

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

*OF*

Speaker Box

MODEL No.: ADS15

Trademark: N/A

FCC ID: AWA-ADS15

REPORT NO: ES150324246E

ISSUE DATE: April 21, 2015

*Prepared for*

NYNE MULTIMEDIA INC.

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**VERIFICATION OF COMPLIANCE**

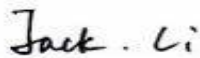
Applicant	:	NYNE MULTIMEDIA INC. 3451 LUNAR COURT, OXNARD, California, United States. 93030
Manufacturer	:	NYNE MULTIMEDIA INC. 3451 LUNAR COURT, OXNARD, California, United States. 93030
Product Description	:	Speaker Box
Brand Name	:	N/A
Model Number	:	ADS15
File Number	:	ES150324246E
Date of Test:	:	March 20, 2015 to April 03, 2015


**We hereby certify that:**

The above equipment was tested by NINGBO 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 C63.10-2013 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 : March 20, 2015 to April 03, 2015

Prepared by :   
Jack Li/Editor

Reviewer :   
Joe Xia/Supervisor

Approve & Authorized Signer :   
Lisa Wang/Manager

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## 1. General Information

### 1.1 Product Description

NYNE MULTIMEDIA INC.

Model: ADS15 (referred to as the EUT in this report) The EUT (Speaker Box) is an short range, lower power Device. It is designed by way of utilizing the GFSK,  $\pi/4$ -DQPSK and 8DPSK modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

- A). Operation Frequency: 2402-2480MHz
- B). Modulation: GFSK,  $\pi/4$ -DQPSK, 8DPSK
- C). Number of Channel: 79
- D). Channel Space: 1MHz
- E). BIT Rate of Transmission: 1Mbps, 2Mbps, 3Mbps
- F). Antenna Type: PCB antenna
- G). Antenna Gain: 0dBi
- H). Power Supply: AC 120V, 50/60Hz

### 1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: AWA-ADS15 filing to comply with Section 15.247 of the FCC Part 15 Subpart C Rules.

### 1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.10 -2013. 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, 2014  
The Certificate Registration Number is 406365.

Accredited by Industry Canada, March 5, 2010  
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 placed on a turn table which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10-2013, conducted emissions from the EUT are measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.

#### **2.3.2 Radiated Emissions**

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 Speaker Box (EUT) were rotated through three orthogonal axes according to the requirements in section 6.4, section 6.5 and section 6.6 of ANSI C63.10-2013.

## 2.4 Limitation

### (1) Channel Separation Test

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

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

### (2) 20dB Bandwidth

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

### (3) Quantity of Hopping Channel

FCC Part 15, Subpart C Section 15.247

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

### (4) Time of Occupancy(Dwell Time)

FCC Part 15, Subpart C Section 15.247

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

**Note:** The “( )” is all channel’s average time of occupancy.



**(5) Maximum Peak Output Power**

FCC Part 15, Subpart C Section 15.247

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

**(6) Band edge**

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

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

**(7) Conducted Emission**

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

**Note:**

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

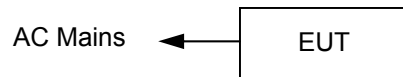
**(8) Radiated Emission**

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

Frequency (MHz)	Field strength $\mu\text{V/m}$	Distance(m)	Field strength at 3m $\text{dB}\mu\text{V/m}$
0.009~0.490	2400/F(KHz)	300	/
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  $= 40 \log(\text{Specific distance} / \text{test distance})$  (dB);  
Limit line = Specific limits (dB $\mu\text{V}$ ) + distance extrapolation factor.

**2.5 Configuration of Tested System**



## 2.6 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
1.	Speaker Box	NYNE	ADS15	AWA-ADS15	N/A	EUT
\		\	\	\	\	\

**Note:**

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

## 2.7 Description of Test Modes

The EUT (Speaker Box) has been tested under normal operating condition. This EUT is a FHSS system. Pre-scanned tests, were conducted to determine the final configuration from all possible combinations. We use software control the EUT, Let EUT hopping on and transmit with highest power, all the modes have been tested. 79 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test

Channel	Frequency(MHz)
Low channel	2402
Middle channel	2441
High channel	2480

### 3. Summary of Test Results

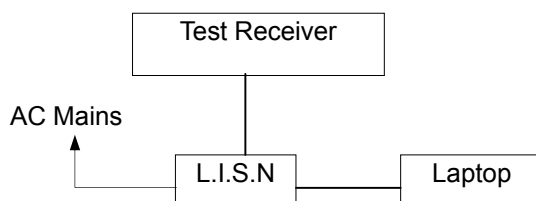
FCC Rules	Description Of Test	Result
FCC Part 15.247(a)(1)	Channel Separation Test	Compliant
FCC Part 15.247(a)(1)	20dB Bandwidth	Compliant
FCC Part 15.247(a)(1)	Quantity of Hopping Channel	Compliant
FCC Part 15.247(a)(1)	Time of Occupancy (Dwell Time)	Compliant
FCC Part 15.247(b)	Max Peak Output Power Test	Compliant
FCC Part 15.247(d)	Band Edge Test	Compliant
FCC Part 15.207	Conducted Emission	Compliant
FCC Part 15.247(d)&15.209	Radiated Emission	Compliant
FCC Part 15.247(d)	Antenna Port Emission	Compliant
FCC Part 15.203&15.247(b)	Antenna Requirement	Compliant

## 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 three highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

### 4.2 Test SET-UP (Block Diagram of Configuration)



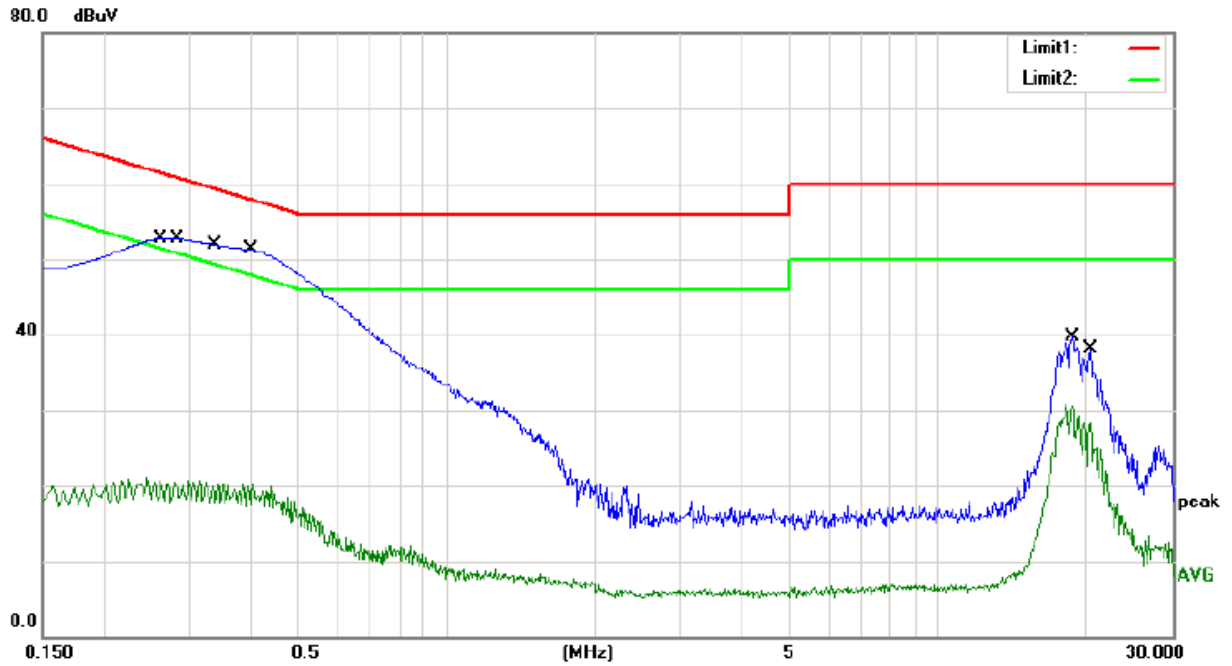
### 4.3 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/17/2014	05/16/2015
L.I.S.N.	Rohde & Schwarz	ENV216	101161	05/17/2014	05/16/2015
L.I.S.N.	Schwarzbeck	NNLK8129	8129203	05/17/2014	05/17/2015
50Ω Coaxial Switch	Anritsu	MP59B	M20531	N/A	N/A
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	05/17/2014	05/17/2015

### 4.4 Measurement Equipment Used

Pass.  
Please refer to the following data.

BT Mode:



Site site #1

Phase: **L1**

Temperature: 20

Limit: (CE)FCC PART 15 class B\_QP

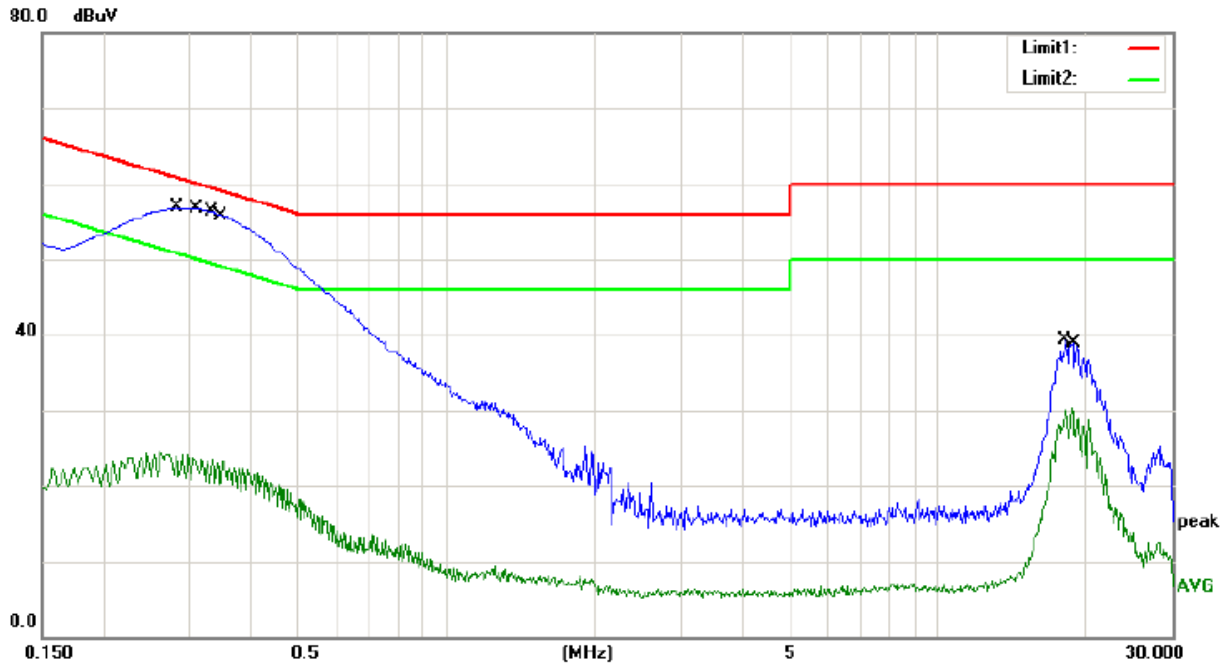
Power: AC 120V/60Hz

Humidity: 51 %

Mode: BT Mode

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2620	41.70	11.00	52.70	61.37	-8.67	QP	
2		0.2620	7.60	11.00	18.60	51.37	-32.77	AVG	
3		0.2820	41.70	11.00	52.70	60.76	-8.06	QP	
4		0.2820	9.00	11.00	20.00	50.76	-30.76	AVG	
5		0.3420	40.70	11.00	51.70	59.15	-7.45	QP	
6		0.3420	9.30	11.00	20.30	49.15	-28.85	AVG	
7	*	0.3997	40.30	11.00	51.30	57.86	-6.56	QP	
8		0.3997	7.70	11.00	18.70	47.86	-29.16	AVG	
9		18.7360	28.60	11.00	39.60	60.00	-20.40	QP	
10		18.7360	19.40	11.00	30.40	50.00	-19.60	AVG	
11		20.3960	27.10	11.00	38.10	60.00	-21.90	QP	
12		20.3960	17.20	11.00	28.20	50.00	-21.80	AVG	



Site site #1

Phase: *N*

Temperature: 20

Limit: (CE)FCC PART 15 class B\_QP

Power: AC 120V/60Hz

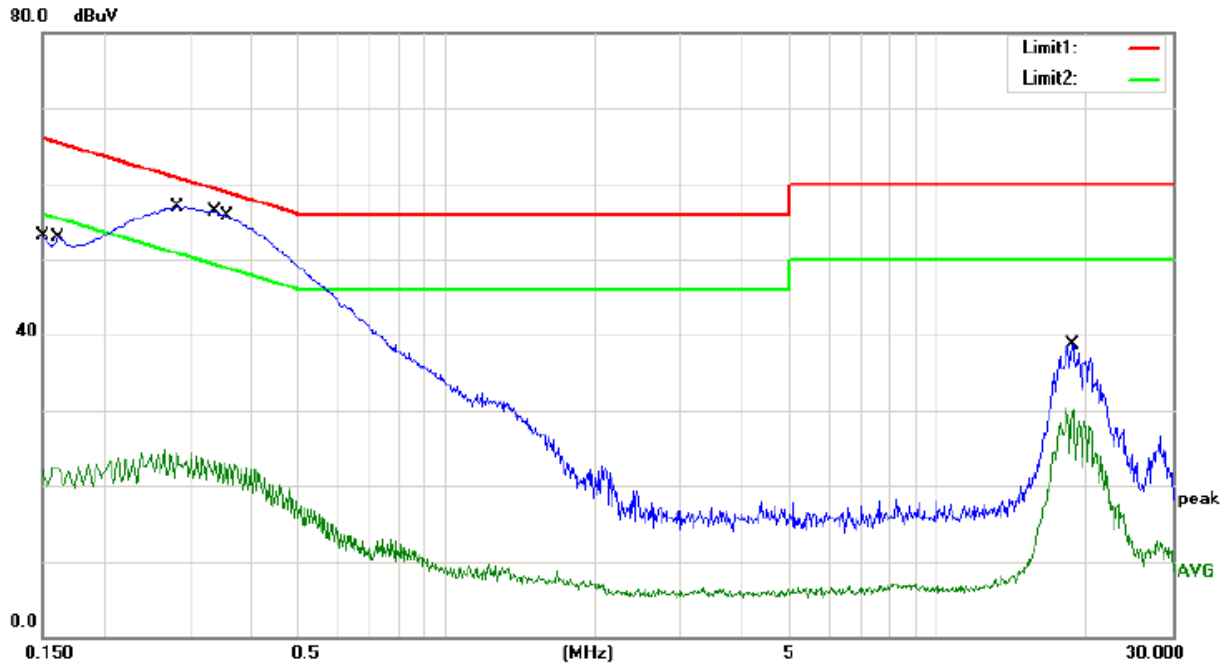
Humidity: 51 %

Mode: BT Mode

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2820	41.80	11.00	52.80	60.76	-7.96	QP	
2		0.2820	12.90	11.00	23.90	50.76	-26.86	AVG	
3		0.3100	41.60	11.00	52.60	59.97	-7.37	QP	
4		0.3100	12.10	11.00	23.10	49.97	-26.87	AVG	
5	*	0.3380	41.10	11.00	52.10	59.25	-7.15	QP	
6		0.3380	9.50	11.00	20.50	49.25	-28.75	AVG	
7		0.3520	40.70	11.00	51.70	58.92	-7.22	QP	
8		0.3520	11.80	11.00	22.80	48.92	-26.12	AVG	
9		18.2040	28.20	11.00	39.20	60.00	-20.80	QP	
10		18.2040	19.00	11.00	30.00	50.00	-20.00	AVG	
11		18.8240	27.80	11.00	38.80	60.00	-21.20	QP	
12		18.9240	15.80	11.00	26.80	50.00	-23.20	AVG	

USB Playing mode:



Site site #1

Phase: **L1**

Temperature: 20

Limit: (CE)FCC PART 15 class B\_QP

Power: AC 120V/60Hz

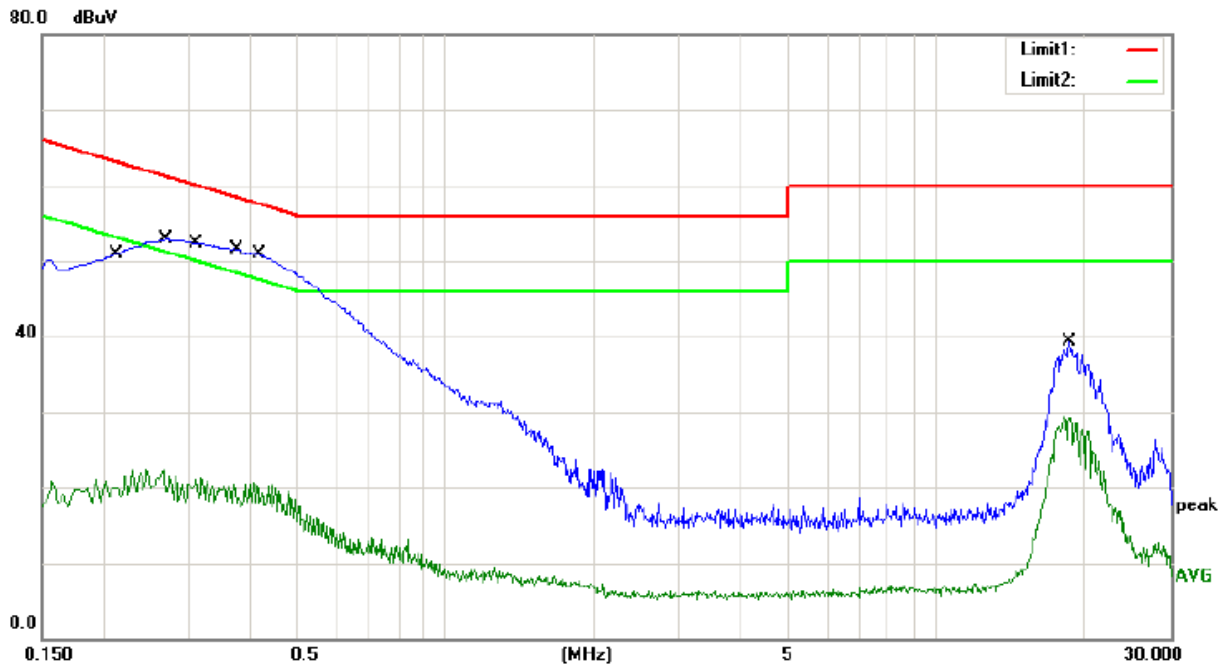
Humidity: 51 %

Mode: USB Playing

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	42.10	11.00	53.10	66.00	-12.90	QP	
2		0.1500	11.00	11.00	22.00	56.00	-34.00	AVG	
3		0.1620	41.80	11.00	52.80	65.36	-12.56	QP	
4		0.1620	11.30	11.00	22.30	55.36	-33.06	AVG	
5		0.2820	41.80	11.00	52.80	60.76	-7.96	QP	
6		0.2820	13.40	11.00	24.40	50.76	-26.36	AVG	
7	*	0.3392	41.20	11.00	52.20	59.22	-7.02	QP	
8		0.3392	11.50	11.00	22.50	49.22	-26.72	AVG	
9		0.3620	40.50	11.00	51.50	58.68	-7.18	QP	
10		0.3620	11.90	11.00	22.90	48.68	-25.78	AVG	
11		18.7560	27.60	11.00	38.60	60.00	-21.40	QP	
12		18.7560	18.60	11.00	29.60	50.00	-20.40	AVG	

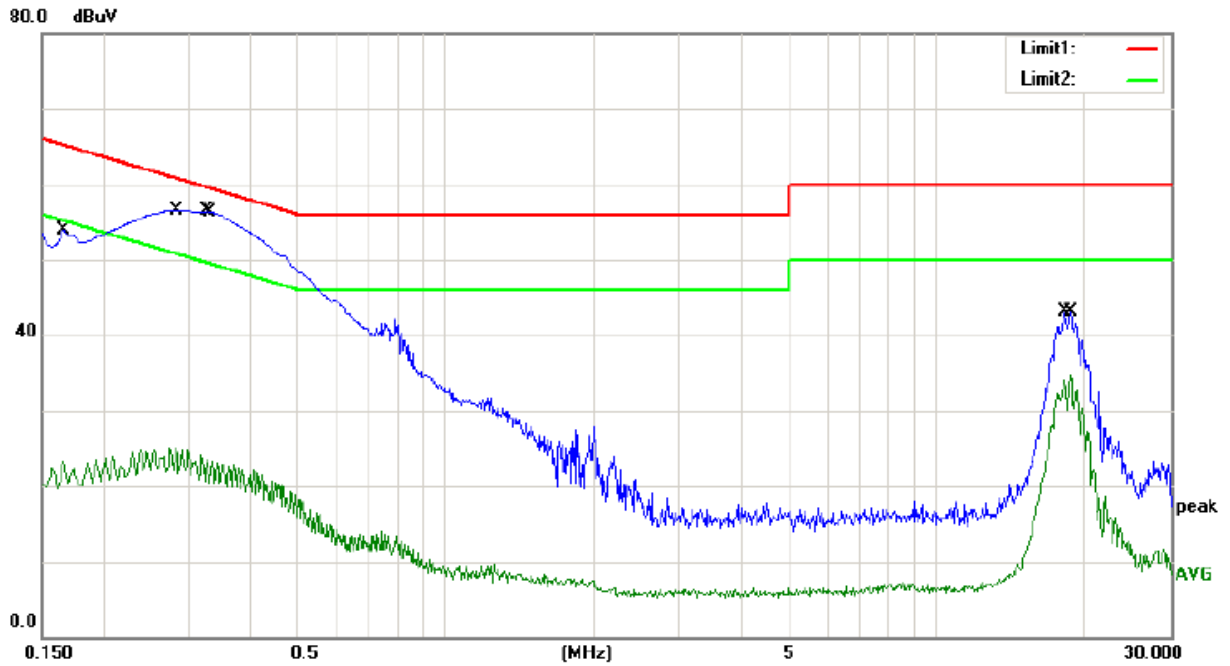




Site site #1 Phase: **N** Temperature: 20  
 Limit: (CE)FCC PART 15 class B\_QP Power: AC 120V/60Hz Humidity: 51 %  
 Mode: USB Playing  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2100	39.70	11.00	50.70	63.21	-12.51	QP	
2		0.2100	8.90	11.00	19.90	53.21	-33.31	AVG	
3		0.2700	41.80	11.00	52.80	61.12	-8.32	QP	
4		0.2700	8.40	11.00	19.40	51.12	-31.72	AVG	
5		0.3100	41.40	11.00	52.40	59.97	-7.57	QP	
6		0.3100	10.10	11.00	21.10	49.97	-28.87	AVG	
7		0.3791	40.40	11.00	51.40	58.30	-6.90	QP	
8		0.3791	7.30	11.00	18.30	48.30	-30.00	AVG	
9	*	0.4193	39.70	11.00	50.70	57.46	-6.76	QP	
10		0.4193	7.30	11.00	18.30	47.46	-29.16	AVG	
11		18.7000	28.30	11.00	39.30	60.00	-20.70	QP	
12		18.7000	18.30	11.00	29.30	50.00	-20.70	AVG	

Audio input mode



Site site #1

Phase: **N**

Temperature: 20

Limit: (CE)FCC PART 15 class B\_QP

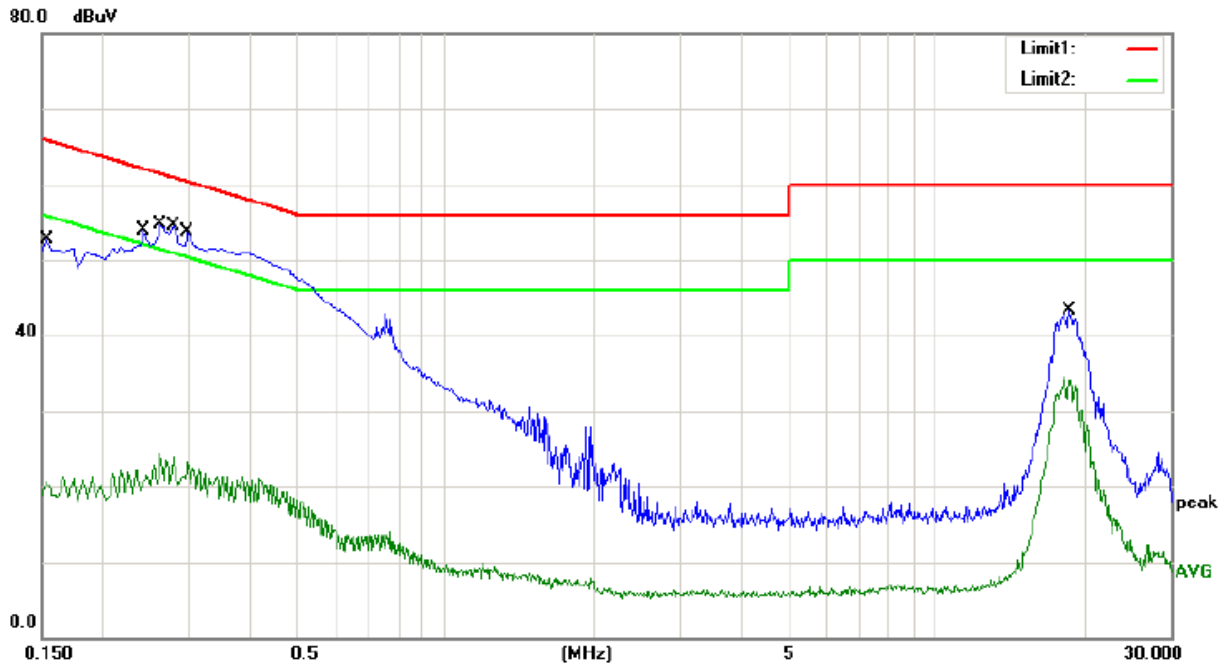
Power: AC 120V/60Hz

Humidity: 51 %

Mode: Audio input

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1660	42.90	11.00	53.90	65.16	-11.26	QP	
2		0.1660	12.30	11.00	23.30	55.16	-31.86	AVG	
3		0.2820	41.50	11.00	52.50	60.76	-8.26	QP	
4		0.2820	14.00	11.00	25.00	50.76	-25.76	AVG	
5		0.3260	41.40	11.00	52.40	59.55	-7.15	QP	
6		0.3260	12.40	11.00	23.40	49.55	-26.15	AVG	
7	*	0.3340	41.30	11.00	52.30	59.35	-7.05	QP	
8		0.3340	12.30	11.00	23.30	49.35	-26.05	AVG	
9		18.2880	32.20	11.00	43.20	60.00	-16.80	QP	
10		18.2880	23.00	11.00	34.00	50.00	-16.00	AVG	
11		18.8160	32.00	11.00	43.00	60.00	-17.00	QP	
12		18.8160	23.60	11.00	34.60	50.00	-15.40	AVG	



Site site #1

Phase: **L1**

Temperature: 20

Limit: (CE)FCC PART 15 class B\_QP

Power: AC 120V/60Hz

Humidity: 51 %

Mode: Audio input

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1540	41.70	11.00	52.70	65.78	-13.08	QP	
2		0.1540	9.70	11.00	20.70	55.78	-35.08	AVG	
3		0.2420	42.90	11.00	53.90	62.03	-8.13	QP	
4		0.2420	9.60	11.00	20.60	52.03	-31.43	AVG	
5		0.2620	43.60	11.00	54.60	61.37	-6.77	QP	
6		0.2620	13.30	11.00	24.30	51.37	-27.07	AVG	
7	*	0.2780	43.40	11.00	54.40	60.88	-6.48	QP	
8		0.2788	12.30	11.00	23.30	50.85	-27.55	AVG	
9		0.2980	42.70	11.00	53.70	60.30	-6.60	QP	
10		0.2980	12.20	11.00	23.20	50.30	-27.10	AVG	
11		18.6640	32.20	11.00	43.20	60.00	-16.80	QP	
12		18.6640	23.00	11.00	34.00	50.00	-16.00	AVG	

## 5. Radiated Emission Test

### 5.1 Measurement Procedure

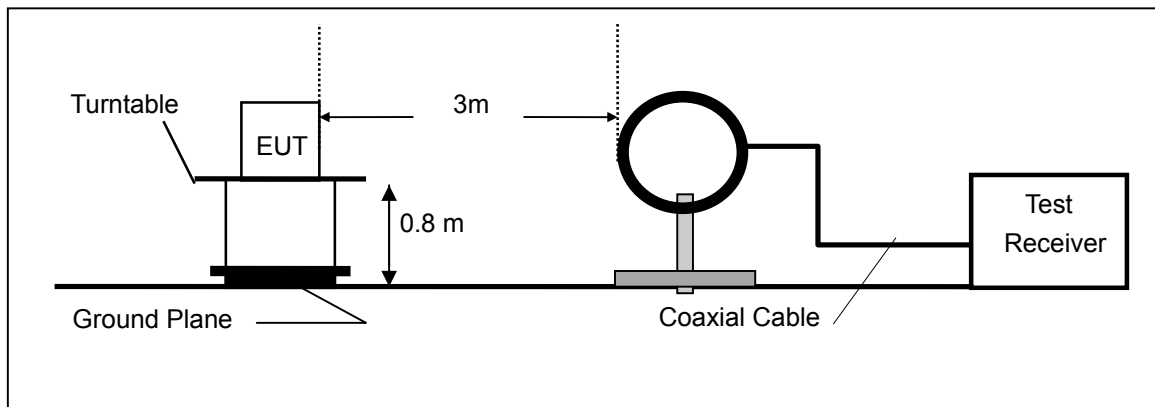
1. The EUT was placed on a turntable which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured was complete.

