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Middlefield, Ohio 44062
United States of America
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CERTIFICATION TEST REPORT

Manufacturer:	**Avnet Inc.** **2211 South 47th Street** **Phoenix, Arizona 85034 USA**
Applicant:	**Same as Above**
Product Name:	**Azure Sphere MT3620 Modules**
Product Description:	Microsoft Azure Sphere certified Wi-Fi SoC module for highly-secured IoT applications (Dual UFL connector version for external antennas, RX and TX diversity and Industrial temperature operating range)
Operating Voltage/Frequency:	**3.3V DC**
Modular Radio Model:	**AES-MS-MT3620-M-G**
Radio Module FCC ID:	**2AF62-AVT3620C**
Testing Commenced:	Mar. 11, 2019
Testing Ended:	May 14, 2019
Summary of Test Results:	**In Compliance** The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Rule(s):

- **FCC Part 15 Subpart E – Unlicensed National Information Infrastructure Devices, Section 15.407 General technical requirements**
- **FCC15.207 - Conducted Limits**

Evaluation Conducted by:

Julius Chiller, EMC/Wireless Engineer

Report Reviewed by:

Ken Littell, Director of EMC & Wireless Operations

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1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD**.**

1.2 Measurement Procedure:

All measurements were performed according to ANSI C63.10:2013 and recommended FCC procedure of measurement of DTS operating under Section 15.407 and in KDB789033. A list of the measurement equipment can be found in Section 6.

1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used, and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data and are expressed with a 95% confidence factor using a coverage factor of k=2. The Uncertainty for a laboratory are referred to as *U*lab. For Radiated and Conducted Emissions, the Expanded Uncertainty is compared to the *U*cispr values to determine if a specific margin is required to deem compliance.

*U*lab

Measurement Range	Combined Uncertainty	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	2.54	5.07dB
Radiated Emissions <1 GHz @ 10m	2.55	5.09dB
Radiated Emissions 1 GHz to 2.7 GHz	1.81	3.62dB
Radiated Emissions 2.7 GHz to 18 GHz	1.55	3.10dB
AC Power Line Conducted Emissions, 150kHz to 30 MHz	1.38	2.76dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	1.66	3.32dB

*U*cispr

Measurement Range	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	5.2dB
Radiated Emissions <1 GHz @ 10m	5.2dB
Radiated Emissions 1 GHz to 2.7 GHz	Under Consideration
Radiated Emissions 2.7 GHz to 18 GHz	Under Consideration
AC Power Line Conducted Emissions, 150kHz to 30 MHz	3.6dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	4.0dB

If *U*lab is less than or equal to *U*cispr, then:

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If *U*lab is greater than *U*cispr in table 1, then:

- compliance is deemed to occur if no measured disturbance, increased by (*U*lab – *U*cispr), exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance, increased by (*U*lab – *U*cispr), exceeds the disturbance limit.

Note: Only measurements listed in the tables above that relate to tests included in this Test Report are applicable.

1.4 Document History

Document Number	Description	Issue Date	Approved By
F2P20567A-02E	First Issue	May 14, 2019	K. Littell

2 SUMMARY OF TEST RESULTS

Note: Results below apply to both 5.1 GHz and 5.7 GHz.

Test Name	Standard(s)	Results
Radiated Spurious Emissions: 5.15-5.25 GHz	CFR 47 Part 15.205 / KDB789033	Complies
Occupied Bandwidth	CFR 47 Part 15.407(e) / Part 15.209 / KDB789033	Complies
Output Power	CFR 47 Part 15.407(a)(1)(iv) / Part 15.407(a)(3) / KDB789033	Complies
Power Spectral Density	CFR 47 Part 15.407(a)(1)(iv) / Part 15.407(a)(3) / KDB789033	Complies
Radiated Spurious Emissions: 5.725-5.85 GHz	CFR 47 Part 15.205 / KDB789033	Complies
Conducted Spurious Emissions	CFR 47 Part 15.407(b)(1,4)	Complies
Voltage Variations	CFR 47 Part 15.31(e)	Complies
Conducted Emissions	CFR 47 Part 15.207(a)	Complies

Modifications Made to the Equipment
None

3 TABLE OF MEASURED RESULTS

For the 5.15-5.25 GHz band, 5.18 GHz was the low channel, 5.22 GHz was the mid channel, and 5.24 GHz was the high channel.

For the 5.725-5.85 band, 5.745 GHz was the low channel, 5.785 GHz was the mid channel, and 5.825 GHz was the high channel.

Test			Low Channel	Mid Channel	High Channel
Channel Power	5.1 GHz	CCK	12.74mW, 11.05dBm	10.07mW, 10.03dBm	10.87mW, 10.36dBm
		OFDM	11.77mW, 10.71dBm	10.23mW, 10.10dBm	8.8mW, 9.44dBm
		HT20	16.6mW, 12.21dBm	6.82mW, 8.34dBm	9.2mW, 9.64dBm
	5.7 GHz	CCK	12.05mW, 10.81dBm	8.45mW, 9.27dBm	7.9mW, 8.96dBm
		OFDM	6.2mW, 7.93dBm	5.86mW, 7.68dBm	5.5mW, 7.39dBm
		HT20	6.63mW, 8.21dBm	6.3mW, 8.00dBm	7.6mW, 8.82dBm
Output Power Limits	5.1 GHz		250mW, 24dBm	250mW, 24dBm	250mW, 24dBm
	5.7 GHz		1 Watt, 30dBm	1 Watt, 30dBm	1 Watt, 30dBm
E.I.R.P.*	5.1 GHz	CCK	21.14mW, 13.25dBm	16.7mW, 12.23dBm	18.03mW, 12.56dBm
		OFDM	19.54mW, 12.91dBm	16.98mW, 12.3dBm	14.58mW, 11.64dBm
		HT20	27.6mW, 14.41dBm	11.32mW, 10.54dBm	15.27mW, 11.84dBm
	5.7 GHz	CCK	20.0mW, 13.01dBm	14.03mW, 11.47dBm	13.07mW, 11.16dBm
		OFDM	10.3mW, 10.13dBm	9.73mW, 9.88dBm	9.1mW, 9.59dBm
		HT20	11.0mW, 10.41dBm	10.47mW, 10.2dBm	12.65mW, 11.02dBm
E.I.R.P. Limits	5.1 GHz		1W 30 dBm	1W 30 dBm	1W 30 dBm
	5.7 GHz		4W 36dBm	4W 36dBm	4W 36dBm
Peak Power Spectral Density	HT20, UNII1		10.64dBm	9.37dBm	9.21dBm
	Limit:		11dBm/1 MHz	11dBm/1 MHz	11dBm/1 MHz
	HT20, UNII3		6.11dBm	6.18dBm	5.78dBm
	Limit:		30dBm/500kHz	30dBm/500kHz	30dBm/500kHz
-6dB Occupied Bandwidth (MHz)	5.7 GHz	CCK	13.29	13.27	13.16
		OFDM	16.12	16.30	16.28
		HT20	16.374	18.778	16.320
-26dB Occupied Bandwidth (MHz)	5.1 GHz	CCK	17.215	17.220	17.273
		OFDM	19.851	19.572	19.722
		HT20	19.585	19.740	19.845
	5.7 GHz	CCK	17.117	17.121	16.885
		OFDM	19.987	19.724	19.523
		HT20	19.820	19.726	19.952
99% Occupied Bandwidth (MHz)	5.1 GHz	CCK	13.278	13.281	13.272
		OFDM	16.493	16.528	16.519
		HT20	16.488	16.496	16.532
	5.7 GHz	CCK	13.230	13.250	13.277
		OFDM	16.473	16.455	16.500
		HT20	16.496	16.485	16.473

Test			Low Channel	Mid Channel	High Channel
*Voltage Variations UNII1	CCK11	3.3V	7.365 dBm 5.18GHz	9.293 dBm 5.219775 GHz	5.061 dBm 5.240 GHz
		@ 85%	6.715 dBm 5.180075 GHz	8.578 dBm 5.220 GHz	5.108 dBm 5.2391 GHz
		@ 115%	7.417 dBm 5.17985 GHz	9.293 dBm 5.219775 GHz	5.519 dBm 5.2388 GHz
	OFDM54	3.3V	-5.418 dBm 5.179775 GHz	8.856 dBm 5.219775 GHz	3.251 dBm 5.239775 GHz
		@ 85%	-5.418 dBm 5.179775 GHz	8.856 dBm 5.219775 GHz	3.251 dBm 5.239775 GHz
		@ 115%	-6.193 dBm 5.180 GHz	6.184 dBm 5.220 GHz	3.41 dBm 5.239925 GHz
	HT20	3.3V	-4.053 dBm 5.179775 GHz	-6.278 dBm 5.219775 GHz	-6.373 dBm 5.239775 GHz
		@ 85%	-3.873 dBm 5.17970 GHz	3.251 dBm 5.239775 GHz	-6.373 dBm 5.239775 GHz
		@ 115%	-6.372 dBm 5.180 GHz	-7.478 dBm 5.219925 GHz	-7.275 dBm 5.239925 GHz
Voltage Variations UNII 3	CCK11	3.3V	-4.556 dBm 5.744775 GHz	-5.836 dBm 5.784775 GHz	-4.259 dBm 5.824775 GHz
		@ 85%	-5.558 dBm 5.74470 GHz	-5.032 dBm 5.7847 GHz	-5.758 dBm 5.8247 GHz
		@ 115%	-5.693 dBm 5.745 GHz	-5.259 dBm 5.7850 GHz	-4.955 dBm 5.8250 GHz
	OFDM54	3.3V	-7.876 dBm 5.744775 GHz	-7.281 dBm 5.784775 GHz	-6.553 dBm 5.824775 GHz
		@ 85%	-4.332 dBm 5.74470 GHz	-6.968 dBm 5.78470 GHz	-5.458 dBm 5.82470 GHz
		@ 115%	-8.599 dBm 5.7450 GHz	-6.691 dBm 5.785225 GHz	-7.72 dBm 5.825225 GHz
	HT20	3.3V	-8.126 dBm 5.744775 GHz	-5.386 dBm 5.784775 GHz	-6.994 dBm 5.824775 GHz
		@ 85%	-5.869 dBm 5.744700 GHz	-5.386 dBm 5.784775 GHz	-6.994 dBm 5.824775 GHz
		@ 115%	-5.943 dBm 5.744475 GHz	-6.168 dBm 5.784475 GHz	-5.598 dBm 5.824475 GHz

**Accounts for antenna gain of 2.2 dBi.*

4 ENGINEERING STATEMENT

This report has been prepared on behalf of Avent Inc. to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15.407 of the FCC Rules using ANSI C63.10 and KDB789033 standards. The test results found in this test report relate only to the items tested.

5 EUT INFORMATION AND DATA

5.1 Equipment Under Test:

Product: Azure Sphere MT3620 Modules
Model: AES-MS-MT360-M-G
Serial No.: 0002B501E625
FCC ID: 2AF62-AVT3620C

5.2 Trade Name:

Avnet Inc.

5.3 Power Supply:

3.3V DC

5.4 Applicable Rules:

CFR 47, Part 15.407, subpart E

5.5 Equipment Category:

Radio Transmitter-UNII

5.6 Antenna:

2.2dBi Integral Antenna

5.7 Accessories:

PC: Dell 15-3000, ser. no. 8486780294
Charger: Dell OKXITW

5.8 Test Item Condition:

Transmitter was operated in the Continuous mode. Measurements were taken on low, mid and high channels in each appropriate band and on each applicable modulation.

5.9 Testing Algorithm:

The EUT was set up in a test mode to continuous transmit at low, mid and high frequencies of the 5.15-5.25 GHz and 5.725-5.85 GHz spectrum.

For the 5.15-5.25 GHz band, 5.18 GHz was the Center frequency for the low channel, 5.22 GHz was the Center frequency for the mid channel, and 5.24 GHz was the Center frequency for the high channel.

For the 5.725-5.85 band, 5.745 GHz was the Center frequency for the low channel, 5.785 GHz was the Center frequency for the mid channel, and 5.825 GHz was the Center frequency for the high channel.

No channel used a channel bandwidth greater than 20 MHz.

EUT was powered with 3.3VDC from the client supplied development PCB. The highest emissions were recorded in the data tables.

6 LIST OF MEASUREMENT INSTRUMENTATION

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Spectrum Analyzer	CL147	Agilent	E7402A	MY45101241	Jan. 25, 2020
Spectrum Analyzer	CL138	Agilent Technologies	E4407B	US41192779	June 19, 2019
LISN	CL181	Com-Power	LI-125A	191226	July 3, 2021
LISN	CL182	Com-Power	LI-125A	191225	July 3, 2021
Shielded Chamber 2014	CL166-E	AlbatrossProjects	B83117-DF435-T261	US140023	Aug. 30, 2019
Shield Room	0175-3V	Ray Proof	N/A	11645	May 31, 2019
Temp/Hum. Recorder	CL234	Extech	445814	03	Mar. 22, 2019
Receiver	CL151	Rohde & Schwarz	ESU40	100319	Oct. 25, 2019
Receiver	CL204	Rohde & Schwarz	ESR7	101714	Oct. 29, 2019
Antenna, JB3 Combination	CL175	Sunol Sciences	JB3	A030315	Oct. 11, 2019
Horn Antenna	CL098	Emco	3115	9809-5580	Jan. 31, 2021
Antenna, Horn	CL114	A. H. Systems, Inc.	SAS-572	237	Feb. 4, 2021
Pre-Amplifier	0197	Hewlett Packard	8447D	1726A01006	Oct. 25, 2019
Pre-Amplifier	CL153	Agilent	83006-69007	MY39500791	Aug. 24, 2019
Antenna, Horn	CL188	Com-Power	AH-640	091065	June 16, 2019
Antenna, 18” Active Loop	CL194	A.H. Systems, Inc.	SAS-562B	281	May 23, 2020
Software:	Tile Version 3.4.B.3.		Software Verified: Mar. 11-12, 2019		
Software:	EMC 32, Version 8.53.0		Software Verified: Mar. 11-12, 2019		

7 OCCUPIED BANDWIDTH

7.1 Requirements:

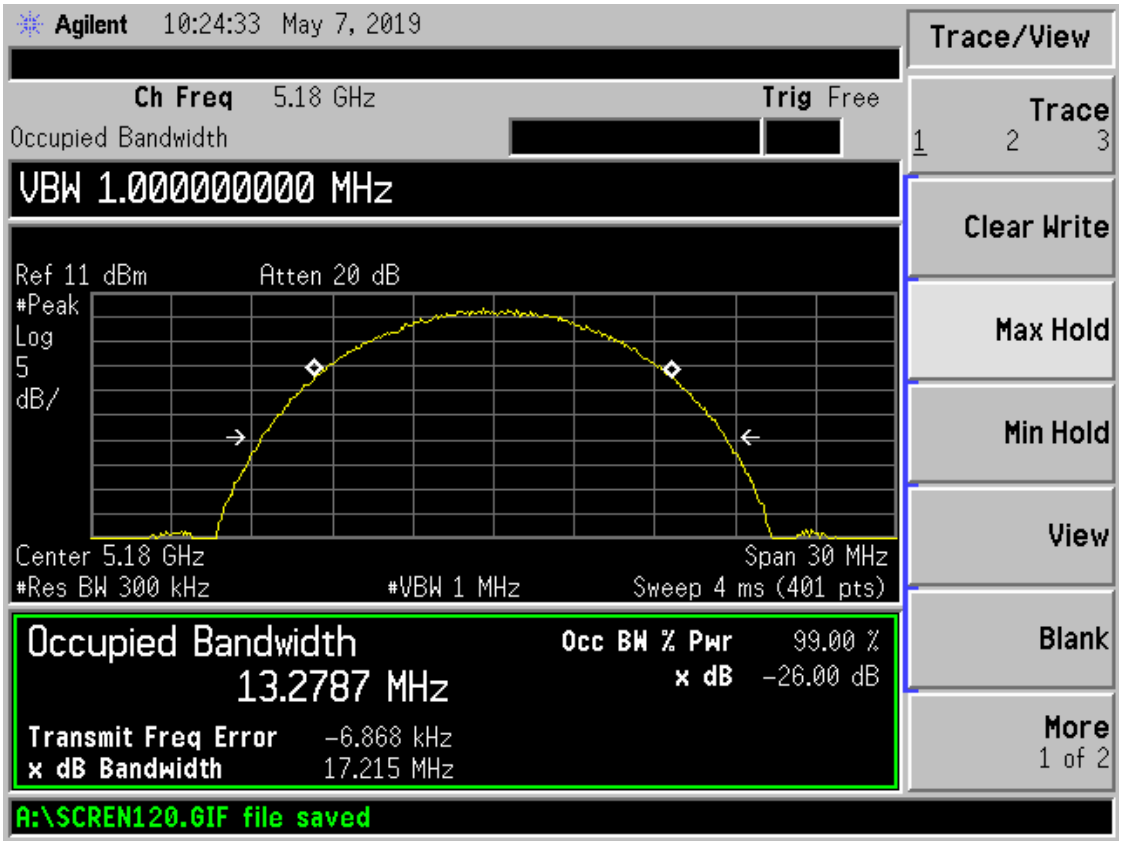
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the -26dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

Bandwidth measurements were made at the low, mid and high frequencies. The bandwidth was measured using the analyzer's marker function.

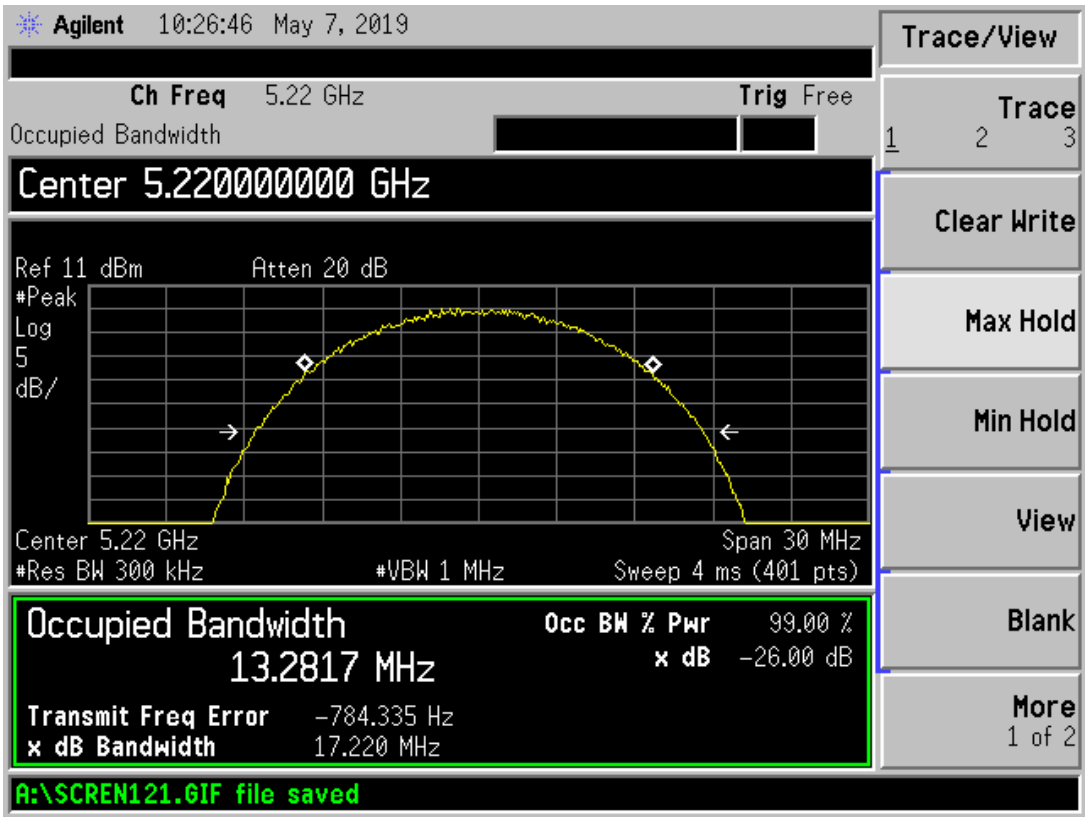
7.2 Occupied Bandwidth Test Data

Test Date(s):	Mar. 18, 2019; May 7 & 14, 2019	**Test Engineer(s):**	J. Chiller
Standards:	CFR 47 Part 15.215(c)	**Air Temperature:**	22.6ºC / 21.2
		Relative Humidity:	33% / 43%

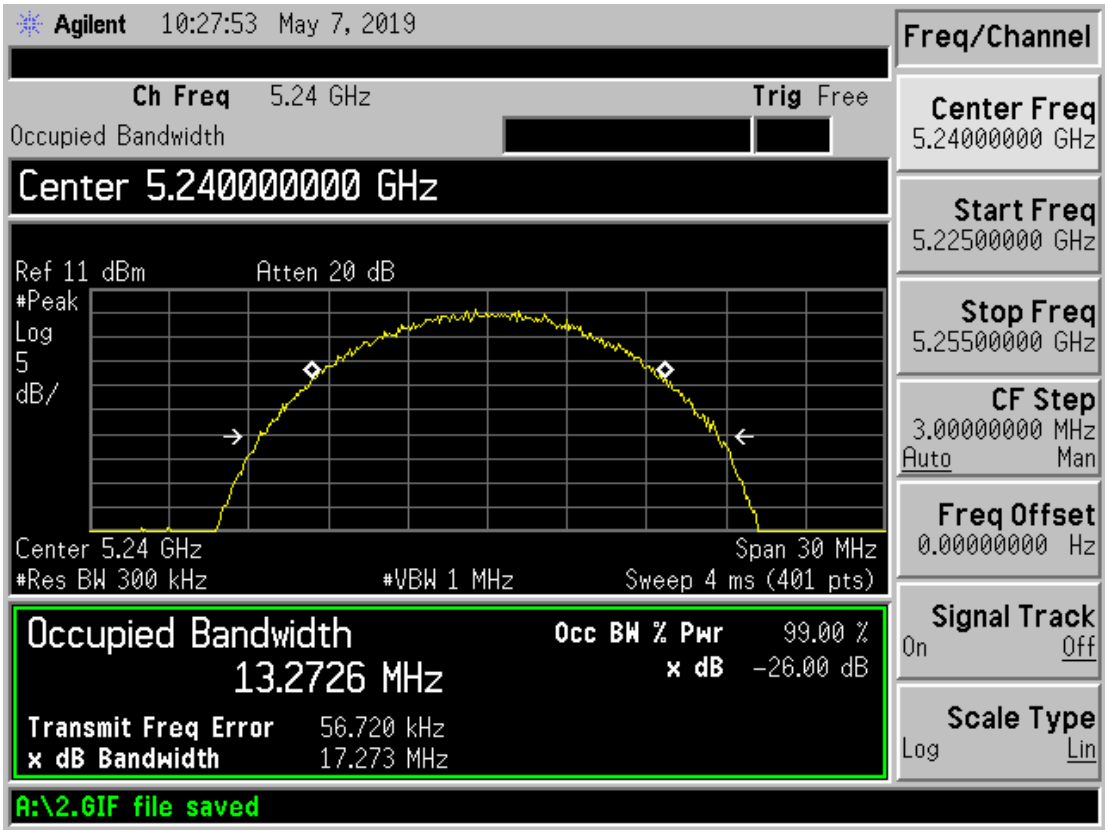
5.1 GHz: CCK, 99% / -26dB OBW, Low Channel



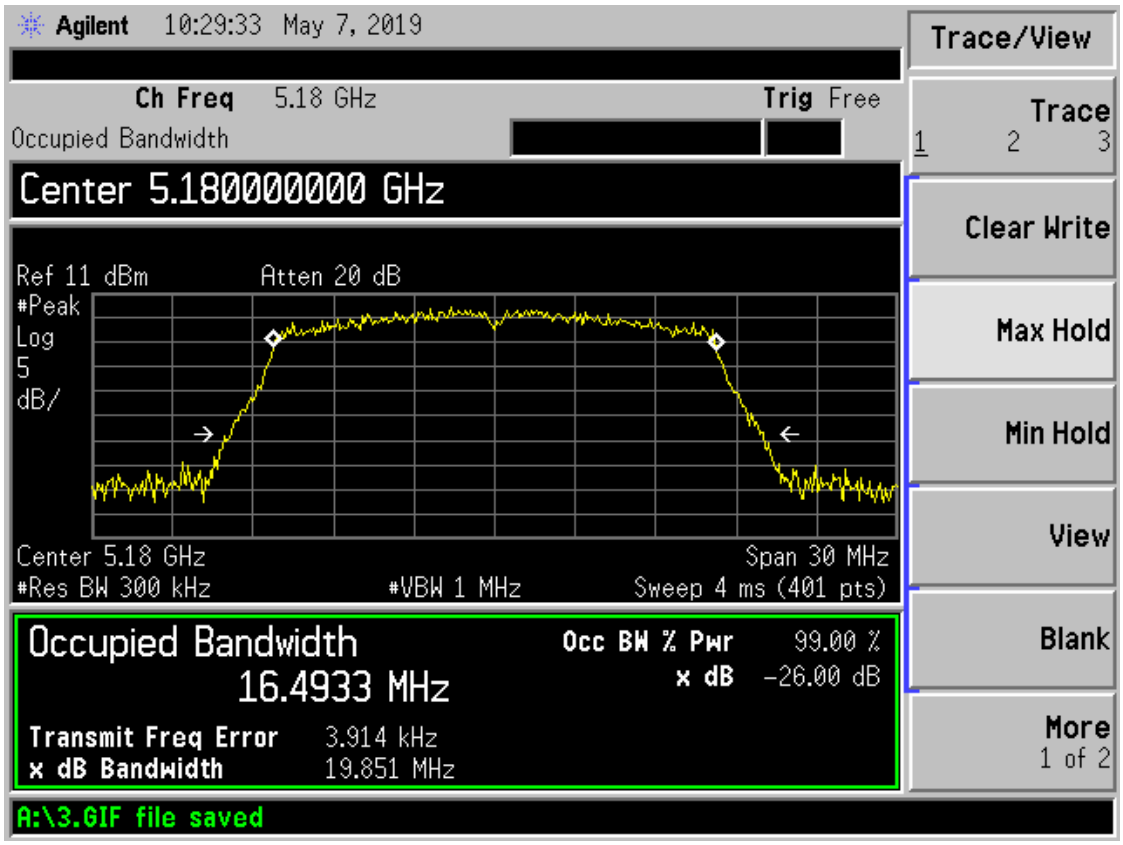
5.1 GHz: CCK, 99% / -26dB OBW, Mid Channel



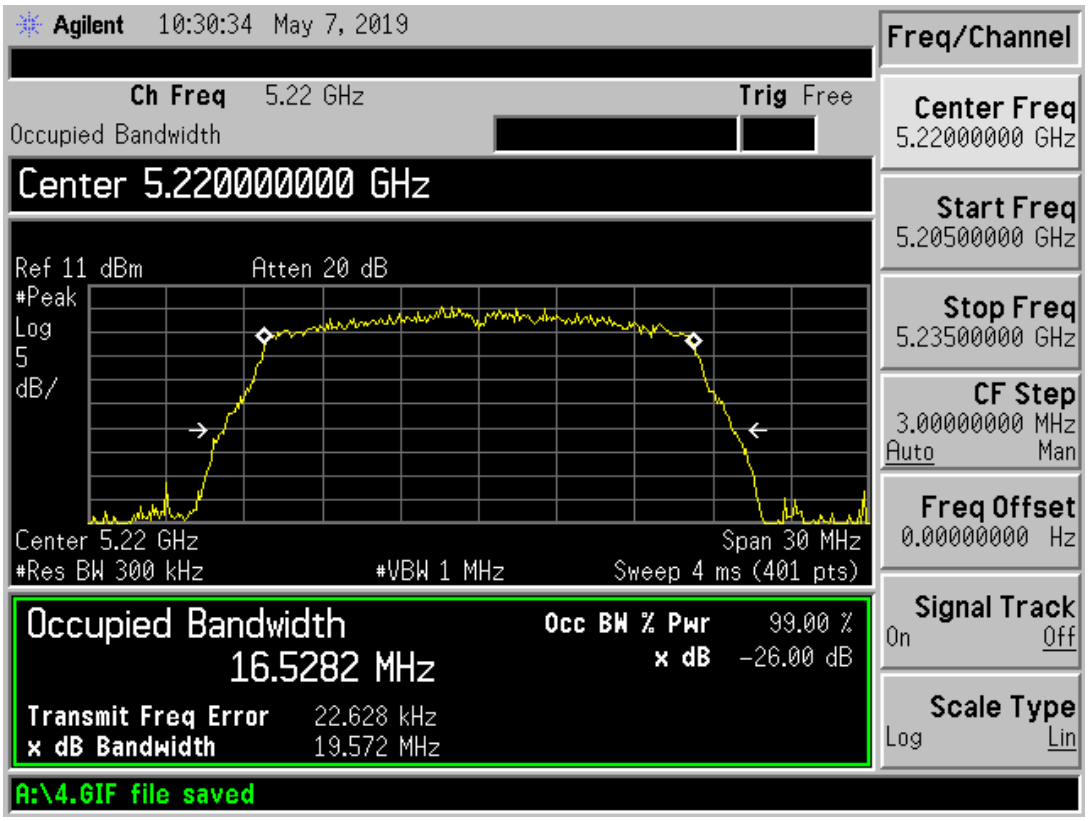
5.1 GHz: CCK, 99% / -26dB OBW, High Channel



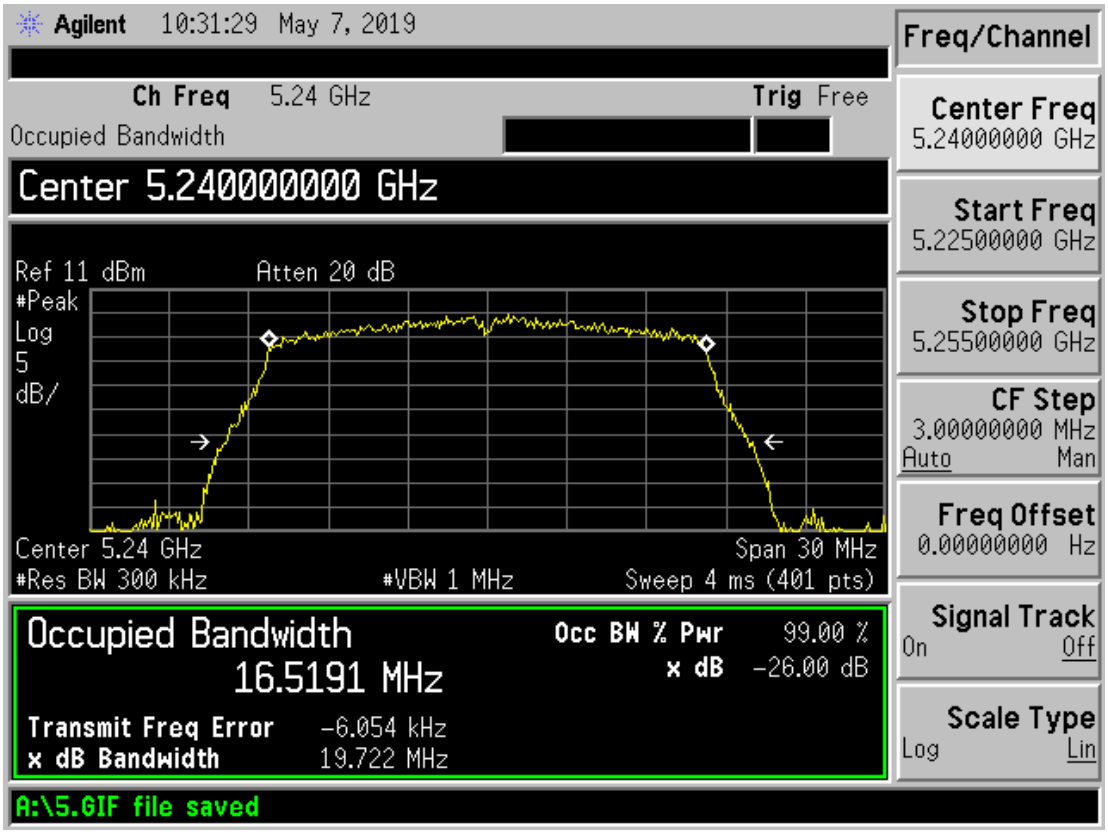
5.1 GHz: OFDM, 99% / -26dB OBW, Low Channel



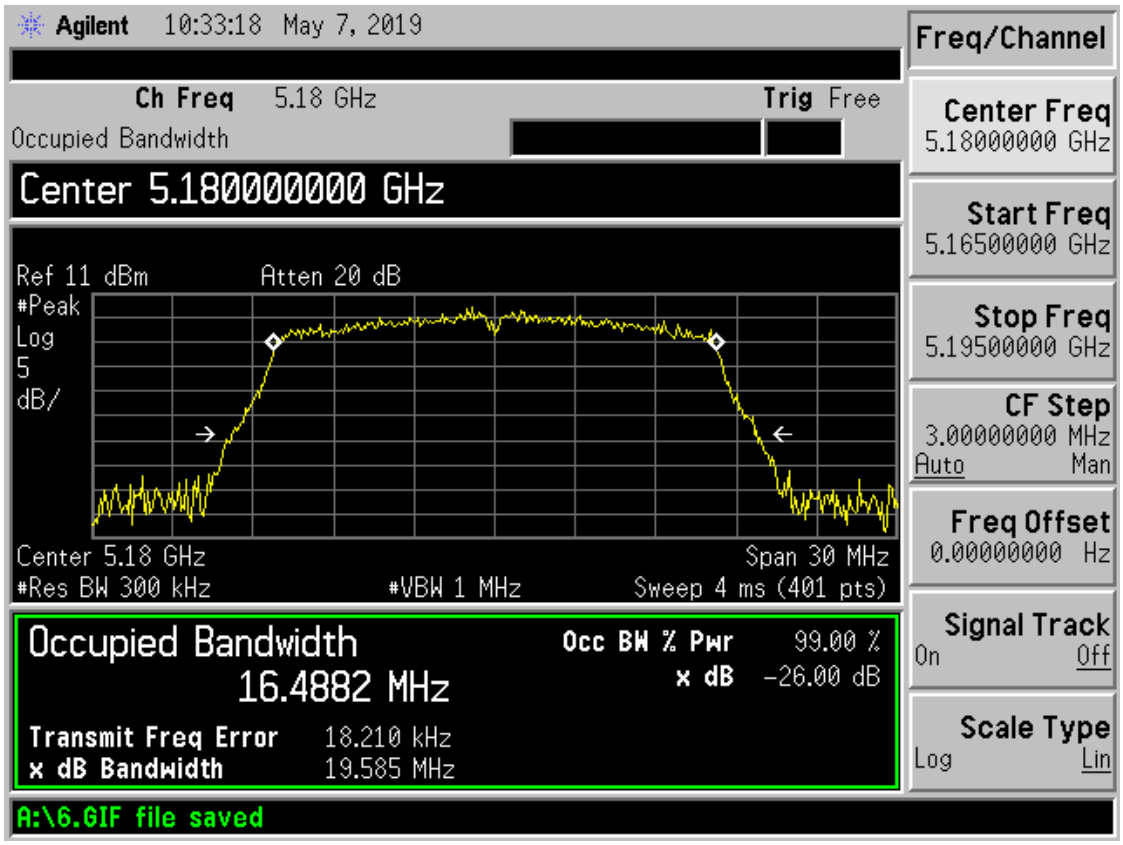
5.1 GHz: OFDM, 99% / -26dB OBW, Mid Channel



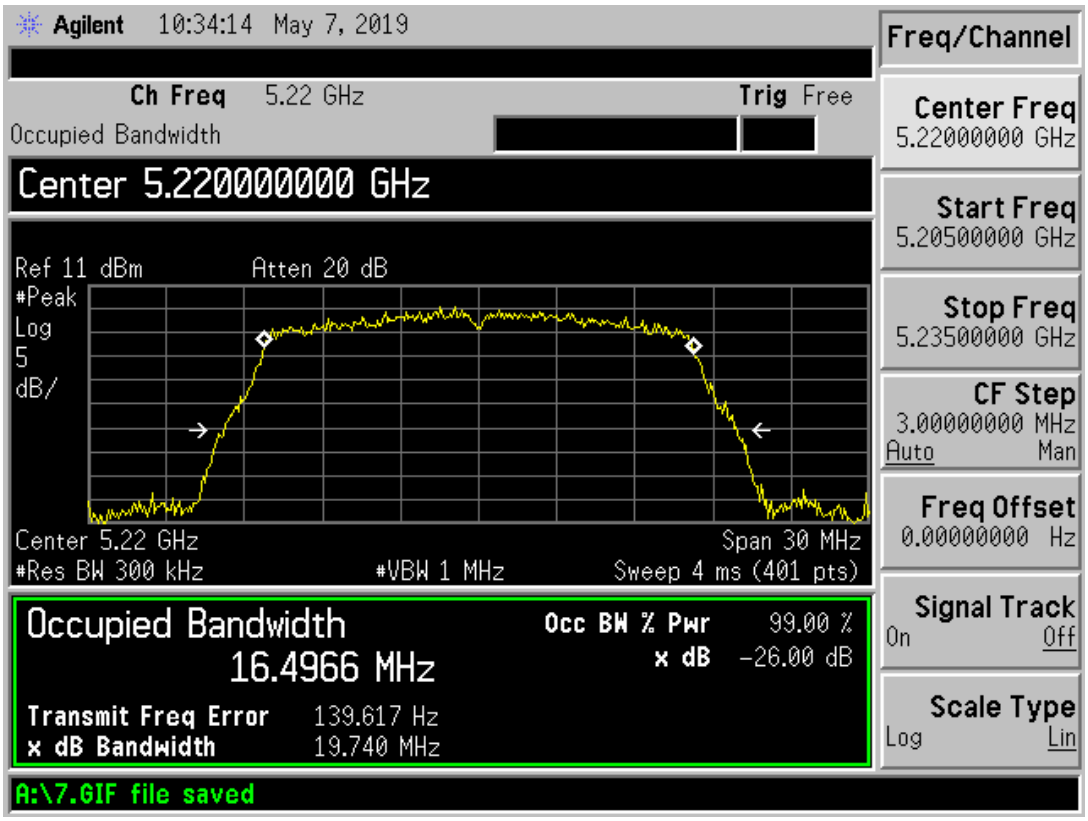
5.1 GHz: OFDM, 99% / -26dB OBW, High Channel



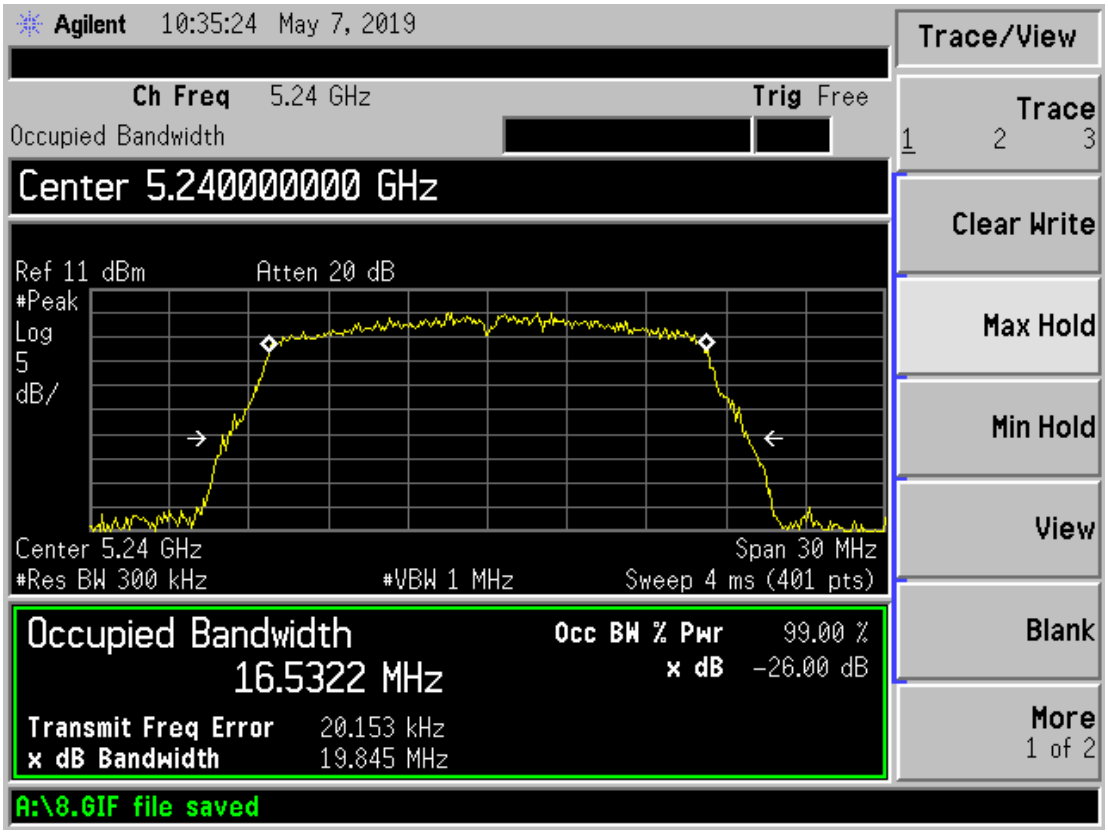
5.1 GHz: HT20, 99% / -26dB OBW, Low Channel



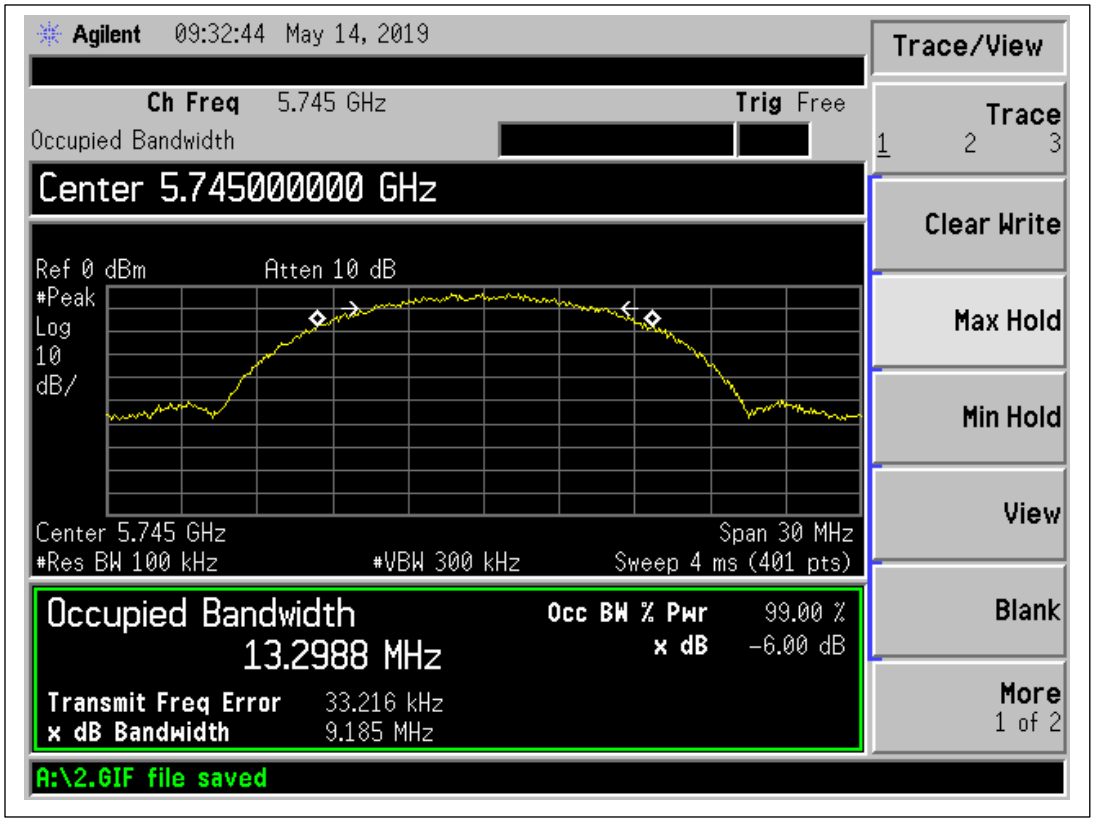
5.1 GHz: HT20, 99% / -26dB OBW, Mid Channel



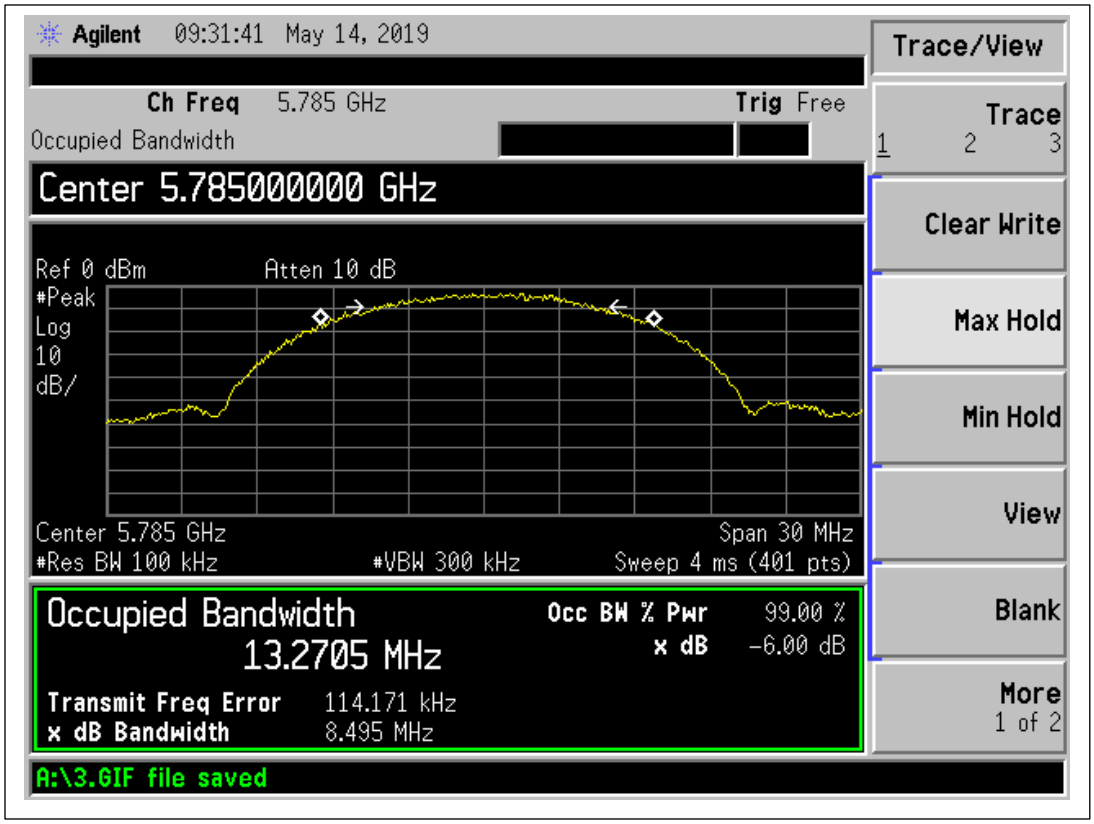
5.1 GHz: HT20, 99% / -26dB OBW, High Channel



