

TEST REPORT

Product Name: CD soundmachine

Trade Mark:



or PHILIPS

Model No. / HVIN: AZ797T/37

Add. Model No: AZ797TAQ/37, AZ797Txx/yy(x=A-Z or nil,yy=00-99 or Nil , for country code)

Report Number: 2209021334RFC-1

Test Standards: FCC 47 CFR Part 15 Subpart C
RSS-247 Issue 2
RSS-Gen Issue 5

FCC ID: 2AR2SAZ797T37

IC: 24589-AZ797T37

Test Result: PASS

Date of Issue: October 28, 2022

Prepared for:

MMD Hong Kong Holding Limited
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Prepared by:

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Version

Version No.	Date	Description
V1.0	October 28, 2022	Original



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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	MMD Hong Kong Holding Limited
Address of Applicant:	Unit 1006 , 10th Floor, C-Bons International Center, 108 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong
Manufacturer:	MMD Hong Kong Holding Limited
Address of Manufacturer:	Unit 1006, 10th Floor, C-Bons International Center, 108 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	CD soundmachine	
Model No. / HVIN:	AZ797T/37	
Add. Model No. / HVIN:	AZ797TAQ/37, AZ797Txx/yy(x=A-Z or nil,yy=00-99 or Nil , for country code)	
Trade Mark:	 or PHILIPS	
DUT Stage:	Production Unit	
EUT Supports Function: (Provided by the customer)	2.4 GHz ISM Band:	Bluetooth 5.0
Software Version:	1.0 (Provided by the customer)	
Hardware Version:	1.0 (Provided by the customer)	
Sample Received Date:	September 2, 2022	
Sample Tested Date:	September 8, 2022 to September 20, 2022	
Note: The additional model AZ797TAQ/37, AZ797Txx/yy(x=A-Z or nil,yy=00-99 or Nil , for country code) is identical with the test model AZ797T/37 except the model number for marketing purpose.		

1.2.2 Description of Accessories

Cable	
Description:	AC Cable
Cable Type:	Unshielded without ferrite
Length:	1.50 Meter

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Bluetooth Version:	Bluetooth BR + 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: (Provided by the customer)	PCB Antenna
Antenna Gain: (Provided by the customer)	2 dBi
Maximum Peak Power:	0.71 dBm
Normal Test Voltage:	120 Vac

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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	DELL	Latitude3400	16238087894	UnionTrust
Headphone	HYUNDAI	CJC-8213	1.8m	UnionTrust
tablet	HUAWEI	JDN2-W09	N/A	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.30 Meter	UnionTrust
2	AUX Cable	Audio port	0.5 Meter	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

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1.7 TEST FACILITY

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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 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

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 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

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
8	Occupied Bandwidth	±1.86%
9	RF power, conducted	±0.68dB
10	RF conducted test with spectrum	±2.7dB
11	Transmission Time	±0.19%
12	Radio Frequency	± 6.5 x 10-8

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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 (b)(4) RSS-Gen Issue 5, Section 6.8	N/A	PASS
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207 RSS-Gen Issue 5, Section 8.8	ANSI C63.10-2013 Section 6.2	PASS
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 Section 7.8.5	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 Section 6.9.2	PASS
Occupied Bandwidth	RSS-Gen section 6.7	RSS-Gen section 6.7	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 Section 7.8.2	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 Section 7.8.3	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 Section 7.8.4	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 Section 6.10.4 & Section 7.8.8	PASS
Radiated Emissions	FCC 47 CFR Part 15 Subpart C Section 15.205/15.209 RSS-Gen Issue 5, Section 6.13/8.9/8.10	ANSI C63.10-2013 Section 6.3 & 6.5 & 6.6	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 Section 6.10.5	PASS
Disclaimer and Explanations: The declared of product specification and data (e.g., antenna gain, RF specification, etc) for EUT presented in the report are provided by the customer, and the customer takes all the responsibilities for the accuracy of product specification.			

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
<input checked="" type="checkbox"/>	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	Euroshiedpn-CT001270-1317	22-Jan-2021	21-Jan-2024
<input checked="" type="checkbox"/>	Receiver	R&S	ESIB26	100114	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	Loop Antenna	ETS-LINDGREN	6502	00202525	11-Nov-2021	10-Nov-2023
<input checked="" type="checkbox"/>	Broadband Antenna	ETS-LINDGREN	3142E	00201566	11-Nov-2021	10-Nov-2023
<input checked="" type="checkbox"/>	6dB Attenuator	Talent	RA6A5-N-18	18103001	11-Nov-2021	10-Nov-2023
<input checked="" type="checkbox"/>	Preamplifier	HP	8447F	2805A02960	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	17-Apr-2022	16-Apr-2024
<input checked="" type="checkbox"/>	Pre-amplifier	ETS-LINDGREN	00118385	00201874	6-Nov-2021	5-Nov-2022
<input checked="" type="checkbox"/>	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	14-Nov-2020	13-Nov-2022
<input checked="" type="checkbox"/>	Pre-amplifier	ETS-LINDGREN	00118384	00202652	17-Nov-2020	16-Nov-2022
<input checked="" type="checkbox"/>	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
<input checked="" type="checkbox"/>	Receiver	R&S	ESR7	101181	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	LISN	R&S	ESH2-Z5	860014/024	5-Nov-2021	4-Nov-2022
<input type="checkbox"/>	LISN	ETS-Lindgren	3816/2SH	00201088	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9 20151119i		

RF Conducted Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
<input checked="" type="checkbox"/>	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	15-Apr-2022	14-Apr-2023
<input checked="" type="checkbox"/>	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430023	5-Nov-2021	4-Nov-2022
<input type="checkbox"/>	EXG-B RF Analog Signal Generator	KEYSIGHT	N5171B	MY53051777	5-Nov-2021	4-Nov-2022
<input checked="" type="checkbox"/>	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	5-Nov-2021	4-Nov-2022

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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	120	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test Sample

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
AC Power Line Conducted Emission	23.1	58.0	99.14	S20220902445-ZJA02/8	David Zhang
Conducted Peak Output Power	24.6	54.0	100.12	S20220902445-ZJA02/8	Rain Wang
20 dB Bandwidth & Occupied Bandwidth	24.6	54.0	100.12	S20220902445-ZJA02/8	Rain Wang
Carrier Frequencies Separation	24.6	54.0	100.12	S20220902445-ZJA02/8	Rain Wang
Number of Hopping Channel	24.6	54.0	100.12	S20220902445-ZJA02/8	Rain Wang
Dwell Time	24.6	54.0	100.12	S20220902445-ZJA02/8	Rain Wang
Conducted Out of Band Emission	24.6	54.0	100.12	S20220902445-ZJA02/8	Rain Wang
Radiated Emissions	23.1	58.0	99.14	S20220902445-ZJA02/8	Andy Lin
Band Edge Measurement	23.1	58.0	99.14	S20220902445-ZJA02/8	Andy Lin

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
π /4DQPSK (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/ π /4DQPSK/ 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.

Power Setting(Provided by the customer)
Power Setting:7.

