

FCC PART 15.239
EMI MEASUREMENT AND TEST REPORT
For

Besstec Electronics (Zhongshan) Co., Ltd.

Yujing Industrial Park, No. 106, Qihao Road, Torch Development Zone, Zhongshan City, China

FCC ID: Z37FM-A

October 8, 2011

This Report Concerns: Original Report	Equipment Type: FM TRANSMITTER
Test Engineer: Eric Li	<i>Eric Li</i>
Report No.:	<u>BSTDG11090099Y-1ER-3</u>
Receive EUT	
Date/Test Date:	<u>September 25, 2011/ September 26-30, 2011</u>
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1. GENERAL INFORMATION

1.1. Report information

1.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that BST approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BST in any way guarantees the later performance of the product/equipment.

1.1.2. The sample/s mentioned in this report is/are supplied by Applicant, BST therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through BST, unless the applicant has authorized BST in writing to do so.

Test Facility -

The test site used to collect the radiated data is located on the address of SinTek Laboratory Co.,Ltd.

(FCC Registered Test Site Number: 963441) on

No.7, Xinshidai Industrial, Guantian Village, Shiyan Town, Baoan District, Shenzhen, Guangdong 518108, China

The Test Site is constructed and calibrated to meet the FCC requirements.

1.2. Measurement Uncertainty

Available upon request.

2. PRODUCT DESCRIPTION

2.1. EUT Description

Description : FM TRANSMITTER

Applicant : Besstec Electronics (Zhongshan) Co., Ltd.
Yujing Industrial Park, No. 106, Qihao Road, Torch Development
Zone, Zhongshan City, China

Model Number : FM-A03, FM-A01, FM-A02, FM-A04, FM-A05, FM-A06,
FM-A07, FM-A08, FM-A09

Trade Name : BESSTEC

Frequency : 88.1-107.9MHz (step 0.1MHz)

Power Supply : DC 3.7V or DC 12V (Powered by car cigarette-lighter)