The frequency range from 30MHz to 1000MHz was pre-scanned with a peak detector (RBW=100kHz, VBW=300kHz) and all final readings of measurement from Test Receiver are Quasi-Peak values(Quasi Peak detector used with a bandwidth of 120 kHz).

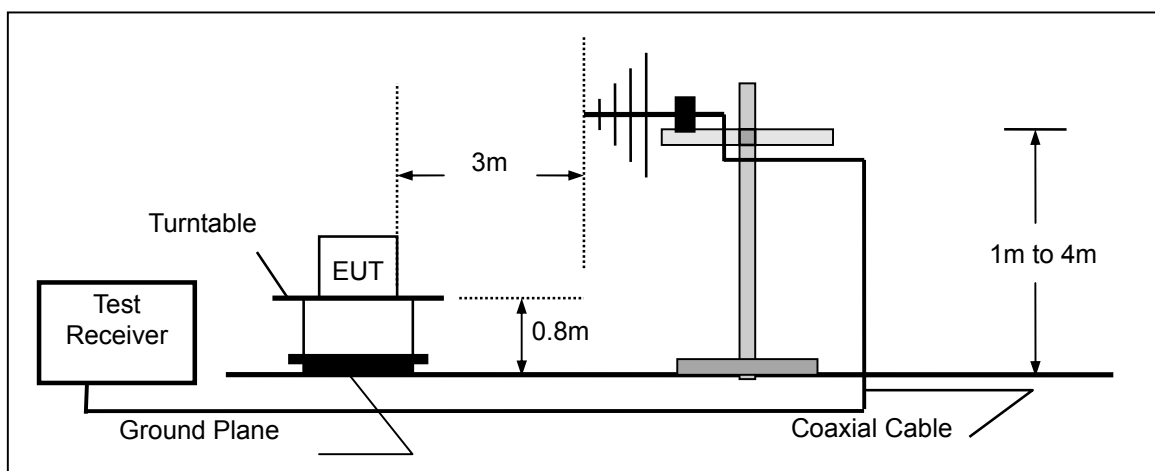
The frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

### 5.2 Test SET-UP (Block Diagram of Configuration)

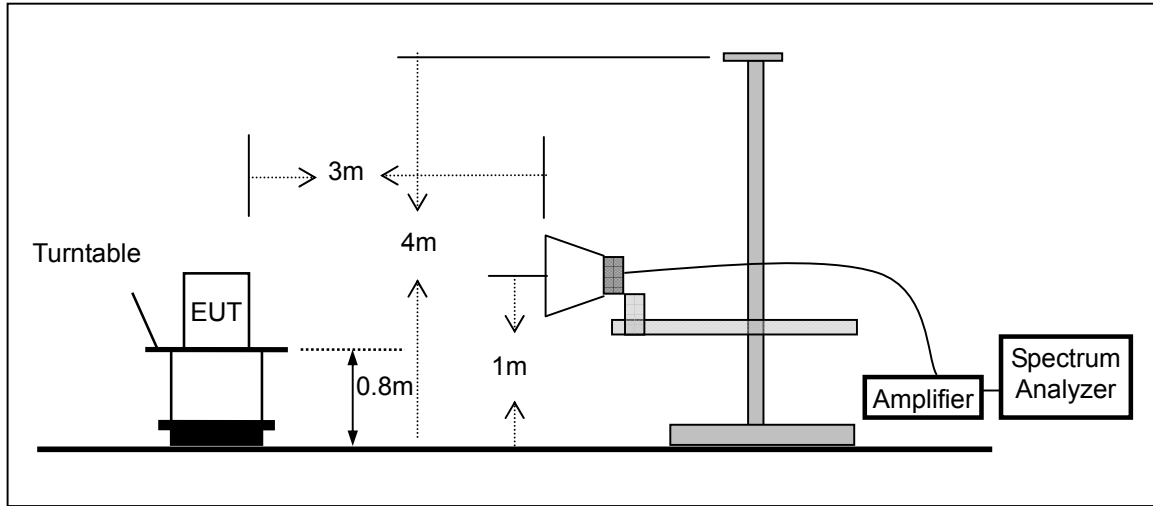
(A) Radiated Emission Test Set-Up, Frequency below 30MHz



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



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



**5.3 Measurement Equipment Used**

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	05/17/2014	1 Year
2.	Pre-Amplifier	HP	8447D	2944A07999	05/17/2014	1 Year
3.	Pre-Amplifier	A.H.	PAM-0126	1415261	05/17/2014	1 Year
4.	Bilog Antenna	Schwarzbeck	VULB9163	142	05/17/2014	1 Year
5.	Loop Antenna	Schwarzbeck	FMZB 1519	1519-012	05/17/2014	1 Year
6.	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/17/2014	1 Year
7.	Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/17/2014	1 Year
8.	Cable	Schwarzbeck	AK9513	ACRX1	05/17/2014	1 Year
9.	Cable	Rosenberger	N/A	FP2RX2	05/17/2014	1 Year
10.	Cable	Schwarzbeck	AK9513	CRPX1	05/17/2014	1 Year
11.	Cable	Schwarzbeck	AK9513	CRRX2	05/17/2014	1 Year

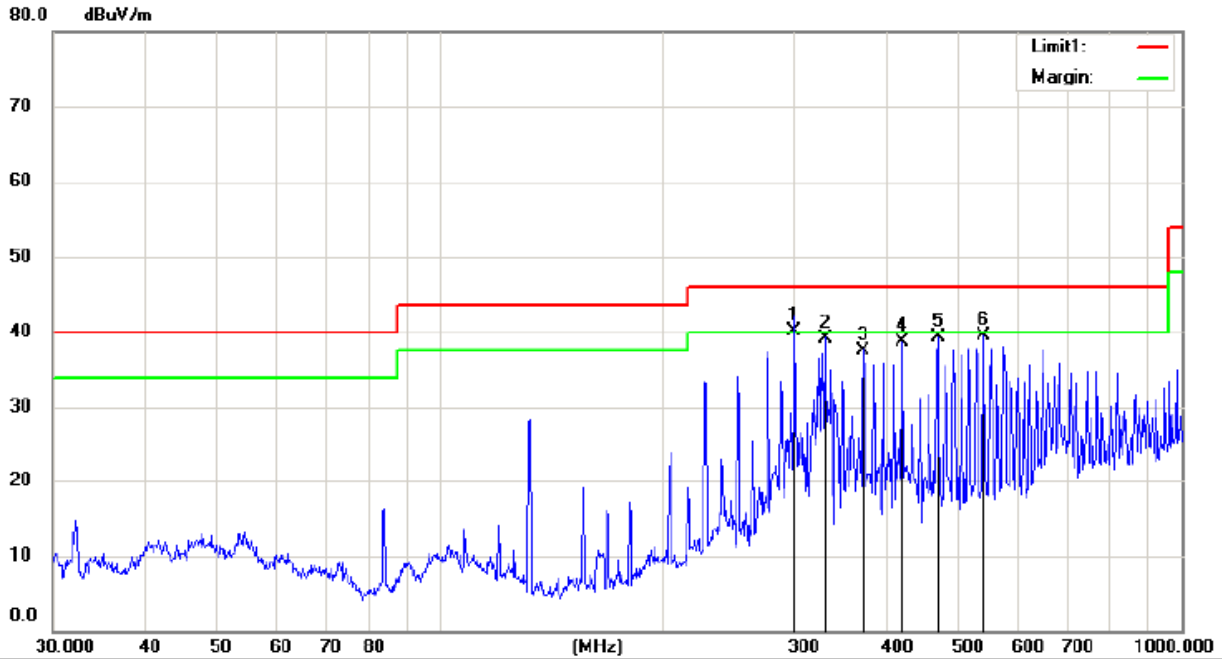
**5.4 Measurement Result**

(For range 9KHz~30MHz, The measured value is really too low to be recorded.)

**Below 1000MHz (30M-1GHz)**

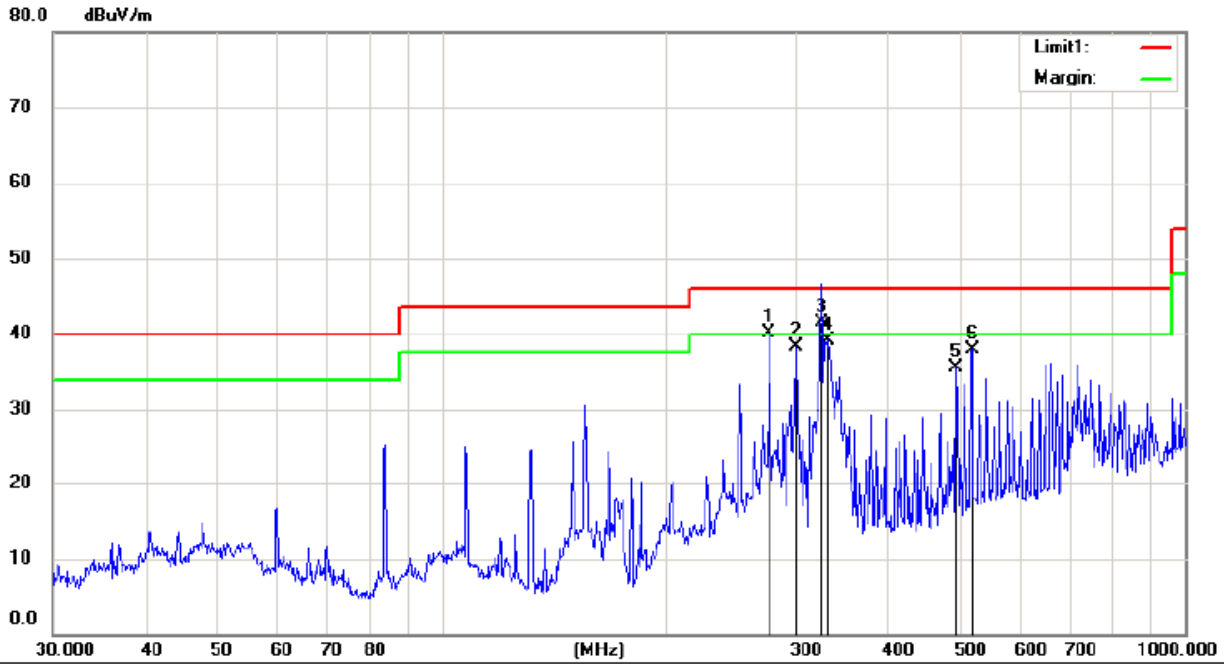
**Bluetooth mode:**

(Bluetooth (GFSK, pi/4-DQPSK, 8DPSK) mode have been tested, and the worst result was report as below.)



Site site #1 Polarization: **Horizontal** Temperature: 18 C  
 Limit: FCC Part15 Class B 3M Radiation Power: AC 120V/60Hz Humidity: 42 %  
 Mode: Bluetooth (GFSK, Middle channel)  
 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	*	300.3672	59.05	-18.95	40.10	46.00	-5.90	QP		
2		330.1950	57.28	-18.08	39.20	46.00	-6.80	QP		
3		372.0045	54.96	-17.36	37.60	46.00	-8.40	QP		
4		420.5803	55.35	-16.65	38.70	46.00	-7.30	QP		
5		468.8762	55.70	-16.40	39.30	46.00	-6.70	QP		
6		541.3725	52.46	-12.96	39.50	46.00	-6.50	QP		

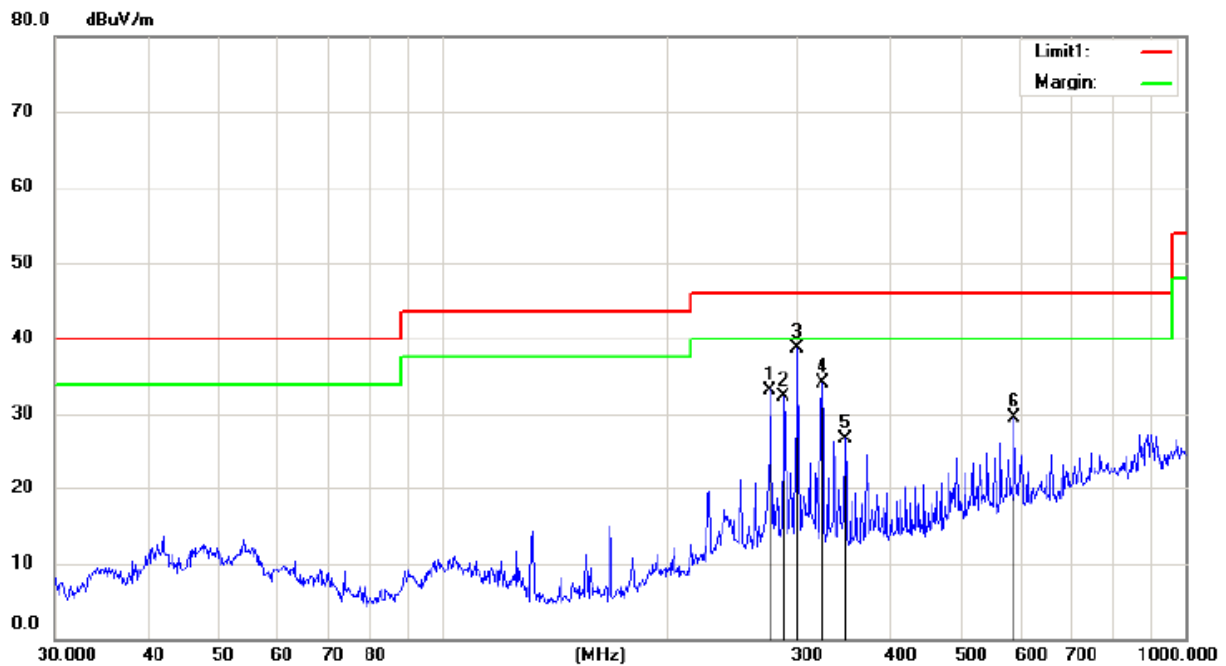


Site site #1 Polarization: *Vertical* Temperature: 18 C  
 Limit: FCC Part15 Class B 3M Radiation Power: AC 120V/60Hz Humidity: 42 %  
 Mode: Bluetooth (GFSK, Middle channel)  
 Note:

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	!	276.1235	59.45	-19.35	40.10	46.00	-5.90			QP
2		300.3672	57.25	-18.95	38.30	46.00	-7.70			QP
3	*	324.4561	59.57	-18.07	41.50	46.00	-4.50			QP
4		331.3546	57.22	-18.02	39.20	46.00	-6.80			QP
5		492.4685	50.55	-14.95	35.60	46.00	-10.40			QP
6		517.2480	51.57	-13.57	38.00	46.00	-8.00			QP

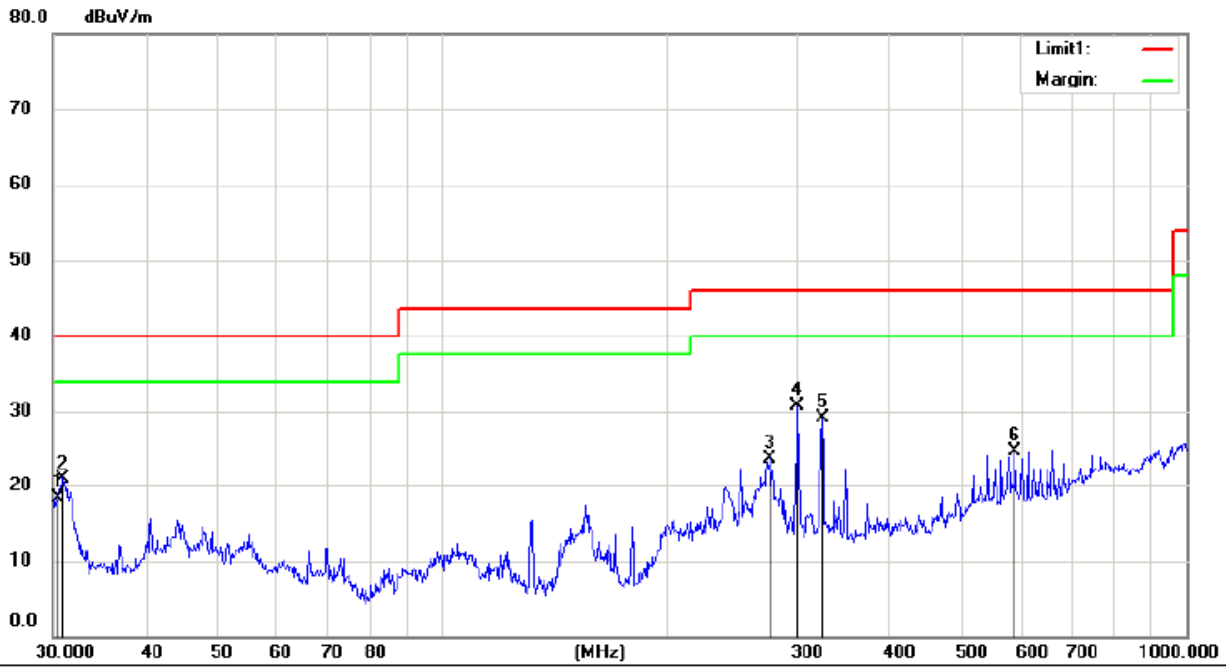






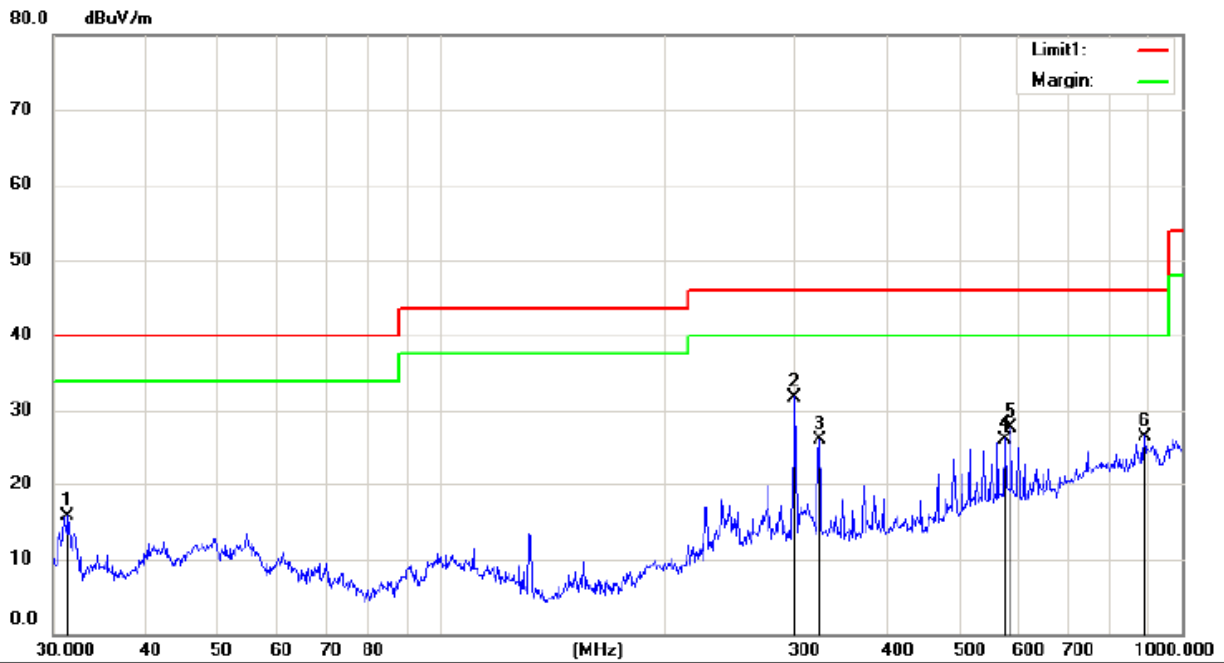
Site site #1      Polarization: **Horizontal**      Temperature: 18 C  
 Limit: FCC Part15 Class B 3M Radiation      Power: AC 120V/60Hz      Humidity: 42 %  
 Mode: Bluetooth (GFSK, Low channel)  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1		276.1235	52.55	-19.35	33.20	46.00	-12.80	QP		
2		287.9904	51.61	-19.31	32.30	46.00	-13.70	QP		
3	*	300.3672	57.65	-18.95	38.70	46.00	-7.30	QP		
4		324.4561	52.17	-18.07	34.10	46.00	-11.90	QP		
5		348.0274	44.94	-18.14	26.80	46.00	-19.20	QP		
6		588.9051	41.44	-11.94	29.50	46.00	-16.50	QP		



Site site #1 Polarization: **Vertical** Temperature: 18 C  
 Limit: FCC Part15 Class B 3M Radiation Power: AC 120V/60Hz Humidity: 42 %  
 Mode: Bluetooth (GFSK, High channel)  
 Note:

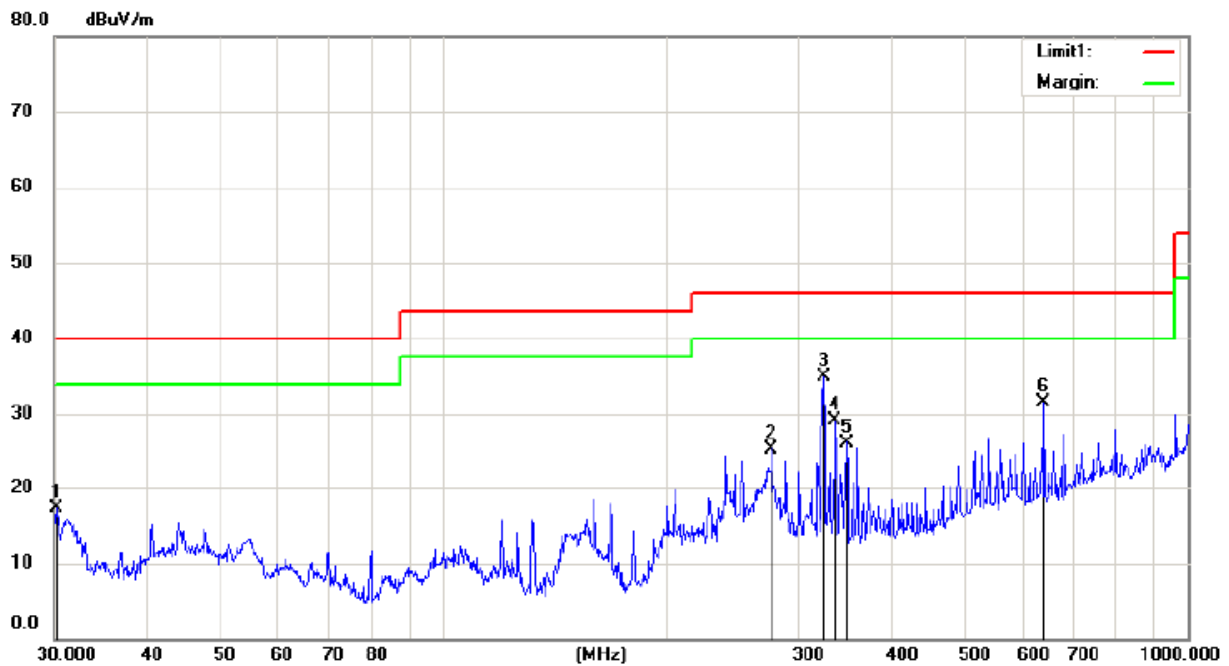
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		30.3173	42.51	-24.21	18.30	40.00	-21.70	QP		
2		30.9620	44.84	-23.84	21.00	40.00	-19.00	QP		
3		276.1235	43.15	-19.35	23.80	46.00	-22.20	QP		
4	*	300.3672	49.65	-18.95	30.70	46.00	-15.30	QP		
5		324.4561	47.17	-18.07	29.10	46.00	-16.90	QP		
6		588.9051	36.64	-11.94	24.70	46.00	-21.30	QP		



Site site #1 Polarization: **Horizontal** Temperature: 18 C  
 Limit: FCC Part15 Class B 3M Radiation Power: AC 120V/60Hz Humidity: 42 %  
 Mode: Bluetooth (GFSK, High channel)  
 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	Comment
1		31.3992	39.40	-23.60	15.80	40.00	-24.20	QP		
2	*	300.3672	50.75	-18.95	31.80	46.00	-14.20	QP		
3		324.4561	44.17	-18.07	26.10	46.00	-19.90	QP		
4		576.6443	37.88	-11.68	26.20	46.00	-19.80	QP		
5		588.9051	39.64	-11.94	27.70	46.00	-18.30	QP		
6		890.7278	33.63	-7.03	26.60	46.00	-19.40	QP		

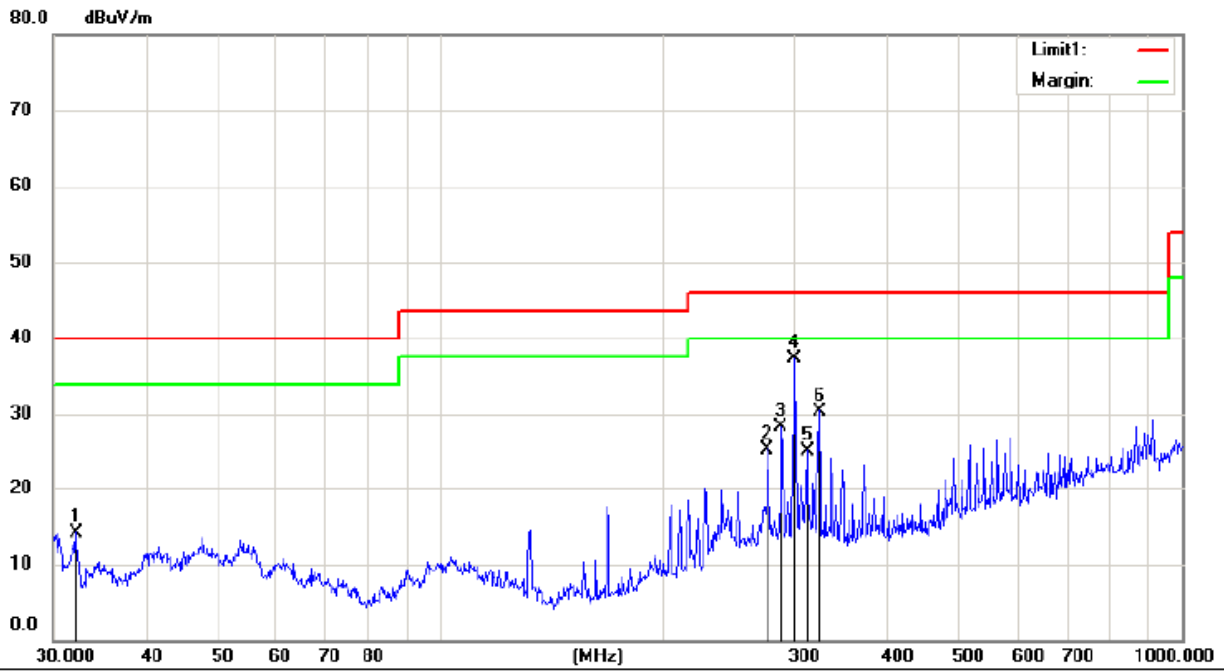




Site site #1      Polarization: **Vertical**      Temperature: 18 C  
 Limit: FCC Part15 Class B 3M Radiation      Power: AC 120V/60Hz      Humidity: 42 %  
 Mode: USB Playing  
 Note:

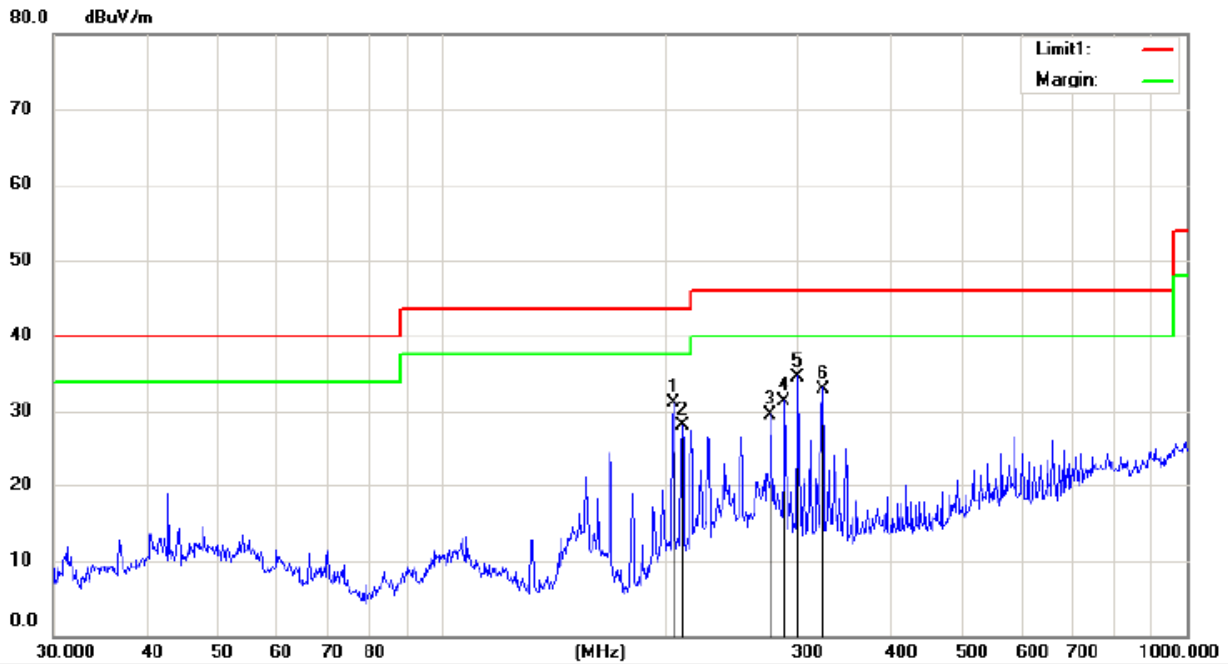
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1		30.2111	41.56	-24.26	17.30	40.00	-22.70	QP		
2		276.1235	44.75	-19.35	25.40	46.00	-20.60	QP		
3	*	324.4561	52.97	-18.07	34.90	46.00	-11.10	QP		
4		336.0352	46.87	-17.77	29.10	46.00	-16.90	QP		
5		348.0274	44.34	-18.14	26.20	46.00	-19.80	QP		
6		640.6110	43.86	-12.36	31.50	46.00	-14.50	QP		

