TEST REPORT

Applicant:	unitech electronics co., ltd.
Address:	5F., No. 136, Ln. 235, Baoqiao Rd., Xindian Dist., New Taipei City 231, Taiwan
Equipment Type:	Rugged Handheld Computer
Model Name:	PA768e (refer to section 2.3)
Brand Name:	unitech
FCC ID:	HLEPA768EBWNWU
Test Standard:	47 CFR Part 15 Subpart C (refer to section 3.1)
Sample Arrival Date:	May 23, 2025
Test Date:	Jul. 01, 2025 - Jul. 09, 2025
Date of Issue:	Jul. 23, 2025

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Yang Wenxuan **Checked by:** Ye Hongji **Approved by:** Sunny Zou (Technical Director)

Revision History

Version	Issue Date	Revisions
Rev. 01	Jul. 23, 2025	Initial Issue

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	unitech electronics co., ltd.
Address	5F., No. 136, Ln. 235, Baoqiao Rd., Xindian Dist., New Taipei City 231, Taiwan

2.2 Manufacturer Information

Manufacturer	unitech electronics co., ltd.
Address	5F., No. 136, Ln. 235, Baoqiao Rd., Xindian Dist., New Taipei City 231, Taiwan

2.3 General Description for Equipment under Test (EUT)

EUT Name	Rugged Handheld Computer
Model Name Under Test	PA768e
Series Model Name	PA768
Description of Model name differentiation	Only differences are model names for trading purpose. (this information provided by the applicant).
Hardware Version	FH22_MB_PCB_V1.2
Software Version	RAYAe_V14.00.00.09_20250517
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	2G Network GPRS/EDGE 850/900/1800/1900 MHz 3G Network WCDMA/HSDPA/HSUPA/DC-HSDPA/HSPA+ Band 1/2/5/8 4G Network LTE FDD Band 1/2/3/4/5/7/8/12/14/17/20/28 LTE TDD Band 38/39/41 Bluetooth (BR+EDR+BLE) WIFI 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac and 802.11ax NFC, GPS, GLONASS, Galileo, BDS, UHF

The requirement for the following technical information of the EUT was tested in this report:

Modulation Technology	Frequency hopping system
Modulation Type	UHF
Product Type	☐ Mobile ☒ Portable ☐ Fix Location
Frequency Range	The frequency range used is 902 MHz to 928 MHz.
Number of Channel	50
Tested Channel	0 (902.75 MHz), 26 (915.25 MHz), 63 (927.25 MHz)
Antenna Type	PIFA Antenna
Antenna Gain	-0.79 dBi
Antenna System(MIMO Smart Antenna)	N/A

All channel was listed on the following table:

Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)	Channel number	Freq. (MHz)
1	**902.75**	14	909.25	27	915.75	40	922.25
2	903.25	15	909.75	28	916.25	41	922.75
3	903.75	16	910.25	29	916.75	42	923.25
4	904.25	17	910.75	30	917.25	43	923.75
5	904.75	18	911.25	31	917.75	44	924.25
6	905.25	19	911.75	32	918.25	45	924.75
7	905.75	20	912.25	33	918.75	46	925.25
8	906.25	21	912.75	34	919.25	47	925.75
9	906.75	22	913.25	35	919.75	48	926.25
10	907.25	23	913.75	36	920.25	49	926.75
11	907.75	24	914.25	37	920.75	**50**	**927.25**
12	908.25	25	914.75	38	921.25	\	\
13	908.75	**26**	**915.25**	39	921.75	\	\

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C	Intentional radiators of radio frequency equipment
2 ☆	KDB Publication 558074 D01v05r02	GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES
3	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Test Verdict