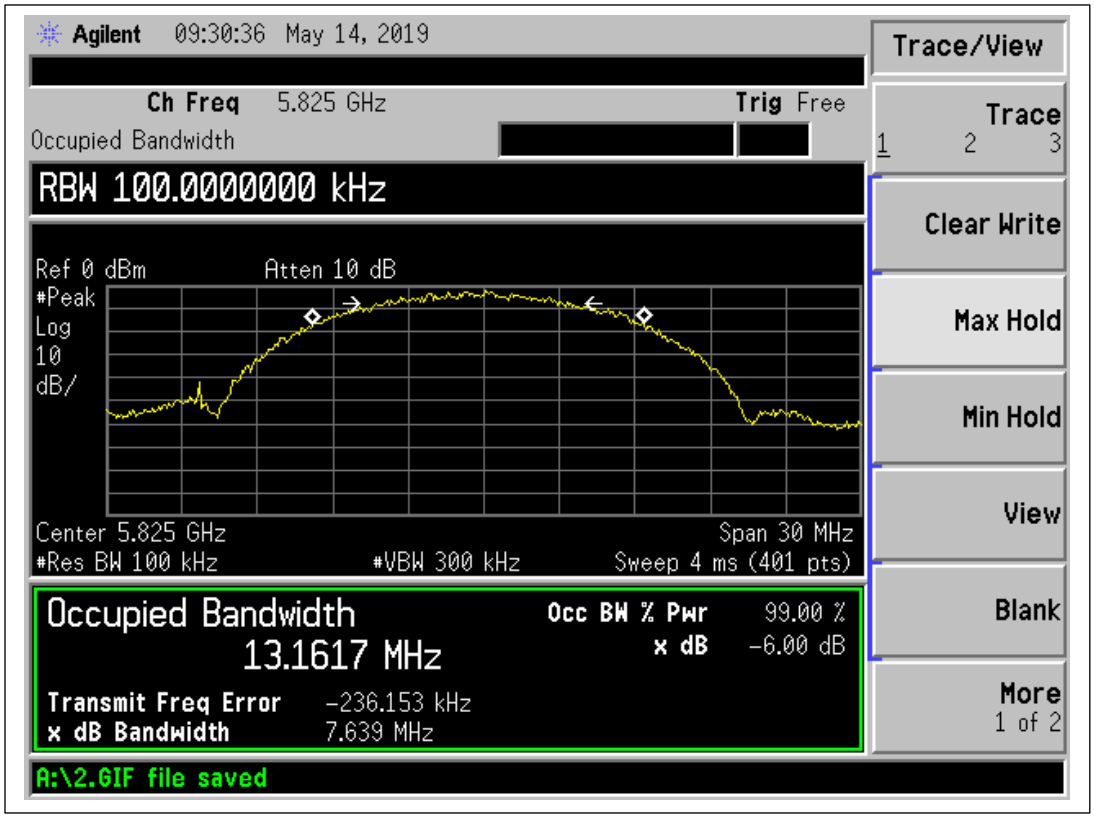
5.7 GHz: CCK, -6dB OBW, Low Channel



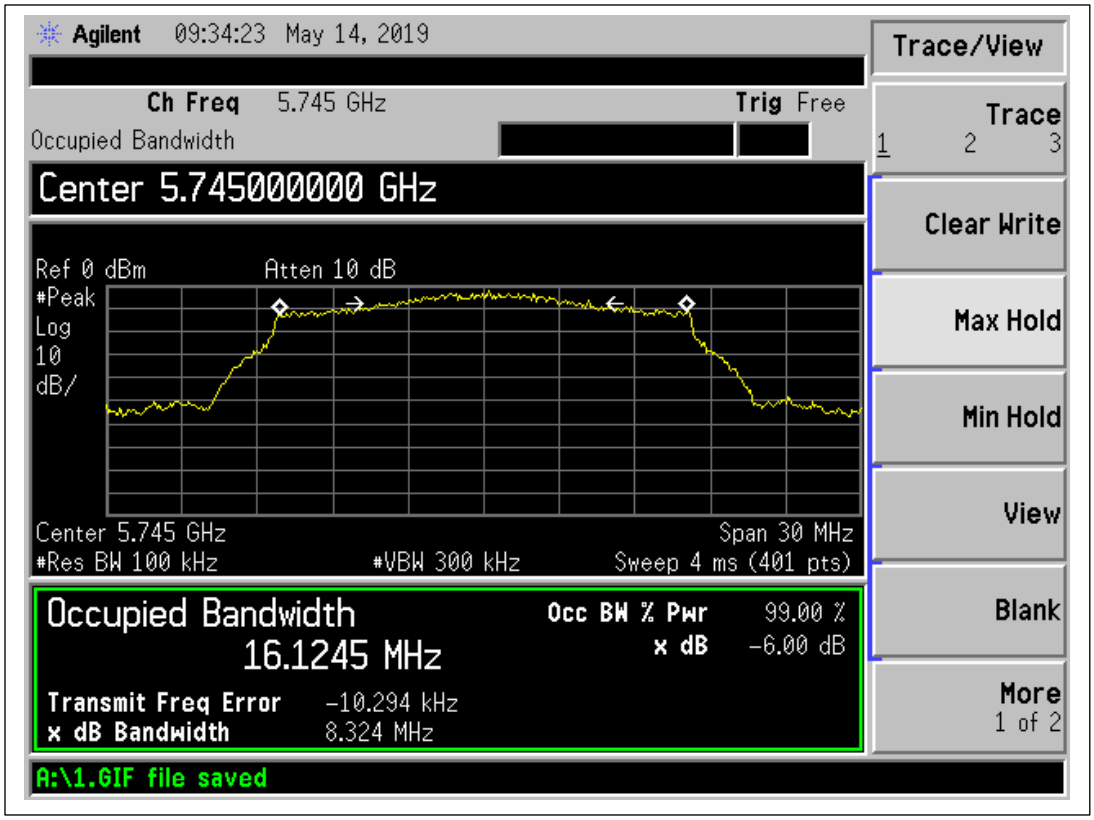
5.7 GHz: CCK, -6dB OBW, Mid Channel



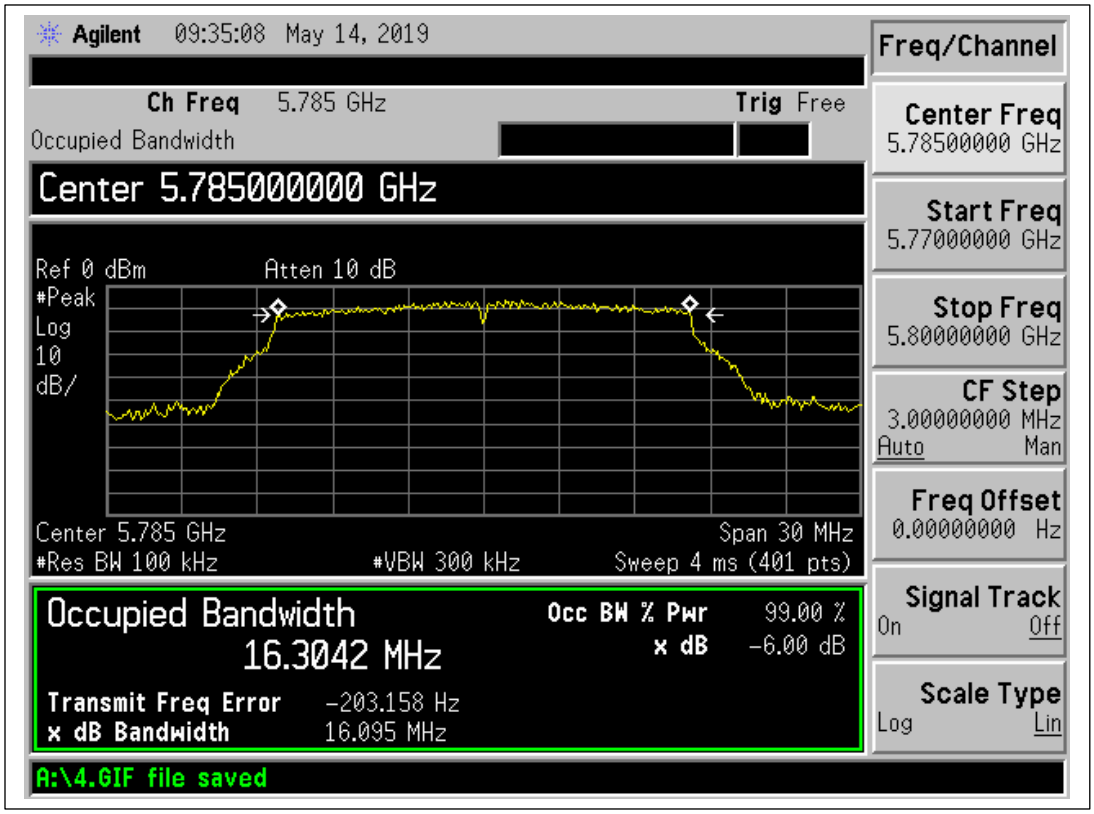
5.7 GHz: CCK, -6dB OBW, High Channel



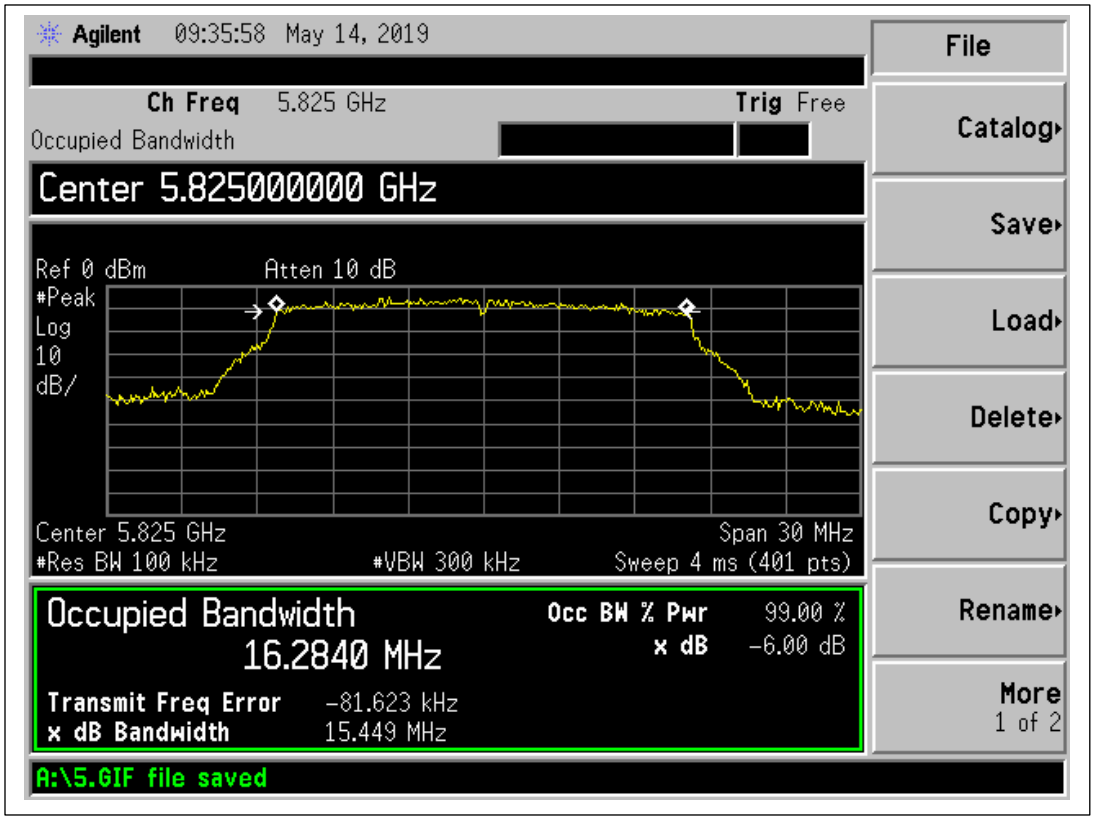
5.7 GHz: OFDM, -6dB OBW, Low Channel



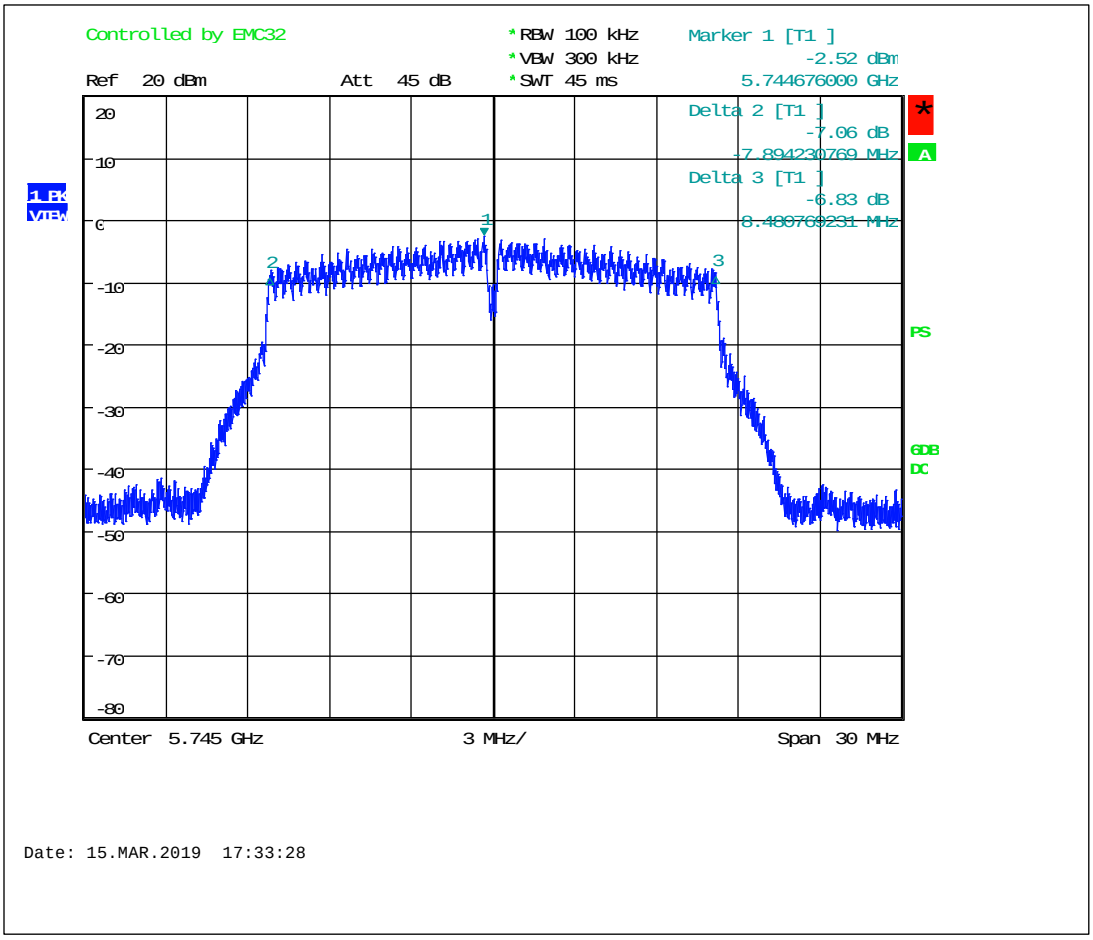
5.7 GHz: OFDM, -6dB OBW, Mid Channel



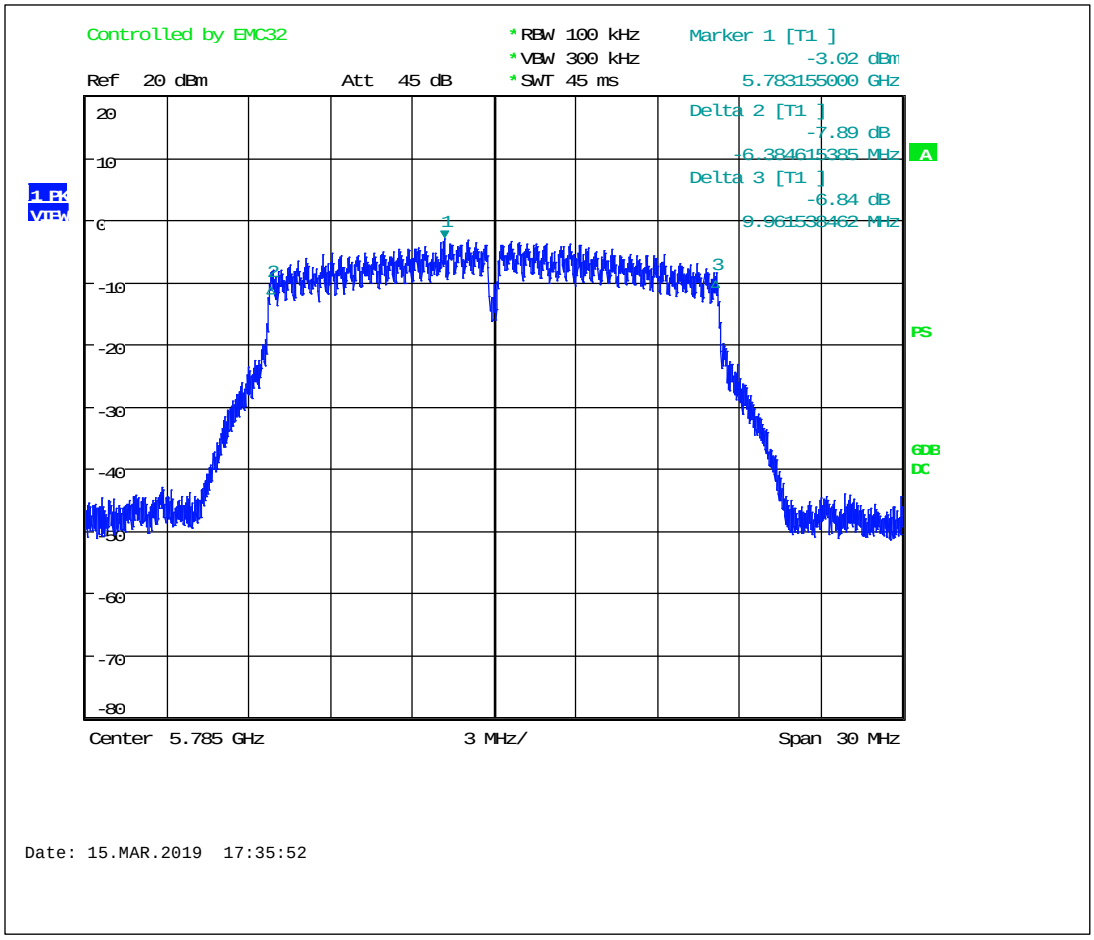
5.7 GHz: OFDM, -6dB OBW, High Channel



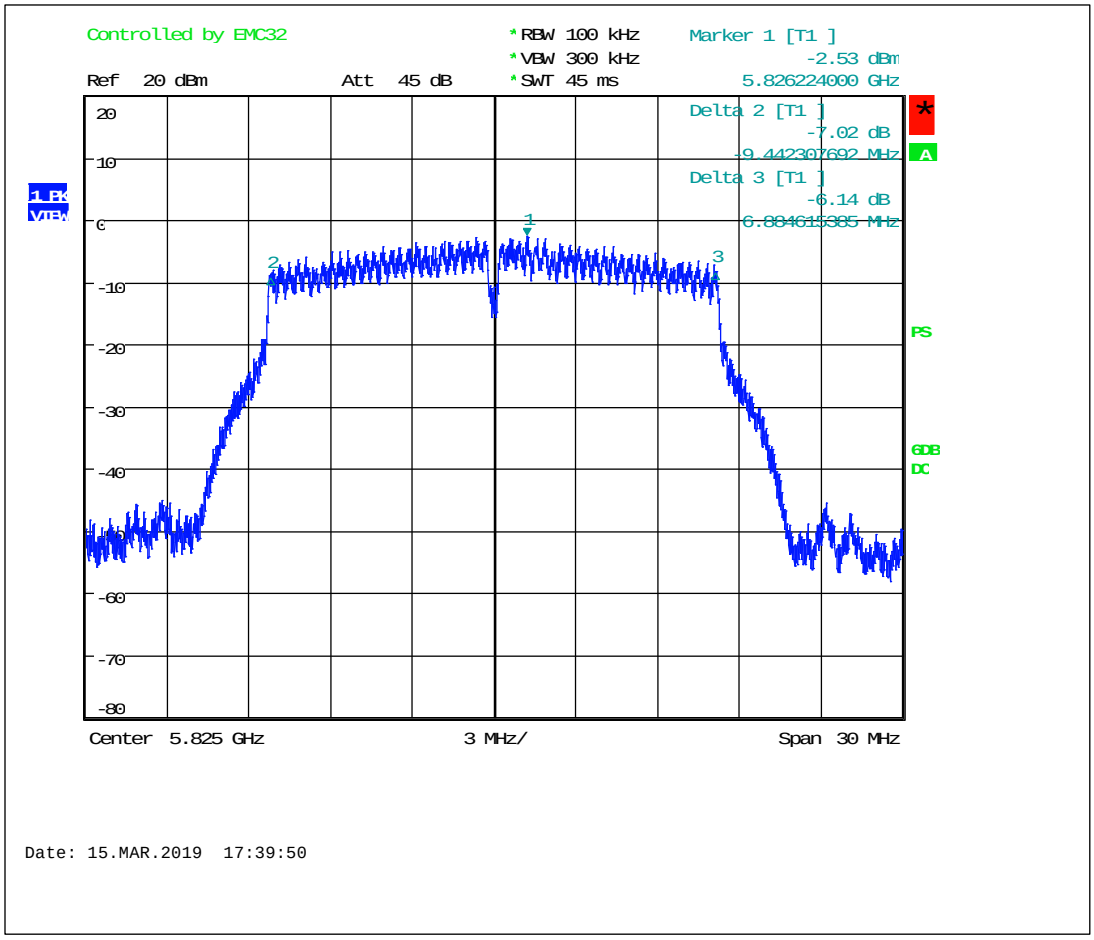
5.7 GHz: HT20, -6dB OBW, Low Channel



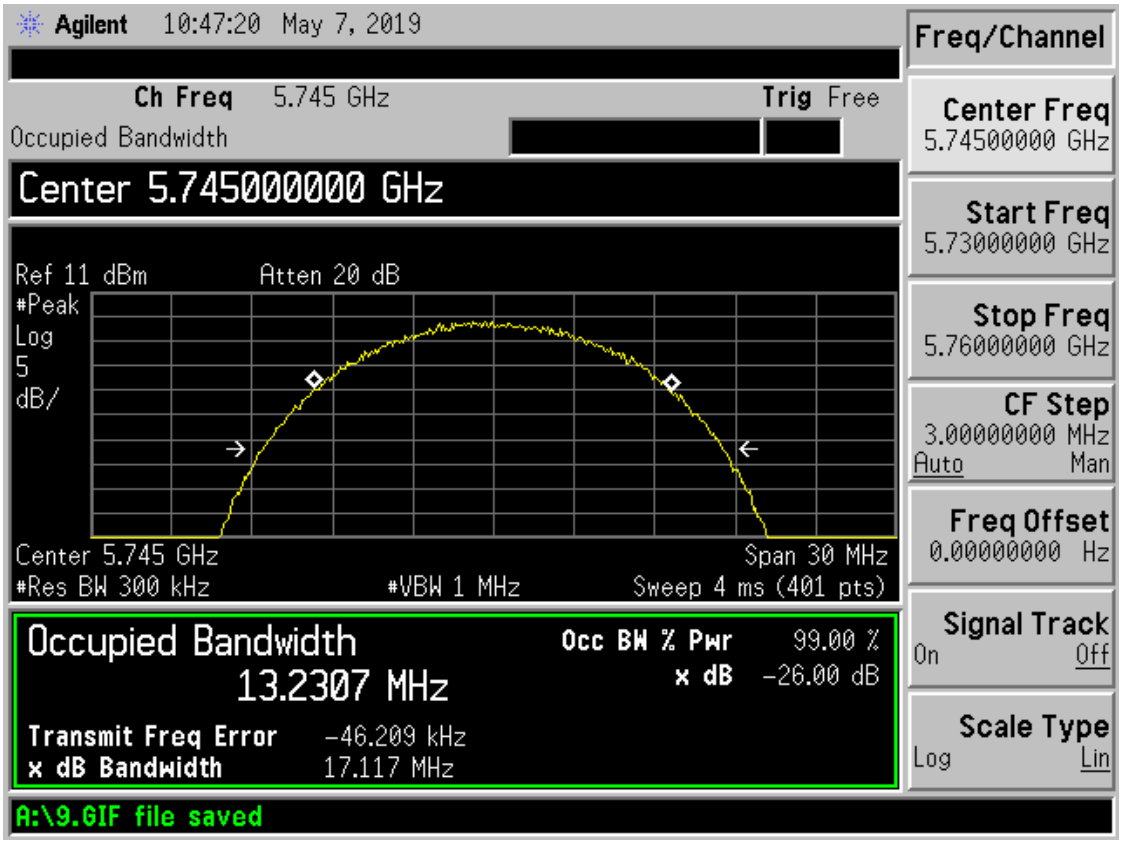
5.7 GHz: HT20, -6dB OBW, Mid Channel



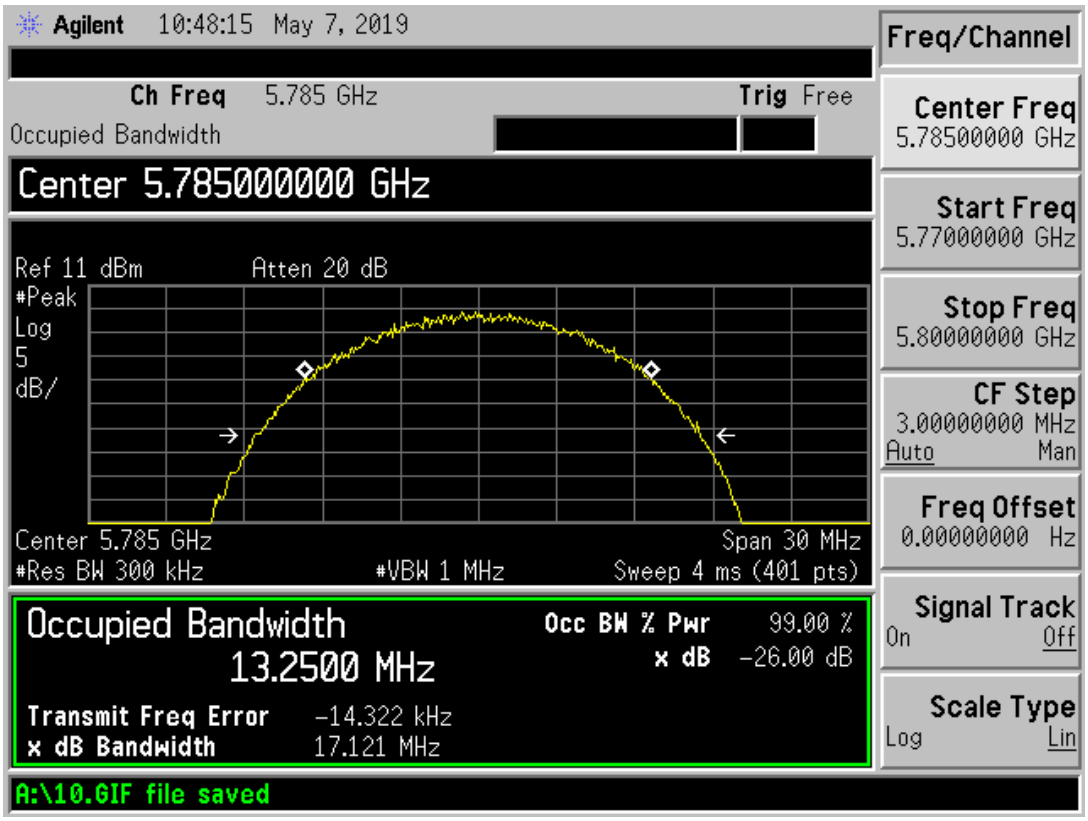
5.7 GHz: HT20, -6dB OBW, High Channel



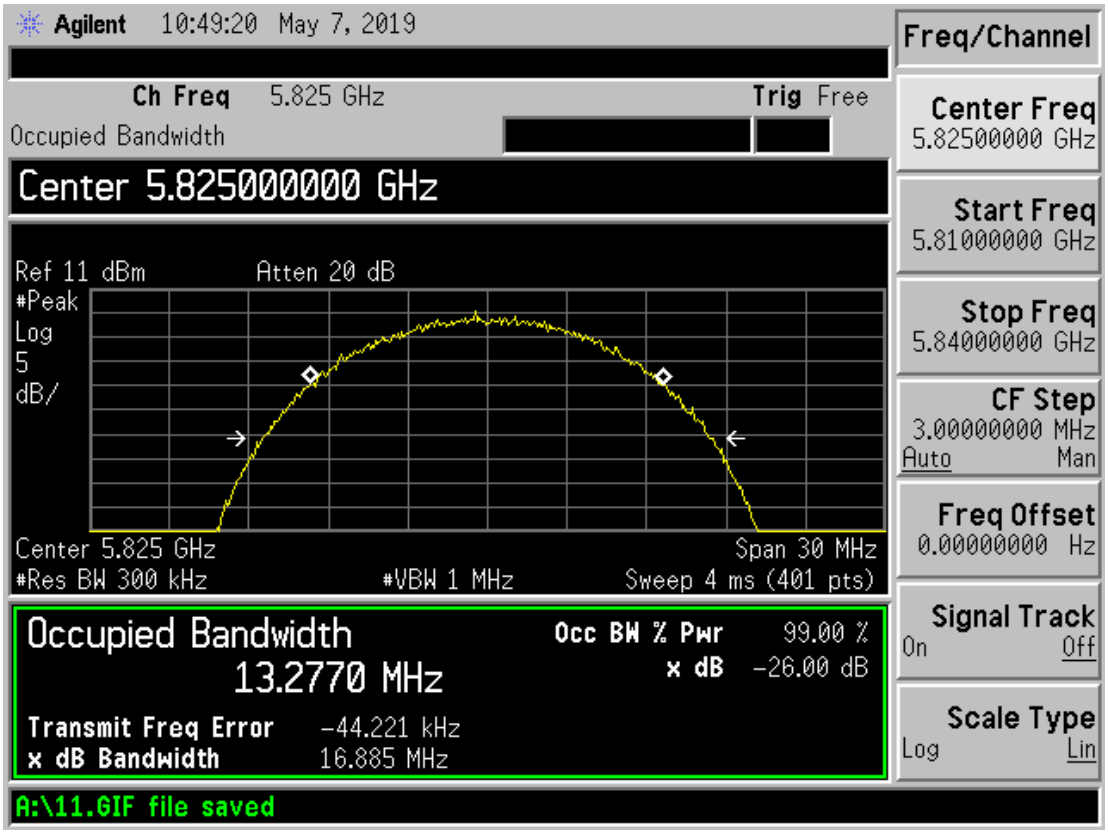
5.7 GHz: CCK, 99% / -26dB OBW, Low Channel



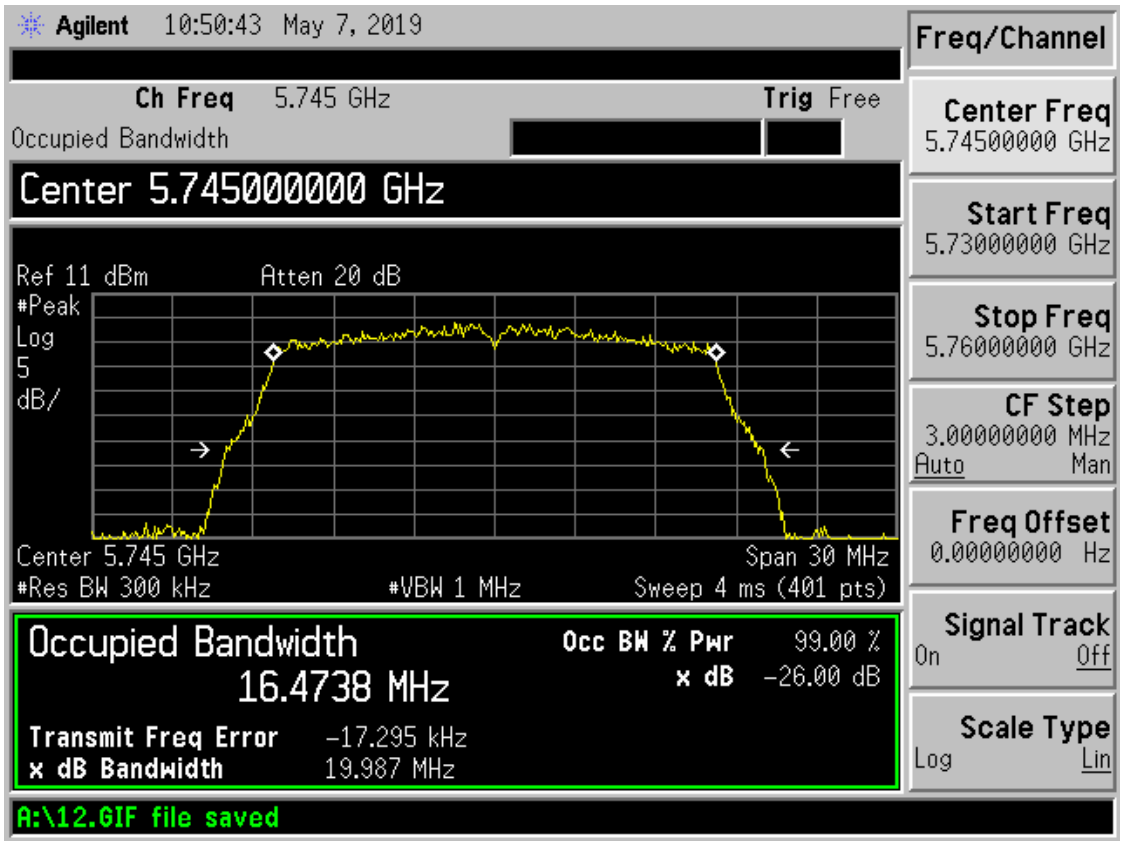
5.7 GHz: CCK, 99% / -26dB OBW, Mid Channel



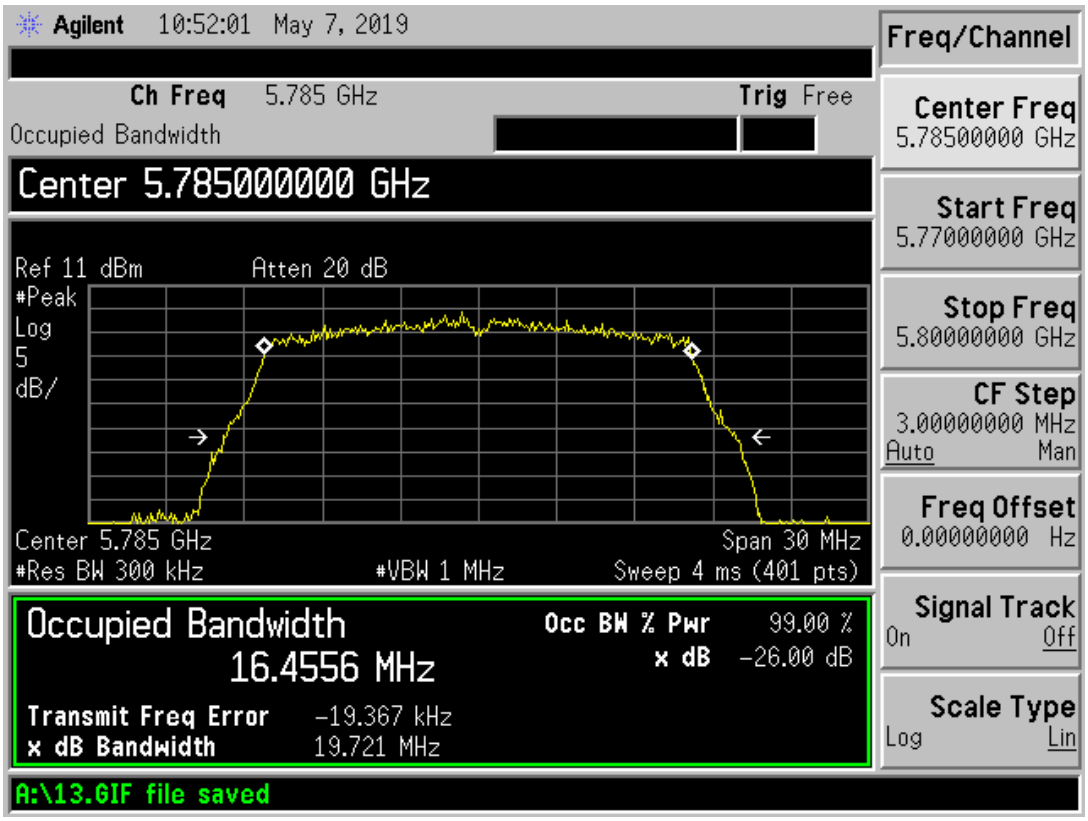
5.7 GHz: CCK, 99% / -26dB OBW, High Channel



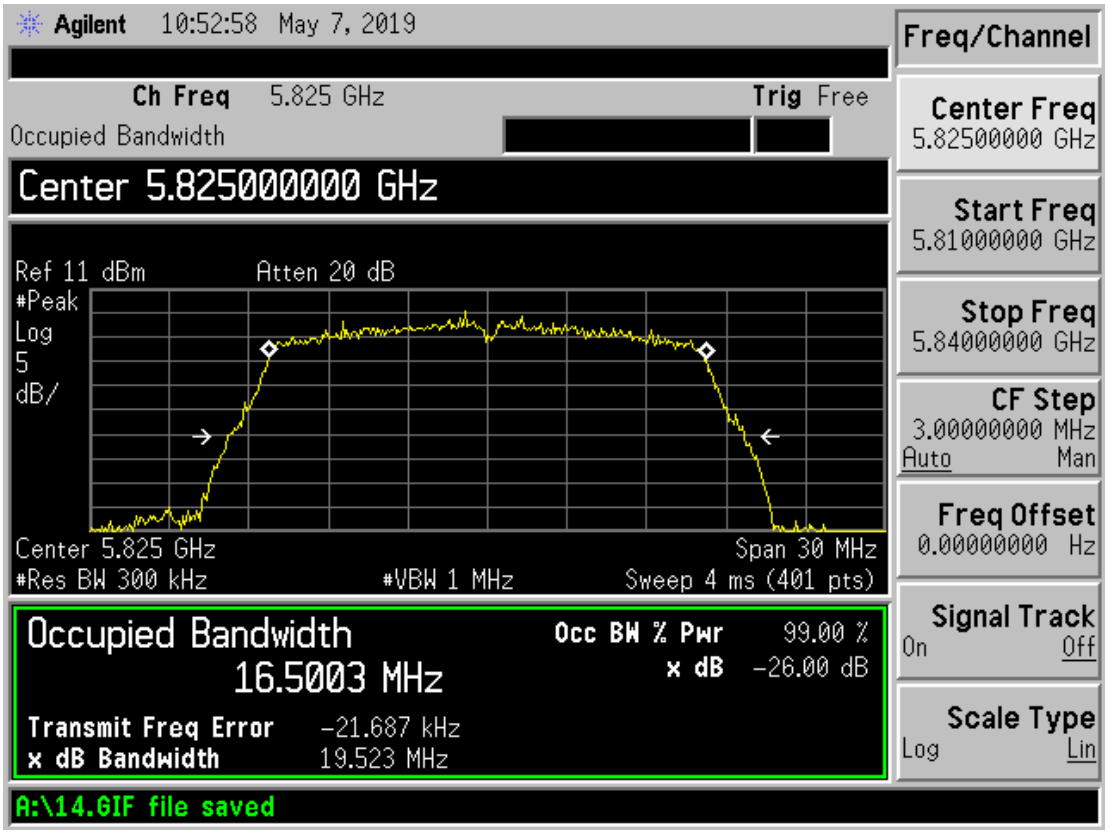
5.7 GHz: OFDM, 99% / -26dB OBW, Low Channel



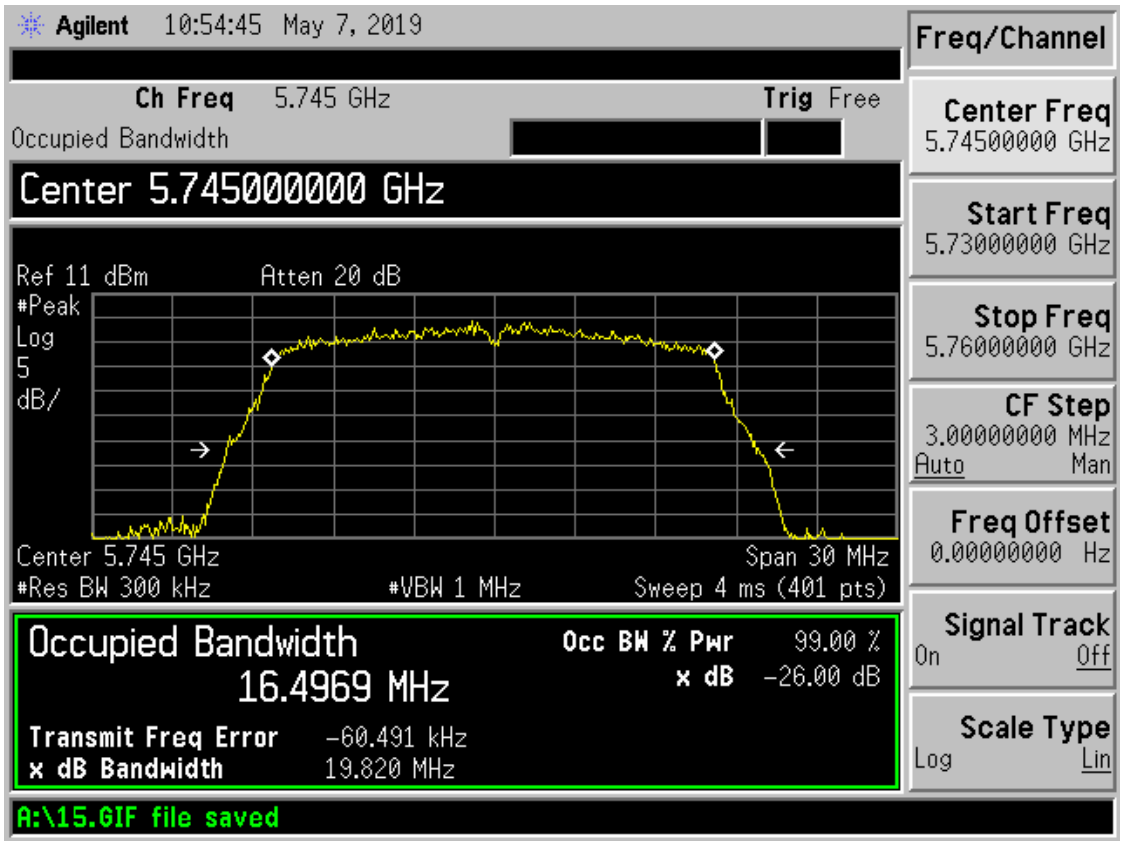
5.7 GHz: OFDM, 99% / -26dB OBW, Mid Channel



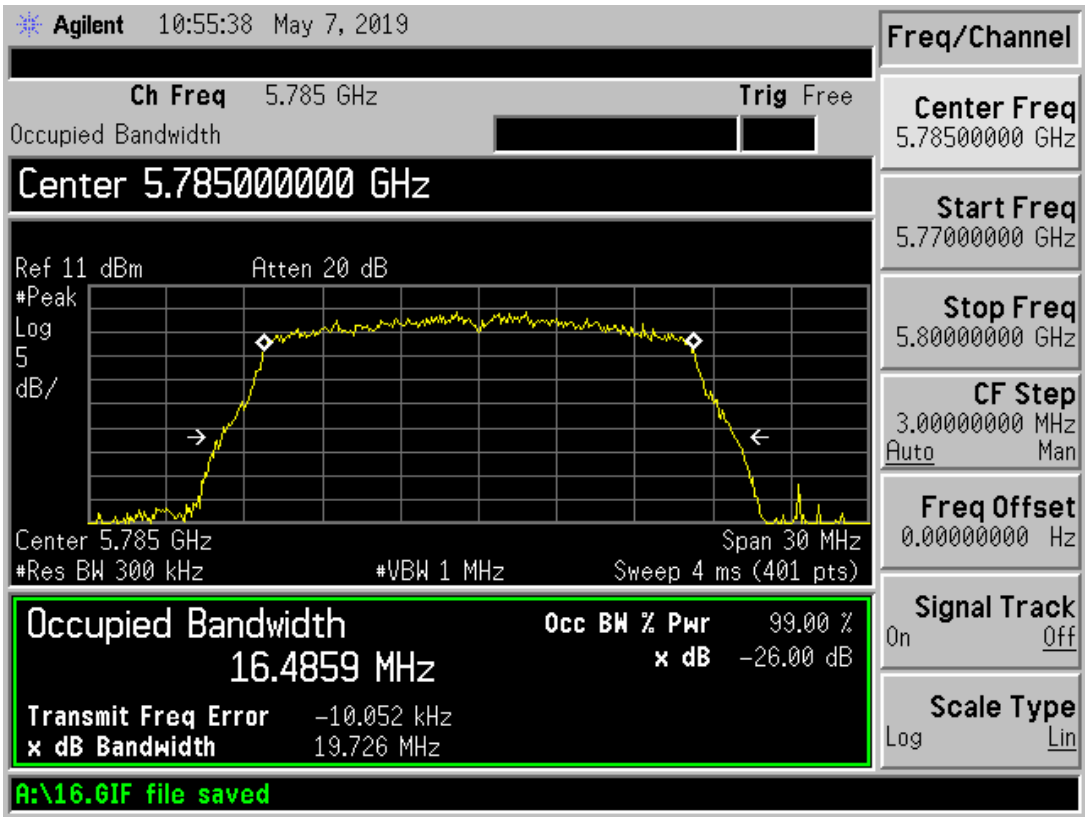
5.7 GHz: OFDM, 99% / -26dB OBW, High Channel



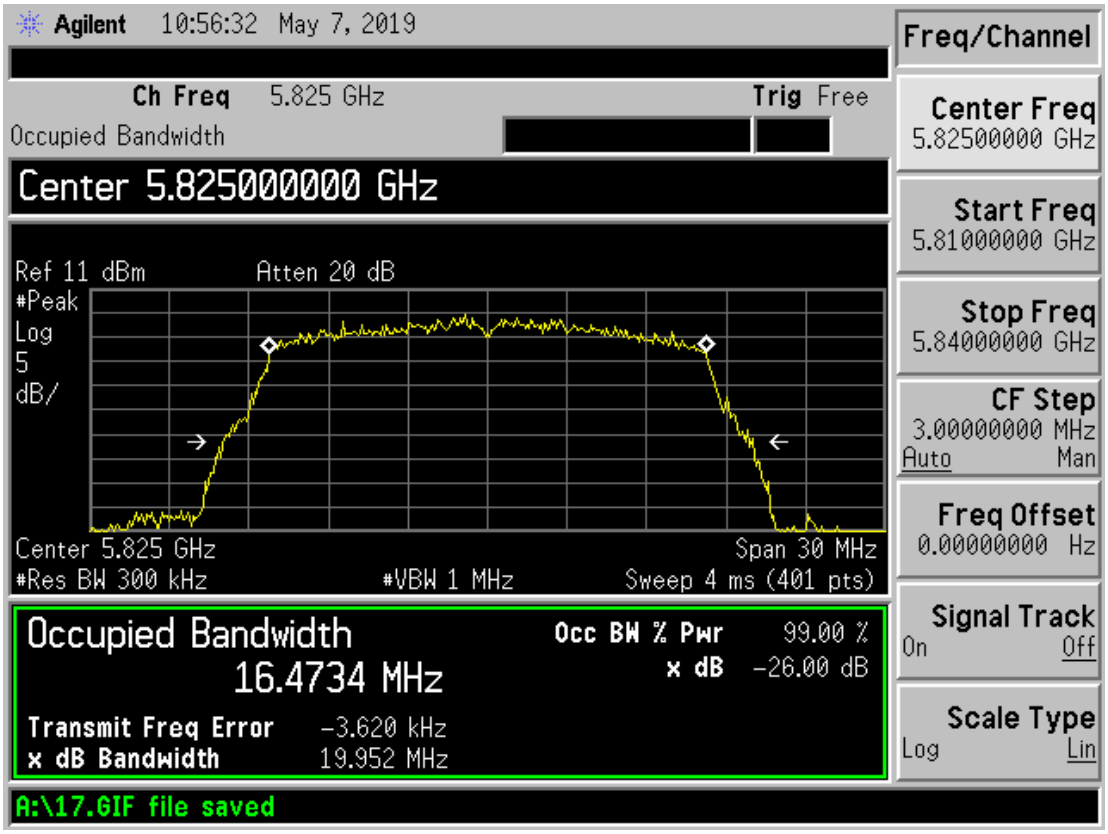
5.7 GHz: HT20, 99% / -26dB OBW, Low Channel



5.7 GHz: HT20, 99% / -26dB OBW, Mid Channel



5.7 GHz: HT20, 99% / -26dB OBW, High Channel



8 OUTPUT POWER

The EUT antenna port was fitted with an SMA connector and directly connected to the input of the receiver. The peak power output was measured.

8.1 Requirements:

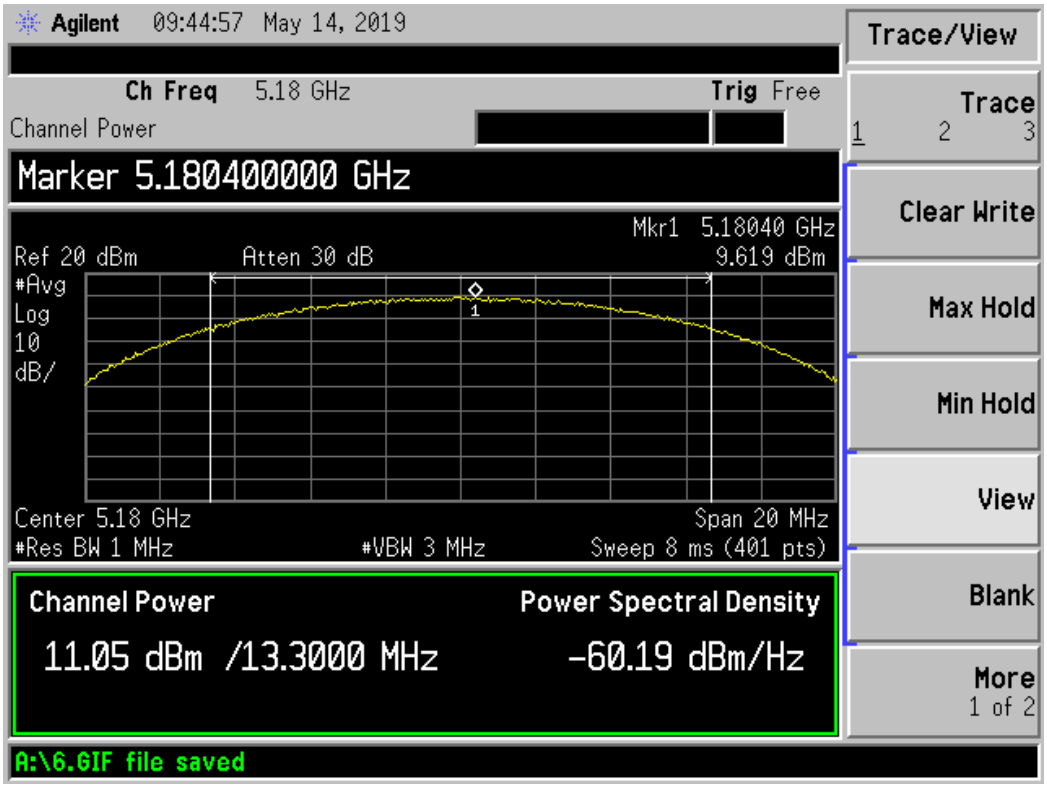
For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24 dBm) provided the maximum antenna gain does not exceed 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30 dBm).

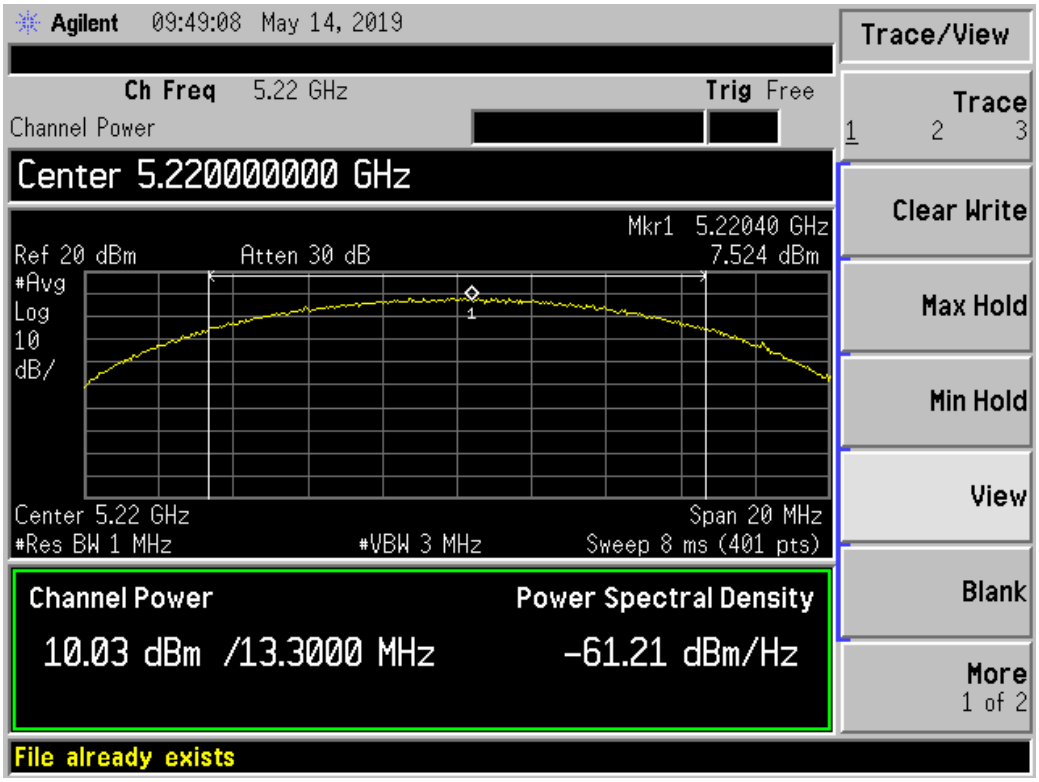
8.2 Output Power Test Data

Test Date:	May 14, 2019	**Test Engineer:**	J. Chiller
Standards:	CFR 47 Part 15.407(a)(1,3); KDB789033	**Air Temperature:**	21.9ºC
		Relative Humidity:	33%

