

TEST REPORT

FCC ID: 2ACN6PBT3014

Product: BLUETOOTH SPEAKER

Model No.: PBT3014

**Additional Model: PBT 3015, PBT1010, SBT1010, SBT1012, SBT1011, PBT1011,
PBT1012, BT-101, BT-104, BT-105, BT-110, BT-109, AR1002**

Trade Mark: POLAROID, SHARPER IMAGE, ART+SOUND

Report No.: TCT151104E904

Issued Date: Nov. 10, 2015

Issued for:

**SHENZHENG YONGCHENGCHUANGXIN TECHNOLOGY CO., LTD.
7/F.Keji Block, Yongqixifa C district, yintian baoan, Shenzhen, China**

Issued By:

**Shenzhen Tongce Testing Lab.
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1. Test Certification

Product:	BLUETOOTH SPEAKER
Model No.:	PBT3014
Additional Model:	PBT 3015, PBT1010, SBT1010, SBT1012, SBT1011, PBT1011, PBT1012, BT-101, BT-104, BT-105, BT-110, BT-109, AR1002
Applicant:	SHENZHENG YONGCHENGCHUANGXIN TECHNOLOGY CO., LTD.
Address:	7/F.Keji Block, Yongqixifa C district, yintian baoan, Shenzhen, China
Manufacturer:	SHENZHENG YONGCHENGCHUANGXIN TECHNOLOGY CO., LTD.
Address:	7/F.Keji Block, Yongqixifa C district, yintian baoan, Shenzhen, China
Date of Test:	Nov. 05 –Nov. 09, 2015
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:



Beryl Zhao

Date:

Nov. 09, 2015

Reviewed By:



Joe Zhou

Date:

Nov. 10, 2015

Approved By:



Tomsin

Date:

Nov. 10, 2015

2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	See Note 5
Conducted Peak Output Power	§15.247 (b)(1)	PASS
20dB Occupied Bandwidth	§15.247 (a)(1)	See Note 5
Carrier Frequencies Separation	§15.247 (a)(1)	See Note 5
Hopping Channel Number	§15.247 (a)(1)	See Note 5
Dwell Time	§15.247 (a)(1)	See Note 5
Radiated Emission	§15.205/§15.209	PASS
Band Edge	§15.247(d)	See Note 5

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.
5. The result of the term is referred to the report which the number is TCT150506E008

3. EUT Description

Product Name:	BLUETOOTH SPEAKER
Model :	PBT3014
Additional Model:	PBT 3015, PBT1010, SBT1010, SBT1012, SBT1011, PBT1011, PBT1012, BT-101, BT-104, BT-105, BT-110, BT-109, AR1002
Trade Mark:	POLAROID, SHARPER IMAGE, ART+SOUND
Operation Frequency:	2402MHz~2480MHz
Transfer Rate:	1/2 Mbits/s
Number of Channel:	79
Modulation Type:	GFSK, $\pi/4$ -DQPSK
Modulation Technology:	FHSS
Antenna Type:	Internal Antenna
Antenna Gain:	0.5dBi
Power Supply:	DC 5V via Adapter Adapter Information: Model: JK050150-S02USD Input: AC 100V-240V, 50/60Hz, 0.3A Output: DC 5V, 1.5A
Remark:	All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement.

Operation Frequency each of channel for GFSK, $\pi/4$ -DQPSK

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
...
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
...
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz	-	-

Remark: Channel 0, 39 & 78 have been tested for GFSK, $\pi/4$ -DQPSK modulation mode.

4. Genera Information

4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations
<p>The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.</p>	

4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 20dB Occupied Bandwidth, Carrier Frequencies Separation, Hopping Channel Number, Dwell Time, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 572331

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

- CNAS - Registration No.: CNAS L6165

Shenzhen TCT Testing Technology Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6165.

