

TEST REPORT

Product Name: Mobile Phone
Trade Mark: ACER
Model No.: SOSPIRO-A60G
Add. Model No.: SOSPIRO-A60S
Report Number: 211008003RFC-2
Test Standards: FCC 47 CFR Part 15.247
FCC ID: 2AZYA-A60
Test Result: PASS
Date of Issue: Dec. 03, 2021

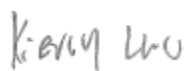
Prepared for:

Senwa Global International, S.A. de C.V.
Carretera Mexico-Toluca No. 5324 PB, Colonia El Yaqui Del.
Cuajimalpa de Morelos, C.P. 05320 Ciudad de Mexico

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Version

Version No.	Date	Description
V1.0	Dec. 03, 2021	Original Report



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1. GENERAL INFORMATION

1.1. CLIENT INFORMATION

Applicant:	Senwa Global International, S.A. de C.V.
Address of Applicant:	Carretera Mexico-Toluca No. 5324 PB, Colonia El Yaqui Del. Cuajimalpa de Morelos, C.P. 05320 Ciudad de Mexico
Manufacturer:	Senwa Mobile China Ltd
Address of Manufacturer:	A611, Languang technology building, No. 27, Gaoxin North 6th Road, songpingshan community, Xili street, Nanshan District, Shenzhen, Guangdong Province

1.2. EUT INFORMATION

1.2.1. General Description of EUT

Product Name:	Mobile Phone
Model No.:	SOSPIRO-A60G
Add. Model No.:	SOSPIRO-A60S (Note 1)
Trade Mark:	ACER
DUT Stage:	Identical Prototype
Power Supply (AC):	100-240 V~50/60 Hz, 0.2 A
Power Supply (DC):	5.0 V/1 A or USB Port
Power Supply (Battery):	3.8 Vdc
Software Version:	Acer_A60_Ver01
Hardware Version:	sp7731e_1h10
Sample Received Date:	October 8, 2021
Sample Tested Date:	October 11, 2021 to October 20, 2021
Note 1: SOSPIRO-A60S is the serial model of SOSPIRO-A60G, there is no any other different for these two models except color. The last letter of model indicated different color, G is for green, S is for silver.	

1.2.2. Description of Accessories

Adapter	
Model No.:	SGCH1000
Input:	100-240 V~50/60 Hz, 0.2 A
Output:	5.0 V/1 A
AC Cable:	N/A
DC Cable:	N/A

Battery	
Model No.:	SGBT3000
Battery Type:	Lithium-ion Rechargeable Battery
Rated Voltage:	3.8 Vdc
Limited Charge Voltage:	4.4 Vdc
Rated Capacity:	3000 mAh

Cable	
Model No.:	N/A
Description:	USB Micro-B Plug Cable
Cable Type:	Unshielded without ferrite
Length:	1 Meter

Earphone	
Model No.:	N/A
Cable Type:	Unshielded without ferrite
Length:	0.9 Meter

1.3. PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

EUT Supports technology of radio frequency	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Bluetooth Version:	Bluetooth V4.2
Bluetooth Mode:	Bluetooth BR + EDR
Modulation Technique:	Frequency Hopping Spread Spectrum (FHSS)
Type of Modulation:	GFSK, p/4DQPSK, 8DPSK
Number of Channels:	79
Channel Separation:	1 MHz
Maximum Peak Power:	7.941 dBm
Antenna Type:	PIFA Antenna
Antenna Gain:	1.2 dBi
Normal Test Voltage:	3.8 Vdc
EUT Test software:	Test Mode: *#*#83781#*#*

1.4. GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a Mobile Phone according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC 47 CFR Part 15.247

All test items have been performed and recorded as per the above standards

1.5. DESCRIPTION OF SUPPORT UNITS

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
--	--	--	--	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	SMA Cable	3.5mm SMA	0.15m	UnionTrust

1.6. TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

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1.7. TEST FACILITY

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

Shenzhen UnionTrust Quality and Technology Co., Ltd.

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 manufacturers 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	9 kHz to 150 kHz: ± 3.2 dB (AMN)
2		150 kHz to 30 MHz: ± 2.7 dB (AMN)
3	Radiated emission	9 kHz to 30 MHz: ± 4.7 dB (SAC)
4		30 MHz to 1 GHz: ± 4.6 dB (SAC)
5		1 GHz to 18 GHz: ± 4.4 dB (FAR)
6		18 GHz to 26 GHz: ± 4.6 dB (FAR)
7		26 GHz to 40 GHz: ± 4.6 dB (FAR)
8	Conducted Output Power	± 0.68 dB
9	Bandwidth	± 1.86 %
10	Power Spectral Density	± 0.6 dB
11	Conducted Out of Band Emission	± 2.7 dB
12	Radio Frequency	$\pm 6.5 \times 10^{-8}$
13	Transmission Time	± 0.19 %

2. TEST SUMMARY

RF Measurement Requirements					
Test Item	Test Standard	Test Requirement	Test Method	Limit	Result
AC Power Line Conducted Emission	FCC 47 CFR Part 15.247	FCC Part 15.207	ANSI C63.10-2013 Clause 6.2	FCC Part 15.207	Pass
Conducted Peak Output Power	FCC 47 CFR Part 15.247	FCC Part 15.247 (b)(1)	ANSI C63.10-2013 Clause 7.8.5	FCC Part 15.247 (b)(1)	Pass
20 dB Bandwidth	FCC 47 CFR Part 15.247	FCC Part 15.247 (a)(1)	ANSI C63.10-2013 Clause 6.9.2	FCC Part 15.247 (a)(1)	Pass
Carrier Frequencies Separation	FCC 47 CFR Part 15.247	FCC Part 15.247 (a)(1)	ANSI C63.10-2013 Clause 7.8.2	FCC Part 15.247 (a)(1)	Pass
Number of Hopping Channel	FCC 47 CFR Part 15.247	FCC Part 15.247 (b)(1)	ANSI C63.10-2013 Clause 7.8.3	FCC Part 15.247 (b)(1)	Pass
Dwell Time	FCC 47 CFR Part 15.247	FCC Part 15.247 (a)(1)	ANSI C63.10-2013 Clause 7.8.4	FCC Part 15.247 (a)(1)	Pass
Conducted Out of Band Emission	FCC 47 CFR Part 15.247	FCC Part 15.247(d)	ANSI C63.10-2013 Clause 6.10.4 & Clause 7.8.8	FCC Part 15.247(d)	Pass
Radiated Emissions	FCC 47 CFR Part 15.247	FCC Part 15.205/15.209	ANSI C63.10-2013 Clause 6.3 & 6.5 & 6.6	FCC Part 15.205/15.209	Pass
Band Edge Measurement	FCC 47 CFR Part 15.247	FCC Part 15.205/15.209	ANSI C63.10-2013 Clause 6.10.5	FCC Part 15.205/15.209	Pass
Duty Cycle	FCC 47 CFR Part 15.247	None; for reporting purposes only.	ANSI C63.10-2013, Clause 11.6	N/A	Pass

RF Evaluation Requirements					
Test Item	Test Standard	Test Requirement	Test Method	Limit	Result
Antenna Requirement	FCC 47 CFR Part 15.247	FCC Part 15.203/15.247 (b)(4)	N/A	FCC Part 15.203/15.247 (b)(4)	Pass

3. EQUIPMENT LIST

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Test Equipment of AC Power Line Conducted Emission					
Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm dd, yyyy)	Cal.Due Date (mm dd, yyyy)
LISN Artificial Mains Network	ROHDE & SCHWARZ	ESH2-Z5	860014/024	18-Nov-2020	17-Nov-2021
Receiver	ROHDE & SCHWARZ	ESR7	101181	18-Nov-2020	17-Nov-2021
Pulse Limiter	ROHDE & SCHWARZ	ESH3-Z2	0357.8810.54	18-Nov-2020	17-Nov-2021
Test Software	Audix	e3	Software Version: 9 20151119i	N/A	N/A

Test Equipment of RF Conducted					
Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm dd, yyyy)	Cal.Due Date (mm dd, yyyy)
EXA Signal Analyzer	KEYSIGHT	N9010A	MY51440197	22-Apr-2021	21-Apr-2022
USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	10-Nov-2020	9-Nov-2021

Test Equipment of Radiated Emissions & Equipment of Band Edge Measurement					
Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm dd, yyyy)	Cal.Due Date (mm dd, yyyy)
3 m SAC	ETS-Lindgren	3 m	Euroshiedpn-CT001270-1317	22-Jan-2021	21-Jan-2024
Loop Antenna	ETS-Lindgren	6502	00202525	14-Nov-2020	13-Nov-2022
Broadband Antenna	ETS-Lindgren	3142E	00201566	14-Nov-2020	13-Nov-2022
Double-Ridged Waveguide Horn Antenna(Pre-amplifier)	ETS-Lindgren	3117-PA	00201541	30-Apr-2021	29-Apr-2023
Pre-amplifier	ETS-Lindgren	00118385	00201874	10-Nov-2020	9-Nov-2021
Double-Ridged Waveguide Horn Antenna(Pre-amplifier)	ETS-Lindgren	3116C-PA	00202652	14-Nov-2020	13-Nov-2022
Pre-amplifier	ETS-Lindgren	00118384	00202652	17-Nov-2020	16-Nov-2022
Receiver	ROHDE & SCHWARZ	ESIB26	100114	18-Nov-2020	17-Nov-2021
Pre-amplifier	HP	8447F	2805A02960	10-Nov-2020	9-Nov-2021
Test Software	Audix	e3	Software Version: 19815(V9)	N/A	N/A
Multi device Controller	ETS-Lindgren	7006-001	00160105	N/A	N/A

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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	Relative Humidity (%)
TN/VN	+15 to +35	3.8 V	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	25	48	101.1	David Zhang
Conducted Peak Output Power	24	51	101.8	Hank Wu
20 dB Bandwidth	24	51	101.8	Hank Wu
Carrier Frequencies Separation	24	51	101.8	Hank Wu
Number of Hopping Channel	24	51	101.8	Hank Wu
Dwell Time	24	51	101.8	Hank Wu
Conducted Out of Band Emission	24	51	101.8	Hank Wu
Radiated Emissions	24.5	46	100.14	Fire Huo
Band Edge Measurement	24.5	46	100.14	Fire Huo
Duty Cycle	24	51	101.8	Hank Wu

4.2. CHANNEL LIST

4.2.1. All Channel List

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

4.2.2. Test Channel

BR+EDR				
Type of Modulation	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 (2DH1, 2DH3, 2DH5)	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78
		2402 MHz	2441 MHz	2480 MHz
8DPSK (3DH1, 3DH3, 3DH5)	2402 MHz to 2480 MHz	Channel 0	Channel 39	Channel 78
		2402 MHz	2441 MHz	2480 MHz

4.3. TEST MODES

Type of Modulation	Tx Function	Description
GFSK/ π /4DQPSK/ 8DPSK	1Tx	<ol style="list-style-type: none"> 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			π /4DQPSK			8DPSK		
Packets	1-DH1	1-DH3	1-DH5	2-DH1	2-DH3	2-DH5	3-DH1	3-DH3	3-DH5
Power (dBm)	1.62	4.83	5.54	-0.23	2.85	3.53	-0.25	2.86	3.52

4.4.2. Worst-case data packets

Type of Modulation	Worst-case data packets
GFSK	DH5
π /4DQPSK	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 rates 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	Frequency Hopping Channel 0 to 78								
	Link								
Conducted Peak Output Power	Channel 0 & 39 & 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20 dB Bandwidth	Channel 0 & 39 & 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Carrier Frequencies Separation	Frequency Hopping Channel 0 to 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Number of Hopping Channel	Frequency Hopping Channel 0 to 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dwell Time	Channel 39								
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conducted Out of Band Emission	Channel 0 & 39 & 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Emissions	Channel 0 & 39 & 78								
	<input type="checkbox"/>	<input type="checkbox"/>	<input 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 type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Remark: 1. The mark “ <input type="checkbox"/> ” means is chosen for testing; 2. The mark “ <input type="checkbox"/> ” means is not chosen for testing.									

5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1. ANTENNA REQUIREMENT

5.1.1. Applicability

FCC Part 15.203/15.247(b)(4)

5.1.2. Requirements

Antenna 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>

5.1.3. Description

The EUT Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 1.2 dBi.

5.2. AC POWER LINE CONDUCTED EMISSION

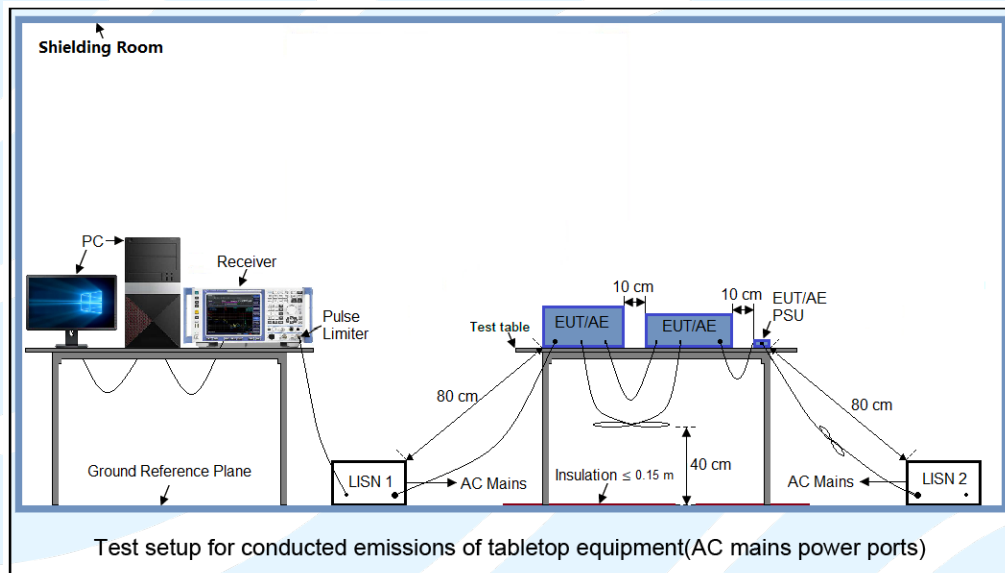
Test Standard FCC 47 CFR Part 15.247
Test Requirement: FCC Part 15.207
Test Method: ANSI C63.10-2013 Clause 6.2
Limit:

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup:



Test Procedures:

Test frequency range :150kHz-30MHz

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu H + 5\Omega$ 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.
- 3) 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,
- 4) 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.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Equipment Used: Refer to section 3 for details.

