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ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPARTC REQUIREMENT

OF

BT TOWER SPEAKER

MODEL No.: 927032, TSB-501M, TSB-506M

FCC ID: OKUTSB501M

REPORT NO: ES130418125E

ISSUE DATE: April 28, 2013

Prepared for

Shenzhen Junlan Electronic Ltd
District 2 type A plant in the second layer 1-4, NO.2 Industrial Fuyuan Tangwei Fuyong Baoan Shenzhen China

Prepared by

SHENZHEN EMTEK CO., LTD

Bldg 69, Majialong Industry Zone, Nanshan District,
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VERIFICATION OF COMPLIANCE

Applicant:	Shenzhen Junlan Electronic Ltd District 2 type A plant in the second layer 1-4, NO.2 Industrial Fuyuan Tangwei Fuyong Baoan Shenzhen China
Manufacturer:	Shenzhen Junlan Electronic Ltd District 2 type A plant in the second layer 1-4, NO.2 Industrial Fuyuan Tangwei Fuyong Baoan Shenzhen China
Product Description:	BT TOWER SPEAKER
Model Number:	927032, TSB-501M, TSB-506M (Note:all the models are the same, except their model number. We take TSB-501M to test.)
File Number:	ES130418125E
Date of Test:	April 2, 2013 to April 28, 2013

We hereby certify that:

The above equipment was tested by SHENZHEN EMTEK CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2009) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247.

The test results of this report relate only to the tested sample identified in this report.

Date of Test : April 2, 2013 to April 28, 2013

Prepared by : Jessie
Joe Xia/Editor

Reviewer : King wang
King Wang/Supervisor

Approve & Authorized Signer :
Lisa Wang/Manager

Table of Contents

1. GENERAL INFORMATION

1.1 Product Description

Model: TSB-501M (referred to as the EUT in this report) The EUT is a short range, lower power, BT TOWER SPEAKER designed as an Device. It is designed by way of utilizing the GFSK, 1/4∏-DQPSK and 8DPSK modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

A). Operation Frequency: 2402-2480MHz
B). Modulation: GFSK, 1/4∏-DQPSK, 8DPSK
C). Number of Channel: 79
D). Channel space: 1MHz
E). RF Output Power: 3.02dbm
F). BIT Rate of Transmission: 1Mbps, 2Mbps, 3Mbps
G). Antenna Type: PCB Antenna
H). Antenna Gain: 0dBi
I). Power Supply: AC 120V/60Hz

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: OKUTSB501M filing to comply with Section 15.247 of the FCC Part 15 Subpart C Rules.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2009) and FCC Public Notice DA 00-705. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Special Accessories

Not available for this EUT intended for grant.

1.5 Equipment Modifications

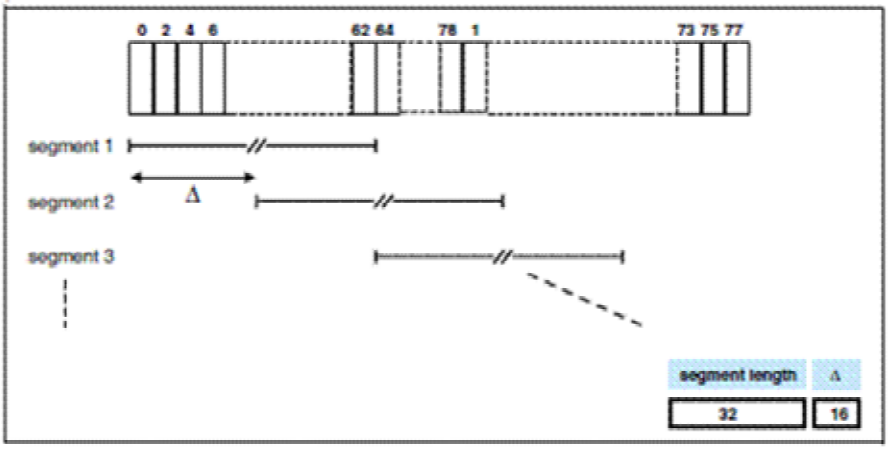
Not available for this EUT intended for grant.

1.6 Information about the FHSS characteristics

1.6.1. Pseudorandom Frequency Hopping Sequence Frequency Hopping Systems. A spread spectrum system in which the carrier is modulated with the coded information in a conventional manner causing a conventional spreading of the RF energy about the frequency carrier. The frequency of the carrier is not fixed but changes at fixed intervals under the

direction of a coded sequence. The wide RF bandwidth needed by such a system is not required by spreading of the RF energy about the carrier but rather to accommodate the range of frequencies to which the carrier frequency can hop. The test of a frequency hopping system is that the near term distribution of hops appears random, the long term distribution appears evenly distributed over the hop set, and sequential hops are randomly distributed in both direction and magnitude of change in the hop set.

The selection scheme chooses a segment of 32 hop frequencies spanning about 64 MHz and visits these hops in a pseudo-random order. Next, a different 32-hop segment is chosen, etc. In the page, master page response, slave page response, page scan, inquiry, inquiry response and inquiry scan hopping sequences, the same 32-hop segment is used all the time (the segment is selected by the address; different devices will have different paging segments). When the basic channel hopping sequence is selected, the output constitutes a pseudo-random sequence that slides through the 79 hops. The principle is depicted in the figure below.



Hop selection scheme in CONNECTION state.

Pseudorandom Frequency Hopping Sequence Table as below: Channel: 08, 24, 40, 56, 40, 56, 72, 09, 01, 09, 33, 41, 33, 41, 65, 73, 53, 69, 06, 22, 04, 20, 36, 52, 38, 46, 70, 78, 68, 76, 21, 29, 10, 26, 42, 58, 44, 60, 76, 13, 03, 11, 35, 43, 37, 45, 69, 77, 55, 71, 08, 24, 08, 24, 40, 56, 40, 48, 72, 01, 72, 01, 25, 33, 12, 28, 44, 60, 42, 58, 74, 11, 05, 13, 37, 45, etc. Each frequency used equally on the average by each transmitter. The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

1.6.2. Equal Hopping Frequency Use All Bluetooth units participating in the Pico net are time and hop-synchronized to the channel. Each new transmission event begins on the next channel in the hopping sequence after the final channel used in the previous transmission event.

1.6.3. System Receiver Input Bandwidth Each channel bandwidth is 1MHz. The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

1.7 Test Facility

Site Description

EMC Lab. : Accredited by CNAS, 2010.10.29
The certificate is valid until 2013.10.28
The Laboratory has been assessed and proved to be in compliance with CNAS/CL01:2006(identical to ISO/IEC17025: 2005)
The Certificate Registration Number is L2291

Accredited by TUV Rheinland Shenzhen 2010.5.25
The Laboratory has been assessed according to the requirements ISO/IEC 17025

Accredited by FCC, October 28, 2010
The Certificate Registration Number is 406365.

Accredited by Industry Canada, March 5, 2010
The Certificate Registration Number is 46405-4480.

Name of Firm : SHENZHEN EMTEK CO., LTD

Site Location : Bldg 69, Majialong Industry Zone,
Nanshan District, Shenzhen, Guangdong, China

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. The Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-2009 Conducted emissions from the EUT measured in the **frequency range between 0.15 MHz and 30MHz** using **CISPR Quasi-Peak and average detector mode**.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-2009.

2.4 Limitation

(1) Channel Separation test

FCC Part 15, Subpart C Section 15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 Bandwidth of the hopping channel, whichever is greater.

Frequency Range (MHz)	Limit(kHz)
902-928	>25kHz
2400-2483.5	>25kHz
5725-5850	>25kHz

(2) 20dB Bandwidth

Frequency Range(MHz)	Quantity of Hopping Channel	Limit(kHz) 50	25	15	75
902-928		<250	>250	NA	NA
2400-2483.5		NA	NA	>1000	<1000

(3) Quantity of Hopping Channel

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	Limit(Quantity of Hopping Channel) 20dB bandwidth <250kHz	20dB bandwidth >250kHz	20dB bandwidth <1MHz	20dB bandwidth >1MHz
902-928	50	25	NA	NA
2400-2483.5	NA	NA	75	15
5725-5850	NA	NA	75	NA

(4) Time of Occupancy(Dwell Time)

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	LIMIT(rms) 20dB bandwidth <250kHz(50Channel)	20dB bandwidth >250kHz(25Channel)	20dB bandwidth <1MHz(75Channel)
902-928	400(20S)	400(10S)	NA
2400-2483.5	NA	NA	400(30S)
5725-5850	NA	NA	400(30S)

Note: The "()"is all channel's average time of occupancy.

(5) Maximum Peak Output Power

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	Quantity of Hopping Channel	LIMIT(W) 50	25	15	75
902-928		1(30dBm)	0.125(21dBm)	NA	NA
2400-2483.5		NA	NA	0.125(21dBm)	1(30dBm)
5725-5850		NA	NA	NA	1(30dBm)

(6) Band edge

FCC Part15, Subpart C Section 15.247, In any 100kHz bandwidth outside the frequency band in with the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a).

Operating Frequency Range(MHz)	Spurious emission frequency	Limit	
		Peak power ration to emission(dBc)	Emission level(dBuV/m)
902-928	<902	>20	NA
	>928	>20	NA
	960-1240	NA	54
2400-2483.5	<2400	>20	NA
	>2483.5-2500	NA	54
5725-5850	<5350-5460	NA	54
	<5725	>20	NA
	>5850	>20	NA

(7) Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

(8) Radiated Emission

FCC Part 15, Subpart C Section 15.209 limit of radiated emission for frequency below 1000GHz. The emissions from an intentional radiator shall not exceed the field strength level specified in the following table:

Frequency (MHz)	Field strength μV/m	Distance(m)	Field strength at 3m dBμV/m
0.009~0.490	2400/F(KHz)	300	See the remark
0.490~1.705	2400/F(KHz)	30	
1.705~30.0	30	30	
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

Remark: 1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

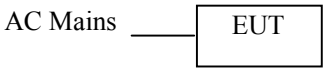


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
1.	BT TOWER SPEAKER	N/A	TSB-501M	OKUTSB501M	N/A	EUT

Note:

(1) Unless otherwise denoted as EUT in『Remark』column, device(s) used in tested system is a support equipment.

2.6 Description of test modes

The EUT (BT TOWER SPEAKER) has been tested under normal operating condition. This EUT is a FHSS system. Pre-scanned tests, were conducted to determine the final configuration from all possible combinations. We use blue test to control the EUT, Let EUT hopping on and transmit with highest power, All the modes GFSK, 1/4Π-DQPSK,8DQPSK have been tested and the worst result was reported with modulation GFSK. 79 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

Channel	Frequency(MHz)
1	2402
40	2441
79	2480

3. Summary of Test Results

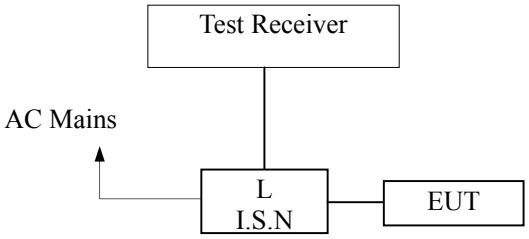
FCC Rule	Description Of Test	Result
15.247(a)(1)	Channel Separation test	Pass
15.247(a)(1)	20dB Bandwidth	Pass
15.247(a)(1)	Quantity of Hopping Channel	Pass
15.247(a)(1)	Time of Occupancy (Dwell Time)	Pass
15.247(b)(1)	Max Peak output Power test	Pass
15.247(d)	Band edge test	Pass
15.207	AC Power Conducted Emission	Pass
15.247(d)	Radiated Emission	Pass
§15.247(d)	Antenna Port Emission	Pass
15.203&15.247(b)	Antenna Application	Pass

4. Conducted Emissions Test

4.1 Measurement Procedure:

1. The EUT was placed on a table which is 12mm above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

4.2 Test SET-UP (Block Diagram of Configuration)



4.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/29/2012	05/28/2013
L.I.S.N.	Schwarzbeck	NNLK8129	8129203	05/29/2012	05/28/2013
50Ω Coaxial Switch	Anritsu	MP59B	M20531	N/A	N/A
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	05/29/2012	05/28/2013
Voltage Probe	Rohde & Schwarz	TK9416	N/A	05/29/2012	05/28/2013
I.S.N	Rohde & Schwarz	ENY22	1109.9508.02	05/29/2012	05/28/2013

4.4 Conducted Emission Limit

(7) Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.5 Measurement Result:

Date of Test:	April 5, 2013	Temperature:	22℃
Frequency Detector:	0.15~30MHz	Humidity:	50%
Test Result:	PASS	Test Mode:	Bluetooth Mode

Test Line	Frequency MHz	Emission Level QP dB(μV)	Emission Level AV dB(μV)	Limits QP dB(μV)	Limits AV dB(μV)	Margin QP dB(μV)	Margin AV dB(μV)
Line	1.11	48.04	16.48	56.00	46.00	-7.96	-29.52
	1.33	50.15	17.85	56.00	46.00	-5.85	-28.15
	5.41	51.17	19.32	60.00	50.00	-8.83	-30.68
	6.55	47.06	21.01	60.00	50.00	-12.94	-28.99
	7.84	44.38	19.34	60.00	50.00	-15.62	-30.66
	11.75	41.78	14.63	60.00	50.00	-18.22	-35.37
Neutral	0.51	45.69	14.09	56.00	46.00	-10.31	-31.91
	2.21	49.25	20.70	56.00	46.00	-6.75	-25.30
	3.49	50.24	20.68	56.00	46.00	-5.76	-25.32
	4.75	44.75	20.09	56.00	46.00	-11.25	-25.91
	6.07	44.79	20.77	60.00	50.00	-15.21	-29.23
	6.90	47.12	19.71	60.00	50.00	-12.88	-30.29

5. Radiated Emission Test

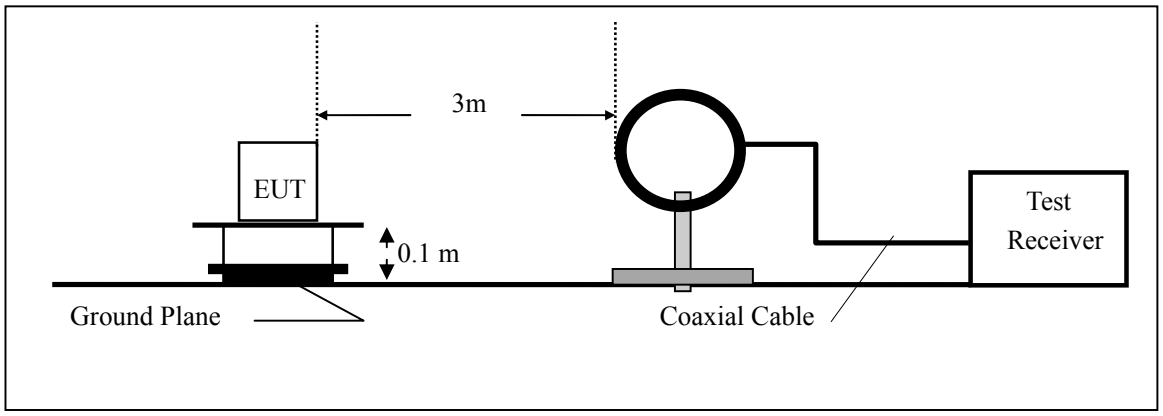
5.1 Measurement Procedure

1. The EUT was placed on a turn table which is 12mm above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured was complete.

