

**FCC PART 90
MEASUREMENT AND TEST REPORT
FOR**

UNIER TECHNOLOGY CO., LTD.

5F, Huahan Innovation Park, Building D, Keyuan Roa, Shenzhen, China

FCC ID: UTLF6

Report Concerns: Original Report	Equipment Type: Two-way Radio
Model: F6	
Report No.: <u>STR07108012I</u>	
Test/Witness Engineer: <u>Lahm Peng</u>	
Test Date: <u>2007-10-15</u>	
Prepared By: Shenzhen SEM.Test Compliance Service Co., Ltd Room 609-610, Baotong Building, Baomin 1 st Road, Baoan District, Shenzhen, Guangdong, P.R.C. (518133)	
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 permission by SEM.Test Compliance Service Co., Ltd.

TABLE OF CONTENTS

1. GENERAL INFORMATION	4
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	4
1.2 TEST STANDARDS.....	4
1.3 RELATED SUBMITTAL(S)/GRANT(S)	4
1.4 TEST METHODOLOGY	5
1.5 TEST FACILITY	5
1.6 EUT EXERCISE SOFTWARE	5
1.7 ACCESSORIES EQUIPMENT LIST AND DETAILS	5
1.8 EUT CABLE LIST AND DETAILS	5
2. SUMMARY OF TEST RESULTS	6
3. §2.1046-CONDUCTED OUTPUT POWER.....	7
3.1 STANDARD APPLICABLE.....	7
3.2 TEST EQUIPMENT LIST AND DETAIL.....	7
3.3 TEST PROCEDURE.....	7
3.4 TEST RESULT/PLOTS	7
4. §2.1046, AND §90.205-RADIATED OUTPUT POWER (E.I.R.P.).....	11
4.1 STANDARD APPLICABLE.....	11
4.2 TEST EQUIPMENT LIST AND DETAIL.....	11
4.3 TEST PROCEDURE.....	11
4.4 TEST RESULT.....	12
5. §2.1047, AND §90.207-MODULATION CHARACTERISTICS.....	13
5.1 STANDARD APPLICABLE.....	13
5.2 TEST EQUIPMENT LIST AND DETAILS	13
5.3 TEST PROCEDURE.....	13
5.4 ENVIRONMENTAL CONDITIONS	13
5.5 TEST RESULTS/PLOTS.....	14
6. §2.1049 AND §90.209 - OCCUPIED BANDWIDTH OF EMISSION.....	17
6.1 STANDARD APPLICABLE.....	17
6.2 TEST EQUIPMENT LIST AND DETAILS	17
6.3 TEST PROCEDURE.....	18
6.4 TEST RESULTS/MASKS	18
7. 2.1053 AND §90.210- RADIATED SPURIOUS EMISSION	26
7.1 MEASUREMENT UNCERTAINTY	26
7.2 STANDARD APPLICABLE.....	26
7.3 TEST EQUIPMENT LIST AND DETAILS	26
7.4 TEST PROCEDURE	27
7.5 ENVIRONMENTAL CONDITIONS	27
7.6 SUMMARY OF TEST RESULTS/PLOTS	27
8. §2.1051 AND §90.210-SPURIOUS EMISSIONS AT ANTENNA TERMINALS	29
8.1 STANDARD APPLICABLE.....	29
8.2 TEST EQUIPMENT LIST AND DETAILS	29
8.3 TEST PROCEDURE	29
8.4 SUMMARY OF TEST RESULTS/PLOTS	29
9. §2.1055 (D) AND §90.213- FREQUENCY STABILITY	33
9.1 STANDARD APPLICABLE.....	33
9.2 TEST EQUIPMENT LIST AND DETAILS	33
9.3 TEST PROCEDURE	33
9.4 TEST RESULTS/PLOTS	33
10. §90.214-TRANSIENT FREQUENCY BEHAVIOR.....	35
10.1 STANDARD APPLICABLE.....	35
10.2 TEST EQUIPMENT LIST AND DETAILS	35
10.3 TEST PROCEDURE	35

10.4 TEST RESULTS/PLOTS.....	35
11. §1.1307 AND §2.1093-RF EXPOSURE EVALUATION	39
11.1 STANDARD APPLICABLE.....	39
11.2 MEASUREMENT RESULT:.....	39

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: UNIER TECHNOLOGY CO., LTD.
Address of applicant: 5F, Huahan Innovation Park, Building D, Keyuan Roa, Shenzhen, China

Manufacturer: UNIER TECHNOLOGY CO., LTD.
Address of manufacturer: 5F, Huahan Innovation Park, Building D, Keyuan Roa, Shenzhen, China

General Description of E.U.T

Items	Description
EUT Description:	Two-way Radio
Trade Name:	UNIER
Model No.:	F6 F8 F5 F3 F9
Rated Voltage:	DC 7.2V Battery
Rated Conducted Output Power:	4 W
Frequency Range:	136~174MHz
Channel Spacing:	12.5kHz/25kHz
Size:	12.0X5.6X3.8 cm
Antenna Length:	14.0 cm
For more information refer to the circuit diagram form and the user's manual.	

Note: The test data is gathered from a production sample, provided by the manufacturer, which the conducted output power is 3.9w. Test is carried out with Model F6 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 UNIER TECHNOLOGY 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 and 12.5kHz Narrowband specifications since EUT is designed with 25kHz/12.5kHz channel bandwidth. For more detail refer to the Operating Instructions.

1.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

United States of American Federal Communications Commission (**FCC**), and the registration number is **556682**
Certification and Engineering Bureau of Industry Canada for radio equipment testing with the registration number is **6002**.

All measurement required was performed at laboratory of SGS-CSTC Standards Technical Services Co., Ltd., No.1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China.

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 EUT is keep transmitting.

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
DC Power Cable	1.75	Unshielded	Without Core

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	2007-06-30	2008-06-29
Atten	Attenuator	DC-4GHz	ATS100-4-20	2007-06-30	2008-06-29
VICTOR	Multimeter	VC9801A	98965350	2007-06-30	2008-06-29
FLUKE	Multimeter	15B	91280239	2007-06-30	2008-06-29

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

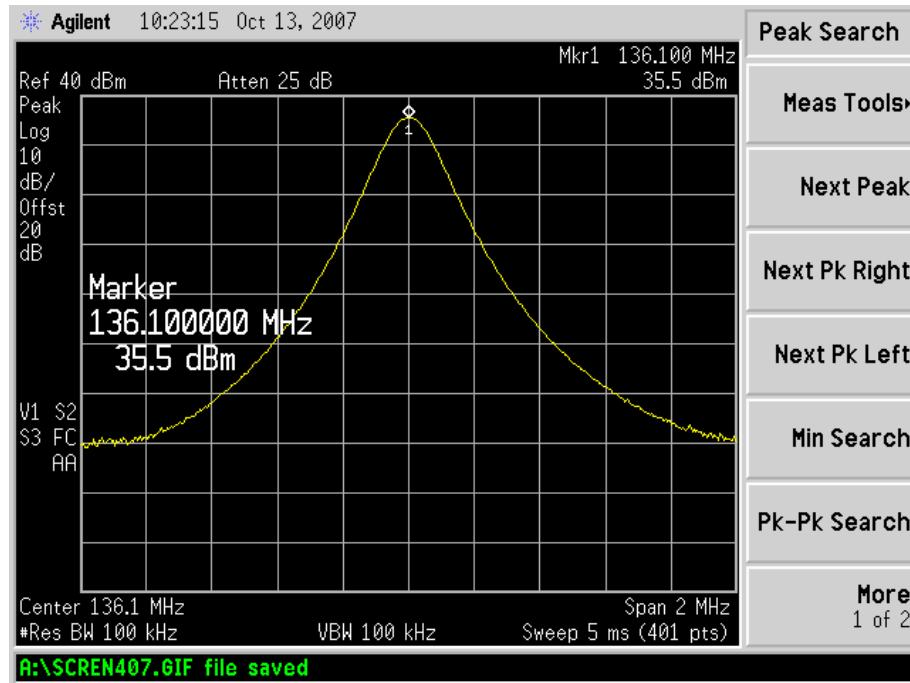
3.3 Test Procedure

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 +7.2VDC. The Spectrum Analyzer was connected at antenna terminal to measure RF power of the carrier.
3. A Multimeter was connected in series with Q15 of FINAL AMP to measure the current of Q15, the RF amplifier device. A Multimeter was used to measure Q15 supply voltage.

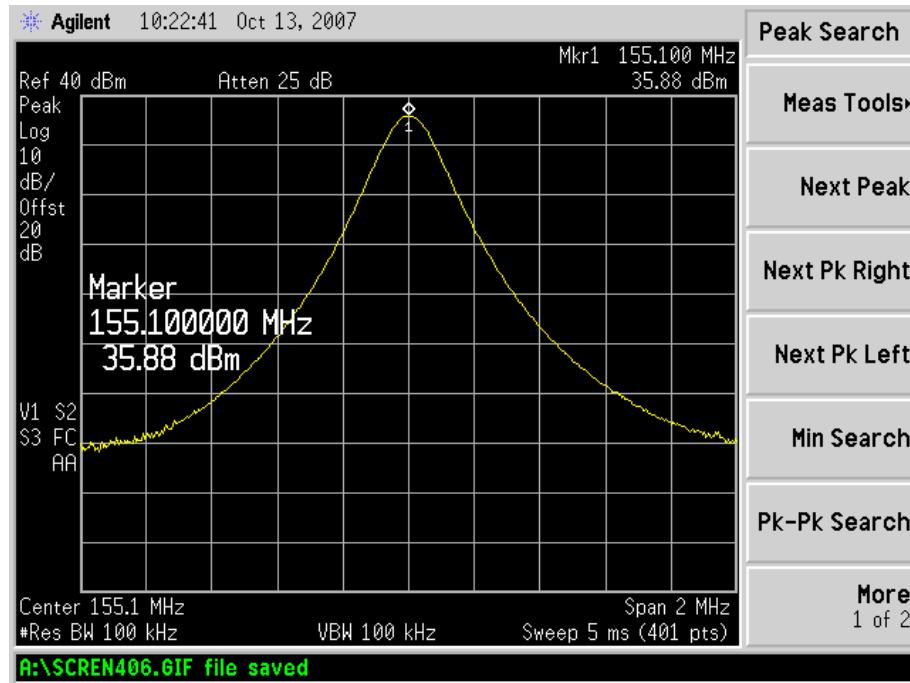
3.4 Test Result/Plots

Type	Channel	Frequency (MHz)	Collected Voltage (VDC)	Collected Current (A)	Output Power (dBm)	Output Power (W)
Narrowband	Low CH	136.100	7.2	0.586	35.50	3.548
	Middle CH	155.100	7.2	0.598	35.88	3.872
	High CH	173.900	7.2	0.588	35.60	3.631
Wideband	Low CH	136.100	7.2	0.585	35.52	3.565
	Middle CH	155.100	7.2	0.601	35.90	3.890
	High CH	173.900	7.2	0.589	35.55	3.589

