

FCC PART 22, 74, 80 and 90



TEST REPORT

For

Hytera Communications Co., Ltd.

Hyt Tower, Hi-Tech Industrial Park North, Nanshan District, Shenzhen, China

FCC ID: YAMRD98XSVHF

Report Type: Original Report	Product Type: Digital Base Station Repeater
Test Engineer: Tiger Ye 	
Report Number: RSZ130416005-00A	
Report Date: 2013-06-14	
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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Hytera Communications Co., Ltd.*'s product, model number: *RD982S VHF (FCC ID: YAMRD98XSVHF)* or the "EUT" in this report was a *Digital Base Station Repeater*, which was measured approximately: 366 mm (L) x 88 mm (W) x 483 mm (H), rated with input voltage: DC 13.6V.

Note: The product, series model RD982S VHF, RD985S VHF, RD986S VHF and RD988S VHF are electrically identical, they are just different in model number due to market purposes, which was explained in the attached declaration letter. Model RD982S VHF was selected for fully testing, which was stated and guaranteed by the applicant.

** All measurement and test data in this report was gathered from production sample serial number: 1304083 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2013-04-16.*

Objective

This test report is prepared on behalf of *Hytera Communications Co., Ltd.* in accordance with Part 2, and Part 90 of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

No related submittal.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of federal Regulations Title 47 Part 2, Sub-part J as well as the following individual parts:

Part 22 – Public Mobile Service

Part 74 – Experimental Radio, Auxiliary, Special Broadcast and other Program Distributional Service

Part 80 – Stations in the Maritime Service

Part 90 – Private Land Mobile Radio Service

Applicable Standards: TIA 603-D and ANSI 63.4-2009.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Description of Test Configuration

Equipment Modifications

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Mean Well	DC Power	SP-320-13.5	N/A

Cable Description	Length (m)	From/Port	To
Unshielded detachable DC Power Cable	3.0	EUT	DC Power

The diagram illustrates the experimental setup. A large rectangular area represents the test environment. At the top right, a box labeled "AC Mains" is connected to a box labeled "DC Power". The "DC Power" box is connected to a dashed rectangular box labeled "Non-conductive Table 150 cm above Ground Plane". Inside this dashed box is a box labeled "EUT". Below the dashed box is another box labeled "Non-conductive Table 80 cm above Ground Plane". The overall dimensions of the setup are indicated by arrows: a width of 1.5 Meters and a height of 1.0 Meter.

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1307 (b)(1), §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§2.1046; § 22.727; §74.461; § 80.215; §90.205	RF Output Power	Compliance
§2.1047; §74.463; §80.213;§90.207	Modulation Characteristic	Compliance
§2.1049;§22.357;§ 22.731; §74.462; § 80.205; § 80.207;§90.209; §90.210	Occupied Bandwidth & Emission Mask	Compliance
§2.1051; §22.861; §74.461; § 80.211;§90.210	Spurious Emission at Antenna Terminal	Compliance
§2.1053; §22.861; §74.461; § 80.211;§90.210	Spurious Radiated Emissions	Compliance
§2.1055; § 22.355; §74.464; § 80.209;§90.213	Frequency Stability	Compliance
§90.214	Transient Frequency Behavior	Compliance

Note: The uncertainty of any RF tests which use conducted method measurement is 0.96 dB.

The uncertainty of any radiation emissions measurement is 4.0 dB.

FCC §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

f = frequency in MHz

* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
	(dBi)	(numeric)	(dBm)	(mW)			
136.015	6.5	4.47	47.64	58076	350	0.17	1.0

Radiation Exposure Statement:

To comply with FCC RF exposure requirements, a minimum separation distance of 3.5m is required between the antenna and all public persons.

Result: Compliance

FCC §2.1046 & § 22.727 & §74.461 & §80.215 & §90.205- RF OUTPUT POWER**Applicable Standard**

FCC §2.1046, § 22.727, §74.461, § 80.215 and §90.205

Test Procedure

Conducted RF Output Power:

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

Spectrum Analyzer Setting:

R B/W	Video B/W
100 kHz	300 kHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

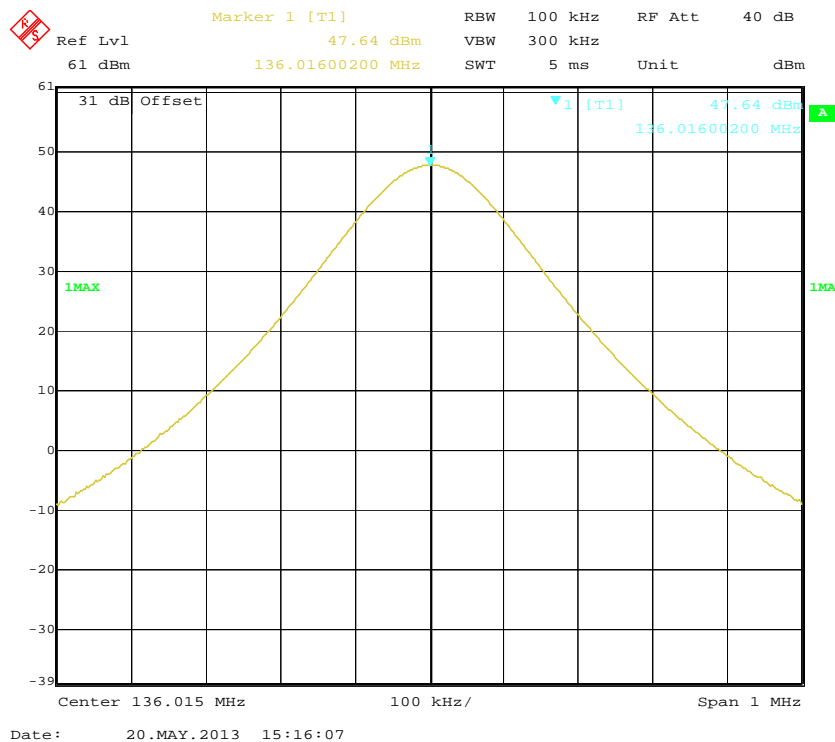
The testing was performed by Tiger Ye on 2013-05-20.

Test Mode: Transmitting

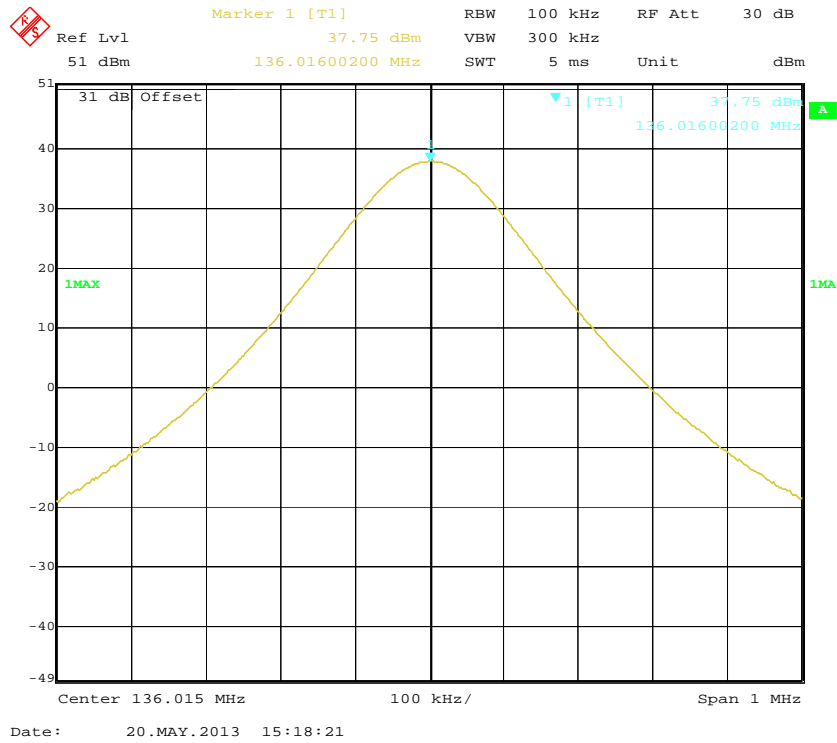
Test Result: Compliance. Please refer to following table.

Frequency (MHz)	Modulation	Power level	Conducted Output Power (dBm)	Conducted Output Power (W)
136.015	Analog	High	47.64	58.08
		Low	37.75	5.96
	Digital	High	47.63	57.94
		Low	37.75	5.96
156.000	Analog	High	47.57	57.15
		Low	37.74	5.94
	Digital	High	47.58	57.28
		Low	37.71	5.90
173.970	Analog	High	47.57	57.15
		Low	37.79	6.01
	Digital	High	47.59	57.41
		Low	37.75	5.96

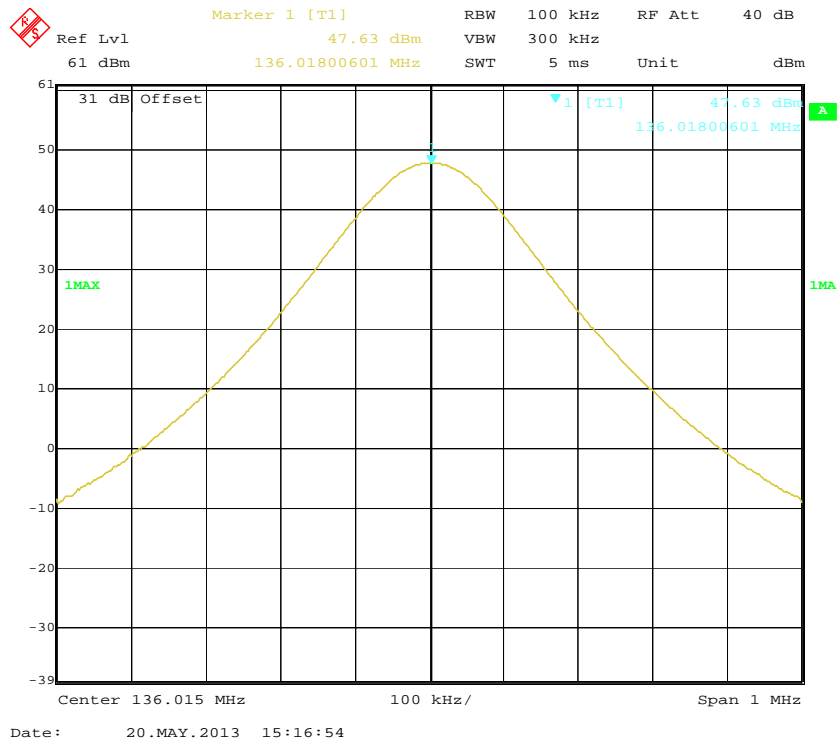
136.015 MHz, Analog Modulation, High Power