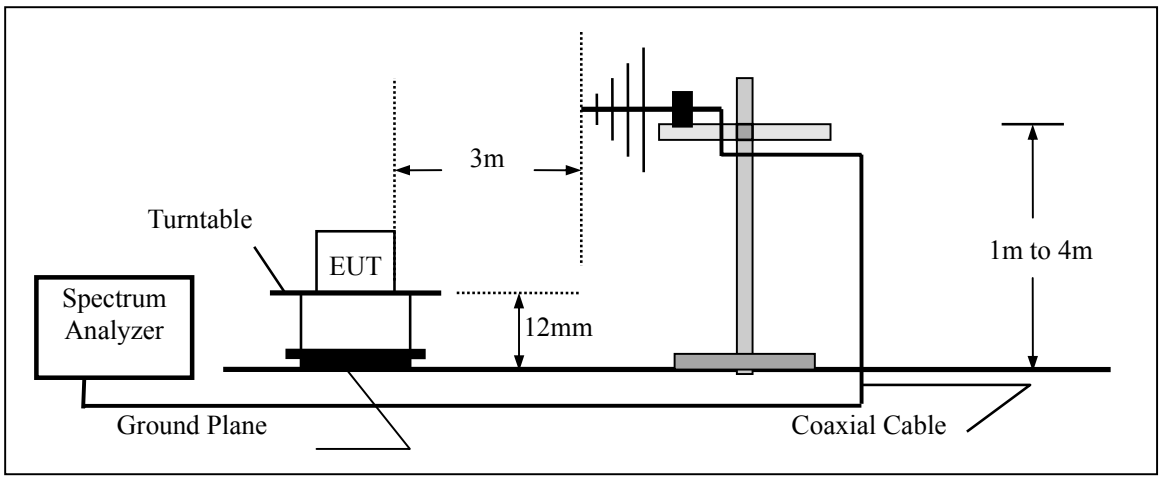
When spectrum scanned from 9 KHz-30MHz setting resolution bandwidth 10 kHz and video bandwidth 30kHz, 30M- 1GHz setting resolution bandwidth 100 kHz and video bandwidth 300kHz. And spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz.

5.2 Test SET-UP (Block Diagram of Configuration)

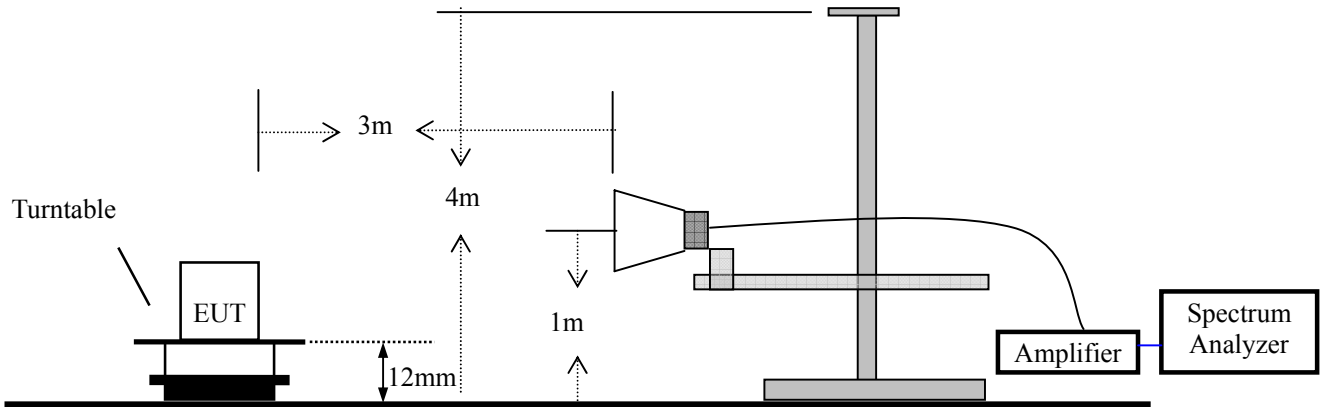
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



5.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSP7	839511/010	05/29/2012	05/29/2013
Spectrum Analyzer	HP	E4407B	839840481	05/29/2012	05/29/2013
EMI Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/29/2012	05/29/2013
Pre-Amplifier	HP	8447D	2944A07999	05/29/2012	05/29/2013
Bilog Antenna	Schwarzbeck	VULB9163	142	05/29/2012	05/29/2013
Loop Antenna	Schwarzbeck	FMZB 1519	012	05/29/2012	05/29/2013
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/29/2012	05/29/2013
Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/29/2012	05/29/2013

5.4 Measurement Result

All the modulation modes were tested the data of the worst mode (GFSK) are recorded in the following pages and all modulation methods do not exceed the limits.

Operation Mode:	Bluetooth Mode	Test Date :	April 5, 2013
Frequency Range:	9~30MHz	Temperature :	28℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	WOLF

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
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Note: 1. that measurements below 30MHz are required with a loop antenna per KDB460108
2. the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported according part15.31..

Operation Mode:	2402MHz	Test Date :	April 5, 2013
Frequency Range:	30~1000MHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	KL

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
54.87	V	14.72	40.00	-25.28	QP
101.51	V	15.39	43.50	-28.11	QP
222.76	V	20.39	46.00	-25.61	QP
378.21	V	26.82	46.00	-19.18	QP
471.47	V	26.74	46.00	-19.26	QP
603.61	V	22.68	46.00	-23.32	QP
50.21	H	15.67	40.00	-24.33	QP
99.95	H	14.69	43.50	-28.81	QP
367.32	H	27.67	46.00	-18.33	QP
378.21	H	27.36	46.00	-18.64	QP
420.18	H	25.22	46.00	-20.78	QP
457.48	H	26.32	46.00	-19.68	QP

Operation Mode:	2441MHz	Test Date :	April 5, 2013
Frequency Range:	30~1000MHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	KL

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
42.44	V	14.63	40.00	-25.37	QP
118.61	V	15.29	43.50	-28.21	QP
222.76	V	20.11	46.00	-25.89	QP
288.05	V	19.61	46.00	-26.39	QP
362.66	V	23.70	46.00	-22.30	QP
469.92	V	29.59	46.00	-16.41	QP
54.87	H	15.42	40.00	-24.58	QP
109.28	H	14.53	43.50	-28.97	QP
378.21	H	28.76	46.00	-17.24	QP
413.96	H	24.86	46.00	-21.14	QP
426.39	H	26.09	46.00	-19.91	QP
474.58	H	24.65	46.00	-21.35	QP

Operation Mode:	2480MHz	Test Date :	April 5, 2013
Frequency Range:	30~1000MHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	KL

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
50.21	V	15.45	40.00	-24.55	QP
103.06	V	17.01	43.50	-26.49	QP
283.38	V	16.74	46.00	-29.26	QP
378.21	V	24.05	46.00	-21.95	QP
469.92	V	29.93	46.00	-16.07	QP
653.35	V	24.15	46.00	-21.85	QP
103.06	H	15.02	43.50	-28.48	QP
224.31	H	15.73	46.00	-30.27	QP
303.59	H	20.32	46.00	-25.68	QP
361.11	H	28.83	46.00	-17.17	QP
431.06	H	27.05	46.00	-18.95	QP

Note: (1) All Readings are Peak Value.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) The average measurement was not performed when the peak measured data under the limit of average detection.
(4) All the x/y/z orientation has been investigated, and only worst case is presented in this report.

Operation Mode:	CH1: 2402MHz	Test Date :	April 5, 2013
Frequency Range:	1-25GHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

Freq.	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
4803.73	V	56.48	44.16	74.00	54.00	-17.52	-9.84
7205.68	V	56.41	43.66	74.00	54.00	-17.59	-10.34
9607.72	V	55.62	41.39	74.00	54.00	-18.38	-12.61
4803.71	H	57.35	42.96	74.00	54.00	-16.65	-11.04
7205.74	H	56.04	42.74	74.00	54.00	-17.96	-11.26
9607.75	H	54.10	40.36	74.00	54.00	-19.90	-13.64

Operation Mode:	CH40: 2441MHz	Test Date :	April 5, 2013
Frequency Range:	1-25GHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

Freq.	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
4881.73	V	58.82	44.15	74.00	54.00	-15.18	-9.85
7322.68	V	57.76	43.00	74.00	54.00	-16.24	-11.00
9763.72	V	54.83	42.72	74.00	54.00	-19.17	-11.28
4881.71	H	58.01	43.66	74.00	54.00	-15.99	-10.34
7322.74	H	57.70	42.61	74.00	54.00	-16.30	-11.39
9763.75	H	54.92	40.76	74.00	54.00	-19.08	-13.24

Operation Mode:	CH79: 2480MHz	Test Date :	April 5, 2013
Frequency Range:	1-25GHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m) PK	Emission Level(dBuV/m) AV	Limit 3m(dBuV/m) PK	Limit 3m(dBuV/m) AV	Margin(dB) PK	Margin(dB) AV
4959.73	V	56.96	42.85	74.00	54.00	-17.04	-11.15
7439.68	V	54.17	39.64	74.00	54.00	-19.83	-14.36
9919.72	V	51.26	37.53	74.00	54.00	-22.74	-16.47
4959.71	H	57.08	43.46	74.00	54.00	-16.92	-10.54
7439.74	H	55.95	42.21	74.00	54.00	-18.05	-11.79
9919.75	H	53.00	39.61	74.00	54.00	-21.00	-14.39

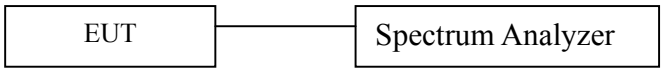
Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) Data of measurement within this frequency range shown " -- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(4) All the x/y/z orientation has been investigated, and only worst case is presented in this report.

6. Channel Separation test

6.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

6.2 Test SET-UP (Block Diagram of Configuration)



6.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	88156318	05/29/2012	05/28/2013

6.4 Measurement Results:

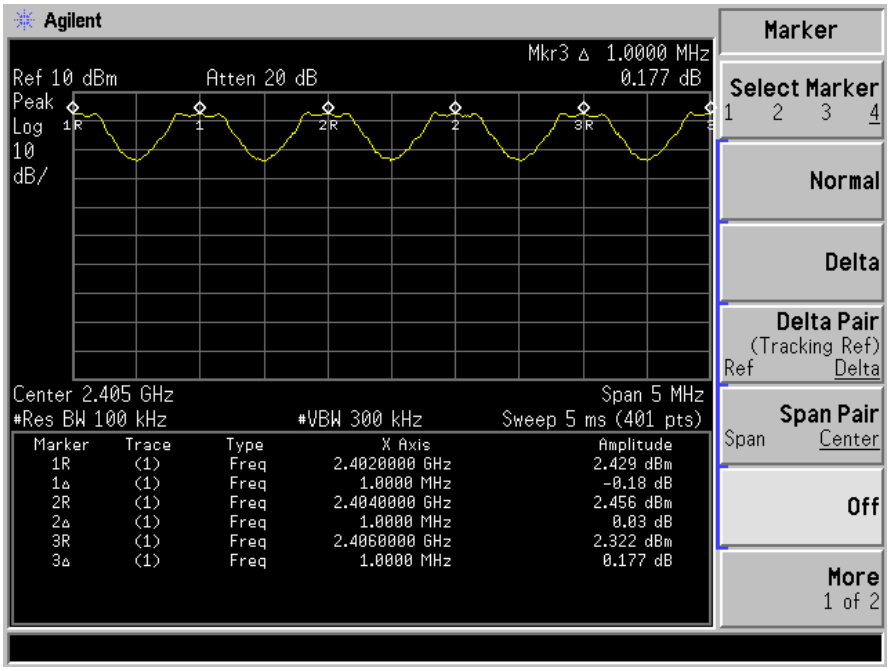
The following table is the setting of spectrum analyzer.

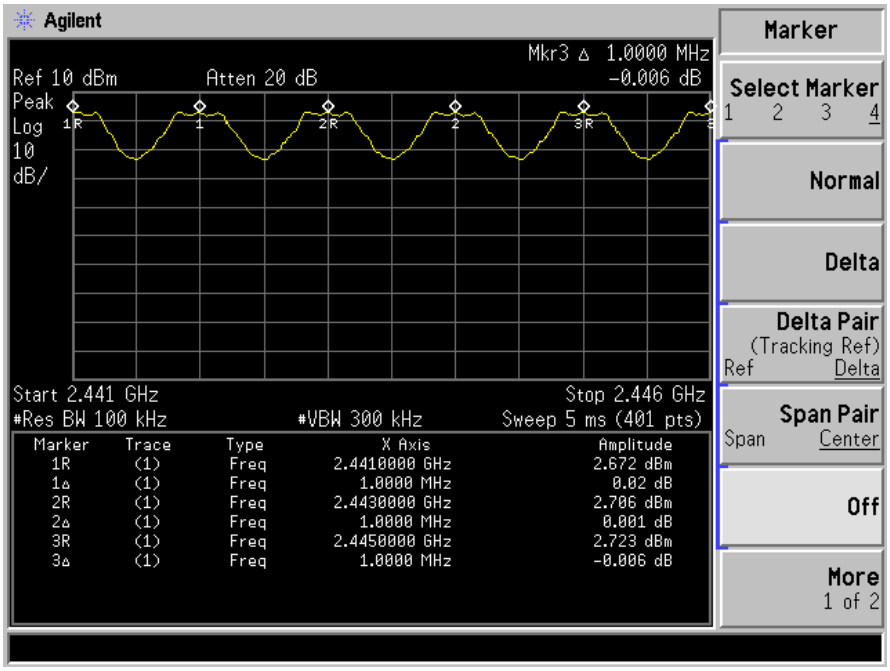
EMI Test Receiver	Setting
Attenuation	Auto
RB	100kHz
VB	300kHz
Detector	Peak
Trace	Max hold

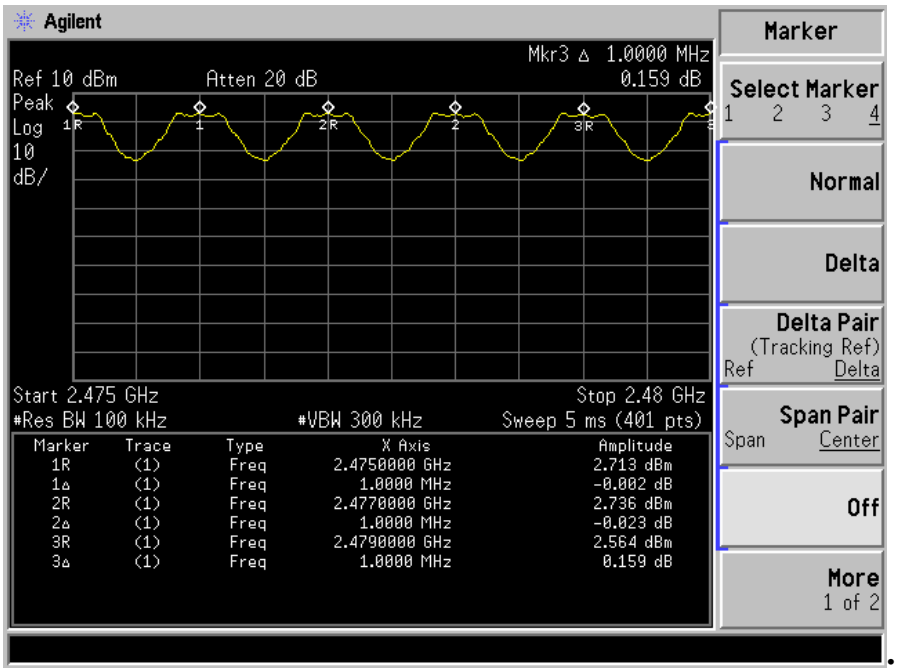
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	April 10, 2013
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Modulation:	GFSK		

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 20dB Down BW(kHz)
1	2402	1000.00	>856.762
40	2441	1000.00	>859.634
79	2480	1000.00	>921.568

