



Engineering Solutions & Electromagnetic Compatibility Services

FCC & IC Certification Report

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Model: P5500 VHF

FCC ID: OWDTR-0067-E
IC: 3636B-0067

August 17, 2011

Standards Referenced for this Report	
Part 2: 2010	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 80: 2010	Stations in the Maritime Services
Part 90: 2010	Private Land Portable Radio Services
ANSI/TIA-603-C-2004	Land Portable 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 Portable 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 138-144 MHz and 148-174 MHz

Report Prepared By: Richard B. McMurray, P.E.

Document Number: 2011135

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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	TX Mode
136 – 150 (Federal) 150 – 174 (FCC) 138 – 174 (IC)	5.0	0.37	11K0F3E	Narrow Band Analog (Voice)
136 – 150 (Federal) 150 – 174 (FCC) 138 – 174 (IC)	5.0	0.37	10K8F1D	Narrow Band Digital 2-FSK (9600 Data)
136 – 150 (Federal) 150 – 174 (FCC) 138 – 174 (IC)	5.0	0.37	10K8F1E	Narrow Band Digital 2-FSK (9600 Digital Voice)
136 – 150 (Federal) 150 – 174 (FCC) 138 – 174 (IC)	5.0	0.37	7K80F1D	Narrow Band Digital 2-FSK (4800 Data)
136 – 150 (Federal) 150 – 174 (FCC) 138 – 174 (IC)	5.0	0.37	7K80F1E	Narrow Band Digital 2-FSK (4800 Digital Voice)
136 – 150 (Federal) 150 – 174 (FCC) 138 – 174 (IC)	5.0	0.37	8K40F1D	Narrow Band Digital C4FM (9600 Data)
136 – 150 (Federal) 150 – 174 (FCC) 138 – 174 (IC)	5.0	0.37	8K40F1E	Narrow Band Digital C4FM (9600 Digital Voice)

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1 Test Result Summary

Test	FCC Reference	IC Reference	Result
RF Power Output	2.1046(a), 80.215, 90.205	RSS-119 5.4	Complies
Spurious Emissions at Antenna Terminals	2.1046(a), 80.217, 90.210	RSS-119 5.5, 5.8	Complies
Field Strength of Spurious Radiation	2.1053(a), 90.210	RSS-119 5.5, 5.8	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 90.210	RSS-119 5.5, 5.8	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 80.209, 90.213	RSS-119 5.3	Complies
Modulation Characteristics	2.1047(a)(b)	N/A	Complies
Transient Frequency Response	90.214	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 the **P5500 VHF**, a 5 W Portable Radio; **FCC ID: OWDTR-0067-E, IC: 3636B-0067**.

The radio is subject to FCC DoC due to the optional data connection through the UDC connector. 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, 80 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)

N/A

2.3 Grant Notes

RF power switchable from 0.5 W to rated power (5 W).
The grant listed power is rated power.

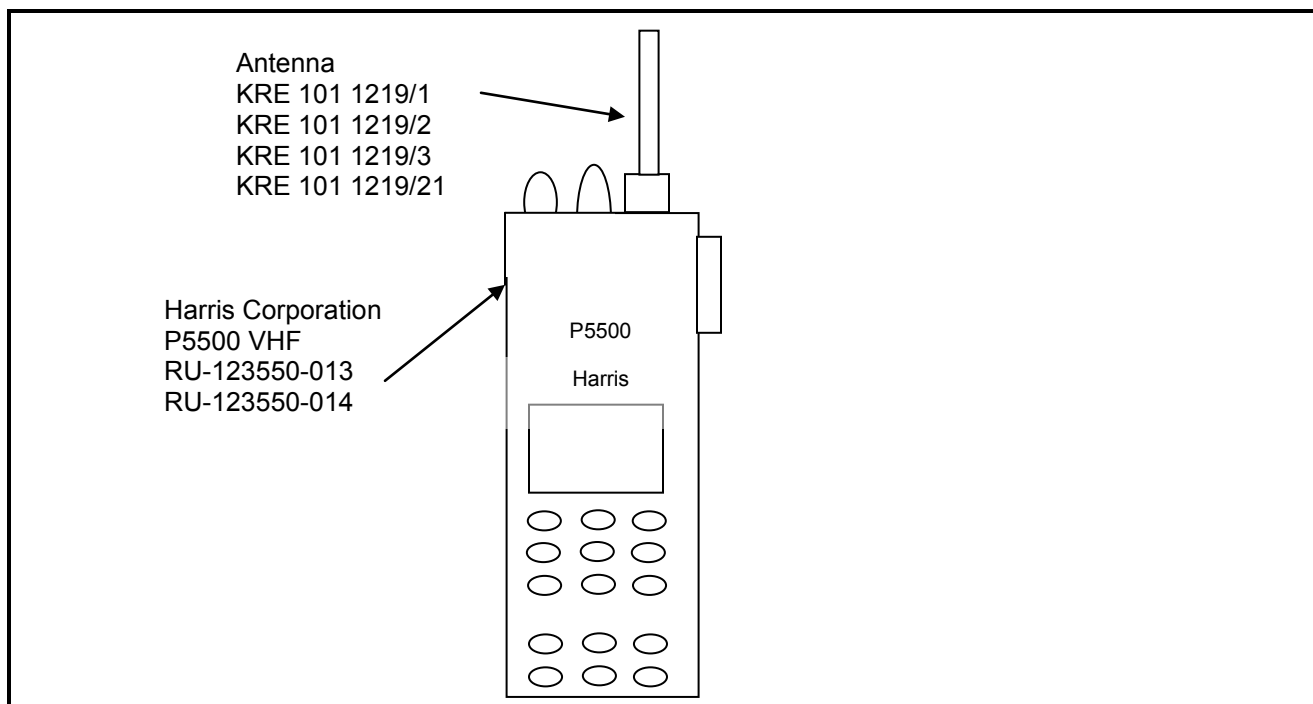
2.4 Tested System Details

The test sample was received on August 10, 2011. 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	Serial Number	FCC ID	RTL Bar Code
P5500 VHF	Harris Corporation	P5550 VHF – EX55 (Scan)	RU-123550-013	Re-VT-001	OWDTR-0067-E	20389
P5500 VHF	Harris Corporation	P5570 VHF – EX55 (System)	RU-123550-014	Re-VT-002	OWDTR-0067-E	20390

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

7.5 VDC Nominal / 2.25 A max

4 FCC Rules and Regulations Part 2.1046(a): RF Power Output: Conducted, Part 90.541(b)/90.542(a)(6): Transmitting Power Limits; Part 80.215: Transmitter Power; RSS-119 4.1 Transmitter Output Power

4.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.1

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

Part 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

Manufacturer's Rated Power: 5.0 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)	37.2	5.3	27.3	0.5
138.0125 (IC)	37.2	5.2	27.3	0.5
141.0000 (IC)	37.1	5.1	27.2	0.5
143.9875 (IC)	37.1	5.1	27.2	0.5
148.0125 (IC)	37.1	5.1	27.2	0.5
150.0125 (FCC Part 90)	37.1	5.1	27.2	0.5
154.025 (FCC Part 80)	37.1	5.1	27.2	0.5
162.0000 (FCC/IC)	37.1	5.2	27.3	0.5
173.175 (FCC Part 80)	37.1	5.1	27.2	0.5
173.9875 (FCC Part 90)	37.3	5.3	27.5	0.6

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
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	1/20/12
901356	Agilent	E9323A	Power Sensor	31764-264	1/20/12

Test Personnel:

Daniel Baltzell		August 15, 2011
EMC Test Engineer	Signature	Date of Test

5 FCC Rules and Regulations Part 2.1051: Spurious Emissions at Antenna Terminals; Part 80.217: Suppression of Interference Aboard Ships; Part 90.210: Emission Limitations, 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.

Part 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:

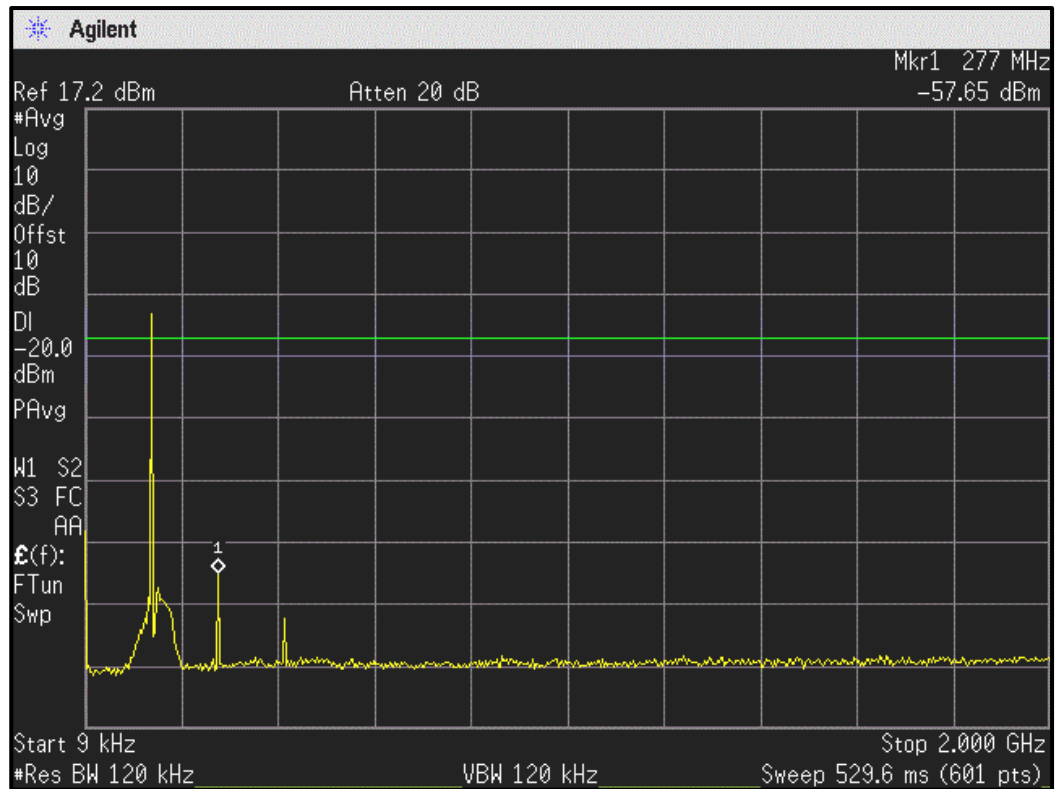
Frequency of Interfering Emissions	Power to Artificial Antenna in Microwatts
Below 30 MHz	0.1
30 to 100 MHz	3.0
100 to 300 MHz	1.0
Over 300 MHz	3.0

or

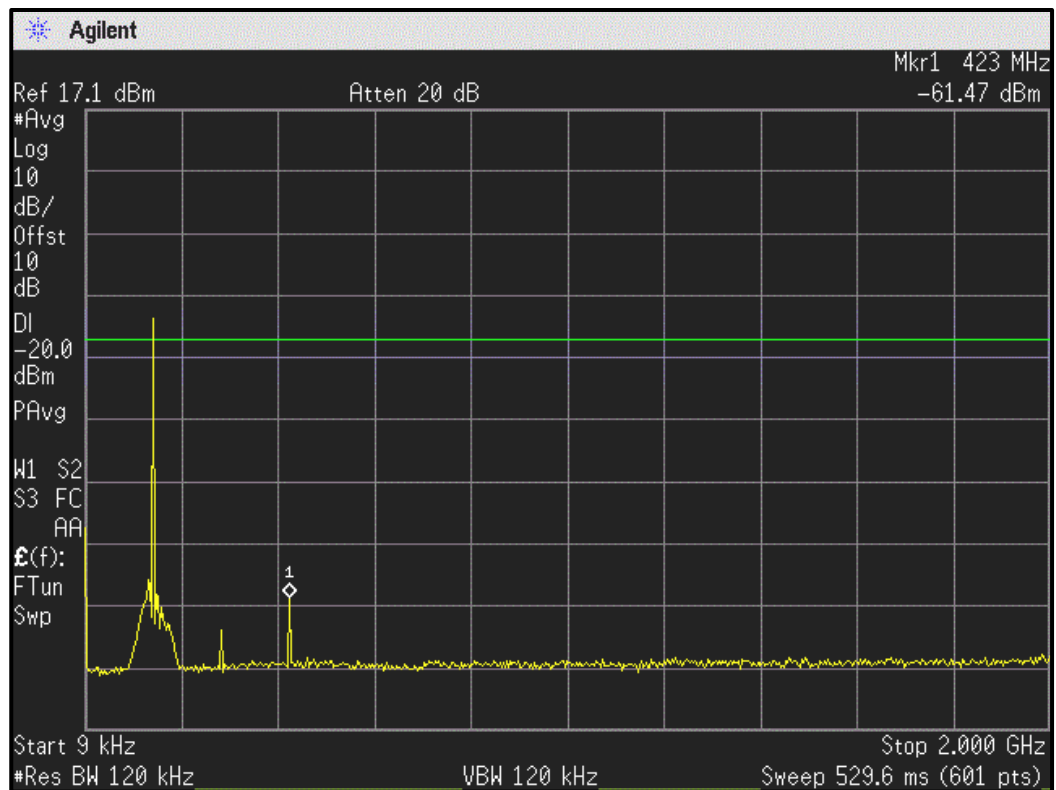
deliver not more than the following amounts of power to an artificial antenna having electrical characteristics equivalent to those of the average receiving antenna(s) used on shipboard:

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

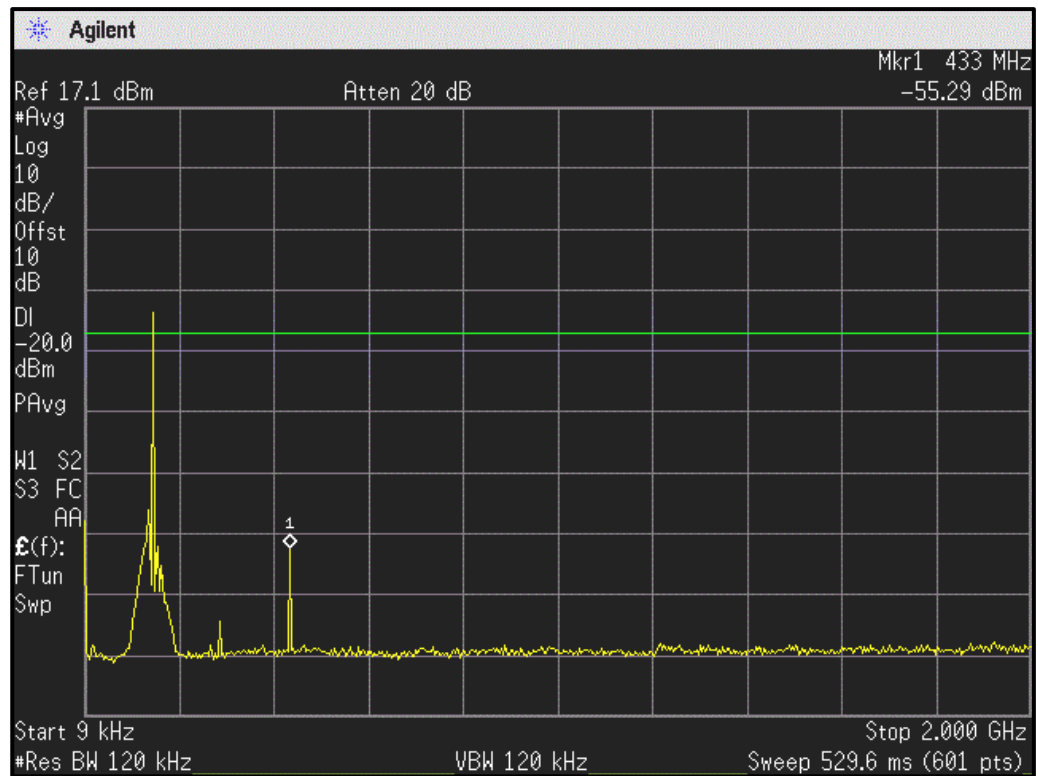
Plot 5-2: Conducted Spurious Emissions – 138.0125 MHz – Analog High Power



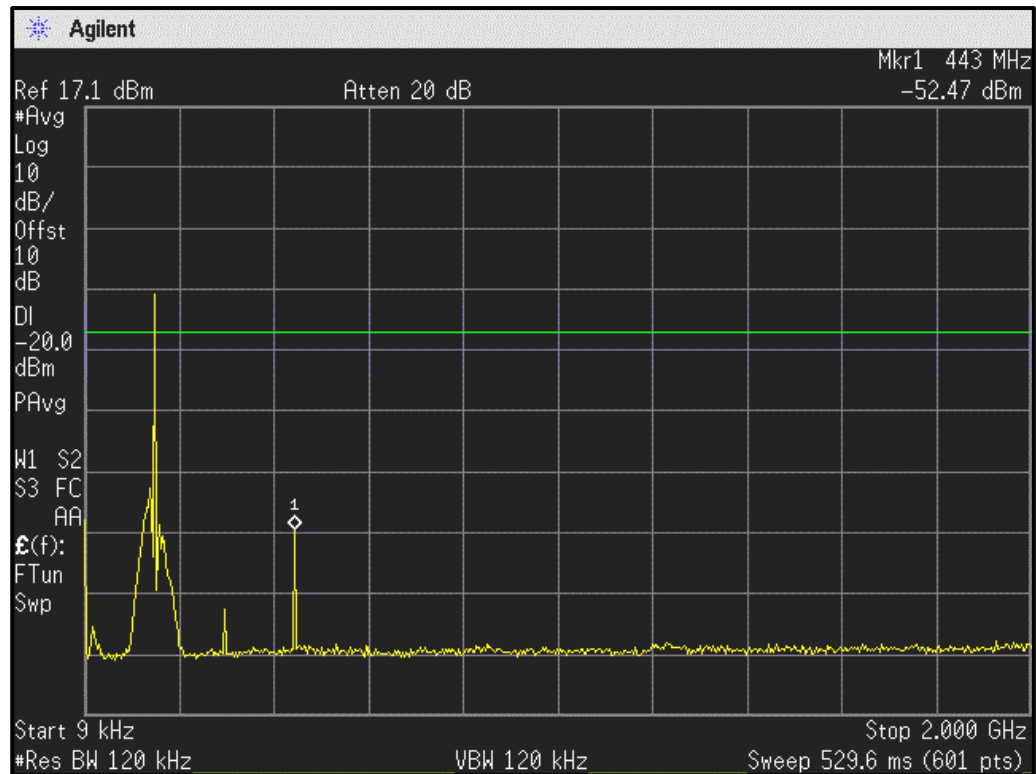
Plot 5-3: Conducted Spurious Emissions – 141 MHz – Analog High Power



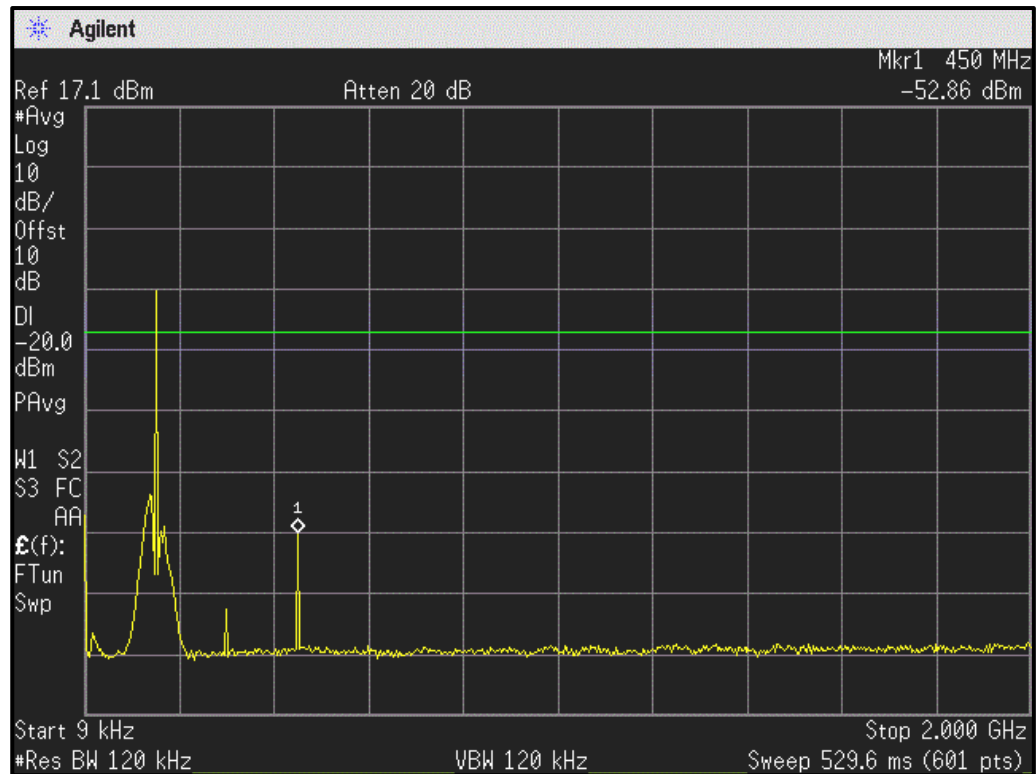
Plot 5-4: Conducted Spurious Emissions – 143.9875 MHz – Analog High Power



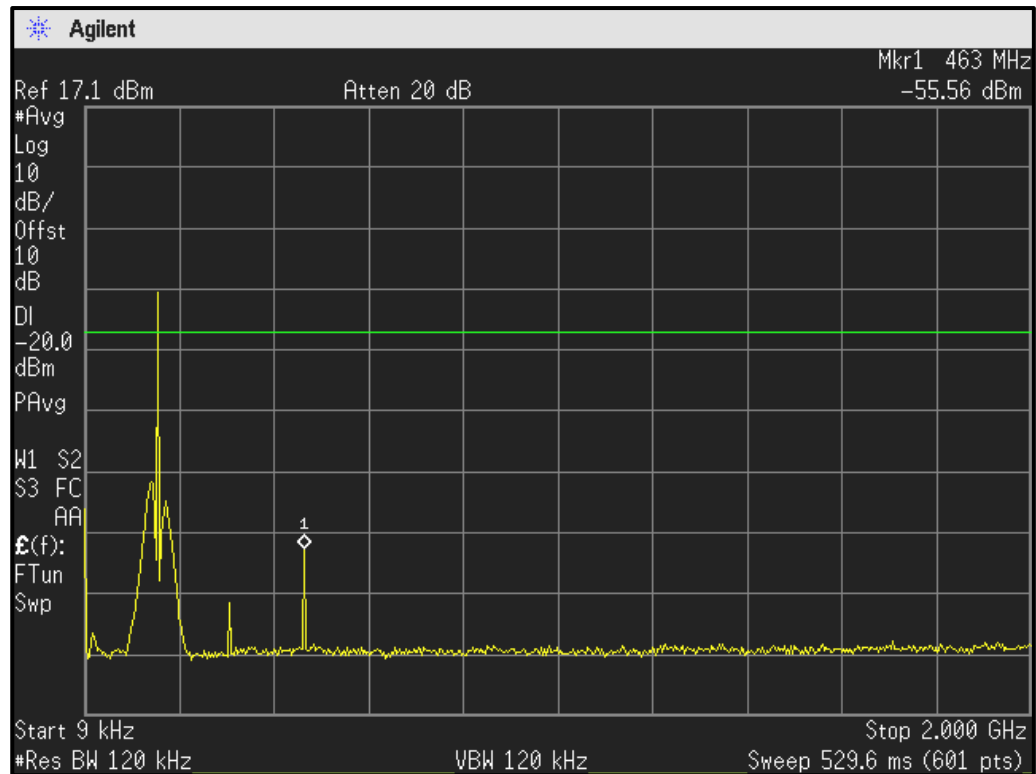
Plot 5-5: Conducted Spurious Emissions - 148.0125 MHz - Analog High Power