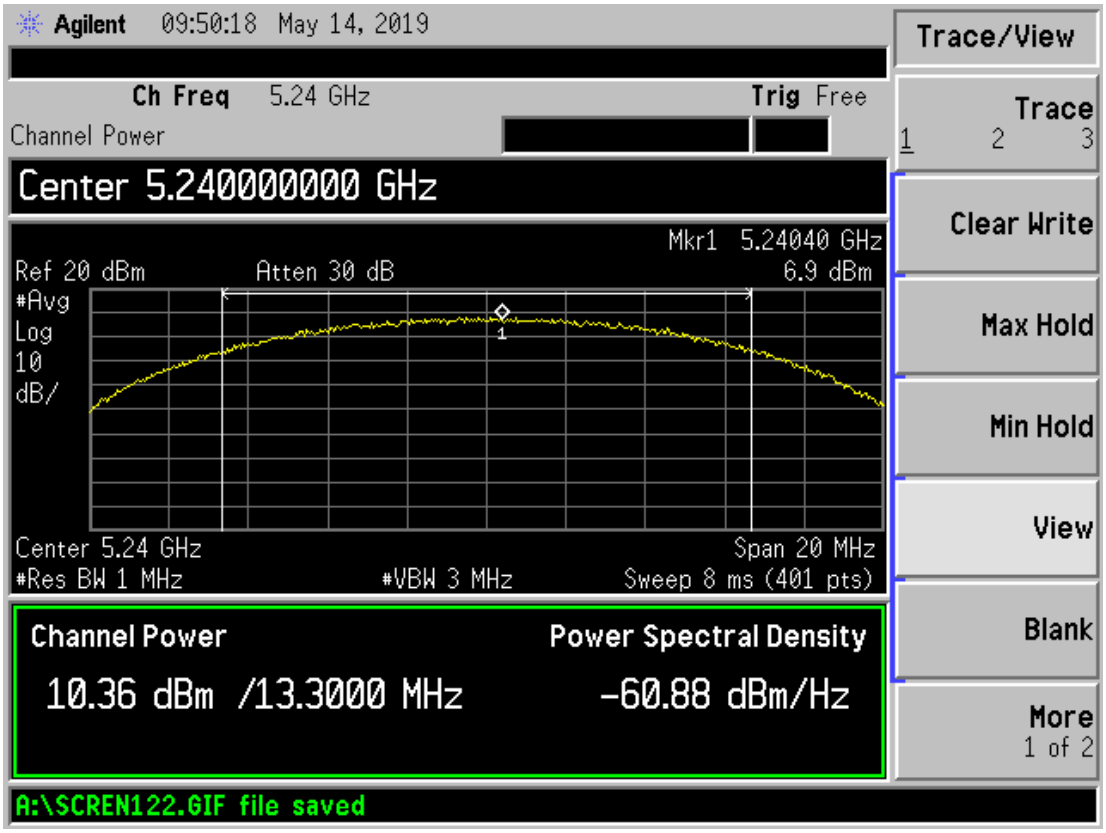
5.1 GHz, CCK, Low Channel



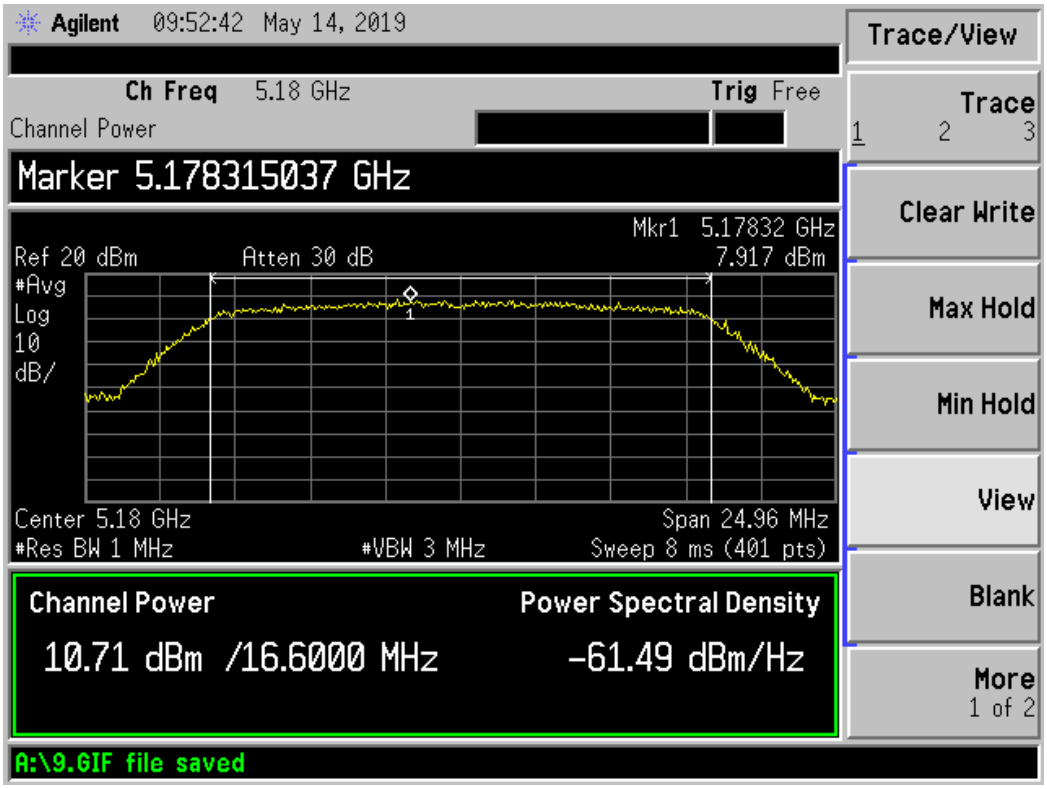
5.1 GHz, CCK, Mid Channel



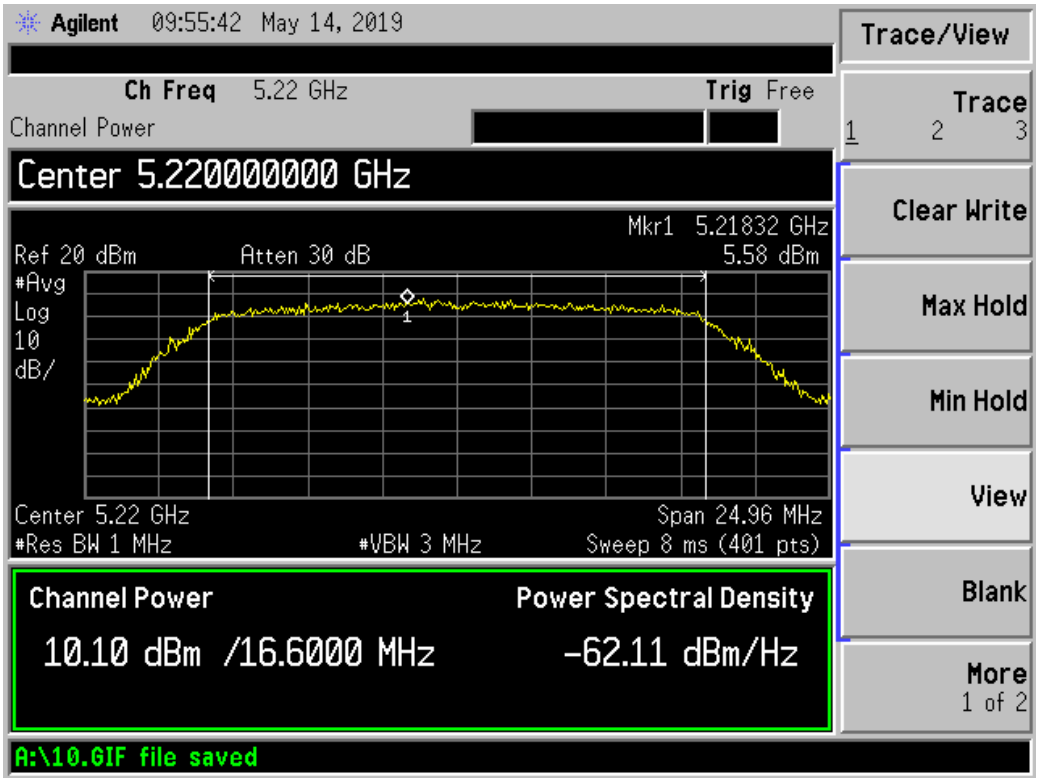
5.1 GHz, CCK, High Channel



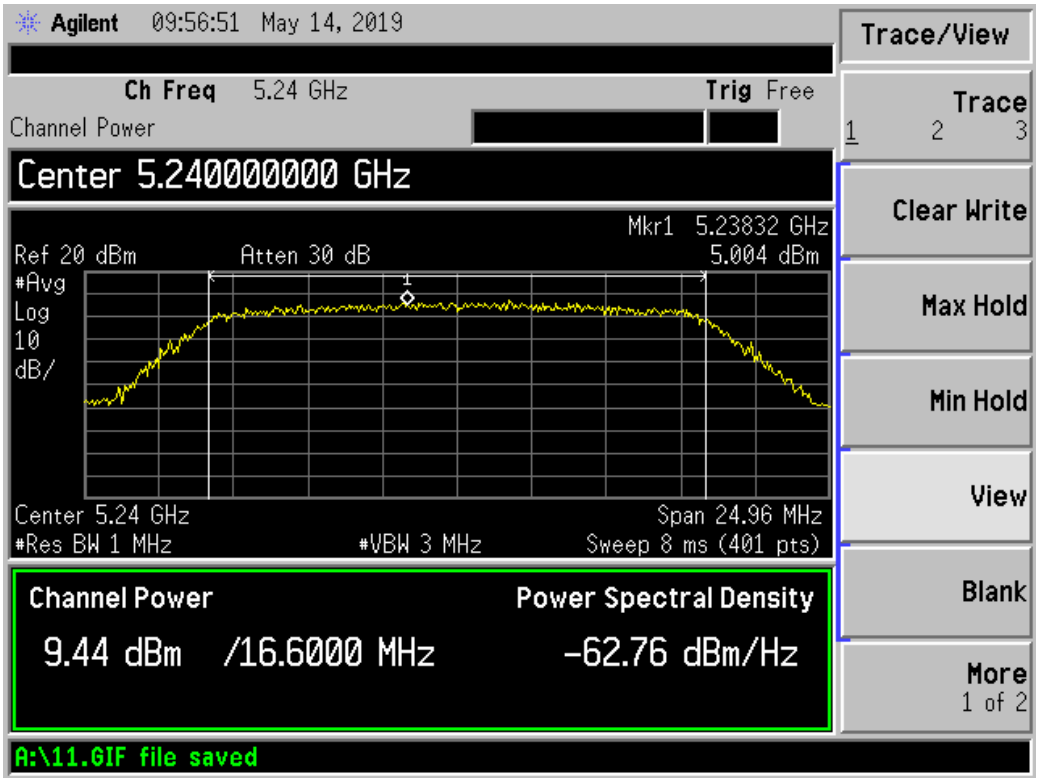
5.1 GHz, OFDM, Low Channel



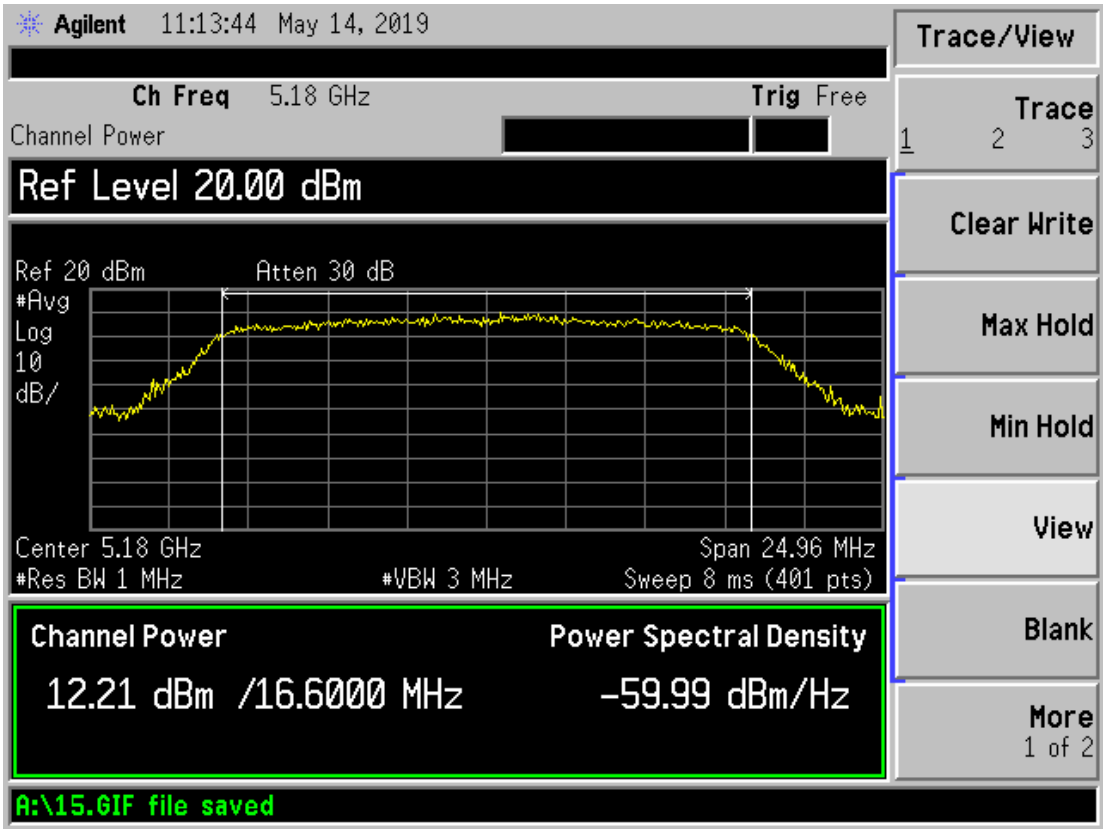
5.1 GHz, OFDM, Mid Channel



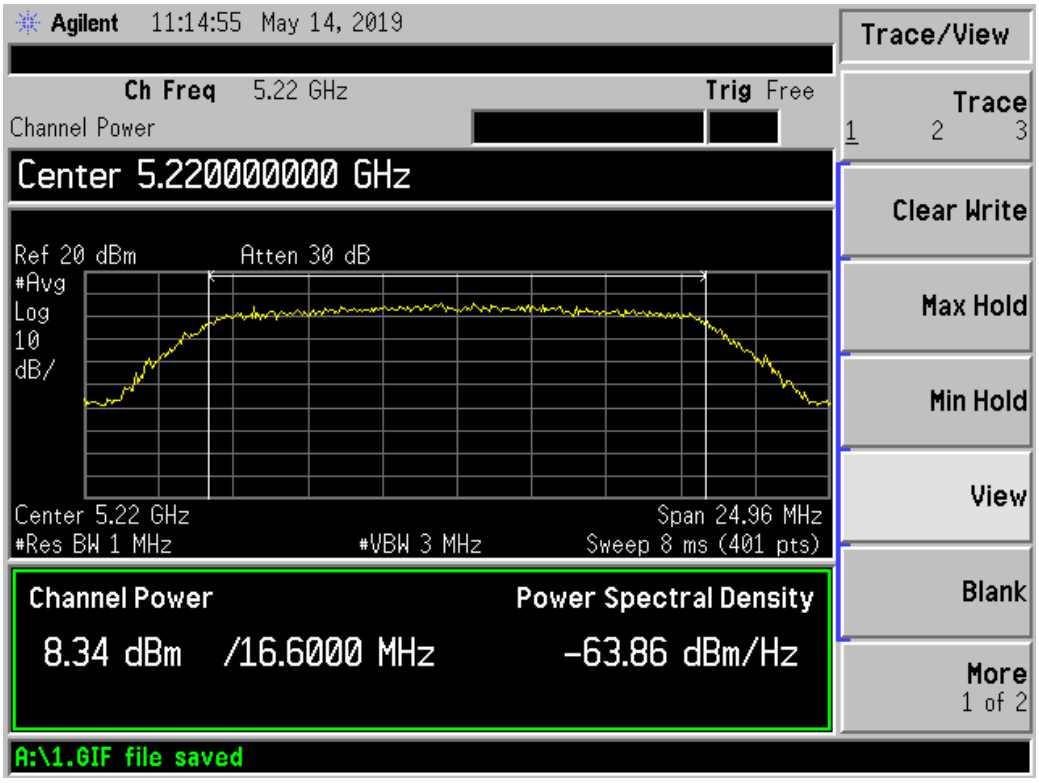
5.1 GHz, OFDM, High Channel



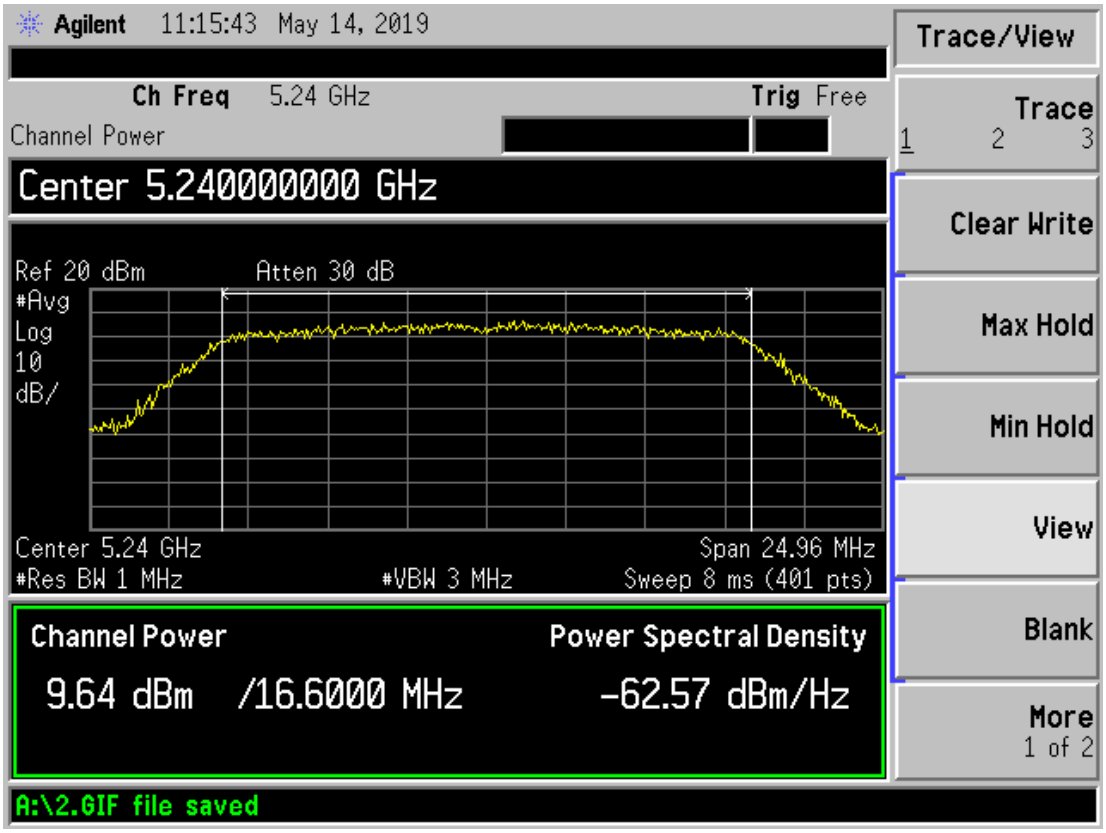
5.1 GHz, HT20, Low Channel



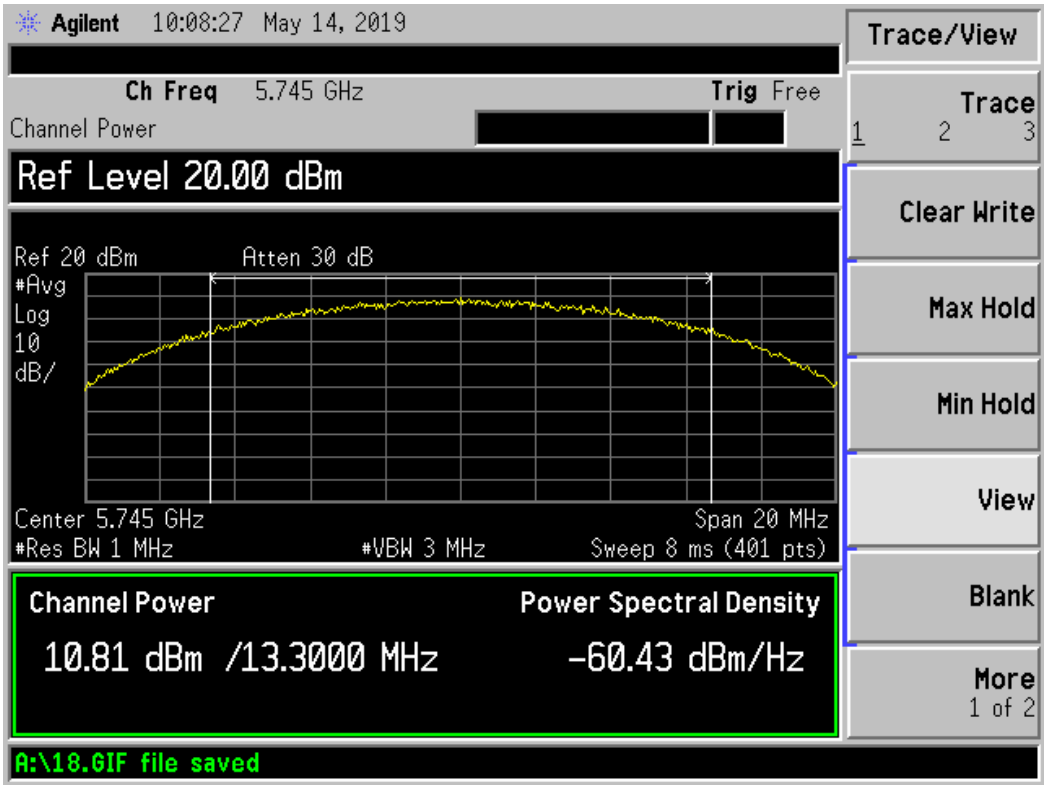
5.1 GHz, HT20, Mid Channel



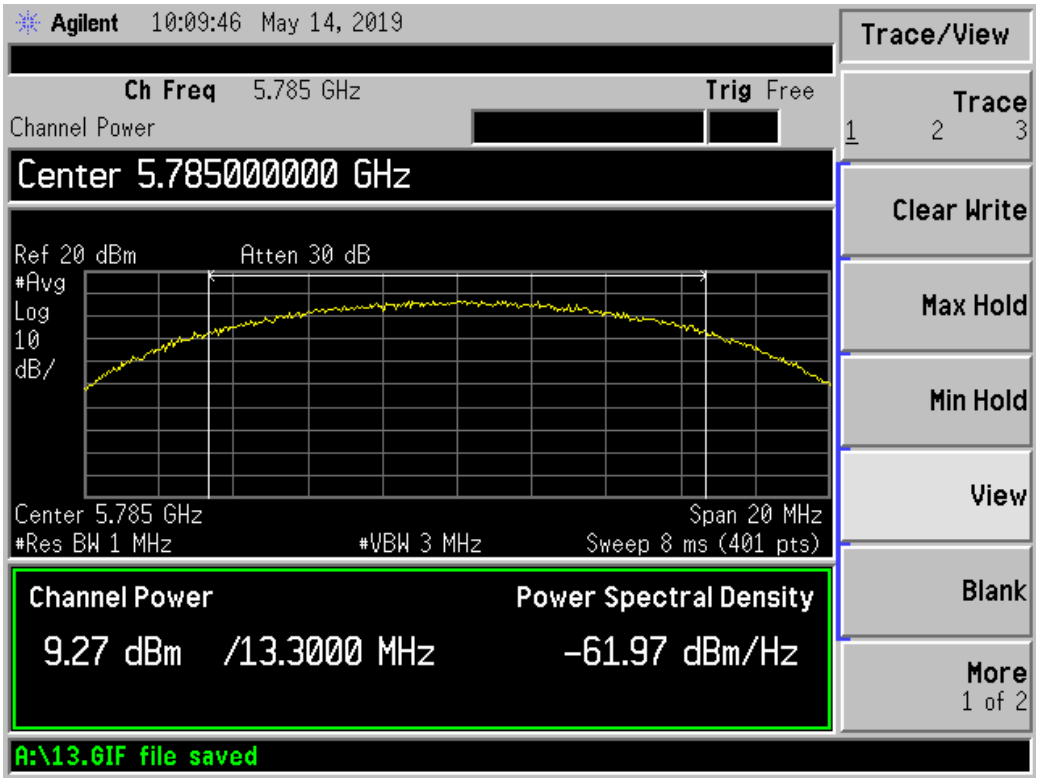
5.1 GHz, HT20, High Channel



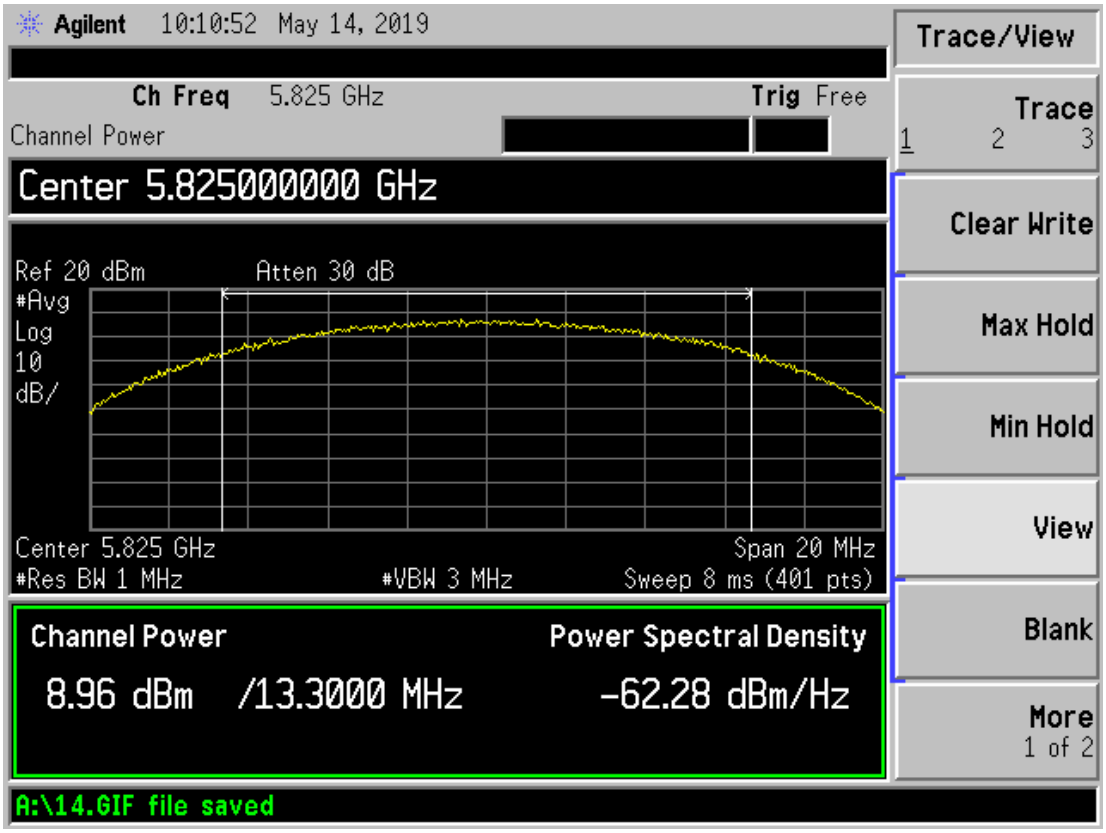
5.7 GHz, CCK, Low Channel



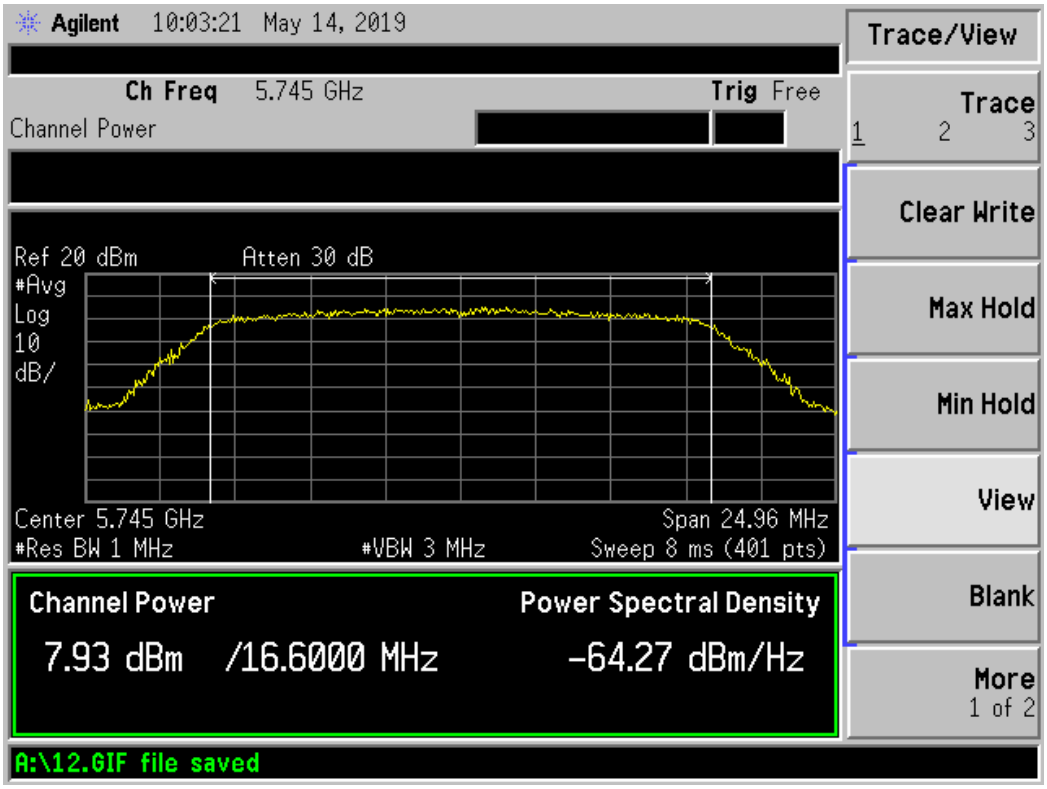
5.7 GHz, CCK, Mid Channel



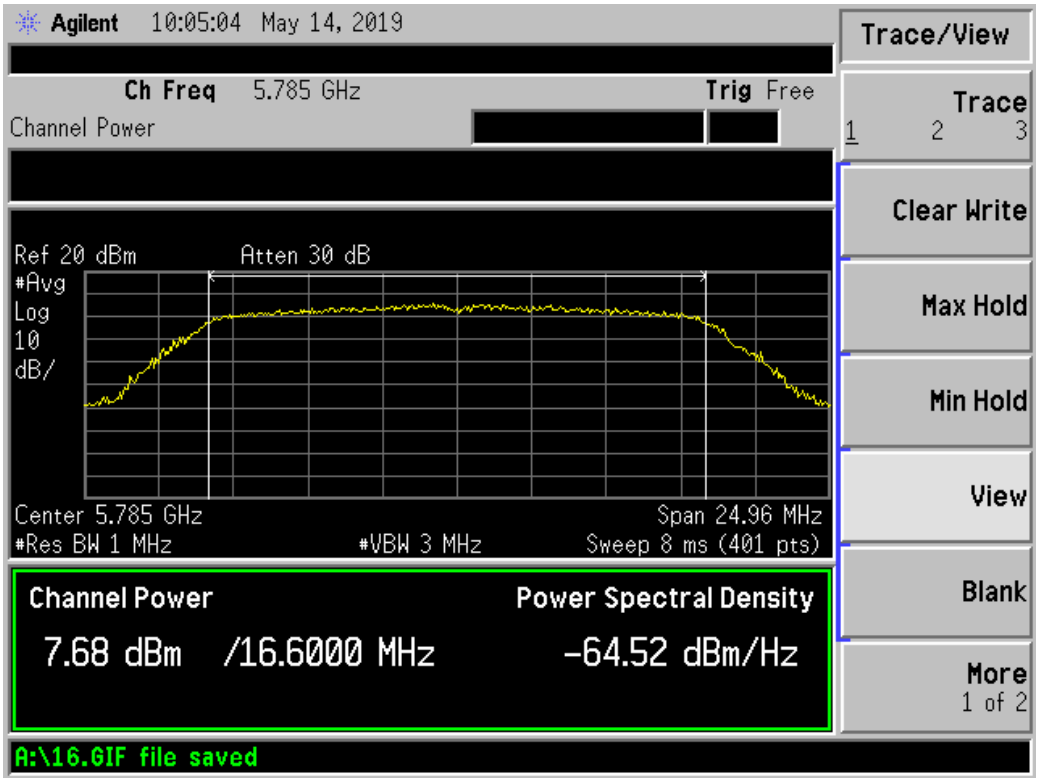
5.7 GHz, CCK, High Channel



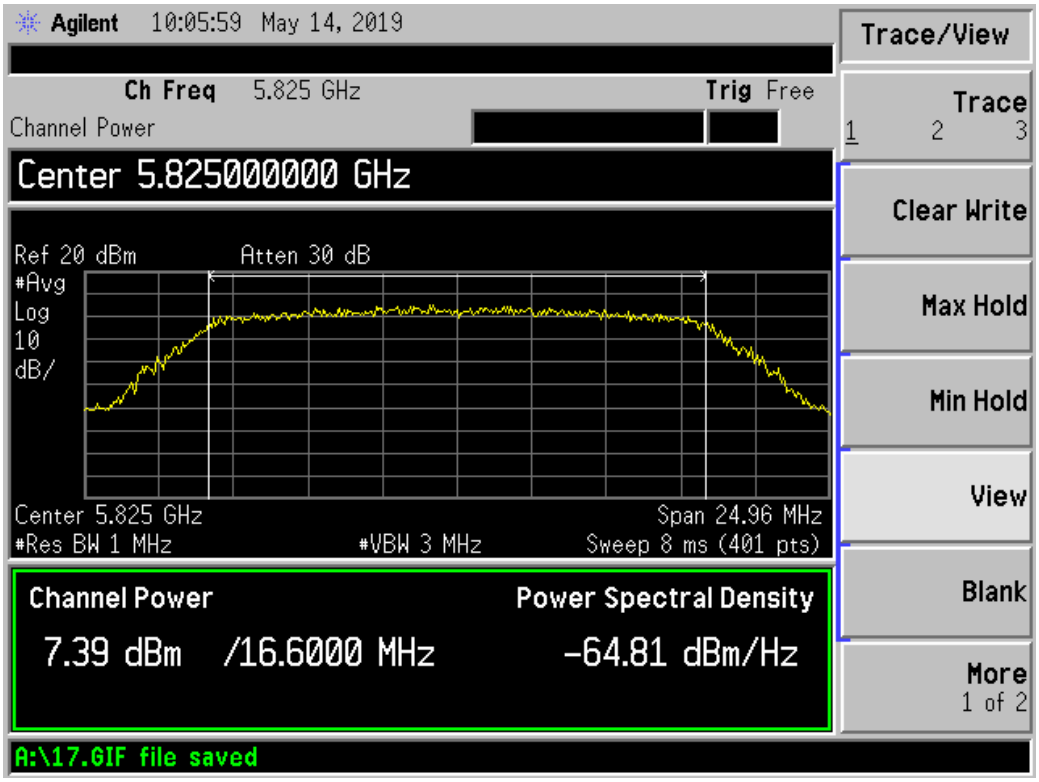
5.7 GHz, OFDM, Low Channel



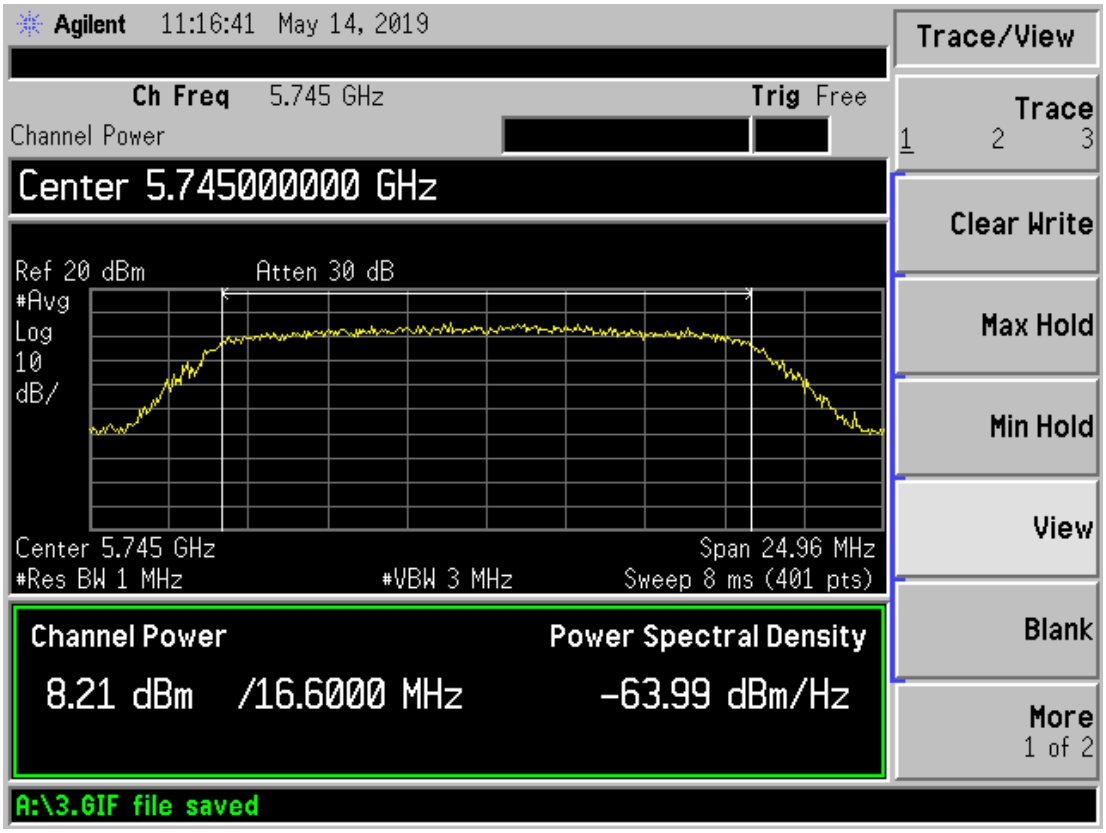
5.7 GHz, OFDM, Mid Channel



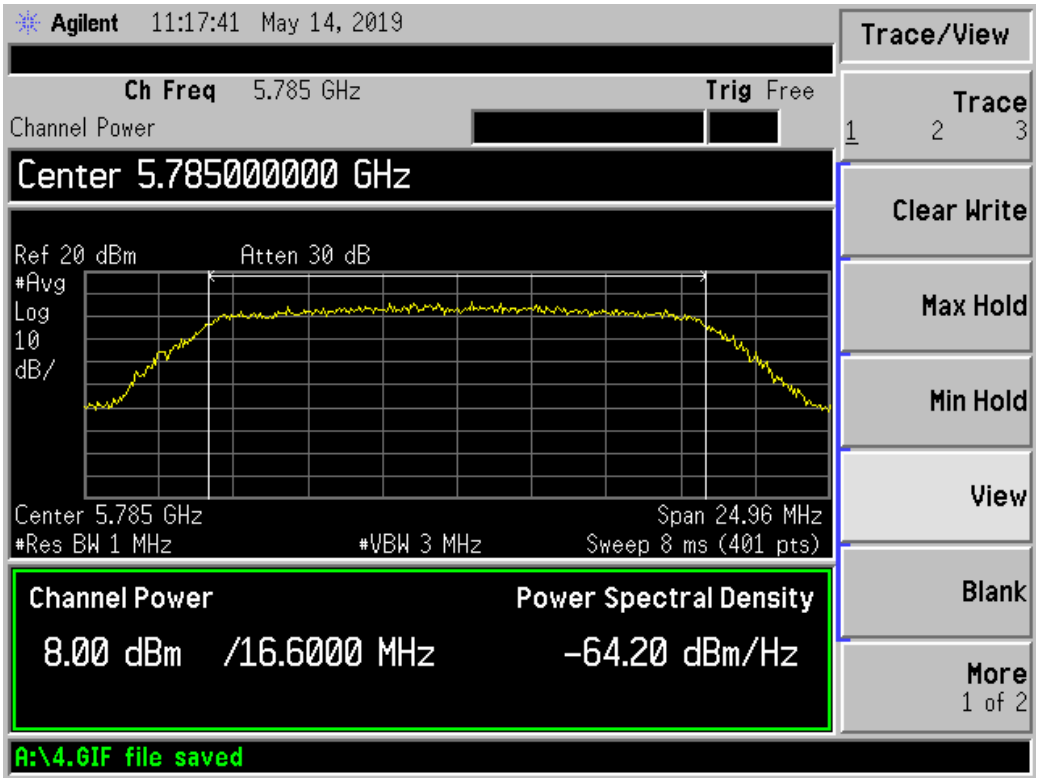
5.7 GHz, OFDM, High Channel



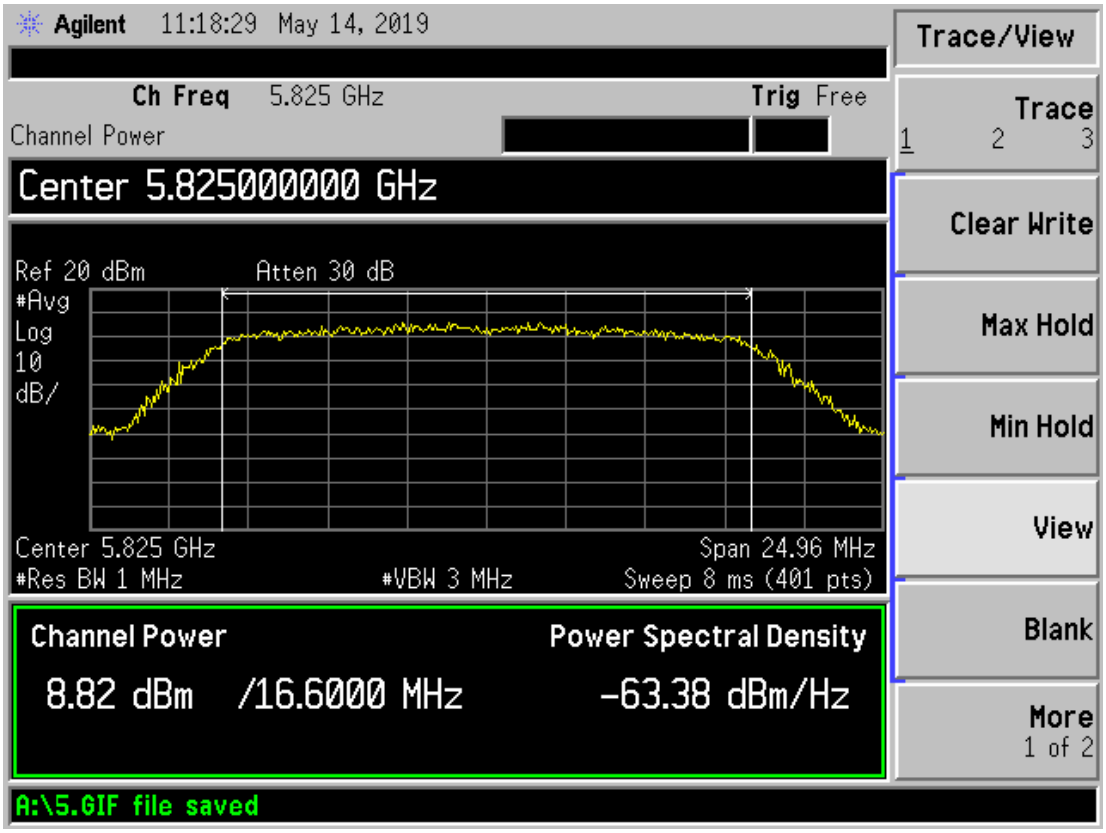
5.7 GHz, HT20, Low Channel



5.7 GHz, HT20, Mid Channel



5.7 GHz, HT20, High Channel



9 PEAK POWER SPECTRAL DENSITY (PSD)

Peak power spectral density measurements were performed.

9.1 Requirements:

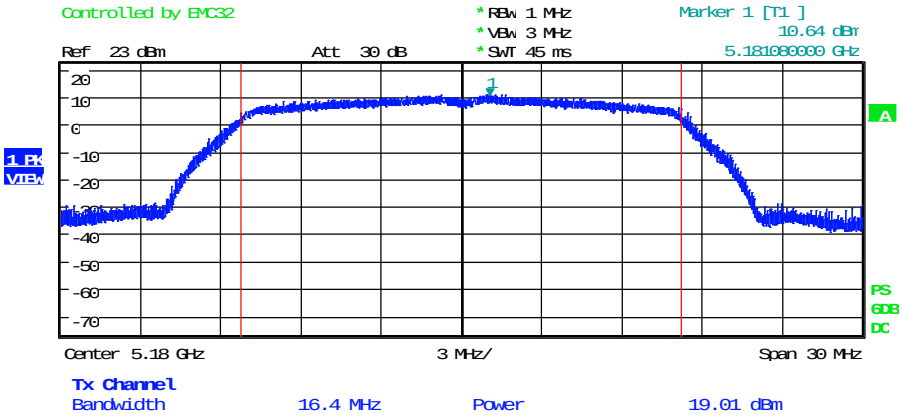
For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6dBi. In addition, the maximum power spectral density shall not exceed 11dBm in any 1 MHz band.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W. In addition, the maximum power spectral density shall not exceed 30dBm in any 500 kHz band.

9.2 Peak Power Spectral Density Test Data

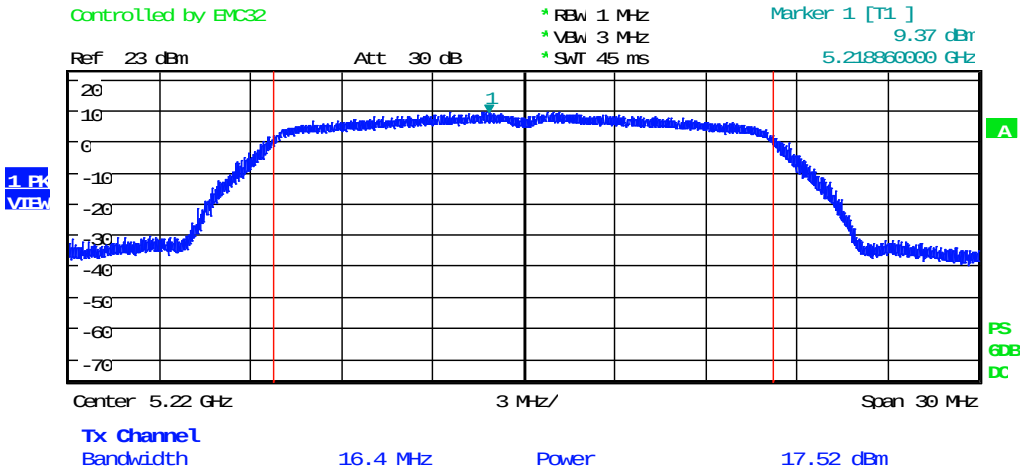
Test Date(s):	Mar. 18, 2019	Test Engineer:	J. Chiller
Standards:	CFR 47 Part 15.407(a)(1,3); KDB789033	Air Temperature:	22.9ºC
		Relative Humidity:	33%

5.1 GHz, Low Channel



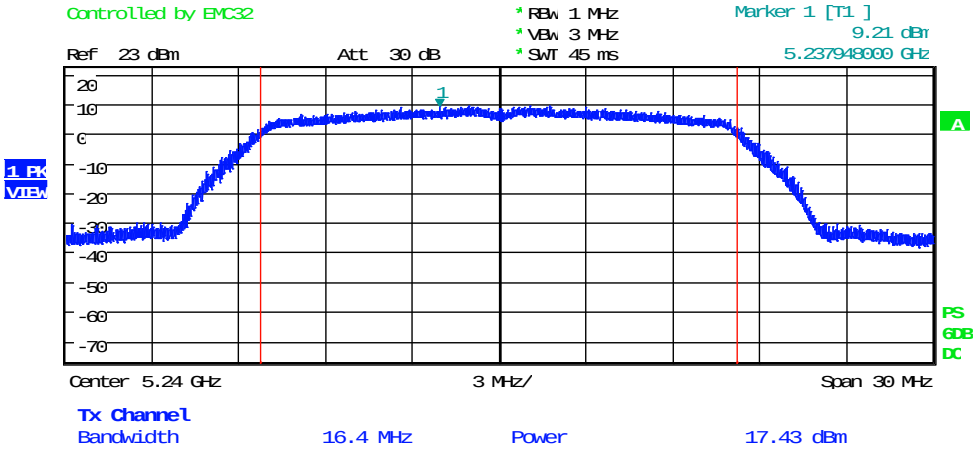
Date: 18.MAR.2019 11:28:17

5.1 GHz, Mid Channel



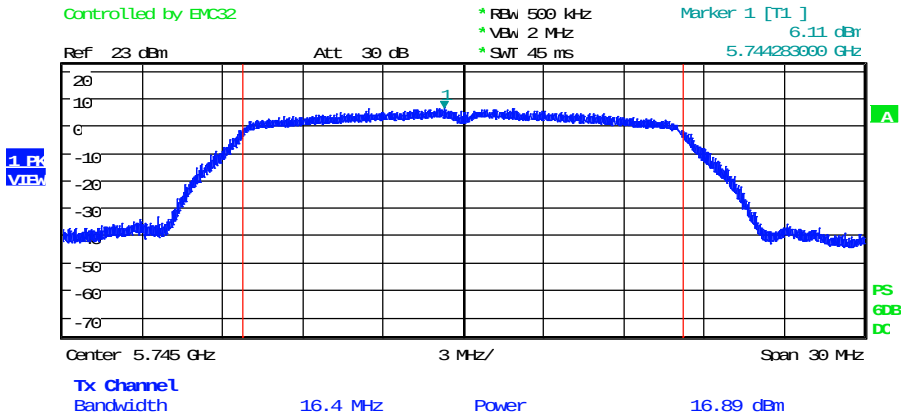
Date: 18.MAR.2019 11:29:47

5.1 GHz, High Channel



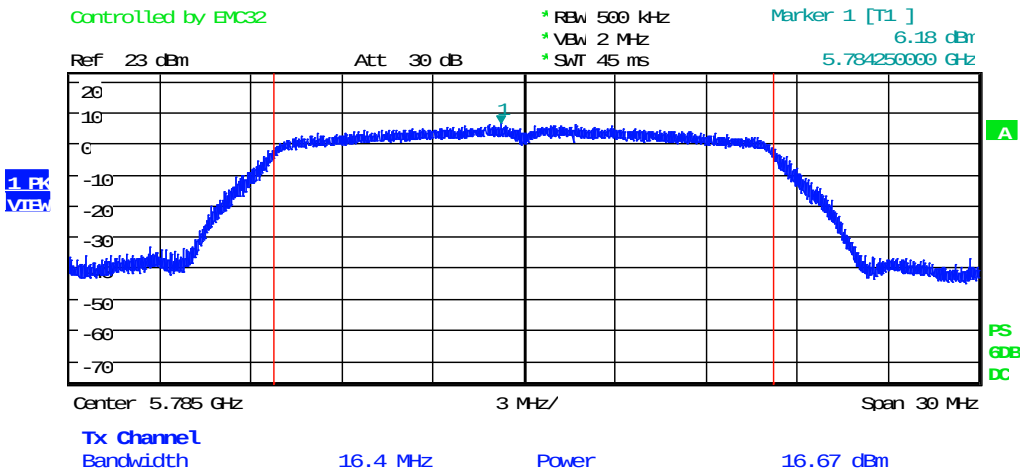
Date: 18.MAR.2019 11:30:49

5.7 GHz, Low Channel



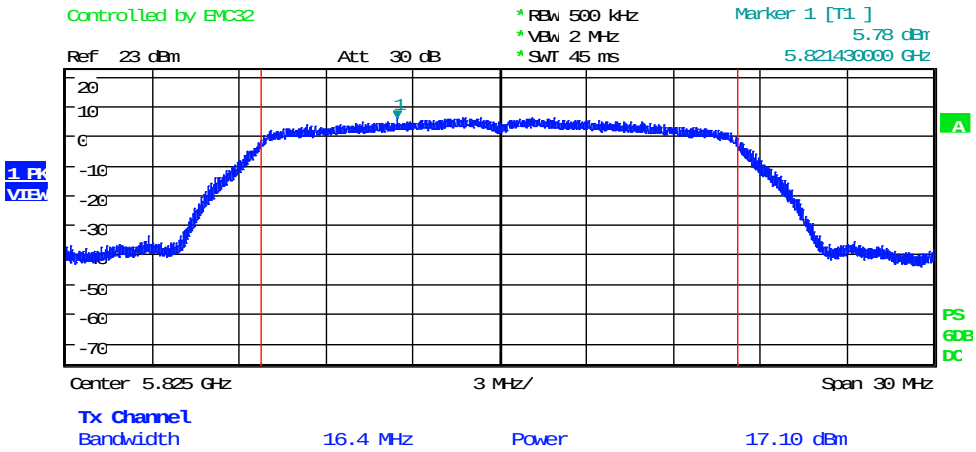
Date: 18.MAR.2019 12:02:54

5.7 GHz, Mid Channel



Date: 18.MAR.2019 12:01:40

5.7 GHz, High Channel



Date: 18.MAR.2019 12:00:32

10 RADIATED SPURIOUS EMISSION

The EUT antenna port was fitted with its integral/internal chip antenna. Radiated emissions were measured in a Semi-Anechoic Chamber. All emissions generated that fall in the restricted bands per FCC Part 15.205 were examined.

10.1 Requirements:

All emissions that fall in the restricted bands defined in FCC Part 15.205 shall not exceed the maximum field strength listed in FCC Part 15.209(a).

All other undesirable emission that do not fall under the provisions of Part 15.205, shall meet 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.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

NOTE: Per KDB 789033 D02 General UNII Test Procedures New Rules v01, the requirements of 15.407(b)(1) & 15.407(b)(4) are met due to all of the out of band peak and average emissions being below the limits of 15.209.

10.2 Radiated Spurious Emission Test Data

Test Date(s):	Mar. 11, 2019	**Test Engineer:**	J. Chiller
Standards:	CFR 47 Part 15.407; Part 15.209 / KDB789033	**Air Temperature:**	23.8ºC
		Relative Humidity:	23%

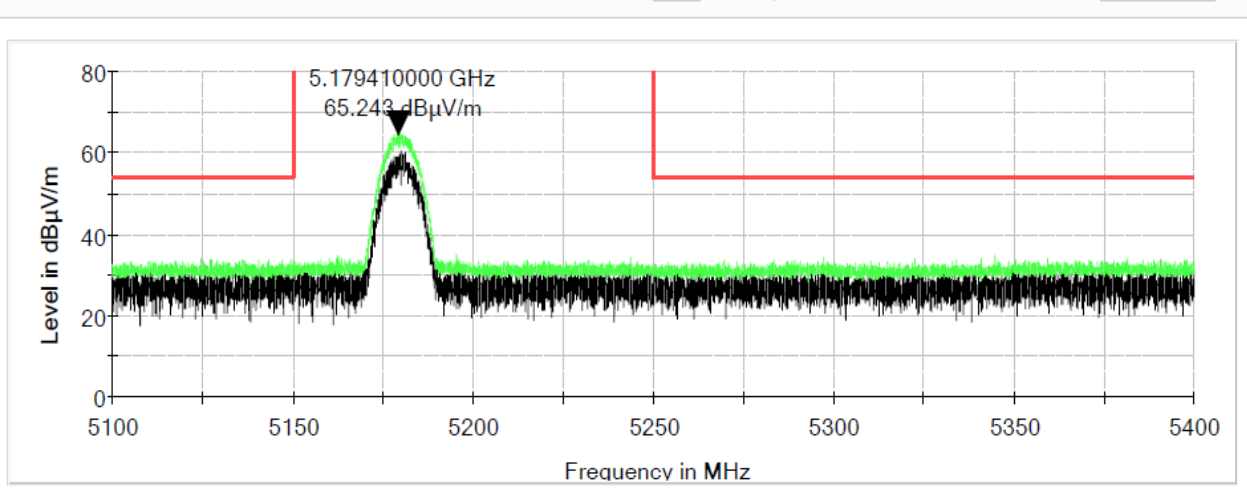
Notes: Plots are peak, max hold prescan data included only to determine what frequencies to investigate and measure. The EUT was initially placed in a semi-anechoic chamber, and rotated in all three orthogonal positions to maximize the emissions. The orthogonal position that showed the highest emissions was used. Characterization measurements were then performed to determine at which frequencies significant emissions occurred. These graphs are shown below.

The equipment was fully exercised with all cabling attached to the EUT and was positioned in a semi-anechoic chamber for maximum emissions. While the equipment was energized, the receiving antenna was scanned from 1.0 meter to 4.0 meters in both vertical and horizontal polarities while the turntable was adjusted 360 degrees to determine the maximum field strength. The tables of measured results can be found below.

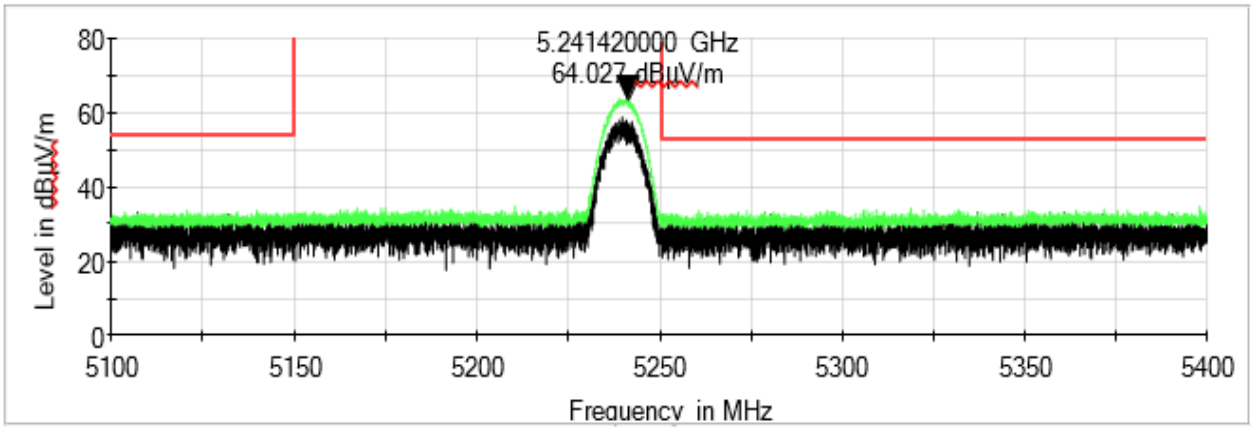
Some of the frequencies did not change with the EUT on or off. At those frequencies, the test distance was shortened to 1 meter and still no emissions from the EUT were visible or over the ambient or limit.

In the following plots, emissions to be found by the EUT were measured and listed in tables. The black lines are active scans while the green lines are the max peak scan of the unit during rotations. The plots are for reference only and the limit lines are not actual limit lines but merely a guide.