Test Software(Provided by the customer)
Test software name: BT_Tool.exe;

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)	-3.68	-4.27	-5.29	-3.88	-4.50	-5.48	-3.87	-4.49	-5.47

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-DH 1	1-DH 3	1-DH 5	2-DH 1	2-DH 3	2-DH 5	3-DH 1	3-DH 3	3-DH 5
Available Channel	0 to 78								
Test Item	Test channel and choose of data packets								
AC Power Line Conducted Emission	Frequency Hopping Channel 0 to 78								
	Link								
Conducted Peak Output Power	Channel 0 & 39 & 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
20 dB Bandwidth	Channel 0 & 39 & 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Carrier Frequencies Separation	Frequency Hopping Channel 0 to 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Number of Hopping Channel	Frequency Hopping Channel 0 to 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Dwell Time	Channel 39								
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Conducted Out of Band Emission	Channel 0 & 39 & 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Radiated Emissions	Channel 0 & 39 & 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Band Edge Measurements (Radiated)	Channel 0 & 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

Figure 1. Below 30MHz

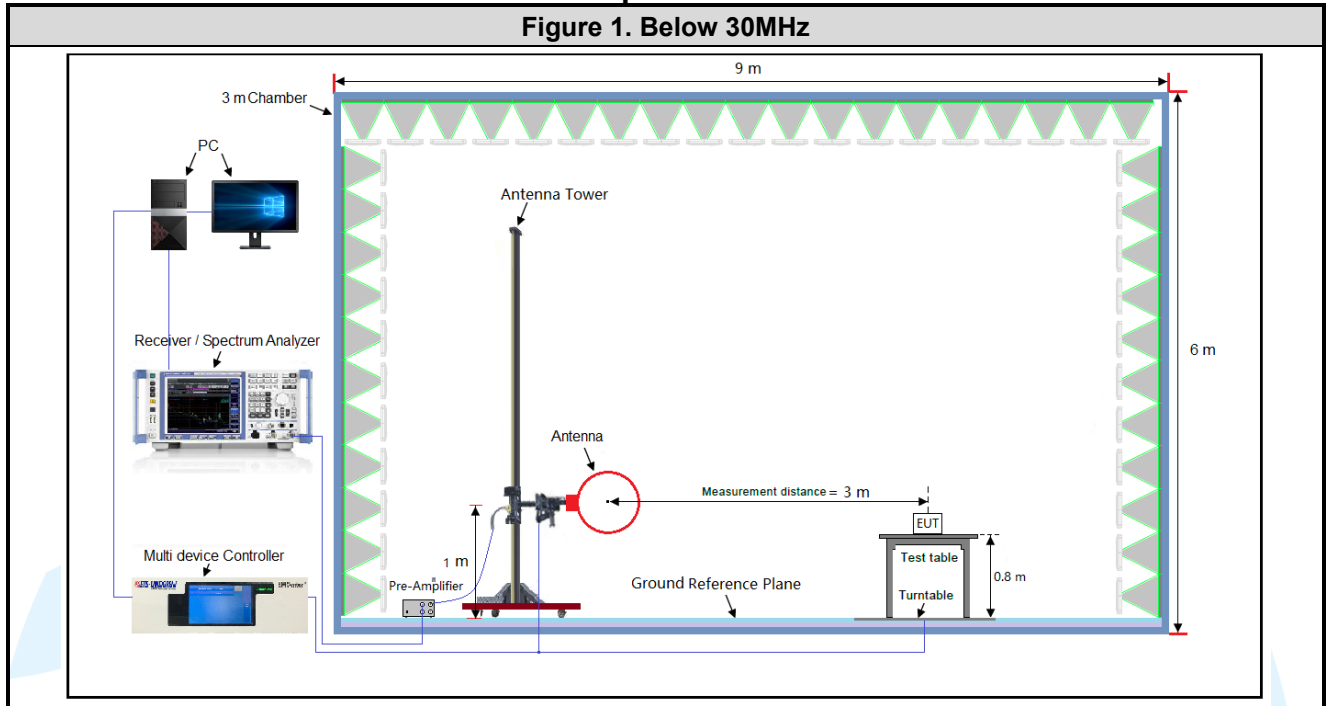
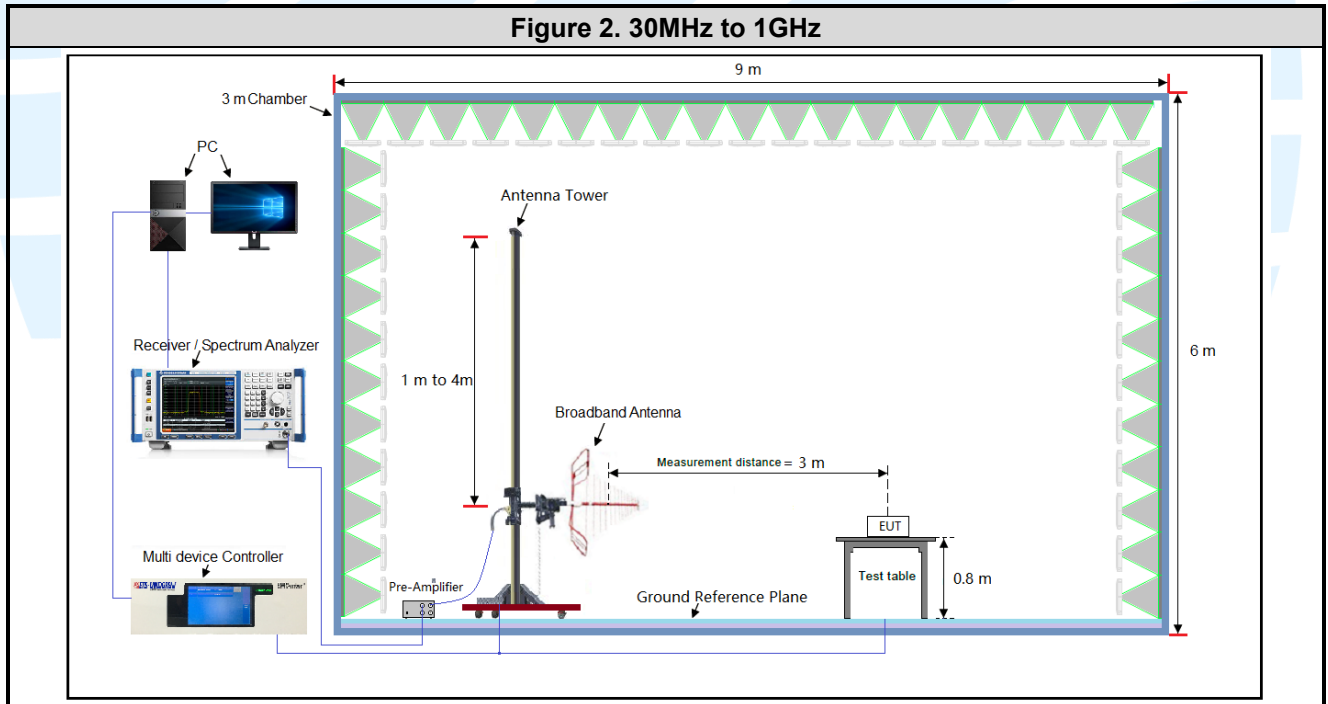
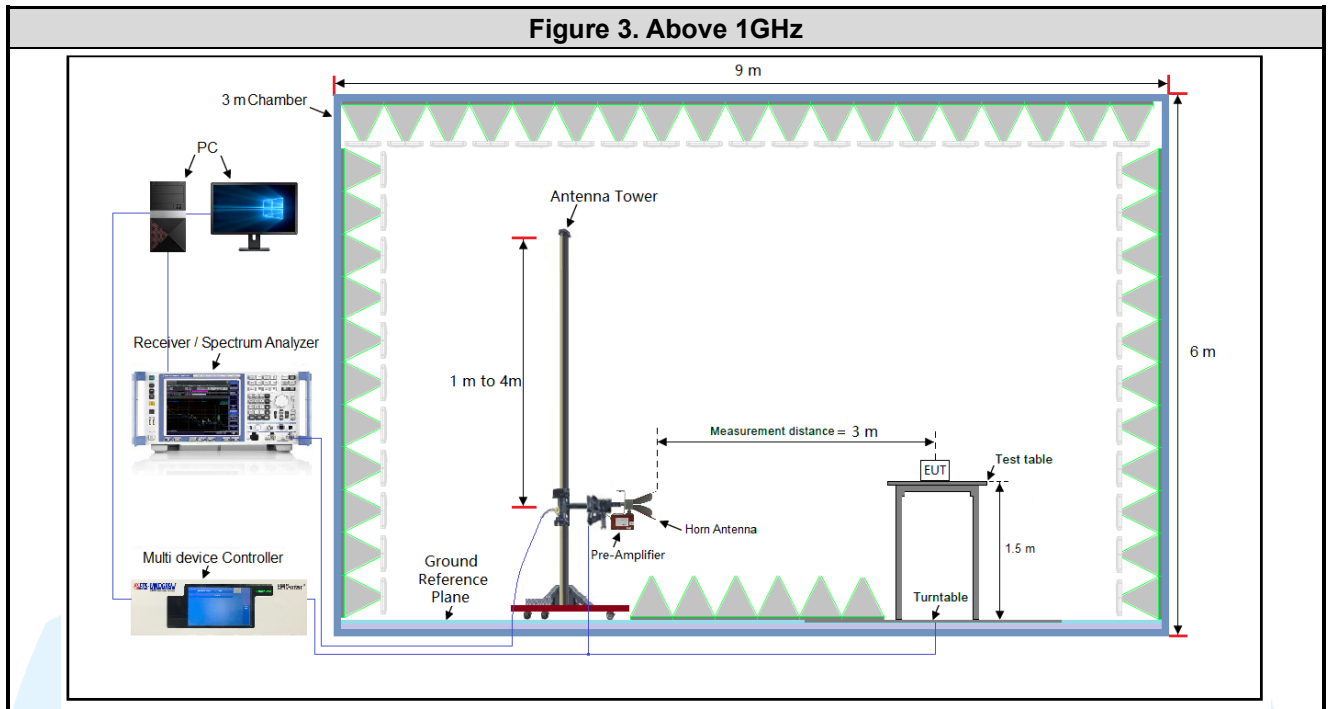
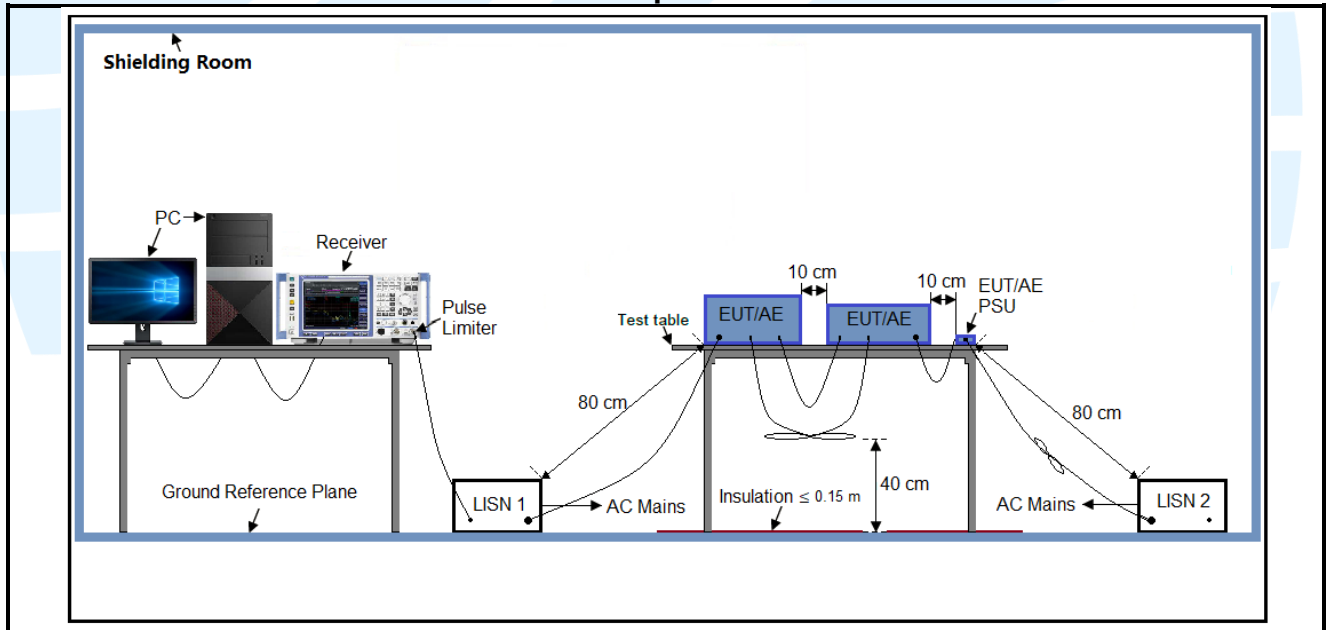


