FCC RF Test Report

APPLICANT	:	PAX Technology Limited
EQUIPMENT	:	UNATTENDED PAYMENT TERMINAL
BRAND NAME	:	PAX
MODEL NAME	:	IM30
FCC ID	:	V5PIM304GBWL
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure
TEST DATE(S)	:	Aug. 22, 2023 ~ Oct. 07, 2023

We, Sporton International Inc. (ShenZhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (ShenZhen), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia

Sporton International Inc. (ShenZhen)
1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055
People's Republic of China

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR380711E	Rev. 01	Initial issue of report	Oct. 12, 2023

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit for U-NII-1/2A/2C	Limit for U-NII-3	Result	Remark
3.1	2.1049 & 15.403(i)	6dB, 26dB & 99% Bandwidth	-	6dB Bandwidth > 500kHz	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 24 dBm	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 11 dBm/MHz	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	Unwanted Emissions	15.407(b) & 15.209(a)	15.407(b)(4)(i) &15.209(a)	Pass	Under limit 3.10 dB at 5351.71 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	15.207(a)	Pass	Under limit 15.42 dB at 0.15 MHz
3.6	15.203 & 15.407(a)	Antenna Requirement	15.203 & 15.407(a)	15.203 & 15.407(a)	Pass	-

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

1 General Description

1.1 Applicant

PAX Technology Limited
Room 2416, 24/F., Sun Hung Kai Centre, 30 Harbour Road, Wanchai, Hong Kong

1.2 Manufacturer

PAX Computer Technology (Shenzhen) Co., Ltd.
401 and 402,Building 3, Shenzhen Software Park, Nanshan District, Shenzhen City, Guangdong Province, P.R.C

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	UNATTENDED PAYMENT TERMINAL
Brand Name	PAX
Model Name	IM30
FCC ID	V5PIM304GBWL
SN	Conducted: 1640169811 Conduction: 1640169774 Radiation: 1640169776
HW Version	NA
SW Version	NA
EUT Stage	Production Unit

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	5180 MHz ~ 5240 MHz 5260 MHz ~ 5320 MHz 5500 MHz ~ 5700 MHz 5745 MHz ~ 5825 MHz
Maximum Output Power to Antenna	**<5180 MHz ~ 5240 MHz>** 802.11a : 14.42 dBm / 0.0277 W 802.11n HT20 : 14.03 dBm / 0.0253 W 802.11n HT40 : 13.16 dBm / 0.0207 W 802.11ac VHT80: 10.17 dBm / 0.0104 W **<5260 MHz ~ 5320 MHz>** 802.11a : 14.52 dBm / 0.0283 W 802.11n HT20 : 14.09 dBm / 0.0256 W 802.11n HT40 : 13.16 dBm / 0.0207 W 802.11ac VHT80: 10.20 dBm / 0.0105 W **<5500 MHz ~ 5700 MHz >**

	802.11a : 14.63 dBm / 0.0290 W 802.11n HT20 : 14.22 dBm / 0.0264 W 802.11n HT40 : 13.19 dBm / 0.0208 W 802.11ac VHT80: 10.08 dBm / 0.0102 W **<5745 MHz ~ 5825 MHz>** 802.11a : 13.98 dBm / 0.0250 W 802.11n HT20 : 13.82 dBm / 0.0241 W 802.11n HT40 : 13.33 dBm / 0.0215 W 802.11ac VHT80: 9.55 dBm / 0.0090 W
99% Occupied Bandwidth	**<5180 MHz ~ 5240 MHz>** 802.11a : 17.702 MHz 802.11n HT20 : 18.661 MHz 802.11n HT40 : 36.603 MHz 802.11ac VHT80 : 75.764 MHz **<5260 MHz ~ 5320 MHz>** 802.11a : 17.902 MHz 802.11n HT20 : 18.541 MHz 802.11n HT40 : 36.364 MHz 802.11ac VHT80 : 75.604 MHz **<5500 MHz ~ 5700 MHz>** 802.11a : 17.742 MHz 802.11n HT20 : 18.661 MHz 802.11n HT40 : 36.364 MHz 802.11ac VHT80 : 75.445 MHz **<5745 MHz ~ 5825 MHz>** 802.11a : 17.622 MHz 802.11n HT20 : 18.661 MHz 802.11n HT40 : 36.444 MHz 802.11ac VHT80 : 75.764 MHz
Antenna Type / Gain	**<5180 MHz ~ 5240 MHz>** metal antenna with gain 2.3 dBi **<5260 MHz ~ 5320 MHz>** metal antenna with gain 2.3 dBi **<5500 MHz ~ 5700 MHz>** metal antenna with gain 2.3 dBi **<5745 MHz ~ 5825 MHz>** metal antenna with gain 2.3 dBi
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)

Note:

1. WLAN operation in 5600 MHz ~ 5650 MHz is notched.
2. 802.11ac VHT20/VHT40 power level will be controlled equal or less than 802.11n HT20/HT40, thus the test results of 11n HT20/HT40 also cover 11ac VHT20/VHT40.

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton International Inc. (ShenZhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International Inc. (ShenZhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-SZ TH01-SZ	CN1256	421272

Test Firm	Sporton International Inc. (ShenZhen)		
Test Site Location	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City, Guangdong Province 518103 People's Republic of China TEL: +86-755-86066985		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH01-SZ	CN1256	421272

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH01-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

b. AC power line Conducted Emission was tested under maximum output power.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5180-5240 MHz U-NII-1	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240
	42#	5210		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5260-5320 MHz U-NII-2A	52	5260	60	5300
	54*	5270	62*	5310
	56	5280	64	5320
	58#	5290		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5500-5700MHz U-NII-2C	100	5500	112	5560
	102*	5510	116	5580
	104	5520	132	5660
	106#	5530	134*	5670
	108	5540	136	5680
	110*	5550	140	5700

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5745-5825 MHz U-NII-3	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155#	5775	165	5825

Note:

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "#" were 802.11ac VHT80.

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20 (cover 11ac VHT20)	MCS0
802.11n HT40 (cover 11ac VHT40)	MCS0
802.11ac VHT80	MCS0

AC Conducted Emission	Mode 1 : WCDMA Band5 Idle (ANT 2) + WLAN Link(5G) + Adapter (MDB Port)
Remark: For Radiated Test Cases, The tests were performance with Adapter and AC Cable	

RSE Co-location
802.11a CH64 5320 + LTE Band13 Link

Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		802.11a	802.11a	802.11a	802.11a
L	Low	36	52	100	149
M	Middle	44	60	116	157
H	High	48	64	140	165

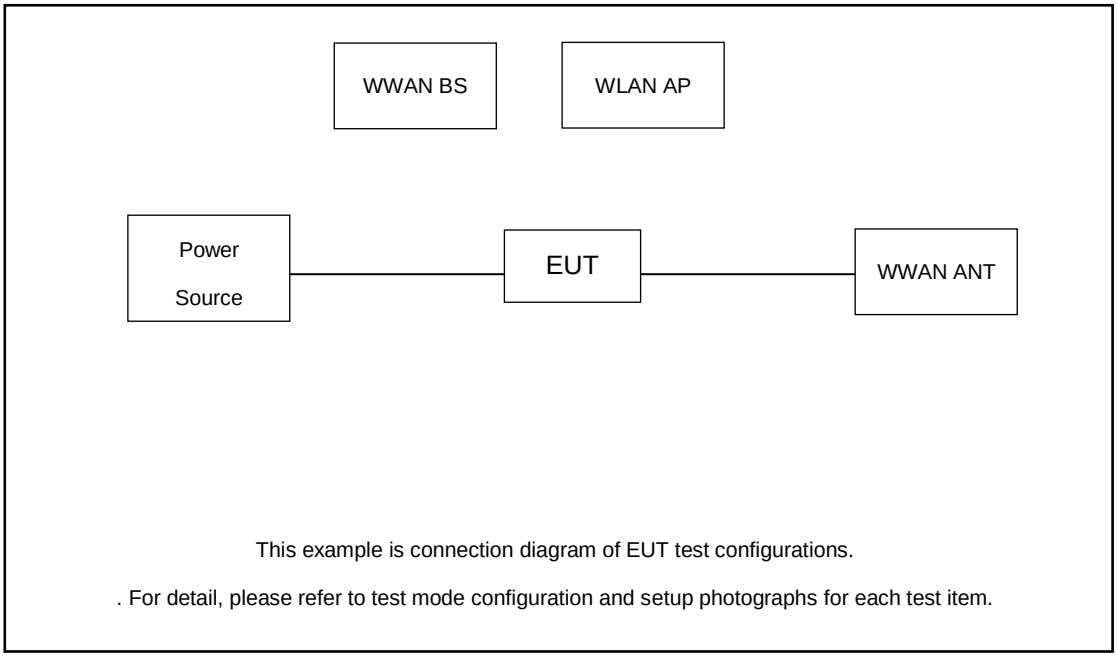
Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		802.11n HT20	802.11n HT20	802.11n HT20	802.11n HT20
L	Low	36	52	100	149
M	Middle	44	60	116	157
H	High	48	64	140	165

Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		802.11n HT40	802.11n HT40	802.11n HT40	802.11n HT40
L	Low	38	54	102	151
M	Middle	-	-	110	-
H	High	46	62	134	159

Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		802.11ac VHT80	802.11ac VHT80	802.11ac VHT80	802.11ac VHT80
L	Low	-	-	106	-
M	Middle	42	58	-	155
H	High	-	-	-	-

2.3 Connection Diagram of Test System

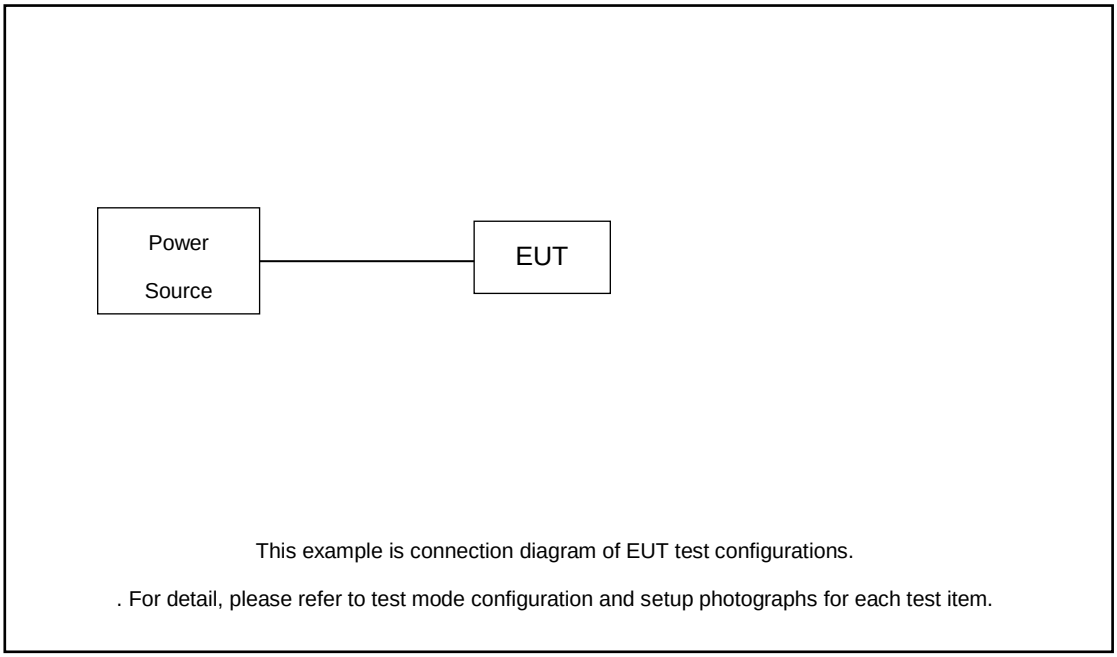
AC Conducted Emission:



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

Radiated Emission:



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Base Station(LTE)	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	WLAN AP	Dlink	DIR-820L	KA2IR820LA1	N/A	Unshielded,1.8m
3.	Adapter	N/A	N/A	N/A	N/A	N/A
4.	AC Cable	N/A	N/A	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuously transmit.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

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2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.23 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.23 + 10 = 14.23 (dB)

3 Test Result

3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

3.1.1 Description of 6dB and 26dB and 99% Occupied Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

26dB and 99% Occupied bandwidth are reporting only.

3.1.2 Measuring Instruments

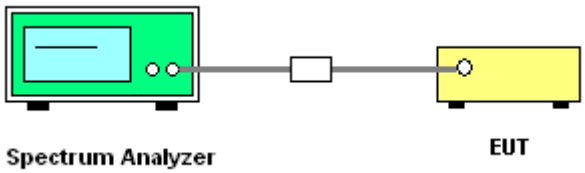
The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

☒	Section C) Bandwidth Measurement 1. Emission Bandwidth (EBW) and 99% OBW
	1. Set RBW = approximately 1% of the emission bandwidth. **2.** Set the VBW > RBW. **3.** Detector = Peak. **4.** Trace mode = max hold **5.** Measure the maximum width of the emission that is 26 dB down from the peak 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%. **6.** For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set to 1%~5% of the OBW and set the Video bandwidth (VBW) ≥ 3 * RBW. **7.** Measure and record the results in the test report.
☒	Section C) Bandwidth Measurement 2. Minimum Emission Bandwidth for the band 5.725 - 5.85 GHz
	1. Set RBW = 100kHz. **2.** Set the VBW ≥ 3 x RBW. **3.** Detector = Peak. **4.** Trace mode = max hold **5.** Measure the maximum width of the emission that is 6 dB down from the peak of the emission. **6.** Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

3.2 Maximum Conducted Output Power Measurement

3.2.1 Limit of Maximum Conducted Output Power

<FCC 14-30 CFR 15.407>

For mobile and portable 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.

For the 5.25–5.725 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.

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note that U-NII-2 band, 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.

3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

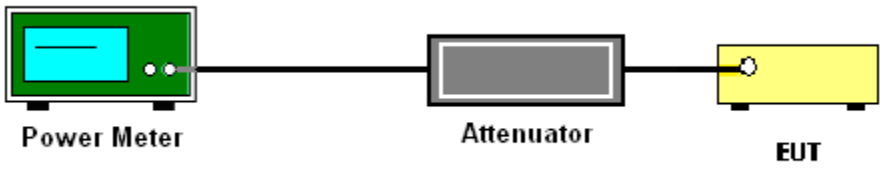
3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

<FCC 14-30 CFR 15.407>

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band.

For the 5.25–5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the band 5.725–5.85 GHz, 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, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04.
Section F) Maximum power spectral density.

For devices operating in the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, and 5.47 - 5.725 GHz

 # Method SA-2 #

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 1 MHz.
- Set VBW ≥ 3 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.

For devices operating in the band 5.725 - 5.85 GHz

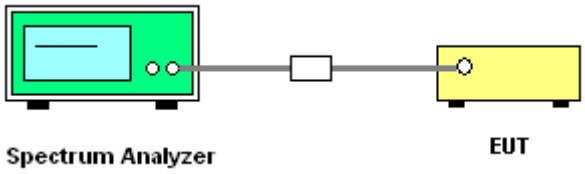
 # Method SA-2 #

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 500KHz (or 300 kHz if the SA can't set RBW=500KHz).
- Set VBW ≥ 1 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- If the SA can't set RBW=500KHz, then add 10 log(500kHz/RBW) to the test result.
- Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.

1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

3.4 Unwanted Emissions Measurement

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part15.205.

3.4.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of –27dBm/MHz.

For transmitters operating in the 5250-5350 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band must meet all applicable technical requirements for operation in the 5150-5250 MHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5150-5250 MHz band.

For transmitters operating in the 5470-5600 MHz and 5650-5725MHz band: all emissions outside of the 5470-5600 MHz and 5650-5725MHz band shall not exceed an EIRP of -27 dBm/MHz.

(2) For transmitters operating in the 5.725-5.85 GHz band:
15.407(b)(4)(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.

(3) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

(4) EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.2

Note: The following formula is used to convert the EIRP to field strength.

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

(4) ANSI C63.10-2013 clause 12.7.3 note 97

As specified by regulatory requirements, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit. However, an out-of-band emission that complies with both the average and peak general regulatory limits is not required to satisfy the peak emission limit.

3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04. Section G) Unwanted emissions measurement.

   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz

   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

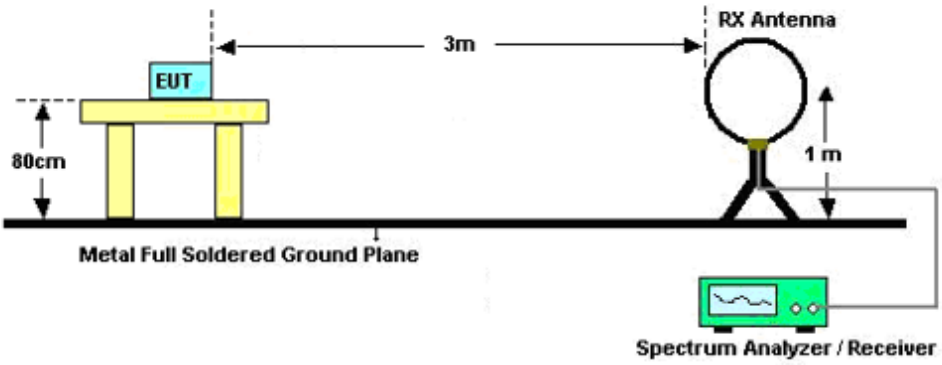
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on.

