

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

OF

Active Subwoofer

MODEL No.: MEGA PARTY EXPRESS

FCC ID: 2AB3E-ISP45

Trade Mark: ION

REPORT NO: ES140820257E

ISSUE DATE: September 20, 2014

Prepared for

**Ion Audio, LLC
200 Scenic View Drive, Suite 201 Cumberland, RI 02864, U.S.A.**

Prepared by

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VERIFICATION OF COMPLIANCE

Applicant:	Ion Audio, LLC 200 Scenic View Drive, Suite 201 Cumberland, RI 02864, U.S.A.
Manufacturer:	Dolsonmuse (Foshan Nanhai) Electronic CO., LTD. Pingtang Industrial Park, Guanyao, Nanhai, Foshan, Guangdong, China
Product Description:	Active Subwoofer
Model Number:	MEGA PARTY EXPRESS
Trade Mark:	ION
Serial Number:	N/A
File Number:	ES140820257E
Date of Test:	September 10, 2014 to September 20, 2014

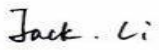
We hereby certify that:

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 : September 10, 2014 to September 20, 2014

Prepared by : 
Joe Xia/Editor

Reviewer : 
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 Π -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 Π -DQPSK, 8DPSK
- C). Number of Channel: 79 channel
- D). Channel space: 1MHz
- E). RF Output Power: 1.90dBm
- 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: 2AB3E-ISP45 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 0.1 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 0.1 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)

		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 and RSS 210 A8.1(4)

		Limit(Quantity of Hopping Channel)		
Frequency Range (MHz)	20dB bandwidth	20dB bandwidth >250 kHz	20dB bandwidth <1MHz	20dB bandwidth >1M Hz
902-928	<250kHz	50	25	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)

		LIMIT(rms)	
Frequency Range (MHz)	20dB bandwidth	20dB bandwidth >250kHz(25Channel)	20dB bandwidth <1MHz(75Channel)
	<250kHz(50Channel)		
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

		LIMIT(W)			
Frequency Range (MHz)	Quantity of Hopping Channel	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 $\mu\text{V/m}$	Distance(m)	Field strength at 3m $\text{dB}\mu\text{V/m}$
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 $\text{dB}\mu\text{V/m}=20 \log (\mu\text{V/m})$
 2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
 3. Distance extrapolation factor $=40 \log (\text{Specific distance/ test distance}) (\text{dB})$;
 Limit line=Specific limits($\text{dB}\mu\text{V}$) + distance extrapolation factor.

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

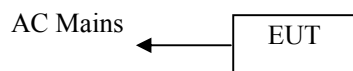


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
1.	Active Subwoofer	ION	MEGA PARTY EXPRESS	2AB3E-ISP45	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 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, 1/4II-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

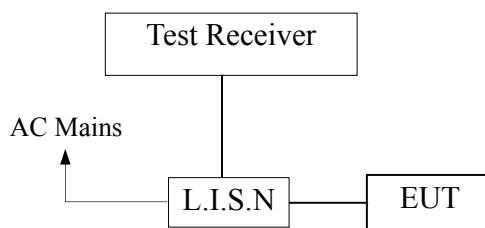
FCC Rule	Description Of Test	Result
15.247(a)(1)	Channel Separation test	Pass
15.247(a)(1)	20dB Bandwidth	Pass
15.247(a)(1)	Quantity of Hopping Channel	Pass
15.247(a)(1)	Time of Occupancy (Dwell Time)	Pass
15.247(b)(1)	Max Peak output Power test	Pass
15.247(d)	Band edge test	Pass
15.207	AC Power Conducted 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 0.1m 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

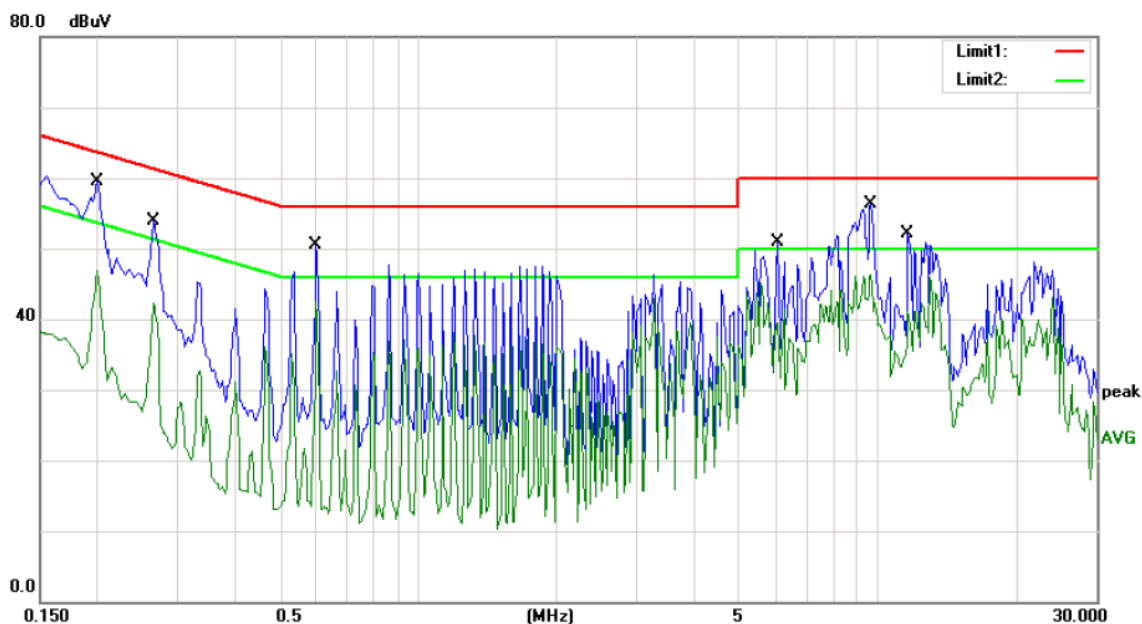
4.4 Conducted Emission Limit

(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.



Site Conduction #1

Phase: **N**

Temperature: 26

Limit: (CE)FCC PART 15 class B_QP

Power: AC 120V/60Hz

Humidity: 60 %

EUT: Home Entertainment Party Speakers

M/N: MEGA PARTY EXPRESS

Mode: BT ON

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2000	59.58	0.00	59.58	63.61	-4.03	QP	
2		0.2000	46.85	0.00	46.85	53.61	-6.76	AVG	
3		0.2650	53.96	0.00	53.96	61.27	-7.31	QP	
4		0.2650	42.21	0.00	42.21	51.27	-9.06	AVG	
5		0.6000	50.56	0.00	50.56	56.00	-5.44	QP	
6	*	0.6000	42.48	0.00	42.48	46.00	-3.52	AVG	
7		6.0600	50.88	0.00	50.88	60.00	-9.12	QP	
8		6.0600	39.56	0.00	39.56	50.00	-10.44	AVG	
9		9.6540	56.38	0.00	56.38	60.00	-3.62	QP	
10		9.6540	46.20	0.00	46.20	50.00	-3.80	AVG	
11		11.6500	52.15	0.00	52.15	60.00	-7.85	QP	
12		11.6500	41.08	0.00	41.08	50.00	-8.92	AVG	

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

5. Radiated Emission Test

5.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.1m 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 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

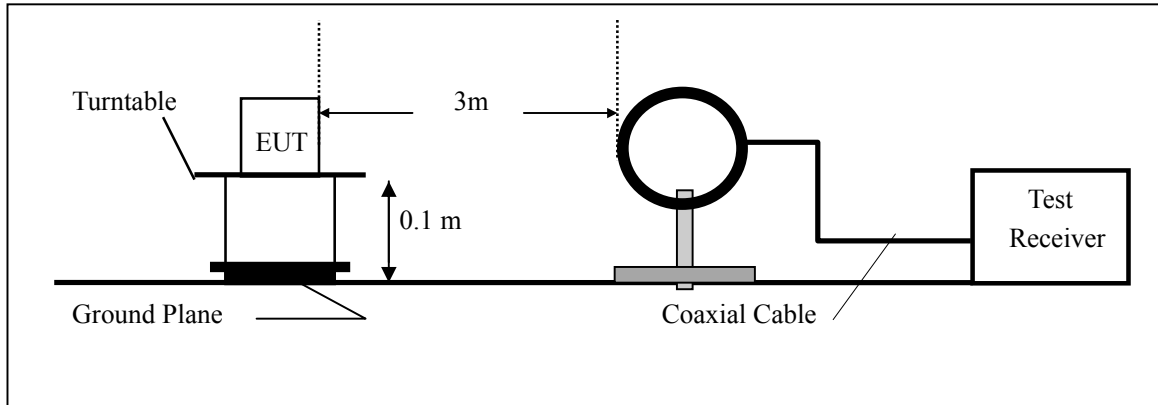
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

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

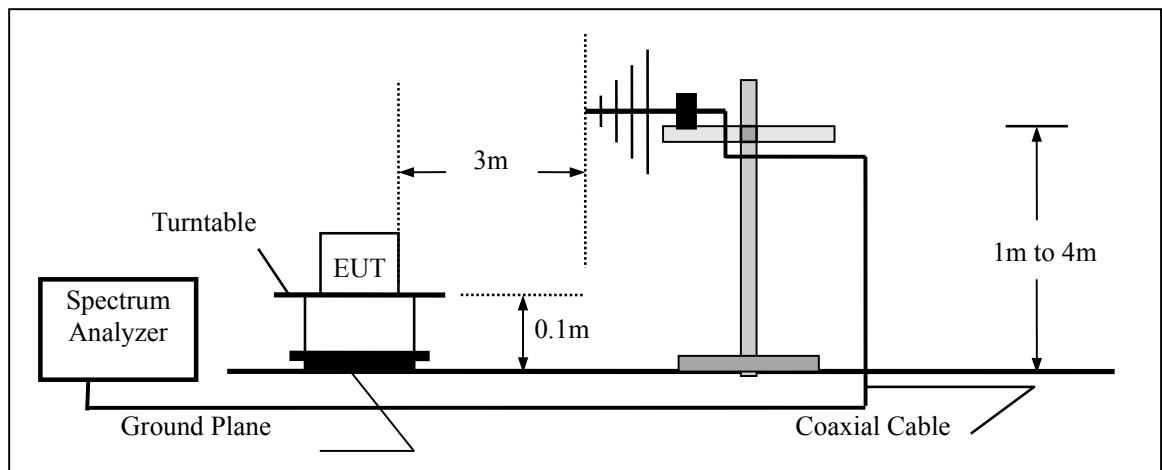
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	Peak
Trace	Max hold

5.2 Test SET-UP (Block Diagram of Configuration)

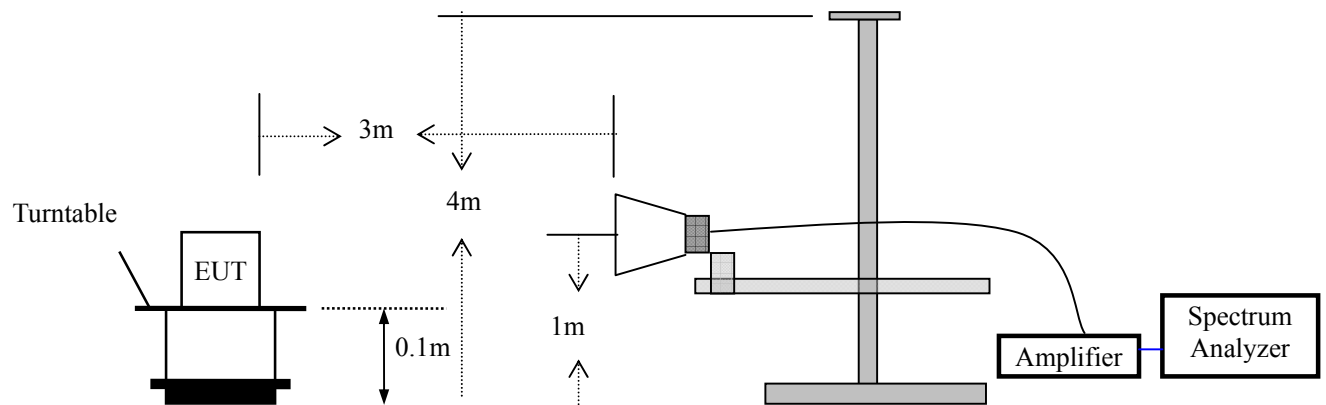
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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