**Audio input mode:**



Site site #1 Polarization: **Horizontal** Temperature: 18 C  
 Limit: FCC Part15 Class B 3M Radiation Power: AC 120V/60Hz Humidity: 42 %  
 Mode: Audio input  
 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		32.1795	37.38	-23.18	14.20	40.00	-25.80	QP		
2		276.1235	44.75	-19.35	25.40	46.00	-20.60	QP		
3		287.9904	47.61	-19.31	28.30	46.00	-17.70	QP		
4	*	300.3672	56.35	-18.95	37.40	46.00	-8.60	QP		
5		312.1794	43.84	-18.64	25.20	46.00	-20.80	QP		
6		324.4561	48.47	-18.07	30.40	46.00	-15.60	QP		



Site site #1 Polarization: **Vertical** Temperature: 18 C  
 Limit: FCC Part15 Class B 3M Radiation Power: AC 120V/60Hz Humidity: 42 %  
 Mode: Audio input  
 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	Detector	Comment
1		204.2377	53.32	-22.22	31.10	43.50	-12.40			QP	
2		210.0482	50.74	-22.64	28.10	43.50	-15.40			QP	
3		276.1235	48.95	-19.35	29.60	46.00	-16.40			QP	
4		287.9904	50.71	-19.31	31.40	46.00	-14.60			QP	
5	*	300.3672	53.55	-18.95	34.60	46.00	-11.40			QP	
6		324.4561	51.07	-18.07	33.00	46.00	-13.00			QP	

**Above 1000MHz:**

Test Date : 03/29/2015 Temperature : 24 °C  
 Test Result: PASS Humidity : 53 %  
 Test By: KK

GFSK Mode: Low channel							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4808.000	V	59.55	40.60	74.00	54.00	-14.45	-13.40
5760.000	V	48.29	31.90	74.00	54.00	-25.71	-22.10
9653.000	V	48.59	32.60	74.00	54.00	-25.41	-21.40
13750.000	V	49.70	33.90	74.00	54.00	-24.30	-20.10
16504.000	V	51.42	36.50	74.00	54.00	-22.58	-17.50
17898.000	V	52.69	35.50	74.00	54.00	-21.31	-18.50
4808.000	H	61.77	40.90	74.00	54.00	-12.23	-13.10
5947.000	H	51.11	33.60	74.00	54.00	-22.89	-20.40
7205.000	H	50.93	33.90	74.00	54.00	-23.07	-20.10
8446.000	H	50.65	35.10	74.00	54.00	-23.35	-18.90
9500.000	H	50.24	33.40	74.00	54.00	-23.76	-20.60
16487.000	H	52.76	36.50	74.00	54.00	-21.24	-17.50

GFSK Mode: Middle channel							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4876.000	V	59.95	40.30	74.00	54.00	-14.05	-13.70
6457.000	V	51.91	35.20	74.00	54.00	-22.09	-18.80
8412.000	V	50.97	33.60	74.00	54.00	-23.03	-20.40
9449.000	V	51.80	33.90	74.00	54.00	-22.20	-20.10
12543.000	V	50.21	33.10	74.00	54.00	-23.79	-20.90
17745.000	V	53.48	37.10	74.00	54.00	-20.52	-16.90
4876.000	H	60.73	39.50	74.00	54.00	-13.27	-14.50
8395.000	H	50.72	33.90	74.00	54.00	-23.28	-20.10
9636.000	H	51.48	35.10	74.00	54.00	-22.52	-18.90
12254.000	H	51.88	34.70	74.00	54.00	-22.12	-19.30
15807.000	H	52.52	36.30	74.00	54.00	-21.48	-17.70
17592.000	H	53.74	37.20	74.00	54.00	-20.26	-16.80

GFSK Mode: High channel							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4961.000	V	60.59	40.30	74.00	54.00	-13.41	-13.70
6389.000	V	51.58	33.60	74.00	54.00	-22.42	-20.40
9551.000	V	49.57	32.50	74.00	54.00	-24.43	-21.50
13478.000	V	50.80	33.10	74.00	54.00	-23.20	-20.90
16487.000	V	52.67	34.90	74.00	54.00	-21.33	-19.10
17932.000	V	53.17	36.50	74.00	54.00	-20.83	-17.50
4961.000	H	58.11	40.10	74.00	54.00	-15.89	-13.90
6338.000	H	51.53	33.90	74.00	54.00	-22.47	-20.10
8412.000	H	51.90	34.60	74.00	54.00	-22.10	-19.40
9517.000	H	52.35	34.60	74.00	54.00	-21.65	-19.40
12934.000	H	52.39	35.10	74.00	54.00	-21.61	-18.90
18000.000	H	53.85	37.10	74.00	54.00	-20.15	-16.90



Test Date : 03/29/2015  
 Test Result: PASS  
 Test By: KK

Temperature : 24 °C  
 Humidity : 53 %

π/4-DQPSK: Low channel							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
3615.385	V	46.45	28.65	74.00	54.00	-27.55	-25.35
4814.103	V	51.92	33.90	74.00	54.00	-22.08	-20.10
6639.423	V	49.54	31.46	74.00	54.00	-24.46	-22.54
7238.782	V	53.41	35.94	74.00	54.00	-20.59	-18.06
7919.872	V	52.01	33.69	74.00	54.00	-21.99	-20.31
9881.41	V	51.55	33.25	74.00	54.00	-22.45	-20.75
3179.487	H	41.24	23.32	74.00	54.00	-32.76	-30.68
4814.103	H	46.54	27.71	74.00	54.00	-27.46	-26.29
5086.538	H	46.34	28.10	74.00	54.00	-27.66	-25.90
7238.782	H	52.86	34.75	74.00	54.00	-21.14	-19.25
9254.808	H	52.05	33.34	74.00	54.00	-21.95	-20.66
9908.654	H	52.22	34.64	74.00	54.00	-21.78	-19.36

π/4-DQPSK: Middle channel							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
3615.385	V	46.09	29.05	74.00	54.00	-27.91	-24.95
4814.103	V	48.75	30.00	74.00	54.00	-25.25	-24.00
7238.782	V	52.83	34.74	74.00	54.00	-21.17	-19.26
8028.846	V	50.84	34.54	74.00	54.00	-23.16	-19.46
9799.679	V	52.52	35.58	74.00	54.00	-21.48	-18.42
14594.551	V	53.06	35.47	74.00	54.00	-20.94	-18.53
4814.103	H	46.11	30.41	74.00	54.00	-27.89	-23.59
6557.692	H	47.84	31.80	74.00	54.00	-26.16	-22.20
7238.782	H	52.13	34.15	74.00	54.00	-21.87	-19.85
8028.846	H	50.72	34.55	74.00	54.00	-23.28	-19.45
8491.987	H	50.04	32.86	74.00	54.00	-23.96	-21.14
9935.897	H	50.90	33.53	74.00	54.00	-23.10	-20.47

π/4-DQPSK: High channel							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
3615.385	V	45.73	27.55	74.00	54.00	-28.27	-26.45
4814.103	V	49.20	31.50	74.00	54.00	-24.80	-22.50
5958.333	V	47.16	28.87	74.00	54.00	-26.84	-25.13
7238.782	V	52.67	35.64	74.00	54.00	-21.33	-18.36
9336.538	V	51.92	34.14	74.00	54.00	-22.08	-19.86
9799.679	V	51.54	34.08	74.00	54.00	-22.46	-19.92
4814.103	H	47.06	29.31	74.00	54.00	-26.94	-24.69
6394.231	H	47.80	30.46	74.00	54.00	-26.20	-23.54
7238.782	H	52.69	35.15	74.00	54.00	-21.31	-18.85
8628.205	H	51.43	34.89	74.00	54.00	-22.57	-19.11
9990.385	H	50.80	33.01	74.00	54.00	-23.20	-20.99
14621.795	H	51.68	33.91	74.00	54.00	-22.32	-20.09

Test Date : 03/22/2015  
Test Result: PASS  
Test By: ZHL

Temperature : 24 °C  
Humidity : 53 %

8DPSK: Low channel							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
8437.500	V	53.650	34.580	74.000	54.000	-20.350	-19.420
9472.756	V	54.780	35.810	74.000	54.000	-19.220	-18.190
10943.910	V	53.520	34.530	74.000	54.000	-20.480	-19.470
13641.026	V	53.150	34.480	74.000	54.000	-20.850	-19.520
15657.051	V	53.140	33.810	74.000	54.000	-20.860	-20.190
17046.474	V	52.280	33.720	74.000	54.000	-21.720	-20.280
7838.141	H	52.90	34.11	74.00	54.00	-21.10	-19.89
8491.987	H	53.35	34.44	74.00	54.00	-20.65	-19.56
9581.731	H	52.98	34.02	74.00	54.00	-21.02	-19.98
10998.397	H	53.30	34.59	74.00	54.00	-20.70	-19.41
13232.372	H	53.05	33.67	74.00	54.00	-20.95	-20.33
18000.000	H	53.12	35.18	74.00	54.00	-20.88	-18.82

8DPSK: Middle channel							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
6448.718	V	53.03	34.37	74.00	54.00	-20.97	-19.63
8083.333	V	53.26	34.38	74.00	54.00	-20.74	-19.62
9772.436	V	55.03	35.64	74.00	54.00	-18.97	-18.36
10943.910	V	53.76	35.03	74.00	54.00	-20.24	-18.97
13068.910	V	52.94	34.66	74.00	54.00	-21.06	-19.34
17972.756	V	52.90	35.22	74.00	54.00	-21.10	-18.78
8464.744	H	51.88	32.21	74.00	54.00	-22.12	-21.79
9500.000	H	52.72	33.74	74.00	54.00	-21.28	-20.26
10971.154	H	52.32	32.51	74.00	54.00	-21.68	-21.49
13804.487	H	53.04	34.21	74.00	54.00	-20.96	-19.79
14349.359	H	53.02	34.05	74.00	54.00	-20.98	-19.95
16937.500	H	52.24	33.89	74.00	54.00	-21.76	-20.11

8DPSK: High channel							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
8219.551	V	53.27	34.73	74.00	54.00	-20.73	-19.27
9527.244	V	53.32	34.10	74.00	54.00	-20.68	-19.90
10971.154	V	53.49	34.21	74.00	54.00	-20.51	-19.79
13777.244	V	53.06	34.85	74.00	54.00	-20.94	-19.15
14431.090	V	52.91	34.12	74.00	54.00	-21.09	-19.88
16637.821	V	53.23	34.58	74.00	54.00	-20.77	-19.42
7865.385	H	53.31	34.44	74.00	54.00	-20.69	-19.56
8410.256	H	53.30	34.44	74.00	54.00	-20.70	-19.56
11080.128	H	54.50	35.84	74.00	54.00	-19.50	-18.16
12197.115	H	53.56	33.77	74.00	54.00	-20.44	-20.23
16447.115	H	52.16	34.05	74.00	54.00	-21.84	-19.95
17972.756	H	53.59	35.12	74.00	54.00	-20.41	-18.88

Test Date : 03/27/2015  
 Test Result: PASS  
 Test By: KK

Temperature : 23 °C  
 Humidity : 56%

USB Playing mode							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
1715	V	50.59	36.96	74.00	54.00	-23.41	-17.04
2435	V	46.29	30.51	74.00	54.00	-27.71	-23.49
3305	V	43.38	31.17	74.00	54.00	-30.62	-22.83
4615	V	51.25	35.17	74.00	54.00	-22.75	-18.83
5290	V	51.93	37.47	74.00	54.00	-22.07	-16.53
5750	V	54.91	39.39	74.00	54.00	-19.09	-14.61
1715	H	52.27	36.96	74.00	54.00	-21.73	-17.04
2435	H	53.77	37.21	74.00	54.00	-20.23	-16.79
3670	H	43.70	30.52	74.00	54.00	-30.30	-23.48
4585	H	50.32	36.85	74.00	54.00	-23.68	-17.15
4855	H	52.32	36.41	74.00	54.00	-21.68	-17.59
5690	H	53.39	38.99	74.00	54.00	-20.61	-15.01

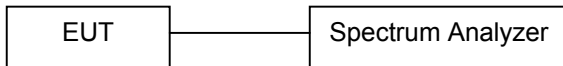
Audio input mode:							
Freq. (MHz)	Ant.Pol. (H/V)	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
1435	V	43.73	33.46	74.00	54.00	-30.27	-20.54
1560	V	43.09	33.25	74.00	54.00	-30.91	-20.75
2460	V	44.44	34.98	74.00	54.00	-29.56	-19.02
4575	V	50.25	40.59	74.00	54.00	-23.75	-13.41
4920	V	50.66	40.58	74.00	54.00	-23.34	-13.42
5780	V	52.74	42.78	74.00	54.00	-21.26	-11.22
1435	H	42.01	32.98	74.00	54.00	-31.99	-21.02
1940	H	43.99	33.48	74.00	54.00	-30.01	-20.52
2410	H	43.92	33.85	74.00	54.00	-30.08	-20.15
3935	H	47.05	37.95	74.00	54.00	-26.95	-16.05
5080	H	51.07	41.24	74.00	54.00	-22.93	-12.76
5760	H	53.96	43.78	74.00	54.00	-20.04	-10.22

## 6. Channel Separation Test

### 6.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Print 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

Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	ESCI	10017	08/01/2014	08/01/2015

### 6.4 Measurement Results

The following table is the setting of spectrum analyzer.

Attenuation	Auto
RB	100KHz
VB	300KHz
Detector	Peak
Trace	Max hold

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	03/19/2015
Test By:	Kuki	Temperature :	21 °C
Test Result:	PASS	Humidity :	55 %

#### GFSK Mode:

Test Channel	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 20dB Down BW(kHz)
Low Channel	2402	1000.00	876
Adjacency Channel	2403		
Middle channel	2441	1000.00	894
Adjacency Channel	2440		
High Channel	2480	1000.00	894
Adjacency Channel	2479		

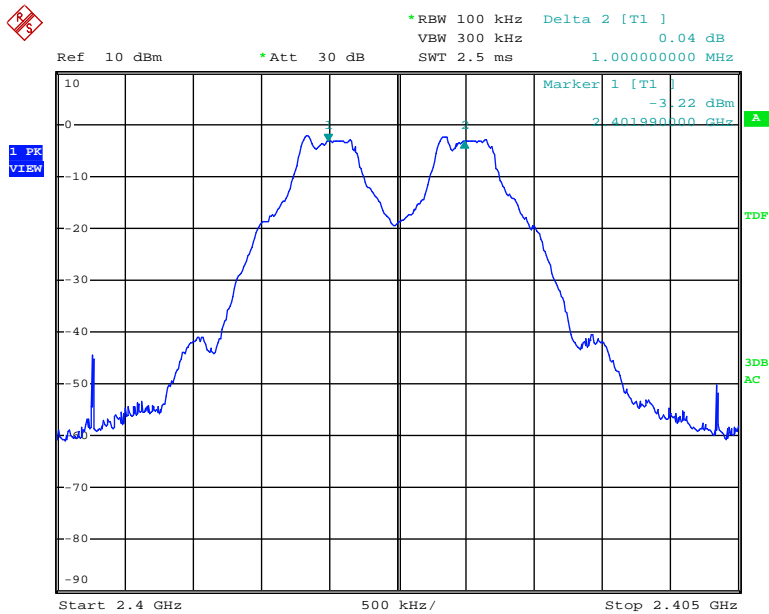
**$\pi/4$ -DQPSK Mode**

Test Channel	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
Low Channel	2402	1000.00	860
Adjacency Chanel	2403		
Middle channel	2441	1000.00	864
Adjacency Chanel	2440		
High Channel	2480	1000.00	864
Adjacency Chanel	2479		

**8DPSK Mode:**

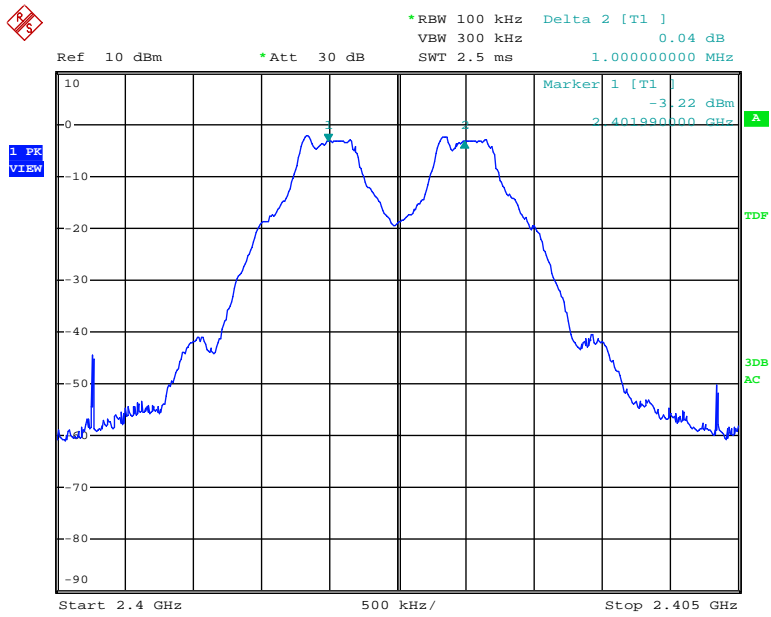
Test Channel	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
Low Channel	2402	1000.00	856
Adjacency Chanel	2403		
Middle channel	2441	1000.00	856
Adjacency Chanel	2440		
High Channel	2480	1000.00	856
Adjacency Chanel	2479		

**GFSK Mode: Low channel**



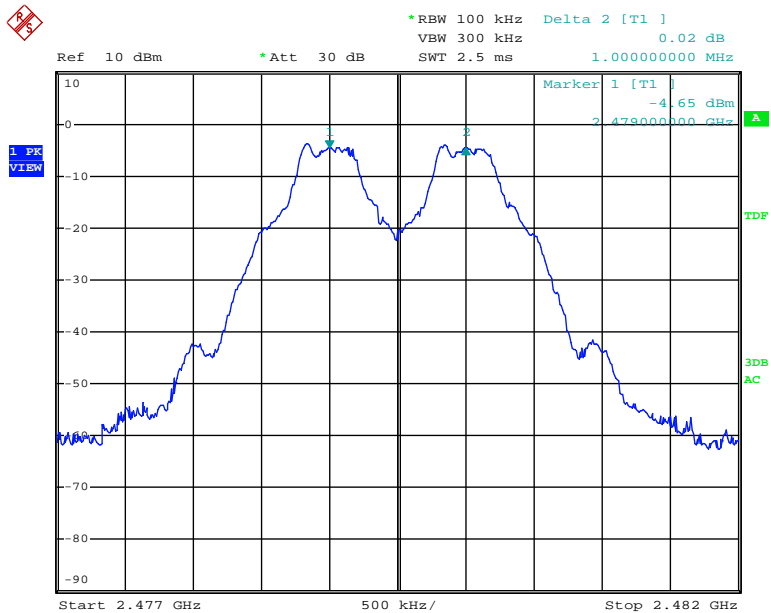
Date: 19.MAR.2015 16:33:39

GFSK Mode: Middle channel



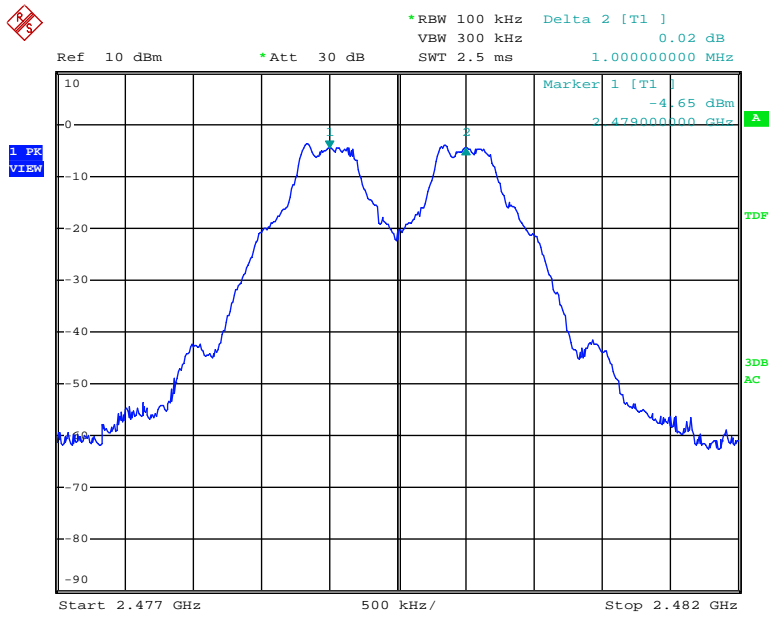
Date: 19.MAR.2015 16:33:39

GFSK Mode: High channel



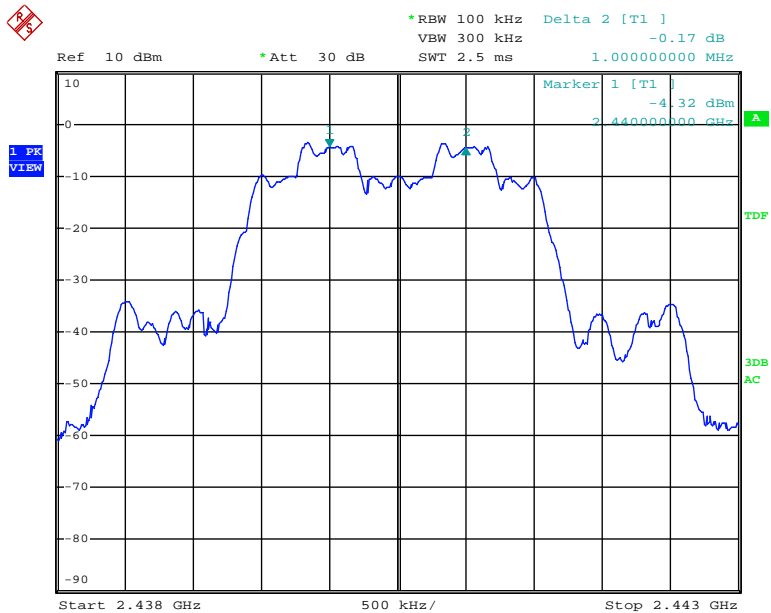
Date: 19.MAR.2015 16:37:12

$\pi/4$ -DQPSK Mode: Low channel



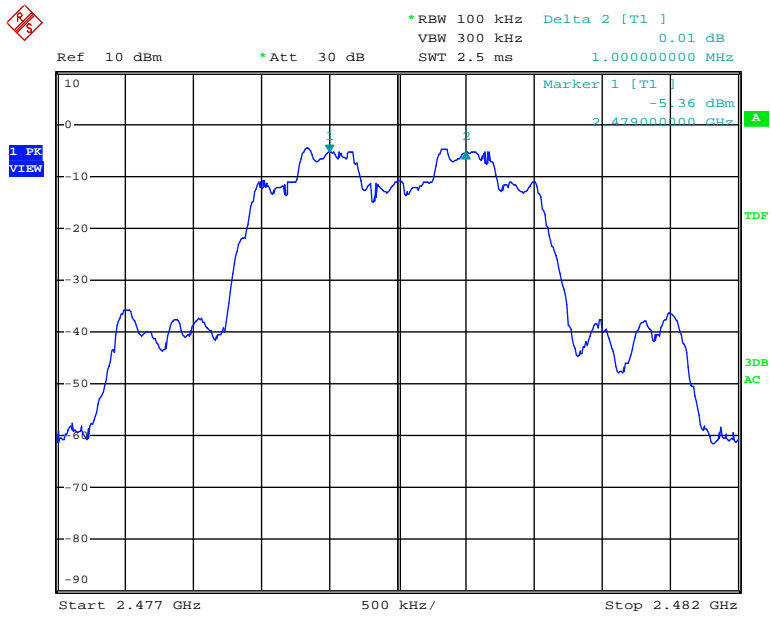
Date: 19.MAR.2015 16:37:12

$\pi/4$ -DQPSK Mode: Middle channel



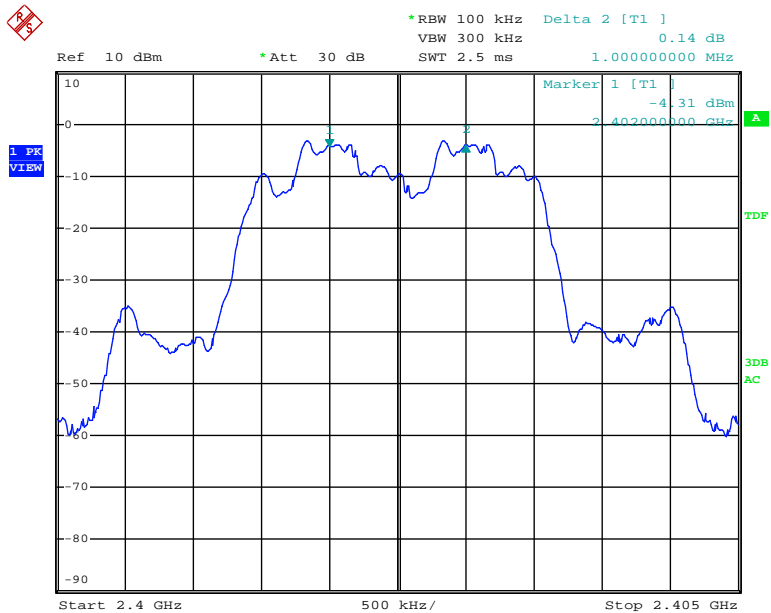
Date: 19.MAR.2015 16:46:14

$\pi/4$ -DQPSK Mode: High channel



Date: 19.MAR.2015 16:47:19

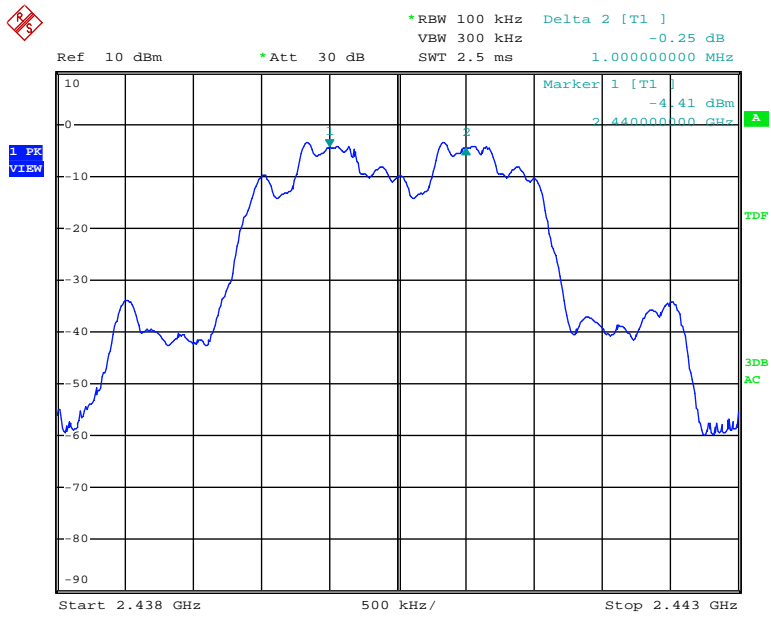
8DPSK Mode: Low channel



Date: 19.MAR.2015 16:51:28

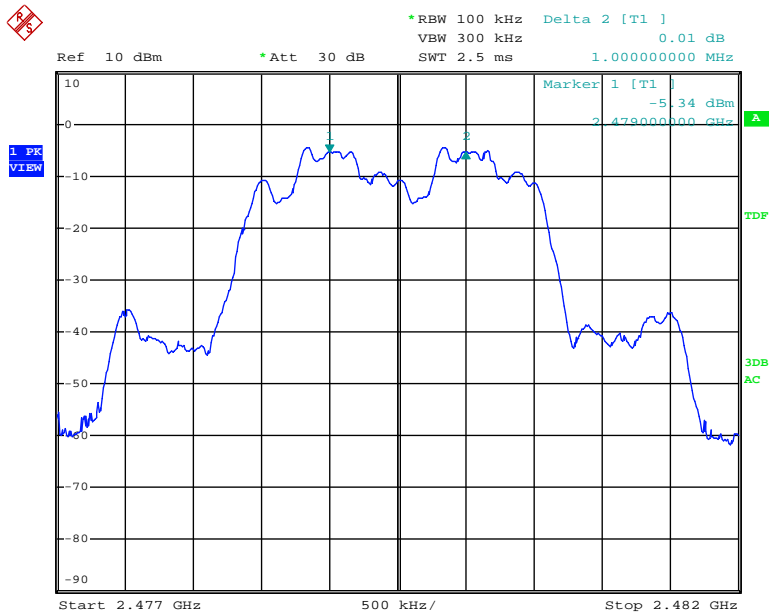


8DPSK Mode: Middle channel



Date: 19.MAR.2015 16:50:04

8DPSK Mode: High channel



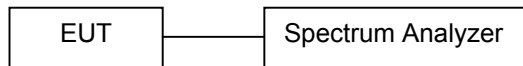
Date: 19.MAR.2015 16:48:28

## 7. Bandwidth Test

### 7.1 Measurement Procedure

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

### 7.2 Test SET-UP (Block Diagram of Configuration)



### 7.3 Measurement Equipment Used

Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	ESCI	10017	08/01/2014	08/01/2015

### 7.4 Measurement Results

The following table is the setting of spectrum analyzer.

