Test Report Number:	**LCZE14070043**	***Total Page(s):*** *36*
Applicant Name:	Yuhua Lighting Co.,Ltd.	
Applicant Address:	Nanxing Street,Huangpu Town,Zhongshan,Guangdong, 528429,China	
Test item:	9 ft. Solar Lighted Speaker Umbrella with Olefin	
Model / Type Reference:	90086,50400143,50400143-WEB	
FCC ID:	2AC6LYH50400143	
Date of Issue:	2014-09-10	
Testing Laboratory:	LCTECH (Zhongshan) Testing Service Co.,Ltd 2/F.,Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China	
Test Specification:	FCC Rules and Regulations Part 15 Subpart C: 2012	
Test Result:	Passed	

Compiled by:				**Reviewed by:**			
2014-09-10	Map He	Map He		2014-09-10	Gordon Xie	Gordon Xie	
Date	*Name*	*Signature*	*Engineer*	*Date*	*Name*	*Signature*	*EMC Manager*

Remark:

N/A

Contents

1 Summary of test results

EMISSION (EMI)		
Description of Test Item	**Standard**	**Result**
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1) ANSI C63.10 :2009 ANSI C63.4:2009	PASS
20dB Bandwidth	FCC Part 15: 15.215 ANSI C63.10 :2009 ANSI C63.4:2009	PASS
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) ANSI C63.10 :2009 ANSI C63.4:2009	PASS
Number Of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2009 ANSI C63.4:2009	PASS
Dwell Time	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10 :2009 ANSI C63.4:2009	PASS
Radiated Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10 :2009 ANSI C63.4:2009	PASS*
Band Edge Compliance	FCC Part 15: 15.247(d) ANSI C63.10 :2009 ANSI C63.4:2009	PASS
Power Line Conducted Emissions	FCC Part 15: 15.207 ANSI C63.10 :2009 ANSI C63.4:2009	N/A
Antenna requirement	FCC Part 15: 15.203 ANSI C63.4:2009	PASS
Note: N/A is an abbreviation for Not Applicable, and means this item is not applicable for this device.		

Test Standard Used:FCC Rules and Regulations Part 15 Subpart C: 2012

Test procedure used: ANSI C63.10:2009, ANSI C63.4:2009

2 General test informatiOn

2.1 Description of EUT

EUT* Name	:	9 ft. Solar Lighted Speaker Umbrella with Olefin
Model Number	:	90086,50400143,50400143-WEB
EUT function description		Please reference user manual of this device
Power supply	:	3.7VDC,4000mAh(Li-ion battery package)
Trade mark	:	N/A
Radio Specification		Bluetooth V2.1+EDR
Operation frequency		2402MHz -2480MHz
Modulation		GFSK, π/4 QPSK, 8-DPSK
Data rate		3Mbps
Antenna Type	:	Integrated PCB antenna, Maximum Gain: 0dBi
Date of Receipt	:	2014/08/05
Sample Type	:	Series production

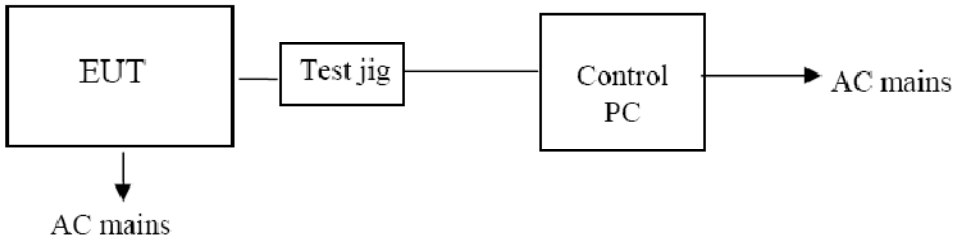
Remark:The device meets the requirements stated within Parts 15.247(g)&(h) in that they were Developed under the Bluetooth protocol and operate as a true frequency hopping system.The device does not have the ability to be coordinated with other FHSS systems in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

According to the declaration from the applicant, this report covers the model as below: 90086,50400143 and 50400143-WEB.These models were same sample, the difference of these models were packaging. Therefore only one model 50400143 was fully tested in the report.

2.2 Assistant equipment used for test

Description of Assistant equipment	Manufacturer	Model number or Type	Other
Notebook	Lenovo	Lenovo G475GX	Window 7 system
Notebook	DELL	Latitude D610	Window 7 system
Mouse	Lenovo	M20N	0.7m long, unshielded

2.3 Block diagram EUT configuration for test



EUT's Bluetooth module was connected to a special test jig provided by manufacturer which has a USB cable connector to connect to control PC, and the control PC will run a special test software"RF Control Kit v1.0" provided by manufacturer to control EUT work in test mode as blow tab.

Tested mode, channel, information		
Mode	Channel	Frequency (MHz)
GFSK hopping on Tx Mode	CH0 to CH78	2402 to 2480
π/4 QPSK Hopping on TX mode	CH0 to CH78	2402 to 2480
8-DPSK hopping on Tx Mode	CH0 to CH78	2402 to 2480
GFSK hopping off Tx Mode	CH0	2402
	CH39	2441
	CH78	2480
π/4 QPSK hopping off Tx Mode	CH0	2402
	CH39	2441
	CH78	2480
8-DPSK hopping off Tx Mode	CH0	2402
	CH39	2441
	CH78	2480

Note: For π/4 QPSK its same modulation type with 8-DPSK, and based exploratory test, there is no significant difference of that two types test result, after the preliminary scan, 8-DPSK will have higher emission, so except output power, all other items final test were only performed with the worse case 8-DPSK and GFSK.

2.4 Test environment conditions

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

Temperature range:	21-25℃
Humidity range:	40-75%
Pressure range:	86-106kPa

2.5 Test laboratory

LCTECH (Zhongshan) Testing Service Co.,Ltd FCC Registration Number:899331

2/F.,Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China

Dongguan Dongdian Testing Service Co., Ltd FCC Registration Number:270092

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China

Band Edge Compliance and Radiated Emission 1GHz to 18GHz test in Dongguan Dongdian Testing Service Co., Ltd.

2.6 Measurement uncertainty

Test Item	Uncertainty
Occupied Channel Bandwidth	±1%
Uncertainty for radio frequency	1×10-9
RF Output power, conducted	±0.6dB
Power Spectral Density, Conducted	±1.2dB
Unwanted Emissions, Conducted	±0.6dB
DC and Low frequency voltage	±0.5%
Time	±1%
Duty Cycle	±1%
Uncertainty for Radiation Emission test (30MHz-1GHz)	3.14 dB (Antenna Polarize: V)
	3.16 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1GHz to 25GHz)	2.08dB(Antenna Polarize: V)
	2.56dB (Antenna Polarize: H)
Uncertainty for Conduction emission test	2.44dB
Uncertainty for Radiation Emission test (150KHz-30MHz)	3.21dB

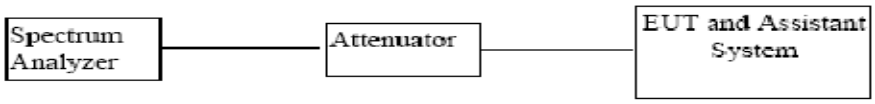
Note：This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3 Maximum Peak Output Power

3.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal.date	Cal.Due date
1	EMI Test Receiver	R&S	ESCI 7	100965	2014/06/04	2015/06/03
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2014/06/04	2015/06/03
3	RF Cable	R&S	R01	10005	2014/06/04	2015/06/03

3.2 Block diagram of test setup



3.3 Limits

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, the e.i.r.p shall not exceed 4W.

3.4 Test Procedure

(1) Configure EUT and assistant system according clause 2.3 and 3.2

(2) Connect EUT's antenna output to spectrum analyzer by RF cable.

(3) Configure EUT work in test mode as stated in clause 2.3.

(4) Measure the maximum output power of EUT by spectrum analyzer with PK detector and RBW=2MHz(above 20dB bandwidth of measured signal), VBW=3MHz

Note: The attenuator loss was inputted into spectrum analyzer as amplitude offset.

3.5 Test Resul

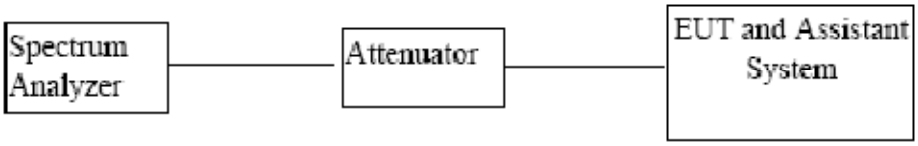
M/N: 50400143					
Mode	Freq (MHz)	Result (dBm)	Limit (dBm)	Margin (MHz)	Conclusion
GFSK	2402	-0.96	30	30.96	PASS
	2441	-0.97	30	30.97	PASS
	2480	-1.32	30	31.32	PASS
π/4 QPSK	2402	-2.73	30	32.73	PASS
	2441	-2.69	30	32.69	PASS
	2480	-2.96	30	32.96	PASS
8-DPSK	2402	-2.73	30	32.73	PASS
	2441	-2.67	30	32.67	PASS
	2480	-2.90	30	32.90	PASS
Test Date : 2014/09/09				Test Engineer : Map	

4 20dB Bandwidth

4.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal.date	Cal.Due date
1	EMI Test Receiver	R&S	ESCI 7	100965	2014/06/04	2015/06/03
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2014/06/04	2015/06/03
3	RF Cable	R&S	R01	10005	2014/06/04	2015/06/03

4.2 Block diagram of test setup



4.3 Limits

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 sectionunder which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.4 Test Procedure

(1) Configure EUT and assistant system according clause 2.3 and 4.2

(2) Connect EUT's antenna output to spectrum analyzer by RF cable.

