Shenzhen TCT Testing Technology Co., Ltd.

FCC ID TEST REPORT

for

Motorcycle Bluetooth Intercom Headset

Model: DUO

FCC ID: ZSF-DUO

Prepared for : Vigor Sports, Inc.
16918 Edwards Road Cerritos, CA 90703, USA

Prepared by: Shenzhen TCT Testing Technology Co.,Ltd
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Report Number：TCS1211013-1
Date of Test： November 10~27, 2012
Date of Report： November 28, 2012

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1.0 General Details

1.1 Test Lab Details

Name : Shenzhen Tongce Testing Lab
Address: 1F, Leinuo Watch Building, Fuyong Town, Baoan District, Shenzhen City, China
Telephone: +86-755-33026382 Fax: +86-755-27952656

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: Vigor Sports, Inc.
Address: 16918 Edwards Road Cerritos, CA 90703, USA
Telephone: 562-407-2184 ext:311 Fax: 213-949-4190

Manufacturer: LEXIN ELECTRONICS CO.,LTD
Address: RM1206, Baoyuan Huafeng Headquarter Economic Bldg., Xixiang Blvd, BaoAn District, Shenzhen City, China
Telephone: 0755-29100824 Fax: 0755-29064872

1.3 Description of EUT

Product:	Motorcycle Bluetooth Intercom Headset
Model No.:	DUO
Additional Model No.:	N/A
Brand Name:	N/A
Rating:	DC 3.7V (lithium battery)
Modulation Type:	GFSK, Pi/4-QDPSK, 8DPSK
Transfer Data Rate	1/2/3 Mbps
Channel number:	79
Channel spacing:	1 MHz
Operation Frequency:	2402~2480MHz
Antenna Designation:	A PCB printed antenna and the maximum gain is 0dBi

1.4 Statement by manufacturer: The EUT can operate in charging mode.

1.5 Test Duration

2012-11-10 to 2012-11-27

1.6 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	2012-12-03	2013-12-02
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	2012-12-03	2013-12-02
System Controller	CT	SC100	-	2012-02-17	2013-02-16
Spectrum Analyzer	ROHDE&SCHWARZ	FSU	-	2012-02-17	2013-02-16
Pre-amplifier	Teseq	LAN6900	--	2012-02-17	2013-02-16
Pre-amplifier	Agilent	8447D	83153007374	2012-02-17	2013-02-16
Pre-amplifier	Agilent	8449B	3008A01738	2012-02-17	2013-02-16
Triple-loop antenna	ROHDE&SCHWARZ	HM020	843885/002	2012-02-17	2013-02-16
Horn Antenna	ETS LINDGREN	3117	--	2012-02-17	2013-02-16
Horn Antenna	ETS LINDGREN	3160	--	2012-02-17	2013-02-16

2.2 AE used during the test		
Equipment type	Manufacturer	Model
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	Notes
Power Line Conducted Emission Test	**15.207(a)**	**PASS**	**Complies**
20dB Channel Bandwidth	**15.247 (a)(1), 15.215(c)**	**PASS**	**Complies**
Maximum Peak Output Power	**15.247(b)(1)**	**PASS**	**Complies**
Carrier Frequency Separation	**15.247 (a)(1)**	**PASS**	**Complies**
Number of Hopping Channels	**15.247(a)(iii)**	**PASS**	**Complies**
Time of Occupancy (Dwell Time)	**15.247(a)(iii)**	**PASS**	**Complies**
Band age Measurement, Spurious Emission Test	**15.247 (d), 15.205 (a), 15.209 (a)**	**PASS**	**Complies**
Antenna Requirement	**15.203**	**PASS**	**Complies**
RF Exposure	**15.247(b), 1.1307(b)**	**PASS**	**Complies**

3.2 Test Standards

FCC Part 15:2011 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)

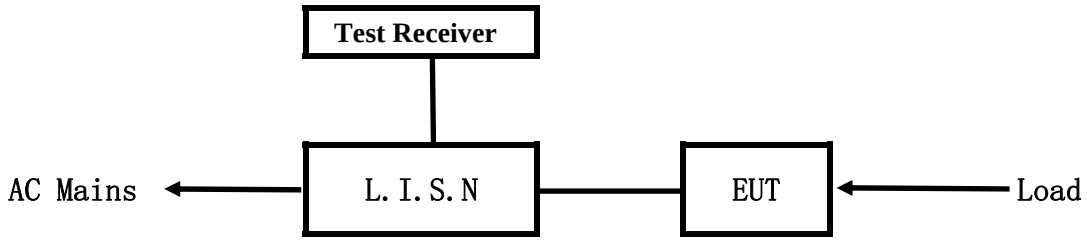
No.	Item	MU
1.	Radio Frequency	±1×10^{-9}
2.	Temperature	±0.1℃
3.	Humidity	±1.0%
4.	RF power, conducted	±0.34dB
5.	RF power density, conducted	±1.45dB
6.	Spurious emissions, conducted	±3.70dB
7.	All emissions, radiated	±4.50dB

Note: 1) The EUT has a USB port, which is used to charge to the built-in battery by an adaptor of 120VAC 60Hz; and an Audio out port, which connects an external headset including microphone by an audio line.

2) The device can operate in charging mode.

6.0 Power Line Conducted Emission Test

6.1 Schematics of the test



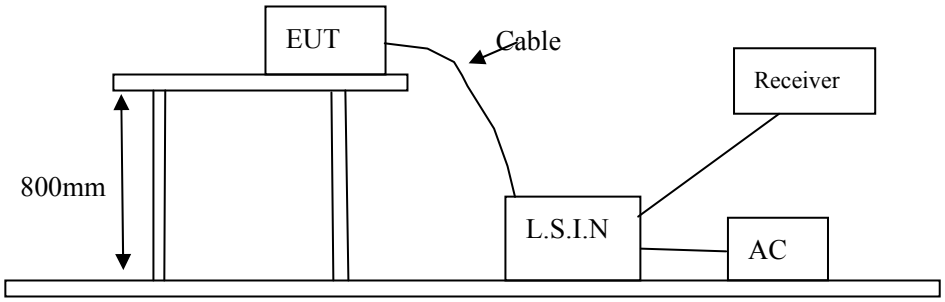
EUT: Equipment Under Test

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 μ V)		Class B Limits (dB μ 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: 23° C Humidity: 51% Atmospheric pressure: 103kPa

Frequency range: 0.15 MHz – 30 MHz

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

- Charging mode

6.8 Test result

Min. limit margin 3.36 dB at 0.165 MHz

The requirements are FULFILLED

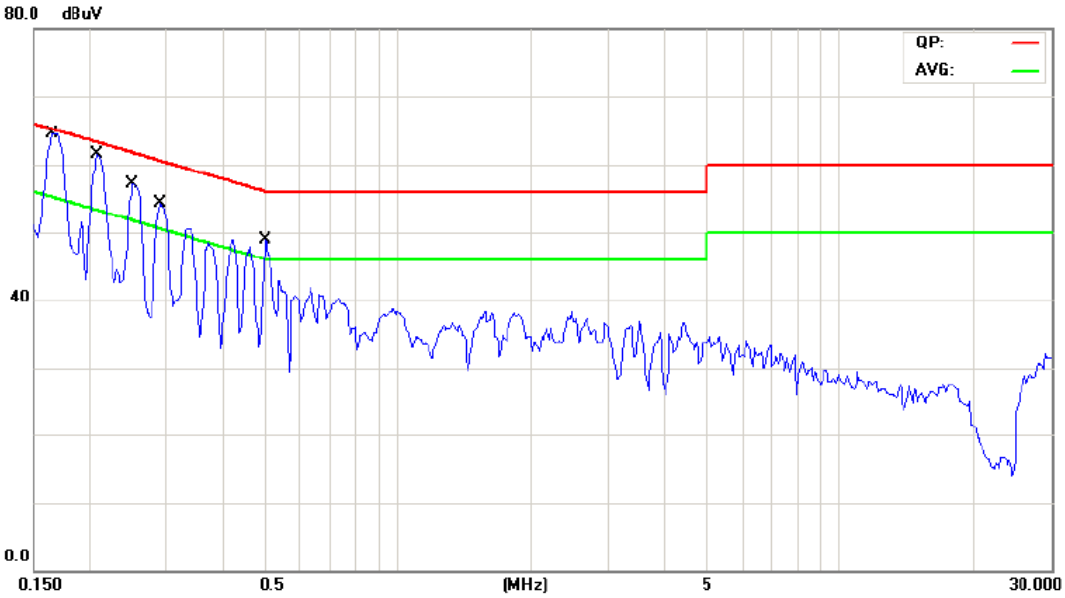
Remarks: 1) According to FCC part 15.207(a)

2) The EUT can operate in charging mode

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

EUT Description: Motorcycle Bluetooth Intercom Headset
Operation Mode: Charging mode
Tested By: Charlle Lai
Test Date: November 14, 2012

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

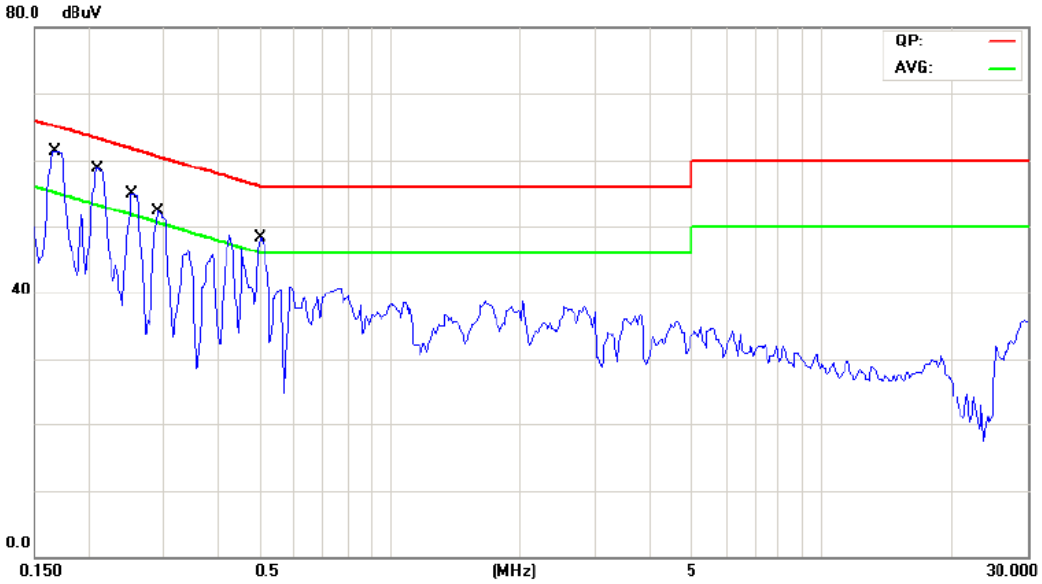


Frequency (MHz)	Reading(dB μ V)				Limit (dB μ V)	
	Live		Neutral			
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
0.165	61.82	49.55	--	--	65.18	55.18
0.208	58.70	46.11	--	--	63.26	53.26
0.251	54.04	41.72	--	--	61.70	51.70
0.290	49.27	34.89	--	--	60.50	50.50
0.501	45.29	36.27	--	--	56.00	46.00

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

EUT Description: Motorcycle Bluetooth Intercom Headset
Operation Mode: Charging mode
Tested By: Charlle Lai
Test Date: November 14, 2012

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
0.169	--	--	58.89	50.23	64.98	54.98
0.212	--	--	56.22	46.78	63.10	53.10
0.255	--	--	52.02	42.02	61.57	51.57
0.294	--	--	48.94	37.74	60.39	50.39
0.501	--	--	45.47	33.46	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 22° C Humidity: 50% 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:

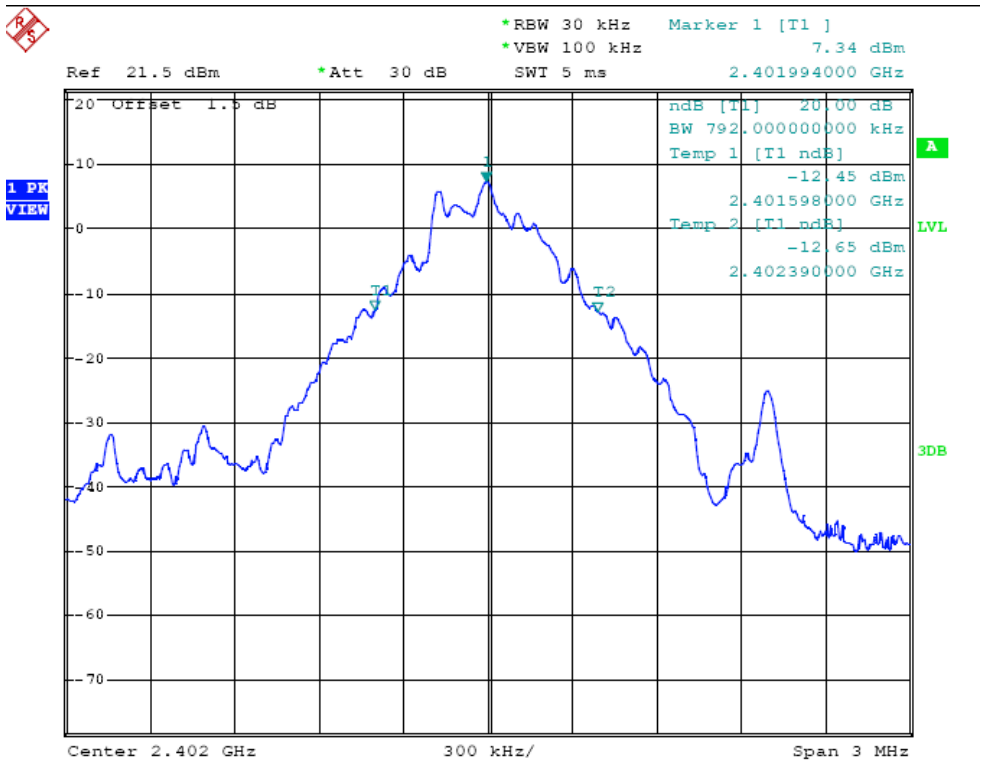
Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8-DPSK mode, which indicates that the worst case is 8-DPSK mode, so it is reported GFSK and 8-DPSK mode only.