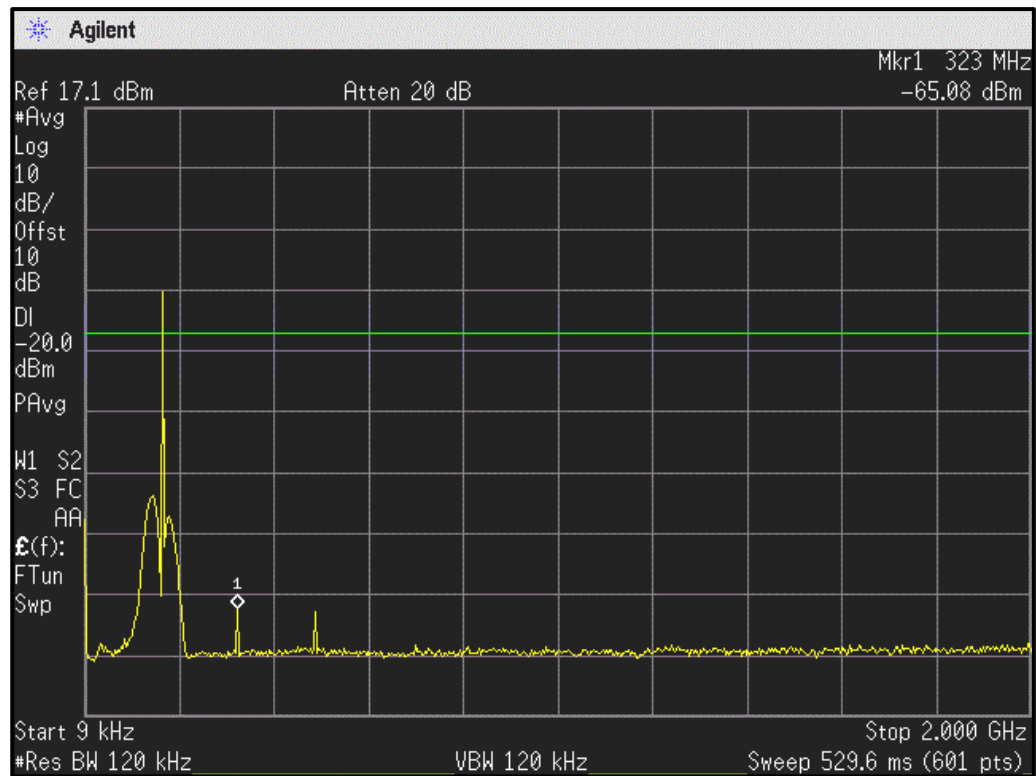
Plot 5-6: Conducted Spurious Emissions – 150.0125 MHz – Analog High Power



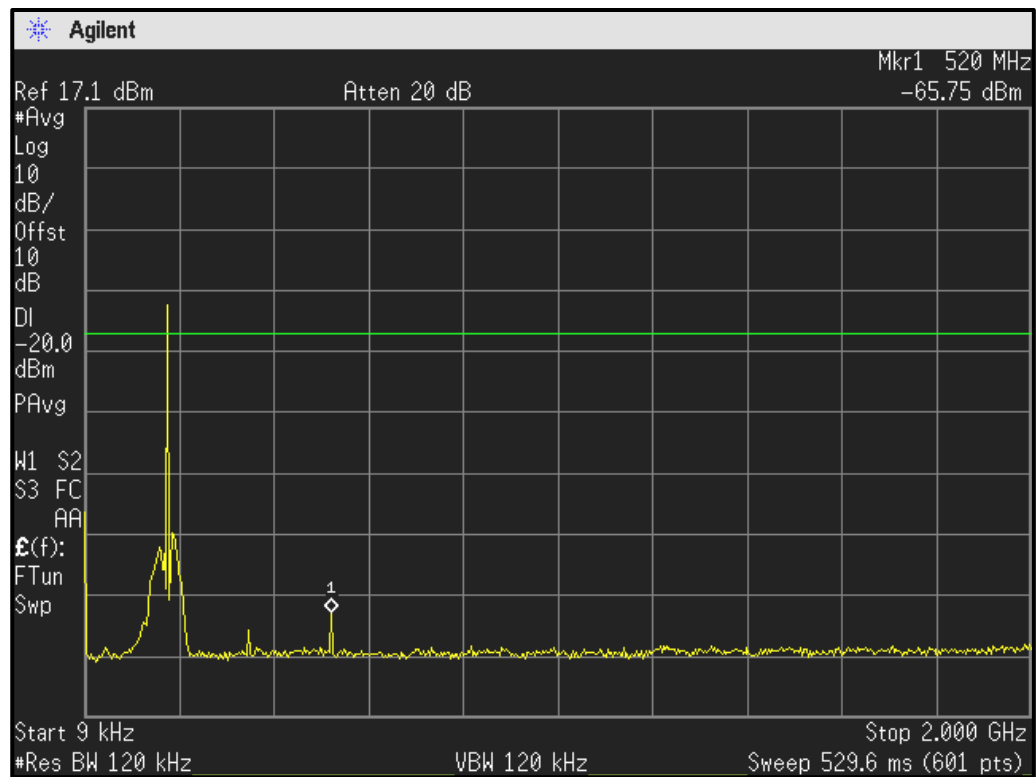
Plot 5-7: Conducted Spurious Emissions – 154.025 MHz – Analog High Power



Plot 5-8: Conducted Spurious Emissions – 162 MHz – Analog High Power



Plot 5-9: Conducted Spurious Emissions – 173.175 MHz – Analog High Power



Plot 5-10: Conducted Spurious Emissions – 173.9875 MHz – Analog High Power

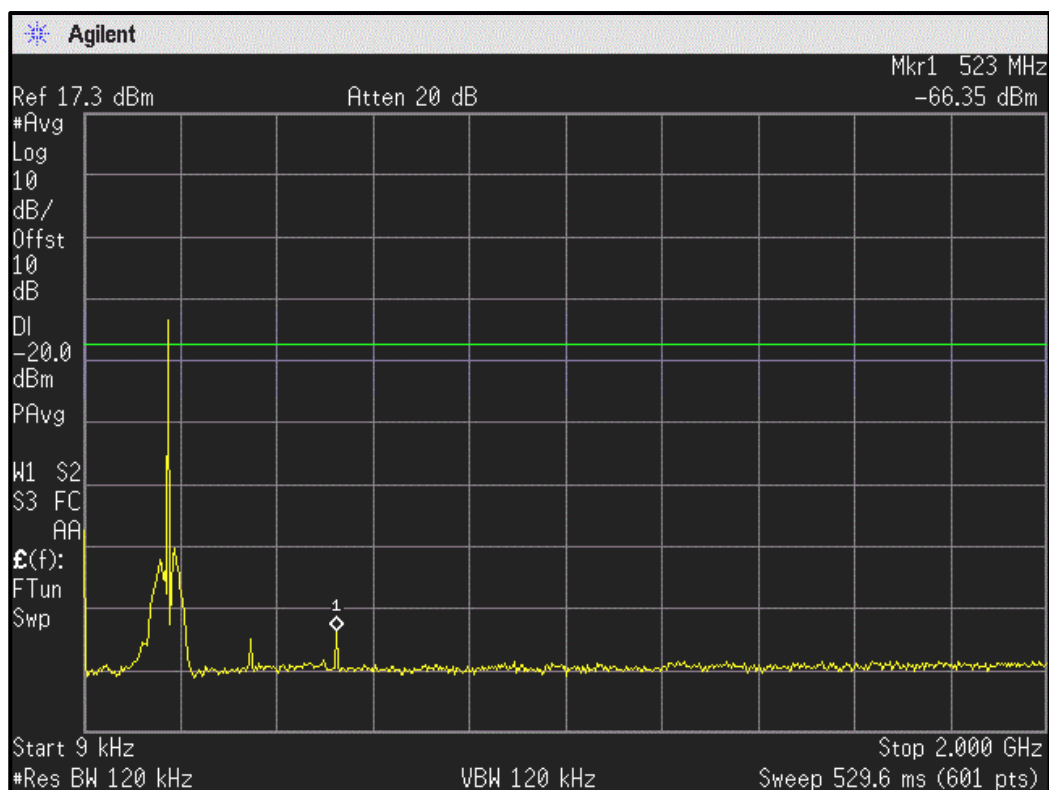


Table 5-1: Test Equipment Used For Testing Conducted Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	PSA Spectrum Analyzer	US44020346	4/8/12
901129	Par Electronics	118-174 (25W)	VHF Notch Filter	N/A	3/10/12
901337	Narda Microline	766-10	10 dB Attenuator	6242	7/15/12

Test Personnel:

Daniel Baltzell EMC Test Engineer	 Signature	August 15, 2011 Date of Test
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6 FCC Rules and Regulations Part 2.1053(a): Field Strength of Spurious Radiation; Part 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 $50+10\log(P)$ 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)
272.0250	56.2	-56.2	0.6	1.7	92.3	-35.1
408.0375	46.2	-68.1	0.7	1.9	104.1	-46.9
544.0500	36.8	-81.0	0.7	0.5	118.4	-61.2
680.0625	32.3	-81.1	0.8	1.3	117.8	-60.6
816.0750	34.1	-80.3	0.9	1.1	117.3	-60.0
952.0875	32.8	-80.9	0.9	1.6	117.4	-60.2
1088.1000	23.9	-89.5	1.0	4.3	123.4	-66.2
1224.1125	16.8	-96.2	1.0	4.9	129.5	-72.3
1360.1250	22.6	-89.8	1.1	5.6	122.5	-65.3

Table 6-2: Field Strength of Spurious Radiation – 138.0 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)
276.0250	49.7	-63.1	0.6	1.6	99.3	-42.2
414.0375	48.9	-65.4	0.7	1.8	101.5	-44.3
552.0500	33.5	-84.2	0.7	1.3	120.8	-63.6
690.0625	35.7	-77.7	0.8	1.3	114.4	-57.2
828.0750	36.7	-76.2	0.9	1.1	113.2	-56.1
966.0875	30.3	-82.5	0.9	1.7	118.9	-61.7
1104.1000	28.9	-85.0	1.0	4.3	118.9	-61.7
1242.1125	22.3	-90.8	1.0	4.9	124.1	-66.9
1380.1250	18.7	-93.6	1.1	5.7	126.2	-69.1

Table 6-3: Field Strength of Spurious Radiation – 141 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	53.8	-65.9	0.6	1.6	102.0	-44.9
423	47.2	-67.1	0.7	1.8	103.1	-46.0
564	21.5	-92.3	0.7	1.3	128.8	-71.7
705	34.9	-78.4	0.8	1.3	115.0	-58.0
846	29.1	-83.8	0.9	1.1	120.7	-63.6
987	24.1	-88.7	0.9	1.8	124.9	-67.8
1128	16.1	-97.2	1.0	4.4	130.9	-73.8
1269	14.2	-98.7	1.0	5.0	131.8	-74.8
1410	13.8	-98.3	1.1	5.9	130.6	-73.6

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	54.5	-65.5	0.5	1.5	101.6	-44.6
431.9625	46.0	-68.2	0.6	1.8	104.1	-47.0
575.9500	20.4	-93.4	0.7	1.3	129.8	-72.8
719.9375	34.1	-79.2	0.8	1.3	115.7	-58.7
863.9250	32.8	-80.0	0.8	1.2	116.8	-59.7
1007.9125	10.0	-102.8	0.8	4.4	136.3	-79.2
1151.9000	18.4	-95.2	0.9	4.5	128.7	-71.6
1295.8875	10.2	-102.6	1.0	5.1	135.5	-78.5
1439.8750	13.1	-98.9	1.1	6.1	131.0	-73.9

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	49.2	-65.7	0.6	1.4	102.0	-45.0
444.0375	41.9	-72.3	0.7	1.7	108.4	-51.3
592.0500	46.3	-70.9	0.8	1.2	107.6	-50.5
740.0625	35.4	-79.9	0.8	1.2	116.6	-59.5
888.0750	43.1	-70.6	0.9	1.3	107.3	-50.2
1036.0875	26.8	-87.4	1.0	4.4	121.1	-64.0
1184.1000	16.7	-96.4	1.0	4.7	129.8	-72.7
1332.1125	11.0	-101.6	1.0	5.4	134.3	-77.2
1480.1250	13.1	-98.7	1.1	6.3	130.6	-73.5

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	51.8	-63.6	0.6	1.4	99.9	-42.8
450.0375	39.7	-74.5	0.7	1.7	110.6	-53.5
600.0500	33.9	-79.8	0.8	1.2	116.5	-59.4
750.0625	37.6	-75.6	0.8	1.2	112.3	-55.2
900.0750	35.5	-77.3	0.9	1.3	114.0	-56.9
1050.0875	26.1	-88.1	1.0	4.4	121.8	-64.7
1200.1000	14.7	-98.6	1.0	4.8	131.9	-74.8
1350.1125	14.8	-97.7	1.1	5.5	130.4	-73.3
1500.1250	8.9	-102.7	1.1	6.5	134.4	-77.4

Table 6-7: Field Strength of Spurious Radiation – 154.025 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	46.7	-69.5	0.6	1.5	105.7	-48.6
462.075	34.3	-79.8	0.6	1.7	115.9	-58.8
616.100	32.4	-81.2	0.7	1.2	117.8	-60.8
770.125	31.7	-83.2	0.8	1.1	120.0	-62.9
924.150	31.6	-81.2	0.9	1.4	117.8	-60.7
1078.175	18.0	-95.4	0.9	4.3	129.1	-72.0
1232.200	10.3	-102.8	1.0	4.9	136.0	-79.0
1386.225	7.8	-104.5	1.1	5.8	136.9	-79.8
1540.250	11.7	-99.7	1.2	6.6	131.4	-74.3

Table 6-8: Field Strength of Spurious Radiation – 162 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	55.6	-66.4	0.6	1.6	102.5	-45.4
486	31.2	-82.8	0.7	1.5	119.1	-62.0
648	16.8	-96.7	0.8	1.3	133.3	-76.2
810	29.0	-84.0	0.9	1.0	121.0	-63.8
972	36.3	-76.5	0.9	1.7	112.8	-55.6
1134	27.9	-85.8	1.0	4.4	119.5	-62.3
1296	21.9	-90.9	1.0	5.1	123.9	-66.7
1458	14.7	-97.2	1.1	6.2	129.2	-72.0
1620	11.5	-99.5	1.2	6.7	131.1	-73.9

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	52.3	-71.0	0.6	1.8	106.9	-49.8
519.525	26.9	-87.0	0.6	1.3	123.4	-66.4
692.700	21.0	-92.4	0.7	1.3	128.9	-71.8
865.875	26.0	-86.8	0.8	1.2	123.6	-66.5
1039.050	23.8	-89.0	0.9	4.4	122.6	-65.5
1212.225	24.4	-88.6	1.0	4.8	121.9	-64.8
1385.400	15.7	-96.6	1.1	5.8	129.0	-71.9
1558.575	11.6	-99.7	1.2	6.6	131.4	-74.3
1731.750	16.9	-93.4	1.3	6.5	125.4	-68.3

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

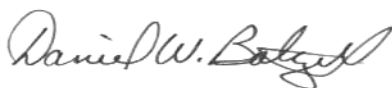
Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
347.975	56.8	-66.6	0.6	1.8	102.7	-45.5
521.9625	32.3	-81.6	0.7	1.3	118.3	-61.1
695.95	20.7	-92.7	0.8	1.3	129.5	-72.2
869.9375	44.2	-68.6	0.9	1.2	105.6	-48.4
1043.925	25.0	-88.5	1.0	4.4	122.4	-65.2
1217.913	19.1	-93.1	1.0	4.8	126.6	-69.4
1391.9	10.6	-99.4	1.1	5.8	132.0	-74.8
1565.888	19.0	-91.2	1.2	6.7	123.0	-65.7
1739.875	12.9	-97.4	1.3	6.5	129.5	-72.3

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

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	1/31/13
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	2/22/12
900933	Hewlett Packard	11975A	Amplifier (2 - 8 GHz)	2304A00348	2/22/12
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3143.9875A20839	9/13/11
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	9/13/11
901516	Insulated Wire, Inc.	KPS-150.01253-2400-KPS-09302008	RF cable, 20'	NA	10/19/11
901517	Insulated Wire Inc.	KPS-150.01253-360-KPS-09302008	RF cable 36"	NA	10/19/11
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	6/14/12
900321	EMCO	3161-03	Horn Antennas (4 – 8 GHz)	9508-1020	6/14/12
900928	Hewlett Packard	83752A	Synthesized Sweeper, (0.01 - 20 GHz)	3610A00866	2/17/12
901262	ETS	3160-9	Double ridged Guide Antenna (1 - 18 GHz)	6748	5/1/12
900724	Antenna Research Associates, Inc.	LPB-2520	LOG/Bicon Antenna (25 – 1000 MHz)	1037	7/17/12
900905	Rhein Tech Laboratories, Inc.	PR-1040	OATS 1 Preamplifier 40dB (30 MHz – 2 GHz)	1006	4/10/12

Test Personnel:

Daniel Baltzell
Test Engineer



Signature

August 18, 2011
Date of Test

7 FCC Rules and Regulations Part 2.1049(c)(1): Occupied Bandwidth; Part 90.210 Authorized Bandwidth; RSS-119 5.5 Channel Spacing, Authorized Bandwidth, Occupied Bandwidth and Spectrum Masks

Occupied Bandwidth - Compliance with the Emission Masks

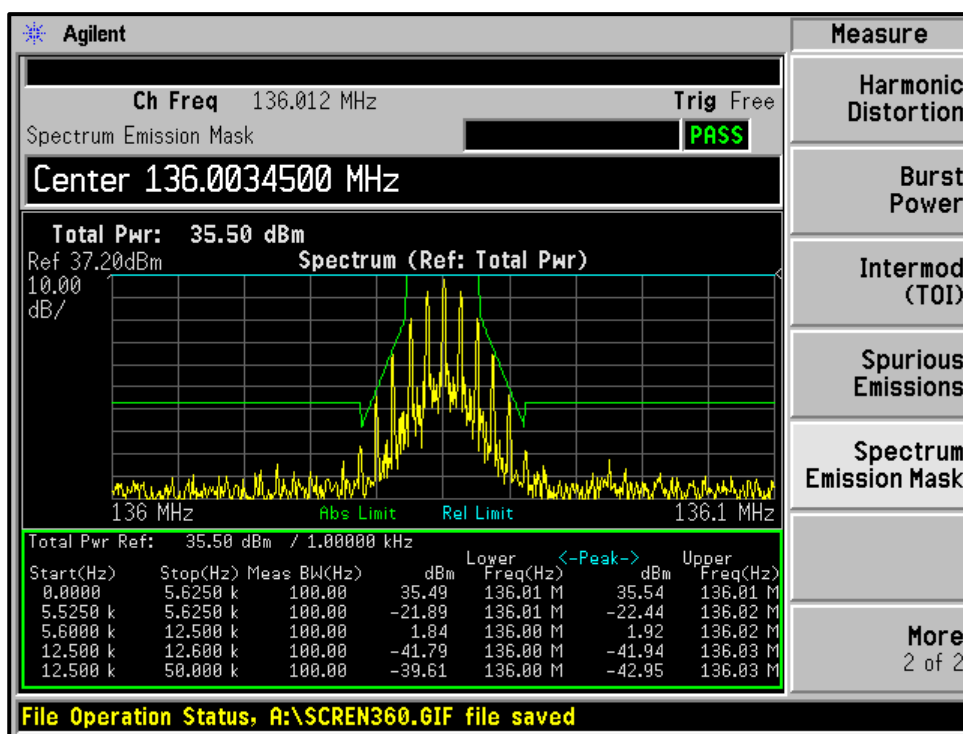
7.1 Test Procedure

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

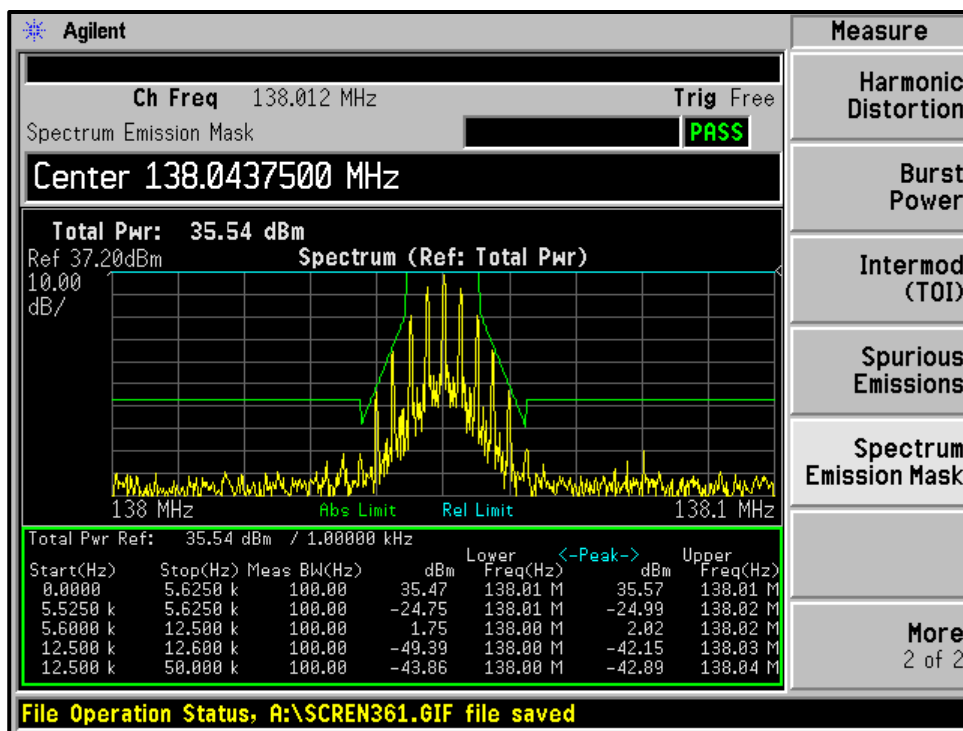
Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence – 19,200 bps for OTP and 9,600 bps for P25 and EDACS modes.

