

FCC TEST REPORT

Product Name: Wireless Sport Earbuds
Trade Mark: INSIGNIA
Model No.: NS-AHBTSPORT2
HVIN: NSAHBT2
Report Number: 180207001RFC-1
Test Standards: FCC 47 CFR Part 15 Subpart C
RSS-247 Issue 2
RSS-Gen Issue 4
FCC ID: 2ALVK-NSAHBT2
IC: 11136A-NSAHBT2
Test Result: PASS
Date of Issue: March 6, 2018

Prepared for:

Cosonic Intelligent Technologies Co.,Ltd.
5th Floor,1st Building,No.6 South Industry Road Songshan Lake Hi-tech Industrial Development Zone

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
16/F, Block A, Building 6, Baoneng Science and Technology Park,
Qingxiang Road No.1, Longhua New District, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Tested by: Henry Lu
Henry Lu
Engineer

Reviewed by: Kevin Liang
Kevin Liang
Team Leader

Approved by: Jim Long
Jim Long
Assistant Manager

Date: March 6, 2018



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

[Http://www.uttlab.com](http://www.uttlab.com)

Version

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V1.0	March 6, 2018	Original



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Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Cosonic Intelligent Technologies Co.,Ltd.
Address of Applicant:	5th Floor,1st Building,No.6 South Industry Road Songshan Lake Hi-tech Industrial Development Zone
Manufacturer:	Cosonic Intelligent Technologies Co.,Ltd.
Address of Manufacturer:	5th Floor,1st Building,No.6 South Industry Road Songshan Lake Hi-tech Industrial Development Zone

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Wireless Sport Earbuds	
Model No.:	NS-AHBTSPORT2	
Trade Mark:	INSIGNIA	
DUT Stage:	Identical Prototype	
EUT Supports Function:	2.4 GHz ISM Band:	Bluetooth V4.1+EDR
Software Version:	V1.1	
Hardware Version:	V0.16	
Sample Received Date:	February 27, 2018	
Sample Tested Date:	February 27, 2018 to March 1, 2018	

1.2.2 Description of Accessories

Battery	
Trade Mark:	VDL
Model No.:	551419
Battery Type:	Lithium-ion Polymer Rechargeable Battery
Rated Voltage:	3.7 Vdc
Rated Capacity:	100 mAh

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Range:	2400 MHz to 2483.5 MHz
Bluetooth Version:	Bluetooth V4.1+EDR
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Type of Modulation:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels:	79
Channel Separation:	1 MHz
Hopping Channel Type:	Adaptive Frequency Hopping Systems
Antenna Type:	Ceramic Antenna
Antenna Gain:	2.5 dBi
Maximum Peak Power:	4.53 dBm
Normal Test Voltage:	3.7 Vdc

1.4 OTHER INFORMATION

Operation Frequency Each of Channel	
$f = 2402 + k \text{ MHz}, k = 0, \dots, 78$	
Note:	
f	is the operating frequency (MHz);
k	is the operating channel.

Modulation Configure			
Modulation	Packet	Packet Type	Packet Size
GFSK	1-DH1	4	27
	1-DH3	11	183
	1-DH5	15	339
$\pi/4$ DQPSK	2-DH1	20	54
	2-DH3	26	367
	2-DH5	30	679
8DPSK	3-DH1	24	83
	3-DH3	27	552
	3-DH5	31	1021

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	Lenovo	E450	SL10G10780	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.3 Meter	UnionTrust
2	USB Cable	USB	0.5 Meter	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109
Telephone: +86 (0) 755 2823 0888
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1.7 TEST FACILITY

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

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

IC-Registration No.: 21600-1

The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart C Test Cases			
Test Item	Test Requirement	Test Method	Result
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203/15.247 (c) RSS-Gen Issue 4, Section 8.3	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207 RSS-Gen Issue 4, Section 8.8	ANSI C63.10-2013	N/A(See Note 1, 2)
Conducted Peak Output Power	FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(1) RSS-247 Issue 2, Section 5.4(b)	ANSI C63.10-2013	PASS
20 dB Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1) RSS-247 Issue 2, Section 5.1(a)	ANSI C63.10-2013	PASS
Occupied Bandwidth	RSS-Gen section 6.6	RSS-Gen section 6.6	PASS
Carrier Frequencies Separation	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1) RSS-247 Issue 2, Section 5.1(b)	ANSI C63.10-2013	PASS
Number of Hopping Channel	FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(1) RSS-247 Issue 2, Section 5.1(d)	ANSI C63.10-2013	PASS
Dwell Time	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1) RSS-247 Issue 2, Section 5.1(d)	ANSI C63.10-2013	PASS
Pseudorandom Frequency Hopping Sequence	FCC 47 CFR Part 15 Subpart C Section 15.247(a)(1)(g)(h) RSS-247 Issue 2, Section 5.1	ANSI C63.10-2013	PASS
Conducted Out of Band Emission	FCC 47 CFR Part 15 Subpart C Section 15.247(d) RSS-247 Issue 2, Section 5.5	ANSI C63.10-2013	PASS
Radiated Emissions	FCC 47 CFR Part 15 Subpart C Section 15.205/15.209 RSS-Gen Issue 4, Section 6.13/8.9/8.10	ANSI C63.10-2013	PASS
Band Edge Measurement	FCC 47 CFR Part 15 Subpart C Section 15.205/15.209 RSS-247 Issue 2, Section 5.5	ANSI C63.10-2013	PASS
Note: 1) N/A: In this whole report not application. 2) Bluetooth does not work in charging mode.			

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 20, 2015	Dec. 19, 2018
☒	Receiver	R&S	ESIB26	100114	Dec. 10, 2017	Dec. 10, 2018
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Dec.17, 2017	Dec. 17, 2018
☒	Preamplifier	HP	8447F	2805A02960	Dec.10, 2017	Dec. 10, 2018
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	Dec. 17, 2017	Dec. 17, 2018
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Band Rejection Filter (2400MHz~2500MHz)	Micro-Tronics	BRM50702	G248	Jun. 21, 2017	Jun. 20, 2018
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Dec. 10, 2017	Dec. 10, 2018
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Dec. 10, 2017	Dec. 10, 2018
☒	LISN	R&S	ESH2-Z5	860014/024	Dec. 10, 2017	Dec. 10, 2018
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted RF test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Dec. 10, 2017	Dec. 10, 2018
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	Dec. 10, 2017	Dec. 10, 2018
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430023	Dec. 10, 2017	Dec. 10, 2018

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NT/NV	+15 to +35	3.7	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)	Tested by
AC Power Line Conducted Emission	23	47	101.2	Fire huo
Conducted Peak Output Power	23	47	101.2	Fire huo
20 dB Bandwidth	23	47	101.2	Fire huo
Carrier Frequencies Separation	23	47	101.2	Fire huo
Number of Hopping Channel	23	47	101.2	Fire huo
Dwell Time	23	47	101.2	Fire huo
Conducted Out of Band Emission	23	47	101.2	Fire huo
Radiated Emissions	23	47	101.2	Fire huo
Band Edge Measurement	23	47	101.2	Fire huo

4.2 TEST CHANNELS

Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
GFSK (DH1, DH3, DH5)	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78
		2402 MHz	2441 MHz	2480 MHz
$\pi/4$ DQPSK (DH1, DH3, DH5)	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78
		2402 MHz	2441 MHz	2480 MHz
8DPSK (DH1, DH3, DH5)	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78
		2402 MHz	2441 MHz	2480 MHz

4.3 EUT TEST STATUS

Type of Modulation	Tx Function	Description
GFSK/ $\pi/4$ DQPSK/ 8DPSK	1Tx	1. Keep the EUT in continuously transmitting with Modulation test single 2. Keep the EUT in continuously transmitting with Modulation test Hopping Frequency.

4.4 PRE-SCAN

4.4.1 Pre-scan under all packets at middle channel

Conducted Average Power (dBm) for packets									
Type of Modulation	GFSK			$\pi/4$ DQPSK			8DPSK		
Packets	1-DH1	1-DH3	1-DH5	2-DH1	2-DH3	2-DH5	3-DH1	3-DH3	3-DH5
Power (dBm)	-1.65	-1.23	1.22	-1.61	-0.68	1.17	-1.55	-0.71	1.57

4.4.2 Worst-case data packets

Type of Modulation	Worst-case data rates
GFSK	1-DH5
$\pi/4$ DQPSK	2-DH5
8DPSK	3-DH5

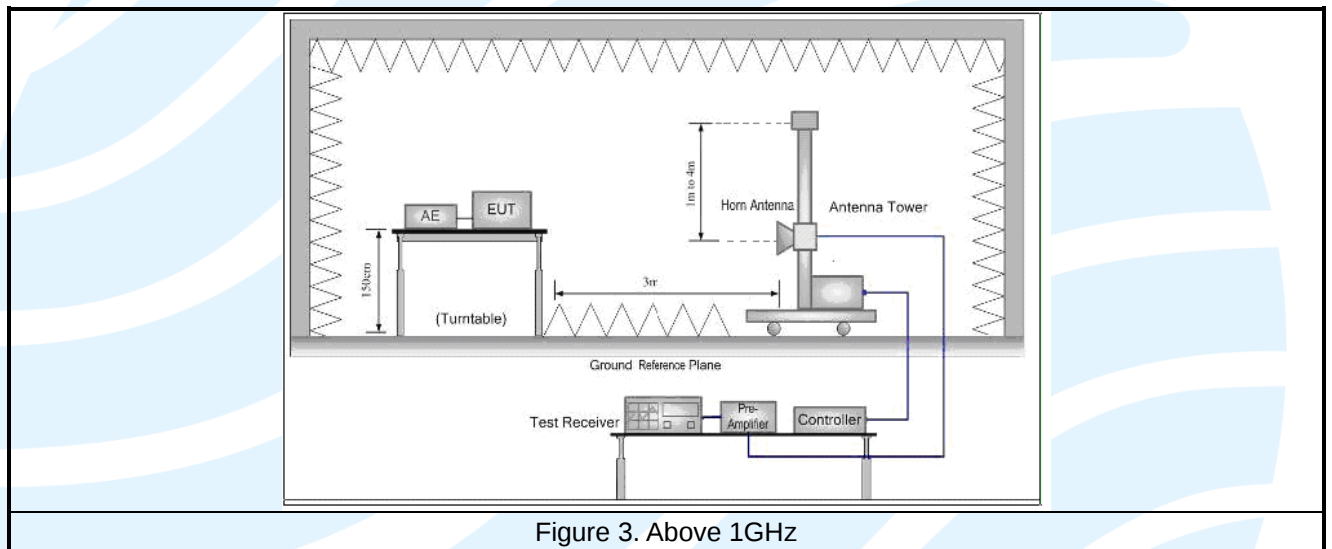
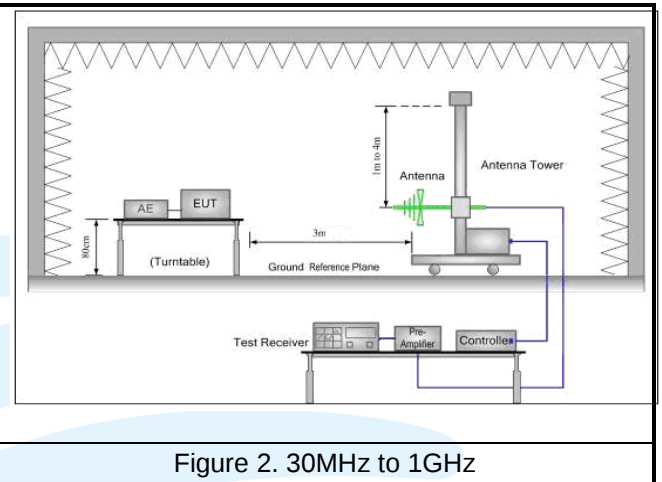
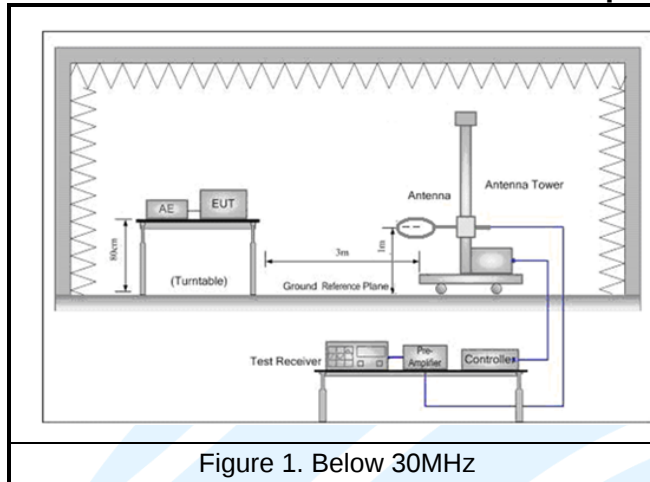
4.4.3 Tested channel detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data packets and antenna ports (if EUT with antenna diversity architecture). Following channel(s) was (were) selected for the final test as listed below.

Type of Modulation	GFSK			$\pi/4$ DQPSK			8DPSK		
Data Packets	1-DH1	1-DH3	1-DH5	2-DH1	2-DH3	2-DH5	3-DH1	3-DH3	3-DH5
Available Channel	0 to 78								
Test Item	Test channel and choose of data packets								
AC Power Line Conducted Emission	N/A								
Conducted Peak Output Power	Channel 0 & 39 & 78								
	☐	☐	☒	☐	☐	☒	☐	☐	☒
20 dB Bandwidth	Channel 0 & 39 & 78								
	☐	☐	☒	☐	☐	☒	☐	☐	☒
Carrier Frequencies Separation	Frequency Hopping Channel 0 to 78								
	☐	☐	☒	☐	☐	☒	☐	☐	☒
Number of Hopping Channel	Frequency Hopping Channel 0 to 78								
	☐	☐	☒	☐	☐	☒	☐	☐	☒
Dwell Time	Channel 39								
	☒	☒	☒	☒	☒	☒	☒	☒	☒
Conducted Out of Band Emission	Channel 0 & 39 & 78								
	☐	☐	☒	☐	☐	☒	☐	☐	☒
Radiated Emissions	Channel 0 & 39 & 78								
	☐	☐	☐	☐	☐	☐	☐	☐	☒
Band Edge Measurements (Radiated)	Channel 0 & 78								
	☐	☐	☐	☐	☐	☐	☐	☐	☒
Remark:									
1. The mark " ☒ " means is chosen for testing;									
2. The mark " ☐ " means is not chosen for testing.									

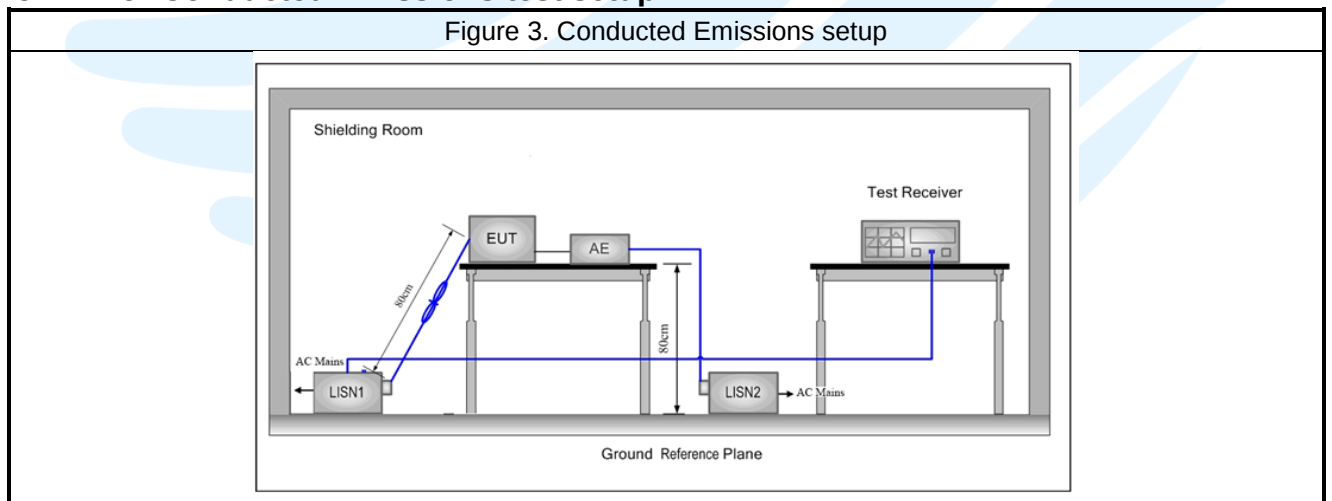
4.5 TEST SETUP

4.5.1 For Radiated Emissions test setup

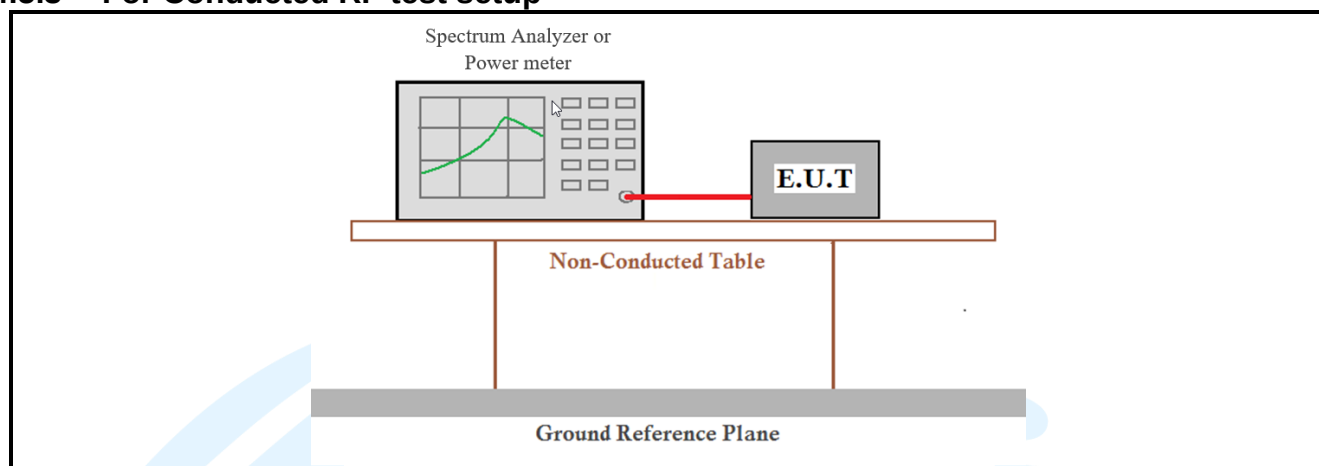


4.5.2 For Conducted Emissions test setup

Figure 3. Conducted Emissions setup



4.5.3 For Conducted RF test setup



4.6 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.7Vdc rechargeable Li-on battery. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency	Mode	Antenna Port	Worst-case axis positioning
Above 1GHz	1TX	Chain 0	Y axis

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

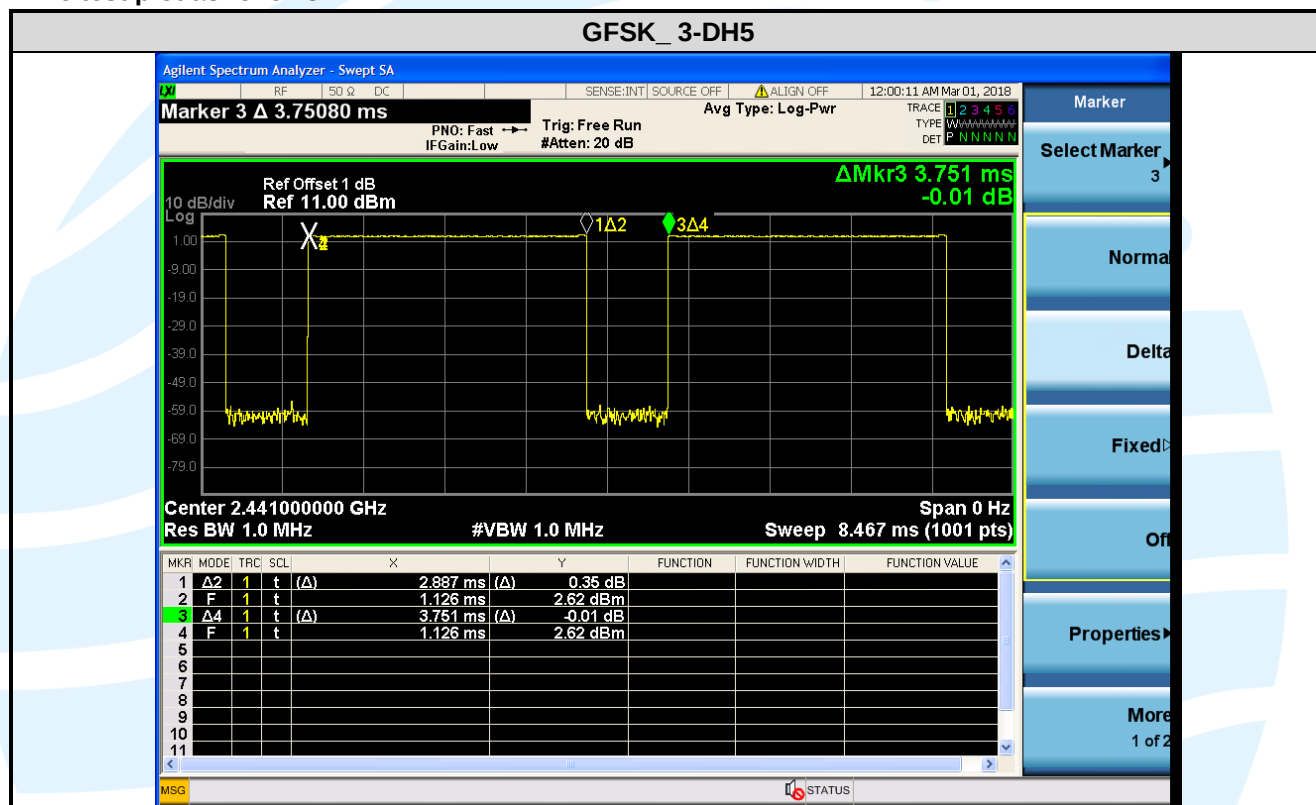
4.7 DUTY CYCLE

Type of Modulation	Packets	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/ T Minimum VBW (kHz)	Average Factor (dB)
GFSK	3-DH5	2.887	3.751	0.77	76.97	1.14	0.35	-2.27

Remark:

- 1) Duty cycle= On Time/ Period;
- 2) Duty Cycle factor = $10 * \log(1/ \text{Duty cycle})$;
- 3) Average factor = $20 \log_{10} \text{Duty Cycle}$.

The test plot as follows



5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	RSS-247 Issue 2	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
4	RSS-Gen Issue 4	General Requirements for Compliance of Radio Apparatus
5	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

5.2 ANTENNA REQUIREMENT

Standard Requirement
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(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi. RSS-Gen Issue 4, Section 8.3 requirement: According to RSS-Gen Issue 4, section 8.3, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. EUT Antenna: Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 2.5 dBi.

5.3 CONDUCTED PEAK OUTPUT POWER

Test Requirement:	FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(1) RSS-247 Issue 2, Section 5.4(b)
Test Method:	ANSI C63.10-2013 Section 7.8.5
Limit:	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. 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.
Test Procedure:	Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer. a) Use the following spectrum analyzer settings: 1) Span: Approximately 5 x 20 dB bandwidth, centered on a hopping channel. 2) RBW > 20 dB bandwidth of the emission being measured. 3) VBW ≥ RBW. 4) Sweep: Auto. 5) Detector function: Peak. 6) Trace: Max hold. b) Allow trace to stabilize. c) Use the marker-to-peak function to set the marker to the peak of the emission. d) The indicated level is the peak output power, after any corrections for external attenuators and cables. e) A plot of the test results and setup description shall be included in the test report.
Test Setup:	Refer to section 4.5.3 for details.
Instruments Used:	Refer to section 3 for details
Test Mode:	Transmitter mode
Test Results:	Pass
Test Data:	

Type of Modulation	Peak Output Power (dBm)			Peak Output Power (mW)		
	Channel 0	Channel 39	Channel 78	Channel 0	Channel 39	Channel 78
GFSK	3.38	3.315	3.865	2.18	2.15	2.44
$\pi/4$ DQPSK	3.958	3.583	4.308	2.49	2.28	2.70
8DPSK	3.974	3.459	4.531	2.50	2.22	2.84

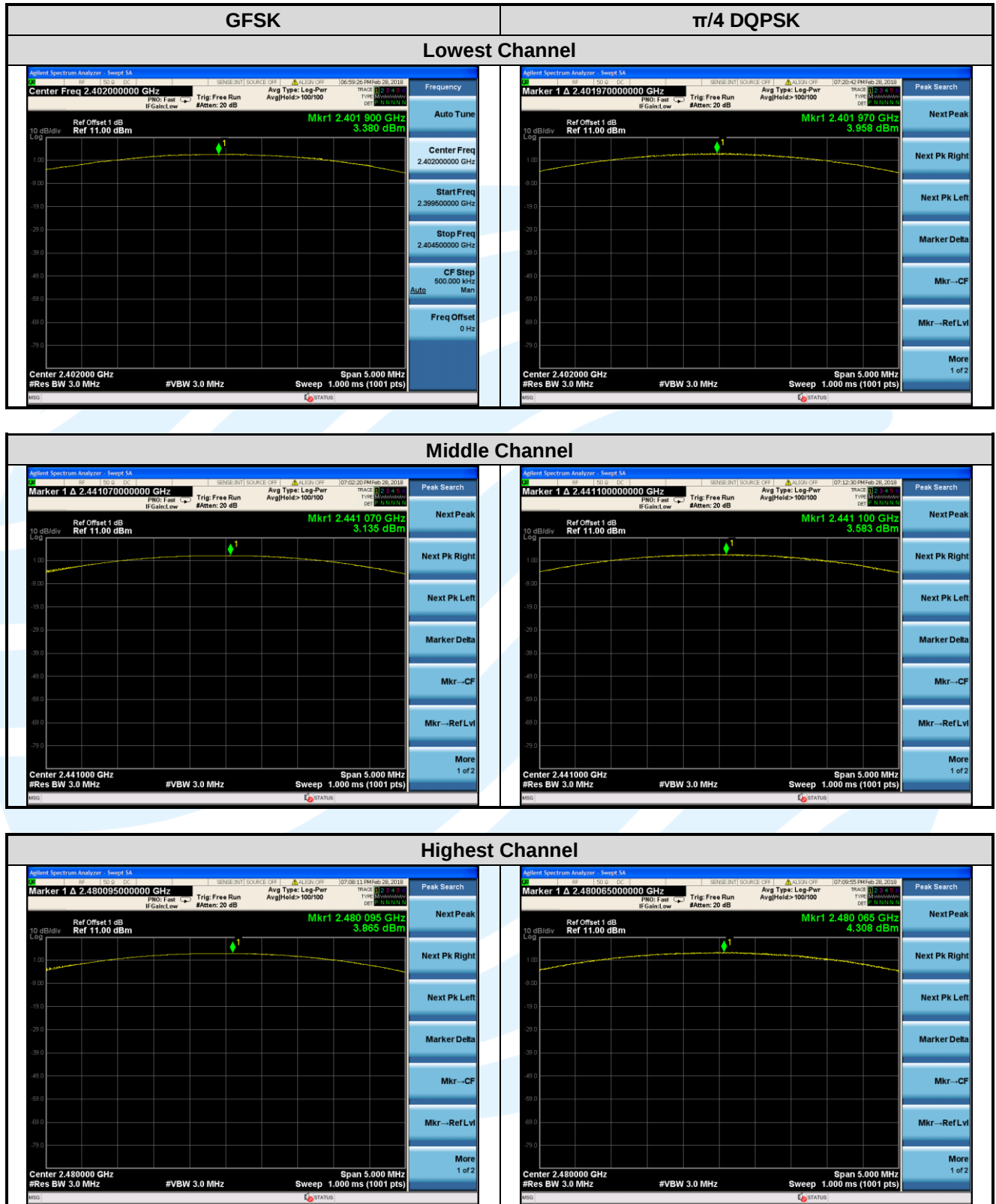
Note: The antenna gain of 2.5 dBi less than 6dBi maximum permission antenna gain value based on 1 watt peak output power limit.

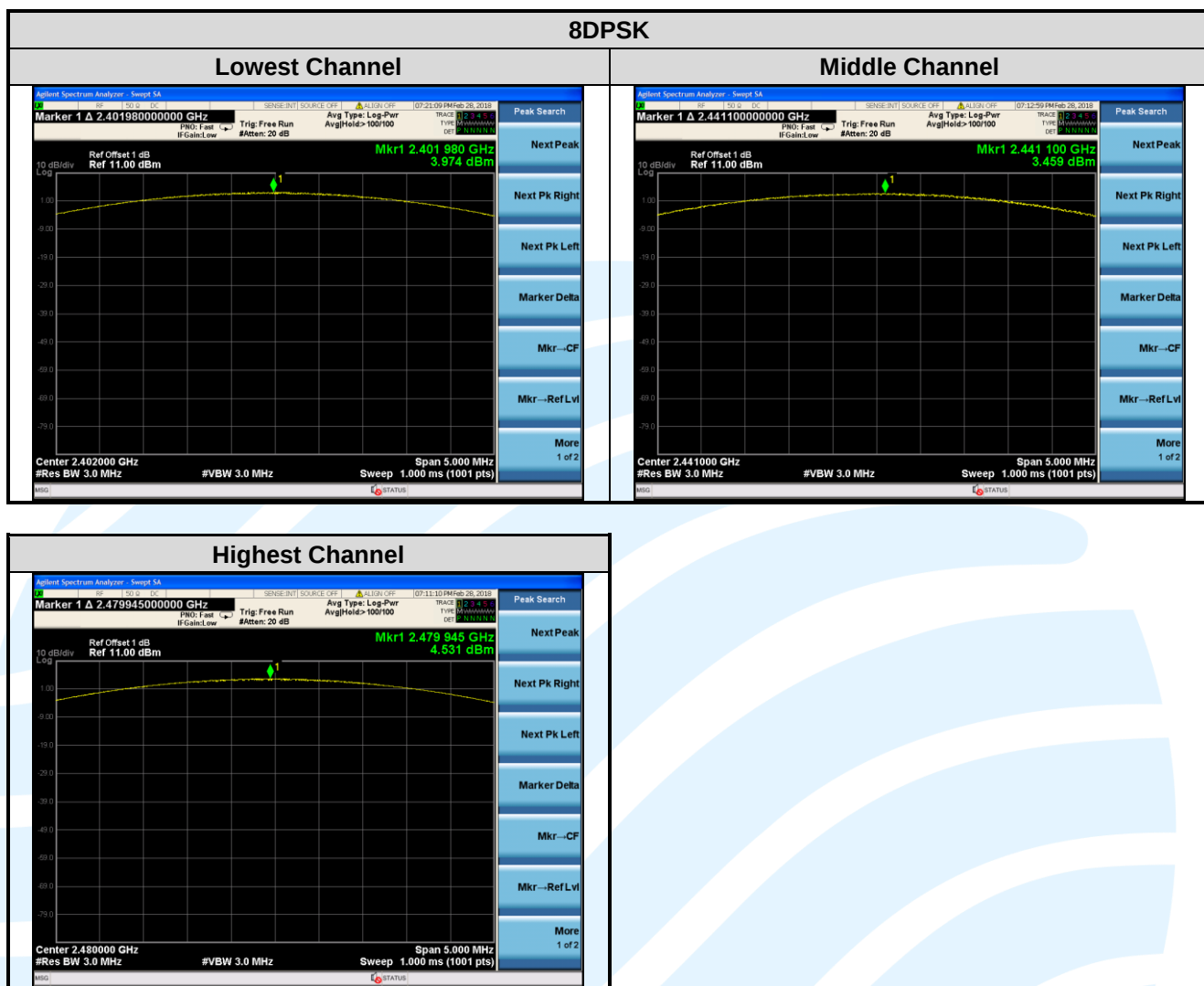
For maximum e.i.r.p.

Type of Modulation	e.i.r.p (dBm)			e.i.r.p (mW)		
	Channel 0	Channel 39	Channel 78	Channel 0	Channel 39	Channel 78
GFSK	5.88	5.82	6.37	3.87	3.82	4.33
$\pi/4$ DQPSK	6.46	6.08	6.81	4.42	4.06	4.80
8DPSK	6.47	5.96	7.03	4.44	3.94	5.05
Limit (mW)	4000					
Pass/Fail	Pass					

Note: e.i.r.p = maximum peak conducted output power + antenna gain

The test plot as follows:





5.420 DB BANDWIDTH & OCCUPIED BANDWIDTH

FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1)

Test Requirement: RSS-247 Issue 2, Section 5.1(a)

RSS-Gen section 6.6

Test Method: ANSI C63.10-2013 Section 6.9.2

Limit: None; for reporting purposes only.

Test Procedure: Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Use the following spectrum analyzer settings:

- Span = approximately 2 to 5 times the OBW, centered on a hopping channel.
- RBW = 1% to 5% of the OBW.
- VBW $\geq 3 \times$ RBW
- Sweep = auto;
- Detector function = peak
- Trace = max hold
- All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down bandwidth of the emission.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Transmitter mode

Test Results: Pass

Test Data:

Type of Modulation	20 dB Bandwidth (MHz)			99% Bandwidth (MHz)		
	Channel 0	Channel 39	Channel 78	Channel 0	Channel 39	Channel 78
GFSK	1.033	1.038	1.034	0.89916	0.90122	0.90115
$\pi/4$ DQPSK	1.287	1.290	1.288	1.1661	1.1694	1.1678
8DPSK	1.288	1.307	1.291	1.1732	1.1841	1.1746

GFSK

π/4 DQPSK

Lowest Channel

Agilent Spectrum Analyzer - Occupied BW

(S) (F) (B) (S) (A) (P) (O) OFF ▲ (A) (L) (S) (H) (O) OFF

ID: 31.18 MHz 01.2018
 Radio Std: None

Ref Value 20.00 dBm

Center Freq: 2.402000000 GHz

Trig: Free Run

Avg/Hold: 10/10

Radio Device: BTS

#F Gain: Low

#Att: 20 dB

Center 2.402 GHz	#VBW 91 kHz	Span 3 MHz
#Res BW 30 kHz		Sweep 3.2 ms

Occupied Bandwidth	Total Power	10.8 dBm
899.16 kHz		
Transmit Freq Error	-39.376 kHz	OBW Power
x dB Bandwidth	1.033 MHz	x dB
		-20.00 dB

Recal State

 From File...

 Edit Register Names

 Register 1
 Last: 12/13/2012 9:58:45 AM

 Register 2 (empty)

 Register 3 (empty)

 Register 4 (empty)

 More 1 of 3

Agilent Spectrum Analyzer - Occupied BW

(S) (F) (B) (S) (A) (P) (O) OFF ▲ (A) (L) (S) (H) (O) OFF

ID: 31.35 MHz 01.2018
 Radio Std: None

Center Freq 2.402000000 GHz

Trig: Free Run

Avg/Hold: 10/10

Radio Device: BTS

#F Gain: Low

#Att: 20 dB

Center 2.402 GHz	#VBW 91 kHz	Span 3 MHz
#Res BW 30 kHz		Sweep 3.2 ms

Occupied Bandwidth	Total Power	10.3 dBm
1.166 MHz		
Transmit Freq Error	-44.932 kHz	OBW Power
x dB Bandwidth	1.287 MHz	x dB
		-20.00 dB

Recal State

 From File...

 Edit Register Names

 Register 1
 Last: 12/13/2012 9:58:45 AM

 Register 2 (empty)

 Register 3 (empty)

 Register 4 (empty)

 More 1 of 3

MSG [File <EDR_20 dB BW state> recalled]

STATUS

The figure displays two side-by-side Agilent Spectrum Analyzer screenshots, both showing the 'Middle Channel' at a center frequency of 2.441 GHz. The left screenshot shows a signal with a 3 MHz span and 901.22 kHz occupied bandwidth. The right screenshot shows a signal with a 3 MHz span and 1.1694 MHz occupied bandwidth. Both screenshots show a peak at 2.441 GHz. The left screenshot also shows a transmit frequency error of -40.709 kHz and an x dB bandwidth of 1.038 MHz. The right screenshot shows a transmit frequency error of -45.188 kHz and an x dB bandwidth of 1.290 MHz. Both screenshots show a total power of 10.6 dBm and an OBW power of 99.00 %.

High Channel

Left Screenshot:

Agilent Spectrum Analyzer - Occupied BW

Center Freq: 2.480000000 GHz

Ref Offset: 1 dB

Ref: 20.00 dBm

Span: 3 MHz

Res BW: 30 kHz

VBW: 91 kHz

Sweep: 3.2 ms

Occupied Bandwidth: 901.15 kHz

Total Power: 11.3 dBm

Transmit Freq Error: -41.663 kHz

OBW Power: 99.00 %

x dB Bandwidth: 1.034 MHz

x dB: -20.00 dB

Right Screenshot:

Agilent Spectrum Analyzer - Occupied BW

Center Freq: 2.480000000 GHz

Ref Offset: 1 dB

Ref: 20.00 dBm

Span: 3 MHz

Res BW: 30 kHz

VBW: 91 kHz

Sweep: 3.2 ms

Occupied Bandwidth: 1.1678 MHz

Total Power: 10.7 dBm

Transmit Freq Error: -45.405 kHz

OBW Power: 99.00 %

x dB Bandwidth: 1.288 MHz

x dB: -20.00 dB



5.5 CARRIER FREQUENCIES SEPARATION

Test Requirement:	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1) RSS-247 Issue 2, Section 5.1(b)
Test Method:	ANSI C63.10-2013 Section 7.8.2
Limit:	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. 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.
Test Procedure:	Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer. Use the following spectrum analyzer settings: a) Span: Wide enough to capture the peaks of two adjacent channels. b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel. c) Video (or average) bandwidth (VBW) $\geq$ RBW. d) Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. h) Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.
Test Setup:	Refer to section 4.5.3 for details.
Instruments Used:	Refer to section 3 for details
Test Mode:	Hopping Frequencies Transmitter mode
Test Results:	Pass
Test Data:	

Type of Modulation	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)
	Channel 39	Channel 0
GFSK	1.000	0.689
$\pi/4$ DQPSK	1.000	0.858
8DPSK	1.000	0.859
Note: The minimum limit is two-third 20 dB bandwidth.		

The test plot as follows:

