

EMC

TEST REPORT

Report No. : TS13110075-EME
Model No. : JME-8389C, 2603765
Issued Date : Dec. 17, 2013

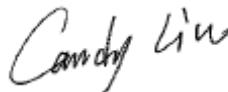
Applicant: Jing Mold Electronics Technology (Shenzhen) Co., Ltd
Xinqiao, 3rd Industrial Estate, Shajing Baoan, Shenzhen,
China

Test Method/ Standard: 47 CFR FCC Part 15.249 & ANSI C63.4 2003

Test By: Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

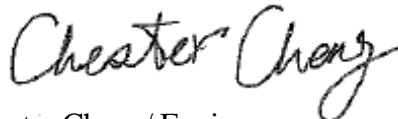
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The test report was prepared by:



Candy Liu/ Assistant

These measurements were taken by:



Chester Cheng/ Engineer

The test report was reviewed by:

Name Rico Deng
Title Senior Engineer

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Summary of Tests

Test	Reference	Results
Radiated Emission test	15.249(c), 15.209	Pass
Emission on the Band Edge	15.249(d)	Pass
Conducted Emission of AC Power	15.207	N/A
20dB Bandwidth	15.215(c)	Pass



1. General information

1.1 Identification of the EUT

Product: 2.4G Wireless keyboard
Model No.: JME-8389C
FCC ID.: FPWJME8389C
Frequency Range: 2401MHz ~ 2479MHz
Channel Number: 79 channels
Frequency of Each Channel: 2401 MHz + 1k MHz; k=0~78
Type of Modulation: GFSK
Rated Power: DC 3V from battery
Power Cord: N/A
Data Cable: N/A
Sample Received: Nov. 21, 2013
Test Date(s): Nov. 25, 2013~ Dec. 12, 2013

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Note 2: When determining the test conclusion, the Measurement Uncertainty of test has been considered.



1.2 Additional information about the EUT

The EUT is a 2.4G Wireless keyboard, and was defined as information technology equipment.

The customer confirmed 2603765 is series model to JME-8389C (EUT), the different model numbers are served as marketing strategy.

Trade Name	Model Number
Sunrex	JME-8389C
radioshack	2603765

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : 3.42 dBi

Antenna Type : Print antenna

Connector Type : N/A

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

The EUT is supplied with DC 3 V from battery and press the power button and enter different key set for EUT fixed frequency continuous emission.

2.4 Test equipment

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100018	2013/12/3	2014/12/2
Spectrum Analyzer	Rohde&schwarz	FSP30	100137	2013/6/21	2014/6/20
Spectrum Analyzer	Rohde&schwarz	FSEK30	100186	2013/1/23	2014/1/22
Horn Antenna (1-18G)	Schwarzbeck	BBHA 9120 D	9120D-456	2012/9/3	2014/9/3
Horn Antenna (14-42G)	SHWARZBECK	BBHA 9170	BBHA9170159	2012/9/5	2014/9/5
Broadband Antenna	SCHWARZBEC K	VULB 9168	9168-172	2013/8/8	2015/8/7
Pre-Amplifier	MITEQ	AFS44-00102650 --42-10P-44	1495287	2013/10/27	2015/10/26
Pre-Amplifier	MITEQ	JS4-26004000--2 7-8A	828825	2012/9/18	2014/9/17
Power Meter	Anritsu	ML2495A	0844001	2013/10/10	2014/10/9
Power Sensor	Anritsu	MA2411B	0738452	2013/10/10	2014/10/9
Temperature&Humidity Test Chamber	TERCHY	MHU-225LRU (SA)	950838	2013/6/14	2014/6/13
Two-Line V-Network	Rohde&schwarz	ESH3-Z5	838979/014	2013/10/12	2014/10/11

Note: The above equipments are within the valid calibration period.