7.5 Test Result:

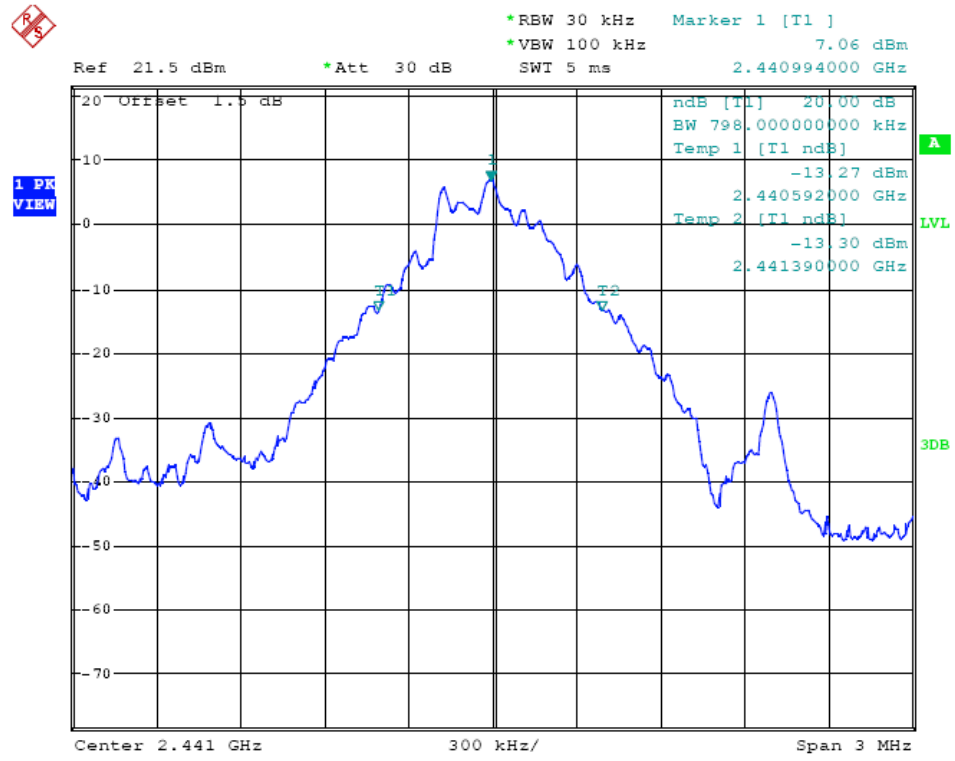
Modulation Type	Channel number	20dB Bandwidth (kHz)	Limit (kHz)	Conclusion
GFSK	(Low)	792	---	PASS
	(Middle)	798	---	PASS
	(High)	804	---	PASS
8-DPSK	(Low)	1200	---	PASS
	(Middle)	1206	---	PASS
	(High)	1218	---	PASS

Modulation: GFSK

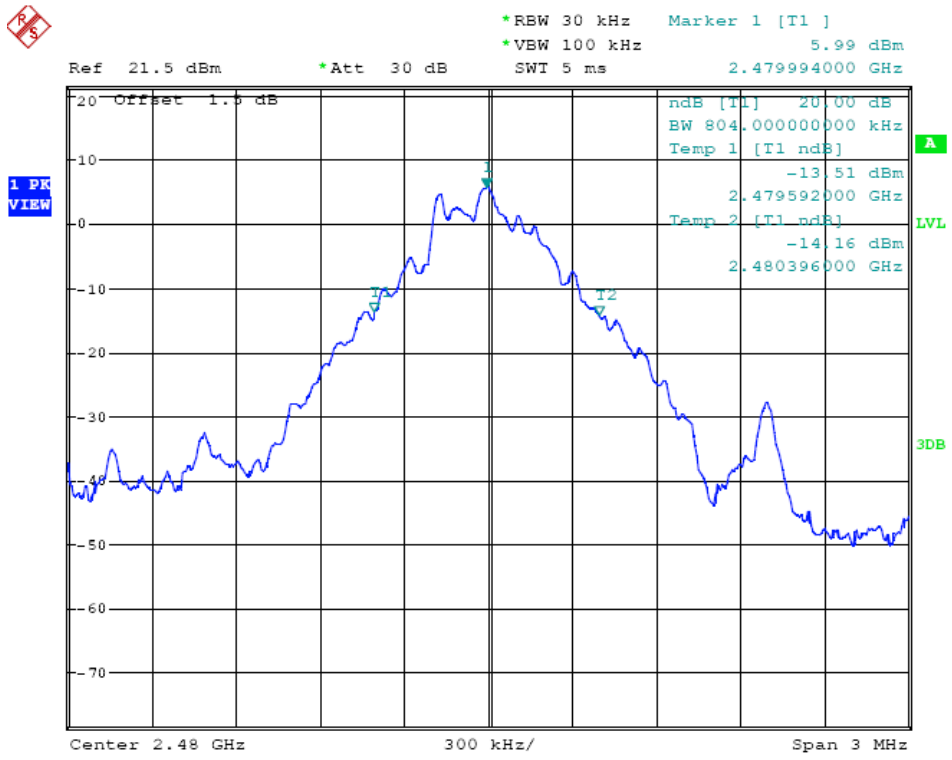
Low channel



Middle channel

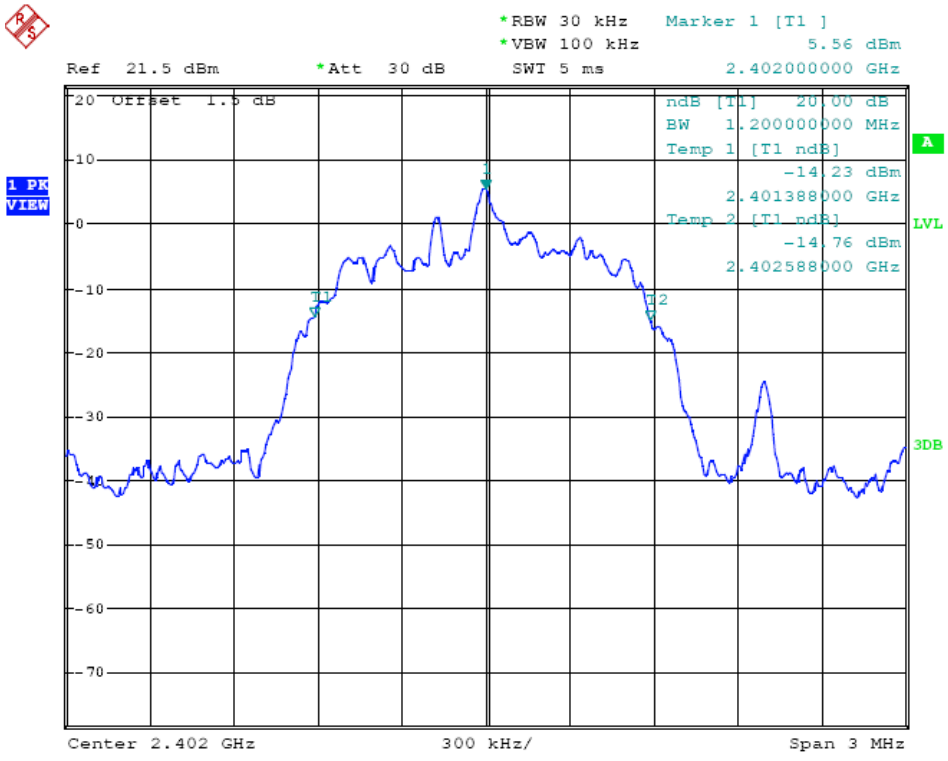


High channel

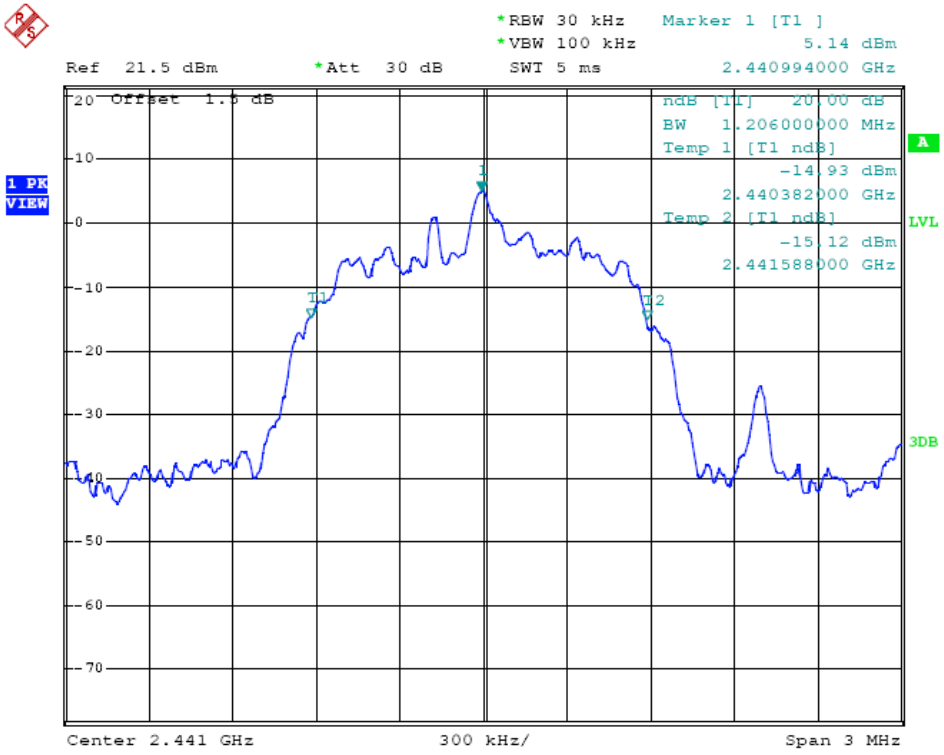


Modulation: 8-DPSK

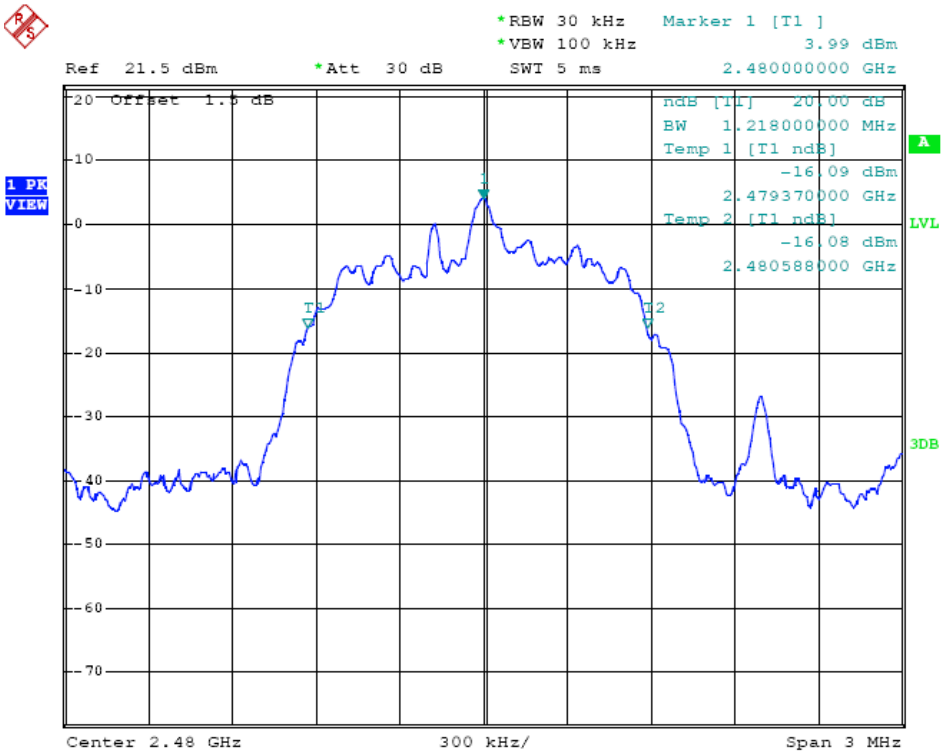
Low channel



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 ≥ 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	7.06	30	Pass
	2441	7.01	30	Pass
	2480	6.95	30	Pass
Pi/4 DQPSK	2402	6.32	30	Pass
	2441	6.15	30	Pass
	2480	6.03	30	Pass
8-DPSK	2402	6.46	30	Pass
	2441	6.28	30	Pass
	2480	6.09	30	Pass

Note: Peak Power Output = Peak Power Reading + Cable loss + Attenuator

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) ≥ 1% of the span; Video (or Average) Bandwidth (VBW) ≥ 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 8-DPSK mode, which indicates that the worst case is 8-DPSK mode, so it is reported GFSK and 8-DPSK mode only.