Attenuation	Auto
SPAN	3MHz
RB	30KHz
VB	100KHz
Detector	Peak
Trace	Max hold

20dB Bandwidth test data Chart:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date:	03/19/2015
Test By:	Kuki	Temperature:	21 °C
Test Result:	N/A	Humidity:	55 %

GFSK Mode:

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
Low channel	2402	876
Middle channel	2441	894
High channel	2480	894

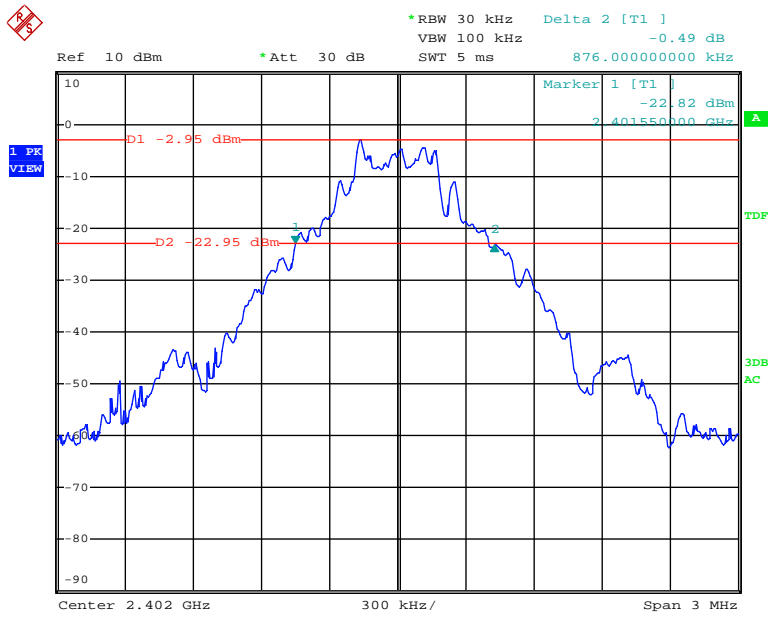
$\pi/4$ -DQPSK Mode:

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
Low channel	2402	1290
Middle channel	2441	1296
High channel	2480	1296

8DPSK Mode:

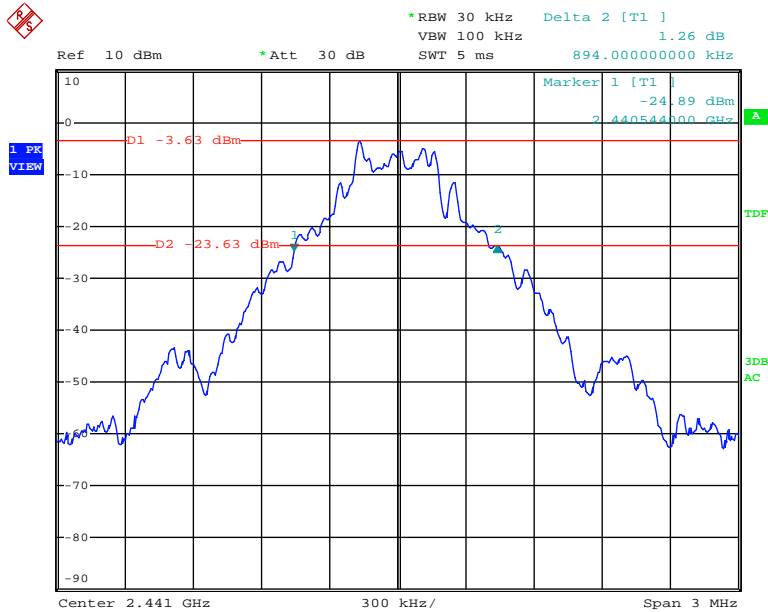
Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
Low channel	2402	1284
Middle channel	2441	1284
High channel	2480	1284

GFSK Mode: Low channel



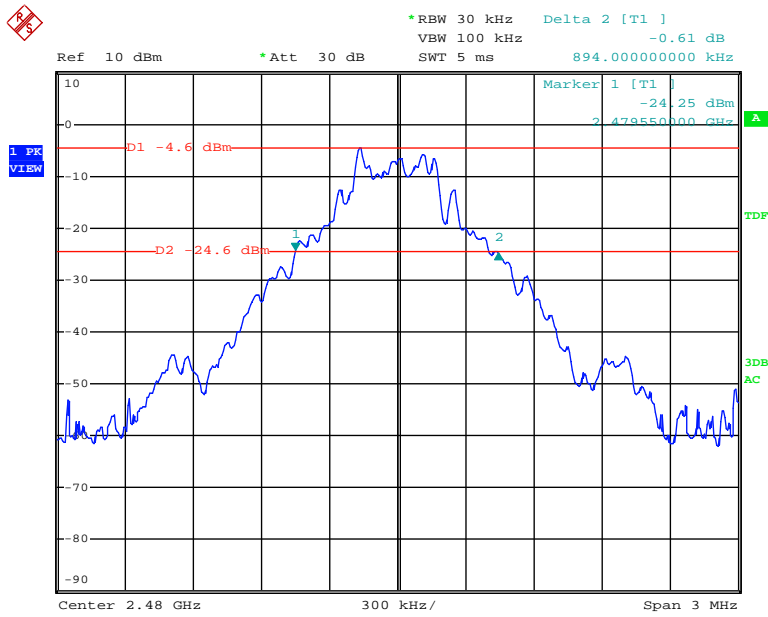
Date: 19.MAR.2015 15:35:01

GFSK Mode: Middle channel



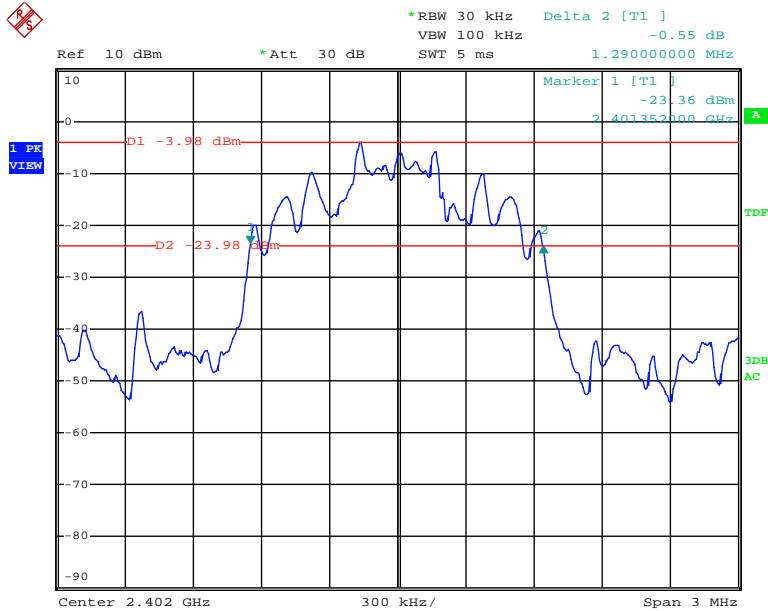
Date: 19.MAR.2015 15:37:04

GFSK Mode: High channel



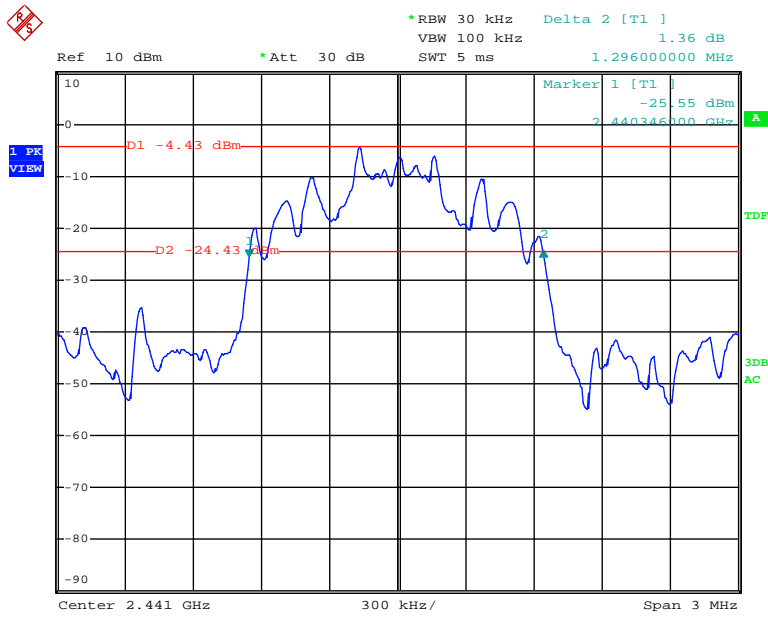
Date: 19.MAR.2015 15:39:07

$\pi/4$ -DQPSK Mode: Low channel



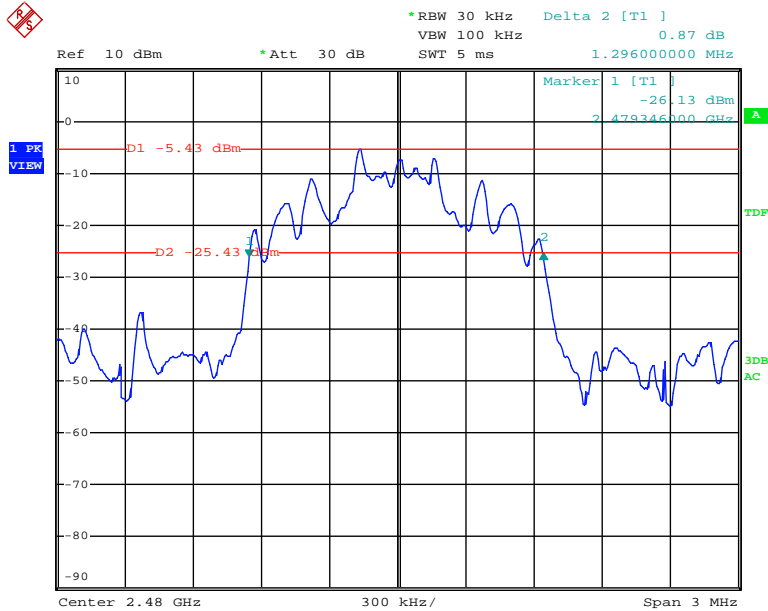
Date: 19.MAR.2015 15:41:00

$\pi/4$ -DQPSK Mode: Middle channel



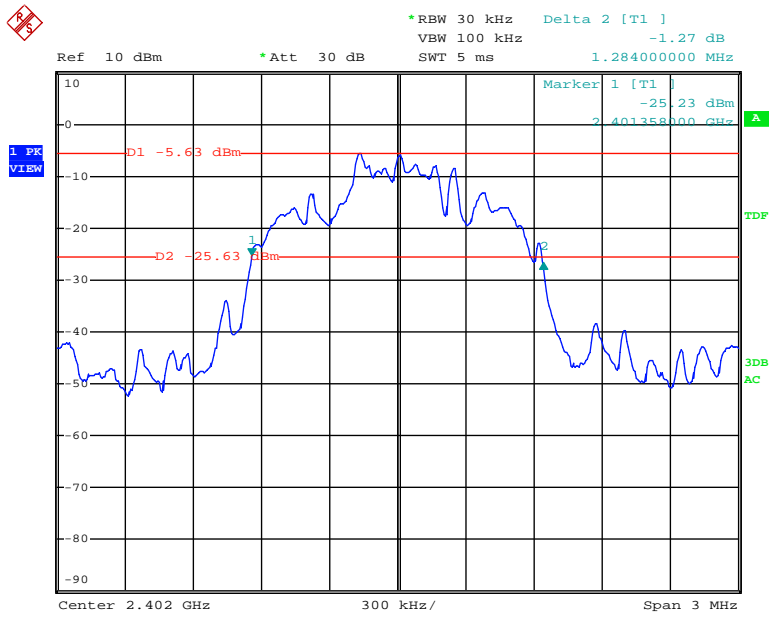
Date: 19.MAR.2015 15:45:54

$\pi/4$ -DQPSK Mode: High channel



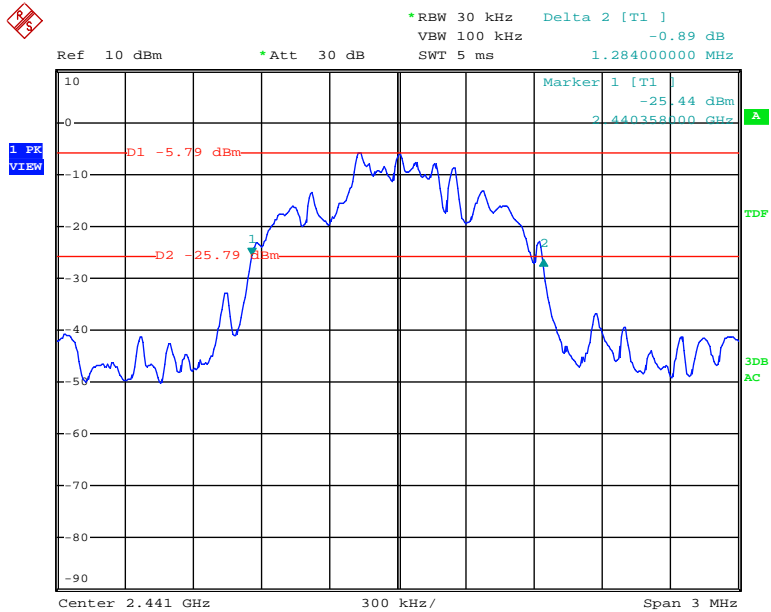
Date: 19.MAR.2015 15:48:14

### 8DPSK Mode: Low channel



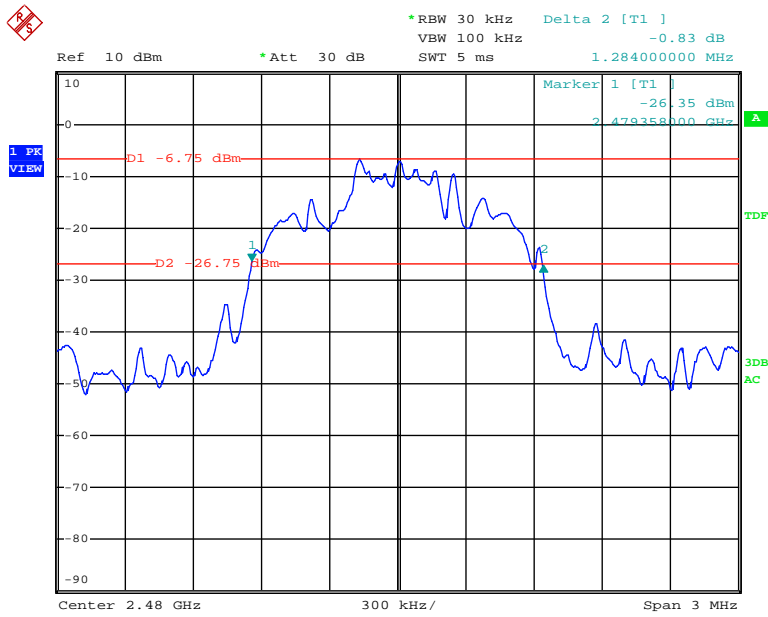
Date: 19.MAR.2015 15:54:39

### 8DPSK Mode: Middle channel



Date: 19.MAR.2015 15:52:38

8DPSK Mode: High channel



Date: 19.MAR.2015 15:50:37

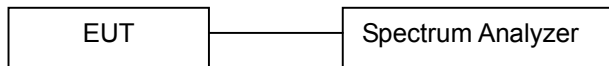


## 8. Quantity of Hopping Channel Test

### 8.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Print 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

Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	ESCI	10017	08/01/2014	08/01/2015

### 8.4 Measurement Results

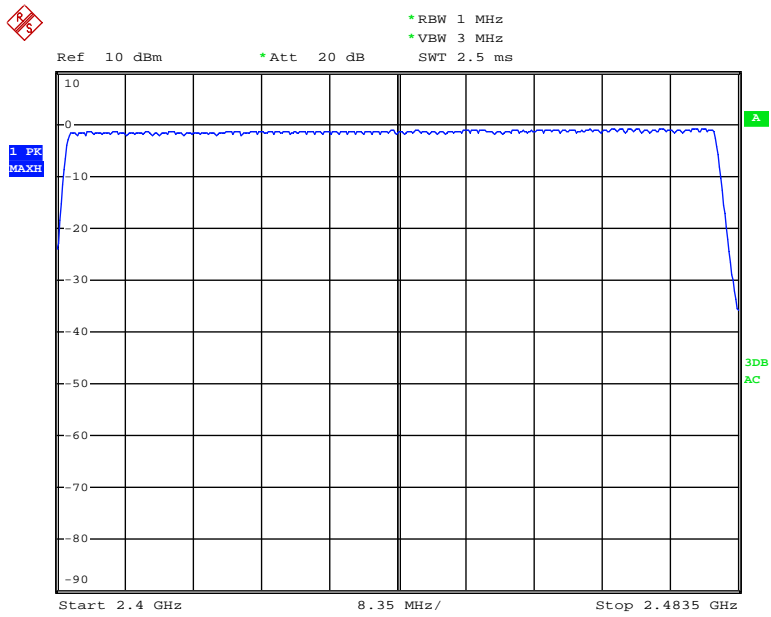
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	03/23/2015
Test By:	Jary	Temperature :	21 °C
Test Result:	Pass	Humidity :	55 %

GFSK Mode,  $\pi/4$ -DQPSK Mode, 8DPSK Mode:

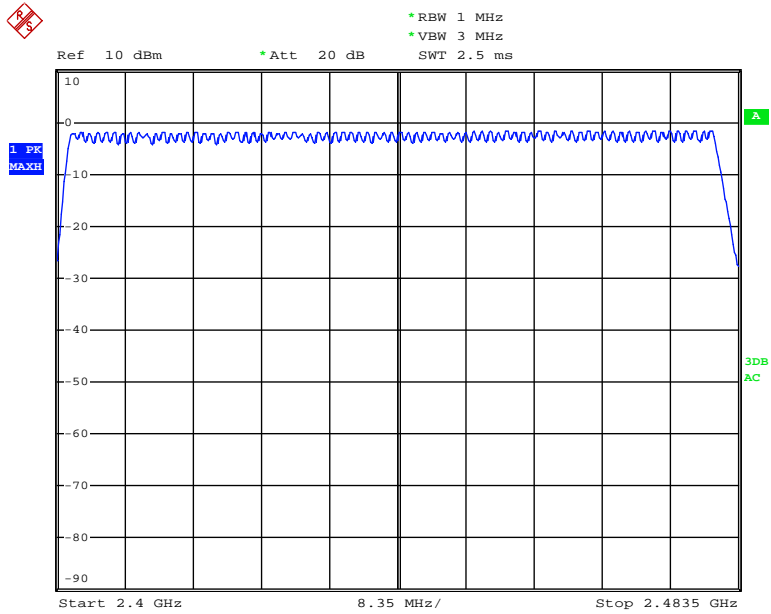
Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel limit
2402-2480	79	>15

### GFSK Mode



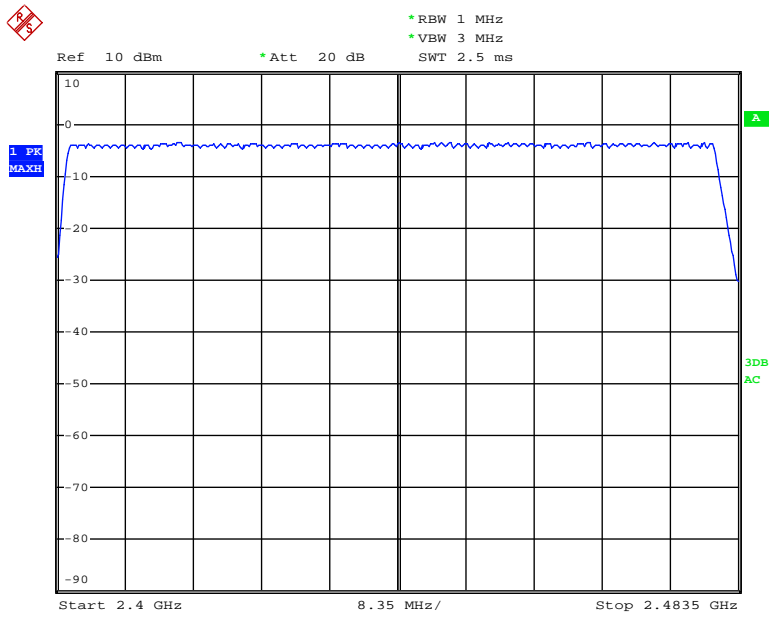
Date: 23.MAR.2015 18:15:29

### $\pi/4$ -DQPSK Mode



Date: 23.MAR.2015 18:09:12

### 8DPSK Mode



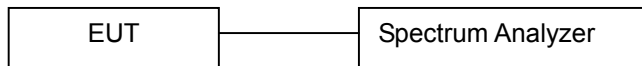
Date: 23.MAR.2015 18:02:54

## 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

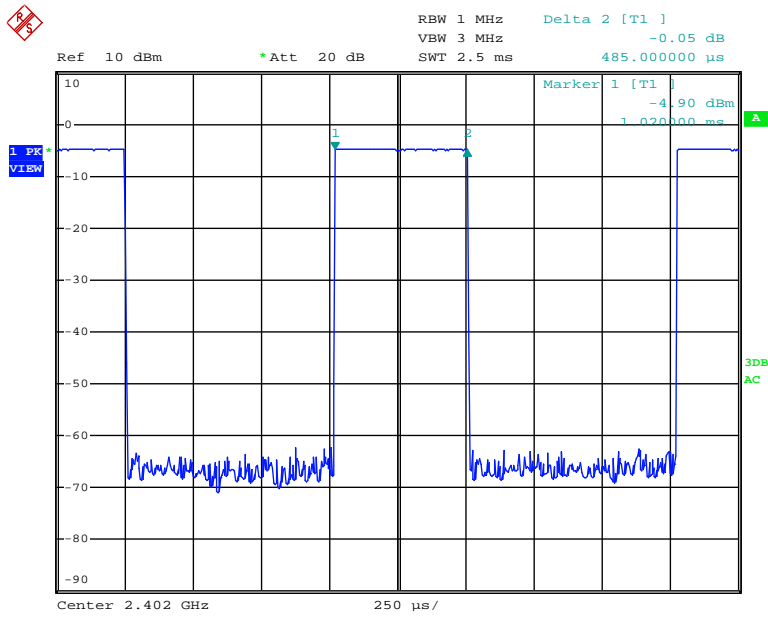
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	ESCI	10017	08/01/2014	08/01/2015

### 9.4 Measurement Results

Refer to attached data chart.