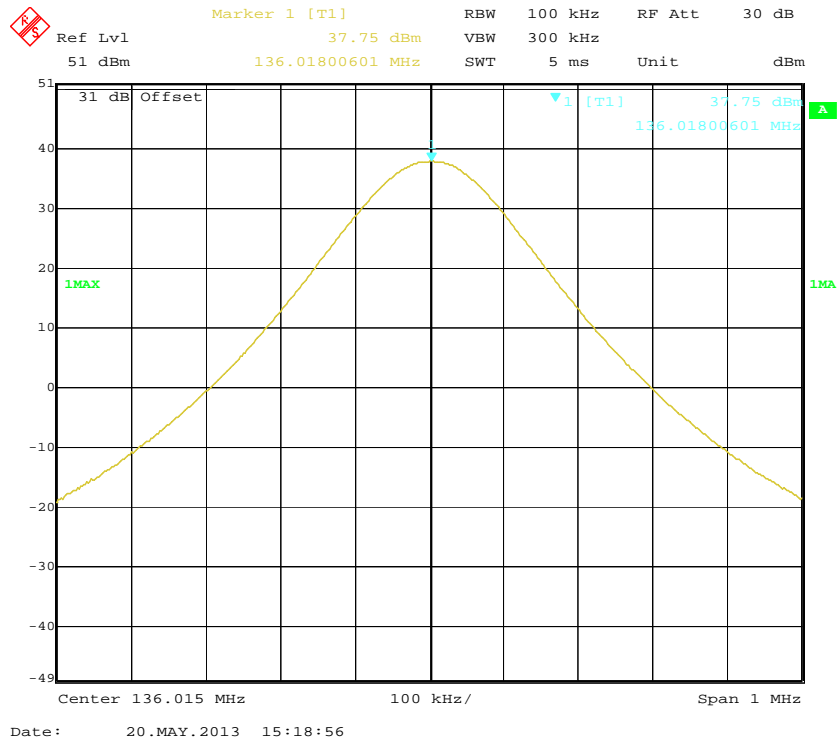
136.015 MHz, Analog Modulation, Low Power



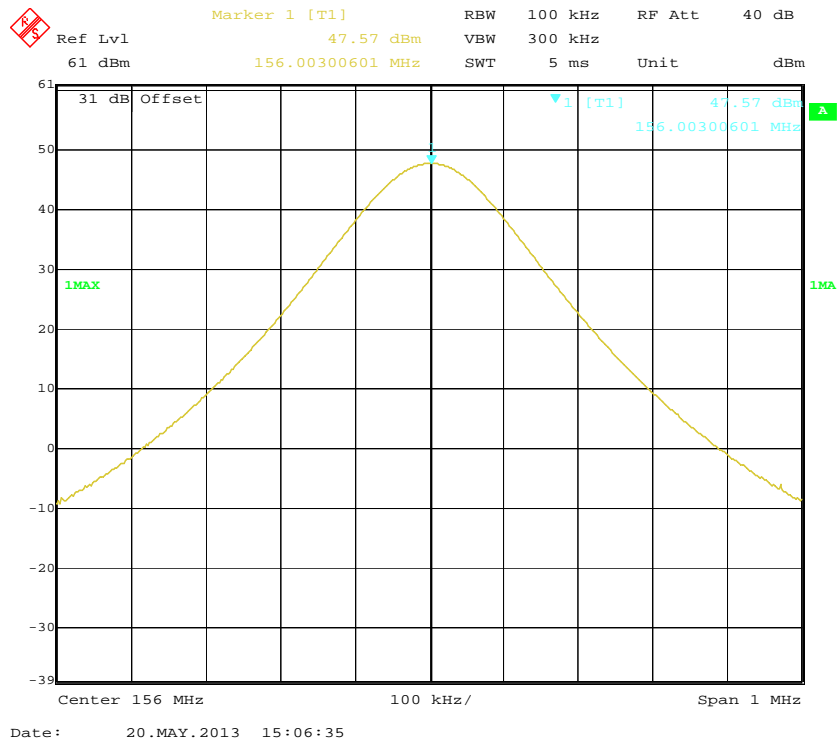
136.015 MHz, Digital Modulation, High Power



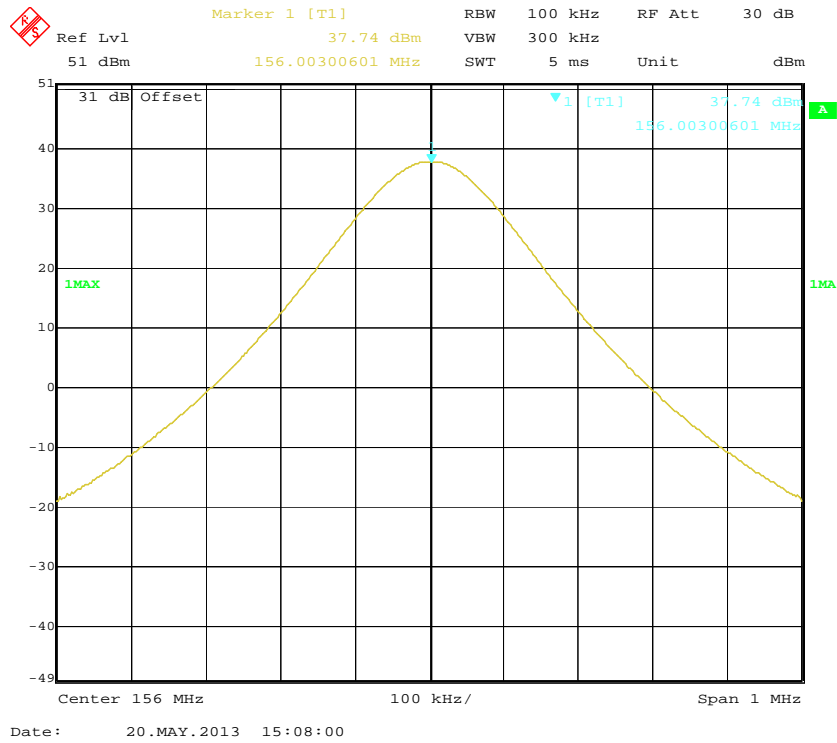
136.015 MHz, Digital Modulation, Low Power



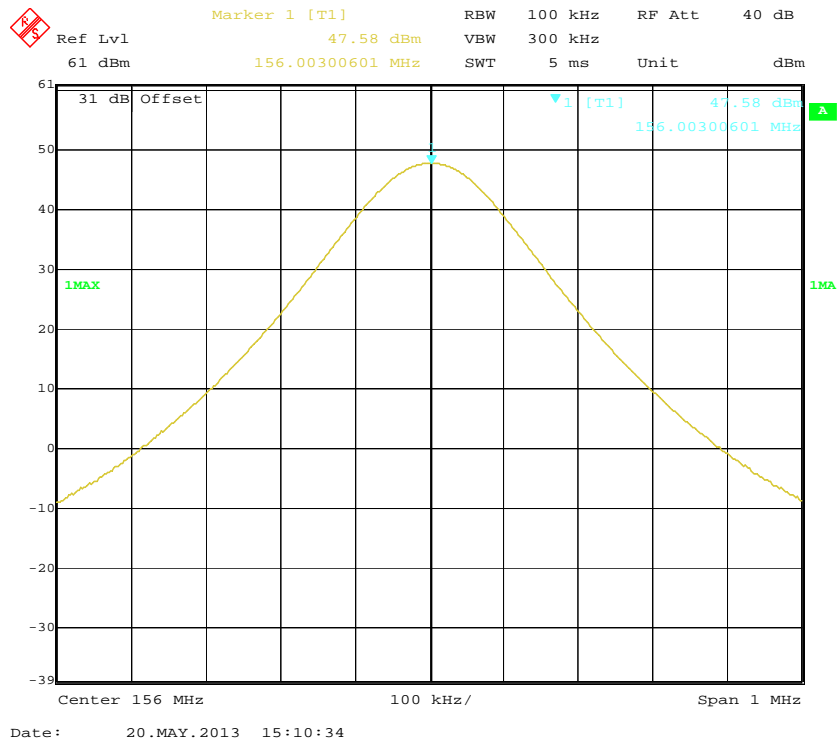
156.000 MHz, Analog Modulation, High Power



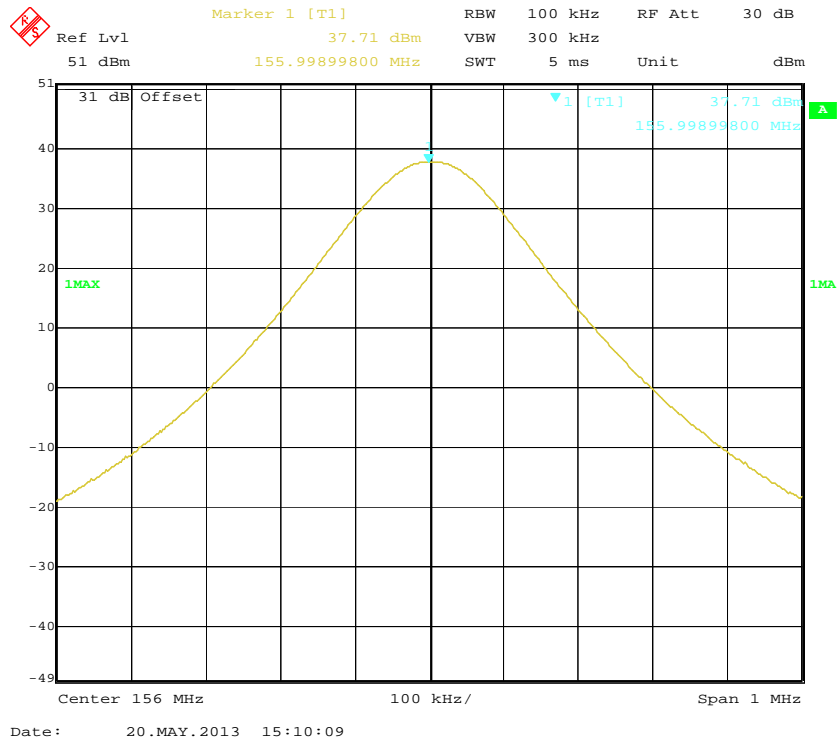
156.000 MHz, Analog Modulation, Low Power



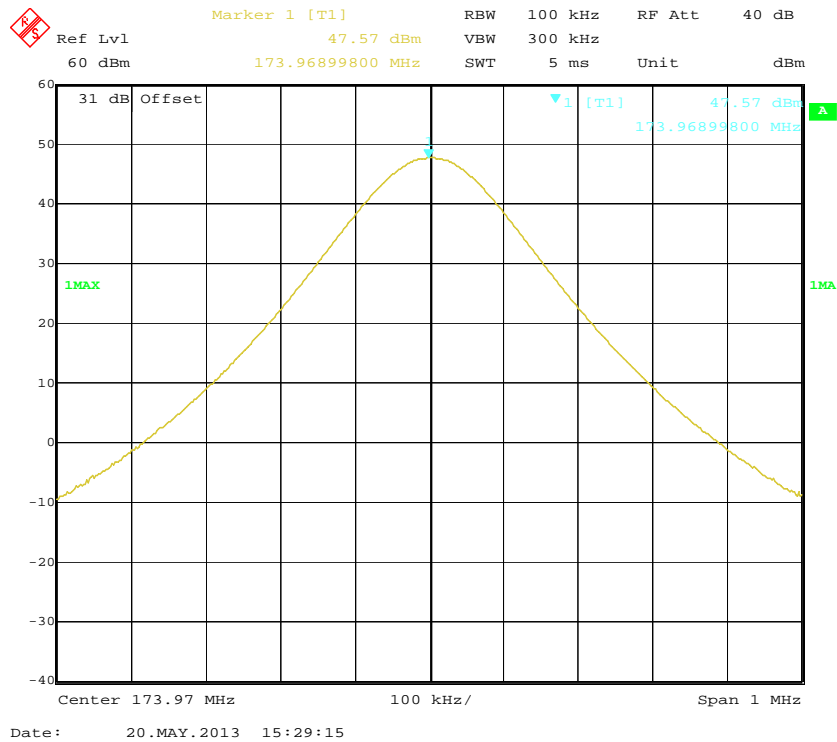
156.000 MHz, Digital Modulation, High Power



