



**Shenzhen Global Test Service Co.,Ltd.**

1F, Building No. 13A, Zhonghaixin Science and Technology City, No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District, Shenzhen, Guangdong

## FCC PART 15 SUBPART C TEST REPORT

### FCC PART 15.247

Report Reference No.....: **GTSR16050103-BLE**

FCC ID. .... : **2AIOW-YONO-EAR**

Compiled by

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Date of issue .....: Jun. 8, 2016

**Representative Laboratory Name :** **Shenzhen Global Test Service Co.,Ltd.**

Address .....: 1F, Building No. 13A, Zhonghaixin Science and Technology City,  
No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District,  
Shenzhen, Guangdong

**Applicant's name** .....: **YONO Health Inc.**

Address .....: 1259 Lakeside Drive,#3208,Sunnyvale,CA 94085

**Test specification** .....:

Standard.....: **FCC Part 15.247: Operation within the bands 902-928 MHz,  
2400-2483.5 MHz and 5725-5850 MHz**

TRF Originator.....: Shenzhen Global Test Service Co.,Ltd.

Master TRF .....: Dated 2014-12

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**Test item description** .....: **YONO Earbud**

Trade Mark.....: /

Manufacturer .....: **YONO Health Inc.**

Model/Type reference .....: YONO-EAR-PO-LZ

Listed Models .....: /

Modulation Type.....: GFSK

Operation Frequency.....: From 2402MHz to 2480MHz

EUT Type .....: Production Unit

Hardware Version .....: AD-P61085

Software Version .....: YO-N-V1.1

Rating.....: DC 3.7V

Result.....: **PASS**

## TEST REPORT

Test Report No. :	GTSR16050103- BLE	Jun. 8, 2016 Date of issue
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Equipment under Test : **YONO Earbud**

Model /Type : **YONO-EAR-PO-LZ**

Listed Models : **/**

**Applicant** : **YONO Health Inc.**

Address : **1259 Lakeside Drive,#3208,Sunnyvale,CA 94085**

**Manufacturer** : **YONO Health Inc.**

Address : **1259 Lakeside Drive,#3208,Sunnyvale,CA 94085**

<b>Test Result:</b>	<b>PASS</b>
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The test report merely corresponds to the test sample.  
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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## 1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB558074 D01 V03r05](#): Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

## 2. SUMMARY

### 2.1. General Remarks

Date of receipt of test sample	:	May 25, 2016
Testing commenced on	:	May 25, 2016
Testing concluded on	:	Jun. 8, 2016

### 2.2. Product Description

Name of EUT	YONO Earbud
Trade Mark	/
Model Number	YONO-EAR-PO-LZ
List Model	/
FCC ID	2AIOW-YONO-EAR
Antenna Type	Internal
Bluetooth FCC Operation frequency	2402MHz-2480MHz
Bluetooth Modulation	GFSK
Bluetooth	Supported BT4.0
Remark: The products are identical in interior structure, electrical circuits and components, just model names and color are different.	

### 2.3. Equipment Under Test

#### Power supply system utilised

Power supply voltage	:	<input type="radio"/> 230V / 50 Hz	<input type="radio"/> 120V / 60Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input checked="" type="radio"/> Other (specified in blank below)	

DC 3.7V

### 2.4. Short description of the Equipment under Test (EUT)

This is a YONO Earbud.

For more details, refer to the user's manual of the EUT.

### 2.5. EUT operation mode

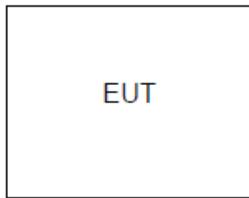
The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 40 channels provided to the EUT. Channel 00/19/39 was selected to test.

### 2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AIOW-YONO-EAR** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

## 2.7. Block Diagram of Test Setup



## 2.8. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - Supplied by the lab

<input type="radio"/>	Adapter	M/N:	HW-050100C01
		Manufacturer:	HUAWEI

## 2.9. Modifications

No modifications were implemented to meet testing criteria.

## 2.10. NOTE

	Test Standards	Reference Report
Bluetooth-BLE	FCC Part 15 Subpart C	GTSR16050103-BLE
MPE	FCC Per 47 CFR 2.1093(d)	GTSR16050103-MPE

### **3. TEST ENVIRONMENT**

#### **3.1. Address of the test laboratory**

##### **Shenzhen Global Test Service Co.,Ltd.**

1F, Building No. 13A, Zhonghaixin Science and Technology City, No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District, Shenzhen, Guangdong

##### **Shenzhen CTL Testing Technology Co., Ltd**

1/F.-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, Guangdong, China

#### **3.2. Test Facility**

The test facility is recognized, certified, or accredited by the following organizations:

##### **FCC-Registration No.: 964637**

Shenzhen Global Test Service Co.,Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 964637, Jul 24, 2015.

##### **CNAS-Lab Code: L8169**

Shenzhen Global Test Service Co.,Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories. Date of Registration: Dec. 11, 2015. Valid time is until Dec. 10, 2018.

##### **FCC-Registration No.: 970318**

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, December 19, 2013.

#### **3.3. Environmental conditions**

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

### 3.4. Test Description

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(e)	Power spectral density	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(1)	Spectrum bandwidth – 6 dB bandwidth	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(b)(1)	Maximum output power	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	Band edge compliance conducted	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.205	Band edge compliance radiated	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious emissions conducted	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious emissions radiated	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	GFSK	-/-	GFSK	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	GFSK	-/-	GFSK	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

### 3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Global Test Service Co.,Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3.6. Equipments Used during the Test

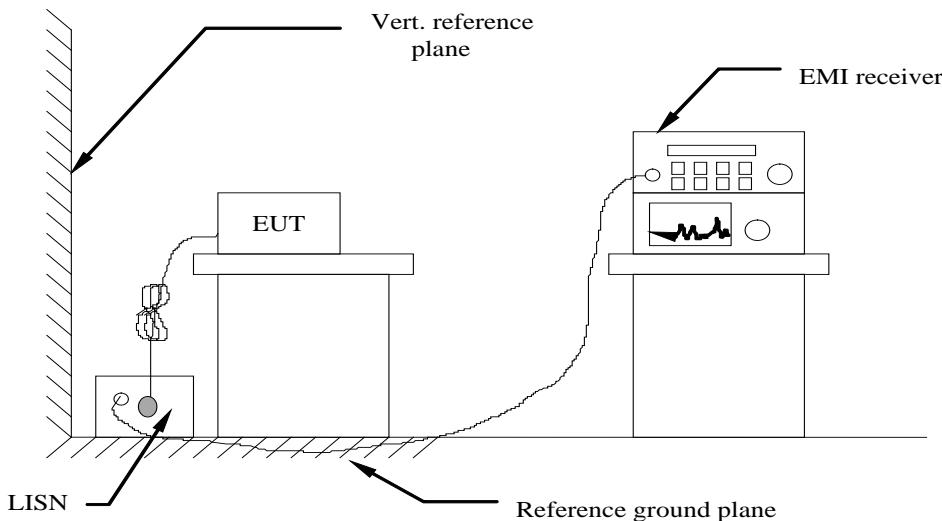
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.08	2016/05/28	2017/05/27
LISN	R&S	ESH2-Z5	893606/008	2016/05/27	2017/05/26
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2016/06/02	2017/06/01
EMI Test Receiver	R&S	ESCI	101102	2015/06/26	2016/06/25
Spectrum Analyzer	Agilent	N9020A	MY48010425	2015/06/17	2016/06/16
Controller	EM Electronics	Controller EM 1000	N/A	2016/05/21	2017/05/20
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2016/05/19	2017/05/18
Active Loop Antenna	SCHWARZBEC K	FMZB1519	1519-037	2016/05/19	2017/05/18
Amplifier	Agilent	8349B	3008A02306	2016/05/19	2017/05/18
Amplifier	Agilent	8447D	2944A10176	2016/05/19	2017/05/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2016/05/20	2017/05/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2016/05/20	2017/05/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2016/05/20	2017/05/19
RF Cable	HUBER+SUHNE R	RG214	N/A	2016/05/20	2017/05/19

Note: The Cal.Interval was one year.

