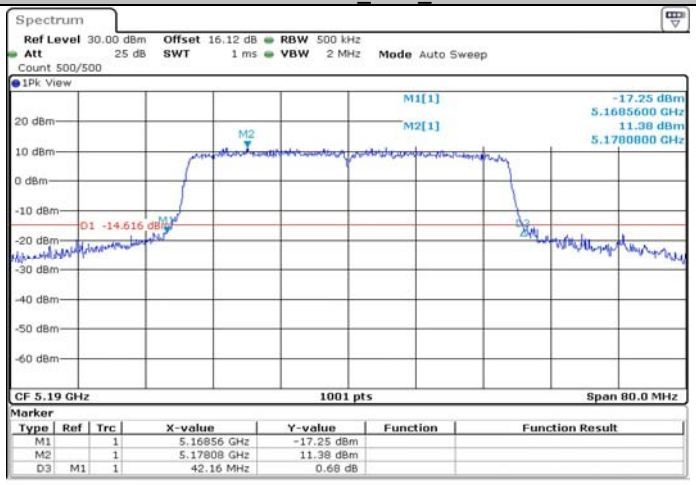
11AX20MIMO_Ant2_5240



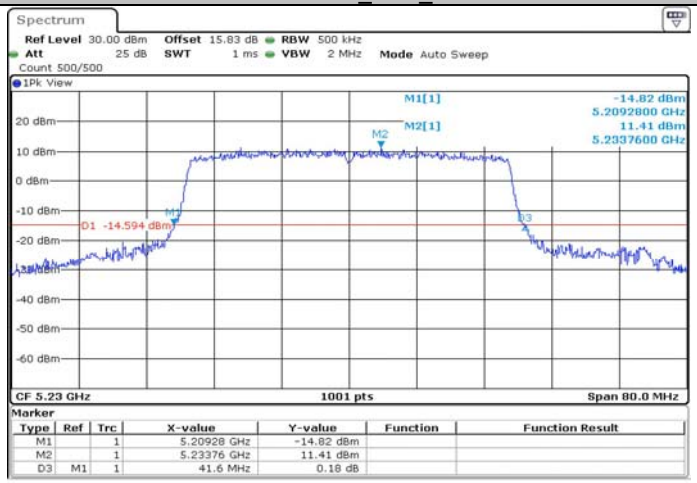
11AX40MIMO_Ant1_5190



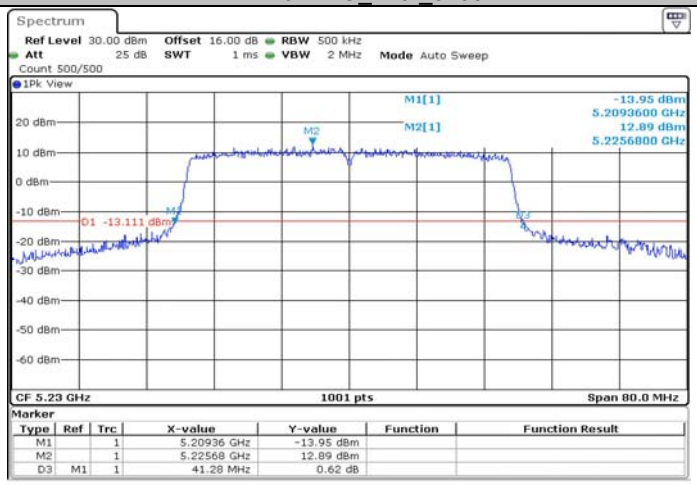
11AX40MIMO_Ant2_5190



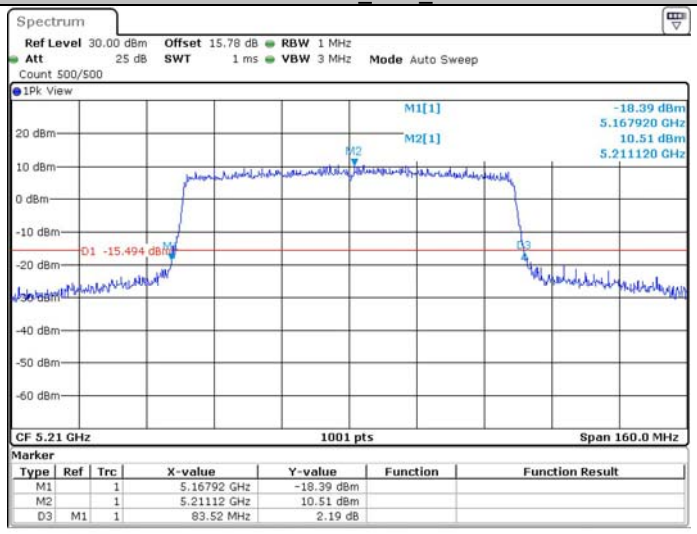
11AX40MIMO_Ant1_5230



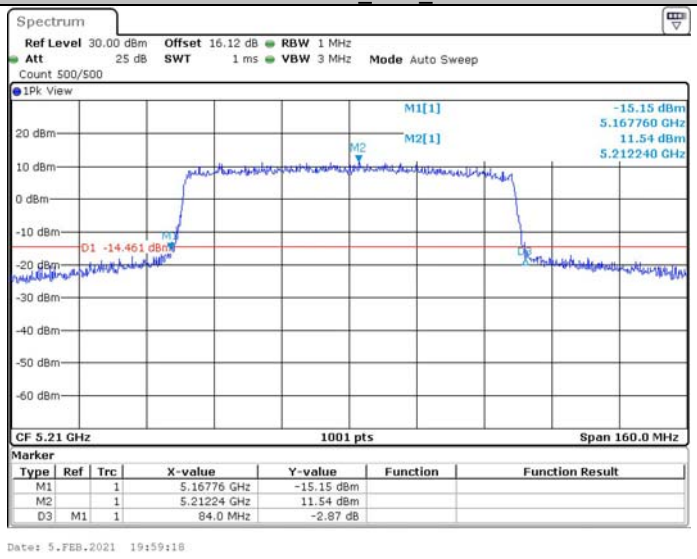
11AX40MIMO_Ant2_5230



11AX80MIMO_Ant1_5210



11AX80MIMO_Ant2_5210



AppendixA2: Occupied channel bandwidth

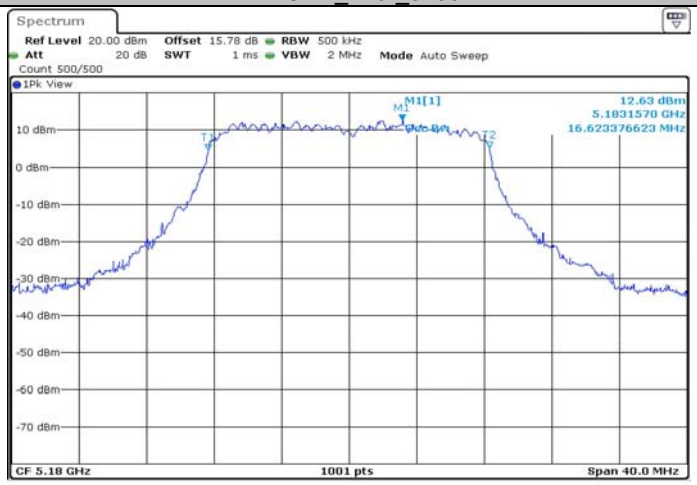
Test Result

TestMode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
11A-CDD	Ant1	5180	16.623	---	PASS
	Ant2	5180	16.743	---	PASS
	Ant1	5200	16.623	---	PASS
	Ant2	5200	16.783	---	PASS
	Ant1	5240	16.663	---	PASS
	Ant2	5240	16.783	---	PASS
	Ant2	5745	16.783	---	PASS
	Ant1	5785	16.623	---	PASS
	Ant2	5785	16.703	---	PASS
	Ant1	5825	16.583	---	PASS
	Ant2	5825	16.703	---	PASS
11N20MIMO	Ant1	5180	17.742	---	PASS
	Ant2	5180	17.862	---	PASS
	Ant1	5200	17.822	---	PASS
	Ant2	5200	17.862	---	PASS
	Ant1	5240	17.822	---	PASS
	Ant2	5240	17.862	---	PASS
	Ant2	5745	17.822	---	PASS
	Ant1	5785	17.822	---	PASS
	Ant2	5785	17.822	---	PASS
	Ant1	5825	17.782	---	PASS
	Ant2	5825	17.862	---	PASS
11N40MIMO	Ant1	5190	36.444	---	PASS
	Ant2	5190	36.444	---	PASS
	Ant1	5230	36.364	---	PASS
	Ant2	5230	36.523	---	PASS
	Ant1	5755	36.284	---	PASS
	Ant2	5755	36.364	---	PASS
	Ant1	5795	36.284	---	PASS
	Ant2	5795	36.284	---	PASS
11AC20MIMO	Ant1	5180	17.742	---	PASS
	Ant2	5180	17.822	---	PASS
	Ant1	5200	17.782	---	PASS
	Ant2	5200	17.862	---	PASS
	Ant1	5240	17.782	---	PASS
	Ant2	5240	17.822	---	PASS
	Ant1	5745	17.702	---	PASS
	Ant2	5745	17.742	---	PASS
	Ant1	5785	17.742	---	PASS
	Ant2	5785	17.742	---	PASS
	Ant1	5825	17.702	---	PASS
	Ant2	5825	17.742	---	PASS
11AC40MIMO	Ant1	5190	36.364	---	PASS
	Ant2	5190	36.523	---	PASS
	Ant1	5230	36.364	---	PASS
	Ant2	5230	36.523	---	PASS
	Ant1	5755	35.884	---	PASS
	Ant2	5755	36.603	---	PASS
	Ant1	5795	35.884	---	PASS
	Ant2	5795	36.444	---	PASS
11AC80MIMO	Ant1	5210	75.604	---	PASS
	Ant2	5210	75.924	---	PASS
	Ant1	5775	75.285	---	PASS
	Ant2	5775	75.445	---	PASS

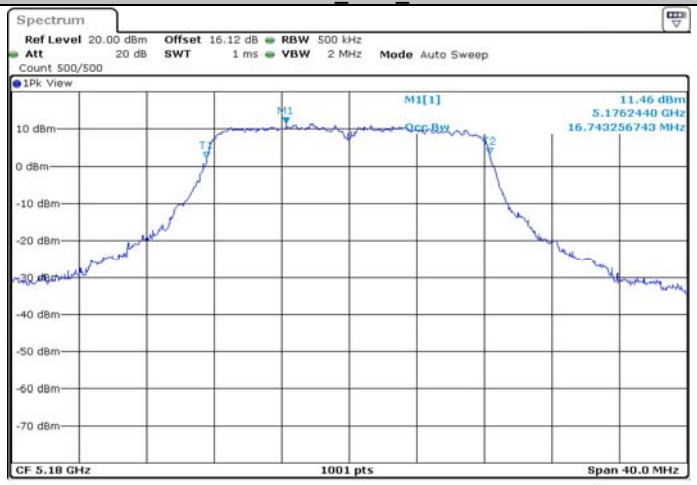
11AX20MIMO	Ant1	5180	18.701	---	PASS
	Ant2	5180	18.701	---	PASS
	Ant1	5200	18.661	---	PASS
	Ant2	5200	18.701	---	PASS
	Ant1	5240	18.941	---	PASS
	Ant2	5240	18.941	---	PASS
	Ant1	5745	19.021	---	PASS
	Ant2	5745	19.021	---	PASS
	Ant1	5785	19.021	---	PASS
	Ant2	5785	19.061	---	PASS
	Ant1	5825	18.941	---	PASS
	Ant2	5825	19.021	---	PASS
11AX40MIMO	Ant1	5190	38.042	---	PASS
	Ant2	5190	38.122	---	PASS
	Ant1	5230	38.042	---	PASS
	Ant2	5230	38.042	---	PASS
	Ant1	5755	38.042	---	PASS
	Ant2	5755	38.122	---	PASS
	Ant1	5795	38.042	---	PASS
	Ant2	5795	38.042	---	PASS
11AX80MIMO	Ant1	5210	77.522	---	PASS
	Ant2	5210	77.682	---	PASS
	Ant1	5775	77.522	---	PASS
	Ant2	5775	77.842	---	PASS