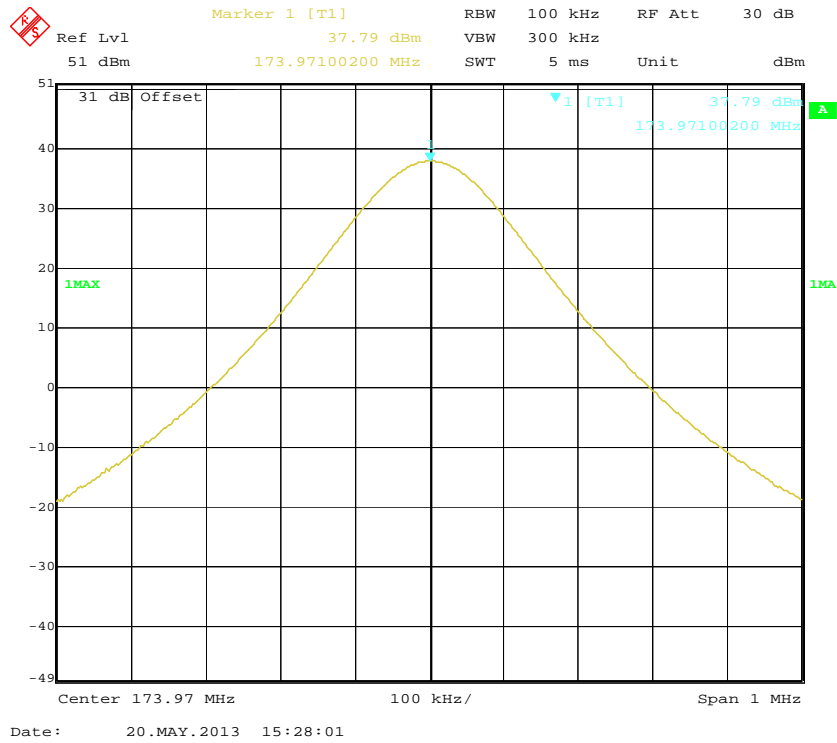
156.000 MHz, Digital Modulation, Low Power



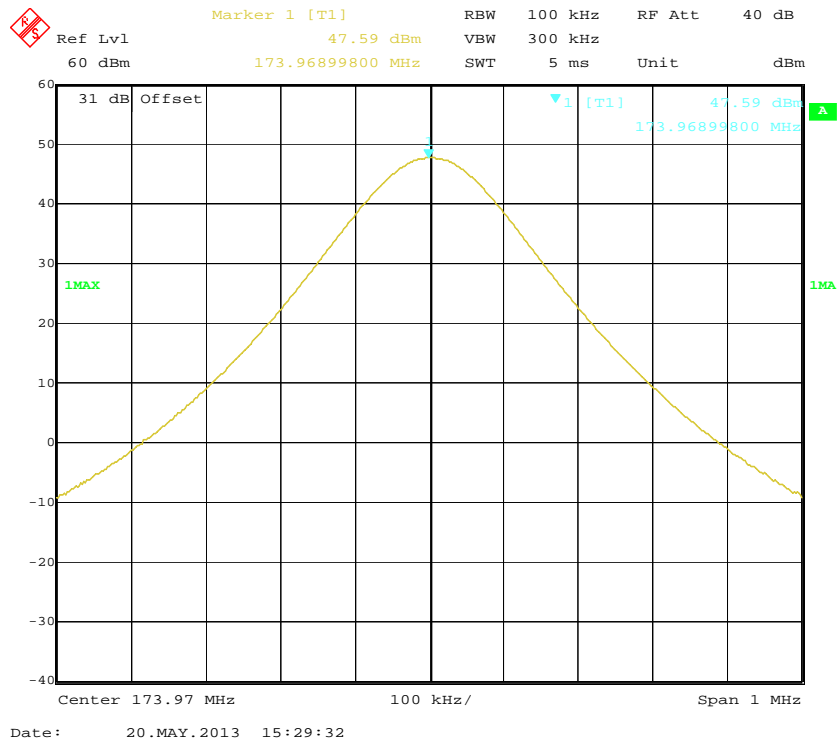
173.970 MHz, Analog Modulation, High Power



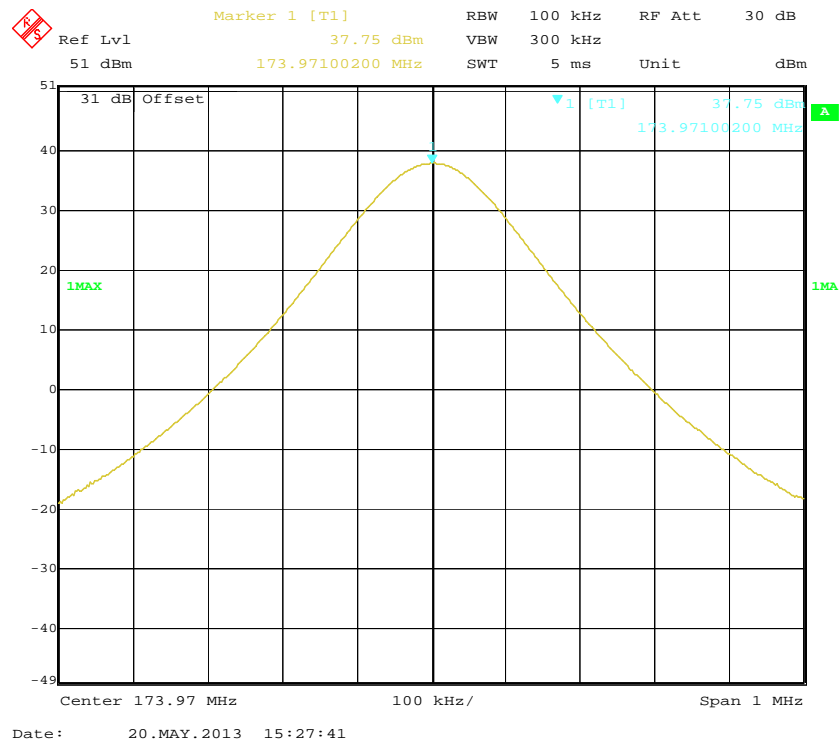
173.970 MHz, Analog Modulation, Low Power



173.970 MHz, Digital Modulation, High Power



173.970 MHz, Digital Modulation, Low Power



FCC §2.1047 & §74.463 & §80.213 & §90.207 - MODULATION CHARACTERISTIC**Applicable Standard**

FCC§2.1047, §74.463, §80.213 and §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.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
HP	RF Communication Test Set	8920A	3438A05201	2012-06-14	2013-06-13
LEADER	MILLIVOLTMETER	LMV-181A	6041126	2013-05-09	2014-05-08

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

Test Method: TIA/EIA-603 2.2.3

Test Data**Environmental Conditions**

Temperature:	25°C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

The testing was performed by Tiger Ye on 2013-05-20.

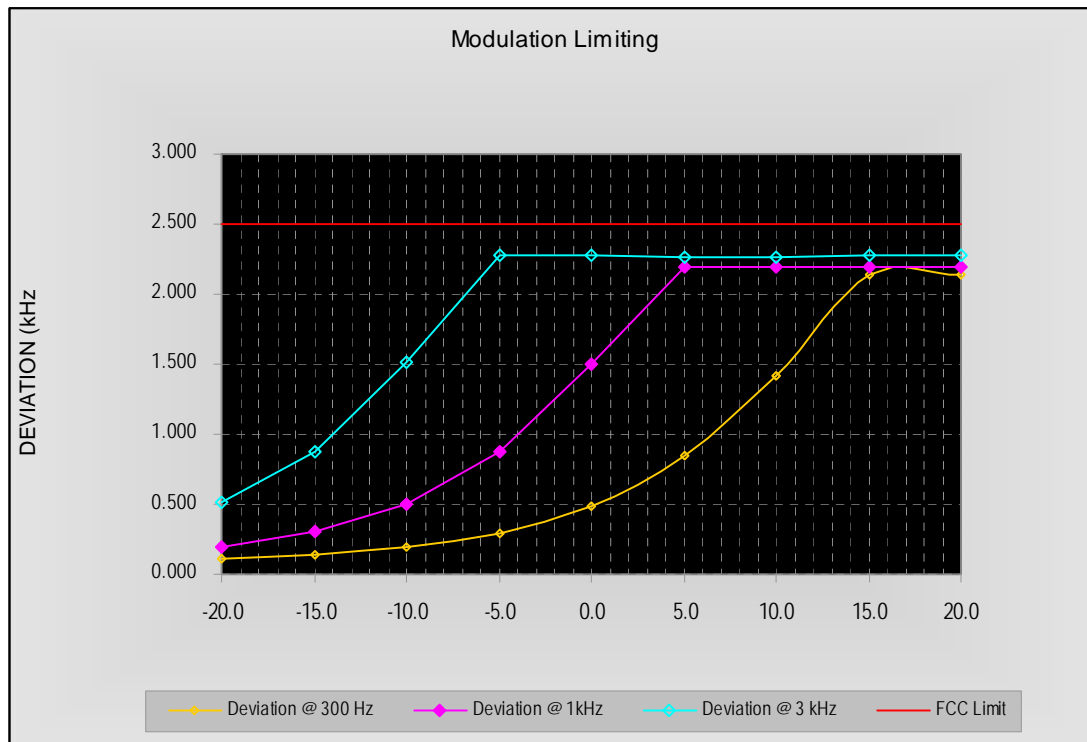
Test Mode: Transmitting

Result: Compliance.

