Shenzhen EMTEK Co., Ltd.
Building 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China
www.emtek.com.cn Tel:+86-755-2695 4280 Fax:+86-755-2695 4282

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENTS

OF

Bluetooth music player

MODEL No.: BTS220B, BTS220W

FCC ID: 2ABM5-BTS220

Trade Mark: neon

REPORT NO: ES140813156E

ISSUE DATE: August 31, 2014

Prepared for

Zhong Shan City LI TAI Electronic Industrial Co., Ltd
No.3 Industrial District, Wuguishan Town, Zhongshan, China

Prepared by

SHENZHEN EMTEK CO., LTD

Bldg 69, Majialong Industry Zone, Nanshan District,
Shenzhen, Guangdong, China
TEL: 86-755-26954280
FAX: 86-755-26954282

VERIFICATION OF COMPLIANCE

Applicant:	Zhong Shan City LI TAI Electronic Industrial Co., Ltd No.3 Industrial District, Wuguishan Town, Zhongshan, China
Manufacturer:	Zhong Shan City LI TAI Electronic Industrial Co., Ltd No.3 Industrial District, Wuguishan Town, Zhongshan, China
Product Description:	Bluetooth music player
Model Number:	BTS220B, BTS220W
Trade Mark:	neon
Serial Number:	N/A
File Number:	ES140813156E
Date of Test:	August 15, 2014 to August 31, 2014

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 : August 15, 2014 to August 31, 2014

Prepared by : Joe Xia

Joe Xia/Editor

Reviewer : Jack. Li

Jack Li/Supervisor

Approve & Authorized Signer :

Lisa Wang/Manager

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1. GENERAL INFORMATION

1.1 Product Description

The EUT is a short range, lower power, Mobile Internet Device designed as a 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:
Bluetooth: 2402-2480MHz;
B). Modulation: GFSK, 1/4∏-DQPSK, 8DPSK
C). Number of Channel: 79 channel
D). Channel space: 1MHz
E). RF Output Power: 1.842dBm
F). BIT Rate of Transmission: 1Mbps, 2Mbps, 3Mbps
G). Antenna Type: PCB antenna
H). Antenna GAIN: 2.12dBi
I). Power Supply: DC 5V with USB port and DC 3.7V from Li-ion Battery.

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2ABM5-BTS220 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.
The composite system is compliance with Subpart B is authorized under a DOC procedure.

1.3 Test Methodology

Both conducted and radiated testing was 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 Test Facility

Site Description

EMC Lab. : Accredited by CNAS, 2013.10.29
The certificate is valid until 2016.10.28
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, April 17, 2013
The Certificate Registration Number is 406365.

Accredited by Industry Canada, March 5, 2012
The Certificate Registration Number is 4480A-2.

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) and RSS 210 A8.1(2) 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)

Frequency Range(MHz)	20dB Bandwidth Limit(kHz)			
Quantity of Hopping Channel	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 and RSS 210 A8.1(4)

Frequency Range (MHz)	Limit(Quantity of Hopping Channel) 20dB bandwidth <250kHz	20dB bandwidth >250 kHz	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 and RSS 210 A8.1(4)

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 and RSS 210 A8.4

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 and RSS 210 A8.5

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

FCC Part15, Subpart C Section 15.247 and RSS-GEN, Section 7.2.2

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 and RSS 210 A8.5 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

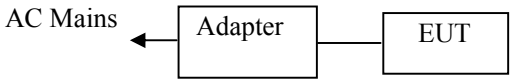


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
1.	Bluetooth music player	neon	BTS220B	2ABM5-BTS220	N/A	EUT
2.	PC	lenovo	9702	N/A	N/A	
3.	LCD Monitor	lenovo	9227-AE6	N/A	N/A	
4.	Keyboard	lenovo	KU-0225	N/A	N/A	
5.	Mouse	lenovo	MO28UOL	N/A	N/A	

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 has been tested under TX operating condition.
This EUT is a FHSS system, were conducted to determine the final configuration from all possible combinations. We use software control the EUT, Let EUT hopping on and transmit with highest power, All the modes GFSK, 1/4Π-DQPSK, 8DPSK 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)
0	2402
39	2441
78	2480

3. Summary of Test Results

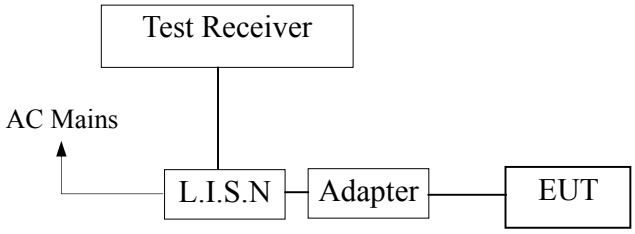
FCC Rule	Description Of Test	Result
15.247(a)(1)	Channel Separation test	Pass
15.247(a)(1)	20dB Bandwidth	Pass
15.247(a)(1)	Quantity of Hopping Channel	Pass
15.247(a)(1)	Time of Occupancy (Dwell Time)	Pass
15.247(b)(1)	Max Peak output Power test	Pass
15.247(d)	Band edge test	Pass
15.207	AC Power Conducted Emission	Pass
15.247(d)	Radiated Emission	Pass
§15.247(d)	Antenna Port Emission	Pass
15.203&15.247(b)	Antenna Application	Pass
N/A	99%dB Bandwidth	Pass

4. Conducted Emissions Test

4.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m 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 # 4					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/17/2014	05/16/2015
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/17/2014	05/16/2015
50ΩCoaxial Switch	Anritsu	MP59B	M20531	05/17/2014	05/16/2015

4.4 Conducted Emission Limit

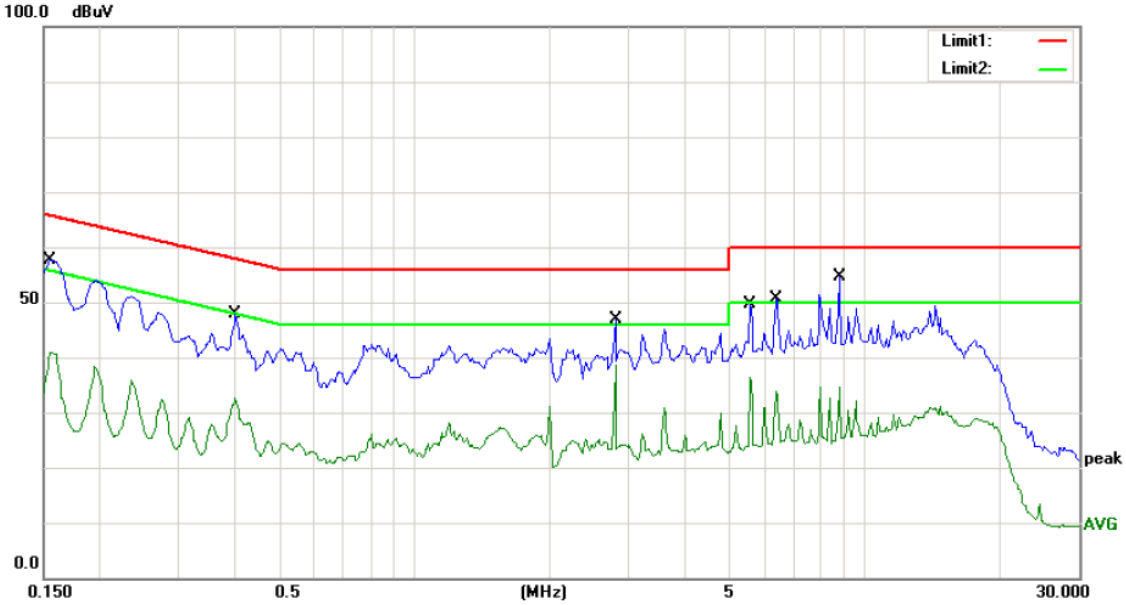
(7) Conducted Emission

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.

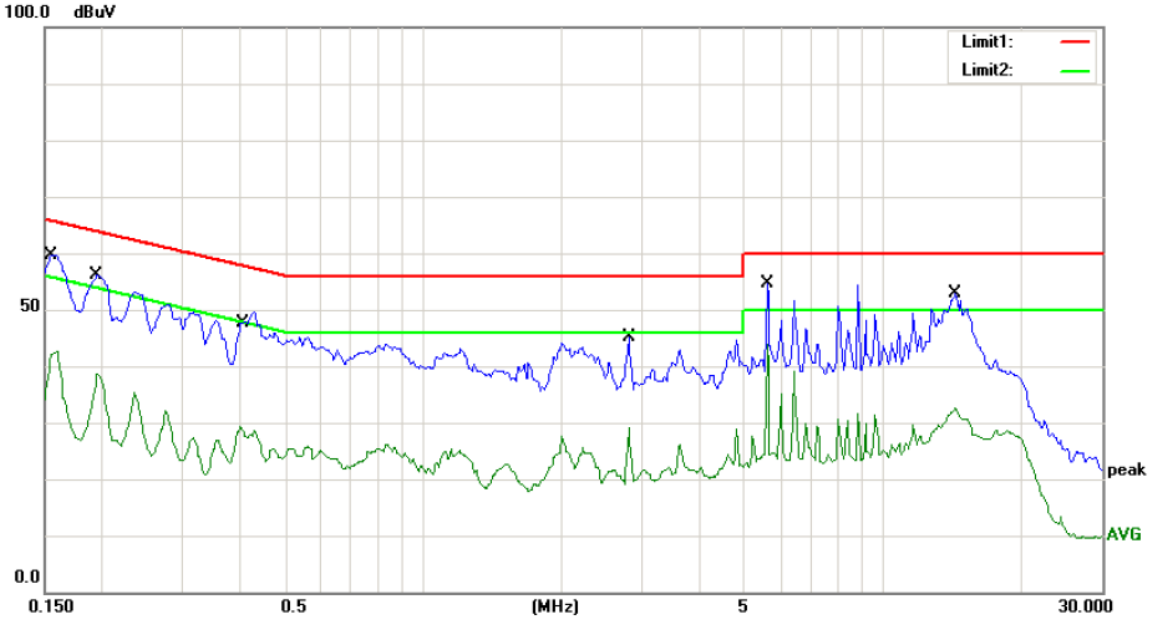
4.5 Measurement Result:



Site Conduction #2 Phase: *L1* Temperature: 26
Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 55 %
EUT: Bluetooth music player
M/N: BTS220B
Mode: BT ON
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1550	57.70	0.00	57.70	65.73	-8.03	QP	
2		0.1550	40.99	0.00	40.99	55.73	-14.74	AVG	
3		0.4000	47.89	0.00	47.89	57.85	-9.96	QP	
4		0.4000	32.56	0.00	32.56	47.85	-15.29	AVG	
5		2.8000	46.99	0.00	46.99	56.00	-9.01	QP	
6		2.8000	38.69	0.00	38.69	46.00	-7.31	AVG	
7		5.5900	49.60	0.00	49.60	60.00	-10.40	QP	
8		5.5900	36.35	0.00	36.35	50.00	-13.65	AVG	
9		6.3800	50.69	0.00	50.69	60.00	-9.31	QP	
10		6.3800	33.76	0.00	33.76	50.00	-16.24	AVG	
11	*	8.8100	54.60	0.00	54.60	60.00	-5.40	QP	
12		8.8100	34.62	0.00	34.62	50.00	-15.38	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: Cai



Site Conduction #2 Phase: *N* Temperature: 26
Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 55 %
EUT: Bluetooth music player
M/N: BTS220B
Mode: BT ON
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1550	59.60	0.00	59.60	65.73	-6.13	QP	
2		0.1550	42.63	0.00	42.63	55.73	-13.10	AVG	
3		0.1950	56.14	0.00	56.14	63.82	-7.68	QP	
4		0.1950	38.63	0.00	38.63	53.82	-15.19	AVG	
5		0.4000	29.46	0.00	29.46	47.85	-18.39	AVG	
6		0.4000	49.65	0.00	49.65	57.85	-8.20	QP	
7		2.8000	45.19	0.00	45.19	56.00	-10.81	QP	
8		2.8000	29.21	0.00	29.21	46.00	-16.79	AVG	
9	*	5.6100	54.51	0.00	54.51	60.00	-5.49	QP	
10		5.6100	43.92	0.00	43.92	50.00	-6.08	AVG	
11		14.4000	52.90	0.00	52.90	60.00	-7.10	QP	
12		14.4000	32.69	0.00	32.69	50.00	-17.31	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver. Operator: Cai

5. Radiated Emission Test

5.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m 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 30 MHz to 1GHz setting resolution bandwidth 100 kHz, video bandwidth 300kHz, detector is QP. And spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz, detector is PK and AV.

When spectrum scanned from 30 MHz to 1GHz setting resolution bandwidth 120 kHz and video bandwidth 300kHz.

EMI Test Receiver	Setting
Attenuation	Auto
RB	120kHz
VB	300kHz
Detector	QP
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz.

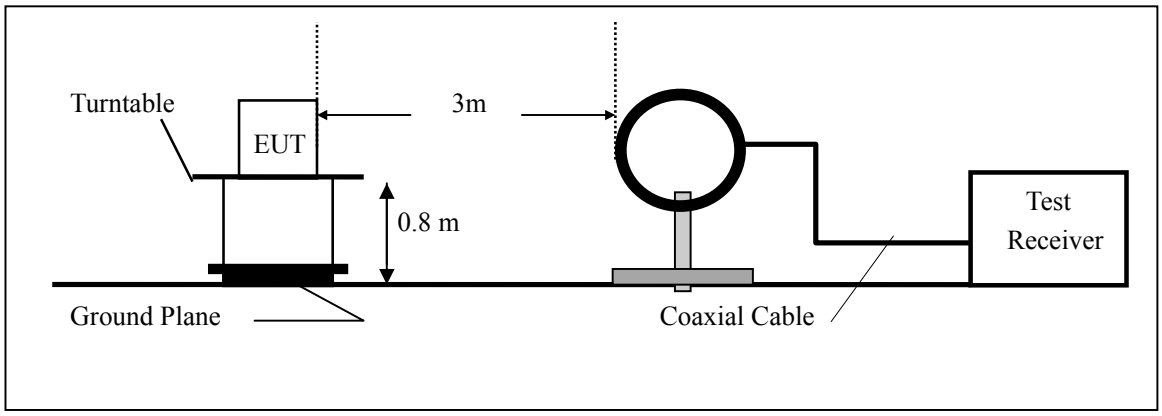
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz.