## 4. TEST CONDITIONS AND RESULTS

### 4.1. AC Power Conducted Emission

#### TEST CONFIGURATION



#### TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2013
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
- 4 The EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

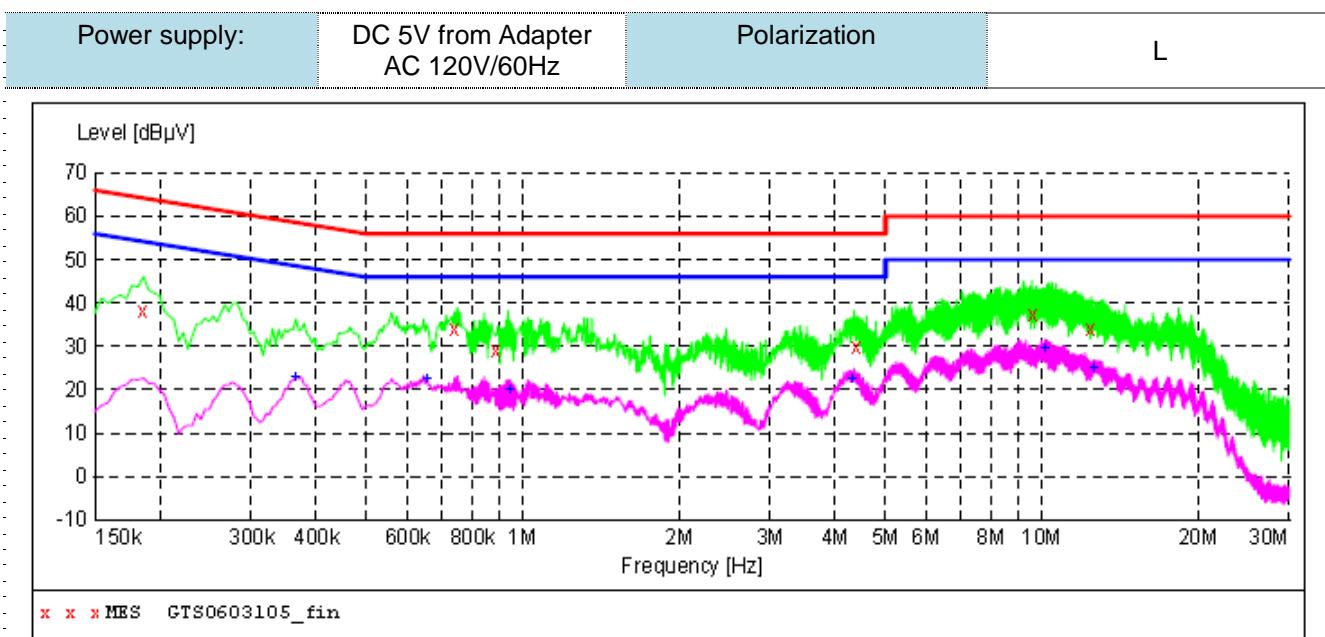
#### AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

#### TEST RESULTS



**MEASUREMENT RESULT: "GTS0603105\_fin"**

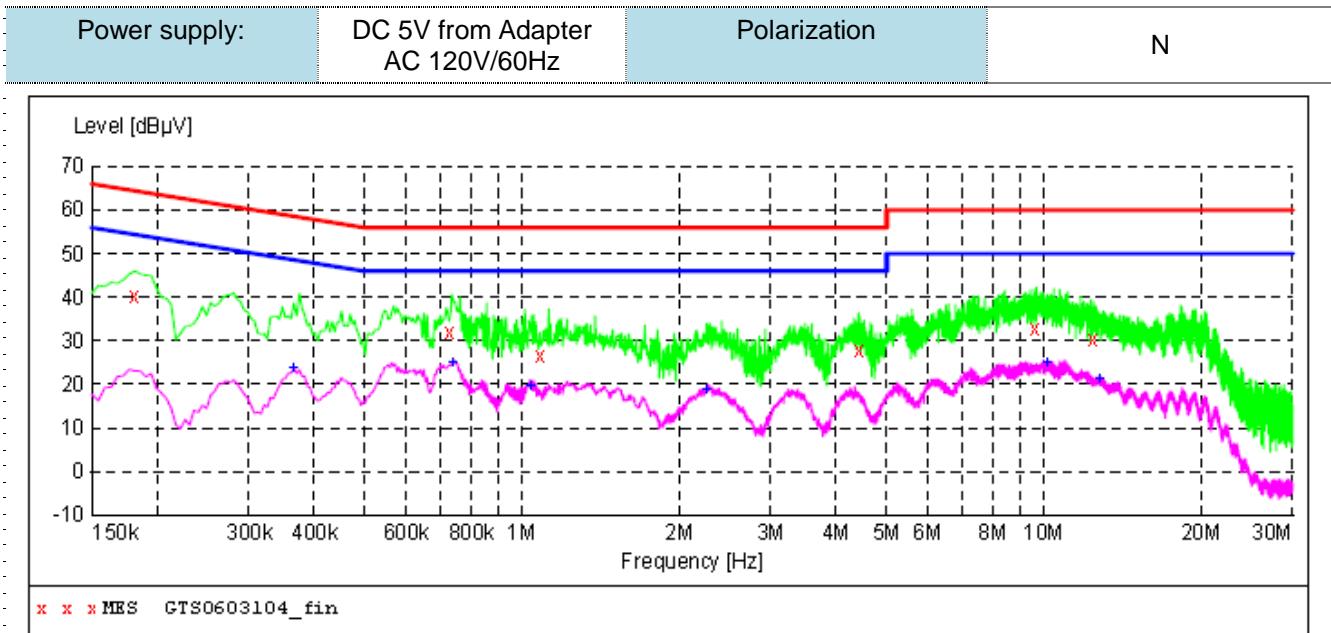
6/3/2016 6:56PM

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.186000	38.30	10.0	64	25.9	QP	L1	GND
0.739500	33.90	9.7	56	22.1	QP	L1	GND
0.892500	28.90	9.6	56	27.1	QP	L1	GND
4.384500	30.10	9.3	56	25.9	QP	L1	GND
9.609000	37.50	8.9	60	22.5	QP	L1	GND
12.462000	33.90	8.5	60	26.1	QP	L1	GND

**MEASUREMENT RESULT: "GTS0603105\_fin2"**

6/3/2016 6:56PM

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.366000	22.70	9.9	49	25.9	AV	L1	GND
0.654000	22.40	9.7	46	23.6	AV	L1	GND
0.946500	20.00	9.6	46	26.0	AV	L1	GND
4.326000	22.30	9.4	46	23.7	AV	L1	GND
10.171500	29.60	8.9	50	20.4	AV	L1	GND
12.561000	24.80	8.5	50	25.2	AV	L1	GND

**MEASUREMENT RESULT: "GTS0603104\_fin"**

6/3/2016 6:51PM

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.181500	40.10	10.0	64	24.3	QP	N	GND
0.726000	31.80	9.7	56	24.2	QP	N	GND
1.081500	26.70	9.6	56	29.3	QP	N	GND
4.420500	27.80	9.3	56	28.2	QP	N	GND
9.649500	32.60	8.9	60	27.4	QP	N	GND
12.430500	30.20	8.5	60	29.8	QP	N	GND

**MEASUREMENT RESULT: "GTS0603104\_fin2"**

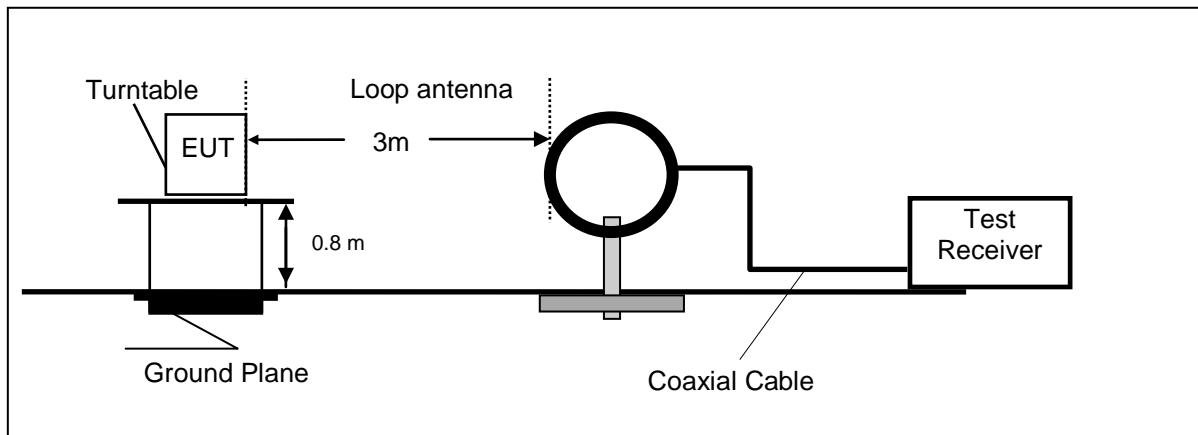
6/3/2016 6:51PM

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.366000	23.80	9.9	49	24.8	AV	N	GND
0.739500	25.00	9.7	46	21.0	AV	N	GND
1.041000	19.70	9.6	46	26.3	AV	N	GND
2.251500	18.60	9.5	46	27.4	AV	N	GND
10.167000	25.10	8.9	50	24.9	AV	N	GND
12.790500	21.30	8.5	50	28.7	AV	N	GND

