

FCC PART 90 MEASUREMENT AND TEST REPORT FOR

Quanzhou Wouxun Electronics Co., Ltd.

**No.928 Nanhuan Road, Jiangan High Technology Industry Park, Quanzhou,
Fujian, China**

FCC ID: WVTWOUXUN06

Report Concerns: Original Report	Equipment Type: TWO-WAY RADIO
Model:	<u>KG-816</u>
Report No.:	<u>STR11058081I</u>
Test Date:	<u>2011-05-13 to 2011-05-26</u>
Issue Date:	<u>2011-06-15</u>
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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, Jiangnan High Technology Industry Park, Quanzhou, Fujian, China

Manufacturer: Quanzhou Wouxun Electronics Co., Ltd.
 Address of manufacturer: No.928 Nanhuan Road, Jiangnan 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-816
Adding Models:	KG-819, KG-829, KG-839, KG-859, KG-869, KG-879, KG-889, KG-899, KG-818, KG-828, KG-928, KG-929
Rated Voltage:	DC 7.4V Battery
Conducted Output Power:	Max.1.32W
Frequency Range:	136~174MHz
Channel Spacing:	Narrowband:12.5kHz
Size:	10.1X5.7X3.3 cm
Antenna Length:	15 cm
For more information refer to the circuit diagram form and the users' manual.	

The test data gathered are from a production sample provided by the manufacturer. Which the conducted output power is 1.32w; Test is carried out with Model KG-816 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 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 12.5kHz Wideband specifications since EUT is designed with 12.5kHz channel bandwidth Only. For more detail refers to the Operating Instructions.

1.4 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.

1.5 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.

1.6 Accessories Equipment List and Details

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

1.7 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
§ 15.207	Conducted Emission	Compliant
§ 15.209	Radiated Emission	Compliant
§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. §15.207 (a) CONDUCTED EMISSIONS

3.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

3.2 Test Equipment List and Details

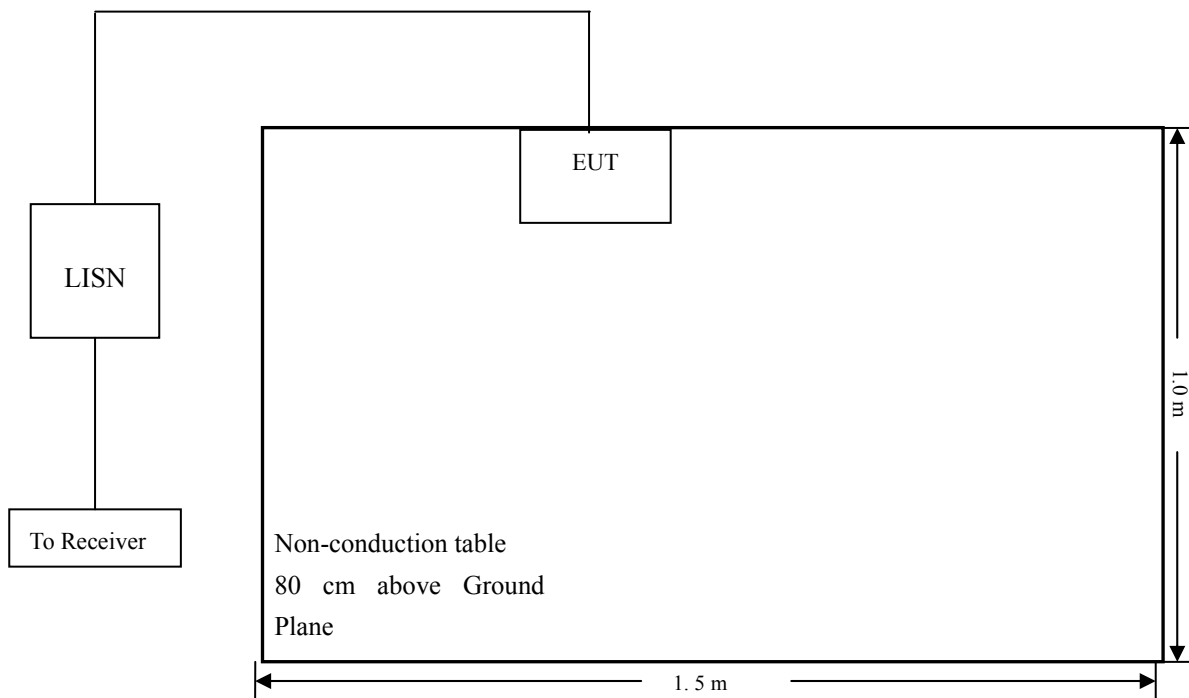
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2010-12-20	2011-12-19
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2010-12-20	2011-12-19
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2010-12-20	2011-12-19

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

3.3 Test Procedure

Test is conducting under the description of 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.

3.4 Basic Test Setup Block Diagram



3.5 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

3.6 Summary of Test Results/Plots

According to the data in section 3.7, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

-5.04 dB μ V at 0.346 MHz in the **Neutral, Ave** detector, 0.15-30MHz

3.7 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

Conducted Disturbance

EUT: TWO-WAY RADIO

M/N: KG-816

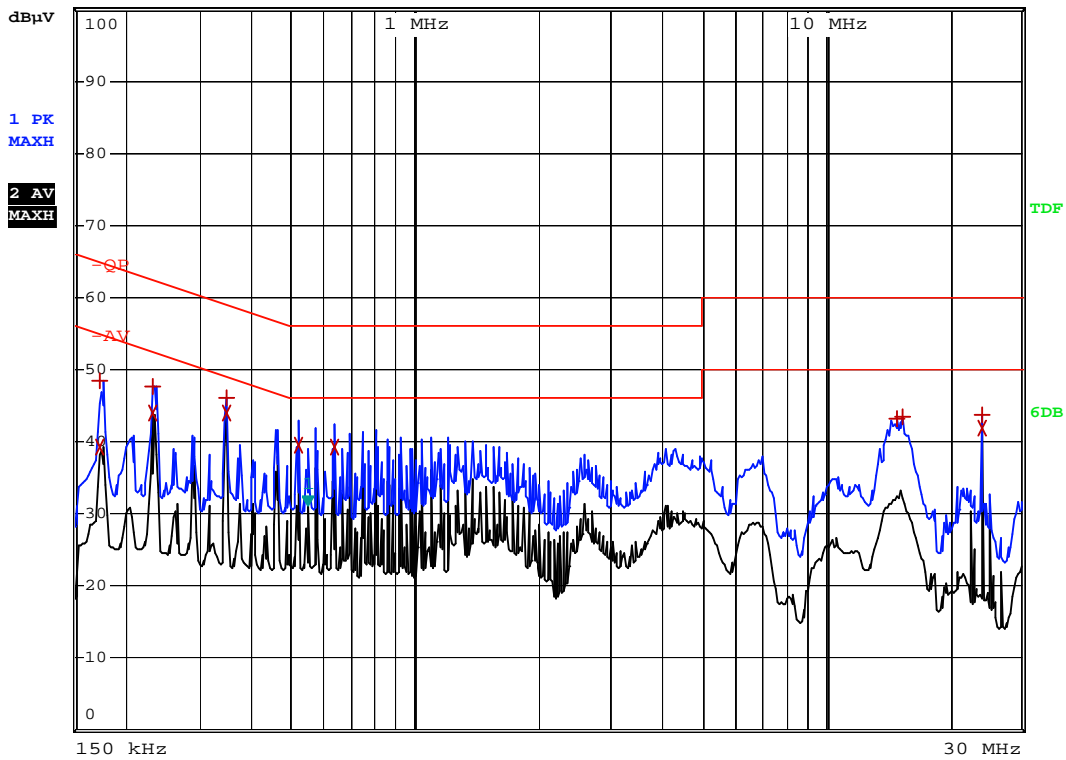
Operating Condition: Charging

Test Specification: N

Comment: 120V/60Hz



RBW 9 kHz Marker 1 [T2]
 MT 5 ms 31.19 dBµV
 Att 10 dB AUTO 546.00000000 kHz



EDIT PEAK LIST (Prescan Results)			
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
1 Max Peak	174 kHz	48.36	-16.40
2 Average	174 kHz	39.28	-15.48
2 Average	230 kHz	43.98	-8.46
1 Max Peak	234 kHz	47.74	-14.56
1 Max Peak	346 kHz	45.98	-13.07
2 Average	346 kHz	44.01	-5.04
2 Average	518 kHz	39.57	-6.42
2 Average	634 kHz	39.36	-6.63
1 Max Peak	14.958 MHz	43.10	-16.89
1 Max Peak	15.374 MHz	43.46	-16.53
1 Max Peak	23.986 MHz	43.65	-16.34
2 Average	23.986 MHz	41.75	-8.24

Plot of Conducted Emissions Test Data

Conducted Disturbance

EUT: TWO-WAY RADIO

M/N: KG-816

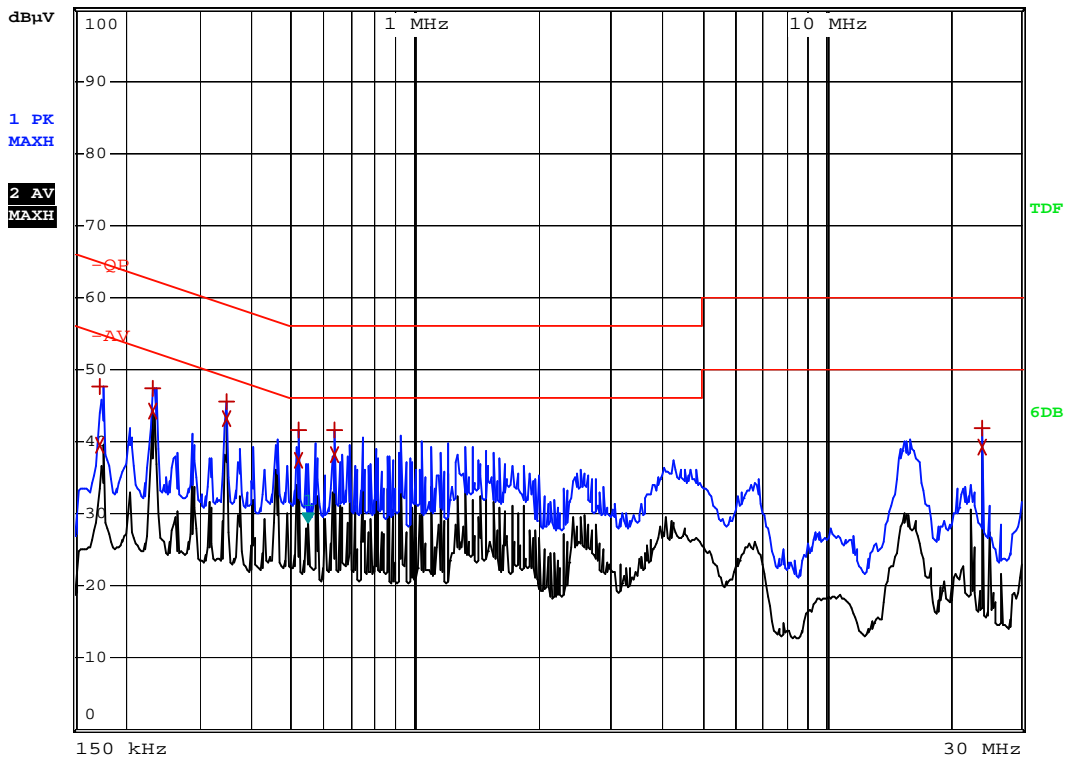
Operating Condition: Charging

Test Specification: L

Comment: 120V/60Hz



RBW 9 kHz Marker 1 [T2]
 MT 5 ms 28.63 dBµV
 Att 10 dB AUTO 546.00000000 kHz



EDIT PEAK LIST (Prescan Results)			
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
1 Max Peak	174 kHz	47.51	-17.24
2 Average	174 kHz	39.63	-15.13
2 Average	230 kHz	44.35	-8.09
1 Max Peak	234 kHz	47.44	-14.86
1 Max Peak	346 kHz	45.65	-13.39
2 Average	346 kHz	43.26	-5.79
1 Max Peak	518 kHz	41.67	-14.32
2 Average	518 kHz	37.40	-8.59
1 Max Peak	634 kHz	41.63	-14.36
2 Average	634 kHz	38.27	-7.72
1 Max Peak	23.986 MHz	41.73	-18.26
2 Average	23.986 MHz	39.31	-10.68

4. §15.209(a)- RADIATED EMISSION

4.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any radiation emissions measurement is ± 5.10 dB.