7.2 Test Data

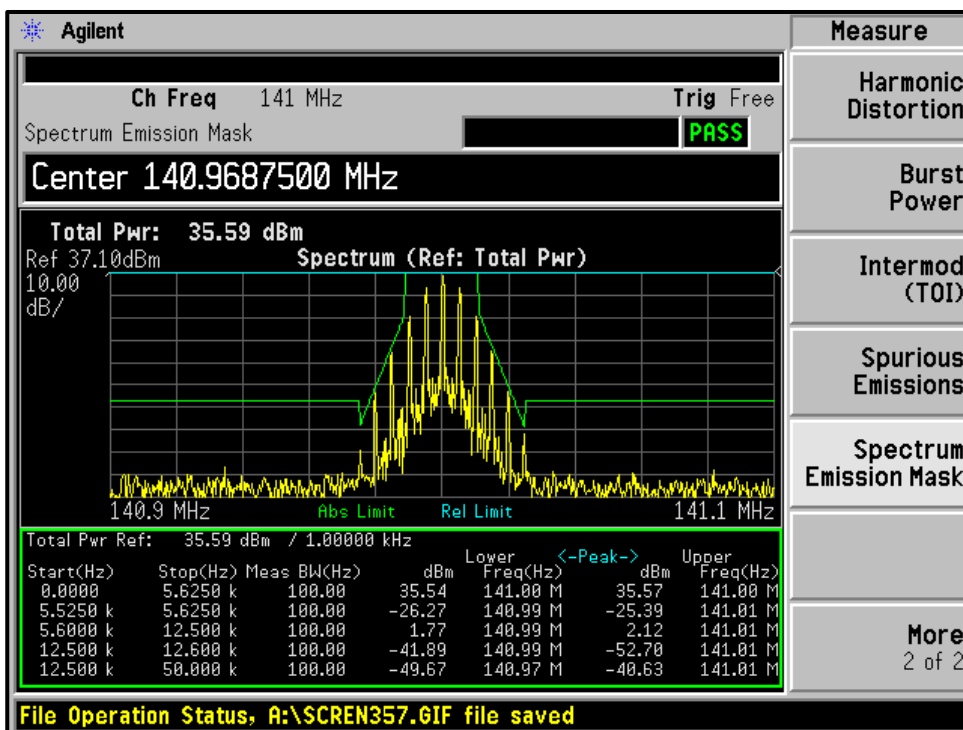
Plot 7-1: Occupied Bandwidth – 136.0125 MHz; Analog (Mask D)



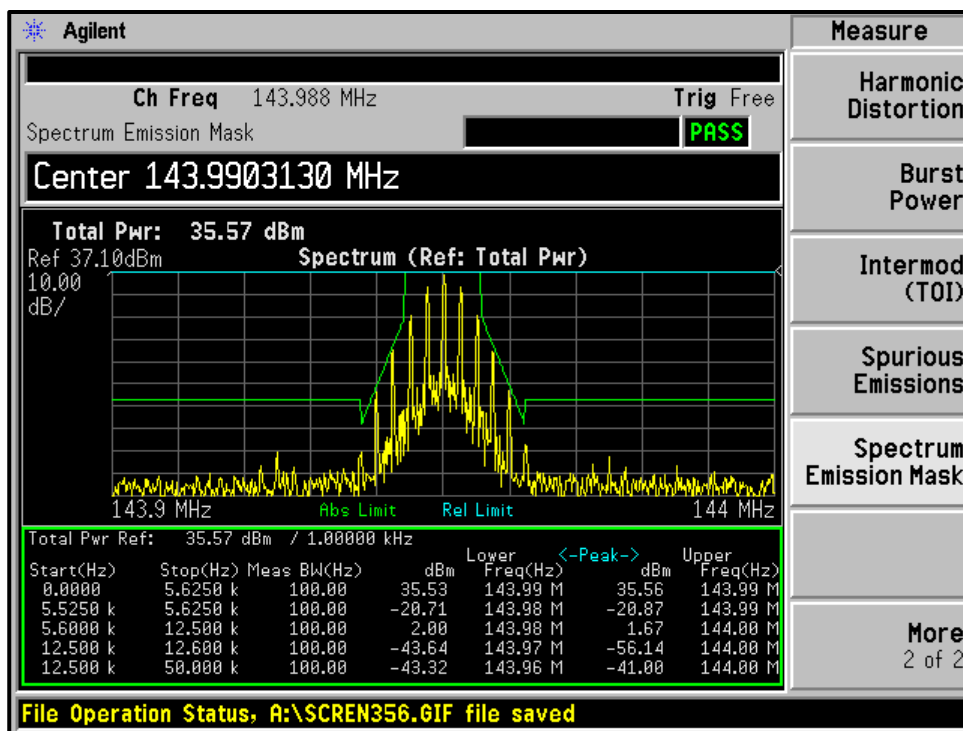
Plot 7-2: Occupied Bandwidth – 138.0 MHz; Analog (Mask D)



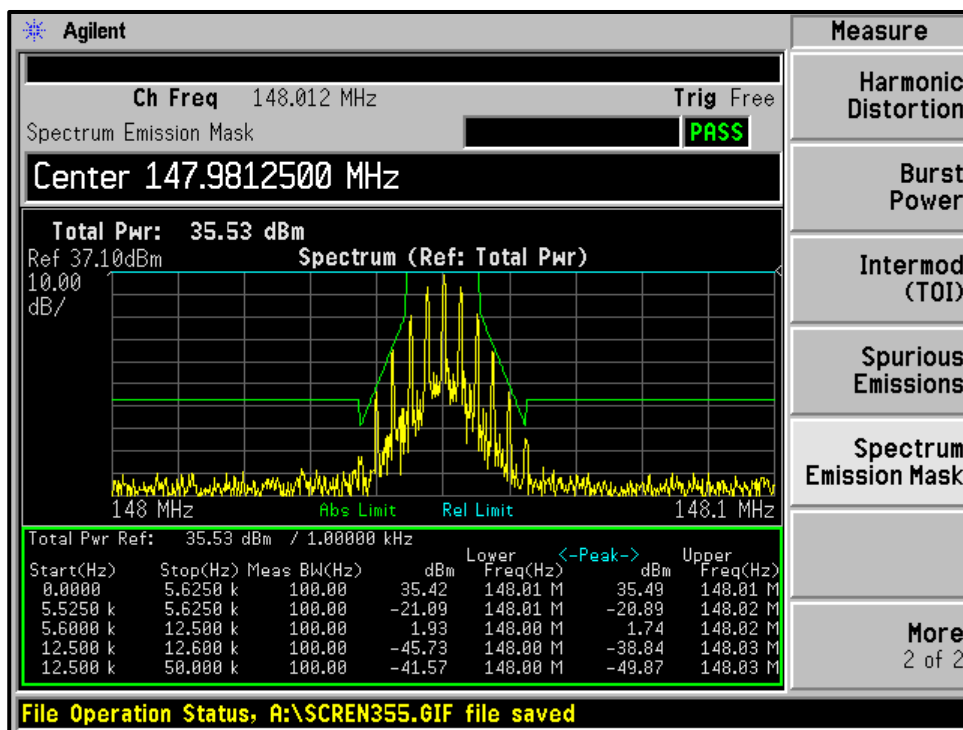
Plot 7-3: Occupied Bandwidth – 141 MHz; Analog (Mask D)



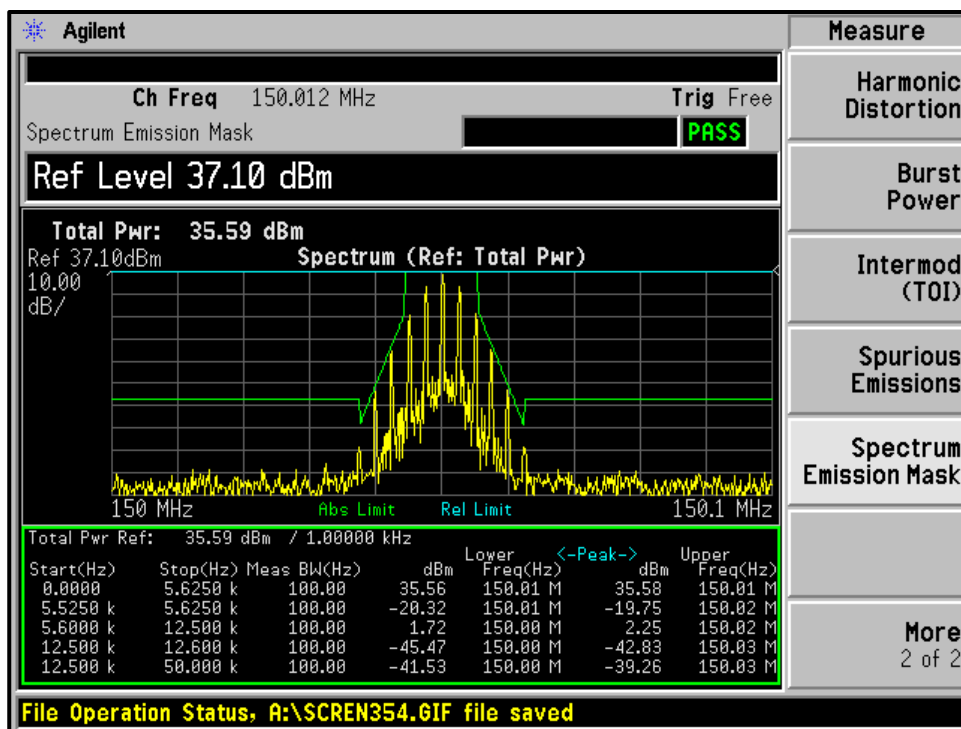
Plot 7-4: Occupied Bandwidth – 143.9875 MHz; Analog (Mask D)



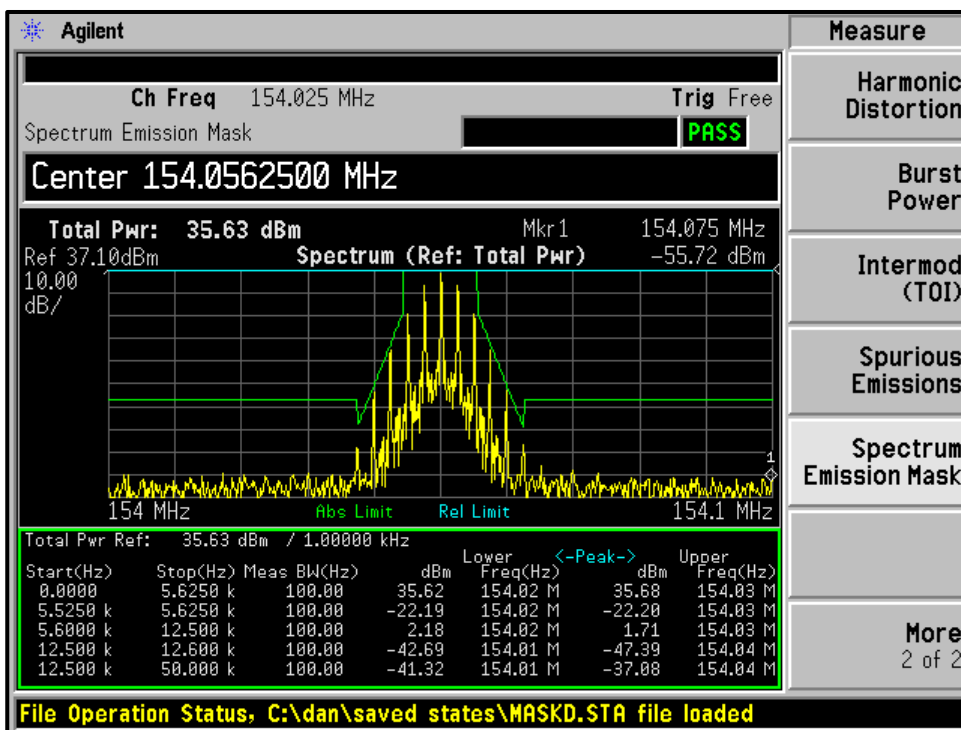
Plot 7-5: Occupied Bandwidth – 148.0125 MHz; Analog (Mask D)



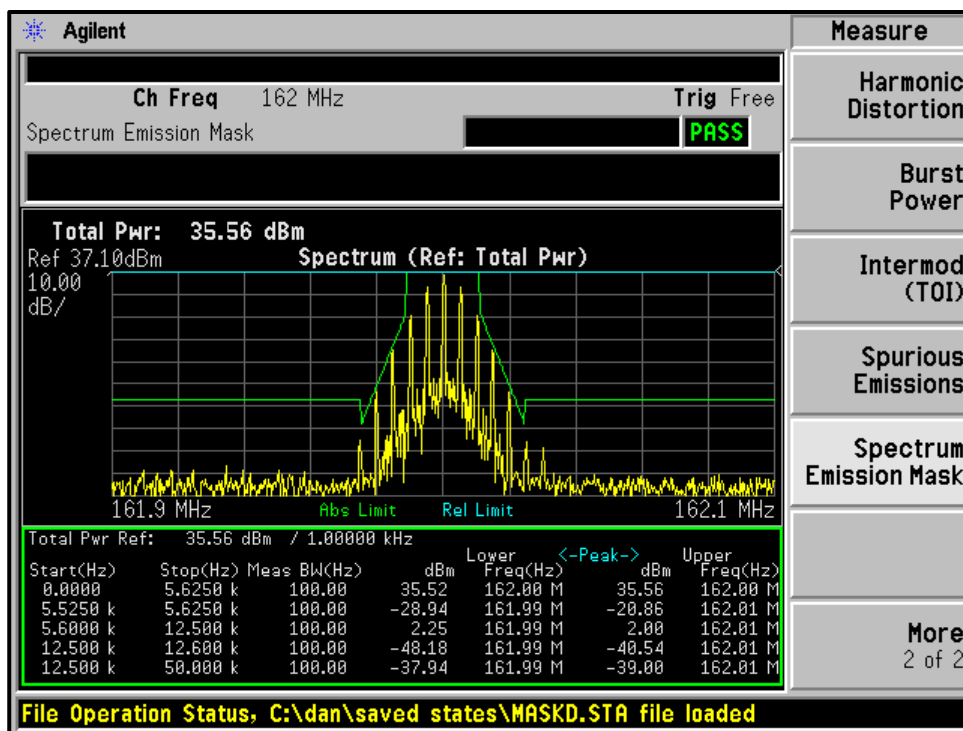
Plot 7-6: Occupied Bandwidth – 150.0125 MHz; Analog (Mask D)



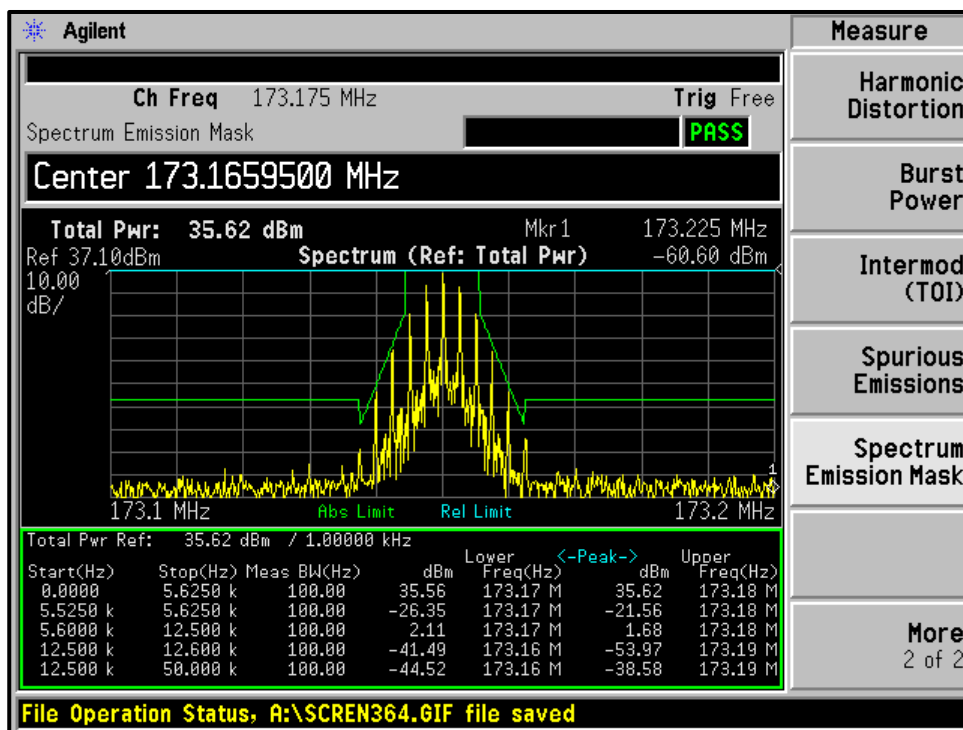
Plot 7-7: Occupied Bandwidth – 154.025 MHz; Analog (Mask D)



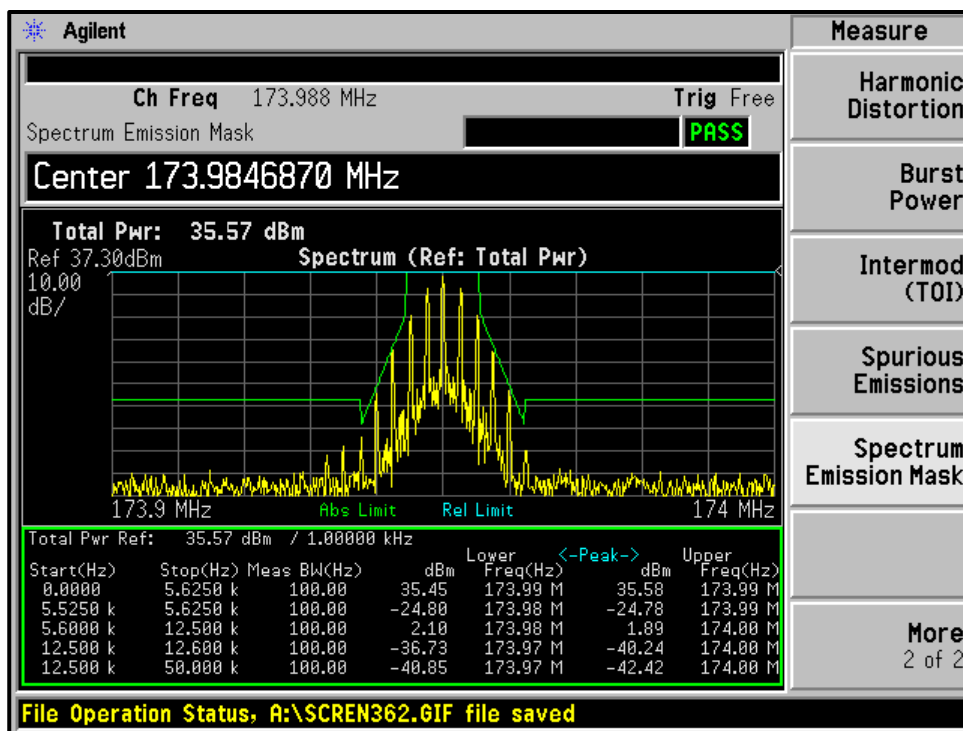
Plot 7-8: Occupied Bandwidth – 162 MHz; Analog (Mask D)



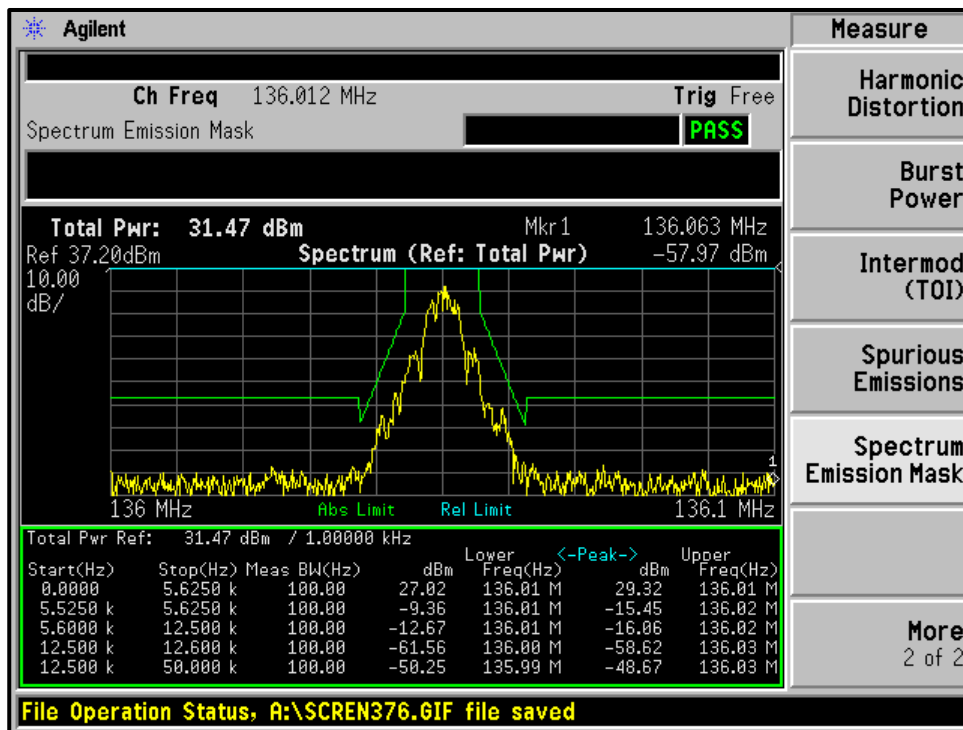
Plot 7-9: Occupied Bandwidth – 173.175 MHz; Analog (Mask D)



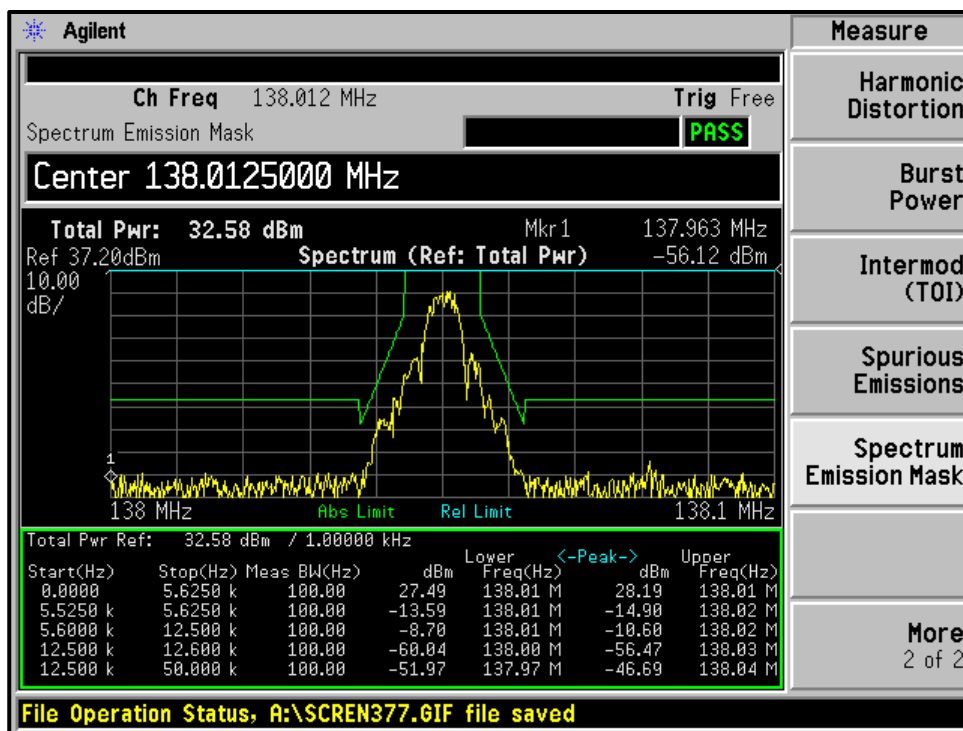
Plot 7-10: Occupied Bandwidth – 173.9875 MHz; Analog (Mask D)



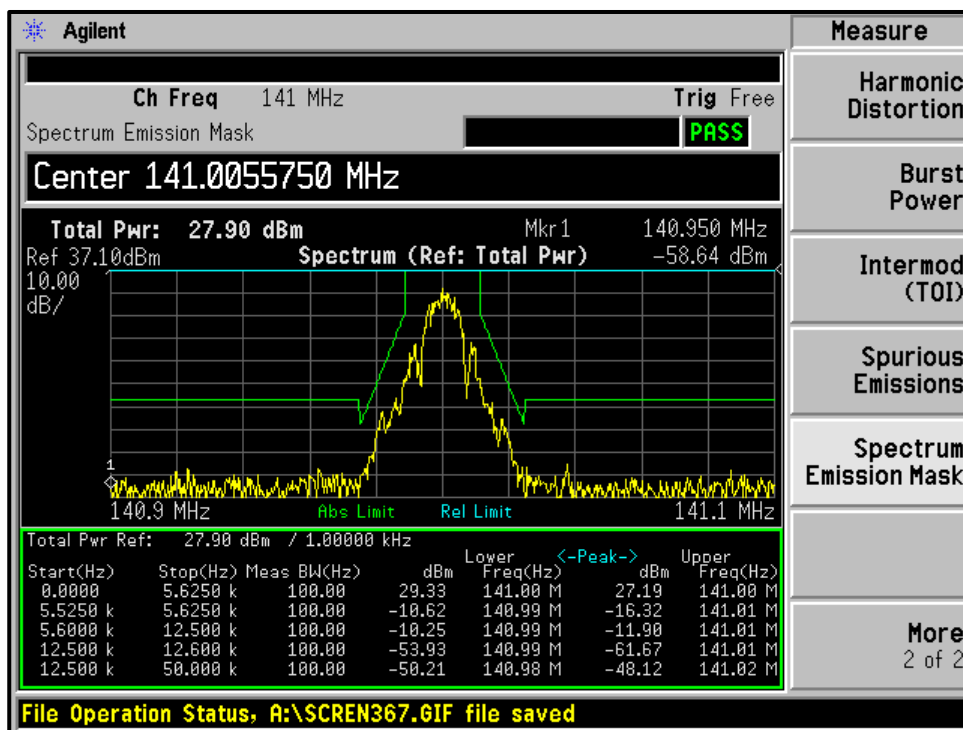
Plot 7-11: Occupied Bandwidth – 136.0125 MHz; 2 level NB 4800 (Mask D)



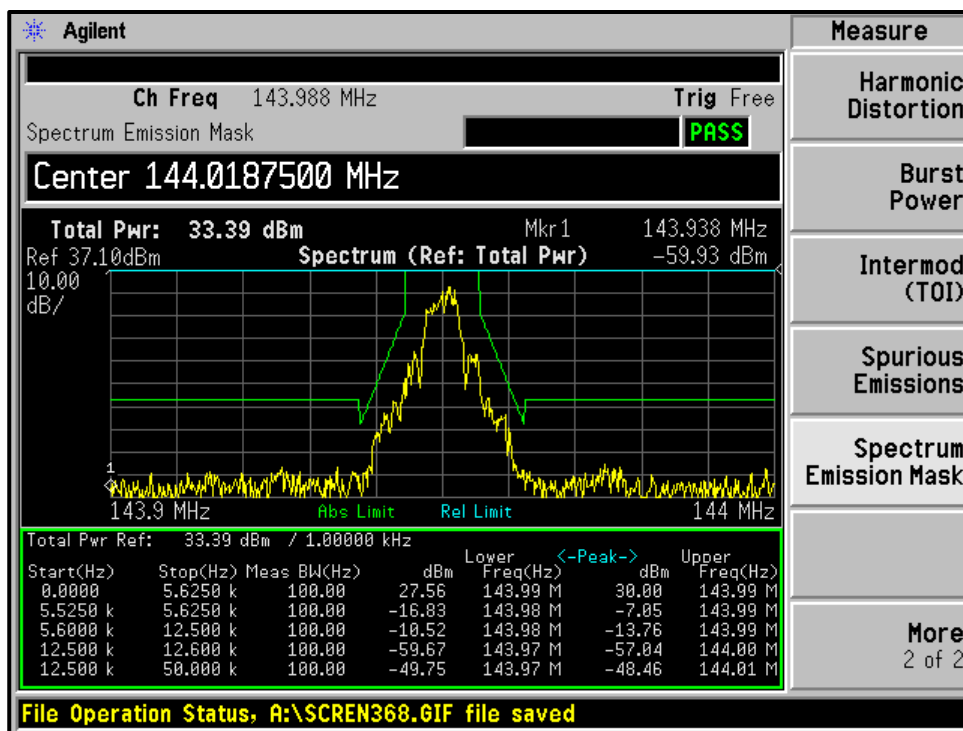
Plot 7-12: Occupied Bandwidth – 138.0125 MHz; 2 level NB 4800 (Mask D)