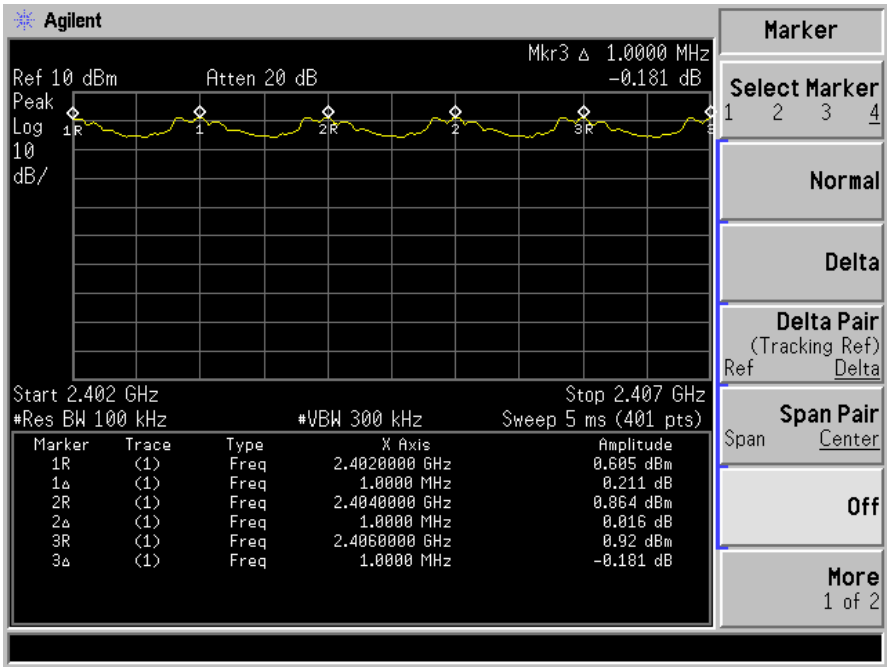

Agilent
Mkr3 Δ 1.0000 MHz
Ref 10 dBm
Atten 20 dB
0.177 dB
Peak
Log
10
dB/
Center 2.405 GHz
Span 5 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 5 ms (401 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.4020000 GHz 2.429 dBm
1Δ (1) Freq 1.0000 MHz -0.18 dB
2R (1) Freq 2.4040000 GHz 2.456 dBm
2Δ (1) Freq 1.0000 MHz 0.03 dB
3R (1) Freq 2.4060000 GHz 2.322 dBm
3Δ (1) Freq 1.0000 MHz 0.177 dB
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

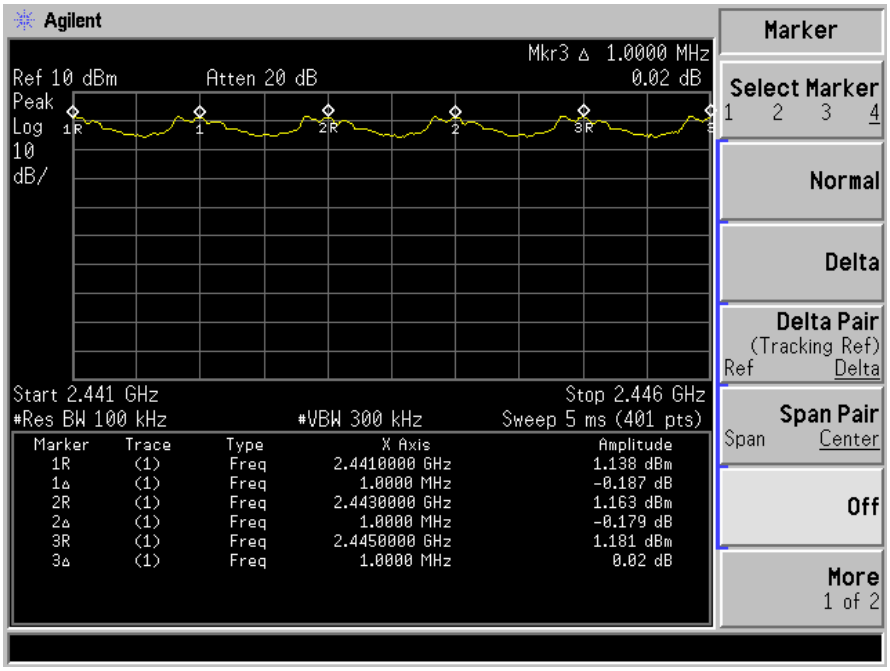

Agilent
Mkr3 Δ 1.0000 MHz
Ref 10 dBm
Atten 20 dB
-0.006 dB
Peak
Log
10
dB/
Start 2.441 GHz
Stop 2.446 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 5 ms (401 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.4410000 GHz 2.672 dBm
1Δ (1) Freq 1.0000 MHz 0.02 dB
2R (1) Freq 2.4430000 GHz 2.706 dBm
2Δ (1) Freq 1.0000 MHz 0.001 dB
3R (1) Freq 2.4450000 GHz 2.723 dBm
3Δ (1) Freq 1.0000 MHz -0.006 dB
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

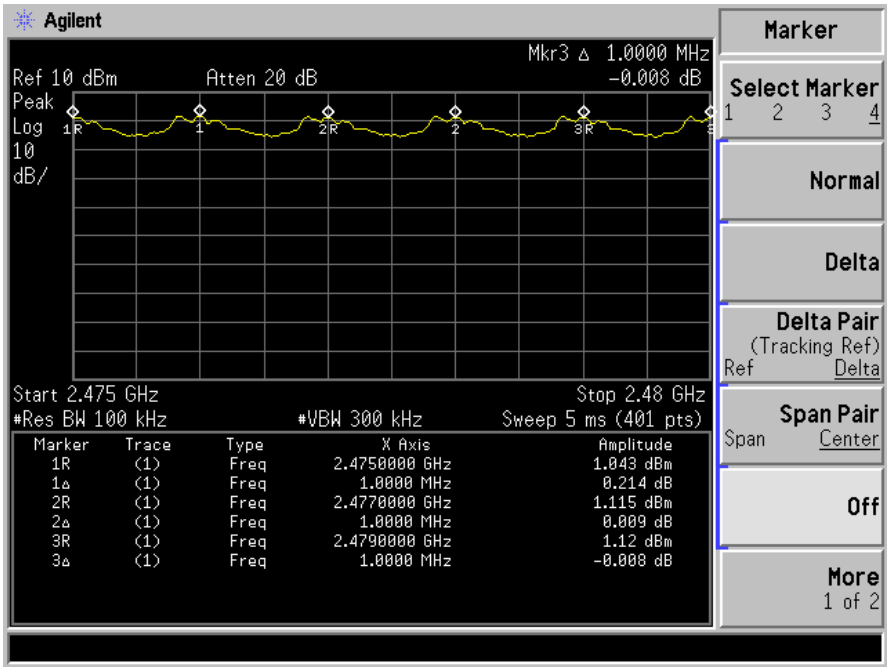


Spectrum Detector:	PK	Test Date :	April 10, 2013
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Modulation:	1/4∏-DQPSK		

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
1	2402	1000.00	>827.17 kHz
40	2441	1000.00	>823.84 kHz
79	2480	1000.00	>827.84 kHz

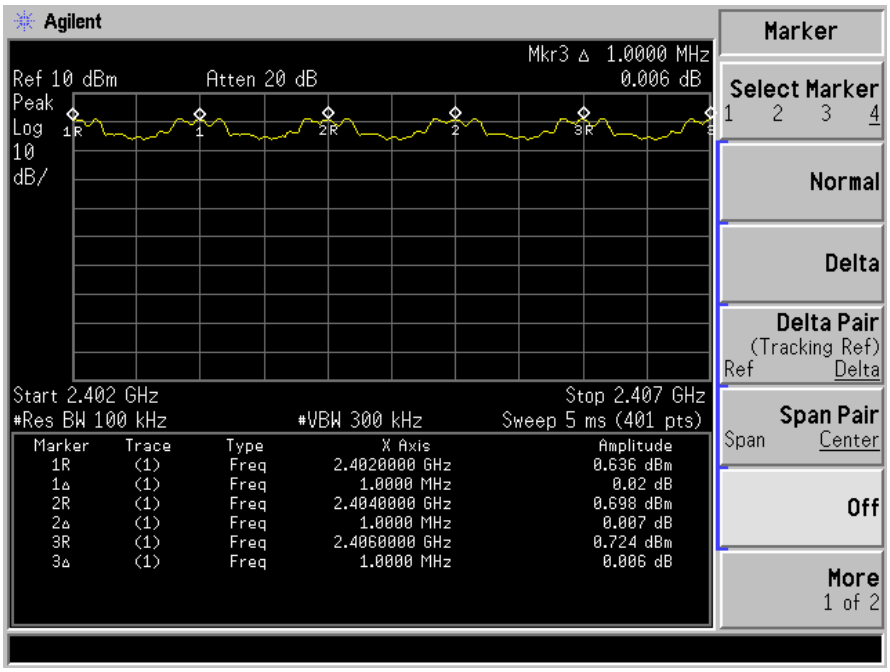

Agilent
Mkr3 Δ 1.0000 MHz
Ref 10 dBm
Atten 20 dB
-0.181 dB
Peak
Log
10
dB/
Start 2.402 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.407 GHz
Sweep 5 ms (401 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.4020000 GHz 0.605 dBm
1Δ (1) Freq 1.0000 MHz 0.211 dB
2R (1) Freq 2.4040000 GHz 0.864 dBm
2Δ (1) Freq 1.0000 MHz 0.016 dB
3R (1) Freq 2.4060000 GHz 0.92 dBm
3Δ (1) Freq 1.0000 MHz -0.181 dB
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

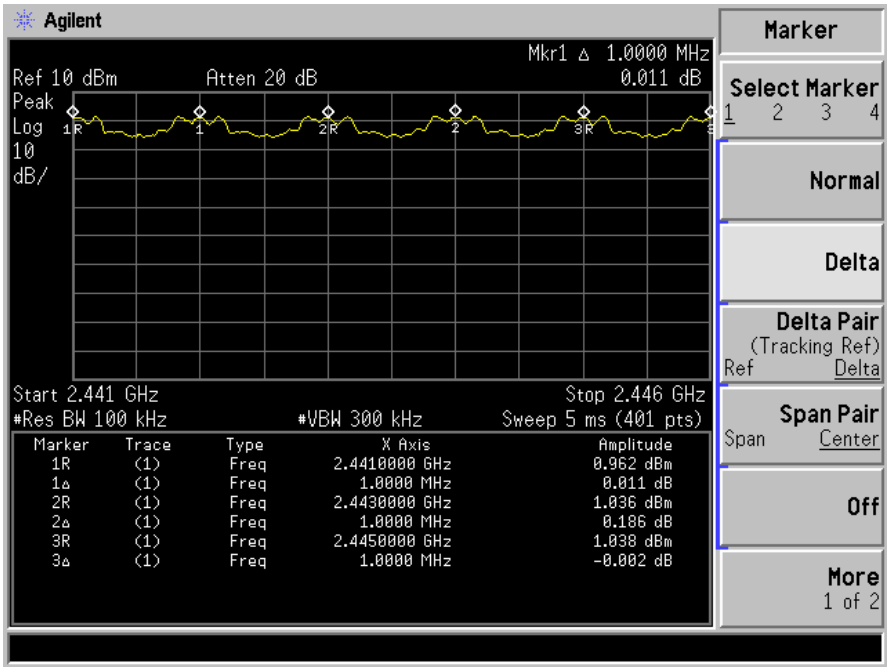

Agilent
Mkr3 Δ 1.0000 MHz
Ref 10 dBm
Atten 20 dB
0.02 dB
Peak
Log
10
dB/
Start 2.441 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.446 GHz
Sweep 5 ms (401 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.4410000 GHz 1.138 dBm
1Δ (1) Freq 1.0000 MHz -0.187 dB
2R (1) Freq 2.4430000 GHz 1.163 dBm
2Δ (1) Freq 1.0000 MHz -0.179 dB
3R (1) Freq 2.4450000 GHz 1.181 dBm
3Δ (1) Freq 1.0000 MHz 0.02 dB
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

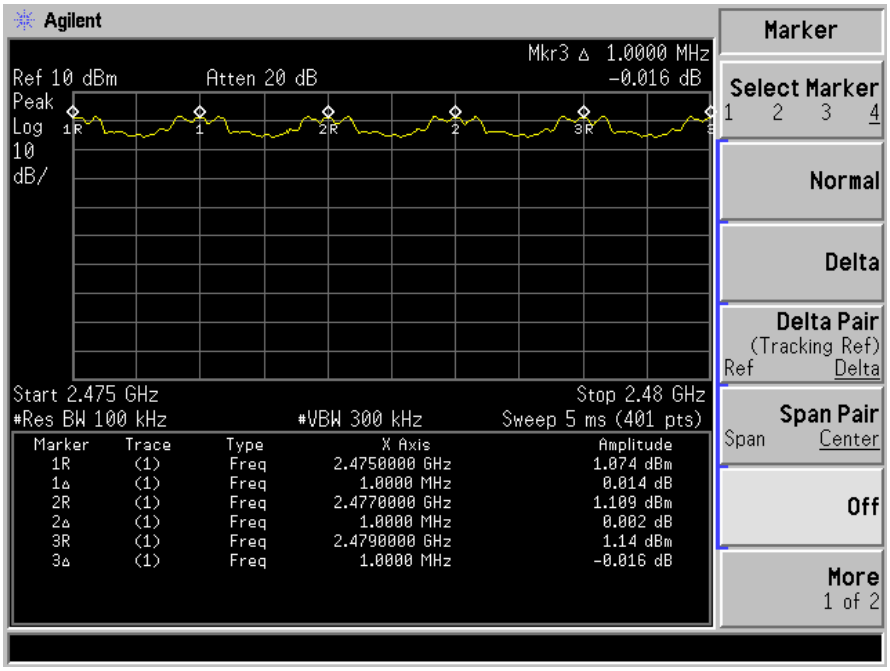


Spectrum Detector:	PK	Test Date :	April 10, 2013
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Modulation:	8DPSK		

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
1	2402	1000.00	>809.19kHz
40	2441	1000.00	>809.86kHz
79	2480	1000.00	>809.86kHz


Agilent
Mkr3 Δ 1.0000 MHz
Ref 10 dBm
Atten 20 dB
0.006 dB
Peak
Log
10
dB/
Start 2.402 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.407 GHz
Sweep 5 ms (401 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.4020000 GHz 0.636 dBm
1Δ (1) Freq 1.0000 MHz 0.02 dB
2R (1) Freq 2.4040000 GHz 0.698 dBm
2Δ (1) Freq 1.0000 MHz 0.007 dB
3R (1) Freq 2.4060000 GHz 0.724 dBm
3Δ (1) Freq 1.0000 MHz 0.006 dB
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
Mkr1 Δ 1.0000 MHz
Ref 10 dBm
Atten 20 dB
0.011 dB
Peak
Log
10
dB/
Start 2.441 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.446 GHz
Sweep 5 ms (401 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.4410000 GHz 0.962 dBm
1Δ (1) Freq 1.0000 MHz 0.011 dB
2R (1) Freq 2.4430000 GHz 1.036 dBm
2Δ (1) Freq 1.0000 MHz 0.186 dB
3R (1) Freq 2.4450000 GHz 1.038 dBm
3Δ (1) Freq 1.0000 MHz -0.002 dB
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

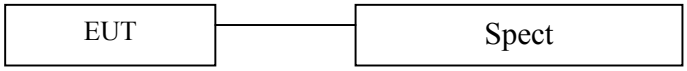

Agilent
Mkr3 Δ 1.0000 MHz
-0.016 dB
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
Start 2.475 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.48 GHz
Sweep 5 ms (401 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.4750000 GHz 1.074 dBm
1Δ (1) Freq 1.0000 MHz 0.014 dB
2R (1) Freq 2.4770000 GHz 1.109 dBm
2Δ (1) Freq 1.0000 MHz 0.002 dB
3R (1) Freq 2.4790000 GHz 1.14 dBm
3Δ (1) Freq 1.0000 MHz -0.016 dB
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

7. 20dB Bandwidth test

7.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

7.2 Test SET-UP (Block Diagram of Configuration)



7.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	88156318	05/29/2012	05/28/2013

7.4 Measurement Results:

The following table is the setting of spectrum analyzer.