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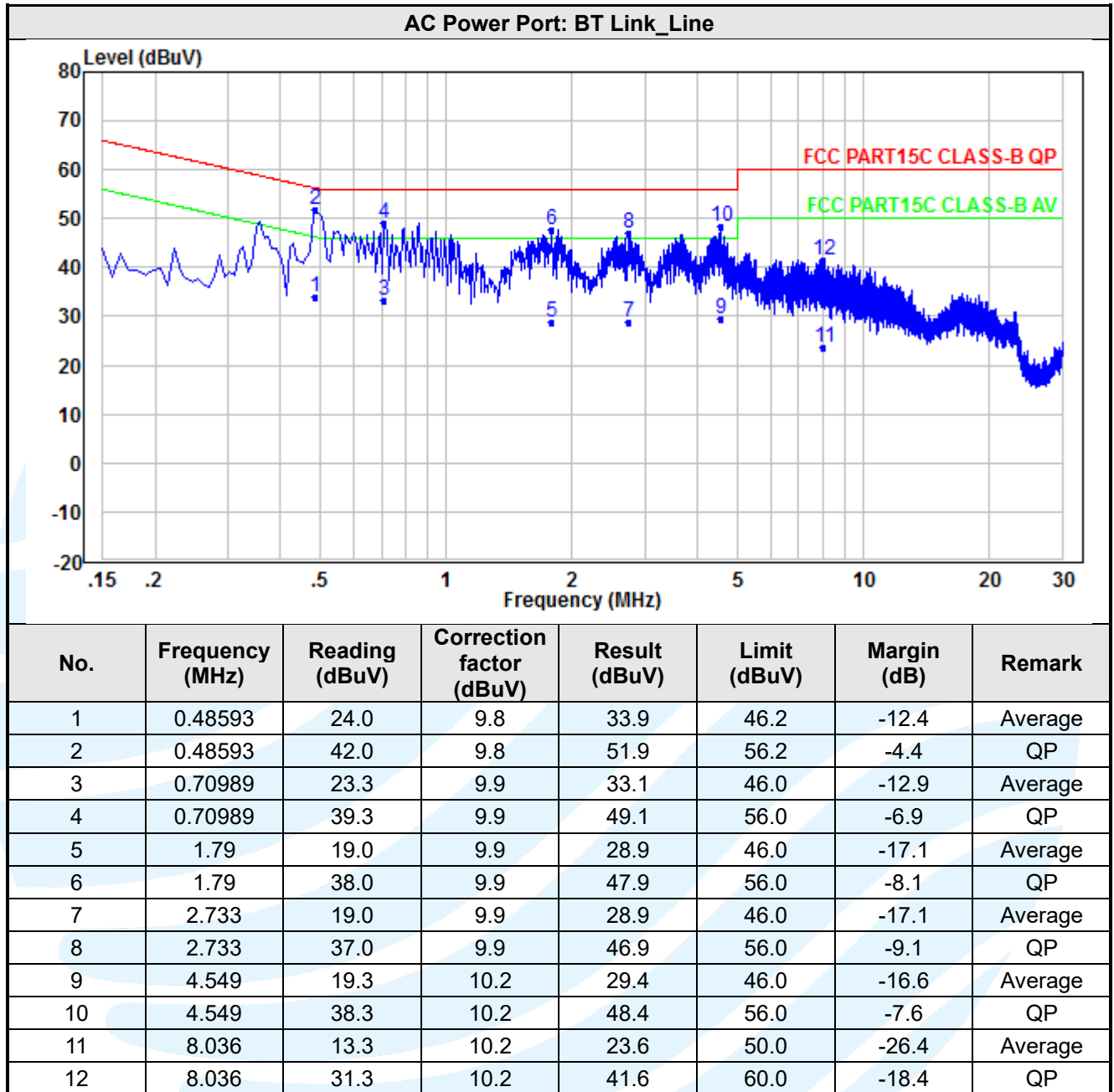
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Test Result: Pass

The measurement data as follows:



Shenzhen UnionTrust Quality and Technology Co., Ltd.

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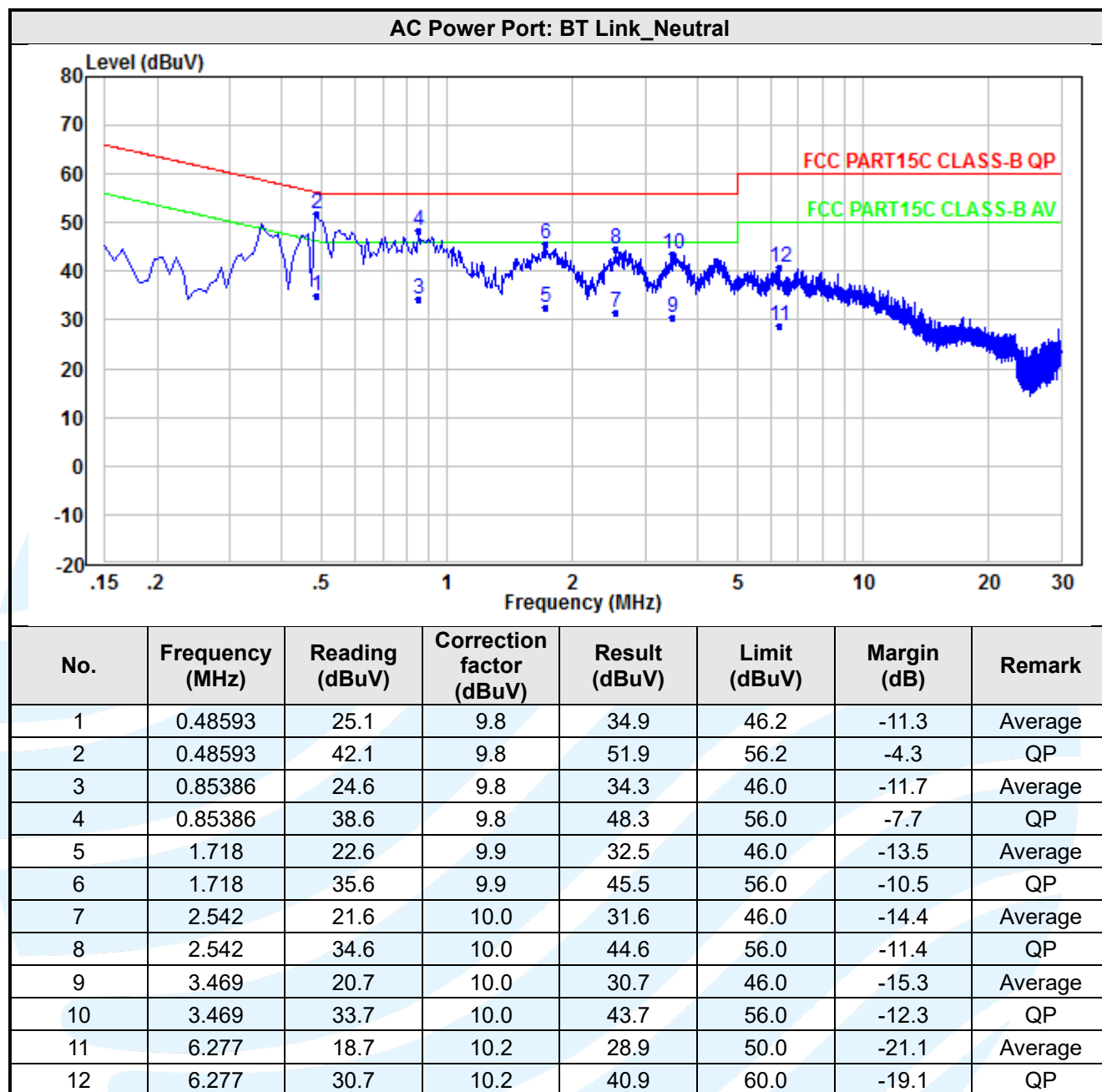
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5.3. CONDUCTED PEAK OUTPUT POWER

Test Standard FCC 47 CFR Part 15.247

Test Requirement: FCC Part 15.247 (b)(1)

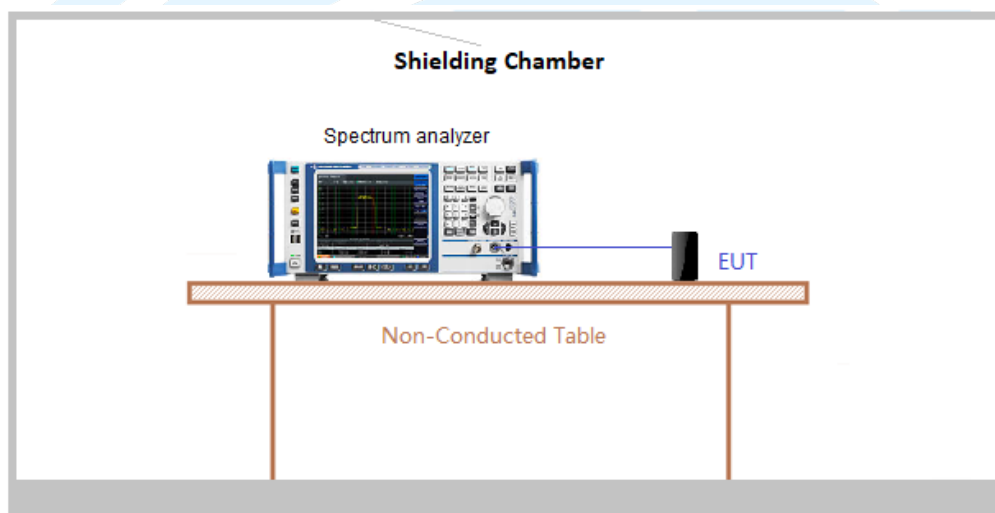
Test Method: ANSI C63.10-2013 Clause 7.8.5

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 Setup:



Test Procedures:

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

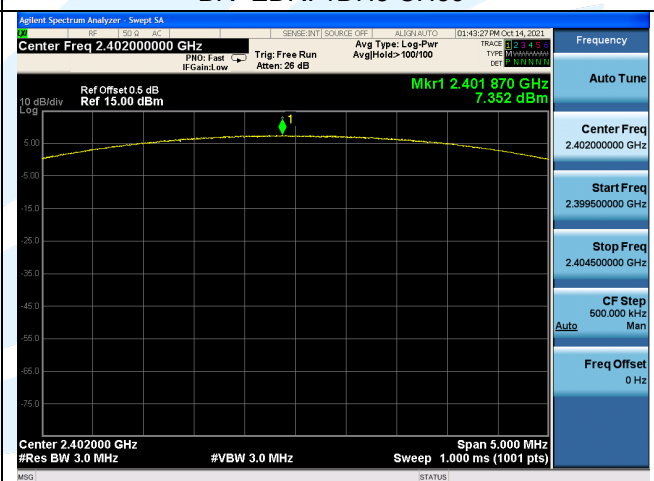
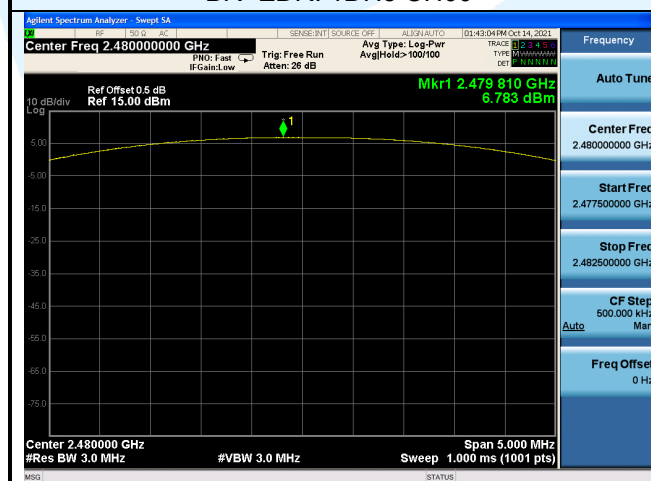
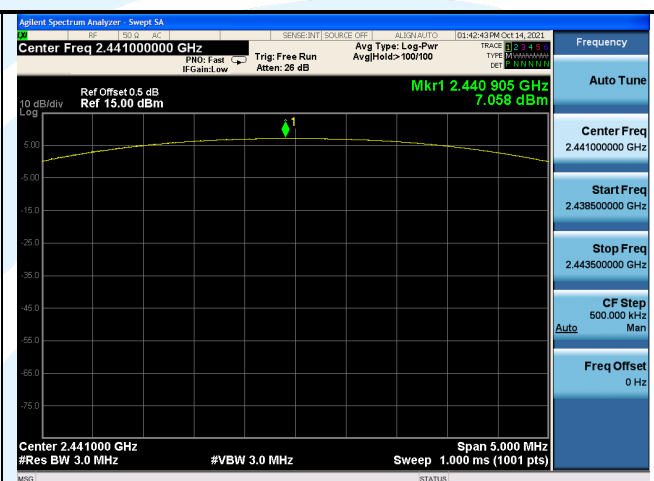
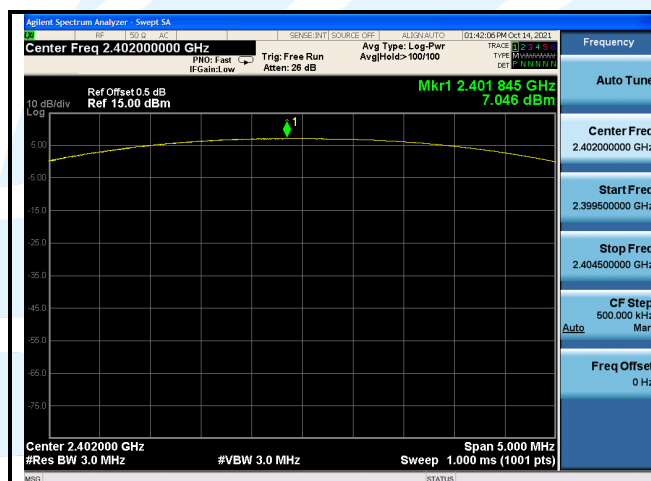
- a) Use the following spectrum analyzer settings:
 - 1) Span: Approximately 5 x 20 dB bandwidth, centered on a hopping channel.
 - 2) RBW > 20 dB bandwidth of the emission being measured.
 - 3) VBW \geq RBW.
 - 4) Sweep: Auto.
 - 5) Detector function: Peak.
 - 6) Trace: Max hold.
- b) Allow trace to 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.

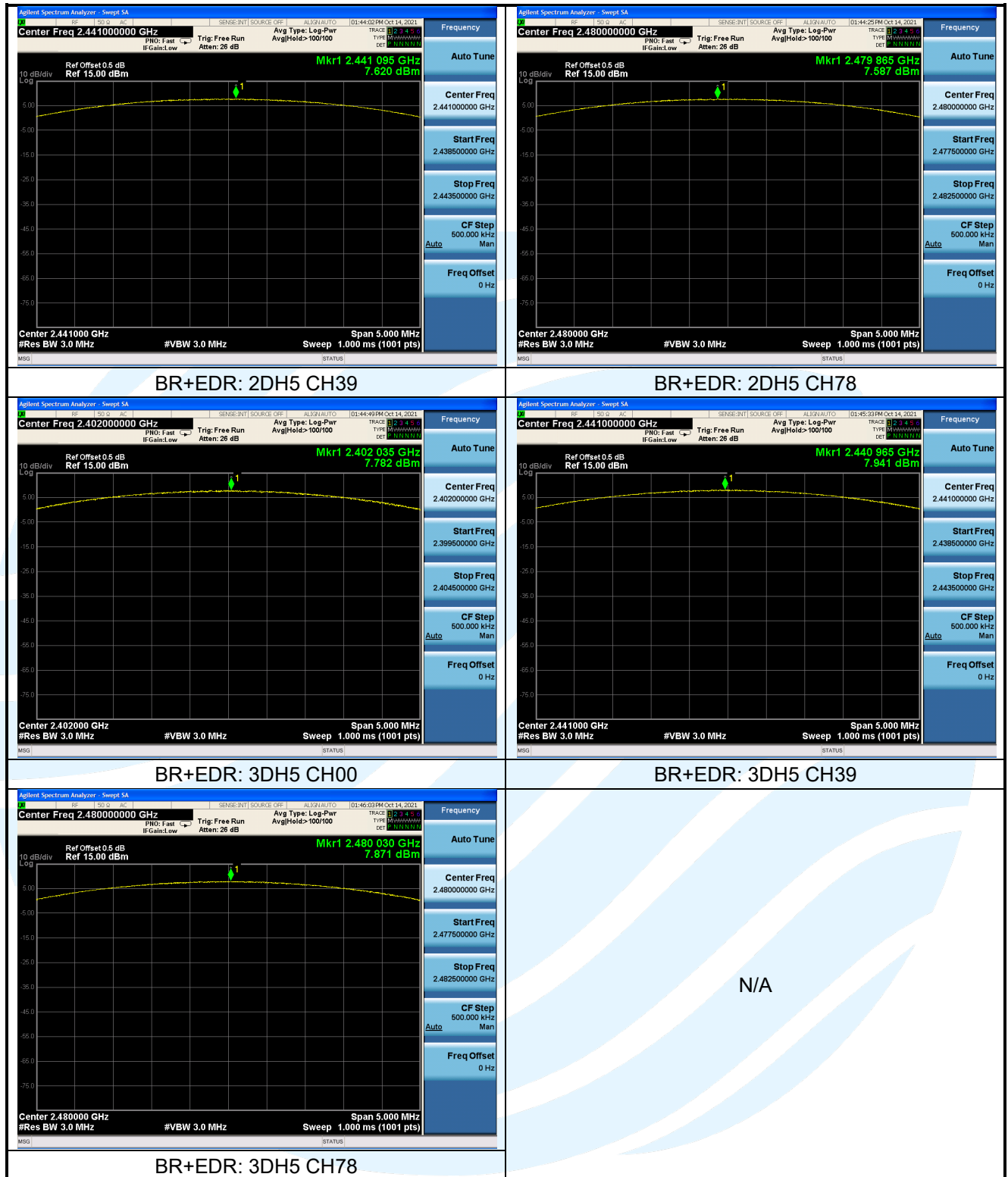
Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Modulation	Packets	Frequency (MHz)	Power Setting	Peak Output Power (dBm)	Limit (dBm)	Results
GFSK	DH5	2402	4	7.046	21	Pass
GFSK	DH5	2441	4	7.058	21	Pass
GFSK	DH5	2480	4	6.783	21	Pass
$\pi/4$ DQPSK	2-DH5	2402	4	7.352	21	Pass
$\pi/4$ DQPSK	2-DH5	2441	4	7.620	21	Pass
$\pi/4$ DQPSK	2-DH5	2480	4	7.587	21	Pass
8DPSK	3-DH5	2402	4	7.782	21	Pass
8DPSK	3-DH5	2441	4	7.941	21	Pass
8DPSK	3-DH5	2480	4	7.871	21	Pass