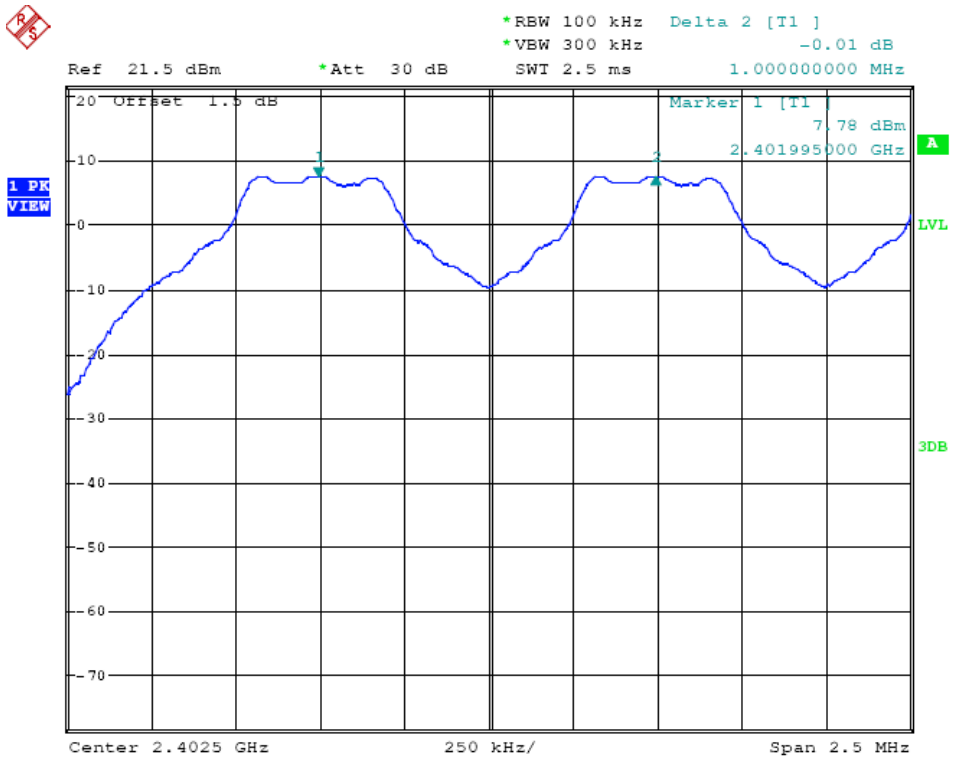
9.6 Test Result

Modulation Type	Carrier Frequency Separation	Limit	Pass/ Fail
GFSK	1.000MHz	≥ 25 kHz or two-thirds 20 dB bandwidth	Pass
8-DPSK	1.000MHz	≥ 25 kHz or two-thirds 20 dB bandwidth	Pass

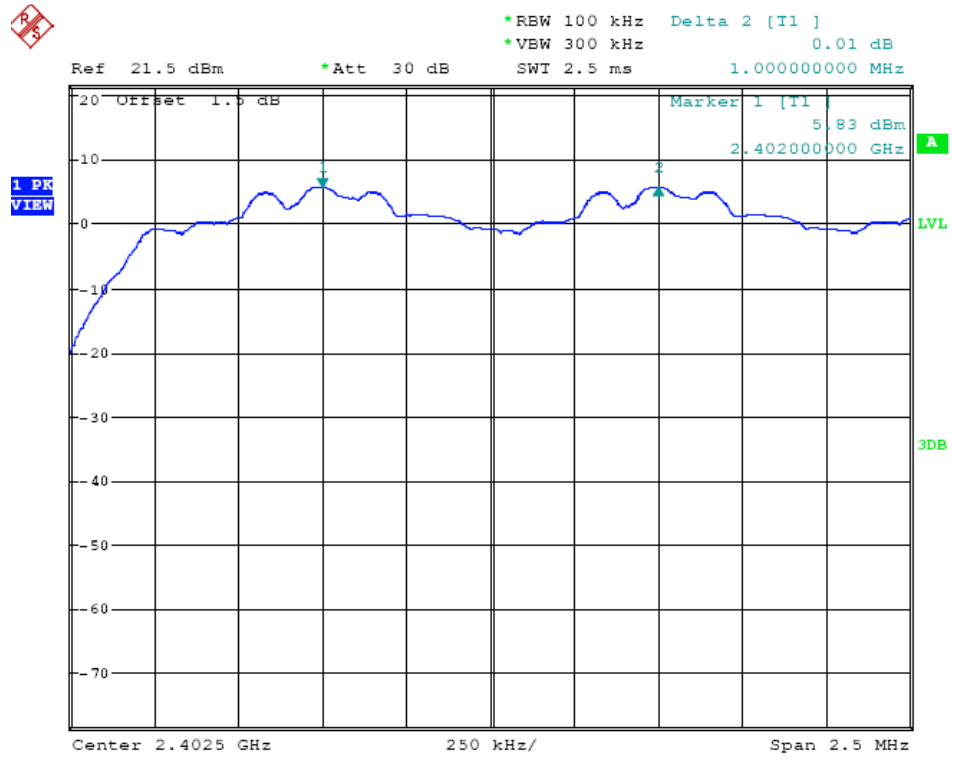
Note: Two-thirds 20 dB bandwidth: GFSK: 536 kHz; 8-DPSK: 808 kHz

Test plot

Modulation Type: GFSK



Modulation Type: 8-DPSK



10.0 Number of Hopping Channels

10.1 Test Equipment

Please refer to the Section 2

10.2 Test specification:

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

10.3 Test Procedure

Set the spectrum analyzer as follows: Span = the frequency band of operation; RBW ≥ 1% of the span; VBW ≥ 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:

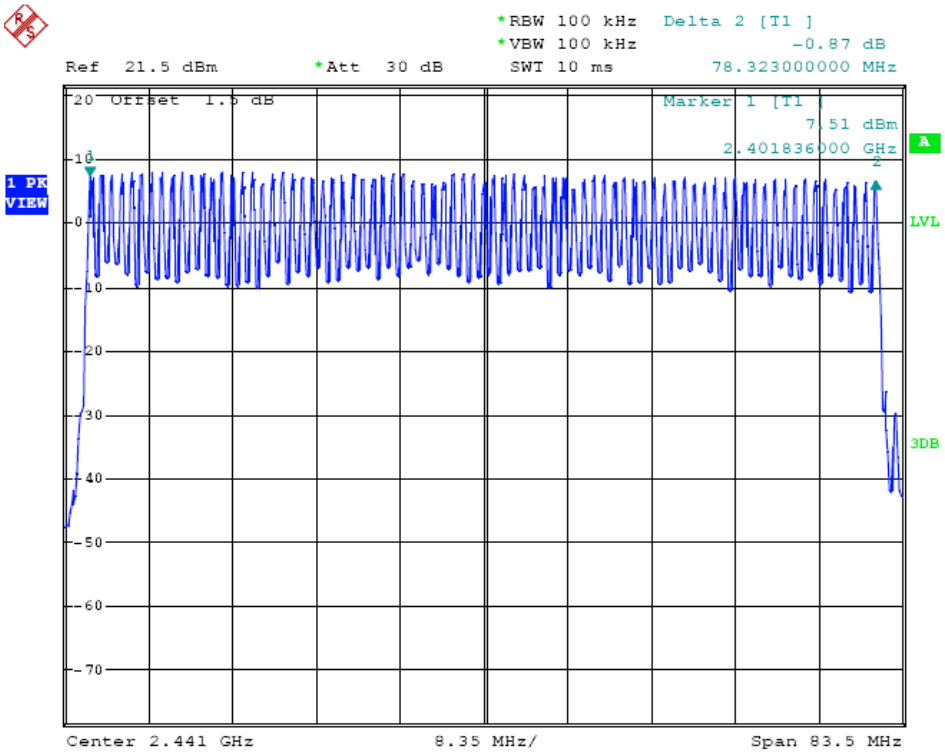
Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8-DPSK mode, which indicates that the worst case is 8-DPSK mode, so it is reported GFSK and 8-DPSK mode only.

10.6 Test Result

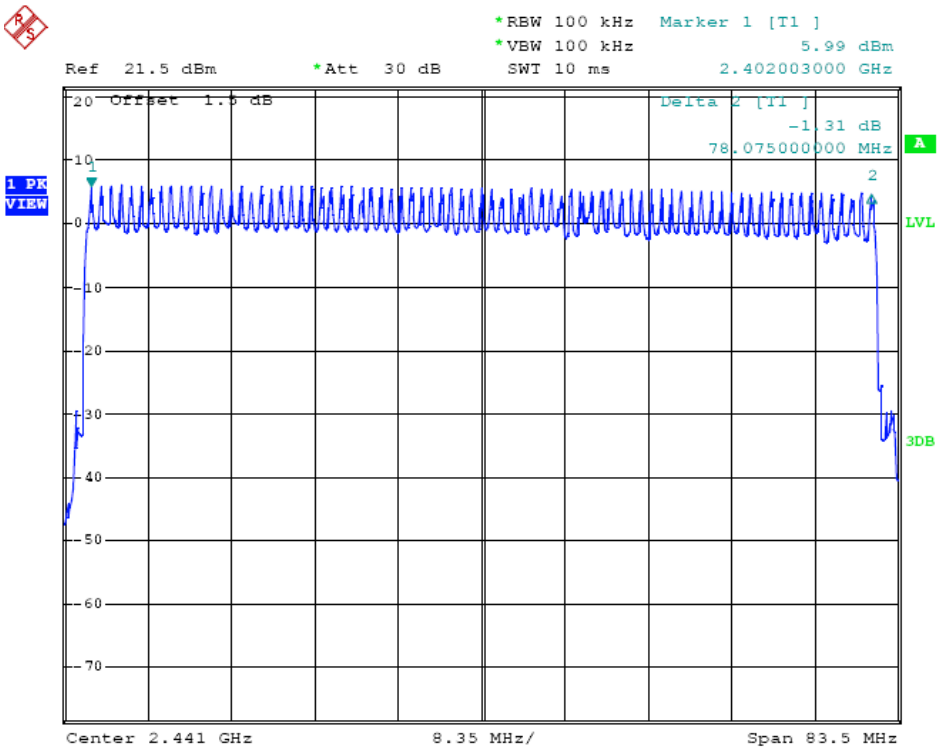
Modulation Type	Operating Frequency	Number of hopping channels	Limit	Pass/ Fail
GFSK	2402-2480MHz	79	≥ 15	Pass
8-DPSK	2402-2480MHz	79	≥ 15	Pass

Test Plot:

Modulation Type: GFSK



Modulation Type: 8-DPSK



11.0 Time of Occupancy (Dwell Time)

11.1 Test Equipment

Please refer to the Section 2

11.2 Test specification:

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

11.3 Test Procedure

Span = zero span, centred on a hopping channel; RBW = 1 MHz; VBW ≥ 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 8-DPSK mode, which indicates that the worst case is 8-DPSK mode, so it is reported GFSK and 8-DPSK mode only.