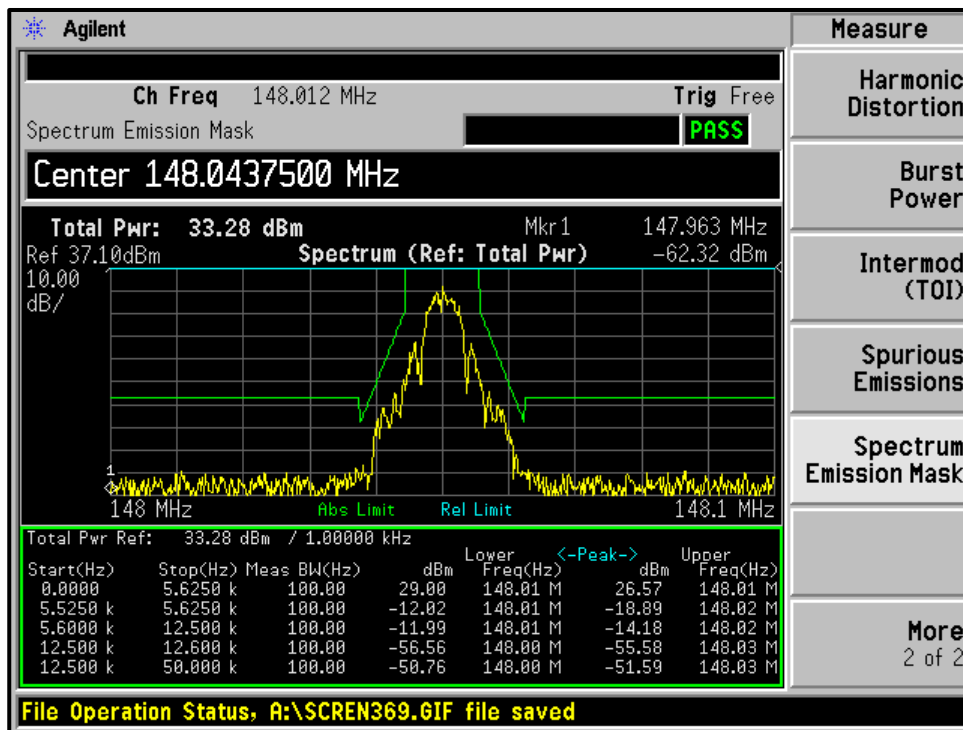
Plot 7-13: Occupied Bandwidth – 141 MHz; 2 level NB 4800 (Mask D)



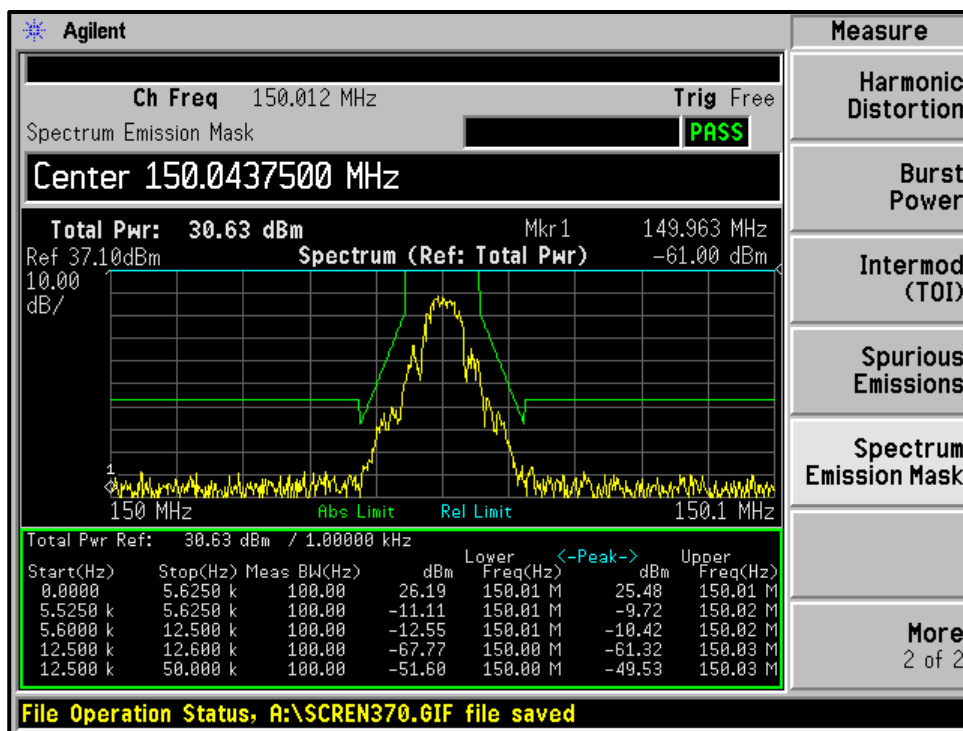
Plot 7-14: Occupied Bandwidth – 143.9875 MHz; 2 level NB 4800 (Mask D)



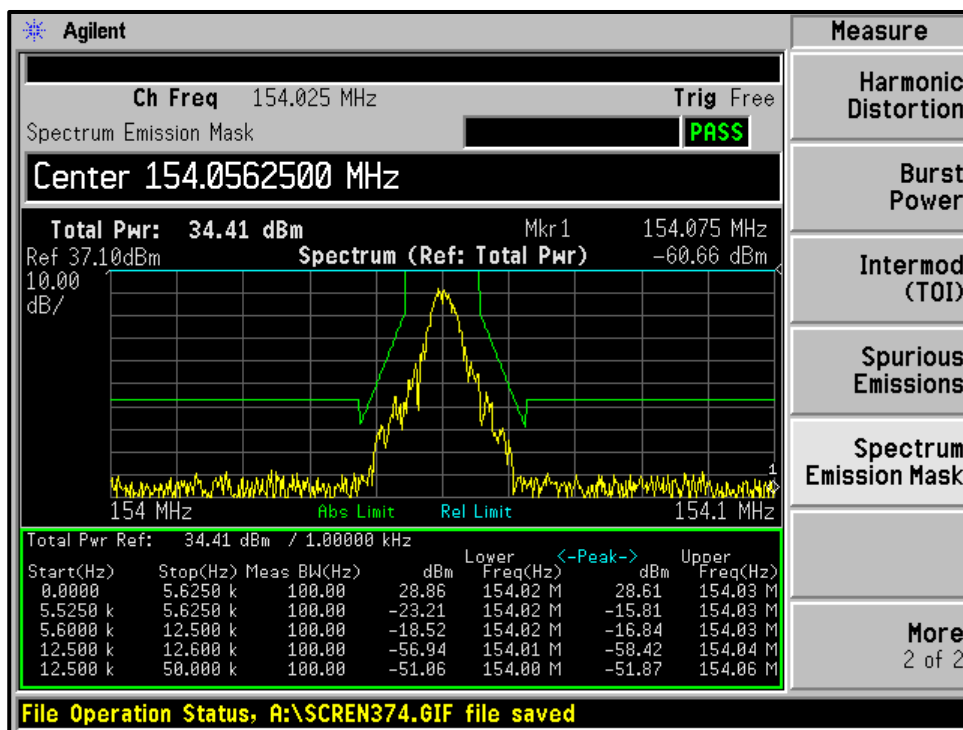
Plot 7-15: Occupied Bandwidth – 148.0125 MHz; 2 level NB 4800 (Mask D)



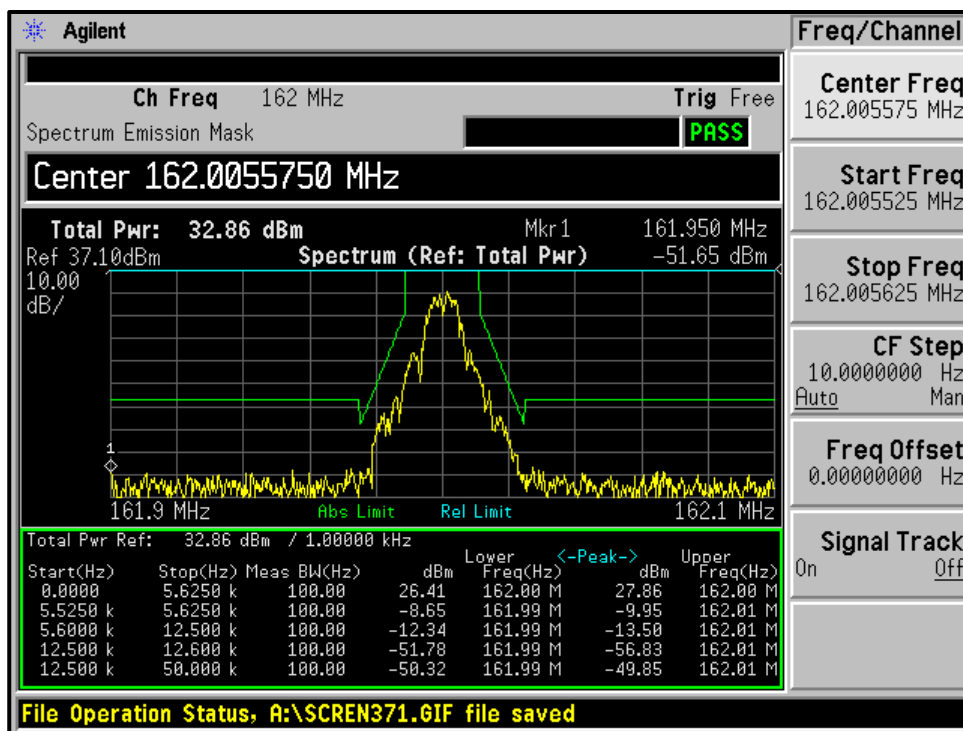
Plot 7-16: Occupied Bandwidth – 150.0125 MHz; 2 level NB 4800 (Mask D)



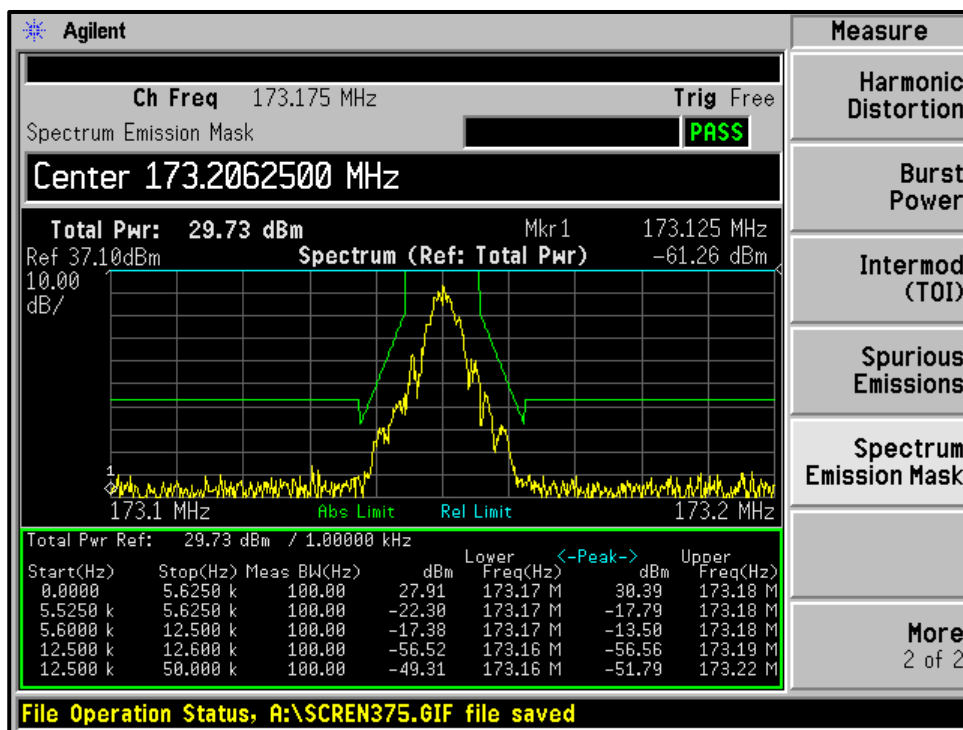
Plot 7-17: Occupied Bandwidth – 154.025 MHz; 2 level NB 4800 (Mask D)



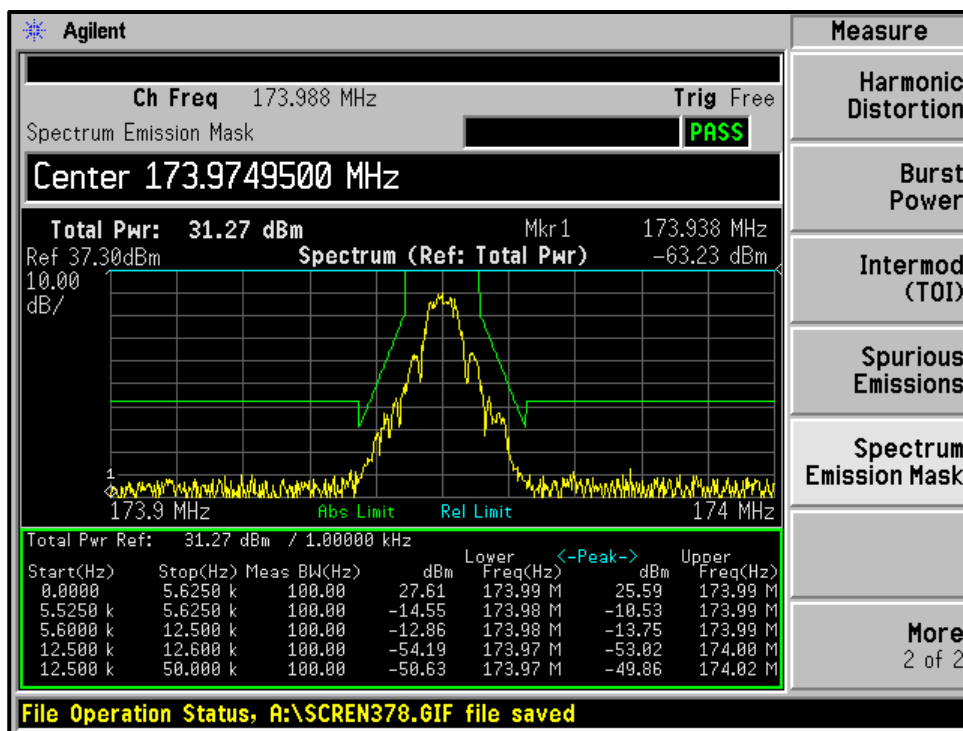
Plot 7-18: Occupied Bandwidth – 162 MHz; 2 level NB 4800 (Mask D)



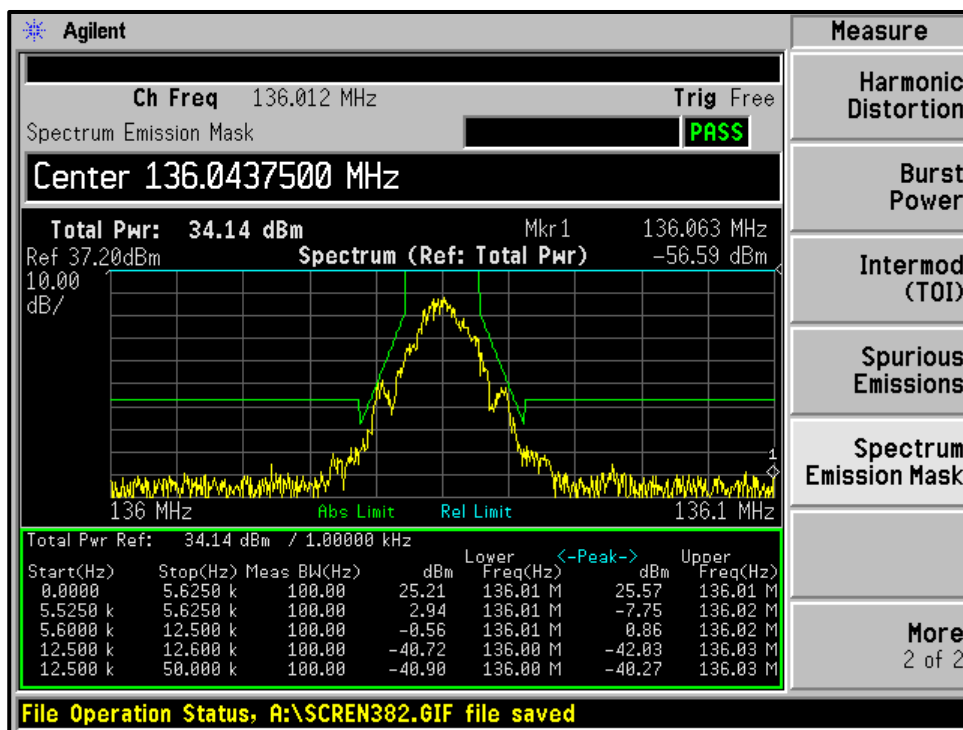
Plot 7-19: Occupied Bandwidth – 173.175 MHz; 2 level NB 4800 (Mask D)



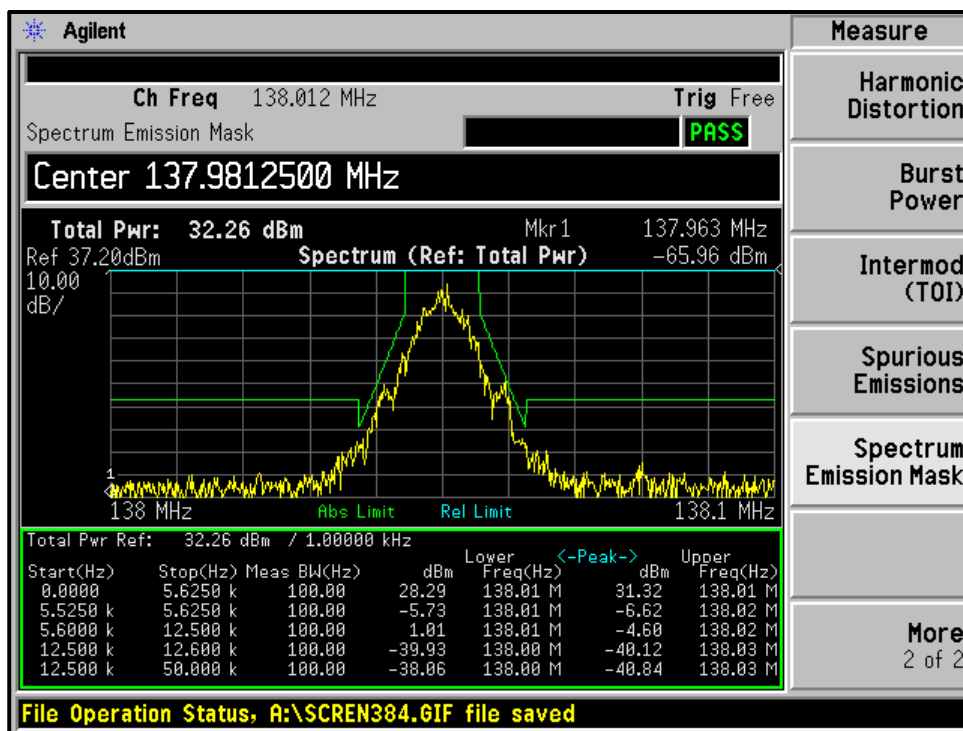
Plot 7-20: Occupied Bandwidth – 173.9875 MHz; 2 level NB 4800 (Mask D)



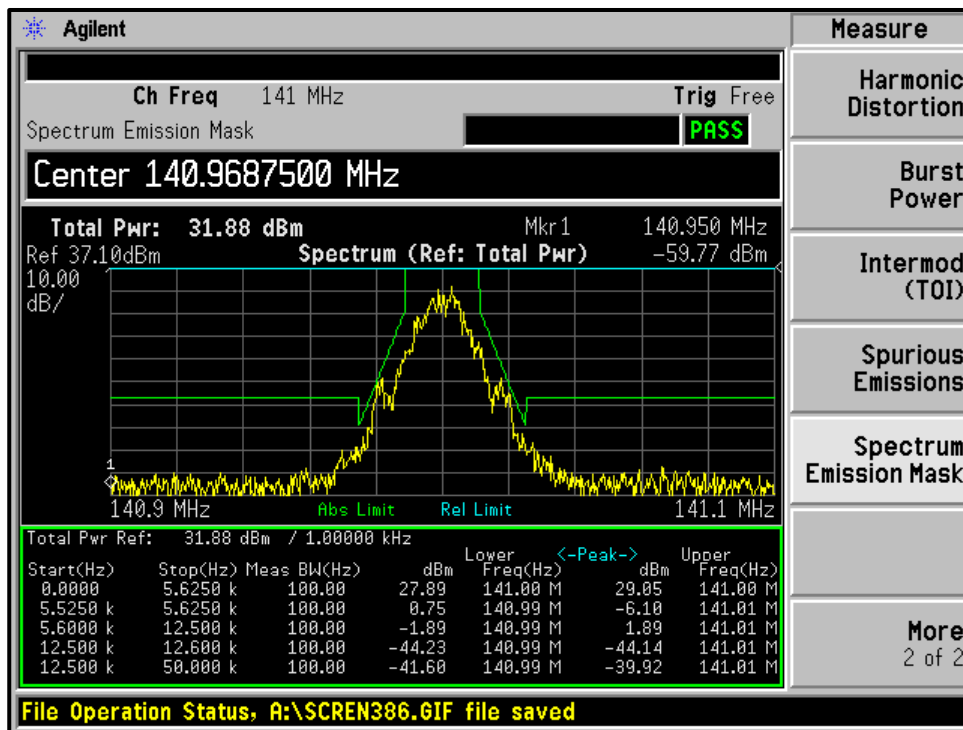
Plot 7-21: Occupied Bandwidth – 136.0125 MHz; 2 level NB 9600 (Mask D)



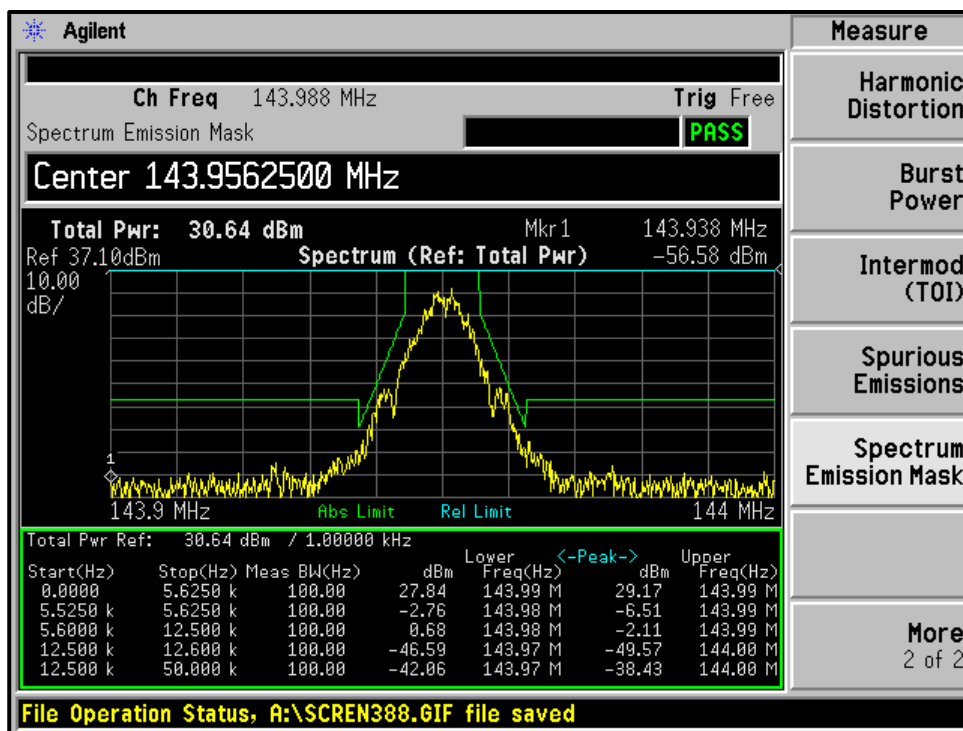
Plot 7-22: Occupied Bandwidth – 138.0 MHz; 2 level NB 9600 (Mask D)