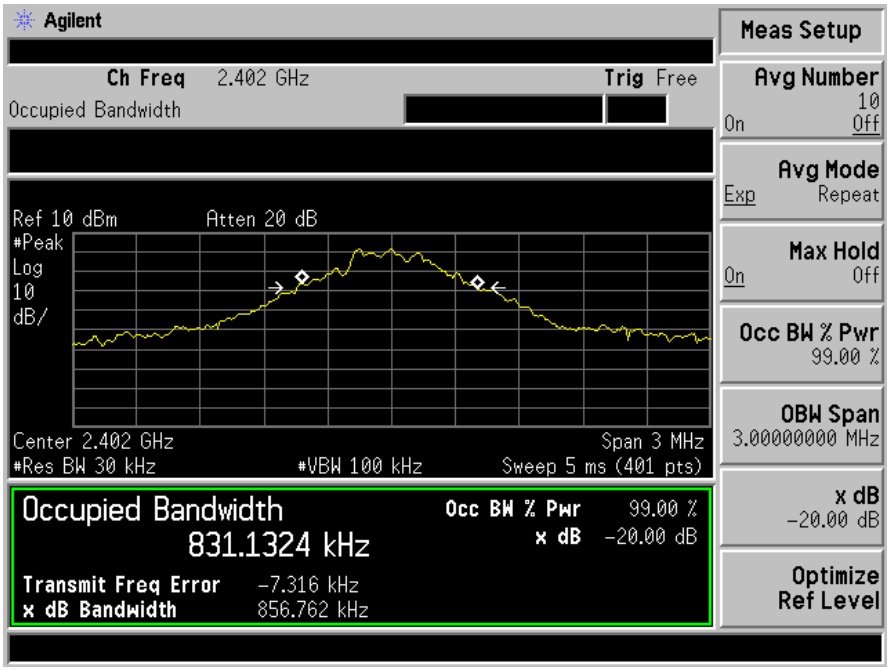
EMI Test Receiver	Setting
Attenuation	Auto
Span	3MHz
RB	30kHz
VB	100kHz
Detector	Peak
Trace	Max hold

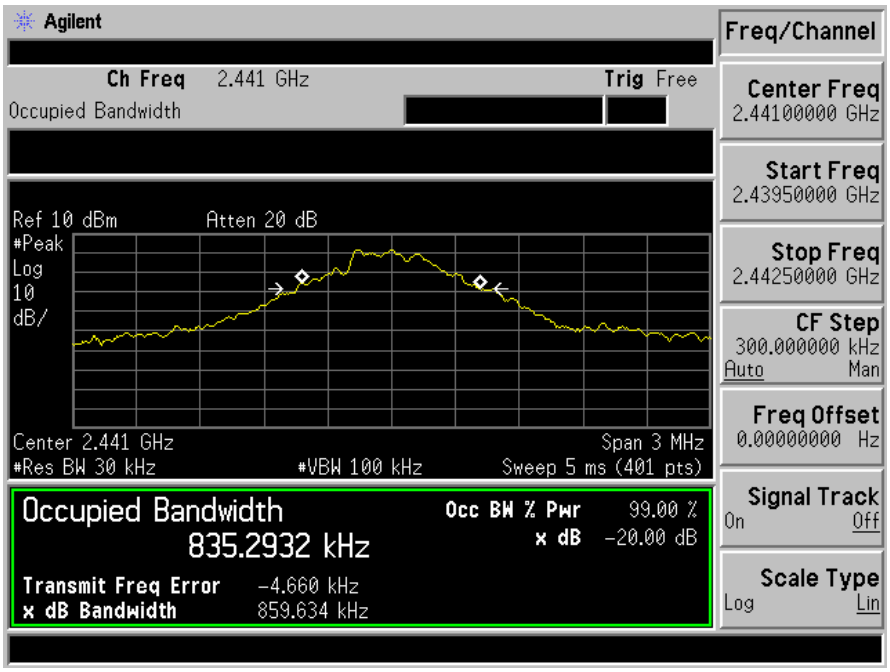
All the modes GFSK, 1/4Π-DQPSK,8DPSK have been tested and the worst result recorded in the following pages.

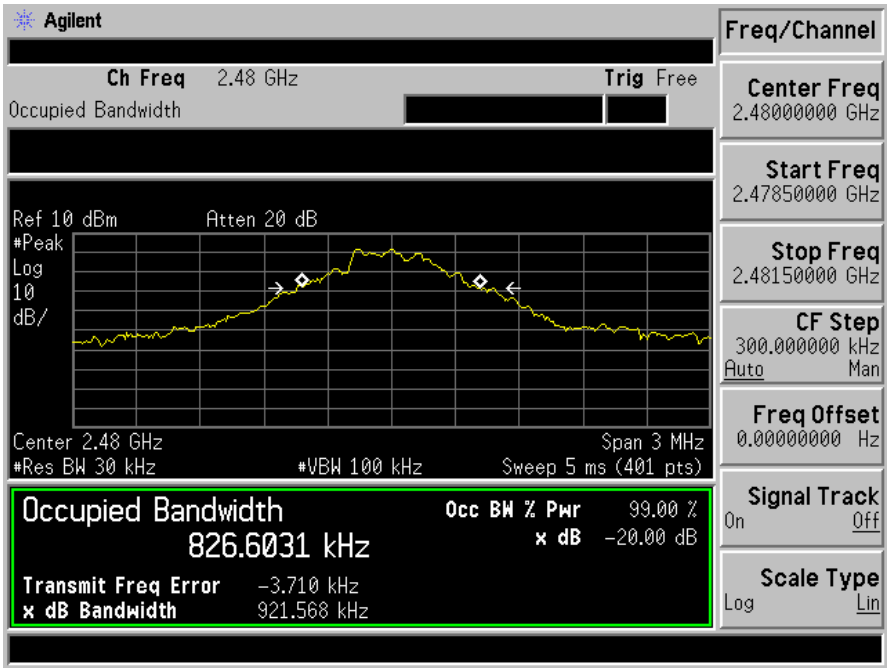
7.4.1. 20dB Bandwidth test data Chart:
Refer to attached data chart.

Spectrum Detector:	PK	Test Date:	April 10, 2013
Test By:	Andy	Temperature:	28 ℃
Test Result:	PASS	Humidity:	65 %
Modulation:	GFSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
1	2402	856.762
40	2441	859.634
79	2480	921.568

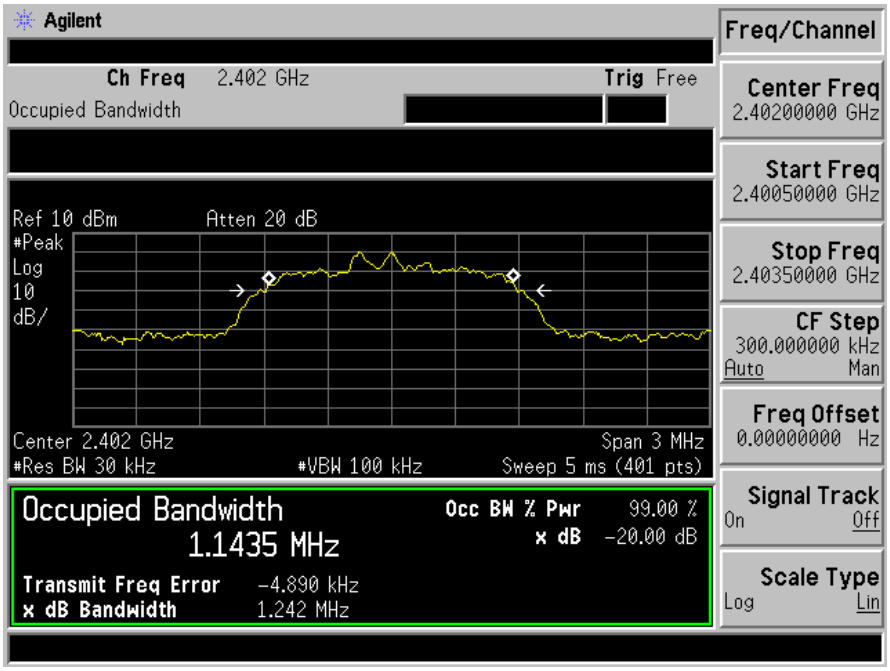


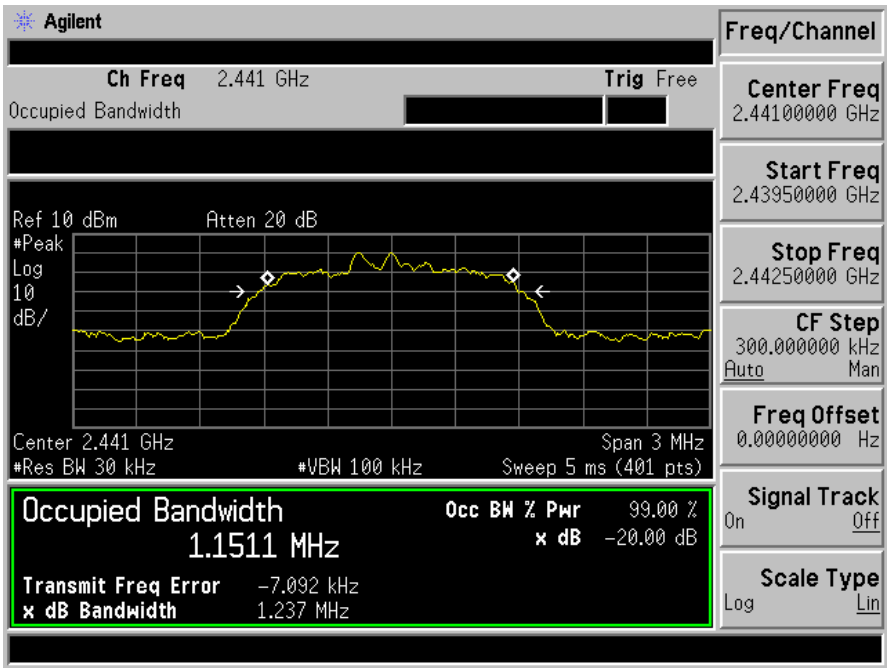

Agilent
Freq/Channel
Ch Freq 2.441 GHz
Trig Free
Occupied Bandwidth
Center Freq
2.44100000 GHz
Start Freq
2.43950000 GHz
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Stop Freq
2.44250000 GHz
CF Step
300.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Center 2.441 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 5 ms (401 pts)
Occupied Bandwidth
835.2932 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Signal Track
On Off
Transmit Freq Error -4.660 kHz
x dB Bandwidth 859.634 kHz
Scale Type
Log Lin

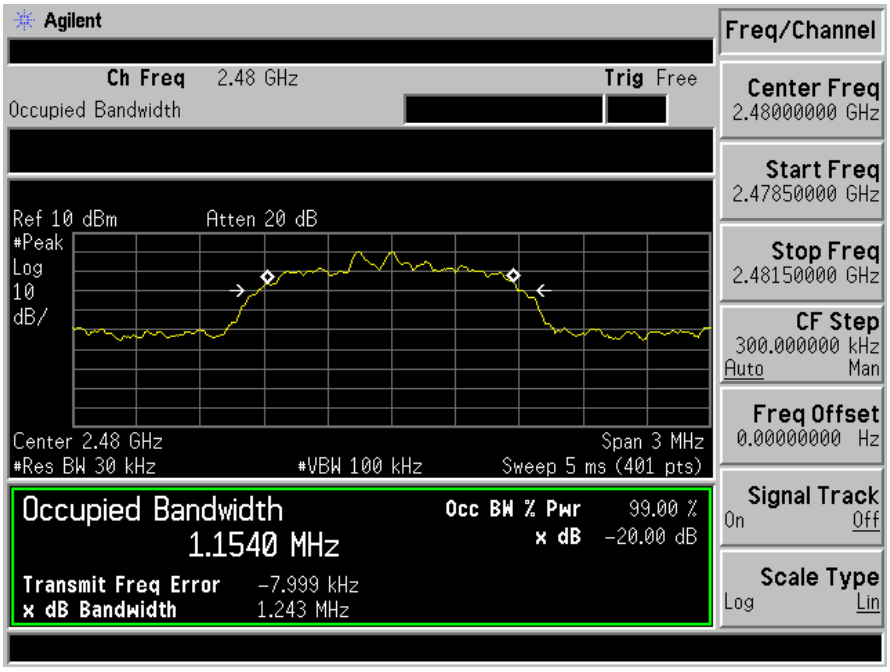

Agilent
Freq/Channel
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
Center Freq
2.48000000 GHz
Start Freq
2.47850000 GHz
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Stop Freq
2.48150000 GHz
CF Step
300.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Center 2.48 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 5 ms (401 pts)
Occupied Bandwidth
826.6031 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Signal Track
On Off
Transmit Freq Error -3.710 kHz
x dB Bandwidth 921.568 kHz
Scale Type
Log Lin

Spectrum Detector:	PK	Test Date:	April 10, 2013
Test By:	Andy	Temperature:	28 ℃
Test Result:	PASS	Humidity:	65 %
Modulation:	1/4∏-DQPSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
1	2402	1242.00
40	2441	1237.00
79	2480	1243.00

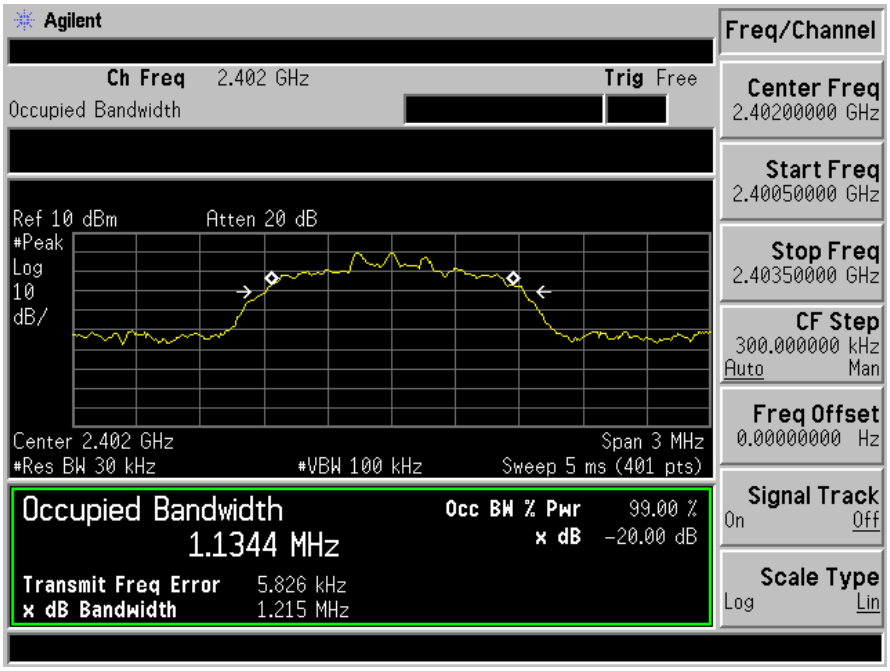


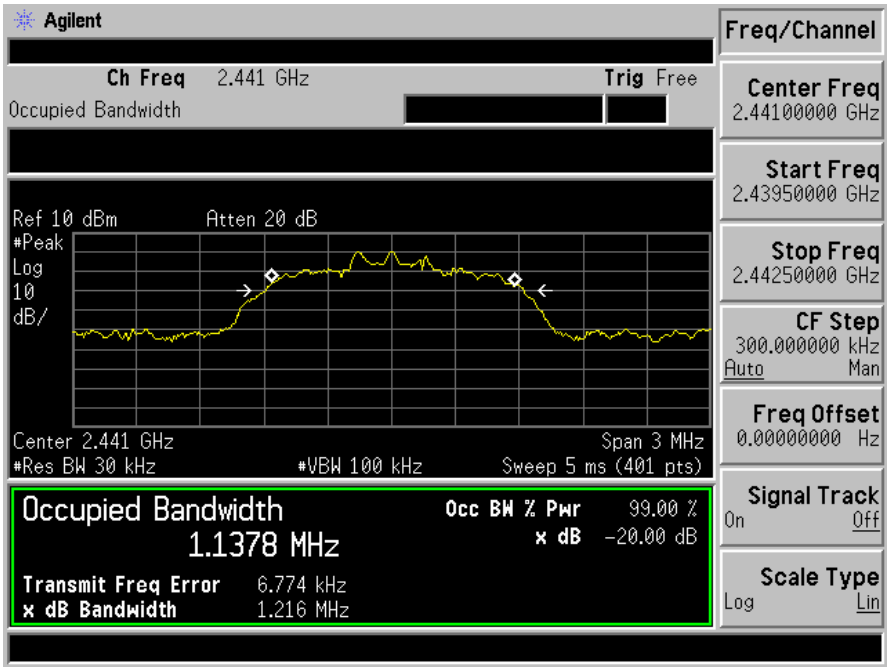

Agilent
Ch Freq 2.441 GHz
Trig Free
Occupied Bandwidth
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Center 2.441 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 5 ms (401 pts)
Occupied Bandwidth
1.1511 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -7.092 kHz
x dB Bandwidth 1.237 MHz
Freq/Channel
Center Freq
2.44100000 GHz
Start Freq
2.43950000 GHz
Stop Freq
2.44250000 GHz
CF Step
300.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