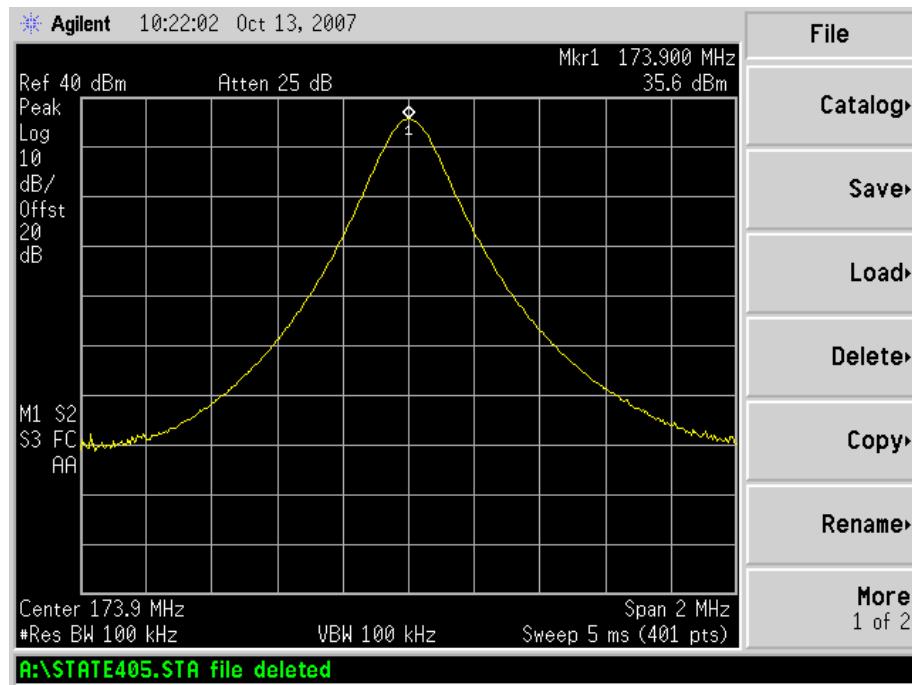
Narrowband-Low Channel:



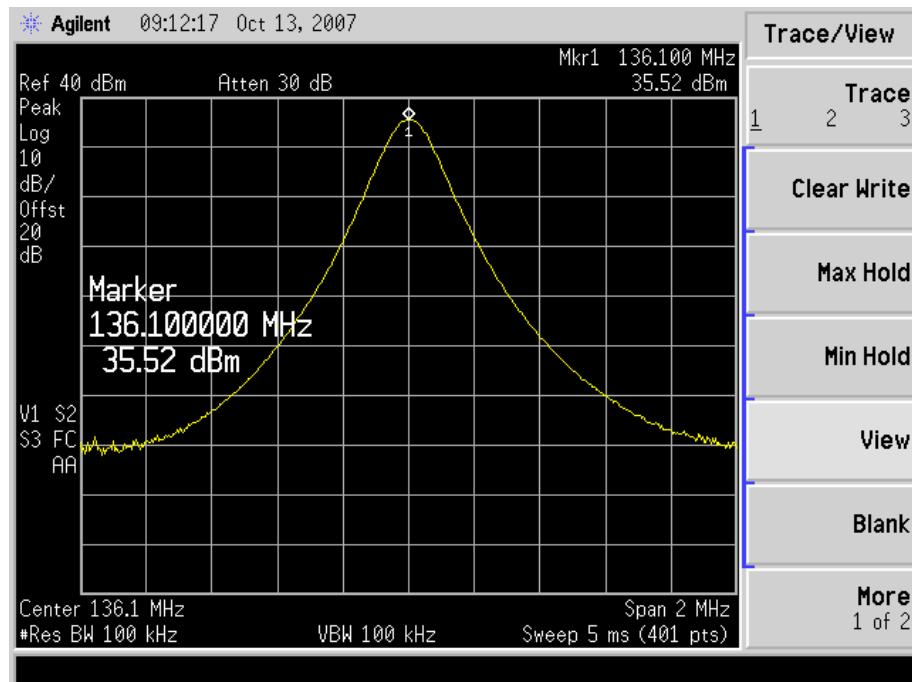
Narrowband-Middle Channel:



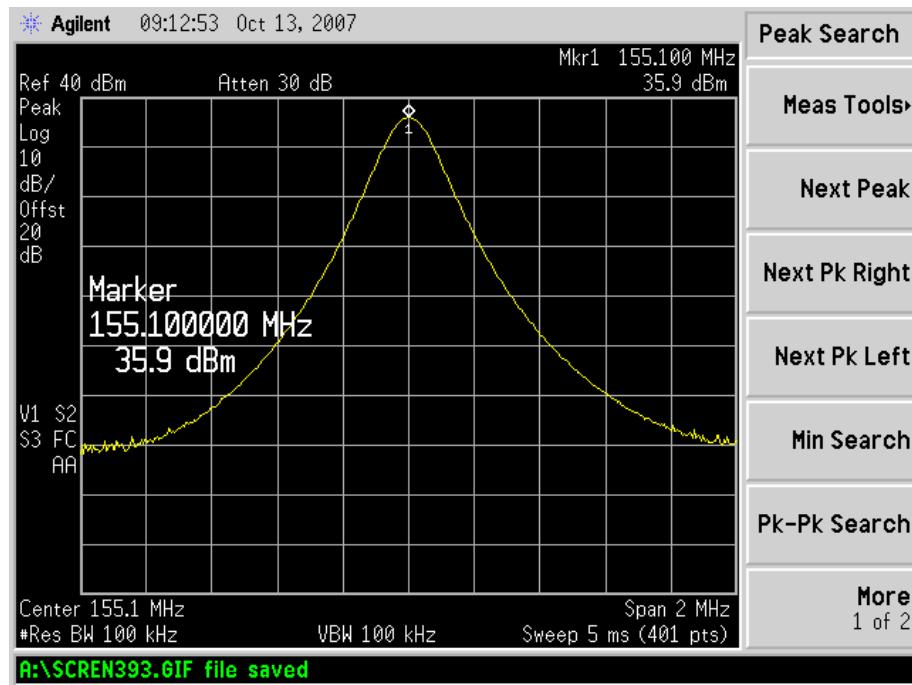
Narrowband-High Channel:



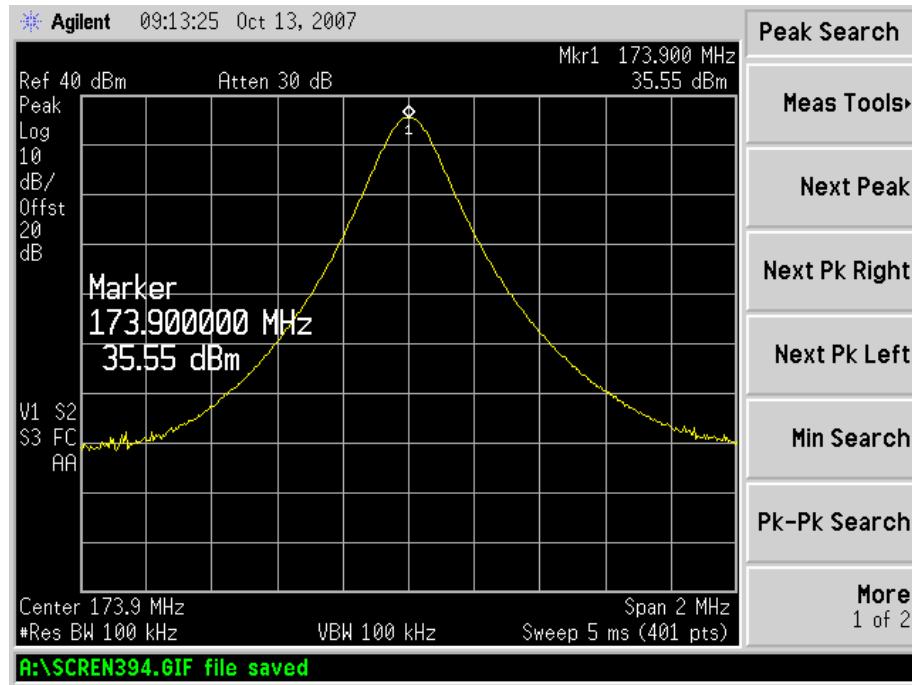
Wideband-Low Channel:



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	2007-01-26	2008-01-25
ETS	Multi_Device Controller	2090	57230	2007-01-26	2008-01-25
Antenna	Schwarzbeck	VUBA9117	115	2006-01-24	2009-01-25
3m chamber	Albatross Projects	9X6X6	----	2006-01-24	2008-01-25
Rohde & Schwarz	Horn Antenna	HF906	100014	2007-01-26	2008-01-25
Signal Generator	Rohde & Schwarz	SMR20	100047	2007-01-24	2008-01-25
Dipole Antenna	Schwarzbeck	H00009170	9136	2007-01-24	2008-01-25

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

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								
136.100	19.6	1.4	226	H	1.1	0	18.5	0.071
136.100	35.7	1.5	182	V	1.1	0	34.6	2.884
Narrowband-Middle Channel								
155.100	20.2	1.4	220	H	1.1	0	19.1	0.081
155.100	35.9	1.5	190	V	1.1	0	34.8	3.019
Narrowband-High Channel								
173.900	19.8	1.5	232	H	1.2	0	18.6	0.072
173.900	35.5	1.6	185	V	1.2	0	34.5	2.818
Wideband-Low Channel								
136.100	19.2	1.4	225	H	1.1	0	18.1	0.065
136.100	35.4	1.5	186	V	1.1	0	34.3	2.691
Wideband-Mid Channel								
155.100	19.9	1.4	220	H	1.1	0	18.8	0.076
155.100	36.0	1.5	192	V	1.1	0	34.9	3.090
Wideband-High Channel								
173.900	20.3	1.5	231	H	1.2	0	19.1	0.081
173.900	35.8	1.6	180	V	1.2	0	34.6	2.884

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	2007-06-30	2008-06-29
Attenuator	Atten	DC-4GHz	ATS100-4-20	2007-06-30	2008-06-29
Audio Generator	MEILI	MFG-3005	200612187	2007-06-30	2008-06-29

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.