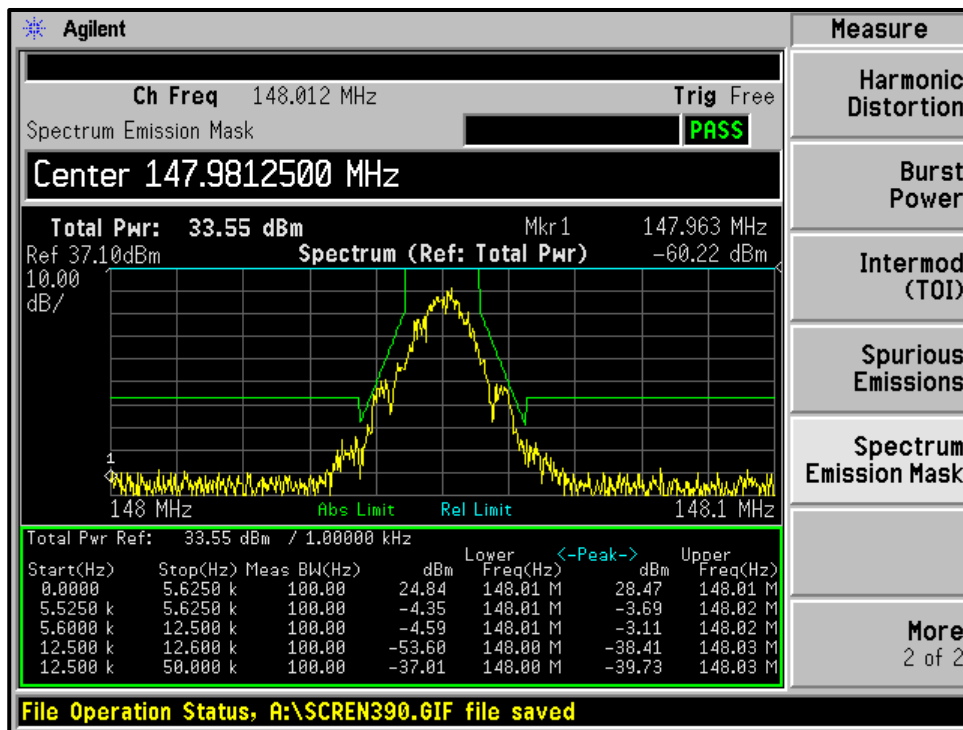
Plot 7-23: Occupied Bandwidth – 141 MHz; 2 level NB 9600 (Mask D)



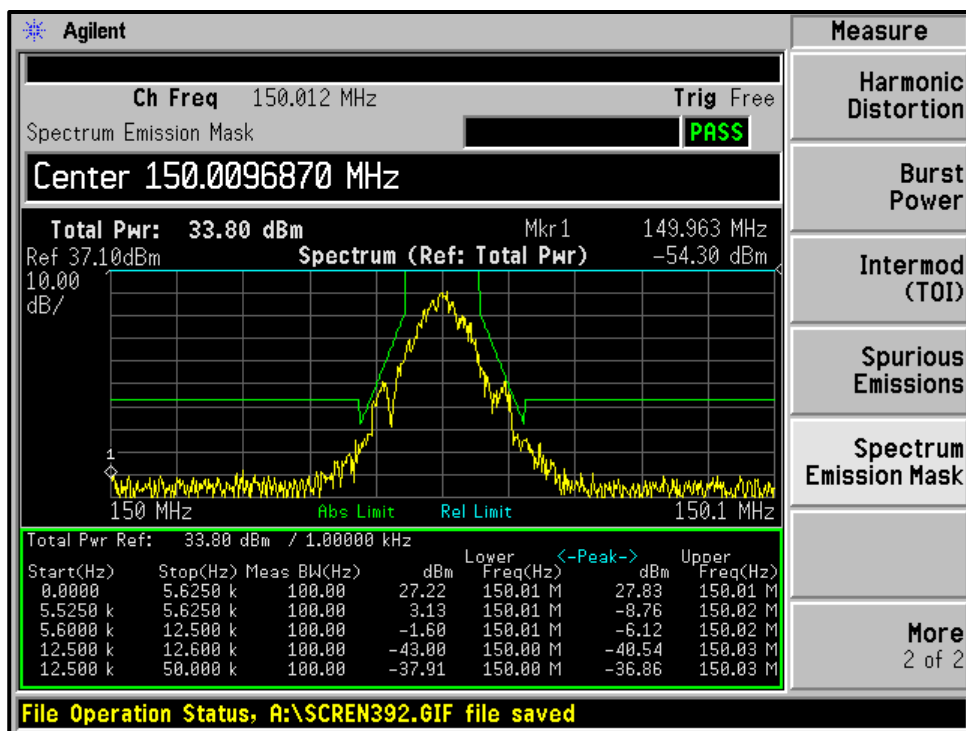
Plot 7-24: Occupied Bandwidth – 143.9875 MHz; 2 level NB 9600 (Mask D)



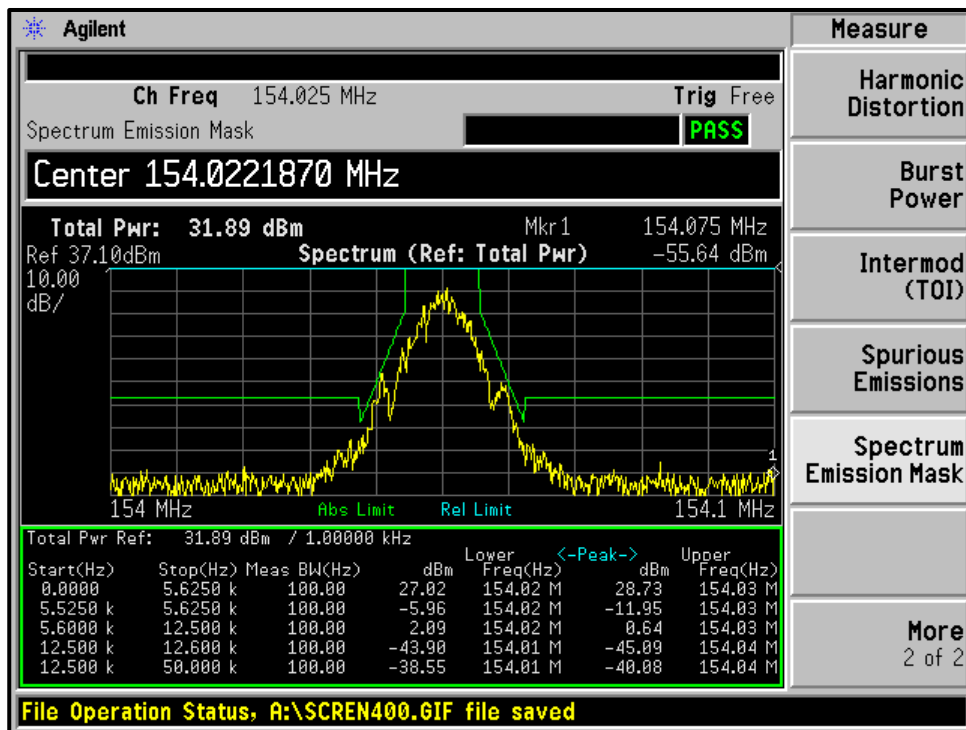
Plot 7-25: Occupied Bandwidth – 148.0125 MHz; 2 level NB 9600 (Mask D)



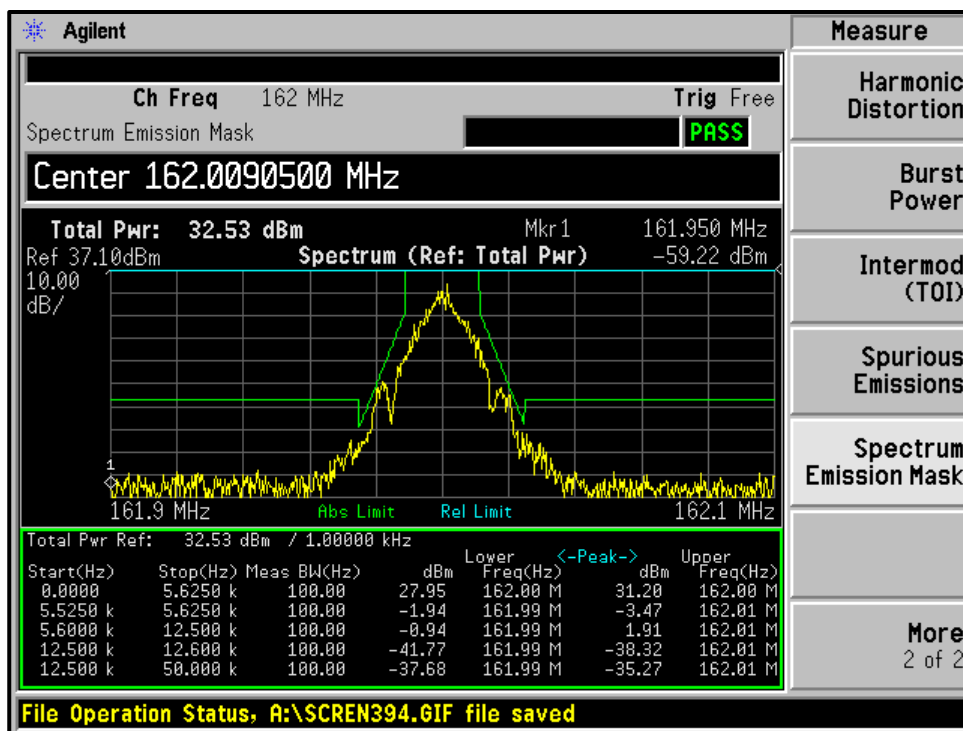
Plot 7-26: Occupied Bandwidth – 150.0125 MHz; 2 level NB 9600 (Mask D)



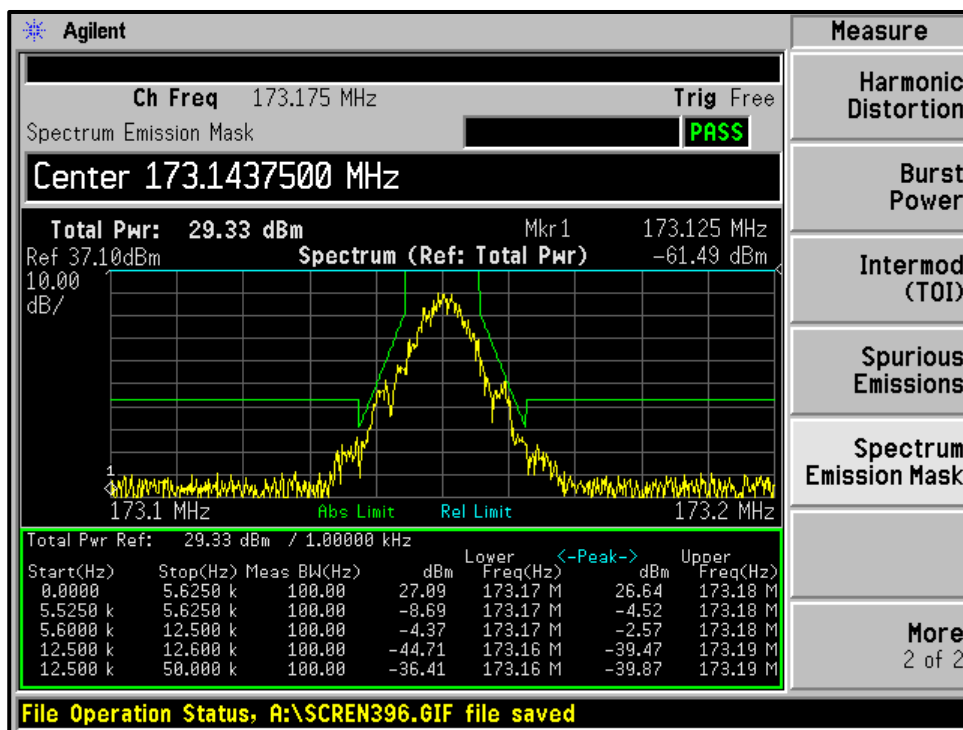
Plot 7-27: Occupied Bandwidth – 154.025 MHz; 2 level NB 9600 (Mask D)



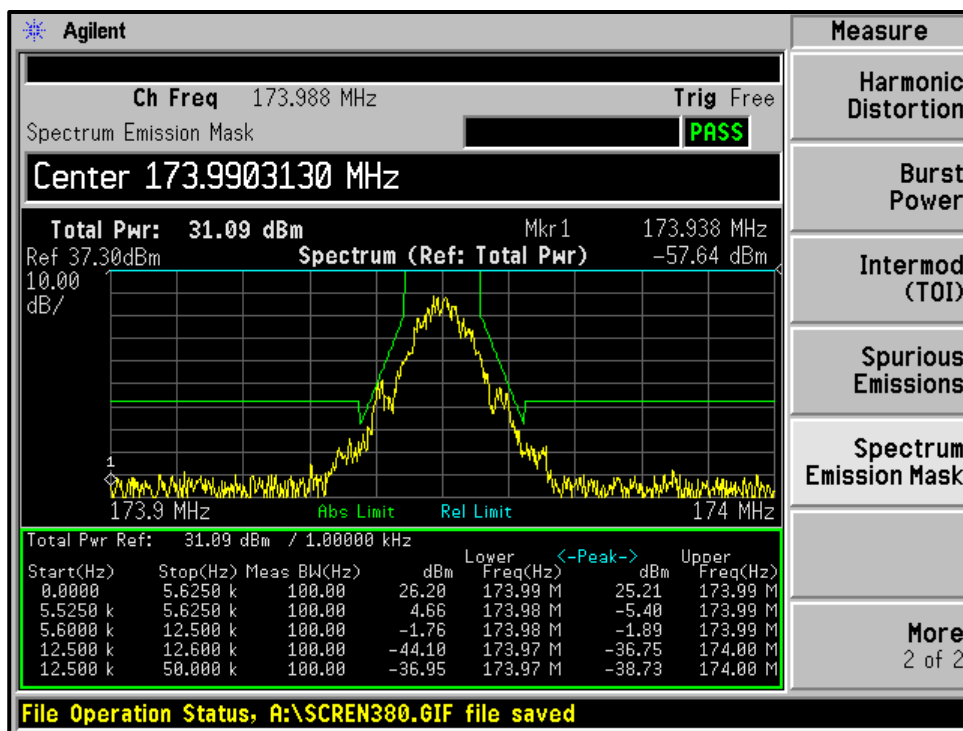
Plot 7-28: Occupied Bandwidth – 162 MHz; 2 level NB 9600 (Mask D)



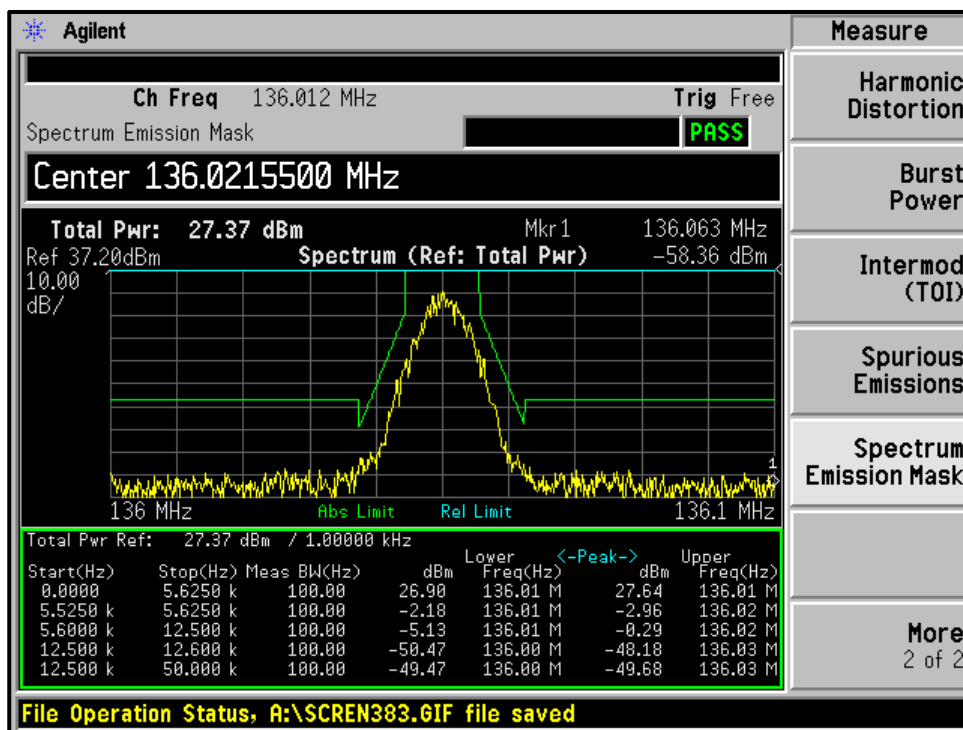
Plot 7-29: Occupied Bandwidth – 173.175 MHz; 2 level NB 9600 (Mask D)



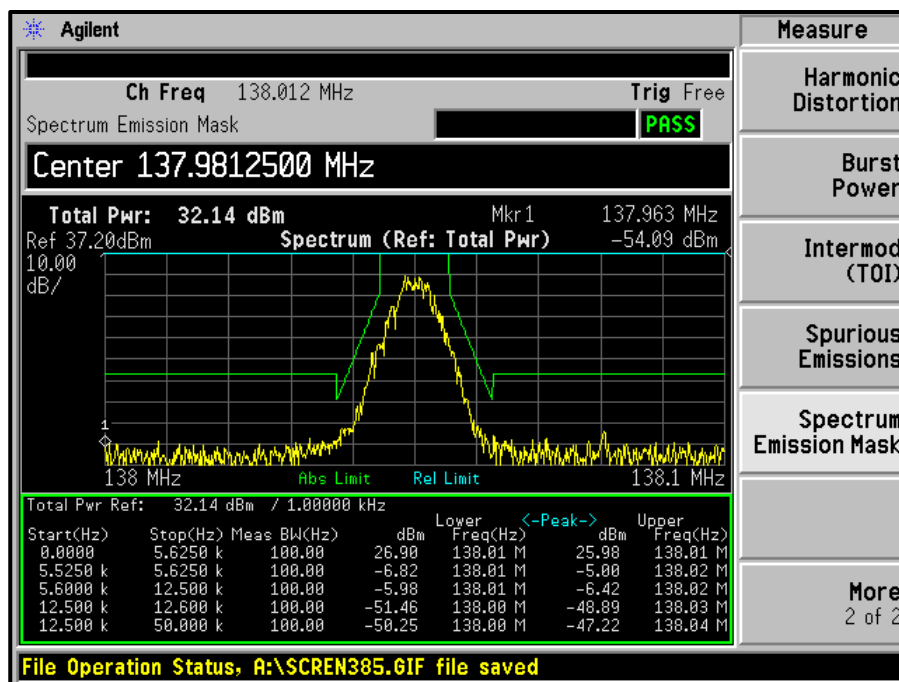
Plot 7-30: Occupied Bandwidth – 173.9875 MHz; 2 level NB 9600 (Mask D)



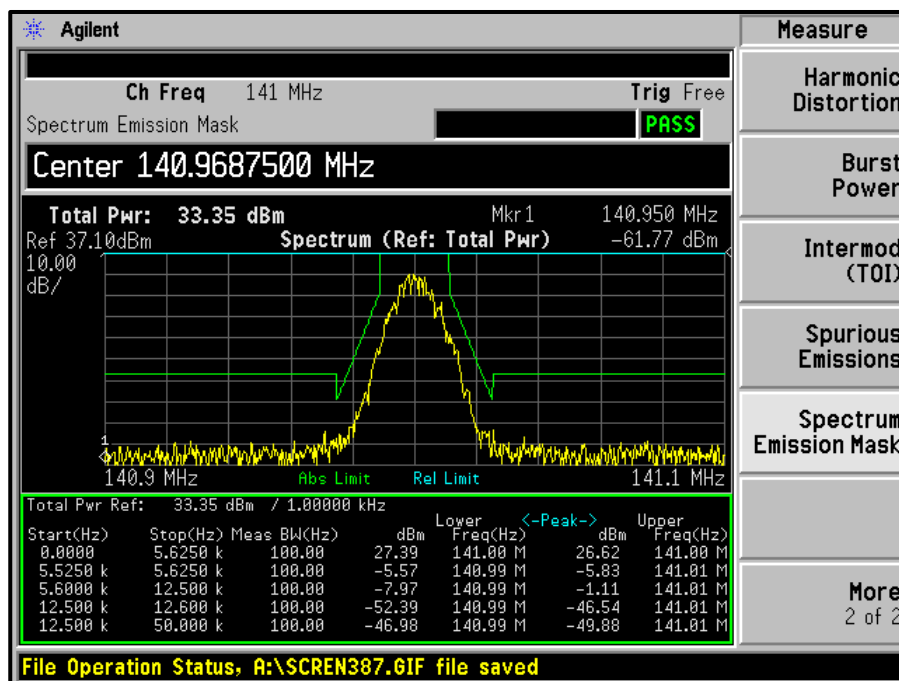
Plot 7-31: Occupied Bandwidth – 136.0125 MHz; P25 (Mask D)



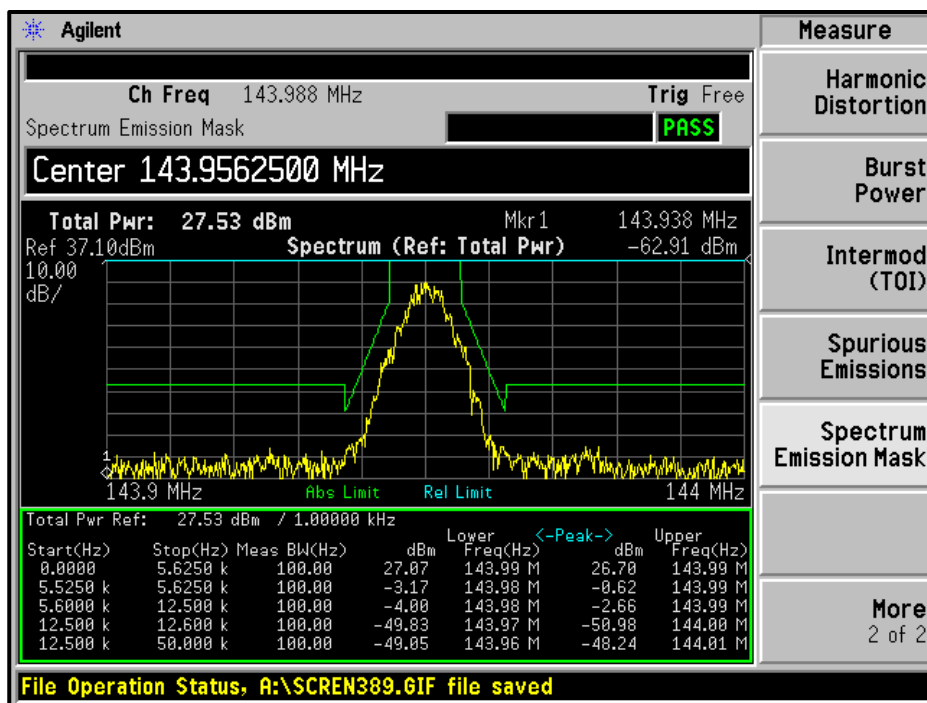
Plot 7-32: Occupied Bandwidth – 138.0 MHz; P25 (Mask D)