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China

Tel: 86-755-36638142

5.3. Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^{\circ}\text{C}$
7	Humidity	$\pm 1.0\%$

6. Test Results and Measurement Data

6.1. Antenna requirement

Standard requirement:

FCC Part15 C Section 15.203 /247(c)

15.203 requirement:

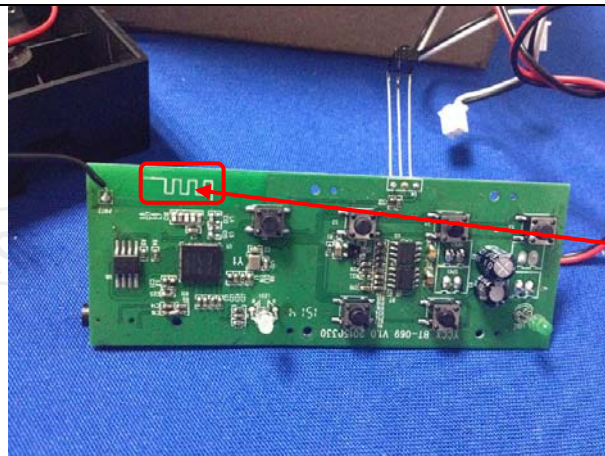
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

E.U.T Antenna:


The Bluetooth antenna is an internal antenna which permanently attached, and the best case gain of the antenna is 0.5dBi.



Antenna

6.2. Conducted Output Power

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013 and DA00-705
Limit:	Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (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 2400-2483.5 MHz band 0.125 watts.
Test Setup:	 <p style="text-align: center;">Spectrum Analyzer EUT</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<p>Use the following spectrum analyzer settings:</p> <p>Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel</p> <p>RBW > the 20 dB bandwidth of the emission being measured</p> <p>VBW ≥ RBW</p> <p>Sweep = auto</p> <p>Detector function = peak</p> <p>Trace = max hold</p> <p>Allow the trace to stabilize.</p> <p>Use the marker-to-peak function to set the marker to the peak of the emission.</p>
Test Result:	PASS

6.2.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSU	200054	Sep. 11, 2016
RF Cable	TCT	RE-06	N/A	Sep. 12, 2016
Antenna Connector	TCT	RFC-01	N/A	Sep. 12, 2016

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.2.3. Test Data

GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	0.964	21.00	PASS
Middle	-1.201	21.00	PASS
Highest	-2.183	21.00	PASS

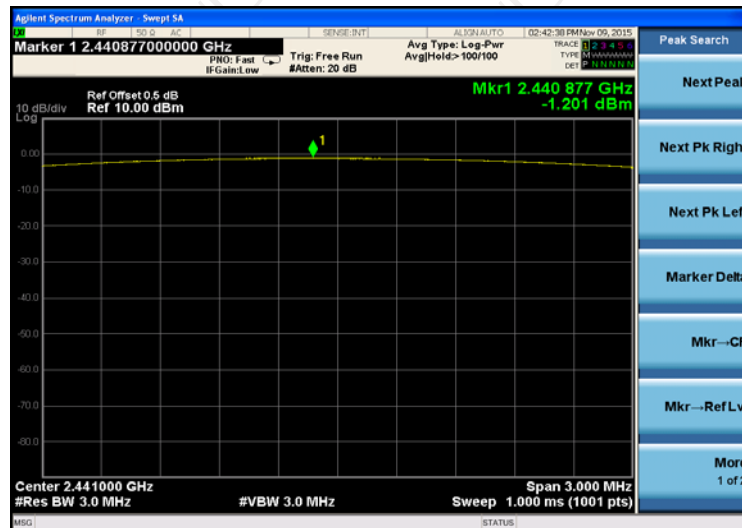
Pi/4DQPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-2.936	21.00	PASS
Middle	-3.415	21.00	PASS
Highest	-4.244	21.00	PASS

Test plots as follows:

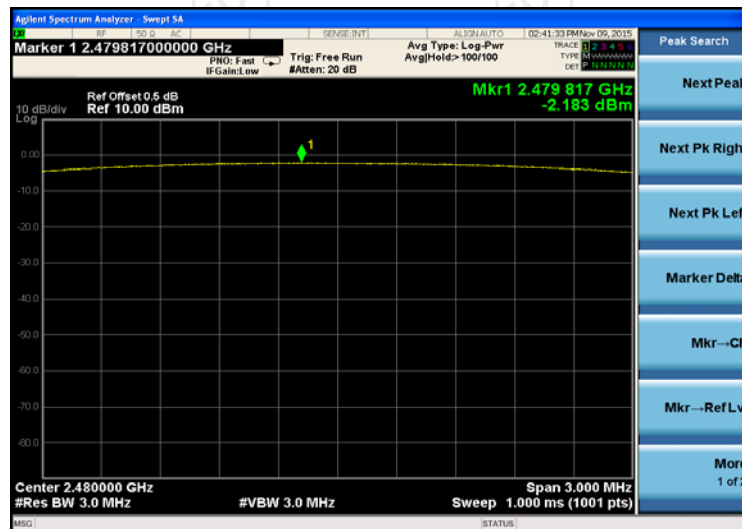
Lowest channel



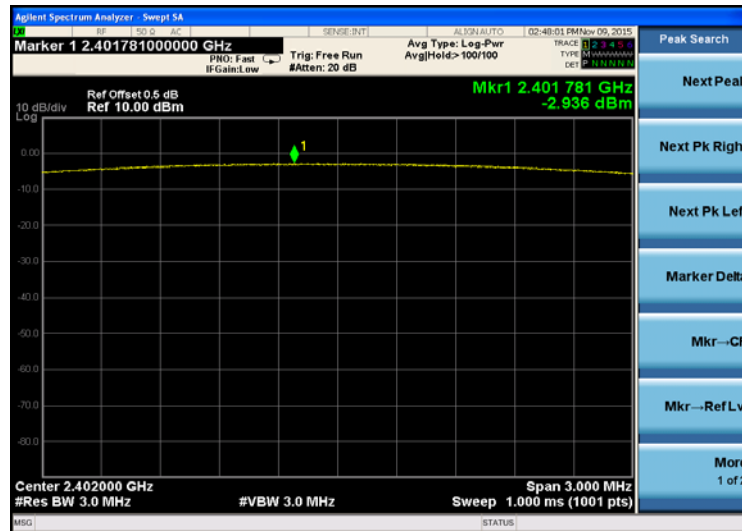
Middle channel



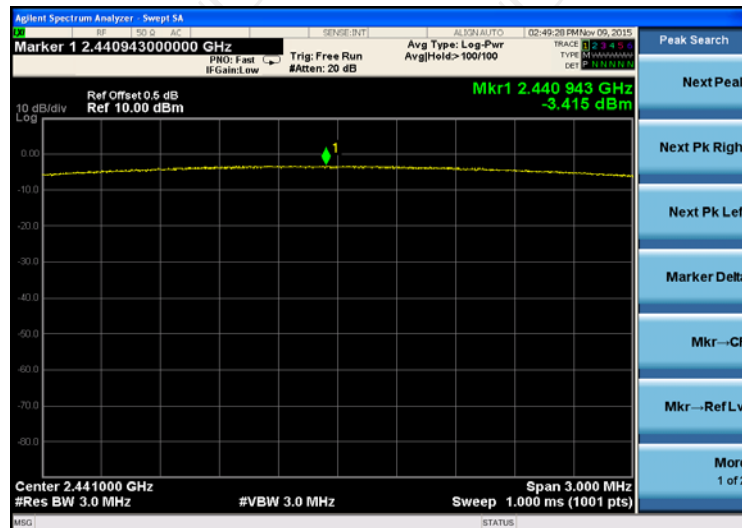
Highest channel



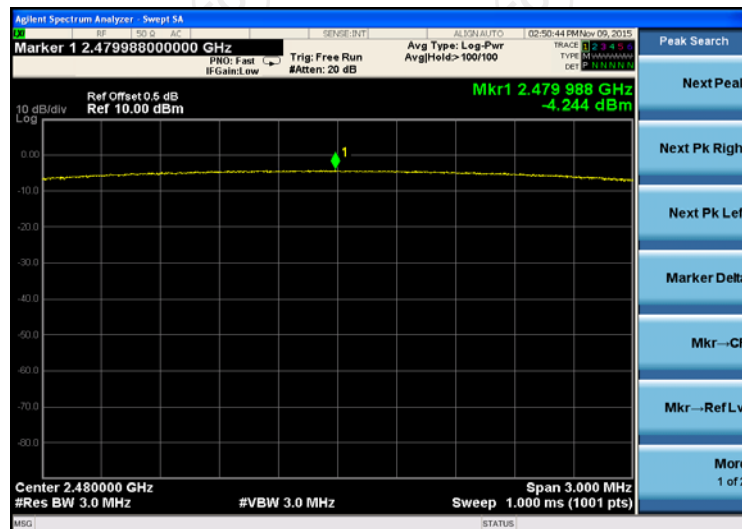
Lowest channel



Middle channel

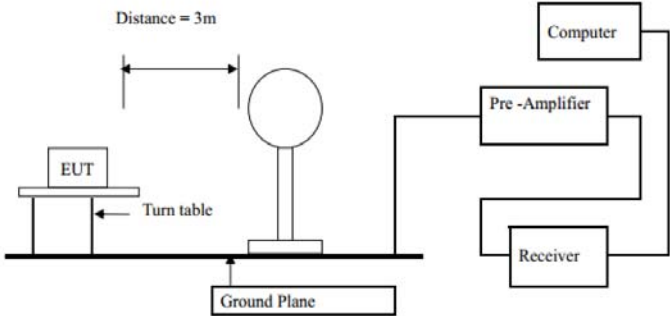


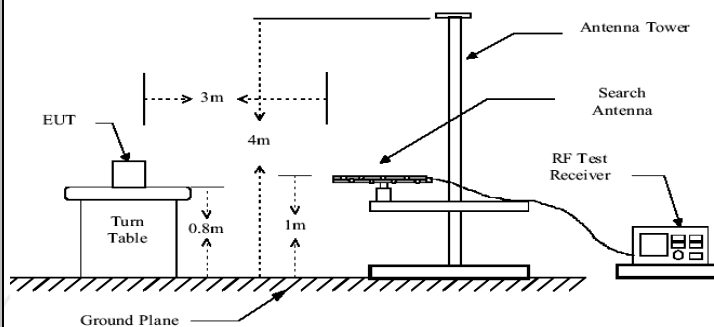
Highest channel



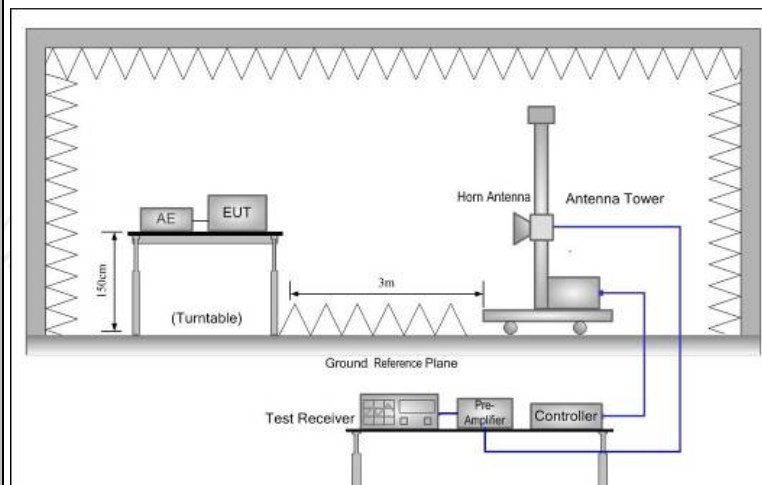
6.3. Radiated Spurious Emission Measurement

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.209			
Test Method:	ANSI C63.4: 2014 and ANSI C63.10: 2013			
Frequency Range:	9 kHz to 25 GHz			
Measurement Distance:	3 m			
Antenna Polarization:	Horizontal & Vertical			
Receiver Setup:	Frequency	Detector	RBW	VBW
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz
	30MHz-1GHz	Quasi-peak	100KHz	300KHz
	Above 1GHz	Peak	1MHz	3MHz
Limit:	Remark			
	Quasi-peak Value			
	Quasi-peak Value			
	Quasi-peak Value			
	Peak Value			
Test setup:	Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	
	0.009-0.490	2400/F(KHz)	300	
	0.490-1.705	24000/F(KHz)	30	
	1.705-30	30	30	
	30-88	100	3	
Test setup:	88-216	150	3	
	216-960	200	3	
	Above 960	500	3	
	Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector
	Above 1GHz	500	3	Average
		5000	3	Peak
Test setup:	For radiated emissions below 30MHz			
				
	30MHz to 1GHz			



Above 1GHz



Test Mode:

Transmitting mode with modulation

Test Procedure:

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. For the radiated emission test below 1GHz:
The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high PASS filter are used for the test in order to get better signal level.
For the radiated emission test above 1GHz:
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT,