Test Graphs

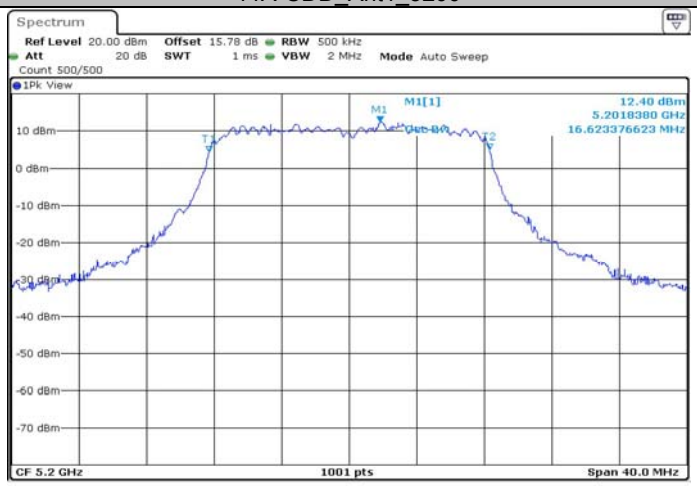
11A-CDD_Ant1_5180



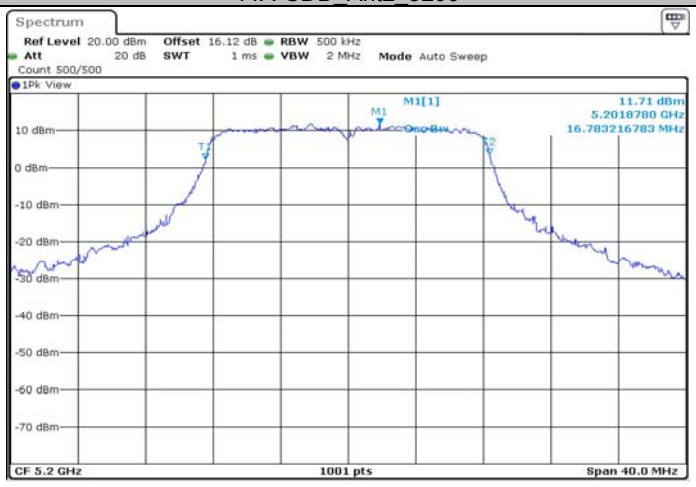
11A-CDD_Ant2_5180



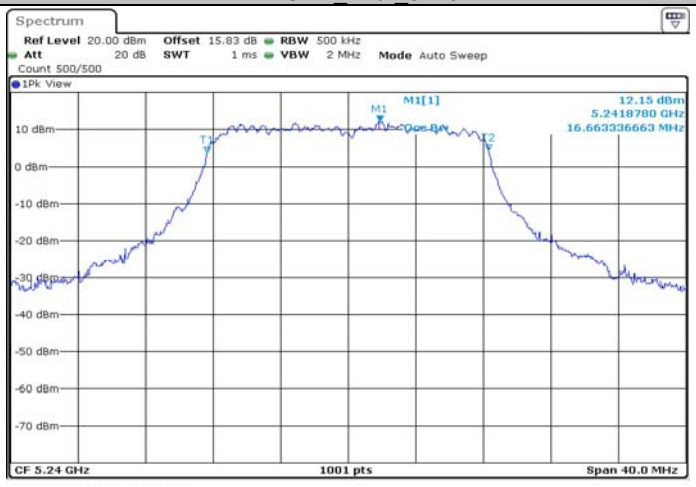
11A-CDD_Ant1_5200



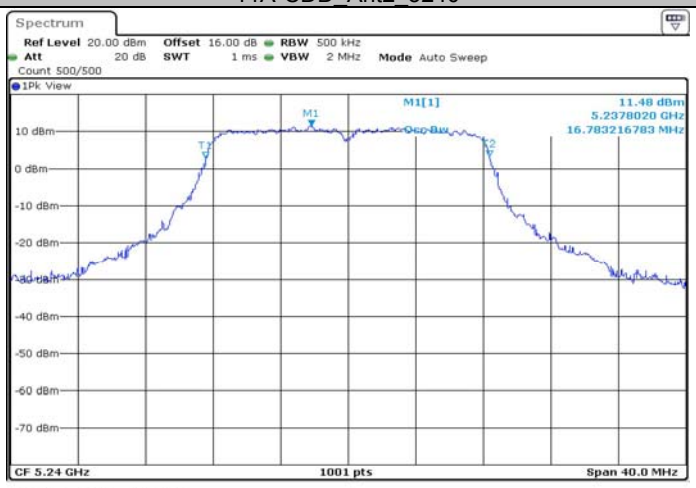
11A-CDD_Ant2_5200



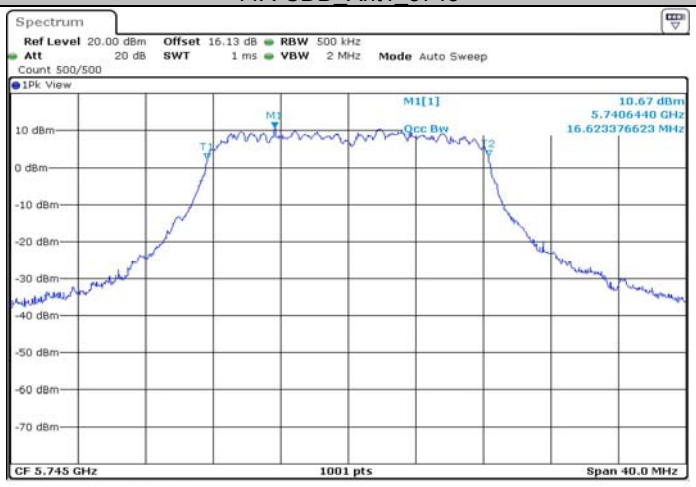
11A-CDD_Ant1_5240



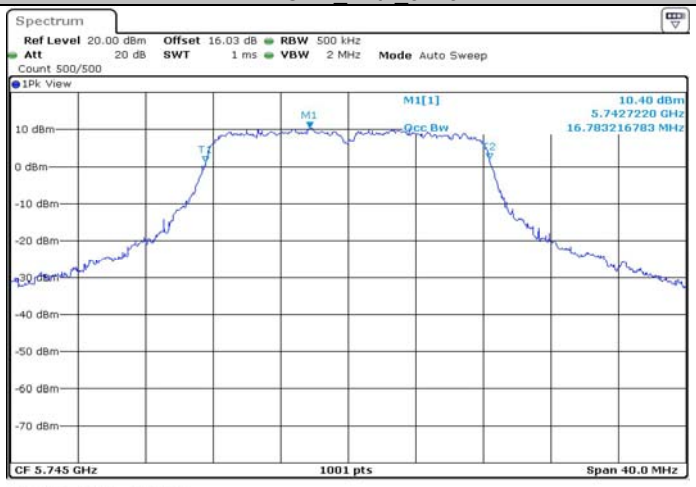
11A-CDD_Ant2_5240



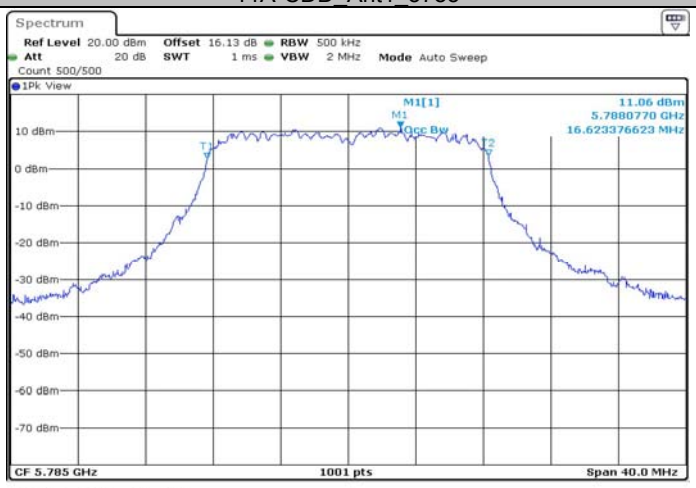
11A-CDD_Ant1_5745



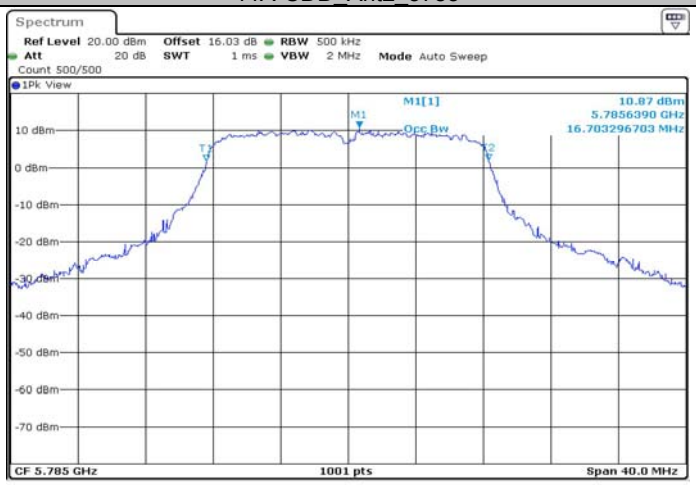
11A-CDD_Ant2_5745



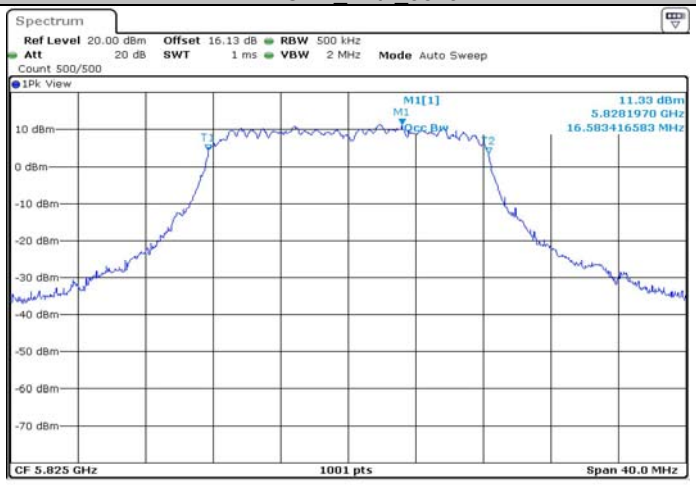
11A-CDD_Ant1_5785



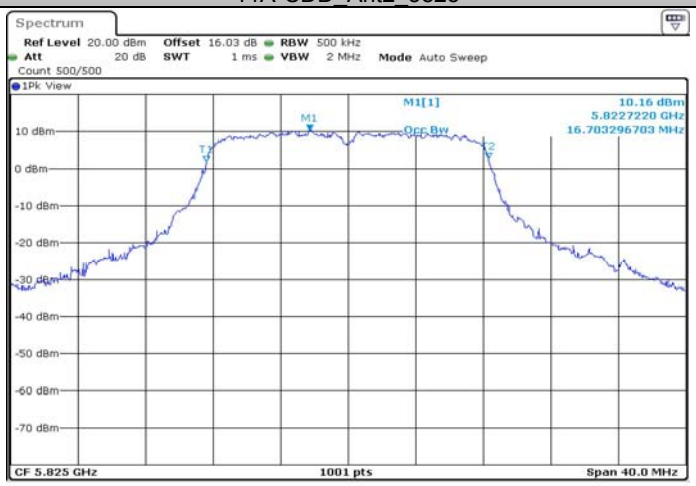
11A-CDD_Ant2_5785



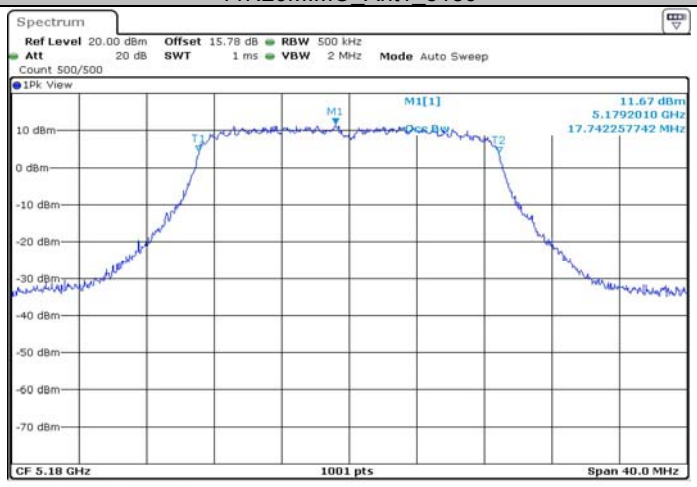