Analog Modulation:**MODULATION LIMITING**

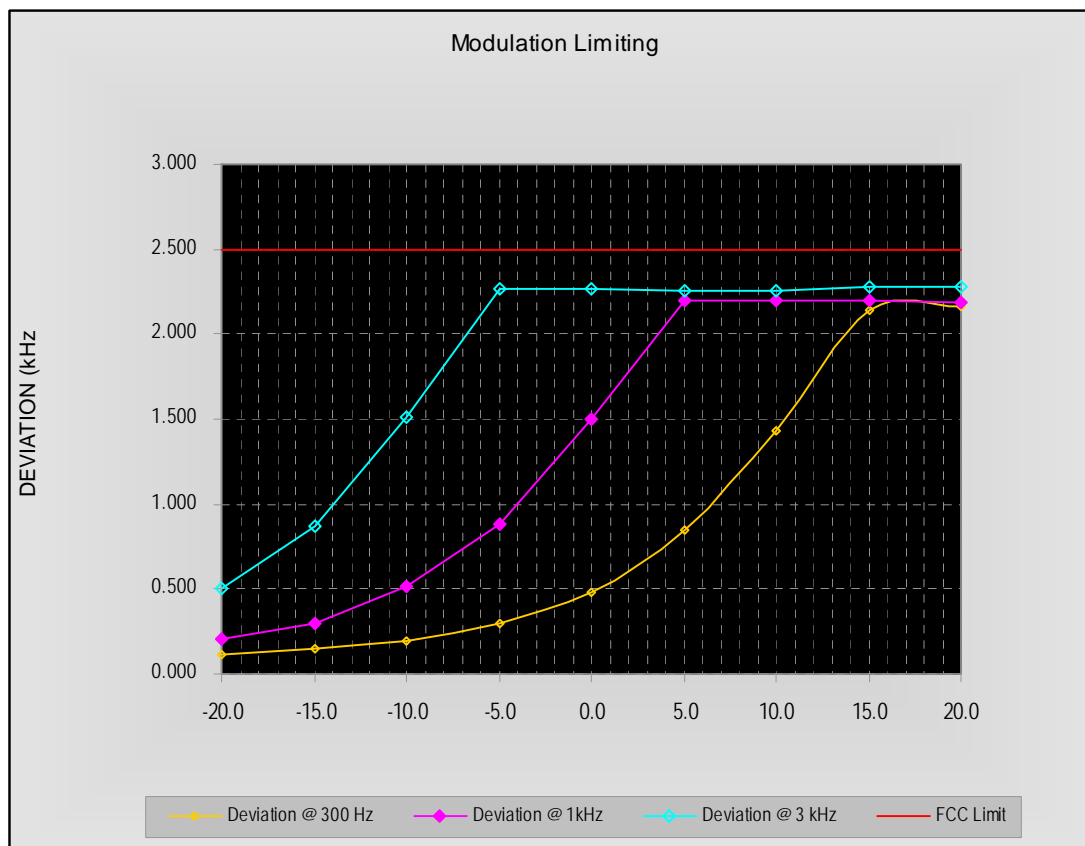
Carrier Frequency: 156.000 MHz, Channel Separation=12.5 kHz, Low Power

Audio Input Level [dB]	Frequency Deviation (kHz)			Limit [kHz]
	@ 300 Hz	@ 1kHz	@ 3 kHz	
20.0	2.145	2.193	2.280	2.5
15.0	2.142	2.189	2.275	2.5
10.0	1.423	2.188	2.266	2.5
5.0	0.848	2.198	2.263	2.5
0.0	0.480	1.500	2.275	2.5
-5.0	0.297	0.869	2.276	2.5
-10.0	0.199	0.505	1.507	2.5
-15.0	0.135	0.308	0.879	2.5
-20.0	0.107	0.200	0.517	2.5



Carrier Frequency: 156.000 MHz, Channel Separation=12.5 kHz, High Power

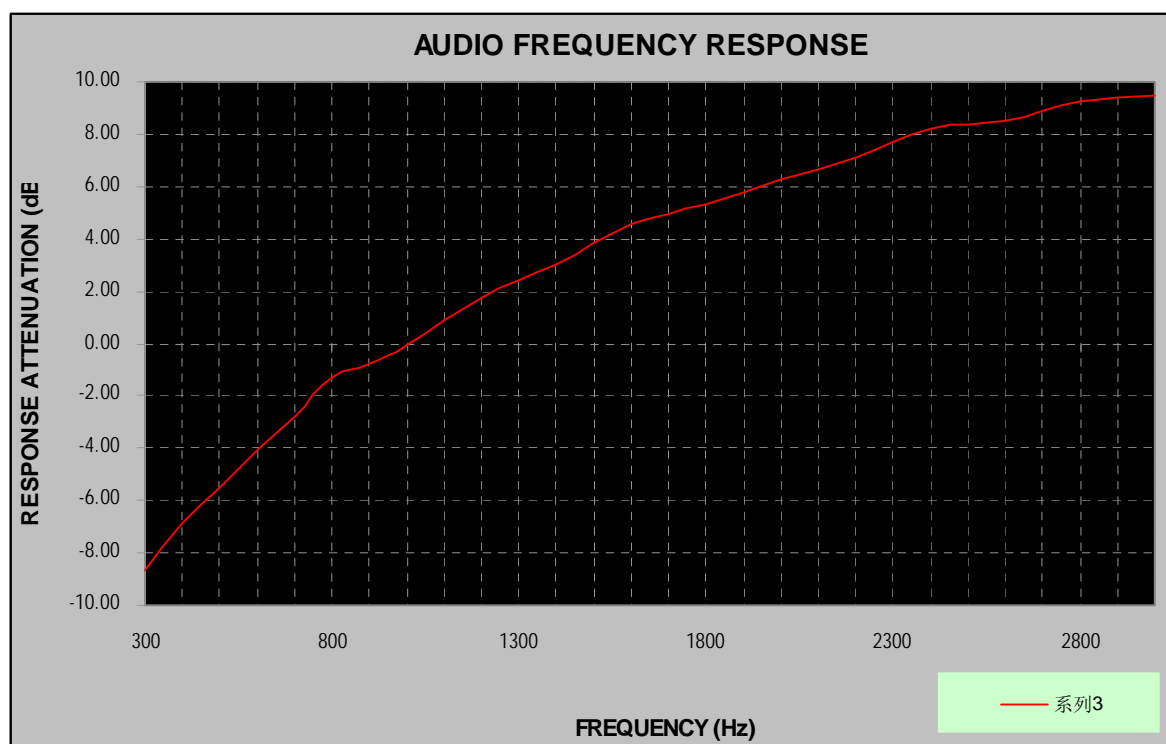
Audio Input Level [dB]	Frequency Deviation (kHz)			Limit [kHz]
	@ 300 Hz	@ 1kHz	@ 3 kHz	
20.0	2.164	2.183	2.274	2.5
15.0	2.144	2.204	2.283	2.5
10.0	1.430	2.202	2.259	2.5
5.0	0.845	2.199	2.256	2.5
0.0	0.485	1.500	2.262	2.5
-5.0	0.303	0.878	2.269	2.5
-10.0	0.199	0.515	1.508	2.5
-15.0	0.147	0.301	0.873	2.5
-20.0	0.118	0.208	0.508	2.5



Audio Frequency Response

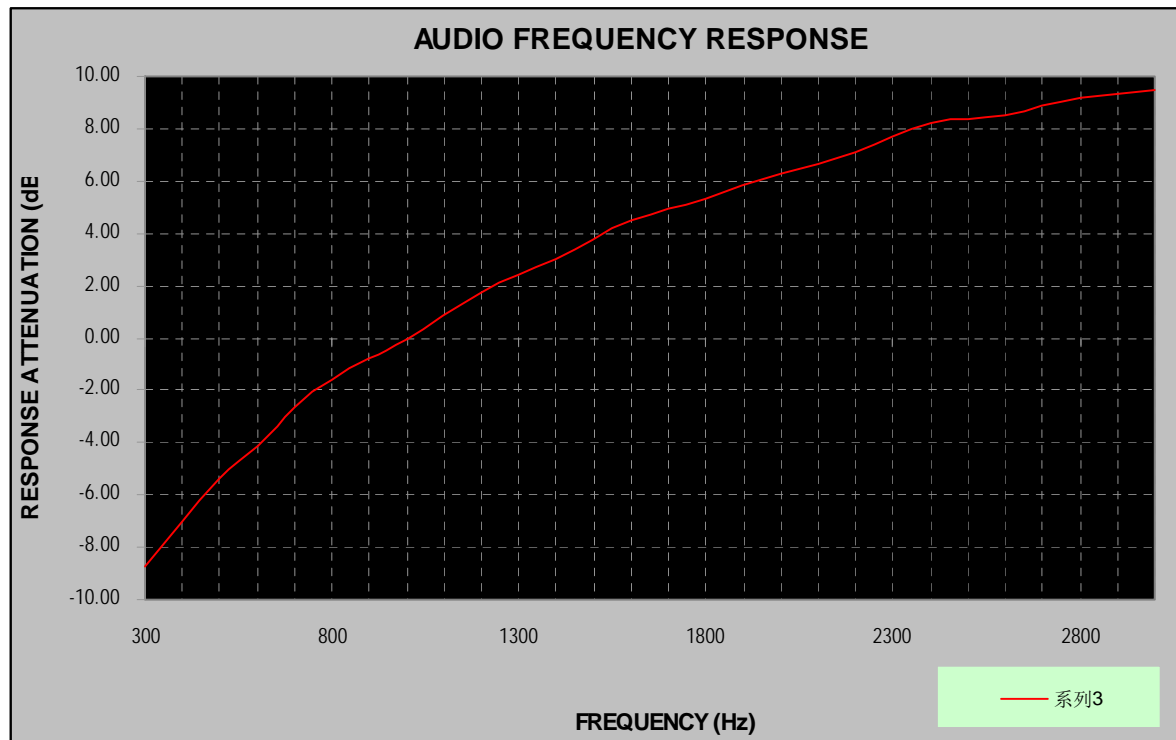
Carrier Frequency: 156.000 MHz, Channel Separation=12.5 kHz, Low Power

Audio Frequency (Hz)	Response Attenuation (dB)
300	-8.64
400	-6.90
500	-5.55
600	-4.04
700	-2.81
800	-1.31
900	-0.76
1000	0.00
1200	1.77
1400	3.01
1600	4.56
1800	5.30
2000	6.26
2200	7.08
2400	8.21
2600	8.55
2800	9.26
3000	9.51



Carrier Frequency: 156.000 MHz, Channel Separation=12.5 kHz, High Power

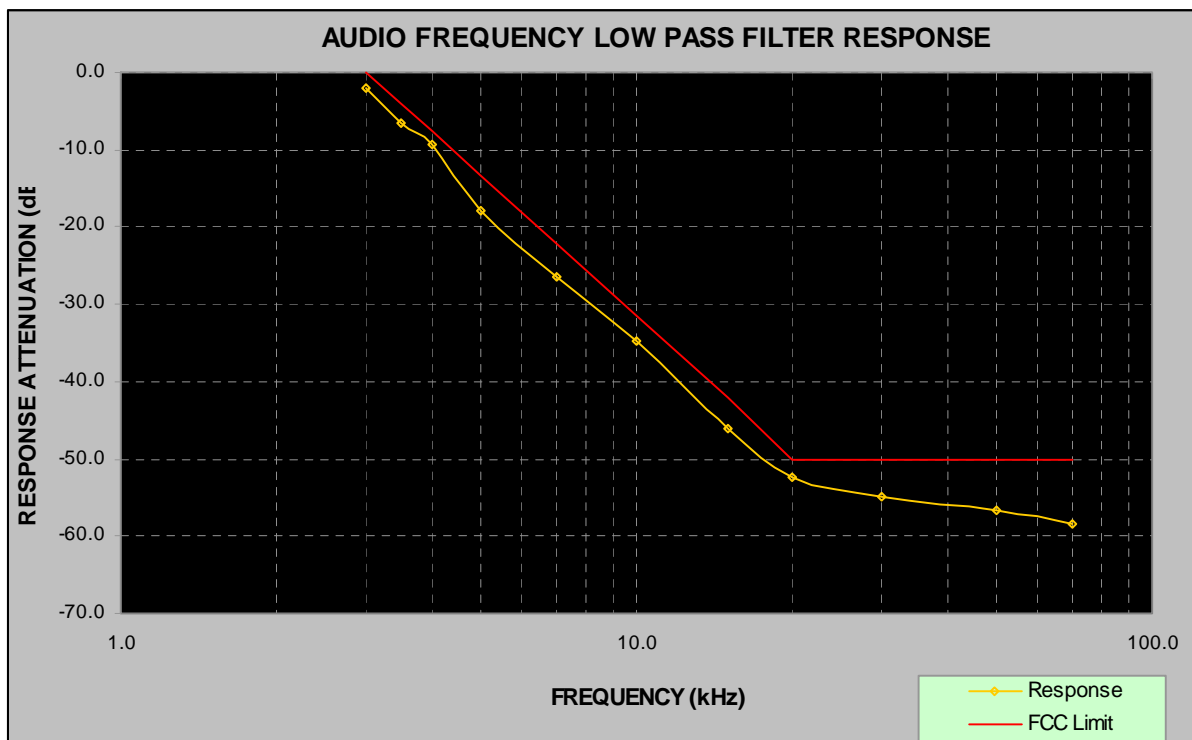
Audio Frequency (Hz)	Response Attenuation (dB)
300	-8.73
400	-7.05
500	-5.38
600	-4.10
700	-2.64
800	-1.58
900	-0.80
1000	0.00
1200	1.74
1400	3.01
1600	4.53
1800	5.29
2000	6.29
2200	7.07
2400	8.21
2600	8.51
2800	9.21
3000	9.48