2.2. Block Diagram of EUT Configuration

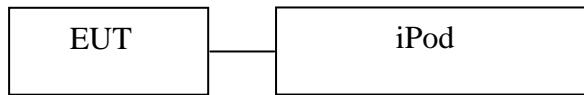


Figure 1 EUT Setup

2.3. Support Equipment List

Name	Model No	S/N	Manufacturer	Used “ ”
iPod	iPod Touch	N/A	Apple	

2.4. Test Conditions

Temperature: 20~25

Relative Humidity: 50~63 %

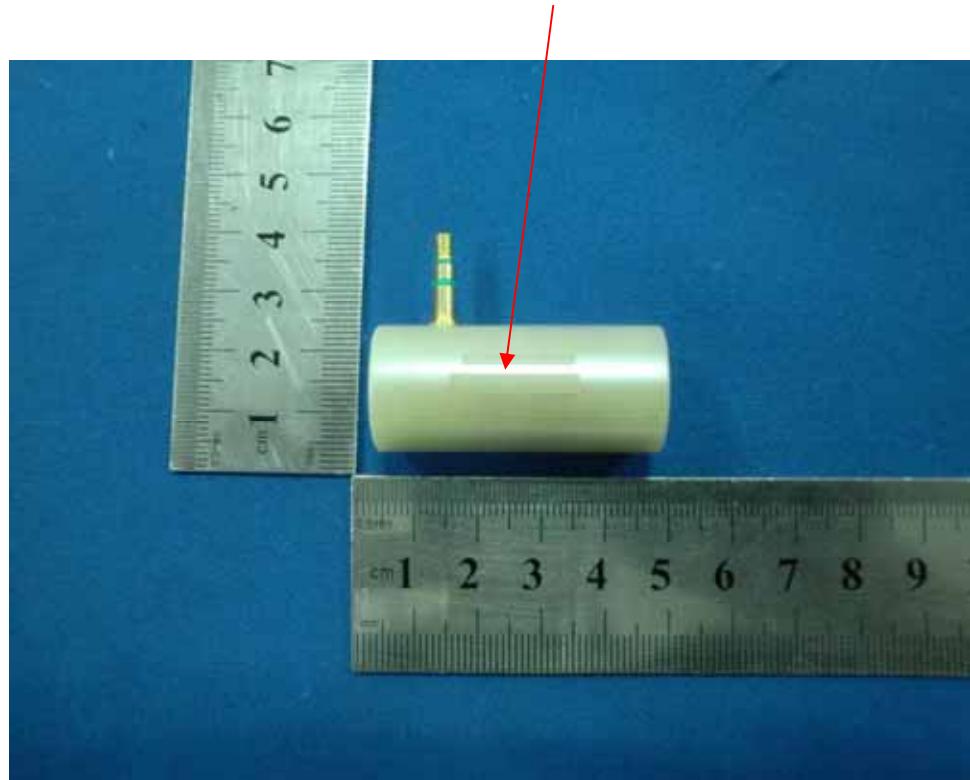
3. FCC ID LABEL

FCC ID: Z37FM-A

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: 1. This device may not cause harmful interference, and 2. This device must accept any interference received, including interference that may cause undesired operation.

Label Location on EUT

EUT View/ FCC ID Label Location



4. TEST RESULTS SUMMARY

FCC 15 Subpart C, Paragraph 15.239

FCC Rules	Description of Test	Result
Section 15.207	Conducted Emission	N/A
Section 15.239(c) Section 15.209	Harmonics and Spurious Radiated Emission	Compliant
Section 15.239(b)	Fundamental Radiated Emission	Compliant
Section 15.239(a)	Occupied Bandwidth	Compliant
Section 15.203	Antenna Requirement	Compliant

Remark: "N/A" means "Not applicable".

Statement: All testing was performed using the test procedures found in ANSI C63.4-2003.

Modifications

No modification was made.

5. TEST EQUIPMENT USED

Equipment/Facilities	Manufacturer	Model #	Serial no.	Date of Cal.	Cal. Interval
Cable	Resenberger	N/A	NO.1	Mar 10 , 2011	1 Year
Cable	SCHWARZBECK	N/A	NO.2	Mar 10 , 2011	1 Year
Cable	SCHWARZBECK	N/A	NO.3	Mar 10 , 2011	1 Year
LISN	Rohde & Schwarz	ESH3-Z5	100305	Mar 10 , 2011	1 Year
50 Coaxial Switch	ANRITSU CORP	MP59B	6200283933	Mar 10 , 2011	1 Year
EMI Test Receiver	Rohde & Schwarz	ESP13	100180	Oct.11,2010	1 Year
Spectrum Analyzer	Rohde & Schwarz	FSP40	100273	Sep.10,2011	1 Year
3m Semi-Anechoic Chamber	Albatross Projects	9mx6mx6m	N/A	Feb.20,2011	1 Year
Signal Generator	FLUKE	PM5418 + Y/C	LO747012	Feb.20,2011	1 Year
Signal Generator	FLUKE	PM5418TX	LO738007	Feb.20,2011	1 Year
Loop Antenna	SCHWARZBECK	FMZB1516	113	Jan.30,2011	1 Year
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB9161	9161-4079	Sep.22,2011	1 Year
Broad-Band Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-564	Sep.22,2011	1 Year
Ultra Broadband Antenna	Rohde & Schwarz	HL-562	100110	June.15,2011	1 Year
AMN	Rohde & Schwarz	ESH3-Z5	100196	Oct.11,2010	1 Year
AMN	Rohde & Schwarz	ESH3-Z5	100197	Oct.11,2010	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	N/A	N/A	N/A
Power Meter	Rohde & Schwarz	NRVD	100041	Feb.20,2011	1 Year
EMI Test Receiver	Rohde & Schwarz	ESCS30	100003	Feb.20,2011	1 Year
Coaxial Cable with N-connectors	SCHWARZBECK	AK9515H	95549	Sep.22,2011	1 Year
Radio Communication Test Set	Rohde & Schwarz	CMS 54	846621/024	Feb.20,2011	1 Year
Modulation Analyzer	Hewlett-Packard	8901B	2303A00362	Feb.20,2011	1 Year
Absorbing clamp	Rohde & Schwarz	MDS-21	N/A	Oct.11,2010	1 Year

6. ANTENNA REQUIREMENT

6.1. STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

6.2. ANTENNA CONNECTED CONSTRUCTION

According to § 15.203, An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna is formed by a short copper wire soldered on the PCB. The antenna is permanently attached. Refer to the product photo.

