Compliance Testing, LLC
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Test Report

Prepared for: ISC Technologies

Model: ISC-T8611
FCC ID: SS6ISC-T8611
Class II Permissive Change

Description: Licensed Non-Broadcast Station Transmitter

To

FCC Part 90

And

FCC Part 22

Date of Issue: March 7, 2013

On the behalf of the applicant:	**ISC Technologies** **301 Oak Street** **Quincy, IL 62301**
Attention of:	**Tim Anderson, Vice President** **Ph: (217) 221-0985** **E-Mail: anderson@illinoissignal.com**

Prepared By
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Project No: p12a0013

Greg Corbin

Greg Corbin
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	March 7, 2013	Greg Corbin	Original Document

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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009)

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

Testing Certificate Number: **2152.01**

FCC OATS Reg, #933597

IC Reg. #2044A-1

Non-accredited tests contained in this report:

N/A

The Applicant has been cautioned as to the following:

15.21: **Information to the User**

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a): **Special Accessories**

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II, Part 2, Sub-part J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1079, 2.1051, 2.1053, 2.1055, 2.1057, and the following individual Parts 22 and 90.

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing.
In accordance with ANSI/C63.4-2009, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temp (ºC)	**Humidity (%)**	**Pressure (mbar)**
19.9 – 23.5	20.6 – 25.6	960 – 967.7

Measurement results, unless otherwise noted, are worst-case measurements.

EUT Description

Model: ISC-T8611
Description: Licensed Non-Broadcast Station Transmitter
DSP Firmware: ver 2.12
Control Software: ver 2.27

Additional Information

Refer to the following table for the EUT operating frequency and manufacturer's rated power levels.

Rule Section	Frequency Range (MHz)	Power Level (Watts)
FCC Part 22	152.8 – 152.855 157.45 – 161.9625	450
FCC Part 90	152 – 174	350

The EUT is a one way paging transmitter system, consisting of an exciter and power amplifier.
The EUT is powered by an AC to DC power supply.

EUT Operation during Tests

The EUT was installed in a 19 inch rack and was tested under normal operation.
A pc with a hyper-terminal program connected to the VT 100 serial port was used to communicate to the EUT as required.

For analog modulation, a 3 kHz sinewave @ 1.2 Vp-p was connected to Pins 3 and 4 (the analog audio input) of the J4 I/O connector.

The analog audio settings in the control software were set as follows:

- Analog Deviation = 1900 Hz
- Analog Limiter = 3000 Hz

For Part 22 and Part 90 using Mask D for 9K60F1D, the following digital modulation settings were used:
A 1.2 kHz square wave signal @ 4 Vp-p was connected to Pins 5 and 8 (the digital modulation input) of the J4 I/O connector.

The digital modulation settings in the control software were set as follows:

- Deviation = 3000 Hz

For Part 22 using Mask B for 19K6F1D, the following digital modulation settings were used:
A 4.04 kHz square wave signal @ 4 Vp-p was connected to Pins 5 and 8 (the digital modulation input) of the J4 I/O connector.

The digital modulation settings in the control software were set as follows:

- Deviation = 4800 Hz

Accessories: None

Cables: None

Modifications: None

15.203: Antenna Requirement:

	The antenna is permanently attached to the EUT
	The antenna uses a unique coupling
X	The EUT must be professionally installed
	The antenna requirement does not apply

Test Result Summary

Specification	Test Name	Pass, Fail, N/A	Comments
2.1046 22.565(b) 90.205(s)	Carrier Output Power (Conducted)	Pass	
2.1051 22.359 90.210(d)	Unwanted Emissions (Transmitter Conducted)	Pass	
2.1049 22.357 90.210(d)	Emission Masks (Occupied Bandwidth)	Pass	
2.202	Necessary Bandwidth Calculation	Pass	

Carrier Output Power (Conducted)

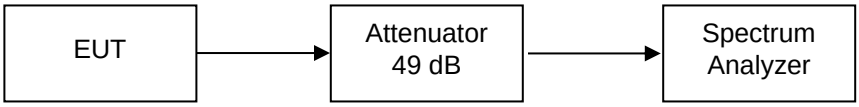
Name of Test: Carrier Output Power (Conducted) **Engineer:** Greg Corbin

Test Equipment Utilized: i00172, i00331 **Test Date:** 2/19/2013

Measurement Procedure

The Equipment Under Test (EUT) was connected directly to a power meter input. The peak readings were taken and the result was then compared to the limit.

Test Setup



Part 22 - Peak Output Power

Tuned Frequency (MHz)	Recorded Measurements (dBm)	(Watts)	Limit (Watts)	Result
152.825	56.70	467.735	500	Pass
160	56.60	457.088	500	Pass

Part 90 - Peak Output Power

Tuned Frequency (MHz)	Recorded Measurements (dBm)	(Watts)	Limit (Watts)	Result
152	55.46	351.560	500	Pass
162	55.43	349.140	500	Pass
174	55.44	349.945	500	Pass

Note:
1. Measured Output Power is within 20% of the manufacturers rated output power per 90.205(s).
2. Mfr rated output power is 450 watts for Part 22 and 350 watts for Part 90.

Conducted Spurious Emissions

Name of Test:	Conducted Spurious Emissions	**Engineer:** Greg Corbin
Test Equipment Utilized:	i00118, i00124, i00172, i00331	**Test Date:** 2/19/2013

Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the UUT met the requirements for spurious emissions.

A tunable notch filter was utilized to ensure the fundamental did not put the spectrum analyzer into compression.

The frequency range from 30 MHz to the 10th harmonic of the fundamental transmitter was observed and plotted.

Conducted spurious emissions were recorded with both types of modulation.

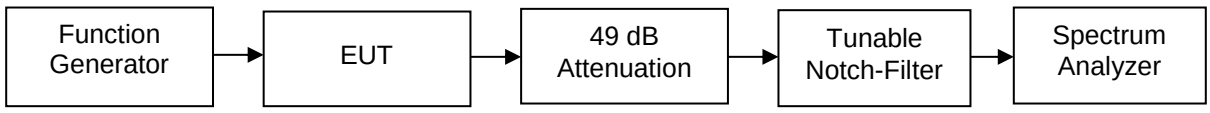
For analog modulation, a 3 kHz sinewave @ 1.2 Vp-p was connected to Pins 3 and 4 (the analog audio input) of the J4 I/O connector.
The analog audio settings in the control software were set as follows:

- Analog Deviation = 1900 Hz
- Analog Limiter = 3000 Hz

For digital modulation, a 1.2 kHz square wave signal @ 4 Vp-p was connected to Pins 5 and 8 (the digital modulation input) of the J4 I/O connector.
The digital modulation settings in the control software were set as follows:

- Deviation = 3000 Hz

Test Setup



Part 22 - Conducted Spurious Emissions Summary Test Table

Analog Modulation

Tuned Frequency (MHz)	Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Specification Limit (dBm)	Result
152.825	374.4	-26.7	-20	Pass
160	912.7	-26.6	-20	Pass

Part 22 - Conducted Spurious Emissions Summary Test Table

Digital Modulation

Tuned Frequency (MHz)	Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Specification Limit (dBm)	Result
152.825	847.2	-26.9	-20	Pass
160	655.7	-27.1	-20	Pass

Part 90 - Conducted Spurious Emissions Summary Test Table

Analog Modulation

Tuned Frequency (MHz)	Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Specification Limit (dBm)	Result
152	587.8	-26.5	-20	Pass
162	854.5	-27.6	-20	Pass
174	873.9	-25.9	-20	Pass

Part 90 - Conducted Spurious Emissions Summary Test Table

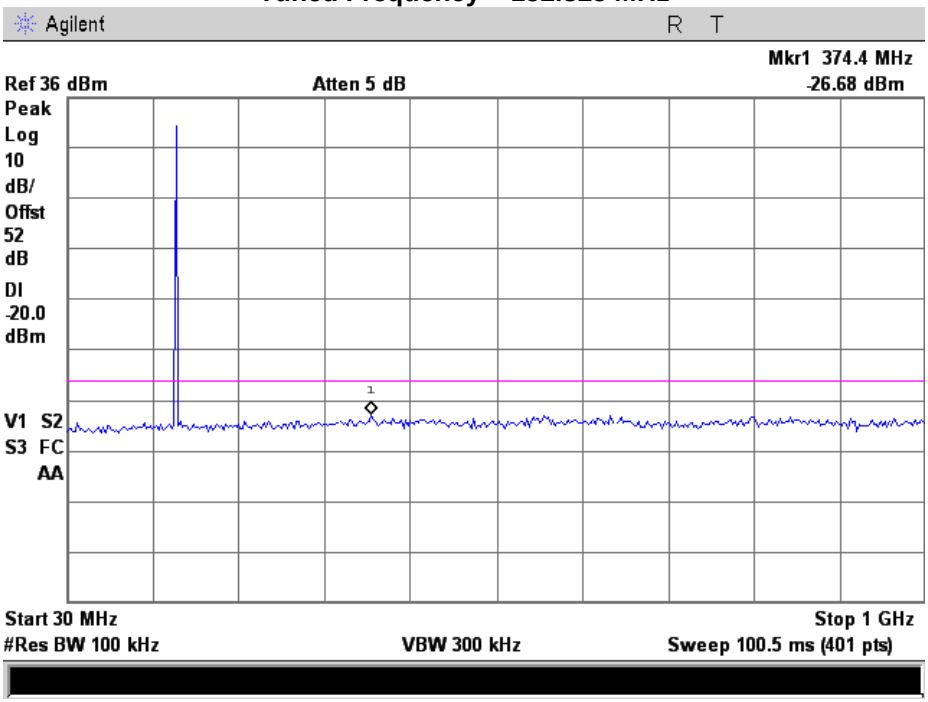
Digital Modulation

Tuned Frequency (MHz)	Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Specification Limit (dBm)	Result
152	573.2	-25.8	-20	Pass
162	856.9	-25.5	-20	Pass
174	563.5	-26.4	-20	Pass

Conducted Spurious Emission Test Plots

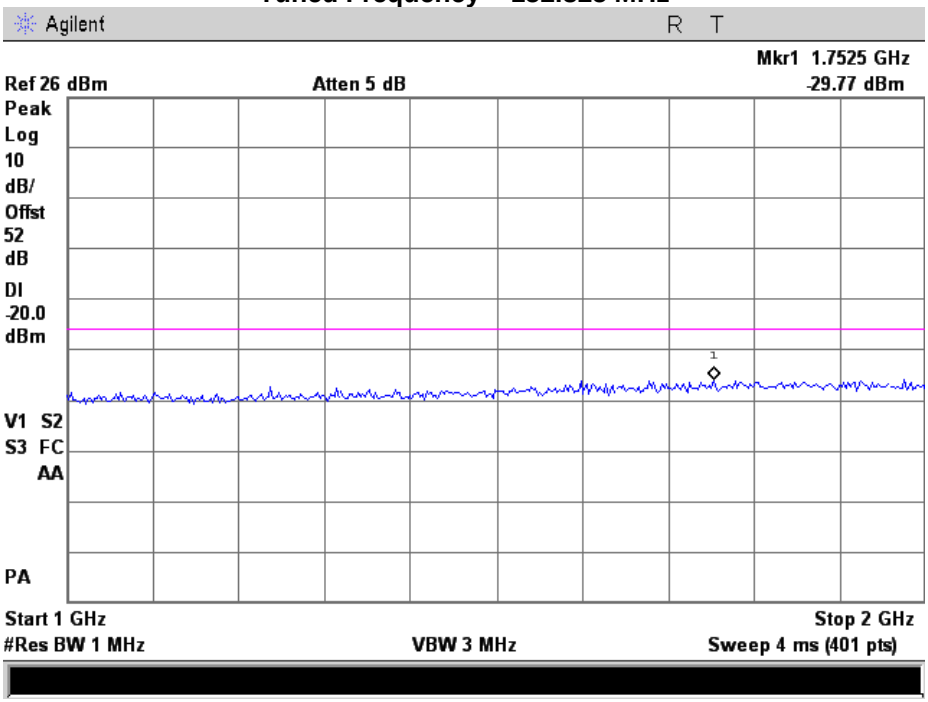
Part 22 – Analog Modulation 30 MHz – 1 GHz