4.2 Test Equipment List and Details

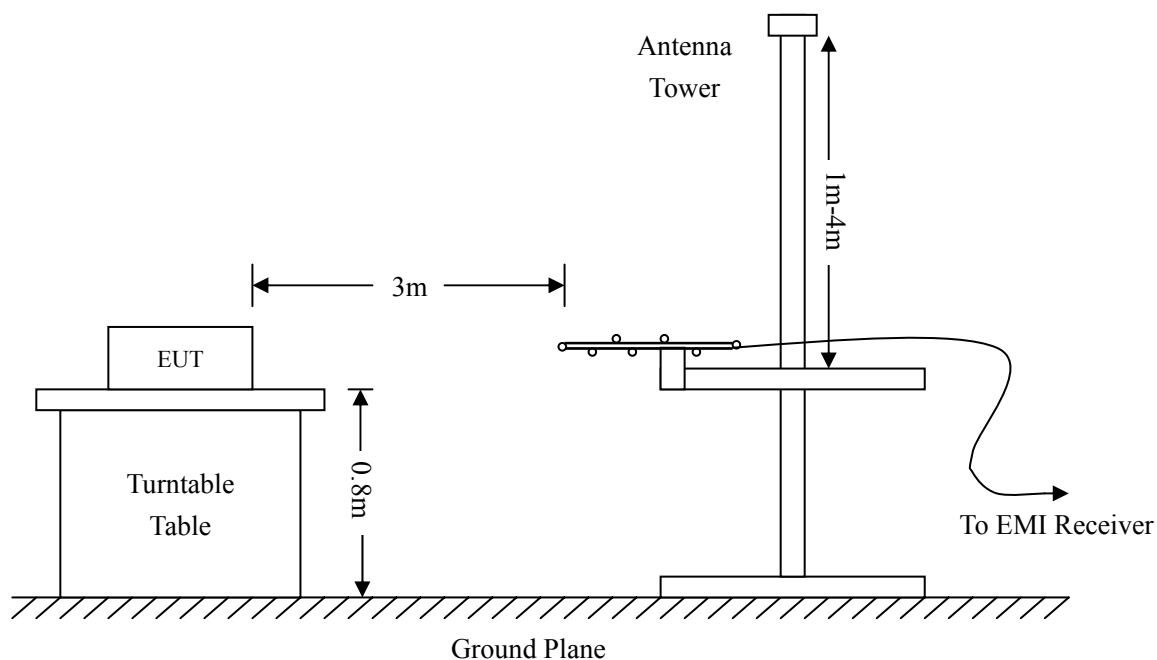
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-12-20	2011-12-19
EMI Test Receiver	R&S	ESVB	825471/005	2010-12-20	2011-12-19
Positioning Controller	C&C	CC-C-1F	N/A	2010-12-20	2011-12-19
RF Switch	EM	EMSW18	SW060023	2010-12-20	2011-12-19
Pre-amplifier	Agilent	8447F	3113A06717	2010-12-20	2011-12-19
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-12-20	2011-12-19
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2011-01-09	2012-01-08
Horn Antenna	ETS	3117	00086197	2011-01-09	2012-01-08

4.3 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.109 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.



4.4 Test Receiver Setup

During the radiated emission test for above 1GHz, the test receiver was set with the following configurations:

For peak detector:

RBW = 1000kHz, VBW = 3000kHz, Sweep Time = Auto

For average detector:

RBW = 1000kHz, VBW = 10Hz, Sweep Time = Auto

4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} - \text{Corr. Factor}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15B Limit}$$

4.6 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	55 %
ATM Pressure:	1011 mbar

4.7 Summary of Test Results/Plots

According to the data, the EUT complied with the FCC Part 15.209 Class B standards, and had the worst margin of:

-5.75 dB μ V at 46.0164 MHz in the Vertical polarization, 30 MHz to 1 GHz, 3Meters

Plot of Radiation Emissions Test

Radiated Disturbance

EUT: TWO-WAY RADIO

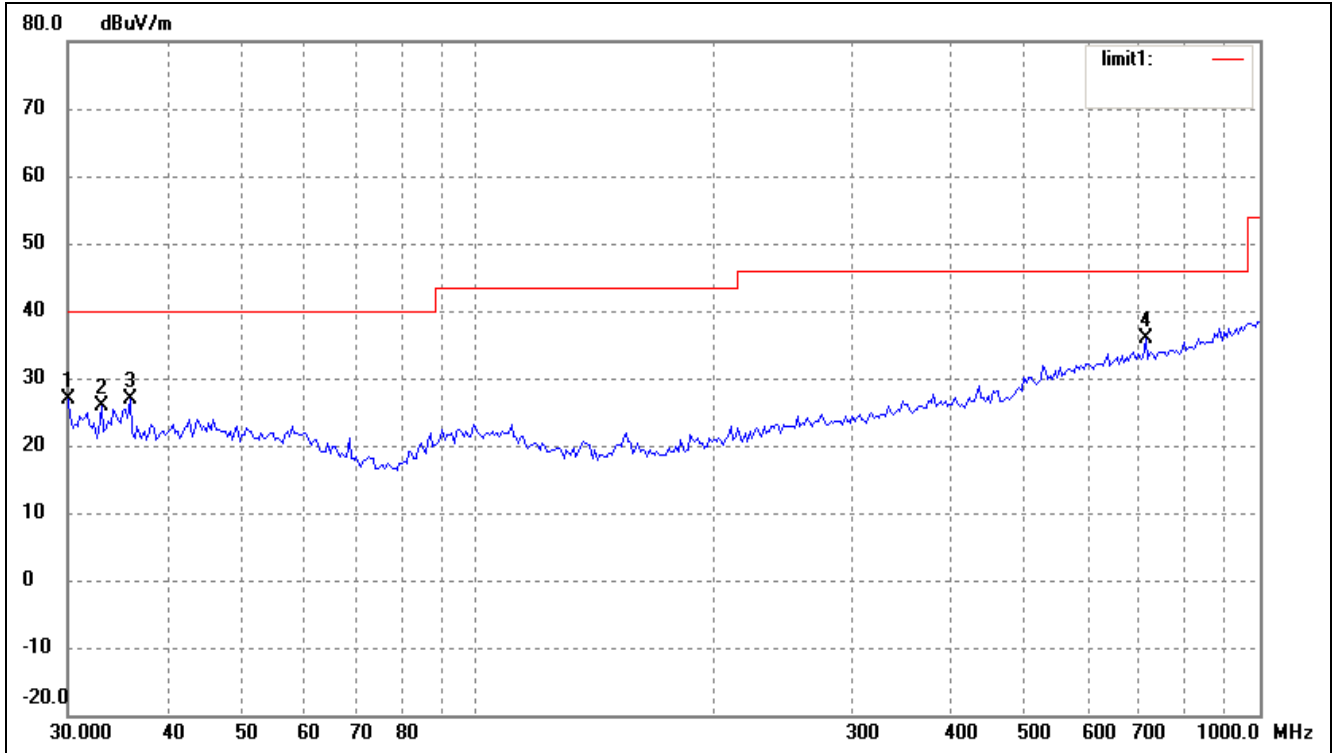
M/N: KG-816

Operating Condition: Charging

Test Specification: Horizontal & Vertical

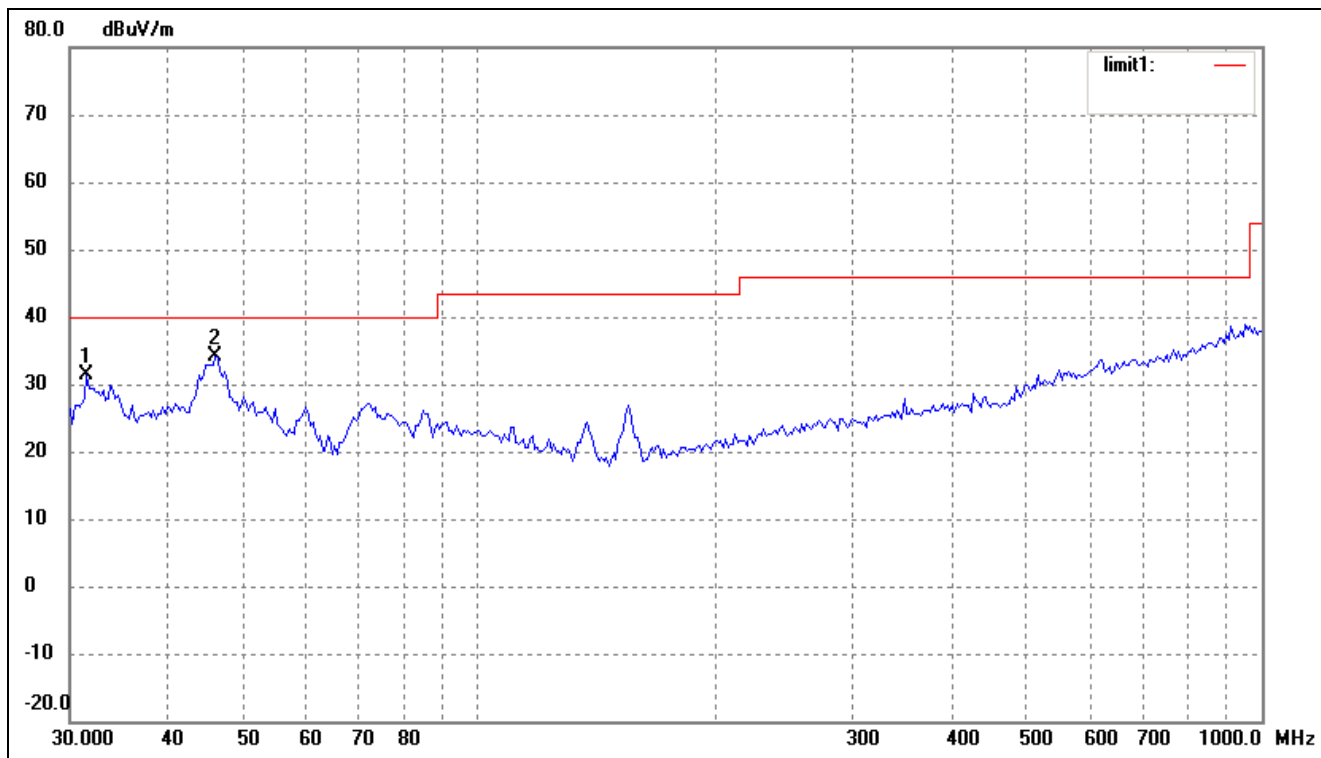
Comment: AC 120V/60Hz

Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	30.0000	20.20	6.77	26.97	40.00	-13.03	30	100	peak
2	33.0950	19.05	6.77	25.82	40.00	-14.18	60	100	peak
3	36.0007	19.84	7.05	26.89	40.00	-13.11	91	100	peak
4	714.1734	18.15	17.71	35.86	46.00	-10.14	24	100	peak

Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	31.5095	24.68	6.77	31.45	40.00	-8.55	24	100	peak
2	46.0164	26.07	8.18	34.25	40.00	-5.75	57	100	peak

