Electromagnetic Compatibility Test Report

Tests Performed on a Westell Technologies, Inc.

Bi-Directional Amplifier, Model PS71090E

Radiometrics Document RP-9209A3

Product Detail:
FCC ID: NVRPS71090E-PS78 Equipment type: 788-805, 758-775, 806-817 & 851-862 MHz Public Safety Signal Booster
Test Standards:
FCC KDB 935210 D05: 2019 FCC Part 90.219, and CFR Title 47: 2020

Tests Performed For:	*Test Facility:*
Westell Technologies, Inc. 750 Commons Dr. Aurora, IL 60504	**Radiometrics Midwest Corporation** 12 Devonwood Avenue Romeoville, IL 60446 Phone: (815) 293-0772

Test Date(s):
December 19, 2019 thru April 18, 2020

Document RP-9209A3 Revisions:

Rev.	Issue Date	Affected Sections	Revised By
0	April 21, 2020		

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1.0 ADMINISTRATIVE DATA

Equipment Under Test:	
A Westell Technologies, Inc., Public Safety Signal Booster Model: PS71090E; Serial Number: 19RF11060004 This will be referred to as the EUT in this Report	
Date EUT Received at Radiometrics:	*Test Date(s):*
December 9, 2019	December 19, 2019 thru April 18, 2020
Test Report Written and Approved By:	*Radiometrics' Personnel Responsible for Test:*
Joseph Strzelecki 04/21/2020 Date Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	Joseph Strzelecki Senior EMC Engineer Richard L. Tichgelaar EMC Technician Dave Jarvis EMC Technician
Test Witnessed By:	
The tests were not witnessed by personnel from Westell Technologies, Incorporated	
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2.0 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Public Safety Signal Booster, Model PS71090E, manufactured by Westell, Inc. The detailed test results are presented in a separate section. The following is a summary of the test results.

Transmitter Requirements

Environmental Phenomena	Frequency Range	FCC KDB 935210 section	Test Result
AGC Threshold	758-862 MHz	4.2	Pass
Out of Band Rejection	758-862 MHz	4.3	Pass
Input vs Output Signal Comparison	758-862 MHz	4.4	Pass
Input/output power and amplifier gain	758-862 MHz	4.5	Pass
Noise figure Measurements	758-862 MHz	4.6	Pass
Out-of-band/out-of-block emissions conducted measurements	758-862 MHz	4.7.2	Pass
EUT spurious emissions conducted measurements	30-9,000 MHz	4.7.3	Pass
Frequency Stability	N/A	4.7	Note 1
Field Strength of Spurious Radiated emissions	30-9,000 MHz	4.9	Pass
Spurious emissions per 90.543 (e) & (f)	30-9,000 MHz	4.7.3	Pass

Note 1: Test not required since the amplifier, repeater does not alter the input signal in any way.

3.0 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a Bi-Directional Amplifier, Public Safety Signal Booster, Model PS71090E, manufactured by Westell, Inc. The RF communications link is encrypted in both directions. The EUT was in good working condition during the tests, with no known defects.

The EUT was tested at 120 VAC 60 Hz input power.
The EUT has a gain of 90 dB, Power of 33 dBm, and a frequency range of 788-805 MHz for uplink
The EUT has a gain of 90 dB, Power of 33 dBm, and a frequency range of 806-817 MHz for uplink
The EUT has a gain of 90 dB, Power of 33 dBm, and a frequency range of 758-775 MHz for downlink
The EUT has a gain of 90 dB, Power of 33 dBm, and a frequency range of 851-862 MHz for downlink
The output signal coupling attenuation is 0 dB
Note: The 0.5W version has an attenuation of 10 dB and a gain of 80 dB.

4.0 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations. The identification for all equipment used in the tested system is:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Bi-Directional Amplifier; 2W	E	Westell Technologies Inc.	PS71090E	19RF11060004
2	Bi-Directional Amplifier 0.5watt	E	Westell Technologies Inc.	PS51080E	19RF11060004

* Type: E = EUT, S = Support Equipment

4.2 EUT Operating Modes

The following Modulations were used during the tests:

Modulation	Description
AWGN	Broadband modulation with an occupied bandwidth (OBW) of 4.1 MHz. This is representative of a 5 MHz LTE channel
CW	Continuous Wave; No Modulation
FM 4 kHz	Frequency Modulation; 4 kHz OBW, 6.25 kHz Channel Bandwidth, 1 kHz Audio Freq.
FM 11 kHz	Frequency Modulation; 11.3 kHz OBW, 12.5 kHz Channel Bandwidth, 1 kHz Audio Freq.
FM 16 kHz	Frequency Modulation; 16 kHz OBW, 25 kHz Channel Bandwidth, 1 kHz Audio Freq.

4.3 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

5.0 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC KDB 935210 D05	2019	Measurements Guidance for Industrial and Non-Consumer Signal Bi-Directional Wireless, Repeater, and Amplifier Devices; v01r03
FCC KDB 971168 D01	2018	Measurement Guidance for Certification of Licensed Digital Transmitters v03r01
TIA-603-E	2016	Land Mobile FM or PM Communications Equipment – Measurement and Performance Standards
ANSI C63.26	2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

6.0 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2017 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber A: Is an anechoic chamber that measures 24' L X 12' W X 12' H. The walls and ceiling are fully lined with ferrite absorber tiles. The floor has a 10' x 10' section of ferrite absorber tiles located in the center. Panashield of Rowayton, Connecticut manufactured the chamber. The enclosure is NAMAS certified.

Chamber B: Is a shielded enclosure that measures 20' L X 12' W X 8' H. Erik A. Lindgren & Associates of Chicago, Illinois manufactured the enclosure.

Chamber E: Is a custom-made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber.

A separate ten-foot long, brass plated, steel ground rod attached via a 6-inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as site number IC3124A-1.

7.0 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

8.0 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification. The results relate only to the EUT listed herein. Any modifications made to the EUT subsequent to the indicated test date will invalidate the data and void this certification.

9.0 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
ANT-06	EMCO	Log-Periodic Ant.	3146	1248	200-1000MHz	24 Mo.	12/13/19
ANT-07	RMC	Log-Periodic Ant.	LP1000	1001	200-1000MHz	24 Mo.	11/19/18
ANT-08	RMC	Log-Periodic Ant.	LP1000	1002	200-1000MHz	24 Mo.	11/19/18
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	01/16/19
ANT-36	Ailtech-Eaton	Horn Antenna	96001	2013	1.0-18GHz	24 Mo.	11/19/18
ANT-66	ETS-Lindgren	Horn Antenna	3115	62580	1.0-18GHz	24 Mo.	03/05/19
ATT-53	Weinschel	Attenuator (20 dB)	23-20-34	CG7857	DC-18 GHz	12 Mo	11/06/19
ATT-54	Weinschel	Attenuator (20 dB)	34-20-34	BP7085	DC-4 GHz	12 Mo	07/16/19
CAB-044A	Teledyne	Coaxial Cable	N/A	044A	DC-18 GHz	24 Mo.	05/15/18
CAB-090C	Teledyne	Coaxial Cable	N/A	090C	DC-18 GHz	24 Mo.	05/15/18
CAB-114F	Teledyne	Coaxial Cable	N/A	114F	DC-18 GHz	24 Mo.	05/15/18
CAB-114G	Teledyne	Coaxial Cable	N/A	114G	DC-18 GHz	24 Mo.	05/15/18
CAB-142G	Teledyne	Coaxial Cable	N/A	142G	DC-18 GHz	24 Mo.	05/09/18
CAB-144F	Teledyne	Coaxial Cable	N/A	142G	DC-18 GHz	24 Mo.	05/15/18
CAB-160B	Teledyne	Coaxial Cable	N/A	160B	DC-18 GHz	24 Mo.	05/09/18
CAB-210A	Teledyne	Coaxial Cable	N/A	210A	DC-18 GHz	24 Mo.	05/09/18
CAB-210B	Teledyne	Coaxial Cable	N/A	210B	DC-18 GHz	24 Mo.	05/09/18
CAB-272A	Teledyne	Coaxial Cable	N/A	272A	DC-18 GHz	24 Mo.	05/09/18
CAB-1090	Teledyne	Coaxial Cable	N/A	1090	DC-18 GHz	24 Mo.	05/16/18
COM-01	Anaren	Coupler	10023-3	COM-01	250-1000MHz	12 Mo.	12/06/19
COM-W1	CSI	Combiner/Splitter	CSI-S2BSC	None	500-3000MHz	12 Mo.	12/06/19
REC-11	Agilent	Spectrum Analyzer	E7405A	US39110103	9kHz-3GHz	24 Mo.	04/02/18
REC-21	Agilent	Spectrum Analyzer	E7405A	MY45118341	9kHz-26.5GHz	24 Mo.	01/06/18 01/14/20
REC-22	Rohde Schwarz	Spectrum Analyzer	ESIB 26	100145	26.5 GHz	24 Mo	09/16/19
REC-31	Agilent	Spectrum Analyzer	E7402A	US41160415	9kHz-3GHz	24 Mo.	05/20/19
RNT-17	Agilent	Spectrum Analyzer	E4440A	MY42510244 1DS202512B7.1	3Hz-26.5GHz	36 Mo	07/19/17
SIG-21	HP / Agilent	Signal Generator	8341B	2910A02352	0.01-20 GHz	12 Mo.	07/26/19
SIG-31	Rohde Schwarz	Vector Signal Generator	SMJ 100A	101395	100kHz-6GHz	36 Mo.	08/25/17
THM-03	Fluke	Temp/Humid Meter	971	95850465	N/A	12 Mo.	05/03/19

Note: All calibrated equipment is subject to periodic checks.
NCR – No Calibration Required. Device monitored by calibrated equipment. N/A: Not Applicable.

For each individual test, the equipment used was within its calibration interval during the test.

9.1 Test Software

Software Company	Test Software Name	Version	Applicable Tests
Radiometrics	REREC11D	06.18.18	RF Radiated Emissions (ISED; FCC Part 15)
Agilent	PSA/ESA-E/L/EMC	2.4.0.42	Bandwidth and screen shots

10.0 TEST SECTIONS

The following sections are the detailed results in accordance to FCC KDB 935210 D05.

11.0 AGC THRESHOLD

11.1 Applicable Standard

The EUT shall comply with FCC KDB 935210 section 4.2.

11.2 Test procedures

a) A signal generator was connected to the input of the EUT.
b) A power meter was connected to the output of the EUT using an external 20 dB attenuator.
c) A signal generator was initially configured to produce a CW signal
d) The signal generator frequency was set to the center frequency of the EUT operating band.
e) While monitoring the output power of the EUT, measured using the methods of 3.5.3 of KDB 935210, the input level was increased until a 1 dB increase in the input signal power no longer causes a 1 dB increase in the output signal power.
f) This level was recorded as the AGC threshold level.
g) The procedure was repeated with the remaining test signal bands.

11.2.1 AGC Threshold Test Results

Model	PS71090E	Specifications	FCC KDB 935210 D05 Sec. 4.2
Serial Number	19RF11060004	Test Date	04/02/2020 & 4/17/2020
Test Personnel	Richard L. Tichgelaar Joseph Strzelecki	Test Location	Chamber B
Test Equipment	EMI Receiver (REC-21)		

Modulation	Transmit Band MHz	Generator Output MHz	Generator Output dBm	Uncorrected Reading dBm	Output Change dB	Output Power dBm
CW	788-805	796.5	-58.6	11.0	N/A	31.0
CW	788-805	796.5	-57.6	12.0	1.0	32.0
CW	788-805	796.5	-56.6	13.0	1.0	33.0
CW	788-805	796.5	-55.6	12.5	-0.5	32.5
CW	806-817	811.5	-59.0	9.9	N/A	30.0
CW	806-817	811.5	-58.0	10.9	1.0	31.0
CW	806-817	811.5	-57.0	11.9	1.0	32.0
CW	806-817	811.5	-56.0	12.9	0.9	32.9
CW	806-817	811.5	-55.0	12.8	-0.1	32.8
CW	758-775	766.5	-60.1	9.0	N/A	29.0
CW	758-775	766.5	-59.1	10.0	1.0	30.0
CW	758-775	766.5	-58.1	11.0	1.0	31.0
CW	758-775	766.5	-57.1	12.0	1.0	32.0
CW	758-775	766.5	-56.1	13.0	1.0	33.0
CW	758-775	766.5	-55.1	12.5	-0.5	32.5
CW	851-862	856.5	-59.1	10.0	N/A	30.1
CW	851-862	856.5	-58.1	11.0	1.0	31.1
CW	851-862	856.5	-57.1	12.0	1.0	32.1
CW	851-862	856.5	-56.1	13.0	1.0	33.0
CW	851-862	856.5	-54.1	12.4	-0.6	32.4
AWGN	758-775	763.0	-38.0	9.9	N/A	29.9
AWGN	758-775	763.0	-37.0	11.8	1.9	31.8
AWGN	758-775	763.0	-36.0	11.8	0.0	31.8

Modulation	Transmit Band MHz	Generator Output MHz	Generator Output dBm	Uncorrected Reading dBm	Output Change dB	Output Power dBm
AWGN	758-775	763.0	-35.0	12.9	1.1	32.9
AWGN	758-775	763.0	-34.5	12.3	-0.6	32.3
AWGN	788-798	793.0	-38.0	9.8	N/A	29.8
AWGN	788-798	793.0	-37.0	10.8	0.9	30.8
AWGN	788-798	793.0	-36.0	11.8	1.1	31.8
AWGN	788-798	793.0	-35.0	12.9	1.1	32.9
AWGN	788-798	793.0	-34.5	12.3	-0.6	32.3

The Highlighted cells are the AGC Threshold.

12.0 OUT OF BAND REJECTION

12.1 Applicable Standard

The EUT shall comply with sections 4.3 of FCC KDB 935210 for passband gain.

12.2 Test Procedures

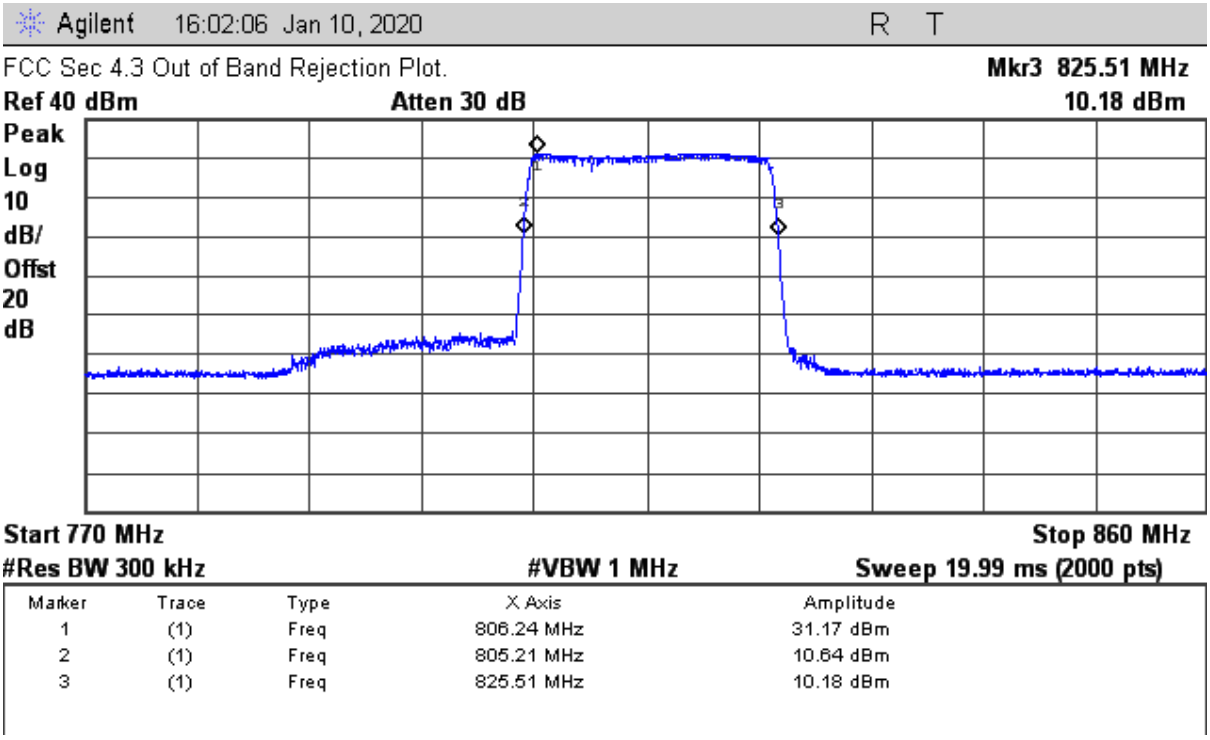
The internal gain control of the EUT was adjusted to the maximum gain for which equipment certification is sought.
a) A signal generator was connected to the input of the EUT.
b) The swept CW signal was configured with the following parameters:
1) The frequency range was set to ± 250 % of the manufacturer's specified pass band.
2) The CW amplitude was 3 dB below the AGC threshold and shall not activate the AGC threshold throughout the test.
3) Dwell time = approximately 10 mS.
4) Frequency step = 50 kHz.
c) A spectrum analyzer was connected to the output of the EUT using appropriate attenuation.
d) The RBW of the spectrum analyzer was set to between 1 % and 5 % of the manufacturer's rated passband, and VBW = 3 × RBW.
e) The detector was set to Peak and the trace to Max-Hold.
f) After the trace was completely filled, a marker was placed at the peak amplitude, which is designated as f0, and with two additional delta markers at the 20 dB bandwidth (where the level has fallen by 20 dB).
g) The frequency response plot was captured for inclusion in the test report.

12.3 Passband Bandwidth Test Results

Model	PS71090E	Specification	KDB 935210 D05 Sec 4.3
Serial Number	19RF11060004	Test Date	1/10/2020
Test Personnel	Richard L. Tichgelaar	Test Location	Chamber B
Test Equipment	EMI Receiver (REC-11)		

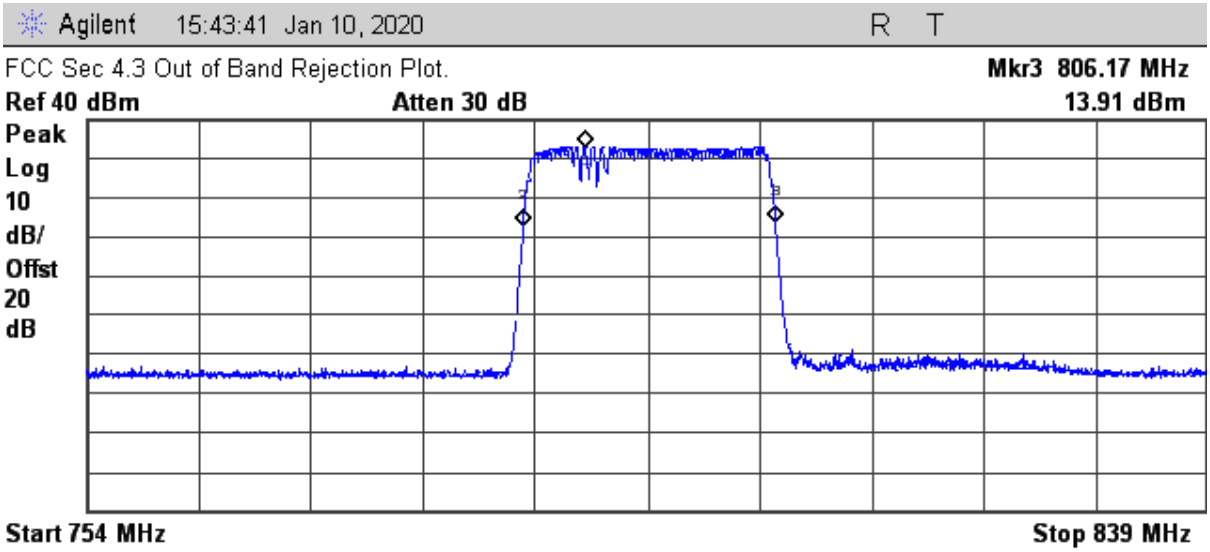
RBW MHz	VBW MHz	Band in MHz	20 dB Down 1st Freq. MHz	20 dB Down 2nd Freq. MHz	20 dB BW MHz	Max Reading F0 MHz	Max Reading dBm
0.3	1.0	788-805	787.17	806.17	19.0	791.8	32.97
0.3	1.0	806-824	805.2	825.51	20.31	806.24	31.17
0.3	1.0	758-775	756.57	776.5	19.93	759.91	32.05
0.3	1.0	851-869	849.35	870.65	21.3	855.61	33.62

The above data shows the additional marker data from the plots below.



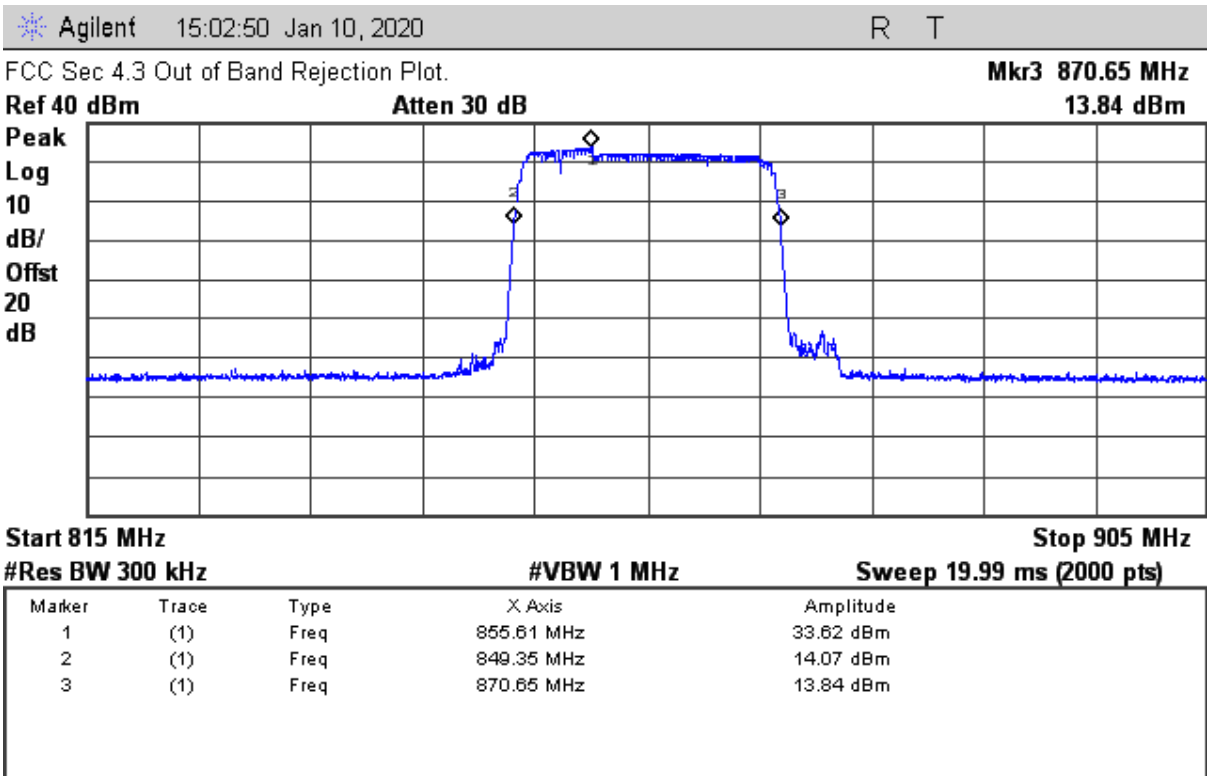
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	806.24 MHz	31.17 dBm
2	(1)	Freq	805.21 MHz	10.64 dBm
3	(1)	Freq	825.51 MHz	10.18 dBm

Uplink

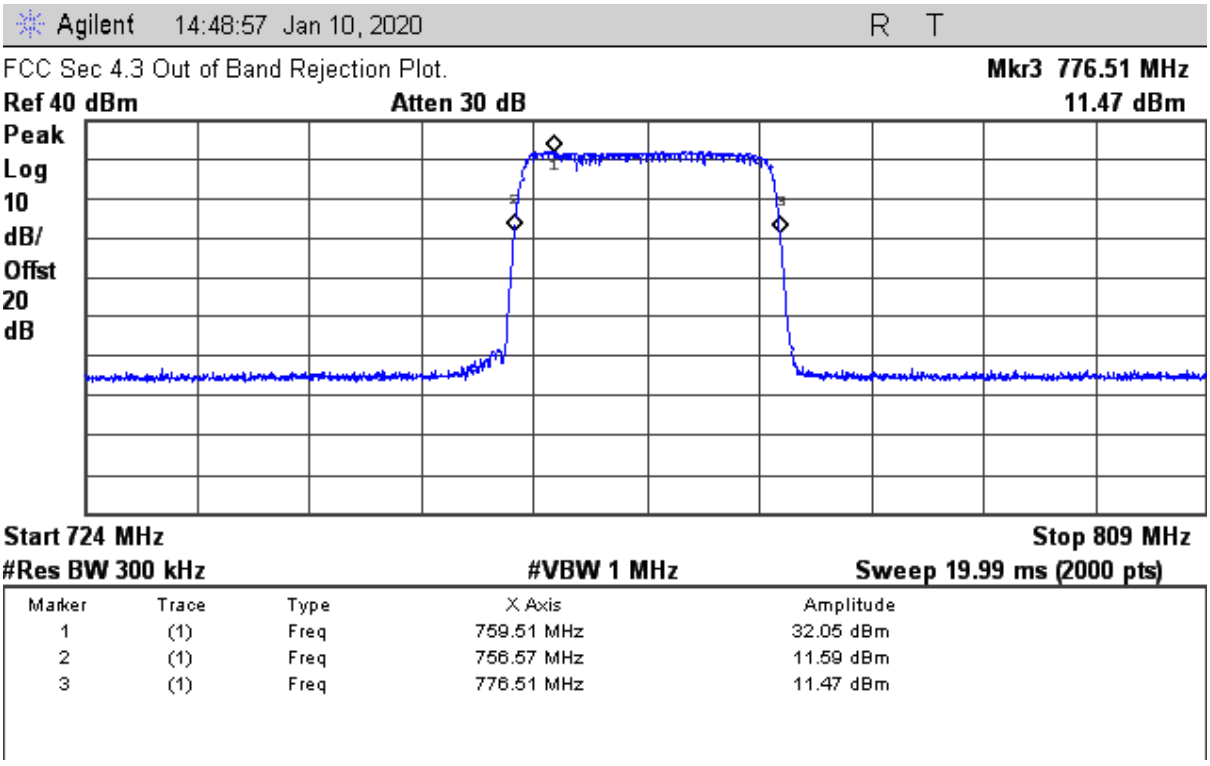


Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	791.80 MHz	32.97 dBm
2	(1)	Freq	787.17 MHz	12.95 dBm
3	(1)	Freq	806.17 MHz	13.91 dBm

Uplink



Downlink



Downlink

13.0 INPUT VS OUTPUT SIGNAL COMPARISON

13.1 Applicable Standard

The EUT shall comply with FCC KDB 935210 section 4.4.

13.2 Test procedures

A 26 dB bandwidth measurement was performed on the input signal and the output signal.

Refer to the applicable regulatory requirements (e.g., § 90.210) for emission mask specifications.
a) A signal generator was connected to the input of the EUT.
b) The signal generator was configured to transmit the appropriate test signal associated with the public safety emission designation (see Table 1).
c) The signal level was configured to be just below the AGC threshold (see results from 4.2).
d) A spectrum analyzer was connected to the output of the EUT using appropriate attenuation as necessary.
e) The spectrum analyzer center frequency was set to the nominal EUT channel center frequency. The span range for the spectrum analyzer was between 2 times to 5 times the EBW (or OBW).
f) The nominal RBW was be 300 Hz for 16K0F3E, and 100 Hz for all other emissions types.
g) The reference level of the spectrum analyzer was set to accommodate the maximum input amplitude level, i.e., the level at f0 per 4.2.
h) The spectrum analyzer detection mode was set to peak, and trace mode to max hold.
i) The trace was allowed to fully stabilize.
j) The signal was confirmed to be contained within the appropriate emissions mask.
k) The marker function was used to determine the maximum emission level and record the associated frequency as f0.
l) The emissions mask plot was captured for inclusion in the test report (output signal spectra).
m) The EUT input signal power (signal generator output signal) was measured directly from the signal generator using power measurement guidance provided in KDB Publication 971168 [R8] (input signal spectra).
n) The spectral plot of the output signal (determined in step k) was compared to the input signal (determined in step l) to affirm they are similar (in passband and roll off characteristic features and relative spectral locations).
o) Steps d) to n) were repeated with the input signal amplitude set 3 dB above the AGC threshold.
p) Steps b) to o) were repeated for all authorized operational bands and emissions types (see applicable regulatory specifications, e.g., § 90.210).
q) All accumulated spectral plots depicting EUT input signal and EUT output signal were included in the test report and noted any observed dissimilarities.

13.2.1 Input Vs Output Test Results

Model	PS71090E	Specifications	FCC KDB 935210 D05 Sec. 4.4
Serial Number	19RF11060004	Test Date	1/10/2020 thru 04/16/2020
Test Personnel	Richard L. Tichgelaar	Test Location	Chamber B
Test Equipment	EMI Receiver (REC-21 & REC-11)		

Output Mode	Modul. Type	Plot #	Generator Settings with 20 dB Att. MHz	dBm	Channel BW kHz	Analyzer RBW kHz	VBW kHz	Test Port	26 dB BW Reading MHz	EUT AGC Mode
UP	FM 16k	1	796.5	-22.0	25	0.30	1	Generator	20.27	ON+3
UP	FM 16k	2	796.5	-25.5	25	0.30	1	Amp Out	20.27	Below
UP	FM 16k	3	796.5	-22.0	25	0.30	1	Amp Out	20.3	ON+3
UP	FM 16k	7	815	-22.0	25	0.30	1	Generator	20.3	ON+3
UP	FM 16k	8	815	-25.5	25	0.30	1	Amp Out	20.3	Below
UP	FM 16k	9	815	-22.0	25	0.30	1	Amp Out	20.3	ON+3
DOWN	FM 16k	13	766.5	-22.0	25	0.30	1	Generator	20.3	ON+3
DOWN	FM 16k	14	766.5	-25.5	25	0.30	1	Amp Out	20.2	Below
DOWN	FM 16k	15	766.5	-22.0	25	0.30	1	Amp Out	20.3	ON+3

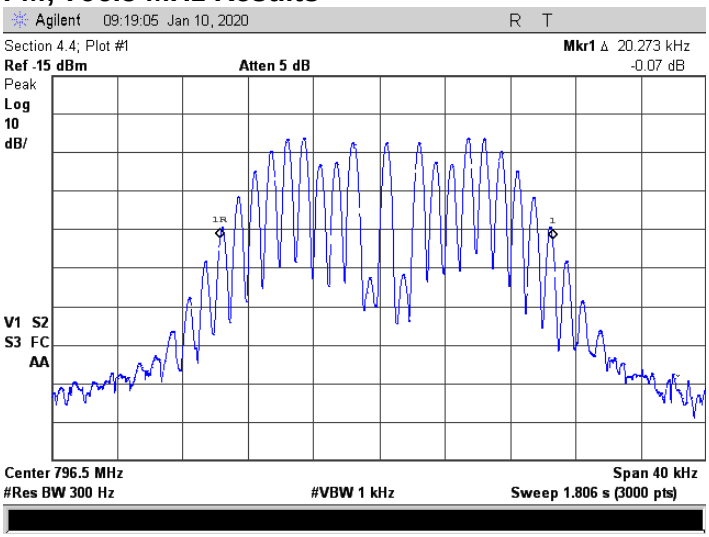
Output Mode	Modul. Type	Plot #	Generator Settings with 20 dB Att. MHz	dBm	Channel BW kHz	Analyzer RBW kHz	VBW kHz	Test Port	26 dB BW Reading MHz	EUT AGC Mode
DOWN	FM 16k	19	860	-23.5	25	0.30	1	Generator	20.25	ON+3
DOWN	FM 16k	20	860	-27.0	25	0.30	1	Amp Out	20.26	Below
DOWN	FM 16k	21	860	-23.5	25	0.30	1	Amp Out	20.26	ON+3
UP	FM 11k	4	796.5	-22	12.5	0.10	1	Generator	14.1	ON+3
UP	FM 11k	5	796.5	-26.5	12.5	0.10	1	Amp Out	14.1	Below
UP	FM 11k	6	796.5	-22	12.5	0.10	1	Amp Out	14.1	ON+3
UP	FM 11k	10	815	-22	12.5	0.10	1	Generator	14.1	ON+3
UP	FM 11k	11	815	-26	12.5	0.10	1	Amp Out	14.1	Below
UP	FM 11k	12	815	-22	12.5	0.10	1	Amp Out	14.1	ON+3
DOWN	FM 11k	16	766.5	-22	12.5	0.10	1	Generator	14.1	ON+3
DOWN	FM 11k	17	766.5	-26	12.5	0.10	1	Amp Out	14.1	Below
DOWN	FM 11k	18	766.5	-22	12.5	0.10	1	Amp Out	14.1	ON+3
DOWN	FM 11k	22	860	-23.5	12.5	0.10	1	Generator	14.1	ON+3
DOWN	FM 11k	23	860	-27.5	12.5	0.10	1	Amp Out	14.1	Below
DOWN	FM 11k	24	860	-23.5	12.5	0.10	1	Amp Out	14.1	ON+3
UP	FM 4k	25	796.5	-22.4	12.5	0.10	1	Generator	4.161	ON+3
UP	FM 4k	26	796.5	-26	12.5	0.10	1	Amp Out	4.161	Below
UP	FM 4k	27	796.5	-22.4	12.5	0.10	1	Amp Out	4.161	ON+3
UP	FM 4k	28	815	-21.2	12.5	0.10	1	Generator	4.168	ON+3
UP	FM 4k	29	815	-24.7	12.5	0.10	1	Amp Out	4.168	Below
UP	FM 4k	30	815	-21.2	12.5	0.10	1	Amp Out	4.168	ON+3
DOWN	FM 4k	31	766.5	-22.6	6.25	0.10	1	Generator	4.161	ON+3
DOWN	FM 4k	32	766.5	-26.1	6.25	0.10	1	Amp Out	4.161	Below
DOWN	FM 4k	33	766.5	-22.6	6.25	0.10	1	Amp Out	4.161	ON+3
DOWN	FM 4k	34	860	-22	6.25	0.10	1	Generator	4.168	ON+3
DOWN	FM 4k	35	860	-25.5	6.25	0.10	1	Amp Out	4.168	Below
DOWN	FM 4k	36	860	-22	6.25	0.10	1	Amp Out	4.168	ON+3
UP	FM 16k	**B1**	802	-21	25	0.30	1	Generator	20.29	ON+3
UP	FM 16k	**B2**	802	-31	25	0.30	1	Amp Out	20.29	Below
UP	FM 16k	**B3**	802	-27	25	0.30	1	Amp Out	20.3	ON+3
UP	FM 11k	**B4**	802	-21	12.5	0.10	1	Generator	14.12	ON+3
UP	FM 11k	**B5**	802	-31	12.5	0.10	1	Amp Out	14.1	Below
UP	FM 11k	**B6**	802	-27	12.5	0.10	1	Amp Out	14.1	ON+3
UP	FM 4k	**B7**	802	-21	6.25	0.10	1	Generator	4.17	ON+3
UP	FM 4k	**B8**	802	-31	6.25	0.10	1	Amp Out	4.17	Below
UP	FM 4k	**B9**	802	-27	6.25	0.10	1	Amp Out	4.17	ON+3
UP	AWGN	**B10**	802	-23	4100	100	300	Generator	4.41	ON+3
UP	AWGN	**B11**	802	-33	4100	100	300	Amp Out	4.415	Below
UP	AWGN	**B12**	802	-29	4100	100	10	Amp Out	4.405	ON+3
Down	FM 16k	**B13**	772	-21	25	0.30	1	Generator	20.286	ON+3
Down	FM 16k	**B14**	772	-31	25	0.30	1	Amp Out	20.27	Below
Down	FM 16k	**B15**	772	-27	25	0.30	1	Amp Out	20.29	ON+3
Down	FM 11k	**B16**	772	-21	12.5	0.10	1	Generator	14.12	ON+3
Down	FM 11k	**B17**	772	-31	12.5	0.10	1	Amp Out	14.1	Below
Down	FM 11k	**B18**	772	-27	12.5	0.10	1	Amp Out	14.1	ON+3

Output Mode	Modul. Type	Plot #	Generator Settings with 20 dB Att. MHz	dBm	Channel BW kHz	Analyzer RBW kHz	VBW kHz	Test Port	26 dB BW Reading MHz	EUT AGC Mode
Down	FM 4k	**B19**	772	-21	6.25	0.10	1	Generator	4.17	ON+3
Down	FM 4k	**B20**	772	-31	6.25	0.10	1	Amp Out	4.17	Below
Down	FM 4k	**B21**	772	-27	6.25	0.10	1	Amp Out	4.17	ON+3
Down	AWGN	**B22**	772	-23	4100	100	300	Generator	4.404	ON+3
Down	AWGN	**B23**	772	-33	4100	100	300	Amp Out	4.39	Below
Down	AWGN	**B24**	772	-29	4100	100	300	Amp Out	4.405	ON+3

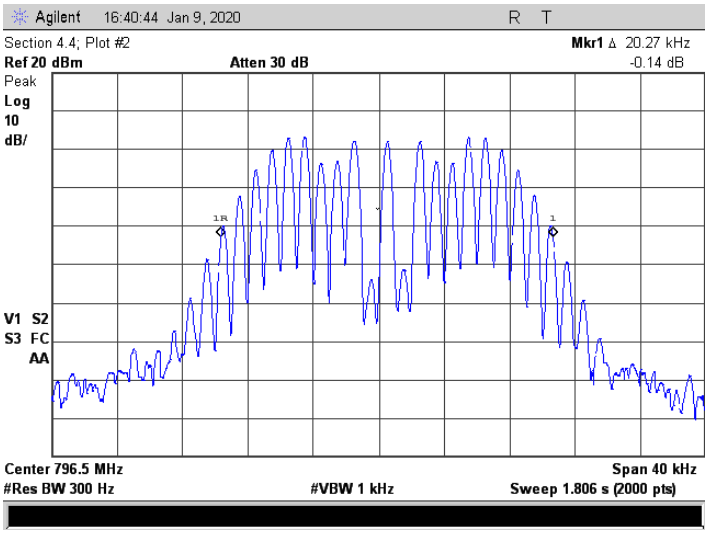
The generator output signal is the amplifier input.