Tuned Frequency = 152.825 MHz



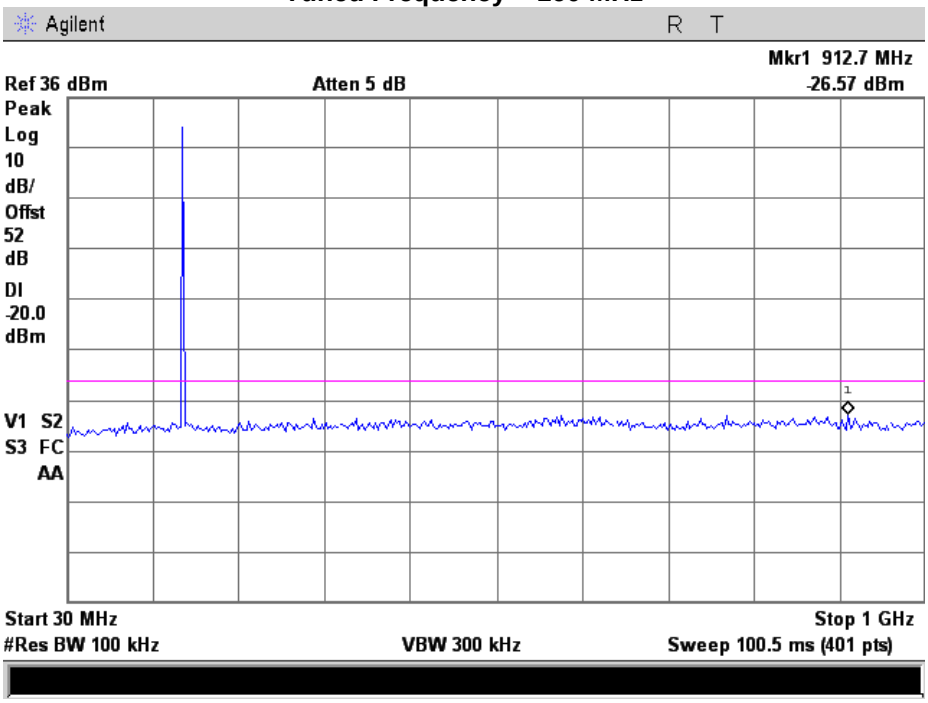
Part 22 – Analog Modulation 1 - 2 GHz

Tuned Frequency = 152.825 MHz



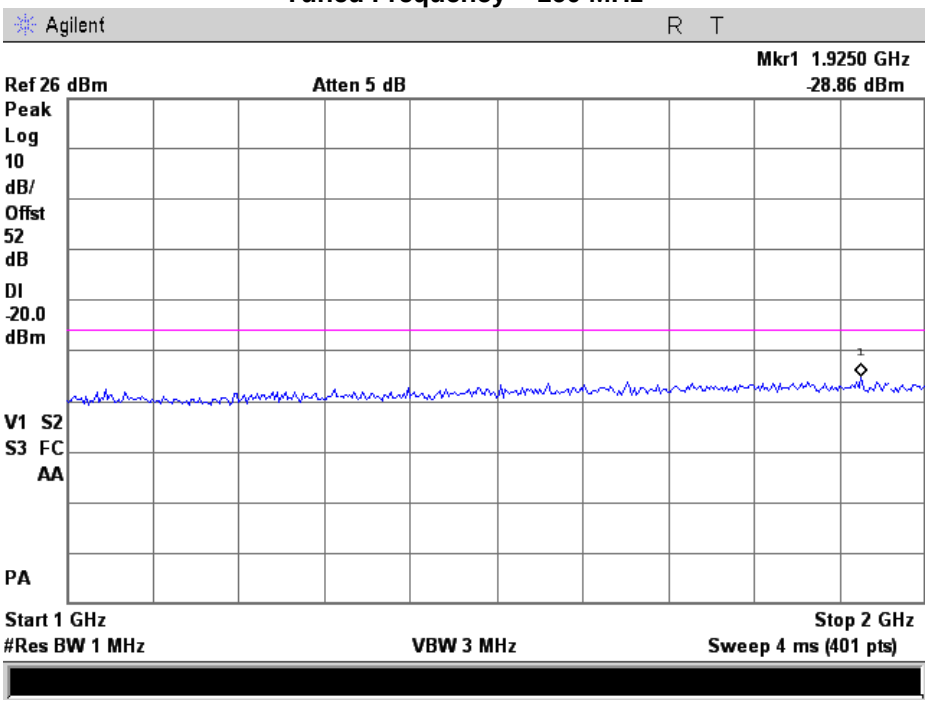
Part 22 – Analog Modulation 30 MHz – 1 GHz

Tuned Frequency = 160 MHz



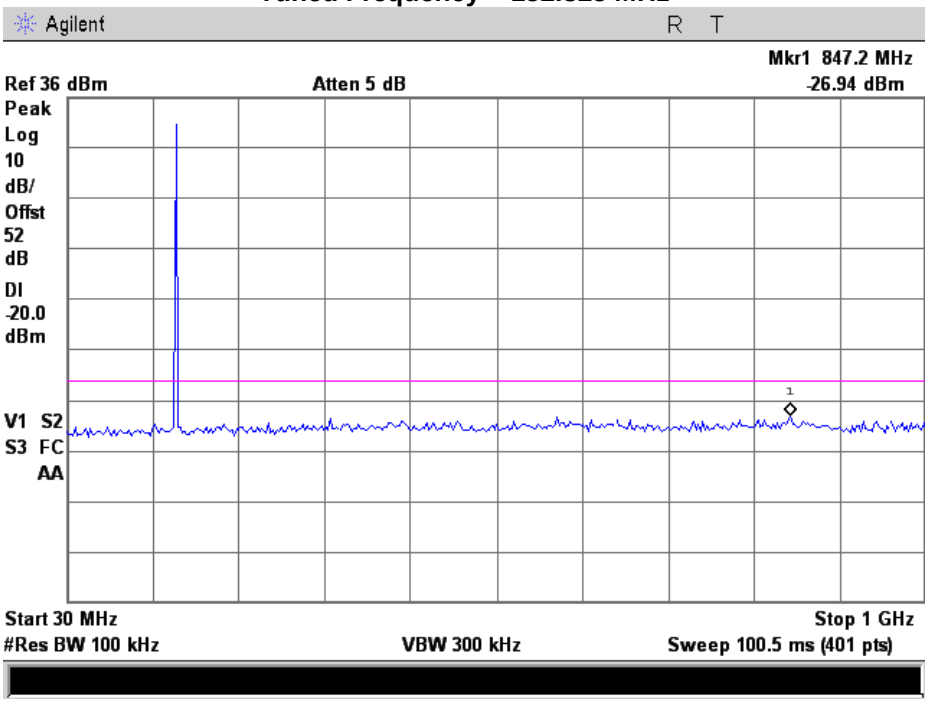
Part 22 – Analog Modulation 1 - 2 GHz

Tuned Frequency = 160 MHz



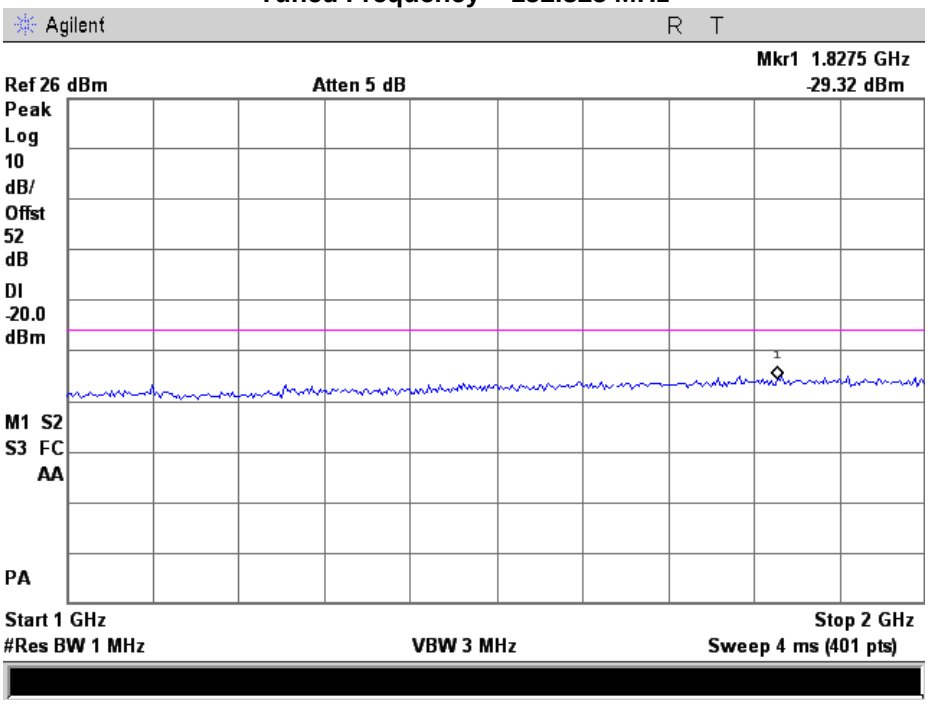
Part 22 – Digital Modulation 30 MHz – 1 GHz