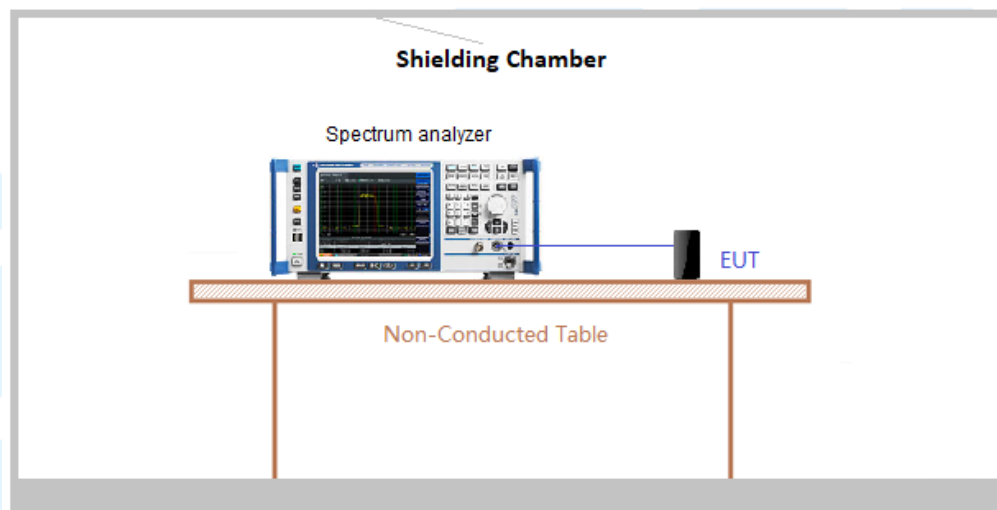




5.4. 20 DB BANDWIDTH

Test Standard FCC 47 CFR Part 15.247
Test Requirement: FCC Part 15.247 (a)(1)
Test Method: ANSI C63.10-2013 Clause 6.9.2
Limit:
 None; for reporting purposes only.

Test Setup:



Test Procedures:

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, centred 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.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

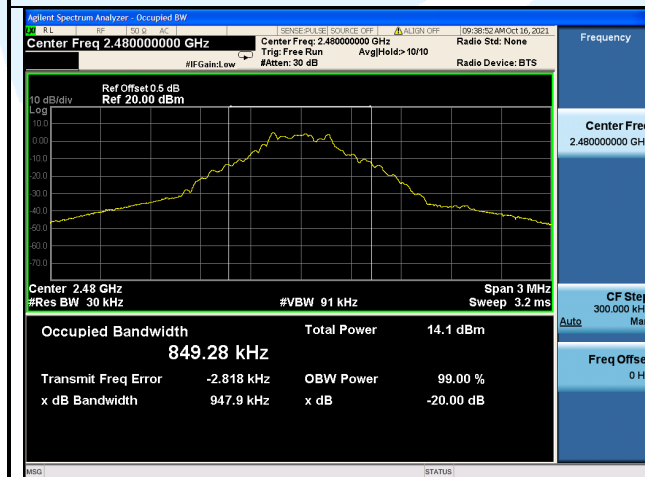
Modulation	Packets	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
GFSK	DH5	2402	0.9495	0.8493
GFSK	DH5	2441	0.9459	0.8511
GFSK	DH5	2480	0.9479	0.8493
$\pi/4$ DQPSK	2-DH5	2402	1.1853	1.2910
$\pi/4$ DQPSK	2-DH5	2441	1.1868	1.2900
$\pi/4$ DQPSK	2-DH5	2480	1.1849	1.2900
8DPSK	3-DH5	2402	1.1831	1.3020
8DPSK	3-DH5	2441	1.1845	1.3010
8DPSK	3-DH5	2480	1.1865	1.3030



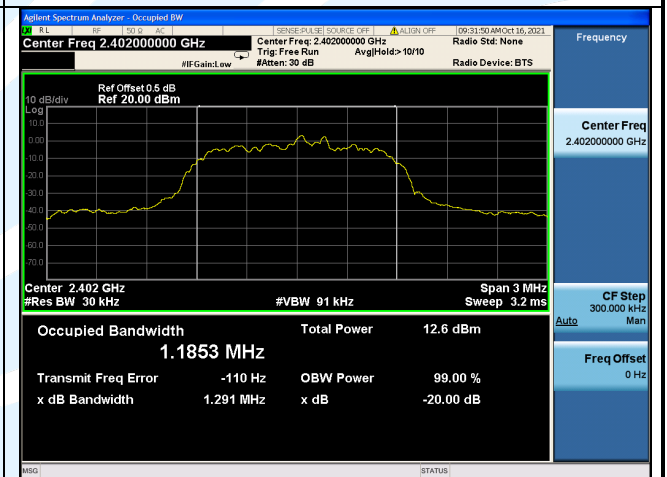
BR+EDR: 1DH5 CH00



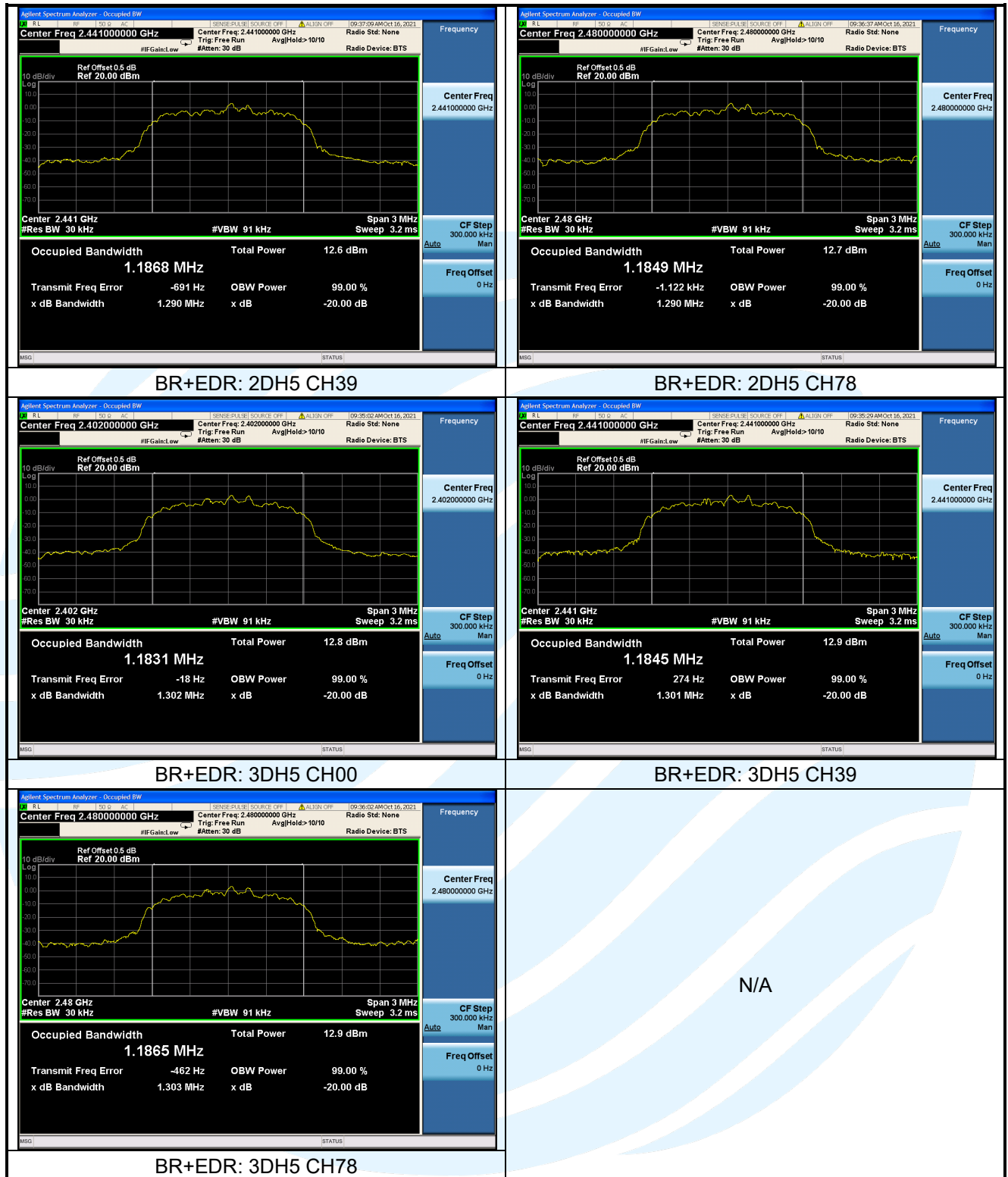
BR+EDR: 1DH5 CH39



BR+EDR: 1DH5 CH78



BR+EDR: 2DH5 CH00



5.5. CARRIER FREQUENCIES SEPARATION

Test Standard FCC 47 CFR Part 15.247

Test Requirement: FCC Part 15.247 (a)(1)

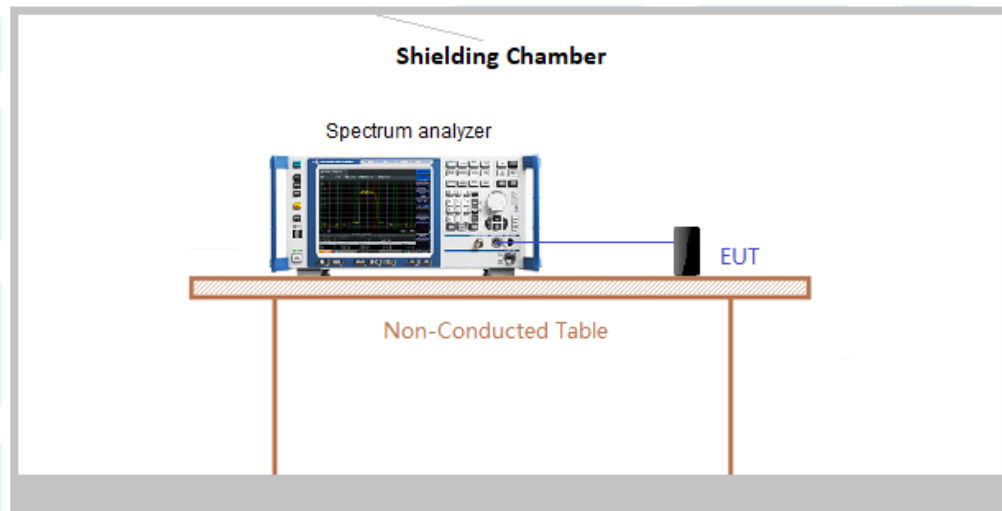
Test Method: ANSI C63.10-2013 Clause 7.8.2

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 Setup:



Test Procedures:

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: Wide enough to capture the peaks of two adjacent channels.
- 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.
- Video (or average) bandwidth (VBW) \geq RBW.
- Sweep: Auto.
- Detector function: Peak.
- Trace: Max hold.
- Allow the trace to stabilize.
- Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

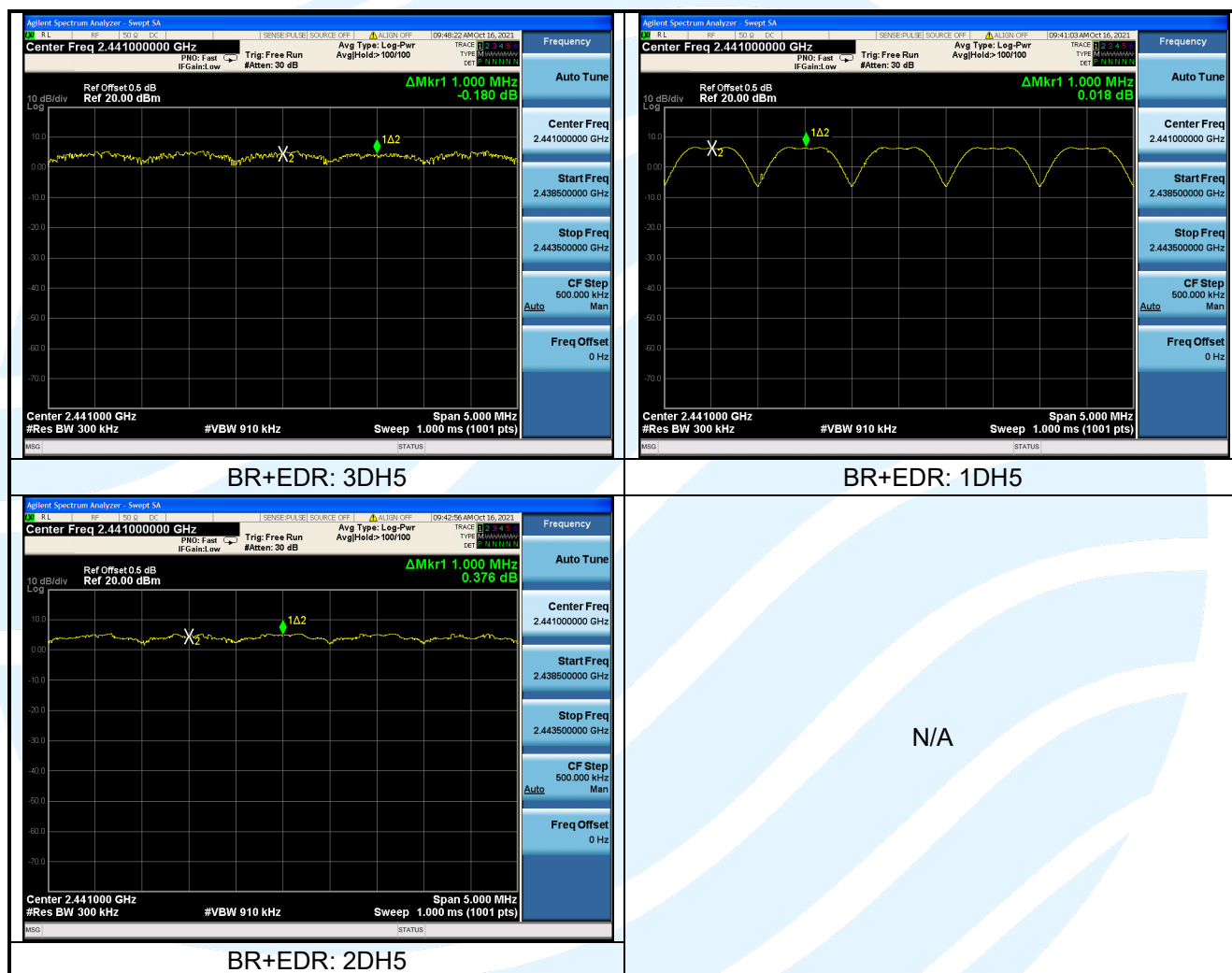
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Modulation	Packets	Channel	Adjacent Channel Separation (MHz)	Limit	Results
GFSK	DH5	2402	1.000	Two-thirds of the 20 dB bandwidth	Pass
$\pi/4$ DQPSK	2-DH5	2402	1.000	Two-thirds of the 20 dB bandwidth	Pass
8DPSK	3-DH5	2402	1.000	Two-thirds of the 20 dB bandwidth	Pass