Plot of Radiation Emissions Test

Radiated Disturbance

EUT: TWO-WAY RADIO

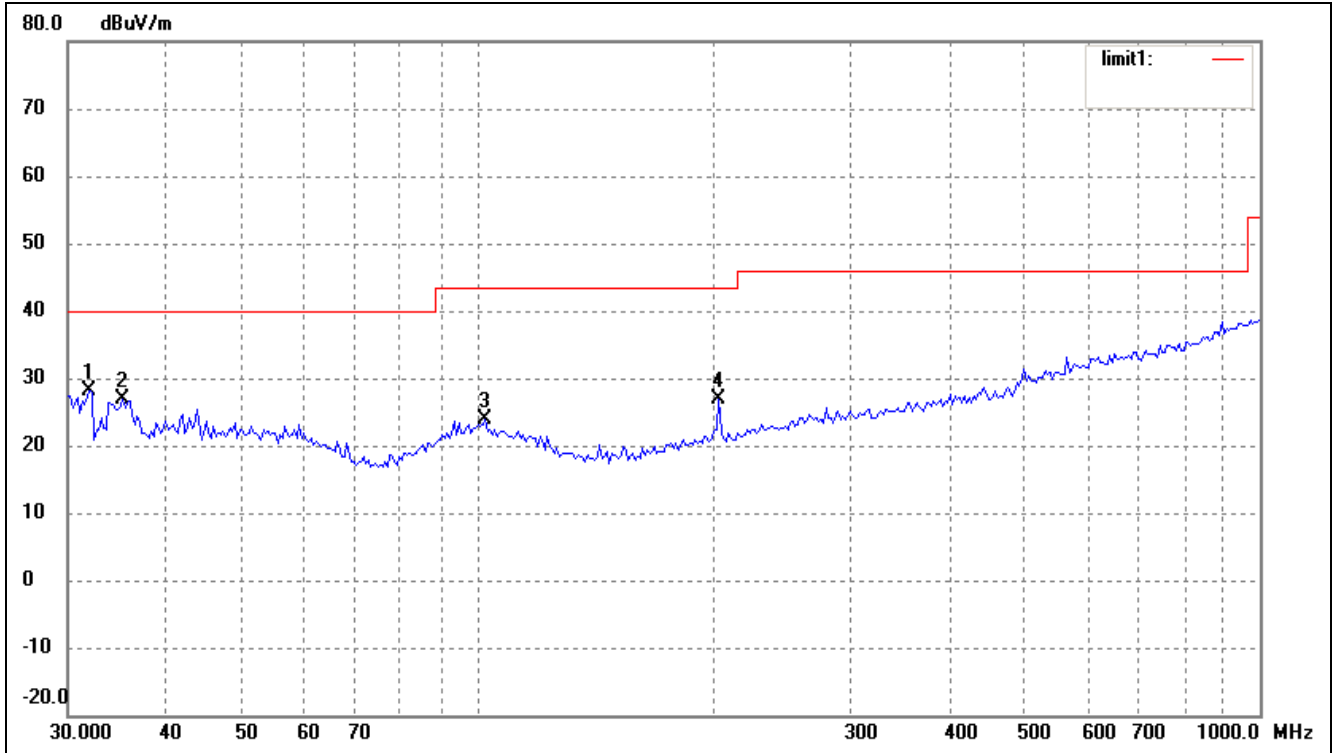
M/N: KG-816

Operating Condition: Charging

Test Specification: Horizontal & Vertical

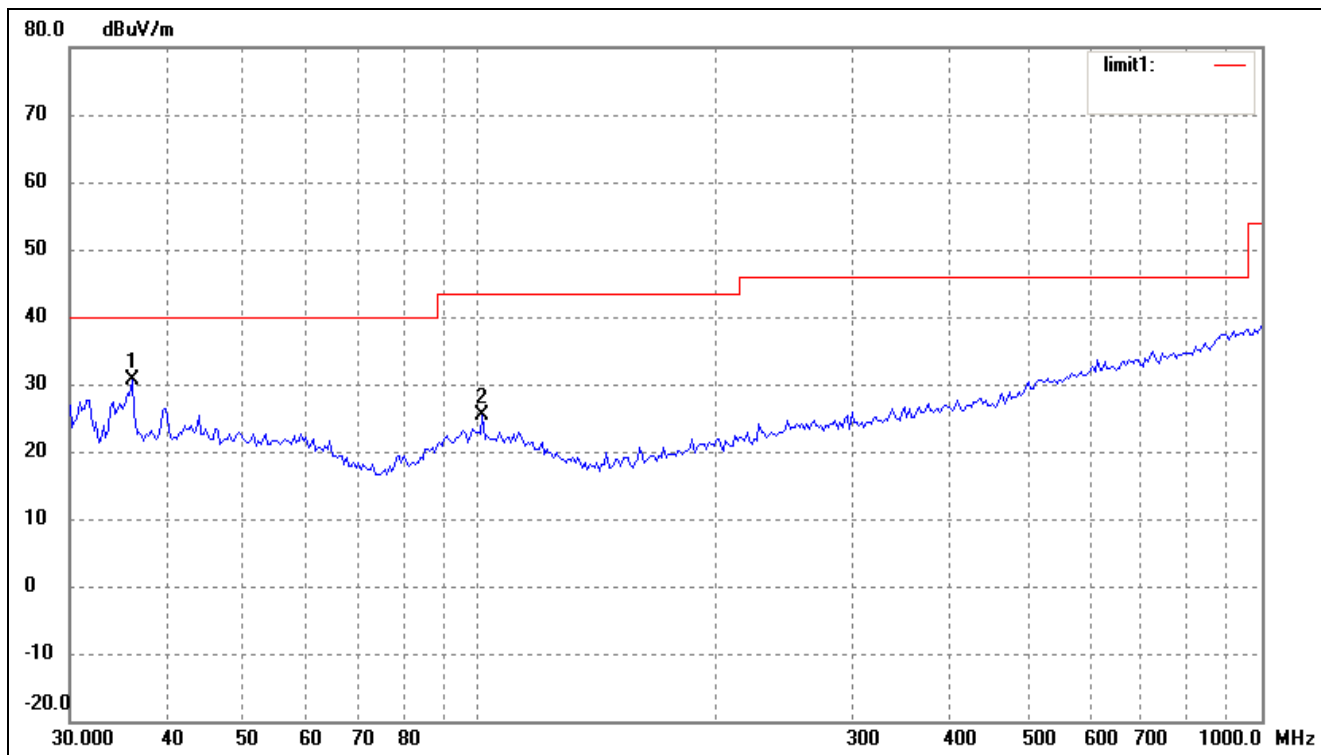
Comment: DC 12V

Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	31.9546	21.30	6.77	28.07	40.00	-11.93	305	100	peak
2	35.2512	20.14	6.83	26.97	40.00	-13.03	79	100	peak
3	102.3597	15.64	8.23	23.87	43.50	-19.63	0	100	peak
4	203.5228	20.27	6.71	26.98	43.50	-16.52	6	100	peak

Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	36.0007	23.65	7.05	30.70	40.00	-9.30	124	100	peak
2	100.9339	16.92	8.34	25.26	43.50	-18.24	57	100	peak

5. §2.1046-CONDUCTED OUTPUT POWER

5.1 Standard Applicable

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

5.2 Test Equipment List and Detail

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2010-12-20	2011-12-19
Atten	Attenuator	ATS100-4-20	/	2010-12-20	2011-12-19
VICTOR	Multimeter	VC9801A	98965350	2010-12-20	2011-12-19
FLUKE	Multimeter	15B	91280239	2010-12-20	2011-12-19

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

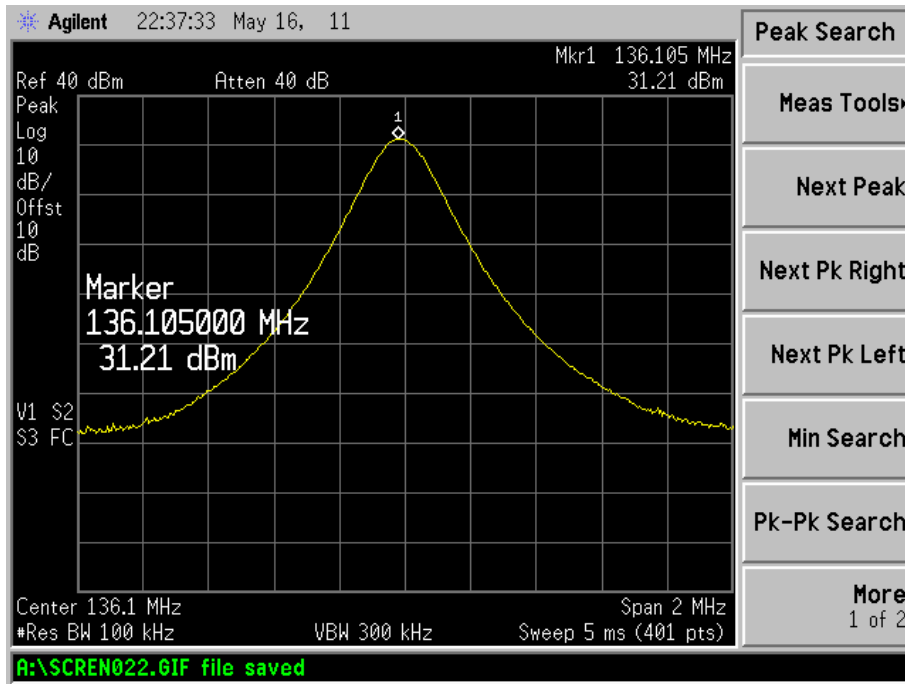
5.3 Test Procedure

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.

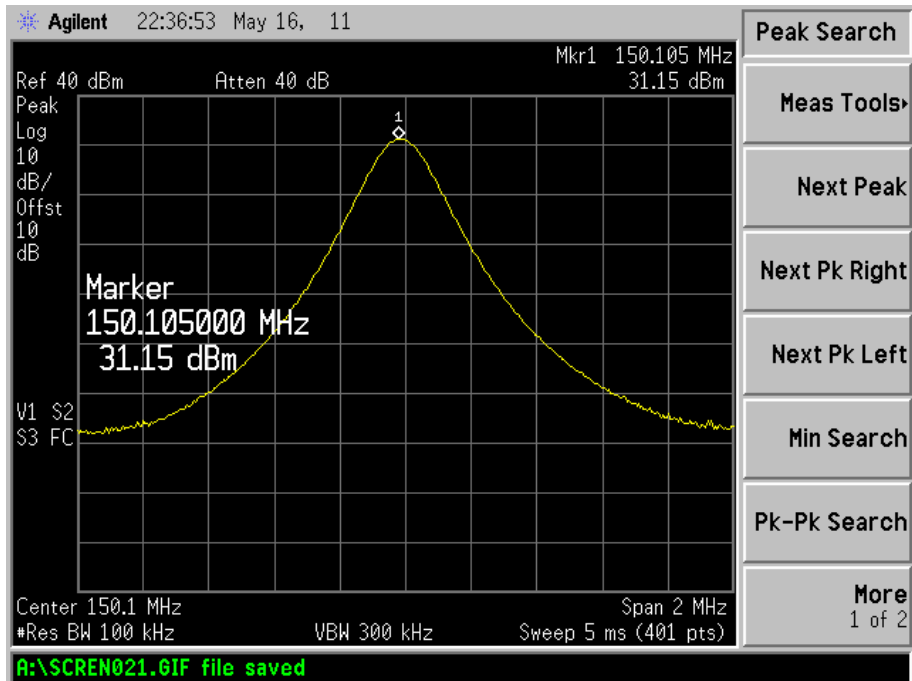
5.4 Test Result/Plots

Type	Channel	Frequency (MHz)	Collected Voltage (VDC)	Collected Current (A)	Output Power (dBm)	Output Power (W)
Narrowband	Low CH	136.125	7.4	0.615	31.21	1.3213
	Middle CH	150.125	7.4	0.608	31.15	1.3032
	High CH	173.875	7.4	0.603	31.09	1.2853

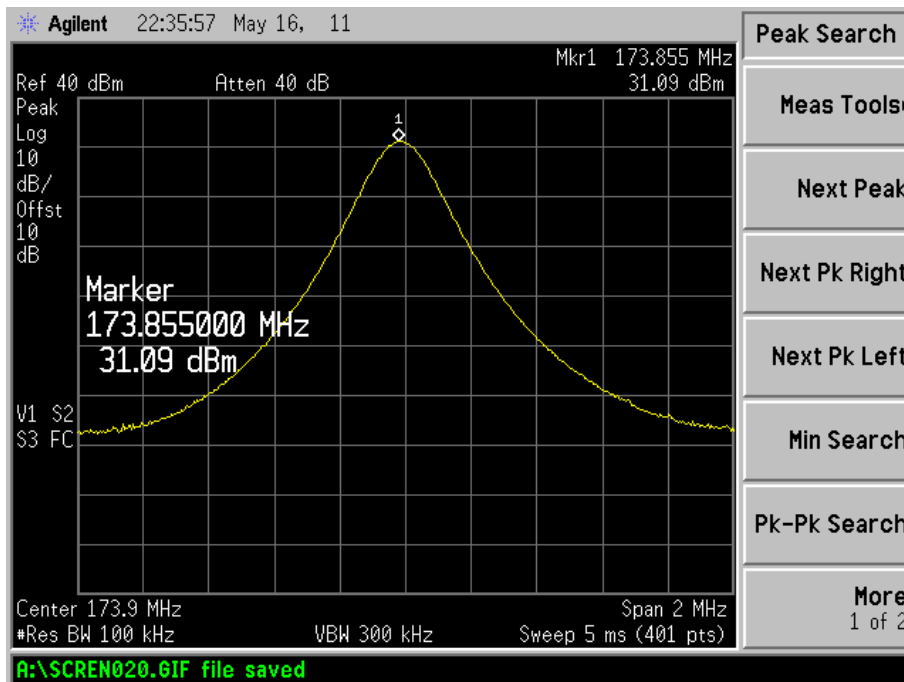
Narrowband-Low Channel:



Narrowband-Middle Channel:



Narrowband-High Channel:



6. §2.1046, and §90.205-RADIATED OUTPUT POWER (E.I.R.P.)

6.1 Standard Applicable

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

6.2 Test Equipment List and Detail

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-12-20	2011-12-19
Positioning Controller	C&C	CC-C-1F	N/A	2010-12-20	2011-12-19
RF Switch	EM	EMSW18	SW060023	2010-12-20	2011-12-19
Pre-amplifier	Agilent	8447F	3113A06717	2010-12-20	2011-12-19
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-12-20	2011-12-19
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2011-01-09	2012-01-08
Horn Antenna	ETS	3117	00086197	2011-01-09	2012-01-08
Signal Generator	Rohde & Schwarz	SMR20	100047	2010-12-20	2011-12-19

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

6.3 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

6.4 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								
136.125	19.75	1.5	33	H	1.3	0	18.45	0.0700
136.125	31.52	1.5	26	V	1.3	0	30.22	1.0512
Narrowband-Middle Channel								
150.125	19.26	1.5	46	H	1.4	0	17.86	0.0611
150.125	31.65	1.5	18	V	1.4	0	30.25	1.0592
Narrowband-High Channel								
173.875	18.59	1.5	185	H	1.4	0	17.19	0.0524
173.875	30.60	1.5	66	V	1.4	0	29.20	0.8318

7. §2.1047, and §90.207-MODULATION CHARACTERISTICS

7.1 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.

