

## **FCC ID TEST REPORT**

for

**Wireless Speaker**

**Model: BT-200**

**FCC ID: 2AAKHBT-200**

Prepared for: PANODIC ELECTRIC (SHENZHEN) LIMITED  
12/F,Grentech Building,Keji.C.Road 3rd Hi-Tech Industrial  
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Report Number: TCT1306273469F2-1

Date of Test: July 01~25, 2013

Date of Report: July 25, 2013

*The results detailed in this test report relate only to the specific sample(s) tested. It is the Application's responsibility to ensure that all production units are manufactured with equivalent EMC characteristics. This report is not to be reproduced except in full, without written approval from TCT Testing Technology.*

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## 1.0 General Details

### 1.1 Test Lab Details

Name :	Shenzhen TCT Testing Technology Co.,Ltd
Address:	1F, Building 1, Yibaolai Industrial Park, Qiaotou Village, Fuyong Town, Baoan District, Shenzhen, Guangdong, China
Telephone:	+86-0755-27673339
Fax:	+86-0755-27673332

Site Listed with Federal Communication Commission

Registration Number: 572331

For 3m chamber

Site Listed with Industry Canada of Ottawa, Canada

Registration Number IC: 10668A-1


For 3m chamber

### 1.2 Applicant Details

Applicant:	PANODIC ELECTRIC (SHENZHEN) LIMITED
Address:	12/F,Grentech Building,Keji.C.Road 3rd Hi-Tech Industrial Park,Nanshan District,Shenzhen,China
Telephone:	13691678549
Fax:	0755-27347592

Manufacturer:	PANODIC ELECTRIC (SHENZHEN) LIMITED
Address:	12/F,Grentech Building,Keji.C.Road 3rd Hi-Tech Industrial Park,Nanshan District,Shenzhen,China
Telephone:	13691678549
Fax:	0755-27347592

1.3 Description of EUT

Product:	Wireless Speaker
Model No.:	BT-200
Additional Model No.:	BT-200 Black, BT-200 White, BT-200 Red, BT-200 Blue, BT-200 Purple
Brand Name:	
Rating:	AC Adapter: Model: BY-M04-0951000U Input: AC 100-240V, 50/60Hz Output: DC 9.5V, 1A Or Battery: DC 7.4V, 1A
Modulation Type:	GFSK, Pi/4QDPSK, 8DPSK
Transfer Data Rate	1/2/3 Mbps
Channel number:	79
Channel spacing:	1 MHz
Operation Frequency:	2402~2480MHz
Antenna Designation:	An integral antenna and the maximum antenna gain is 0dBi.

1.4 Statement: N/A

1.5 Test Engineer

The sample tested by



Printed name: Jack Kang

## 2.0 Test equipments and Associated Equipment used during the test.

### 2.1 Test Equipments

Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	July 7, 2013	July 6, 2014
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	July 7, 2013	July 6, 2014
System Controller	CT	SC100	-	July 8, 2013	July 7, 2014
Spectrum Analyzer	ROHDE&SCHWARZ	FSEM	848597/001	July 8, 2013	July 7, 2014
Pre-amplifier	Teseq	LAN6900	--	July 8, 2013	July 7, 2014
Pre-amplifier	Agilent	8447D	83153007374	July 8, 2013	July 7, 2014
Pre-amplifier	Agilent	8449B	3008A01738	July 8, 2013	July 7, 2014
Triple-loop antenna	ROHDE&SCHWARZ	HM020	843885/002	July 8, 2013	July 7, 2014
Horn Antenna	ETS LINDGREN	3117	--	July 8, 2013	July 7, 2014
Horn Antenna	ETS LINDGREN	3160	--	July 8, 2013	July 7, 2014
EMI Test Receiver	R&S	ESCS30	100139	July 7, 2013	July 6, 2014
LISN	AFJ	LS16C	16010222119	July 7, 2013	July 6, 2014

### 2.2 AE used during the test

Equipment type	Manufacturer	Model
N/A		
N/A		
N/A		
N/A		

### 3.0 Technical Details

#### 3.1 Summary of test results

The EUT has been tested according to the following specifications

Requirement	CFR 47 Section	Result
Power Line Conducted Emission Test	15.207(a)	PASS
20dB Channel Bandwidth	15.247 (a)(1), 15.215(c)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Carrier Frequency Separation	15.247 (a)(1)	PASS
Number of Hopping Channels	15.247(a)(iii)	PASS
Time of Occupancy (Dwell Time)	15.247(a)(iii)	PASS
Band age Measurement, Spurious Emission Test	15.247 (d), 15.205 (a), 15.209 (a)	PASS
Antenna Requirement	15.203	PASS

#### 3.2 Test Standards

FCC Part 15:2012 Subpart C, Paragraph 15.247

#### 4.0 EUT Modification

No modification by Shenzhen TCT Testing Technology Co., Ltd

#### 5.0 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	MU
1.	Radio Frequency	$\pm 1 \times 10^{-9}$
2.	Temperature	$\pm 0.1^{\circ}\text{C}$
3.	Humidity	$\pm 1.0\%$
4.	RF power, conducted	$\pm 0.34\text{dB}$
5.	RF power density, conducted	$\pm 1.45\text{dB}$
6.	Spurious emissions, conducted	$\pm 3.70\text{dB}$
7.	All emissions, radiated	$\pm 4.50\text{dB}$

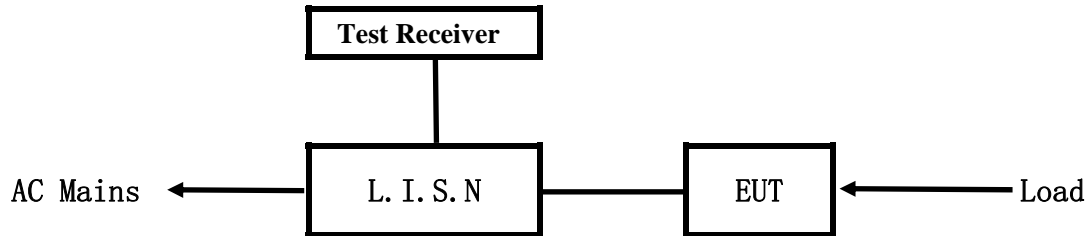
Note: 1) Low channel: 2402MHz, Middle channel: 2441MHz, High channel: 2480MHz

2) The Bluetooth version is Bluetooth 2.1, which has an EDR function.

3) The Wireless Speaker has an AUX port and DC Input port. The device can be as an amplifier by inputting audio signal via AUX port, while the DC Input port is used to charge to the Built-In battery.

## 6.0 Power Line Conducted Emission Test

### 6.1 Schematics of the test



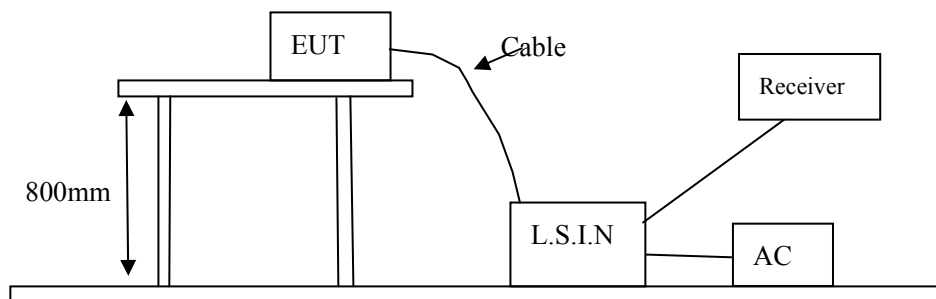
EUT: Equipment Under Test

### 6.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2009. The Frequency spectrum From 0.15MHz to 30MHz was investigated.

Test Voltage: 120V~, 60Hz

Block diagram of Test setup



### 6.3 EUT Operating Condition

Operating condition is according to ANSI C63.10 -2009

- 1) Setup the EUT and simulators as shown on the following
- 2) Enable AF signal and confirm EUT active to normal condition

### 6.4 Test Equipment

Please refer to the Section 2

#### 6.5 Conducted Emission Limit

Frequency(MHz)	Class A Limits (dB $\mu$ V)		Class B Limits (dB $\mu$ V)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ~ 0.50	79.0	66.0	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	73.0	60.0	56.0	46.0
5.00 ~ 30.00	73.0	60.0	60.0	50.0

Notes: 1) \*Decreasing linearly with logarithm of frequency.  
2) The tighter limit shall apply at the transition frequencies

#### 6.6 Photo documentation of the test set-up

Please refer to the Section 17

#### 6.7 Test specification:

Environmental conditions: Temperature: 22° C Humidity: 52% Atmospheric pressure: 103kPa

Frequency range: 0.15 MHz – 30 MHz

The test was carried out in the following operation mode(s):

- Tx mode

#### 6.8 Test result

Min. limit margin >10 dB from 0.15MHz to 30MHz

The requirements are FULFILLED

Remarks:

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**A Conducted Emission on Line Terminal of the power line (150kHz to 30MHz)**

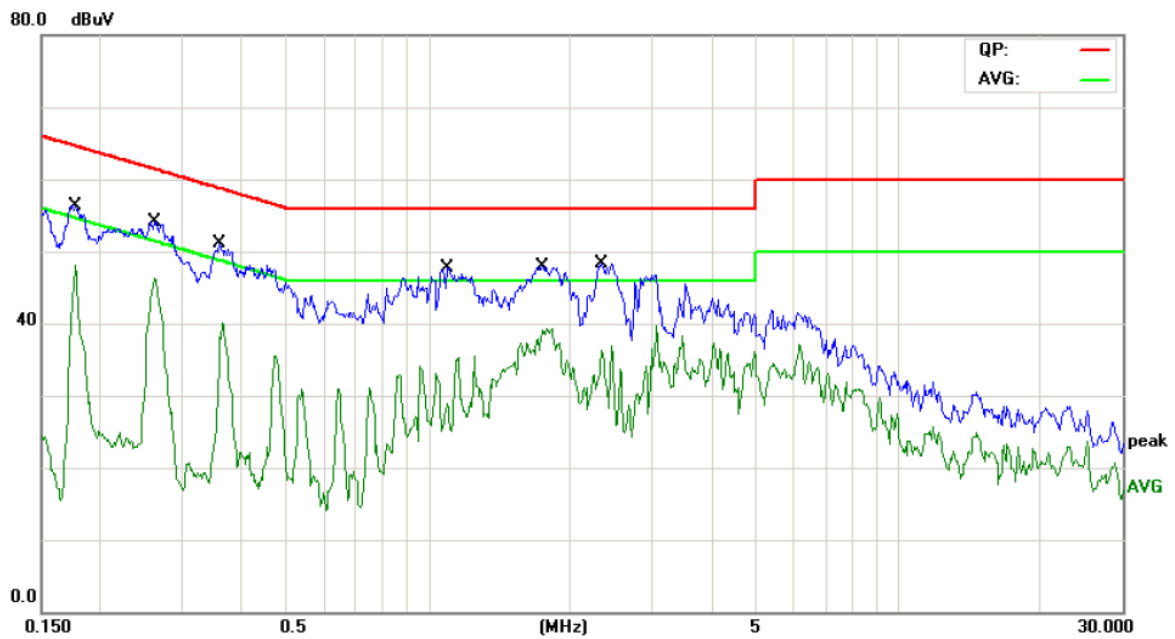
EUT Description: Wireless Speaker

Operation Mode: Tx mode

Tested By: Beryl Zhao

Test Date: July 05, 2013

Start Frequency	Stop Frequency	Step	IF BW	Detector	Final M-Time
0.15MHz	30MHz	4.5KHz	10KHz	QP+AV	1s



Frequency (MHz)	Reading(dB μ V)				Limit (dB μ V)	
	Live		Neutral			
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
0.1773	53.22	40.31	--	--	64.61	54.61
0.2600	51.16	38.43	--	--	61.43	51.43
0.3608	47.87	36.06	--	--	58.71	48.71
1.0947	44.72	32.21	--	--	56.00	46.00
1.7476	45.98	32.24	--	--	56.00	46.00
2.3451	44.28	31.54	--	--	56.00	46.00

## B Conducted Emission on Neutral Terminal of the power line (150kHz to 30MHz)

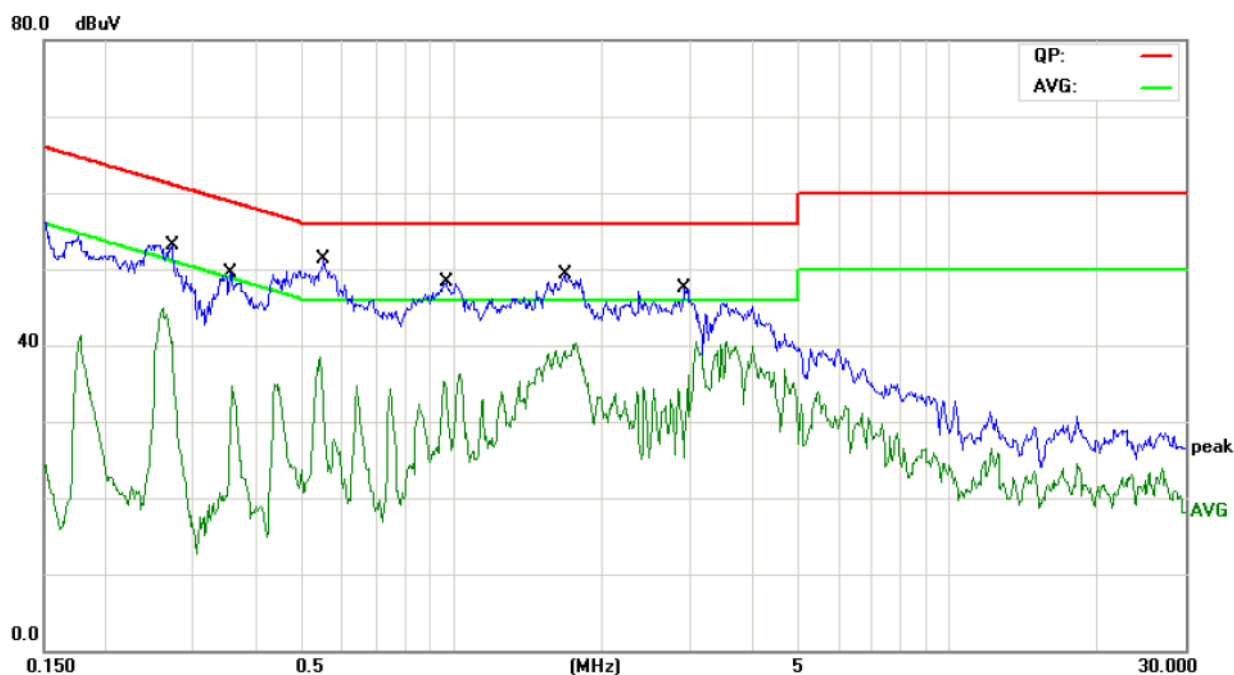
EUT Description: Wireless Speaker

Operation Mode: Tx mode

Tested By: Beryl Zhao

Test Date: July 05, 2013

Start Frequency	Stop Frequency	Step	IF BW	Detector	Final M-Time
0.15MHz	30MHz	4.5KHz	10KHz	QP+AV	1s



Frequency (MHz)	Reading(dB μ V)				Limit (dB μ V)	
	Live		Neutral		Quasi-peak	Average
	Quasi-peak	Average	Quasi-peak	Average		
0.2714	--	--	50.15	37.54	61.07	51.07
0.3568	--	--	46.60	34.57	58.80	48.80
0.5493	--	--	43.54	31.25	56.00	46.00
0.9684	--	--	44.38	32.14	56.00	46.00
1.6794	--	--	45.25	33.43	56.00	46.00
2.9305	--	--	43.47	30.83	56.00	46.00

## 7.0 20dB Bandwidth Measurement

### 7.1 Test Equipment

Please refer to the Section 2

### 7.2 Test Specification:

Environmental conditions:    Temperature    23° C    Humidity:    51%    Atmospheric pressure:    103kPa

### 7.3 Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### 7.4 Test status:

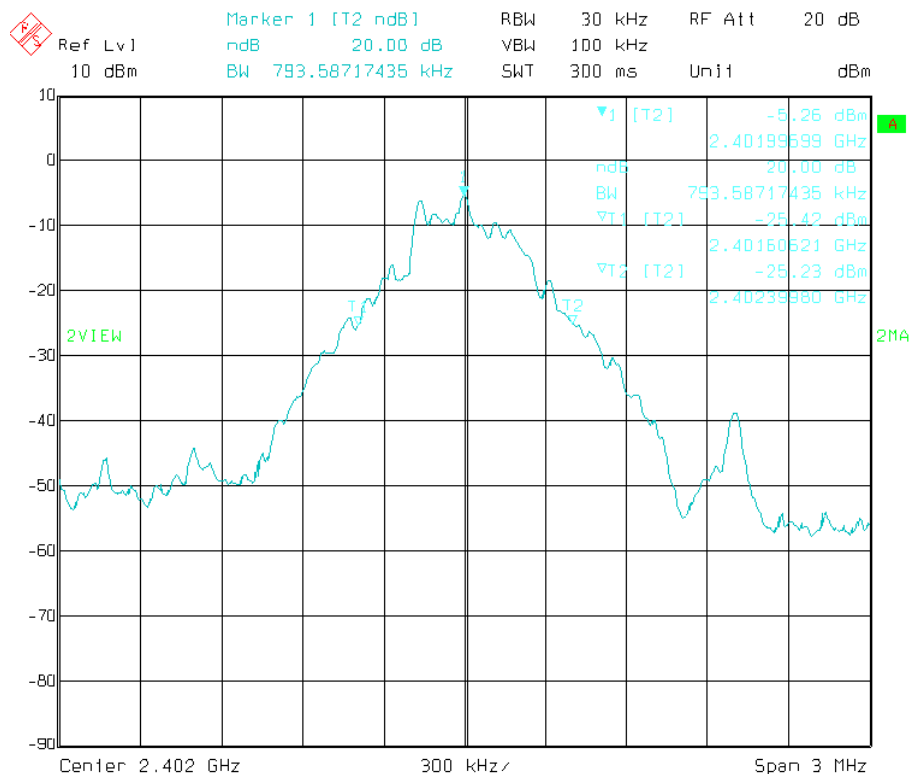
Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8DPSK mode, which indicates that the worst case is 8DPSK mode, so it is reported GFSK and 8DPSK mode only.