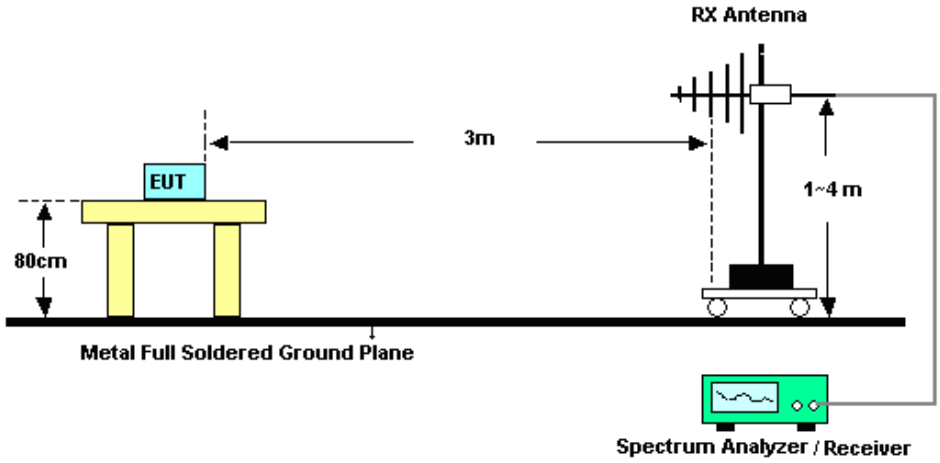
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

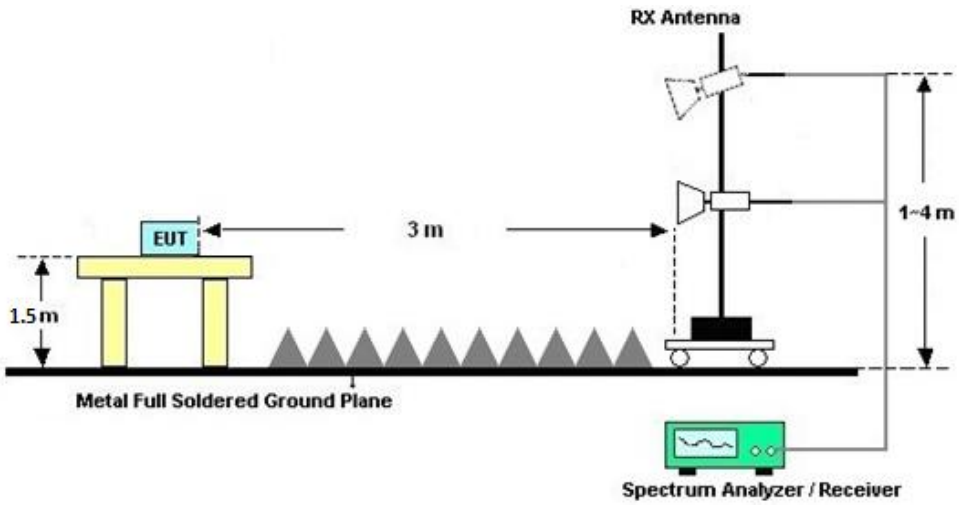
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.4.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.4.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.4.7 Duty Cycle

Please refer to Appendix D.

3.4.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix C.

3.5 AC Conducted Emission Measurement

3.5.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

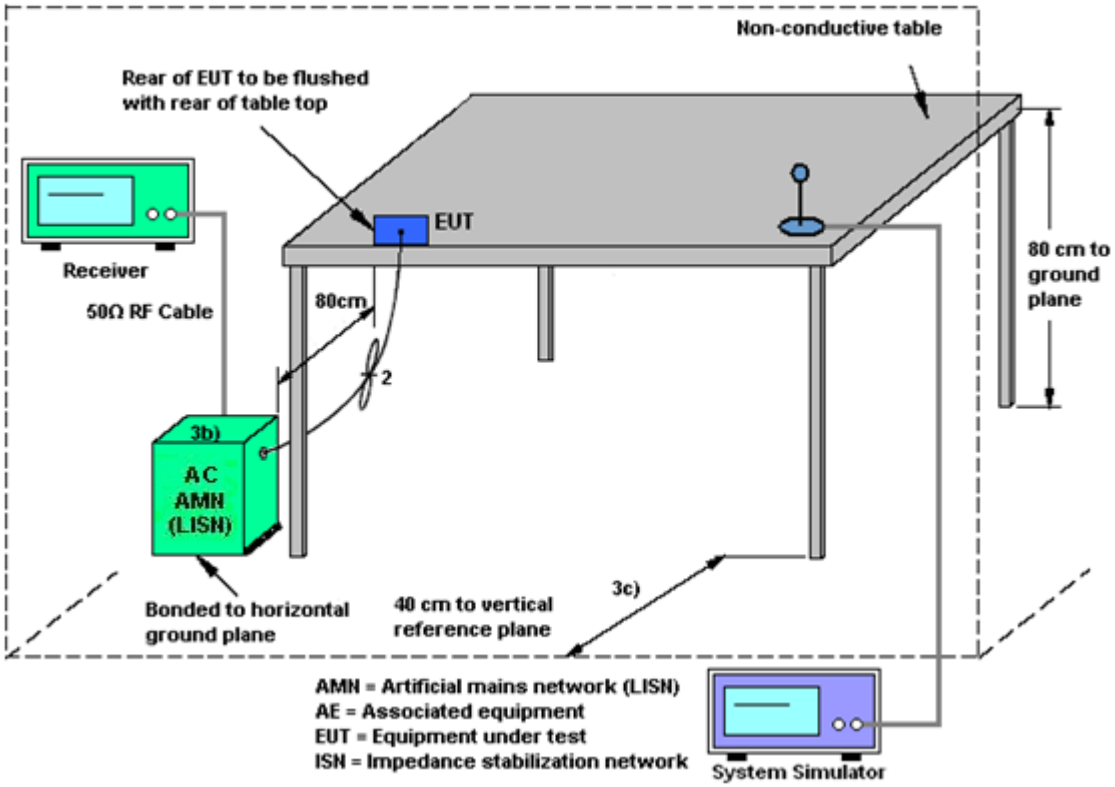
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.5.4 Test Setup



3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.6 Antenna Requirements

3.6.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2) ,if transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.6.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver&SA	Agilent	N9038A	MY52260185	20Hz~26.5GHz	Dec. 26, 2022	Aug. 22, 2023~ Oct. 07, 2023	Dec. 25, 2023	Radiation (03CH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 07, 2023	Aug. 22, 2023~ Oct. 07, 2023	Jul. 06, 2024	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jul. 28, 2022	Aug. 22, 2023~ Oct. 07, 2023	Jul. 27, 2024	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	Sep. 28, 2021	Aug. 22, 2023~ Oct. 07, 2023	Sep. 27, 2023	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	Sep. 27, 2023		Sep. 26, 2024	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00119436	1GHz~18GHz	Jul. 08, 2023	Aug. 22, 2023~ Oct. 07, 2023	Jul. 07, 2024	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Apr. 08, 2023	Aug. 22, 2023~ Oct. 07, 2023	Apr. 07, 2024	Radiation (03CH01-SZ)
LF Amplifier	Burgeon	BPA-530	102209	0.01~3000Mhz	Apr. 04, 2023	Aug. 22, 2023~ Oct. 07, 2023	Apr. 03, 2024	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 19, 2022	Aug. 22, 2023~ Oct. 07, 2023	Oct. 18, 2023	Radiation (03CH01-SZ)
HF Amplifier	KEYSIGHT	83017A	MY53270105	0.5GHz~26.5Ghz	Oct. 19, 2022	Aug. 22, 2023~ Oct. 07, 2023	Oct. 18, 2023	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 07, 2023	Aug. 22, 2023~ Oct. 07, 2023	Jul. 06, 2024	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	Nov. 10, 2022	Aug. 22, 2023~ Oct. 07, 2023	Nov. 09, 2023	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Aug. 22, 2023~ Oct. 07, 2023	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Aug. 22, 2023~ Oct. 07, 2023	NCR	Radiation (03CH01-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jul. 06, 2023	Aug. 23, 2023	Jul. 05, 2024	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Aug. 21, 2023	Aug. 23, 2023	Aug. 20, 2024	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 17, 2022	Aug. 23, 2023	Oct. 16, 2023	Conduction (CO01-SZ)
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 06, 2023	Aug. 25, 2023	Apr. 05, 2024	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 27, 2022	Aug. 25, 2023	Dec. 26, 2023	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 27, 2022	Aug. 25, 2023	Dec. 26, 2023	Conducted (TH01-SZ)
DC Power Supply	TTI	PL330P	290070	Max 32V，3A	Oct. 17, 2022	Aug. 25, 2023	Oct. 16, 2023	Conducted (TH01-SZ)
Thermal Chamber	Ten Billion Hongzhangroup	LP-150U	H2014081803	-40~+150°C	Jul. 05, 2023	Aug. 25, 2023	Jul. 04, 2024	Conducted (TH01-SZ)

NCR: No Calibration Required

5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	±1.34 dB
Conducted Emissions	±1.34 dB
Occupied Channel Bandwidth	±0.012 %
Conducted Power Spectral Density	±1.32 dB

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.8 dB

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.2 dB

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0 dB

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.3 dB

Appendix A. Conducted Test Results

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Zhang Xue Yi	Temperature:	21~25	°C
Test Date:	2023/8/25	Relative Humidity:	51~54	%

Report Number : FR380711E

TEST RESULTS DATA
Average Power Table

FCC UNII-1											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)		Pass/Fail	Power Setting
11a	6Mbps	1	36	5180	0.30	13.46	24.00	2.30		Pass	13
11a	6Mbps	1	44	5220	0.30	14.27	24.00	2.30		Pass	14
11a	6Mbps	1	48	5240	0.30	14.42	24.00	2.30		Pass	14
HT20	MCS0	1	36	5180	0.35	13.25	24.00	2.30		Pass	13
HT20	MCS0	1	44	5220	0.35	14.03	24.00	2.30		Pass	14
HT20	MCS0	1	48	5240	0.35	14.00	24.00	2.30		Pass	14
HT40	MCS0	1	38	5190	0.26	12.19	24.00	2.30		Pass	12
HT40	MCS0	1	46	5230	0.26	13.16	24.00	2.30		Pass	13
VHT80	MCS0	1	42	5210	1.96	10.17	24.00	2.30		Pass	10

Report Number : FR380711E

TEST RESULTS DATA
Average Power Table

FCC UNII-2A											
Mod.	Data Rate	NTx	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	EIRP Power Limit (dBm)	Pass/Fail	Power Setting
11a	6M bps	1	52	5260	0.30	9.13	23.98	2.30	26.99	Pass	9
11a	6M bps	1	56	5280	0.30	14.27	23.98	2.30	26.99	Pass	14
11a	6M bps	1	60	5300	0.30	14.52	23.98	2.30	26.99	Pass	14
11a	6M bps	1	64	5320	0.30	13.56	23.98	2.30	26.99	Pass	13
HT20	MCS 0	1	52	5260	0.35	7.98	23.98	2.30	26.99	Pass	8
HT20	MCS 0	1	56	5280	0.35	14.05	23.98	2.30	26.99	Pass	14
HT20	MCS 0	1	60	5300	0.35	14.09	23.98	2.30	26.99	Pass	14
HT20	MCS 0	1	64	5320	0.35	13.26	23.98	2.30	26.99	Pass	13
HT40	MCS 0	1	54	5270	0.26	13.16	23.98	2.30	26.99	Pass	13
HT40	MCS 0	1	62	5310	0.26	11.02	23.98	2.30	26.99	Pass	11
VHT80	MCS 0	1	58	5290	1.96	10.20	23.98	2.30	26.99	Pass	10

Report Number : FR380711E

TEST RESULTS DATA
Average Power Table

FCC UNII-2C											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	EIRP Power Limit (dBm)	Pass/Fail	Power Setting
11a	6M bps	1	100	5500	0.30	14.63	23.98	2.30	26.99	Pass	14
11a	6M bps	1	116	5580	0.30	14.16	23.98	2.30	26.99	Pass	14
11a	6Mbps	1	140	5700	0.30	13.45	23.98	2.30	26.99	Pass	14
HT20	MCS 0	1	100	5500	0.35	14.22	23.98	2.30	26.99	Pass	14
HT20	MCS 0	1	116	5580	0.35	14.12	23.98	2.30	26.99	Pass	14
HT20	MCS0	1	140	5700	0.35	13.18	23.98	2.30	26.99	Pass	14
HT40	MCS 0	1	102	5510	0.26	13.16	23.98	2.30	26.99	Pass	13
HT40	MCS 0	1	110	5550	0.26	13.17	23.98	2.30	26.99	Pass	13
HT40	MCS 0	1	134	5670	0.26	13.19	23.98	2.30	26.99	Pass	13
VHT80	MCS 0	1	106	5530	1.96	10.08	23.98	2.30	26.99	Pass	10

Report Number : FR380711E

TEST RESULTS DATA
Average Power Table

FCC UNII-3											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)		Pass/Fail	Setting
11a	6M bps	1	149	5745	0.30	13.65	30.00	2.30		Pass	14
11a	6Mbps	1	157	5785	0.30	13.75	30.00	2.30		Pass	14
11a	6Mbps	1	165	5825	0.30	13.98	30.00	2.30		Pass	14
HT20	MCS 0	1	149	5745	0.35	13.55	30.00	2.30		Pass	14
HT20	MCS 0	1	157	5785	0.35	13.52	30.00	2.30		Pass	14
HT20	MCS 0	1	165	5825	0.35	13.82	30.00	2.30		Pass	14
HT40	MCS 0	1	151	5755	0.26	13.30	30.00	2.30		Pass	13
HT40	MCS 0	1	159	5795	0.26	13.33	30.00	2.30		Pass	13
VHT80	MCS 0	1	155	5775	1.96	9.55	30.00	2.30		Pass	10

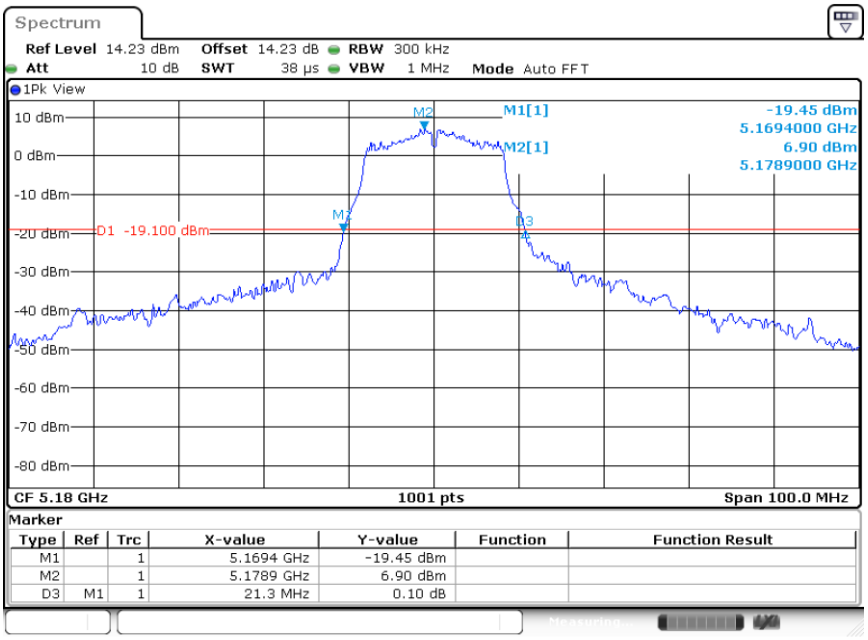
Emission Bandwidth

Test Result

TestMode	Antenna	Freq(MHz)	26dB EBW [MHz]	FL[MHz]	FH[MHz]
11A	Ant1	5180	21.30	5169.40	5190.70
		5220	21.40	5209.20	5230.60
		5240	21.50	5229.20	5250.70
		5260	21.60	5249.30	5270.90
		5300	21.50	5289.30	5310.80
		5320	21.40	5309.40	5330.80
		5500	21.40	5489.30	5510.70
		5580	21.40	5569.30	5590.70
		5700	21.40	5689.30	5710.70
		5745	21.40	5734.30	5755.70
		5785	21.50	5774.20	5795.70
		5825	21.40	5814.30	5835.70
11N20SISO	Ant1	5180	21.80	5169.10	5190.90
		5220	21.40	5209.40	5230.80
		5240	21.80	5229.20	5251.00
		5260	21.70	5249.30	5271.00
		5300	21.90	5289.00	5310.90
		5320	21.80	5309.20	5331.00
		5500	21.70	5489.20	5510.90
		5580	21.90	5569.10	5591.00
		5700	22.00	5689.10	5711.10
		5745	22.00	5734.10	5756.10
		5785	21.80	5774.10	5795.90
		5825	22.70	5813.30	5836.00
11N40SISO	Ant1	5190	39.80	5170.00	5209.80
		5230	40.20	5209.80	5250.00
		5270	40.00	5250.20	5290.20
		5310	40.00	5290.20	5330.20
		5510	39.80	5490.20	5530.00
		5550	40.00	5530.00	5570.00
		5670	40.00	5650.00	5690.00
		5755	40.60	5735.00	5775.60
		5795	40.20	5775.00	5815.20
11AC80SISO	Ant1	5210	81.60	5169.60	5251.20
		5290	81.20	5250.00	5331.20
		5530	81.60	5489.60	5571.20
		5775	80.80	5735.00	5815.80