No.	Description	FCC Part No.	Modulation Technology	Channel	Test Result	Verdict
1	Antenna Requirement	15.203	N/A	N/A	--	Pass[Note]
2	Number of Hopping Frequencies	15.247(a)	Frequency hopping system	Hopping Mode	ANNEX A.1	Pass
3	Peak Output Power	15.247(b)	Frequency hopping system	Low/Middle/High	ANNEX A.2	Pass
4	Occupied Bandwidth	15.247(a)	Frequency hopping system	Low/Middle/High	ANNEX A.3	Pass
5	Carrier Frequency Separation	15.247(a)	Frequency hopping system	Hopping Mode	ANNEX A.4	Pass
6	Time of Occupancy (Dwell time)	15.247(a)	Frequency hopping system	Hopping Mode	ANNEX A.5	Pass
7	Conducted Spurious Emission & Authorized-band band-edge	15.247(d)	Frequency hopping system	Hopping Mode; Low/Middle/High	ANNEX A.6	Pass
8	Conducted Emission	15.207	Frequency hopping system	Low/Middle/High	ANNEX A.7	Pass
9	Radiated Spurious Emission	15.209 15.247(d)	Frequency hopping system	Low/Middle/High	ANNEX A.8	Pass
10	Band Edge(Restricted-band band-edge)	15.209 15.247(d)	Frequency hopping system	Low/High	ANNEX A.9	Pass
Note: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.						

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	46% to 67%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+20.8℃ to +25.1℃
Working Voltage of the EUT	NV (Normal Voltage)	3.85 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	101544	2024.12.16	2025.12.15
Spectrum Analyzer	KEYSIGHT	N9020A	MY56060183	2024.08.01	2025.07.31
Spectrum Analyzer	KEYSIGHT	N9020A	MY52510065	2024.08.01	2025.07.31
Signaling Unit	ROHDE&SCHWARZ	CMW500	171150	2025.04.28	2026.04.27
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	01631	2025.02.22	2028.02.21
Test Antenna-Horn	A-INFO	LB-180400KF	J211060273	2024.06.15	2027.06.14
Anechoic Chamber	RAINFORD	9m*6m*6m	144	2022.02.19	2025.09.03
Amplifier	COM-MV	LSCX_LNA1-12G-01	180602	2024.08.01	2025.07.31
Amplifier	COM-MV	XKu_LNA7-18G-01	180601	2024.08.01	2025.07.31
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2024.08.01	2025.07.31
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-01162	2023.08.04	2026.08.03
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2024.01.23	2027.01.22
Amplifier	COM-MV	ZT30-1000M	B2018054558	2024.11.28	2025.11.27
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	130	2024.07.13	2027.07.12
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2024.08.01	2025.07.31
LISN	SCHWARZBECK	NSLK 8127	8127-687	2025.04.29	2026.04.28
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.5m*3.1m*2.8m	112	2025.02.14	2028.02.13

4.3 Test Software List

Description	Manufacturer	Software Version	Serial No.	Applicable test Setup
BL410R	BALUN	V2.1.1.488	N/A	The section 4.5.1
BL410E	BALUN	V22.930	N/A	The section 4.5.2&4.5.3&4.5.4&4.5.5

4.4 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT 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.

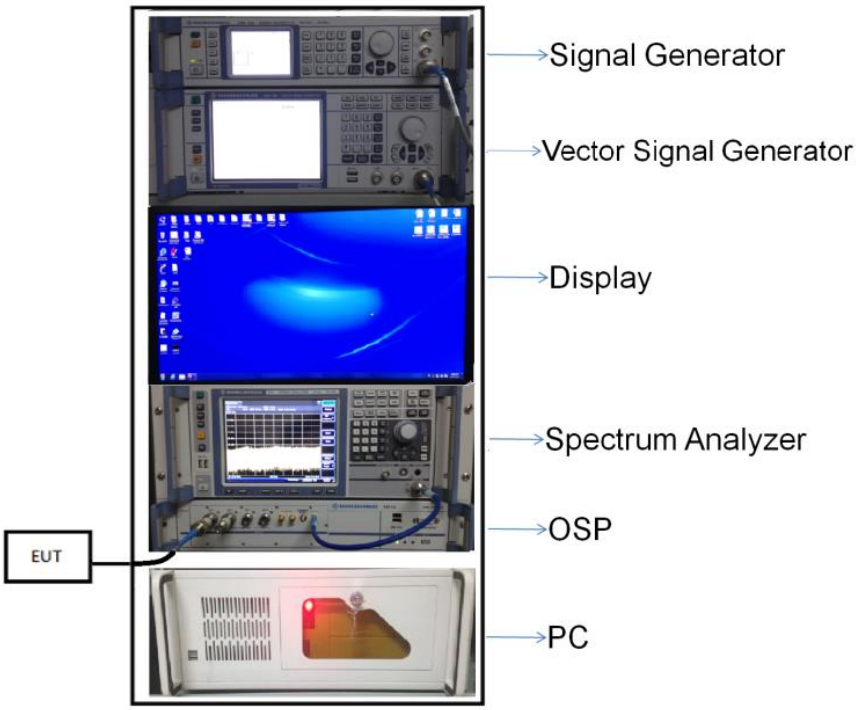
Parameters	Uncertainty
Occupied Channel Bandwidth	2.8%
RF output power, conducted	1.28 dB
Power Spectral Density, conducted	1.30 dB
Unwanted Emissions, conducted	1.84 dB
All emissions, radiated	5.36 dB
Temperature	0.8°C
Humidity	4%