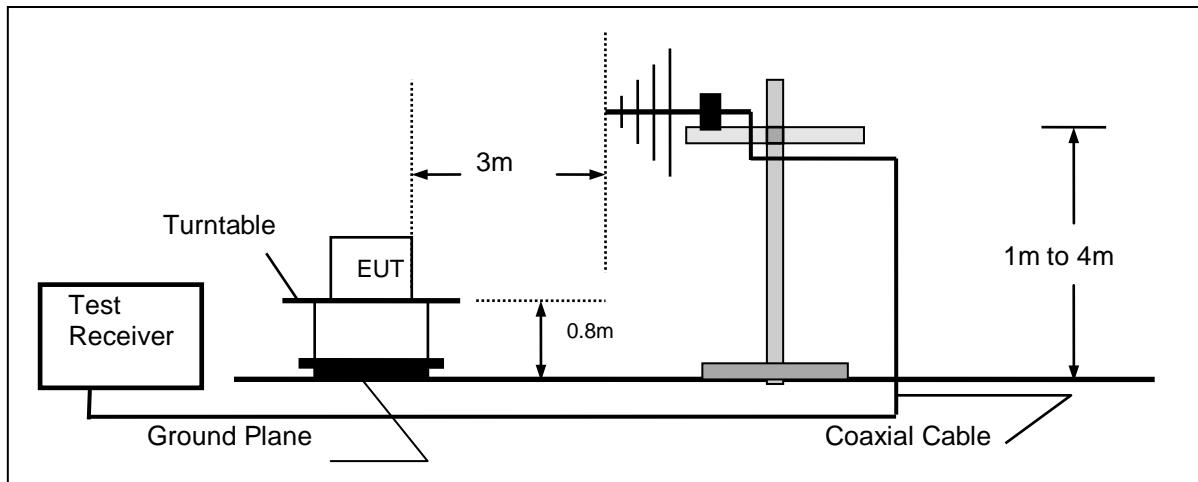
## 4.2. Radiated Emission

### TEST CONFIGURATION

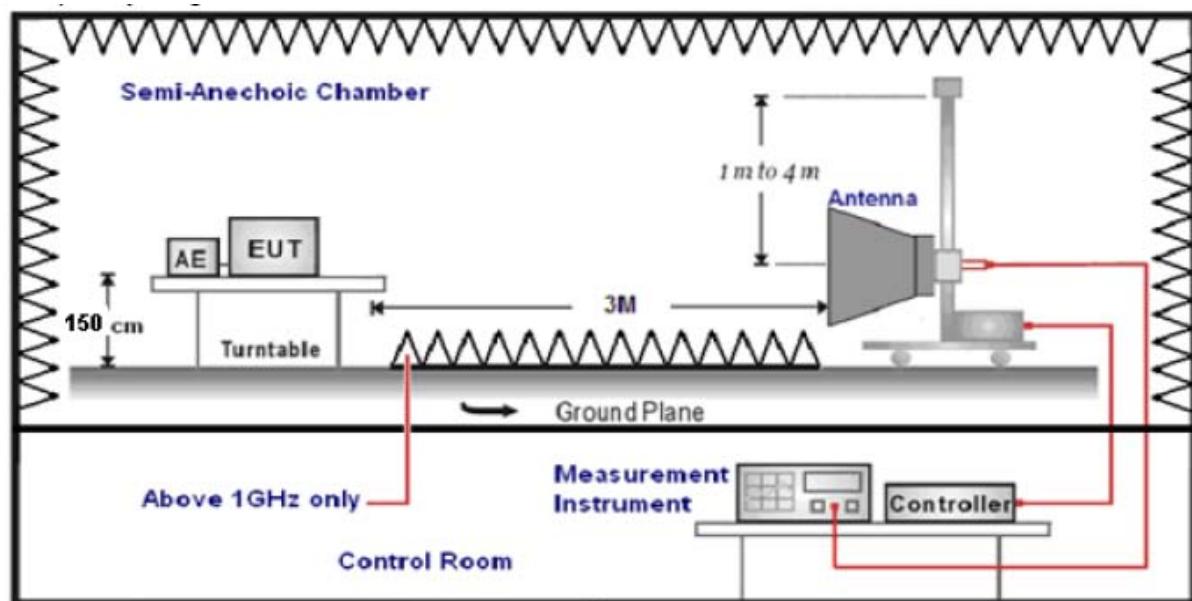
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



## TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz; the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
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 measurements have been completed.
5. The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz. so radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz, Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz, Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz, Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

## Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude		AG = Amplifier Gain
AF = Antenna Factor		

$$Transd = AF + CL - AG$$

## RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT 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 desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

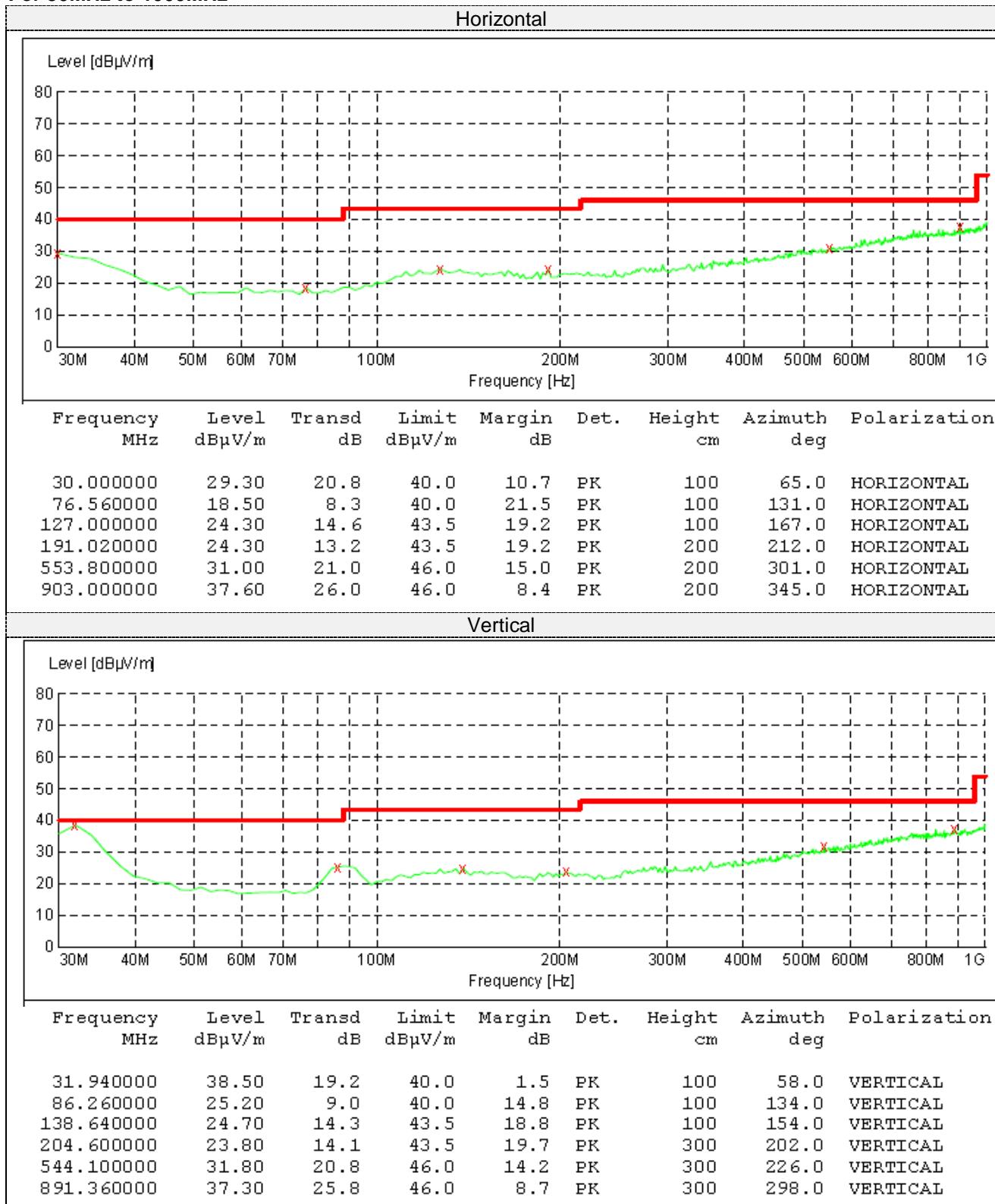
Frequency (MHz)	Distance (Meters)	Radiated (dB $\mu$ V/m)	Radiated ( $\mu$ V/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

**TEST RESULTS**

Remark: Test site: Shenzhen CTL Testing Technology Co., Ltd.

**For 9KHz to 30MHz**

Frequency (MHz)	Corrected Reading (dB <sub>BuV/m</sub> )@3m	FCC Limit (dB <sub>BuV/m</sub> ) @3m	Margin (dB)	Detector	Result
0.22	42.35	100.76	58.41	QP	PASS
1.38	48.02	64.81	16.79	QP	PASS
15.33	52.46	69.54	17.08	QP	PASS
20.59	47.07	69.54	22.47	QP	PASS

**For 30MHz to 1000MHz**

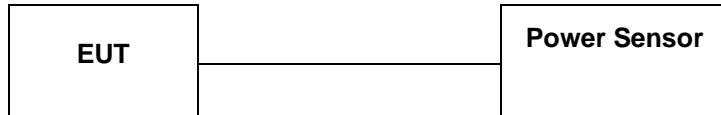
**For 1GHz to 25GHz**

## REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

### 4.3. Maximum Peak Output Power

#### TEST CONFIGURATION



#### TEST PROCEDURE

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power,9.1.2.

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

#### LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

#### TEST RESULTS

Type	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
GFSK	0	-6.52	-4.83	30	Pass
	19	-6.14	-4.79		
	39	-6.62	-4.36		

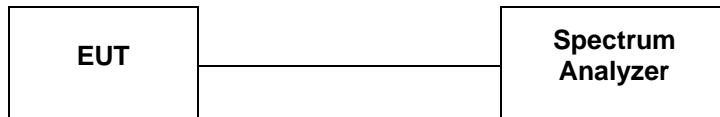
Note: 1.The test results including the cable lose.

