FCC PART 90

MEASUREMENT AND TEST REPORT

FOR

Quanzhou Wouxun Electronics Co., Ltd.

No.928 Nanhuan Road, Jianghan High Technology Industry Park, Quanzhou,

Fujian, China

FCC ID: WVTWOUXUN04

Report Concerns: Original Report	**Equipment Type:** TWO-WAY RADIO

Model: KG-UVD1P

Report No.: STR09128003I

Test/Witness Engineer: 

Test Date: 2009-12-03 to 2009-12-15

Issue Date: 2009-12-31

Prepared By:

SEM.Test Compliance Service Co., Ltd
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Approved & Authorized By: 

Jandy So / PSQ Manager

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by SEM.Test Compliance Service Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Quanzhou Wouxun Electronics Co., Ltd.

Address of applicant: No.928 Nanhuan Road, Jianghan High Technology Industry Park, Quanzhou, Fujian, China

Manufacturer: Quanzhou Wouxun Electronics Co., Ltd.

Address of manufacturer: No.928 Nanhuan Road, Jianghan High Technology Industry Park, Quanzhou, Fujian, China

General Description of E.U.T

Items	Description
EUT Description:	TWO-WAY RADIO
Trade Name:	WOUXUN
Model No.:	KG-UVD1P
Adding Models:	KG-UVD1, KG-UV2D, KG-UV3D
Rated Voltage:	DC 7.4V Battery
Conducted Output Power:	Max. 4.89W
Frequency Range:	136~174MHz / 406.1~470MHz
Channel Spacing:	Narrowband:12.5kHz, Wideband: 25kHz
Size:	10.5X5.8X3.4 cm
Antenna Length:	21 cm
For more information refer to the circuit diagram form and the user's manual.	

The test data gathered are from a production sample provided by the manufacturer. which the conducted output power is 4w, Test is carried out with Model KG-UVD1P since the other models listed in the report have the different appearance only.

1.2 Test Standards

The following report is prepared on behalf of the Quanzhou Wouxun Electronics Co., Ltd. in accordance with Part 90, and Part 2 of the Federal Communication Commissions rules.

The objective is to determine compliance with the Part 90, and Part 2 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Related Submittal(s)/Grant(s)

No Related Submittal(s).

1.4 Test Methodology

Measurements contained in this report were also conducted with TIA EIA 137-A, TIA EIA 98-C, TIA/EIA Standard 603, Telecommunications Industry Association Land Mobile FM or PM Communications Equipment Measurement and Performance Standards and ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted with Low Channel, Middle Channel and High Channel on 25kHz Wideband specifications since EUT is designed with 25kHz channel bandwidth Only. For more detail refere to the Operating Instructions.

1.5 Test Facility

- **FCC – Registration No.: 994117**
  SEM.Test Compliance Services Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 994117.

- **Industry Canada (IC) Registration No.: 7673A**
  The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.

1.6 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components. The test software, provided by the customer, is started while the whole system is running.

1.7 Accessories Equipment List and Details

Manufacturer	Description	Model	Serial Number
MEILI	Audio Generator	MFG-3005	200612187

1.8 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
N/A	N/A	N/A	N/A

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§2.1046	Conducted Output Power	Compliant
§2.1046, §90.205	Radiated Output Power	Compliant
§2.1047 §90.207	Modulation Characteristic	Compliant
§2.1049, §90.209	Occupied Bandwidth	Compliant
§2.1051 §90.210	Spurious Emission at Antenna Terminal	Compliant
§ 2.1053 § 90.210	Spurious Radiated Emissions	Compliant
§ 2.1055 § 90.213	Frequency stability	Compliant
§ 90.214	Transient Frequency Behavior	Compliant
§1.1307 §2.1093	RF Exposure	Compliant

3. §2.1046-CONDUCTED OUTPUT POWER

3.1 Standard Applicable

According to FCC §2.1046, and §90.205, maximum ERP is dependent upon the station's antenna HAAT and required service area.

3.2 Test Equipment List and Detail

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2009-08-12	2010-08-11
Atten	Attenuator	DC-4GHz	ATS100-4-20	2009-08-12	2010-08-11
VICTOR	Multimeter	VC9801A	98965350	2009-08-12	2010-08-11
FLUKE	Multimeter	15B	91280239	2009-08-12	2010-08-11

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

3.3 Test Procedure

1. The maximum peak output power was measured with a Spectrum Analyzer connected to the antenna terminal while EUT was operating in unmodulated situation.

2. Power was supplied to the battery input connector a power supply. The power supply was set for +7.4VDC. The Spectrum Analyzer was connected at antenna terminal to measure RF power of the carrier.

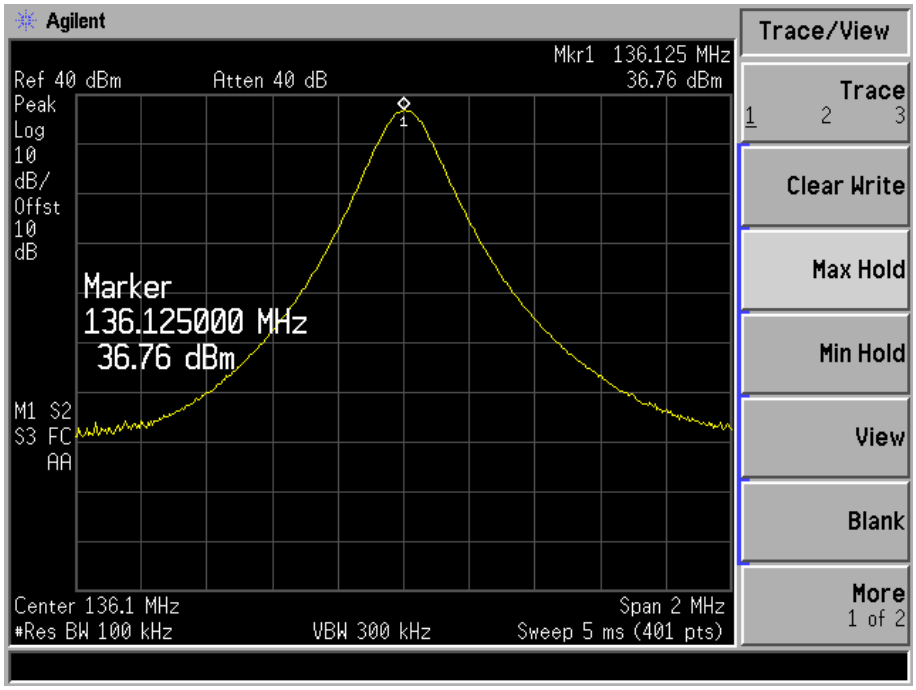
3. A Multimeter was connected in series with Q11 of FINAL AMP to measure the current of Q11, the RF amplifier device. A Multimeter was used to measure Q11 supply voltage.

3.4 Test Result/Plots

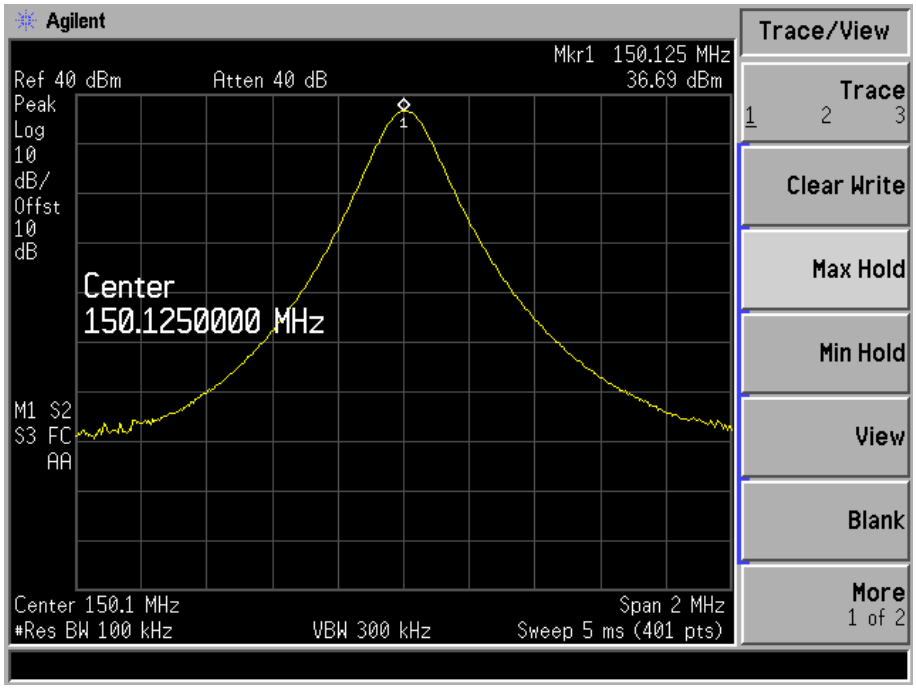
For VHF Channel

Type	Channel	Frequency (MHz)	Collected Voltage (VDC)	Collected Current (A)	Output Power (dBm)	Output Power (W)
Narrowband	Low CH	136.125	7.4	0.613	36.76	4.7424
	Middle CH	150.125	7.4	0.608	36.69	4.6666
	High CH	173.875	7.4	0.603	31.99	1.5812
Wideband	Low CH	136.125	7.4	0.615	36.89	4.8865
	Middle CH	150.125	7.4	0.611	36.70	4.6774
	High CH	173.875	7.4	0.602	31.74	1.4928

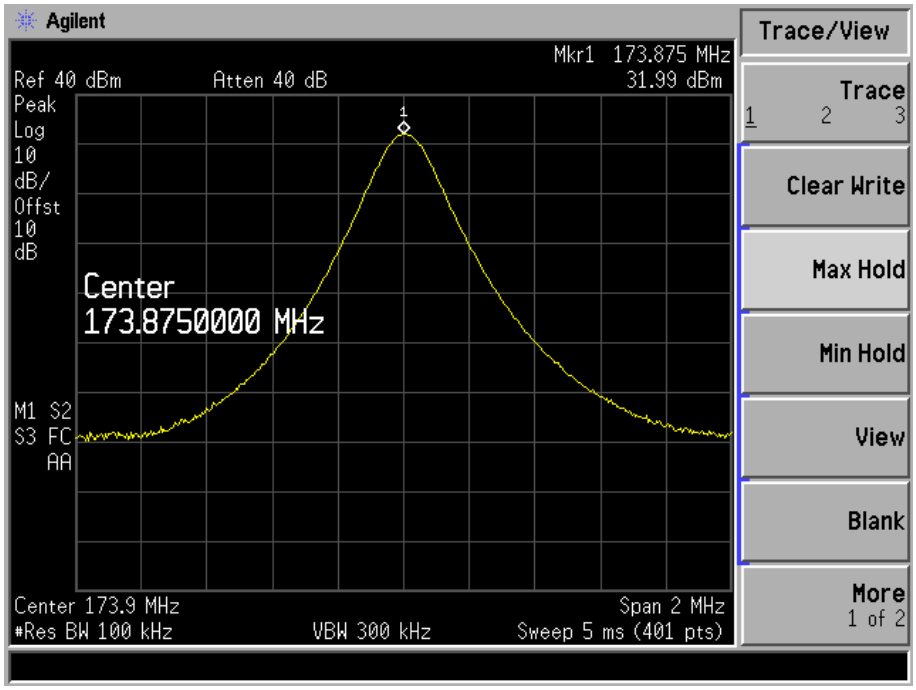
Narrowband-Low Channel:



Narrowband-Middle Channel:



Narrowband-High Channel:



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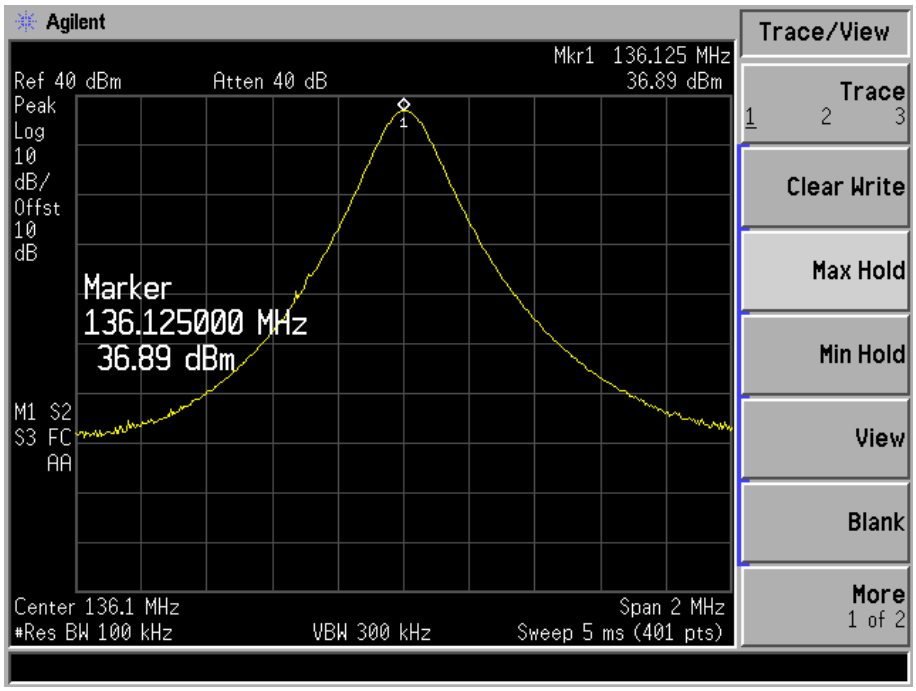
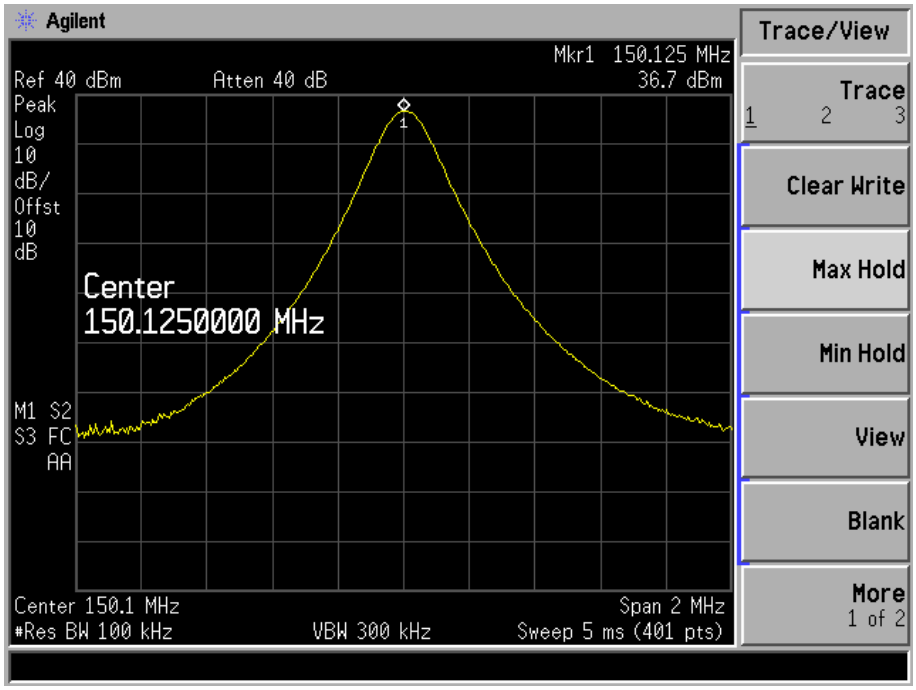
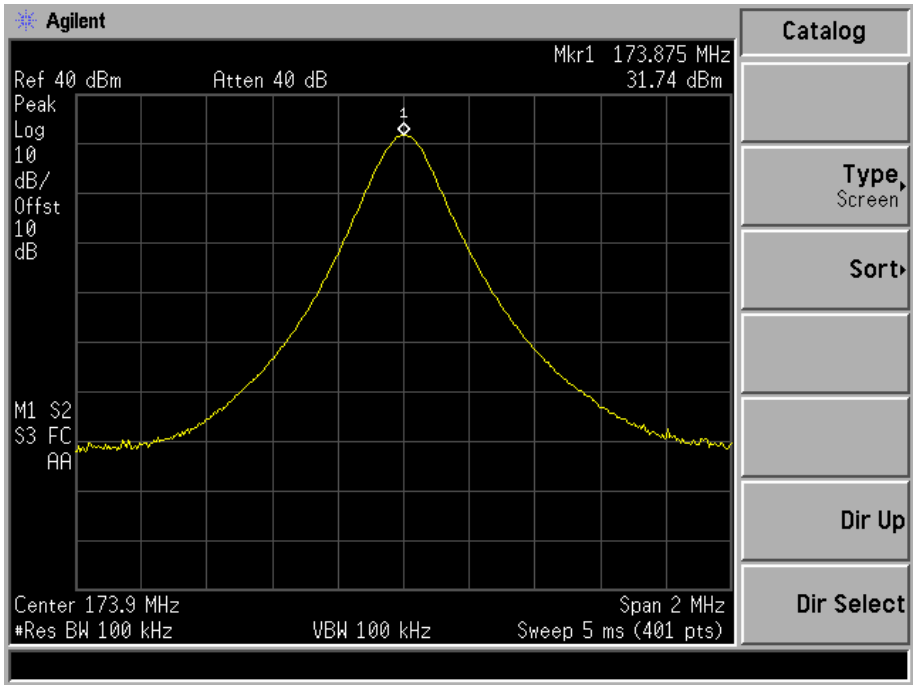


Wideband-Mid Channel:



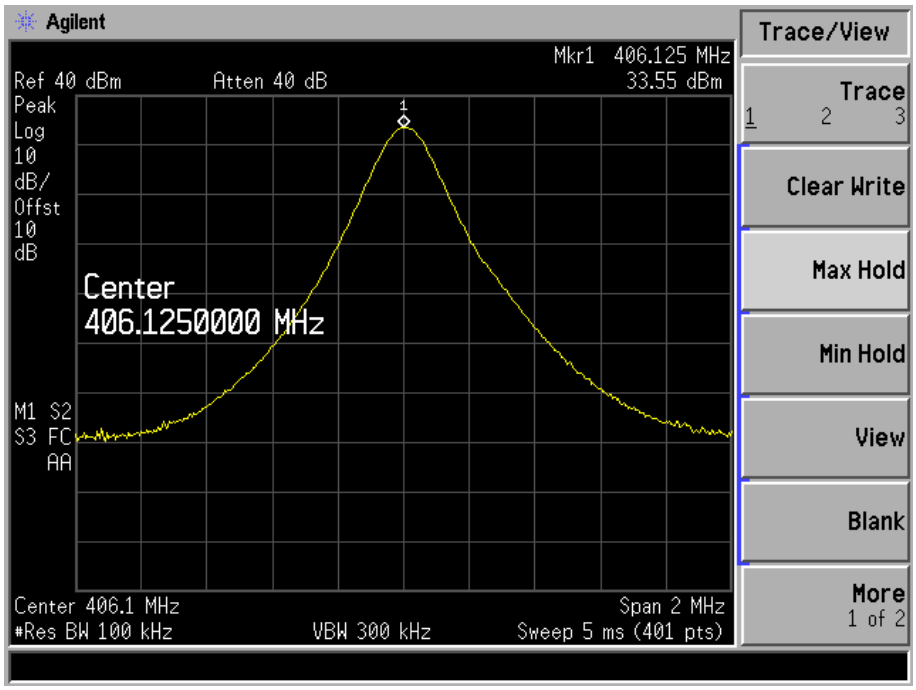
Wideband-High Channel:



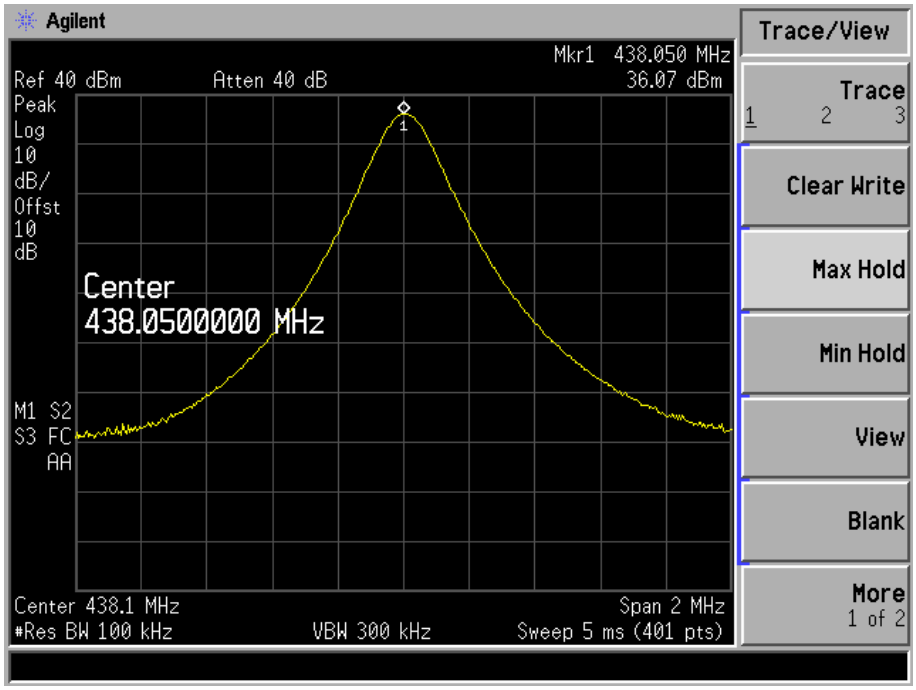
For UHF

Type	Channel	Frequency (MHz)	Collected Voltage (VDC)	Collected Current (A)	Output Power (dBm)	Output Power (W)
Narrowband	Low CH	406.125	7.4	0.604	33.55	2.2646
	Middle CH	438.050	7.4	0.611	36.07	4.0458
	High CH	469.975	7.4	0.609	35.03	3.1842
Wideband	Low CH	406.125	7.4	0.606	33.57	2.2751
	Middle CH	438.050	7.4	0.610	36.06	4.0365
	High CH	469.975	7.4	0.604	34.95	3.1261

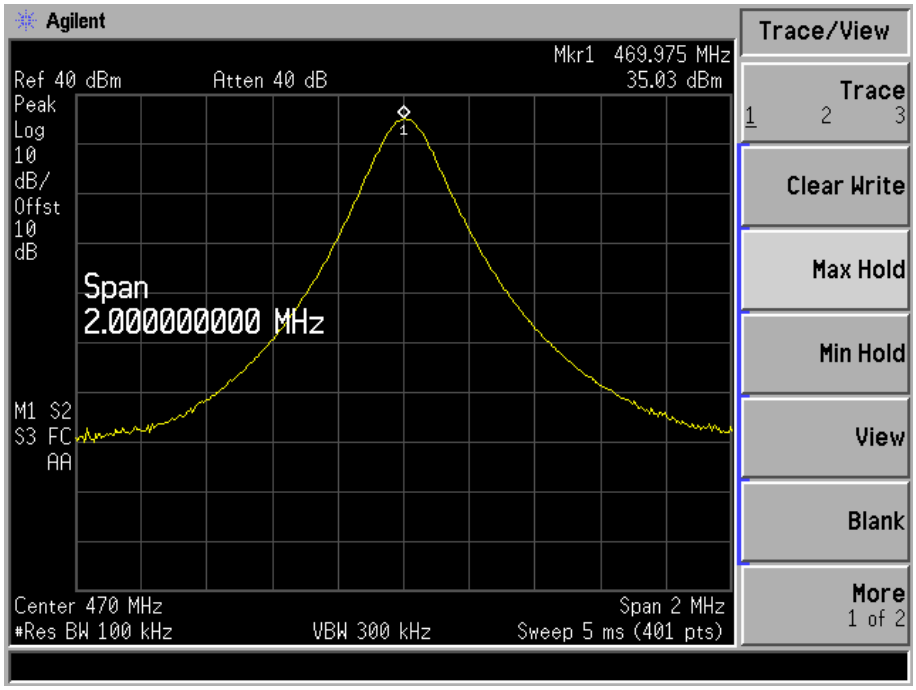
Narrowband-Low Channel:



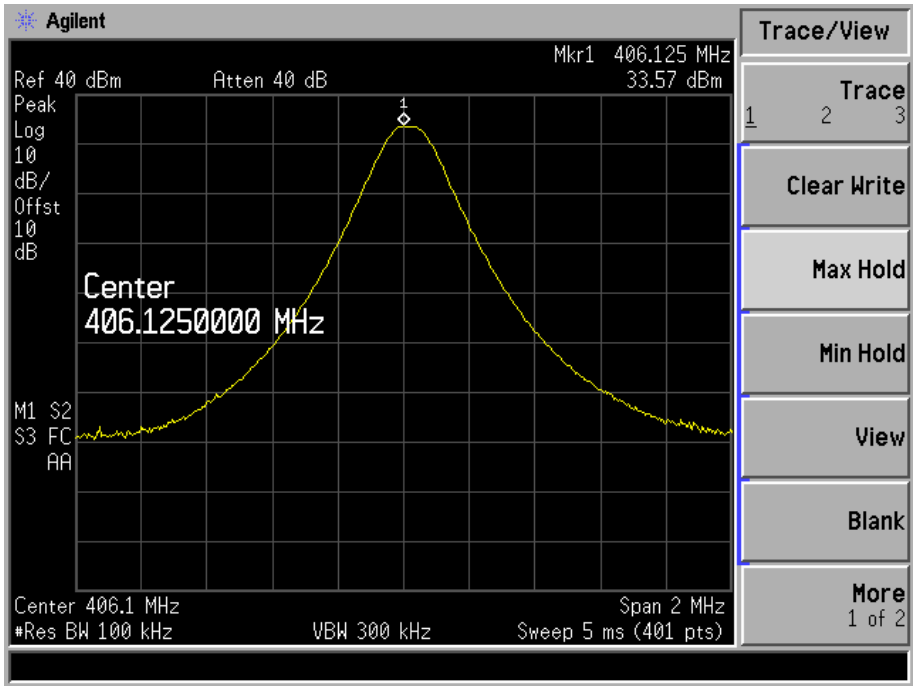
Narrowband-Middle Channel:



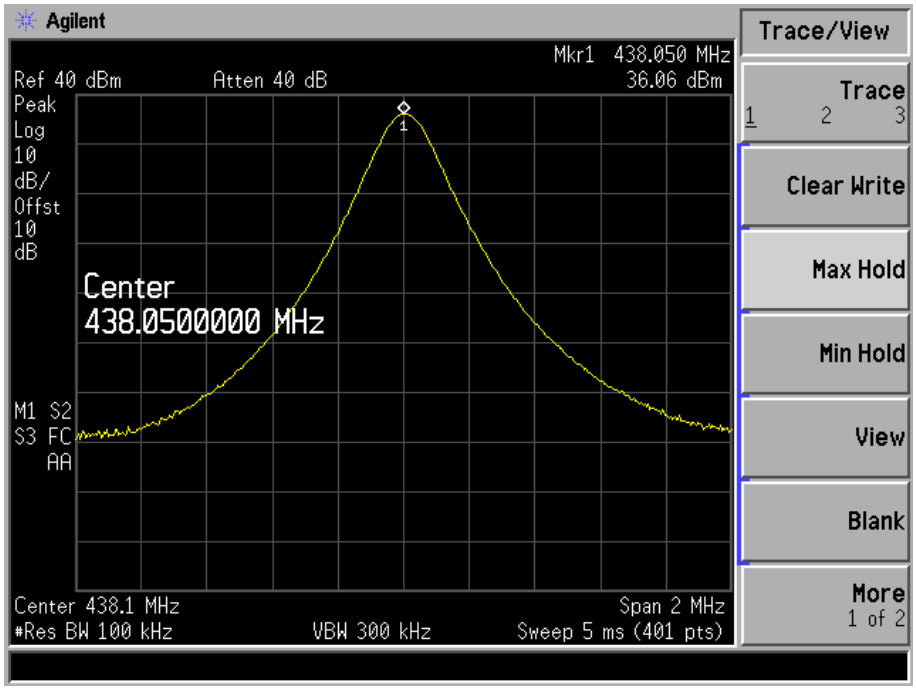
Narrowband-High Channel:



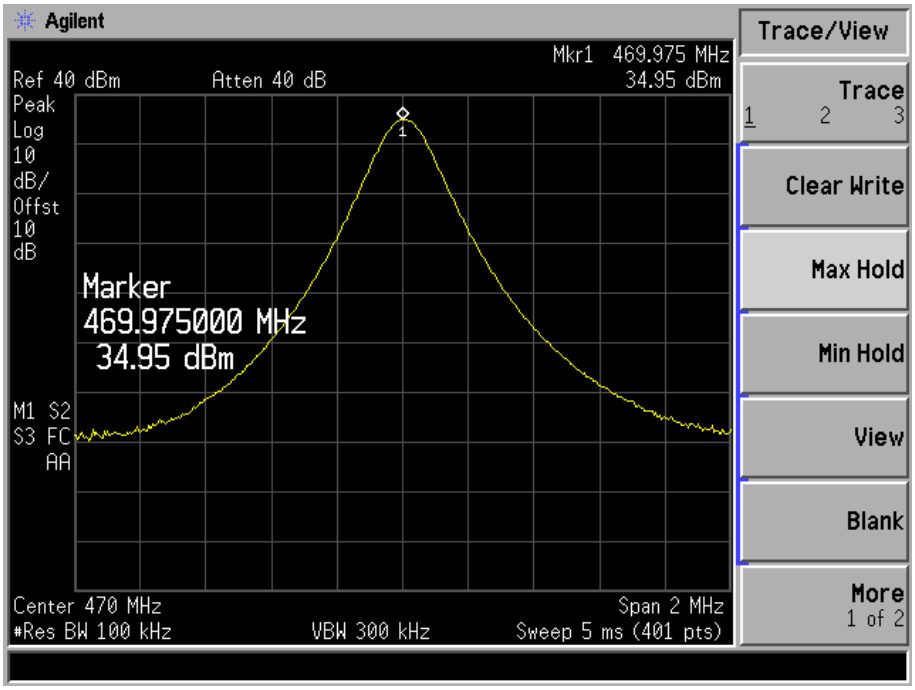
Wideband-Low Channel:



Wideband-Mid Channel:



Wideband-High Channel:



4. §2.1046, and §90.205-RADIATED OUTPUT POWER (E.I.R.P.)

4.1 Standard Applicable

According to FCC §2.1046, and §90.205, maximum ERP is dependent upon the station's antenna HAAT and required service area.

4.2 Test Equipment List and Detail

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Rohde & Schwarz	EMI Test Receiver	ESI26	830245/009	2009-08-12	2010-08-11
ETS	Multi_Device Controller	2090	57230	2009-08-12	2010-08-11
Antenna	Schwarzbeck	VUBA9117	115	2009-08-12	2010-08-11
3m chamber	Albatross Projects	9X6X6	----	2008-01-25	2010-01-24
Rohde & Schwarz	Horn Antenna	HF906	100014	2009-08-12	2010-08-11
Signal Generator	Rohde & Schwarz	SMR20	100047	2009-08-12	2010-08-11
Dipole Antenna	Schwarzbeck	H00009170	9136	2009-08-12	2010-08-11

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

4.3 Test Procedure

1. The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT .The test was performed by placing the EUT on 3-orthogonal axis.

3. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the ERP were measured by the substitution.

4. Absolute level = substituted level + Antenna gain – Cable Loss

4.4 Test Result

For VHF

Frequency	SG Reading	Height	Table	Polar	Cable loss	Antenna Gain	Corrected Ampl.	FCC Part 90
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	W
Narrowband-Low Channel								
136.125	21.75	1.5	30	H	1.3	0	20.45	0.1109
136.125	34.52	1.5	3	V	1.3	0	33.22	2.0989
Narrowband-Middle Channel								
150.125	21.06	1.4	150	H	1.4	0	19.66	0.0925
150.125	34.75	1.5	18	V	1.4	0	33.35	2.1627
Narrowband-High Channel								
173.875	16.99	1.5	185	H	1.4	0	15.59	0.0362
173.875	31.60	1.5	0	V	1.4	0	30.20	1.0471
Wideband-Low Channel								
136.125	20.66	1.5	2	H	1.3	0	19.36	0.0863
136.125	34.50	1.2	0	V	1.3	0	33.20	2.0893
Wideband-Mid Channel								
150.125	21.14	1.5	200	H	1.4	0	19.74	0.0942
150.125	34.42	1.4	18	V	1.4	0	33.02	1.9953
Wideband-High Channel								
173.875	19.80	1.0	130	H	1.4	0	18.40	0.0692
173.875	31.50	1.5	11	V	1.4	0	30.10	1.0233

For UHF

Frequency	SG Reading	Height	Table	Polar	Cable loss	Antenna Gain	Corrected Ampl.	FCC Part 90
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	W
Narrowband-Low Channel								
406.125	20.87	1.5	33	H	1.3	0	19.57	0.0906
406.125	33.54	1.5	130	V	1.3	0	32.24	1.6749
Narrowband-Middle Channel								
438.050	13.75	1.4	120	H	1.4	0	12.35	0.0172
438.050	33.74	1.0	183	V	1.4	0	32.34	1.7140
Narrowband-High Channel								
469.975	16.99	1.5	185	H	1.4	0	15.59	0.0362
469.975	32.74	1.5	0	V	1.4	0	31.64	1.4588
Wideband-Low Channel								
406.125	20.04	1.5	225	H	1.3	0	18.74	0.0748
406.125	32.40	1.5	0	V	1.3	0	31.10	1.2882
Wideband-Mid Channel								
438.050	21.70	1.5	0	H	1.4	0	20.30	0.1072
438.050	33.40	1.5	178	V	1.4	0	32.00	1.5849
Wideband-High Channel								
469.975	20.25	1.0	120	H	1.4	0	18.85	0.0767
469.975	32.12	1.5	183	V	1.4	0	30.72	1.1803

5. §2.1047, and §90.207-MODULATION CHARACTERISTICS

5.1 Standard Applicable

According to FCC §2.1047 & §90.207:

(a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. for equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.

