Engineering Solutions & Electromagnetic Compatibility Services

FCC & IC Certification Report

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Model Number: DM-MV1B
Model Name: XG-25M

FCC ID: OWDTR-0075-E
IC: 3636B-0075

May 22, 2012

Standards Referenced for this Report	
Part 2: 2011	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 80: 2011	Stations in the Maritime Services
Part 90: 2011	Private Land Mobile Radio Services
TIA-EIA-603-C August 2004	Land Mobile FM or PM Communications Equipment – Measurement and Performance Standards
ANSI/TIA/EIA–102.CAAA-2002	Digital C4FM/CQPSK Transceiver Measurement Methods
ANSI/TIA/EIA–102.BAAA–1998	Project 25 FDMA Common Air Interface—New Technology Standards Project—Digital Radio Technical Standards
RSS-119 Issue 11	Land Mobile and Fixed Radio Transmitters and Receivers 27.41 to 960.0 MHz
SRSP-500	Technical Requirements for Land Mobile and Fixed Radio Services Operating in the Bands 138-143.9875 MHz and 148.0125-174 MHz

Report Prepared By: Daniel Baltzell

Document Number: 2012082

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-143.98755.

Frequency Range (MHz)	Rated Conducted Output Power (W)*	Frequency Tolerance (ppm)	Emission Designator
136-150 (Federal) 150-174 (FCC Part 90) 154-173.2 (FCC Part 80) 138-174 (IC)	50.0	2.5	11K0F3E
136-150 (Federal) 150-174 (FCC Part 90) 154-173.2 (FCC Part 80) 138-174 (IC)	50.0	2.5	9K90F1D (2 level NB 9600 FSK)
136-150 (Federal) 150-174 (FCC Part 90) 154-173.2 (FCC Part 80) 138-174 (IC)	50.0	2.5	9K90F1E (2 level NB 9600 FSK)
136-150 (Federal) 150-174 (FCC Part 90) 154-173.2 (FCC Part 80) 138-174 (IC)	50.0	2.5	7K10F1D (2 level NB 4800)
136-150 (Federal) 150-174 (FCC Part 90) 154-173.2 (FCC Part 80) 138-174 (IC)	50.0	2.5	7K10F1E (2 level NB 4800)
136-150 (Federal) 150-174 (FCC Part 90) 154-173.2 (FCC Part 80) 138-174 (IC)	50.0	2.5	8K40F1D (OpenSky/TDMA)
136-150 (Federal) 150-174 (FCC Part 90) 154-173.2 (FCC Part 80) 138-174 (IC)	50.0	2.5	8K40F1E (P25)
154 – 173.2 (FCC Part 80)	50.0	2.5	16K0F3E

** coast station application, 25 W limit for ship stations*

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1 Test Result Summary

Test	FCC Reference	IC Reference	Result
RF Power Output	2.1046(a), 90.205, 80.215	RSS-119 5.4	Complies
Spurious Emissions at Antenna Terminals	2.1046(a), 90.210, 80.211(f)(3)	RSS-119 5.5, 5.8	Complies
Field Strength of Spurious Radiation	2.1053(a), 90.210, 80.211(f)(3)	RSS-119 5.5, 5.8	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 90.210, 80.205, 80.211(f)	RSS-119 5.5, 5.8	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 90.213	RSS-119 5.3	Complies
Modulation Characteristics	2.1047(a)(b)	N/A	Complies
Transient Frequency Response	90.214, 80.213	RSS-119 5.9	Complies

2 General Information

The following Type Certification Report is prepared on behalf of **Harris Corporation** in accordance with the Federal Communications Commission and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was Model # DM-MV1B, Model Name XG-25M, a 50 Watt mobile radio; FCC ID: OWDTR-0075-E, IC: 3636B-0075.

The radio is subject to FCC DoC due to the optional data connection through a data port. DoC testing was performed for the aforementioned accessories and configurations, and the data is contained in a separate DoC report.

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47 Parts 2 and 90, and Industry Canada RSS-119. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

2.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report submitted to, and approved by, the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

2.2 Related Submittal(s)/Grant(s)

This is a new certification application for FCC and Industry Canada.

2.3 Grant Notes

Power is continuously variable from 10 - 50 W. The grant listed power is rated power and actual measured power is shown in the test report. For Part 80 maritime operation, 50 W operation limited to fixed/coast stations; when used as a ship station, conducted power must not exceed 25 W.

2.4 Tested System Details

The test sample was received on April 18, 2012. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable. The device was programmed for multiple modes of operation and modulation types.

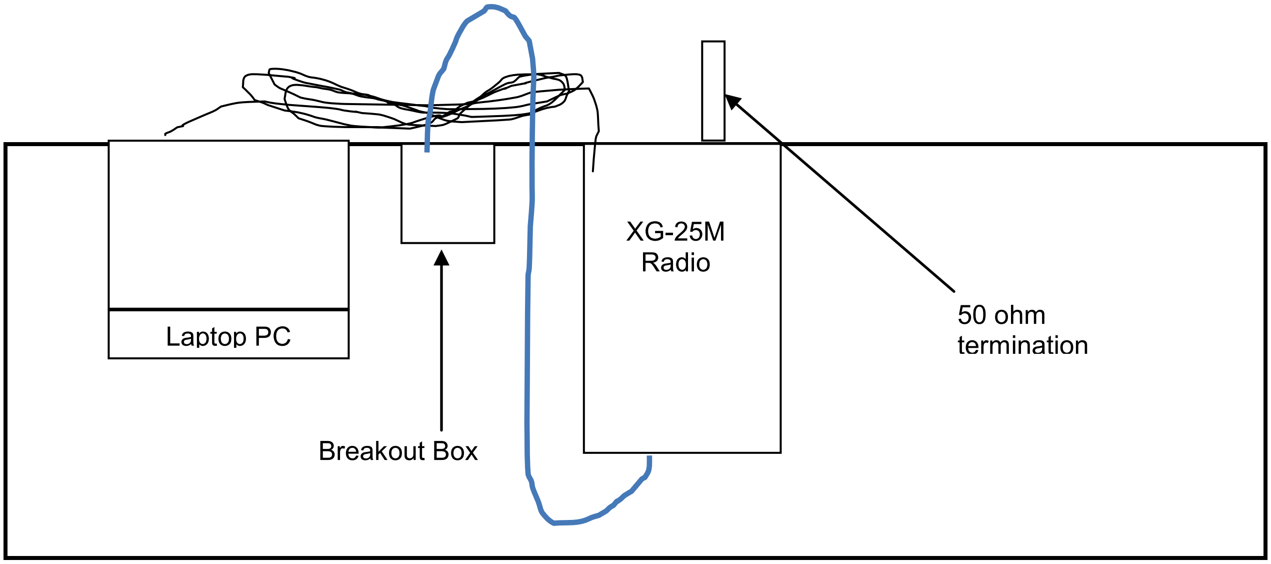
Table 2-1: Equipment Under Test (EUT)

Part	Manufacturer	Model #	Part Number	FCC ID	RTL Bar Code
XG-25M 50 W MobileRadio	Harris Corporation	DM-MV1B	14015-0010	OWDTR-0075-E	20608

Table 2-2: Auxiliary Equipment

Part	Manufacturer	Model	Part Number	FCC ID	RTL Bar Code
Breakout Box	Harris Corporation	N/A	N/A	N/A	20607
Attenuator with termination	Weinschel Corp.	48-20-34	BK5859	N/A	901139
Laptop	Sony	PCG-71314L	N/A	N/A	N/A

Figure 2-1: Configuration of Tested System



3 FCC Rules and Regulations Part 2.1033(C)(8) Voltages and Currents Through The Final Amplifying Stage

13.8 VDC / 3.64A

4 FCC Rules and Regulations Part 2.1046(a): RF Power Output: Conducted, Part 90.205 Transmitting Power Limits; Part 80.215: Transmitter Power; RSS-119 5.4: Transmitter Output Power

4.1 Test Procedure

ANSI/TIA/EIA-603-2002, section 2.2.1

The EUT was connected to a coaxial attenuator having a 50 Ω load impedance.

§80.215 Transmitter Power

(a) Transmitter power shown on the radio station authorization is the maximum power the licensee is authorized to use. Power is expressed in the following terms:

(5) For all other emissions: the carrier power multiplied by 1.67.

(e) Ship stations frequencies above 27500 kHz, the maximum power must not exceed the values listed below:

(1) Ship stations 156–162 MHz: 25 W
(2) Marine utility stations and hand-held portable transmitters: 156–162 MHz: 10 W

Maximum Power Authorized to Use: 10.02 W for VHF, 8.35 W for UHF

Manufacturer's Rated Power: 50.0 W

4.2 Test Data

Table 4-1: RF Conducted Output Power - Measured

Frequency (MHz)	High Power (dBm)	High Power (W)	Low Power (dBm)	Low Power (W)
136.0125 (Federal)	47.3	53.7	40.4	11.0
138.0125 (IC)	47.3	53.7	40.3	10.7
141.0000 (IC)	47.4	55.0	40.3	10.7
143.9875 (IC)	47.3	53.7	40.4	11.0
148.0125 (IC)	47.3	53.7	40.4	11.0
150.0125 (FCC)	47.3	53.7	40.3	10.7
154.0250 (FCC)	47.3	53.7	40.3	10.7
162.0000 (FCC/IC)	47.3	53.7	40.3	10.7
173.1750 (FCC)	47.2	52.5	40.3	10.7
173.9875 (FCC/IC)	47.3	53.7	40.4	11.0

Notes: Data presented is for analog mode. All other modes were investigated and found to have equivalent power within measurement tolerances.

Table 4-2: Test Equipment Used For Testing RF Power Output - Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz - 26.5 GHz)	MY51250846	3/13/13
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	10/14/12

Test Personnel:

Daniel Baltzell		April 20, 2012
EMC Test Engineer	Signature	Date of Test

5 FCC Rules and Regulations Part 2.1051: Spurious Emissions at Antenna Terminals; Part 90.210: Emission Limitations; Part 80.217: Suppression of Interference Aboard Ships; RSS-119 5.8: Transmitter Unwanted Emissions

5.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.13

The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer.

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence – 19,200 bps for OTP and 9,600 bps for P25 modes.

§80.217 Suppression of Interference Aboard Ships

(a) A voluntarily-equipped ship station receiver must not cause harmful interference to any receiver required by statute or treaty.
(b) The electromagnetic field from receivers required by statute or treaty must not exceed the following value at a distance over sea water of one nautical mile from the receiver:

Frequency of Interfering Emissions	Power to Artificial Antenna in Microwatts
Below 30 MHz 30 to 100 MHz 100 to 300 MHz Over 300 MHz	0.1 3.0 1.0 3.0

Or, deliver not more than the following amounts of power, to an artificial antenna having electrical characteristics equivalent to those of the average receiving antenna(s) use on shipboard:

Frequency of Interfering Emissions	Power to Artificial Antenna in Microwatts
Below 30 MHz 30 to 100 MHz 100 to 300 MHz Over 300 MHz	400 (4 dBm) 4,000 (6 dBm) 40,000 (16 dBm) 400,000 (26 dBm)

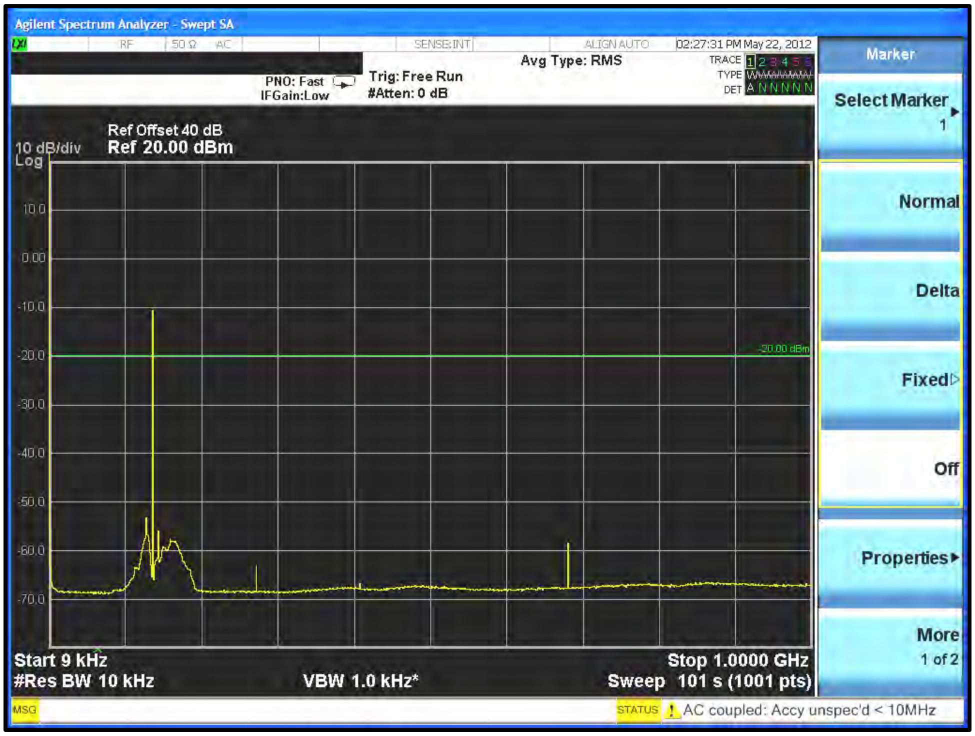
5.2 Test Data

Frequency range of measurement per Part 2.1057: 9 kHz to 10 x Fc

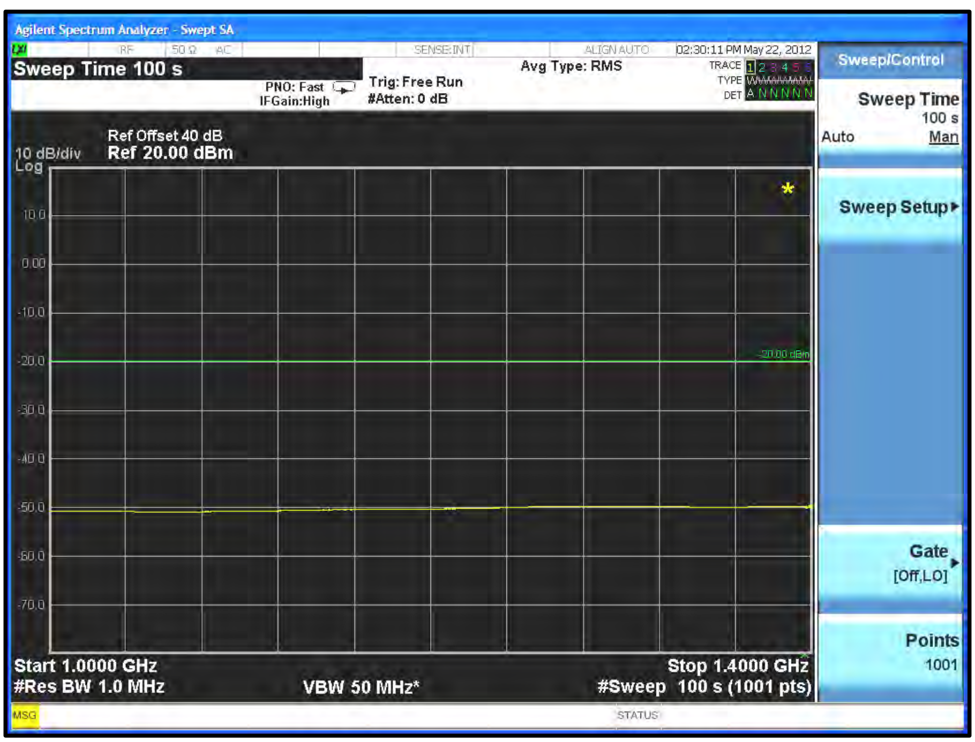
Limits: (50 + 10 LOG P(W))

The following channels (MHz) were investigated: 136.0125 (Federal), 138.0125 (IC), 141.0000 (IC), 143.9875 (IC), 148.0125 (IC), 150.0125 (FCC), 154.0125 (FCC), 162.0000 (FCC/IC), 173.1875 (FCC), 173.9875 (FCC/IC). Both high and low power settings were checked; high power was found to be worst case. All modes were investigated, and analog mode is presented as representative data. No levels were found to be within 20 dB of the limit.

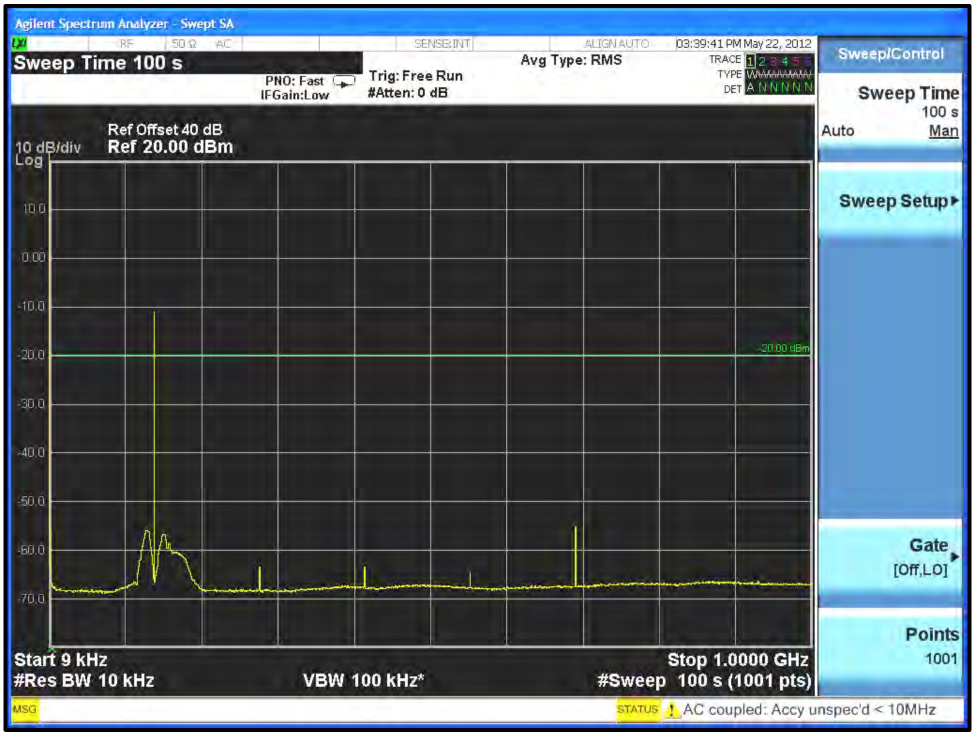
Plot 5-1: Conducted Spurious - 136.0125 MHz; Analog High Power; 9 kHz – 1 GHz



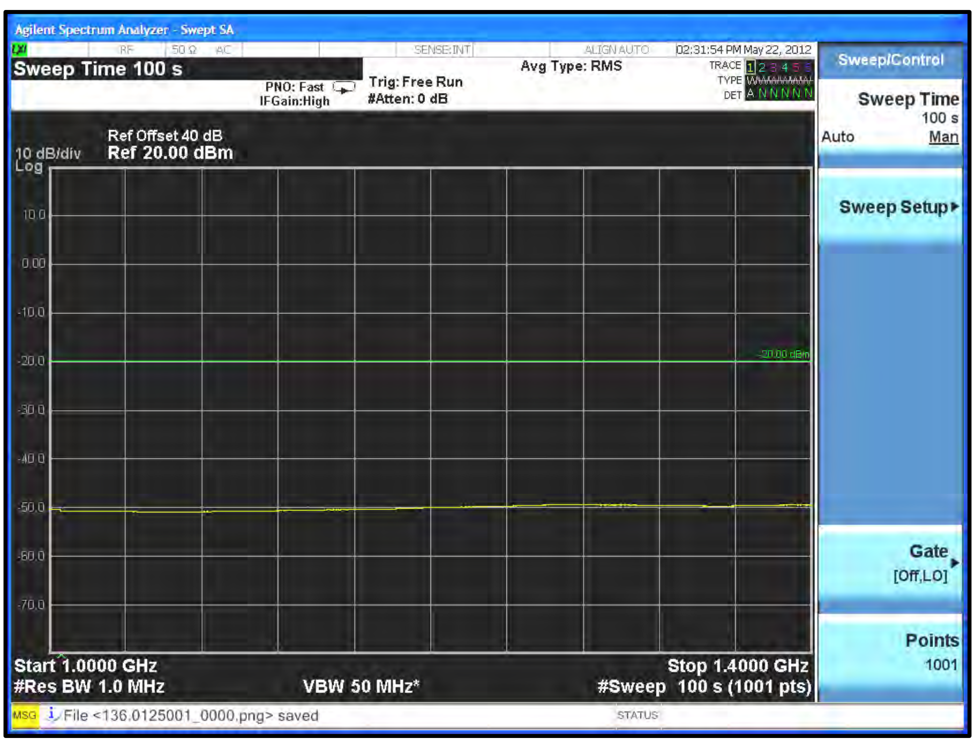
Plot 5-2: Conducted Spurious - 136.0125 MHz; Analog High Power; 1 GHz – 1.4 GHz



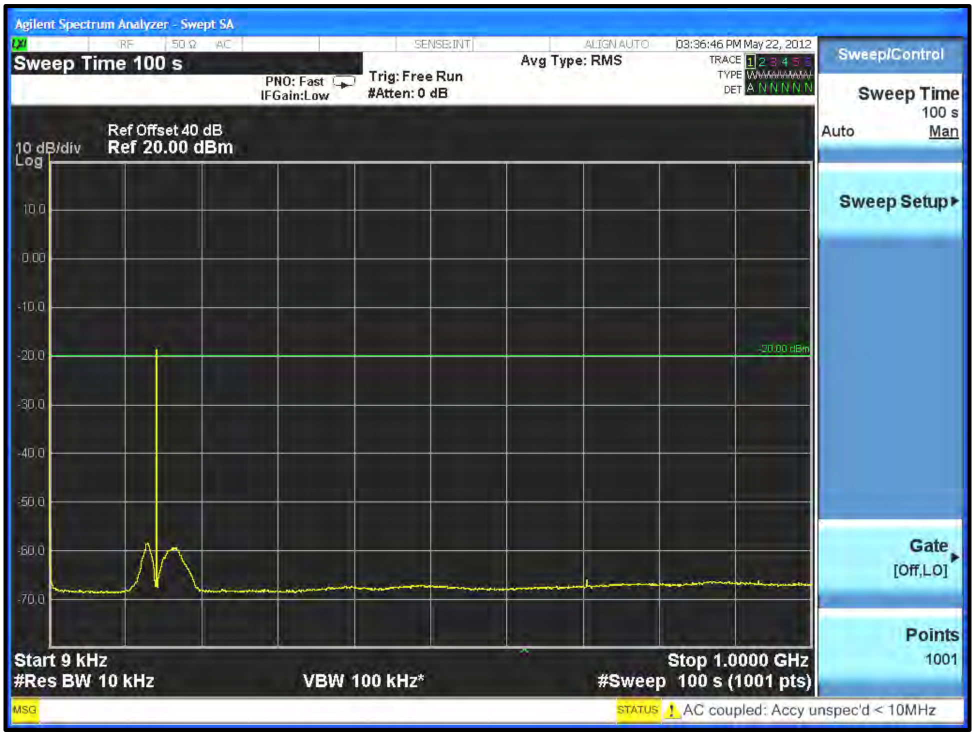
Plot 5-3: Conducted Spurious – 138.0125 MHz; Analog High Power; 9 kHz – 1 GHz



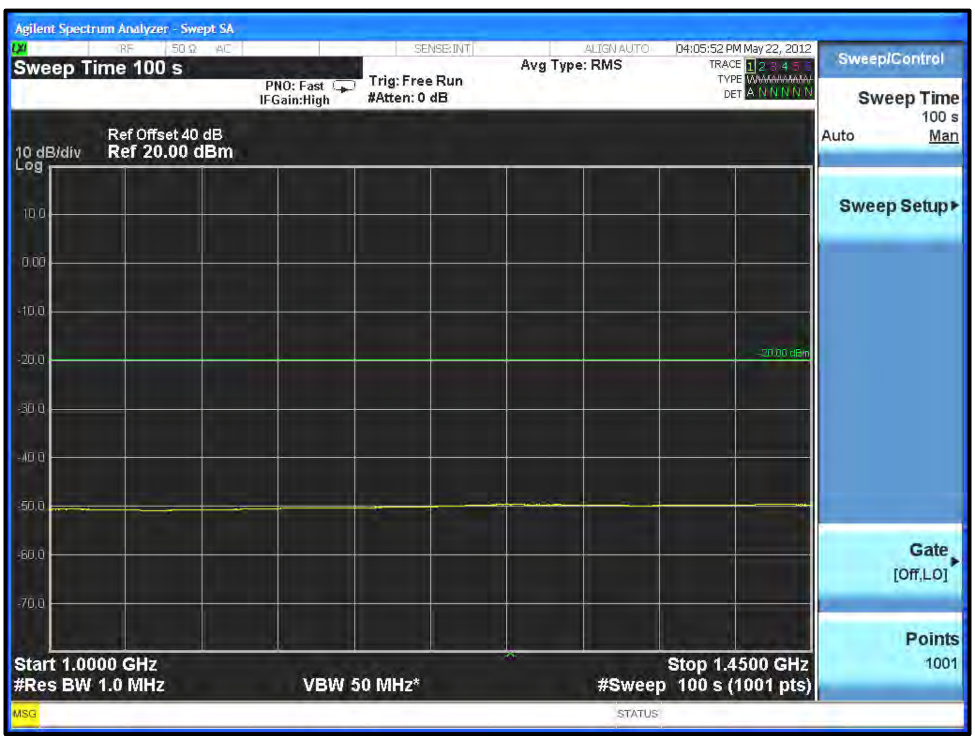
Plot 5-4: Conducted Spurious – 138.0125 MHz; Analog High Power; 1 GHz – 1.4 GHz



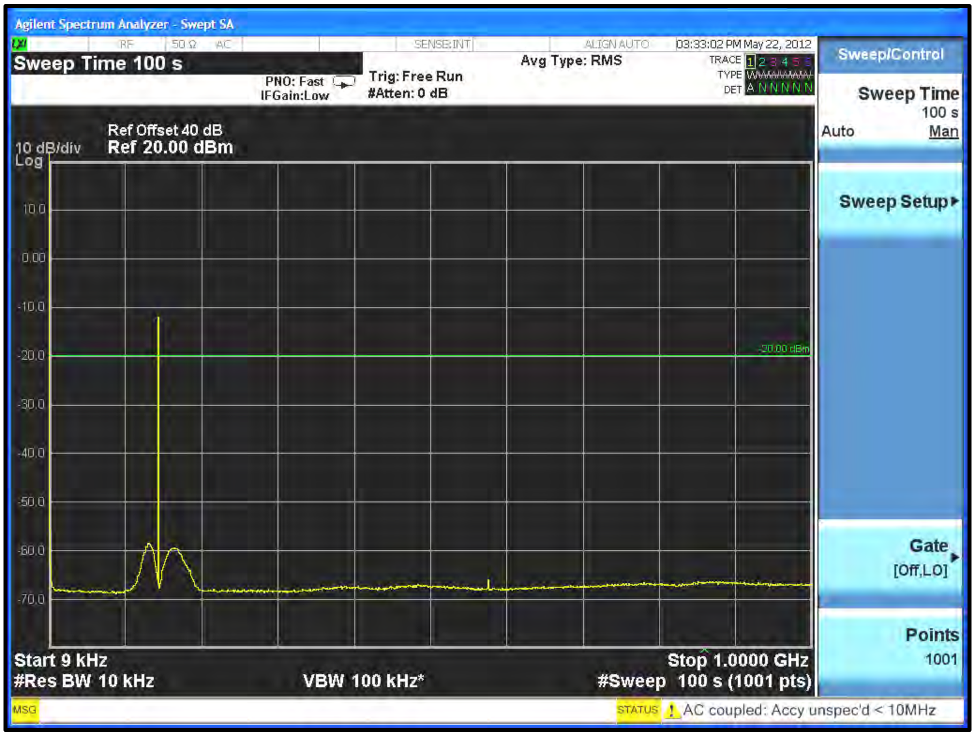
Plot 5-5: Conducted Spurious – 141.0000 MHz; Analog High Power; 9 kHz – 1 GHz



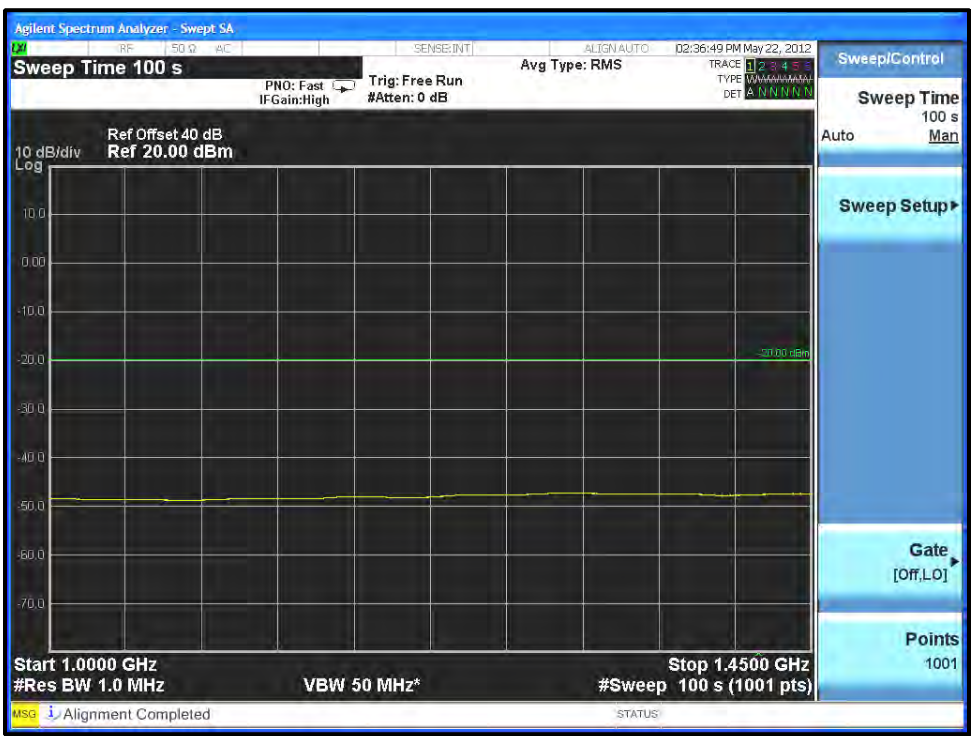
Plot 5-6: Conducted Spurious – 141.0000 MHz; Analog High Power; 1 GHz – 1.45 GHz



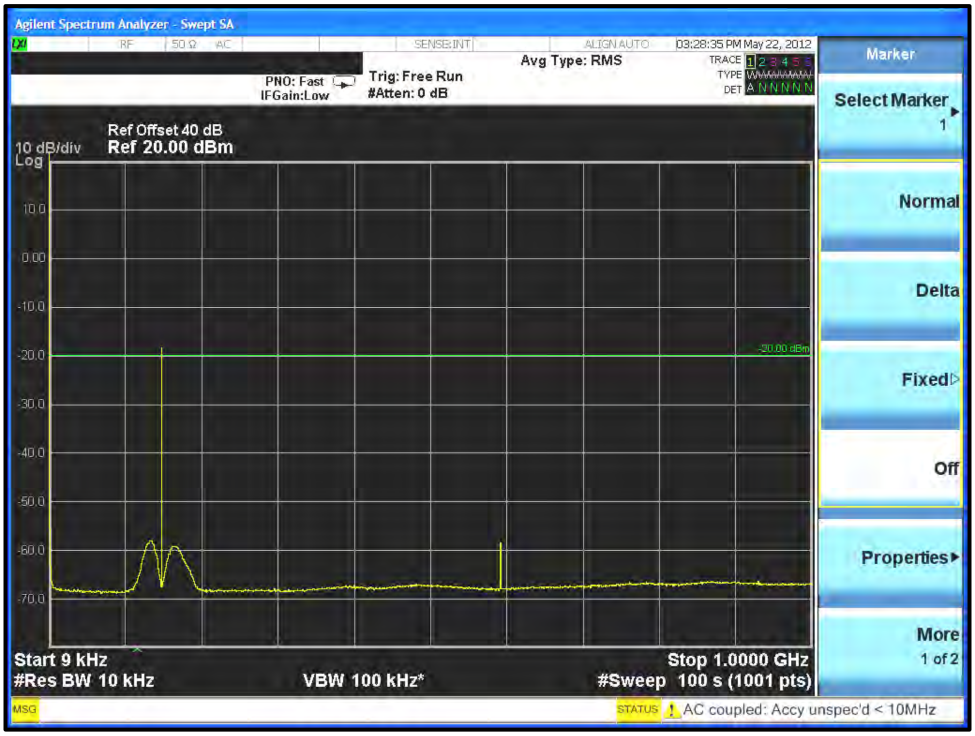
Plot 5-7: Conducted Spurious – 143.9875 MHz; Analog High Power; 9 kHz – 1 GHz



