



Certificate #4312.01

# TEST REPORT

**Product Name:** Long Range High Performance DECT VoIP Base Station  
**Trade Mark:** GRANDSTREAM  
**Model No. / HVIN:** DP755  
**Report Number:** 2305255326RFC-1  
**Test Standards:** FCC 47 CFR Part 15 Subpart D  
RSS-213 Issue 3  
RSS-Gen Issue 5  
**FCC ID:** YZZDP755  
**IC:** 11964A-DP755  
**Test Result:** PASS  
**Date of Issue:** July 7, 2023

Prepared for:

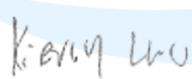
**Grandstream Networks, Inc.**  
**126 Brookline Ave. 3rd Floor Boston, MA 02215, USA.**

Prepared by:

**Shenzhen UnionTrust Quality and Technology Co., Ltd.**  
**Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and**  
**technology park, Longhua district, Shenzhen, China**

**TEL: +86-755-2823 0888**  
**FAX: +86-755-2823 0886**

Prepared by:

  
Kieron Luo  
Project Engineer

Reviewed by:

  
Henry Lu  
Team Leader

Approved by:

  
Kevin Liang  
Assistant Manager

Date:

July 7, 2023

**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

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>UTTR-RF-RSS213-V1.0

**Version**

Version No.	Date	Description
V1.0	July 7, 2023	Original

**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

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-RSS213-V1.0

## CONTENTS

<b>1. GENERAL INFORMATION .....</b>	<b>4</b>
<b>1.1 CLIENT INFORMATION .....</b>	<b>4</b>
<b>1.2 EUT INFORMATION .....</b>	<b>4</b>
<b>1.2.1 GENERAL DESCRIPTION OF EUT .....</b>	<b>4</b>
<b>1.2.2 DESCRIPTION OF ACCESSORIES .....</b>	<b>4</b>
<b>1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD .....</b>	<b>5</b>
<b>1.4 DESCRIPTION OF SUPPORT UNITS .....</b>	<b>5</b>
<b>1.5 TEST LOCATION.....</b>	<b>6</b>
<b>1.6 TEST FACILITY.....</b>	<b>6</b>
<b>1.7 DEVIATION FROM STANDARDS .....</b>	<b>6</b>
<b>1.8 ABNORMALITIES FROM STANDARD CONDITIONS.....</b>	<b>6</b>
<b>1.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER .....</b>	<b>6</b>
<b>1.10 MEASUREMENT UNCERTAINTY .....</b>	<b>7</b>
<b>2. TEST SUMMARY .....</b>	<b>8</b>
<b>3. EQUIPMENT LIST .....</b>	<b>9</b>
<b>4. TEST CONFIGURATION .....</b>	<b>10</b>
<b>4.1 ENVIRONMENTAL CONDITIONS FOR TESTING .....</b>	<b>10</b>
<b>4.1.1 NORMAL OR EXTREME TEST CONDITIONS .....</b>	<b>10</b>
<b>4.1.2 RECORD OF NORMAL ENVIRONMENT AND TEST SAMPLE .....</b>	<b>10</b>
<b>4.2 TEST CHANNELS .....</b>	<b>11</b>
<b>4.3 EUT TEST STATUS .....</b>	<b>11</b>
<b>4.4 TEST SETUP .....</b>	<b>11</b>
<b>4.4.1 FOR RADIATED EMISSIONS TEST SETUP .....</b>	<b>11</b>
<b>4.4.2 FOR CONDUCTED EMISSIONS TEST SETUP .....</b>	<b>12</b>
<b>4.4.3 FOR CONDUCTED RF TEST SETUP .....</b>	<b>13</b>
<b>4.5 SYSTEM TEST CONFIGURATION .....</b>	<b>14</b>
<b>5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION .....</b>	<b>15</b>
<b>5.1 REFERENCE DOCUMENTS FOR TESTING .....</b>	<b>15</b>
<b>5.2 ANTENNA REQUIREMENT .....</b>	<b>15</b>
<b>5.3 DIGITAL MODULATION TECHNIQUES.....</b>	<b>15</b>
<b>5.4 AUTOMATIC DISCONTINUATION OF TRANSMISSION .....</b>	<b>16</b>
<b>5.5 EMISSION BANDWIDTH &amp; OCCUPIED BANDWIDTH .....</b>	<b>17</b>
<b>5.6 IN-BAND EMISSIONS .....</b>	<b>20</b>
<b>5.7 OUT-OF-BAND EMISSIONS .....</b>	<b>23</b>
<b>5.8 RADIATED EMISSIONS .....</b>	<b>27</b>
<b>5.9 PEAK TRANSMIT POWER.....</b>	<b>29</b>
<b>5.10 POWER SPECTRAL DENSITY .....</b>	<b>35</b>
<b>5.11 CARRIER FREQUENCY STABILITY .....</b>	<b>38</b>
<b>5.12 SPECIFIC REQUIREMENTS FOR UPCS .....</b>	<b>39</b>
<b>5.12.1 MONITORING TIME .....</b>	<b>39</b>
<b>5.12.2 LOWEST MONITORING THRESHOLD .....</b>	<b>40</b>
<b>5.12.3 ACKNOWLEDGEMENTS AND TRANSMISSION DURATION .....</b>	<b>40</b>
<b>5.12.4 LEAST INTERFERED CHANNEL (LIC) SELECTION .....</b>	<b>41</b>
<b>5.12.5 RANDOM WAITING .....</b>	<b>42</b>
<b>5.12.6 MONITORING BANDWIDTH.....</b>	<b>42</b>
<b>5.12.7 MONITORING ANTENNA .....</b>	<b>43</b>
<b>5.12.8 DUAL ACCESS CRITERIA CHECK .....</b>	<b>44</b>
<b>5.12.9 ALTERNATIVE MONITORING INTERVAL FOR CO-LOCATED DEVICES .....</b>	<b>45</b>
<b>5.12.10 FRAME REPETITION STABILITY AND PERIOD AND JITTER .....</b>	<b>46</b>
<b>5.13 CONDUCTED EMISSION .....</b>	<b>47</b>
<b>APPENDIX 1 PHOTOS OF TEST SETUP .....</b>	<b>50</b>
<b>APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS .....</b>	<b>50</b>

### 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

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-RSS213-V1.0

## 1. GENERAL INFORMATION

### 1.1 CLIENT INFORMATION

<b>Applicant:</b>	Grandstream Networks, Inc.
<b>Address of Applicant:</b>	126 Brookline Ave. 3rd Floor Boston, MA 02215, USA.
<b>Manufacturer:</b>	Grandstream Networks, Inc.
<b>Address of Manufacturer:</b>	126 Brookline Ave. 3rd Floor Boston, MA 02215, USA.

### 1.2 EUT INFORMATION

#### 1.2.1 General Description of EUT

<b>Product Name:</b>	Long Range High Performance DECT VoIP Base Station	
<b>Model No. / HVIN:</b>	DP755	
<b>Trade Mark:</b>	GRANDSTREAM	
<b>DUT Stage:</b>	Identical Prototype	
<b>EUT Supports Function:</b>	DECT:	1 920 MHz to 1 930 MHz
<b>Software Version:</b>	1.0.1.5 (Provided by the customer)	
<b>Hardware Version:</b>	V1.1 (Provided by the customer)	
<b>Sample Received Date:</b>	May 25, 2023	
<b>Sample Tested Date:</b>	May 25, 2023 to June 20, 2023	
<b>Remark:</b> The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.		

#### 1.2.2 Description of Accessories

Adapter 1	
<b>Model No.:</b>	F06US0500100A
<b>Input:</b>	100-240 V~50/60 Hz 0.2 A max
<b>Output:</b>	5 V == 1 A
<b>DC Cable:</b>	1.5 Meter, Unshielded without ferrite

Adapter 2	
<b>Model No.:</b>	DCT06W050100US-D0
<b>Input:</b>	100-240 V~50/60 Hz 200 mA
<b>Output:</b>	5.0 V == 1.0 A
<b>DC Cable:</b>	1.5 Meter, Unshielded without ferrite

Adapter 3	
<b>Model No.:</b>	GQ06-050100-ZU
<b>Input:</b>	100-240 V~50/60 Hz 0.3 A Max
<b>Output:</b>	5.0 V == 1.0 A
<b>DC Cable:</b>	1.5 Meter, Unshielded without ferrite

Cable	
<b>Connector:</b>	Ethernet Cable
<b>Cable Type:</b>	Unshielded without ferrite
<b>Length:</b>	1.5 Meter, Unshielded without ferrite

<b>Others</b>
1x Bracket

## 1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

<b>Frequency Band:</b>	1920 MHz to 1930 MHz	
<b>Frequency Range:</b>	1921.536 MHz to 1928.448 MHz	
<b>Equipment Type:</b>	Fixed Part (FP)	
<b>Type of Modulation:</b>	Digital: GFSK	
<b>Number of Channels:</b>	5	
<b>Channel Spacing:</b>	1728 kHz	
<b>Antenna Type:</b>	Antenna 0:	Monopole Antenna
	Antenna 1:	Monopole Antenna
<b>Antenna Gain:</b>	Antenna 0:	2.0 dBi
	Antenna 1:	2.0 dBi
<b>Maximum Peak Power:</b>	18.23 dBm	
<b>Emission Designator:</b>	F7D	
<b>Normal Test Voltage:</b>	5 Vdc	
<b>Extreme Test Voltage:</b>	4.75 Vdc to 5.25 Vdc	
<b>Extreme Test Temperature:</b>	-10 °C to +40 °C	

## 1.4 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	Lenovo B40-80	MP12NEQ6	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust
DECT Phone System	GRANDSTREAM	DP722	207GLXMJB0EFD 68C	Applicant
DECT Phone System	GRANDSTREAM	DP722	207GLXMJB0EFD 6BF	Applicant
4 Way Divider	WOKEN	0120A040560002D	N/A	UnionTrust

### 2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable* 2	SMA	0.1 Meter	Applicant
2	USB Cable	USB Micro-B	1.0 Meter	Applicant
3	RF Cable * 3	SMA	0.6 Meter	UnionTrust

## 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

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-RSS213-V1.0

## 1.5 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 518109

Telephone: +86 (0) 755 2823 0888

Fax: +86 (0) 755 2823 0886

---

## 1.6 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 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

---

## 1.7 DEVIATION FROM STANDARDS

None.

## 1.8 ABNORMALITIES FROM STANDARD CONDITIONS

None.

## 1.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

### 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

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-RSS213-V1.0

## 1.10 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	±3.2 dB
2	Conducted emission 150KHz-30MHz	±2.7 dB
3	Radiated emission 9KHz-30MHz	± 4.7 dB
4	Radiated emission 30MHz-1GHz	± 4.6 dB
5	Radiated emission 1GHz-18GHz	± 4.4 dB
6	Radiated emission 18GHz-26GHz	± 4.6 dB
7	Radiated emission 26GHz-40GHz	± 4.6 dB

## 2. TEST SUMMARY

Test Cases			
Test Item	Test Requirement	Reference Method	Result
<b>Antenna Requirement</b>	FCC 47 CFR Part 15.203/ 15.317 RSS-Gen Issue 5, Section 6.8	Declaration & Visual inspection	PASS
<b>AC Power Line Conducted Emission</b>	FCC 47 CFR Part 15.207/ 15.315 RSS-213 Issue 3, Section 5.4	ANSI C63.10-2013 Section 6.2	PASS
<b>Digital Modulation Techniques</b>	FCC 47 CFR Part 15.319(b) RSS-213 Issue 3, Section 5.1	Declaration	PASS
<b>Channel Frequencies</b>	FCC 47 CFR Part 15.303 RSS-213 Issue 3, Section 5.1	Declaration	PASS
<b>Automatic discontinuation of transmission</b>	FCC 47 CFR Part 15.319(f) RSS-213 Issue 3, Section 5.2(4)	Manual evaluation	PASS
<b>Emission Bandwidth &amp; Occupied Bandwidth</b>	FCC 47 CFR Part 15.323(a) RSS-213 Issue 3, Section 5.5	ANSI C63.17-2013 Clause 6.1.3 or 7.4	PASS
<b>In-band emissions</b>	FCC 47 CFR Part 15.323(d) RSS-213 Issue 3, Section 5.8.2	ANSI C63.17-2013 Clause 6.1.6.1	PASS
<b>Out-of-band emissions</b>	FCC 47 CFR Part 15.323(d) RSS-213 Issue 3, Section 5.8.1	ANSI C63.17-2013 Clause 6.1.6.2	PASS
<b>Radiated Emissions</b>	FCC 47 CFR Part 15.319(g)/ 15.232(d)/ 15.109(a)/ 15.209(a) RSS-Gen Issue 5, Section 8.9 RSS-213 Issue 3, Section 5.8.1	ANSI C63.10-2013 Clause 11.11 & Clause 11.12	PASS
<b>Peak Transmit Power and Antenna Gain</b>	FCC 47 CFR Part 15.319(c)(e), 15.31(e) RSS-213 Issue 3, Section 5.6 RSS-Gen Issue 5, Section 6.8	ANSI C63.17-2013 Clause 6.1.2	PASS
<b>Power Spectral Density</b>	FCC 47 CFR Part 15.319(d) RSS-213 Issue 3, Section 5.7	ANSI C63.17-2013 Clause 6.1.5	PASS
<b>Carrier frequency stability</b>	FCC 47 CFR Part 15.323(f) RSS-213 Issue 3, Section 5.3	ANSI C63.17-2013 Clause 6.2.1	PASS
<b>Specific Requirements for UPCS</b>	FCC 47 CFR Part 15.323(c) (e) RSS-213 Issue 3, Section 5.2	ANSI C63.17-2013 Clause 6.2, 7.3, 7.5, 8.1, 8.2, 8.3, 8.4 and Paragraph 4	PASS
<b>Note:</b>			
1) N/A: In this whole report not applicable. 2) Not required if the Conducted Out-of-Band Emissions test is passed, and assessed in the FCC 47 CFR Part 15B test report. 3) Pre-scan with two antennas for conducted peak power, and Antenna 0 for the max power one, which was selected to test conducted items.			