(b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Modulation Analyzer	Rohde & Schwarz	FAM 54	334.2015.54	2009-08-12	2010-08-11
Attenuator	Atten	DC-4GHz	ATS100-4-20	2009-08-12	2010-08-11
Audio Generator	MEILI	MFG-3005	200612187	2009-08-12	2010-08-11

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

5.3 Test Procedure

Test is carried out under the procedure of TIA/EIA-603 §2.2.3.

5.4 Environmental Conditions

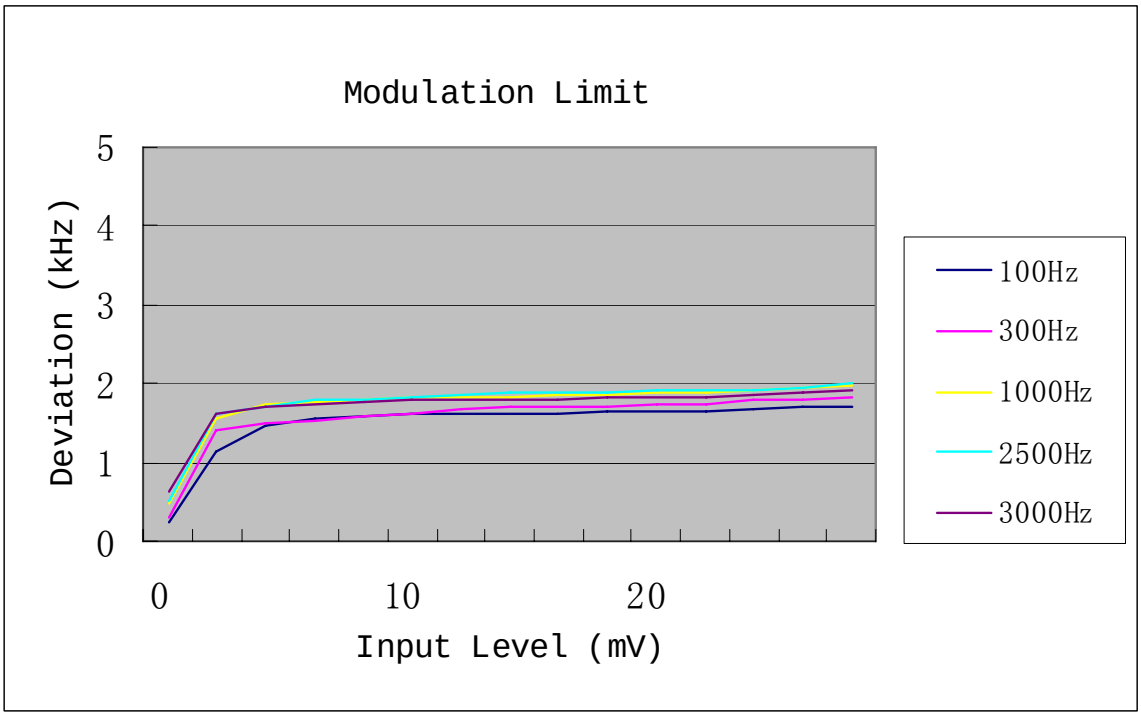
Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	1005mbar

5.5 Test Results/Plots

For VHF

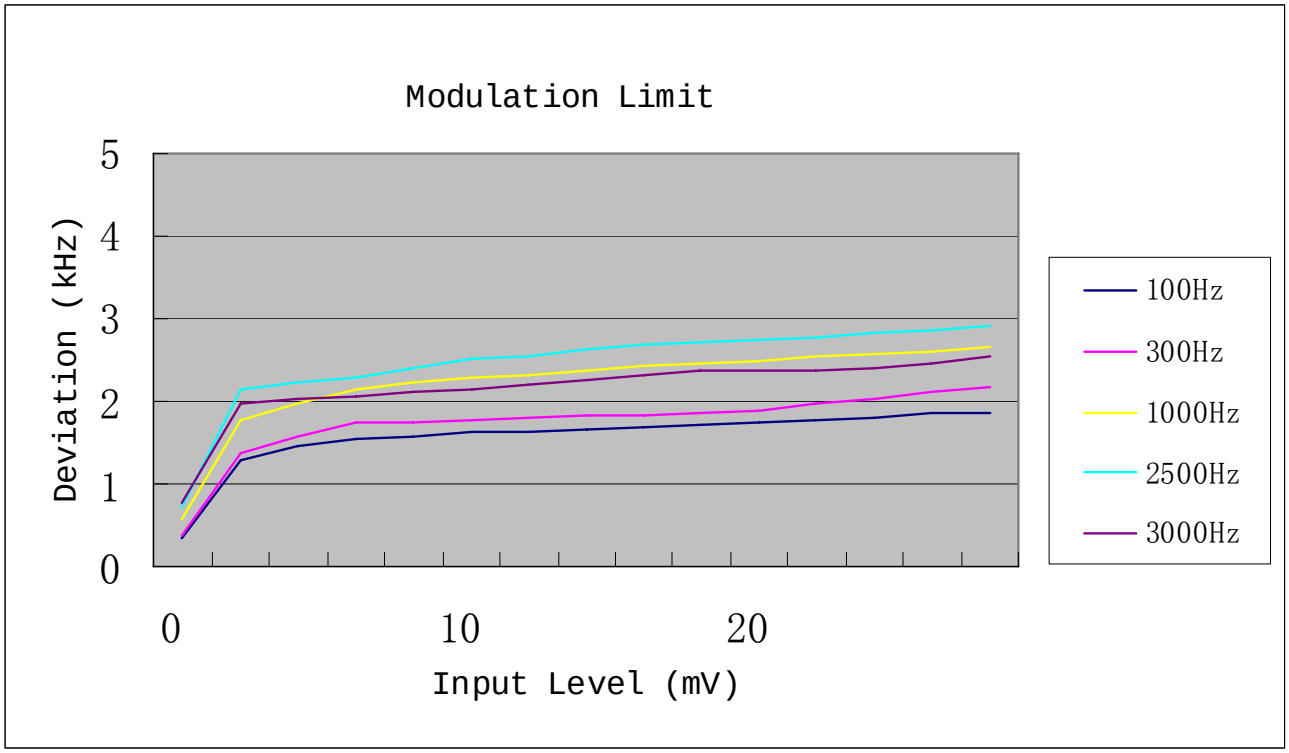
For Narrowband Channel Separation 12.5kHz

Audio Input (mV)	100Hz Deviation (kHz)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz Deviation (kHz)	5kHz Deviation (kHz)
0	0.26	0.29	0.47	0.51	0.64
2	1.14	1.42	1.56	1.61	1.62
4	1.48	1.5	1.74	1.72	1.7
6	1.57	1.54	1.76	1.78	1.74
8	1.59	1.59	1.79	1.8	1.77
10	1.61	1.63	1.82	1.83	1.78
12	1.62	1.68	1.83	1.86	1.8
14	1.63	1.69	1.83	1.89	1.81
16	1.63	1.71	1.85	1.9	1.81
18	1.64	1.72	1.86	1.9	1.82
20	1.65	1.73	1.88	1.91	1.82
24	1.66	1.75	1.89	1.92	1.84
28	1.68	1.78	1.91	1.92	1.85
32	1.71	1.8	1.94	1.94	1.88
36	1.72	1.83	1.97	1.99	1.92

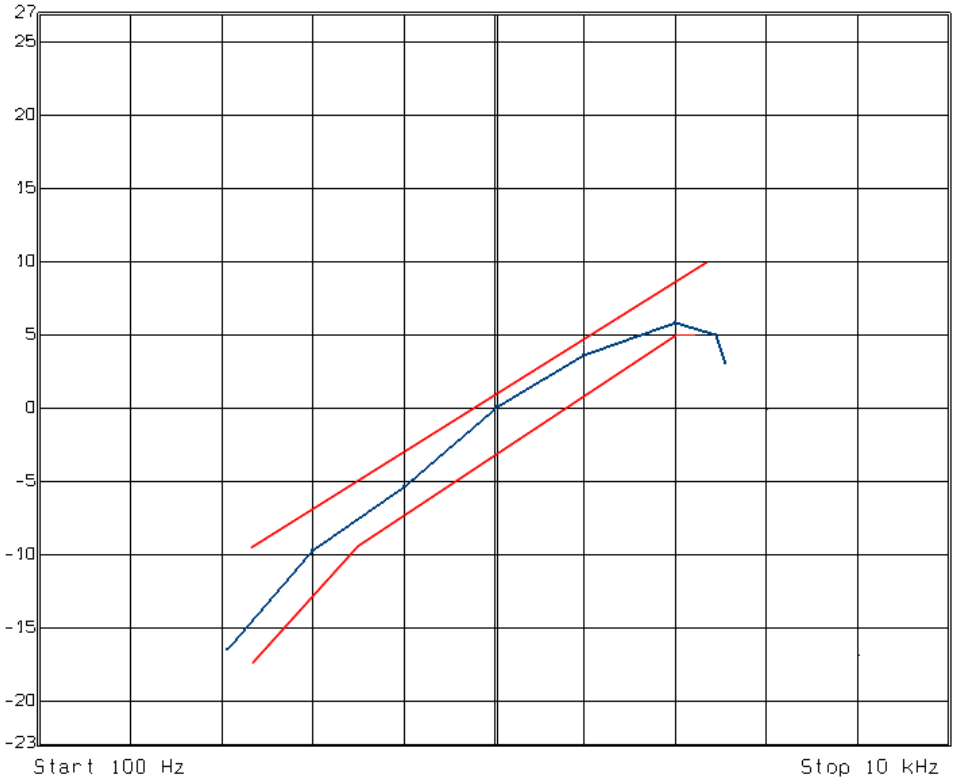


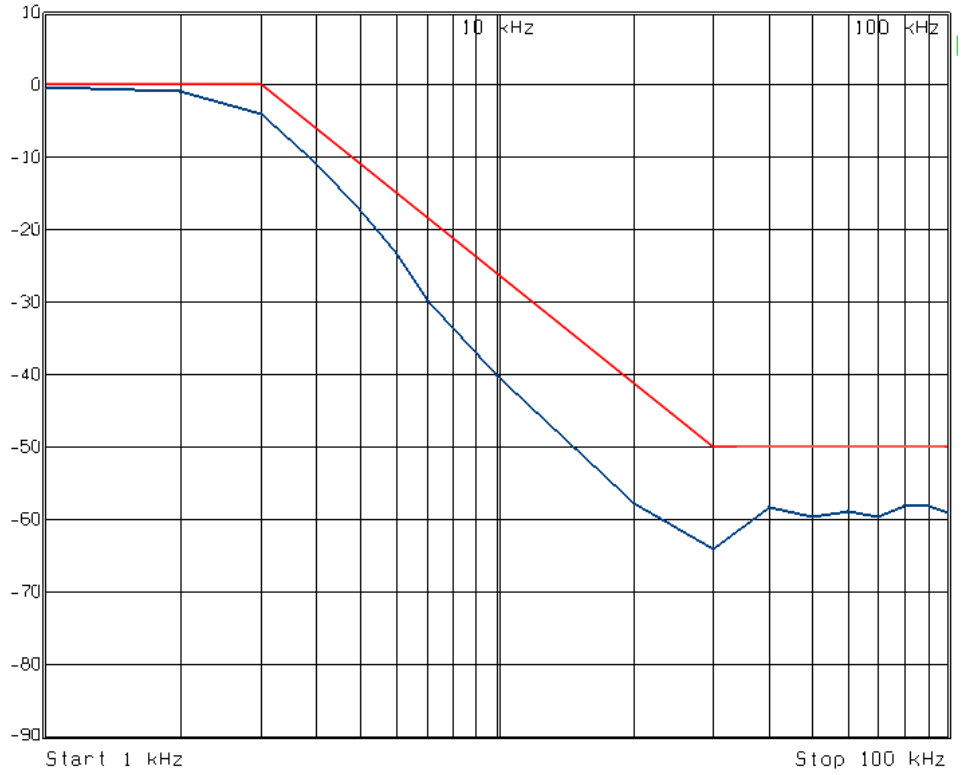
For Wideband Channel Separation 25kHz

Audio Input (mV)	100Hz Deviation (kHz)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz Deviation (kHz)	5kHz Deviation (kHz)
0	0.35	0.37	0.58	0.73	0.77
2	1.28	1.37	1.76	2.13	1.96
4	1.45	1.58	1.98	2.22	2.03
6	1.55	1.73	2.15	2.29	2.07
8	1.56	1.74	2.23	2.39	2.11
10	1.62	1.76	2.28	2.51	2.15
12	1.63	1.8	2.31	2.55	2.18
14	1.65	1.82	2.37	2.63	2.26
16	1.67	1.83	2.42	2.67	2.31
18	1.72	1.86	2.46	2.7	2.36
20	1.75	1.88	2.49	2.74	2.37
24	1.78	1.96	2.53	2.78	2.38
28	1.81	2.01	2.57	2.81	2.41
32	1.84	2.11	2.61	2.85	2.45
36	1.86	2.16	2.66	2.92	2.55



Audio Low Pass Filter Characteristic Curve

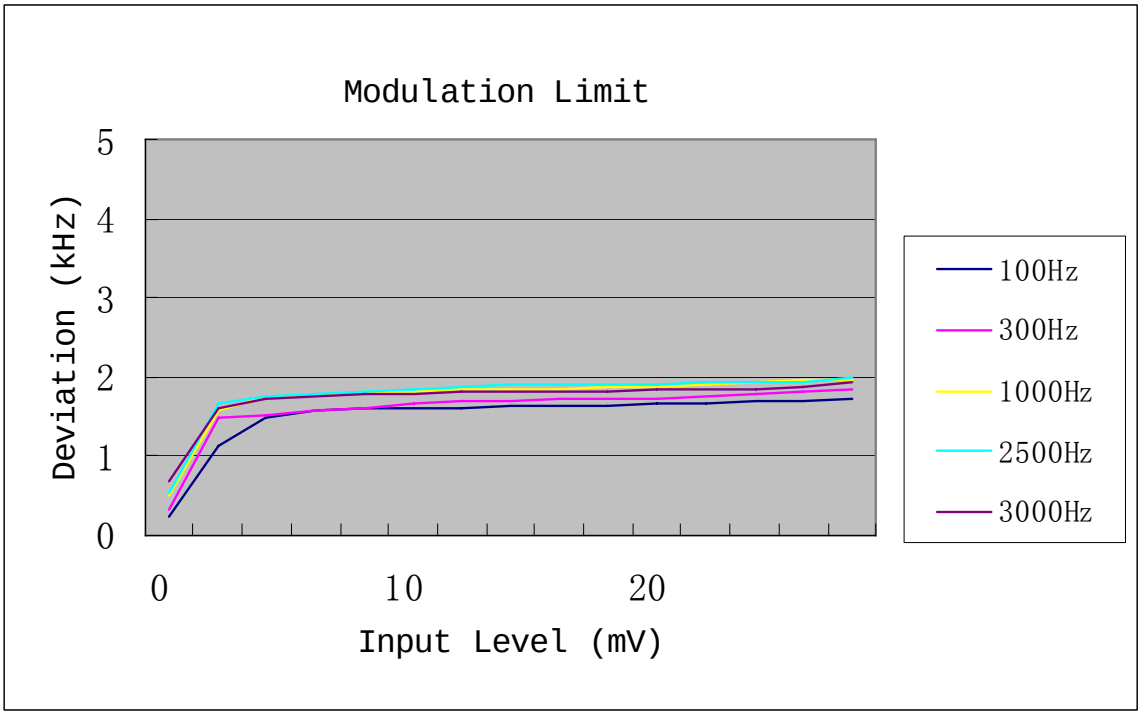




For UHF

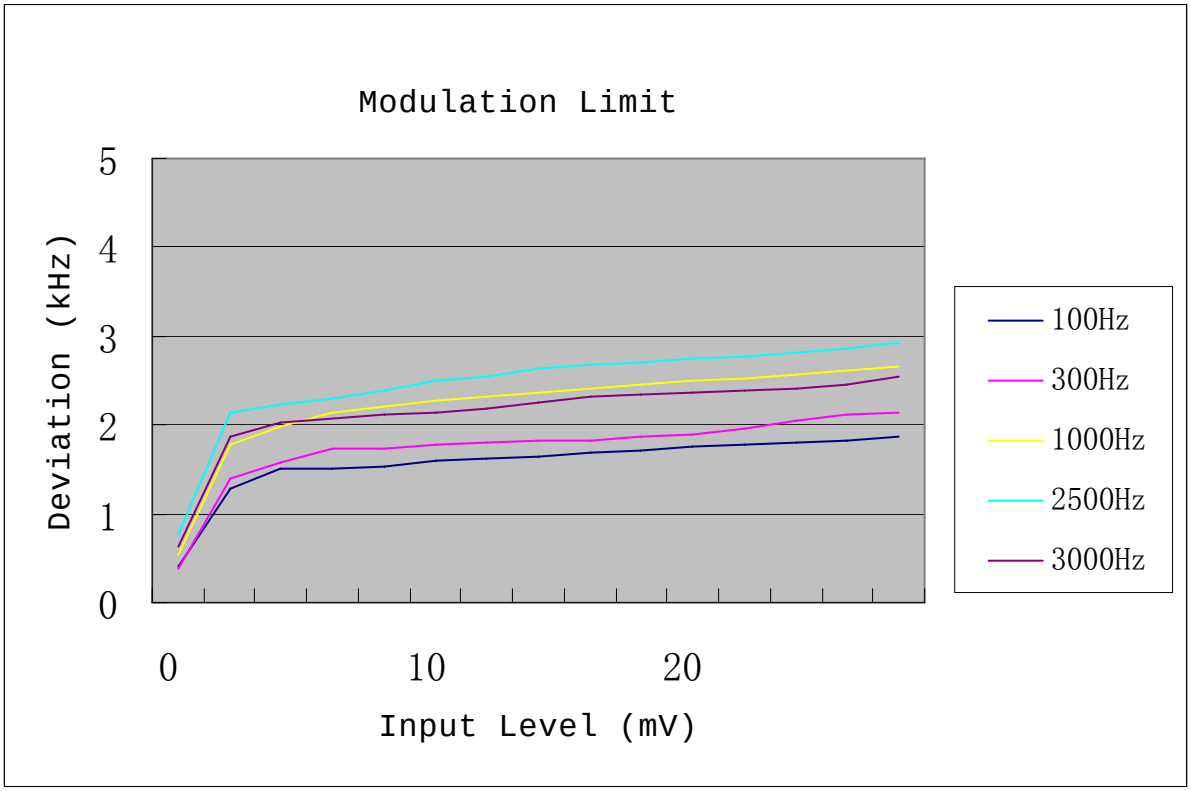
For Narrowband Channel Separation 12.5kHz

Audio Input (mV)	100Hz Deviation (kHz)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz Deviation (kHz)	5kHz Deviation (kHz)
0	100	300	1000	3000	5000
2	0.24	0.31	0.5	0.53	0.67
4	1.12	1.47	1.58	1.66	1.61
6	1.49	1.51	1.74	1.74	1.72
8	1.57	1.56	1.76	1.78	1.74
10	1.59	1.59	1.8	1.81	1.77
12	1.6	1.67	1.82	1.83	1.77
14	1.61	1.68	1.83	1.88	1.81
16	1.63	1.7	1.83	1.89	1.81
18	1.63	1.71	1.85	1.9	1.81
20	1.64	1.73	1.87	1.91	1.82
24	1.65	1.73	1.88	1.91	1.83
28	1.66	1.75	1.89	1.92	1.83
32	1.68	1.78	1.92	1.92	1.85
36	1.7	1.81	1.95	1.94	1.87

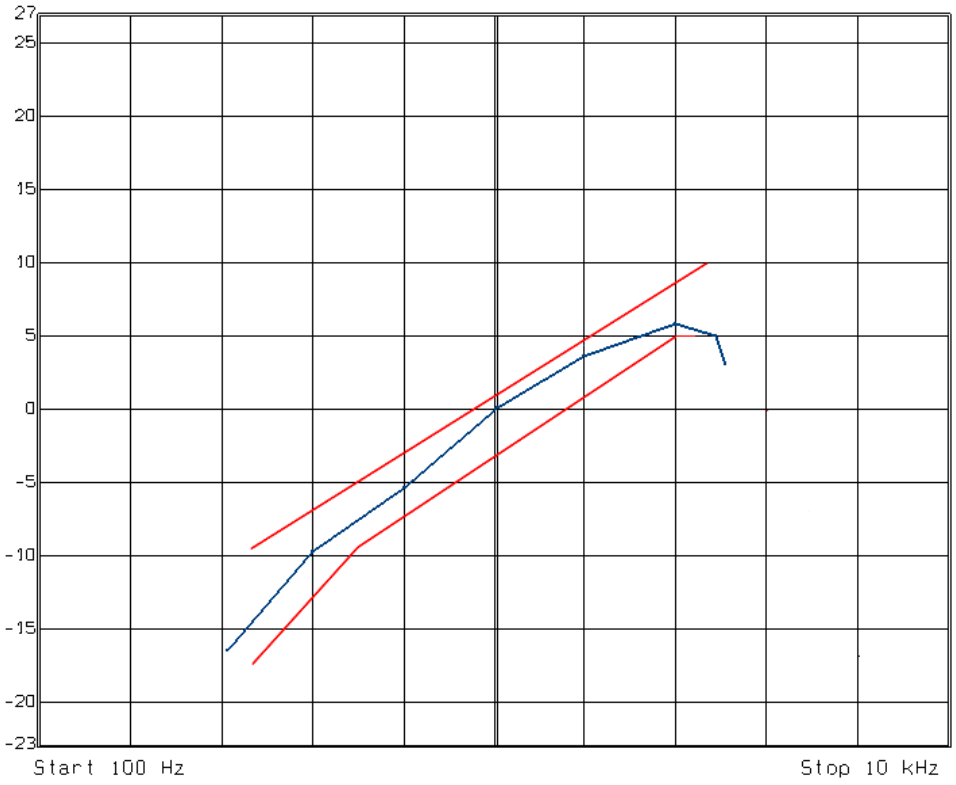


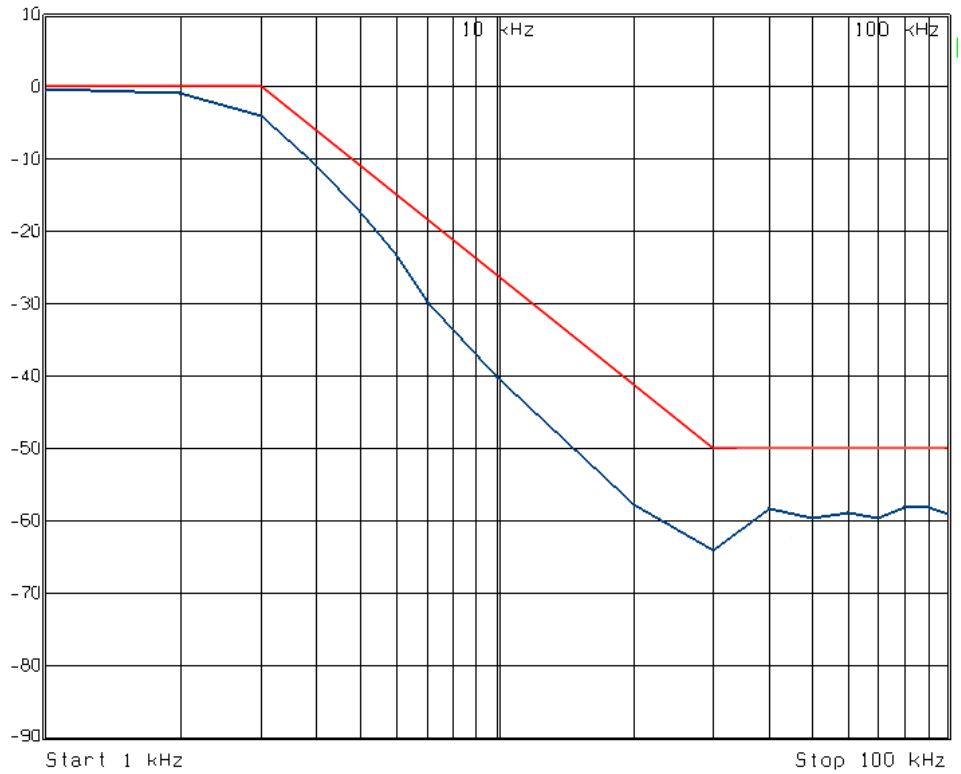
For Wideband Channel Separation 25kHz

Audio Input (mV)	100Hz Deviation (kHz)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz Deviation (kHz)	5kHz Deviation (kHz)
0	0.4	0.39	0.55	0.77	0.64
2	1.29	1.39	1.78	2.13	1.87
4	1.5	1.58	1.98	2.22	2.03
6	1.51	1.73	2.15	2.29	2.07
8	1.54	1.74	2.2	2.39	2.11
10	1.61	1.77	2.28	2.51	2.15
12	1.63	1.81	2.32	2.55	2.18
14	1.65	1.82	2.37	2.63	2.26
16	1.69	1.82	2.42	2.67	2.31
18	1.72	1.86	2.46	2.7	2.34
20	1.76	1.89	2.49	2.74	2.37
24	1.78	1.96	2.53	2.78	2.39
28	1.81	2.04	2.57	2.81	2.41
32	1.83	2.11	2.61	2.85	2.46
36	1.87	2.14	2.66	2.92	2.55



Audio Low Pass Filter Characteristic Curve





6. §2.1049 and §90.209 - OCCUPIED BANDWIDTH OF EMISSION

6.1 Standard Applicable

According to FCC §2.1049, §90.209 and §90.210, the necessary attenuation requirements need to meet as the following:

Emission Mask B For 25kHz bandwidth:

For any frequency removed from the center of the assigned channel by more than 50 percent up to and including 100 percent of the authorized bandwidth, at least 25 dB.

On any frequency removed from the center of the assigned channel by more than 100 percent up to and including 250 percent, at least 35 dB.

On any frequency removed from the center of the assigned channel by more than 250 percent at least:
43+10logP=43+10log(3.02)=47.80dB

Emission Mask D For 12.5kHz bandwidth:

On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than12.5 kHz: At least 7.27(fd−2.88 kHz) dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2009-08-12	2010-08-11
Atten	Attenuator	DC-4GHz	ATS100-4-20	2009-08-12	2010-08-11
Audio Generator	MEILI	MFG-3005	200612187	2009-08-12	2010-08-11

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

6.3 Test Procedure

1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

2. The signal is modulated with 2.5kHz audio signal as necessary levels.

3. The resolution bandwidth of the spectrum analyzer was set at 300 Hz and video bandwidth was set to 1kHz. Then the mask plots was reported.

6.4 Test Results/Masks

The occupied Bandwidth Emission of all fall in the Mask, full fit the requirements of the standards.

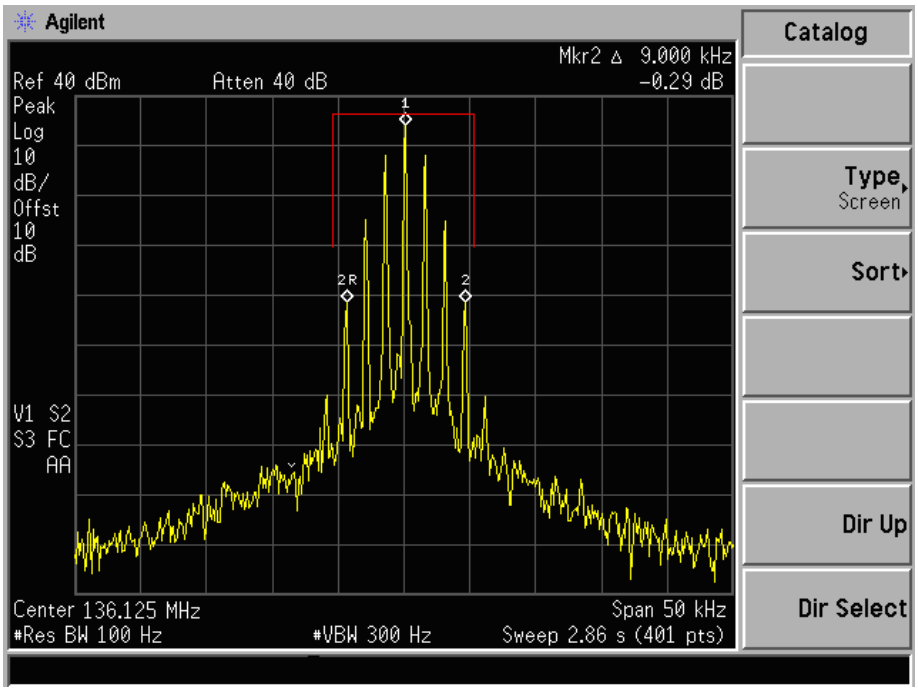
For Narrowband Channel Separation 12.5kHz:
K=1
M=3kHz
D=2.5kHz
B_n=2M+2DK=2*3+2*2.5*1=11kHz
Emission Designation=11K0F3E

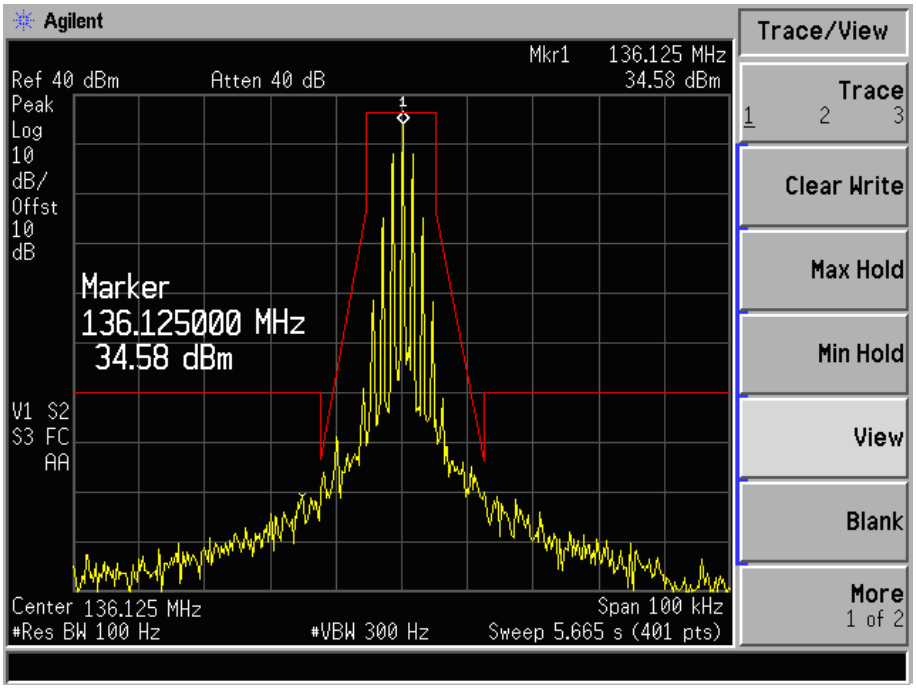
For Wideband Channel Separation 25kHz:
K=1
M=3kHz
D=5kHz
B_n=2M+2DK=2*3+2*5*1=16kHz
Emission Designation=16K0F3E

Refer to the attached plots.