11.6 Test Result

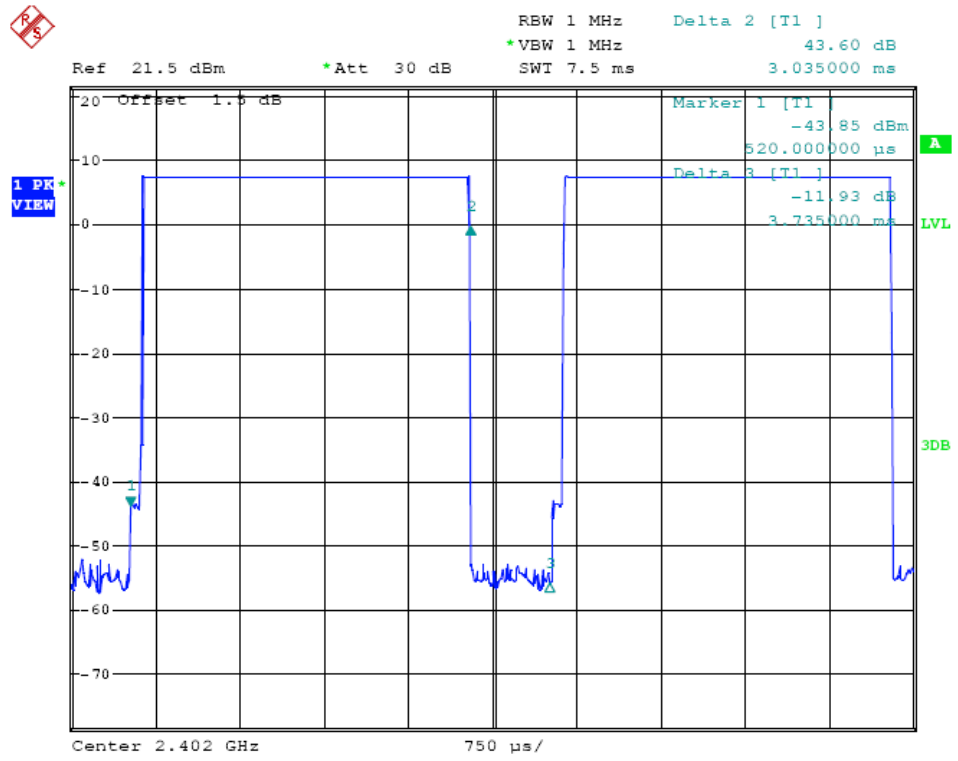
Modulation Type	Packet	Reading (ms)	Hoping Rate	Actual (s)	Limit (s)
GFSK	DH1	0.525	800hop/s	0.168	0.4
	DH3	1.775	400hop/s	0.284	0.4
	DH5	3.035	266.667hop/s	0.324	0.4
8-DPSK	3-DH1	0.535	800hop/s	0.171	0.4
	3-DH3	1.785	400hop/s	0.286	0.4
	3-DH5	3.045	266.667hop/s	0.325	0.4

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.

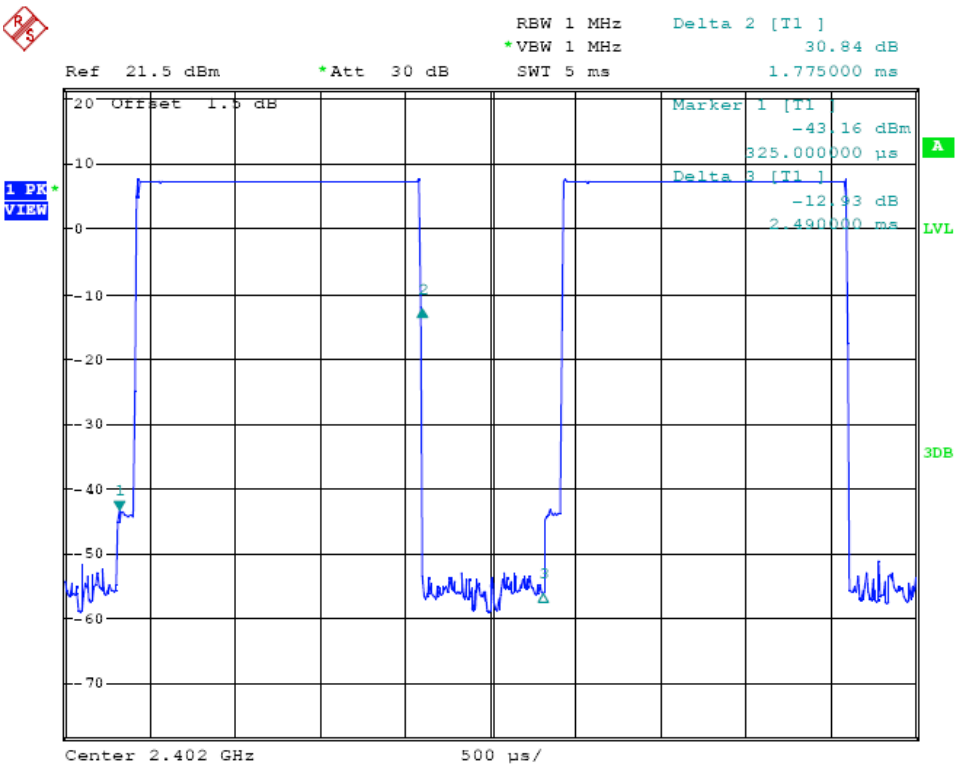
2) Actual = Reading × (Hopping rate / Number of channels) × Test period

3) The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625μs 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.