6.3. Result

Compliance

7. CONDUCTED POWER LINE TEST

7.1. Test Equipment

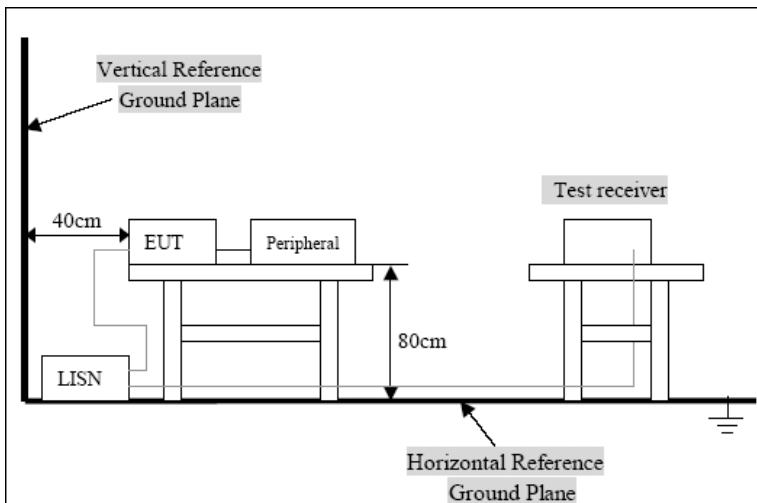
Please refer to section 5 this report.

7.2. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.).This provides a 50ohm/50uh coupling impedance for the measuring equipment.The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uh coupling impedance with 50ohm termination.

Both sides of A.C. Line are check for maximum conducted interference.In order to find the maximum emission,the relative positions of equipment and al of the interface cables must be changed according to ASIN C63.4:2003 on conducted measurement .Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9Khz.

7.3. Test Setup



For the actual test configuration,Please refer to the related items-Photos of testing

7.4. Conducted Power line Emission Limits

FCC Part 15 Paragraph 15.207 (dBuV)		
Frequency Range (MHZ)	Class A QP/AV	Class B QP/AV
0.15-0.5	79/66	65-56/56-46
0.5-5.0	73/60	56-46
5.0-3.0	73/60	60-50

Note: In the above table, the tighter limit applies at the band edges.

7.5. Conducted Power Line Test Result

N/A.

There is no connection to AC mains. Therefore, the test is not applicable and skipped.

8. FUNDAMENTAL RADIATED EMISSION FOR FCC PART 15 SECTION

15.239(B)

8.1. Test Equipment

Please refer to section 5 this report.

8.2. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated emission measurement.

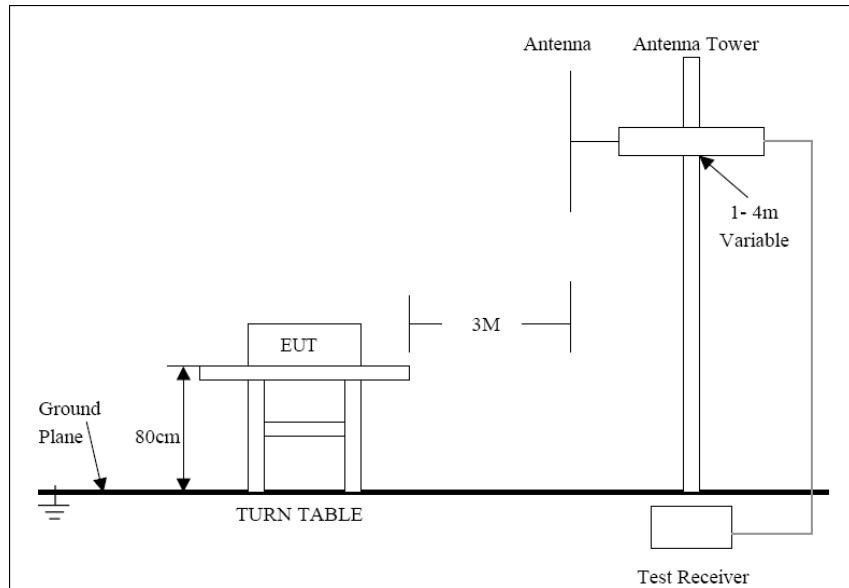
The bandwidth of test receiver is set at 120kHz.