7.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Modulation Analyzer	Rohde & Schwarz	FAM 54	334.2015.54	2010-12-20	2011-12-19
Attenuator	Atten	ATS100-4-20	/	2010-12-20	2011-12-19
Audio Generator	MEILI	MFG-3005	200612187	2010-12-20	2011-12-19

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

7.3 Test Procedure

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

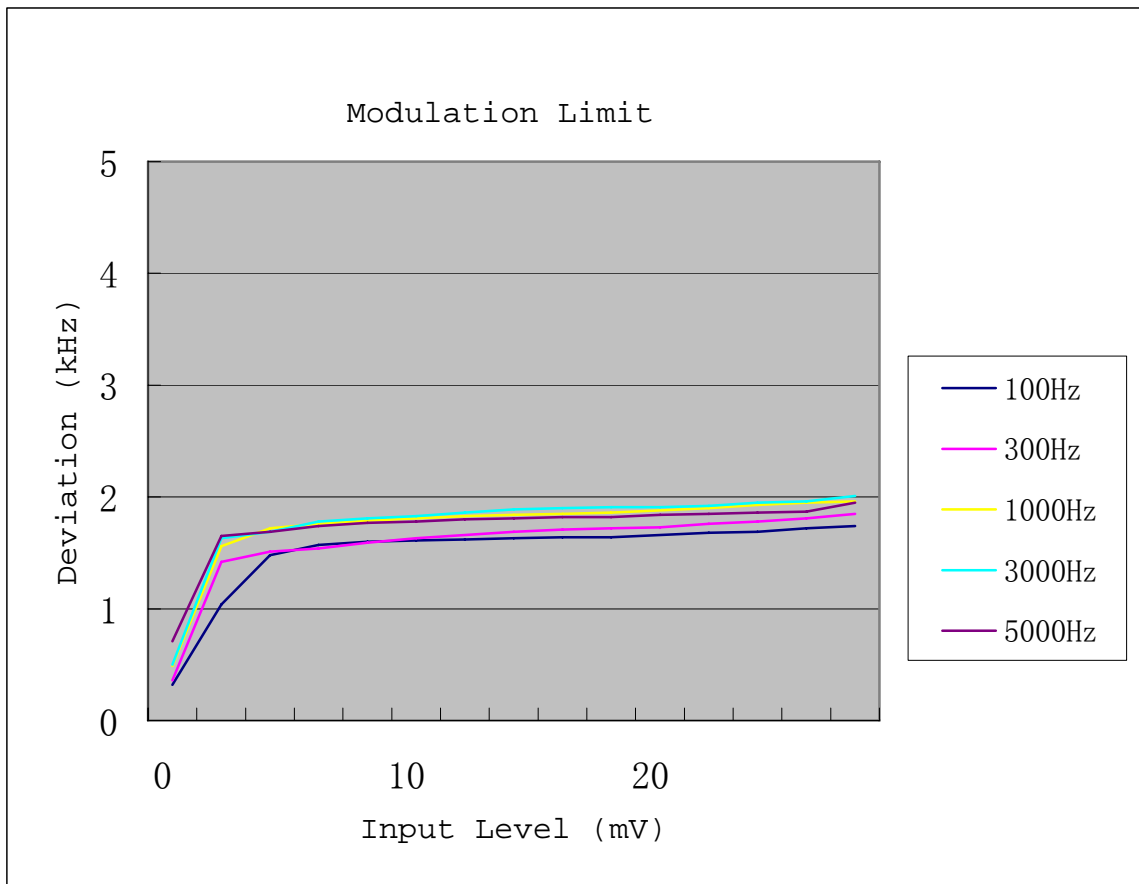
7.4 Environmental Conditions

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

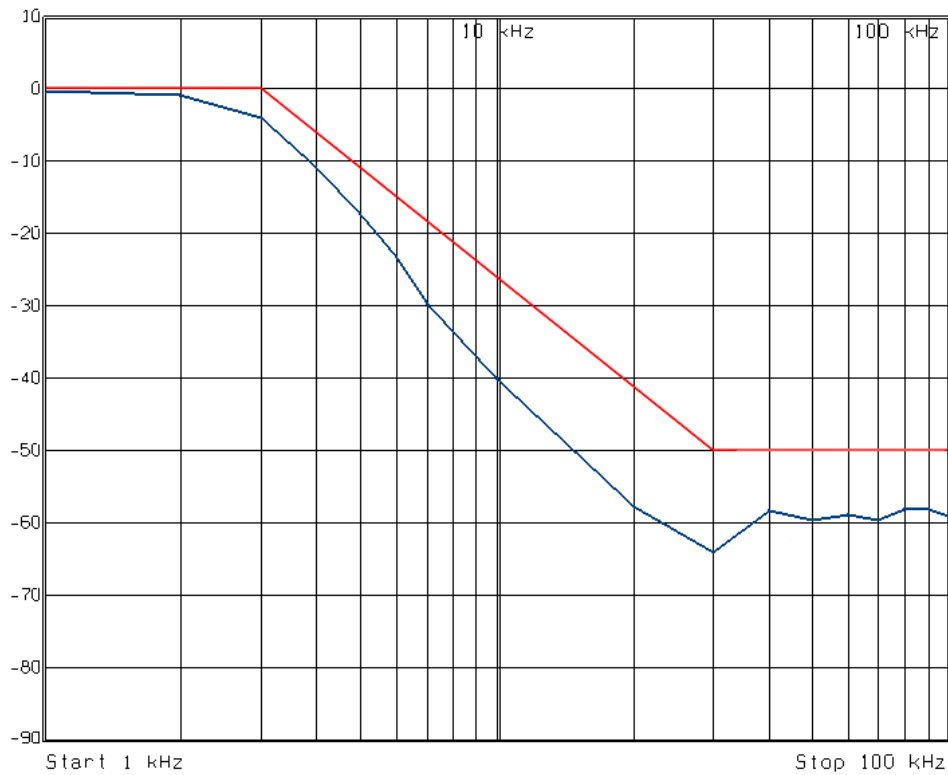
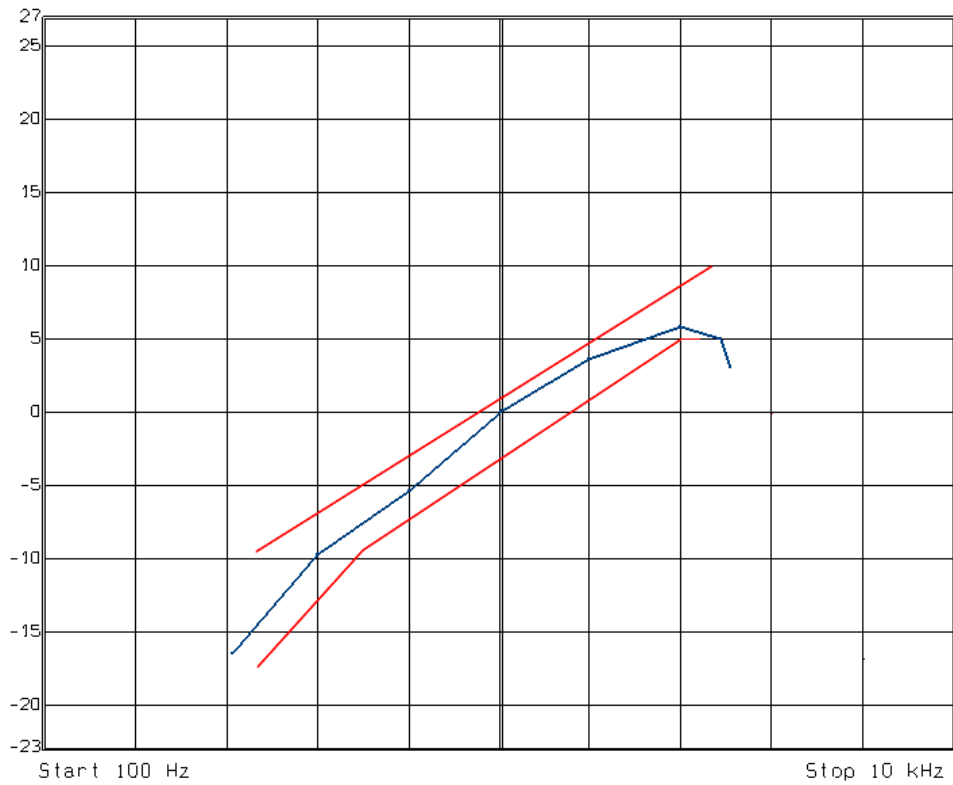
7.5 Test Results/Plots

For Narrowband Channel Separation 12.5 kHz

Audio Input (mV)	100Hz Deviation (kHz)	300Hz Deviation (kHz)	1kHz Deviation (kHz)	3kHz Deviation (kHz)	5kHz Deviation (kHz)
0	0.32	0.36	0.49	0.50	0.71
2	1.04	1.42	1.56	1.63	1.65
4	1.48	1.51	1.72	1.69	1.69
6	1.57	1.54	1.76	1.78	1.74
8	1.60	1.59	1.79	1.81	1.77
10	1.61	1.63	1.81	1.83	1.78
12	1.62	1.66	1.83	1.86	1.80
14	1.63	1.69	1.84	1.89	1.81
16	1.64	1.71	1.85	1.90	1.82
18	1.64	1.72	1.86	1.91	1.82
20	1.66	1.73	1.88	1.91	1.84
24	1.68	1.76	1.90	1.92	1.85
28	1.69	1.78	1.93	1.95	1.86
32	1.72	1.81	1.95	1.96	1.87
36	1.74	1.85	1.96	2.01	1.95



Audio Low Pass Filter Characteristic Curve



8. §2.1049 and §90.209 - OCCUPIED BANDWIDTH OF EMISSION

8.1 Standard Applicable

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

Emission Mask 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 (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88 \text{ kHz})$ dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d 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

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2010-08-12	2011-08-11
Atten	Attenuator	DC-4GHz	ATS100-4-20	2010-08-12	2011-08-11
Audio Generator	MEILI	MFG-3005	200612187	2010-08-12	2011-08-11

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

8.3 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.

8.4 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:

$K=1$

$M=3\text{kHz}$

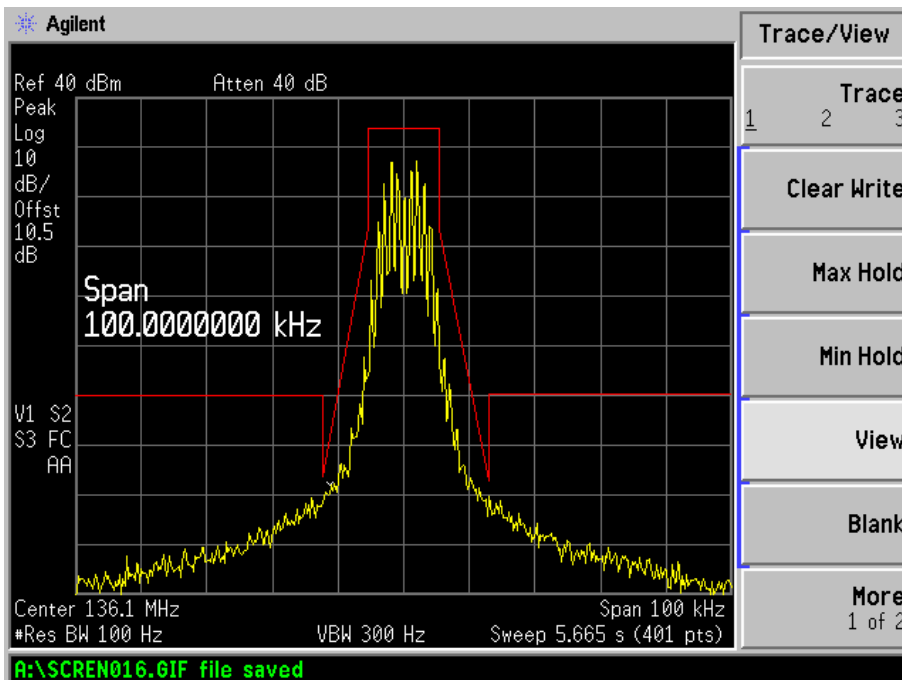
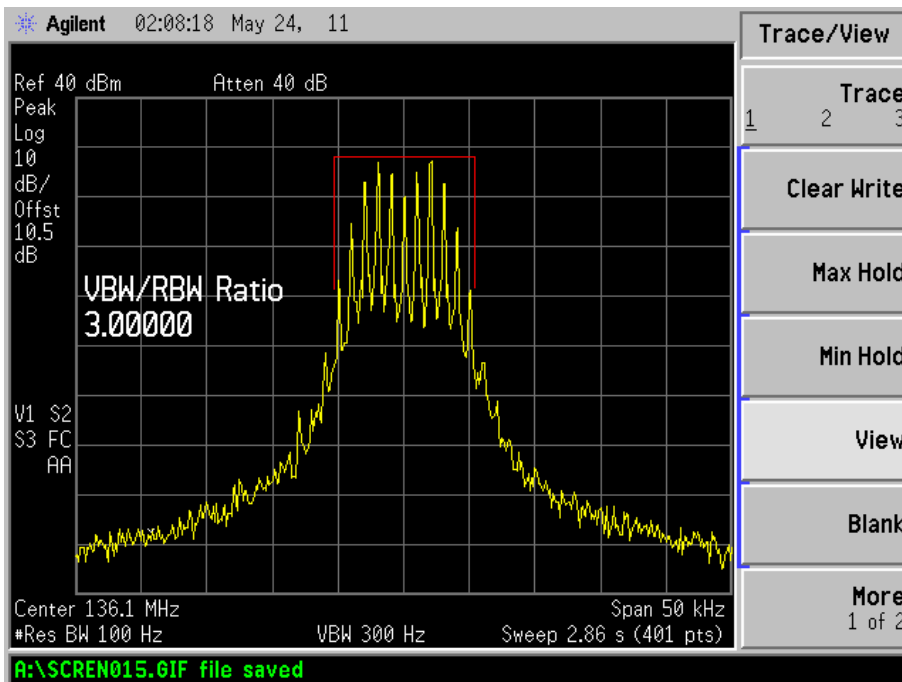
$D=2.5\text{kHz}$