Figure 2. 30MHz to 1GHz

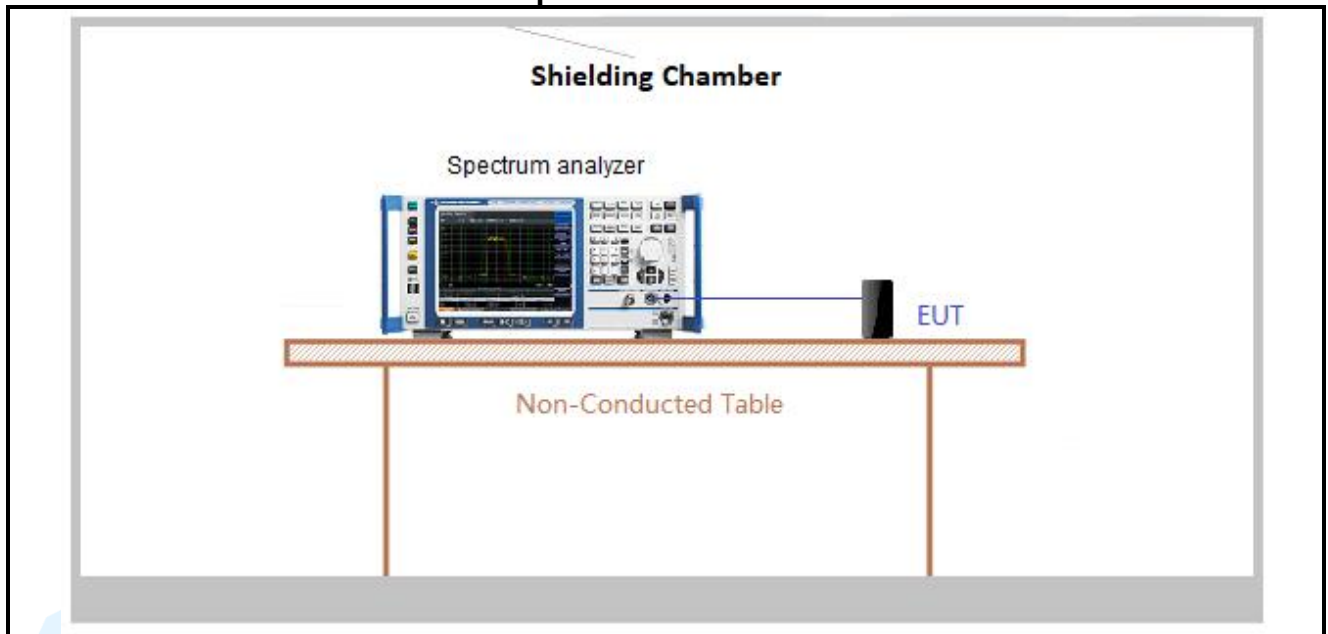




4.5.2 For Conducted Emissions test setup



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. 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 orientation.

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

Test Procedure: ANSI C63.10-2013 Clause 11.6.