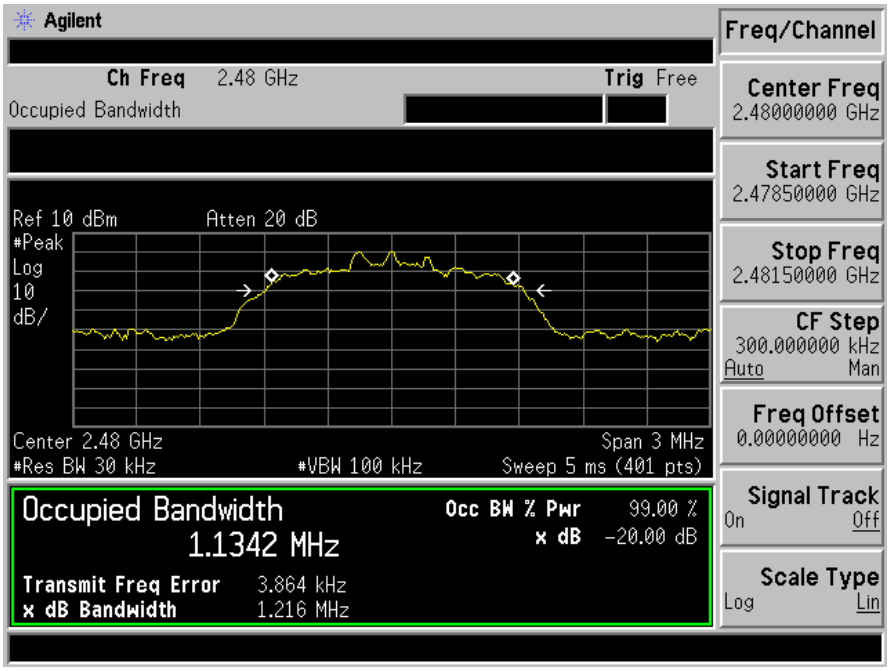

Agilent
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Center 2.48 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 5 ms (401 pts)
Occupied Bandwidth
1.1540 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -7.999 kHz
x dB Bandwidth 1.243 MHz
Freq/Channel
Center Freq
2.48000000 GHz
Start Freq
2.47850000 GHz
Stop Freq
2.48150000 GHz
CF Step
300.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

Spectrum Detector:	PK	Test Date:	April 10, 2013
Test By:	Andy	Temperature:	28 ℃
Test Result:	PASS	Humidity:	65 %
Modulation:	8DPSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
1	2402	1215.00
40	2441	1216.00
79	2480	1216.00




Agilent
Freq/Channel
Ch Freq 2.441 GHz
Trig Free
Occupied Bandwidth
Center Freq
2.44100000 GHz
Start Freq
2.43950000 GHz
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Stop Freq
2.44250000 GHz
CF Step
300.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Center 2.441 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 5 ms (401 pts)
Signal Track
On Off
Occupied Bandwidth
1.1378 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error 6.774 kHz
x dB Bandwidth 1.216 MHz
Scale Type
Log Lin

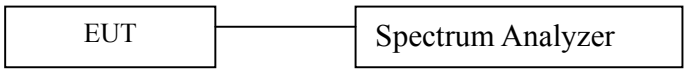

Agilent
Freq/Channel
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
Center Freq
2.48000000 GHz
Start Freq
2.47850000 GHz
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Stop Freq
2.48150000 GHz
CF Step
300.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Center 2.48 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 5 ms (401 pts)
Signal Track
On Off
Occupied Bandwidth
1.1342 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error 3.864 kHz
x dB Bandwidth 1.216 MHz
Scale Type
Log Lin

8. Quantity of Hopping Channel Test

8.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

8.2 Test SET-UP (Block Diagram of Configuration)



8.3 Measurement Equipment Used:

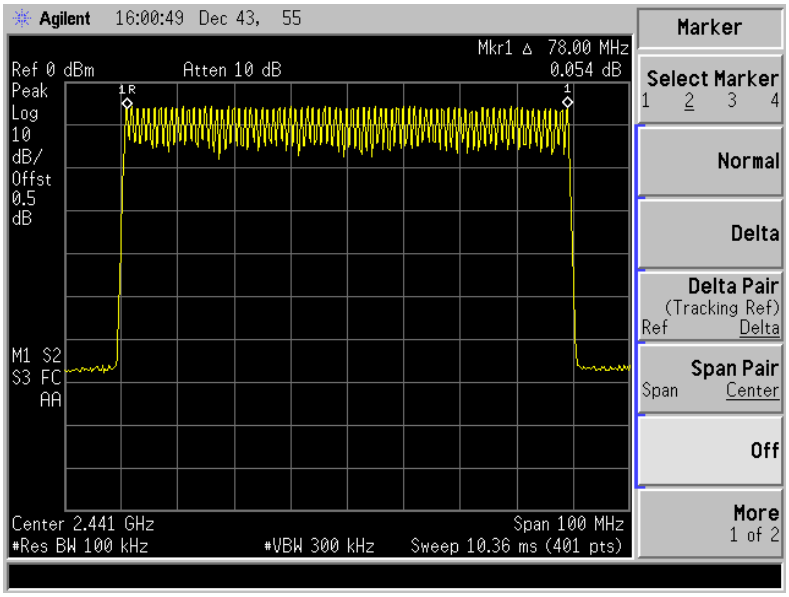
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	88156318	05/29/2012	05/28/2013

8.4 Measurement Results:

All the modulation modes were tested the data of the worst mode (GFSK) are recorded in the following pages and the others modulation methods do not exceed the above mentioned limits.

Spectrum Detector:	PK	Test Date :	April 10, 2013
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %

Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel limit
2402-2480	79	＞15

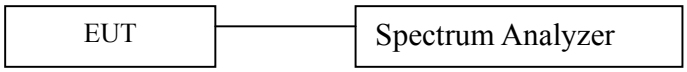


9. Time of Occupancy (Dwell Time) test

9.1 Measurement Procedure

a. Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.

9.2 Test SET-UP (Block Diagram of Configuration)



9.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	88156318	05/29/2012	05/28/2013

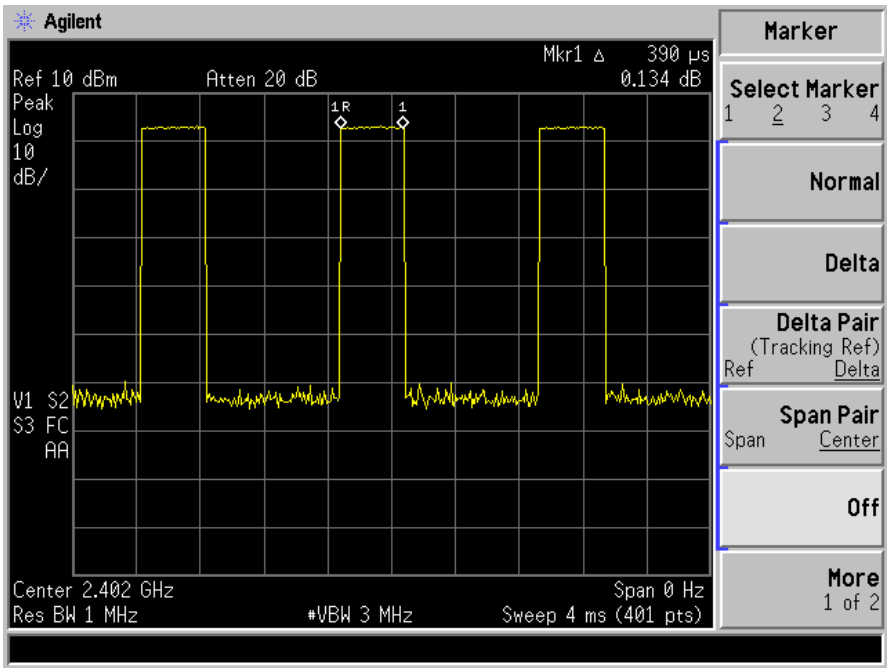
9.4 Measurement Results:

All the modulation modes were tested and the data of the GFSK mode are recorded in the following pages. Low, Middle and Highest channels have been tested, the worst test data channel 2402 was recorded in this report, all modulation methods do not exceed the above mentioned limits.

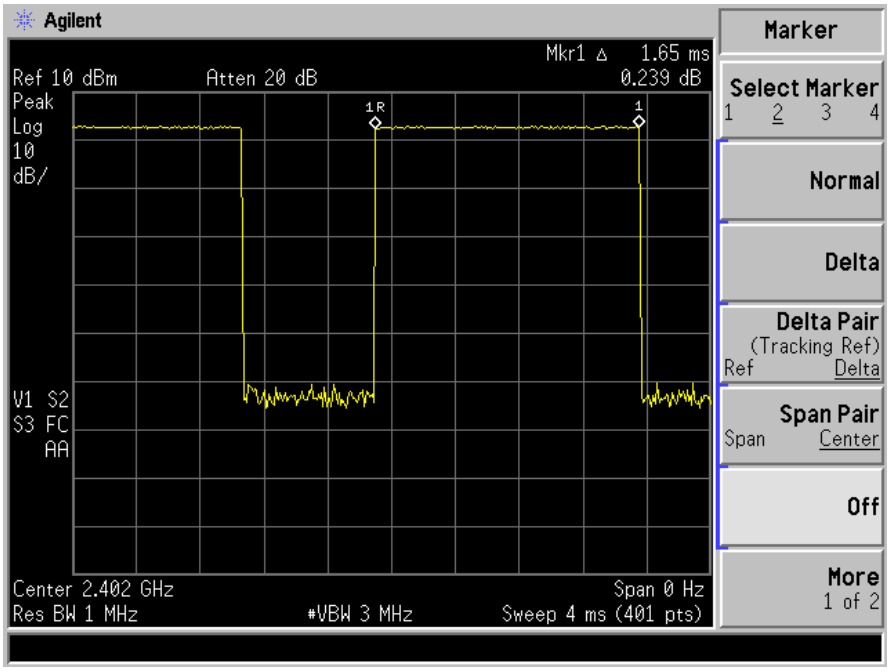
Spectrum Detector:	PK	Test Date :	April 10, 2013
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %

Mode	Number of transmission in a 31.6(79 Hopping*0.4)	Length of transmissions time(msec)	Result (msec)	Limit (msec)
DH1	1600/(2*79) x 31.6 = 320	0.390	124.800	400
DH3	1600/(4*79) x 31.6 =160	1.650	264.000	400
DH5	1600/(6*79) x 31.6 =106.67	2.880	307.210	400

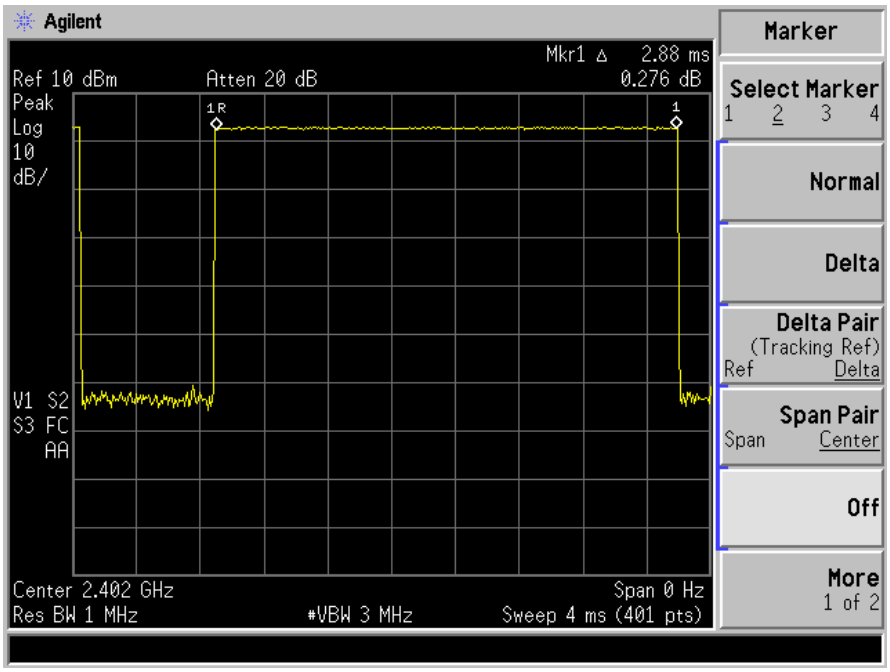
DH1


Agilent
Mkr1 Δ 390 µs
Ref 10 dBm
Atten 20 dB
0.134 dB
Peak
Log
10
dB/
1R
1
V1 S2
S3 FC
AA
Center 2.402 GHz
Res BW 1 MHz
#VBW 3 MHz
Span 0 Hz
Sweep 4 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

DH3


Agilent
Mkr1 Δ 1.65 ms
Ref 10 dBm
Atten 20 dB
0.239 dB
Peak
Log
10
dB/
1R
1
V1 S2
S3 FC
AA
Center 2.402 GHz
Res BW 1 MHz
#VBW 3 MHz
Span 0 Hz
Sweep 4 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

DH5

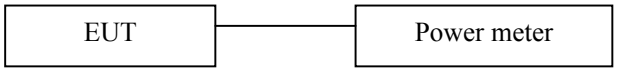

Agilent
Mkr1 Δ 2.88 ms
Ref 10 dBm
Atten 20 dB
0.276 dB
Peak
Log
10
dB/
1R
1
V1 S2
S3 FC
AA
Center 2.402 GHz
Res BW 1 MHz
#VBW 3 MHz
Span 0 Hz
Sweep 4 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

10. MAX IMUM PEAK OUTPUT POWER TEST

10.1 Measurement Procedure

a. Check the calibration of the measuring instrument(Power meter) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using proper RBW and VBW setting.
d. Measure the captured power within the band and recording the plot.
e. Repeat above procedures until all frequencies required were complete.

10.2 Test SET-UP (Block Diagram of Configuration)



10.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power meter	Boonton	4232A	29001	05/29/2012	05/28/2013
Power sensor	Boonton	51011-EMC	31184	05/29/2012	05/28/2013

10.4 Measurement Results:

All the modes GFSK, 1/4Π-DQPSK,8DPSK have been tested and the worst result recorded in the following pages and the others modulation methods do not exceed the limits.