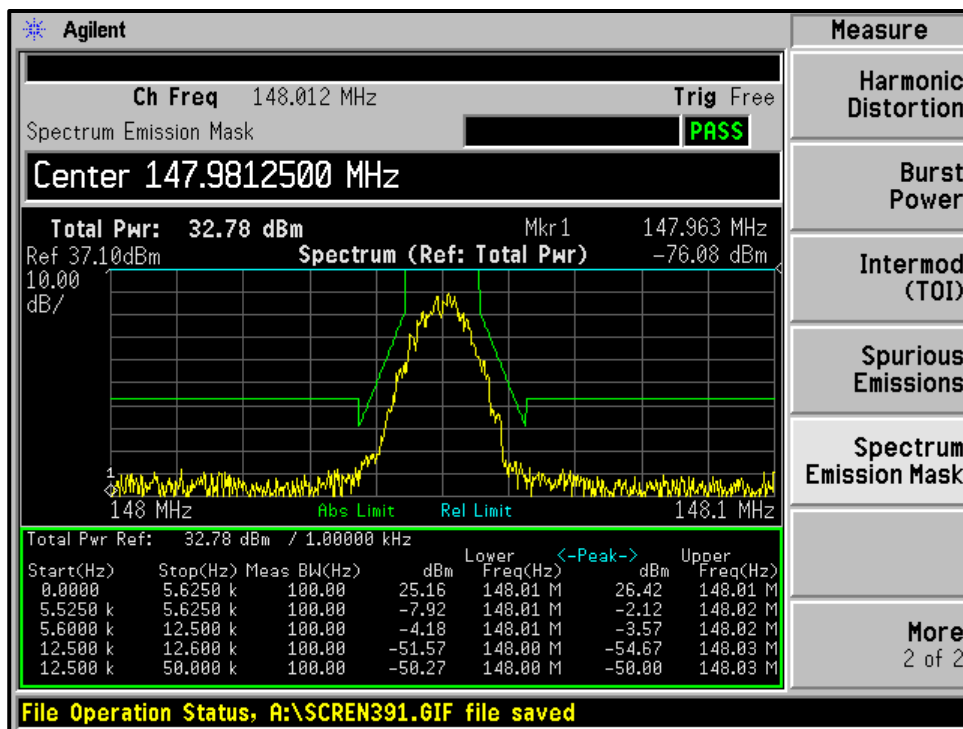
Plot 7-33: Occupied Bandwidth – 141 MHz; P25 (Mask D)



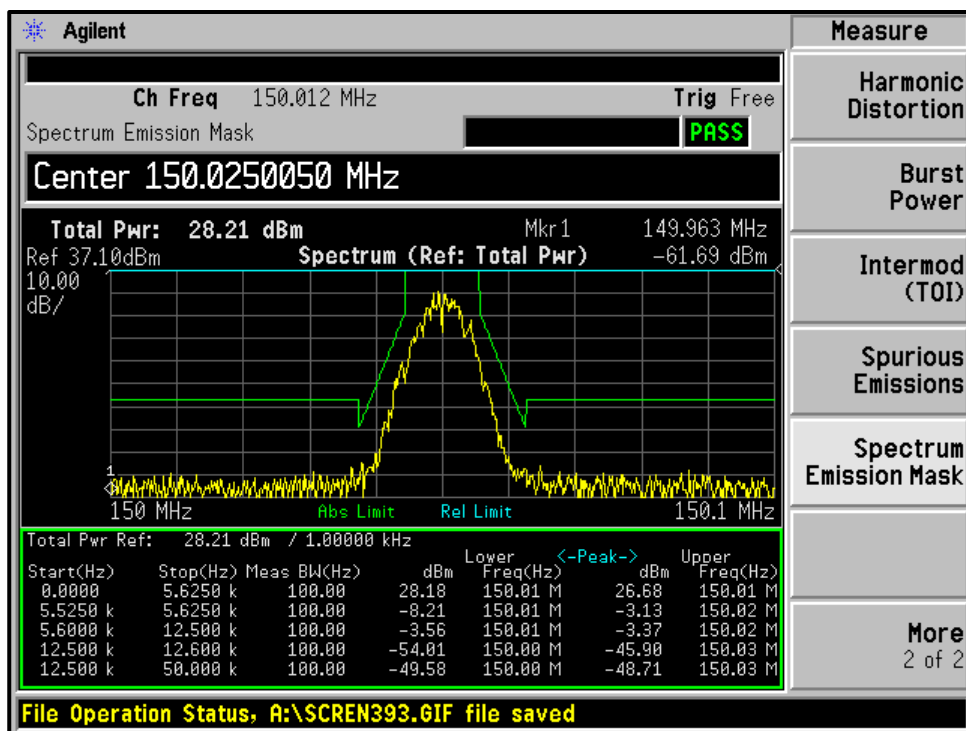
Plot 7-34: Occupied Bandwidth – 143.9875 MHz; P25 (Mask D)



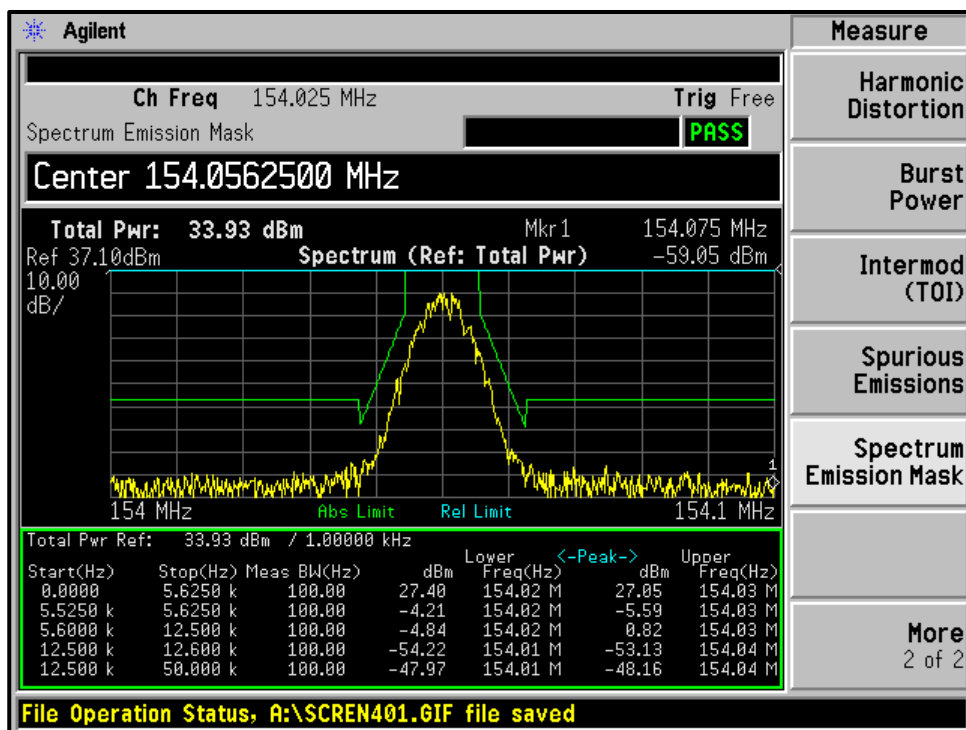
Plot 7-35: Occupied Bandwidth – 148.0125 MHz; P25 (Mask D)



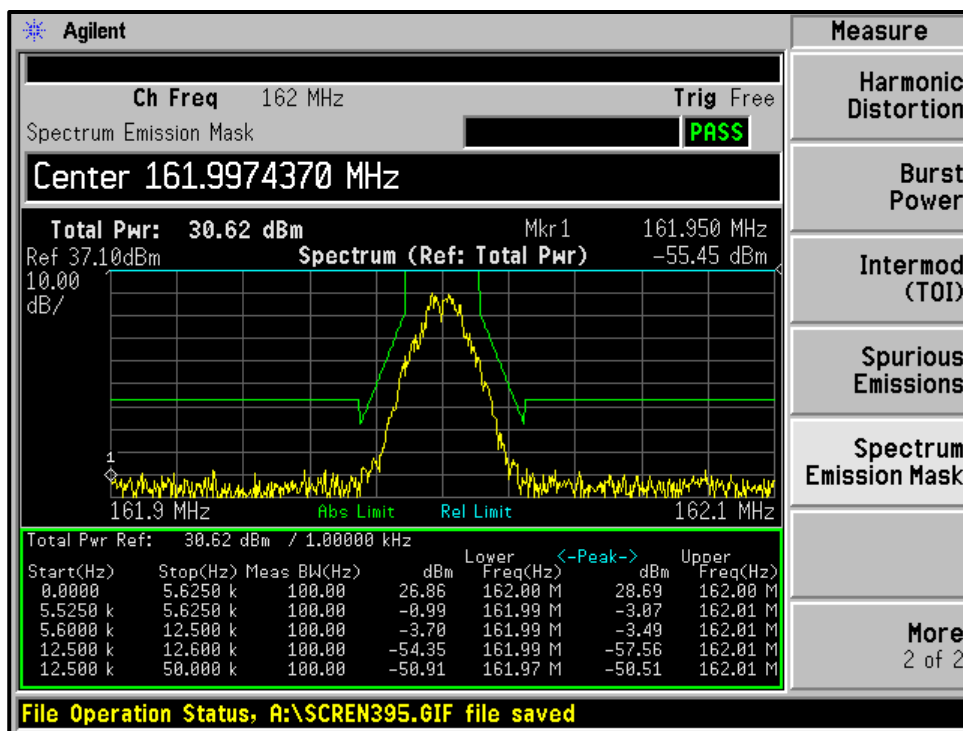
Plot 7-36: Occupied Bandwidth – 150.0125 MHz; P25 (Mask D)



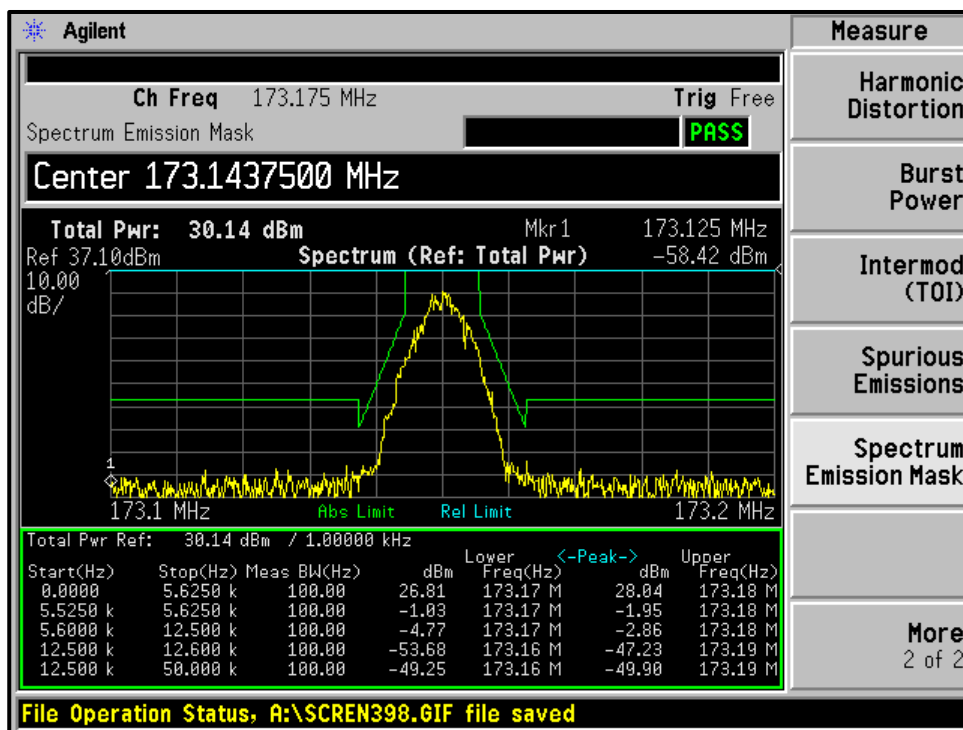
Plot 7-37: Occupied Bandwidth – 154.025 MHz; P25 (Mask D)



Plot 7-38: Occupied Bandwidth – 162 MHz; P25 (Mask D)



Plot 7-39: Occupied Bandwidth – 173.175 MHz; P25 (Mask D)



Plot 7-40: Occupied Bandwidth – 173.9875 MHz; P25 (Mask D)

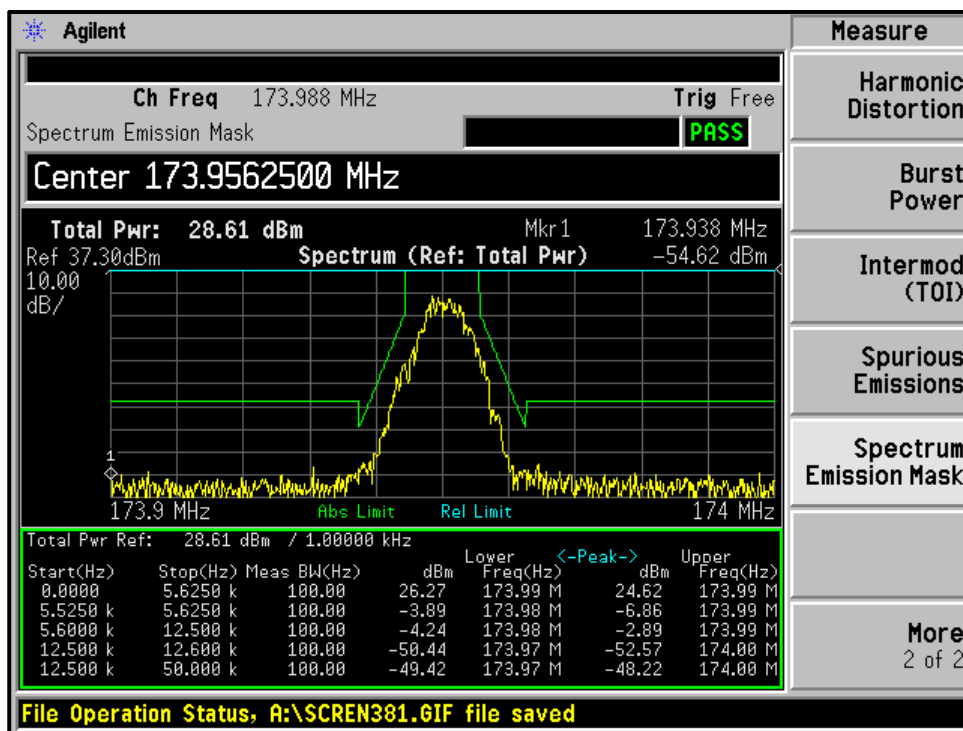


Table 7-1: Test Equipment Used For Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Date
901413	Agilent Technologies	E4448A	PSA Spectrum Analyzer	US44020346	4/8/12
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	3/4/12
901337	Narda Microline	766-10	Attenuator (DC-4GHz, 10 dB, 20W)	6242	7/15/12

Test Personnel:

Daniel Baltzell
Test Engineer

Signature

August 17, 2011
Date of Test

8 FCC Rules and Regulation Part 2.1055: Frequency Stability Part 90.213 and 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.

Part 90.213 limit: 5 ppm for mobile stations (including portables) designed to operate with a 12.5 kHz channel bandwidth

Part 80.209 limit: 10 ppm for the 156 – 162 MHz band

8.2 Test Data

Table 8-1: Temperature Frequency Stability – 150.0125 MHz

Temperature (°C)	Measured Frequency (Hz)	ppm
-30	150.0125,012,344	0.37
-20	150.0125,012,348	0.35
-10	150.0125,012,365	0.23
0	150.0125,012,372	0.19
10	150.0125,012,382	0.12
20 (reference)	150.0125,012,400	0.00
30	150.0125,012,405	0.03
40	150.0125,012,415	0.10
50	150.0125,012,433	0.22
60	150.0125,012,453	0.35

8.2.1 Frequency Stability/Voltage Variation

Table 8-2: Frequency Stability/Voltage Variation – 150.0125 MHz

Voltage (VDC)	Measured Frequency (Hz)	ppm
6.2 (Battery End-Point)	150.0125,012,397	0.02
6.375	150.0125,012,405	0.03
7.5 (reference)	150.0125,012,400	0.00
8.625	150.0125,012,405	0.03

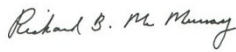
The worst-case deviation was found to be 0.37 ppm.

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

Test Personnel:

Richard B. McMurray, P.E. Test Engineer	 Signature	August 11 & 12, 2011 Dates of Test
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9 FCC Part 2.1047: Modulation Characteristics; Part 80.213 Modulation Requirements; RSS-119 5.8 Types of Modulation

Part 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 $60 \log_{10}(f/3)$ 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-603-C-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 = $20 \text{ LOG } (\text{DEVfreq}/\text{DEVref})$

9.1.2 Audio Low Pass Filter Response

ANSI/TIA-603-C-2004 Section 2.2.15

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

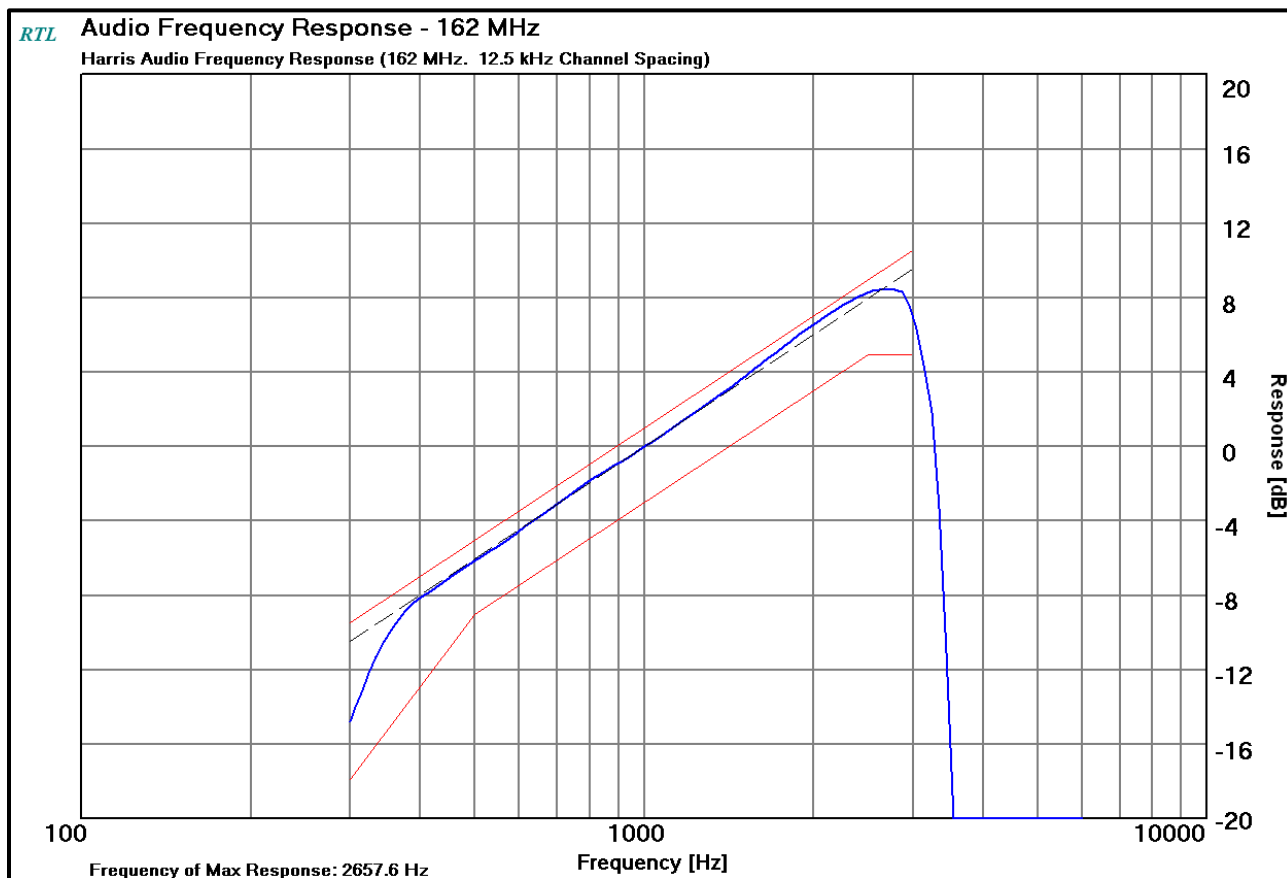
9.1.3 Modulation Limiting

ANSI/TIA-603-C-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.

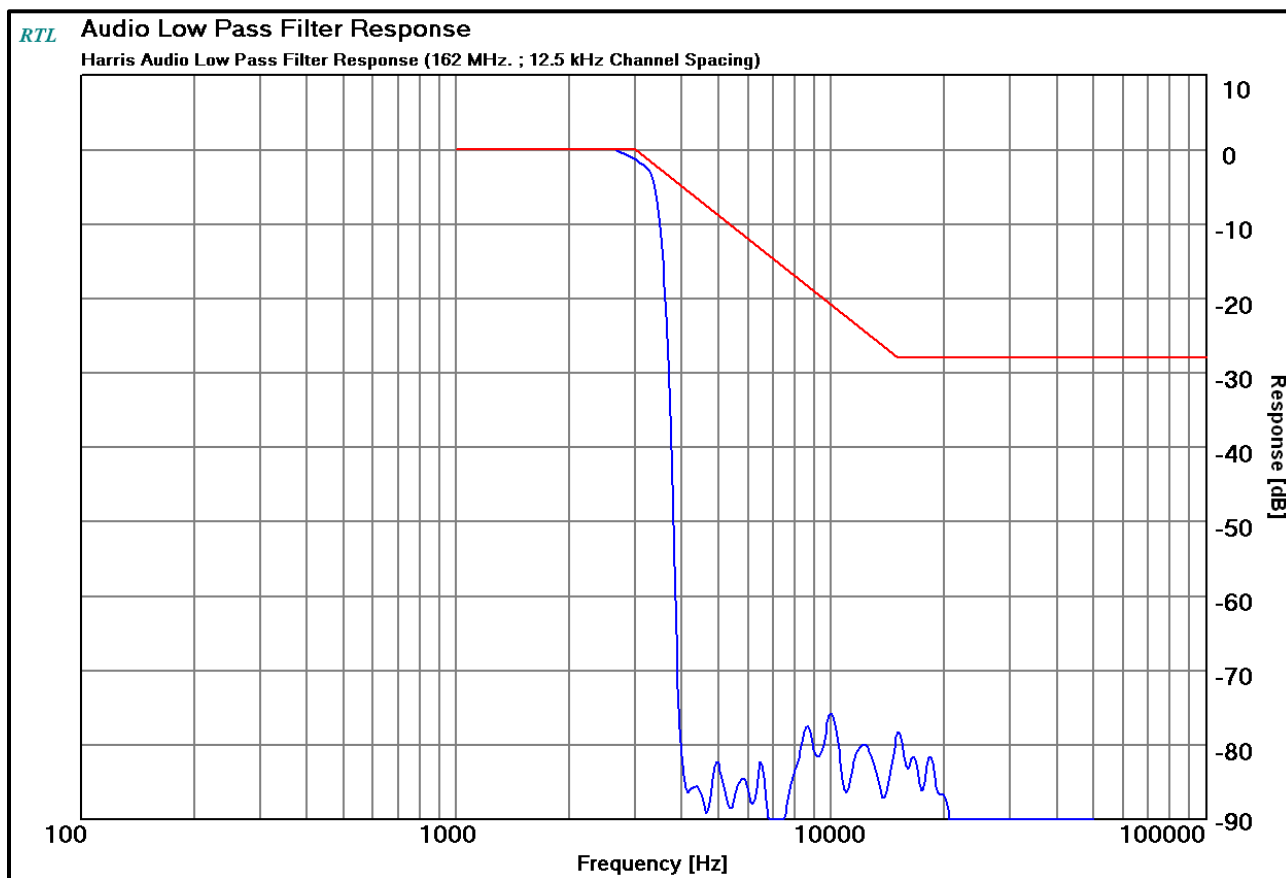
9.2 Test Data

Plot 9-1: Modulation Characteristics - Audio Frequency Response – 162 MHz



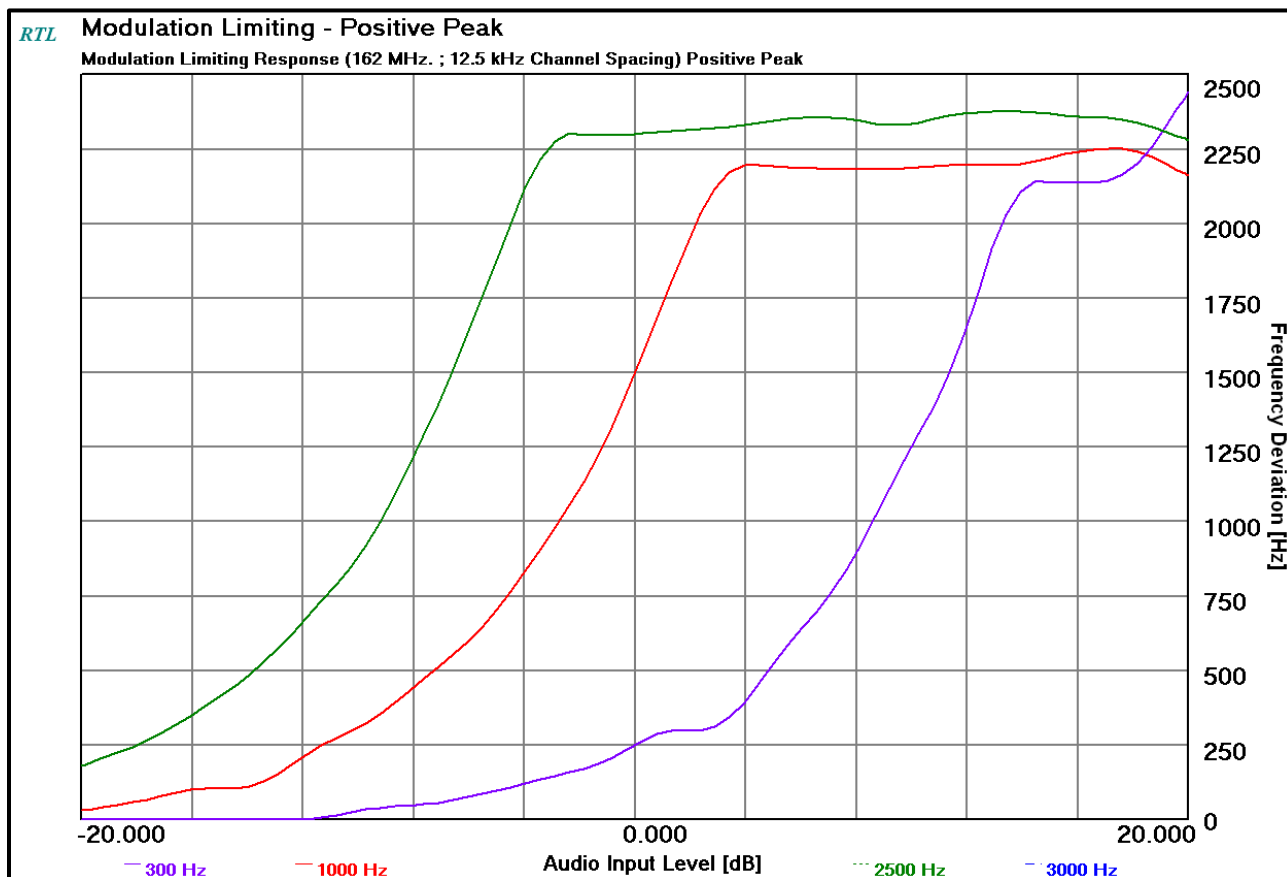
9.2.1 Audio Low Pass Filter Response

Plot 9-2: Modulation Characteristics – Audio Low Pass Filter – 162.0 MHz



9.2.2 Modulation Limiting

Plot 9-3: Modulation Characteristics – Modulation Limiting – 162.0 MHz; Positive Peak