### 3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	3m SAC	ETS-LINDGREN	3M	Euroshiedpn-CT001270-1317	22-Jan-2021	21-Jan-2024
☒	Receiver	R&S	ESIB26	100114	3-Nov-2022	2-Nov-2023
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	14-Apr-2023	13-Apr-2024
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	21-Nov-2022	20-Nov-2023
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	13-Dec-2022	12-Dec-2023
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	13-Dec-2022	12-Dec-2023
☒	Preamplifier	HP	8447F	2805A02960	1-Nov-2022	31-Oct-2023
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	16-Apr-2023	15-Apr-2025
☒	Pre-amplifier	ETS-LINDGREN	00118385	00201874	1-Nov-2022	31-Oct-2023
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	21-Nov-2022	20-Nov-2023
☒	Pre-amplifier	ETS-LINDGREN	00118384	00202652	21-Nov-2022	20-Nov-2023
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	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
☒	Receiver	R&S	ESR7	101181	1-Nov-2022	31-Oct-2023
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	1-Nov-2022	31-Oct-2023
☒	LISN	R&S	ESH2-Z5	860014/024	1-Nov-2022	31-Oct-2023
☐	LISN	ETS-Lindgren	3816/2SH	00201088	1-Nov-2022	31-Oct-2023
☒	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
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	14-Apr-2023	13-Apr-2024
☒	Spectrum analyzer	R&S	FSV40-N	101653	14-Apr-2023	13-Apr-2024
☐	EXG-B RF Analog Signal Generator	KEYSIGHT	N5171B	MY53051777	1-Nov-2022	31-Oct-2023
☒	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	1-Nov-2022	31-Oct-2023
☒	DC Source	KIKUSUI	PWR400L	LK003024	NA	NA
☒	Digital multimeter	FLUKE	15B+	30701460WS 15	2-Nov-2022	1-Nov-2023
☒	Temp & Humidity chamber	Votisch	VT4002	58566133290 020	14-Apr-2023	13-Apr-2024
☒	Digital RadioCommunication tester	R&S	CMD60	825673/0046	1-Nov-2022	31-Oct-2023

### 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

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-RSS213-V1.0

## 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 (%)
TN/VN	+15 to +35	5Vdc or 120Vac	20 to 75
TL/VL	-10	85%	20 to 75
TH/VL	+40	85%	20 to 75
TL/VH	-10	115%	20 to 75
TH/VH	+40	115%	20 to 75

**Remark:**

- 1) The EUT just work in such extreme temperature of -10 °C to +40 °C and the extreme voltage of 85% to 115%, so here the EUT is tested in the temperature of -10 °C to +40 °C and the voltage of 85% to 115%.
- 2) VN: Normal Voltage; TN: Normal Temperature;  
TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;
- 3) VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.

#### 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	24.3	58	99.2	S202305251544-ZJA03/4	Andy Lin
Automatic discontinuation of transmission	24.5	51	99.2		
Emission Bandwidth	24.5	51	99.2		
In-band emissions	24.5	51	99.2		
Out-of-band emissions	24.5	51	99.2		
Peak Transmit Power	24.5	51	99.2		
Power Spectral Density	24.5	51	99.2		
Specific Requirements for UPCS	24.5	51	99.2		
Carrier frequency stability	24.5	51	99.2		
Radiated Emissions	20.6	65.3	99.2	S202305251544-ZJA03/4	Lucas Ouyang

## 4.2 TEST CHANNELS

Operation Frequency Each of Channels					
Channel	0	1	2	3	4
Frequency (MHz)	1928.448	1926.720	1924.992	1923.264	1921.536

Test Channels					
Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists			
GFSK	1920 MHz to 1930 MHz	Lowest(L)	Middle(M)	Highest(H)	
		Channel 4	Channel 2	Channel 0	
		1921.536 MHz	1924.992 MHz	1928.448 MHz	

All channels operation in the 1920-1930 MHz band, meeting the requirement of FCC 47 CFR Part 15.303 and RSS-213 Issue 3 Section 5.1.

## 4.3 EUT TEST STATUS

Type of Modulation	Tx Function	Description
GFSK	1Tx	1. Keep the EUT in continuously transmitting with modulation test single.

Power Setting
Power Setting: not applicable, test used software default power level.

Test Software
Test software name: Secure CRT Commands;

## 4.4 TEST SETUP

### 4.4.1 For Radiated Emissions test setup

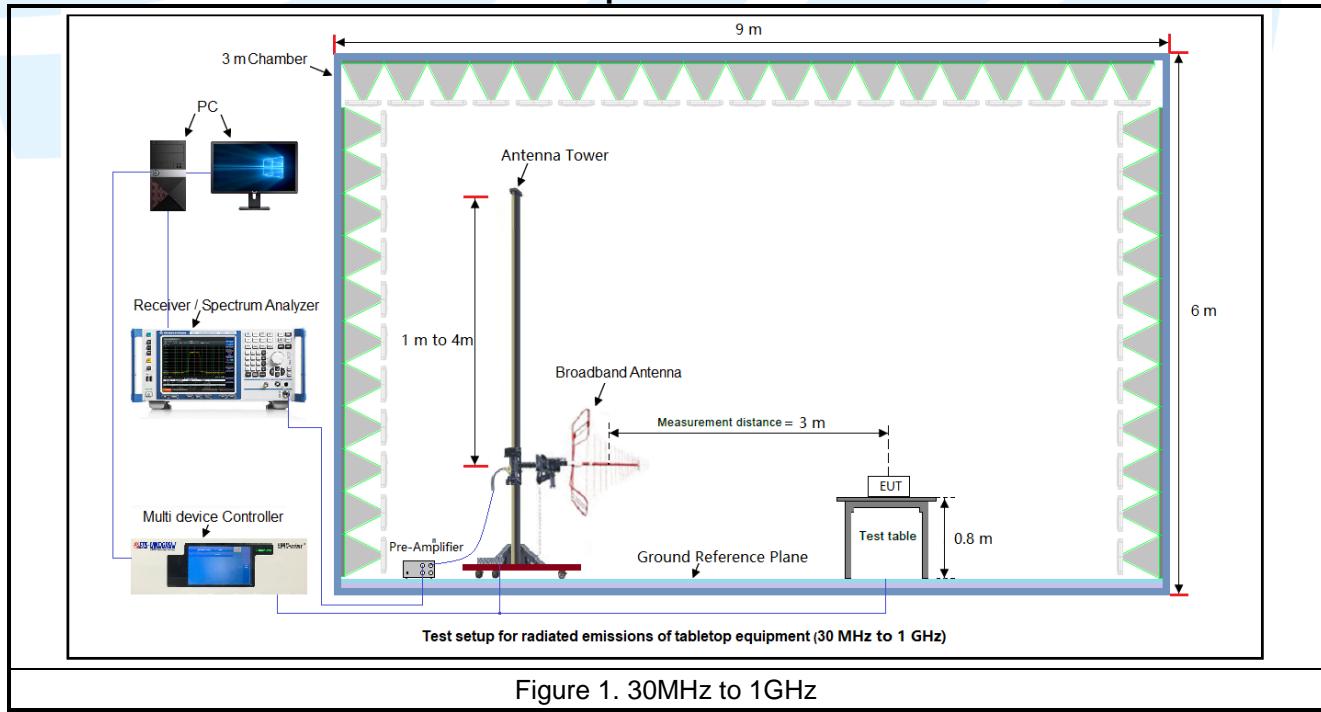
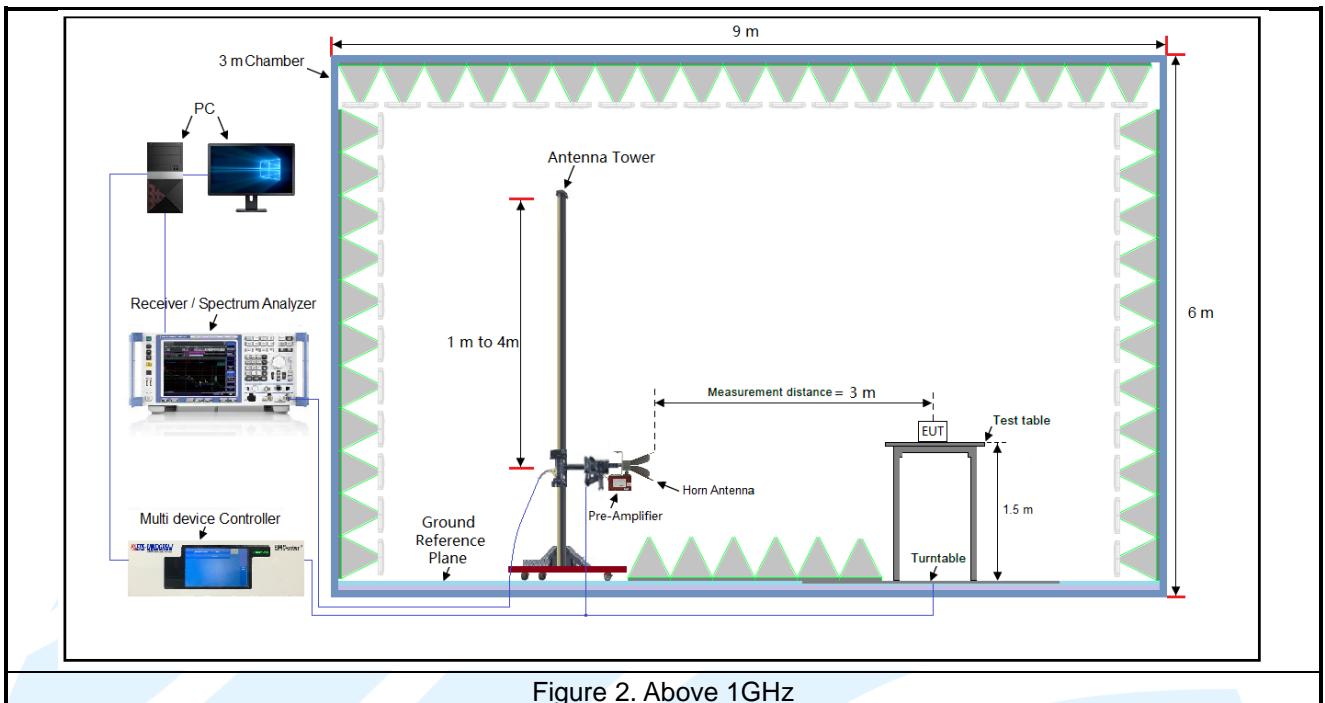
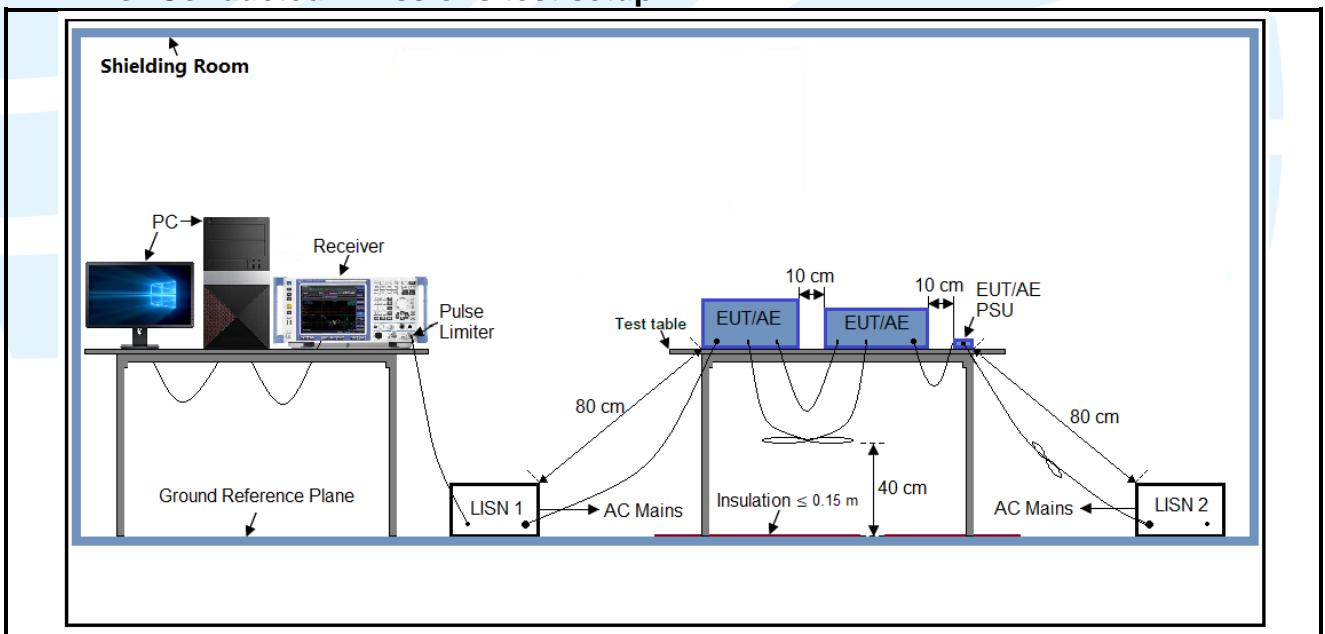


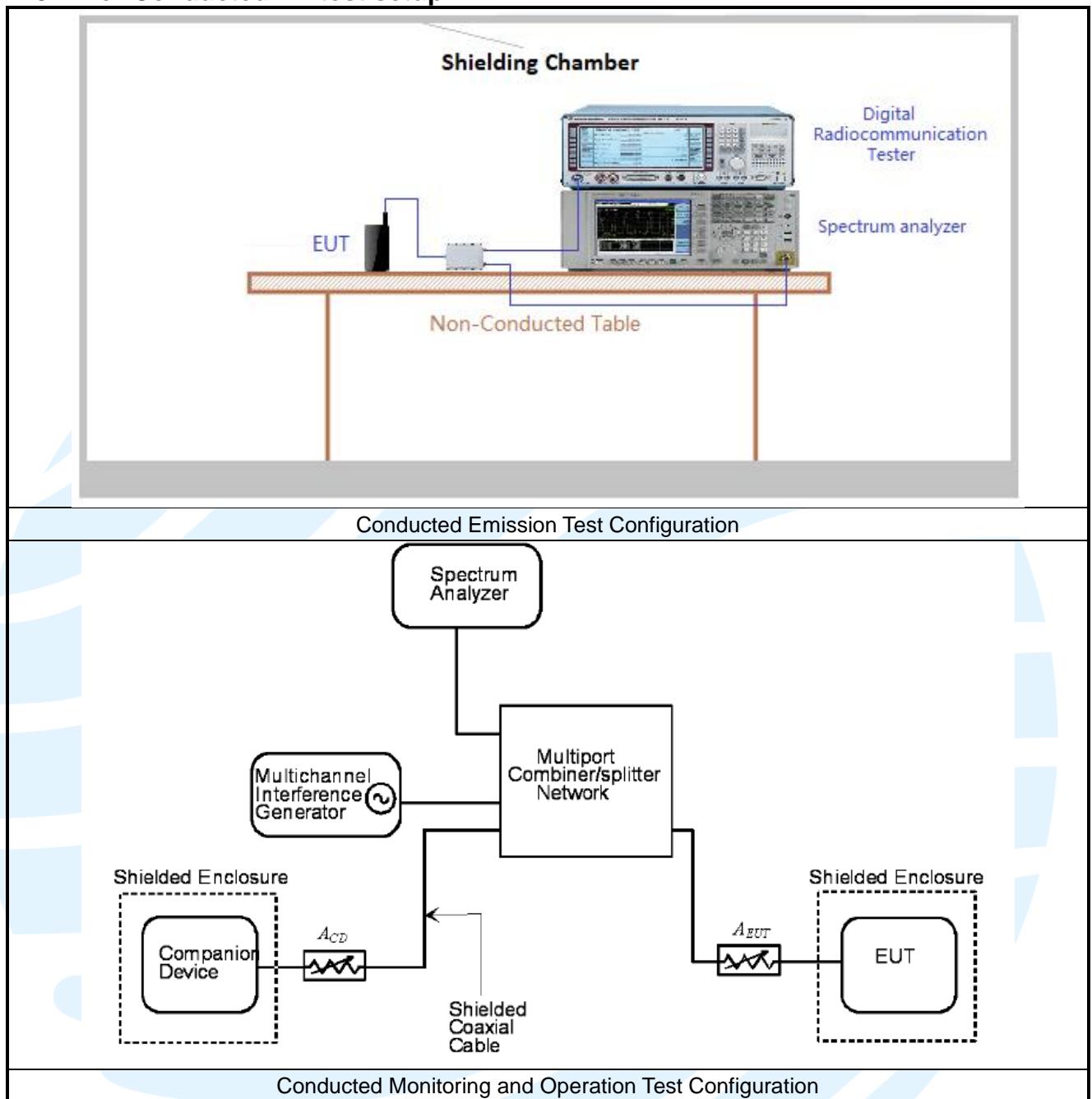
Figure 1. 30MHz to 1GHz



#### 4.4.2 For Conducted Emissions test setup



#### 4.4.3 For Conducted RF test setup



## 4.5 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 (see table below) orientation.

Frequency	Mode	Antenna Port	Worst-case axis positioning
Above 1 GHz	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.