Test Graphs

11A_5180



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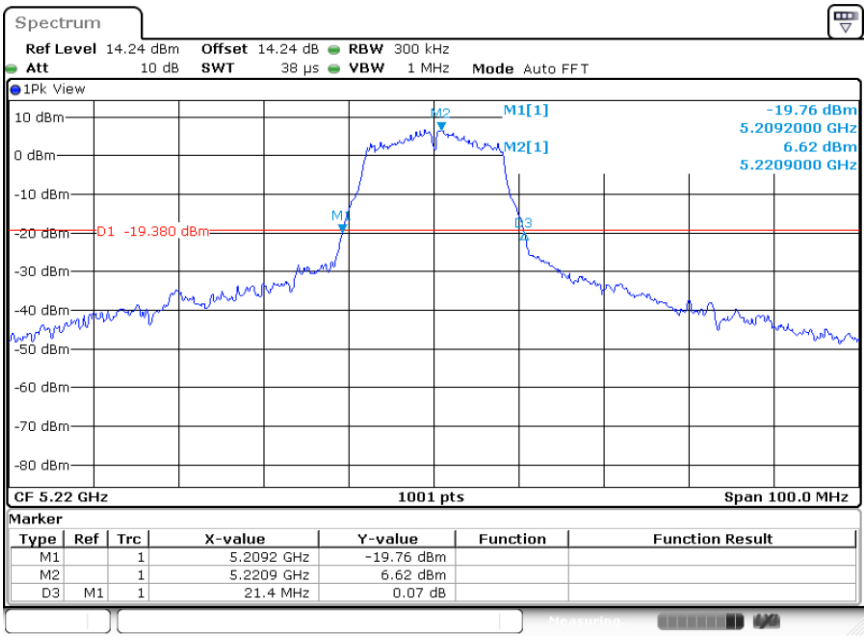

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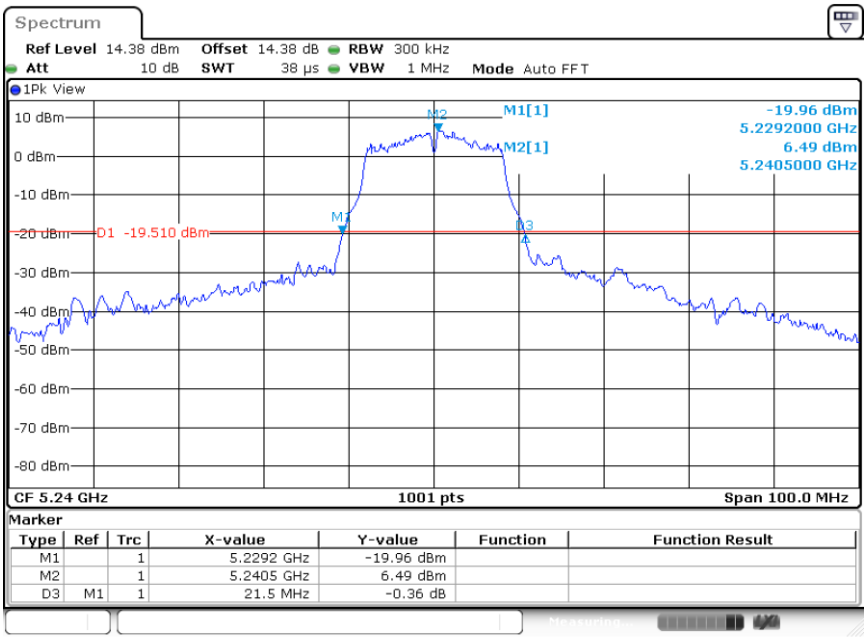

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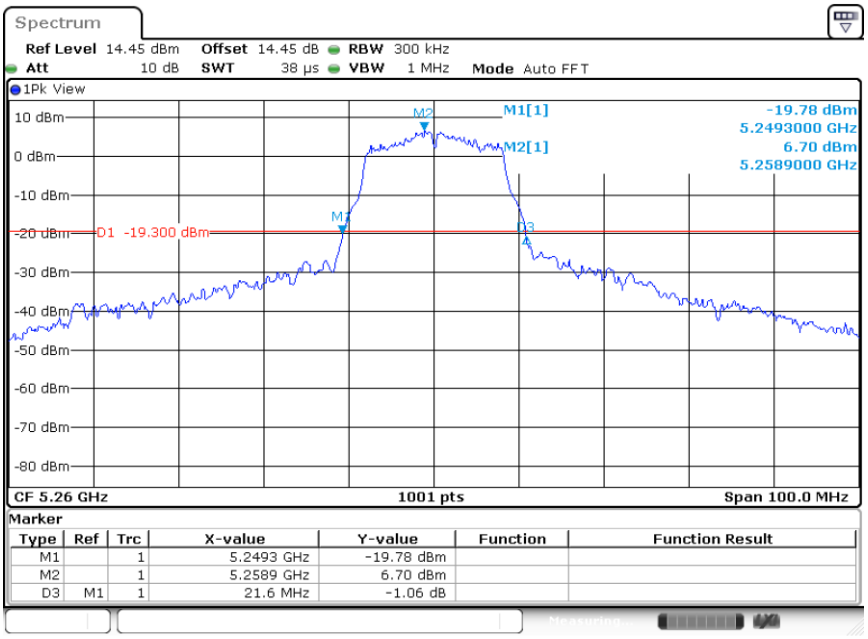

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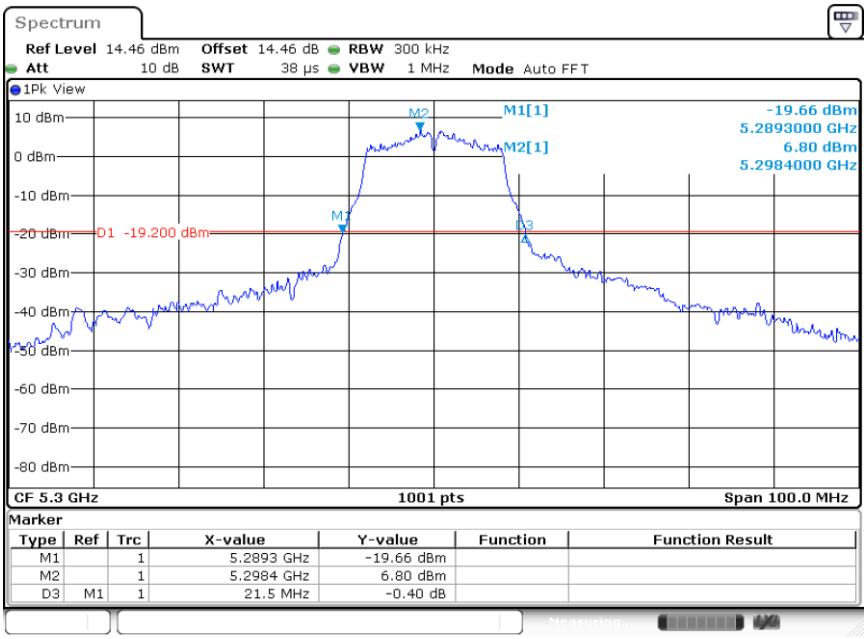

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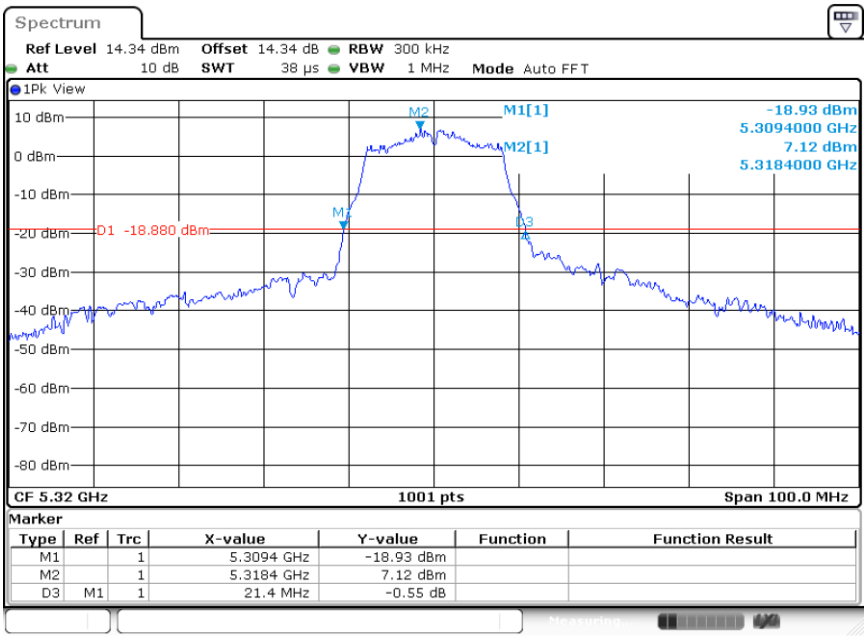

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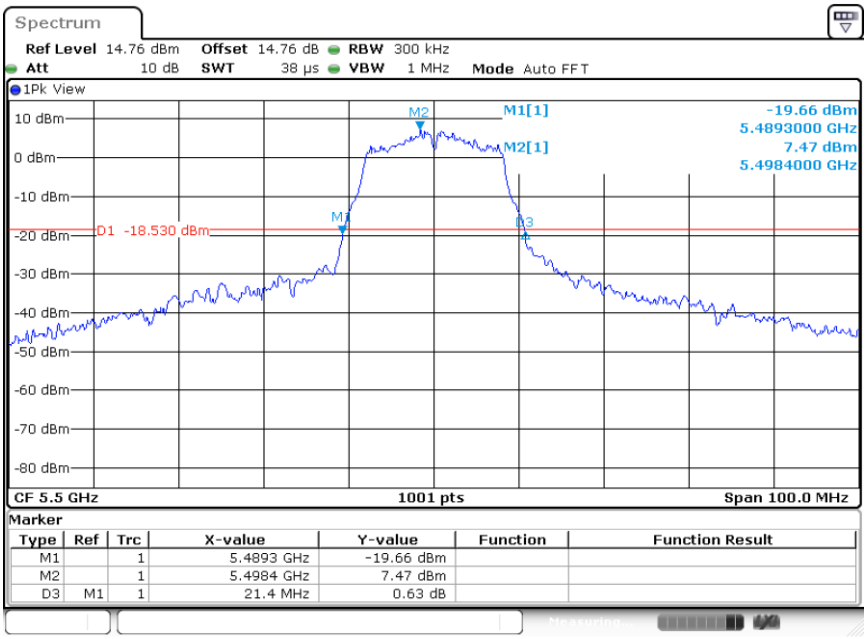

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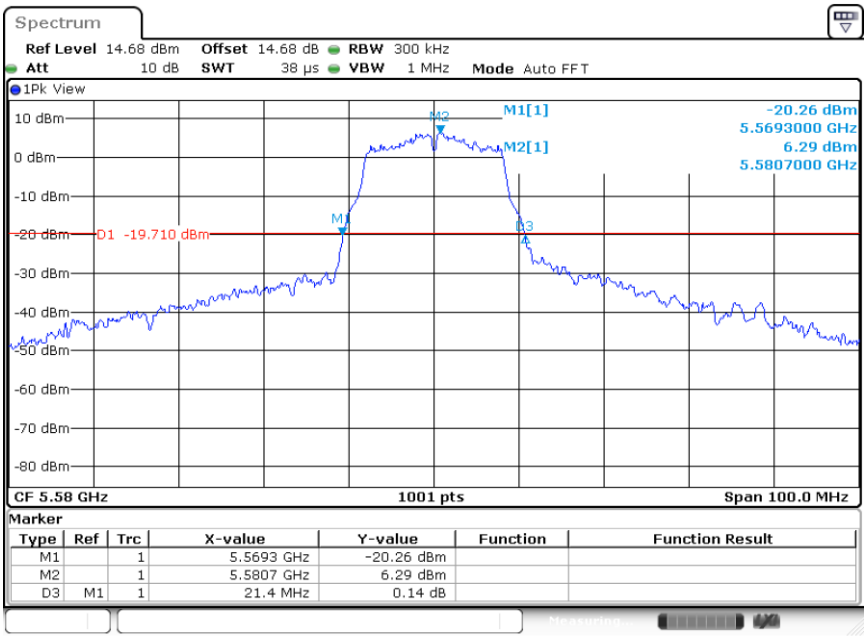

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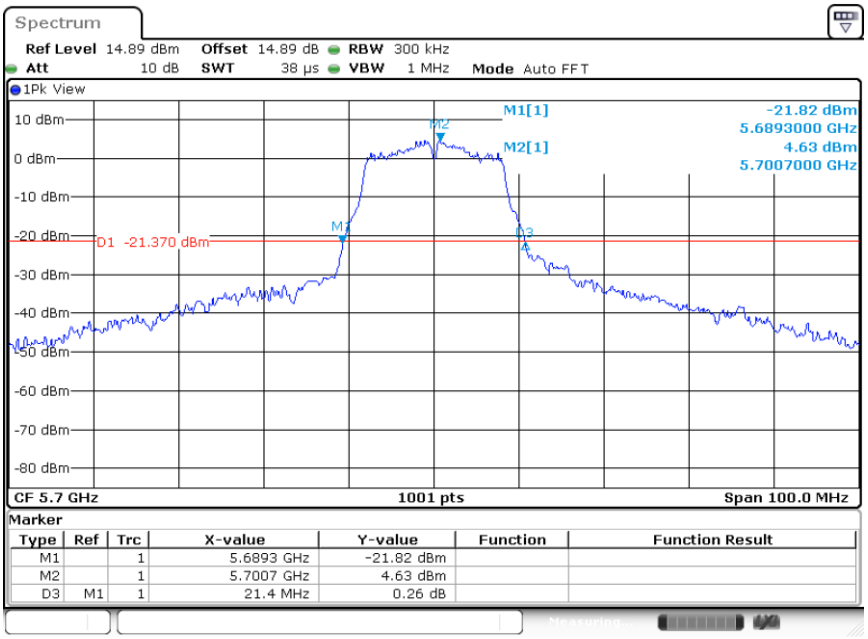

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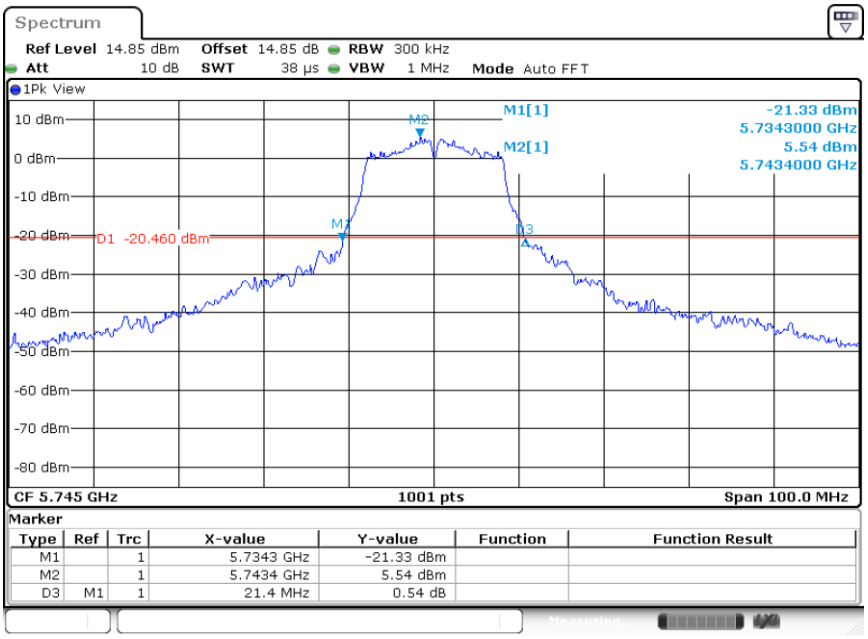

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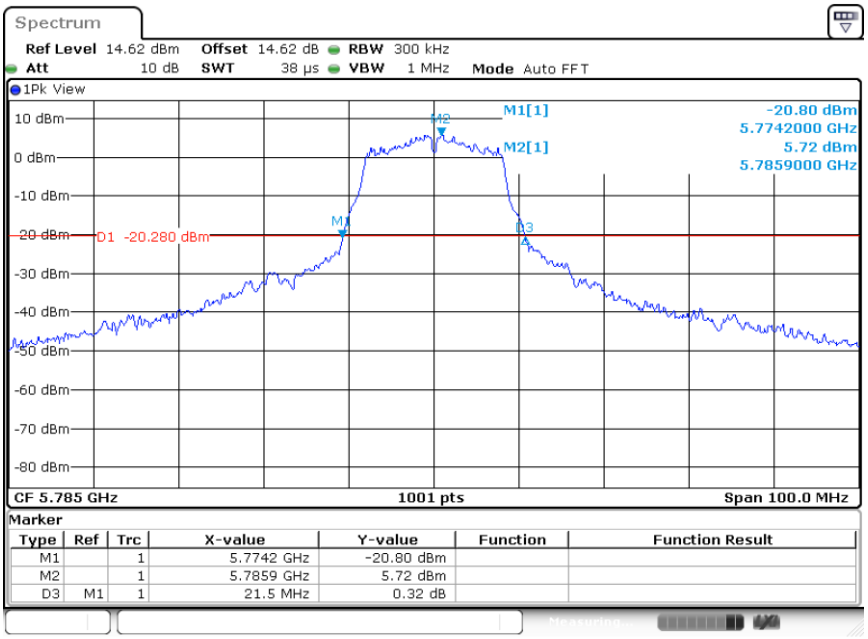