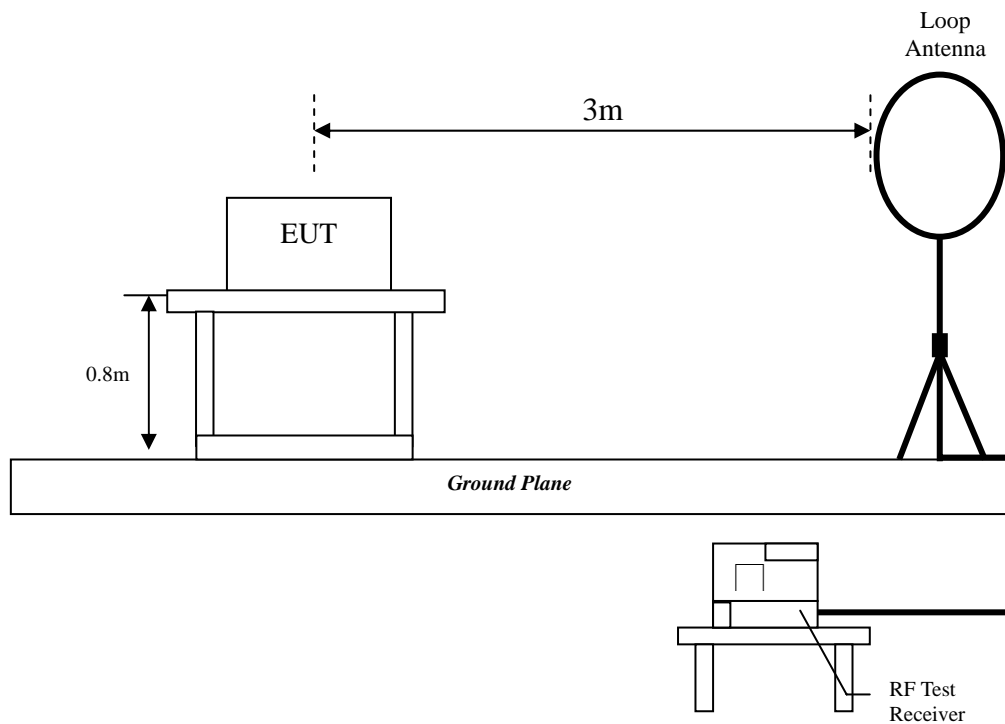
3. Radiated emission test FCC 15.249 (C)

3.1 Operating environment

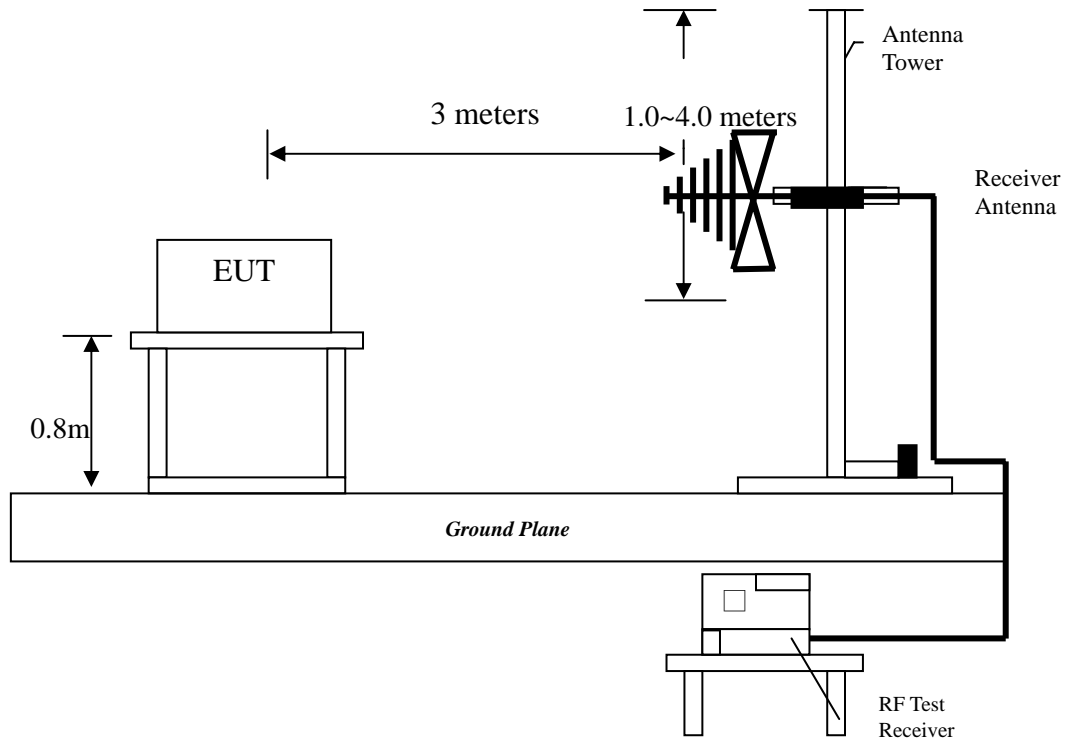
Temperature:	25	°C
Relative Humidity:	50	%
Atmospheric Pressure	1008	hPa