## 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-213 Issue 3	2 GHz Licence-Exempt Personal Communications Services (LE-PCS) Devices
4	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
5	ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
6	ANSI C63.17-2013	American National Standard Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices

### 5.2 ANTENNA REQUIREMENT

Standard Requirement
<b>15.203 requirement:</b> 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.
<b>RSS-Gen Issue 5, Section 6.8 requirement:</b> 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.
<b>EUT Antenna:</b> Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 2.0 dBi.

### 5.3 DIGITAL MODULATION TECHNIQUES

<b>Requirements:</b>	FCC 47 CFR Part 15.319(b), RSS-213 Issue 3, Section 5.1
	All transmissions must use only digital modulation techniques. Both asynchronous and isochronous operations are permitted within the 1920– 1930 MHz band.
<b>Reference Method:</b>	Declaration
<b>Results:</b>	Pass

The test sample is an isochronous digital modulated device that operates in 1920-1930 MHz band. This device bases on DECT technology described in European Standards EN 300 175-2 and EN 300 175-3, now operating in frequency channels mentioned above.

The operating modes are MC/TDMA/TDD (Multi carrier / Time Division Multiple Access / Time Division Duplex) using Digital GFSK (Gaussian Frequency Shift Keying) modulation.

For further details see operational description provided by manufacturer.

## 5.4 AUTOMATIC DISCONTINUATION OF TRANSMISSION

**Requirements:**

FCC 47 CFR Part 15.319(f)  
RSS-213 Issue 3, Section 5.2(4)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. The provisions in this section are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

**Reference Method:** Manual evaluation**Results:** Pass

Does the EUT transmit Control and Signaling Information?

<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
---	-----------------------------

Type of EUT:

<input checked="" type="checkbox"/> Initiating Device	<input type="checkbox"/> Responding Device
---	--

The following tests simulate the reaction of the EUT in case of either absence of information to transmit or operational failure after a connection with the companion device is established.

No.	Test	EUT Reaction	Results
1	Power removed: EUT	A	Pass
2	Switch Off: EUT	N/A	Pass
3	Hook-On: EUT	N/A	Pass
4	Power Removed: Companion Device	B	Pass
5	Switch Off: Companion Device	B	Pass
6	Hook-On: Companion Device	B	Pass

Note:

1. A - Connection breakdown, Cease of all transmissions
2. B - Connection breakdown, EUT transmits control and signaling information
3. C - Connection breakdown, Companion Device transmits control and signaling information
4. N/A : Not Applicable (EUT does not have On/Off switch and cannot perform Hook-On)

## 5.5 EMISSION BANDWIDTH & OCCUPIED BANDWIDTH

**Test Requirement:** FCC 47 CFR Part 15.323(a)  
RSS-Gen Issue 5, Section 5.5

**Reference Method:** ANSI C63.17-2013 Clause 6.1.3 or 7.4  
**Limit:**

### FCC 47 CFR Part 15.323(a)

Operation shall be contained within the 1920–1930 MHz band. The emission bandwidth shall be less than 2.5 MHz. The power level shall be as specified in § 15.319(c), but in no event shall the emission bandwidth be less than 50 kHz.

### RSS-213 Issue 3, Section 5.5

The emission bandwidth shall not be less than 50 kHz nor more than 2.5 MHz

No requirement for 6 dB and 12 dB Bandwidth. These values are only used for testing Monitoring Bandwidth if the Simple Compliance test fails (ANSI C63.17, clause 7.4).

#### Test Procedure:

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.
2. The EUT shall transmit in a burst mode (shall not be configured to transmit continuously) so that transient effects associated with the burst edges are captured by the emission bandwidth measurement.
3. Use the following spectrum analyzer settings:
  - a) Set RBW: Approximately 1% of the emission bandwidth (a rough estimate may be obtained from peak power level measurement, or use manufacturer's declared value).
  - b) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
  - c) Center frequency: Nominal center frequency of channel.
  - d) Span:  $\geq 2 \times$  the expected emission bandwidth.
  - e) Sweep time: Coupled to frequency span and RBW.
  - f) Amplitude scale: Log.
  - g) Detection: Peak detection with maximum hold enabled.
4. Record the maximum level of the modulated carrier. Find the two furthest frequencies above and below the frequency of the maximum level of the modulated carrier where the signal level is 26 dB below the peak level of the carrier. The difference in frequency between these two frequencies is the emission bandwidth.
5. If after measuring the emission bandwidth, it is found that the RBW used was not approximately 1% of the emission bandwidth, then adjust the RBW and repeat the procedure until the correct RBW is used. If the spectrum analyzer has fixed values of RBW, the one that is the nearest to 1% of the emission bandwidth is acceptable, provided it is no less than 0.5% of the emission bandwidth and no greater than 2% of the emission bandwidth.
6. Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

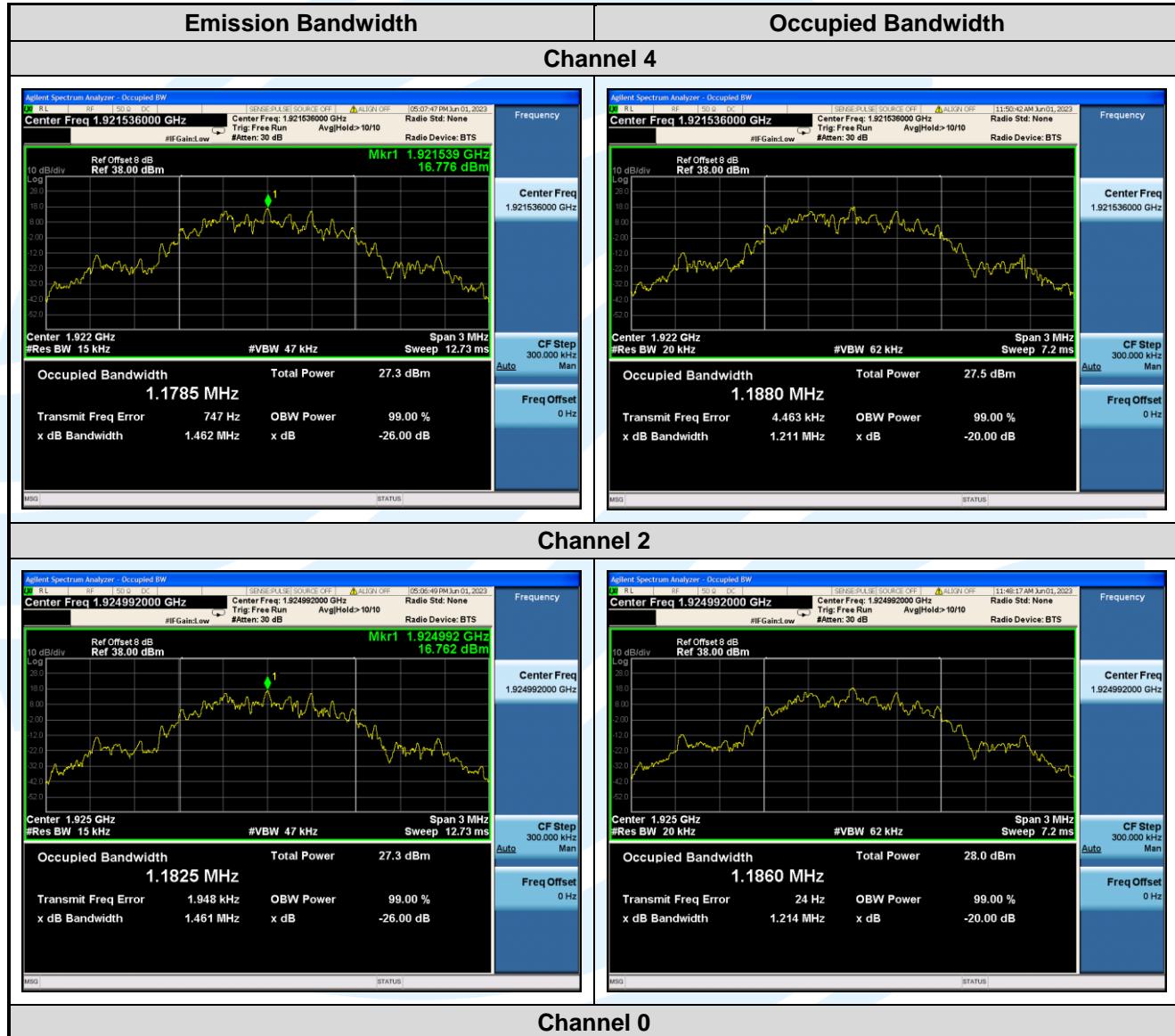
**Test Setup:** Refer to section 4.4.3 for details.

**Equipment Used:** Refer to section 3 for details

**Test Results:** Pass

**Antenna 0**

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	Occupied Bandwidth (MHz)	Emission Bandwidth (MHz)	Emission Bandwidth Limit	Pass / Fail
4	1921.536	1.211	1.1880	1.462	50 kHz~2.5 MHz	Pass
2	1924.992	1.214	1.1860	1.461	50 kHz~2.5 MHz	Pass
0	1928.448	1.211	1.1889	1.463	50 kHz~2.5 MHz	Pass

**The worst test plots as follows:**
**Antenna 0**




## 5.6 IN-BAND EMISSIONS

**Test Requirement:** FCC 47 CFR Part 15.323(d)  
RSS-213 Issue 3, Section 5.8.2

**Reference Method:** ANSI C63.17-2013 Clause 6.1.6.1

**Limit:** For digital transmission systems, the minimum 6 dB bandwidth shall be 500 kHz.

### FCC 47 CFR Part 15.323(d)

Emissions inside the band must comply with the following emission mask: In the bands between 1B and 2B measured from the center of the emission bandwidth the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device; in the bands between 2B and 3B measured from the center of the emission bandwidth the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator; in the bands between 3B and the band edge the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator. B" is defined as the emission bandwidth of the device in hertz. Compliance with the emission limits is based on the use of measurement instrumentation employing peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

### RSS-213 Issue 3, Section 5.8.2

Emissions inside the band 1920-1930 MHz shall be attenuated below the transmit power permitted for that device, as follows:

- 30 dB between the frequencies 1B and 2B measured from the centre of the occupied bandwidth;
- 50 dB between the frequencies 2B and 3B measured from the centre of the occupied bandwidth;
- 60 dB between the frequencies 3B and band edges;

Where B is the occupied bandwidth in hertz.

**Test Procedure:** ANSI C63.17-2013 Clause 6.1.6.1

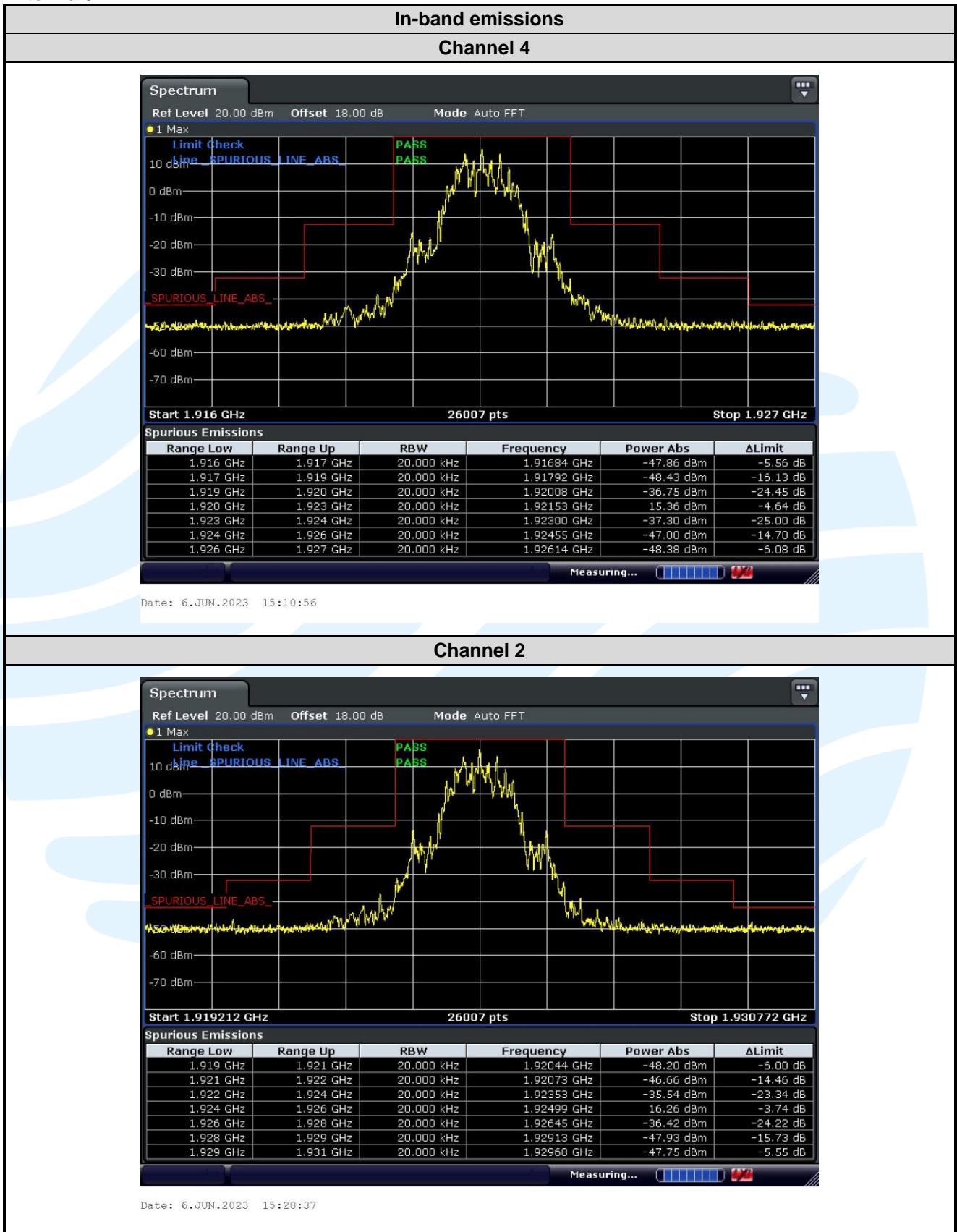
**Test Setup:** Refer to section 4.4.3 for details.