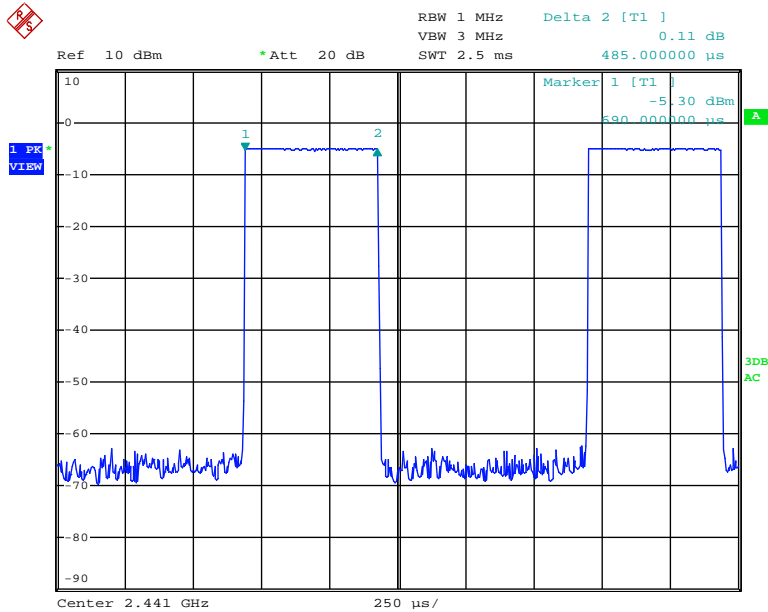


DH1: Low channel



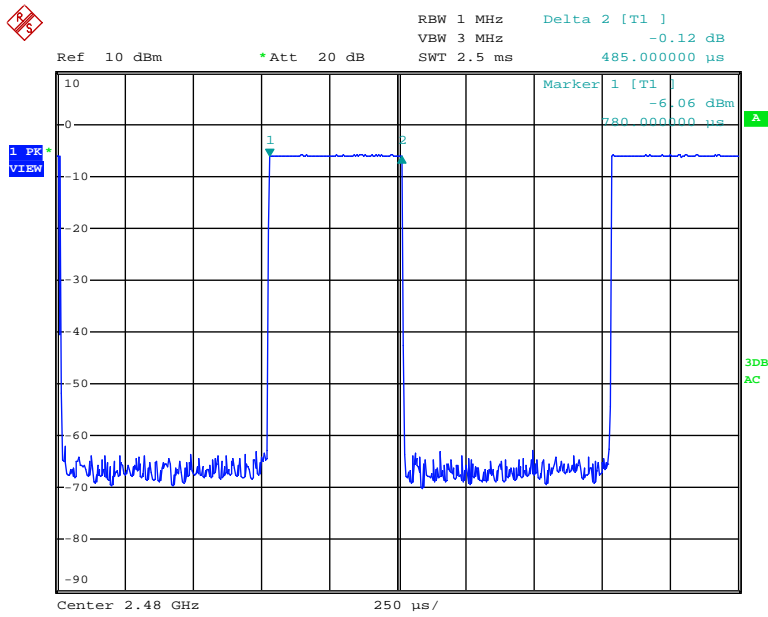
Date: 23.MAR.2015 19:06:30

DH1: Middle channel



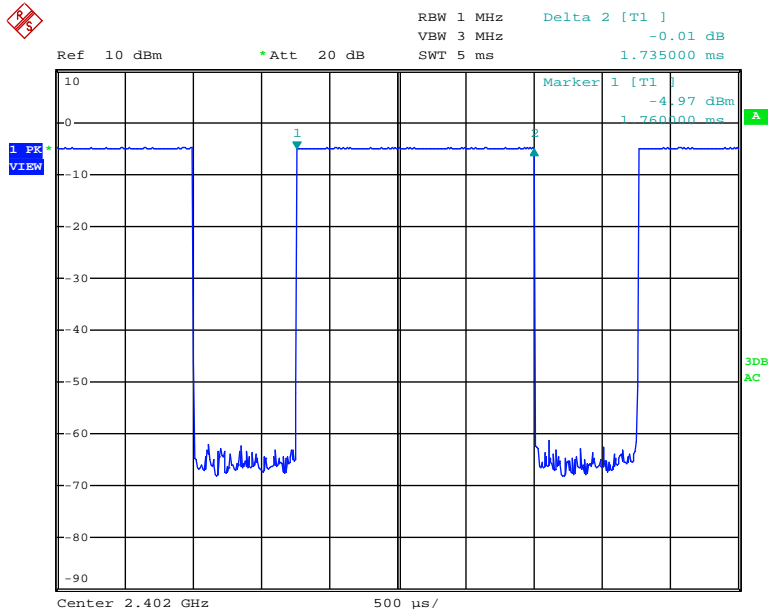
Date: 23.MAR.2015 19:08:37

### DH1: High channel



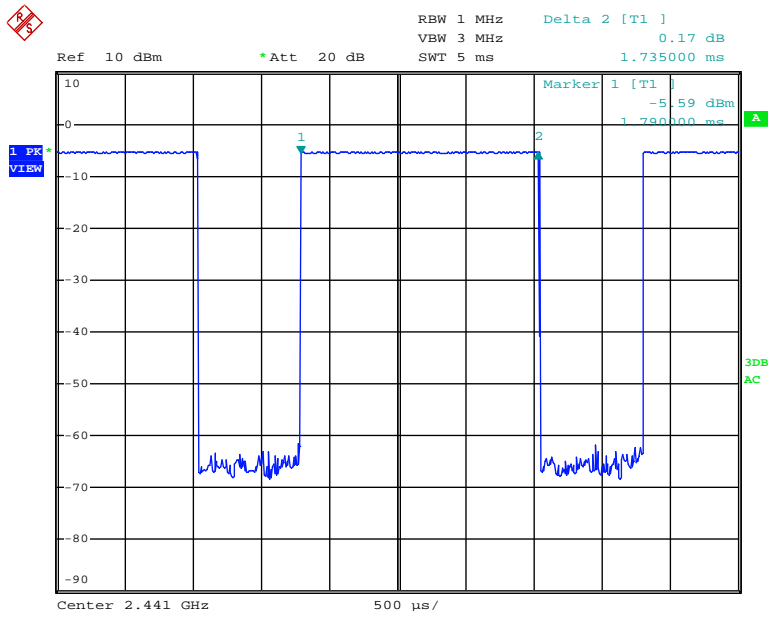
Date: 23.MAR.2015 19:12:20

### DH3: Low channel



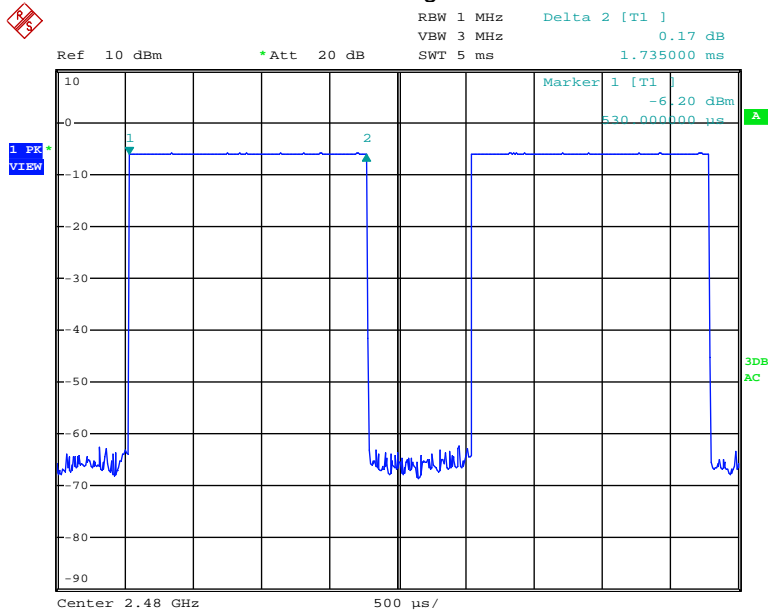
Date: 23.MAR.2015 19:14:43

DH3: Middle channel



Date: 23.MAR.2015 19:13:43

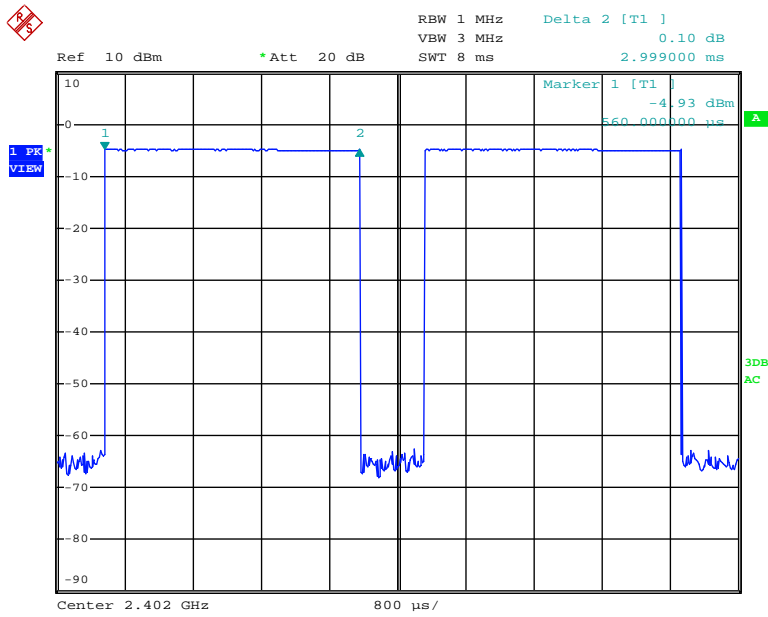
DH3: High channel



Date: 23.MAR.2015 19:11:18

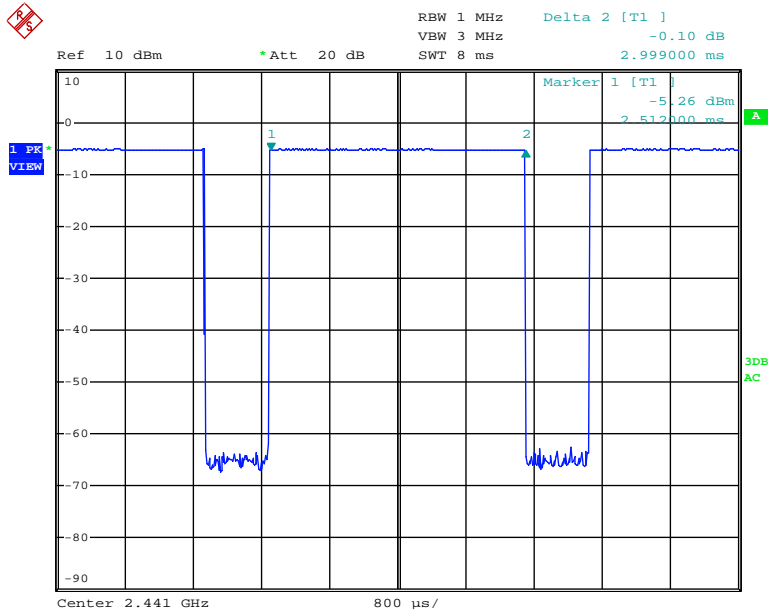


DH5: Low channel



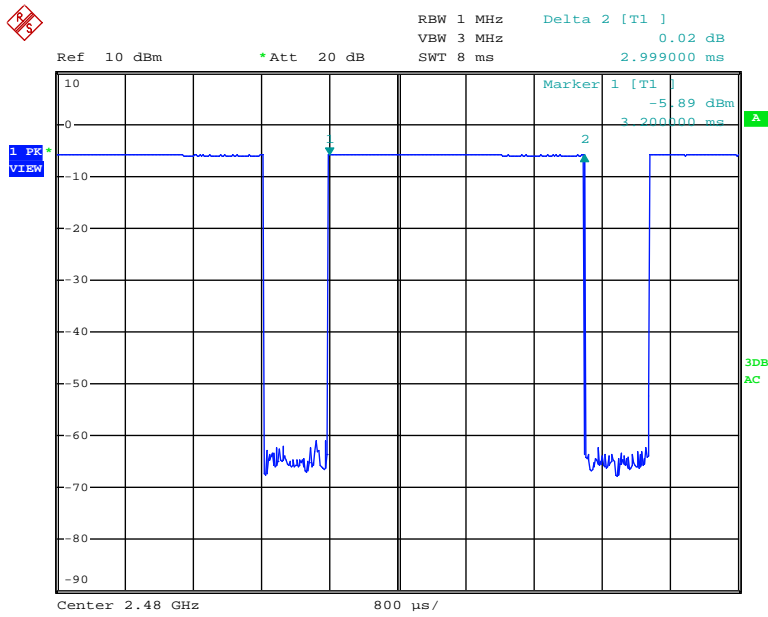
Date: 23.MAR.2015 19:16:00

DH5: Middle channel



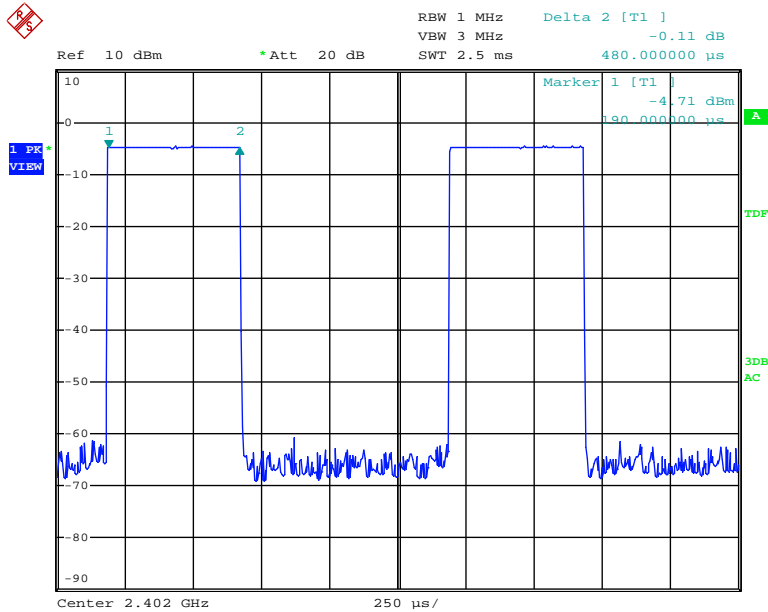
Date: 23.MAR.2015 19:17:22

### DH5: High channel



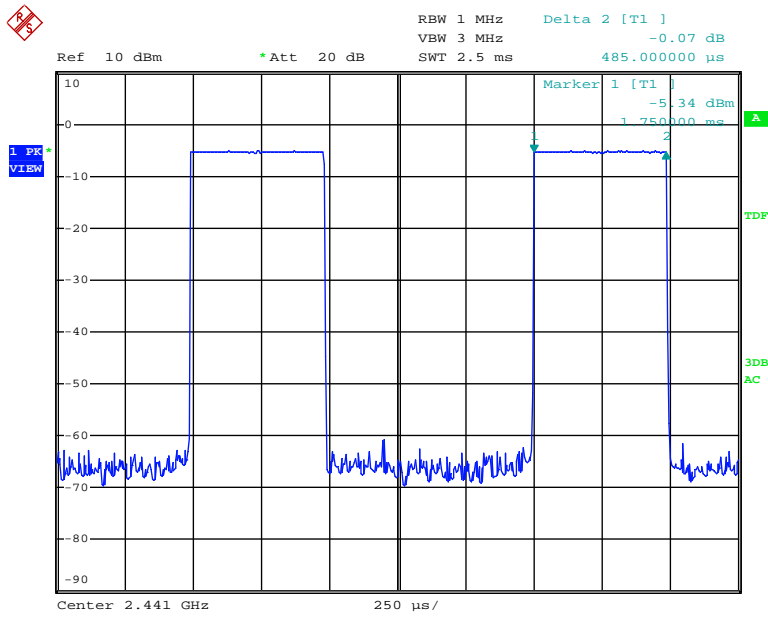
Date: 23.MAR.2015 19:18:28

### 2DH1: Low channel



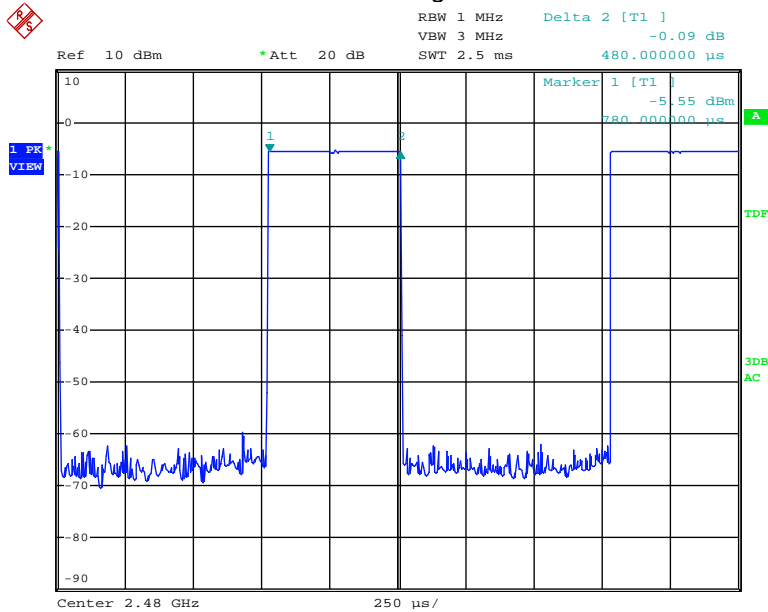
Date: 23.MAR.2015 19:26:54

2DH1: Middle channel



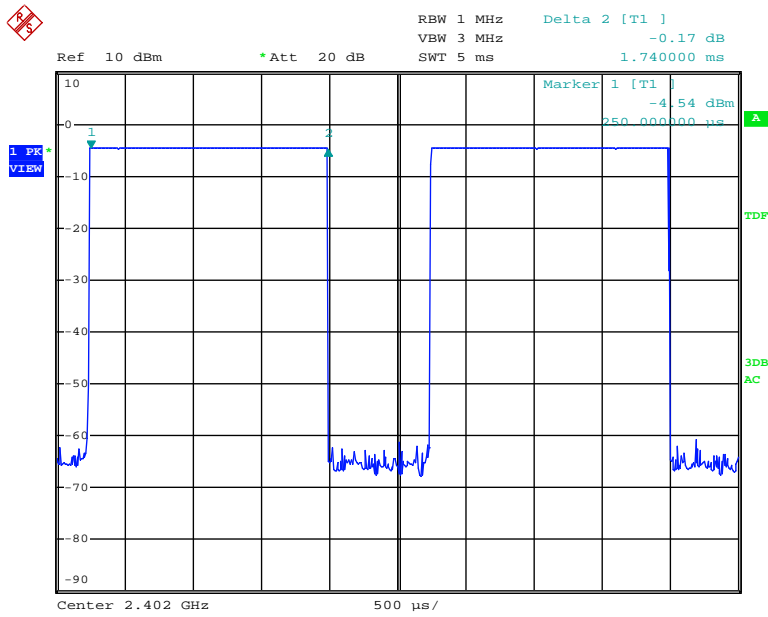
Date: 23.MAR.2015 19:29:04

2DH1: High channel



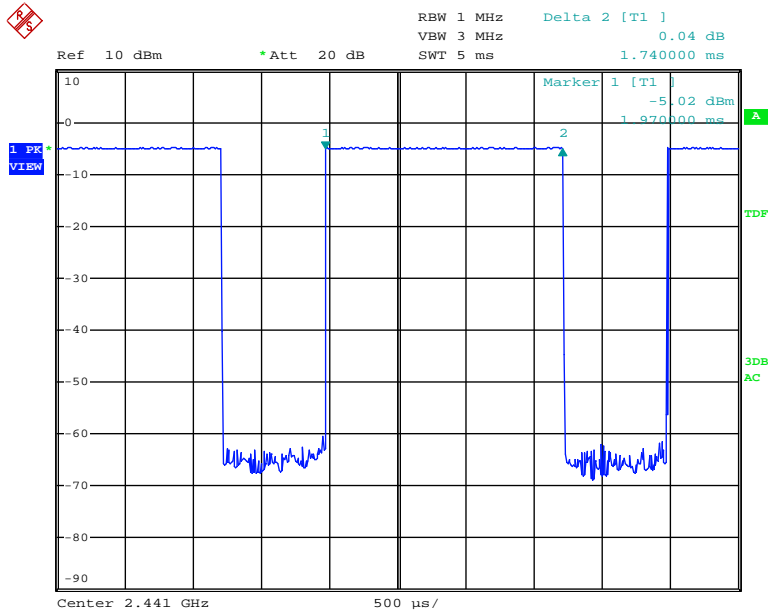
Date: 23.MAR.2015 19:30:12

2DH3: Low channel



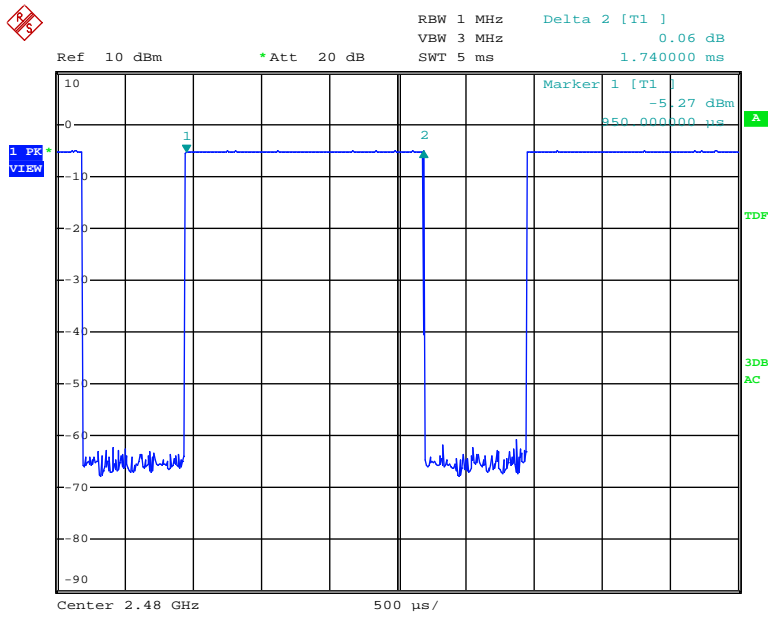
Date: 23.MAR.2015 19:34:13

2DH3: Middle channel



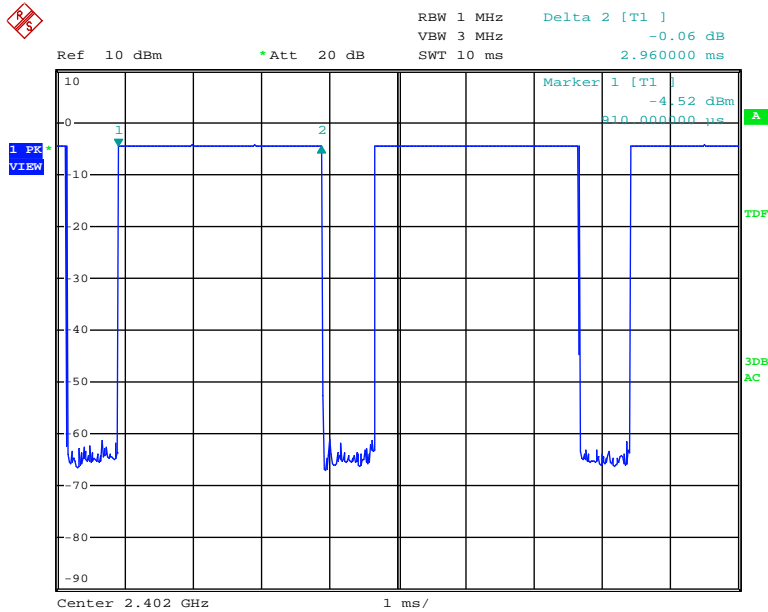
Date: 23.MAR.2015 19:33:18

2DH3: High channel



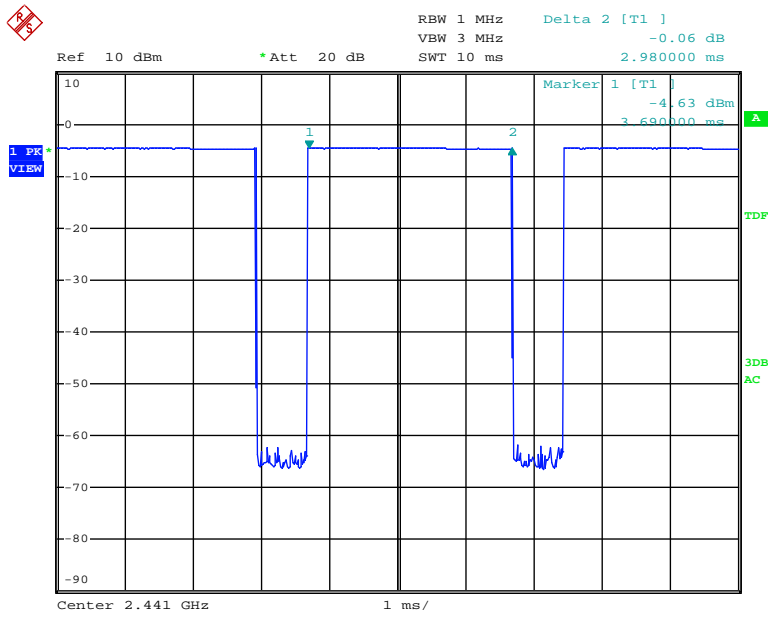
Date: 23.MAR.2015 19:32:16

2DH5: Low channel



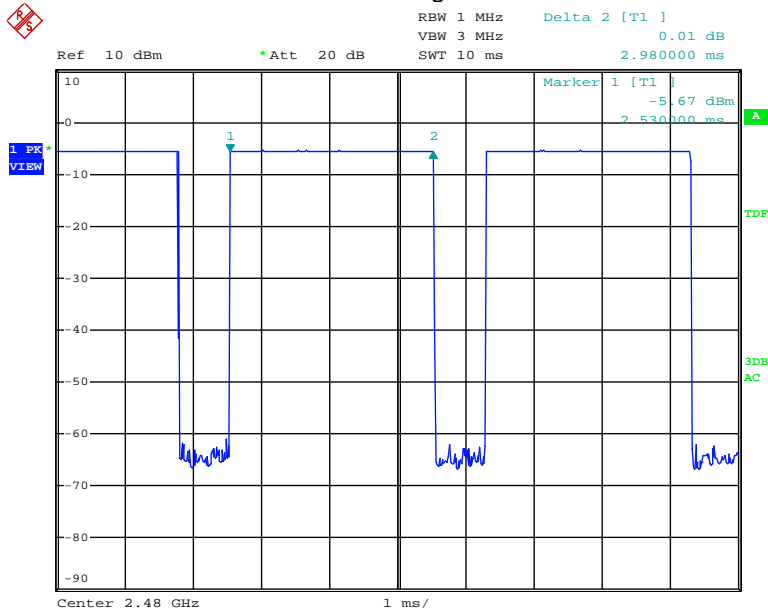
Date: 23.MAR.2015 19:35:12

2DH5: Middle channel



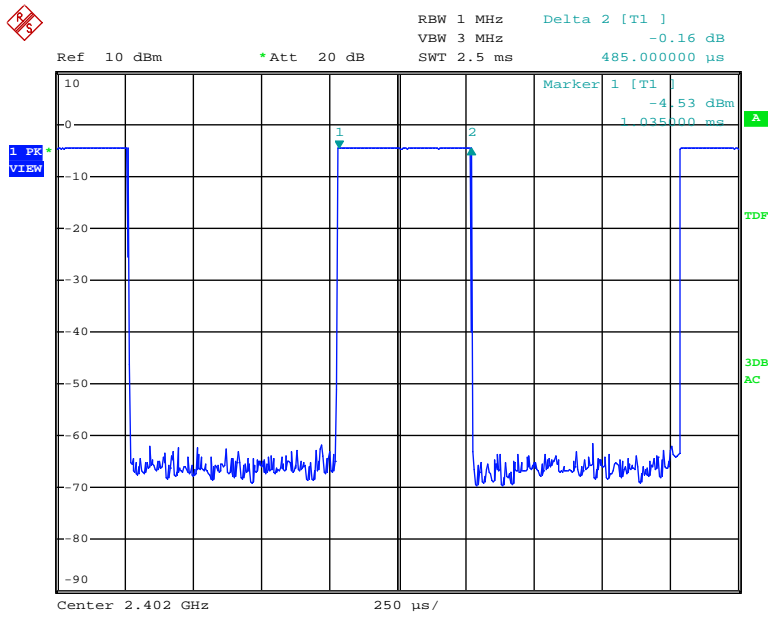
Date: 23.MAR.2015 19:36:22

2DH5: High channel



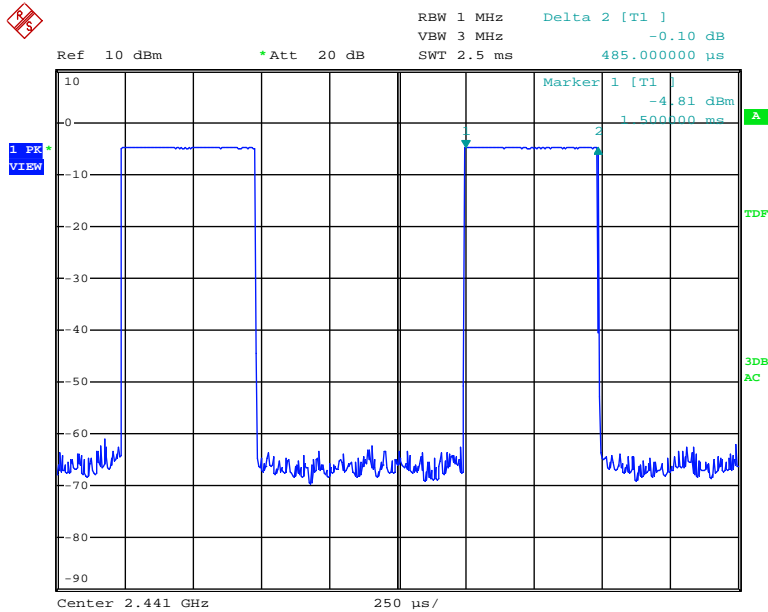
Date: 23.MAR.2015 19:37:24

### 3DH1: Low channel



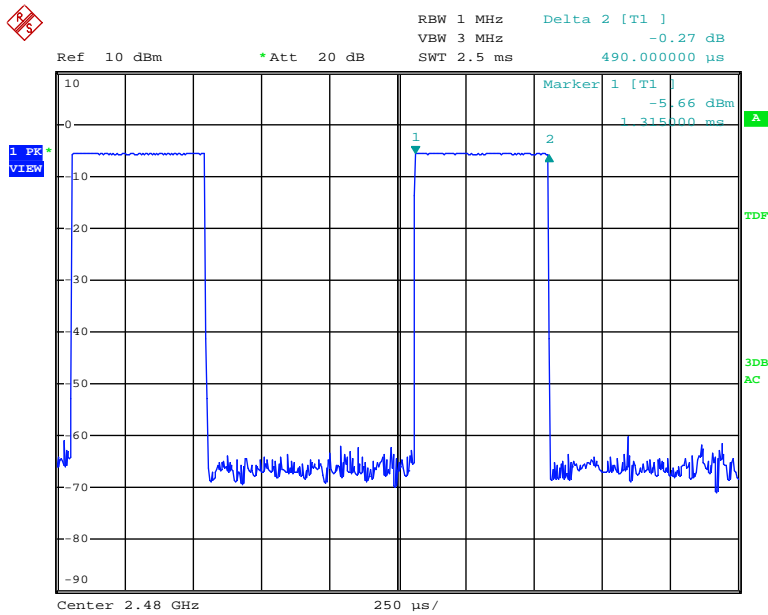
Date: 23.MAR.2015 19:39:57

### 3DH1: Middle channel



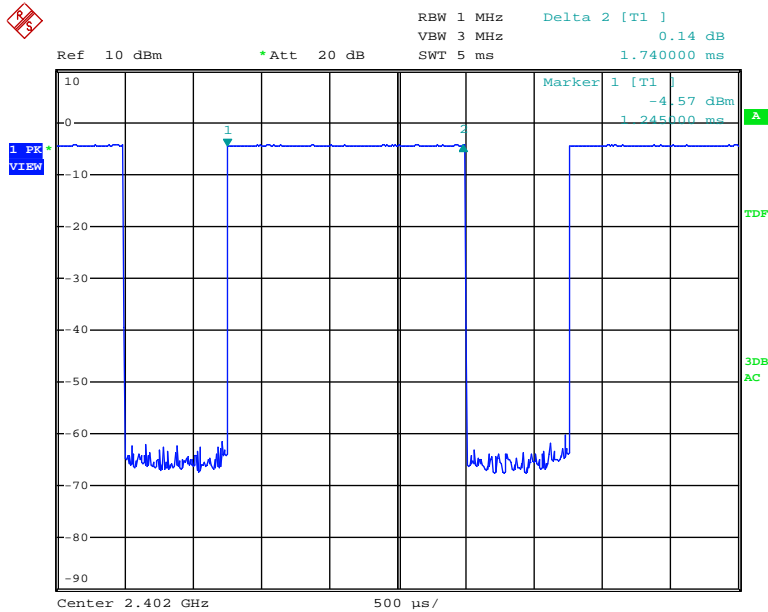
Date: 23.MAR.2015 19:41:28

### 3DH1: High channel



Date: 23.MAR.2015 19:42:45

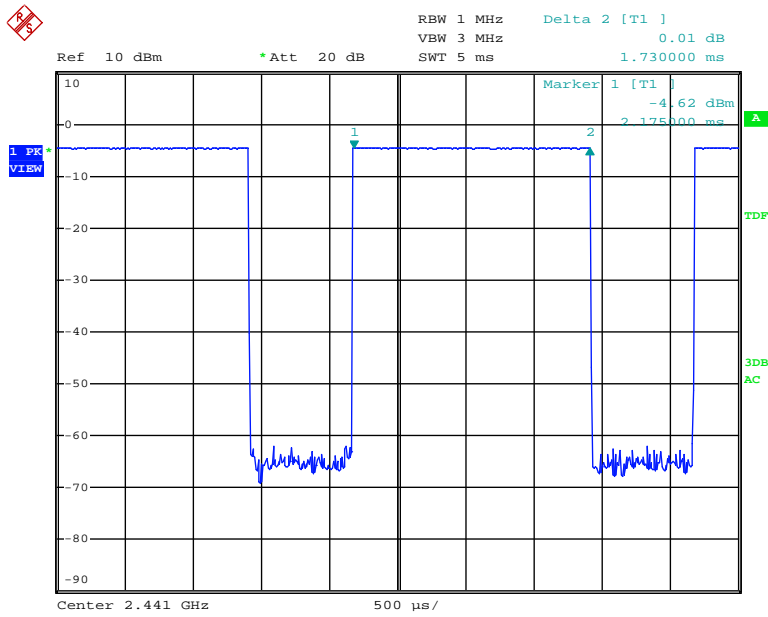
### 3DH3: Low channel



Date: 23.MAR.2015 19:46:35

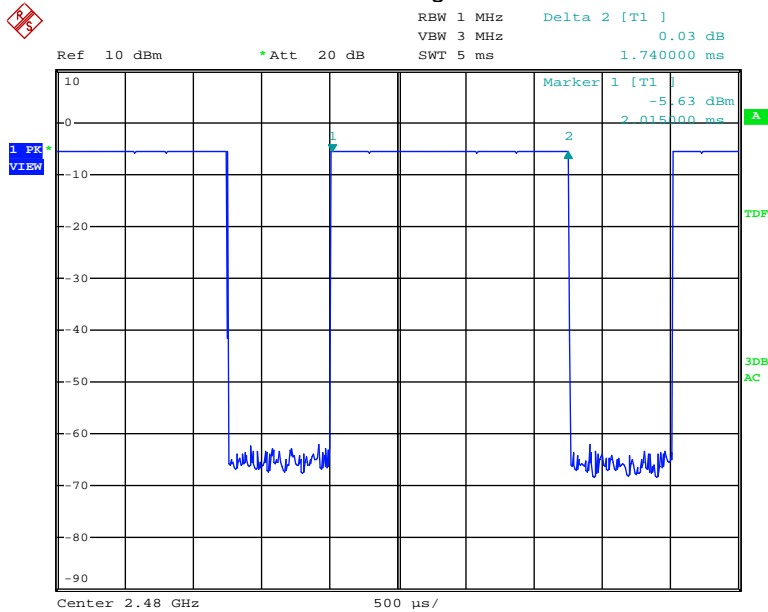


### 3DH3: Middle channel



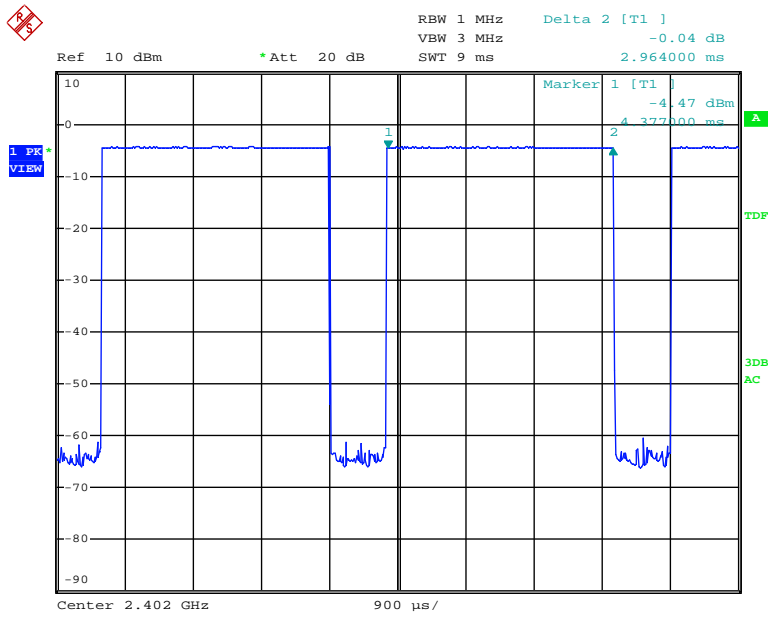
Date: 23.MAR.2015 19:45:15

### 3DH3: High channel



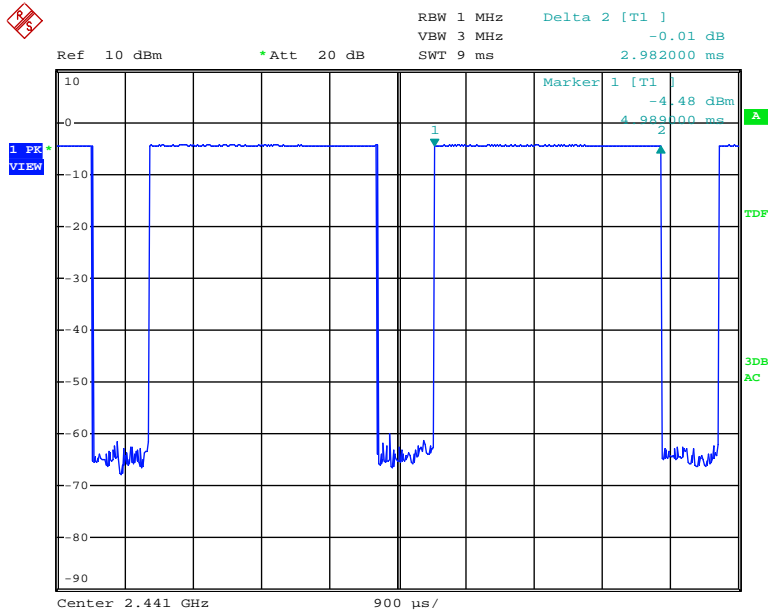
Date: 23.MAR.2015 19:44:22

### 3DH5: Low channel



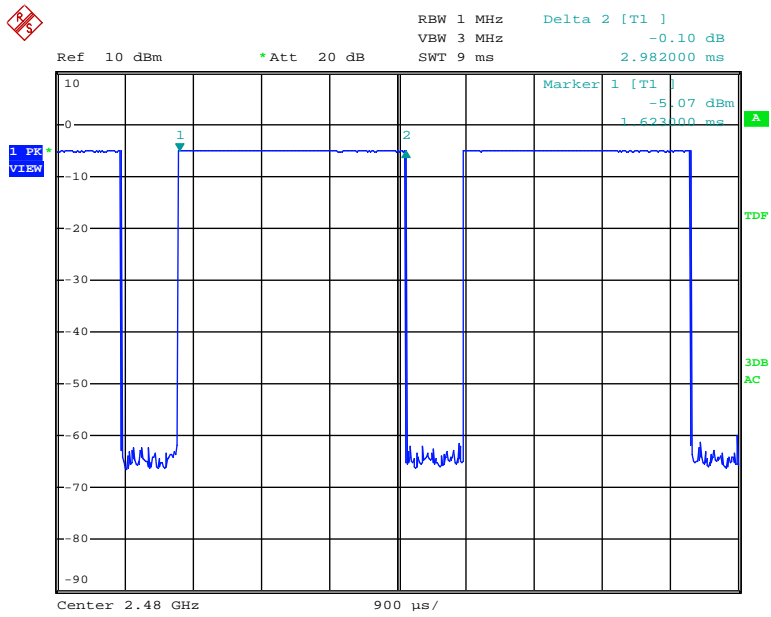
Date: 23.MAR.2015 19:49:30

### 3DH5: Middle channel



Date: 23.MAR.2015 19:50:35

### 3DH5: High channel



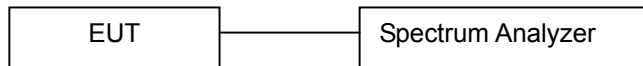
Date: 23.MAR.2015 19:52:13

## 10. Maximum Peak Output Power Test

### 10.1 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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using proper RBW and VBW setting.
- d. Measure the captured power within the band and recording the plot.