Radiated Band Edge: 5.1 GHz, CCK - Low

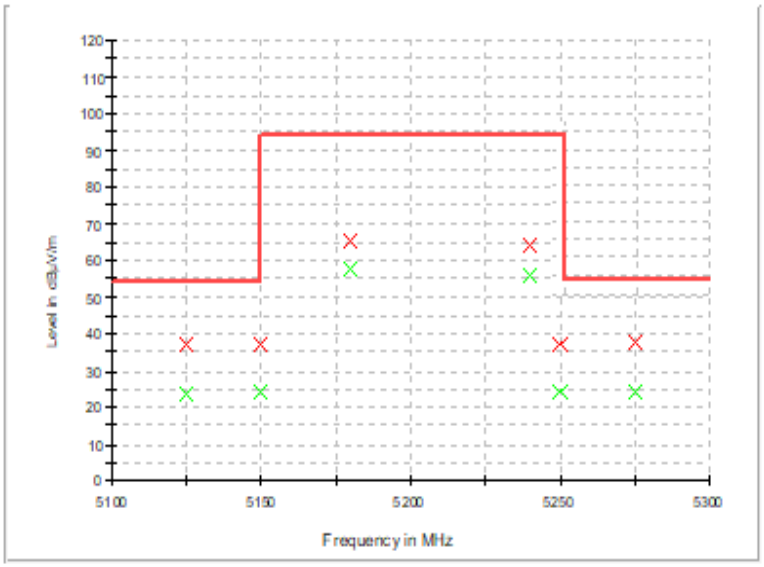


Radiated Band Edge: 5.1 GHz, CCK - High

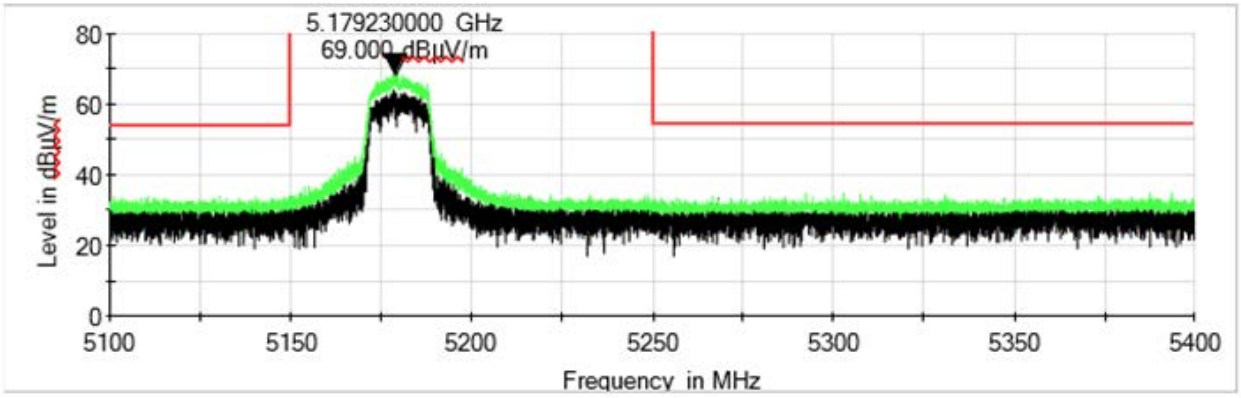


Radiated Band Edge: 5.1 GHz, CCK - Measurements

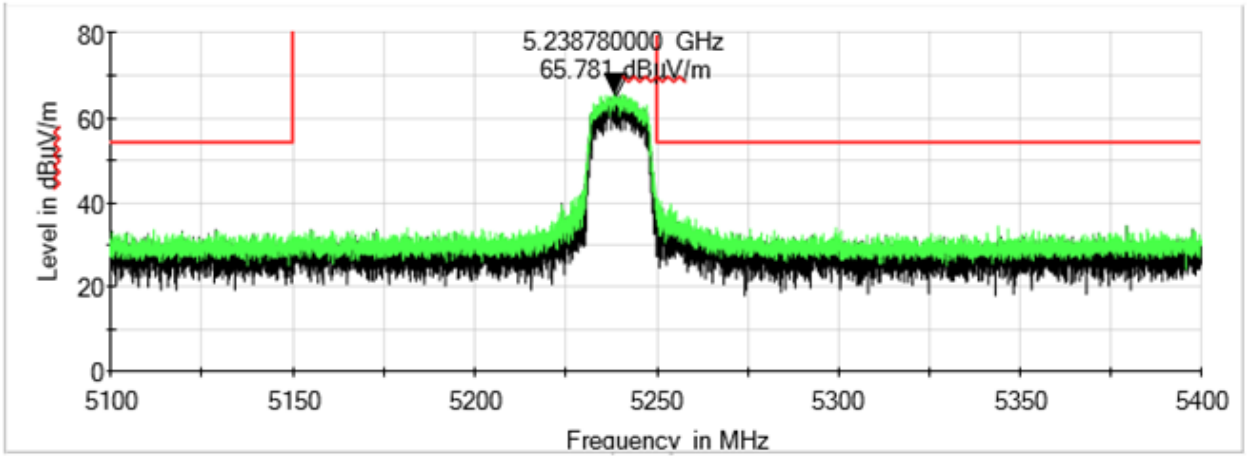
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
5125.000000	37.0	23.9	1000.0	1000.000	150.0	V	45.0	-3.5	30.1	54.0
5150.000000	37.1	24.3	1000.0	1000.000	150.0	V	45.0	-3.2	69.7	94.0
5180.000000	65.6	57.7	1000.0	1000.000	150.0	V	45.0	-3.2	36.3	94.0
5240.000000	64.3	55.9	1000.0	1000.000	150.0	V	336.0	-3.2	38.1	94.0
5250.000000	37.2	24.0	1000.0	1000.000	150.0	V	336.0	-3.2	30.0	54.0
5275.000000	37.3	24.4	1000.0	1000.000	150.0	V	336.0	-3.2	29.6	54.0



Radiated Band Edge: 5.1 GHz, OFDM - Low

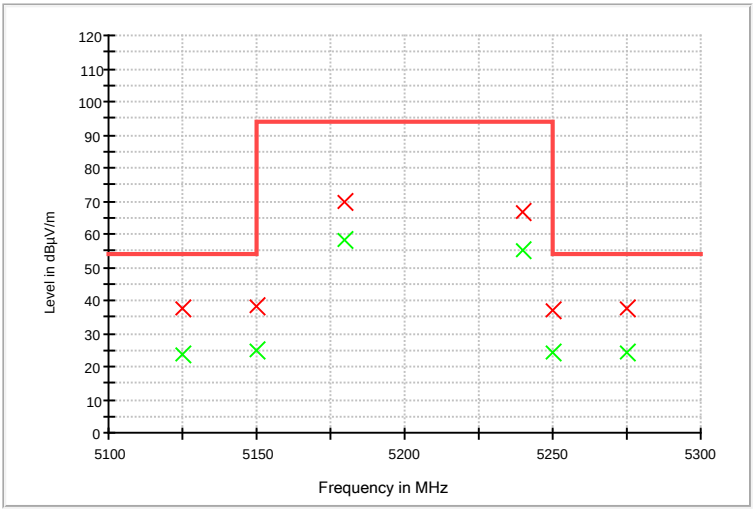


Radiated Band Edge: 5.1 GHz, OFDM - High

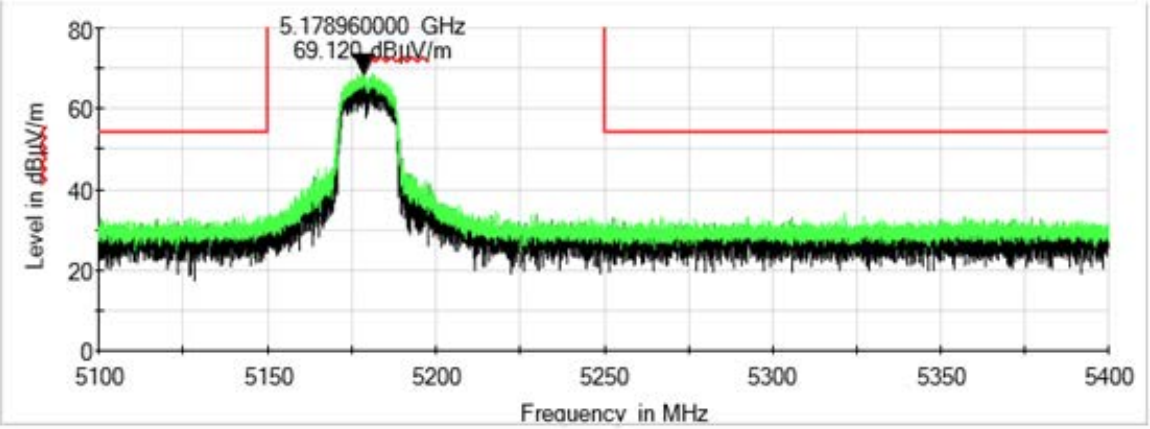


Radiated Band Edge: 5.1 GHz, OFDM - Measurements

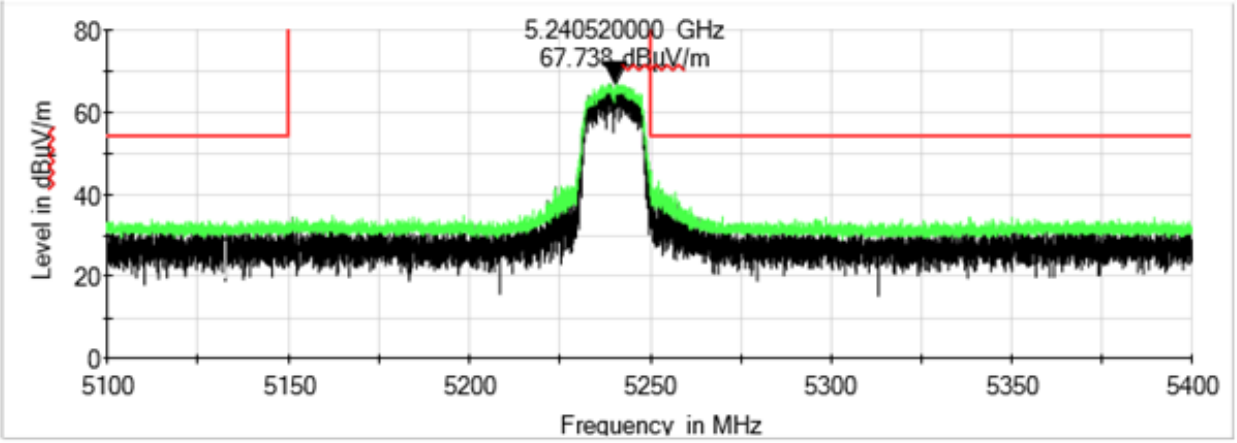
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
5125.000000	37.3	23.9	1000.0	1000.000	150.0	V	45.0	-3.5	30.1	54.0	
5150.000000	38.4	24.9	1000.0	1000.000	150.0	V	45.0	-3.2	69.1	94.0	
5180.000000	69.5	58.0	1000.0	1000.000	150.0	V	45.0	-3.2	36.0	94.0	
5240.000000	66.7	55.4	1000.0	1000.000	150.0	V	340.0	-3.2	38.6	94.0	
5250.000000	37.1	24.0	1000.0	1000.000	150.0	V	340.0	-3.2	30.0	54.0	
5275.000000	37.4	24.1	1000.0	1000.000	150.0	V	340.0	-3.2	29.9	54.0	



Radiated Band Edge: 5.1 GHz, HT20 - Low

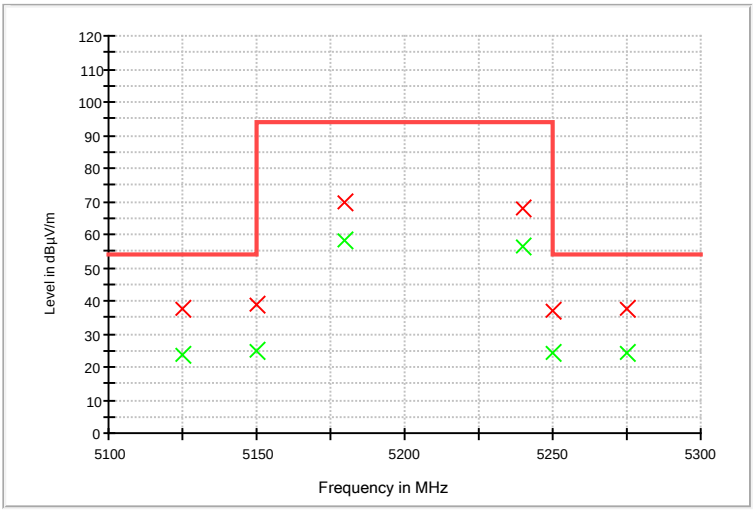


Radiated Band Edge: 5.1 GHz, HT20 - High

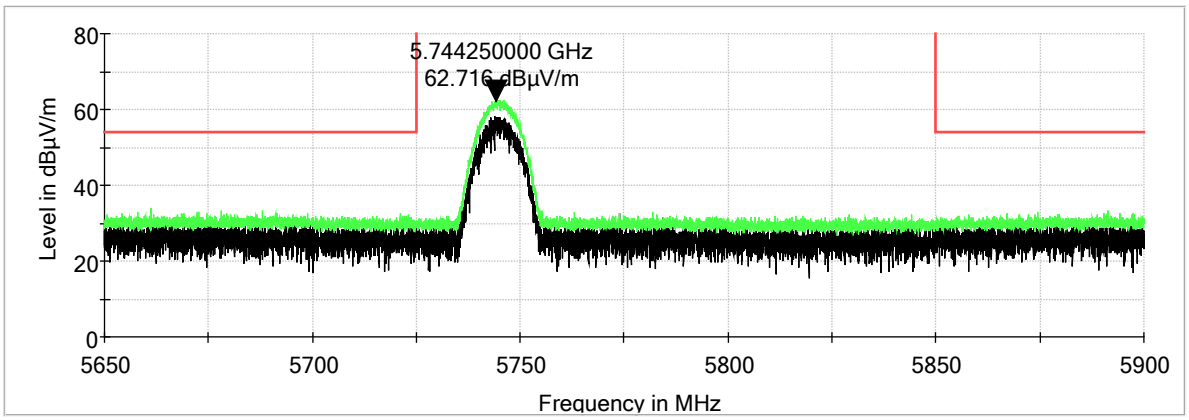


Radiated Band Edge: 5.1 GHz, HT20 - Measurements

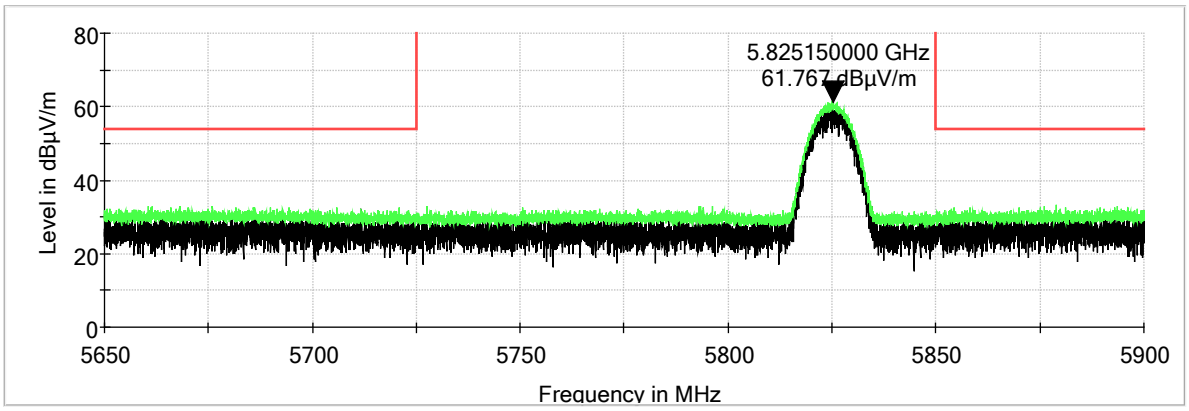
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
5125.000000	37.3	23.9	1000.0	1000.000	150.0	V	45.0	-3.5	30.1	54.0
5150.000000	39.0	24.9	1000.0	1000.000	150.0	V	45.0	-3.2	69.1	94.0
5180.000000	69.4	58.2	1000.0	1000.000	150.0	V	45.0	-3.2	35.8	94.0
5240.000000	67.7	56.4	1000.0	1000.000	150.0	V	50.0	-3.2	37.6	94.0
5250.000000	37.2	24.2	1000.0	1000.000	150.0	V	50.0	-3.2	29.8	54.0
5275.000000	37.4	24.5	1000.0	1000.000	150.0	V	50.0	-3.2	29.5	54.0



Radiated Band Edge: 5.7 GHz, CCK - Low

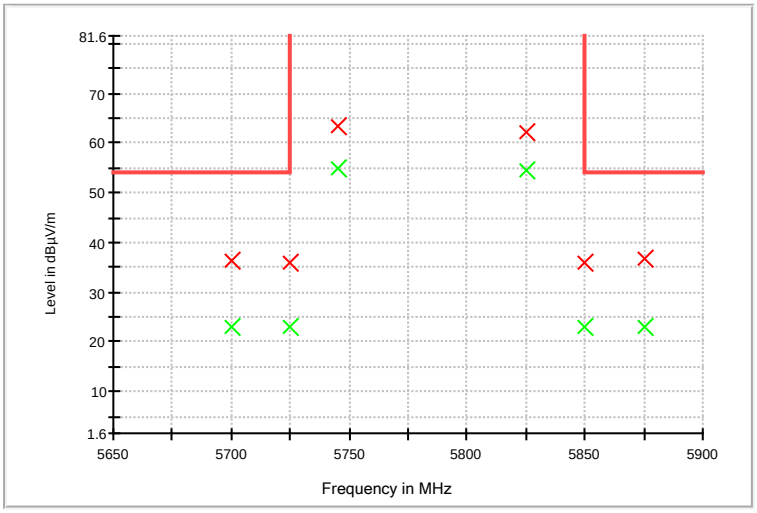


Radiated Band Edge: 5.7 GHz, CCK - High

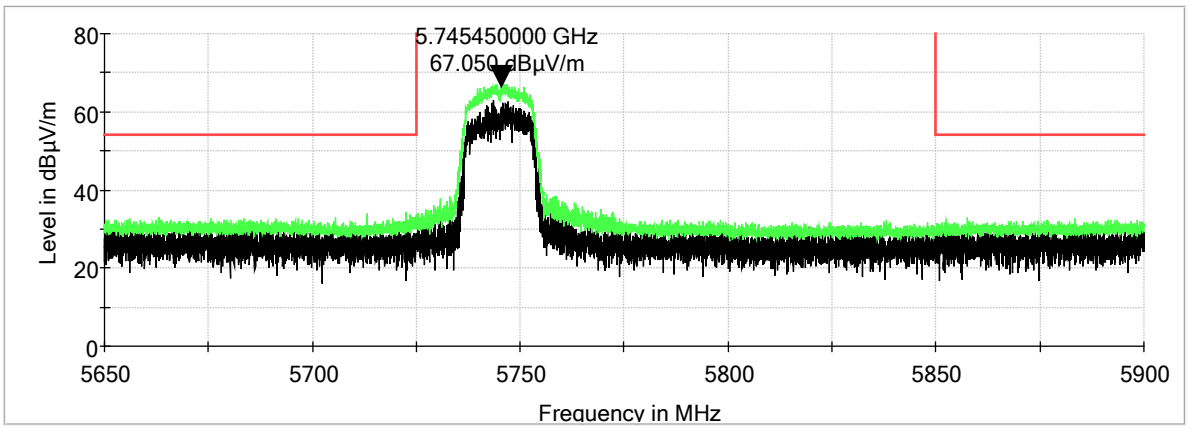


Radiated Band Edge: 5.7 GHz, CCK - Measurements

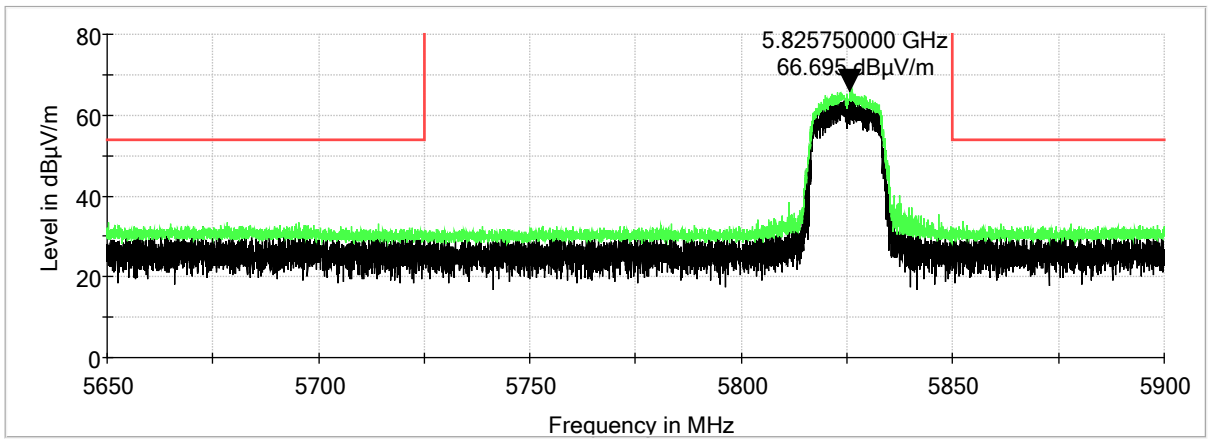
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
5700.000000	36.4	23.0	1000.0	1000.000	150.0	V	76.0	-4.2	31.0	54.0	
5725.000000	36.0	22.8	1000.0	1000.000	150.0	V	76.0	-4.3	71.2	94.0	
5745.000000	63.4	54.7	1000.0	1000.000	150.0	V	76.0	-4.3	39.3	94.0	
5825.000000	62.3	54.3	1000.0	1000.000	150.0	V	88.0	-4.5	39.7	94.0	
5850.000000	36.0	22.9	1000.0	1000.000	150.0	V	88.0	-4.1	31.1	54.0	
5875.000000	36.6	23.0	1000.0	1000.000	150.0	V	88.0	-4.1	31.0	54.0	



Radiated Band Edge: 5.7 GHz, OFDM - Low

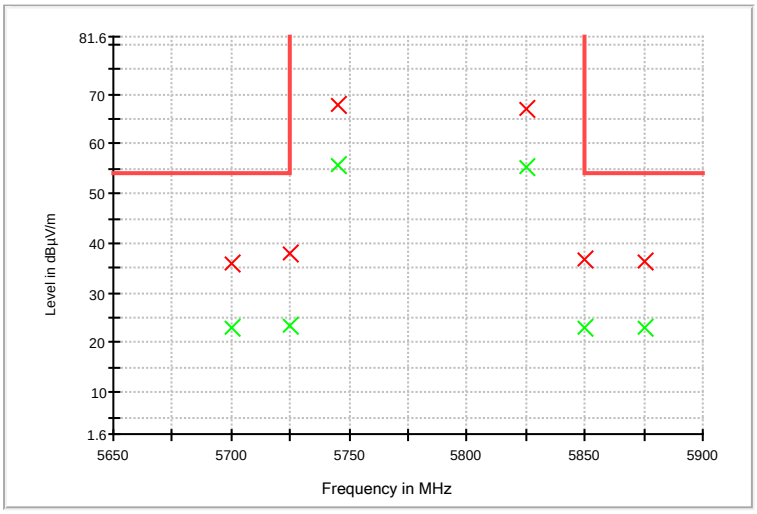


Radiated Band Edge: 5.7 GHz, OFDM - High

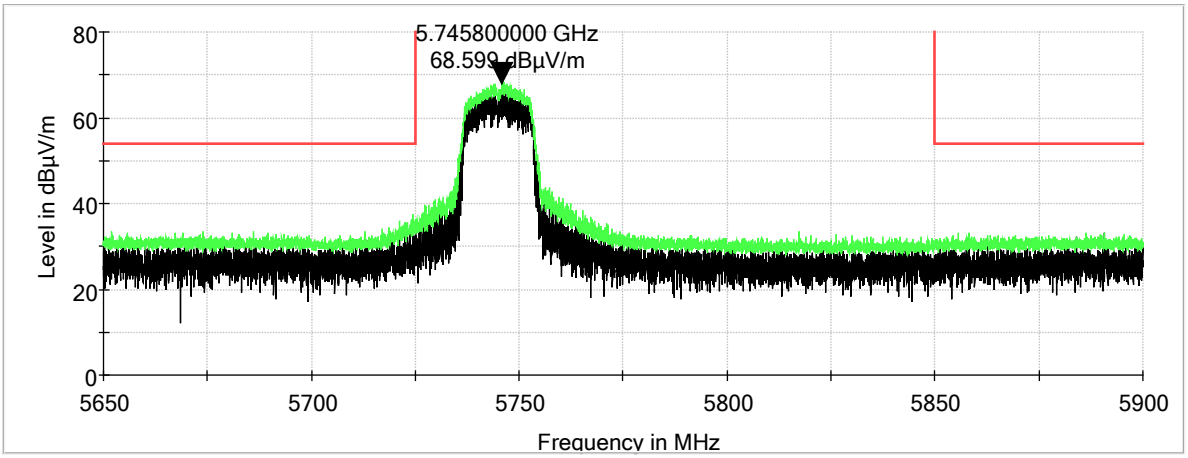


Radiated Band Edge: 5.7 GHz, OFDM - Measurements

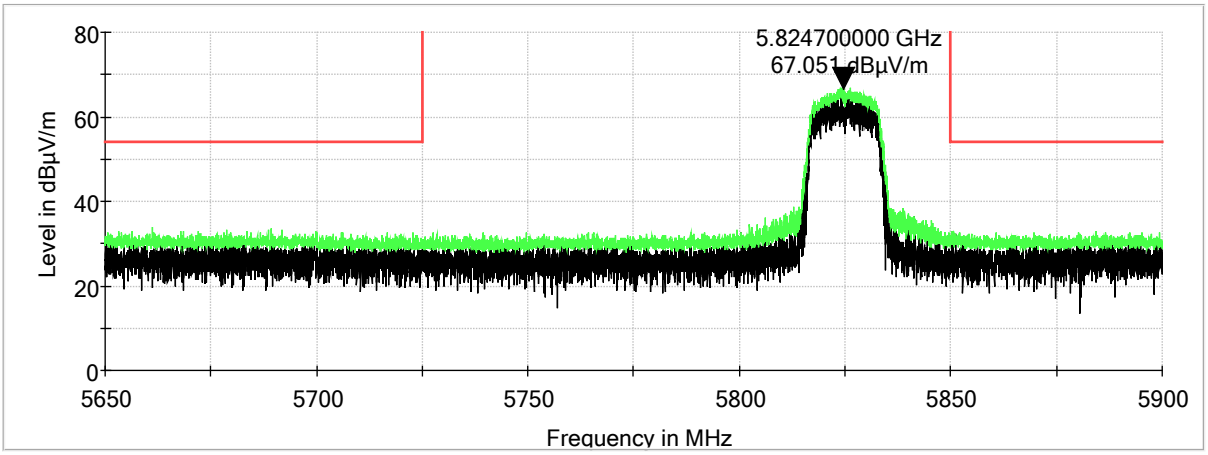
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
5700.000000	36.1	23.0	1000.0	1000.000	150.0	V	106.0	-4.2	31.0	54.0	
5725.000000	38.0	23.5	1000.0	1000.000	150.0	V	106.0	-4.3	70.5	94.0	
5745.000000	67.9	55.8	1000.0	1000.000	150.0	V	101.0	-4.3	38.2	94.0	
5825.000000	67.2	55.3	1000.0	1000.000	150.0	V	79.0	-4.5	38.7	94.0	
5850.000000	36.7	23.1	1000.0	1000.000	150.0	V	79.0	-4.1	30.9	54.0	
5875.000000	36.5	23.0	1000.0	1000.000	150.0	V	79.0	-4.1	31.0	54.0	



Radiated Band Edge: 5.7 GHz, HT20 - Low

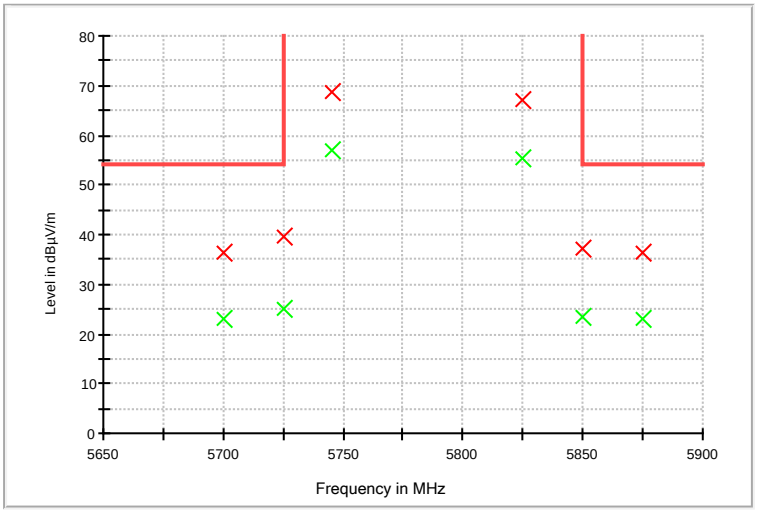


Radiated Band Edge: 5.7 GHz, HT20 - High

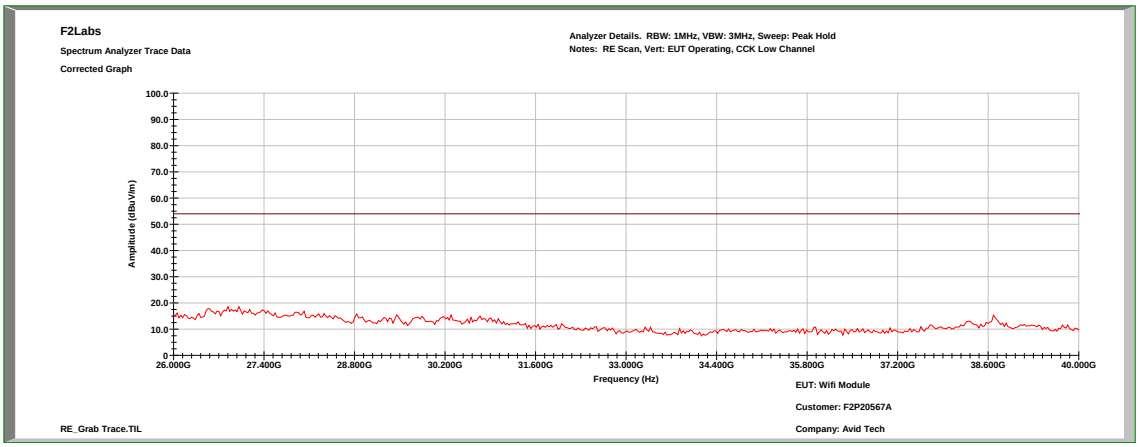


Radiated Band Edge: 5.7 GHz, HT20 - Measurements

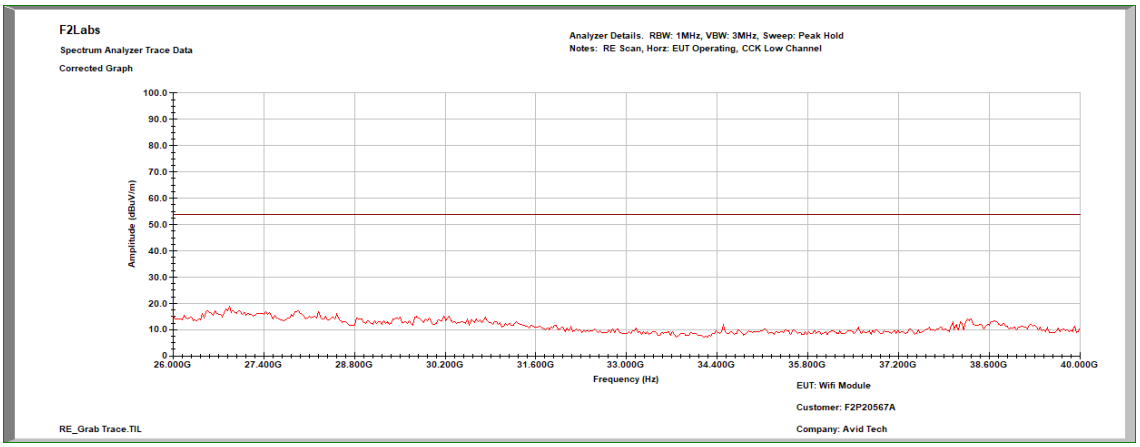
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV/m)	Comment
5700.000000	36.3	23.0	1000.0	1000.000	150.0	V	81.0	-4.2	31.0	54.0	
5725.000000	39.6	25.0	1000.0	1000.000	150.0	V	81.0	-4.3	69.0	94.0	
5745.000000	68.5	56.9	1000.0	1000.000	150.0	V	81.0	-4.3	37.1	94.0	
5825.000000	67.1	55.4	1000.0	1000.000	150.0	V	103.0	-4.5	38.6	94.0	
5850.000000	37.1	23.3	1000.0	1000.000	150.0	V	103.0	-4.1	30.7	54.0	
5875.000000	36.5	23.0	1000.0	1000.000	150.0	V	103.0	-4.1	31.0	54.0	



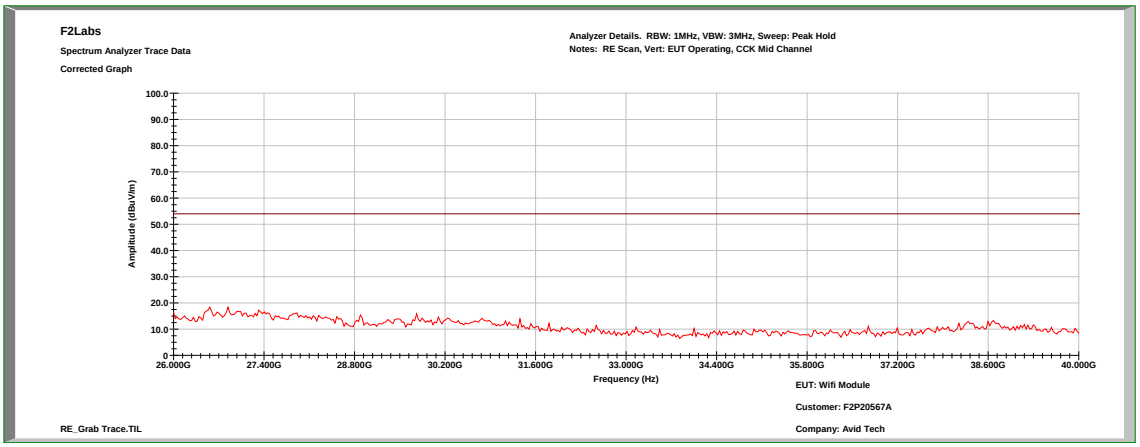
5.1 GHz, CCK, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Vertical



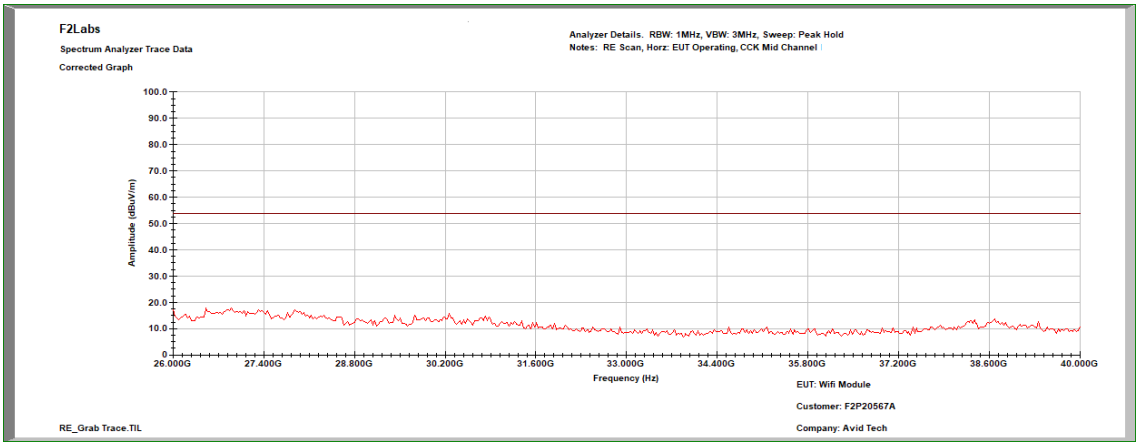
5.1 GHz, CCK, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Horizontal



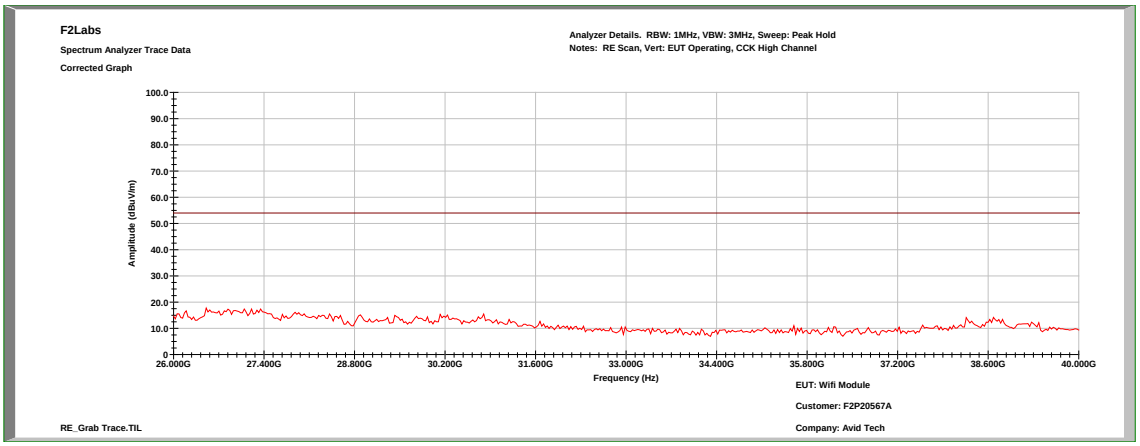
5.1 GHz, CCK, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Vertical



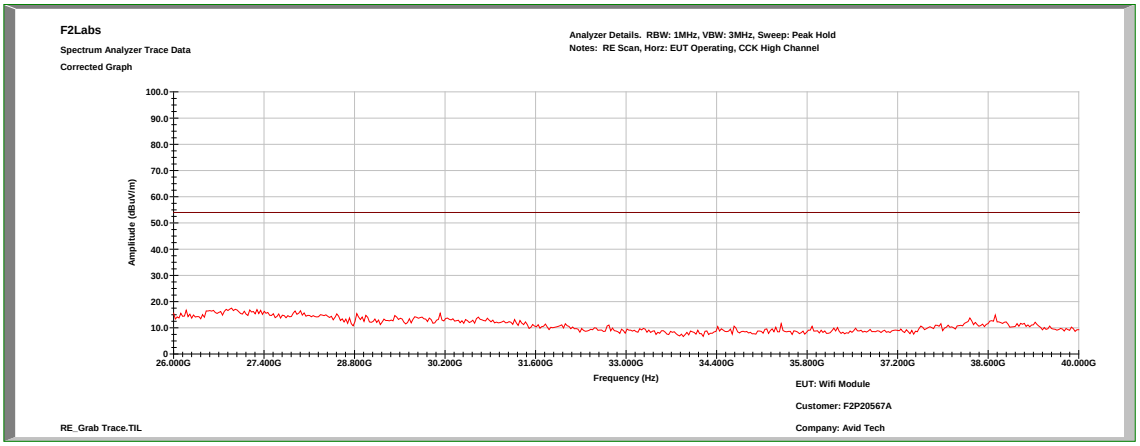
5.1 GHz, CCK, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Horizontal



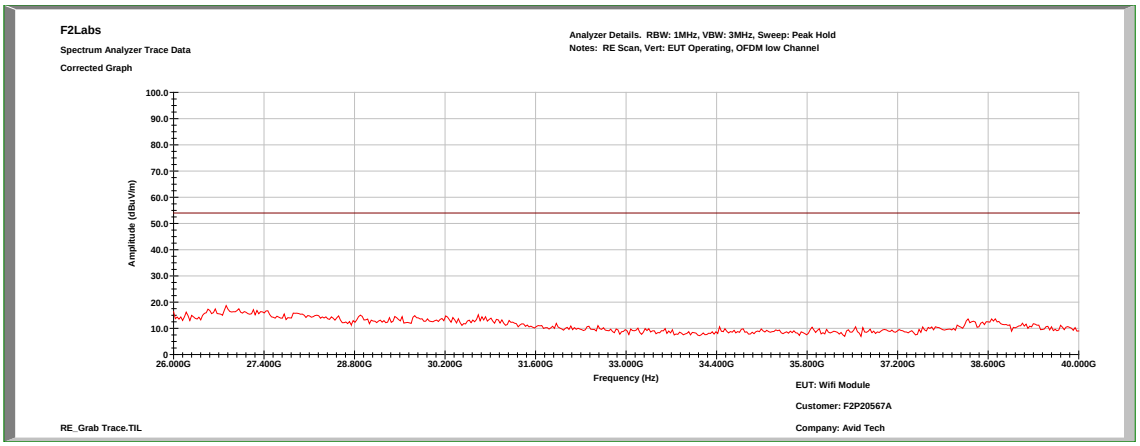
5.1 GHz, CCK, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Vertical



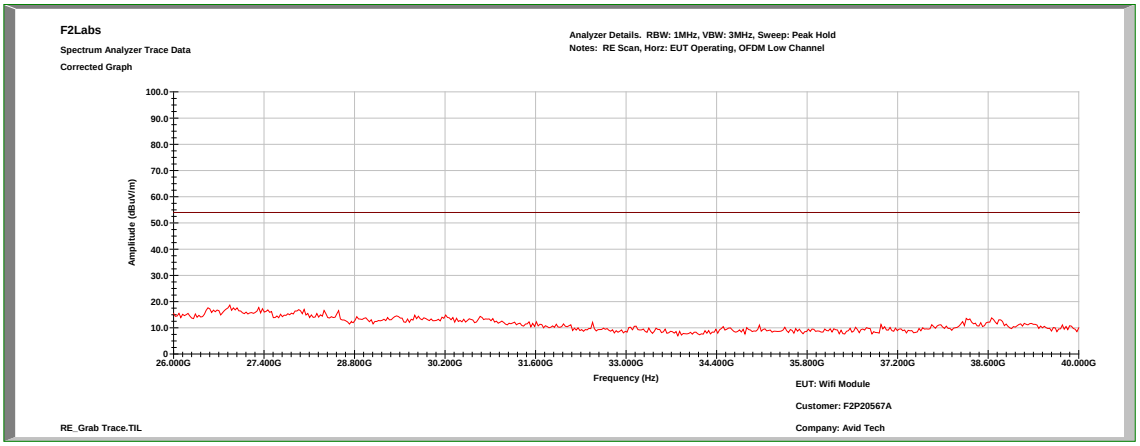
5.1 GHz, CCK, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Horizontal



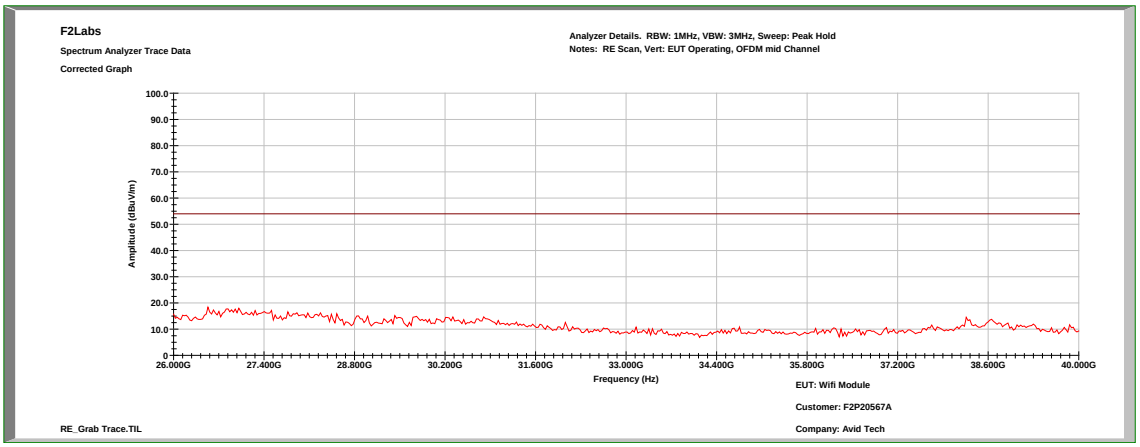
5.1 GHz, OFDM, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Vertical



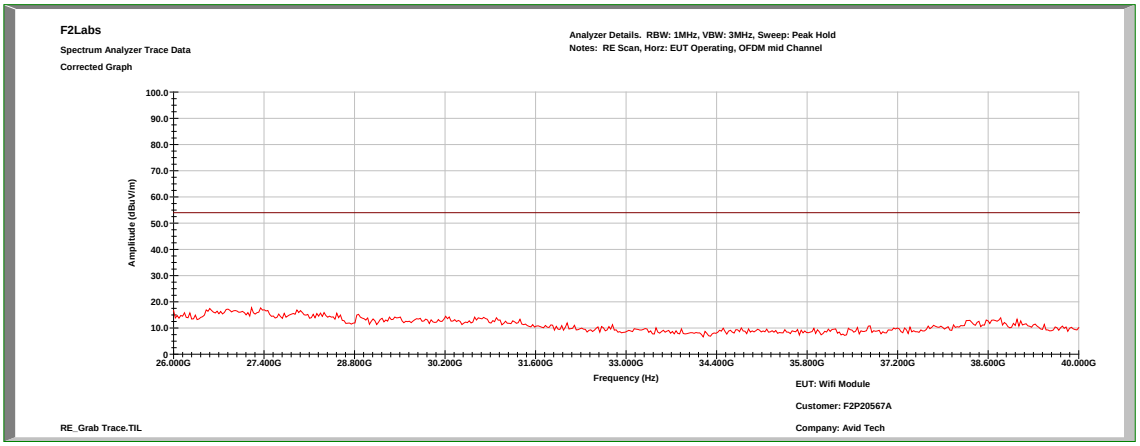
5.1 GHz, OFDM, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Horizontal



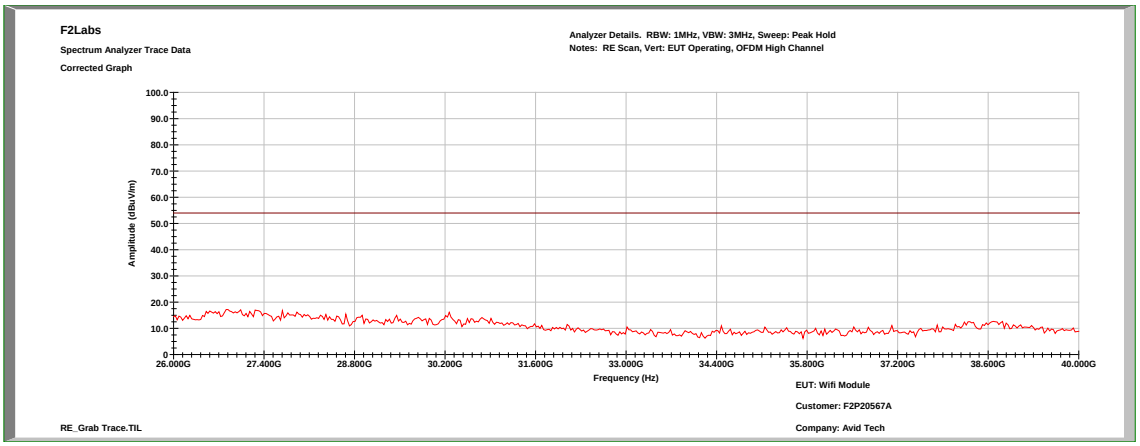
5.1 GHz, OFDM, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Vertical



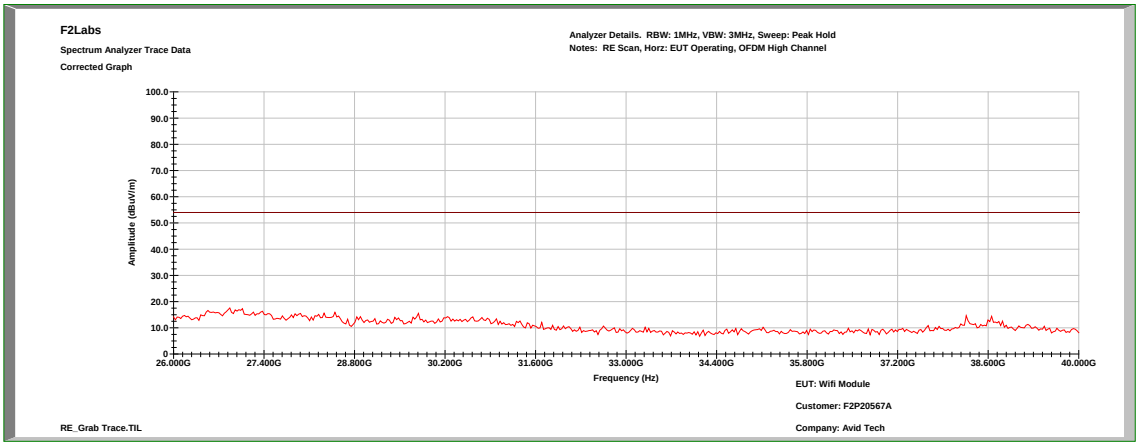
5.1 GHz, OFDM, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Horizontal



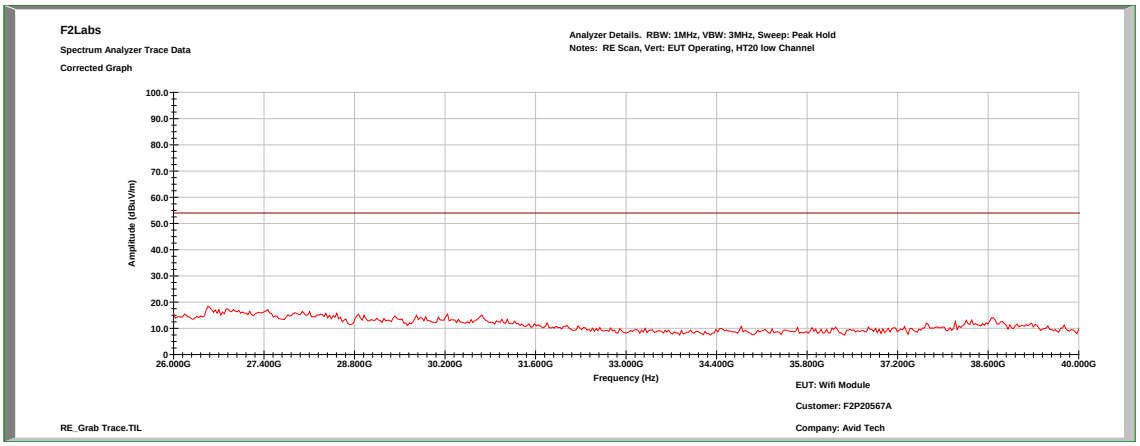
5.1 GHz, OFDM, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Vertical



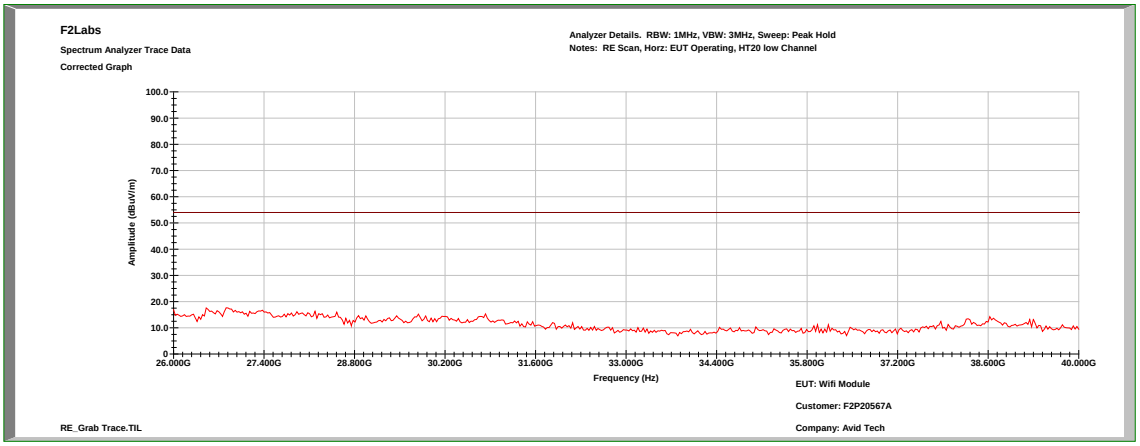
5.1 GHz, OFDM, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Horizontal



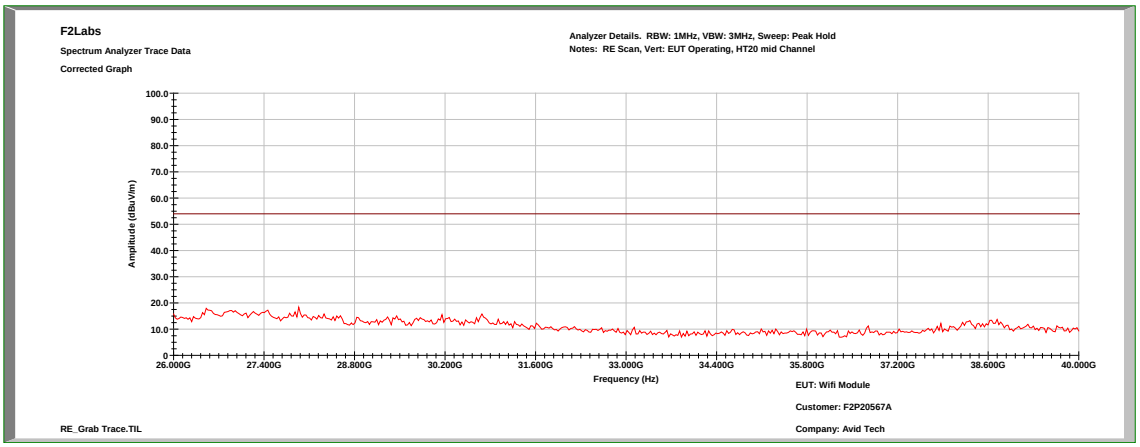
5.1 GHz, HT20, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Vertical



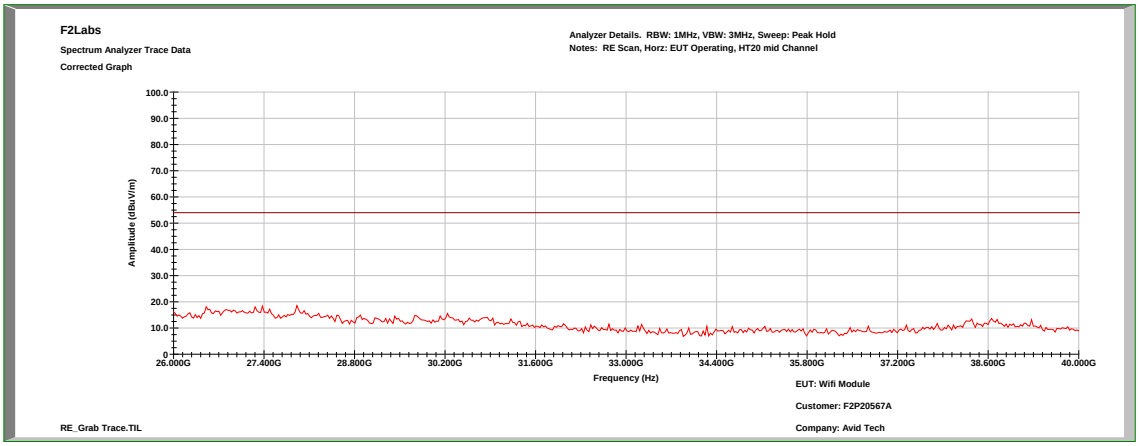
5.1 GHz, HT20, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Horizontal



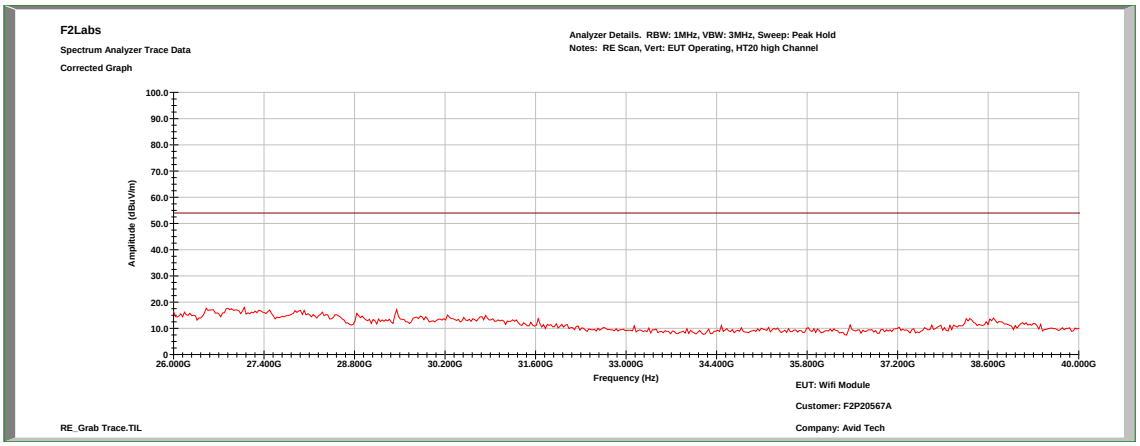
5.1 GHz, HT20, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Vertical