Duty cycle used in all test items: 100%



#### 4.4. Power Spectral Density

##### TEST CONFIGURATION



##### TEST PROCEDURE

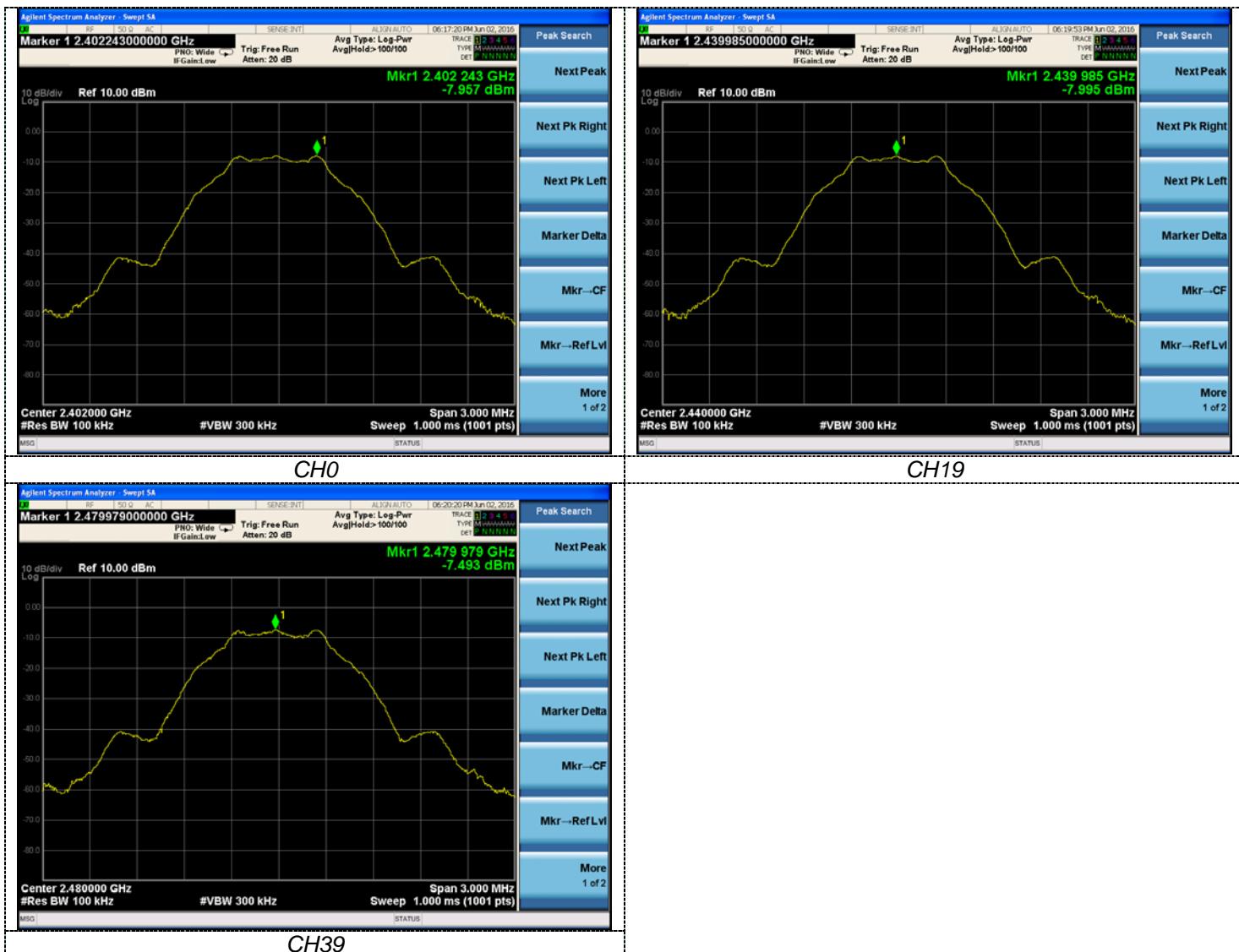
1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW =100 kHz.
3. Set the VBW =300 KHz.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8 dBm.

##### LIMIT

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

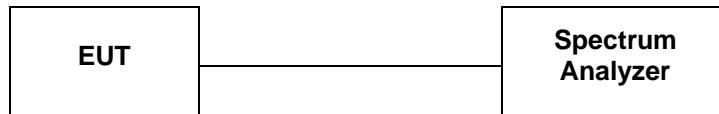
##### TEST RESULTS

Type	Channel	Power Spectral Density (dBm/100KHz)	Limit (dBm/3KHz)	Result
GFSK	0	-7.95	8.00	Pass
	19	-7.99		
	39	-7.49		



## 4.5. 6dB Bandwidth

### TEST CONFIGURATION



### TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB. According to KDB558074 D01 V03 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.

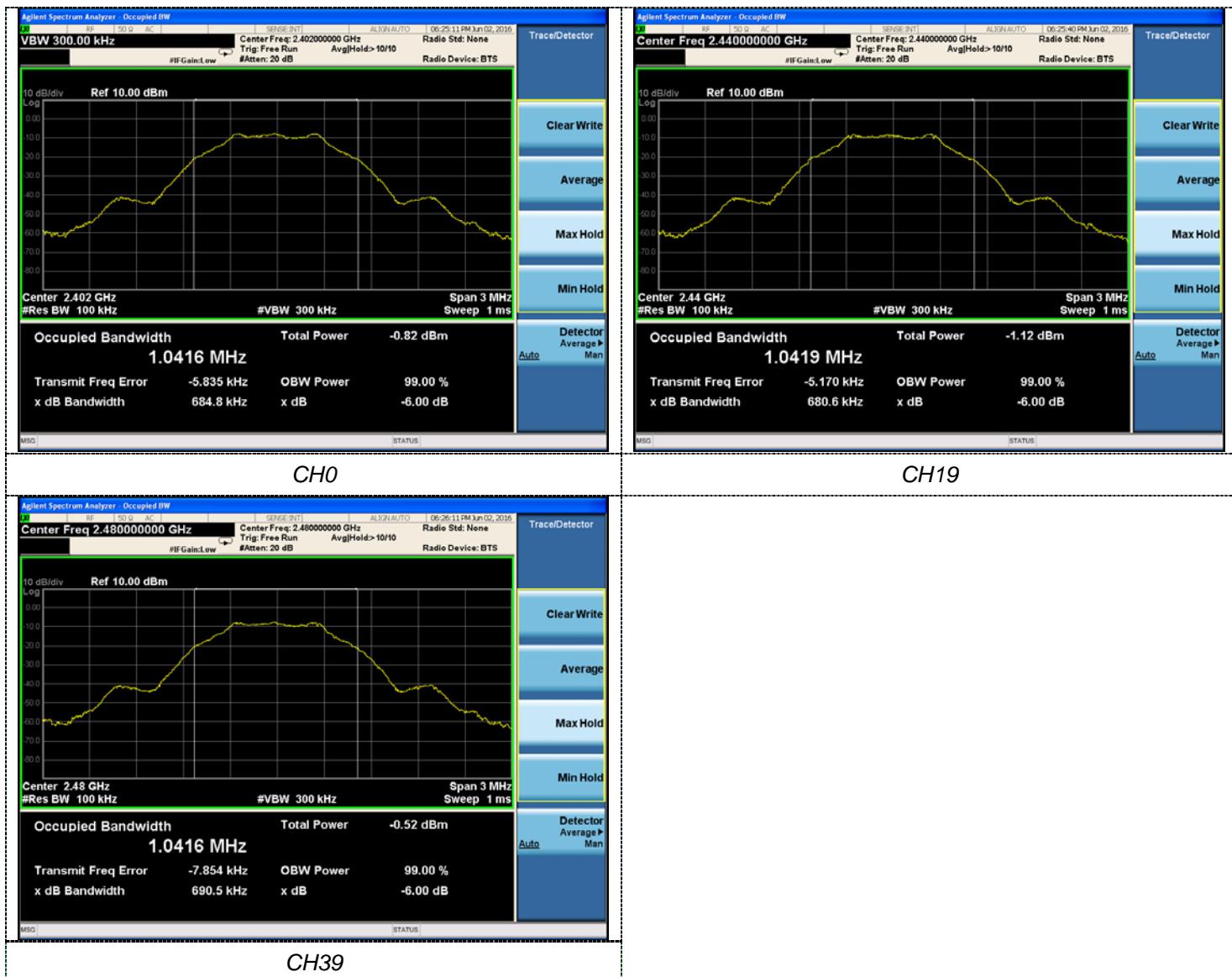
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### LIMIT

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

### TEST RESULTS

Type	Channel	6dB Bandwidth (KHz)	Limit (KHz)	Result
GFSK	0	684.8	$\geq 500$	Pass
	19	680.6		
	39	690.5		