The final measurement are performed with Peak and Average detector.

Through three orthogonal axes to determine which attitude and equipment arrangement produces the highest emission relative to the limit.

Let the EUT work in TX modes [Connect EUT use iPod playing typical audio signal ('Highway Blues' from sample music of windows XP) with maximum audio level] measure it. The transmit frequency are 88.1-107.9MHz. We are select 88.1M, 98.0M, 107.9MHz TX frequency to transmit.

8.3. Radiated Test Setup



For the accrual test configuration, please refer to the related items-photos of Testing.

8.4. Radiated Emission Limit

The field strength of any emission within the permitted 200kHz band shall not exceed 250microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in section 15.35 for limiting peak emissions apply.

8.5. Radiated Emission Test Result

Pass

Test Mode: TX 88.1MHz

Frequency (MHz)	Reading(dB μ V/m)		Factor (dB) Corr.	Result(dB μ V/m)		Limit(dB μ V/m)		Margin (dB)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
88.1080	30.28	32.04	13.75	44.03	45.79	48	68	-3.97	-22.21	Horizontal
88.1080	30.06	31.80	13.73	43.79	45.53	48	68	-4.21	-22.47	Vertical

Test Mode: TX 98.0MHz

Frequency (MHz)	Reading(dB μ V/m)		Factor (dB) Corr.	Result(dB μ V/m)		Limit(dB μ V/m)		Margin (dB)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
98.0070	30.04	31.71	14.03	44.07	45.74	48	68	-3.93	-22.26	Horizontal
98.0070	30.04	31.76	13.93	43.97	45.69	48	68	-4.03	-22.31	Vertical

Test Mode: TX 107.9MHz

Frequency (MHz)	Reading(dB μ V/m)		Factor (dB) Corr.	Result(dB μ V/m)		Limit(dB μ V/m)		Margin (dB)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
107.9080	30.25	31.97	13.77	44.02	45.74	48	68	-3.98	-22.26	Horizontal
107.9080	30.09	31.80	14.19	44.28	45.99	48	68	-3.72	-22.01	Vertical

Note:

1. Measurement was performed with modulated signal with average detector and peak detector.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss + High Pass Filter Loss – Amplifier Gain

9. HARMONICS AND SPURIOUS RADIATED EMISSION FOR FCC PART 15 SECTION 15.239(C)

9.1. Test Equipment

Please refer to section 5 this report.

9.2. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated emission measurement.

The bandwidth of test receiver is set at 9kHz in below 30MHz. and set at 120kHz in 30-1000MHz, and 1MHz in above 1000MHz.

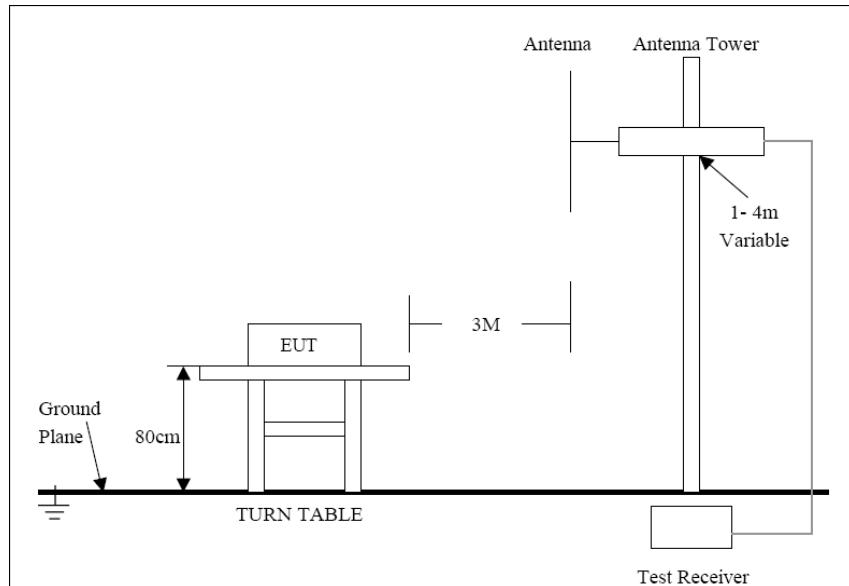
The frequency range from 10MHz to 1080MHz is checked.