5.6. NUMBER OF HOPPING CHANNEL

Test Standard FCC 47 CFR Part 15.247

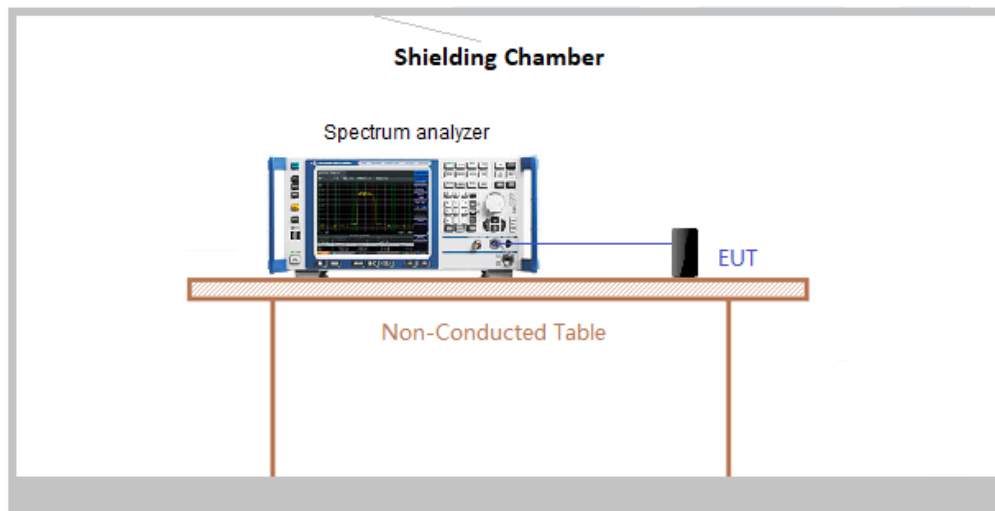
Test Requirement: FCC Part 15.247 (b)(1)

Test Method: ANSI C63.10-2013 Clause 7.8.3

Limit:

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

Test Setup:



Test Procedures:

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: 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.
- RBW < 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- VBW ≥ RBW.
- Sweep: Auto.
- Detector function: Peak.
- Trace: Max hold.
- Allow the trace to stabilize.

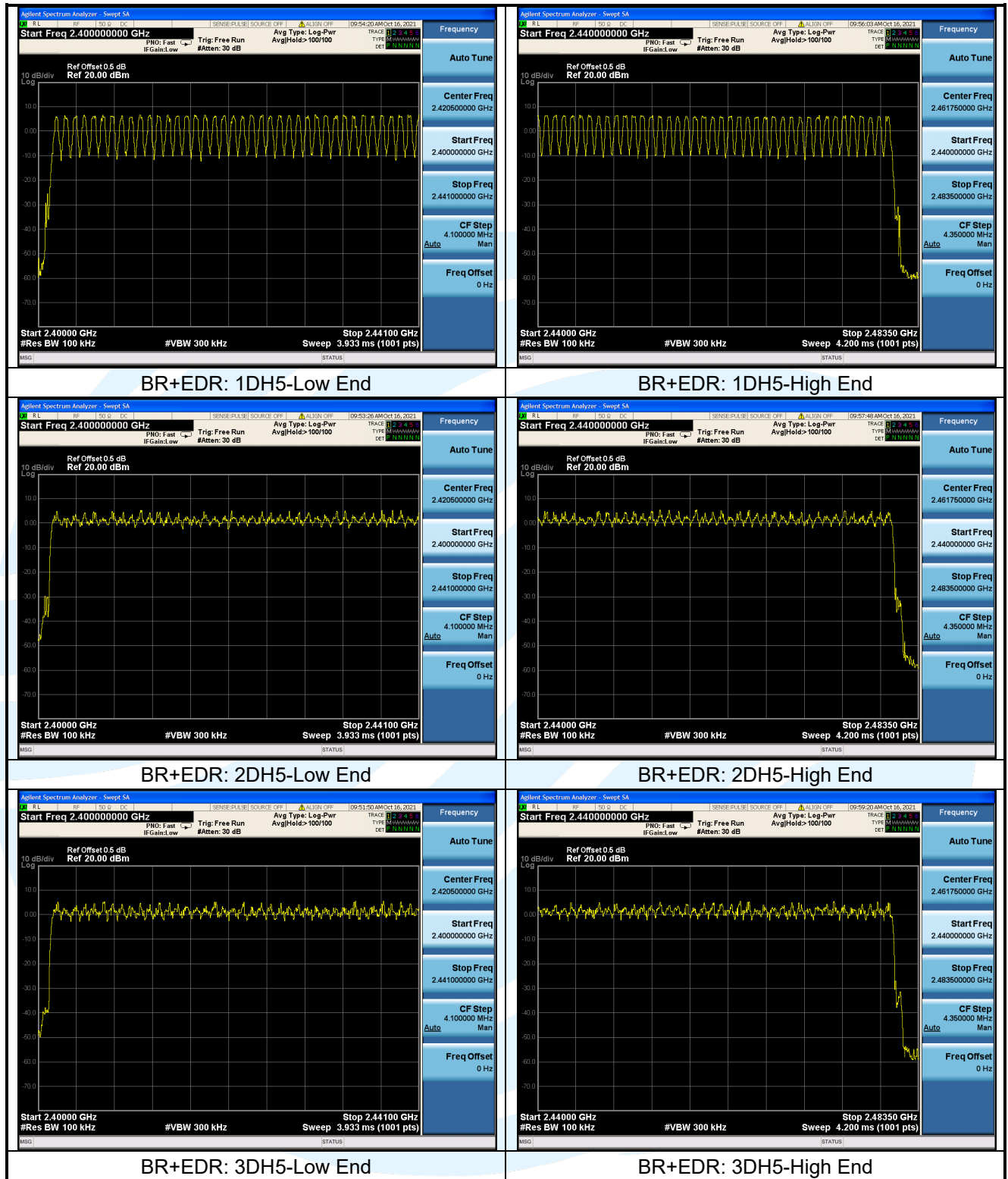
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Modulation	Number of Hopping Channel	Limit	Results
GFSK	79	> 15	Pass
$\pi/4$ DQPSK	79	> 15	Pass
8DPSK	79	> 15	Pass

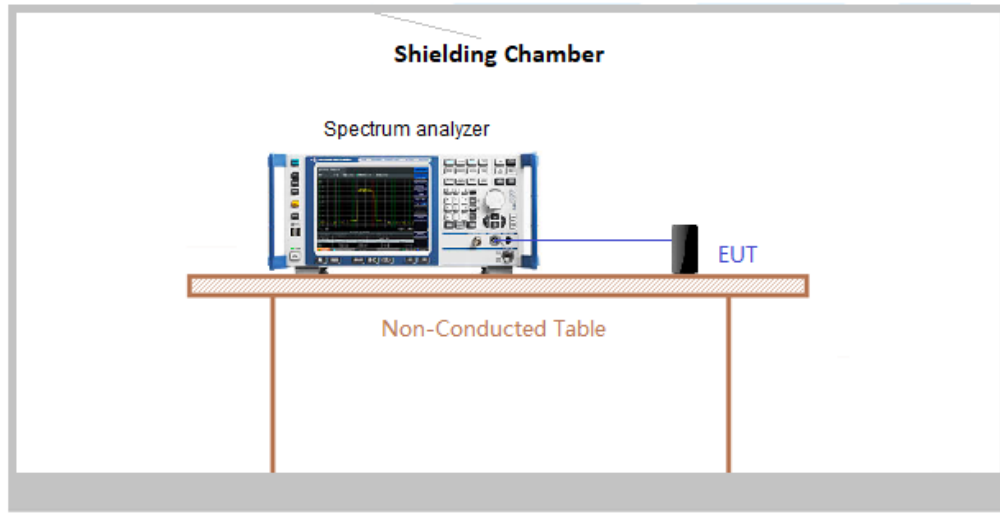


5.7. DWELL TIME

Test Standard FCC 47 CFR Part 15.247
Test Requirement: FCC Part 15.247 (a)(1)
Test Method: ANSI C63.10-2013 Clause 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 Setup:



Test Procedures:

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

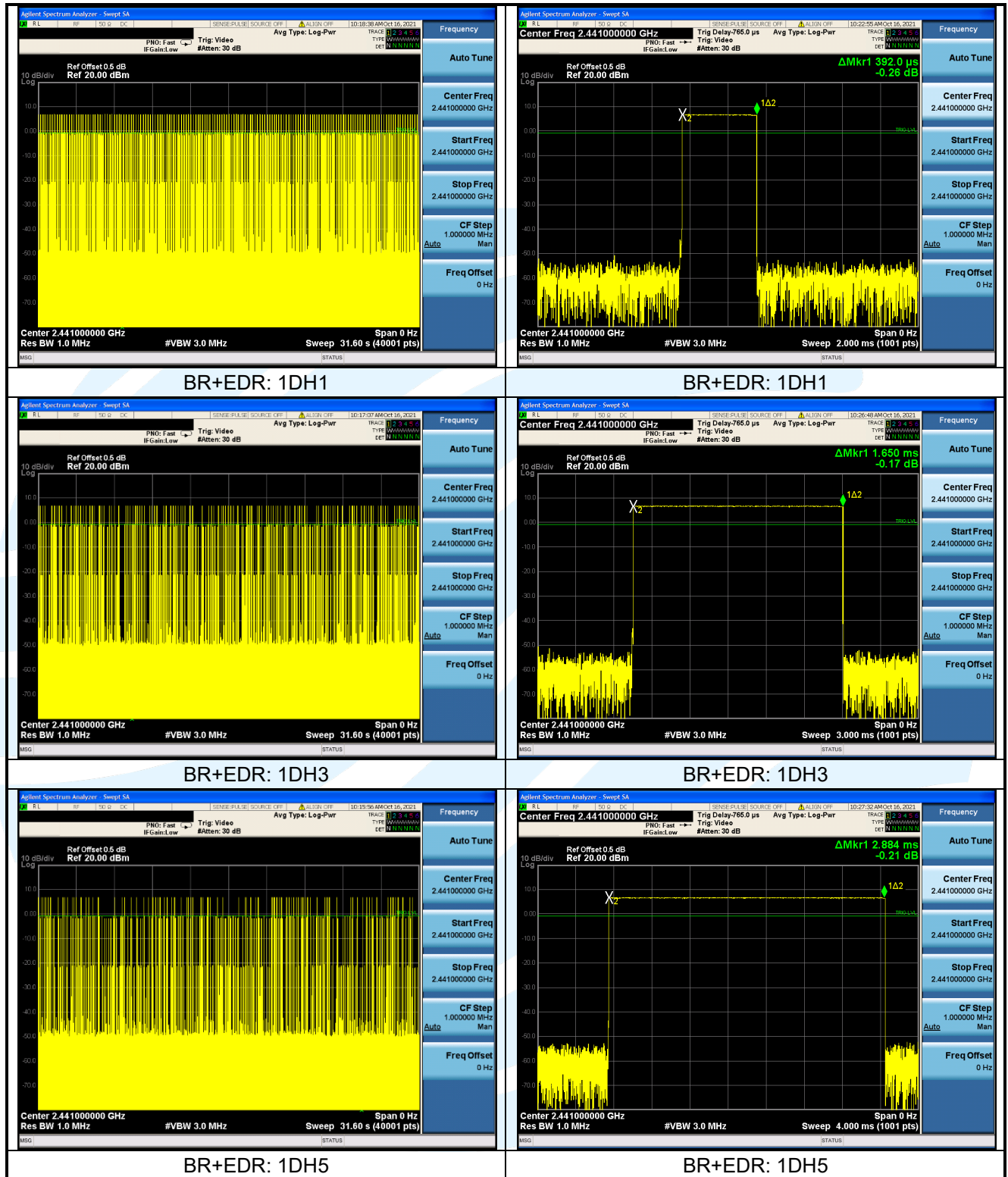
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

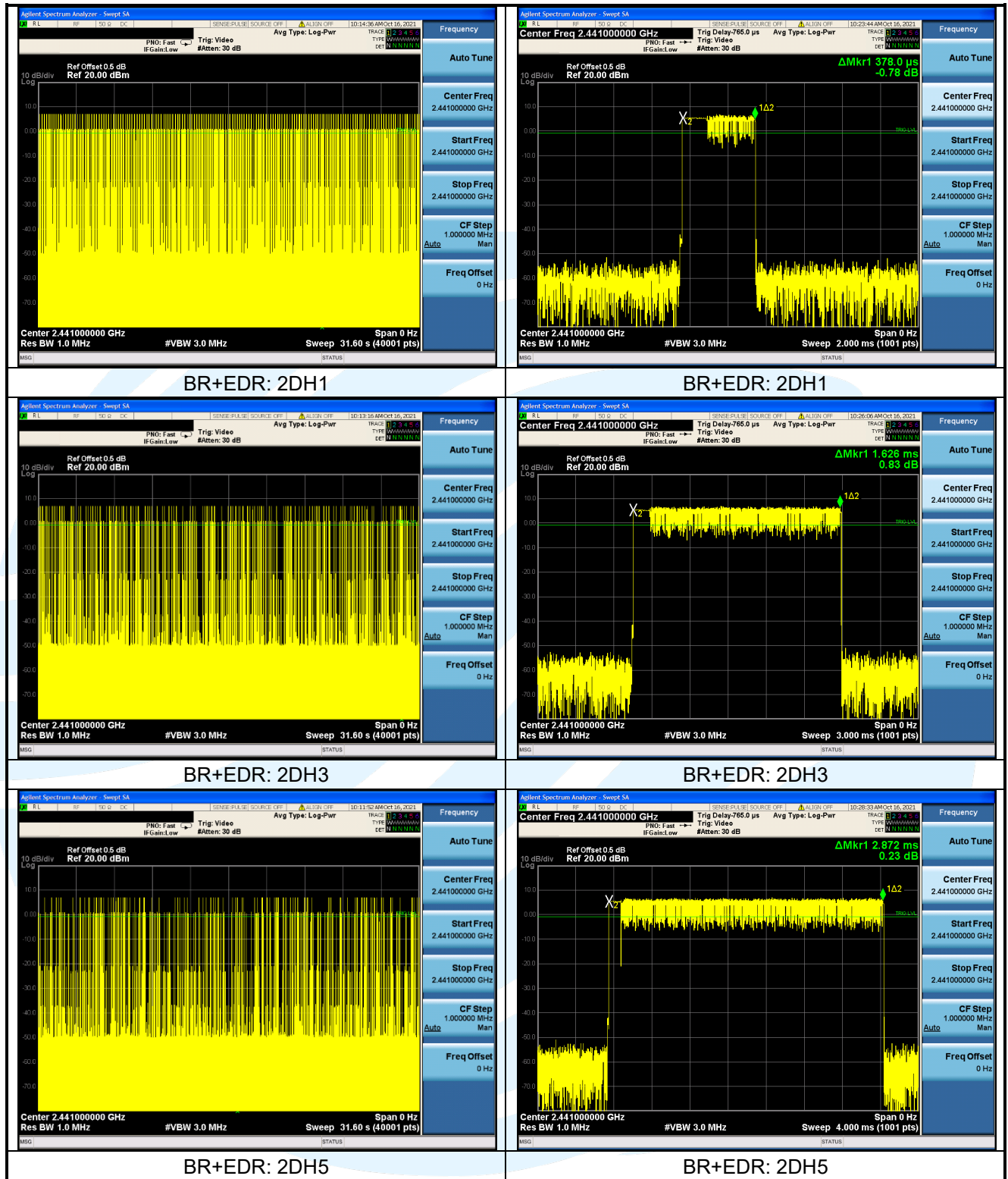
Equipment Used: Refer to section 3 for details.