11A-CDD_Ant1_5825



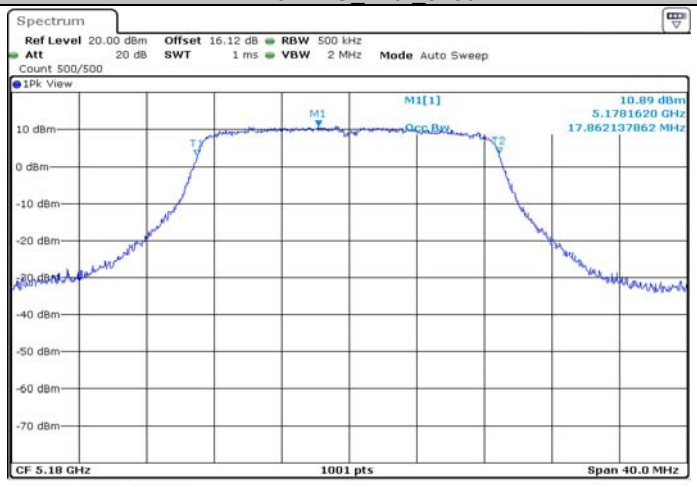
11A-CDD_Ant2_5825



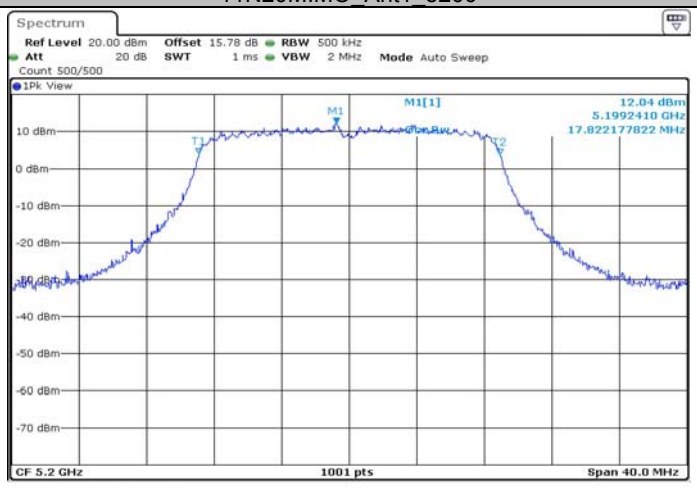
11N20MIMO_Ant1_5180

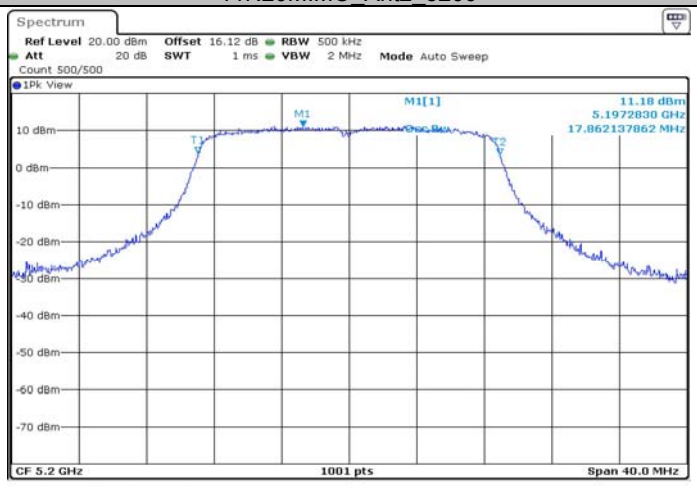
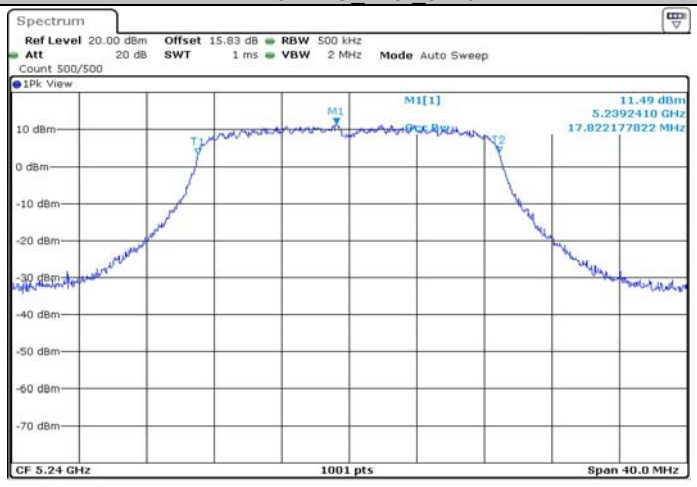
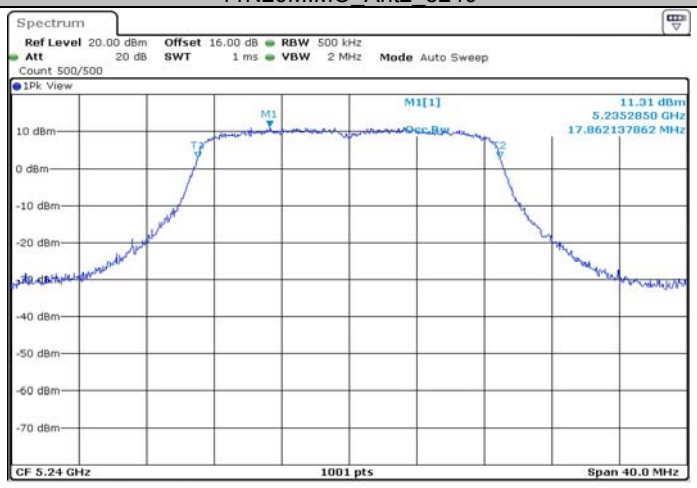


11N20MIMO_Ant2_5180



11N20MIMO_Ant1_5200

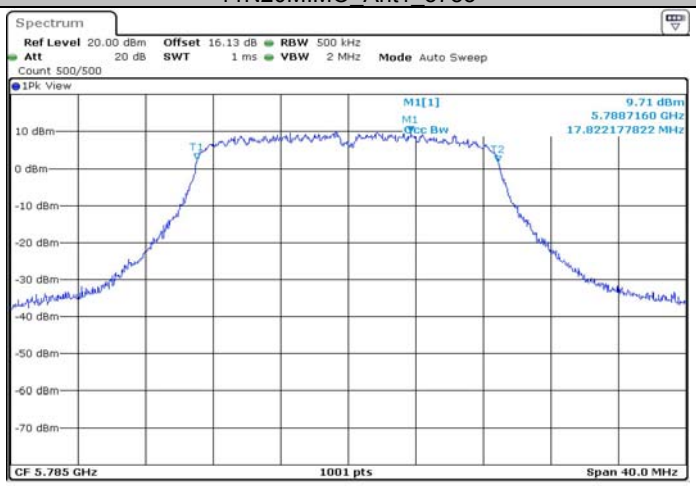


11N20MIMO_Ant2_5200

11N20MIMO_Ant1_5240

11N20MIMO_Ant2_5240


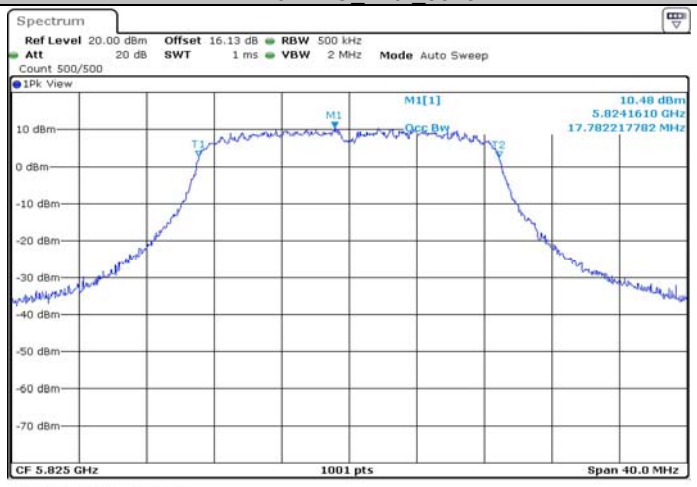
11N20MIMO_Ant1_5745

11N20MIMO_Ant2_5745

11N20MIMO_Ant1_5785



11N20MIMO_Ant2_5785

11N20MIMO_Ant1_5825

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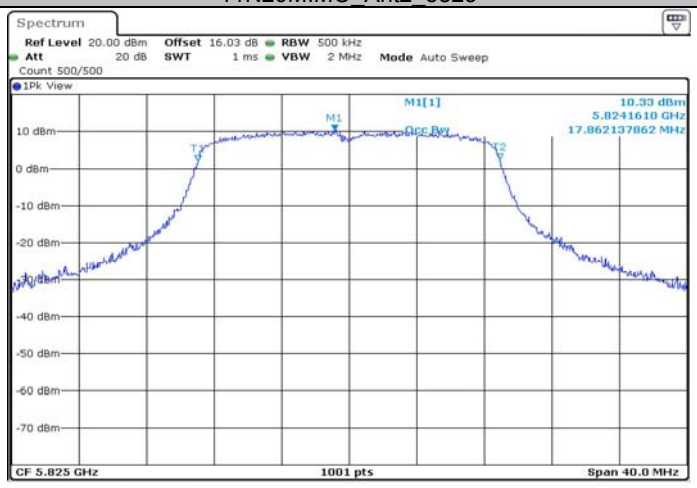