### 7.5 Test Result:

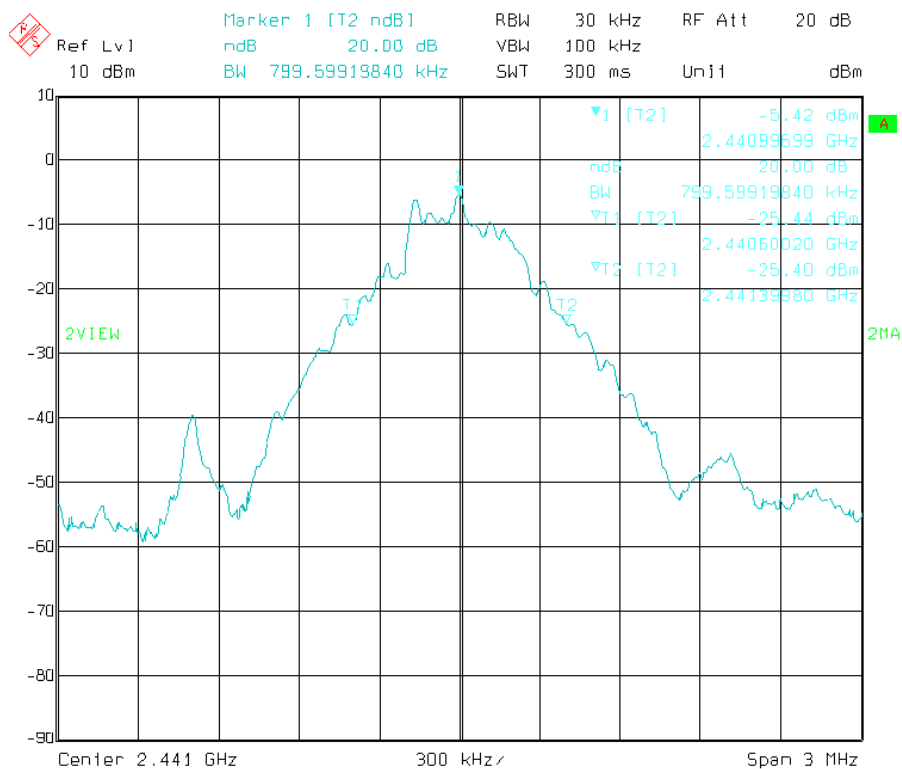
Modulation Type	Channel number	20dB Bandwidth (kHz)	Limit (kHz)	Conclusion
GFSK	Low	793.6	---	PASS
	Middle	799.6	---	PASS
	High	793.6	---	PASS
8DPSK	Low	1232.5	---	PASS
	Middle	1262.5	---	PASS
	High	1268.5	---	PASS

Modulation: GFSK

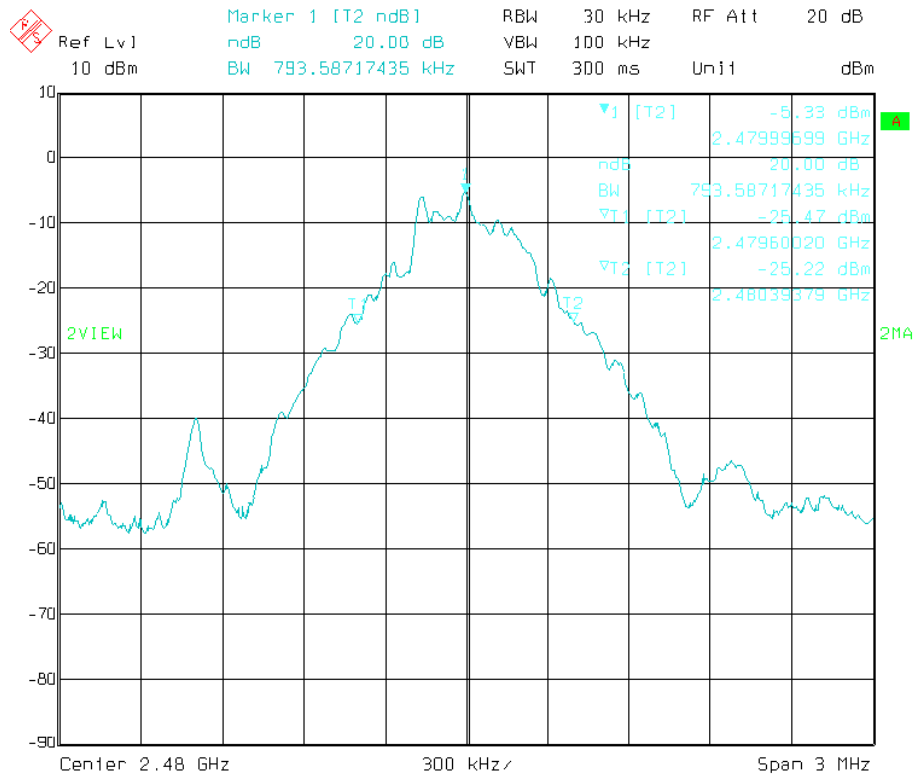
Low channel



Middle channel

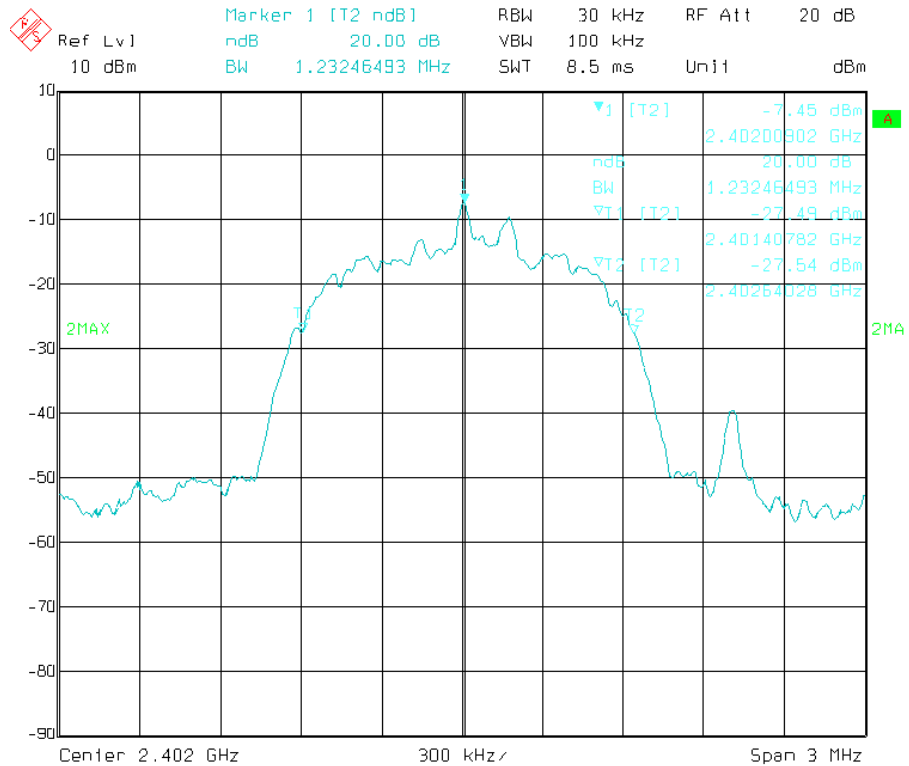


## High channel

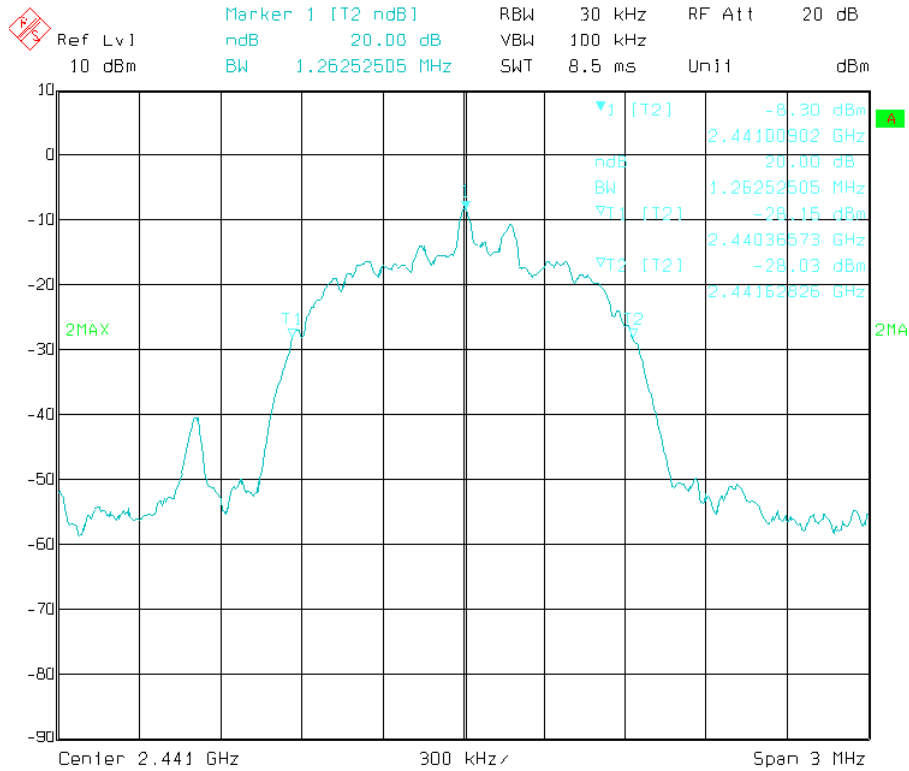


Modulation: 8DPSK

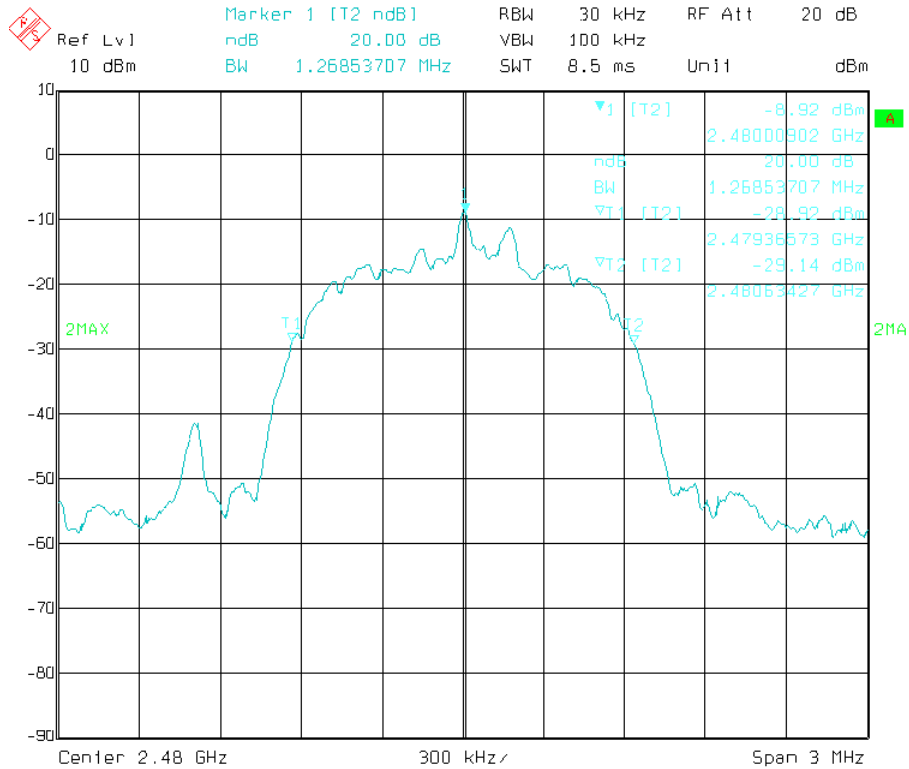
## Low channel



### Middle channel



### High channel



## 8.0 Maximum Peak Output Power

### 8.1 Test Equipment

Please refer to the Section 2

### 8.2 Test specification:

Environmental conditions: Temperature 23° C Humidity: 51% Atmospheric pressure: 103kPa

### 8.3 Test Procedure

- 1) Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
- 2) Set the spectrum analyzer as follows: Span = approximately 5 times the 20 dB bandwidth, centred on a hopping channel; RBW > the 20 dB bandwidth of the emission being measured; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold
- 3) Measure the highest amplitude appearing on spectral display and record the level to calculate results.
- 4) Repeat above procedures until all frequencies measured were complete.