- e. Repeat above procedures until all frequencies required were complete.

### 10.2 Test SET-UP (Block Diagram of Configuration)



### 10.3 Measurement Equipment Used

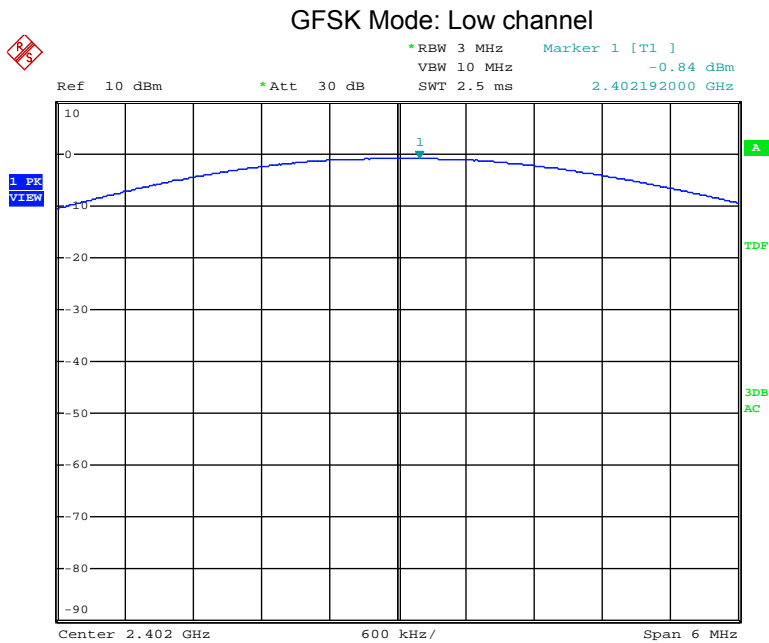
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	ESCI	10017	08/01/2014	08/01/2015

### 10.4 Measurement Results

Refer to attached data chart.

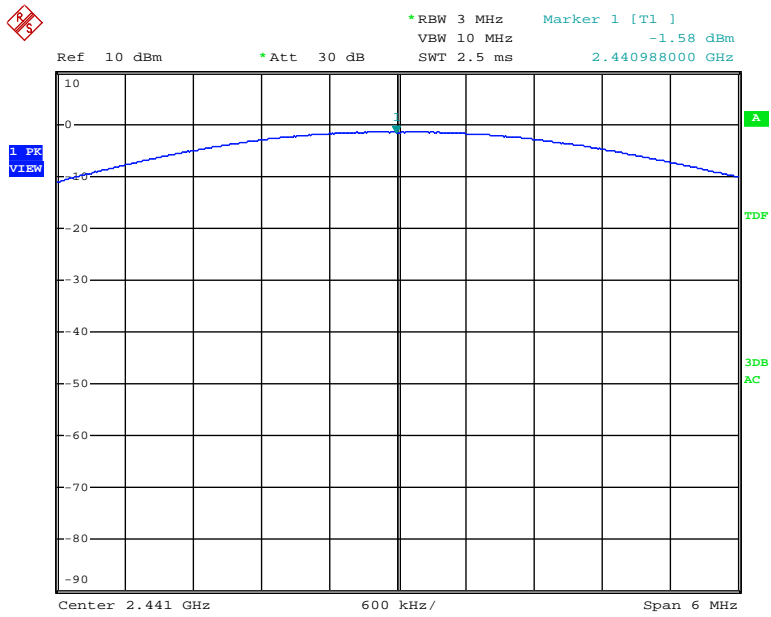
Spectrum Detector: PK                      Test Date : 06/20/2013  
 Test By: Jary                                  Temperature : 21 °C  
 Test Result: PASS                              Humidity : 55 %

GFSK Mode					
Channel	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(mW)	Pass/Fail
Low channel	2402.00	-0.84	0.824	125	PASS
Middle channel	2441.00	-1.58	0.695	125	PASS
High channel	2480.00	-2.28	0.592	125	PASS
π/4-DQPSK Mode					
Channel	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(mW)	Pass/Fail
Low channel	2402.00	-2.48	0.565	125	PASS
Middle channel	2441.00	-3.03	0.498	125	PASS
High channel	2480.00	-3.58	0.439	125	PASS
8DPSK Mode					
Channel	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(mW)	Pass/Fail
Low channel	2402.00	-2.21	0.601	125	PASS
Middle channel	2441.00	-2.58	0.552	125	PASS
High channel	2480.00	-3.49	0.448	125	PASS



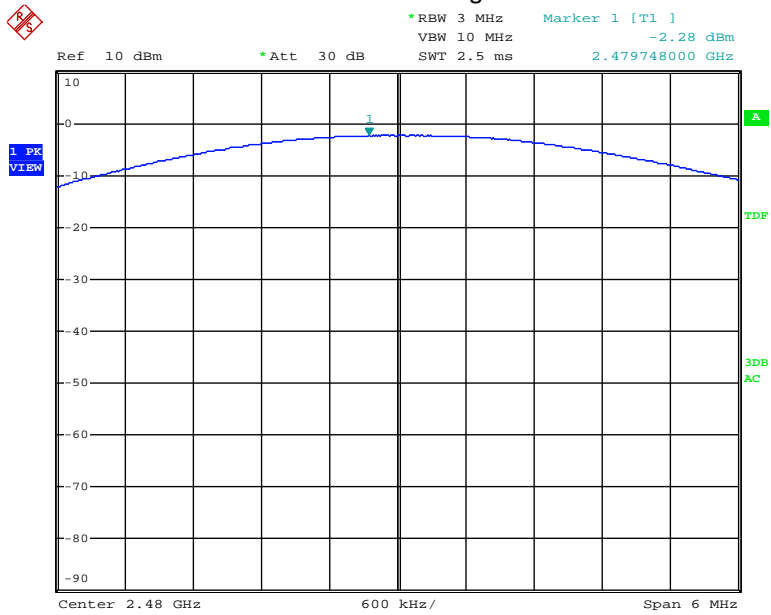
Date: 19.MAR.2015 15:59:29

GFSK Mode: Middle channel



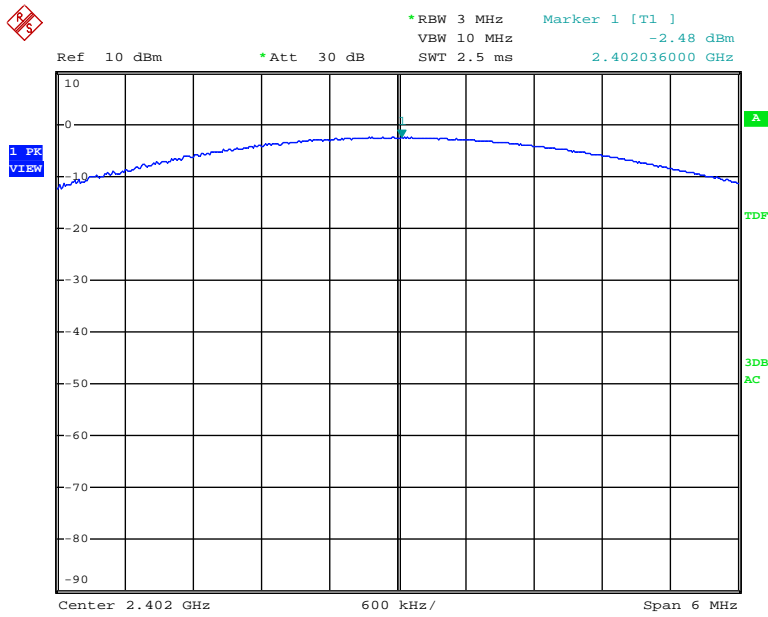
Date: 19.MAR.2015 16:01:37

GFSK Mode: High channel



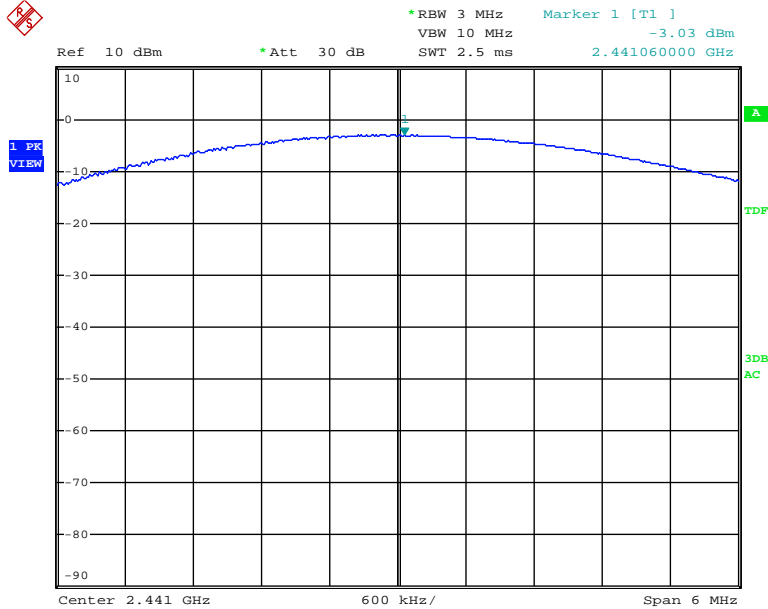
Date: 19.MAR.2015 16:04:07

$\pi/4$ -DQPSK Mode: Low channel



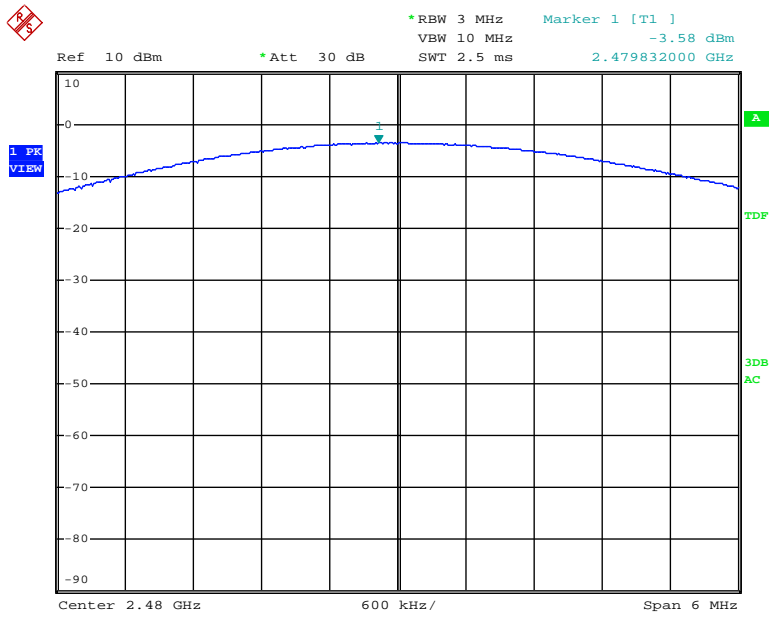
Date: 19.MAR.2015 16:06:06

$\pi/4$ -DQPSK Mode: Middle channel



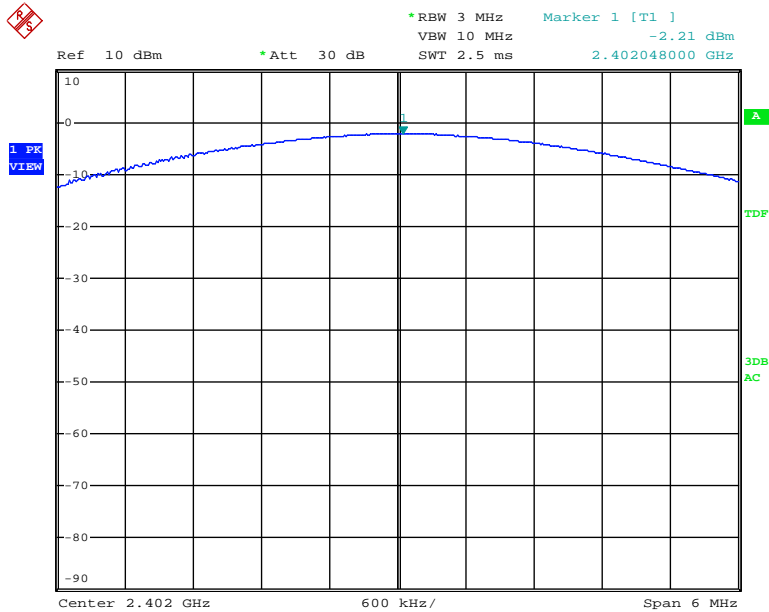
Date: 19.MAR.2015 16:09:34

$\pi/4$ -DQPSK Mode: High channel



Date: 19.MAR.2015 16:10:07

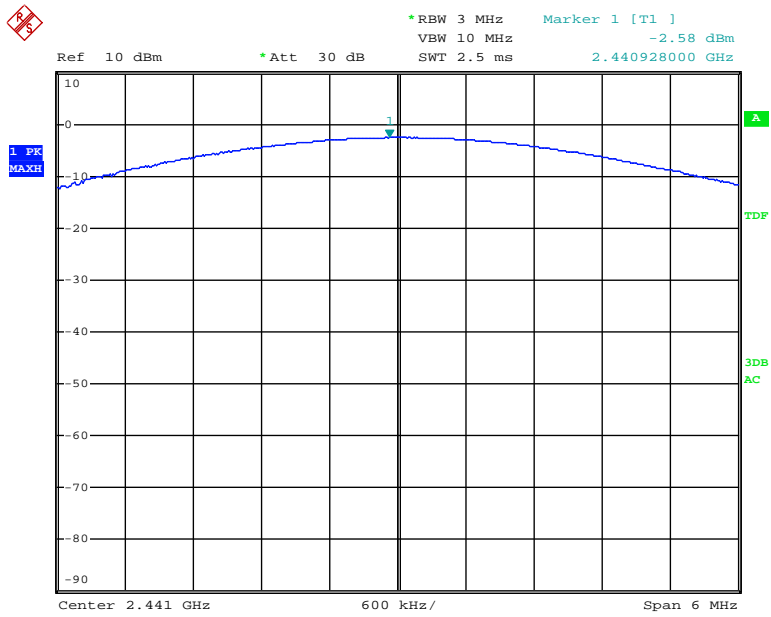
8DPSK Mode: Low channel



Date: 19.MAR.2015 16:11:57

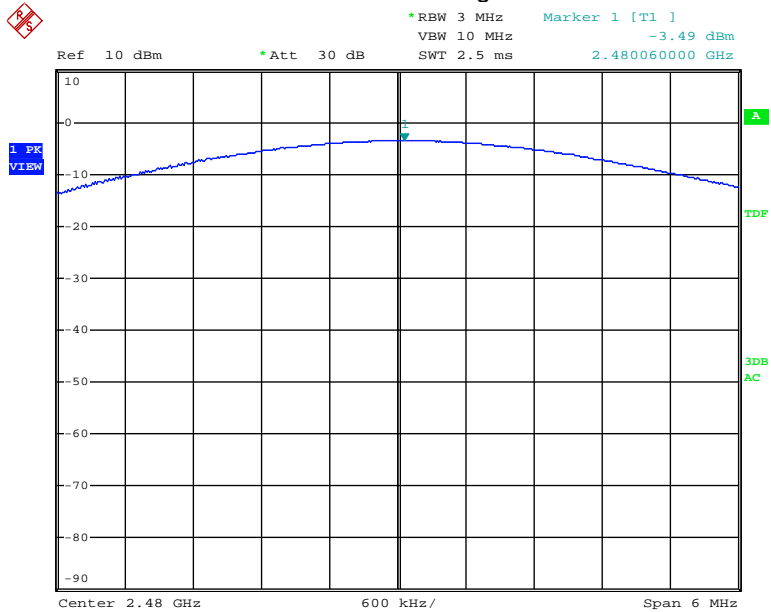


8DPSK Mode: Middle channel



Date: 19.MAR.2015 16:12:53

8DPSK Mode: High channel



Date: 19.MAR.2015 16:15:25

## 11. Band Edge Test

### 11.1 Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### 11.2 Measurement Procedure

(A) Conducted method:

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings: RBW = 100kHz, VBW = 300kHz.

(B) Radiated method:

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.  
(Peak measurement: Peak detector, RBW=1MHz, VBW=3MHz, Sweep=Auto  
Average measurement: Peak detector, RBW=1MHz, VBW=10Hz, Sweep=Auto)

### 11.3 Measurement Equipment Used

Conducted method: Same as 6.3 Channel Separation Measurement.

Radiated method: Same as 5.3 Radiated Emission Measurement.

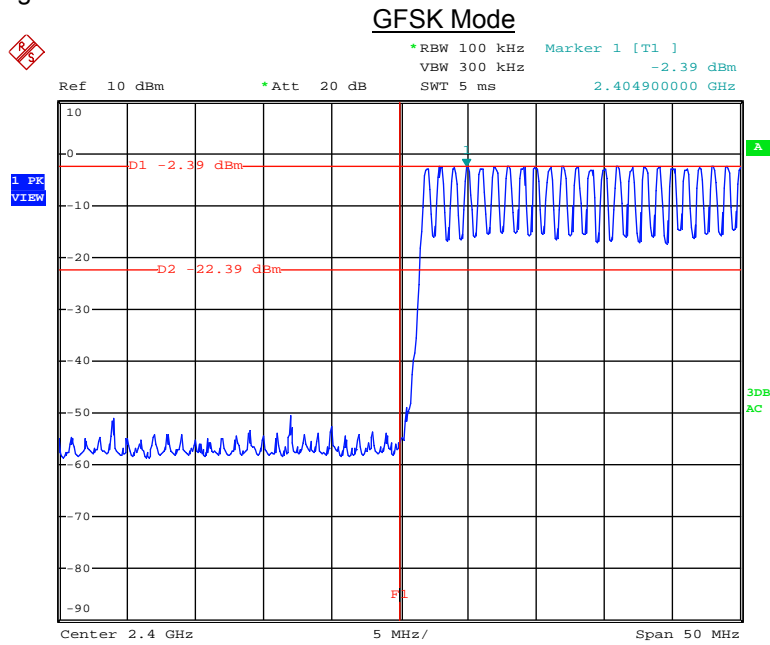
### 11.4 Measurement Results

Pass

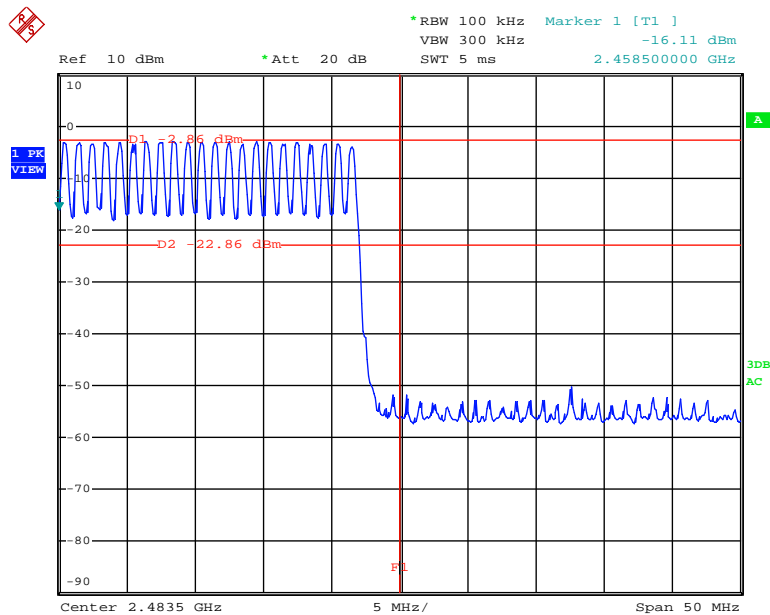
Refer to attached data chart.