13.2.1.1 Occupied Bandwidth Results

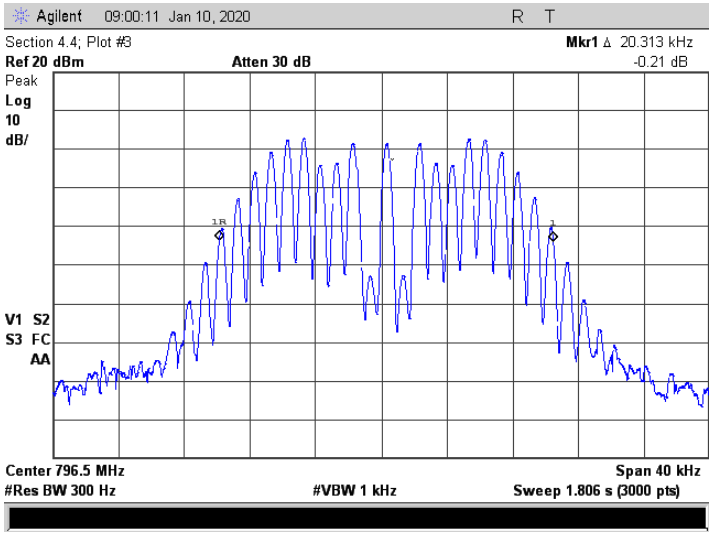
FM; 796.5 MHz Results



Input Signal to Amp; FM 16K

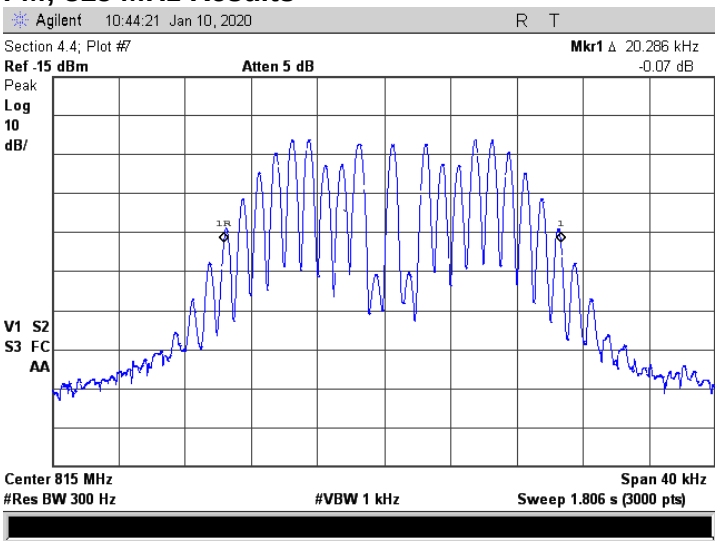


AMP Output: Below AGC, FM 16K

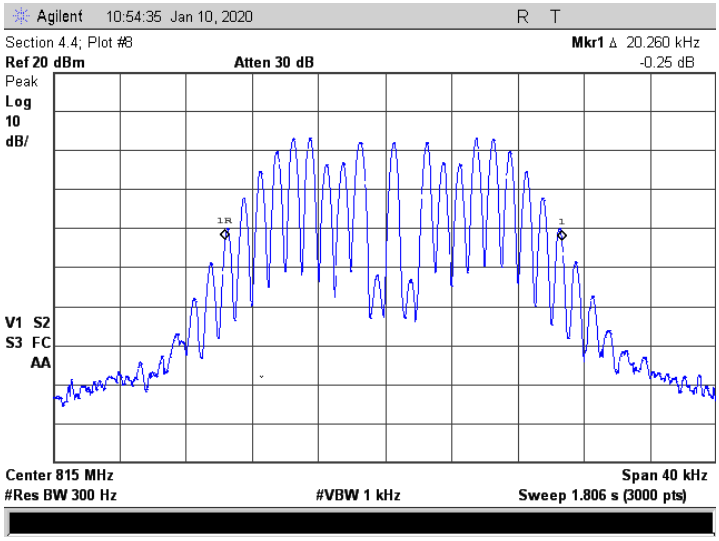


AMP Output: Level Above AGC, FM 16K

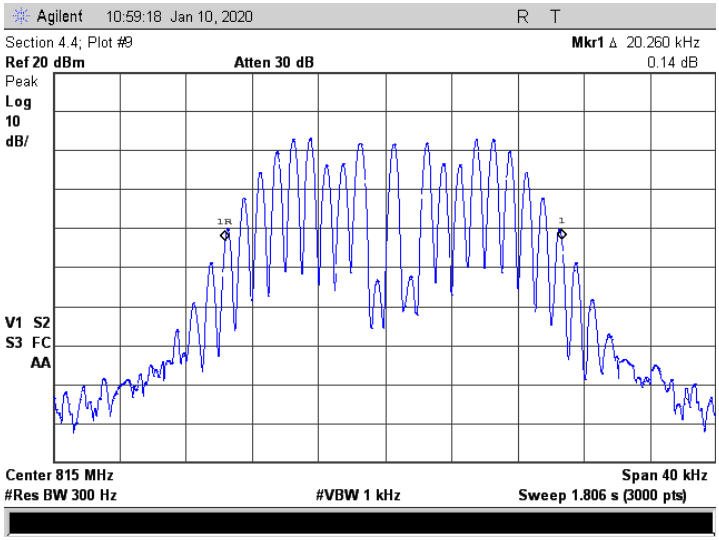
FM; 815 MHz Results



Input Signal to Amp; FM 16K

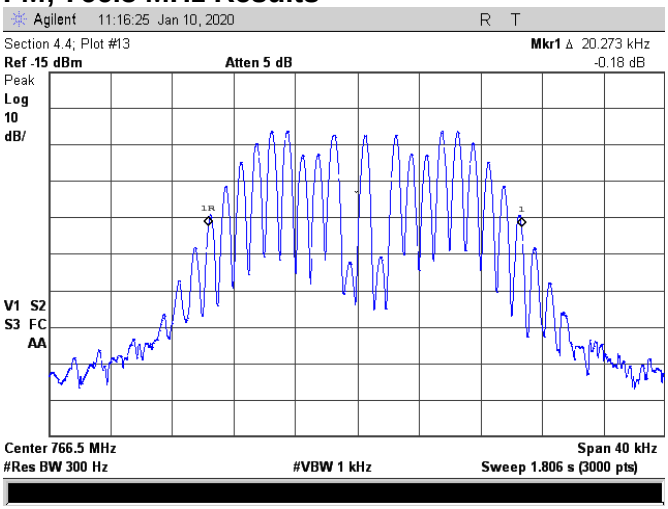


AMP Output: Below AGC; FM 16K

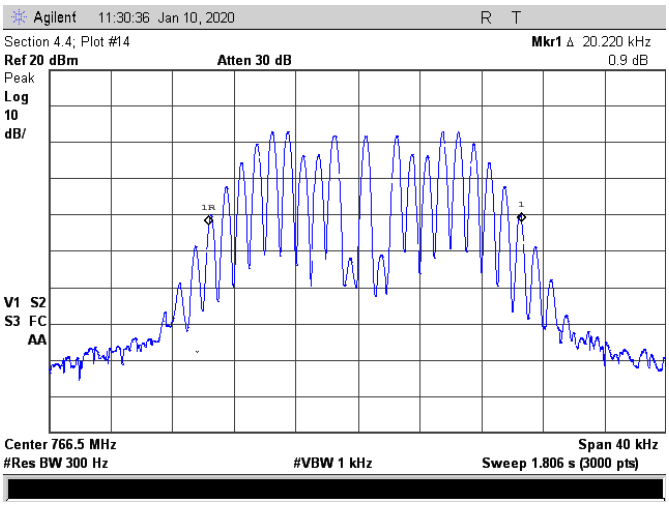


AMP Output: Level Above AGC; FM 16K

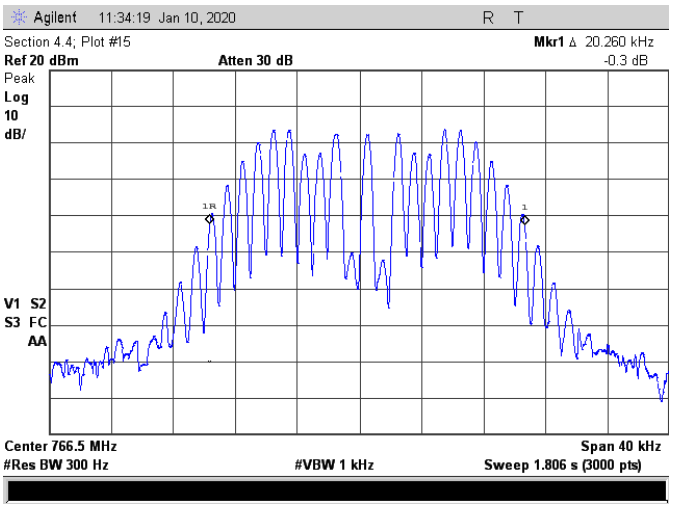
FM; 766.5 MHz Results



Input Signal to Amp; FM 16K

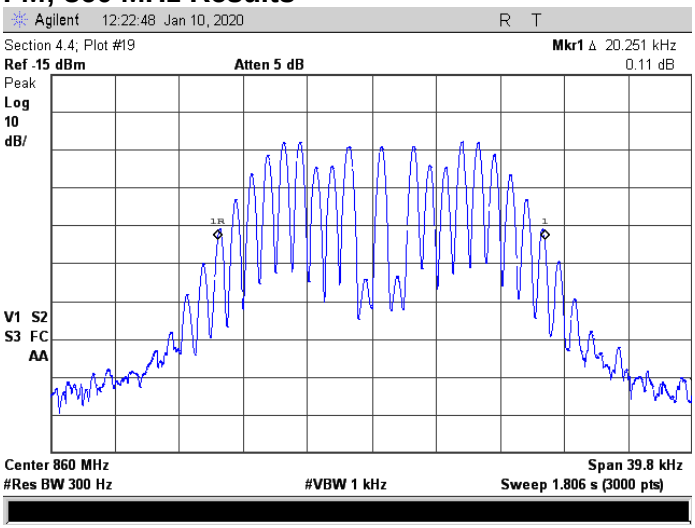


Amp output, Below AGC; FM 16K

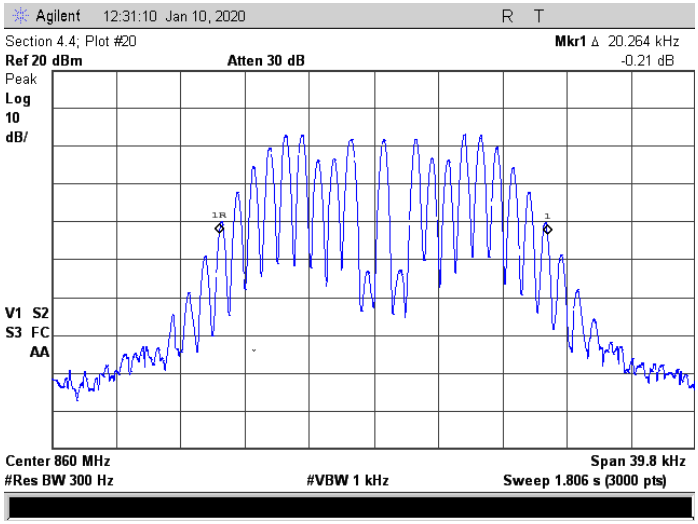


AMP Output: Level Above AGC; FM 16K

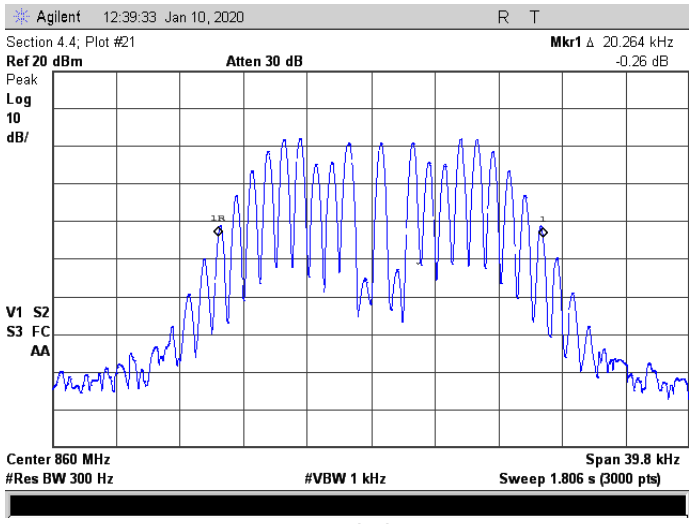
FM; 860 MHz Results



Input Signal to Amp; 300 Hz, FM 16K

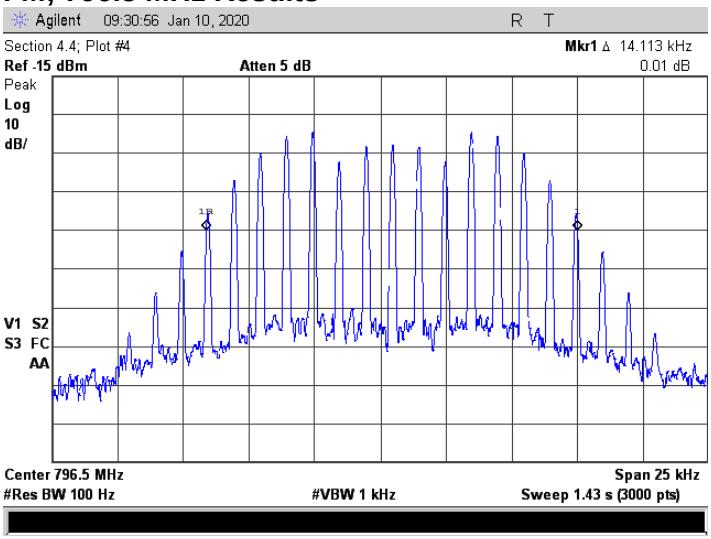


Amp output, Below AGC, FM 16K

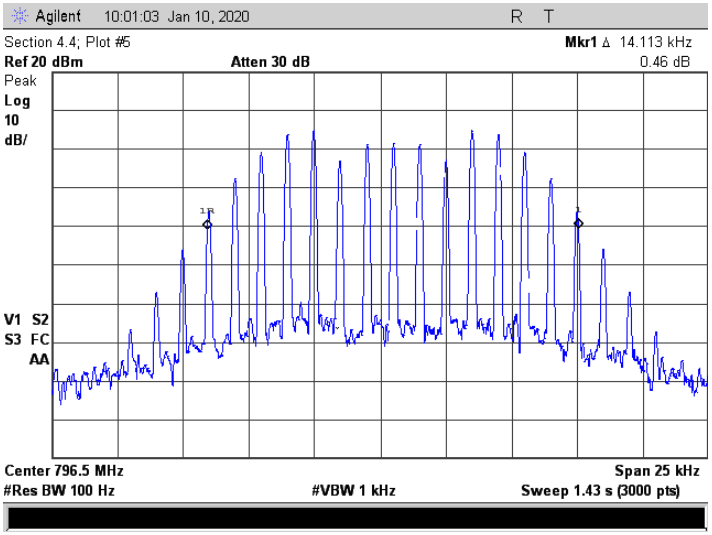


AMP Output: Level above AGC; FM 16K

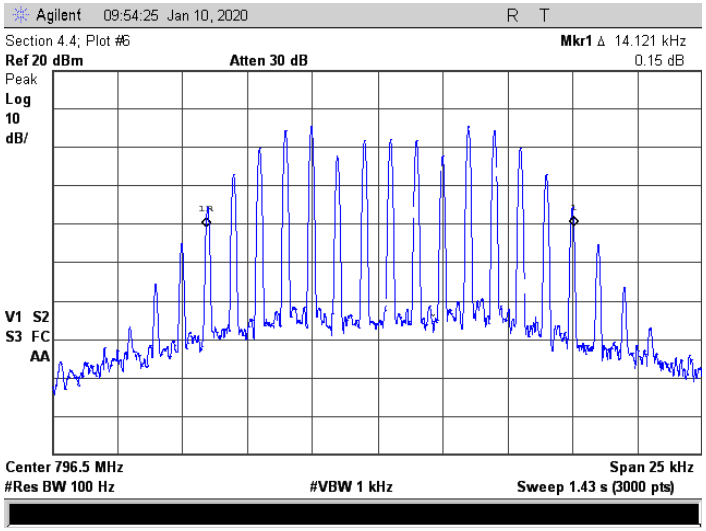
FM; 796.5 MHz Results



Input Signal to Amp; FM 11K

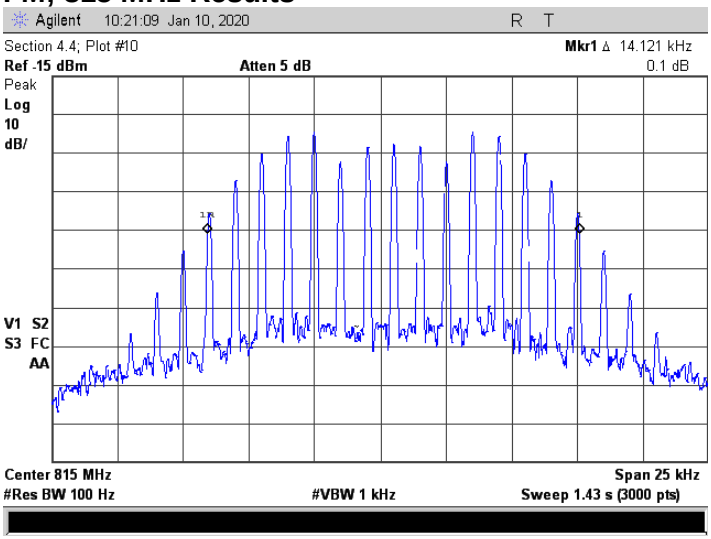


AMP Output: Below AGC, FM 11K

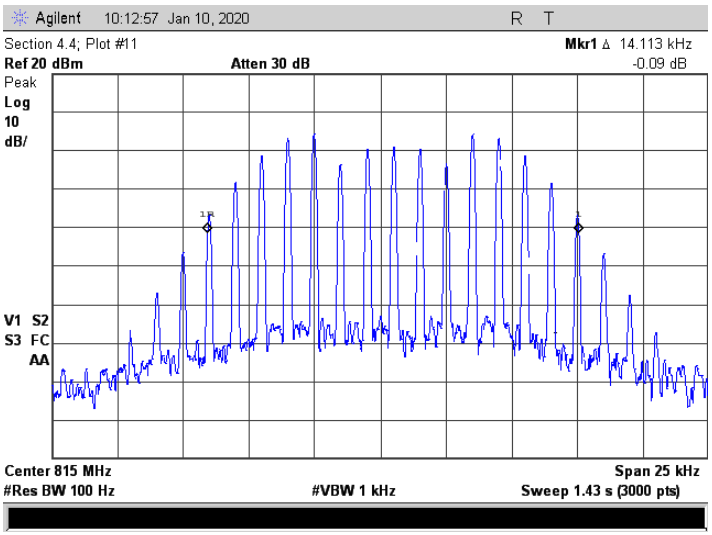


AMP Output: Level above AGC; FM 11K

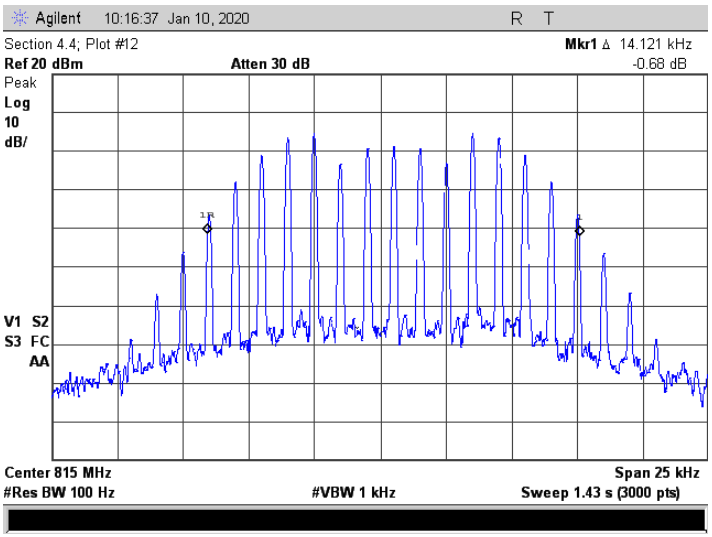
FM; 815 MHz Results



Input Signal to Amp; FM 11K

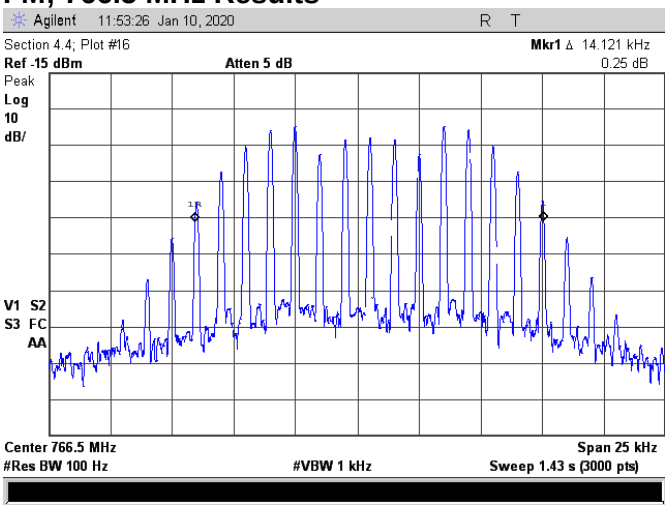


AMP Output: Below AGC, FM 11K

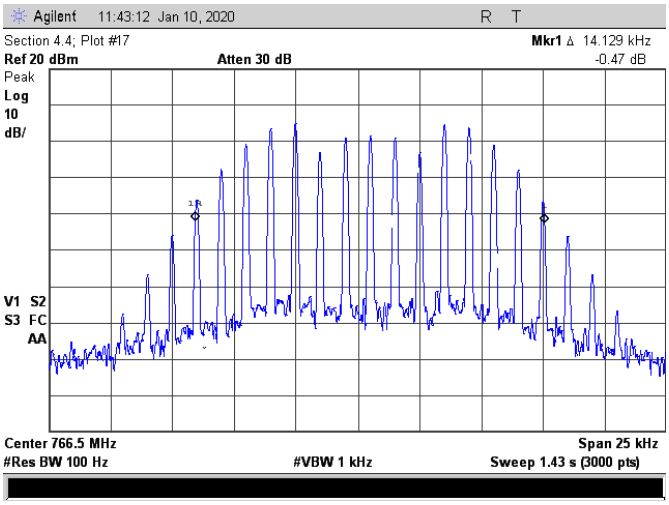


AMP Output: Level above AGC; FM 11K

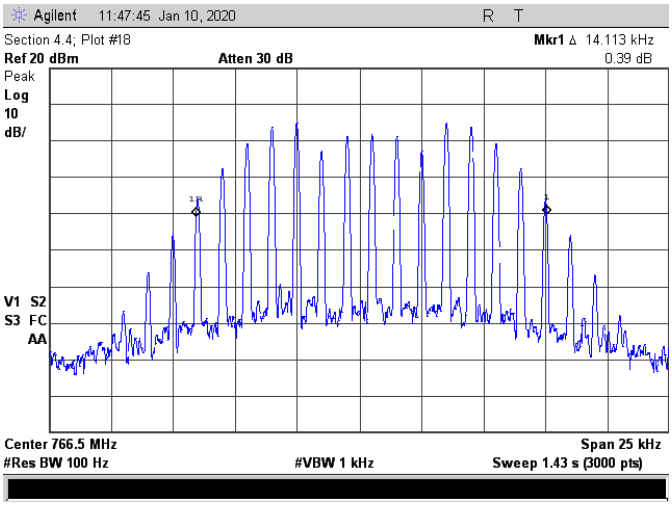
FM; 766.5 MHz Results



Input Signal to Amp; FM 11K

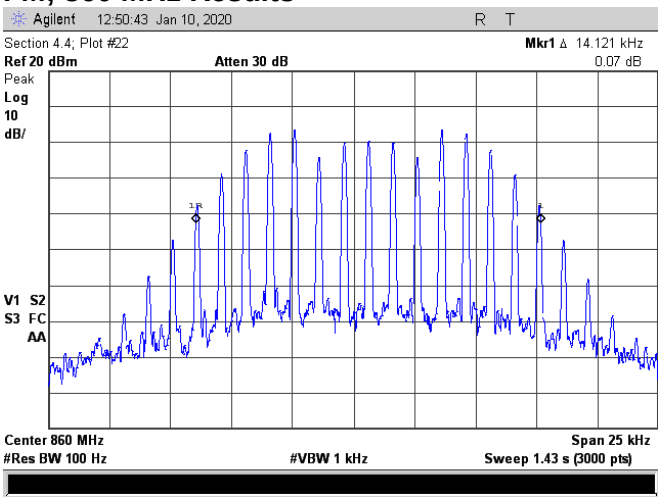


AMP Output: Below AGC, FM 11K

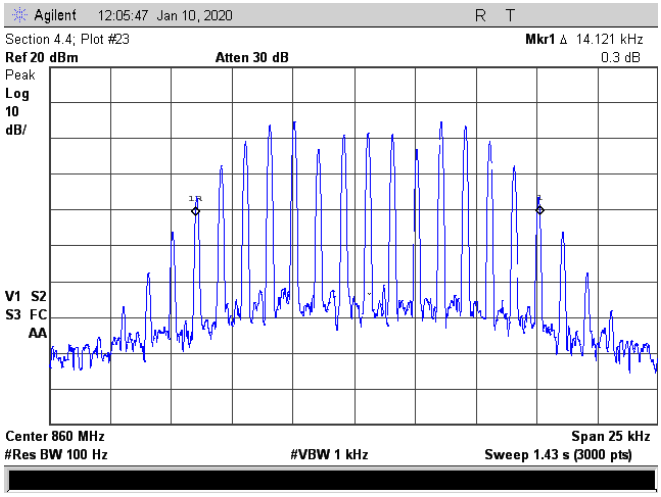


AMP Output: Level above AGC; FM 11K

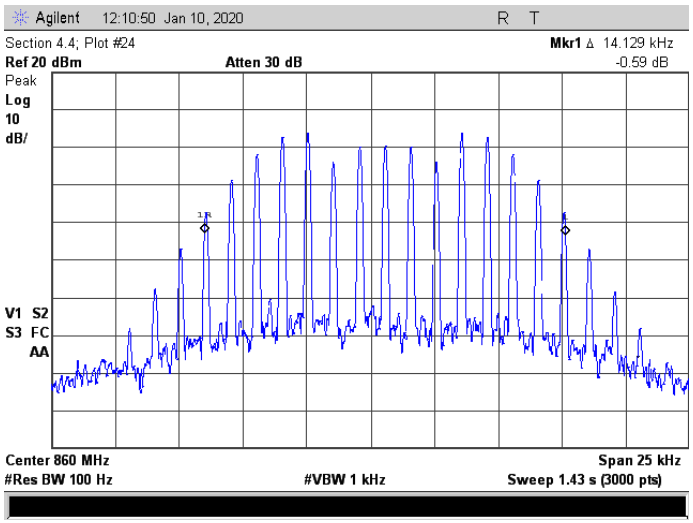
FM; 860 MHz Results



Input Signal to Amp; FM 11K

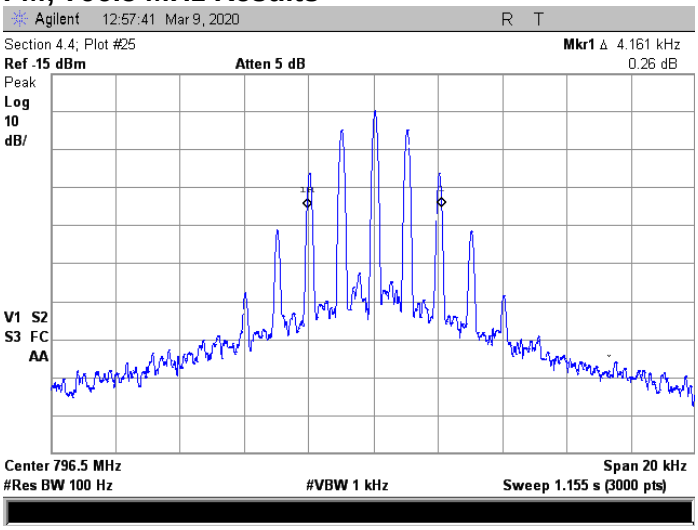


AMP Output: Below AGC, FM 11K

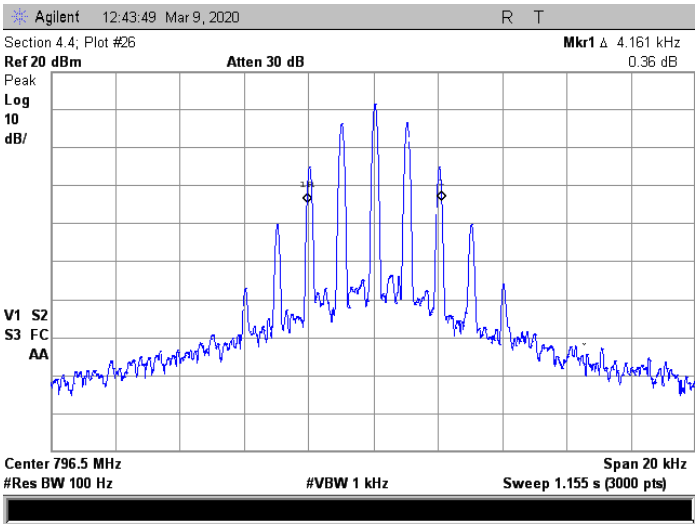


AMP Output: Level above AGC; FM 11K

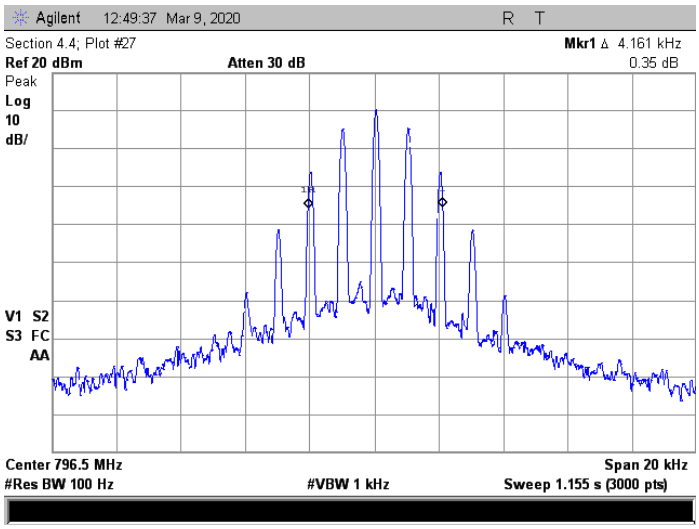
FM; 796.5 MHz Results



Input Signal to Amp; FM 4K

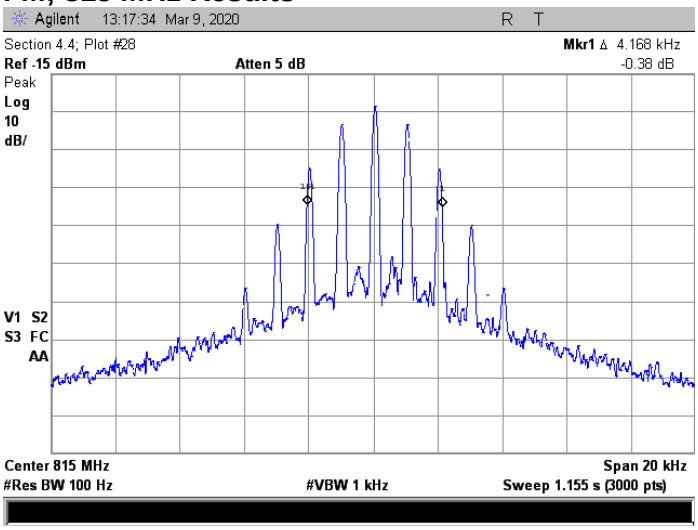


AMP Output: Below AGC, FM 4K

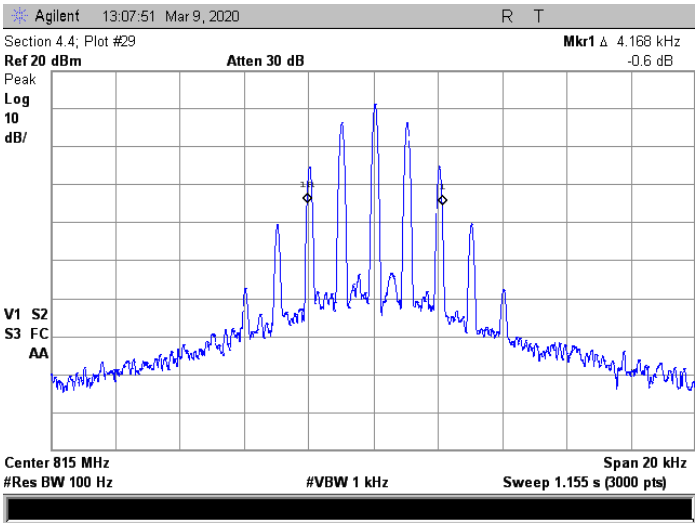


AMP Output: Level above AGC; FM 11K