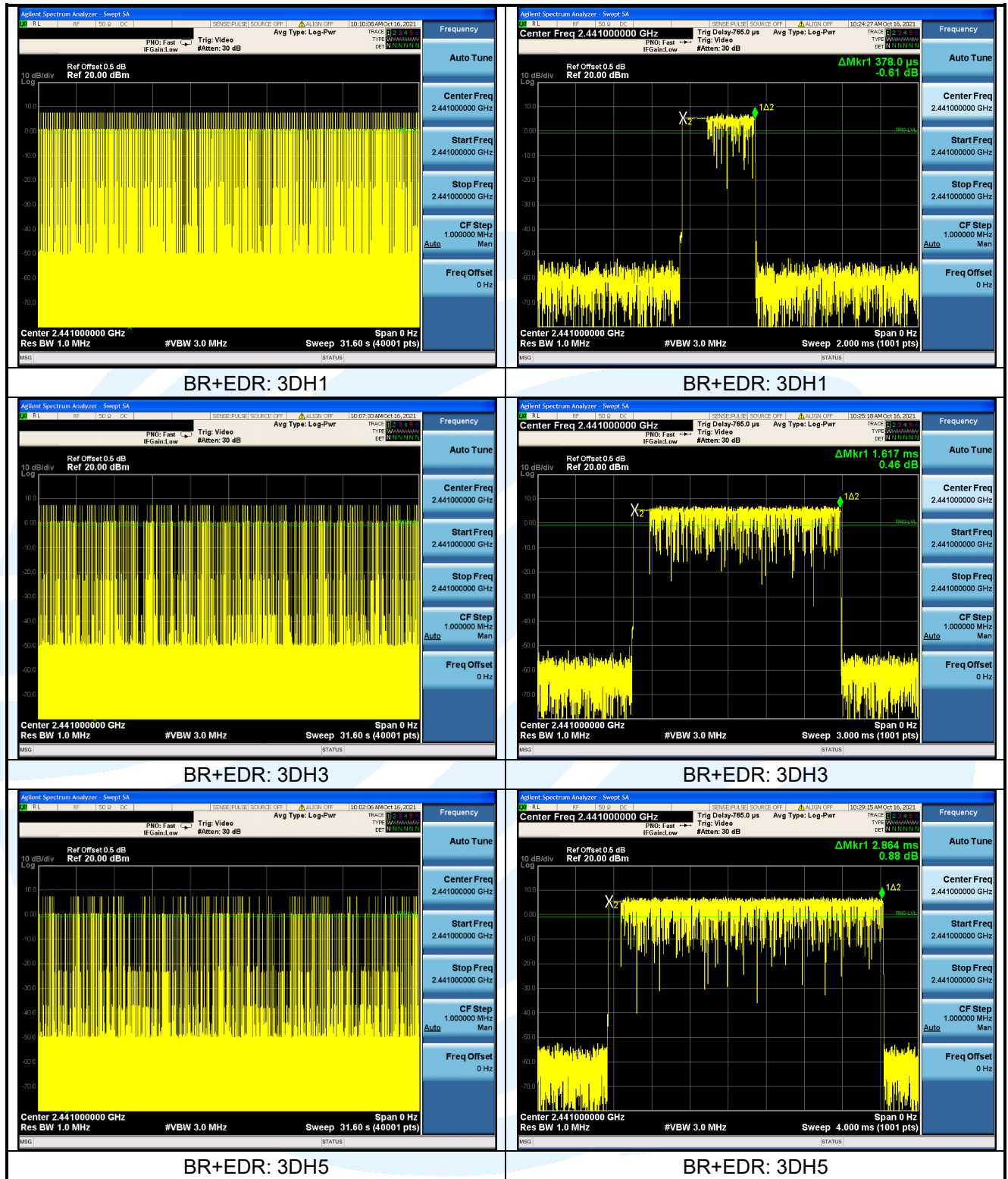
Test Result: Pass

The measurement data as follows:

Modulation	Test Frequency	Packets	Pulse Width (ms)	Number of Pulses in 31.6 seconds	Dwell Time (ms)	Limit (ms)	Results
GFSK	2441MHz	DH1	0.392	188	73.6960	< 400	Pass
GFSK	2441MHz	DH3	1.650	138	227.7000	< 400	Pass
GFSK	2441MHz	DH5	2.884	89	256.6760	< 400	Pass
$\pi/4$ DQPSK	2441MHz	2-DH1	0.378	197	74.4660	< 400	Pass
$\pi/4$ DQPSK	2441MHz	2-DH3	1.626	130	211.3800	< 400	Pass
$\pi/4$ DQPSK	2441MHz	2-DH5	2.872	103	295.8160	< 400	Pass
8DPSK	2441MHz	3-DH1	0.378	187	70.6860	< 400	Pass
8DPSK	2441MHz	3-DH3	1.617	134	216.6780	< 400	Pass
8DPSK	2441MHz	3-DH5	2.864	88	252.0320	< 400	Pass







5.8. CONDUCTED OUT OF BAND EMISSION

Test Standard FCC 47 CFR Part 15.247

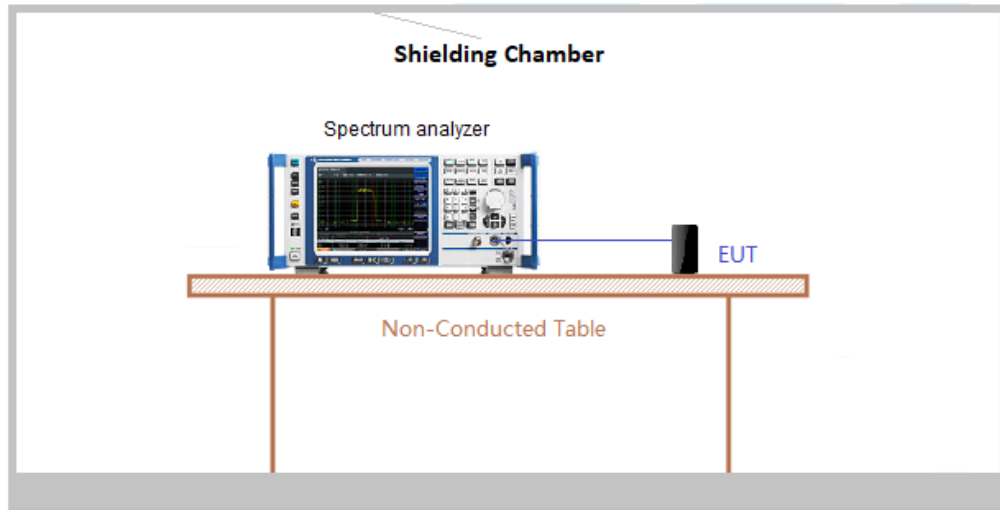
Test Requirement: FCC Part 15.247(d)

Test Method: ANSI C63.10-2013 Clause 6.10.4 & Clause 7.8.8

Limit:

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

Test Setup:



Test Procedures:

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:

Step 1: Measurement Procedure REF

- Set instrument center frequency to DTS channel center frequency.
- Set the span to ≥ 1.5 times the DTS bandwidth.
- Set the RBW = 100 kHz.
- Set the VBW $\geq 3 \times$ RBW.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum PSD level.
- Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

Step 2: Measurement Procedure OOB

- Set RBW = 100 kHz.
- Set VBW ≥ 300 kHz.
- Detector = peak.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

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

Equipment Used: Refer to section 3 for details.

Test Result: Pass

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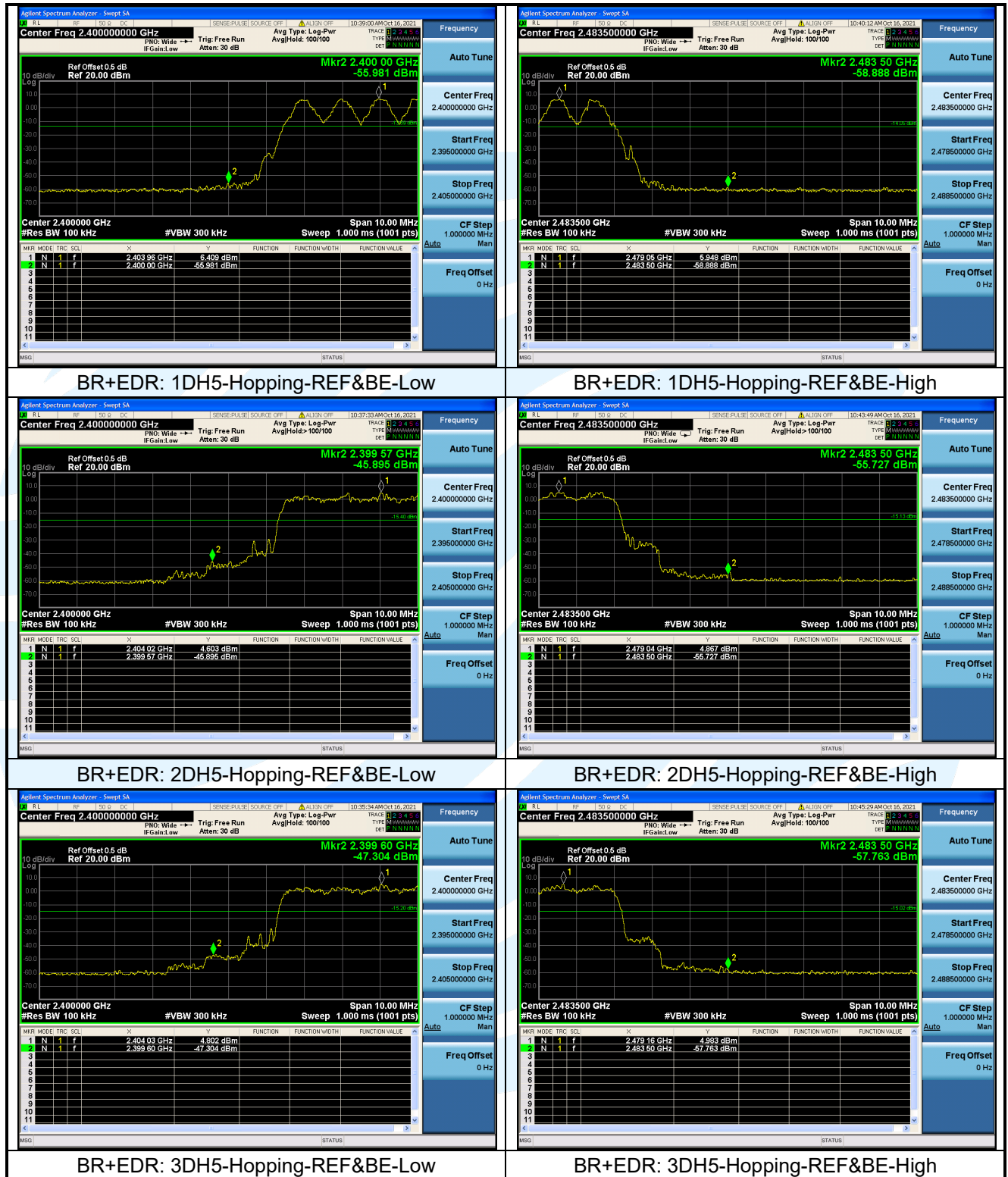
Fax: +86-755-28230886

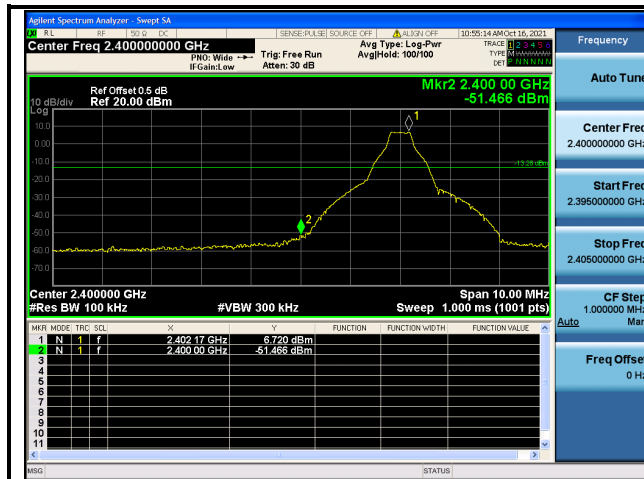
E-mail: info@uttlab.com

<http://www.uttlab.com>

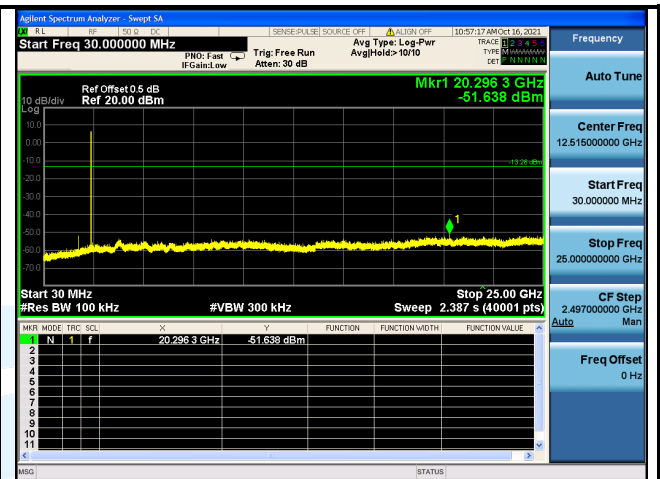
UTTR-EMC-AUTO-V1.0

The measurement data as follows:

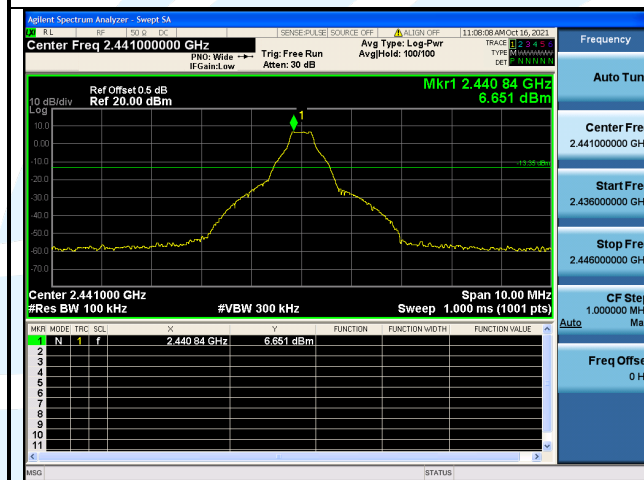




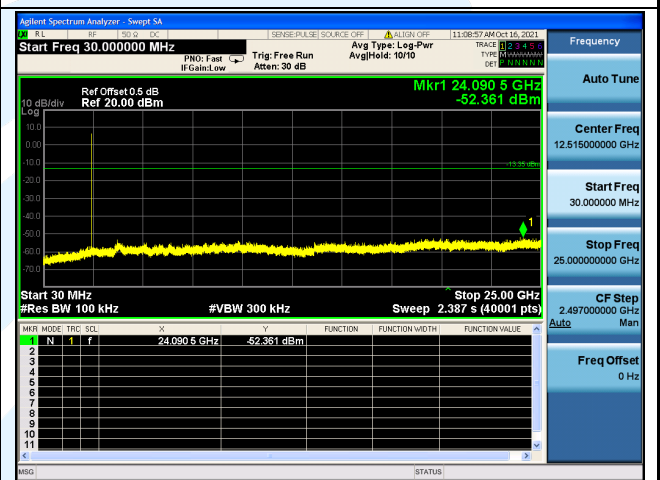
BR+EDR: 1DH5-CH00-REF&BE



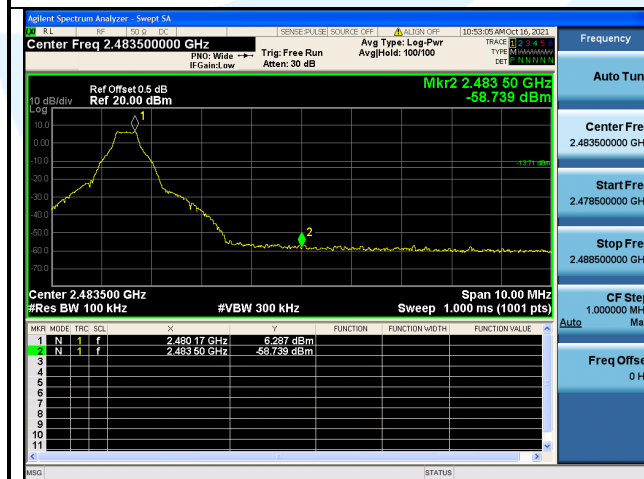
BR+EDR: 1DH5-CH00-CSE



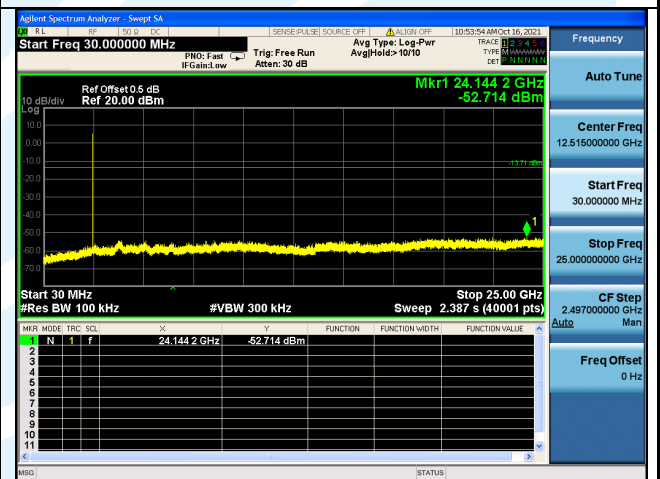
BR+EDR: 1DH5-CH39-REF&BE



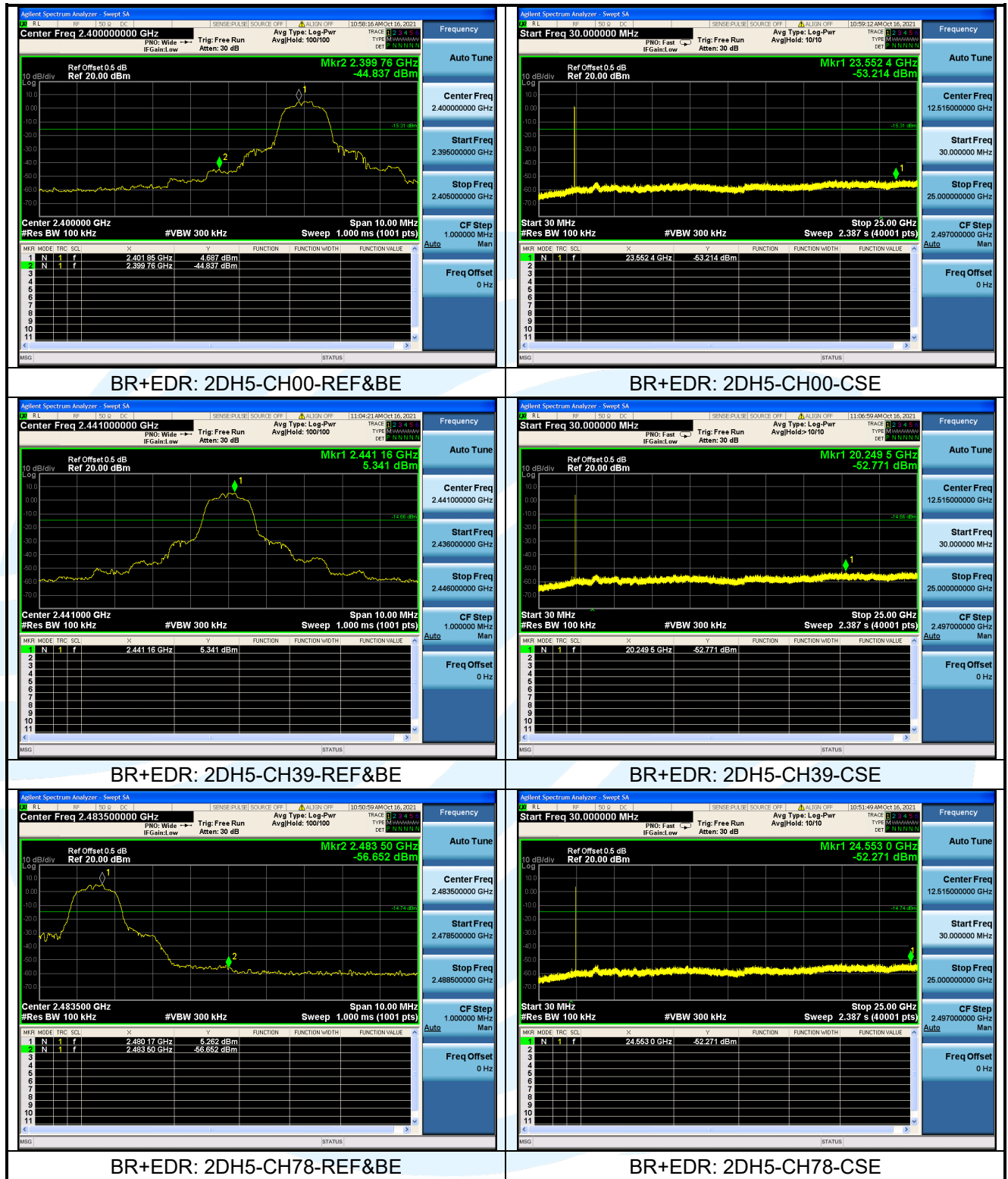
BR+EDR: 1DH5-CH39-CSE



BR+EDR: 1DH5-CH78-REF&BE



BR+EDR: 1DH5-CH78-CSE





5.9. RADIATED EMISSIONS

Test Standard FCC 47 CFR Part 15.247
Test Requirement: FCC Part 15.205/15.209
Test Method: ANSI C63.10-2013 Clause 6.3 & 6.5 & 6.6
Limit:

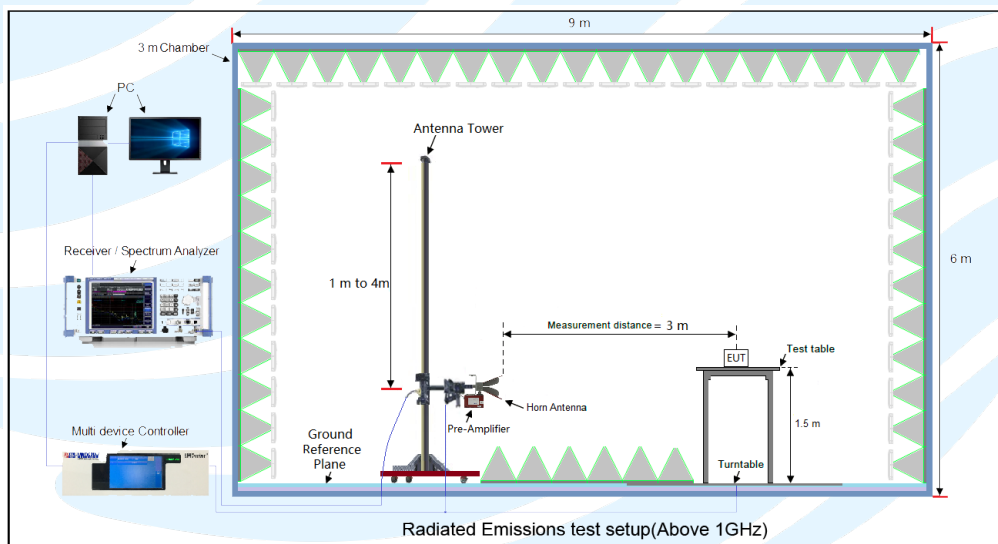
Spurious Emissions

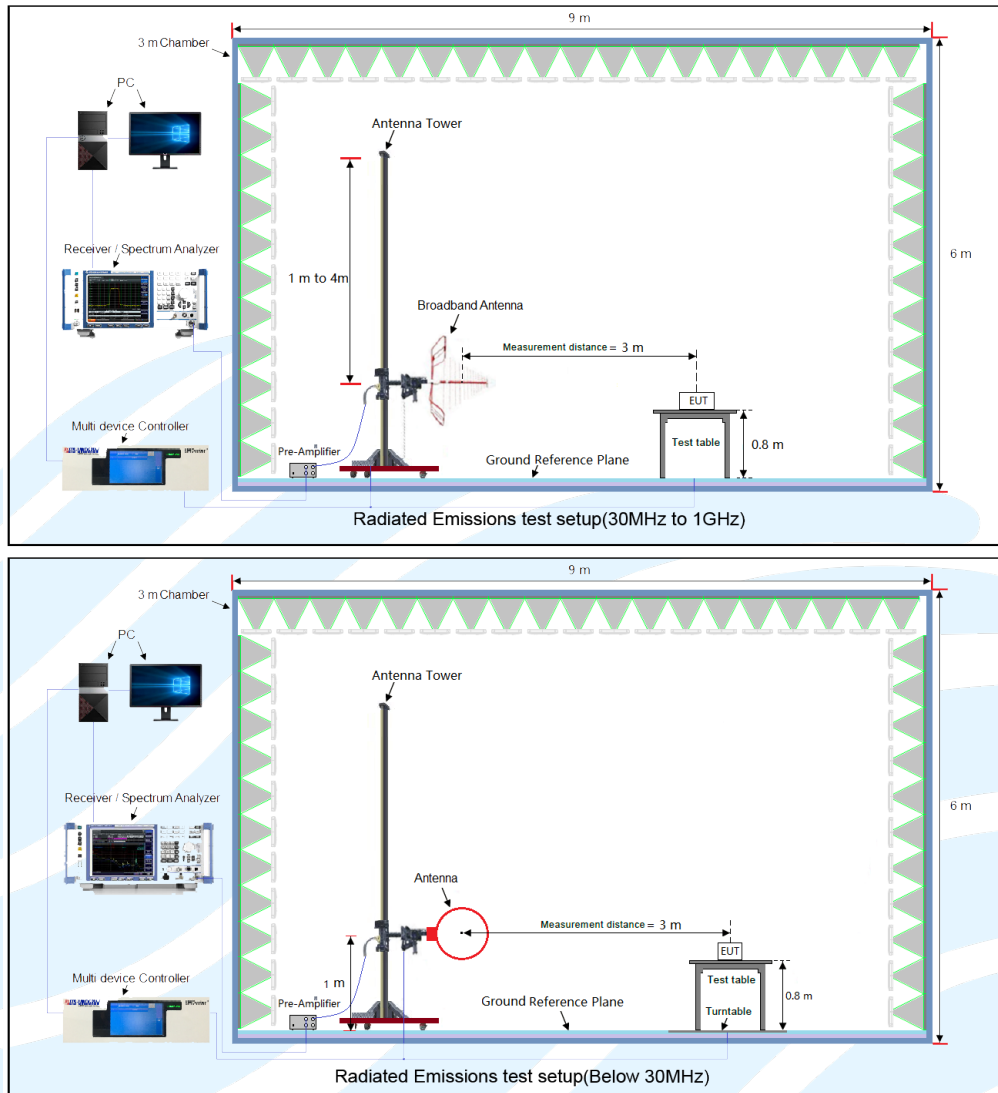
Frequency	Field strength (microvolt/meter)	Limit (dB μ V/m)	Detector	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup:





Test Procedures:

➤ From 30 MHz to 1GHz test procedure as below:

- 1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3-meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotating table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise, the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

➤ Above 1GHz test procedure as below:

- 1) Different from above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change from table 0.8 meter to 1.5 meter (Above 18GHz the distance is 1 meter and table is 1.5