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

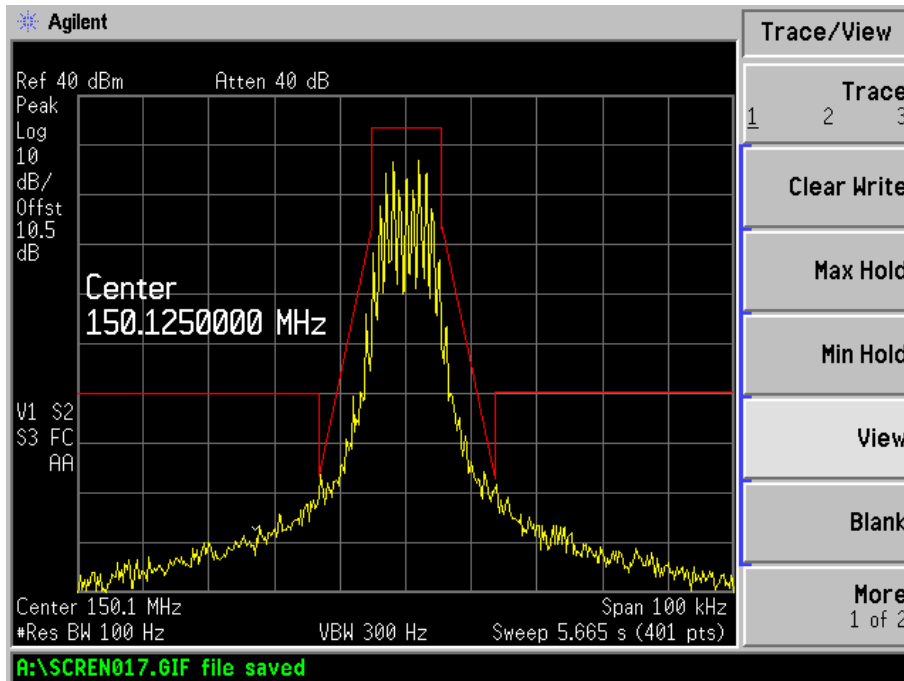
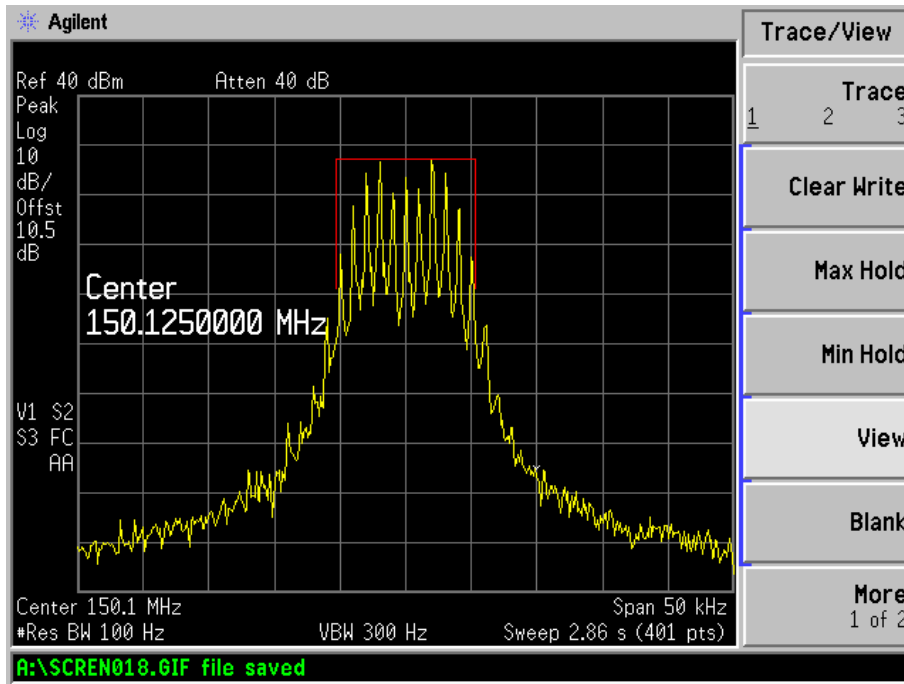
Emission Designation=11K0F3E

Refer to the attached plots.

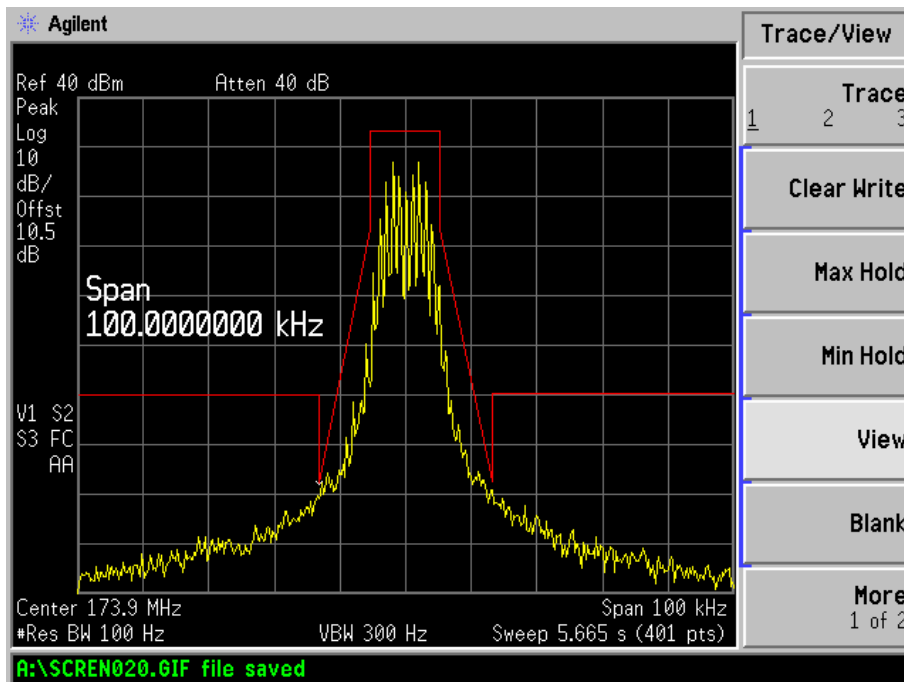
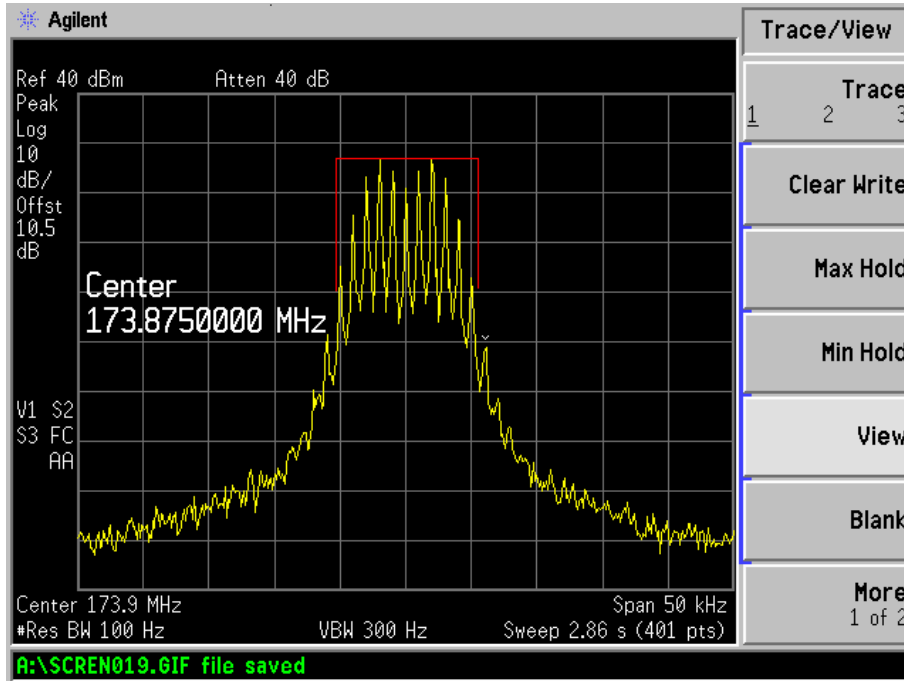
Narrowband-Low Channel:



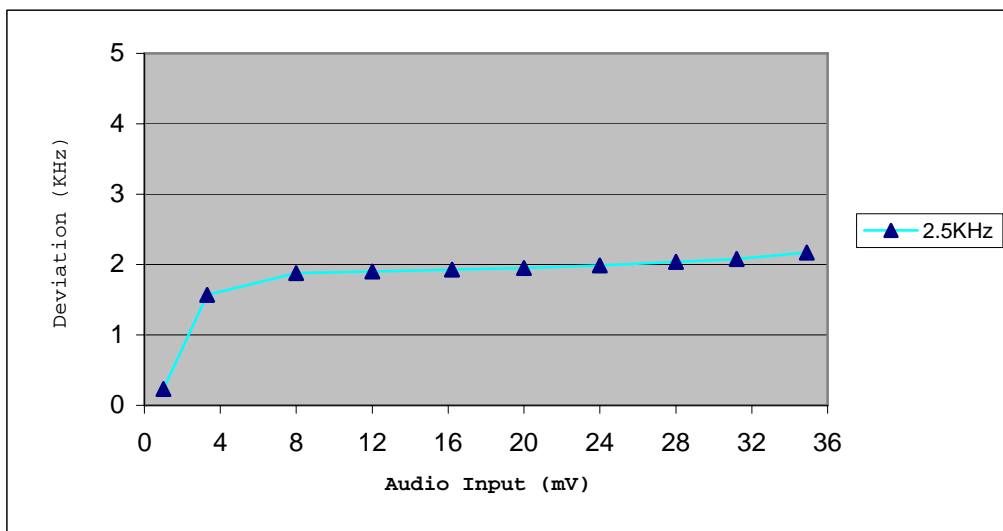
Narrowband-Middle Channel:



Narrowband-High Channel:



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



9. §2.1053 and §90.210- RADIATED SPURIOUS EMISSION

9.1 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 ± 5.10 dB.

9.2 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 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 (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88 \text{ kHz})$ dB.

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

9.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2010-12-20	2011-12-19
Positioning Controller	C&C	CC-C-1F	N/A	2010-12-20	2011-12-19
RF Switch	EM	EMSW18	SW060023	2010-12-20	2011-12-19
Pre-amplifier	Agilent	8447F	3113A06717	2010-12-20	2011-12-19
Pre-amplifier	Compliance Direction	PAP-0118	24002	2010-12-20	2011-12-19
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2011-01-09	2012-01-08
Horn Antenna	ETS	3117	00086197	2011-01-09	2012-01-08
Signal Generator	Rohde & Schwarz	SMR20	100047	2010-12-20	2011-12-19

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

9.4 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.