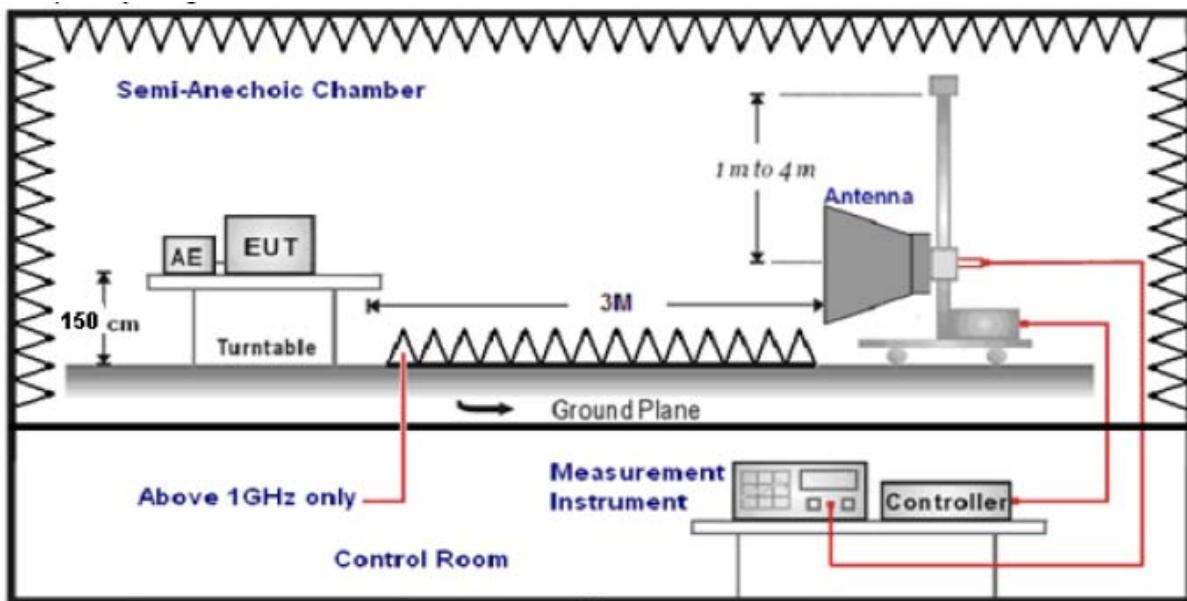


## 4.6. Band Edge Compliance of RF Emission

### TEST REQUIREMENT

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)).

### TEST CONFIGURATION



### TEST PROCEDURE

1. The EUT was placed on a turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT.
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 measurements have been completed..
5. The distance between test antenna and EUT was 3 meter:
6. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

### LIMIT

Below -20dB of the highest emission level in operating band.

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)

**TEST RESULTS****4.6.1 For Radiated Bandedge Measurement**

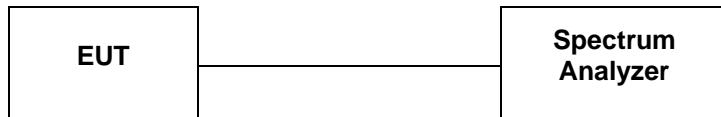
Frequency(MHz):		2402			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2390.00	50.26 PK	74.00	21.46	1.00	124	55.57	27.49	3.32	36.12	-5.31
2390.00	43.45 AV	54.00	12.77	1.00	124	48.76	27.49	3.32	36.12	-5.31
Frequency(MHz):		2402			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2390.00	52.34 PK	74.00	22.54	1.00	238	57.65	27.49	3.32	36.12	-5.31
2390.00	41.55 AV	54.00	13.56	1.00	238	46.86	27.49	3.32	36.12	-5.31
Frequency(MHz):		2480			Polarity:			HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2483.50	53.21 PK	74.00	22.36	1.00	207	58.93	27.45	3.38	36.55	-5.72
2483.50	39.08 AV	54.00	12.71	1.00	207	44.80	27.45	3.38	36.55	-5.72
Frequency(MHz):		2480			Polarity:			VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2483.50	52.46 PK	74.00	18.51	1.00	142	58.18	27.45	3.38	36.55	-5.72
2483.50	42.37 AV	54.00	12.42	1.00	142	48.09	27.45	3.38	36.55	-5.72

**4.6.2 For Conducted Bandedge Measurement**

Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2400.00	-57.19	-20	PASS
2483.50	-63.53	-20	PASS
2400.00	-57.19	-20	PASS
2483.50	-63.53	-20	PASS
2402	2480		

## 4.7. Spurious RF Conducted Emission

### TEST CONFIGURATION



### TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300KHz to measure the peak field strength , and measure frequency range from 9KHz to 25GHz.

### LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

### TEST RESULTS

Remark: The measurement frequency range is from 9KHz to the 10<sup>th</sup> harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandwidth measurement data.



Test Mode: GFSK Test channel : 00

Agilent Spectrum Analyzer - Swept SA

Marker 1 2.4000000000000000 GHz

RF: Fast IF Gain:Low Trig: Free Run Atten: 20 dB

Avg Type: Log-Pwr Avg/Hold: 4/100

ALIGN AUTO 06:49:52 PM Jun 02, 2016

TRACE 1: 2.400 GHz TYPE: M:MIN/MAX DET: P:MIN/MAX

10 dB/div Ref 10.00 dBm

Mkr1 2.400 GHz -7.775 dBm

0.00 -10.00 -20.00 -30.00 -40.00 -50.00 -60.00 -70.00 -80.00

Start 1.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 8.000 GHz Sweep 669.0 ms (1001 pts)

MSG STATUS

Peak Search

Next Peak

Next Pk Right

Next Pk Left

Marker Delta

Mkr→CF

Mkr→Ref Lvl

More 1 of 2

1GHz~8GHz

Agilent Spectrum Analyzer - Swept SA

Marker 1 15.632000000000000 GHz

RF: 150 Ω AC SENSE: INT Trig: Free Run Atten: 20 dB

Avg Type: Log-Pwr Avg/Hold: 6/100

ALIGN AUTO 06:50:03 PM Jun 02, 2016

TRACE 1: 15.632 GHz TYPE: M:MIN/MAX DET: P:MIN/MAX

10 dB/div Ref 10.00 dBm

Mkr1 15.632 GHz -64.357 dBm

0.00 -10.00 -20.00 -30.00 -40.00 -50.00 -60.00 -70.00 -80.00

Start 8.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 16.000 GHz Sweep 764.0 ms (1001 pts)

MSG STATUS

Peak Search

Next Peak

Next Pk Right

Next Pk Left

Marker Delta

Mkr→CF

Mkr→Ref Lvl

More 1 of 2

8GHz~16GHz

Agilent Spectrum Analyzer - Swept SA

Marker 1 24.514000000000000 GHz

RF: 150 Ω AC SENSE: INT Trig: Free Run Atten: 20 dB

Avg Type: Log-Pwr Avg/Hold: 7/100

ALIGN AUTO 06:50:13 PM Jun 02, 2016

TRACE 1: 24.514 GHz TYPE: M:MIN/MAX DET: P:MIN/MAX

10 dB/div Ref 10.00 dBm

Mkr1 24.514 GHz -57.589 dBm

0.00 -10.00 -20.00 -30.00 -40.00 -50.00 -60.00 -70.00 -80.00

Start 16.000 GHz #Res BW 100 kHz #VBW 300 kHz Stop 25.000 GHz Sweep 860.1 ms (1001 pts)