Plot 9-4: Modulation Characteristics – Modulation Limiting – 162.0 MHz; Negative Peak

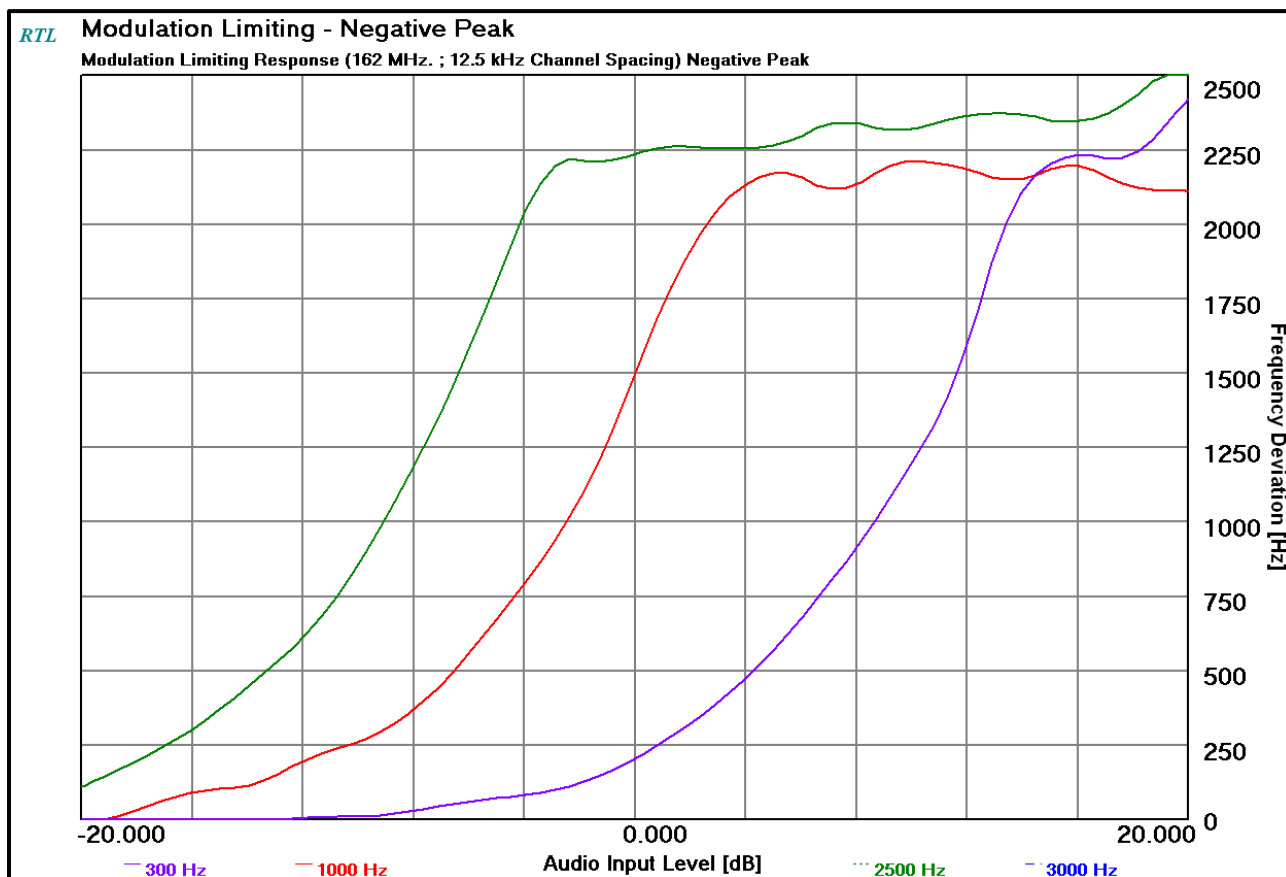


Table 9-1: Test Equipment Used For Testing Modulation Requirements

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	3/4/12
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	10/7/11
901139	Weinschel Corp.	48-20-34 DC-18GHz	Attenuator, 100W 40dB	BK5859	2/17/12

Test Personnel:

Daniel Baltzell
Test Engineer

Daniel W. Baltzell

Signature

August 16, 2011
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

Part 90.214 Transient Frequency Behavior

Transmitters designed to operate in the 150–174 MHz and 421–512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals ^{1,2}	Maximum frequency difference ³	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t ₁ ⁴	±25.0 kHz	5.0 ms	10.0 ms
t ₂	±12.5 kHz	20.0 ms	25.0 ms
t ₃ ⁴	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t ₁ ⁴	±12.5 kHz	5.0 ms	10.0 ms
t ₂	±6.25 kHz	20.0 ms	25.0 ms
t ₃ ⁴	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
t ₁ ⁴	±6.25 kHz	5.0 ms	10.0 ms
t ₂	±3.125 kHz	20.0 ms	25.0 ms
t ₃ ⁴	±6.25 kHz	5.0 ms	10.0 ms

¹ _{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t₁ is the time period immediately following t_{on}.

t₂ is the time period immediately following t₁.

t₃ is the time period from the instant when the transmitter is turned off until t_{off}.

t_{off} is the instant when the 1 kHz test signal starts to rise.

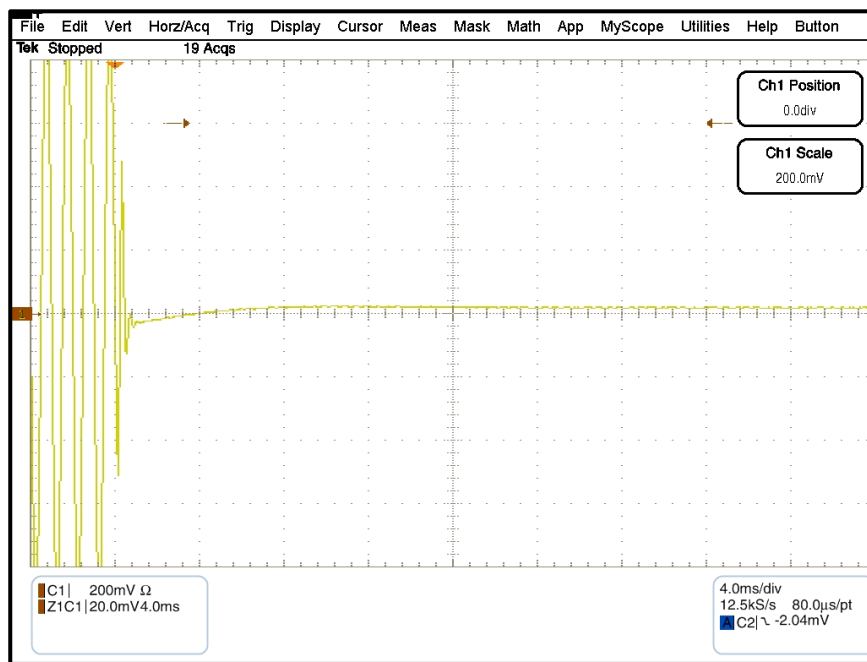
² During the time from the end of t₂ to the beginning of t₃, the frequency difference must not exceed the limits specified in §90.213.

³ Difference between the actual transmitter frequency and the assigned transmitter frequency.

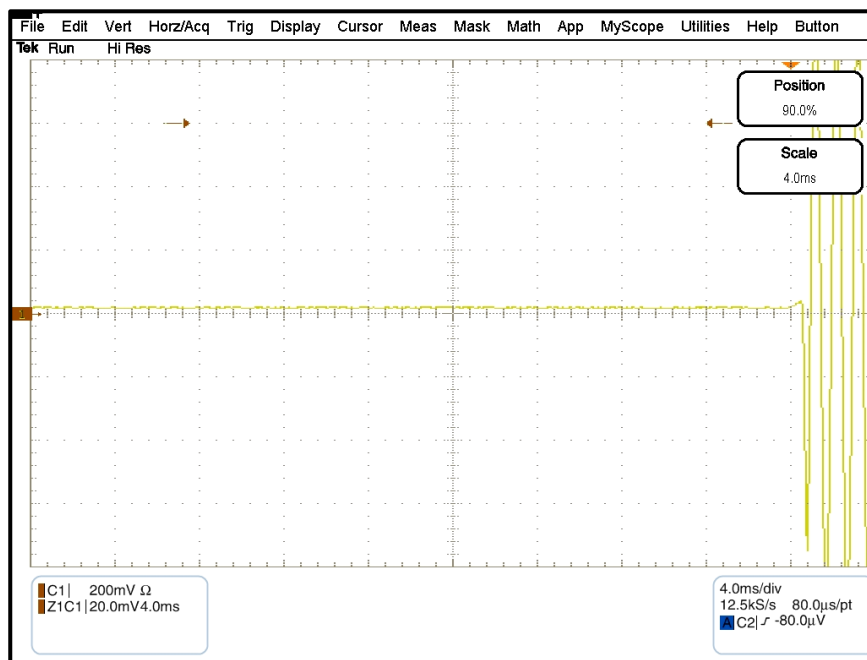
⁴ If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

10.2 Test Data

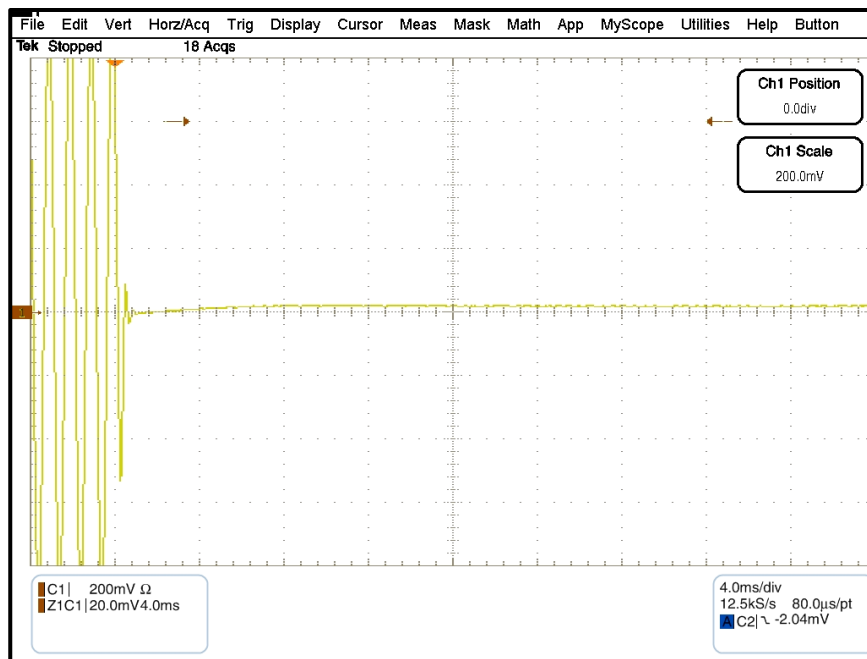
Plot 10-1: Transient Frequency Behavior – 136.0125 MHz; High Power; Carrier ON Time



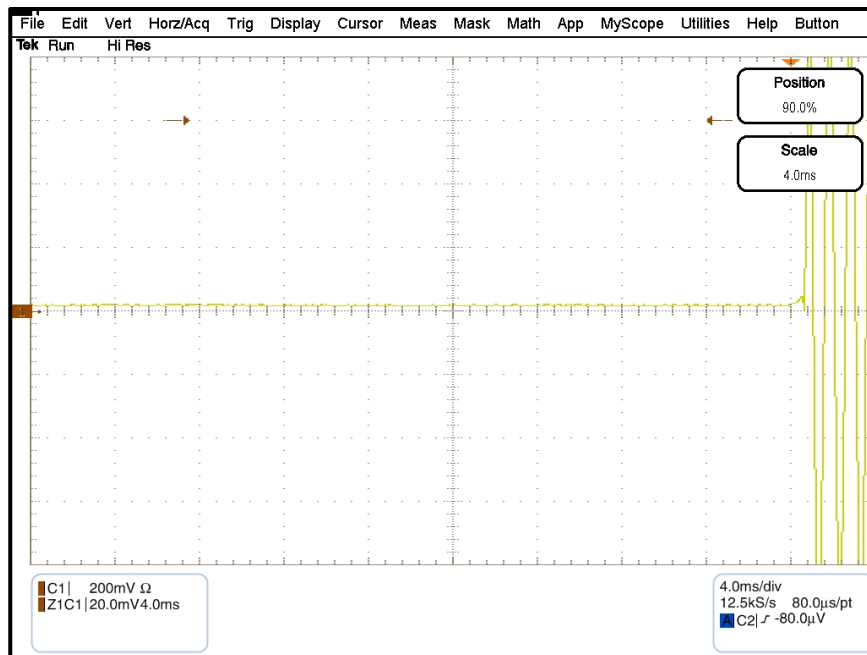
Plot 10-2: Transient Frequency Behavior – 136.0125 MHz; High Power; Carrier OFF Time



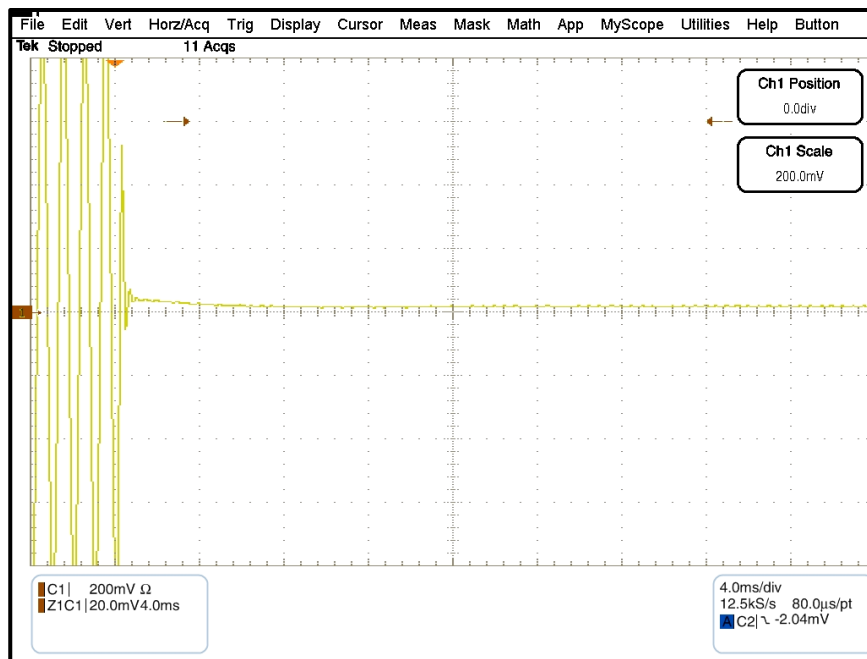
Plot 10-3: Transient Frequency Behavior – 138.0125 MHz; High Power; Carrier ON Time



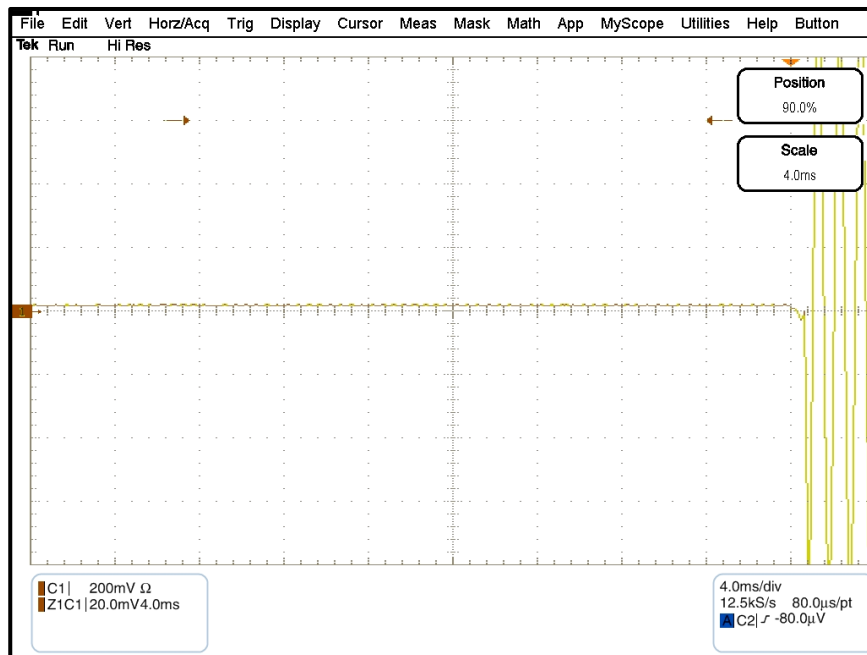
Plot 10-4: Transient Frequency Behavior – 138.0125 MHz; High Power; Carrier OFF Time



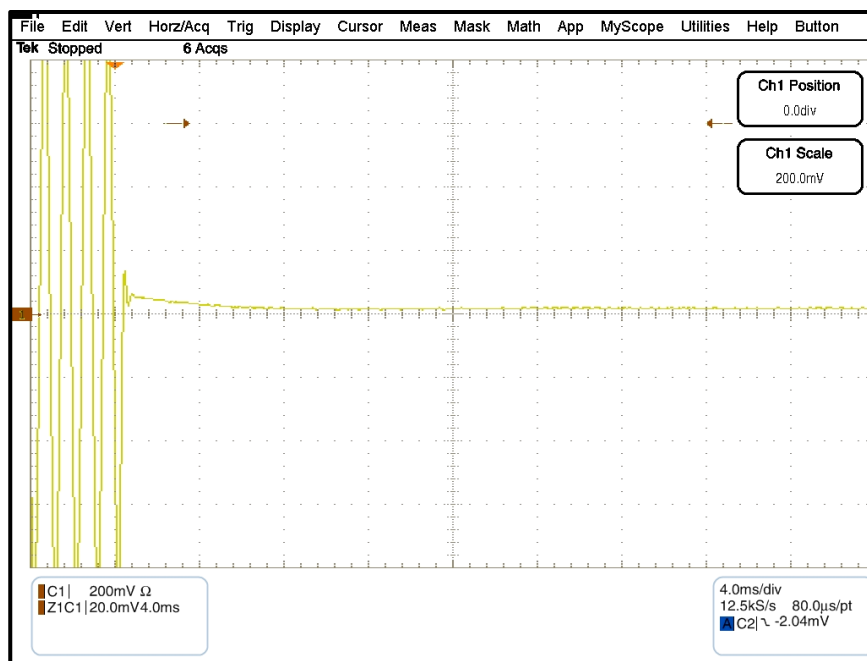
Plot 10-5: Transient Frequency Behavior – 141.0 MHz; High Power; Carrier ON Time



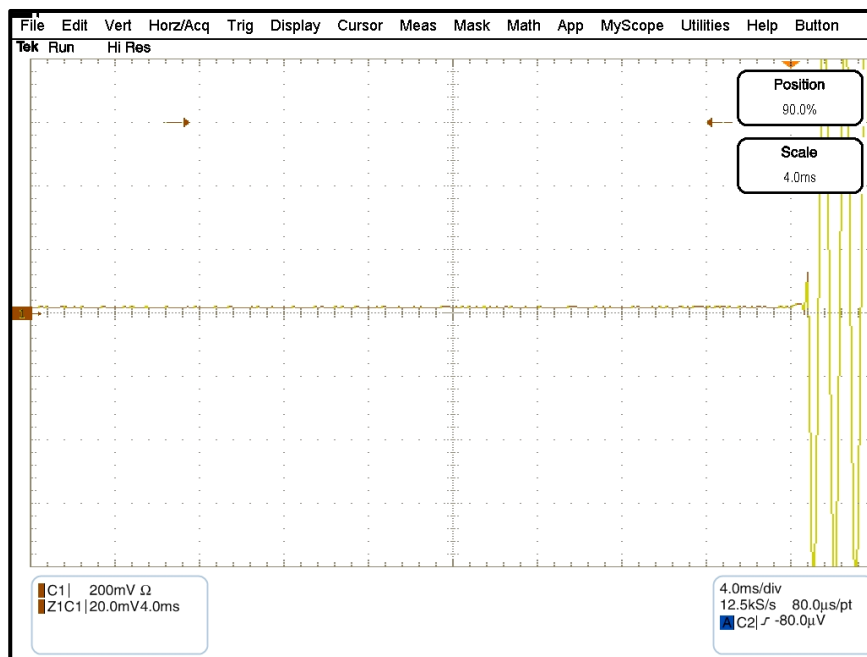
Plot 10-6: Transient Frequency Behavior – 141.0 MHz; High Power; Carrier OFF Time



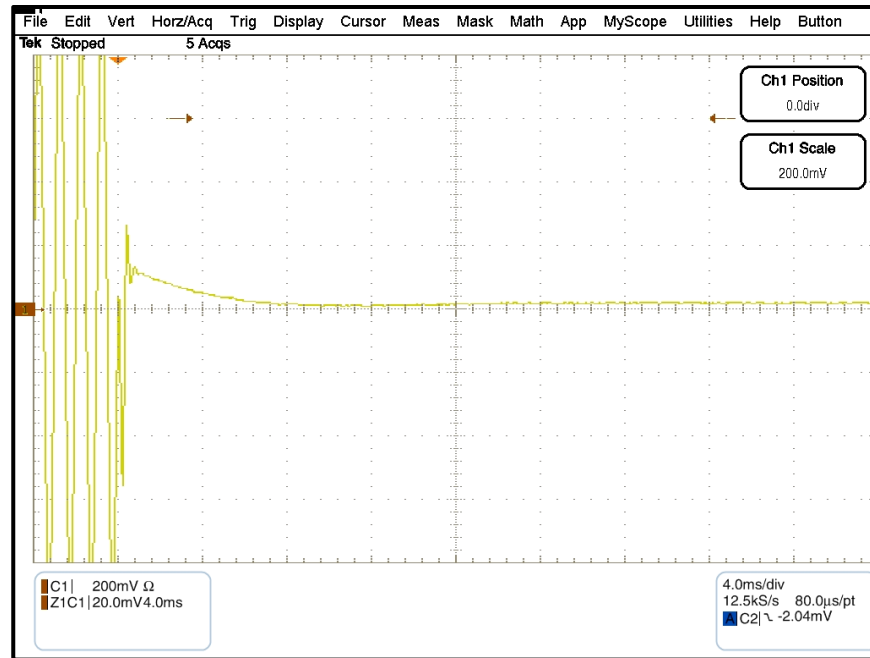
Plot 10-7: Transient Frequency Behavior – 143.9875 MHz; High Power; Carrier ON Time