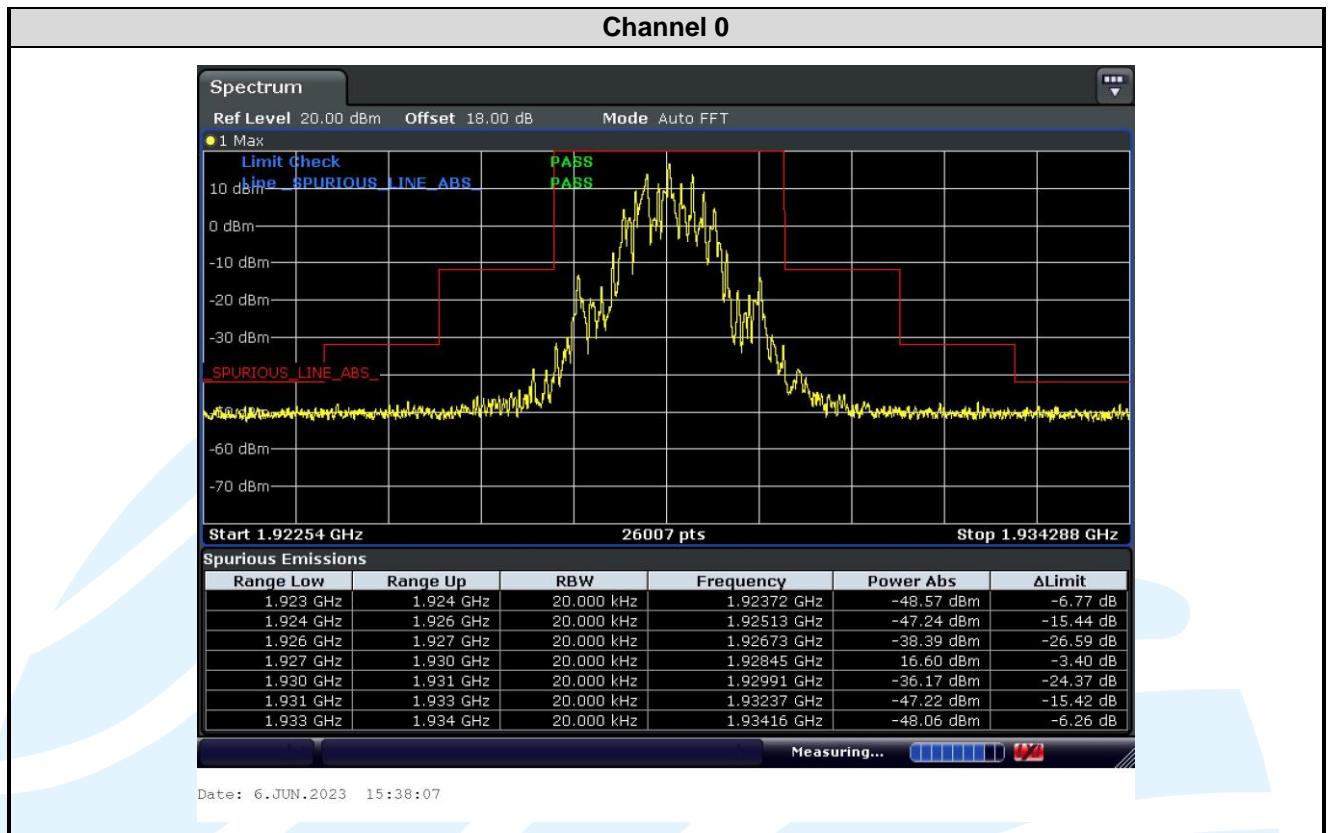
**Equipment Used:** Refer to section 3 for details

**Test Results:** Pass

The worst test plots as follows:

Antenna 0





## 5.7 OUT-OF-BAND EMISSIONS

**Test Requirement:** FCC 47 CFR Part 15.323(d)  
RSS-213 Issue 3, Section 5.8.1

**Reference Method:** ANSI C63.17-2013 Clause 6.1.6.2

**Limit:** For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

### FCC 47 CFR Part 15.323(d)

Emissions outside the band shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the band and 1.25 MHz above or below the band; 50 dB between 1.25 and 2.5 MHz above or below the band; and 60 dB at 2.5 MHz or greater above or below the band.

### RSS-213 Issue 3, Section 5.8.1

Emissions outside the band 1920-1930 MHz shall be attenuated below a reference power of 112 mW (-9.5 dBW) by at least:

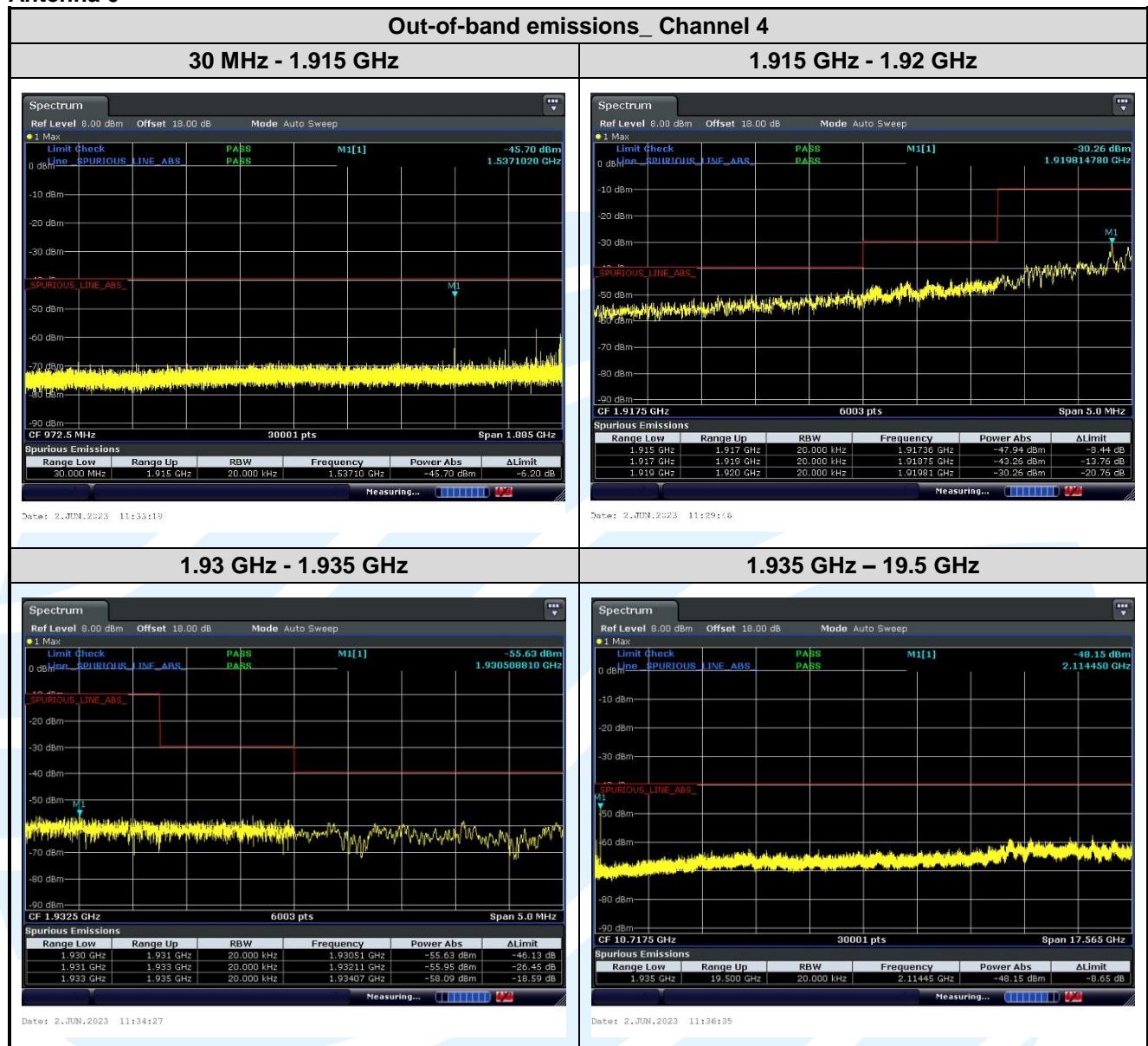
- 30 dB between the band edges and 1.25 MHz above and below the band edges;
- 50 dB between 1.25 MHz and 2.5 MHz above or below the band edges; and
- 60 dB at 2.5 MHz or greater above or below the band edges.

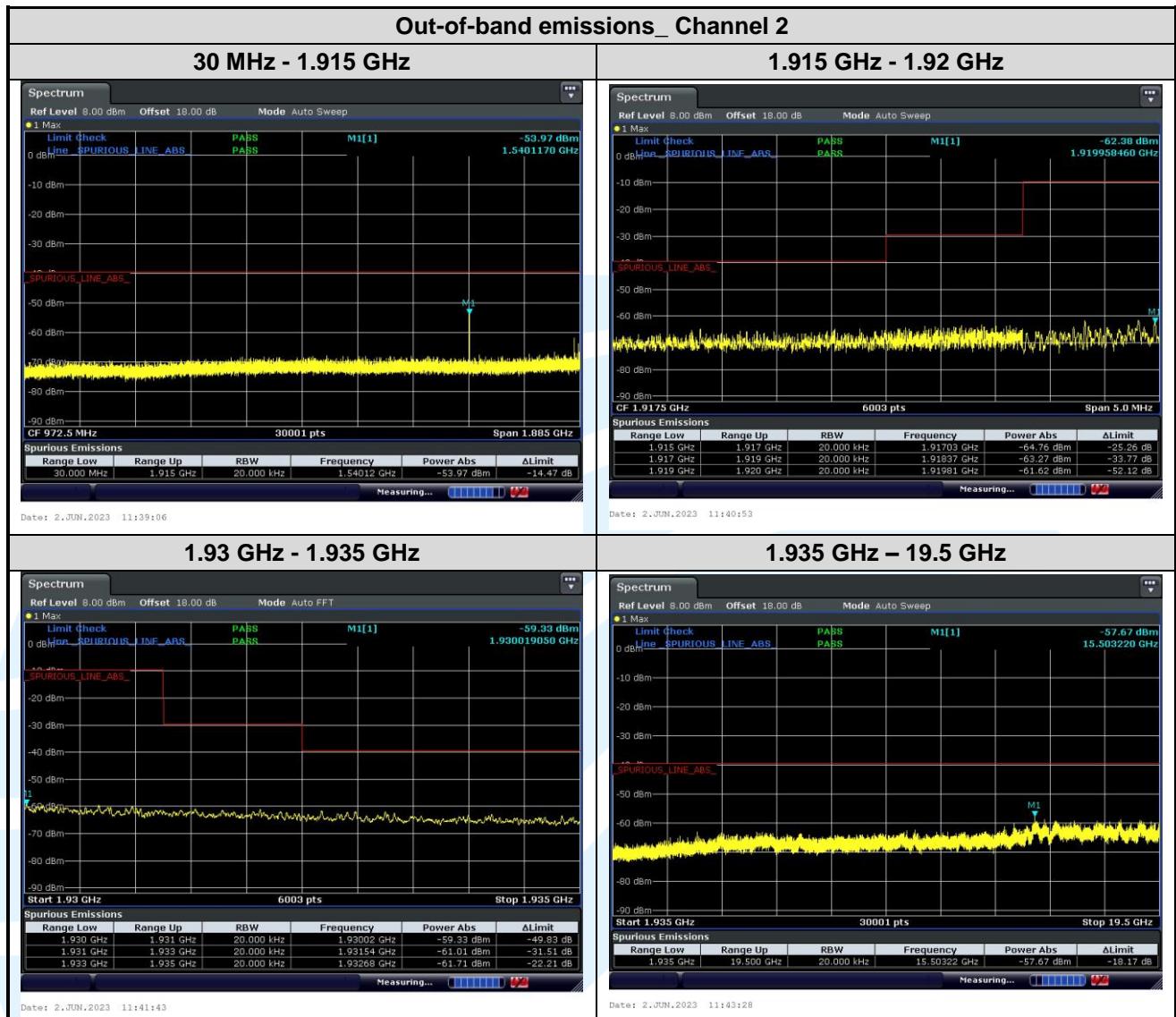
**Test Procedure:** ANSI C63.17-2013 Clause 6.1.6.2