### 8.4 Limits

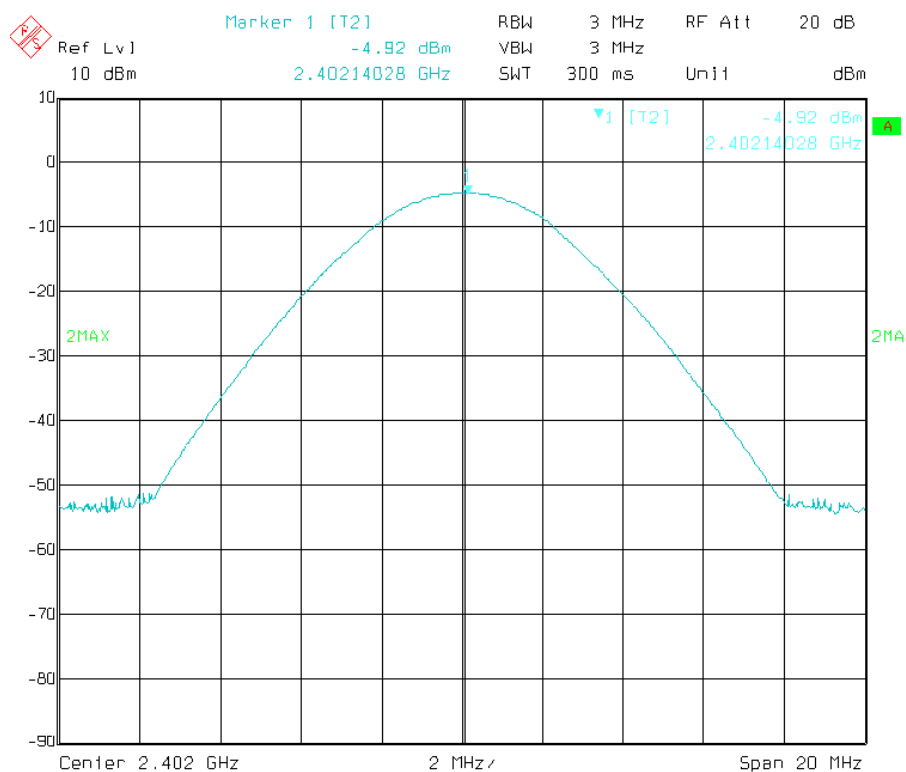
According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5MHz band: 0.125 watts. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 8.5 Test Result

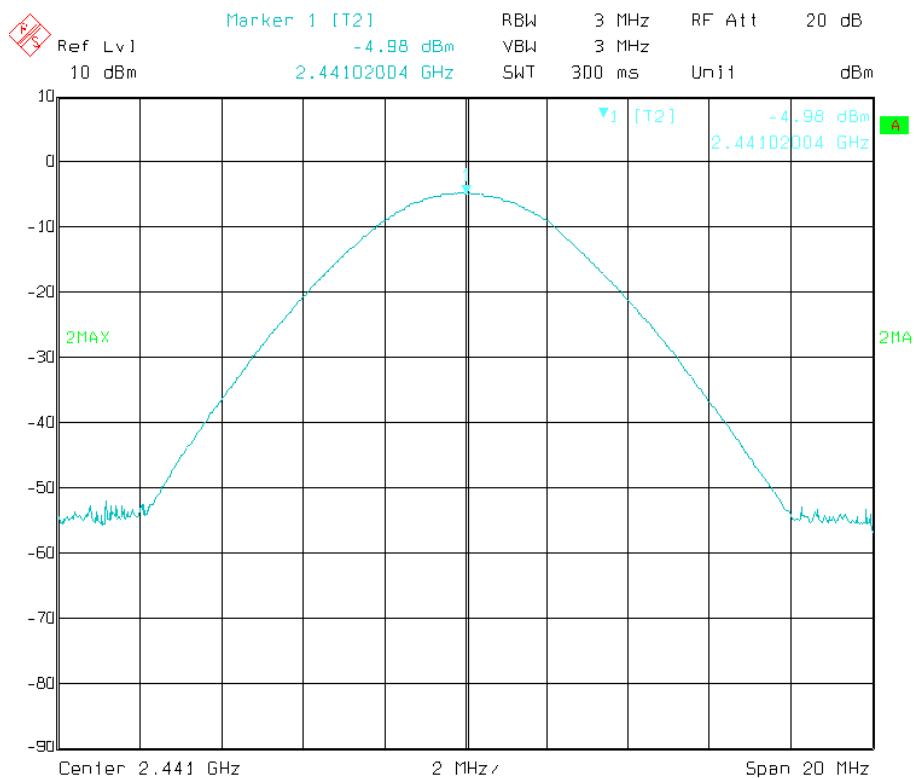
Modulation Type	Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass/ Fail
GFSK	2402	-4.92	30	Pass
	2441	-4.98	30	Pass
	2480	-4.85	30	Pass
Pi/4 QDPSK	2402	-6.26	30	Pass
	2441	-6.97	30	Pass
	2480	-7.29	30	Pass
8 DPSK	2402	-5.79	30	Pass
	2441	-6.51	30	Pass
	2480	-7.03	30	Pass