(3) Configure EUT work in test mode as stated in clause 2.3.

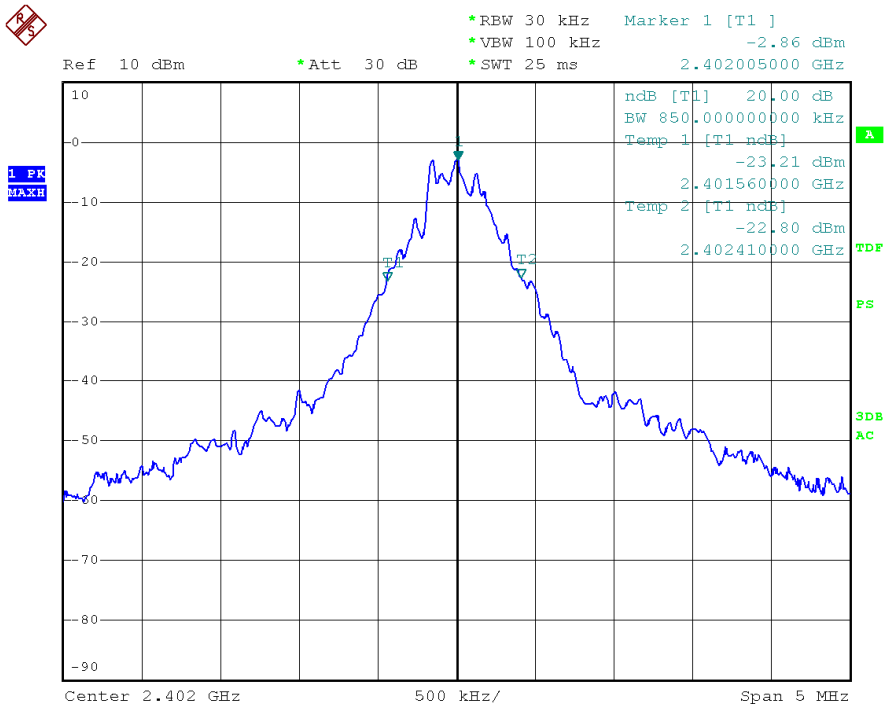
(4) The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 kHz RBW and 100 kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.5 Test Result

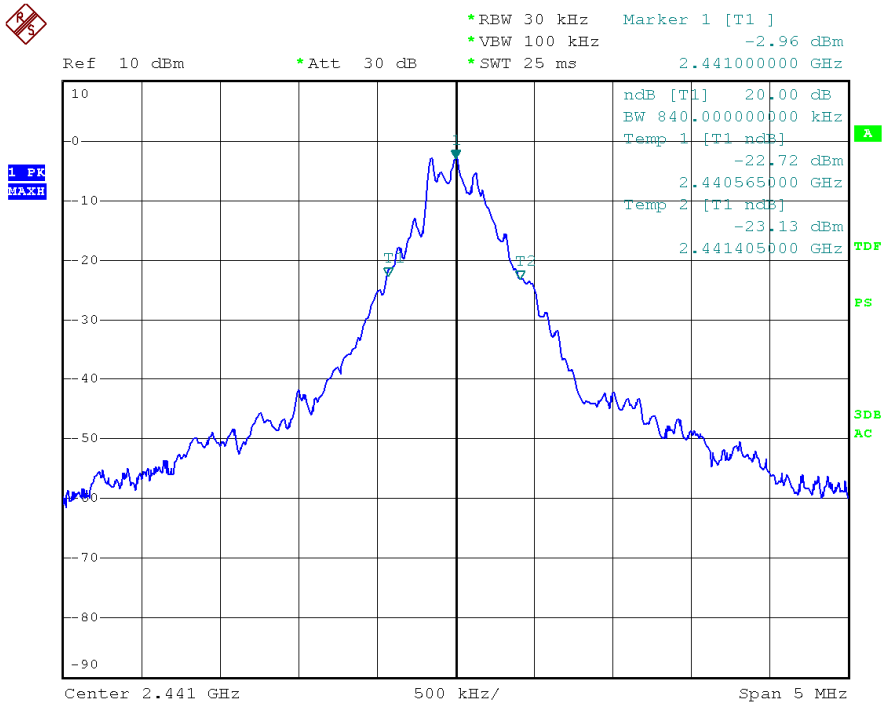
M/N:50400143					
Mode	Freq (MHz)	Result (MHz)	Limit (MHz)	Margin (MHz)	Conclusion
GFSK	2402	0.850	/	/	PASS
	2441	0.840	/	/	PASS
	2480	0.835	/	/	PASS
8-DPSK	2402	1.210	/	/	PASS
	2441	1.210	/	/	PASS
	2480	1.210	/	/	PASS
Test Date : 2014/09/09			Test Engineer : Map		

4.6 Original test data

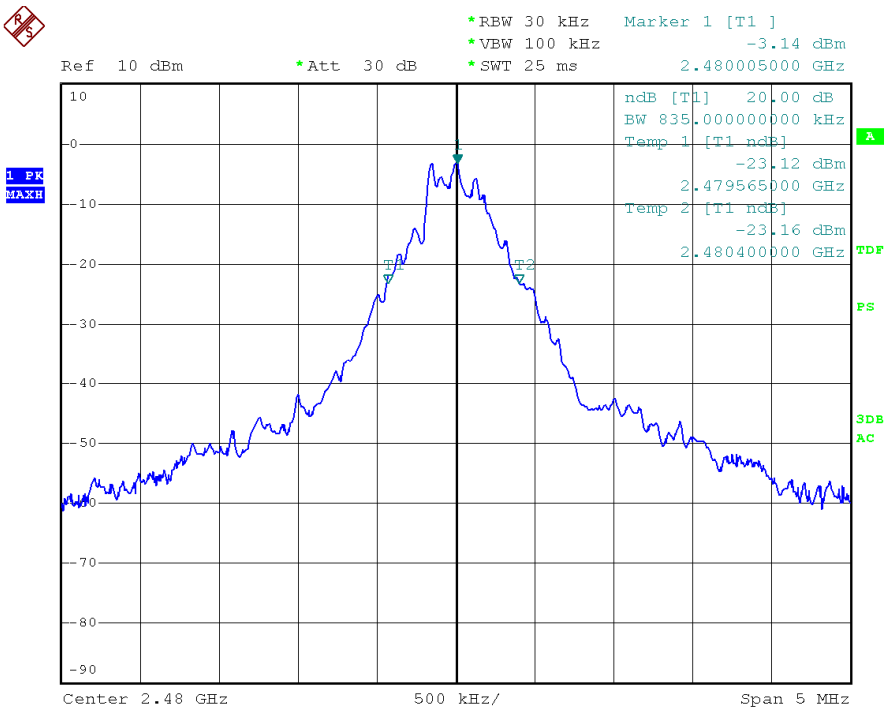
T est mode:	GFSK	Test channel:	2402MHz



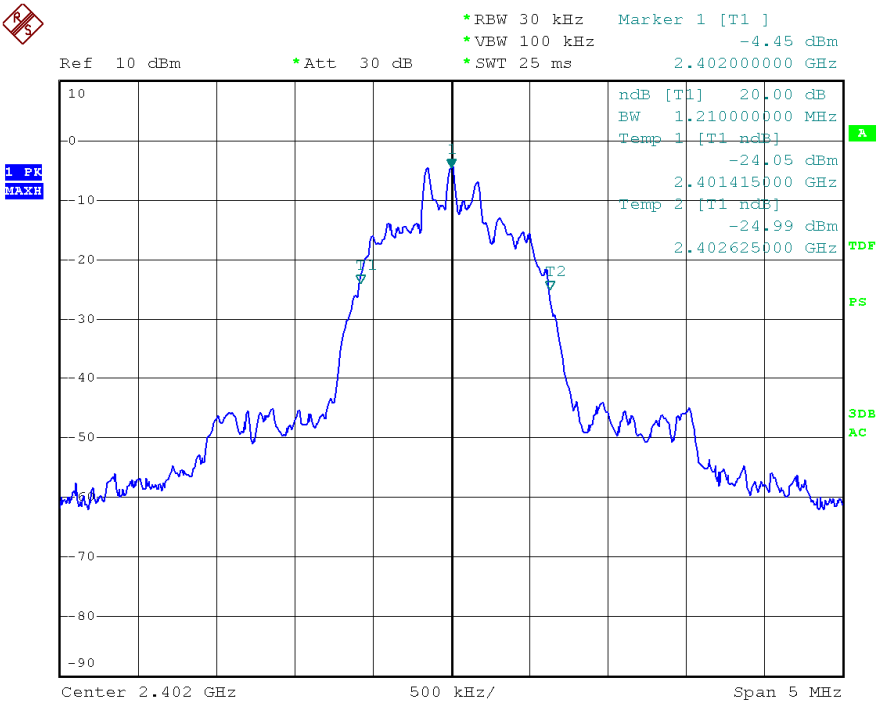
T est mode:	GFSK	Test channel:	2441MHz



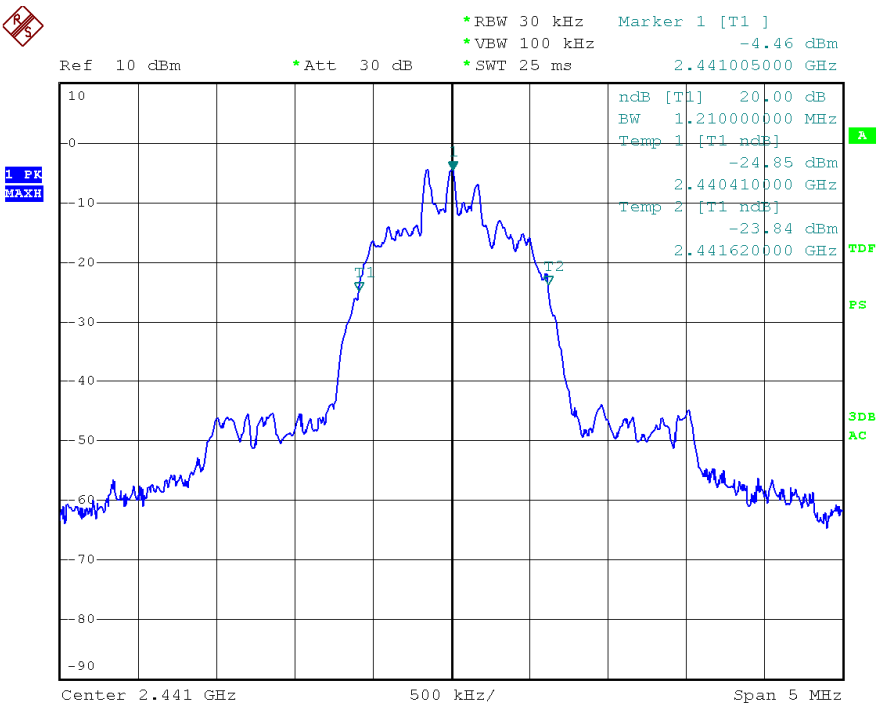
T est mode:	GFSK	Test channel:	2480MHz



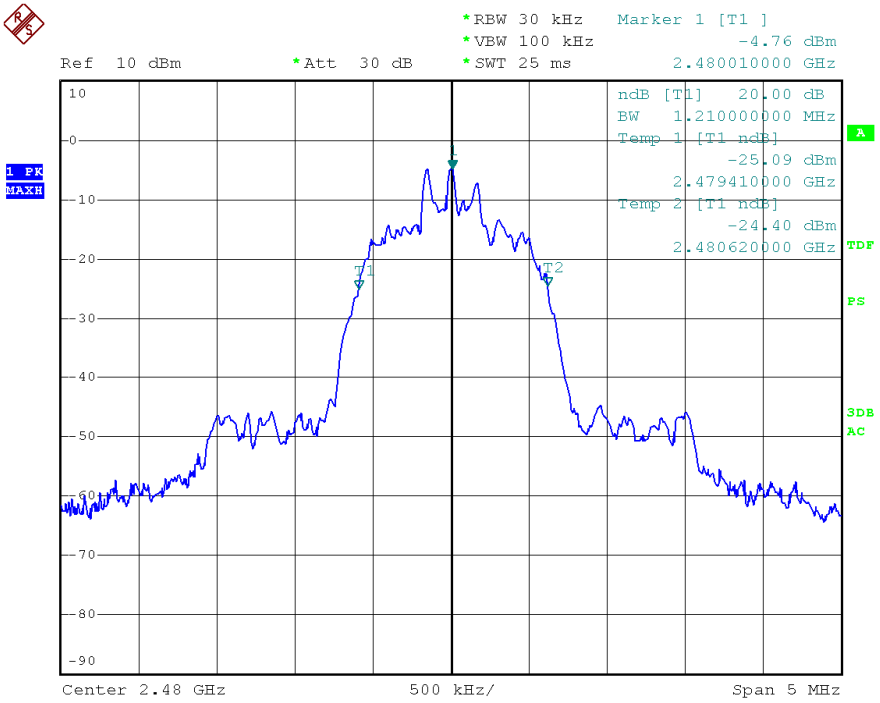
T est mode:	8-DPSK Mode	Test channel:	2402MHz



T est mode:	8-DPSK Mode	Test channel:	2441MHz



T est mode:	8-DPSK Mode	Test channel:	2480MHz

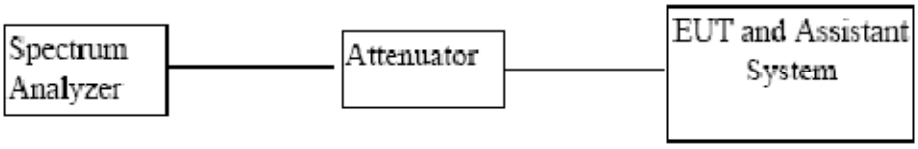


5 Carrier Frequency Separation

5.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal.date	Cal.Due date
1	EMI Test Receiver	R&S	ESCI 7	100965	2014/06/04	2015/06/03
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2014/06/04	2015/06/03
3	RF Cable	R&S	R01	10005	2014/06/04	2015/06/03

5.2 Block diagram of test setup



5.3 limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz 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.

5.4 Test Procedure

(1) Configure EUT and assistant system according clause 2.3 and 5.2

(2) Connect EUT's antenna output to spectrum analyzer by RF cable.

(3) Configure EUT work in test mode as stated in clause 2.3.

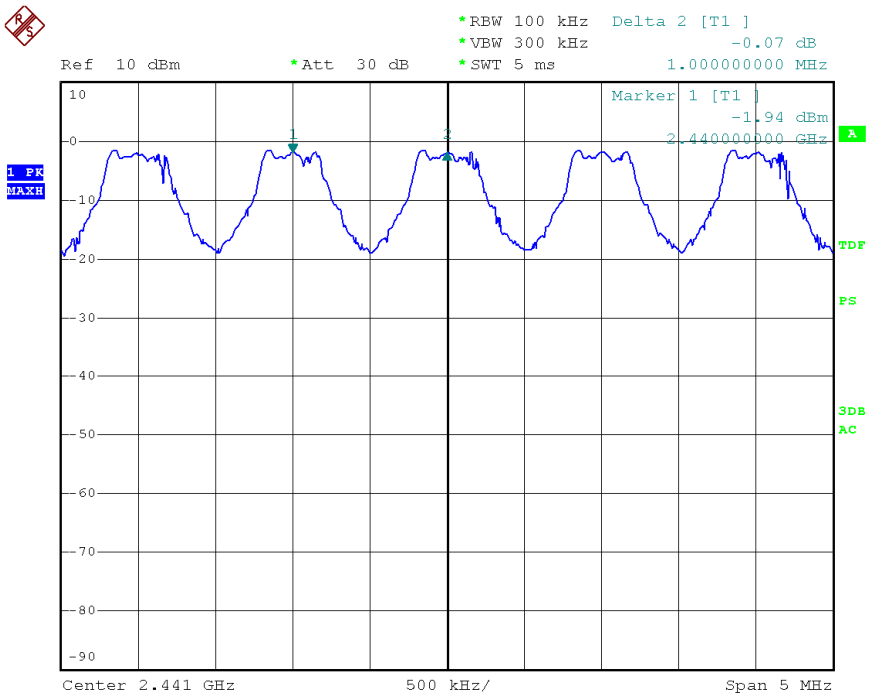
(4) The carrier frequency was measured by spectrum analyzer with 100 KHz RBW and 300KHz VBW.

5.5 Test result

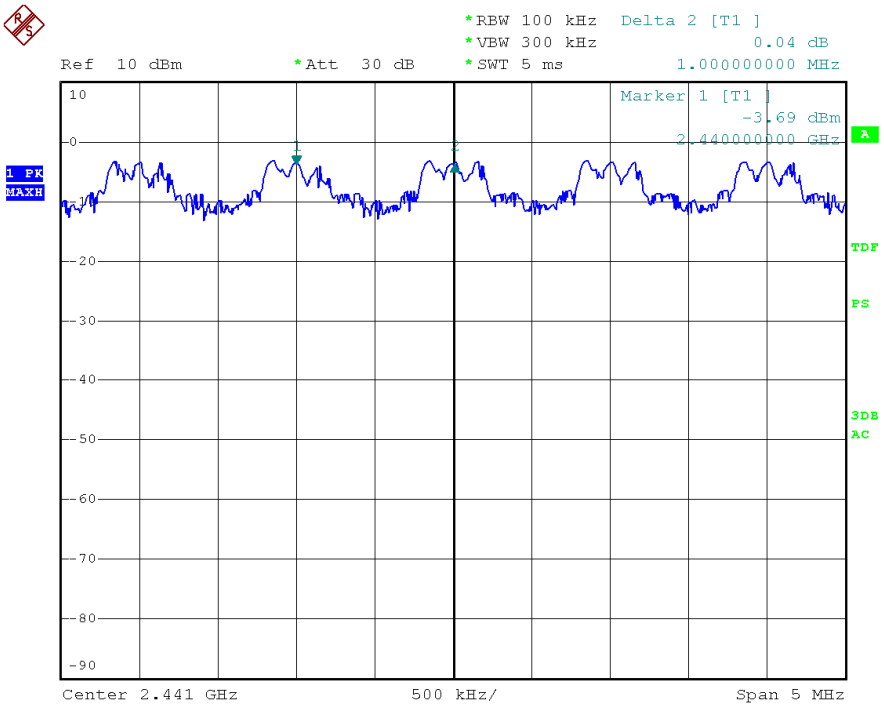
M/N: 50400143				
Mode	Channel separation (MHz)	20dB Bandwidth (MHz)	Limit (MHz) 2/3 of 20dB bandwidth	Conclusion
GFSK	1	0.850	0.566	PASS
8-DPSK	1	1.210	0.806	PASS
Test Date : 2014/09/09			Test Engineer : Map	

5.6 Original test data

T est mode:	GFSK	Test channel:	Middle



T est mode:	8-DPSK	Test channel:	Middle

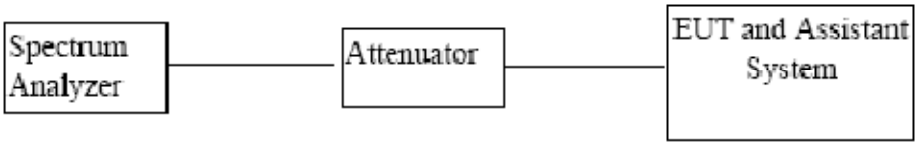


6 Number Of Hopping Channel

6.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal.date	Cal.Due date
1	EMI Test Receiver	R&S	ESCI 7	100965	2014/06/04	2015/06/03
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2014/06/04	2015/06/03
3	RF Cable	R&S	R01	10005	2014/06/04	2015/06/03

6.2 Block diagram of test setup



6.3 limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

6.4 Test Procedure

(1) Configure EUT and assistant system according clause 2.3 and 6.2

(2) Connect EUT's antenna output to spectrum analyzer by RF cable.

(3) Configure EUT work in test mode as stated in clause 2.3.

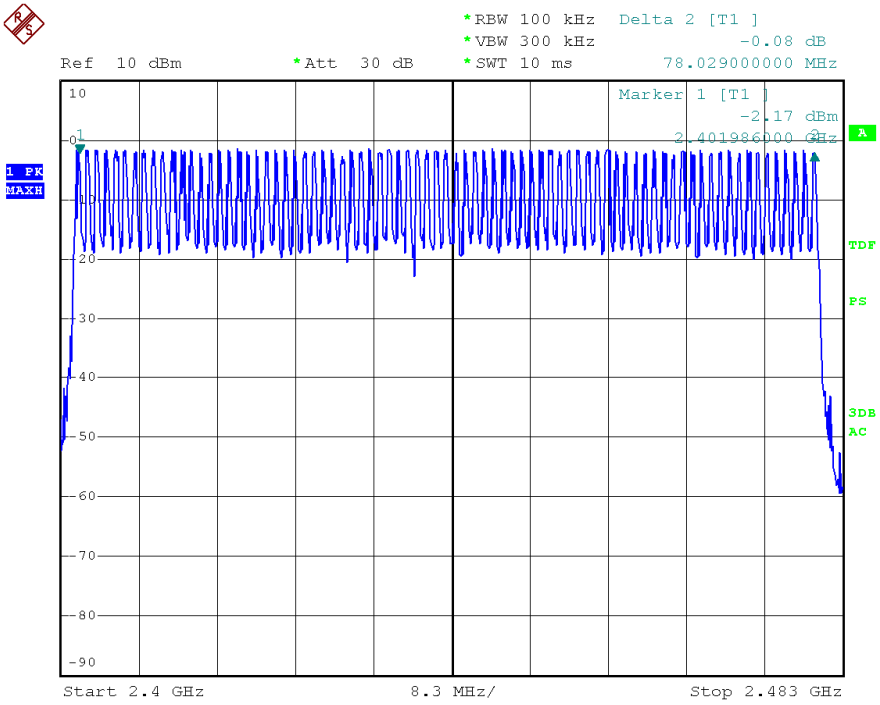
(4) The number of hopping channel was measured by spectrum analyzer with RBW 100 kHz and VBW 300KHz.

6.5 Test result

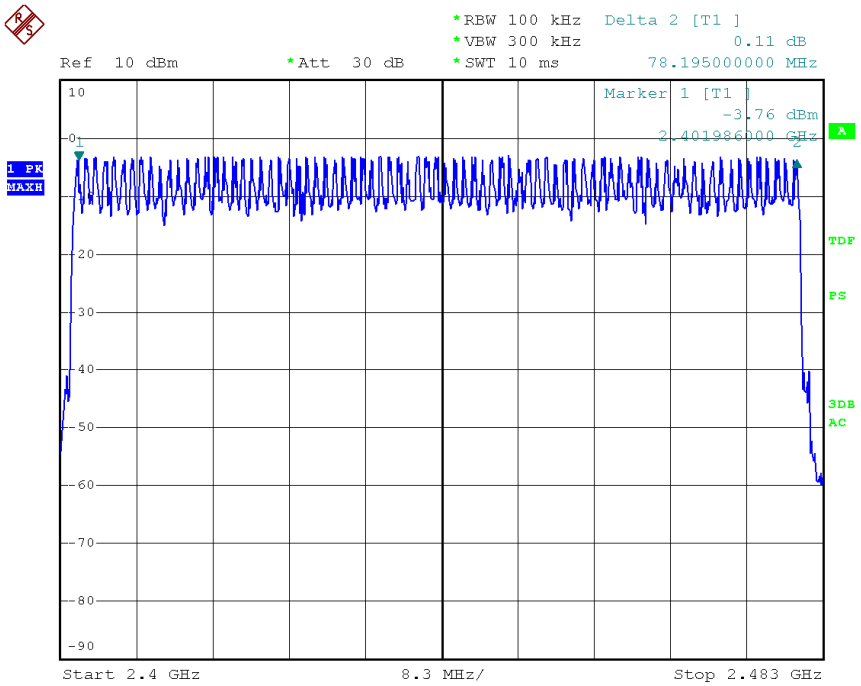
M/N: 50400143			
Mode	Number of hopping channel	Limit	Conclusion
GFSK	79	>15	PASS
8-DPSK	79	>15	PASS
Test Date : 2014/09/09		Test Engineer : Map	

6.6 Original test data

T est mode:	GFSK



T est mode:	8-DPSK

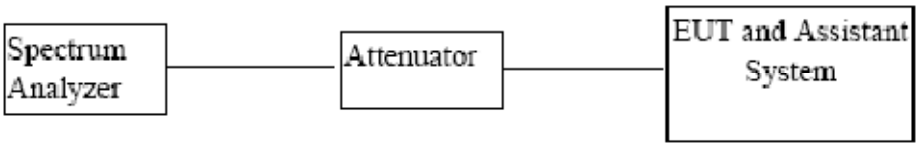


7 Dwell Time

7.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal.date	Cal.Due date
1	EMI Test Receiver	R&S	ESCI 7	100965	2014/06/04	2015/06/03
2	Attenuator	Mini-Circuits	BW-S10W2	101109	2014/06/04	2015/06/03
3	RF Cable	R&S	R01	10005	2014/06/04	2015/06/03

7.2 Block diagram of test setup



7.3 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.

7.4 Test Procedure

(1) Configure EUT and assistant system according clause 2.3 and 7.2

(2) Connect EUT's antenna output to spectrum analyzer by RF cable.

(3) Configure EUT work in test mode as stated in clause 2.3.

(4) Measure the hopping number and on time of each pulse with spectrum analyzer in zero span set.

7.5 Test result

Observing period = 79 x 0.4s = 31.6s

Measure the maximum time duration of one single pulse;

DH5 Packet permit maximum :

= 1600 / 79 /6

= 3.37 hop/s in each channel (5 times slots Rx, 1 times slot Tx)

Transmission Times within observing period

= 3.37 x 31.6

= 106.6

DH3 Packet permit maximum :

= 1600 / 79 /4

= 5.06 hop/s in each channel (3 times slots Rx, 1 times slot Tx)

Transmission Times within observing period

= 5.06 x 31.6

= 160

DH1 Packet permit maximum :

= 1600 / 79 /2

= 10.12 hop/s in each channel (1 times slots Rx, 1 times slot Tx)

Transmission Times within observing period

= 10.12 x 31.6

= 320

Dwell Time = Pulse Duration x Length of Transmission time

Result shown as below table and data graph.

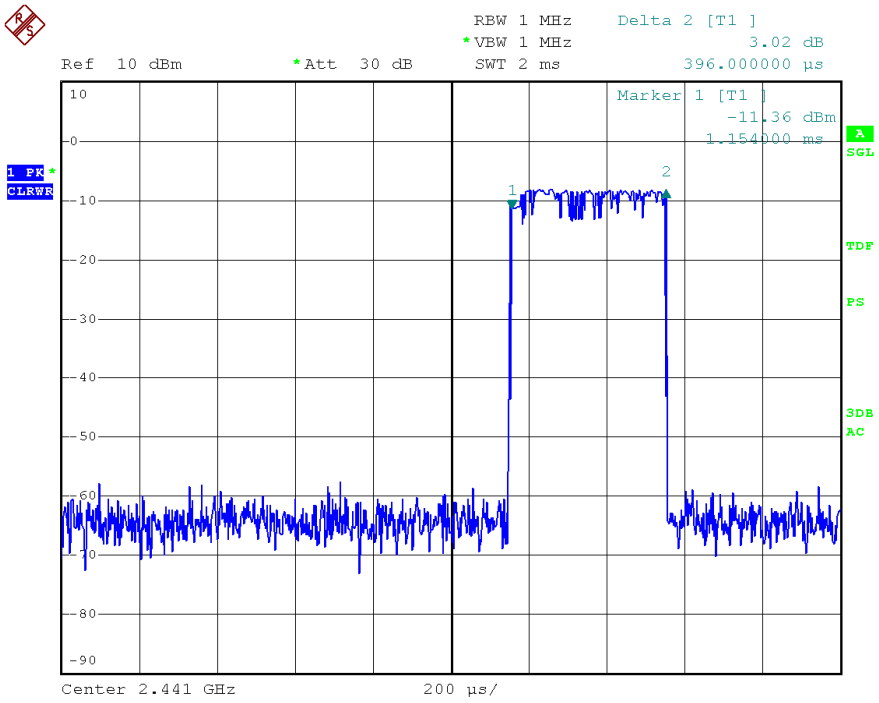
M/N: 50400143

Mode	Packet	Pulse Duration(ms)	Dwell time (ms)	Limit (ms)	Conclusion
GFSK	DH1	0.396	126.7	<400	PASS
	DH3	1.611	257.8	<400	PASS
	DH5	2.877	306.7	<400	PASS
8-DPSK	3-DH1	0.406	129.2	<400	PASS
	3-DH3	1.596	255.4	<400	PASS
	3-DH5	2.890	308.1	<400	PASS

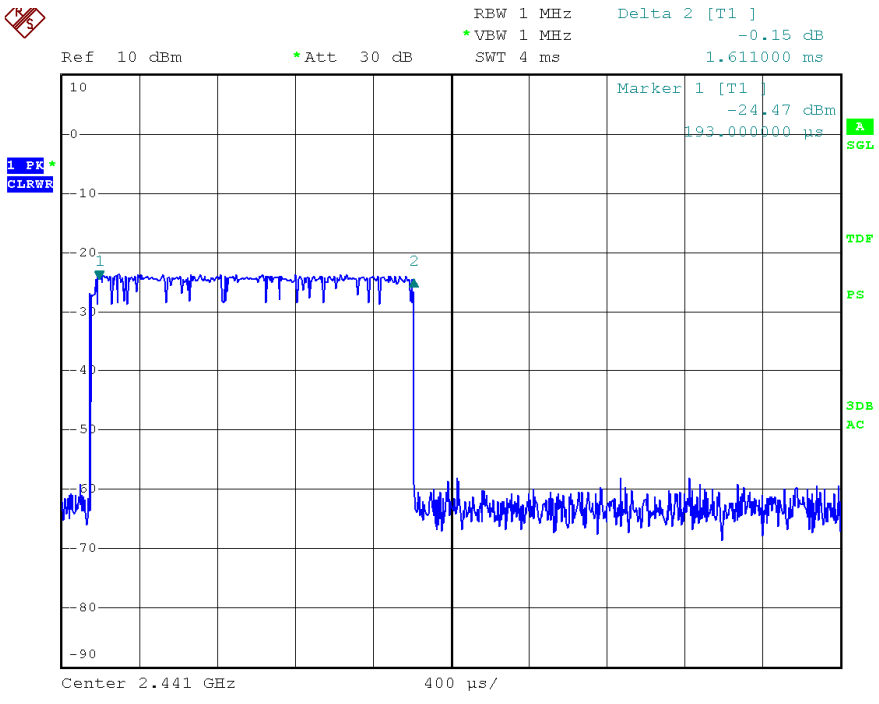
Test Date : 2014/09/09 Test Engineer : Map

7.6 Original test data

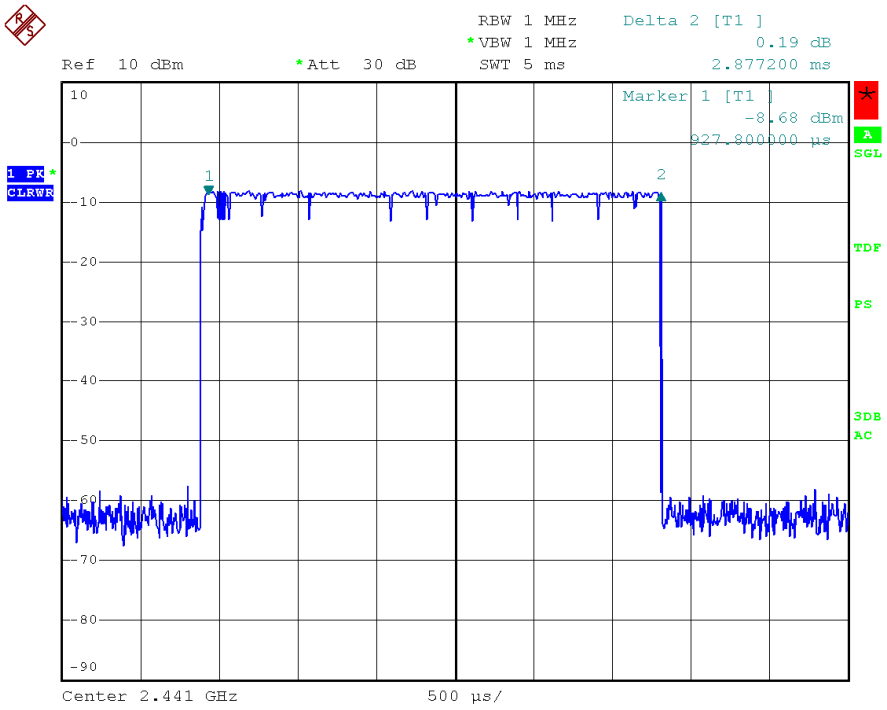
T est mode:	GFSK Mode	Test Packet:	DH1



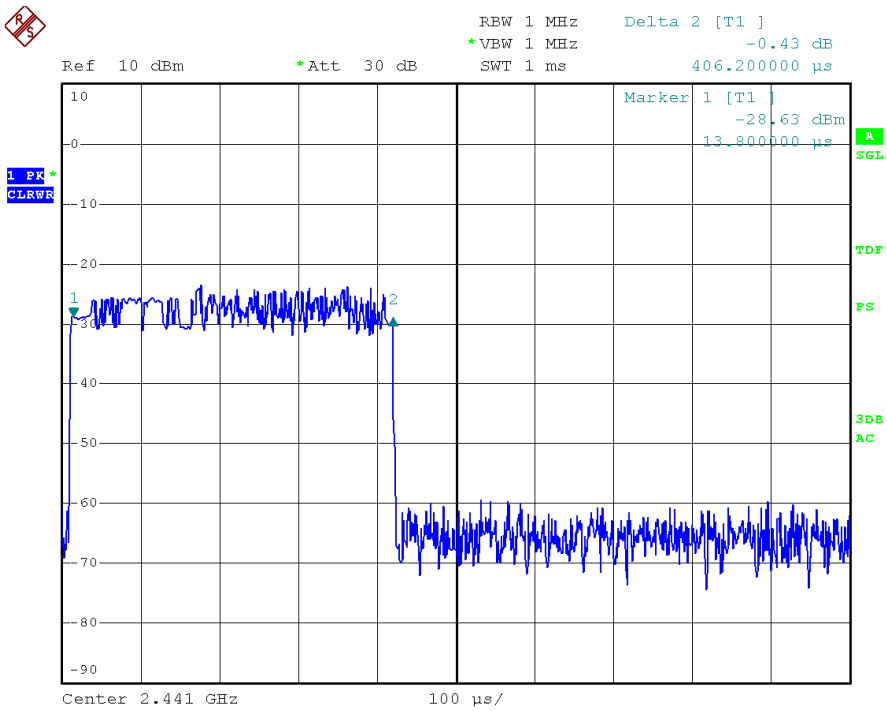
T est mode:	GFSK Mode	Test Packet:	DH3



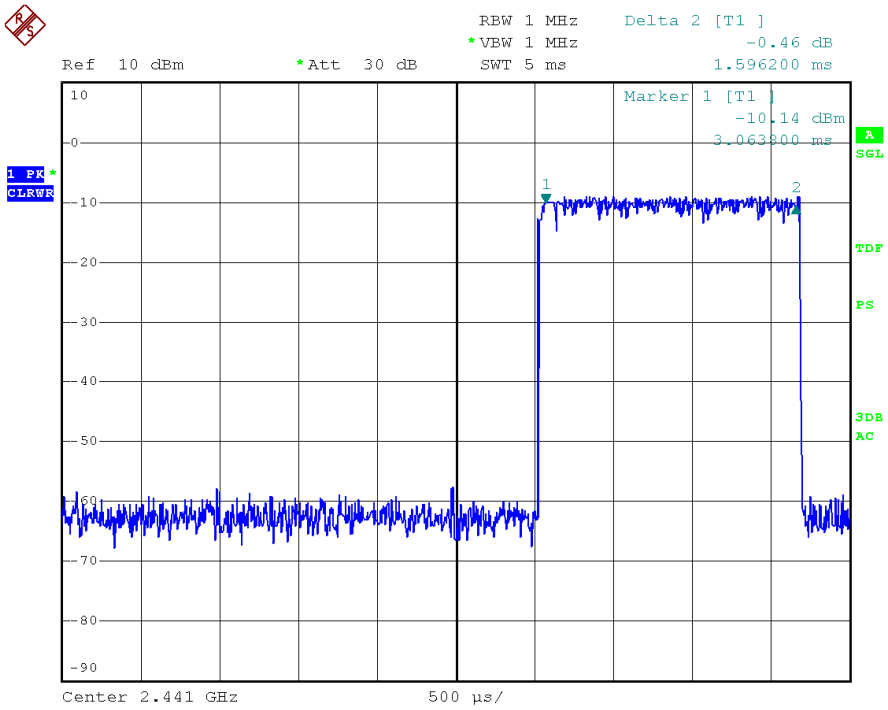
T est mode:	GFSK Mode	Test Packet:	DH5



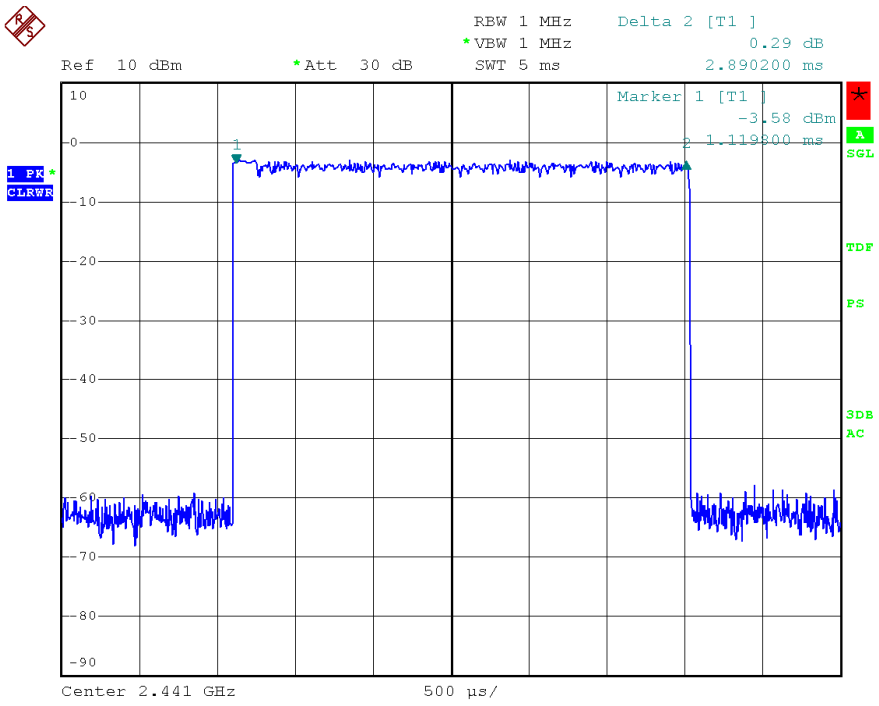
T est mode:	8-DPSK Mode	Test Packet:	3DH1



T est mode:	8-DPSK Mode	Test Packet:	3DH3



T est mode:	8-DPSK Mode	Test Packet:	3DH5



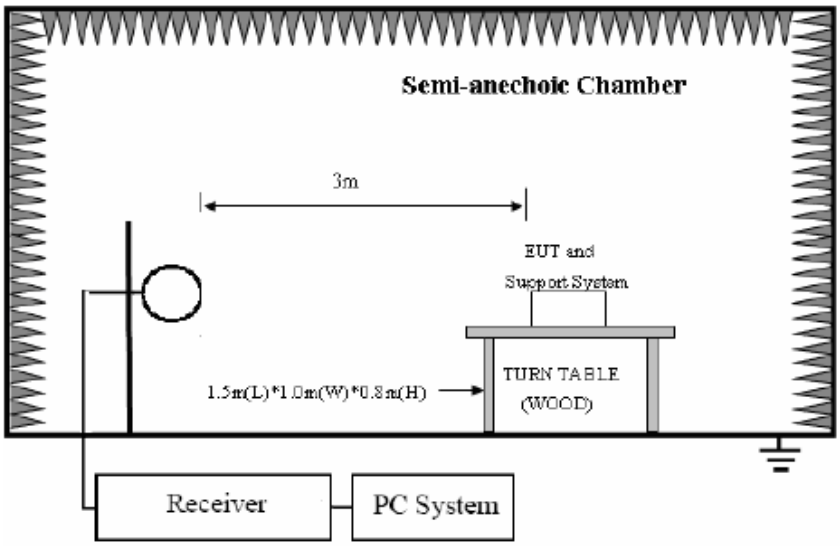
8 Radiated emission

8.1 Test equipment

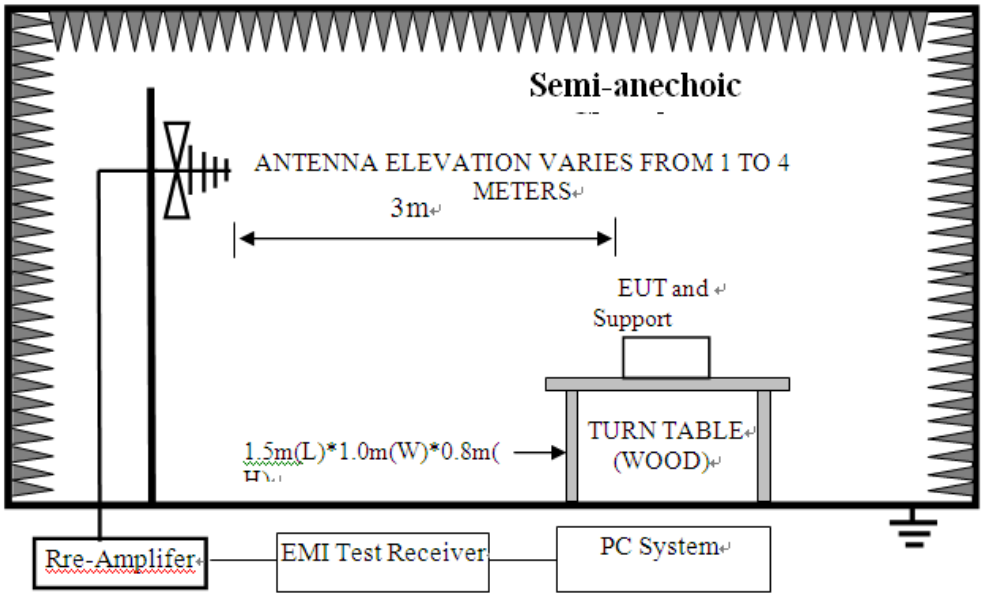
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal.date	Cal.Due date
LCTECH (Zhongshan) Testing Service Co.,Ltd						
1	EMI Test Receiver	R&S	ESCI 7	100965	2014/06/04	2015/06/03
2	Log-periodic Dipole Antenna	Schwarzbeck	VULB 9162	058	2014/05/30	2015/05/29
3	Pre-Amplifier	SCHWARZBECK	BBV9743	9743-143	2014/06/25	2015/06/24
4	3m Semi-anechoic	Zhongshuo Electronics	9mx6mx6m	N/A	2014/01/05	2015/01/04
5	Loop Antenna	Schwarzbeck	SB FMZB	1519-045	2014/06/25	2015/06/24
Dongguan Dongdian Testing Service Co., Ltd						
6	EMI Test Receiver	R&S	ESU8	100316	2013/11/13	2014/11/12
7	Spectrum analyzer	R&S	FSU	1166.1660.26	2013/11/13	2014/11/12
8	Double Ridged Horn Antenna	R&S	HF907	100276	2013/11/16	2013/11/15
9	Pre-amplifier	A.H.	PAM0-1840VH	562	2013/11/13	2013/11/12
10	RF Cable	R&S	R01	10403	2013/11/13	2013/11/12
11	RF Cable	R&S	R02	10512	2013/11/13	2013/11/12

8.2 Block diagram of test setup

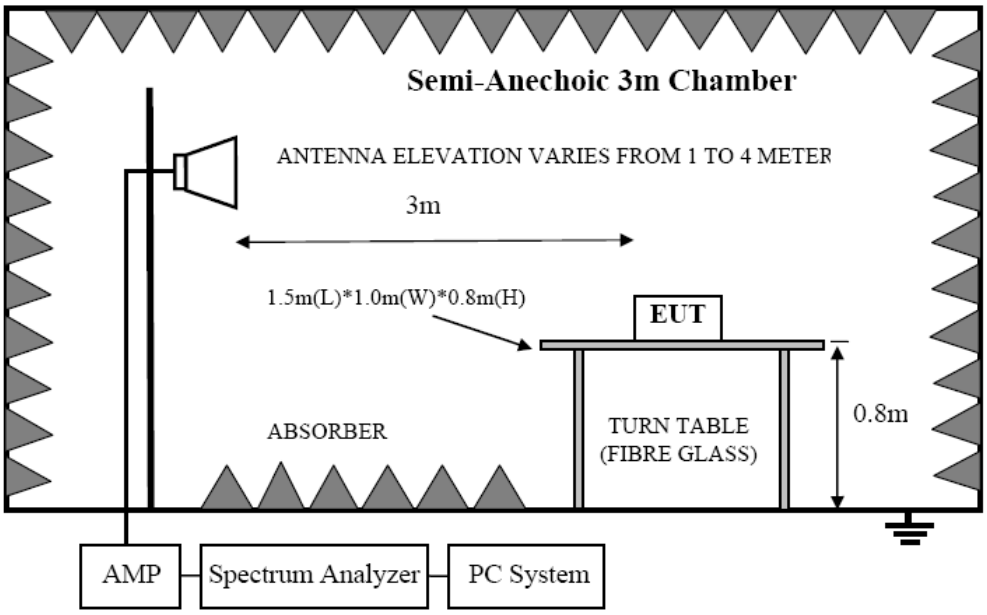
In 3m Anechoic Chamber Test Setup Diagram for 9KHz-30MHz



In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

8.3 Limit

8.3.1 FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

8.3.2 FCC 15.209 Limit.

Frequency（MHz）	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		uV/m	dB(uV)/m
0.009 ~ 0.490	300	2400/F(KHz) 67.6	20log(F)
0.490 ~ 1.705	30	24000/F(KHz) 87.6	20log(F)
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Note: (1)The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz and above 1000MHz.Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer then that specified, and the limit at closer measurement distance can be extrapolated by below formula:

Limit3m(dBuV/m)= Limit30m(dBuV/m) + 40Log(30m/3m)

8.3.3 Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

8.4 Test Procedure

(1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.

(2) Setup EUT and assistant system according clause 2.3 and 8.2

(3) Test antenna was located 3m from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used
9KHz-30MHz	Active Loop antenna
30MHz-1GHz	Trilog Broadband Antenna
1GHz-18GHz	Double Ridged Horn Antenna(1GHz-18GHz)
18GHz-40GHz	Horn Antenna(18GHz-40GHz)

According ANSI C63.10:2009 clause 6.4.4.2 and 6,5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also be positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. For measurement above 30MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT,Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

(4) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiatedemissions from 9KHz to 25GHz:

(a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1m to 4m(Except loop antenna, it's fixed 1m above ground.)

(b) Change work frequency or channel of device if practicable.

(c) Change modulation type of device if practicable.

(d) Change power supply range from 85% to 115% of the rated supply voltage

(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produceshighest emissions.Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated,

and no any obvious emission were detected from 18GHz to 25GHz, so below final test was

performed with frequency range from 9KHz to 18GHz.

(5) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2009 on Radiated Emission test.

(6) The emissions from 9KHz to 1GHz were measured based on CISPR QP detector,above 1GHz were measured based on average detector and peak detector , peak emissions also be measured and need comply with Peak limit. (according ANSI C63.10:2009 clause 4.2.3.2.1&4.2.3.2.2)

(7) The emissions from 9KHz to 1GHz, QP or average values were measured with EMI receiver with below RBW

Frequency Band	RBW
9KHz-150KHz	200Hz
150KHz-30MHz	9KHz
30MHz-1GHz	120KHz

(8) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure(according ANSI C63.10:2009 clause 4.2.3.2.3 procedure for average measure). Both PK and AV level test, PK detector is used.

8.5 Test result

PASS. (See below detailed test result)

All the emissions except fundamental emission from 9 KHz to 25GHz were comply with 8.3.2 limit.

Note1: According exploratory test no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so the final test was performed with frequency range from 30MHz to 18GHz and recorded in below.

Note2: For emissions below 1GHz, according exploratory explorer test, when change Tx mode and channel,have no distinct influence on emissions level, so for emissions below 1GHz, the final test was only performed with EUT working in GFSK, Tx 2441MHz mode.

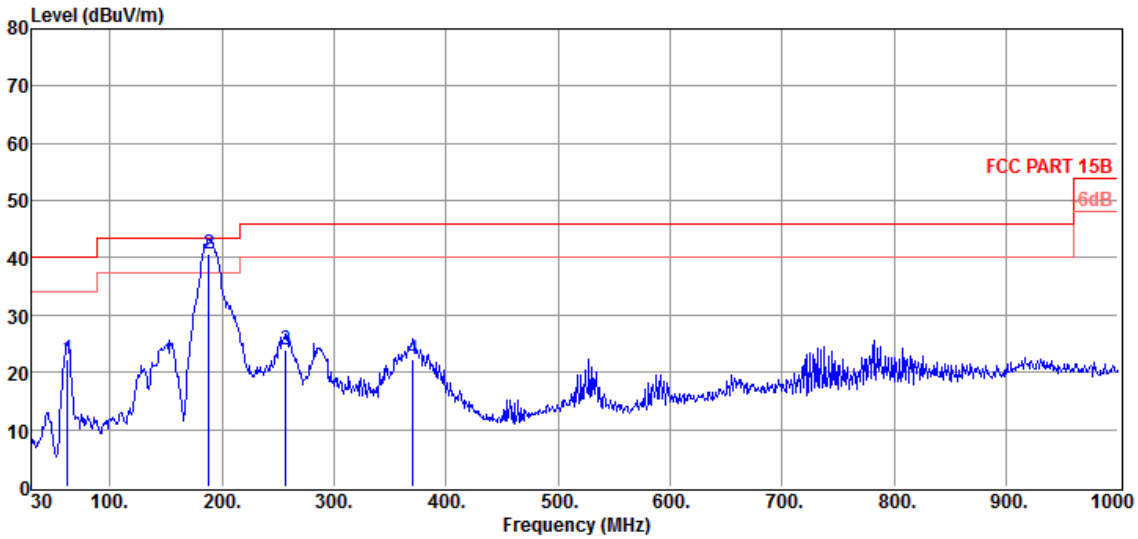
Note3: For emissions above 1GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

Radiated Emission 1GHz to 18GHz test in Dongguan Dongdian Testing Service Co., Ltd.
Please refer on page 12 to 35 of The Report 2 DDT-REL140200.

Radiated Emission Test Result

Test Site	: 3m Chamber	E:\2014 Test Data\LCZE14070043RF	
Test Date	: 2014-09-05	**Tested By**	: Map He
EUT	: 9 ft. Solar Lighted Speaker Umbrella with Olefin	**Model Number**	: 50400143
Power Supply	: DC 3.7V from EUT	**Test Mode**	: discharging mode with iphone
Condition	: Temp:24.5'C,Humi:55%, Press:100.1kPa	**Antenna/Distance**	: VULB9162/3m/HORIZONTAL
Memo	:		

Data : 1



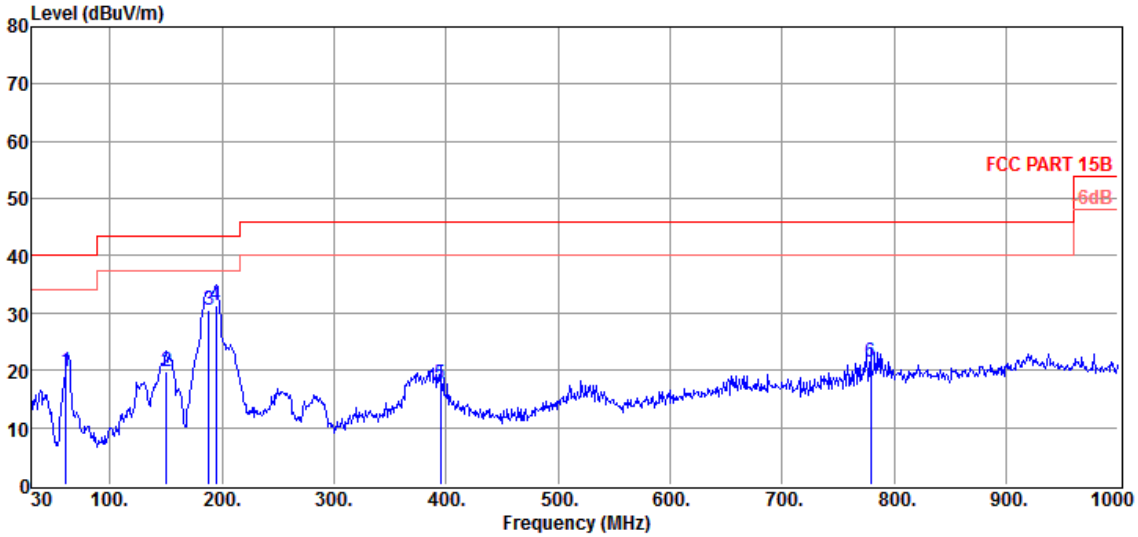
Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	62.01	39.50	10.32	28.00	0.58	22.40	40.00	-17.60	QP	HORIZONTAL
2	188.11	58.50	8.74	27.90	1.28	40.62	43.50	-2.88	QP	HORIZONTAL
3	256.98	38.80	12.22	28.00	0.98	24.00	46.00	-22.00	QP	HORIZONTAL
4	370.47	34.50	14.43	28.00	1.42	22.35	46.00	-23.65	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor
2. If Peak Result comply with QP limit,QP Result is deemed to comply with QP limit

Radiated Emission Test Result

Test Site	:	3m Chamber	E:\2014 Test Data\LCZE14070043RF		
Test Date	:	2014-09-05	**Tested By**	:	Map He
EUT	:	9 ft. Solar Lighted Speaker Umbrella with Olefin	**Model Number**	:	50400143
Power Supply	:	DC3.7V from EUT	**Test Mode**	:	discharging mode with iphone
Condition	:	Temp:24.5'C,Humi:55%, Press:100.1kPa	**Antenna/Distance**	:	VULB9162/3m/VERTICAL
Memo	:				

Data : 2



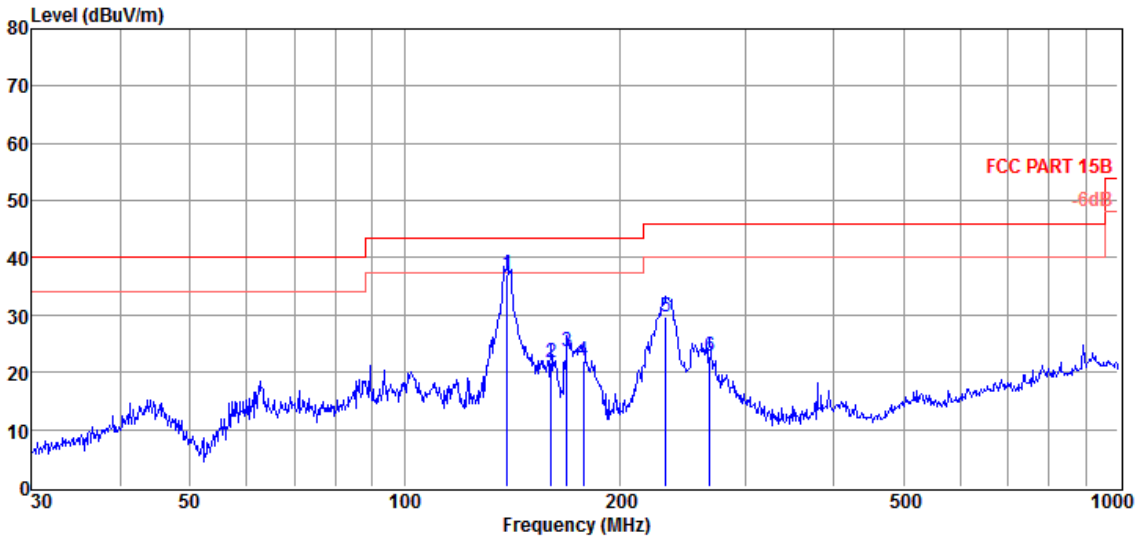
Item (Mark)	Freq (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	61.04	36.50	10.65	28.00	0.57	19.72	40.00	-20.28	QP	VERTICAL
2	150.28	39.21	7.49	28.00	1.16	19.86	43.50	-23.64	QP	VERTICAL
3	188.11	48.50	8.74	27.90	1.28	30.62	43.50	-12.88	QP	VERTICAL
4	194.90	48.31	9.78	27.95	1.30	31.44	43.50	-12.06	QP	VERTICAL
5	394.72	28.30	15.84	28.00	1.56	17.70	46.00	-28.30	QP	VERTICAL
6	778.84	25.50	21.53	27.74	2.04	21.33	46.00	-24.67	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor
2. If Peak Result comply with QP limit,QP Result is deemed to comply with QP limit

Radiated Emission Test Result

Test Site	: 3m Chamber	E:\2014 Test Data\LCZE14070043RF	
Test Date	: 2014-09-05	**Tested By**	: Map He
EUT	: 9 ft. Solar Lighted Speaker Umbrella with Olefin	**Model Number**	: 50400143
Power Supply	: DC3.7 V from EUT	**Test Mode**	: TX mode
Condition	: Temp:24.5'C,Humi:55%, Press:100.1kPa	**Antenna/Distance**	: VULB9162/3m/HORIZONTAL
Memo	:		

Data : 2



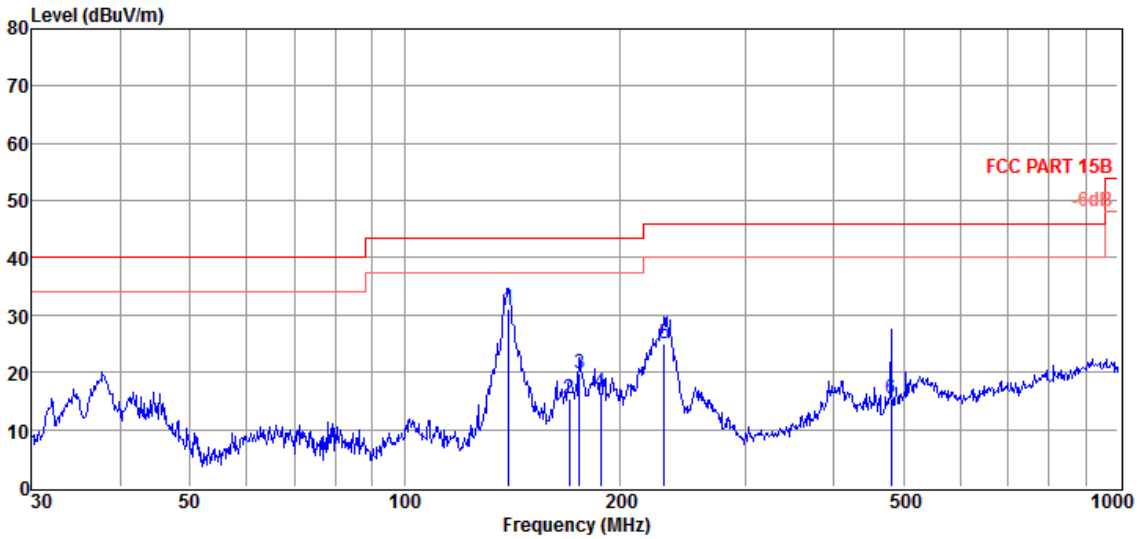
Item (Mark)	Freq (MHz)	Read Level (dBµV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBµV/m)	Limit Line (dBµV/m)	Over Limit (dB)	Detector	Polarization
1	139.36	56.09	7.84	28.00	1.13	37.06	43.50	-6.44	QP	HORIZONTAL
2	160.35	41.31	7.19	28.00	1.19	21.69	43.50	-21.81	QP	HORIZONTAL
3	169.01	43.50	6.78	27.91	1.22	23.59	43.50	-19.91	QP	HORIZONTAL
4	178.13	41.60	7.15	27.90	1.25	22.10	43.50	-21.40	QP	HORIZONTAL
5	232.53	45.20	11.50	28.00	1.08	29.78	46.00	-16.22	QP	HORIZONTAL
6	267.55	37.50	12.40	28.00	1.03	22.93	46.00	-23.07	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor
2. If Peak Result comply with QP limit,QP Result is deemed to comply with QP limit

Radiated Emission Test Result

Test Site	: 3m Chamber	E:\2014 Test Data\LCZE14070043RF	
Test Date	: 2014-09-05	**Tested By**	: Map He
EUT	: 9 ft. Solar Lighted Speaker Umbrella with Olefin	**Model Number**	: 50400143
Power Supply	: DC3.7V from EUT	**Test Mode**	: TX mode
Condition	: Temp:24.5'C,Humi:55%, Press:100.1kPa	**Antenna/Distance**	: VULB9162/3m/VERTICAL
Memo	:		

Data : 3



Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	139.85	50.20	7.81	28.00	1.13	31.14	43.50	-12.36	QP	VERTICAL
2	170.20	35.40	6.71	27.90	1.22	15.43	43.50	-28.07	QP	VERTICAL
3	175.65	39.50	6.95	27.90	1.24	19.79	43.50	-23.71	QP	VERTICAL
4	188.41	34.30	8.78	27.90	1.28	16.46	43.50	-27.04	QP	VERTICAL
5	230.91	40.50	11.44	28.00	1.09	25.03	46.00	-20.97	QP	VERTICAL
6	480.53	25.60	16.03	28.00	1.65	15.28	46.00	-30.72	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor
2. If Peak Result comply with QP limit,QP Result is deemed to comply with QP limit

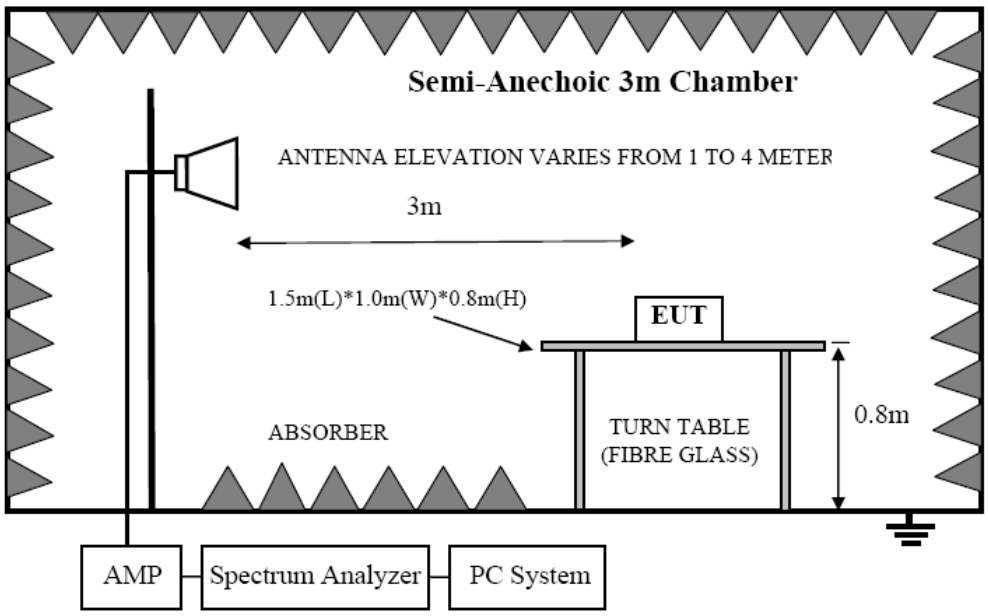
9 Band Edge Compliance

9.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal.date	Cal.Due date
Dongguan Dongdian Testing Service Co., Ltd						
1	EMI Test Receiver	R&S	ESU8	100316	2013/11/13	2014/11/12
2	Spectrum analyzer	R&S	FSU	1166.1660.26	2013/11/13	2014/11/12
3	Double Ridged Horn Antenna	R&S	HF907	100276	2013/11/16	2013/11/15
4	Pre-amplifier	A.H.	PAM0-1840VH	562	2013/11/13	2013/11/12
5	RF Cable	R&S	R01	10403	2013/11/13	2013/11/12
6	RF Cable	R&S	R02	10512	2013/11/13	2013/11/12

9.2 Block diagram of test setup

In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

9.3 Limit

All the lower and upper band-edges emissions appearing within all restriction band for example 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions.

9.4 Test Procedure

Same with clause 8.4 except change investigated frequency range from 2310MHz to 2415MHz and 2475MHz to 2500MHz.

Remark: All restriction band have been tested, and only the worse case is shown in report.

9.5 Test result

PASS. (See below detailed test result)
Remark: All modes have been tested, only worse case is reported.
Band Edge Compliance test in Dongguan Dongdian Testing Service Co., Ltd.
Please refer on page 38 to 53 of Test Report 2 DDT-REL140200.

10 Antenna Requirements

10.1 Limit

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if 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.

10.2 Result

The antennas used for this product are PCB antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0dBi.

11 Pseudorandom Frequency Hopping Sequence

11.1 Standard requirement

15.247(a)(1) requirement:

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, whichever is greater 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

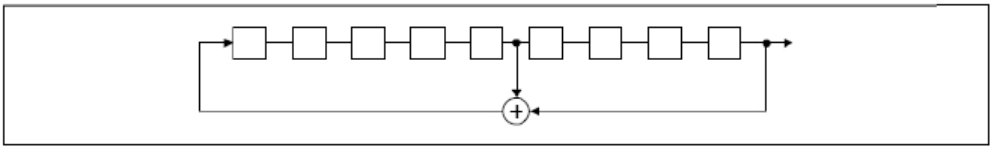
11.2 EUT Pseudorandom Frequency Hopping Sequence

The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

Number of shift register stages: 9

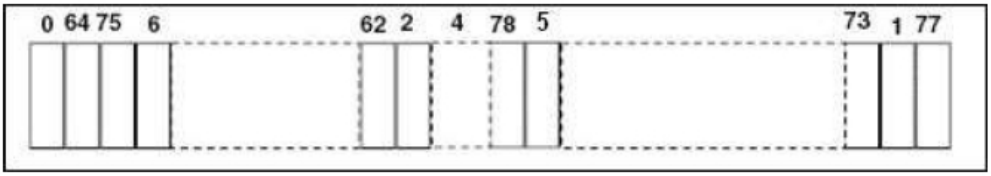
Length of pseudo-random sequence: 29 -1=511 bits

Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

------End of test report------