Lab Code: 200707-0

FCC PART 90

TEST REPORT

For

Hytera Communications Corporation Ltd.

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

FCC ID: YAMPD79XEXVHF

Report Type:	Product Type:
Original Report	Ex Digital Radio

Test Engineer:	Eric Lee
Report Number:	R1DG120904005-00
Report Date:	2012-12-27
Reviewed By:	Alvin Huang RF Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Hytera Communications Corporation Ltd.*'s product, model number: *PD79X Ex VHF (FCC ID: YAMPD79XEXVHF)* (the "EUT") in this report was a *Ex Digital Radio,* which was measured approximately: 15.5 cm (L, without antenna) x 6.5 cm (W) x 4.5 cm (H), rated input voltage: DC 7.4 V Li-ion battery.

** All measurement and test data in this report was gathered from production sample serial number: 120904005 (Assigned by BACL, Shenzhen). The EUT was received on 2012-09-04.*

Objective

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

Related Submittal(s)/Grant(s)

No related submittal(s).

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 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.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).

Lab Code: 200707-0

The current scope of accreditations can be found at http://ts.nist.gov/Standards/scopes/2007070.htm.

SYSTEM TEST CONFIGURATION

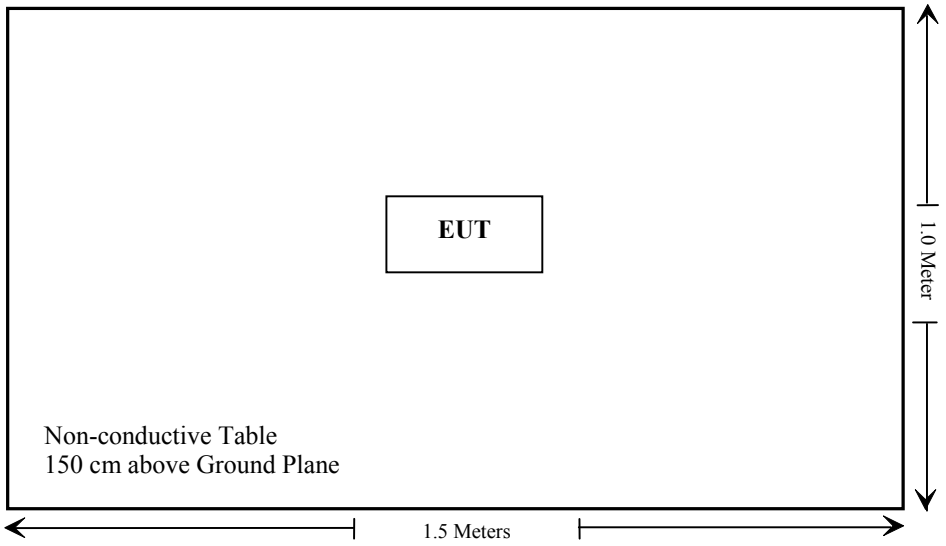
Description of Test Configuration

The system was configured for testing in a test mode which has been done in the factory.

Equipment Modifications

No modification was made to the EUT tested.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§1.1307 (b); §2.1093	RF Exposure	Compliance
§2.1046; §90.205	RF Output Power	Compliance
§2.1047; §90.207	Modulation Characteristic	Compliance
§2.1049; §90.209; §90.210	Occupied Bandwidth & Emission Mask	Compliance
§2.1051; §90.210	Spurious Emission at Antenna Terminal	Compliance
§2.1053; §90.210	Spurious Radiated Emissions	Compliance
§2.1055; §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) & §2.1093 - RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §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.

According to FCC KDB 447498 D01 Mobile Portable RF Exposure v04 section 5, Push-to-talk (PTT) devices:

a) RF exposure is evaluated with a duty factor of 50% when the actual operating duty factor is ≤ 50%. Devices supporting higher duty factors shall be evaluated at the maximum duty factor; for example, devices supporting operator-assisted PSTN calls. Contact the FCC Laboratory when unable to test a device at the required duty factor due to hardware limitations or other reasons.

b) Portable PTT devices

i) The power thresholds and operating conditions in Table 1 are used to determine SAR test requirements for PTT radios required to comply with the general population exposure limit. When the occupational exposure limit applies, these power thresholds are increased by a factor of five (5) to determine the test requirements. SAR is required for PTT devices with maximum output power greater than these thresholds.28 SAR evaluation is also required for separation distances smaller than those in Table 1. Contact the FCC Laboratory to determine if SAR evaluation is necessary for other frequencies or when the SAR is very low.

Table 1 - SAR Evaluation Power Thresholds for PTT devices, $f \leq 0.5$ GHz

Exposure Conditions	mW
Held to face ≥ 2.5 cm	250
Body-worn ≥ 1.5 cm	200
Body-worn ≥ 1.0 cm	150

Notes:
1. The time-averaged output power, corresponding to the required PTT duty factor, is compared with these thresholds.
2. The closest distance between the user and the device or its antenna is used to determine the power thresholds.

SAR Evaluation Power Thresholds for PTT devices,f≤0. 5GHz

Exposure Conditions	mW (for uncontrolled)	mW (for occupational)
Held to face ≥2.5cm	250	1250
Body-worn ≥1.5cm	200	1000
Body-worn ≥1.0cm	150	750

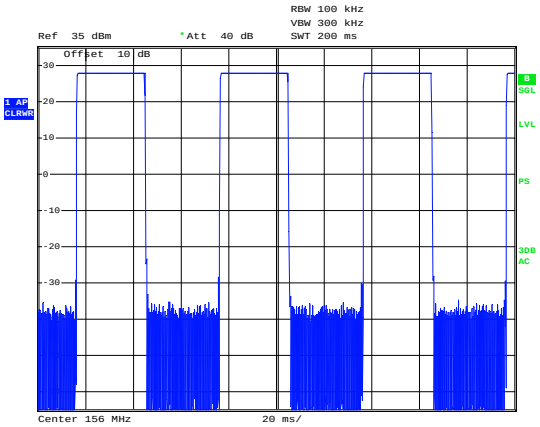
ii) Additional SAR evaluation with a SAM phantom is required for PTT devices with held-to-ear operating mode.29 Contact the FCC Laboratory for device operating and test configurations.

Routine SAR evaluation refers to that specifically required by §2.1093, using measurements or computer simulation. When routine SAR evaluation is not required, portable transmitters with output power greater than the applicable low threshold require SAR evaluation to qualify for TCB approval.

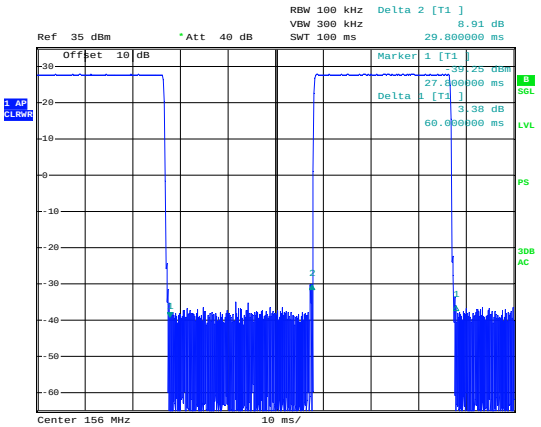
Result:

1. The distance between the antenna and the users is 2.3cm for boby worn,and 2.5cm for face
2. The output power:

Mode	Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (mW)	Duty Cycle (%)	Average Output Power (mW)	Comments
Analog Modulation (FM)	136.5	30.00	1000	50.00	500	High Power
	138.5	30.00	1000	50.00	500	High Power
	146.5	30.40	1096	50.00	603	High Power
	147.5	30.45	1109	50.00	616	High Power
	155.5	30.24	1057	50.00	560	High Power
	159.5	30.53	1130	50.00	638	High Power
	160.5	30.52	1127	50.00	637	High Power
	167.5	30.36	1086	50.00	592	High Power
	173.5	30.07	1016	50.00	518	High Power
Digital Modulation (4FSK)	136.5	30.01	1002	49.68	498	High Power
	138.5	30.01	1002	49.68	498	High Power
	146.5	30.43	1104	49.68	603	High Power
	147.5	30.49	1119	49.68	623	High Power
	155.5	30.25	1059	49.68	558	High Power
	159.5	30.57	1140	49.68	646	High Power
	160.5	30.57	1140	49.68	646	High Power
	167.5	30.39	1094	49.68	592	High Power
	173.5	30.08	1019	49.68	516	High Power



Date: 21.DEC.2012 18:52:09



Date: 21.DEC.2012 18:53:16

Note: duty cycle=Ton/Tp=29.8ms/60ms=0.4968 (49.68%) for 4FSK modulation, worst case at data transmiting mode

Conclusion:

The maximum time-averaged output power is 646 mW ＜the exclusion thresholds is 1000 mW

According to FCC KDB 447498 D01 Mobile Portable RF Exposure v04 section 5, Push-to-talk (PTT) devices, the SAR evaluation is not required.