Audio Frequency Low Pass Filter Response**Analog Modulation:**

Carrier Frequency: 156.000 MHz, Channel Separation=12.5 kHz

Audio Frequency (kHz)	Response Attenuation (dB)	FCC Limit (dB)
3.0	-1.9	0.0
3.5	-6.6	-4.0
4.0	-9.3	-7.5
5.0	-17.9	-13.3
7.0	-26.5	-22.1
10.0	-34.8	-31.4
15.0	-46.2	-42.0
20.0	-52.4	-50.0
30.0	-54.9	-50.0
50.0	-56.6	-50.0
70.0	-58.3	-50.0



FCC §2.1049 & §22.357 & § 22.731 & §74.462 & § 80.205 & § 80.207 & §90.209 & §90.210 – OCCUPIED BANDWIDTH & EMISSION MASK

Applicable Standard

FCC §2.1049, §22.357, § 22.731, §74.462, § 80.205, § 80.207, §90.209 and §90.210

Emission Mask D—12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

1) For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 , 0dB.

2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 ($f_d - 2.88$ kHz) dB.

3) 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:

$$50+10\log P=50+10 \log (1.574) = 51.97 \text{ dB}$$

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

1) 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.

2) 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.

3) On any frequency removed from the center of the assigned channel by more than 250 percent at least:

$$43+10\log P=43+10\log (1.622) = 45.10 \text{ dB}$$

The resolution bandwidth was 300 Hz or greater for measuring up to 250 kHz from the edge of the authorized frequency segment, and 30 kHz or greater for measuring more than 250 kHz from the authorized frequency segment.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23
HP	RF Communication Test Set	8920A	3438A05201	2012-06-14	2013-06-13

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 300 Hz and the spectrum was recorded in the frequency band ± 35 kHz from the carrier frequency.

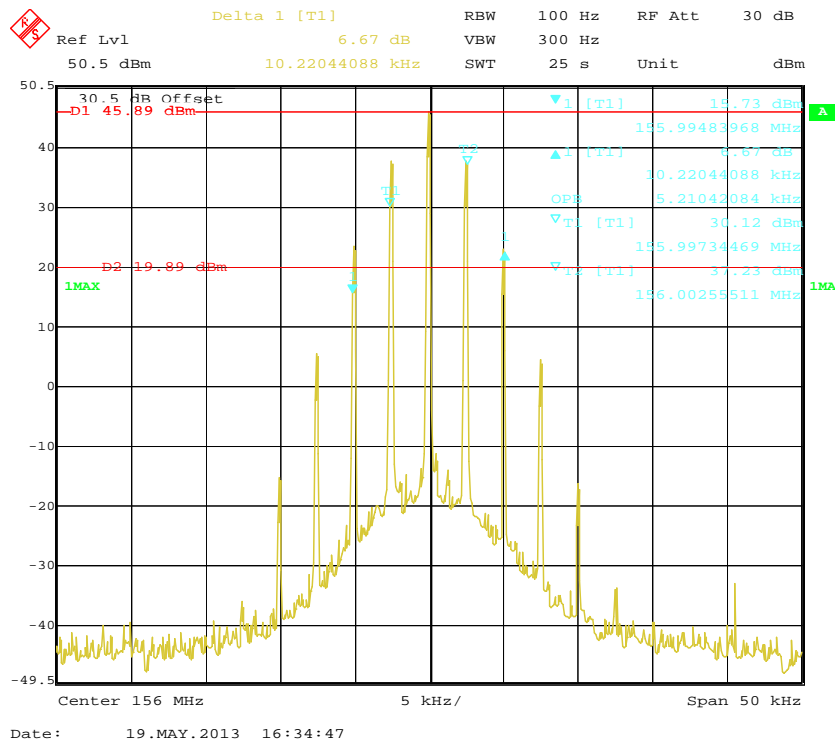
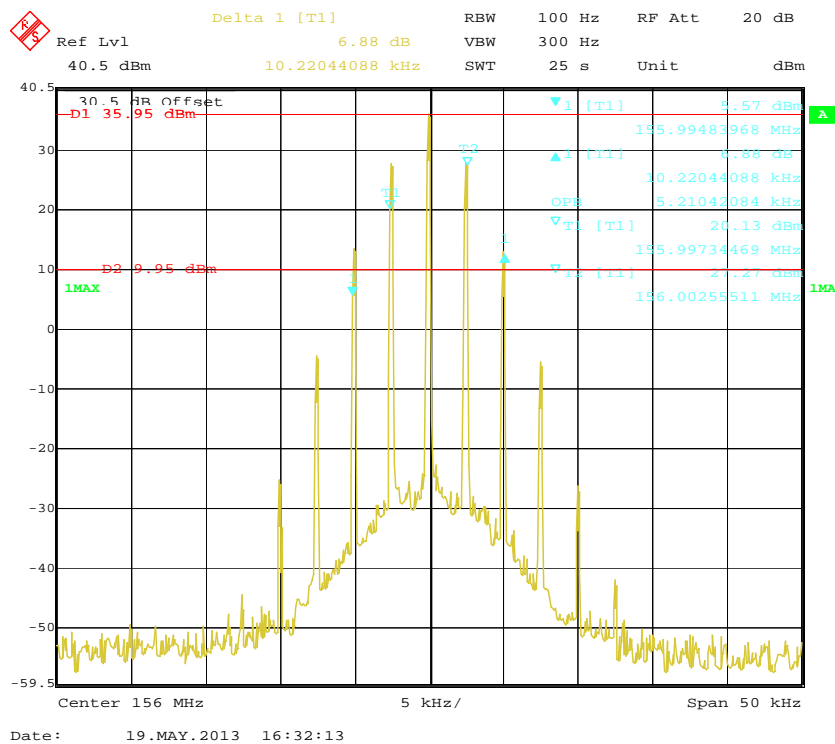
Test Data

Environmental Conditions

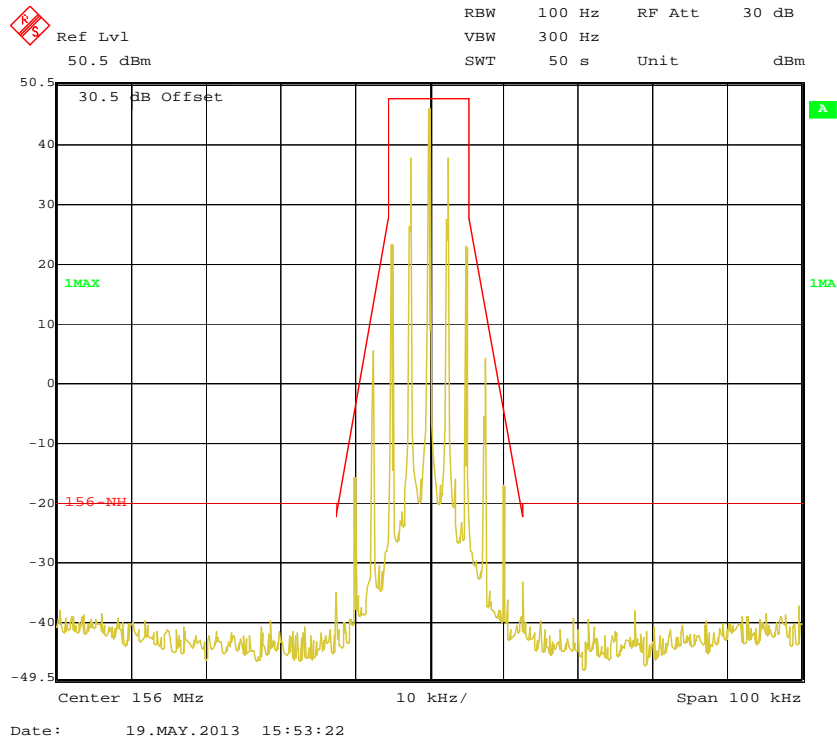
Temperature:	20~24 °C
Relative Humidity:	50~53 %
ATM Pressure:	100.0~101.0 kPa

The testing was performed by Tiger Ye on 2013-05-19 and 2013-05-22.

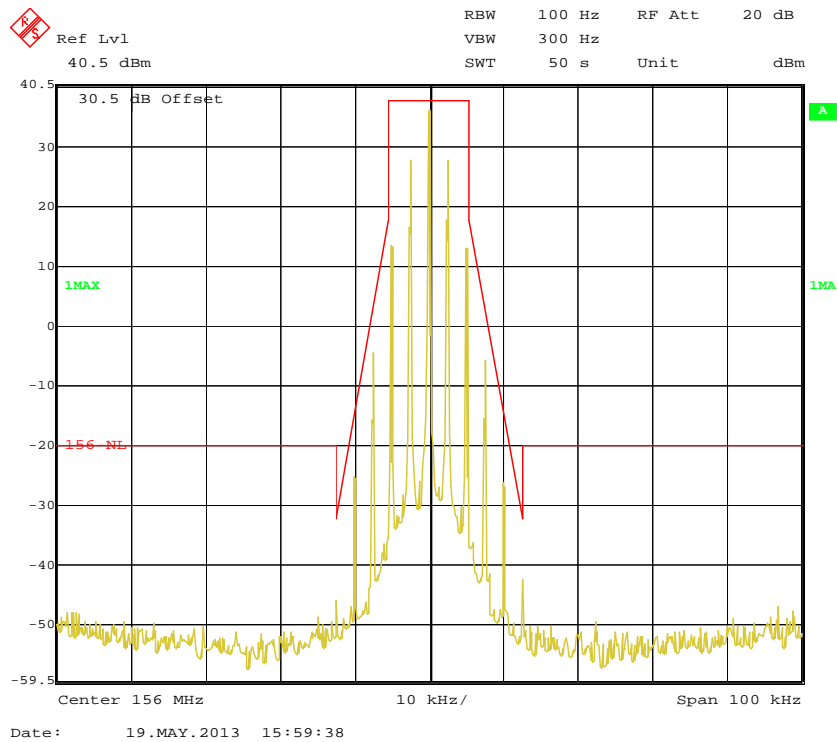
Modulation	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)	Power Level
Analog Modulation	156.000	5.21	10.22	High Power
	156.000	5.21	10.22	Low Power
Digital Modulation	156.000	7.62	9.32	High Power
	156.000	7.72	9.32	Low Power