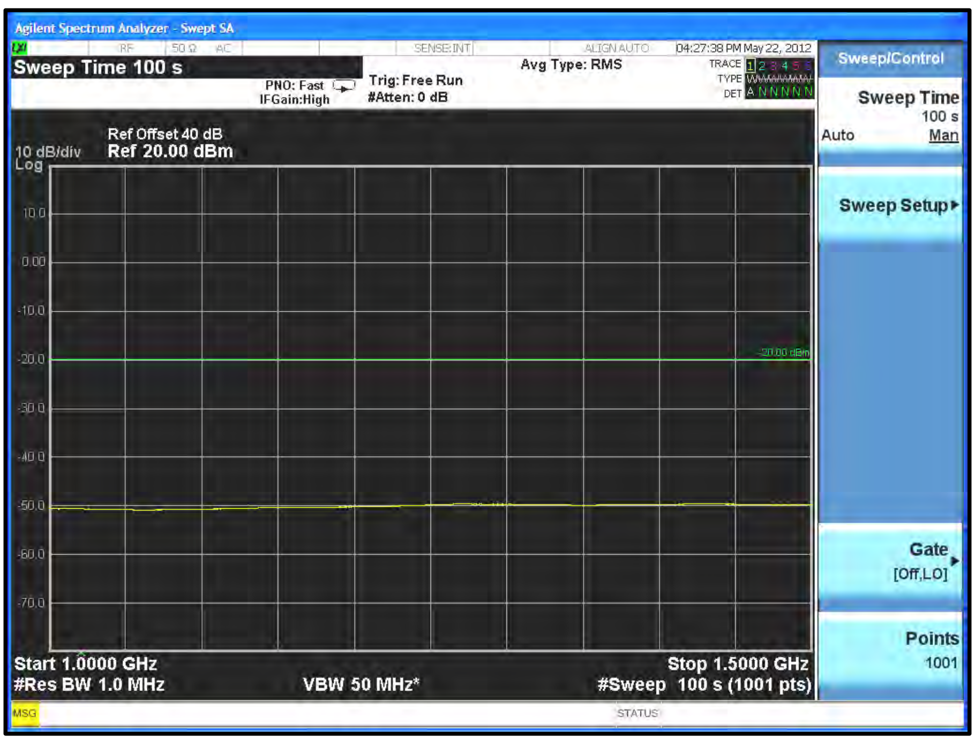
Plot 5-8: Conducted Spurious – 143.9875 MHz; Analog High Power; 1 GHz – 1.45 GHz



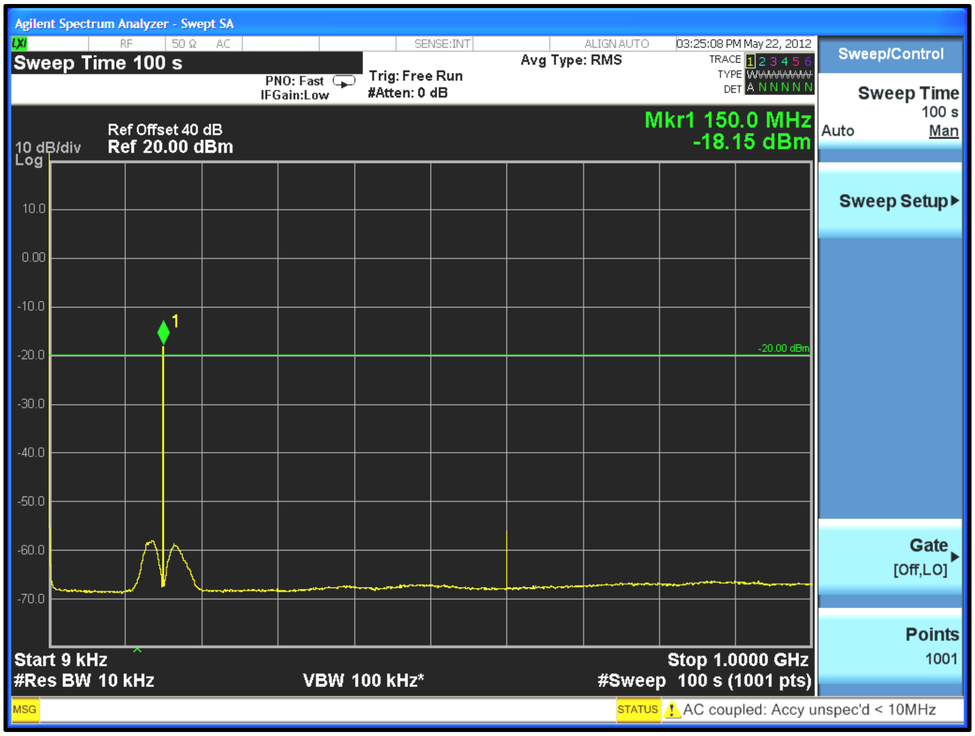
Plot 5-9: Conducted Spurious – 148.0125 MHz; Analog High Power; 9 kHz – 1 GHz



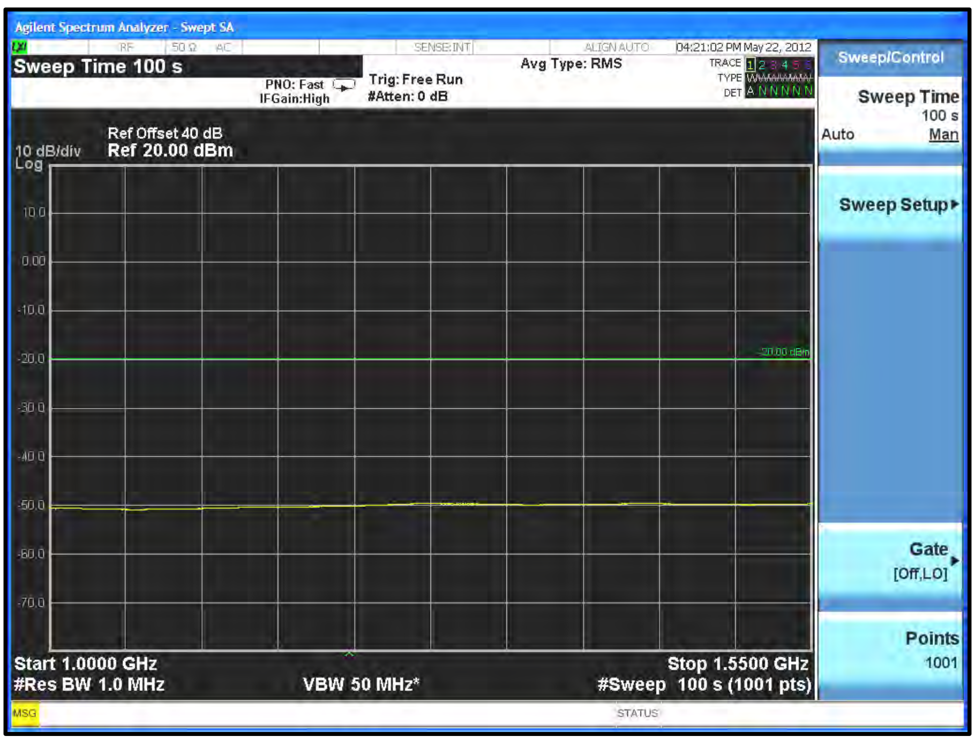
Plot 5-10: Conducted Spurious – 148.0125 MHz; Analog High Power; 1 GHz – 1.5 GHz



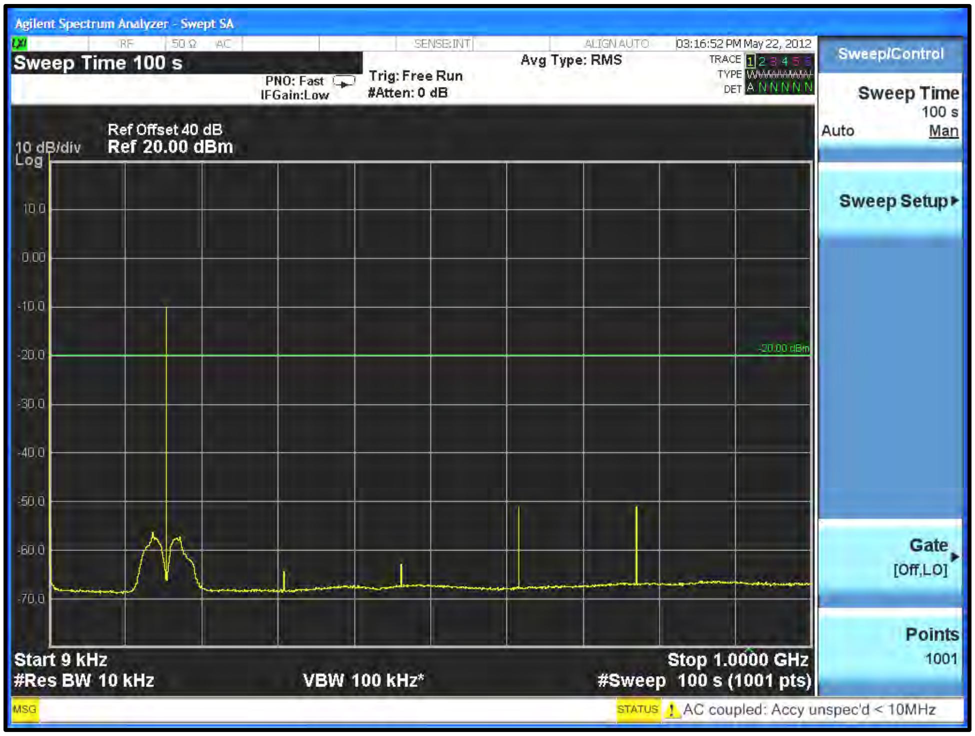
Plot 5-11: Conducted Spurious – 150.0125 MHz; Analog High Power; 9 kHz – 1 GHz



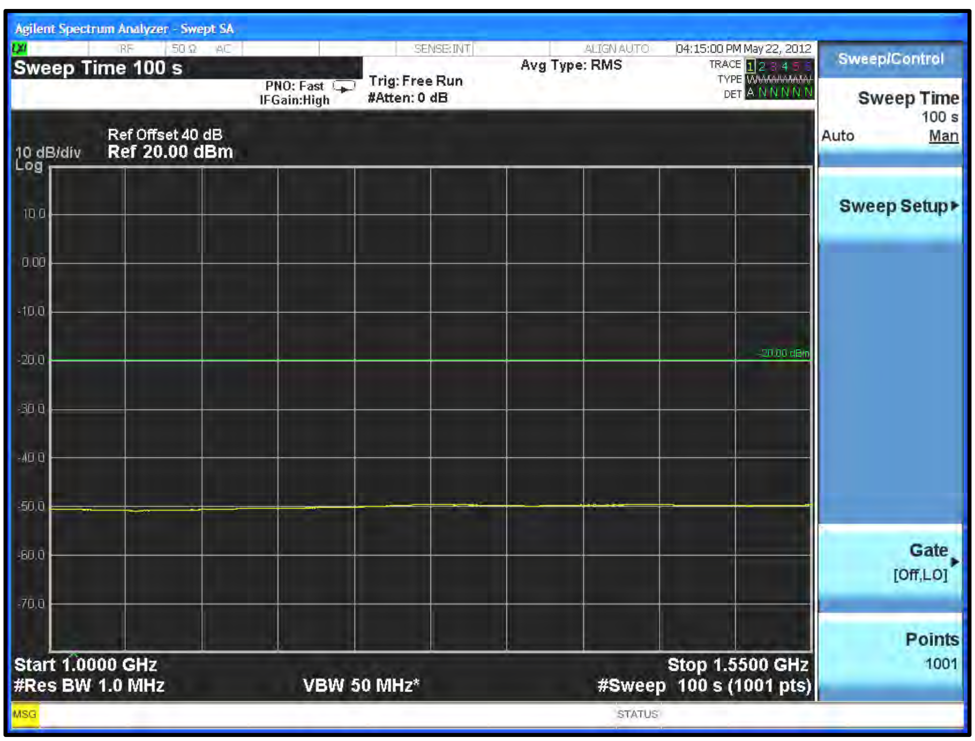
Plot 5-12: Conducted Spurious – 150.0125 MHz; Analog High Power; 1 GHz – 1.55 GHz



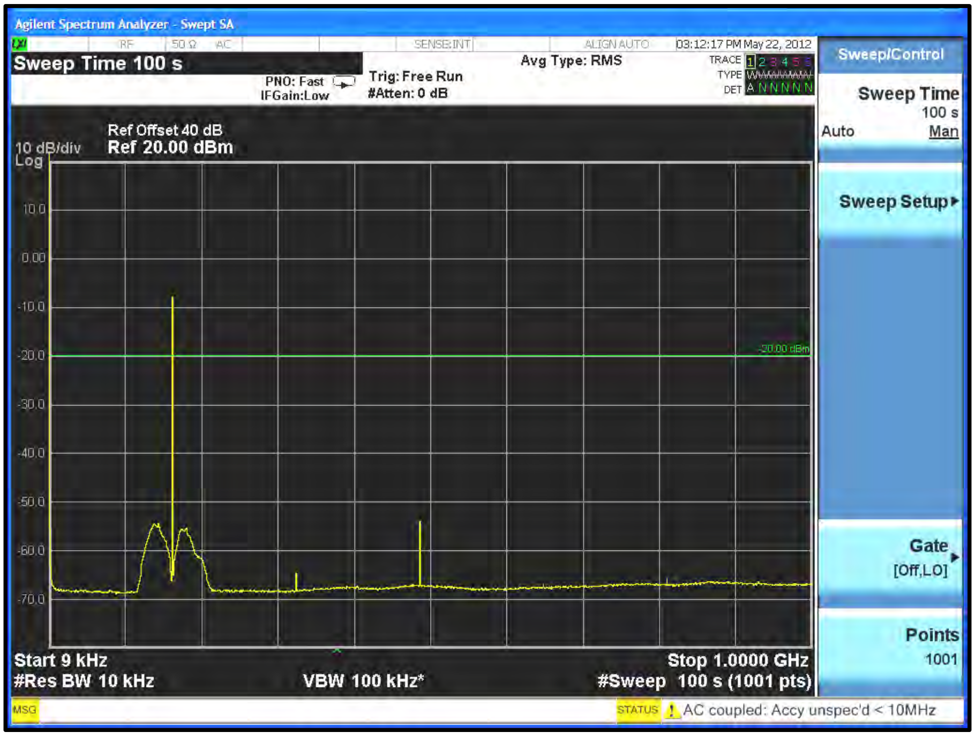
Plot 5-13: Conducted Spurious – 154.0250 MHz; Analog High Power; 9 kHz – 1 GHz



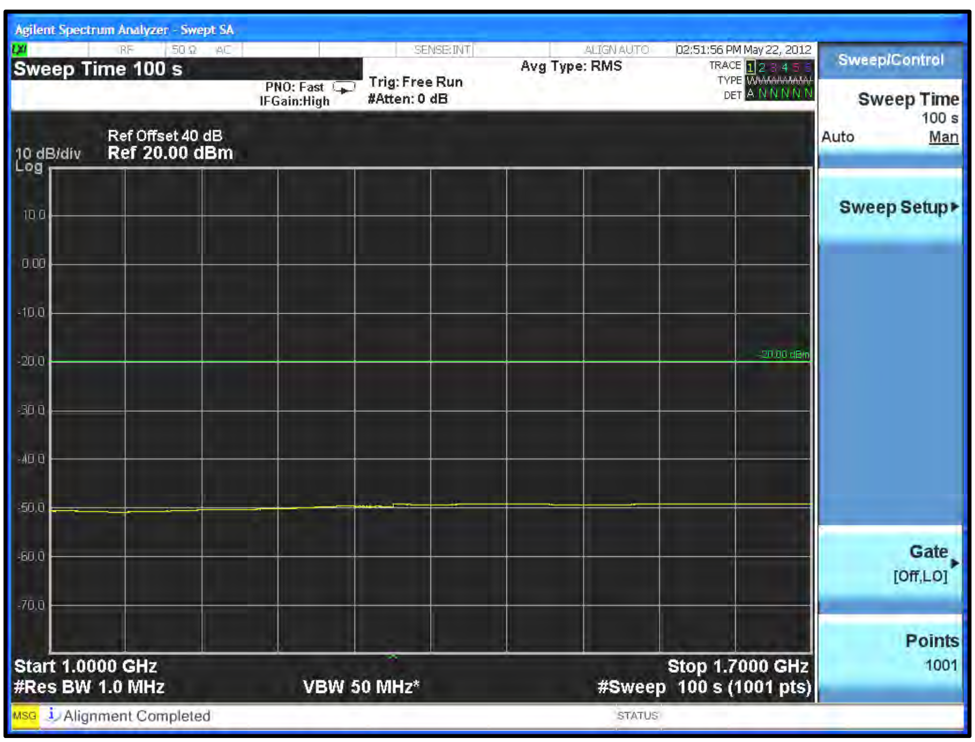
Plot 5-14: Conducted Spurious – 154.0250 MHz; Analog High Power; 1 GHz – 1.55 GHz



Plot 5-15: Conducted Spurious – 162.0000 MHz; Analog High Power; 9 kHz – 1 GHz

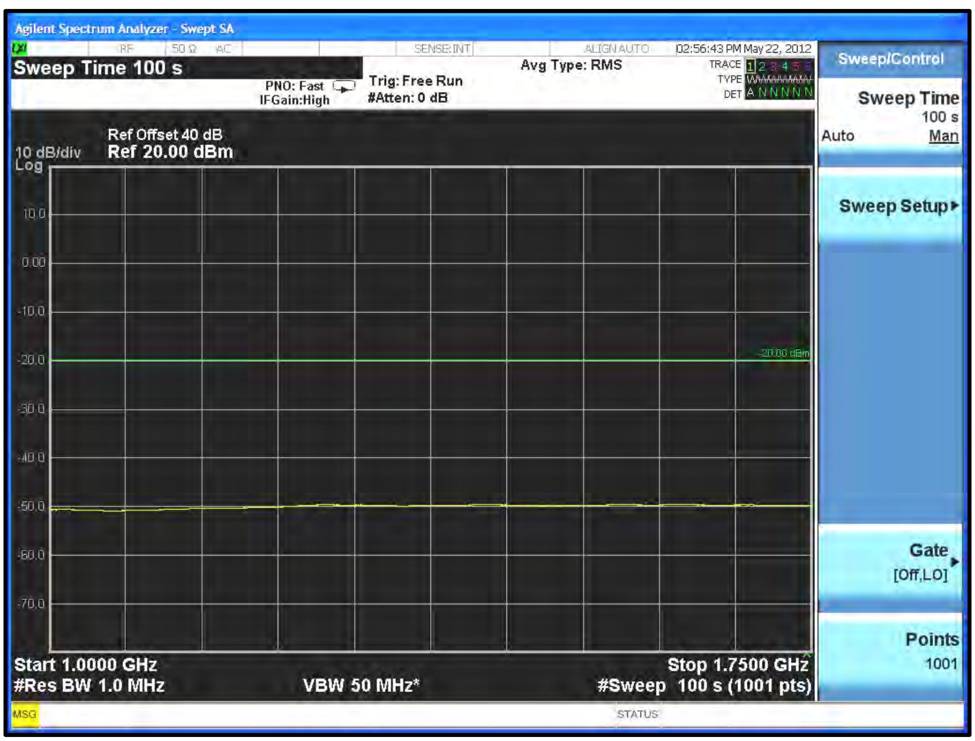


Plot 5-16: Conducted Spurious – 162.0000 MHz; Analog High Power; 1 GHz – 1.7 GHz

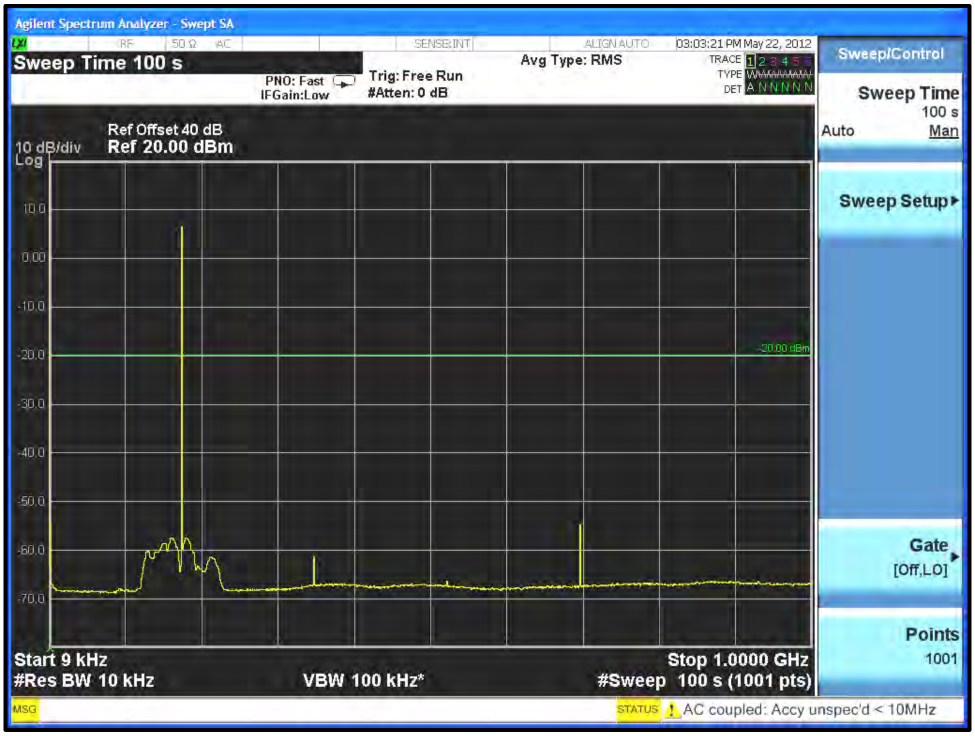


Plot 5-17: Conducted Spurious – 173.1750 MHz; Analog High Power; 9 kHz – 1 GHz

Plot 5-18: Conducted Spurious – 173.1750 MHz; Analog High Power; 1 GHz – 1.75 GHz



Plot 5-19: Conducted Spurious – 173.9875 MHz; Analog High Power; 9 kHz – 1 GHz



Plot 5-20: Conducted Spurious – 173.9875 MHz; Analog High Power; 1 GHz – 1.75 GHz

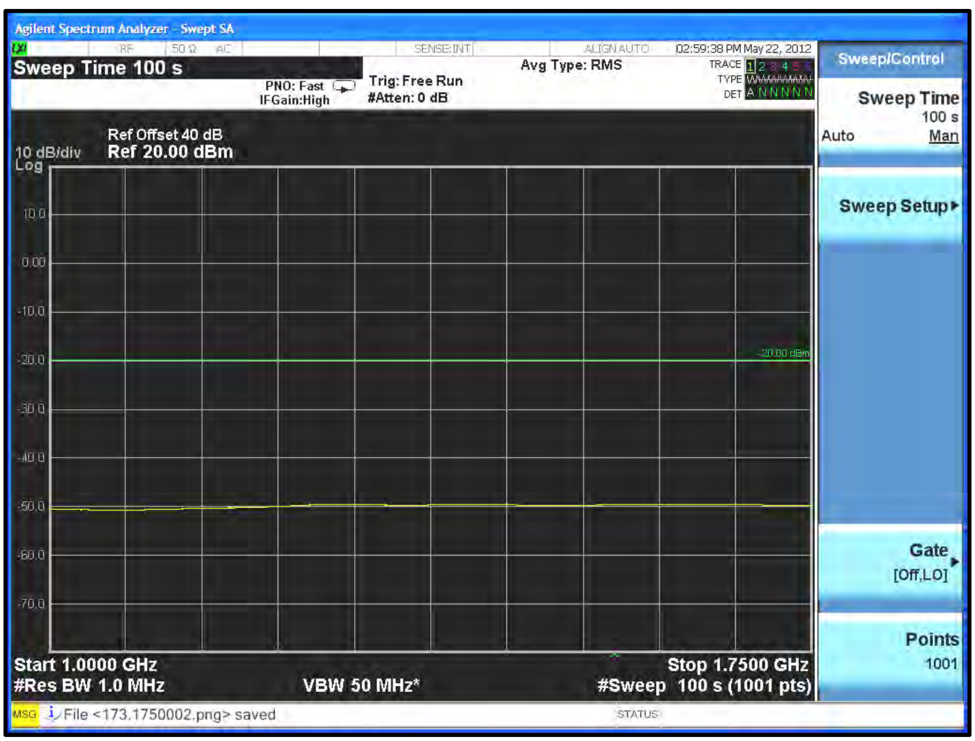


Table 5-1: Test Equipment Used For Testing Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz - 26.5 GHz)	MY51250846	3/13/13
901129	Par Electronics	118-174 (25W)	VHF Notch Filter	N/A	2/29/13
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	10/14/12

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	May 22, 2012
EMC Test Engineer	Signature	Date of Test

6 FCC Rules and Regulations Part 2.1053(a): Field Strength of Spurious Radiation; Part 90 90.210 Out of Band Emissions Limit; RSS-119 5.8: Unwanted Emissions

6.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.12

Analog Modulation: The transmitter is terminated with a 50 Ω load and is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1,000 Hz. Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence – 19,200 bps for OTP and 9,600 bps for P25 and EDACS modes.

The spurious emissions levels were measured, and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half wave dipole. The narrowband limit of 50+10log(P) was used.

6.2 Test Data

6.2.1 CFR 47 Part 90.210 Requirements

The worst-case emissions test data are shown.

Table 6-1: Field Strength of Spurious Radiation – 136.0125 MHz; Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
272.025	79.4	-48.2	0.6	1.7	94.4	-27.1
408.038	80.0	-44.0	0.7	1.8	90.2	-22.9
544.050	59.3	-64.2	0.7	1.4	110.8	-43.5
680.063	58.5	-61.6	0.8	1.2	108.5	-41.2
816.075	47.1	-72.3	0.9	0.7	119.8	-52.5
952.088	47.4	-66.1	0.9	1.2	113.1	-45.8
1088.100	45.4	-70.1	1.0	4.3	114.1	-46.8
1224.113	41.0	-72.9	1.0	4.9	116.4	-49.1
1360.125	33.4	-58.1	1.1	5.6	100.9	-33.6

Table 6-2: Field Strength of Spurious Radiation – 138.0125 MHz; Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
276.025	80.2	-48.0	0.6	1.6	94.3	-27.0
414.038	87.0	-36.8	0.7	1.7	83.1	-15.8
552.050	63.2	-60.3	0.7	1.4	106.9	-39.6
690.063	62.2	-59.2	0.8	1.2	106.1	-38.8
828.075	42.1	-76.4	0.9	0.7	123.9	-56.6
966.088	52.0	-61.3	0.9	1.3	108.2	-40.9
1104.100	47.4	-69.8	1.0	4.3	113.8	-46.5
1242.113	41.0	-72.5	1.0	4.9	115.9	-48.6
1380.125	48.1	-58.0	1.1	5.7	100.7	-33.4

Table 6-3: Field Strength of Spurious Radiation – 141.0000 MHz; Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
282.0	85.2	-41.8	0.6	1.6	88.2	-20.8
423.0	81.9	-41.0	0.7	1.7	87.4	-20.0
564.0	63.5	-59.8	0.7	1.3	106.6	-39.2
705.0	63.3	-56.0	0.8	1.2	103.0	-35.6
846.0	51.8	-66.8	0.9	0.7	114.4	-47.0
987.0	60.3	-55.7	0.9	1.4	102.6	-35.2
1128.0	46.1	-70.8	1.0	4.4	114.8	-47.4
1269.0	52.2	-60.3	1.0	5.0	103.7	-36.3
1410.0	60.5	-51.4	1.1	5.9	94.0	-26.6

Table 6-4: Field Strength of Spurious Radiation – 143.9875 MHz; Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
287.9750	82.0	-41.7	0.6	1.5	88.1	-20.8
431.9625	69.7	-53.5	0.7	1.7	99.8	-32.5
575.9500	60.9	-61.2	0.7	1.3	107.9	-40.6
719.9375	55.2	-65.8	0.8	1.1	112.8	-45.5
863.9250	45.9	-72.8	0.9	0.8	120.2	-52.9
1007.9125	53.8	-65.0	0.9	4.4	108.8	-41.5
1151.9000	41.6	-71.1	1.0	4.5	114.9	-47.6
1295.8875	44.3	-68.6	1.0	5.1	111.8	-44.5
1439.8750	51.6	-57.7	1.1	6.1	100.0	-32.7

Table 6-5: Field Strength of Spurious Radiation – 148.0125 MHz; Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
296.0250	90.1	-34.5	0.6	1.4	81.0	-13.7
444.0375	55.5	-67.5	0.7	1.7	113.8	-46.5
592.0500	67.8	-50.5	0.8	1.3	97.3	-30.0
740.0625	57.0	-63.7	0.8	1.0	110.8	-43.5
888.0750	47.1	-69.9	0.9	0.9	117.2	-49.9
1036.0875	51.1	-66.4	1.0	4.4	110.3	-43.0
1184.1000	50.5	-64.0	1.0	4.7	107.6	-40.3
1332.1125	45.0	-63.7	1.0	5.4	106.6	-39.3
1480.1250	45.3	-65.3	1.1	6.3	107.4	-40.1

Table 6-6: Field Strength of Spurious Radiation – 150.0125 MHz; Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
300.0250	89.9	-35.9	0.6	1.4	82.4	-15.1
450.0375	53.9	-70.2	0.7	1.7	116.5	-49.2
600.0500	75.1	-47.1	0.8	1.3	93.9	-26.6
750.0625	56.8	-61.6	0.8	0.9	108.8	-41.5
900.0750	34.4	-74.1	0.9	0.9	121.4	-54.1
1050.0875	50.5	-67.7	1.0	4.4	111.6	-44.3
1200.1000	50.3	-63.9	1.0	4.8	107.4	-40.1
1350.1125	45.3	-60.7	1.1	5.5	103.6	-36.3
1500.1250	37.3	-69.8	1.1	6.5	111.7	-44.4

Table 6-7: Field Strength of Spurious Radiation – 154.0250 MHz; Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
308.050	86.5	-39.0	0.6	1.5	85.4	-18.1
462.075	64.4	-60.0	0.7	1.7	106.3	-39.0
616.100	64.1	-54.4	0.8	1.3	101.2	-33.9
770.125	58.7	-59.7	0.8	0.8	107.0	-39.7
924.150	37.9	-74.2	0.9	1.0	121.4	-54.1
1078.175	54.1	-63.5	1.0	4.3	107.5	-40.2
1232.200	44.1	-66.8	1.0	4.9	110.2	-42.9
1386.225	46.4	-55.4	1.1	5.8	98.0	-30.7
1540.250	35.0	-70.3	1.1	6.6	112.2	-44.9

Table 6-8: Field Strength of Spurious Radiation – 162.0000 MHz; Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
324.0	77.6	-47.4	0.6	1.5	93.8	-26.5
486.0	79.4	-43.0	0.7	1.6	89.4	-22.1
648.0	45.5	-72.8	0.8	1.3	119.6	-52.3
810.0	51.6	-65.1	0.9	0.6	112.7	-45.4
972.0	46.3	-68.0	0.9	1.3	114.9	-47.6
1134.0	50.0	-65.6	1.0	4.4	109.5	-42.2
1296.0	49.1	-61.0	1.0	5.1	104.2	-36.9
1458.0	55.3	-54.7	1.1	6.2	96.9	-29.6
1620.0	32.0	-73.0	1.2	6.7	114.8	-47.5

Table 6-9: Field Strength of Spurious Radiation – 173.175 MHz; Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
346.350	77.1	-47.3	0.6	1.7	93.5	-26.3
519.525	74.1	-47.8	0.7	1.5	94.2	-27.0
692.700	55.9	-62.8	0.8	1.2	109.6	-42.4
865.875	55.3	-60.1	0.9	0.8	107.4	-40.2
1039.050	48.6	-67.4	1.0	4.4	111.2	-44.0
1212.225	50.9	-62.3	1.0	4.8	105.7	-38.5
1385.400	29.9	-58.8	1.1	5.8	101.3	-34.1
1558.575	34.5	-67.8	1.1	6.6	109.5	-42.3
1731.750	38.7	-70.3	1.3	6.5	112.3	-45.1