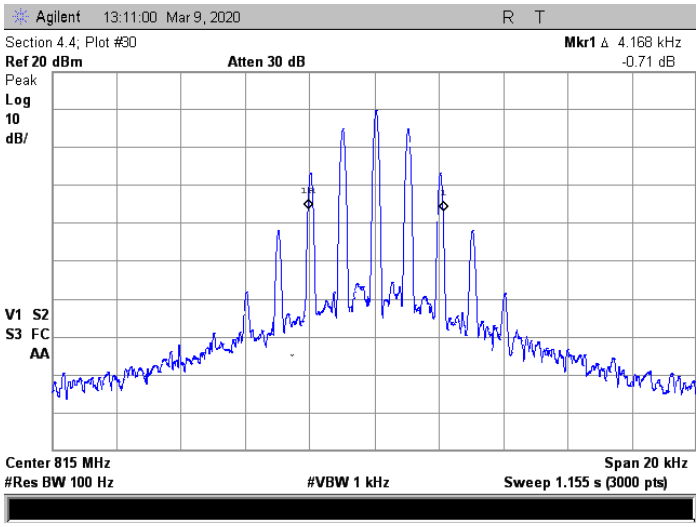
FM; 815 MHz Results



Input Signal to Amp; FM 4K

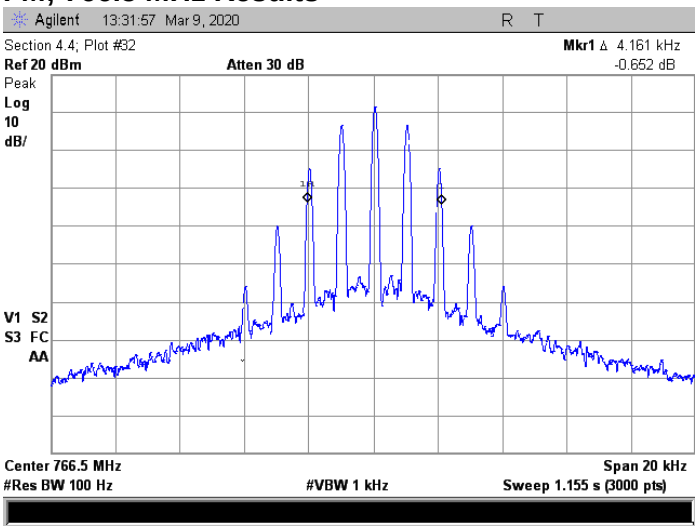


AMP Output: Below AGC, FM 4K

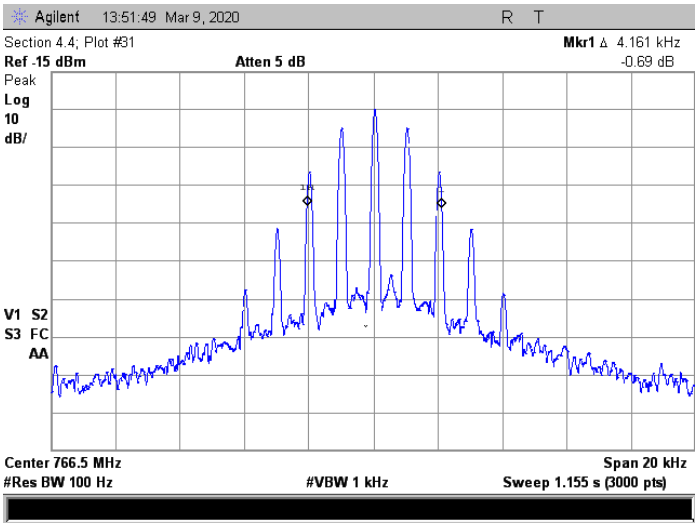


AMP Output: Level above AGC; FM 4K

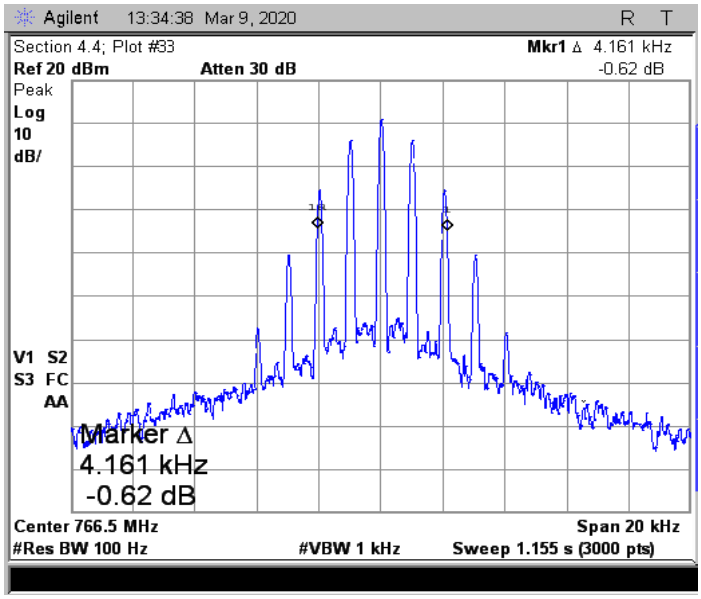
FM; 766.5 MHz Results



Input Signal to Amp; FM 4K

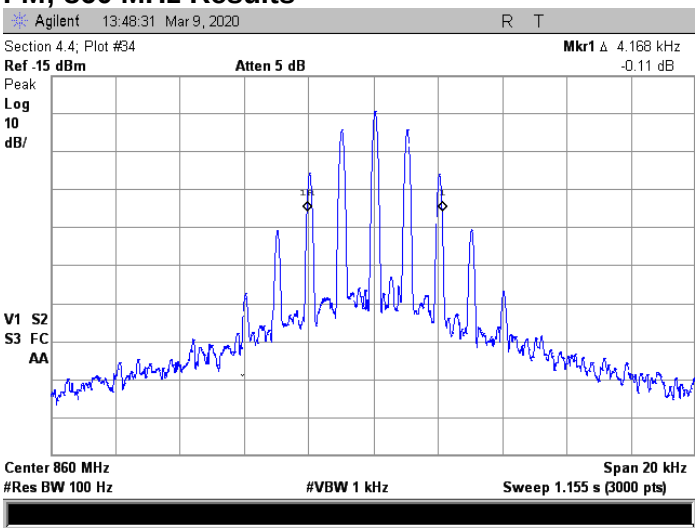


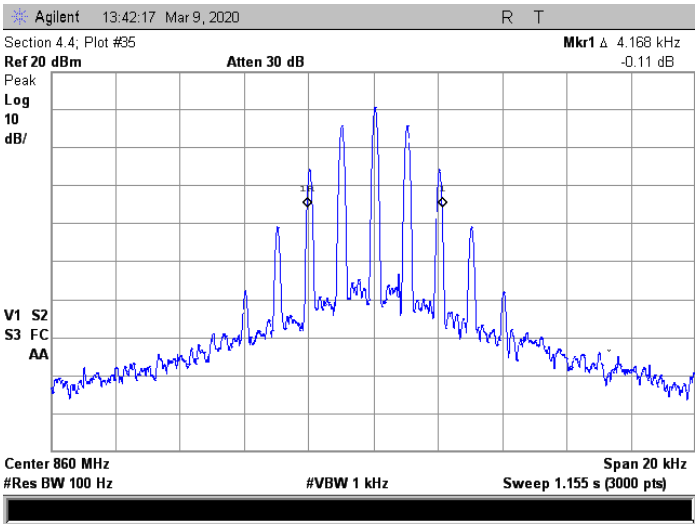
AMP Output: Below AGC, FM 4K



AMP Output: Level above AGC; FM 4K

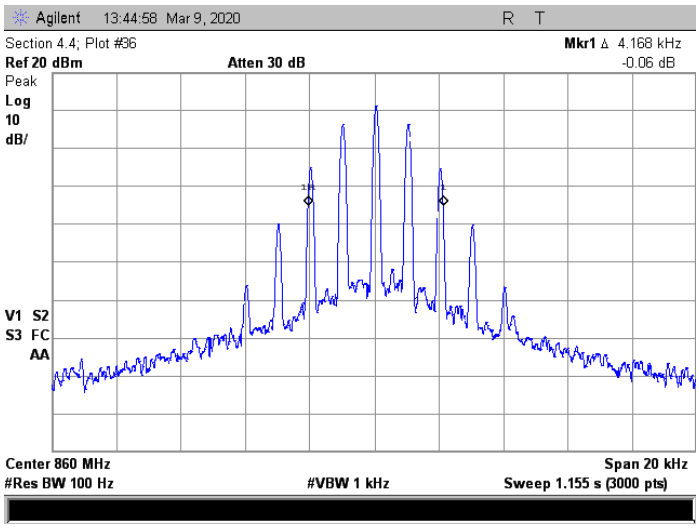
FM; 860 MHz Results





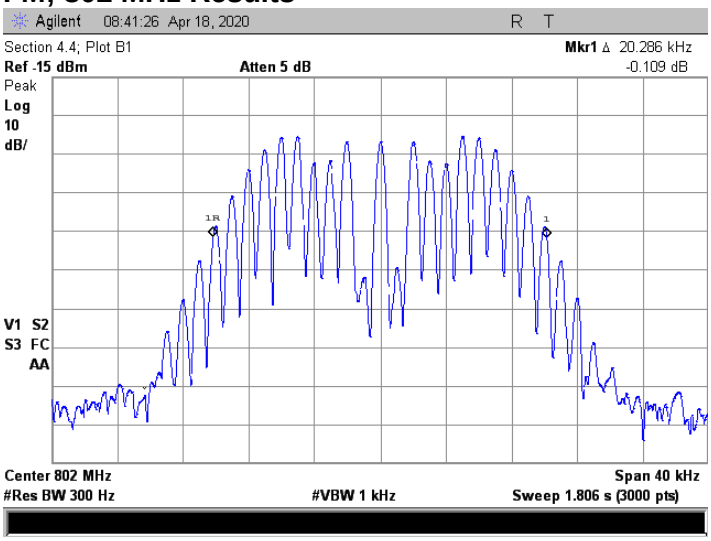
Input Signal to Amp; FM 4K

AMP Output: Below AGC, FM 4K

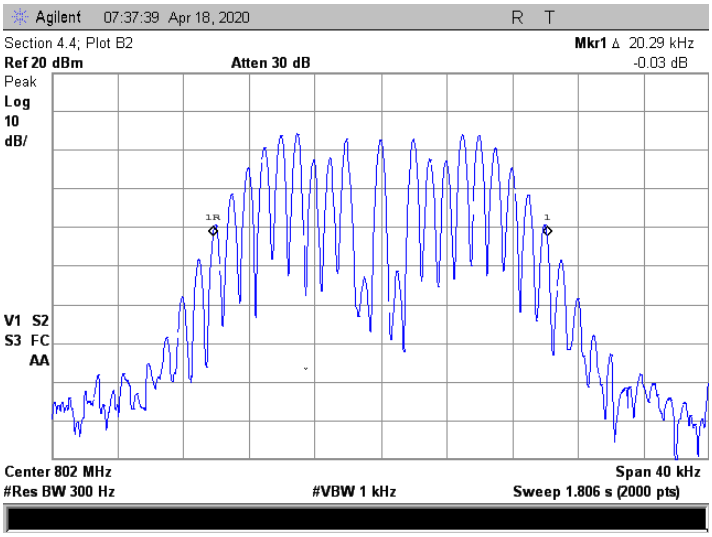


AMP Output: Level above AGC; FM 11K

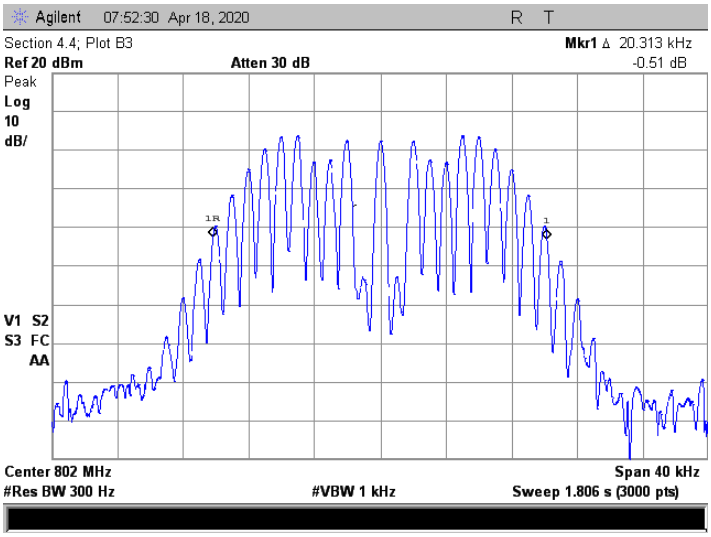
FM; 802 MHz Results



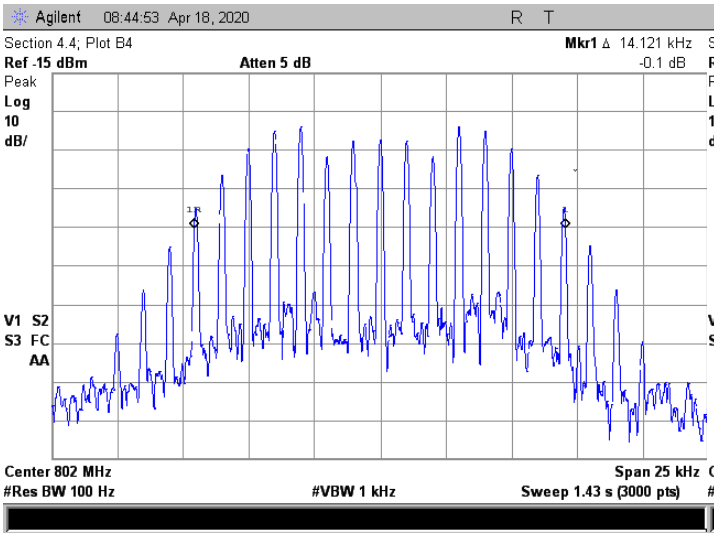
Generator; FM 16K



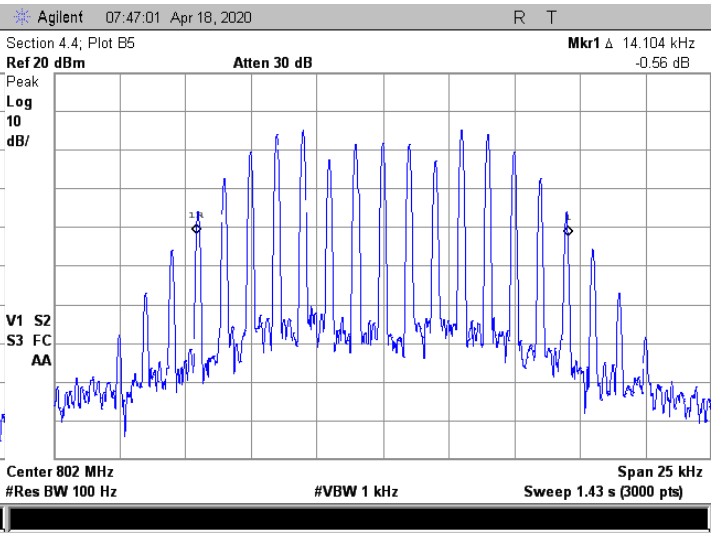
AMP Output, FM 16K



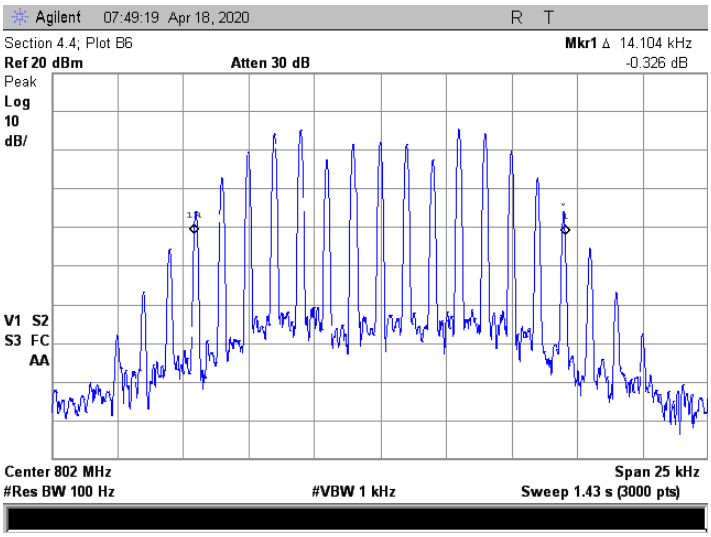
AMP Output, FM 16K



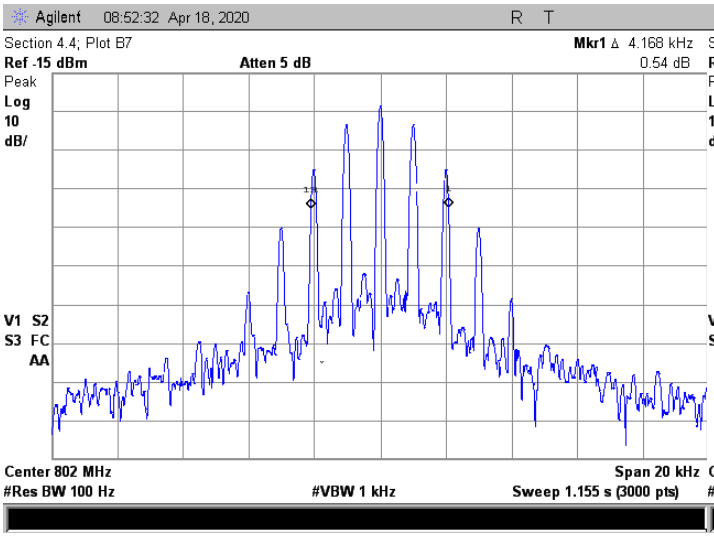
Generator; FM 11K



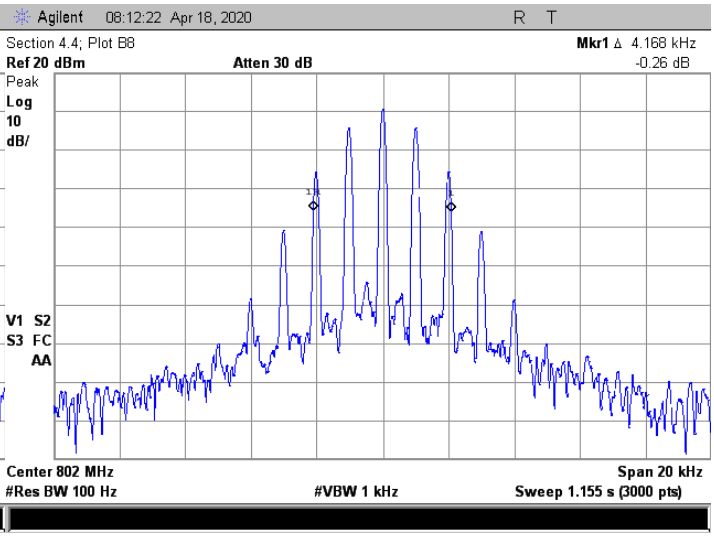
AMP Output, FM 11K



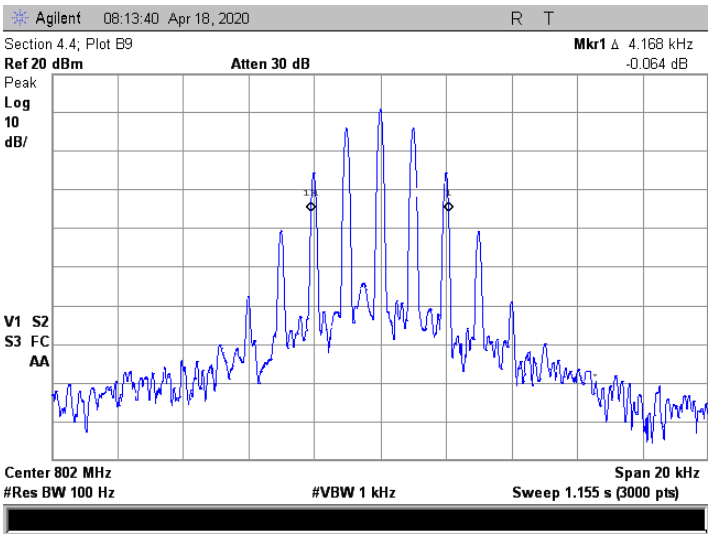
AMP Output, FM 11K



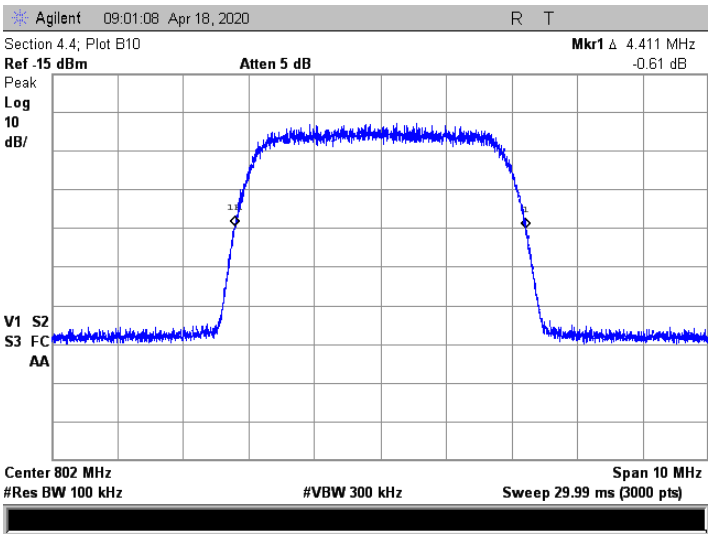
Generator; FM 4K



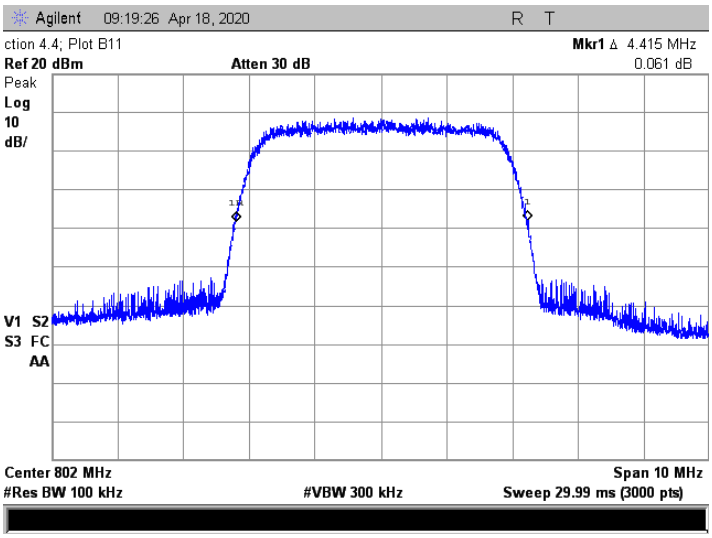
AMP Output, FM 4K



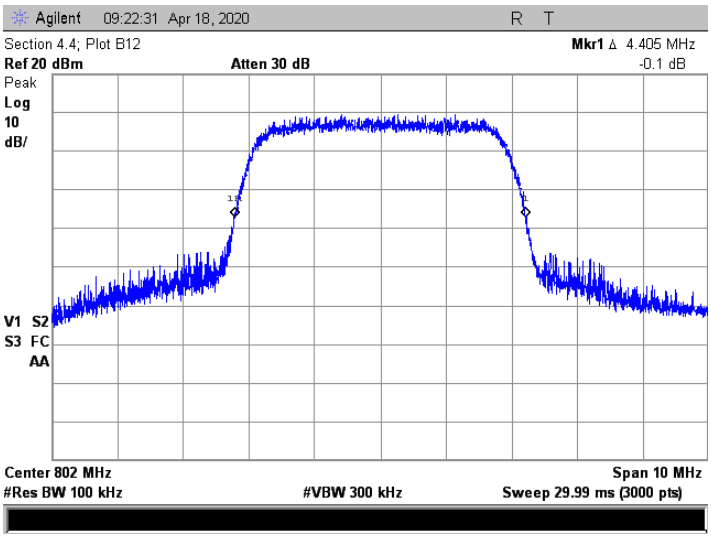
AMP Output, FM 4K



Generator; AWGN

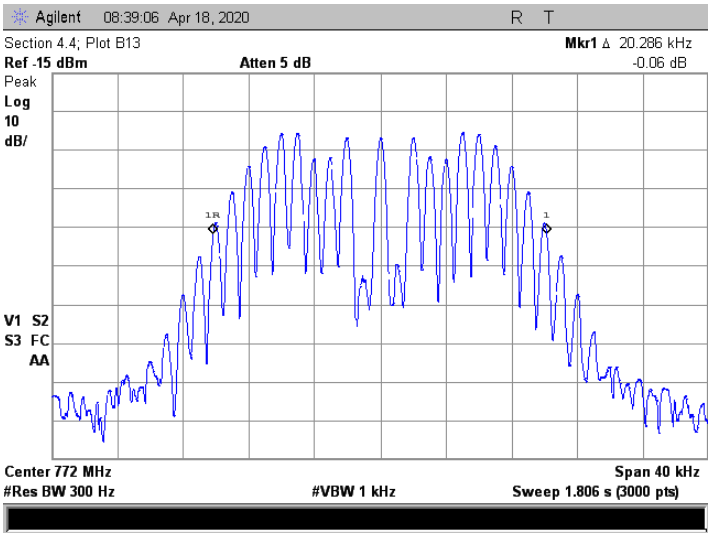


AMP Output, AWGN

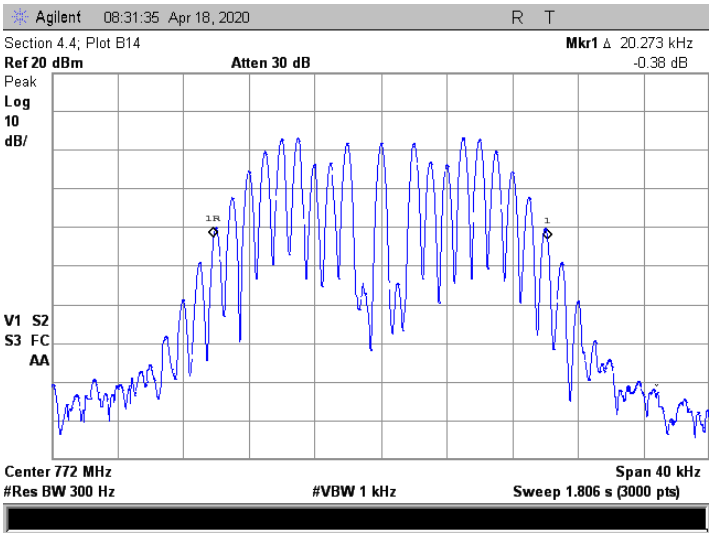


AMP Output, AWGN

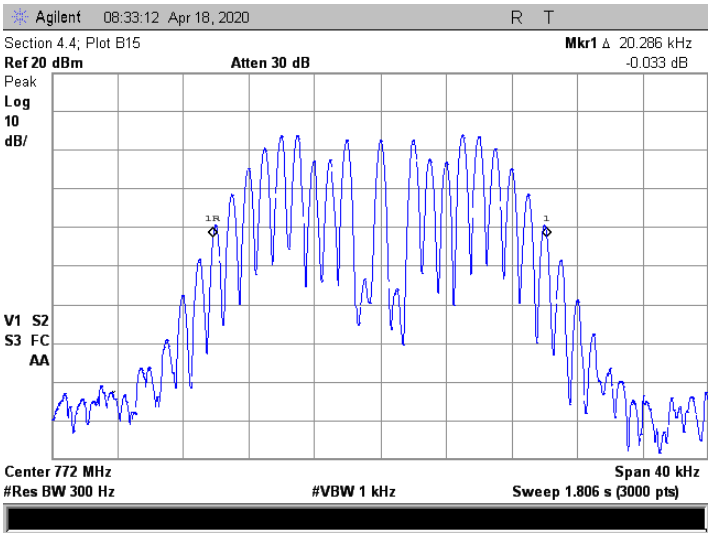
FM; 772 MHz Results



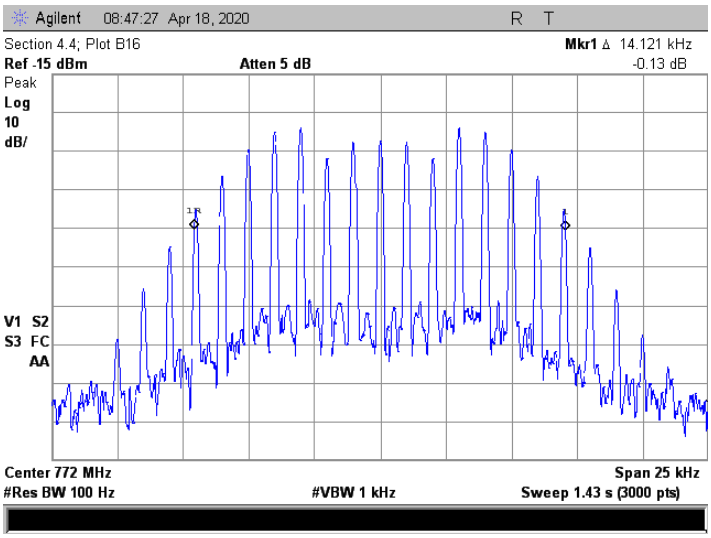
Generator; FM 16K



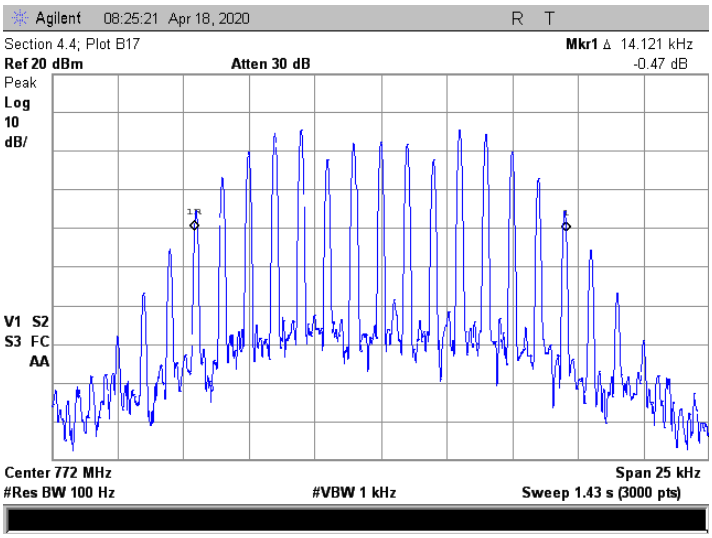
AMP Output, FM 16K



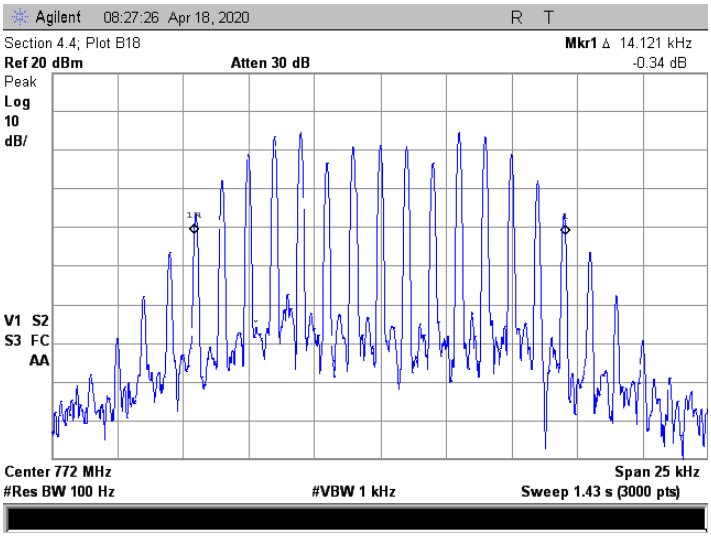
AMP Output, FM 16K



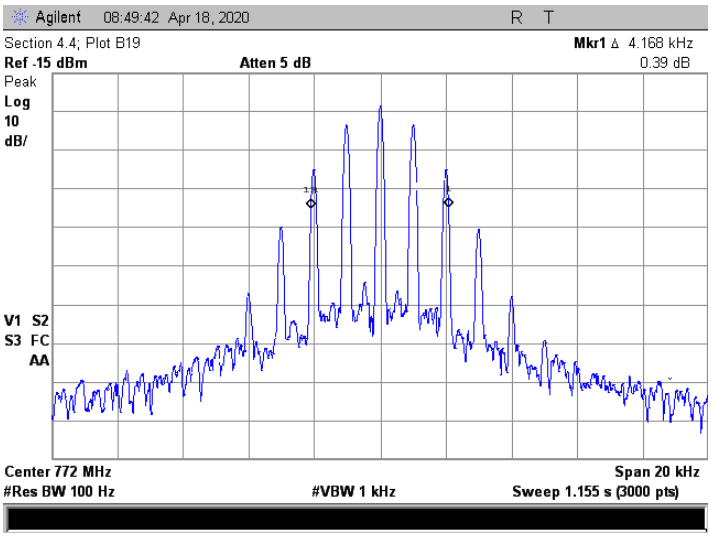
Generator; FM 11K



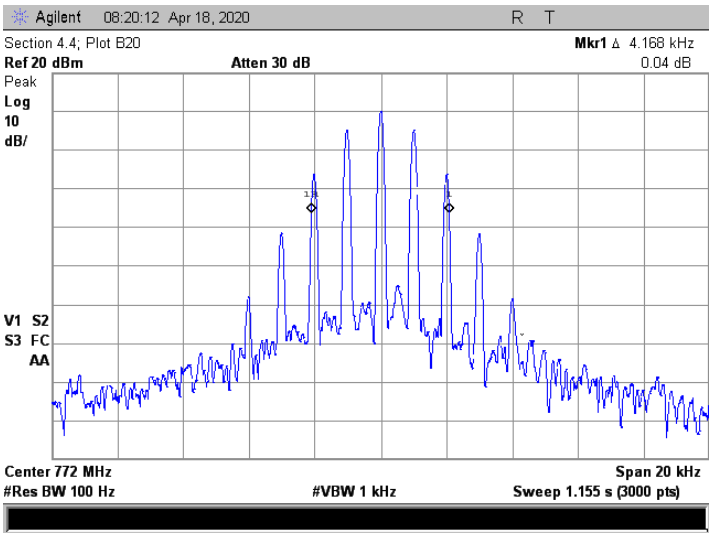
AMP Output, FM 11K



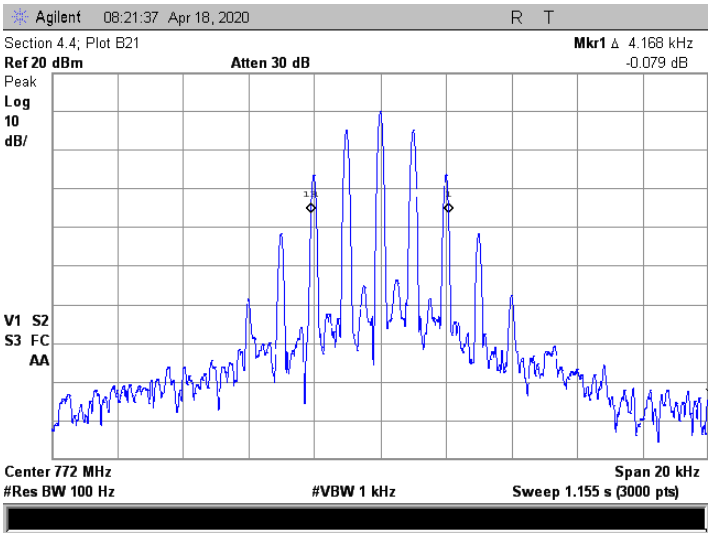
AMP Output, FM 11K



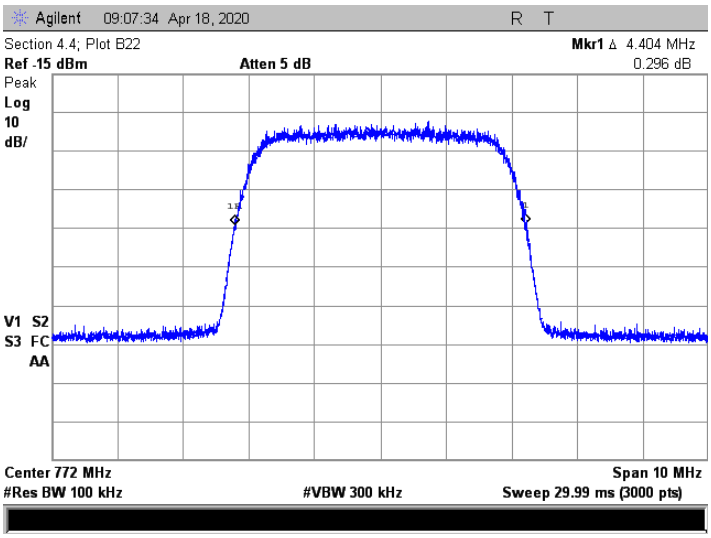
Generator; FM 4K



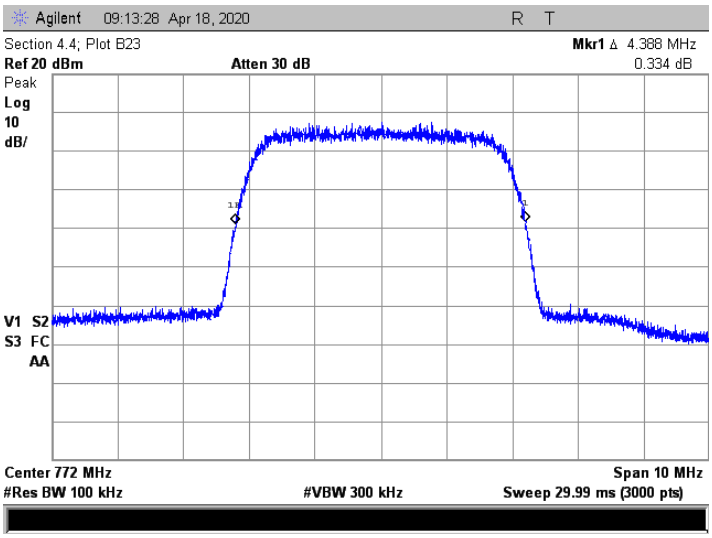
AMP Output, FM 4K



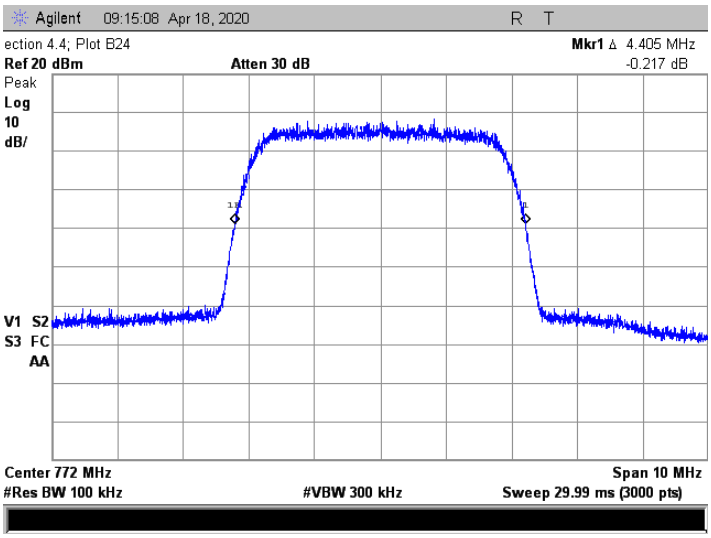
AMP Output, FM 4K



Generator; AWGN



AMP Output, AWGN



AMP Output, AWGN

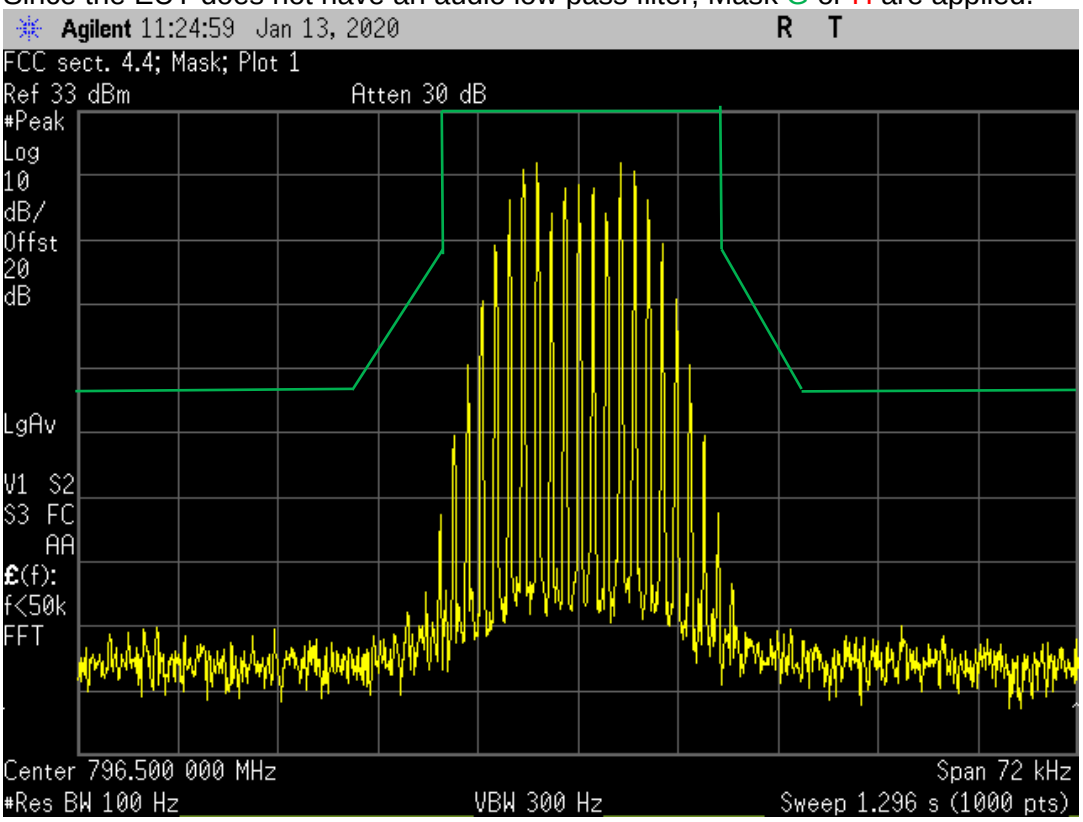
Judgement: Pass