Modulation: GFSK

Low channel

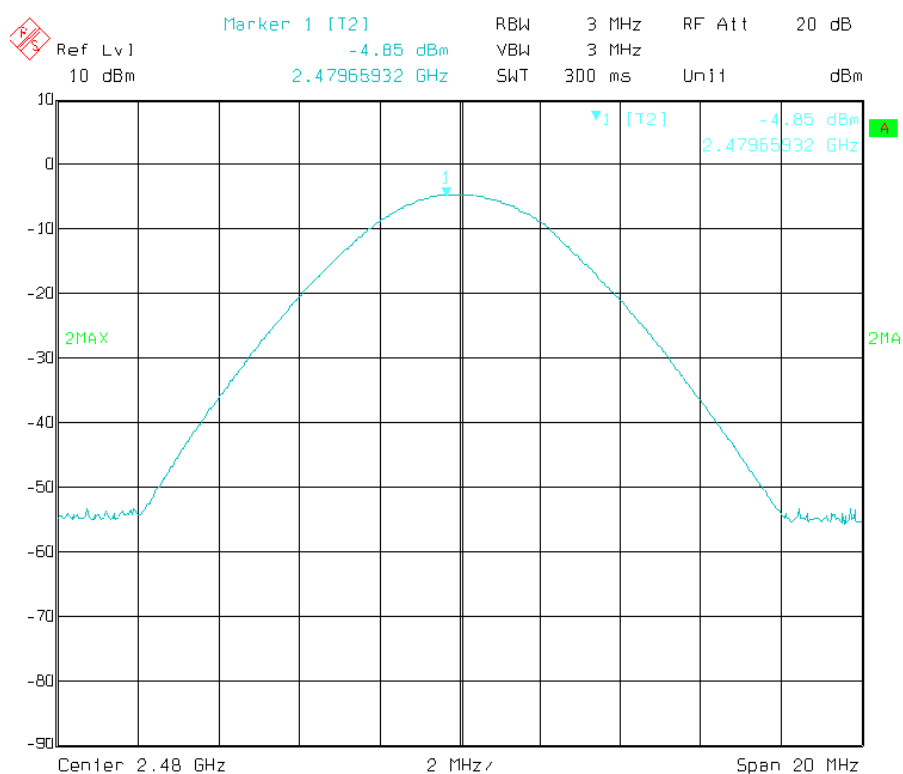


Middle channel



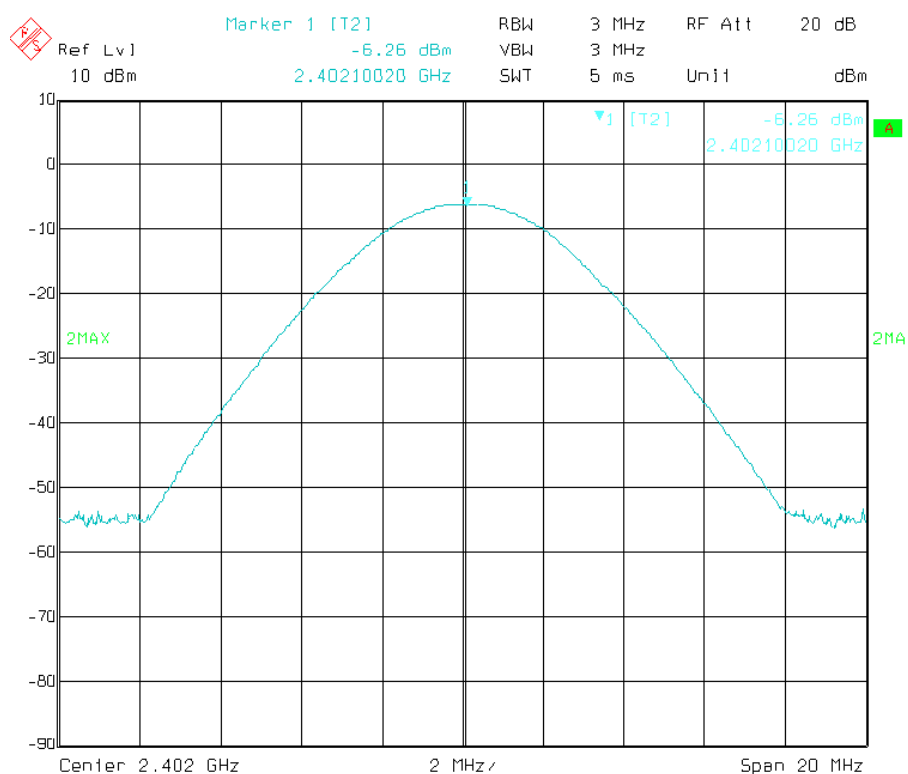


## High channel

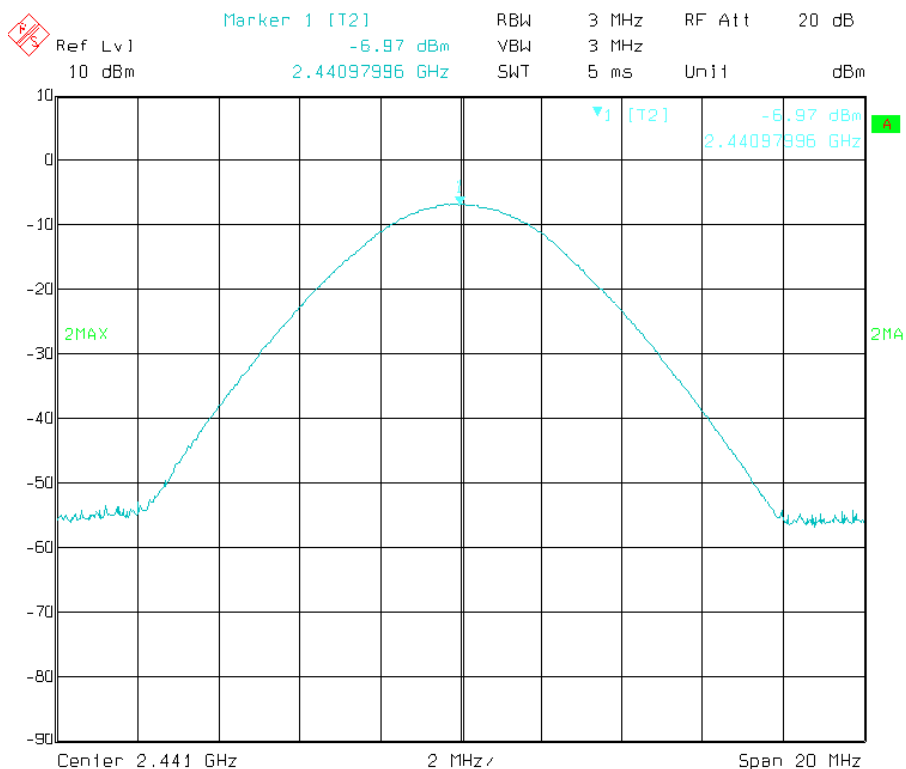


## Modulation: Pi/4DQPSK

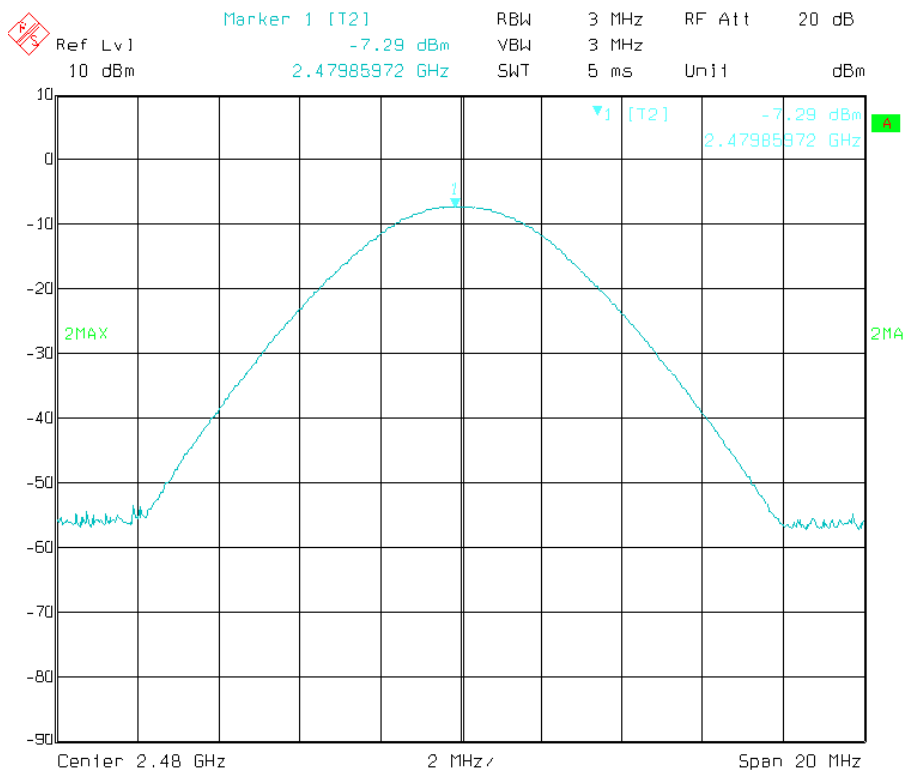
## Low channel



## Middle channel

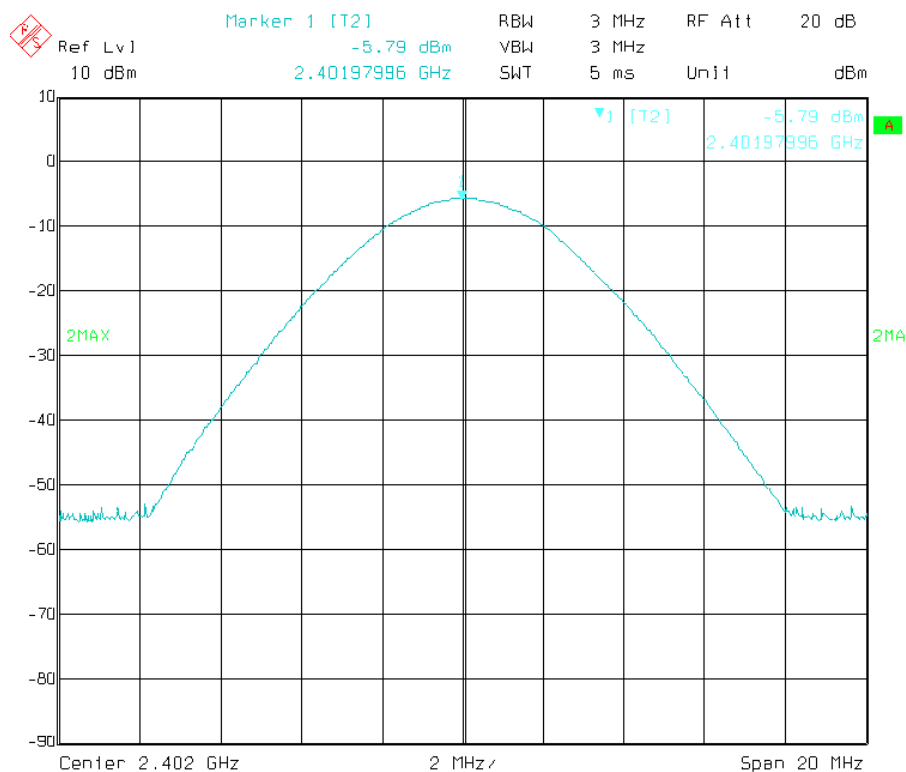


## High channel

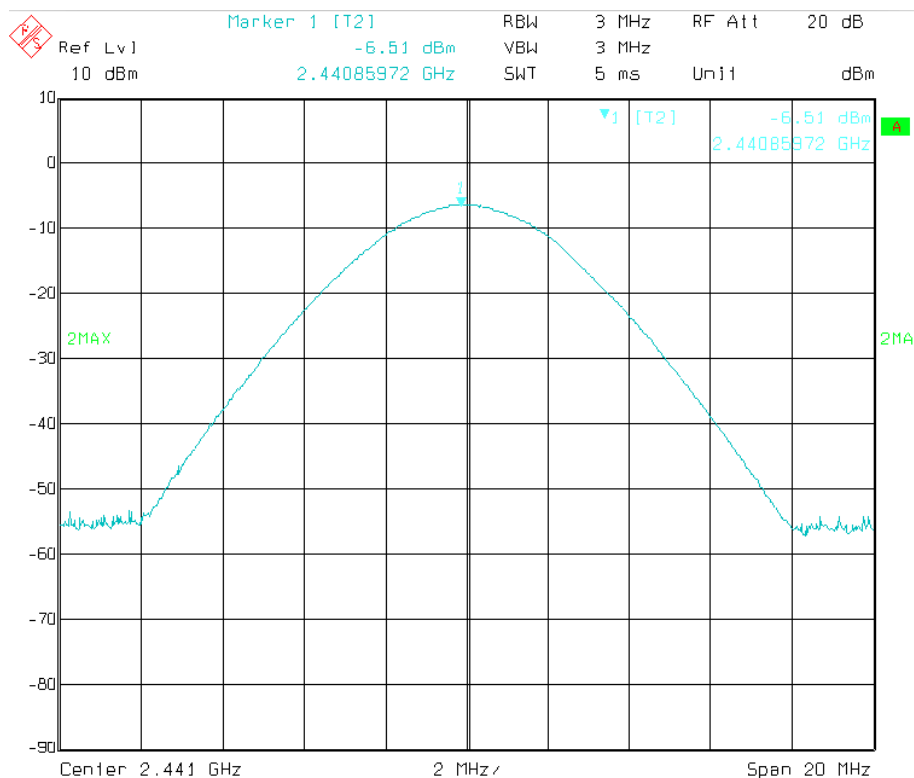


Modulation: 8DPSK

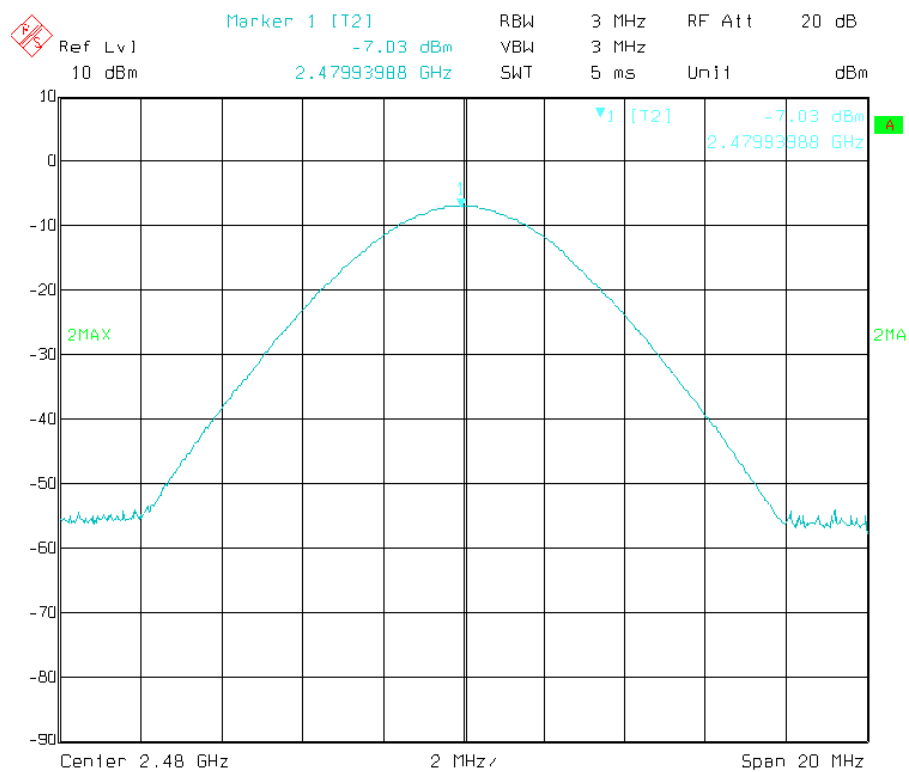
Low channel



Middle channel



# High channel



## 9.0 Carrier Frequency Separation

### 9.1 Test Equipment

Please refer to the Section 2

### 9.2 Test specification:

Environmental conditions: Temperature 23° C Humidity: 51% Atmospheric pressure: 103kPa

### 9.3 Test Procedure

1. Set the spectrum analyzer as follows: Span = wide enough to capture the peaks of two adjacent channels: Resolution (or IF) Bandwidth (RBW)  $\geq$  1% of the span; Video (or Average) Bandwidth (VBW)  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold
2. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
3. Repeat above procedures until all frequencies measured were complete.

### 9.4 Limits

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 9.5 Test status:

Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8DPSK mode, which indicates that the worst case is 8DPSK mode, so it is reported GFSK and 8DPSK mode only.

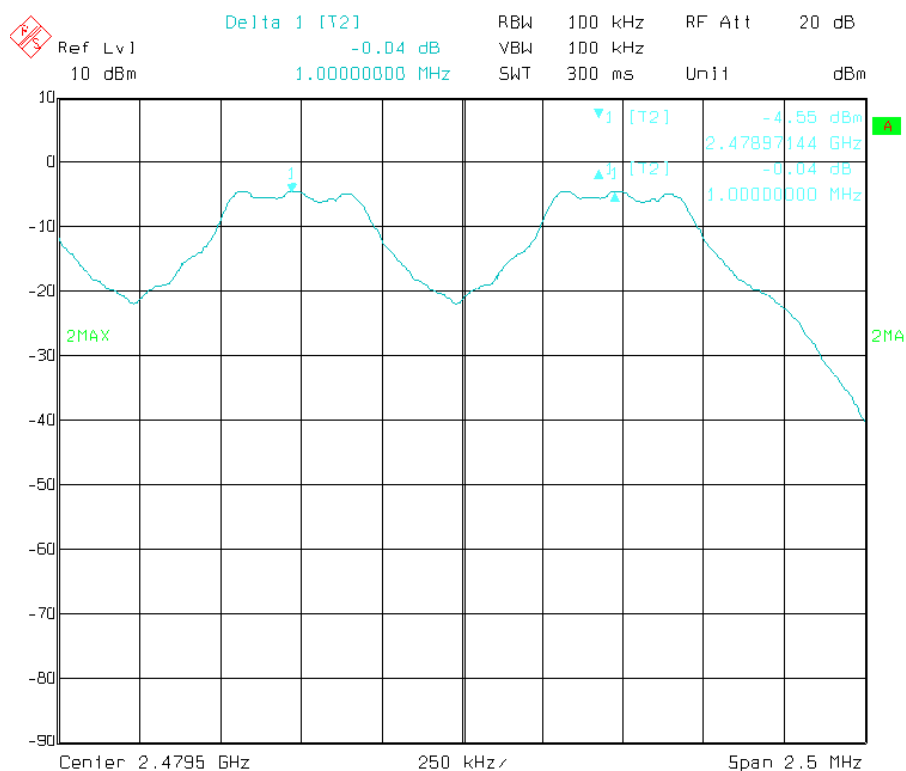
### 9.6 Test Result

Modulation Type	Channel number	Carrier Frequency Separation	Limit	Pass/ Fail
GFSK	Low	1.000MHz	$\geq$ 25 kHz or two-thirds 20 dB bandwidth	Pass
	Middle	1.000MHz		Pass
	High	1.000MHz		Pass
8DPSK	Low	1.000MHz	$\geq$ 25 kHz or two-thirds 20 dB bandwidth	Pass
	Middle	1.000MHz		Pass
	High	1.000MHz		Pass

Note: Two-thirds 20 dB bandwidth: GFSK: 533 kHz; 8DPSK: 845 kHz

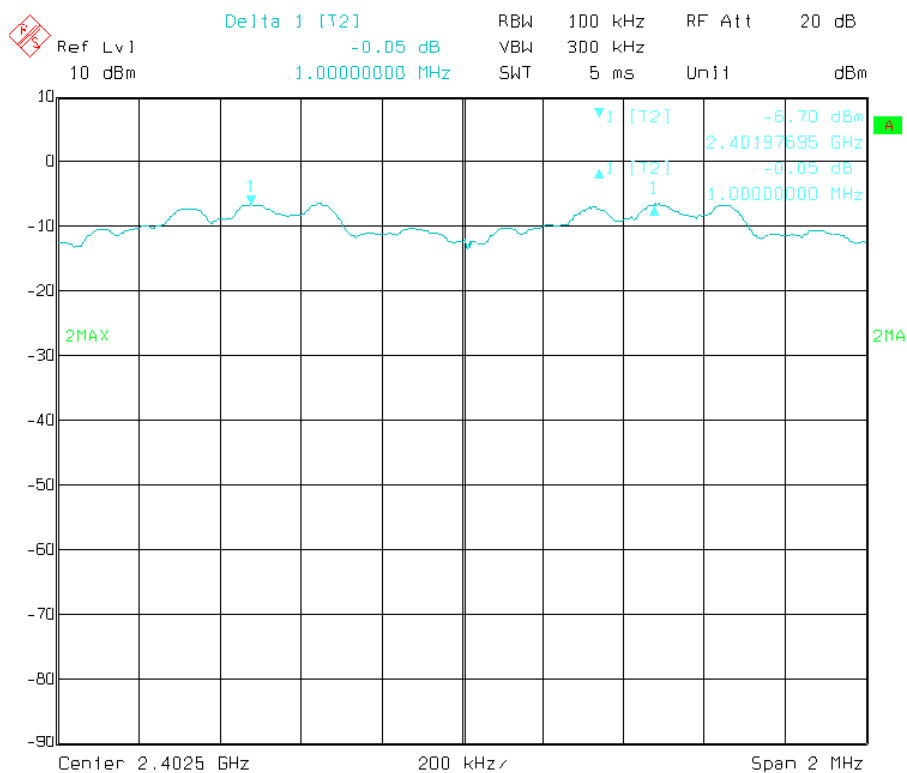


## High channel

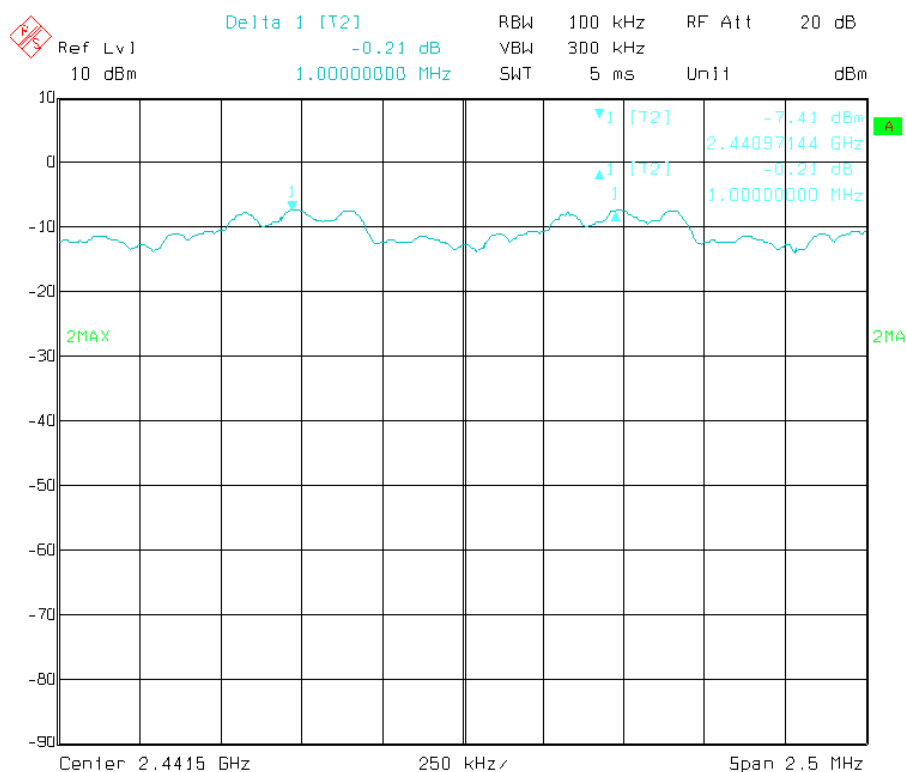


Modulation: 8DPSK

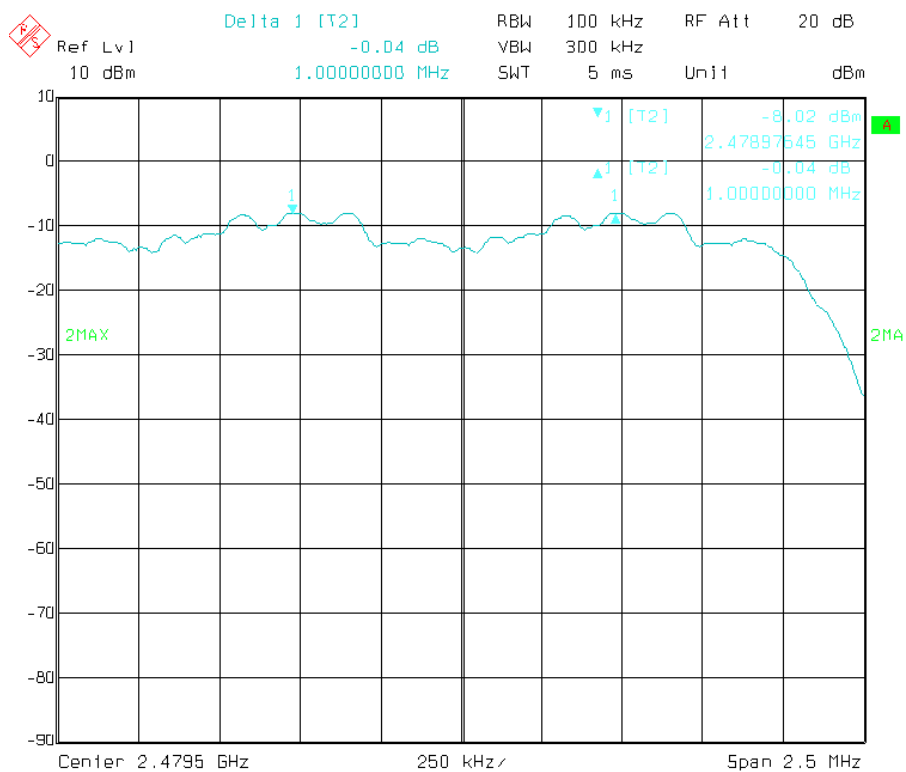
## Low channel



## Middle channel



## High channel





## 10.0 Number of Hopping Channels

### 10.1 Test Equipment

Please refer to the Section 2

### 10.2 Test specification:

Environmental conditions:    Temperature    22° C    Humidity:    51%    Atmospheric pressure:    103kPa

### 10.3 Test Procedure

Set the spectrum analyzer as follows: Span = the frequency band of operation; RBW  $\geq$  1% of the span;  
VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold

### 10.4 Limits

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

### 10.5 Test status:

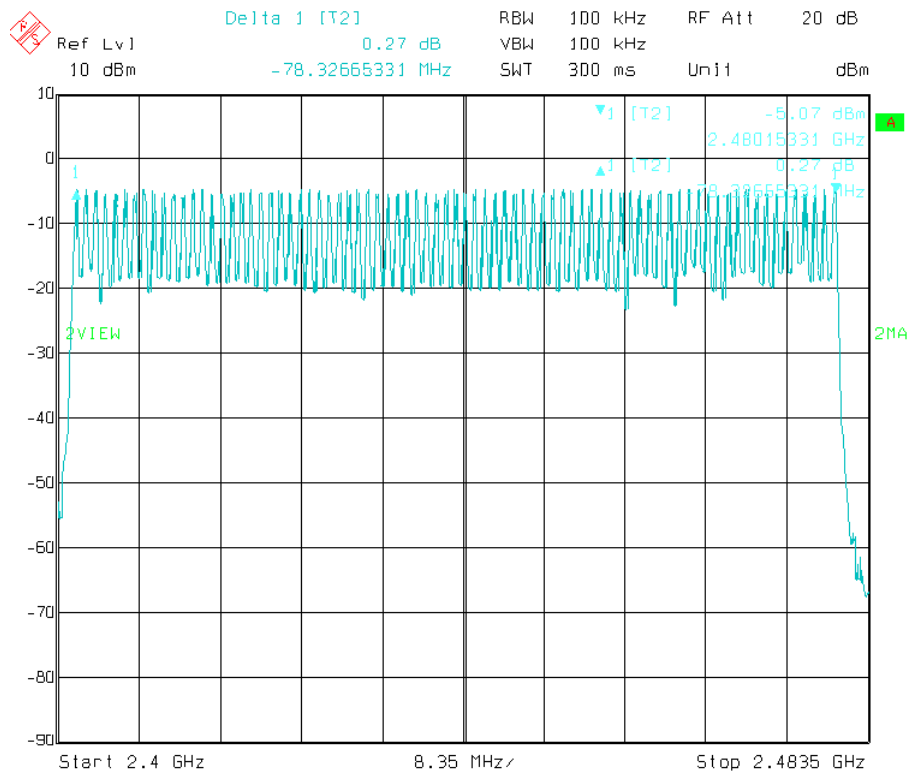
Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8DPSK mode, which indicates that the worst case is 8DPSK mode, so it is reported GFSK and 8DPSK mode only.