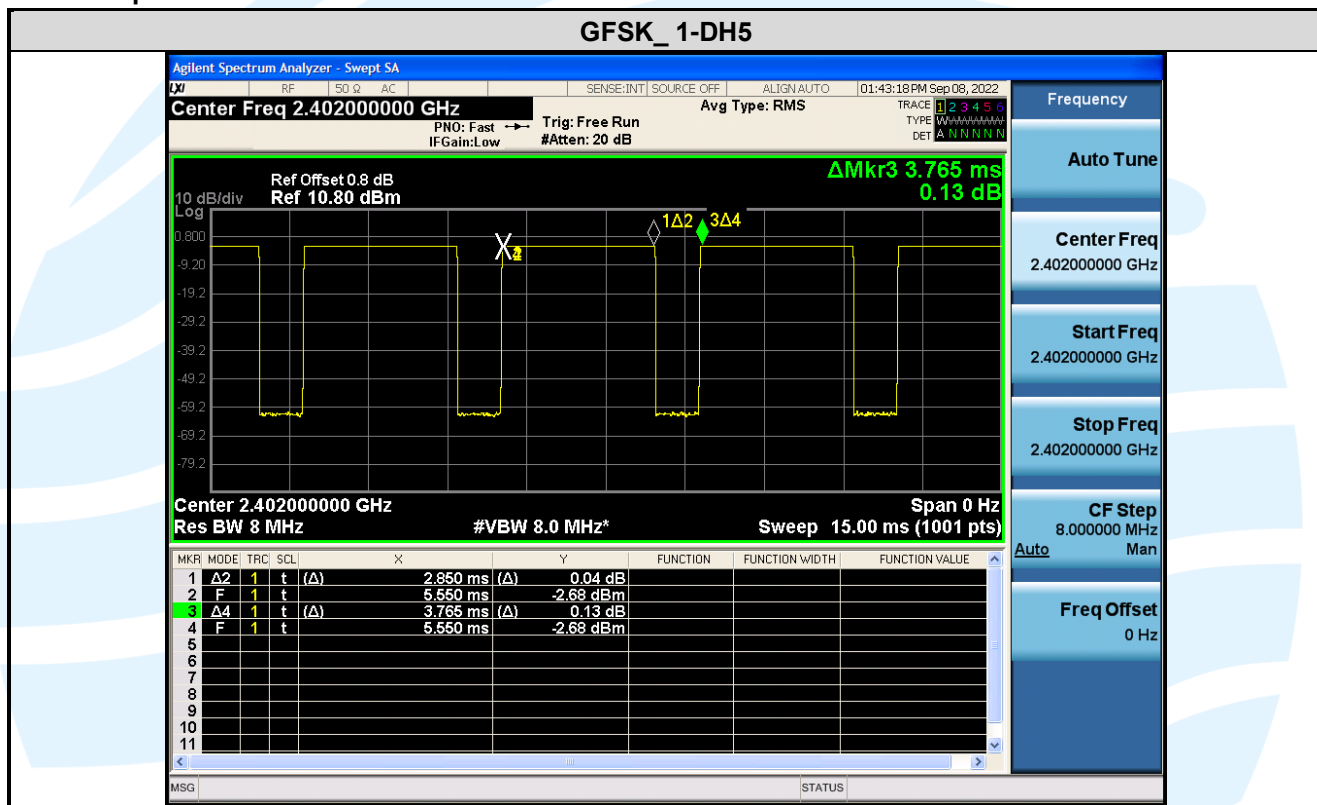
Test Results

Modulation	Packets	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/T Minimum VBW (kHz)
GFSK	1-DH5	2.850	3.765	0.76	75.70	1.21	0.35

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 5	General Requirements for Compliance of Radio Apparatus
5	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
6	KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on Digital Transmission Systems, Frequency Hopping Spread Spectrum system, and Hybrid system devices operating under Section 15.247 of the FCC rules

5.2 ANTENNA REQUIREMENT

Standard Requirement
<p>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.</p> <p>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.</p> <p>RSS-Gen Issue 5, Section 6.8 requirement: According to RSS-Gen Issue 5, section 6.8, 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.</p>
<p>EUT Antenna: Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 2 dBi.</p>

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 FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e). FHSs 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, FHSs operating in the band 2400-2483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W.
Test Procedure:	Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer. <ul style="list-style-type: none"> a) Use the following spectrum analyzer settings: <ul style="list-style-type: none"> 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 Results:	Pass

Modulation	Frequency (MHz)	Maximum Conducted Peak Power		EIRP		Verdict
		Result (dBm)	Limit (dBm)	Result (dBm)	Limit (dBm)	
GFSK	2402	-2.29	≤20.97	-0.29	≤36.02	PASS
	2441	-2.84	≤20.97	-0.84	≤36.02	PASS
	2480	-3.57	≤20.97	-1.57	≤36.02	PASS
π/4DQPSK	2402	0.03	≤20.97	2.03	≤36.02	PASS
	2441	-0.49	≤20.97	1.51	≤36.02	PASS
	2480	-1.25	≤20.97	0.76	≤36.02	PASS
8DPSK	2402	0.71	≤20.97	2.71	≤36.02	PASS
	2441	0.14	≤20.97	2.14	≤36.02	PASS
	2480	-0.60	≤20.97	1.40	≤36.02	PASS

- Note: 1. The antenna gain of 2 dBi less than 6dBi maximum permission antenna gain value based on 125 mW (21 dBm) peak output power limit.
2. The maximum ERP/EIRP is calculated from max output power and antenna gain, the antenna gain provided by the customer, and the customer takes all the responsibilities for the accuracy of antenna gain.