Table 6-10: Field Strength of Spurious Radiation – 173.9875 MHz; Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
347.9750	75.3	-50.6	0.6	1.7	96.8	-29.5
521.9625	71.9	-50.3	0.7	1.5	96.8	-29.5
695.9500	56.9	-63.1	0.8	1.2	110.0	-42.7
869.9375	52.8	-65.7	0.9	0.8	113.1	-45.8
1043.9250	51.0	-65.4	1.0	4.4	109.3	-42.0
1217.9125	57.6	-55.2	1.0	4.8	98.7	-31.4
1391.9000	58.0	-39.1	1.1	5.8	81.7	-14.4
1565.8875	47.9	-55.3	1.2	6.7	97.1	-29.8
1739.8750	45.4	-61.0	1.3	6.5	103.1	-35.8

Table 6-11: Test Equipment Used For Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900725	Antenna Research Associates, Inc.	LPB-2520	Log Periodic / Biconal Antenna	1036	3/29/14
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	7/14/12
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz - 26.5 GHz)	MY51250846	3/13/13
901516	Insulated Wire, Inc.	KPS-150.01253-2400-KPS-09302008	RF cable, 20'	NA	10/14/12
901517	Insulated Wire Inc.	KPS-150.01253-360-KPS-09302008	RF cable 36"	NA	10/14/12
900878	Rhein Tech Laboratories, Inc.	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Laboratories, Inc.	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	4/19/14
900321	EMCO	3161-03	Horn Antennas (4 – 8 GHz)	9508-1020	4/19/14
900928	Hewlett Packard	83752A	Synthesized Sweeper, (0.01 - 20 GHz)	3610A00866	2/18/13
901262	ETS	3160-9	Double ridged Guide Antenna (1 - 18 GHz)	6748	5/11/14
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40dB (30 MHz – 2 GHz)	1006	7/14/12

Test Personnel:

Daniel W. Baltzell

Daniel Baltzell		May 4, 2012
Test Engineer	Signature	Date of Test

7 FCC Rules and Regulations Part 2.1049(c)(1): Occupied Bandwidth; Part 90.210 Authorized Bandwidth; RSS-119 5.8: Transmitter Unwanted Emissions

Occupied Bandwidth - Compliance with the Emission Masks

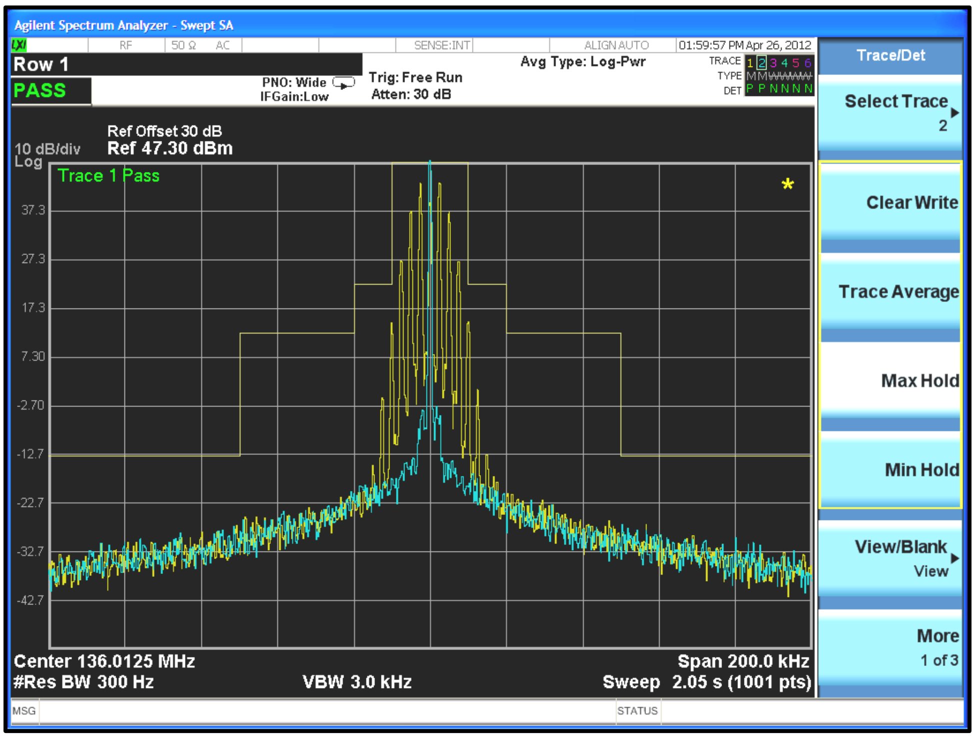
7.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.11 and TIA/EIA-102.CAAA-2002 Section 2.2.5

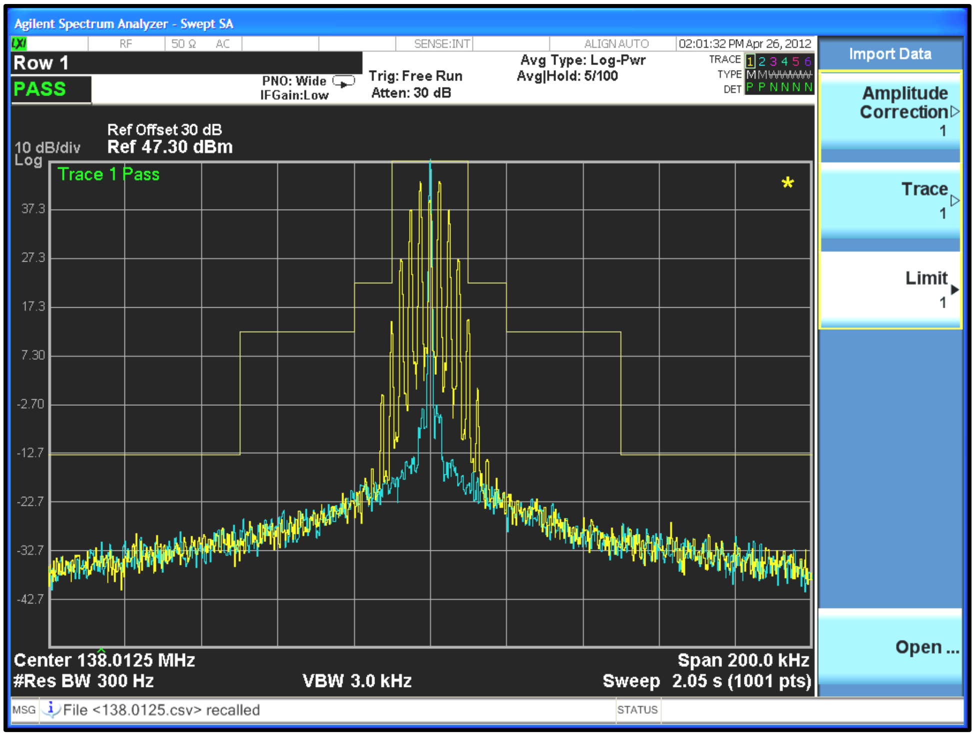
Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence – 19,200 bps for OTP and 9,600 bps for P25 and EDACS modes.

7.2 Test Data

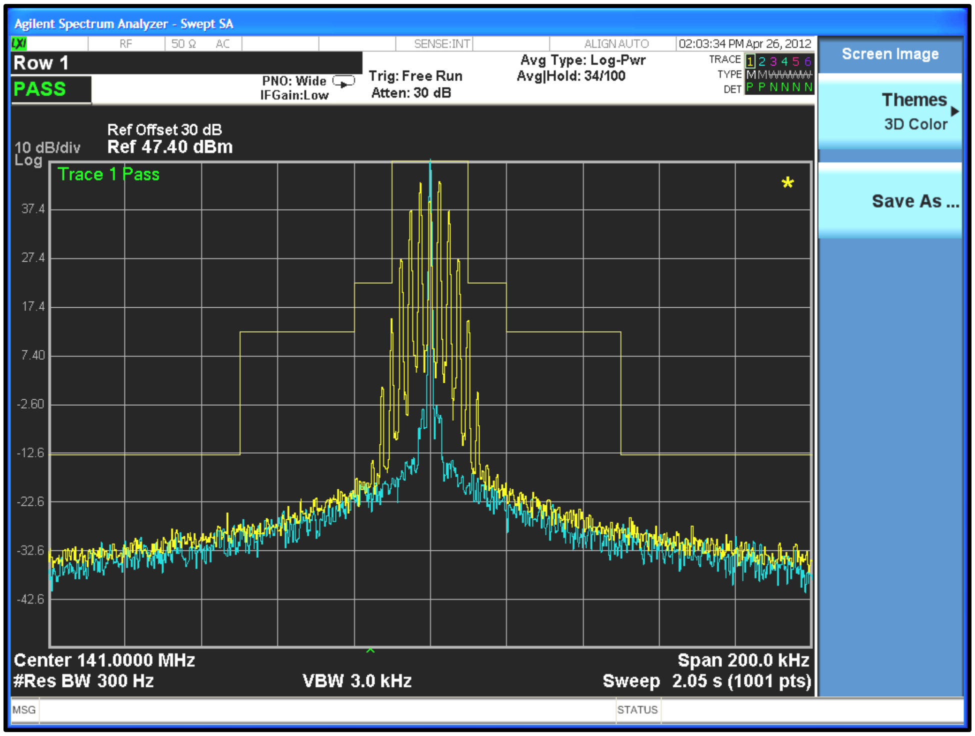
Plot 7-1: Occupied Bandwidth – 136.0125 MHz; WB-Analog (Mask B)



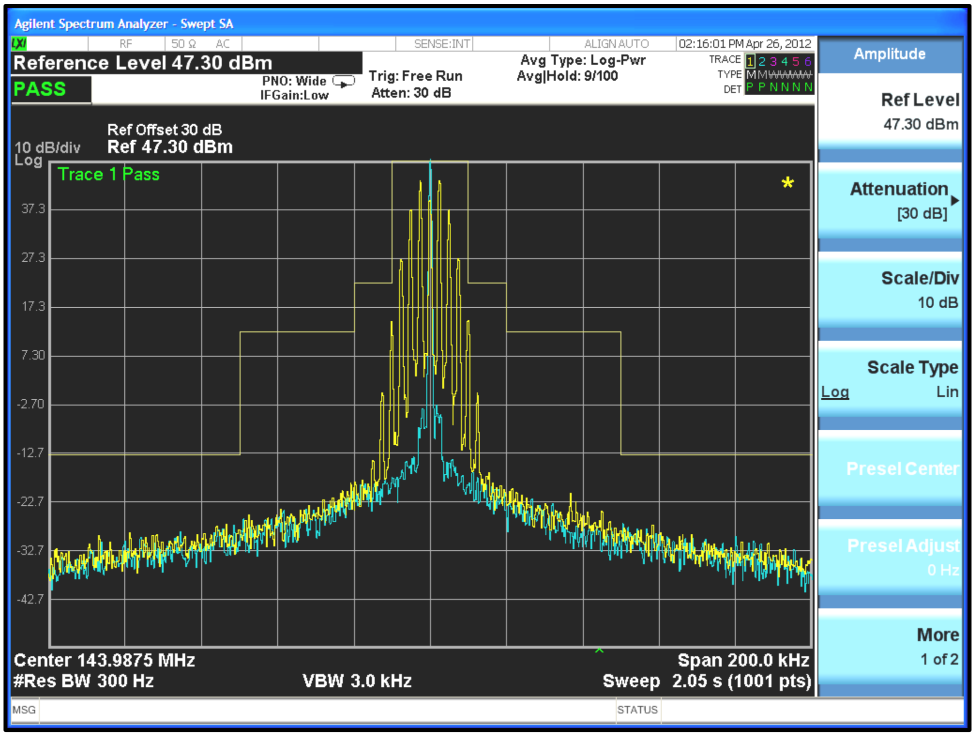
Plot 7-2: Occupied Bandwidth – 138.0125 MHz; WB-Analog (Mask B)



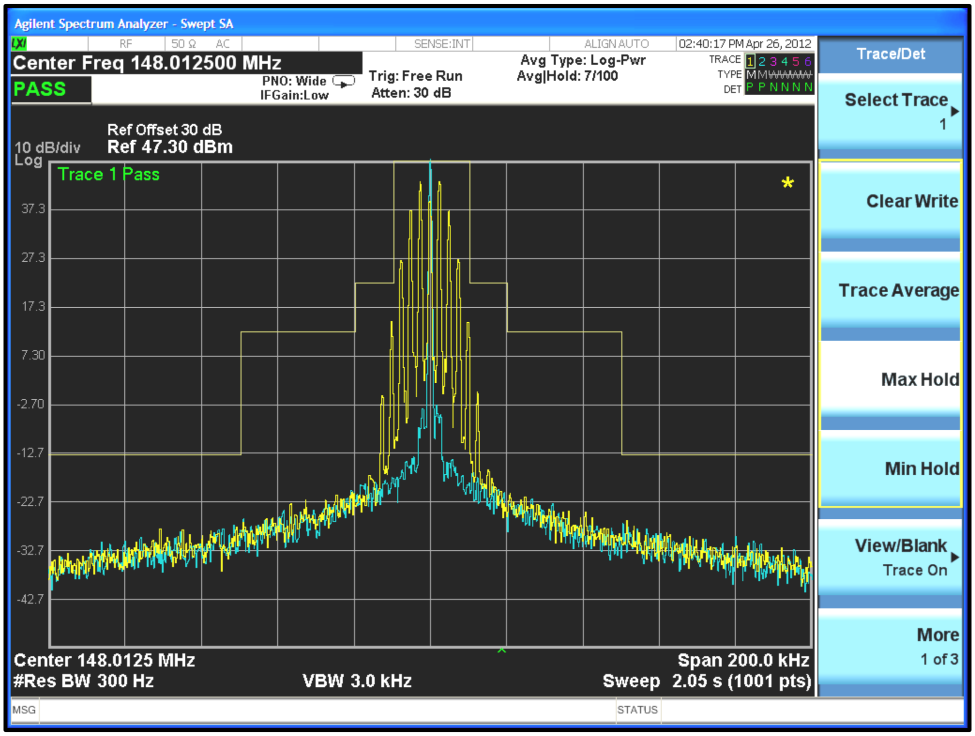
Plot 7-3: Occupied Bandwidth – 141.0000 MHz; WB-Analog (Mask B)



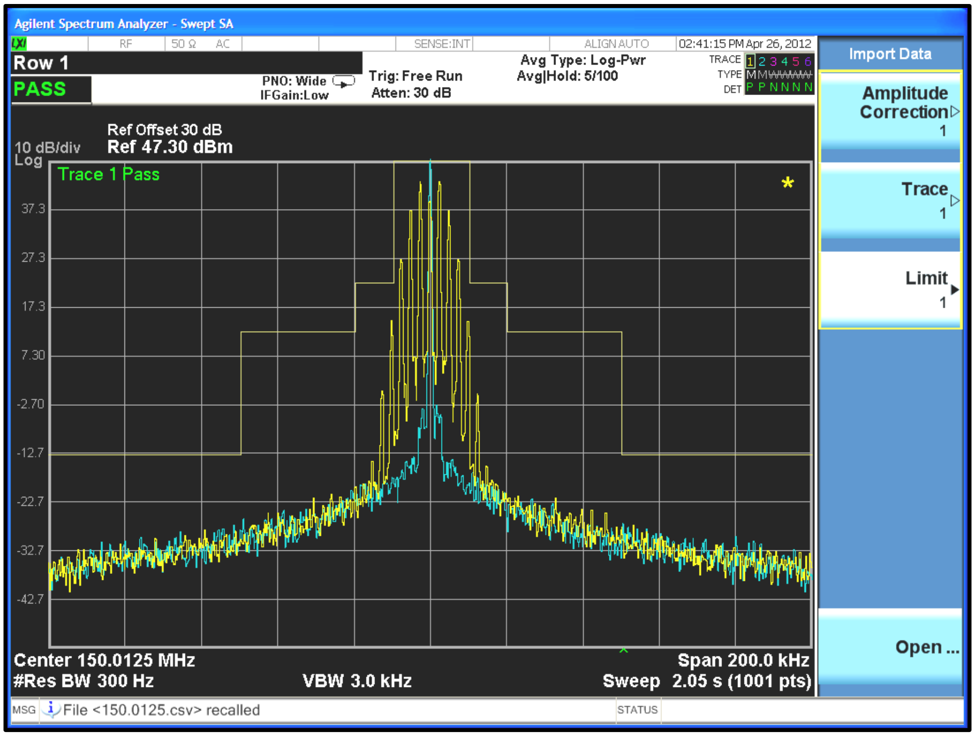
Plot 7-4: Occupied Bandwidth – 143.9875 MHz; WB-Analog (Mask B)



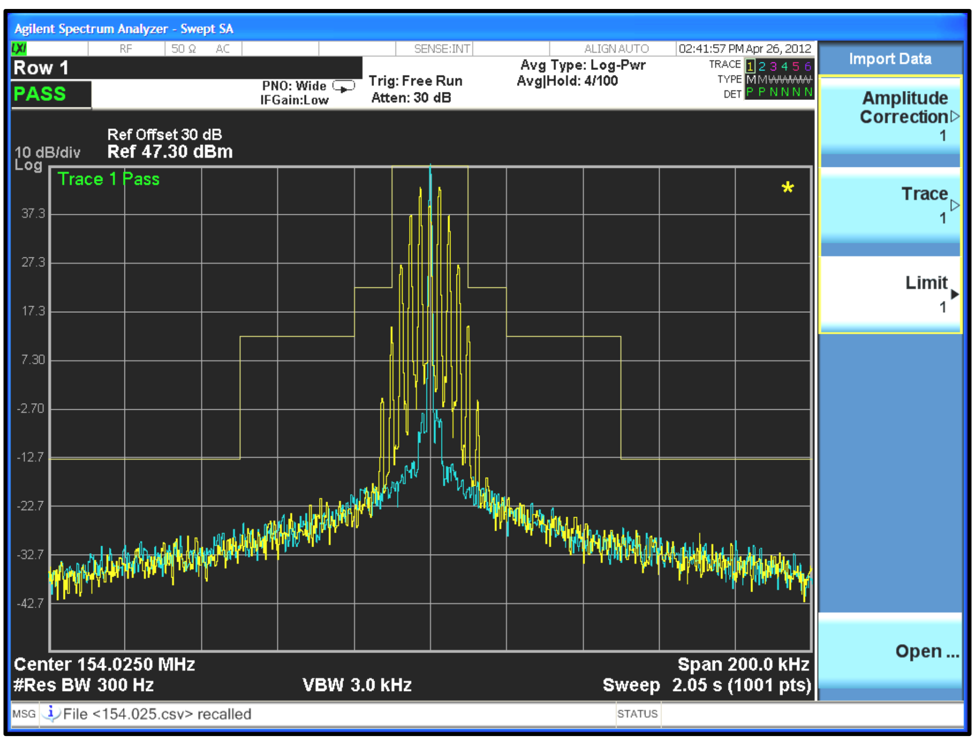
Plot 7-5: Occupied Bandwidth – 148.0125 MHz; WB-Analog (Mask B)



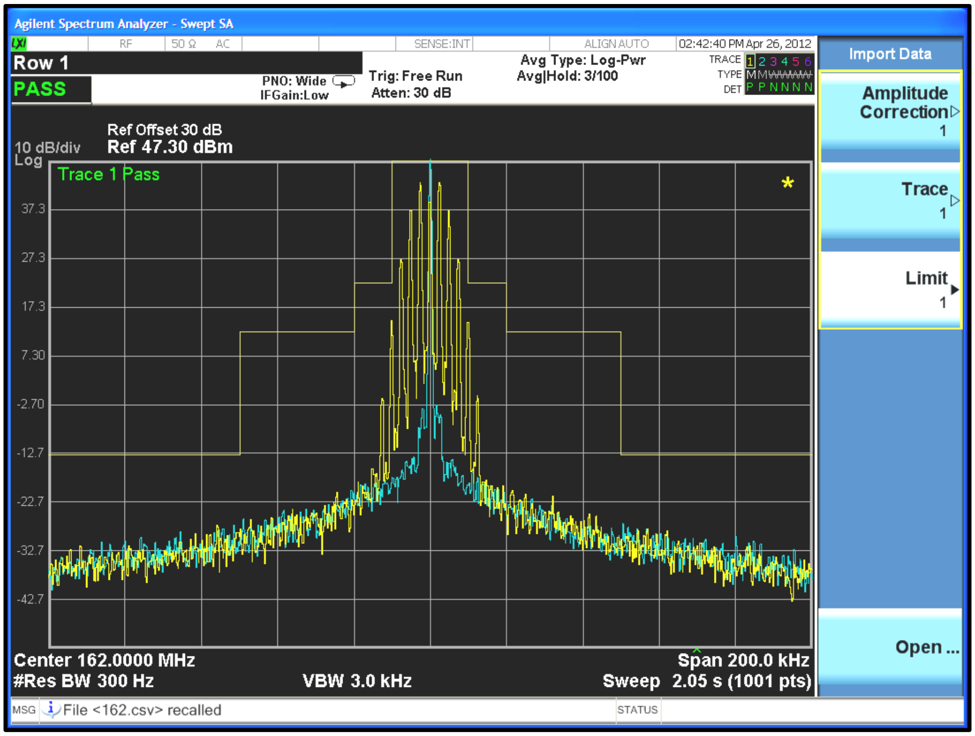
Plot 7-6: Occupied Bandwidth – 150.0125 MHz; WB-Analog (Mask B)



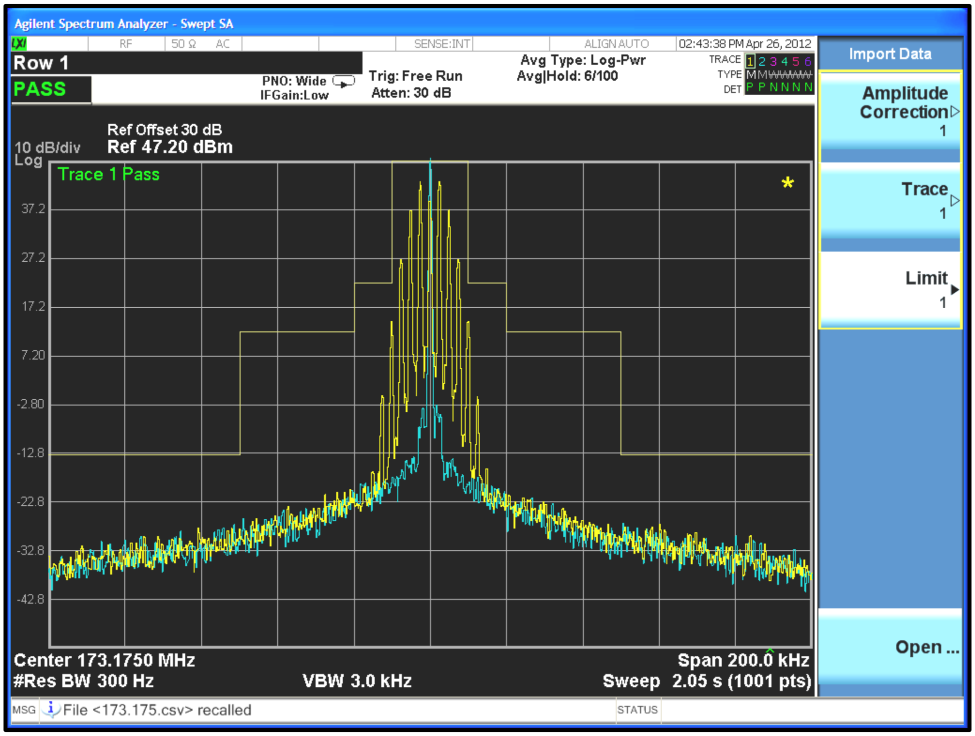
Plot 7-7: Occupied Bandwidth – 154.025 MHz; WB-Analog (Mask B)



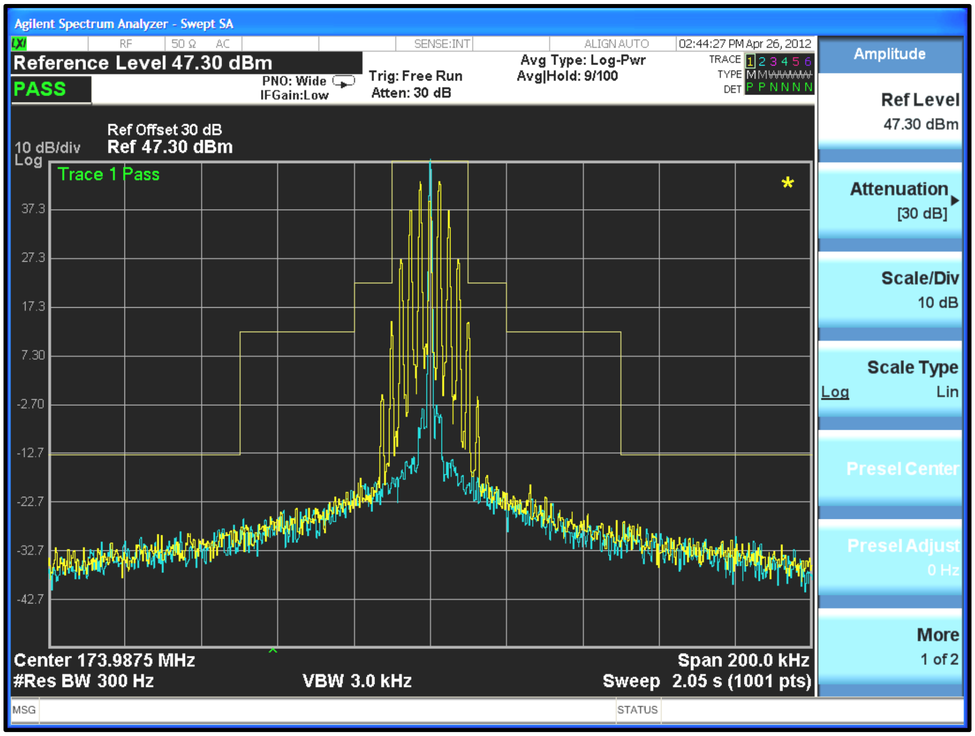
Plot 7-8: Occupied Bandwidth – 162.0000 MHz; WB-Analog (Mask B)



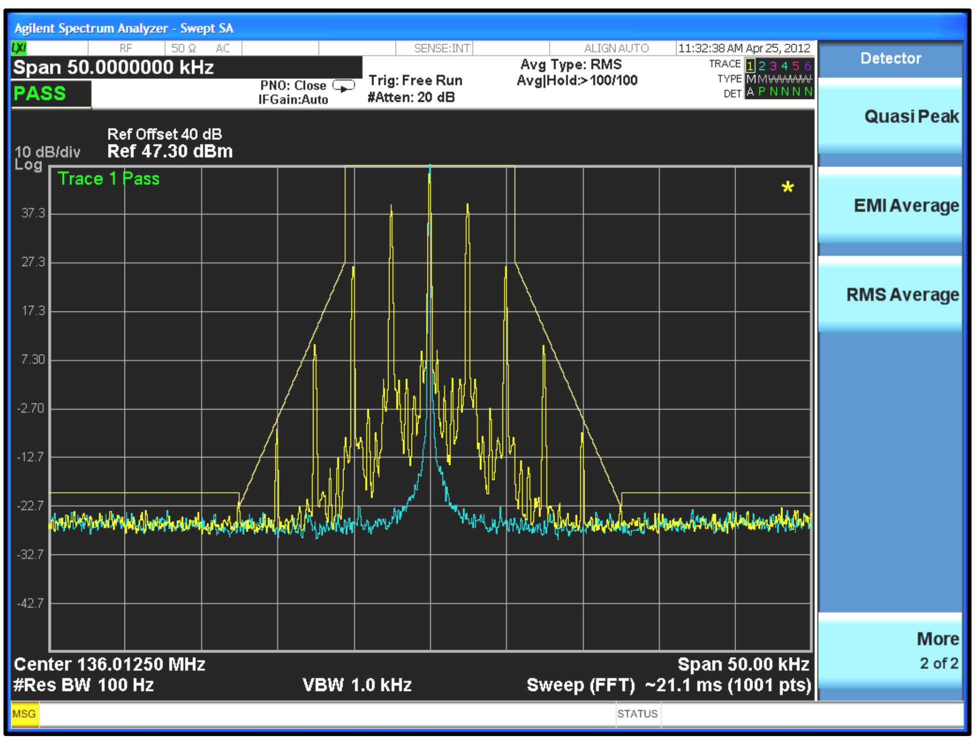
Plot 7-9: Occupied Bandwidth – 173.175 MHz; WB-Analog (Mask B)



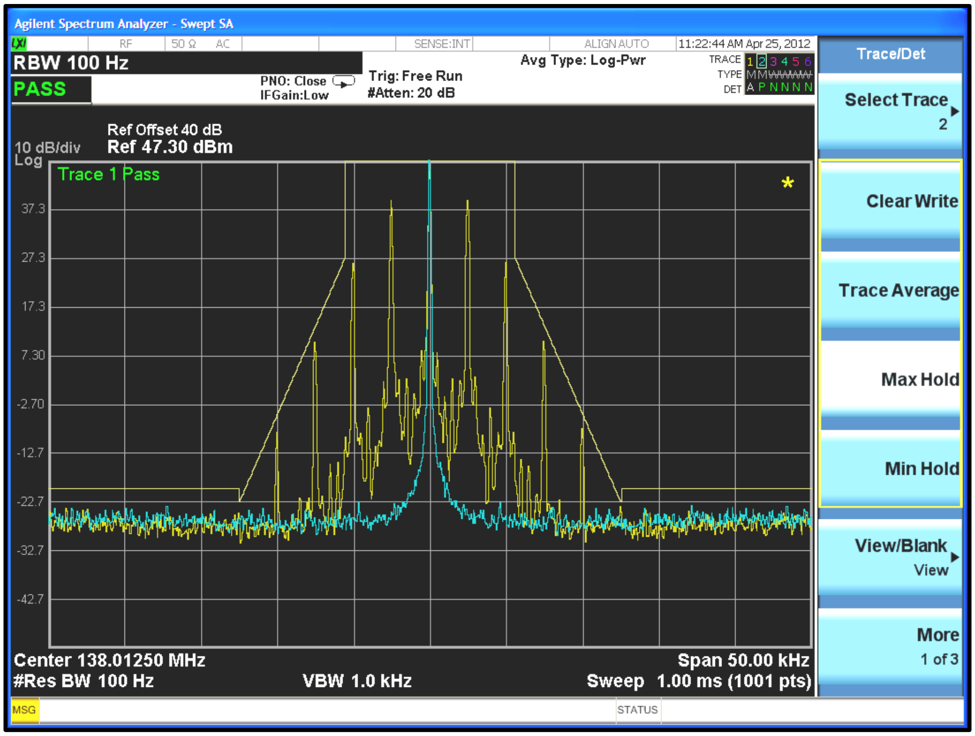
Plot 7-10: Occupied Bandwidth – 173.9875 MHz; WB-Analog (Mask B)



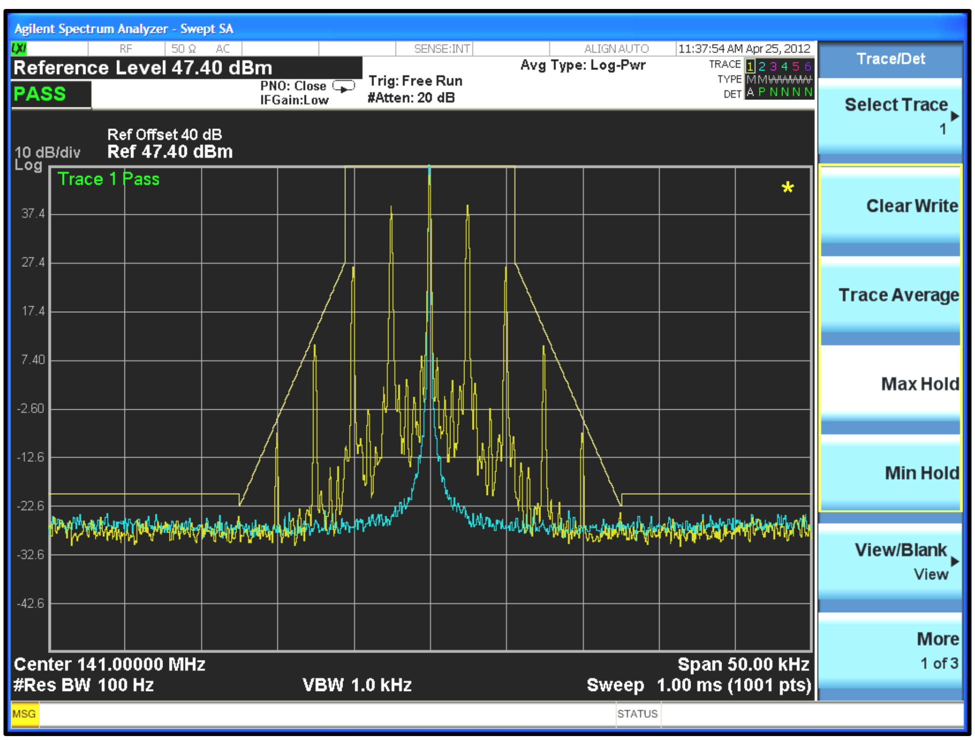
Plot 7-11: Occupied Bandwidth – 136.0125 MHz; NB-Analog (Mask D)