3.2 Test setup & procedure

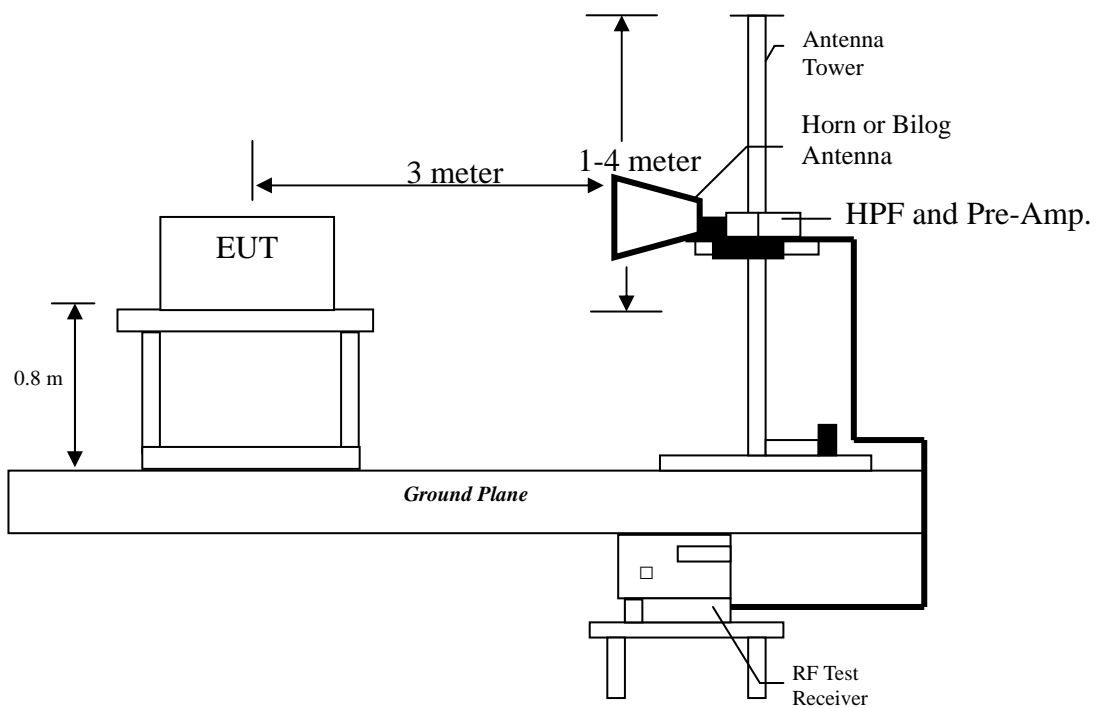
Radiated emission from 9 kHz to 30 MHz uses Loop Antenna:



Radiated emission from 30 MHz to 1 GHz uses Bilog Antenna:



Radiated emission above 1 GHz uses Horn Antenna:



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

3.3 Emission limit

3.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
2400-2483.5	50	94	500	54

3.3.2 General radiated emission limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Measurement uncertainty was calculated in accordance with TR 100 028-1.