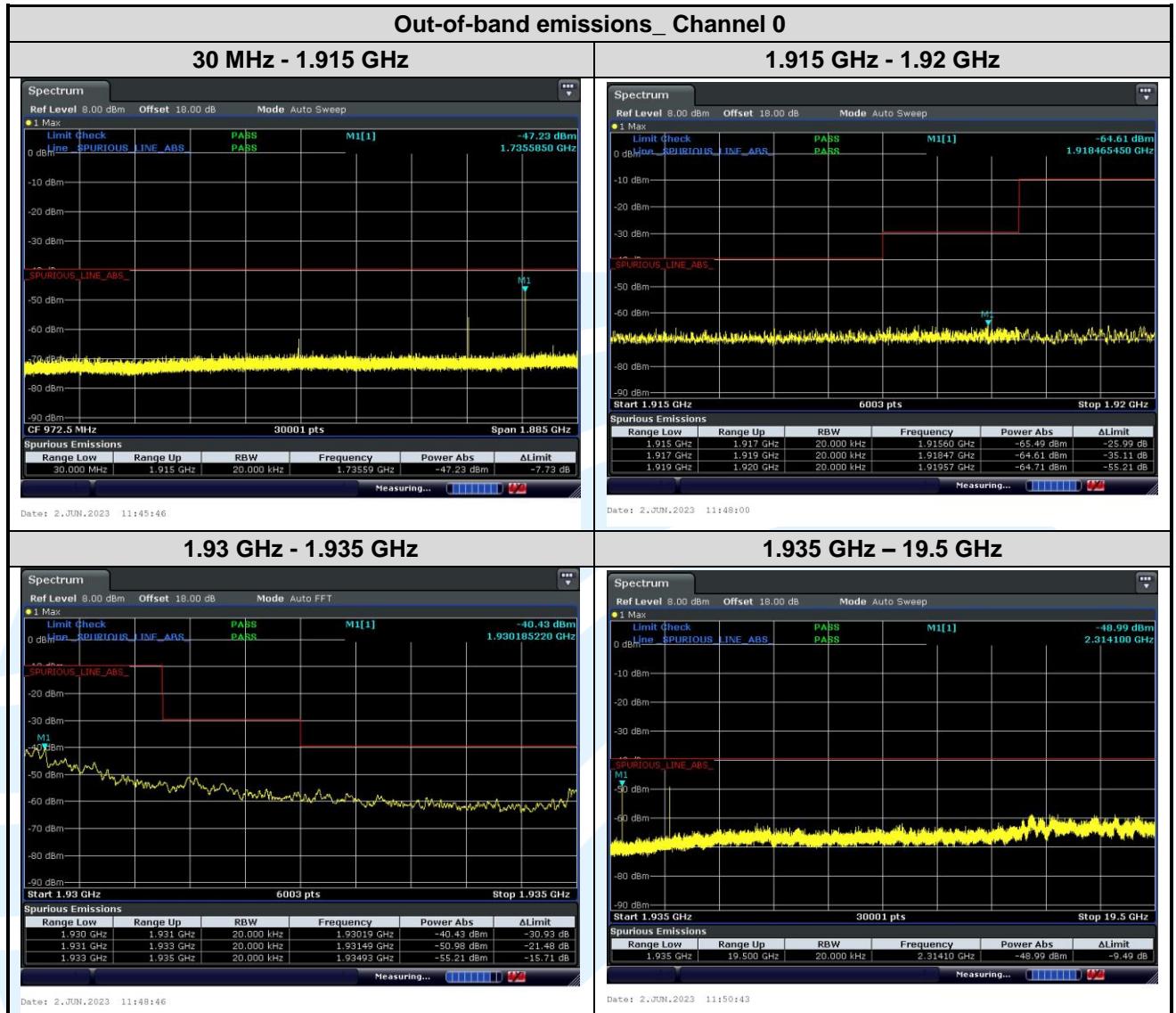
**Test Setup:** Refer to section 4.4.3 for details.

**Equipment Used:** Refer to section 3 for details

**Test Results:** Pass

**The worst test plots as follows:**
**Antenna 0**






Note 1: The BS spurious out-of-band transmission level is below the indicated limit.

Note 2: During the test RTX's modulation type was PSBR.

## 5.8 RADIATED EMISSIONS

FCC 47 CFR Part 15.319(g)/ 15.109(a)/ 15.209(a) /15.323(d)

**Test Requirement:** RSS-213 Issue 3, Section 5.8.1  
RSS-Gen Issue 5, Section 8.9

**Reference Method:** ANSI C63.10-2013 Clause 11.11 & Clause 11.12

**Limits:**

### Spurious Emissions

Frequency (MHz)	Field strength	Limit	Remark	Measurement distance (m)
30 -88	100 $\mu$ V/m	40.0 $\mu$ V/m	Quasi-peak	3
88 -216	150 $\mu$ V/m	43.5 $\mu$ V/m	Quasi-peak	3
216 -960	200 $\mu$ V/m	46.0 $\mu$ V/m	Quasi-peak	3
960-1000	500 $\mu$ V/m	54.0 $\mu$ V/m	Quasi-peak	3
1000 -1917.5	500 $\mu$ V/m	54.0 $\mu$ V/m	Average	3
1932.5 - 20000	500 $\mu$ V/m	54.0 $\mu$ V/m	Average	3

**Remark:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB $\mu$ V/m) = 20 log Emission level (uV/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:** Refer to section 4.4.1 for details.

**Test Procedures:**

1. 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 rota table 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.

2. Above 1GHz test procedure as below:

- 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter( Above 18GHz the distance is 1 meter and table is 1.5 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 found the Y axis positioning which it is worse case.
- 4) Repeat above procedures until all frequencies measured was complete.

**Equipment Used:** Refer to section 3 for details.

**Test Result:** Pass

**The worst measurement data as follows:**

### 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

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

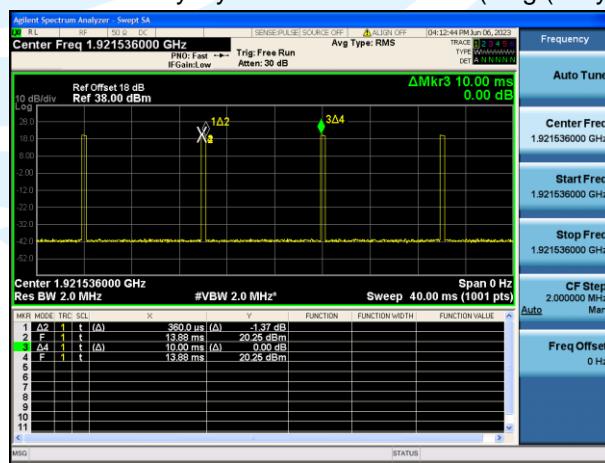
<http://www.uttlab.com>

UTTR-RF-RSS213-V1.0

Radiated Emission Test Data								
Lowest Channel:								
No.	Frequency (MHz)	Reading (dB $\mu$ V)	Correction factor (dB/m)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Detector	Antenna Polaxis
1	3843.072	49.00	-3.64	45.36	74.00	-28.64	Peak	Horizontal
2	5764.608	37.83	-0.49	37.34	74.00	-36.66	Peak	Horizontal
3	7686.144	46.22	2.14	48.36	74.00	-25.64	Peak	Horizontal
4	3843.072	49.55	-3.64	45.91	74.00	-28.09	Peak	Vertical
5	5764.608	37.61	-0.49	37.12	74.00	-36.88	Peak	Vertical
6	7686.144	37.75	2.14	39.89	74.00	-34.11	Peak	Vertical
Middle Channel:								
1	3843.072	48.26	-3.64	44.62	74.00	-29.38	Peak	Horizontal
2	5774.976	40.47	-0.50	39.97	74.00	-34.03	Peak	Horizontal
3	7699.968	47.02	2.16	49.18	74.00	-24.82	Peak	Horizontal
4	3843.072	49.56	-3.64	45.92	74.00	-28.08	Peak	Vertical
5	5774.976	39.60	-0.50	39.10	74.00	-34.90	Peak	Vertical
6	7699.968	38.84	2.16	41.00	74.00	-33.00	Peak	Vertical
Highest Channel:								
1	3856.896	48.54	-3.58	44.96	74.00	-29.04	Peak	Vertical
2	5785.344	39.53	-0.51	39.02	74.00	-34.98	Peak	Vertical
3	7713.792	47.21	2.19	49.40	74.00	-24.60	Peak	Vertical
4	3856.896	49.69	-3.58	46.11	74.00	-27.89	Peak	Vertical
5	5785.344	33.74	-0.51	33.23	74.00	-40.77	Peak	Vertical
6	7713.792	41.41	2.19	43.60	74.00	-30.40	Peak	Vertical

## Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit
4. 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.
5. Average Result = Peak Result + Duty Cycle Corrected Factor (20lg (Duty cycle) = -28.87)



## 5.9 PEAK TRANSMIT POWER

**Test Requirement:** FCC 47 CFR Part 15.319(c)(e), 15.31(e)  
 RSS-213 Issue 3, Section 5.6

**Reference Method:** ANSI C63.17-2013 Clause 6.1.2

**Limit:**

### FCC 47 CFR Part 15.319(c)

Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz.

### FCC 47 CFR Part 15.319(e)

The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.

### RSS-213 Issue 3, Section 5.6

Peak transmit power shall not exceed 100  $\mu$ W multiplied by the square root of the occupied bandwidth in hertz. The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.

**Test Procedure:** ANSI C63.17-2013 Clause 6.1.2

**Test Setup:** Refer to section 4.4.3 for details.

**Equipment Used:** Refer to section 3 for details

**Test Results:** Pass

### FCC 47 CFR Part 15.319

Antenna 0

Channel	Frequency (MHz)	Maximum Antenna Gain (dBi)	Minimum EBW (MHz)	Maximum Conducted Peak Transmit Power (dBm)	Limit (dBm)	Pass / Fail
4	1921.536	2.0	1.461	17.73	20.82 (Note 1, 2)	Pass
2	1924.992	2.0		17.80		Pass
0	1928.448	2.0		18.23		Pass

Antenna 1

Channel	Frequency (MHz)	Maximum Antenna Gain (dBi)	Minimum EBW (MHz)	Maximum Conducted Peak Transmit Power (dBm)	Limit (dBm)	Pass / Fail
4	1921.536	2.0	1.461	17.81	20.82 (Note 1, 2)	Pass
2	1924.992	2.0		17.94		Pass
0	1928.448	2.0		18.02		Pass

## RSS-213 Issue 3, Section 5.6

## Antenna 0

Channel	Frequency (MHz)	Maximum Antenna Gain (dBi)	Minimum OBW (MHz)	Maximum Conducted Peak Transmit Power (dBm)	Limit (dBm)	Pass / Fail
4	1921.536	2.0	1.1860	17.73	20.37 (Note 1, 2)	Pass
2	1924.992	2.0		17.80		Pass
0	1928.448	2.0		18.23		Pass

## Antenna 1

Channel	Frequency (MHz)	Maximum Antenna Gain (dBi)	Minimum OBW (MHz)	Maximum Conducted Peak Transmit Power (dBm)	Limit (dBm)	Pass / Fail
4	1921.536	2.0	1.1799	17.81	20.36 (Note 1, 2)	Pass
2	1924.992	2.0		17.94		Pass
0	1928.448	2.0		18.02		Pass

## Note:

1. Limit

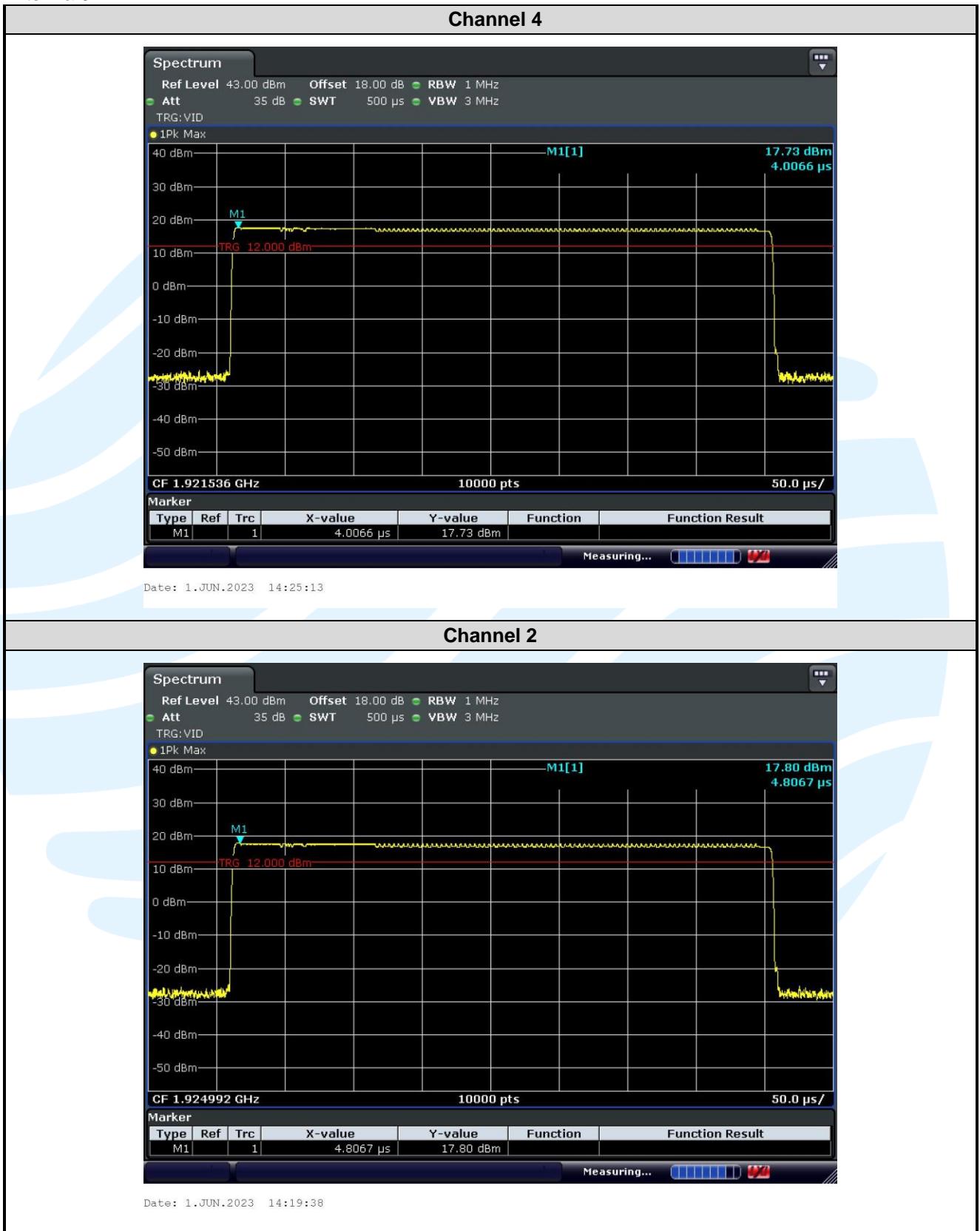
$$\text{Peak Transmit Power Limit [dBm]} = \begin{cases} P_{max} - (gain - 3), & \text{if } gain > 3\text{dBi} \\ P_{max}, & \text{if } gain \leq 3\text{dBi} \end{cases}$$