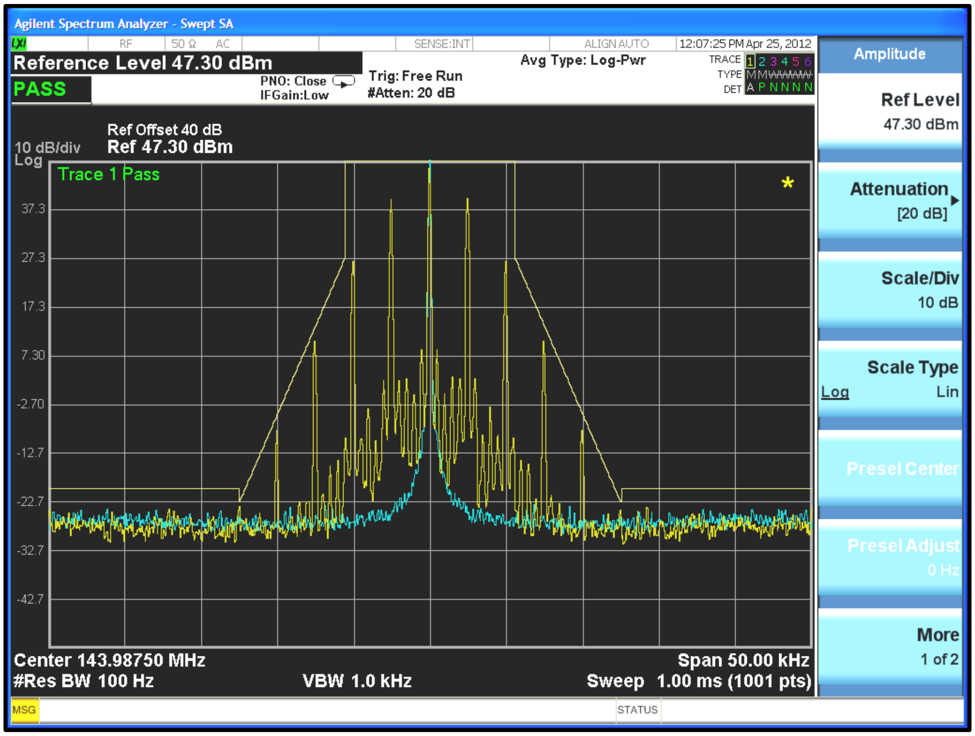
Plot 7-12: Occupied Bandwidth – 138.0125 MHz; NB-Analog (Mask D)



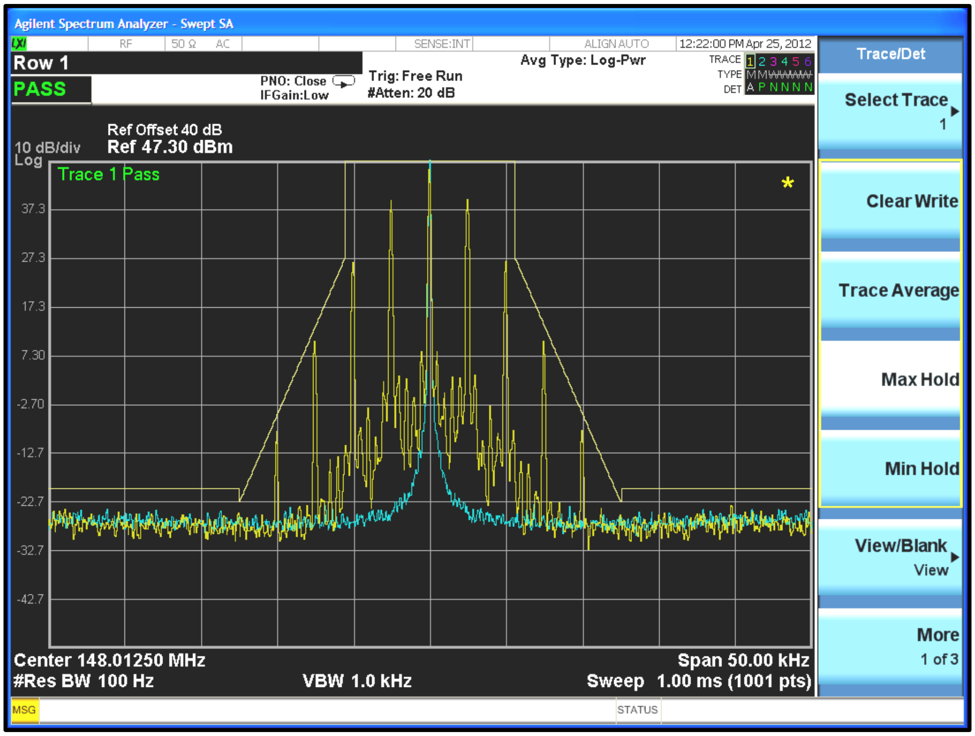
Plot 7-13: Occupied Bandwidth – 141.0000 MHz; NB-Analog (Mask D)



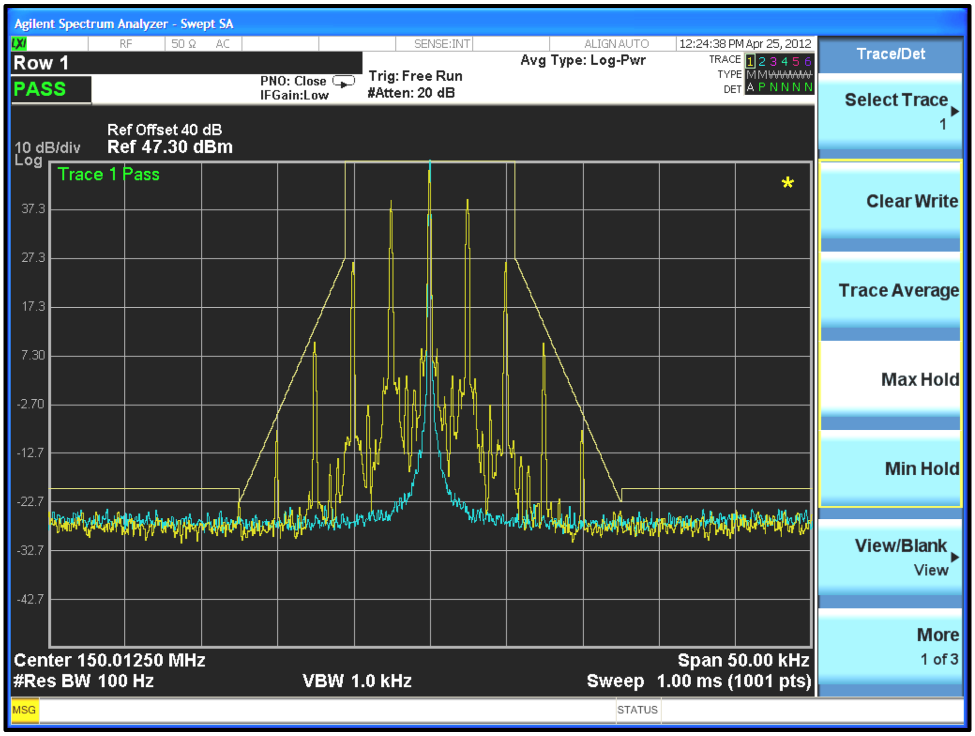
Plot 7-14: Occupied Bandwidth – 143.9875 MHz; NB-Analog (Mask D)



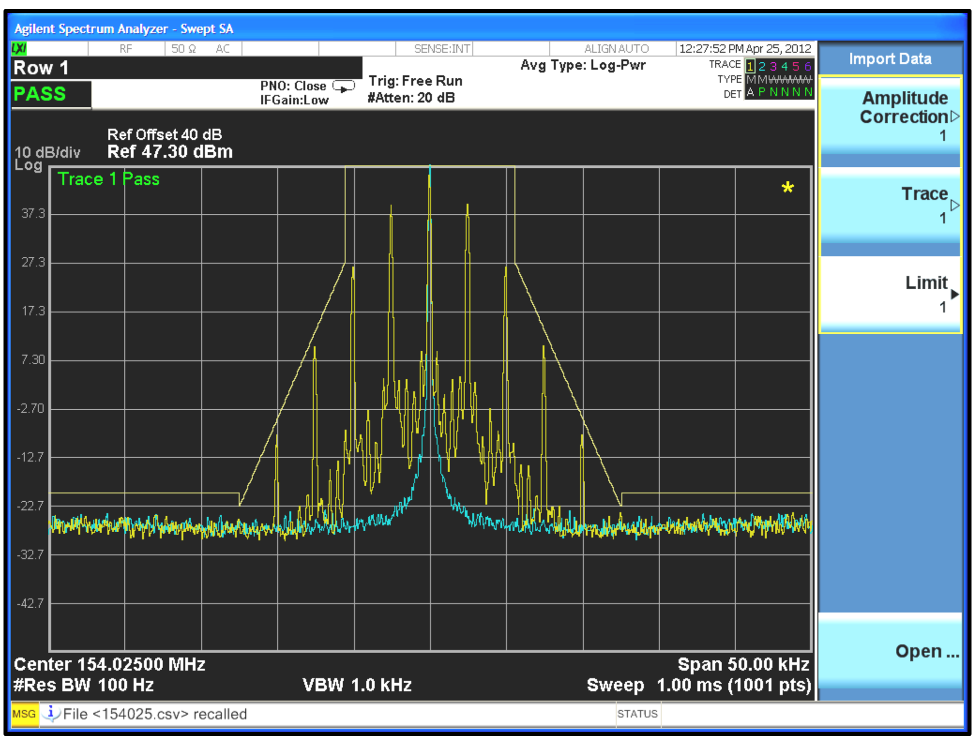
Plot 7-15: Occupied Bandwidth – 148.0125 MHz; NB-Analog (Mask D)



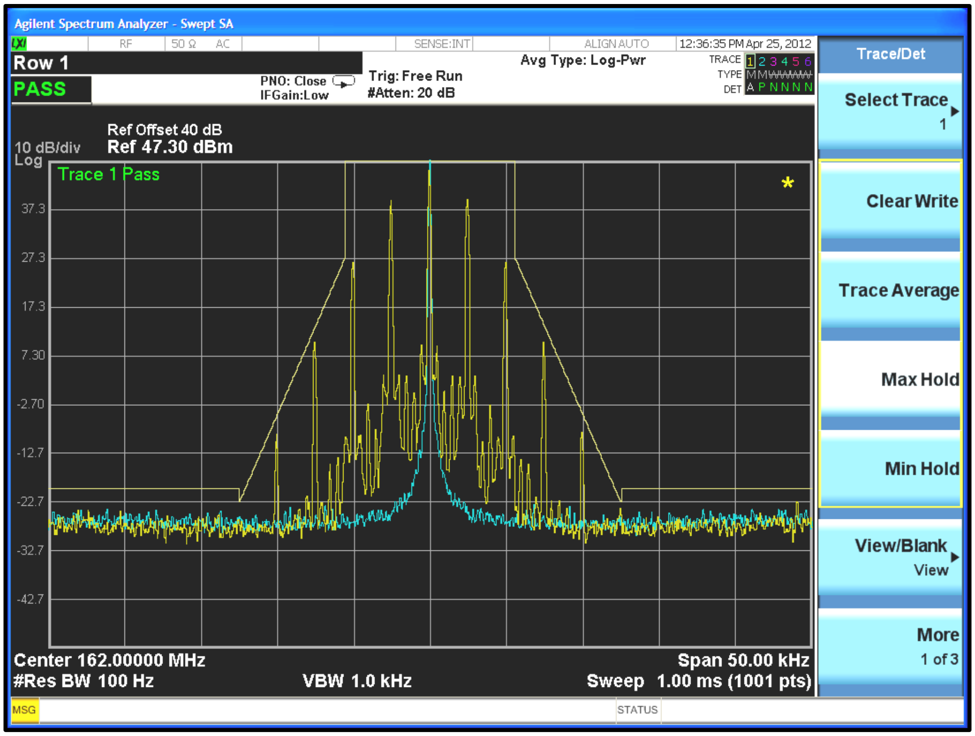
Plot 7-16: Occupied Bandwidth – 150.0125 MHz; NB-Analog (Mask D)



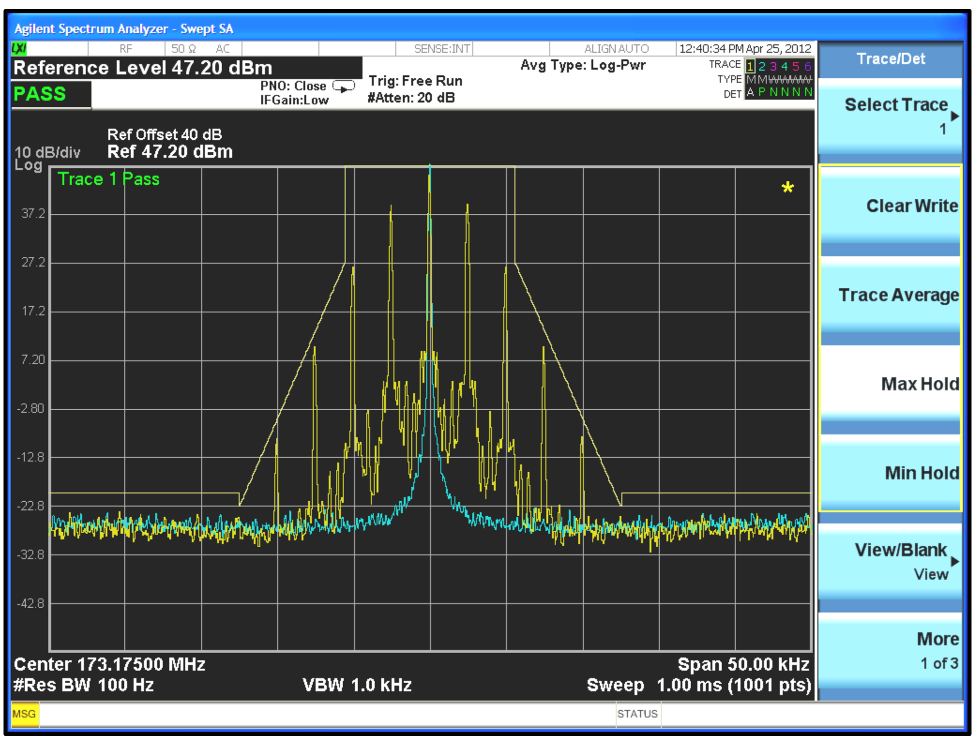
Plot 7-17: Occupied Bandwidth – 154.025 MHz; NB-Analog (Mask D)



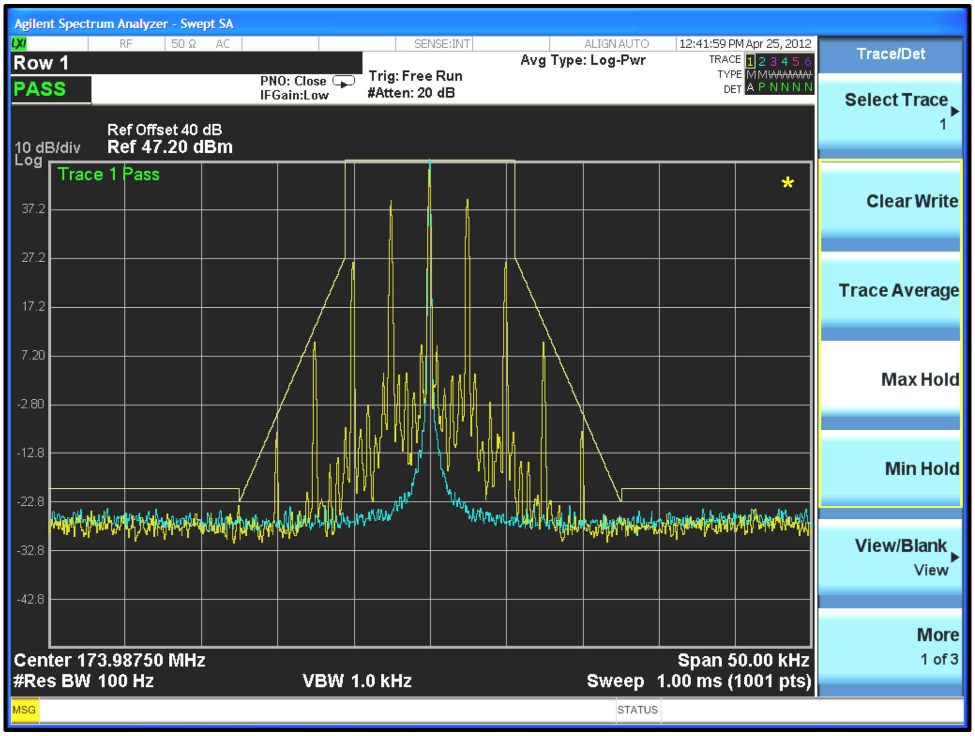
Plot 7-18: Occupied Bandwidth – 162.0000 MHz; NB-Analog (Mask D)



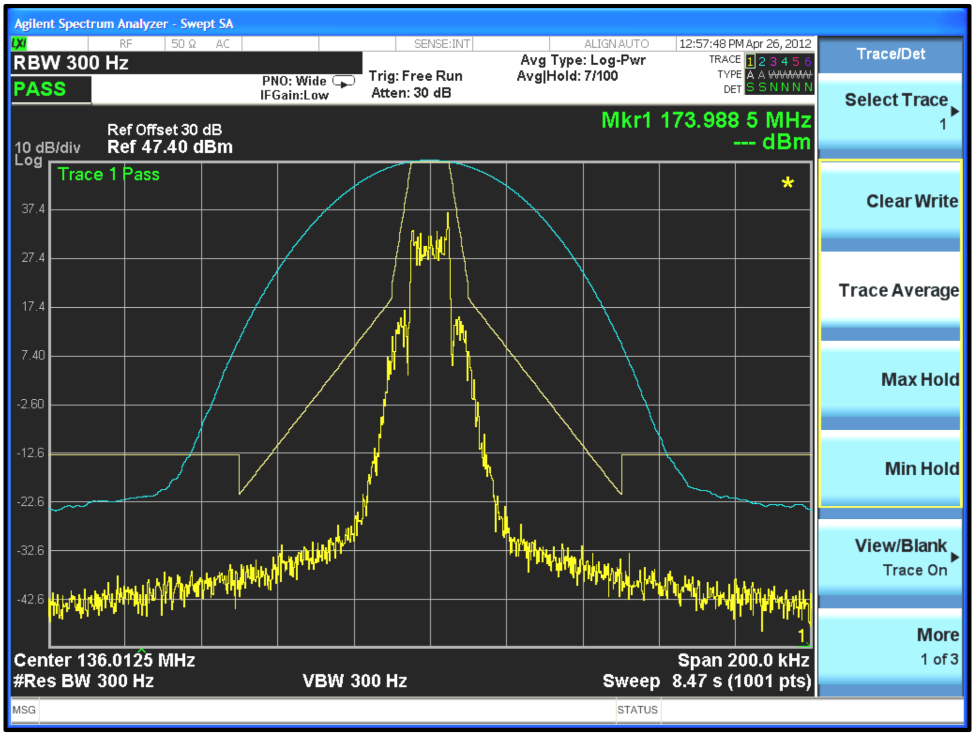
Plot 7-19: Occupied Bandwidth – 173.175 MHz; NB- Analog (Mask D)



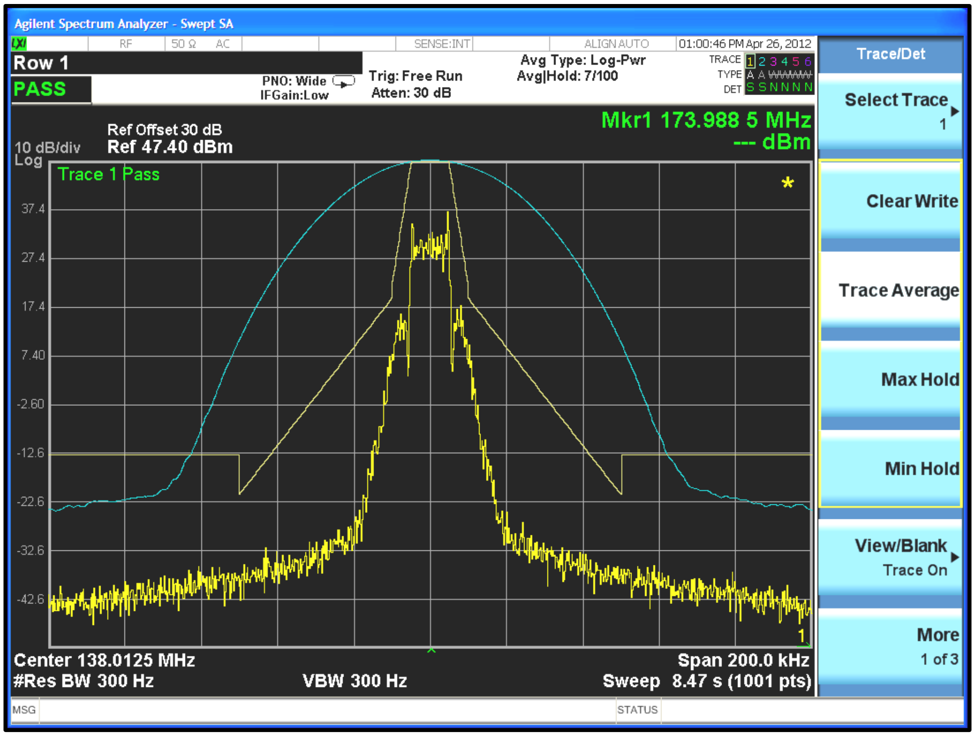
Plot 7-20: Occupied Bandwidth – 173.9875 MHz; NB-Analog (Mask D)



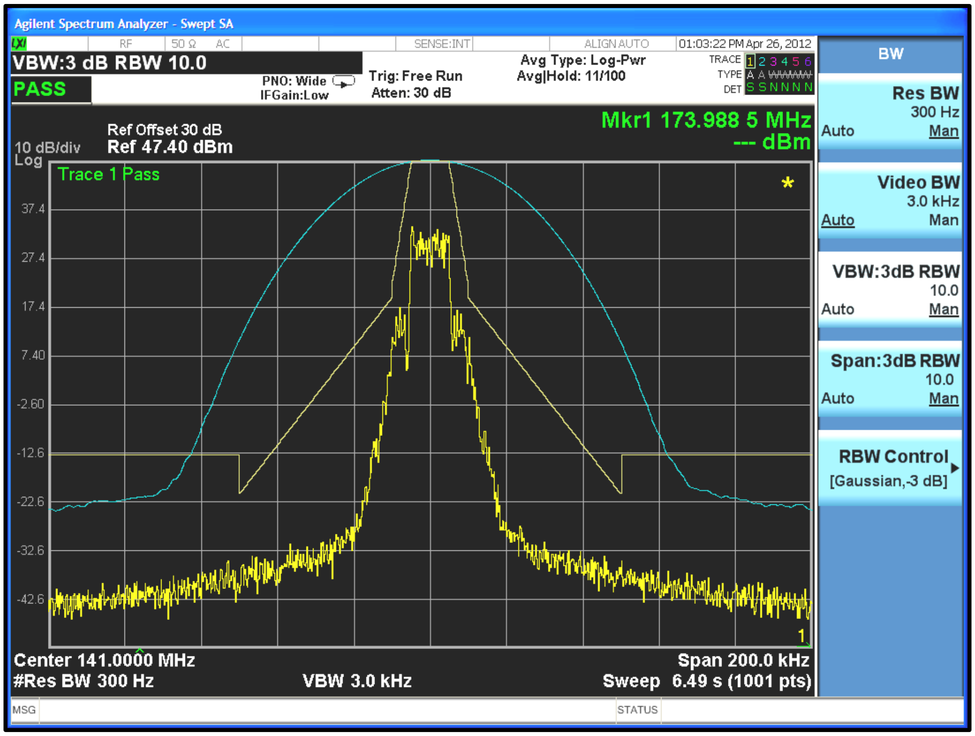
Plot 7-21: Occupied Bandwidth – 136.0125 MHz; 2 level WB 9600 (Mask C)



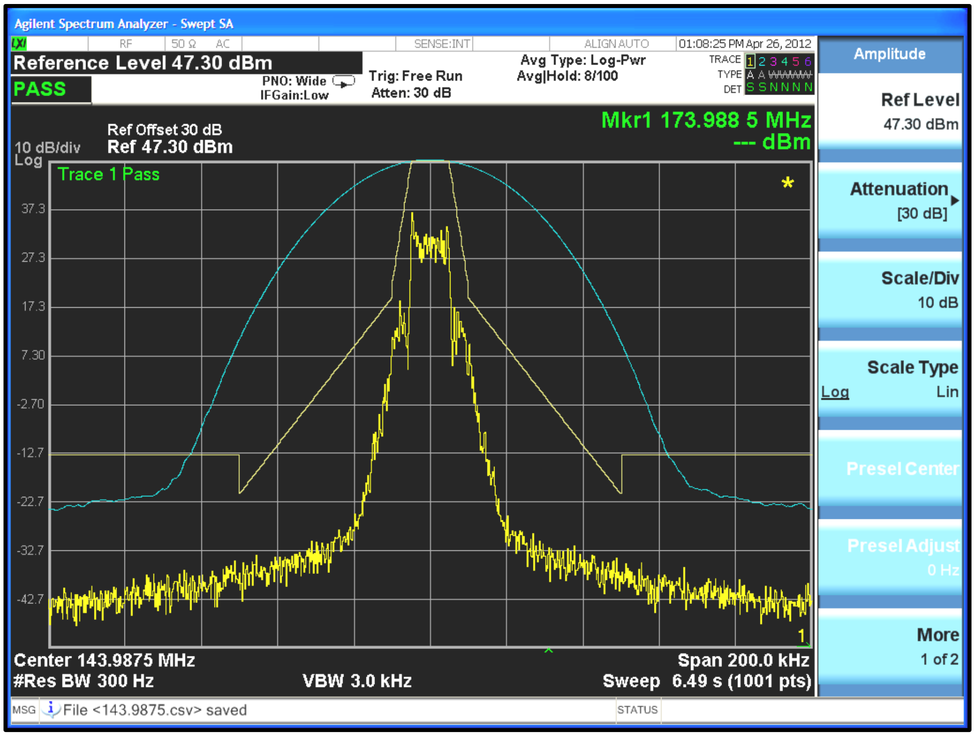
Plot 7-22: Occupied Bandwidth – 138.0125 MHz; 2 level WB 9600 (Mask C)



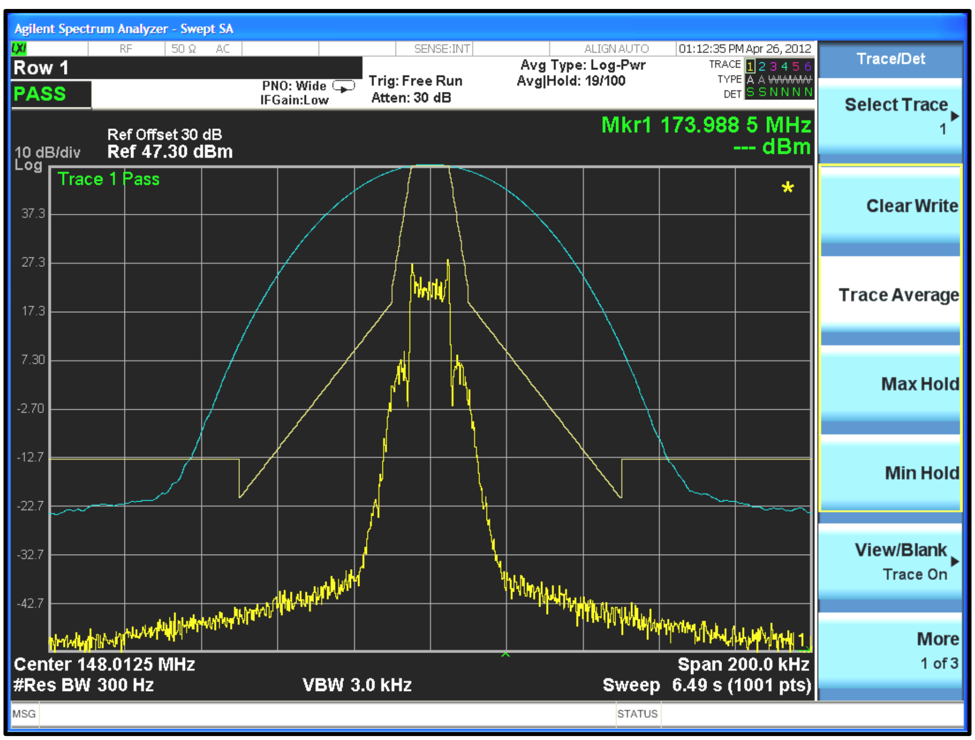
Plot 7-23: Occupied Bandwidth – 141.0000 MHz; 2 level WB 9600 (Mask C)



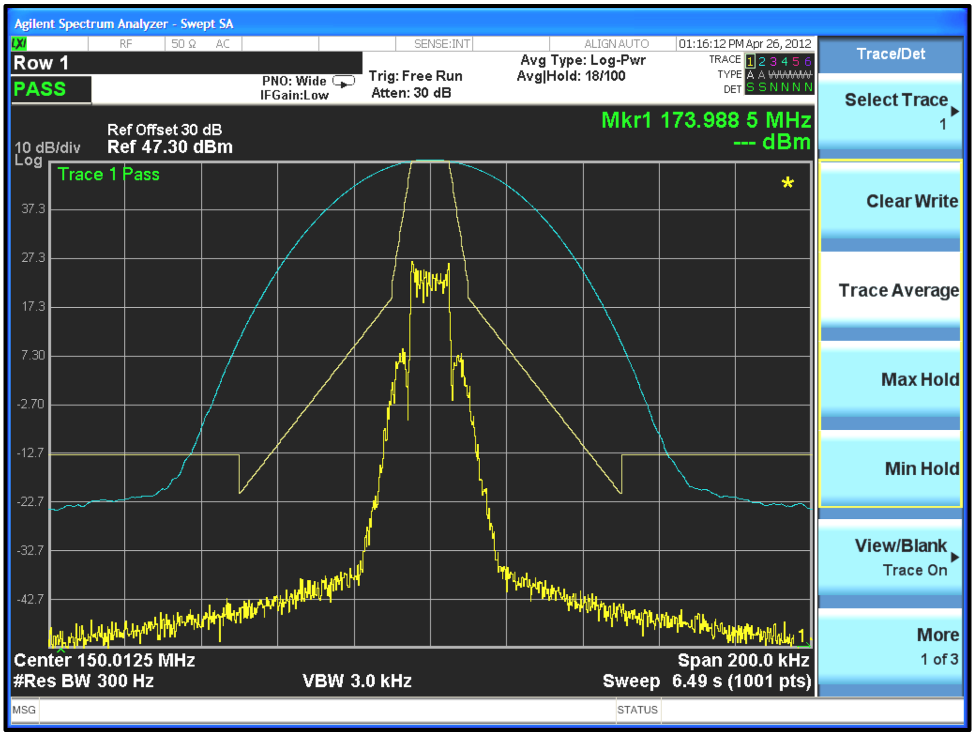
Plot 7-24: Occupied Bandwidth – 143.9875 MHz; 2 level WB 9600 (Mask C)