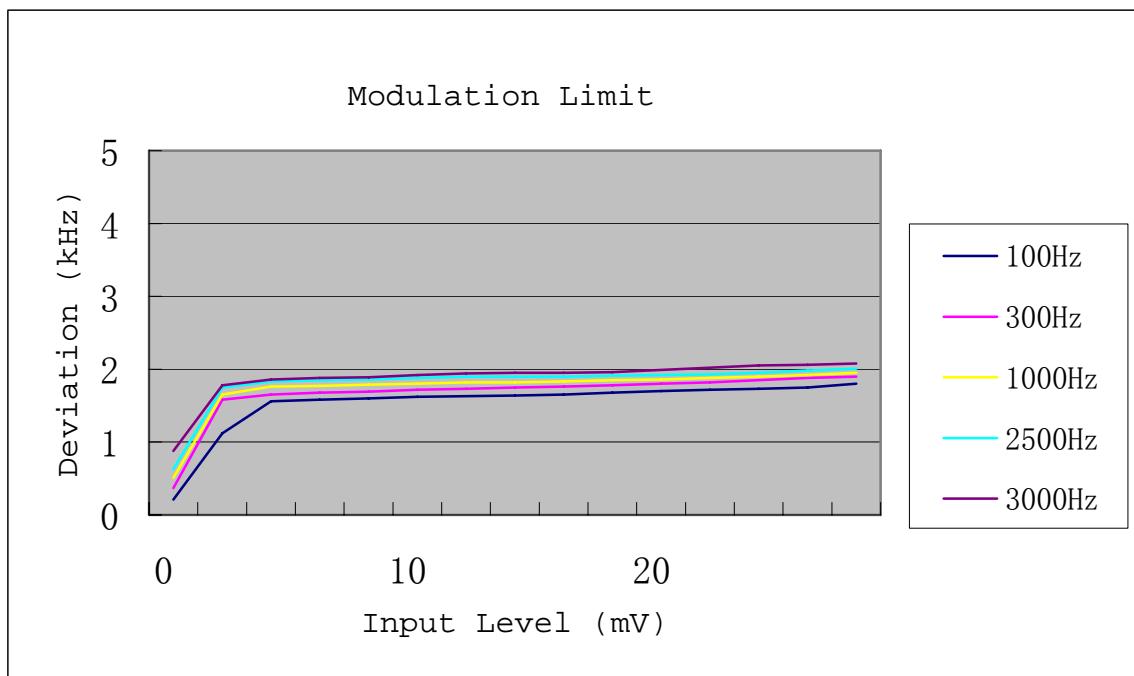
5.4 Environmental Conditions

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

5.5 Test Results/Plots

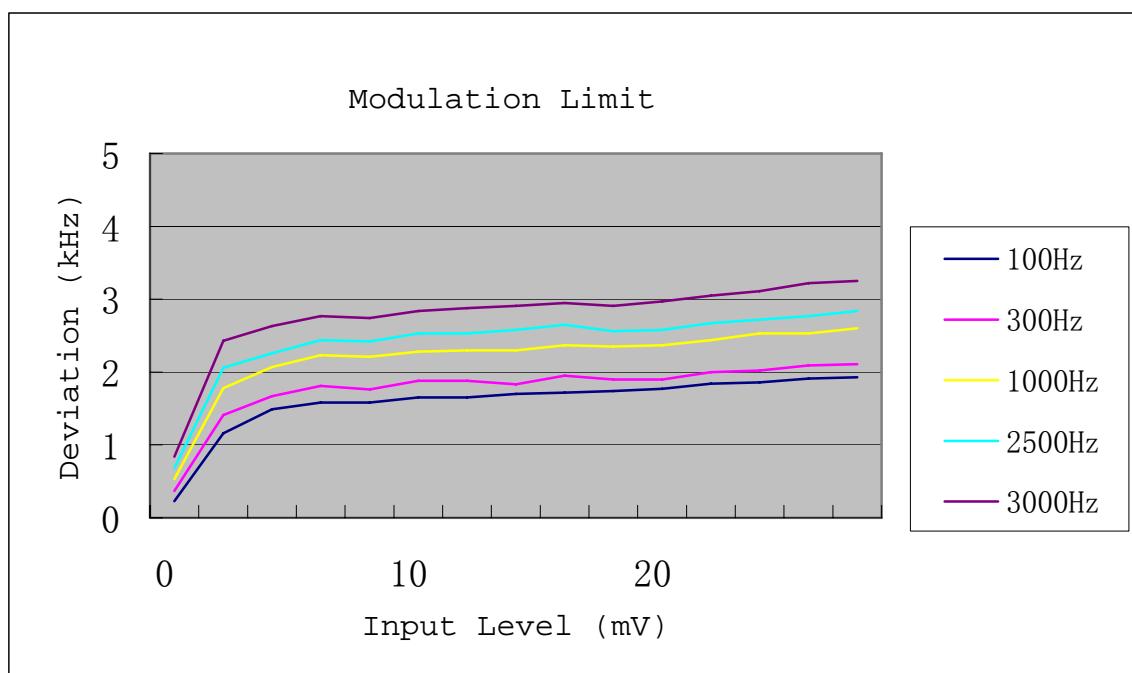
For Narrowband Channel Separation 12.5kHz

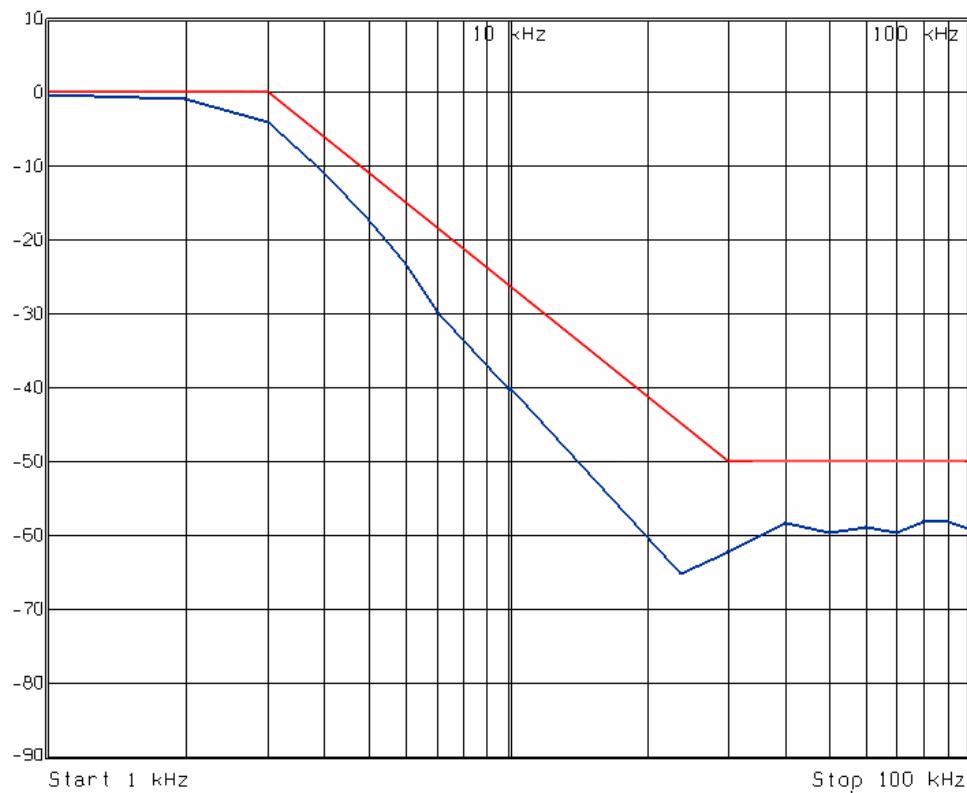
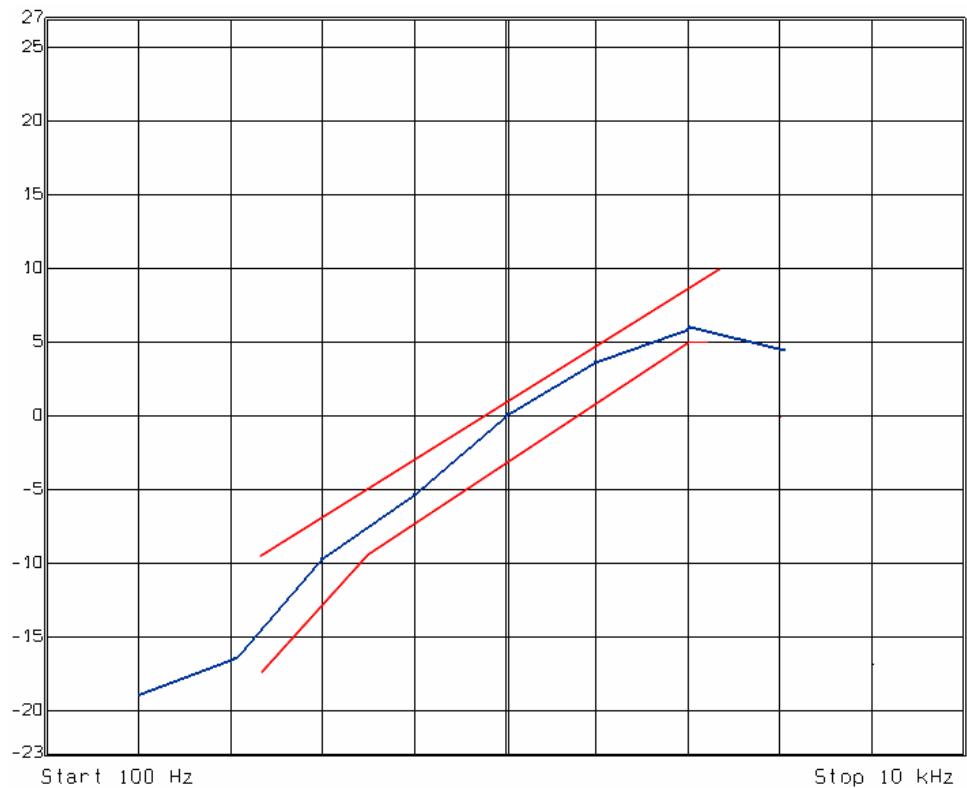
Audio Input (mV)	100Hz Deviation (kHz)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz Deviation (kHz)	5kHz Deviation (kHz)
0	0.22	0.371	0.52	0.62	0.87
2	1.12	1.58	1.65	1.75	1.78
4	1.56	1.65	1.76	1.83	1.86
6	1.58	1.68	1.77	1.85	1.88
8	1.60	1.69	1.79	1.86	1.89
10	1.62	1.72	1.80	1.88	1.92
12	1.63	1.73	1.82	1.90	1.94
14	1.64	1.75	1.82	1.90	1.95
16	1.65	1.76	1.83	1.90	1.95
18	1.68	1.78	1.85	1.91	1.96
20	1.70	1.80	1.86	1.92	1.99
24	1.72	1.82	1.88	1.93	2.02
28	1.73	1.85	1.90	1.95	2.05
32	1.75	1.88	1.92	1.98	2.06
36	1.81	1.91	1.96	2.00	2.09



For Wideband Channel Separation 25kHz

Audio Input (mV)	100Hz Deviation (kHz)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz Deviation (kHz)	5kHz Deviation (kHz)
0	0.22	0.36	0.52	0.67	0.83
2	1.16	1.41	1.78	2.06	2.43
4	1.49	1.67	2.07	2.26	2.63
6	1.58	1.81	2.23	2.44	2.77
8	1.58	1.76	2.21	2.42	2.74
10	1.65	1.88	2.28	2.53	2.84
12	1.65	1.88	2.30	2.53	2.88
14	1.70	1.83	2.30	2.58	2.91
16	1.72	1.95	2.37	2.65	2.95
18	1.74	1.90	2.35	2.56	2.91
20	1.77	1.90	2.37	2.58	2.97
24	1.84	2.00	2.44	2.67	3.05
28	1.86	2.02	2.53	2.72	3.11
32	1.91	2.09	2.53	2.77	3.22
36	1.92	2.10	2.61	2.83	3.26



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:

$$43+10\log P=43+10\log(3.09)=47.90 \text{ dB}$$

Emission Mask D For 12.5kHz bandwidth:

On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : 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 than 12.5 kHz: At least $7.27(fd - 2.88 \text{ kHz})$ 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	2007-06-30	2008-06-29
Atten	Attenuator	DC-4GHz	ATS100-4-20	2007-06-30	2008-06-29
Audio Generator	MEILI	MFG-3005	200612187	2007-06-30	2008-06-29

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

$$B_n = 2M + 2DK = 2*3 + 2*2.5*1 = 11\text{kHz}$$

Emission Designation=11K0F3E

For Wideband Channel Separation 25kHz:

K=1

M=3kHz

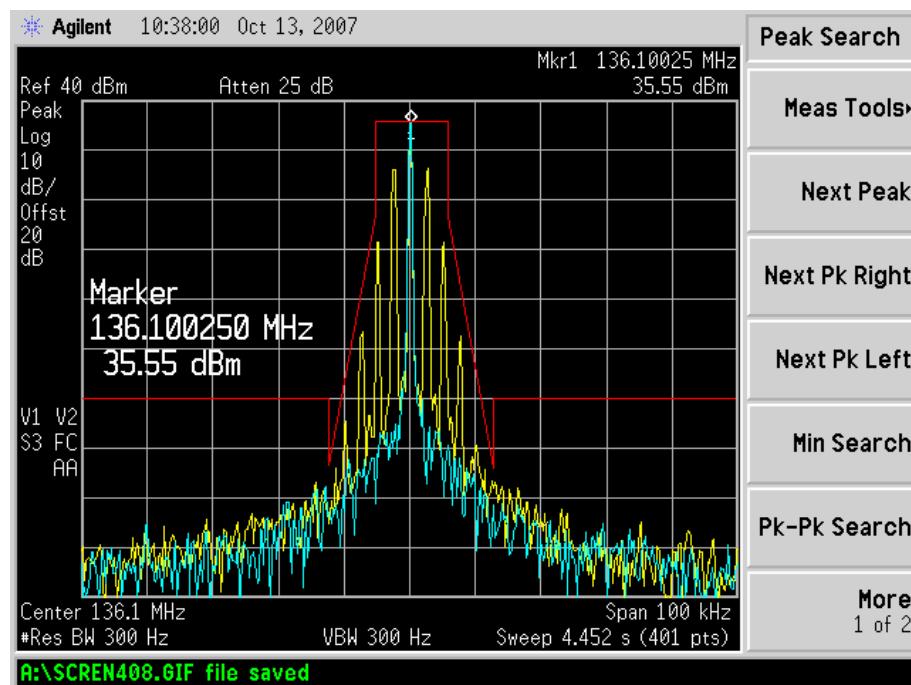
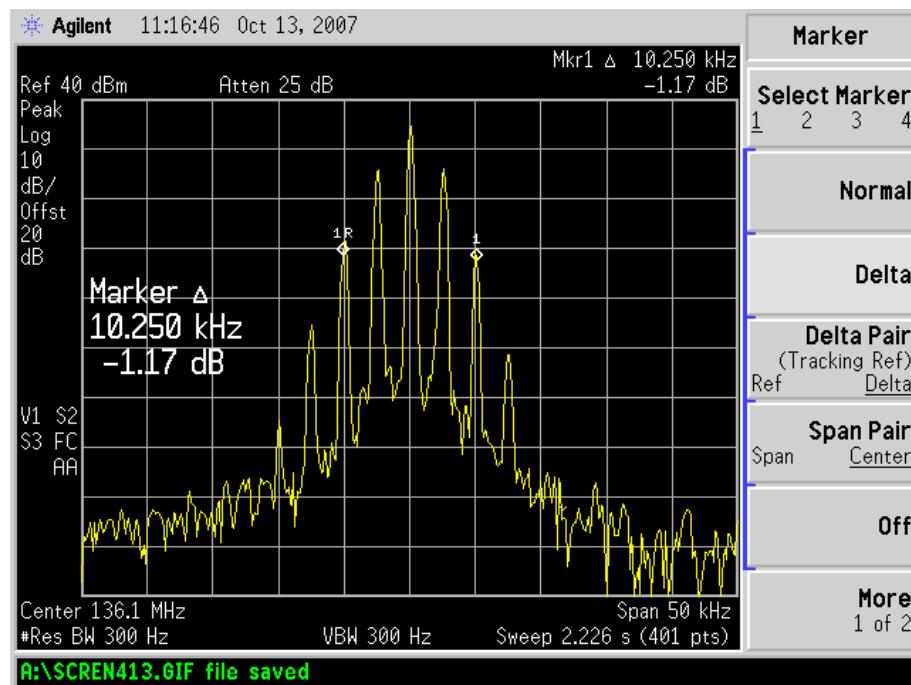
D=5kHz

$$B_n = 2M + 2DK = 2*3 + 2*5*1 = 16\text{kHz}$$

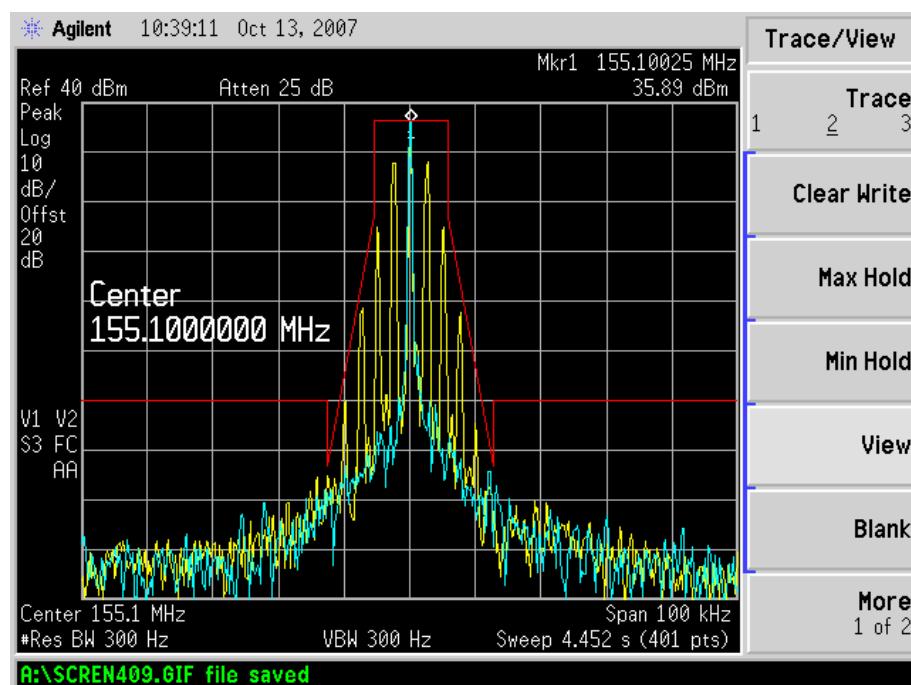
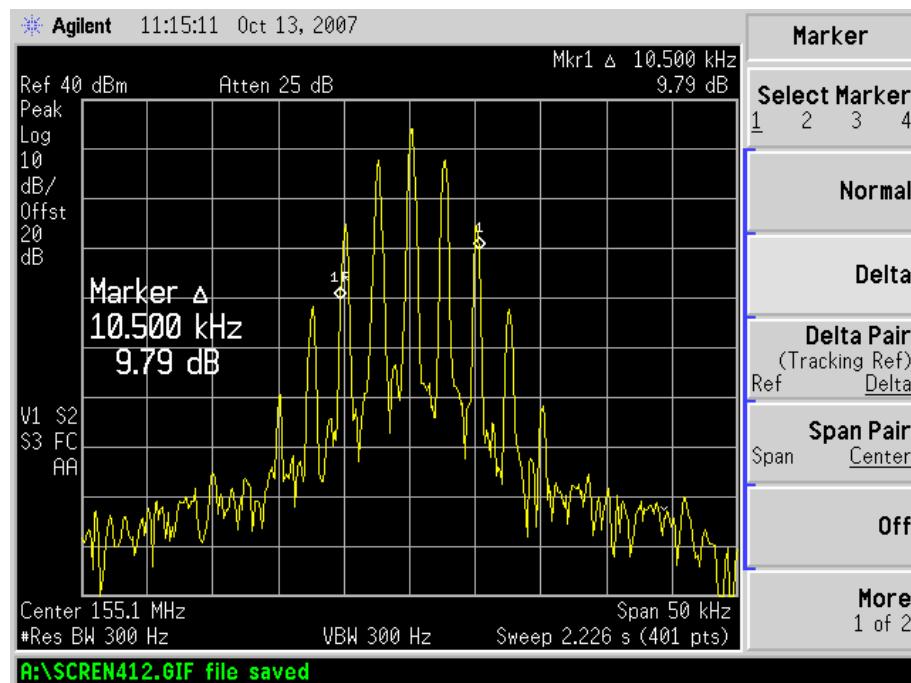
Emission Designation=16K0F3E

Refer to the attached plots.

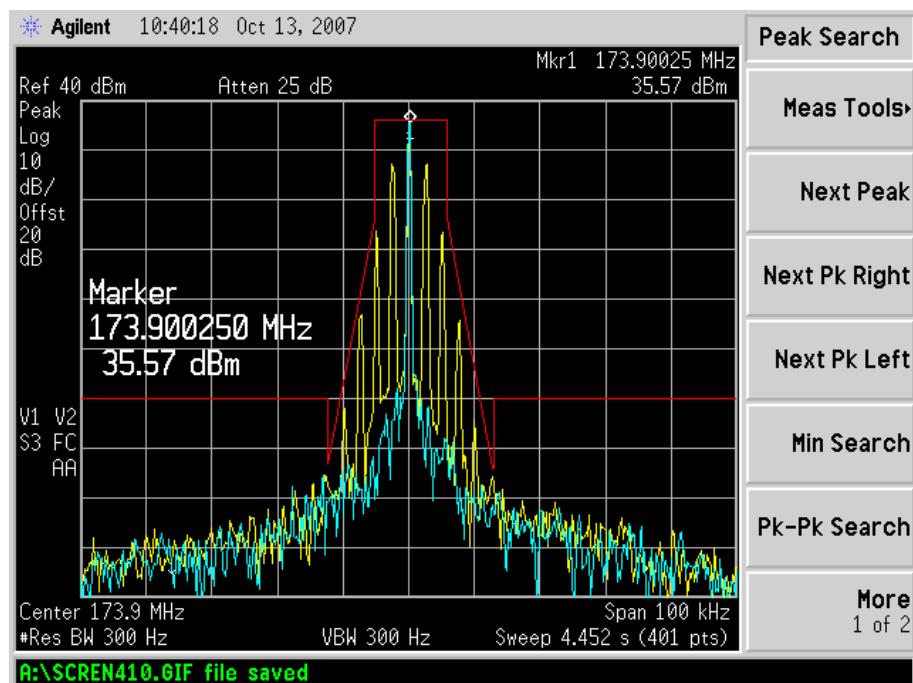
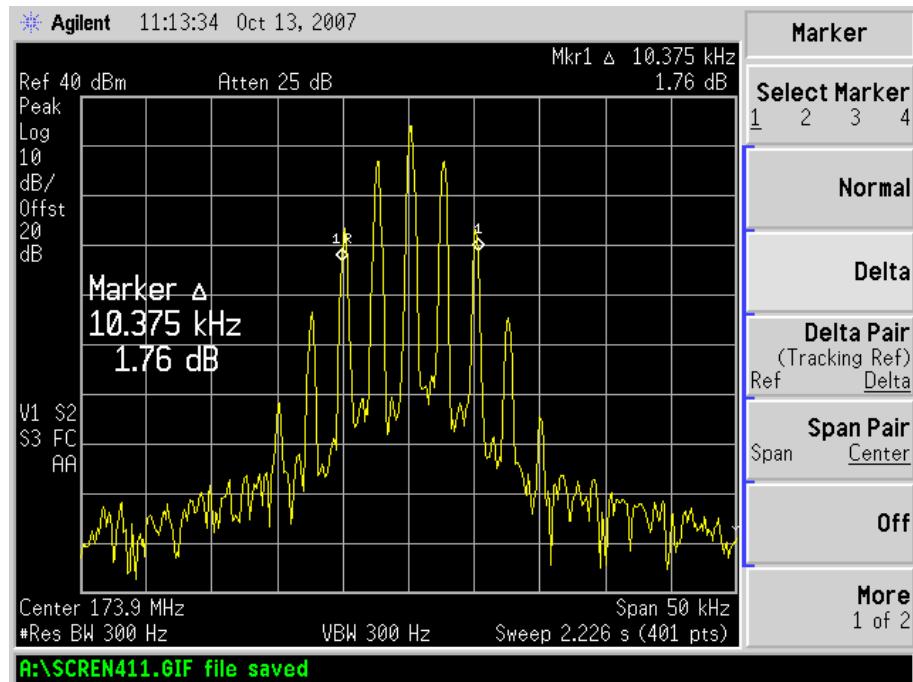
Narrowband-Low Channel:



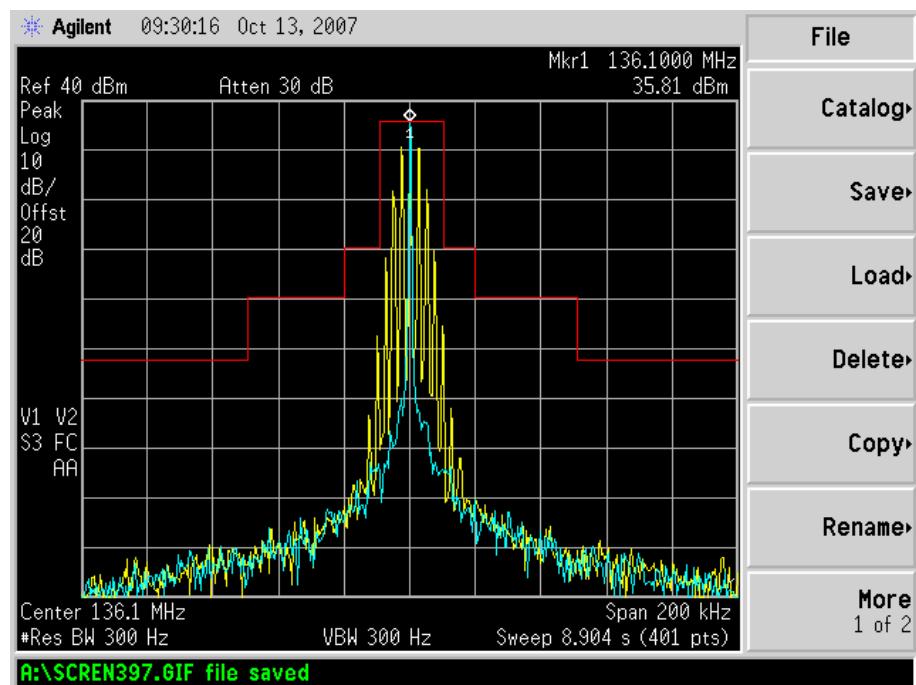
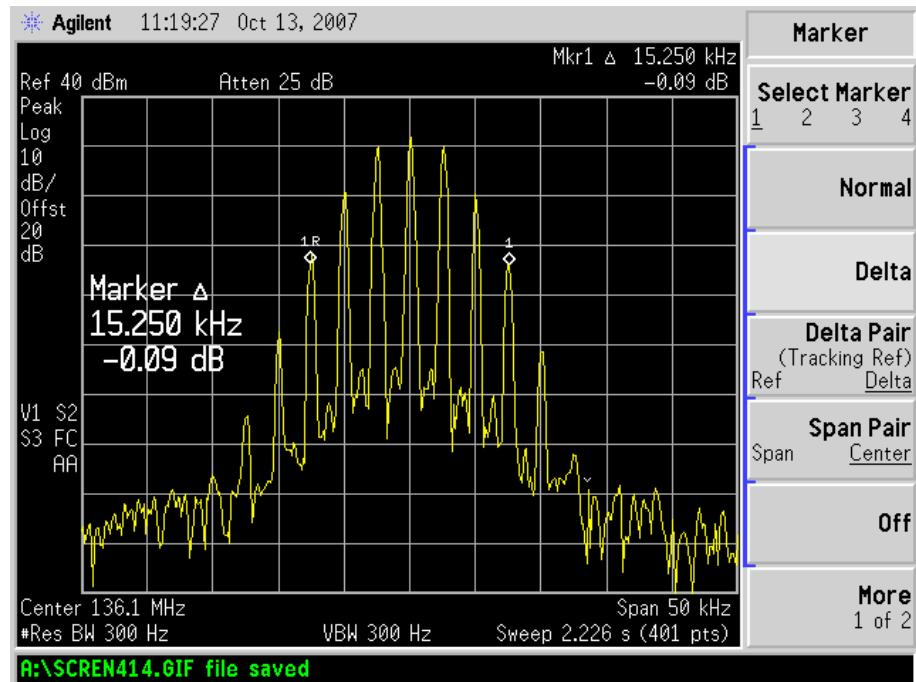
Narrowband-Middle Channel:



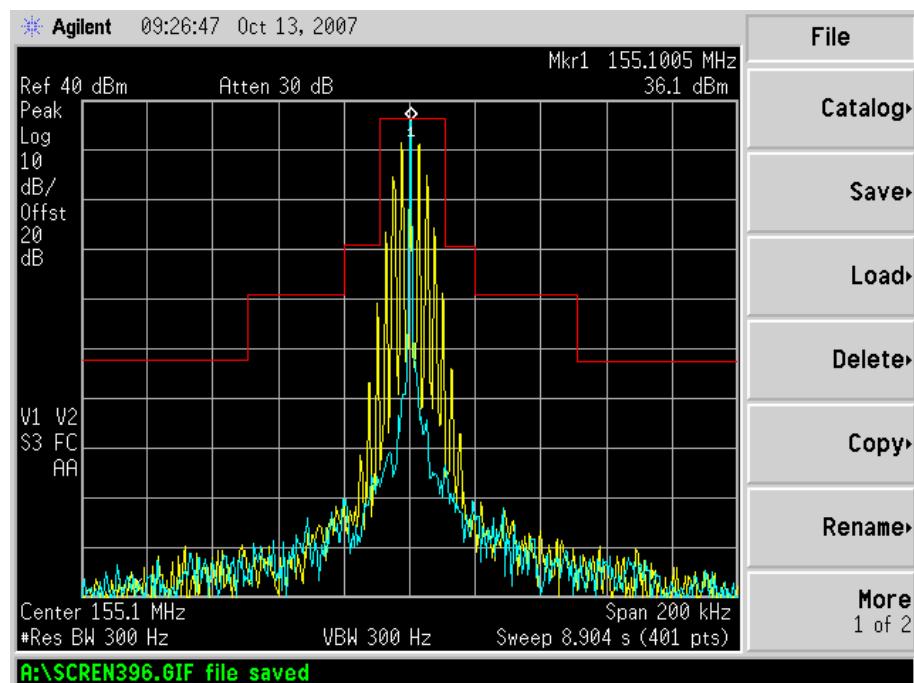
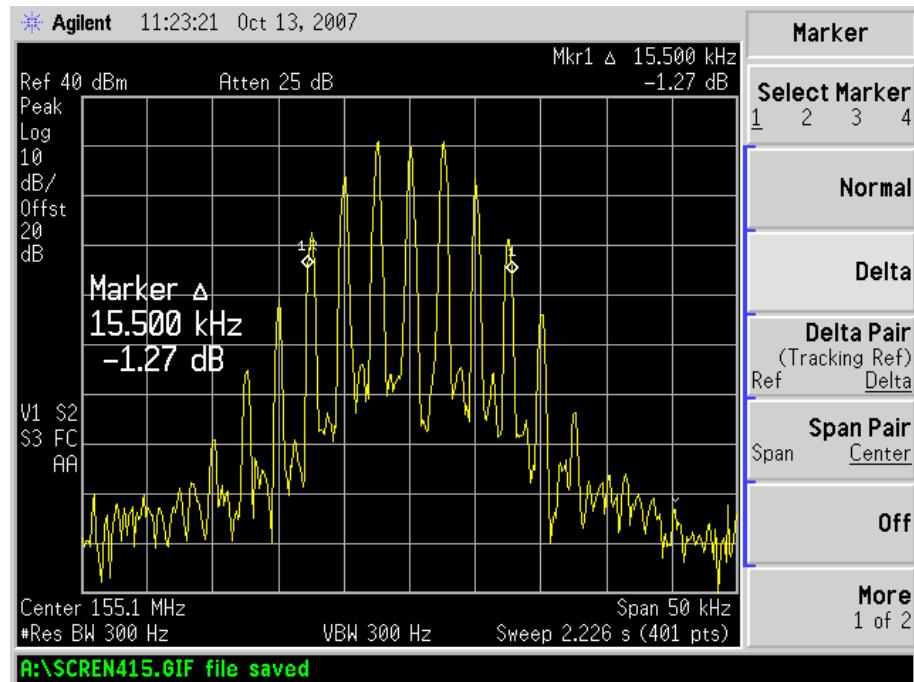
Narrowband-High Channel:



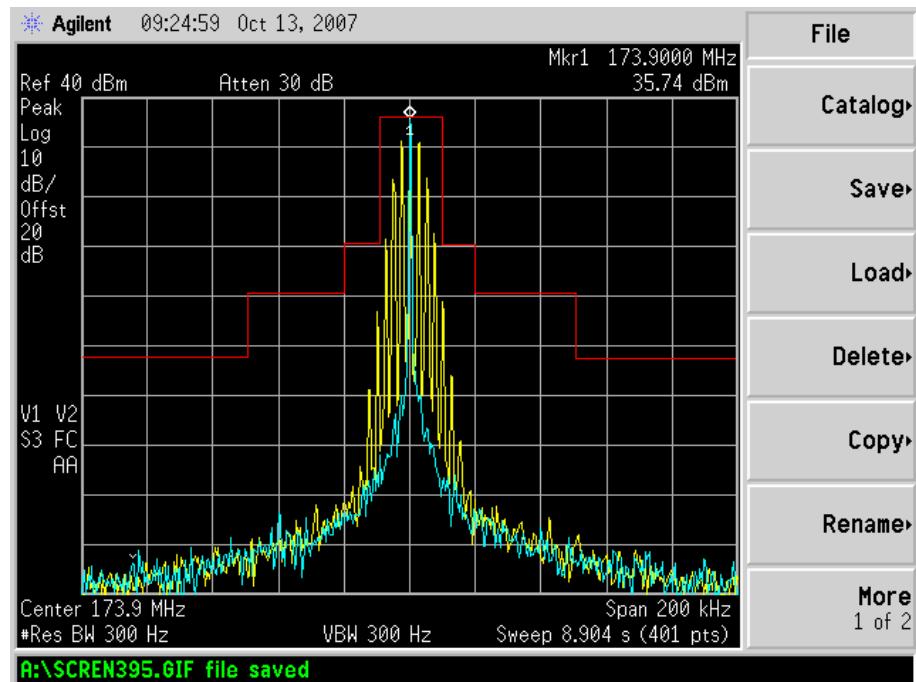
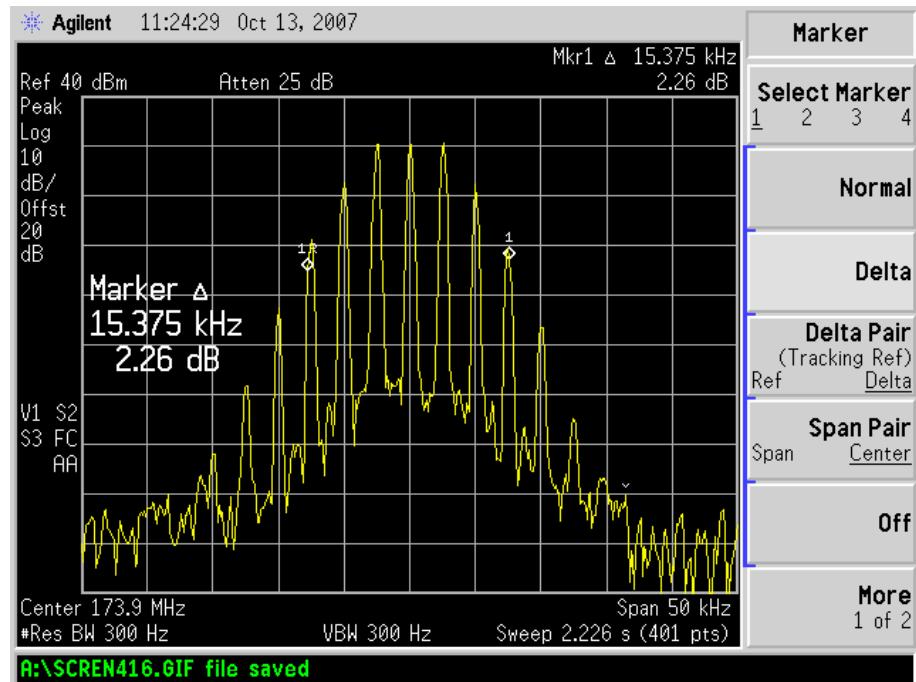
Wideband-Low Channel:



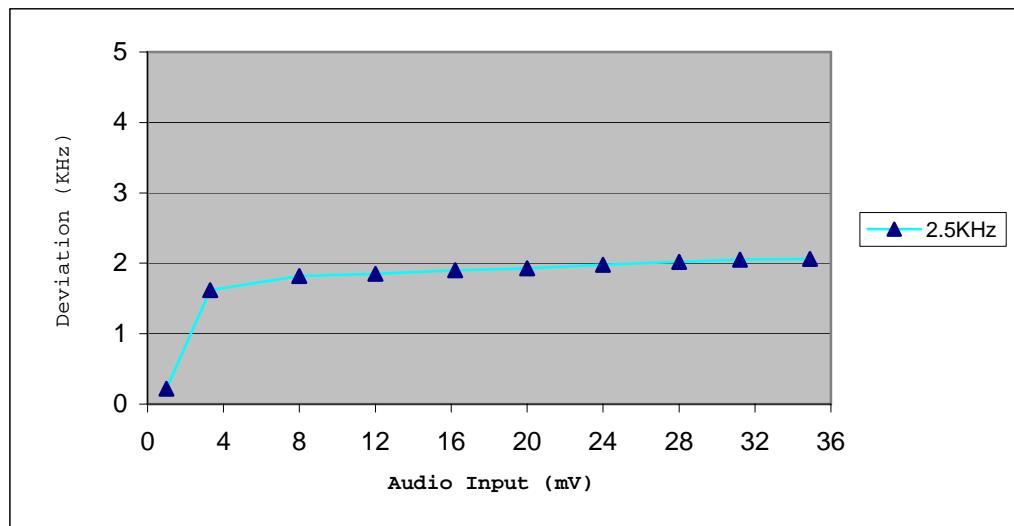
Wideband-Mid Channel:



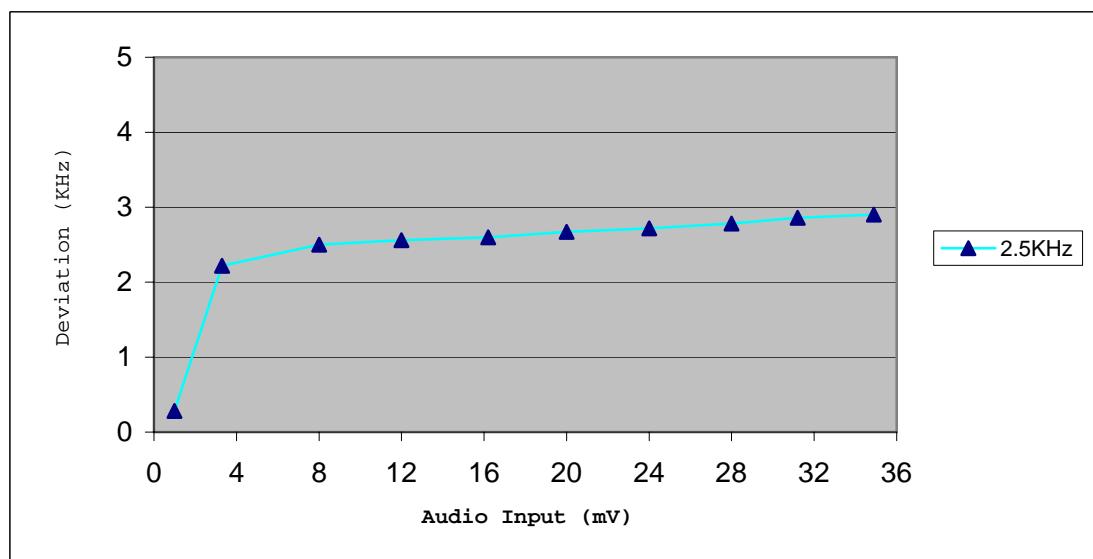
Wideband-High Channel:



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 12.5kHz bandwidth:

On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : 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 than 12.5 kHz: At least $7.27(fd - 2.88)$ 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 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:
 $43 + 10 \log(P)$ 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	2007-01-26	2008-01-25
ETS	Multi_Device Controller	2090	57230	2007-01-26	2008-01-25
Antenna	Schwarzbeck	VUBA9117	115	2006-01-24	2009-01-25
3m chamber	Albatross Projects	9X6X6	----	2006-01-24	2008-01-25
Rohde & Schwarz	Horn Antenna	HF906	100014	2007-01-26	2008-01-25
Signal Generator	Rohde & Schwarz	SMR20	100047	2007-01-24	2008-01-25
Dipole Antenna	Schwarzbeck	H00009170	9136	2007-01-24	2008-01-25

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:

-17.6 dB at 310.2 MHz in the Vertical of Middle channel polarization, 30 MHz to 2 GHz, 3Meters.

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								
272.2	-37.1	1.6	V	1.4	0	-38.5	-20	-18.5
272.2	-45.5	1.6	H	1.4	0	-46.9	-20	-26.9
408.3	-39.5	1.6	V	2.1	0	-41.6	-20	-21.6
408.3	-46.2	1.6	H	2.1	0	-48.3	-20	-28.3
Narrowband-Middle Channel								
310.2	-35.9	1.5	V	1.7	0	-37.6	-20	-17.6
310.2	-43.9	1.4	H	1.7	0	-45.6	-20	-25.6
465.3	-38.5	1.5	V	2.3	0	-40.8	-20	-20.8
465.3	-47.4	1.4	H	2.3	0	-49.7	-20	-29.7
Narrowband-High Channel								
347.8	-37.4	1.4	V	1.8	0	-39.2	-20	-19.2
347.8	-46.5	1.6	H	1.8	0	-48.3	-20	-28.3
521.7	-40.3	1.5	V	2.5	0	-42.8	-20	-22.8
521.7	-47.2	1.6	H	2.5	0	-49.7	-20	-29.7
Wideband Low Channel								
272.2	-36.2	1.4	V	1.4	0	-37.6	-13	-24.6
272.2	-44.8	1.5	H	1.4	0	-46.2	-13	-33.2
408.3	-37.4	1.6	V	2.1	0	-39.5	-13	-26.5
408.3	-45.7	1.6	H	2.1	0	-47.8	-13	-34.8
Wideband Middle Channel								
310.2	-35.5	1.5	V	1.7	0	-37.2	-13	-24.2
310.2	-44.8	1.5	H	1.7	0	-46.5	-13	-33.5
465.3	-39.8	1.4	V	2.3	0	-42.1	-13	-29.1
465.3	-47.9	1.6	H	2.3	0	-50.2	-13	-37.2
Wideband High Channel								
347.8	-36.7	1.6	V	1.8	0	-38.5	-13	-25.5
347.8	-46.1	1.4	H	1.8	0	-47.9	-13	-34.9
521.7	-40.5	1.4	V	2.5	0	-43.0	-13	-30.0
521.7	-48.1	1.6	H	2.5	0	-50.6	-13	-37.6

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 §2.1051 and §90.210

For 25kHz bandwidth

On any frequency removed from the center of the assigned channel by more than 250 percent at least:
 $43 + 10 \log (P) \text{ dB}$

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 $50 + 10 \log (P) \text{ dB}$ 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	2007-06-30	2008-06-29
Atten	Attenuator	DC-4GHz	ATS100-4-20	2007-06-30	2008-06-29
Rohde & Schwarz	EMI Test Receiver	ESI26	830245/009	2007-01-26	2008-01-25
ETS	50 ohm Coaxial Cable	SUCOFLEX 104	25498514	2007-01-26	2008-01-25

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

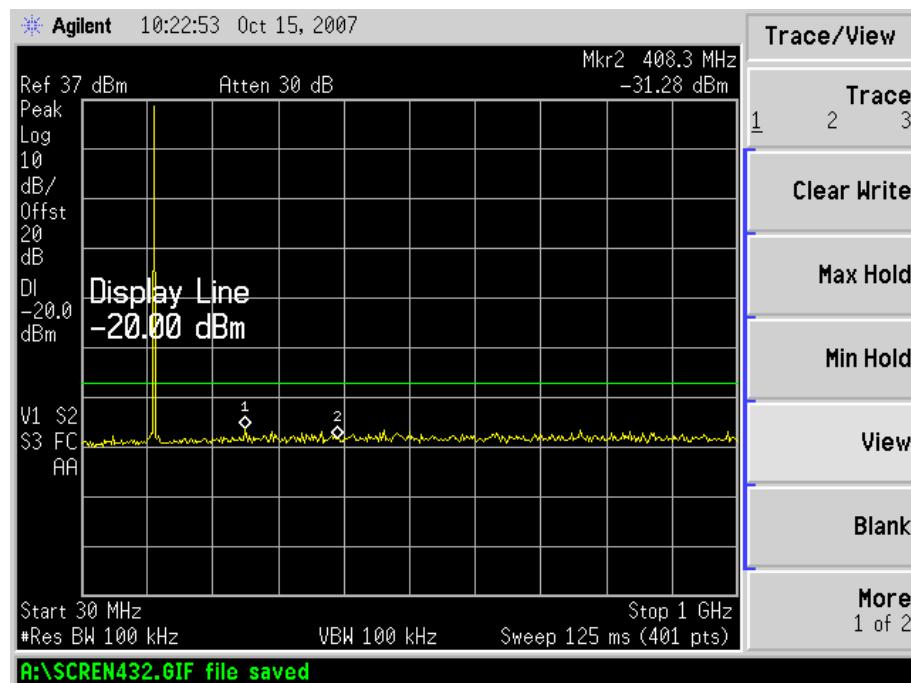
8.3 Test Procedure

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.

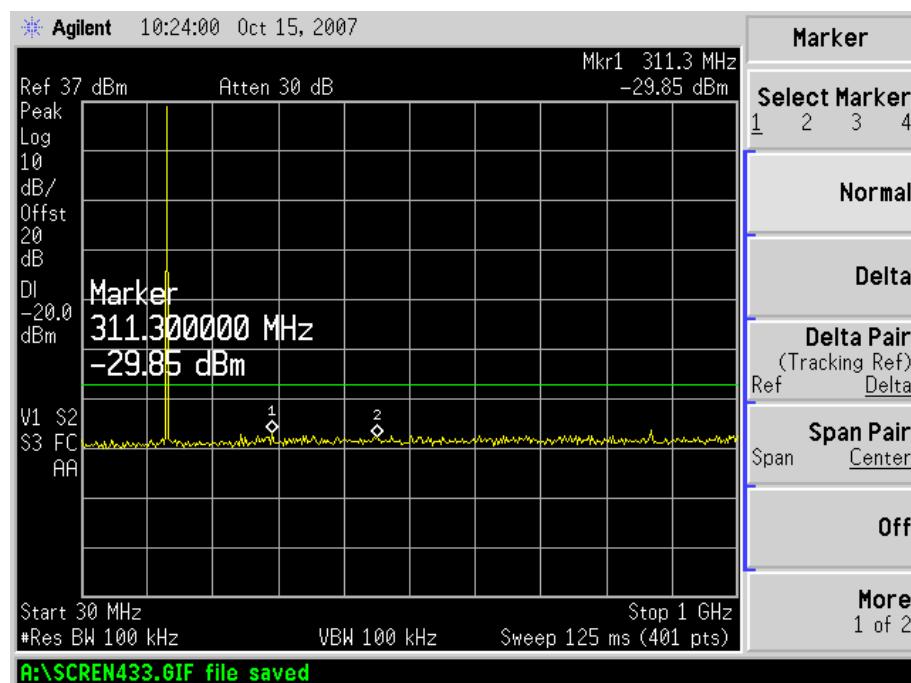
8.4 Summary of Test Results/Plots

Refer to the attached plots.