(A) Conducted Measurement

For Hopping Mode:

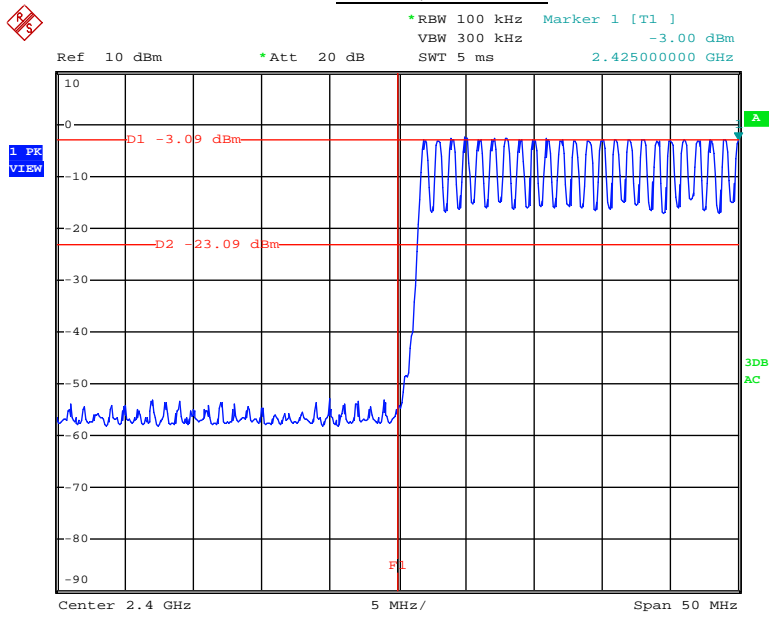


Date: 23.MAR.2015 21:10:35

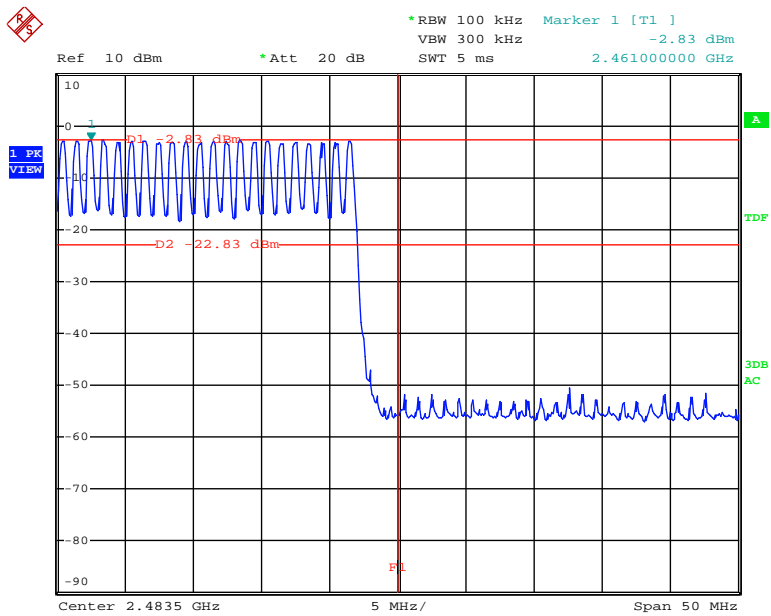


Date: 23.MAR.2015 21:45:15

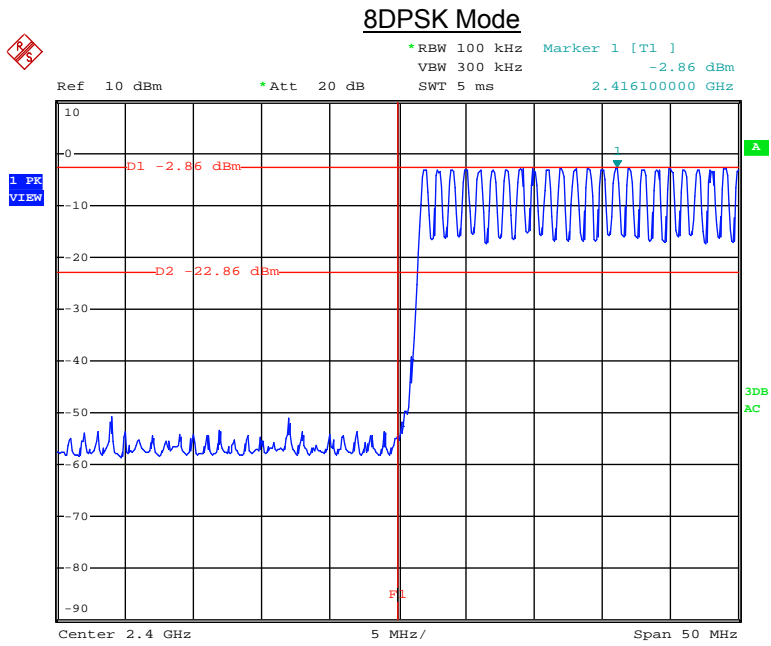
$\pi/4$ -DQPSK Mode



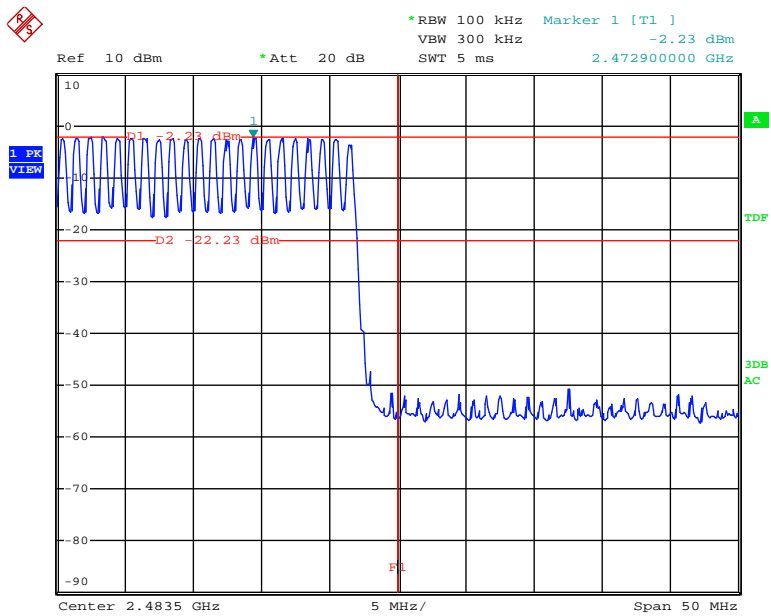
Date: 23.MAR.2015 21:32:31



Date: 23.MAR.2015 21:48:48



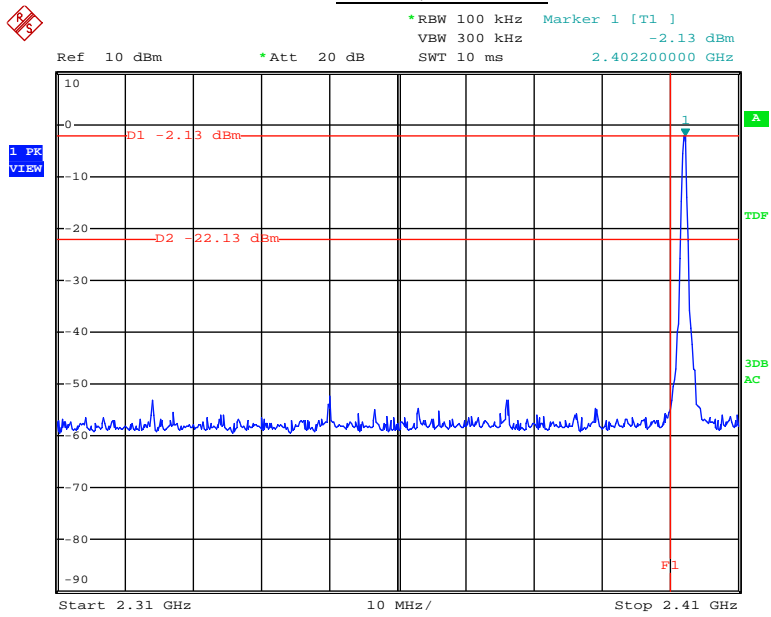
Date: 23.MAR.2015 21:40:51



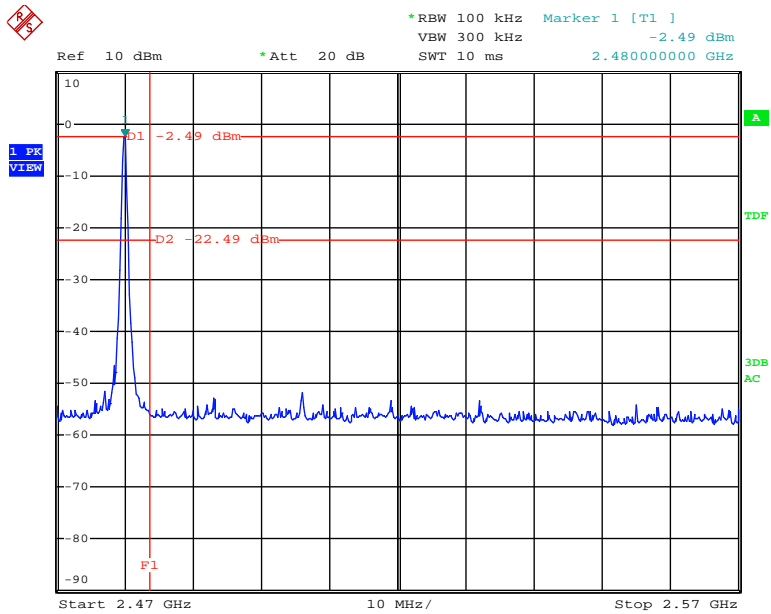
Date: 23.MAR.2015 21:53:11

For Non-Hopping Mode

**$\pi/4$ -DQPSK Mode**

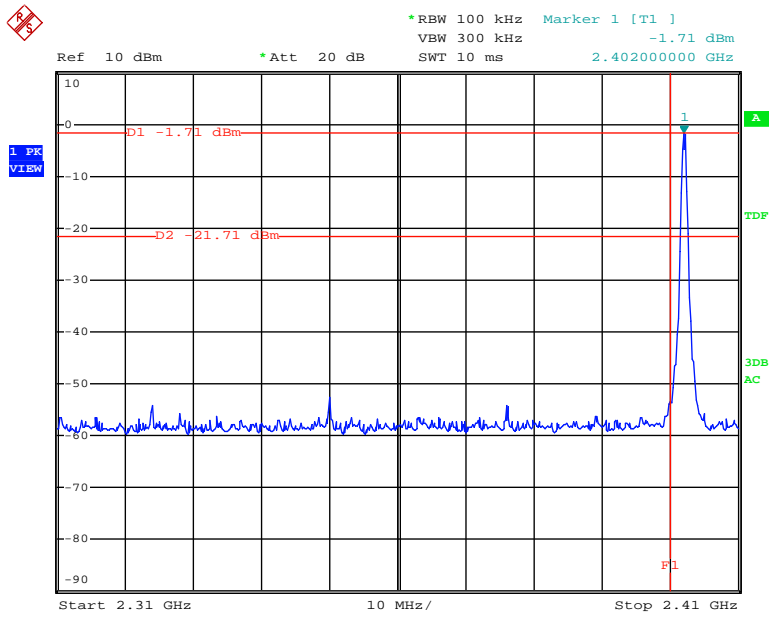


Date: 23.MAR.2015 20:17:53

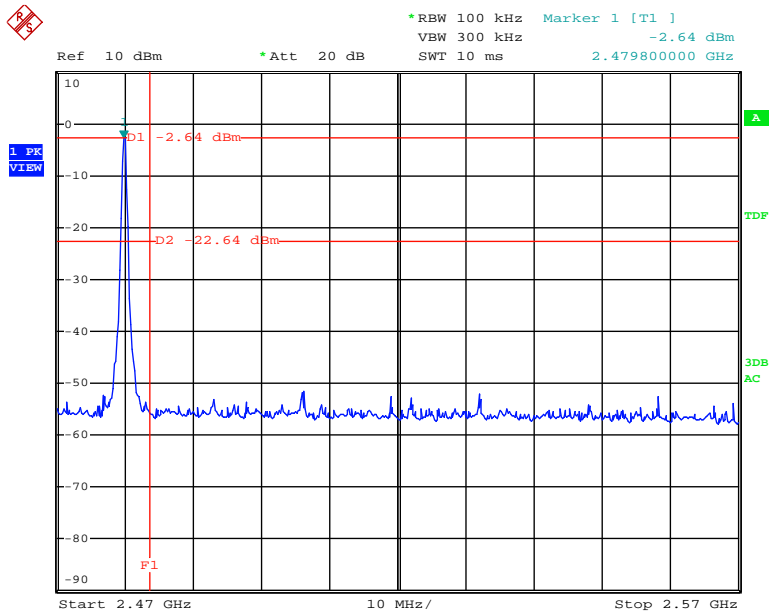


Date: 23.MAR.2015 20:24:31

GFSK Mode

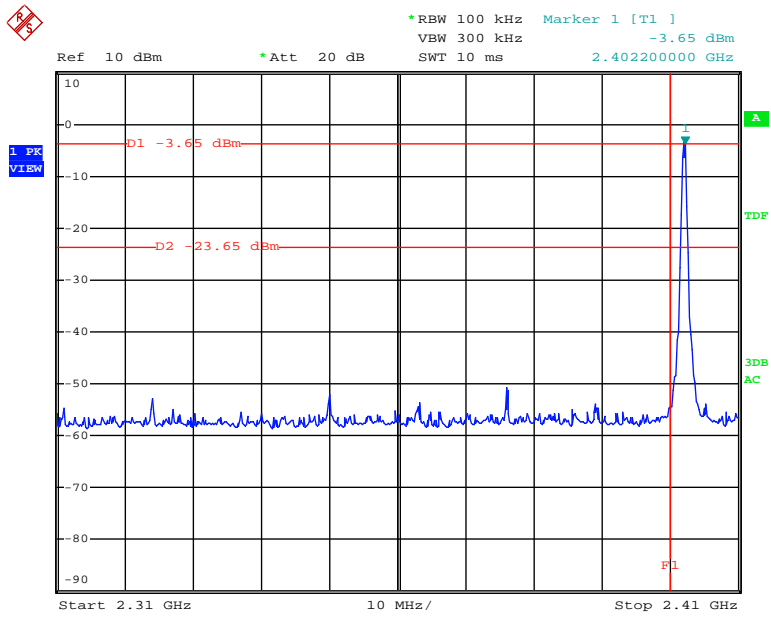


Date: 23.MAR.2015 20:15:40

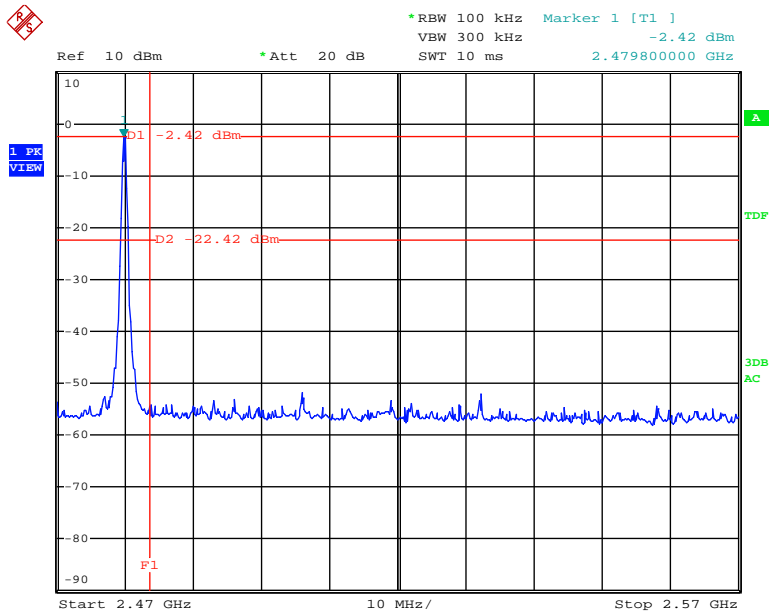


Date: 23.MAR.2015 20:22:45

**8DPSK Mode**



Date: 23.MAR.2015 20:13:49



Date: 23.MAR.2015 20:21:28

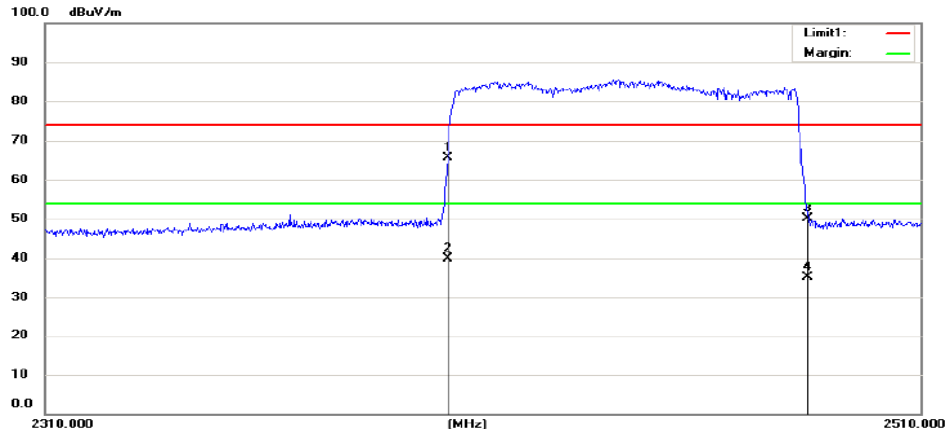


(B) Radiated Measurement

For Hopping Mode:

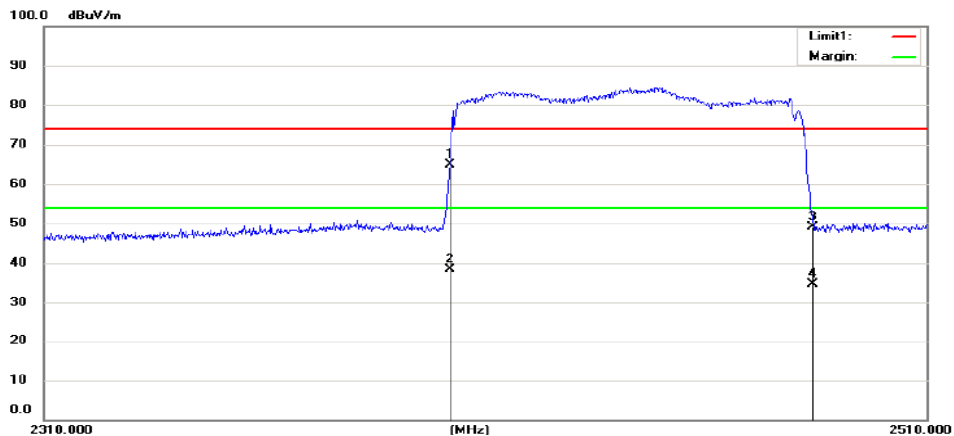
8DPSK Mode

Vertical:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB
1	*	2400.000	54.60	10.93	65.53	73.90	-8.37
2		2400.000	28.87	10.93	39.80	73.90	-34.10
3		2483.500	39.21	11.00	50.21	73.90	-23.69
4		2483.500	24.10	11.00	35.10	73.90	-38.80

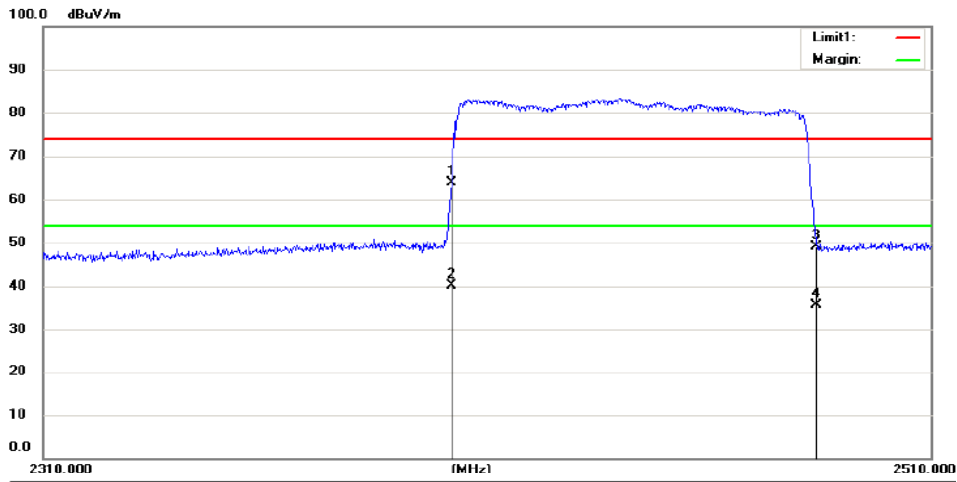
Horizontal:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB
1	*	2400.000	53.93	10.93	64.86	73.90	-9.04
2		2400.000	27.47	10.93	38.40	73.90	-35.50
3		2483.500	38.22	11.00	49.22	73.90	-24.68
4		2483.500	23.60	11.00	34.60	73.90	-39.30

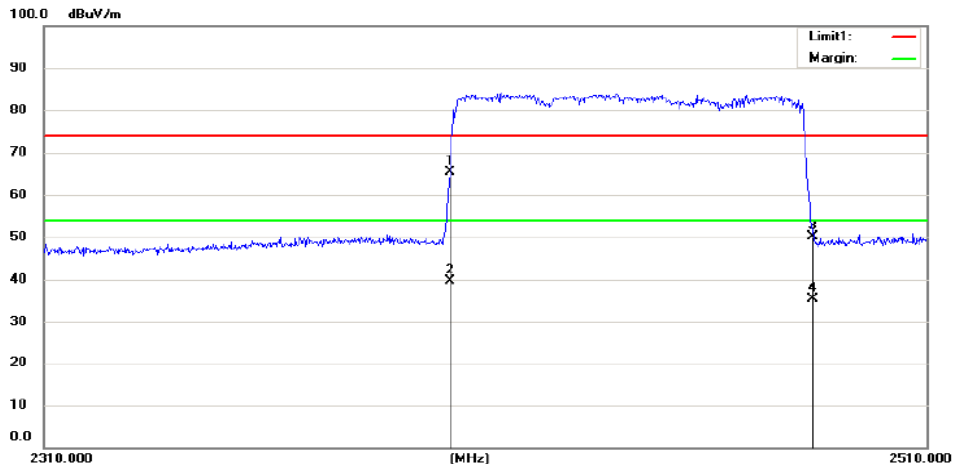
$\pi/4$ -DQPSK Mode

Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1	*	2400.000	52.88	10.93	63.81	73.90	-10.09
2		2400.000	29.17	10.93	40.10	73.90	-33.80
3		2483.500	38.24	11.00	49.24	73.90	-24.66
4		2483.500	24.70	11.00	35.70	73.90	-38.20

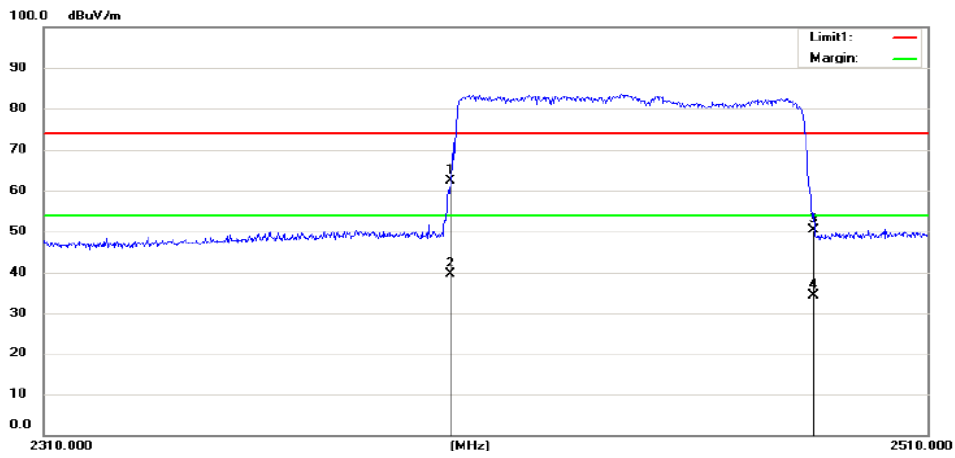
Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1	*	2400.000	54.56	10.93	65.49	73.90	-8.41
2		2400.000	28.67	10.93	39.60	73.90	-34.30
3		2483.500	39.11	11.00	50.11	73.90	-23.79
4		2483.500	24.30	11.00	35.30	73.90	-38.60

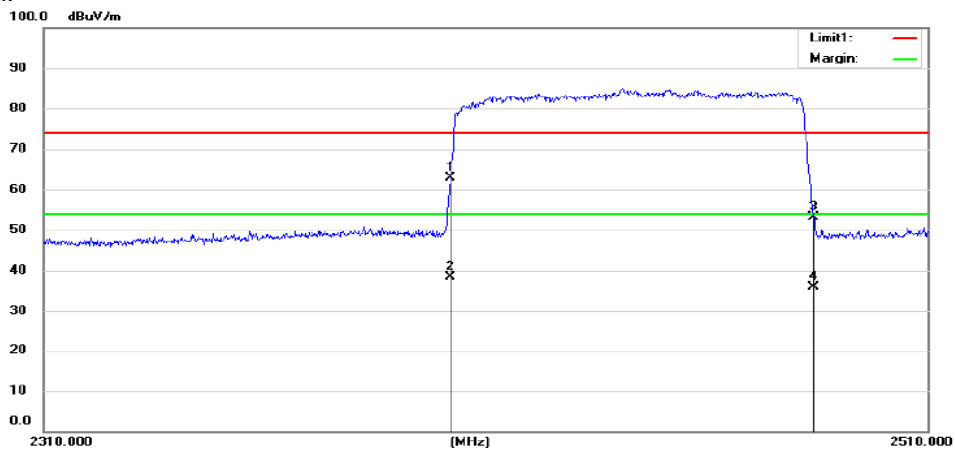
GFSK Mode

Vertical:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB
1	*	2400.000	51.49	10.93	62.42	73.90	-11.48
2		2400.000	28.77	10.93	39.70	73.90	-34.20
3		2483.500	39.30	11.00	50.30	73.90	-23.60
4		2483.500	23.50	11.00	34.50	73.90	-39.40

Horizontal:

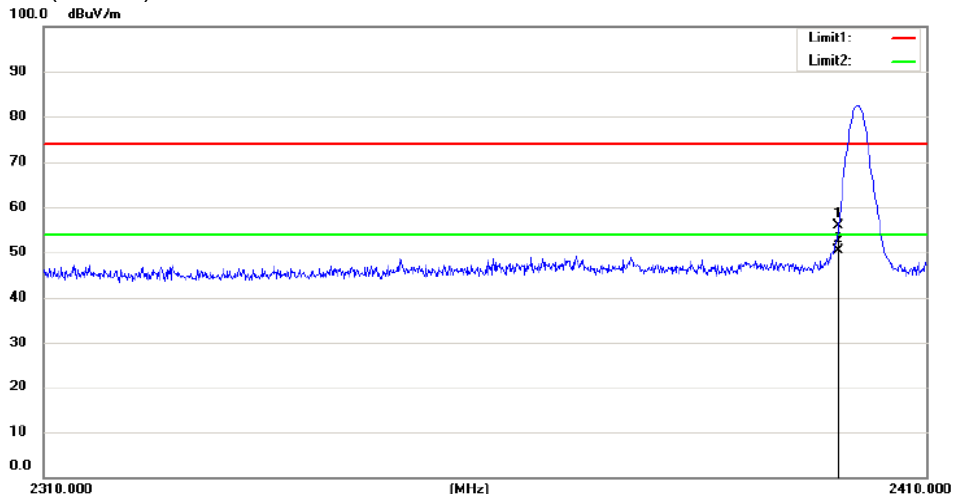


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB
1	*	2400.000	52.04	10.93	62.97	73.90	-10.93
2		2400.000	27.57	10.93	38.50	73.90	-35.40
3		2483.500	42.20	11.00	53.20	73.90	-20.70
4		2483.500	25.00	11.00	36.00	73.90	-37.90

For Non-Hopping Mode:

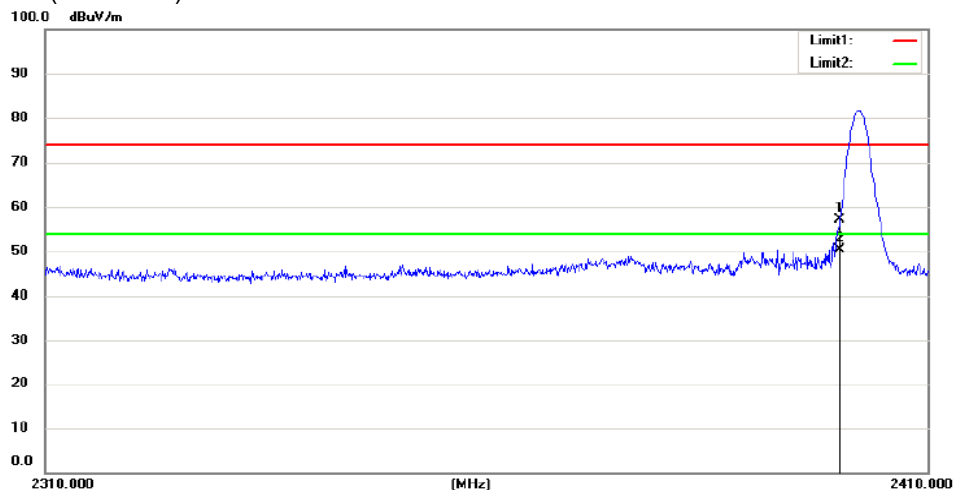
GFSK Mode

Low Channel (Vertical):



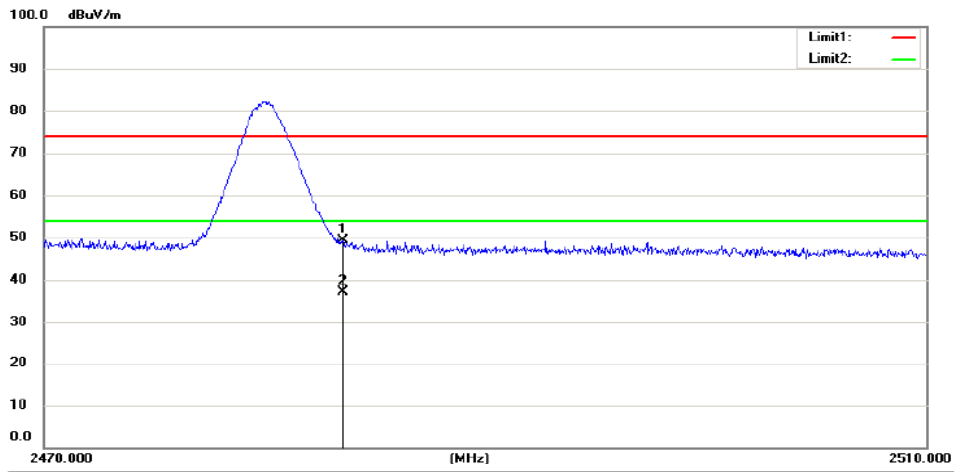
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1		2400.000	44.89	10.93	55.82	73.90	-18.08
2	*	2400.000	39.57	10.93	50.50	53.90	-3.40

Low Channel (Horizontal):



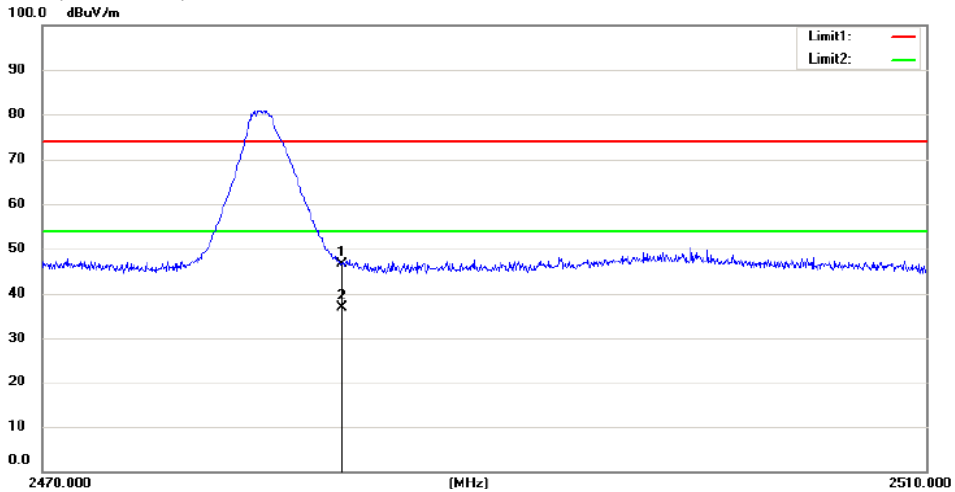
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1		2400.000	46.19	10.93	57.12	73.90	-16.78
2	*	2400.000	39.37	10.93	50.30	53.90	-3.60