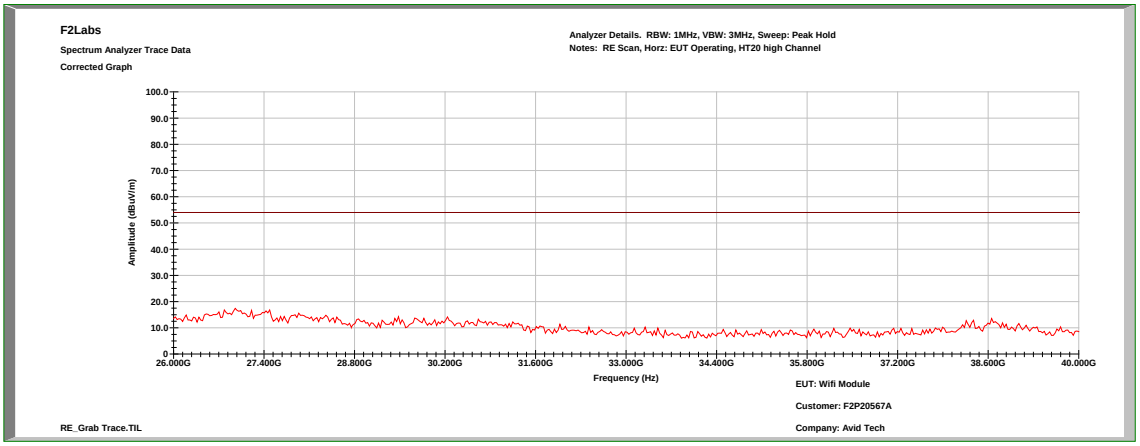
5.1 GHz, HT20, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Horizontal



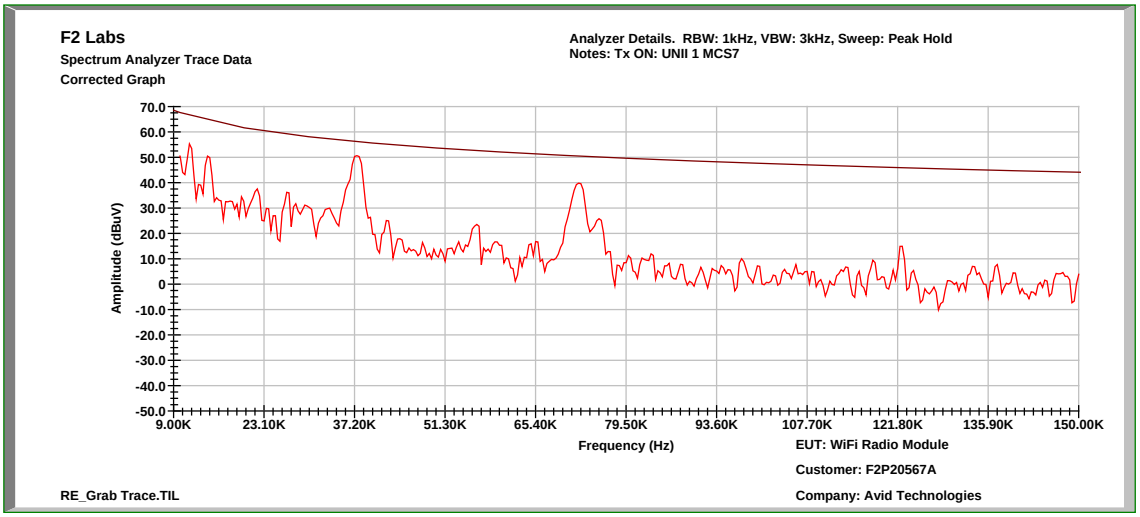
5.1 GHz, HT20, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Vertical



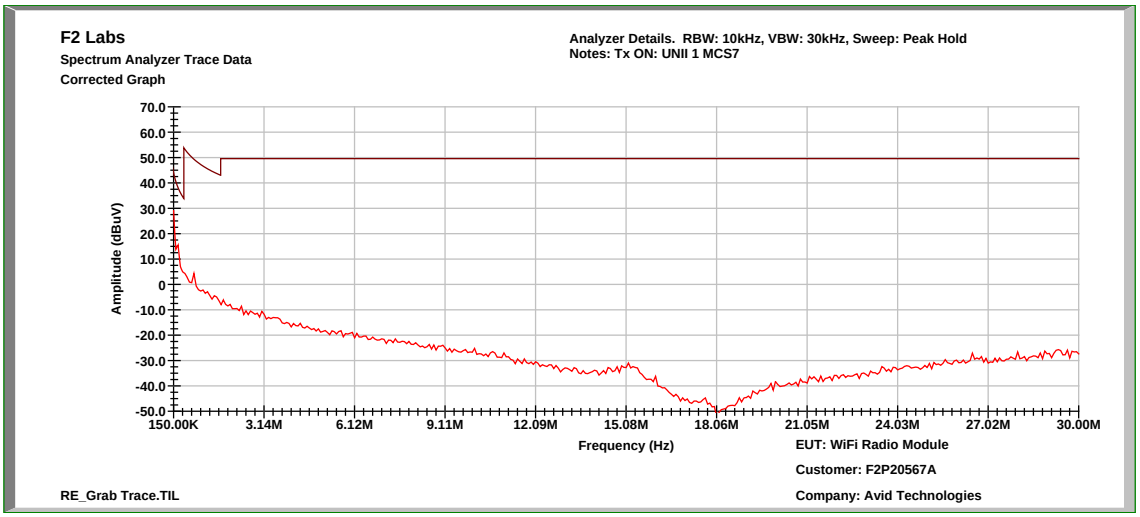
5.1 GHz, HT20, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Horizontal



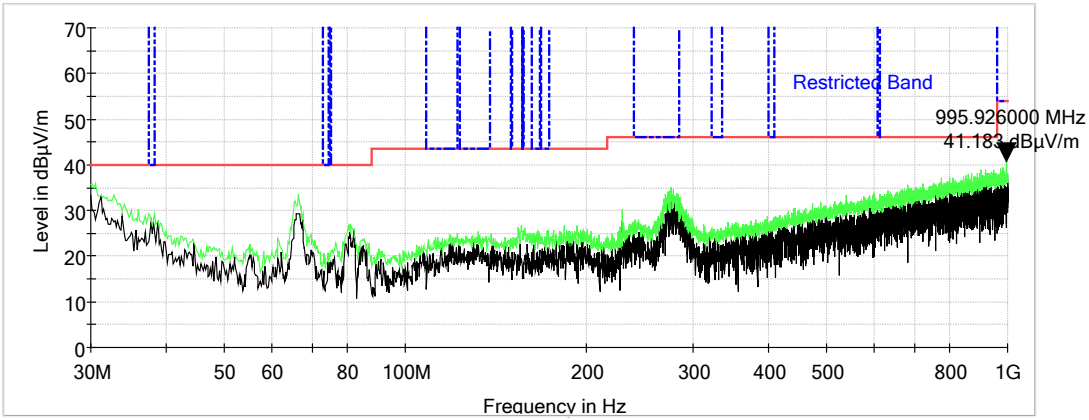
5.1 GHz, HT20, Radiated Spurious Emissions: Low Channel, 9k to 150k



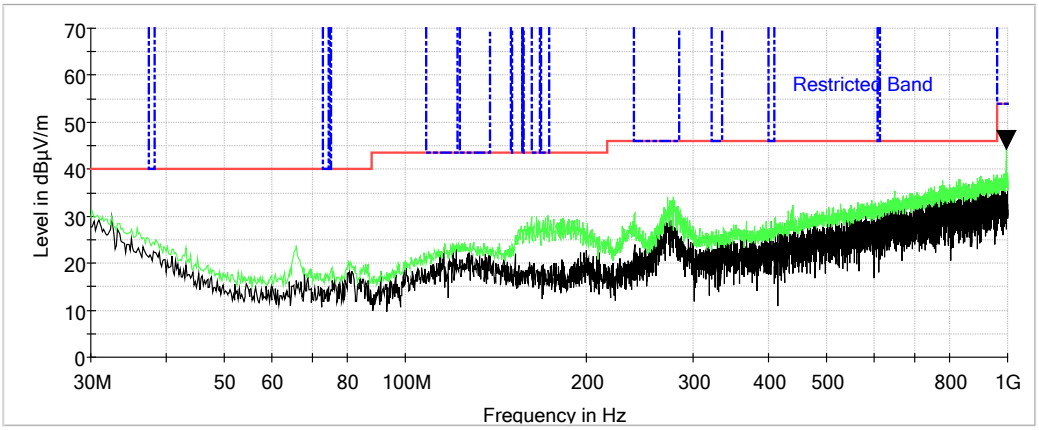
5.1 GHz, HT20, Radiated Spurious Emissions: Low Channel, 150k to 30 MHz



5.1 GHz, HT20, Radiated Spurious Emissions, Restricted Bands: Low Channel, 30 MHz to 1 GHz, Vertical

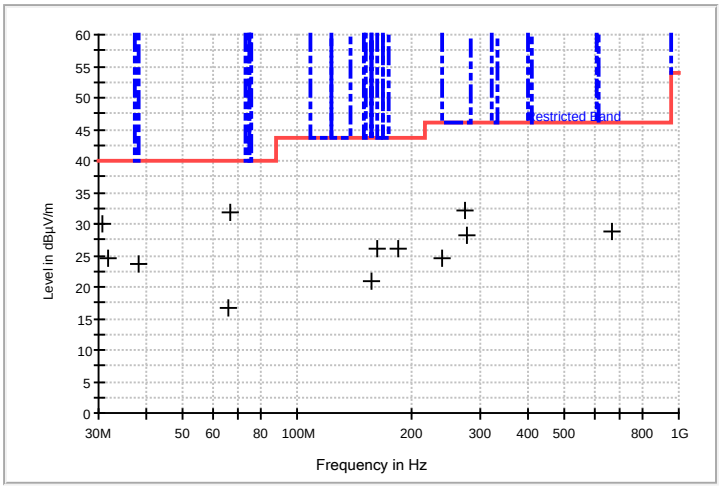


5.1 GHz, HT20, Radiated Spurious Emissions, Restricted Bands: Low Channel, 30 MHz to 1 GHz, Horizontal

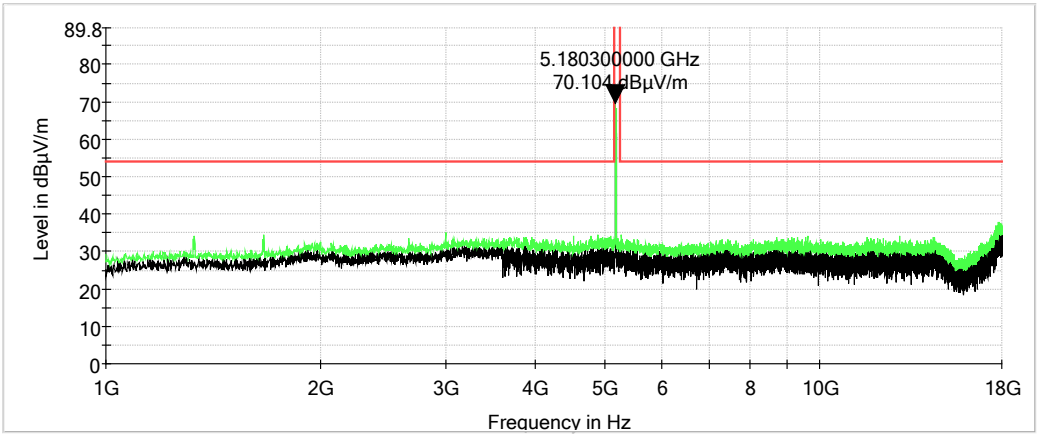


Measurements – Restricted Bands, 5.1 GHz, HT20

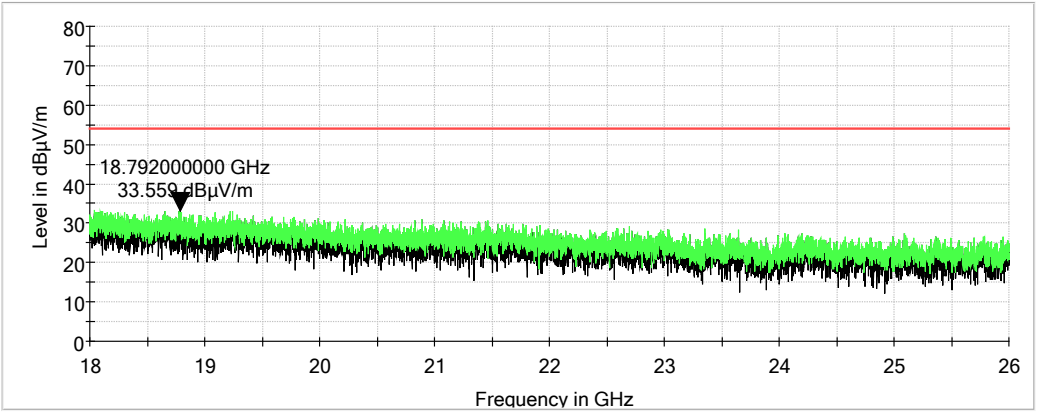
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (degrees)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.600000	V	100.00	5.00	25.0	5.0	30.00	40.0	-10.0
31.960000	H	100.00	0.00	20.9	3.8	24.70	40.0	-15.3
38.360000	V	100.00	0.00	24.8	-1.1	23.70	40.0	-16.3
65.680000	H	100.00	260.00	25.1	-8.3	16.80	40.0	-23.2
66.280000	V	100.00	234.00	40.0	-8.2	31.80	40.0	-8.2
155.720000	V	100.00	0.00	23.7	-2.7	21.00	43.5	-22.5
161.720000	H	100.00	96.00	28.8	-2.8	26.00	43.5	-17.5
183.440000	H	100.00	105.00	29.8	-3.7	26.10	43.5	-17.4
239.920000	H	100.00	244.00	27.2	-2.5	24.70	46.0	-21.3
274.440000	V	100.00	324.00	32.6	-0.6	32.00	46.0	-14.0
277.920000	H	100.00	357.00	28.8	-0.5	28.30	46.0	-17.7
664.000000	V	100.00	331.00	21.4	7.4	28.80	46.0	-17.2



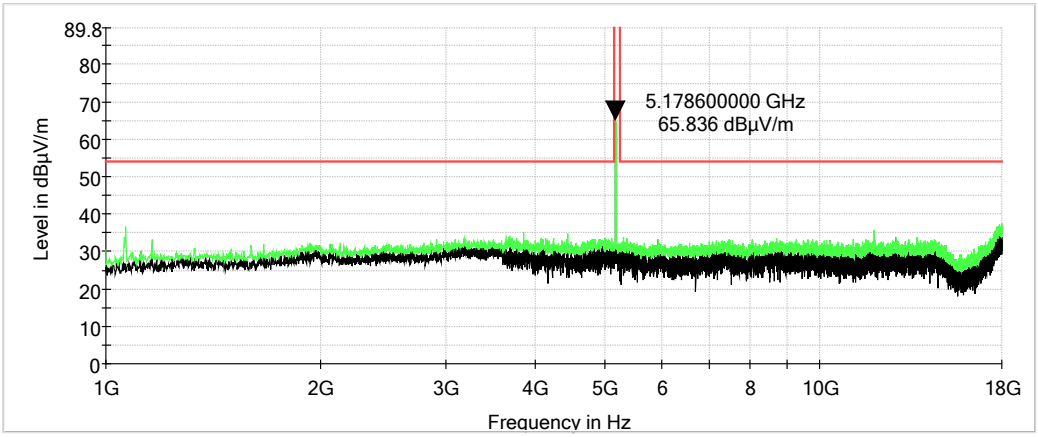
5.1 GHz, HT20, Radiated Spurious Emissions: Low Channel, 1 GHz to 18 GHz, Vertical



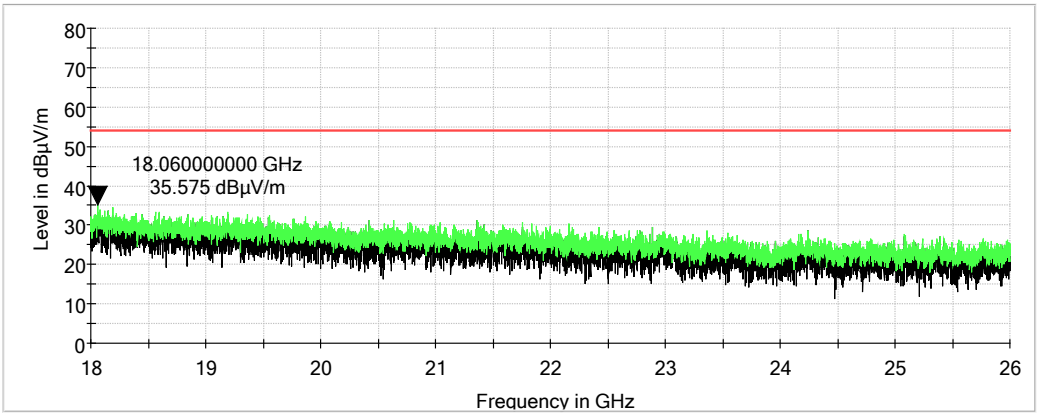
5.1 GHz, HT20, Radiated Spurious Emissions: Low Channel, 18 GHz to 26 GHz, Vertical



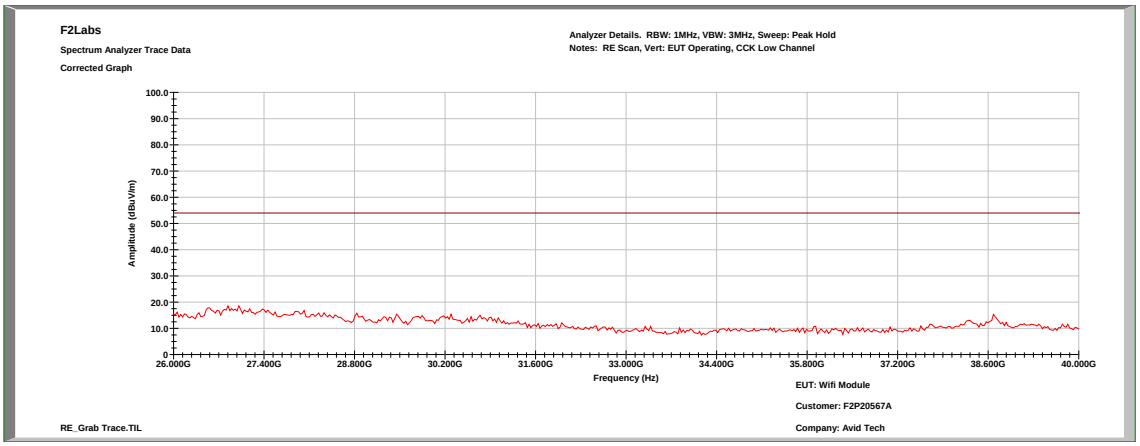
5.1 GHz, HT20, Radiated Spurious Emissions: Low Channel, 1 GHz to 18 GHz, Horizontal



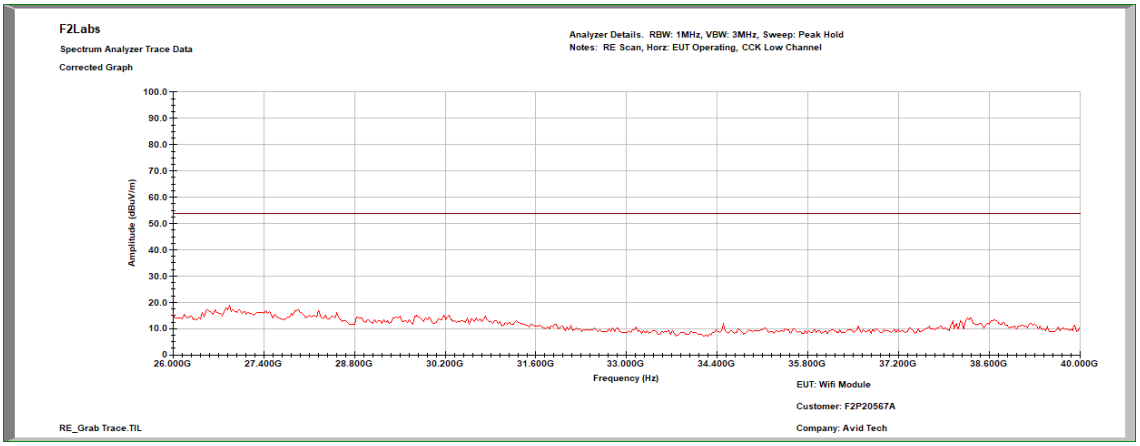
5.1 GHz, HT20, Radiated Spurious Emissions: Low Channel, 18 GHz to 26 GHz, Horizontal



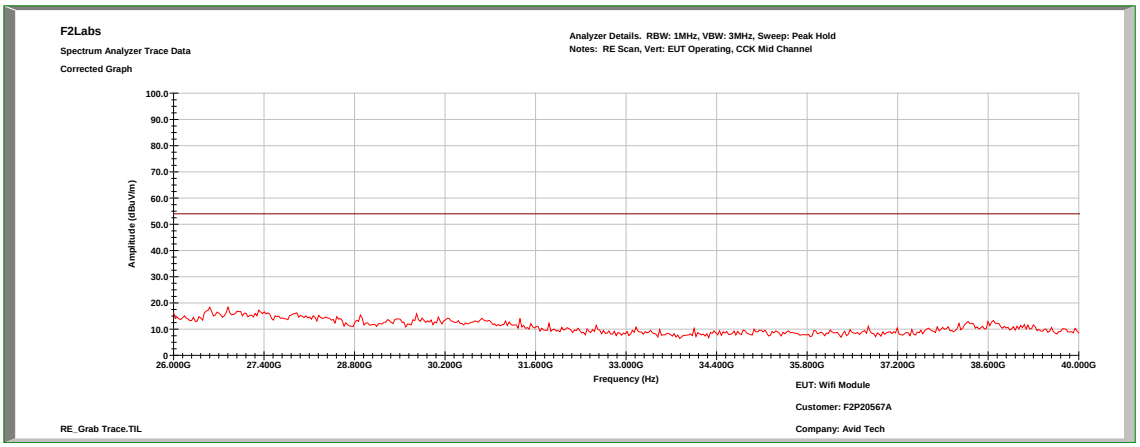
5.7 GHz, CCK, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Vertical



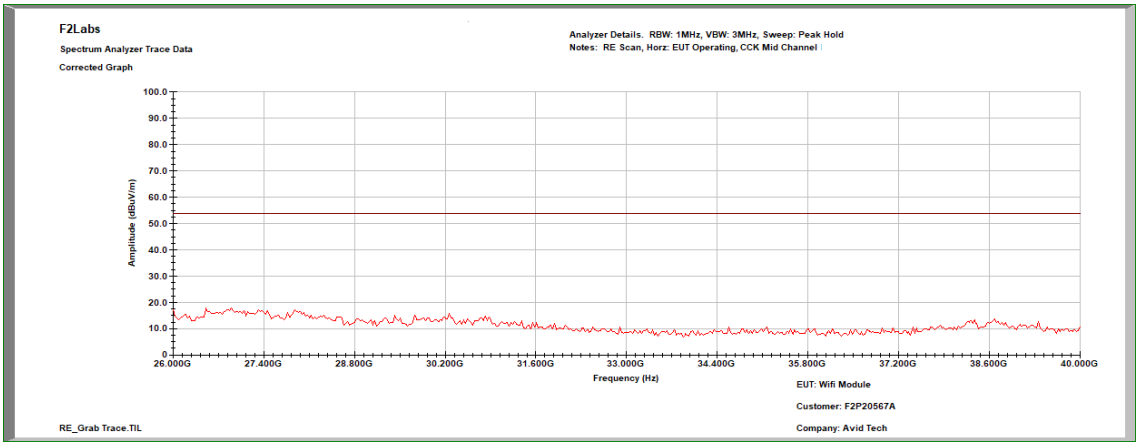
5.7 GHz, CCK, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Horizontal



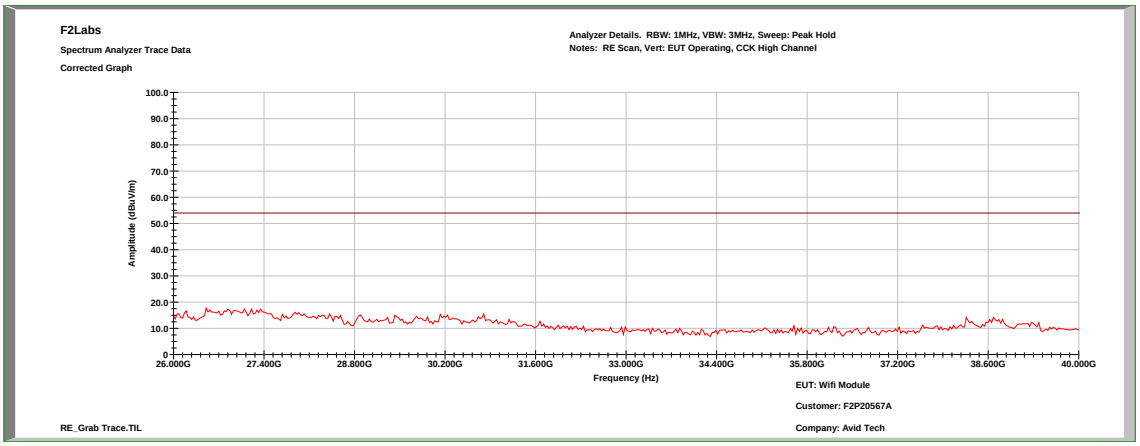
5.7 GHz, CCK, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Vertical



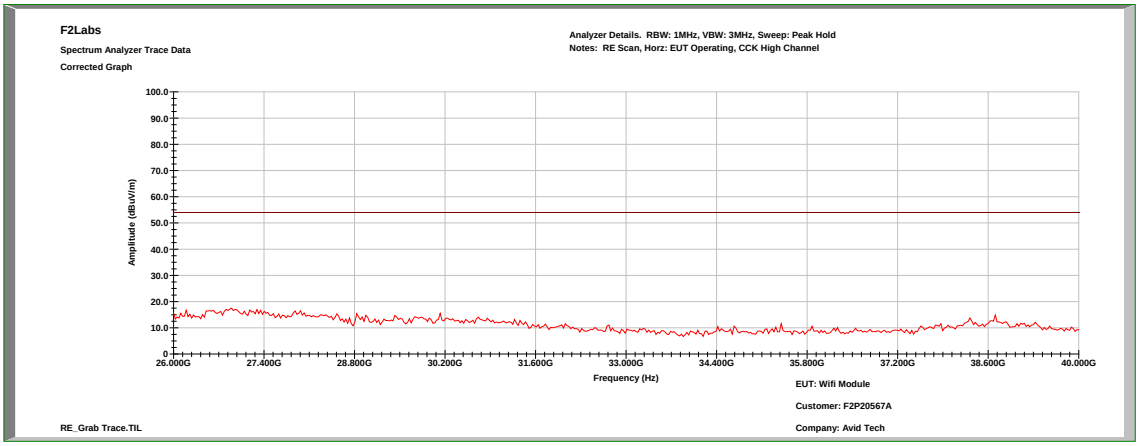
5.7 GHz, CCK, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Horizontal



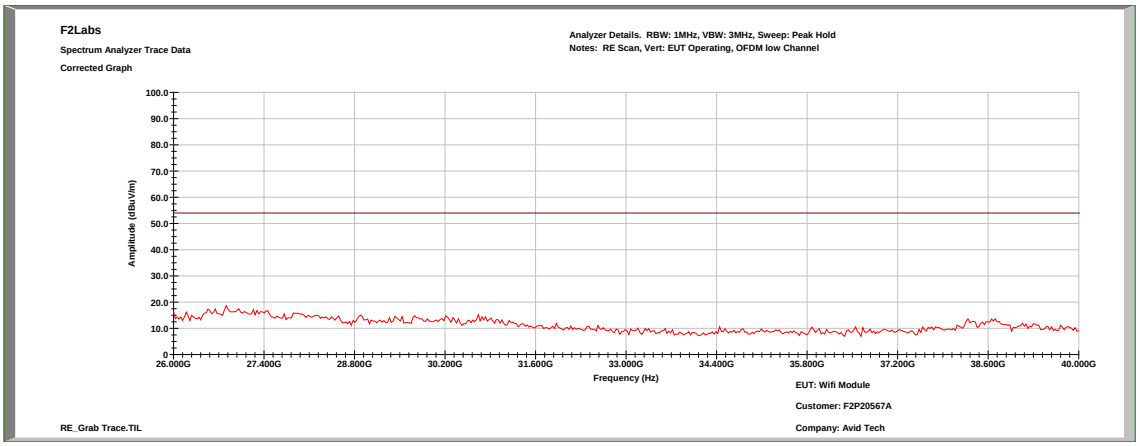
5.7 GHz, CCK, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Vertical



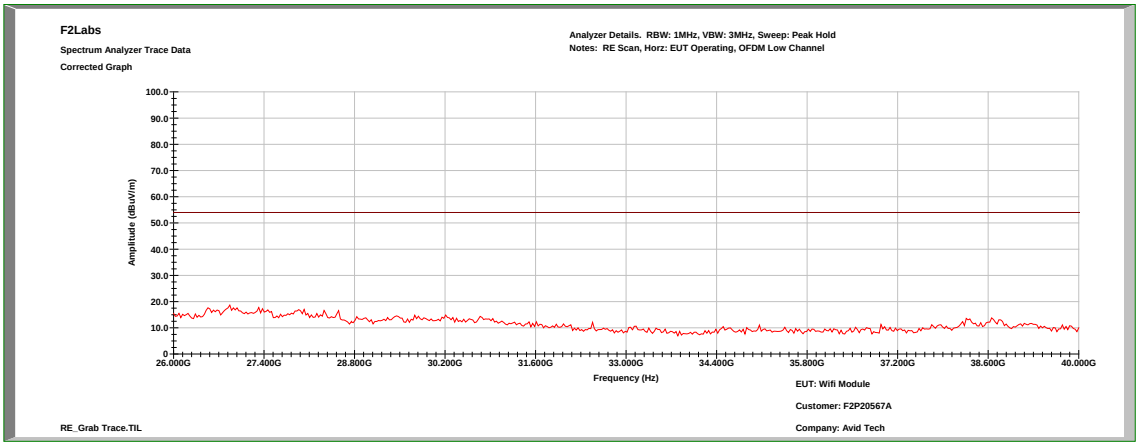
5.7 GHz, CCK, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Horizontal



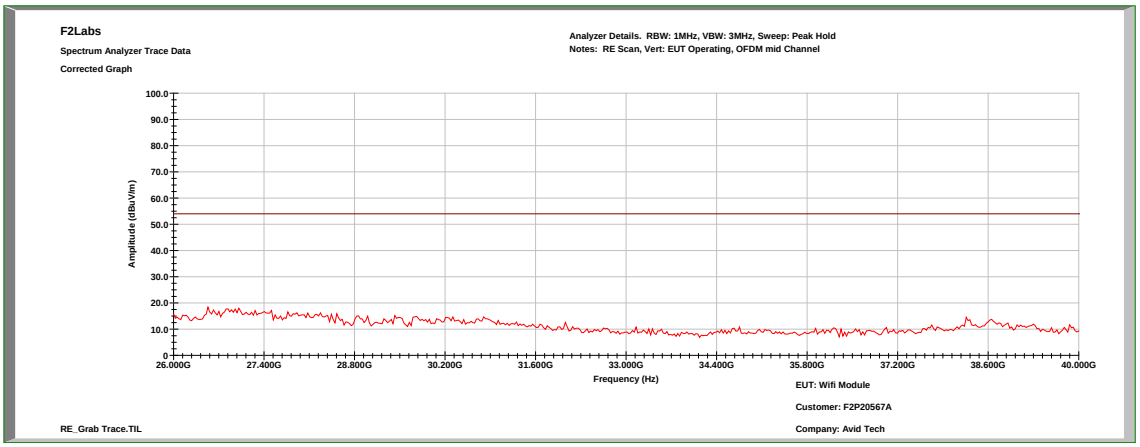
5.7 GHz, OFDM, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Vertical



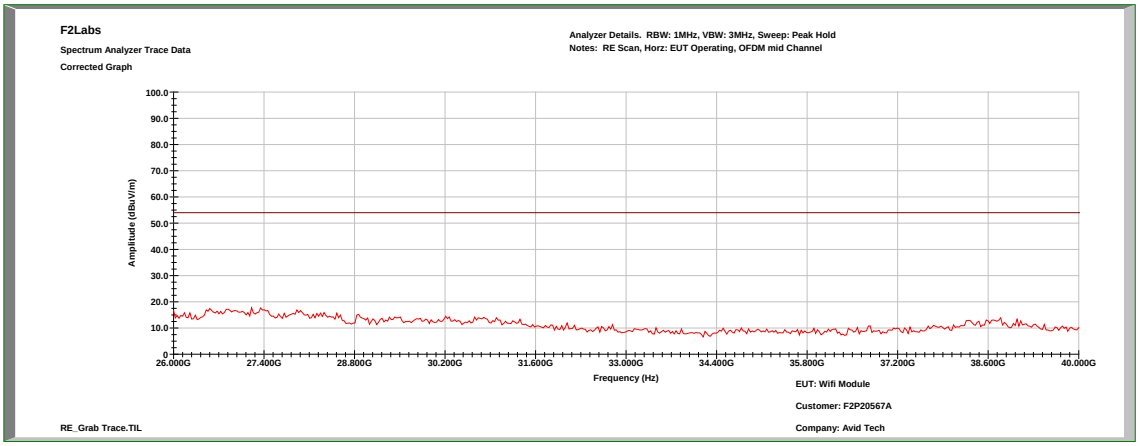
5.7 GHz, OFDM, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Horizontal



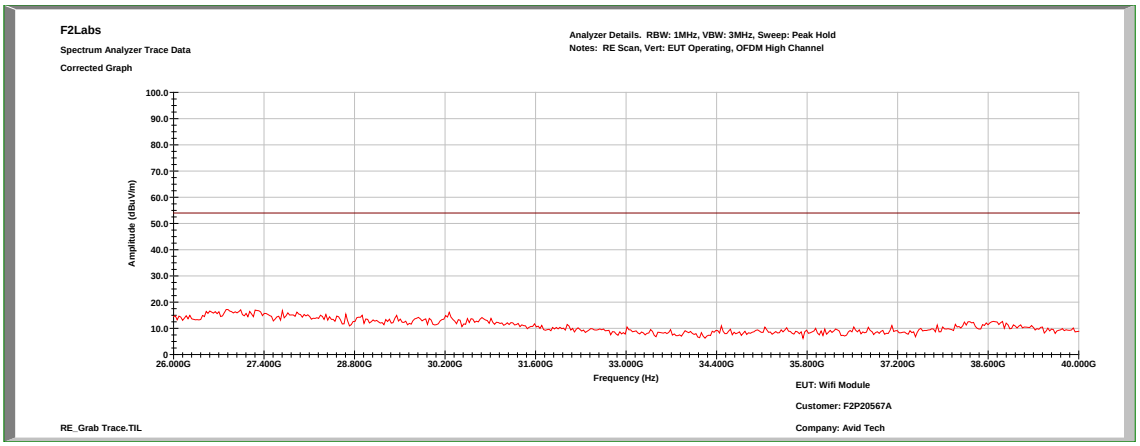
5.7 GHz, OFDM, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Vertical



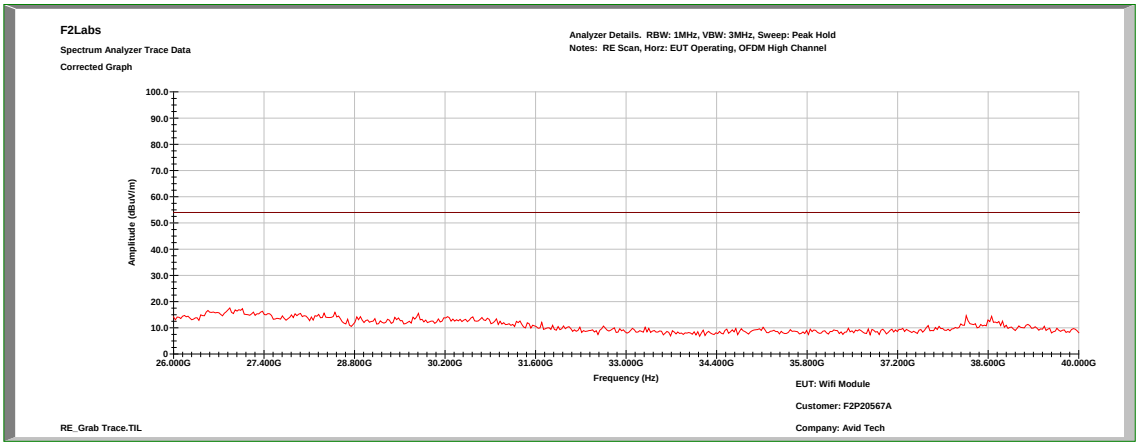
5.7 GHz, OFDM, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Horizontal



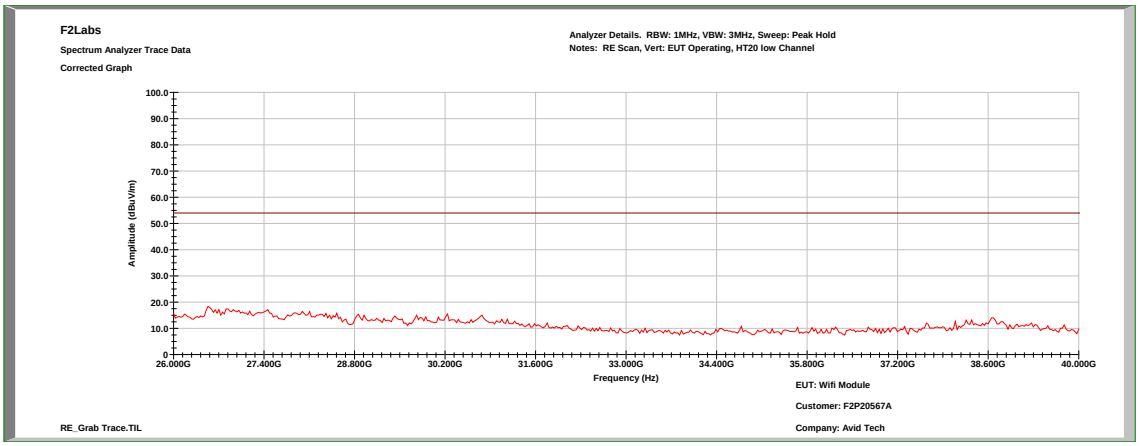
5.7 GHz, OFDM, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Vertical



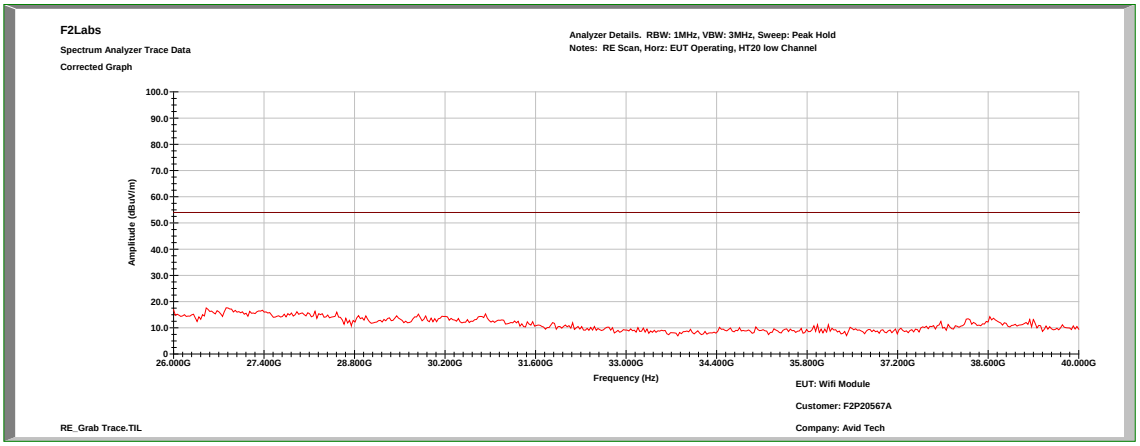
5.7 GHz, OFDM, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Horizontal



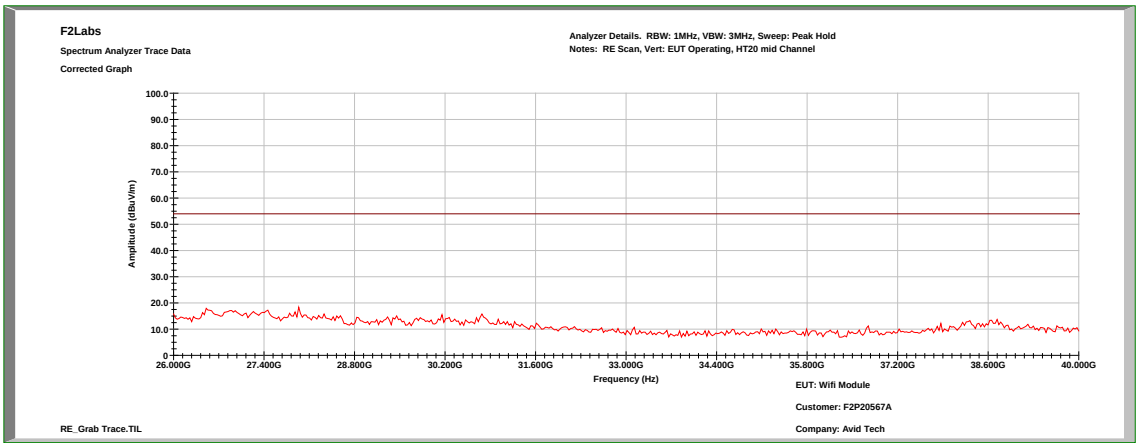
5.7 GHz, HT20, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Vertical



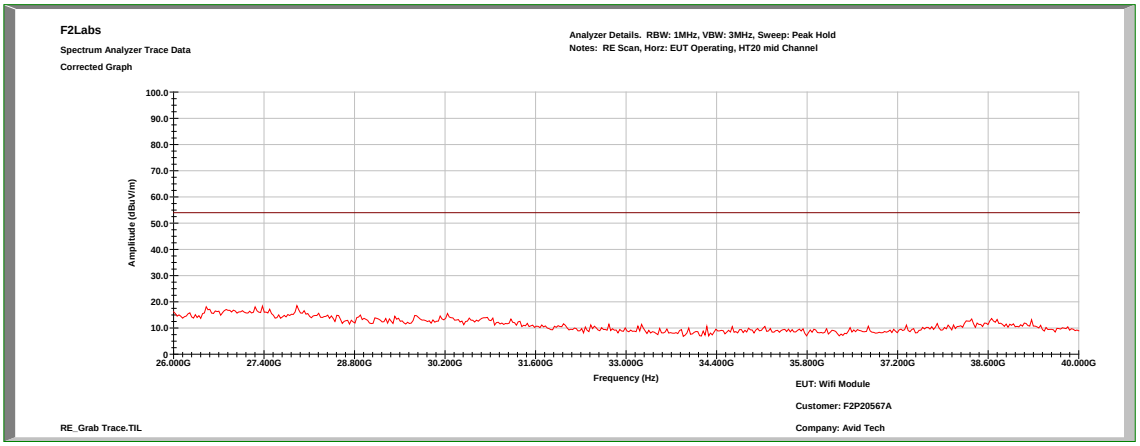
5.7 GHz, HT20, Radiated Spurious Emissions: Low Channel, 26 GHz to 40 GHz, Horizontal



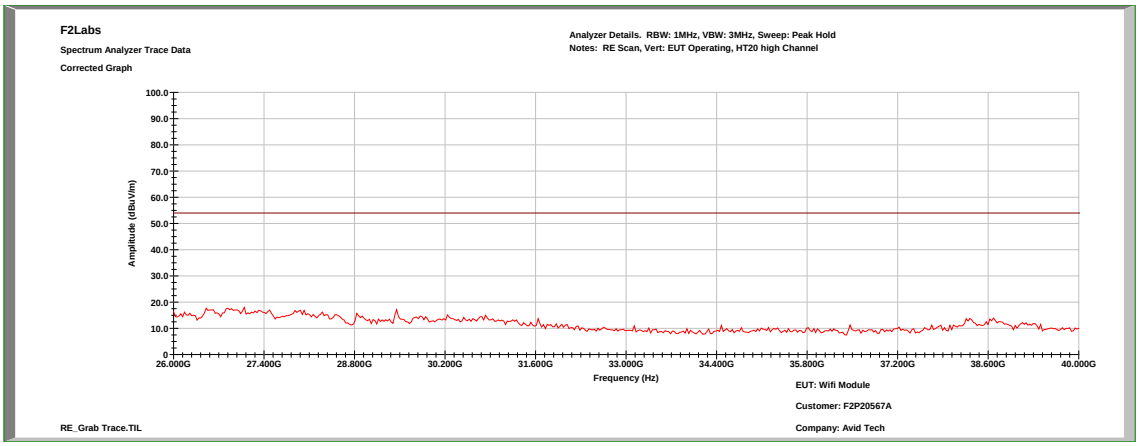
5.7 GHz, HT20, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Vertical



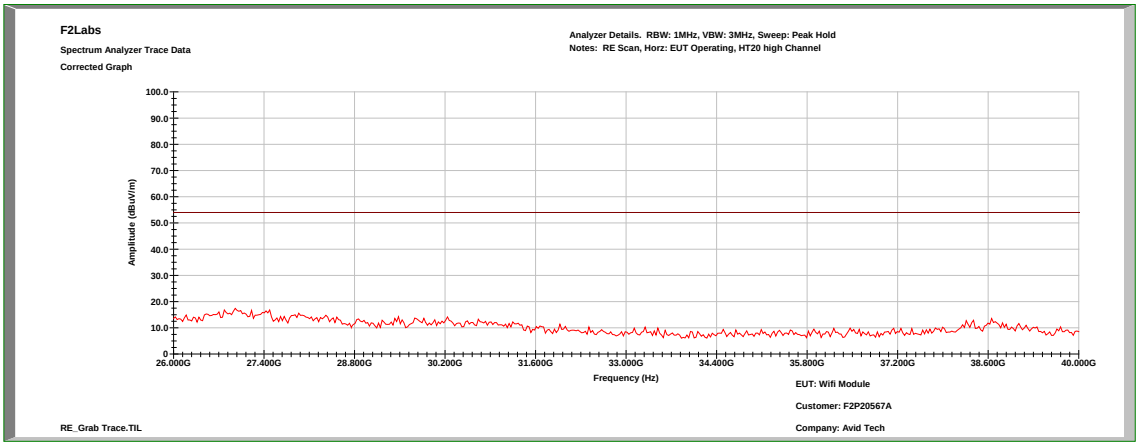
5.7 GHz, HT20, Radiated Spurious Emissions: Mid Channel, 26 GHz to 40 GHz, Horizontal



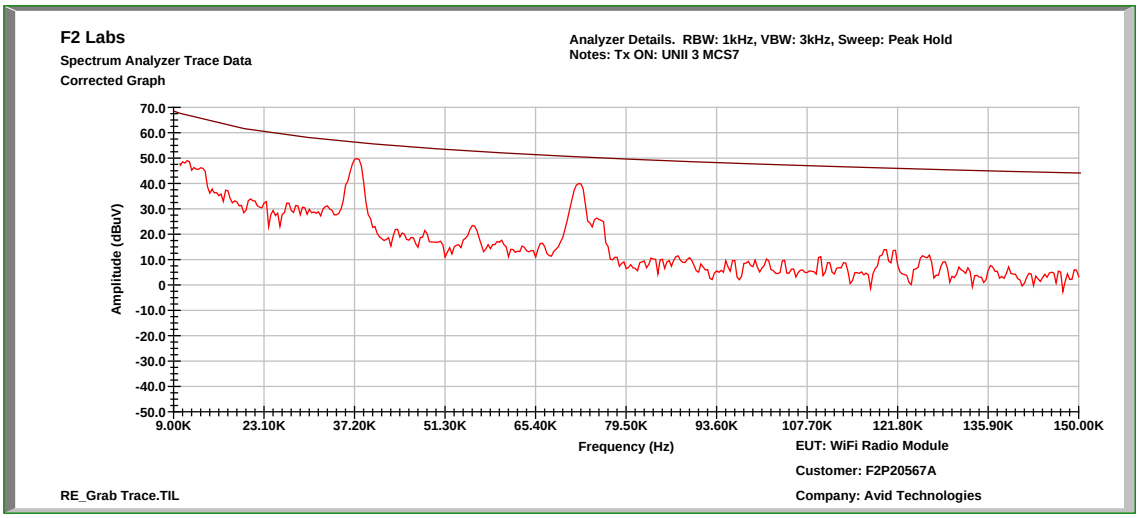
5.7 GHz, HT20, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Vertical



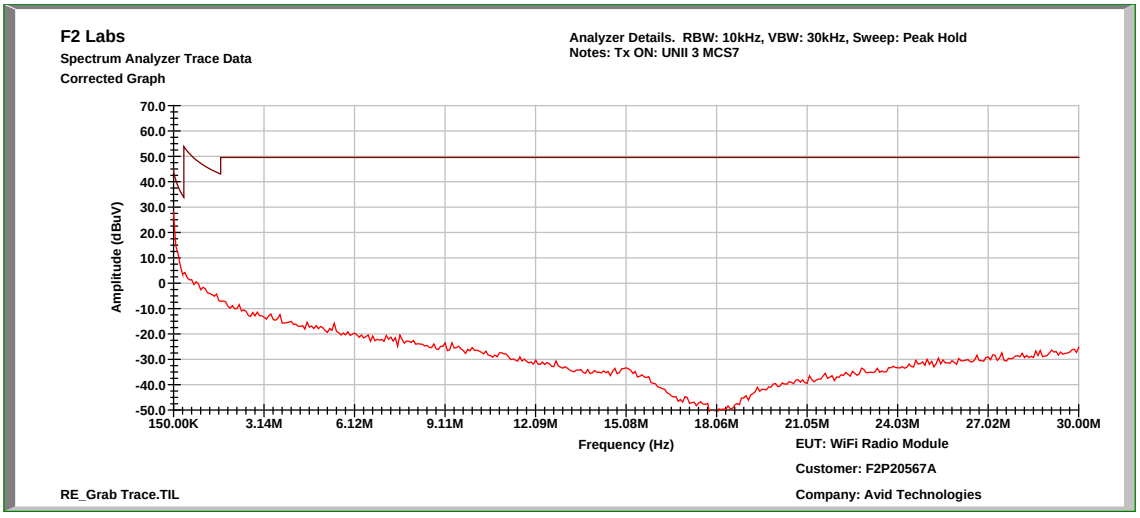
5.7 GHz, HT20, Radiated Spurious Emissions: High Channel, 26 GHz to 40 GHz, Horizontal



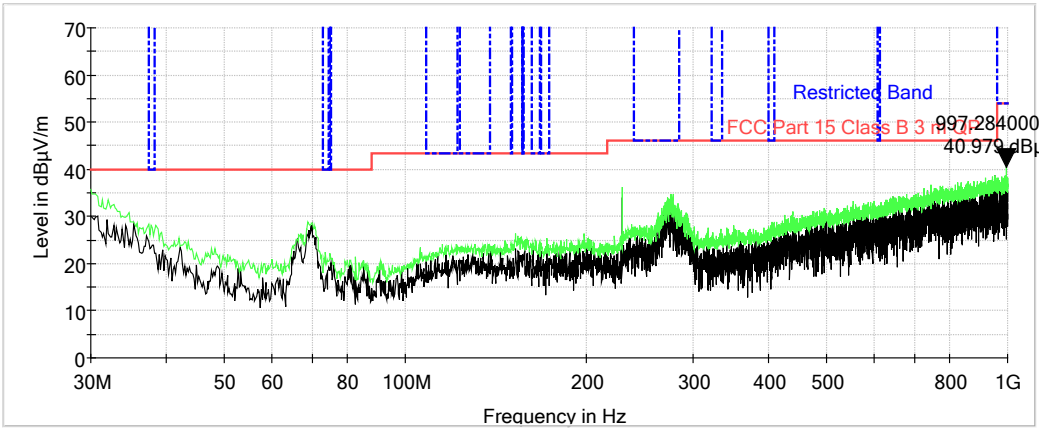
5.7 GHz, HT20, Radiated Spurious Emissions: Low Channel, 9k to 150k



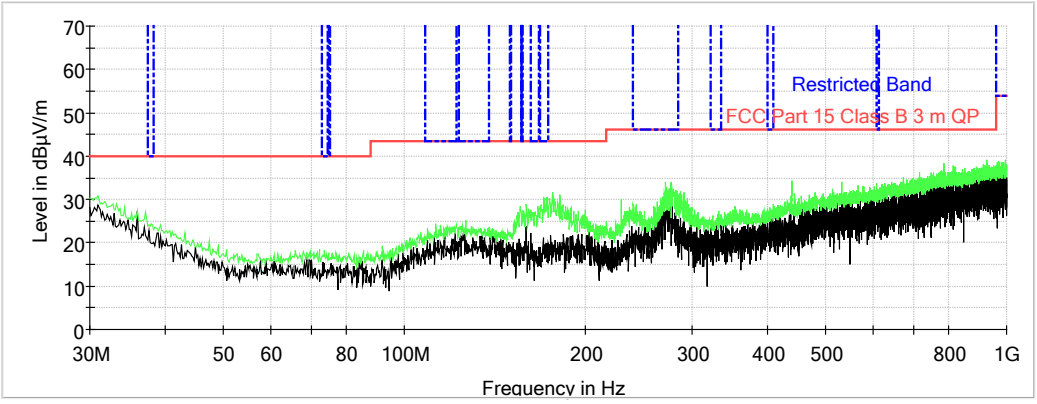
5.7 GHz, HT20, Radiated Spurious Emissions: Low Channel, 150k to 30 MHz



5.7 GHz, HT20, Radiated Spurious Emissions, Restricted Bands: Low Channel, 30 MHz to 1 GHz, Vertical

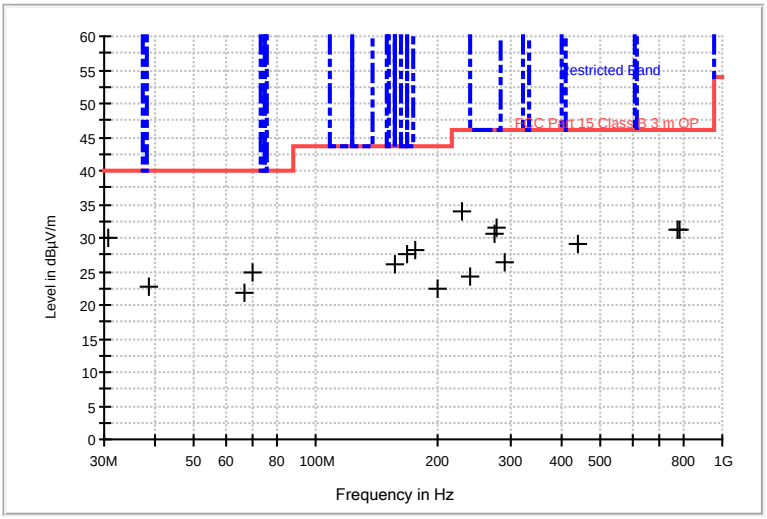


5.7 GHz, HT20, Radiated Spurious Emissions, Restricted Bands: Low Channel, 30 MHz to 1 GHz, Horizontal

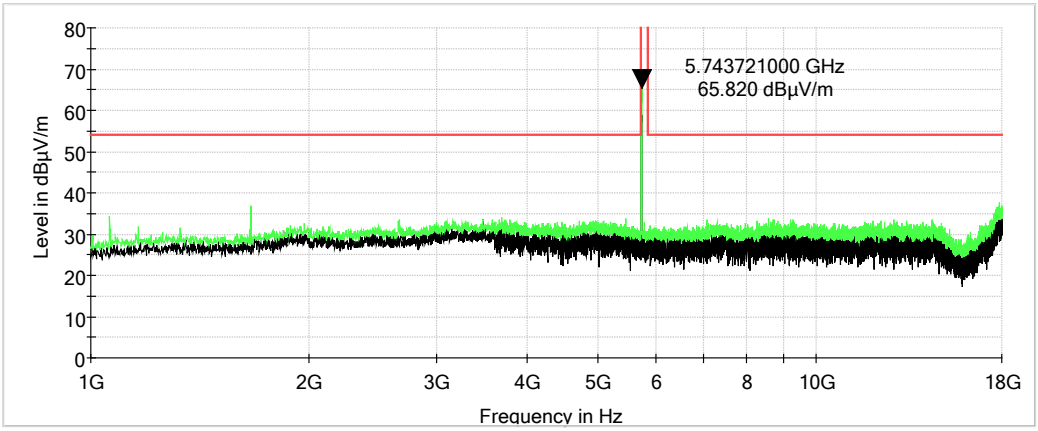


Measurements – Restricted Bands, 5.7 GHz, HT20

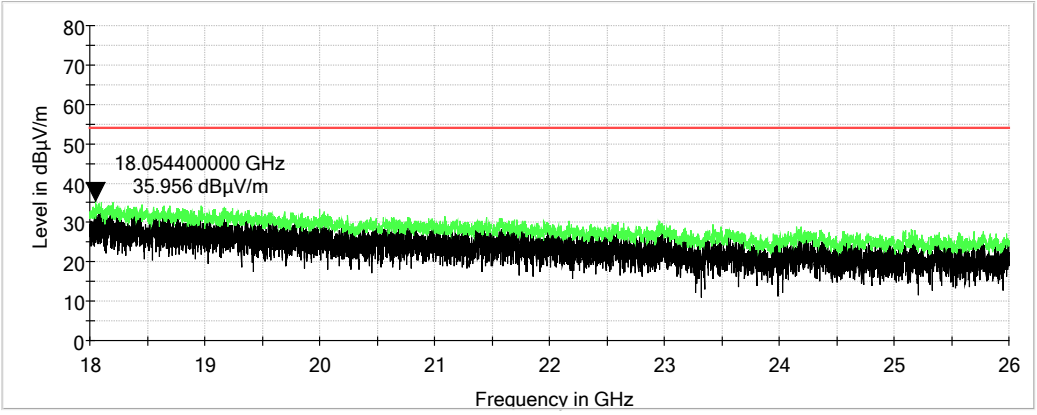
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (degrees)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30.600000	V	100.00	79.00	25.0	5.0	30.00	40.0	-10.0
38.520000	V	100.00	153.00	23.9	-1.2	22.70	40.0	-17.3
66.480000	V	100.00	119.00	30.2	-8.2	22.00	40.0	-18.0
69.960000	V	100.00	343.00	32.8	-8.0	24.80	40.0	-15.2
155.720000	H	100.00	208.00	28.7	-2.7	26.00	43.5	-17.5
166.760000	H	100.00	104.00	30.6	-3.1	27.50	43.5	-16.0
176.080000	H	100.00	82.00	31.8	-3.7	28.10	43.5	-15.4
199.760000	H	100.00	95.00	24.3	-1.8	22.50	43.5	-21.0
229.240000	V	100.00	19.00	37.0	-3.0	34.00	46.0	-12.0
239.920000	H	100.00	285.00	26.7	-2.5	24.20	46.0	-21.8
276.200000	V	100.00	311.00	31.1	-0.6	30.50	46.0	-15.5
277.720000	H	100.00	115.00	31.9	-0.5	31.40	46.0	-14.6
292.680000	V	100.00	343.00	26.8	-0.4	26.40	46.0	-19.6
439.160000	H	100.00	50.00	25.9	3.3	29.20	46.0	-16.8
774.000000	V	100.00	343.00	21.8	9.4	31.20	46.0	-14.8
787.760000	H	100.00	52.00	21.6	9.6	31.20	46.0	-14.8



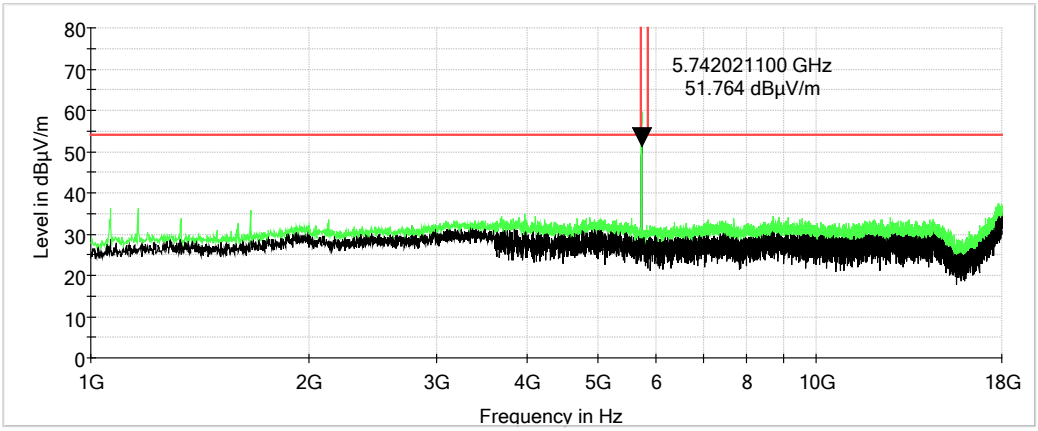
5.7 GHz, HT20, Radiated Spurious Emissions: Low Channel, 1 GHz to 18 GHz, Vertical



5.7 GHz, HT20, Radiated Spurious Emissions: Low Channel, 18 GHz to 26 GHz, Vertical



5.7 GHz, HT20, Radiated Spurious Emissions: Low Channel, 1 GHz to 18 GHz, Horizontal



5.7 GHz, HT20, Radiated Spurious Emissions: Low Channel, 18 GHz to 26 GHz, Horizontal

11 CONDUCTED SPURIOUS EMISSIONS

The following tests were performed to demonstrate compliance.