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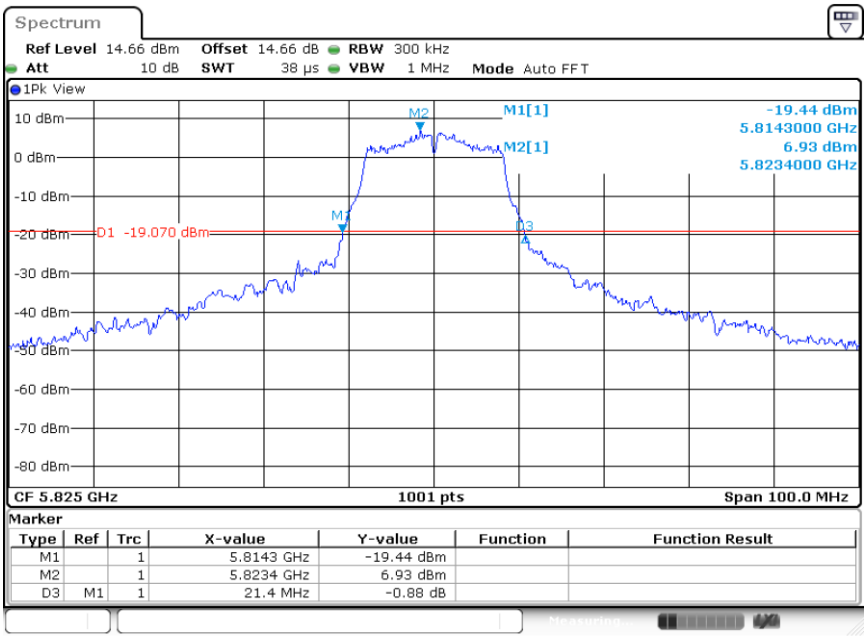

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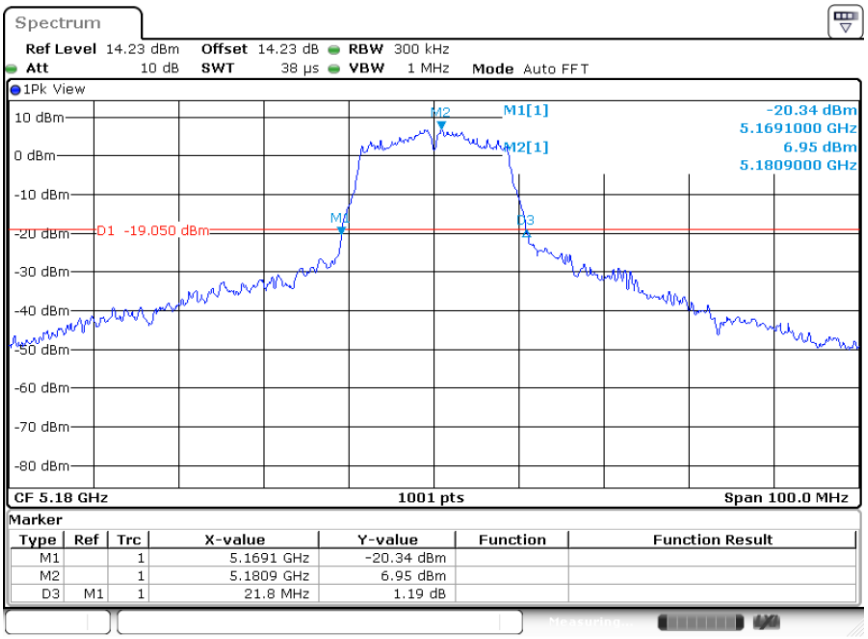

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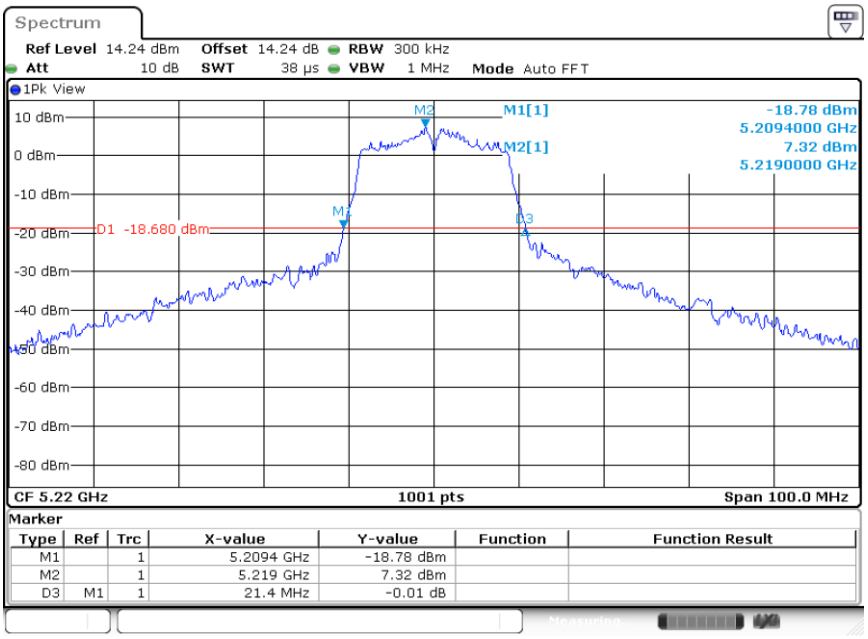

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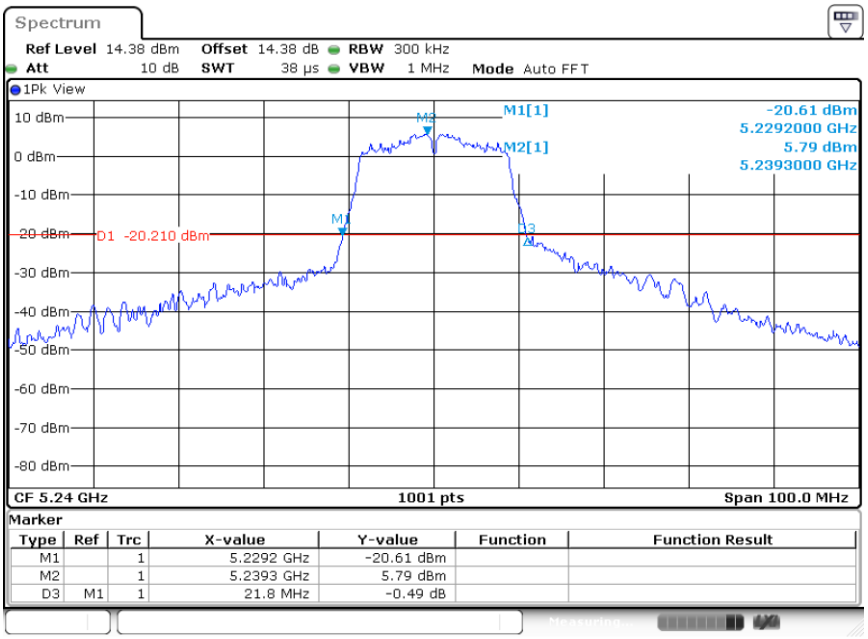

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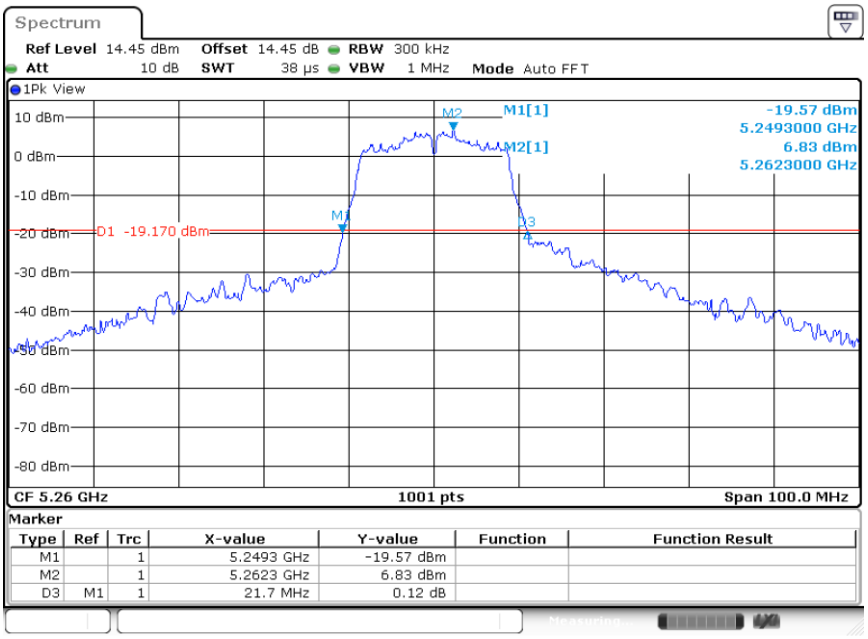

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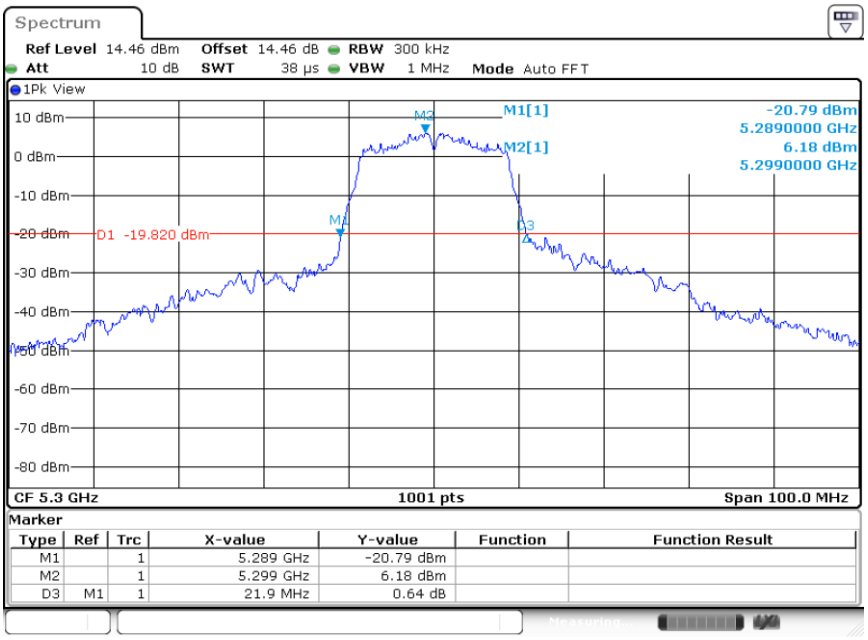

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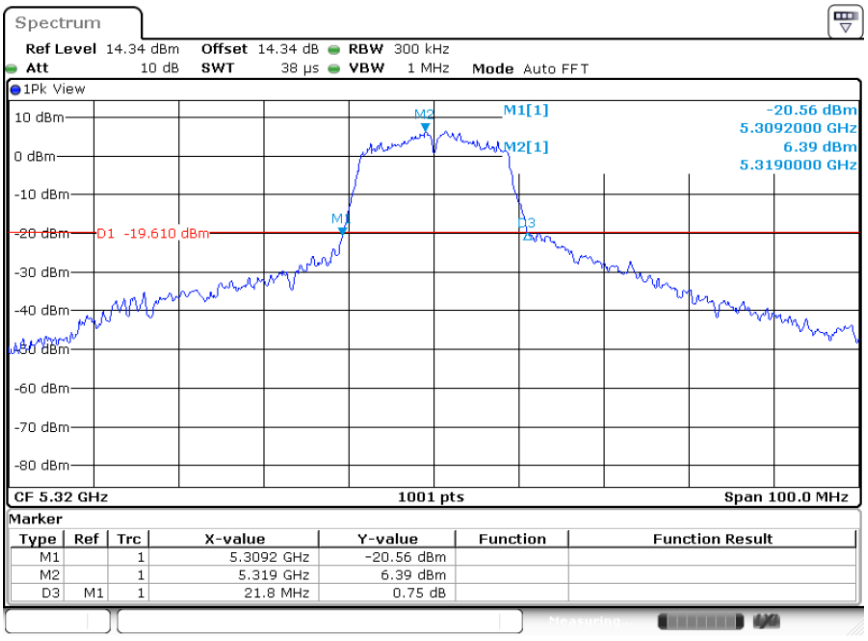

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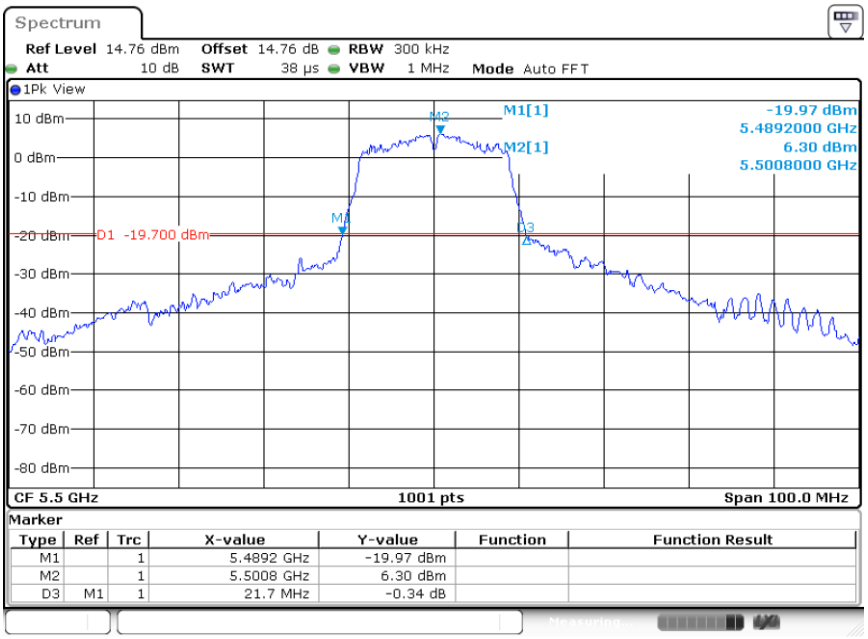

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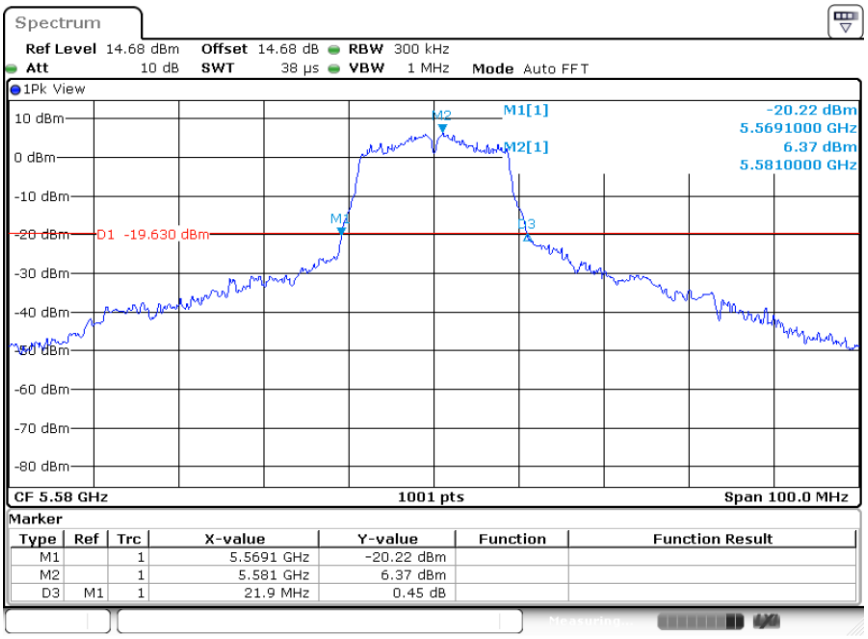

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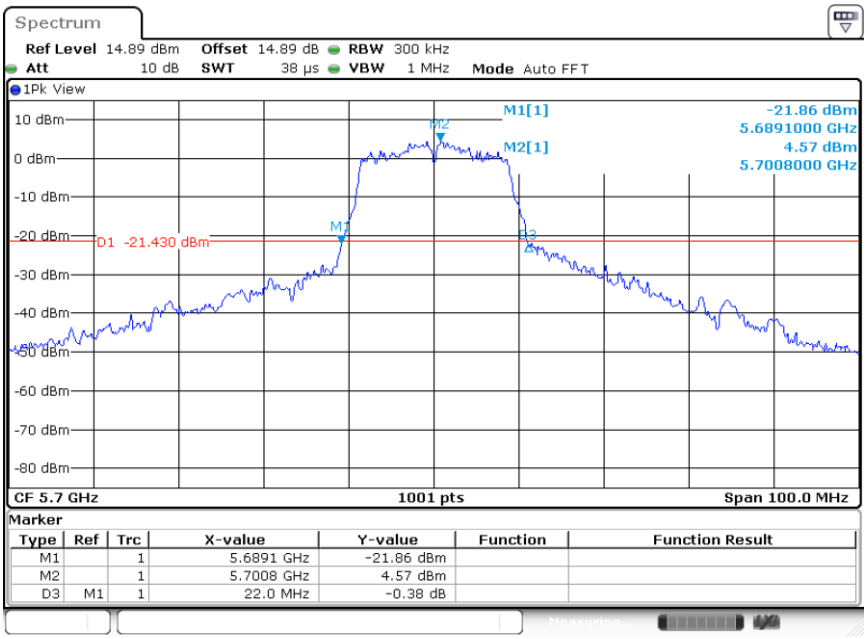

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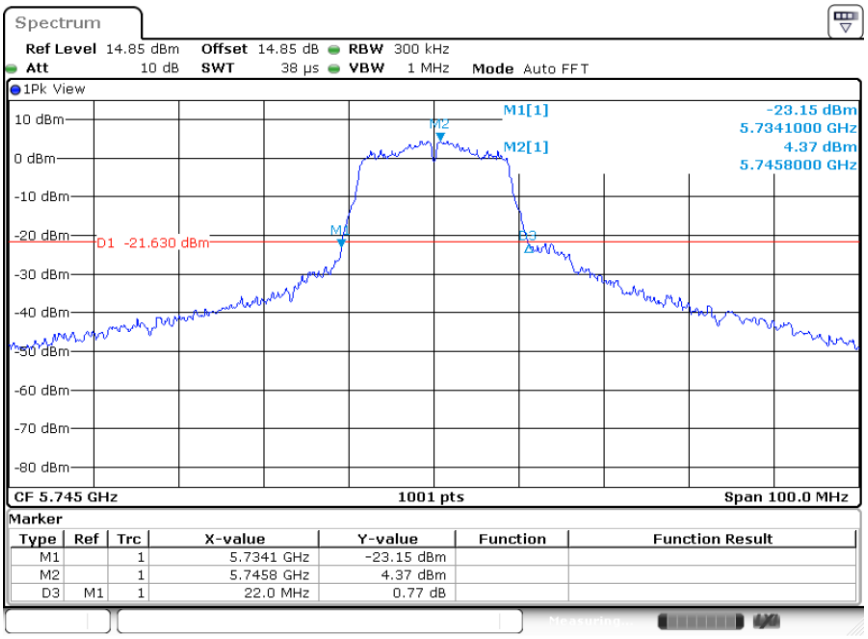