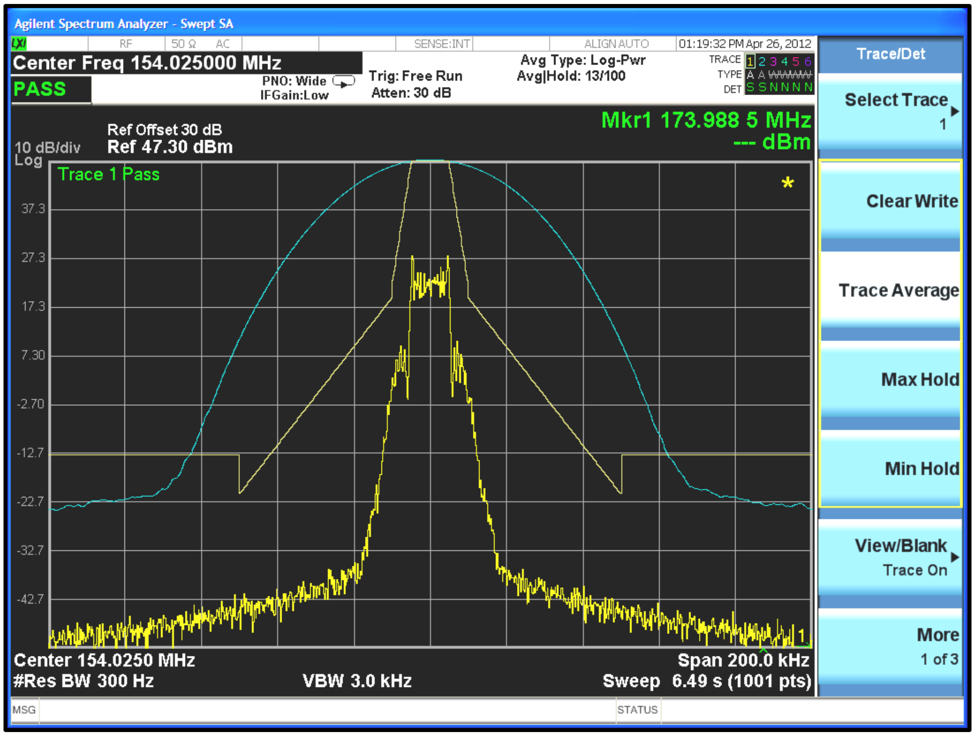
Plot 7-25: Occupied Bandwidth – 148.0125 MHz; 2 level WB 9600 (Mask C)



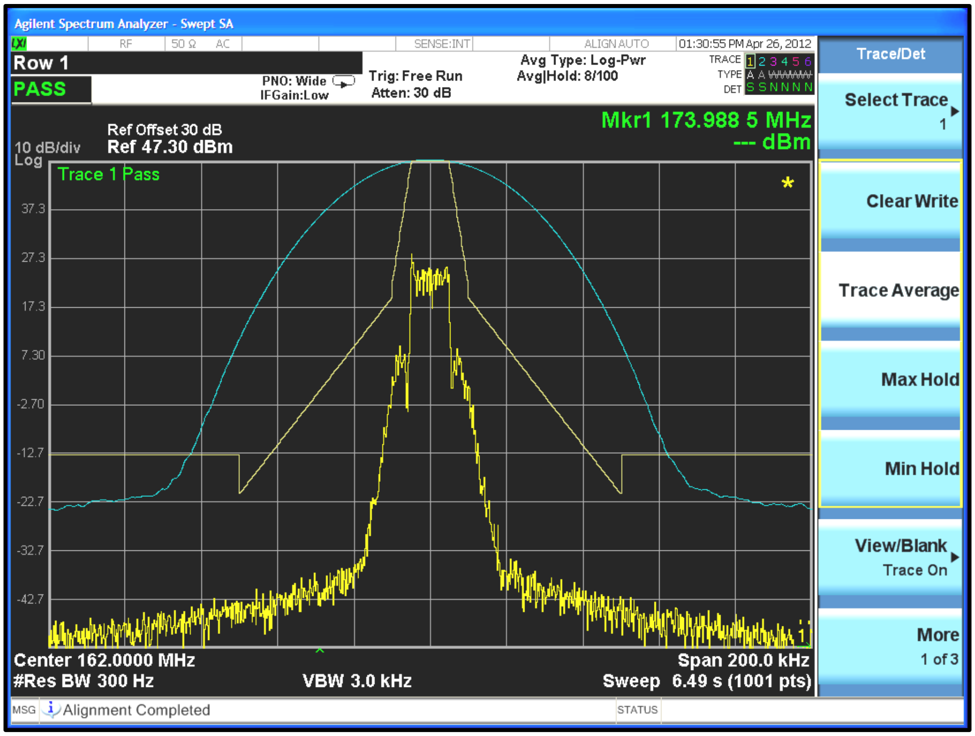
Plot 7-26: Occupied Bandwidth – 150.0125 MHz; 2 level WB 9600 (Mask C)



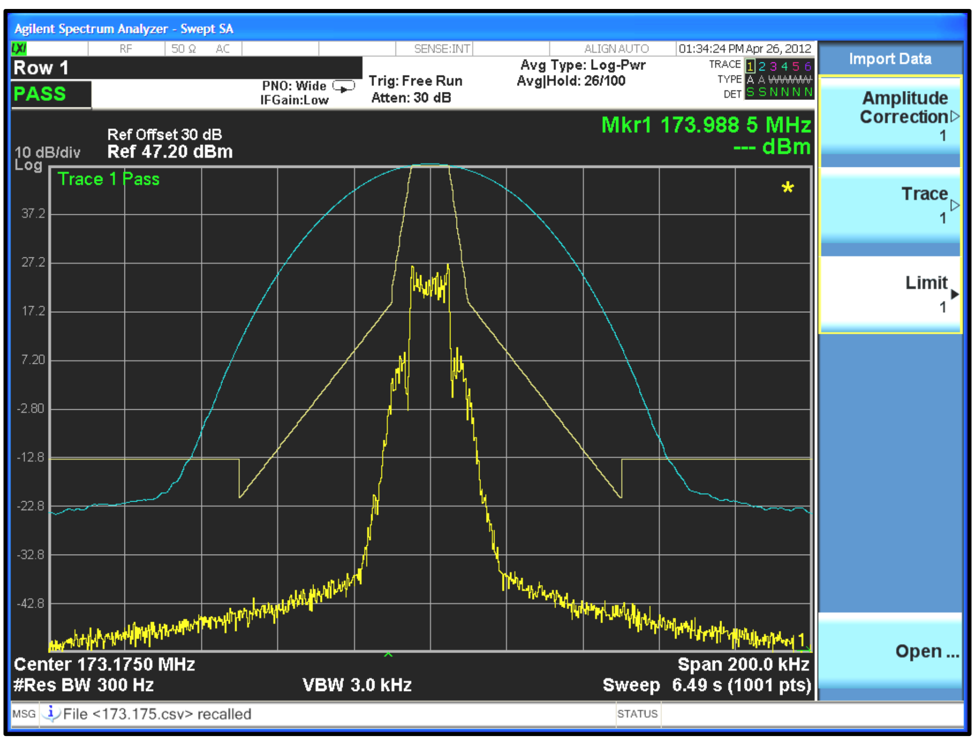
Plot 7-27: Occupied Bandwidth – 154.025 MHz; 2 level WB 9600 (Mask C)



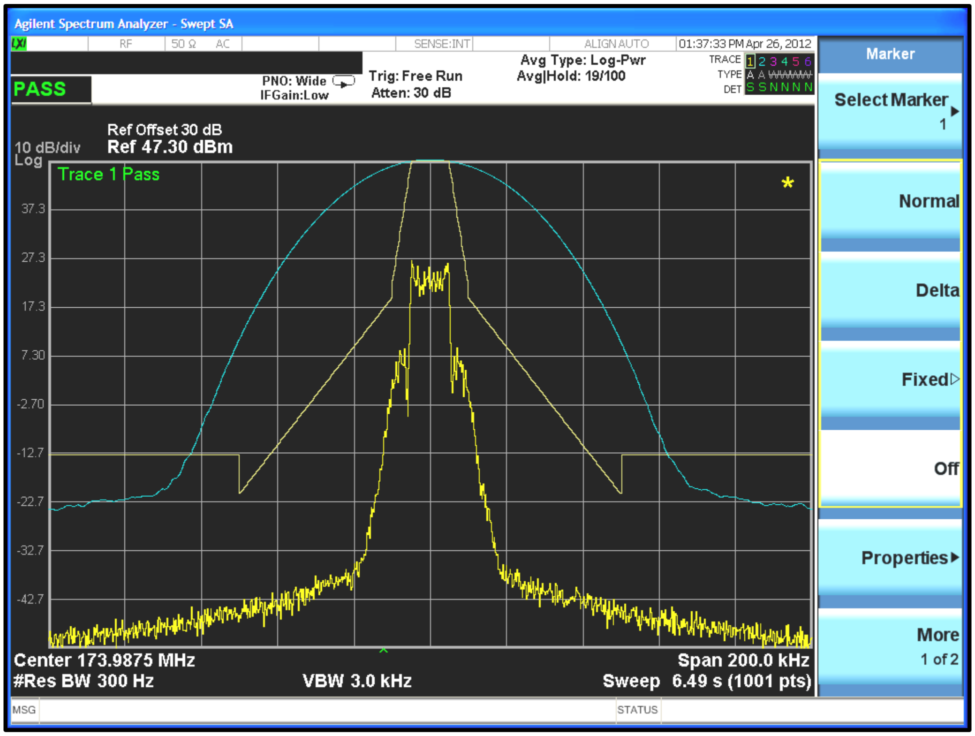
Plot 7-28: Occupied Bandwidth – 162.0000 MHz; 2 level WB 9600 (Mask C)



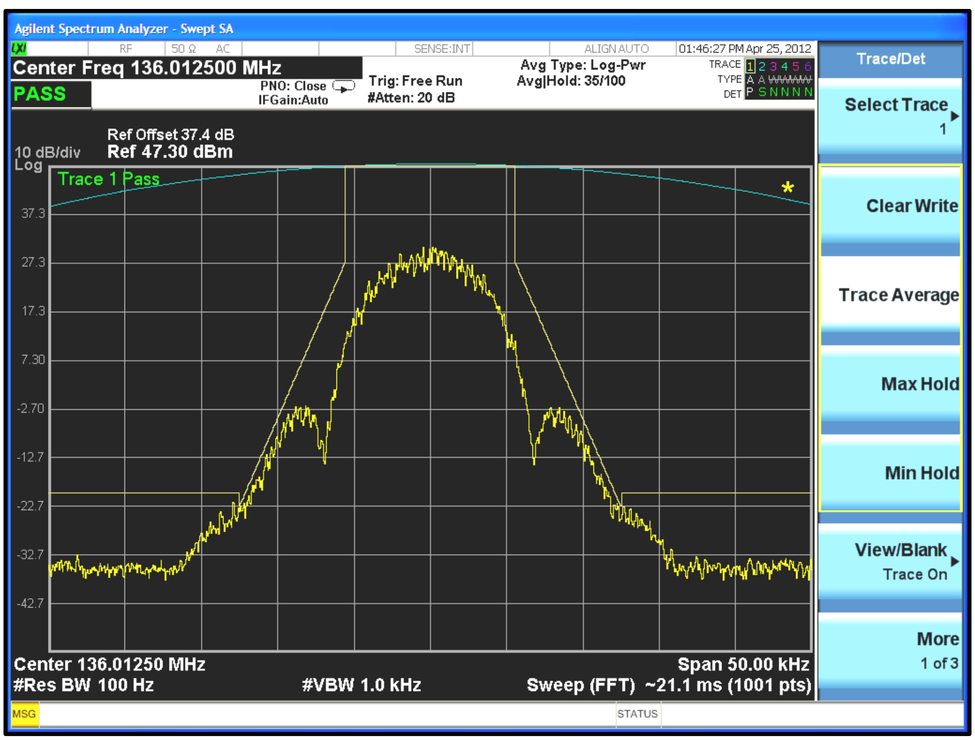
Plot 7-29: Occupied Bandwidth – 173.175 MHz; 2 level WB 9600 (Mask C)



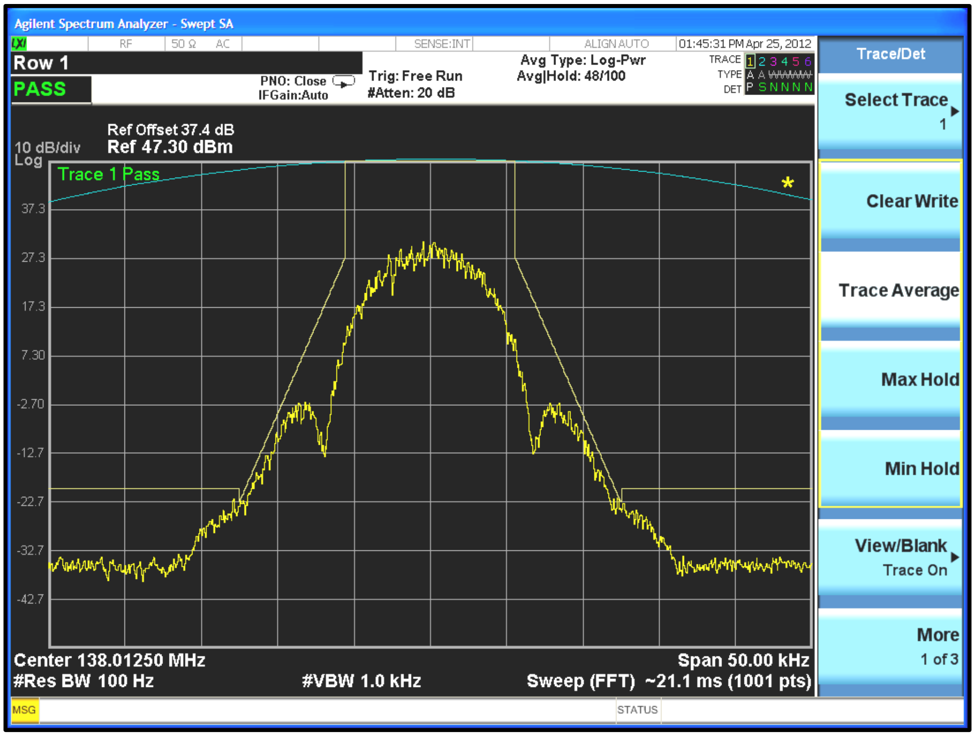
Plot 7-30: Occupied Bandwidth – 173.9875 MHz; 2 level WB 9600 (Mask C)



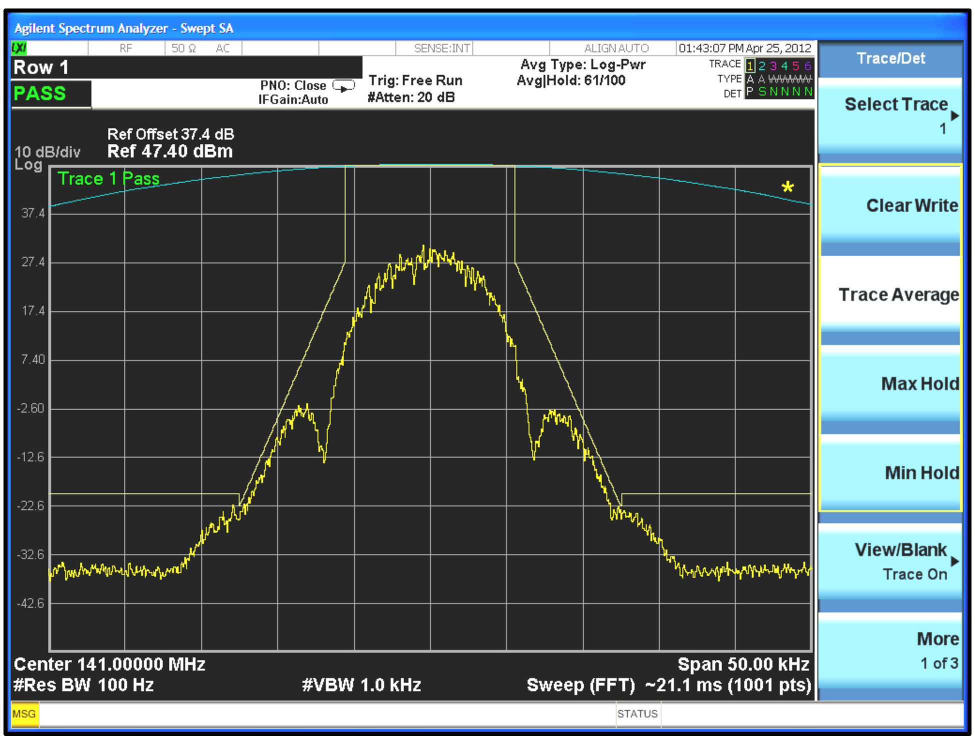
Plot 7-31: Occupied Bandwidth – 136.0125 MHz; 2 level NB 9600 (Mask D)



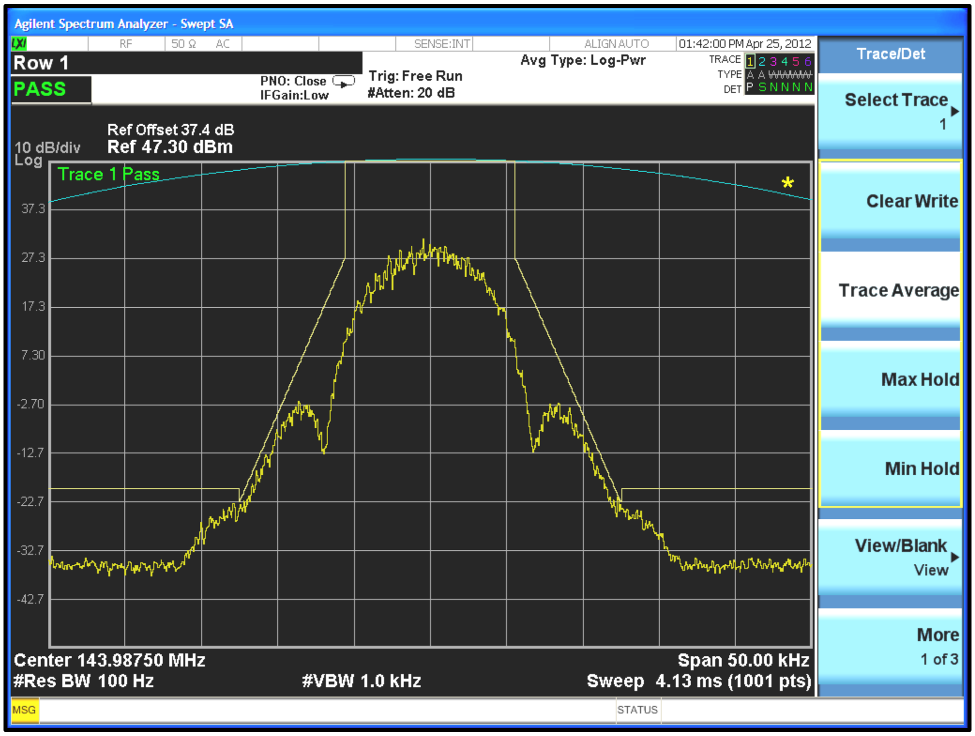
Plot 7-32: Occupied Bandwidth – 138.0125 MHz; 2 level NB 9600 (Mask D)



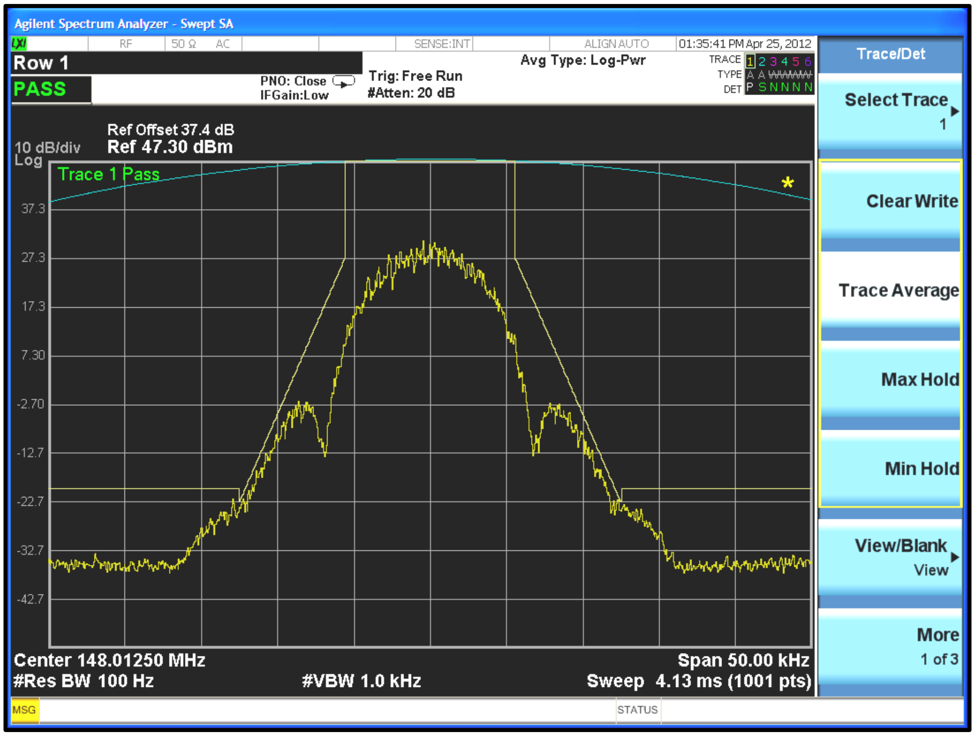
Plot 7-33: Occupied Bandwidth – 141.0000 MHz; 2 level NB 9600 (Mask D)



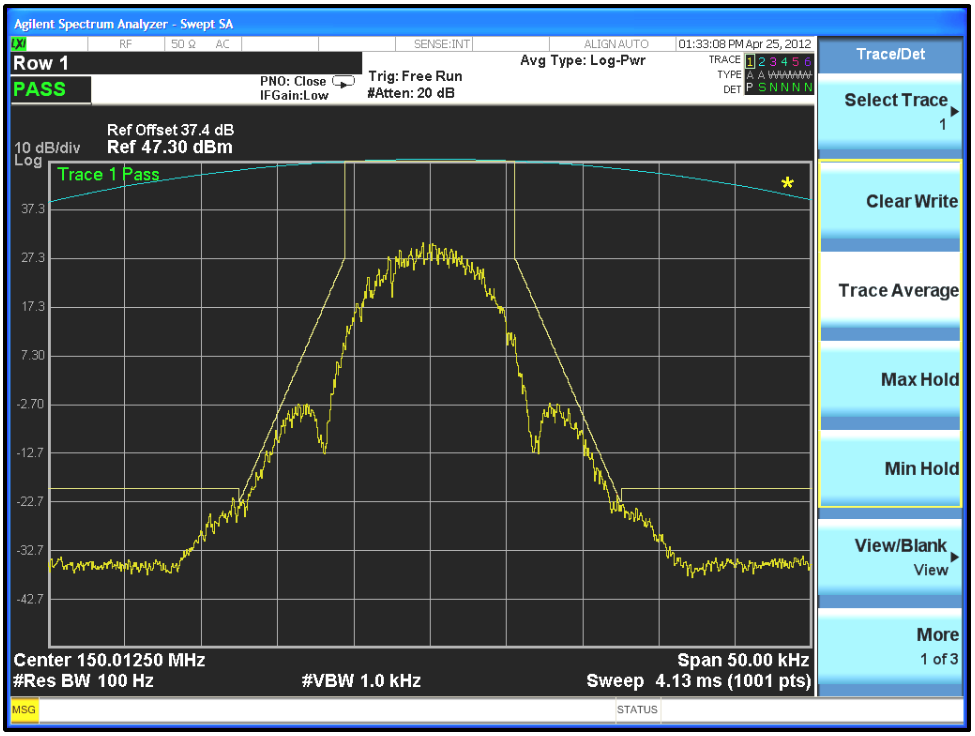
Plot 7-34: Occupied Bandwidth – 143.9875 MHz; 2 level NB 9600 (Mask D)



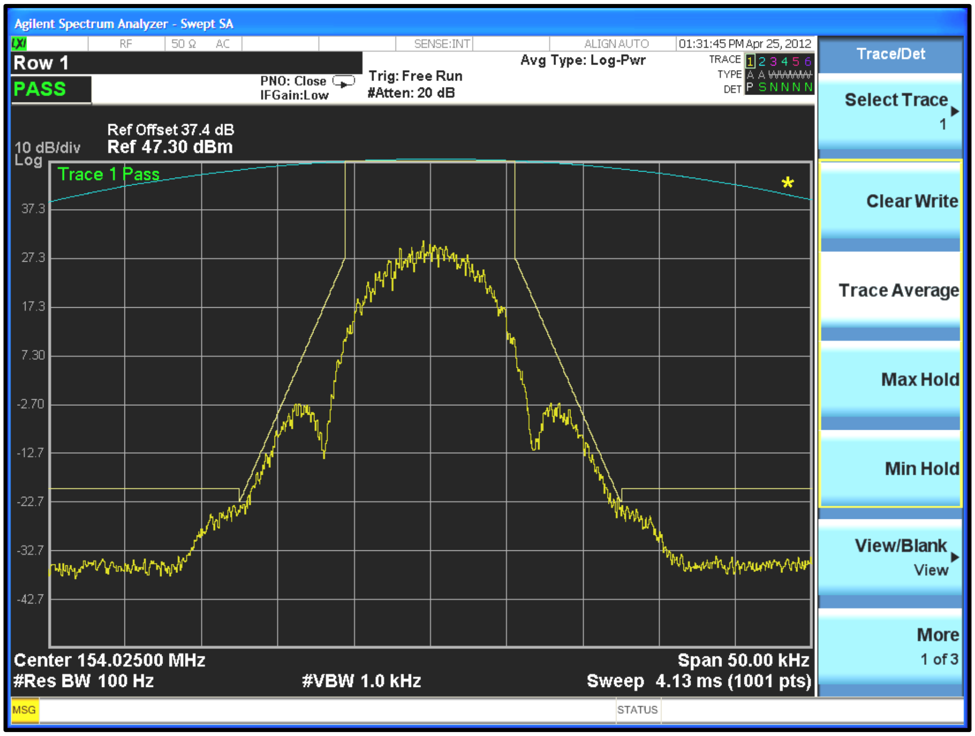
Plot 7-35: Occupied Bandwidth – 148.0125 MHz; 2 level NB 9600 (Mask D)



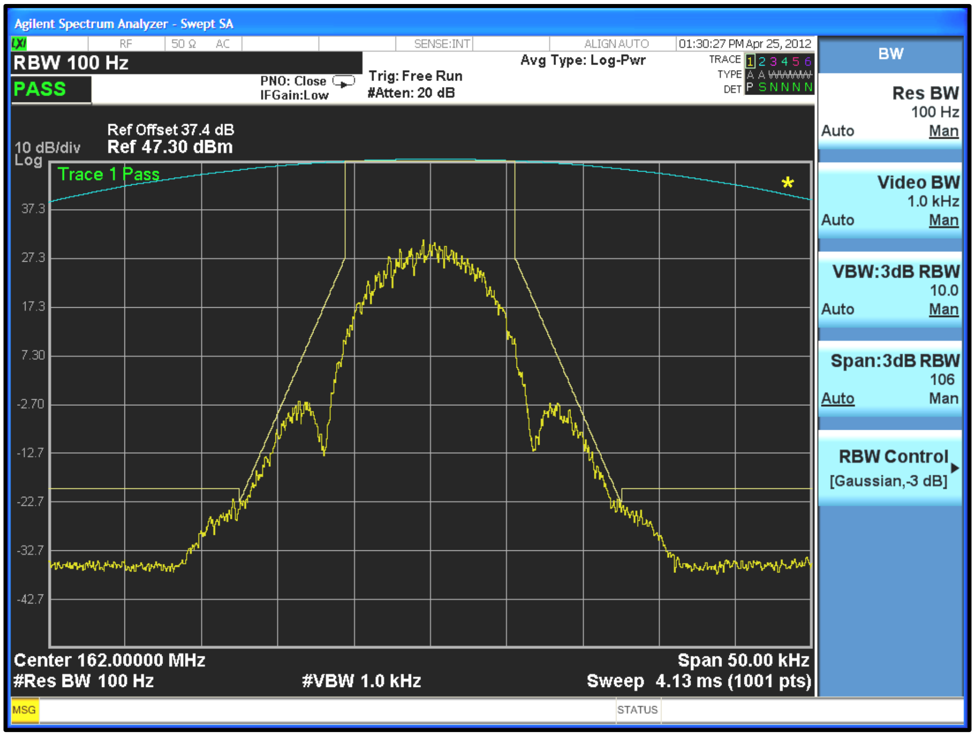
Plot 7-36: Occupied Bandwidth – 150.0125 MHz; 2 level NB 9600 (Mask D)



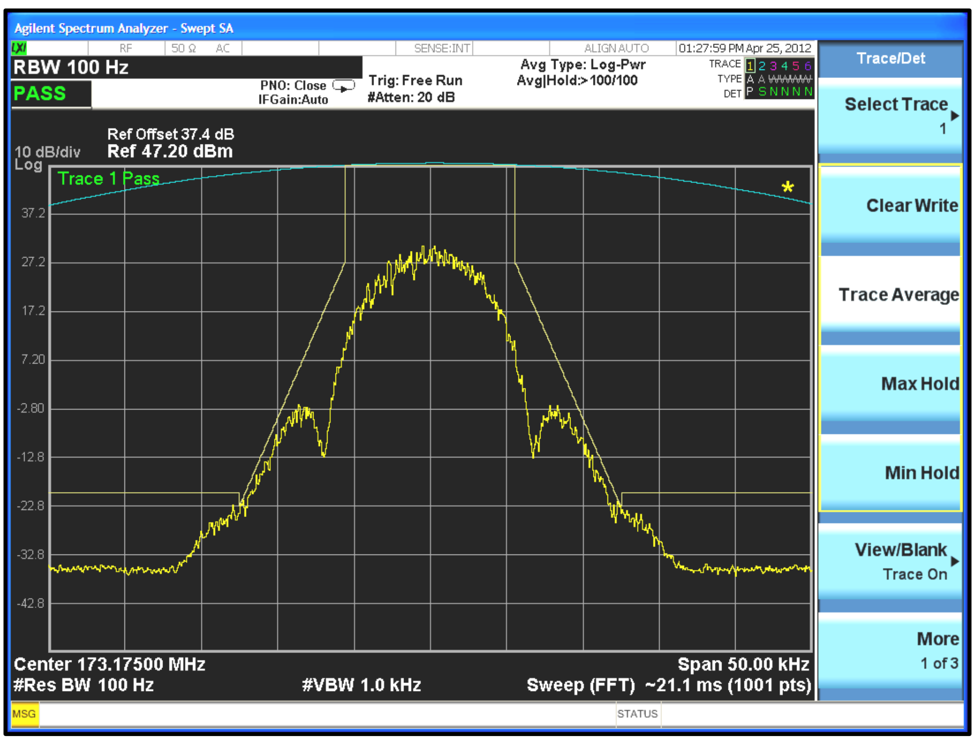
Plot 7-37: Occupied Bandwidth – 154.025 MHz; 2 level NB 9600 (Mask D)



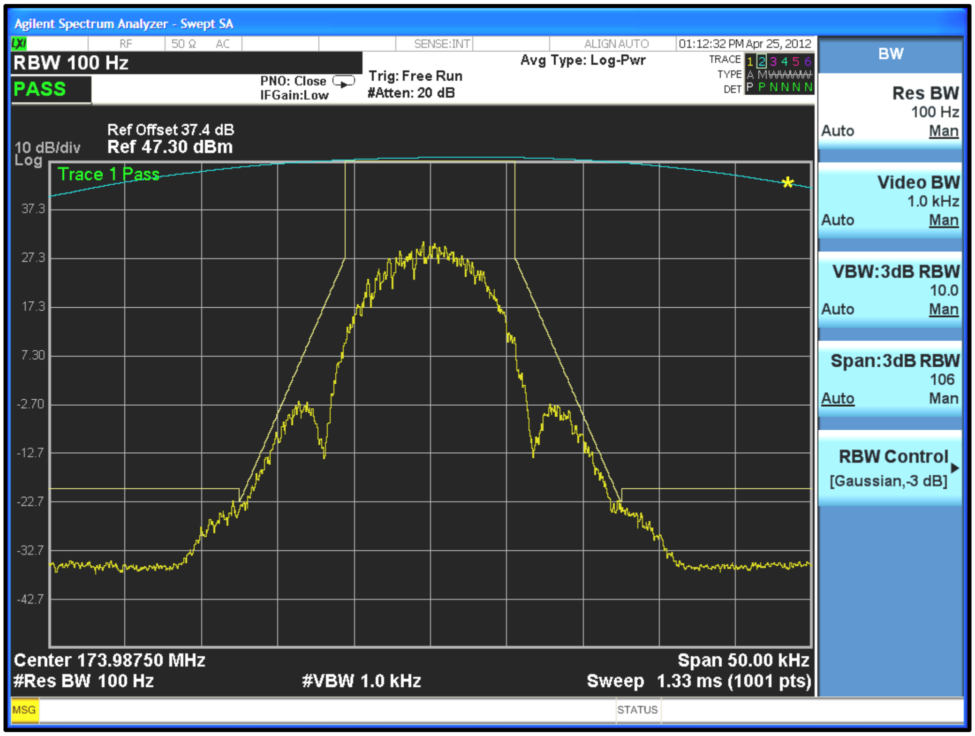
Plot 7-38: Occupied Bandwidth – 162.0000 MHz; 2 level NB 9600 (Mask D)