MSG STATUS

Peak Search

Next Peak

Next Pk Right

Next Pk Left

Marker Delta

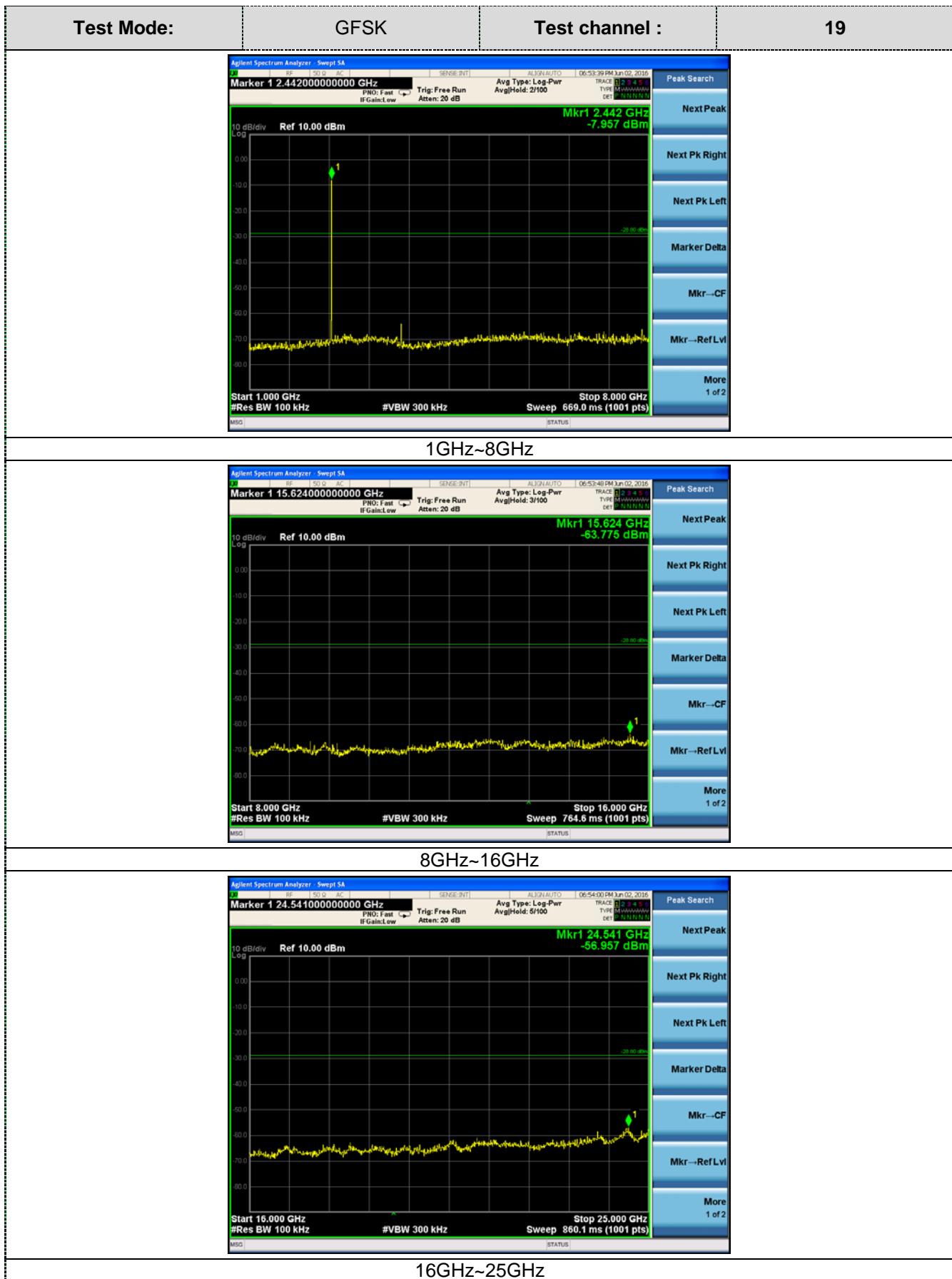
Mkr→CF

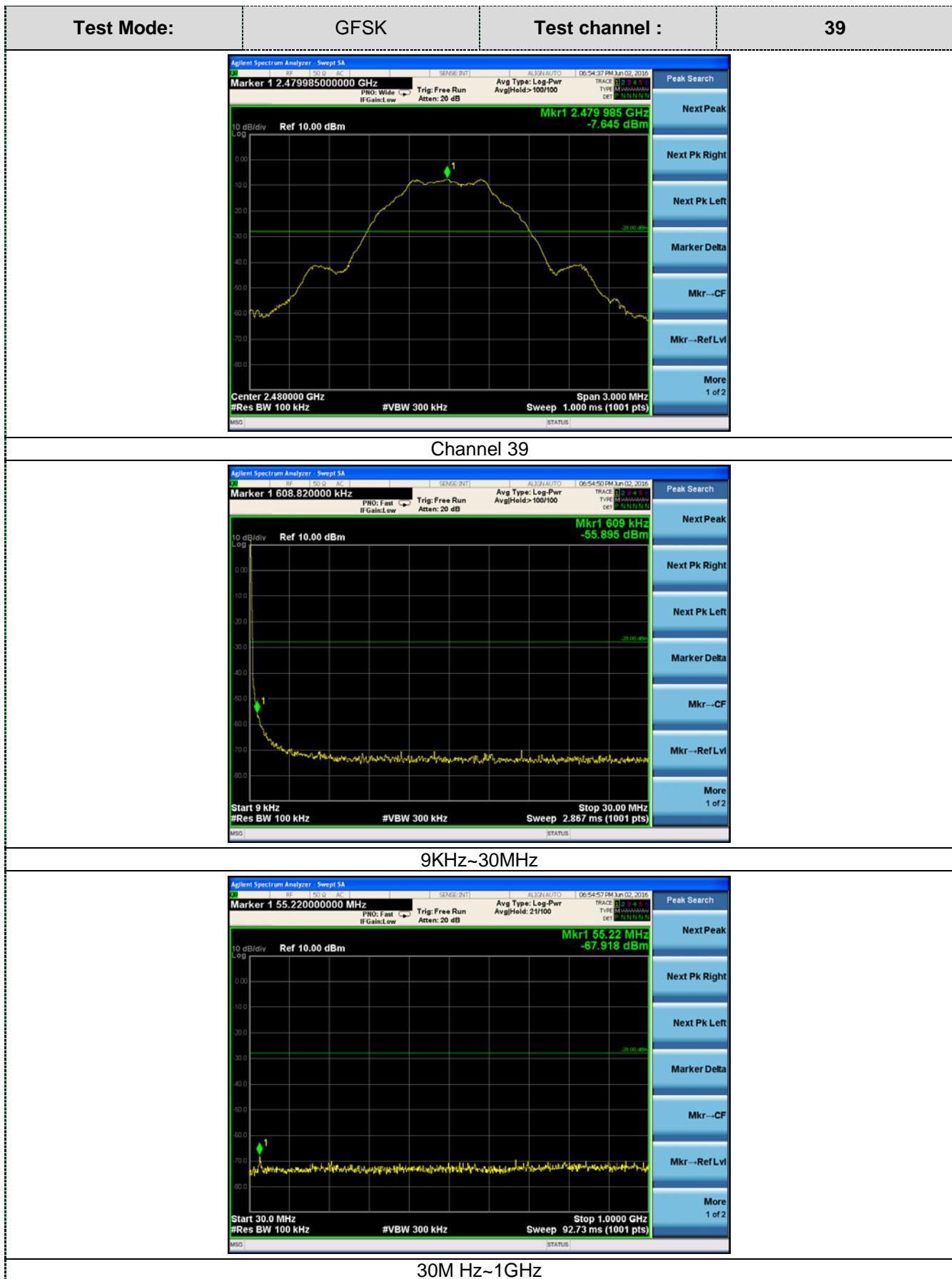
Mkr→Ref Lvl

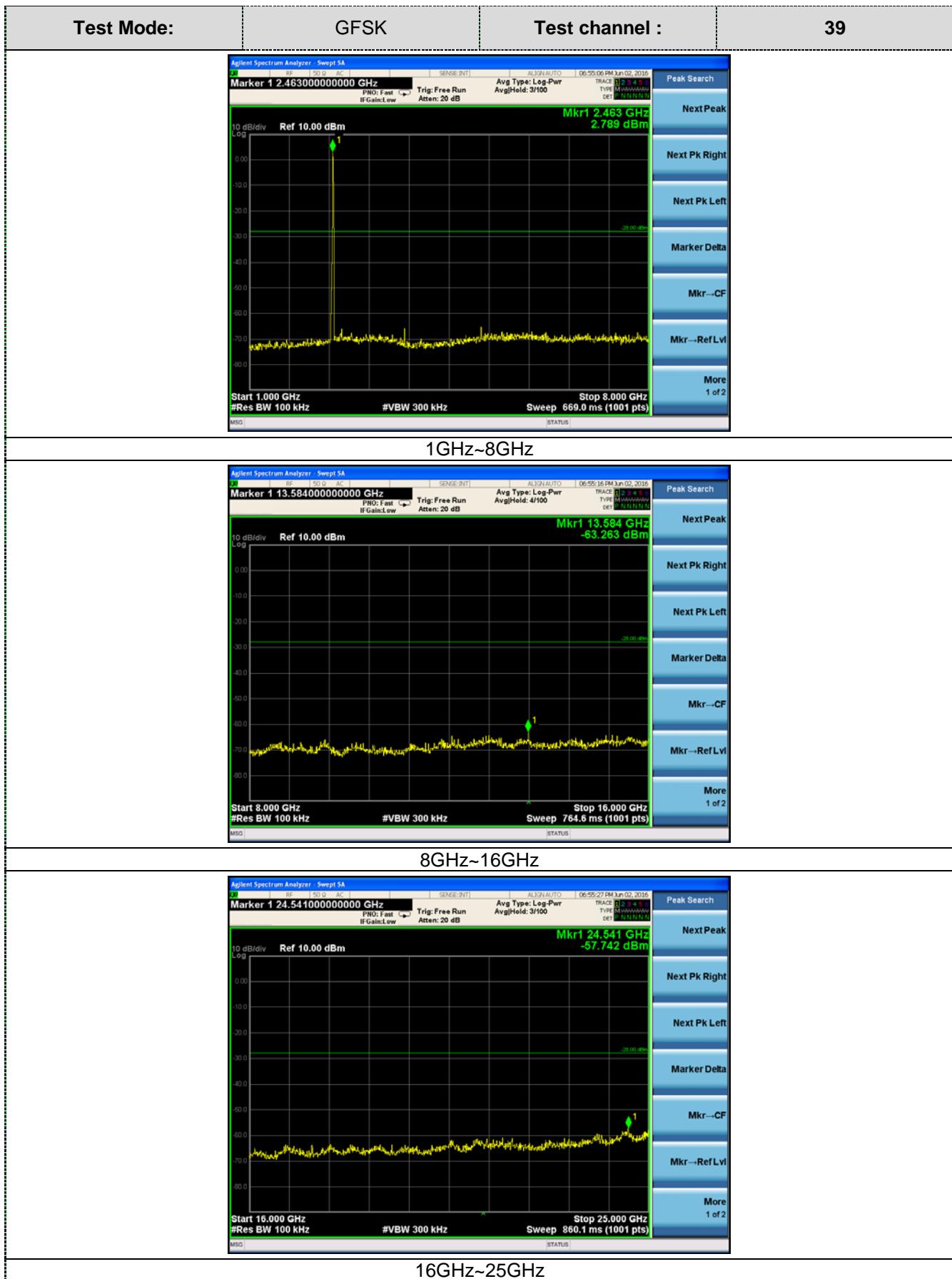
More 1 of 2

16GHz~25GHz









## 4.8. Antenna Requirement

### 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 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### Refer to statement below for compliance