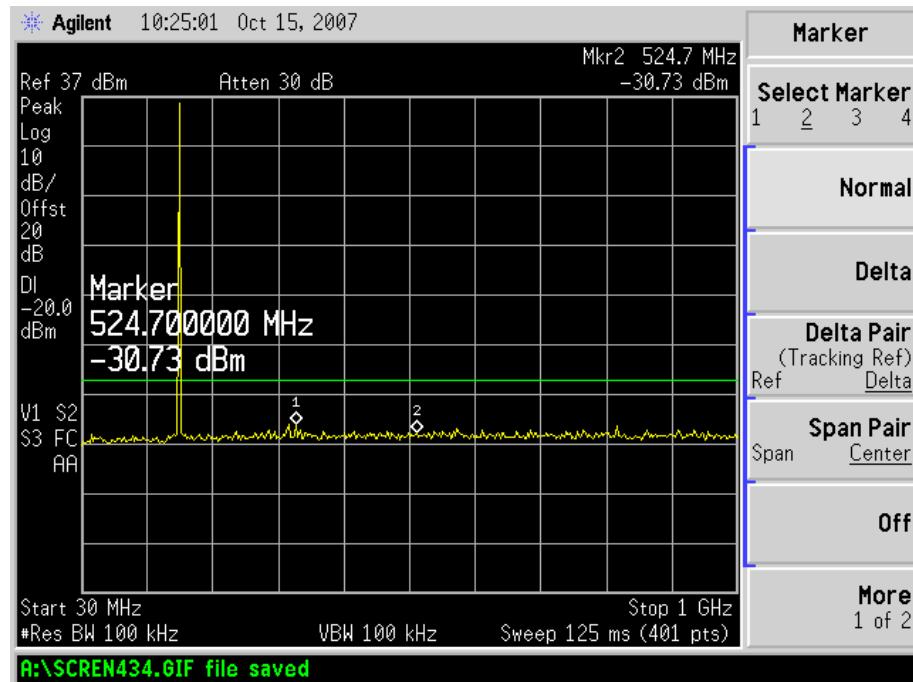
Narrowband-Low Channel:



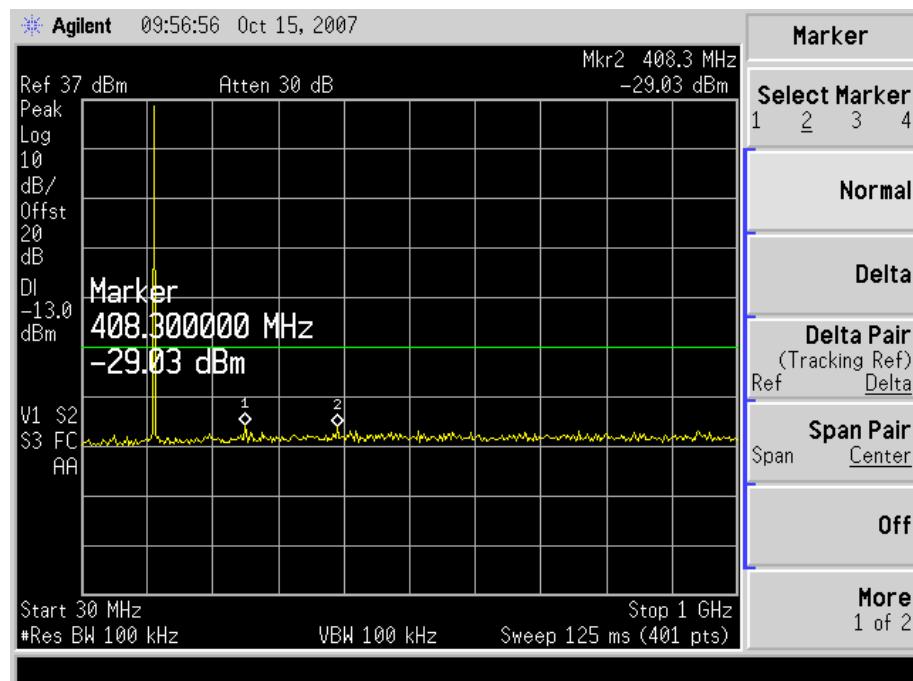
Narrowband-Middle Channel:



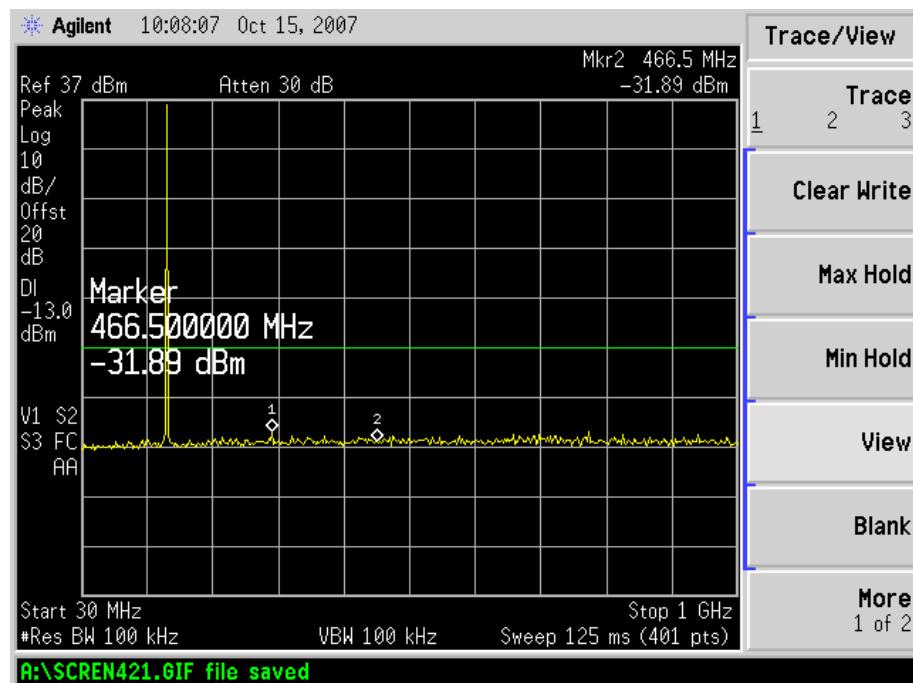
Narrowband-High Channel:



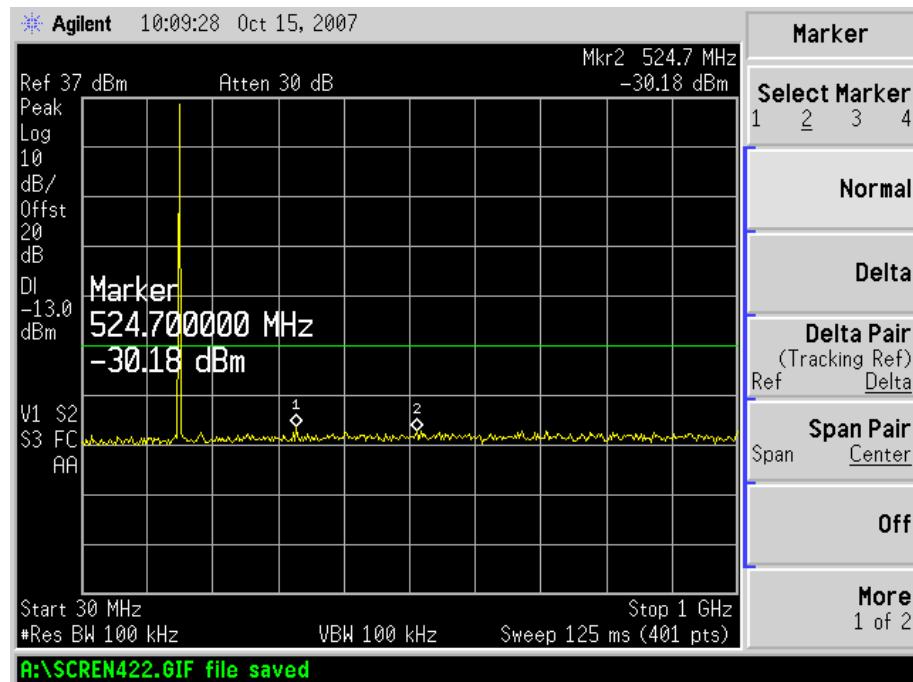
Wideband-Low Channel



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.

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	2007-06-30	2008-06-29
Atten	Attenuator	DC-4GHz	ATS100-4-20	2007-06-30	2008-06-29
GONGWEN	Moisture Test Chamber	GDS-150	SEMT-0013	2007-06-30	2008-06-29

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 -30°C to 50°C 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 Narrowband

Test Conditions		PPM Error		
		Low CH (136.100MHz)	Middle CH (155.100MHz)	High CH (173.900MHz)
$T_{nom}(22^{\circ}C)$	$V_{nom}(7.20V)$	1.06	0.95	0.85
$T_{min}(-30^{\circ}C)$	$V_{nom}(7.20V)$	1.25	1.12	1.05
$T_{min}(-20^{\circ}C)$	$V_{nom}(7.20V)$	1.22	1.09	1.01
$T_{min}(-10^{\circ}C)$	$V_{nom}(7.20V)$	1.16	1.02	0.96
$T_{min}(0^{\circ}C)$	$V_{nom}(7.20V)$	1.08	0.96	0.89
$T_{max}(+30^{\circ})$	$V_{nom}(7.20V)$	1.05	0.96	0.85
$T_{max}(+40^{\circ})$	$V_{nom}(7.20V)$	1.09	0.97	0.87
$T_{max}(+50^{\circ})$	$V_{nom}(7.20V)$	1.10	0.97	0.88
Max. frequency error (ppm)		1.25	1.12	1.05
Limit		5.0ppm		
End Point		DC 6.42V		

For Wideband

Test Conditions		PPM Error		
		Low CH (136.100MHz)	Middle CH (155.100MHz)	High CH (173.900MHz)
$T_{nom}(22^{\circ}C)$	$V_{nom}(7.20V)$	1.11	1.02	0.95
$T_{min}(-30^{\circ}C)$	$V_{nom}(7.20V)$	1.24	1.08	1.05
$T_{min}(-20^{\circ}C)$	$V_{nom}(7.20V)$	1.18	1.05	1.03
$T_{min}(-10^{\circ}C)$	$V_{nom}(7.20V)$	1.15	1.02	0.98
$T_{min}(0^{\circ}C)$	$V_{nom}(7.20V)$	1.06	1.01	0.95
$T_{max}(+30^{\circ})$	$V_{nom}(7.20V)$	1.08	1.03	0.95
$T_{max}(+40^{\circ})$	$V_{nom}(7.20V)$	1.12	1.05	0.96
$T_{max}(+50^{\circ})$	$V_{nom}(7.20V)$	1.13	1.04	0.96
Max. frequency error (ppm)		1.24	1.08	1.05
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	5.0 ms	10.0 ms
kHz			
t2.....	± 12.5	20.0 ms	25.0 ms
kHz			
t3.....	± 25.0	5.0 ms	10.0 ms
kHz			