Spectrum Detector:	PK	Test Date :	April 10, 2013
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Modulation:	GFSK		

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power Limit(mW)	Pass/Fail
1	2402.00	3.02	1000	PASS
40	2441.00	2.85	1000	PASS
79	2480.00	2.74	1000	PASS

Spectrum Detector:	PK	Test Date :	April 10, 2013
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Modulation:	1/4∏-DQPSK		

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power Limit(mW)	Pass/Fail
1	2402.00	1.51	125	PASS
40	2441.00	1.43	125	PASS
79	2480.00	1.30	125	PASS

Spectrum Detector:	PK	Test Date :	April 10, 2013
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Modulation:	8DPSK		

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power Limit(mW)	Pass/Fail
1	2402.00	1.80	125	PASS
40	2441.00	1.64	125	PASS
79	2480.00	1.55	125	PASS

11. Band EDGE test

11.1 Measurement Procedure

1. The EUT was Operating in hopping mode or could be controlled its channel. Printed out test result from the spectrum by hard copy function.
2. The EUT was placed on a turn table which is 0.8m above ground plane.
3. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until all frequency measured were complete.

11.2 Test SET-UP (Block Diagram of Configuration)

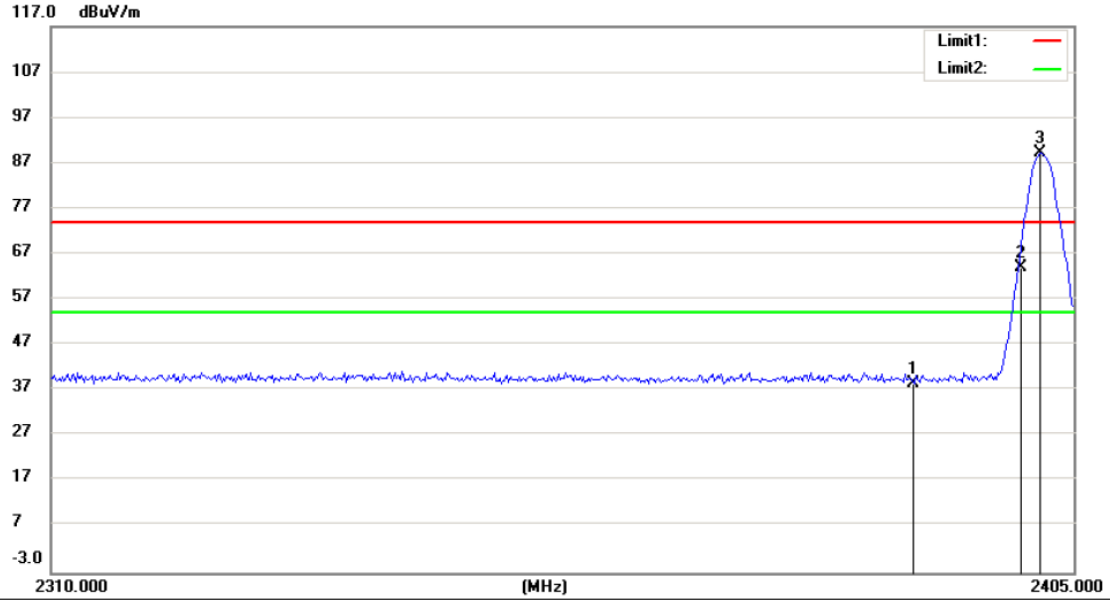
As 5.2 Test set up (B) and (C)

11.3 Measurement Equipment Used:

Same as 5.3 Radiated Emission Measurement.

11.4 Measurement Results:

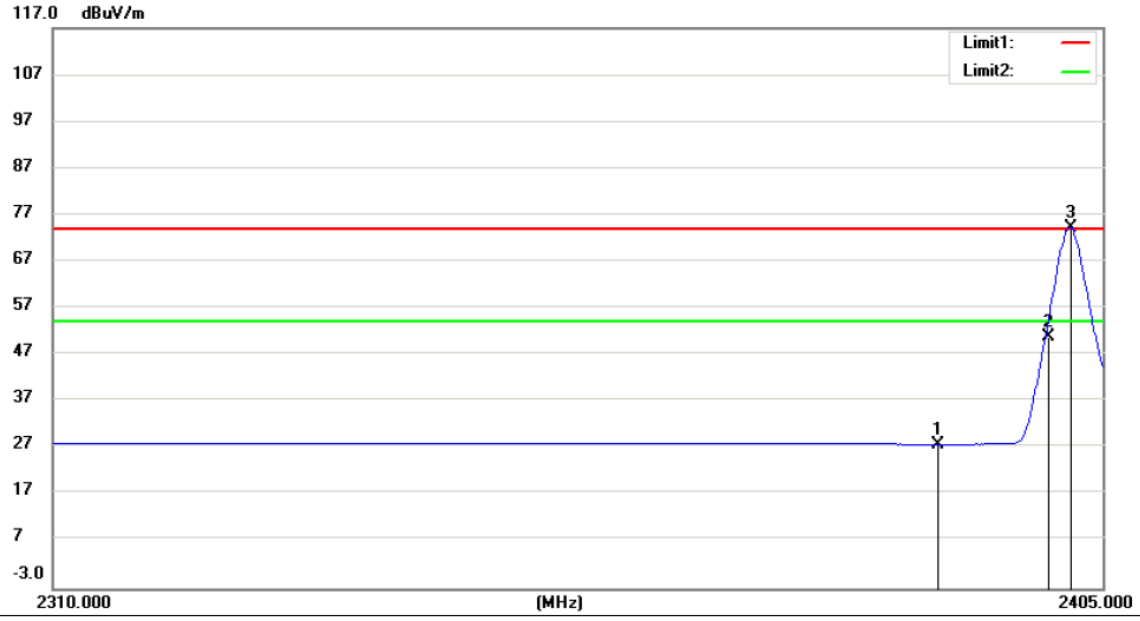
GFSK 2402



Site site #1 Polarization: *Vertical* Temperature: 26
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %
EUT: BT TOWER SPEAKER
M/N: TSB-501M
Mode:TX2402
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	47.21	-8.67	38.54	74.00	-35.46	peak			
2		2400.000	72.69	-8.70	63.99	74.00	-10.01	peak			
3	*	2402.000	97.86	-8.70	89.16	74.00	15.16	peak			

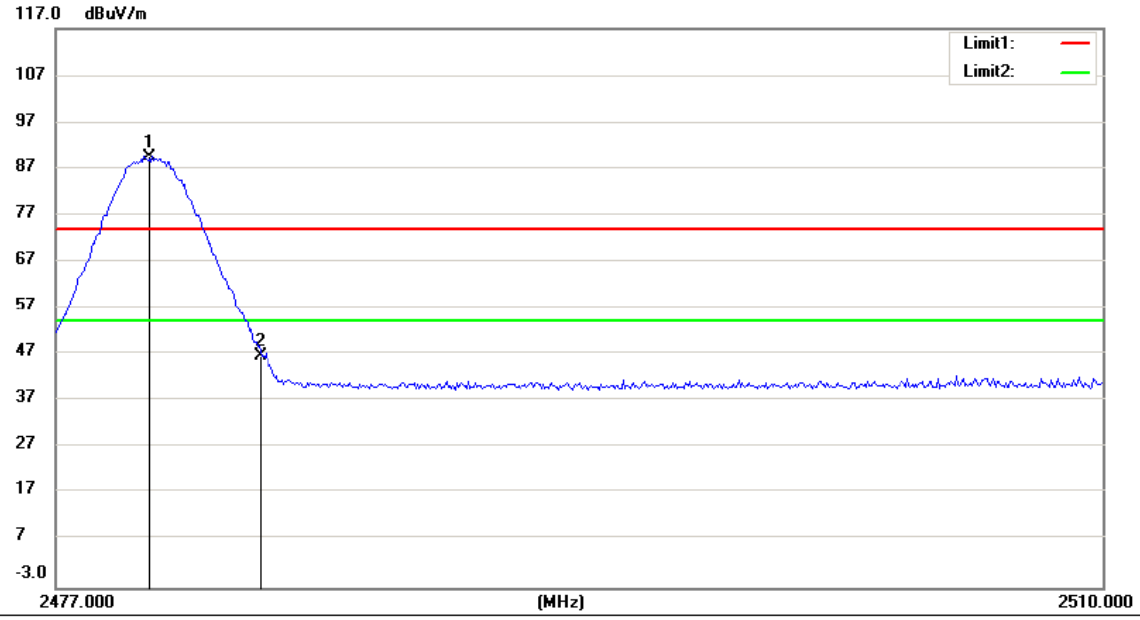
*:Maximum data x:Over limit !:over margin Operator: KK



Site site #1 Polarization: *Vertical* Temperature: 26
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %
EUT: BT TOWER SPEAKER
M/N: TSB-501M
Mode:TX2402
Note:

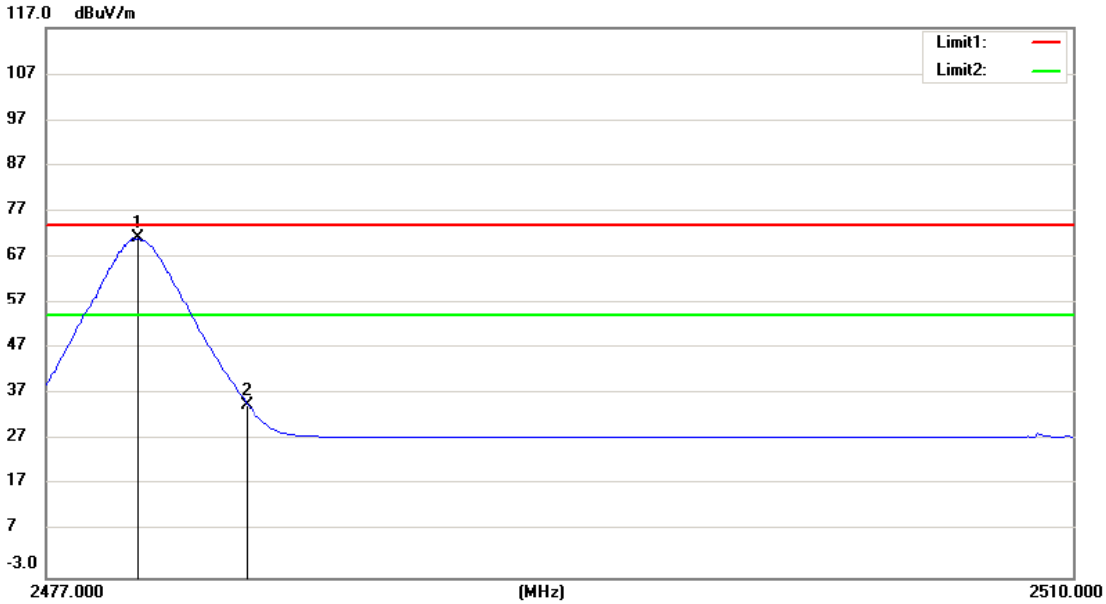
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	36.50	-8.67	27.83	54.00	-26.17	AVG			
2		2400.000	59.41	-8.70	50.71	54.00	-3.29	AVG			
3	*	2402.000	83.06	-8.70	74.36	54.00	20.36	AVG			

GFSK 2480



Site site #1 Polarization: *Vertical* Temperature: 26
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %
EUT: BT TOWER SPEAKER
M/N: TSB-501M
Mode:TX2480

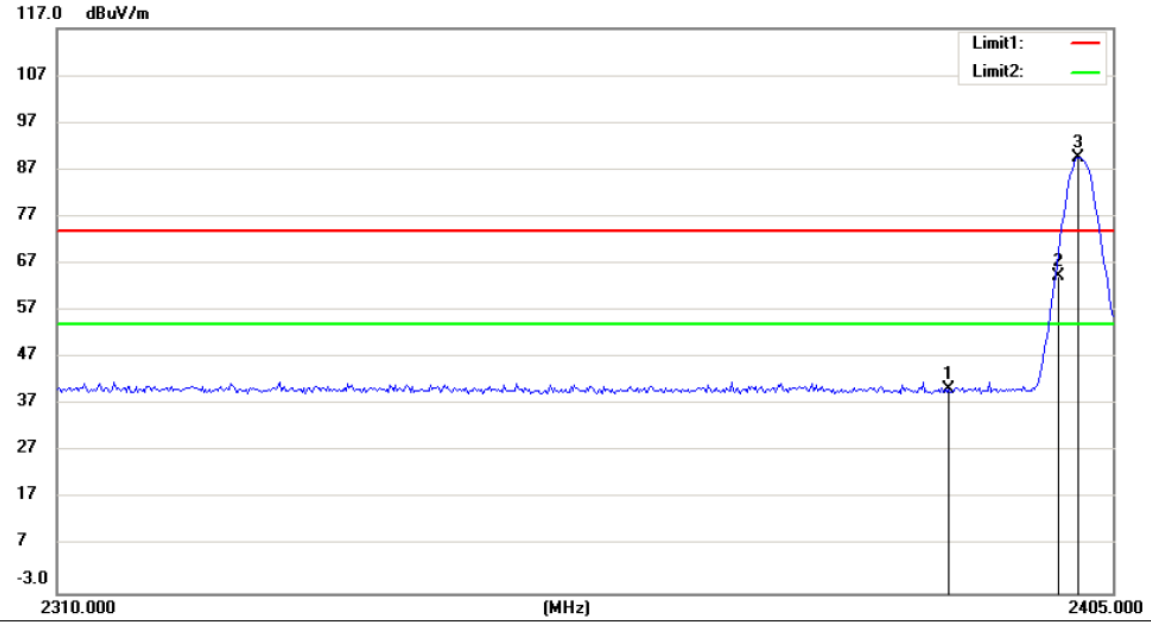
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.000	98.24	-8.66	89.58	74.00	15.58	peak			
2		2483.500	55.32	-8.66	46.66	74.00	-27.34	peak			



Site site #1 Polarization: *Vertical* Temperature: 26
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %
EUT: BT TOWER SPEAKER
M/N: TSB-501M
Mode:TX2480

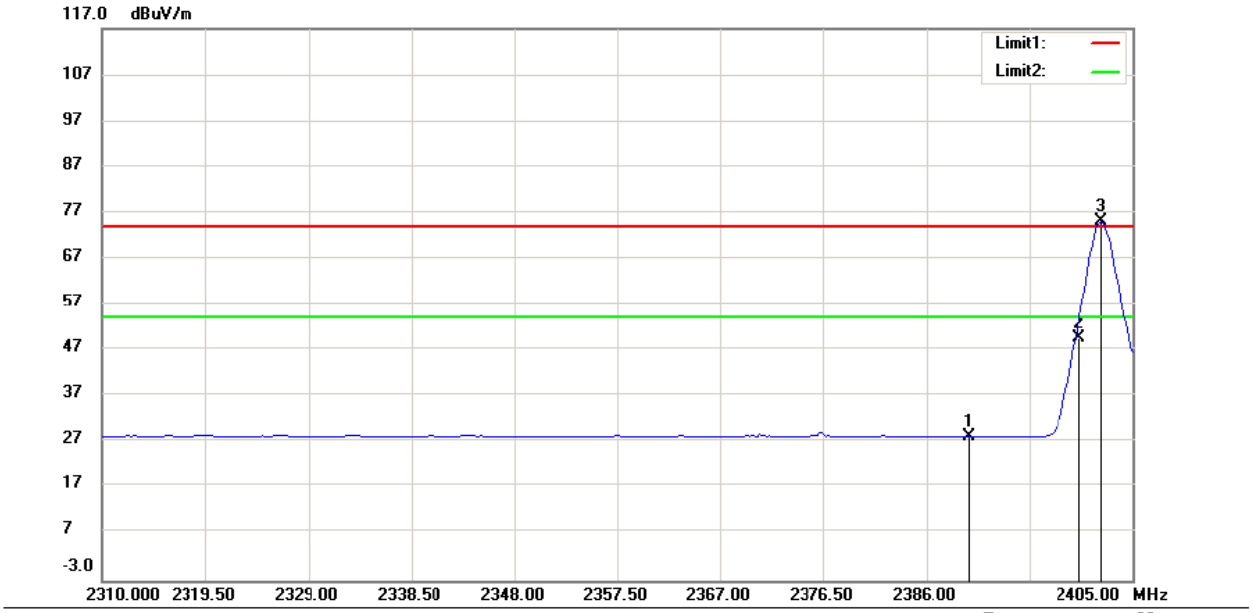
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.000	79.90	-8.66	71.24	54.00	17.24	AVG			
2		2483.500	43.24	-8.66	34.58	54.00	-19.42	AVG			