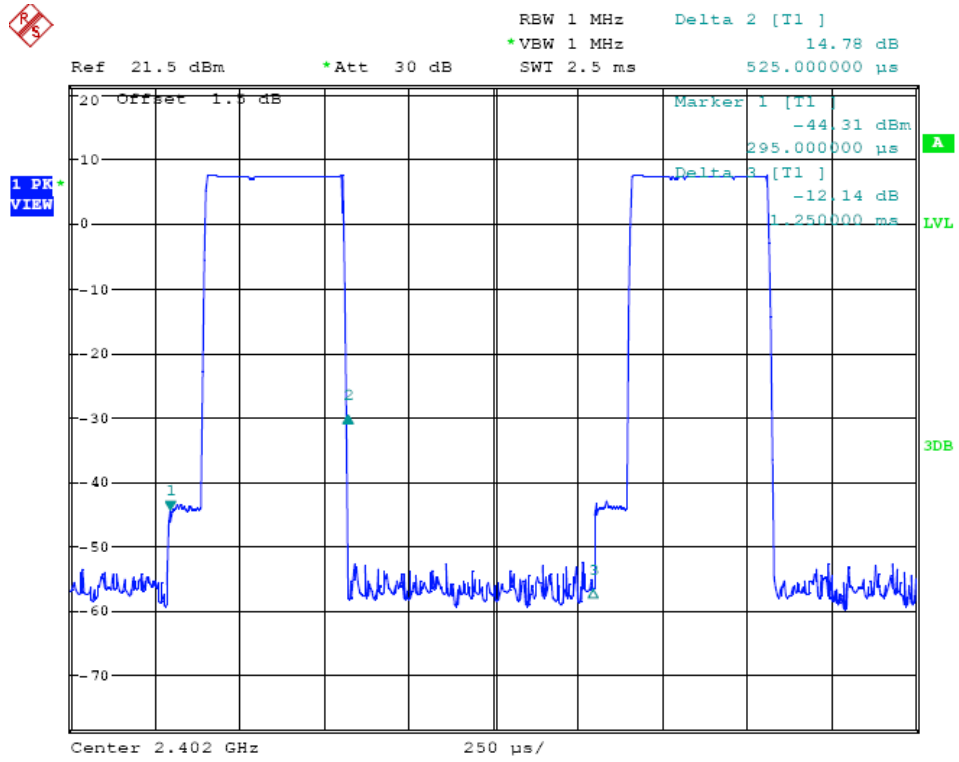
Modulation Type: GFSK
Packet Type: DH5



Packet Type: DH3

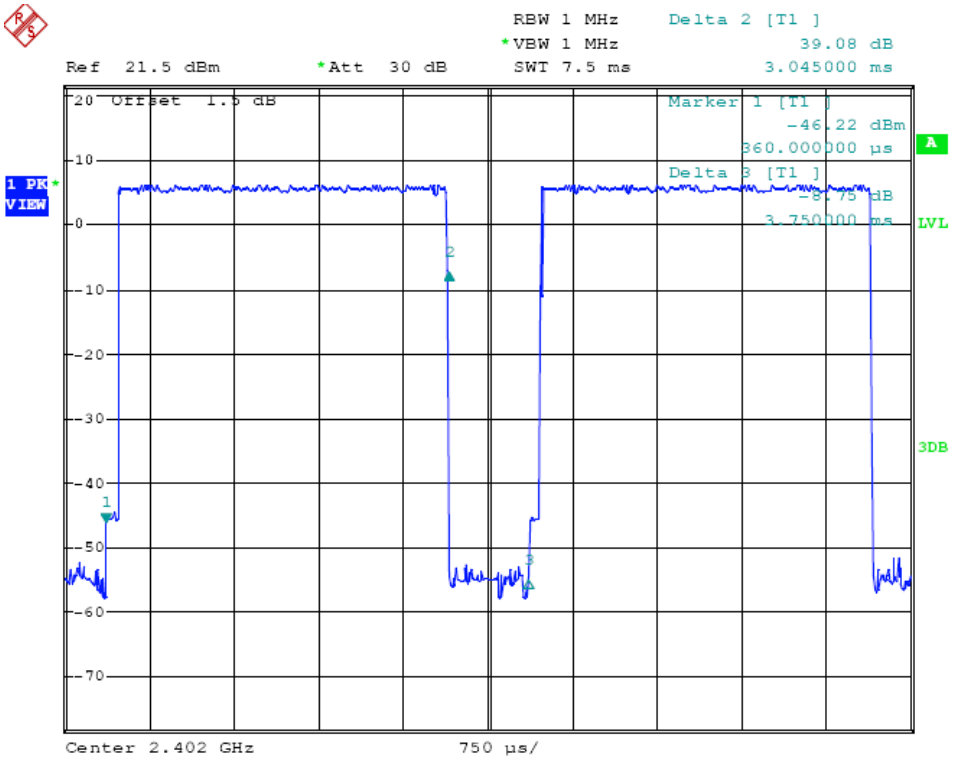


Packet Type: DH1

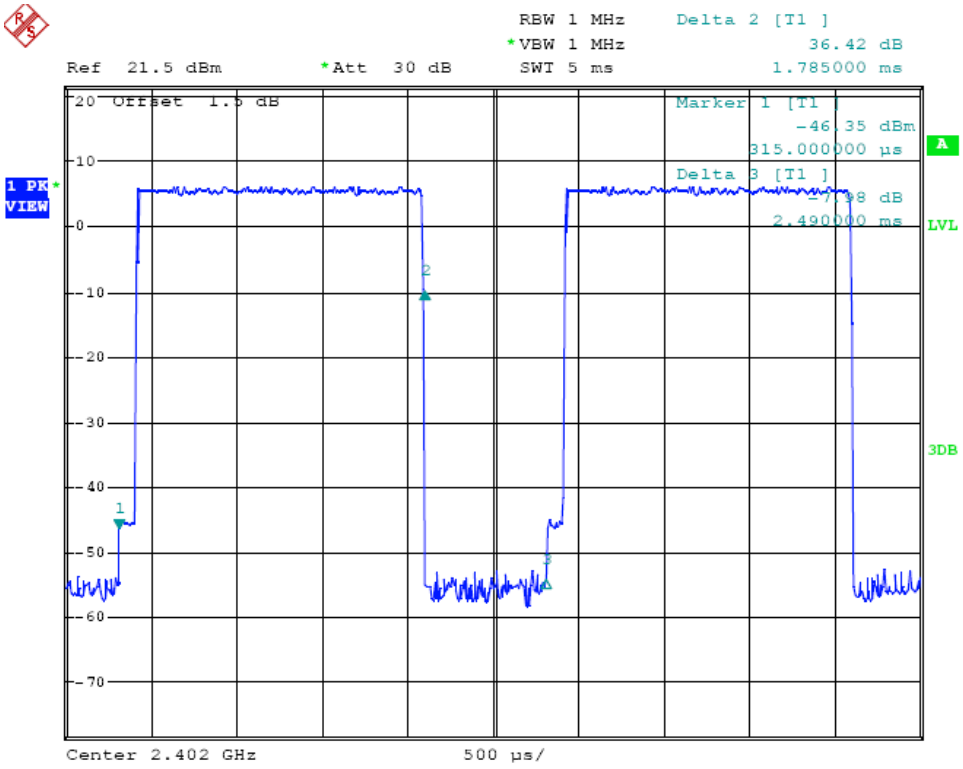


Modulation Type: 8DPSK

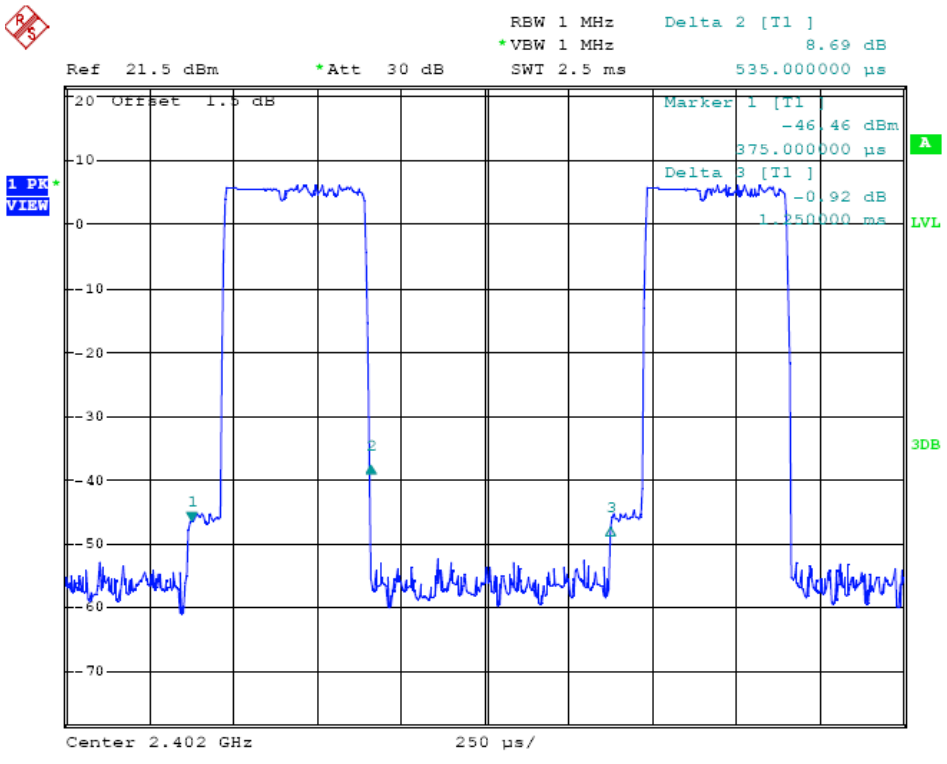
Packet Type: 3-DH5



Packet Type: 3-DH3



Packet Type: 3-DH1



12.0 Band age Measurement

12.1 Test Equipment

Please refer to the Section 2

12.2 Test specification:

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

12.3 Test Procedure

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 Test status:

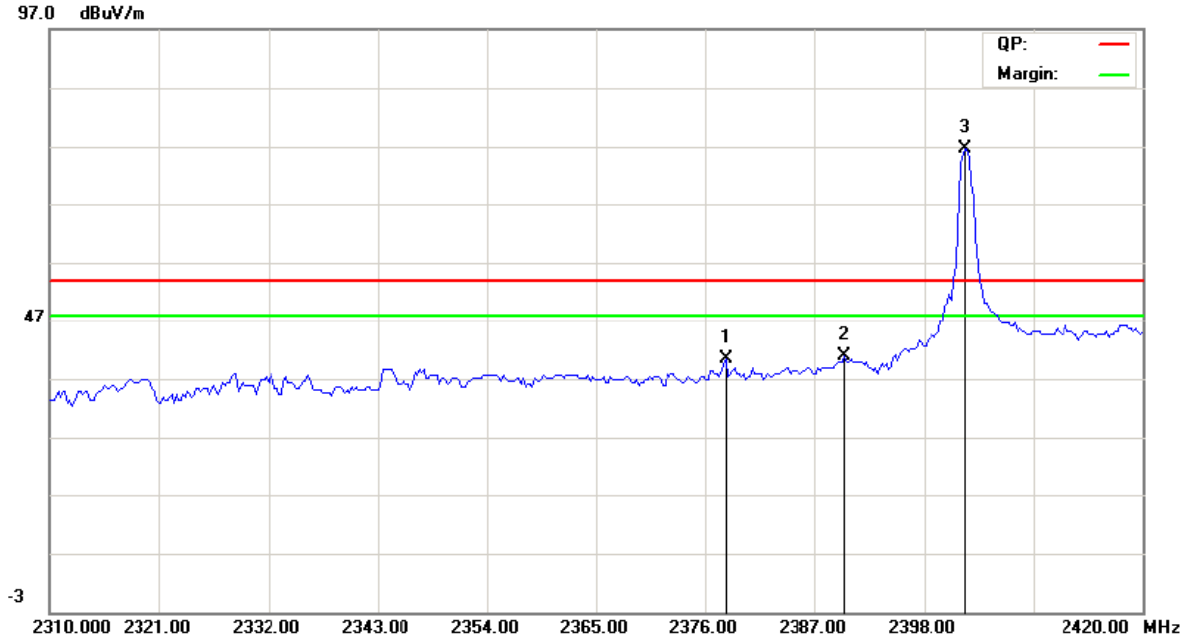
Pre-tests were made in continuous transmitting mode at lowest (2402 MHz), middle (2441 MHz) and highest (2480MHz) channel with GFSK, Pi/4 QDPSK and 8-DPSK mode, which indicates that the worst case is 8-DPSK mode, so it is reported GFSK and 8-DPSK mode only.

12.5 Limit

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

Modulation Type: GFSK

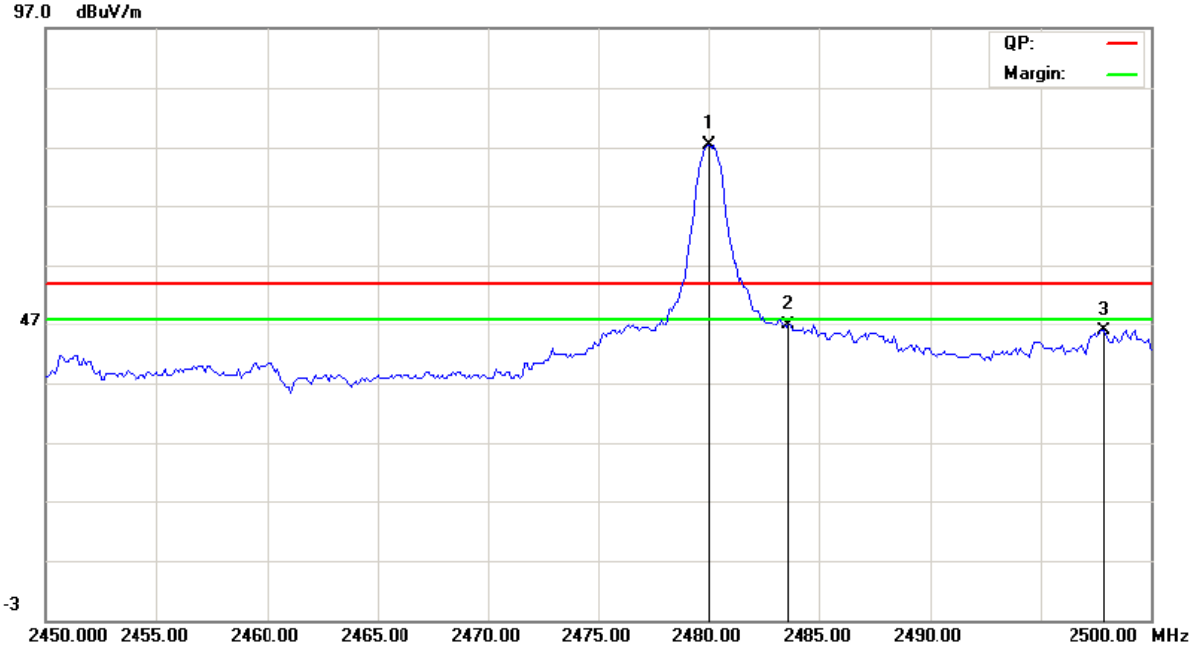
EUT operation mode: Keep transmitting in low channel



Remark: 1) The radiated measurements were made in horizontal and vertical polarity, and the horizontal is the worst case.

2) The maximum emission was 40.97dBuv at 2390 MHz, which less than the average limit, so the test result complied with the radiated emission limits specified in 15.209(a).

EUT operation mode: Keep transmitting in high channel

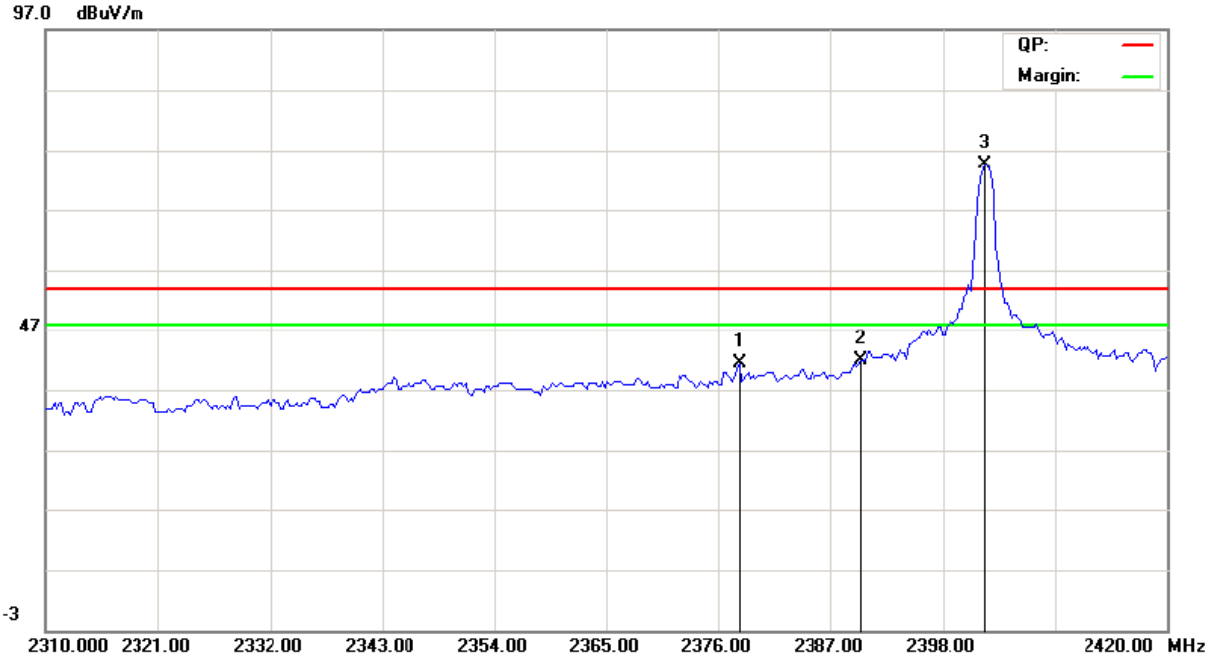


Remark: 1) The radiated measurements were made in horizontal and vertical polarity, and the horizontal is the worst case.

2) The maximum emission was 46.86dBuv at 2483.5 MHz, which less than the average limit, so the test result complied with the radiated emission limits specified in 15.209(a).

Modulation Type: 8-DPSK

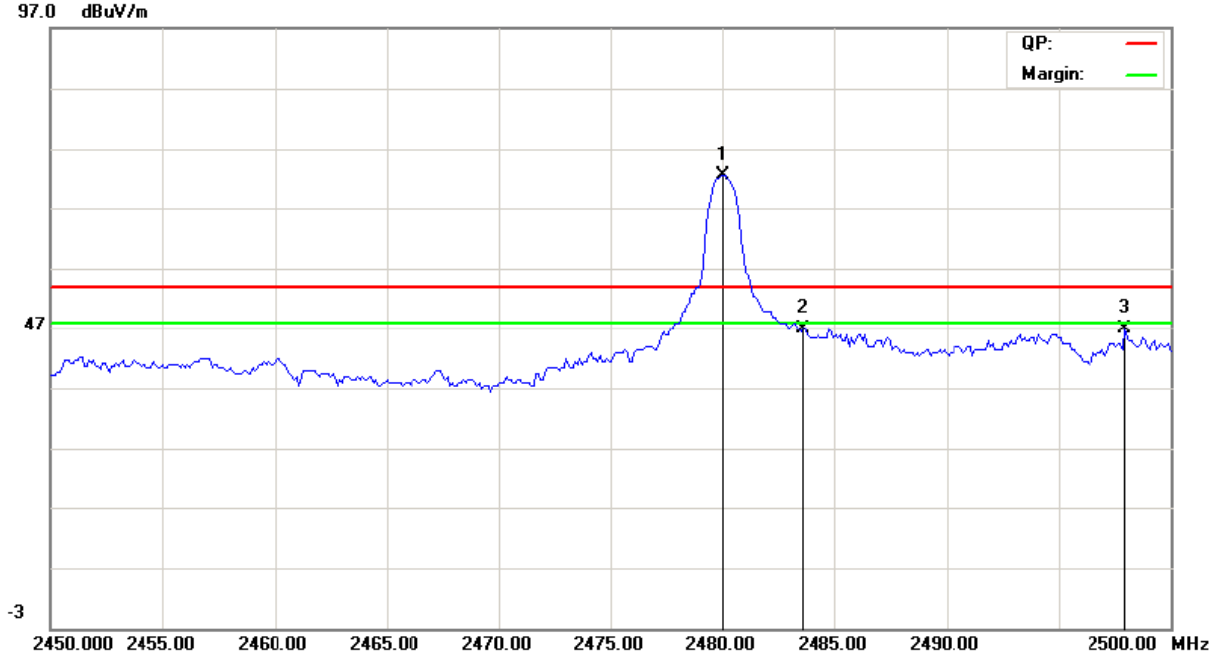
EUT operation mode: Keep transmitting in low channel



Remark: 1) The radiated measurements were made in horizontal and vertical polarity, and the horizontal is the worst case.