RF Antenna Conducted Test
The EUT antenna port was fitted with an SMA connector and directly connected to the input of the spectrum analyzer.

11.1 Requirements:

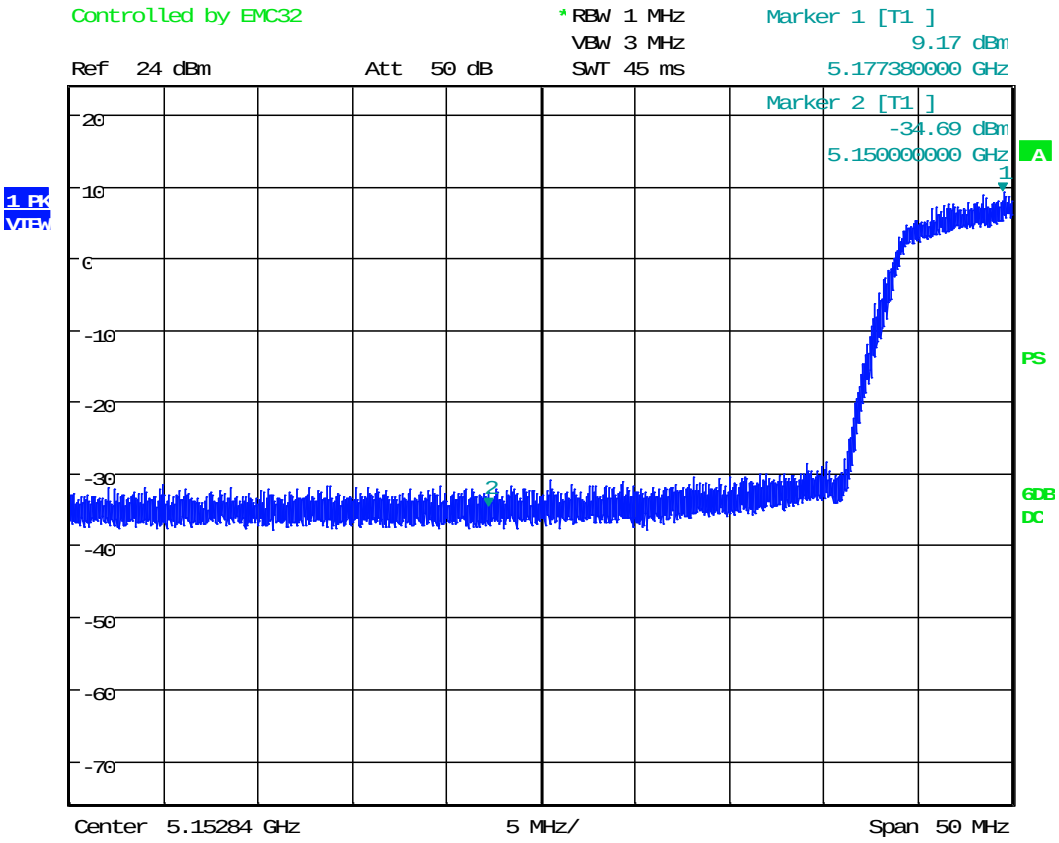
All Spurious Emissions must be at least 20dB down from the highest emission level measured within the authorized band up through the tenth harmonic.

Spurious emissions measurements were made at the low, mid, and upper channels with the appropriate spectrum analyzer impulse bandwidth. Additionally, 20dB down points were measured for the low and high channels to verify band edge compliance.

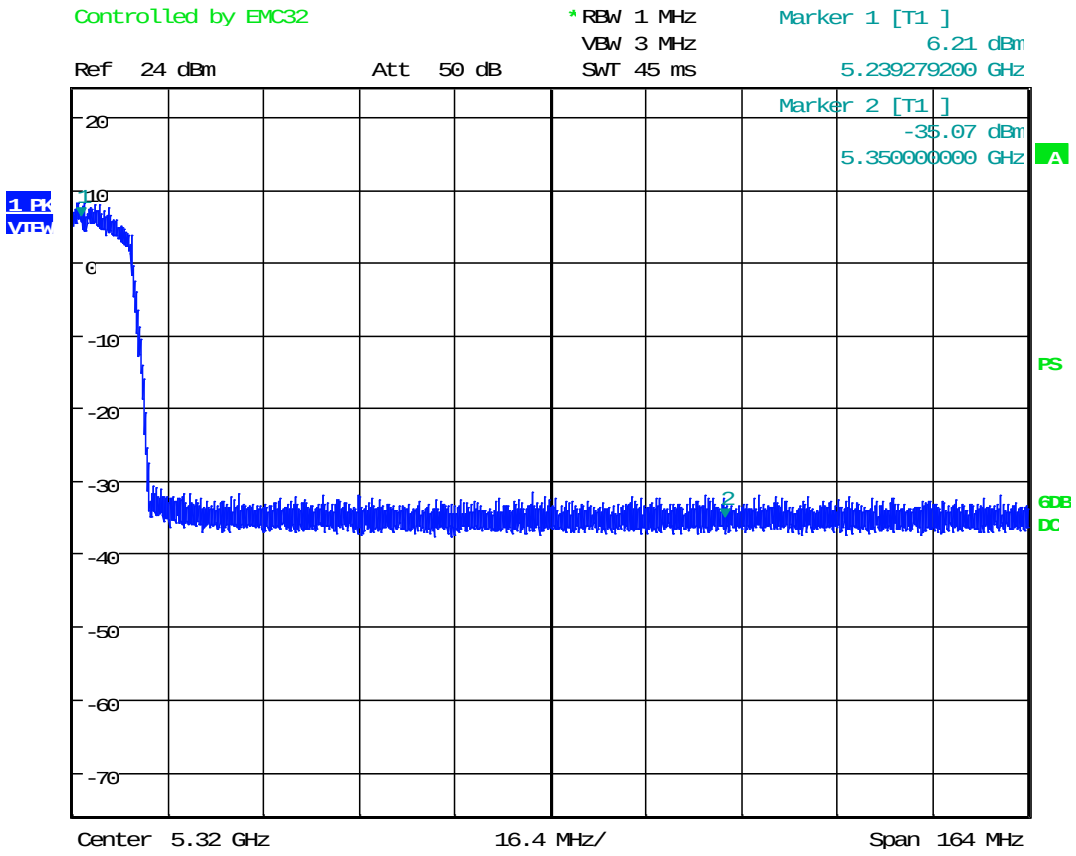
11.2 Conducted Spurious Emissions Test Data

Test Date:	Mar. 18, 2019	**Test Engineer:**	J. Chiller
Standards:	CFR 47 Part 15.407(b)(1,4)	**Air Temperature:**	23.4ºC
		Relative Humidity:	33%

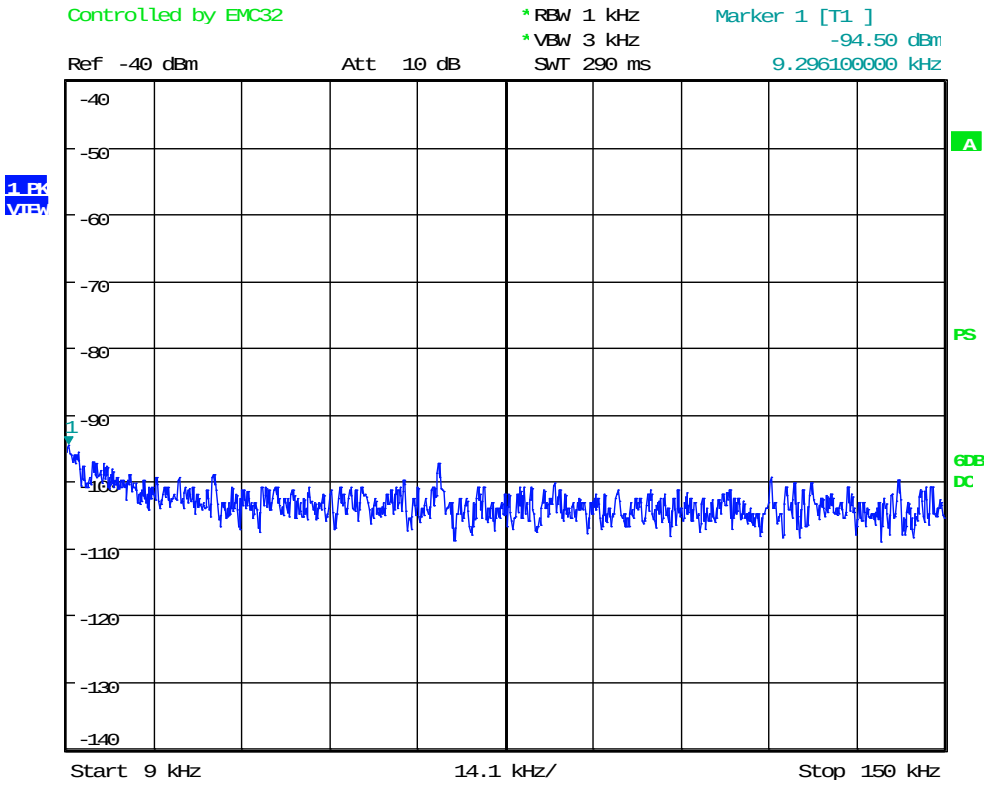
5.1 GHz, Band Edge - Low



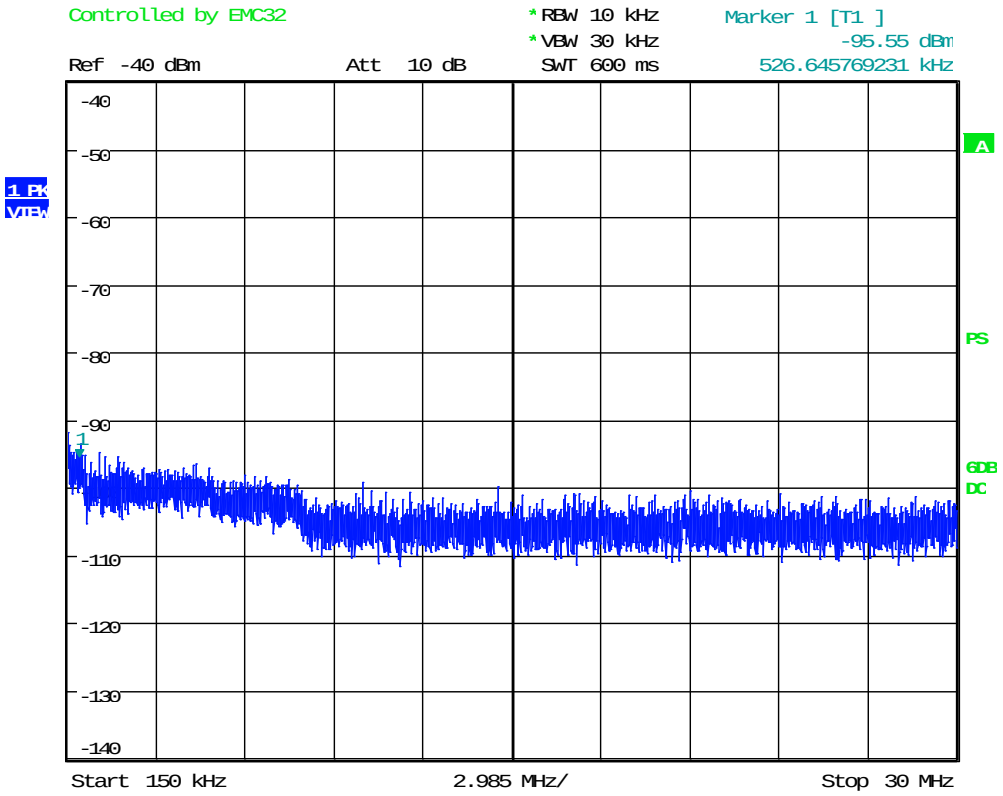
5.1 GHz, Band Edge - High



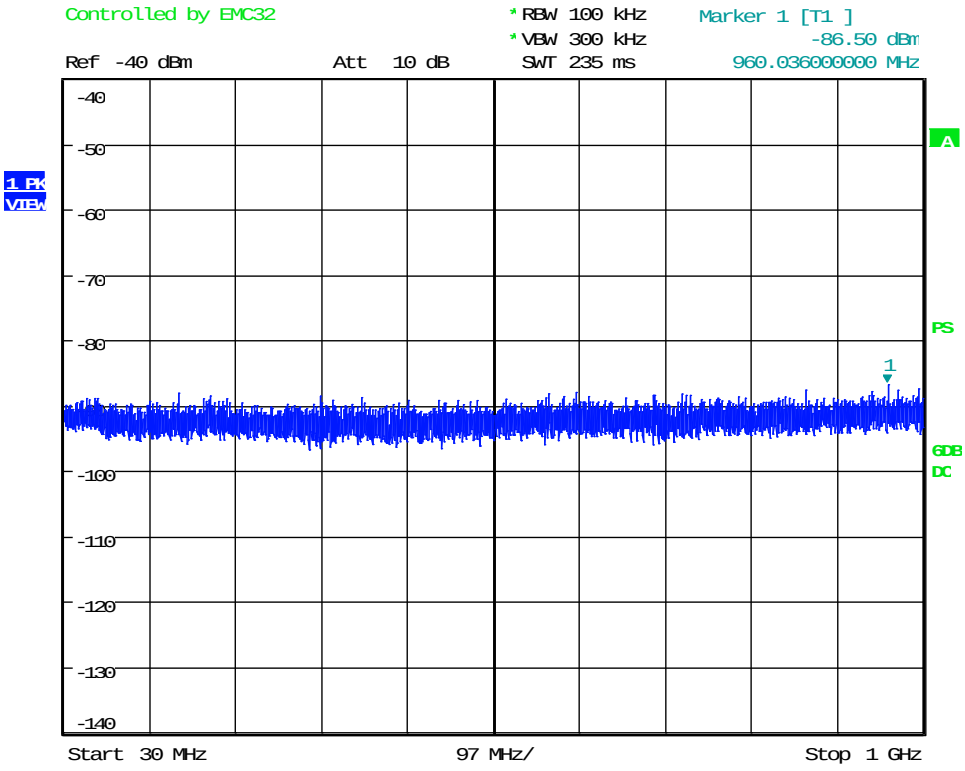
5.1 GHz: Low Channel, 0.009 MHz to 0.15 MHz



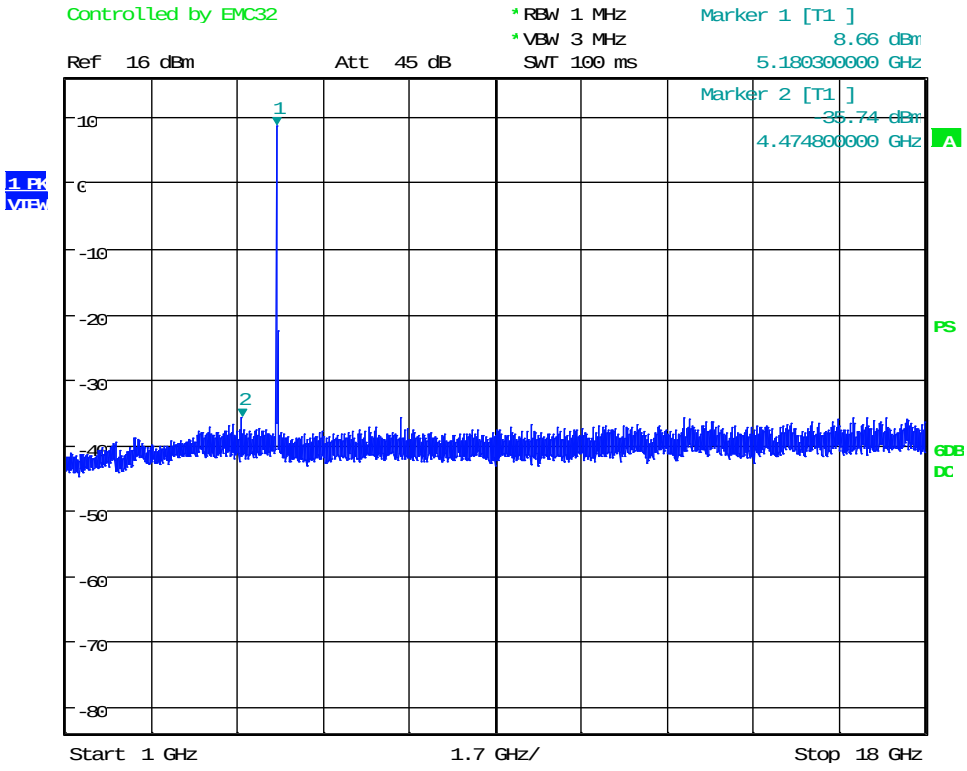
5.1 GHz: Low Channel, 0.15 MHz to 30 MHz



5.1 GHz: Low Channel, 30 MHz to 1000 MHz



5.1 GHz: Low Channel, 1 GHz to 18 GHz



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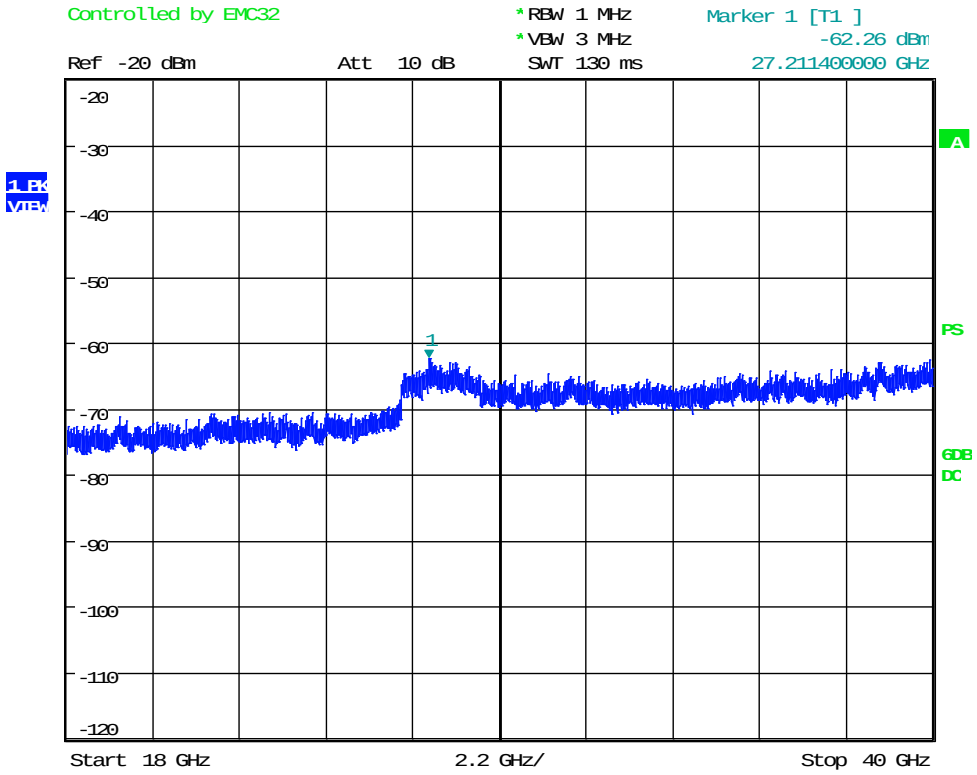
5.1 GHz: Low Channel, 18 GHz to 40 GHz



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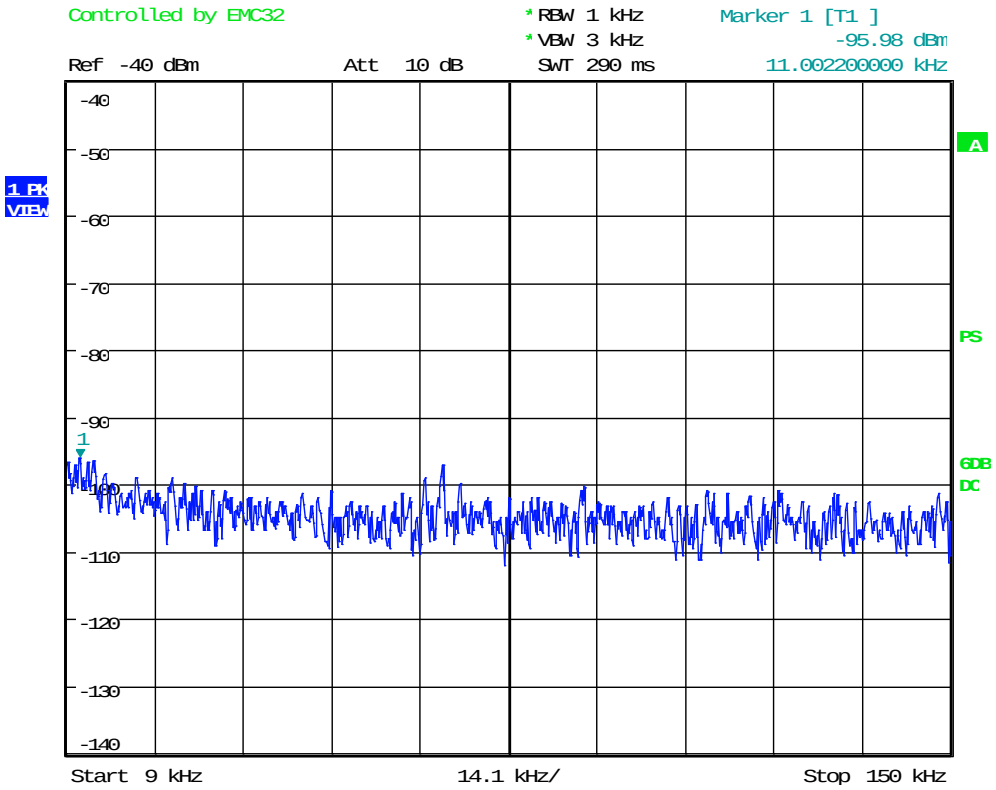
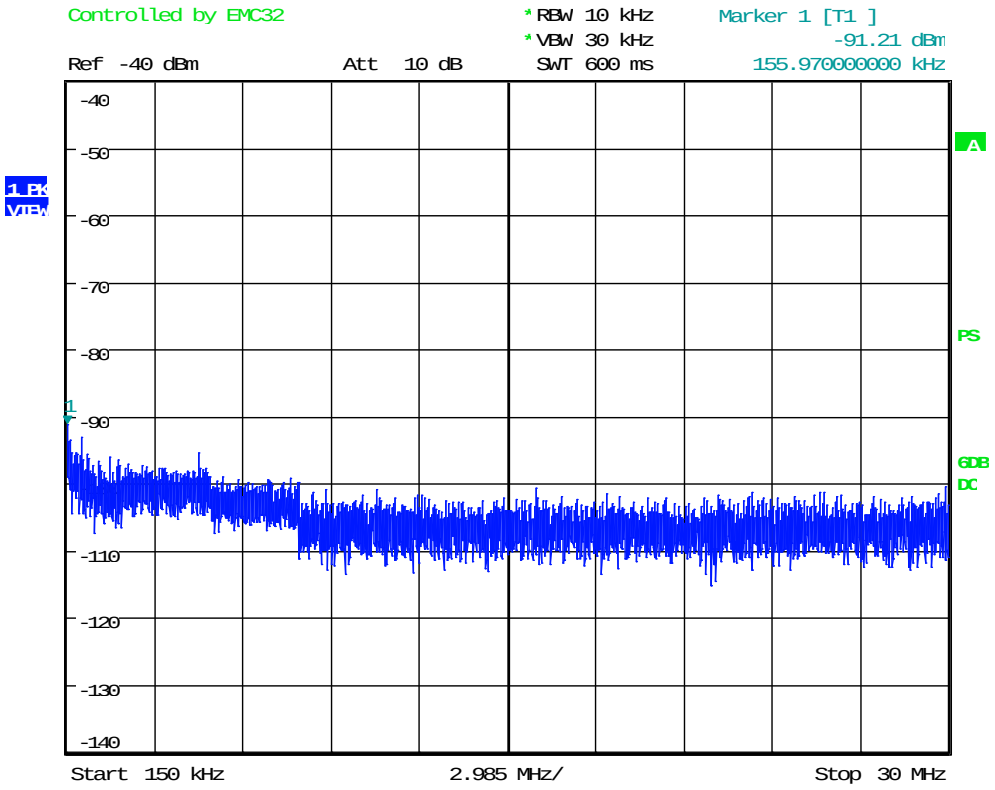
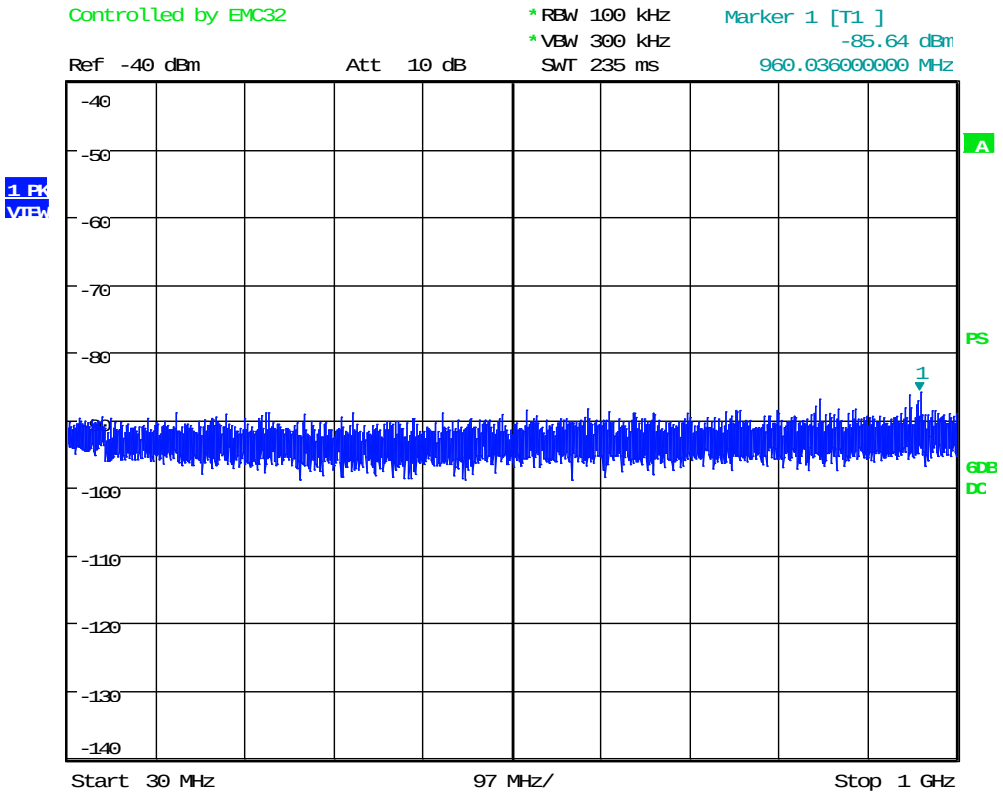
5.1 GHz: Mid Channel, 0.009 MHz to 0.15 MHz



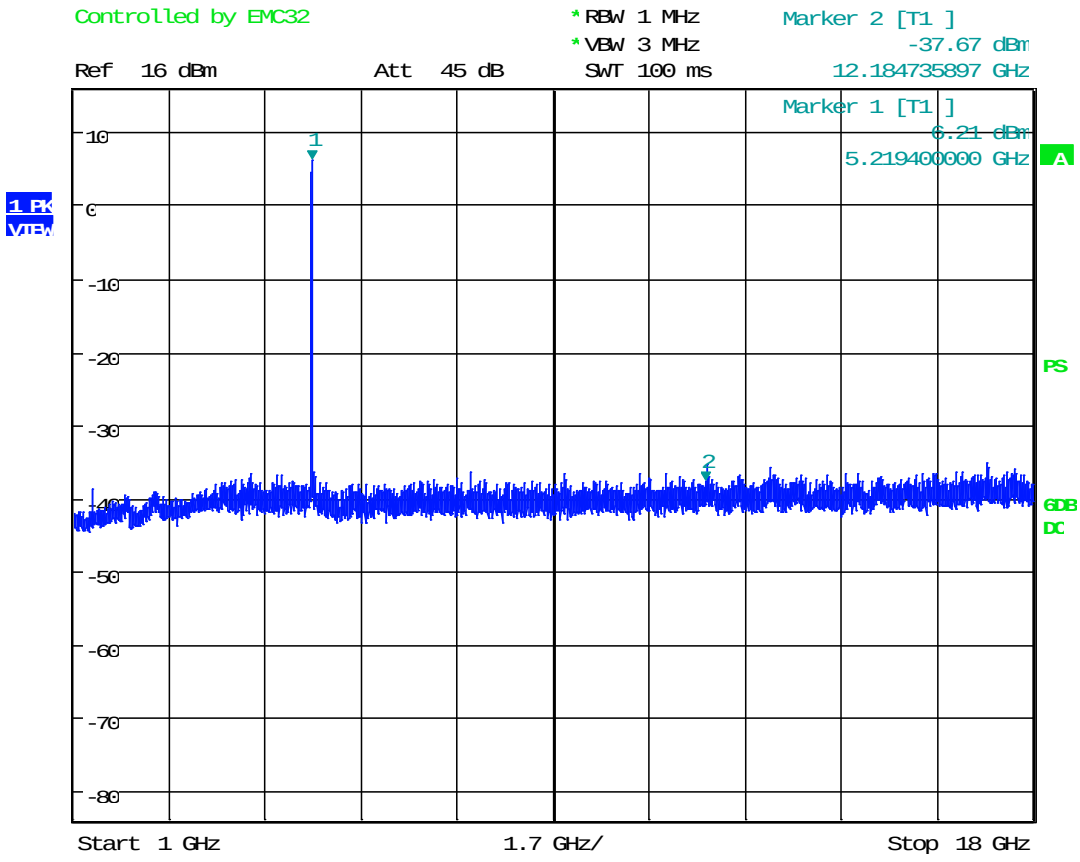
5.1 GHz: Mid Channel, 0.15 MHz to 30 MHz



5.1 GHz: Mid Channel, 30 MHz to 1000 MHz

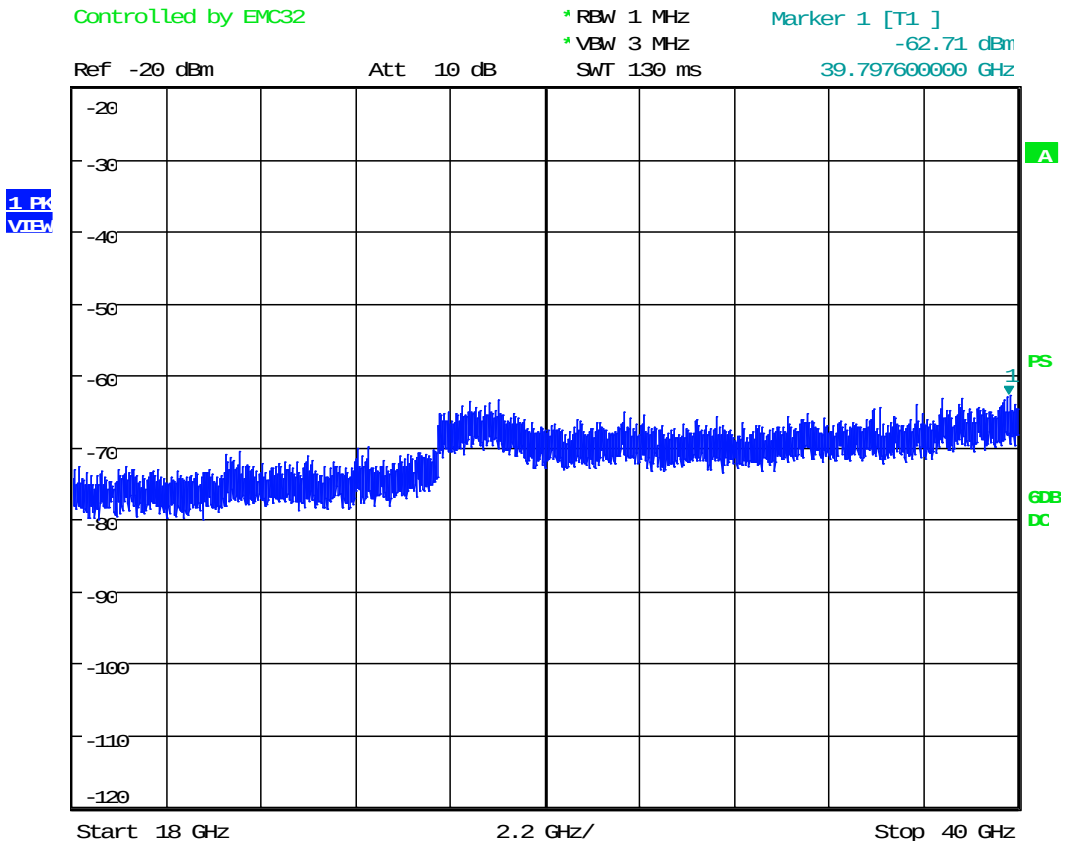


5.1 GHz: Mid Channel, 1 GHz to 18 GHz



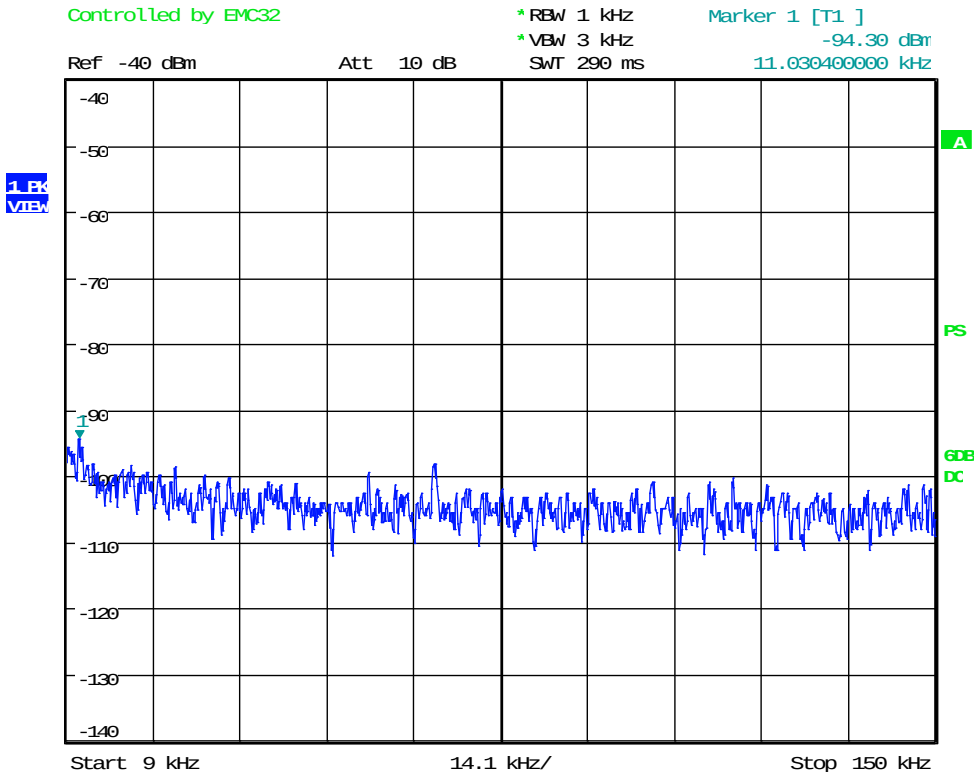
Date: 18.MAR.2019 13:25:56

5.1 GHz: Mid Channel, 18 GHz to 40 GHz



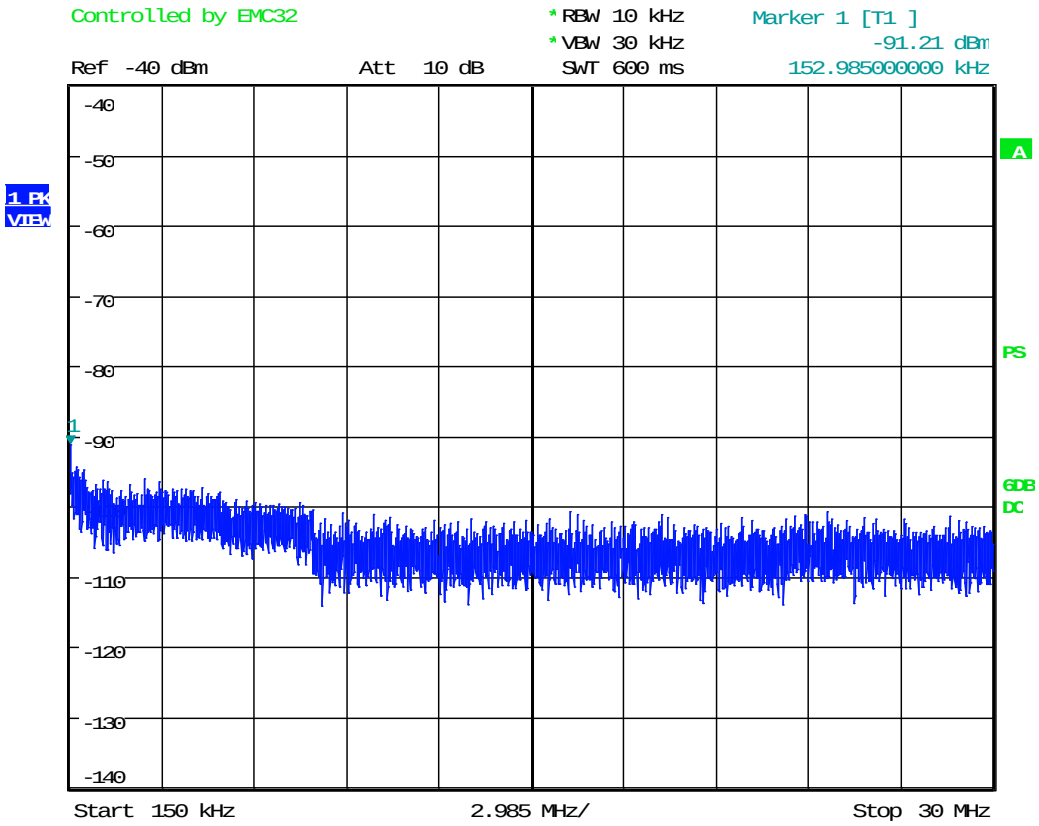
Date: 18.MAR.2019 13:34:48

5.1 GHz: High Channel, 0.009 MHz to 0.15 MHz



Date: 18.MAR.2019 13:01:18

5.1 GHz: High Channel, 0.15 MHz to 30 MHz



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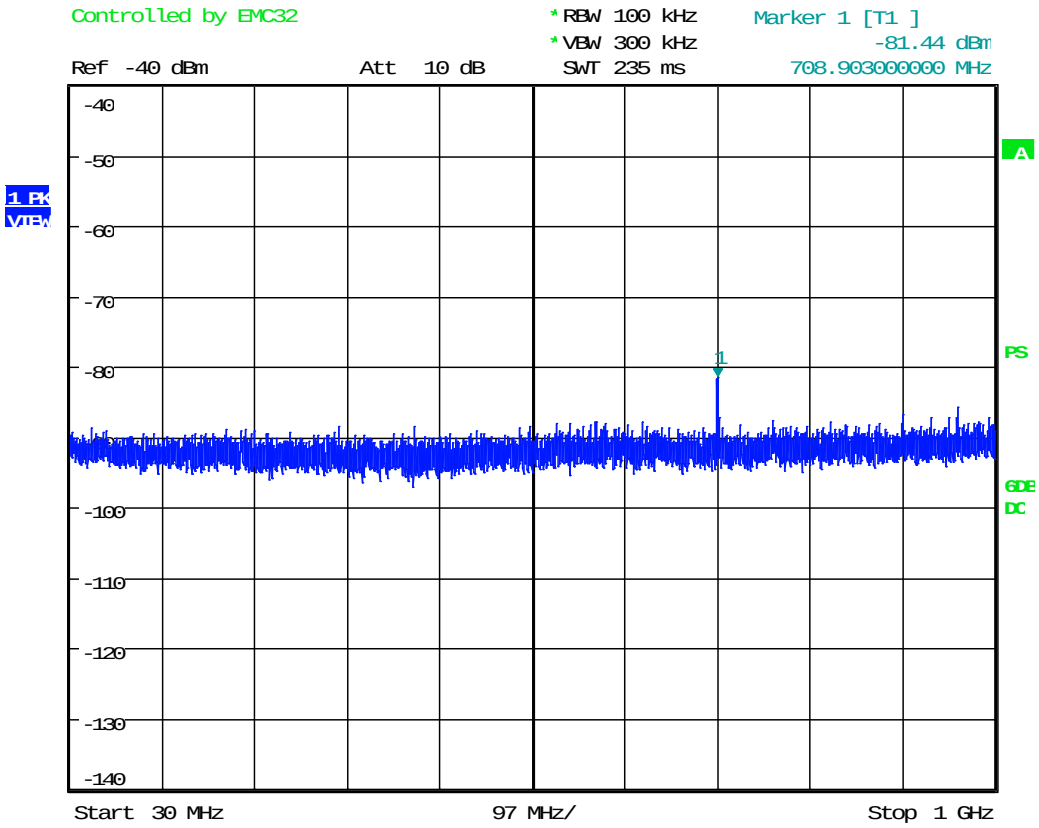
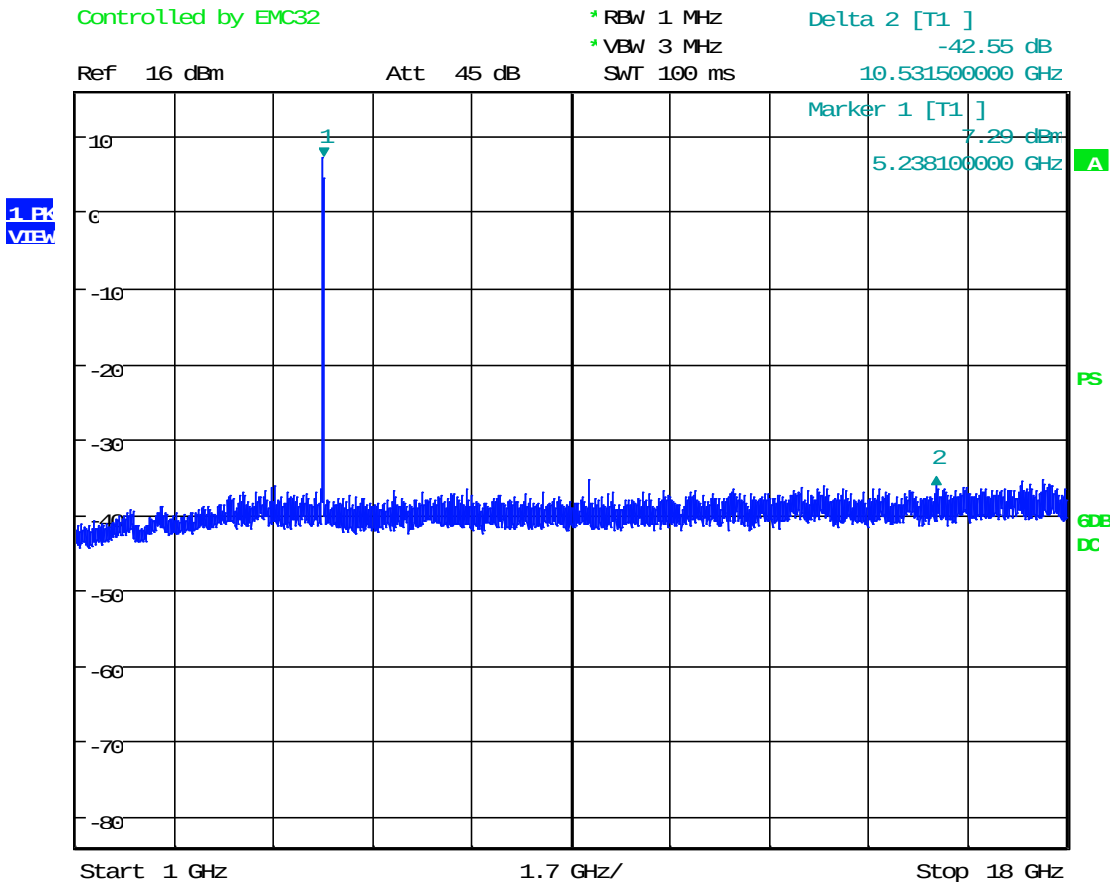
5.1 GHz: High Channel, 30 MHz to 1000 MHz