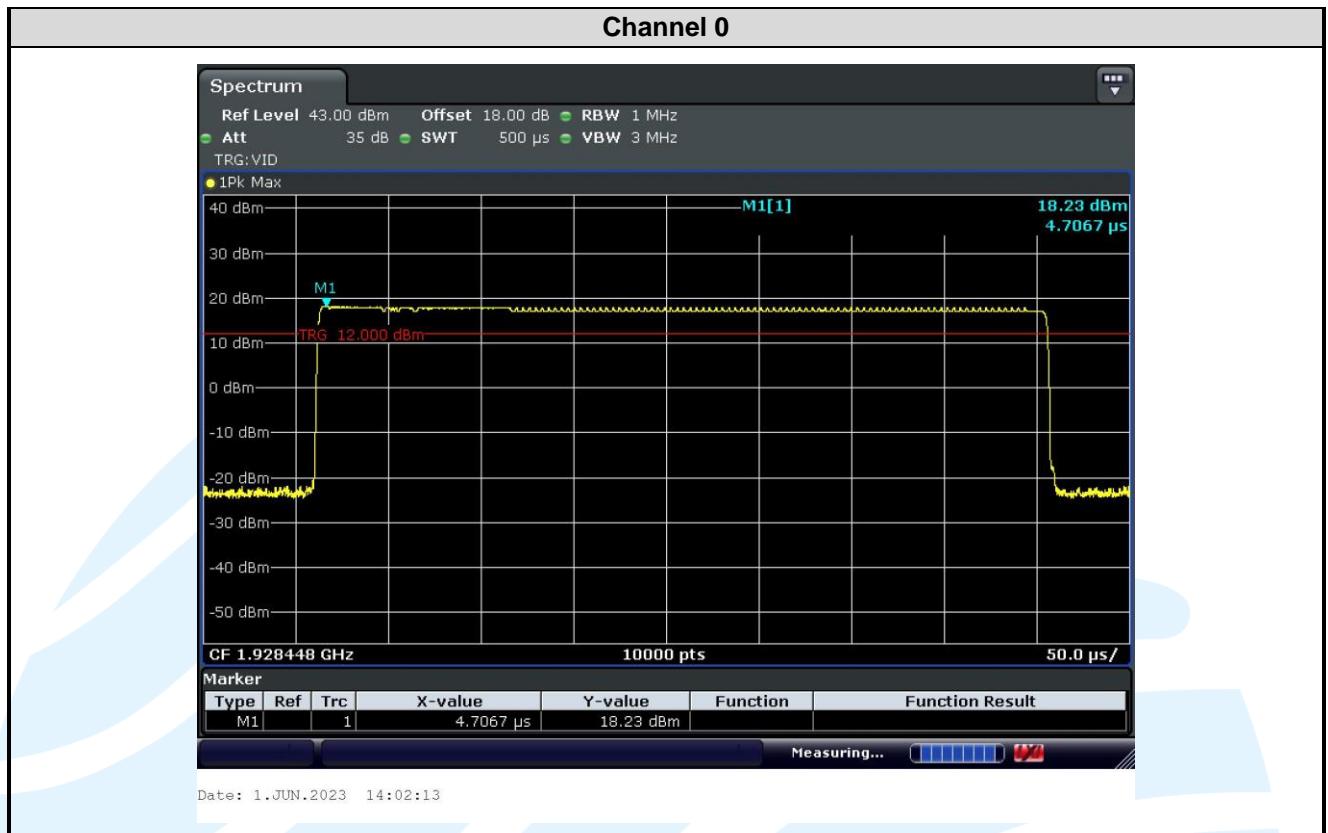
 2.  $P_{max}$ 

$$P_{max} [\text{dBm}] = 5 \log(\text{EBW or OBW} [\text{Hz}]) - 10\text{dBm}$$

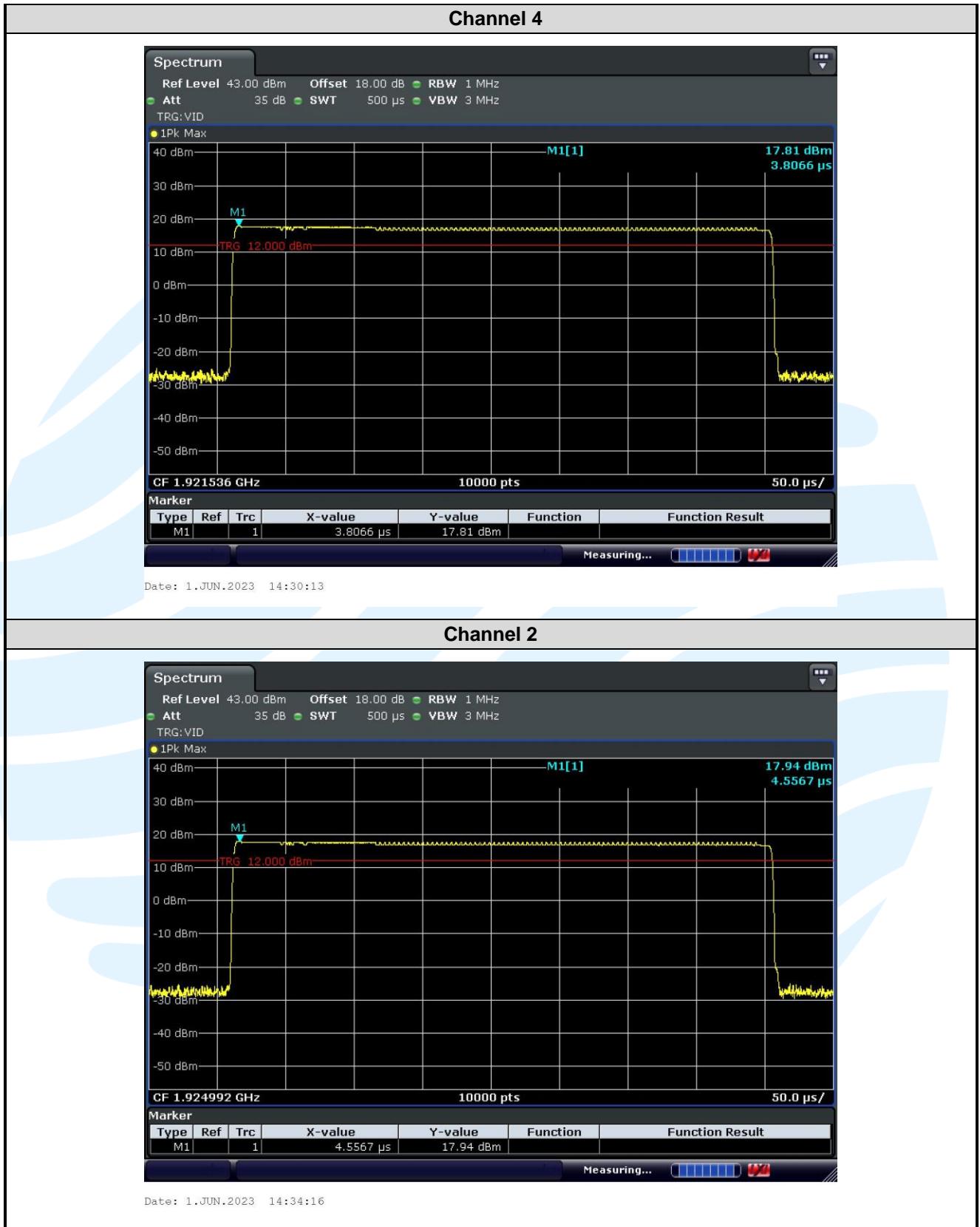
The test plots as follows:

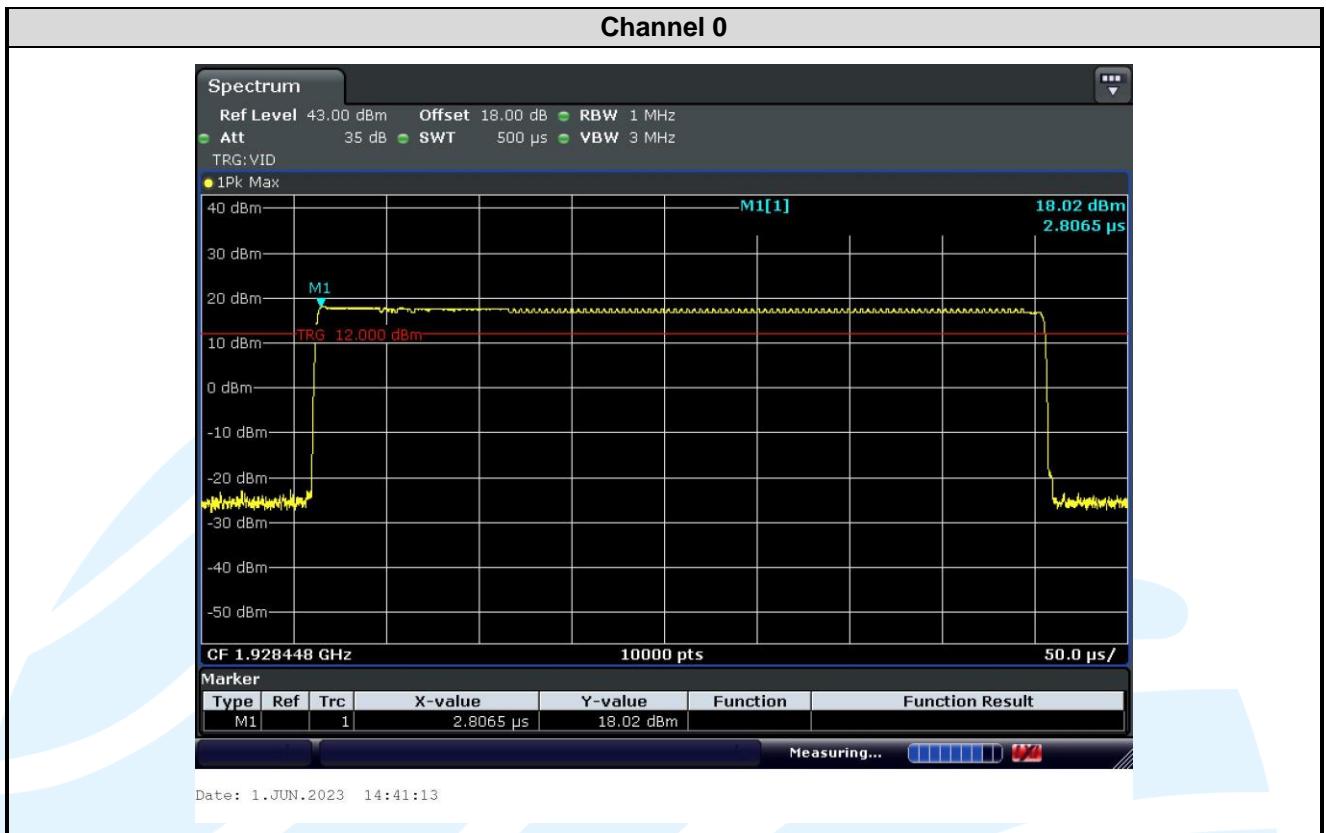
Antenna 0





Antenna 1





## 5.10 POWER SPECTRAL DENSITY

**Test Requirement:** FCC 47 CFR Part 15.319(d)  
**Reference Method:** RSS-213 Issue 3, Section 5.7  
**Limit:** ANSI C63.17-2013 Clause 6.1.5

### FCC 47 CFR Part 15.319(d)

Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

### RSS-213 Issue 3, Section 5.7

The peak-hold power spectral density of transmitters shall not exceed 12 mW per any 3 kHz bandwidth. As an alternative to the peak-hold power spectral density, the time-averaged power spectral density may be measured and it shall not exceed 3 mW per any 3 kHz bandwidth.