2) The maximum emission was 41.96dBuv at 2390 MHz, which less than the average limit, so the test result complied with the radiated emission limits specified in 15.209(a).

EUT operation mode: Keep transmitting in high channel



Remark: 1) The radiated measurements were made in horizontal and vertical polarity, and the horizontal is the worst case.

2) The maximum emission was 46.98dBuv at 2497.996 MHz, which less than the average limit, so the test result complied with the radiated emission limits specified in 15.209(a).

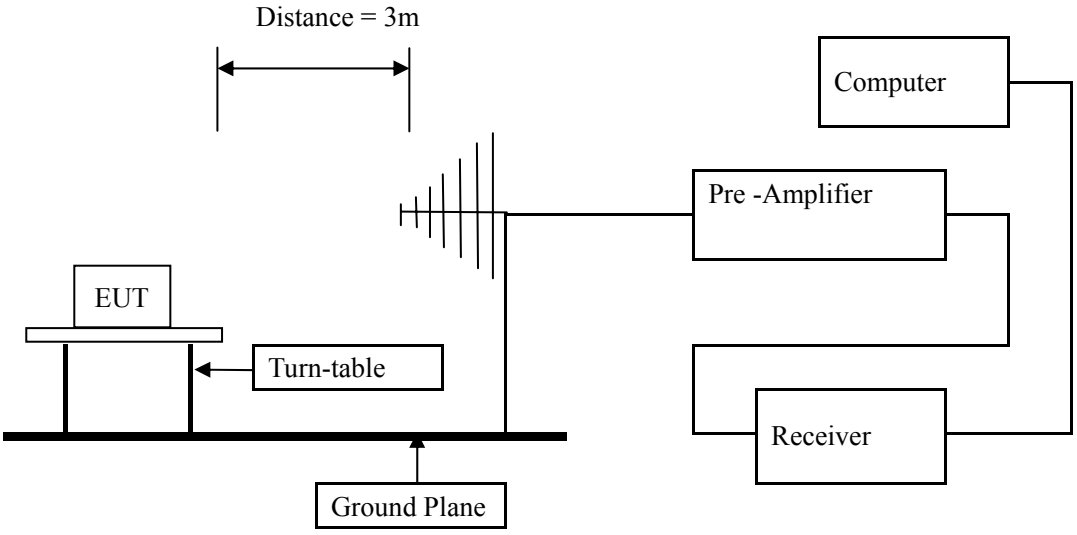
13.0 Spurious Emission Test

13.1 Radiated emissions

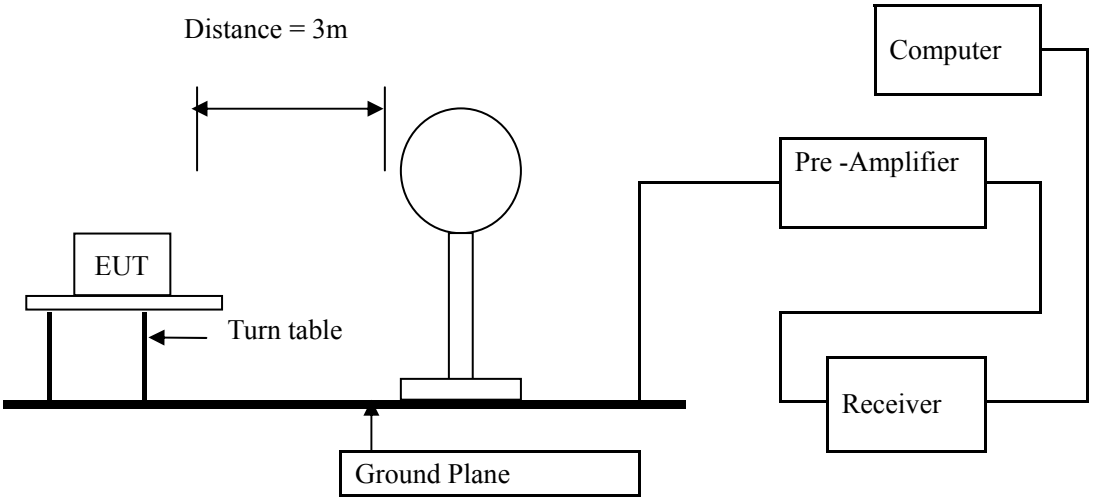
13.1.1 Test Method and test Procedure:

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.

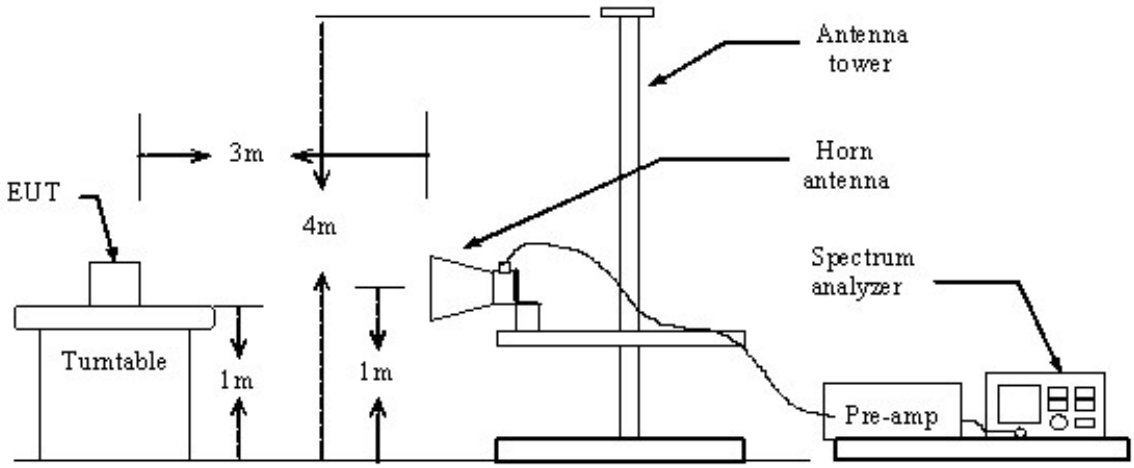
13.1.2 Block diagram of Test setup



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 μ V/m)
0.009-0.490	3	20log 2400/F (kHz) + 80
0.490-1.705	3	20log 24000/F (kHz) + 40
1.705-30	3	20log 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 handhold 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

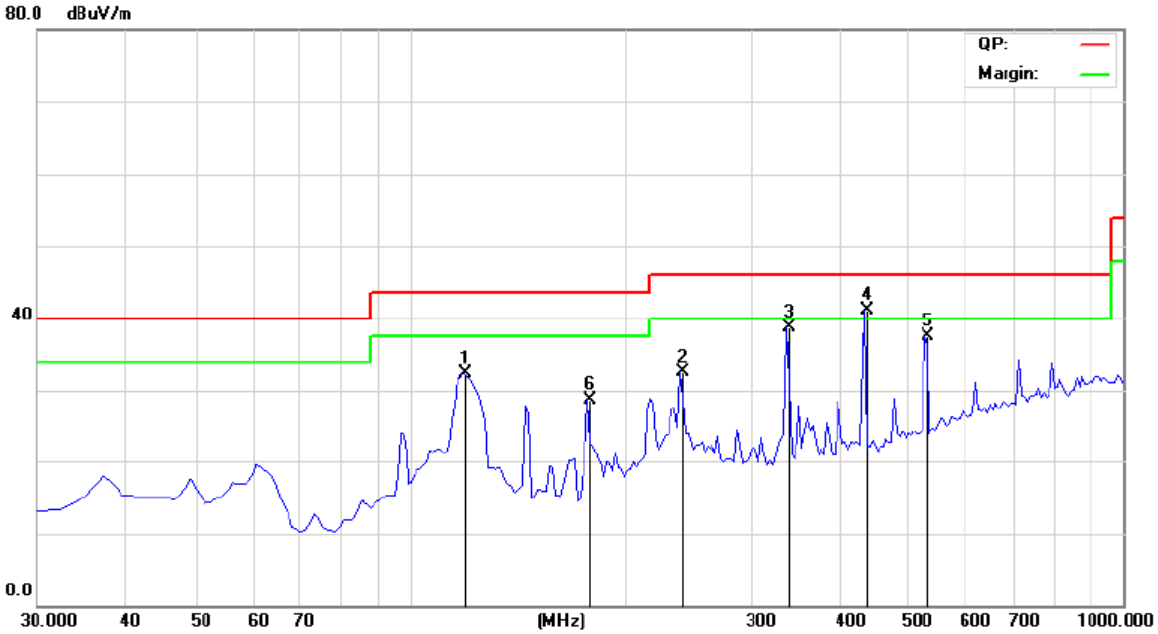
Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
--	--	V	--
--	--	H	--
--	--	V	--
--	--	H	--

B General Radiated Emissions Data

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

Please refer to following diagram for individual

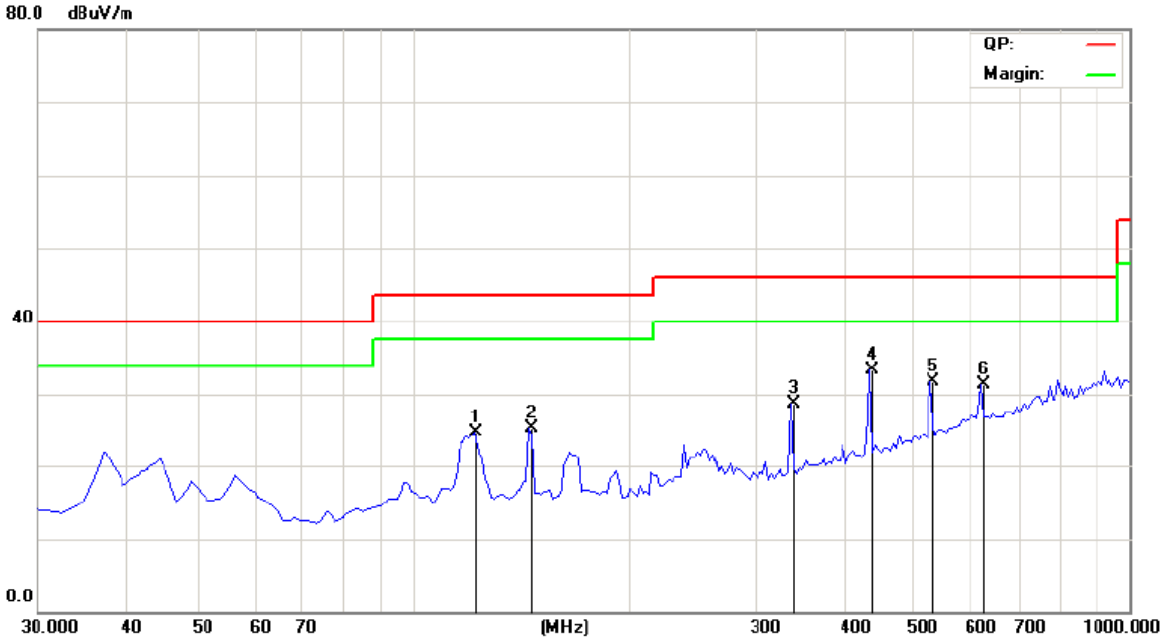
High channel: 2480 MHz



Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
119.725	32.30	H	43.50
177.925	28.65	H	43.50
240.975	32.55	H	46.00
337.975	38.71	H	46.00
434.975	41.19	H	46.00
529.550	37.48	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 μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
122.150	24.66	V	43.50
146.400	25.31	V	43.50
337.975	28.63	V	46.00
434.975	33.22	V	46.00
529.550	31.63	V	46.00
626.550	31.36	V	46.00

Note: 1) Pre-tests were conducted in all modes (e.g.: Charging mode, BT operating mode and some modes' combination), which indicates that BT transmitting mode can be as the worst case.

2) 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 8-DPSK mode, which indicates that the worst case is 8-DPSK mode, so it is reported GFSK and 8-DPSK mode only.