	<p>depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.</p> <p>3. Set to the maximum power setting and enable the EUT transmit continuously.</p> <p>4. Use the following spectrum analyzer settings:</p> <p>(1) Span shall wide enough to fully capture the emission being measured;</p> <p>(2) Set RBW=100 kHz for $f < 1$ GHz, RBW=1MHz for $f > 1$GHz ; VBW\geqRBW; Sweep = auto; Detector function = peak; Trace = max hold for peak</p> <p>(3) For average measurement: use duty cycle correction factor method per 15.35(c). Duty cycle = On time/100 milliseconds On time = $N_1 \cdot L_1 + N_2 \cdot L_2 + \dots + N_{n-1} \cdot L_{n-1} + N_n \cdot L_n$ Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + $20 \cdot \log(\text{Duty cycle})$</p> <p>Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level</p>
Test results:	PASS

6.3.2. Test Instruments

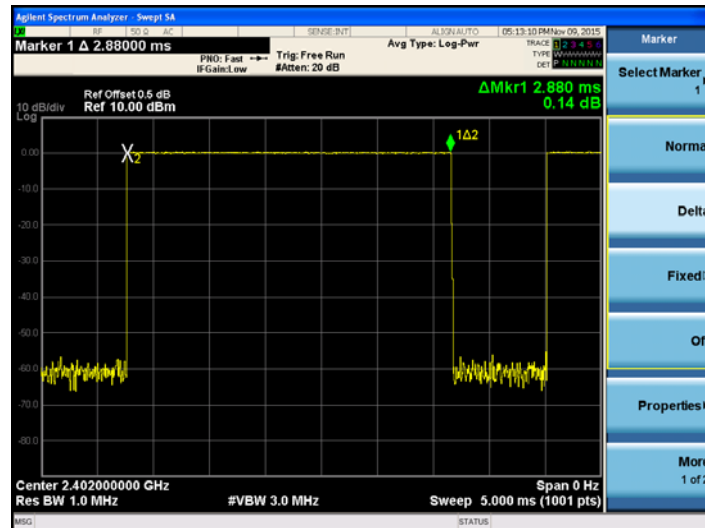
Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESPI Test Receiver	ROHDE&SCHW ARZ	ESVD	100008	Sep. 11, 2016
Spectrum Analyzer	ROHDE&SCHW ARZ	FSEM	848597/001	Sep. 11, 2016
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 12, 2016
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 11, 2016
Pre-amplifier	HP	8447D	2727A05017	Sep. 11, 2016
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 13, 2016
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 13, 2016
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 13, 2016
Horn Antenna	Schwarzbeck	BBHA 9170	373	Sep. 13, 2016
Antenna Mast	CCS	CC-A-4M	N/A	N/A
Coax cable	TCT	RE-low-01	N/A	Sep. 11, 2016
Coax cable	TCT	RE-high-02	N/A	Sep. 11, 2016
Coax cable	TCT	RE-low-03	N/A	Sep. 11, 2016
Coax cable	TCT	RE-high-04	N/A	Sep. 11, 2016
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