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E-mail: info@uttlab.com

<http://www.uttlab.com>

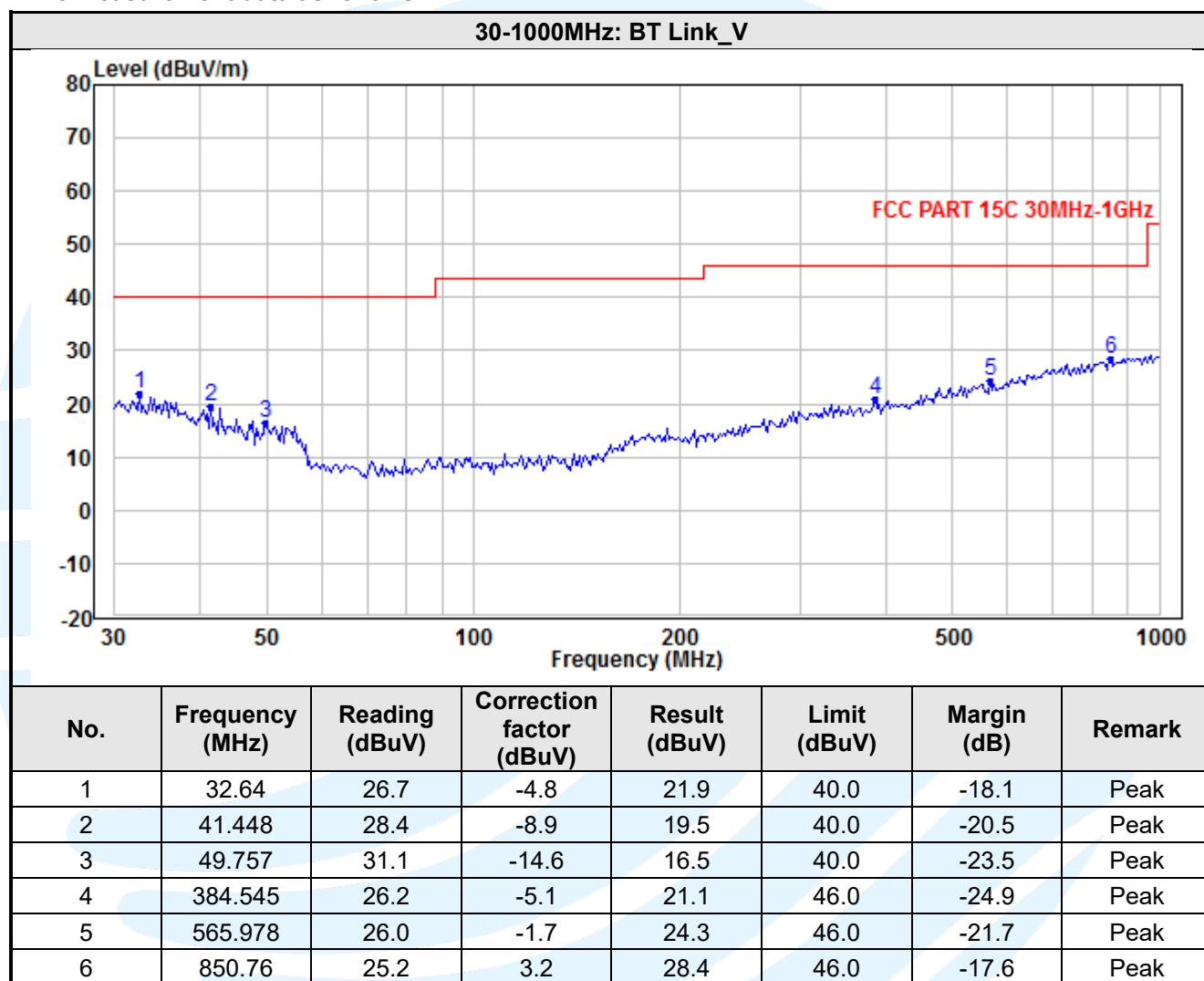
UTTR-EMC-AUTO-V1.0

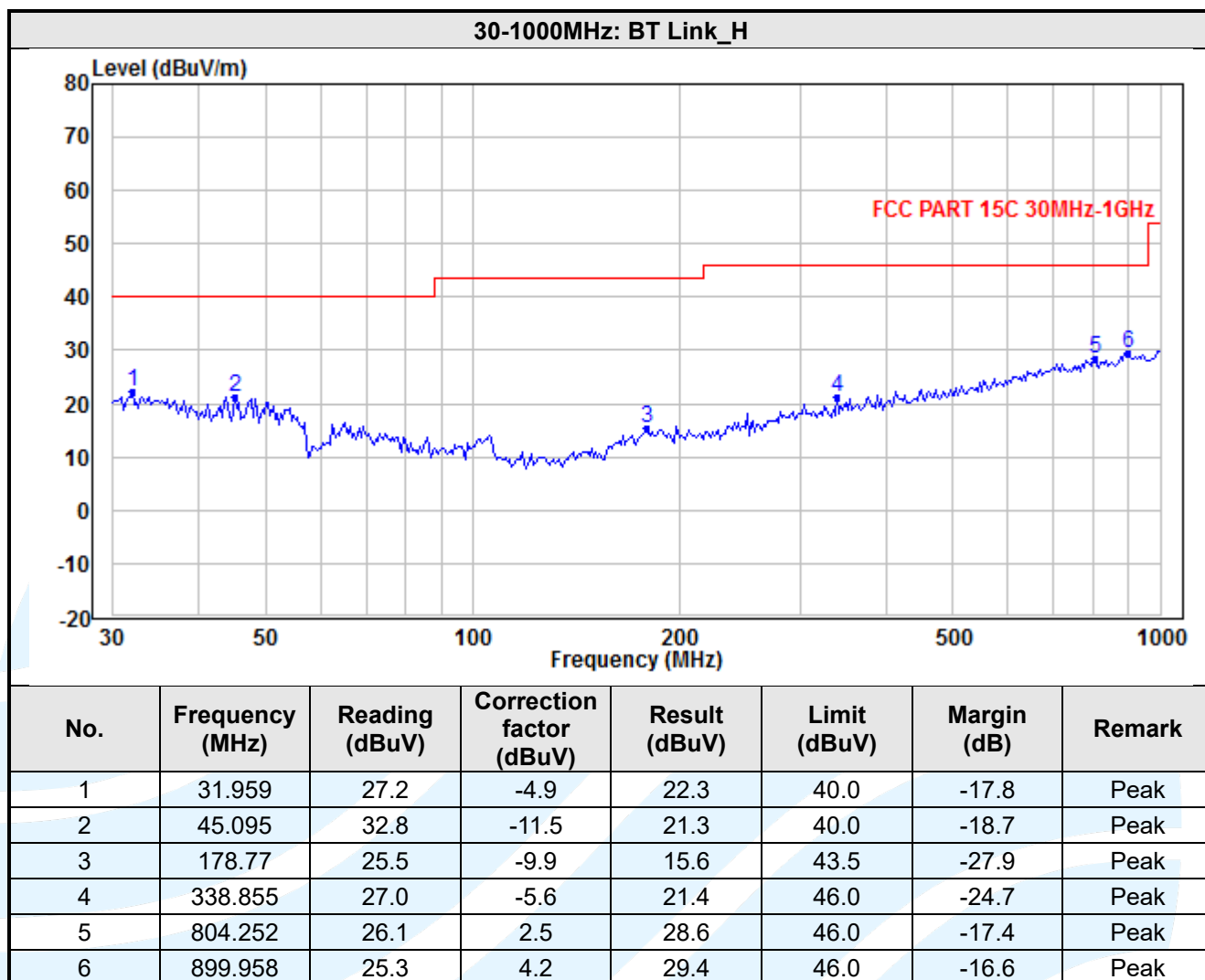
- meter).
- 2) Test the EUT in the lowest channel, middle channel, the Highest channel
 - 3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and test the worst-case axis positioning.
 - 4) Repeat above procedures until all frequencies measured was complete.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:





Above 1GHz: DH5_2402MHz_H							
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dBuV)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	4804	42.4	-2.3	40.1	74.0	-33.9	Peak
2	7206	40.2	1.4	41.6	74.0	-32.4	Peak
Above 1GHz: DH5_2402MHz_V							
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dBuV)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	4804	42.3	-2.3	39.9	74.0	-34.1	Peak
2	7206	39.2	1.4	40.7	74.0	-33.3	Peak
Above 1GHz: DH5_2441MHz_H							
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dBuV)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	4882	40.5	-2.3	38.2	74.0	-35.8	Peak
2	7323	40.7	1.6	42.3	74.0	-31.7	Peak
Above 1GHz: DH5_2441MHz_V							
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dBuV)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	4882	40.3	-2.3	38.0	74.0	-36.1	Peak
2	7323	40.3	1.6	41.9	74.0	-32.1	Peak
Above 1GHz: DH5_2480MHz_H							
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dBuV)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	4960	43.1	-2.3	40.8	74.0	-33.2	Peak
2	7440	38.5	1.8	40.3	74.0	-33.7	Peak
Above 1GHz: DH5_2480MHz_V							
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dBuV)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	4960	42.5	-2.3	40.2	74.0	-33.8	Peak
2	7440	41.5	1.8	43.3	74.0	-30.7	Peak

Remark:

- Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
Result = Reading + Correct Factor.
Margin = Result – Limit
- As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

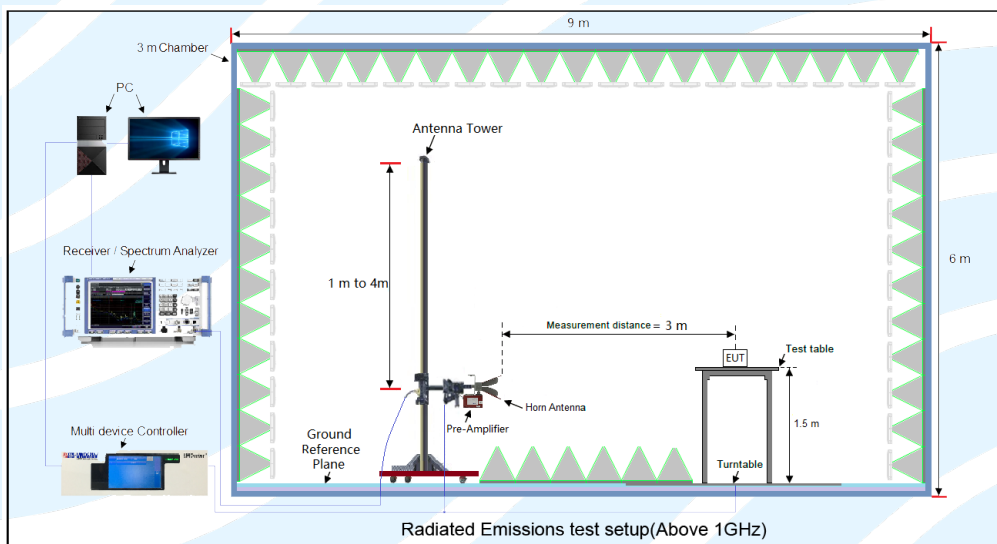
5.10. BAND EDGE MEASUREMENT

Test Standard FCC 47 CFR Part 15.247
Test Requirement: FCC Part 15.205/15.209
Test Method: ANSI C63.10-2013 Clause 6.10.5
Limit:

Radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a).

Frequency	Limit (dBμV/m @3m)	Remark
30 MHz-88 MHz	40.0	Quasi-peak Value
88 MHz-216 MHz	43.5	Quasi-peak Value
216 MHz-960 MHz	46.0	Quasi-peak Value
960 MHz-1 GHz	54.0	Quasi-peak Value
Above 1 GHz	54.0	Average Value
	74.0	Peak Value

Test Setup:



Test Procedures:

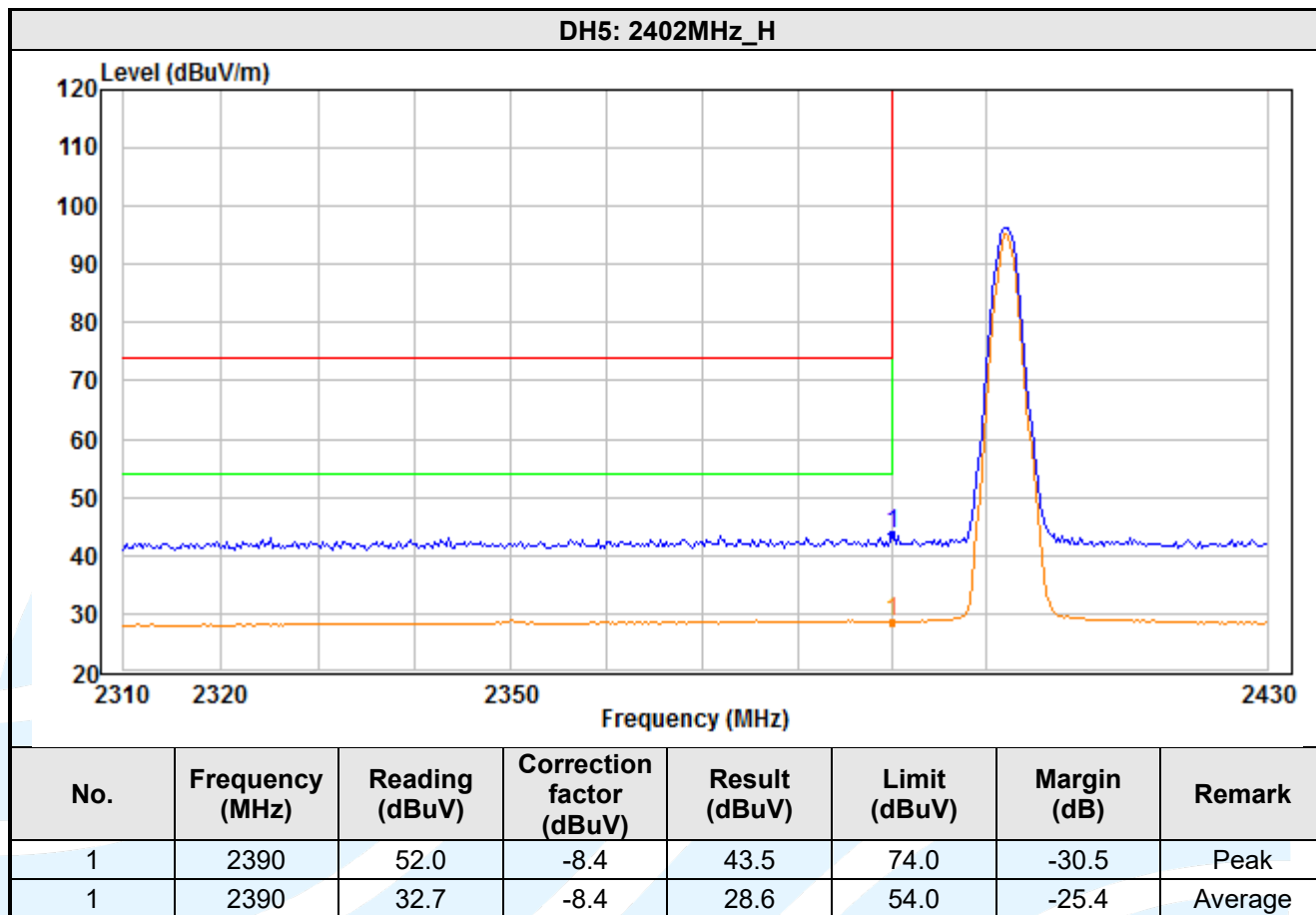
Radiated band edge measurements at 2390 MHz and 2483.5 MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 3 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz or 1/T for average levels).

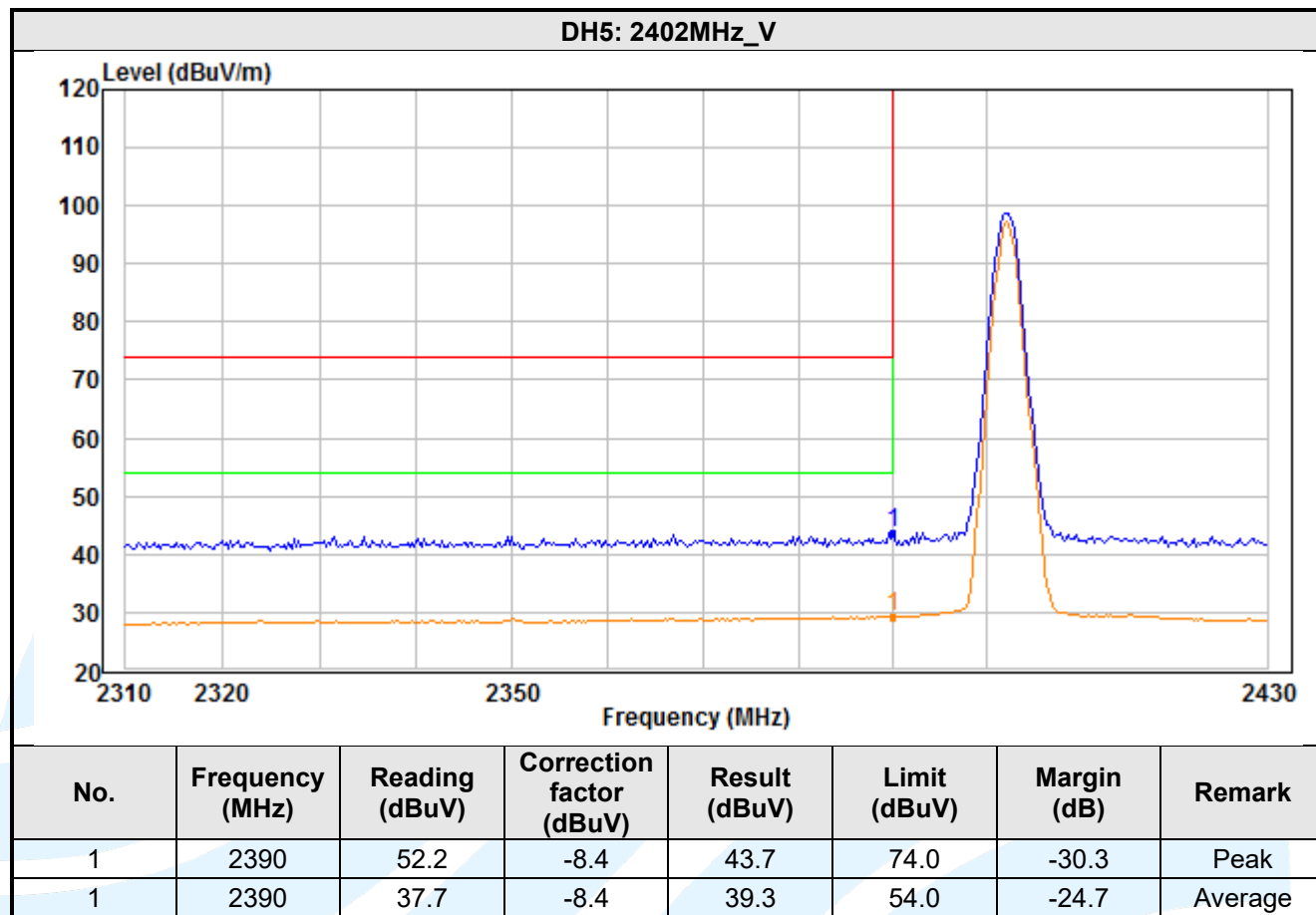
1. Use radiated spurious emission test procedure described in clause 5.10. The transmitter output (antenna port) was connected to the test receiver.
2. Set the Peak and Average limit line.
3. Record the fundamental emission and emissions out of the band-edge.
4. Determine band-edge compliance as required.