13.2.1.2 Emissions Masks per 90.210

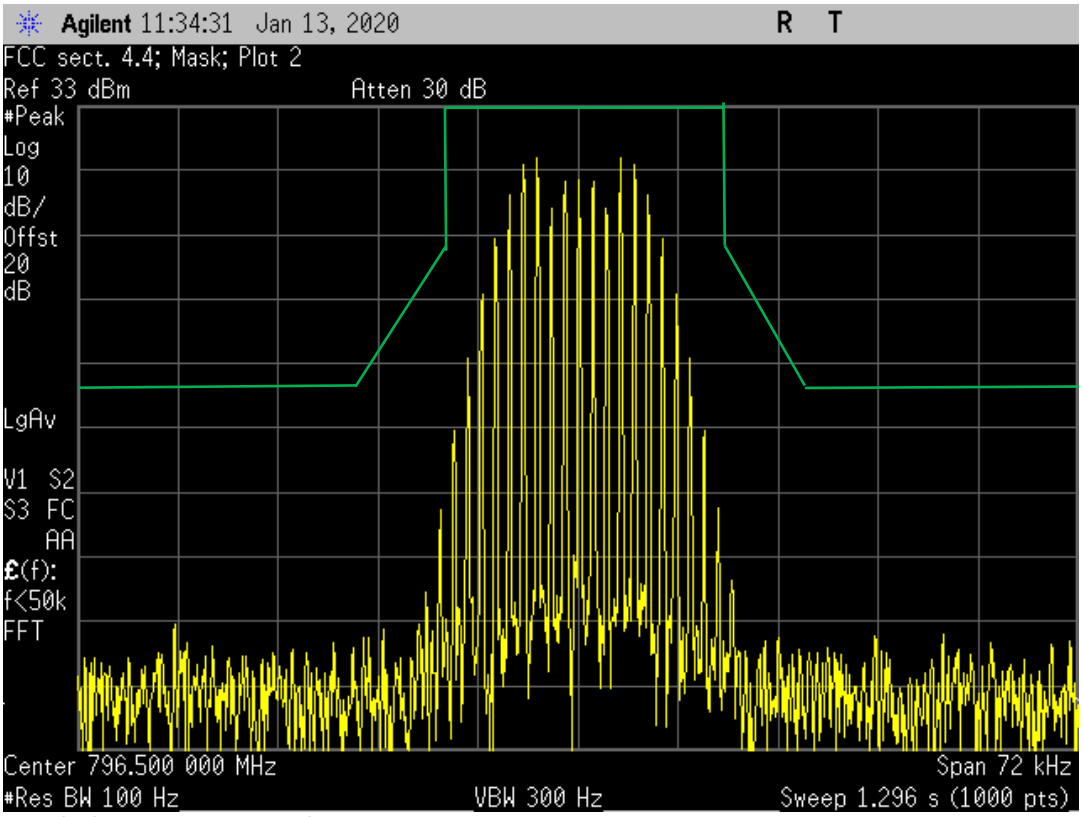
Model	PS71090E	Specifications	FCC KDB 935210 D05 Sec. 4.4
Serial Number	19RF11060004	Test Date	1/13/2020
Test Personnel	Richard L. Tichgelaar	Test Location	Chamber B
Test Equipment	EMI Receiver (RNT-17)		

		EUT		Generator		Settings		
Output	Modulation	AGC	Plot	Output		RBW	VBW	Test
Mode	Type	Mode	#	MHz	Mask	Hz	Hz	Port
Up	FM 11k	Below	1	796.5	H	100	300	Amp Out
Up	FM 11k	ON+3	2	796.5	H	100	300	Amp Out
Up	FM 16k	Below	3	796.5	G	300	1000	Amp Out
Up	FM 16k	ON+3	4	796.5	G	300	1000	Amp Out
Up	FM 11k	Below	5	815	H	100	300	Amp Out
Up	FM 11k	ON+3	6	815	H	100	300	Amp Out
Up	FM 16k	Below	7	815	G	300	1000	Amp Out
Up	FM 16k	ON+3	8	815	G	300	1000	Amp Out
Down	FM 11k	Below	9	766.5	H	100	300	Amp Out
Down	FM 11k	ON+3	10	766.5	H	100	300	Amp Out
Down	FM 16k	Below	11	766.5	G	300	1000	Amp Out
Down	FM 16k	ON+3	12	766.5	G	300	1000	Amp Out
Down	FM 11k	Below	13	860	H	100	300	Amp Out
Down	FM 11k	ON+3	14	860	H	100	300	Amp Out
Down	FM 16k	Below	15	860	G	300	1000	Amp Out
Down	FM 16k	ON+3	16	860	G	300	1000	Amp Out
N/A	FM 16k	N/A	17	796.5	G	300	1000	Generator
N/A	FM 11k	N/A	18	796.5	H	100	300	Generator
N/A	FM 16k	N/A	19	815	G	300	1000	Generator
N/A	FM 11k	N/A	20	815	H	100	300	Generator
N/A	FM 16k	N/A	21	766.5	G	300	1000	Generator
N/A	FM 11k	N/A	22	766.5	H	100	300	Generator
N/A	FM 16k	N/A	23	860	G	300	1000	Generator
N/A	FM 11k	N/A	24	860	H	100	300	Generator

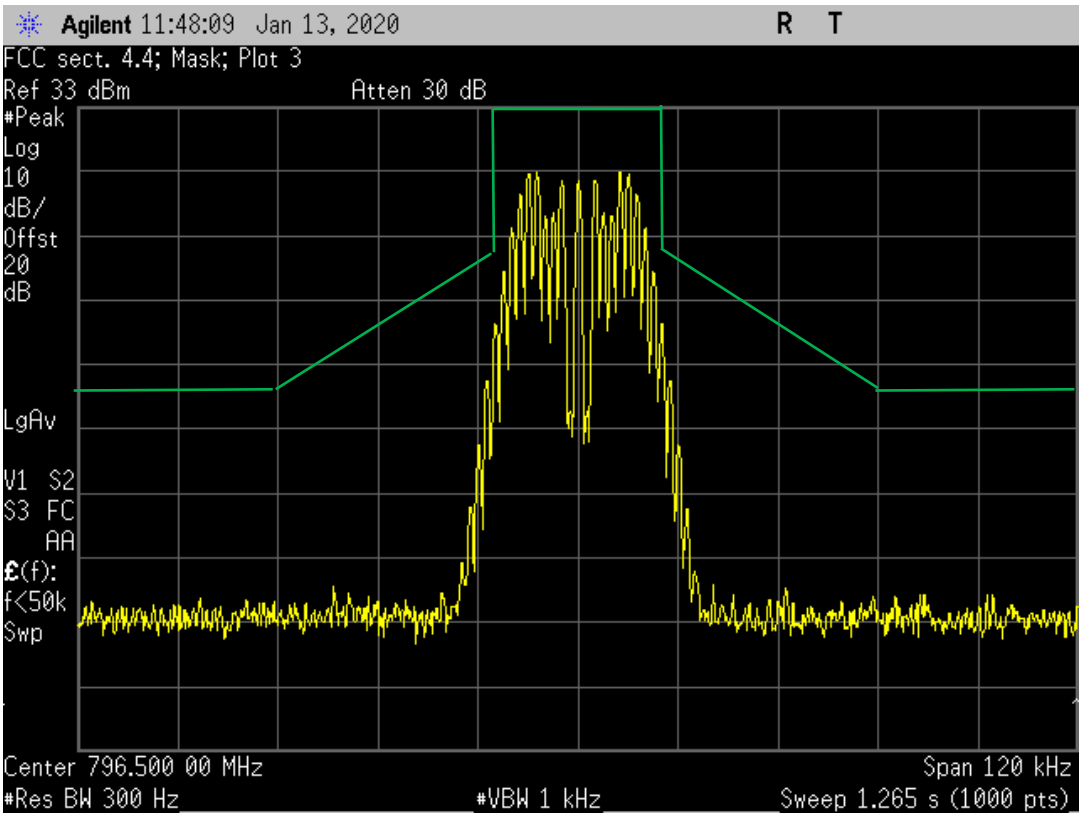
Since the EUT does not have an audio low pass filter, Mask G or H are applied.



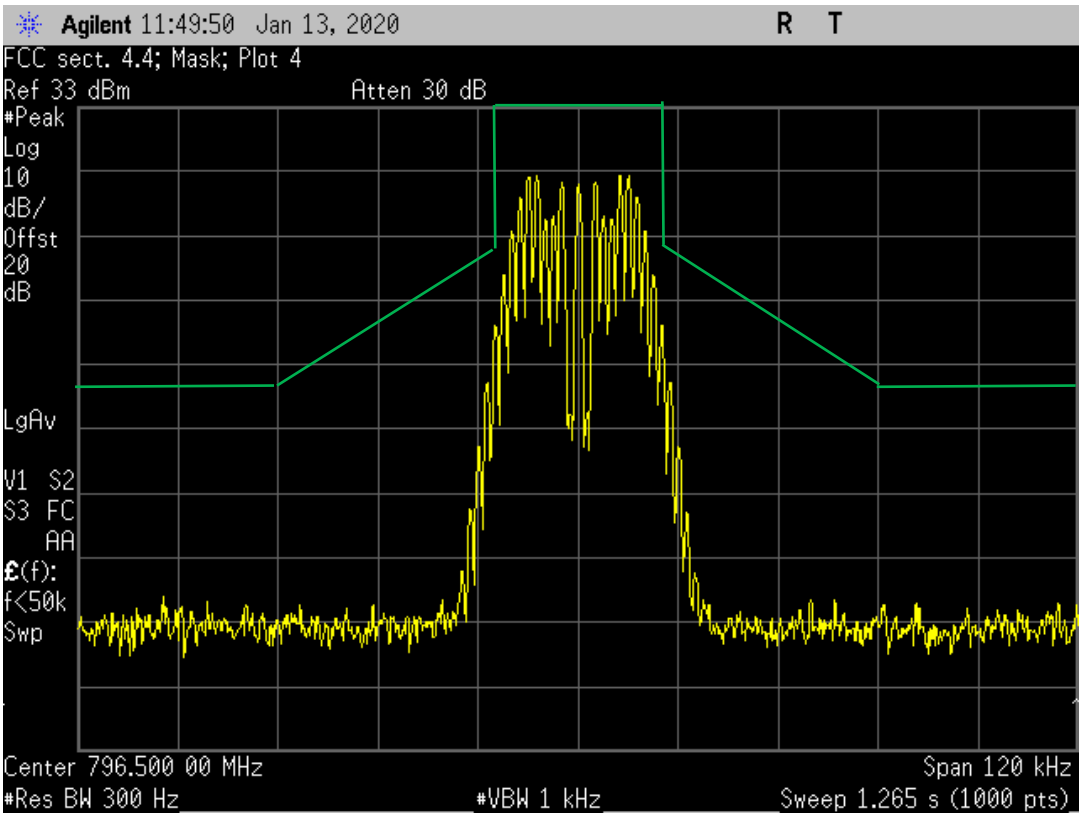
Below AGC; H Mask; Amp Out



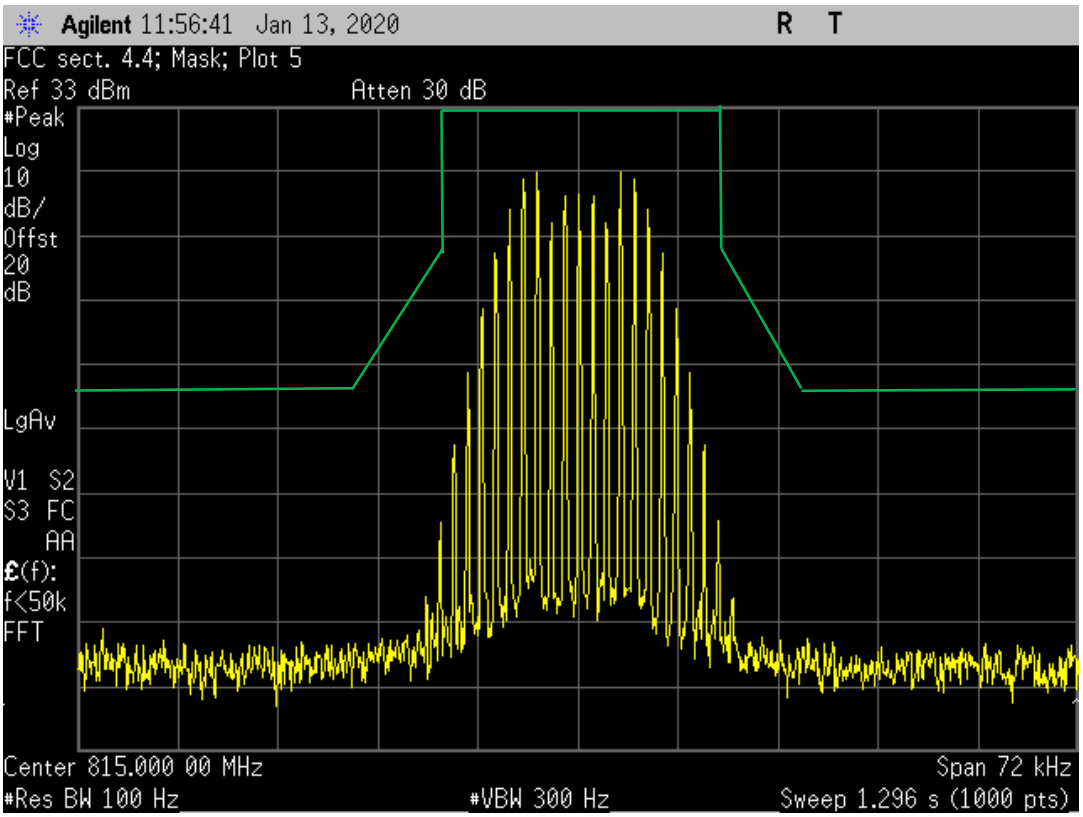
Level Above AGC; H Mask; Amp Out



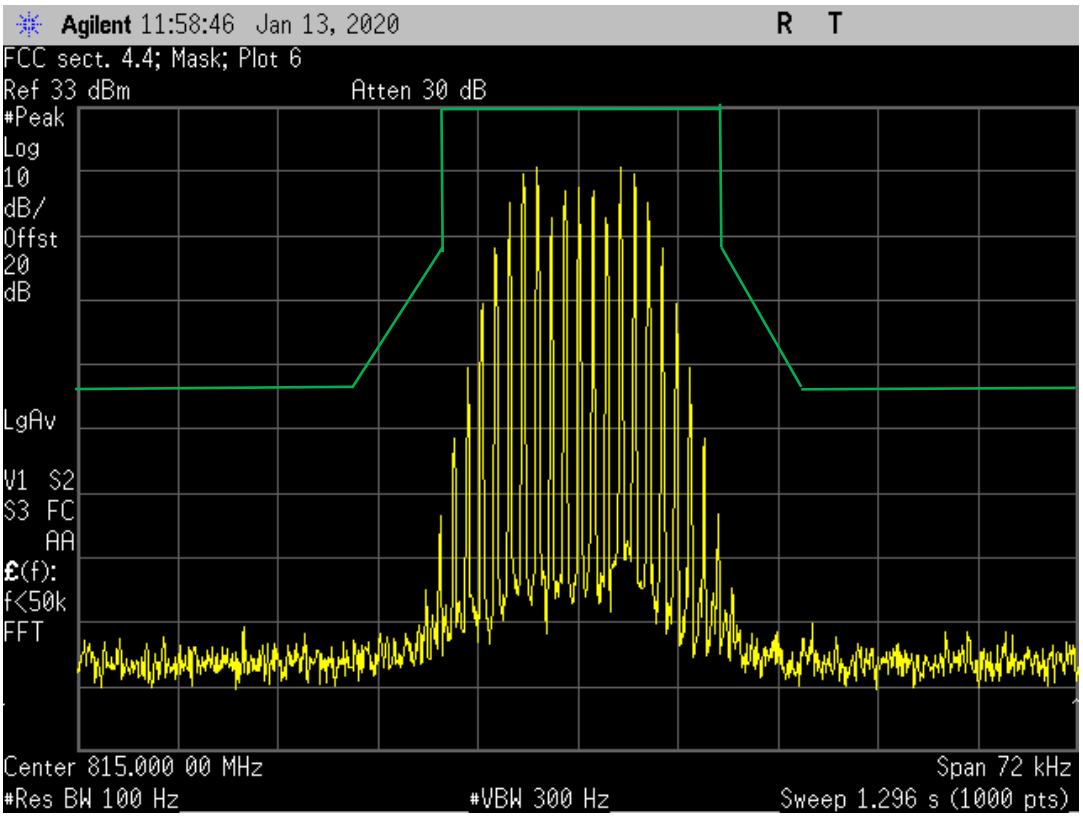
Below AGC; G Mask; Amp Out



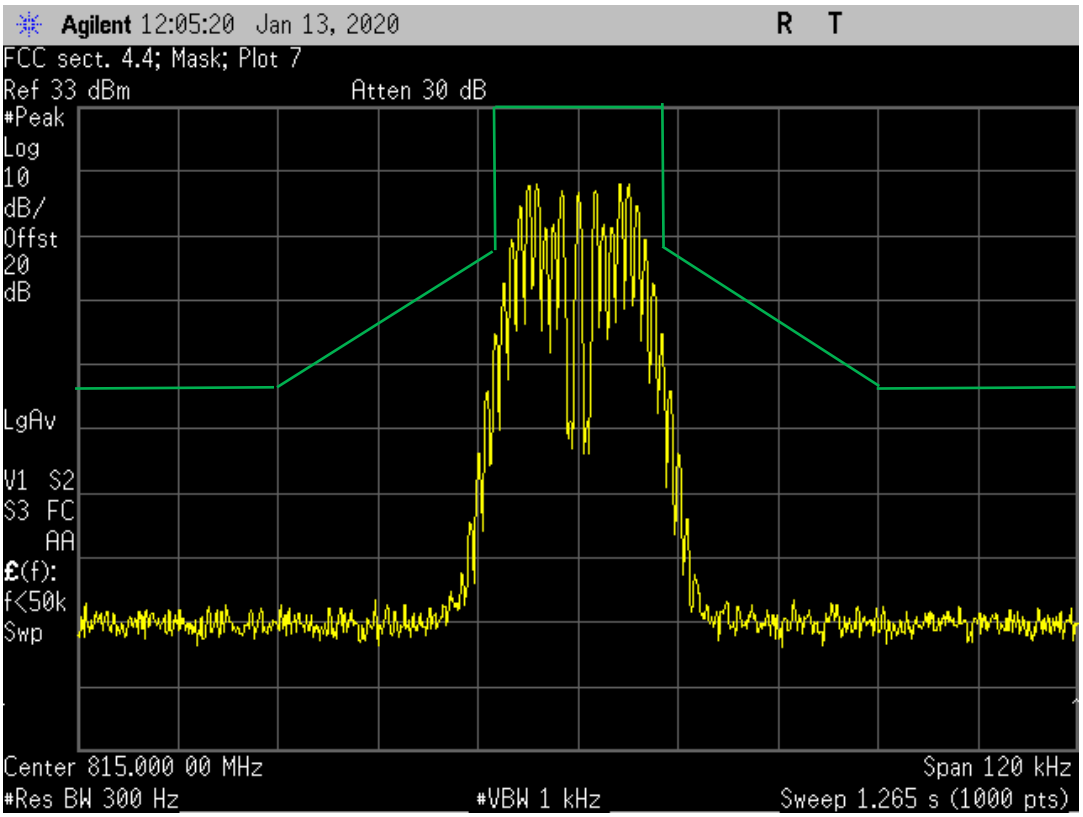
Level Above AGC; G Mask; Amp Out



Below AGC; H Mask; Amp Out



Level Above AGC; H Mask; Amp Out



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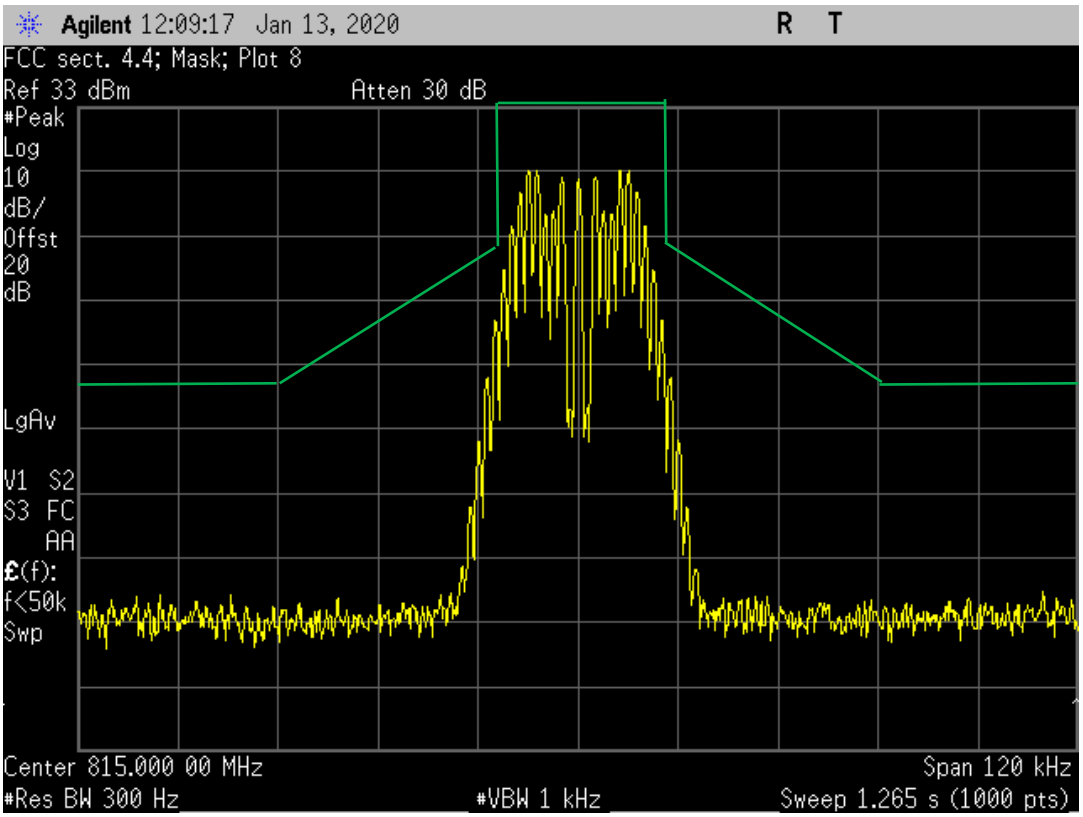
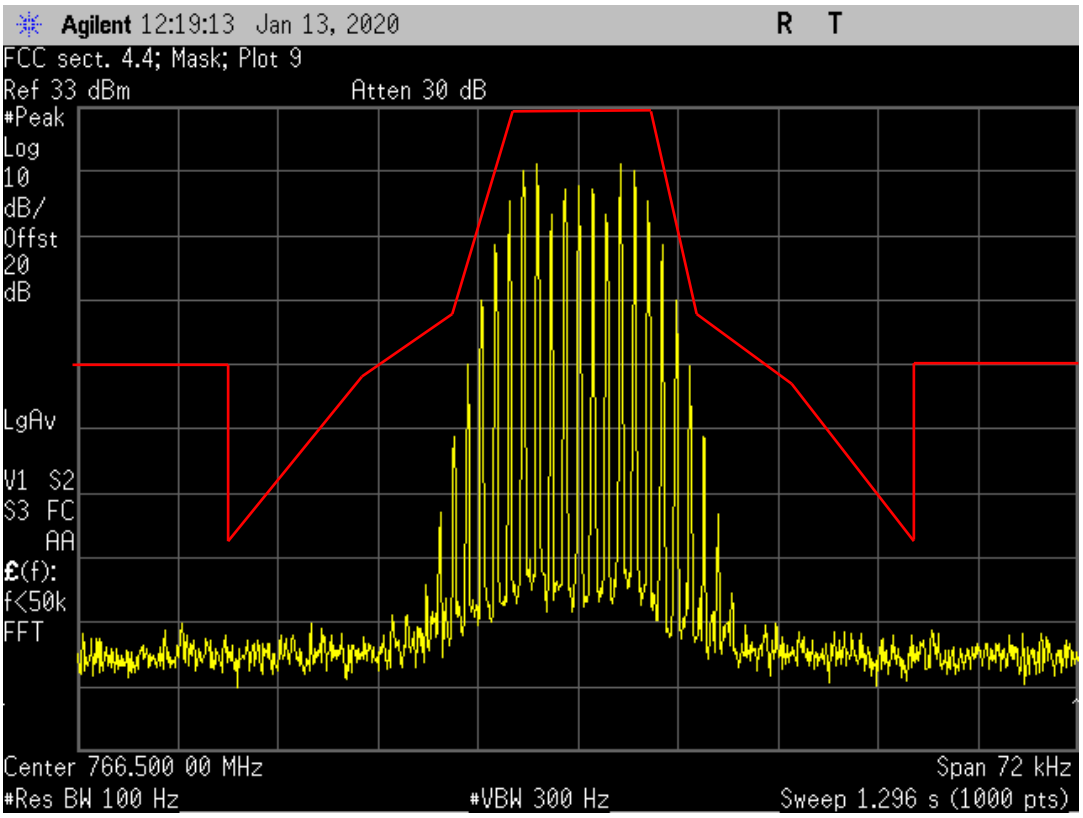


Level Above AGC; G Mask; Amp Out



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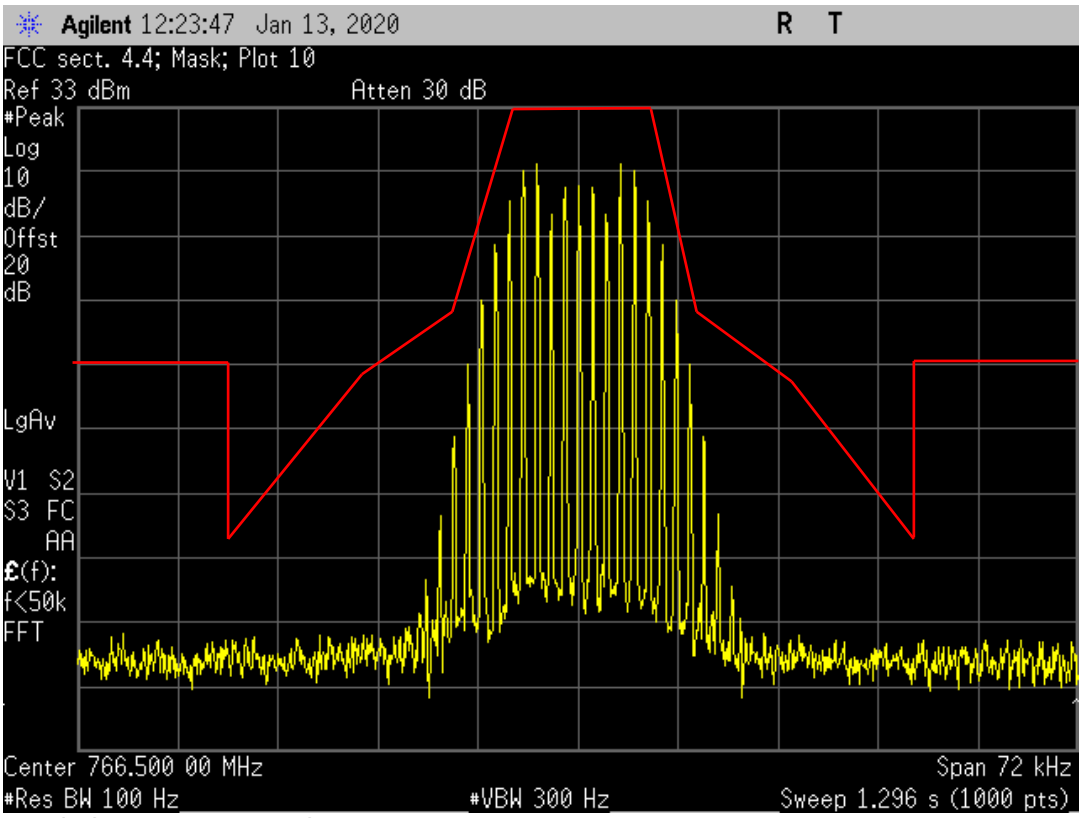
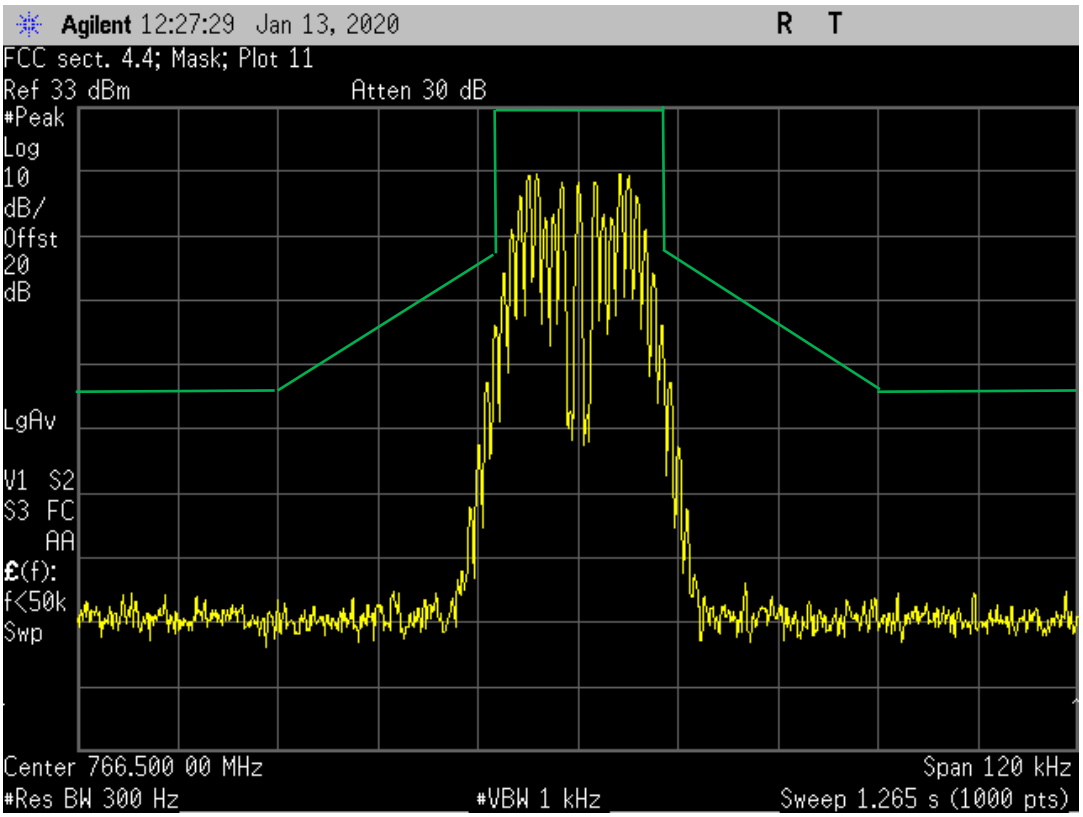
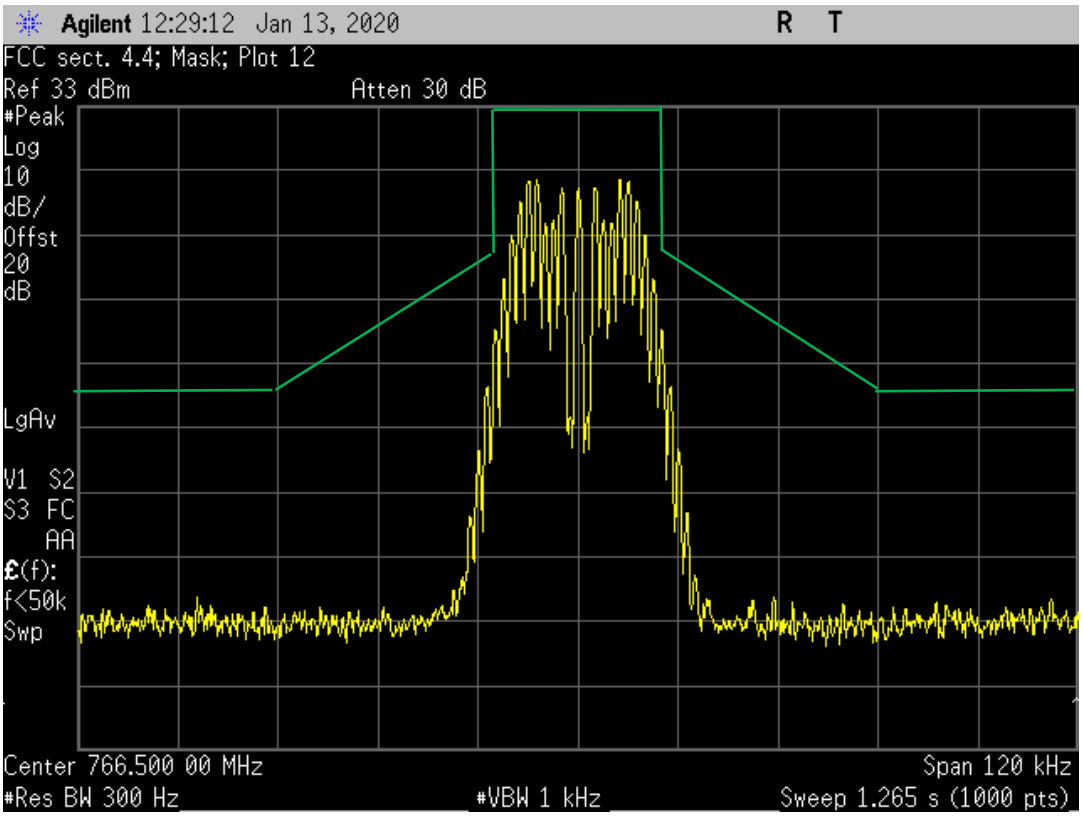