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	2007-06-30	2008-06-29
Attenuator	Atten	DC-4GHz	ATS100-4-20	2007-06-30	2008-06-29
Audio Generator	MEILI	MFG-3005	200612187	2007-06-30	2008-06-29
Signal Generator	Rohde & Schwarz	SMR20	100047	2007-01-24	2008-01-25
Oscilloscope	Agilent	DSO3102A	CN45002725	2007-01-24	2008-01-25
Spectrum Analyzer	Agilent	E4402B	US41192821	2007-06-30	2008-06-29

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

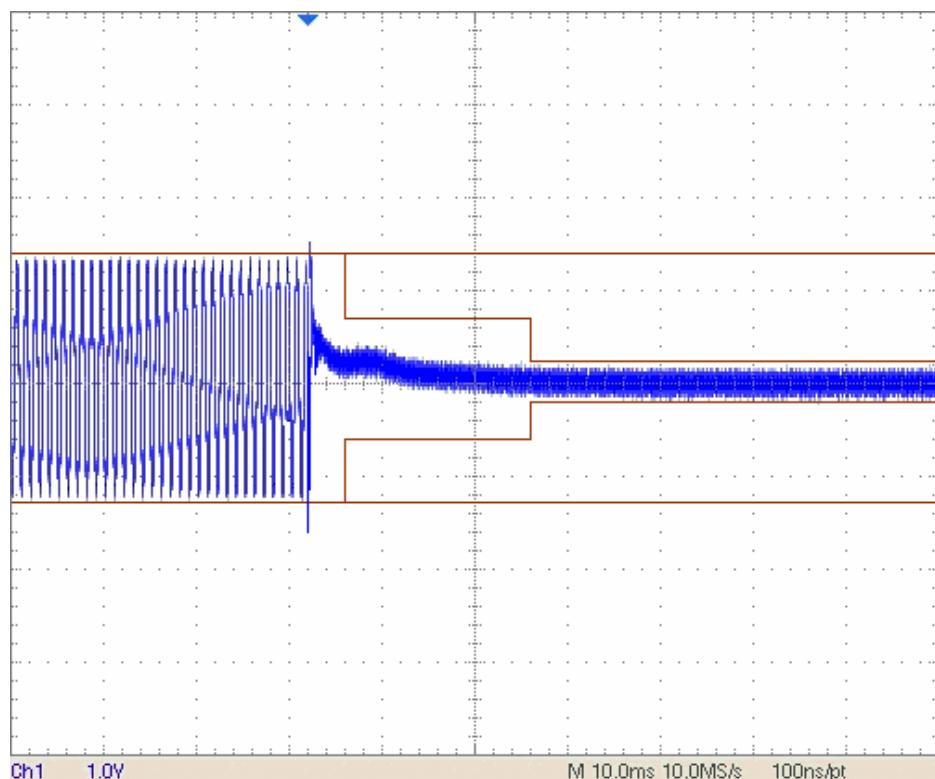
Operation Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency
155.100	12.5	<5	+/-12.5 kHz
		<20	+/-6.25 kHz
		<5	+/-12.5kHz

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

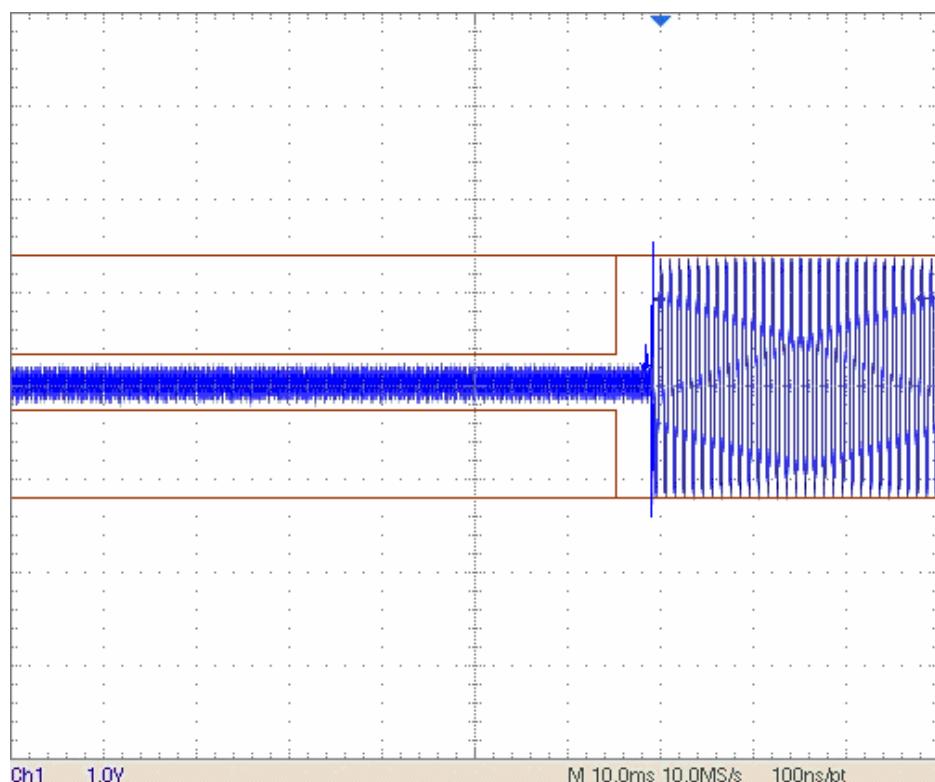
Operation Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency
155.100	25	<5	+/-25.0 kHz
		<20	+/-12.5 kHz
		<5	+/-25.0kHz

For Narrowband

TRANSIENT FREQUENCY BEHAVIOR-On

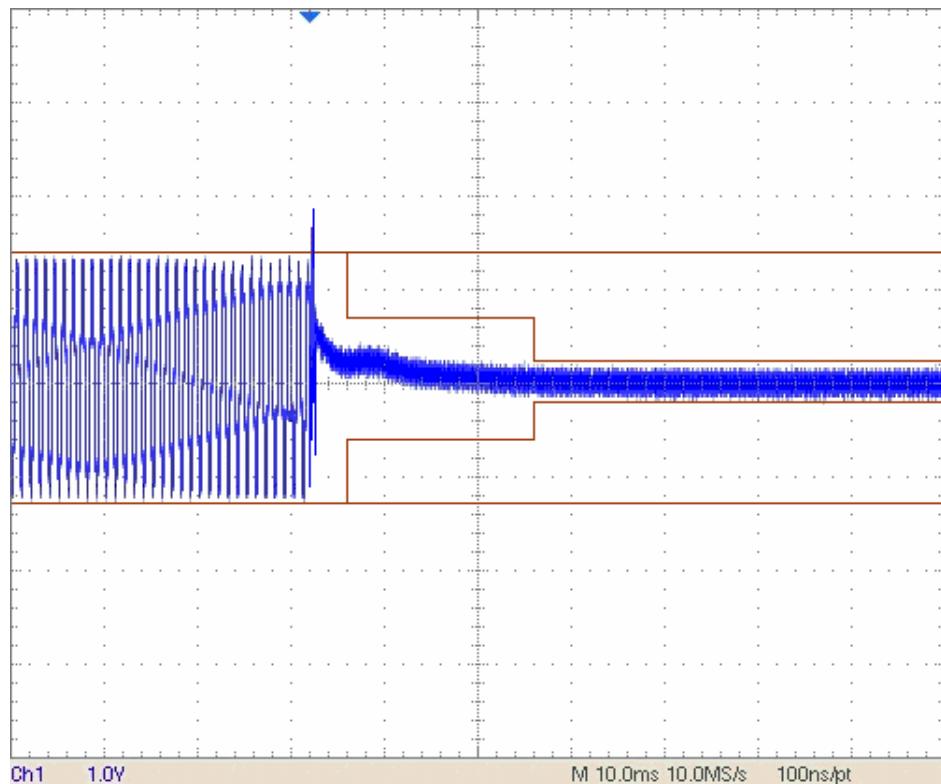


TRANSIENT FREQUENCY BEHAVIOR-Off

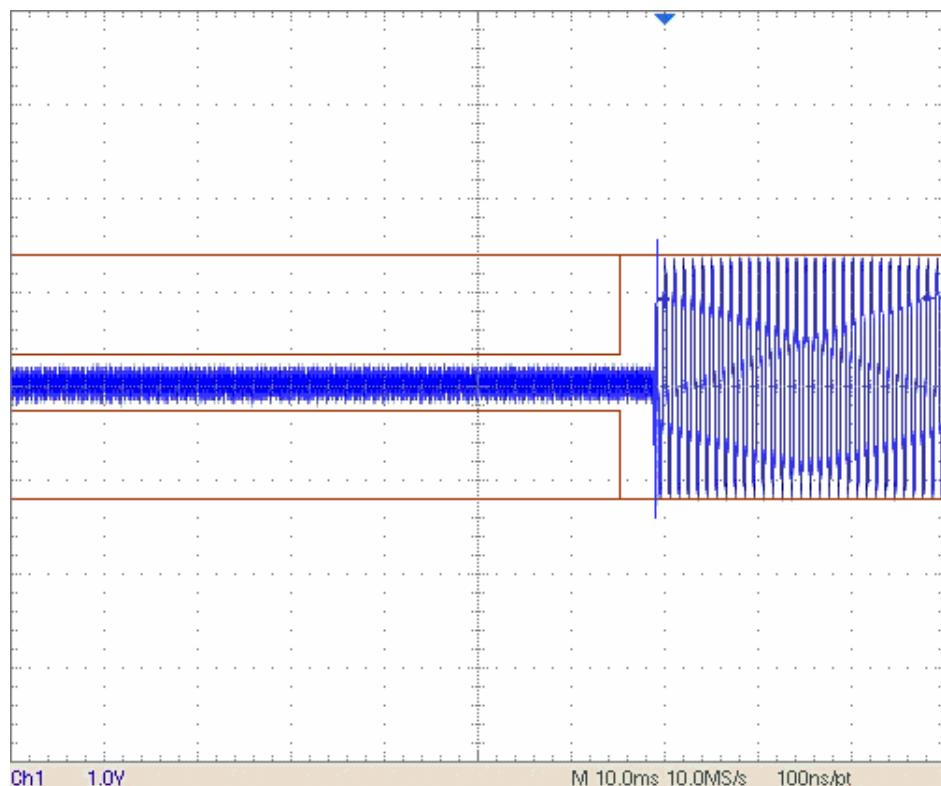


For Wideband

TRANSIENT FREQUENCY BEHAVIOR-On



TRANSIENT FREQUENCY BEHAVIOR-Off



11. §1.1307 and §2.1093-RF EXPOSURE EVULATION

11.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline. Routine SAR evaluation refers to that specifically required by § 2.1093, using measurements or computer simulation.

According to FCC Exclusion list, In the following table, f_{GHz} is mid-band frequency in GHz, and d is the distance to a person's body, excluding hands, wrists, feet, and ankles.

Exposure category	<u>low threshold</u>	<u>high threshold</u>
general population	$(60/f_{\text{GHz}})$ mW, $d < 2.5$ cm $(120/f_{\text{GHz}})$ mW, $d \geq 2.5$ cm	$(900/f_{\text{GHz}})$ mW, $d < 20$ cm
occupational	$(375/f_{\text{GHz}})$ mW, $d < 2.5$ cm $(900/f_{\text{GHz}})$ mW, $d \geq 2.5$ cm	$(2250/f_{\text{GHz}})$ mW, $d < 20$ cm

11.2 Measurement Result:

This is an Occupational device and the max effective radiated power is
 $3.09 < (900/0.155\text{GHz})$ mW/50%Dutycycle = 11.61W

The SAR measurement is not necessary.

For more information and Operational guidelines please refer to the User manual