Parameter	Uncertainty
Radiated Emission	Vertical: 4.13 dB Horizontal: 3.85 dB
Conducted Emission	2.08 dB.

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

3.4 Radiated spurious emission test data

3.4.1 Measurement results: frequency range from 9 kHz to 30 MHz

Frequency (kHz)	Detector	Corrected Factor (dB/m)	Reading (dBuV)	Emission (dBuV)	Limit (dBuV)	Margin (dB)
30	QP	-28.52	52.36	23.84	38.1	-14.26
350	QP	-62.15	34.40	-27.75	16.71	-44.46
710	QP	-22.85	31.57	8.72	30.8	-22.08
16000	QP	-29.35	30.67	1.32	28.32	-27.00

Note: The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

3.4.2 Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under GFSK continuously transmitting mode. Channel 0, 39, 78 were verified. The worst case occurred at GFSK TX Channel 0

EUT : JME-8389C
Test Condition : Tx at channel 0

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
V	43.58	QP	14.92	5.86	20.78	40.00	-19.22
V	142.52	QP	14.60	4.96	19.56	43.50	-23.94
V	159.98	QP	15.07	4.89	19.96	43.50	-23.54
V	493.66	QP	20.66	6.77	27.43	46.00	-18.57
V	522.76	QP	21.23	19.98	41.21	46.00	-4.79
V	643.04	QP	23.30	5.65	28.95	46.00	-17.05
H	161.92	QP	14.96	4.74	19.70	43.50	-23.80
H	247.28	QP	14.31	4.57	18.88	46.00	-27.12
H	394.72	QP	18.45	4.99	23.44	46.00	-22.56
H	497.54	QP	20.73	16.44	37.17	46.00	-8.83
H	518.88	QP	21.16	10.12	31.28	46.00	-14.72
H	648.86	QP	23.34	5.40	28.74	46.00	-17.26

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

3.4.3 Measurement results: frequency above 1GHz

EUT : JME-8389C
Test Condition : Tx at channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4802	PK	V	-0.36	56.97	56.61	74	-17.39
4802	AV	V	-0.36	32.3	31.94	54	-22.06
4802	PK	H	-0.36	54.87	54.51	74	-19.49
4802	AV	H	-0.36	29.87	29.51	54	-24.49

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : JME-8389C
Test Condition : Tx at channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4880	PK	V	-0.72	63.22	62.5	74	-11.50
4880	AV	V	-0.72	34.23	33.51	54	-20.49
4880	PK	H	-0.72	57.55	56.83	74	-17.17
4880	AV	H	-0.72	32.55	31.83	54	-22.17
7320	PK	V	6.71	44.81	51.52	74	-22.48

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz.The data value listed above which is higher than the system noise floor.

EUT : JME-8389C
 Test Condition : Tx at channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4958	PK	V	-0.12	63.14	63.02	74	-10.98
4958	AV	V	-0.12	33.73	33.61	54	-20.39
4958	PK	H	-0.12	57.78	57.66	74	-16.34
4958	AV	V	-0.12	32.78	32.66	54	-21.34
7437	PK	H	7.2	48.22	55.42	74	-18.58
7437	AV	V	7.2	23.22	30.42	54	-23.58

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

3.4.4 Measurement results: Fundamental and harmonics emission

EUT : JME-8389C
Test Condition : Tx at channel 0

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2401	PK	V	32.59	59.91	92.50	94	-1.50
2401	PK	H	32.59	50.58	96.78	114	-17.22
2401	AV	H	32.59	50.58	71.78	94	-22.22

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : JME-8389C
Test Condition : Tx at channel 39

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2440	PK	V	32.63	45.19	77.82	94	-16.18
2440	PK	H	32.63	62.37	95.00	114	-19.00
2440	AV	H	32.63	37.37	70.00	94	-24.00

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

EUT : JME-8389C
 Test Condition : Tx at channel 78

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2479	PK	V	32.64	55.11	87.75	94	-6.25
2479	PK	H	32.64	55.90	88.54	114	-25.46

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. The data value listed above which is higher than the system noise floor.