FCC §2.1046 & §90.205- RF OUTPUT POWER

Applicable Standard

FCC §2.1046 and §90.205.

Test Procedure

Conducted RF Output Power:

TIA-603-D section 2.2.1

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

Spectrum Analyzer setting:

RBW	***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	FSIQ 26	837405/203	2012-03-15.	2013-03-14

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56%
ATM Pressure:	100.1 kPa

The testing was performed by Eric Lee on 2012-09-12.

Test Mode: Transmitting

Conducted output power:

Mode	Frequency (MHz)	Output Power (dBm)	Output Power (Watt)	Comments
Analog Modulation (FM,12.5kHz spacing)	136.5	30.00	1.00	High Power
	136.5	27.78	0.60	Low Power
	138.5	30.00	1.00	High Power
	138.5	27.88	0.61	Low Power
	146.5	30.40	1.10	High Power
	146.5	27.71	0.59	Low Power
	147.5	30.45	1.11	High Power
	147.5	27.76	0.60	Low Power
	155.5	30.24	1.06	High Power
	155.5	27.67	0.58	Low Power
	159.5	30.53	1.13	High Power
	159.5	27.74	0.59	Low Power
	160.5	30.52	1.13	High Power
	160.5	27.71	0.59	Low Power
	167.5	30.36	1.09	High Power
	167.5	27.43	0.55	Low Power
	173.5	30.07	1.02	High Power
	173.5	27.67	0.58	Low Power
Digital Modulation (4FSK,12.5kHz spacing)	136.5	30.01	1.00	High Power
	136.5	27.71	0.59	Low Power
	138.5	30.01	1.00	High Power
	138.5	27.81	0.60	Low Power
	146.5	30.43	1.10	High Power
	146.5	27.57	0.57	Low Power
	147.5	30.49	1.12	High Power
	147.5	27.64	0.58	Low Power
	155.5	30.25	1.06	High Power
	155.5	27.58	0.57	Low Power
	159.5	30.57	1.14	High Power
	159.5	27.59	0.57	Low Power
	160.5	30.57	1.14	High Power
	160.5	27.61	0.58	Low Power
	167.5	30.39	1.09	High Power
	167.5	27.34	0.54	Low Power
	173.5	30.08	1.02	High Power
	173.5	27.58	0.57	Low Power

Antenna Gain:

136-147 MHz		147-160 MHz		160-174 MHz	
Frequency (MHz)	**Gain (dBi)**	**Frequency (MHz)**	**Gain (dBi)**	**Frequency (MHz)**	**Gain (dBi)**
135	-14.78	145	-13.64	160	-11.91
140	-11.69	150	-10.11	165	-8.78
145	-9.28	155	-8.58	170	-7.39
150	-7.83	160	-7.13	175	-5.50

Note:

EIRP = Conducted output power + Antenna Gain (dBi)

FCC §2.1047 & §90.207 - MODULATION CHARACTERISTIC

Applicable Standard

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.

Test Procedure

Test Method: TIA/EIA-603 2.2.3

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
HP	RF Communication Test Set	8920	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 NVLAP requirements, traceable to the NIST.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50%
ATM Pressure:	100.1 kPa

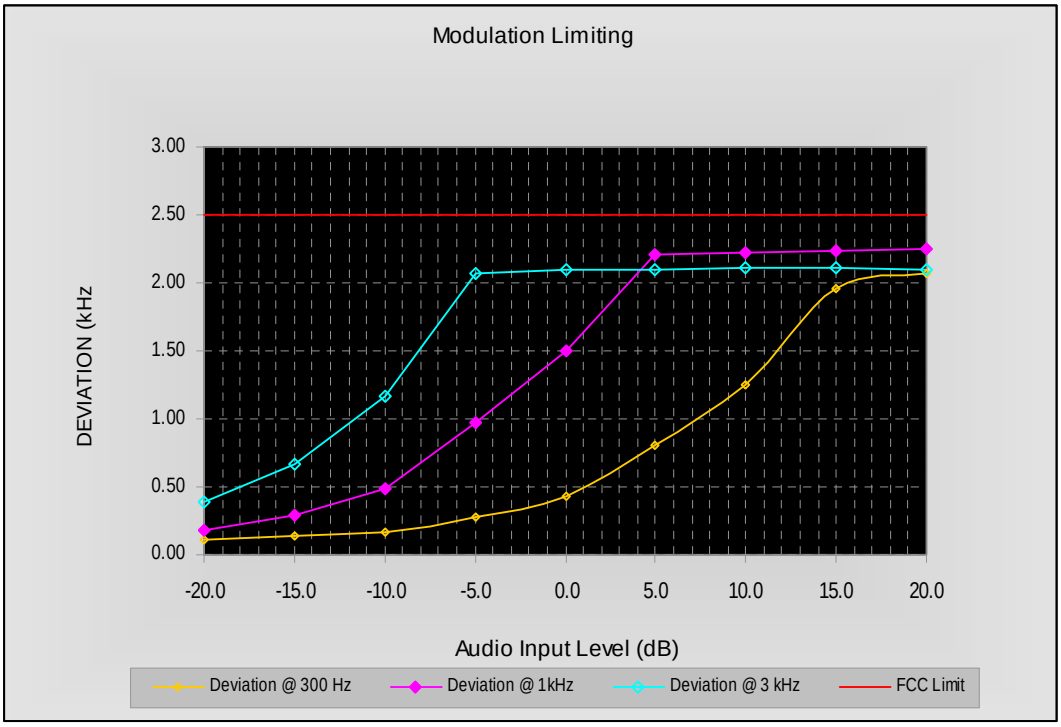
The testing was performed by Eric Lee on 2012-09-12.

Test Mode: Transmitting

MODULATION LIMITING

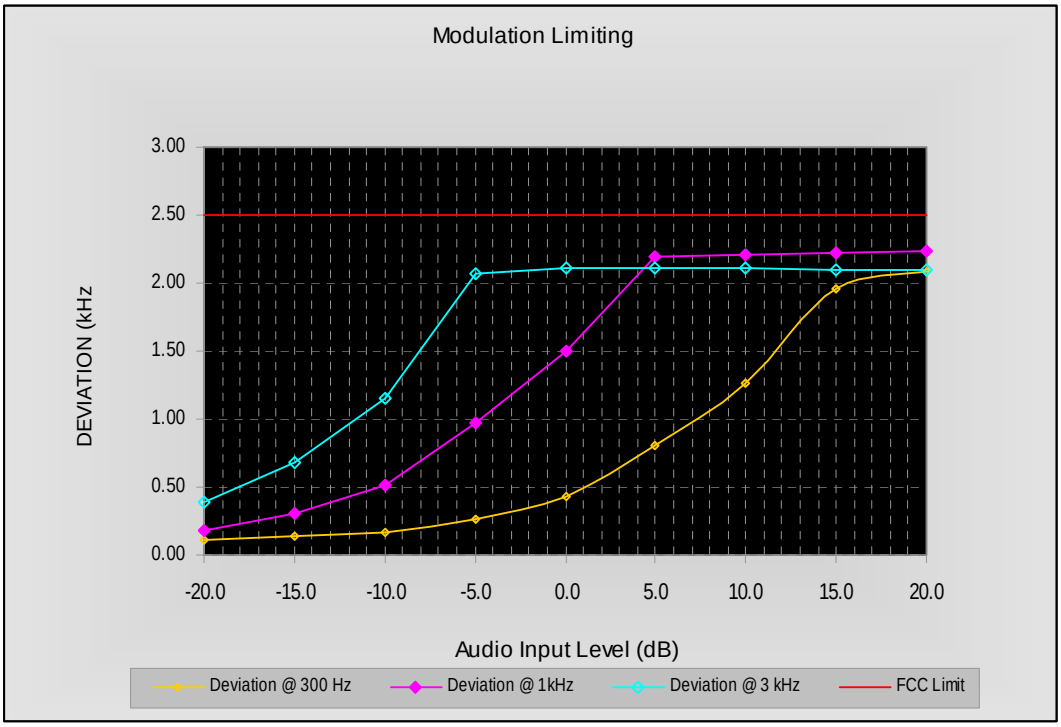
Carrier Frequency: 155.5 MHz, Channel Separation=12.5 kHz, Low Power