4.5 Description of Test Setup

4.5.1 For Antenna Port Test

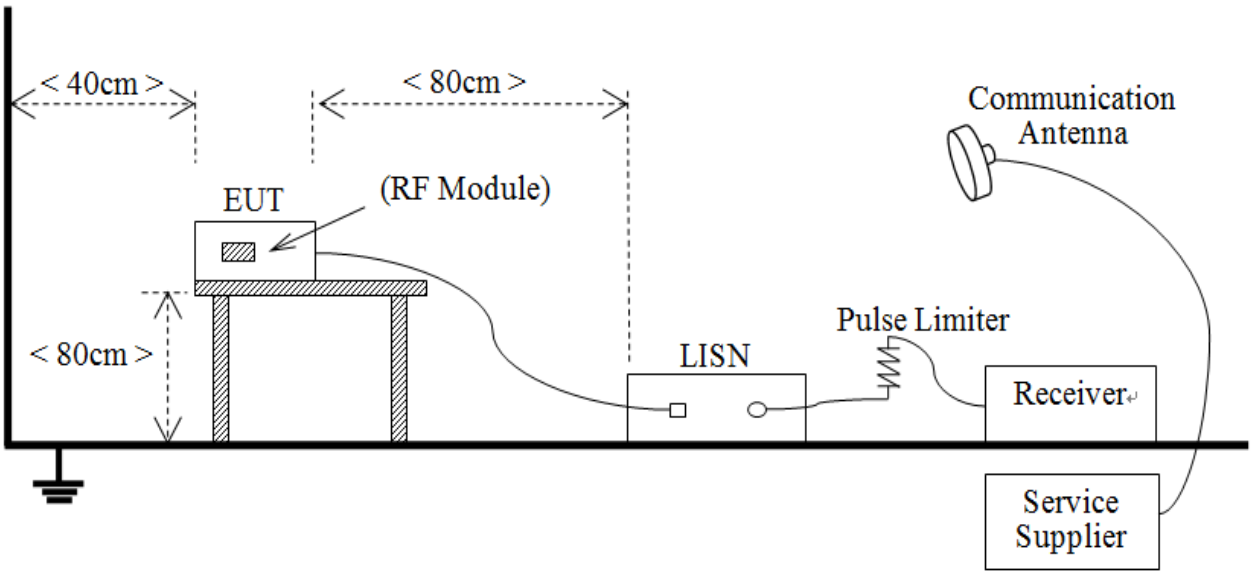
Conducted value (dBm) = Measurement value (dBm) + cable loss (dB)

For example: the measurement value is 10 dBm and the cable 0.5dBm used, then the final result of EUT:
Conducted value (dBm) = 10 dBm + 0.5 dB = 10.5 dBm