Tuned Frequency = 152.825 MHz



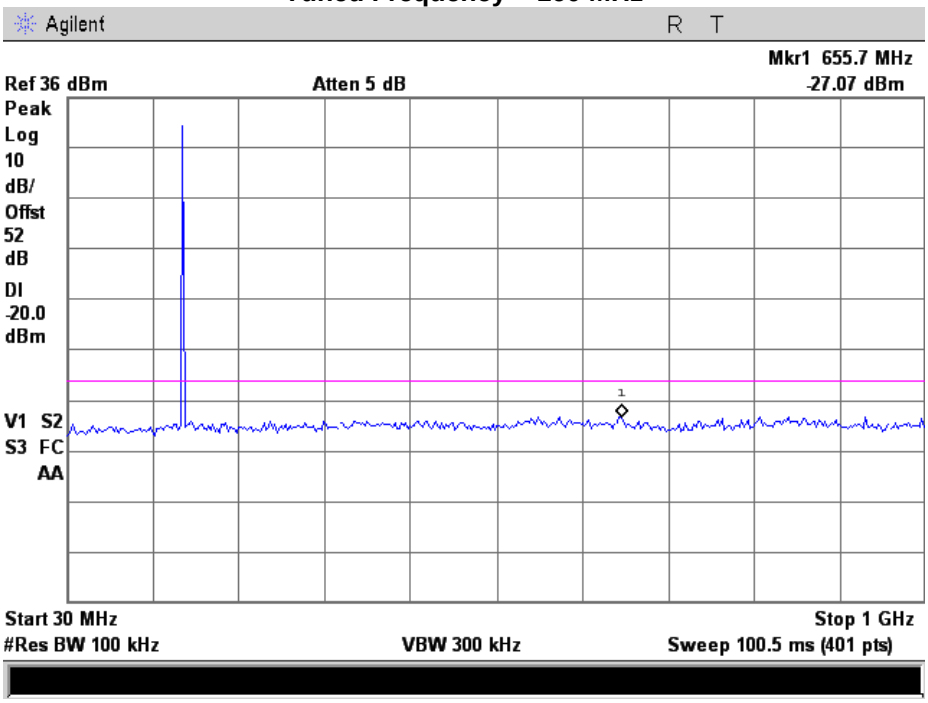
Part 22 – Digital Modulation 1 - 2 GHz

Tuned Frequency = 152.825 MHz

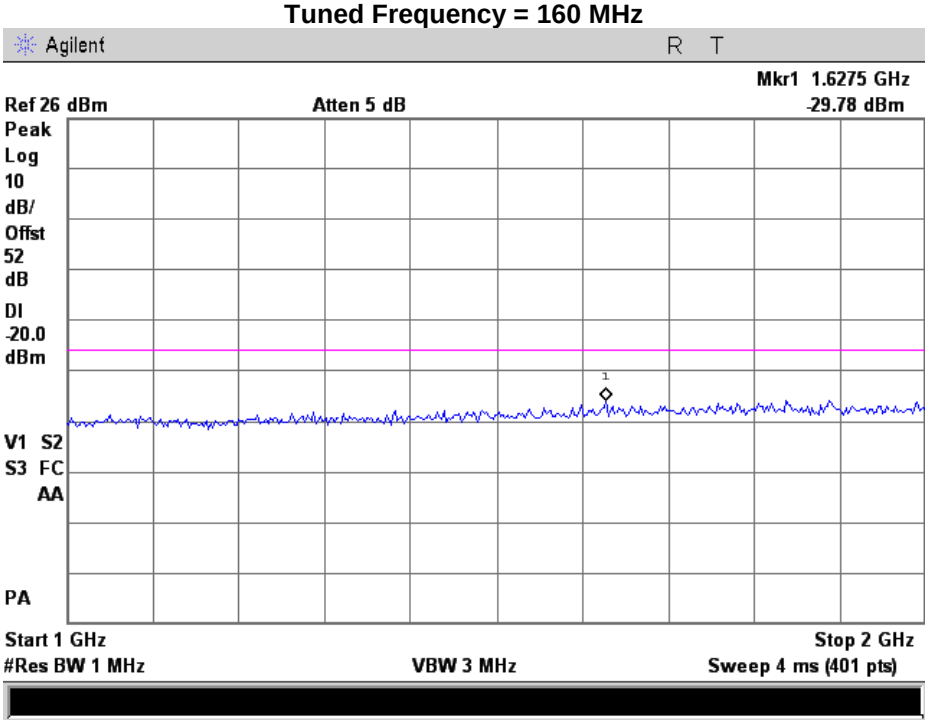


Part 22 – Digital Modulation 30 MHz – 1 GHz

Tuned Frequency = 160 MHz

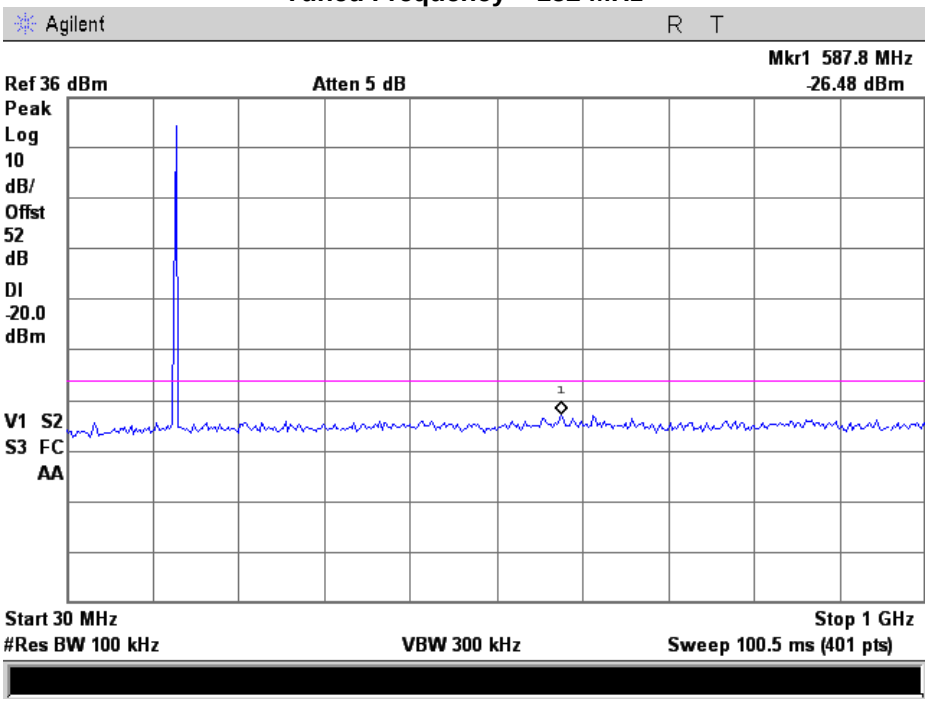


Part 22 – Digital Modulation_1 - 2 GHz
Tuned Frequency = 160 MHz



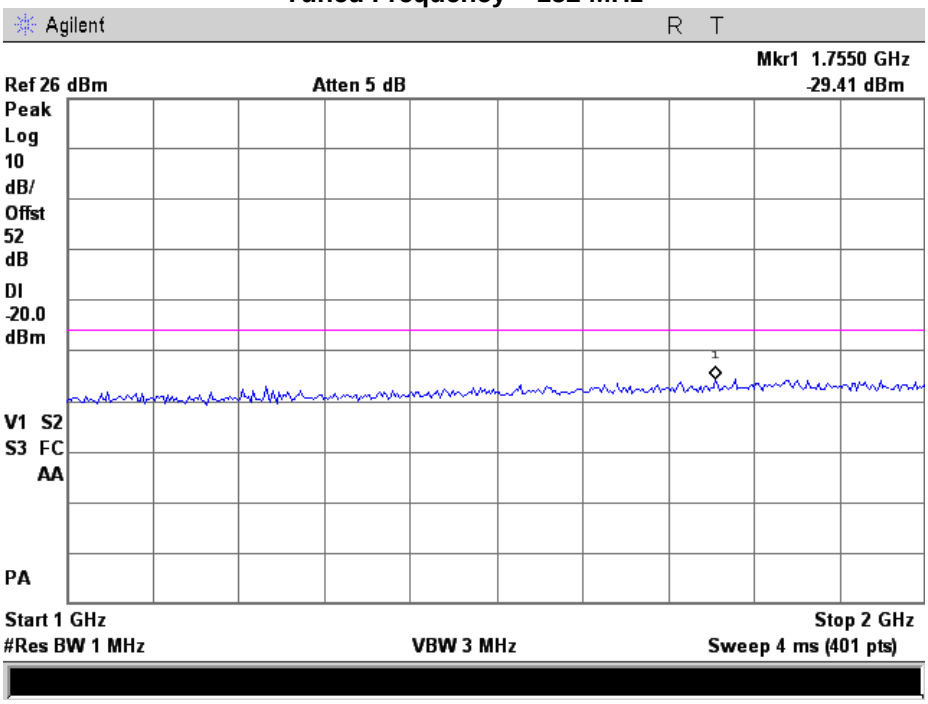
Part 90 – Analog Modulation 30 MHz – 1 GHz

Tuned Frequency = 152 MHz



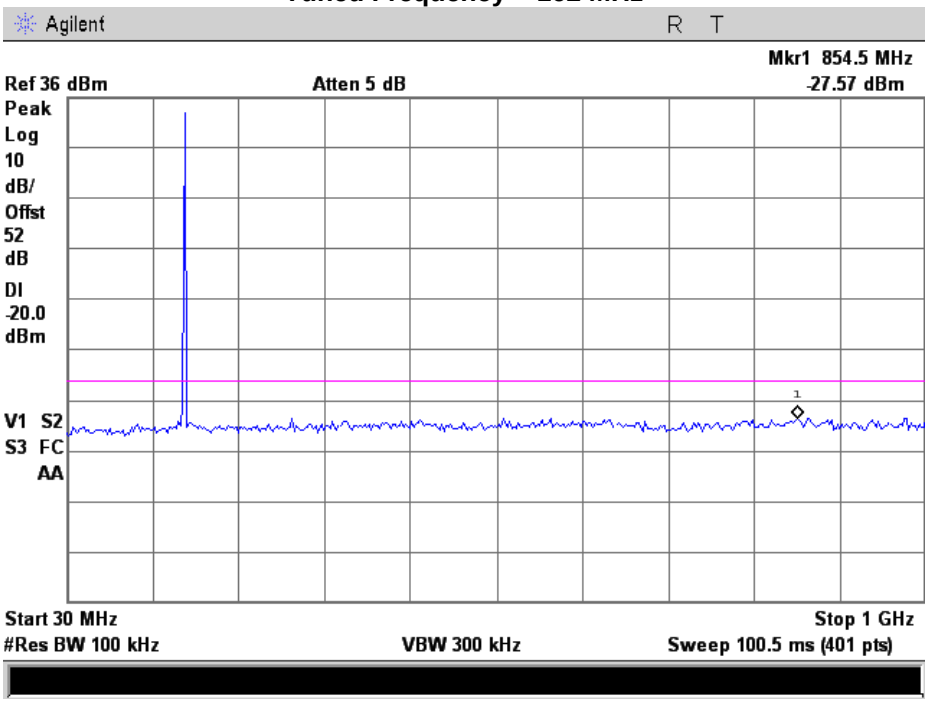
Part 90 – Analog Modulation 1 - 2 GHz

Tuned Frequency = 152 MHz



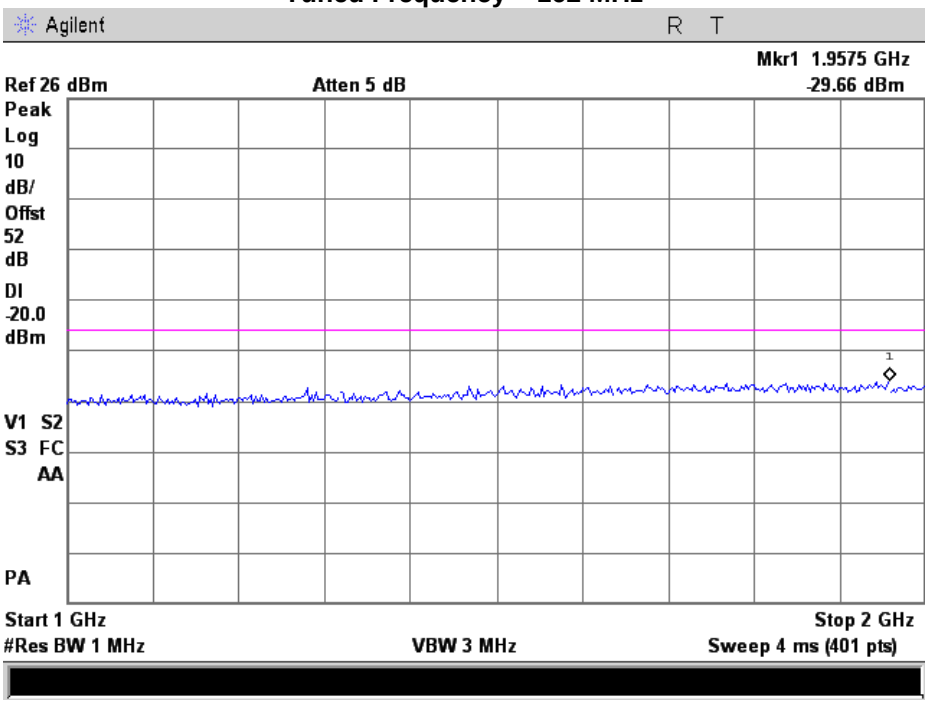
Part 90 – Analog Modulation 30 MHz – 1 GHz

Tuned Frequency = 162 MHz



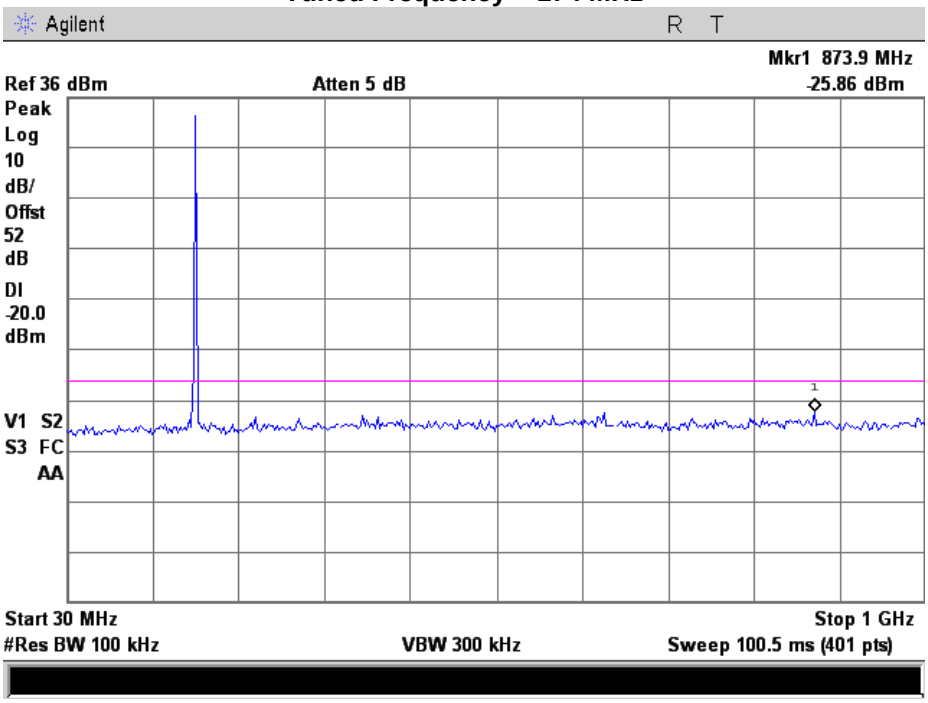
Part 90 – Analog Modulation 1 - 2 GHz

Tuned Frequency = 162 MHz



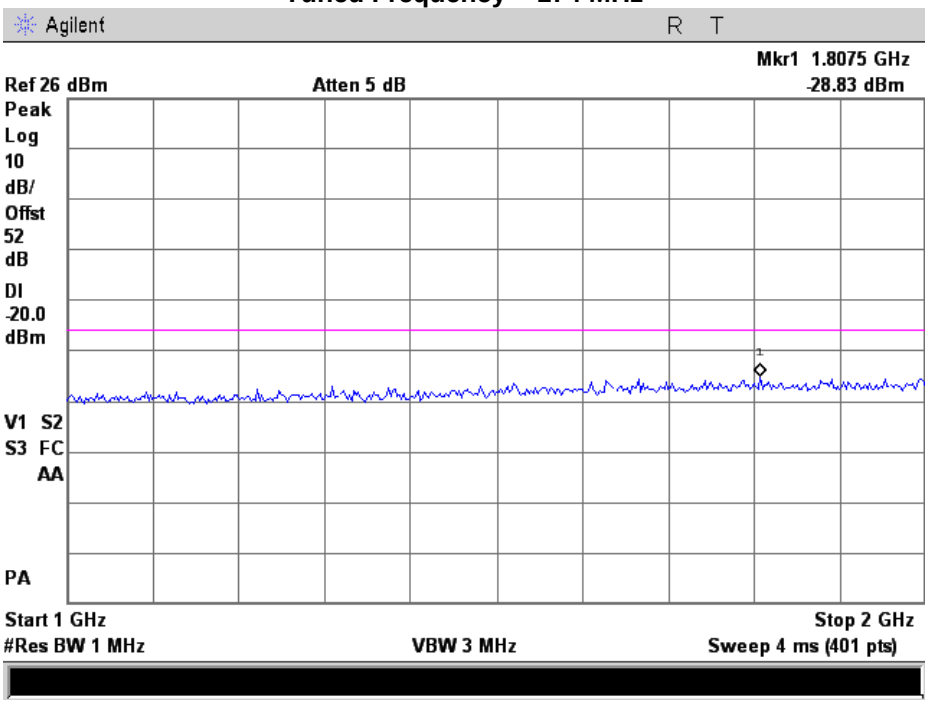
Part 90 – Analog Modulation 30 MHz – 1 GHz