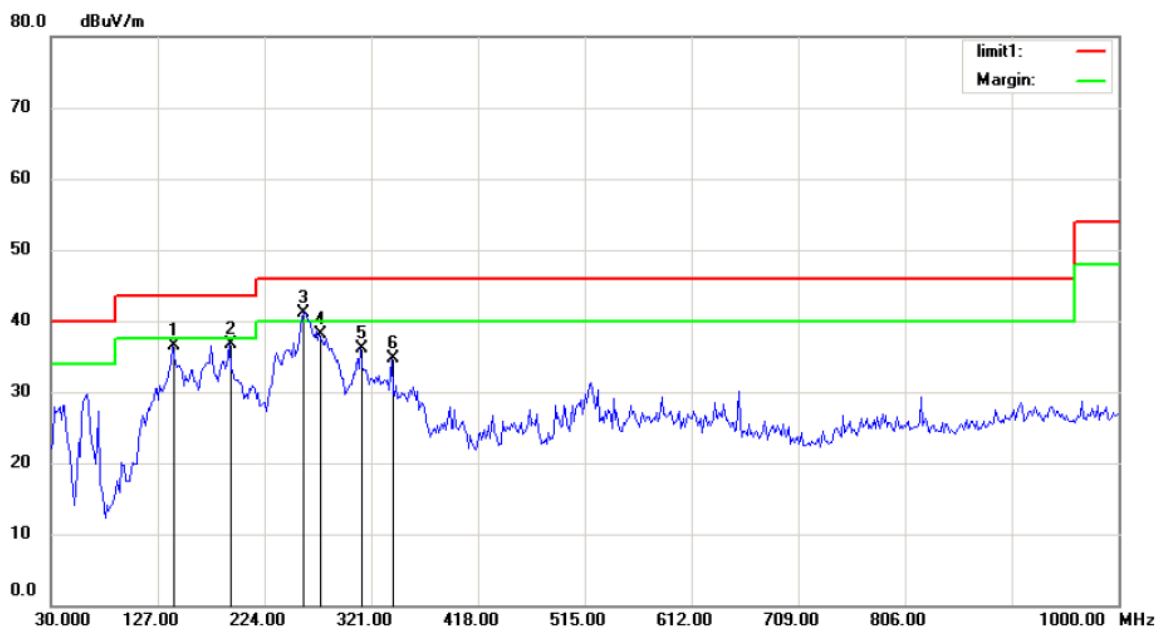


5.3 Measurement Equipment Used:

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: Home Entertainment Party Speakers

M/N: MEGA PARTY EXPRESS

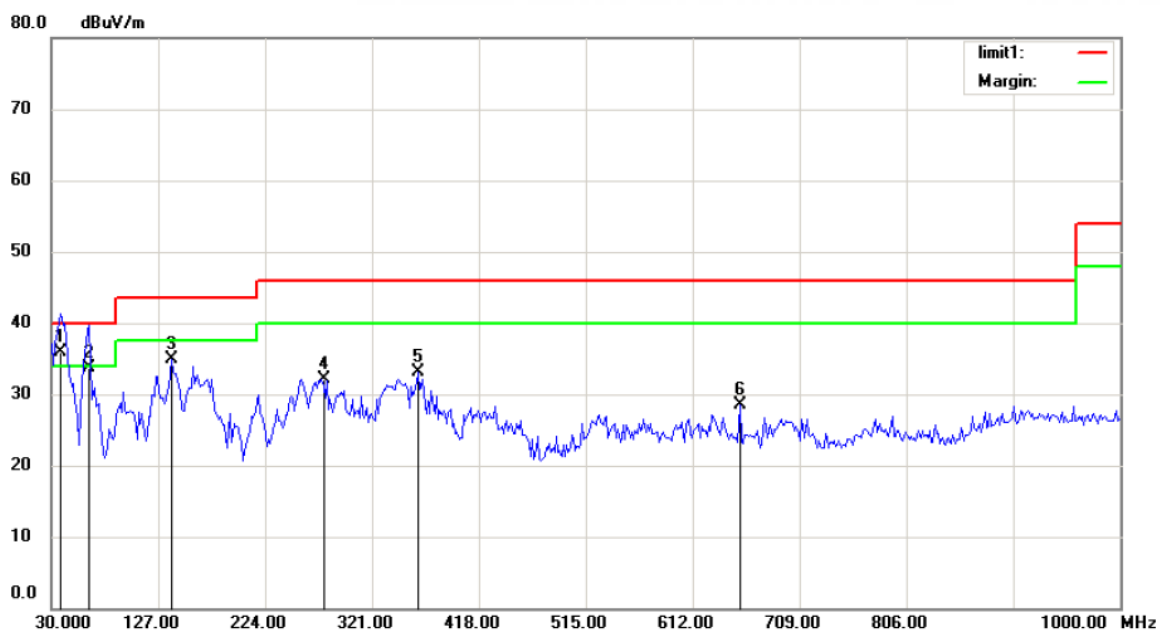
Mode:2402

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		140.3686	27.45	9.09	36.54	43.50	-6.96	QP		
2		191.6667	26.37	10.29	36.66	43.50	-6.84	QP		
3	*	260.0641	26.53	14.57	41.10	46.00	-4.90	QP		
4		274.0545	23.02	15.11	38.13	46.00	-7.87	QP		
5		311.3622	21.86	14.19	36.05	46.00	-9.95	QP		
6		339.3430	19.22	15.46	34.68	46.00	-11.32	QP		

*:Maximum data x:Over limit l: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: Home Entertainment Party Speakers

M/N: MEGA PARTY EXPRESS

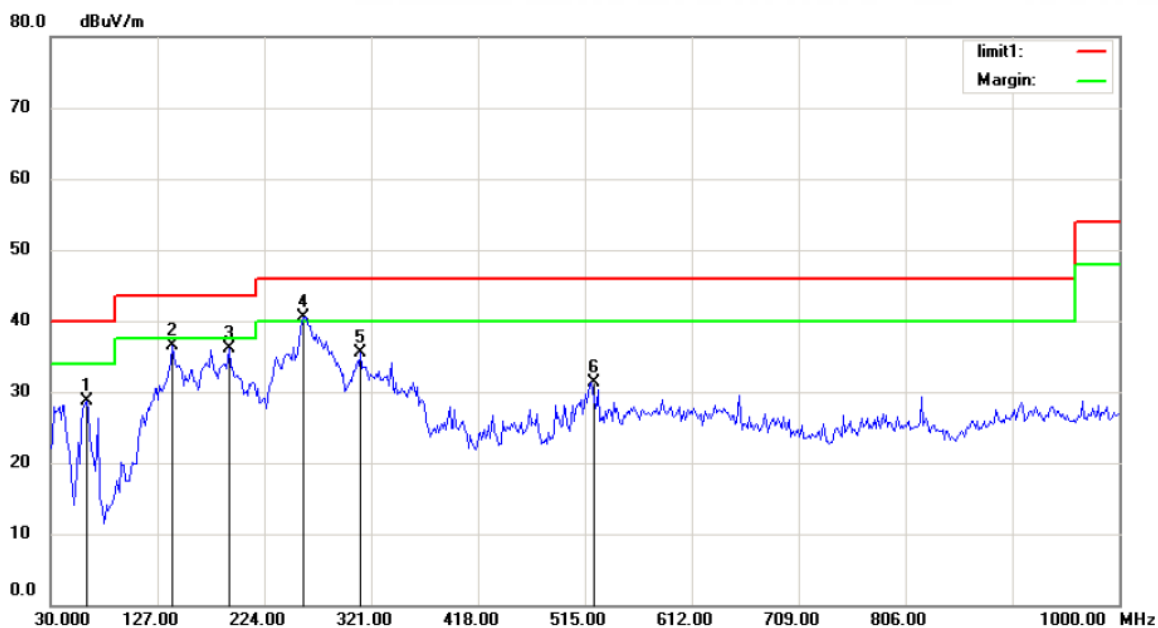
Mode:2402

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1	*	37.7723	22.00	13.97	35.97	40.00	-4.03	QP		
2		64.1987	22.77	10.85	33.62	40.00	-6.38	QP		
3		138.8140	25.73	9.22	34.95	43.50	-8.55	QP		
4		275.6090	16.96	15.14	32.10	46.00	-13.90	QP		
5		362.6601	16.06	17.03	33.09	46.00	-12.91	QP		
6		654.9038	5.31	23.13	28.44	46.00	-17.56	QP		

*:Maximum data x:Over limit l: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: Home Entertainment Party Speakers

M/N: MEGA PARTY EXPRESS

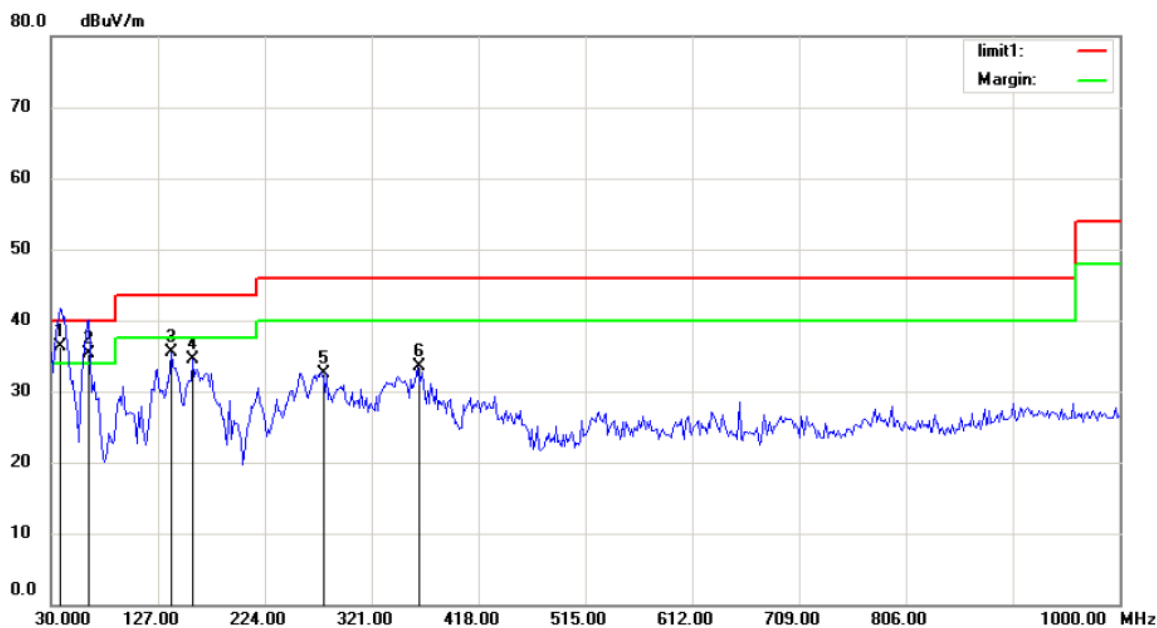
Mode:2441

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		62.6441	17.03	11.64	28.67	40.00	-11.33	QP		
2		140.3684	27.45	9.09	36.54	43.50	-6.96	QP		
3		191.6665	25.87	10.29	36.16	43.50	-7.34	QP		
4	*	260.0640	26.03	14.57	40.60	46.00	-5.40	QP		
5		311.3620	21.36	14.19	35.55	46.00	-10.45	QP		
6		521.2180	9.77	21.49	31.26	46.00	-14.74	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: Home Entertainment Party Speakers