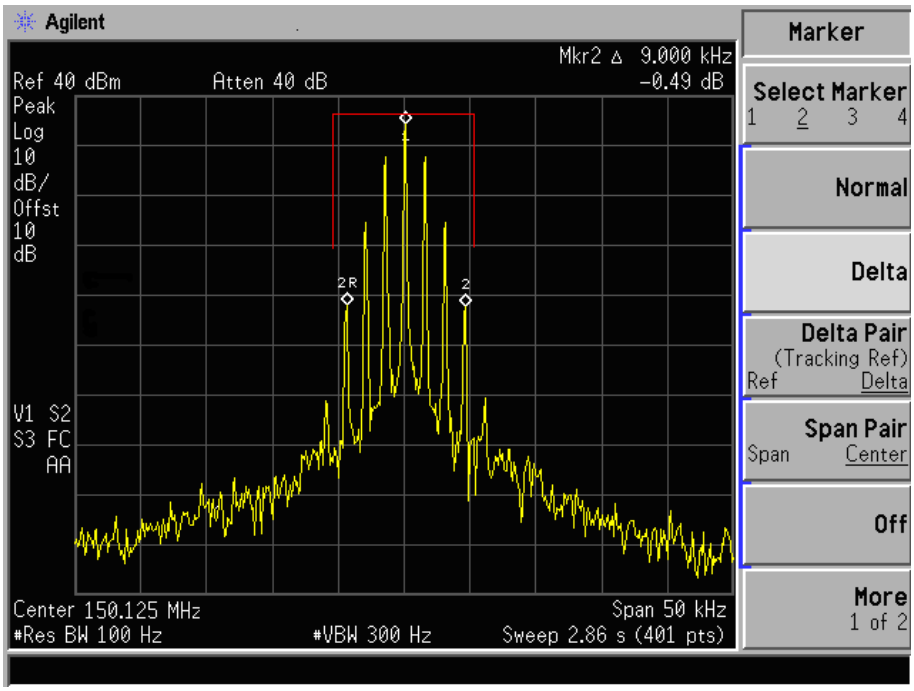
For VHF

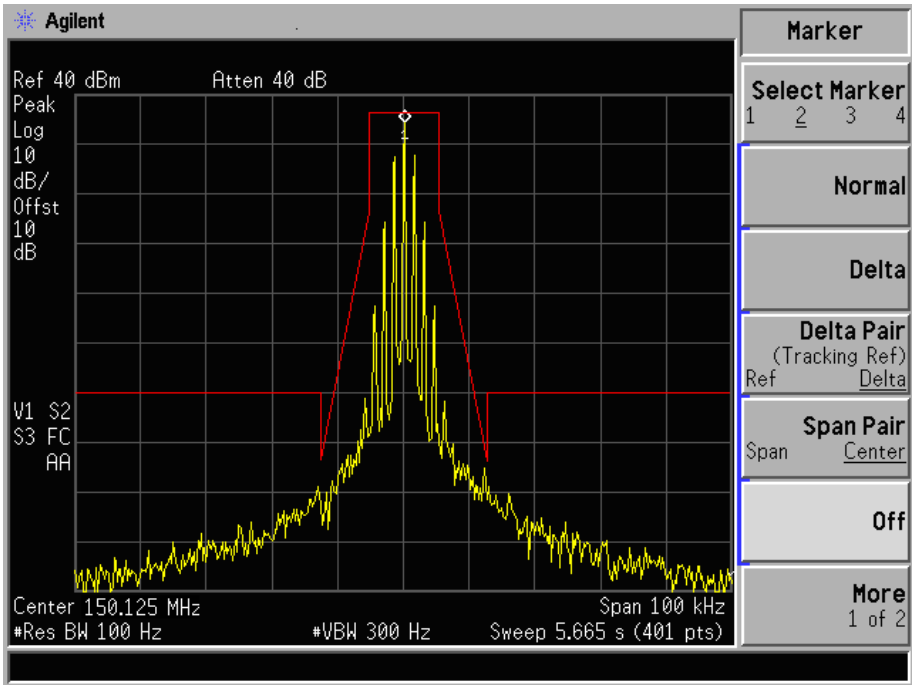
Narrowband-Low Channel:



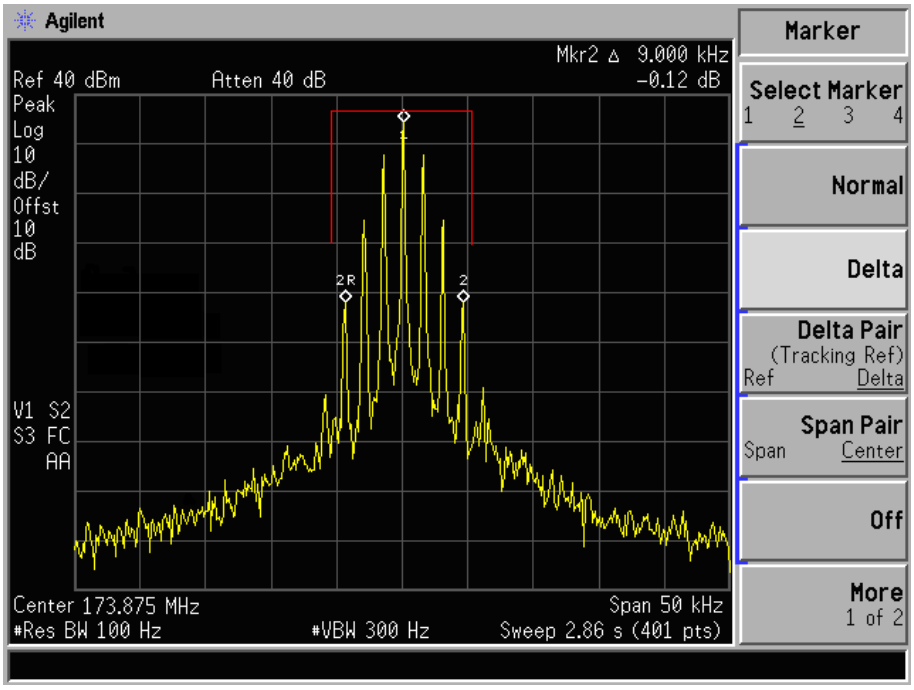


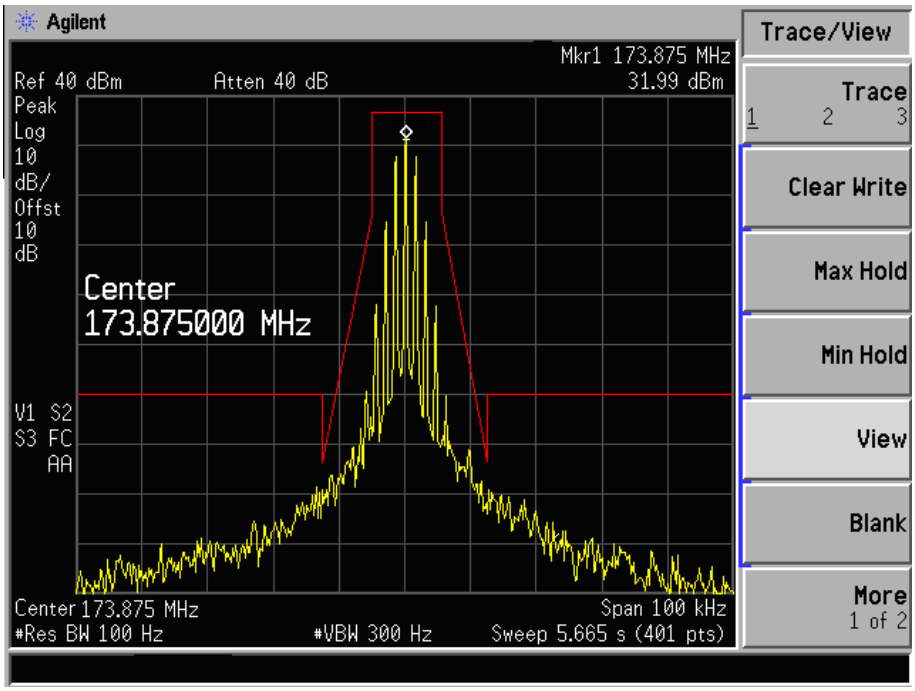
Narrowband-Middle Channel:



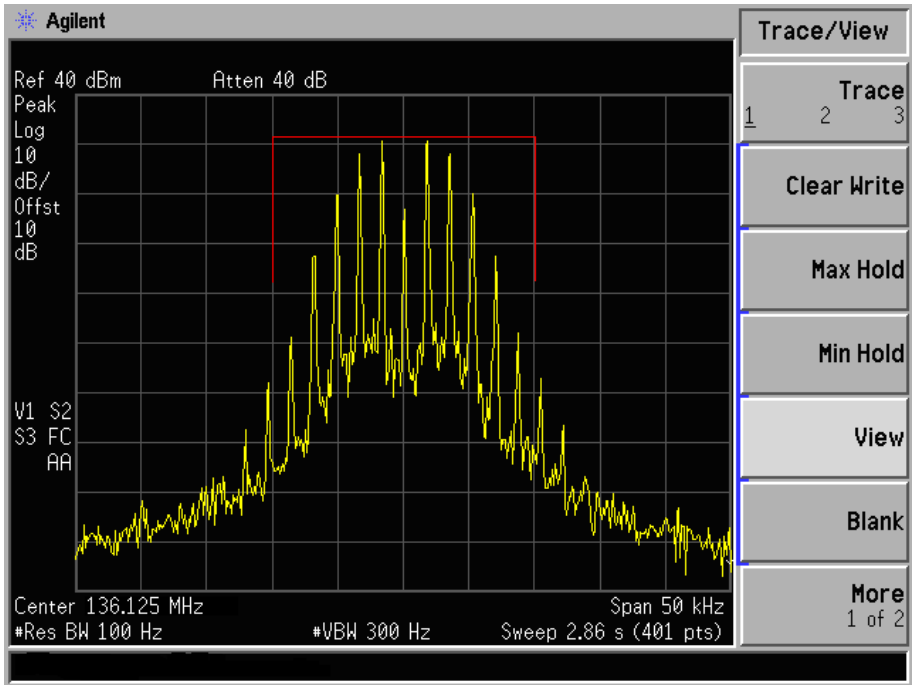


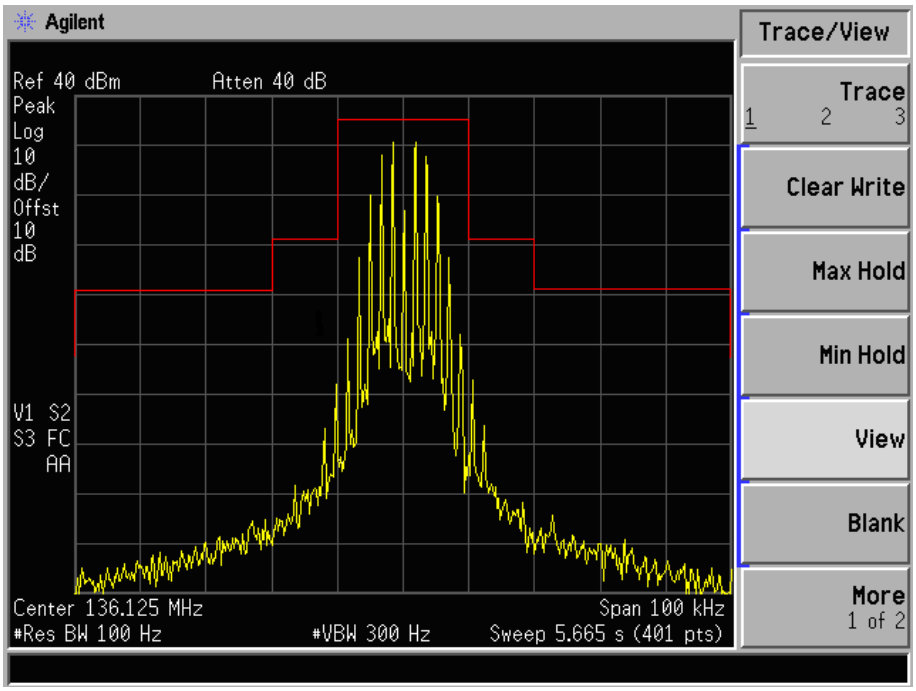
Narrowband-High Channel:



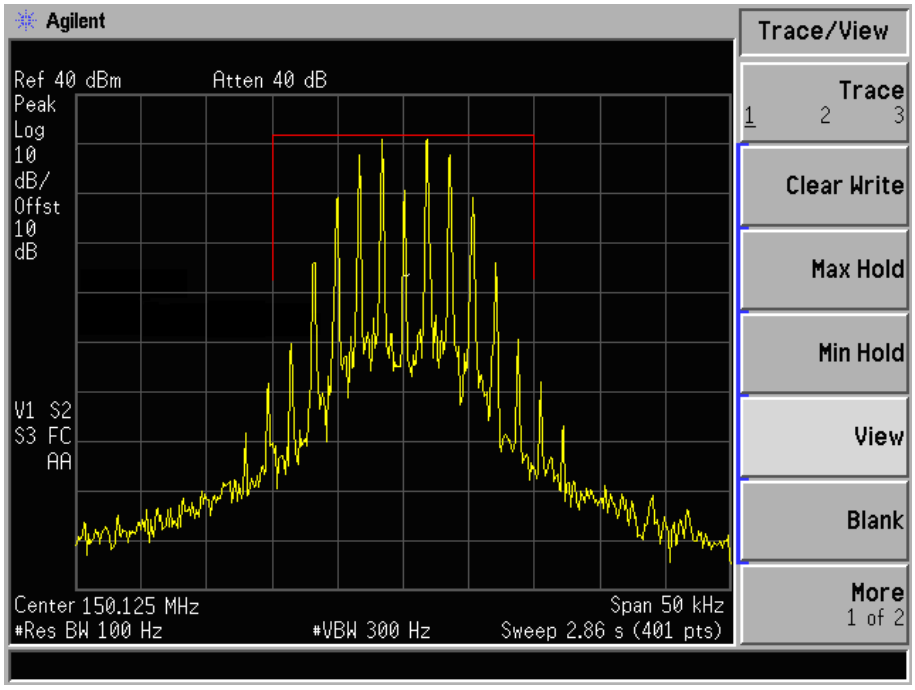


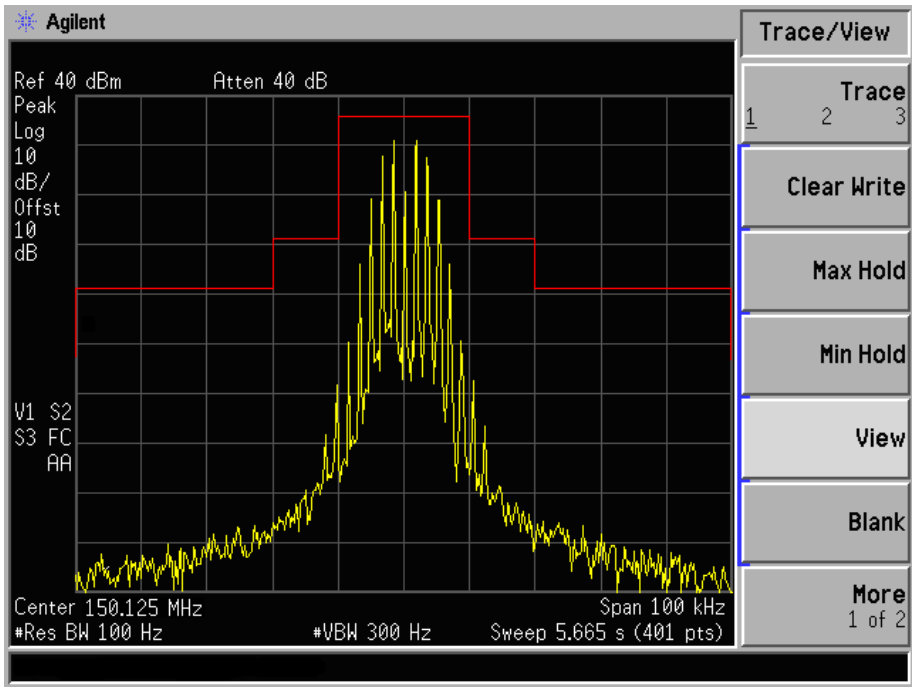
Wideband-Low Channel:



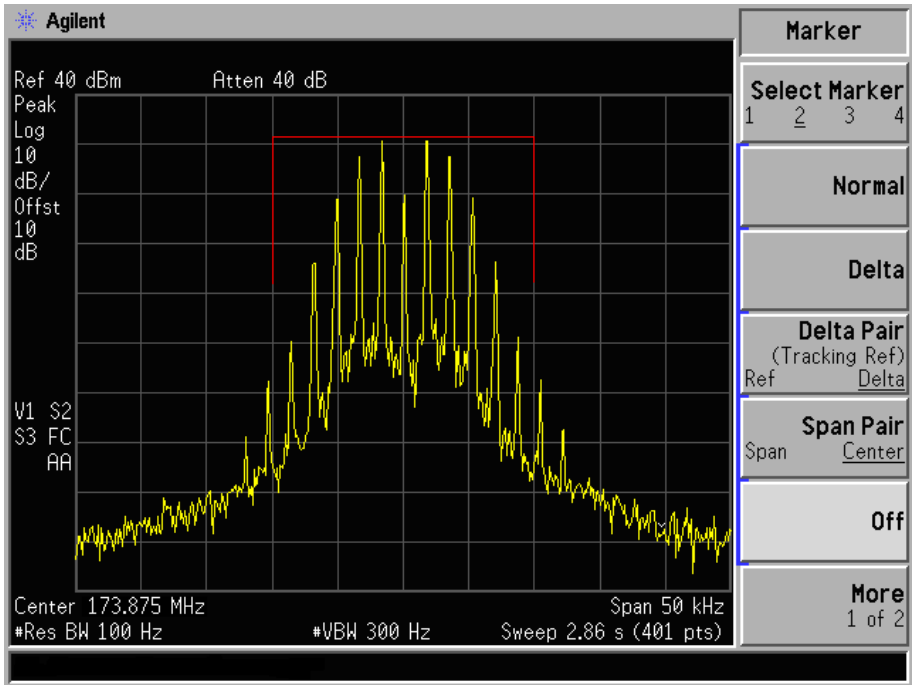


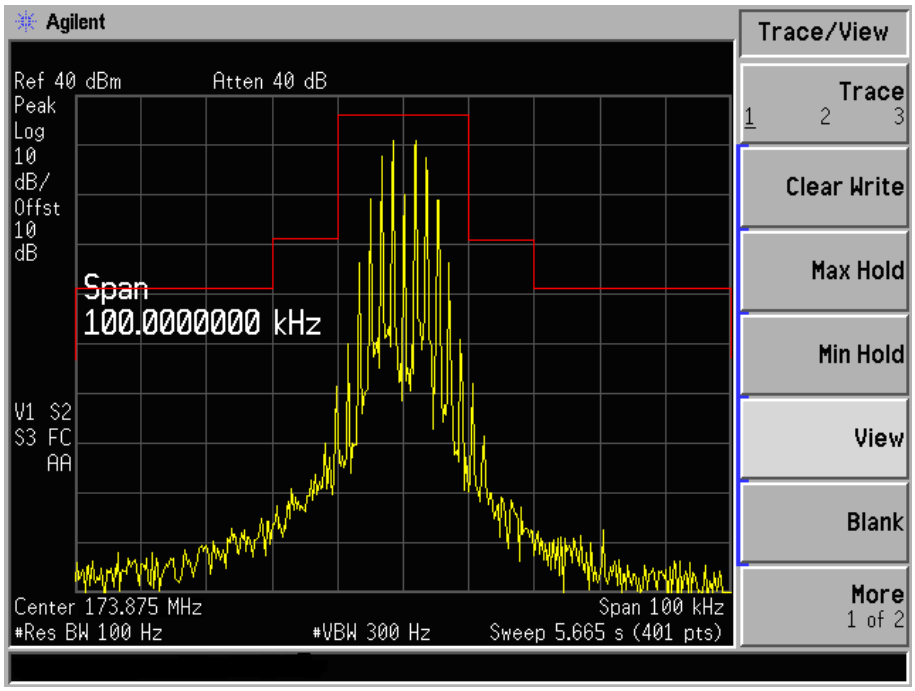
Wideband-Mid Channel:



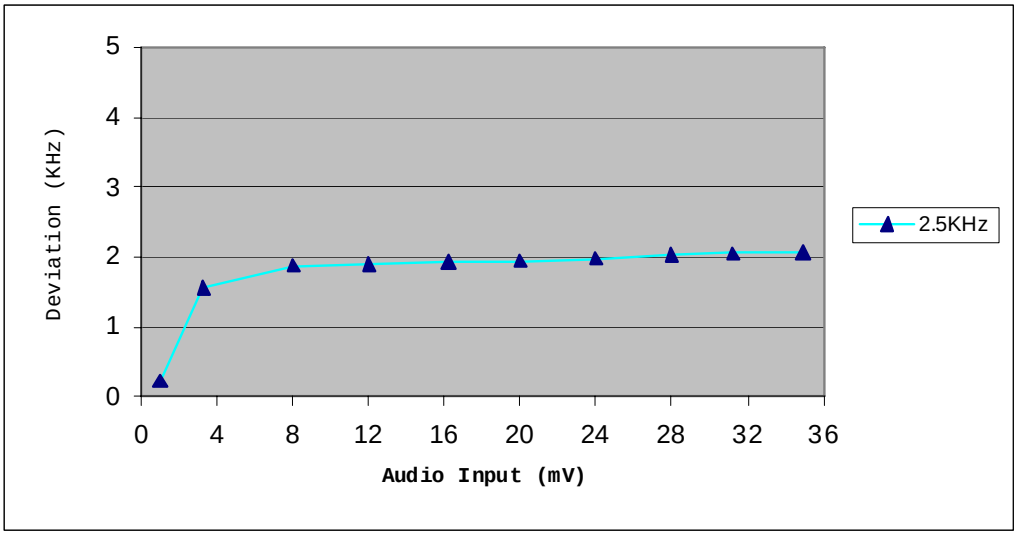


Wideband-High Channel:

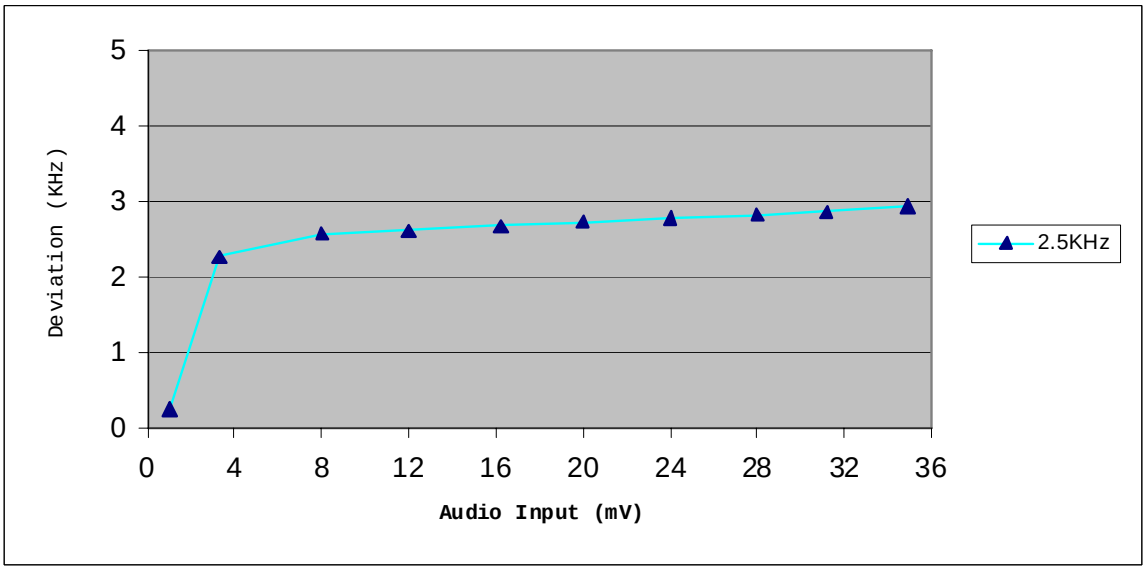




Deviation Vs Audio Level with the wore case (Narrowband-High Channel)

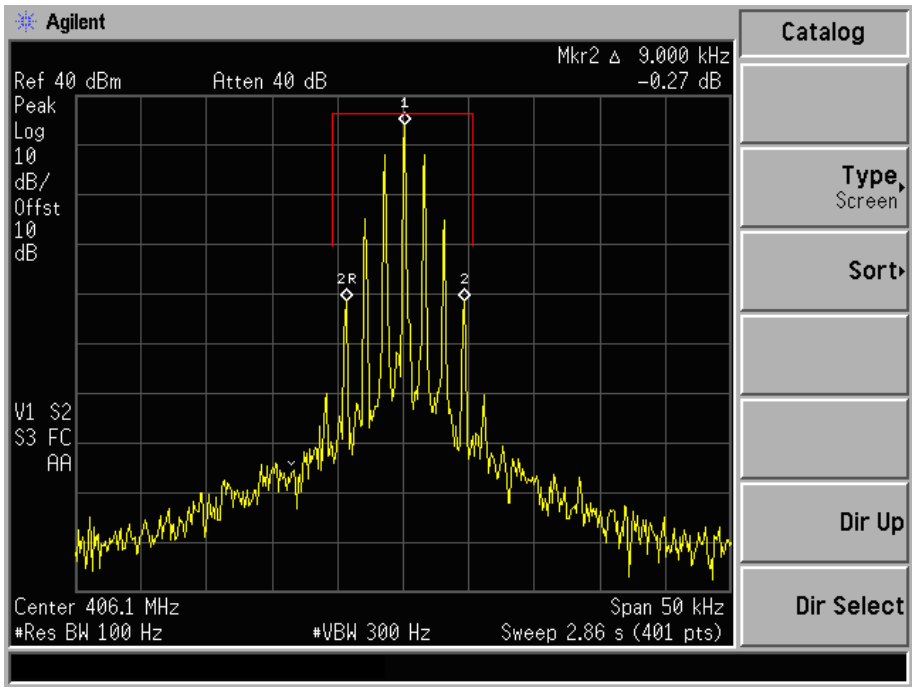


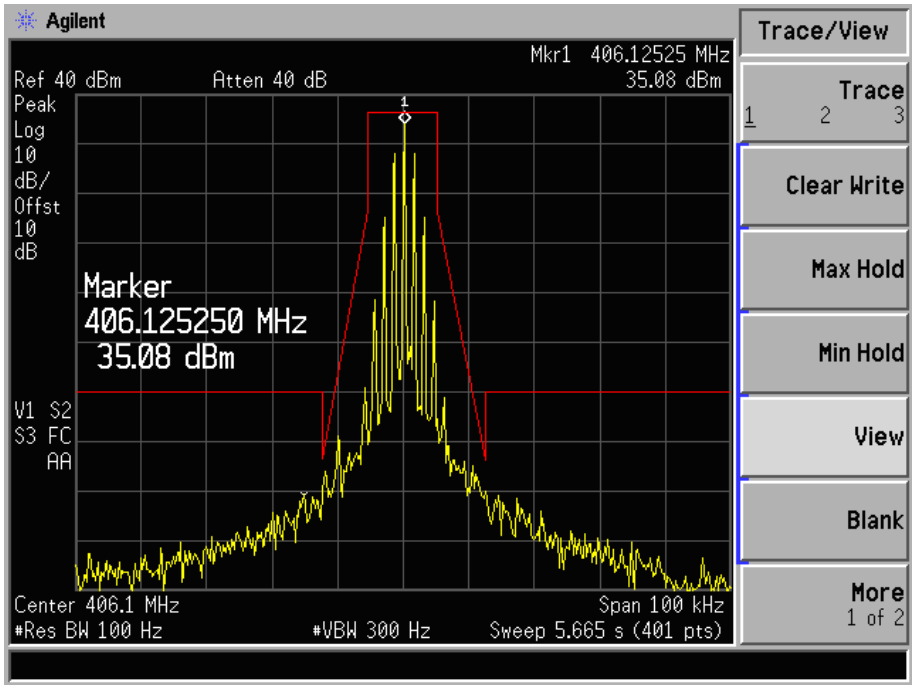
Deviation Vs Audio Level with the wore case (Wideband-High Channel)



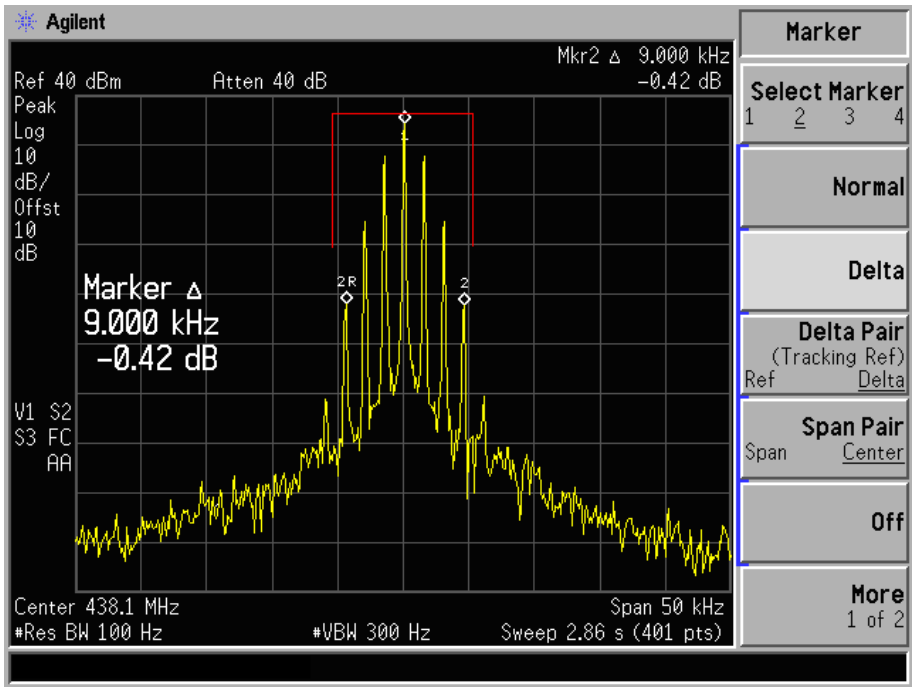
For UHF

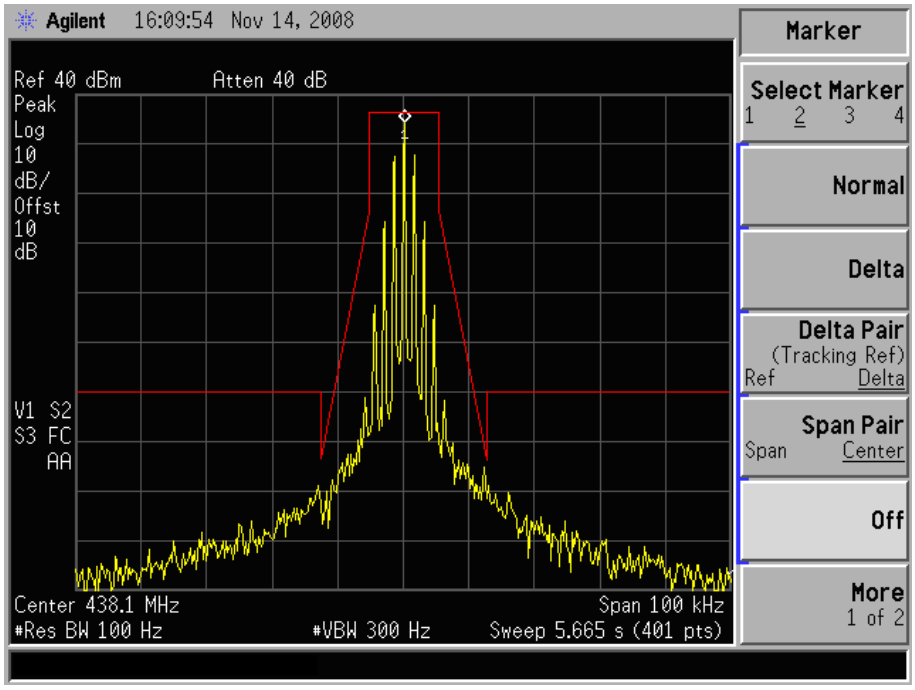
Narrowband-Low Channel:



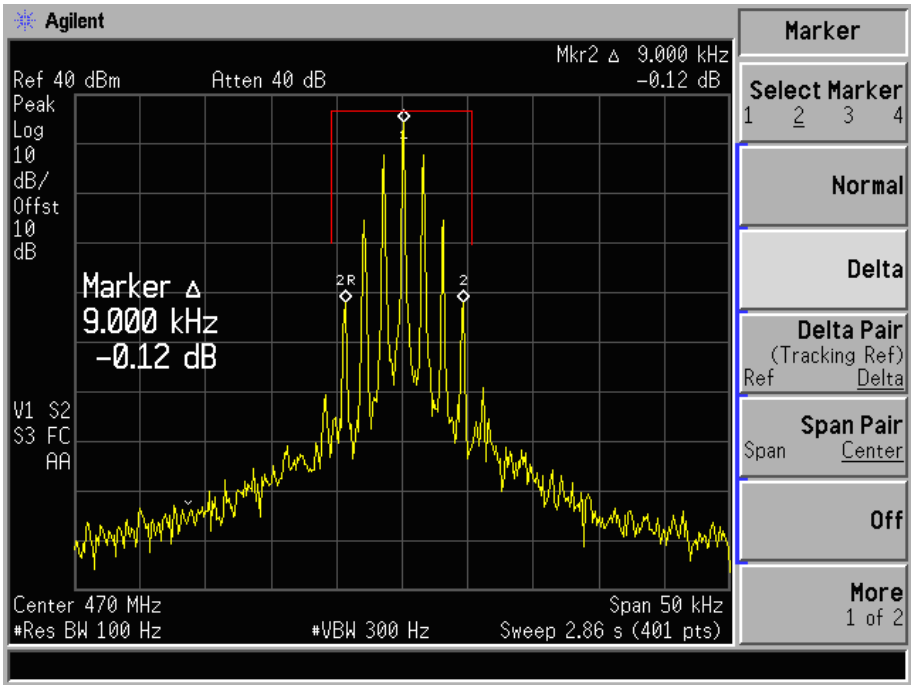


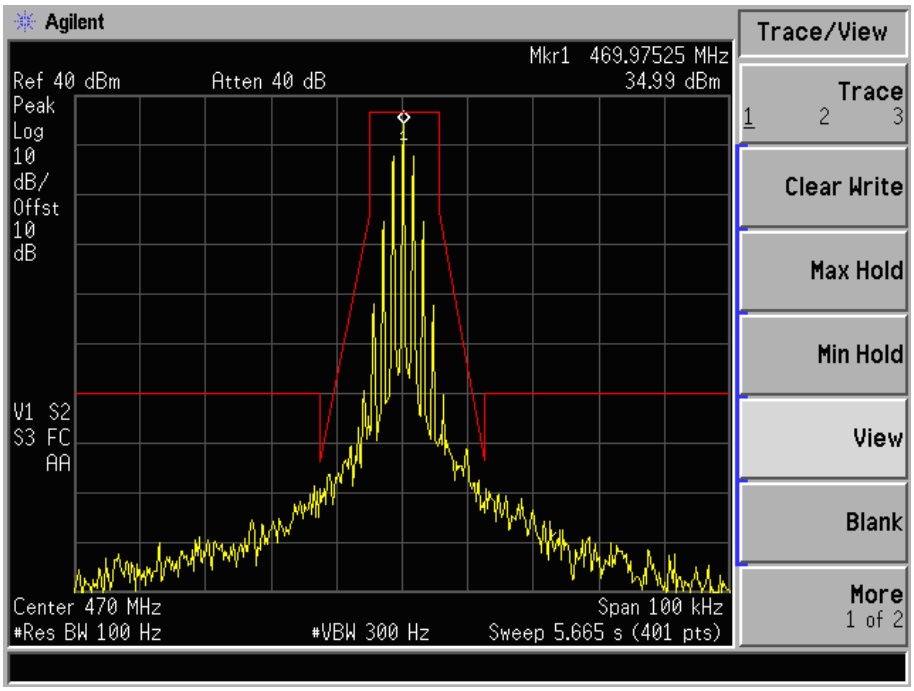
Narrowband-Middle Channel:



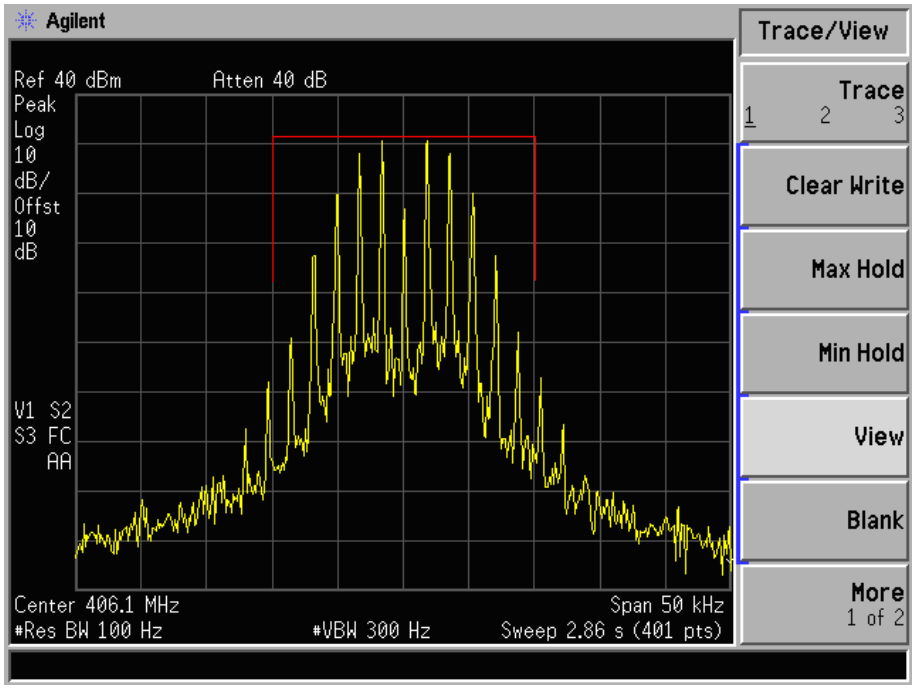


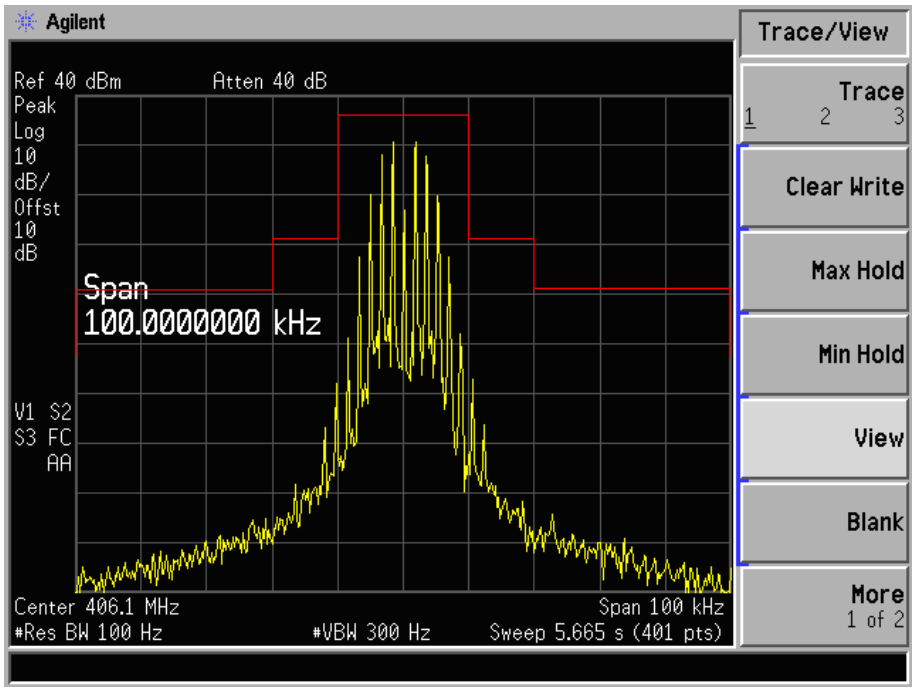
Narrowband-High Channel:



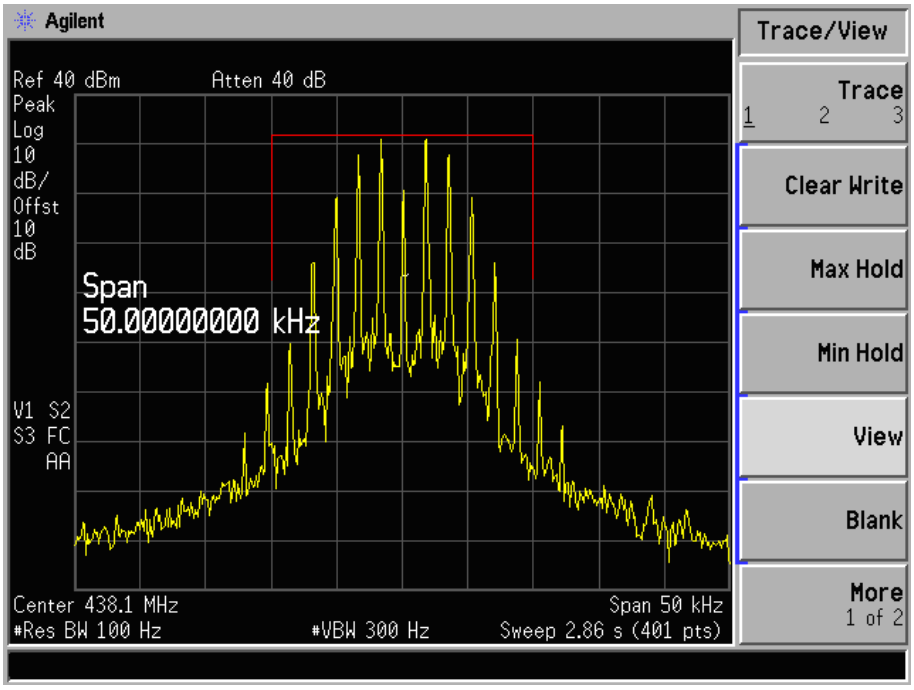


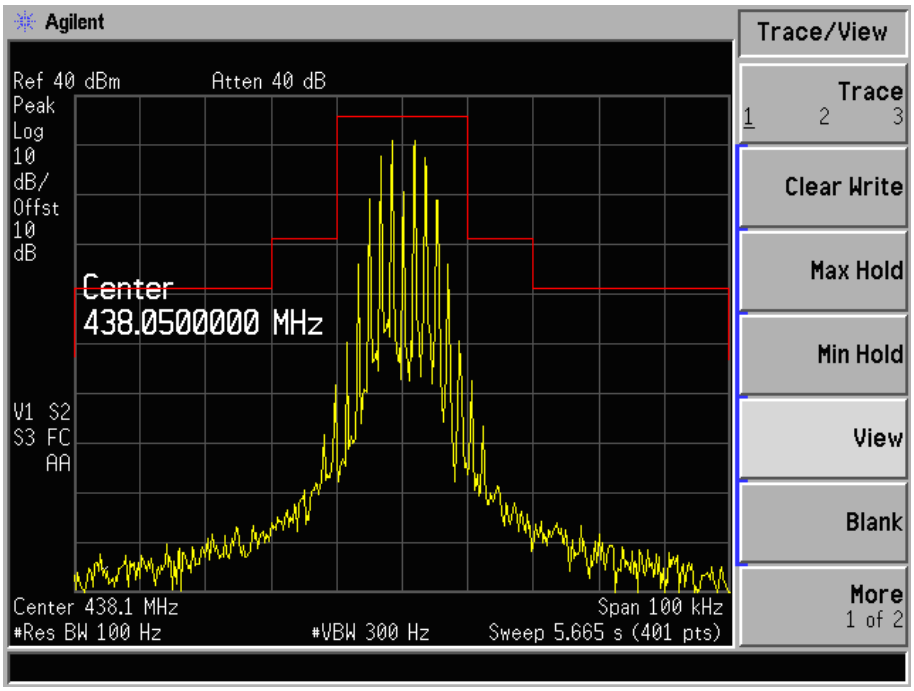
Wideband-Low Channel:



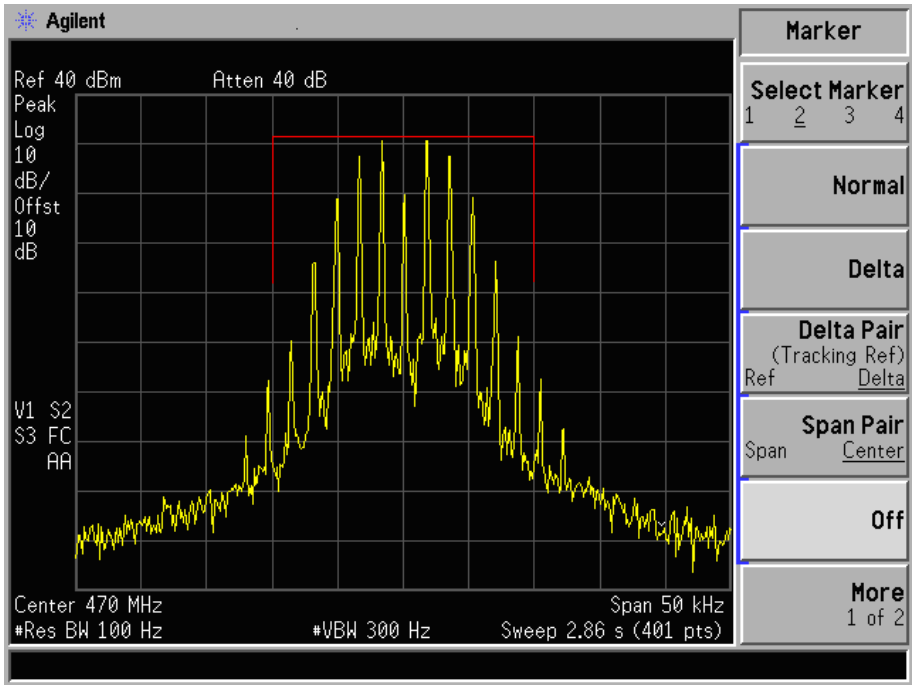


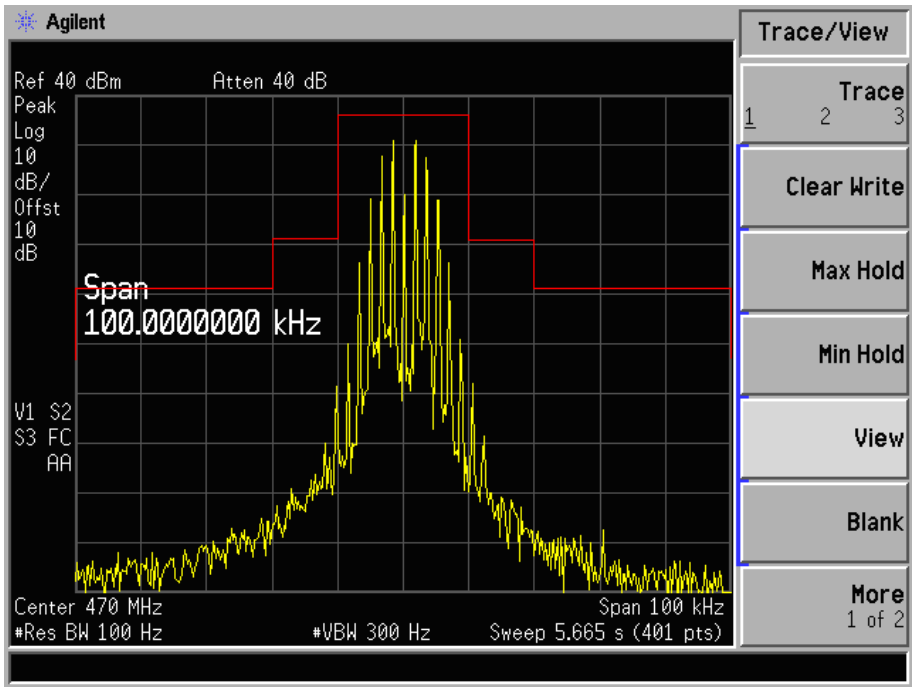
Wideband-Mid Channel:



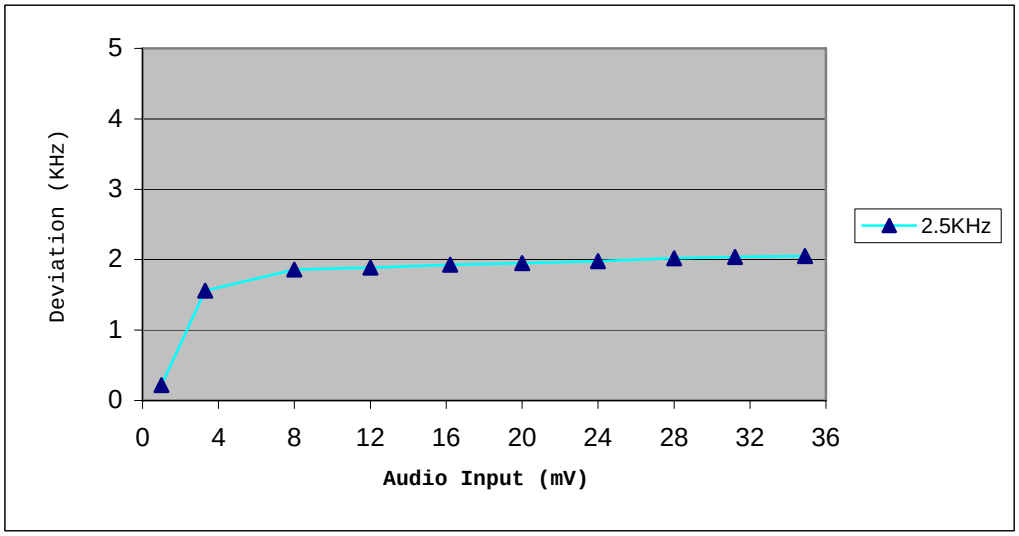


Wideband-High Channel:

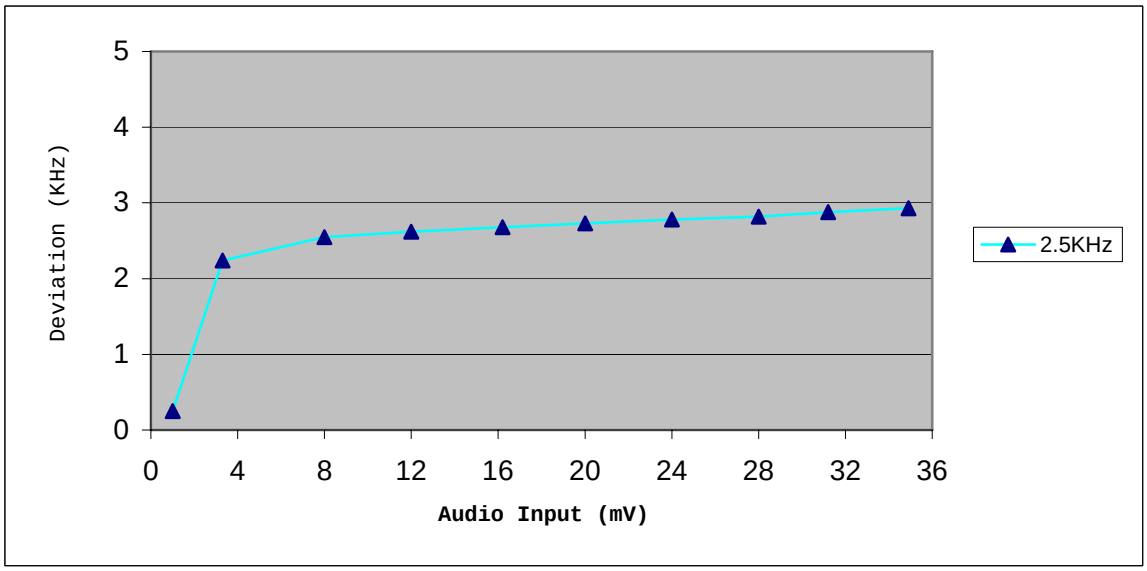




Deviation Vs Audio Level with the wore case (Narrowband-High Channel)



Deviation Vs Audio Level with the wore case (Wideband-High Channel)



7. §2.1053 and §90.210- RADIATED SPURIOUS EMISSION

7.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is ±3.0 dB.

7.2 Standard Applicable

According to FCC §2.1053, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediated circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a halfwave dipole antenna.
According to FCC §90.210, the necessary attenuation requirements need to meet as the following:
Emission Mask D For 12.5 kHz bandwidth:

On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.
On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than12.5 kHz: At least 7.27(fd−2.88 kHz) dB.
On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

Emission Mask B For 25 kHz bandwidth:

For any frequency removed from the center of the assigned channel by more than 50 percent up to and including 100 percent of the authorized bandwidth, at least 25 dB.
On any frequency removed from the center of the assigned channel by more than 100 percent up to and including 250 percent, at least 35 dB.
On any frequency removed from the center of the assigned channel by more than 250 percent at least:
43 + 10 log (P) dB.

7.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Rohde & Schwarz	EMI Test Receiver	ESI26	830245/009	2009-08-12	2010-08-11
ETS	Multi_Device Controller	2090	57230	2009-08-12	2010-08-11
Antenna	Schwarzbeck	VUBA9117	115	2009-08-12	2010-08-11
3m chamber	Albatross Projects	9X6X6	----	2008-01-25	2010-01-24
Rohde & Schwarz	Horn Antenna	HF906	100014	2009-08-12	2010-08-11
Signal Generator	Rohde & Schwarz	SMR20	100047	2009-08-12	2010-08-11
Dipole Antenna	Schwarzbeck	H00009170	9136	2009-08-12	2010-08-11

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

7.4 Test Procedure

The setup of EUT is according with per TIA/EIA Standard 603 and ANSI C63.4-2003 measurement procedure.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

7.5 Environmental Conditions

Temperature:	20° C
Relative Humidity:	53%
ATM Pressure:	1019 mbar

7.6 Summary of Test Results/Plots

According to the data below, the FCC Part 90 standards, and had the worst margin of:

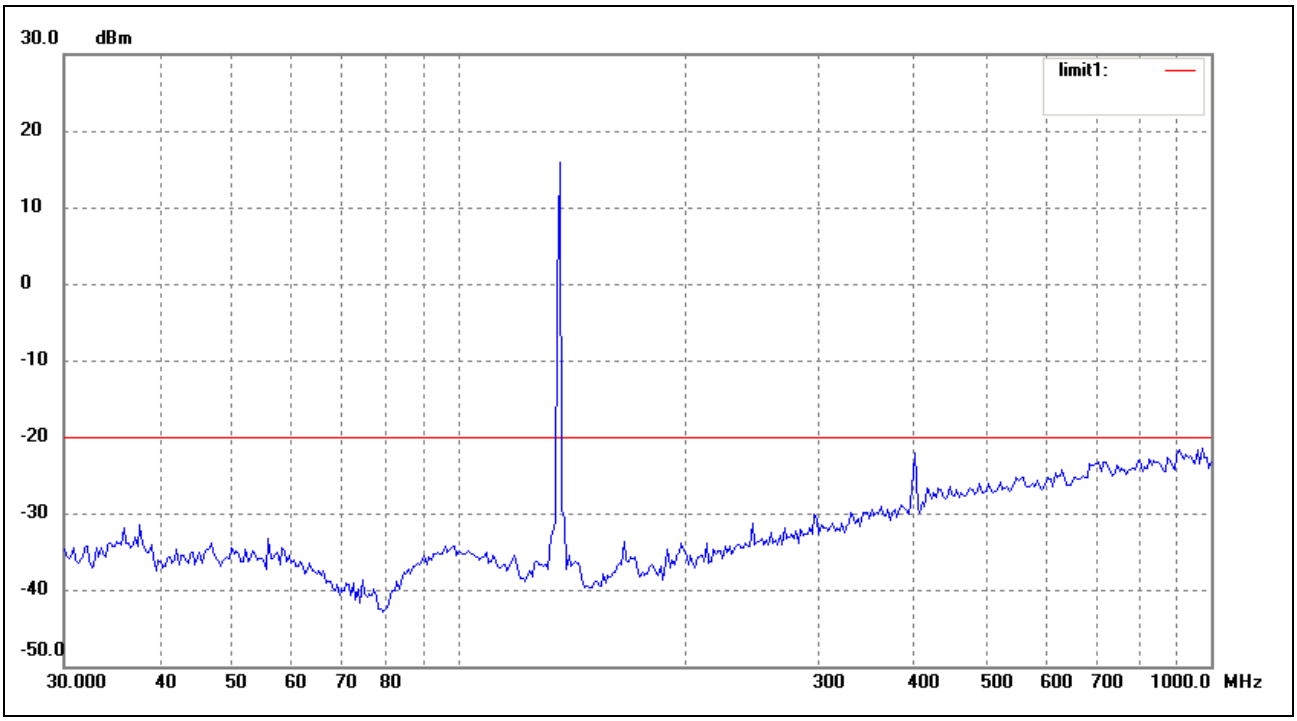
-16.5 dB at **750.625 MHz** in the **Vertical of Wideband-Middle channel** polarization, **30 MHz to 2 GHz, 3Meters.**

For VHF

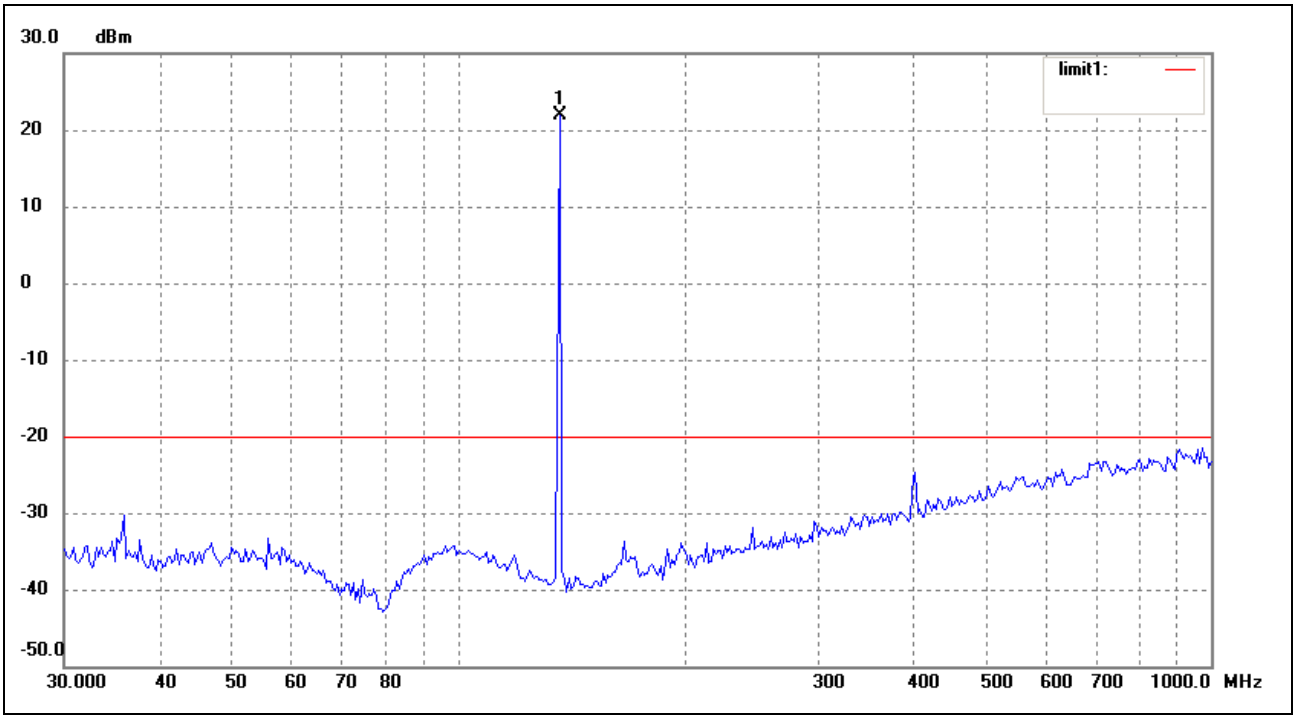
Plots of the spurious emission for below 1GHz:

Narrowband Low Channel:

Horizontal:

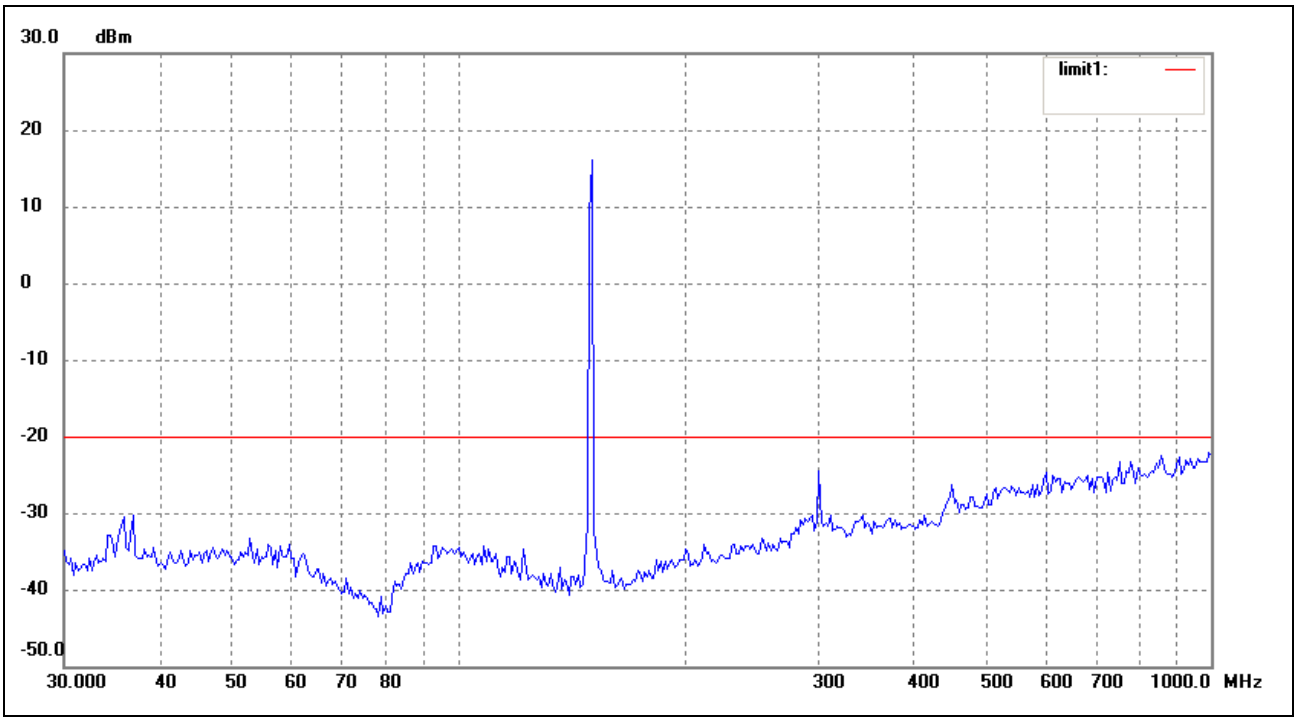


Vertical:

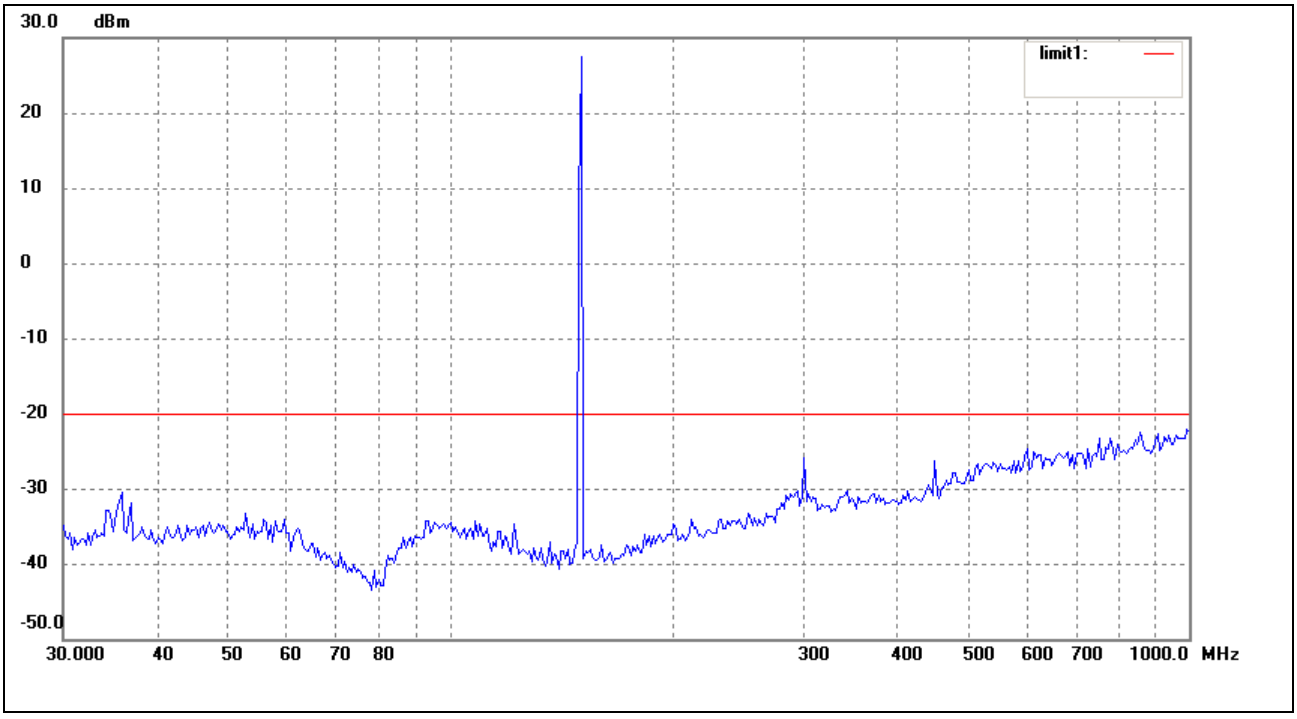


Narrowband Middle Channel:

Horizontal:

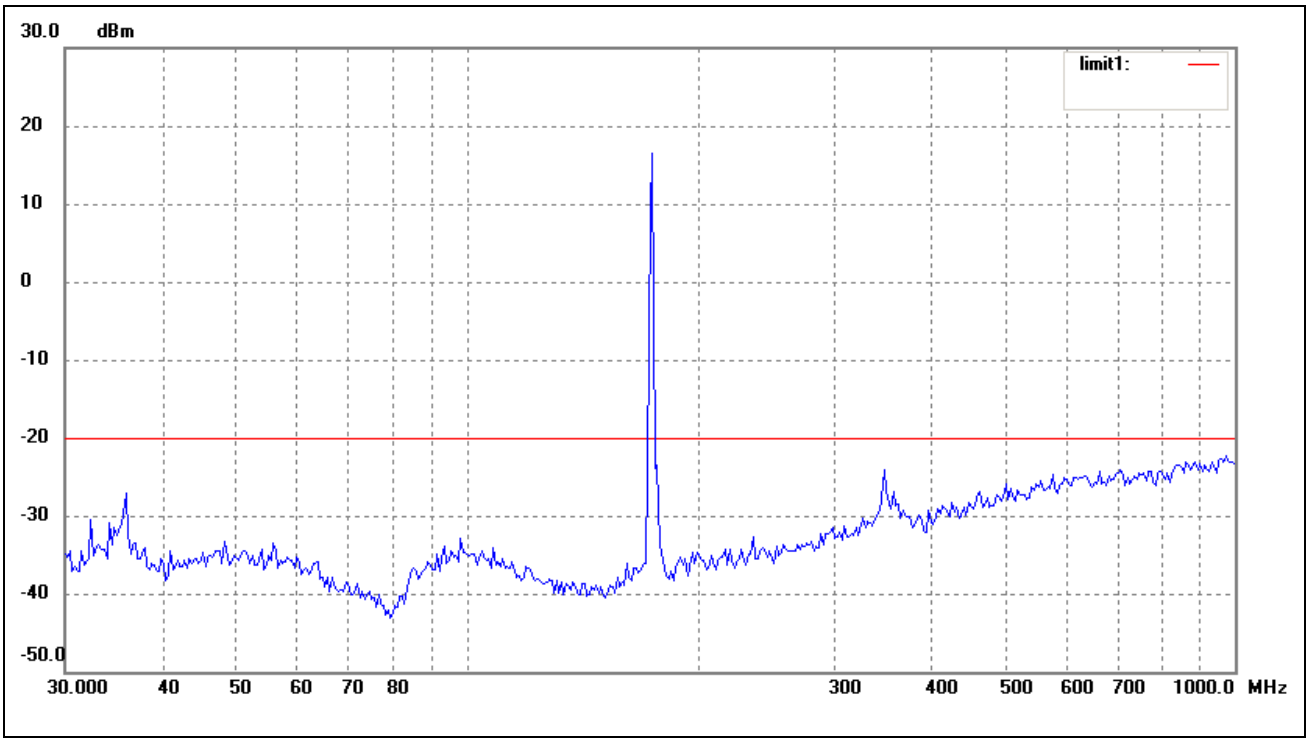


Vertical:

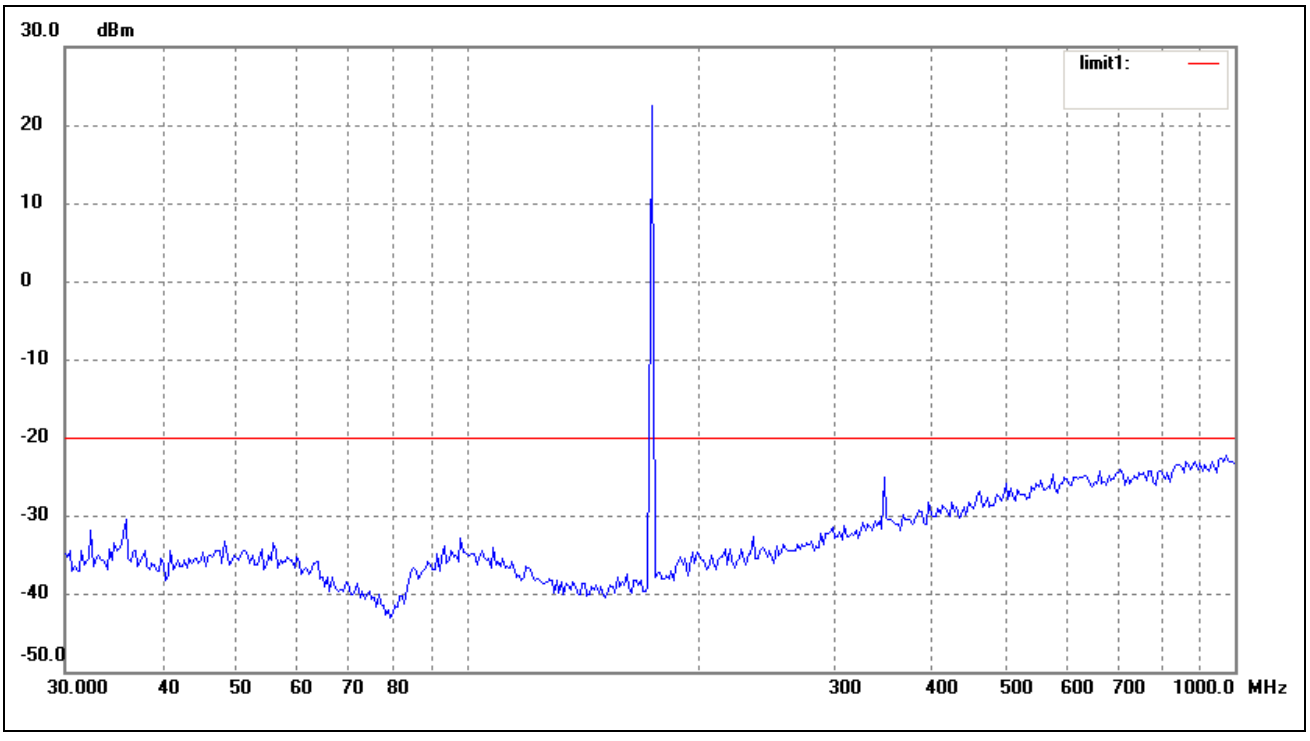


Narrowband High Channel:

Horizontal:

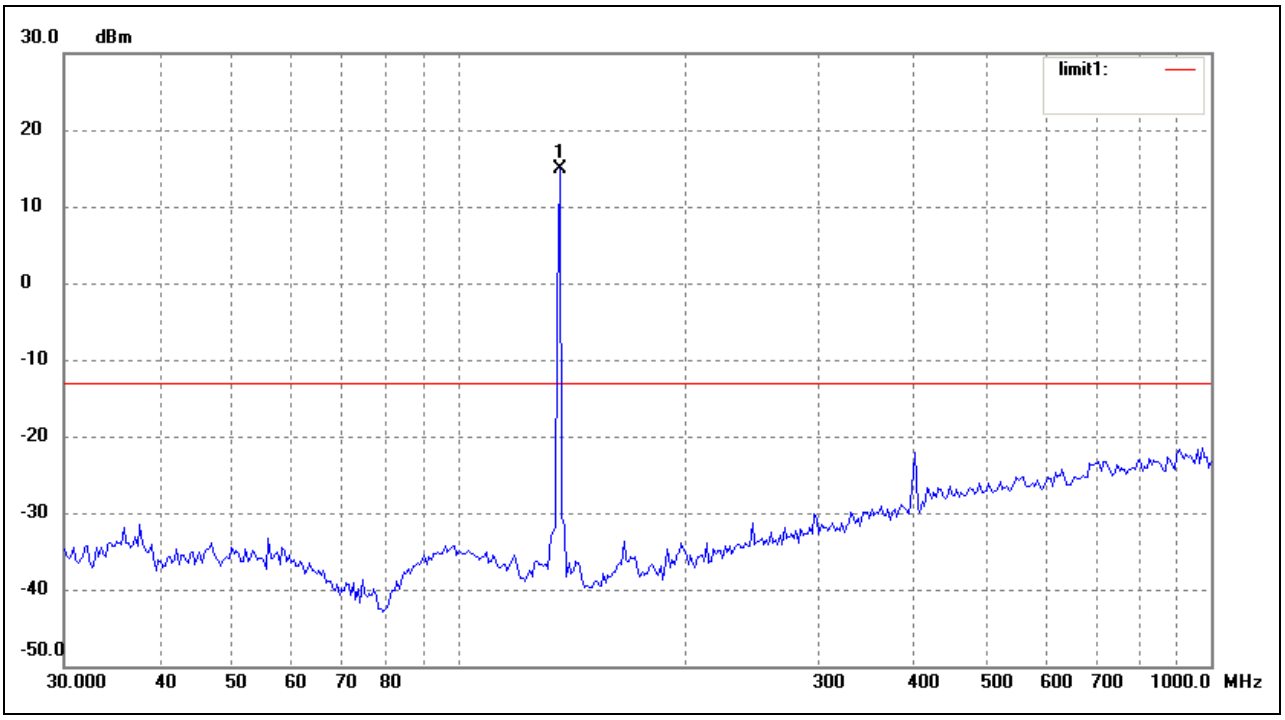


Vertical:

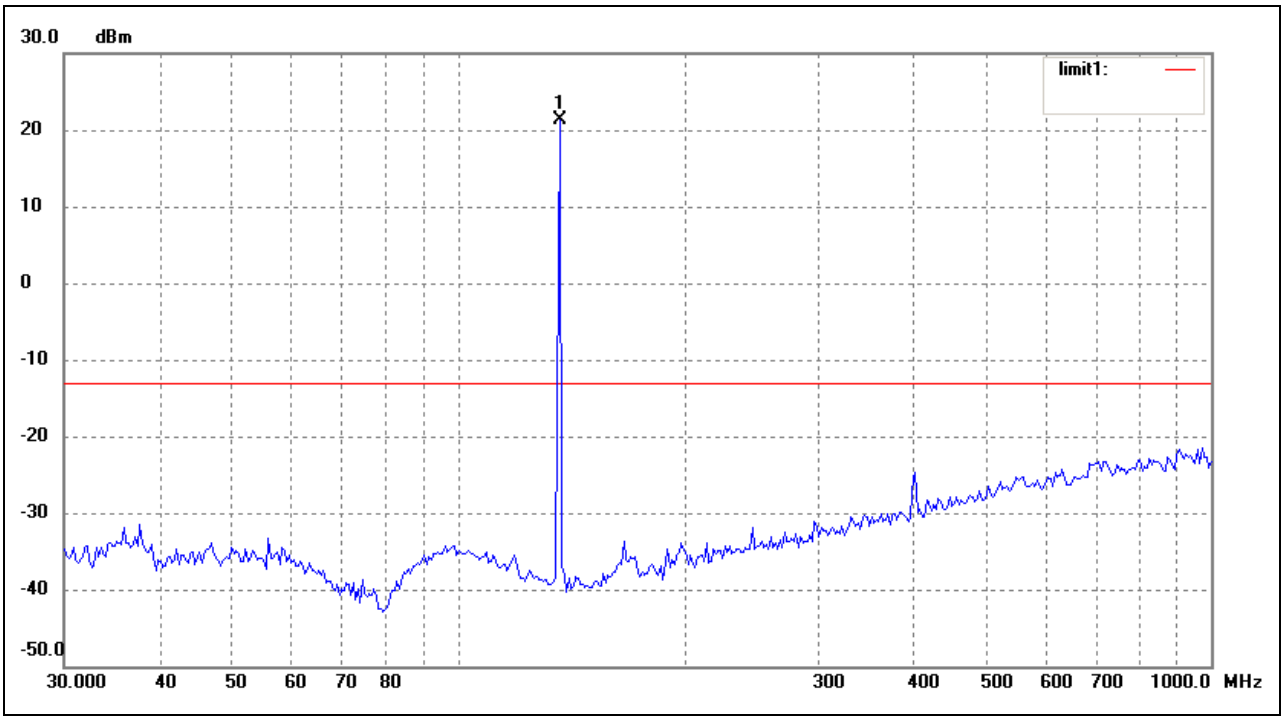


Wideband Low Channel:

Horizontal:

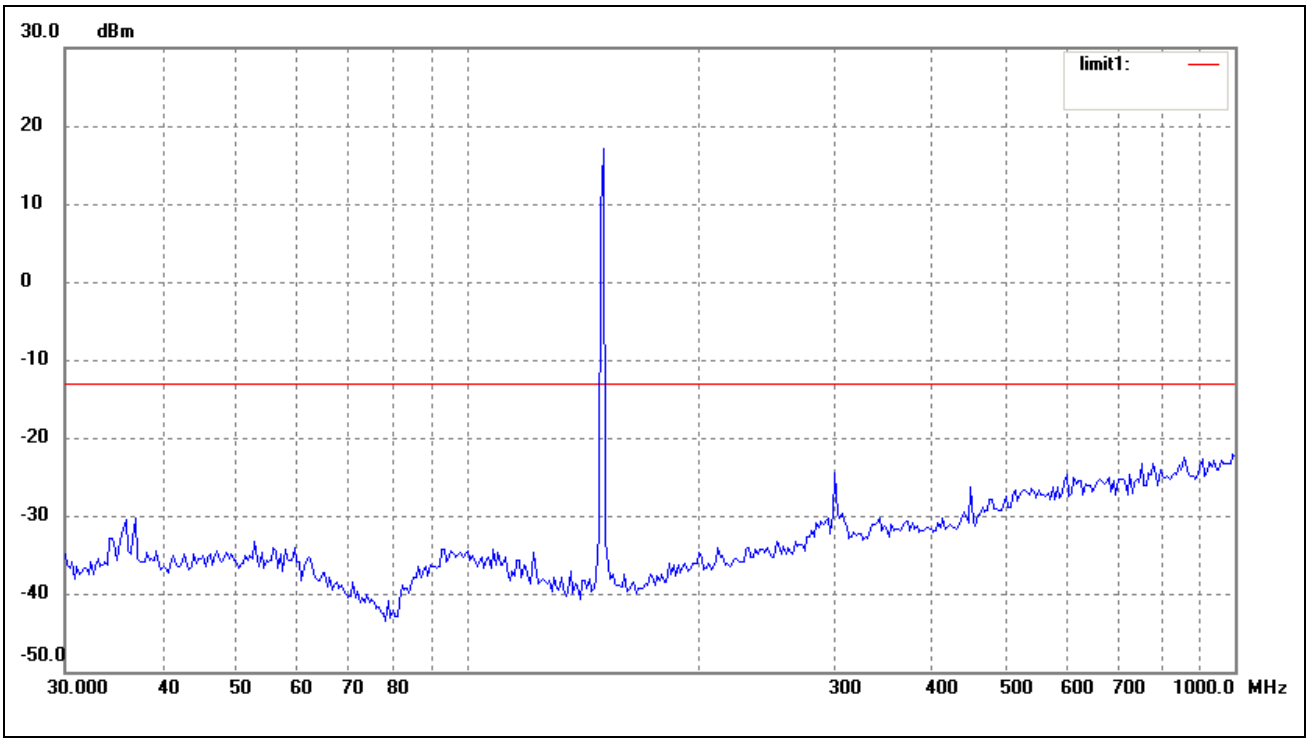


Vertical:

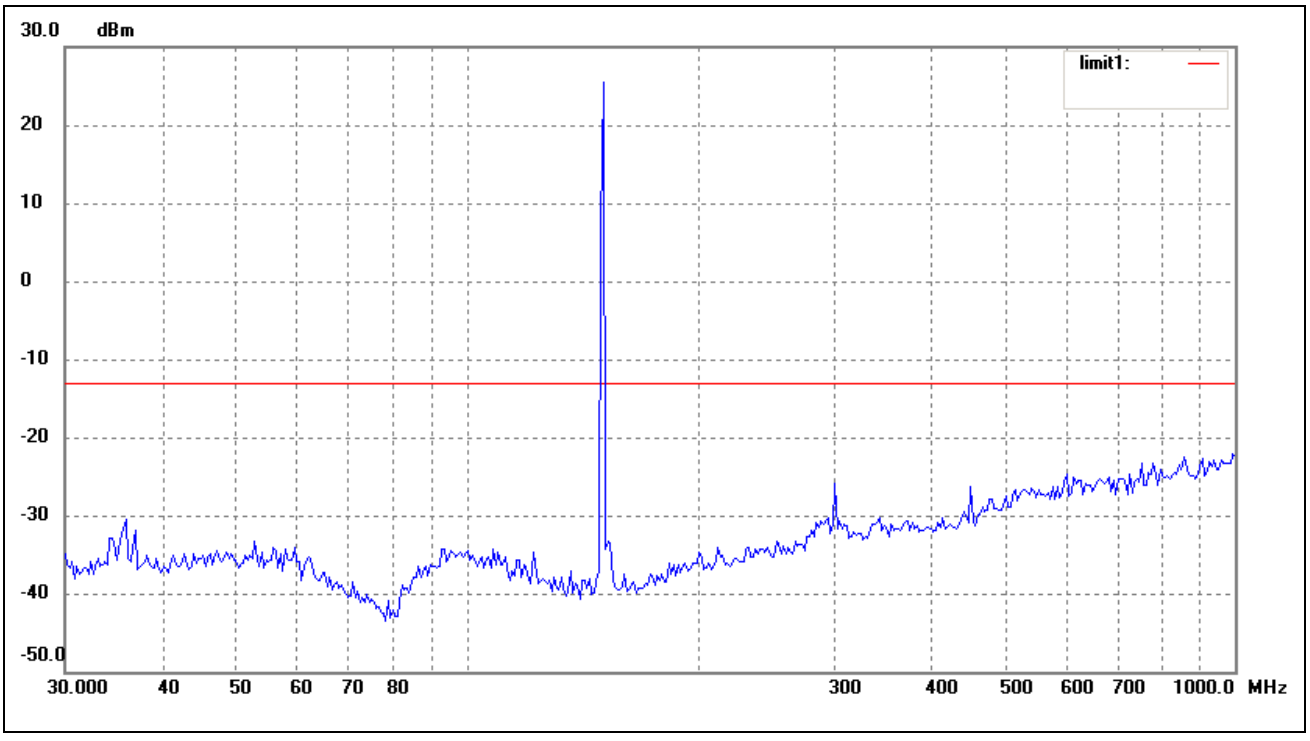


Wideband Middle Channel:

Horizontal:

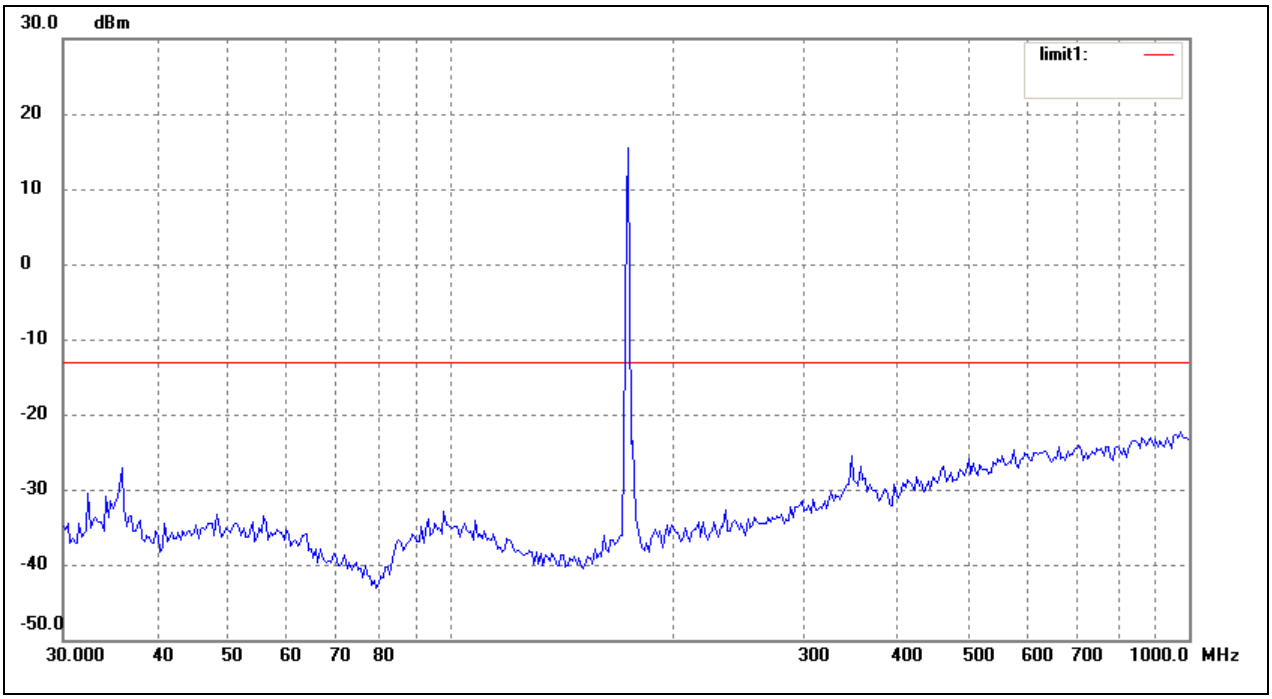


Vertical:

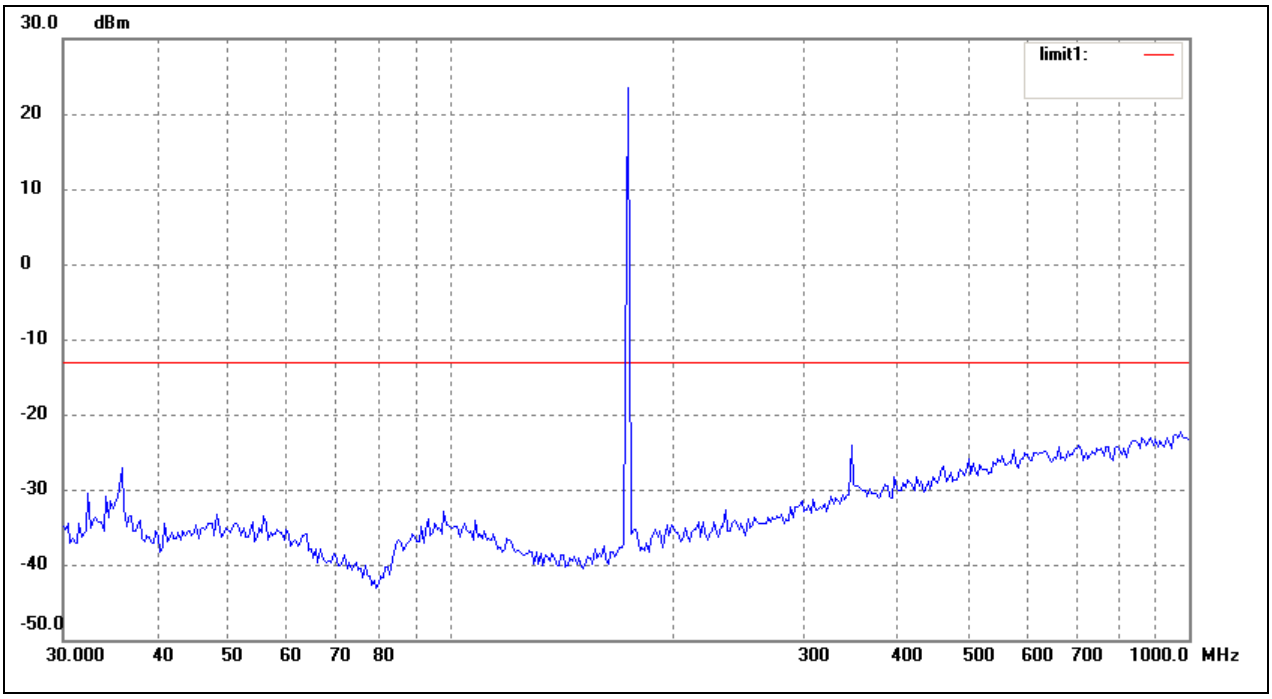


Wideband High Channel:

Horizontal:



Vertical:



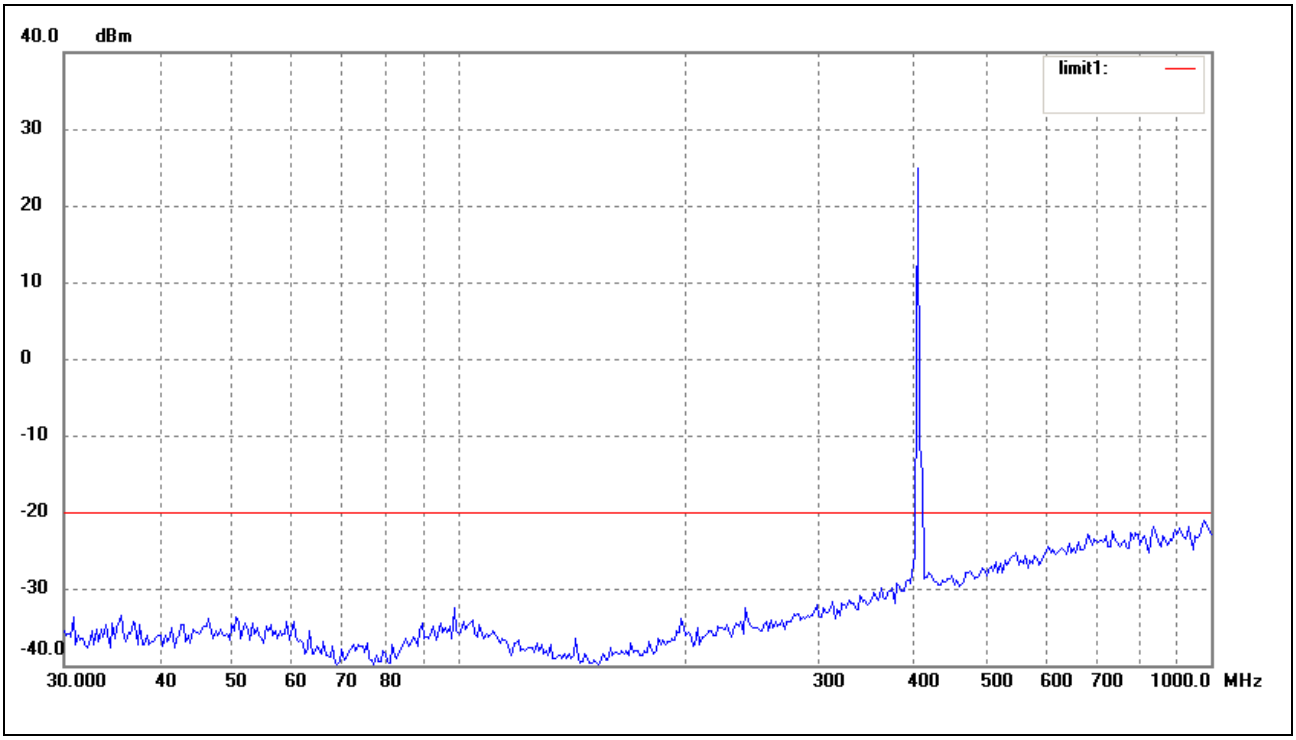
Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics. Emissions undetected below the base noise are not reported.

For UHF

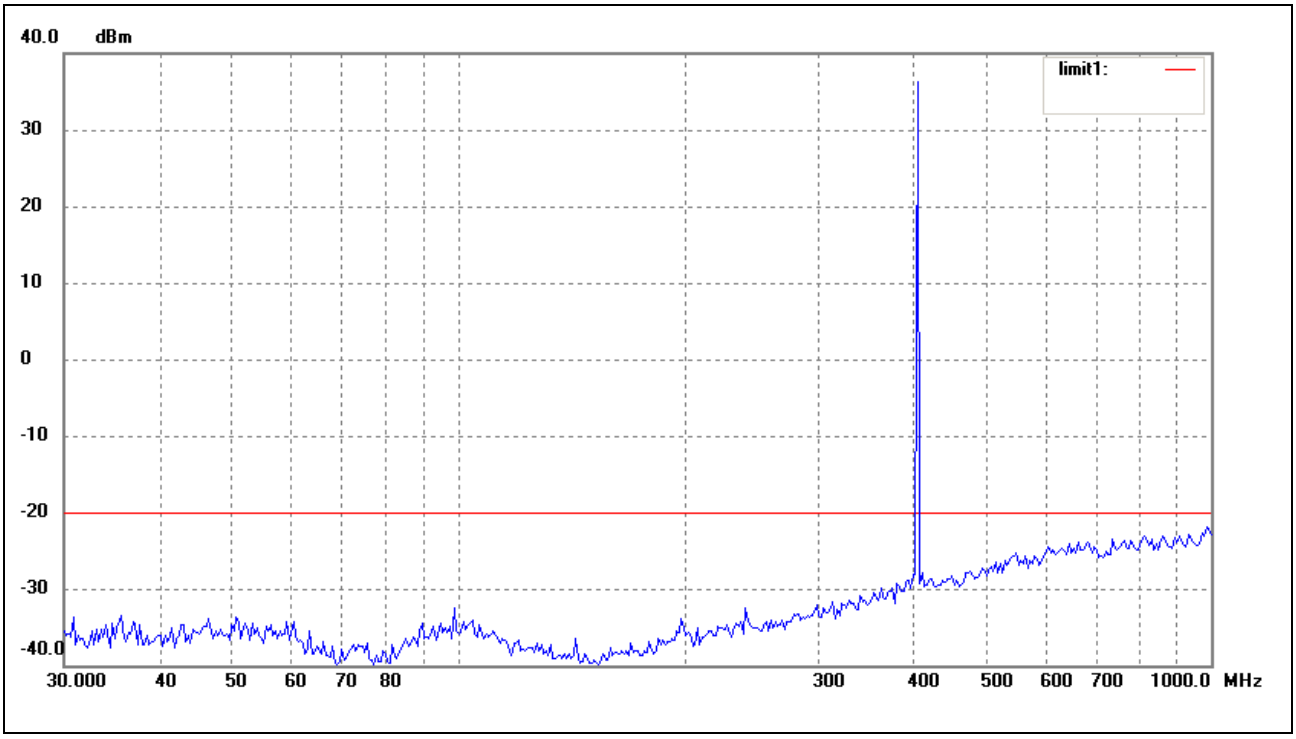
Plots of the spurious emission:

Narrowband Low Channel:

Horizontal:

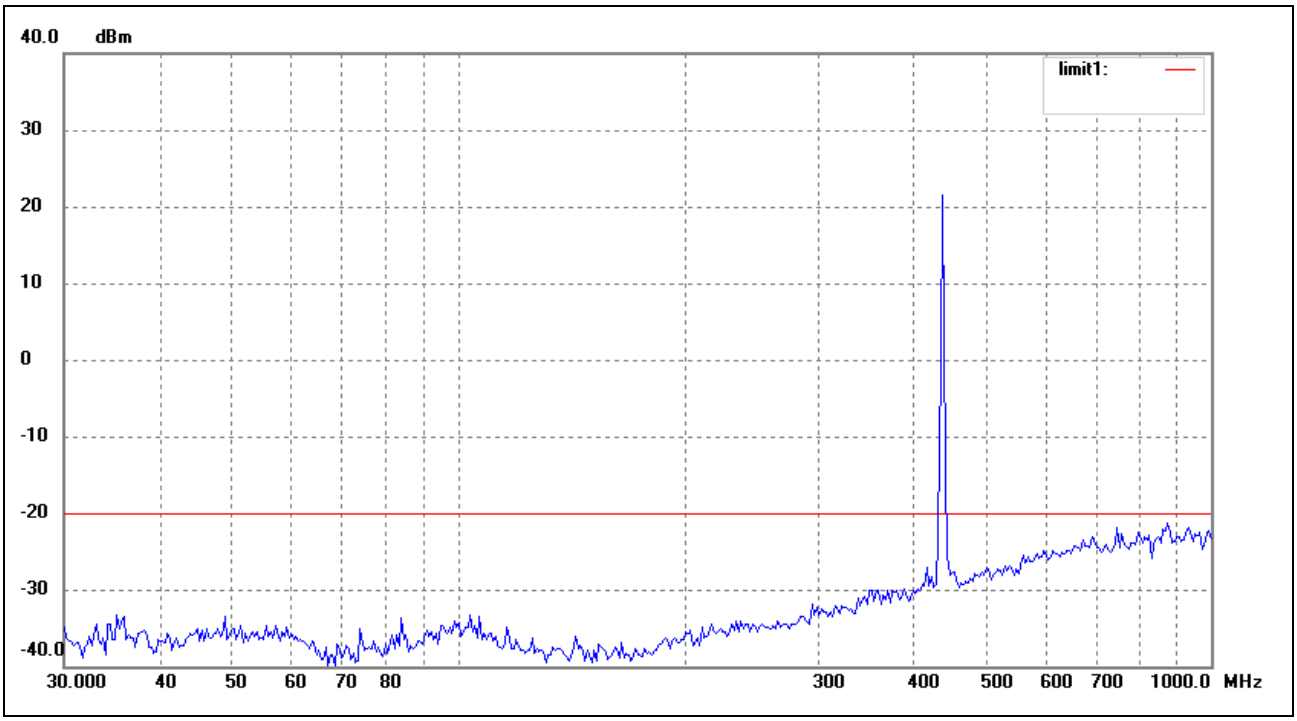


Vertical:

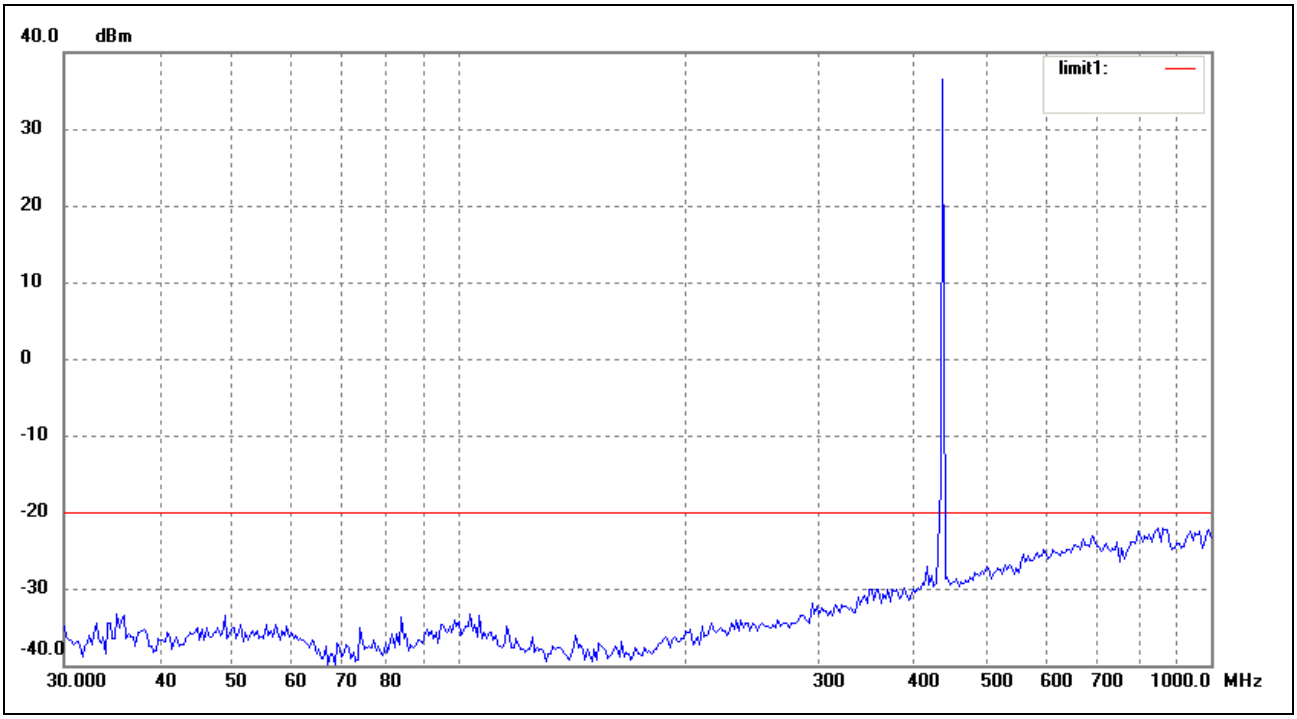


Narrowband Middle Channel:

Horizontal:

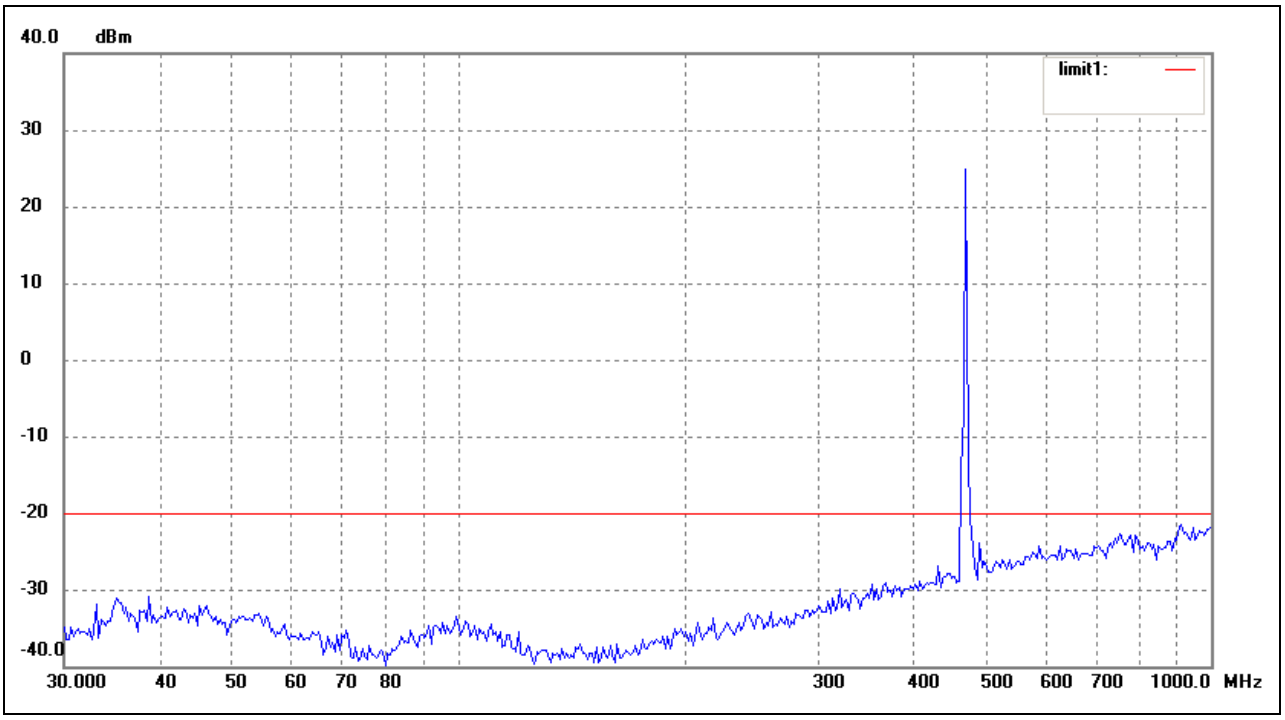


Vertical:

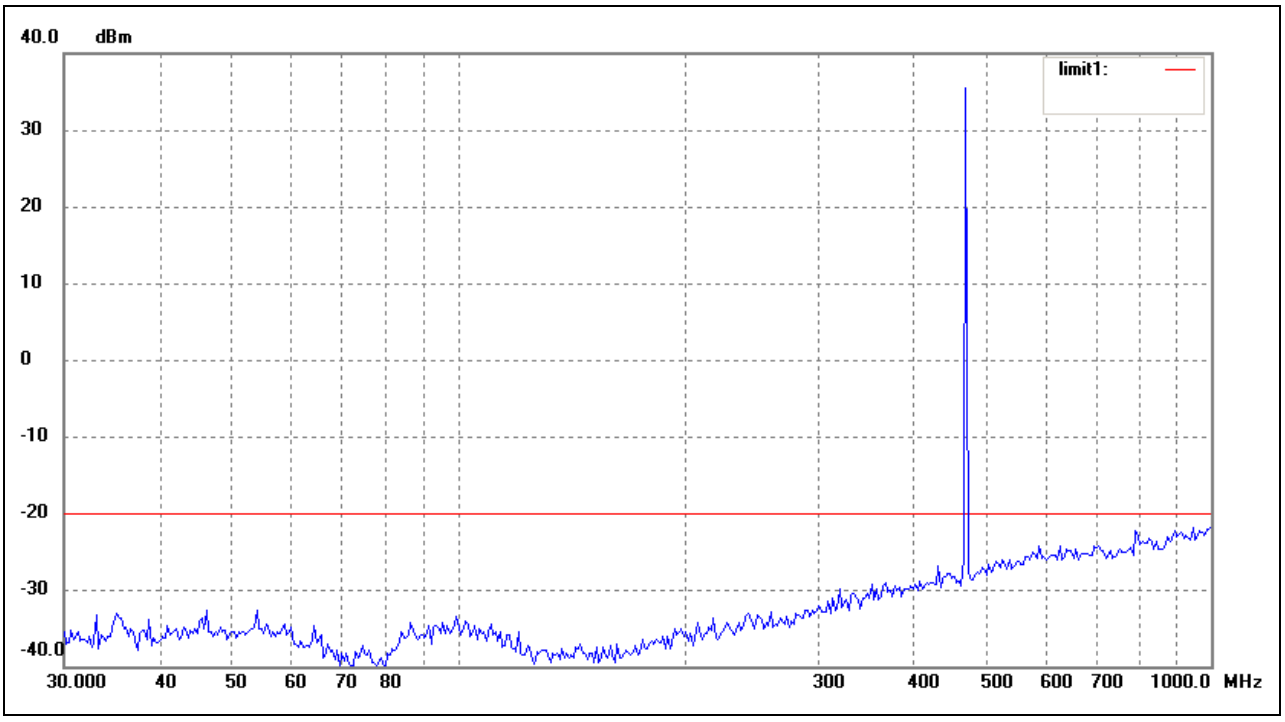


Narrowband High Channel:

Horizontal:

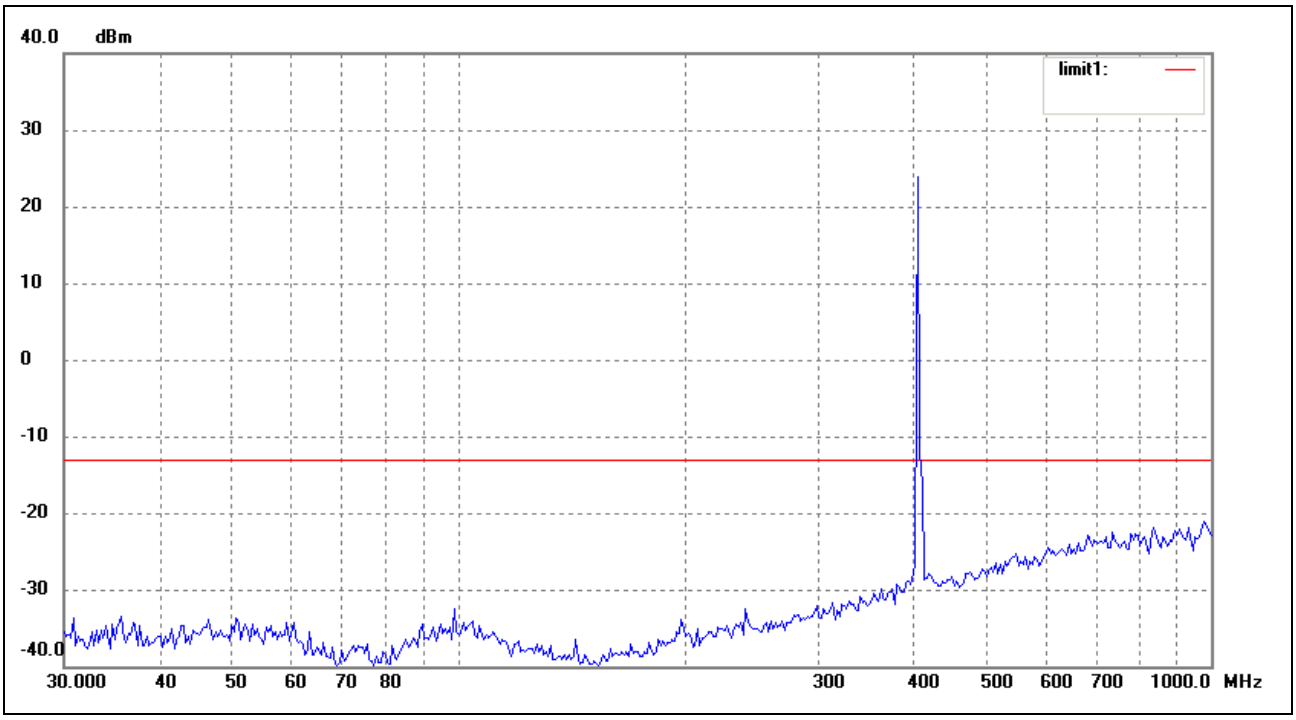


Vertical:

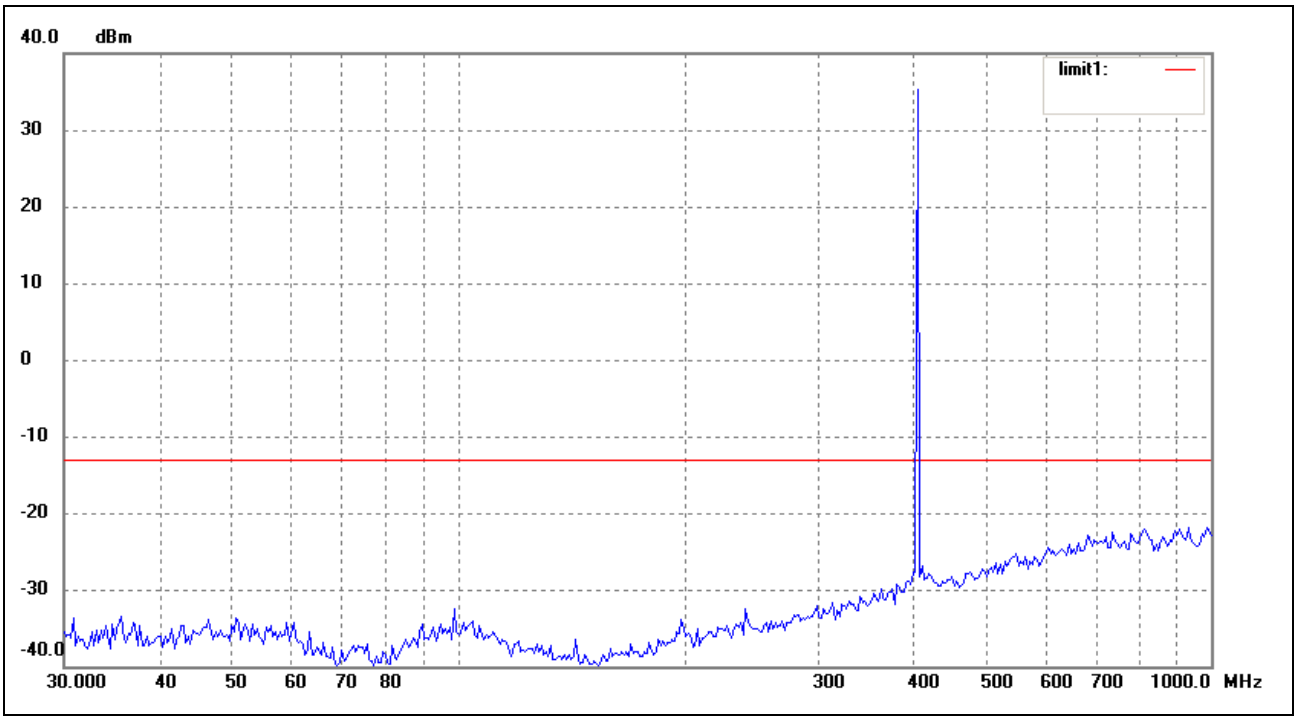


Wideband Low Channel:

Horizontal:

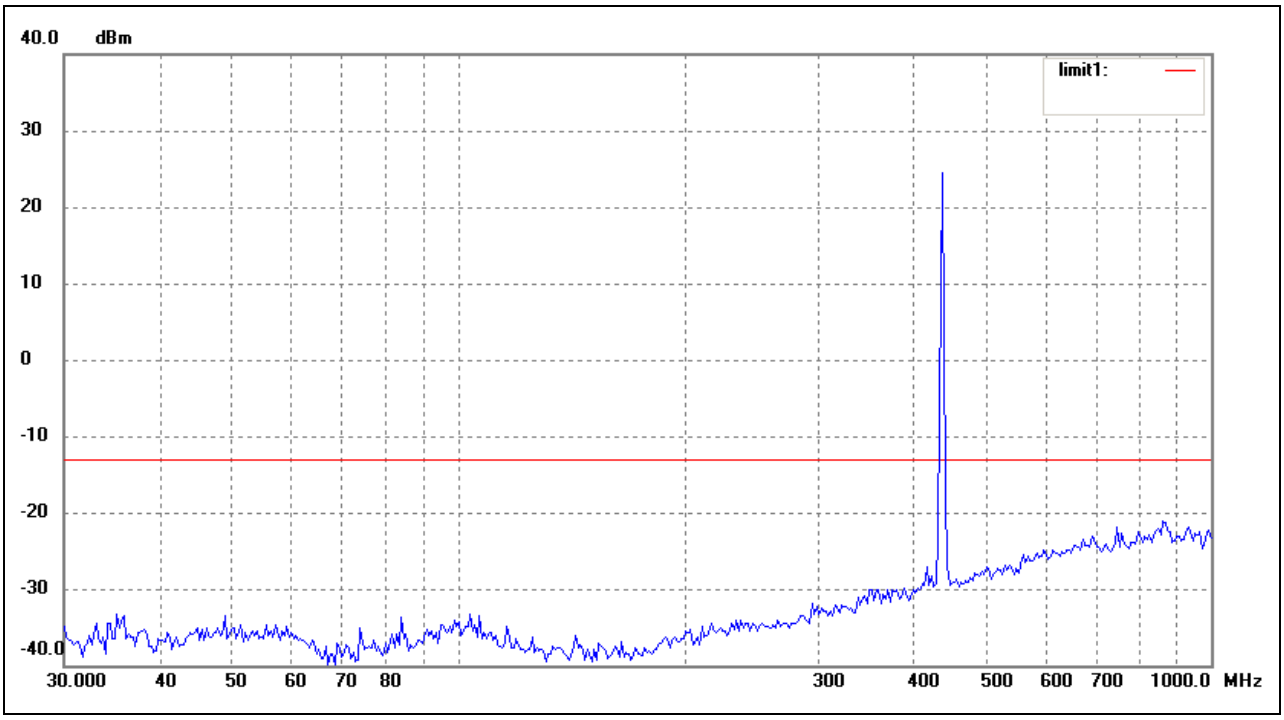


Vertical:

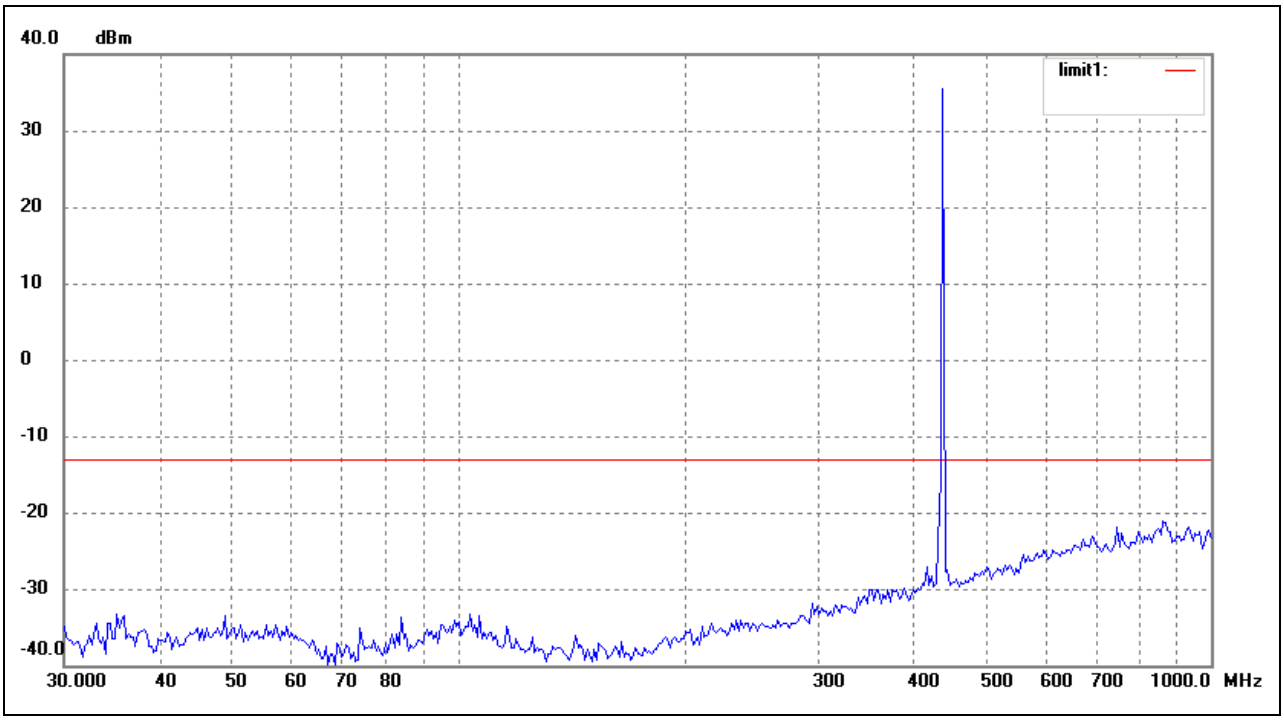


Wideband Middle Channel:

Horizontal:

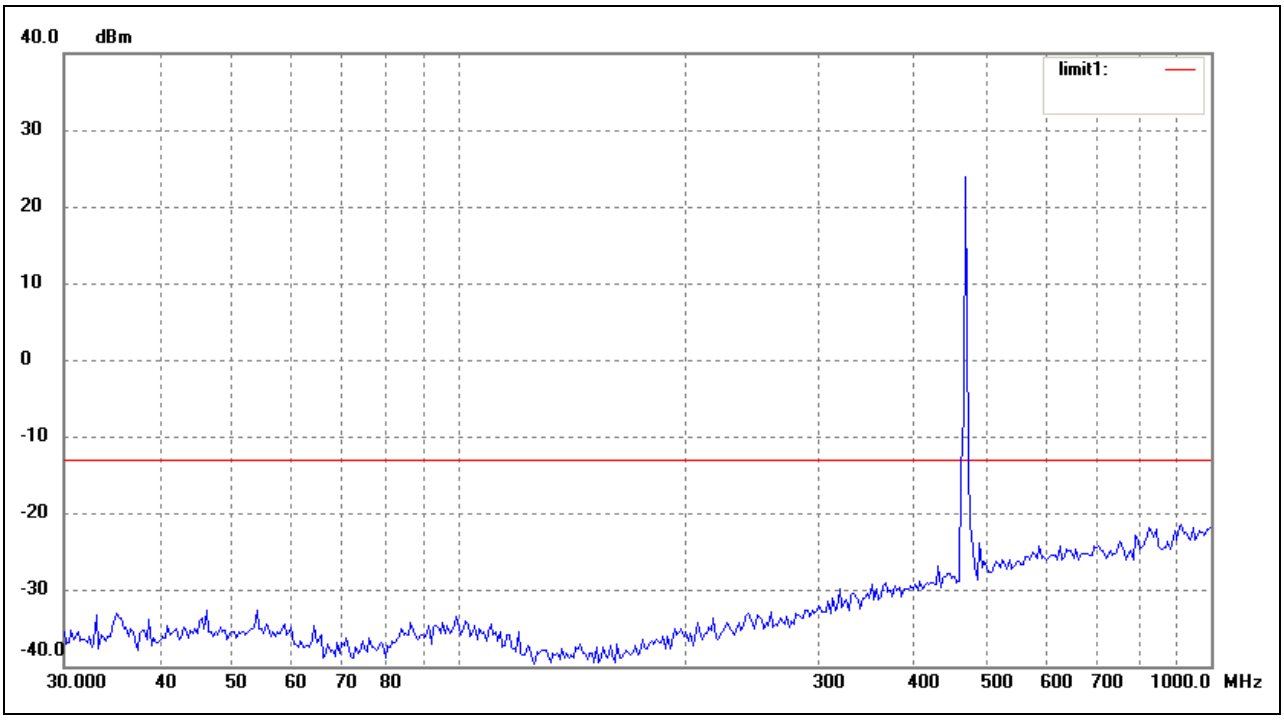


Vertical:

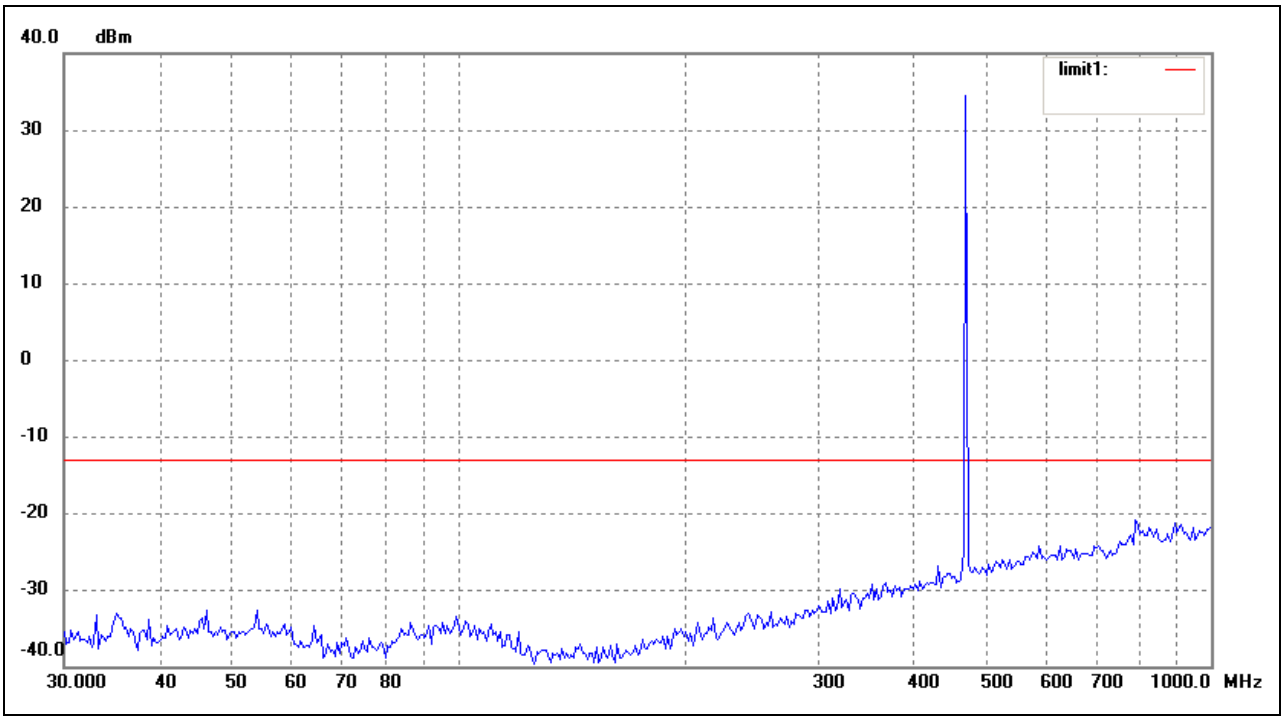


Wideband High Channel:

Horizontal:



Vertical:



Frequency	SG Reading	Height	Polar	Cable loss	Antenna Gain	Corrected Ampl.	FCC Part 90 Limit	FCC Part 90 Margin
MHz	dBm	Meter	H / V	dB	dB	dBm	dBm	dB
Narrowband-Low Channel								
812.25	-21.6	1.5	V	1.9	0	-23.5	-20	-3.5
812.25	-23.7	1.5	H	1.9	0	-25.6	-20	-5.6
1218.4	-32.9	1	V	2.5	7.2	-35.4	-20	-15.4
1218.4	-36.05	1.5	H	2.5	7.2	-38.55	-20	-18.55
Narrowband-Middle Channel								
876.1	-22.55	1.5	V	2.1	0	-24.65	-20	-4.65
876.1	-26.89	1	H	2.1	0	-28.99	-20	-8.99
1314.2	-35.96	1.5	V	2.6	6.4	-38.56	-20	-18.56
1314.2	-37.62	1.5	H	2.6	6.4	-40.22	-20	-20.22
Narrowband-High Channel								
939.95	-23.56	1.5	V	2.1	0	-25.66	-20	-5.66
939.95	-25.44	1	H	2.1	0	-27.54	-20	-7.54
1409.9	-33.04	1.5	V	2.7	7.4	-35.74	-20	-15.74
1409.9	-36.29	1.2	H	2.7	7.4	-38.99	-20	-18.99
Wideband Low Channel								
812.25	-21.55	1.4	V	1.9	0	-23.45	-13	-10.45
812.25	-24.64	1.5	H	1.9	0	-26.54	-13	-13.54
1218.4	-33.14	1.5	V	2.5	7.2	-35.64	-13	-22.64
1218.4	-37.35	1.5	H	2.5	7.2	-39.85	-13	-26.85
Wideband Middle Channel								
876.1	-20.88	1.5	V	2.1	0	-22.98	-13	-9.98
876.1	-23.64	1	H	2.1	0	-25.74	-13	-12.74
1314.2	-33.05	1.4	V	2.6	6.4	-35.65	-13	-22.65
1314.2	-35.96	1.5	H	2.6	6.4	-38.56	-13	-25.56
Wideband High Channel								
939.95	-21.35	1	V	2.1	0	-23.45	-13	-10.45
939.95	-24.68	1.5	H	2.1	0	-26.78	-13	-13.78
1409.9	-32.77	1.4	V	2.7	7.4	-35.47	-13	-22.47
1409.9	-36.25	1.5	H	2.7	7.4	-38.95	-13	-25.95

Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics. Emissions undetected below the base noise are not reported.

8. §2.1051 and §90.210-SPURIOUS EMISSIONS AT ANTENNA TERMINALS

8.1 Standard Applicable

According to §2.1051and §90.210

For 25kHz bandwidth
On any frequency removed from the center of the assigned channel by more than 250 percent at least:
43 + 10 log (P) dB

For 12.5kHz bandwidth
On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

8.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2009-08-12	2010-08-11
Rohde & Schwarz	EMI Test Receiver	ESI26	830245/009	2009-08-12	2010-08-11
ETS	50 ohm Coaxial Cable	SUCOFLEX 104	25498514	2009-08-12	2010-08-11

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

8.3 Test Procedure

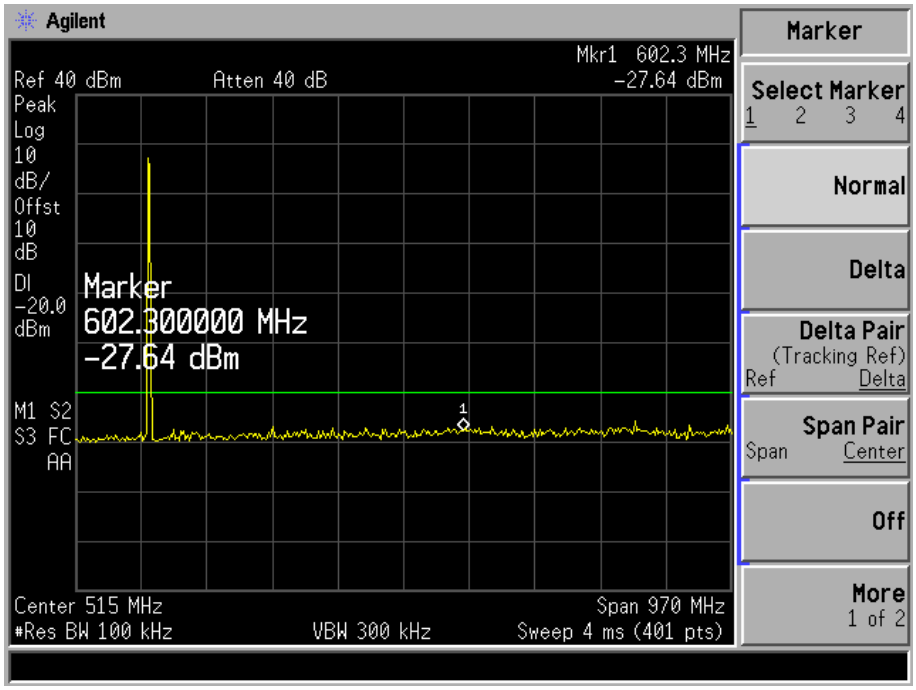
Connect a suitable artificial antenna properly, set the Low, Middle and High Transmitting Channel, observed the spurious emissions from antenna port, and then mark the higher-level emission for comparing with the rules.

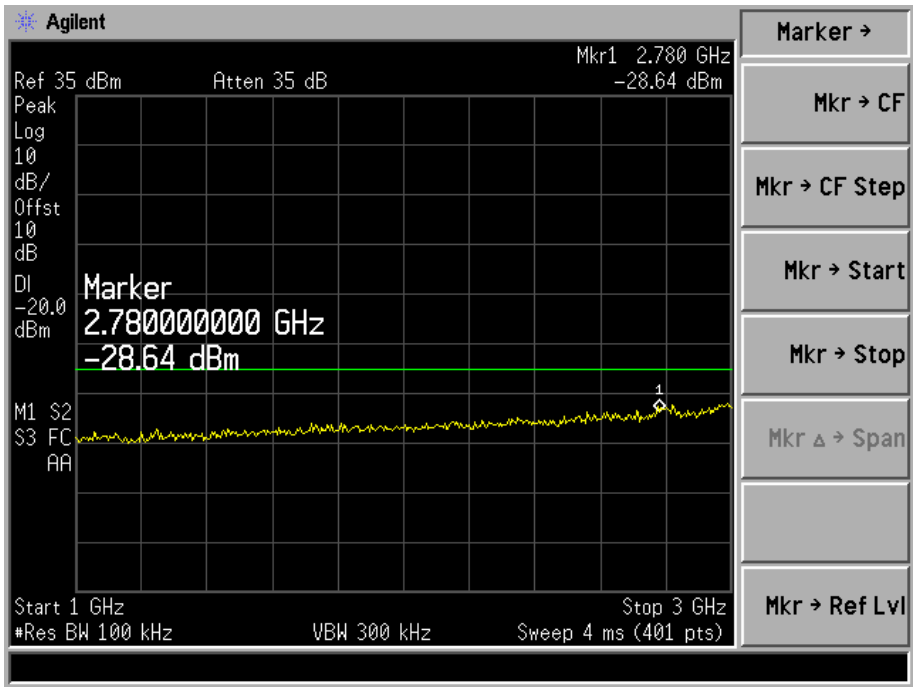
8.4 Summary of Test Results/Plots

Refer to the attached plots.