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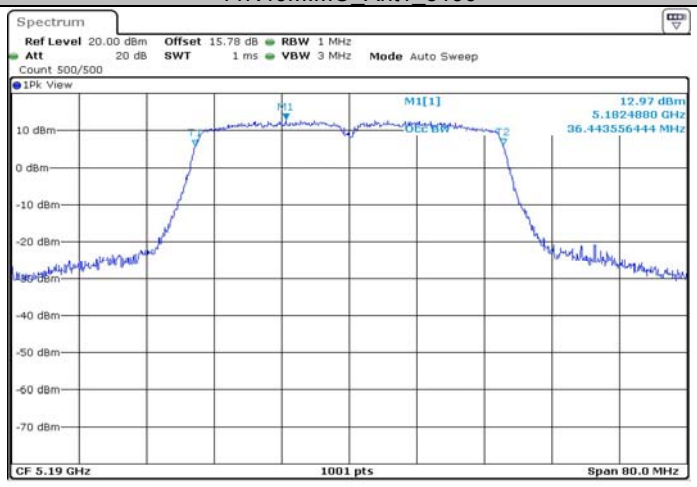

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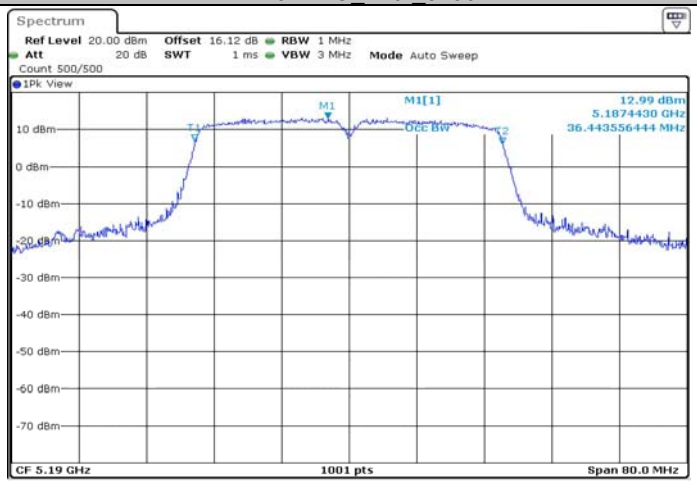

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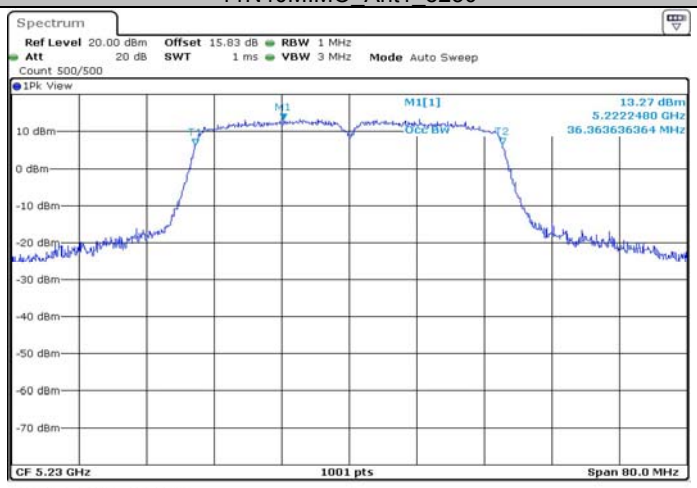

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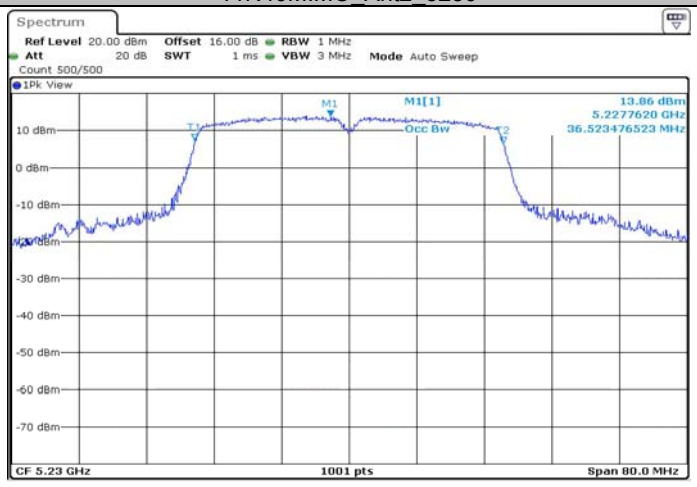

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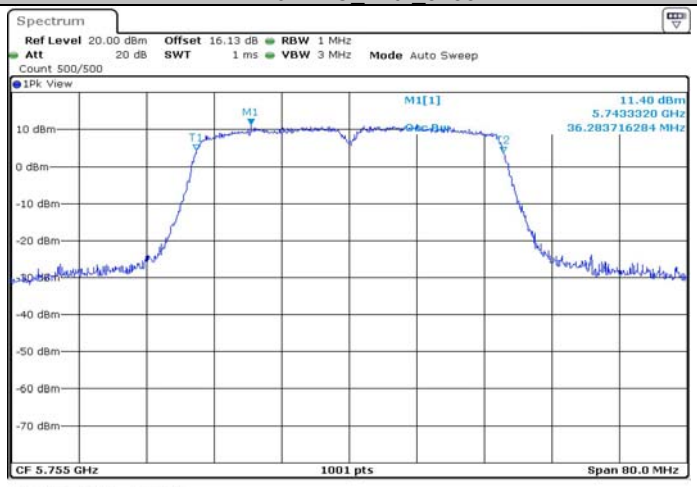

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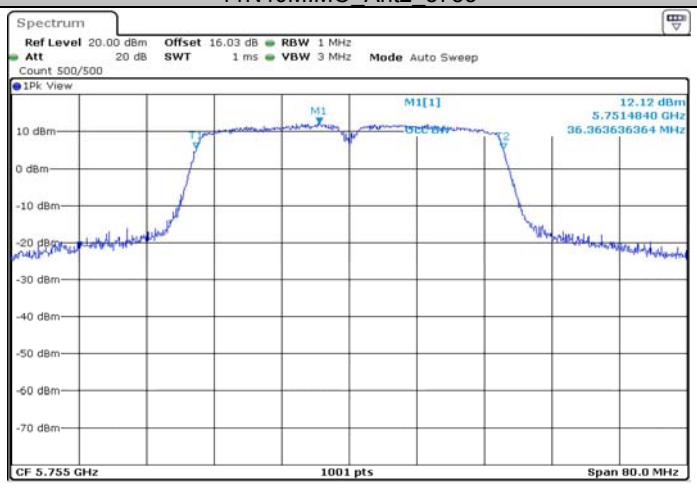

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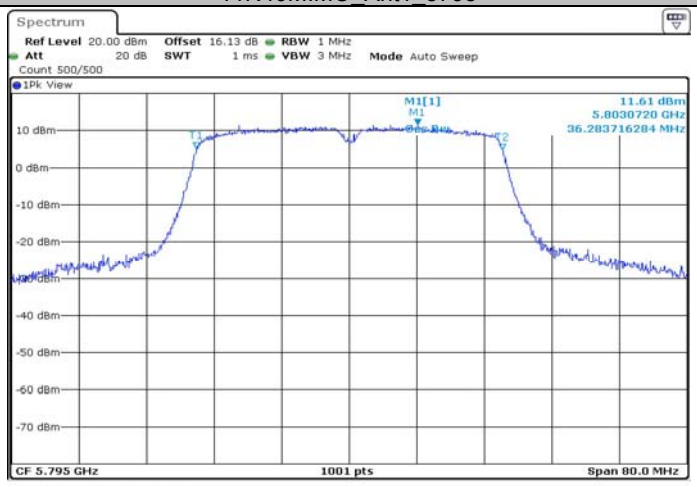

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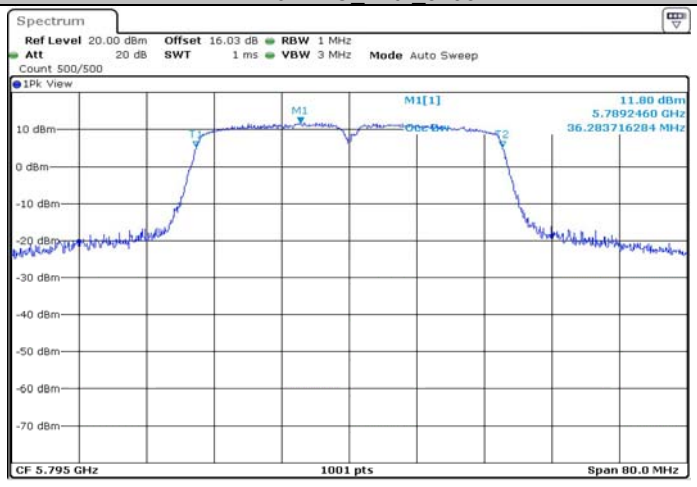

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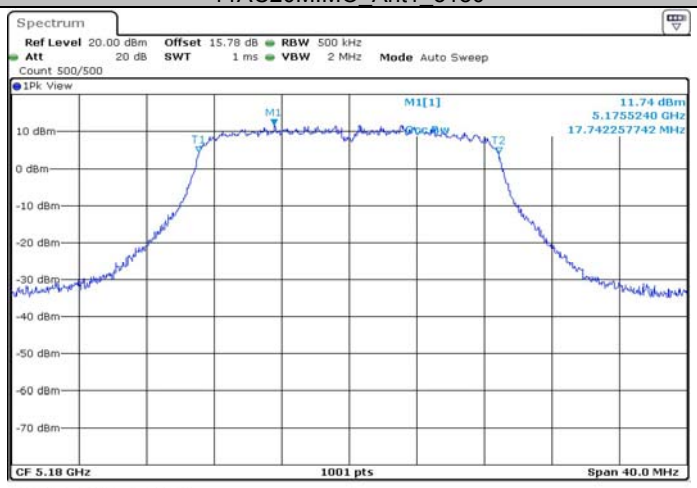