M/N: MEGA PARTY EXPRESS

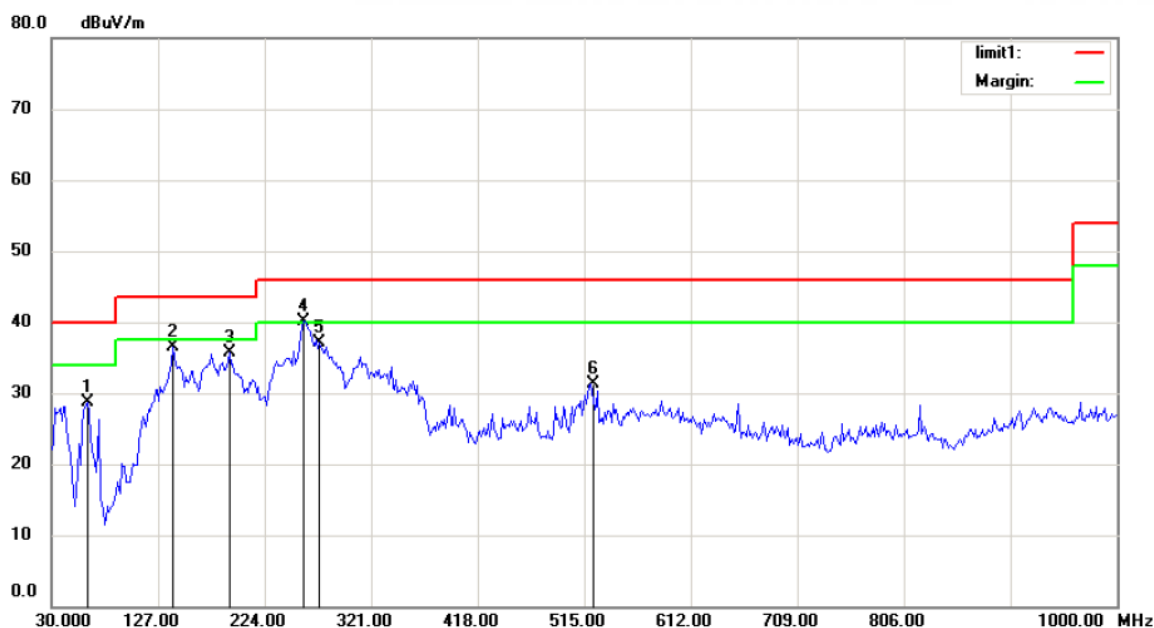
Mode:2441

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	37.7723	22.30	13.97	36.27	40.00	-3.73	QP		
2	!	64.1987	24.50	10.85	35.35	40.00	-4.65	QP		
3		138.8141	26.23	9.22	35.45	43.50	-8.05	QP		
4		159.0224	26.23	8.27	34.50	43.50	-9.00	QP		
5		275.6090	17.46	15.14	32.60	46.00	-13.40	QP		
6		362.6603	16.56	17.03	33.59	46.00	-12.41	QP		

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

Operator: ZHL



Site 3m Chamber #1

Polarization: **Horizontal**

Temperature:

Limit: (RE)FCC PART 15 CLASS B

Power: AC 120V/60Hz

Humidity: 53 %

EUT: Home Entertainment Party Speakers

M/N: MEGA PARTY EXPRESS

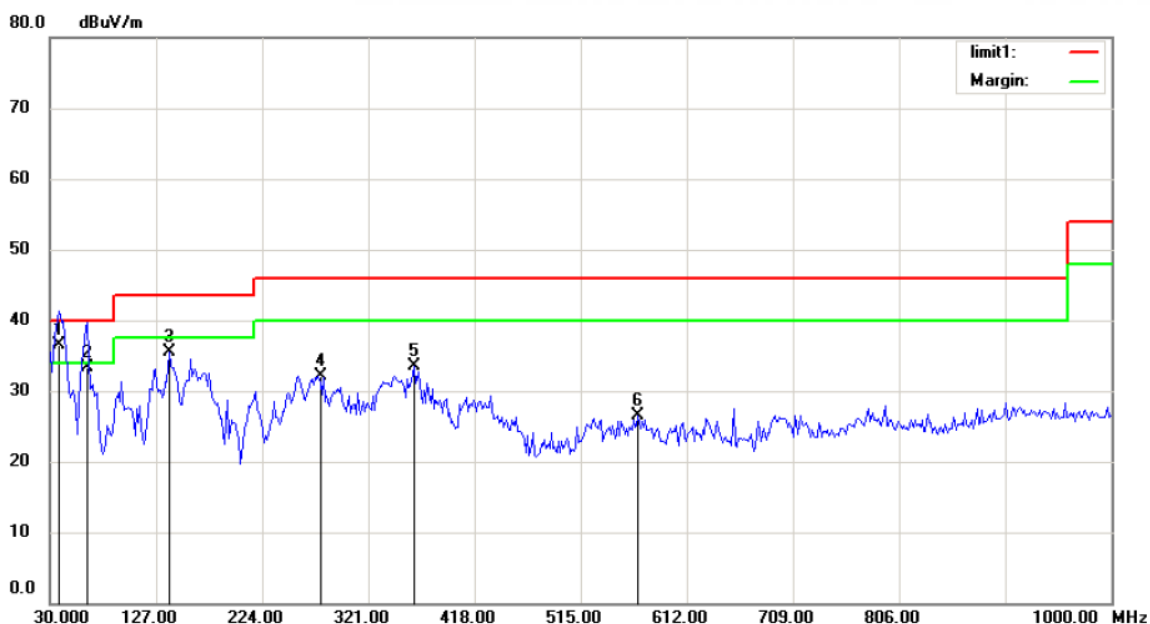
Mode:2480

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		62.6441	17.03	11.64	28.67	40.00	-11.33	QP		
2		140.3684	27.45	9.09	36.54	43.50	-6.96	QP		
3		191.6665	25.37	10.29	35.66	43.50	-7.84	QP		
4	*	260.0640	25.53	14.57	40.10	46.00	-5.90	QP		
5		274.0542	22.02	15.11	37.13	46.00	-8.87	QP		
6		521.2180	9.77	21.49	31.26	46.00	-14.74	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: Home Entertainment Party Speakers

M/N: MEGA PARTY EXPRESS

Mode:2480

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	*	37.7723	22.50	13.97	36.47	40.00	-3.53	QP			
2		64.1987	22.50	10.85	33.35	40.00	-6.65	QP			
3		138.8140	26.23	9.22	35.45	43.50	-8.05	QP			
4		275.6090	16.96	15.14	32.10	46.00	-13.90	QP			
5		362.6600	16.56	17.03	33.59	46.00	-12.41	QP			
6		567.8523	6.67	19.85	26.52	46.00	-19.48	QP			

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

Operator: ZHL

Operation Mode: 2402MHz Test Date : September 15, 2014
Frequency Range: 1-25GHz Temperature : 25°C
Test Result: PASS Humidity : 55 %
Measured Distance: 3m Test By: KL
Test mode: GFSK

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
5360.04	V	43.07	26.44	74.00	54.00	-30.93	-27.56
7791.90	V	46.58	29.09	74.00	54.00	-27.42	-24.91
7920.91	V	46.38	30.05	74.00	54.00	-27.62	-23.95
9964.19	V	52.43	34.76	74.00	54.00	-21.57	-19.24
11133.27	V	51.63	34.61	74.00	54.00	-22.37	-19.39
14132.47	V	50.74	34.77	74.00	54.00	-23.26	-19.23
5357.62	H	44.60	27.36	74.00	54.00	-29.40	-26.64
7791.89	H	48.58	31.70	74.00	54.00	-25.42	-22.30
7920.94	H	48.89	30.91	74.00	54.00	-25.11	-23.09
9964.24	H	50.88	33.90	74.00	54.00	-23.12	-20.10
10615.55	H	49.36	34.54	74.00	54.00	-24.64	-19.46
14459.31	H	48.50	42.14	74.00	54.00	-25.50	-11.86

No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.247.

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.

Operation Mode: 2441MHz Test Date : September 15, 2014
Frequency Range: 1-25GHz Temperature : 25°C
Test Result: PASS Humidity : 55 %
Measured Distance: 3m Test By: KL
Test mode: GFSK

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
5357.53	V	42.90	26.18	74.00	54.00	-31.10	-27.82
7791.75	V	46.45	28.89	74.00	54.00	-27.55	-25.11
7920.88	V	46.16	29.74	74.00	54.00	-27.84	-24.26
9961.63	V	52.23	34.58	74.00	54.00	-21.77	-19.42
11133.15	V	51.53	34.31	74.00	54.00	-22.47	-19.69
14132.39	V	50.60	34.58	74.00	54.00	-23.40	-19.42
5357.53	H	44.47	27.23	74.00	54.00	-29.53	-26.77
7791.78	H	48.42	31.50	74.00	54.00	-25.58	-22.50
7920.86	H	48.72	30.69	74.00	54.00	-25.28	-23.31
9961.66	H	50.78	33.67	74.00	54.00	-23.22	-20.33
10615.52	H	49.07	34.35	74.00	54.00	-24.93	-19.65
14459.32	H	48.12	42.04	74.00	54.00	-25.88	-11.96

No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.247.

- 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.

Operation Mode: 2480MHz Test Date : September 15, 2014
Frequency Range: 1-25GHz Temperature : 25°C
Test Result: PASS Humidity : 55 %
Measured Distance: 3m Test By: KL
Test mode: GFSK

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
5357.59	V	42.62	25.97	74.00	54.00	-31.38	-28.03
7791.91	V	46.24	28.76	74.00	54.00	-27.76	-25.24
7920.94	V	45.91	29.61	74.00	54.00	-28.09	-24.39
9961.77	V	52.04	34.47	74.00	54.00	-21.96	-19.53
11135.65	V	51.20	34.15	74.00	54.00	-22.80	-19.85
14132.46	V	50.38	34.43	74.00	54.00	-23.62	-19.57
5357.63	H	44.22	27.07	74.00	54.00	-29.78	-26.93
7794.33	H	48.16	31.28	74.00	54.00	-25.84	-22.72
7918.52	H	48.51	30.45	74.00	54.00	-25.49	-23.55
9961.76	H	50.53	33.49	74.00	54.00	-23.47	-20.51
10618.05	H	48.87	33.98	74.00	54.00	-25.13	-20.02
14459.43	H	47.98	41.69	74.00	54.00	-26.02	-12.31

No others harmonics emissions are higher than 20dB below the limits of 47 CFR Part 15.247.

- 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.

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:

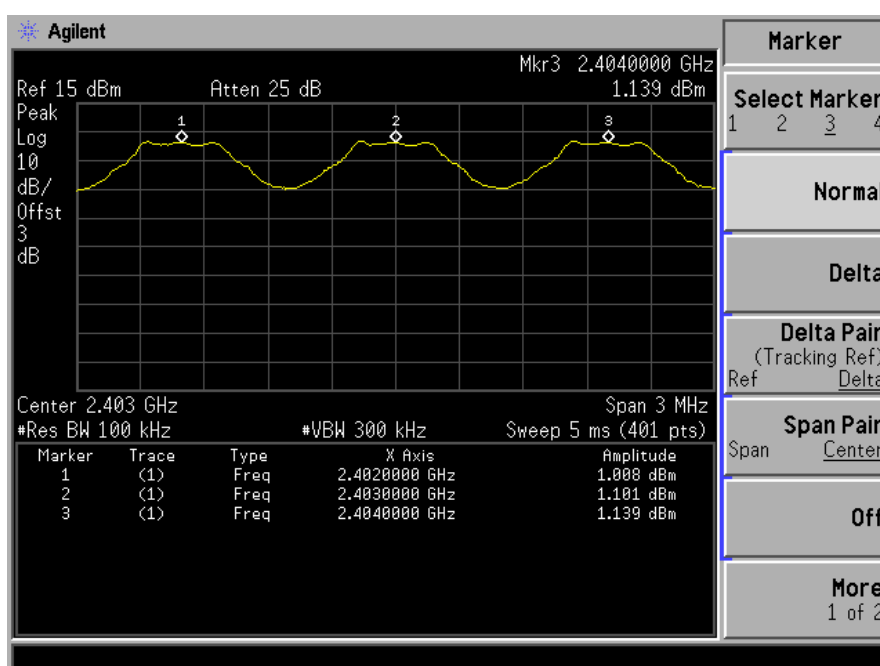
The following table is the setting of spectrum analyzer.