**Test Procedure:** ANSI C63.17-2013 Clause 6.1.5

**Test Setup:** Refer to section 4.4.3 for details.

**Equipment Used:** Refer to section 3 for details

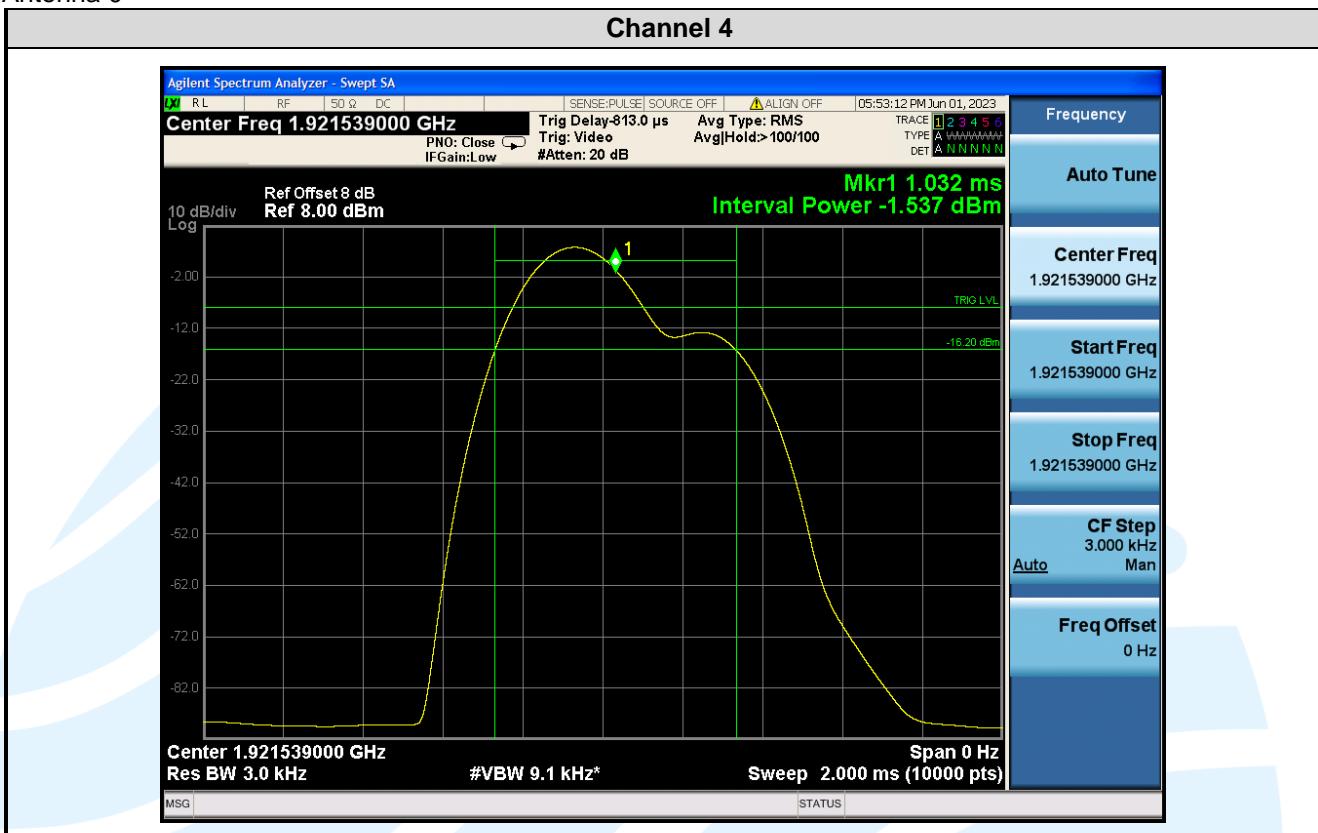
**Test Results:** Pass

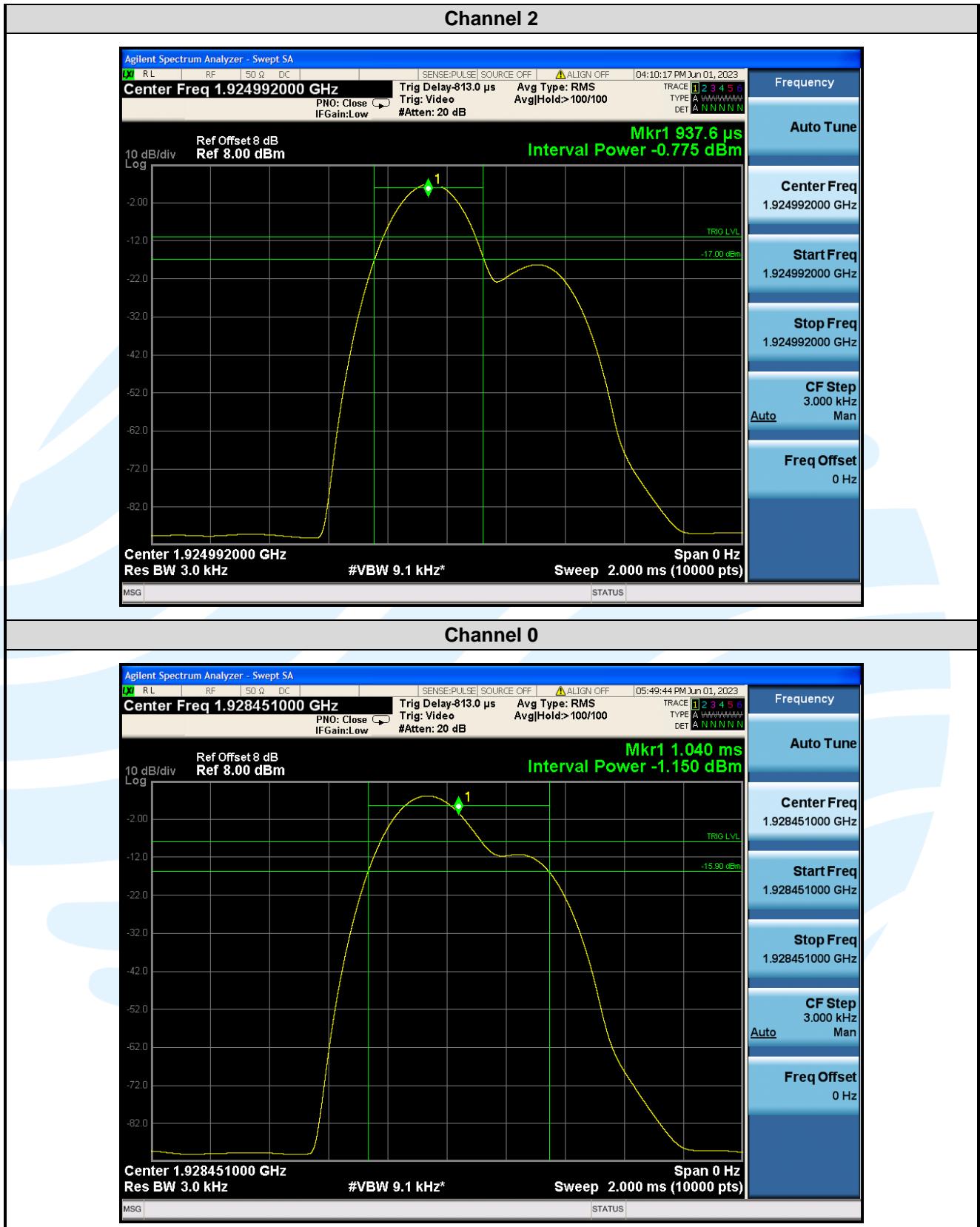
Antenna 0

Channel	Frequency (MHz)	Measured PSD (dBm / 3kHz)	Measured PSD (mW / 3kHz)	Limit (mW / 3kHz)	Pass / Fail
4	1921.536	-1.537	0.702	≤ 3.00	Pass
2	1924.992	-0.775	0.837		Pass
0	1928.448	-1.150	0.767		Pass

**The worst test plots as follows:**

Antenna 0





## 5.11 CARRIER FREQUENCY STABILITY

**Test Requirement:** FCC 47 CFR Part 15.323(f)  
 RSS-213 Issue 3, Section 5.3

**Reference Method:** ANSI C63.17-2013 Clause 6.2.1

**Limit:**

### FCC 47 CFR Part 15.323(f)

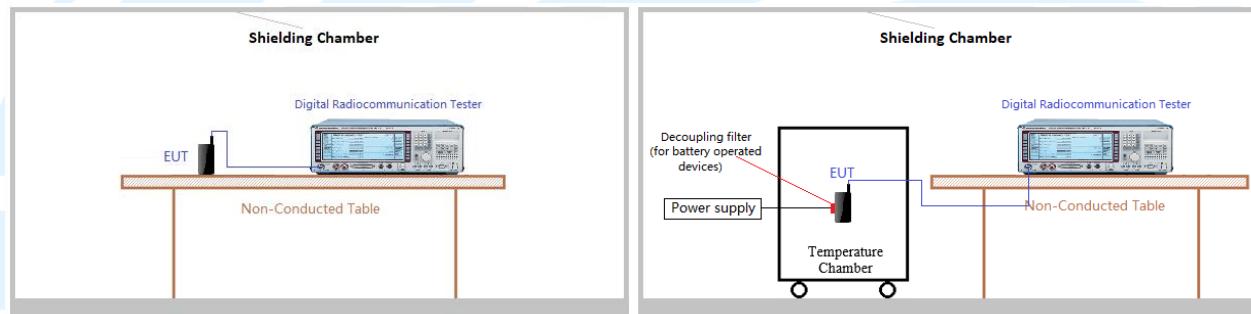
The frequency stability of the carrier frequency of the intentional radiator shall be maintained within  $\pm 10$  ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of  $-20^{\circ}$  to  $+50^{\circ}$  C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of  $20^{\circ}$  C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

### RSS-213 Issue 3, Section 5.3

The carrier frequency stability shall be maintained within  $\pm 10$  ppm ( $\pm 0.001\%$ ).

**Test Procedure:** ANSI C63.17-2013 Clause 6.2.1

**Test Setup:**



**Equipment Used:** Refer to section 3 for details

**Test Results:** Pass

#### Carrier Frequency Stability over Time

Supply Voltage	Temperature (°C)	Measured Frequency Offset Over an hour (ppm)		Limit (ppm)	Result
		Max.	Min.		
Nominal	+20	1.34	0.63	$\pm 10$	Pass

#### Carrier Frequency Stability over Power Supply Voltage

Supply Voltage	Temperature (°C)	Measured Frequency Offset Over an hour (ppm)	Limit (ppm)	Result
85%	+20	1.34	$\pm 10$	Pass
115%	+20	1.34	$\pm 10$	Pass

#### Carrier Frequency Stability over Temperature

Supply Voltage	Temperature (°C)	Measured Frequency Offset Over an hour (ppm)	Limit (ppm)	Result
Nominal	-20	1.52	$\pm 10$	Pass
Nominal	+50	1.34	$\pm 10$	Pass

## 5.12 SPECIFIC REQUIREMENTS FOR UPSCS

### 5.12.1 Monitoring Time

**Test Requirement:** FCC 47 CFR Part 15.323(c) (1)  
RSS-213 Issue 3, Section 5.2 (1)

Immediately prior to initiating a transmission, devices must monitor the combined time and spectrum window that they intend to use to verify if the channel is free for at least 10 ms for systems designed to use a 10 ms or shorter frame period, or at least 20 ms for systems designed to use a 20 ms frame period.

**Reference Method:** ANSI C63.17-2013 Clause 7.3.4, 7.5

**Test Setup:** Refer to section 4.4.3 for details.

**Equipment Used:** Refer to section 3 for details.

**Test Results:** Pass

Initial transmit channel and Interferer level	Final transmit Channel	Results
Apply the interference on f1 at level $T_u+U_M$ , and no interference on f2. Initiate transmission and verify the transmission on f2.	f2	Pass
Apply the interference on f2 at level $T_u+U_M$ , at the same time, no interference on f1. After about 20ms, initiate transmission and verify the transmission on f1.	f1	Pass

### 5.12.2 Lowest Monitoring Threshold

**Test Requirement:** FCC 47 CFR Part 15.323(c) (2)  
RSS-213 Issue 3, Section 5.2(2)

The monitoring threshold must not be more than 30 dB above the thermal noise power (KTB) of a bandwidth equivalent to the occupied bandwidth of the device.

**Reference Method:** ANSI C63.17-2013 Clause 7.3.1

**Test Result:** Not Applicable

### 5.12.3 Acknowledgements and Transmission Duration

**Test Requirement:** FCC 47 CFR Part 15.323(c) (3)(4)  
RSS-213 Issue 3, Section 5.2(3)(4)

Occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 h is not permitted without repeating the access criteria.

Once access to specific combined time and spectrum windows is obtained, an acknowledgement from a system participant must be received by the initiating transmitter within 1 s or transmission must cease.

Periodic acknowledgements must be received at least every 30 s or transmission must cease.

Channels used exclusively for control and signalling information may transmit continuously for 30 s without receiving an acknowledgement, at which time the access criteria must be repeated.

**Reference Method:** ANSI C63.17-2013 Clause 8.2.1, 8.2.2

**Test Result:** Pass

Refer to ANSIC63.17 clause 8.2.1	Observation	Results
Initial transmission without acknowledgements	Not applicable for EUT that transmits control and signaling information	N/A
Transmission time after loss of acknowledgements	10.0	Pass

Refer to ANSIC63.17 clause 8.2.2	Observation	Results
Transmission duration on same time and frequency window	Only for initiating device that controls which time slot is used	N/A

#### 5.12.4 Least Interfered Channel (LIC) Selection

**Test Requirement:** FCC 47 CFR Part 15.323(c) (5)  
RSS-213 Issue 3, Section 5.2(5)

If access to spectrum is not available as determined by the above, and a minimum of 20 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level may be accessed.

A device utilizing the provisions of this paragraph 5.2(5) must have monitored all access channels defined for its system within the last 10 s and must verify, within the 20 ms (40 ms for devices designed to use a 20 ms frame period) immediately preceding actual channel access, that the detected power of the selected time and spectrum windows is no higher than the previously detected value.

The power measurement resolution bandwidth for this comparison must be accurate to within 6 dB.

No device or group of cooperating devices located within 1 m of each other shall during any frame period occupy more than 6 MHz of aggregate bandwidth, or alternatively, more than one third of the time and spectrum windows defined by the system.

##### Calculation of monitoring threshold limits for isochroous devices:

Lowest threshold:  $T_L = -174 + 10\log_{10}B + M_u + P_{MAX} - P_{EUT}$  [dBm]

Upper threshold:  $T_U = -174 + 10\log_{10}B + M_u + P_{MAX} - P_{EUT}$  [dBm]

$M_u$  = dB the threshold may exceed thermal noise (30 for  $T_L$  & 50 for  $T_U$ )

$P_{max}$  [dBm] =  $5 \log B - 10$  dBm

$P_{EUT}$  = Transmitted power [dBm]

B: For FCC Part 15D, B = Emission bandwidth [Hz],

For RSS-213, B = Occupied Bandwidth [Hz]

Monitor Threshold	B (MHz)		M <sub>u</sub> (dB)	P <sub>MAX</sub> (dBm)		P <sub>EUT</sub> (dBm)	Threshold (dBm)	
	FCC	IC		FCC	IC		FCC	IC
T <sub>L</sub>	1.463	1.1889	30	20.82	20.37	18.23	-79.76	-81.11
T <sub>U</sub>			50			18.23	-59.76	-61.11

The EUT must not transmit until the interference level is less than or equal to: Measured Threshold Level  $\leq$  TU Where: TU=Upper threshold level

**Reference Method:** ANSI C63.17-2013 Clause 7.3.2, 7.3.3, 7.3.4

**Equipment Used:** Refer to section 3 for details.

**Test Result:** Pass

Monitor threshold	Measured Threshold Level	Limit (dBm)	
		FCC	IC
Lowest Threshold (dBm)	N/A	-79.76	-81.11
Upper Threshold (dBm)	N/A	-59.76	-61.11

Note: N/A Not applicable- EUT which supports at least of 40 duplex system access channels and implements Least Interfered Channel (LIC) algorithm is permitted to use an upper monitoring threshold.

### 5.12.5 Random waiting

**Test Requirement:** FCC 47 CFR Part 15.323(c) (6)  
RSS-213 Issue 3, Section 5.2(6)

If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 ms, commencing from the time when the channel becomes available.

**Reference Method:** ANSI C63.17-2013 Clause 8.1.3

**Test Result:** The manufacturer declares that this provision is not utilized by the EUT

### 5.12.6 Monitoring Bandwidth

**Test Requirement:** FCC 47 CFR Part 15.323(c) (7)  
RSS-213 Issue 3, Section 5.2(7)

The monitoring system bandwidth must be equal to or greater than the occupied bandwidth of the intended transmission. Note: Testing of the monitoring system bandwidth is not required if the designed bandwidth from the manufacturer is available and given in the test report.

The maximum reaction time of the monitor shall be less than  $50\sqrt{1.25/EBW \text{ [MHz]}} \mu\text{s}$  for signals at the applicable threshold level but shall not be required to be less than  $50 \mu\text{s}$ .

If a signal of 6 dB or more above the threshold level is detected, the maximum reaction time shall be  $35\sqrt{1.25/EBW \text{ [MHz]}} \mu\text{s}$  but shall not be required to be less than  $35 \mu\text{s}$ .