Audio Input Level (dB)	Frequency Deviation (kHz)			FCC Limit (kHz)
	@ 300 Hz	@ 1 kHz	@ 3 kHz	
20.0	2.07	2.25	2.10	2.5
15.0	1.96	2.24	2.11	2.5
10.0	1.25	2.23	2.11	2.5
5.0	0.81	2.21	2.10	2.5
0.0	0.43	1.50	2.10	2.5
-5.0	0.28	0.97	2.06	2.5
-10.0	0.17	0.49	1.17	2.5
-15.0	0.14	0.29	0.67	2.5
-20.0	0.11	0.18	0.39	2.5



Carrier Frequency: 155.5 MHz, Channel Separation=12.5 kHz, High Power

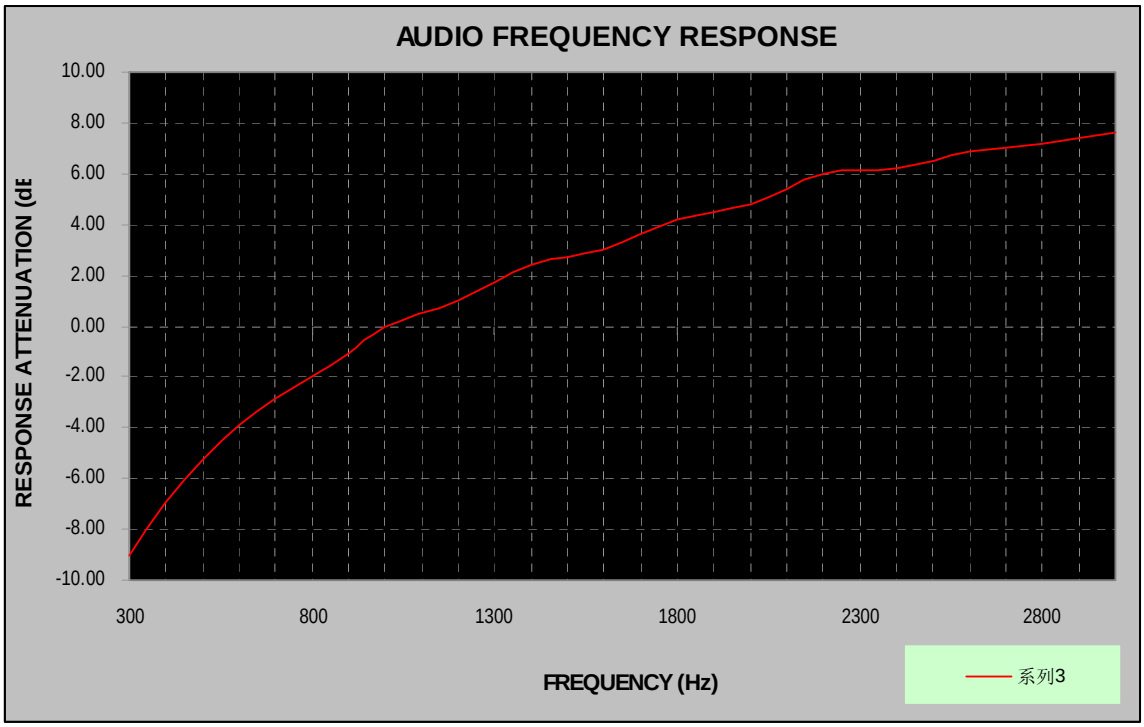
Audio Input Level (dB)	Frequency Deviation (kHz)			FCC Limit (kHz)
	@ 300 Hz	@ 1 kHz	@ 3 kHz	
20.0	2.08	2.24	2.10	2.5
15.0	1.96	2.22	2.10	2.5
10.0	1.26	2.22	2.11	2.5
5.0	0.80	2.19	2.11	2.5
0.0	0.43	1.50	2.12	2.5
-5.0	0.26	0.98	2.07	2.5
-10.0	0.17	0.51	1.16	2.5
-15.0	0.13	0.30	0.67	2.5
-20.0	0.11	0.18	0.38	2.5



Audio Frequency Response

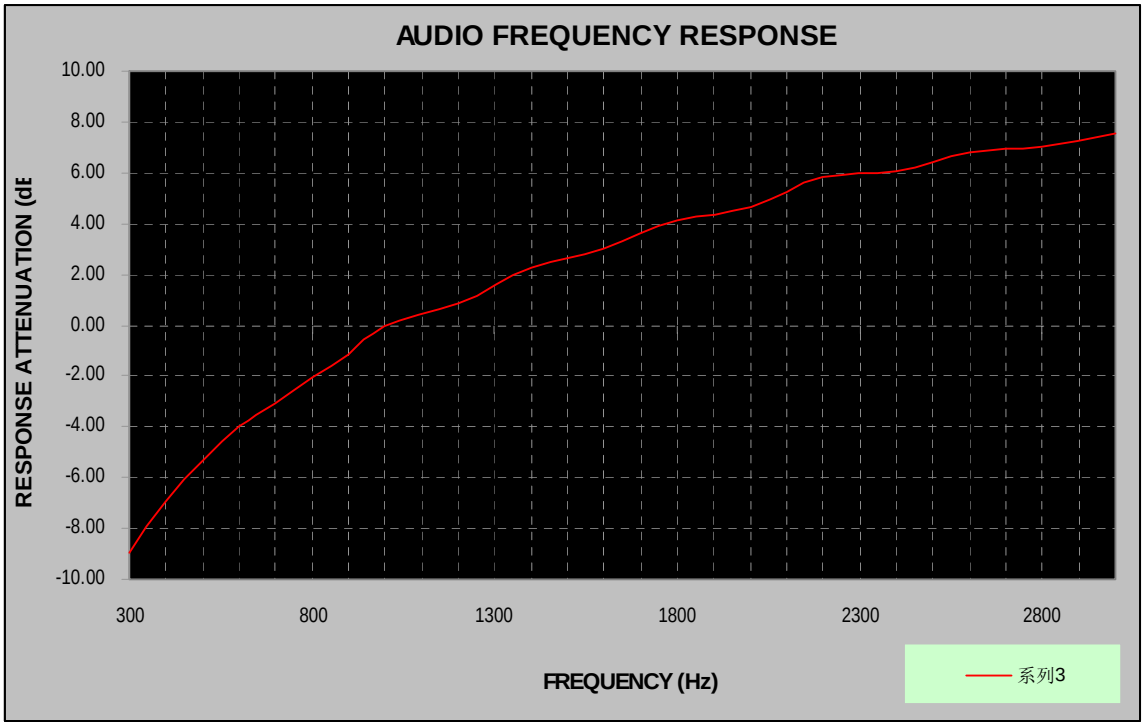
Carrier Frequency: 155.5 MHz, Channel Separation=12.5 kHz, Low Power

Audio Frequency (Hz)	Response Attenuation (dB)
300	-9.02
400	-6.94
500	-5.22
600	-3.93
700	-2.88
800	-1.96
900	-1.09
1000	0.00
1200	1.02
1400	2.42
1600	3.03
1800	4.23
2000	4.76
2200	5.96
2400	6.24
2600	6.87
2800	7.20
3000	7.65