Analog Modulation: 99% Occupied & 26 dB Bandwidth with High Power**Analog Modulation: 99% Occupied & 26 dB Bandwidth with Low Power**

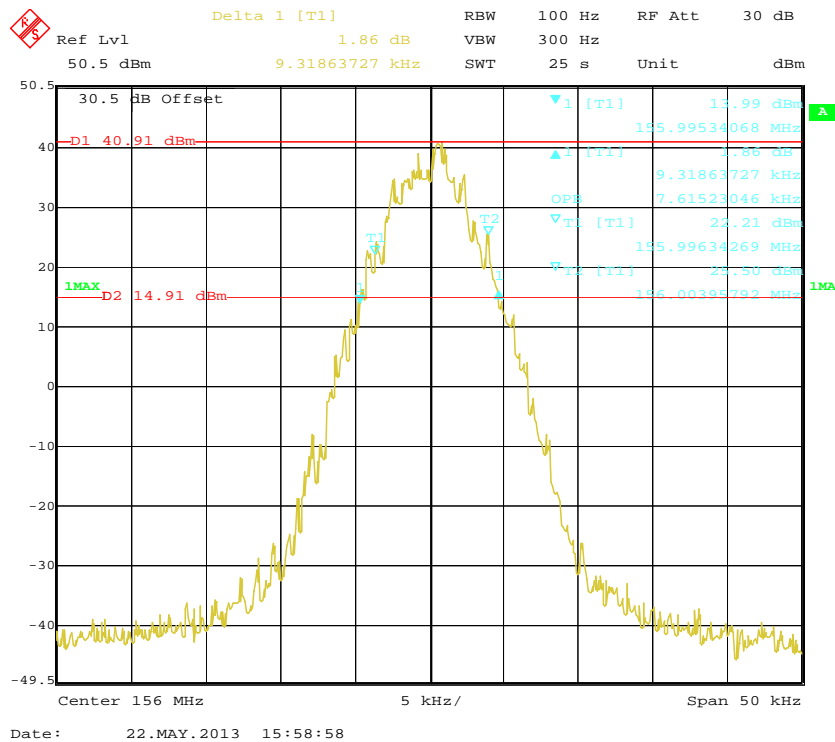
Analog Modulation: Emission Mask with High Power



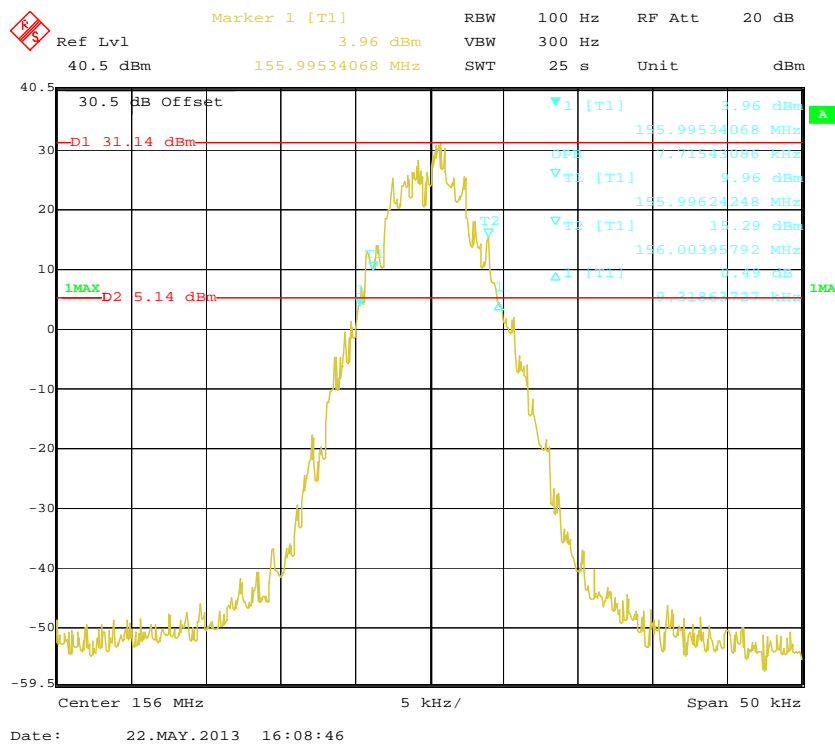
Analog Modulation: Emission Mask with Low Power



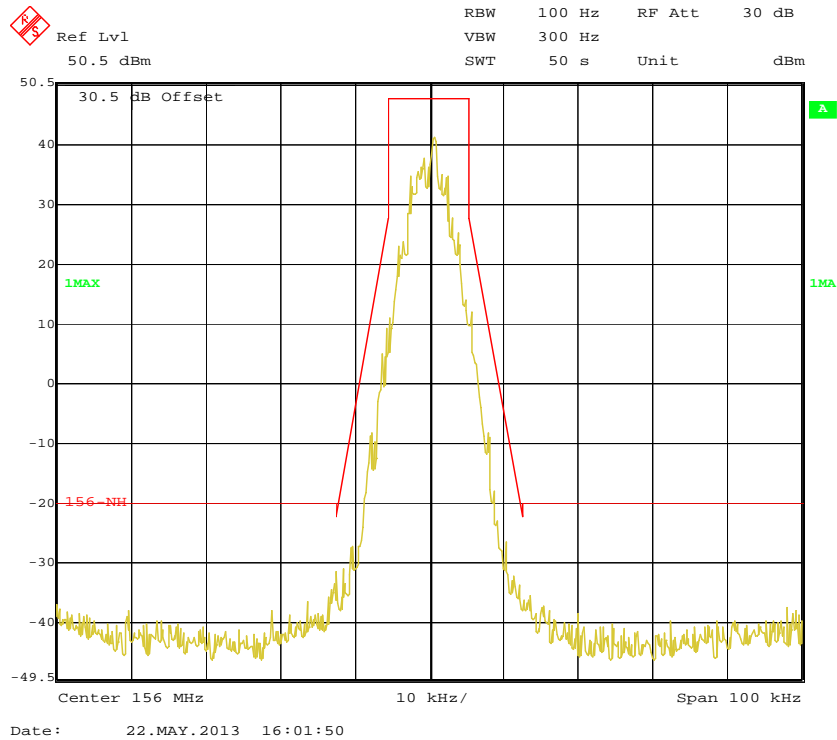
Digital Modulation: 99% Occupied & 26 dB Bandwidth with High Power



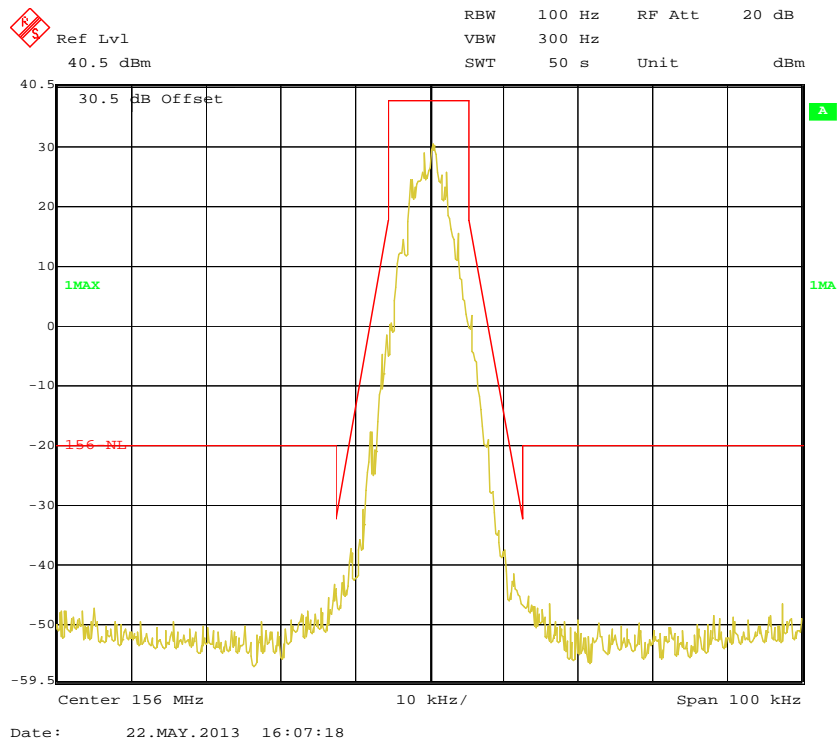
Digital Modulation: 99% Occupied & 26 dB Bandwidth with Low Power



Digital Modulation: Emission Mask with High Power



Digital Modulation: Emission Mask with Low Power



FCC §2.1051 & §22.861 & §74.461 & § 80.211 & §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

Emission Mask D—12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- 1) For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 , 0 dB.
- 2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 ($f_d - 2.88$ kHz) dB.
- 3) 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:

$$50 + 10 \log P = 50 + 10 \log (P) \text{ dB}$$

Emission Mask B. For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- 1) 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.
- 2) 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.
- 3) On any frequency removed from the center of the assigned channel by more than 250 percent at least:

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

The resolution bandwidth was 300 Hz or greater for measuring up to 250 kHz from the edge of the authorized frequency segment, and 30 kHz or greater for measuring more than 250 kHz from the authorized frequency segment.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23

Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

Test Data

Environmental Conditions

Temperature:	20~25 °C
Relative Humidity:	53~56 %
ATM Pressure:	100.0~101.0 kPa

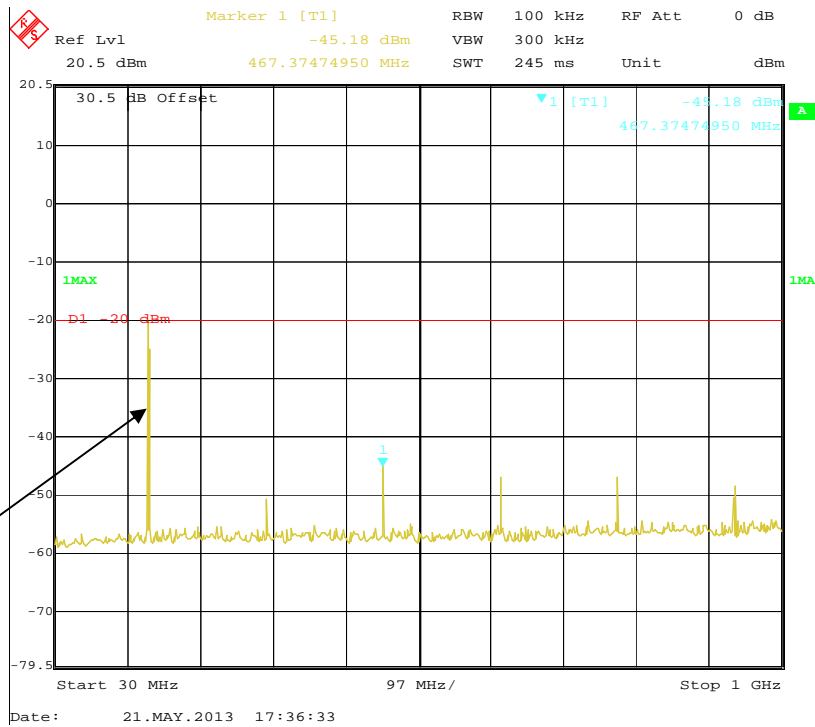
The testing was performed by Tiger Ye on 2013-05-21 and 2013-05-22.