### 10.6 Test Result

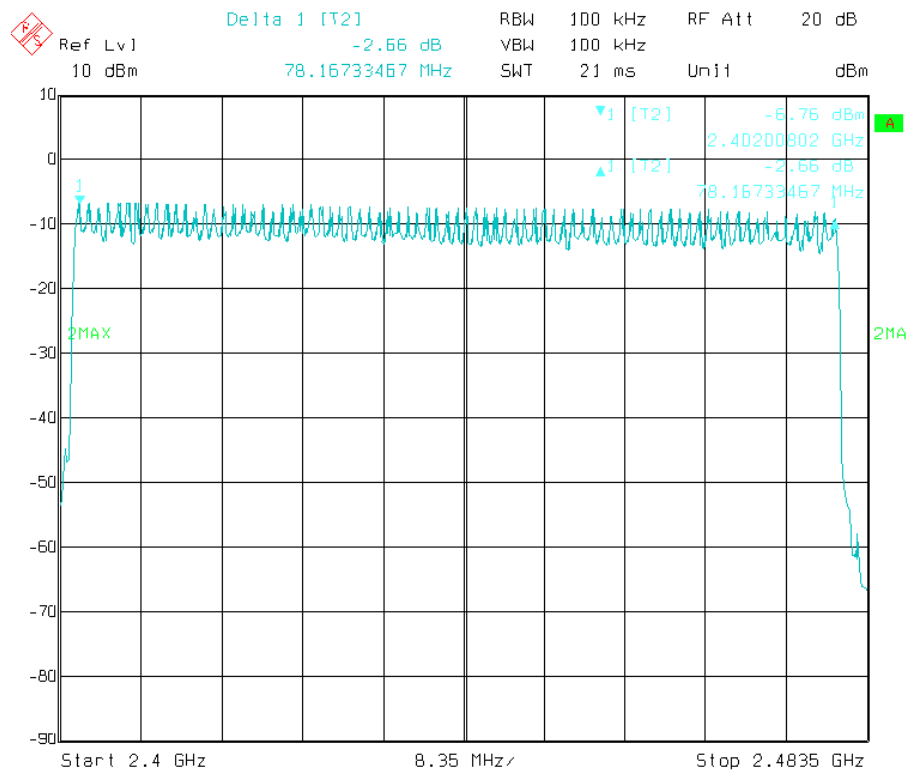
Modulation Type	Operating Frequency	Number of hopping channels	Limit	Pass/ Fail
GFSK	2402-2480MHz	79	$\geq 15$	Pass
8-DPSK	2402-2480MHz	79	$\geq 15$	Pass

Test Plot:

Modulation Type: GFSK



Modulation Type: 8DPSK



## 11.0 Time of Occupancy (Dwell Time)

### 11.1 Test Equipment

Please refer to the Section 2

### 11.2 Test specification:

Environmental conditions: Temperature 22° C Humidity: 52% Atmospheric pressure: 103kPa

### 11.3 Test Procedure

Span = zero span, centred on a hopping channel; RBW = 1 MHz; VBW  $\geq$  RBW; Detector function = peak;

Sweep = as necessary to capture the entire dwell time per hopping channel; Trace = max hold

Measure the dwell time using the marker-delta function.

Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

### 11.4 Limits

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed

### 11.5 Test status:

Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8DPSK mode, which indicates that the worst case is 8DPSK mode, so it is reported GFSK and 8DPSK mode only.

### 11.6 Test Result

Modulation Type	Packet	Reading (ms)	Hopping Rate	Actual (s)	Limit (s)
GFSK	DH1	0.536	800hop/s	0.1715	0.4
	DH3	1.804	400hop/s	0.2886	0.4
	DH5	3.082	266.667hop/s	0.3287	0.4
8DPSK	DH1	0.542	800hop/s	0.1734	0.4
	DH3	1.794	400hop/s	0.2870	0.4
	DH5	3.036	266.667hop/s	0.3238	0.4

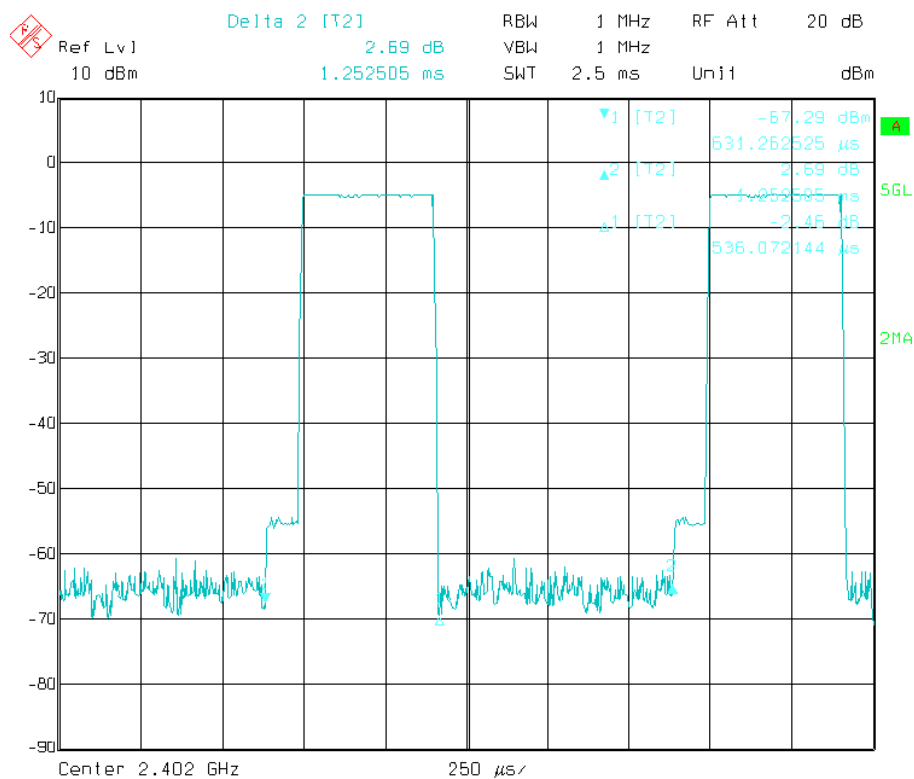
Note: 1) The measurements were conducted in High, Middle, Low channel. The Low channel could represent the character of the other channels, so the low channel measurement was submitted in the report only.

2) Actual = Reading  $\times$  (Hopping rate / Number of channels)  $\times$  Test period

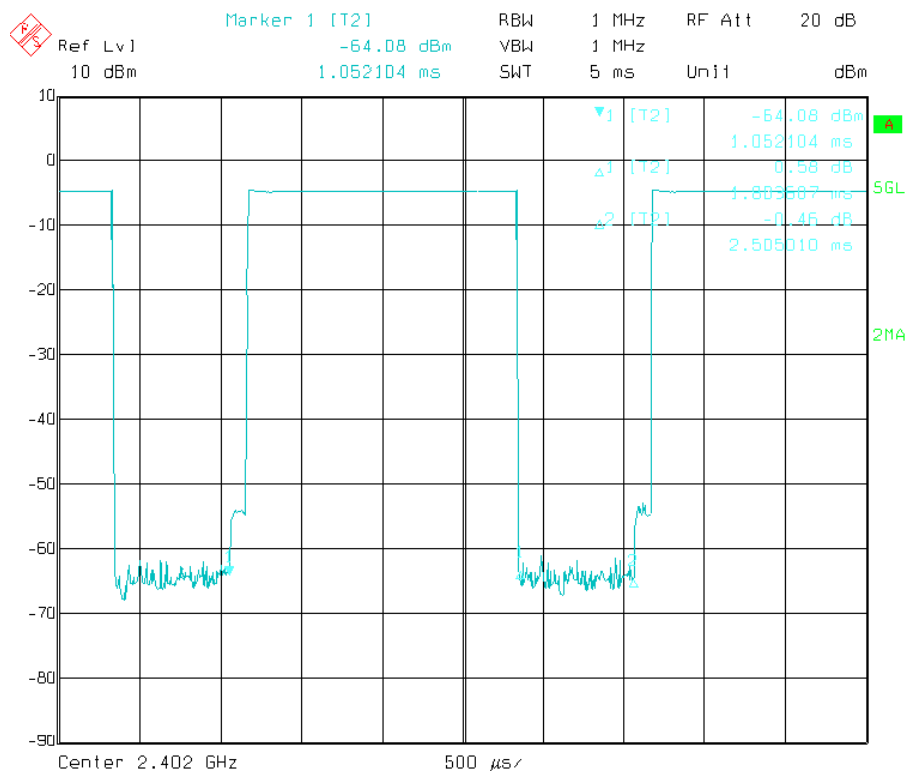
3) The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625 $\mu$ s with 79 channels. A DH5 Packet needs 5 time slot for transmitting and 1 time slot for receiving. So the EUT makes worst case 266.667 hops per second with 79 channels, and the DH5 is the worst case.

Modulation Type: GFSK

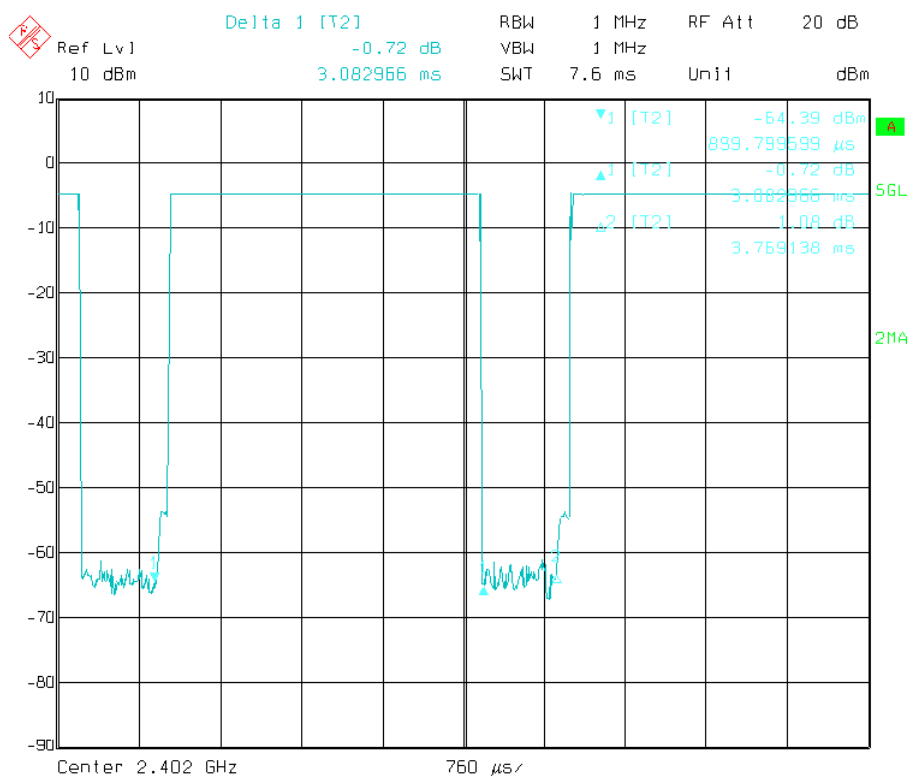
Packet Type: DH1



Packet Type: DH3

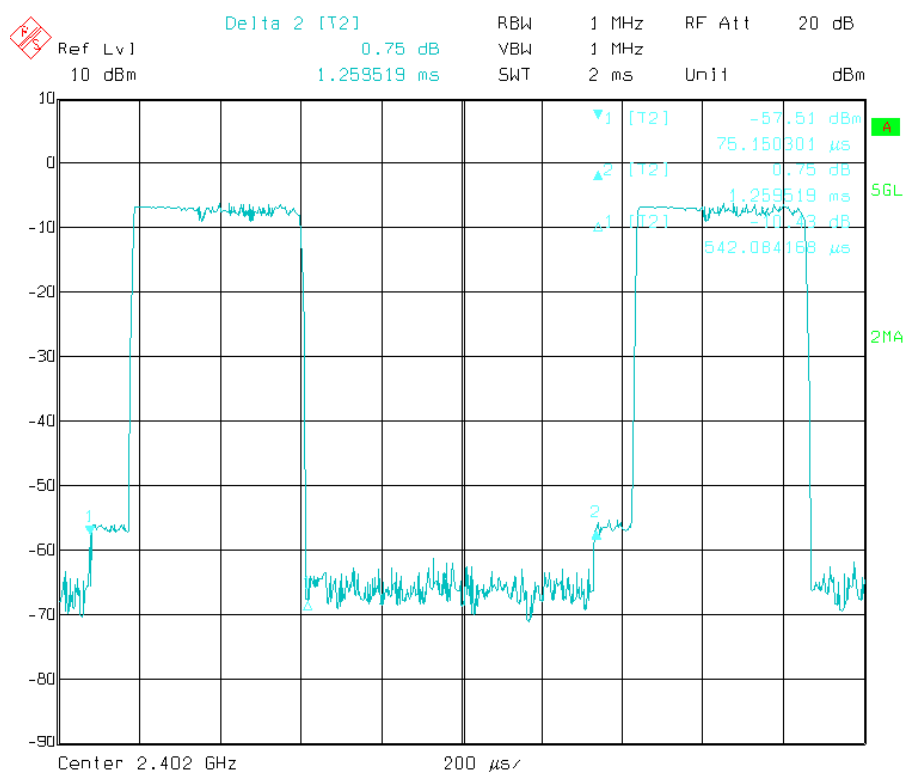


Packet Type: DH5

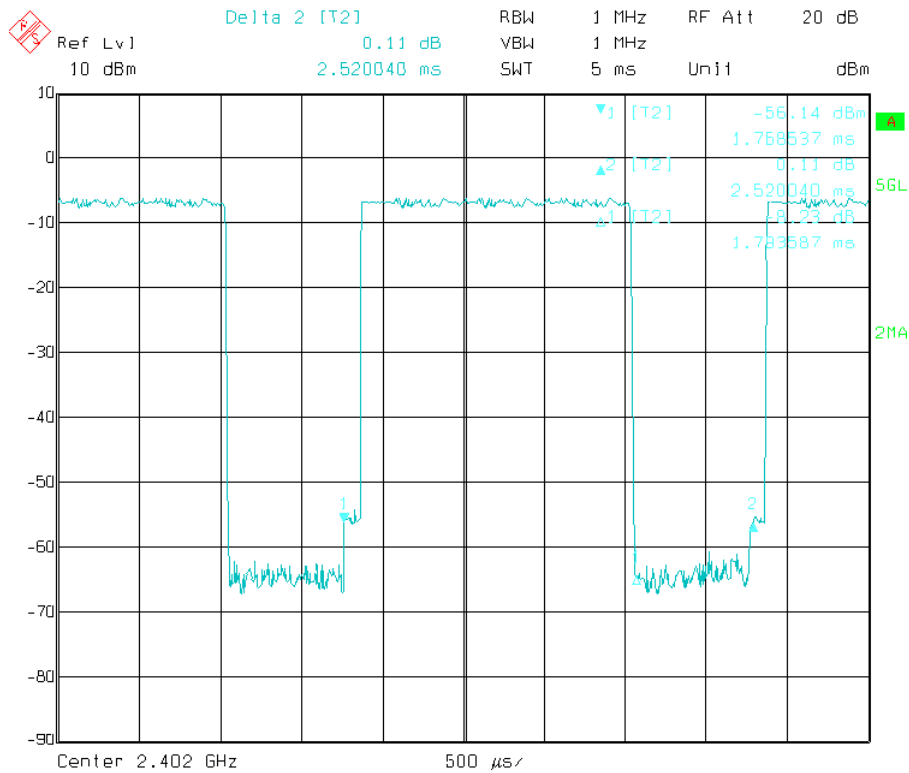


Modulation Type: 8DPSK

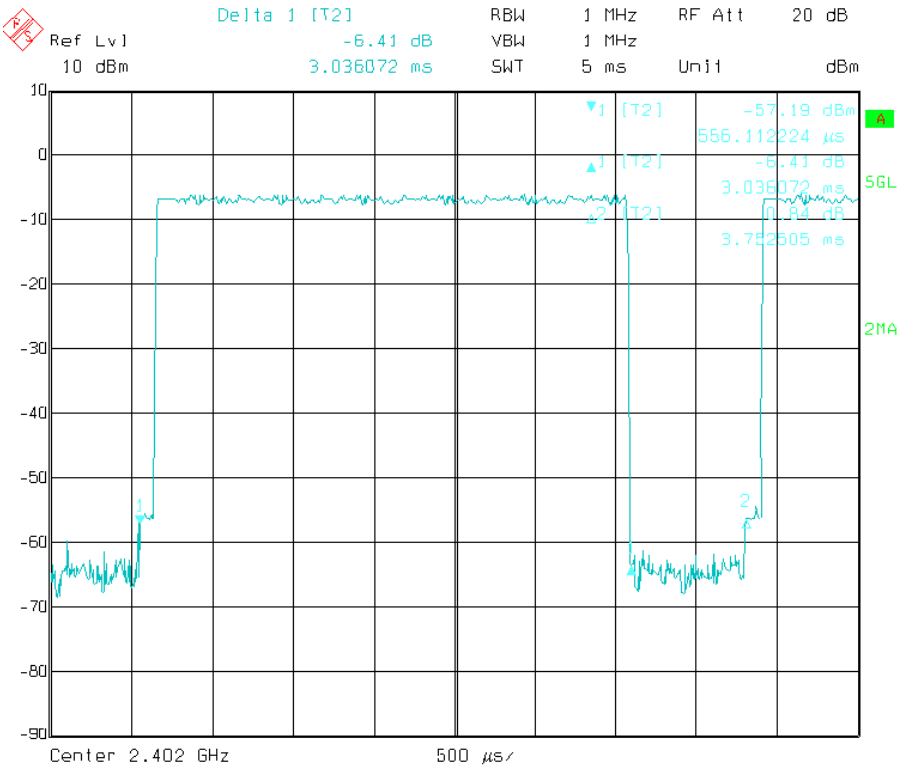
Packet Type: 3-DH1



Packet Type: 3-DH3



Packet Type: 3-DH5



## 12.0 Band age Measurement

### 12.1 Test Equipment

Please refer to the Section 2

### 12.2 Test specification:

Environmental conditions: Temperature 22° C Humidity: 52% Atmospheric pressure: 103kPa