Carrier Frequency: 155.5 MHz, Channel Separation=12.5 kHz, High Power

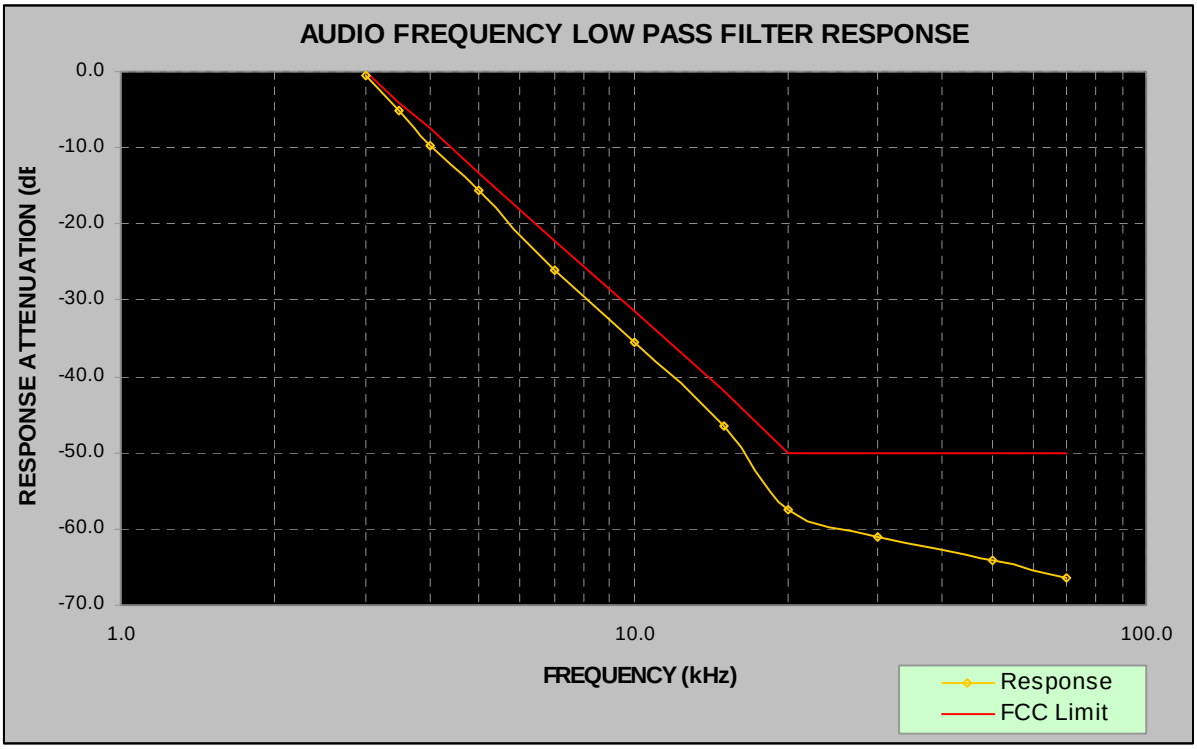
Audio Frequency (Hz)	Response Attenuation (dB)
300	-8.97
400	-6.94
500	-5.29
600	-3.96
700	-3.05
800	-2.03
900	-1.17
1000	0.00
1200	0.83
1400	2.29
1600	2.98
1800	4.10
2000	4.62
2200	5.86
2400	6.05
2600	6.82
2800	7.05
3000	7.55



Audio Frequency Low Pass Filter Response

Carrier Frequency: 155.52 MHz, Channel Separation=12.5 kHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-0.5	0.0
3.5	-5.2	-4.0
4.0	-9.6	-7.5
5.0	-15.7	-13.3
7.0	-26.0	-22.1
10.0	-35.6	-31.4
15.0	-46.4	-42.0
20.0	-57.5	-50.0
30.0	-61.1	-50.0
50.0	-64.1	-50.0
70.0	-66.3	-50.0



FCC §2.1049, §90.209 & §90.210 – OCCUPIED BANDWIDTH & EMISSION MASK

Applicable Standard

FCC §2.1049, §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+10logP=50+10 log (1.574) = 51.97 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+10logP=43+10log (1.622) = 45.10 dB

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 100 Hz.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2011-11-17	2012-11-16
HP	RF Communication Test Set	8920	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 NVLAP requirements, traceable to the NIST.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56%
ATM Pressure:	100.0 kPa

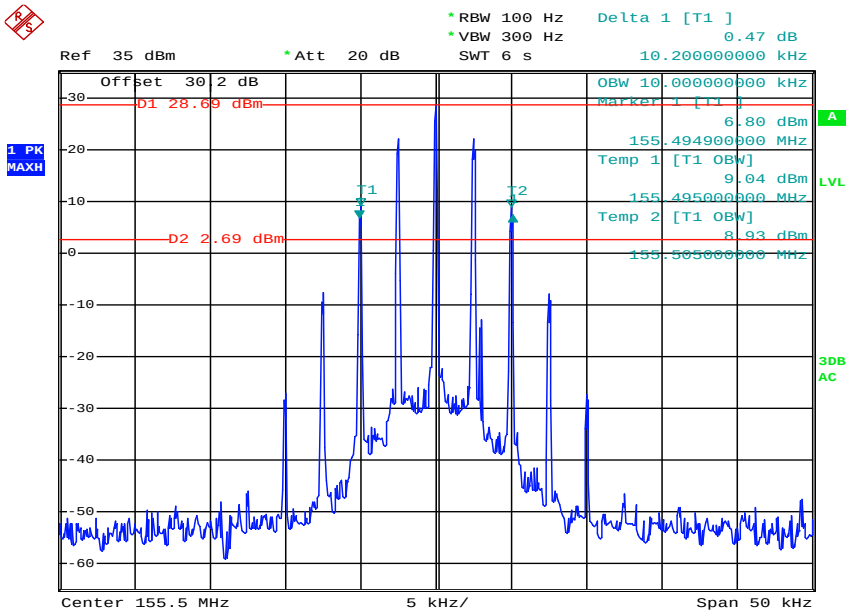
The testing was performed by Eric Lee on 2012-09-13.

Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)	Power level
Analog modulation			
155.5	10.00	10.20	High
Digital modulation			
155.5	7.40	9.40	High

Please refer to the emission mask hereinafter plots.

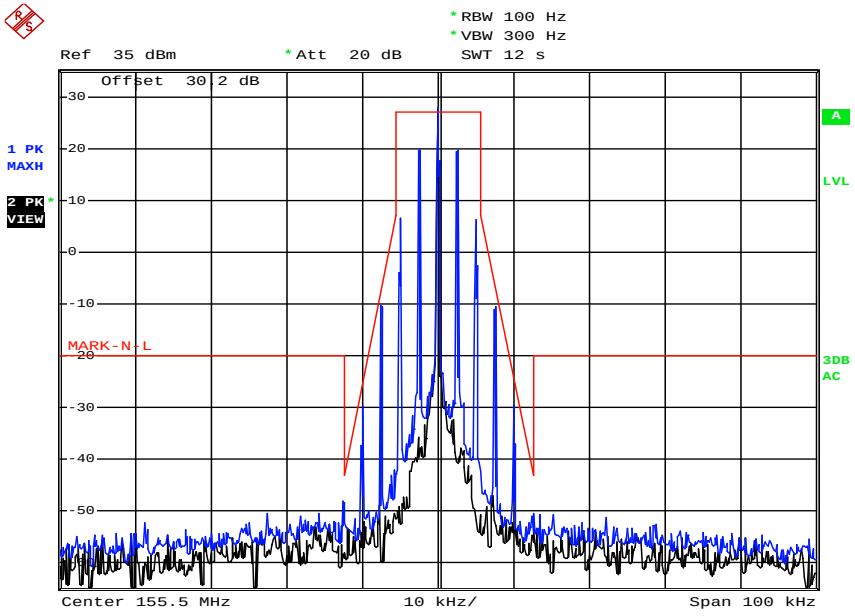
Analog modulation:

Occupied Bandwidth



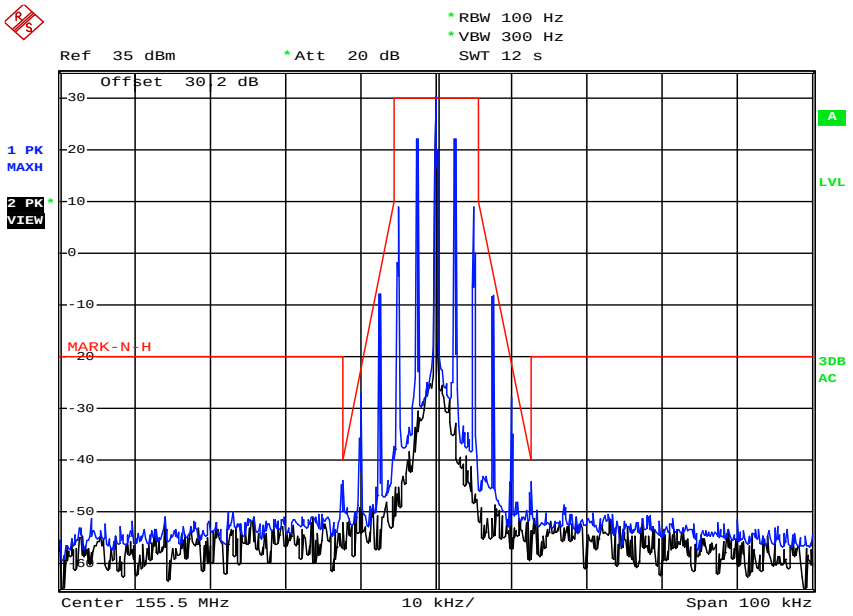
Date: 13.SEP.2012 08:57:02

Emission Mask (Low Power)