**Reference Method:** ANSI C63.17-2013 Clause 7.5

**Equipment Used:** Refer to section 3 for details.

**Test Result:**

#### For FCC 47 CFR Part 15.323(c)(7)

Channel	Emission Bandwidth (MHz)	Pulse width from Bandwidth ( $\mu\text{s}$ )	Pulse width for test ( $\mu\text{s}$ )	Connection possible	Result
4	1.462	$50\sqrt{1.25/EBW \text{ [MHz]}} = 46.23$	50	No	Pass
		$35\sqrt{1.25/EBW \text{ [MHz]}} = 32.36$	35	No	Pass
0	1.463	$50\sqrt{1.25/EBW \text{ [MHz]}} = 46.22$	50	No	Pass
		$35\sqrt{1.25/EBW \text{ [MHz]}} = 32.35$	35	No	Pass

#### RSS-213 Issue 3, Section 5.2(7)

Channel	Emission Bandwidth (MHz)	Pulse width from Bandwidth ( $\mu\text{s}$ )	Pulse width for test ( $\mu\text{s}$ )	Connection possible	Result
4	1.1880	$50\sqrt{1.25/OBW \text{ [MHz]}} = 50$	50	No	Pass
		$35\sqrt{1.25/OBW \text{ [MHz]}} = 35$	35	No	Pass
0	1.1889	$50\sqrt{1.25/OBW \text{ [MHz]}} = 50$	50	No	Pass
		$35\sqrt{1.25/OBW \text{ [MHz]}} = 35$	35	No	Pass

### 5.12.7 Monitoring Antenna

**Test Requirement:** FCC 47 CFR Part 15.323(c) (8) (9)  
RSS-213 Issue 3, Section 5.2(8) (9)

**FCC 47 CFR Part 15.323(c)(8) & RSS-213 Issue 3, Section 5.2(8)**

The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

**FCC 47 CFR Part 15.323(c)(9) & RSS-213 Issue 3, Section 5.2(9)**

Devices that have a power output lower than the maximum permitted under this standard may increase their detection threshold by 1 dB for each 1 dB that the transmitter power is below the maximum permitted.

**Reference Method:** ANSI C63.17-2013 paragraph 4

**Result:**

**FCC 47 CFR Part 15.323(c)(8) & RSS-213 Issue 3, Section 5.2(8)**

The antenna of the EUT used for transmission is the same interior antenna that used for monitoring.

**FCC 47 CFR Part 15.323(c)(9) & RSS-213 Issue 3, Section 5.2(9)**

Not Applicable

### 5.12.8 Dual Access Criteria Check

**Test Requirement:** FCC 47 CFR Part 15.323(c) (10)  
RSS-213 Issue 3, Section 5.2(10)

A device initiating a communication (hereafter called an initiating device) may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows.

If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window.

If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting in the receive time and spectrum window monitored by the initiating device.

**Reference Method:** ANSI C63.17-2013 Clause 8.3.1, 8.3.2

**Test Result:**

**EUT that do NOT implements the LIC procedure:**

ANSI C63.17 clause 8.3.1	Observation	Result
b) EUT is restricted to a single carrier f1 for TDMA systems. The Test is Pass if EUT can transmit	EUT can transmit	Pass
c) d) Interference at level $T_L + U_M$ on all timeslots except one receive slot where interference is at least 10 dB below $T_L$	No connection possible	N/A
e) f) Interference at level $T_L + U_M$ on all timeslots except one transmit slot where interference is at least 10 dB below $T_L$	No connection possible	N/A

**EUTs that implements the LIC procedure:**

ANSI C63.17 clause 8.3.1	Observation	Result
b) EUT is restricted to a single carrier f1 for TDMA systems. The Test is Pass if EUT can transmit	EUT can transmit	Pass
c) d) Transmission on interference-free receive time/spectrum window	Connected on the target Rx window and its duplex mate.	Pass
e) f) Transmission on interference-free transmit time/spectrum window	Connected on the target Rx window and its duplex mate.	Pass

### 5.12.9 Alternative monitoring interval for co-located devices

**Test Requirement:** FCC 47 CFR Part 15.323(c) (11)  
RSS-213 Issue 3, Section 5.2(11)

An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within 1 m) transmitter of the same system, may monitor the portions of the time and spectrum window in which they are to receive over a period of at least 10 ms.

The monitored time and spectrum window must total at least 50% of the 10 ms frame interval and the monitored spectrum must be within 1.25 MHz of the centre frequency of channel(s) already occupied by that device or co-located cooperating devices.

If the access criteria are met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.

**Reference Method:** ANSI C63.17-2013 Clause 8.4

**Test Result:**

ANSI C63.17 Clause 8.4	Observation	Result
a) Only a single carrier f1 for EUT TDMA systems and on f1 and f2 and corresponding duplex carriers for FDMA systems.	EUT can transmit	Pass
b) Apply interference with same parameters as EUT transmissions on all Tx windows with level TL+UM on the enabled carrier(s) and no interference on the Rx windows on the enabled carriers.	No connection is established	Pass

### 5.12.10 Frame Repetition Stability and Period and Jitter

**Test Requirement:** FCC 47 CFR Part 15.323(c) (13)  
RSS-213 Issue 3, Section 5.2(13)

The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in this sub-band shall be  $20 \text{ ms}/X$  where X is a positive whole number.

Each device that implements time division for the purpose of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per million (ppm).

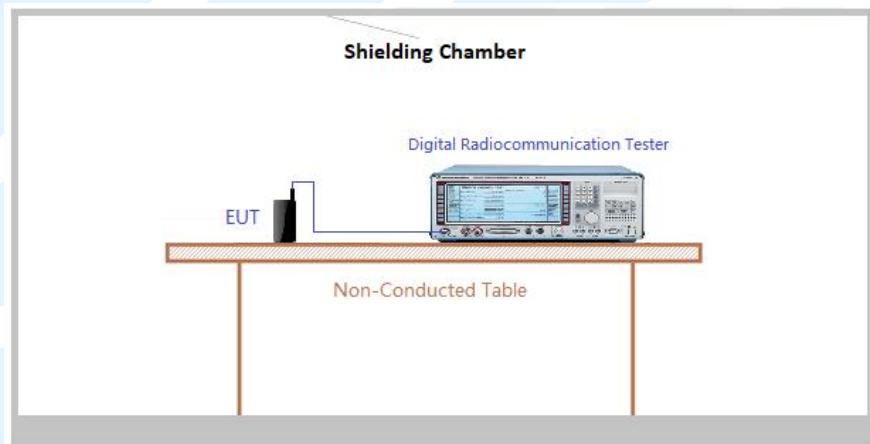
Each device that further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm.

The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the 2 ends of such a communication link shall not exceed  $25 \mu\text{s}$  for any 2 consecutive transmissions.

Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

**Reference Method:** ANSI C63.17-2013 Clause 6.2.2, 6.2.3

**Test Setup:**



**Equipment Used:** Refer to section 3 for details.

**Test Results:** Pass

Carrier Frequency (MHz)	Frame Jitter (us)		Limit
	min	max	
1924.992	-0.18	0.34	$\pm 25$

## 5.13 CONDUCTED EMISSION

**Test Requirement:** 47 CFR Part 15C Section 15.207  
RSS-213 Issue 3, Section 5.4

**Reference Method:** ANSI C63.10-2013 Section 6.2

**Limits:**

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:** Refer to section 4.4.2 for details.

**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  $50\Omega/50\mu\text{H} + 5\Omega$  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.

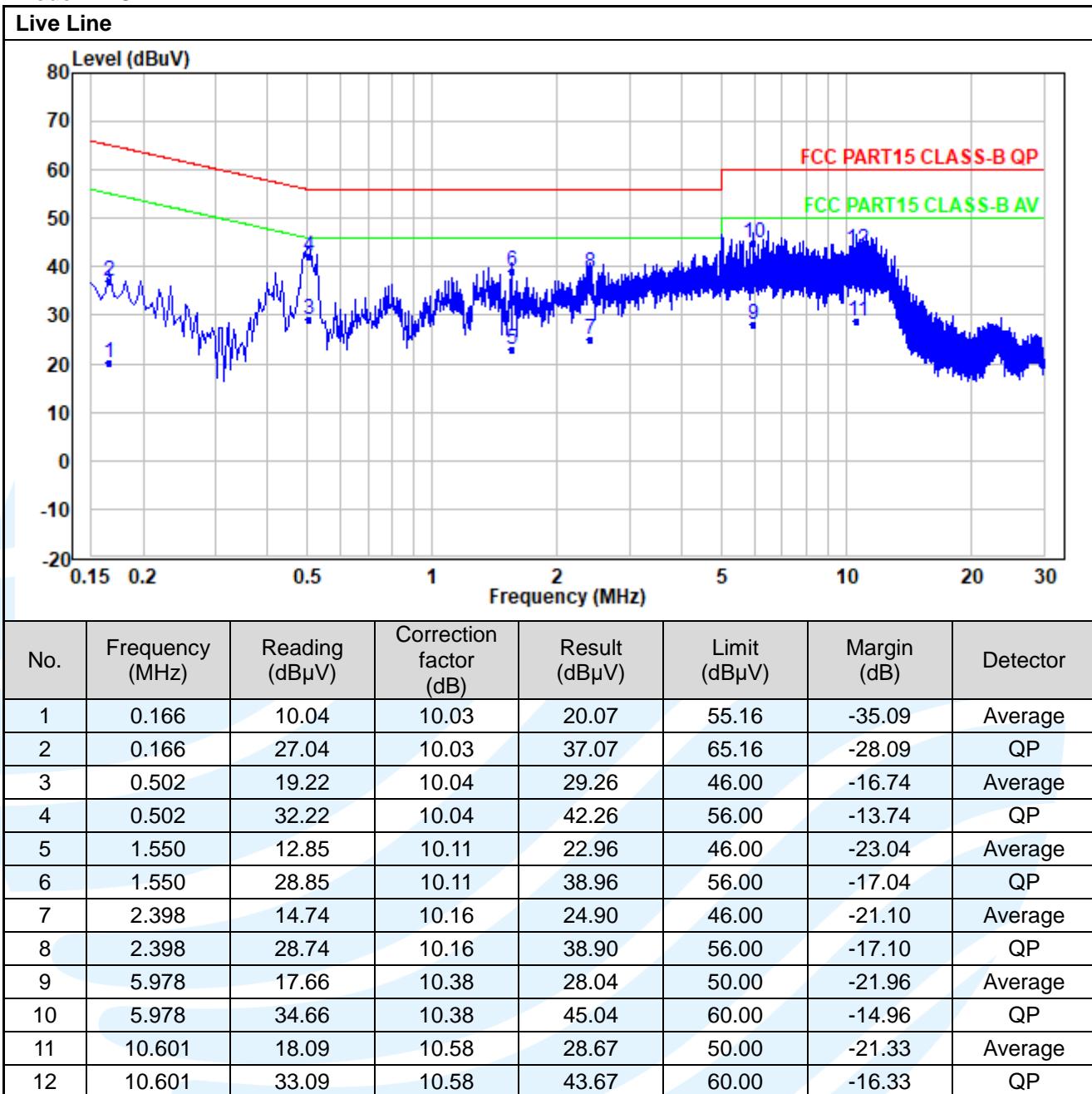
**Equipment Used:** Refer to section 3 for details.

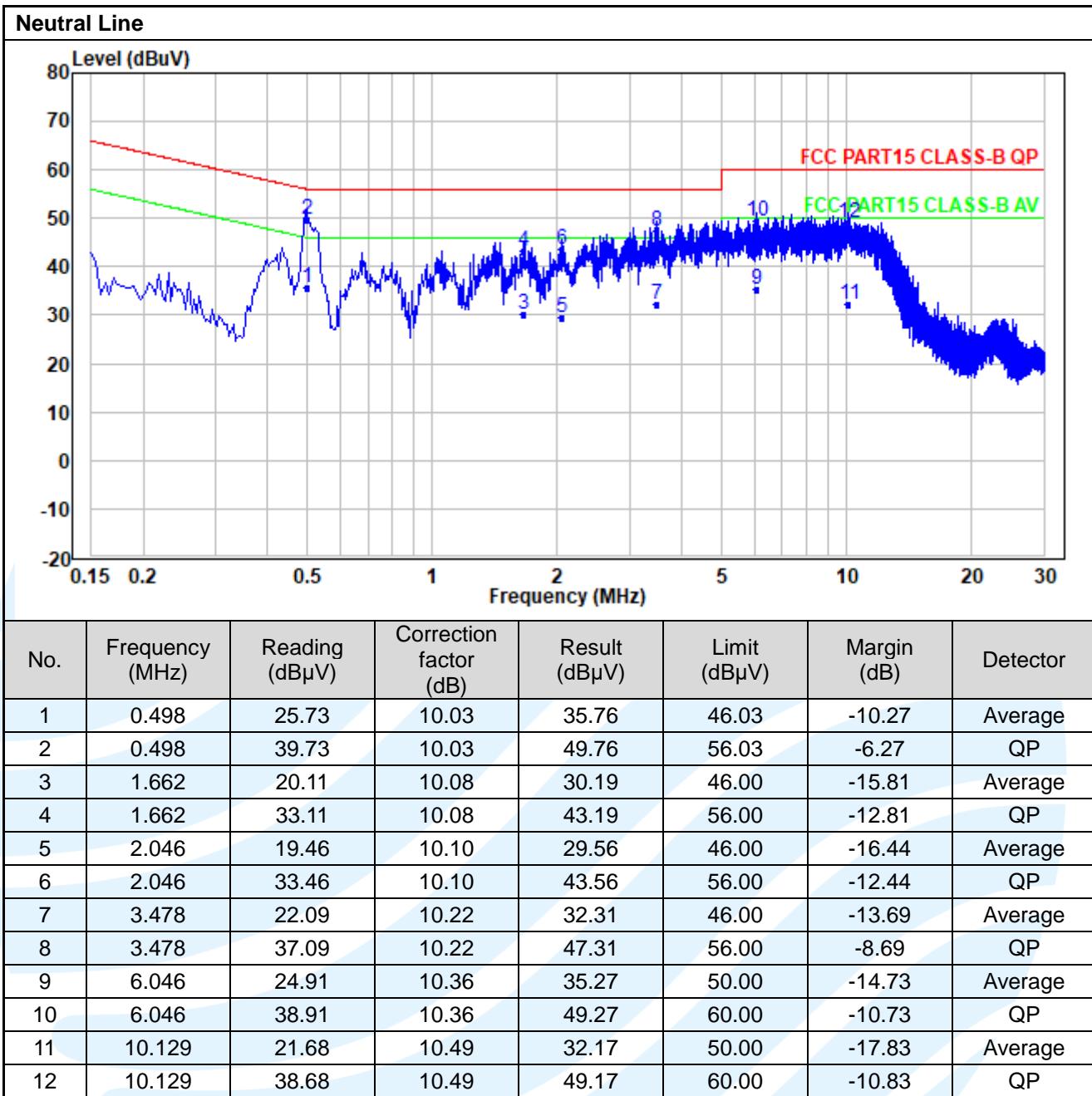
**Test Result:** Pass

The worst measurement data as follows:

Quasi Peak and Average:

Mode: DECT Link





**Remark:**

1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result - Limit
4. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.
5. All possible modes of operation were investigated, and testing at two nominal voltages of 240V/50Hz and 120V/60Hz, only the worst case emissions reported.

## APPENDIX 1 PHOTOS OF TEST SETUP

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

## APPENDIX 2 PHOTOS 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.

---