9.5 Environmental Conditions

Temperature:	22 °C
Relative Humidity:	53%
ATM Pressure:	1014 mbar

9.6 Summary of Test Results/Plots

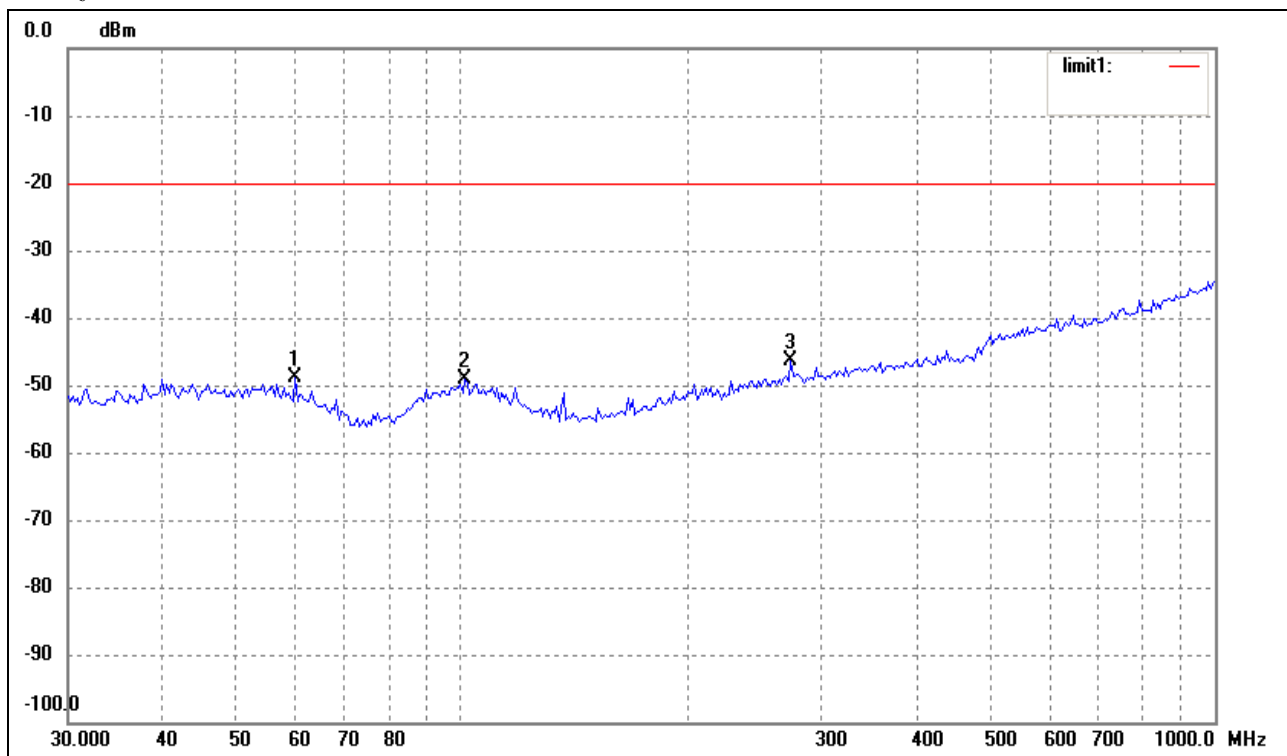
According to the data below, the FCC Part 90 standards, and had the worst margin of:

**-15.58 dB at 938.8324 MHz in the Vertical of Narrow-High channel polarization, 30 MHz to 2 GHz,
3Meters.**

Plots of the spurious emission for below 1GHz:

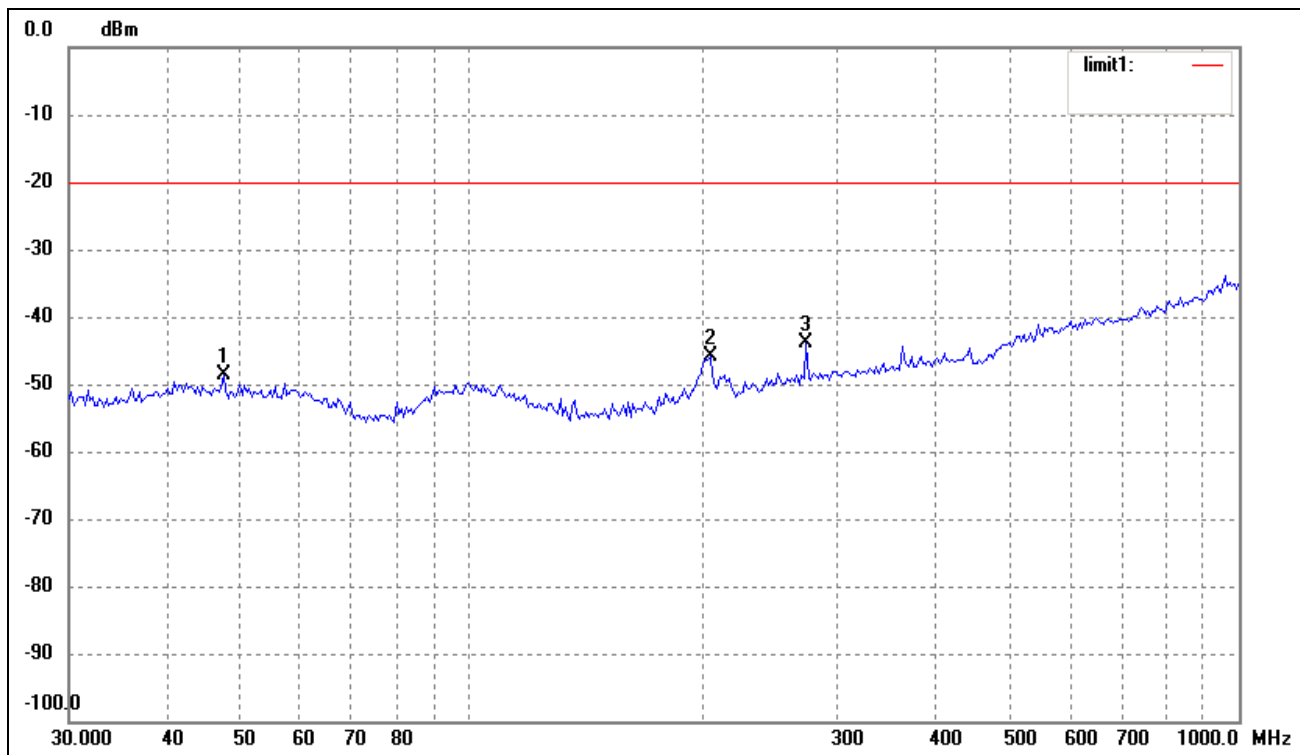
Narrowband Low Channel:

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	60.0691	-68.22	19.30	-48.92	-20.00	-28.92	ERP
2	100.9340	-69.36	20.14	-49.22	-20.00	-29.22	ERP
3	273.2341	-67.47	21.13	-46.34	-20.00	-26.34	ERP

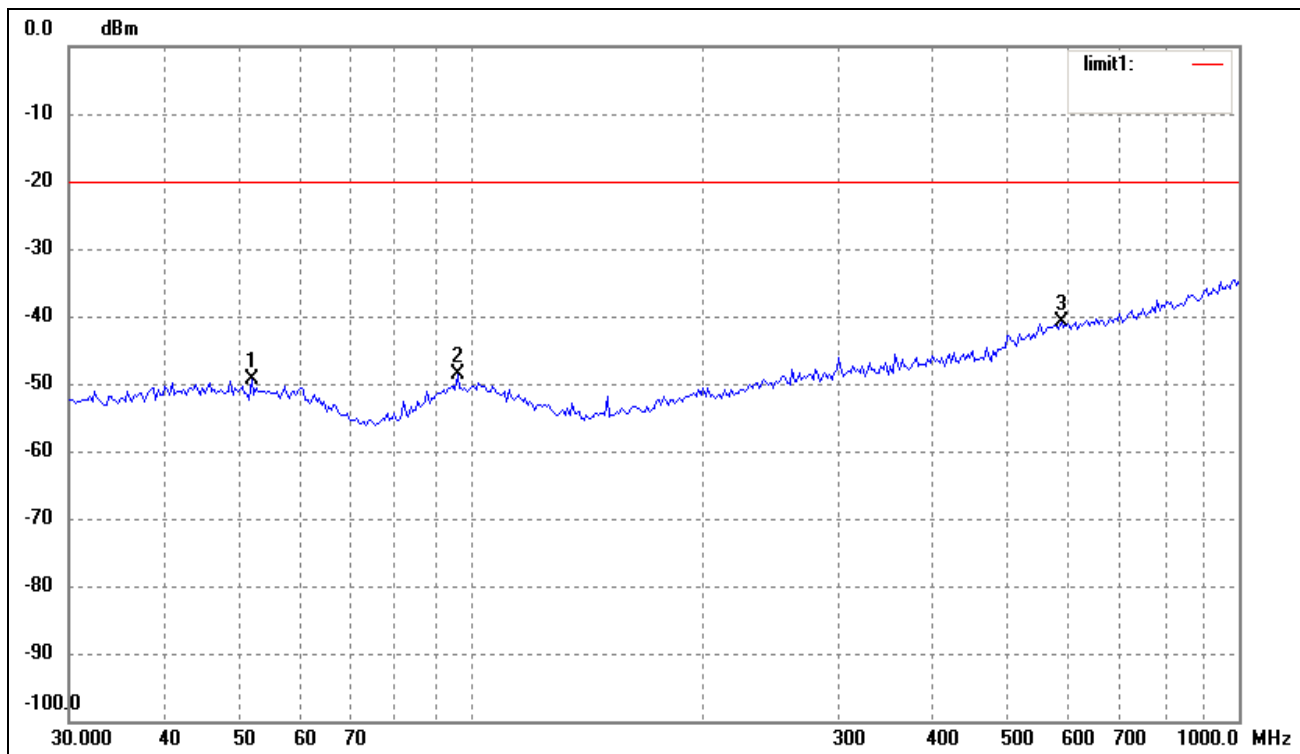
Vertical:



No.	Frequency (MHz)	Reading (dBm)	Correct (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	47.6586	-68.61	19.89	-48.72	-20.00	-28.72	ERP
2	204.9551	-64.38	18.55	-45.83	-20.00	-25.83	ERP
3	273.2341	-65.02	21.13	-43.89	-20.00	-23.89	ERP

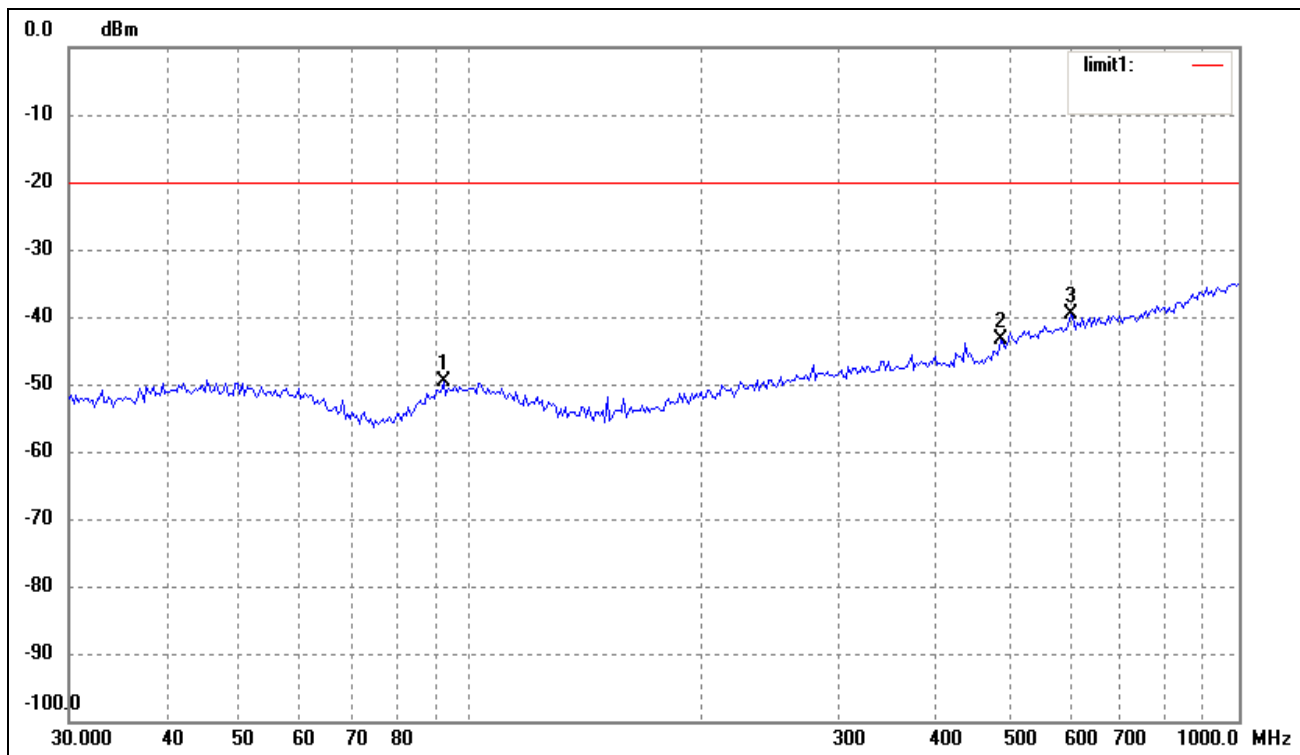
Narrowband Middle Channel:

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	51.8430	-68.98	19.70	-49.28	-20.00	-29.28	ERP
2	96.0986	-68.53	19.94	-48.59	-20.00	-28.59	ERP
3	586.8437	-68.95	28.18	-40.77	-20.00	-20.77	ERP