Tuned Frequency = 174 MHz



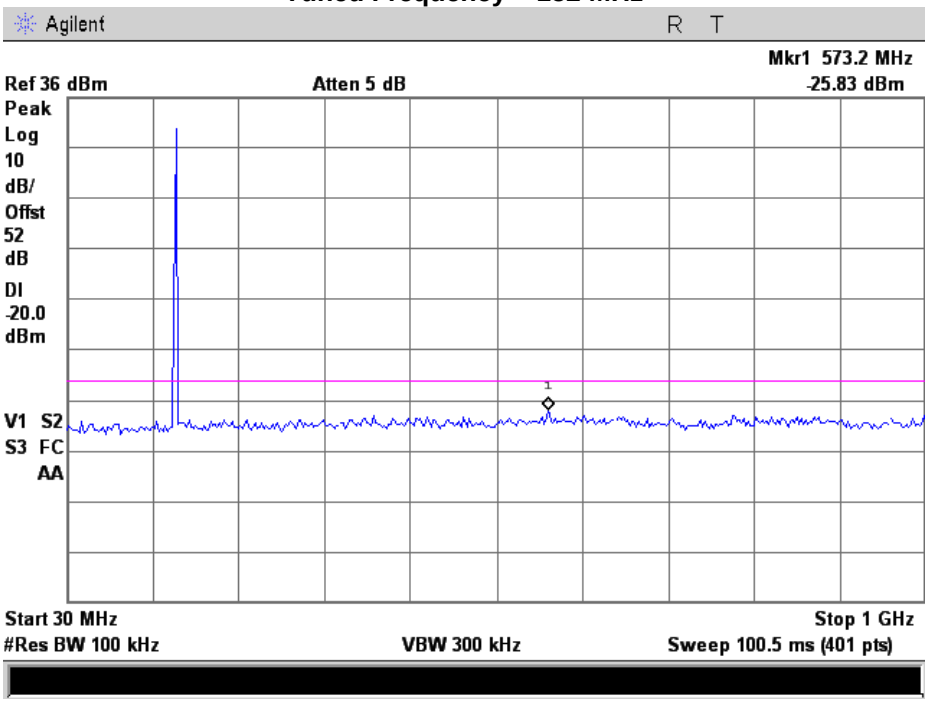
Part 90 – Analog Modulation 1 - 2 GHz

Tuned Frequency = 174 MHz



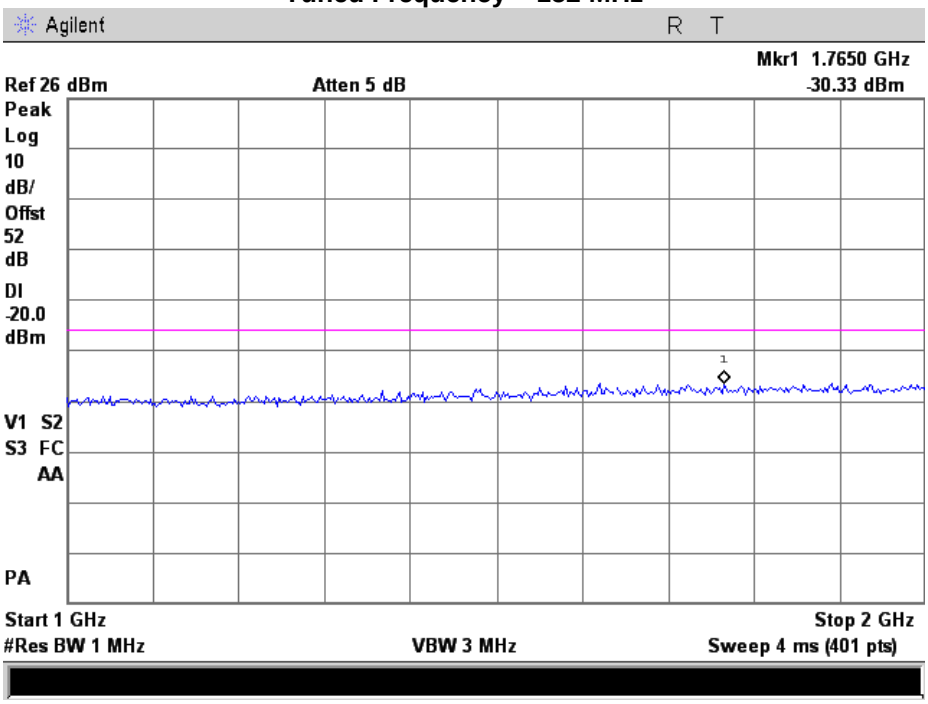
Part 90 – Digital Modulation 30 MHz – 1 GHz

Tuned Frequency = 152 MHz



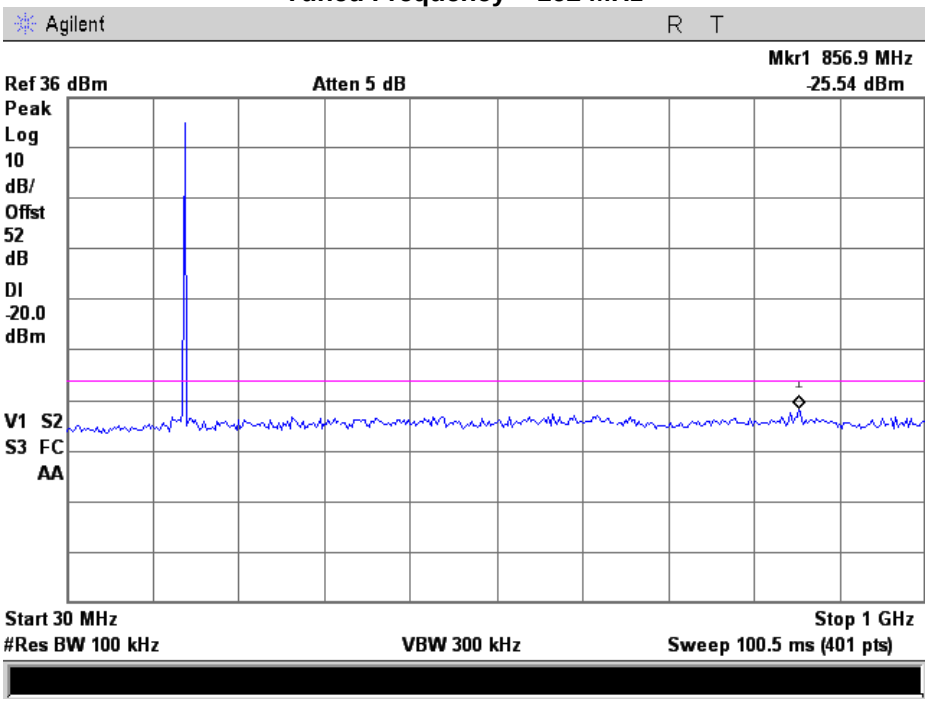
Part 90 – Digital Modulation 1 - 2 GHz

Tuned Frequency = 152 MHz



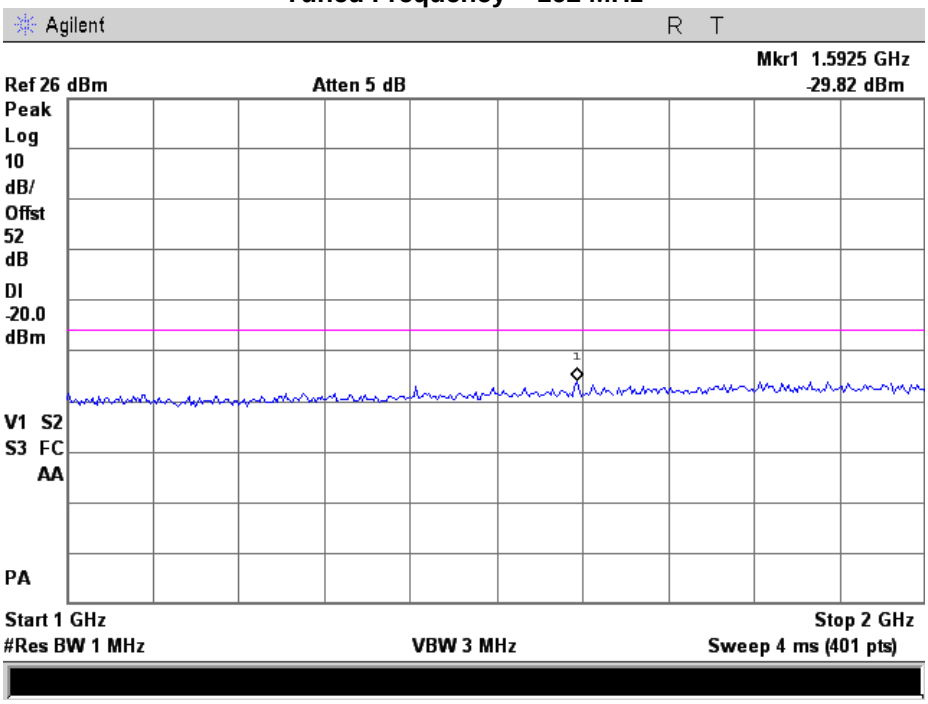
Part 90 – Digital Modulation 30 MHz – 1 GHz

Tuned Frequency = 162 MHz



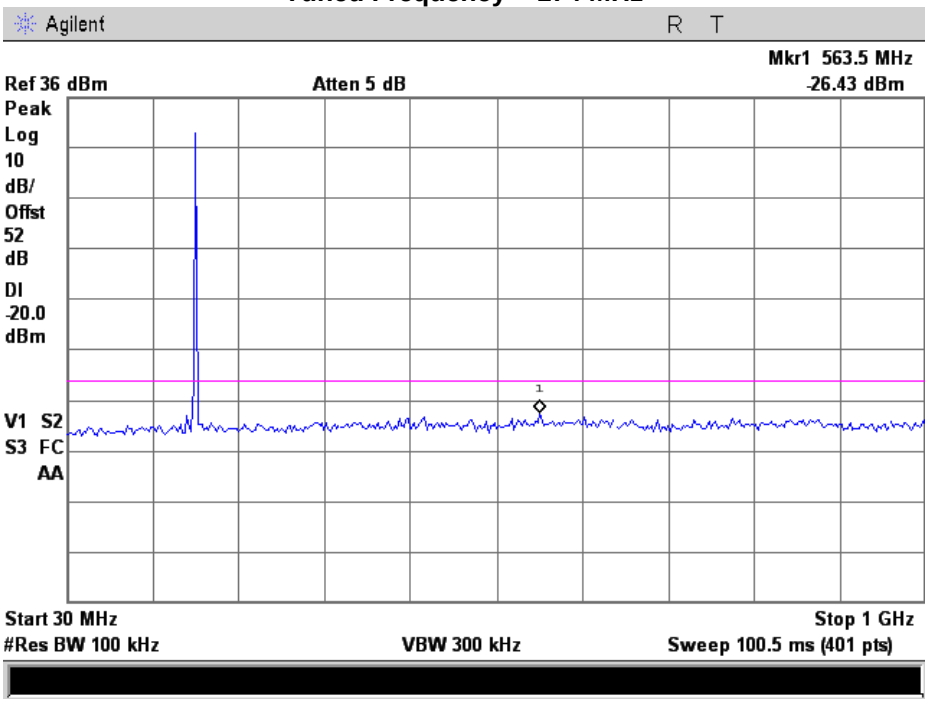
Part 90 – Digital Modulation 1 - 2 GHz

Tuned Frequency = 162 MHz



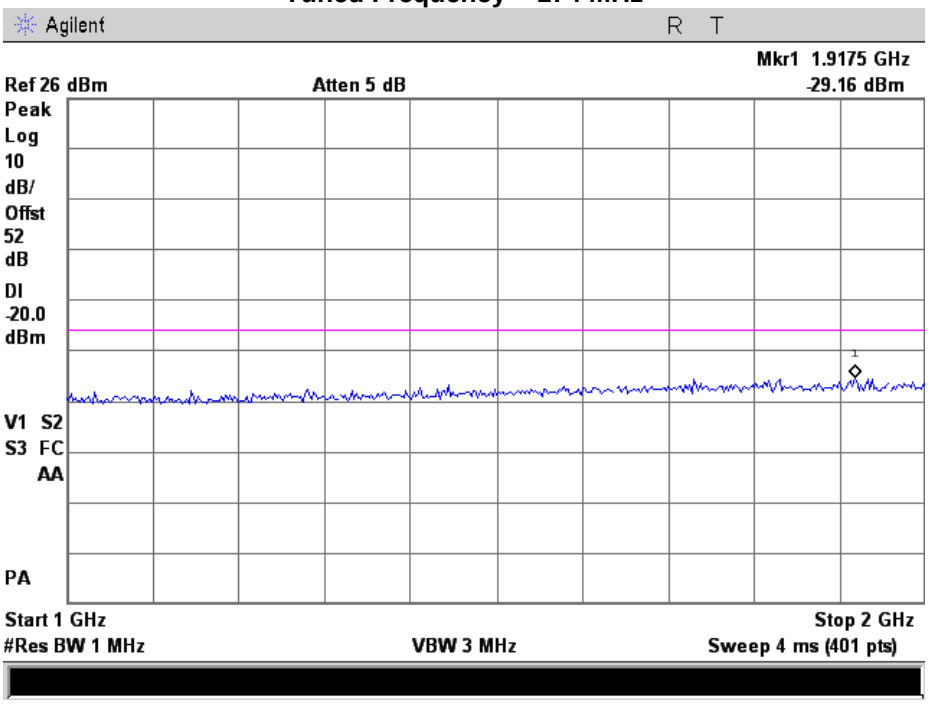
Part 90 – Digital Modulation 30 MHz – 1 GHz

Tuned Frequency = 174 MHz



Part 90 – Digital Modulation 1 - 2 GHz

Tuned Frequency = 174 MHz



Emission Masks (Occupied Bandwidth)

Name of Test:	Emission Masks (Occupied Bandwidth)	**Engineer:** Greg Corbin
Test Equipment Utilized:	i00118, i00172, i00331	**Test Date:** 2/19/2013

Measurement Procedure

The EUT was connected directly to a spectrum analyzer to verify that the EUT meets the required emissions mask. A reference level plot is provided to verify that the peak power was established prior to testing the mask.