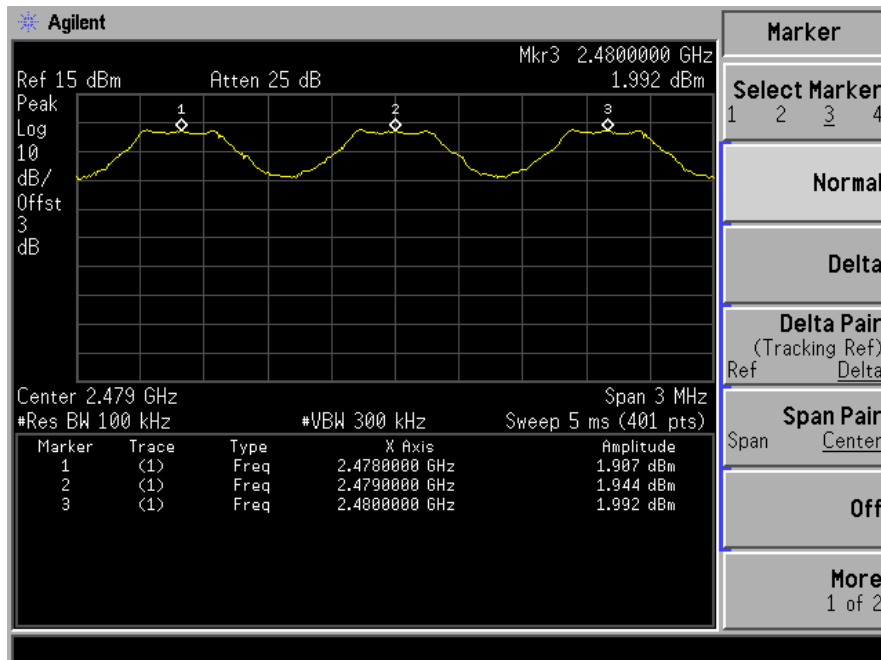
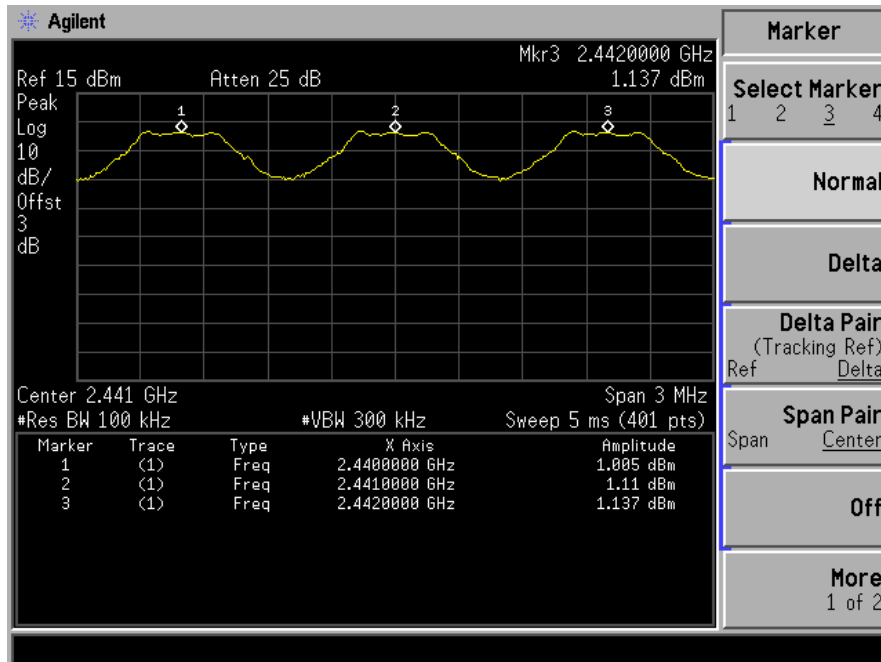
EMI Test Receiver	Setting
Attenuation	Auto
RB	100kHz
VB	300kHz
Detector	Peak
Trace	Max hold

Refer to attached data chart.

Spectrum Detector: PK Test Date : September 15, 2014
Test By: Andy Temperature : 28 °C
Test Result: PASS Humidity : 65 %
Modulation: GFSK

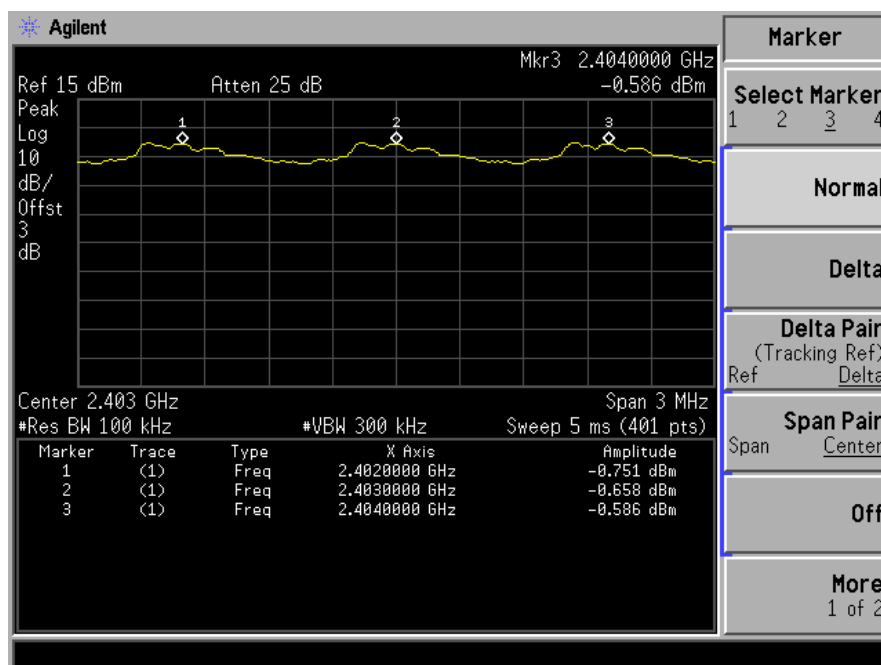
Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 20dB Down BW(kHz)
0	2402	1000.00	863.399
39	2441	1000.00	922.367
78	2480	1000.00	926.834

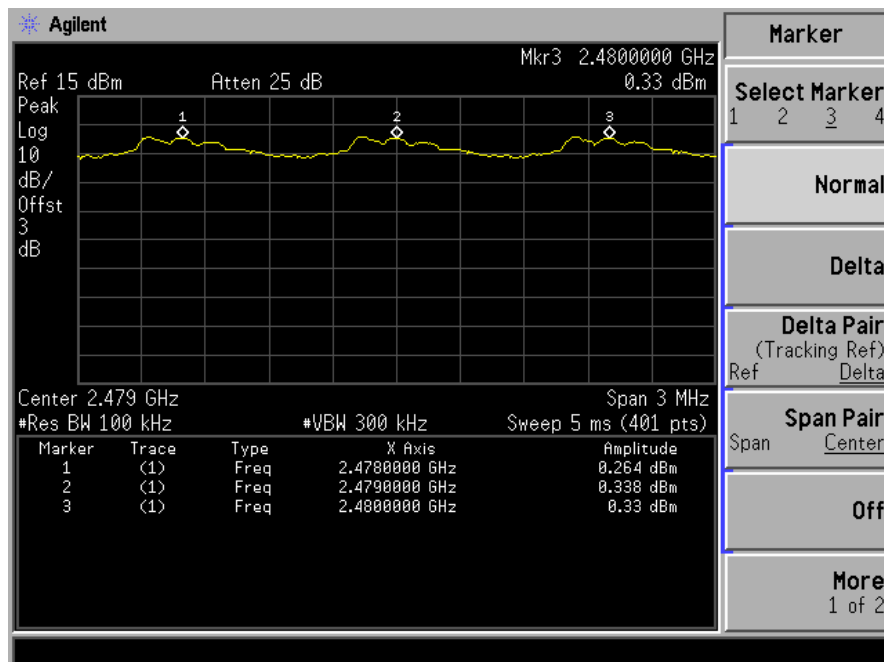
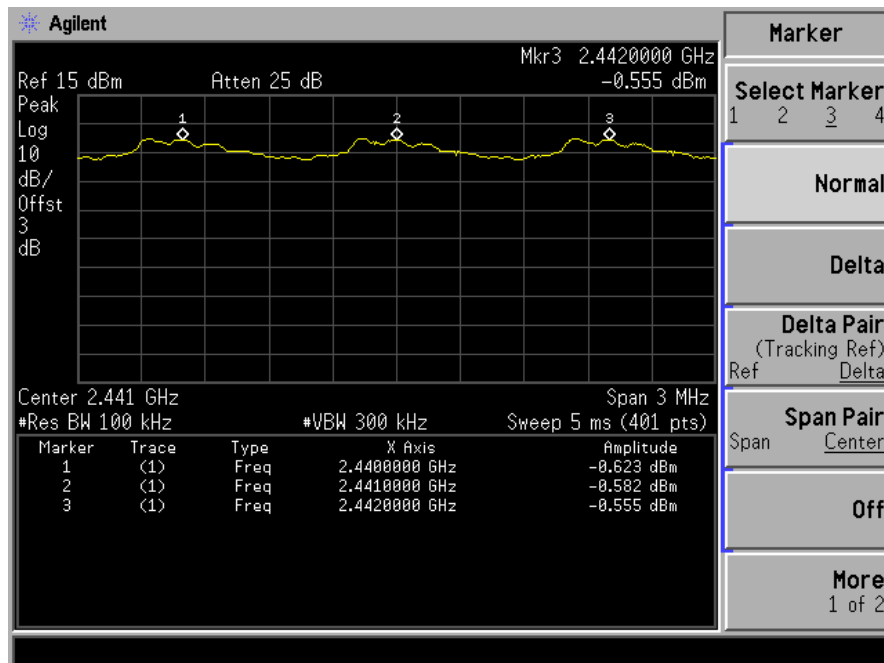




Spectrum Detector: PK Test Date : September 15, 2014
 Test By: Andy Temperature : 28 °C
 Test Result: PASS Humidity : 65 %
 Modulation: 1/4 II -DQPSK