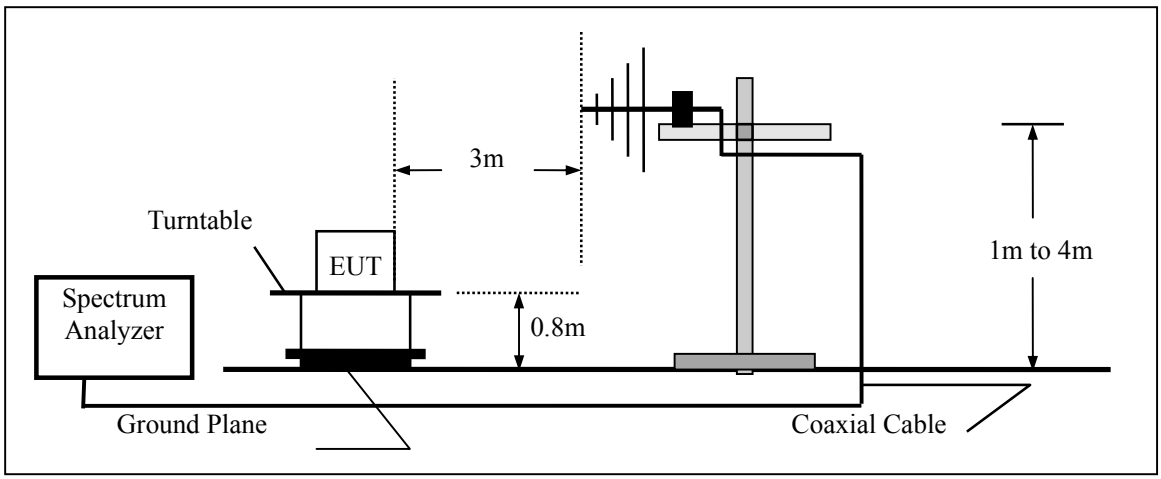
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	AVG
Trace	Max hold

5.2 Test SET-UP (Block Diagram of Configuration)

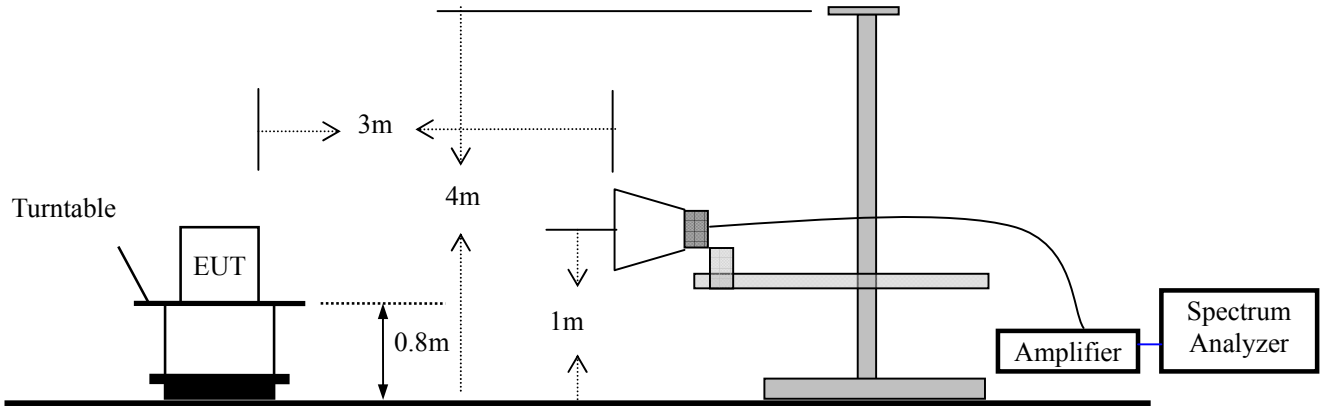
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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

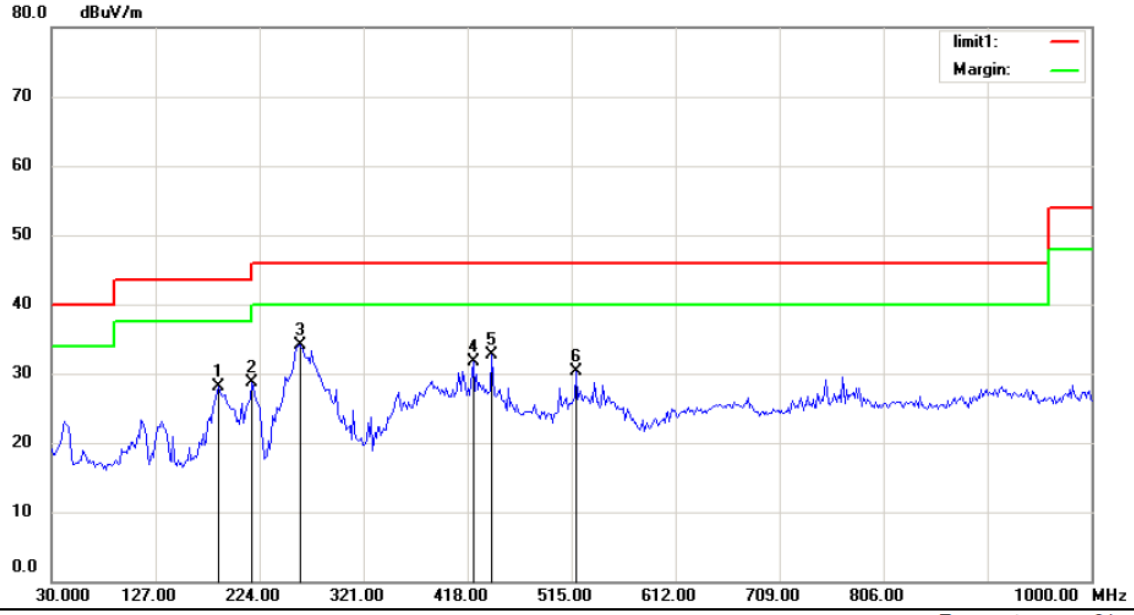


5.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSP7	839511/010	05/17/2014	05/16/2015
Spectrum Analyzer	HP	E4407B	839840481	05/17/2014	05/16/2015
EMI Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/17/2014	05/16/2015
Pre-Amplifier	HP	8447D	2944A07999	05/17/2014	05/16/2015
Bilog Antenna	Schwarzbeck	VULB9163	142	05/17/2014	05/16/2015
Loop Antenna	ARA	PLA-1030/B	1029	05/17/2014	05/16/2015
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/17/2014	05/16/2015
Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/17/2014	05/16/2015

5.4 Measurement Result

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 limits.



Site 3m Chamber #1 Polarization: *Horizontal* Temperature: 24

Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %

EUT: Bluetooth music player

M/N: BTS220B

Mode:GFSK(2402)

Note:

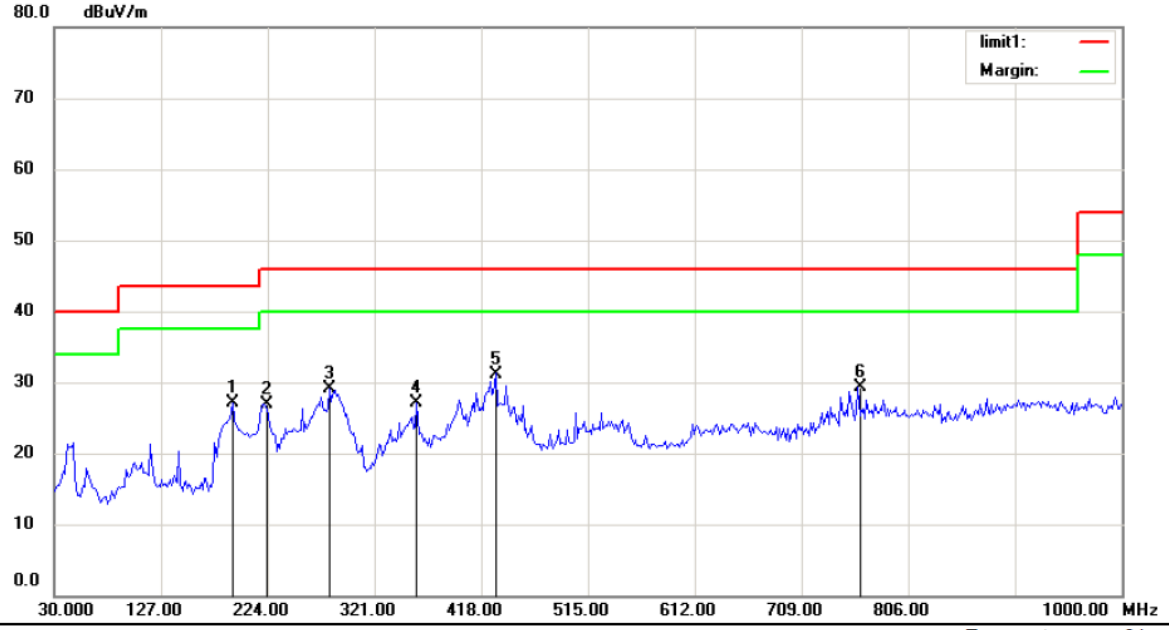
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		185.4487	18.66	9.42	28.08	43.50	-15.42	QP			
2		216.5383	17.78	10.86	28.64	46.00	-17.36	QP			
3	*	261.6184	19.45	14.58	34.03	46.00	-11.97	QP			
4		423.2851	13.17	18.47	31.64	46.00	-14.36	QP			
5		440.3845	15.49	17.26	32.75	46.00	-13.25	QP			
6		519.6634	8.85	21.42	30.27	46.00	-15.73	QP			

*:Maximum data x:Over limit I:over margin Operator: ZHL

Site 3m Chamber #1 Polarization: *Vertical* Temperature: 24
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: Bluetooth music player
M/N: BTS220B
Mode:GFSK(2402)
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		39.3270	13.55	15.05	28.60	40.00	-11.40	QP			
2		145.0320	19.85	8.84	28.69	43.50	-14.81	QP			
3	*	191.6665	22.37	10.29	32.66	43.50	-10.84	QP			
4		264.7275	14.64	14.60	29.24	46.00	-16.76	QP			
5		423.2851	14.34	18.47	32.81	46.00	-13.19	QP			
6		519.6634	6.21	21.42	27.63	46.00	-18.37	QP			

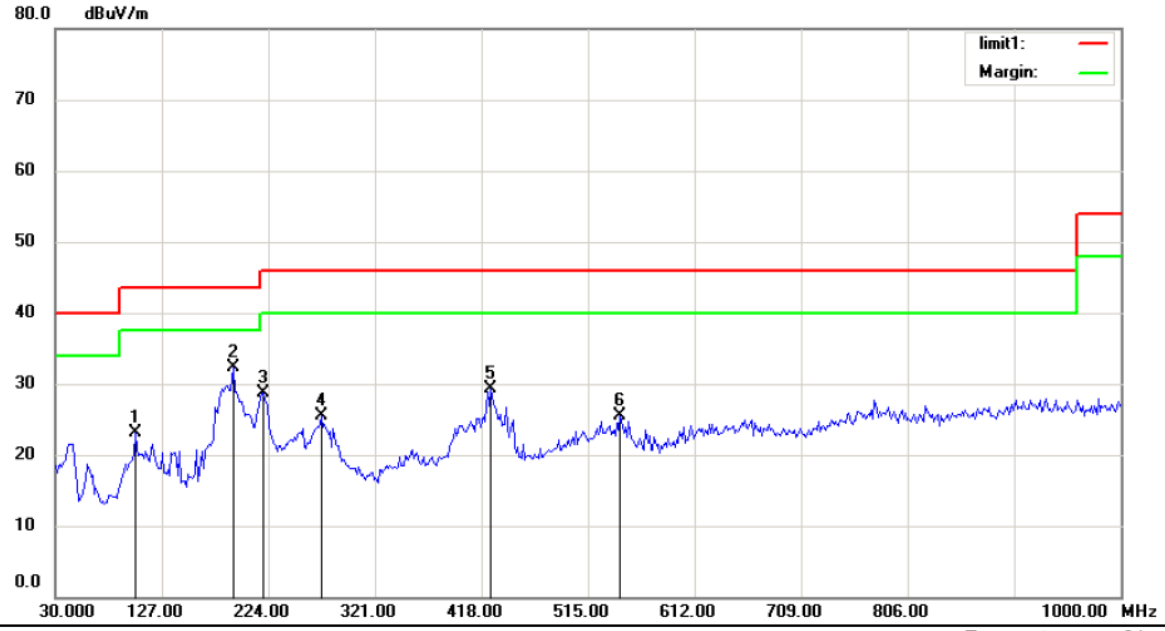
*:Maximum data x:Over limit !:over margin Operator: ZHL



Site 3m Chamber #1 Polarization: *Horizontal* Temperature: 24
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: Bluetooth music player
M/N: BTS220B
Mode:GFSK(2441)
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		191.6665	16.80	10.29	27.09	43.50	-16.41	QP			
2		221.2020	15.80	11.03	26.83	46.00	-19.17	QP			
3		280.2724	14.13	14.97	29.10	46.00	-16.90	QP			
4		359.5511	10.18	17.00	27.18	46.00	-18.82	QP			
5	*	431.0575	13.19	18.01	31.20	46.00	-14.80	QP			
6		760.6090	4.75	24.48	29.23	46.00	-16.77	QP			

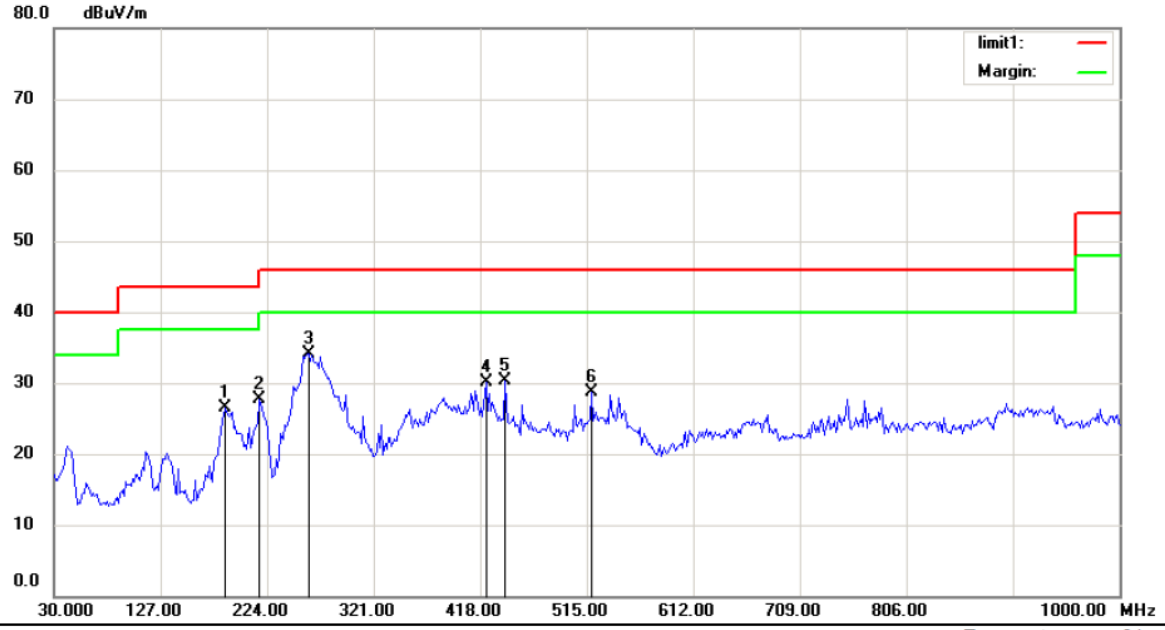
*:Maximum data x:Over limit !:over margin Operator: ZHL



Site 3m Chamber #1 Polarization: *Vertical* Temperature: 24
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: Bluetooth music player
M/N: BTS220B
Mode:GFSK(2441)
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		103.0608	10.31	12.87	23.18	43.50	-20.32	QP			
2	*	191.6665	22.00	10.29	32.29	43.50	-11.21	QP			
3		219.6474	17.85	10.94	28.79	46.00	-17.21	QP			
4		272.5000	10.42	15.04	25.46	46.00	-20.54	QP			
5		426.3942	11.00	18.31	29.31	46.00	-16.69	QP			
6		544.5352	4.77	20.67	25.44	46.00	-20.56	QP			

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



Site 3m Chamber #1 Polarization: *Horizontal* Temperature: 24
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: Bluetooth music player
M/N: BTS220B
Mode: GFSK(2480)
Note:

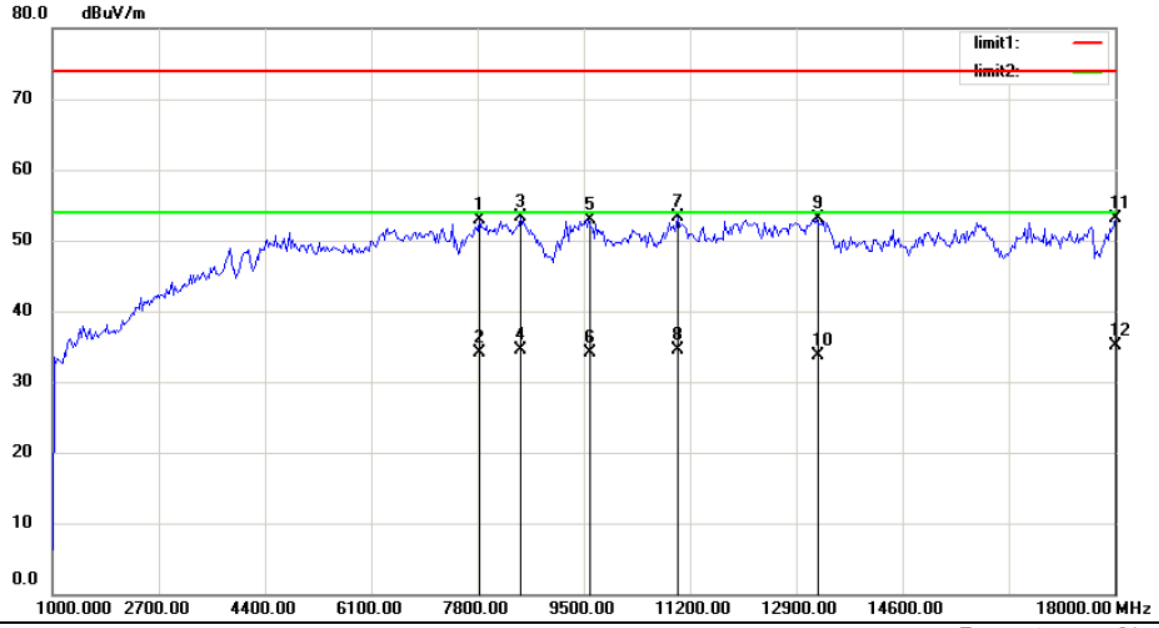
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		185.4487	17.16	9.42	26.58	43.50	-16.92	QP			
2		216.5383	16.78	10.86	27.64	46.00	-18.36	QP			
3	*	261.6184	19.45	14.58	34.03	46.00	-11.97	QP			
4		423.2851	11.67	18.47	30.14	46.00	-15.86	QP			
5		440.3845	12.99	17.26	30.25	46.00	-15.75	QP			
6		519.6634	7.35	21.42	28.77	46.00	-17.23	QP			

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

Site 3m Chamber #1 Polarization: *Vertical* Temperature: 24
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: Bluetooth music player
M/N: BTS220B
Mode:GFSK(2480)
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		39.3270	11.55	15.05	26.60	40.00	-13.40	QP			
2	*	191.6665	21.87	10.29	32.16	43.50	-11.34	QP			
3		264.7275	14.14	14.60	28.74	46.00	-17.26	QP			
4		413.9583	12.42	18.80	31.22	46.00	-14.78	QP			
5		423.2851	14.34	18.47	32.81	46.00	-13.19	QP			
6		519.6634	6.71	21.42	28.13	46.00	-17.87	QP			

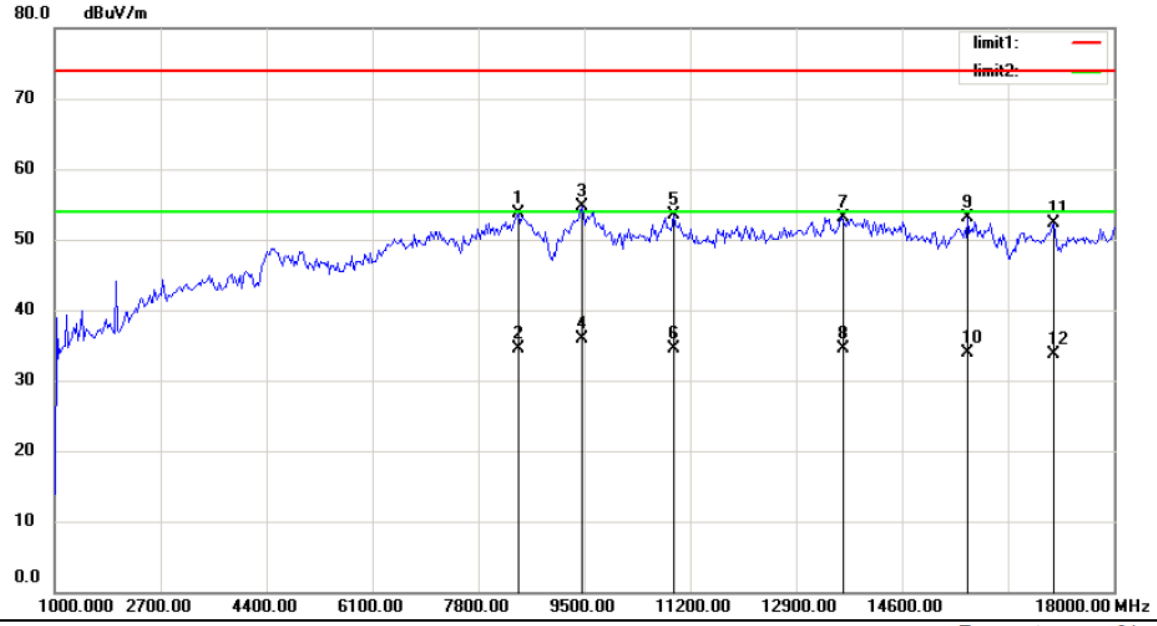
*:Maximum data x:Over limit !:over margin Operator: ZHL



Site 3m Chamber #1 Polarization: *Horizontal* Temperature: 24
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: Bluetooth music player
M/N: BTS220B
Mode:GFSK(2402)
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		7838.141	42.89	10.01	52.90	74.00	-21.10	peak			
2		7838.141	24.10	10.01	34.11	54.00	-19.89	AVG			
3		8491.987	40.21	13.14	53.35	74.00	-20.65	peak			
4		8491.987	21.30	13.14	34.44	54.00	-19.56	AVG			
5		9581.731	36.46	16.52	52.98	74.00	-21.02	peak			
6		9581.731	17.50	16.52	34.02	54.00	-19.98	AVG			
7		10998.39	34.61	18.69	53.30	74.00	-20.70	peak			
8		10998.39	15.90	18.69	34.59	54.00	-19.41	AVG			
9		13232.37	34.68	18.37	53.05	74.00	-20.95	peak			
10		13232.37	15.30	18.37	33.67	54.00	-20.33	AVG			
11		18000.00	25.34	27.78	53.12	74.00	-20.88	peak			
12	*	18000.00	7.40	27.78	35.18	54.00	-18.82	AVG			

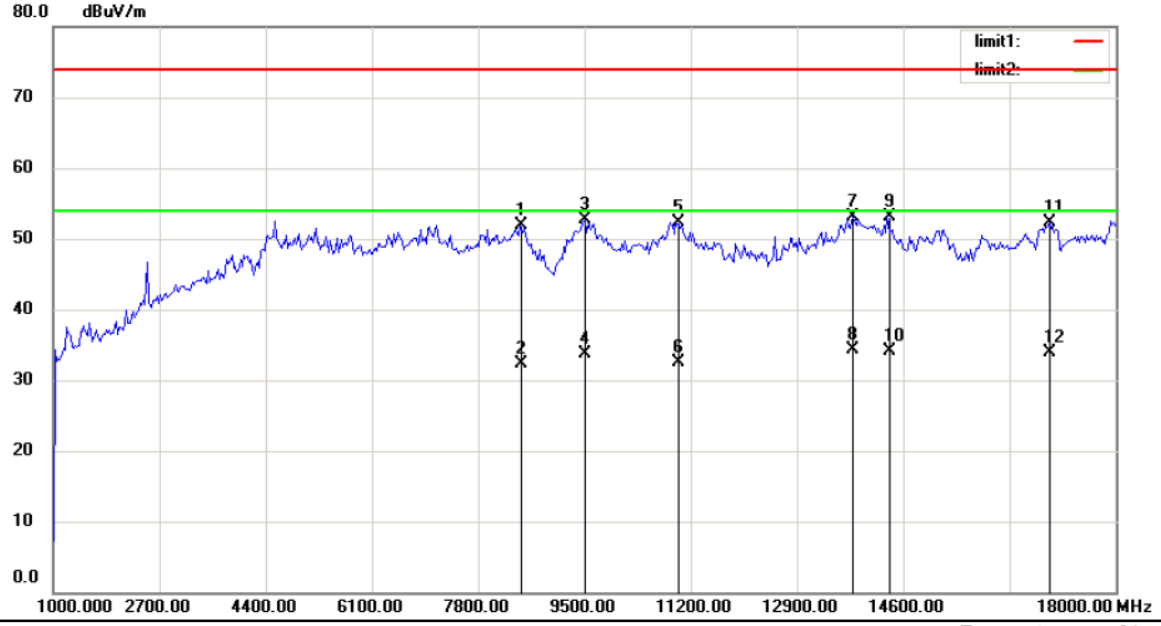
*:Maximum data x:Over limit !:over margin Operator: ZHL



Site 3m Chamber #1 Polarization: *Vertical* Temperature: 24
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: Bluetooth music player
M/N: BTS220B
Mode:GFSK(2402)
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		8437.500	40.77	12.88	53.65	74.00	-20.35	peak			
2		8437.500	21.70	12.88	34.58	54.00	-19.42	AVG			
3		9472.756	38.27	16.51	54.78	74.00	-19.22	peak			
4	*	9472.756	19.30	16.51	35.81	54.00	-18.19	AVG			
5		10943.91	35.19	18.33	53.52	74.00	-20.48	peak			
6		10943.91	16.20	18.33	34.53	54.00	-19.47	AVG			
7		13641.02	33.57	19.58	53.15	74.00	-20.85	peak			
8		13641.02	14.90	19.58	34.48	54.00	-19.52	AVG			
9		15657.05	31.83	21.31	53.14	74.00	-20.86	peak			
10		15657.05	12.50	21.31	33.81	54.00	-20.19	AVG			
11		17046.47	26.76	25.52	52.28	74.00	-21.72	peak			
12		17046.47	8.20	25.52	33.72	54.00	-20.28	AVG			

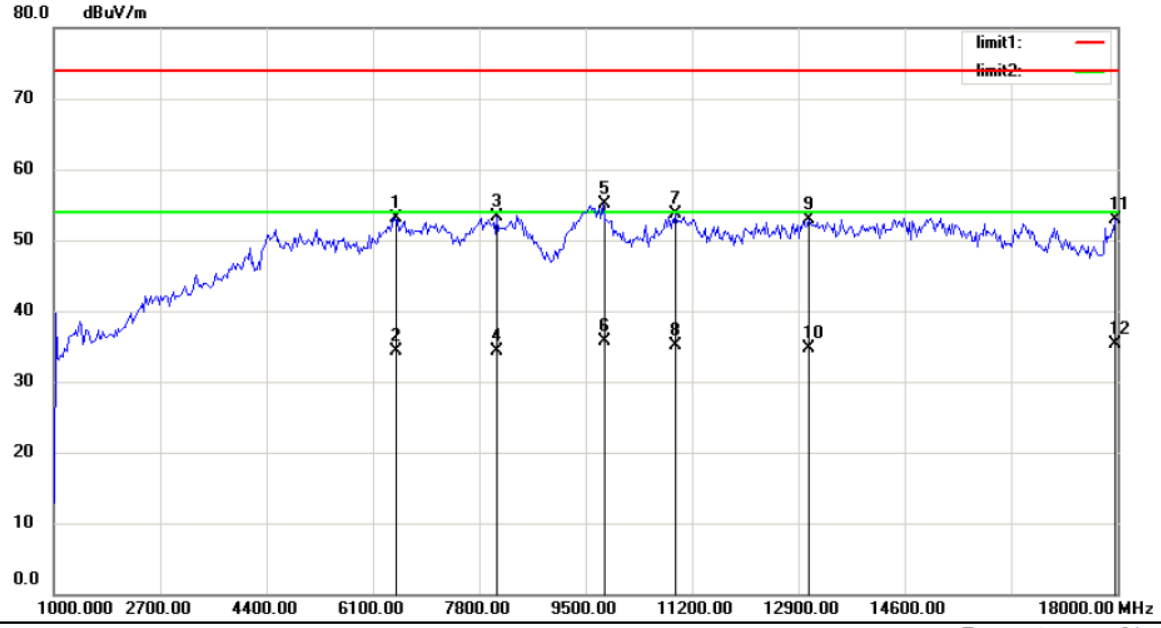
*:Maximum data x:Over limit !:over margin Operator: ZHL



Site 3m Chamber #1 Polarization: *Horizontal* Temperature: 24
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: Bluetooth music player
M/N: BTS220B
Mode:GFSK(2441)
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		8464.744	38.87	13.01	51.88	74.00	-22.12	peak			
2		8464.744	19.20	13.01	32.21	54.00	-21.79	AVG			
3		9500.000	35.78	16.94	52.72	74.00	-21.28	peak			
4		9500.000	16.80	16.94	33.74	54.00	-20.26	AVG			
5		10971.15	33.81	18.51	52.32	74.00	-21.68	peak			
6		10971.15	14.00	18.51	32.51	54.00	-21.49	AVG			
7		13804.48	33.03	20.01	53.04	74.00	-20.96	peak			
8	*	13804.48	14.20	20.01	34.21	54.00	-19.79	AVG			
9		14349.35	32.67	20.35	53.02	74.00	-20.98	peak			
10		14349.35	13.70	20.35	34.05	54.00	-19.95	AVG			
11		16937.50	27.25	24.99	52.24	74.00	-21.76	peak			
12		16937.50	8.90	24.99	33.89	54.00	-20.11	AVG			

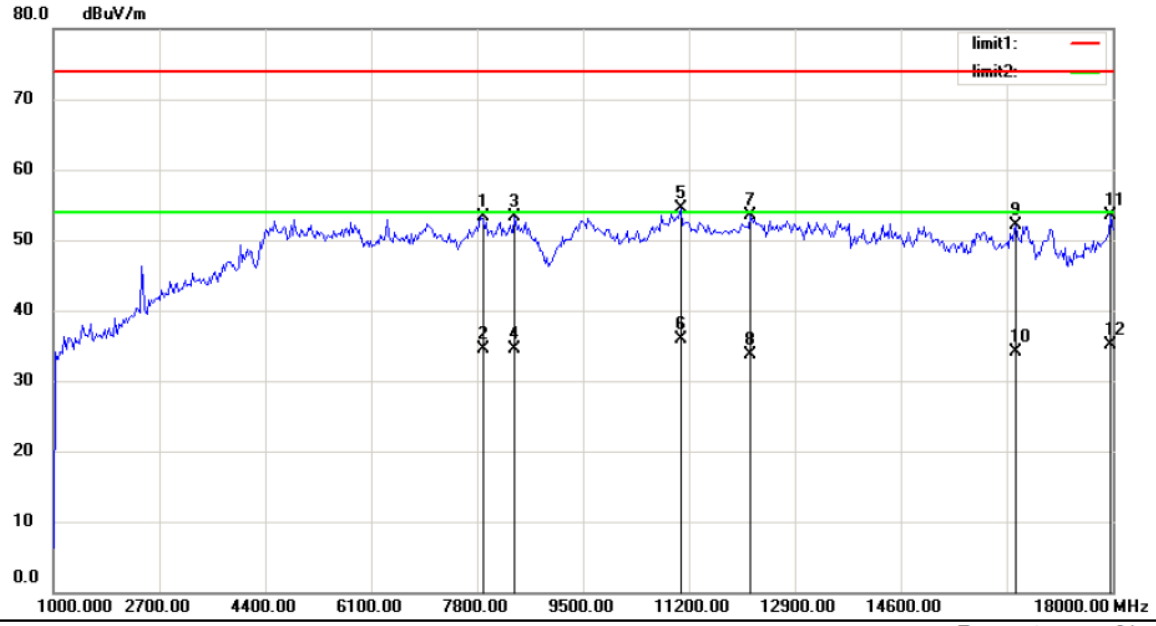
*:Maximum data x:Over limit !:over margin Operator: ZHL