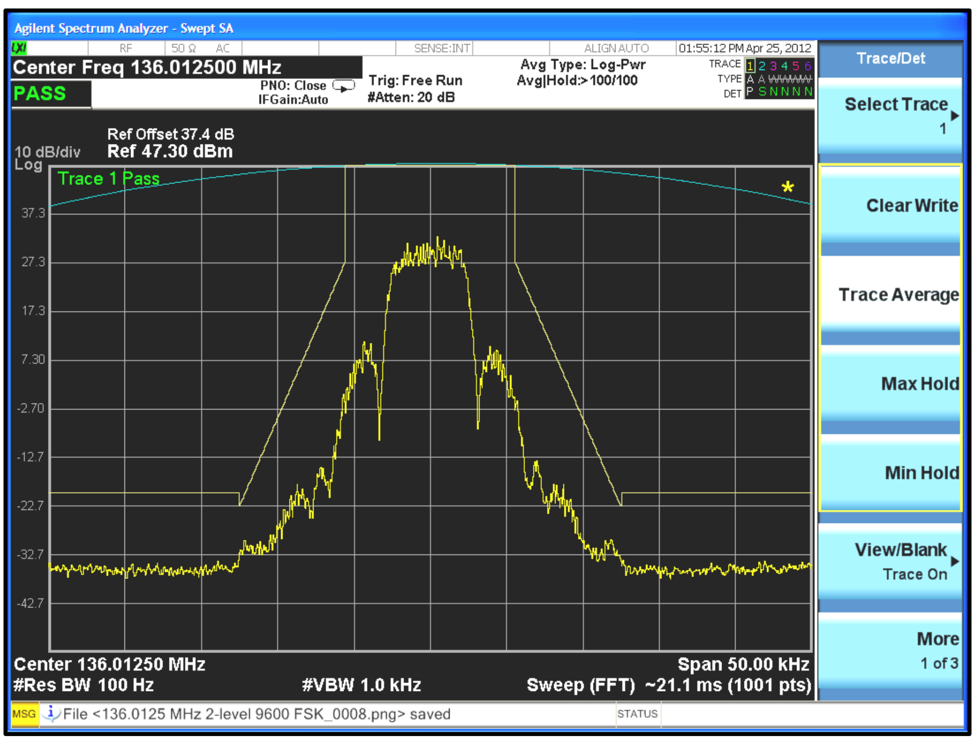
Plot 7-39: Occupied Bandwidth – 173.175 MHz; 2 level NB 9600 (Mask D)



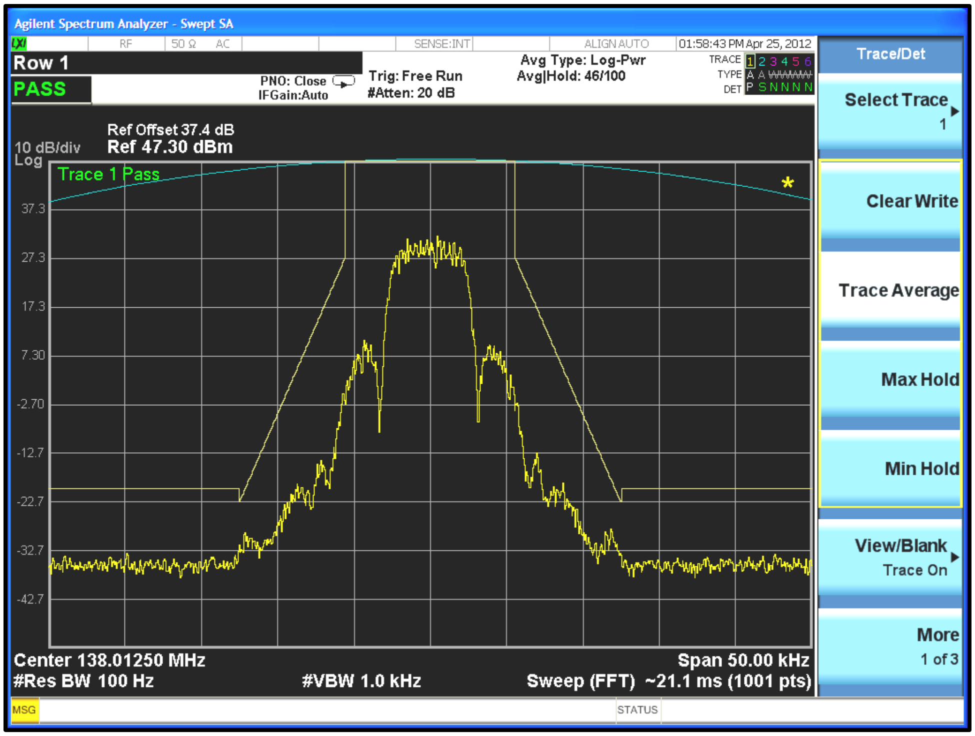
Plot 7-40: Occupied Bandwidth – 173.9875 MHz; 2 level NB 9600 (Mask D)



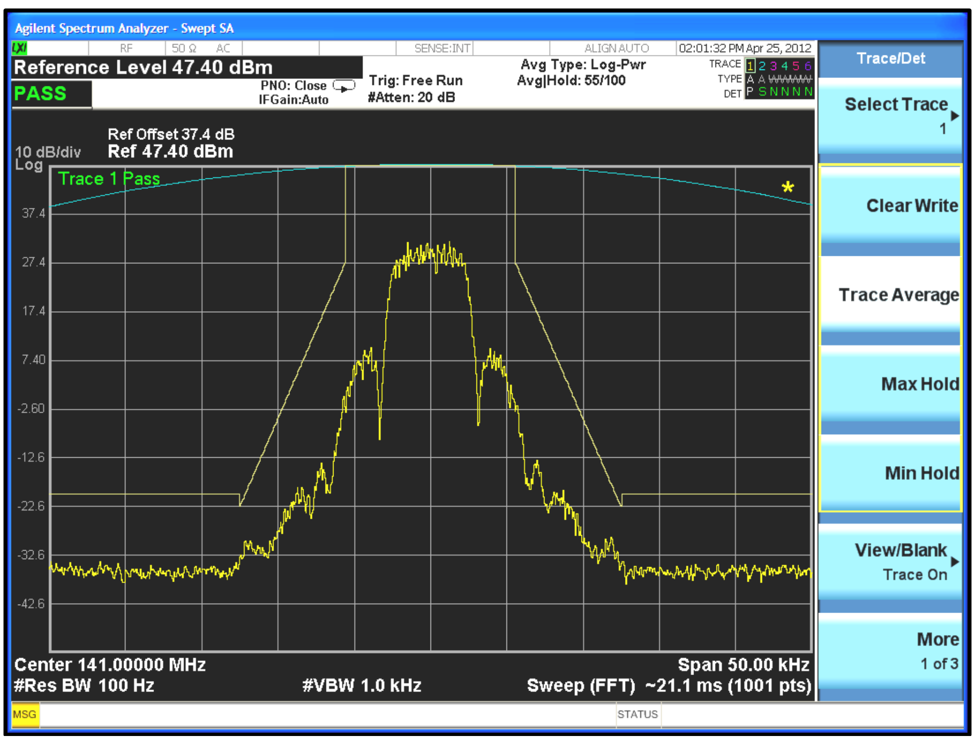
Plot 7-41: Occupied Bandwidth – 136.0125 MHz; 2 level NB 4800 (Mask D)



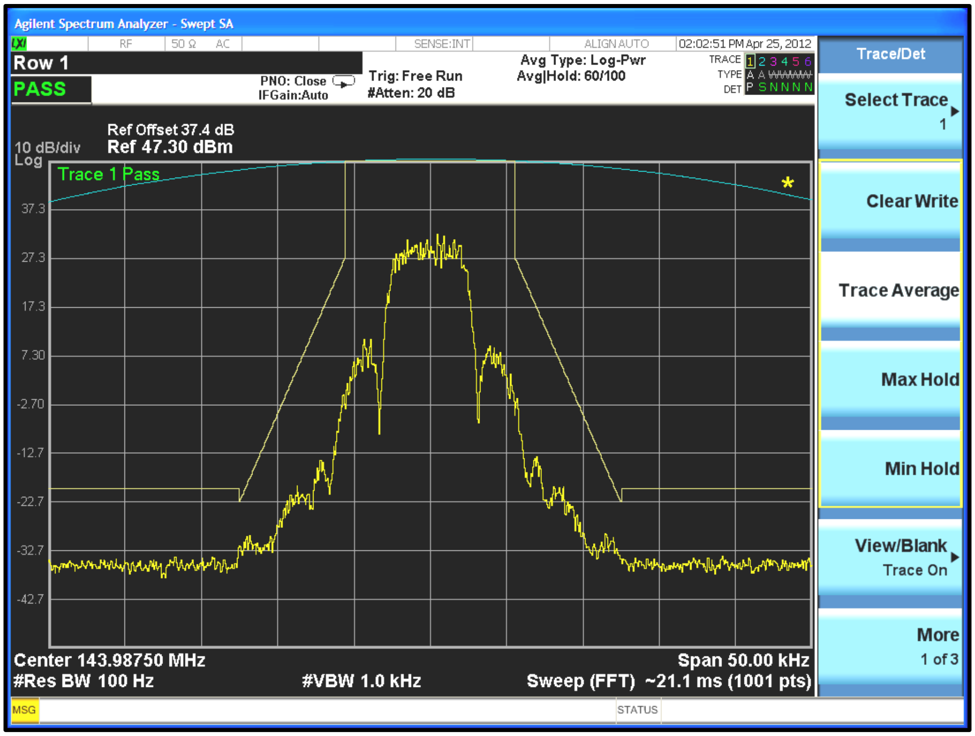
Plot 7-42: Occupied Bandwidth – 138.0125 MHz; 2 level NB 4800 (Mask D)



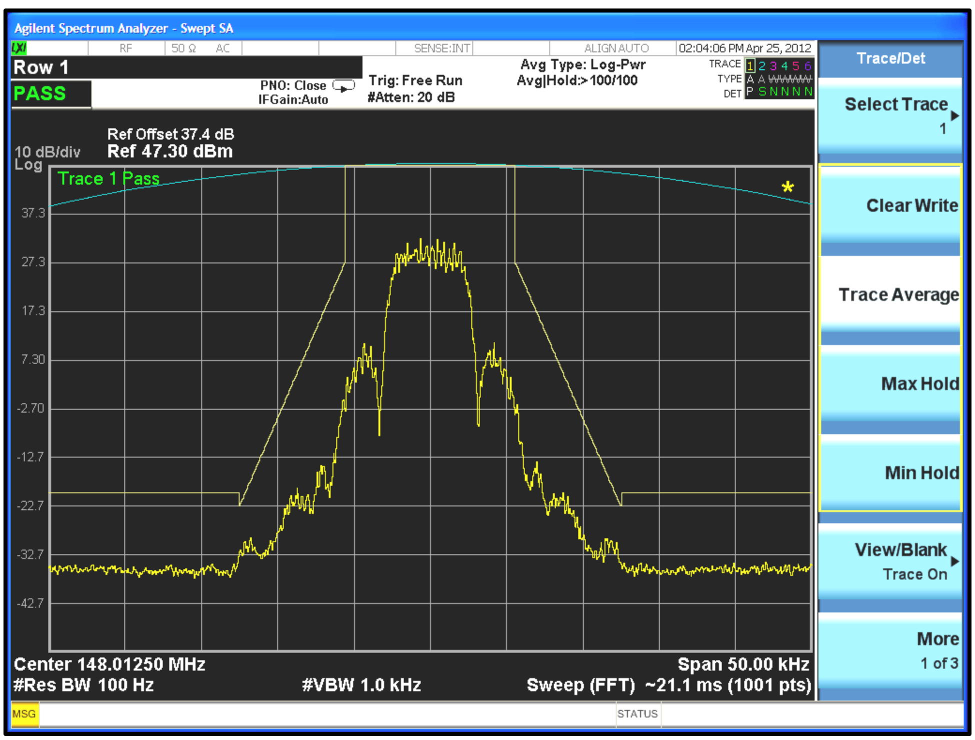
Plot 7-43: Occupied Bandwidth – 141.0000 MHz; 2 level NB 4800 (Mask D)



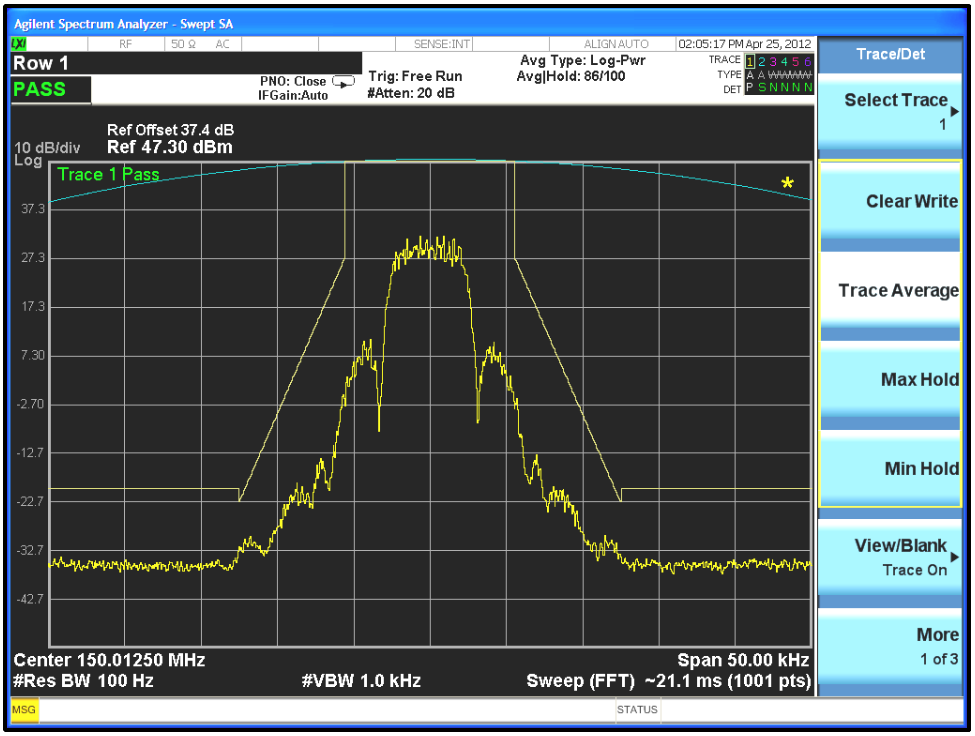
Plot 7-44: Occupied Bandwidth – 143.9875 MHz; 2 level NB 4800 (Mask D)



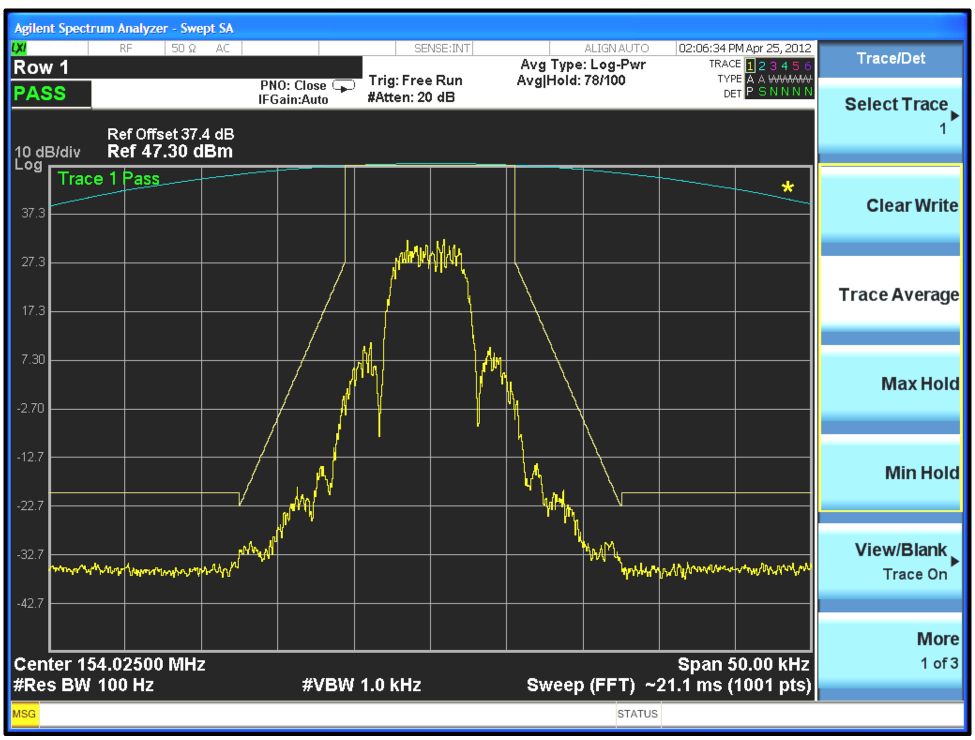
Plot 7-45: Occupied Bandwidth – 148.0125 MHz; 2 level NB 4800 (Mask D)



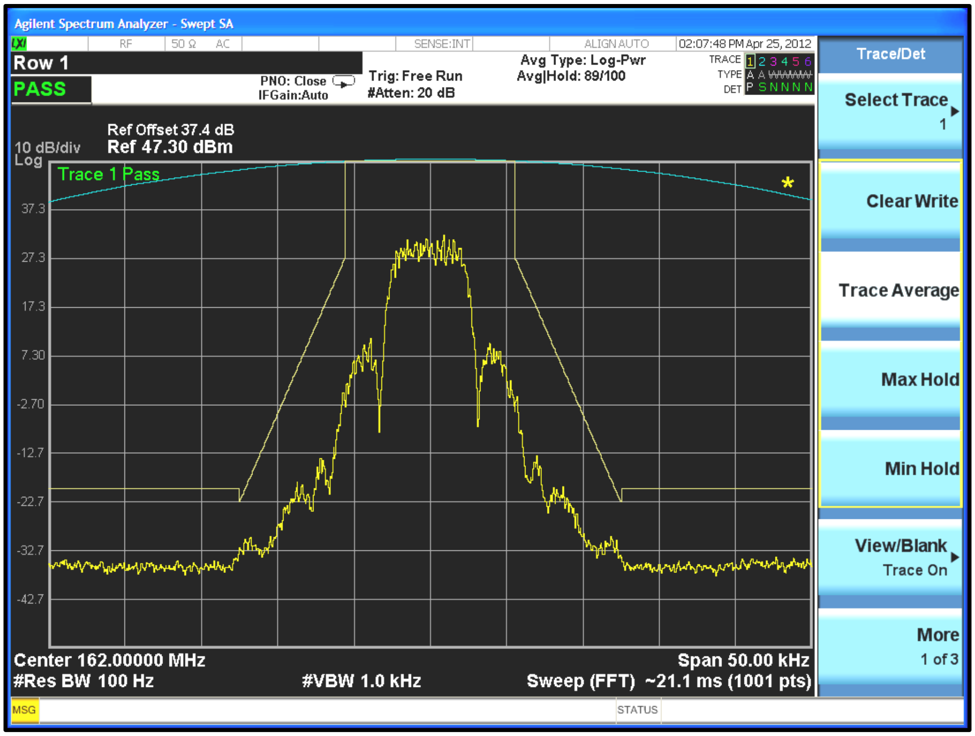
Plot 7-46: Occupied Bandwidth – 150.0125 MHz; 2 level NB 4800 (Mask D)



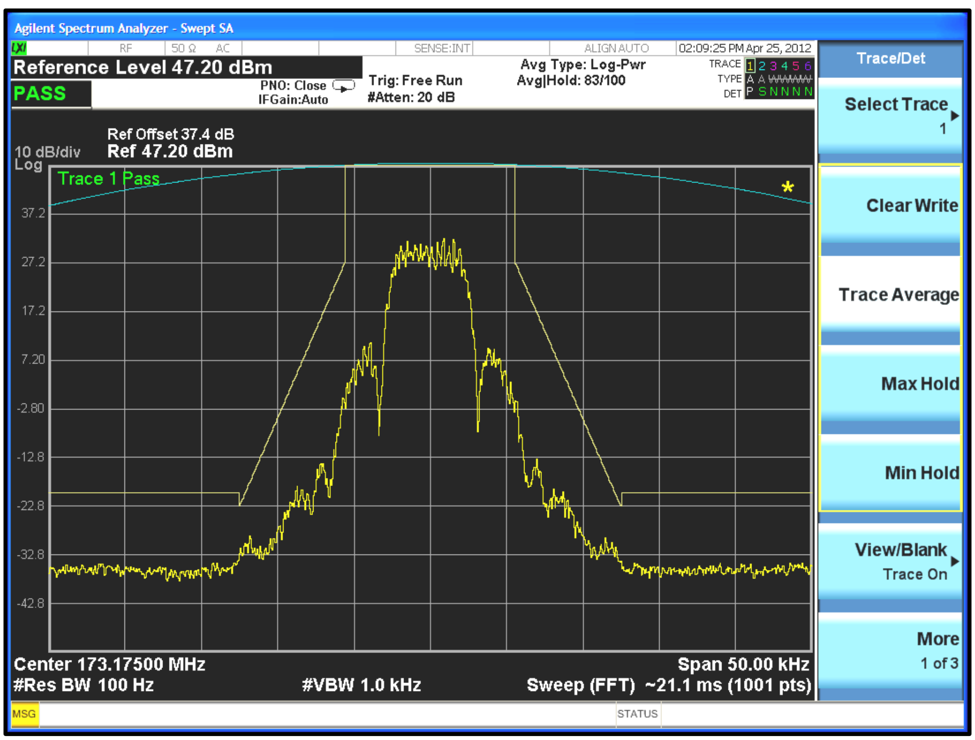
Plot 7-47: Occupied Bandwidth – 154.025 MHz; 2 level NB 4800 (Mask D)



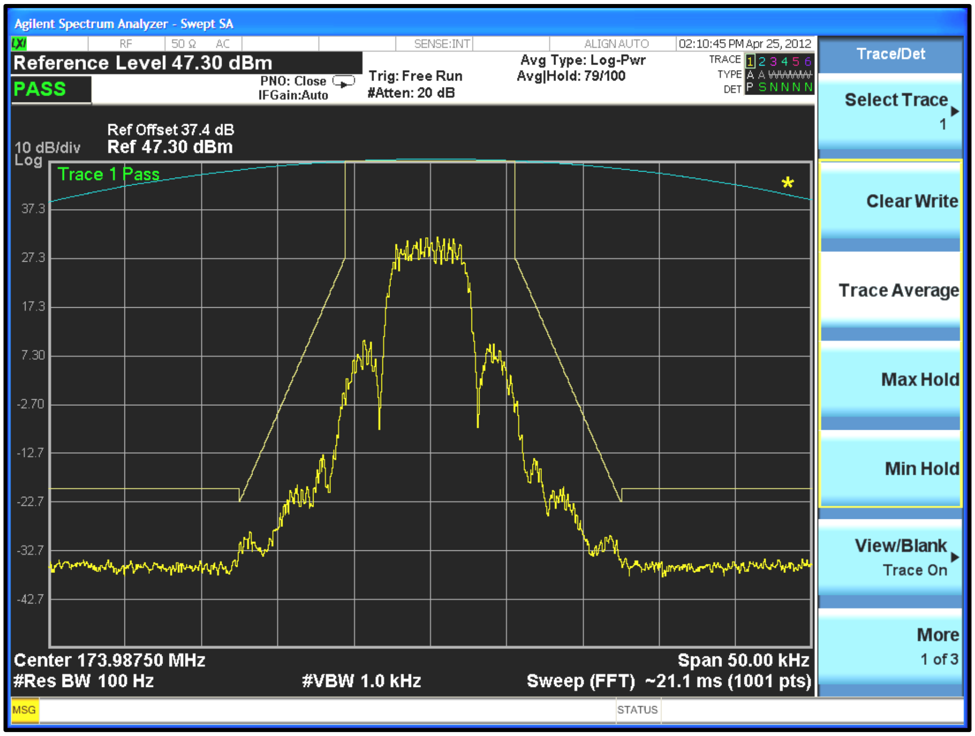
Plot 7-48: Occupied Bandwidth – 162.0000 MHz; 2 level NB 4800 (Mask D)



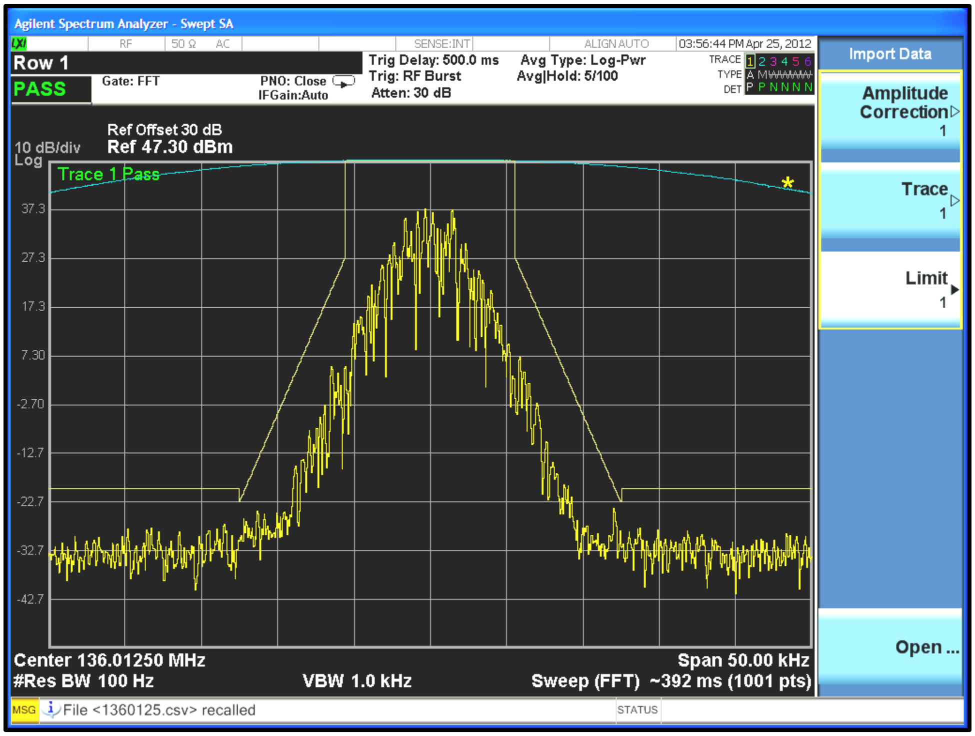
Plot 7-49: Occupied Bandwidth – 173.175 MHz; 2 level NB 4800 (Mask D)



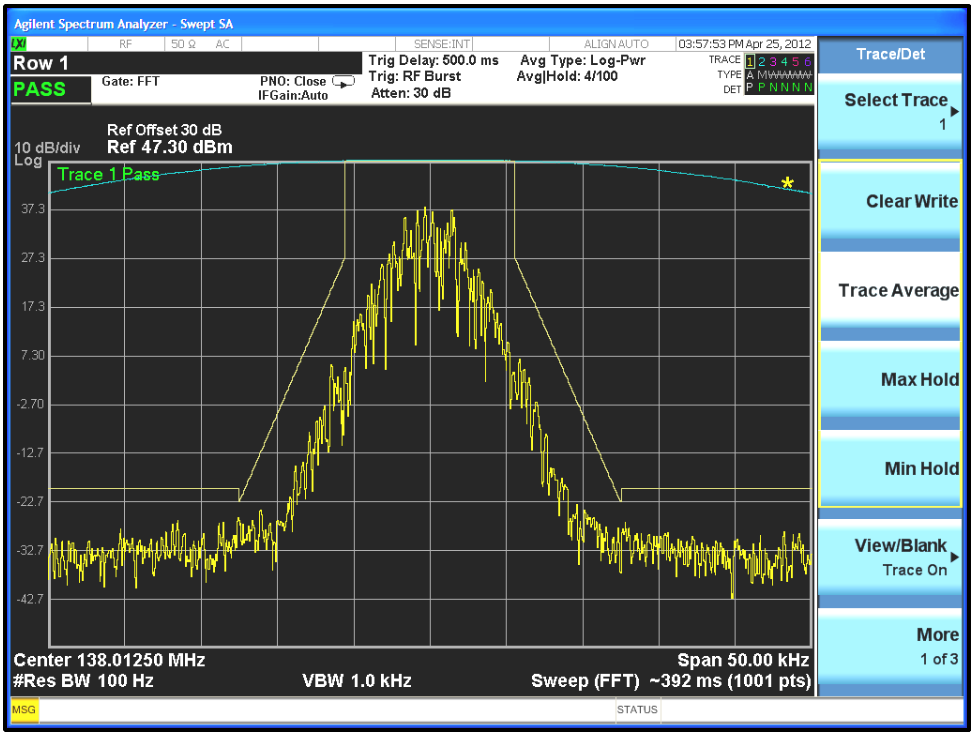
Plot 7-50: Occupied Bandwidth – 173.9875 MHz; 2 level NB 4800 (Mask D)



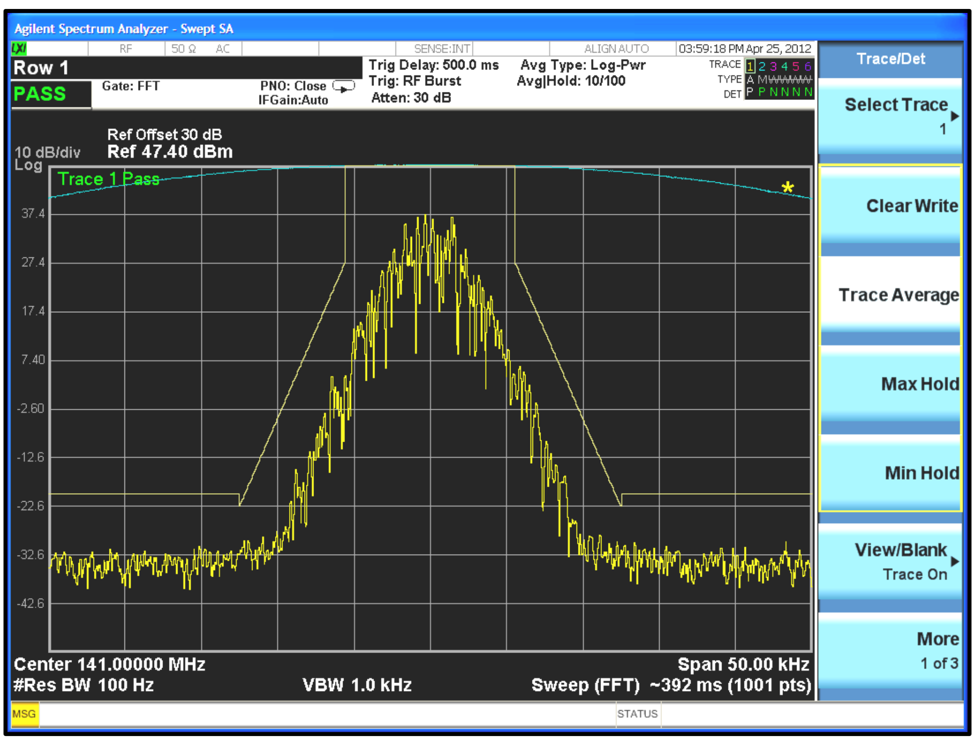
Plot 7-51: Occupied Bandwidth – 136.0125 MHz; OpenSky-TDMA (Mask D)