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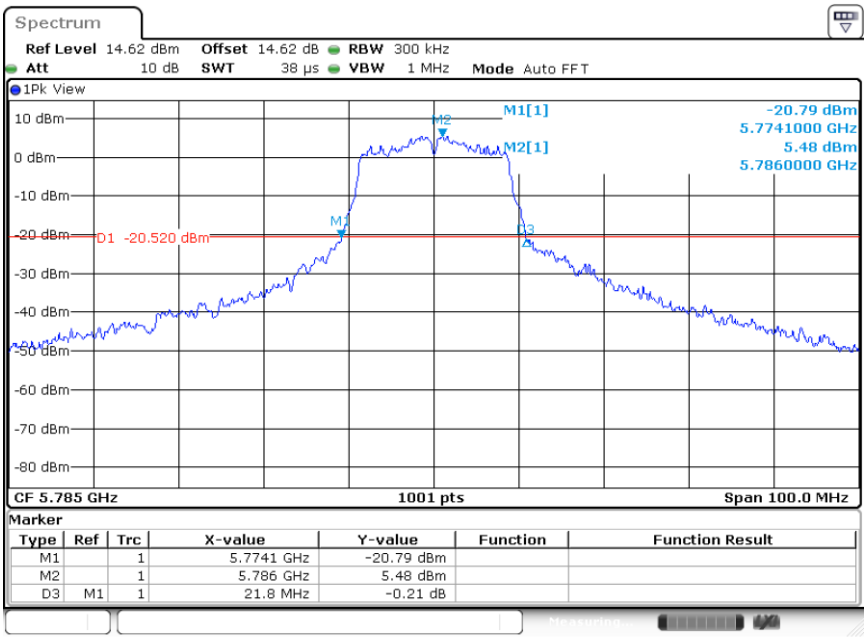

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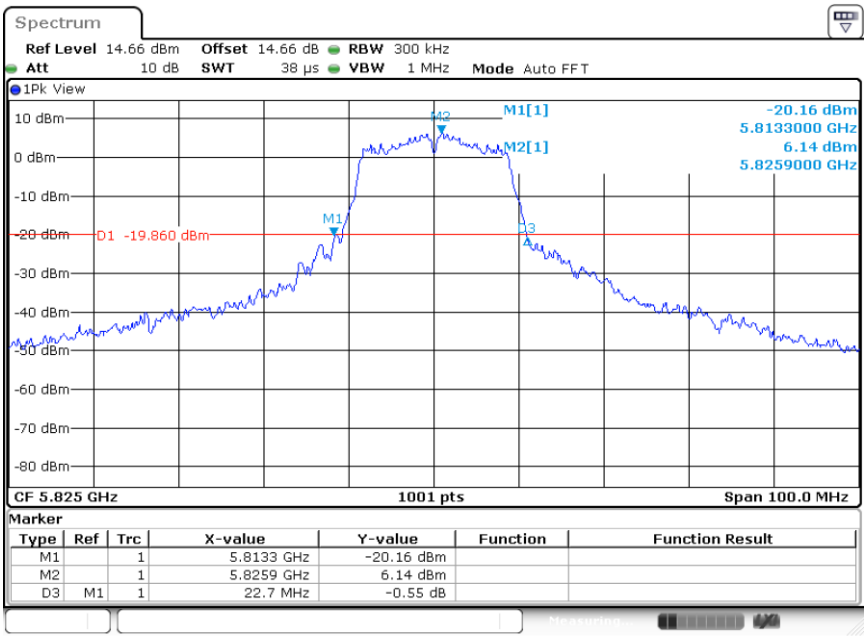

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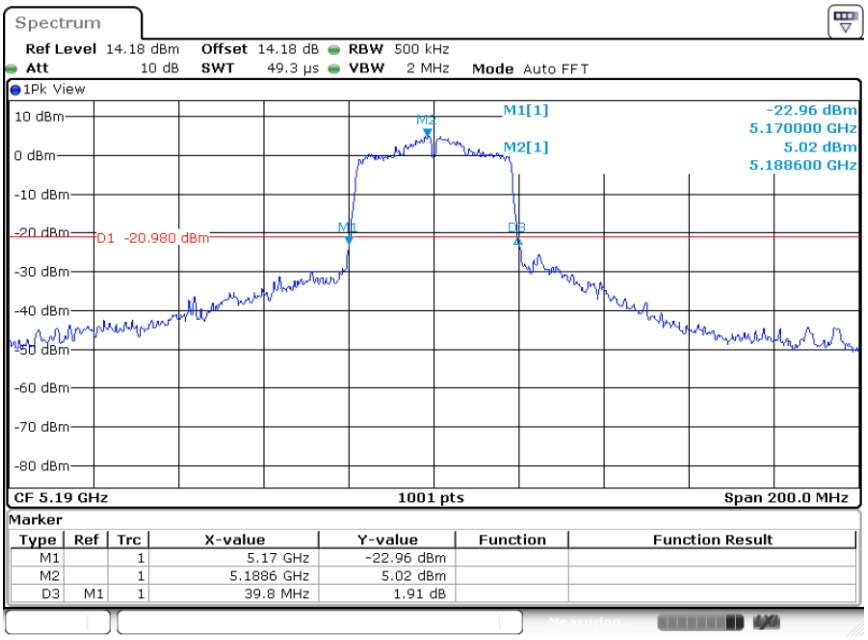

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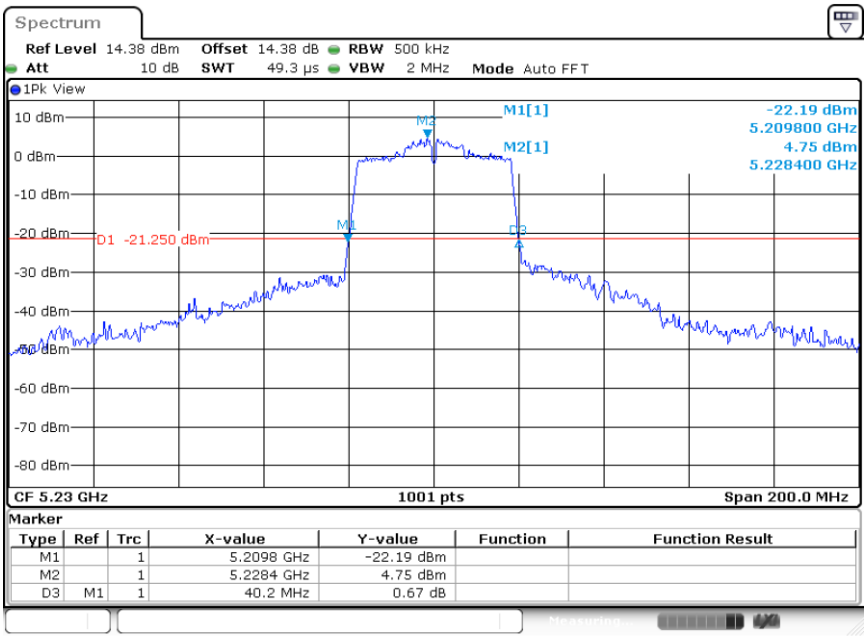

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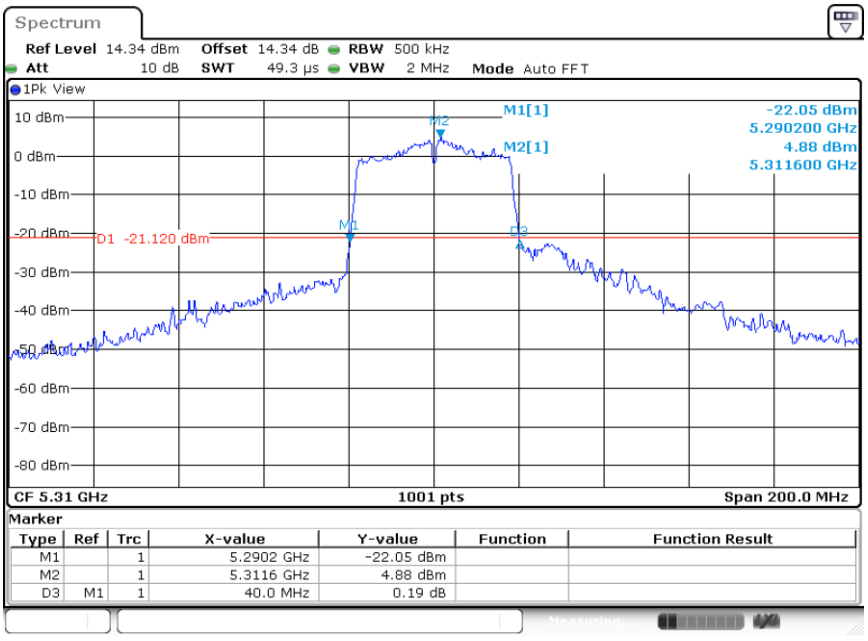

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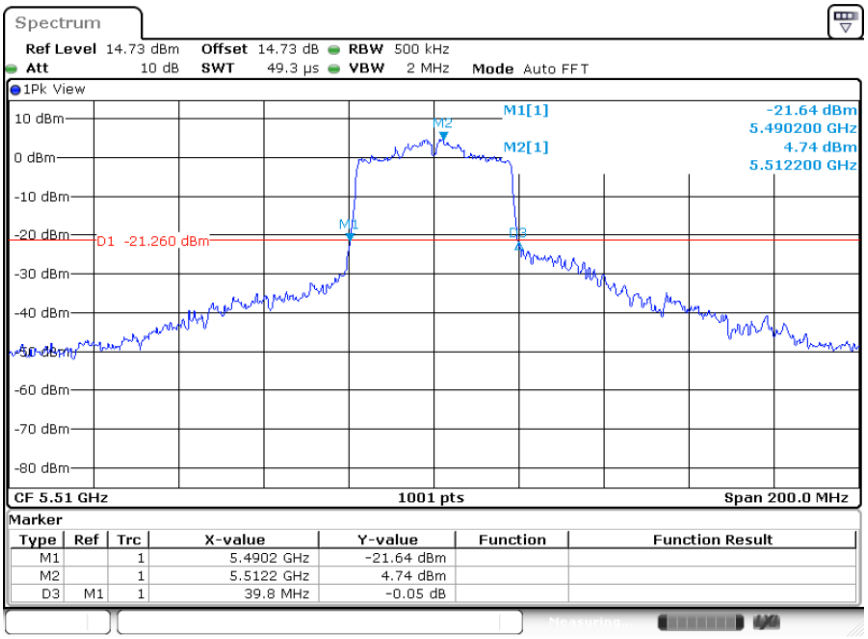

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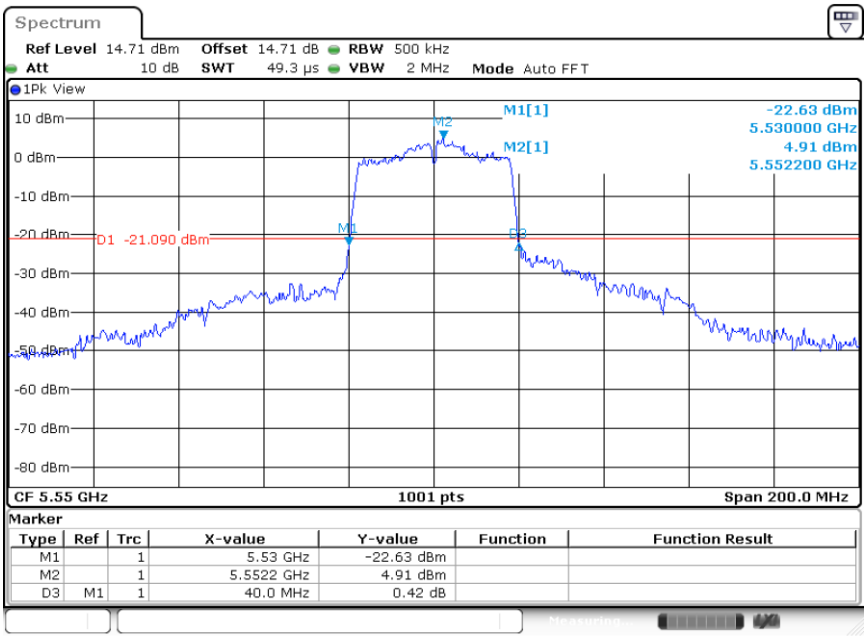

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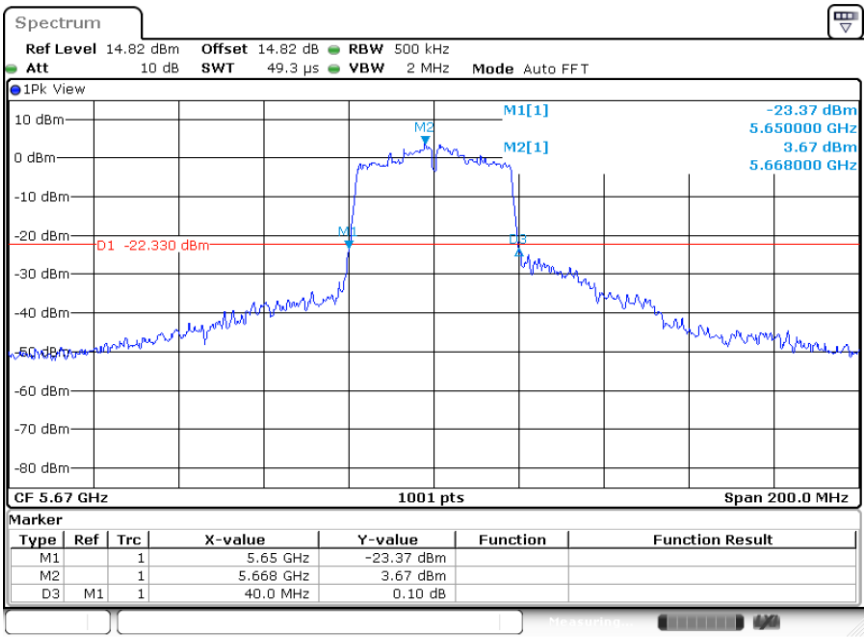

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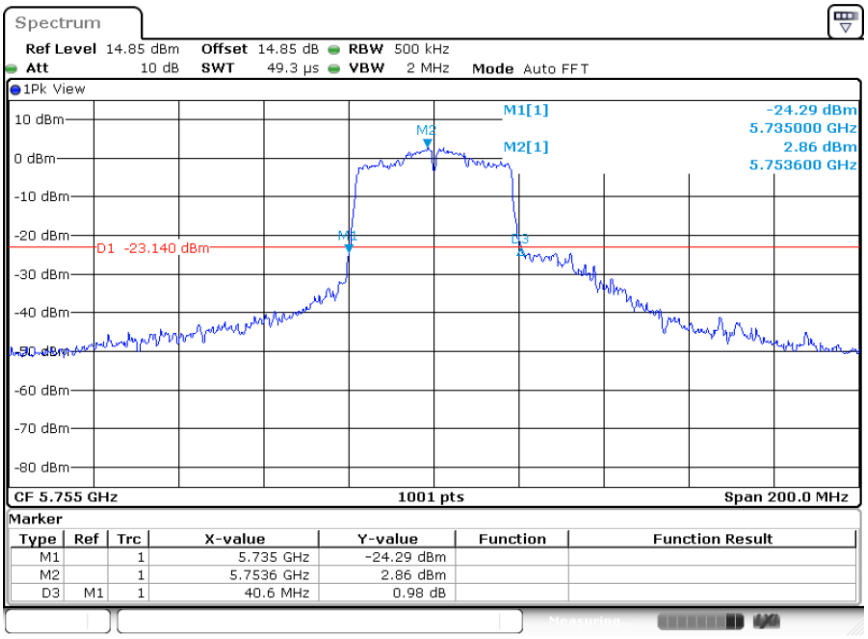

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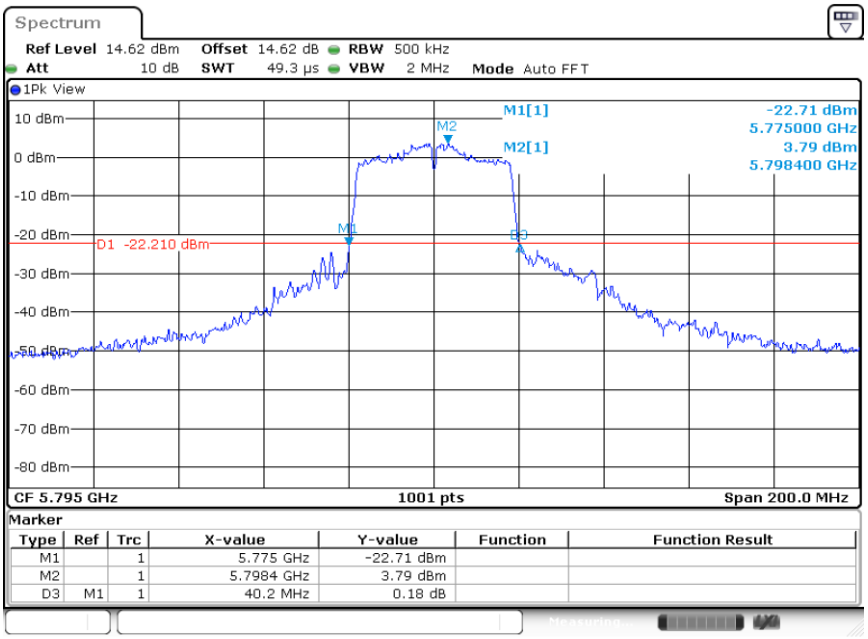