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

### Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

### Measurement parameters

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Trace-Mode:	Max hold

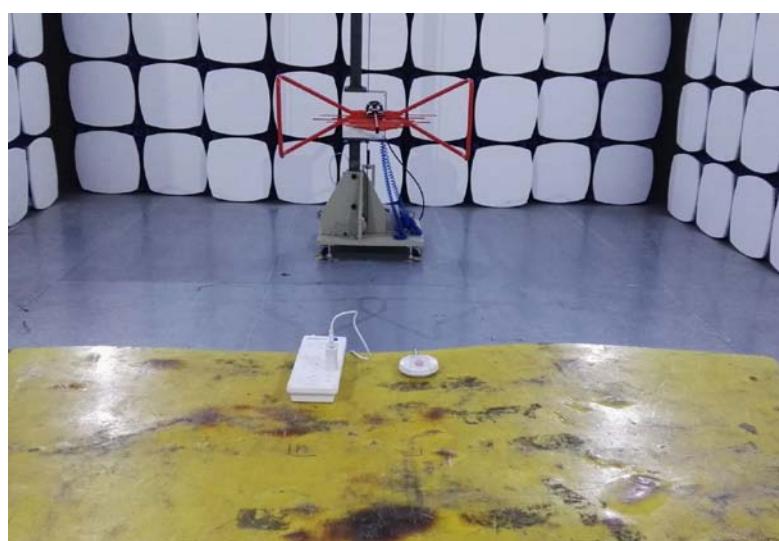
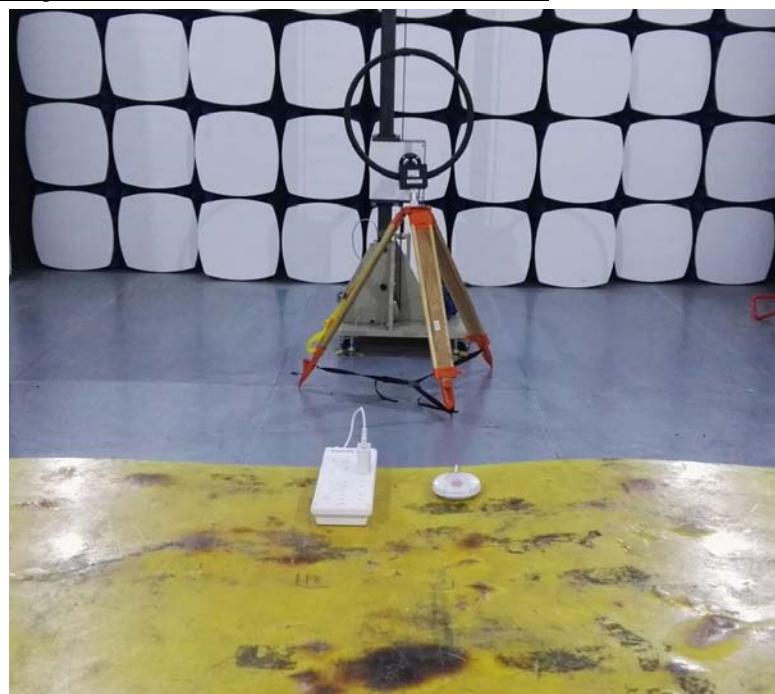
### Limits

Antenna Gain
6 dBi

### Results

T <sub>nom</sub>	V <sub>nom</sub>	Lowest Channel 2402 MHz	Middle Channel 2440 MHz	Highest Channel 2480 MHz
Conducted power [dBm]		-6.52	-6.14	-6.62
Radiated power [dBm]		-5.87	-5.46	-5.87
Gain [dBi] Calculated		0.65	0.68	0.75
Measurement uncertainty		± 0.6 dB (cond.) / ± 4.32 dB (rad.)		

## 5. Test Setup Photos of the EUT

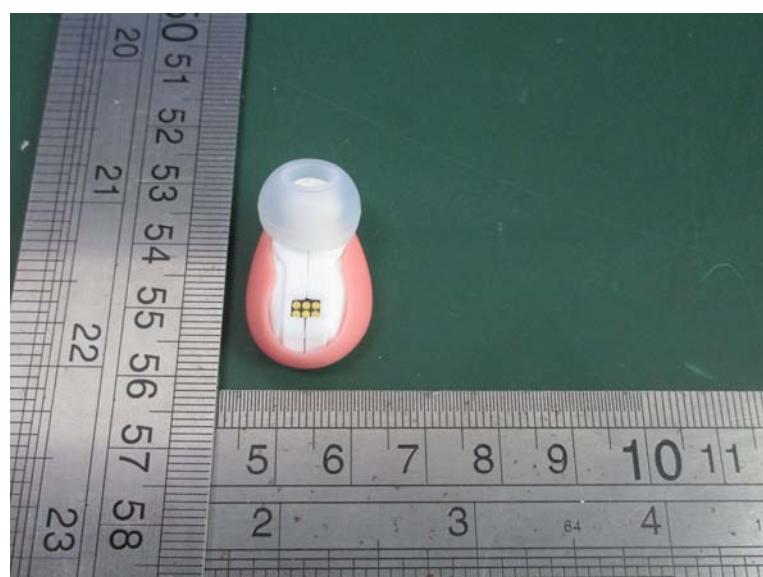
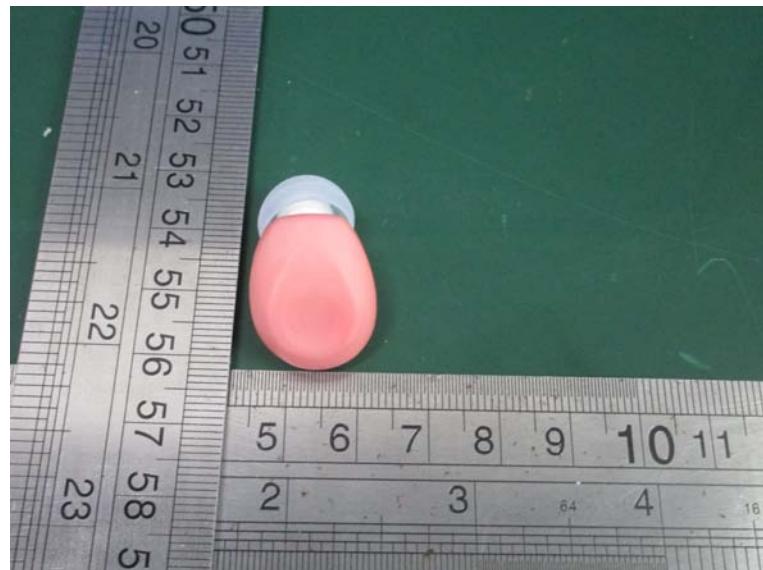




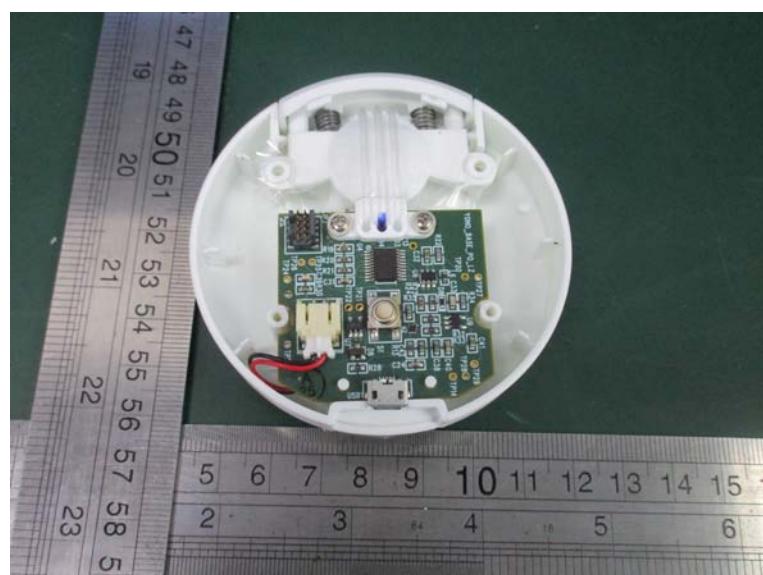
## **6. External and Internal Photos of the EUT**