Test Mode: Transmitting

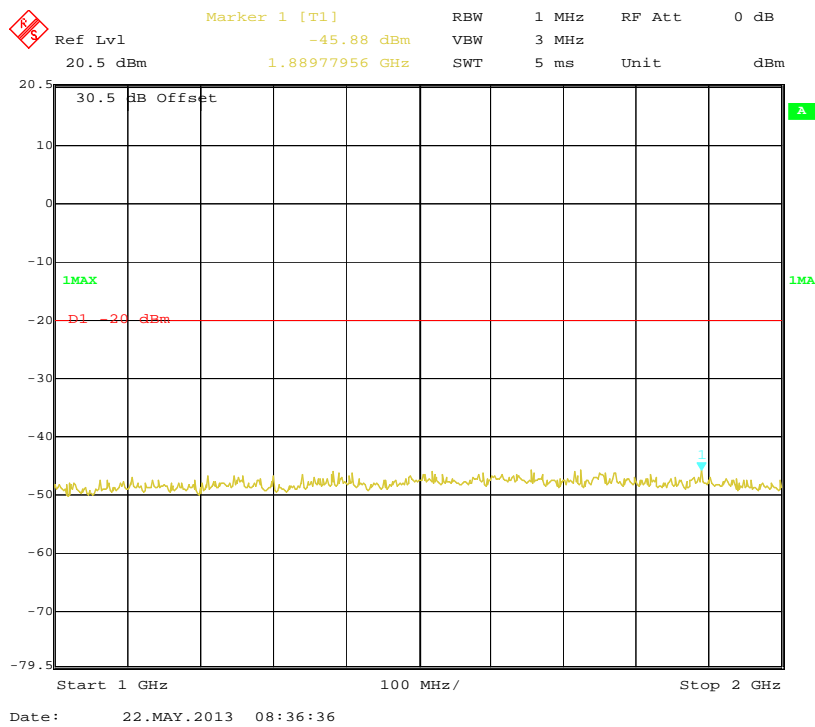
Please refer to the following plots.

Analog Modulation (156.000 MHz):

30 MHz – 1 GHz, Spacing Channel 12.5 kHz

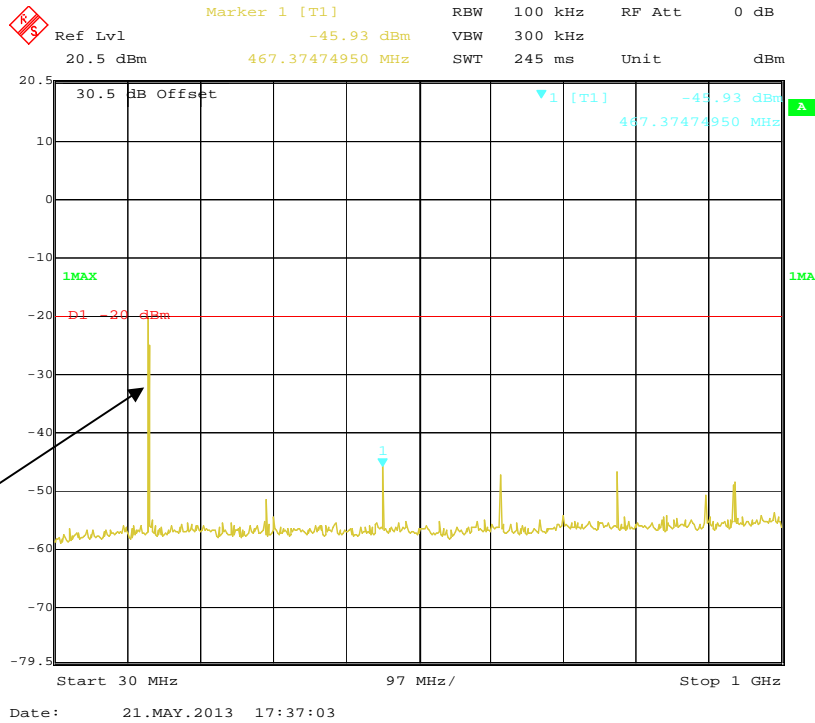


1 GHz – 2 GHz, Spacing Channel 12.5 kHz



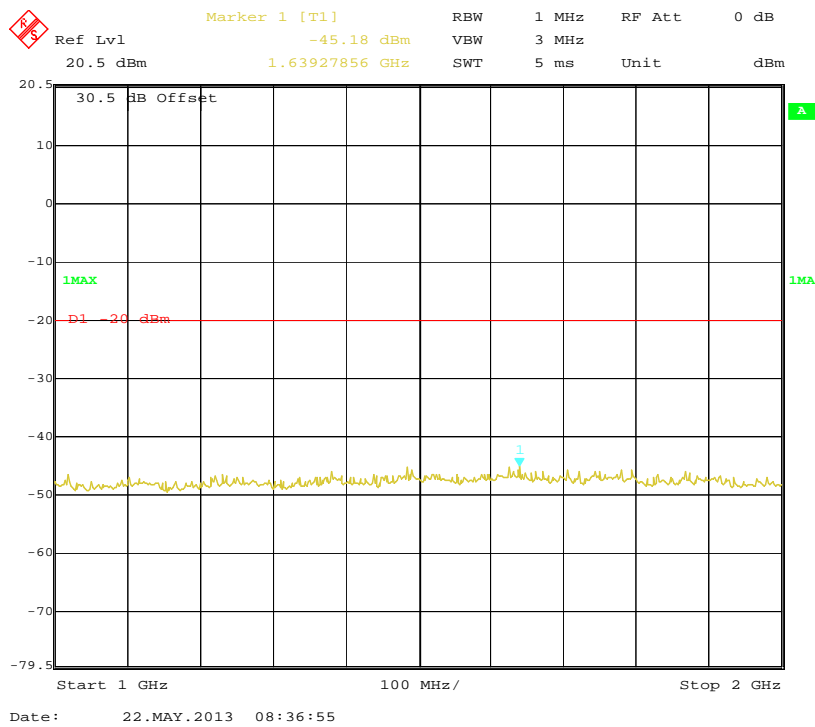
Digital Modulation (156.0 MHz):

30 MHz - 1 GHz, Spacing Channel 12.5 kHz



Fundamental test with Band Reject Filter

1 GHz - 2 GHz, Spacing Channel 12.5 kHz



FCC §2.1053 & §22.861 & §74.461 & § 80.211 & §90.210 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053, §22.861, §74.461, § 80.211 and §90.210

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2014-11-30
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2014-11-27
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23
HP	Signal Generator	8657A	3217A04699	2012-12-19	2013-12-18
A.H. System	Horn Antenna	SAS-200/571	135	2012-02-11	2015-02-10
HP	Synthesized Sweeper	8341B	2624A00116	2013-05-17	2014-05-16

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

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

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 teeth 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.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001)-the absolute level

Spurious attenuation limit in dB = 43 + 10 Log₁₀ (power out in Watts)

Spurious attenuation limit in dB = 50 + 10 Log₁₀ (power out in Watts) for EUT with a 12.5 kHz channel bandwidth.

Test Data**Environmental Conditions**

Temperature:	25°C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

The testing was performed by Tiger Ye on 2013-05-20.

Test Mode: Transmitting

30MHz - 5GHz:

Frequency (MHz)	Receiver Reading (dBμV)	Turn Table Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	FCC Part 90	
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)		Limit (dBm)	Margin (dB)
Analog Modulation (156.00 MHz), Channel Spacing 12.5 kHz										
1404.5	39.41	47	1.4	V	-57.4	0.88	9.00	-49.28	-20	29.28
1404.5	38.87	220	1.8	H	-57.9	0.88	9.00	-49.88	-20	29.88
211.5	41.82	120	1.5	V	-55.0	0.66	0.00	-55.66	-20	35.66
211.5	40.12	210	1.3	H	-56.7	0.66	0.00	-57.36	-20	37.36
Digital Modulation (156.00 MHz)										
1404.5	39.88	221	1.6	V	-56.9	0.88	9.00	-48.88	-20	28.88
1404.5	38.12	121	1.8	H	-58.7	0.88	9.00	-50.58	-20	30.58
211.5	41.87	165	1.7	V	-54.9	0.66	0.00	-55.56	-20	35.56
211.5	41.02	152	1.4	H	-55.8	0.66	0.00	-56.46	-20	36.46

Note:

1. Absolute Level = SG Level - Cable loss + Antenna Gain
2. Margin = Limit- Absolute Level

FCC §2.1055 & § 22.355 & §74.464 & § 80.209 & §90.213- FREQUENCY STABILITY**Applicable Standard**

FCC §2.1055, § 22.355, §74.464, § 80.209 and §90.213

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Hewlett-Packard	Frequency Counter	5343A	2232A00827	2013-05-09	2014-05-09
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2012-11-02	2013-11-01

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

The testing was performed by Tiger Ye on 2013-05-20.

Test Mode: Transmitting

For Analog Modulation (Channel Spacing 12.5 kHz)

Reference Frequency: 156.000 MHz, Limit: 2.5 ppm			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supplied (V _{DC})	Measured Frequency error (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	13.6	155.999976	-0.154
40	13.6	155.999965	-0.224
30	13.6	155.999977	-0.147
20	13.6	155.999971	-0.186
10	13.6	155.999969	-0.199
0	13.6	155.999980	-0.128
-10	13.6	155.999981	-0.122
-20	13.6	155.999976	-0.154
-30	13.6	155.999978	-0.141
Frequency Stability versus Input Voltage			
20	15.6	155.999973	-0.173
20	11.0	155.999969	-0.199

For Digital Modulation (Channel Spacing 12.5 kHz)

Reference Frequency: 156.000 MHz, Limit: 2.5 ppm			
Test Environment		Frequency Measure with Time Elapsed	
Temperature (°C)	Power Supplied (V _{DC})	Measured Frequency error (MHz)	Frequency Error (ppm)
Frequency Stability versus Input Temperature			
50	13.6	155.999981	-0.122
40	13.6	155.999977	-0.147
30	13.6	155.999974	-0.167
20	13.6	155.999973	-0.173
10	13.6	155.999981	-0.122
0	13.6	155.999976	-0.154
-10	13.6	155.999975	-0.160
-20	13.6	155.999973	-0.173
-30	13.6	155.999979	-0.135
Frequency Stability versus Input Voltage			
20	15.6	155.999976	-0.154
20	11.0	155.999977	-0.147

FCC §90.214 - TRANSIENT FREQUENCY BEHAVIOR

Applicable Standard

Regulations: FCC §90.214

Test method: ANSI/TIA-603-D 2010, section 2.2.19.3

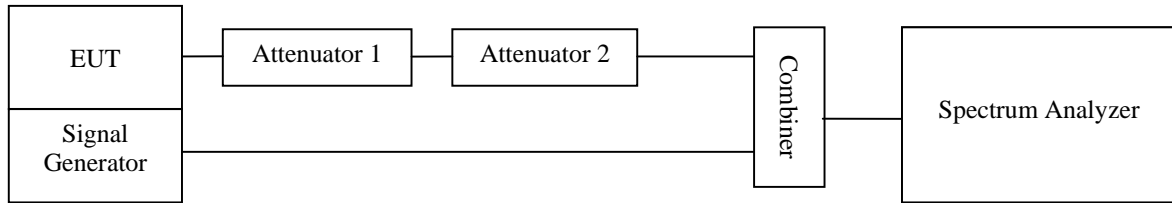
Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2012-11-24	2013-11-23
HP	RF Communication Test Set	8920A	3438A05201	2012-06-14	2013-06-13
R&S	Spectrum Analyzer	FSV13	8512003602	2012-08-25	2013-08-24

Test Procedure

- Connect the EUT and test equipment as shown on the following block diagram.
- Set the Spectrum Analyzer to measure FM deviation, and tune the RF frequency to the transmitter assigned frequency.
- Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at ± 12.5 kHz deviation and set its output level to -100dBm.
- Turn on the transmitter.
- Supply sufficient attenuation via the RF attenuator to provide an input level to the Spectrum Analyzer that is 40 dB below the maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on the Spectrum Analyzer as P_0 .
- Turn off the transmitter.
- Adjust the RF level of the signal generator to provide RF power equal to P_0 . This signal generator RF level shall be maintained throughout the rest of the measurement.
- Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30 dB when the transmitter is turned on.
- Adjust the vertical amplitude control of the spectrum analyzer to display the 1000 Hz at ± 4 divisions vertically centered on the display. Set trigger mode of the Spectrum Analyzer to "Video", and tune the "trigger level" on suitable level. Then set the "trigger offset" to -10ms for turn on and -15ms for turn off.
- Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer. Observe the stored display. The instant when the 1 kHz test signal is completely suppressed is considered to be t_{on} . The trace should be maintained within the allowed divisions during the period t_1 and t_2 .