Site 3m Chamber #1 Polarization: *Vertical* Temperature: 24
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: Bluetooth music player
M/N: BTS220B
Mode:GFSK(2441)
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		6448.718	46.06	6.97	53.03	74.00	-20.97	peak			
2		6448.718	27.40	6.97	34.37	54.00	-19.63	AVG			
3		8083.333	42.08	11.18	53.26	74.00	-20.74	peak			
4		8083.333	23.20	11.18	34.38	54.00	-19.62	AVG			
5		9772.436	39.49	15.54	55.03	74.00	-18.97	peak			
6	*	9772.436	20.10	15.54	35.64	54.00	-18.36	AVG			
7		10943.91	35.43	18.33	53.76	74.00	-20.24	peak			
8		10943.91	16.70	18.33	35.03	54.00	-18.97	AVG			
9		13068.91	35.08	17.86	52.94	74.00	-21.06	peak			
10		13068.91	16.80	17.86	34.66	54.00	-19.34	AVG			
11		17972.75	25.08	27.82	52.90	74.00	-21.10	peak			
12		17972.75	7.40	27.82	35.22	54.00	-18.78	AVG			

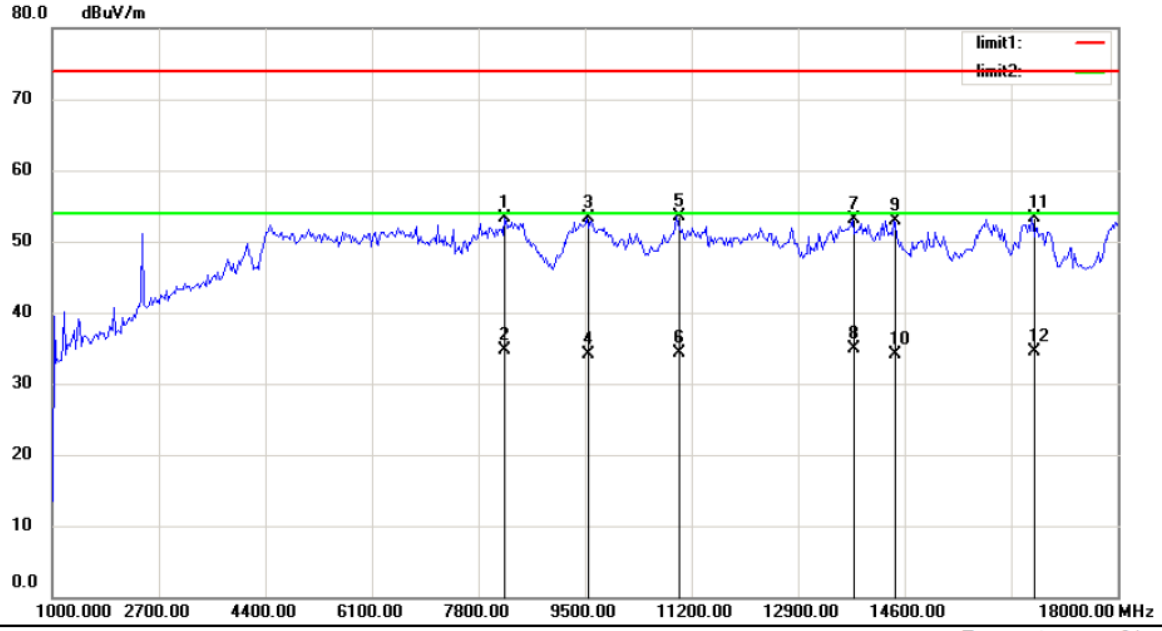
*:Maximum data x:Over limit !:over margin Operator: ZHL



Site 3m Chamber #1 Polarization: *Horizontal* Temperature: 24
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: Bluetooth music player
M/N: BTS220B
Mode:GFSK(2480)
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		7865.385	43.17	10.14	53.31	74.00	-20.69	peak			
2		7865.385	24.30	10.14	34.44	54.00	-19.56	AVG			
3		8410.256	40.56	12.74	53.30	74.00	-20.70	peak			
4		8410.256	21.70	12.74	34.44	54.00	-19.56	AVG			
5		11080.12	36.16	18.34	54.50	74.00	-19.50	peak			
6	*	11080.12	17.50	18.34	35.84	54.00	-18.16	AVG			
7		12197.11	36.99	16.57	53.56	74.00	-20.44	peak			
8		12197.11	17.20	16.57	33.77	54.00	-20.23	AVG			
9		16447.11	28.91	23.25	52.16	74.00	-21.84	peak			
10		16447.11	10.80	23.25	34.05	54.00	-19.95	AVG			
11		17972.75	25.77	27.82	53.59	74.00	-20.41	peak			
12		17972.75	7.30	27.82	35.12	54.00	-18.88	AVG			

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



Site 3m Chamber #1 Polarization: *Vertical* Temperature: 24
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: 53 %
EUT: Bluetooth music player
M/N: BTS220B
Mode:GFSK(2480)
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		8219.551	41.44	11.83	53.27	74.00	-20.73	peak			
2		8219.551	22.90	11.83	34.73	54.00	-19.27	AVG			
3		9527.244	36.52	16.80	53.32	74.00	-20.68	peak			
4		9527.244	17.30	16.80	34.10	54.00	-19.90	AVG			
5		10971.15	34.98	18.51	53.49	74.00	-20.51	peak			
6		10971.15	15.70	18.51	34.21	54.00	-19.79	AVG			
7		13777.24	33.11	19.95	53.06	74.00	-20.94	peak			
8	*	13777.24	14.90	19.95	34.85	54.00	-19.15	AVG			
9		14431.09	32.59	20.32	52.91	74.00	-21.09	peak			
10		14431.09	13.80	20.32	34.12	54.00	-19.88	AVG			
11		16637.82	29.35	23.88	53.23	74.00	-20.77	peak			
12		16637.82	10.70	23.88	34.58	54.00	-19.42	AVG			

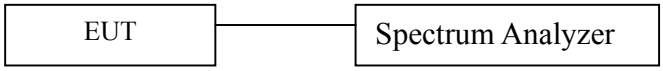
*:Maximum data x:Over limit !:over margin Operator: ZHL

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	05/17/2014	05/16/2015

6.4 Measurement Results:

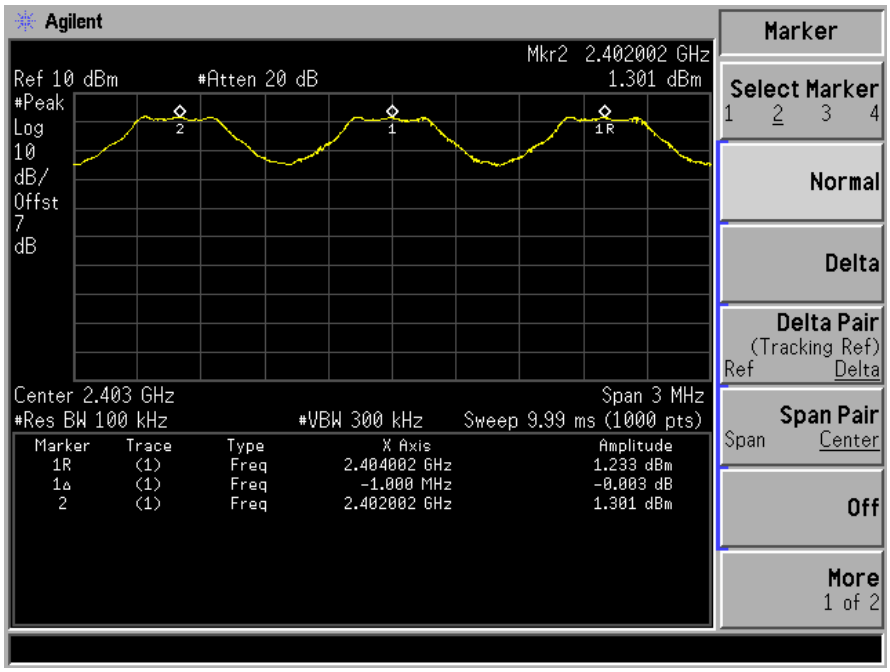
The following table is the setting of spectrum analyzer.

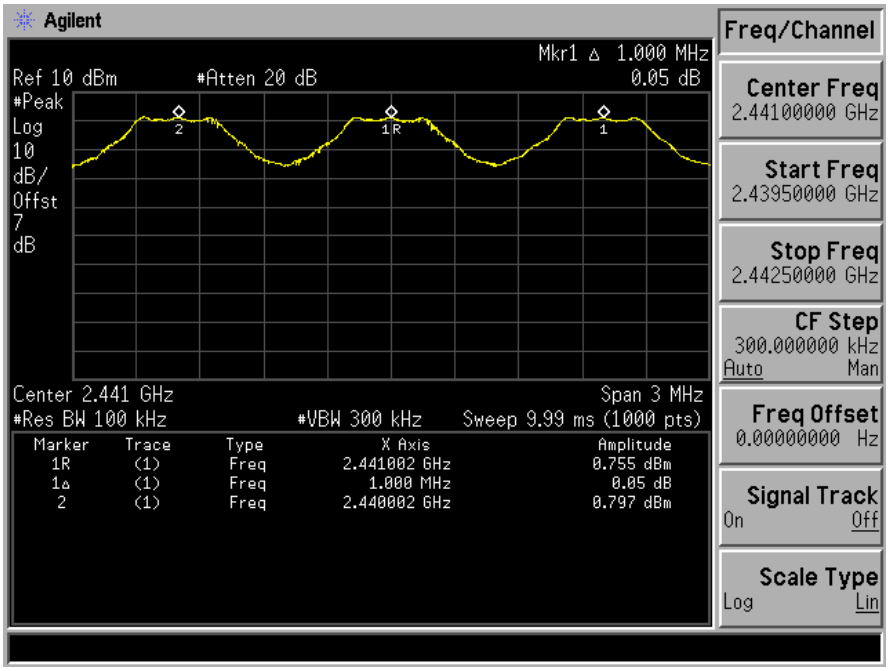
EMI Test Receiver	Setting
Attenuation	Auto
RB	100kHz
VB	300kHz
Detector	Peak
Trace	Max hold

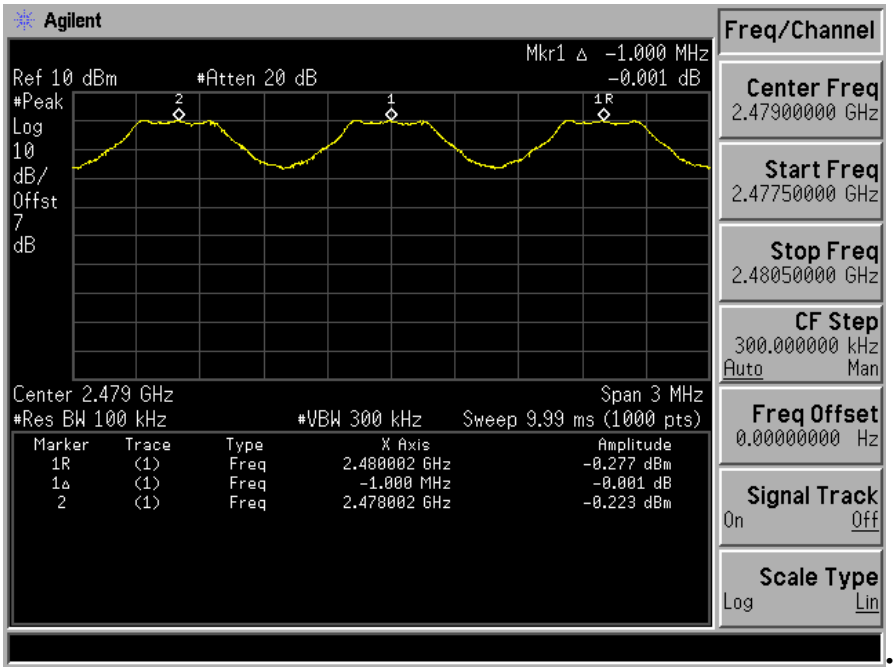
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	August 25, 2014
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)
0	2402	1000.00	>844.050
39	2441	1000.00	>839.308
78	2480	1000.00	>831.438

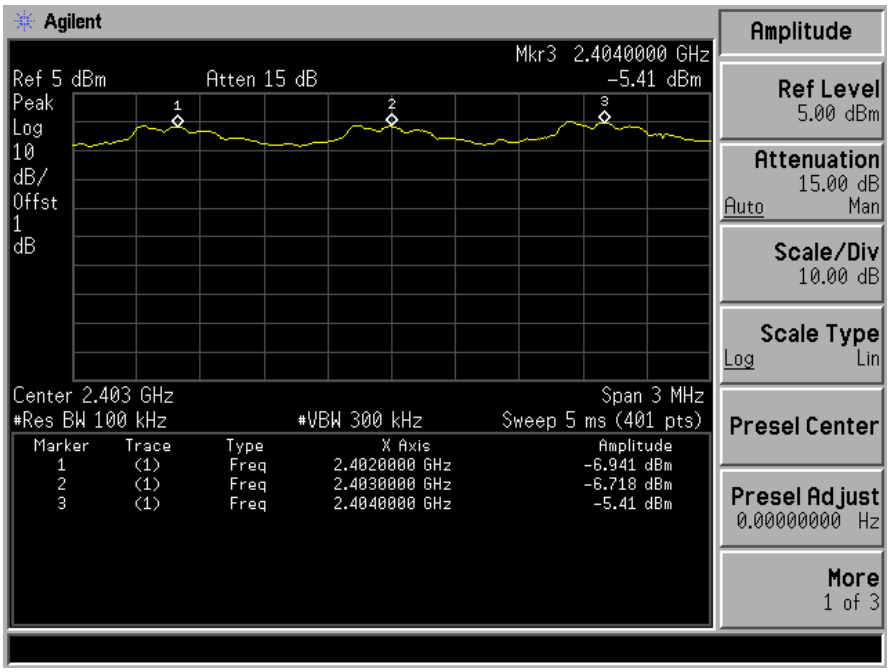


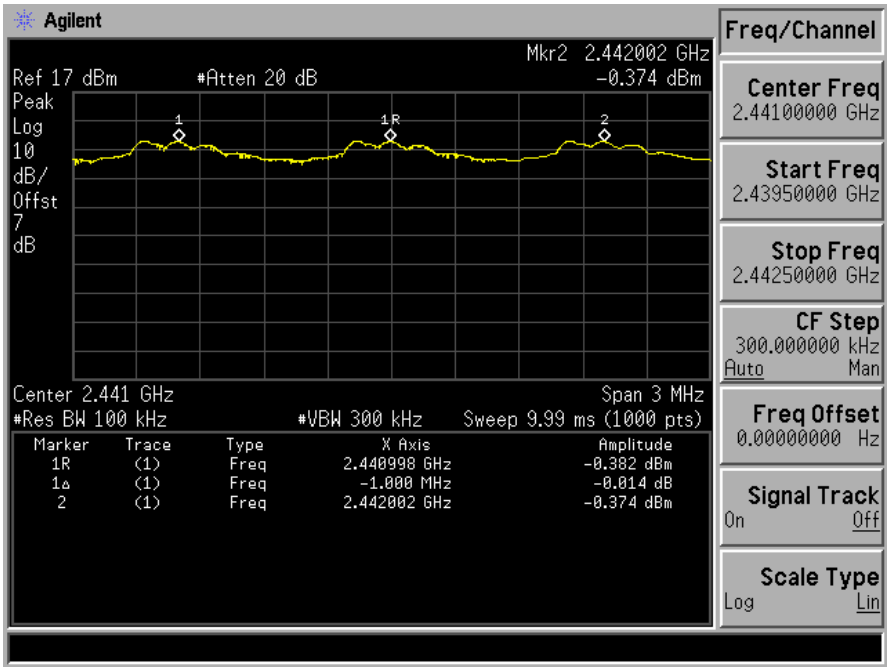

Agilent
Mkr1 Δ 1.000 MHz
Ref 10 dBm
#Atten 20 dB
0.05 dB
#Peak
Log
10
dB/
Offst
7
dB
Center 2.441 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 9.99 ms (1000 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.441002 GHz 0.755 dBm
1Δ (1) Freq 1.000 MHz 0.05 dB
2 (1) Freq 2.440002 GHz 0.797 dBm
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