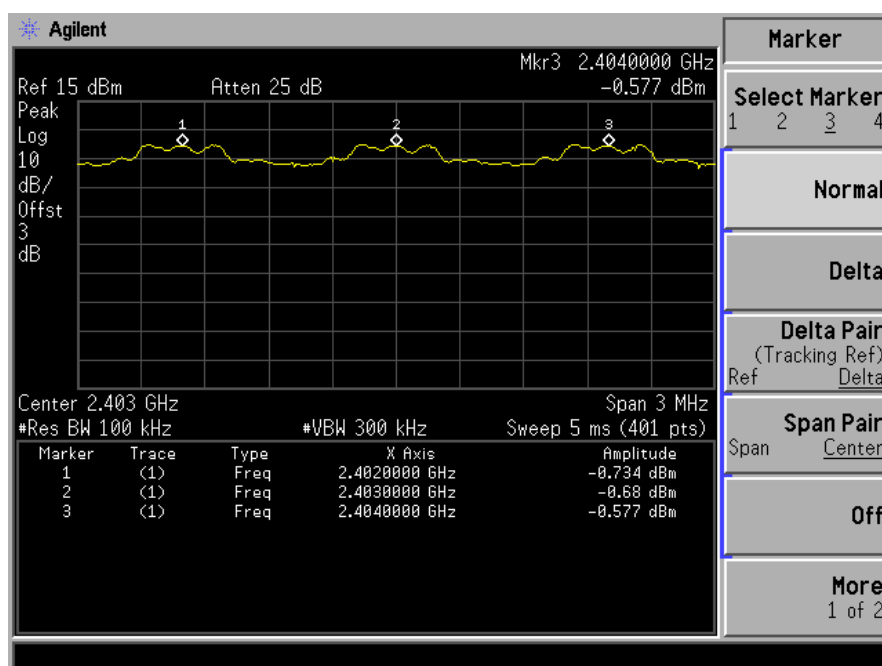
Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
0	2402	1000.00	828.00
39	2441	1000.00	808.67
78	2480	1000.00	821.33

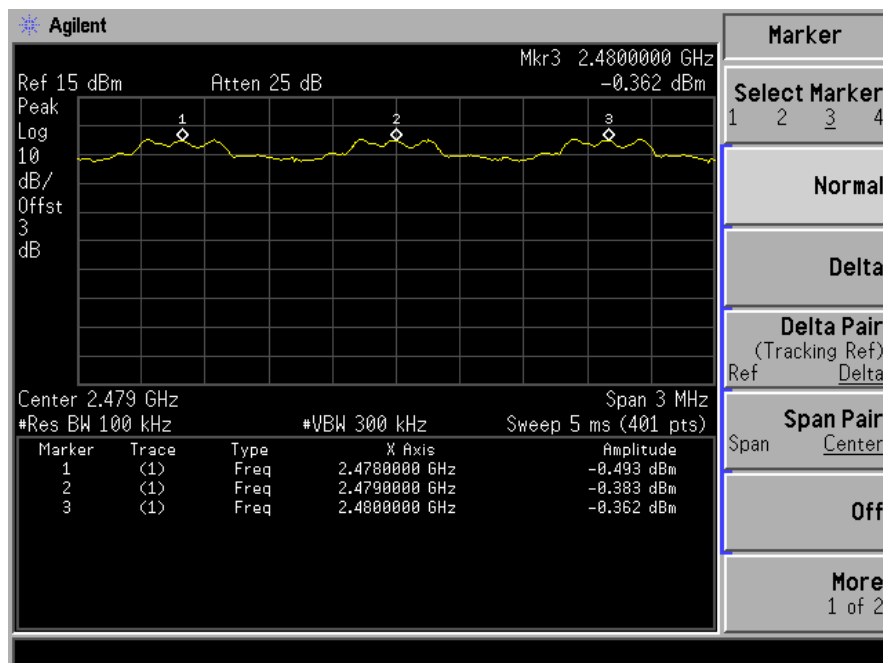
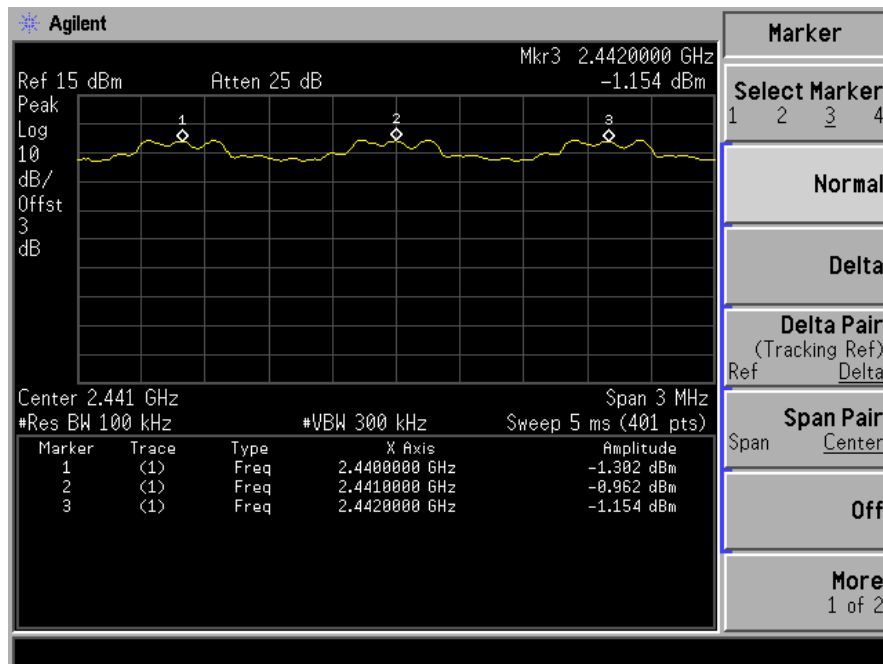




Spectrum Detector: PK Test Date : September 15, 2014
 Test By: Andy Temperature : 28 °C
 Test Result: PASS Humidity : 65 %
 Modulation: 8DPSK

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
0	2402	1000.00	811.33
39	2441	1000.00	811.33
78	2480	1000.00	807.33



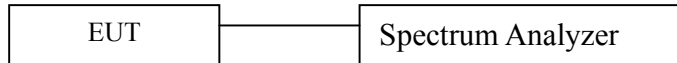


7. Bandwidth test

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

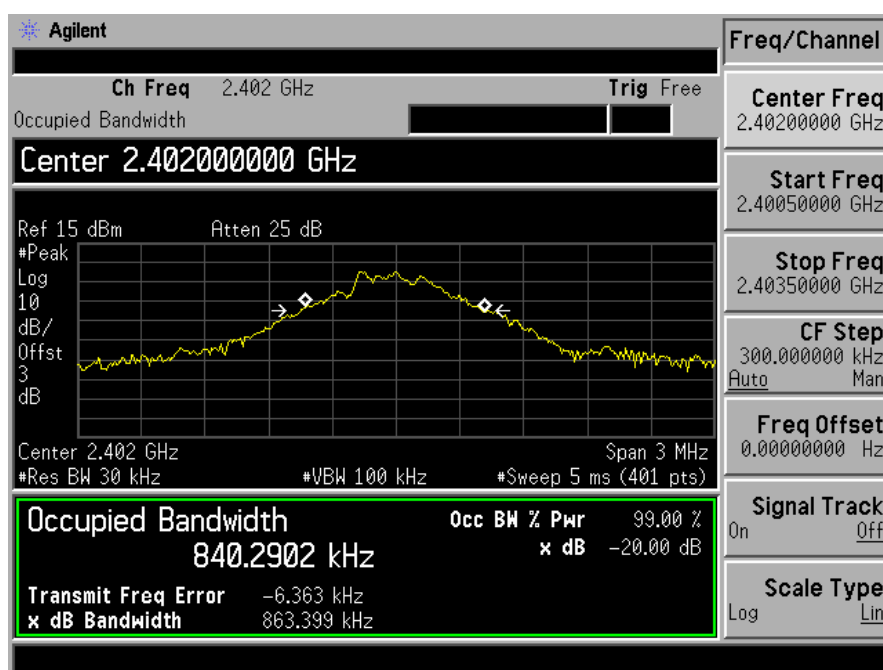
All the modes GFSK, 1/4Π-DQPSK, 8DPSK have been tested and the worst result recorded in the following pages.

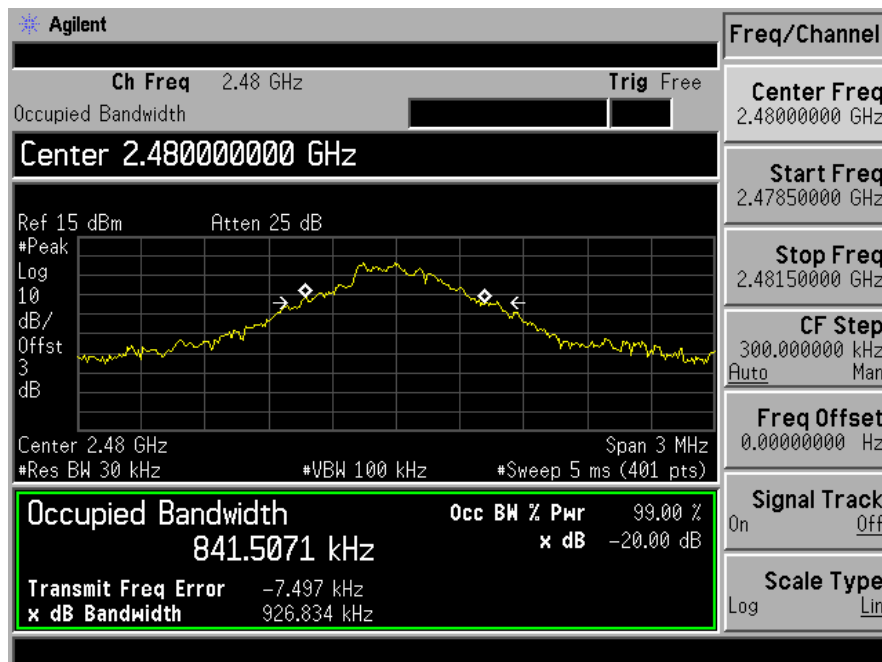
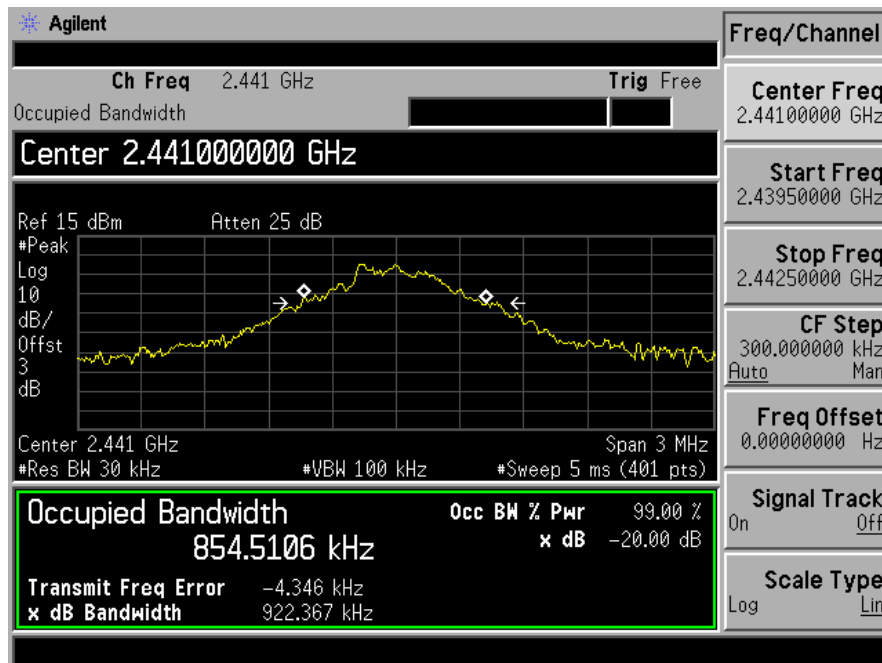
7.4.1. 20dB Bandwidth test data Chart:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date:	September 15, 2014
Test By:	Andy	Temperature:	28 °C
Test Result:	PASS	Humidity:	65 %
Modulation:	GFSK		