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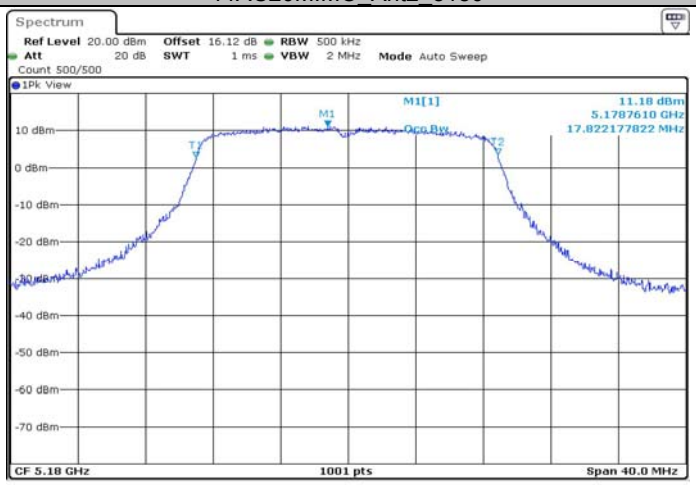

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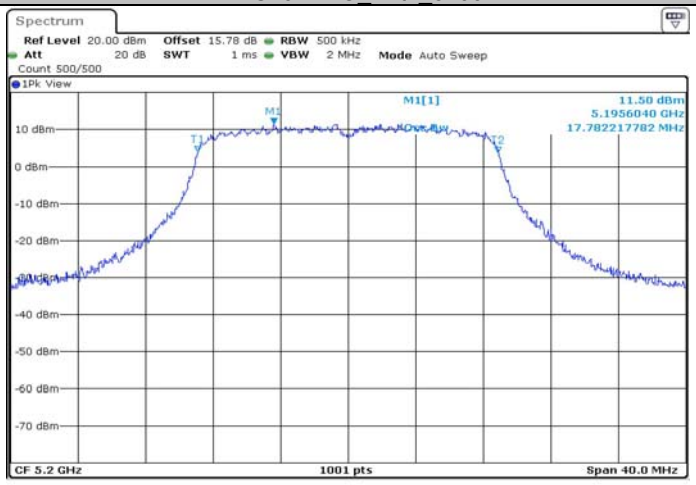

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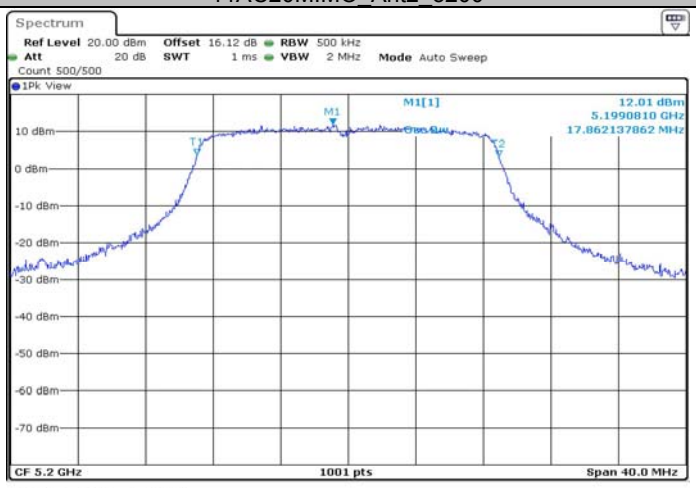

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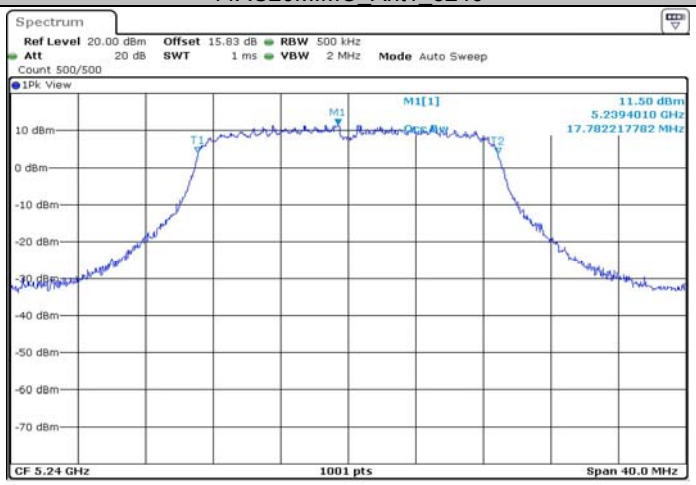

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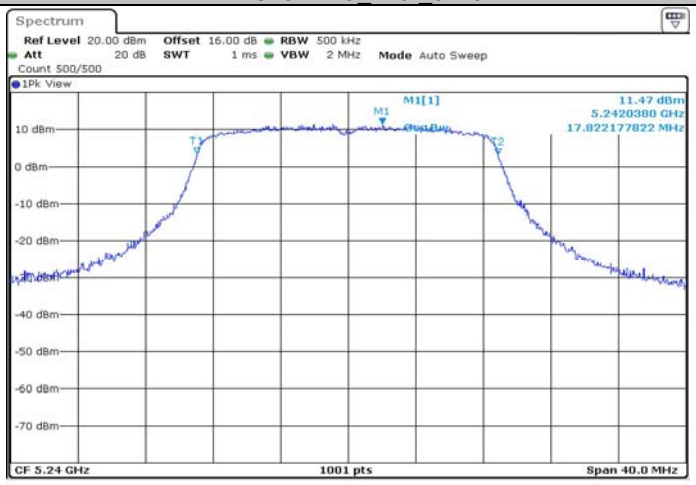

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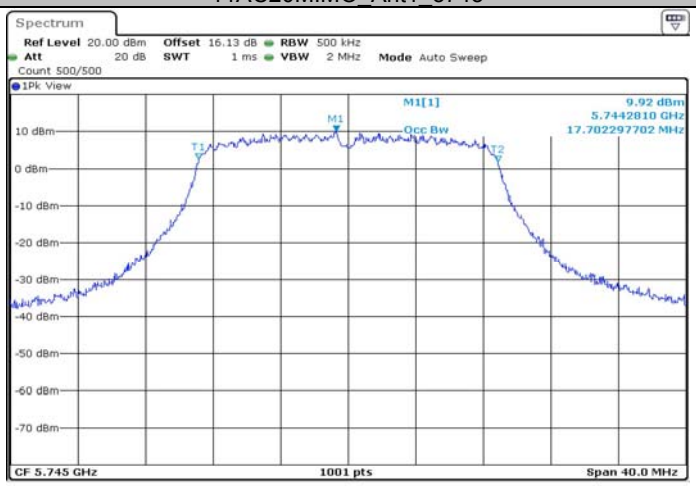

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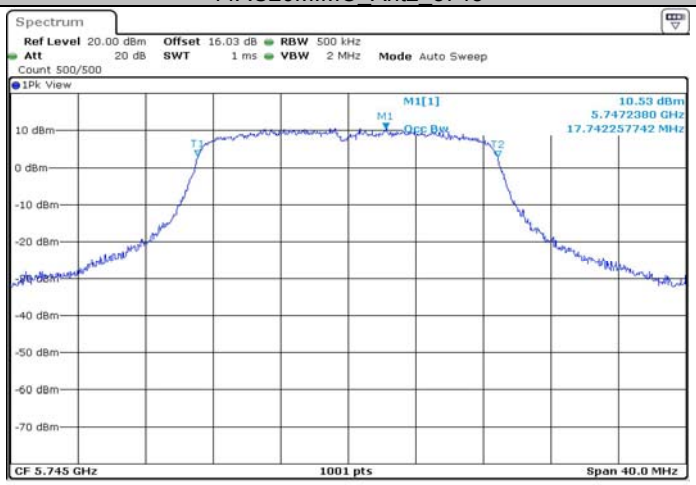

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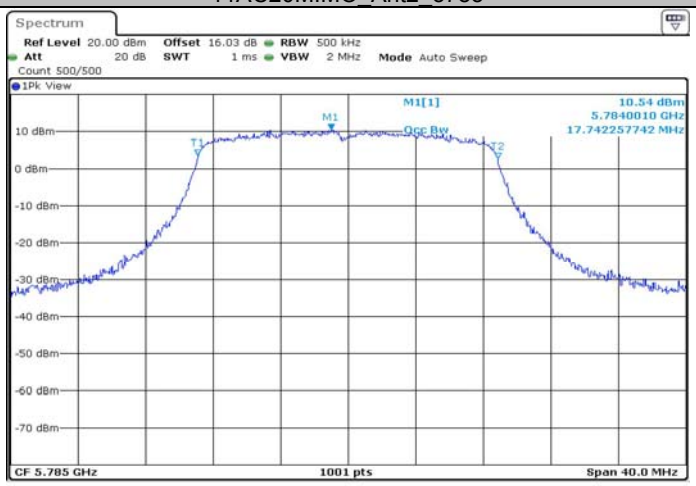

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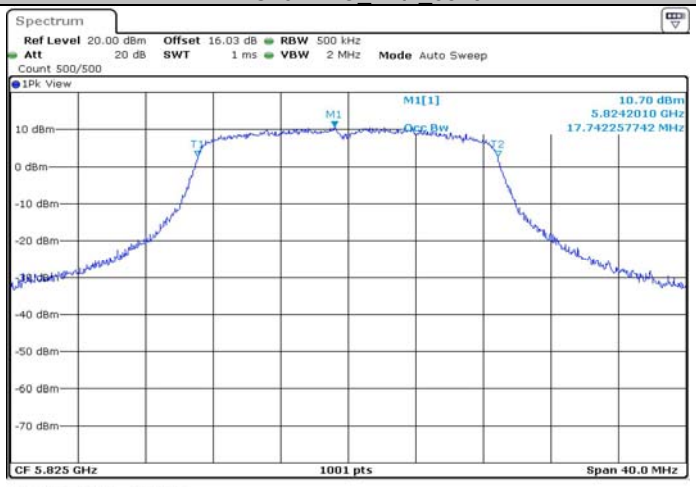

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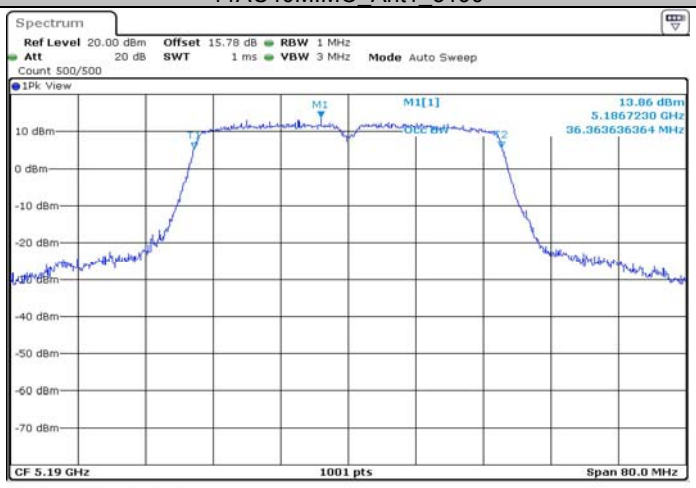

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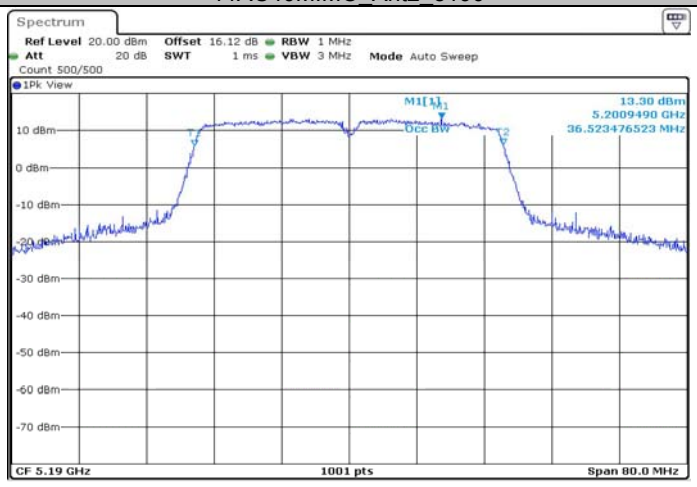

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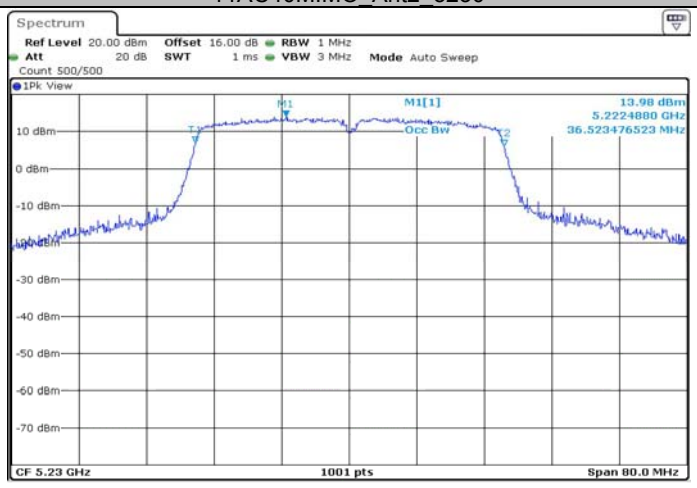

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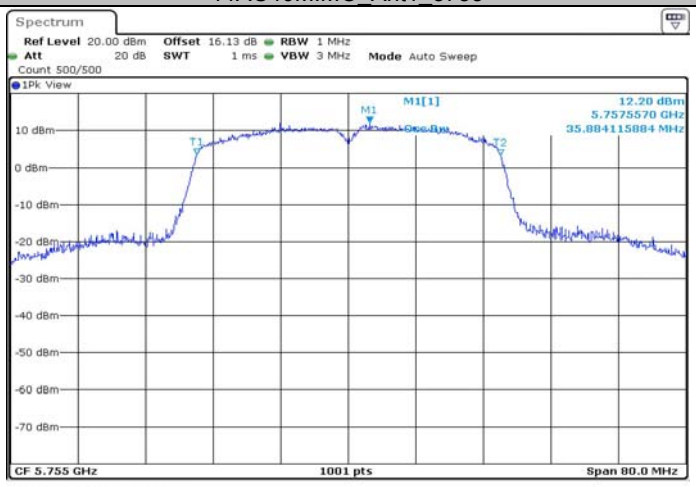

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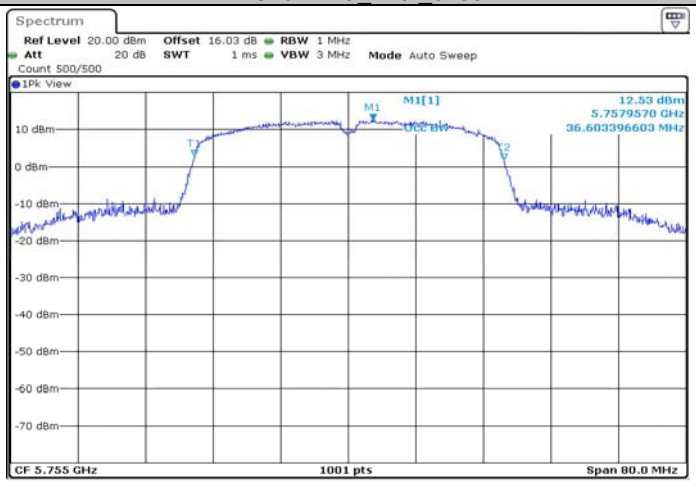

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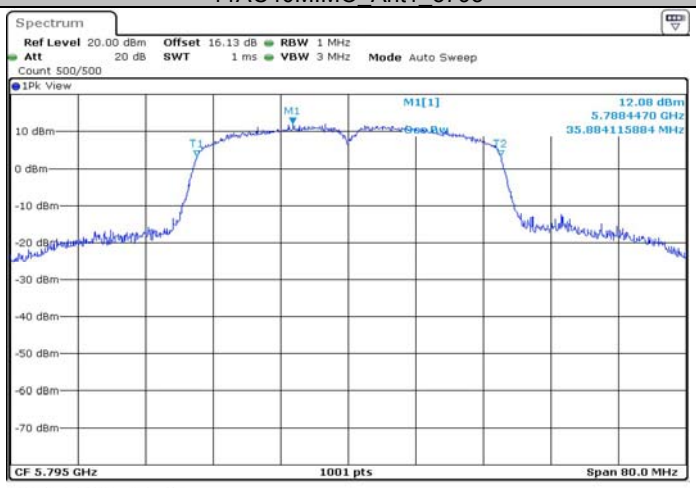

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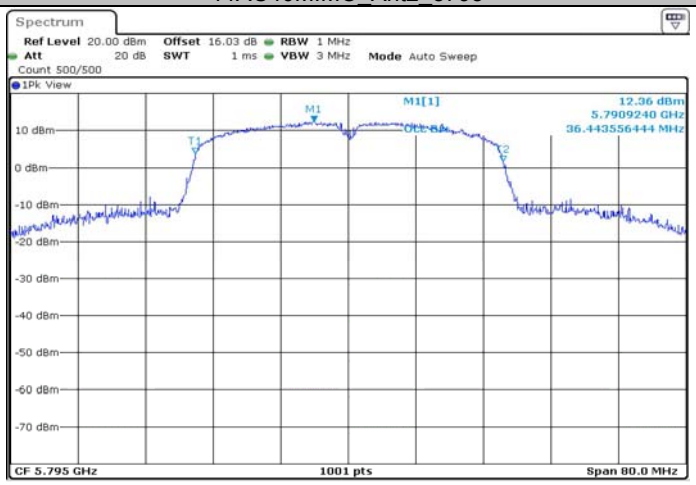
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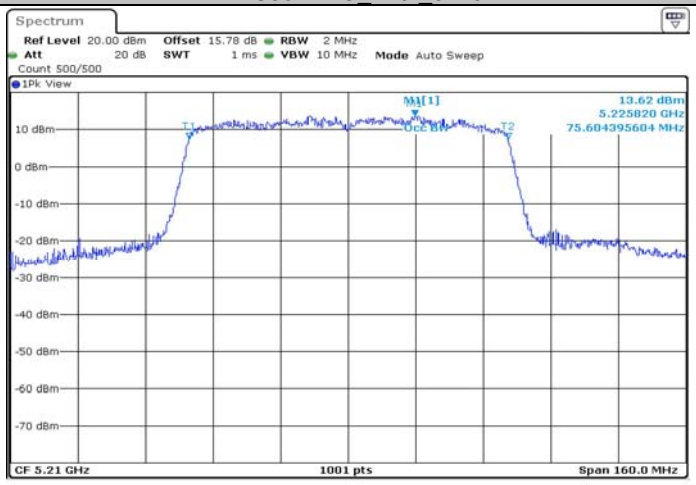
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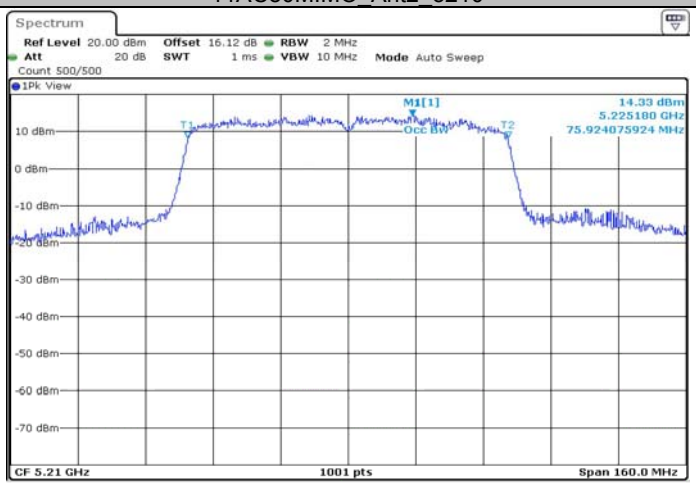

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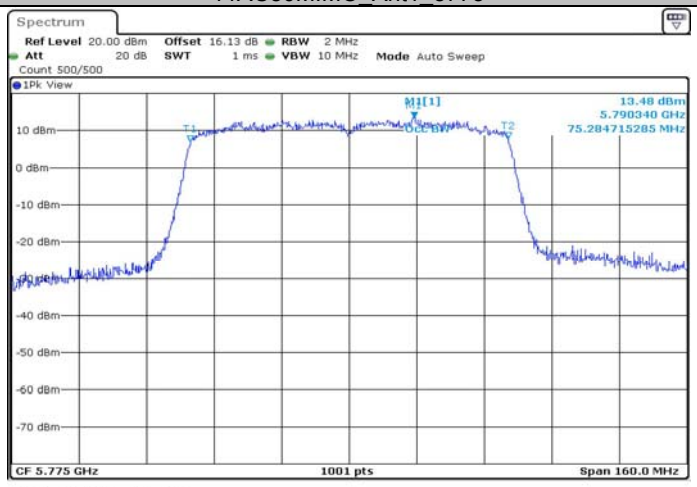

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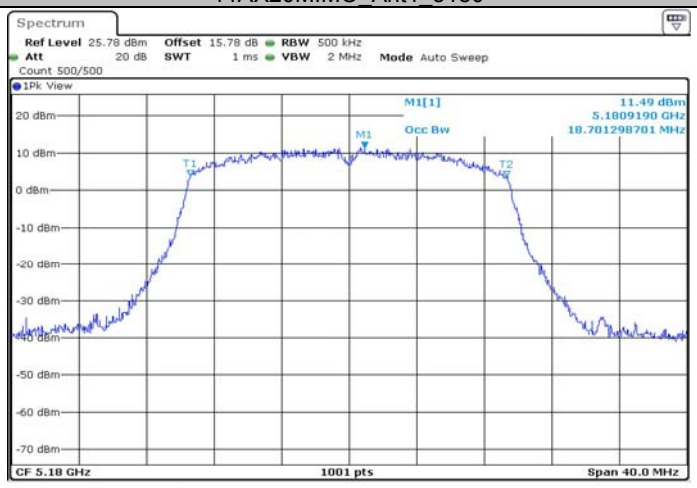

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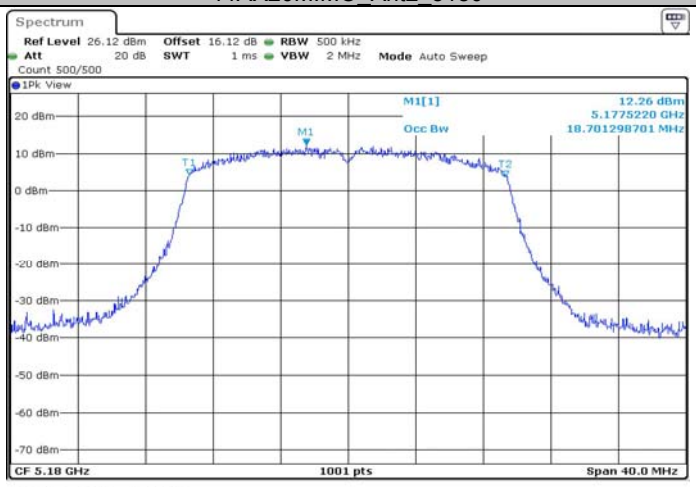

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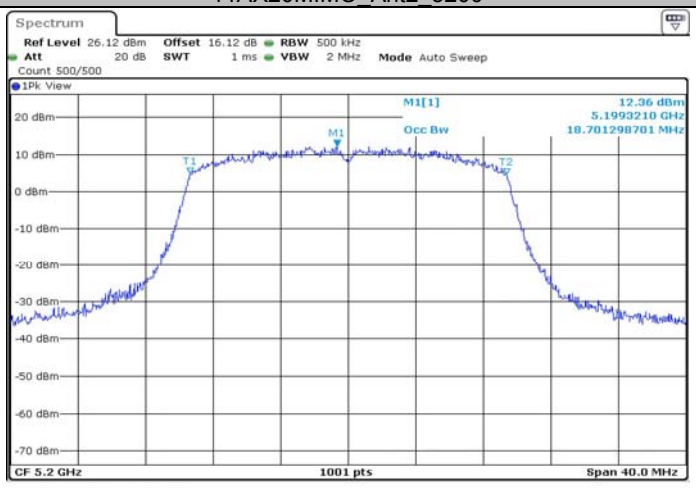

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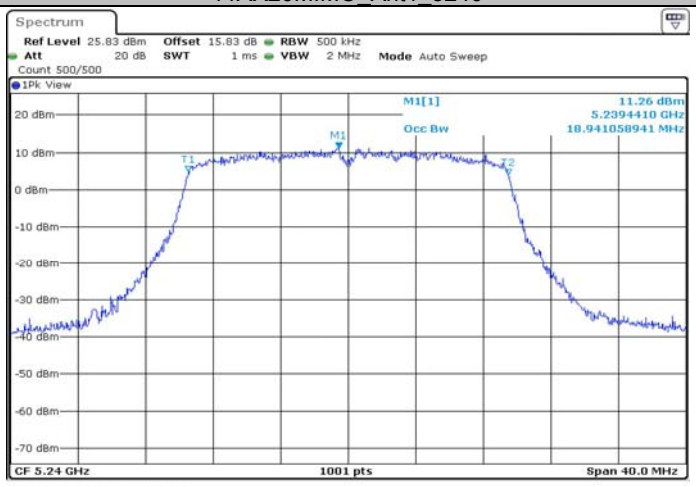

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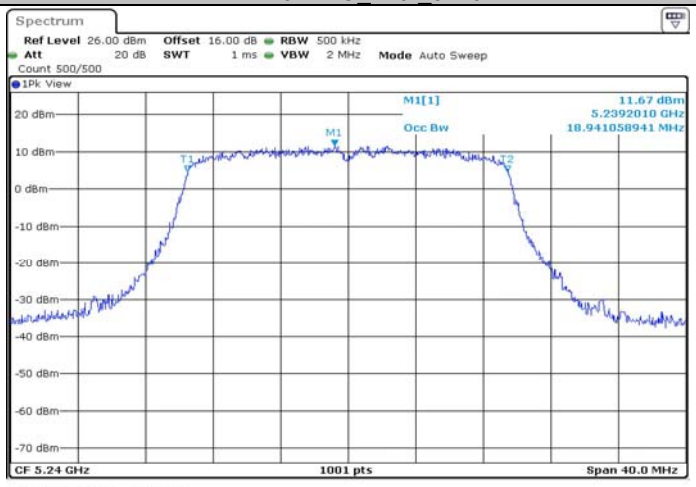

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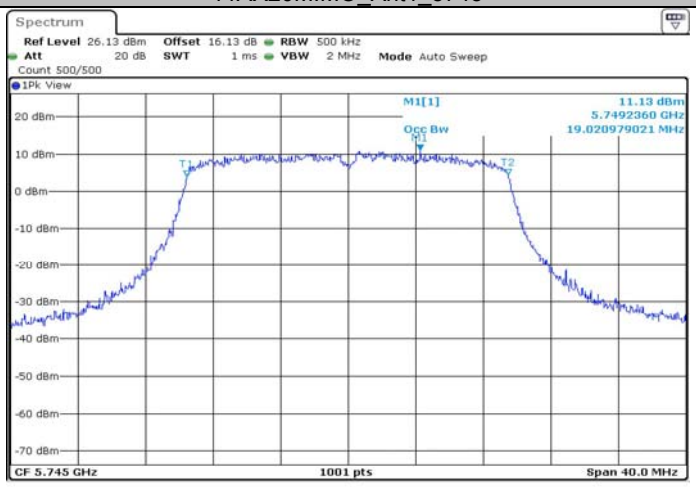

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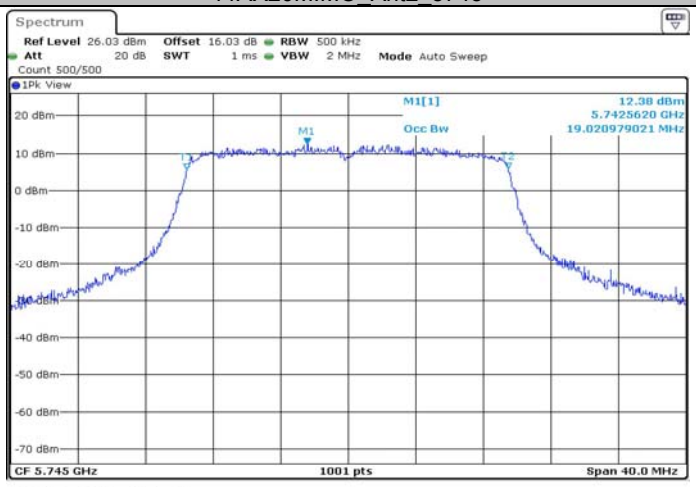

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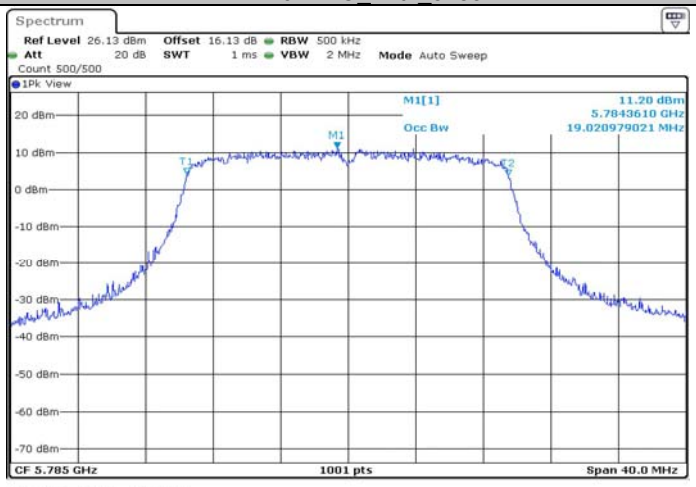

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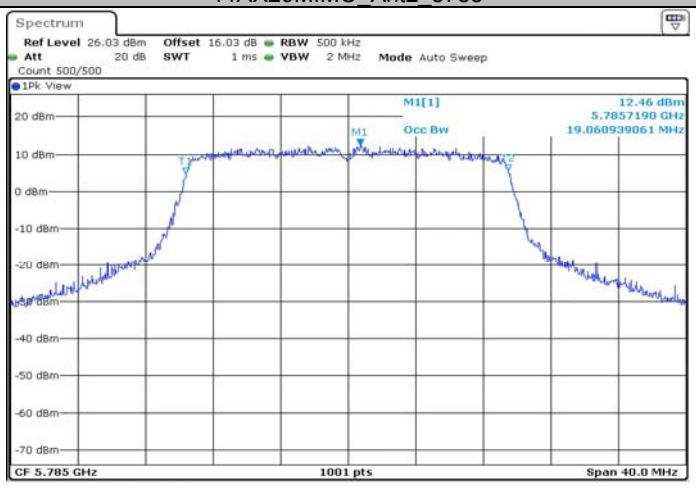

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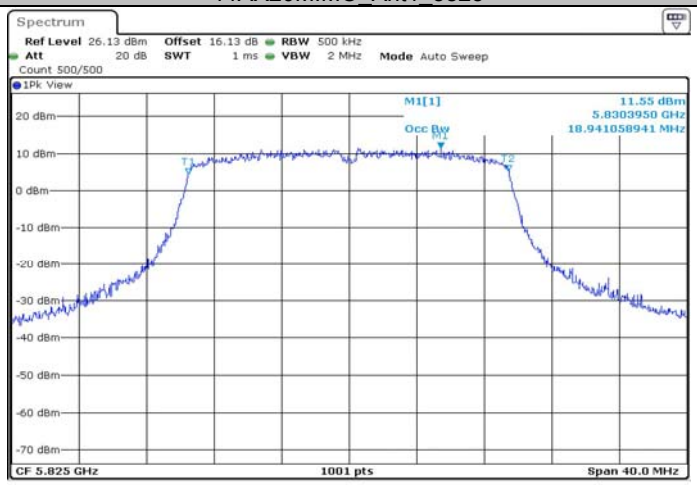
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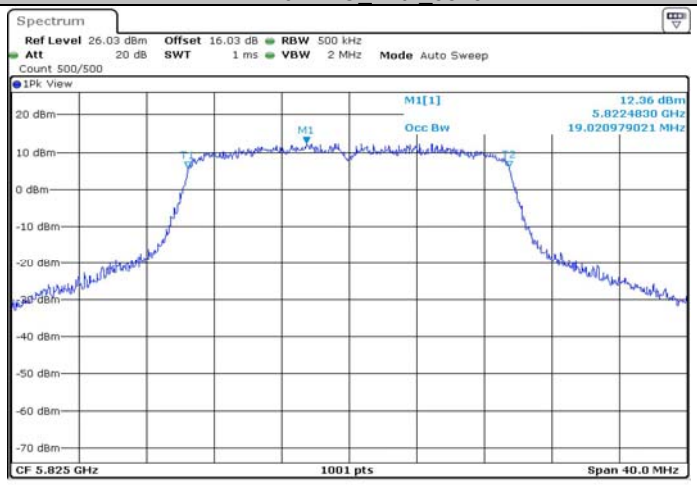
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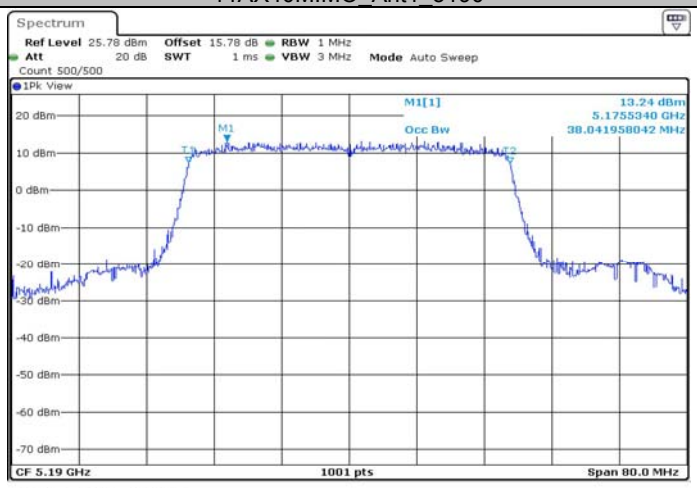