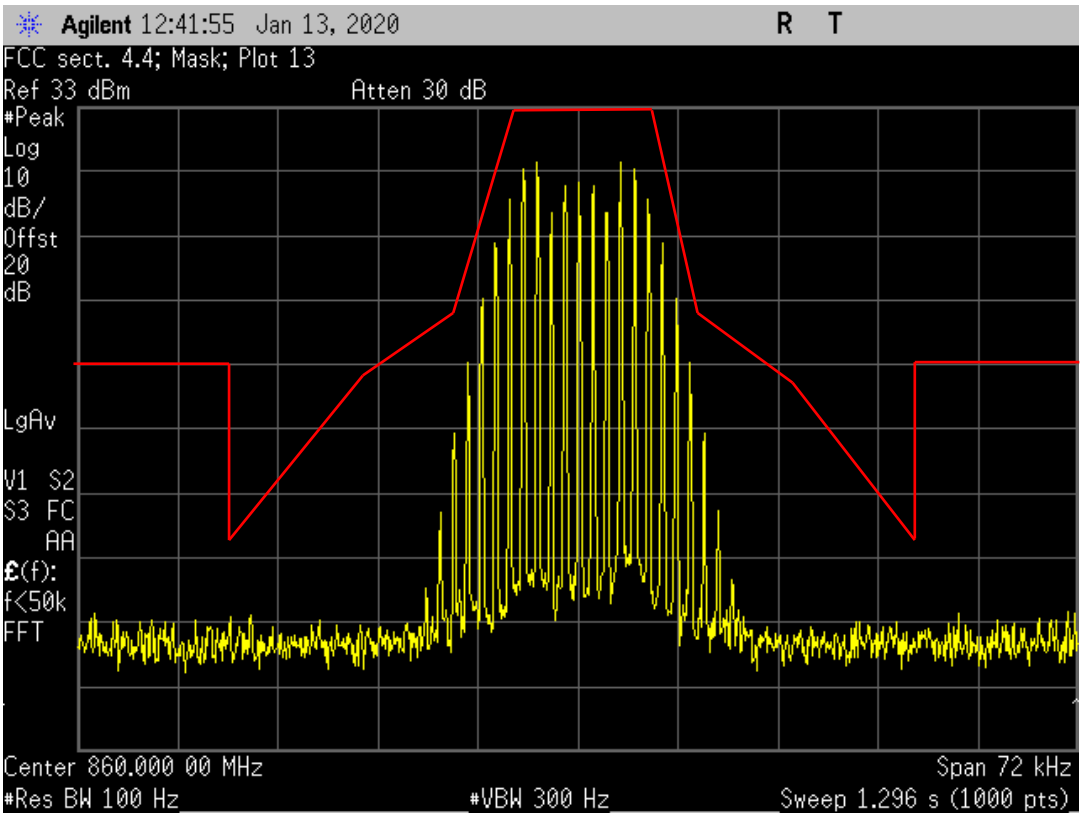
Level Above AGC; H Mask; Amp Out



Below AGC; G Mask; Amp Out



Level Above AGC; G Mask; Amp Out



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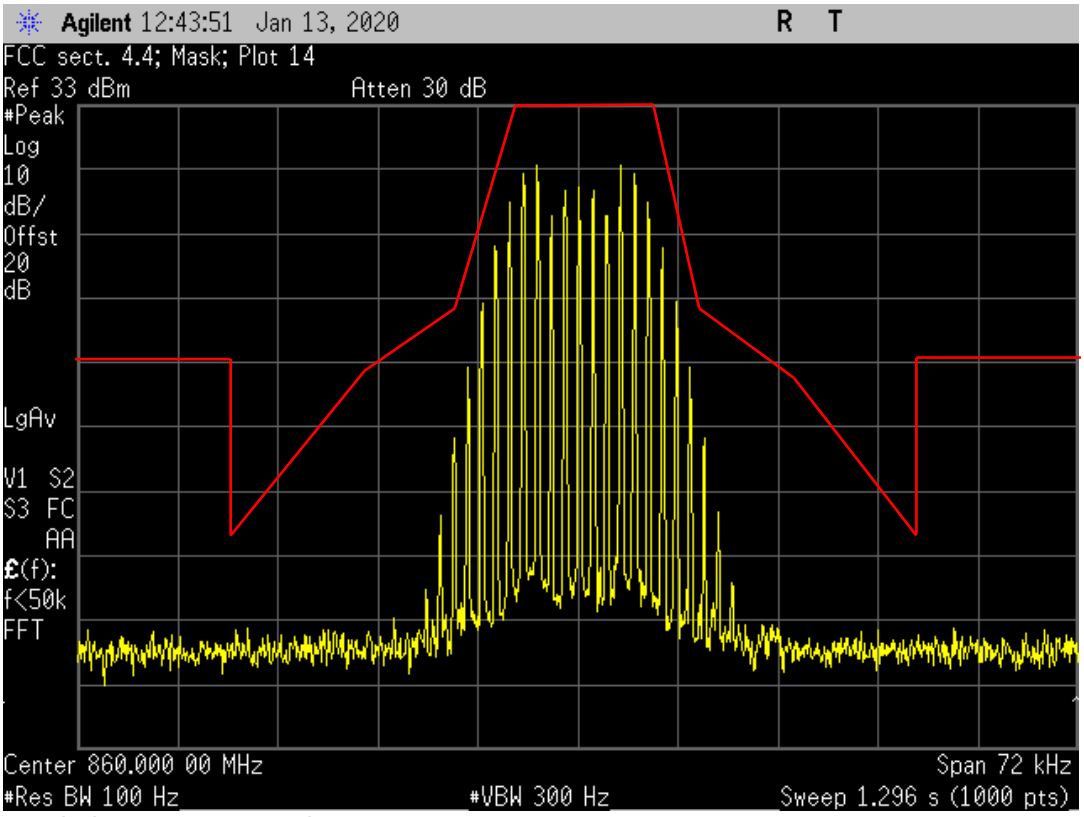
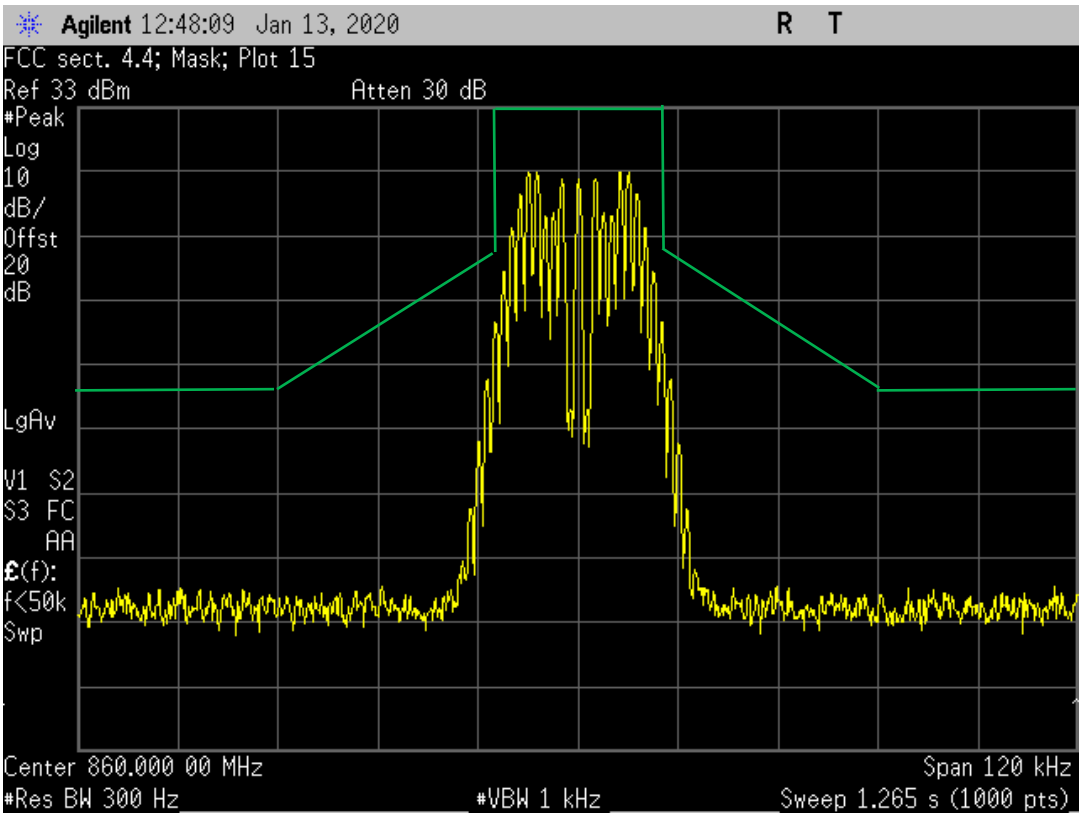
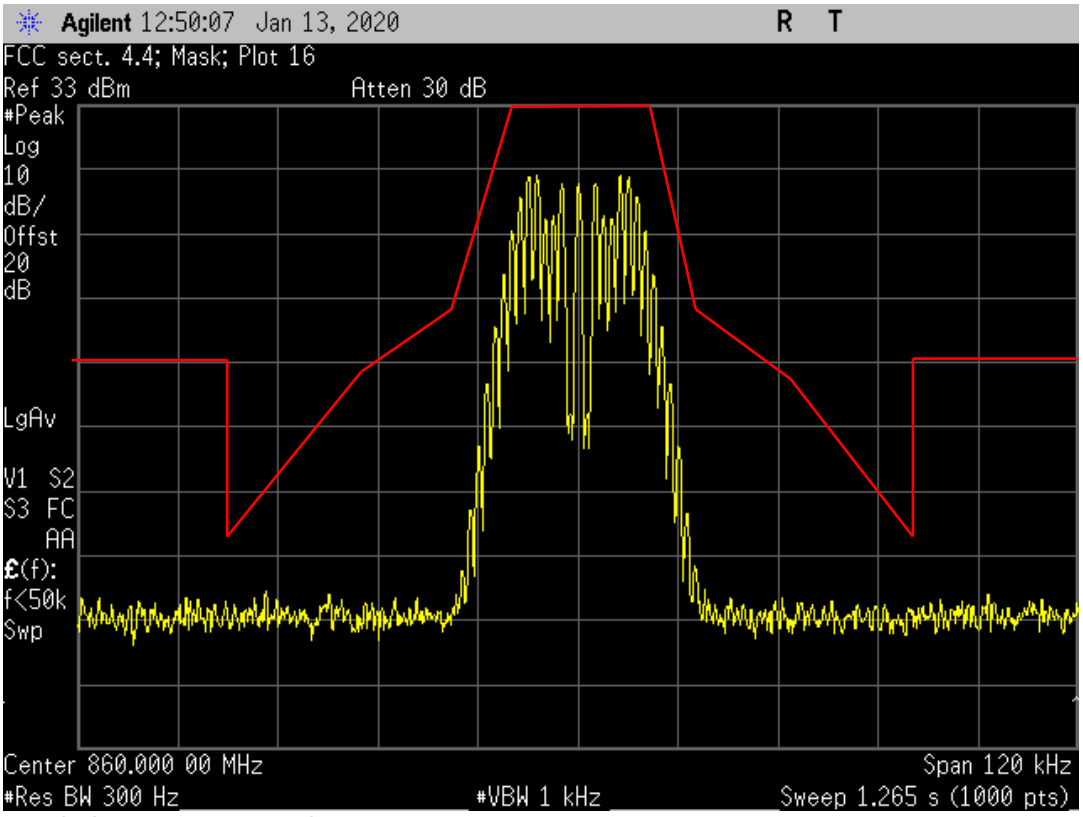


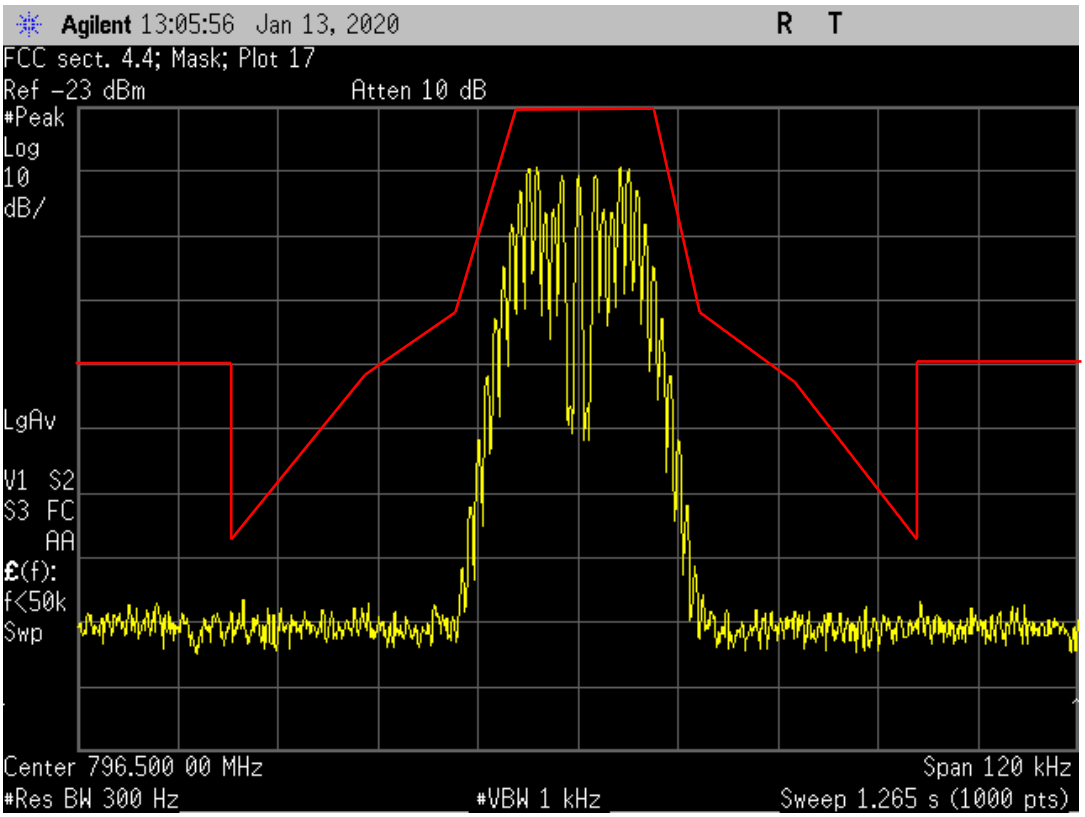
Level Above AGC; H Mask; Amp Out



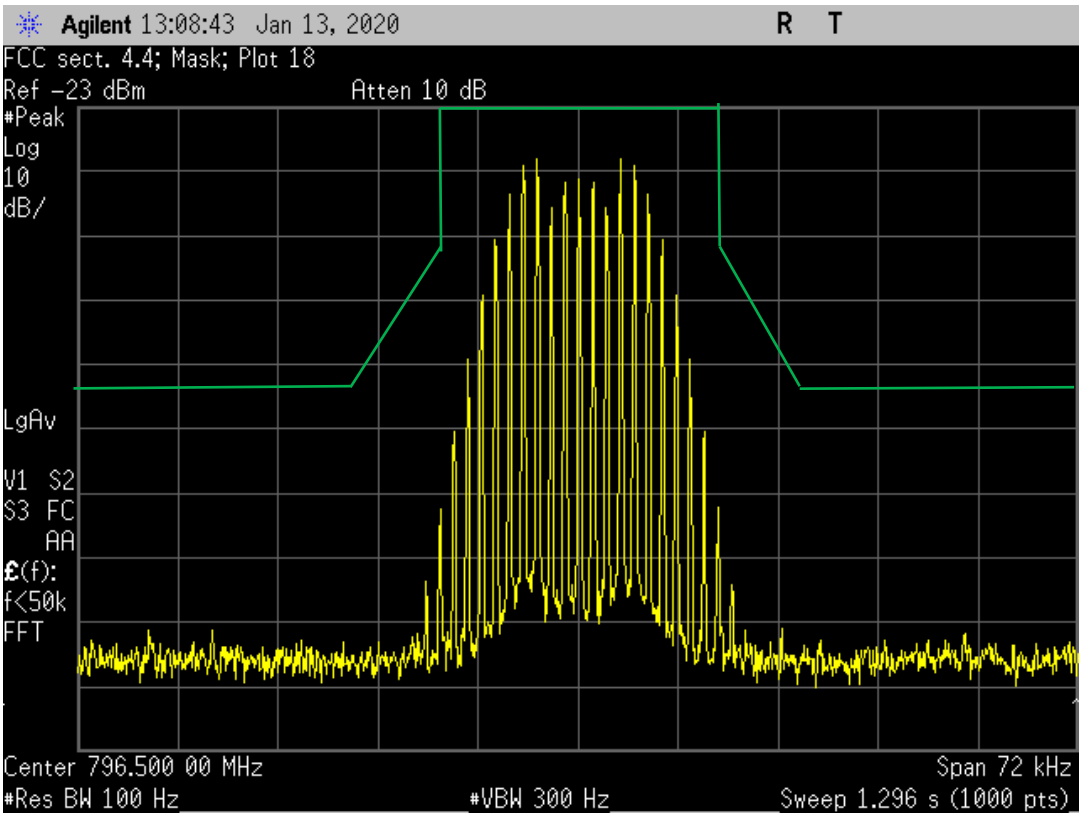
Below AGC; G Mask; Amp Out



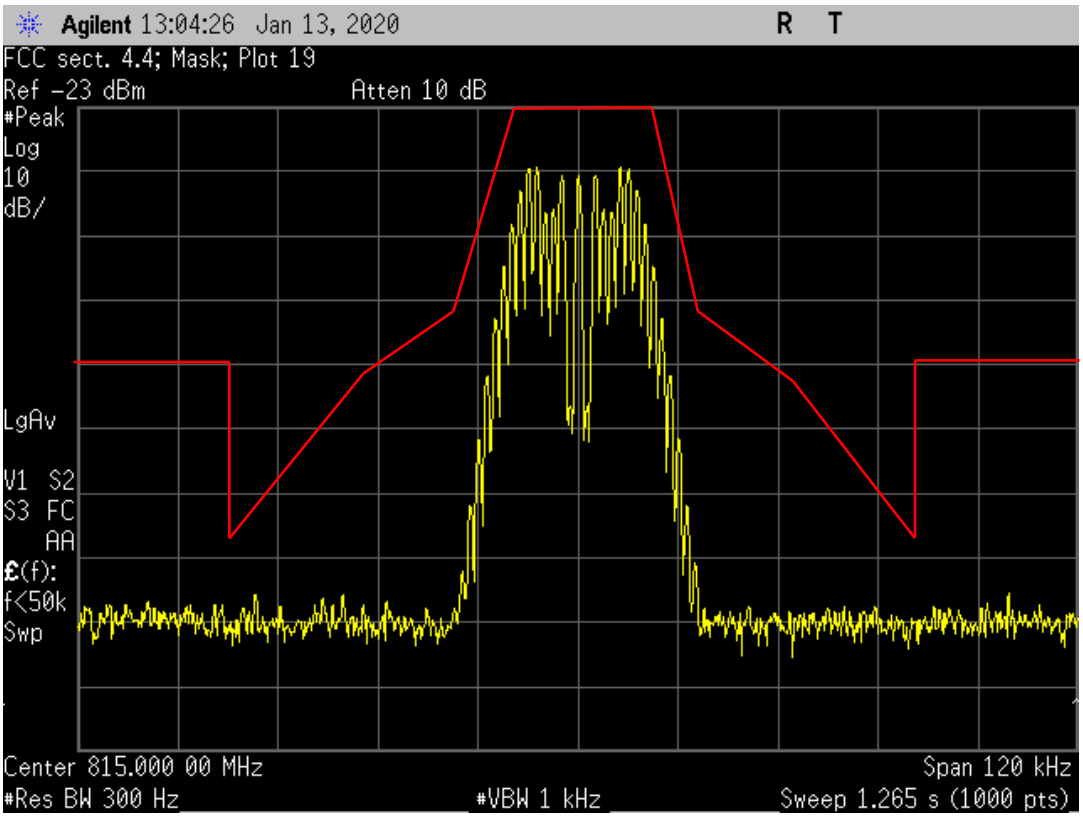
Level Above AGC; G Mask; Amp Out



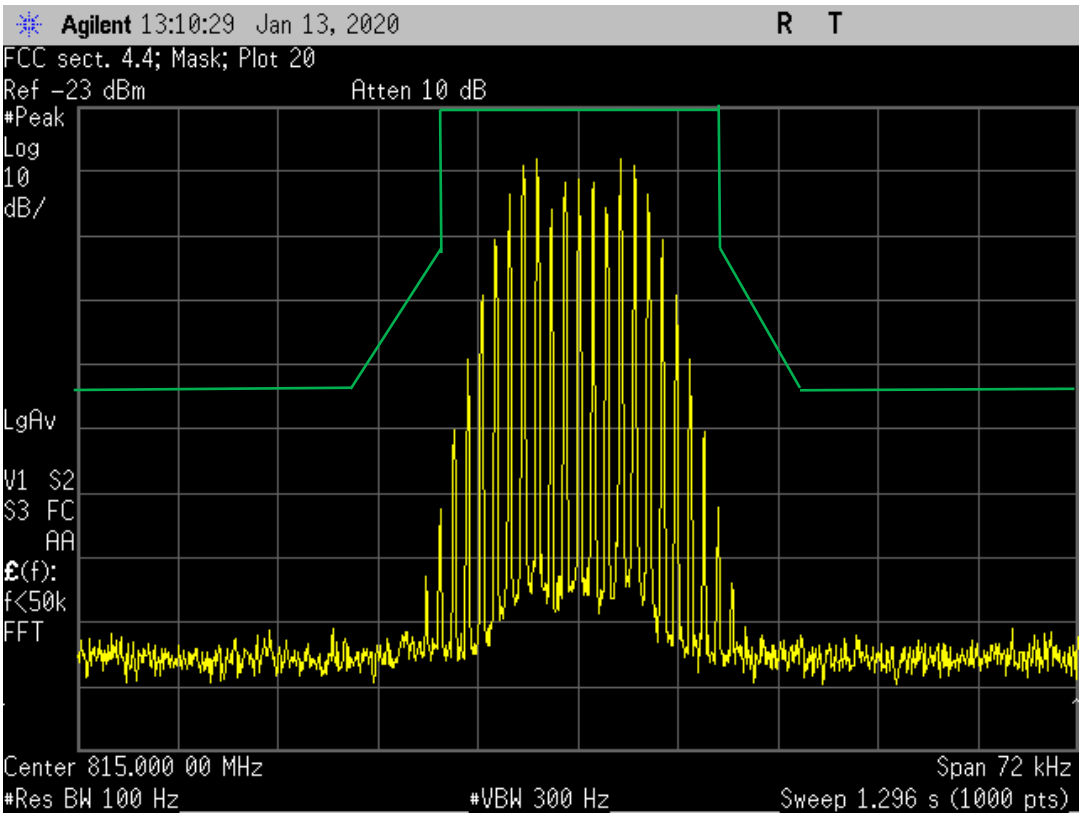
G Mask; Generator Out



H Mask; Generator Out



G Mask; Generator Out



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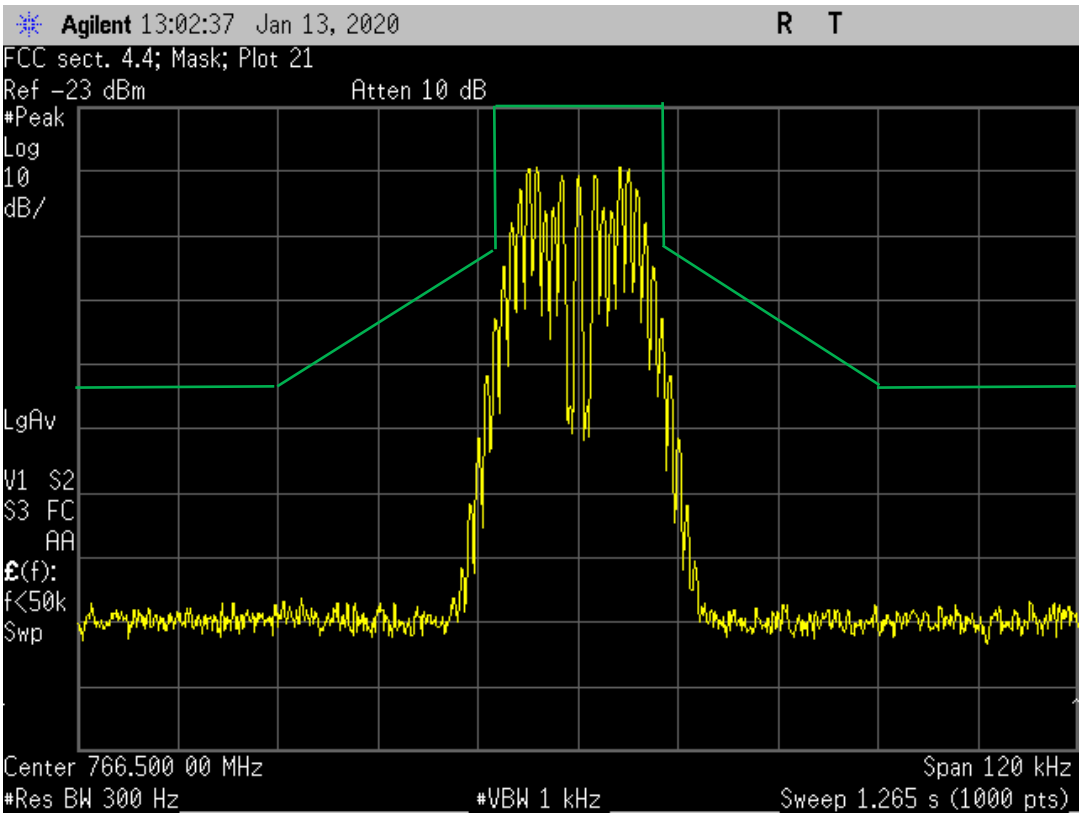

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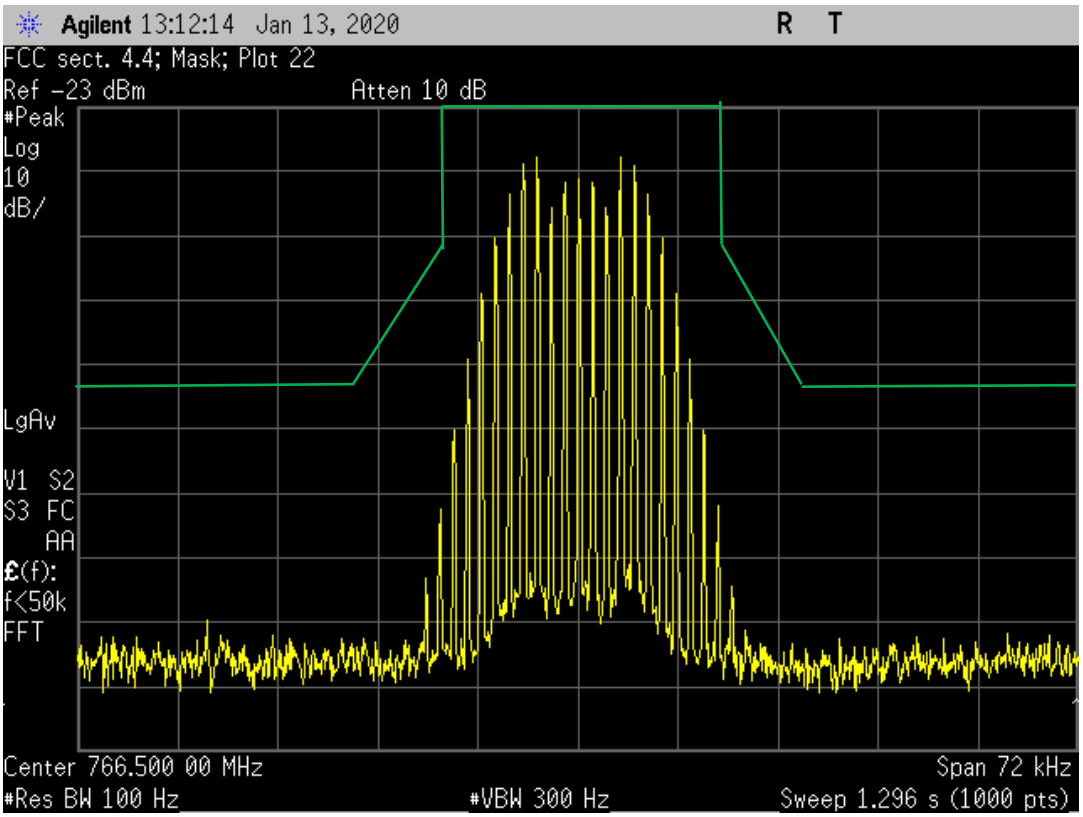
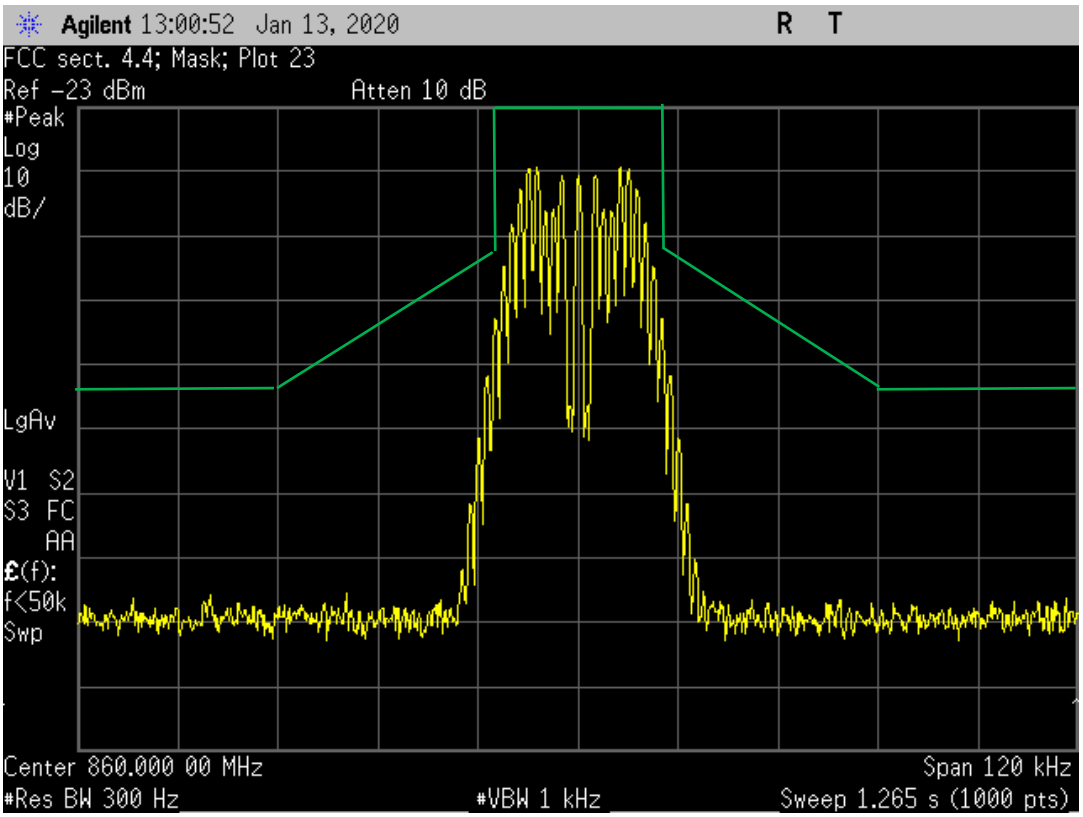


H Mask; Generator Out



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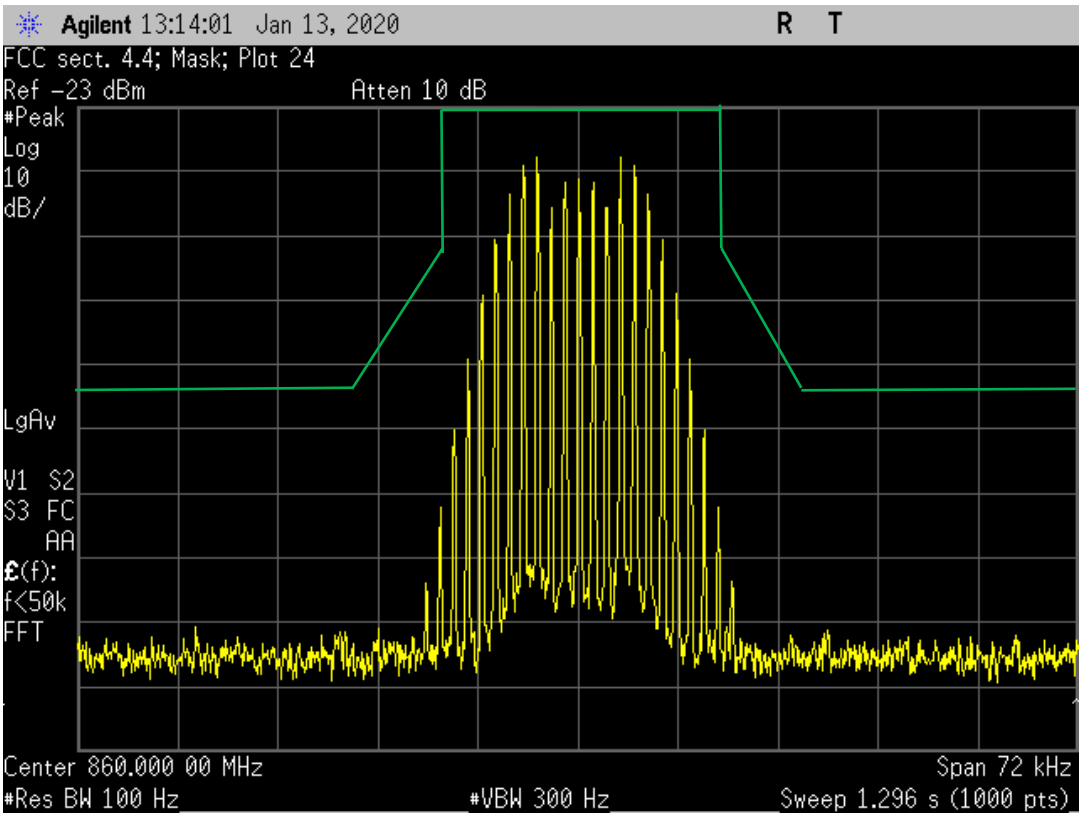


H Mask; Generator Out

14.0 INPUT/OUTPUT POWER AND AMPLIFIER GAIN

14.1 Applicable Standard

The EUT shall comply with FCC KDB 935210 section 4.5.

In accordance with section 4.5 of KDB 935210 D05, the mean input and output power and the amplifier gain was measured by adjusting the internal gain control of the EUT to the maximum gain for which equipment certification is sought. Any EUT attenuation settings were set to their minimum value.

Input power levels (uplink and downlink) were set to maximum input ratings while confirming that the device is not capable of operating in saturation (non-linear mode) at the rated input levels, including during the performance of the input/output power measurements.

14.2 Test procedures

a) A signal generator was connected to the input of the EUT.
b) The frequency of the signal generator was set to the frequency f0 as determined from 3.3 of KDB 935210.
c) A power meter was connected to the output of the EUT using an external attenuator.
d) The signal generator amplitude was configured to be zero to 0.5 dB below the AGC threshold level.
e) The output power of the EUT measured and recorded.
f) The EUT was removed from the measurement setup. Using the same signal generator settings, the power measurement was repeated at the signal generator port, which was used as the input signal to the EUT and recorded as the input power.
h) Steps e) and f) were repeated with input signal amplitude set to 3 dB above the AGC threshold level.
j) Steps d) to f) were repeated for all frequency bands authorized for use by the EUT.

The mean gain was reported for each authorized operating frequency band and each test signal stimulus.

After the mean input and output power levels have been measured as described in the preceding subclauses, the mean gain of the EUT can be determined from:
Gain (dB) = output power (dBm) − input power (dBm).