The final measurement for frequencies below 1000MHz is performed with Quasi Peak detector. The final measurement for frequencies above 1000MHz is performed with Peak detector and Average detector.

Through three orthogonal axes to determine which attitude and equipment arrangement produces the highest emission relative to the limit.

Let the EUT work in TX modes [Connect EUT use iPod playing typical audio signal ('Highway Blues' from sample music of windows XP) with maximum audio level] measure it. The transmit frequency are 88.1-107.9MHz. We are select 88.1M, 98.0M, 107.9MHz TX frequency to transmit.

9.3. Radiated Test Setup



For the accrual test configuration, please refer to the related items-photos of Testing.

9.4. Radiated Emission Limit

The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in Section 15.209.

Radiation Emission Measurement Limits According to Section 15.209

Frequency (MHz)	Limit			
	Field Strength of Quasi-peak Value (microvolts/m)	Field Strength of Quasi-peak Value (dB μ V/m)	Measurement distance (m)	The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.
1.705-30	30	29.5	30	
30 - 88	100	40	3	
88 - 216	150	43.5	3	
216 - 960	200	46	3	
Above 960	500	54	3	

Note: (1) RF Voltage (dB μ V)=20 log Voltage(uV)

(2) In the Above Table, the tighter limit applies at the band edges.

(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

9.5. Radiated Emission Test Result

Pass

Test Mode: TX 88.1MHz

Polarization	Frequency (MHz)	Reading(dB μ V/m) QP	Factor Corr.(dB)	Result(dB μ V/m) QP	Limits(dB μ V/m) QP	Margin(dB) QP
Horizontal	262.8220	24.26	18.64	42.90	46.00	-3.10
Horizontal	350.4310	21.39	20.81	42.20	46.00	-3.80
Horizontal	438.0380	18.82	22.88	41.70	46.00	-4.30
Vertical	175.2160	24.05	15.75	39.80	43.50	-3.70
Vertical	262.8220	23.93	18.64	42.57	46.00	-3.43
Vertical	438.0380	18.91	22.88	41.79	46.00	-4.21

Test Mode: TX 98.0MHz

Polarization	Frequency (MHz)	Reading(dB μ V/m) QP	Factor Corr.(dB)	Result(dB μ V/m) QP	Limits(dB μ V/m) QP	Margin(dB) QP
Horizontal	195.6140	23.95	16.02	39.97	43.50	-3.53
Horizontal	293.4200	24.65	18.60	43.25	46.00	-2.75
Horizontal	489.0346	18.33	23.92	42.25	46.00	-3.75
Vertical	195.6140	24.11	16.02	40.25	43.50	-3.25
Vertical	293.4200	24.33	18.60	42.93	46.00	-3.07
Vertical	489.0346	17.86	23.92	41.78	46.00	-4.22

Test Mode: TX 107.9MHz

Polarization	Frequency (MHz)	Reading(dB μ V/m) QP	Factor Corr.(dB)	Result(dB μ V/m) QP	Limits(dB μ V/m) QP	Margin(dB) QP
Horizontal	215.8160	23.09	16.56	39.65	43.50	-3.85
Horizontal	323.7230	23.31	19.50	42.81	46.00	-3.19
Horizontal	539.5380	17.08	24.94	42.02	46.00	-3.98
Vertical	215.8160	23.46	16.56	40.02	43.50	-3.48
Vertical	323.7230	23.16	19.50	42.66	46.00	-3.34
Vertical	539.5380	17.47	24.94	42.41	46.00	-3.59

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss + High Pass Filter Loss – Amplifier Gain

10. OCCUPIED BANDWIDTH FOR FCC PART 15 SECTION 15.239(A)

10.1. Test Equipment

Please refer to Section 5 this report.

10.2. Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation. Playing typical audio signal (the volume control was set to maximum.)
3. Set EMI test receiver Center Frequency = fundamental frequency, RBW= 3kHz, VBW= 10kHz, Span=500kHz.
4. Set EMI test receiver Max hold. Mark peak, -26dB.
5. Let the EUT work in TX modes [Connect EUT use iPod playing typical audio signal ('Highway Blues' from sample music of windows XP) with maximum audio level] measure it. The transmit frequency are 88.1-107.9MHz. We are select 88.1M, 98.0M, 107.9MHz TX frequency to transmit.