Date: 13.SEP.2012 09:30:42

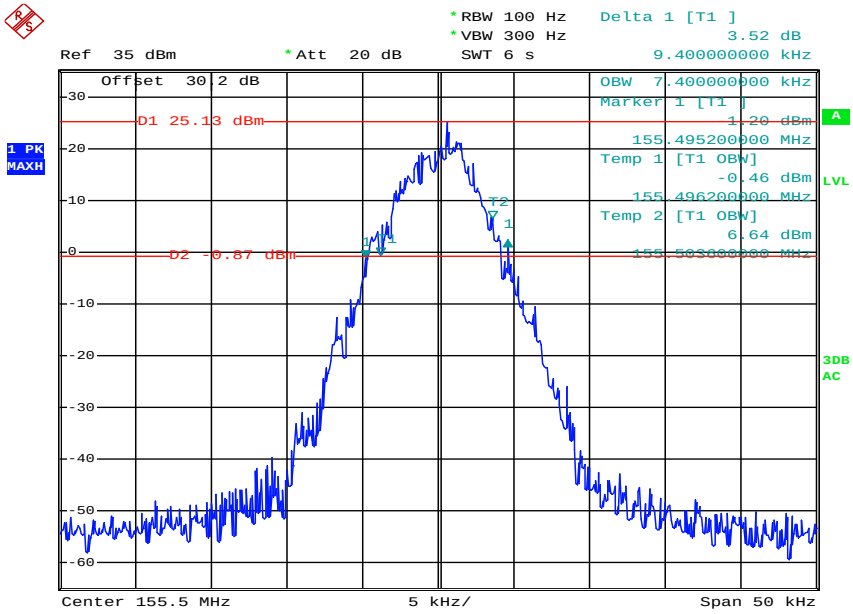
Emission Mask (High Power)



Date: 13.SEP.2012 09:26:00

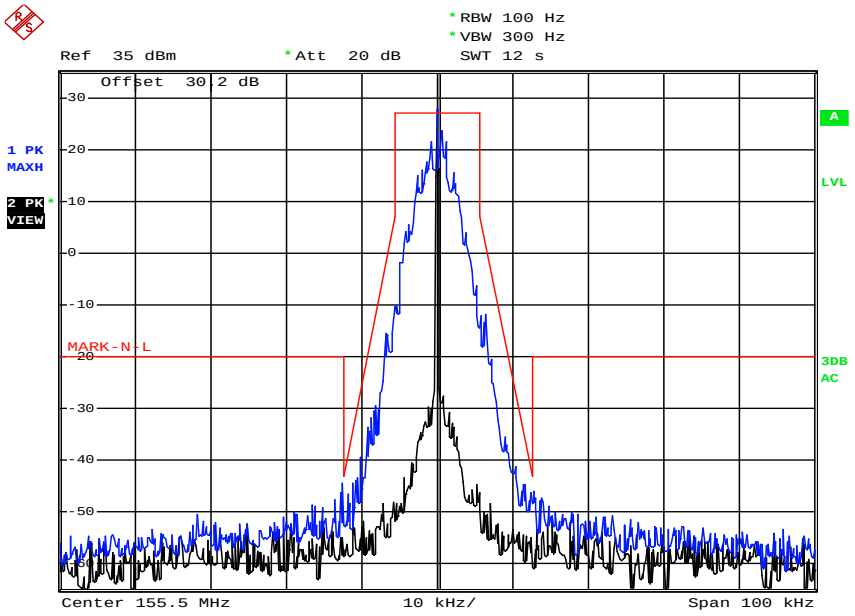
Digital modulation:

Occupied Bandwidth



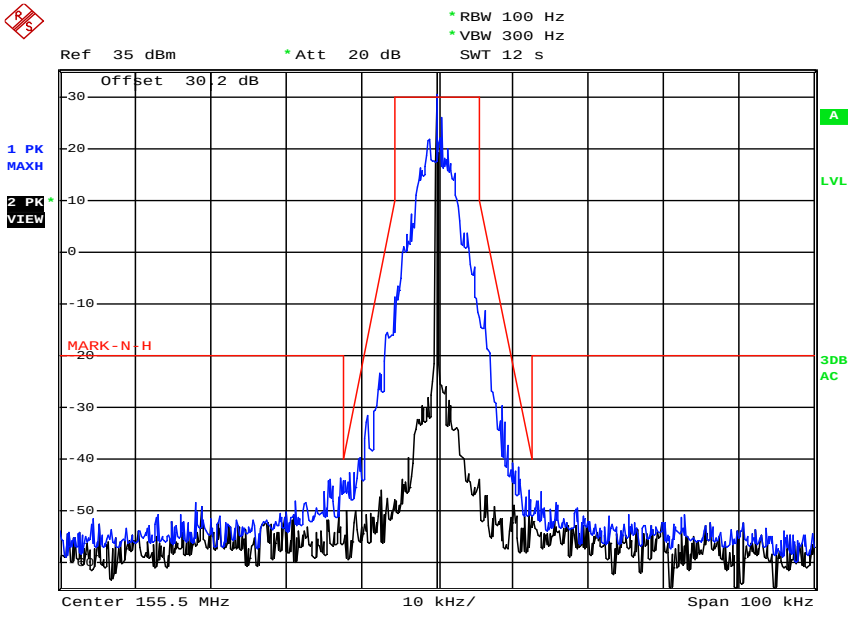
Date: 13.SEP.2012 09:12:41

Emission Mask (Low Power)



Date: 13.SEP.2012 09:34:30

Emission Mask (High Power)



Date: 13.SEP.2012 09:23:56

FCC §2.1051 & §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+10logP=50+10log (P) 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+10logP=43+10log (P) dB

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 10^{th} harmonic.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2011-11-24	2012-11-23

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56%
ATM Pressure:	100.1 kPa

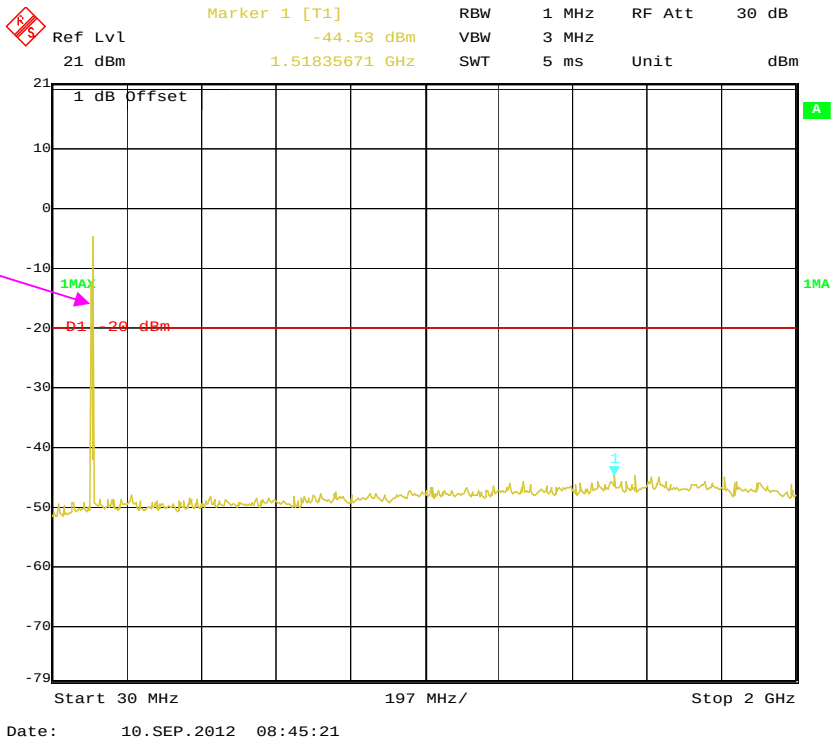
The testing was performed by Eric Lee on 2012-09-10.

Test Mode: Transmitting

Please refer to the following plots.