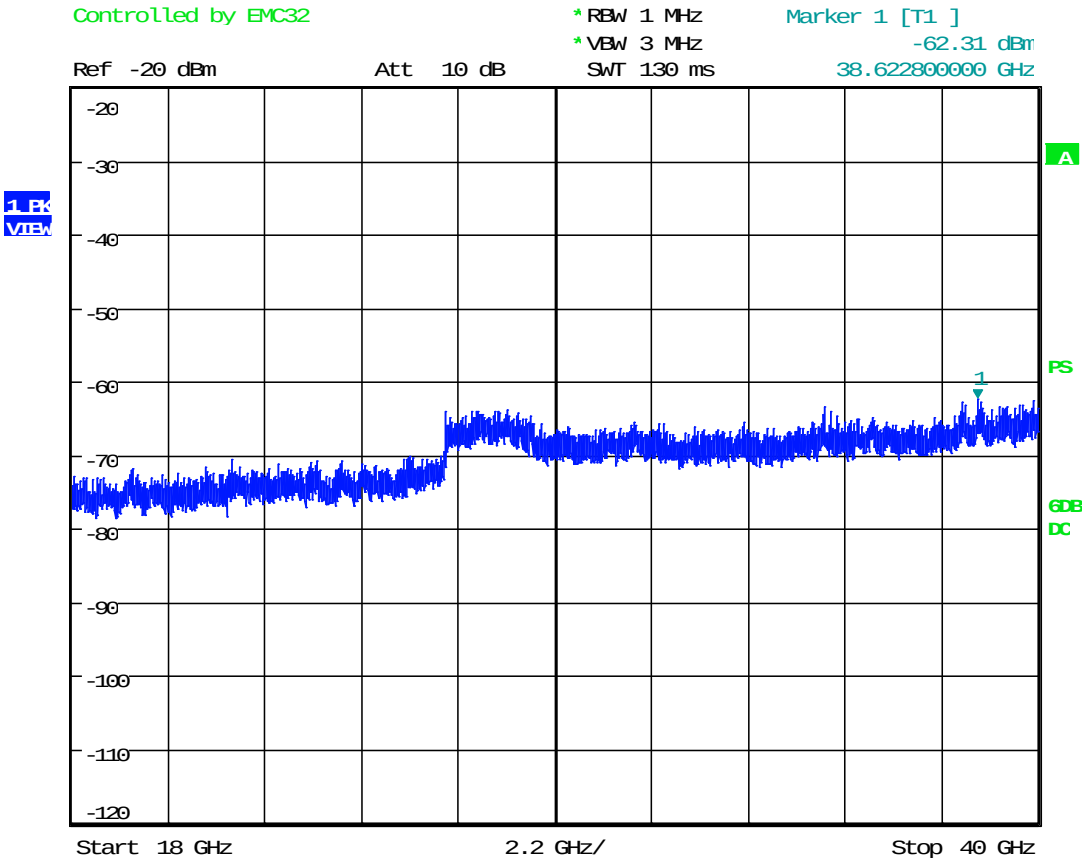


5.1 GHz: High Channel, 1 GHz to 18 GHz



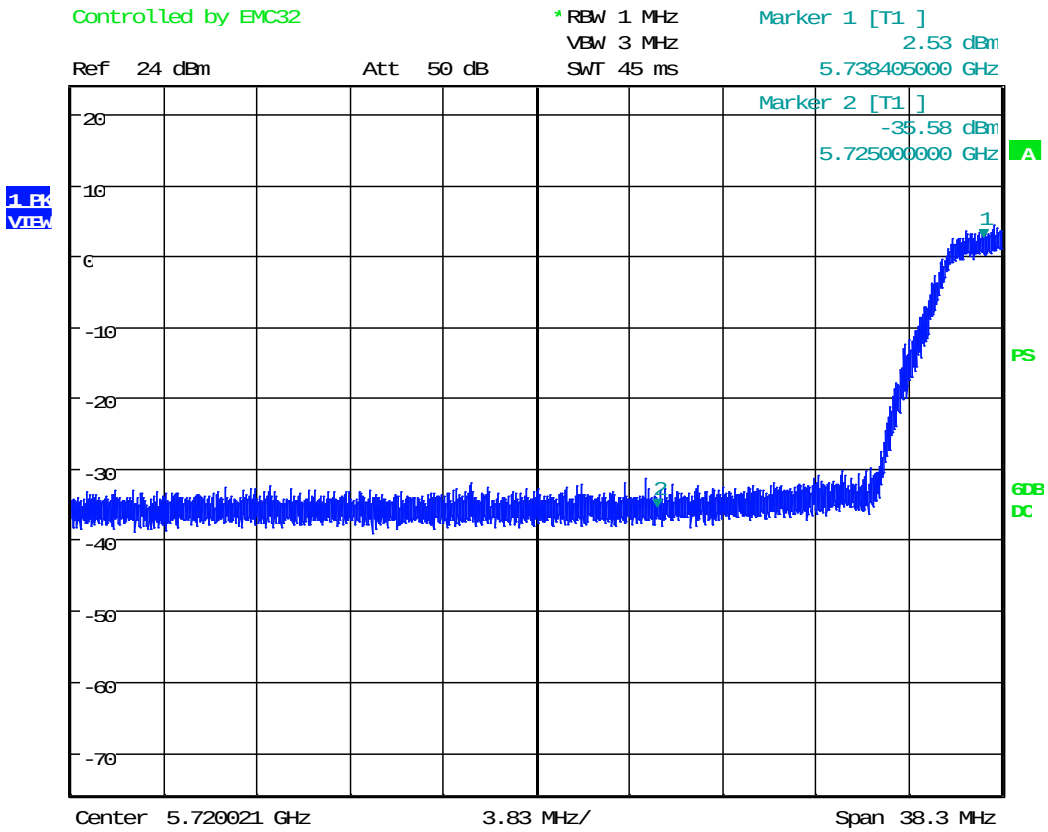
Date: 18.MAR.2019 13:27:04

5.1 GHz: High Channel, 18 GHz to 40 GHz



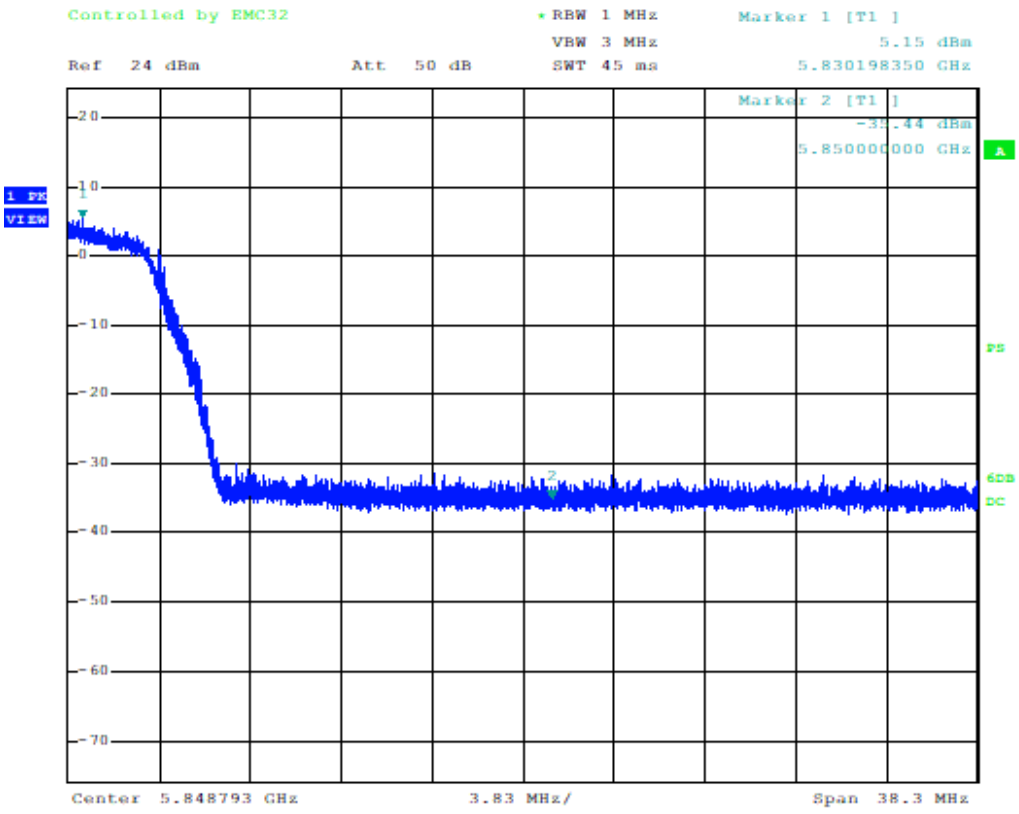
Date: 18.MAR.2019 13:35:29

5.7 GHz, Band Edge - Low



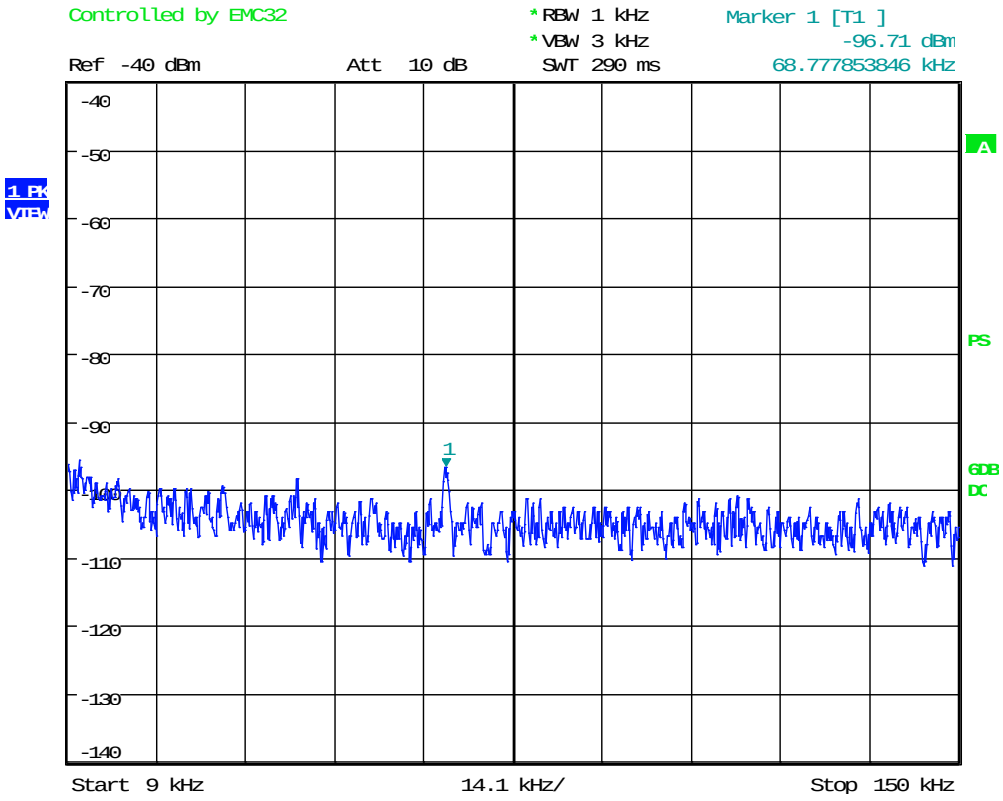
Date: 18.MAR.2019 14:28:37

5.7 GHz, Band Edge - High



Date: 18.MAR.2019 14:27:13

5.7 GHz: Low Channel, 0.009 MHz to 0.15 MHz



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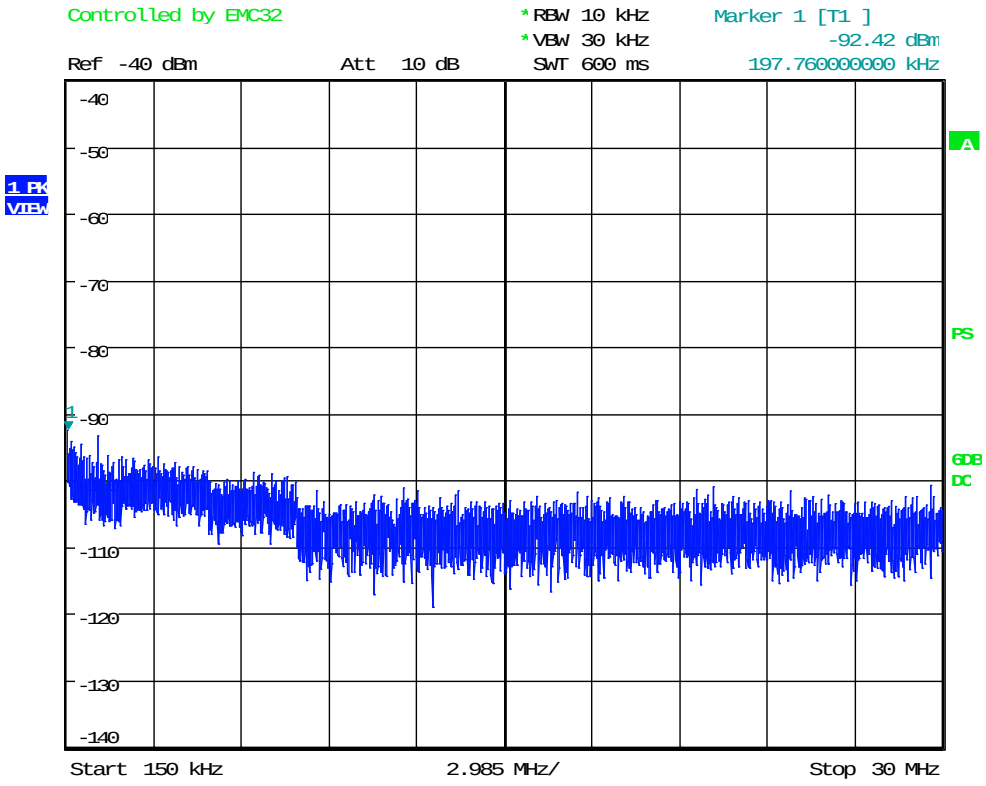
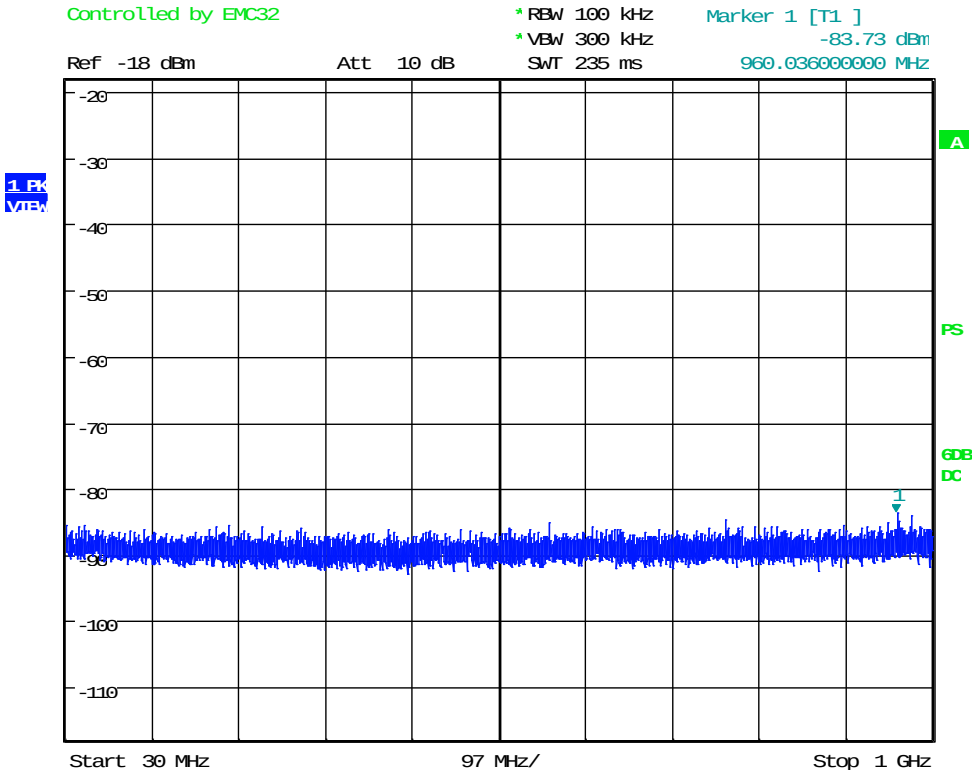
5.7 GHz: Low Channel, 0.15 MHz to 30 MHz



Date: 18.MAR.2019 13:09:18

5.7 GHz: Low Channel, 30 MHz to 1000 MHz



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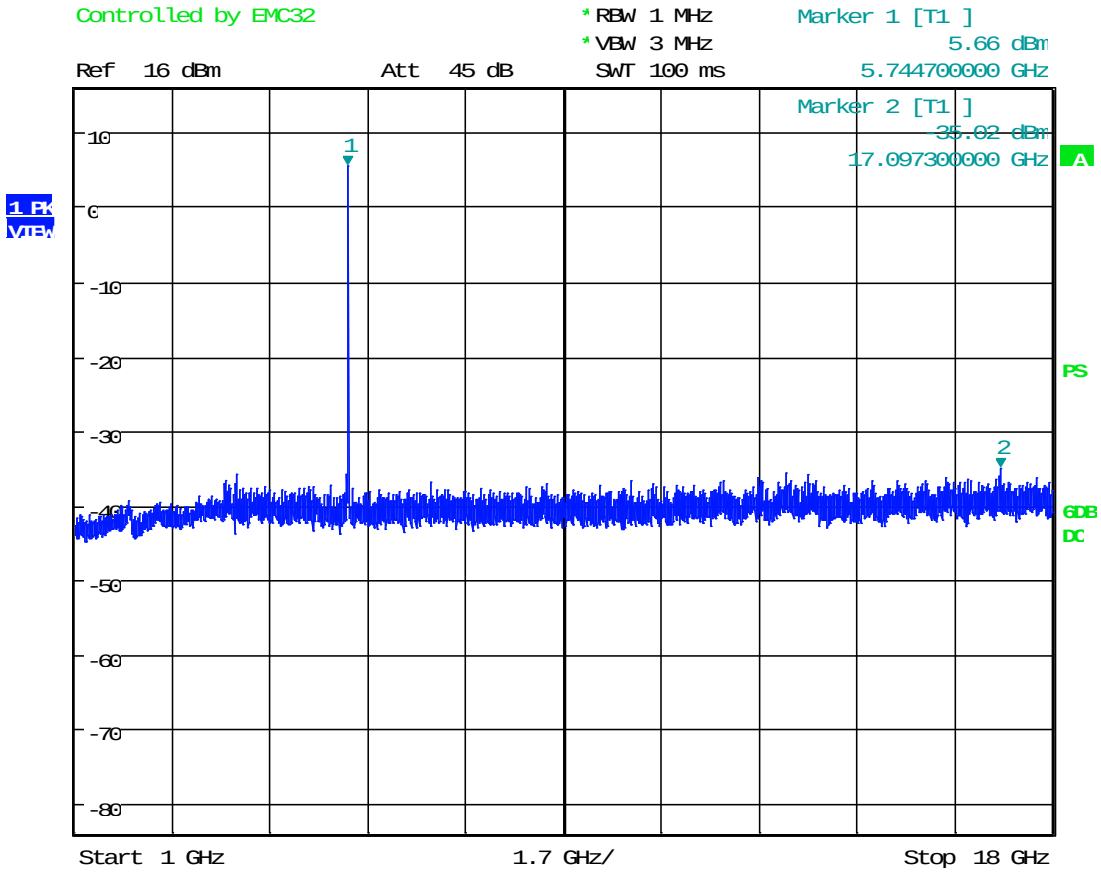
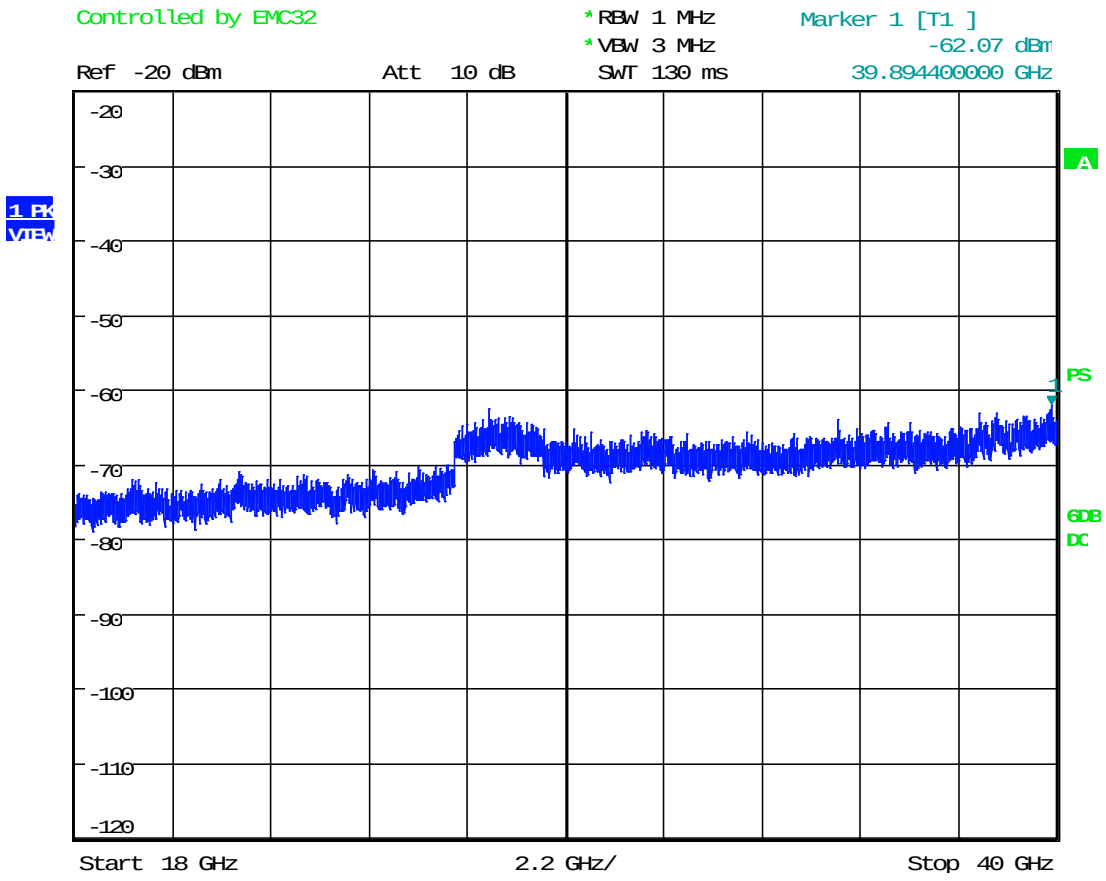
5.7 GHz: Low Channel, 1 GHz to 18 GHz



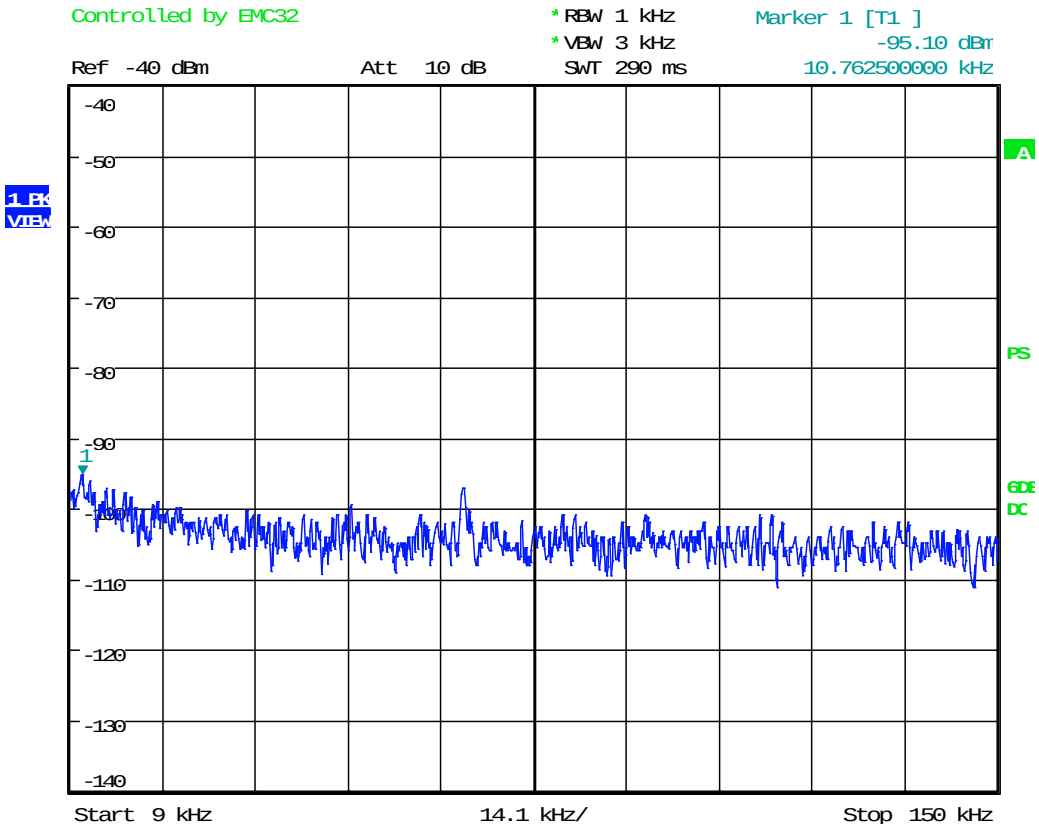
Date: 18.MAR.2019 13:28:38

5.7 GHz: Low Channel, 18 GHz to 40 GHz

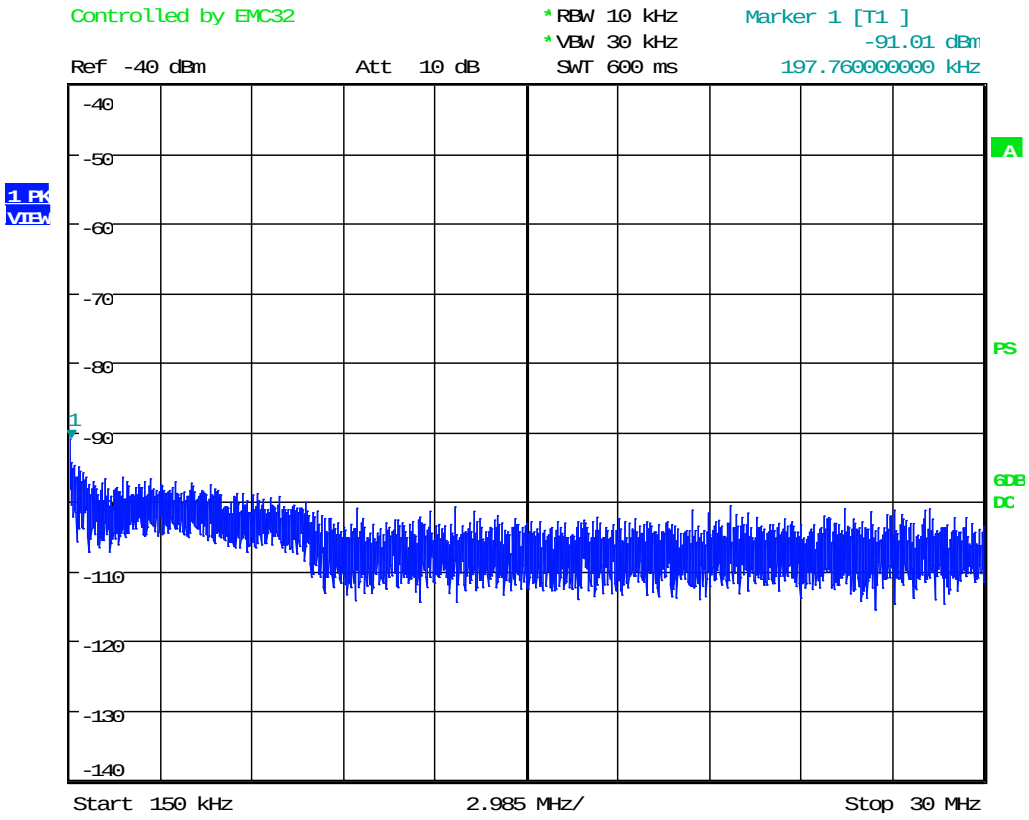


Date: 18.MAR.2019 13:36:19

5.7 GHz: Mid Channel, 0.009 MHz to 0.15 MHz

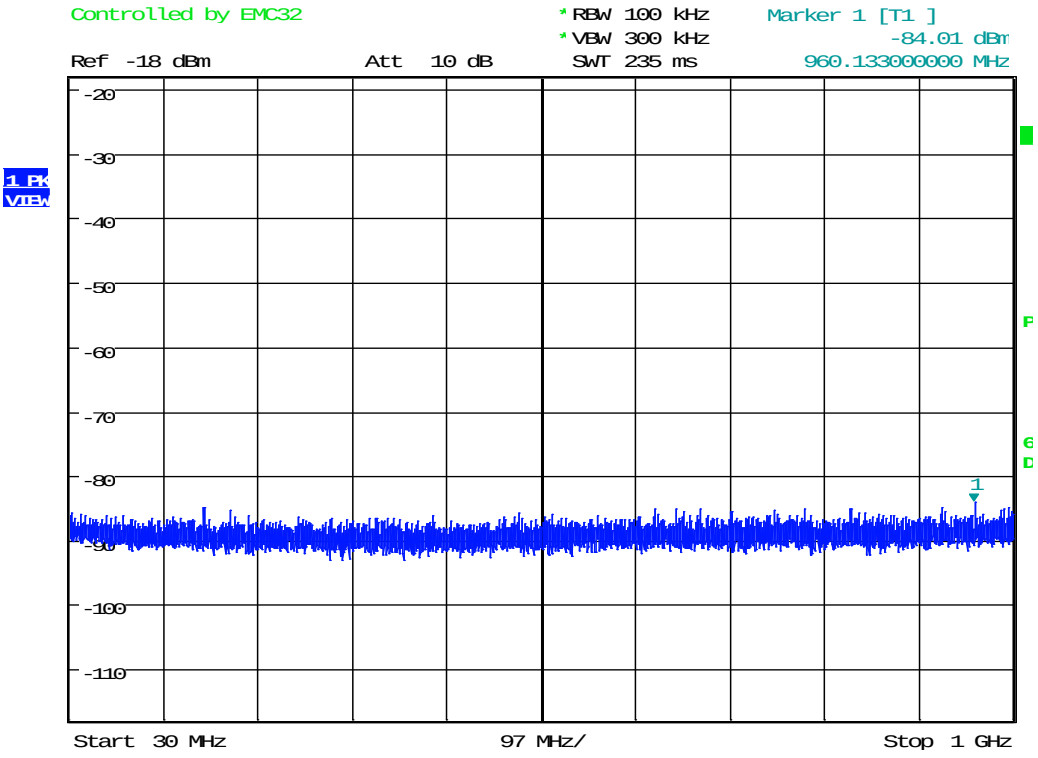


5.7 GHz: Mid Channel, 0.15 MHz to 30 MHz

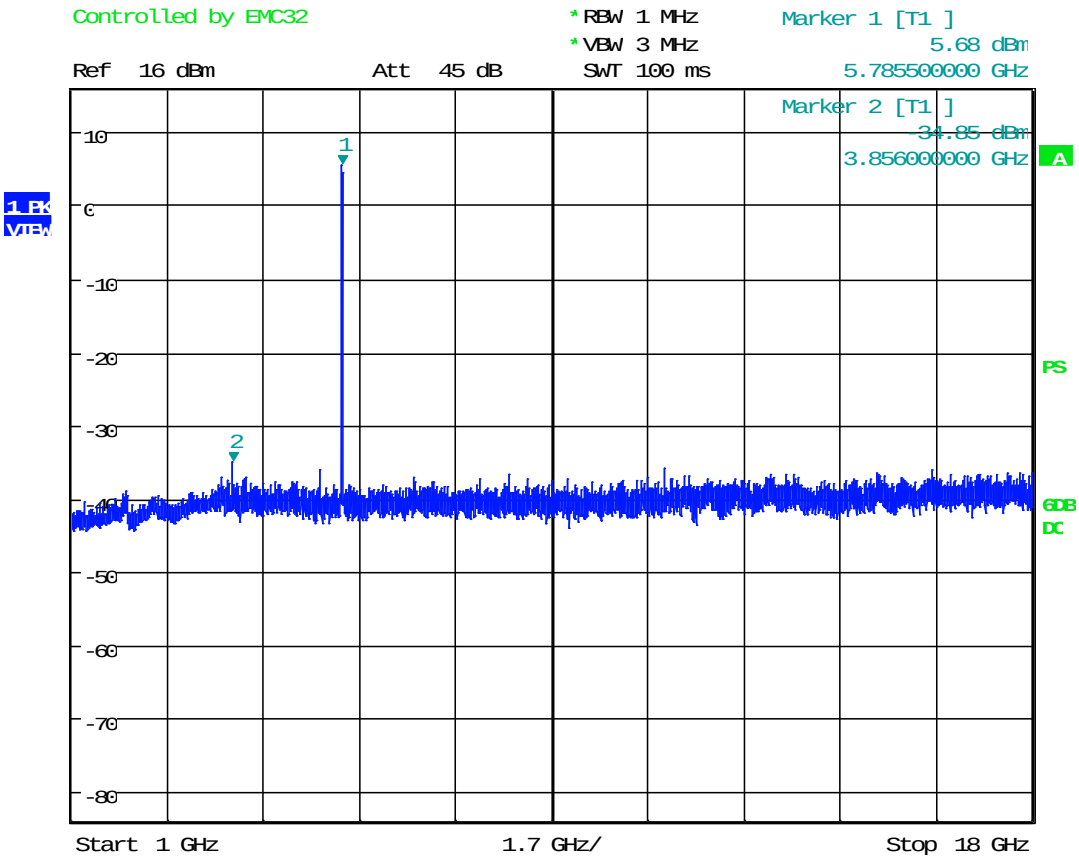


Date: 18.MAR.2019 13:09:48

5.7 GHz: Mid Channel, 30 MHz to 1000 MHz

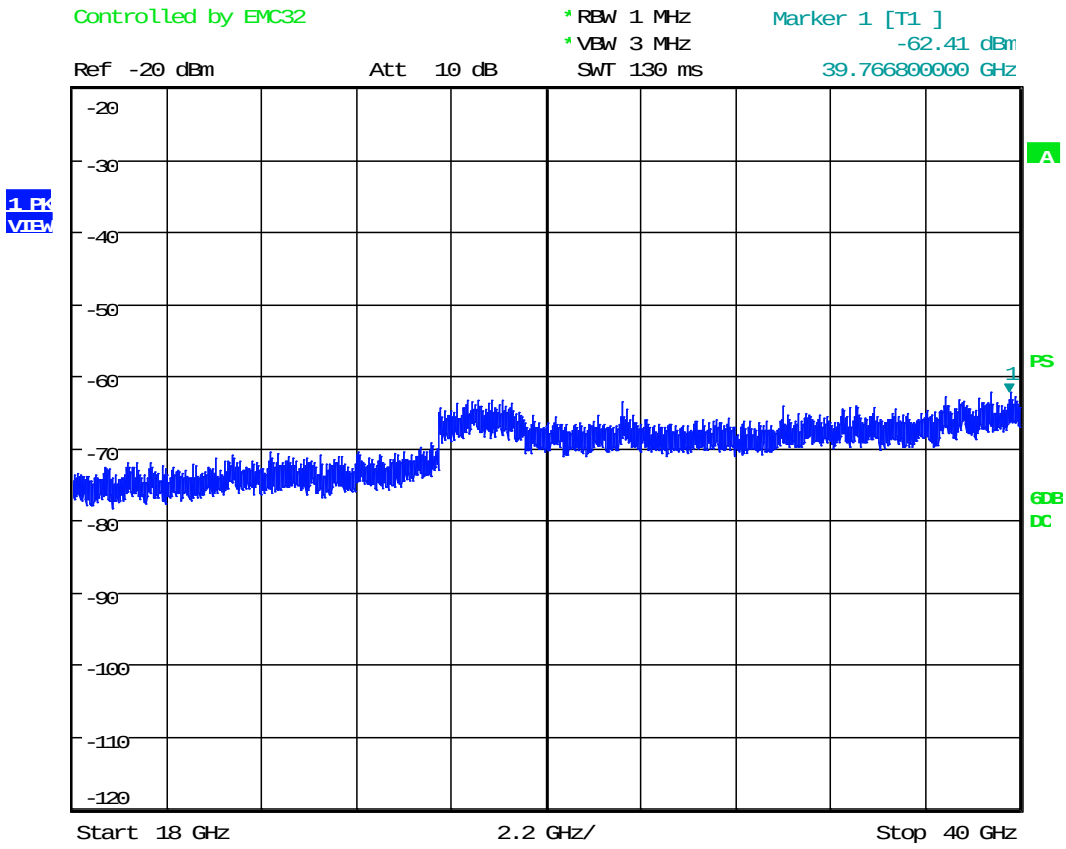


5.7 GHz: Mid Channel, 1 GHz to 18 GHz



Date: 18.MAR.2019 13:29:39

5.7 GHz: Mid Channel, 18 GHz to 40 GHz



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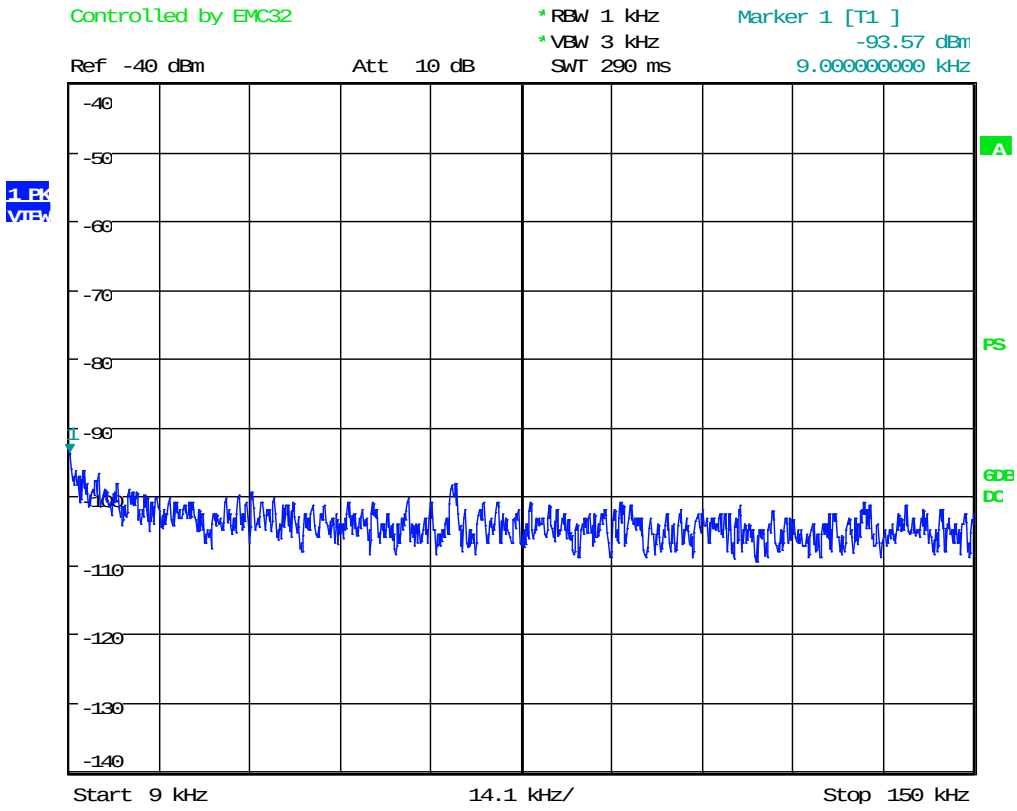
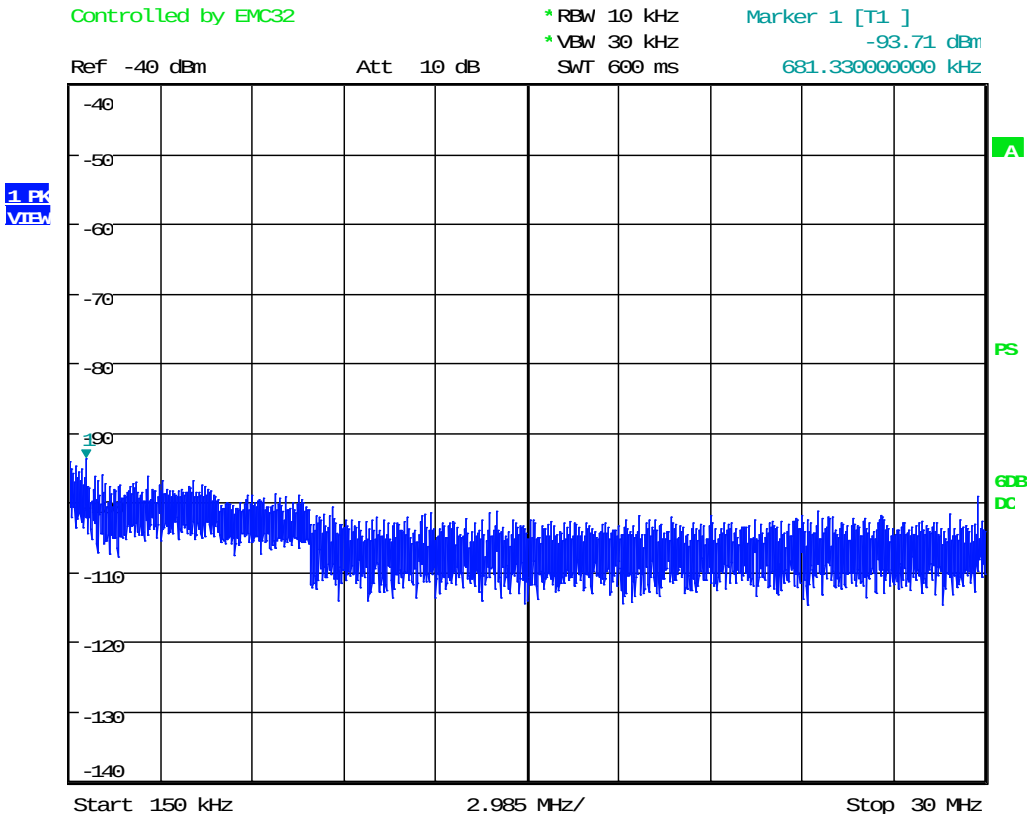
5.7 GHz: High Channel, 0.009 MHz to 0.15 MHz



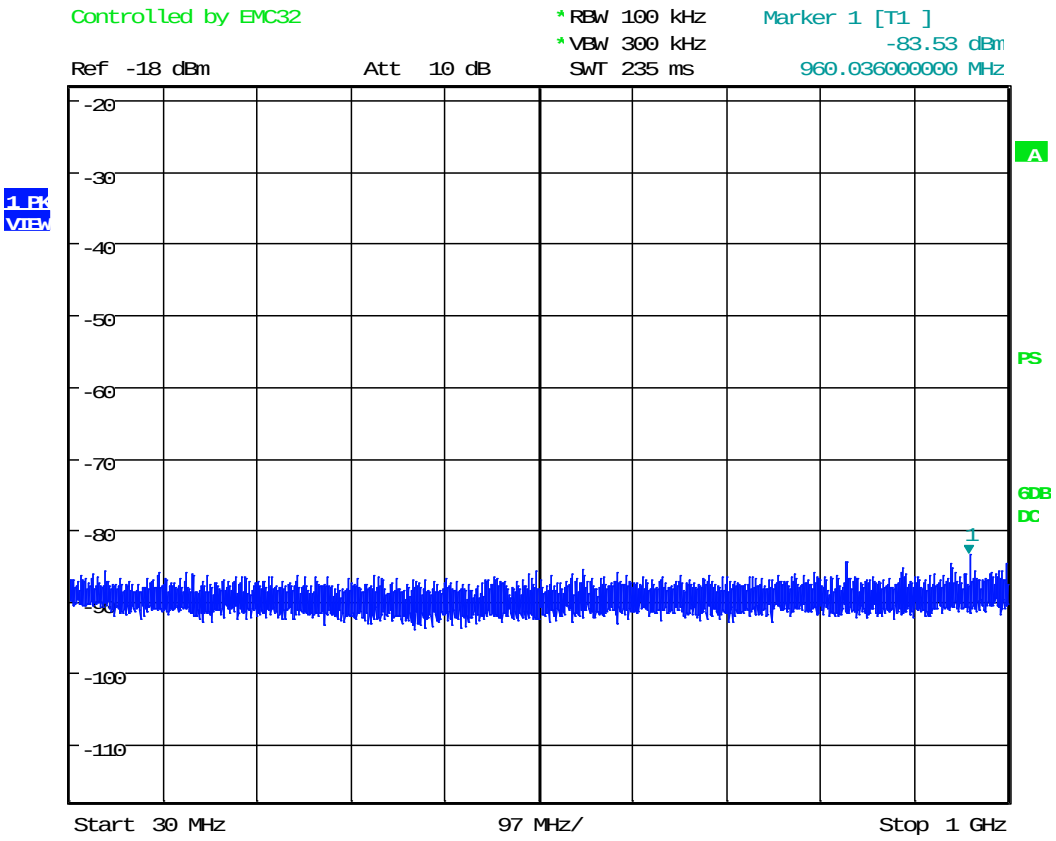
Date: 18.MAR.2019 13:03:56

5.7 GHz: High Channel, 0.15 MHz to 30 MHz

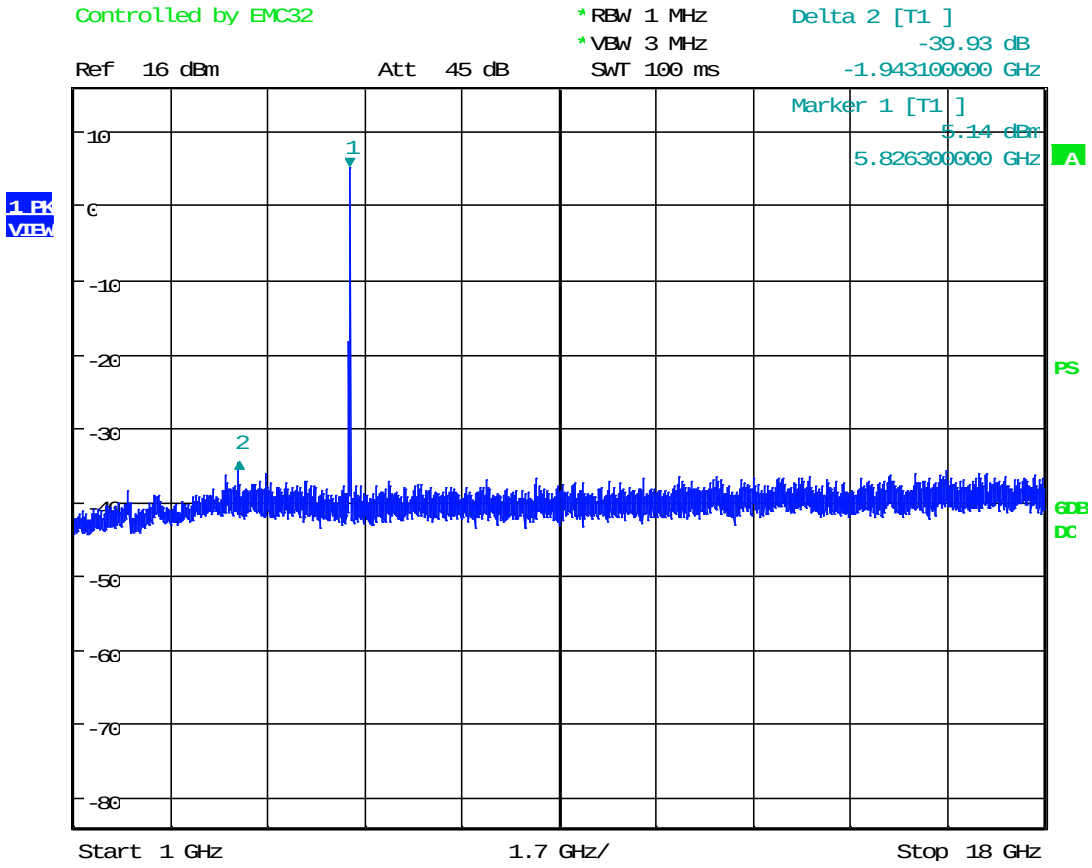


Date: 18.MAR.2019 13:10:34

5.7 GHz: High Channel, 30 MHz to 1000 MHz

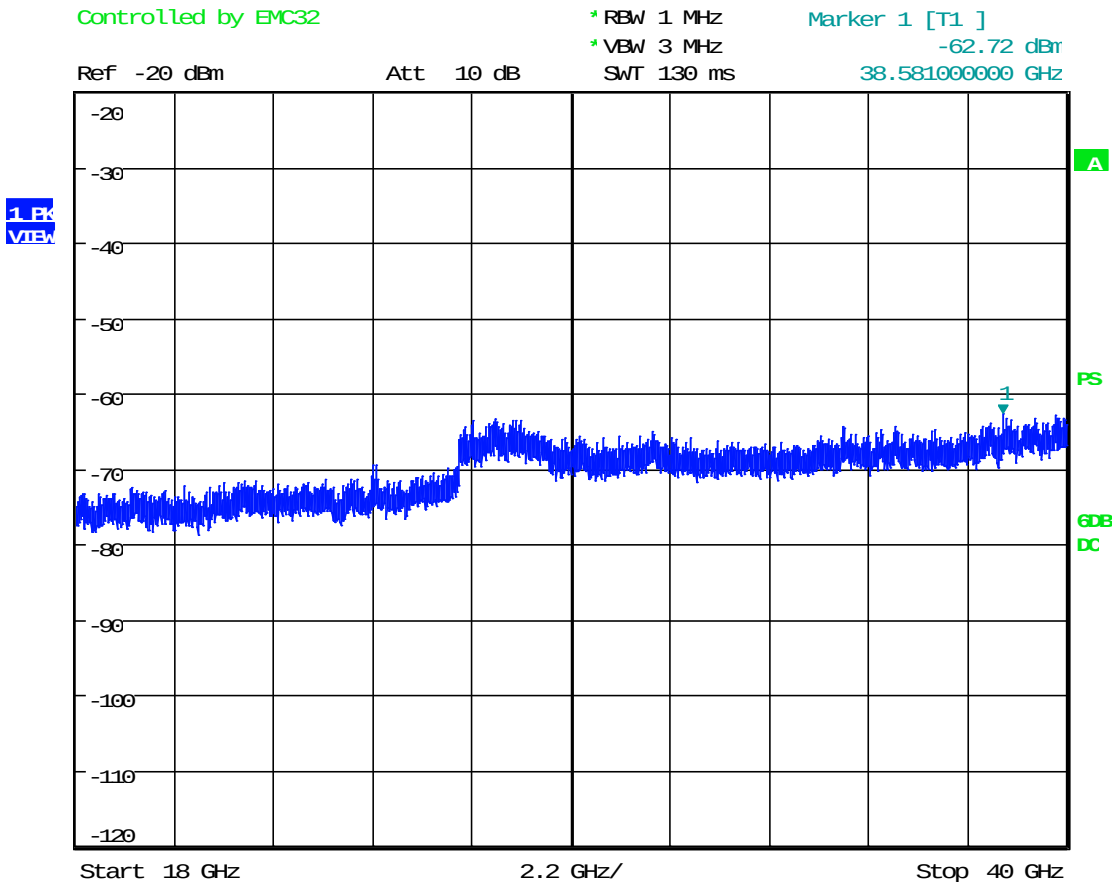


5.7 GHz: High Channel, 1 GHz to 18 GHz



Date: 18.MAR.2019 13:30:43

5.7 GHz: High Channel, 18 GHz to 40 GHz



Date: 18.MAR.2019 13:37:41

12 VOLTAGE VARIATIONS

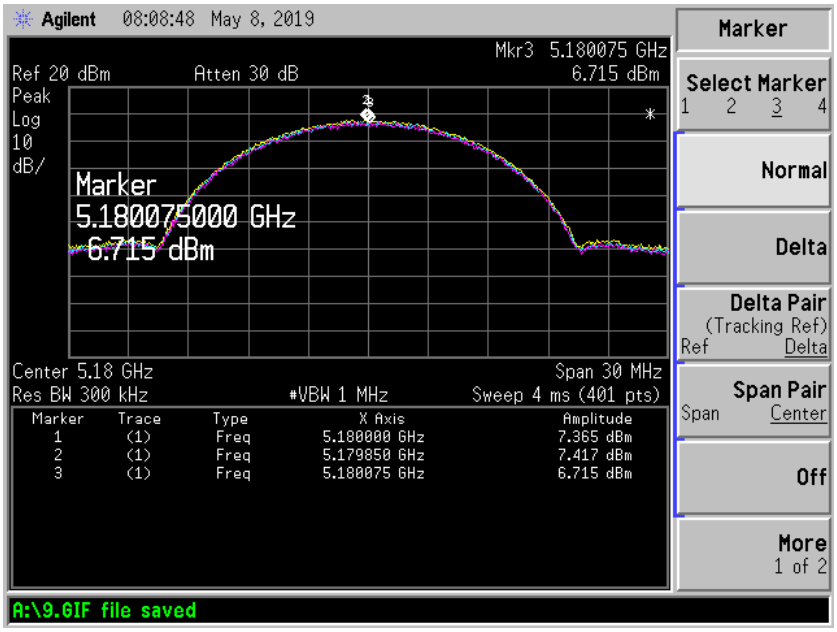
For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery. A nominal voltage of 3.3VDC was used and then 2.9VDC* and 3.8VDC were used as the 85% and 115% variations.

RESULTS: The results showed that the fundamental frequency did not move outside the frequency band and the output power did not increase above the limit during the variations.