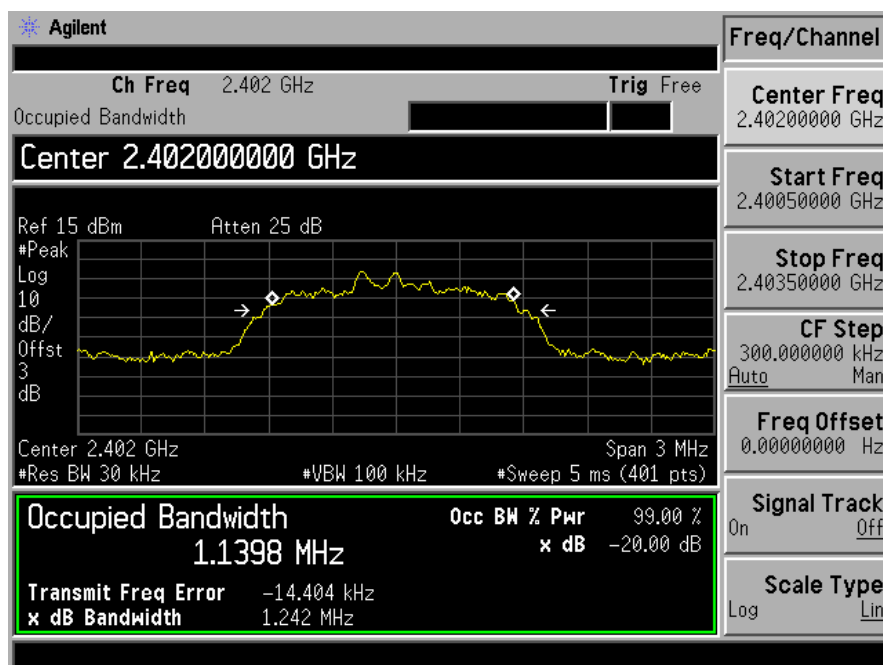
Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
0	2402	863.399
39	2441	922.367
78	2480	926.834

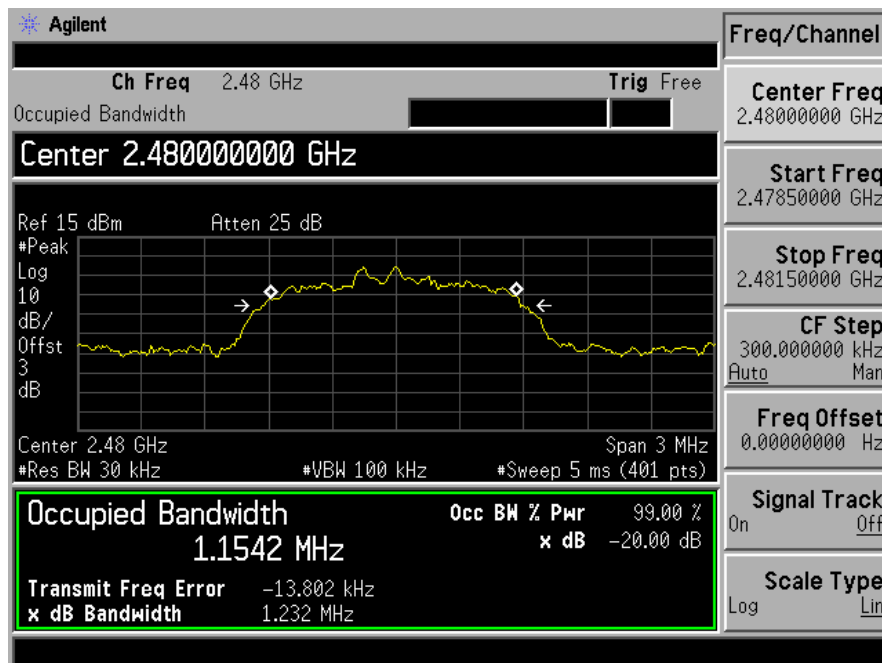
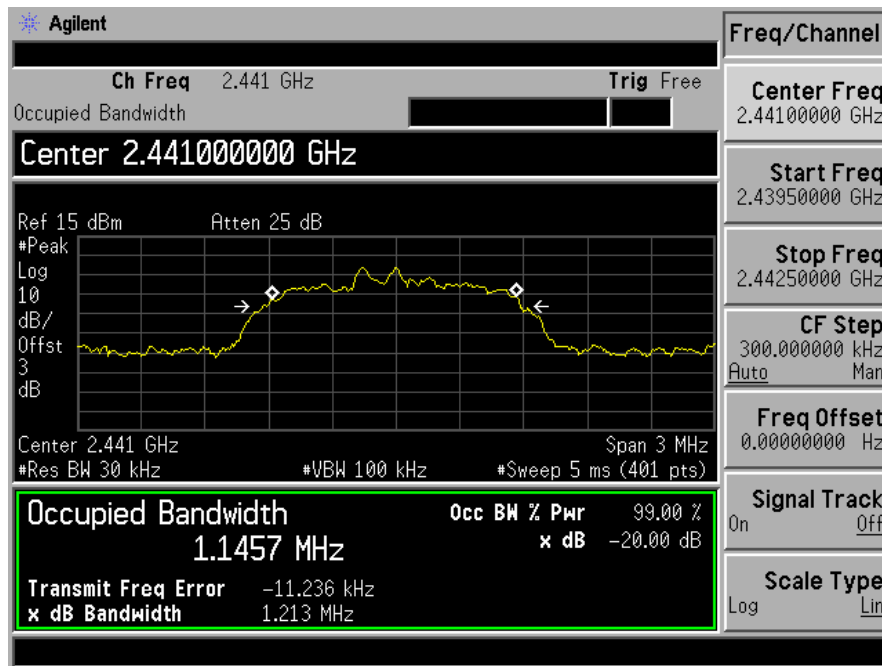




Spectrum Detector: PK Test Date: September 15, 2014
Test By: Andy Temperature: 28 °C
Test Result: PASS Humidity: 65 %
Modulation: 1/4 Π -DQPSK

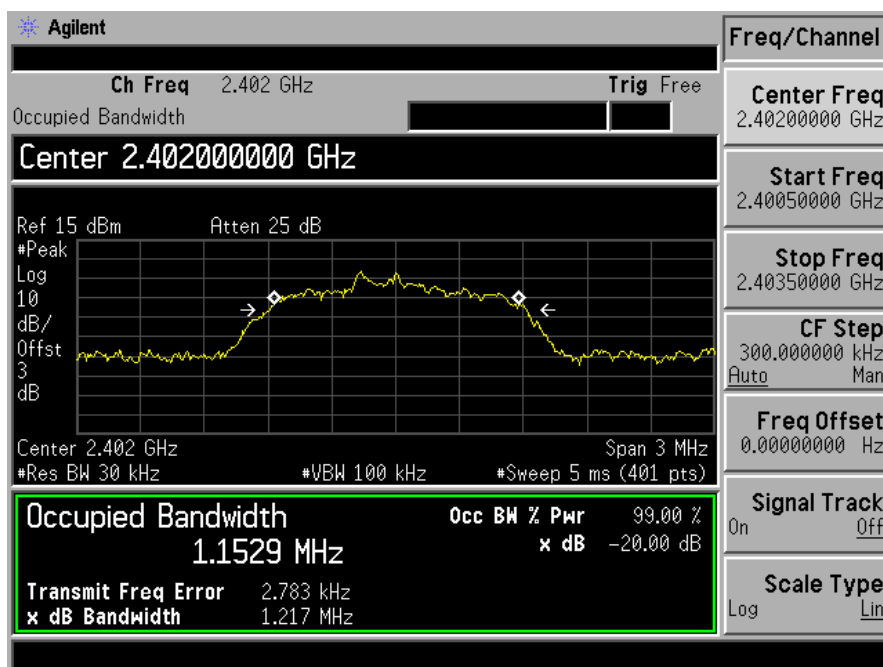
Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
0	2402	1242.00
39	2441	1213.00
78	2480	1232.00

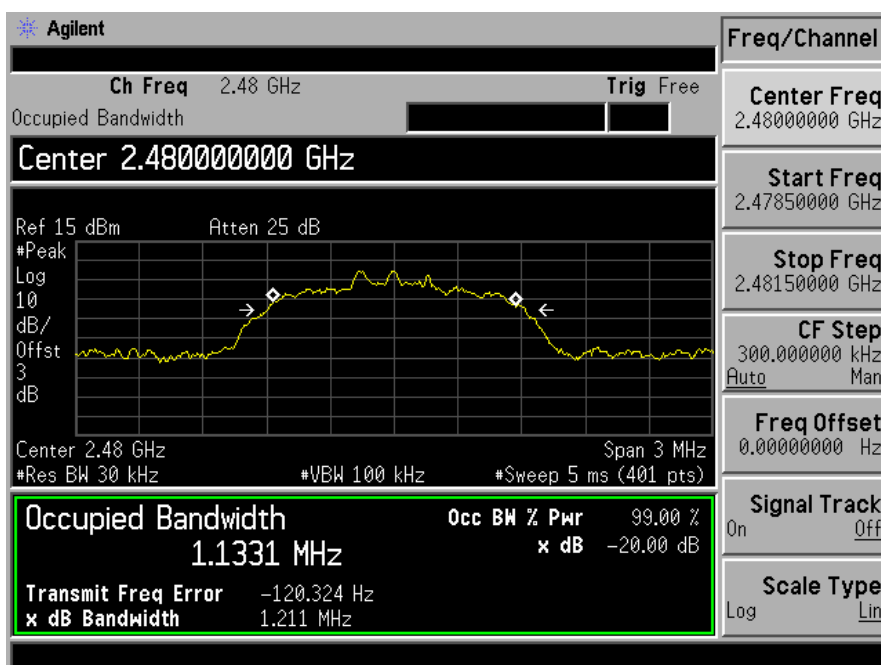
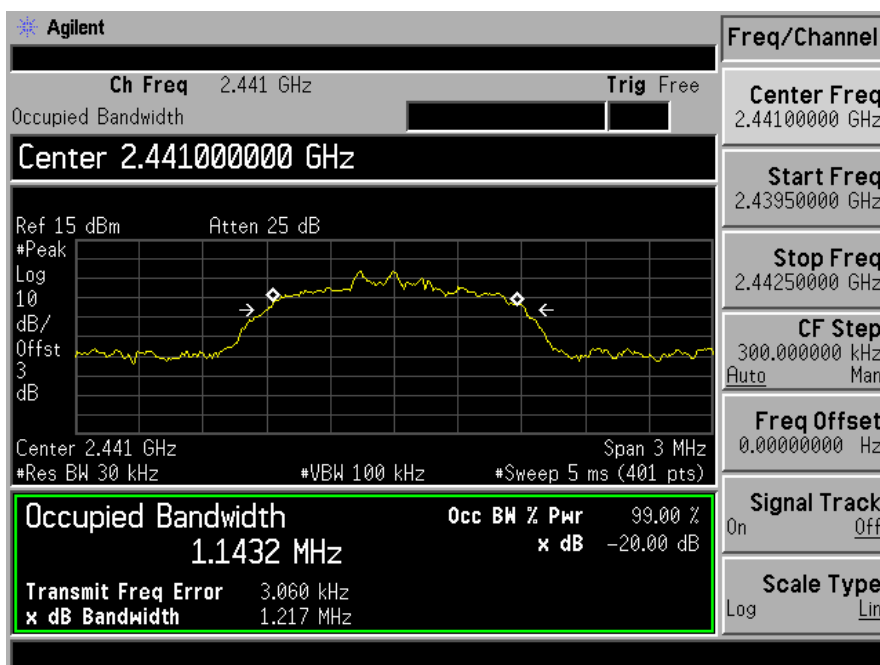




Spectrum Detector:	PK	Test Date:	September 15, 2014
Test By:	Andy	Temperature:	28 °C
Test Result:	PASS	Humidity:	65 %
Modulation:	8DPSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
0	2402	1217.00
39	2441	1217.00
78	2480	1211.00





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:

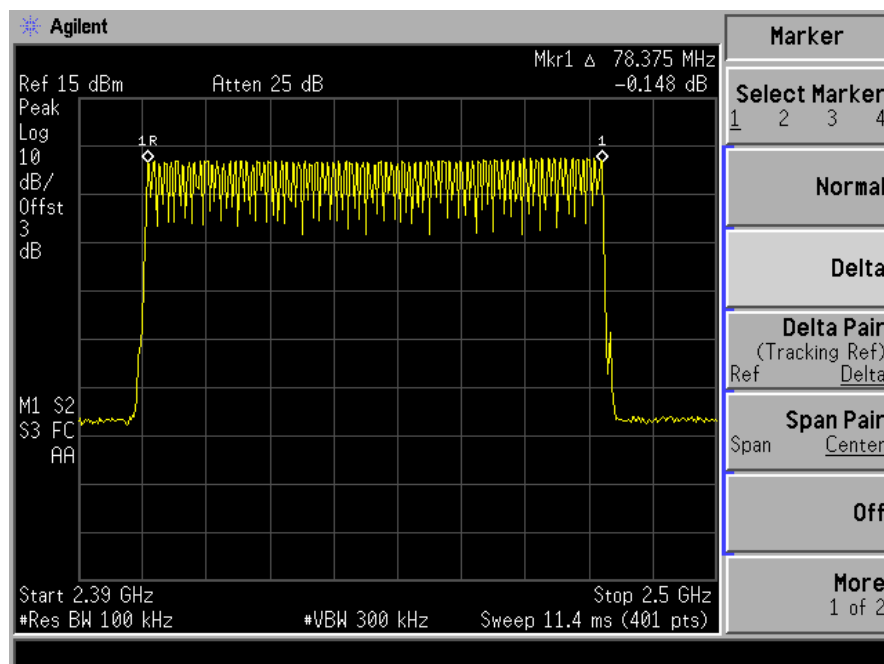
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	88156318	05/17/2014	05/16/2015

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 : September 15, 2014
Test By: Andy Temperature : 28 °C
Test Result: PASS Humidity : 65 %

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

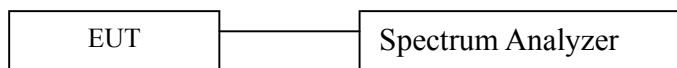


9. Time of Occupancy (Dwell Time) test

9.1 Measurement Procedure

- Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.
- 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.
- 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.
- Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- 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

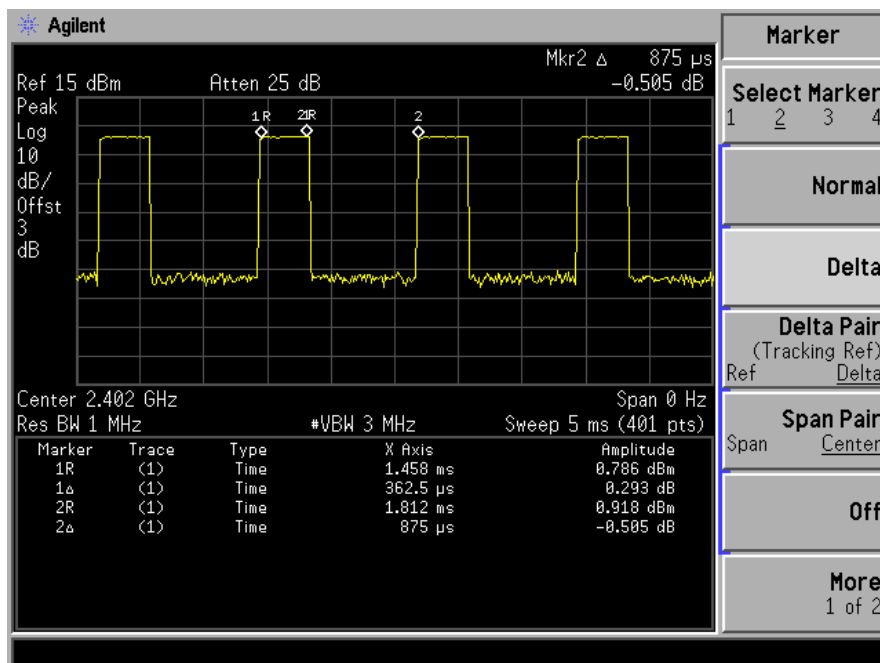
9.4 Measurement Results:

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.

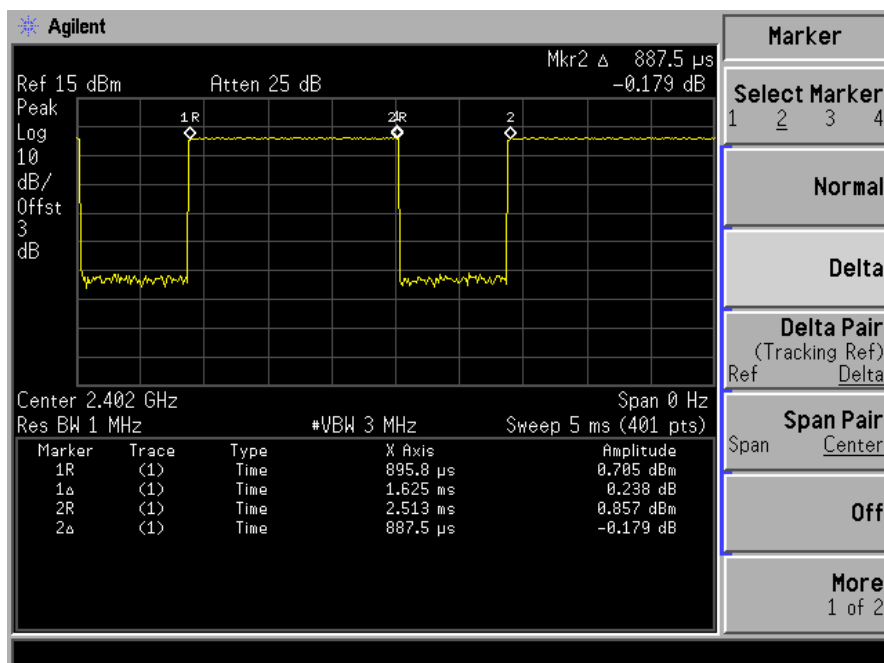
Spectrum Detector: PK Test Date : September 15, 2014
Test By: Andy Temperature : 28 °C
Test Result: PASS Humidity : 65 %

Mode	Number of transmission in a 31.6(79 Hopping*0.4)	Length of transmissions time(msec)	Result (msec)	Limit (msec)
DH1	$1600/(2*79) \times 31.6 = 320$	0.3625	116.00	400
DH3	$1600/(4*79) \times 31.6 = 160$	1.625	260.00	400
DH5	$1600/(6*79) \times 31.6 = 106.67$	2.887	307.96	400

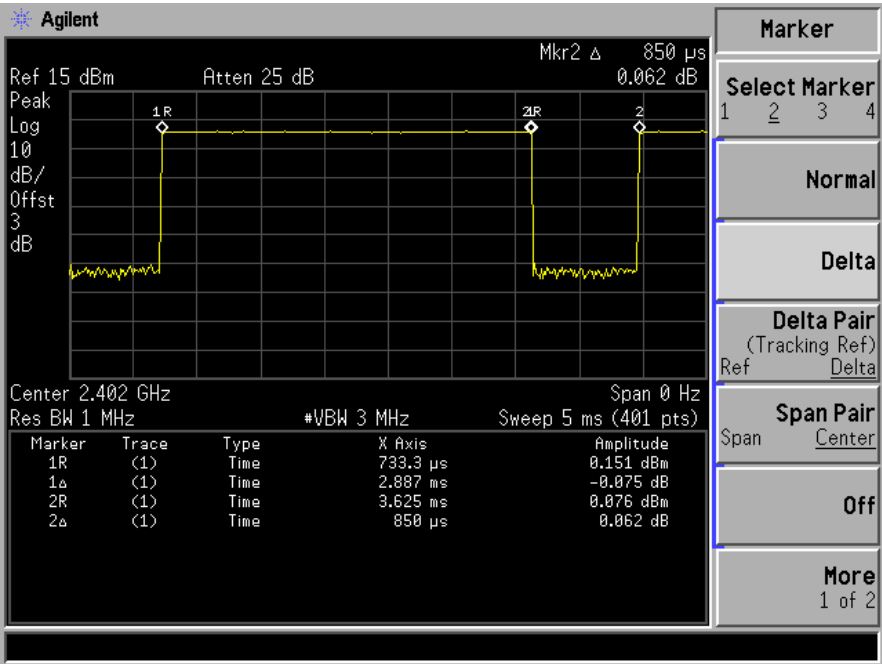
DH1



DH3



DH5

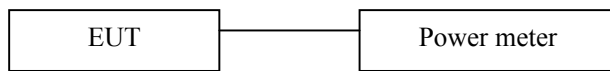


10. MAXIMUM PEAK OUTPUT POWER TEST

10.1 Measurement Procedure

- The testing follows FCC public Notice DA 00-705 Measurement Guidelines.
- The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- Set to the maximum output power setting and enable the EUT transmit continuously.
- Measure the conducted output power with cable loss and record the results in the test report.
- 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 : September 15, 2014
 Test By: Andy Temperature : 28 °C
 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	1.05	1000mW	PASS
39	2441.00	1.02	1000mW	PASS
78	2480.00	1.90	1000mW	PASS

Spectrum Detector: PK Test Date : September 15, 2014
Test By: Andy Temperature : 28 °C
Test Result: PASS Humidity : 65 %
Modulation: 1/4 II -DQPSK

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power Limit(mW)	Pass/Fail
0	2402.00	-0.67	125mW	PASS
39	2441.00	-0.62	125mW	PASS
78	2480.00	0.26	125mW	PASS

Spectrum Detector: PK Test Date : September 15, 2014
Test By: Andy Temperature : 28 °C
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	0.61	125mW	PASS
39	2441.00	-0.60	125mW	PASS
78	2480.00	0.24	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 0.1m 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	Peak
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 : September 15, 2014
Test By: Andy Temperature : 28 °C
Test channel: 00 Humidity : 65 %
Modulation: GFSK

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2379.50	H	48.65	36.75	74	54
2378.96	V	48.02	38.07	74	54

Spectrum Detector: PK/AV Test Date : September 15, 2014
Test By: Andy Temperature : 28 °C
Test channel: 78 Humidity : 65 %
Modulation: GFSK

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2485.25	H	51.95	38.77	74	54
2484.20	V	47.31	37.57	74	54

Spectrum Detector: PK/AV Test Date : September 15, 2014
Test By: Andy Temperature : 28 °C
Test channel: 00 Humidity : 65 %
Modulation: 1/4 Π -DQPSK

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2380.10	H	47.20	37.79	74	54
2380.36	V	45.93	37.00	74	54

Spectrum Detector: PK/AV Test Date : September 15, 2014
Test By: Andy Temperature : 28 °C
Test channel: 78 Humidity : 65 %
Modulation: 1/4 Π -DQPSK

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2488.40	H	47.78	36.65	74	54
2487.50	V	48.34	36.56	74	54

Spectrum Detector: PK/AV Test Date : September 15, 2014
Test By: Andy Temperature : 28 °C
Test channel: 00 Humidity : 65 %
Modulation: 8DPSK

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2380.50	H	48.11	36.93	74	54
2380.10	V	45.29	36.24	74	54

Spectrum Detector: PK/AV Test Date : September 15, 2014
Test By: Andy Temperature : 28 °C
Test channel: 78 Humidity : 65 %
Modulation: 8DPSK

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2487.60	H	48.98	37.07	74	54
2486.25	V	48.23	36.28	74	54

Spectrum Detector: PK/AV Test Date : September 15, 2014
Test By: Andy Temperature : 25°C
Mode: Hopping mode Humidity : 55 %

Frequency (MHz)	Polarity	Level (dBuV/m)		Limited (dBuV/m)	
		PK	AV	PK	AV
2390.00	H	47.09	36.22	74	54
2390.00	V	46.53	35.16	74	54
2483.51	H	46.38	35.46	74	54
2483.51	V	46.39	35.15	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.