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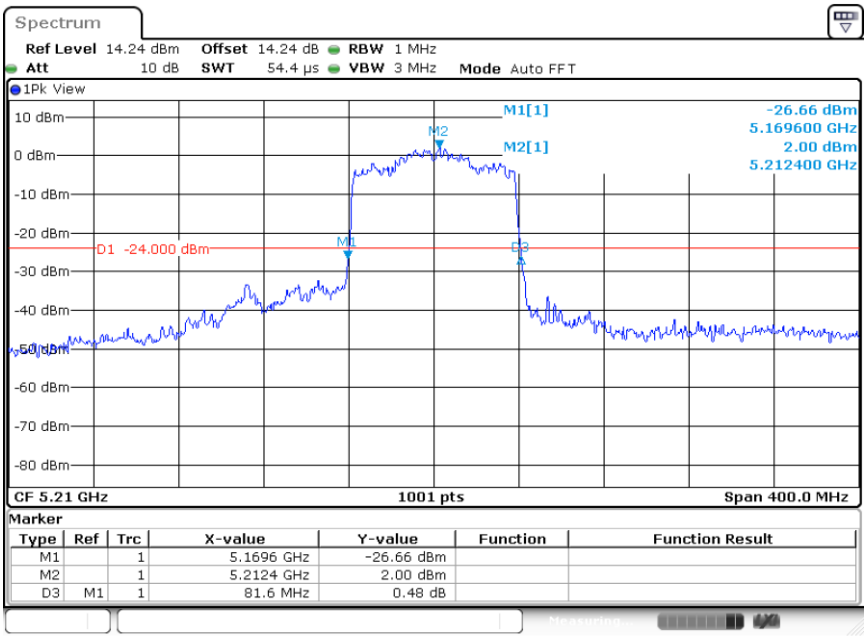
11AC80SISO_5210



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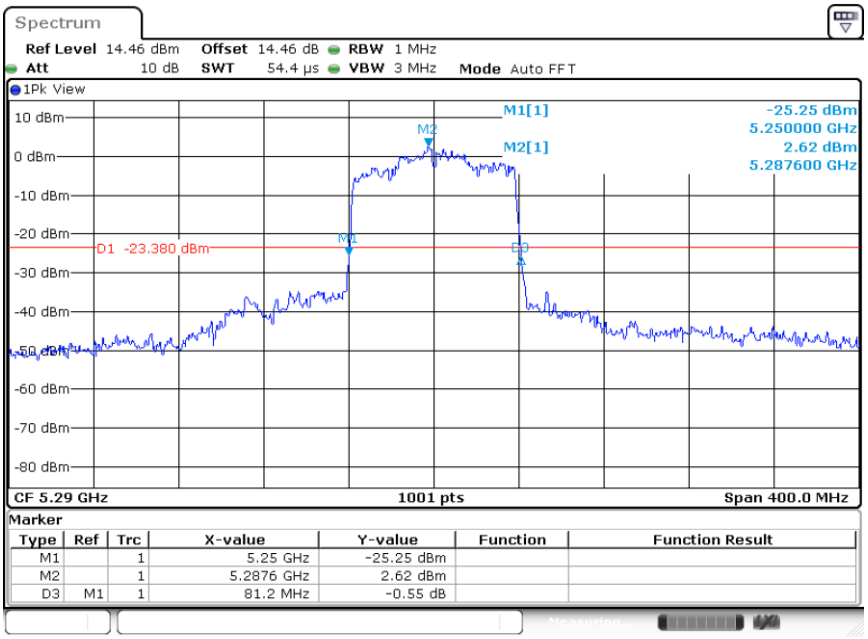

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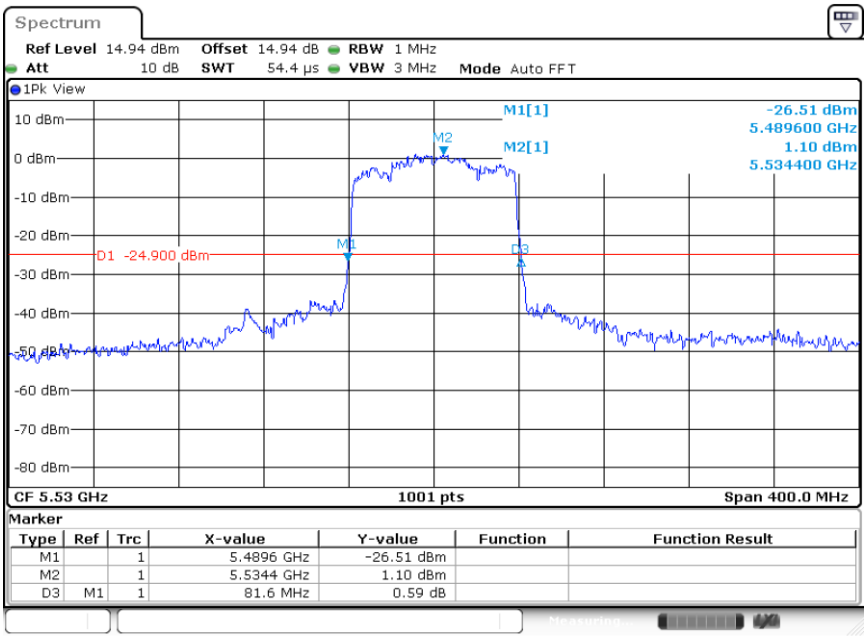

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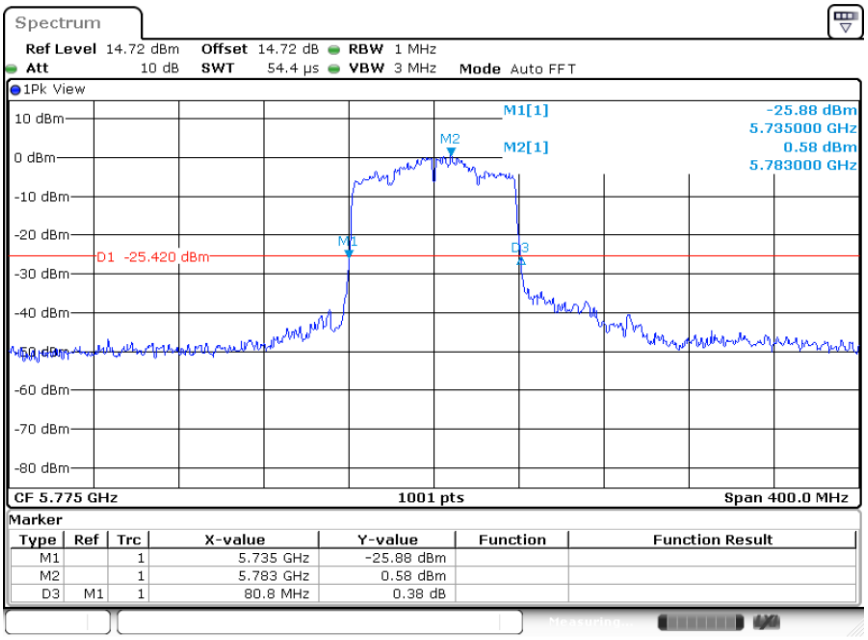


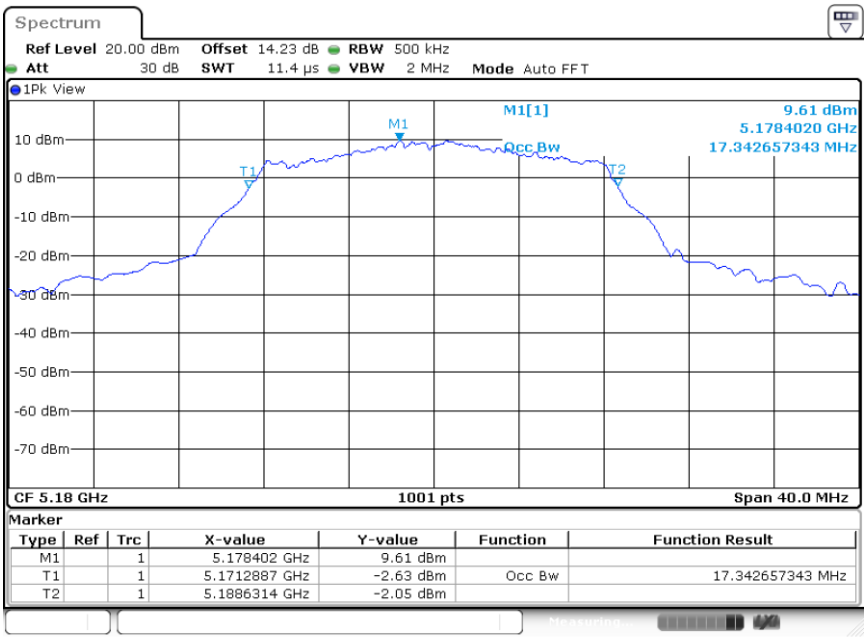
Occupied channel bandwidth

Test Result

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]
11A	Ant1	5180	17.343	5171.2887	5188.6314
		5220	17.702	5211.0889	5228.7912
		5240	17.662	5231.1289	5248.7912
		5260	17.463	5251.2088	5268.6713
		5300	17.902	5291.0090	5308.9111
		5320	17.582	5311.3686	5328.9510
		5500	17.502	5491.3287	5508.8312
		5580	17.742	5571.0889	5588.8312
		5700	17.423	5691.2887	5708.7113
		5745	17.622	5736.1688	5753.7912
		5785	17.542	5776.2887	5793.8312
		5825	17.383	5816.2488	5833.6314
11N20SISO	Ant1	5180	18.661	5170.8492	5189.5105
		5220	18.541	5210.8092	5229.3506
		5240	18.382	5230.9291	5249.3107
		5260	18.541	5250.8492	5269.3906
		5300	18.541	5290.8092	5309.3506
		5320	18.422	5310.8891	5329.3107
		5500	18.661	5490.7692	5509.4306
		5580	18.541	5570.7293	5589.2707
		5700	18.462	5690.8092	5709.2707
		5745	18.661	5735.7692	5754.4306
		5785	18.342	5775.9291	5794.2707
		5825	18.462	5815.8492	5834.3107
11N40SISO	Ant1	5190	36.204	5172.0180	5208.2218
		5230	36.603	5211.7782	5248.3816
		5270	36.284	5252.0180	5288.3017
		5310	36.364	5292.0180	5328.3816
		5510	36.284	5491.9381	5528.2218
		5550	36.284	5532.0180	5568.3017
		5670	36.364	5651.9381	5688.3017
		5755	36.364	5737.0180	5773.3816
		5795	36.444	5776.8581	5813.3017
11AC80SISO	Ant1	5210	75.764	5172.2777	5248.0420
		5290	75.604	5252.5974	5328.2018
		5530	75.445	5492.4376	5567.8821
		5775	75.764	5737.5974	5813.3616

Test Graphs

11A_5180



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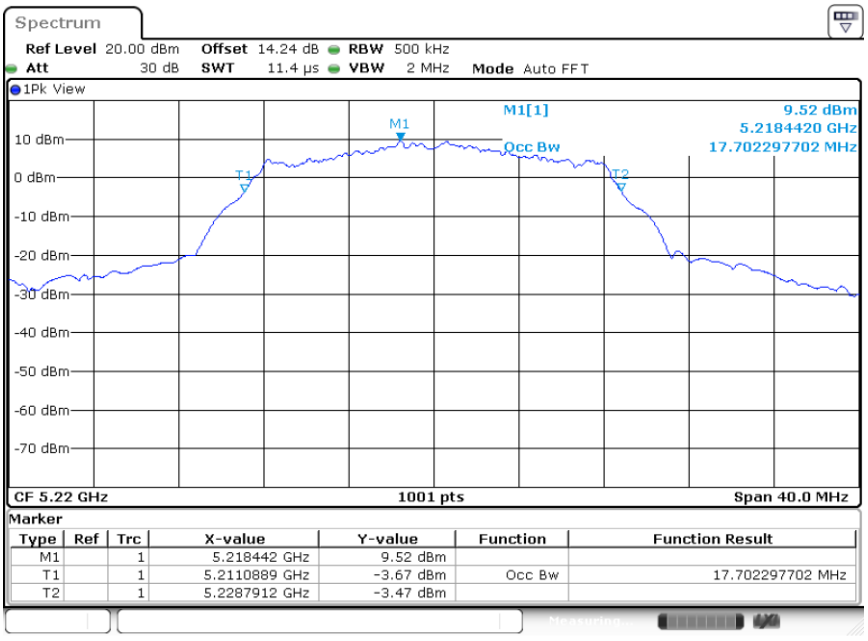

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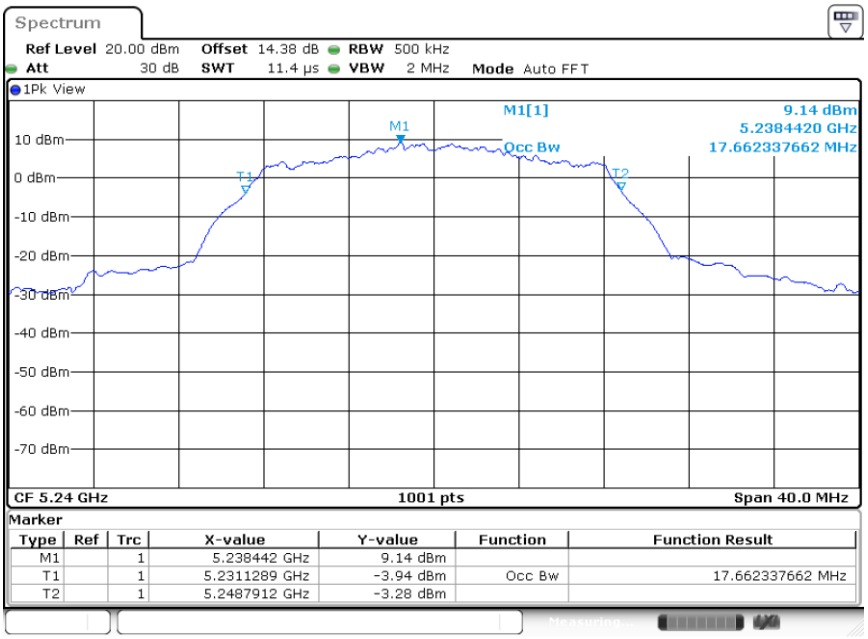

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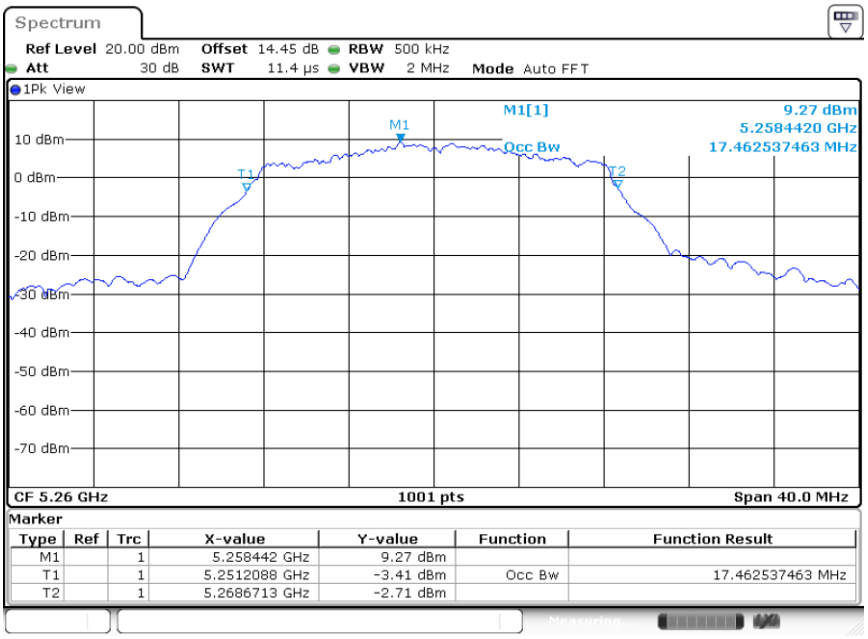

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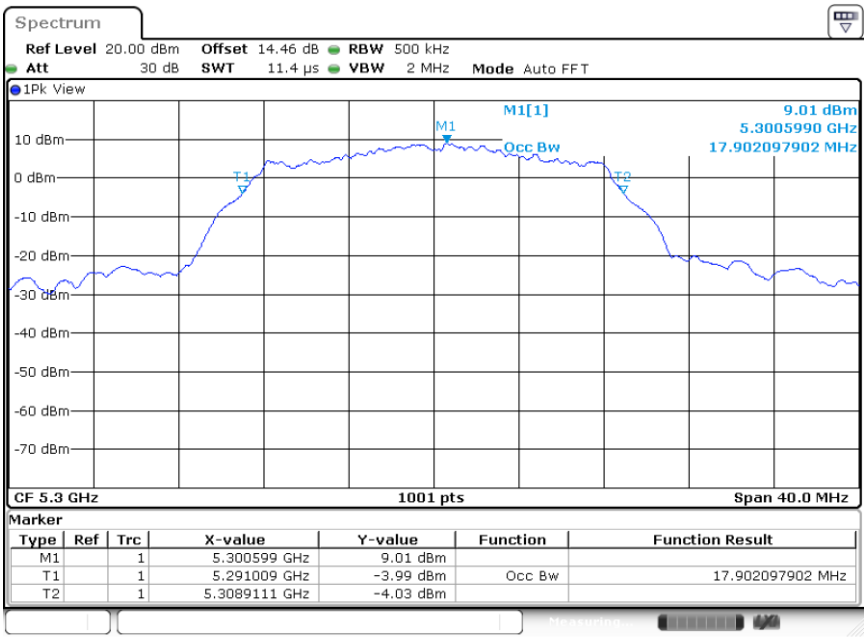