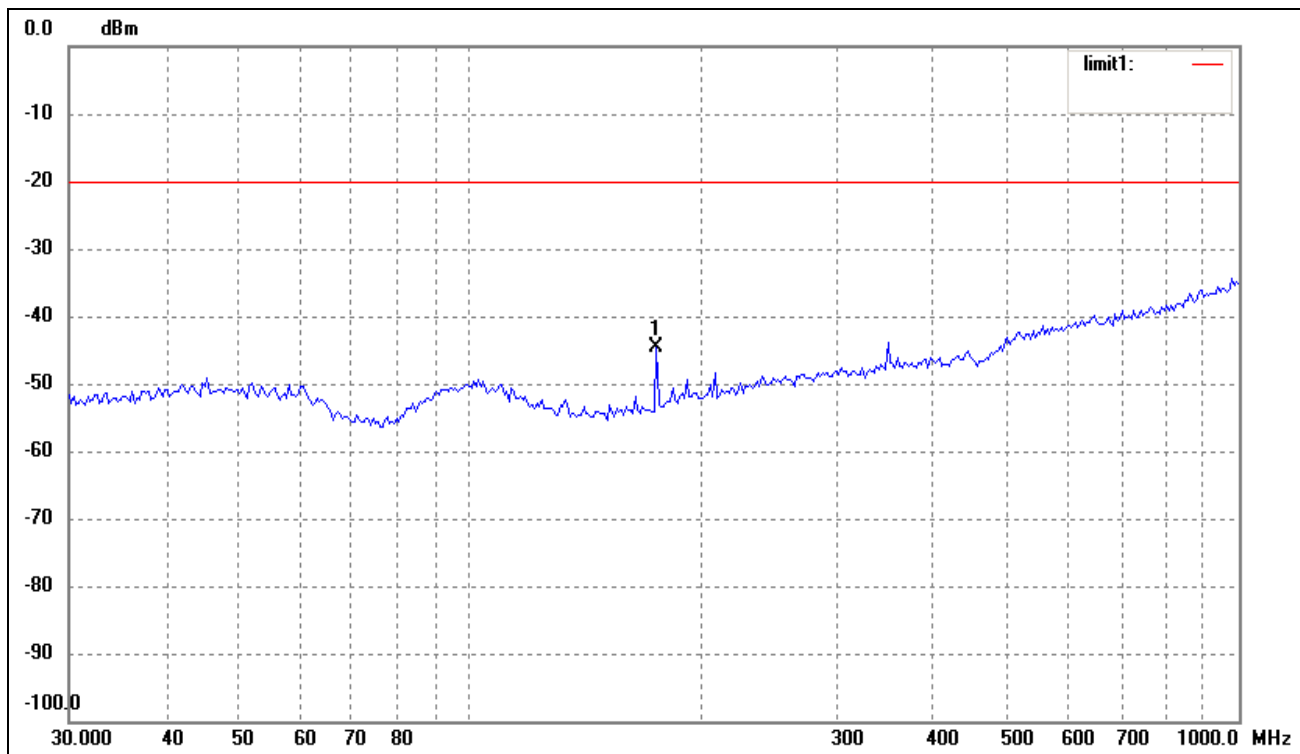
Vertical:



No.	Frequency (MHz)	Reading (dBm)	Correct (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	92.1388	-69.01	19.30	-49.71	-20.00	-29.71	ERP
2	489.0269	-68.51	25.14	-43.37	-20.00	-23.37	ERP
3	603.5392	-68.19	28.50	-39.69	-20.00	-19.69	ERP

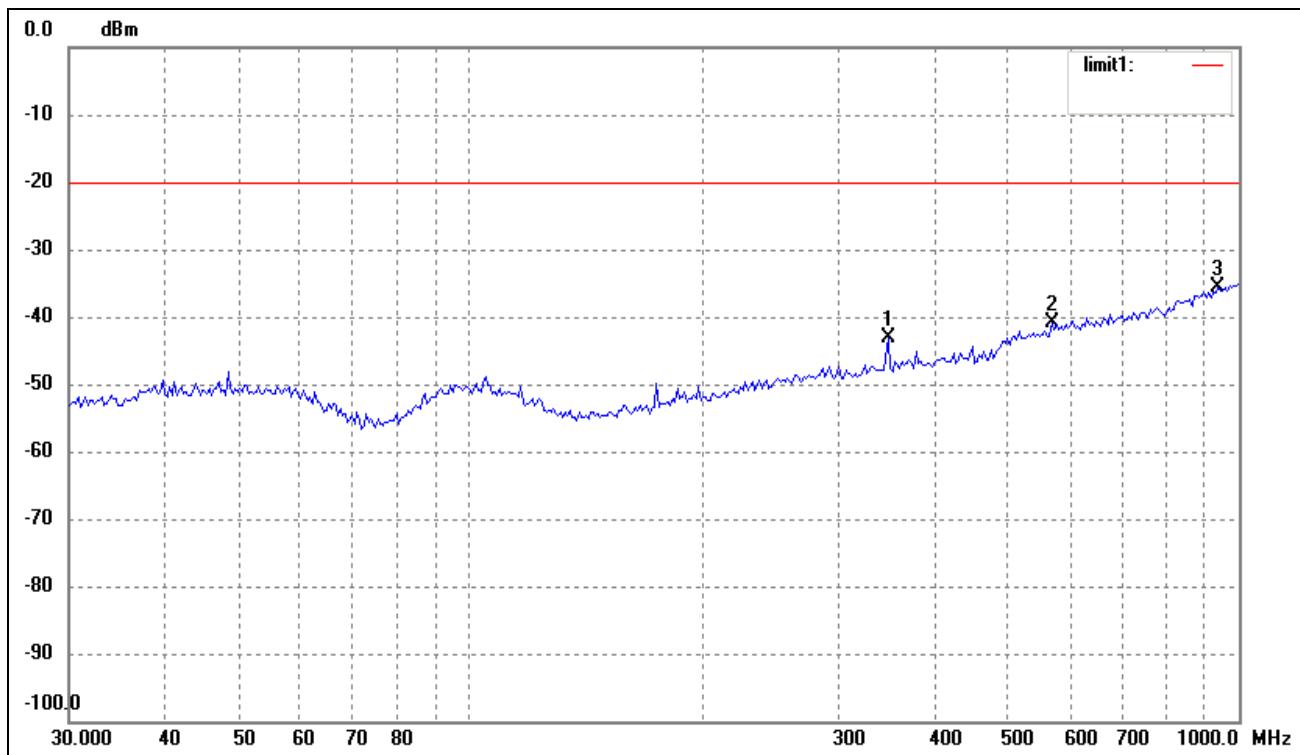
Narrowband High Channel:

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	174.4241	-61.60	17.02	-44.58	-20.00	-24.58	ERP

Vertical:



No.	Frequency (MHz)	Reading (dBm)	Correct (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	349.2500	-65.57	22.45	-43.12	-20.00	-23.12	ERP
2	570.6100	-68.80	27.81	-40.99	-20.00	-20.99	ERP
3	938.8324	-68.99	33.41	-35.58	-20.00	-15.58	ERP

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

10. §2.1051 and §90.210-SPURIOUS EMISSIONS AT ANTENNA TERMINALS

10.1 Standard Applicable

According to §2.1051 and §90.210

For 12.5kHz bandwidth

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

10.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2010-12-20	2011-12-19
ETS	50 ohm Coaxial Cable	SUCOFLEX 104	25498514	2010-12-20	2011-12-19

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

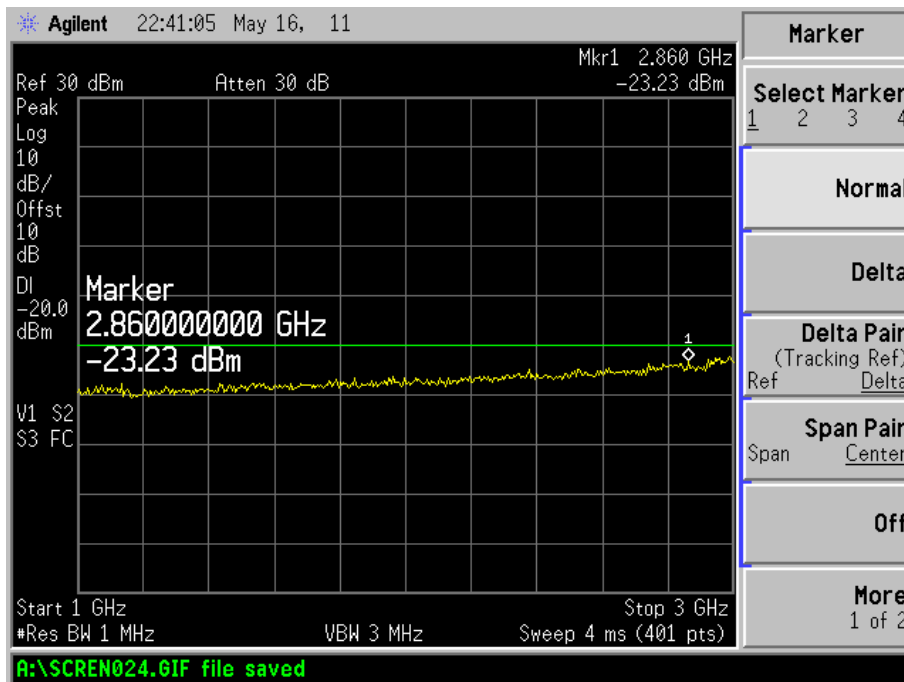
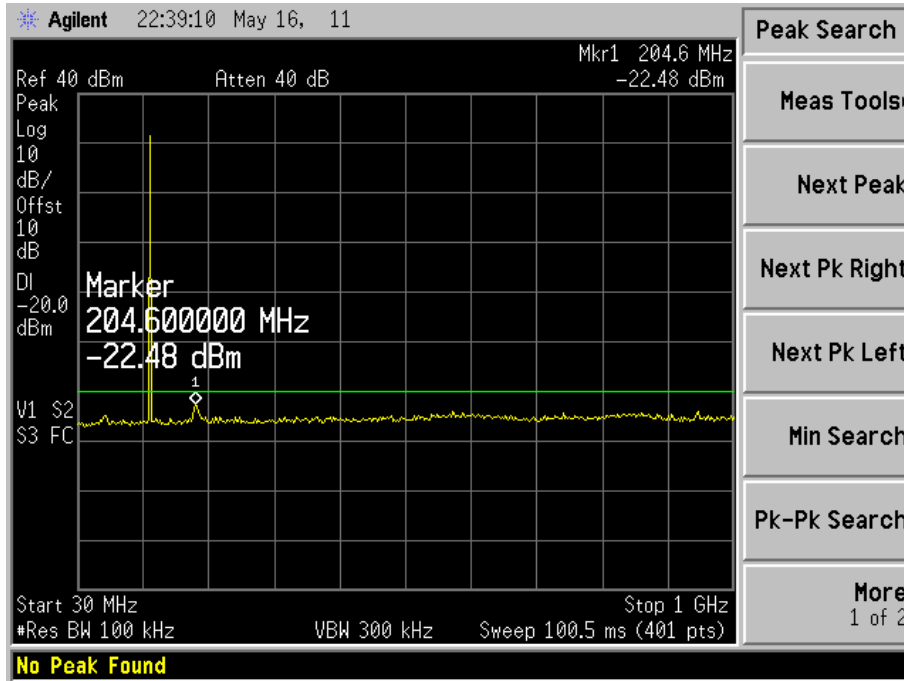
10.3 Test Procedure

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.