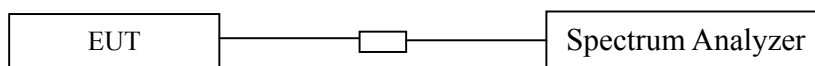
The following table is the setting of spectrum analyzer.

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.

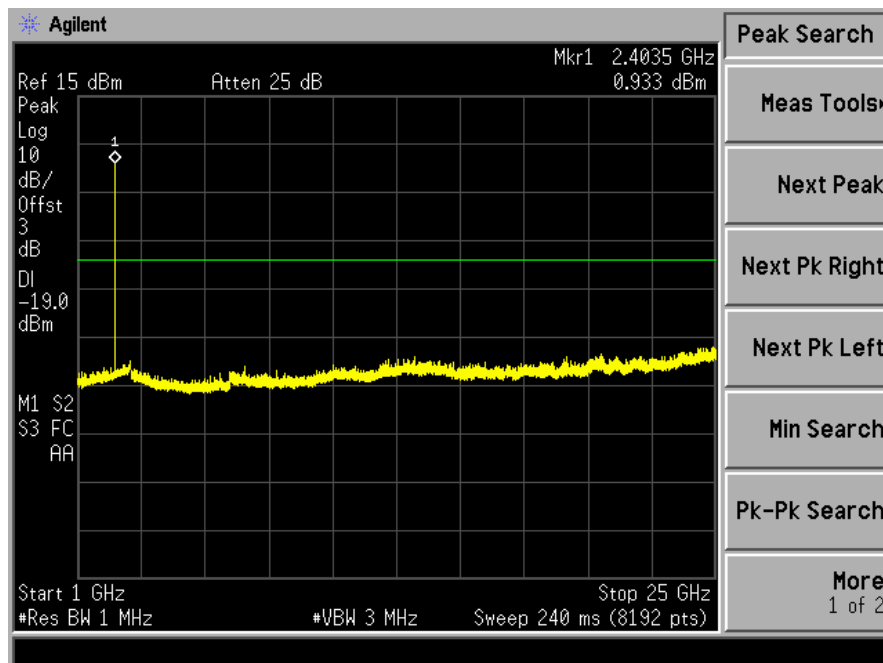
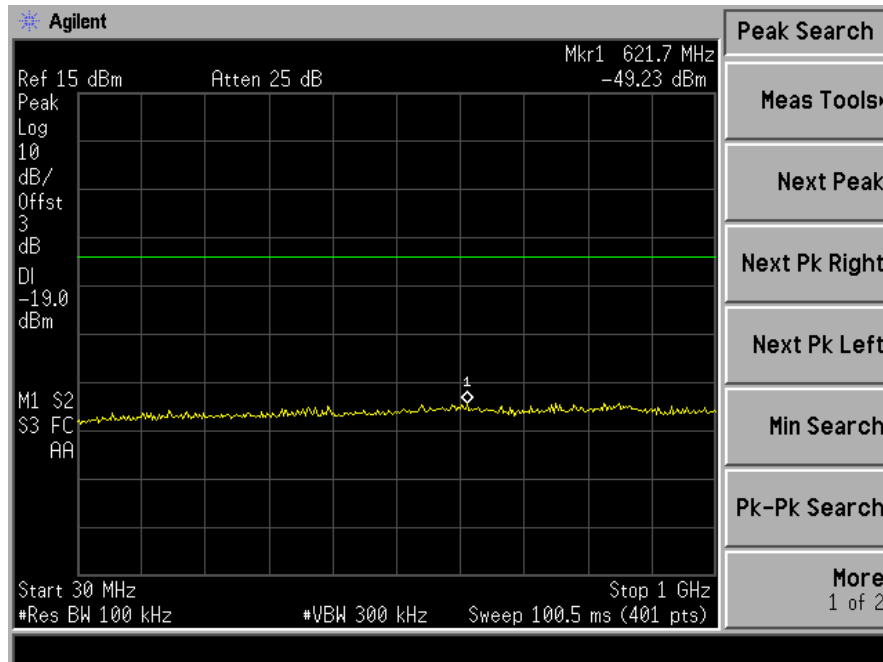
12.4 Block Diagram of Test setup



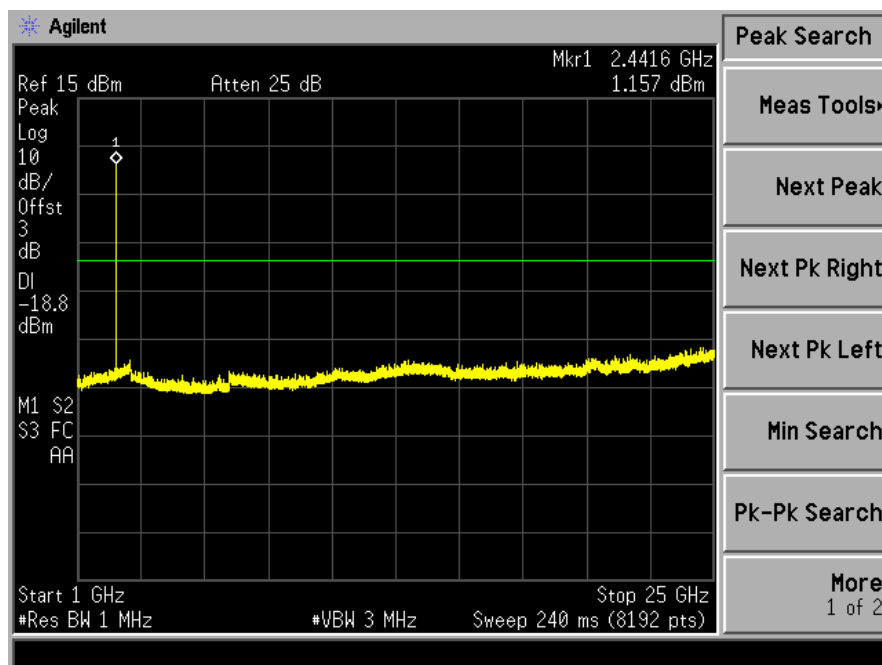
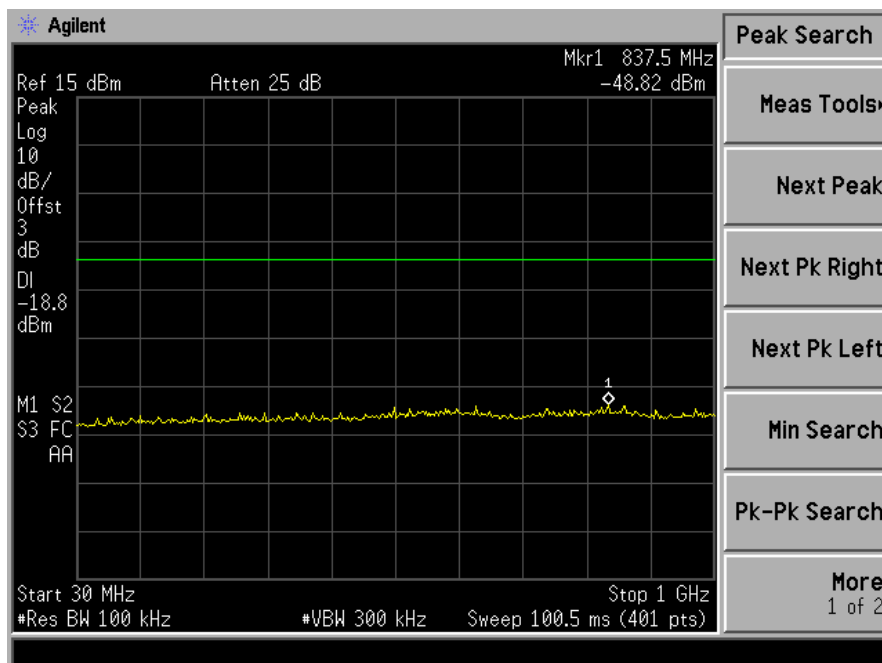
12.5 Test Result

PASS.

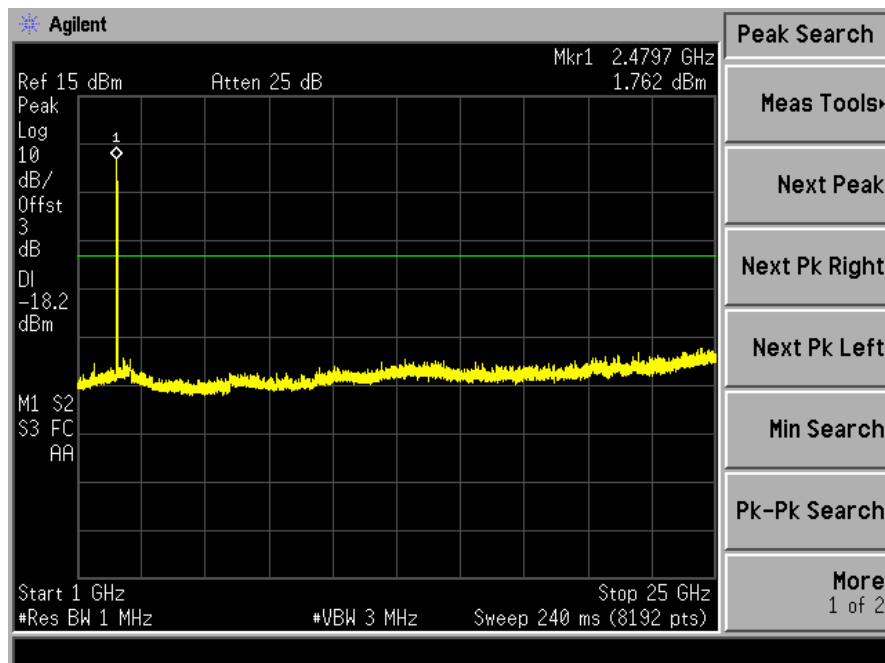
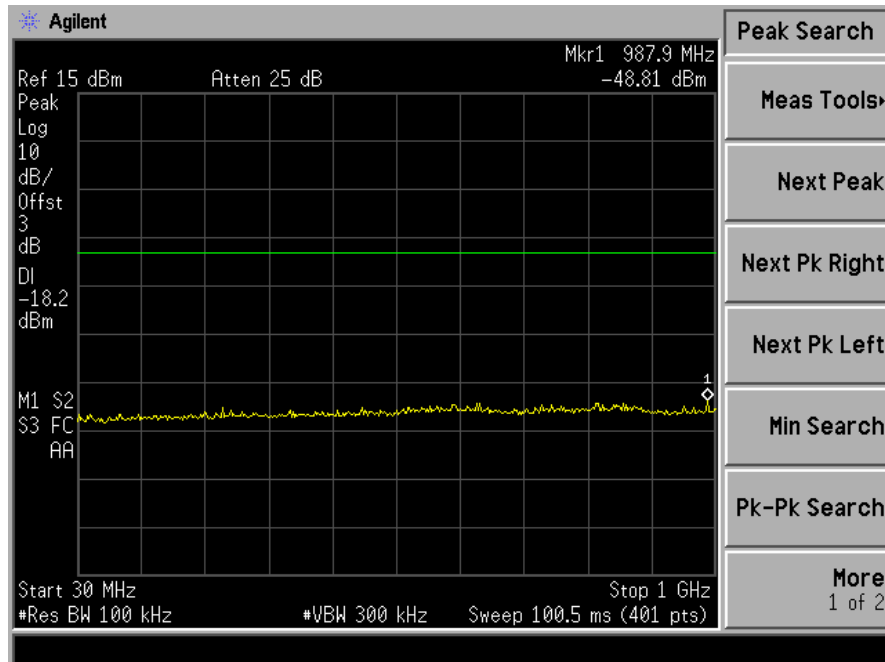
TX 2402MHz



TX 2441MHz



TX 2480MHz



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 0 dBi and meets the requirement.