1/4∏-DQPSK 2402



Site site #1 Polarization: *Vertical* Temperature: 26
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %
EUT: BT TOWER SPEAKER
M/N: TSB-501M
Mode:TX2402
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	49.00	-8.67	40.33	74.00	-33.67	peak			
2		2400.000	73.12	-8.70	64.42	74.00	-9.58	peak			
3	*	2402.000	98.39	-8.70	89.69	74.00	15.69	peak			



Site site #1 Polarization: *Vertical* Temperature: 26

Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %

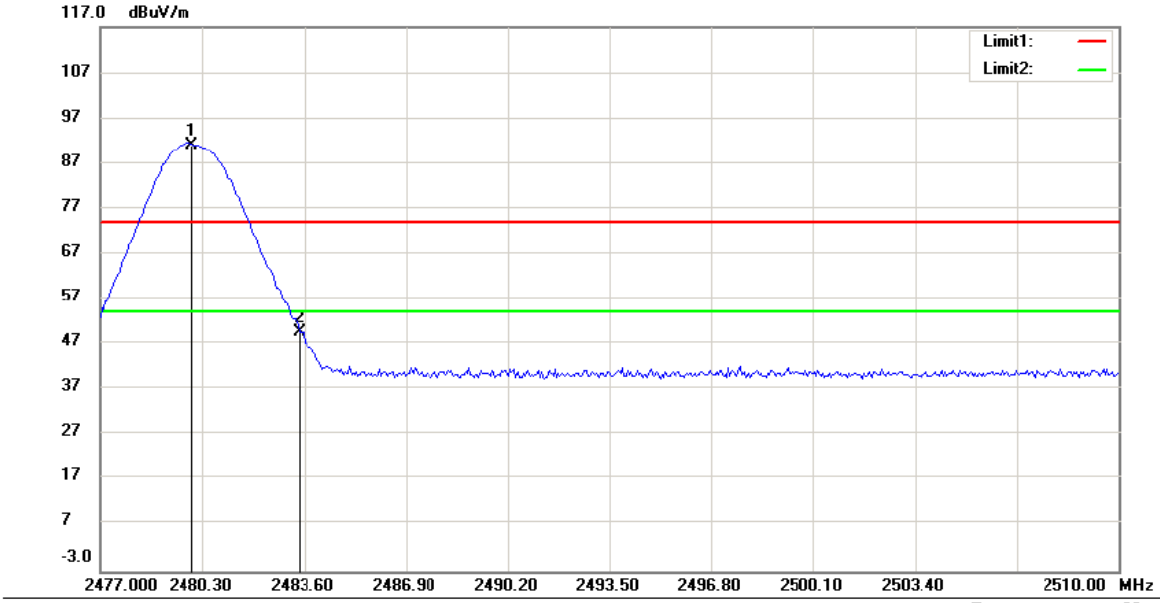
EUT: BT TOWER SPEAKER

M/N: TSB-501M

Mode:TX2402

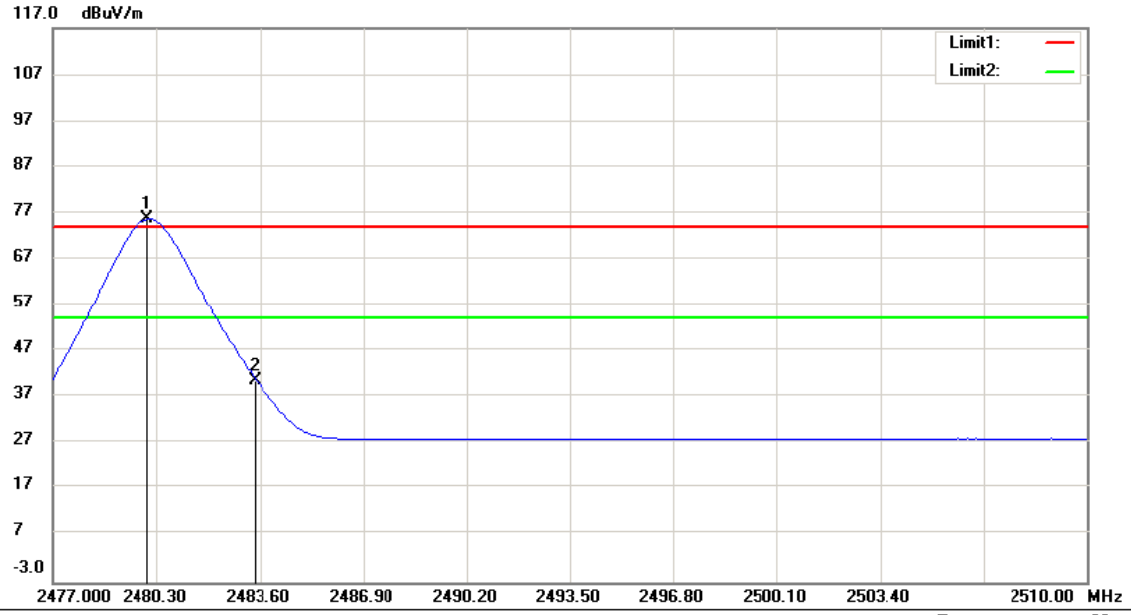
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	36.96	-8.67	28.29	54.00	-25.71	AVG			
2		2400.000	58.40	-8.70	49.70	54.00	-4.30	AVG			
3	*	2402.000	83.74	-8.70	75.04	54.00	21.04	AVG			

1/4Π-DQPSK 2480



Site site #1 Polarization: *Vertical* Temperature: 26
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %
EUT: BT TOWER SPEAKER
M/N: TSB-501M
Mode:TX2480

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.000	99.83	-8.66	91.17	74.00	17.17	peak			
2		2483.500	58.20	-8.66	49.54	74.00	-24.46	peak			



Site site #1 Polarization: *Vertical* Temperature: 26

Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %

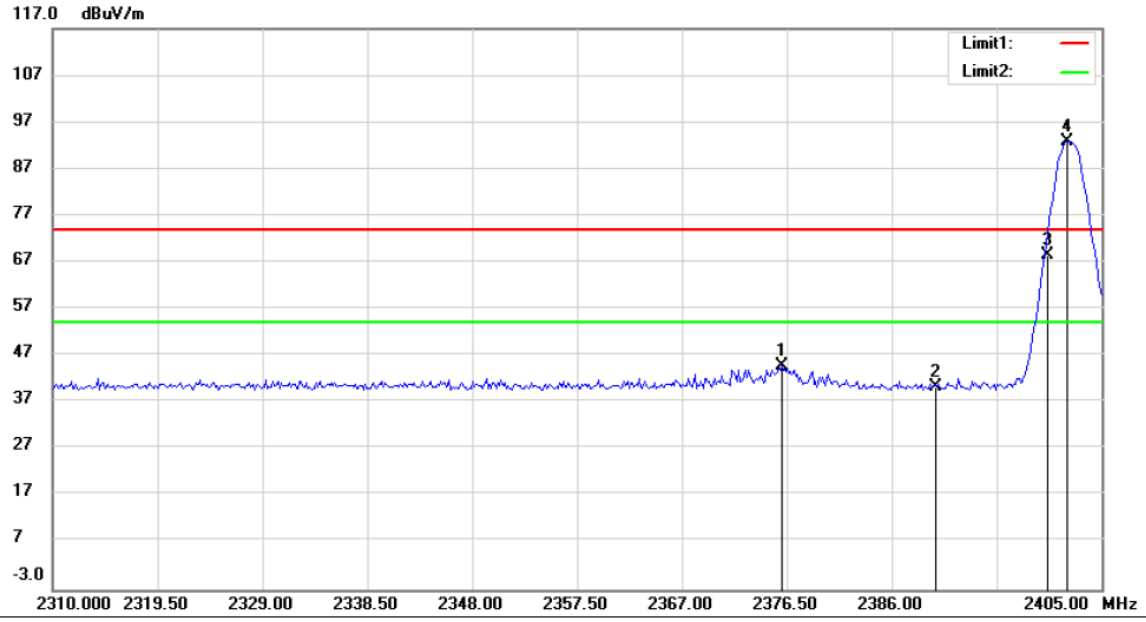
EUT: BT TOWER SPEAKER

M/N: TSB-501M

Mode:TX2480

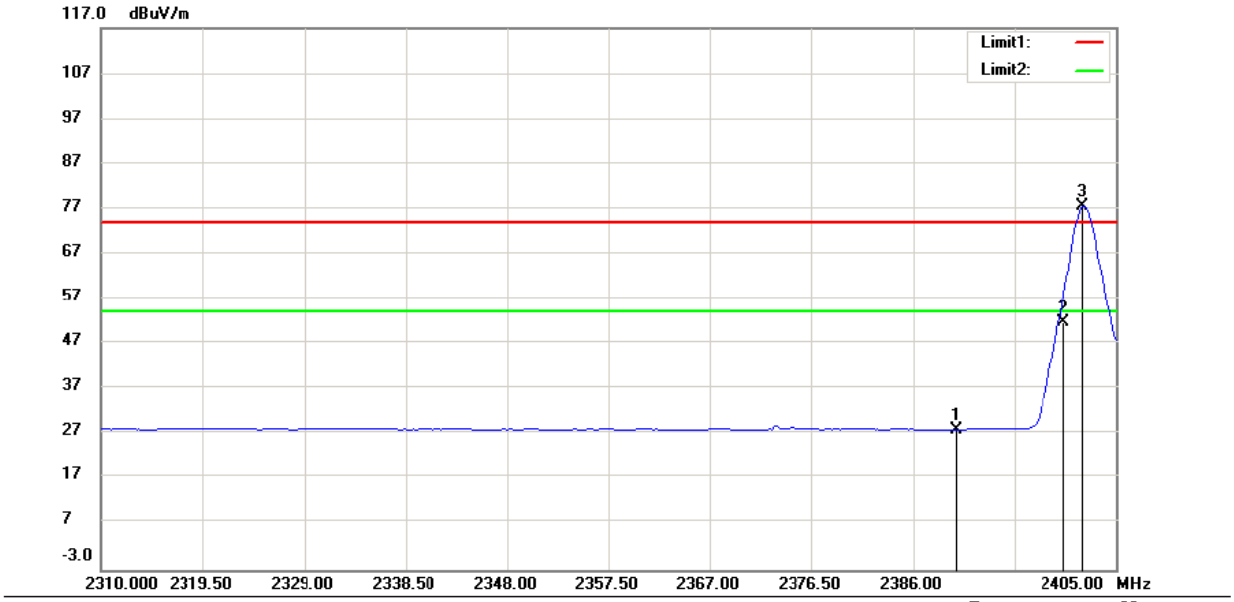
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.000	84.30	-8.66	75.64	54.00	21.64	AVG			
2		2483.500	49.32	-8.66	40.66	54.00	-13.34	AVG			

8DPSK 2402



Site site #1 Polarization: *Vertical* Temperature: 26
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %
EUT: BT TOWER SPEAKER
M/N: TSB-501M
Mode:TX2402
Note:

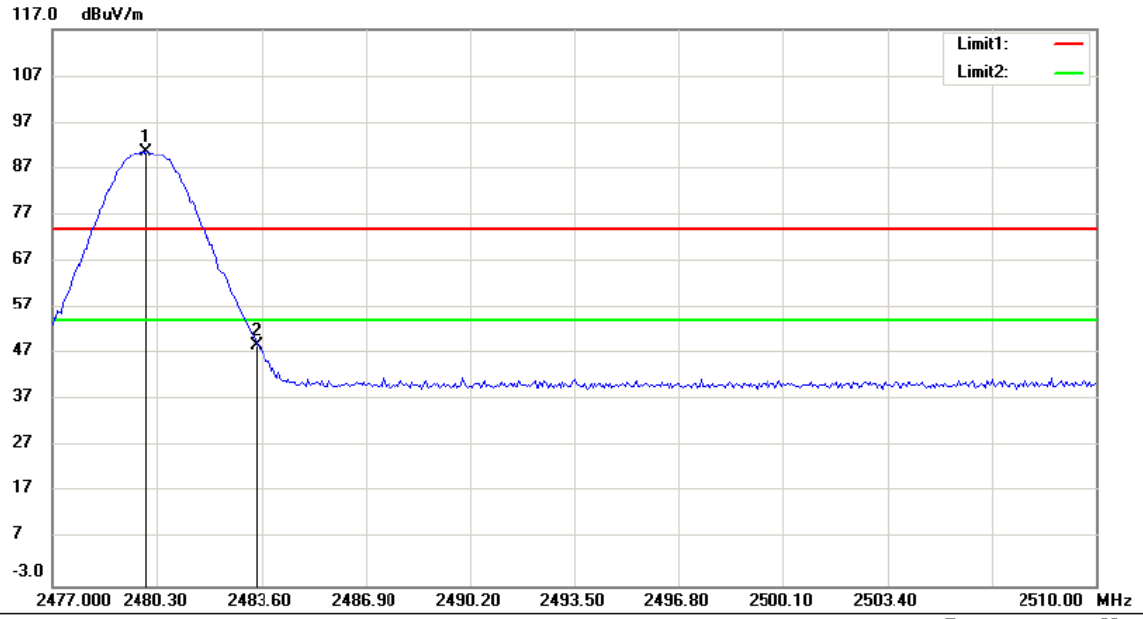
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2376.074	53.45	-8.63	44.82	74.00	-29.18	peak			
2		2390.000	49.00	-8.67	40.33	74.00	-33.67	peak			
3		2400.000	77.17	-8.70	68.47	74.00	-5.53	peak			
4	*	2402.000	101.51	-8.70	92.81	74.00	18.81	peak			



Site site #1 Polarization: *Vertical* Temperature: 26
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %
EUT: BT TOWER SPEAKER
M/N: TSB-501M
Mode:TX2402

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	36.80	-8.67	28.13	54.00	-25.87	AVG			
2		2400.000	60.50	-8.70	51.80	54.00	-2.20	AVG			
3	*	2402.000	86.20	-8.70	77.50	54.00	23.50	AVG			

8DPSK 2480



Site site #1 Polarization: *Vertical* Temperature: 26

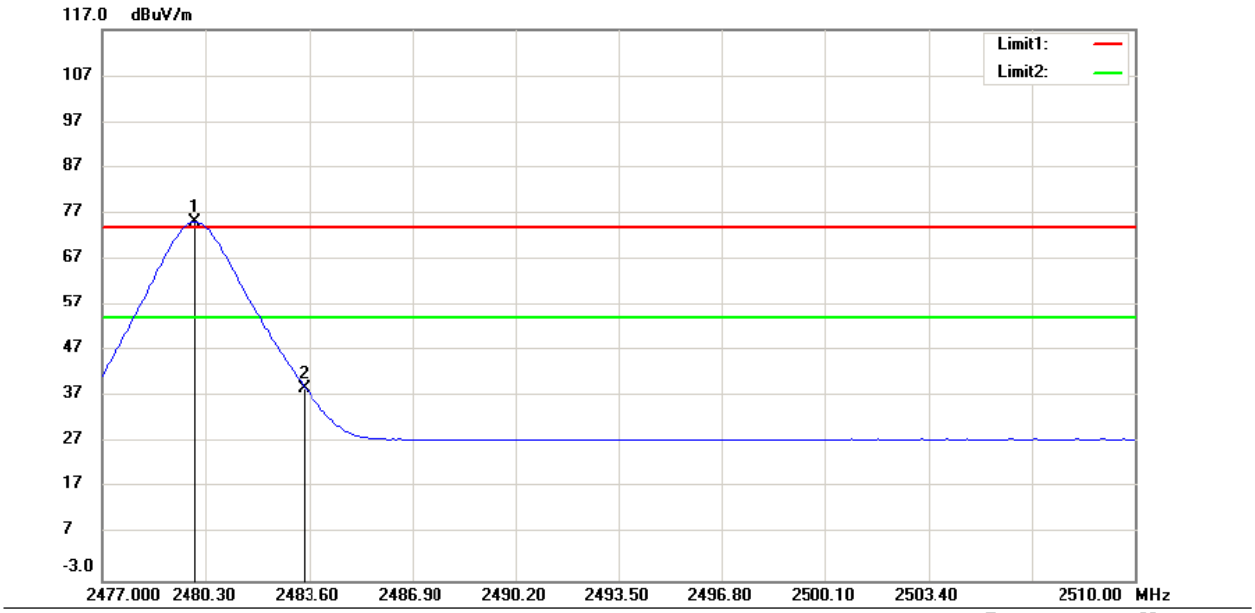
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %

EUT: BT TOWER SPEAKER

M/N: TSB-501M

Mode:TX2480

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.000	99.54	-8.66	90.88	74.00	16.88	peak			
2		2483.500	57.32	-8.66	48.66	74.00	-25.34	peak			



Site site #1 Polarization: *Vertical* Temperature: 26

Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 60 %

EUT: BT TOWER SPEAKER

M/N: TSB-501M

Mode:TX2480

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.000	83.75	-8.66	75.09	54.00	21.09	AVG			
2		2483.500	47.47	-8.66	38.81	54.00	-15.19	AVG			

12. Antenna Port Emission

12.1 Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	88156318	05/29/2012	05/28/2013

12.2 Measuring Instruments and setting

All the modulation modes were tested and the data of the GFSK mode are recorded in the following pages and the others modulation methods do not exceed the limits.