### 12.3 Test Procedure

For bandage test, the spectrum set as follows: RBW=VBW=100 kHz. A conducted measure method is used  
For signals allocated in the restricted bands above and below the 2.4-2.483GHz, a radiated measurement is made  
(Peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz  
and PK detector)

### 12.4 Limit

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

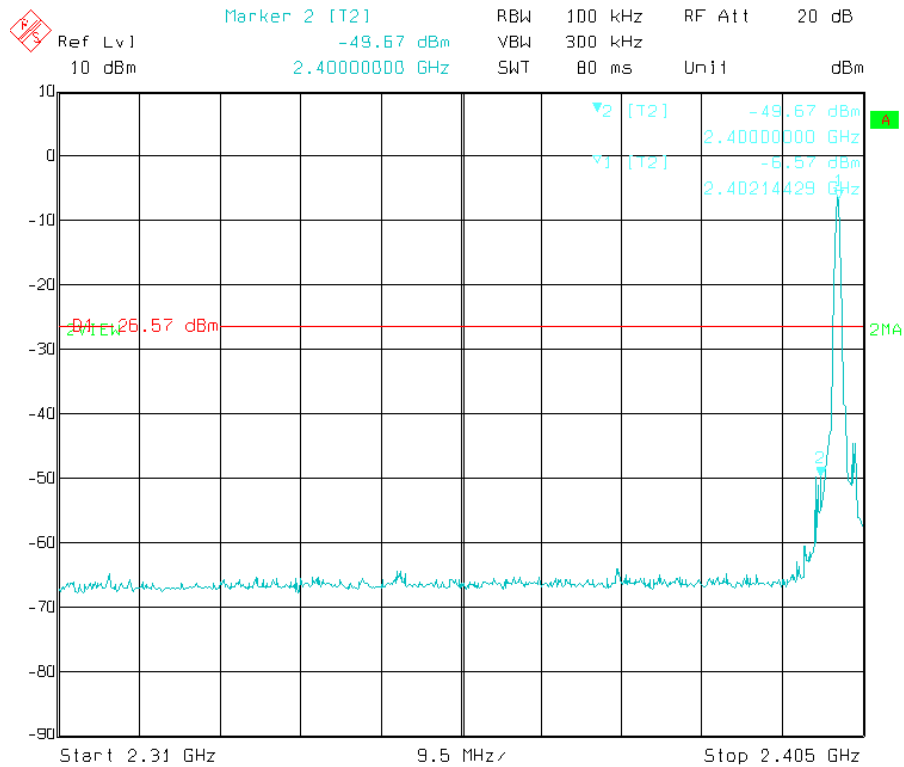
Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

### 12.5 Test status:

Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4-QDPSK and 8-DPSK mode, which indicates that the worst case is 8-DPSK mode, so it is reported GFSK and 8-DPSK mode only.

Modulation: GFSK

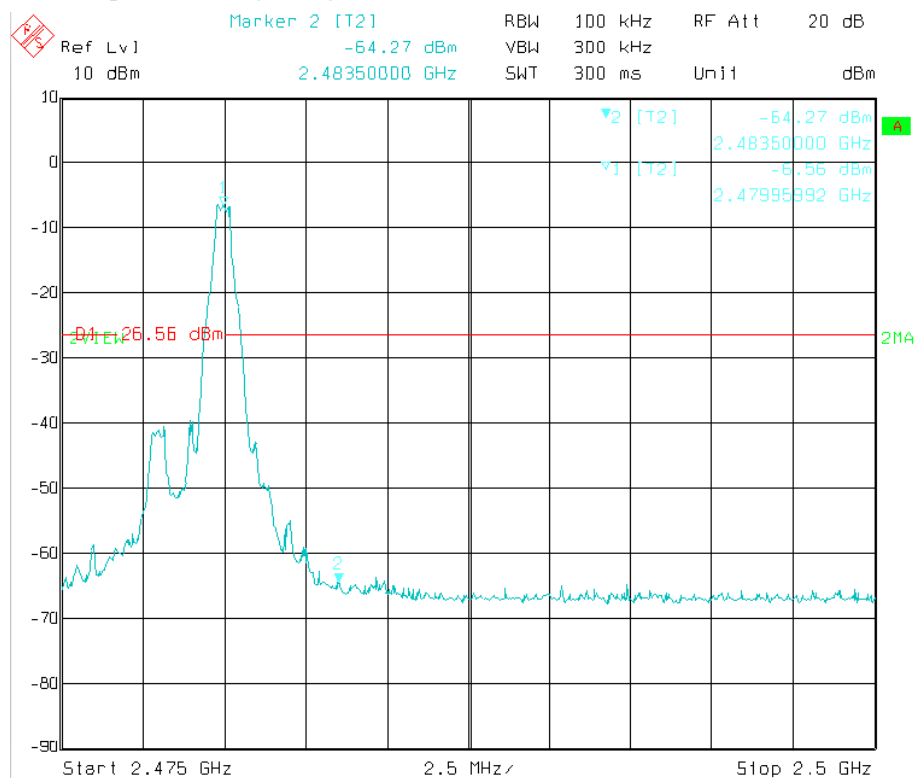
EUT operation mode: Keep transmitting in low channel



- Remark: 1) The radiated measurement was made in horizontal and vertical polarity;
- 2) The maximum emission was 43.07dBuV at 2375.5 MHz, which is less than the Average limit.
- 3) Radiated emissions which fall in the restricted band, as defined in 15.205(a), comply with the radiated emission limits specified in 15.209(a).



EUT operation mode: Keep transmitting in high channel

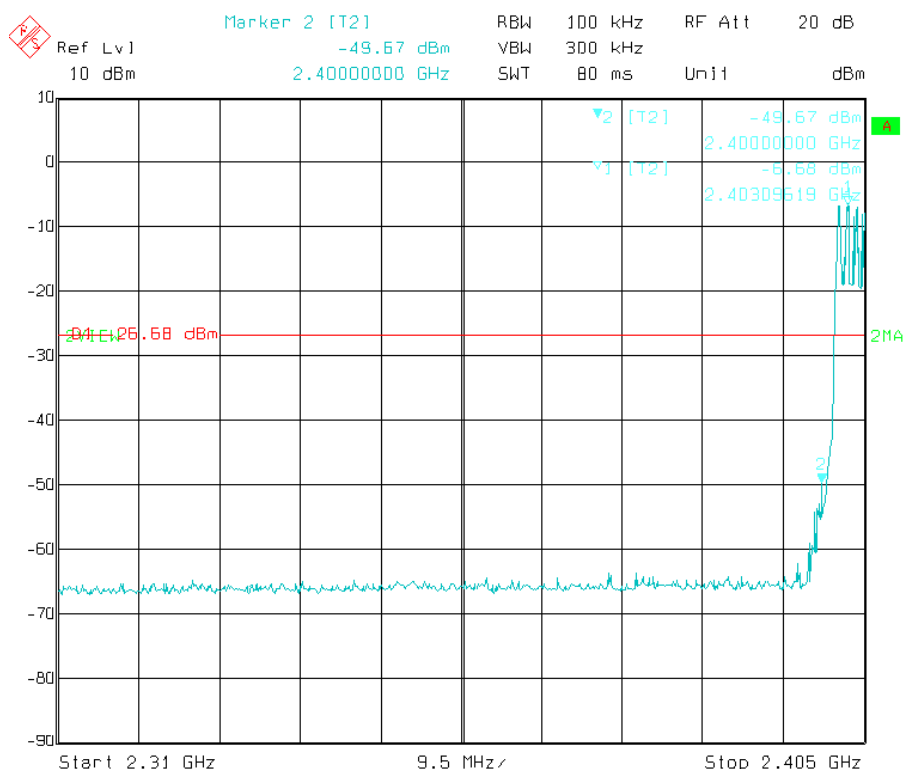


Remark: 1) The radiated measurement was made in horizontal and vertical polarity;

2) The maximum emission was 41.26dBuV at 2490.5MHz, which is less than the Average limit.

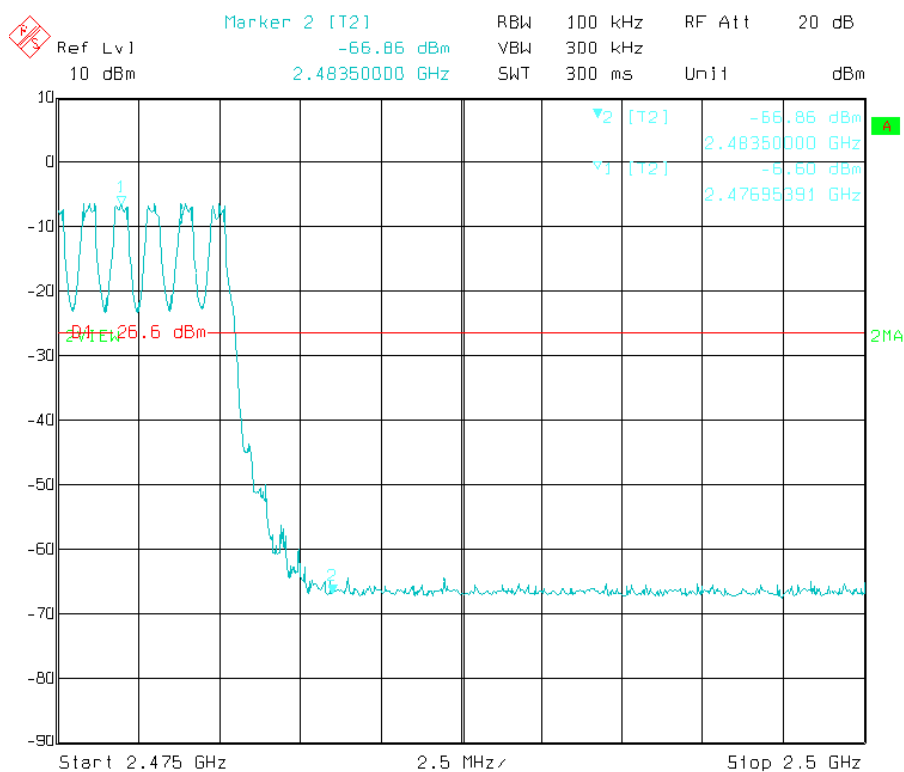
3) Radiated emissions which fall in the restricted band, as defined in 15.205(a), comply with the radiated emission limits specified in 15.209(a).

EUT operation mode: Keep hopping



- Remark: 1) The radiated measurement was made in horizontal and vertical polarity;
- 2) The maximum emission was 43.17dBuV at 2374.6MHz, which is less than the Average limit.
- 3) Radiated emissions which fall in the restricted band, as defined in 15.205(a), comply with the radiated emission limits specified in 15.209(a).

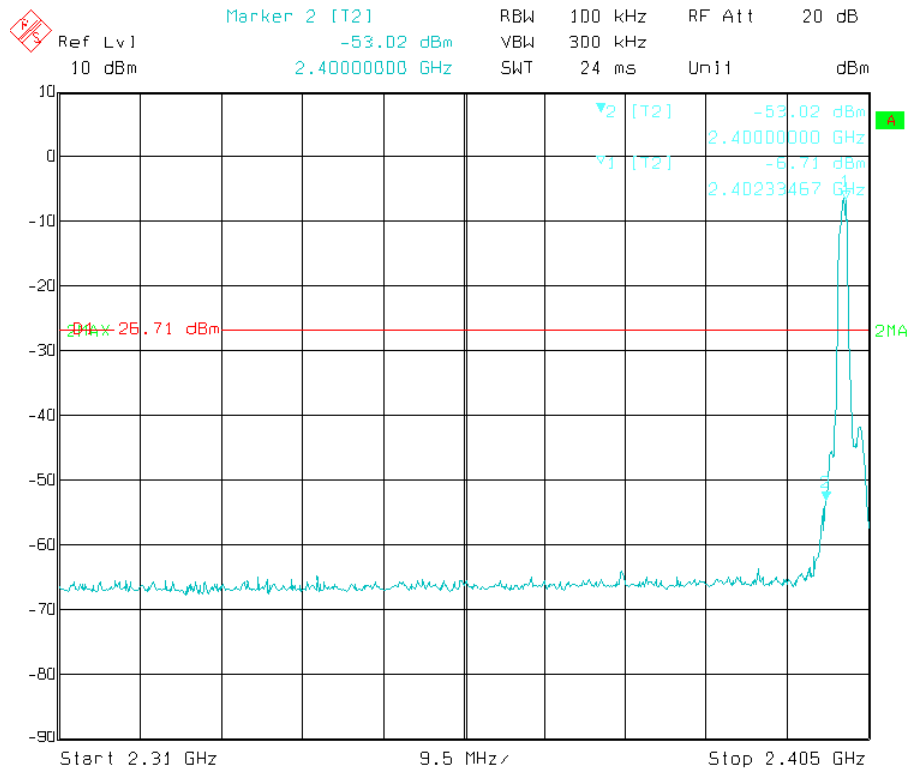
EUT operation mode: Keep hopping



- Remark: 1) The radiated measurement was made in horizontal and vertical polarity;
- 2) The maximum emission was 43.11dBuV at 2487.1MHz, which is less than the Average limit.
- 3) Radiated emissions which fall in the restricted band, as defined in 15.205(a), comply with the radiated emission limits specified in 15.209(a).