4. Radiated emission on the band edge FCC 15.249(d)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental (2401~2479MHz) or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Restricted band (MHz)
2389.38	PK	H	38.02	31.85	69.82	63.65	74	-10.35	2310~2390
2369.01	AV	H	38.02	31.75	51.71	45.44	54	-8.56	
2401.14	PK	H	38.02	31.90	102.90	96.78		96.78	
2401.14	AV	H	38.02	31.90	61.07	54.95		54.95	
2478.94	PK	H	38.04	32.27	96.77	91.00		91.00	
2478.94	AV	H	38.04	32.27	60.08	54.31		54.31	
2483.62	PK	H	38.05	32.29	71.01	65.26	74	-8.74	2483.5~2500
2483.50	AV	H	38.05	32.29	51.29	45.54	54	-8.46	



5. Conducted emission test FCC 15.207

Since the EUT is not connected to AC source, therefore, the test can be waived.

6. 20dB Bandwidth test

6.1 Operating environment

Temperature: 22 °C
Relative Humidity: 56 %
Atmospheric Pressure: 1008 hPa

6.2 Test setup & procedure

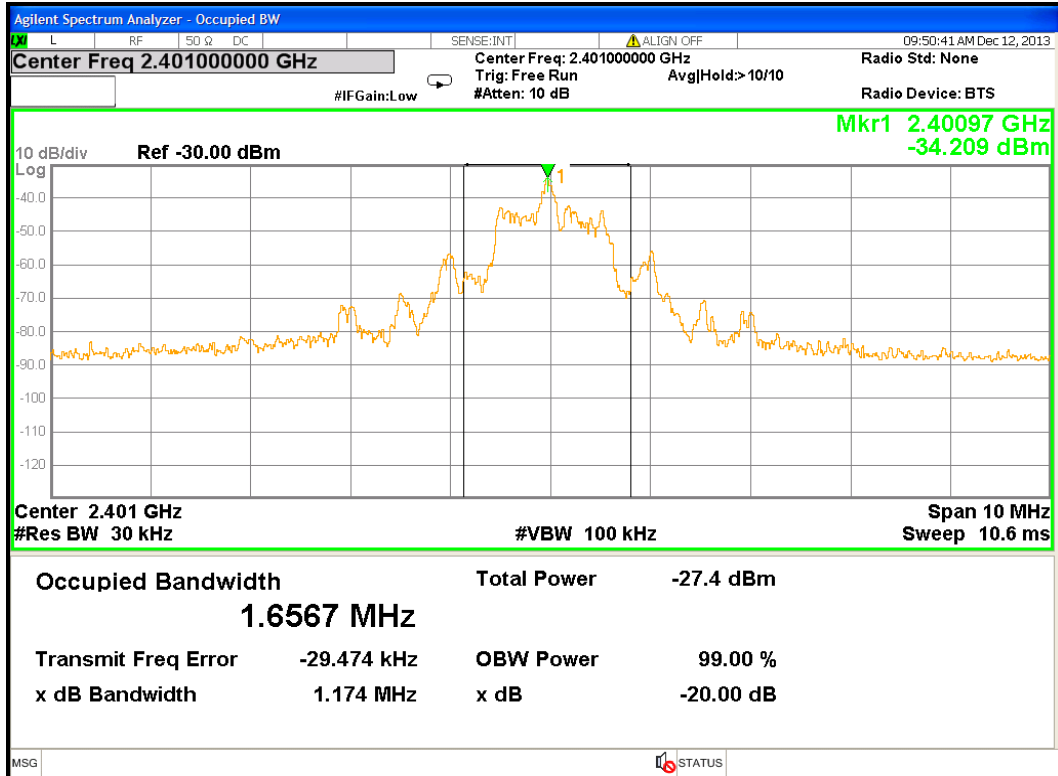
- Step 1: The 20dB bandwidth was measured using a 50 ohm spectrum analyzer
- Step 2: The span range for the SA display shall be between two times and five times the OBW.
- Step 3: The nominal IF filter bandwidth (3 dB RBW) should be approximately 1 % to 5 % of the OBW, unless otherwise specified, depending on the applicable requirement.
- Step 4: The test was performed at 3 channels (lowest, middle and highest channel). The maximum 20dB modulation bandwidth is in the following Table.