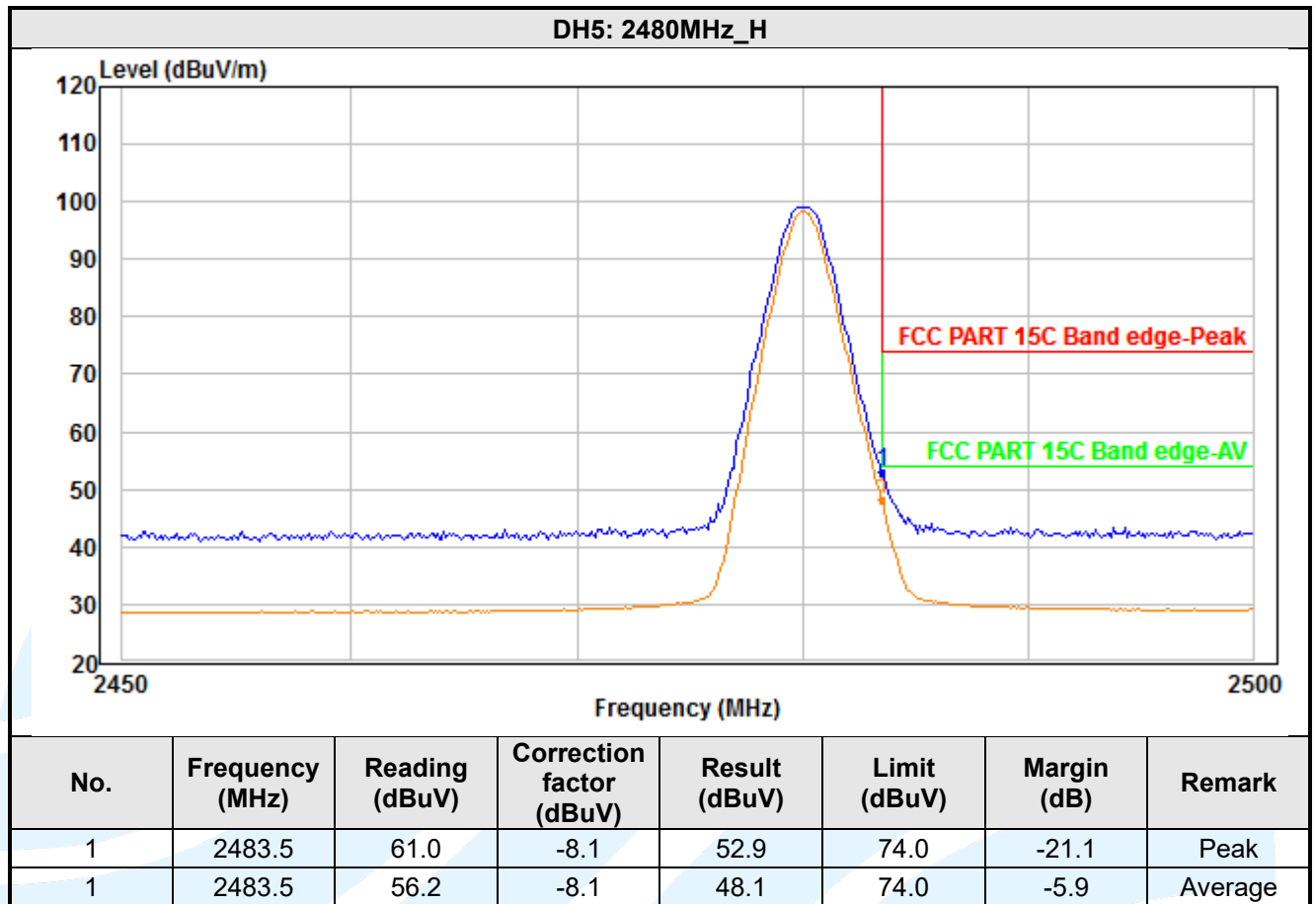
Equipment Used: Refer to section 3 for details.

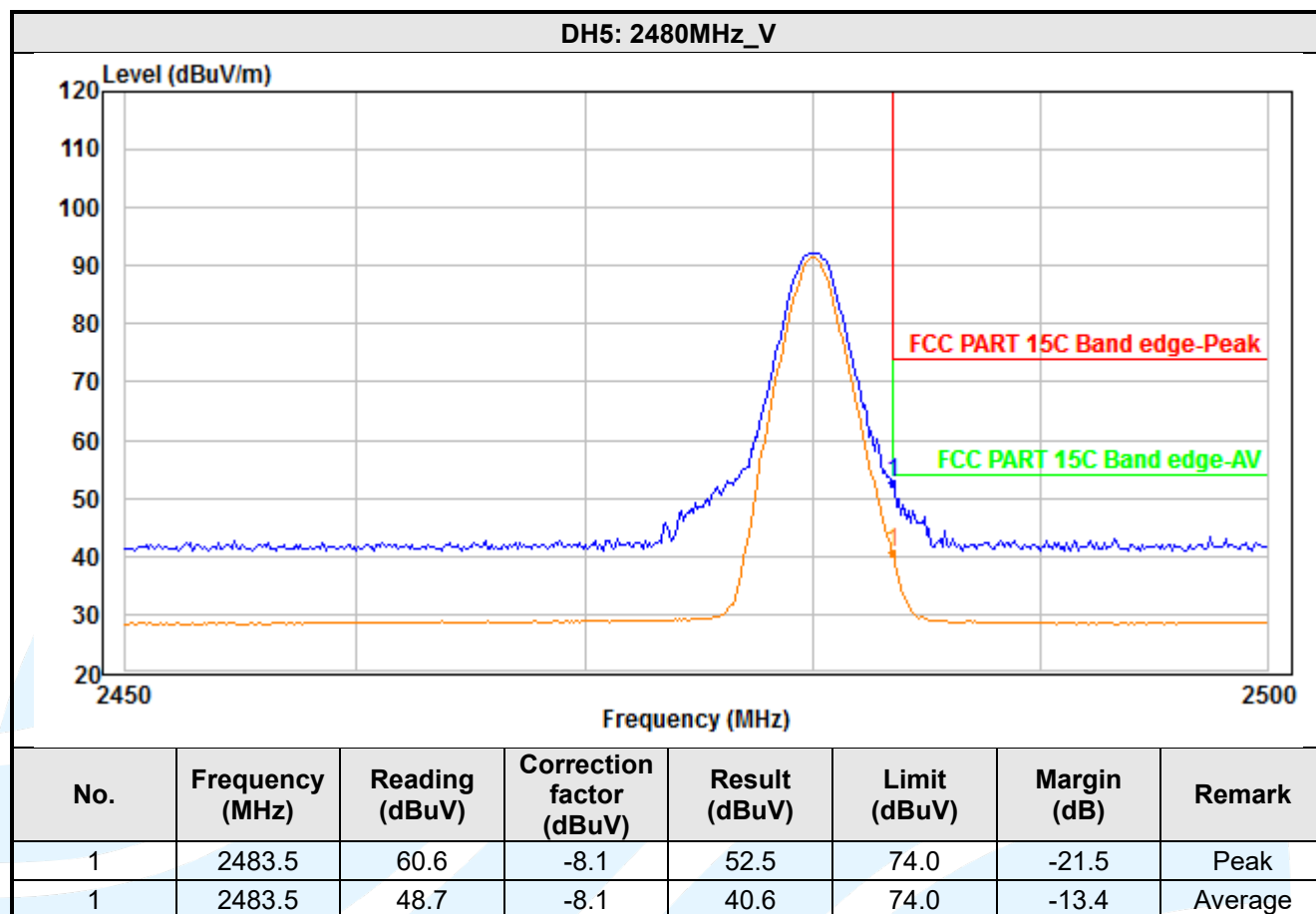
Test Result: Pass

The measurement data as follows:





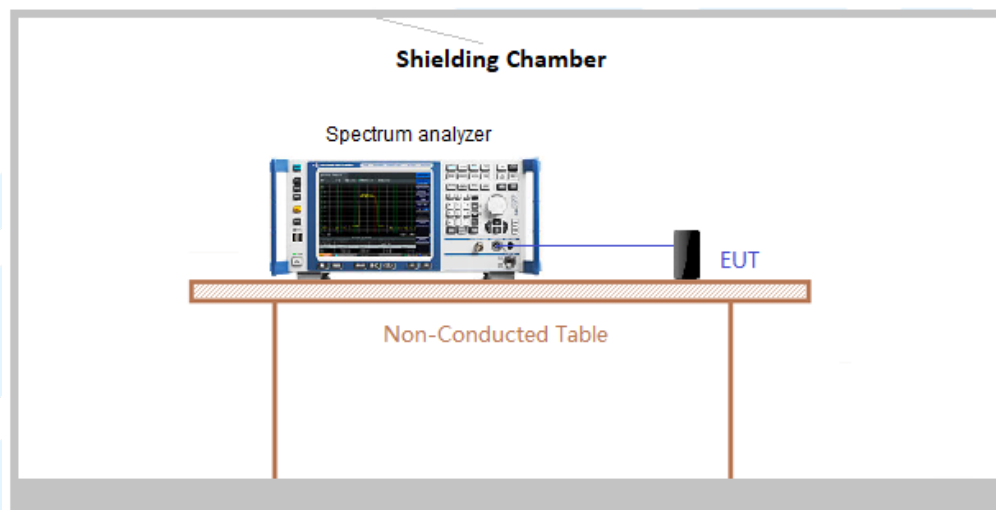




5.11. DUTY CYCLE

Test Standard FCC 47 CFR Part 15.247
Test Requirement: None; for reporting purposes only.
Test Method: ANSI C63.10-2013, Clause 11.6
Limit:
None; for reporting purposes only.

Test Setup:



Test Procedures:

Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

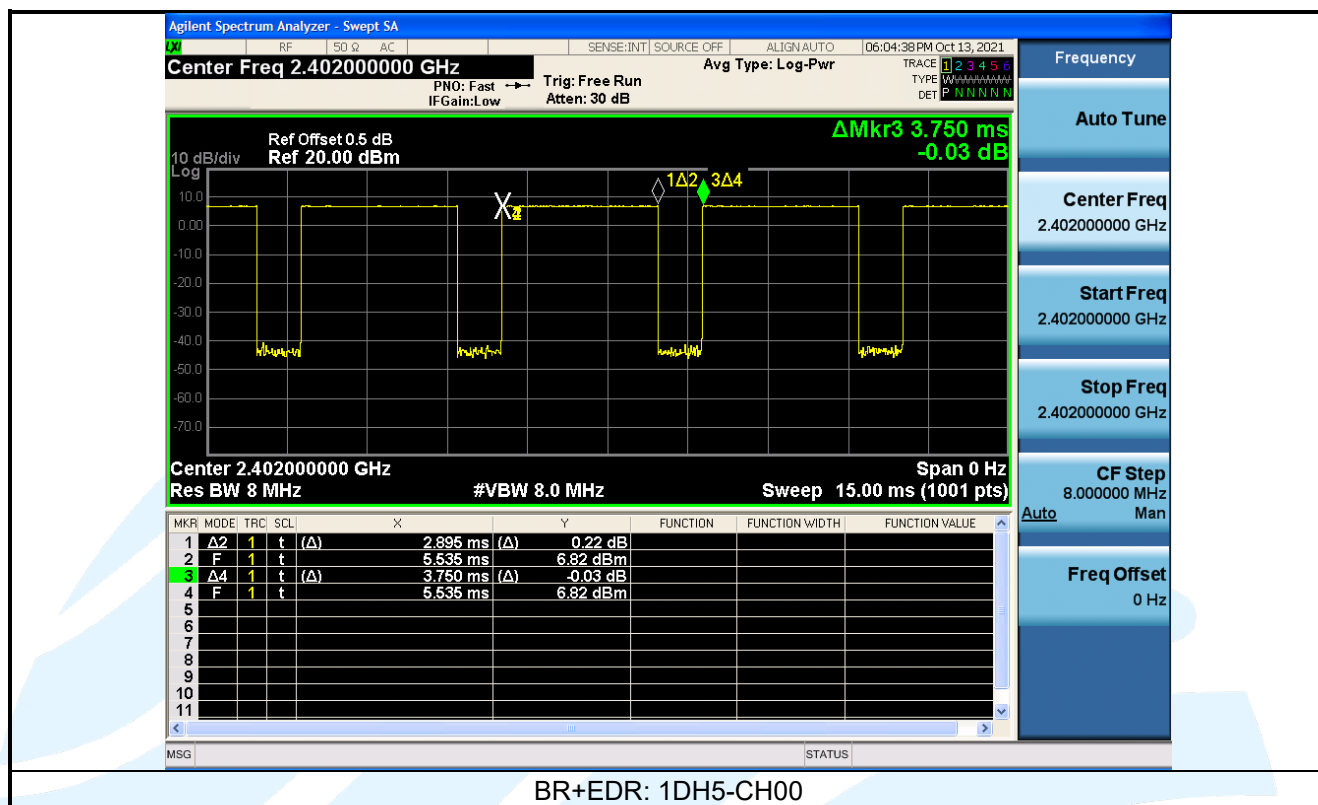
- A diode detector and an oscilloscope that together have a sufficiently short response time to permit accurate measurements of the ON and OFF times of the transmitted signal.
- The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:
 - Set the center frequency of the instrument to the center frequency of the transmission.
 - Set RBW \geq OBW if possible; otherwise, set RBW to the largest available value.
 - Set VBW \geq RBW. Set detector = peak or average.
 - The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$ and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if $T \leq 16.7 \mu s$.)

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Modulation	Packets	On Time (ms)	Period (ms)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/ T Minimum VBW (kHz)	Average Factor (dB)
GFSK	DH5	2.88	3.75	0.77	76.80	1.15	0.35	-2.29



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UTTR-EMC-AUTO-V1.0

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.



APPENDIX 2 PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.