- k) Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum Analyzer. The trace should be maintained within the allowed divisions during the period t_3 .



Test Data

Environmental Conditions

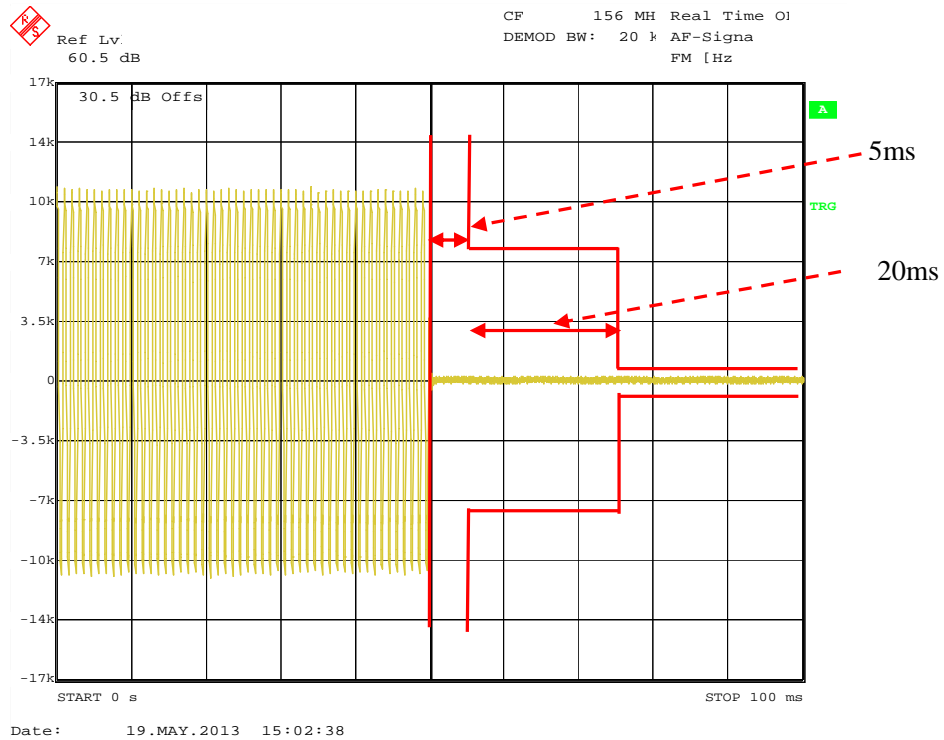
Temperature:	24 °C
Relative Humidity:	50 %
ATM Pressure:	100.0 kPa

The testing was performed by Tiger Ye on 2013-05-19 and 2013-06-13.

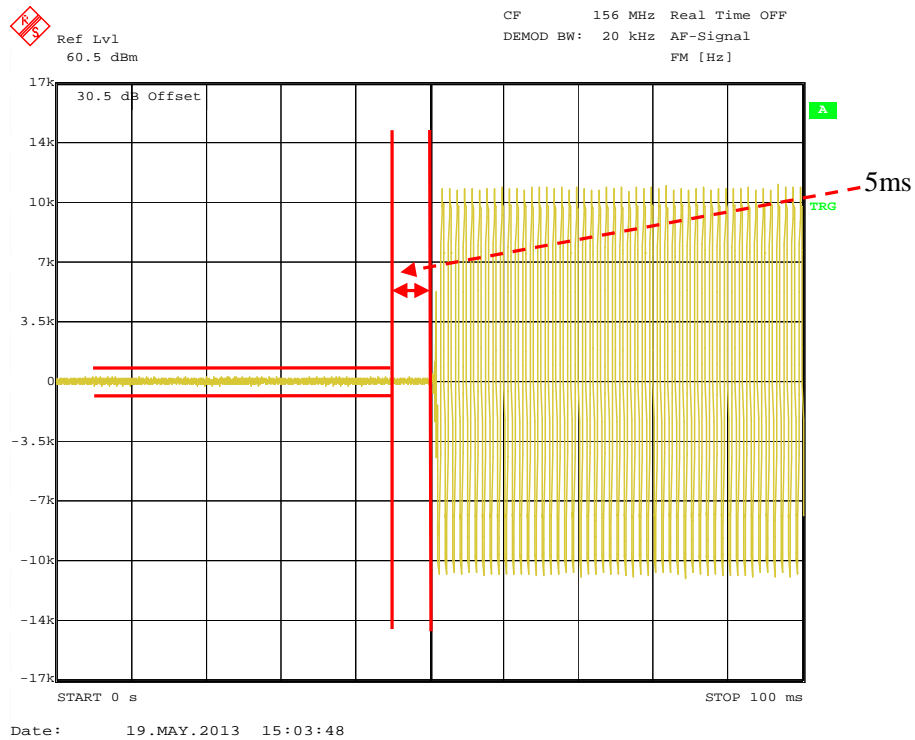
Channel Separation (kHz)	Transient Period (ms)	Transient Frequency	Result
12.5	<5 (t1)	+/-12.5 kHz	Pass
	<20 (t2)	+/-6.25 kHz	
	<5 (t3)	+/-12.5 kHz	

Please refer to the following plots.

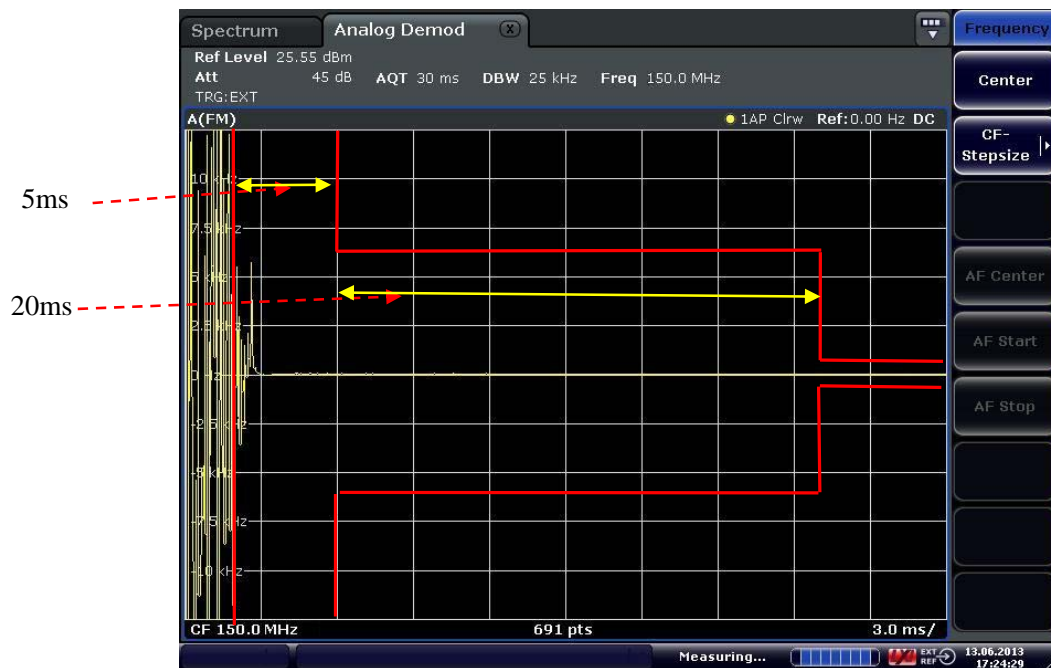
Analog Modulation: Turn on



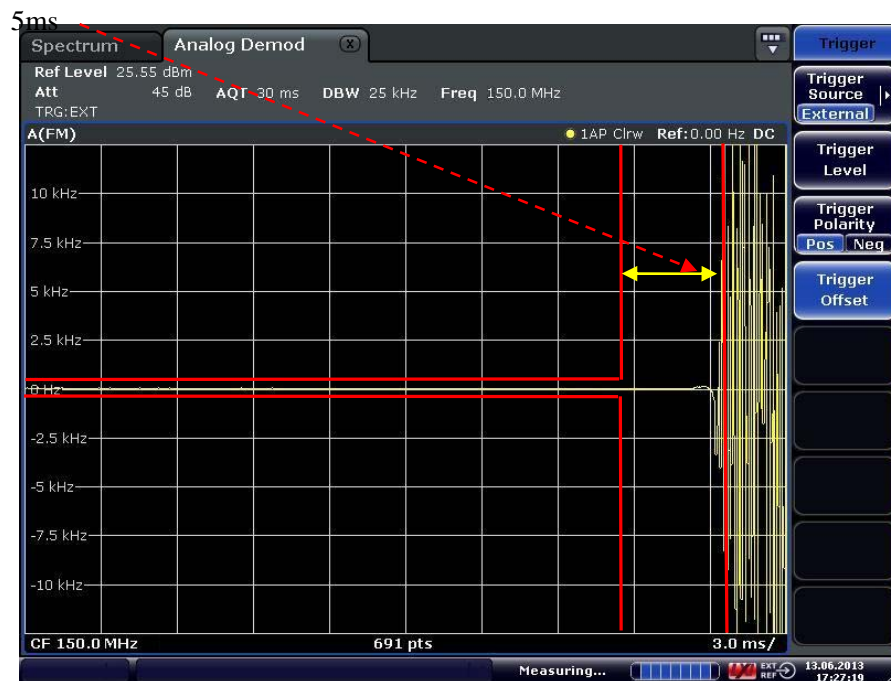
Analog Modulation: Turn off



Digital Modulation, Turn on



Digital Modulation, Turn off



PRODUCT SIMILARITY DECLARATION LETTER



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518057

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Product Similarity Declaration

To Whom It May Concern,

We, Hytera Communications Corporation Ltd. , hereby declare that our Digital Base Station Repeater, Model Number: RD985S VHF, RD986S VHF and RD988S VHF are the same with RD982S VHF which was tested by BACL. They are just different in model number due to market purposes.

Please contact me if you have any question.

Signature: 

Lei Xiong

General Director

2013-5-28

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