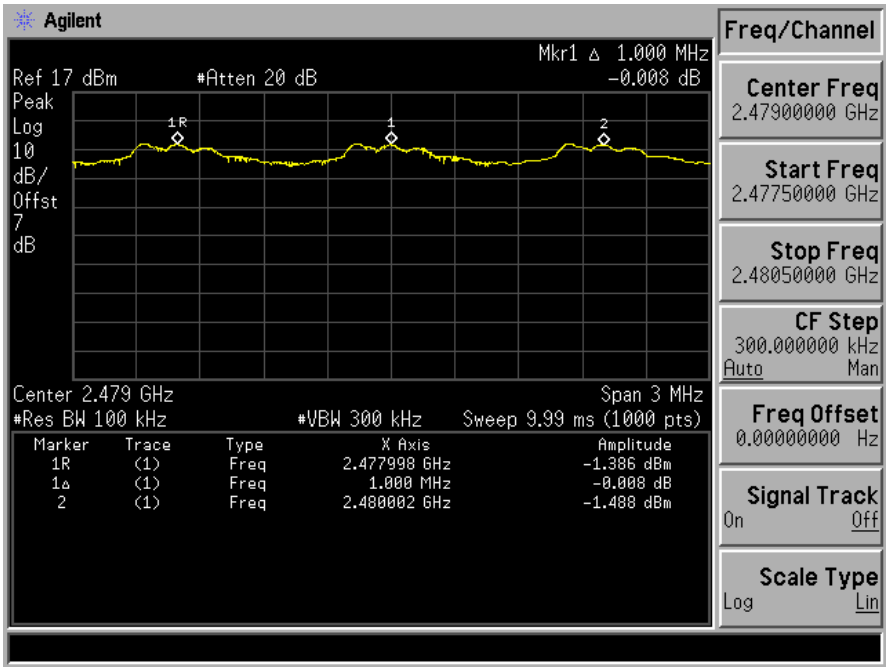

Agilent
Mkr1 Δ -1.000 MHz
Ref 10 dBm
#Atten 20 dB
-0.001 dB
#Peak
Log
10
dB/
Offst
7
dB
Center 2.479 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 9.99 ms (1000 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.480002 GHz -0.277 dBm
1Δ (1) Freq -1.000 MHz -0.001 dB
2 (1) Freq 2.478002 GHz -0.223 dBm
Freq/Channel
Center Freq
2.47900000 GHz
Start Freq
2.47750000 GHz
Stop Freq
2.48050000 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 :	August 25, 2014
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)
0	2402	1000.00	>804.00 kHz
39	2441	1000.00	>802.67 kHz
78	2480	1000.00	> 802.67 kHz

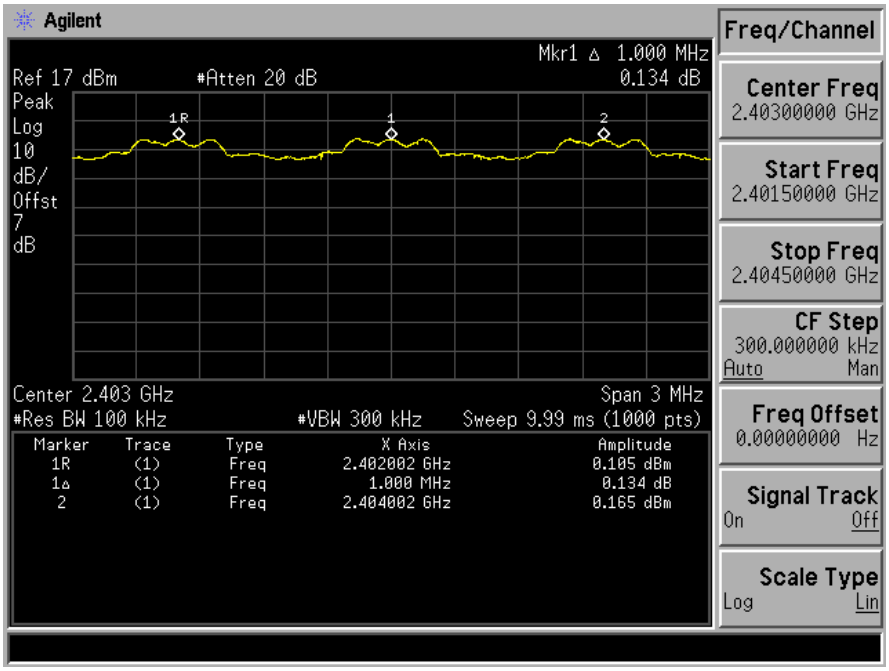


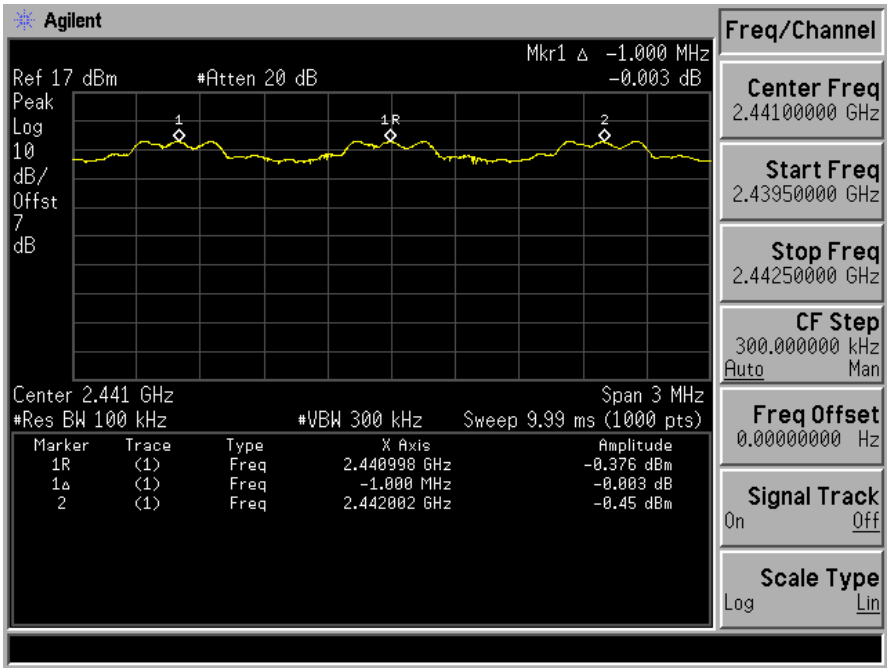

Agilent
Mkr2 2.442002 GHz
Ref 17 dBm
#Atten 20 dB
-0.374 dBm
Peak
Log
10
dB/
Offst
7
dB
Center 2.441 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 9.99 ms (1000 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.440998 GHz -0.382 dBm
1Δ (1) Freq -1.000 MHz -0.014 dB
2 (1) Freq 2.442002 GHz -0.374 dBm
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

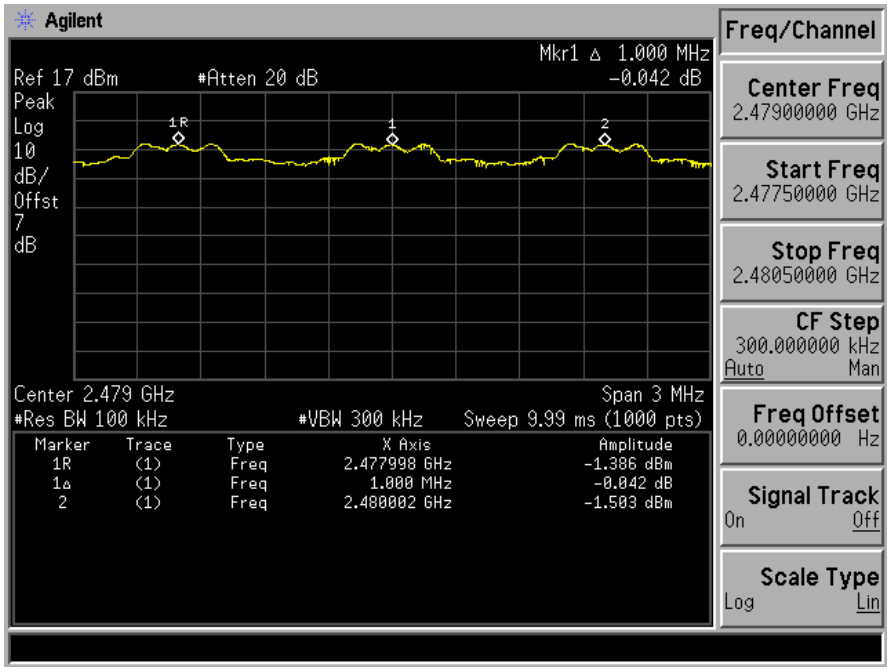

Agilent
Mkr1 Δ 1.000 MHz
Ref 17 dBm
#Atten 20 dB
-0.008 dB
Peak
Log
10
dB/
Offst
7
dB
Center 2.479 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 9.99 ms (1000 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.477998 GHz -1.386 dBm
1Δ (1) Freq 1.000 MHz -0.008 dB
2 (1) Freq 2.480002 GHz -1.488 dBm
Freq/Channel
Center Freq
2.47900000 GHz
Start Freq
2.47750000 GHz
Stop Freq
2.48050000 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 :	August 25, 2014
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)
0	2402	1000.00	>803.33
39	2441	1000.00	>804.00
78	2480	1000.00	>802.00




Agilent
Mkr1 Δ -1.000 MHz
Ref 17 dBm
#Atten 20 dB
-0.003 dB
Peak
Log
10
dB/
Offst
7
dB
Center 2.441 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 9.99 ms (1000 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.440998 GHz -0.376 dBm
1Δ (1) Freq -1.000 MHz -0.003 dB
2 (1) Freq 2.442002 GHz -0.45 dBm
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
Mkr1 Δ 1.000 MHz
Ref 17 dBm
#Atten 20 dB
-0.042 dB
Peak
Log
10
dB/
Offst
7
dB
Center 2.479 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 9.99 ms (1000 pts)
Marker Trace Type X Axis Amplitude
1R (1) Freq 2.477998 GHz -1.386 dBm
1Δ (1) Freq 1.000 MHz -0.042 dB
2 (1) Freq 2.480002 GHz -1.503 dBm
Freq/Channel
Center Freq
2.47900000 GHz
Start Freq
2.47750000 GHz
Stop Freq
2.48050000 GHz
CF Step
300.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

7. Bandwidth test

7.1 Measurement Procedure

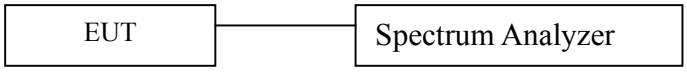
1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

2 Set to the maximum power setting and enable the EUT transmit continuously

3. Make the measurement with the spectrum analyzer 's resolution bandwidth (RBW) = 30 kHz.Set the Video bandwidth (VBW) = 100 kHz. In order to make an accurate measurement The 20dB bandwidth.

4. Measure and record the results in the test report.

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	05/17/2014	05/16/2015

7.4 Measurement Results:

The following table is the setting of spectrum analyzer.

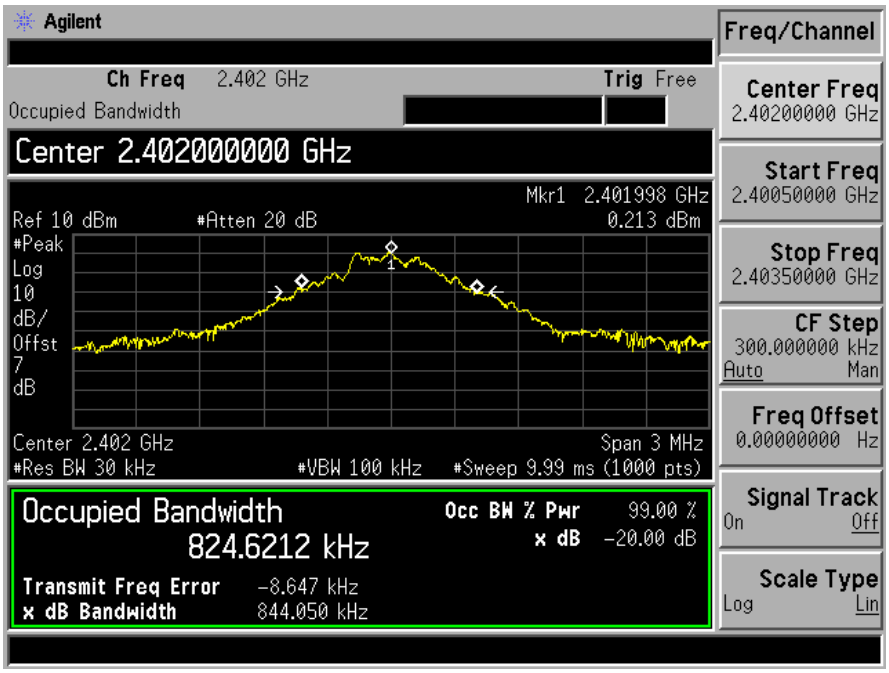
EMI Test Receiver	Setting
Attenuation	Auto
Span	3MHz
RB	30kHz
VB	100kHz
Detector	Peak
Trace	Max hold

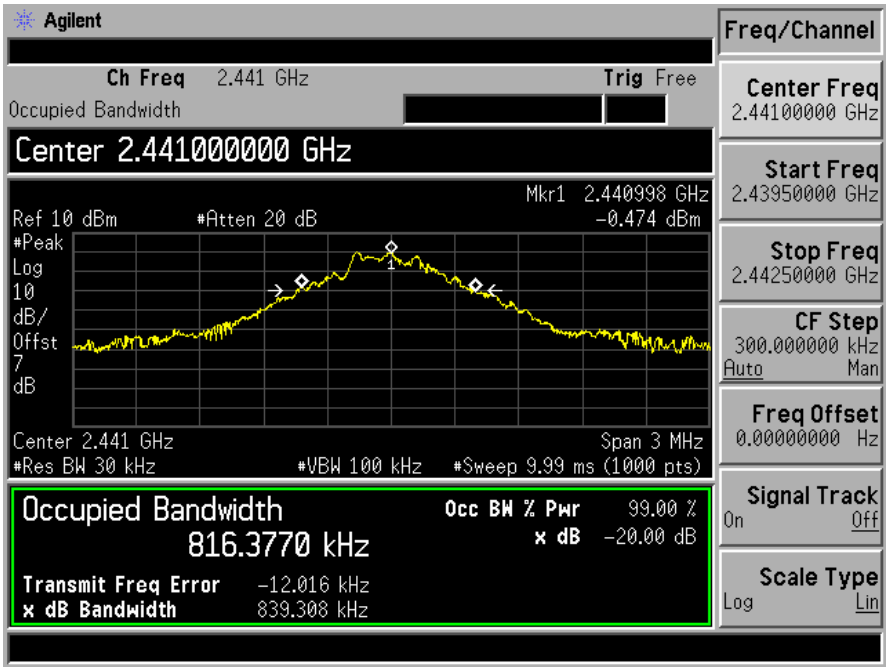
All the modes GFSK, 1/4Π-DQPSK,8DPSK have been tested and the worst result recorded in the following pages.