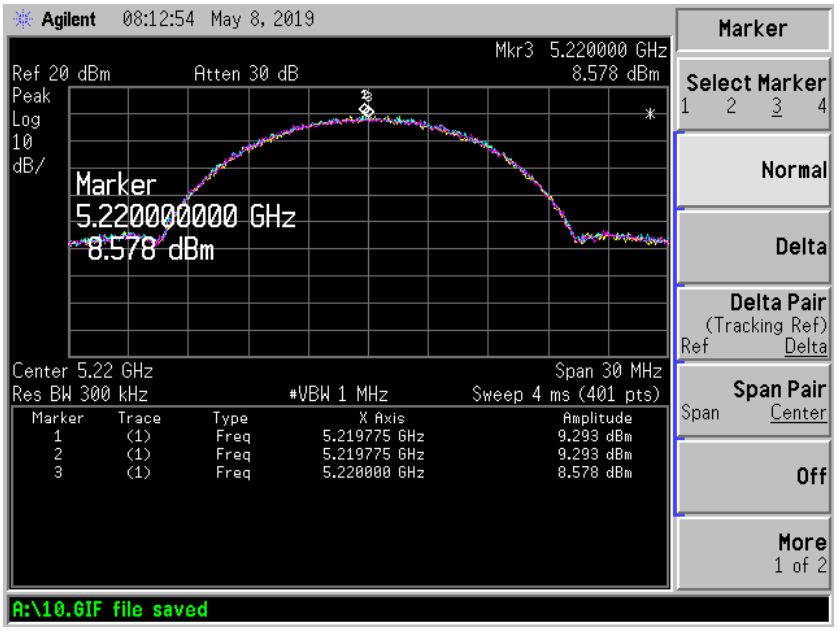
**2.9VDC was used for the low variation since the EUT shut off at 2.85VDC.*

Test Date(s):	May 7, 2019	**Test Engineer(s):**	J. Chiller
Standards:	CFR 47 Part 15.31(e)	**Air Temperature:**	21.6ºC
		Relative Humidity:	28%

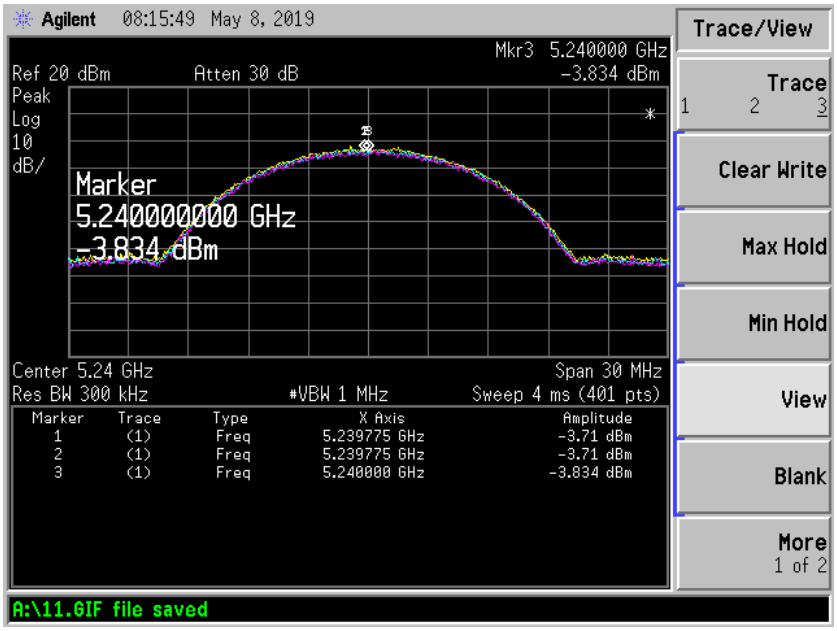
UNII1, CCK: Low



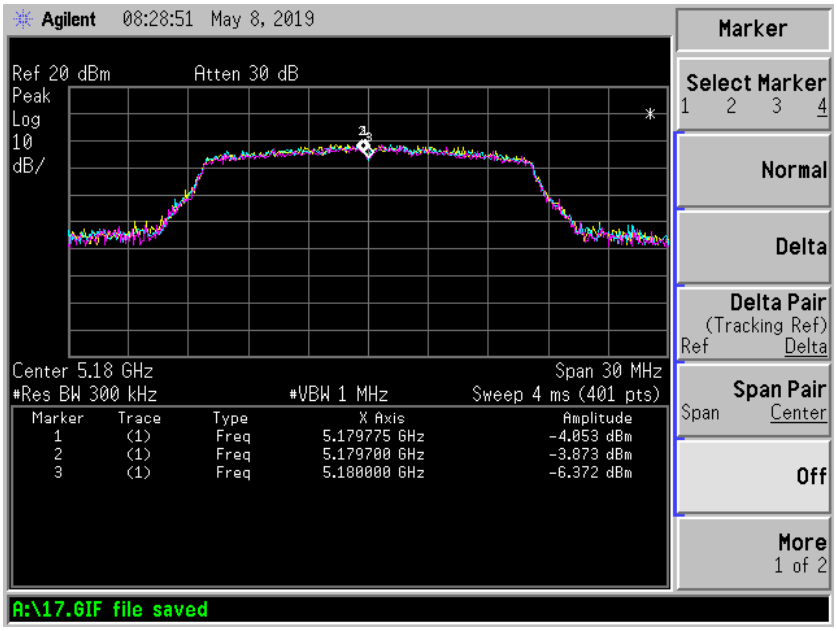
UNII1, CCK: Mid



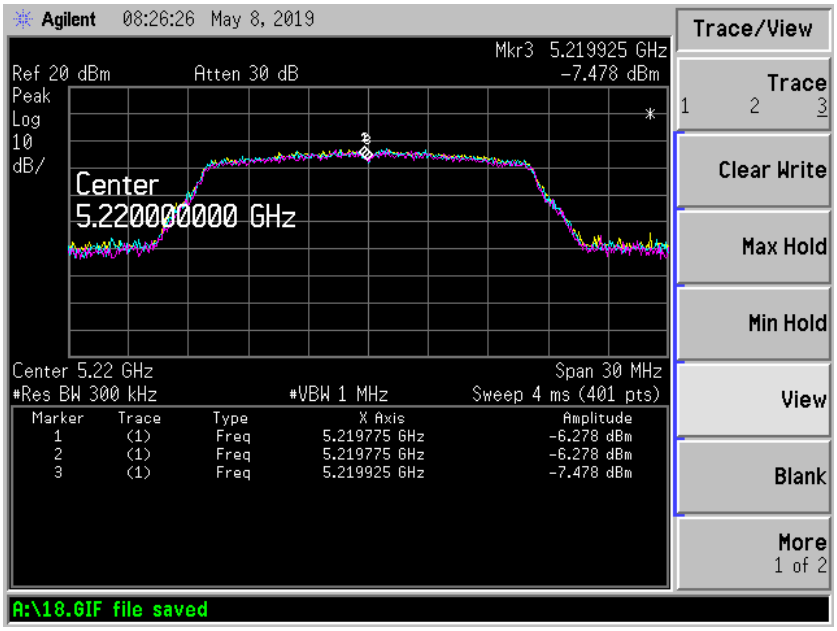
UNII1, CCK: High



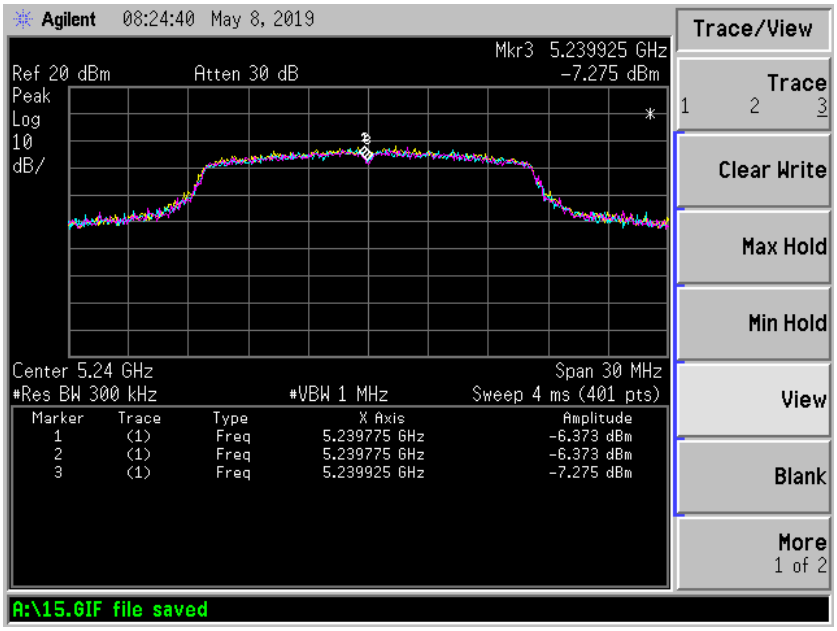
UNII1, HT20: Low



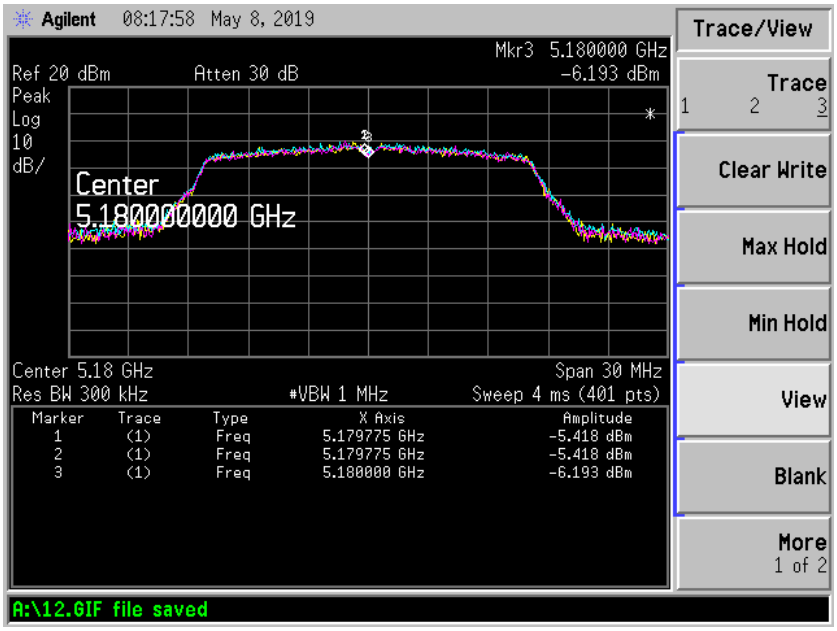
UNII1, HT20: Mid



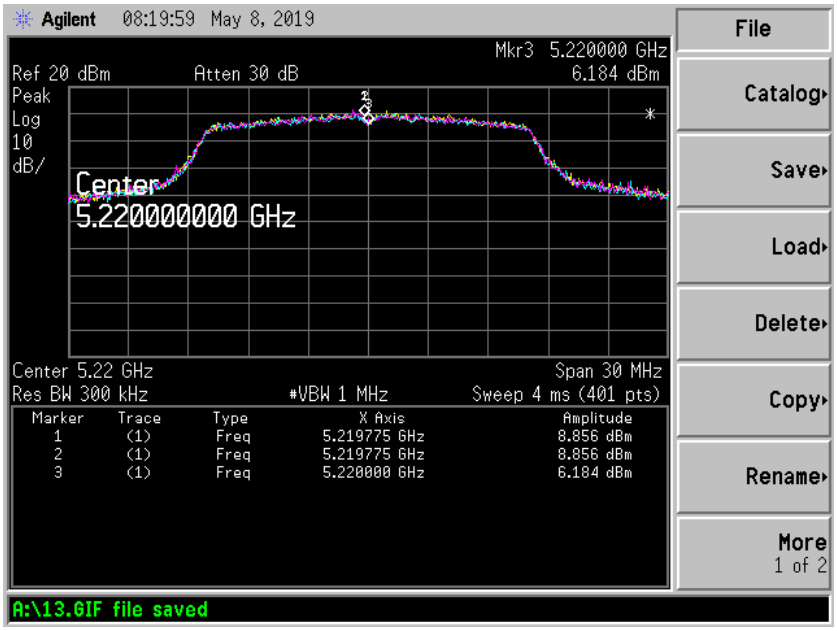
UNII1, HT20: High



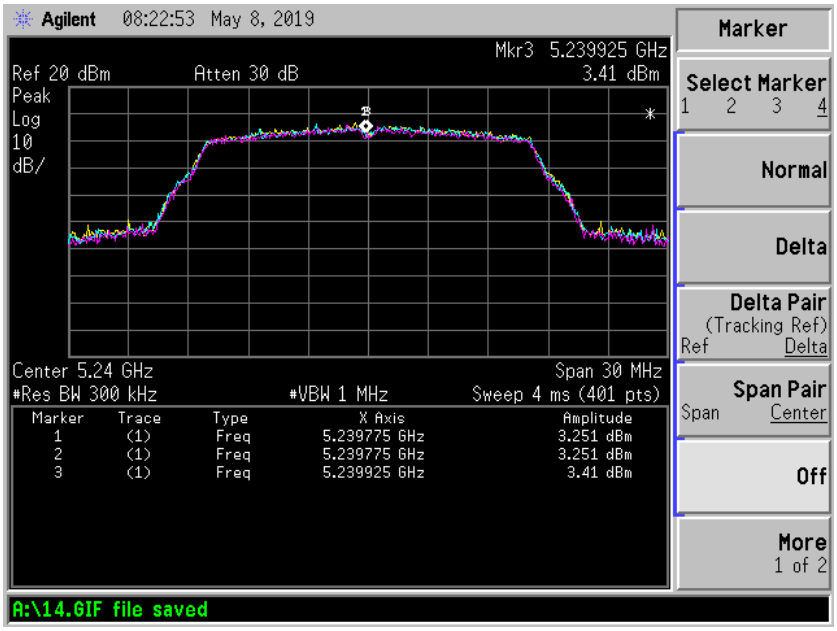
UNII1, OFDM: Low



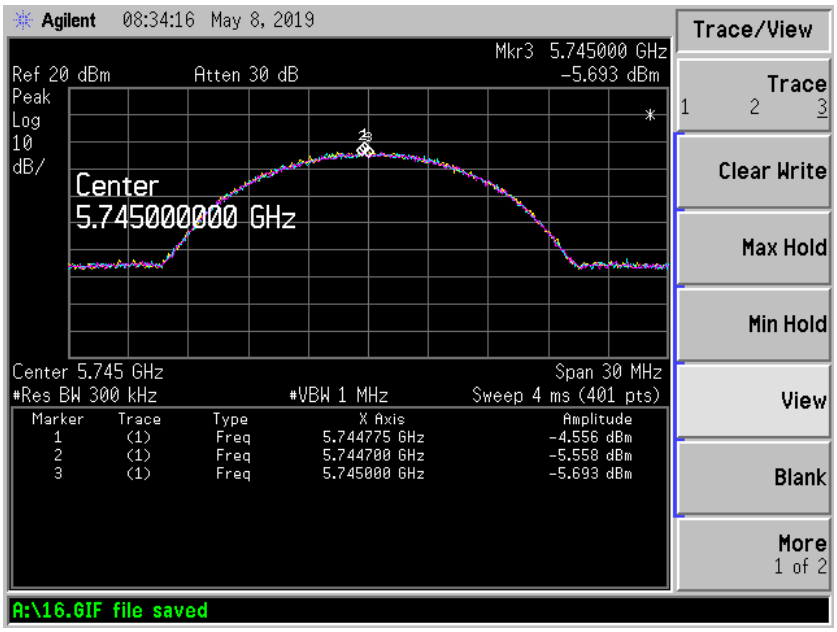
UNII1, OFDM: Mid



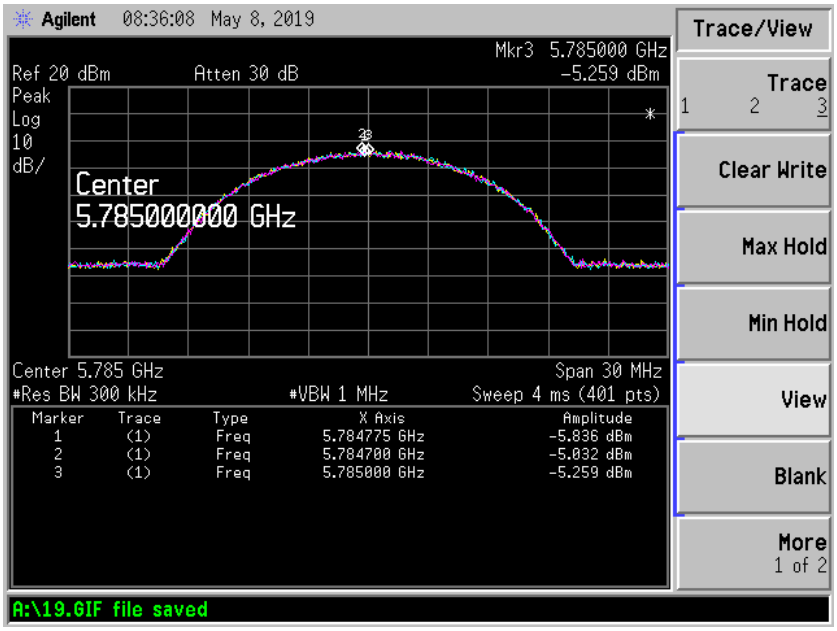
UNII1, OFDM: High



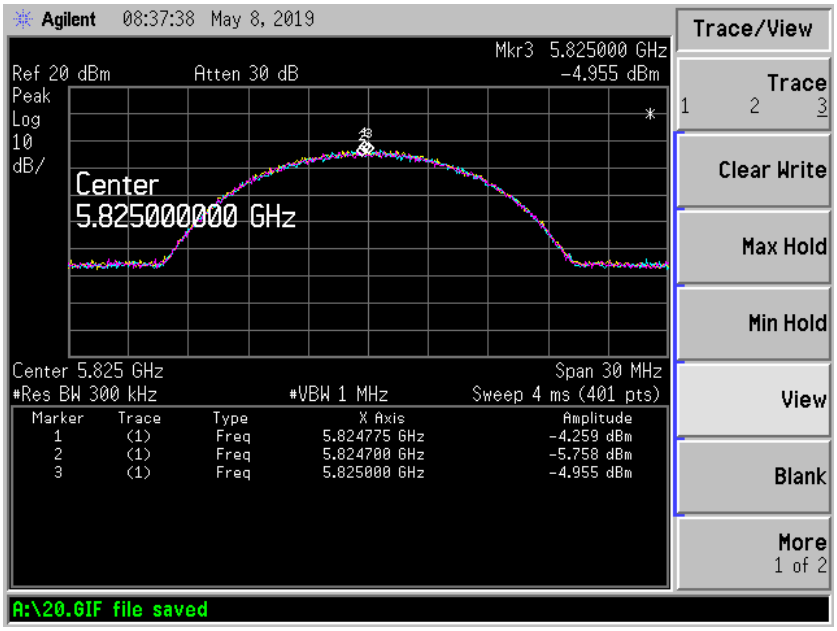
UNII3, CCK: Low



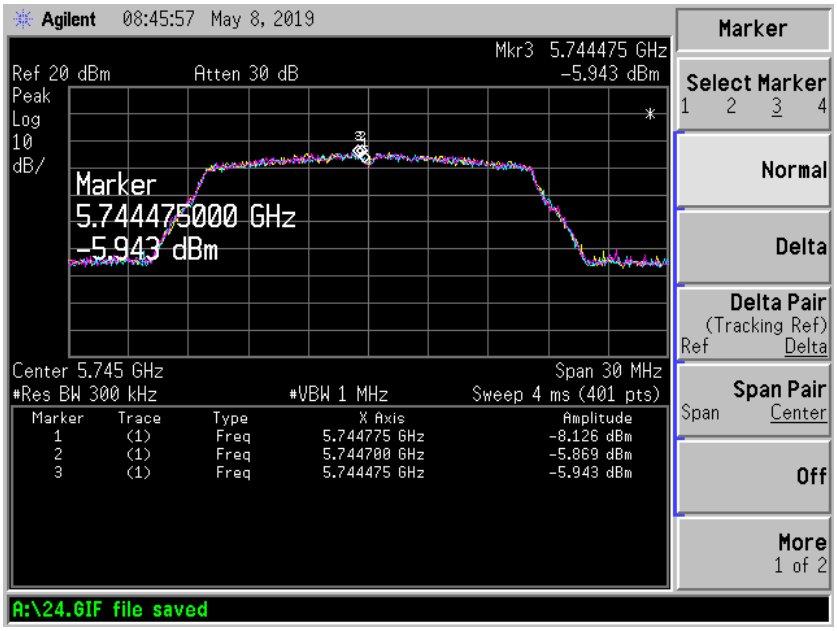
UNII3, CCK: Mid



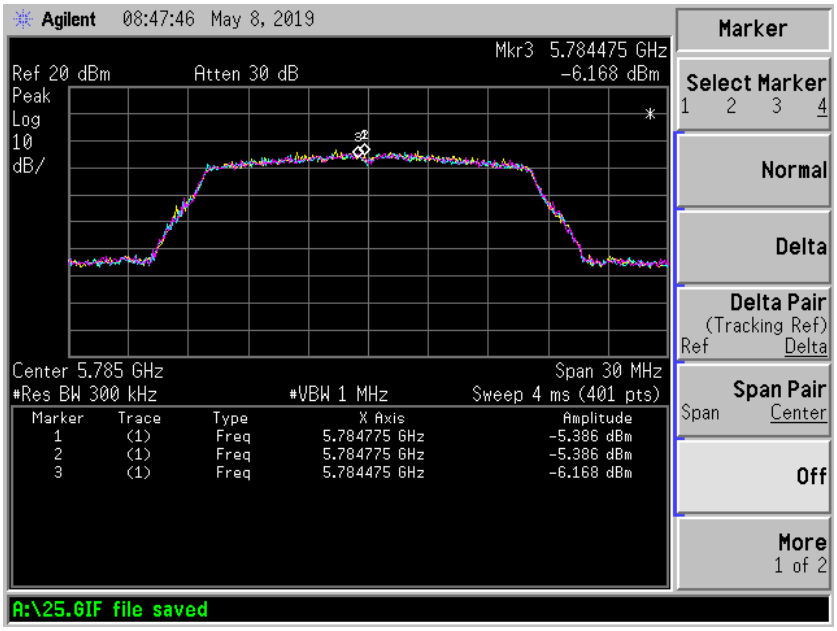
UNII3, CCK: High



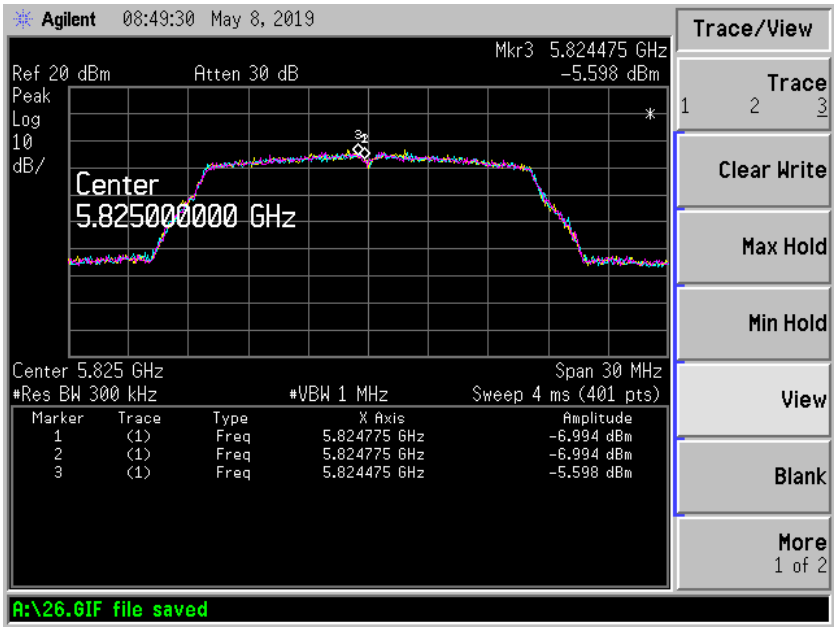
UNII3, HT20: Low



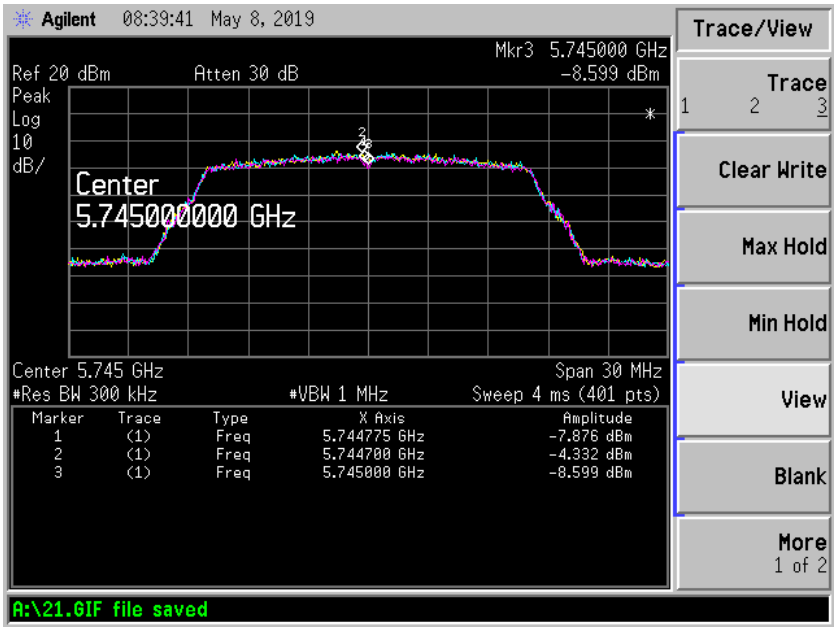
UNII3, HT20: Mid



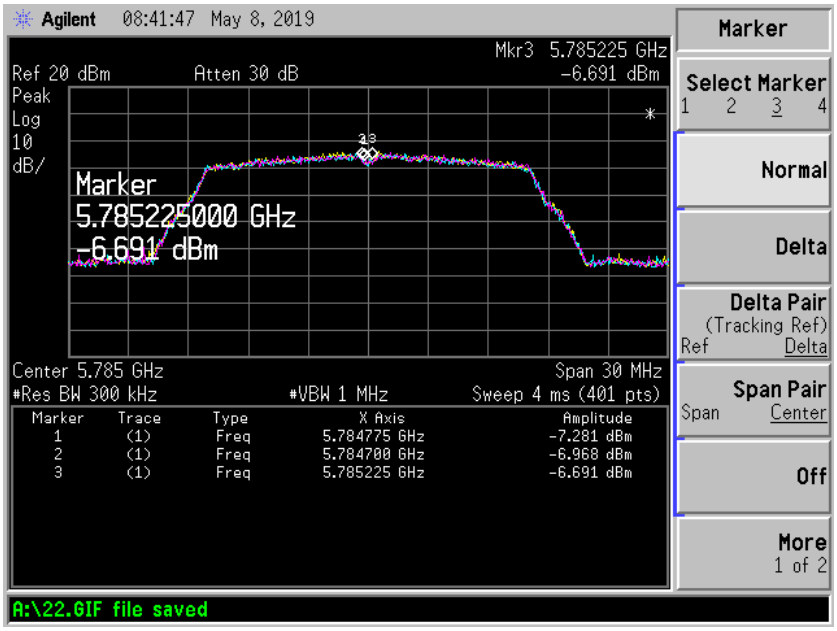
UNII3, HT20: High



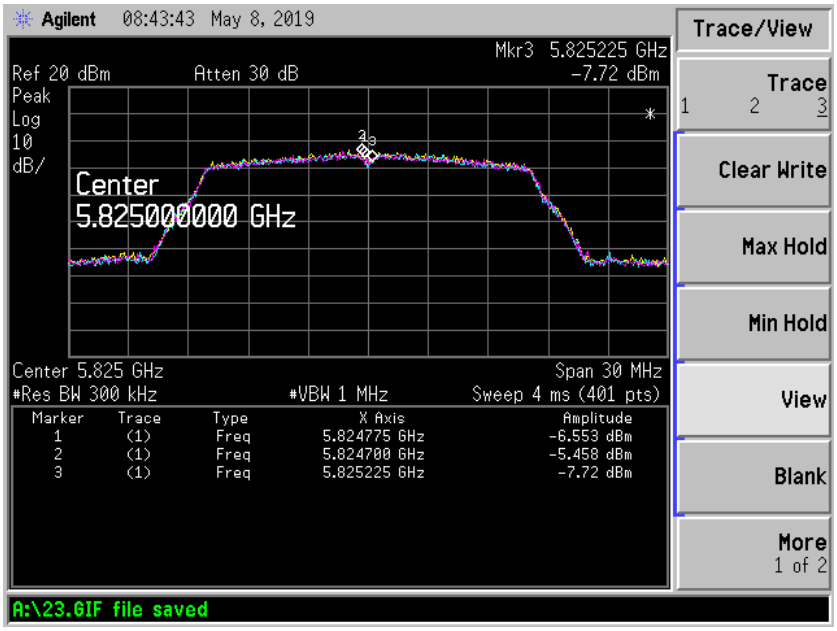
UNII3, OFDM: Low



UNII3, OFDM: Mid



UNII3, OFDM: High



13 CONDUCTED EMISSIONS

13.1 Requirements

In accordance with FCC CFR 47 Part 15.207(a), “Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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.

13.2 Procedure

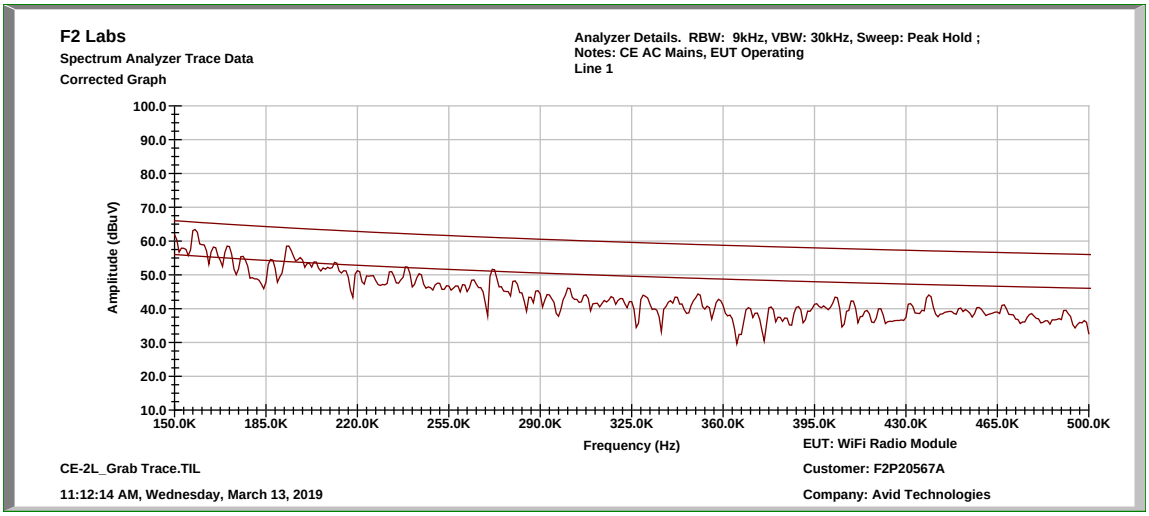
The EUT was placed on a 1.0 x 1.5 meter non-conductive table, 0.8 meter above a horizontal ground plane and 0.4 meter from a vertical ground plane. Power was provided to the EUT through a LISN bonded to a 3 x 2 meter ground plane. The LISN and peripherals were supplied power through a filtered AC power source. The output of the LISN was connected to the input of the receiver via a transient limiter, and emissions in the range 150 kHz to 30 MHz were measured. The measurements were recorded using the quasi-peak and average detectors as directed by the standard, and the resolution bandwidth during testing was 9 kHz. The raw measurements were corrected to allow for attenuation from the LISN, transient limiter and cables.

13.3 Conducted Emissions Test Data

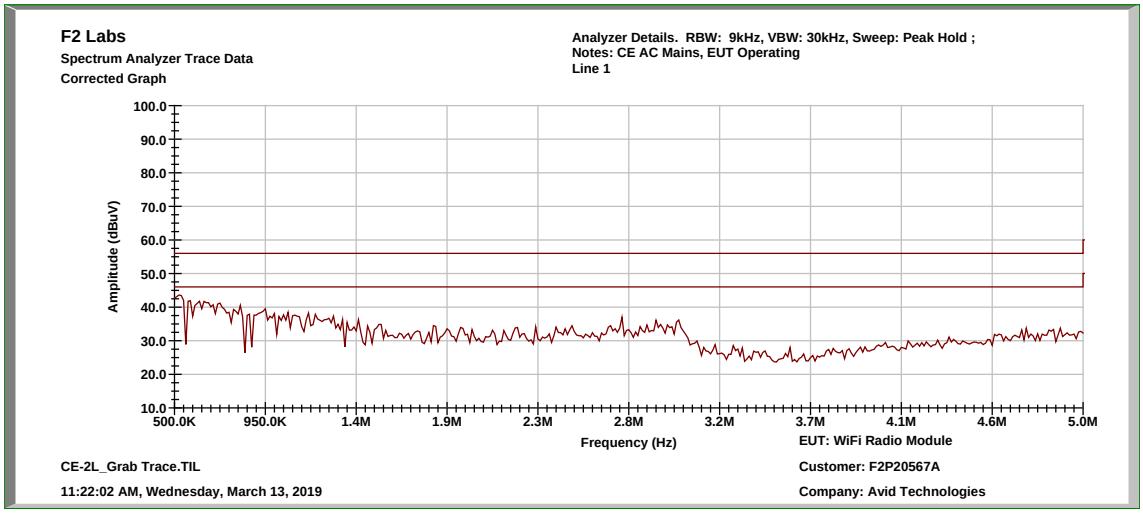
Test Date(s):	Mar. 13, 2019	**Test Engineer:**	J. Chiller
Rule:	15.207	**Air Temperature:**	20.5º C
Test Results:	Complies	**Relative Humidity:**	34%

Note: The data below represents worst case results of all three channels.

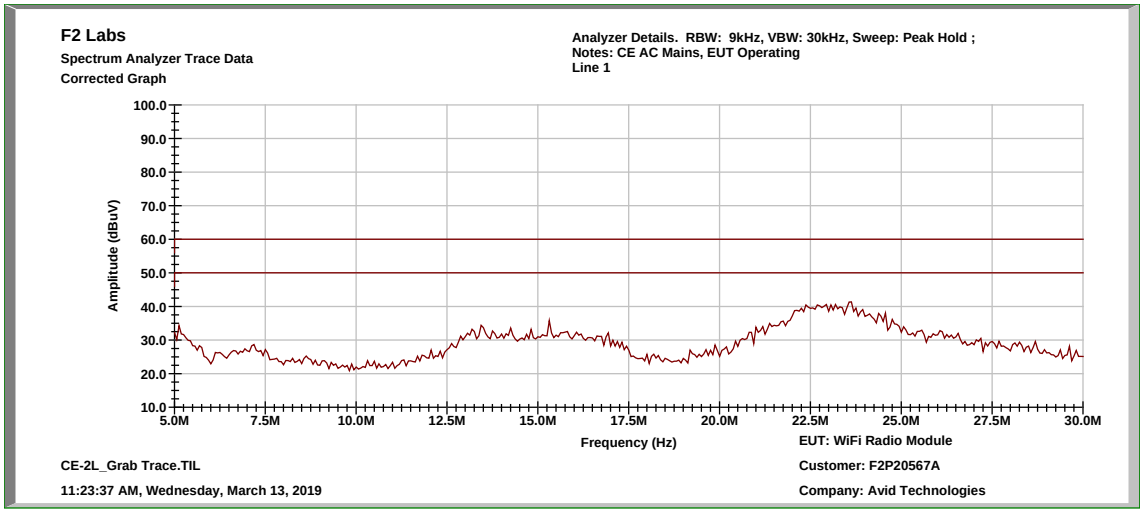
Conducted Test – Line 1: 0.15 MHz to 0.5 MHz



Conducted Test – Line 1: 0.5 MHz to 5.0 MHz

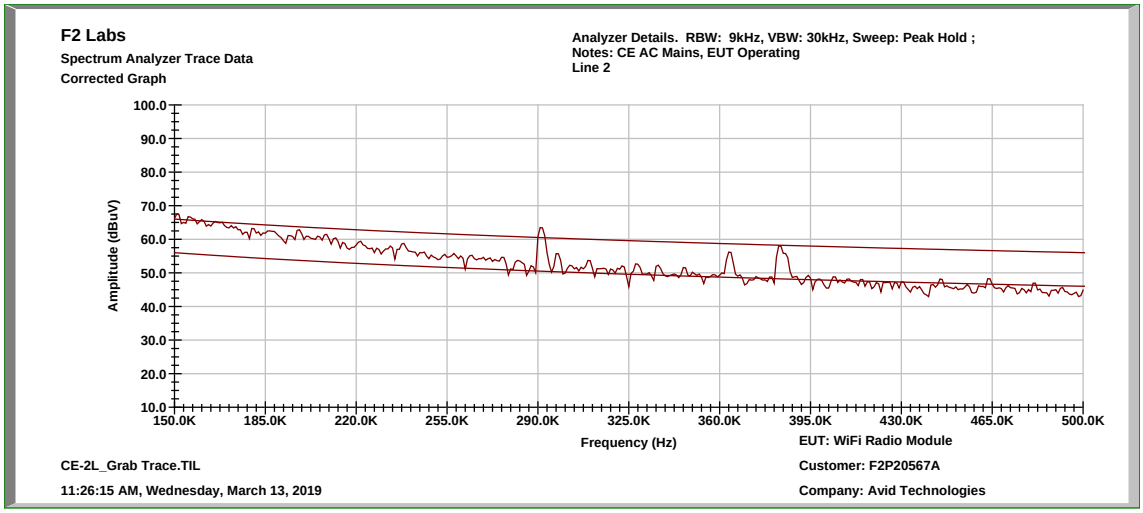


Conducted Test – Line 1: 5.0 MHz to 30.0 MHz

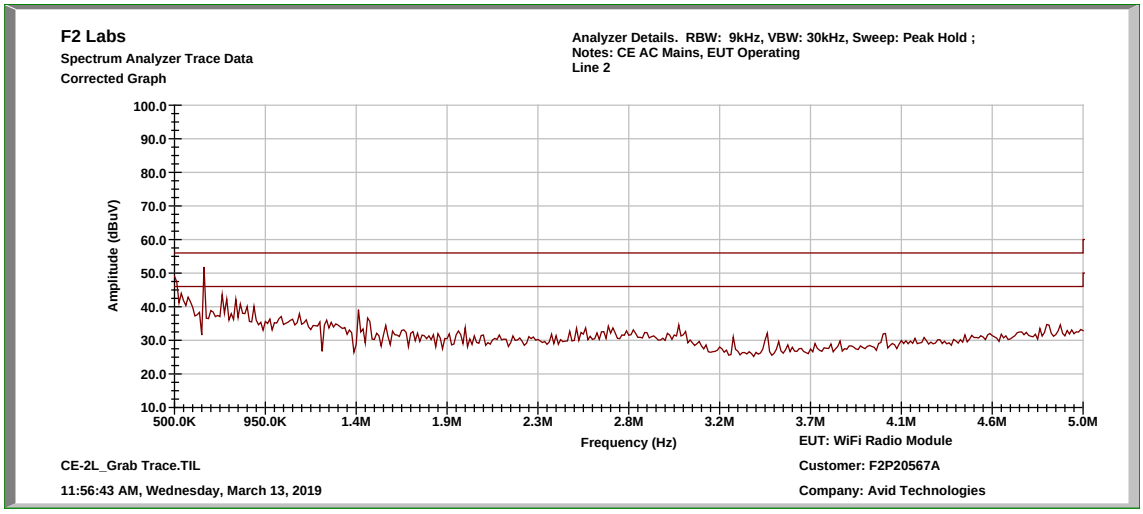


Top Discrete Measurements								
No.	Conductor	Frequency (MHz)	Detector	Level (dBµV)	Adjustment (dB)	Results (dBµV)	Limit (dBµV)	Margin (dB)
1	Line 1	0.15875	Quasi-Peak	43.4	11.547	54.95	65.530	-10.6
			Average	27.33	11.547	38.88	55.530	-16.7
2	Line 1	0.16575	Quasi-Peak	42.13	11.473	53.60	65.171	-11.6
			Average	25.60	11.473	37.07	55.171	-18.1
3	Line 1	0.171000	Quasi-Peak	40.92	11.417	52.34	64.913	-12.6
			Average	22.2	11.417	33.62	54.913	-21.3
4	Line 1	0.19375	Quasi-Peak	39.15	11.176	50.33	63.875	-13.5
			Average	19.04	11.176	30.22	53.875	-23.7
5	Line 1	0.20400	Quasi-Peak	37.44	11.070	48.51	63.437	-14.9
			Average	20.4	11.070	31.47	53.437	-22.0
6	Line 1	0.212125	Quasi-Peak	36.31	10.996	47.31	63.122	-15.8
			Average	20.31	10.996	31.31	53.122	-21.8
7	Line 1	0.2725	Quasi-Peak	31.29	10.631	41.92	61.042	-19.1
			Average	13.95	10.631	24.58	51.042	-26.5

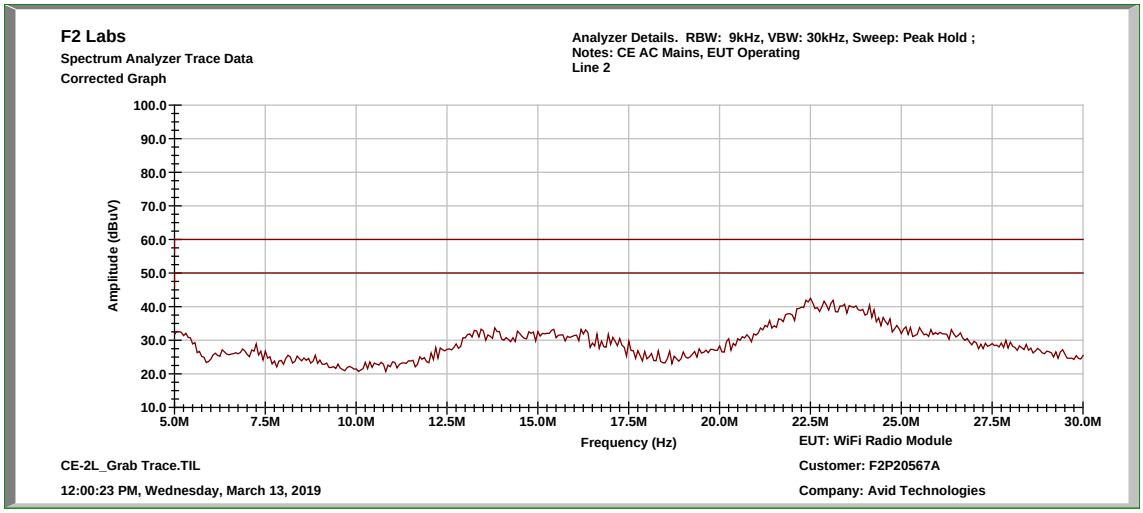
Conducted Test – Line 2: 0.15 MHz to 0.5 MHz



Conducted Test – Line 2: 0.5 MHz to 5.0 MHz



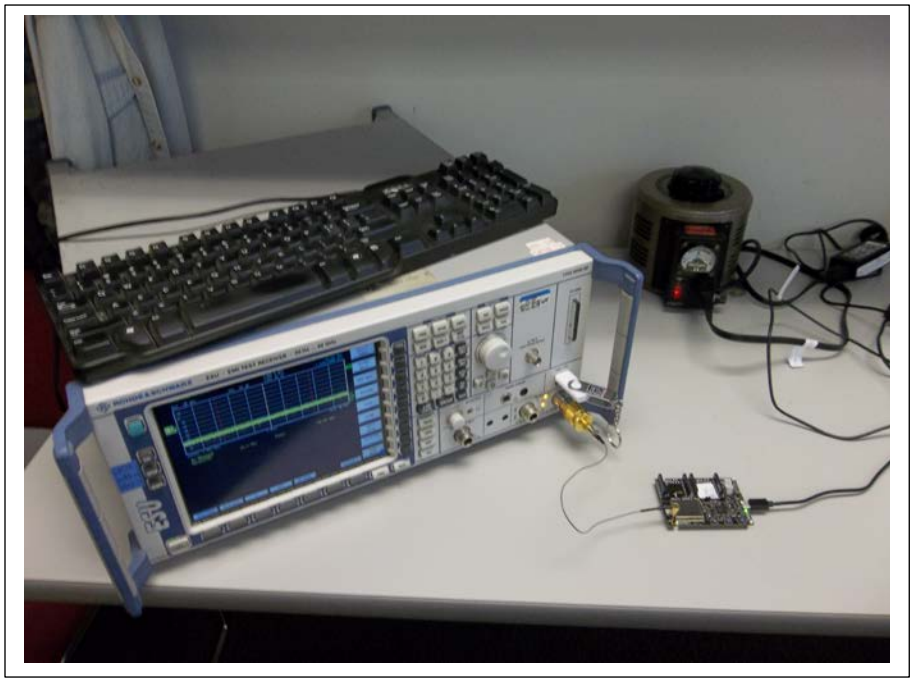
Conducted Test – Line 2: 5.0 MHz to 30.0 MHz



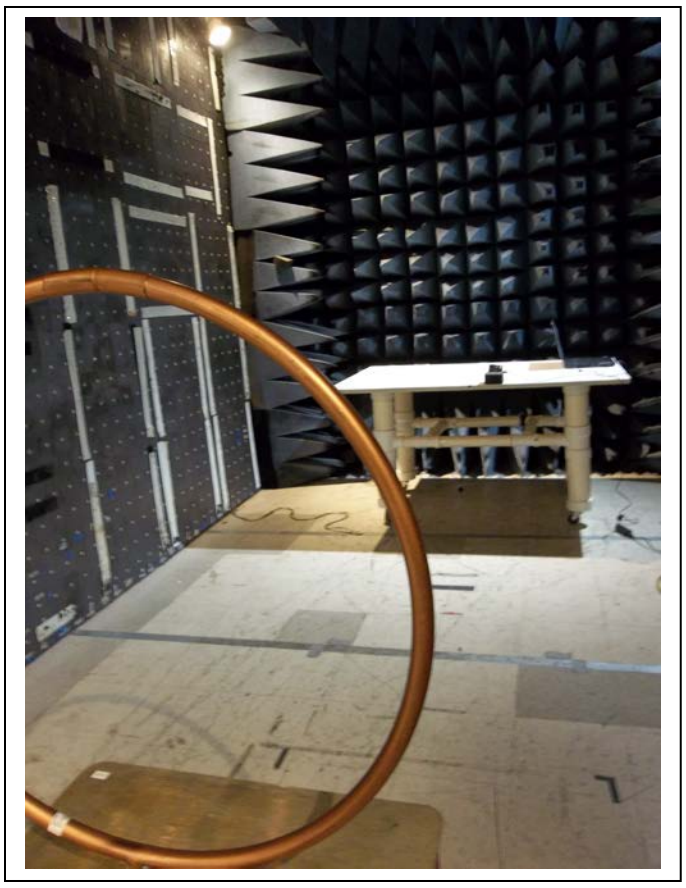
Top Discrete Measurements								
No.	Conductor	Frequency (MHz)	Detector	Level (dBµV)	Adjustment (dB)	Results (dBµV)	Limit (dBµV)	Margin (dB)
1	Line 2	0.15175	Quasi-Peak	49.78	11.640	61.42	66.00	-4.6
			Average	27.79	11.640	39.43	56.00	-16.6
2	Line 2	0.156125	Quasi-Peak	41.44	11.575	53.02	65.669	-12.7
			Average	22.7	11.575	34.28	55.669	-21.4
3	Line 2	0.161375	Quasi-Peak	42.90	11.519	54.42	65.394	-11.0
			Average	26.11	11.519	37.63	55.394	-17.8
4	Line 2	0.166625	Quasi-Peak	42.34	11.464	53.80	65.128	-11.3
			Average	25.06	11.464	36.52	55.128	-18.6
5	Line 2	0.198125	Quasi-Peak	37.6	11.310	48.91	63.690	-14.8
			Average	21.48	11.130	32.61	53.690	-21.1
6	Line 2	0.29175	Quasi-Peak	30.87	10.623	41.49	60.475	-19.0
			Average	12.55	10.623	23.17	50.475	-27.3
7	Line 2	0.297875	Quasi-Peak	32.67	10.621	43.29	60.302	-17.0
			Average	13.64	10.621	24.26	50.302	-26.0
8	Line 2	0.364375	Quasi-Peak	27.84	10.588	38.43	58.625	-20.2
			Average	7.323	10.588	17.91	48.625	-30.7
9	Line 2	0.383625	Quasi-Peak	27.56	10.578	38.14	58.201	-20.1
			Average	9.982	10.578	20.56	48.201	-27.6
10	Line 2	0.500	Quasi-Peak	23.15	10.540	33.69	56.0	-22.3
			Average	10.07	10.540	20.61	46.0	-25.4
11	Line 2	0.64625	Quasi-Peak	21.36	10.446	31.81	56.0	-24.2
			Average	6.536	10.446	16.98	46.0	-29.0

14 PHOTOGRAPHS

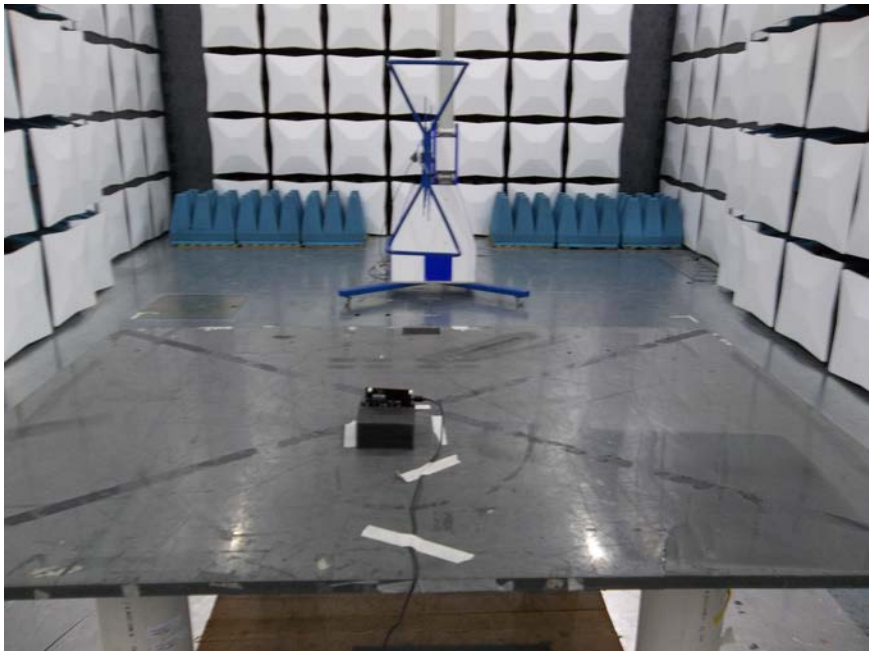
General Conducted Test Setup



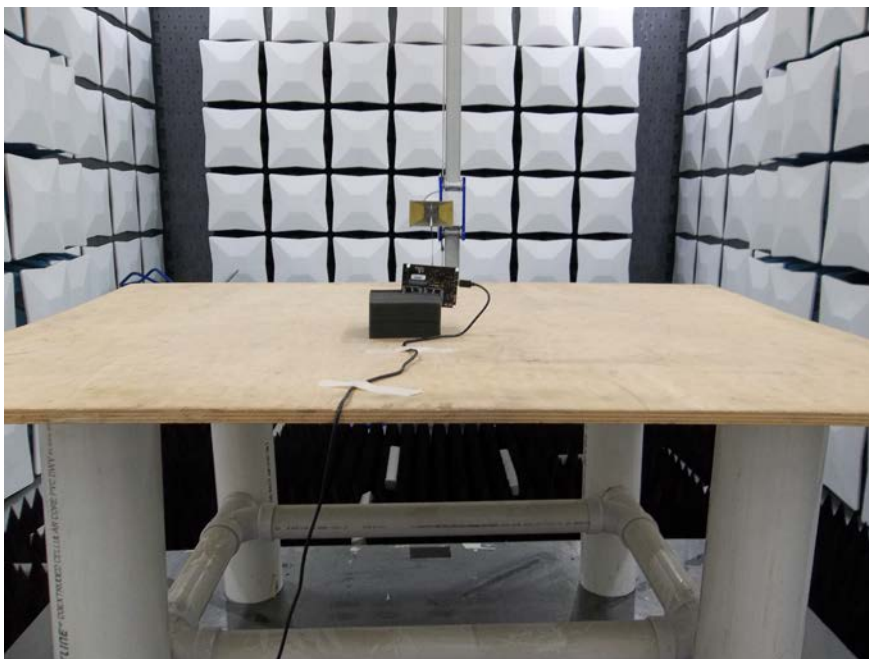
Radiated Spurious Emissions, Less Than 30 MHz



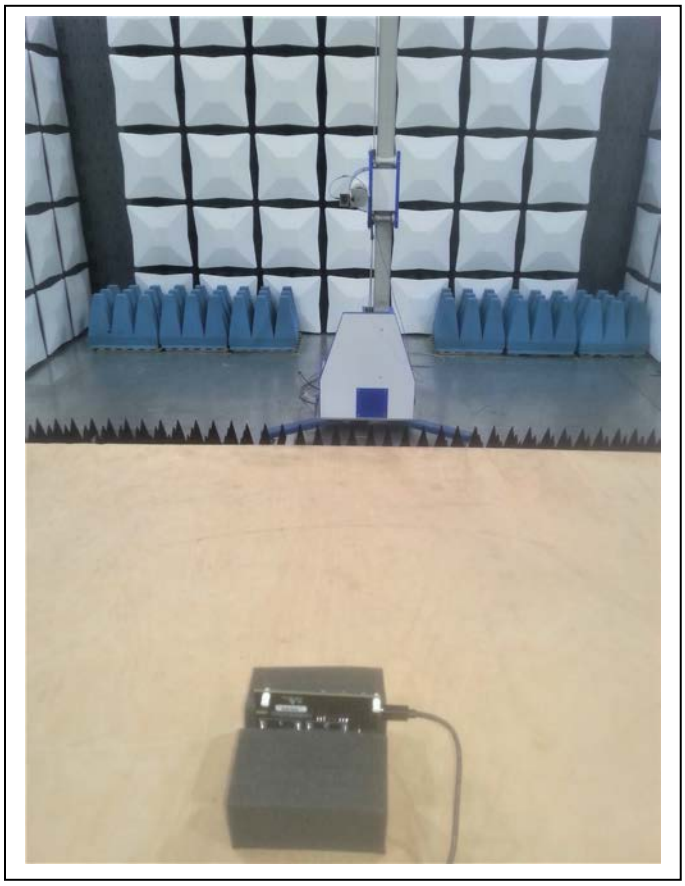
Radiated Spurious Emissions, 30 MHz to 1000 MHz



Radiated Spurious Emissions, 1 GHz to 18 GHz

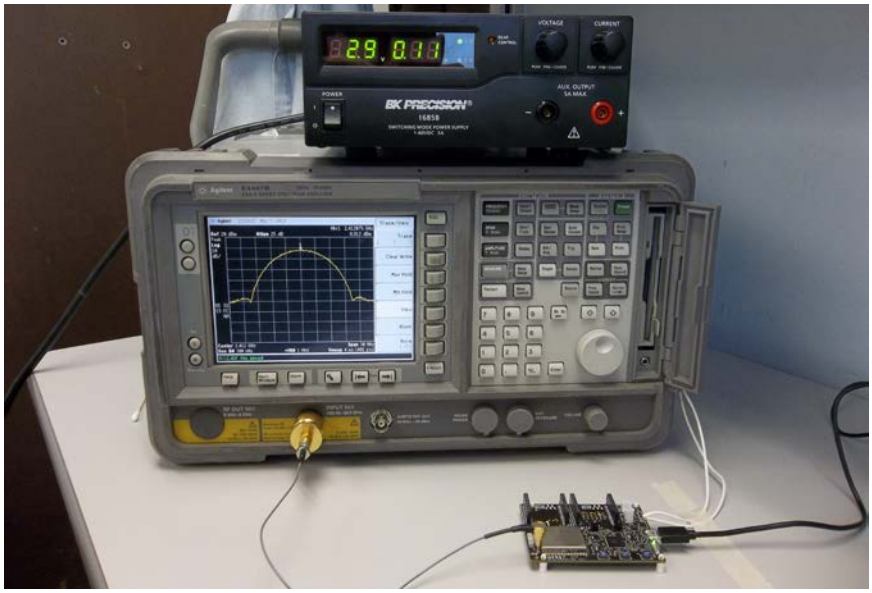


Radiated Spurious Emissions, 18 GHz to 26 GHz

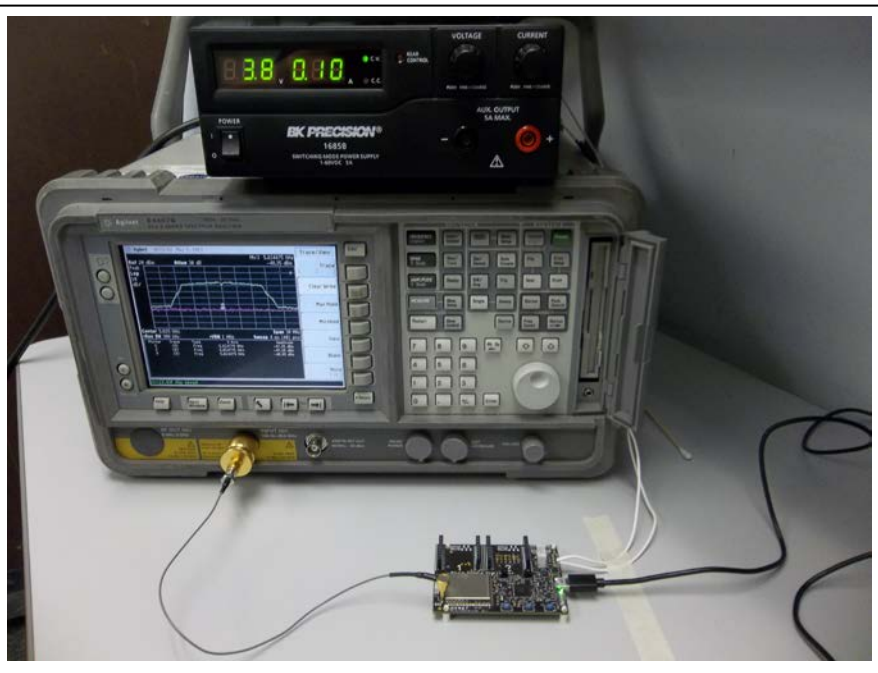


Radiated Spurious Emissions, 26 GHz to 40 GHz

Low Voltage



High Voltage



Conducted Emissions