Emission masks were recorded with both types of modulation.

For analog modulation, a 3 kHz sinewave @ 1.2 Vp-p was connected to Pins 3 and 4 (the analog audio input) of the J4 I/O connector.

The analog audio settings in the control software were set as follows:

- Analog Deviation = 1900 Hz

For Part 22 and Part 90 using Mask D for 9K60F1D, the following digital modulation settings were used:
A 1.2 kHz square wave signal @ 4 Vp-p was connected to Pins 5 and 8 (the digital modulation input) of the J4 I/O connector.

The digital modulation settings in the control software were set as follows:

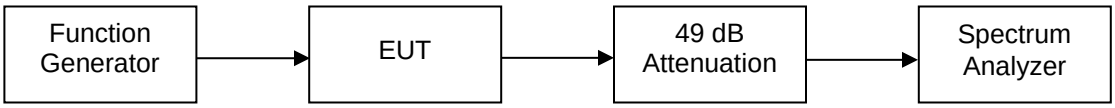
- Deviation = 3000 Hz

For Part 22 using Mask B for 19K6F1D, the following digital modulation settings were used:
A 4.04 kHz square wave signal @ 4 Vp-p was connected to Pins 5 and 8 (the digital modulation input) of the J4 I/O connector.

The digital modulation settings in the control software were set as follows:

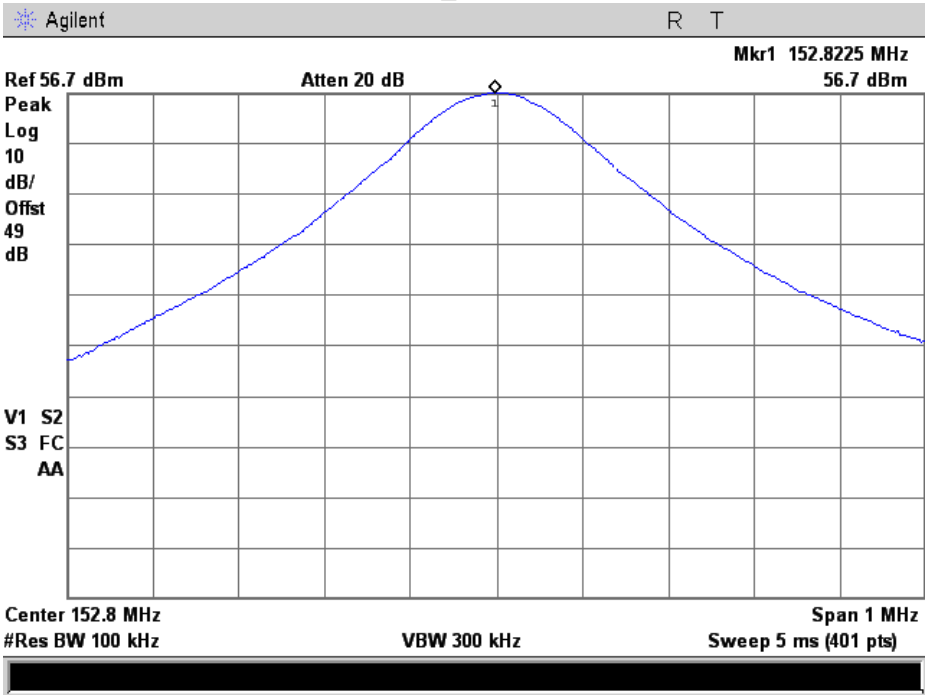
- Deviation = 4800 Hz

Test Setup



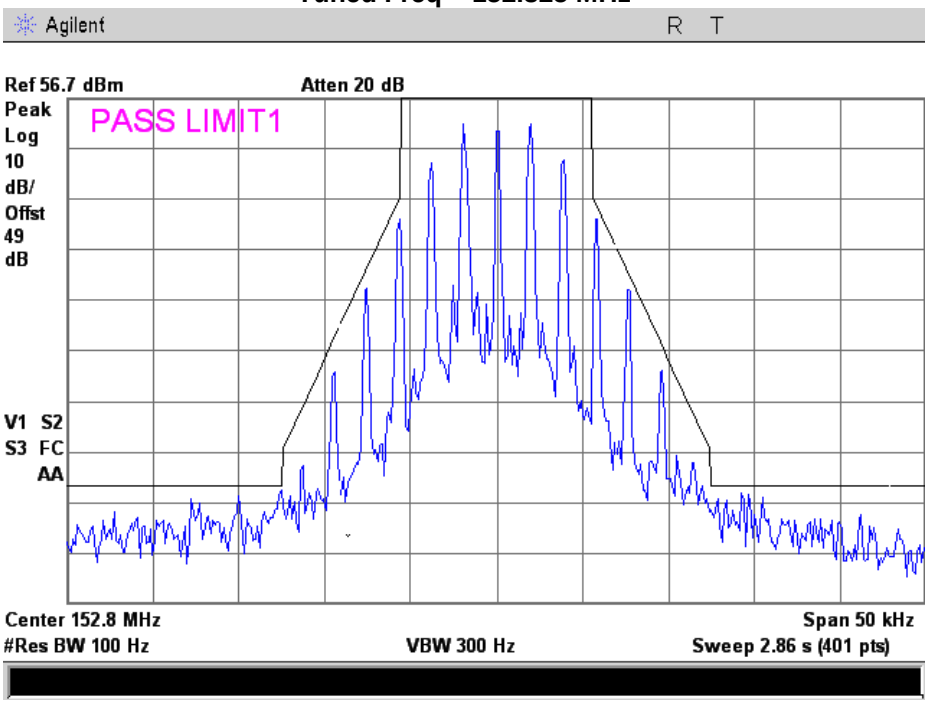
Part 22 Occupied Bandwidth Plots

Reference_152.825 MHz

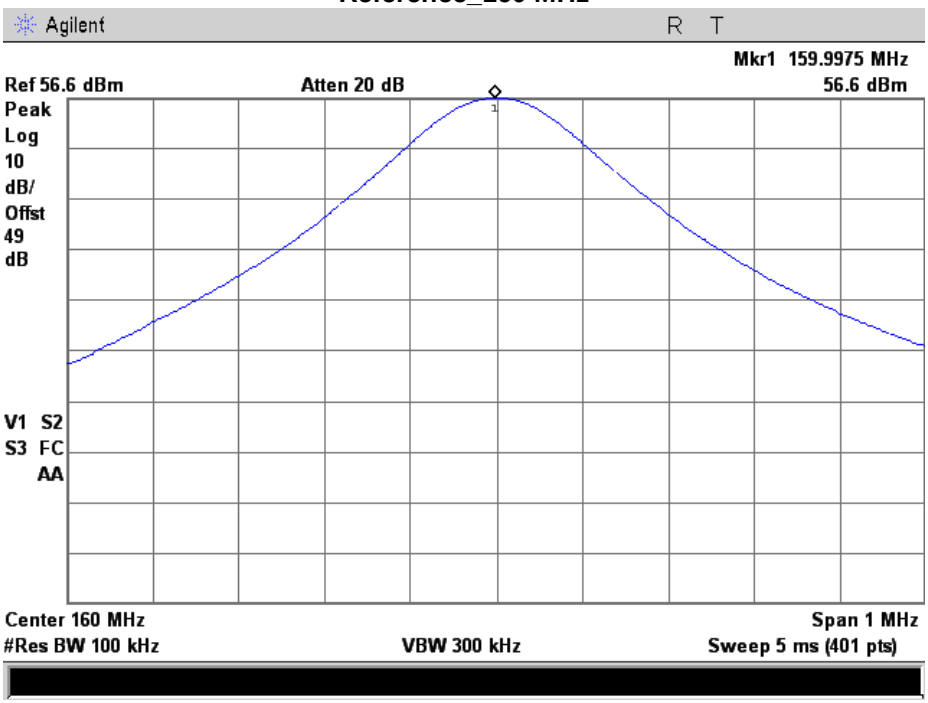


Part 22 Mask D Analog Modulation

Tuned Freq = 152.825 MHz

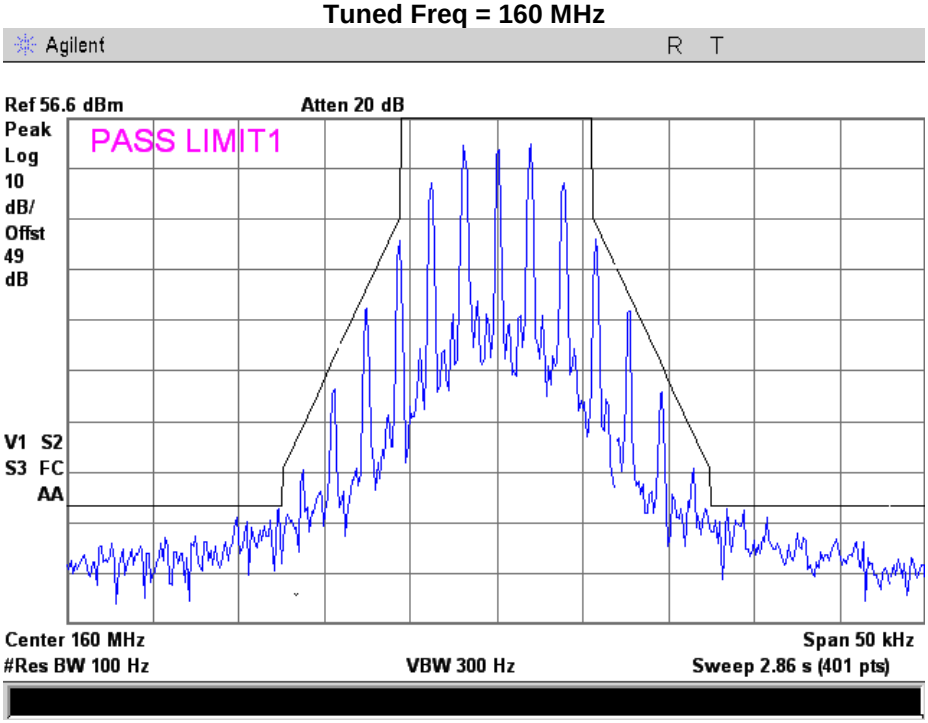


Reference_160 MHz

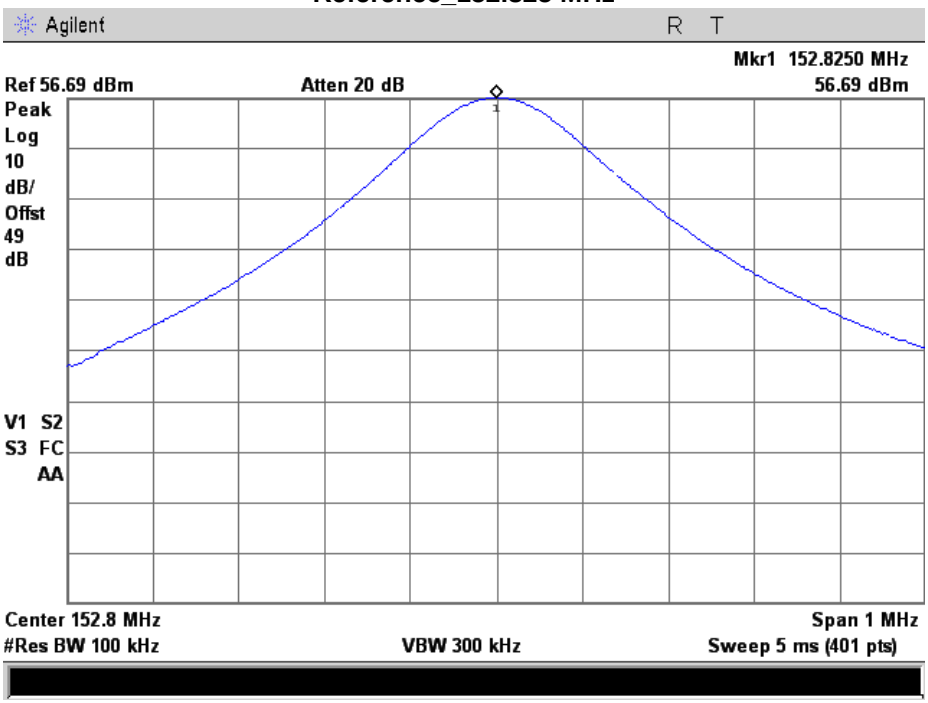


Part 22 Mask D Analog Modulation

Tuned Freq = 160 MHz

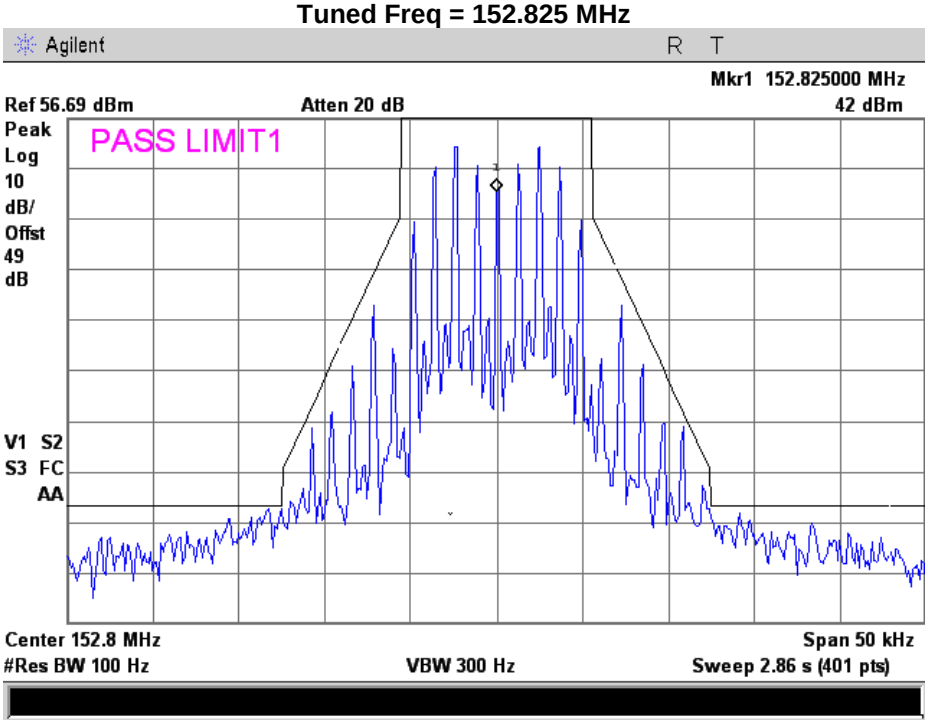


Reference_152.825 MHz



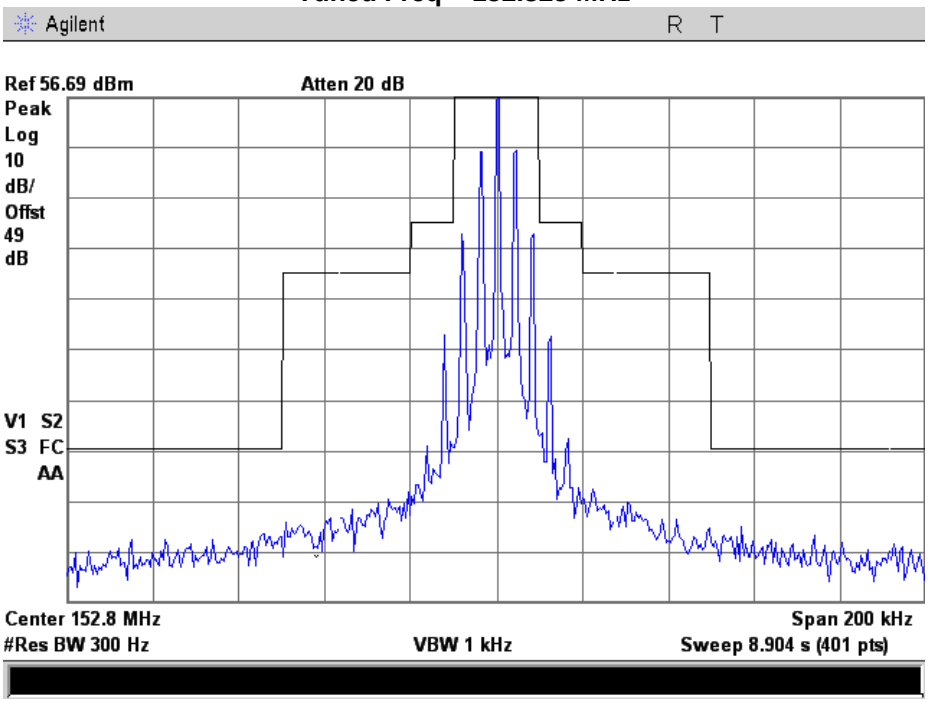
Part 22 Mask D Digital Modulation

Tuned Freq = 152.825 MHz

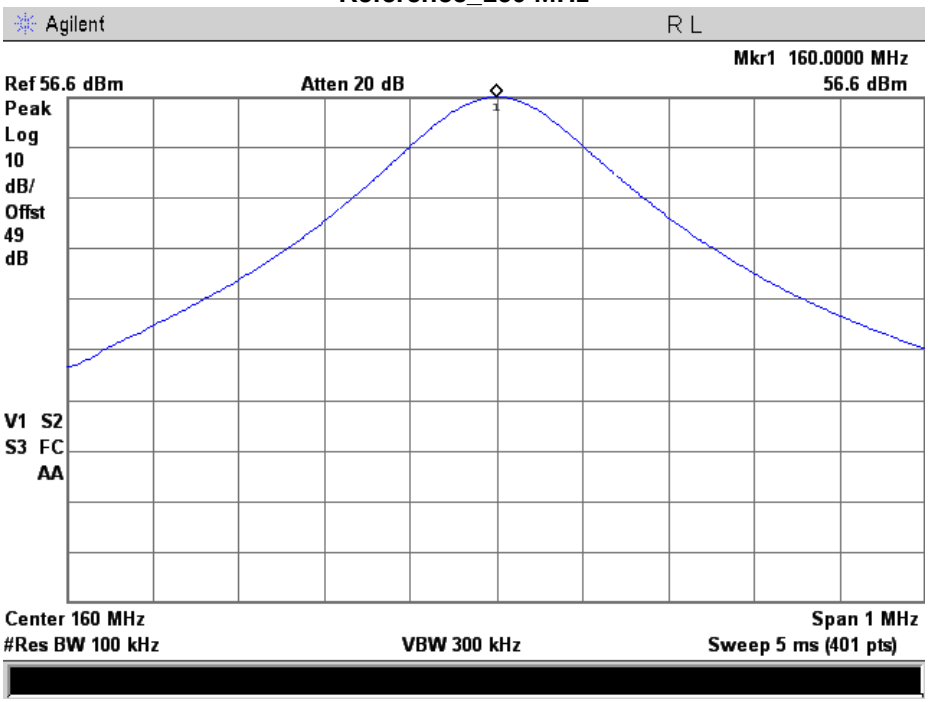


Part 22 Mask B Digital Modulation

Tuned Freq = 152.825 MHz

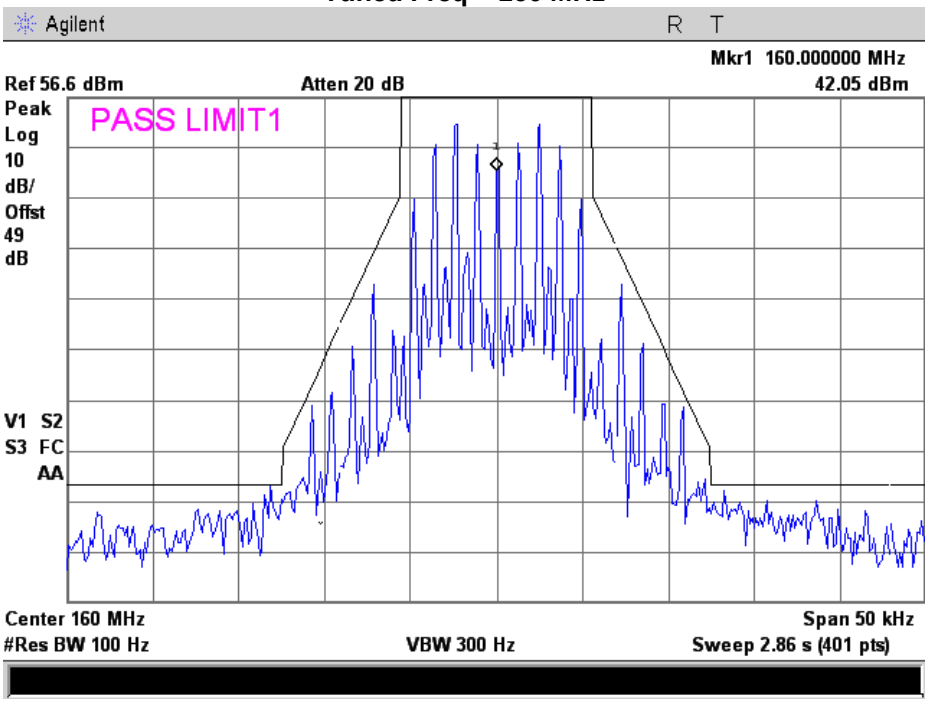


Reference_160 MHz



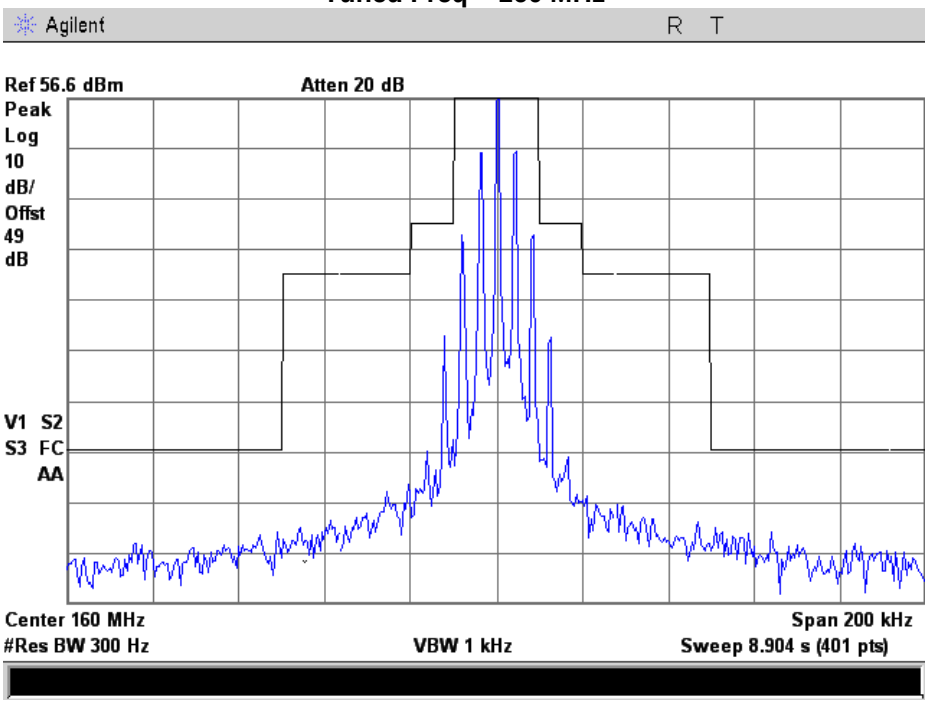
Part 22 Mask D Digital Modulation

Tuned Freq = 160 MHz



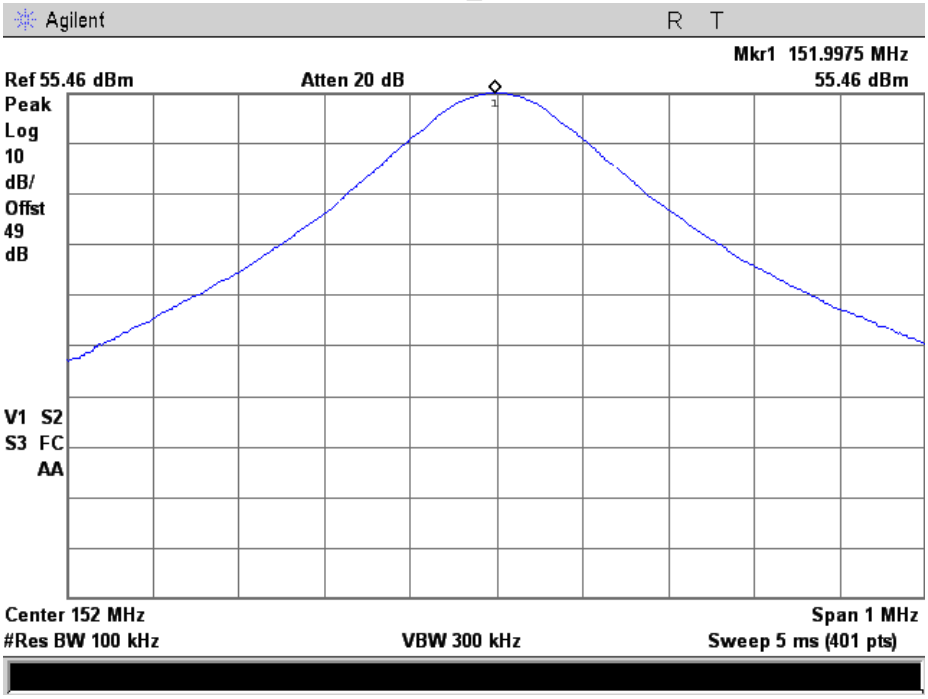
Part 22 Mask B Digital Modulation

Tuned Freq = 160 MHz



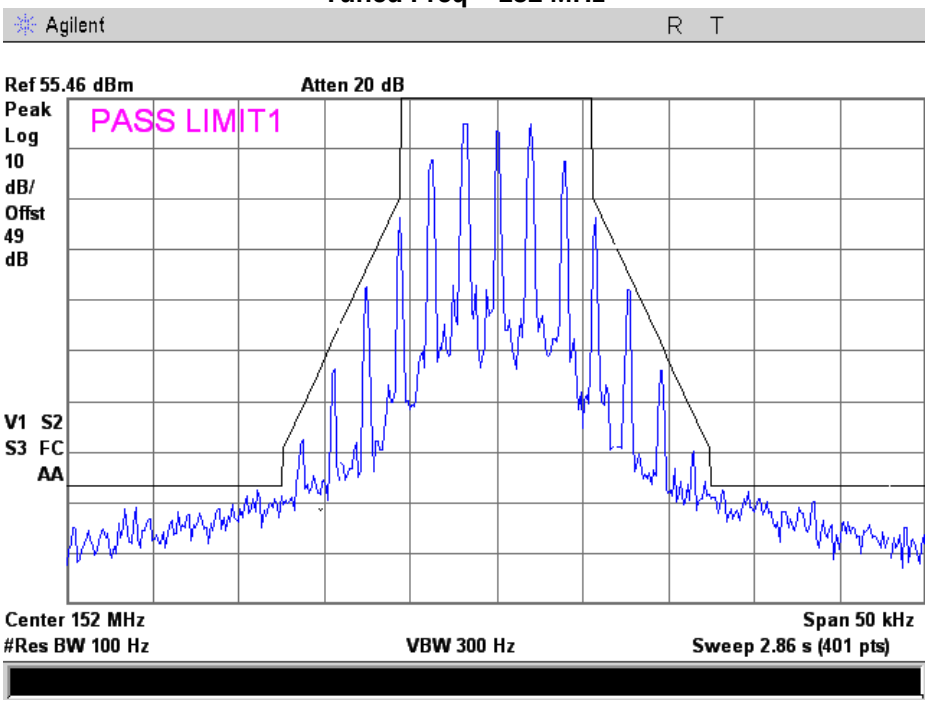
Part 90 Occupied Bandwidth Plots

Reference_152 MHz

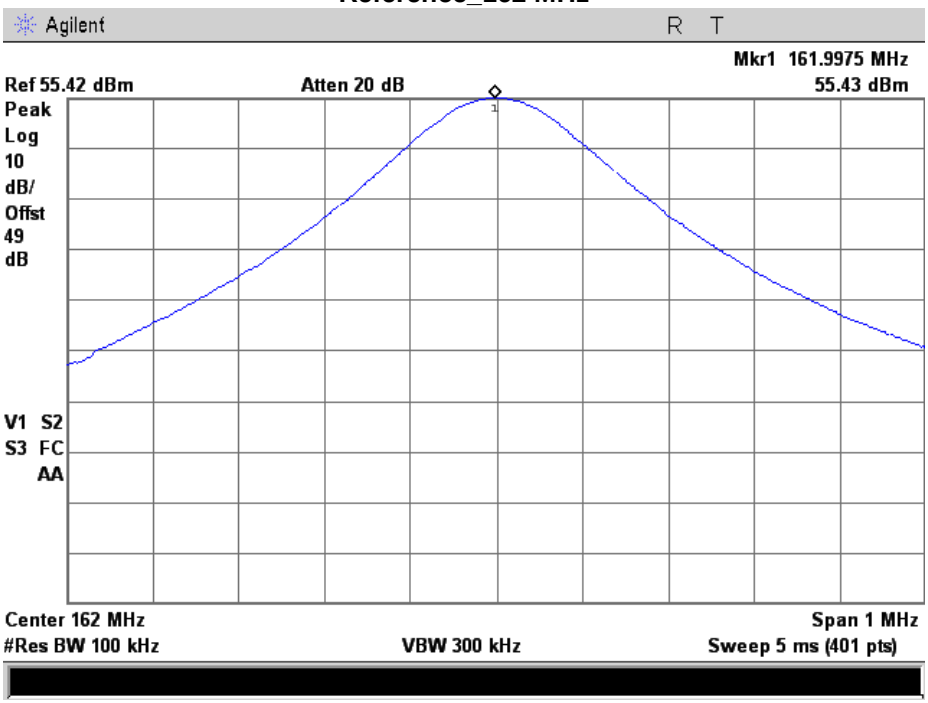