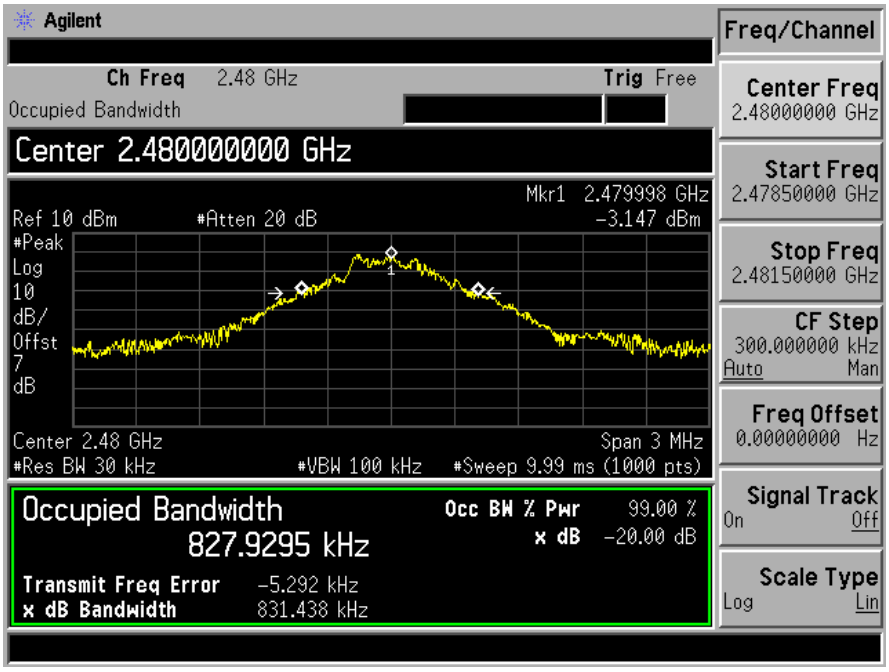
7.4.1. 20dB Bandwidth test data Chart:
Refer to attached data chart.

Spectrum Detector:	PK	Test Date:	August 25, 2014
Test By:	Andy	Temperature:	28 ℃
Test Result:	PASS	Humidity:	65 %
Modulation:	GFSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
0	2402	844.050
39	2441	839.308
78	2480	831.438

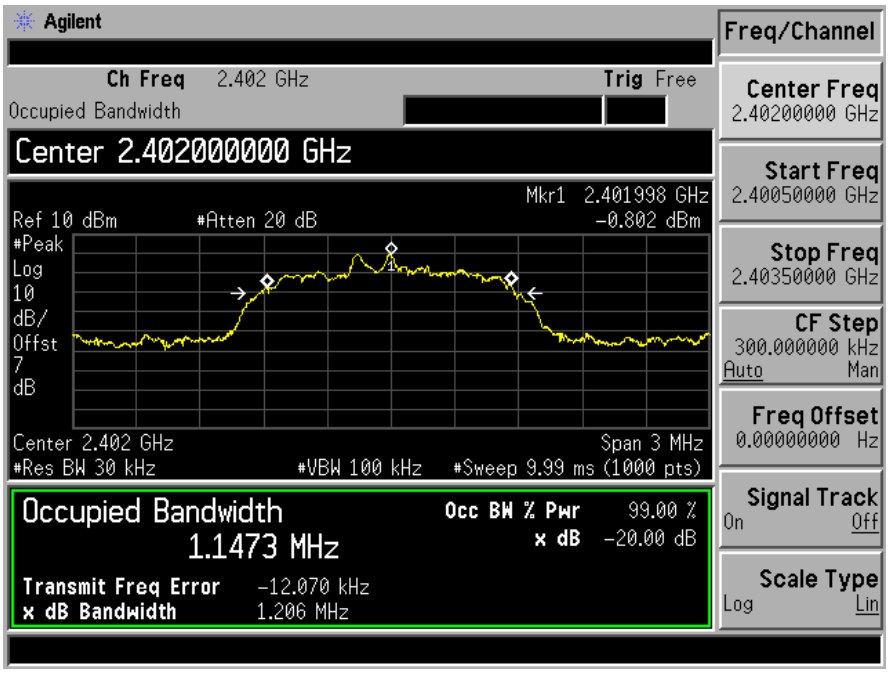


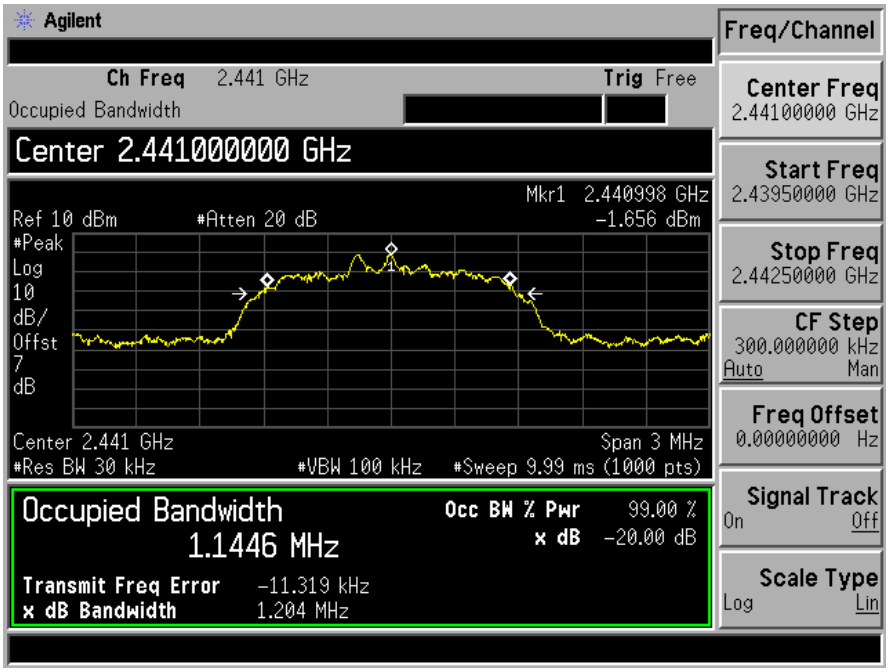

Agilent
Freq/Channel
Ch Freq 2.441 GHz
Trig Free
Occupied Bandwidth
Center 2.441000000 GHz
Center Freq
2.44100000 GHz
Start Freq
2.43950000 GHz
Stop Freq
2.44250000 GHz
CF Step
300.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin
Mkr1 2.440998 GHz
Ref 10 dBm
#Atten 20 dB
-0.474 dBm
#Peak
Log
10
dB/
Offst
7
dB
Center 2.441 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
#Sweep 9.99 ms (1000 pts)
Occupied Bandwidth
816.3770 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -12.016 kHz
x dB Bandwidth 839.308 kHz

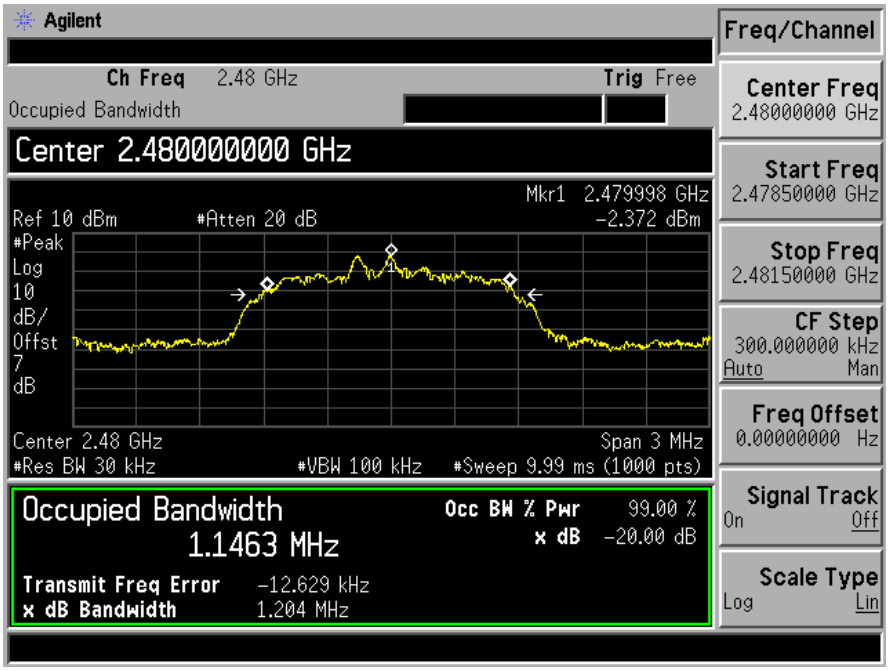

Agilent
Freq/Channel
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
Center 2.480000000 GHz
Center Freq
2.48000000 GHz
Start Freq
2.47850000 GHz
Stop Freq
2.48150000 GHz
CF Step
300.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin
Mkr1 2.479998 GHz
Ref 10 dBm
#Atten 20 dB
-3.147 dBm
#Peak
Log
10
dB/
Offst
7
dB
Center 2.48 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
#Sweep 9.99 ms (1000 pts)
Occupied Bandwidth
827.9295 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -5.292 kHz
x dB Bandwidth 831.438 kHz

Spectrum Detector:	PK	Test Date:	August 25, 2014
Test By:	Andy	Temperature:	28 ℃
Test Result:	PASS	Humidity:	65 %
Modulation:	1/4∏-DQPSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
0	2402	1206.00
39	2441	1204.00
78	2480	1204.00

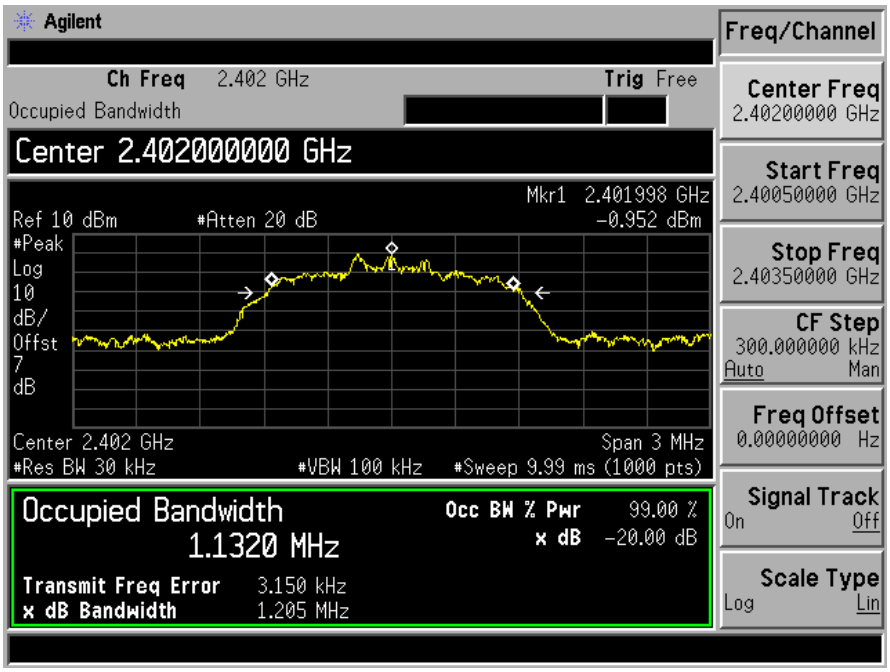


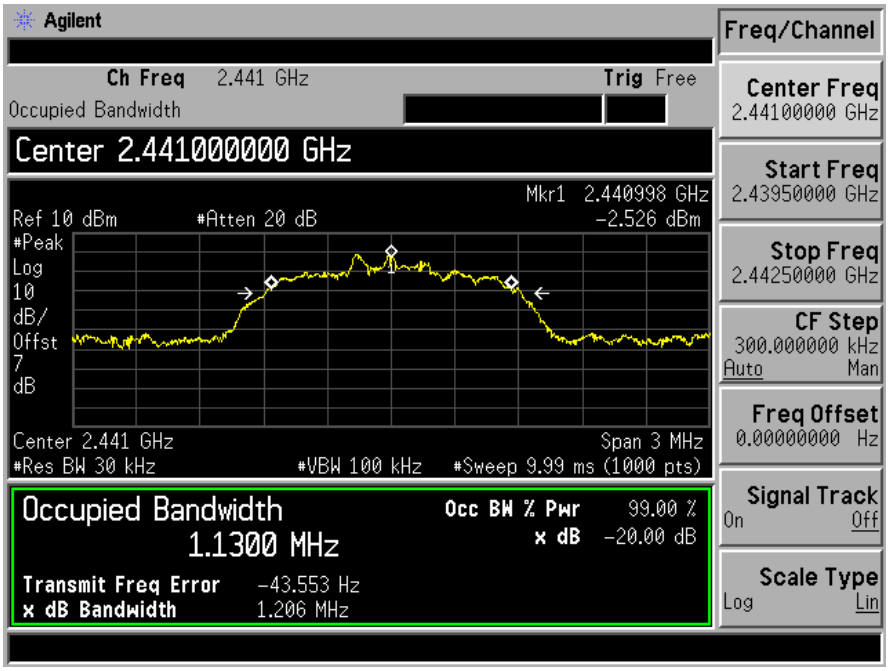

Agilent
Freq/Channel
Ch Freq 2.441 GHz
Trig Free
Occupied Bandwidth
Center 2.441000000 GHz
Center Freq
2.44100000 GHz
Start Freq
2.43950000 GHz
Stop Freq
2.44250000 GHz
CF Step
300.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin
Mkr1 2.440998 GHz
Ref 10 dBm
#Atten 20 dB
-1.656 dBm
#Peak
Log
10
dB/
Offst
7
dB
Center 2.441 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
#Sweep 9.99 ms (1000 pts)
Occupied Bandwidth
1.1446 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -11.319 kHz
x dB Bandwidth 1.204 MHz