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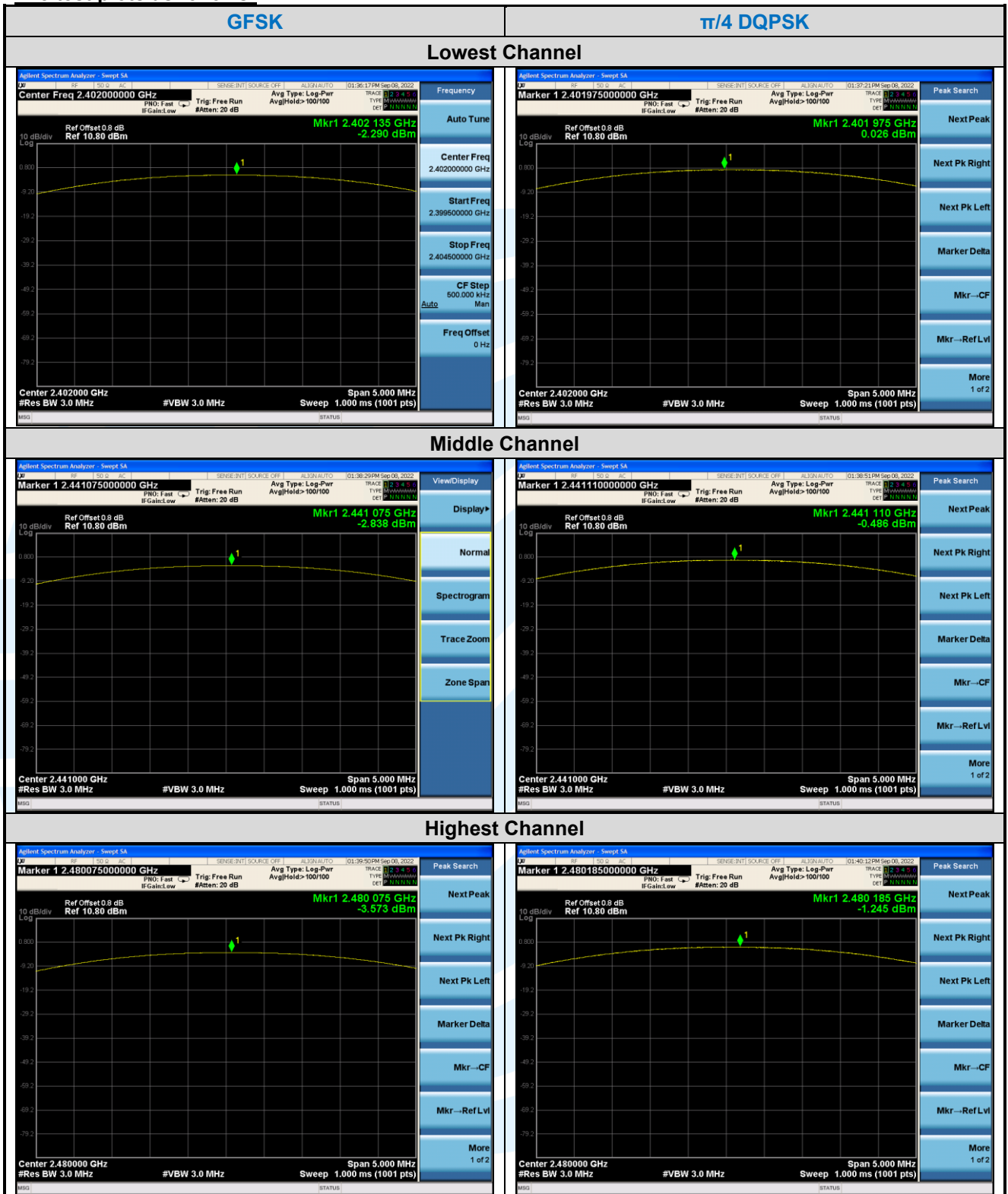
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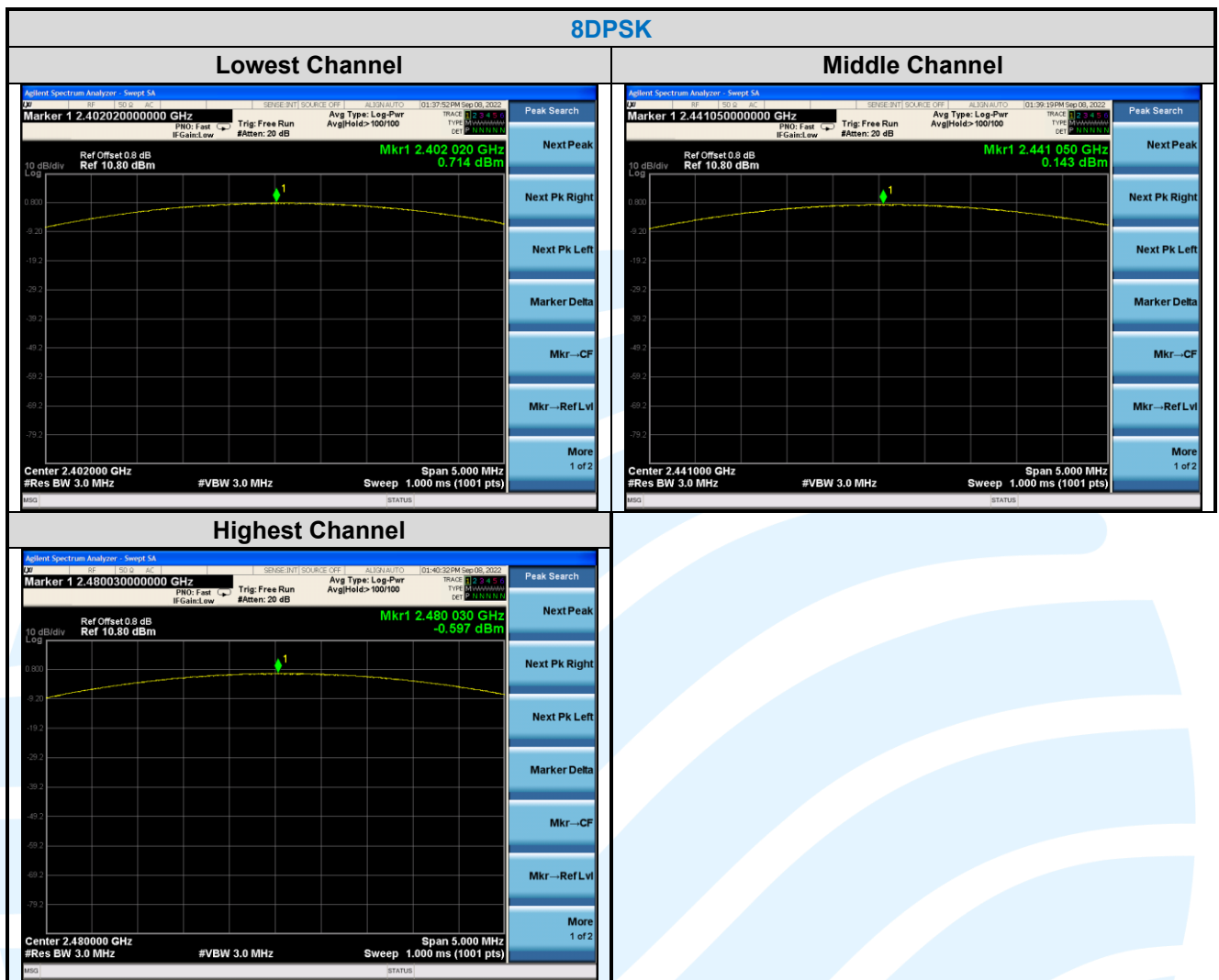
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The test plots as follows:



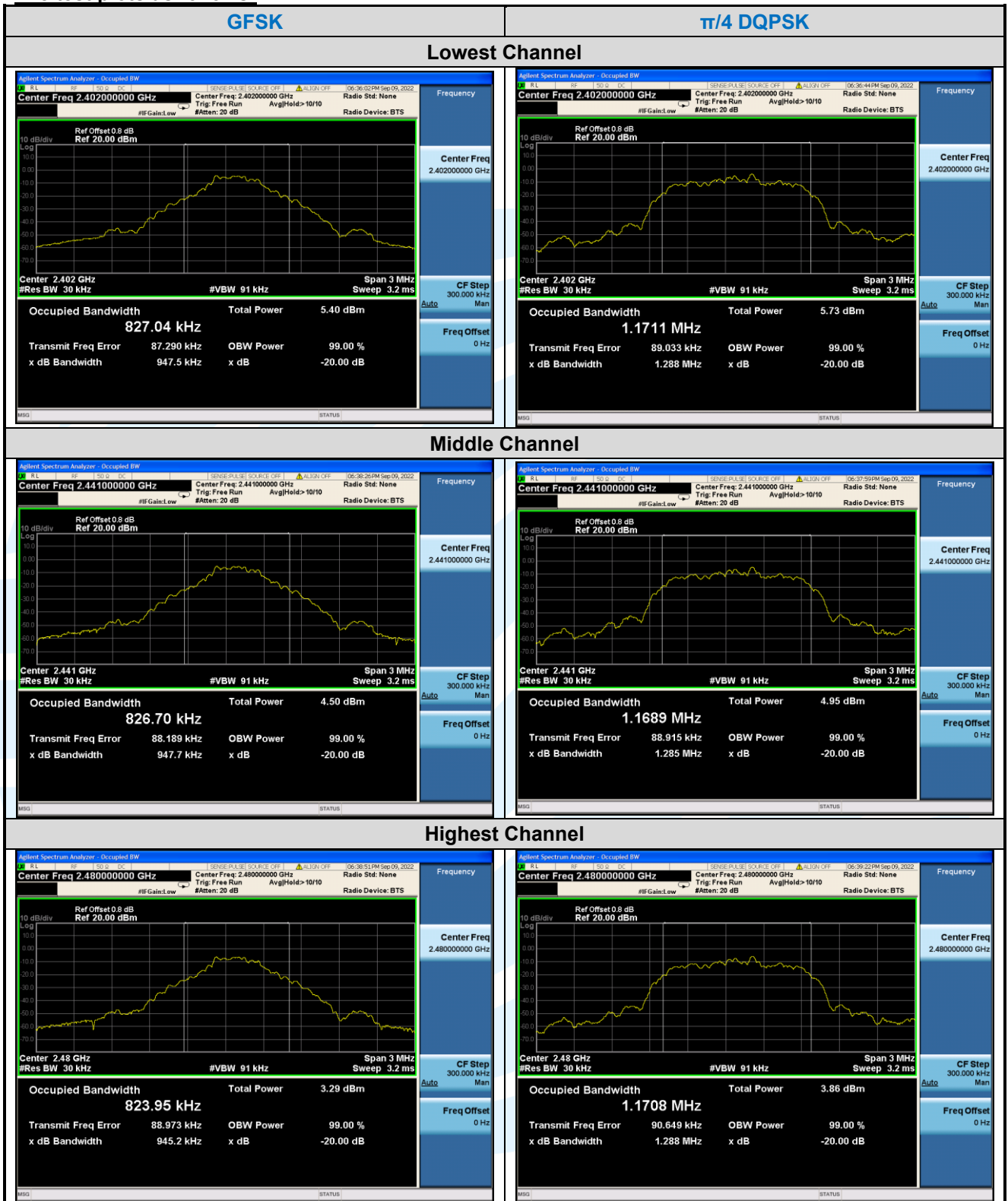


5.420 DB BANDWIDTH & OCCUPIED BANDWIDTH

- Test Requirement:** FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(1)
RSS-247 Issue 2, Section 5.1(a)
RSS-Gen section 6.7
- Test Method:** ANSI C63.10-2013 Section 6.9.2
RSS-Gen section 6.7
- 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:
- a) Span = approximately 2 to 5 times the OBW, centered on a hopping channel.
 - b) RBW = 1% to 5% of the OBW.
 - c) VBW $\geq 3 \times$ RBW
 - d) Sweep = auto;
 - e) Detector function = peak
 - f) Trace = max hold
 - g) 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 Results:** Pass

Type of Modulation	20 dB Bandwidth (MHz)			Occupied Bandwidth (MHz)		
	Channel 0	Channel 39	Channel 78	Channel 0	Channel 39	Channel 78
GFSK	0.9475	0.9477	0.9452	0.82704	0.82670	0.82395
$\pi/4$ DQPSK	1.288	1.285	1.288	1.1711	1.1689	1.1708
8DPSK	1.299	1.300	1.298	1.1704	1.1708	1.1710

The test plots as follows:



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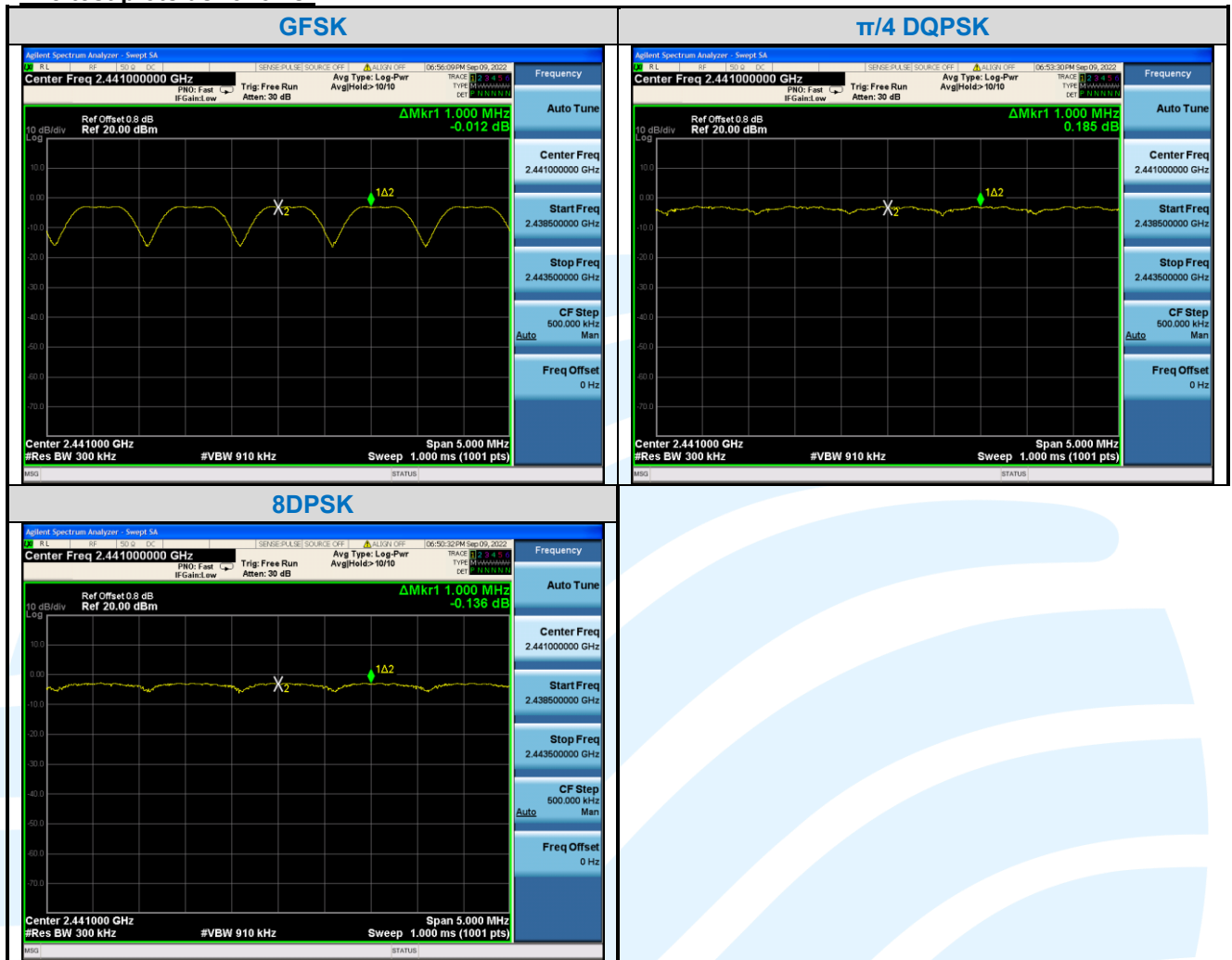
5.5 CARRIER FREQUENCIES SEPARATION

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: <ul style="list-style-type: none">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. <p>Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.</p>
Test Setup:	Refer to section 4.5.3 for details.
Instruments Used:	Refer to section 3 for details
Test Results:	Pass

Type of Modulation	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)
	Channel 39	Channel 39
GFSK	1.000	0.6301
$\pi/4$ DQPSK	1.000	0.8567
8DPSK	1.000	0.8653

Note: The minimum limit is two-third 20 dB bandwidth.

The test plots as follows:



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5.6 NUMBER OF HOPPING CHANNEL

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.247(b)(1)
RSS-247 Issue 2, Section 5.1(d)

Test Method: ANSI C63.10-2013 Section 7.8.3

Limit: Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

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: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
- b) RBW < 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- c) VBW ≥ RBW.
- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max hold.
- g) Allow the trace to stabilize.