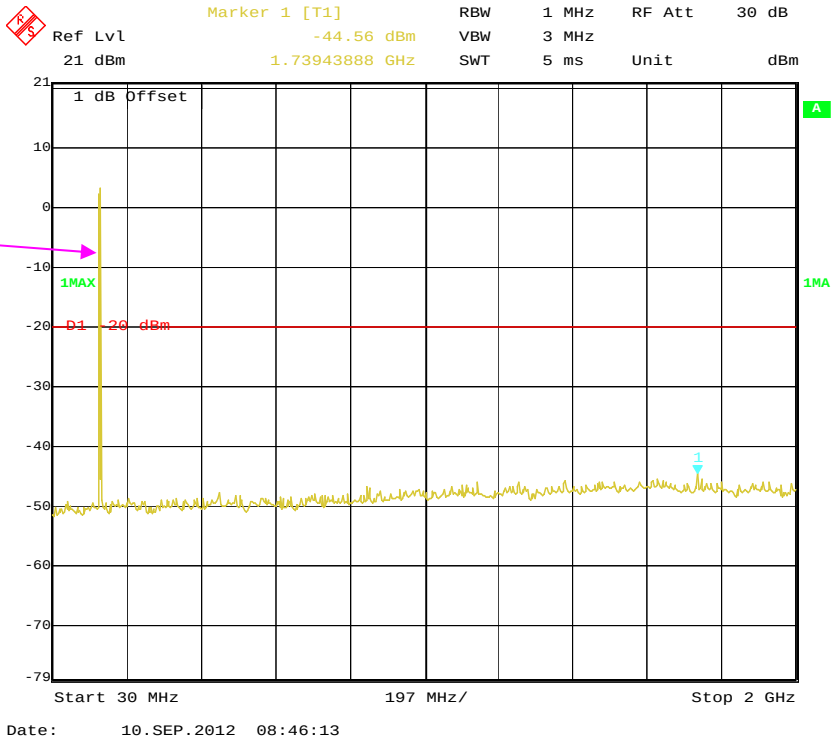
Analog modulation

30 MHz - 2 GHz (Low Channel: 136.5 MHz)



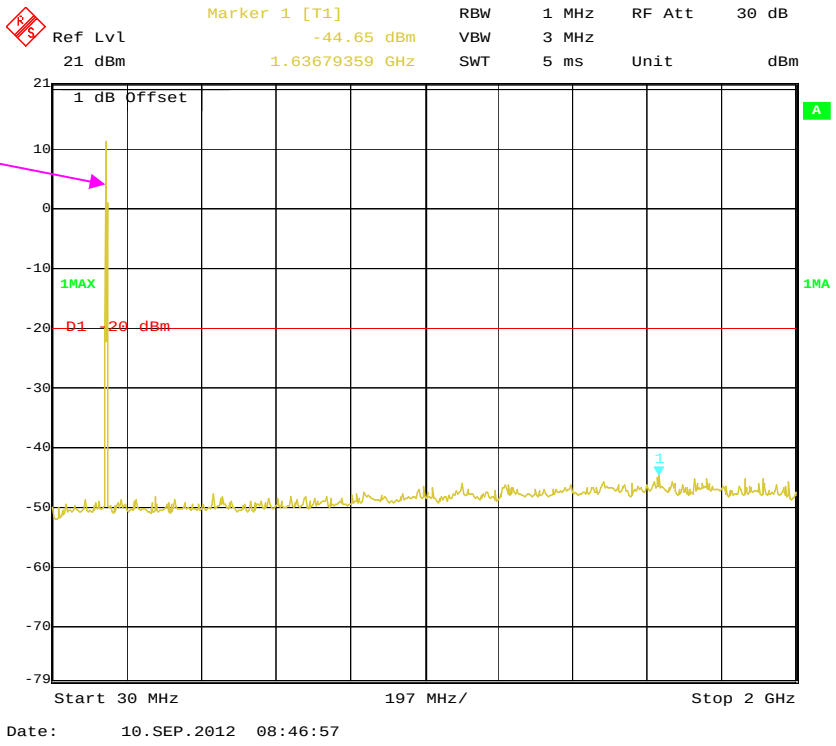
Fundamental test with Band Reject Filter

30 MHz - 2 GHz (Middle Channel: 155.5 MHz)



Fundamental test with Band Reject Filter

30 MHz - 2 GHz (High Channel: 173.5 MHz)

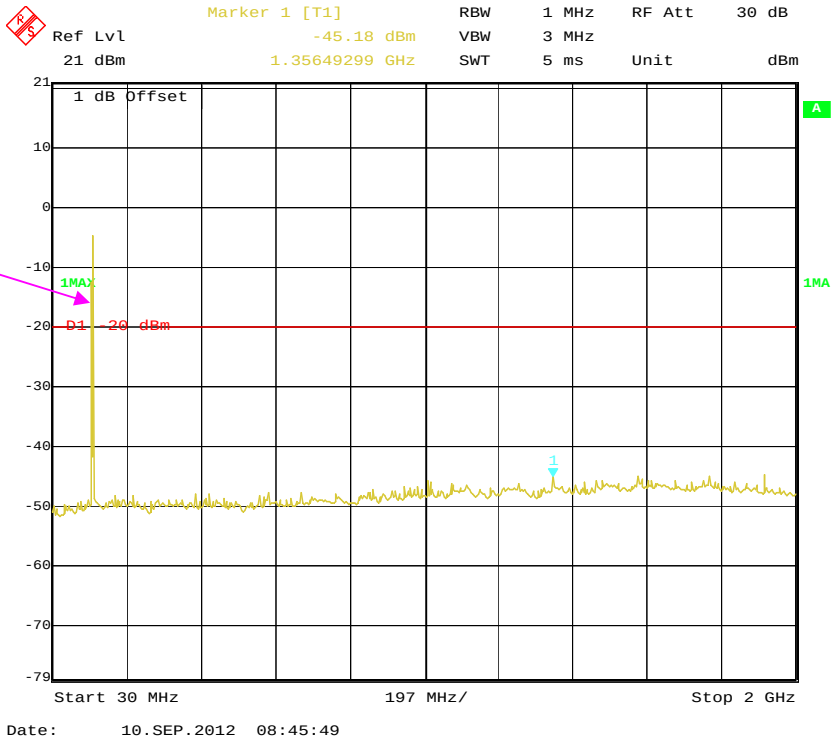


Fundamental test with Band Reject Filter

Digital modulation

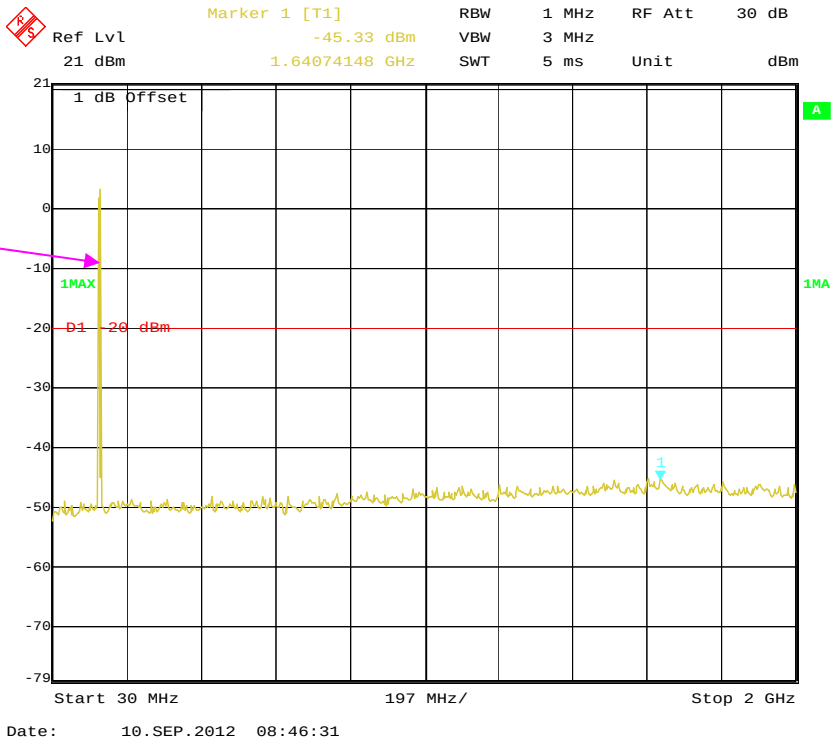
30 MHz - 2 GHz (Low Channel: 136.5 MHz)

Fundamental test with Band Reject Filter



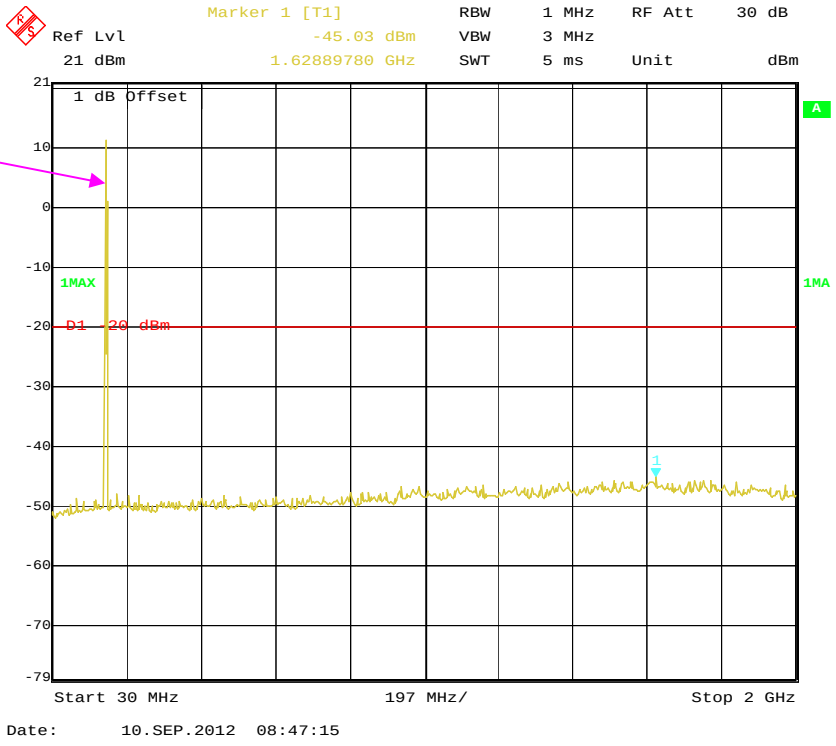
30 MHz - 2 GHz (Middle Channel: 155.5 MHz)

Fundamental test with Band Reject Filter



30 MHz - 2 GHz (High Channel: 173.5 MHz)

Fundamental test with Band Reject Filter



FCC §2.1053 & §90.210 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053 and §90.210

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 1g (TXpwr in Watts/0.001)-the absolute level

Spurious attenuation limit in dB =43+10 Log_{10} (power out in Watts)
Spurious attenuation limit in dB =50+10 Log_{10} (power out in Watts) for EUT with a 12.5 kHz channel bandwidth.