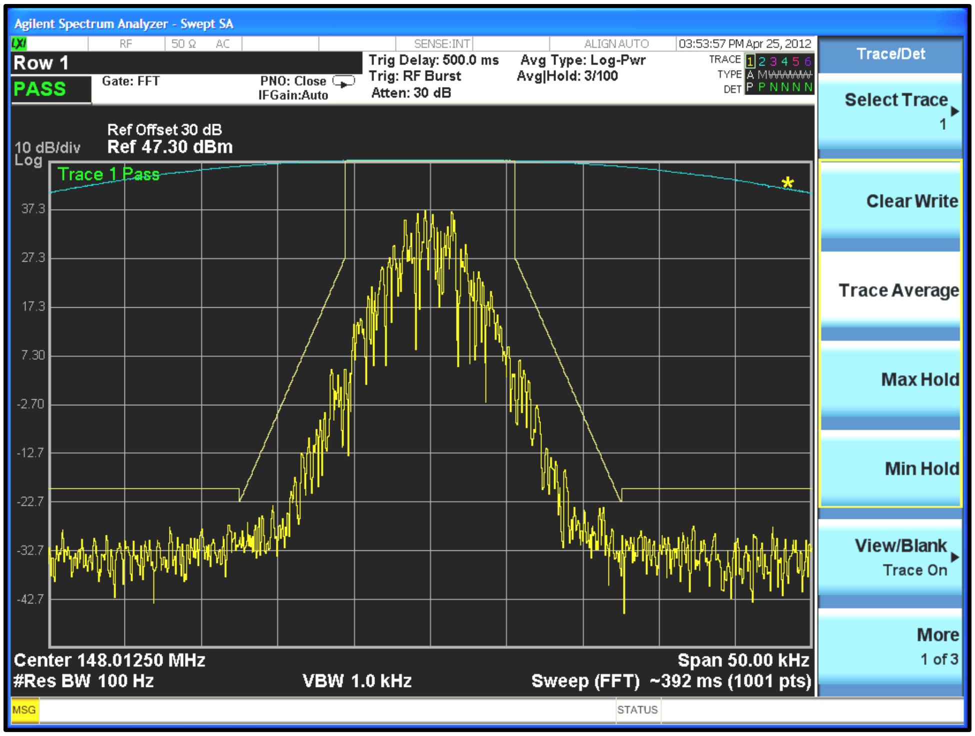
Plot 7-52: Occupied Bandwidth – 138.0125 MHz; OpenSky-TDMA (Mask D)



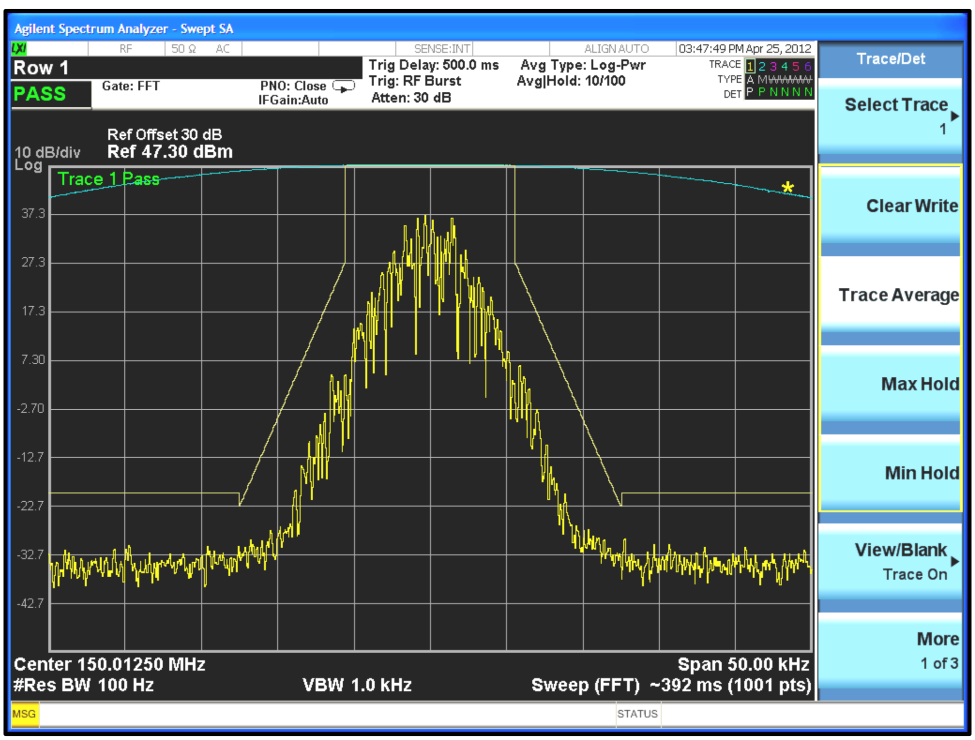
Plot 7-53: Occupied Bandwidth – 141.0000 MHz; OpenSky-TDMA (Mask D)



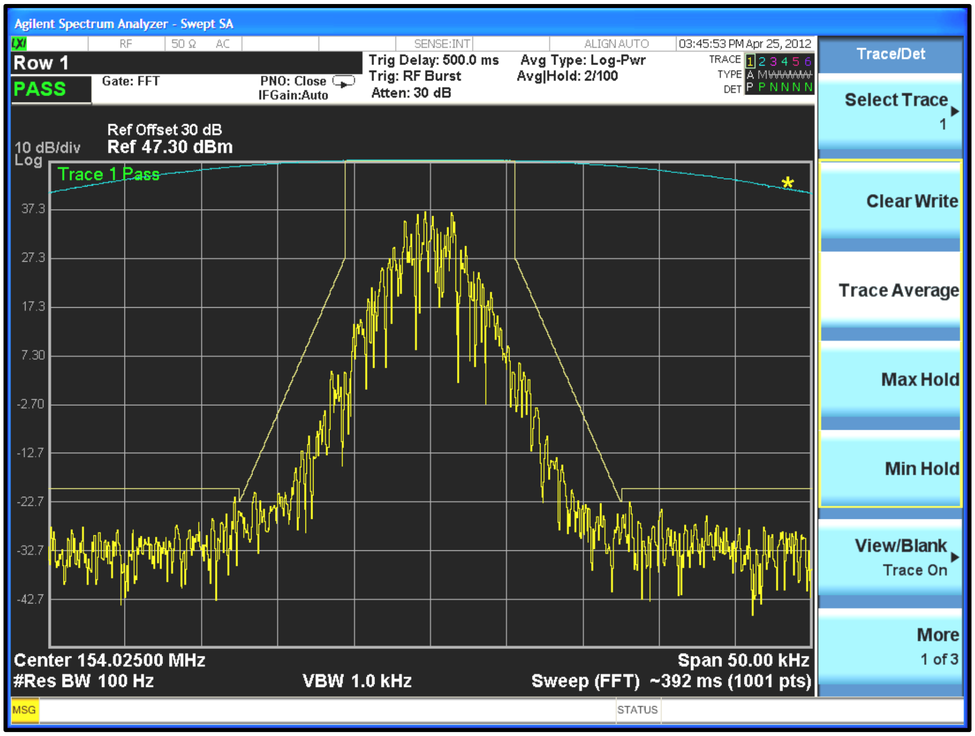
Plot 7-54: Occupied Bandwidth – 148.0125 MHz; OpenSky-TDMA (Mask D)



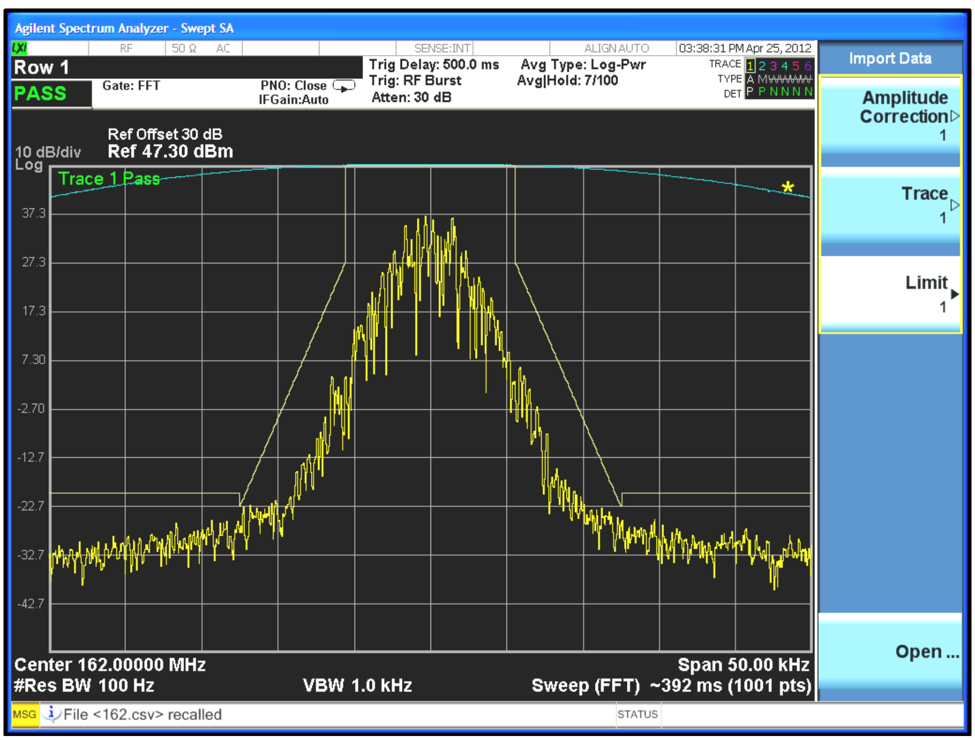
Plot 7-55: Occupied Bandwidth – 150.0125 MHz; OpenSky-TDMA (Mask D)



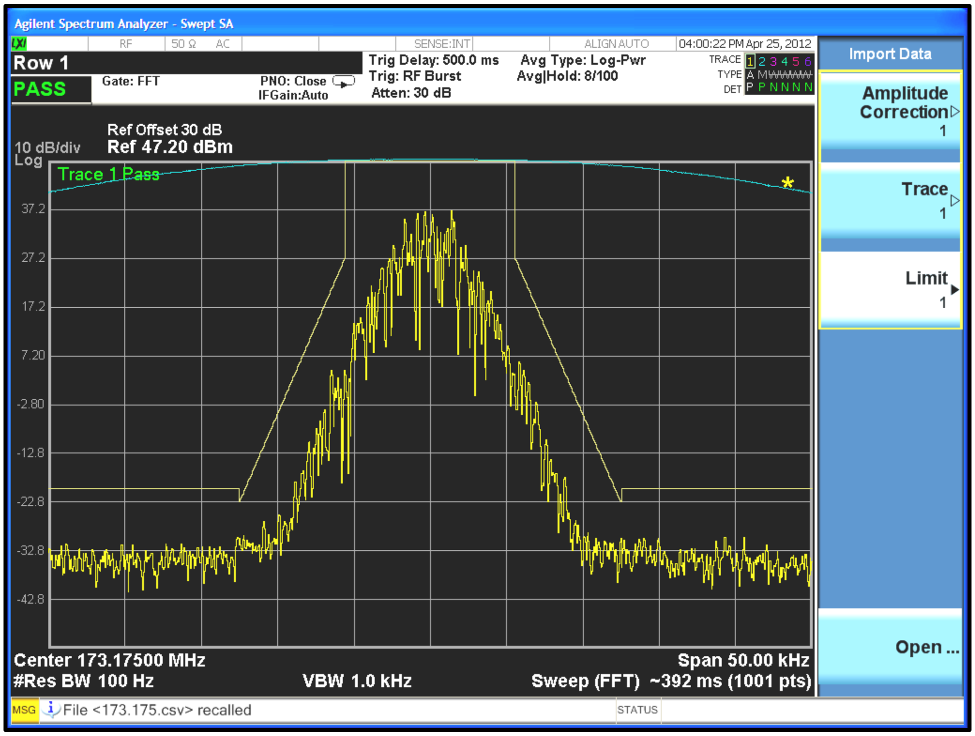
Plot 7-56: Occupied Bandwidth – 154.025 MHz; OpenSky-TDMA (Mask D)



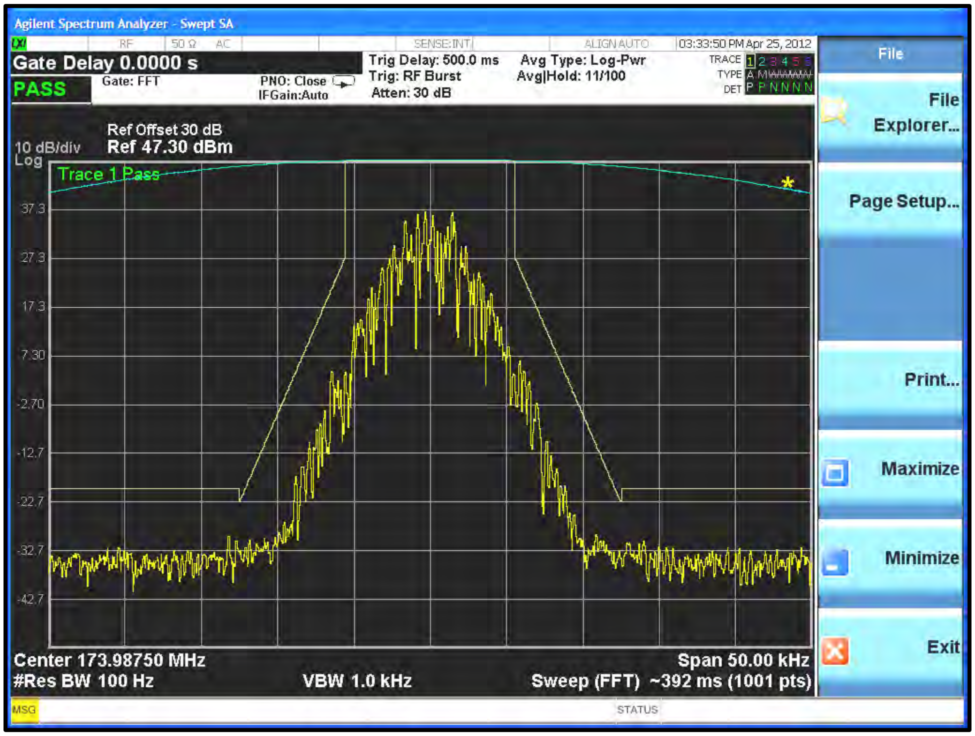
Plot 7-57: Occupied Bandwidth – 162.0000 MHz; OpenSky-TDMA (Mask D)



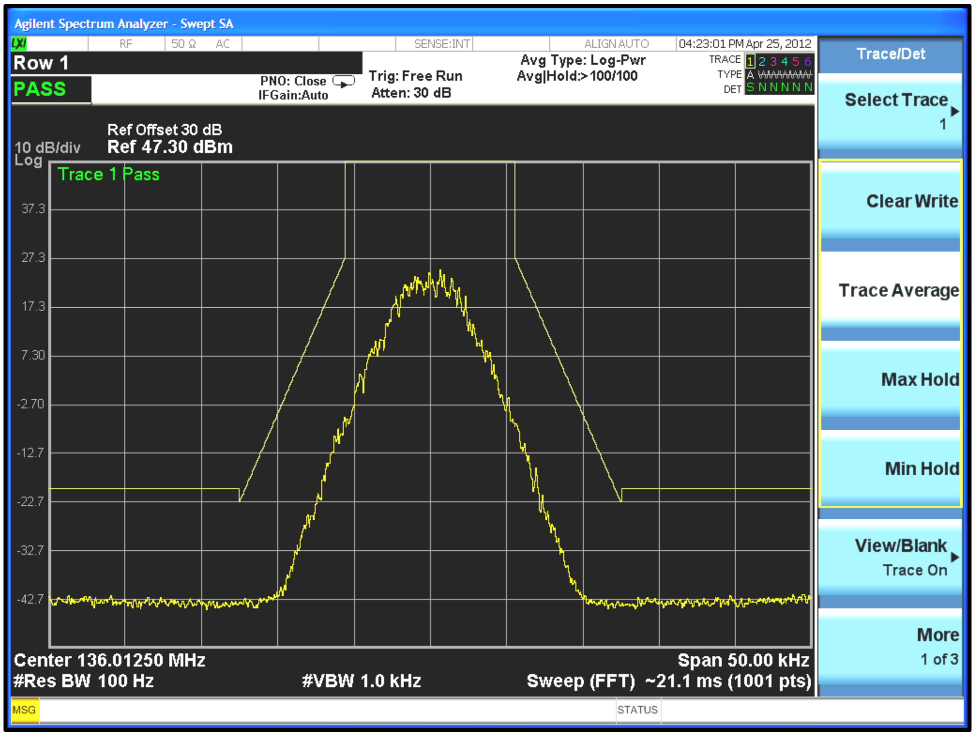
Plot 7-58: Occupied Bandwidth – 173.175 MHz; OpenSky-TDMA (Mask D)



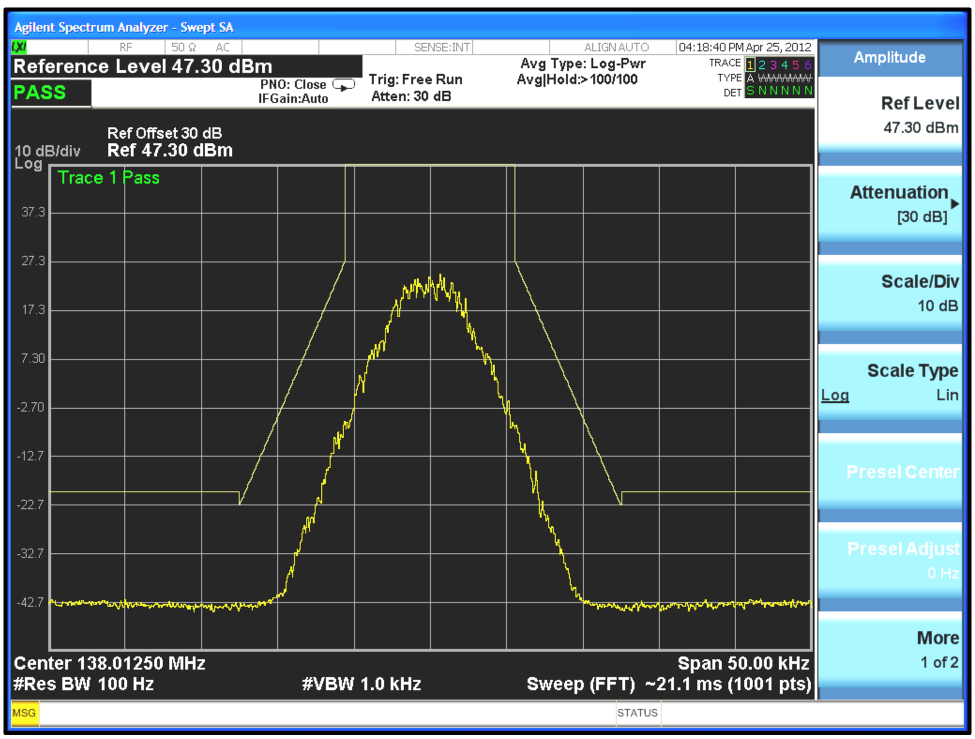
Plot 7-59: Occupied Bandwidth – 173.9875 MHz; OpenSky-TDMA (Mask D)



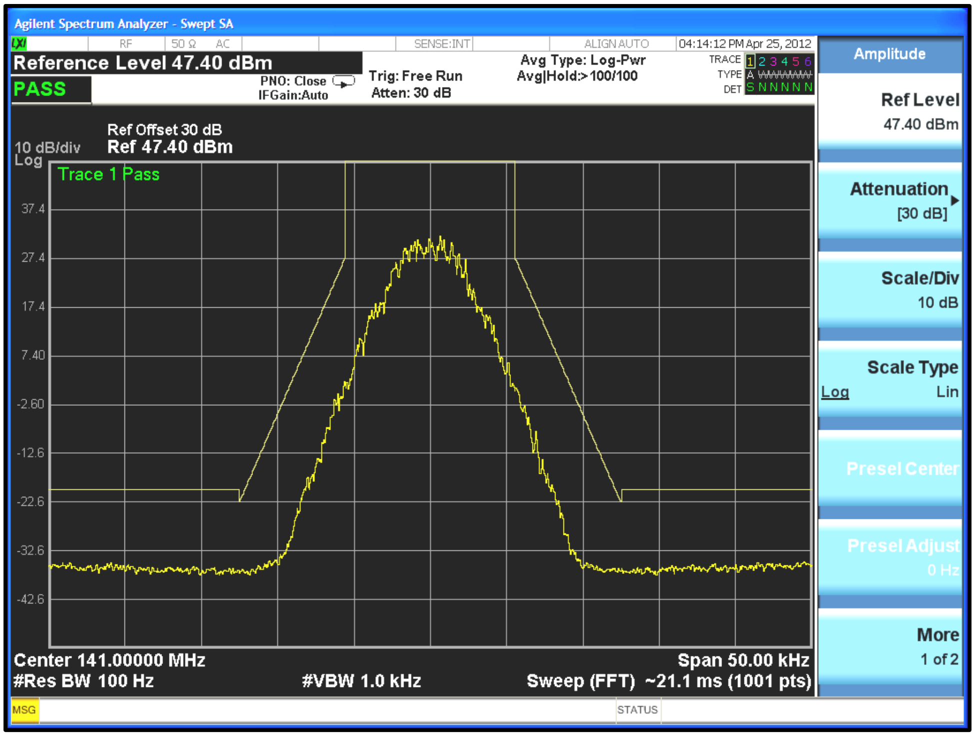
Plot 7-60: Occupied Bandwidth – 136.0125 MHz; P25 (Mask D)



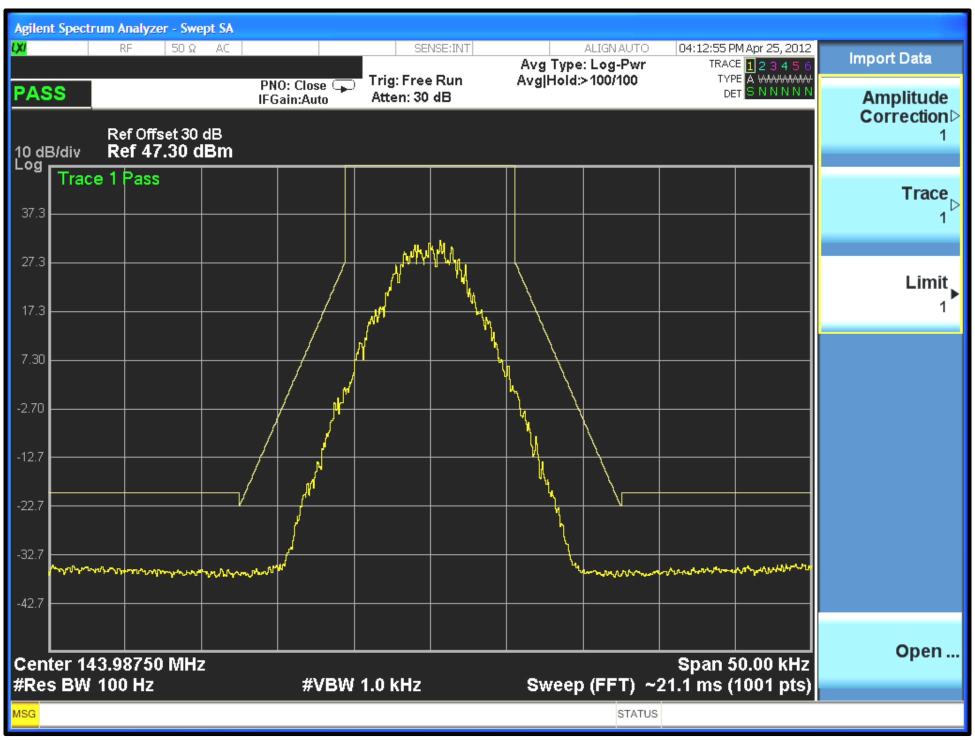
Plot 7-61: Occupied Bandwidth – 138.0125 MHz; P25 (Mask D)



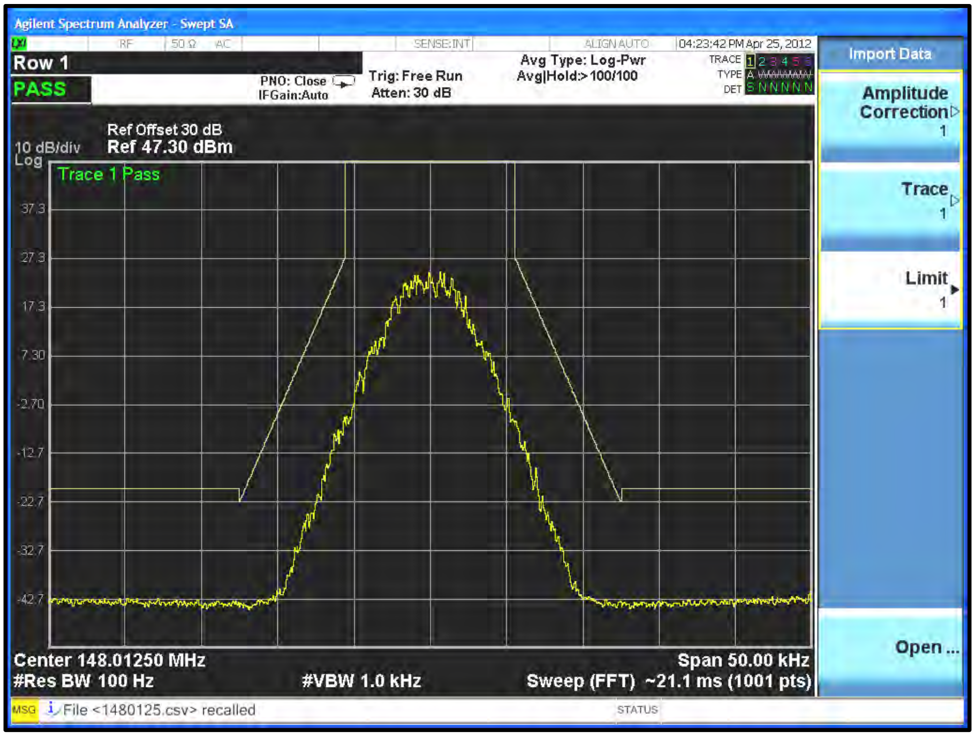
Plot 7-62: Occupied Bandwidth – 141.0000 MHz; P25 (Mask D)



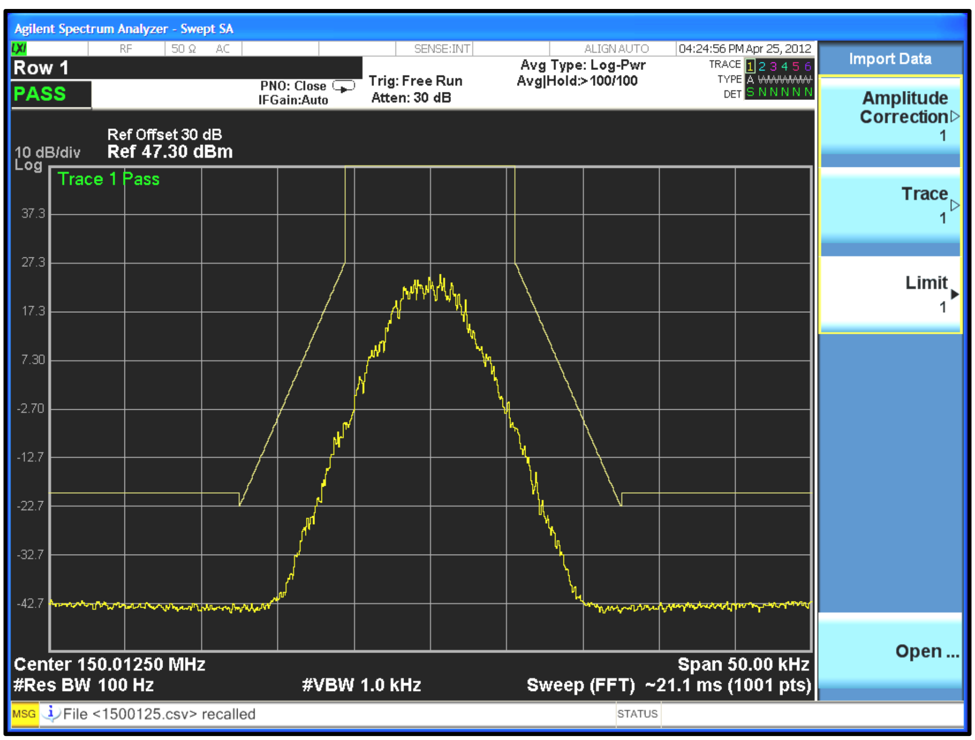
Plot 7-63: Occupied Bandwidth – 143.9875 MHz; P25 (Mask D)



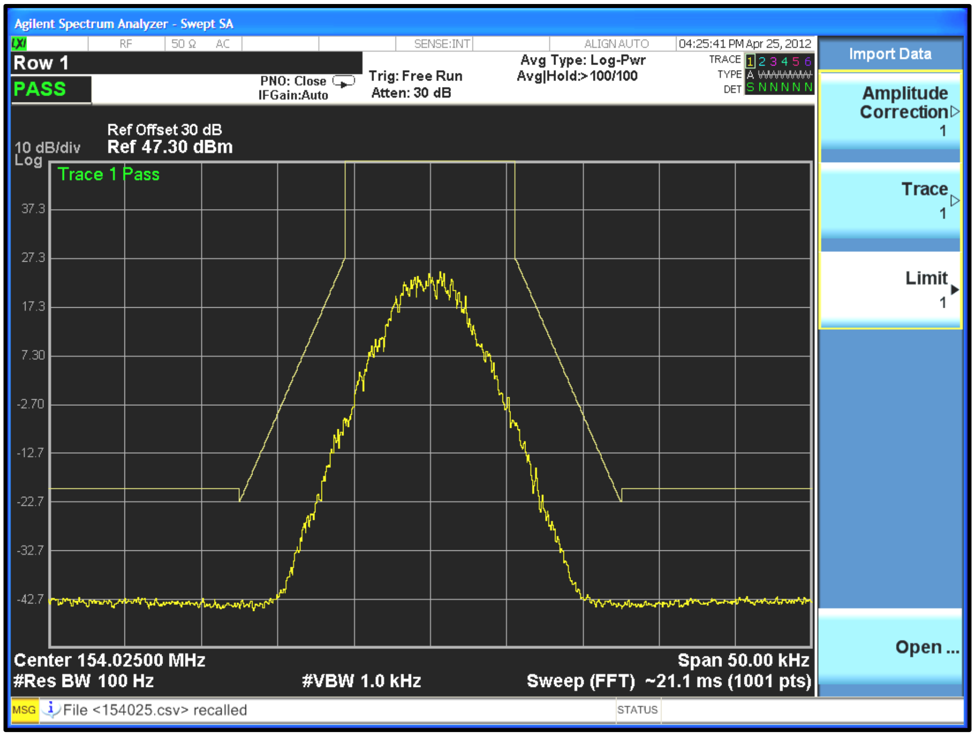
Plot 7-64: Occupied Bandwidth – 148.0125 MHz; P25 (Mask D)



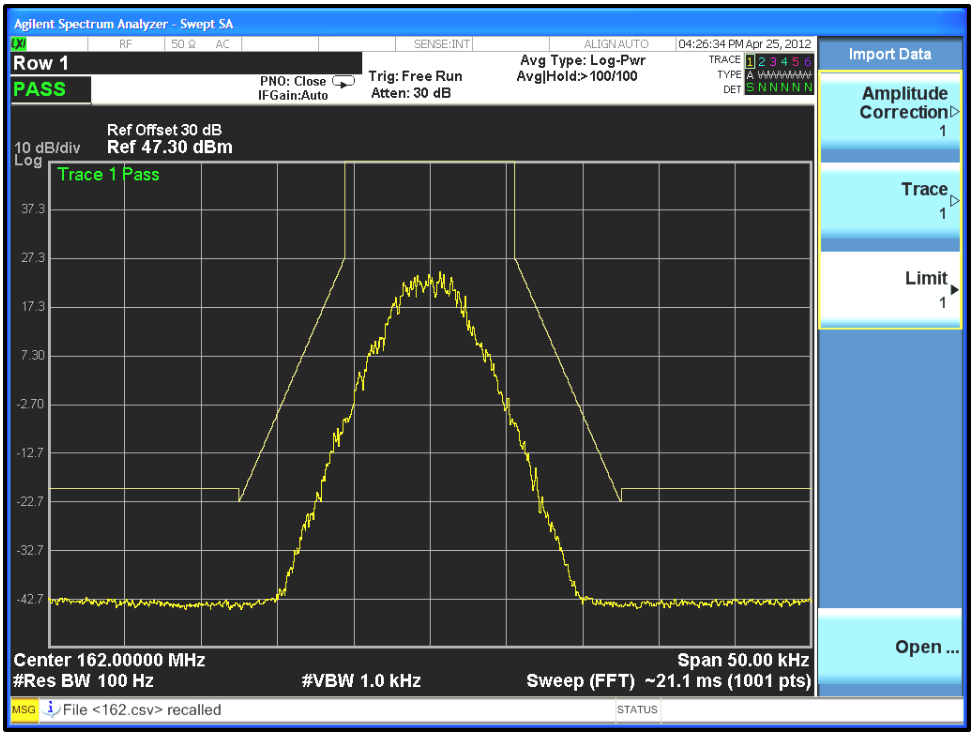
Plot 7-65: Occupied Bandwidth – 150.0125 MHz; P25 (Mask D)