Mask D Analog Modulation

Tuned Freq = 152 MHz

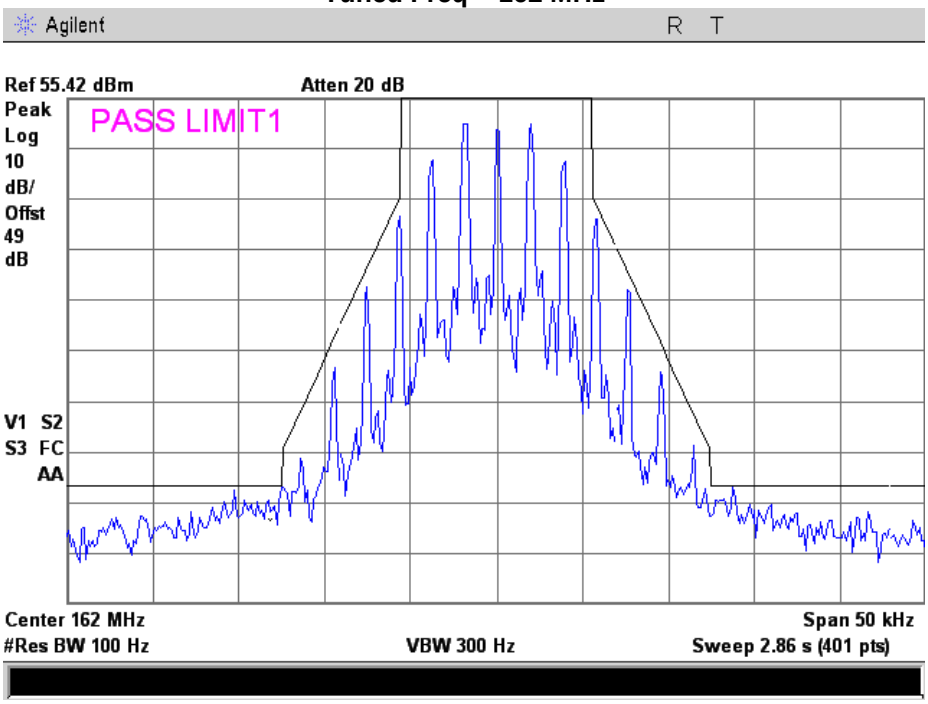


Reference_162 MHz

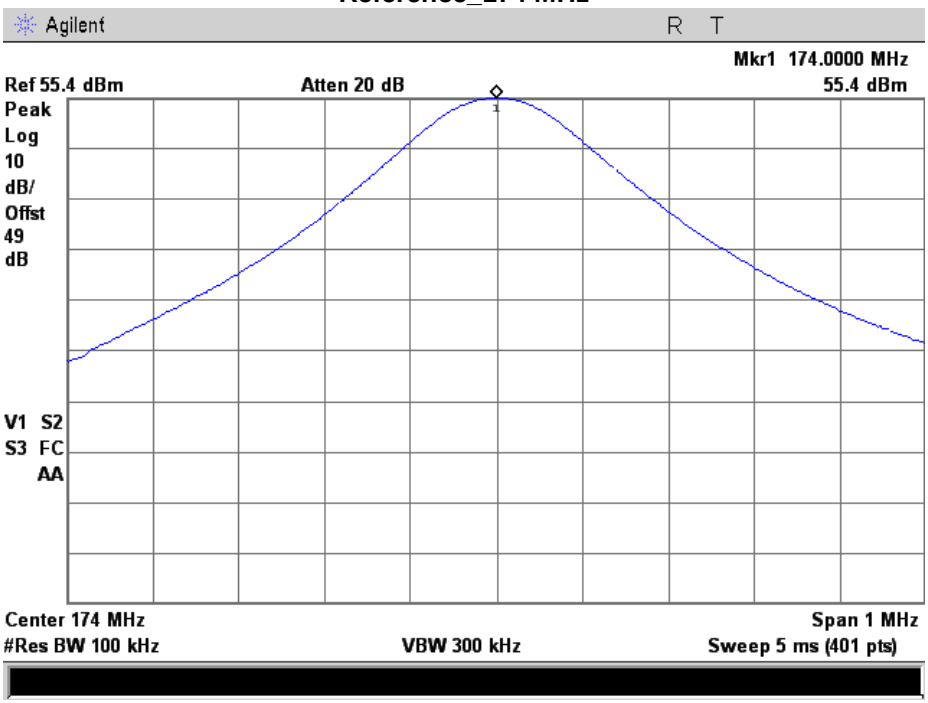


Mask D Analog Modulation

Tuned Freq = 162 MHz

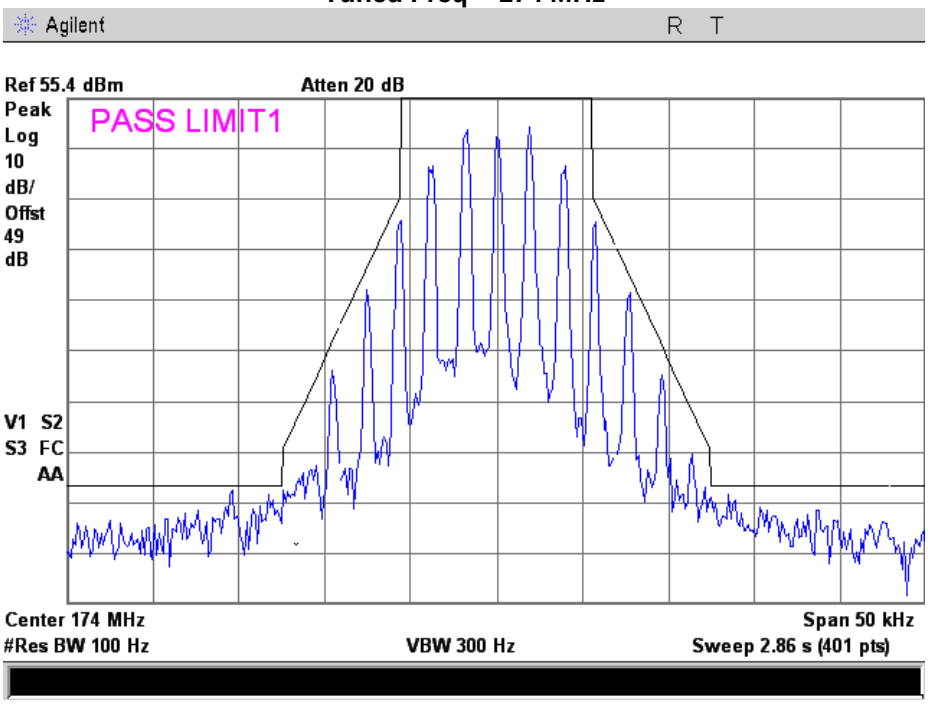


Reference_174 MHz

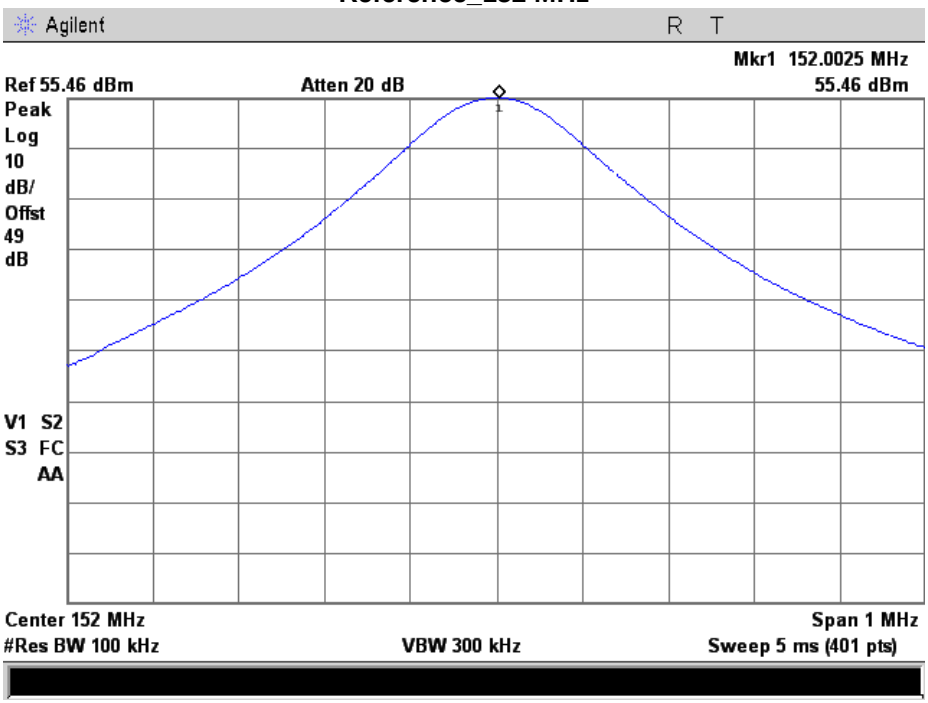


Mask D Analog Modulation

Tuned Freq = 174 MHz

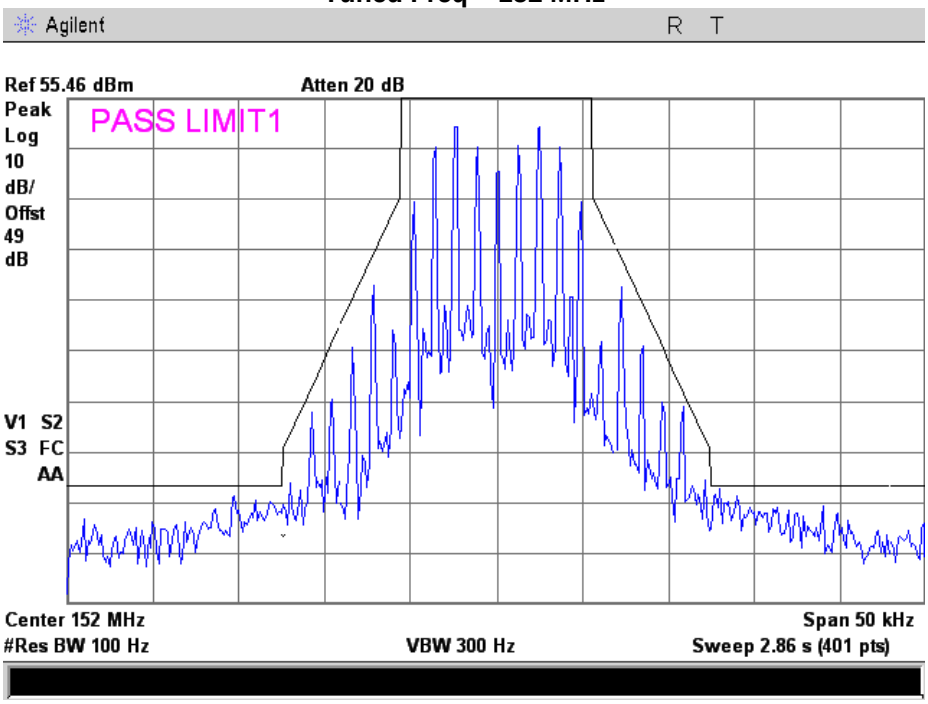


Reference_152 MHz

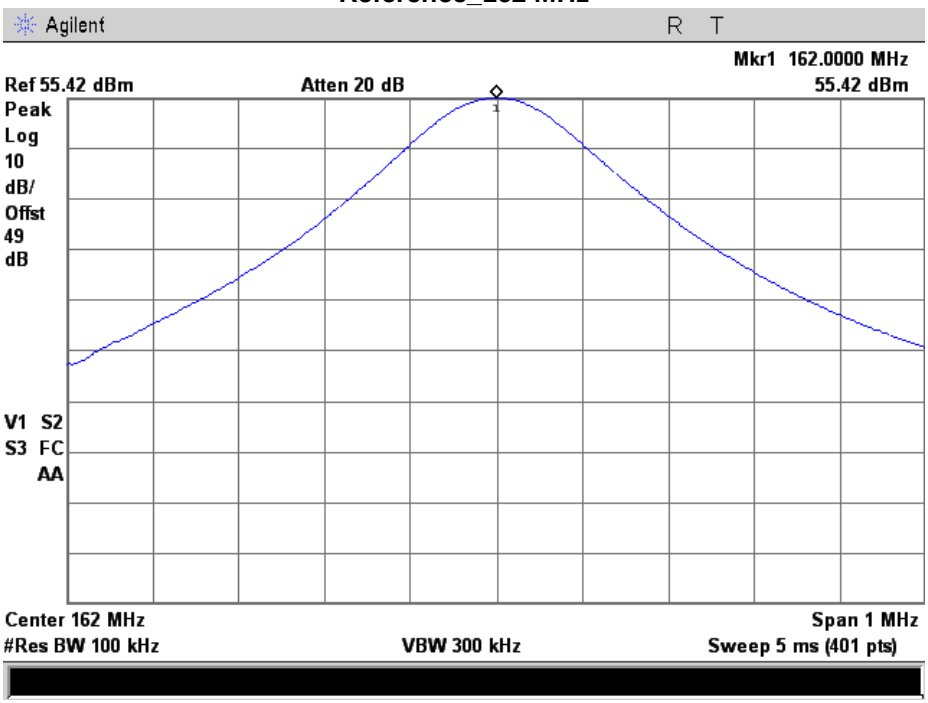


Mask D Digital Modulation

Tuned Freq = 152 MHz

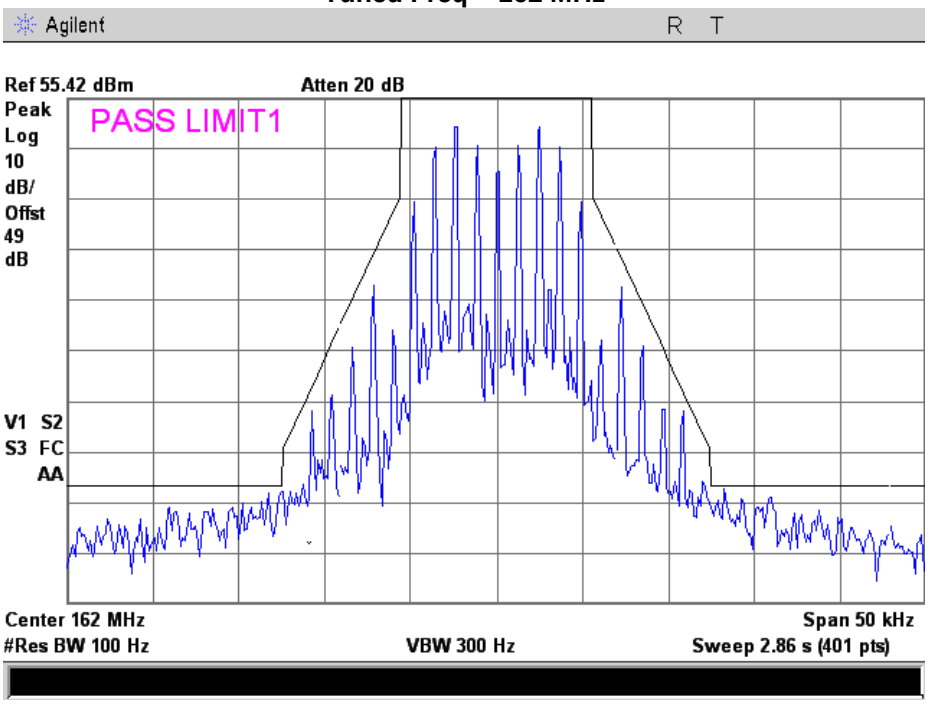


Reference_162 MHz

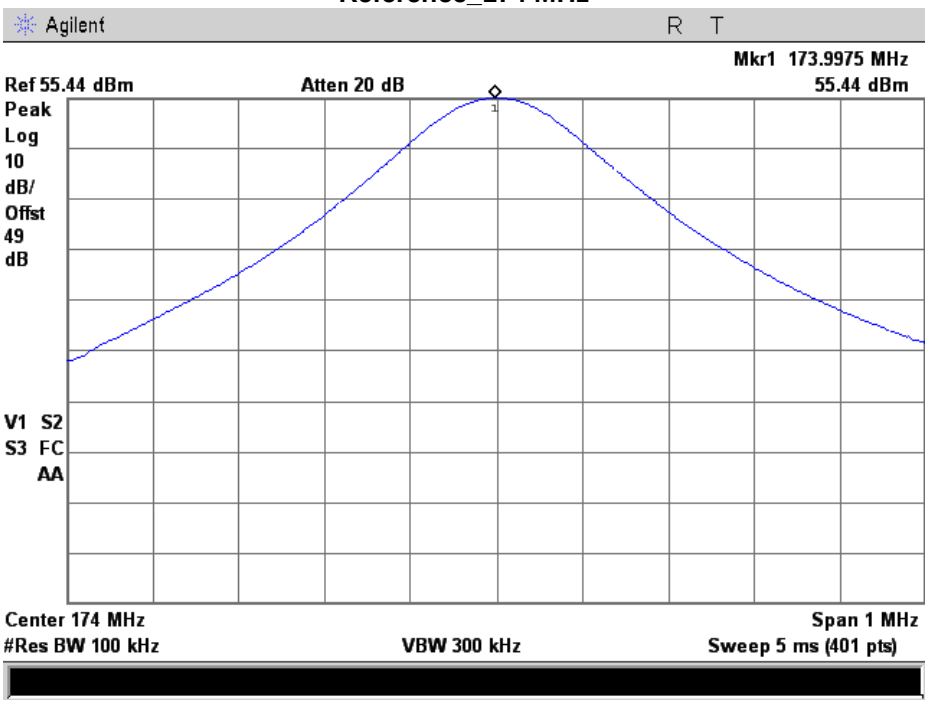


Mask D Digital Modulation

Tuned Freq = 162 MHz

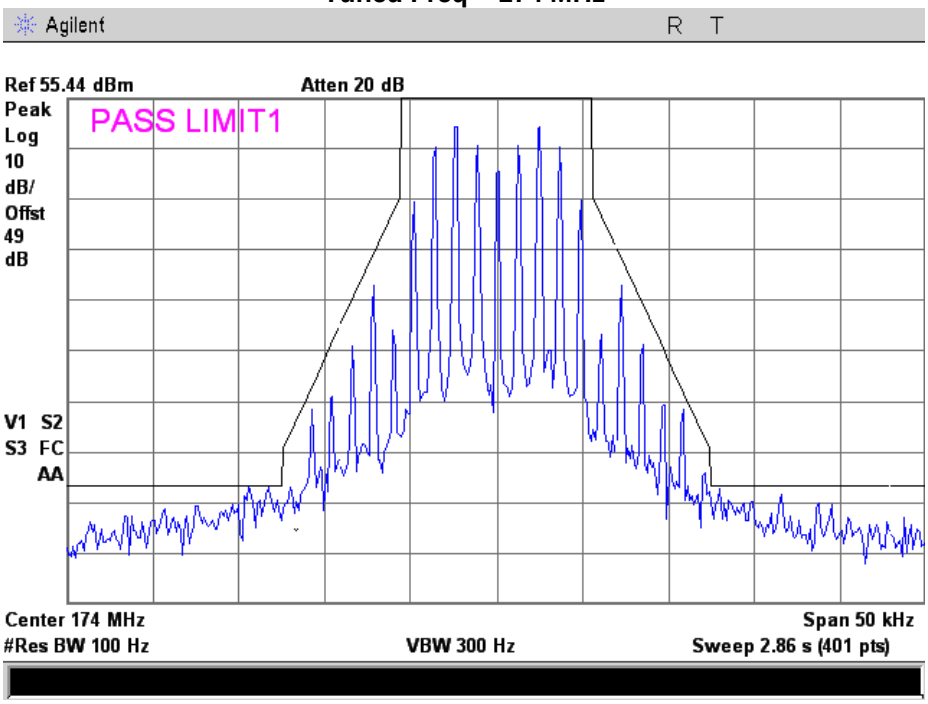


Reference_174 MHz



Mask D Digital Modulation

Tuned Freq = 174 MHz



Necessary Bandwidth Calculations

Name of Test: Necessary Bandwidth Calculations **Engineer:** Greg Corbin
Specification: 2.202 **Test Date:** 2/19/2013

Modulation = 9K80F3E		
Necessary Bandwidth Calculation:		
Maximum Modulation (M), kHz	=	3
Maximum Deviation (D), kHz	=	1.9
Constant Factor (K)	=	1
Necessary Bandwidth (BN), kHz	=	(2xM)+(2xDxK)