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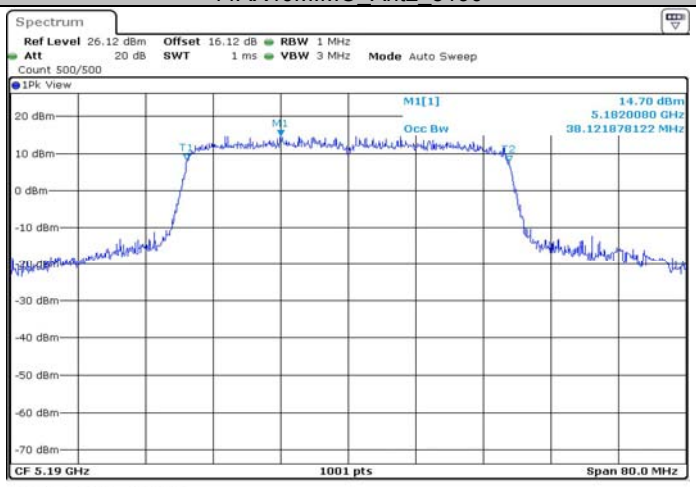
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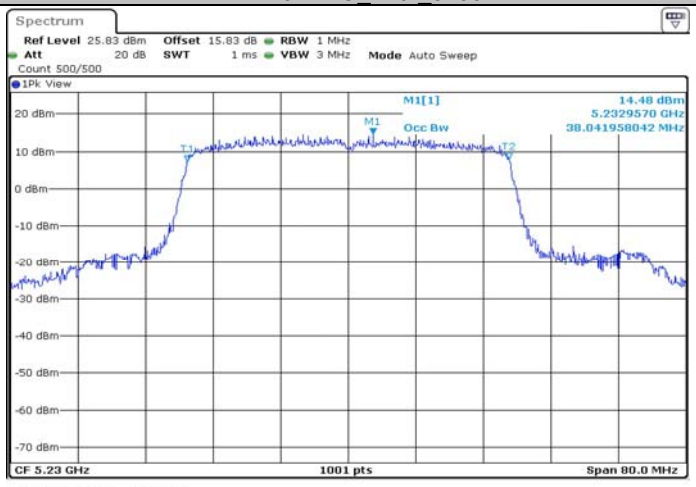
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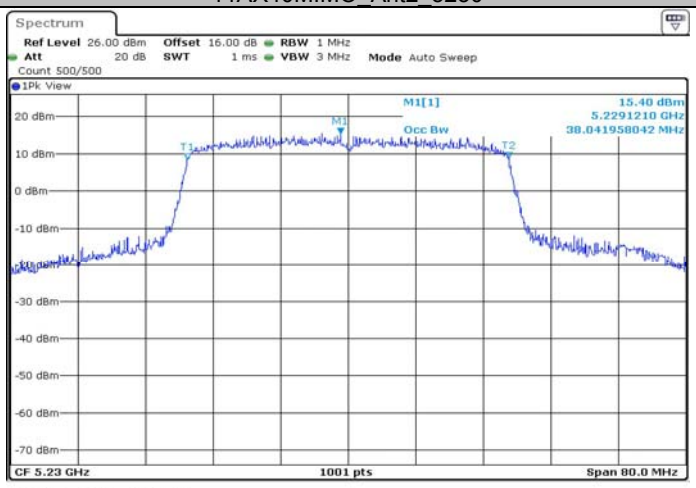

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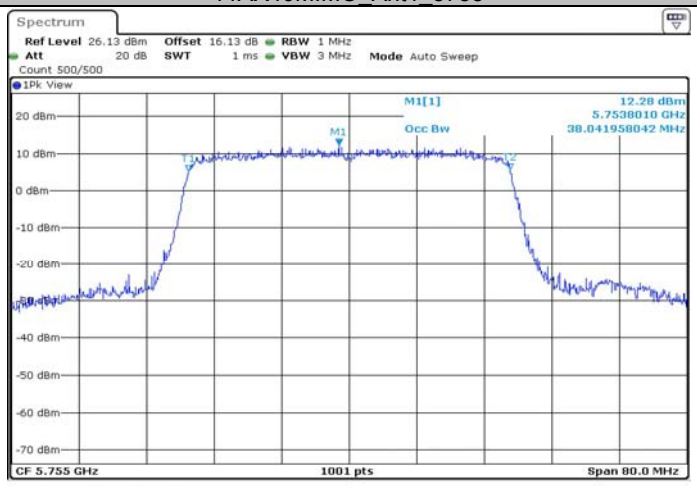
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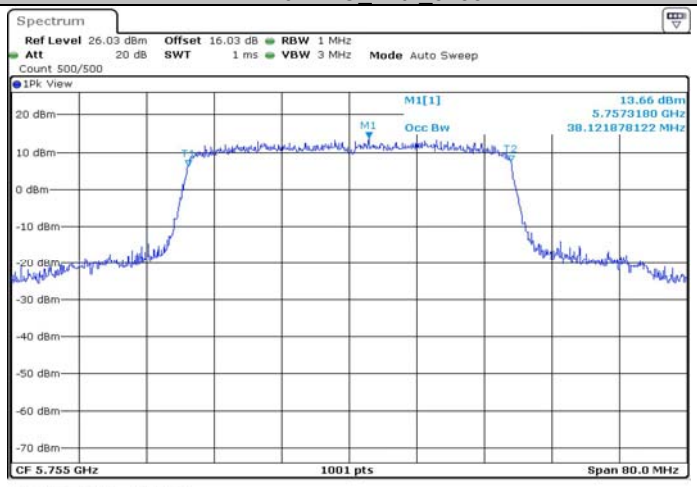
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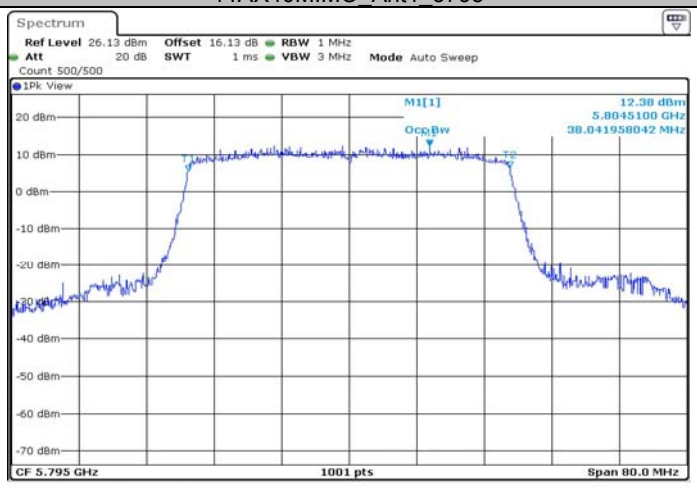

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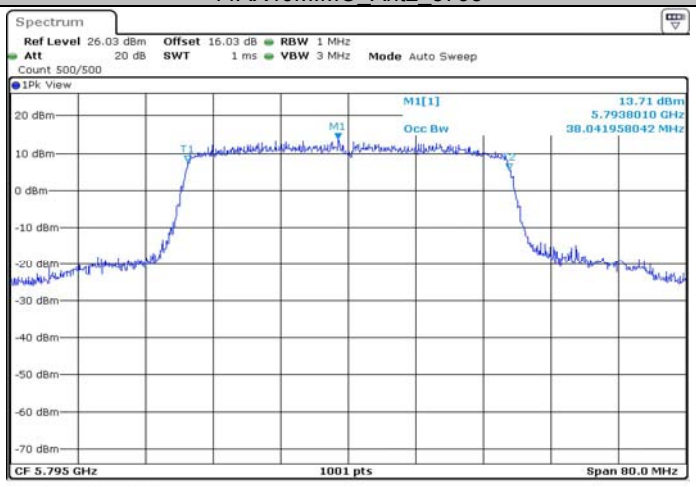
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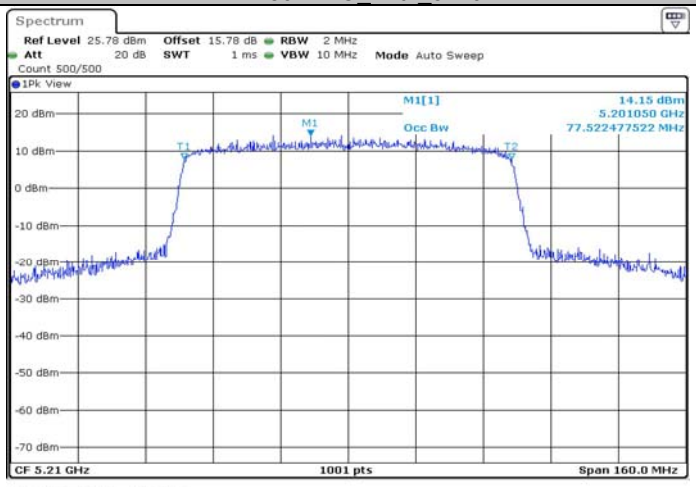
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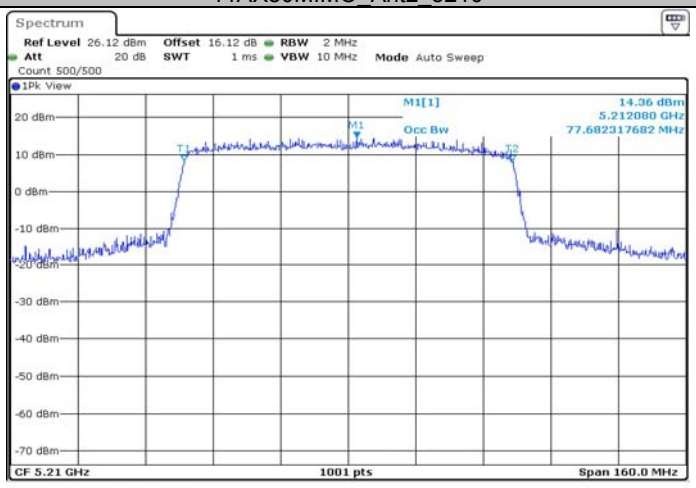

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11AX80MIMO_Ant2_5775