14.3 Gain Test Results

Model	PS51080E & PS71090E	Specification	FCC KDB 935210 Sec. 4.5
Serial Number	19RF11060004	Test Date	January 16, 2020
Test Personnel	Richard L. Tichgelaar	Test Location	Chamber B
Test Equipment	EMI Receiver (REC-11)		

Notes: A CW signal was used. The lower and

0.5-Watt version

Mode	Freq. MHz	Sig Gen dBm	Total Atten. dB	Peak power dBm	Output Atten dB	Cable Loss dB	Output Power dBm	Output power Watts	Gain dB
UP (1)	796.5	-33.0	40.3	6.5	19.8	0.2	26.5	0.447	79.8
UP (2)	796.5	-29.5	40.3	6.5	19.8	0.2	26.5	0.447	76.3
UP (1)	815.0	-32.4	40.3	6.4	19.8	0.2	26.4	0.437	79.1
UP (2)	815.0	-28.9	40.3	6.4	19.8	0.2	26.4	0.437	75.6
Down (1)	766.5	-32.3	40.3	6.4	19.8	0.2	26.4	0.437	79.0
Down (2)	766.5	-28.8	40.3	6.4	19.8	0.2	26.4	0.437	75.5

Mode	Freq. MHz	Sig Gen dBm	Total Atten. dB	Peak power dBm	Output Atten dB	Cable Loss dB	Output Power dBm	Output power Watts	Gain dB
Down (1)	860.0	-33.3	40.3	6.4	19.8	0.2	26.4	0.437	80.0
Down (2)	860.0	-29.8	40.3	6.3	19.8	0.2	26.3	0.427	76.4

2-Watt version

Mode	Freq. MHz	Sig Gen dBm	Total Atten. dB	Peak power dBm	Output Atten dB	Cable Loss dB	Output Power dBm	Output power Watts	Gain dB
UP (1)	796.5	-36.2	40.3	12.5	19.8	0.2	32.5	1.778	89.0
UP (2)	796.5	-32.7	40.3	12.2	19.8	0.2	32.2	1.660	85.2
UP (1)	815.0	-36.3	40.3	12.4	19.8	0.2	32.4	1.738	89.0
UP (2)	815.0	-32.8	40.3	12.0	19.8	0.2	32.0	1.585	85.1
Down (1)	766.5	-37.0	40.3	12.4	19.8	0.2	32.4	1.738	89.7
Down (2)	766.5	-33.5	40.3	12.1	19.8	0.2	32.1	1.622	85.9
Down (1)	860.0	-37.1	40.3	12.5	19.8	0.2	32.5	1.778	89.9
Down (2)	860.0	-33.6	40.3	12.0	19.8	0.2	32.0	1.585	85.9

(1) Level is 0.5 dB below AGC threshold; (2) Level is 3 dB above AGC threshold

Judgement: Pass; The passband gain did not exceed the nominal gain.

14.4 ERP calculations

Model	PS71090E	Specifications	FCC Part 90.219(d)(6)
Serial Number	19RF11060004	Test Date	01/07/2020
Test Personnel	Richard L. Tichgelaar	Test Location	Chamber B
Test Equipment	EMI Receiver (REC-11)		

Transmitter	Freq. MHz	Max Power dBm	Max Ant Gain dBi	Duty Cycle %	EIRP W	AGC Mode
Uplink	788	33.0	3.8	100.0	4.7863	-.5dB Below
Uplink	788	32.2	3.8	100.0	3.9811	+3dB above
DownLink	758	33.0	3.0	100.0	3.9811	-.5dB Below
DownLink	758	32.1	3.0	100.0	3.2359	+3dB above
Uplink	806	33.0	3.8	100.0	4.7863	-.5dB Below
Uplink	806	32.0	3.8	100.0	3.8019	+3dB above
DownLink	851	33.0	3.0	100.0	3.9811	-.5dB Below
DownLink	851	32.0	3.0	100.0	3.1623	+3dB above

15.0 NOISE FIGURE MEASUREMENTS

15.1 Applicable Standard

The EUT shall comply with sections 4.6 of KDB 935210 D05.

§ 90.219(e)(2) limits the noise figure of a signal Bi-Directional amplifier to ≤ 9 dB in either direction.

15.2 Test procedures for section 4.6

a) A spectrum analyzer was connected to the downlink output of the amplifier.
b) The uplink was unterminated.
c) The spectrum analyzer was set to 200 trace average in the RMS average mode.
d) A peak reading was recorded
e) The noise figure was calculated using the following formula

$NF = P_{NOUT} - (-174dBm/Hz + 10*LOG_{10}(RBW) + Gain)$

Notes

P_{NOUT} = Output noise of the amplifier in dBm
174 = Thermal noise for 1 Hz RBW at room temperature
The Thermal noise for 1 MHz RBW = $-174 + 10*LOG_{10}(1E6)$
RBW = Resolution Bandwidth of Spectrum analyzer in Hz
Gain = Gain of amplifier in dB

f) Steps a) to e) were repeated with the analyzer connected to the uplink output of the amplifier

15.3 Results for Section 4.6

Model	PS71090E	Specification	FCC KDB 935210 Sec. 4.6
Serial Number	19RF11060004	Test Date	1/13/2020
Test Personnel	Richard L. Tichgelaar, Joseph Strzelecki	Test Location	Chamber B
Test Equipment	EMI Receiver (RNT-17); RBW= 1 MHz; VBW= 3 MHz; 8000 points		

0.5-Watt version

	Start	Stop	Center	Reading	Gain	Thermal Noise	Cable Loss	Noise Figure	NF Limit
Mode	MHz	MHz	MHz	dBm	dB	dB	dB	dB	dB
UP	785	808	796.5	-31.5	79.8	-114.0	0.4	3.1	9.0
UP	806	824	815	-33.0	79.1	-114.0	0.4	2.3	9.0
Down	755	778	766.5	-27.2	79.0	-114.0	0.4	8.2	9.0
Down	848	872	860	-25.7	80.0	-114.0	0.4	8.7	9.0

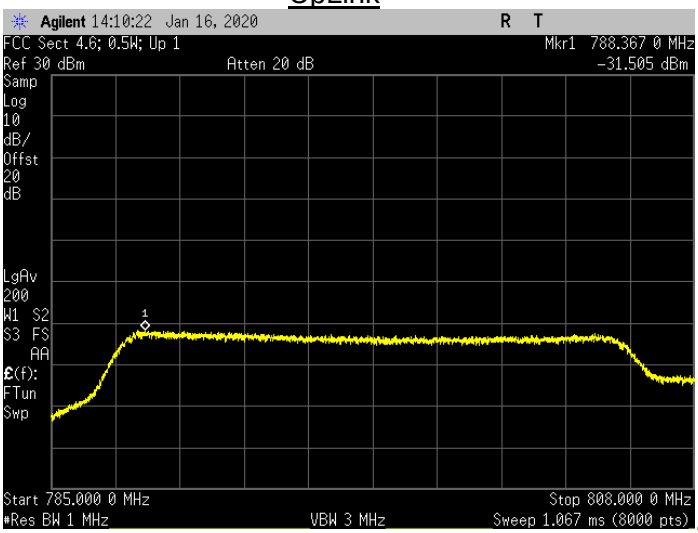
2-Watt version

	Start	Stop	Center	Reading	Gain	Thermal Noise	Cable Loss	Noise Figure	NF Limit
Mode	MHz	MHz	MHz	dBm	dB	dB	dB	dB	dB
UP	785	808	796.5	-22.7	89.0	-114.0	0.4	2.7	9.0
UP	806	824	815	-24.1	89.0	-114.0	0.4	1.3	9.0
Down	755	778	766.5	-21.1	89.7	-114.0	0.4	3.6	9.0
Down	848	872	860	-18.6	89.9	-114.0	0.4	5.9	9.0

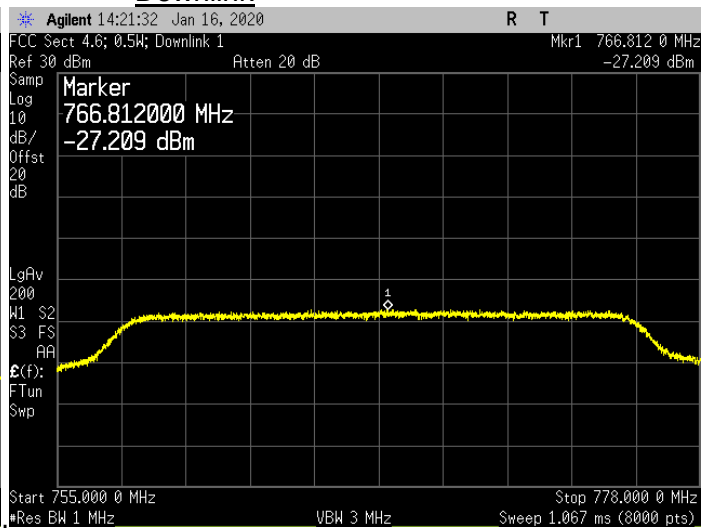
Judgement: Pass

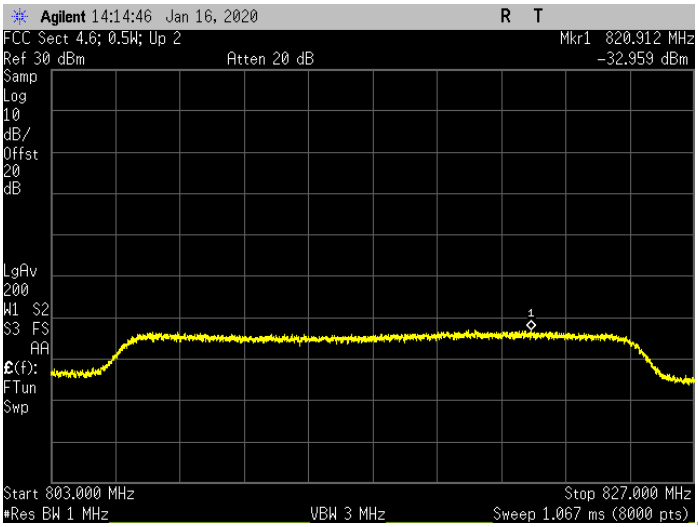
Low Power Mode: 0.5W

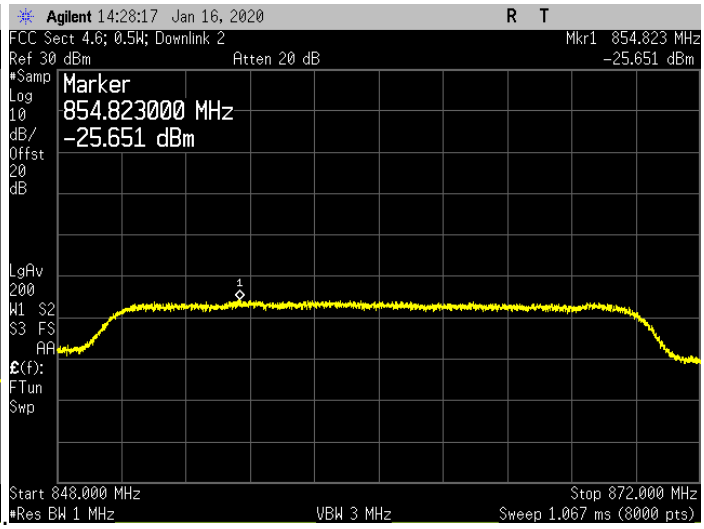
UpLink



Downlink

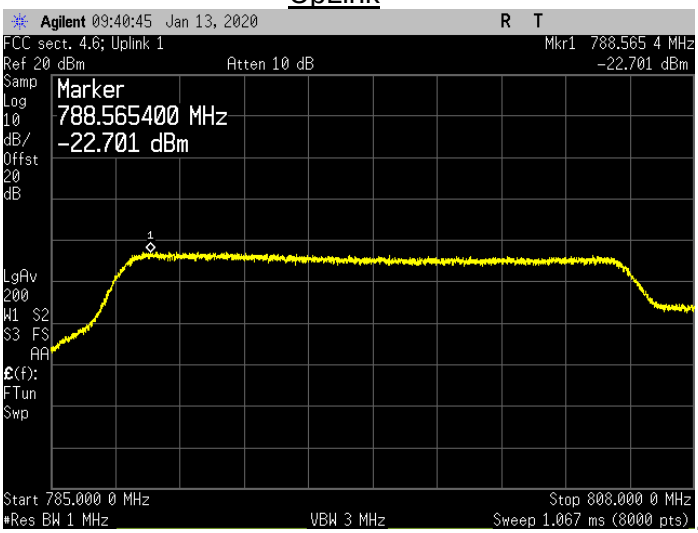






High Power Mode- 2.0W

UpLink



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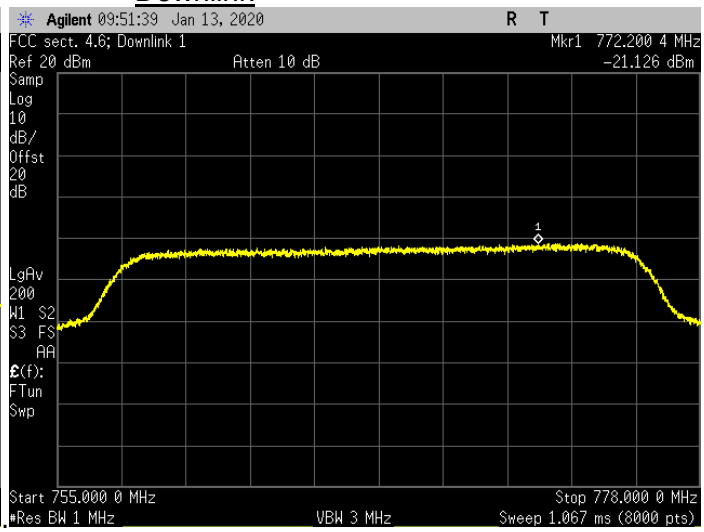
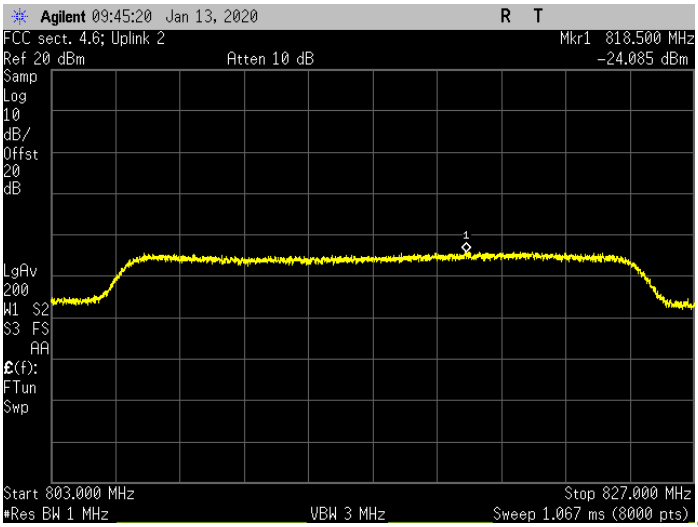
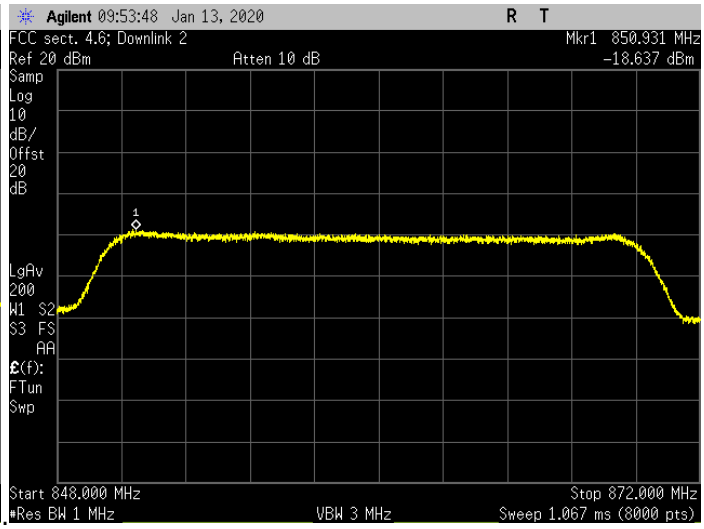






16.0 OUT-OF-BAND/OUT-OF-BLOCK EMISSIONS

16.1 Applicable Standard

The EUT shall comply with sections 4.7.2 of KDB 935210 D05.

For a multi-channel enhancer, any intermodulation product level must be attenuated, relative to P, by at least: $43+10xLog_{10}P$, or 70 dB, whichever is less stringent, where P is the total RF output power of the test tones in watts. Since $43 +10xLog_{10}P$ is less stringent than 70 dB, that limit was used.

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle, and high channels or frequencies within each authorized frequency band of operation.

Out-of-band/out-of-block emissions (including intermodulation products) was measured under each of the following two stimulus conditions:
a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges,
b) a single test signal sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

16.2 Test procedures for section 4.7.2

a) A signal generator was connected to the input of the EUT.
Note; If the signal generator is not capable of producing two independent modulated carriers simultaneously, then two discrete signal generators can be connected, with an appropriate combining network to support the two-signal test.
b) The two signal generators were configured to produce CW on frequencies spaced consistent with 4.7.1, with amplitude levels set to just below the AGC threshold (see 4.2).
c) A spectrum analyzer was connected to the EUT output.
d) The span was set to 100 kHz.
e) RBW was set = 300 Hz with VBW ≥ 3 × RBW.
f) The detector was set to power averaging (rms).
g) A marker was placed on the highest intermodulation product amplitude.
h) The plot was captured for inclusion in the test report.
i) Steps c) to h) were repeated with the composite input power level set to 3 dB above the AGC threshold.
j) Steps b) to i) were repeated for all operational bands.

Any frequency outside the authorized bandwidth was attenuated by at least 43 + 10 log (P) dB. This corresponds to an absolute level of -13 dBm.

16.3 Results for Section 4.7.2

Model	PS71090E	Specification	FCC KDB 935210 Sec. 4.7.2
Serial Number	19RF11060004	Test Date	01/13/2020 & 4/6/2020
Test Personnel	Joseph Strzelecki	Test Location	Chamber B
Test Equipment	EMI Receiver (RNT-17) (1/13/2020) and REC-31 (4/6/2020)		

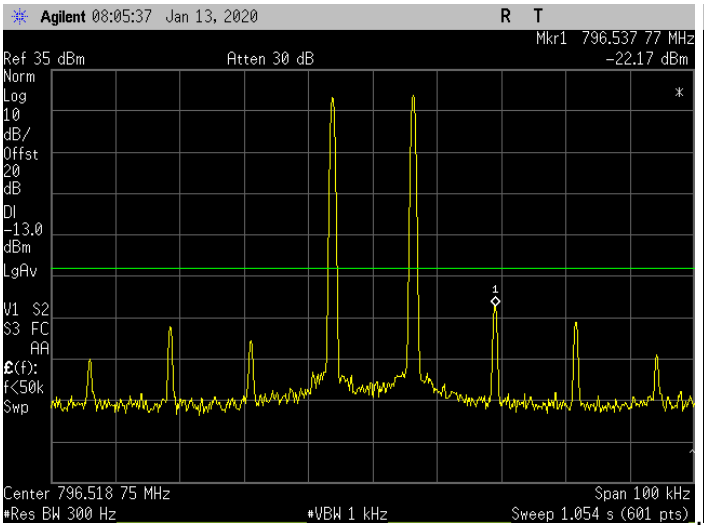
The spectrum analyzer was set to max hold mode. Both signal generators were set to CW

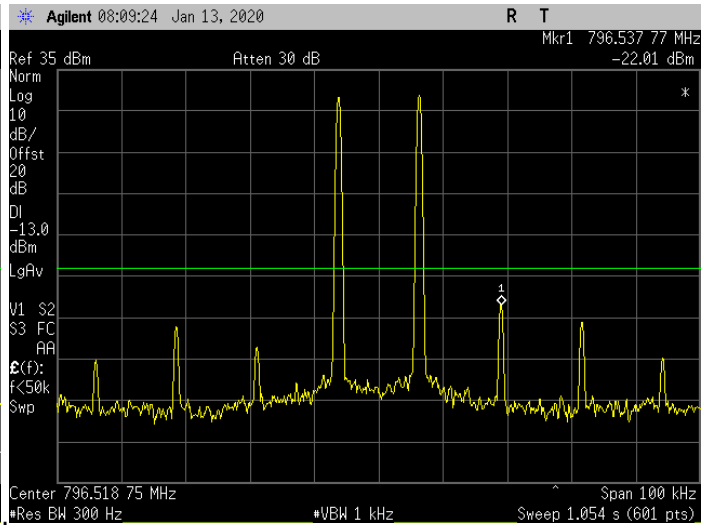
Plot #	RBW Hz	VBW Hz	Signal Generator Channel kHz	#1 MHz	#2 MHz	input to Combine dBm	AGC	Analyzer Center MHz	Freq MHz	Max Reading dBm
1	300	1000	12.5	796.5125	796.525	-35	off	796.51875	796.5380	-22.2
2	300	1000	12.5	796.5125	796.525	-31	on	796.51875	796.5380	-22
3	300	1000	12.5	815.0000	815.0125	-35	off	815.00625	815.0251	-23.4
4	300	1000	12.5	815.0000	815.0125	-31	on	815.00625	815.0251	-23.5
5	300	1000	25	796.525	796.55	-35	off	796.53750	796.5752	-24.2
6	300	1000	25	796.525	796.55	-31	on	796.53750	796.5752	-24.2
7	300	1000	25	815.0000	815.025	-35	off	815.01250	815.0502	-24.3
8	300	1000	25	815.0000	815.025	-31	on	815.01250	815.0502	-24.4
9	300	1000	12.5	766.5125	766.525	-35	off	766.51875	766.5377	-21.6
10	300	1000	12.5	766.5125	766.525	-31	on	766.51875	766.5377	-23.6
11	300	1000	12.5	860.000	860.0125	-35	off	860.00625	860.0252	-25.6
12	300	1000	12.5	860.000	860.0125	-31	on	860.00625	860.0252	-25.5
13	300	1000	25	766.525	766.55	-35	off	766.53750	766.5752	-24.8
14	300	1000	25	766.525	766.55	-31	on	766.53750	766.5752	-22.3
15	300	1000	25	860.0000	860.025	-35	off	860.01250	860.0502	-24.7
16	300	1000	25	860.0000	860.025	-31	on	860.01250	860.0502	-24.8
17	300	1000	6.25	793.00625	793.0125	-35	off	793.00938	793.0146	-19.96
18	300	1000	6.25	793.00625	793.0125	-31	on	793.00938	793.0191	-19.77
19	300	1000	6.25	802.00625	802.0125	-35	off	802.00938	802.1910	-16.69
20	300	1000	6.25	802.00625	802.0125	-31	on	802.00938	802.1910	-18.55
21	300	1000	6.25	815.0000	815.00625	-35	off	815.00313	814.9938	-17.65
22	300	1000	6.25	815.0000	815.00625	-31	on	815.00313	815.0127	-17.54
23	300	1000	6.25	763.00625	763.0125	-35	off	763.00938	763.0000	-21.4
24	300	1000	6.25	763.00625	763.0125	-31	on	763.00938	762.9935	-22.94
25	300	1000	6.25	772.00625	772.0125	-35	off	772.00938	772.0192	-20.1
26	300	1000	6.25	772.00625	772.0125	-31	on	772.00938	772.0192	-20.55
27	300	1000	6.25	860.0000	860.00625	-35	off	860.00313	860.0127	-20.46
28	300	1000	6.25	860.0000	860.00625	-31	on	860.00313	860.0128	-19.37

The table shows the highest spurious noise from the amplifier. The limit is -13 dBm.

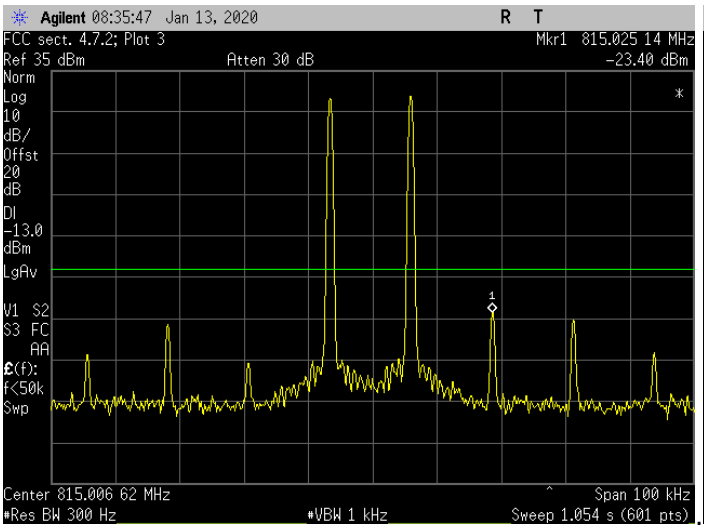
Judgement: Pass

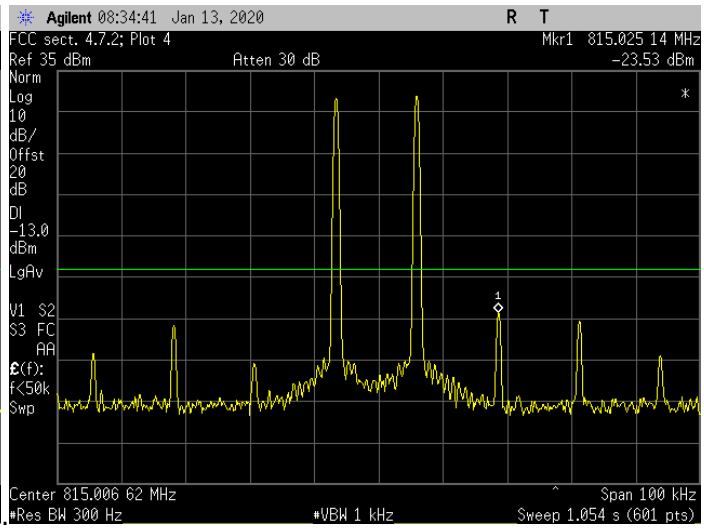
16.3.1 Combined Output Results; Out-of-band/out-of-block emissions



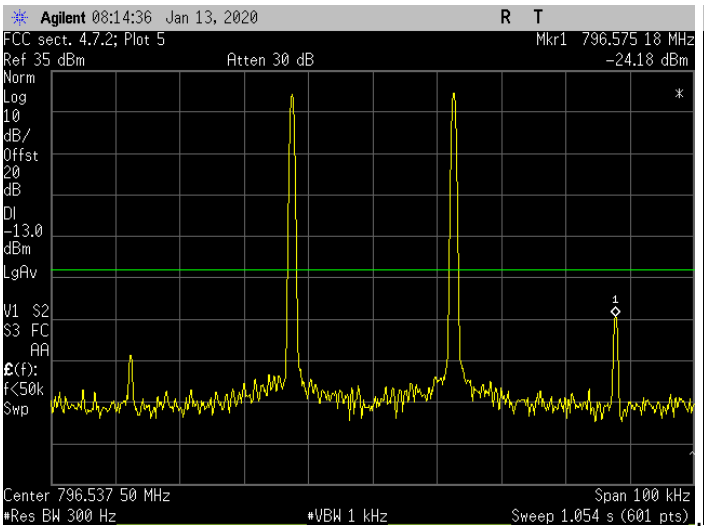


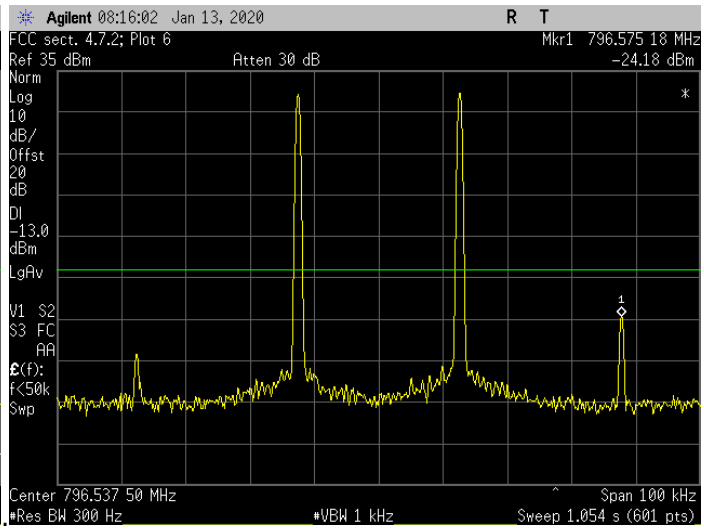
12.5 kHz



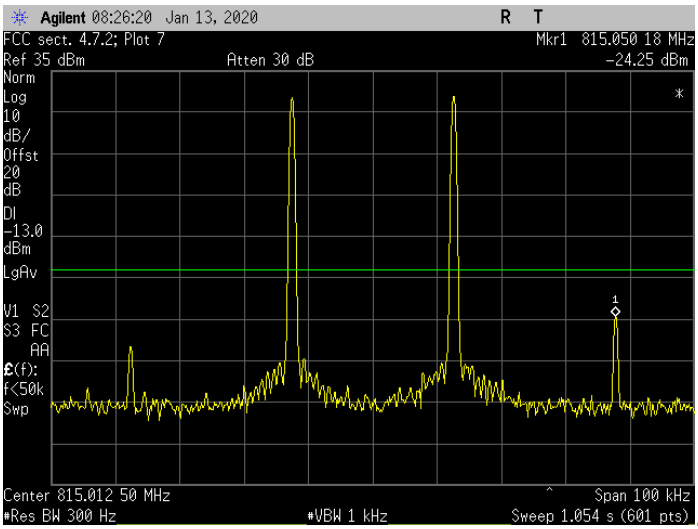


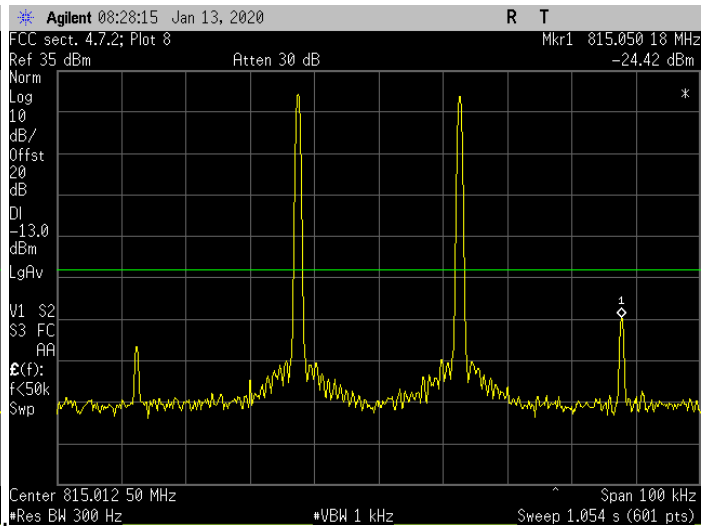
12.5 kHz



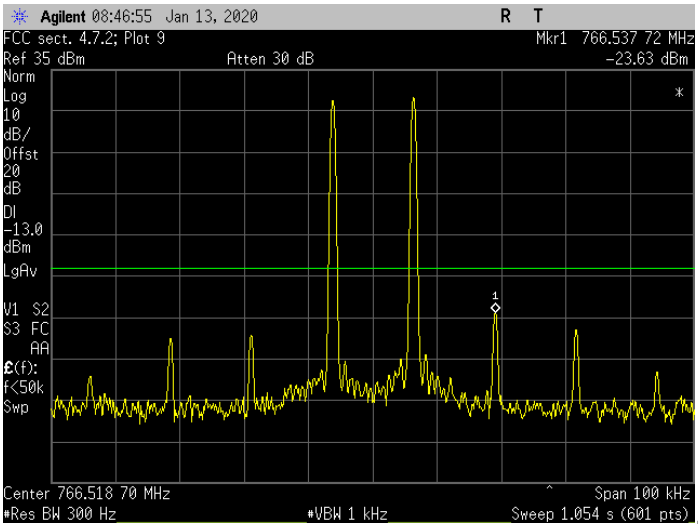


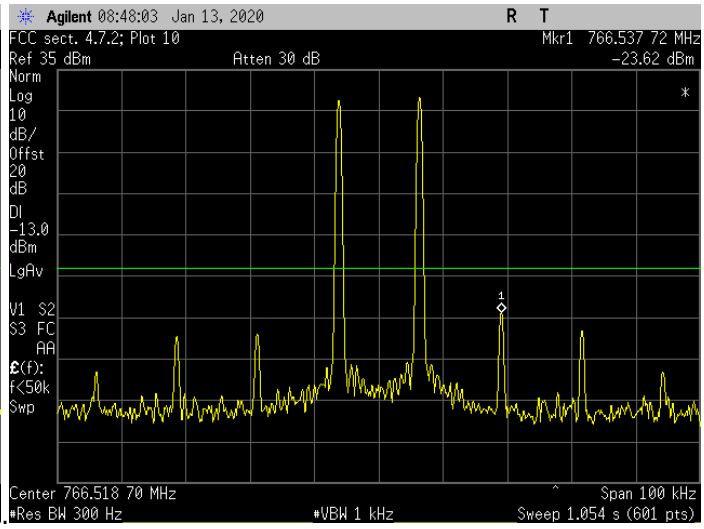
25 kHz


Agilent 08:26:20 Jan 13, 2020
R T
FCC sect. 4.7.2; Plot 7
Mkr1 815.050 18 MHz
Ref 35 dBm
Atten 30 dB
-24.25 dBm
Norm
Log
10
dB/
Offst
20
dB
Dl
-13.0
dBm
LgAv
V1 S2
S3 FC
AA
£(f):
f<50k
Swp
Center 815.012 50 MHz
Span 100 kHz
#Res BW 300 Hz
#VBW 1 kHz
Sweep 1.054 s (601 pts)


Agilent 08:28:15 Jan 13, 2020
R T
FCC sect. 4.7.2; Plot 8
Mkr1 815.050 18 MHz
Ref 35 dBm
Atten 30 dB
-24.42 dBm
Norm
Log
10
dB/
Offst
20
dB
Dl
-13.0
dBm
LgAv
V1 S2
S3 FC
AA
£(f):
f<50k
Swp
Center 815.012 50 MHz
Span 100 kHz
#Res BW 300 Hz
#VBW 1 kHz
Sweep 1.054 s (601 pts)

25 kHz


Agilent 08:46:55 Jan 13, 2020
R T
FCC sect. 4.7.2; Plot 9
Mkr1 766.537 72 MHz
Ref 35 dBm
Atten 30 dB
-23.63 dBm
Norm
Log
10
dB/
Offst
20
dB
Dl
-13.0
dBm
LgAv
V1 S2
S3 FC
AA
£(f):
f<50k
Swp
Center 766.518 70 MHz
Span 100 kHz
#Res BW 300 Hz
#VBW 1 kHz
Sweep 1.054 s (601 pts)


Agilent 08:48:03 Jan 13, 2020
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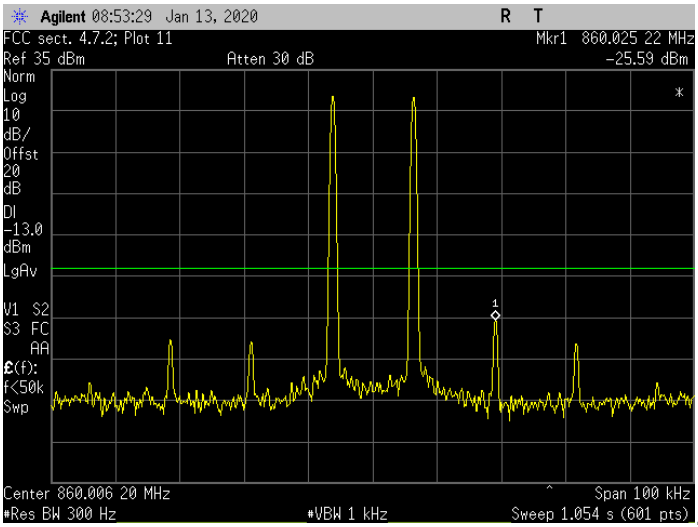
FCC sect. 4.7.2; Plot 10
Mkr1 766.537 72 MHz
Ref 35 dBm
Atten 30 dB
-23.62 dBm
Norm
Log
10
dB/
Offst
20
dB
Dl
-13.0
dBm
LgAv
V1 S2
S3 FC
AA
£(f):
f<50k
Swp
Center 766.518 70 MHz
Span 100 kHz
#Res BW 300 Hz
#VBW 1 kHz
Sweep 1.054 s (601 pts)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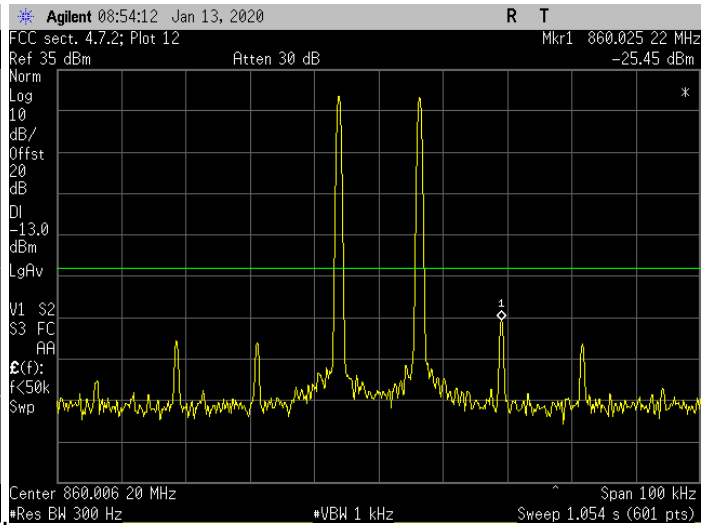
Mkr1 860.025 22 MHz
Ref 35 dBm
Atten 30 dB
-25.59 dBm
Norm
Log
10
dB/
Offst
20
dB
Dl
-13.0
dBm
LgAv
V1 S2
S3 FC
AA
£(f):
f<50k
Swp
Center 860.006 20 MHz
Span 100 kHz
#Res BW 300 Hz
#VBW 1 kHz
Sweep 1.054 s (601 pts)