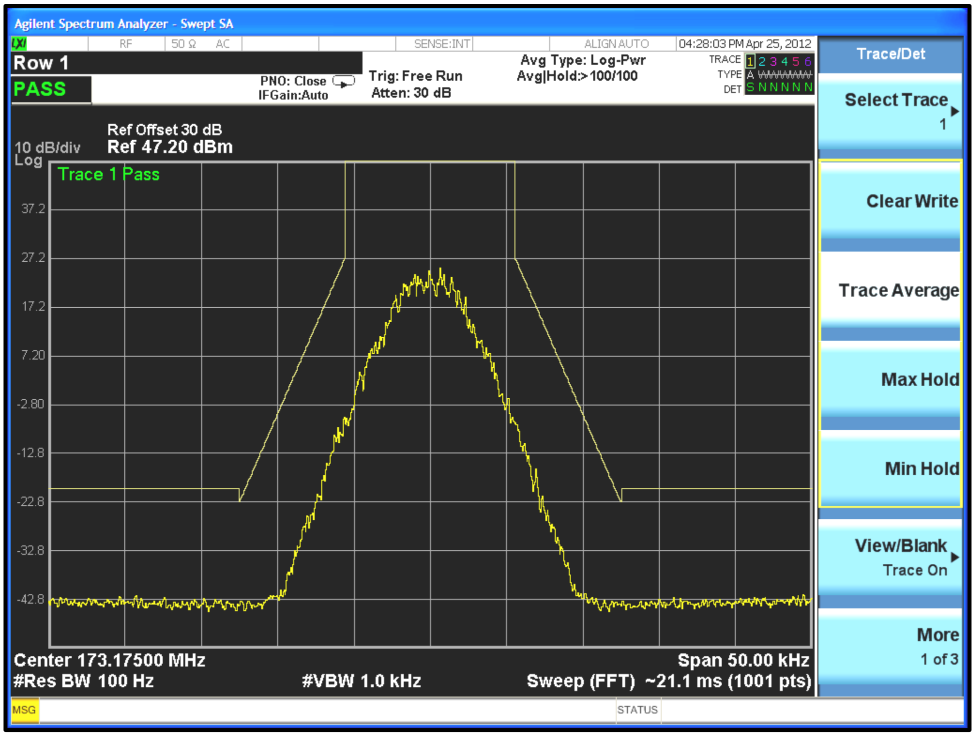
Plot 7-66: Occupied Bandwidth – 154.025 MHz; P25 (Mask D)



Plot 7-67: Occupied Bandwidth – 162.0000 MHz; P25 (Mask D)



Plot 7-68: Occupied Bandwidth – 173.175 MHz; P25 (Mask D)



Plot 7-69: Occupied Bandwidth – 173.9875 MHz; P25 (Mask D)

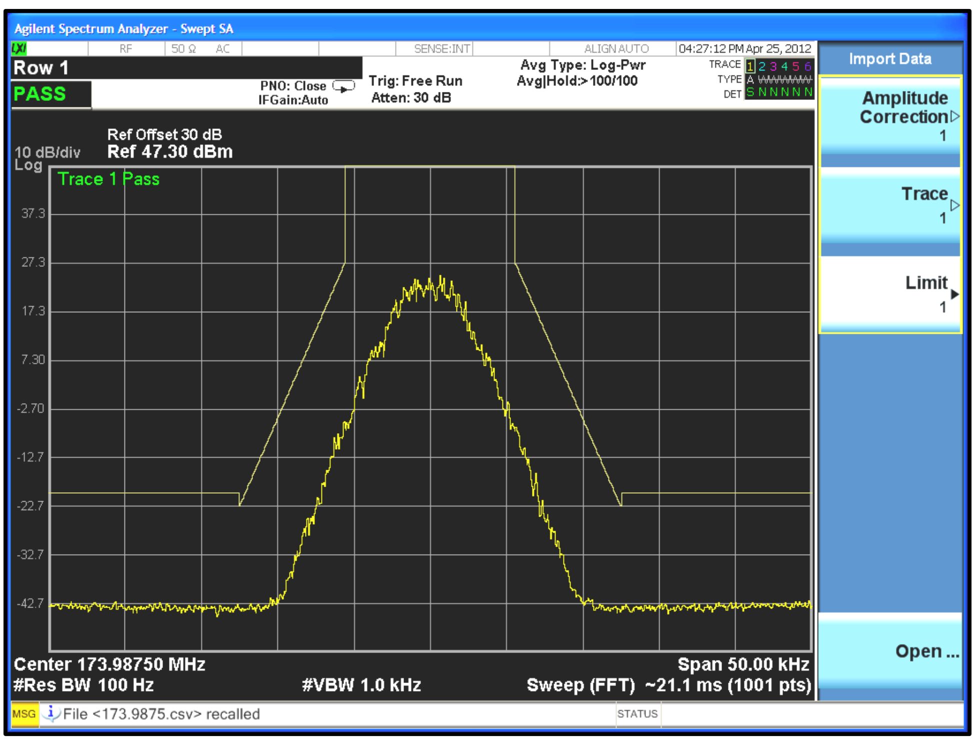


Table 7-1: Test Equipment Used For Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz- 26.5 GHz)	MY51250846	3/13/13
901337	Narda Microline	766-10	Attenuator (DC-4GHz, 10 dB, 20W)	6242	7/15/12

Test Personnel:

Daniel Baltzell		April 25-26, 2012
Test Engineer	Signature	Dates of Test

8 FCC Rules and Regulation Part 2.1055: Frequency Stability; Part 90.213: Frequency Stability; Part 80.209: Frequency Stability; RSS-119 5.3: Transmitter Frequency Stability

8.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.2

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency. The EUT was evaluated over the temperature range -30°C to +60°C. The temperature was initially set to -30°C and a 2-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A ½-hour period was observed to stabilize the EUT at each measurement step and the frequency stability was measured within one minute after application of primary power to the transmitter. The measurement was noted and normalized to 20°C. The voltage stability was measured at +/- 15% and normalized to 20°C.

Limit: 5 ppm for mobile stations (including Mobiles) designed to operate with a 12.5 kHz channel bandwidth

8.2 Test Data

Table 8-1: Temperature Frequency Stability – 148.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	148.012431	-0.47
-20	148.012449	-0.34
-10	148.012474	-0.18
0	148.012488	-0.08
10	148.012489	-0.07
20 (reference)	148.012500	0.00
30	148.012498	-0.01
40	148.012499	-0.01
50	148.012492	-0.05

8.2.1 Frequency Stability/Voltage Variation

Table 8-2: Frequency Stability/Voltage Variation – 148.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
11.73	148.012500	0.00
13.8 (reference)	148.012500	0.00
15.87	148.012501	0.01

The worst-case deviation was found to be 0.47 ppm.

Result: The EUT is compliant.

Table 8-3: Test Equipment Used For Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	01/13/13
901300	Agilent Technologies	53131A	Frequency Counter	MY40001345	07/18/12
901350	Meterman	33XR	Multimeter	040402802	12/28/12
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	10/14/12
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	7/8/12

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	April 23, 2012
Test Engineer	Signature	Date of Test

9 FCC Part 2.1047: Modulation Characteristics; Part 80.213 Modulation Requirements; RSS-119 5.8 Types of Modulation

§80.213 Modulation requirements.

(a)(2) When phase or frequency modulation is used in the 156–162 MHz band, the peak modulation must be maintained between 75 and 100 percent. A frequency deviation of ±5 kHz is defined as 100 percent peak modulation.
(b) Radiotelephone transmitters using A3E, F3E and G3E emission must have a modulation limiter to prevent any modulation over 100 percent. This requirement does not apply to survival craft transmitters, to transmitters that do not require a license, or to transmitters whose output power does not exceed 3 watts.
(d) Ship and coast station transmitters operating in the 156–162 MHz and 216–220 MHz bands must be capable of proper operation with a frequency deviation that does not exceed ±5 kHz when using any emission authorized by §80.207.
(e) Coast station transmitters operating in the 156–162 MHz band must be equipped with an audio low-pass filter. The filter must be installed between the modulation limiter and the modulated radio frequency stage. At frequencies between 3 kHz and 20 kHz, it must have an attenuation greater than at 1 kHz by at least 60log10(f/3) dB where ‘‘f’’ is the audio frequency in kilohertz. At frequencies above 20 kHz, the attenuation must be at least 50 dB greater than at 1 kHz.

9.1 Test Procedures

9.1.1 Audio Frequency Response

ANSI/TIA/EIA-603-2004, section 2.2.6

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

The input audio level at 1000 Hz was set to produce 20% of the rated system deviation. This point is shown as the 0 dB reference level, noted DEVref. The audio signal generator was varied from 100 Hz to 5 kHz with the input level held constant. The deviation in kHz was recorded using a modulation analyzer as DEVfreq. The response in dB relative to 1 kHz was calculated as follows:

Audio Frequency Response = 20 LOG (DEVfreq/DEVref)

9.1.2 Audio Low Pass Filter Response

ANSI/TIA/EIA-603-2004, 2.2.15

The Audio Low Pass Filter Response is the frequency response of the post limiter low pass filter circuit above 3000 Hz.

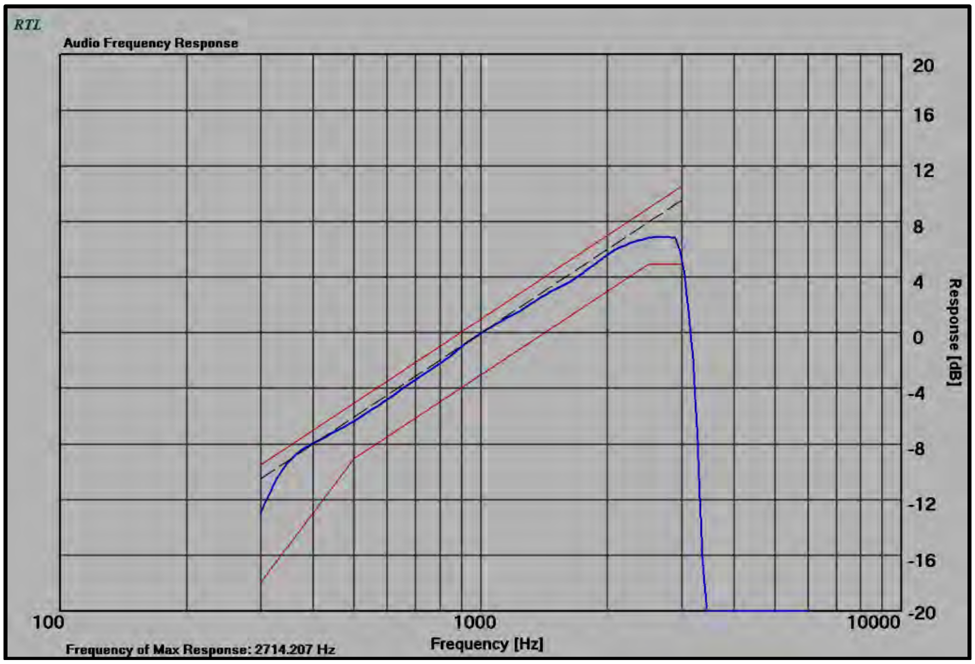
9.1.3 Modulation Limiting

ANSI/TIA/EIA-603-2004, section 2.2.3

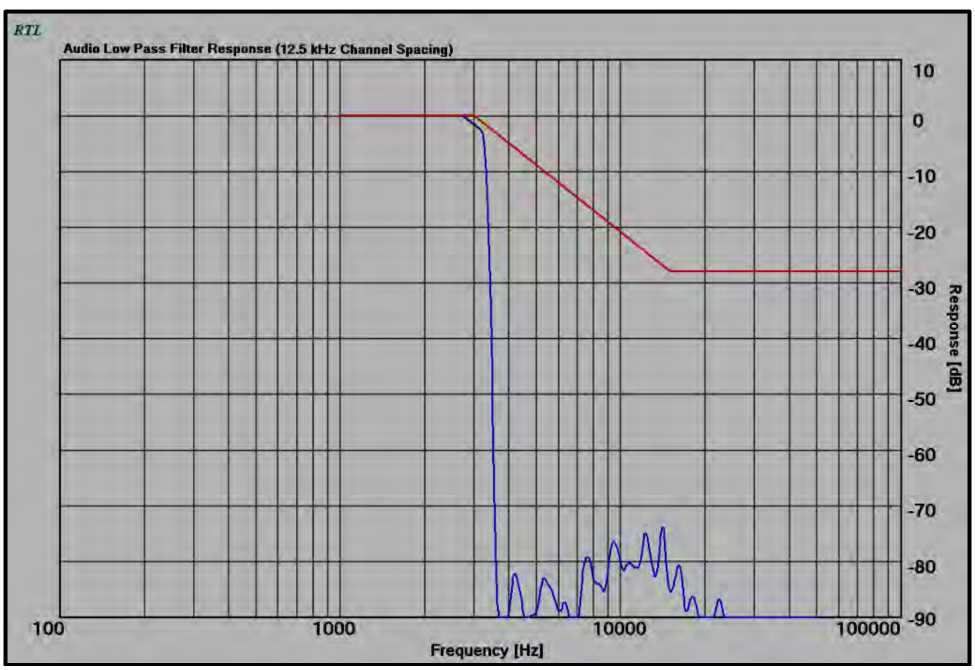
The transmitter was adjusted for full rated system deviation. The audio input level was adjusted for 60% of rated system deviation at 1000 Hz. Using this level (0 dB) as a reference, the audio input level was varied from the reference +/-20 dB for modulation frequencies of 300 Hz, 1,000 Hz, and 2,500 Hz. The system deviation obtained as a function of the input level was recorded. Both positive and negative peak deviations were recorded.

9.2 Test Data

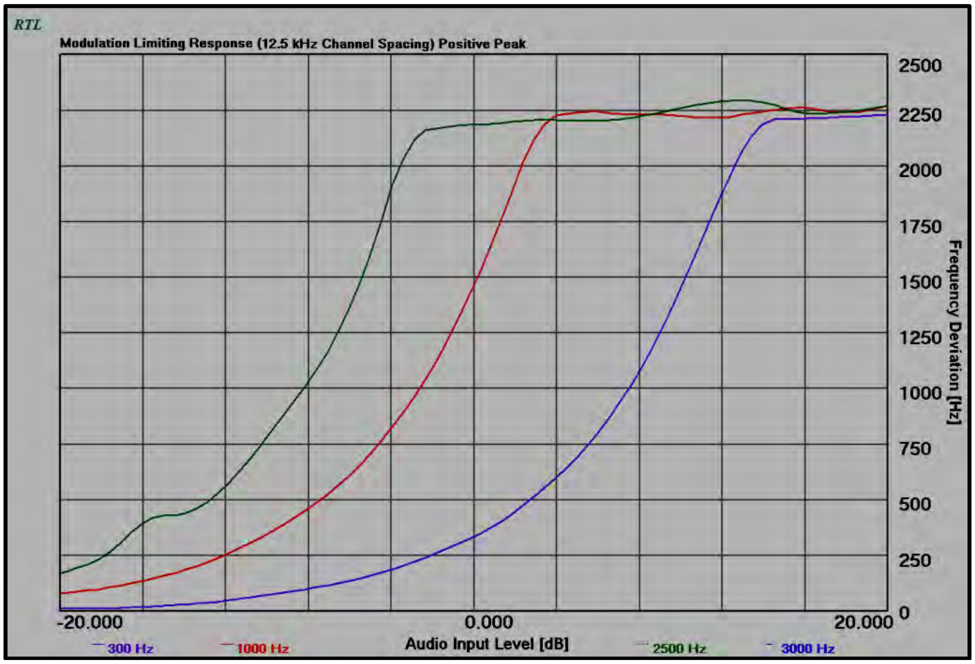
Plot 9-1: Modulation Characteristics - Audio Frequency Response



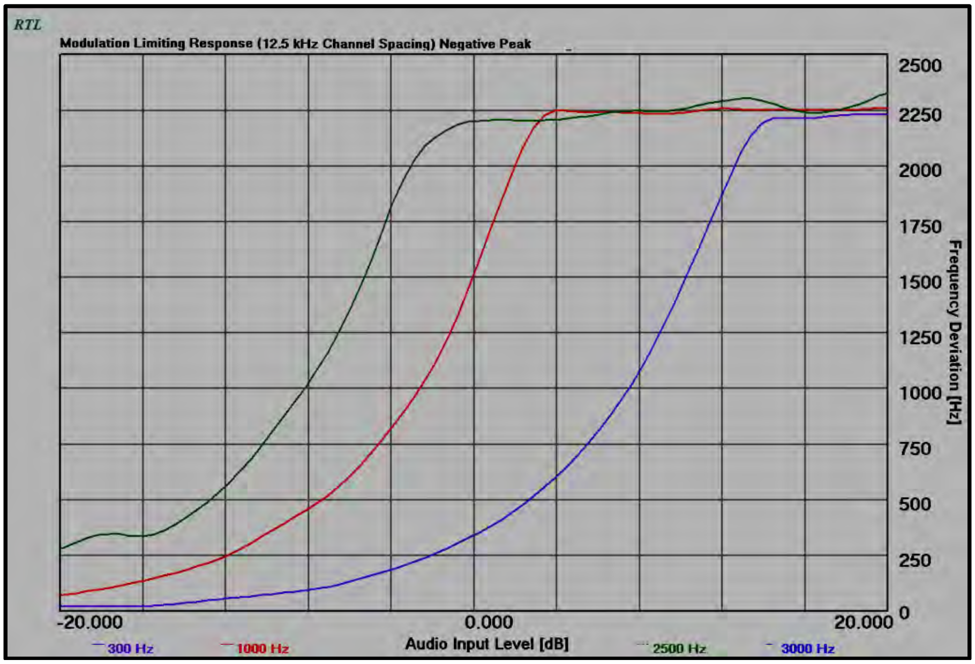
Plot 9-2: Modulation Characteristics – Audio Low Pass Filter



Plot 9-3: Modulation Characteristics – Modulation Limiting; Positive Peak; NB



Plot 9-4: Modulation Characteristics – Modulation Limiting; Negative Peak; NB



Plot 9-5: Modulation Characteristics – Modulation Limiting; Positive Peak; WB

Plot 9-6: Modulation Characteristics – Modulation Limiting; Negative Peak; WB

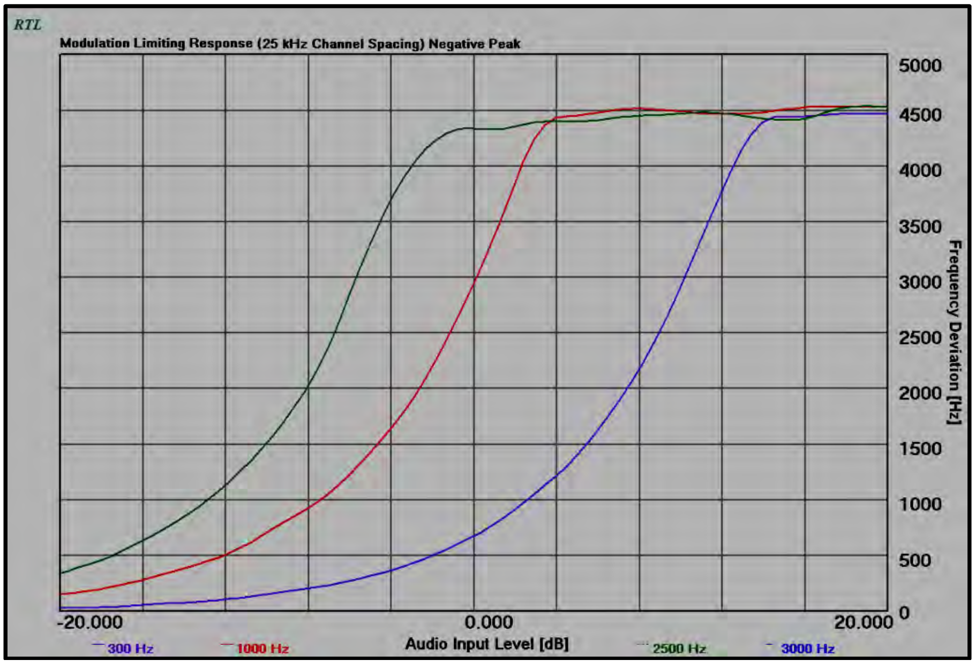


Table 9-1: Test Equipment Used For Testing Modulation Characteristics

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/ Level Generator	2514A02585	10/20/12
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	2/14/13
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	10/14/12

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	April 30, 2012
Test Engineer	Signature	Date of Test

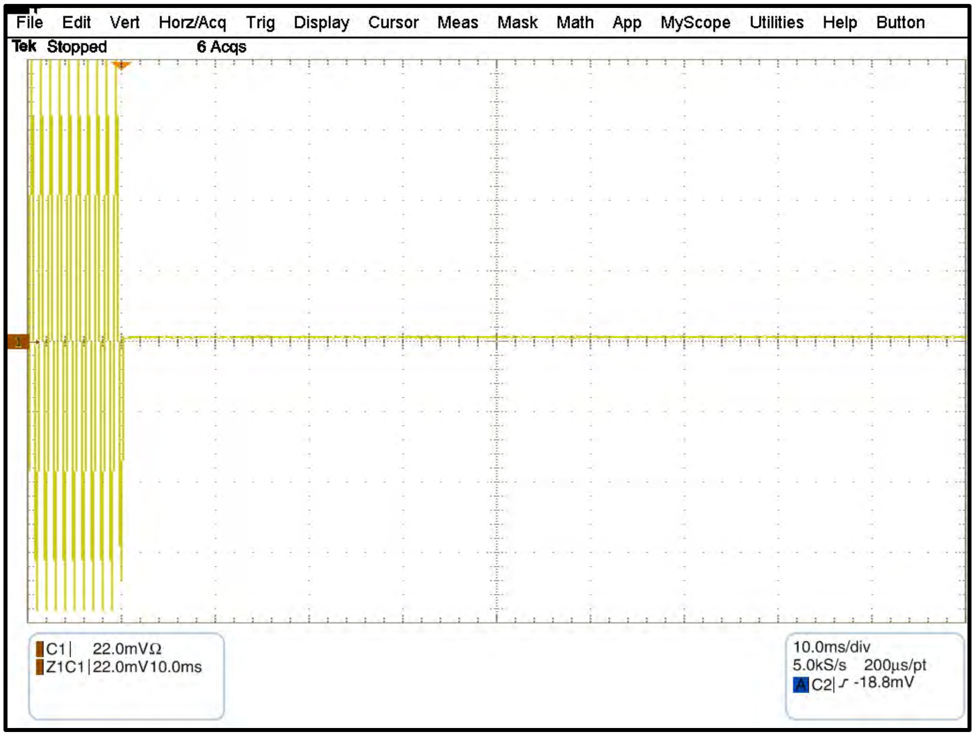
10 FCC Rules and Regulations Part 90.214; IC RSS-119 5.9: Transient Frequency Response

10.1 Test Procedure

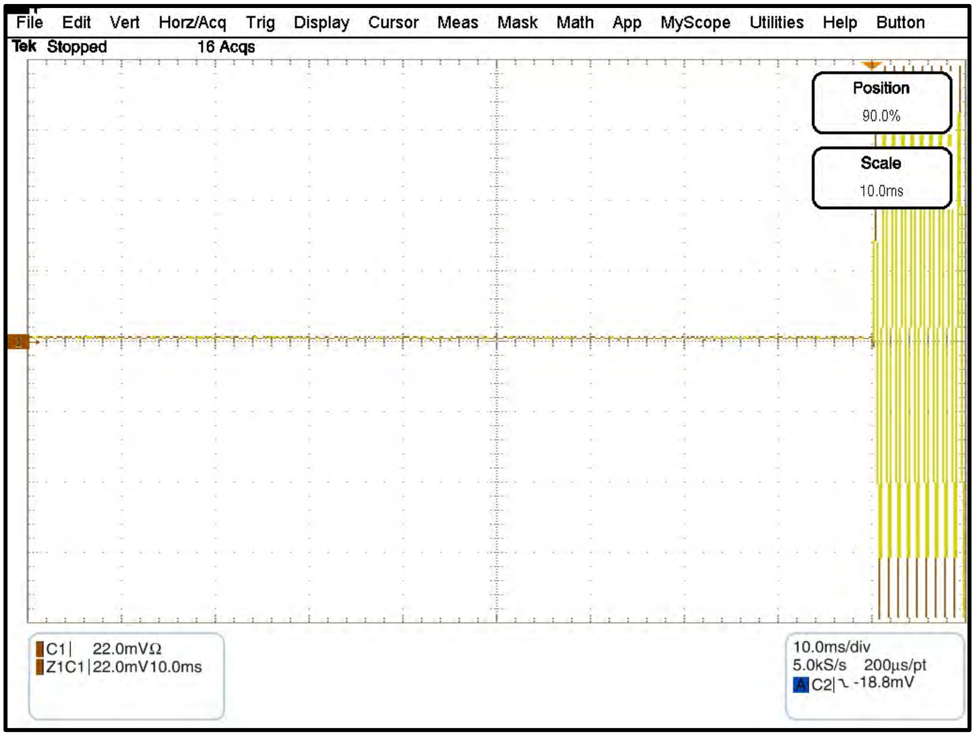
ANSI/TIA-603-C-2004 Section 2.2.3

10.2 Test Data

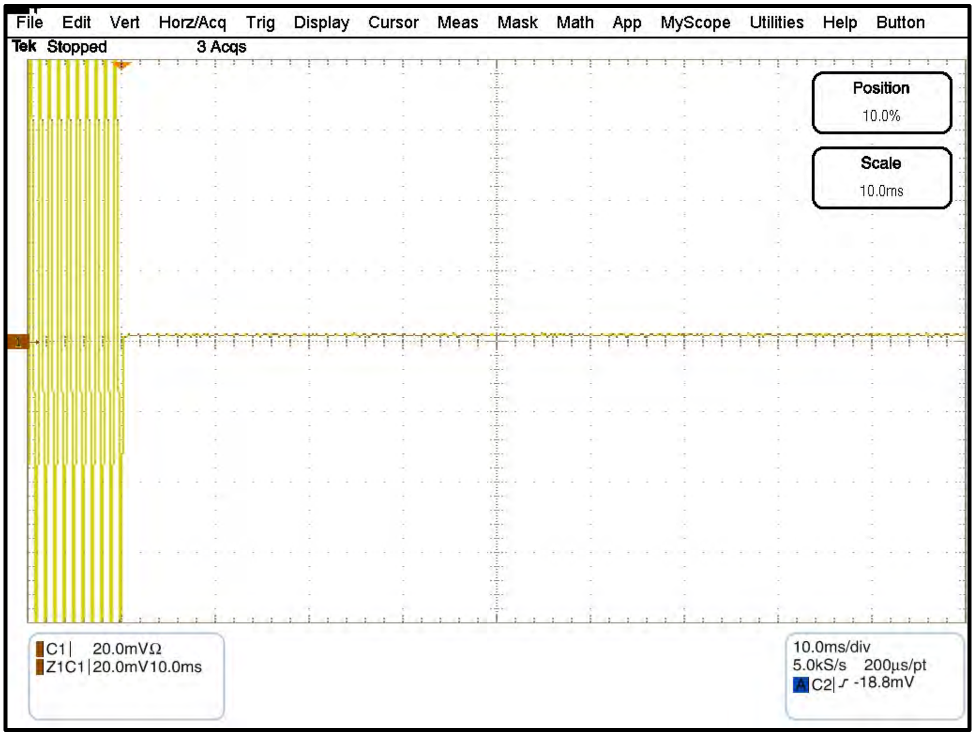
Plot 10-1: Transient Frequency Behavior – NB; Carrier On Time



Plot 10-2: Transient Frequency Behavior – NB; Carrier Off Time



Plot 10-3: Transient Frequency Behavior – WB; Carrier On Time



Plot 10-4: Transient Frequency Behavior – WB; Carrier Off Time

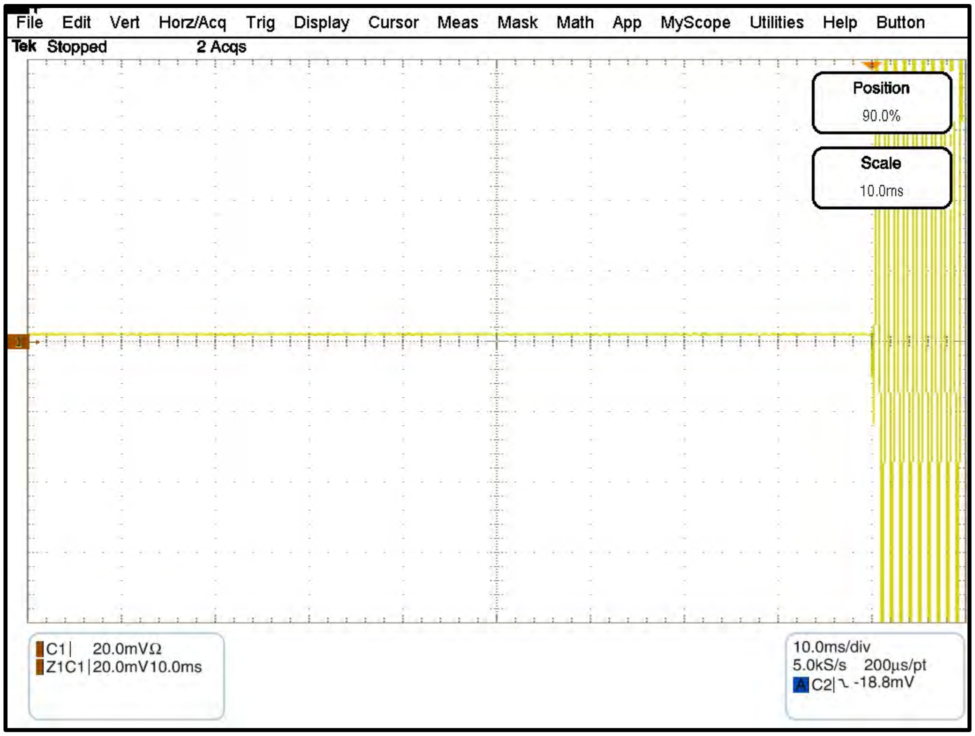


Table 10-1: Test Equipment Used For Testing Transient Frequency Behavior

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901514	Tektronix	TDS7404B	Oscilloscope	B010161	6/28/12
900917	Hewlett Packard	8648C	Synthesized. Signal Generator (9 kHz - 3200 MHz)	3537A01741	10/20/12
900948	Weinschel	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH148.01257	2/28/13
901511	Pasternack	PE 2003	Power Divider (10 MHz - 1 GHz)	NA	N/A
901463	Werlatone Inc.	C1795	Directional Coupler, 100W, 40 dB, 1 - 1000 MHz	4067	7/15/12
901263	Agilent Technologies	.01-12 GHz	SMA Detector	2936A05505	N/A
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	2/14/13
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	10/14/12

Test Personnel:

Daniel Baltzell		April 30, 2012
Test Engineer	Signature	Date of Test

11 FCC Rules and Regulations Part 2.202: Necessary Bandwidth and Emission Bandwidth

Type of Emission: F3E, F1D, F1E

Voice – 25 kHz channel separation
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 5
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 16.0 kHz
Emission designator: 16K0F3E

Voice – 12.5 kHz channel separation
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 2.5
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 11.0 kHz
Emission designator: 11K0F3E

Digital Voice and Data (9600N) – 12.5 kHz channel spacing
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) =3000
Bn = 3.86D + 0.27RK = 3.86(3000) + 0.27(9600)(1) = 14,172 kHz
Emission designator: 14K2F1D, 14K2F1E

Digital Voice and Data (9600N) – 12.5 kHz channel spacing
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) =1894
Bn = 3.86D + 0.27RK = 3.86(1894) + 0.27(9600)(1) = 9,903 kHz
Emission designator: 9K90F1D, 9K90F1E

Digital Voice and Data (4800N) – 12.5 kHz channel spacing
Calculation:
Data rate in bps (R) = 4800
Peak deviation of carrier (D) = 1504
Bn = 3.86D + 0.27RK = 3.86(1504) + 0.27(4800)(1) = 7,101 kHz
Emission designator: 7K10F1D, 7K10F1E

P25 – 4-level FSK 9600 sps:
Calculation:
Data rate in bps (R) = 4800
Peak deviation of carrier (D) = 1800
Bn = [4800/$\log_2$(2) + 2 (1800) (1) = 8.400 kHz
Emission designator: 8K40F1D, 8K40F1E

12 Conclusion

The data in this measurement report shows that the **Harris Corporation Model # DM-MV1B, Model Name XG-25M, FCC ID: OWDTR-0075-E, IC: 3636B-0075,** complies with all the applicable requirements of Parts 90, 80, 15 and 2 of the FCC Rules, and Industry Canada RSS-119.