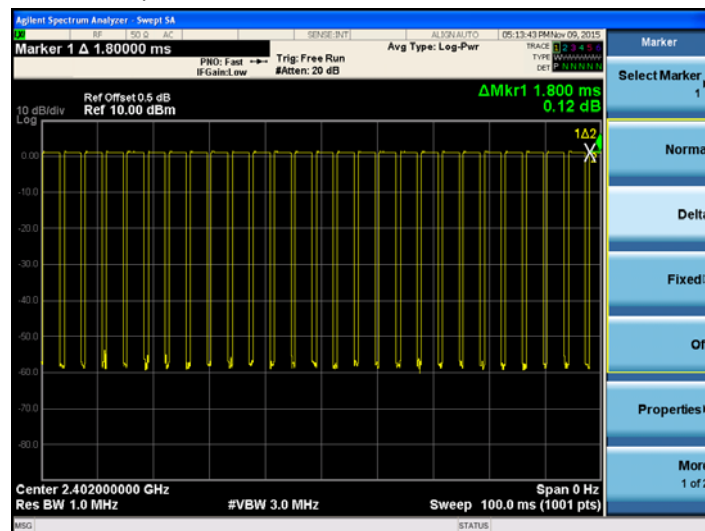
6.3.3. Test Data

Duty cycle correction factor for average measurement

DH5 on time (One Pulse) Plot on Channel 00



DH5 on time (Count Pulses) Plot on Channel 00



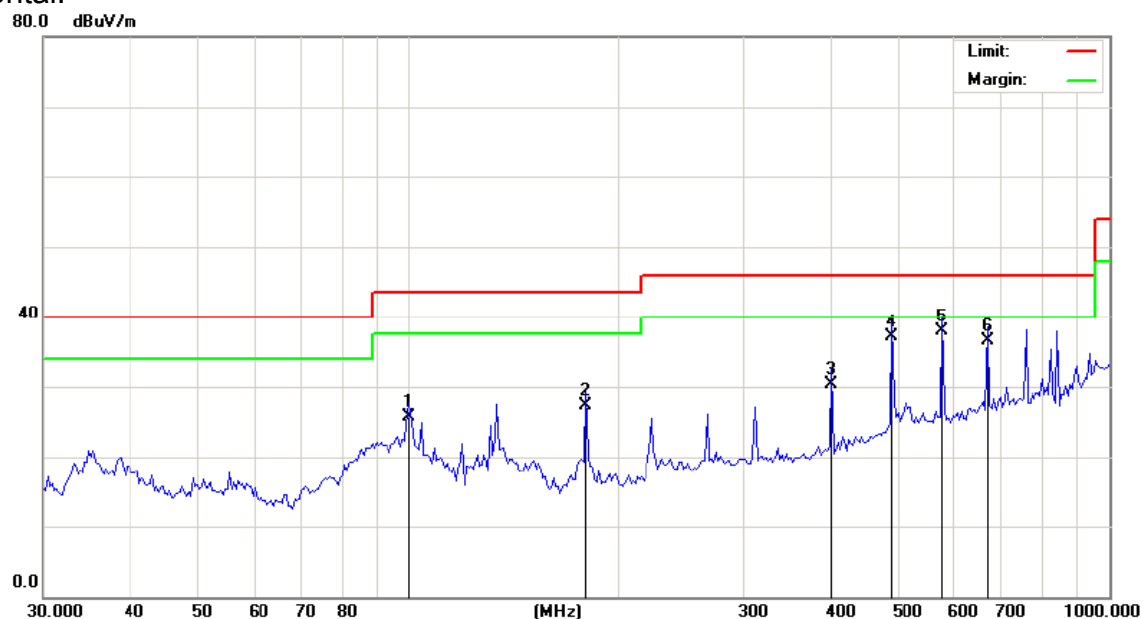
Note:

1. Worst case Duty cycle = on time/100 milliseconds = $(2.88 \times 26 + 1.8) / 100 = 0.7668$
2. Worst case Duty cycle correction factor = $20 \times \log(\text{Duty cycle}) = -2.31 \text{ dB}$
3. DH5 has the highest duty cycle worst case and is reported.
4. The average levels were calculated from the peak level corrected with duty cycle correction factor (-2.31dB) derived from $20 \log(\text{dwell time}/100 \text{ ms})$. This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

Please refer to following diagram for individual

Below 1GHz

Horizontal:



Site

Polarization: **Horizontal**

Temperature: 25

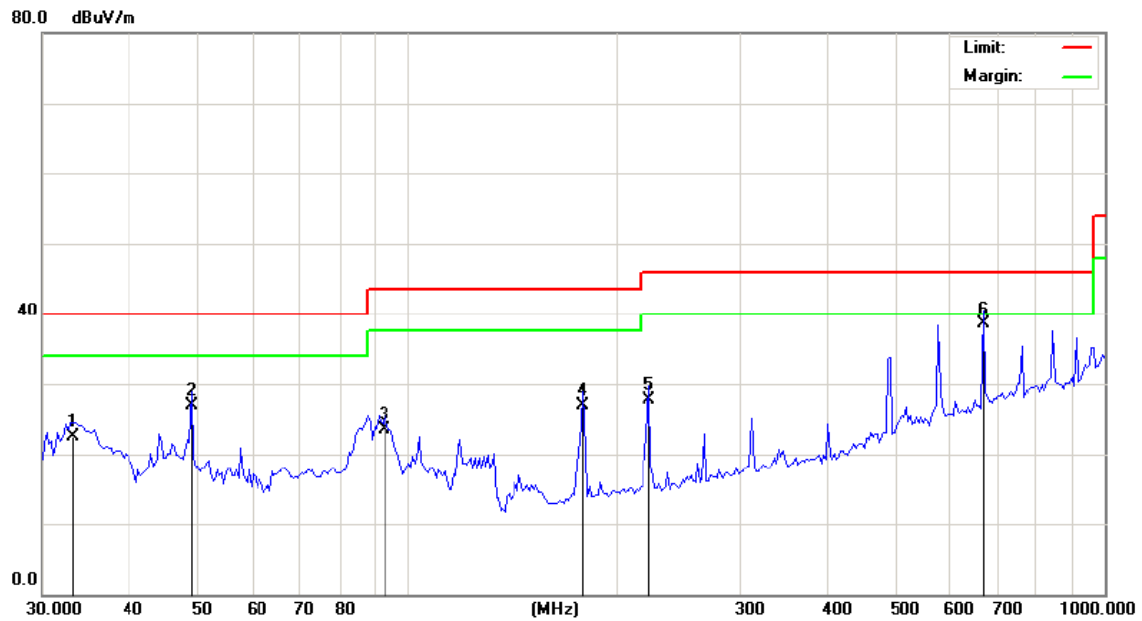
Limit: FCC Part 15B Class B RE_3 m

Power: AC 120V/60Hz

Humidity: 56 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		99.7676	37.10	-11.47	25.63	43.50	-17.87	QP	0	
2		178.7697	40.44	-13.15	27.29	43.50	-16.21	QP	0	
3		401.1050	36.56	-6.16	30.40	46.00	-15.60	QP	0	
4		488.3263	40.44	-3.34	37.10	46.00	-8.90	QP	0	
5	*	578.0357	40.03	-2.16	37.87	46.00	-8.13	QP	0	
6		669.9523	36.94	-0.49	36.45	46.00	-9.55	QP	0	

Vertical:



Site

Polarization: **Vertical**

Temperature: 25

Limit: FCC Part 15B Class B RE_3 m

Power: AC 120V/60Hz

Humidity: 56 %

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		33.1015	35.89	-13.33	22.56	40.00	-17.44	QP	0	
2		49.0626	38.94	-12.08	26.86	40.00	-13.14	QP	0	
3		92.9972	36.09	-12.52	23.57	43.50	-19.93	QP	0	
4		178.7697	39.98	-13.15	26.83	43.50	-16.67	QP	0	
5		222.2804	38.58	-10.91	27.67	46.00	-18.33	QP	0	
6	*	669.9523	38.97	-0.49	38.48	46.00	-7.52	QP	0	

Note: 1. The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported

2. Measurements were conducted in all three channels (high, middle, low) and three modulation (GFSK, Pi/4 DQPSK), and the worst case Mode (Highest channel and GFSK) was submitted only.

Above 1GHz

Modulation Type: GFSK

Low channel: 2402 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
2390	H	47.00	---	-8.23	38.77	---	74	54	-15.23
4804	H	39.43	---	6.59	46.02	---	74	54	-7.98
7206	H	36.92	---	12.87	49.79	---	74	54	-4.21
---	H	---	---	---	---	---	---	---	---
2390	V	40.60	---	-8.23	32.37	---	74	54	-21.63
4804	V	38.47	---	6.59	45.06	---	74	54	-8.94
7206	V	36.77	---	12.87	49.64	---	74	54	-4.36
---	V	---	---	---	---	---	---	---	---

Middle channel: 2441 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4882	H	40.34	---	7.01	47.35	---	74	54	-6.65
7323	H	36.35	---	13.21	49.56	---	74	54	-4.44
---	H	---	---	---	---	---	---	---	---
4882	V	40.26	---	7.01	47.27	---	74	54	-6.73
7323	V	36.24	---	13.21	49.45	---	74	54	-4.55
---	V	---	---	---	---	---	---	---	---

High channel: 2480 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
2483.5	H	41.83	---	-7.52	34.31	---	74	54	-19.69
4960	H	39.49	---	7.44	46.93	---	74	54	-7.07
7440	H	35.93	---	13.54	49.47	---	74	54	-4.53
---	H	---	---	---	---	---	---	---	---
2483.5	V	41.40	---	-7.52	33.88	---	74	54	-20.12
4960	V	40.20	---	7.44	47.64	---	74	54	-6.36
7440	V	35.68	---	13.54	49.22	---	74	54	-4.78
---	V	---	---	---	---	---	---	---	---

Note:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. 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.
6. Measurements were conducted in all three modulation (GFSK, Pi/4 DQPSK), and the worst case Mode (GFSK) was submitted only.

*****END OF REPORT*****