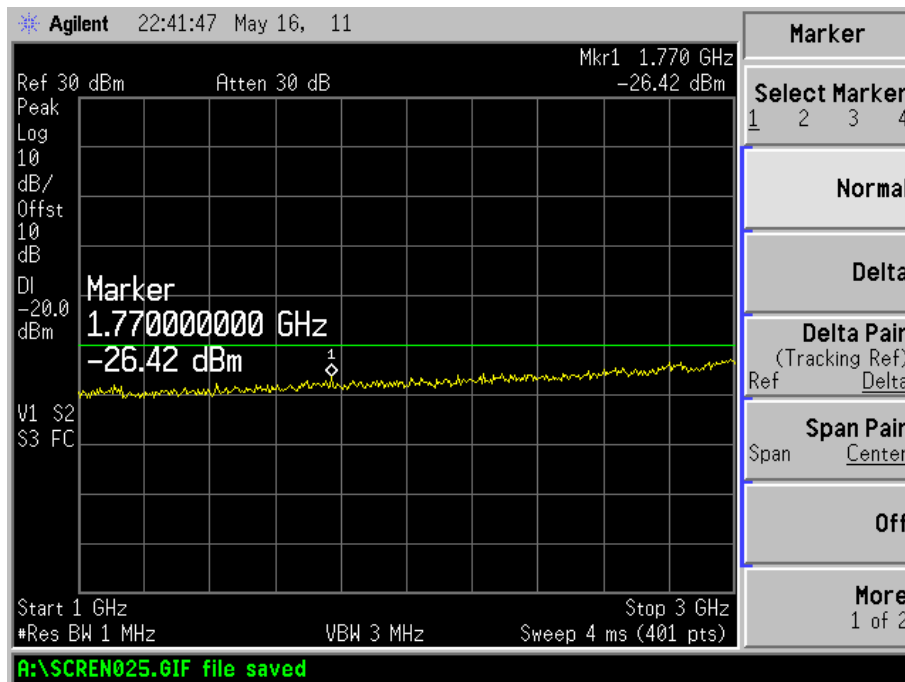
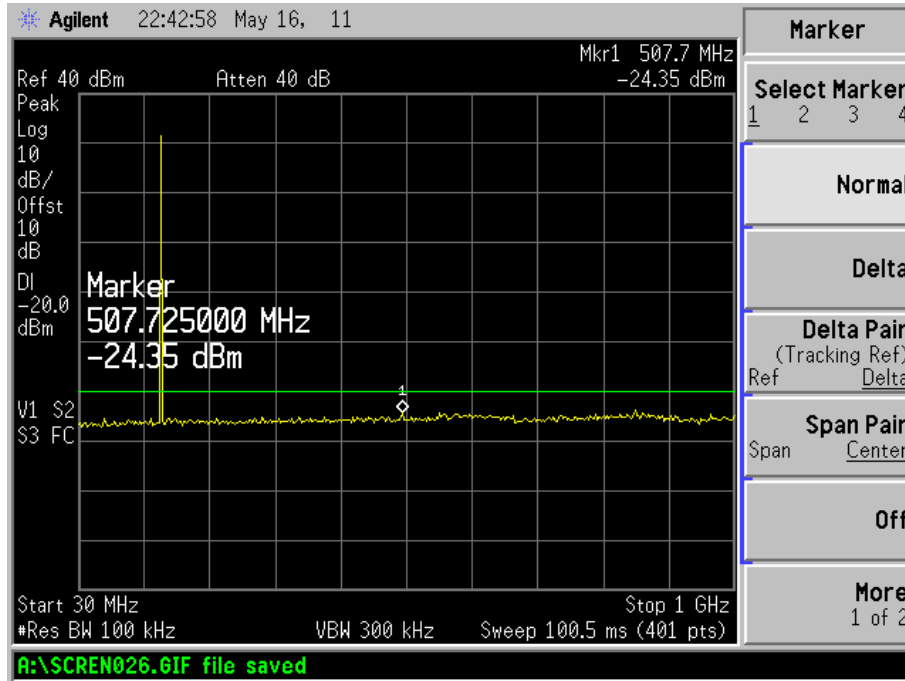
10.4 Summary of Test Results/Plots

Refer to the attached plots.

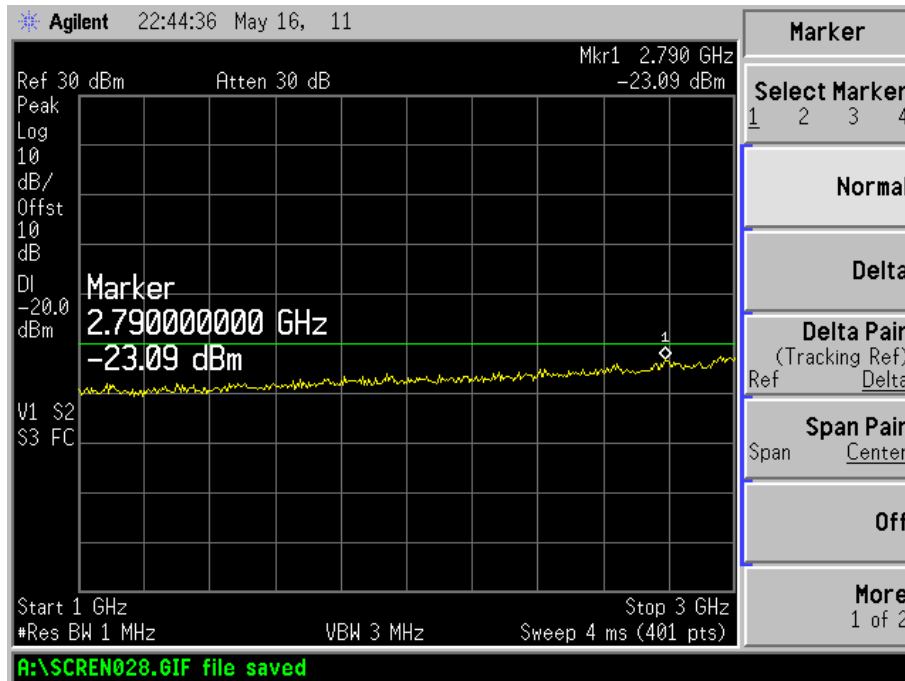
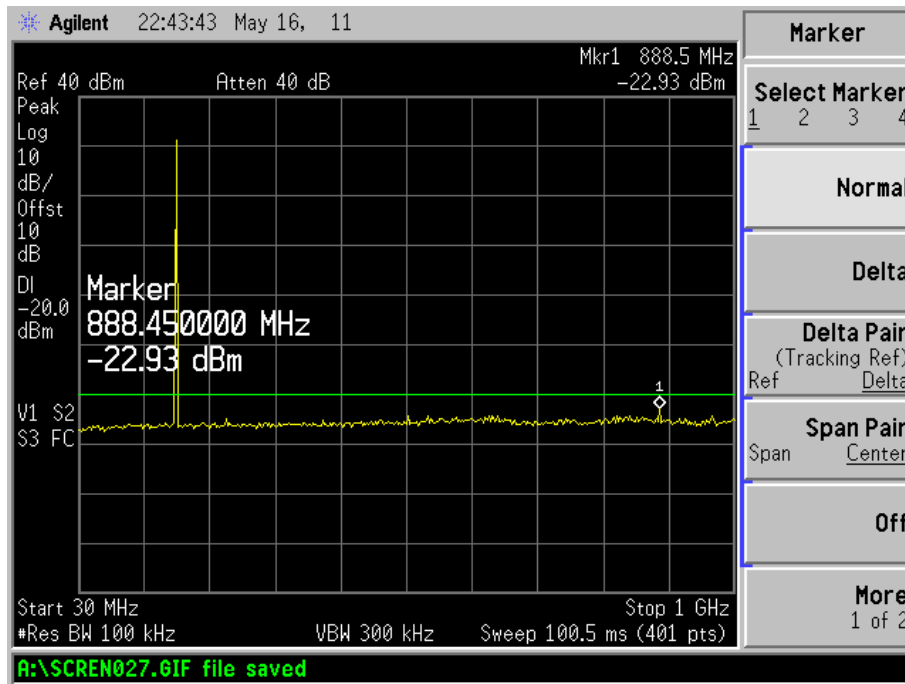
Narrowband-Low Channel:



Narrowband-Middle Channel:



Narrowband-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.

11. §2.1055 (d) and §90.213- FREQUENCY STABILITY

11.1 Standard Applicable

According to FCC §2.1055 (d) and §90.213.

For output power 2 watts or less than 2 watts, the limit is 2.5ppm.

11.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Agilent	Spectrum Analyzer	E4402B	US41192821	2010-12-20	2011-12-19
Atten	Attenuator	ATS100-4-20	/	2010-12-20	2011-12-19
GONGWEN	Moisture Test Chamber	GDS-150	SEMT-0013	2010-12-20	2011-12-19

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

11.3 Test Procedure

1. Setup the configuration of the ambient temperature from -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.

11.4 Test Results/Plots

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)	-0.42	-0.37	-0.37
T _{min} (-30°C)	V _{nom} (7.40V)	-0.45	-0.43	-0.35
T _{min} (-20°C)	V _{nom} (7.40V)	-0.43	-0.44	-0.44
T _{min} (-10°C)	V _{nom} (7.40V)	-0.42	-0.45	-0.43
T _{min} (0°C)	V _{nom} (7.40V)	-0.46	-0.43	-0.43
T _{max} (+30°)	V _{nom} (7.40V)	-0.45	-0.44	-0.43
T _{max} (+40°)	V _{nom} (7.40V)	-0.44	-0.48	-0.45
T _{max} (+50°)	V _{nom} (7.40V)	-0.47	-0.47	-0.47
Max. frequency error (ppm)		-0.47	-0.48	-0.47
Limit		±2.5ppm		
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 Channels:

t1	$\pm 12.5/25.0$	5.0 ms
	kHz	
t2.....	$\pm 6.25/12.5$	20.0 ms
	kHz	
t3.....	$\pm 12.5/25.0$	5.0 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	2010-12-20	2011-12-19
Attenuator	Atten	DC-4GHz	ATS100-4-20	2010-12-20	2011-12-19
Audio Generator	MEILI	MFG-3005	200612187	2010-12-20	2011-12-19
Signal Generator	Rohde & Schwarz	SMR20	100047	2010-12-20	2011-12-19
Oscilloscope	Agilent	DSO3102A	CN45002725	2010-12-20	2011-12-19
Spectrum Analyzer	Agilent	E4402B	US41192821	2010-12-20	2011-12-19

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

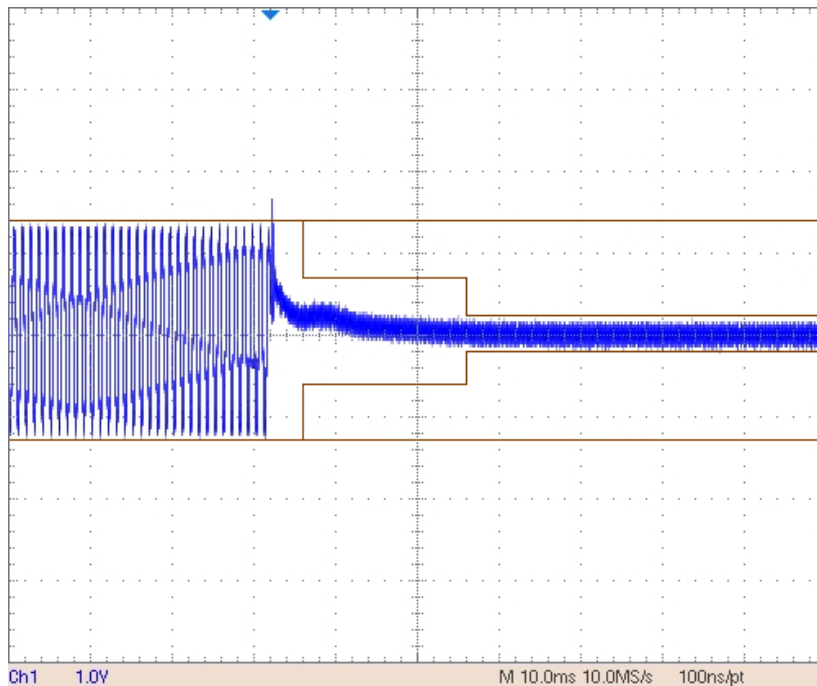
10.4 Test Results/Plots

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

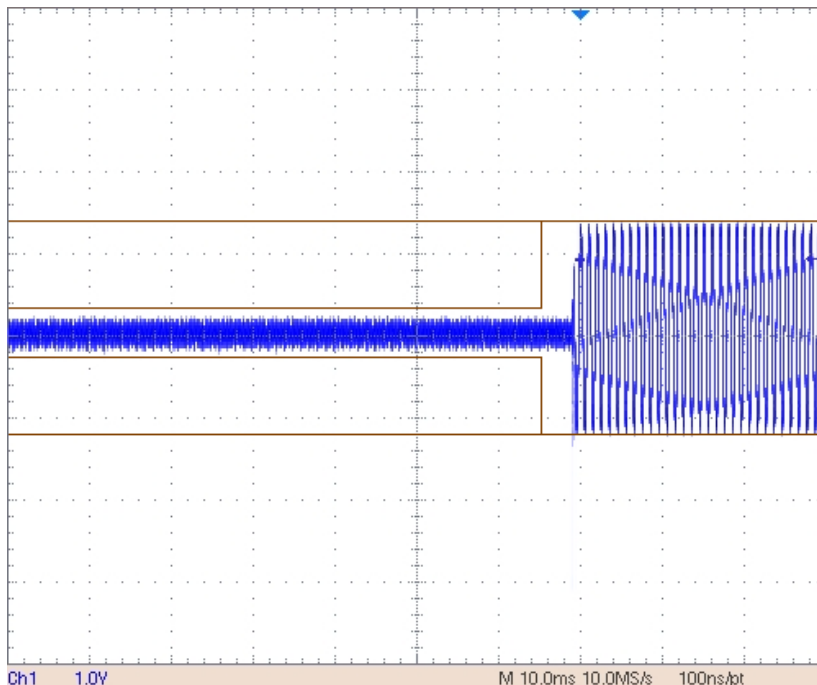
Operation Frequency (MHz)	Channel Separation (kHz)	Transient Period (ms)	Transient Frequency
150.125	12.5	<5	+/-12.5 kHz
		<20	+/-6.25 kHz
		<5	+/-12.5kHz

For Narrowband

TRANSIENT FREQUENCY BEHAVIOR-On



TRANSIENT FREQUENCY BEHAVIOR-Off



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