High Channel (Vertical):



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1		2483.500	38.26	11.00	49.26	73.90	-24.64
2	*	2483.500	26.10	11.00	37.10	53.90	-16.80

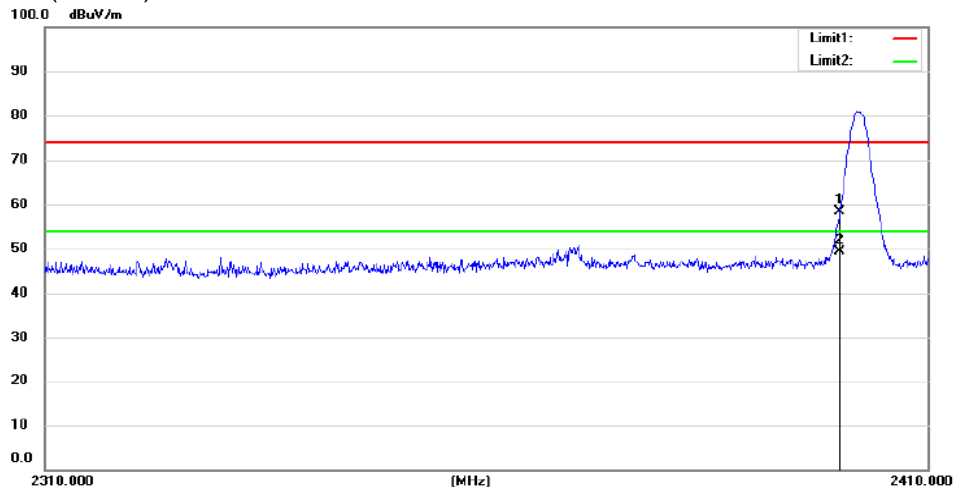
High Channel (Horizontal):



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1		2483.500	35.58	11.00	46.58	73.90	-27.32
2	*	2483.500	26.00	11.00	37.00	53.90	-16.90

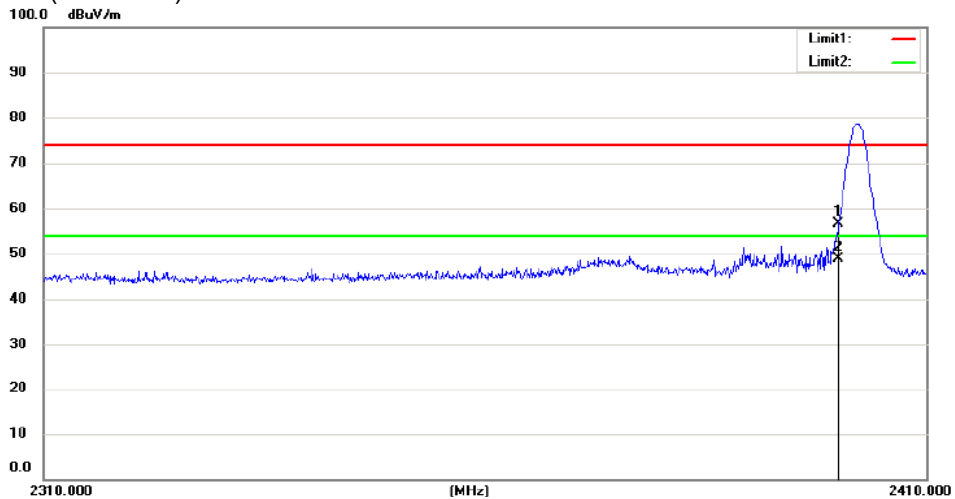
$\pi/4$ -DQPSK Mode

Low Channel (Vertical):



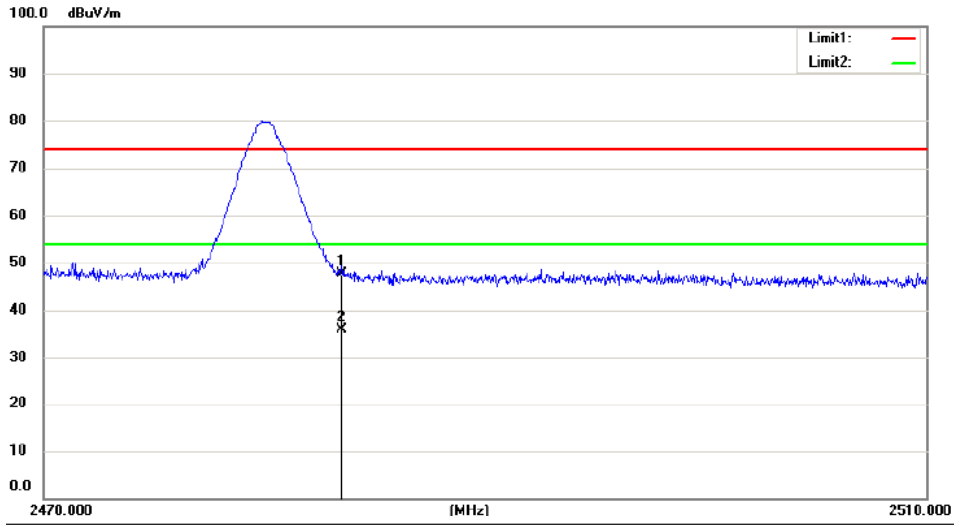
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1		2400.000	47.57	10.93	58.50	73.90	-15.40
2	*	2400.000	38.47	10.93	49.40	53.90	-4.50

Low Channel (Horizontal):



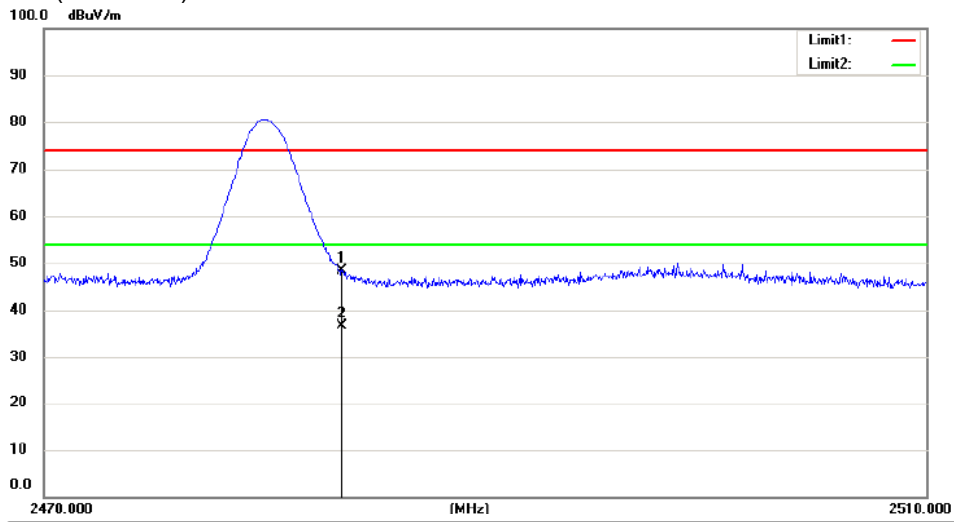
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1		2400.000	45.74	10.93	56.67	73.90	-17.23
2	*	2400.000	38.07	10.93	49.00	53.90	-4.90

High Channel (Vertical):



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB
1		2483.500	36.64	11.00	47.64	73.90	-26.26
2	*	2483.500	24.80	11.00	35.80	53.90	-18.10

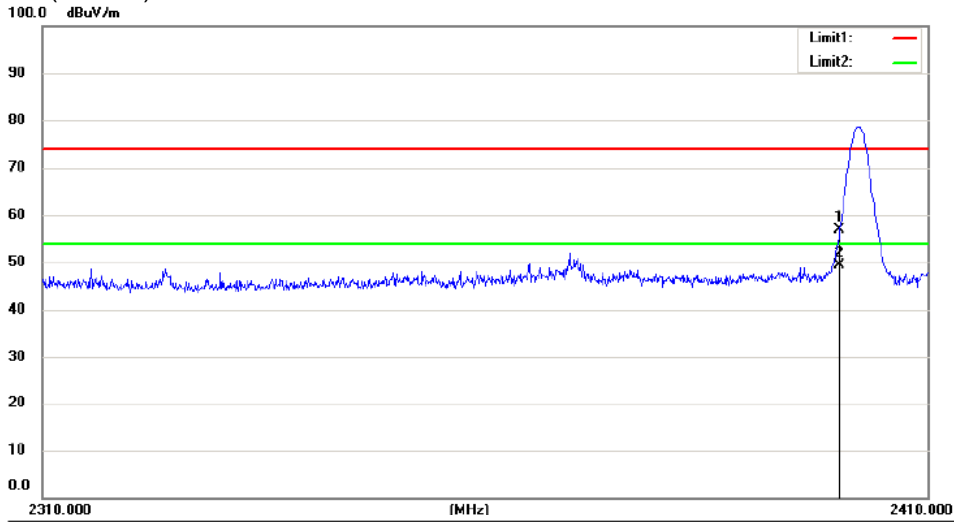
High Channel (Horizontal):



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB
1		2483.500	37.42	11.00	48.42	73.90	-25.48
2	*	2483.500	25.70	11.00	36.70	53.90	-17.20

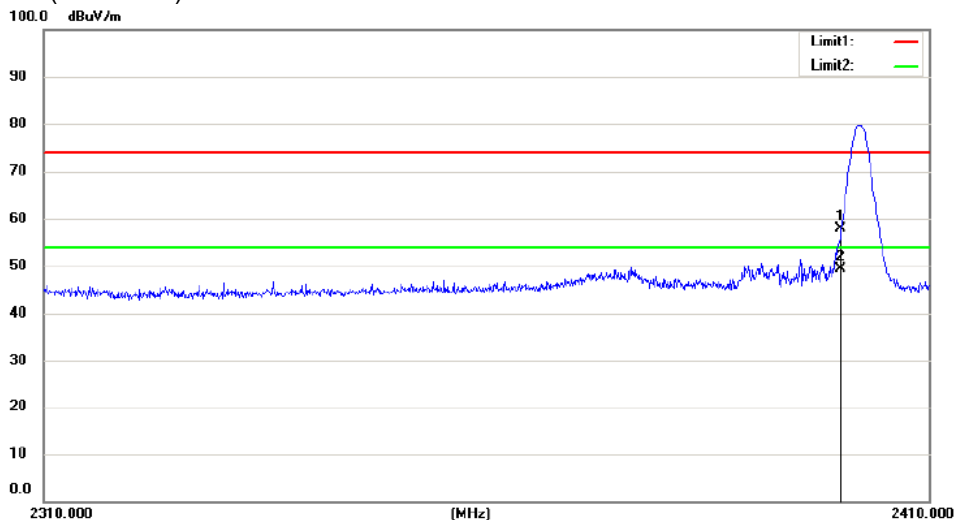
8DPSK Mode

Low Channel (Vertical):



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1		2400.000	45.99	10.93	56.92	73.90	-16.98
2	*	2400.000	38.47	10.93	49.40	53.90	-4.50

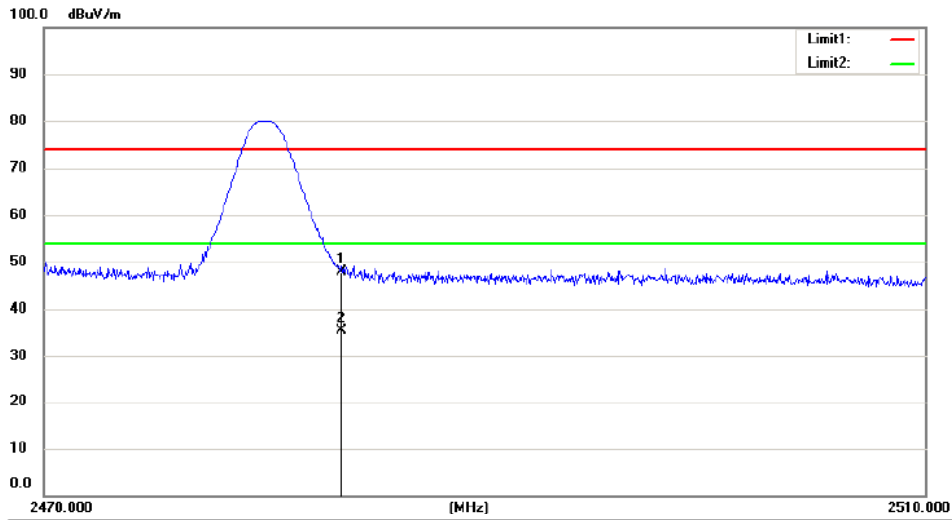
Low Channel (Horizontal):



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1		2400.000	46.86	10.93	57.79	73.90	-16.11
2	*	2400.000	38.37	10.93	49.30	53.90	-4.60

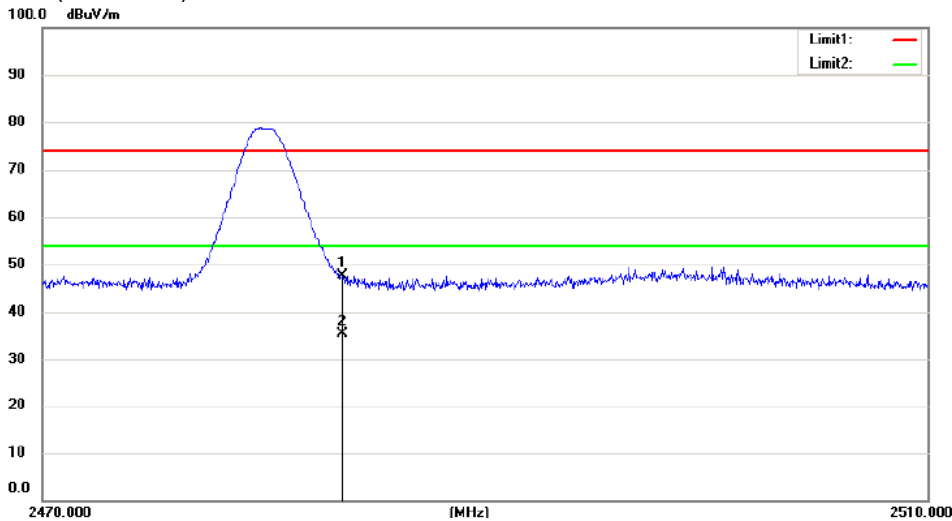


High Channel (Vertical):



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1		2483.500	36.92	11.00	47.92	73.90	-25.98
2	*	2483.500	24.40	11.00	35.40	53.90	-18.50

High Channel (Horizontal):



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1		2483.500	36.74	11.00	47.74	73.90	-26.16
2	*	2483.500	24.50	11.00	35.50	53.90	-18.40

## 12. Antenna Port Emission

### 12.1 Test Equipment

Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	MY45107013	05/17/2014	05/16/2015

### 12.2 Measuring Instruments and setting

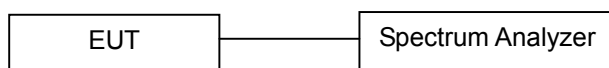
The following table is the setting of spectrum analyzer.

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

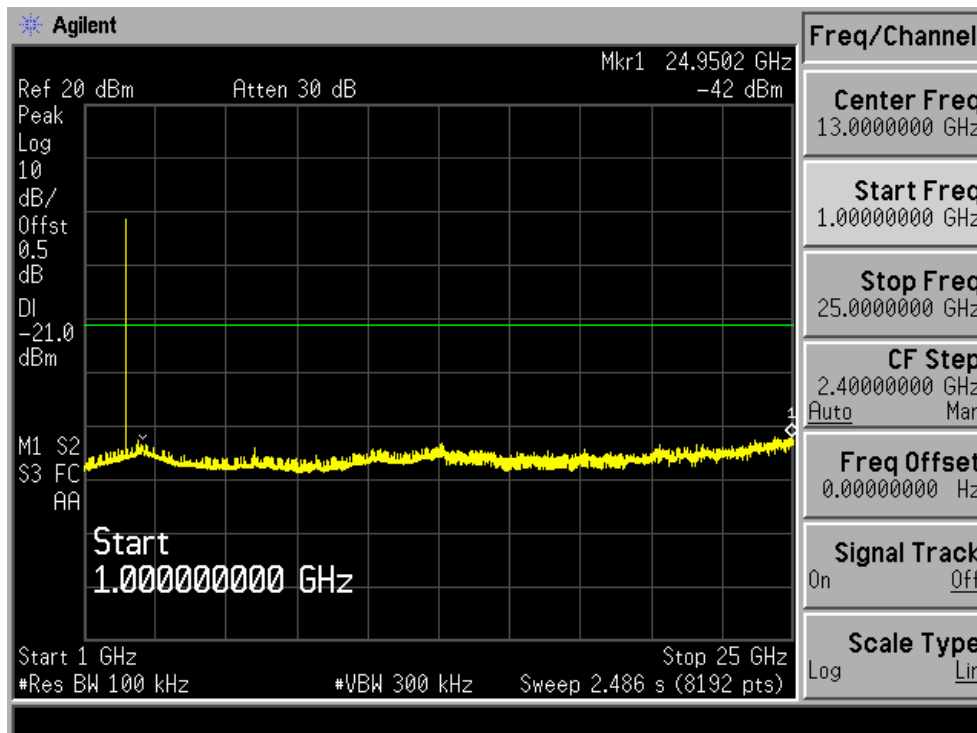
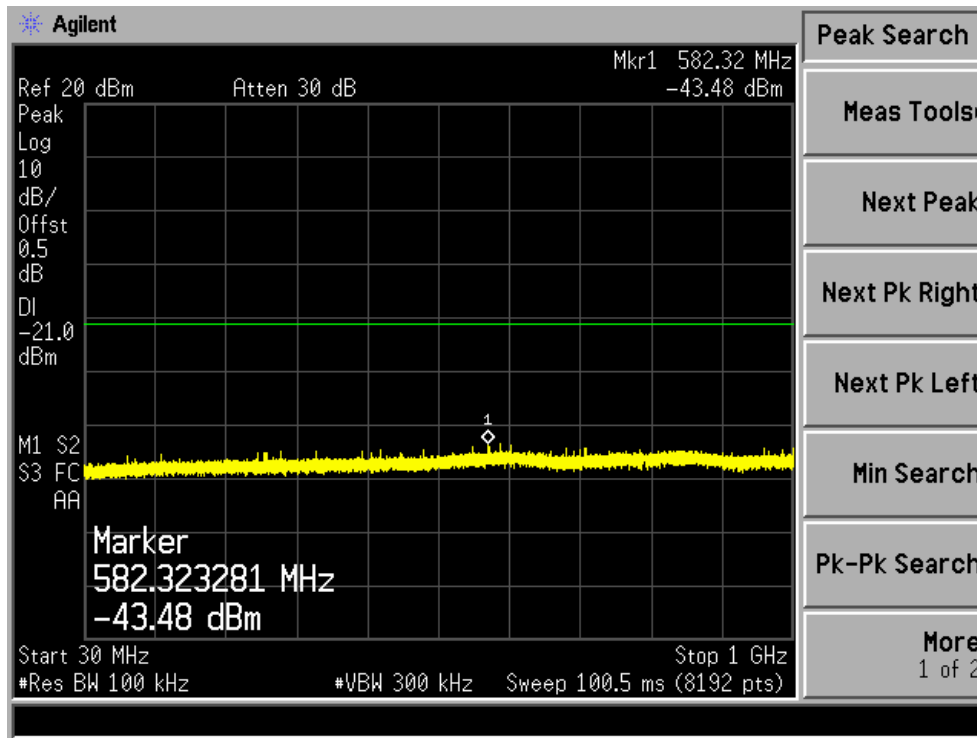


### 12.5 Test Result

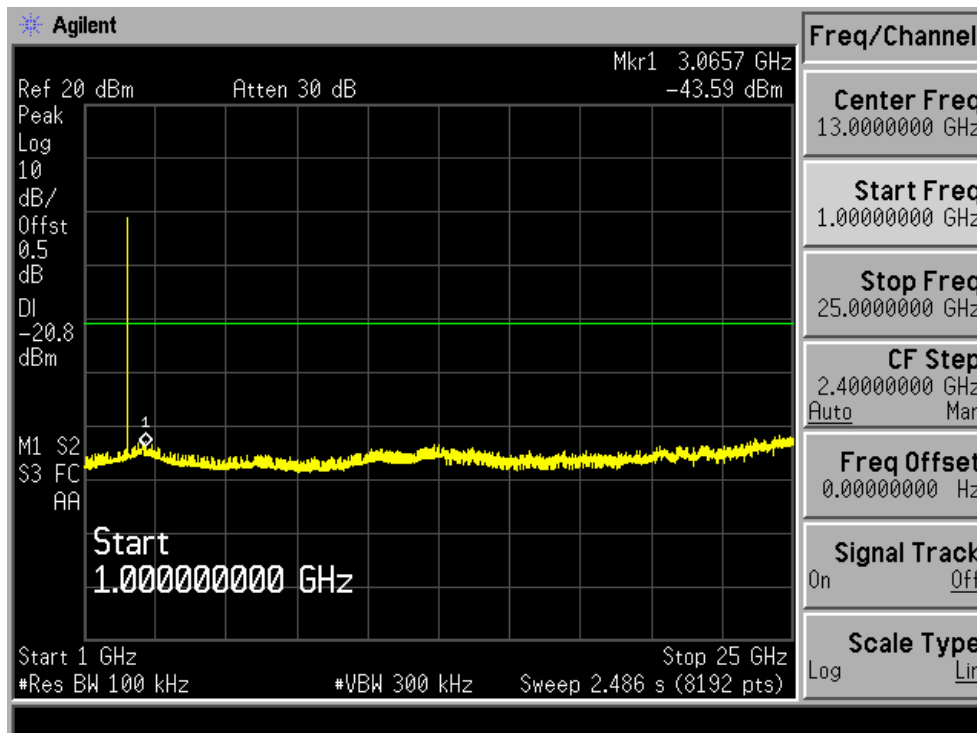
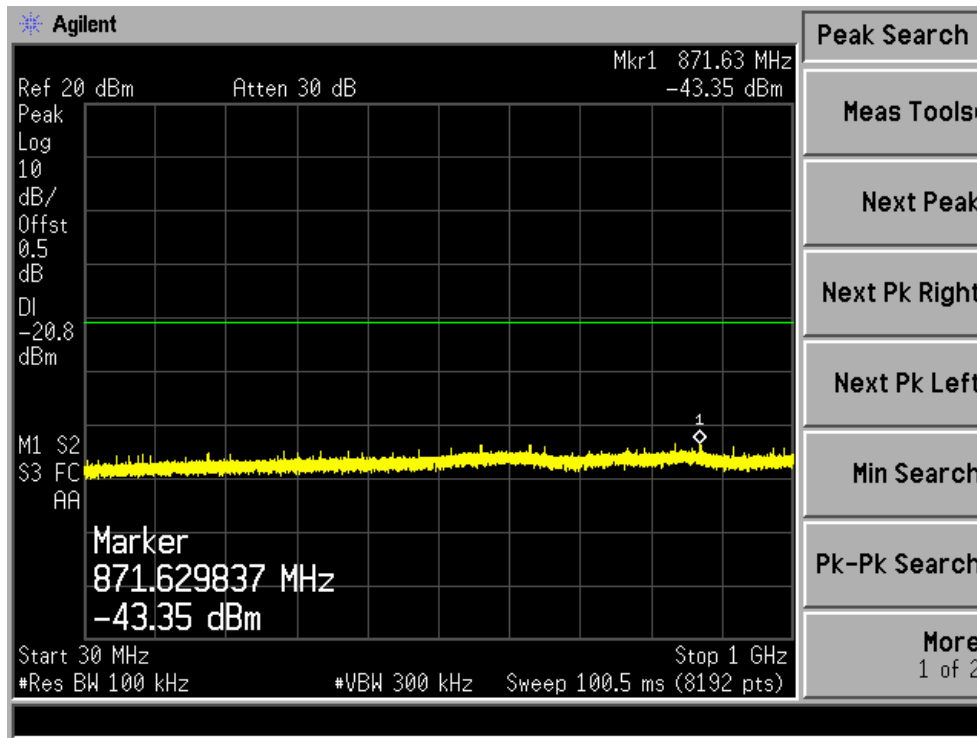
PASS.

(Bluetooth (GFSK, pi/4-DQPSK, 8DPSK) mode have been tested, and the worst result(GFSK) was report as below.)

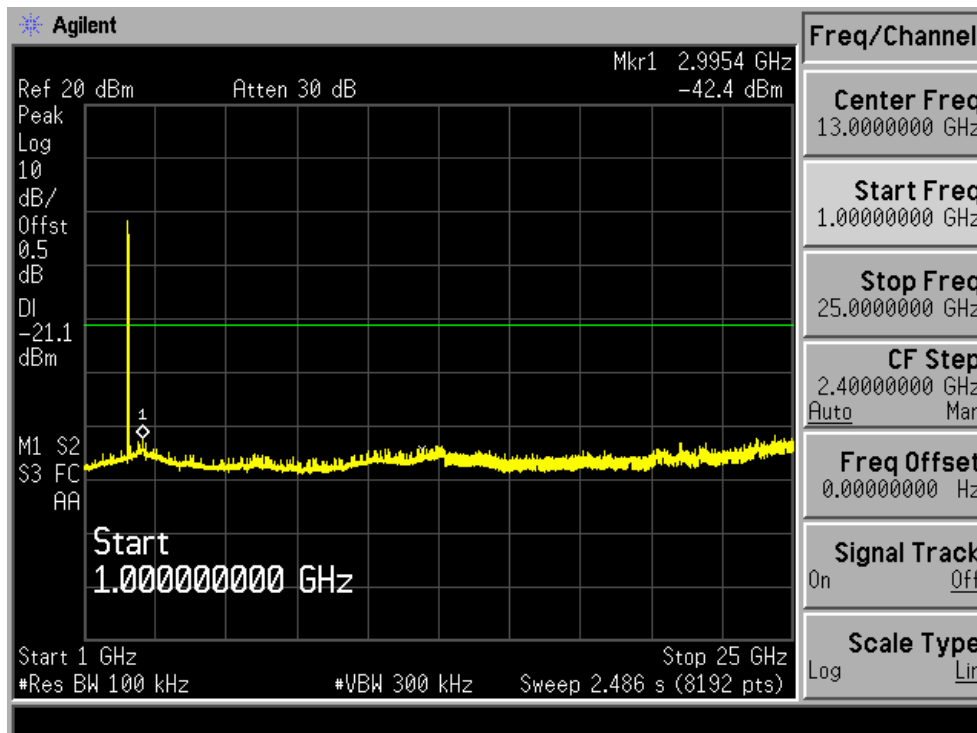
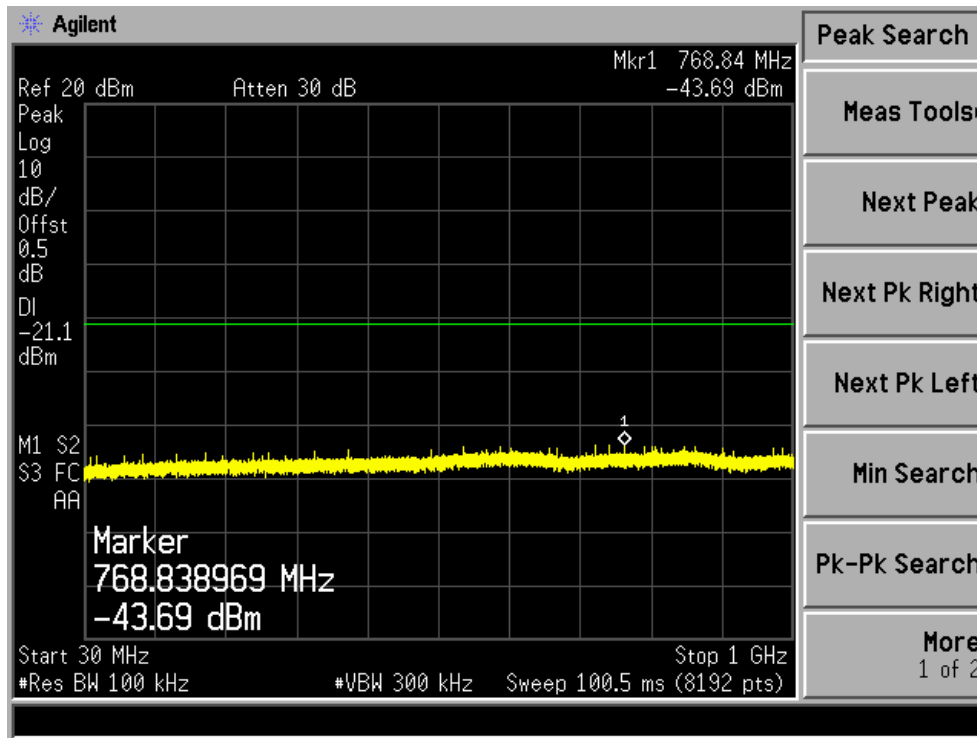
GFSK Mode: Low channel



GFSK Mode: Middle channel



GFSK Mode: High channel



## 13. Antenna Application

### 13.1 Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.240.

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

---The End---