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

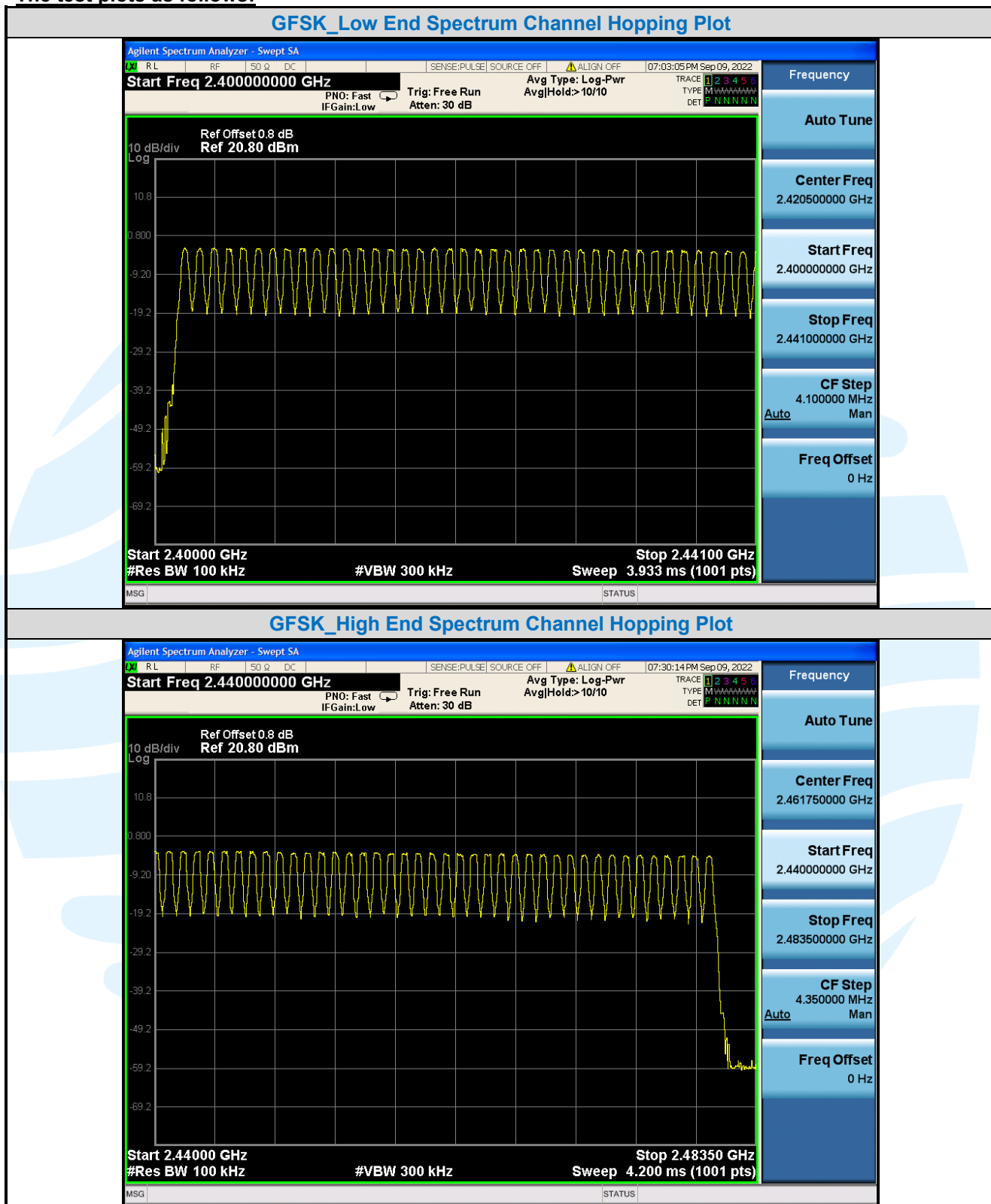
Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Results: Pass

Type of Modulation	Number of Hopping Channel
GFSK	79
$\pi/4$ DQPSK	79
8DPSK	79

The test plots as follows:



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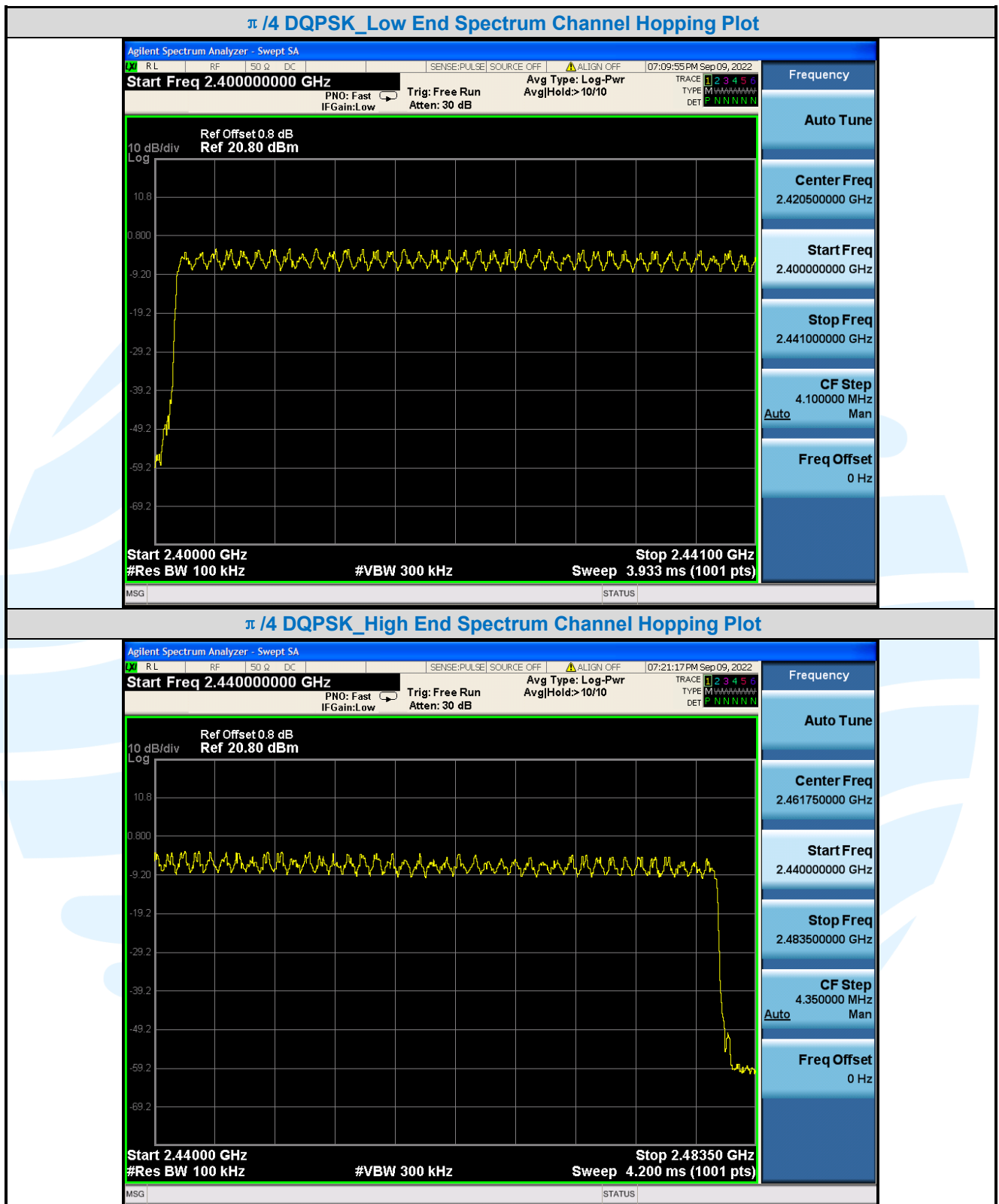
Tel: +86-755-28230888