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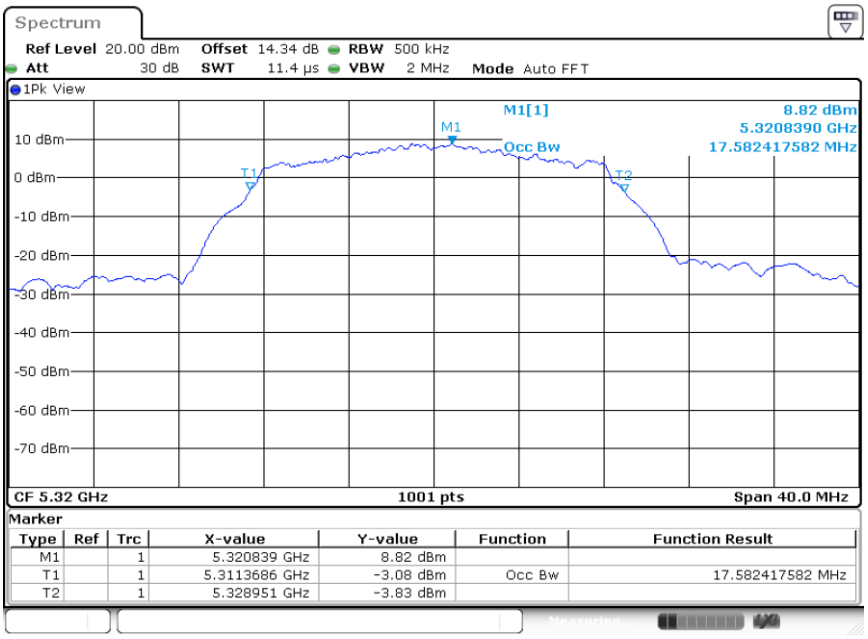

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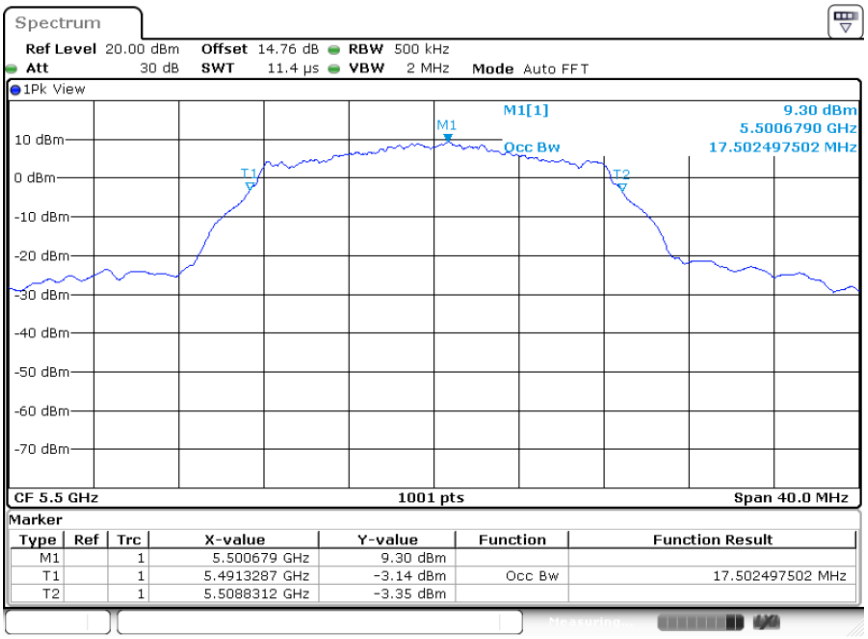

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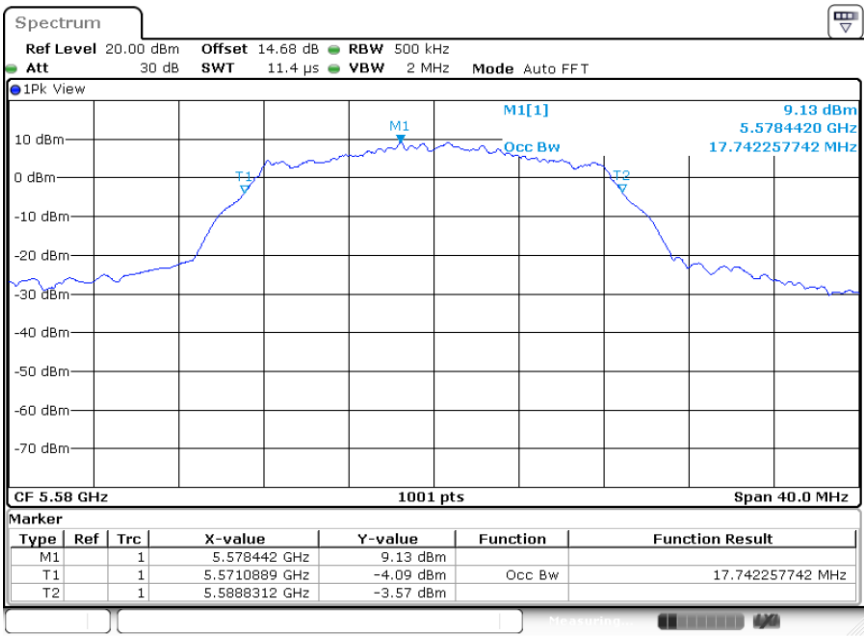

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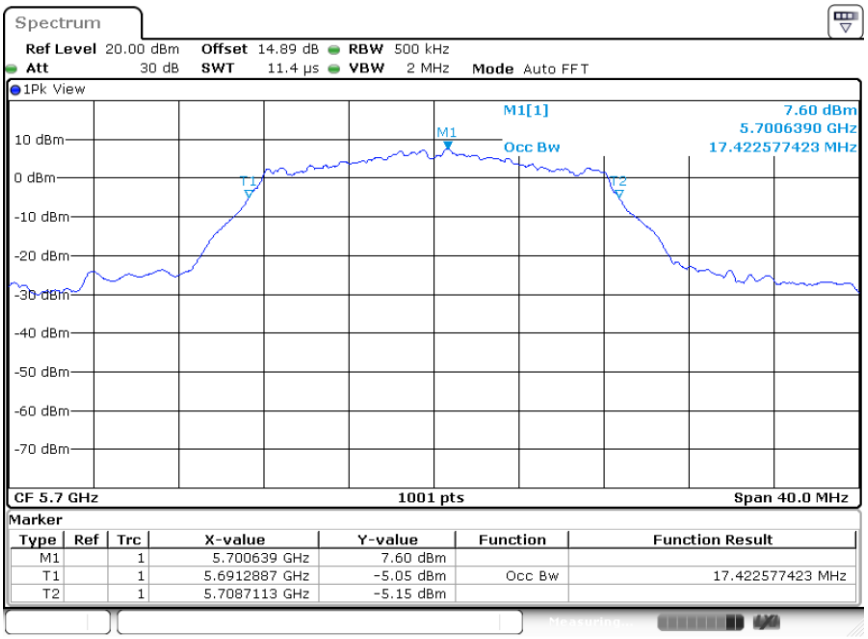

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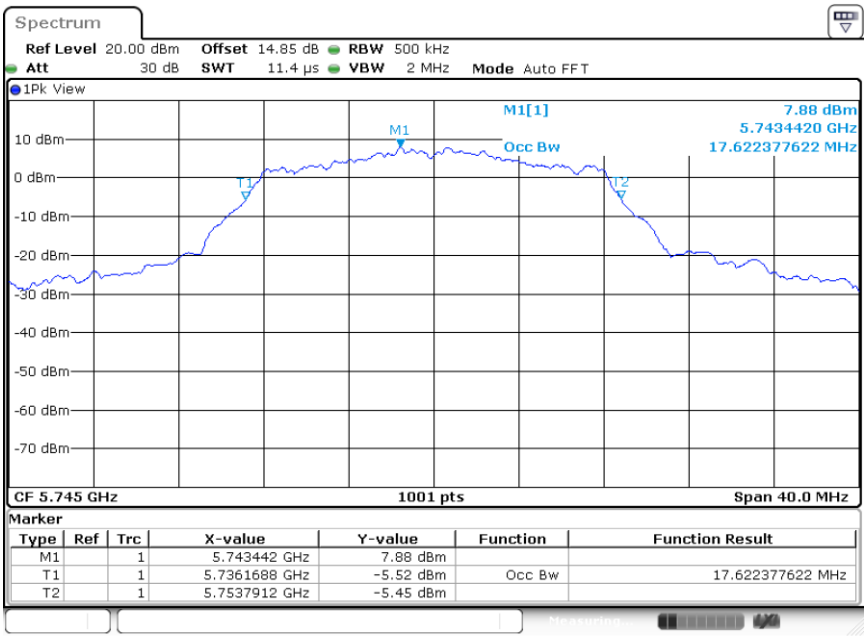

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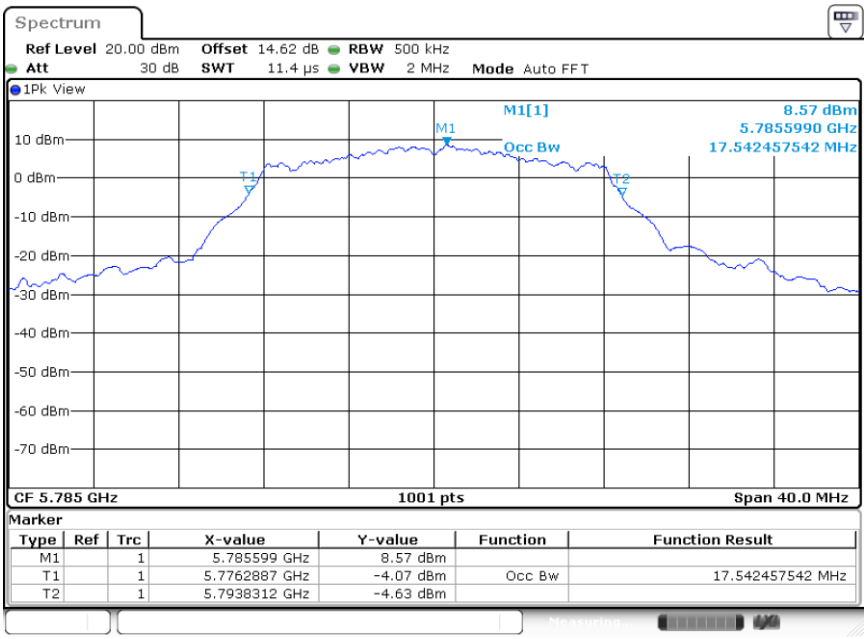

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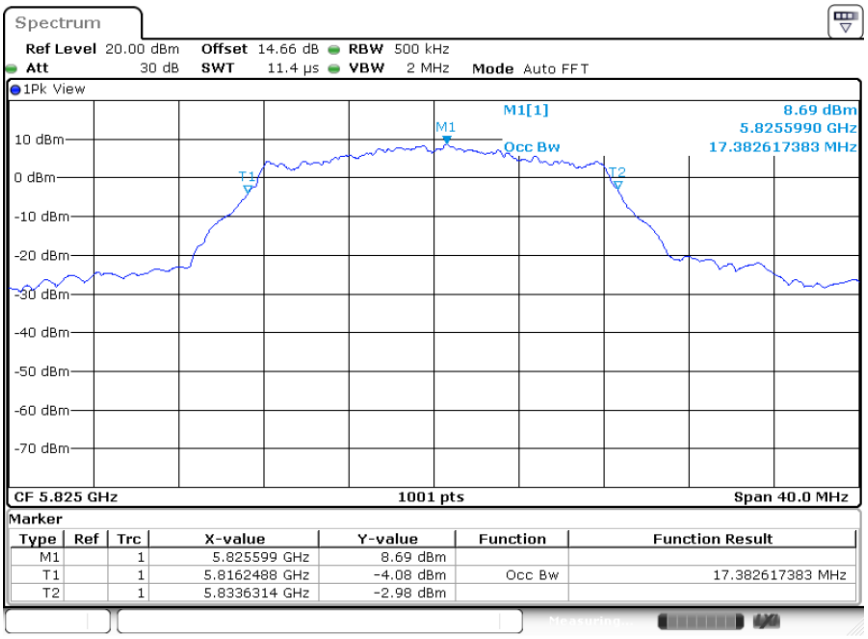

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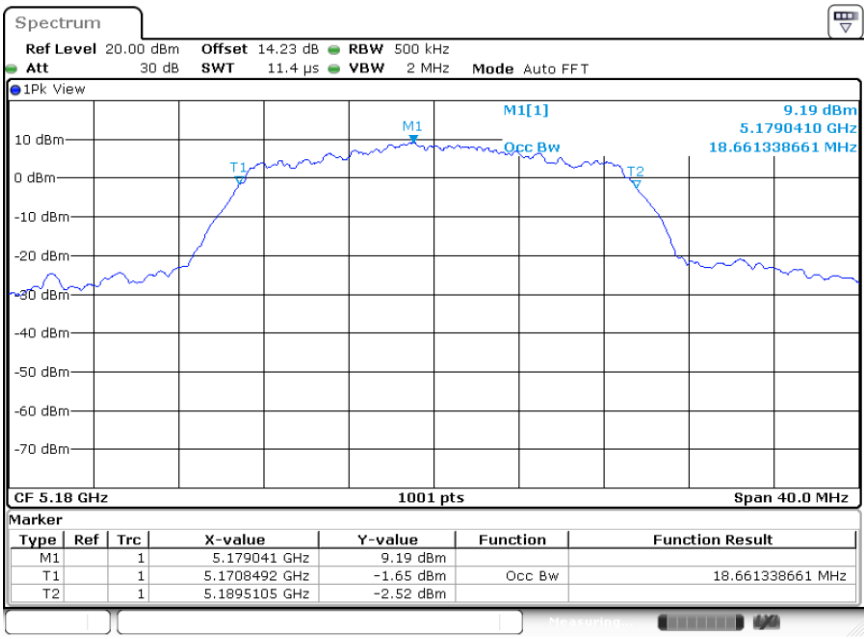

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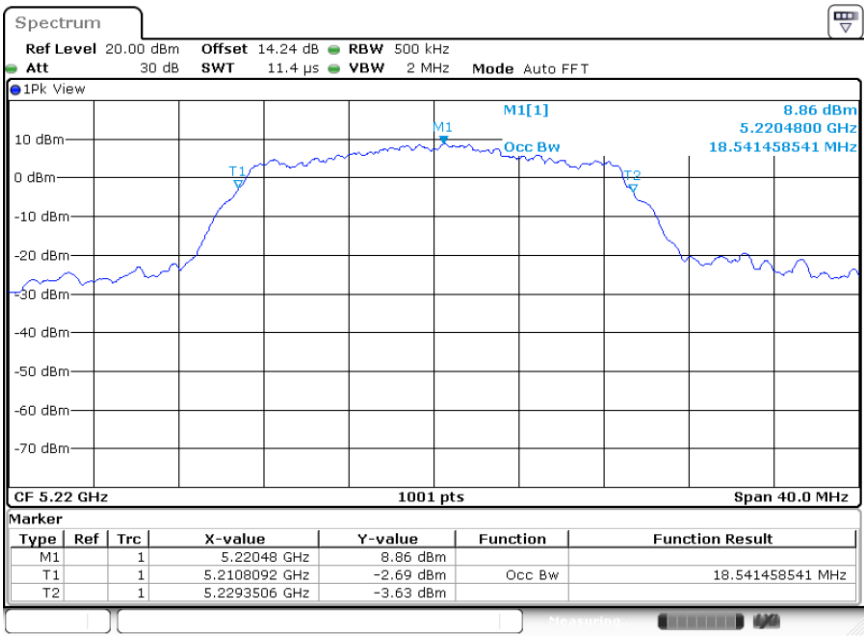

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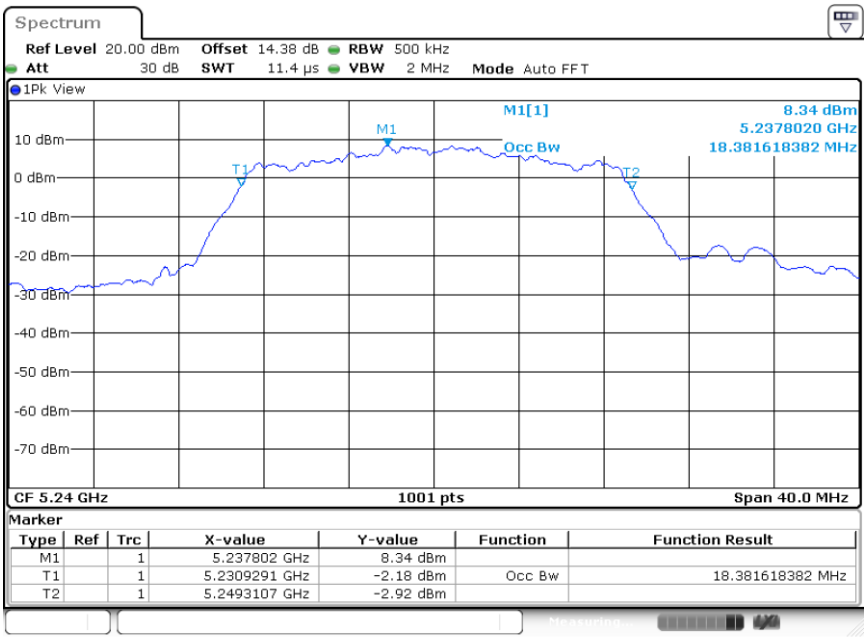