Agilent 08:54:12 Jan 13, 2020
R T
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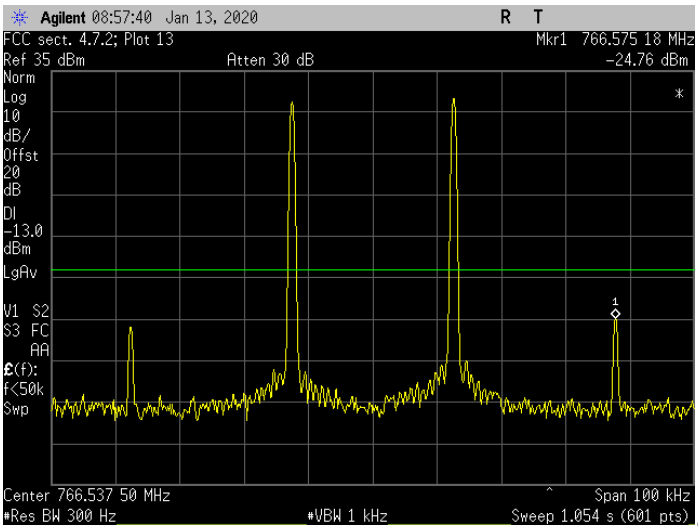
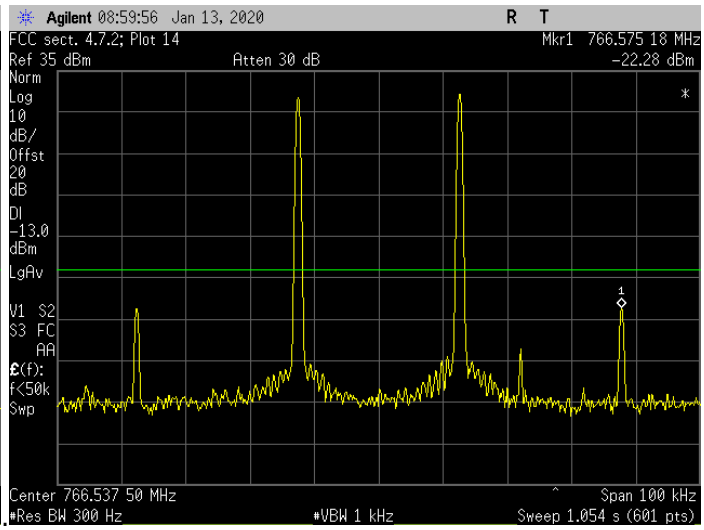
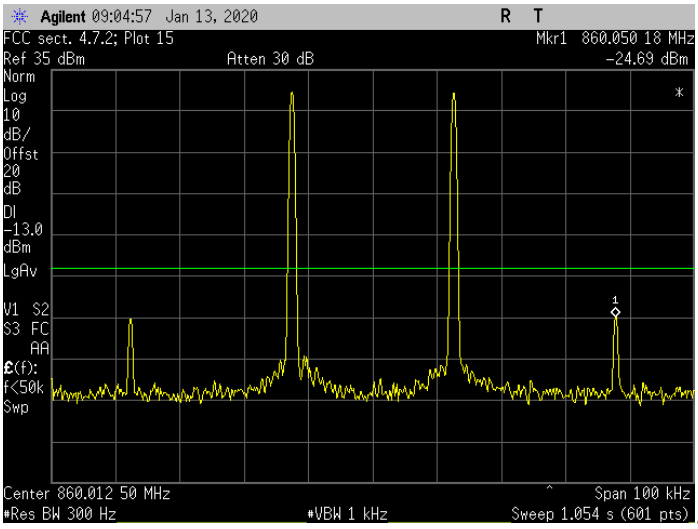
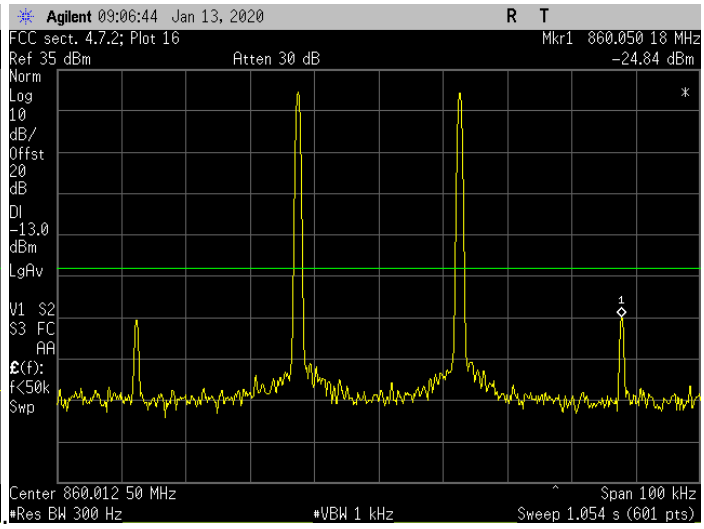
Mkr1 860.025 22 MHz
Ref 35 dBm
Atten 30 dB
-25.45 dBm
Norm
Log
10
dB/
Offst
20
dB
Dl
-13.0
dBm
LgAv
V1 S2
S3 FC
AA
£(f):
f<50k
Swp
Center 860.006 20 MHz
Span 100 kHz
#Res BW 300 Hz
#VBW 1 kHz
Sweep 1.054 s (601 pts)



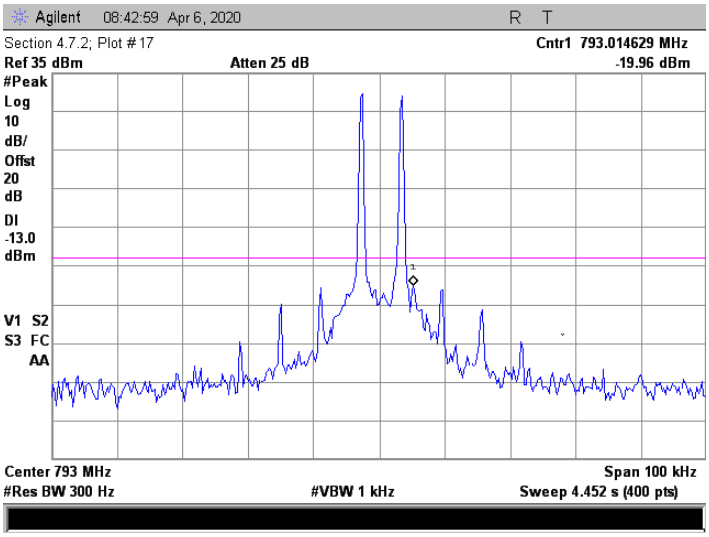


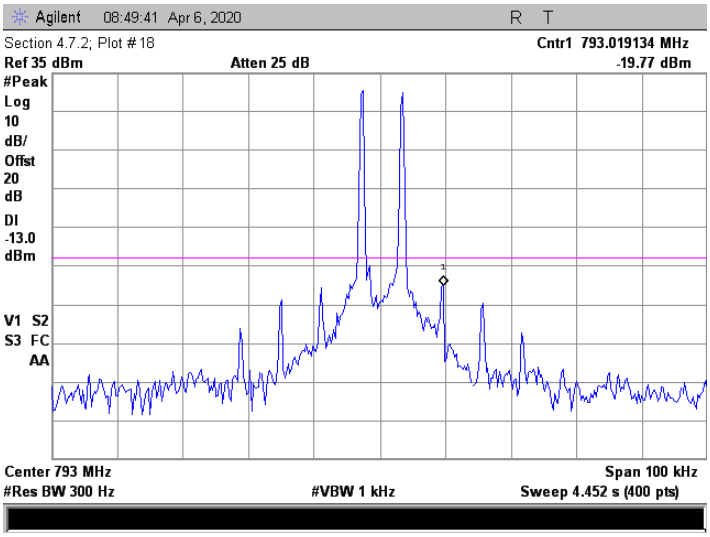
25 kHz



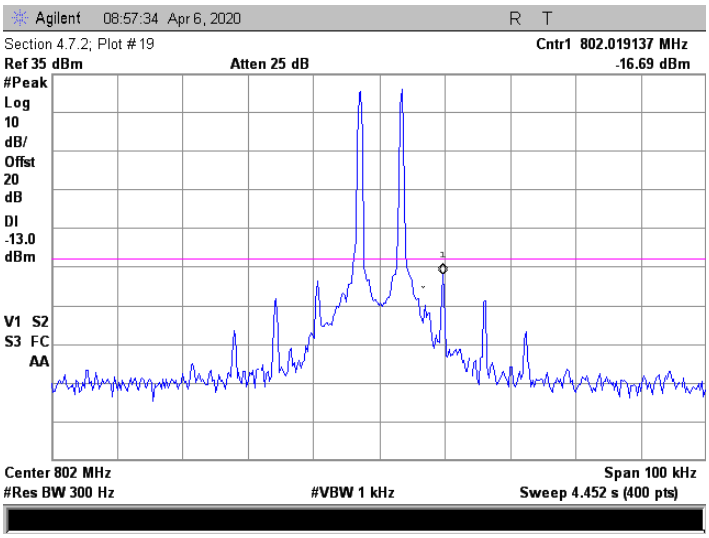


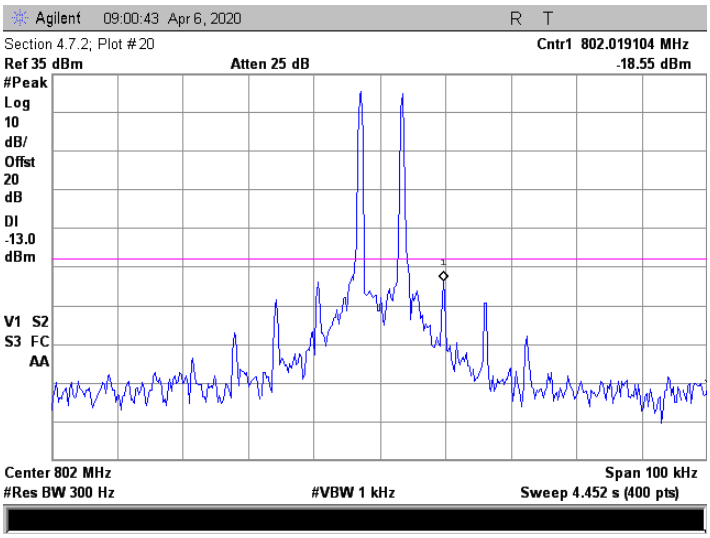
25 kHz



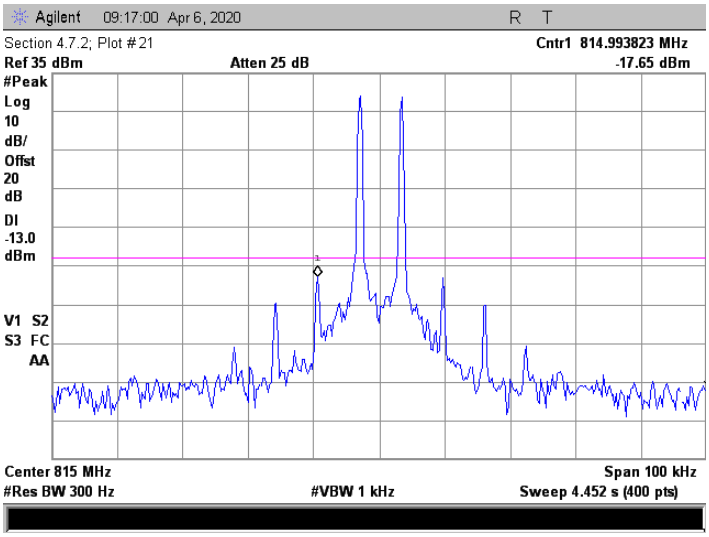


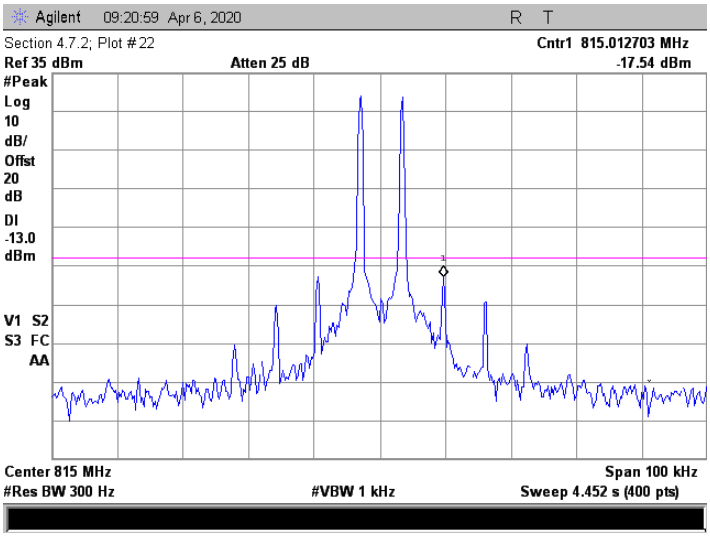
6.25 kHz



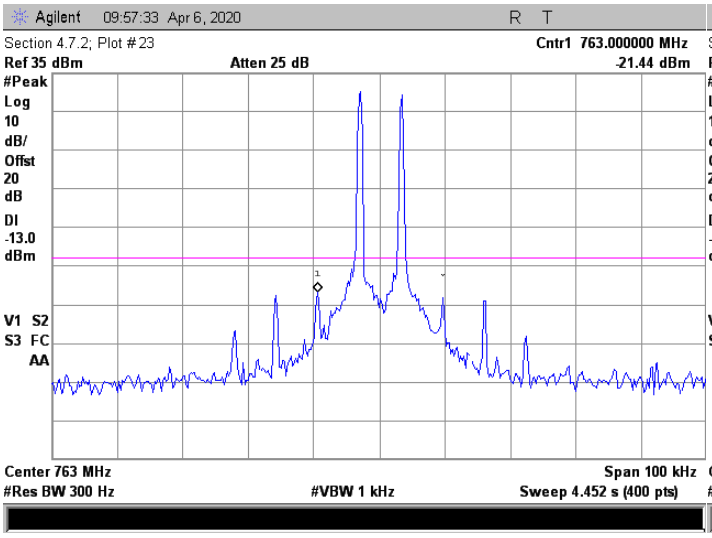


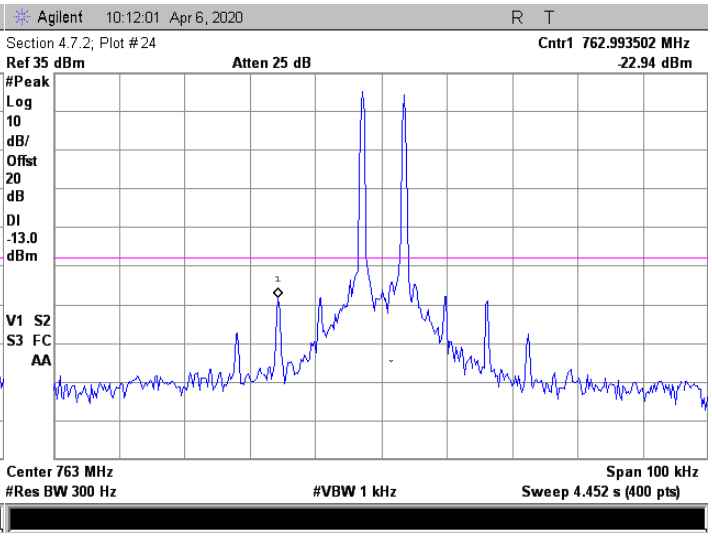
6.25 kHz



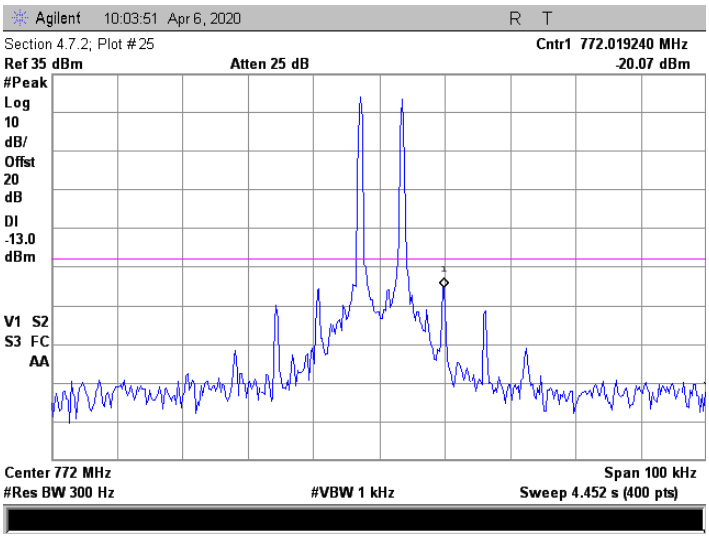


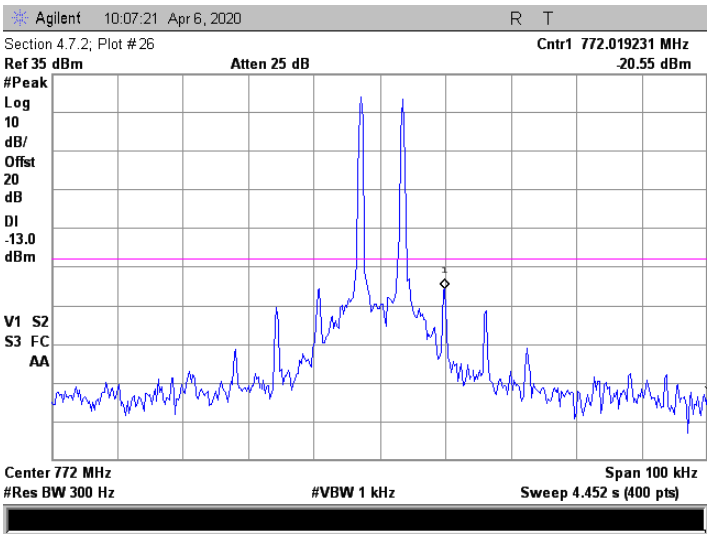
6.25 kHz



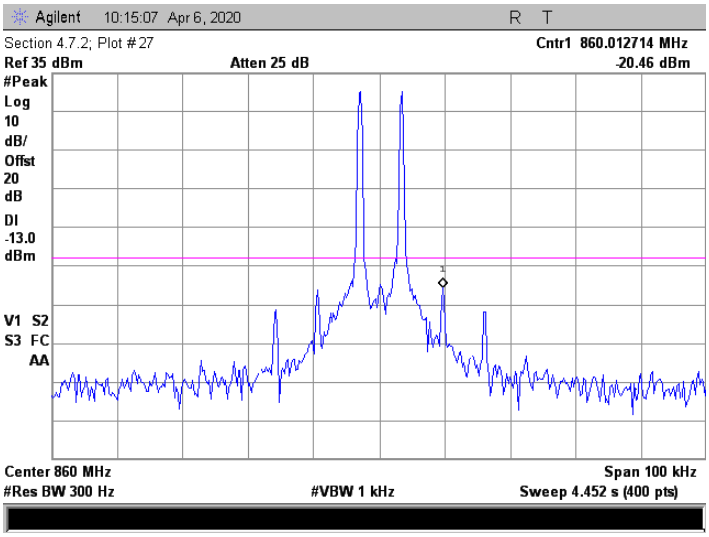


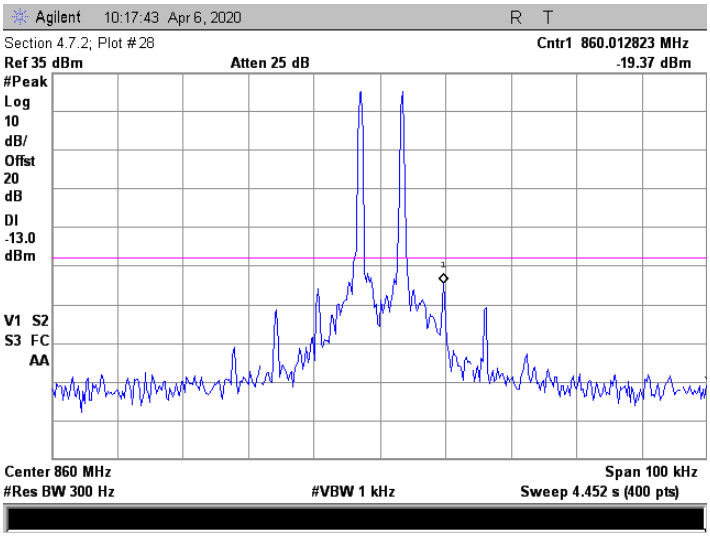
6.25 kHz





6.25 kHz





6.25 kHz

17.0 SPURIOUS EMISSIONS CONDUCTED MEASUREMENTS

17.1 Applicable Standard

The EUT shall comply with sections 4.7.3 of KDB 935210 D05, since it is a Multi-Channel Enhancer.

For a multi-channel enhancer, any intermodulation product level must be attenuated, relative to P, by at least: $43+10xLog_{10}P$, or 70 dB, whichever is less stringent, where P is the total RF output power of the test tones in watts. Since $43 +10xLog_{10}P$ is less stringent than 70 dB, that limit was used.

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle, and high channels or frequencies within each authorized frequency band of operation.

Out-of-band/out-of-block emissions (including intermodulation products) was measured under each of the following two stimulus conditions:
a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges.
b) a single test signal sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

17.2 Test procedures for section 4.7.3

a) A signal generator was connected to the input of the EUT.
b) The signal generator was configured to produce a CW signal.
c) The frequency of the CW signal was set to the center channel of the EUT passband.
d) The output power level was set so that the resultant signal is just below the AGC threshold (see 4.2).
e) A spectrum analyzer was connected to the output of the EUT, using appropriate attenuation as necessary.
f) The RBW was set = 100 kHz. (i.e., for 30 MHz to 1 GHz PLMRS and/or PSRS Bi-Directional devices)
g) The VBW was set = 3 × RBW.
h) The Sweep time was set = auto-couple.
i) The detector was set to PEAK.
j) The spectrum analyzer start frequency was set to 30 MHz (or the lowest radio frequency signal generated in the EUT, without going below 9 kHz if the EUT has additional internal clock. frequencies), and the stop frequency to 10 times the highest allowable frequency of the EUT passband.
k) MAX HOLD was selected, and the marker peak function was used to find the highest emission(s) outside the passband. (This could be either at a frequency lesser or greater than the passband frequencies.)
l) A plot was captured for inclusion in the test report.
m) Steps c) to l) were repeated for each authorized frequency band/block of operation.

Any frequency outside the authorized bandwidth was attenuated by at least 43 + 10 log (P) dB. This corresponds to an absolute level of -13 dBm.

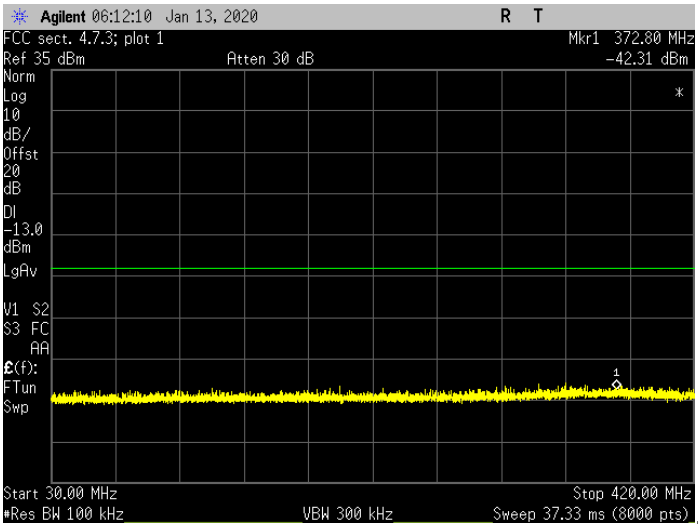
17.3 Results for Section 4.7.3

Model	PS71090E	Specification	FCC KDB 935210 Sec. 4.7.3 FCC part 90.543 (e)(3)
Serial Number	19RF11060004	Test Date	01/10/2020 & 01/13/2020
Test Personnel	Dave Jarvis	Test Location	Chamber B
Test Equipment	EMI Receiver (RNT-17)		

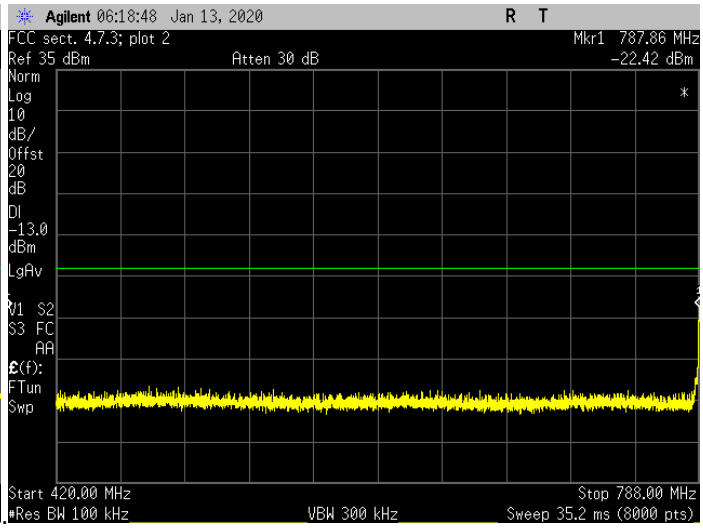
The spectrum analyzer was set to max hold mode.

Plot	RBW	VBW		Sig Gen			Spectrum Analyzer Start	Spectrum Analyzer Stop	Max reading Freq	Max reading
#	MHz	MHz	Mode	Modul	MHz	dBm	MHz	MHz	MHz	dBm
1	0.1	0.3	UP	CW	796.5	-25	30	420	372.8	-42.3
2	0.1	0.3	UP	CW	796.5	-25	420	788	787.86	-22.4
3	0.1	0.3	UP	CW	796.5	-25	805	1000	805.29	-24.3
4	1	3	UP	CW	796.5	-25	1000	5000	3055.3	-28.6
5	1	3	UP	CW	796.5	-25	5000	9000	6764.2	-28.4
6	0.1	0.3	UP	CW	815.0	-24	30	420	366.6	-41.2
7	0.1	0.3	UP	CW	815.0	-24	420	806	805.95	-25.9
8	0.1	0.3	UP	CW	815.0	-24	824	1000	824.81	-25.7
9	1	3	UP	CW	815.0	-24	1000	5000	3079.8	-27.8
10	1	3	UP	CW	815.0	-24	5000	9000	7473.8	-29.2
11	0.1	0.3	Down	CW	766.5	-24	30	420	363.1	-42
12	0.1	0.3	Down	CW	766.5	-24	420	758	758	-24
13	0.1	0.3	Down	CW	766.5	-24	775	1000	775	-19.9
14	1	3	Down	CW	766.5	-24	1000	5000	3274.3	-29.3
15	1	3	Down	CW	766.5	-24	5000	9000	7142.3	-29.2

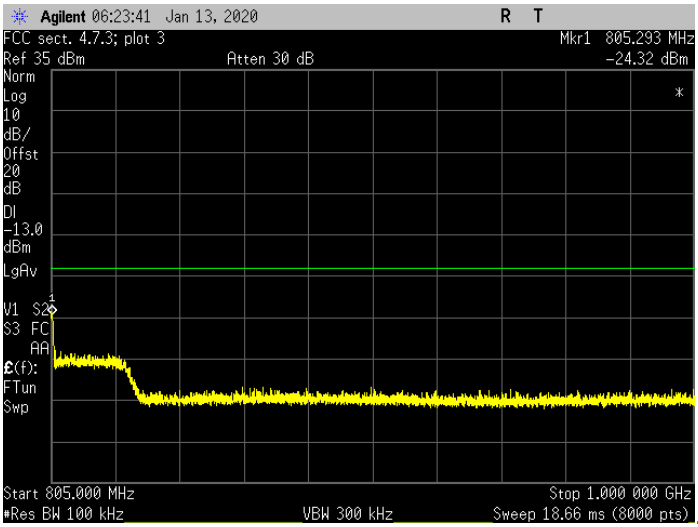
Plot #	RBW MHz	VBW MHz	Mode	Sig Gen			Spectrum Analyzer Start MHz	Spectrum Analyzer Stop MHz	Max reading Freq MHz	Max reading dBm
				Modul	MHz	dBm				
16	0.1	0.3	Down	CW	860.0	-25.5	30	420	351.4	-41.8
17	0.1	0.3	Down	CW	860.0	-25.5	420	600	525.9	-42.1
18	0.1	0.3	Down	CW	860.0	-25.5	600	851	850.9	-17.2
19	0.1	0.3	Down	CW	860.0	-25.5	869	1000	869.3	-17.9
20	1	3	Down	CW	860.0	-25.5	1000	5000	3230.8	-29.3
21	1	3	Down	CW	860.0	-25.5	5000	9000	7110.3	-29.7