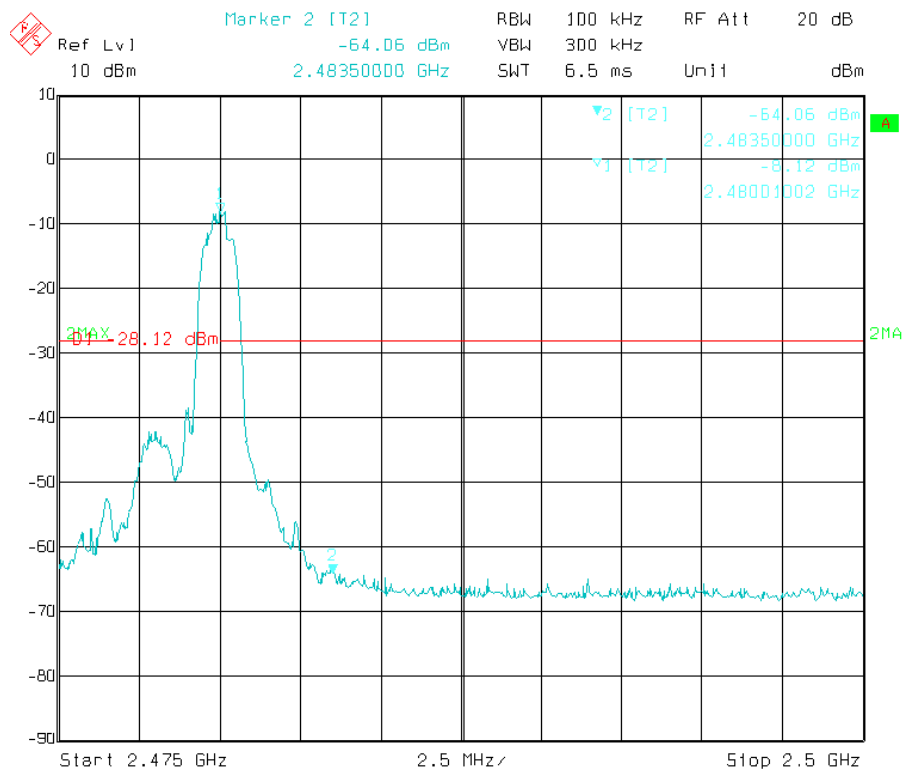
Modulation: 8DPSK

EUT operation mode: Keep transmitting in low channel



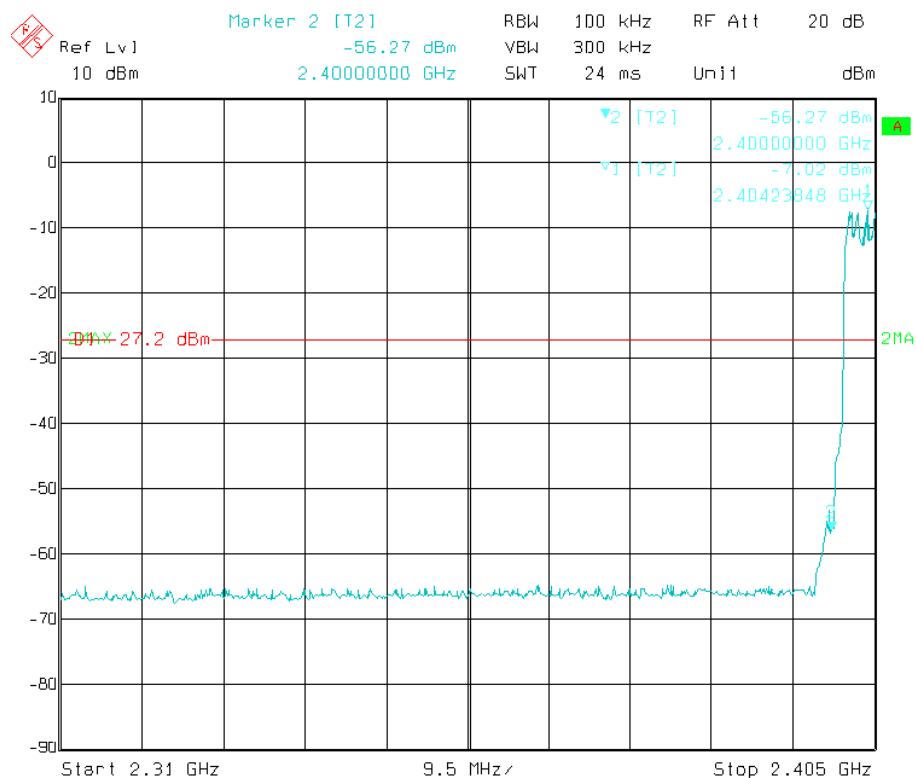
- Remark: 1) The radiated measurement was made in horizontal and vertical polarity;
- 2) The maximum emission was 42.48dBuV at 2340.4MHz, which is less than the Average limit.
- 3) Radiated emissions which fall in the restricted band, as defined in 15.205(a), comply with the radiated emission limits specified in 15.209(a).

EUT operation mode: Keep transmitting in high channel



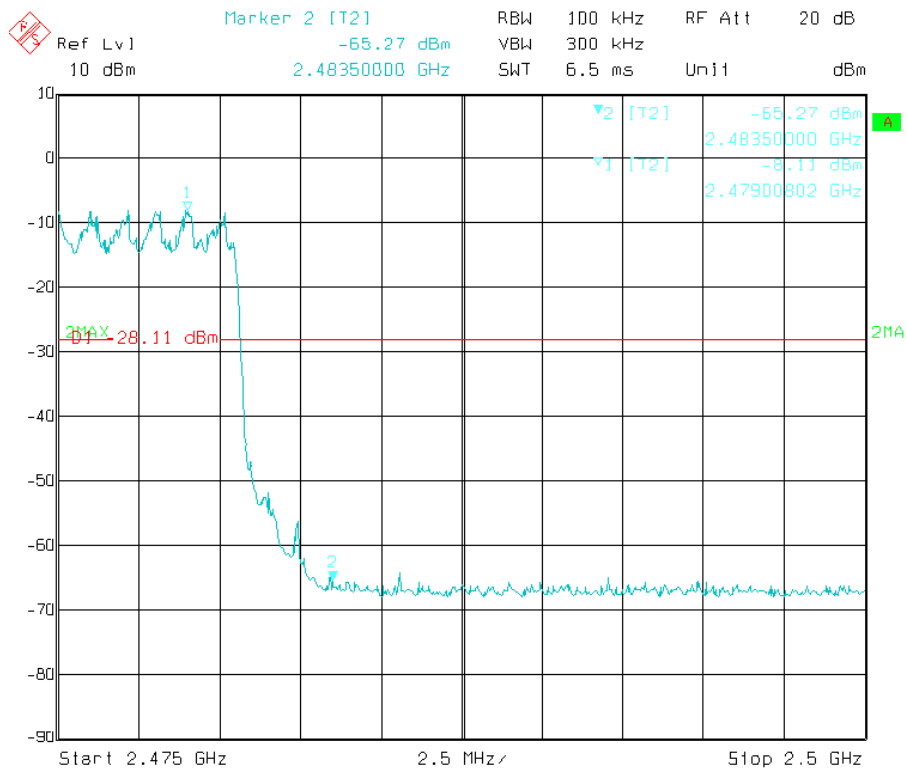
- Remark: 1) The radiated measurement was made in horizontal and vertical polarity;
- 2) The maximum emission was 42.21dBuV at 2491.5 MHz, which is less than the Average limit.
- 3) Radiated emissions which fall in the restricted band, as defined in 15.205(a), comply with the radiated emission limits specified in 15.209(a).

EUT operation mode: Keep hopping



- Remark: 1) The radiated measurement was made in horizontal and vertical polarity;
- 2) The maximum emission was 42.66dBuV at 2365.1 MHz, which is less than the Average limit.
- 3) Radiated emissions which fall in the restricted band, as defined in 15.205(a), comply with the radiated emission limits specified in 15.209(a).

EUT operation mode: Keep hopping



- Remark: 1) The radiated measurement was made in horizontal and vertical polarity;
- 2) The maximum emission was 42.30dBuV at 2497.6MHz, which is less than the Average limit.
- 3) Radiated emissions which fall in the restricted band, as defined in 15.205(a), comply with the radiated emission limits specified in 15.209(a).

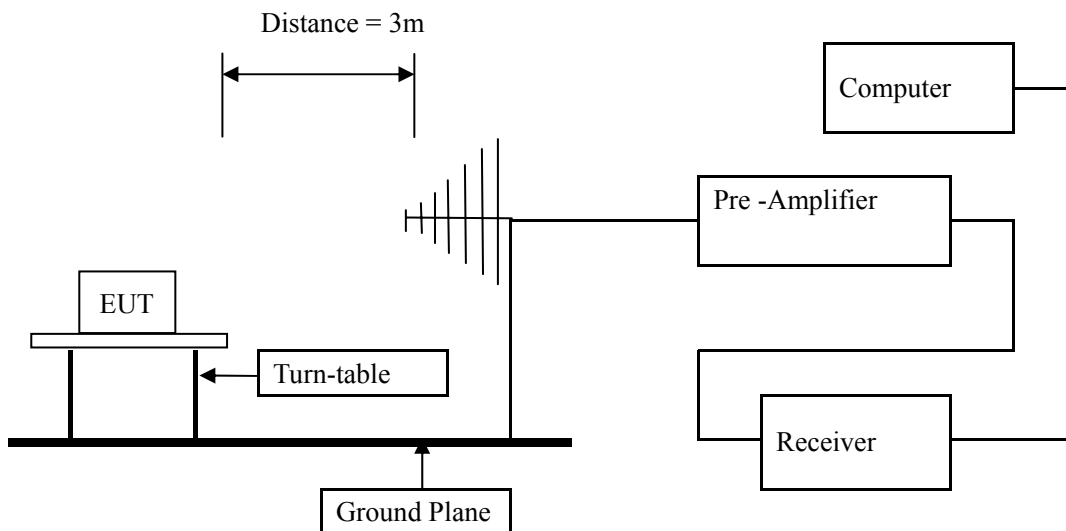
### 13.0 Spurious Emission Test

#### 13.1 Radiated emissions

##### 13.1.1 Test Method and test Procedure:

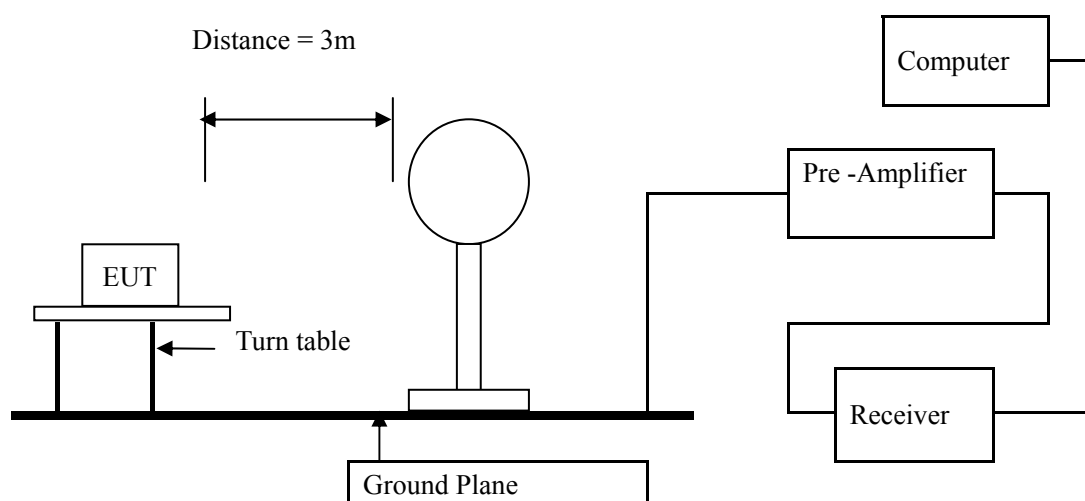
- 1) The EUT was tested according to ANSI C63.10 –2009.
- 2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2009.
- 3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.
- 4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- 5) The antenna polarization: Vertical polarization and Horizontal polarization.

##### 13.1.2 Block diagram of Test setup

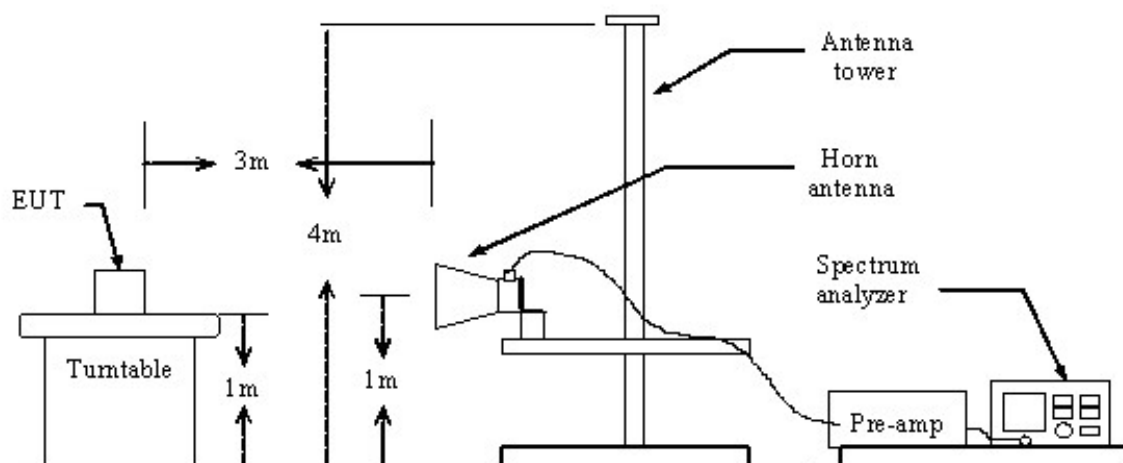




Block diagram of Test setup for frequency below 30MHz



Block diagram of Test setup for frequency above 1GHz



### 13.1.3 EUT Operating Condition

Operating condition is according to ANSI C63.10 -2009

### 13.1.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

**Frequencies in restricted band are complied to limit on Paragraph 15.209.**

Frequency Range (MHz)	Distance (m)	Field strength (dB $\mu$ V/m)
0.009-0.490	3	$20\log 2400/F$ (kHz) + 80
0.490-1.705	3	$20\log 24000/F$ (kHz) + 40
1.705-30	3	$20\log 30 + 40$
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:
- 1) RF Voltage (dBuV) = 20 log RF Voltage (uV)
  - 2) In the Above Table, the tighter limit applies at the band edges.
  - 3) Distance refers to the distance in meters between the measuring instrument antenna and the EUT
  - 4) This is a handheld device. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.
  - 5) All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz. As to 1G-25G, the final emission level got using PK and AV detector.
  - 6) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula  $Ld1 = Ld2 * (d2/d1)$

### 13.1.5 Photo documentation of the test set-up

Please refer to the Section 16

### 13.1.6 Test Equipment:

Please refer to the Section 2

### 13.1.7 Test specification:

Environmental conditions:    Temperature    23° C    Humidity:    50%    Atmospheric pressure:    103kPa

### 13.1.8 Test result

#### **A Radiated Emission (9 kHz----30 MHz)**

Note: 1) Emission Level=Reading+ Cable loss+ Antenna factor-Amp factor  
2) The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

Result: Pass

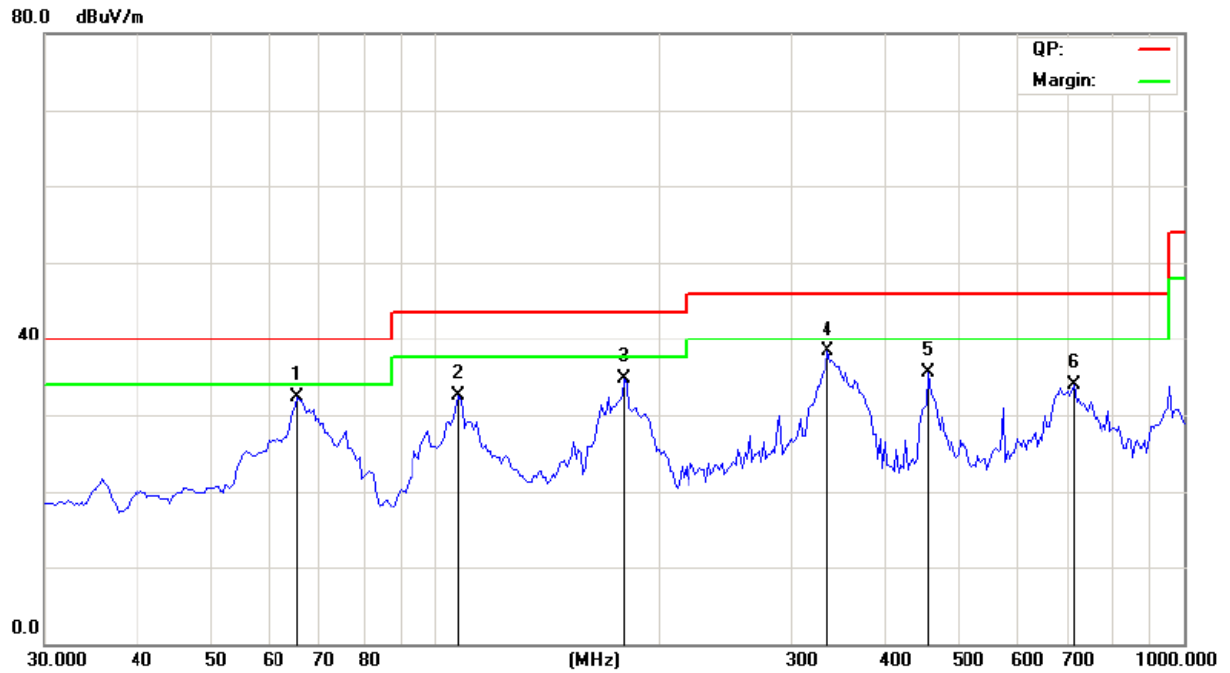
Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
--	--	V	--
--	--	H	--
--	--	V	--
--	--	H	--