10.3. Band Edge FCC 15.249(d) Limit

Emission from the device shall be confined within a band 200kHz wide centered on the operating frequency. The 200kHz band shall lie wholly within the frequency range of 88-108MHz.

10.4. Band Edge Test Result

Pass

FM 88.1MHz

-26dB bandwidth = 107.0kHz

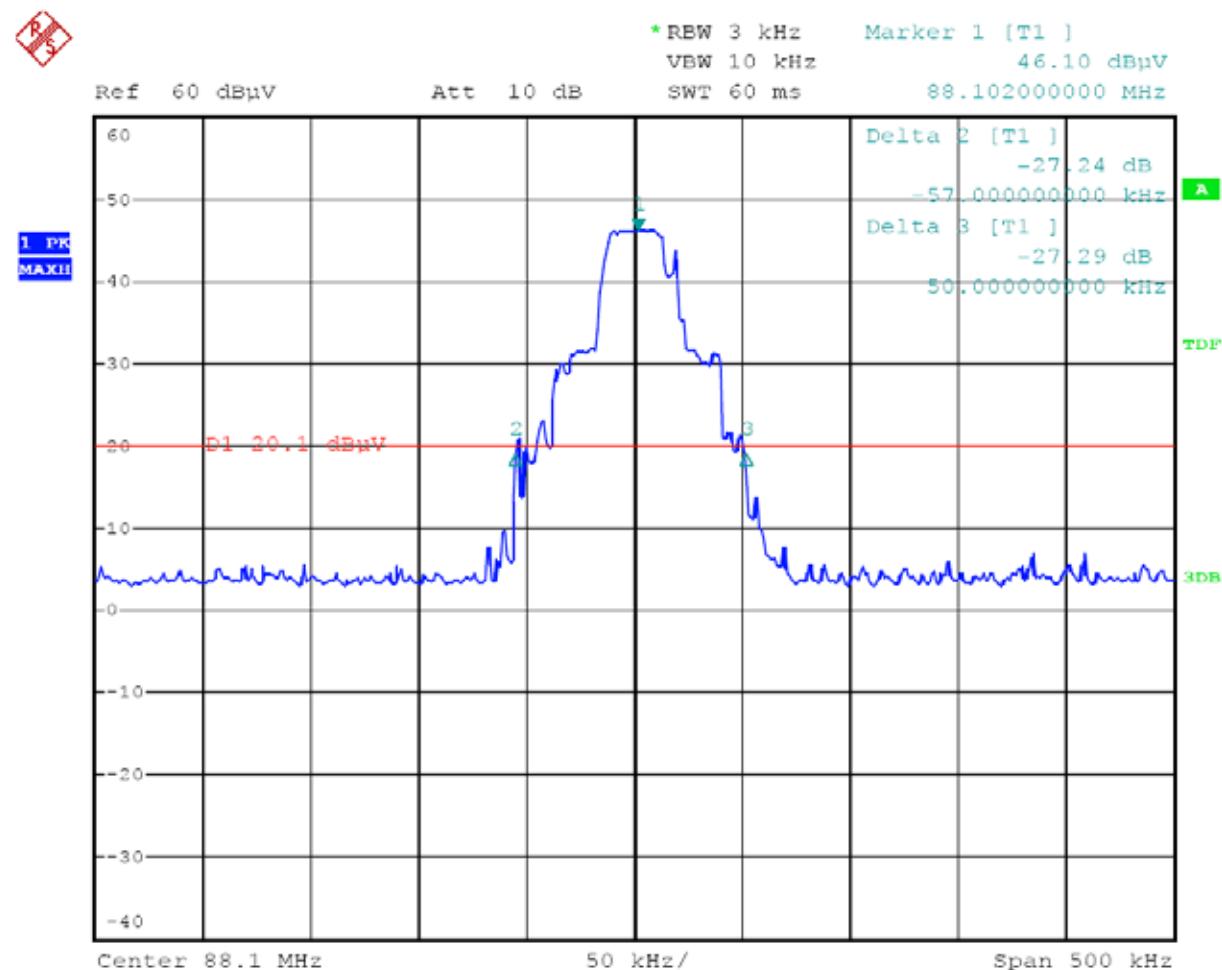
FM 98.0MHz

-26dB bandwidth = 108.0kHz

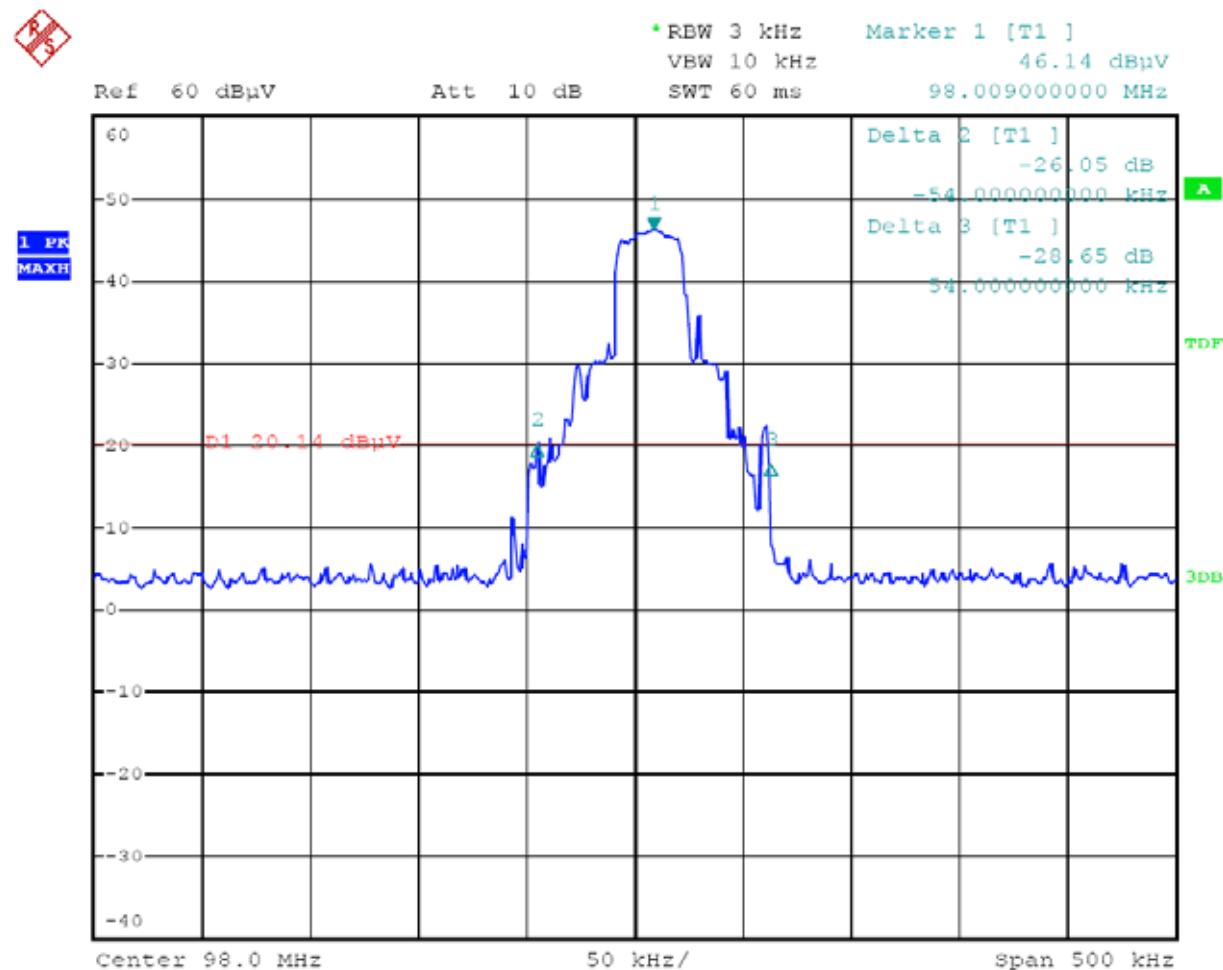
FM 107.9MHz

-26dB bandwidth = 104.0kHz

FM 88.1MHz



FM 98.0MHz



FM 107.9MHz