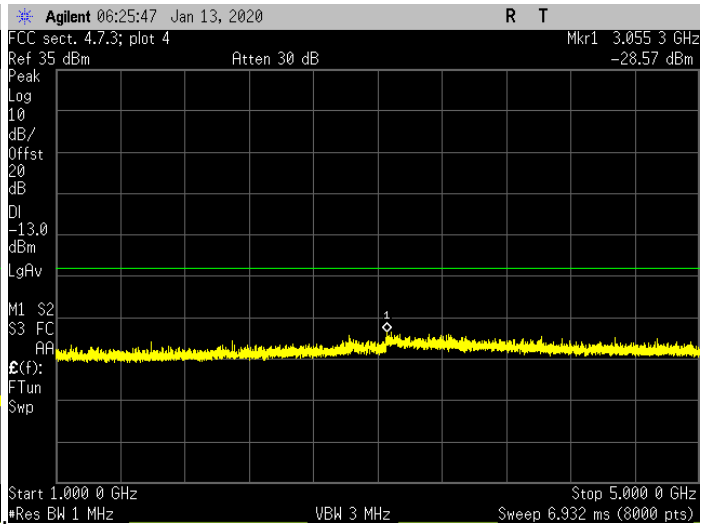
796.5 MHz Injected Signal



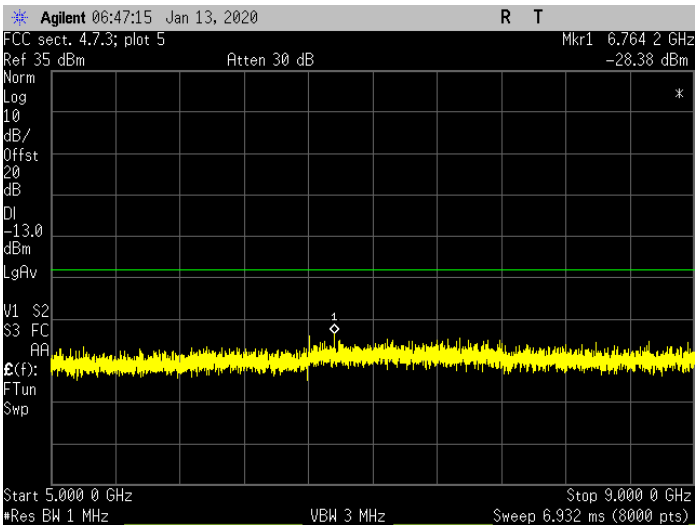
796.5 MHz Injected Signal



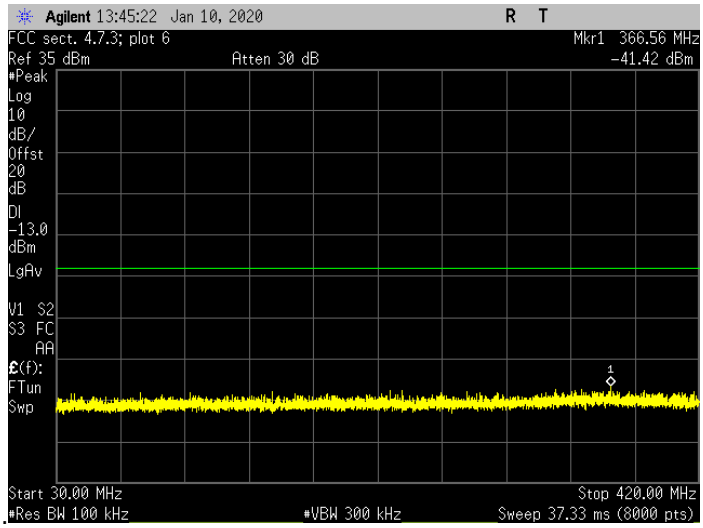
796.5 MHz Injected Signal



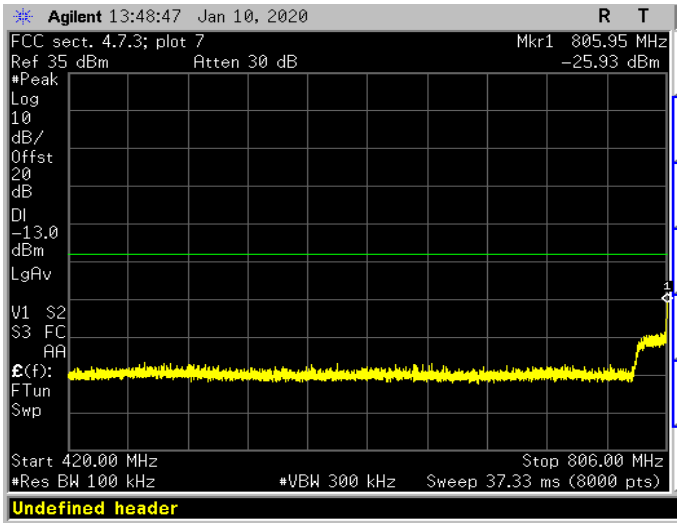
796.5 MHz Injected Signal



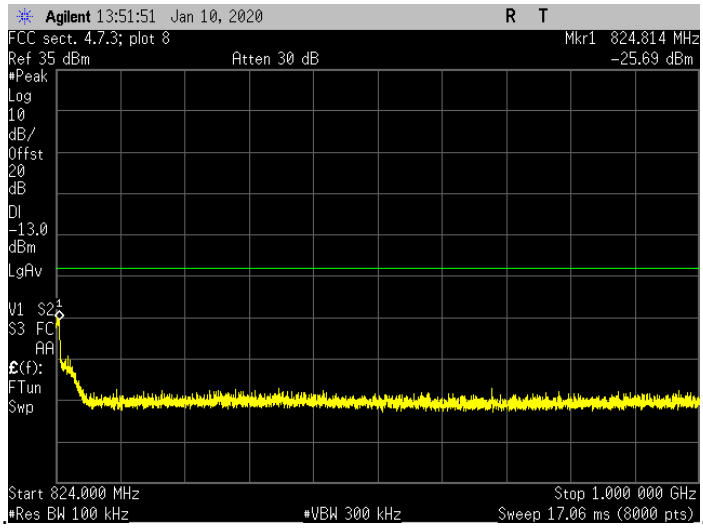
796.5 MHz Injected Signal



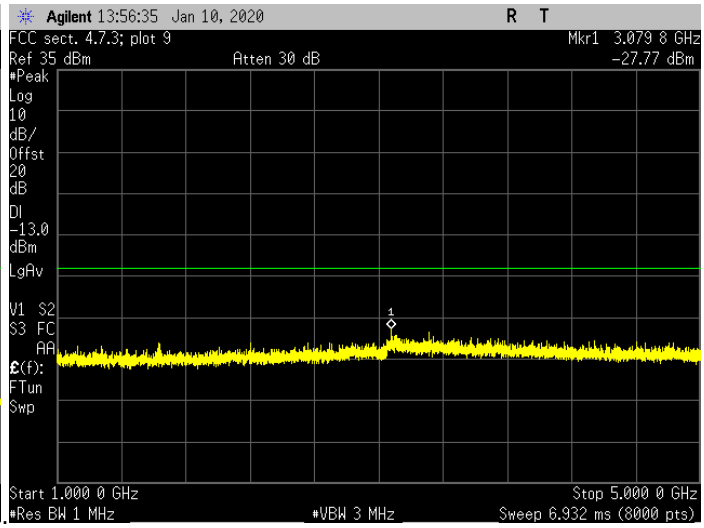
815 MHz Injected Signal



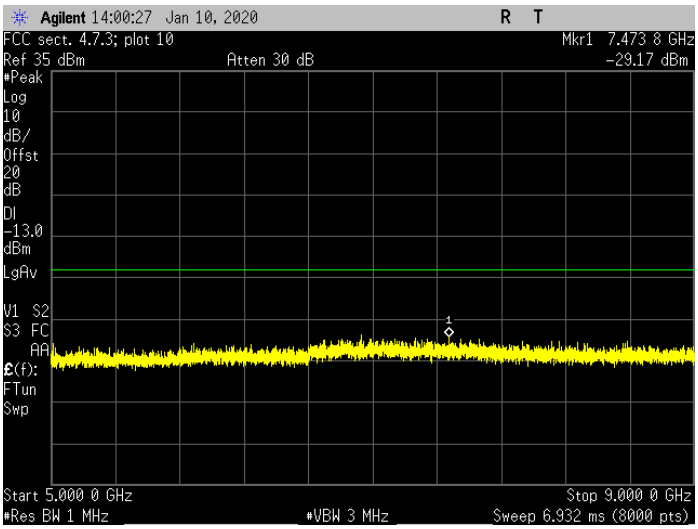
815 MHz Injected Signal



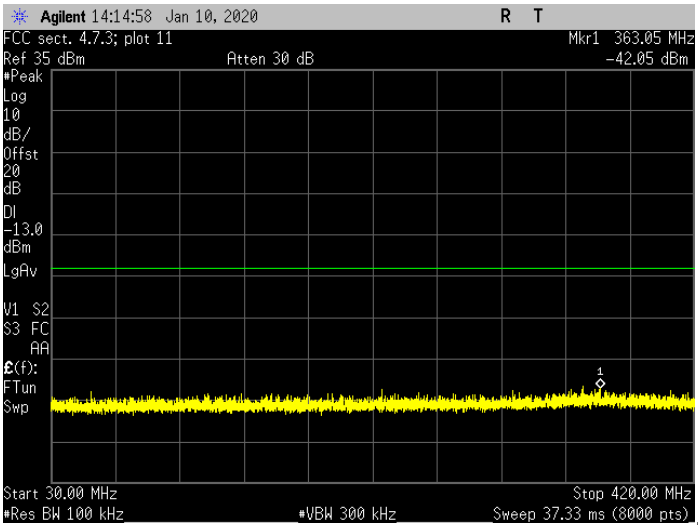
815 MHz Injected Signal



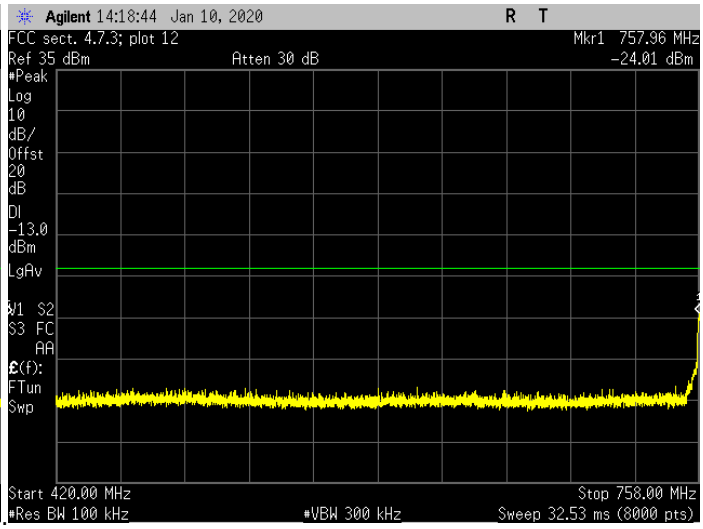
815 MHz Injected Signal



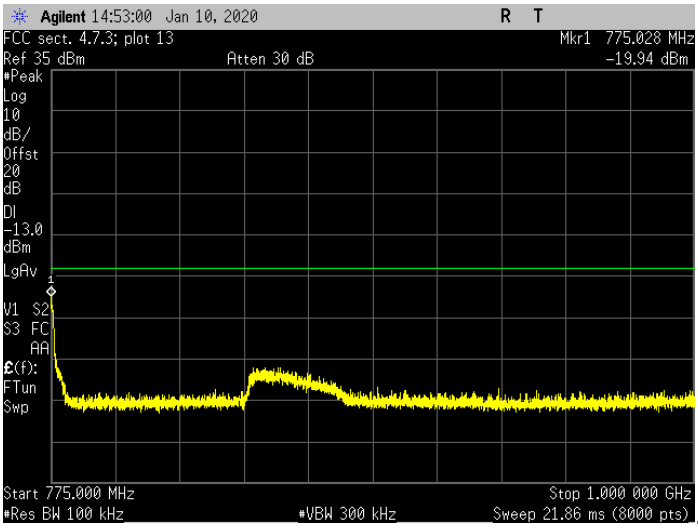
815 MHz Injected Signal



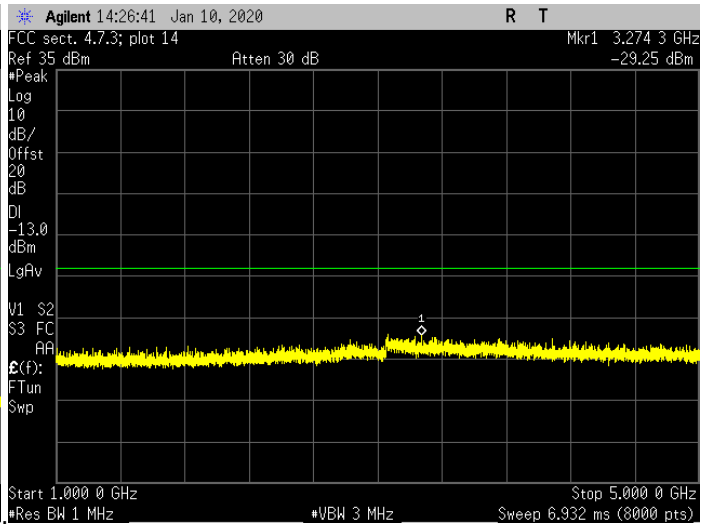
766.5 MHz Injected Signal



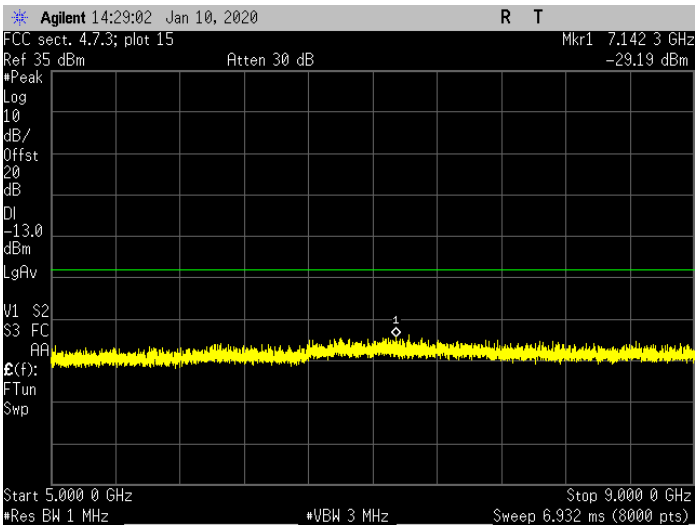
766.5 MHz Injected Signal



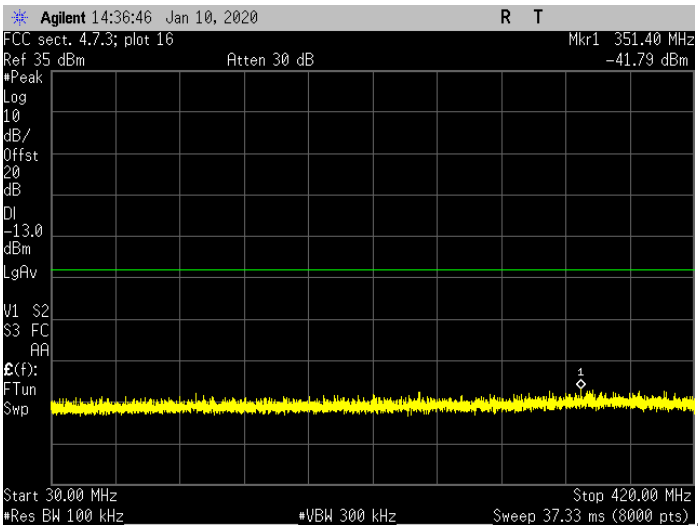
766.5 MHz Injected Signal



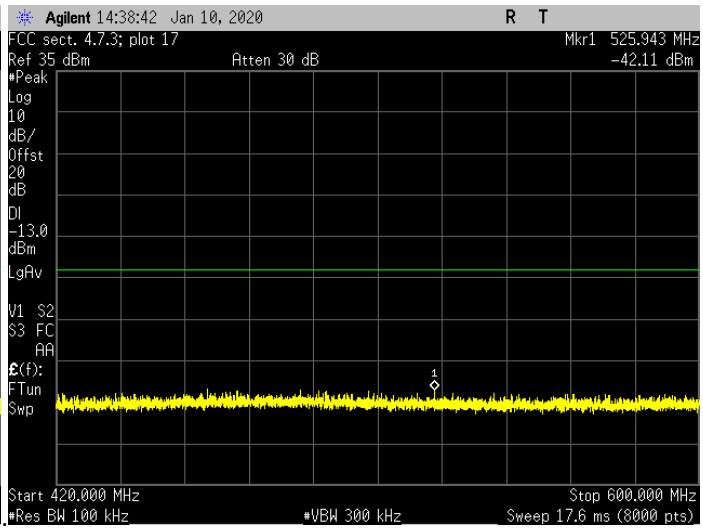
766.5 MHz Injected Signal



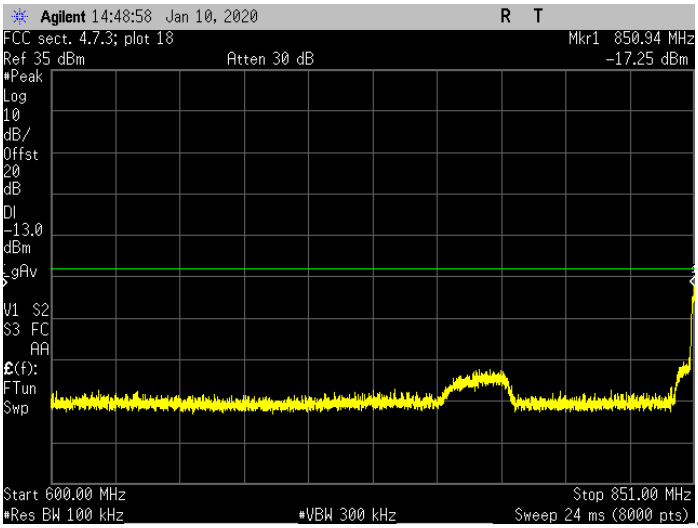
766.5 MHz Injected Signal



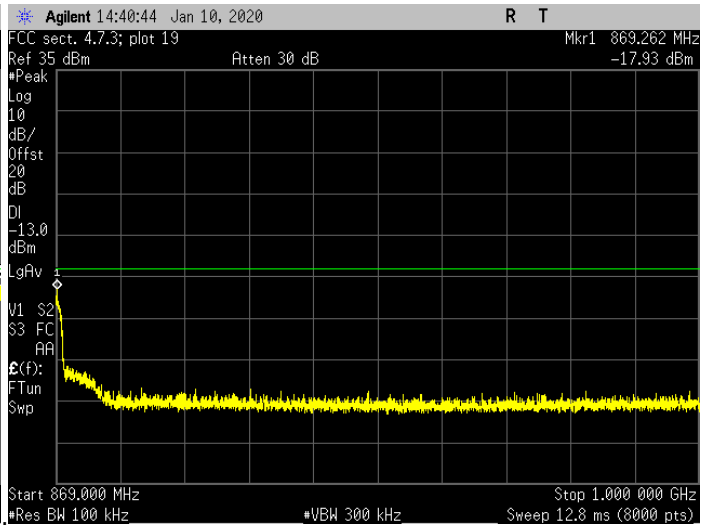
860 MHz Injected Signal



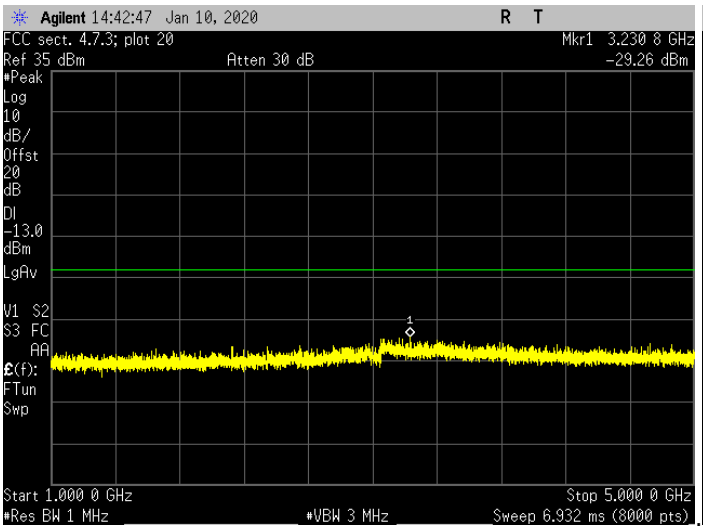
860 MHz Injected Signal



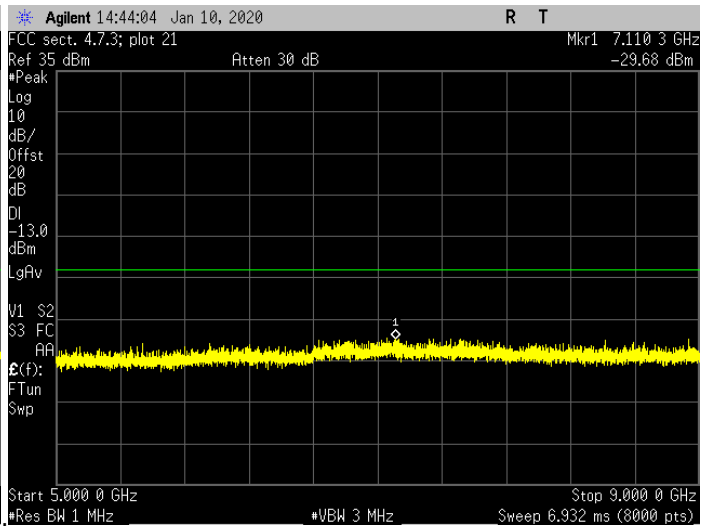
860 MHz Injected Signal



860 MHz Injected Signal



860 MHz Injected Signal



860 MHz Injected Signal

17.4 Results for Section 90.543 (e)

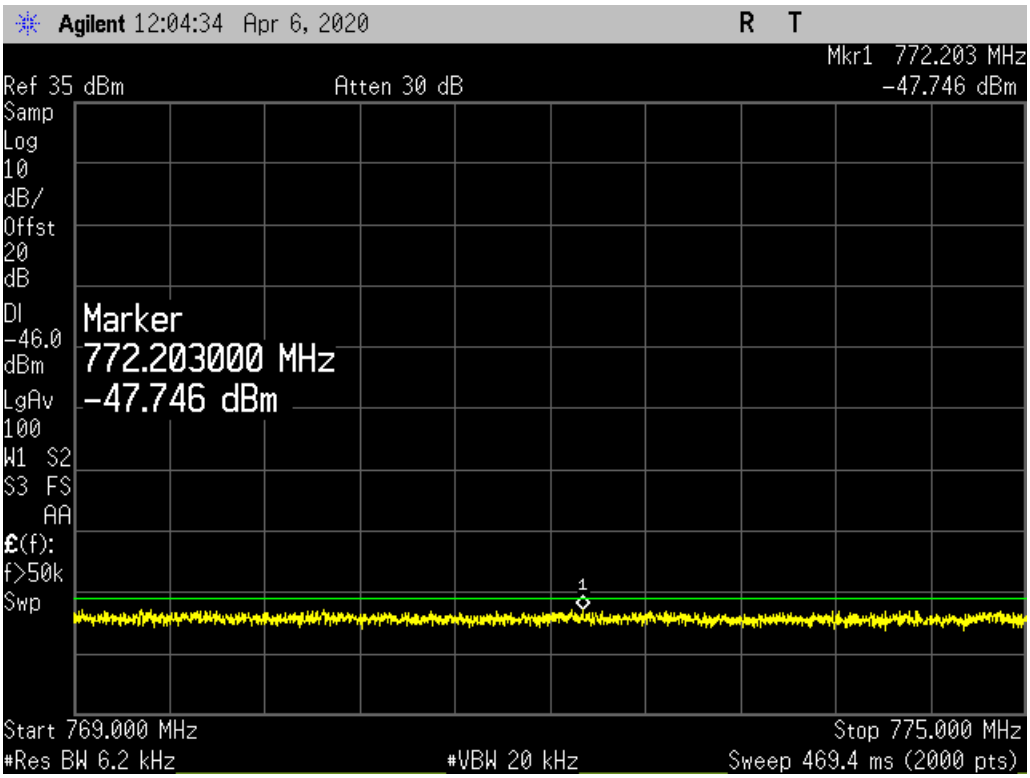
Model	PS71090E	Specification	FCC 90.543 (e)
Serial Number	19RF11060004	Test Date	04/06/2020
Test Personnel	Joseph Strzelecki	Test Location	Chamber B
Test Equipment	EMI Receiver (RNT-17)		

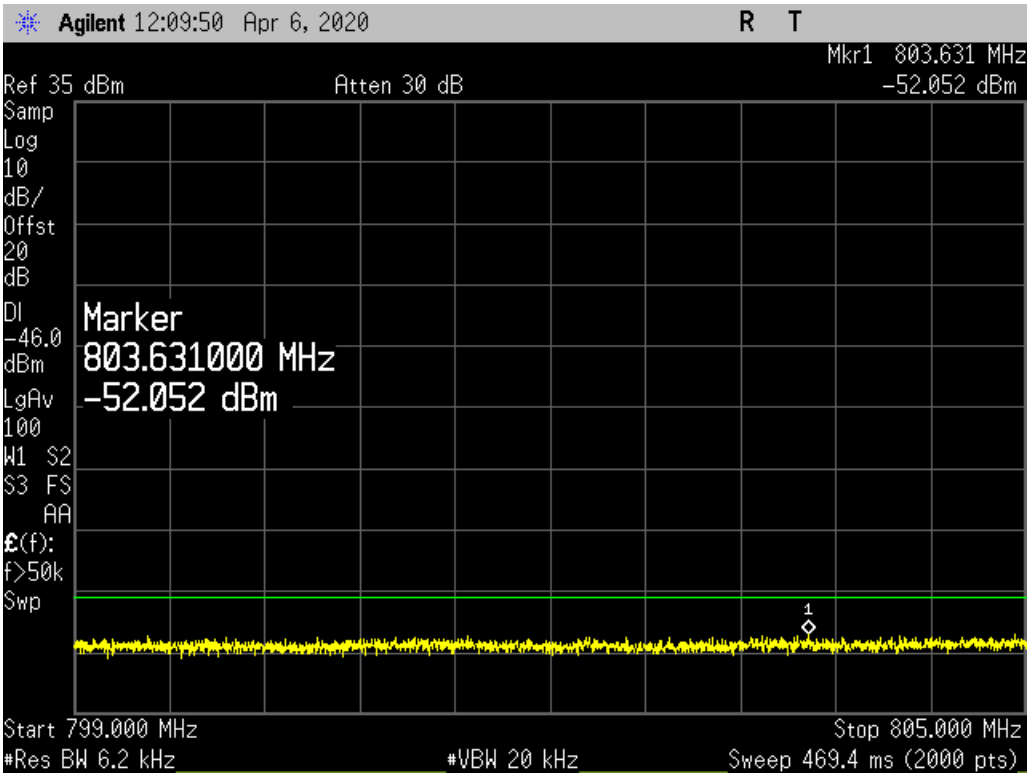
This is an excerpt from FCC 90.543. The text in red is Radiometrics notes.

90.543 (e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.
The limit is equivalent to -46 dBm. This limit was used since it is the most stringent. Judgement: Pass
(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations. See above; Judgement: Pass
(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB. (-13 dBm) OK Done. The results are shown in section 17.3 herein. Judgement: Pass

The spectrum analyzer was set to max hold mode.

Plot	RBW	VBW		Sig Gen			Spectrum Analyzer Start	Spectrum Analyzer Stop	Max reading Freq	Max reading
#	MHz	kHz	Mode	Modul	MHz	dBm	MHz	MHz	MHz	dBm
1	6.25	20	UP	CW	793.0	**-26.3**	799	805	803.631	-52.052
2	6.25	20	Down	CW	763.0	**-25.3**	769	775	772.203	-47.74





18.0 SPURIOUS RADIATED EMISSIONS

18.1 Applicable Standard

The EUT shall comply with section 4.9 of FCC KDB 935210 D05 and FCC Part 2.1053. This test is intended to capture any emissions that radiate directly from the case, cabinet, control circuits, etc., instead of via the antenna output port, and thus would not be captured in conducted spurious emission measurements.

Spurious emissions of zone enhancers shall be suppressed as much as possible. Any emission must be attenuated below the power (P) of the highest emission contained within the authorized band, by at least: $43+10xLog_{10}P$, or 70 dB, whichever is less stringent, where P is the total RF output power of the test tones in watts. Since $43 +10xLog_{10}P$ is less stringent than 70 dB, that limit was used.

18.2 Test Procedures

Radiated emission measurements in the restricted bands were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists. Radiated emissions measurements were performed in the anechoic chamber at a test distance of 3 meters. The entire frequency range from 30 to 7500 MHz was slowly scanned and the emissions in the restricted frequency bands were recorded. Measurements were performed using the peak detector function.

The spectrum analyzer was adjusted for the following settings:

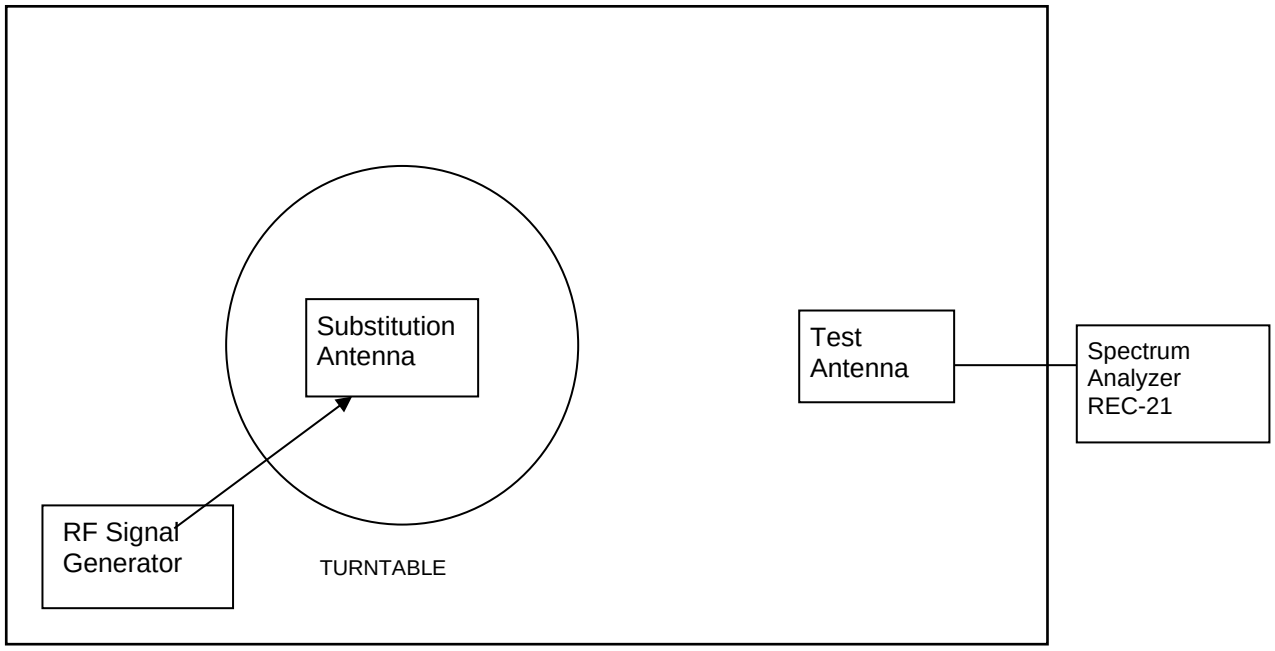
1) Resolution Bandwidth = 100 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1GHz.
2) Video Bandwidth = 300 kHz for spurious emissions below 1 GHz, and 3 MHz for spurious emissions above 1 GHz.
3) Sweep Speed = Slow enough to maintain measurement calibration.
4) Detector Mode = Positive Peak.

The transmitter to be tested was placed on the turntable in the standard test site, or an FCC listed site compliant with ANSI C63.4. The transmitter is transmitting into a non-radiating load that is placed on the turntable (except for the fundamental reading which had an antenna). Since the transmitter has an integral antenna, the tests are to be run with the unit operating into the integral antenna. Measurements were made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier. The transmitter was keyed during the tests.

For each spurious frequency, the test antenna was raised and lowered from 1 m to 4m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Then the turntable was rotated 360°to determine the maximum reading. This procedure was repeated to obtain the highest possible reading. This maximum reading was recorded.

Each measurement was repeated for each spurious frequency with the test antenna polarized vertically.

Figure 1. Drawing of Radiated Emissions Setup



ANSI C63.4 Listed Test Site

Notes:
- Test Antenna height varied from 1 to 4 meters
- Distance from antenna to tested system is 3 meters
- Not to Scale

Frequency MHz	Test Antenna	Substitution Antenna	Receiver	Signal Generator
30 - 200	ANT-80	ANT-79	REC-21	SIG-21
200 - 1000	ANT-06	ANT-07	REC-21	SIG-21
1000-9,000	ANT-13	ANT-66	REC-21	SIG-21

The transmitter was removed and replaced with a broadband substitution antenna. The substitution antenna is calibrated so that the gain relative to a dipole is known. The center of the substitution antenna was approximately at the same location as the center of the transmitter.

The substitution antenna was fed at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, the test antenna was raised and lowered to obtain a maximum reading at the spectrum analyzer. The level of the signal generator output was adjusted until the previously recorded maximum reading for this set of conditions was obtained. The measurements were repeated with both antennas horizontally and vertically polarized for each spurious frequency.

The power in dBm into a reference ideal half-wave dipole antenna was calculated by reducing the readings obtained in steps k) and l) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:
Pd(dBm) = *Pg*(dBm) – *cable loss* (dB) + *antenna gain* (dB)

where:
Pd is the dipole equivalent power and
Pg is the generator output power into the substitution antenna.
The *Pd* levels record in step m) are the absolute levels of radiated spurious emissions in dBm.

Since by mathematical definition, P(dBm) – (43+10xLOG P(W)) = -13 dBm, the limit for spurious emissions was set to -13 dBm equivalent radiated power.

18.2.1 Spurious Radiated Emissions Test Results

Model	PS71090E	Specification	FCC KDB 935210
Serial Number	19RF11060004	Test Date	December 19 & 26, 2019
Test Distance	3 Meters	Notes	Transmit Mode
Test Personnel	Joseph Strzelecki	Test Location	Chamber E
Test Equipment	REC-21		

The emissions were measured from 30-8700 MHz. The worst case is shown below.

Transmit at 766.5 MHz; 758-775 MHz Band

Freq. MHz	Dect.	Ant. Pol.	EUT dBm	Limit dBm	Margin Under Limit dB
68.4	P	H	-45.8	-13.0	32.8
187.5	P	H	-42.4	-13.0	29.4
250.0	P	H	-45.5	-13.0	32.5
263.4	Q	H	-36.5	-13.0	23.5
263.4	P	H	-34.1	-13.0	21.1
991.3	P	H	-29.3	-13.0	16.3
1982.5	P	H	-26.5	-13.0	13.5
2972.5	P	H	-39.7	-13.0	26.7
3965.0	P	H	-43.9	-13.0	30.9
4955.0	P	H	-42.7	-13.0	29.7
6760.0	P	H	-41.7	-13.0	28.7
7405.0	P	H	-36.8	-13.0	23.8
8587.5	P	H	-36.8	-13.0	23.8
71.4	P	V	-46.4	-13.0	33.4
94.1	P	V	-43.8	-13.0	30.8
264.0	P	V	-38.7	-13.0	25.7
284.8	P	V	-37.8	-13.0	24.8
991.3	P	V	-32.1	-13.0	19.1
1982.5	P	V	-26.1	-13.0	13.1
2972.5	P	V	-42.7	-13.0	29.7
3965.0	P	V	-44.2	-13.0	31.2
4955.0	P	V	-42.5	-13.0	29.5
7887.5	P	V	-42.1	-13.0	29.1
8020.0	P	V	-42.6	-13.0	29.6

Transmit at 860 MHz; 851-862 MHz band

Freq. MHz	Dect.	Ant. Pol.	EUT dBm	Limit dBm	Margin Under Limit dB
32.1	P	H	-44.9	-13.0	31.9

Freq. MHz	Dect.	Ant. Pol.	EUT dBm	Limit dBm	Margin Under Limit dB
70.2	P	H	-44.9	-13.0	31.9
94.6	P	H	-48.0	-13.0	35.0
187.5	P	H	-40.5	-13.0	27.5
230.6	P	H	-45.0	-13.0	32.0
250.0	P	H	-44.4	-13.0	31.4
263.4	Q	H	-36.0	-13.0	23.0
263.5	P	H	-33.4	-13.0	20.4
284.9	P	H	-45.8	-13.0	32.8
646.3	P	H	-48.5	-13.0	35.5
757.5	P	H	-44.0	-13.0	31.0
991.3	P	H	-28.1	-13.0	15.1
1982.5	P	H	-27.8	-13.0	14.8
2972.5	P	H	-39.9	-13.0	26.9
4955.0	P	H	-43.5	-13.0	30.5
7927.5	P	H	-40.3	-13.0	27.3
8145.0	P	H	-42.8	-13.0	29.8
8860.0	P	H	-43.5	-13.0	30.5
71.9	P	V	-44.5	-13.0	31.5
94.1	P	V	-43.7	-13.0	30.7
187.5	P	V	-44.9	-13.0	31.9
264.1	P	V	-38.5	-13.0	25.5
285.1	P	V	-36.2	-13.0	23.2
991.0	P	V	-30.9	-13.0	17.9
1982.5	P	V	-26.0	-13.0	13.0
2972.5	P	V	-44.2	-13.0	31.2
3727.5	P	V	-50.9	-13.0	37.9
3965.0	P	V	-46.0	-13.0	33.0
4185.0	P	V	-48.9	-13.0	35.9
4955.0	P	V	-42.4	-13.0	29.4
7862.5	P	V	-43.0	-13.0	30.0

Transmit at 796.5 MHz; 788-805 MHz Band

Freq. MHz	Dect.	Ant. Pol.	EUT dBm	Limit dBm	Margin Under Limit dB
34.2	P	H	-44.3	-13.0	31.3
187.8	P	H	-39.9	-13.0	26.9
250.0	P	H	-42.8	-13.0	29.8
263.5	P	H	-32.4	-13.0	19.4
284.9	P	H	-44.5	-13.0	31.5
757.7	P	H	-43.8	-13.0	30.8
991.3	P	H	-26.8	-13.0	13.8
1625.0	P	H	-51.1	-13.0	38.1
1982.5	P	H	-27.0	-13.0	14.0
2972.5	P	H	-39.3	-13.0	26.3
6957.5	P	H	-44.6	-13.0	31.6
7122.5	P	H	-44.4	-13.0	31.4
7787.5	P	H	-43.1	-13.0	30.1

Freq. MHz	Dect.	Ant. Pol.	EUT dBm	Limit dBm	Margin Under Limit dB
8937.5	P	H	-40.8	-13.0	27.8
94.3	P	V	-41.6	-13.0	28.6
187.7	P	V	-43.3	-13.0	30.3
232.3	P	V	-44.0	-13.0	31.0
264.2	P	V	-35.8	-13.0	22.8
285.1	P	V	-36.1	-13.0	23.1
329.7	P	V	-46.4	-13.0	33.4
715.0	P	V	-46.7	-13.0	33.7
991.3	Q	V	-29.9	-13.0	16.9
1982.5	P	V	-27.7	-13.0	14.7
2972.5	P	V	-43.6	-13.0	30.6
4955.0	P	V	-43.2	-13.0	30.2
8300.0	P	V	-41.2	-13.0	28.2
8875.0	P	V	-39.1	-13.0	26.1

Transmit at 815 MHz; 806-817 MHz Band

Freq. MHz	Dect.	Ant. Pol.	EUT dBm	Limit dBm	Margin Under Limit dB
34.8	P	H	-43.6	-13.0	30.6
69.8	P	H	-41.6	-13.0	28.6
187.5	P	H	-38.9	-13.0	25.9
263.6	Q	H	-34.5	-13.0	21.5
263.6	P	H	-31.1	-13.0	18.1
285.0	P	H	-44.7	-13.0	31.7
757.8	P	H	-42.2	-13.0	29.2
883.9	P	H	-46.4	-13.0	33.4
991.3	P	H	-26.9	-13.0	13.9
1875.0	P	H	-51.9	-13.0	38.9
1982.5	P	H	-28.5	-13.0	15.5
2972.5	P	H	-39.7	-13.0	26.7
7417.5	P	H	-42.1	-13.0	29.1
8842.5	P	H	-40.1	-13.0	27.1
70.0	P	V	-42.6	-13.0	29.6
94.3	P	V	-40.7	-13.0	27.7
187.8	P	V	-42.4	-13.0	29.4
232.3	P	V	-41.0	-13.0	28.0
264.3	P	V	-35.8	-13.0	22.8
285.1	P	V	-34.9	-13.0	21.9
715.2	P	V	-44.3	-13.0	31.3
991.3	P	V	-30.0	-13.0	17.0
1982.5	P	V	-28.0	-13.0	15.0
2972.5	P	V	-43.1	-13.0	30.1
7940.0	P	V	-42.7	-13.0	29.7
8820.0	P	V	-40.2	-13.0	27.2

Judgment: Passed by at least 12 dB.

18.2.2 Results for Section 90.543 (f)

Model	PS71090E	Specification	FCC 90.543 (f)
Serial Number	19RF11060004	Test Date	04/09/2020
Test Personnel	Joseph Strzelecki	Test Location	Chamber E
Test Equipment	REC-31		
Notes	Tested with AI617-6000H06i360A Antenna at uplink output. The input signals were chosen to produce the worst case emissions in the 1559 to 1610 MHz band.		

This is an excerpt from FCC 90.543.

90.543 (f) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

The spectrum analyzer was set to max hold mode using peak detector. The frequency range was scanned from 1559 to 1610 MHz for each of the following tests. A standard antenna was installed on the EUT.

Receiver Setting		Input from Generator		Measured	Maximum EIRP			Margin Under Limit	
			Freq	Freq	Vertical	Horizontal	Limit	Vertical	Horizontal
RBW	VBW	Modulation	MHz	MHz	dBm	dBm	dBm	dB	dB
1 MHz	3 MHz	AWGN	790.0	1580.00	-45.1	-44.2	-40.0	5.1	4.2
1 MHz	3 MHz	AWGN	804.0	1608.00	-44.4	-44.7	-40.0	4.4	4.7
10 kHz	30 kHz	CW	790.0	1580.00	-56.7	-52.3	-50.0	6.7	2.3
10 kHz	30 kHz	CW	804.0	1608.00	-57.8	-54.5	-50.0	7.8	4.5

Judgement: Pass by 2.3 dB

19.0 MEASUREMENT INSTRUMENTATION UNCERTAINTY

Measurement	Uncertainty
Radiated Emissions, E-field, 3 meters, 30 to 200 MHz	3.3 dB
Radiated Emissions, E-field, 3 meters, 200 to 1000 MHz	4.9 dB
Radiated Emissions, E-field, 3 meters, 1 to 18 GHz	4.8 dB
Bandwidth using marker delta method	1% of frequency span
Conducted power	0.8 dB
Amplitude measurement 1-9000 MHz;	1.5 dB

The uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2 in accordance with CISPR 16-4-2.

20.0 REVISION HISTORY

RP-9209A3 Revisions:			
Rev.	Affected Sections	Description	Rationale