Modulation Type: GFSK

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)			
1301.58	H	49.92	---	-4.20	45.72	---	74.00	54.00	-8.28
4804.00	H	50.32	---	-3.98	46.34	---	74.00	54.00	-7.66
5600.12	H	50.36	---	-2.83	47.53	---	74.00	54.00	-6.47
7206.00	H	46.59	---	0.57	47.16	---	74.00	54.00	-6.84
16814.00	H	43.11	---	6.79	49.90	---	74.00	54.00	-4.10
24020.00	H	41.18	---	8.16	49.34	---	74.00	54.00	-4.66
1308.69	V	50.54	---	-4.25	46.29	---	74.00	54.00	-7.71
4804.00	V	51.48	---	-3.98	47.50	---	74.00	54.00	-6.50
5620.84	V	49.72	---	-2.87	46.85	---	74.00	54.00	-7.15
7206.00	V	46.88	---	0.57	47.45	---	74.00	54.00	-6.55
16814.00	V	40.51	---	6.79	47.30	---	74.00	54.00	-6.70
24020.00	V	39.84	---	8.16	48.00	---	74.00	54.00	-6.00

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)			
1301.58	H	49.82	---	-4.20	45.62	---	74.00	54.00	-8.38
4882.00	H	50.13	---	-3.98	46.15	---	74.00	54.00	-7.85
5600.31	H	50.36	---	-2.83	47.53	---	74.00	54.00	-6.47
7323.00	H	46.59	---	0.57	47.16	---	74.00	54.00	-6.84
17087.00	H	43.11	---	6.79	49.90	---	74.00	54.00	-4.10
24410.00	H	41.18	---	8.16	49.34	---	74.00	54.00	-4.66
1308.89	V	50.54	---	-4.25	46.29	---	74.00	54.00	-7.71
4804.00	V	51.48	---	-3.98	47.50	---	74.00	54.00	-6.50
5623.25	V	49.72	---	-2.87	46.85	---	74.00	54.00	-7.15
7206.00	V	46.88	---	0.57	47.45	---	74.00	54.00	-6.55
17087.00	V	40.51	---	6.79	47.30	---	74.00	54.00	-6.70
24410.00	V	39.84	---	8.16	48.00	---	74.00	54.00	-6.00

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)			
1302.01	H	49.92	---	-4.20	45.72	---	74.00	54.00	-8.28
4960.00	H	49.44	---	-3.98	45.46	---	74.00	54.00	-8.54
5601.39	H	50.57	---	-2.83	47.74	---	74.00	54.00	-6.26
7440.00	H	47.22	---	0.57	47.79	---	74.00	54.00	-6.21
17360.00	H	41.38	---	6.79	48.17	---	74.00	54.00	-5.83
24800.00	H	40.13	---	8.16	48.29	---	74.00	54.00	-5.71
1308.43	V	49.91	---	-4.25	45.66	---	74.00	54.00	-8.34
4804.00	V	51.36	---	-3.94	47.42	---	74.00	54.00	-6.58
5624.55	V	48.35	---	-2.87	45.48	---	74.00	54.00	-8.52
7440.00	V	47.81	---	0.57	48.38	---	74.00	54.00	-5.62
17360.00	V	40.26	---	6.79	47.05	---	74.00	54.00	-6.95
24800.00	V	39.21	---	8.16	47.37	---	74.00	54.00	-6.63

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)

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

Modulation Type: 8-DPSK

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)			
1301.89	H	49.72	---	-4.20	45.52	---	74.00	54.00	-8.48
4804.00	H	51.36	---	-3.94	47.42	---	74.00	54.00	-6.58
5600.12	H	49.57	---	-2.83	46.74	---	74.00	54.00	-7.26
7206.00	H	47.15	---	0.52	47.67	---	74.00	54.00	-6.33
16814.00	H	41.78	---	6.73	48.51	---	74.00	54.00	-5.49
24020.00	H	40.61	---	8.11	48.72	---	74.00	54.00	-5.28
1308.54	V	50.75	---	-4.25	46.50	---	74.00	54.00	-7.50
4804.00	V	51.85	---	-3.94	47.91	---	74.00	54.00	-6.09
5624.58	V	49.23	---	-2.87	46.36	---	74.00	54.00	-7.64
7206.00	V	43.47	---	0.52	43.99	---	74.00	54.00	-10.01
16814.00	V	41.24	---	6.73	47.97	---	74.00	54.00	-6.03
24020.00	V	39.93	---	8.11	48.04	---	74.00	54.00	-5.96

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)			
1301.19	H	50.26	---	-4.20	46.06	---	74.00	54.00	-7.94
4882.00	H	51.74	---	-3.98	47.76	---	74.00	54.00	-6.24
5600.38	H	50.01	---	-2.83	47.18	---	74.00	54.00	-6.82
7323.00	H	47.81	---	0.57	48.38	---	74.00	54.00	-5.62
17087.00	H	43.27	---	6.79	50.06	---	74.00	54.00	-3.94
24410.00	H	41.94	---	8.16	50.10	---	74.00	54.00	-3.90
1308.37	V	50.26	---	-4.25	46.01	---	74.00	54.00	-7.99
4804.00	V	51.48	---	-3.98	47.50	---	74.00	54.00	-6.50
5624.72	V	49.43	---	-2.87	46.56	---	74.00	54.00	-7.44
7206.00	V	46.28	---	0.57	46.85	---	74.00	54.00	-7.15
17087.00	V	40.48	---	6.79	47.27	---	74.00	54.00	-6.73
24410.00	V	42.27	---	8.16	50.43	---	74.00	54.00	-3.57

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)			
1301.48	H	50.21	---	-4.20	46.01	---	74.00	54.00	-7.99
4960.00	H	51.74	---	-3.98	47.76	---	74.00	54.00	-6.24
5600.21	H	50.01	---	-2.83	47.18	---	74.00	54.00	-6.82
7440.00	H	46.93	---	0.57	47.50	---	74.00	54.00	-6.50
17360.00	H	42.52	---	6.79	49.31	---	74.00	54.00	-4.69
24800.00	H	41.85	---	8.16	50.01	---	74.00	54.00	-3.99
1308.57	V	50.10	---	-4.25	45.85	---	74.00	54.00	-8.15
4804.00	V	50.78	---	-3.98	46.80	---	74.00	54.00	-7.20
5624.25	V	49.37	---	-2.87	46.50	---	74.00	54.00	-7.50
7440.00	V	46.18	---	0.57	46.75	---	74.00	54.00	-7.25
17360.00	V	40.48	---	6.79	47.27	---	74.00	54.00	-6.73
24800.00	V	41.66	---	8.16	49.82	---	74.00	54.00	-4.18

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

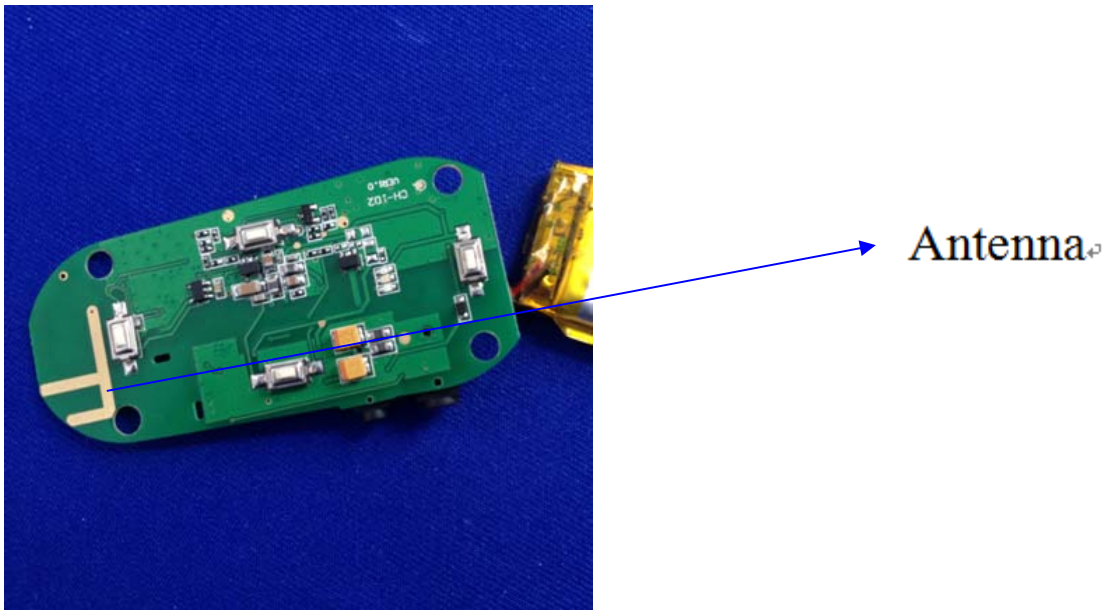
14.1 Standard Applicable

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

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 mount in dB that the directional gain of the antenna exceeds 6 dBi.

14.2 Antenna Specification

According to the manufacturer declared, the EUT has a PCB printed 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.



15.0 Maximum Permissible Exposure

According to KDB 447498 D01 General RF Exposure Guidance V05, RF Expose Evaluation Method:

SAR Test Exclusion Thresholds for 100 MHz-6 GHz and <=50mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

MHz	30	35	40	45	50	mm
150	232	271	310	349	387	SAR Test Exclusion Threshold (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

The maximum output power measured is 5.082 mW, which is less than the SAR Test Exclusion Threshold for 2450 MHz: 10 mW. No SAR test is required.

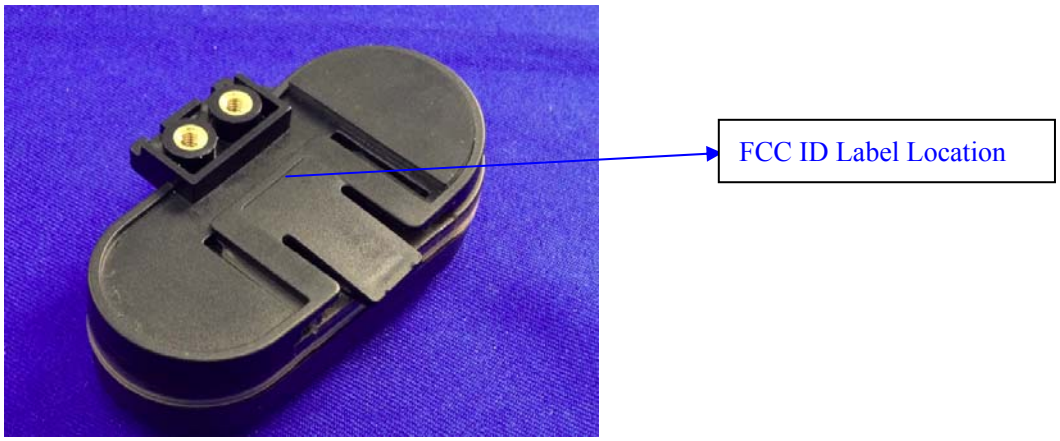
16.0 FCC ID Label

FCC ID: ZSF-DUO

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.

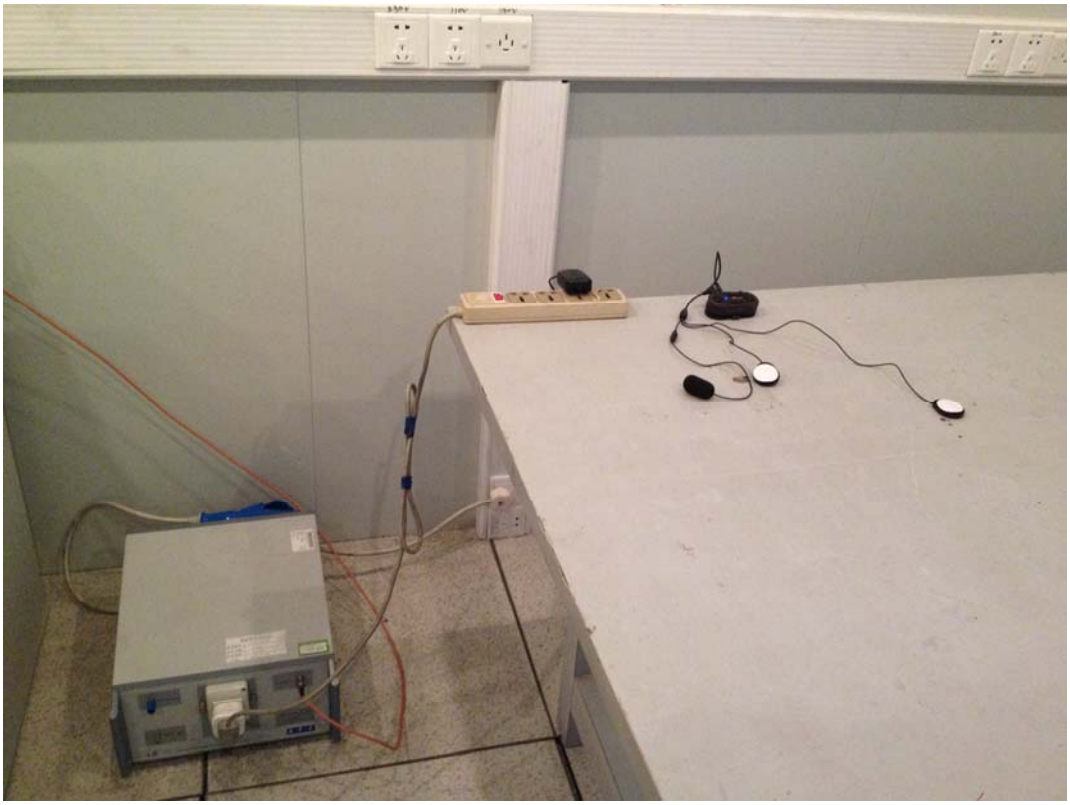
The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Mark Location:

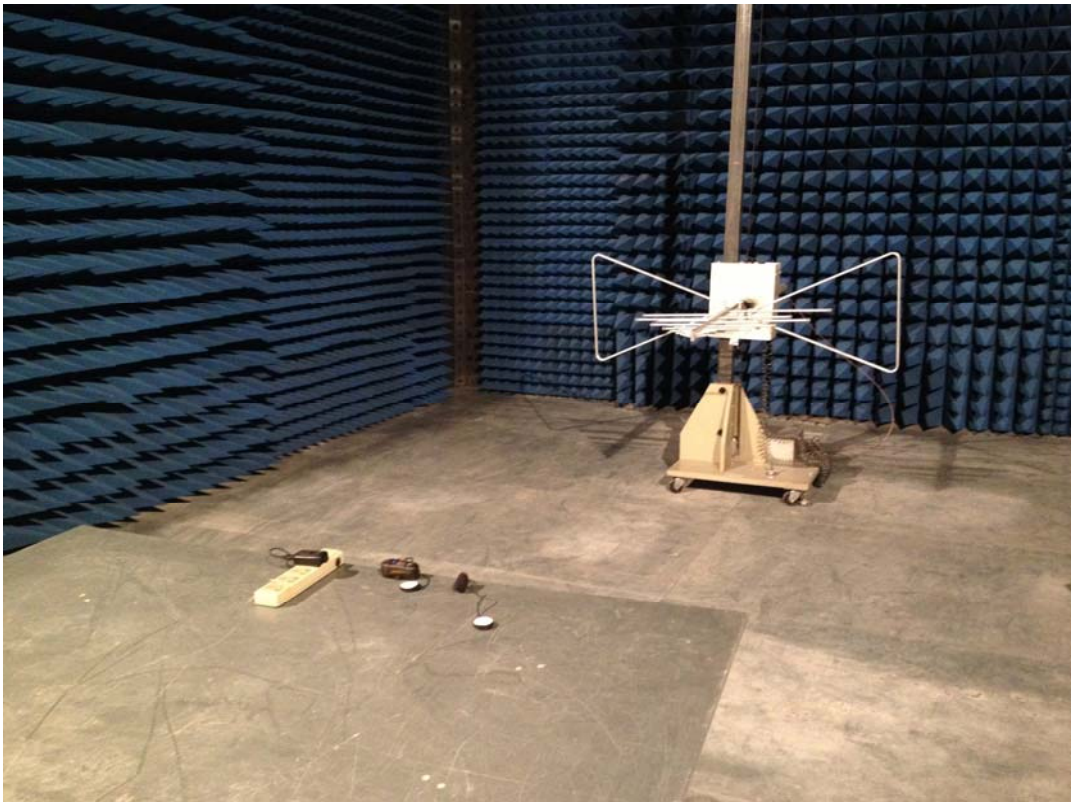


17.0 Photos of testing

17.1 Conducted test View



17.2 Radiated emission test view

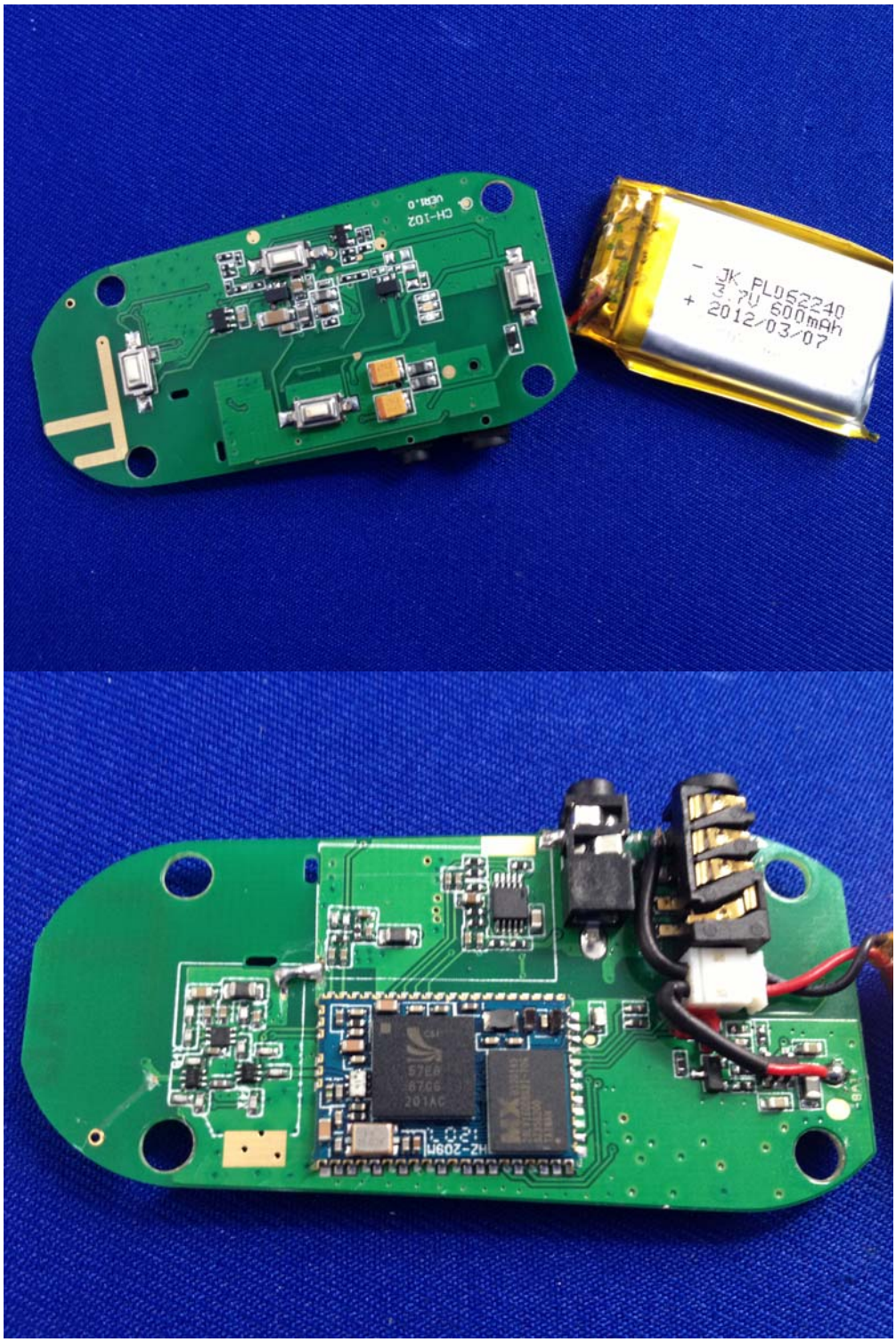


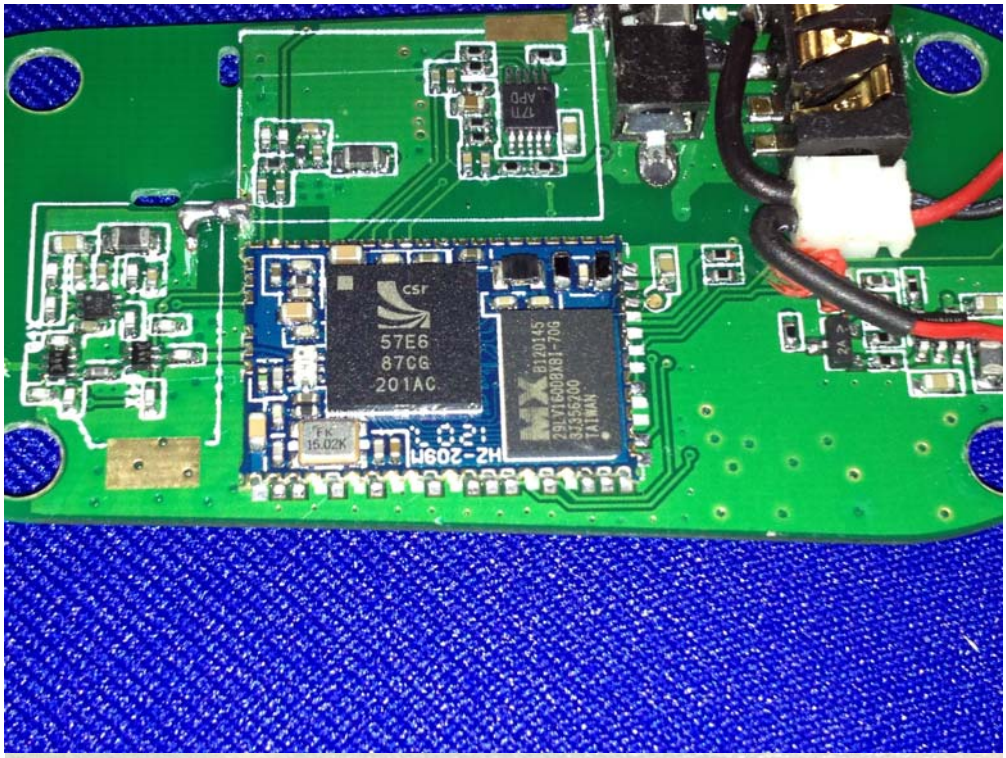
18.0 Photos for the EUT

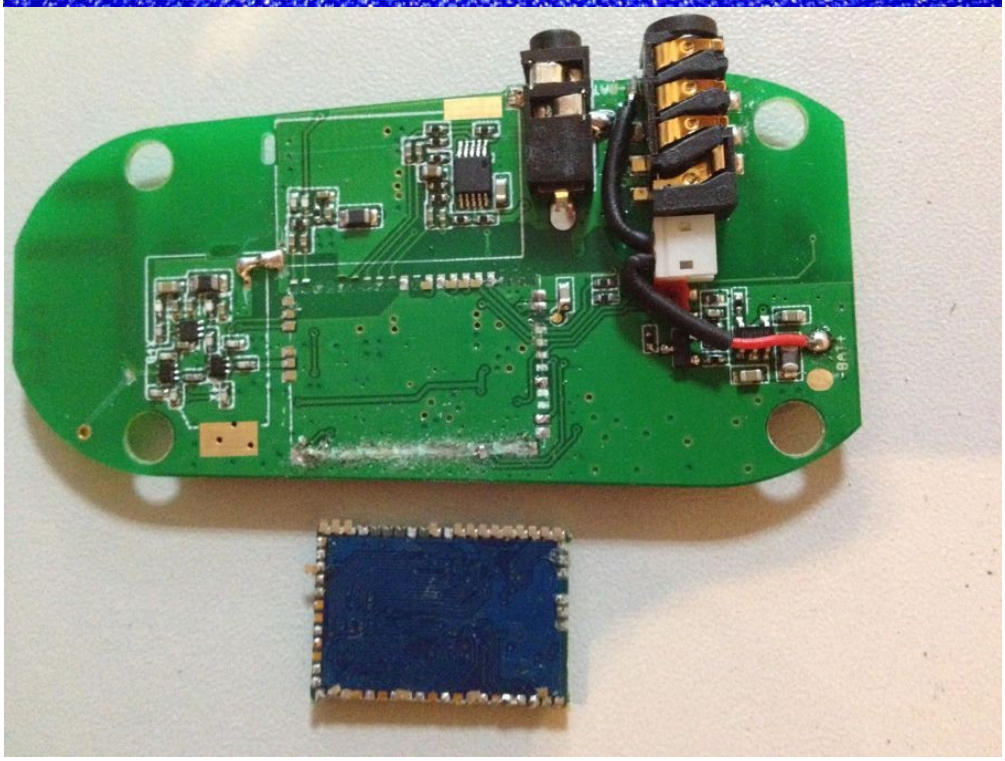
Outside View of the EUT

Outside View of the EUT

Inside View of the EUT







--End of the report--