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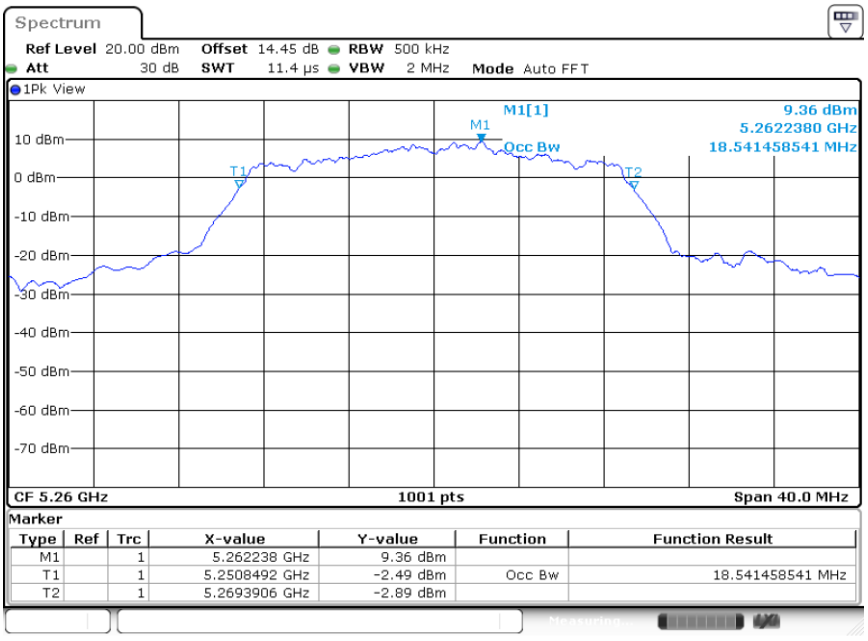

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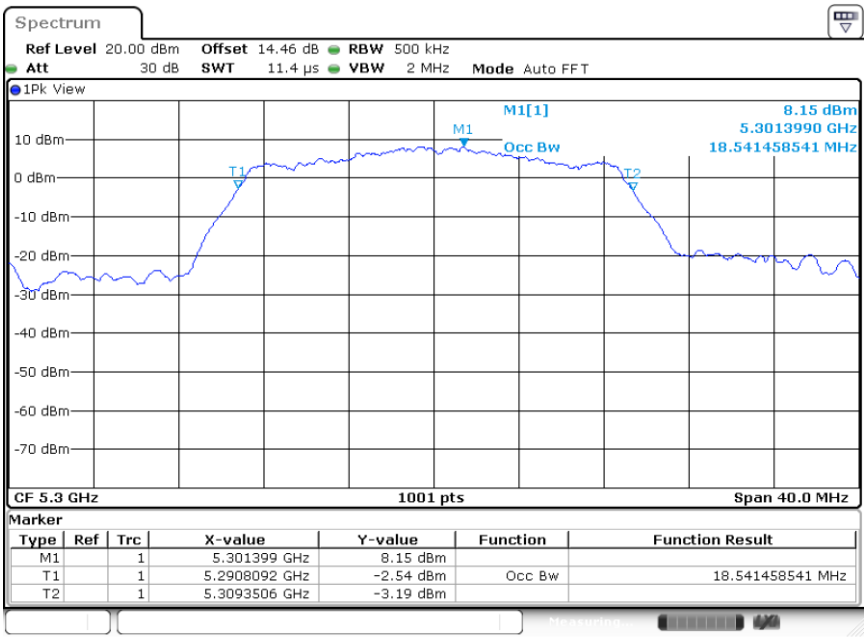

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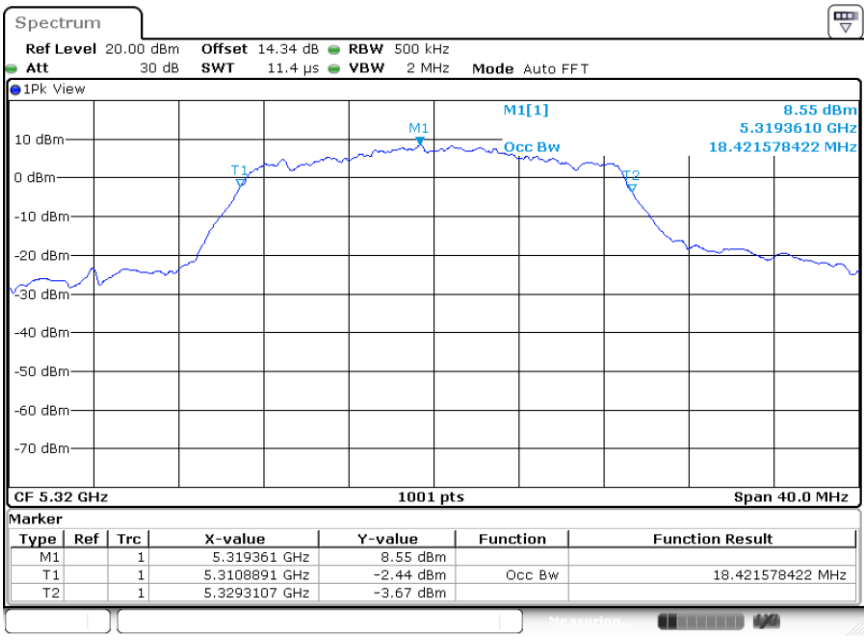

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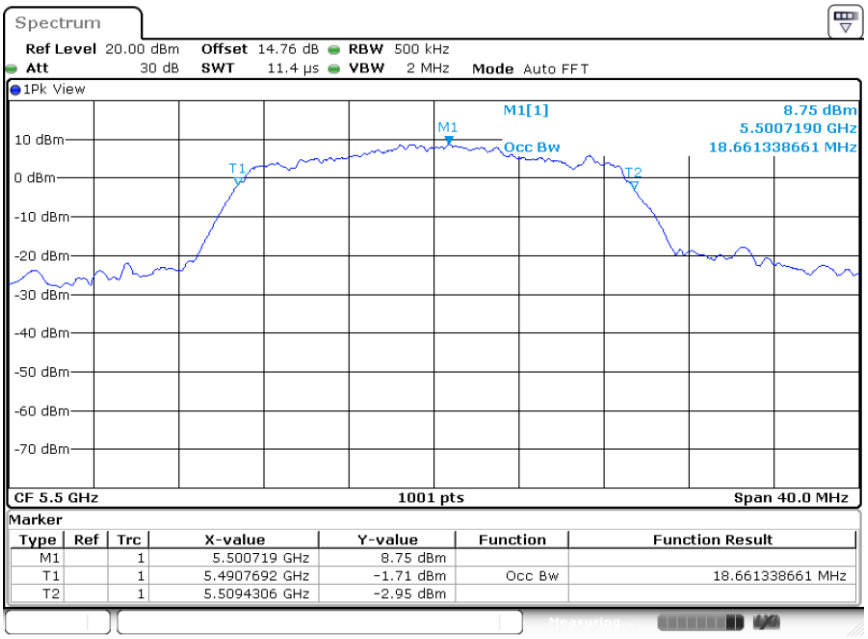

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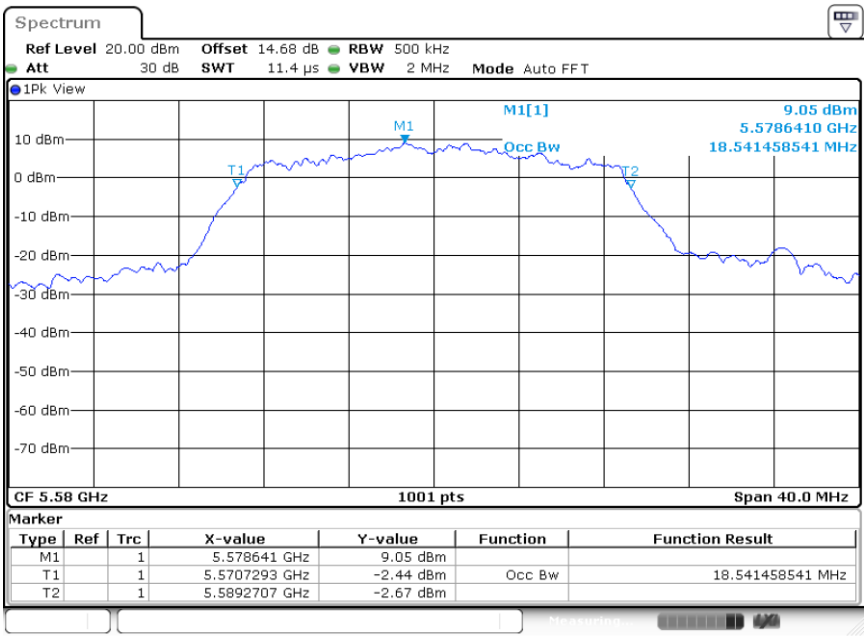

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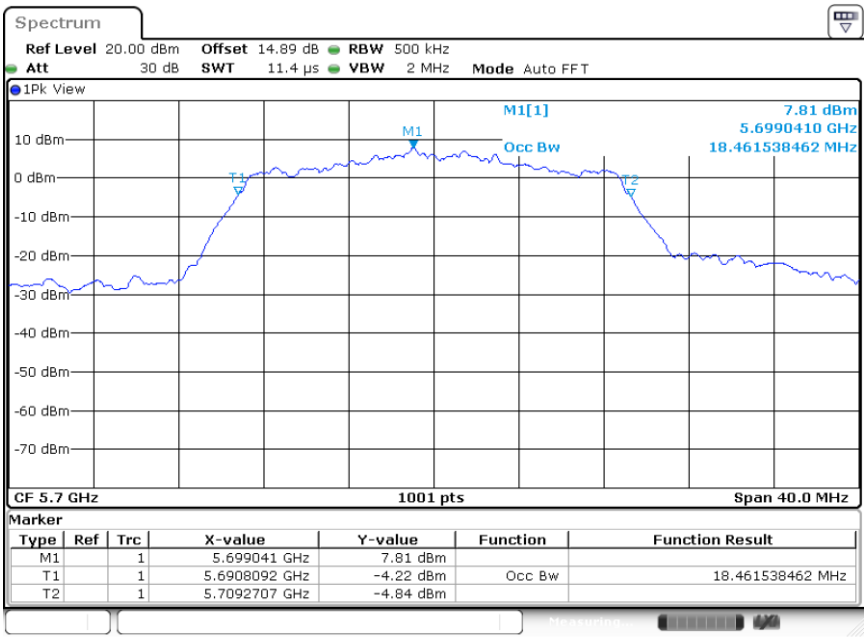

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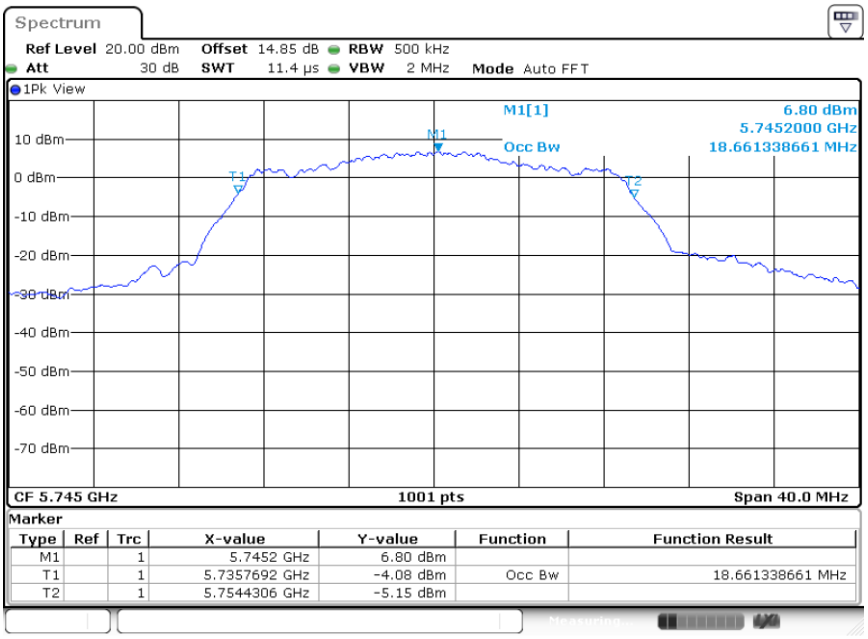

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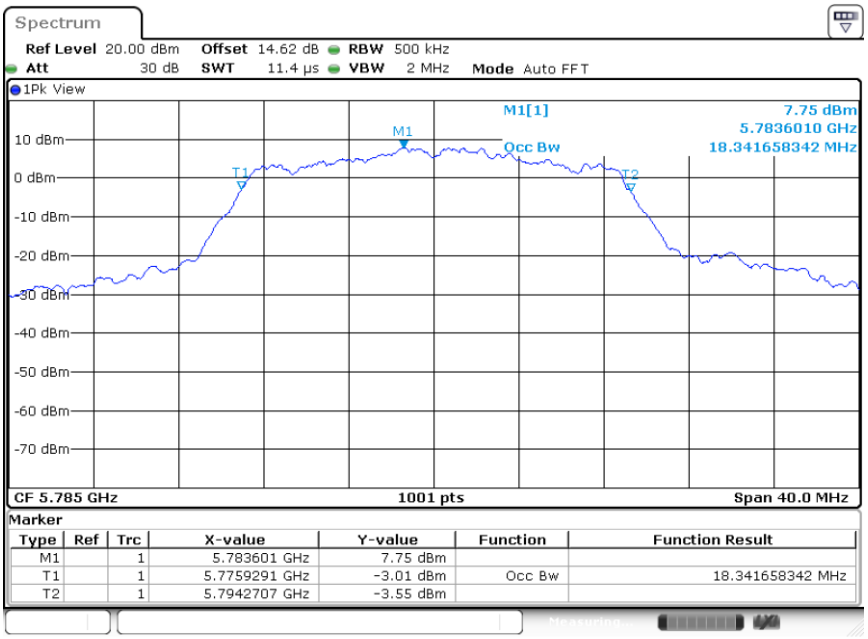

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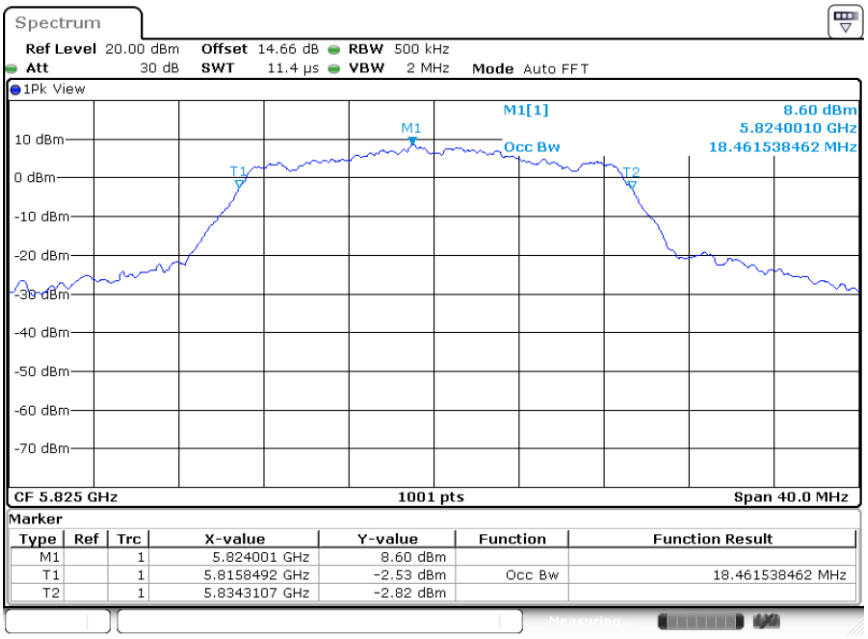

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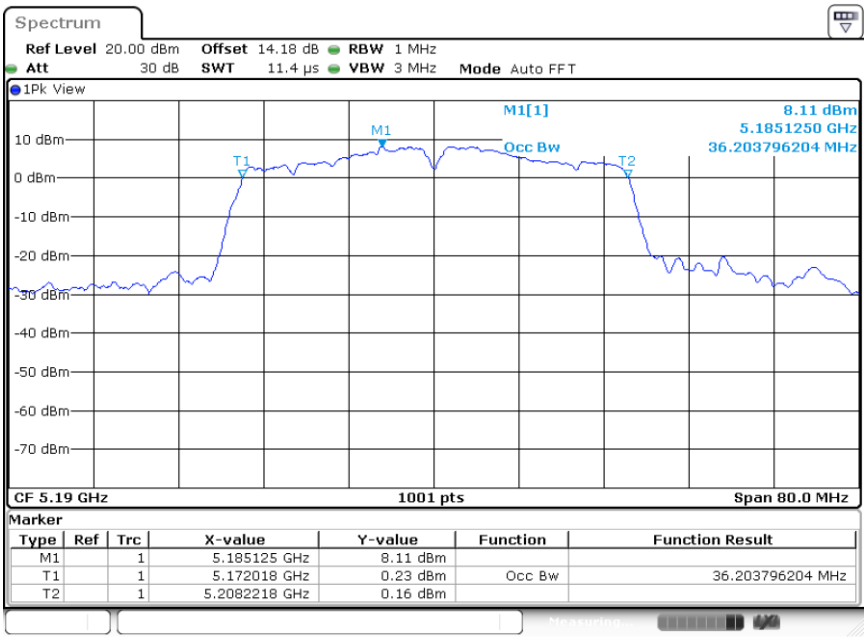

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