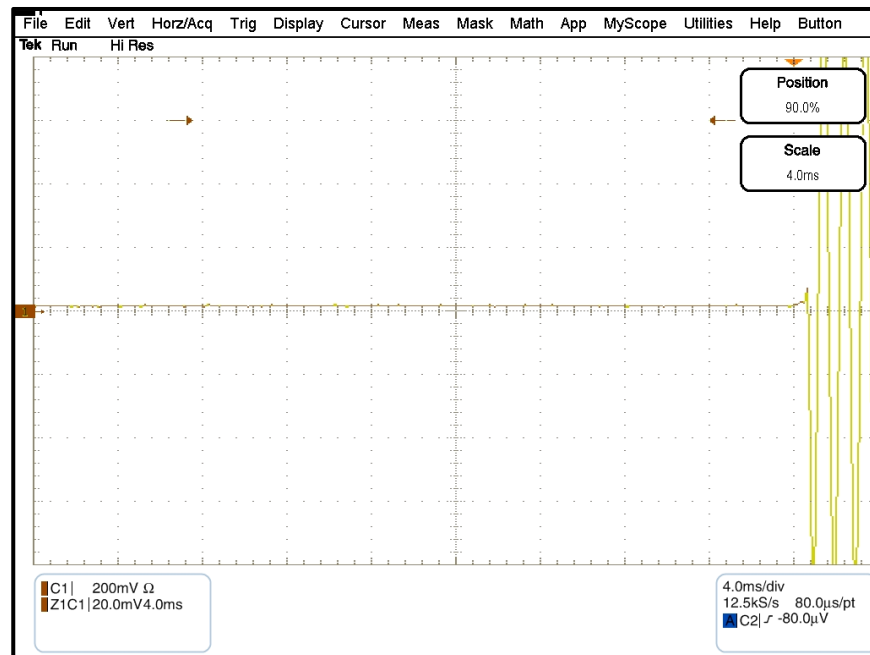
Plot 10-8: Transient Frequency Behavior – 143.9875 MHz; High Power; Carrier OFF Time



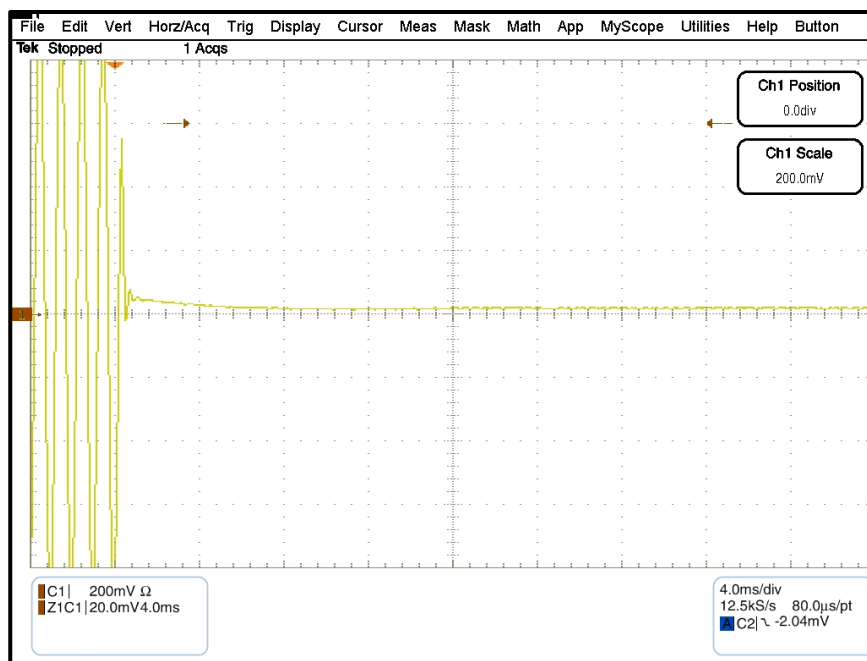
Plot 10-9: Transient Frequency Behavior – 148.0125 MHz; High Power; Carrier ON Time



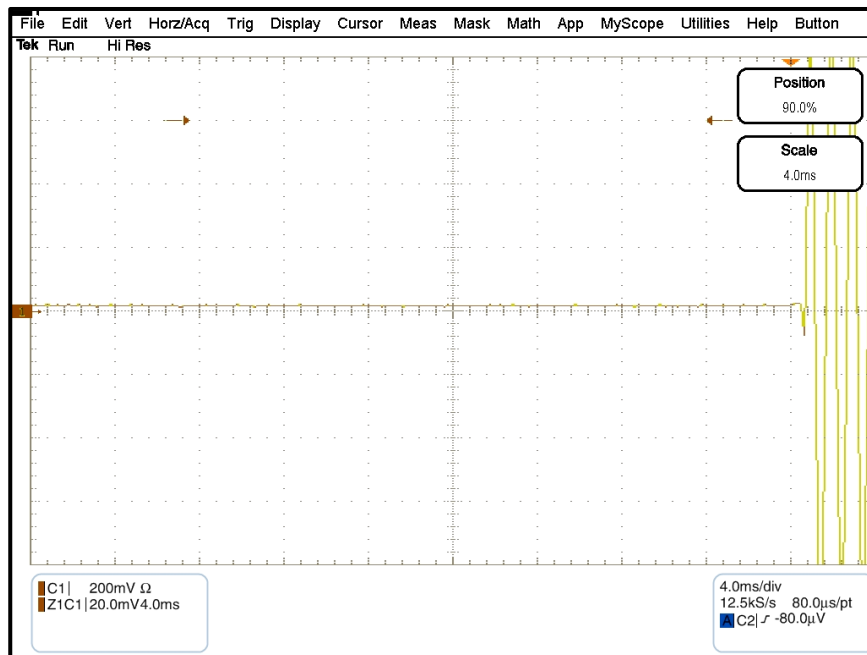
Plot 10-10: Transient Frequency Behavior – 148.0125 MHz; High Power; Carrier OFF Time



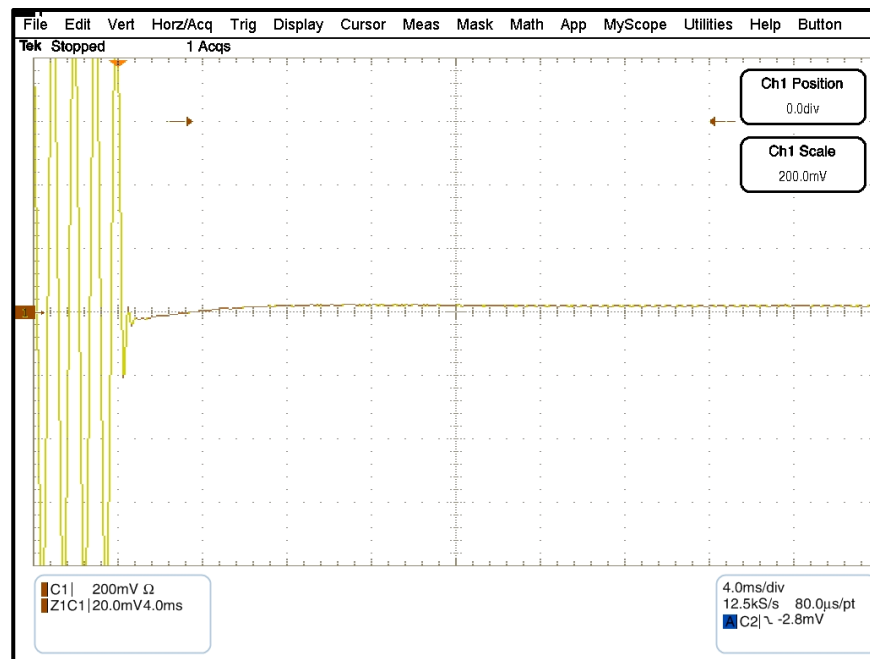
Plot 10-11: Transient Frequency Behavior – 150.0125 MHz; High Power; Carrier ON Time



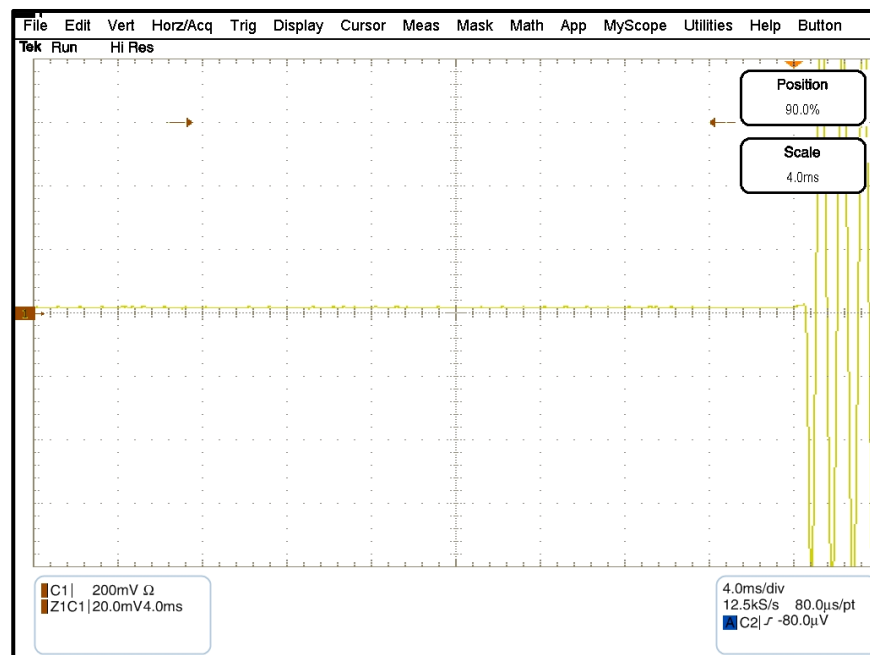
Plot 10-12: Transient Frequency Behavior – 150.0125 MHz; High Power; Carrier OFF Time



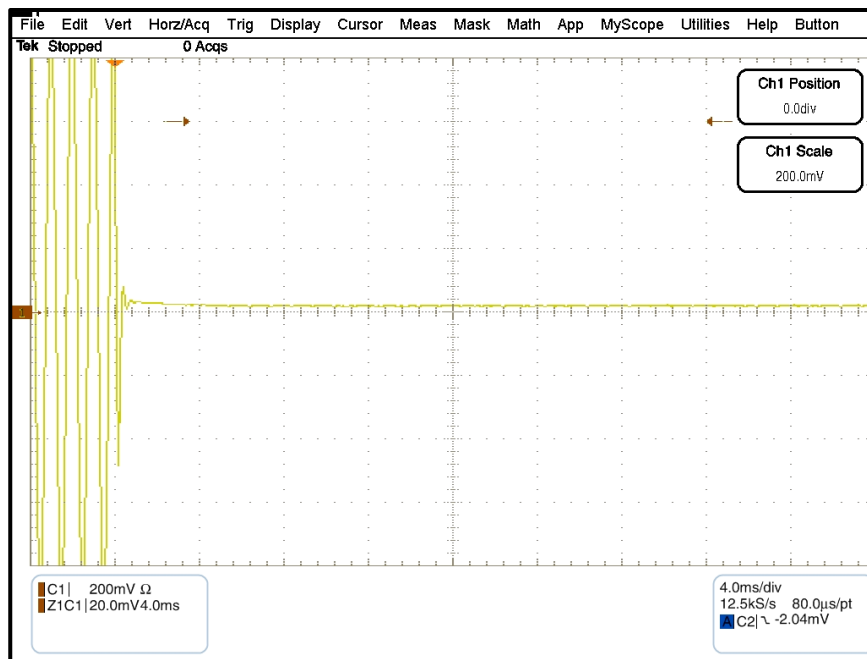
Plot 10-13: Transient Frequency Behavior – 154.025 MHz; High Power; Carrier ON Time



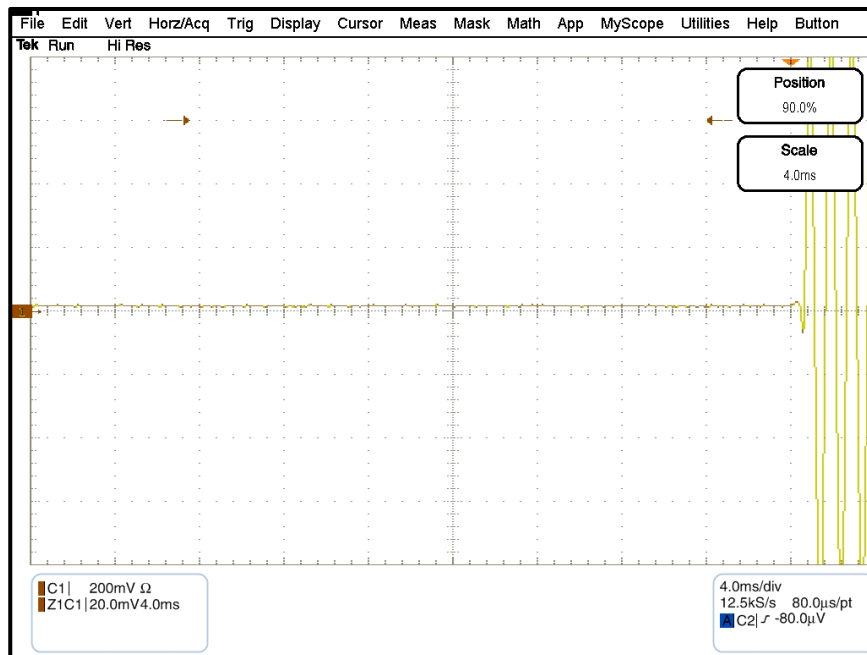
Plot 10-14: Transient Frequency Behavior – 154.025 MHz; High Power; Carrier OFF Time



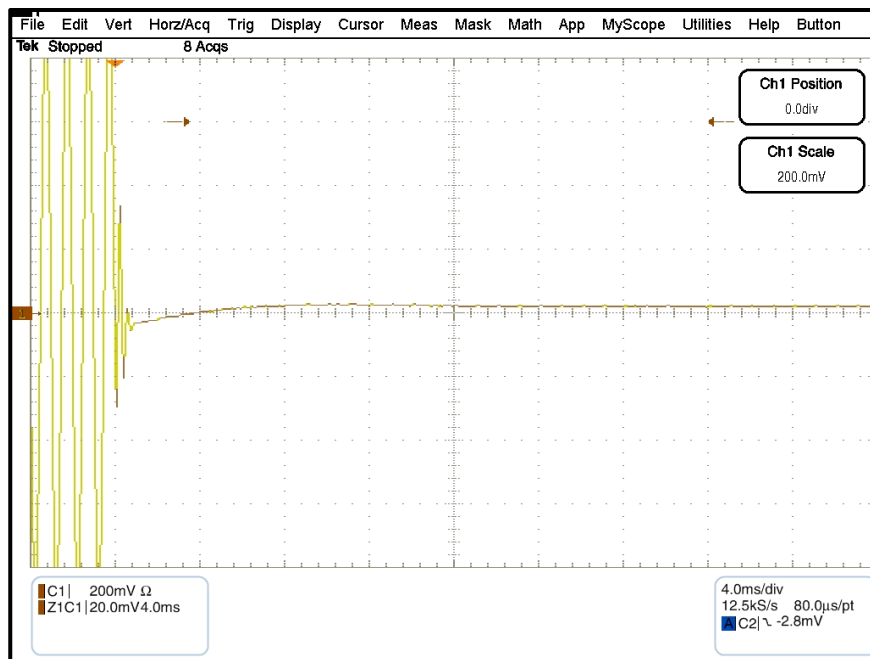
Plot 10-15: Transient Frequency Behavior – 162.0 MHz; High Power; Carrier ON Time



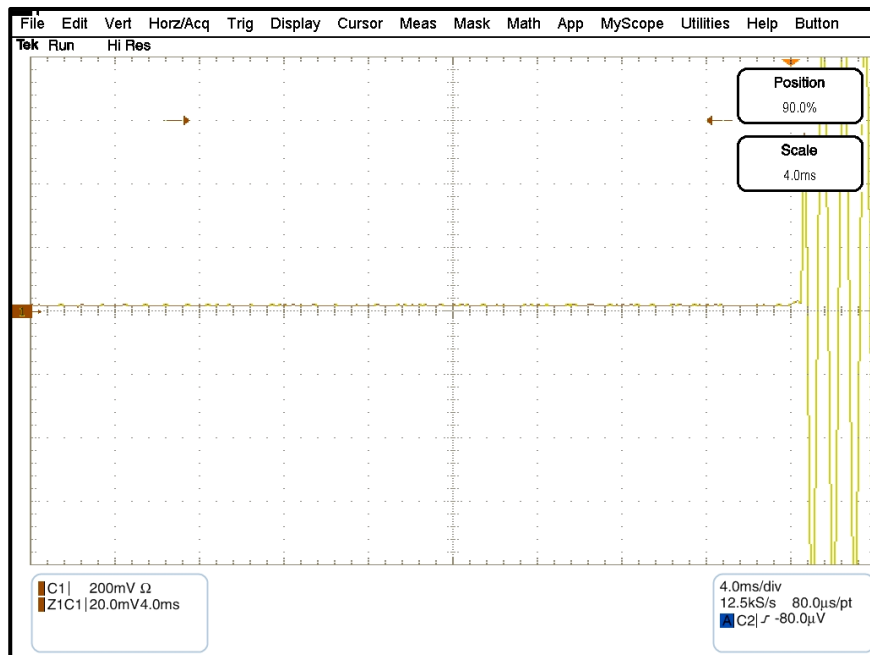
Plot 10-16: Transient Frequency Behavior – 162.0 MHz; High Power; Carrier OFF Time



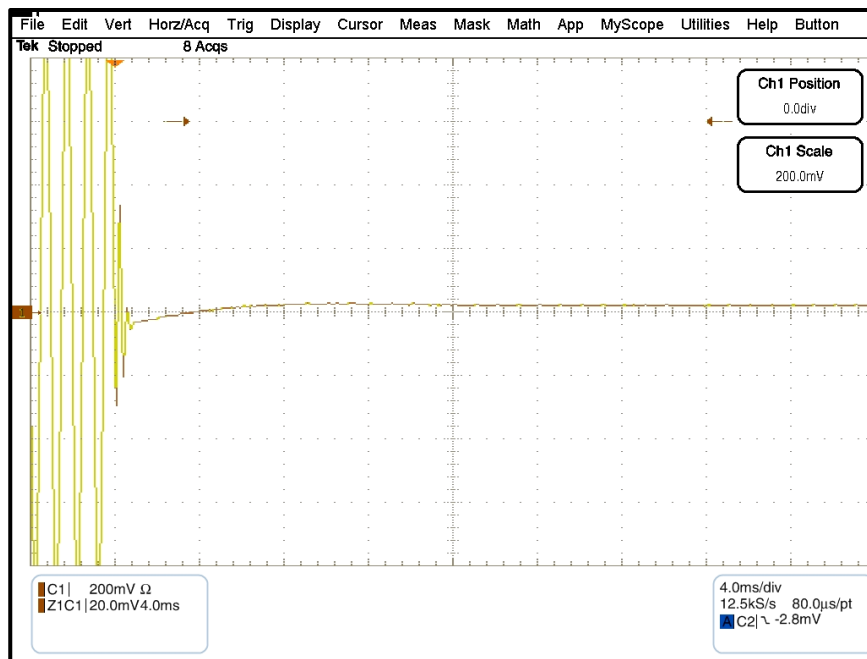
Plot 10-17: Transient Frequency Behavior – 173.175 MHz; High Power; Carrier ON Time



Plot 10-18: Transient Frequency Behavior – 173.175 MHz; High Power; Carrier OFF Time



Plot 10-19: Transient Frequency Behavior – 173.9875 MHz; High Power; Carrier ON Time



Plot 10-20: Transient Frequency Behavior – 173.9875 MHz; High Power; Carrier OFF Time

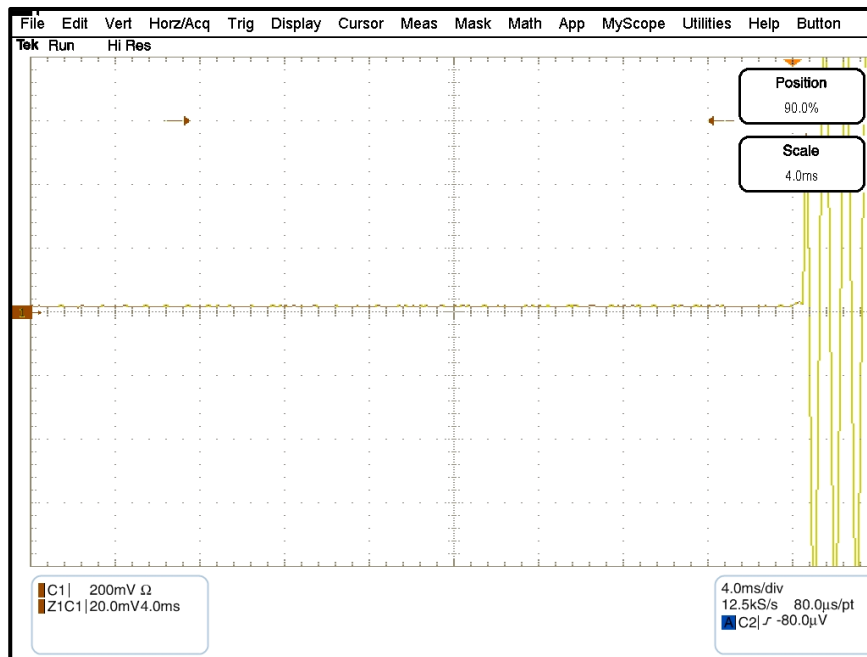
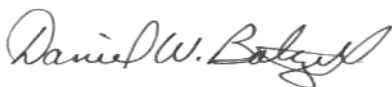


Table 10-1: Test Equipment Used For Testing Transient Frequency Behavior

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	10/7/11
901514	Tektronix	TDS7404B	Oscilloscope	B010161	6/28/12
900917	Hewlett Packard	8648C	Synthesized. Signal Generator (9 kHz - 3200 MHz)	3537A01741	10/20/11
900948	Weinschel	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH148.01257	2/17/12
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	2/18/12
901263	Agilent Technologies	.01-12 GHz	SMA Detector	2936A05505	N/A

Test Personnel:

Daniel Baltzell
 Test Engineer



Signature

August 16, 2011
 Date of Test

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

Type of Emission: F3E, F1D, F1E

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)

$B_n = 2 \times M + 2 \times D \times K = 11.0 \text{ kHz}$

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) = 2130

$B_n = 3.86D + 0.27RK = 3.86(2130) + 0.27(9600)(1) = 10,814 \text{ kHz}$

Emission designator: 10K8F1D, 10K8F1E

Digital Voice and Data (4800N) – 12.5 kHz channel spacing

Calculation:

Data rate in bps (R) = 4800

Peak deviation of carrier (D) = 1685

$B_n = 3.86D + 0.27RK = 3.86(1685) + 0.27(4800)(1) = 7,800 \text{ kHz}$

Emission designator: 7K80F1D, 7K80F1E

P25 – 4-level FSK 9600

Calculation:

Data rate in bps (R) = 4800

Peak deviation of carrier (D) = 1800

$B_n = [4800 / \log_2(2) + 2(1800)](1) = 8,400 \text{ kHz}$

Emission designator: 8K40F1D, 8K40F1E

12 Conclusion

The data in this measurement report shows that the **Harris Corporation Model P5500 VHF, FCC ID: OWDTR-0067-E, IC: 3636B-0067**, complies with all the applicable requirements of Parts 90, 80, 15 and 2 of the FCC Rules, and Industry Canada RSS-119 Issue 11.