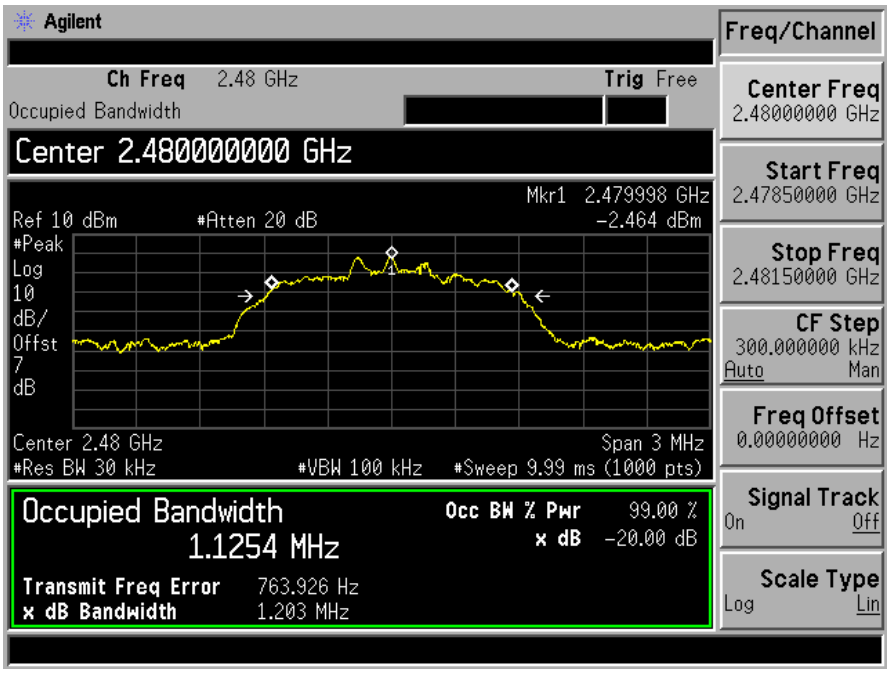

Agilent
Freq/Channel
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
Center 2.480000000 GHz
Center Freq
2.48000000 GHz
Start Freq
2.47850000 GHz
Stop Freq
2.48150000 GHz
CF Step
300.000000 kHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin
Mkr1 2.479998 GHz
Ref 10 dBm
#Atten 20 dB
-2.372 dBm
#Peak
Log
10
dB/
Offst
7
dB
Center 2.48 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
#Sweep 9.99 ms (1000 pts)
Occupied Bandwidth
1.1463 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -12.629 kHz
x dB Bandwidth 1.204 MHz

Spectrum Detector:	PK	Test Date:	August 25, 2014
Test By:	Andy	Temperature:	28 ℃
Test Result:	PASS	Humidity:	65 %
Modulation:	8DPSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
0	2402	1205.00
39	2441	1206.00
78	2480	1203.00




Agilent
Freq/Channel
Ch Freq 2.441 GHz
Trig Free
Occupied Bandwidth
Center 2.441000000 GHz
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
Mkr1 2.440998 GHz
-2.526 dBm
Ref 10 dBm
#Atten 20 dB
#Peak
Log
10
dB/
Offst
7
dB
Center 2.441 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
#Sweep 9.99 ms (1000 pts)
Occupied Bandwidth
1.1300 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -43.553 Hz
x dB Bandwidth 1.206 MHz


Agilent
Freq/Channel
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
Center 2.480000000 GHz
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
Mkr1 2.479998 GHz
-2.464 dBm
Ref 10 dBm
#Atten 20 dB
#Peak
Log
10
dB/
Offst
7
dB
Center 2.48 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
#Sweep 9.99 ms (1000 pts)
Occupied Bandwidth
1.1254 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error 763.926 Hz
x dB Bandwidth 1.203 MHz

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)

EUT — Spectrum Analyzer

8.3 Measurement Equipment Used:

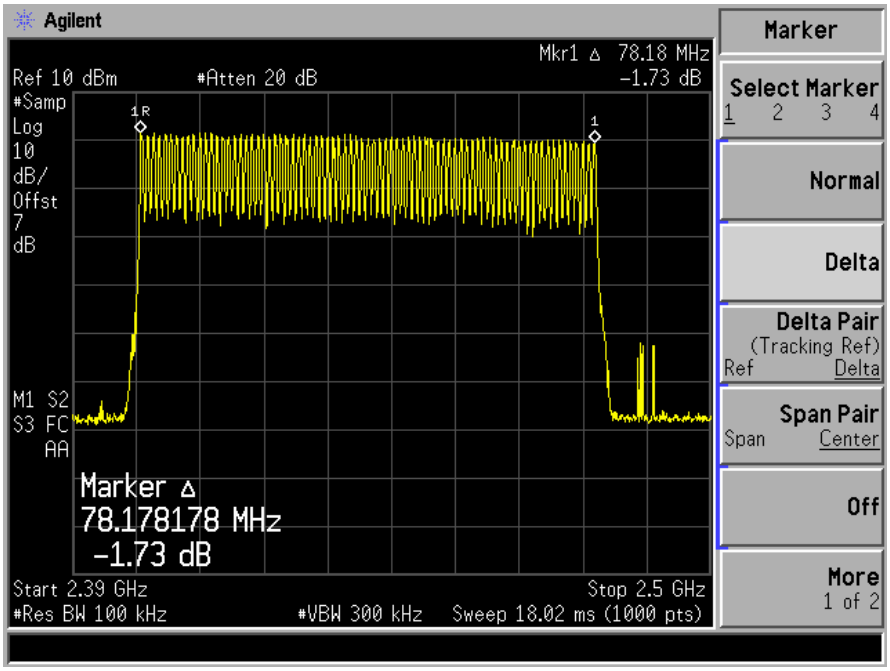
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	88156318	05/17/2014	05/16/2015

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 :	August 25, 2014
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

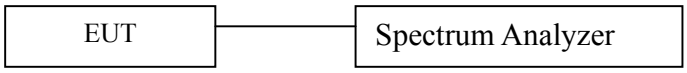


9. Time of Occupancy (Dwell Time) test

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	05/17/2014	05/16/2015

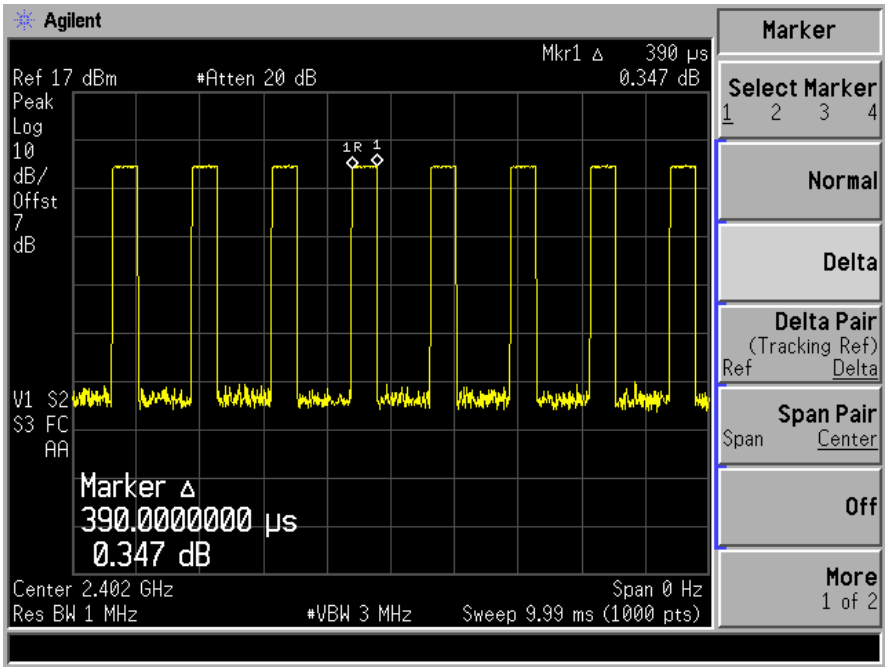
9.4 Measurement Results:

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 were recorded in this report, all modulation methods do not exceed the above mentioned limits.

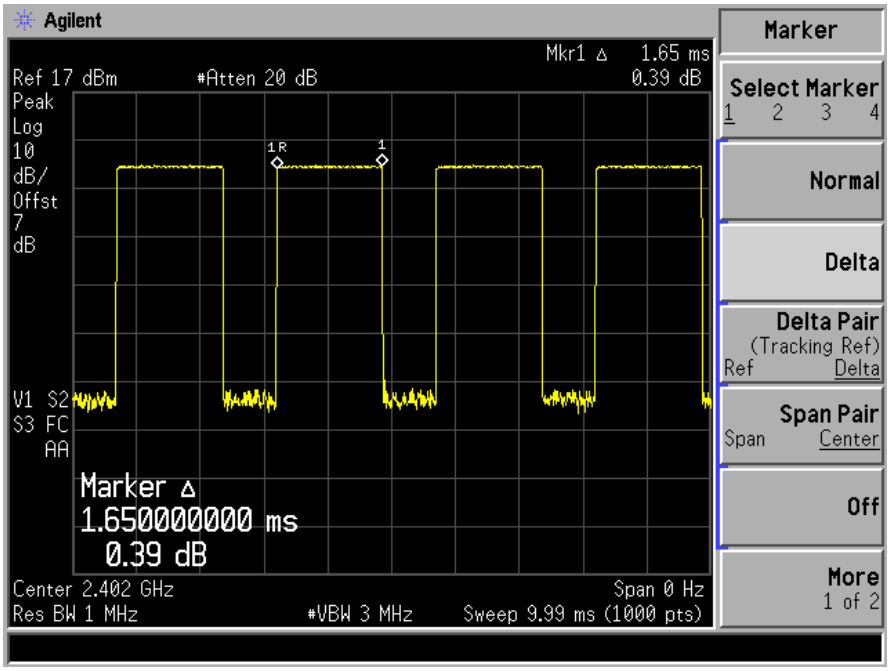
Spectrum Detector:	PK	Test Date :	August 25, 2014
Test By:	Andy	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %

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	124.80	400
DH3	1600/(4*79) x 31.6 =160	1.650	264.00	400
DH5	1600/(6*79) x 31.6 =106.67	2.890	308.28	400

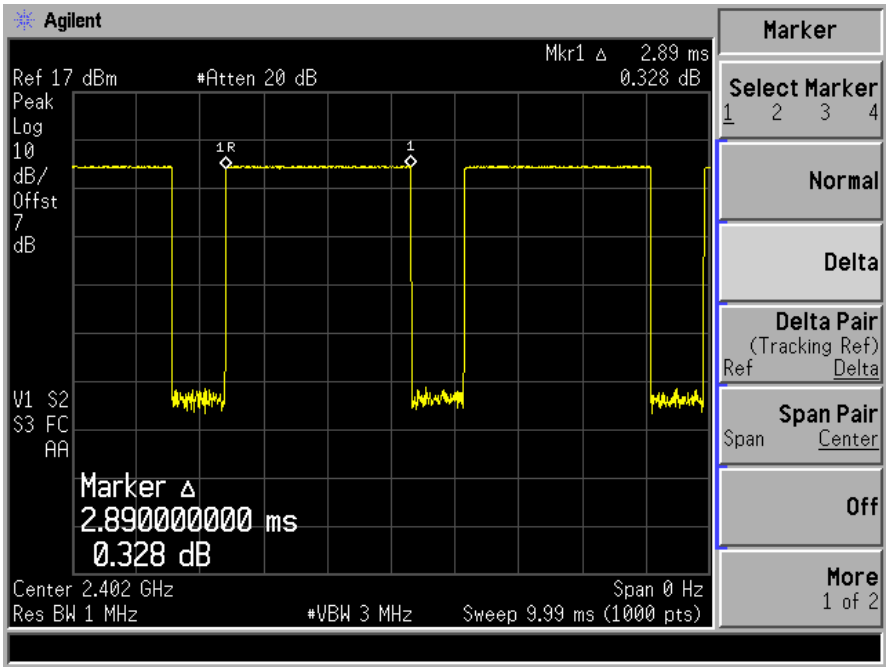
DH1


Agilent
Mkr1 Δ 390 µs
0.347 dB
Ref 17 dBm
#Atten 20 dB
Peak
Log
10
dB/
Offst
7
dB
1R 1
V1 S2
S3 FC
AA
Marker Δ
390.0000000 µs
0.347 dB
Center 2.402 GHz
Res BW 1 MHz
#VBW 3 MHz
Span 0 Hz
Sweep 9.99 ms (1000 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
0.39 dB
Ref 17 dBm
#Atten 20 dB
Peak
Log
10
dB/
Offst
7
dB
1R 1
V1 S2
S3 FC
AA
Marker Δ
1.650000000 ms
0.39 dB
Center 2.402 GHz
Res BW 1 MHz
#VBW 3 MHz
Span 0 Hz
Sweep 9.99 ms (1000 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

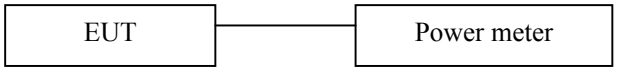

Agilent
Mkr1 Δ 2.89 ms
Ref 17 dBm
#Atten 20 dB
0.328 dB
Peak
Log
10
dB/
Offst
7
dB
1R
1
V1 S2
S3 FC
AA
Marker Δ
2.890000000 ms
0.328 dB
Center 2.402 GHz
Res BW 1 MHz
#VBW 3 MHz
Span 0 Hz
Sweep 9.99 ms (1000 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

10. MAXIMUM PEAK OUTPUT POWER TEST

10.1 Measurement Procedure

a. The testing follows FCC public Notice DA 00-705 Measurement Guidelines.
b. The RF output of EUT was connected to the power meter by RF cable and attnuator. The path loss was compensated to the results for each measurement.
c. Set to the maximum output power setting and enable the EUT transmit continuously.
d. Measure the conducted output power with cable loss and record the results in the test report.
e. Measure and record the results in the report.

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	05/17/2014	05/16/2015
Power sensor	Boonton	51011-EMC	31184	05/17/2014	05/16/2015

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 :	August 25, 2014
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
0	2402.00	1.842	1000mW	PASS
39	2441.00	1.259	1000mW	PASS
78	2480.00	0.162	1000mW	PASS

Spectrum Detector:	PK	Test Date :	August 25, 2014
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
0	2402.00	0.704	125mW	PASS
39	2441.00	0.178	125mW	PASS
78	2480.00	-0.98	125mW	PASS

Spectrum Detector:	PK	Test Date :	August 25, 2014
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
0	2402.00	0.674	125mW	PASS
39	2441.00	0.135	125mW	PASS
78	2480.00	-0.974	125mW	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.

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz.

EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz.

EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	AVG
Trace	Max hold

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:

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/AV	Test Date :	August 25, 2014
Test By:	Andy	Temperature :	28 ℃
Test channel:	00	Humidity :	65 %
Modulation:	GFSK		

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2379.50	H	48.40	36.62	74	54
2378.96	V	47.81	37.91	74	54

Spectrum Detector:	PK/AV	Test Date :	August 25, 2014
Test By:	Andy	Temperature :	28 ℃
Test channel:	78	Humidity :	65 %
Modulation:	GFSK		

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2485.25	H	51.73	38.58	74	54
2484.20	V	47.03	37.39	74	54

Spectrum Detector:	PK/AV	Test Date :	August 25, 2014
Test By:	Andy	Temperature :	28 ℃
Test channel:	00	Humidity :	65 %
Modulation:	1/4∏-DQPSK		

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2380.10	H	46.95	37.62	74	54
2380.36	V	45.72	36.88	74	54

Spectrum Detector:	PK/AV	Test Date :	August 25, 2014
Test By:	Andy	Temperature :	28 ℃
Test channel:	78	Humidity :	65 %
Modulation:	1/4∏-DQPSK		

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2488.40	H	47.54	36.49	74	54
2487.50	V	48.09	36.43	74	54

Spectrum Detector:	PK/AV	Test Date :	August 25, 2014
Test By:	Andy	Temperature :	28 ℃
Test channel:	00	Humidity :	65 %
Modulation:	8DPSK		

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2380.50	H	47.95	36.69	74	54
2380.10	V	45.16	35.98	74	54

Spectrum Detector:	PK/AV	Test Date :	August 25, 2014
Test By:	Andy	Temperature :	28 ℃
Test channel:	78	Humidity :	65 %
Modulation:	8DPSK		

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2487.60	H	48.77	36.91	74	54
2486.25	V	47.94	36.14	74	54

Spectrum Detector:	PK/AV	Test Date :	August 25, 2014
Test By:	Andy	Temperature :	25℃
Mode:	Hopping mode	Humidity :	55 %

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2390.00	H	46.90	35.97	74	54
2390.00	V	46.35	34.95	74	54
2483.51	H	46.27	35.20	74	54
2483.51	V	46.22	34.91	74	54

12. Antenna Port Emission

12.1 Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	88156318	05/17/2014	05/16/2015

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.