6.3 Measured data of modulated bandwidth test results

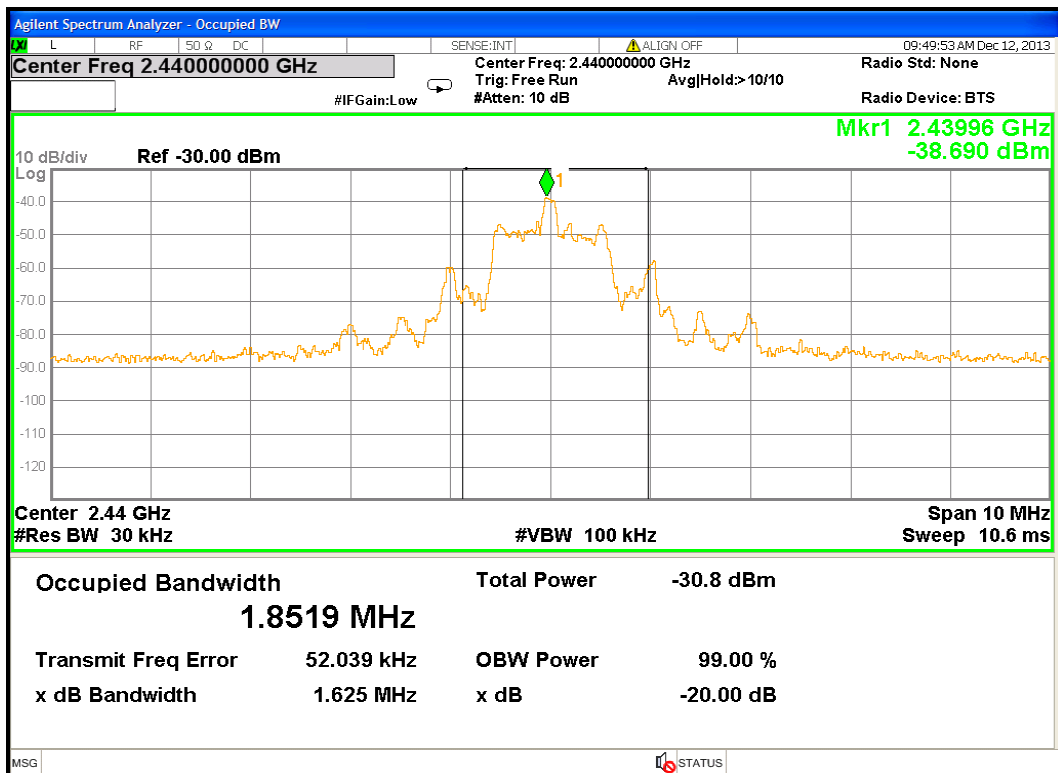
Mode	Channel	Frequency (MHz)	20dB Bandwidth(MHz)
GFSK	CH00	2401	1.174
	CH39	2440	1.625
	CH78	2479	1.586

Please see the plot below.

20 dB Bandwidth @ channel 0



20 dB Bandwidth @ channel 39





20 dB Bandwidth @ channel 78