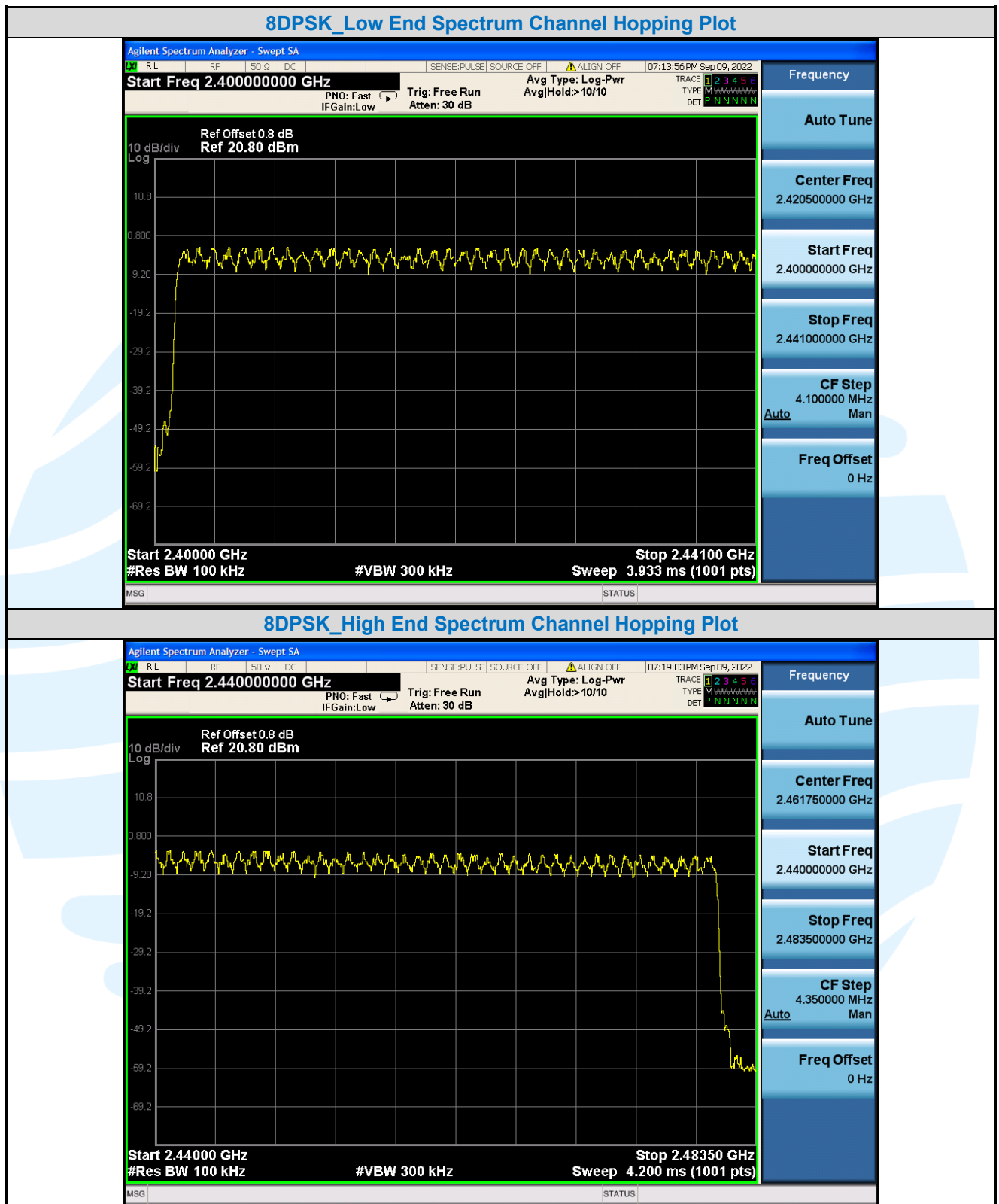
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5.7 DWELL TIME

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.247(a)(1)
RSS-247 Issue 2, Section 5.1(d)

Test Method: ANSI C63.10-2013 Section 7.8.4

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

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 = zero span, centered on a hopping channel
- RBW shall be \leq channel spacing and where possible RBW should be set $\gg 1 / T$, where T is the expected dwell time per channel.
- Sweep = As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
- Detector function = peak
- Trace = max hold
- Use the marker-delta function to determine the dwell time

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

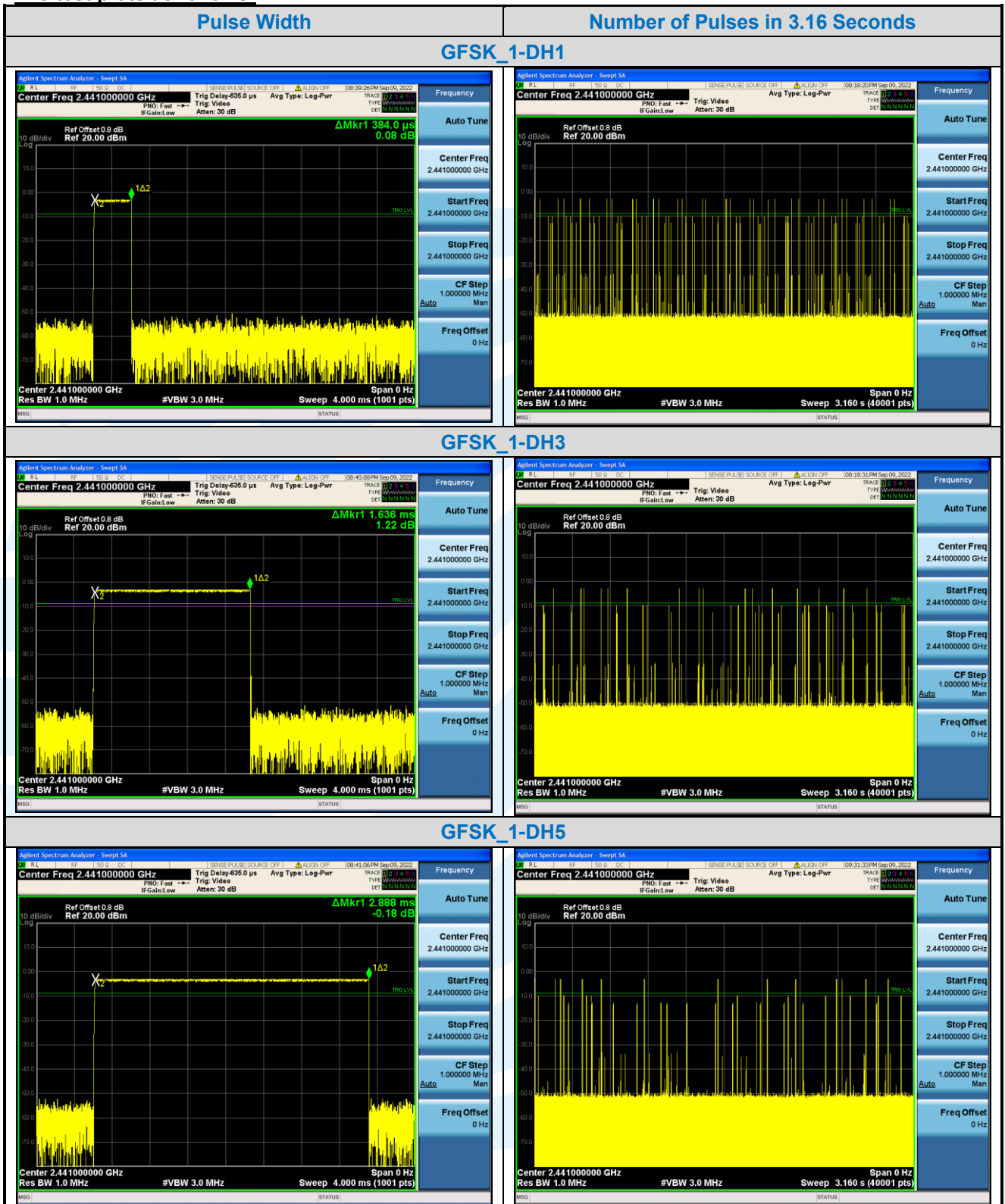
Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Results: Pass

Modulation	Test Frequency (MHz)	Packet	Pulse Width (ms)	Number of Pulses in 3.16 seconds	Dwell Time	Limit (ms)
GFSK	2441	1-DH1	0.384	32	122.88	< 400
		1-DH3	1.636	17	278.12	< 400
		1-DH5	2.888	13	375.44	< 400
$\pi/4$ DQPSK	2441	2-DH1	0.392	31	121.52	< 400
		2-DH3	1.640	16	262.4	< 400
		2-DH5	2.892	9	260.28	< 400
8DPSK	2441	3-DH1	0.396	31	122.76	< 400
		3-DH3	1.644	14	230.16	< 400
		3-DH5	2.896	12	347.52	< 400

The test plots as follows:



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