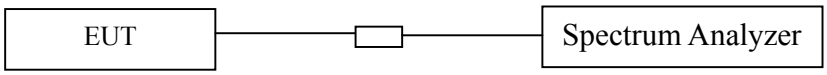
The following table is the setting of spectrum analyzer.

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.

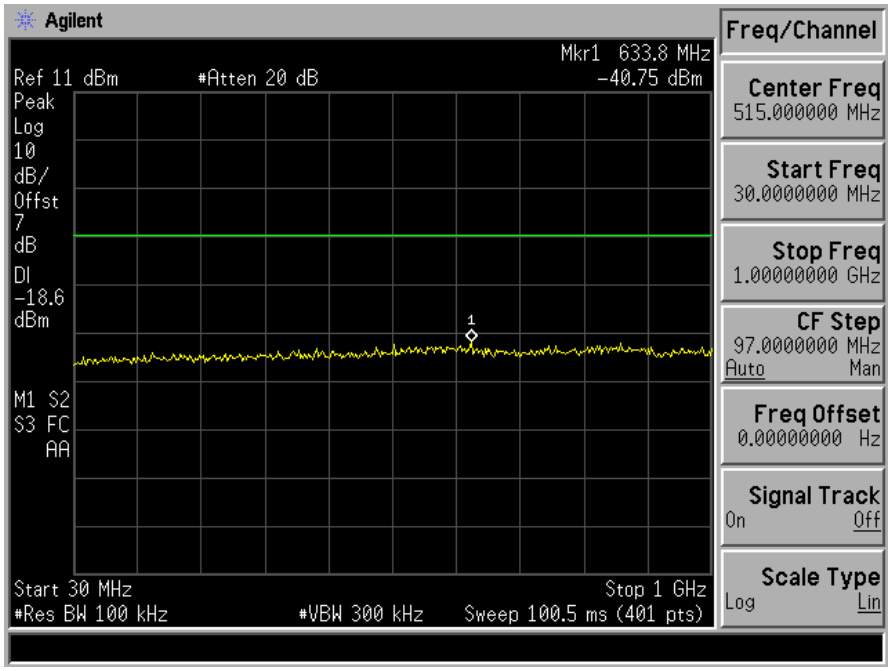
12.4 Block Diagram of Test setup

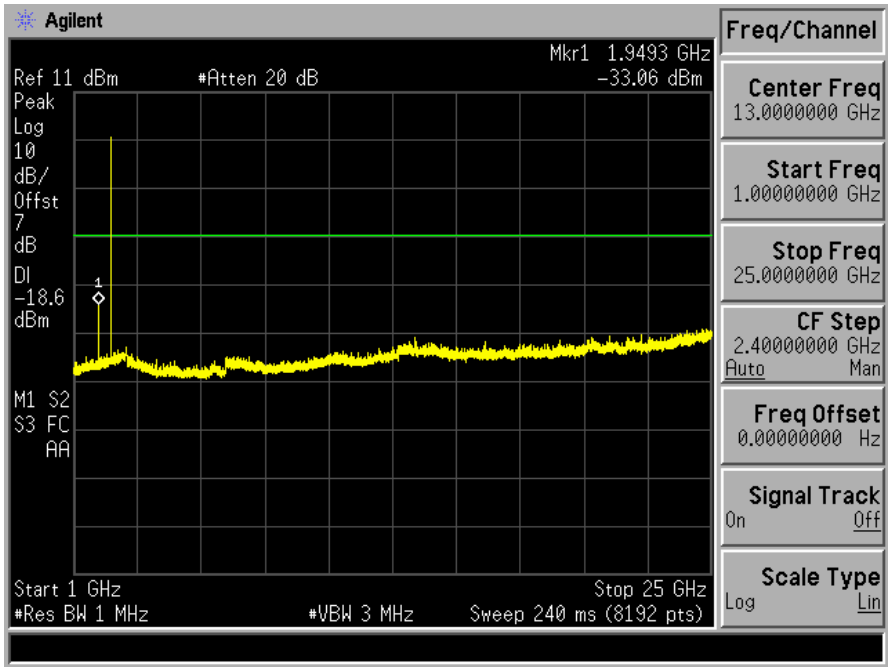


12.5 Test Result

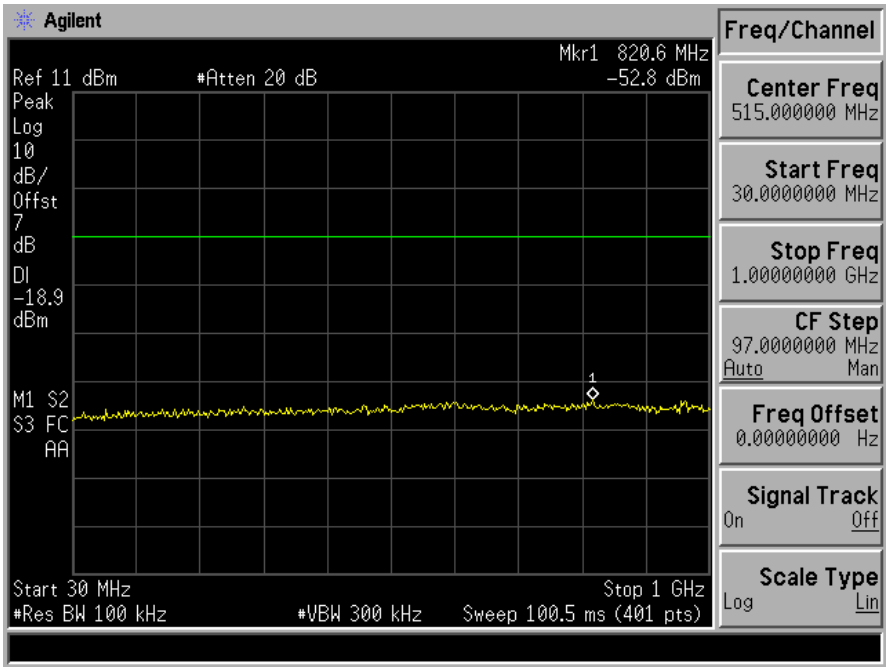
PASS.

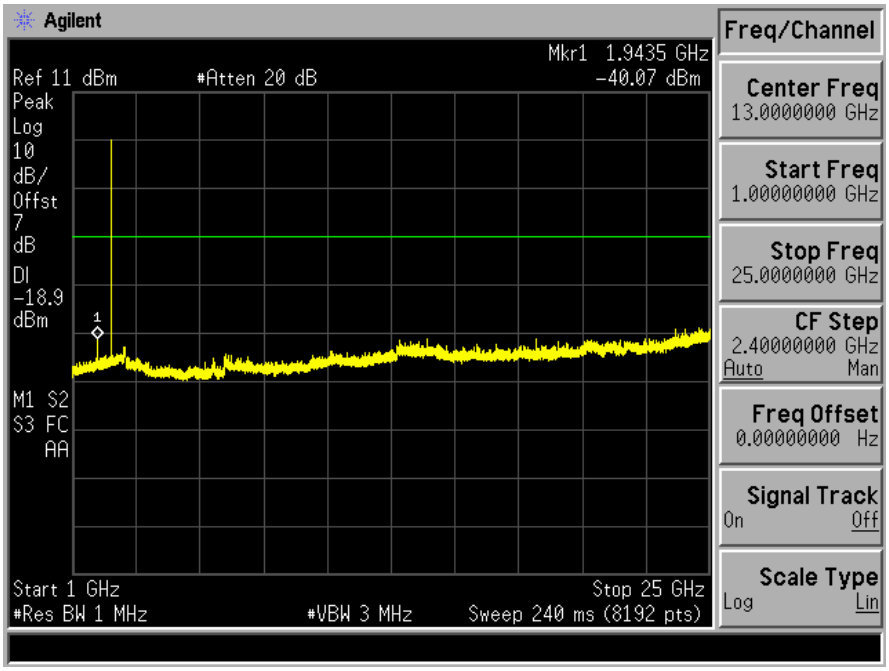
TX 2402MHz


Agilent
Mkr1 633.8 MHz
Ref 11 dBm
#Atten 20 dB
-40.75 dBm
Peak
Log
10
dB/
Offst
7
dB
Dl
-18.6
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)
Freq/Channel
Center Freq
515.000000 MHz
Start Freq
30.0000000 MHz
Stop Freq
1.00000000 GHz
CF Step
97.0000000 MHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off
Scale Type
Log
Lin

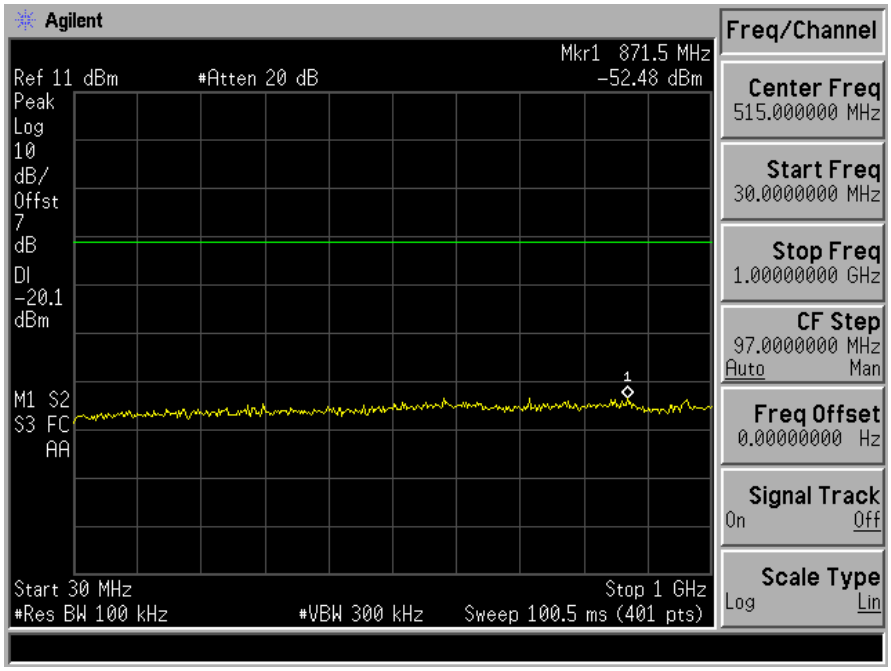

Agilent
Mkr1 1.9493 GHz
Ref 11 dBm
#Atten 20 dB
-33.06 dBm
Peak
Log
10
dB/
Offst
7
dB
Dl
-18.6
dBm
M1 S2
S3 FC
AA
Start 1 GHz
#Res BW 1 MHz
#VBW 3 MHz
Stop 25 GHz
Sweep 240 ms (8192 pts)
Freq/Channel
Center Freq
13.0000000 GHz
Start Freq
1.00000000 GHz
Stop Freq
25.0000000 GHz
CF Step
2.40000000 GHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off
Scale Type
Log
Lin

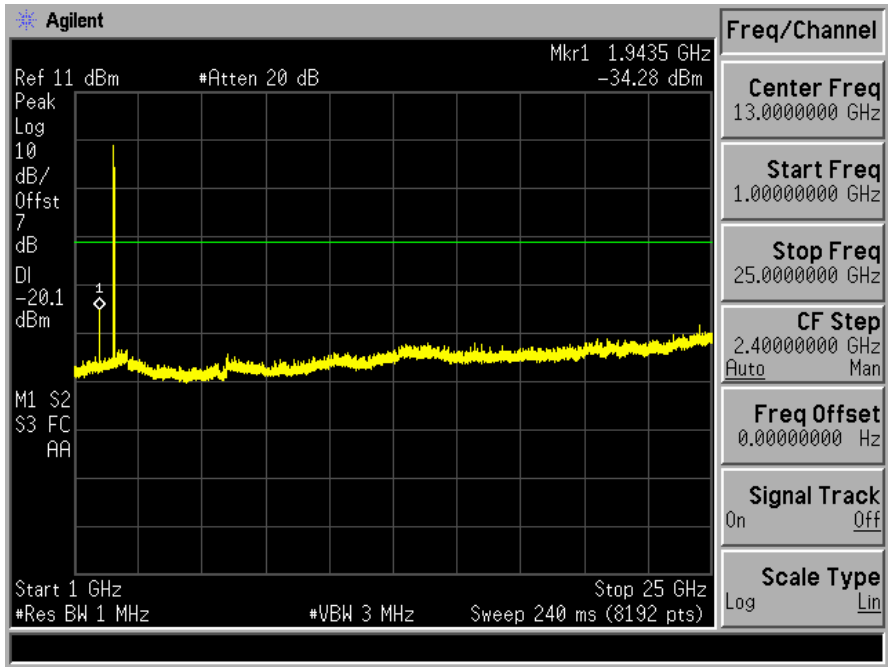
TX 2441MHz


Agilent
Mkr1 820.6 MHz
Ref 11 dBm
#Atten 20 dB
-52.8 dBm
Peak
Log
10
dB/
Offst
7
dB
Dl
-18.9
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)
Freq/Channel
Center Freq
515.000000 MHz
Start Freq
30.0000000 MHz
Stop Freq
1.00000000 GHz
CF Step
97.0000000 MHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off
Scale Type
Log
Lin


Agilent
Mkr1 1.9435 GHz
Ref 11 dBm
#Atten 20 dB
-40.07 dBm
Peak
Log
10
dB/
Offst
7
dB
Dl
-18.9
dBm
M1 S2
S3 FC
AA
Start 1 GHz
#Res BW 1 MHz
#VBW 3 MHz
Stop 25 GHz
Sweep 240 ms (8192 pts)
Freq/Channel
Center Freq
13.0000000 GHz
Start Freq
1.00000000 GHz
Stop Freq
25.0000000 GHz
CF Step
2.40000000 GHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off
Scale Type
Log
Lin

TX 2480MHz


Agilent
Mkr1 871.5 MHz
Ref 11 dBm
#Atten 20 dB
-52.48 dBm
Peak
Log
10
dB/
Offst
7
dB
Dl
-20.1
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)
Freq/Channel
Center Freq
515.000000 MHz
Start Freq
30.0000000 MHz
Stop Freq
1.00000000 GHz
CF Step
97.0000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin


Agilent
Mkr1 1.9435 GHz
Ref 11 dBm
#Atten 20 dB
-34.28 dBm
Peak
Log
10
dB/
Offst
7
dB
Dl
-20.1
dBm
M1 S2
S3 FC
AA
Start 1 GHz
#Res BW 1 MHz
#VBW 3 MHz
Stop 25 GHz
Sweep 240 ms (8192 pts)
Freq/Channel
Center Freq
13.0000000 GHz
Start Freq
1.00000000 GHz
Stop Freq
25.0000000 GHz
CF Step
2.40000000 GHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Scale Type
Log Lin

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 integrated on PCB, The antenna's gain is 2.12 dBi and meets the requirement.