	=	9.8

Modulation = 19K60F1D		
Necessary Bandwidth Calculation:		
Data Rate (R) Kbps	=	8.08
Maximum Deviation (D), kHz	=	4.8
Necessary Bandwidth (B_N), kHz	=	2.4D+1.0R
	=	19.6

Modulation = 9K60F1D		
Necessary Bandwidth Calculation:		
Data Rate (R) Kbps	=	2.4
Maximum Deviation (D), kHz	=	3
Necessary Bandwidth (B_N), kHz	=	2.4D+1.0R
	=	9.6

Modulation = 5K60F1D, 5K60F2D		
Necessary Bandwidth Calculation:		
Data Rate (R) Kbps	=	0.5
Maximum Deviation (D), kHz	=	2.125
Necessary Bandwidth (B_N), kHz	=	2.4D+1.0R
	=	5.6

Test Equipment Utilized

Description	Manufacturer	Model Number	CT Asset #	Last Cal Date	Cal Due Date
Function Generator	HP	33120A	i00118	Verified on: 2/19/13	
Tunable Notch Filter	Eagle	TNF-1-(250-850MHz)	i00124	Verified on: 2/19/13	
Attenuator – 30 dB 2000 watt	Bird	8329	i00172	Verified on: 2/19/13	
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	12/4/12	12/4/13
Spectrum Analyzer	Agilent	E4407B	i00331	4/20/12	4/20/13
Attenuator – 9 dB, 2W	Narda	757C	None	Verified on: 2/19/13	
Attenuator – 10 dB, 2W	Narda	779	None	Verified on: 2/19/13	

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT