FCC Test Report (Bluetooth)

FCC ID	:	**2AIV5CWELL001**
Applicant	:	**CWELL INTERNATIONAL CO.,LTD.** Room 2810-2814, Building A, Qunxing Plaza, Huaqiang North Rd, Futian District, Shenzhen, 518031,China .
Sample Description		
Product Name	:	**Rugged Smartphone**
Model No.	:	HG06
Serial No.	:	N/A
Trademark	:	AngelLira
Receipt Date	:	2016-06-26
Test Date	:	2016-06-27 to 2016-07-05
Issue Date	:	2016-07-06
Test Standard(s)	:	**FCC CFR Title 47 Part 15 Subpart C Section 15.247**
Conclusions	:	**PASSED***

*In the configuration tested, the EUT complied with the standards specified above.

Test/Witness Engineer : Jason Deng

Approved & Authorized : Frank Zhang

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

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1. General Information

1.1. Client Information

Applicant	:	CWELL INTERNATIONAL CO.,LTD.
Address	:	Room 2810-2814, Building A, Qunxing Plaza, Huaqiang North Rd, Futian District, Shenzhen, 518031,China .
Manufacturer	:	CWELL INTERNATIONAL CO.,LTD.
Address	:	Room 2810-2814, Building A, Qunxing Plaza, Huaqiang North Rd, Futian District, Shenzhen, 518031,China .

1.2. General Description of EUT (Equipment Under Test)

Product Name	:	Rugged Smartphone	
Models No.	:	HG06	
Difference	:	N/A	
Product Description	:	Operation Frequency:	2402MHz~2480MHz
		Transfer Rate:	1/2/3 Mbits/s
		Number of Channel:	79 Channels
		Modulation Type:	GFSK, π/4-DQPSK, 8-DPSK
		Modulation Technology:	FHSS
		Antenna Type:	Integral PCB Antenna
		Antenna Gain:	2 dBi
Power Supply	:	USB DC 5V from PC, DC 3.7V from Li-ion battery	

Note:

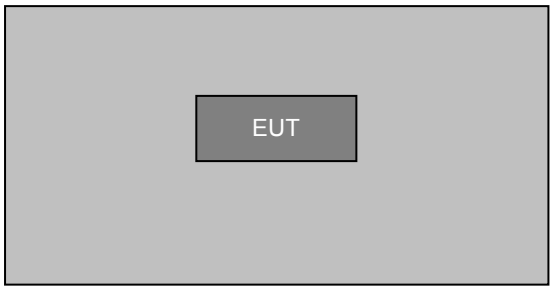
(1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

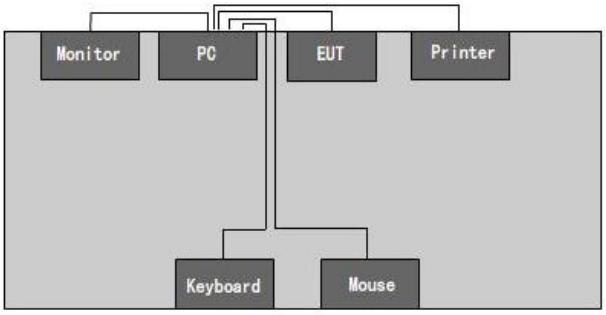
(2) Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462

07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		
Remark: Channel 0, 39 &78 selected for GFSK, π/4-DQPSK and 8DPSK.					

1.3. Block Diagram Showing The Configuration of System Tested





1.4. Description of Support Units

Name	Model	Serial Number	Manufacturer
Printer	HP1020	CNCJ410726	HP
LCD Monitor	G205HV	10306738385	ACER
PC	ASPIREM1830	PTSF90C00305005CAC3000	ACER
Keyboard	SK-9625	KBUSB1580500037E0100	ACER
Mouse	MS.11200.014	M-UAY-ACR2	ACER

1.5. External I/O Cable

Cable Description	Length(m)	From/ Port	To
Shielding Detachable USB Cable	1.5	Host PC	Mouse
Shielding Detachable K/B Cable	1.5	Host PC	Keyboard
Shielding Detachable serial Cable	1.5	Host PC	Printer
Shielding Detachable VGA Cable	1.5	Host PC	LCD Monitor
Unshielding Detachable USB Cable	0.8	EUT	Host PC
Unshielding Audio Cable	0.6	EUT	Host PC

1.6. Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

Test Mode	Description
Charging & Working mode	Keep the EUT in Charging& working mode
Transmitting mode	Keep the EUT in Transmitting mode with worst case data rate
Remark	GFSK(1Mbps) is the worst case mode

Remark: 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.

1.7. Test Instruments List

	Test Equipment	Manufacturer	Model No.	Cal. Date	Cal. Due date
1	Bilog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	May 22, 2016	May 21, 2017
2	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	May 27, 2016	May 26, 2017
3	Coaxial Cable	N/A	N/A	Mar. 28, 2016	Mar. 27, 2017
4	Coaxial Cable	N/A	N/A	Mar. 29, 2016	Mar. 29, 2017
5	Coaxial cable	N/A	N/A	Mar. 29, 2016	Mar. 29, 2017
6	Coaxial Cable	N/A	N/A	Mar. 29, 2016	Mar. 29, 2017
7	Coaxial Cable	N/A	N/A	Mar. 29, 2016	Mar. 29, 2017
8	Amplifier (10kHz-1.3GHz)	HP	8447D	Mar. 29, 2016	Mar. 29, 2017
9	Amplifier (1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	Jun. 06, 2016	Mar. 29, 2017
10	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	Mar. 29, 2016	Mar. 29, 2017
11	Horn Antenna	ETS-LINDGREN	3160	Mar. 27, 2016	Mar. 27, 2017
12	Positioning Controller	UC	UC3000	N/A	N/A
13	Spectrum analyzer 9kHz-30GHz	Rohde & Schwarz	FSP	May 26, 2016	May 27, 2017
14	EMI Test Receiver	Rohde & Schwarz	ESPI	Mar. 29, 2016	Mar. 30, 2017
15	Loop antenna	Laplace instrument	RF300	May 22,, 2016	May 23, 2017
16	Universal radio communication tester	Rhode & Schwarz	CMU200	May 26, 2016	May 27, 2017
17	Signal Analyzer	Rohde & Schwarz	FSIQ3	May 26, 2016	May 27, 2017
18	L.I.S.N.#1	Rohde & Schwarz	NSLK8126	May 26, 2016	May 27, 2017
19	L.I.S.N.#2	Rohde & Schwarz	ENV216	May 26, 2016	May 27, 2017
20	Power Meter	Anritsu	ML2495A	May 26, 2016	May 27, 2017
21	Power sensor	Anritsu	ML2491A	May 26, 2016	May 27, 2017

1.8. Laboratory Location

Shenzhen TOBY technology Co., Ltd

Address: 1 A/F., Bldg.6, Yusheng Industrial Zone The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, 518057, China

At the time of testing, the Laboratory is accredited. It is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562 7.

Tel:0086-755-26509301 Fax: 0086-755-26509195

2. Test Summary

Standard Section	Test Item	Judgment
15.203/15.247(c)	Antenna Requirement	PASSED
15.207	Conducted Emission	PASSED
15.247(b)(1)	Conducted Peak Output Power	PASSED
15.247(a)(1)	20dB Occupied Bandwidth	PASSED
15.247(a)(1)	Carrier Frequencies Separation	PASSED
15.247(a)(1)	Hopping Channel Number	PASSED
15.247(a)(1)	Dwell Time	PASSED
15.247(b)(4)&TCB Exclusion List (7 July 2002)	Pseudorandom Frequency Hopping Sequence	PASSED
15.205/15.209	Spurious Emission	PASSED
15.247(d)	Band Edge	PASSED
Remark: “N/A” is an abbreviation for Not Applicable.		

3. Antenna Requirement

3.1. Standard Requirement

3.1.1 Test standard

FCC Part15 Section 15.203 /247(c)

3.1.2 Requirement

1) 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.

2) 15.247(c) (1)(i) requirement:
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 6 dBi.

3.2. Antenna Connected Construction

The bluetooth antenna is an integral antenna which permanently attached, and the best case gain of the antenna is 2 dBi. It complies with the standard requirement.

4. Conducted Emission Test

4.1. Test Standard and Limit

4.1.1 Test Standard

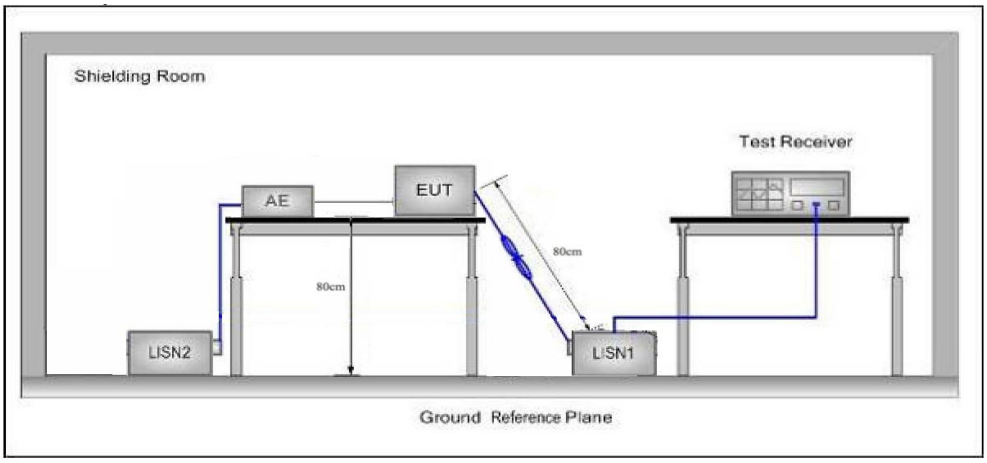
FCC Part15 Section 15.207

4.1.2 Test Limit

Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dBμV)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequencies.		

4.2. Test Setup



4.3. Test Procedure

1) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

2) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal

ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

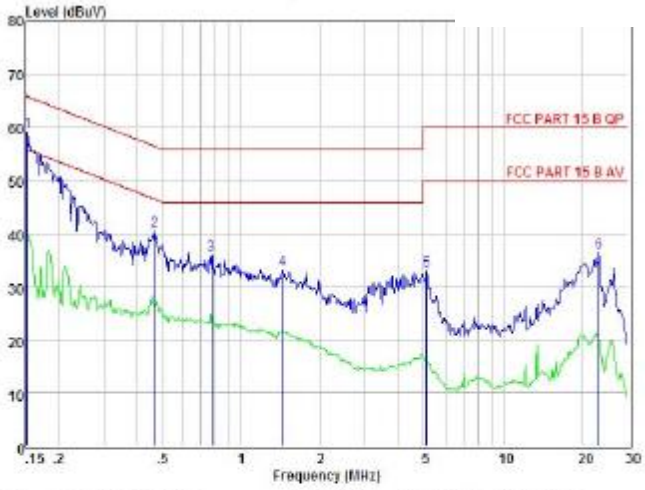
The Test Receiver setup: RBW=9kHz, VBW=30kHz, Sweep time= auto

4.4. Test Data

Please to see the following pages

Conducted Emission Test Data

EUT:	Rugged Smartphone	M/N: HG06
Operating Condition:	Charging & Working mode	
Test Site:	Shielded room	
Operator:	Jason	
Test Specification:	AC120V/60Hz	
Polarization:	Line	
Note	Tem:25℃ Hum:50%	



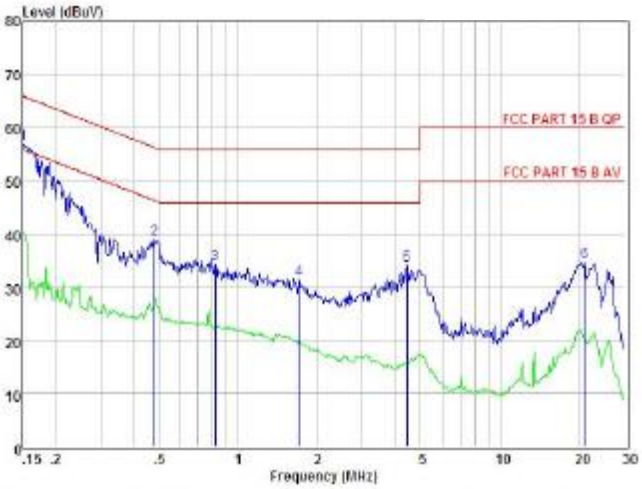
Condition : FCC PART 15 B QP POL: LINE Temp:20.1 ℃ Hum:45 %

Item	Freq MHz	Read dBuV	LISN Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	0.152	49.98	0.09	-9.72	0.10	50.29	65.91	-6.68	Peak
2	0.466	30.73	0.03	-9.72	0.10	40.58	56.58	-16.00	Peak
3	0.775	26.36	0.00	-9.71	0.10	36.11	56.00	-19.89	Peak
4	1.449	23.37	0.05	-9.71	0.10	33.23	56.00	-22.77	Peak
5	5.166	23.15	0.10	-9.67	0.12	33.04	60.00	-26.96	Peak
6	29.140	26.00	0.42	-9.55	0.43	36.40	60.00	-23.60	Peak

Remarks: Level = Read + LISN Factor - Preamp Factor + Cable Loss

Conducted Emission Test Data

EUT:	Rugged Smartphone	M/N: HG06
Operating Condition:	Charging & Working mode	
Test Site:	Shielded room	
Operator:	Jason	
Test Specification:	AC 120V/60Hz	
Polarization:	Neutral	
Note	Tem:25℃	Hum:50%



Condition : FCC PART 15 B QP POL: NEUTRAL Temp:20.1 ℃ Hum:45 %

Item	Freq MHz	Read dBuV	LISN Factor dB	Preamp Factor dB	Cable loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	0.150	47.24	0.03	-9.72	0.10	37.69	66.00	-8.81	Peak
2	0.481	29.14	0.08	-9.72	0.10	38.99	56.32	-17.33	Peak
3	0.822	24.45	0.02	-9.71	0.10	34.28	56.00	-21.72	Peak
4	1.716	21.65	0.05	-9.70	0.10	31.50	56.00	-24.50	Peak
5	4.454	24.26	0.09	-9.68	0.12	34.15	56.00	-21.85	Peak
6	20.924	24.49	0.34	-9.51	0.37	34.71	60.00	-25.29	Peak

Remarks: Level = Read + LISN Factor - Preamp Factor + Cable loss

5. Conducted Peak Output Power Test

5.1. Test Standard and Limit

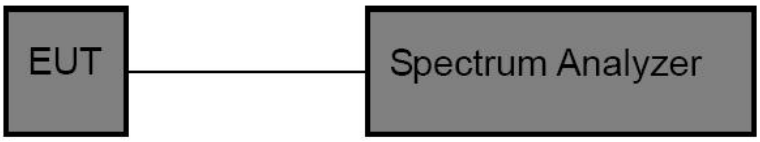
5.1.1 Test Standard

FCC Part15 C Section 15.247 (b)(3)

5.1.2 Test Limit

FCC Part 15 Subpart C(15.247)		
Test Item	Limit	Frequency Range (MHz)
Peak Output Power	Hopping Channels>75 Power<1W(30dBm) Other <125 mW(21dBm)	2400~2483.5

5.2. Test Setup



5.3. Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:

RBW=1MHz, VBW=3MHz, Detector=Peak (If 20dB BW ≤1 MHz)

RBW=3MHz, VBW=10MHz, Detector=Peak (If 20dB BW > 1 MHz)

(3) The EUT was set to continuously transmitting in the max power during the test.

5.4. Test Data

GFSK mode				
Channel Number	**Channel Frequency (MHz)**	**Test Result (dBm)**	**Limit (30dBm)**	**Judgment**
CH 00	2402	4.155	21	PASSED
CH 39	2441	5.736	21	PASSED
CH 78	2480	6.279	21	PASSED
π/4-DQPSK mode				
Channel Number	**Channel Frequency (MHz)**	**Test Result (dBm)**	**Limit (30dBm)**	**Judgment**
CH 00	2402	1.942	21	PASSED
CH 39	2441	4.240	21	PASSED
CH 78	2480	5.079	21	PASSED
8DPSK mode				
Channel Number	**Channel Frequency (MHz)**	**Test Result (dBm)**	**Limit (30dBm)**	**Judgment**
CH 00	2402	2.419	21	PASSED
CH 39	2441	4.689	21	PASSED
CH 78	2480	5.447	21	PASSED
Remark: Test plot as follows				

.....

Modulation mode		GFSK mode
2402MHz		
2441MHz		

2480MHz	

Modulation mode	π/4-DQPSK
2402MHz	

2441MHz		
2480MHz		

Modulation mode		8DPSK	
2402MHz			
2441MHz			

2480MHz		

Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 2.479960000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Mkr1 2.479 96 GHz
5.447 dBm
10 dB/div
Log
Ref 10.00 dBm
Center 2.480000 GHz
#Res BW 2.0 MHz
#VBW 6.0 MHz
Span 10.00 MHz
Sweep 1.000 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

6. 20dB Occupy Bandwidth Test

6.1. Test Standard and Limit

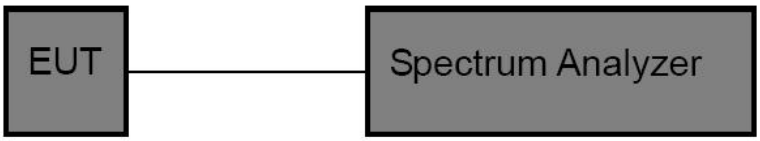
6.1.1 Test Standard

FCC Part15 C Section 15.247 (a)(1)

6.1.2 Test Limit

FCC Part 15 Subpart C(15.247)		
Test Item	Limit	Frequency Range (MHz)
Bandwidth	20dB bandwidth	2400~2483.5

6.2. Test Setup



6.3. Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:

Bandwidth: RBW=30 kHz, VBW=100 kHz, detector= Peak

6.4. Test Data

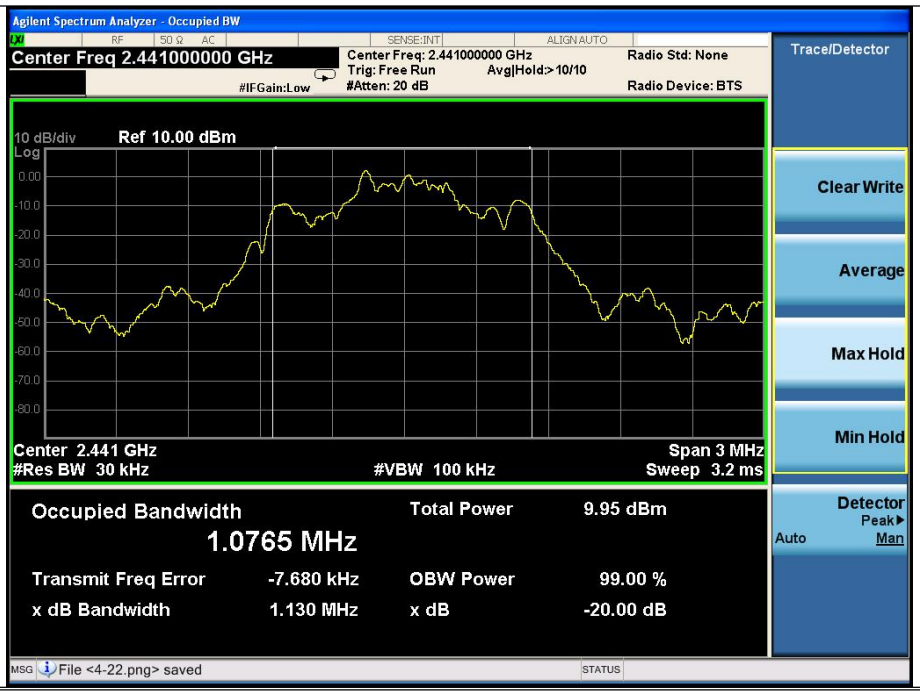
Channel Number	Channel Frequency	20dB Bandwidth (MHz)		
		GFSK	π/4-DQPSK	8DPSK
CH 00	2402(MHz)	0.882	1.126	1.156
CH 39	2441(MHz)	0.891	1.130	1.157
CH 78	2480(MHz)	0.893	1.126	1.156
Remark: Test plot as follows				

Modulation mode		GFSK mode
2402MHz		
2441MHz		

2480MHz		

Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 20 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Trace/Detector
10 dB/div
Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Clear Write
Average
Max Hold
Min Hold
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 3.2 ms
Occupied Bandwidth
861.91 kHz
Total Power 10.6 dBm
Transmit Freq Error 2.499 kHz
OBW Power 99.00 %
x dB Bandwidth 893.0 kHz
x dB -20.00 dB
Detector
Peak
Auto
Man
MSG
STATUS

Modulation mode		π/4-DQPSK
2402MHz		
2441MHz		

2480MHz		 Agilent Spectrum Analyzer - Occupied BW Center Freq 2.441000000 GHz Center Freq: 2.441000000 GHz Trig: Free Run Avg|Hold:>10/10 #Atten: 20 dB #IFGain:Low Radio Std: None Radio Device: BTS Trace/Detector 10 dB/div Ref 10.00 dBm Log 0.00 -10.0 -20.0 -30.0 -40.0 -50.0 -60.0 -70.0 -80.0 Clear Write Average Max Hold Min Hold Center 2.441 GHz #Res BW 30 kHz #VBW 100 kHz Span 3 MHz Sweep 3.2 ms Occupied Bandwidth 1.0765 MHz Total Power 9.95 dBm Transmit Freq Error -7.680 kHz OBW Power 99.00 % x dB Bandwidth 1.130 MHz x dB -20.00 dB Detector Peak Auto Man MSG File <4-22.png> saved STATUS

Modulation mode		8DPSK
2402MHz		
2441MHz		

2480MHz		Agilent Spectrum Analyzer - Occupied BW Center Freq 2.480000000 GHz Center Freq: 2.480000000 GHz Trig: Free Run Avg|Hold:>10/10 #Atten: 20 dB #IFGain:Low Radio Std: None Radio Device: BTS Trace/Detector 10 dB/div Ref 10.00 dBm Log 0.00 -10.0 -20.0 -30.0 -40.0 -50.0 -60.0 -70.0 -80.0 Clear Write Average Max Hold Min Hold Center 2.48 GHz #Res BW 30 kHz #VBW 100 kHz Span 3 MHz Sweep 3.2 ms Occupied Bandwidth 1.0788 MHz Total Power 9.81 dBm Transmit Freq Error -445 Hz OBW Power 99.00 % x dB Bandwidth 1.156 MHz x dB -20.00 dB Detector Peak Auto Man File <8-33.png> saved

7. Carrier Frequency Separation Test

7.1. Test Standard and Limit

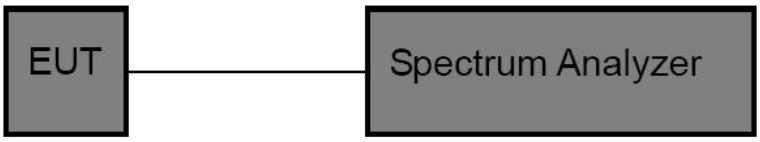
7.1.1 Test Standard

FCC Part15 C Section 15.247 (a)(1)

7.1.2 Test Limit

FCC Part 15 Subpart C(15.247)		
Test Item	Limit	Frequency Range (MHz)
Channel Separation	>25KHz or >two-thirds of the 20 dB bandwidth (Which is greater)	2400~2483.5

7.2. Test Setup



7.3. Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

(2) Spectrum Setting:
RBW=100 kHz, VBW=300 kHz, detector= Peak, Sweep Time =auto.

(3) The EUT was set to the Hopping Mode for Channel Separation Test and continuously transmitting for the Test.

7.4. Test Data

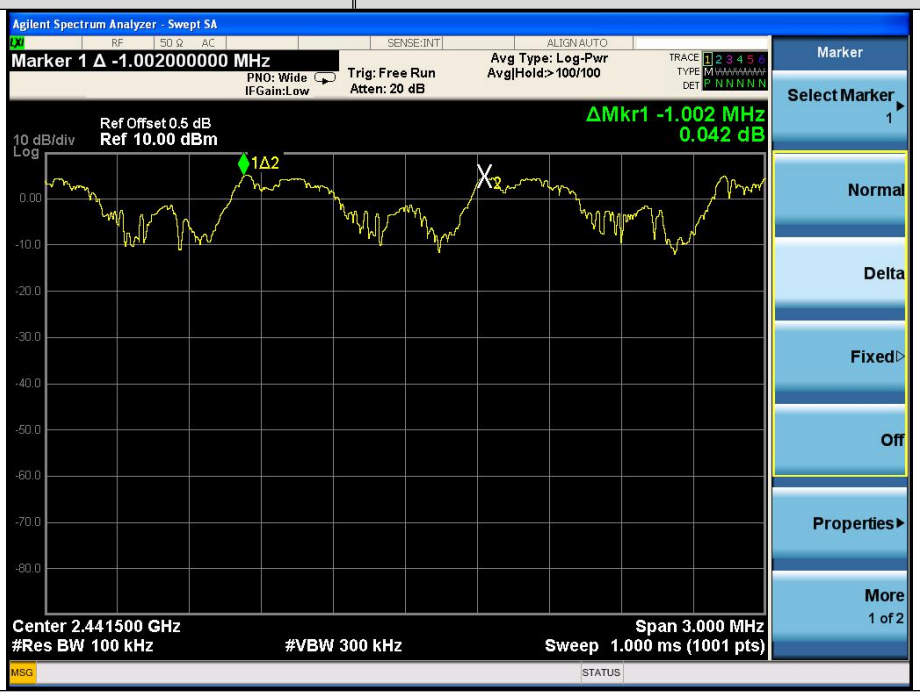
GFSK mode				
Channel Number	**Channel Frequency (MHz)**	**Test Result (MHz)**	**Limit (MHz)**	**Judgment**
CH 39	2441	1.002	0.594	PASSED
π/4-DQPSK mode				
Channel Number	**Channel Frequency (MHz)**	**Test Result (MHz)**	**Limit (MHz)**	**Judgment**
CH 39	2441	1.020	0.594	PASSED
8DPSK mode				
Channel Number	**Channel Frequency (MHz)**	**Test Result (MHz)**	**Limit (MHz)**	**Judgment**
CH 39	2441	1.002	0.771	PASSED
Remark: Test plot as follows				

According to section 6.4

Test Mode	20dB bandwidth (MHz) (worse case)	Limit (MHz) (Carrier Frequency Separation)
GFSK	0.891	0.594
π/4-DQPSK	1.13	0.594
8DPSK	1.157	0.771

Modulation mode		GFSK mode
2441MHz		

Modulation mode		π/4-DQPSK
2441MHz		

Modulation mode		8DPSK
2441MHz		

8. Number of Hopping Channel

8.1. Test Standard and Limit

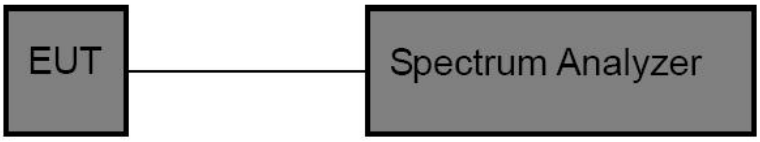
8.1.1 Test Standard

FCC Part15 C Section 15.247 (a)(1)

8.1.2 Test Limit

FCC Part 15 Subpart C (15.247)		
Test Item	Limit	Frequency Range (MHz)
Number of Hopping Channel	>15 channels	2400~2483.5

8.2. Test Setup



8.3. Test Procedure

(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.

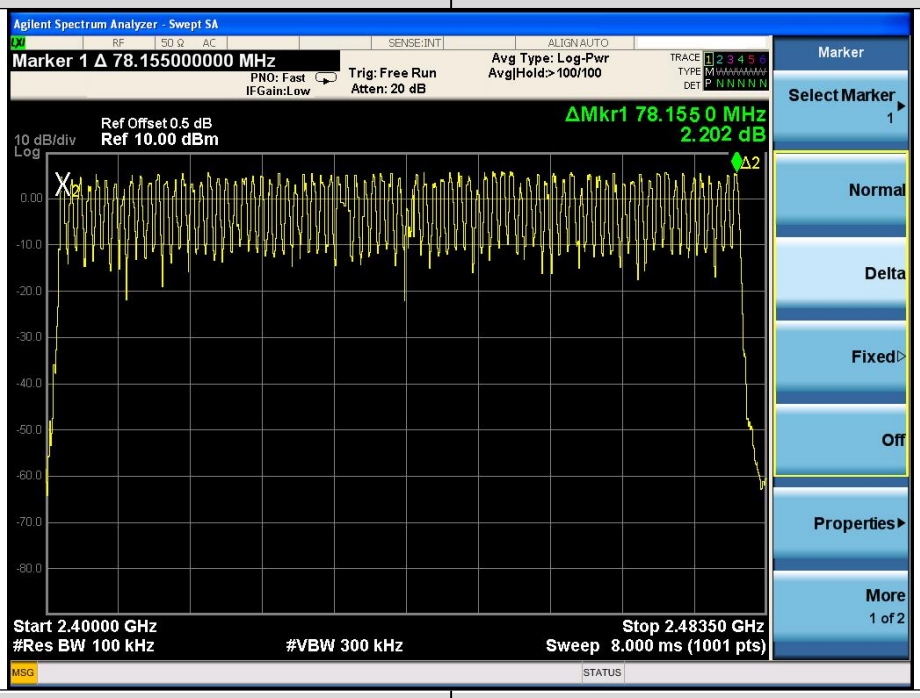
(2) Spectrum Setting: RBW=100 kHz, VBW=300 kHz, Detector=Peak, Sweep time= Auto.

(3) The EUT was set to the Hopping Mode for Channel Separation Test and continuously transmitting for the Test.

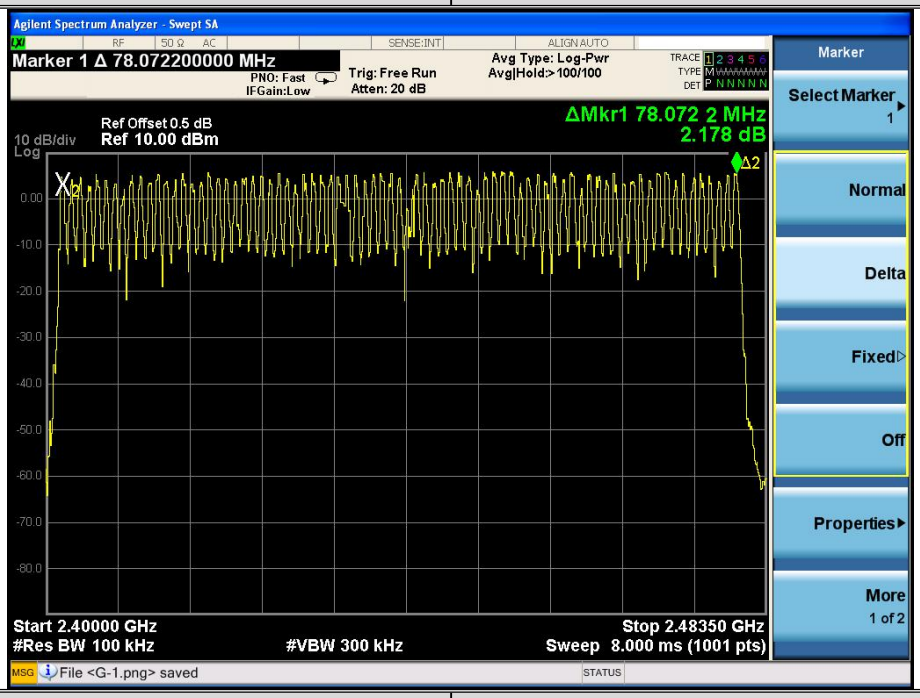
8.4. Test Data

Mode	Quantity of Hopping Channel	Limit	Judgment
GFSK, π/4-DQPSK, 8DPSK	79	>15	PASSED

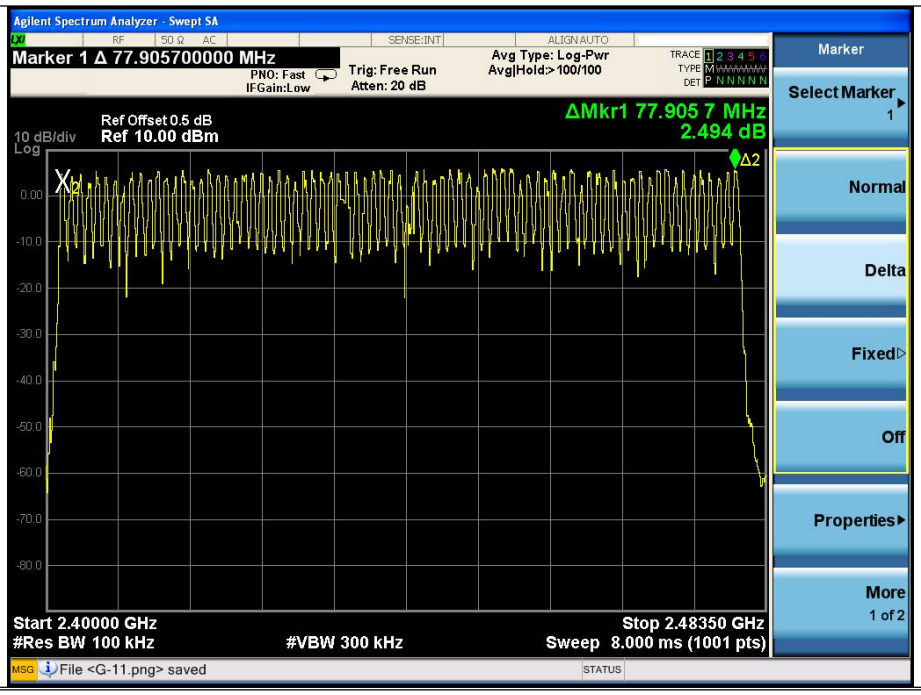
Modulation mode	GFSK mode



Modulation mode	π/4-DQPSK



Modulation mode	8DPSK


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 77.905700000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ref Offset 0.5 dB
10 dB/div
Log
Ref 10.00 dBm
ΔMkr1 77.905 7 MHz
2.494 dB
Δ2
Start 2.40000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.48350 GHz
Sweep 8.000 ms (1001 pts)
Marker
Select Marker 1
Normal
Delta
Fixed
Off
Properties
More 1 of 2
File <G-11.png> saved

9. Dwell Time Test

9.1. Test Standard and Limit

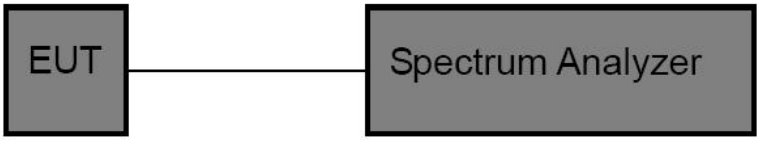
9.1.1 Test Standard

FCC Part15 C Section 15.247 (a)(1)

9.1.2 Test Limit

FCC Part 15 Subpart C(15.247)		
Section	Test Item	Limit
15.247(a)(1)	Dwell time	0.4 sec

9.2. Test Setup



9.3. Test Procedure

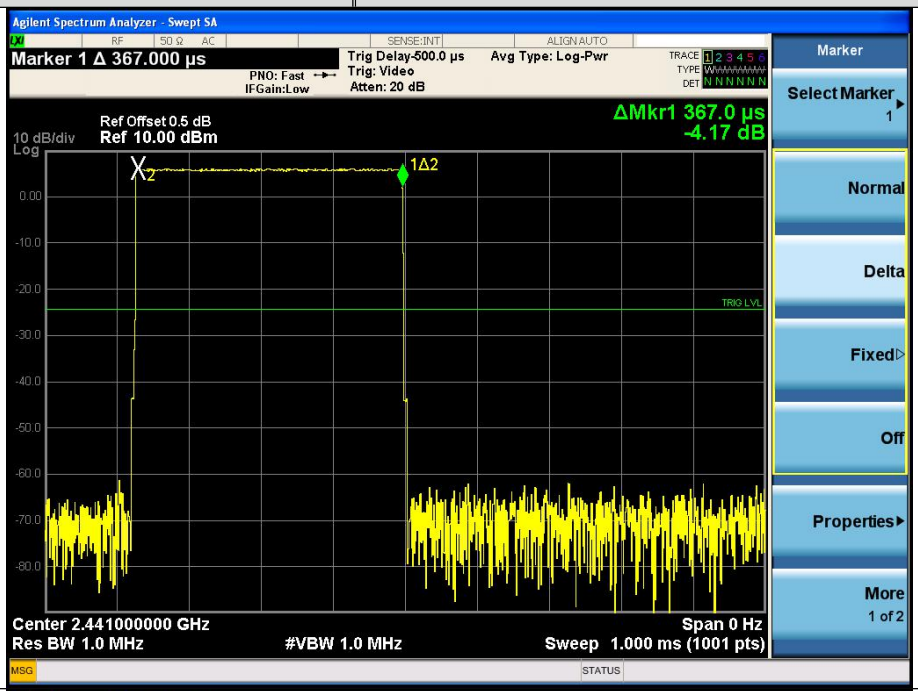
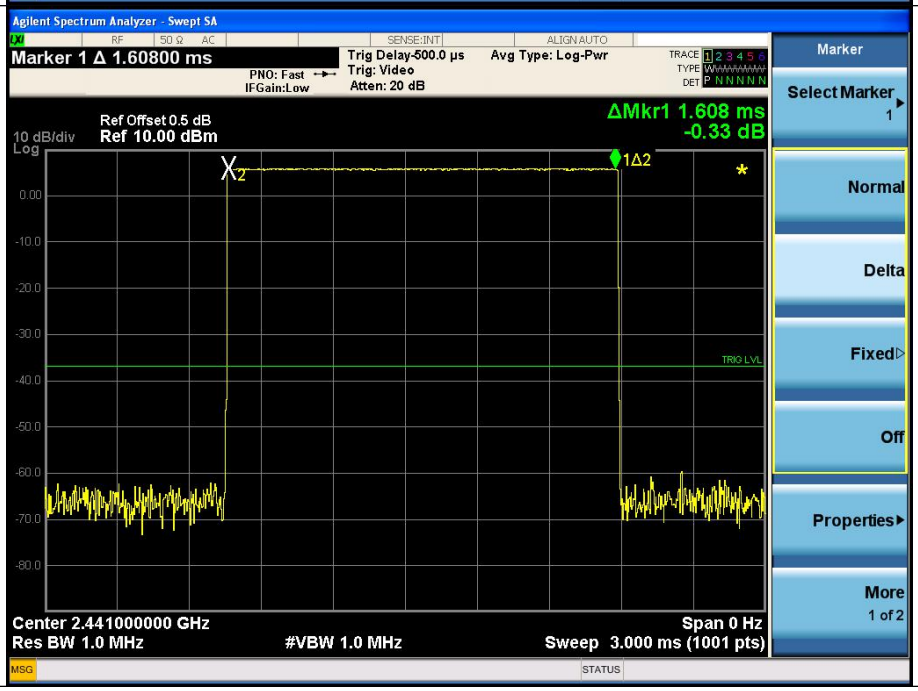
(1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
(2) Spectrum Setting: RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak
(3) Use video trigger with the trigger level set to enable triggering only on full pulses.
(4) Sweep Time is more than once pulse time.
(5) Set the center frequency on any frequency would be measure and set the frequency span to zero span.
(6) Measure the maximum time duration of one single pulse.
(7) Set the EUT for packet transmitting.
(8) Measure the maximum time duration of one single pulse.
(9) The EUT was set to the Hopping Mode for Dwell Time Test

9.4. Test Data

For GFSK, π/4-DQPSK and 8DPSK:

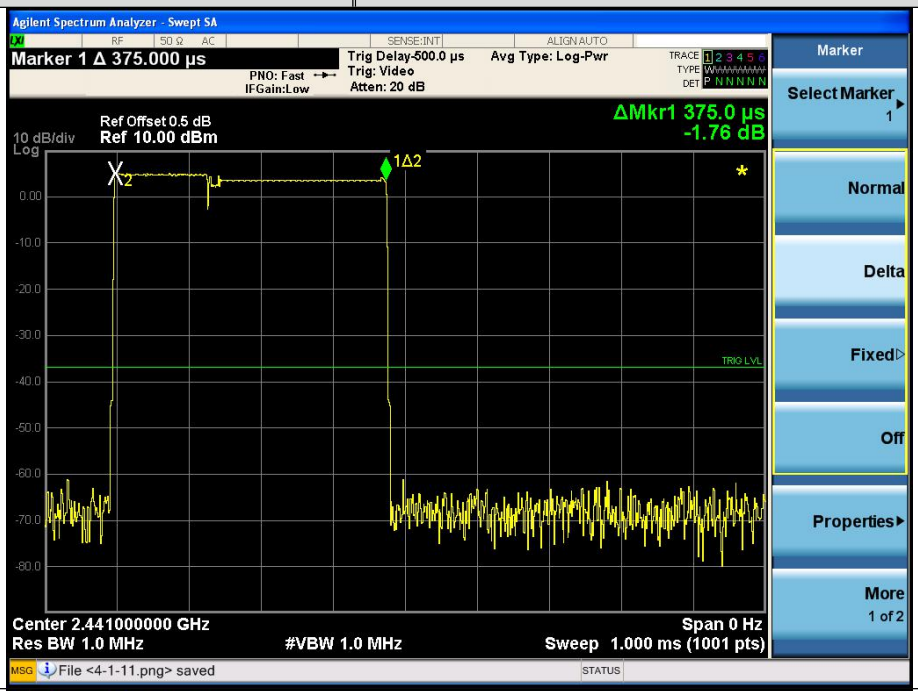
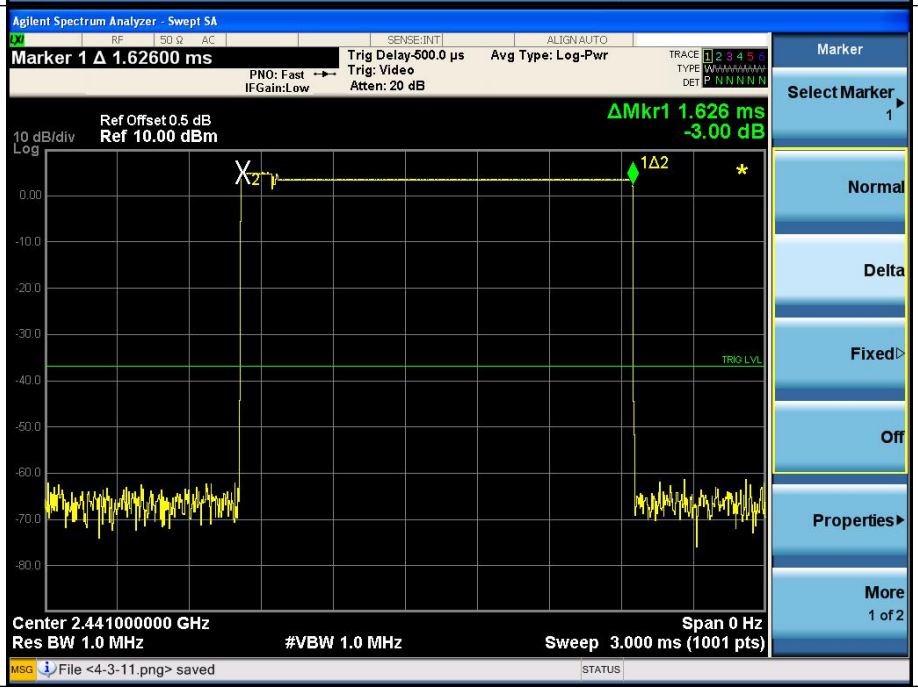
The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

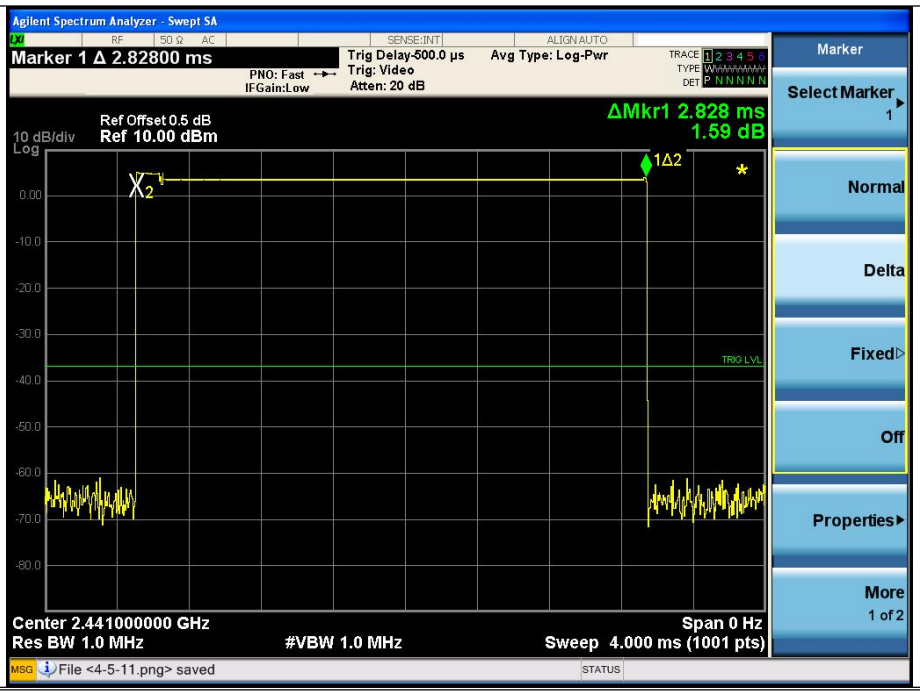
EUT: Bluetooth Headset M/N: X7						
Test date: 2015-01-08		Test site: RF site				
Mode	Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limit (s)	Conclusion
GFSK	DH1	2441	0.367	0.235	<0.4	PASS
	DH3	2441	1.608	0.343	<0.4	PASS
	DH5	2441	2.868	0.367	<0.4	PASS
π/4 DQPSK	DH1	2441	0.375	0.240	<0.4	PASS
	DH3	2441	1.626	0.347	<0.4	PASS
	DH5	2441	2.828	0.362	<0.4	PASS
8- DQPSK	DH1	2441	0.375	0.240	<0.4	PASS
	DH3	2441	1.653	0.353	<0.4	PASS
	DH5	2441	2.860	0.366	<0.4	PASS
Note: 1 A period time = 0.4 (s) * 79 = 31.6(s) 2 DH1 time slot = Pulse Duration * (1600/(1*79)) * A period time DH3 time slot = Pulse Duration * (1600/(3*79)) * A period time DH5 time slot = Pulse Duration * (1600/(5*79)) * A period time						

Modulation mode		GFSK mode	
DH1			
DH3			

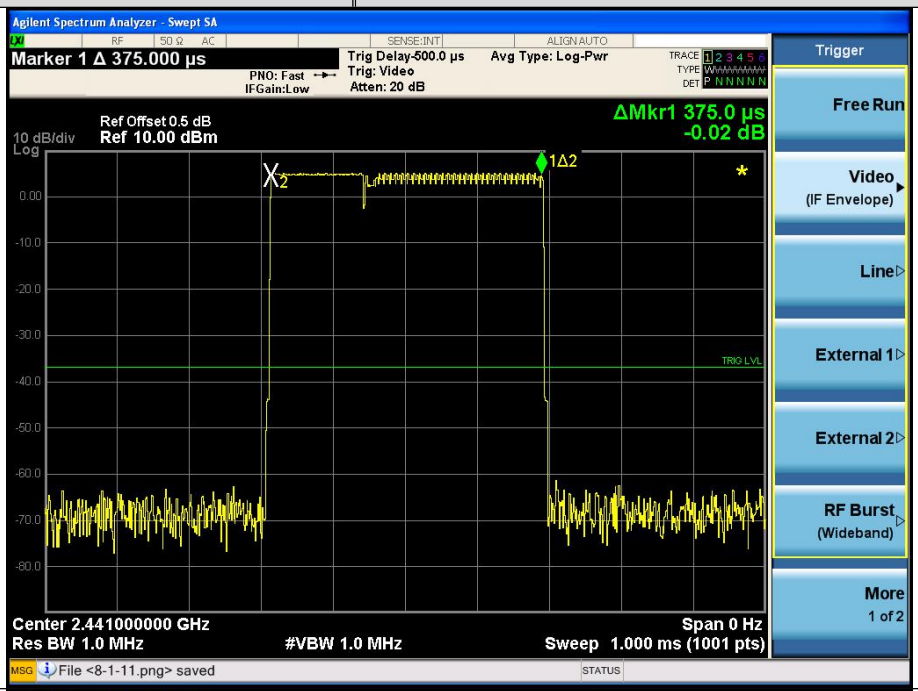
DH5		

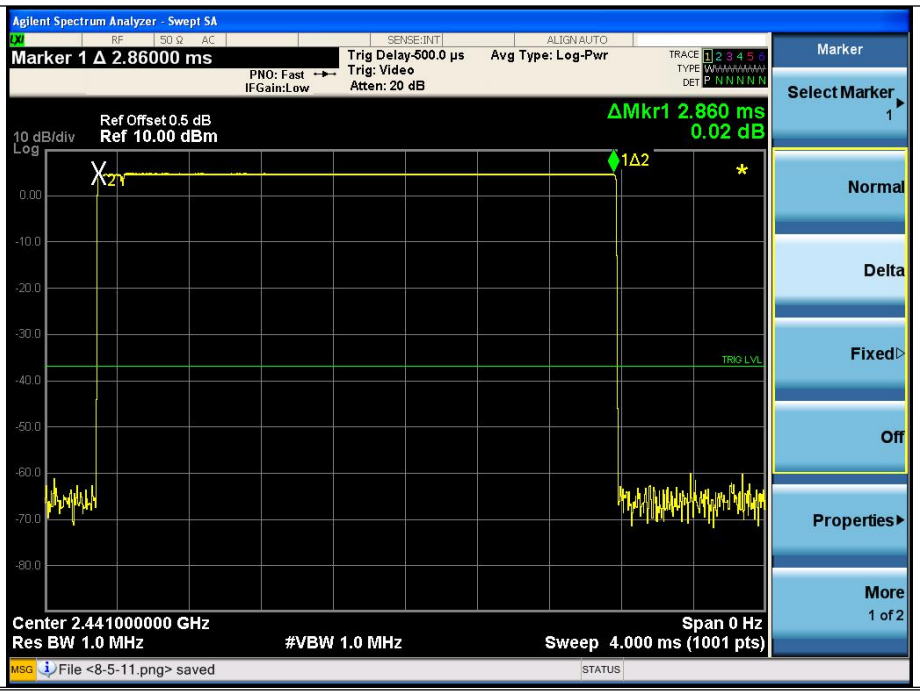
Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 2.86800 ms
PNO: Fast
IFGain:Low
Trig Delay-500.0 µs
Trig: Video
Atten: 20 dB
Avg Type: Log-Pwr
Ref Offset 0.5 dB
10 dB/div
Ref 10.00 dBm
ΔMkr1 2.868 ms
-0.14 dB
1Δ2
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 4.000 ms (1001 pts)
File <G-5-11.png> saved
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2

Modulation mode		π/4-DQPSK	
2-DH1			
2-DH3			

2-DH5		

Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 2.82800 ms
PNO: Fast
IFGain:Low
Trig Delay-500.0 µs
Trig: Video
Atten: 20 dB
Avg Type: Log-Pwr
Ref Offset 0.5 dB
10 dB/div
Ref 10.00 dBm
ΔMkr1 2.828 ms
1.59 dB
Center 2.441000000 GHz
Res BW 1.0 MHz
#VBW 1.0 MHz
Span 0 Hz
Sweep 4.000 ms (1001 pts)
File <4-5-11.png> saved
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2

Modulation mode		8DPSK
3-DH1		
3-DH3		

3-DH5		 Agilent Spectrum Analyzer - Swept SA Marker 1 Δ 2.86000 ms PNO: Fast IFGain:Low Trig Delay-500.0 µs Trig: Video Atten: 20 dB Avg Type: Log-Pwr Ref Offset 0.5 dB 10 dB/div Ref 10.00 dBm ΔMkr1 2.860 ms 0.02 dB Center 2.441000000 GHz Res BW 1.0 MHz #VBW 1.0 MHz Span 0 Hz Sweep 4.000 ms (1001 pts) File <8-5-11.png> saved Marker Select Marker Normal Delta Fixed Off Properties More 1 of 2

10. Pseudorandom Frequency Hopping Sequence

10.1. Standard Requirement

10.1.1 Test Standard

FCC Part15 C Section 15.247 (a)(1)

10.1.2 Requirement

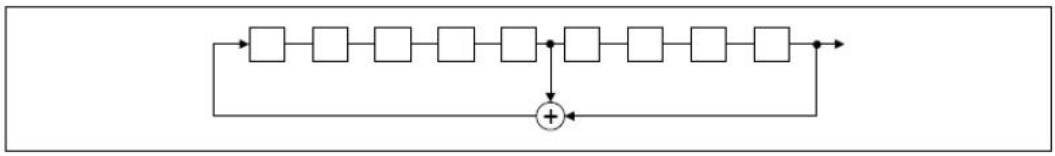
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel 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. 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.

10.2. 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: 2^9 -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.