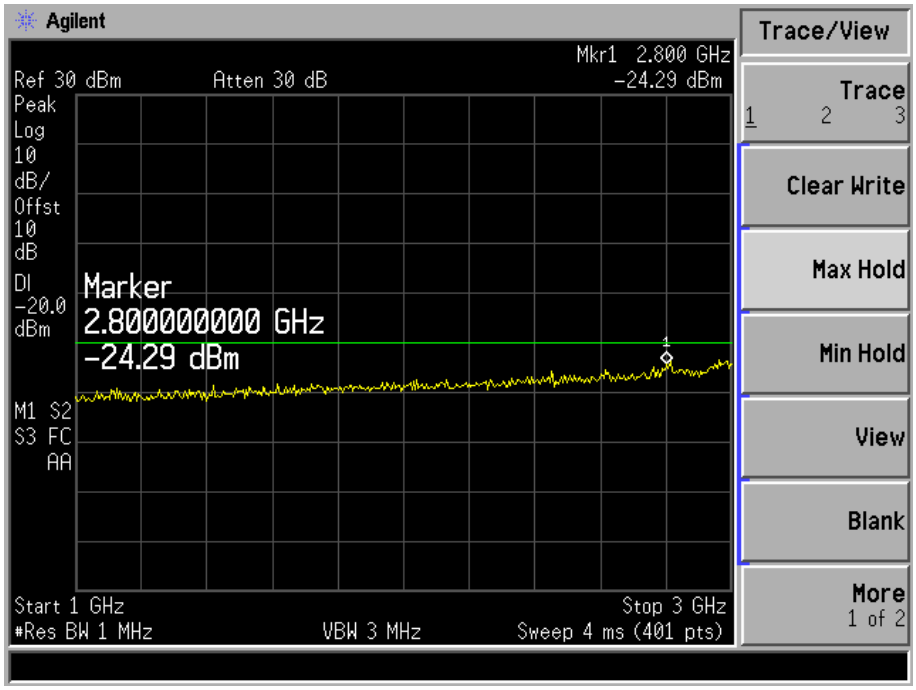
For VHF

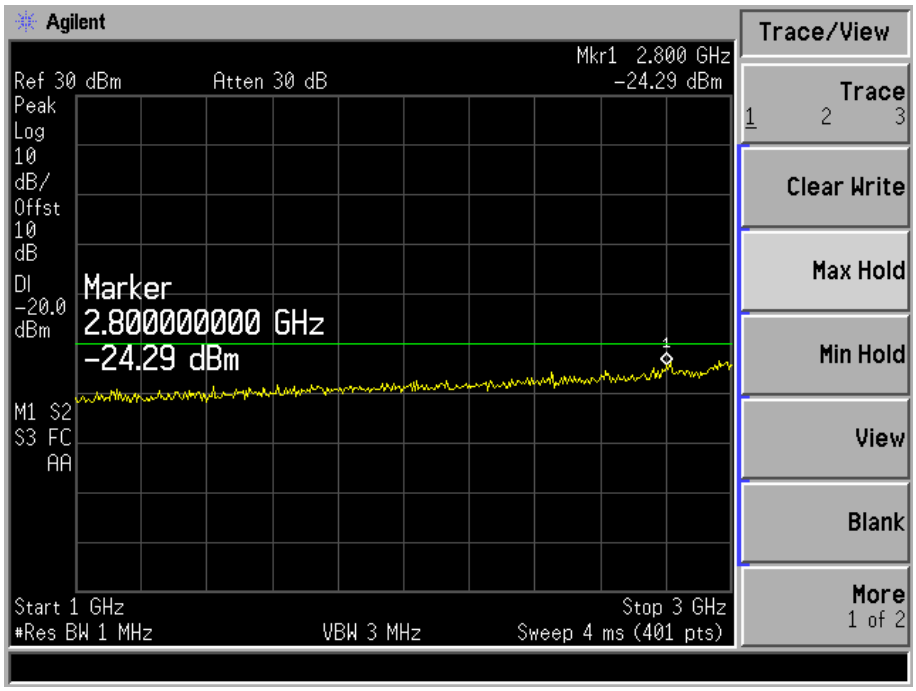
Narrowband-Low Channel:



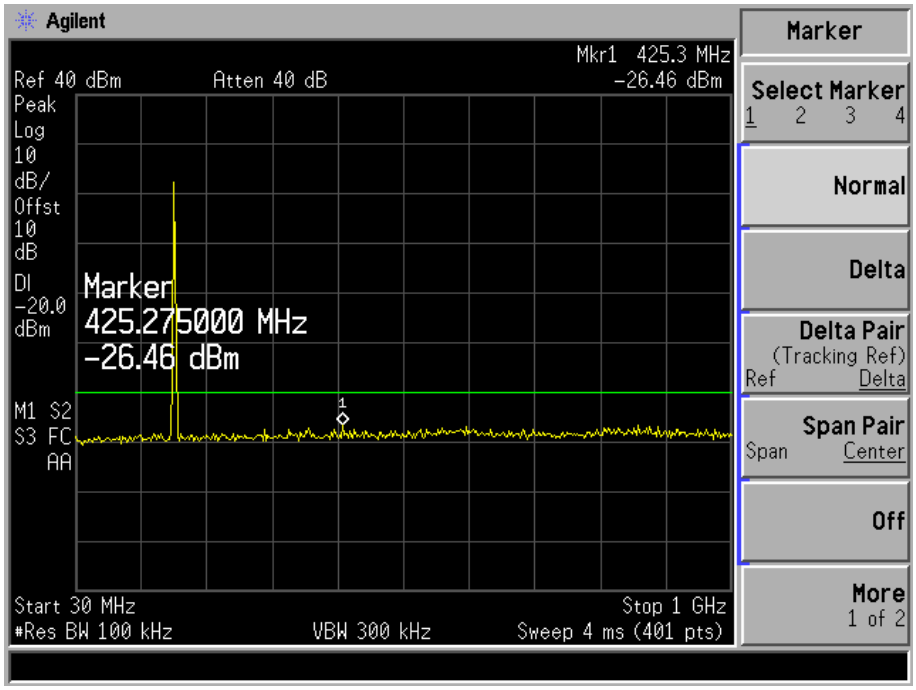


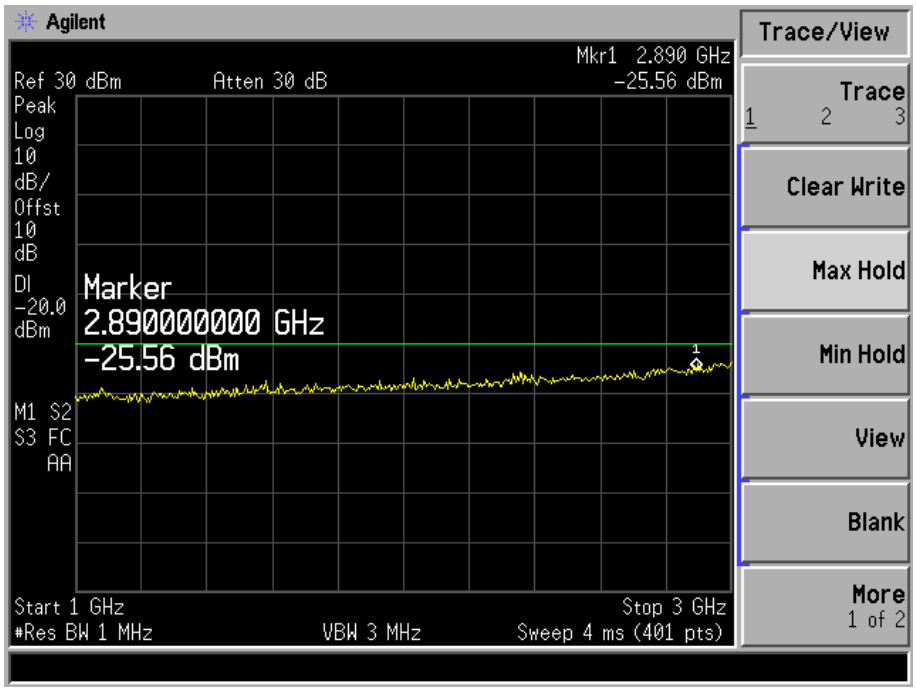
Narrowband-Middle Channel:



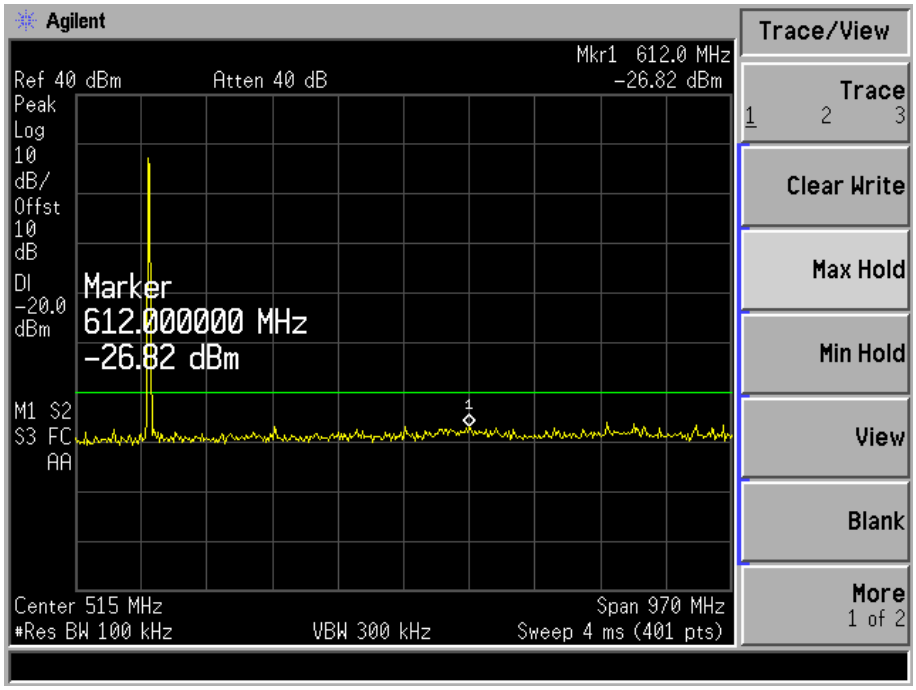


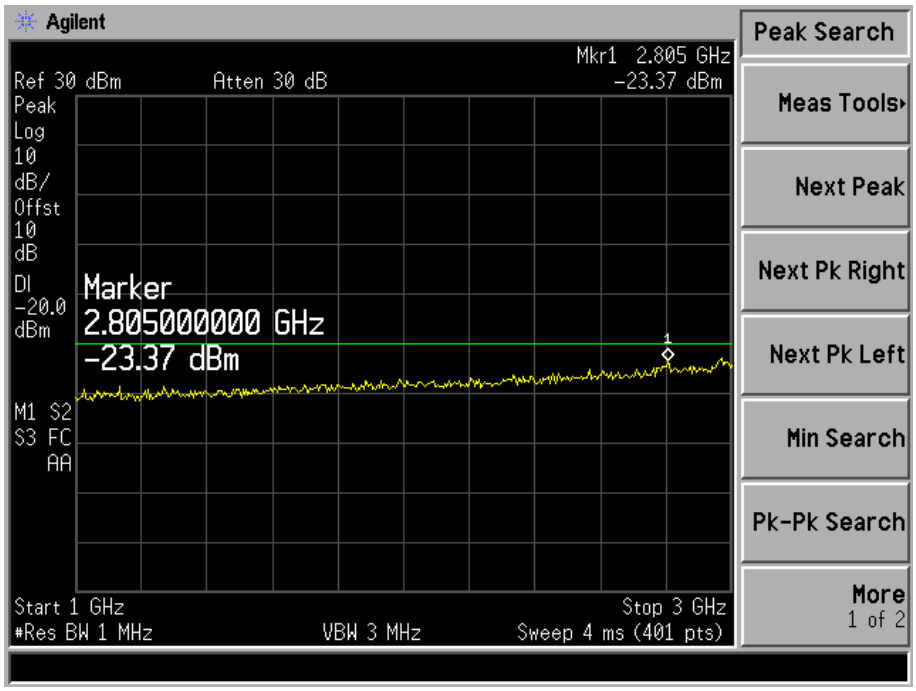
Narrowband-High Channel:



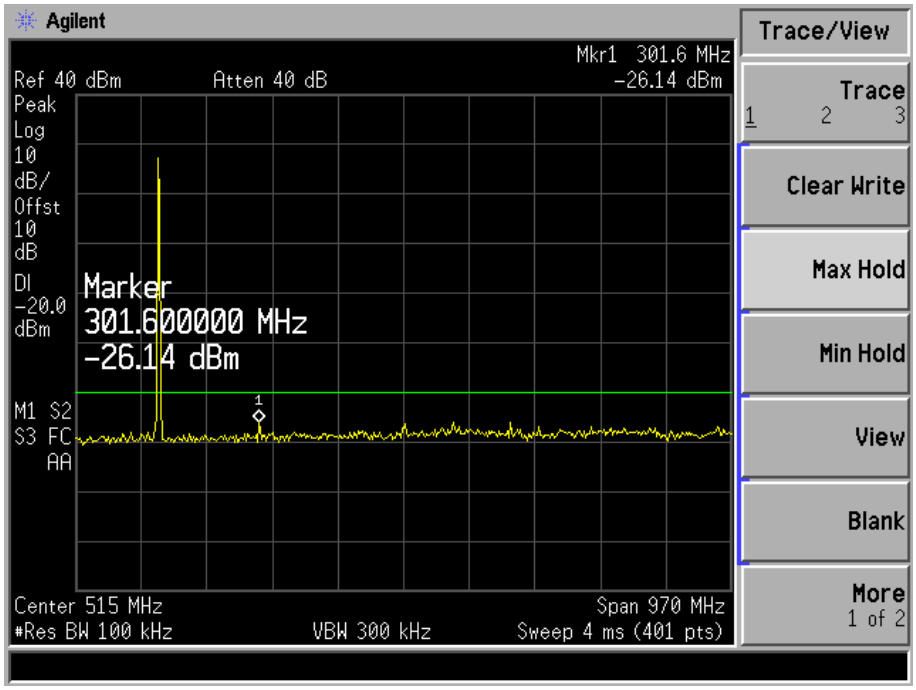


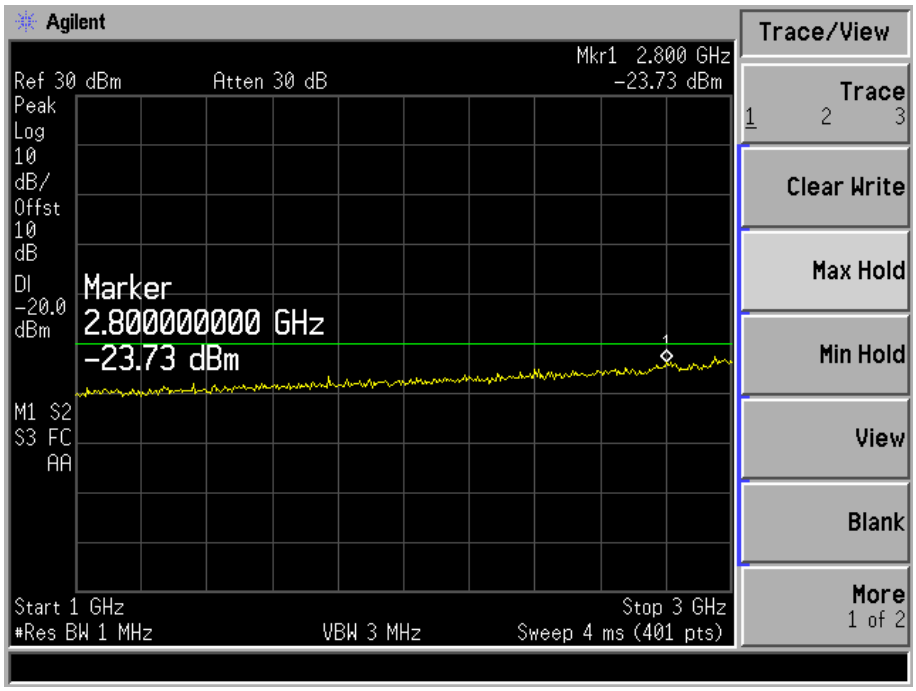
Wideband-Low Channel



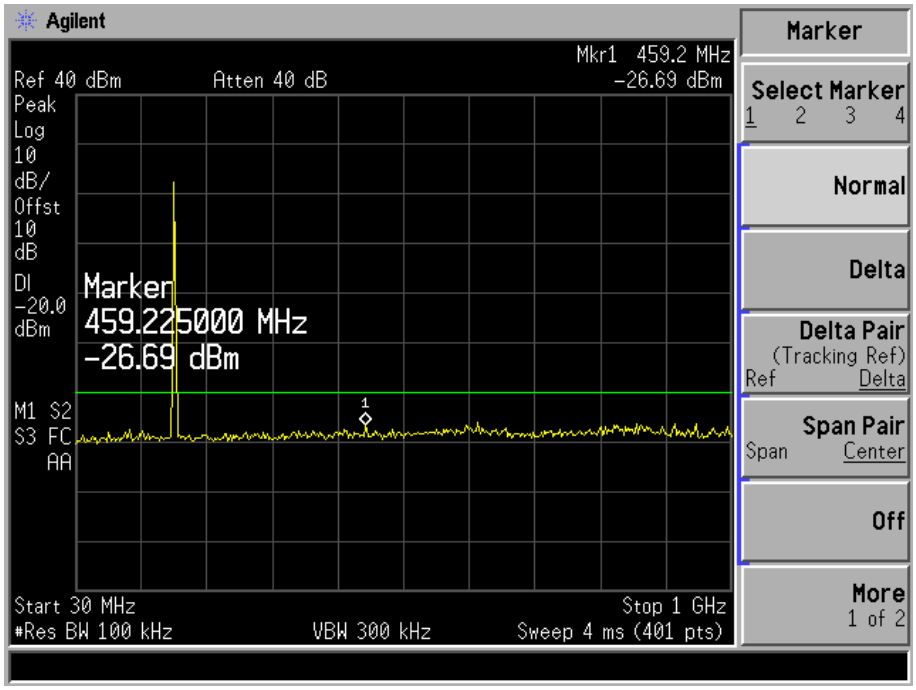


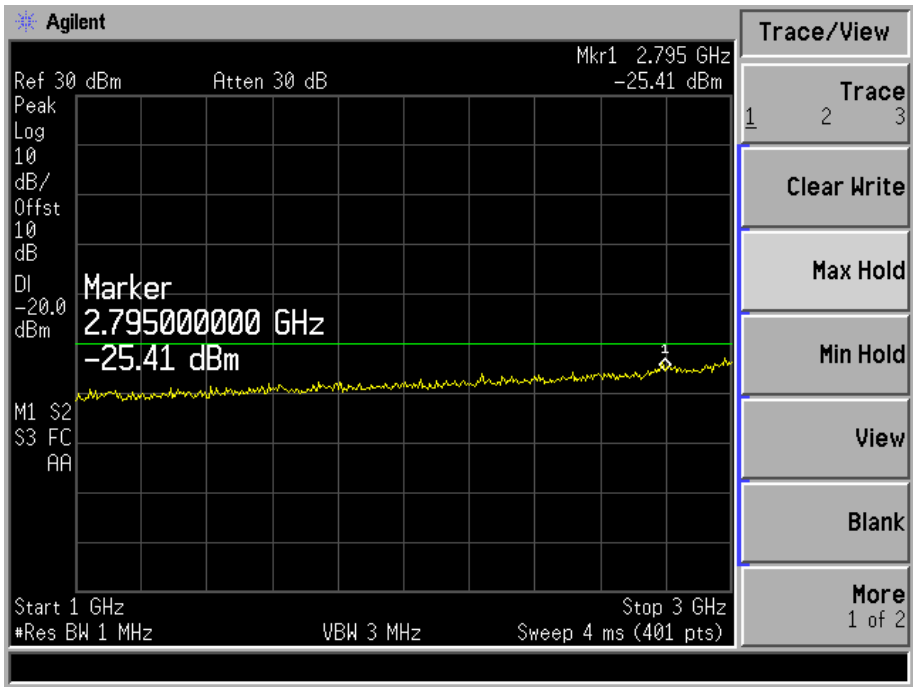
Wideband-Middle Channel





Wideband-High Channel

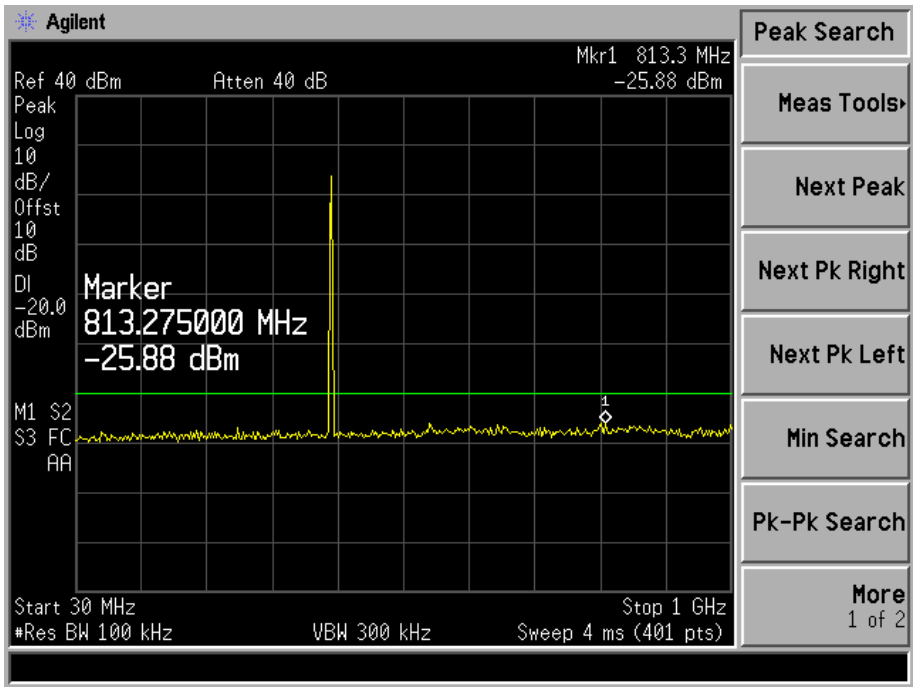


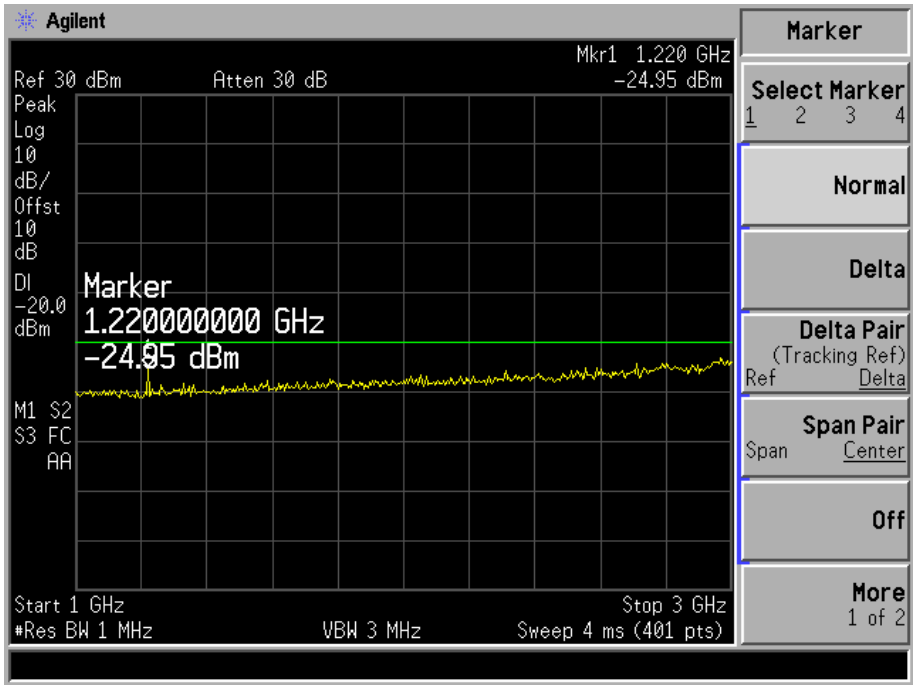


Note: Emissions up to 5th harmonics is close to the base noise, checking through radiated strength fields. There is no peak detected when EUT is operating in Standby mode.

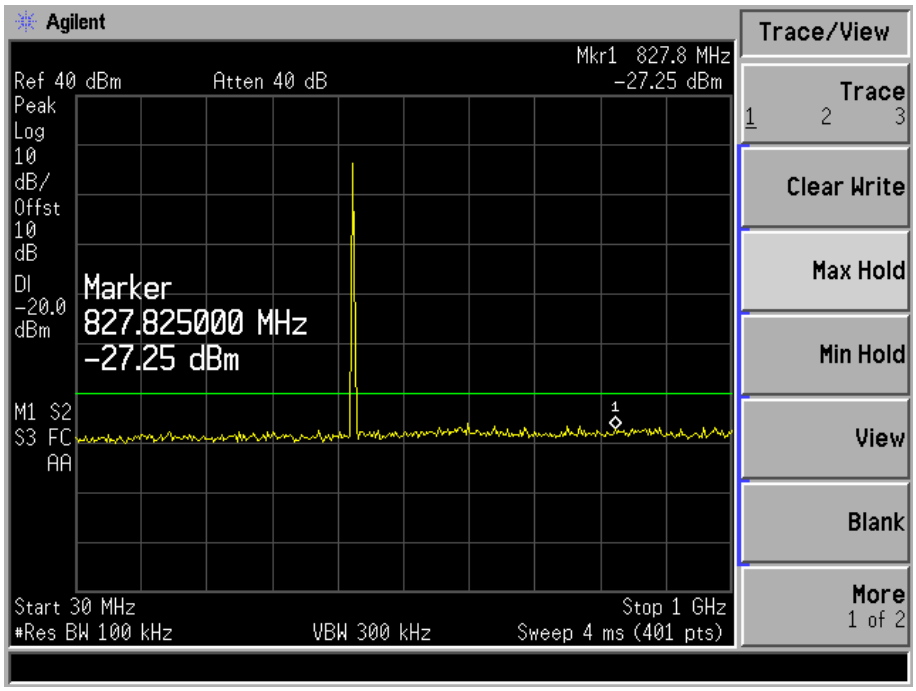
For UHF

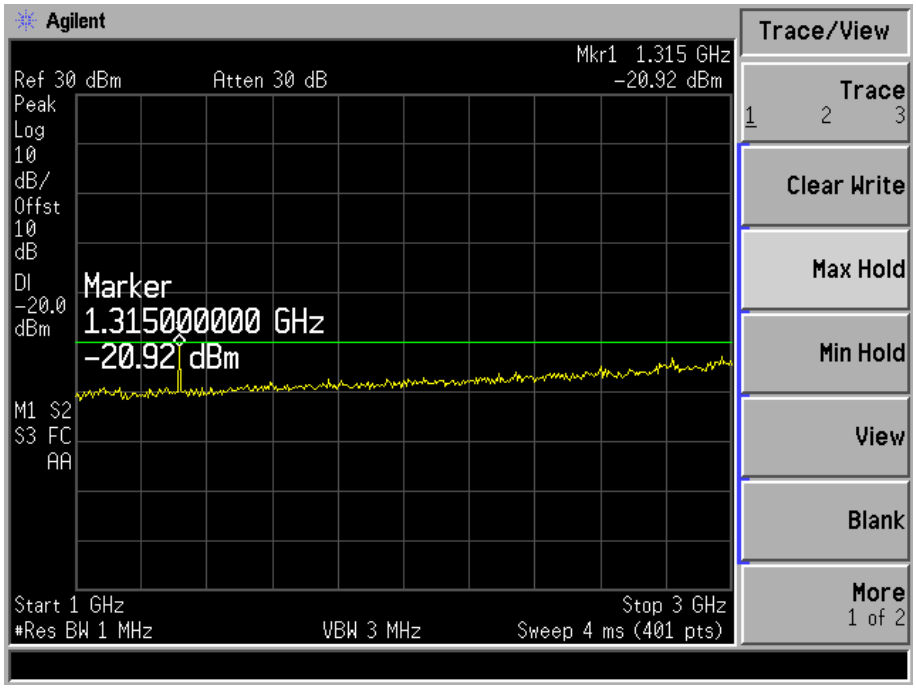
Narrowband-Low Channel:



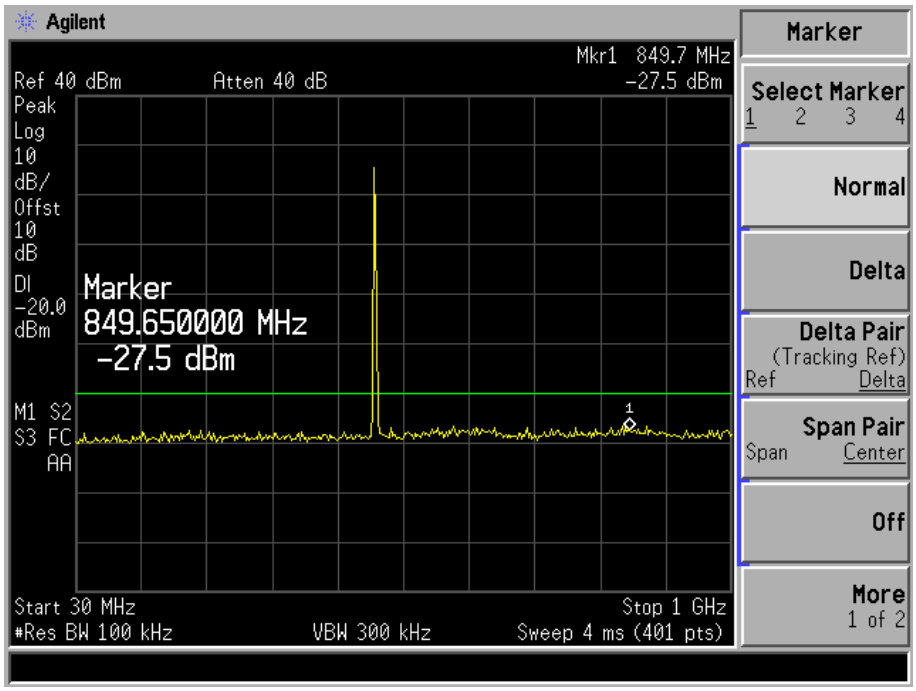


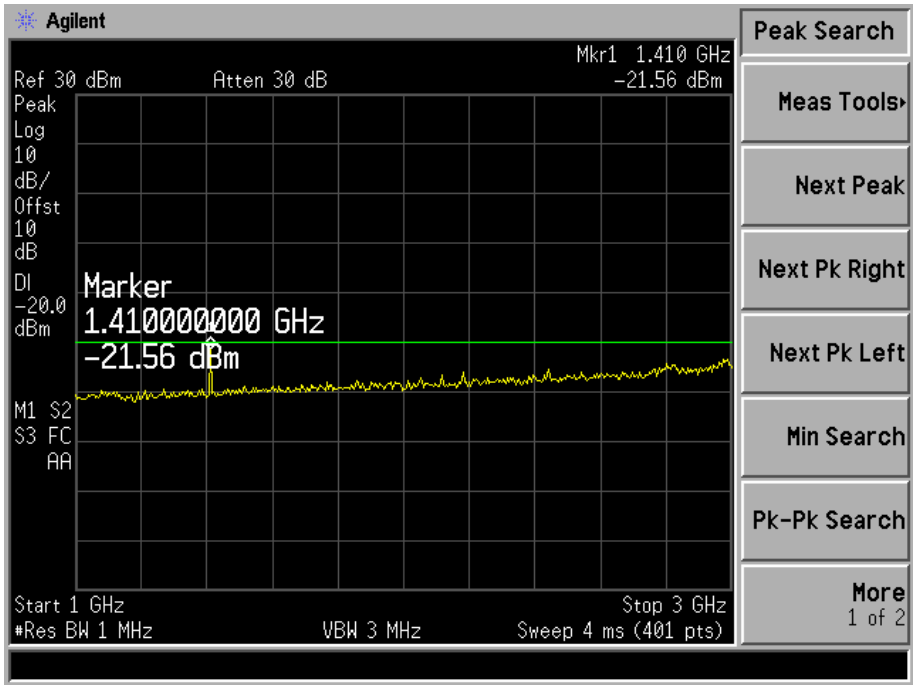
Narrowband-Middle Channel:



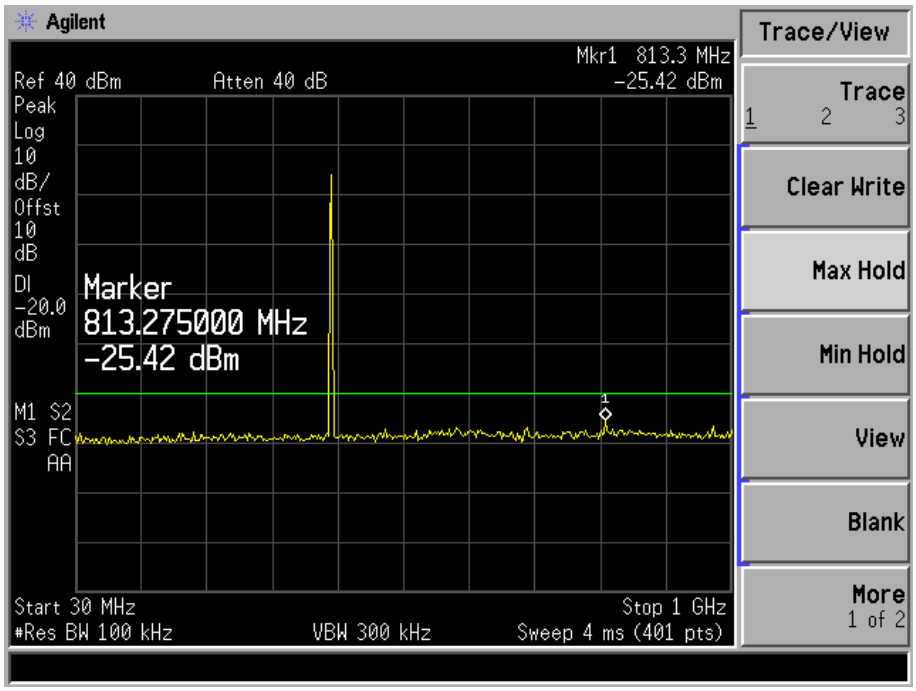


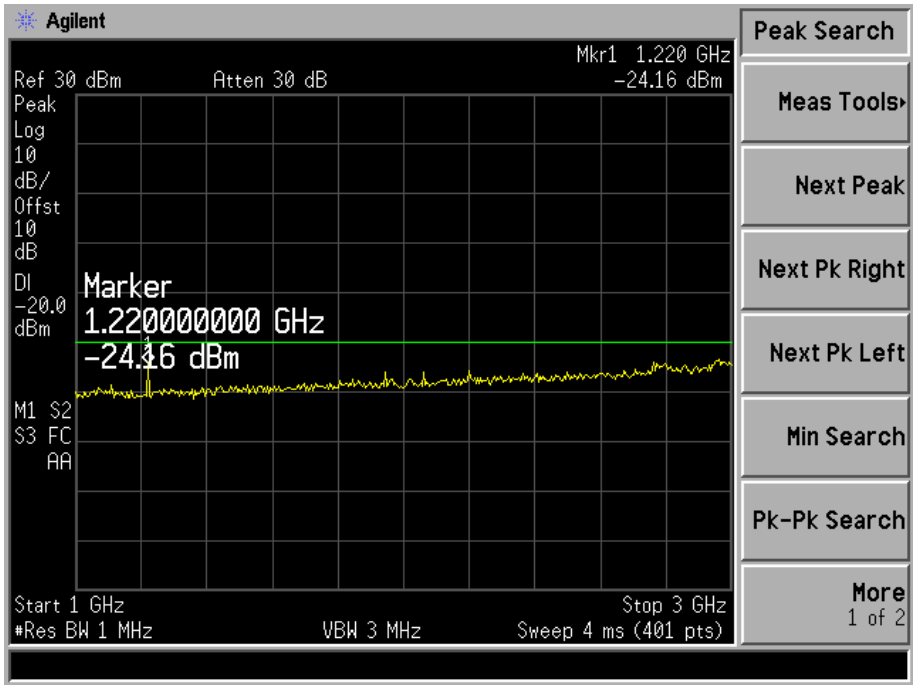
Narrowband-High Channel:



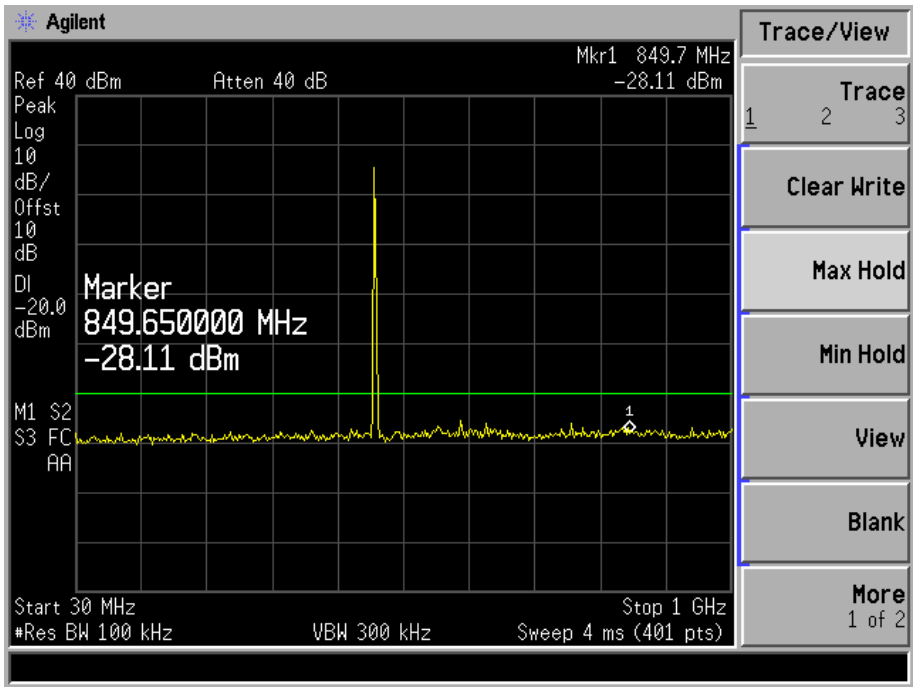


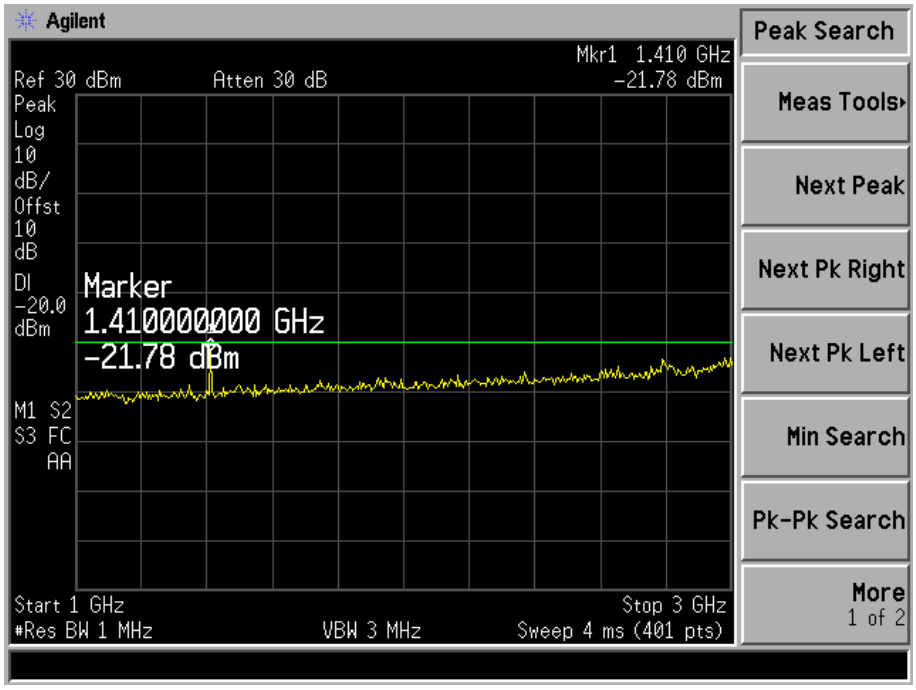
Wideband-Low Channel



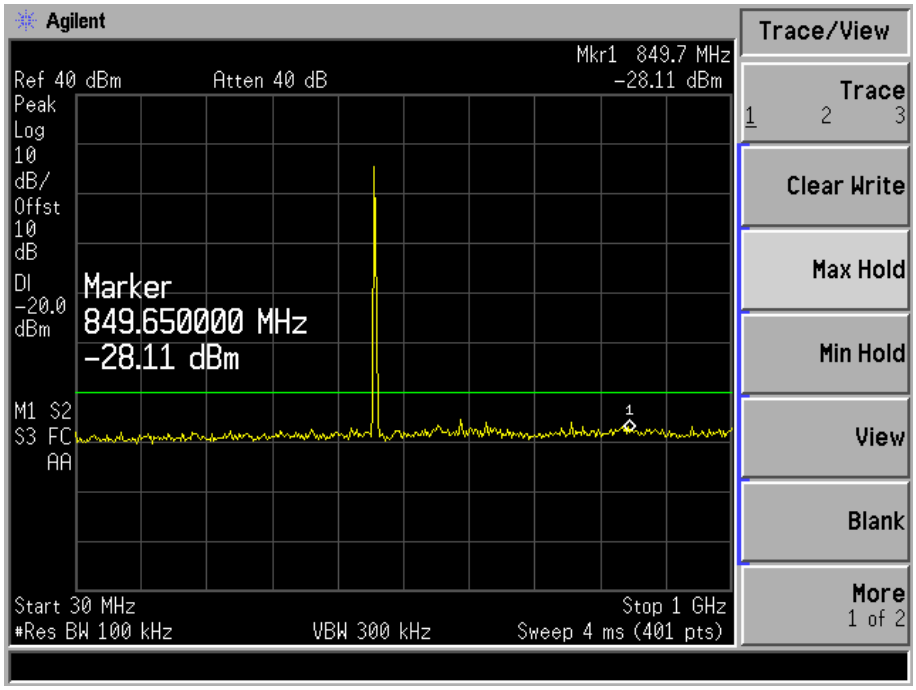


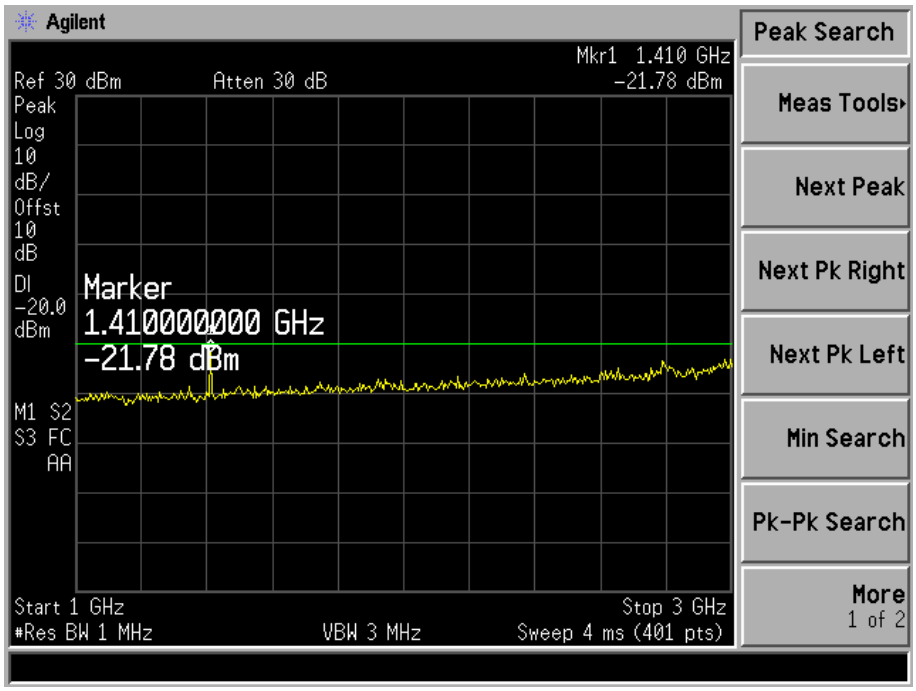
Wideband-Middle Channel





Wideband-High Channel





Note: Emissions up to third harmonics is close to the base noise, checking through radiated strength fields. There is no peak detected when EUT is operating in Standby mode.

9. §2.1055 (d) and §90.213- FREQUENCY STABILITY

9.1 Standard Applicable

According to FCC §2.1055 (d) and §90.213.
For output power > 2 watts, the limit is 5.0ppm.

9.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2009-08-12	2010-08-11
Atten	Attenuator	DC-4GHz	ATS100-4-20	2009-08-12	2010-08-11
GONGWEN	Moisture Test Chamber	GDS-150	SEMT-0013	2009-08-12	2010-08-11

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

9.3 Test Procedure

1. Setup the configuration of the ambient temperature form -30ºC to 50ºC with sufficient time. And measure the different power of the EUT with an artificial power from highest to end point voltage.
2. Active the Analyzer frequency counter option, center frequency to the right frequency needs to be measured.

9.4 Test Results/Plots

For VHF

For Narrowband

Test Conditions		PPM Error		
		Low CH (136.125MHz)	Middle CH (150.125MHz)	High CH (173.875MHz)
T_{nom}(22°C)	V_{nom}(7.40V)	+0.24	+0.27	+0.27
T_{min}(-30°C)	V_{nom}(7.40V)	+0.25	+0.23	+0.25
T_{min}(-20°C)	V_{nom}(7.40V)	+0.23	+0.24	+0.24
T_{min}(-10°C)	V_{nom}(7.40V)	+0.22	+0.25	+0.23
T_{min}(0°C)	V_{nom}(7.40V)	+0.26	+0.23	+0.23
T_{max}(+30°)	V_{nom}(7.40V)	+0.25	+0.24	+0.23
T_{max}(+40°)	V_{nom}(7.40V)	+0.24	+0.28	+0.25
T_{max}(+50°)	V_{nom}(7.40V)	+0.27	+0.27	+0.27
Max. frequency error (ppm)		+0.27	+0.28	+0.27
Limit		±5.0ppm		
End Point		DC 6.42V		

For Wideband

Test Conditions		PPM Error		
		Low CH (136.125MHz)	Middle CH (150.125MHz)	High CH (173.875MHz)
T_{nom}(22°C)	V_{nom}(7.40V)	+0.31	+0.33	+0.33
T_{min}(-30°C)	V_{nom}(7.40V)	+0.30	+0.33	+0.32
T_{min}(-20°C)	V_{nom}(7.40V)	+0.33	+0.32	+0.33
T_{min}(-10°C)	V_{nom}(7.40V)	+0.32	+0.31	+0.34
T_{min}(0°C)	V_{nom}(7.40V)	+0.33	+0.34	+0.31
T_{max}(+30°)	V_{nom}(7.40V)	+0.35	+0.33	+0.33
T_{max}(+40°)	V_{nom}(7.40V)	+0.34	+0.31	+0.32
T_{max}(+50°)	V_{nom}(7.40V)	+0.34	+0.30	+0.32
Max. frequency error (ppm)		+0.35	+0.33	+0.34
Limit		±5.0ppm		
End Point		DC 6.42V		

For UHF

For Narrowband

Test Conditions		PPM Error		
		Low CH (406.125MHz)	Middle CH (440.050MHz)	High CH (469.975MHz)
T_{nom}(22°C)	V_{nom}(7.40V)	+0.23	+0.26	+0.27
T_{min}(-30°C)	V_{nom}(7.40V)	+0.22	+0.25	+0.25
T_{min}(-20°C)	V_{nom}(7.40V)	+0.24	+0.22	+0.26
T_{min}(-10°C)	V_{nom}(7.40V)	+0.22	+0.23	+0.26
T_{min}(0°C)	V_{nom}(7.40V)	+0.25	+0.26	+0.24
T_{max}(+30°)	V_{nom}(7.40V)	+0.26	+0.27	+0.27
T_{max}(+40°)	V_{nom}(7.40V)	+0.27	+0.26	+0.29
T_{max}(+50°)	V_{nom}(7.40V)	+0.25	+0.28	+0.28
Max. frequency error (ppm)		+0.27	+0.27	+0.29
Limit		±5.0ppm		
End Point		DC 6.42V		

For Wideband

Test Conditions		PPM Error		
		Low CH (406.125MHz)	Middle CH (440.050MHz)	High CH (469.975MHz)
T_{nom}(22°C)	V_{nom}(7.40V)	+0.35	+0.36	+0.34
T_{min}(-30°C)	V_{nom}(7.40V)	+0.34	+0.37	+0.35
T_{min}(-20°C)	V_{nom}(7.40V)	+0.34	+0.35	+0.34
T_{min}(-10°C)	V_{nom}(7.40V)	+0.37	+0.36	+0.33
T_{min}(0°C)	V_{nom}(7.40V)	+0.36	+0.35	+0.36
T_{max}(+30°)	V_{nom}(7.40V)	+0.35	+0.36	+0.34
T_{max}(+40°)	V_{nom}(7.40V)	+0.38	+0.37	+0.33
T_{max}(+50°)	V_{nom}(7.40V)	+0.39	+0.35	+0.36
Max. frequency error (ppm)		+0.39	+0.37	+0.36
Limit		±5.0ppm		
End Point		DC 6.42V		

10. §90.214-TRANSIENT FREQUENCY BEHAVIOR

10.1 Standard Applicable

According to FCC §90.214, Transmitters designed to operate in the 150–174 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Transient Frequency Behavior for Equipment Designed to Operate on 12.5kHz or 25 kHz Channels:

t1	±25.0 kHz	5.0 ms	10.0 ms
t2.....	±12.5 kHz	20.0 ms	25.0 ms
t3…….....	±25.0 kHz	5.0 ms	10.0 ms

10.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Modulation Analyzer	Rohde & Schwarz	FAM 54	334.2015.54	2009-08-12	2010-08-11
Attenuator	Atten	DC-4GHz	ATS100-4-20	2009-08-12	2010-08-11
Audio Generator	MEILI	MFG-3005	200612187	2009-08-12	2010-08-11
Signal Generator	Rohde & Schwarz	SMR20	100047	2009-08-12	2010-08-11
Oscilloscope	Agilent	DSO3102A	CN45002725	2009-08-12	2010-08-11
Spectrum Analyzer	Agilent	E4402B	US41192821	2009-08-12	2010-08-11

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

10.3 Test Procedure

Test is carried under TIA/EIA-603 §2.2.19

10.4 Test Results/Plots

For VHF

For Narrowband channel separation=12.5KHz. Worse case as below.

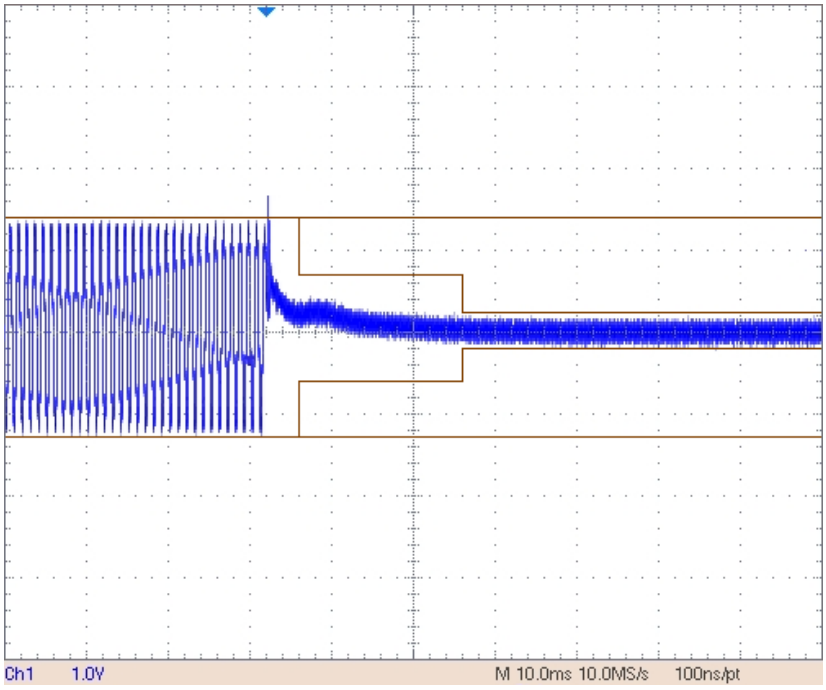
Operation Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency
150.125	12.5	<5	+/-12.5 kHz
		<20	+/-6.25 kHz
		<5	+/-12.5kHz

For wideband channel separation=25KHz. Worse case as below.

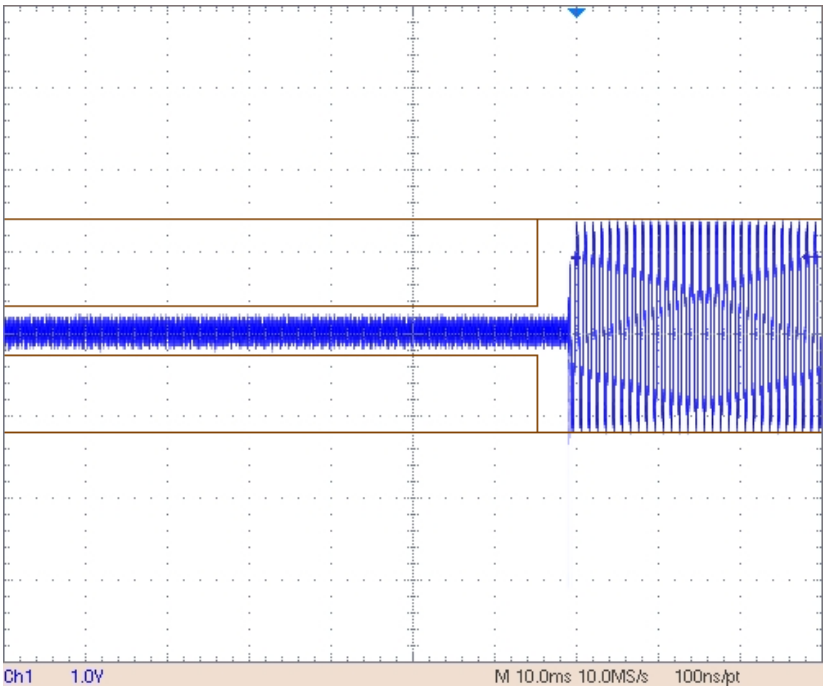
Operation Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency
150.125	25	<5	+/-25.0 kHz
		<20	+/-12.5 kHz
		<5	+/-25.0kHz

For Narrowband

TRANSIENT FREQUENCY BEHAVIOR-On

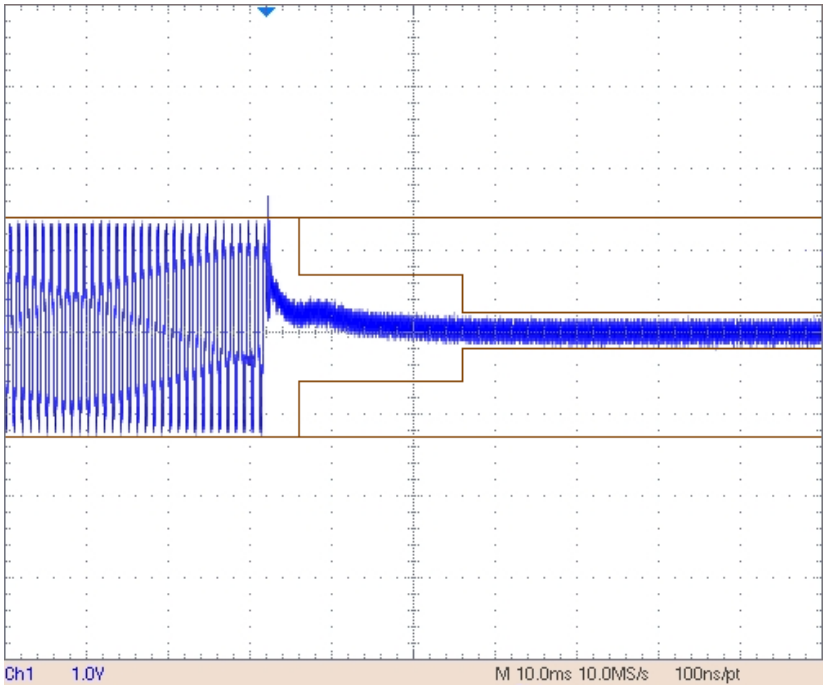


TRANSIENT FREQUENCY BEHAVIOR-Off

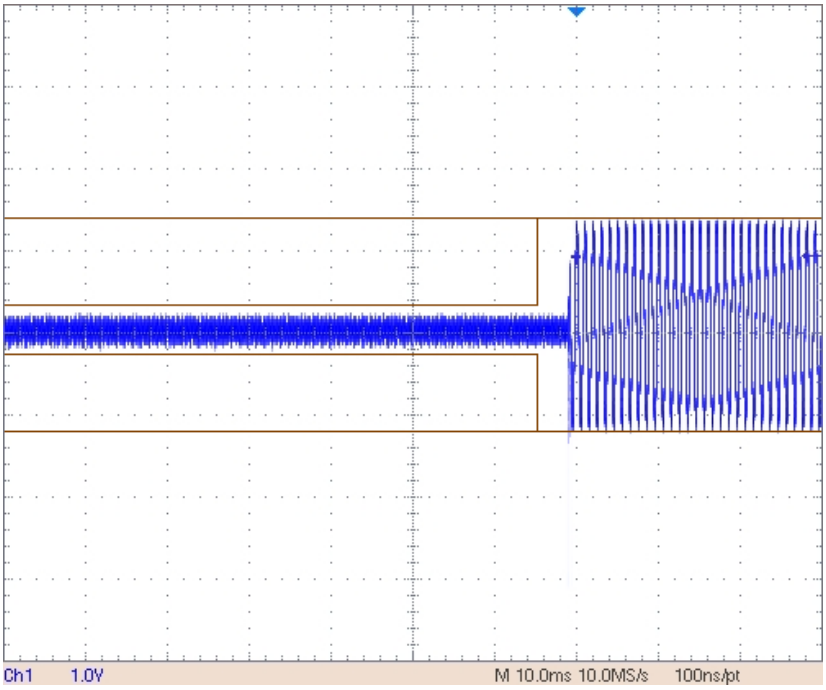


For Wideband

TRANSIENT FREQUENCY BEHAVIOR-On



TRANSIENT FREQUENCY BEHAVIOR-Off



For UHF

For Narrowband channel separation=12.5KHz. Worse case as below.

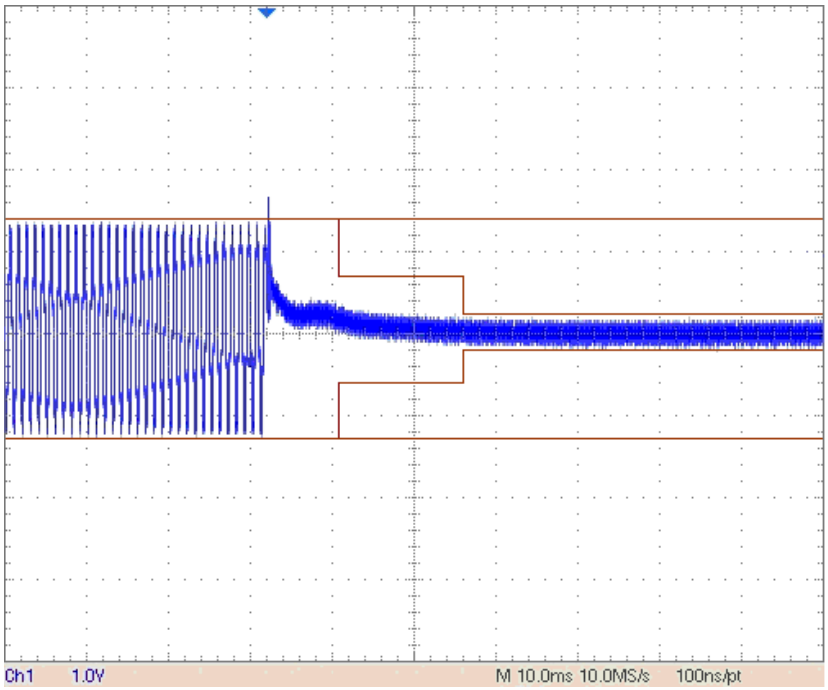
Operation Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency
438.050	12.5	<10	+/-12.5 kHz
		<25	+/-6.25 kHz
		<10	+/-12.5kHz

For wideband channel separation=25KHz. Worse case as below.

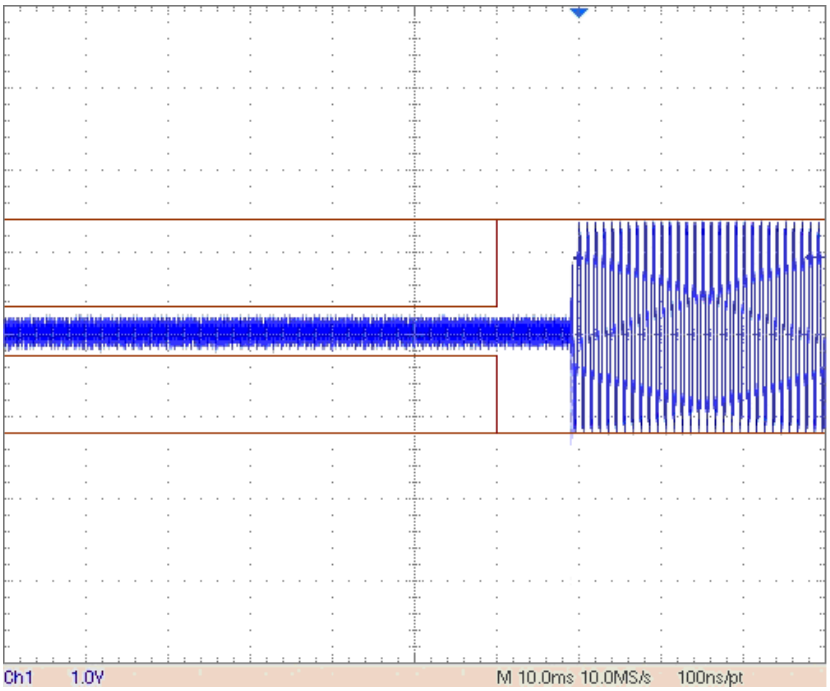
Operation Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency
438.050	25	<10	+/-25.0 kHz
		<25	+/-12.5 kHz
		<10	+/-25.0kHz

For Narrowband

TRANSIENT FREQUENCY BEHAVIOR-On

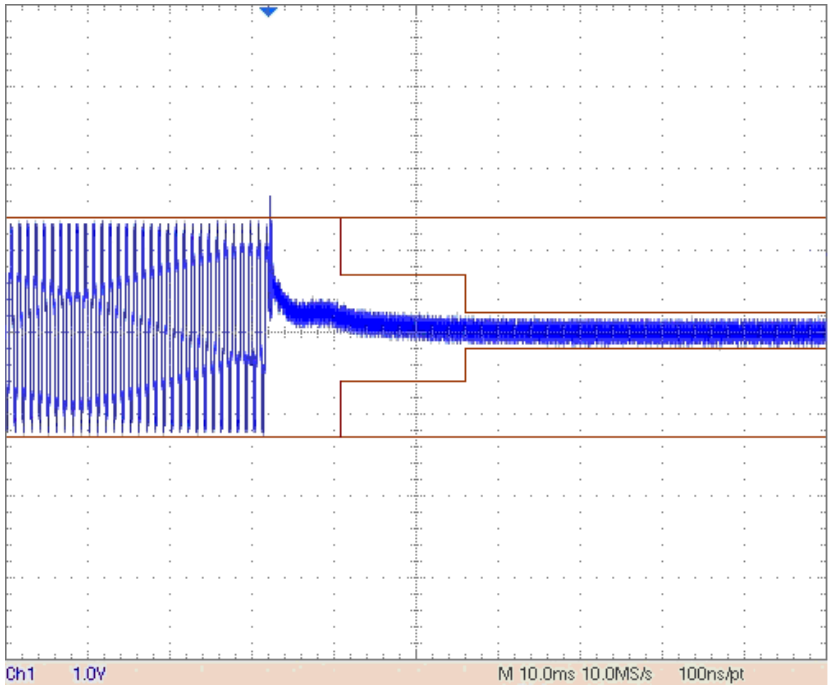


TRANSIENT FREQUENCY BEHAVIOR-Off

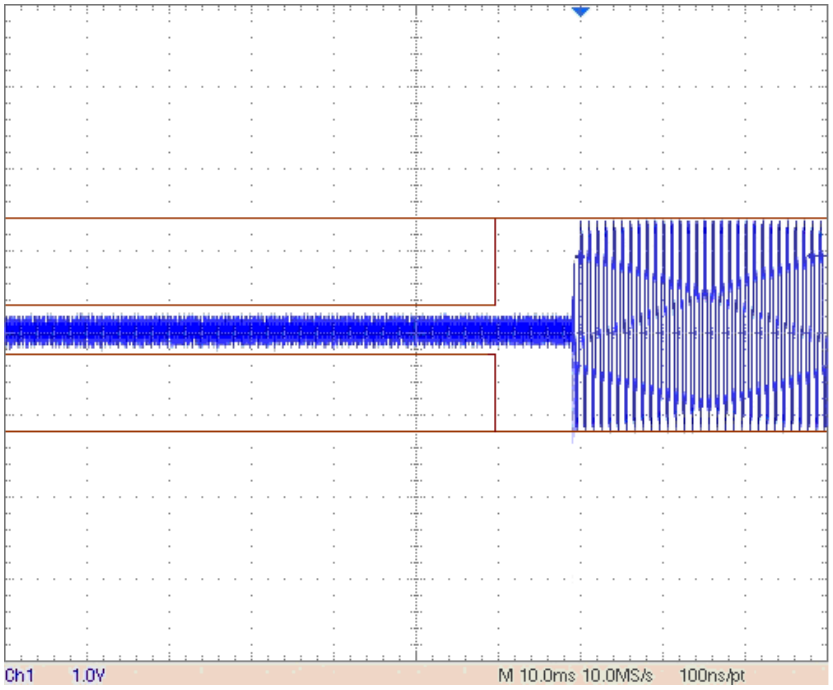


For Wideband

TRANSIENT FREQUENCY BEHAVIOR-On



TRANSIENT FREQUENCY BEHAVIOR-Off



******* END OF REPORT *******