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	2012-11-30
Com Power	Dipole Antenna	AD-100	041000	2012-06-06	2013-06-05
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2012-11-27
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2011-11-24	2012-11-23
HP	Signal Generator	8657A	3217A04699	2011-12-19	2012-12-18
A.H. System	Horn Antenna	SAS-200/571	135	2012-02-11	2013-02-10
HP	Synthesized Sweeper	8341B	2624A00116	2012-05-17	2013-05-16

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	56%
ATM Pressure:	100.1 kPa

The testing was performed by Eric Lee on 2012-09-10.

Test Mode: Transmitting

30MHz-2 GHz:

Indicated		Table	Test Antenna		Substituted			Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)	FCC Part 90	
Frequency (MHz)	Reading (dBμV)	Angle Degree	Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Polar (H/V)				Limit (dBm)	Margin (dB)
Analog modulation												
Frequency:136.5MHz, Channel spacing:12.5 kHz												
229.82	26.21	76	1.5	H	229.82	-70.8	H	0	0.31	-71.11	-20	51.11
273.00	25.96	123	1.8	V	273.00	-71.0	V	0	0.34	-71.34	-20	51.34
220.12	21.27	49	1.8	H	220.12	-75.7	H	0	0.31	-76.01	-20	56.01
229.82	17.89	234	1.6	V	229.82	-79.1	V	0	0.31	-79.41	-20	59.41
Frequency:155.5MHz, Channel spacing: 12.5 kHz												
229.82	25.54	132	1.8	H	229.82	-71.5	H	0	0.31	-71.81	-20	51.81
272.50	21.16	98	2.1	H	272.50	-75.8	H	0	0.34	-76.14	-20	56.14
229.82	18.70	36	1.9	V	229.82	-78.3	V	0	0.31	-78.61	-20	58.61
311.00	17.21	136	1.7	V	311.00	-79.8	V	0	0.37	-80.17	-20	60.17
Frequency:173.5MHz, Channel spacing: 12.5 kHz												
229.82	28.21	132	1.9	H	229.82	-68.8	H	0	0.31	-69.11	-20	49.11
229.82	26.61	72	1.8	V	229.82	-70.4	V	0	0.31	-70.71	-20	50.71
347.00	26.21	163	1.6	H	347.00	-70.8	H	0	0.40	-71.20	-20	51.20
347.00	23.24	54	1.8	V	347.00	-73.8	V	0	0.40	-74.20	-20	54.20
Digital modulation												
Frequency:136.5MHz, Channel spacing:12.5 kHz												
273.00	28.64	168	1.9	V	273.00	-68.4	V	0	0.34	-68.74	-20	48.74
229.82	27.11	246	1.9	H	229.82	-69.9	H	0	0.31	-70.21	-20	50.21
220.12	20.67	89	2.1	H	220.12	-76.3	H	0	0.31	-76.61	-20	56.61
229.82	18.48	128	1.8	V	229.82	-78.5	V	0	0.31	-78.81	-20	58.81
Frequency:155.5MHz, Channel spacing: 12.5 kHz												
78.50	27.62	269	1.7	H	78.50	-69.4	H	0	0.24	-69.64	-20	49.64
229.82	26.11	65	1.9	H	229.82	-70.9	H	0	0.31	-71.21	-20	51.21
229.82	18.22	46	1.8	V	229.82	-78.8	V	0	0.31	-79.11	-20	59.11
311.00	16.72	169	1.9	V	311.00	-80.3	V	0	0.37	-80.67	-20	60.67
Frequency:173.5MHz, Channel spacing: 12.5 kHz												
229.82	28.15	48	1.9	H	229.82	-68.9	H	0	0.31	-69.21	-20	49.21
229.82	27.55	126	2.0	V	229.82	-69.5	V	0	0.31	-69.81	-20	49.81
347.00	25.77	69	1.8	H	347.00	-71.2	H	0	0.40	-71.60	-20	51.60
347.00	23.02	234	1.9	V	347.00	-74.0	V	0	0.40	-74.40	-20	54.40

FCC §2.1055 & §90.213- FREQUENCY STABILITY

Applicable Standard

FCC §2.1055 & §90.213

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external AC 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 AC 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.

The frequency stability shall be measured with variation of primary supply voltage as follows:

For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Hewlett-Packard	Frequency Counter	5343A	2232A00827	2012-04-15	2013-04-14
ESPEC	Temperature & Humidity Chamber	EL-10KA	09107726	2011-11-24	2012-11-23

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data

Environmental Conditions

Temperature:	20 ℃
Relative Humidity:	56%
ATM Pressure:	100.1 kPa

The testing was performed by Eric Lee on 2012-09-10.

Test Mode: Transmitting

Reference Frequency: 155.5 MHz, Channel spacing:12.5kHz, Limit: ±5 ppm			
Test Environment		**Frequency Measure with Time Elapsed**	
Temperature (℃)	**Power Supplied (V_{DC})**	**Measured Frequency error (MHz)**	**Frequency Error (ppm)**
Frequency Stability versus Input Temperature			
50	7.4	155.500021	0.14
40	7.4	155.500032	0.21
30	7.4	155.500026	0.17
20	7.4	155.500015	0.10
10	7.4	155.500020	0.13
0	7.4	155.500027	0.17
-10	7.4	155.500035	0.23
-20	7.4	155.500033	0.21
-30	7.4	155.500019	0.12
Frequency Stability versus Input Voltage			
20	7.0	155.500027	0.17
20	6.2	155.500018	0.12

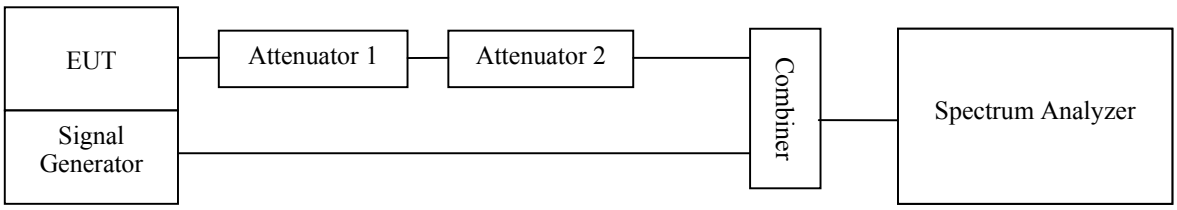
FCC §90.214 - TRANSIENT FREQUENCY BEHAVIOR

Applicable Standard

Regulations: FCC §90.214
Test method: ANSI/TIA-603-D 2010, section 2.2.19.3

Test Procedure

a) Connect the EUT and test equipment as shown on the following block diagram.
b) Set the Spectrum Analyzer to measure FM deviation, and tune the RF frequency to the transmitter assigned frequency.
c) 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.
d) Turn on the transmitter.
e) 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.
f) Turn off the transmitter.
g) 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.
h) Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30 dB when the transmitter is turned on.
i) 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 "tiger offset" to -10ms for turn on and -15ms for turn off.
j) 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 Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	8386001028	2011-11-24	2012-11-23
HP	RF Communication Test Set	8920	3438A05201	2012-06-14	2013-06-13
Agilent	VECTOR SIGNAL ANALYZER	89441A	75182	2012-05-12	2013-05-11