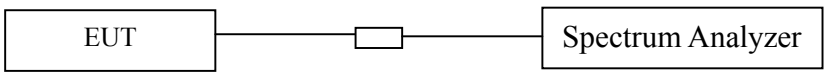
The following table is the setting of spectrum analyzer.

EMI Test Receiver	Setting
Attenuation	Auto
RB	100kHz
VB	300kHz
Detector	Peak
Trace	Max hold

12.3 Test Procedures

The conducted spurious emissions were measured conducted using a spectrum analyzer at low, mid, and hi channels, the limit was determined by attenuation 20dB of the RF peak power output.

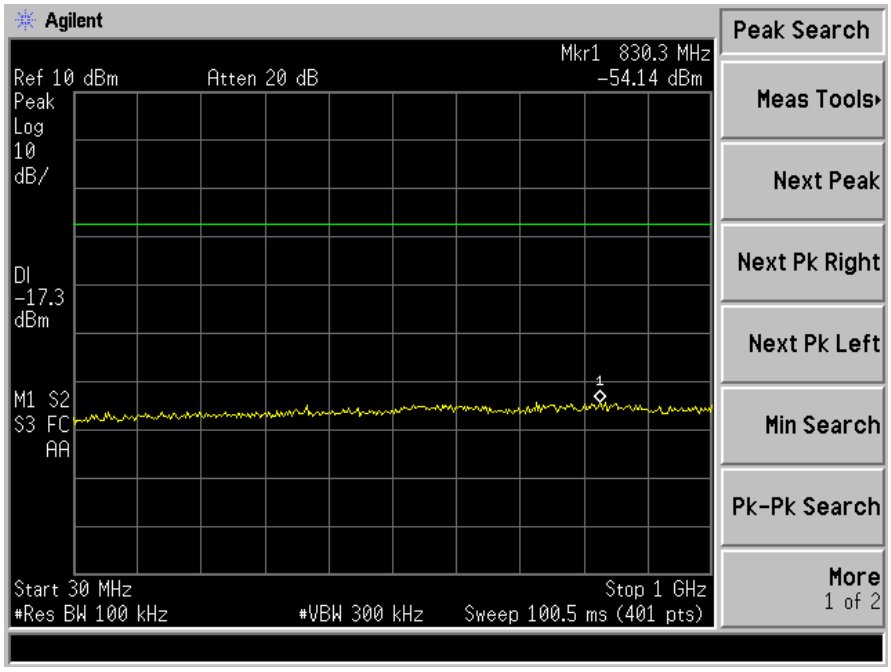
12.4 Block Diagram of Test setup

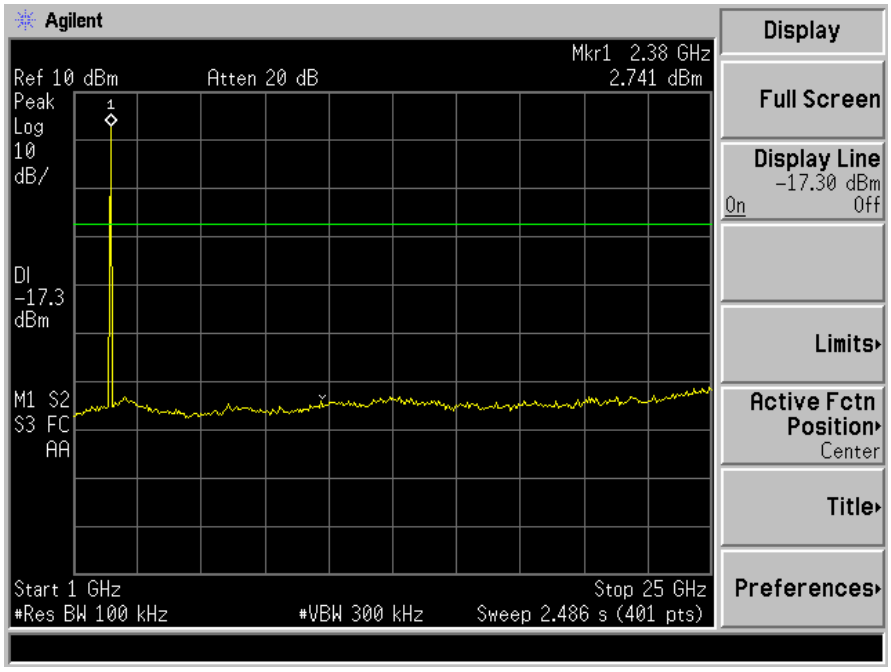


12.5 Test Result

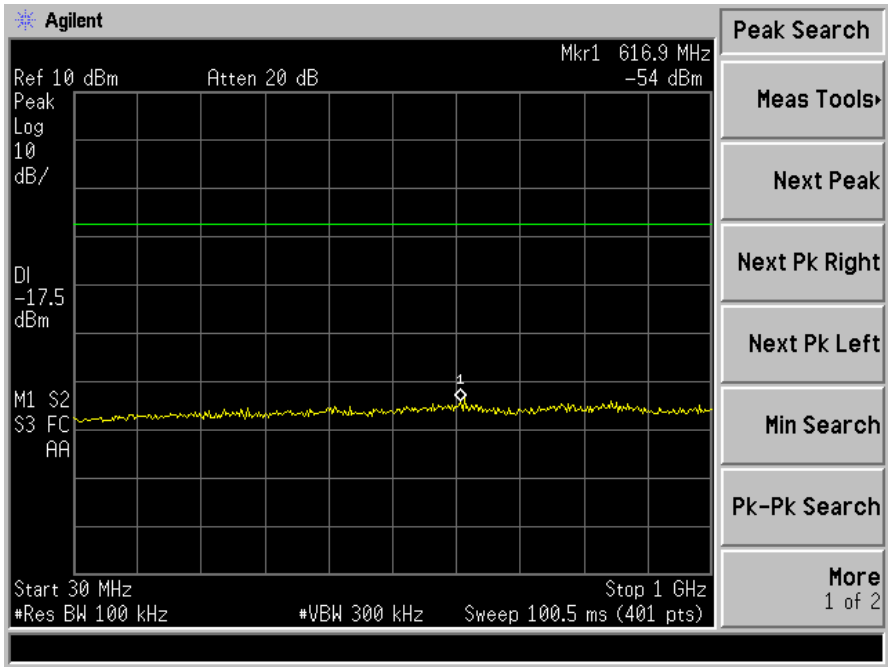
PASS.

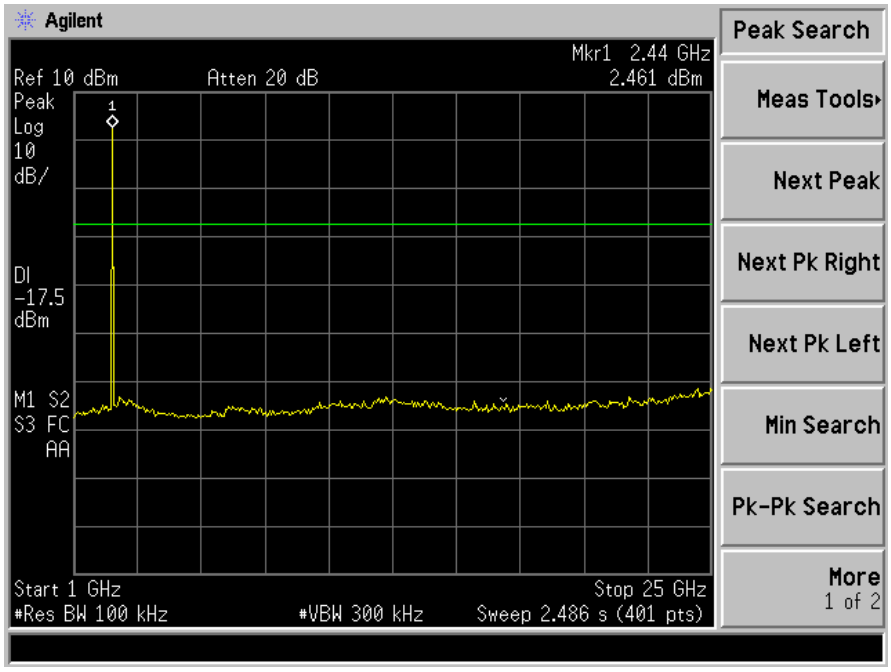
TX 2402MHz


Agilent
Mkr1 830.3 MHz
Ref 10 dBm
Atten 20 dB
-54.14 dBm
Peak
Log
10
dB/
Dl
-17.3
dBm
M1 S2
S3 FC
AA
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1 GHz
Sweep 100.5 ms (401 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

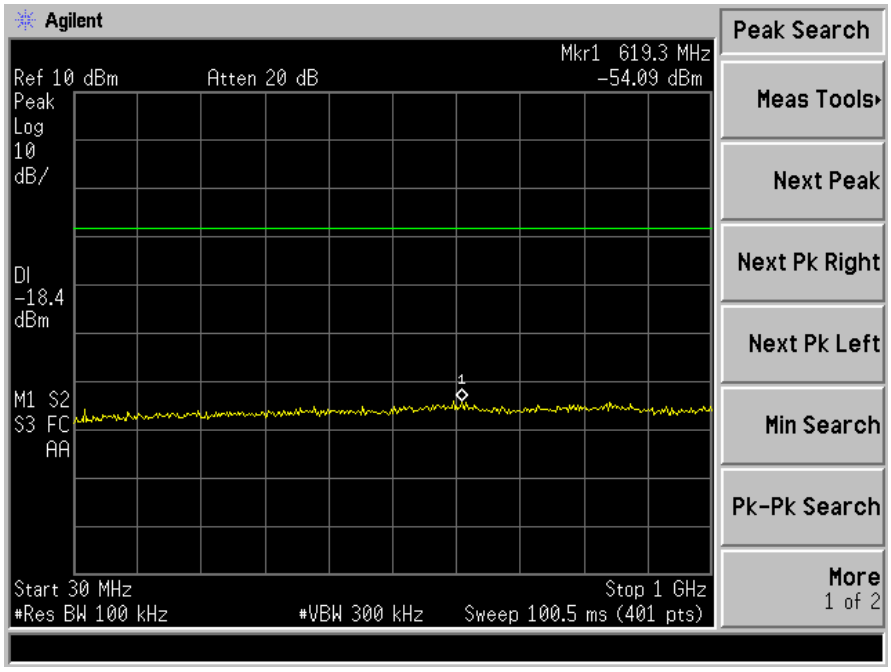

Agilent
Mkr1 2.38 GHz
Ref 10 dBm
Atten 20 dB
2.741 dBm
Peak
Log
10
dB/
Dl
-17.3
dBm
M1 S2
S3 FC
AA
Start 1 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25 GHz
Sweep 2.486 s (401 pts)
Display
Full Screen
Display Line
-17.30 dBm
On
Off
Limits
Active Fctn
Position
Center
Title
Preferences

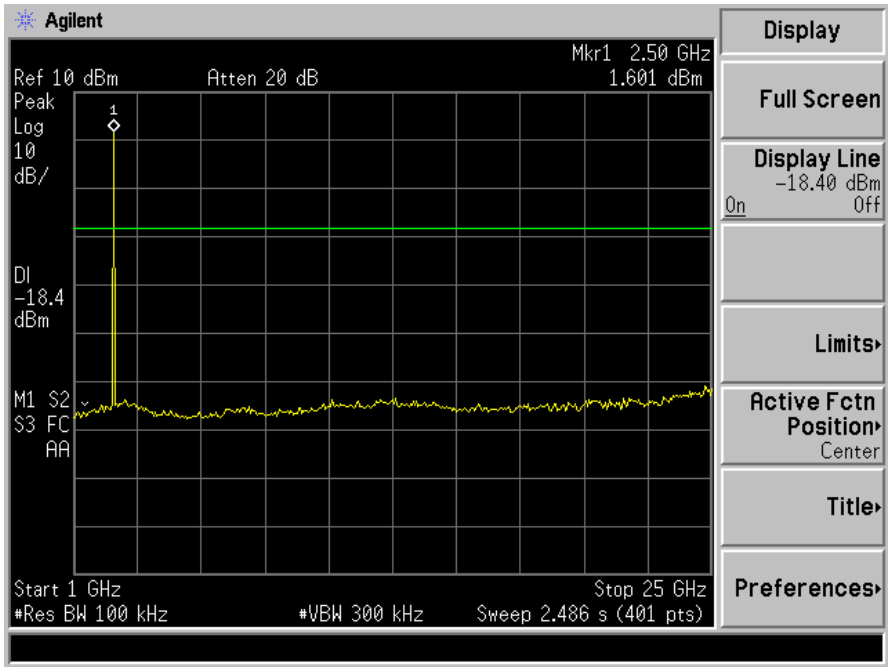
TX 2441MHz


Agilent
Mkr1 616.9 MHz
Ref 10 dBm
Atten 20 dB
-54 dBm
Peak
Log
10
dB/
Dl
-17.5
dBm
M1 S2
S3 FC
AA
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1 GHz
Sweep 100.5 ms (401 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2


Agilent
Mkr1 2.44 GHz
Ref 10 dBm
Atten 20 dB
2.461 dBm
Peak
Log
10
dB/
Dl
-17.5
dBm
M1 S2
S3 FC
AA
Start 1 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25 GHz
Sweep 2.486 s (401 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

TX 2480MHz


Agilent
Mkr1 619.3 MHz
Ref 10 dBm
Atten 20 dB
-54.09 dBm
Peak
Log
10
dB/
Dl
-18.4
dBm
M1 S2
S3 FC
AA
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1 GHz
Sweep 100.5 ms (401 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2


Agilent
Mkr1 2.50 GHz
Ref 10 dBm
Atten 20 dB
1.601 dBm
Peak
Log
10
dB/
Dl
-18.4
dBm
M1 S2
S3 FC
AA
Start 1 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25 GHz
Sweep 2.486 s (401 pts)
Display
Full Screen
Display Line
-18.40 dBm
On
Off
Limits
Active Fctn
Position
Center
Title
Preferences

13. Antenna Application

13.1 Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.247

FCC part 15C section 15.247 requirements:
Systems operating in the 2402-2480MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

13.2 Result

The EUT'S antenna is PCB Antenna. The antenna's gain is 0dBi and meets the requirement.