## B General Radiated Emissions Data

### Radiated Emission In Horizontal (30MHz----1000MHz)

Please refer to following diagram for individual

High channel: 2480 MHz

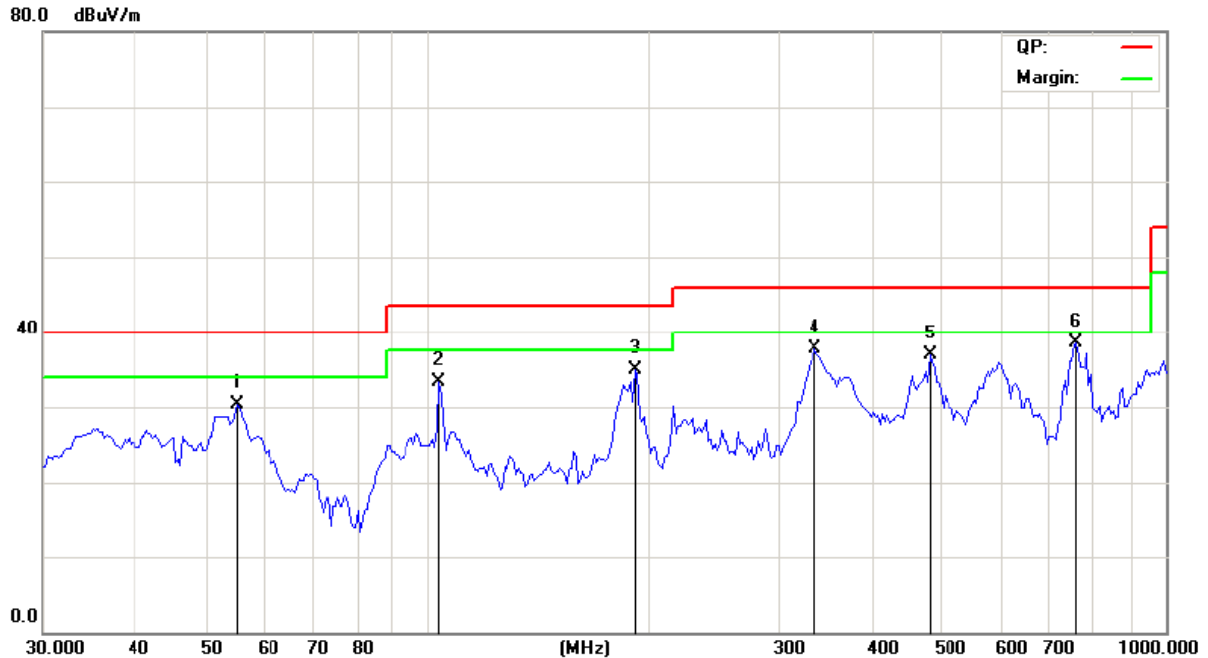


Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
65.4448	32.23	H	40.00
107.7553	32.43	H	43.50
179.6793	34.67	H	43.50
335.1904	38.27	H	46.00
455.7114	35.56	H	46.00
716.1924	33.81	H	46.00

## Radiated Emission In Vertical (30MHz----1000MHz)

Please refer to following diagram for individual

High channel: 2480 MHz



Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
55.2704	30.21	V	40.00
103.8675	33.30	V	43.50
191.3427	34.93	V	43.50
335.1904	37.66	V	46.00
479.0380	36.86	V	46.00
755.0701	38.56	V	46.00

Note: Measurements were conducted in all three channels (high, middle, low), and the worst case (high channel) was submitted only.

### C Fundamental & Harmonics Radiated Emission Data (1000MHz-25000MHz)

Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8DPSK mode, which indicates that the worst case is 8DPSK mode, so it is reported GFSK and 8DPSK mode only.

Modulation Type: GFSK

<b>Low channel: 2402 MHz</b>									
Freq. (MHz)	Ant. Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor (dB)	Emission Level		Peak limit (dBuV/m)	AV limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
1301.58	H	50.92	---	-4.20	46.72	---	74.00	54.00	-7.28
4804.00	H	52.90	---	-3.94	48.96	---	74.00	54.00	-5.04
5600.68	H	49.96	---	-2.83	47.13	---	74.00	54.00	-6.87
7206.00	H	46.52	---	0.52	47.04	---	74.00	54.00	-6.96
16814.00	H	41.77	---	6.73	48.50	---	74.00	54.00	-5.50
24020.00	H	40.14	---	8.11	48.25	---	74.00	54.00	-5.75
1308.16	V	52.44	---	-4.25	48.19	---	74.00	54.00	-5.81
4804.00	V	51.88	---	-3.94	47.94	---	74.00	54.00	-6.06
5620.44	V	49.77	---	-2.87	46.90	---	74.00	54.00	-7.10
7206.00	V	44.68	---	0.52	45.20	---	74.00	54.00	-8.80
16814.00	V	39.83	---	6.73	46.56	---	74.00	54.00	-7.44
24020.00	V	40.78	---	8.11	48.89	---	74.00	54.00	-5.11

Notes: 1) Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.

2) Radiated emissions measured in frequencies above 1GHz were made with peak detector and Average (AV) detector.

3) Average test would be performed if the peak readings were greater than the average limit.

4) Data of measurement shown “---“in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

5) Emission Level=Peak (AV) Reading + Correction Factor;

Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

6) Margin (dB) = Emission Level (Peak) (dBuV/m)-Average limit (dBuV/m)

**Middle channel: 2441 MHz**

Freq. (MHz)	Ant. Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor (dB)	Emission Level		Peak limit (dBuV/m)	AV limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
1301.49	H	50.49	---	-4.20	46.29	---	74.00	54.00	-7.71
4882.00	H	51.20	---	-3.98	47.22	---	74.00	54.00	-6.78
5600.07	H	51.04	---	-2.83	48.21	---	74.00	54.00	-5.79
7323.00	H	47.19	---	0.57	47.76	---	74.00	54.00	-6.24
17087.00	H	42.48	---	6.79	49.27	---	74.00	54.00	-4.73
24410.00	H	40.98	---	8.16	49.14	---	74.00	54.00	-4.86
1308.09	V	51.37	---	-4.25	47.12	---	74.00	54.00	-6.88
4882.00	V	52.28	---	-3.98	48.30	---	74.00	54.00	-5.70
5623.39	V	50.06	---	-2.87	47.19	---	74.00	54.00	-6.81
7323.00	V	47.58	---	0.57	48.15	---	74.00	54.00	-5.85
17087.00	V	41.21	---	6.79	48.00	---	74.00	54.00	-6.00
24410.00	V	32.91	---	8.16	41.07	---	74.00	54.00	-12.93

Notes: 1) Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.

2) Radiated emissions measured in frequencies above 1GHz were made with peak detector and Average (AV) detector.

3) Average test would be performed if the peak result were greater than the average limit.

4) Data of measurement shown “---“in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

5) Emission Level=Peak (AV) Reading + Correction Factor;

Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

6) Margin (dB) = Emission Level (Peak) (dBuV/m)-Average limit (dBuV/m)

High channel: 2480 MHz									
Freq. (MHz)	Ant. Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor (dB)	Emission Level		Peak limit (dBuV/m)	AV limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
1302.66	H	50.39	---	-4.20	46.19	---	74.00	54.00	-7.81
4960.00	H	50.68	---	-3.98	46.70	---	74.00	54.00	-7.30
5601.71	H	50.99	---	-2.83	48.16	---	74.00	54.00	-5.84
7440.00	H	47.64	---	0.57	48.21	---	74.00	54.00	-5.79
17360.00	H	41.81	---	6.79	48.60	---	74.00	54.00	-5.40
24800.00	H	40.42	---	8.16	48.58	---	74.00	54.00	-5.42
1309.16	V	50.37	---	-4.25	46.12	---	74.00	54.00	-7.88
4960.00	V	50.05	---	-3.98	46.07	---	74.00	54.00	-7.93
5624.33	V	48.8	---	-2.87	45.93	---	74.00	54.00	-8.07
7440.00	V	48.65	---	0.57	49.22	---	74.00	54.00	-4.78
17360.00	V	40.96	---	6.79	47.75	---	74.00	54.00	-6.25
24800.00	V	39.71	---	8.16	47.87	---	74.00	54.00	-6.13

Notes: 1) Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.

2) Radiated emissions measured in frequencies above 1GHz were made with peak detector and Average (AV) detector.

3) Average test would be performed if the peak result were greater than the average limit.

4) Data of measurement shown “---“in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

5) Emission Level=Peak (AV) Reading + Correction Factor;

Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

6) Margin (dB) = Emission Level (Peak) (dBuV/m)-Average limit (dBuV/m)



Modulation Type: 8DPSK

Low channel: 2402 MHz									
Freq. (MHz)	Ant. Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor (dB)	Emission Level		Peak limit (dBuV/m)	AV limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
1301.23	H	50.11	---	-4.20	45.91	---	74.00	54.00	-8.09
4804.00	H	52.00	---	-3.94	48.06	---	74.00	54.00	-5.94
5600.96	H	49.13	---	-2.83	46.30	---	74.00	54.00	-7.70
7206.00	H	45.57	---	0.52	46.09	---	74.00	54.00	-7.91
16814.00	H	40.92	---	6.73	47.65	---	74.00	54.00	-6.35
24020.00	H	39.26	---	8.11	47.37	---	74.00	54.00	-6.63
1308.54	V	51.42	---	-4.25	47.17	---	74.00	54.00	-6.83
4804.00	V	50.80	---	-3.94	46.86	---	74.00	54.00	-7.14
5620.37	V	48.80	---	-2.87	45.93	---	74.00	54.00	-8.07
7206.00	V	43.83	---	0.52	44.35	---	74.00	54.00	-9.65
16814.00	V	38.95	---	6.73	45.68	---	74.00	54.00	-8.32
24020.00	V	40.04	---	8.11	48.15	---	74.00	54.00	-5.85

Notes: 1) Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.

2) Radiated emissions measured in frequencies above 1GHz were made with peak detector and Average (AV) detector.

3) Average test would be performed if the peak readings were greater than the average limit.

4) Data of measurement shown “---“in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

5) Emission Level=Peak (AV) Reading + Correction Factor;

Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

6) Margin (dB) = Emission Level (Peak) (dBuV/m)-Average limit (dBuV/m)

**Middle channel: 2441 MHz**

Freq. (MHz)	Ant. Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor (dB)	Emission Level		Peak limit (dBuV/m)	AV limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
1301.12	H	49.70	---	-4.20	45.50	---	74.00	54.00	-8.50
4882.00	H	50.20	---	-3.98	46.22	---	74.00	54.00	-7.78
5600.45	H	49.92	---	-2.83	47.09	---	74.00	54.00	-6.91
7323.00	H	46.29	---	0.57	46.86	---	74.00	54.00	-7.14
17087.00	H	41.69	---	6.79	48.48	---	74.00	54.00	-5.52
24410.00	H	40.00	---	8.16	48.16	---	74.00	54.00	-5.84
1308.78	V	50.37	---	-4.25	46.12	---	74.00	54.00	-7.88
4882.00	V	51.29	---	-3.98	47.31	---	74.00	54.00	-6.69
5623.57	V	49.34	---	-2.87	46.47	---	74.00	54.00	-7.53
7323.00	V	46.82	---	0.57	47.39	---	74.00	54.00	-6.61
17087.00	V	40.45	---	6.79	47.24	---	74.00	54.00	-6.76
24410.00	V	31.95	---	8.16	40.11	---	74.00	54.00	-13.89

Notes: 1) Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.

2) Radiated emissions measured in frequencies above 1GHz were made with peak detector and Average (AV) detector.

3) Average test would be performed if the peak result were greater than the average limit.

4) Data of measurement shown “---“in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

5) Emission Level=Peak (AV) Reading + Correction Factor;

Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

6) Margin (dB) = Emission Level (Peak) (dBuV/m)-Average limit (dBuV/m)

High channel: 2480 MHz									
Freq. (MHz)	Ant. Pol. H/V	Peak reading (dBuV)	AV reading (dBuV)	Correction Factor (dB)	Emission Level		Peak limit (dBuV/m)	AV limit (dBuV/m)	Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)			
1302.66	H	49.59	---	-4.20	45.39	---	74.00	54.00	-8.61
4960.00	H	49.90	---	-3.98	45.92	---	74.00	54.00	-8.08
5601.35	H	50.14	---	-2.83	47.31	---	74.00	54.00	-6.69
7440.00	H	46.83	---	0.57	47.4	---	74.00	54.00	-6.60
17360.00	H	40.92	---	6.79	47.71	---	74.00	54.00	-6.29
24800.00	H	39.73	---	8.16	47.89	---	74.00	54.00	-6.11
1309.27	V	49.56	---	-4.25	45.31	---	74.00	54.00	-8.69
4960.00	V	49.22	---	-3.98	45.24	---	74.00	54.00	-8.76
5624.71	V	48.12	---	-2.87	45.25	---	74.00	54.00	-8.75
7440.00	V	47.85	---	0.57	48.42	---	74.00	54.00	-5.58
17360.00	V	40.04	---	6.79	46.83	---	74.00	54.00	-7.17
24800.00	V	38.99	---	8.16	47.15	---	74.00	54.00	-6.85

Notes: 1) Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.

2) Radiated emissions measured in frequencies above 1GHz were made with peak detector and Average (AV) detector.

3) Average test would be performed if the peak result were greater than the average limit.

4) Data of measurement shown “---“in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

5) Emission Level=Peak (AV) Reading + Correction Factor;

Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

6) Margin (dB) = Emission Level (Peak) (dBuV/m)-Average limit (dBuV/m)

## 14.0 Antenna Requirement

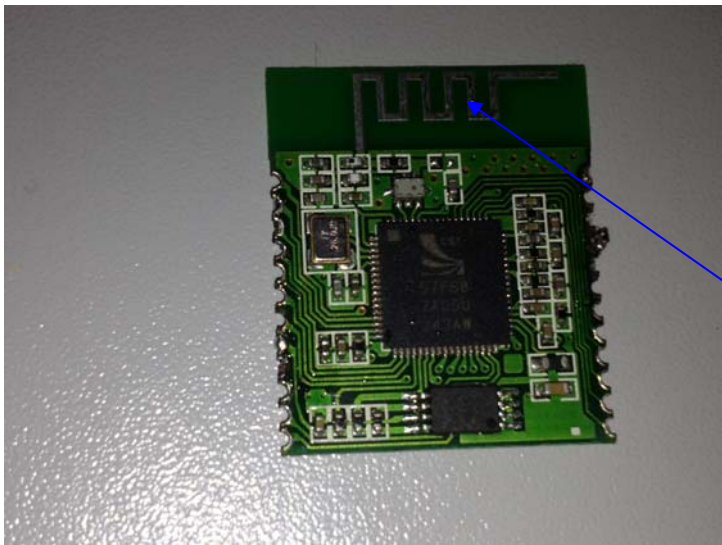
### 14.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitter antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 14.2 Antenna Specification

According to the manufacturer declared, the EUT has an integral antenna; the directional gain of antenna is 0 dBi, and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.



ANTENNA

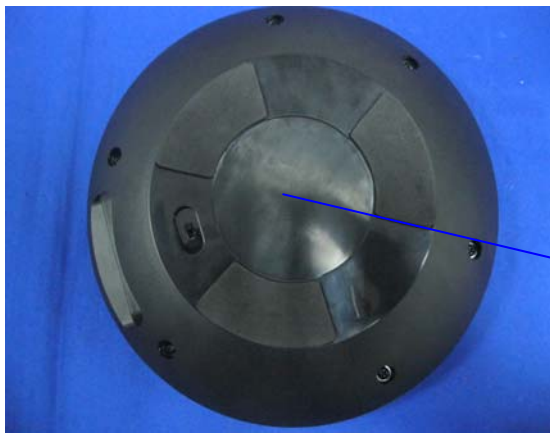
## 15.0 FCC ID Label

### FCC ID: 2AAKHBT-200

**This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.**

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

#### Mark Location:



FCC ID Label Location

**--End of the report--**