Test Data

Environmental Conditions

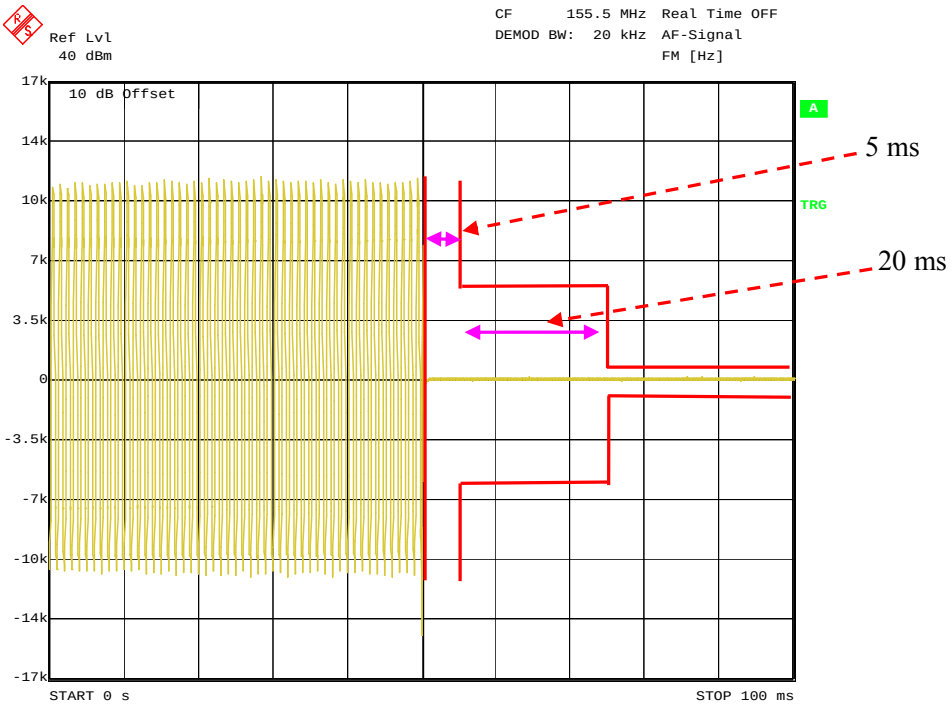
Temperature:	25 ℃
Relative Humidity:	56%
ATM Pressure:	100.1 kPa

The testing was performed by Eric Lee on 2012-09-08.

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	

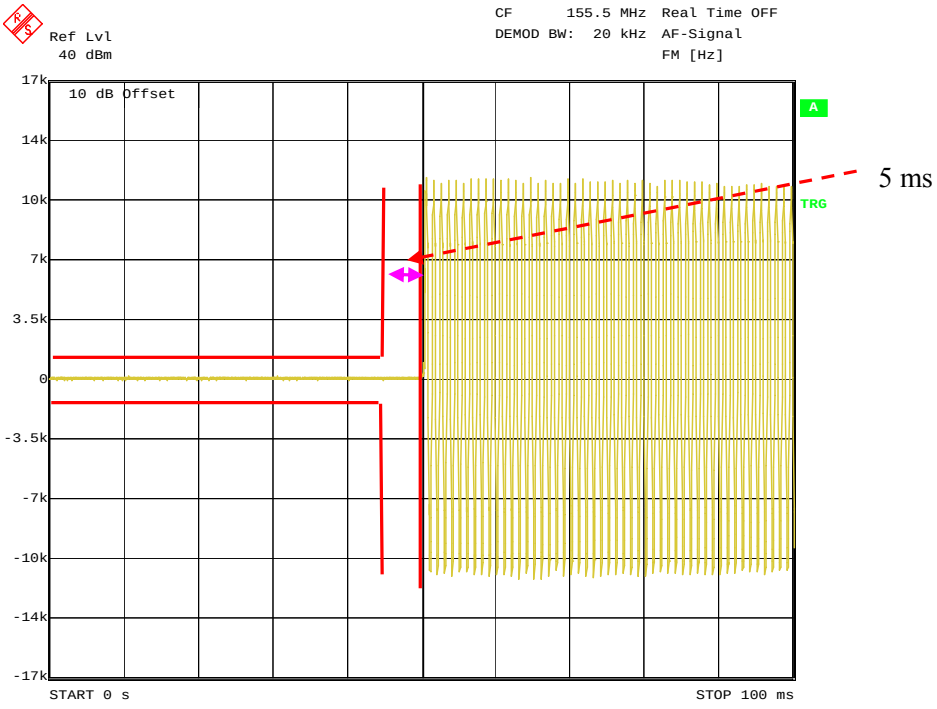
Please refer to the following plots.

Turn on: FM



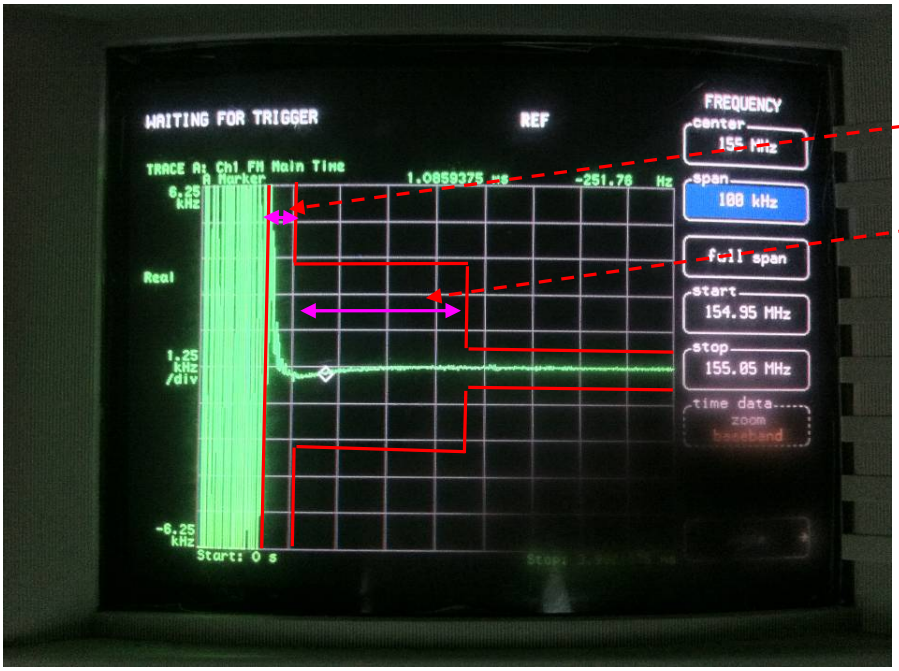
Date: 8.SEP.2012 11:14:39

Turn off: FM

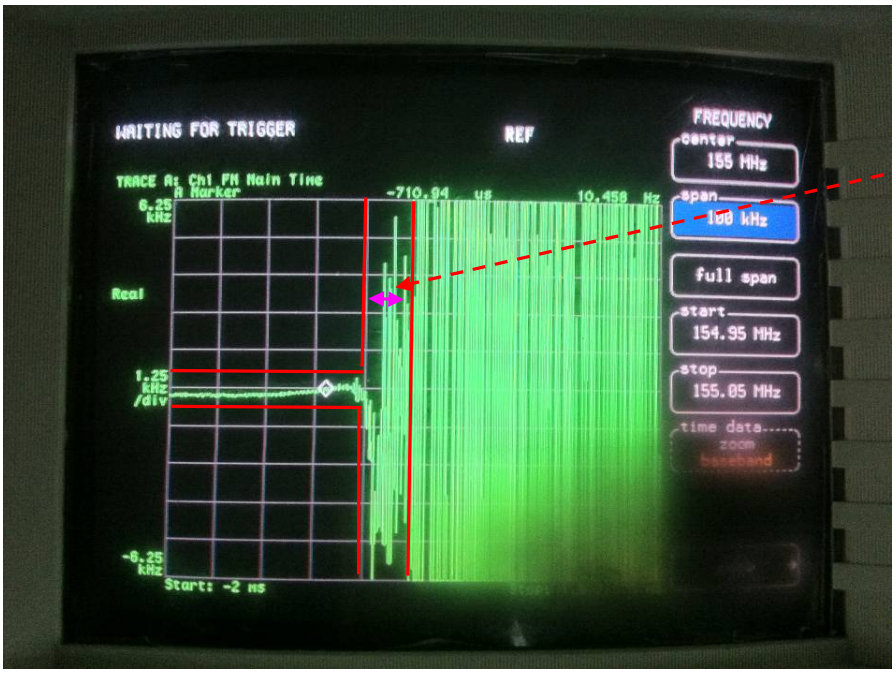


Date: 8.SEP.2012 11:14:22

Turn on: 4FSK



Turn off: 4FSK



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