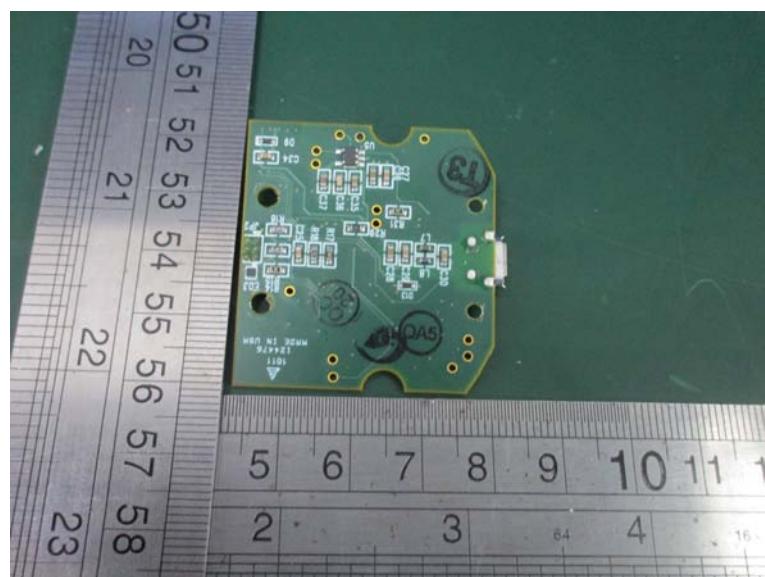
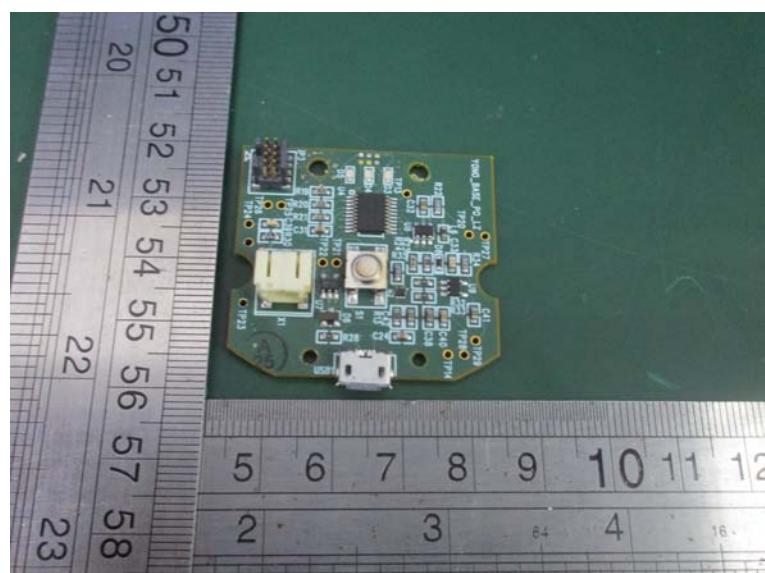
### **External Photos**

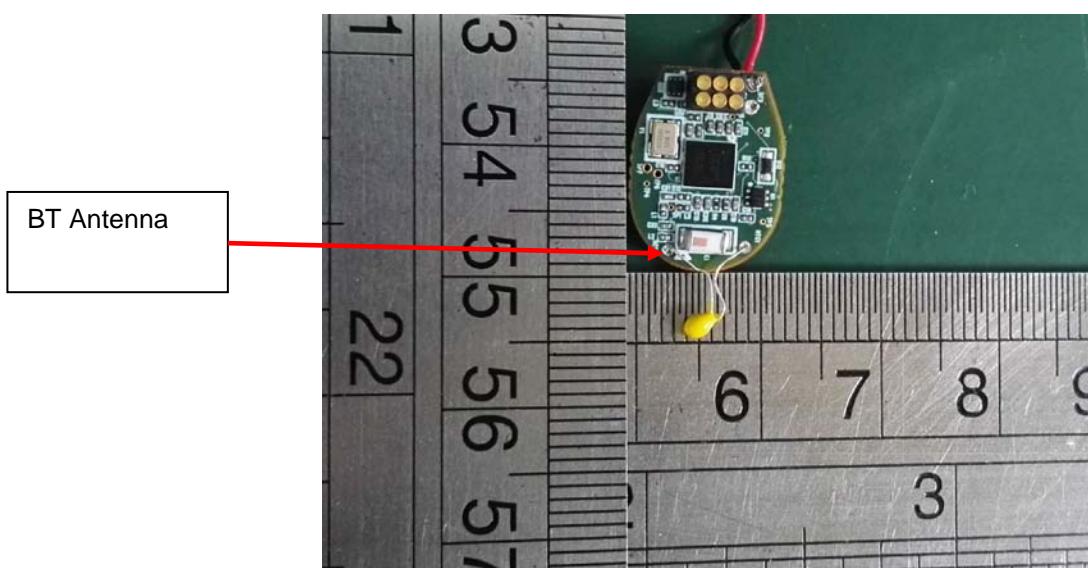
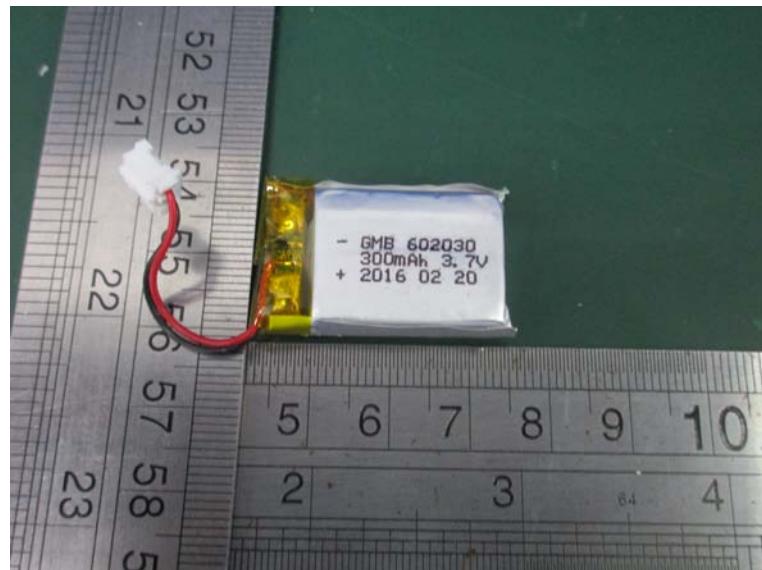


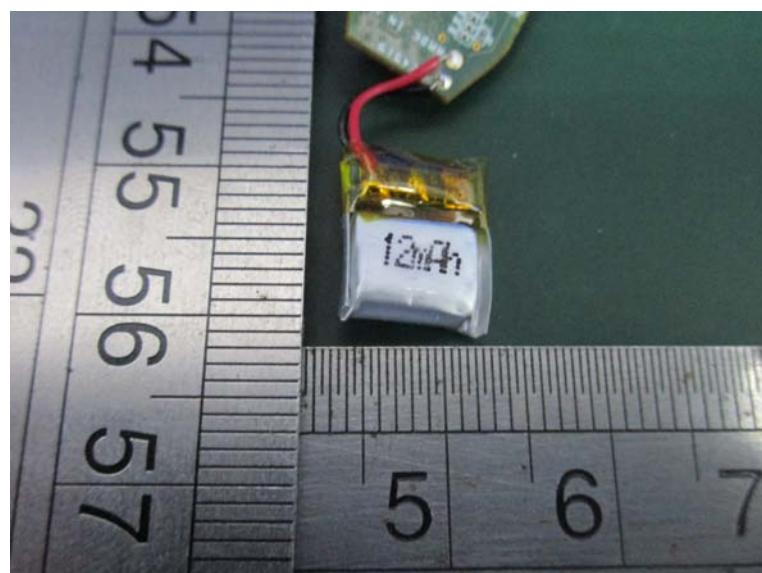
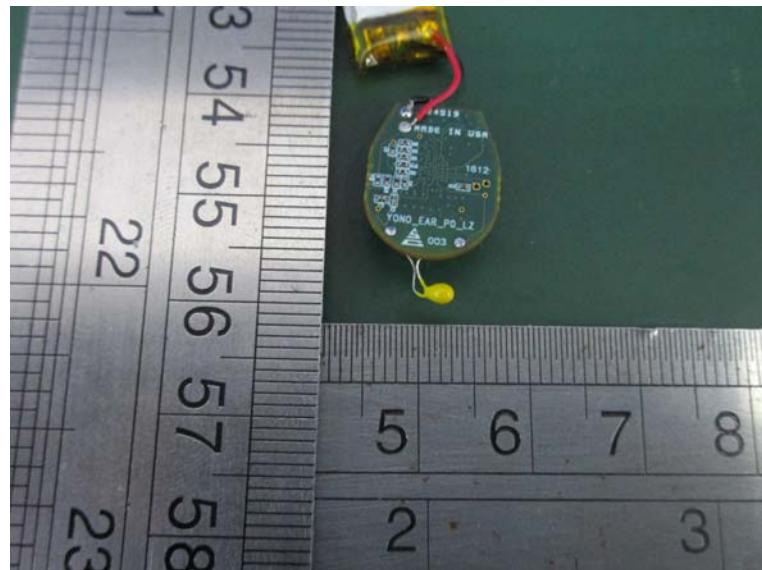


#### Internal Photos









.....End of Report.....