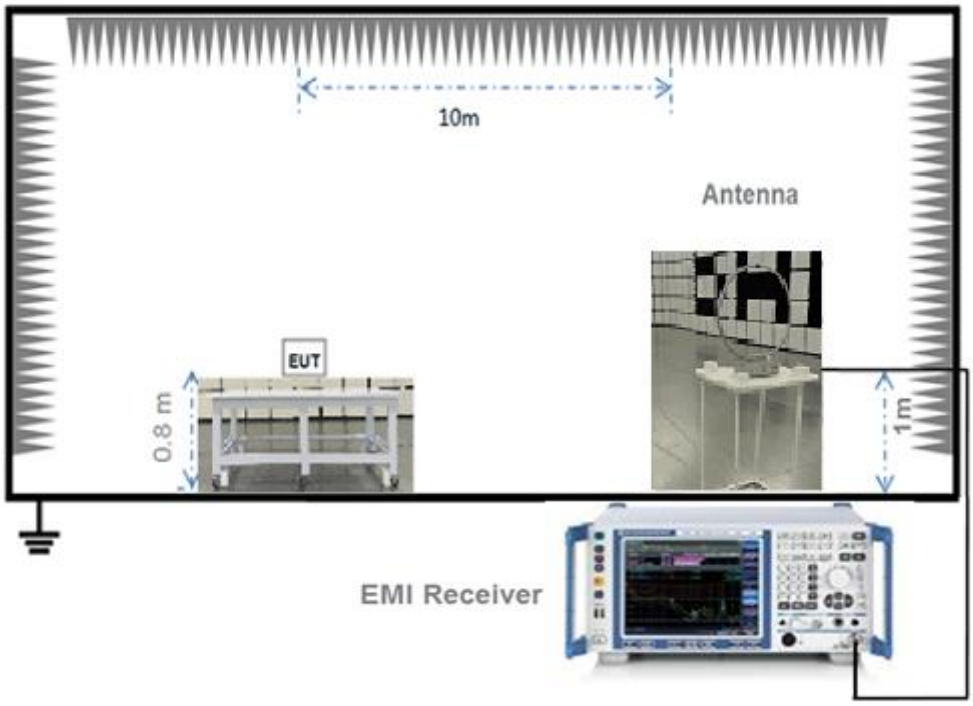
(Diagram 1)

4.5.2 For AC Power Supply Port Test



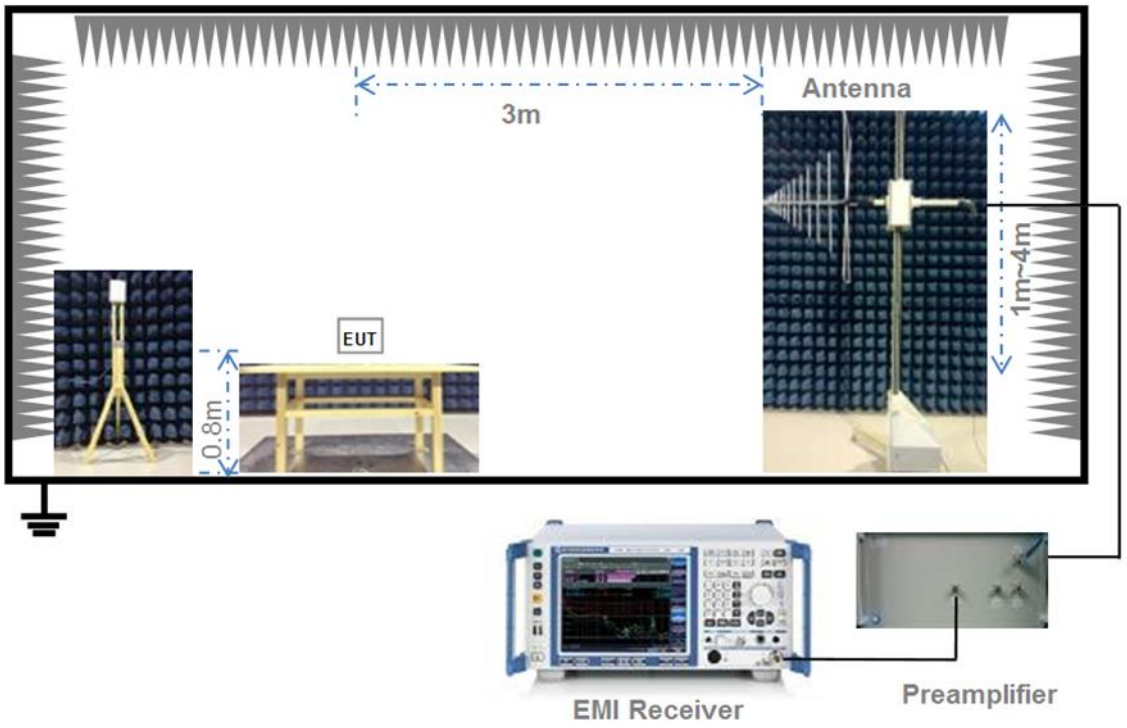
(Diagram 2)

4.5.3 For Radiated Test (Below 30 MHz)



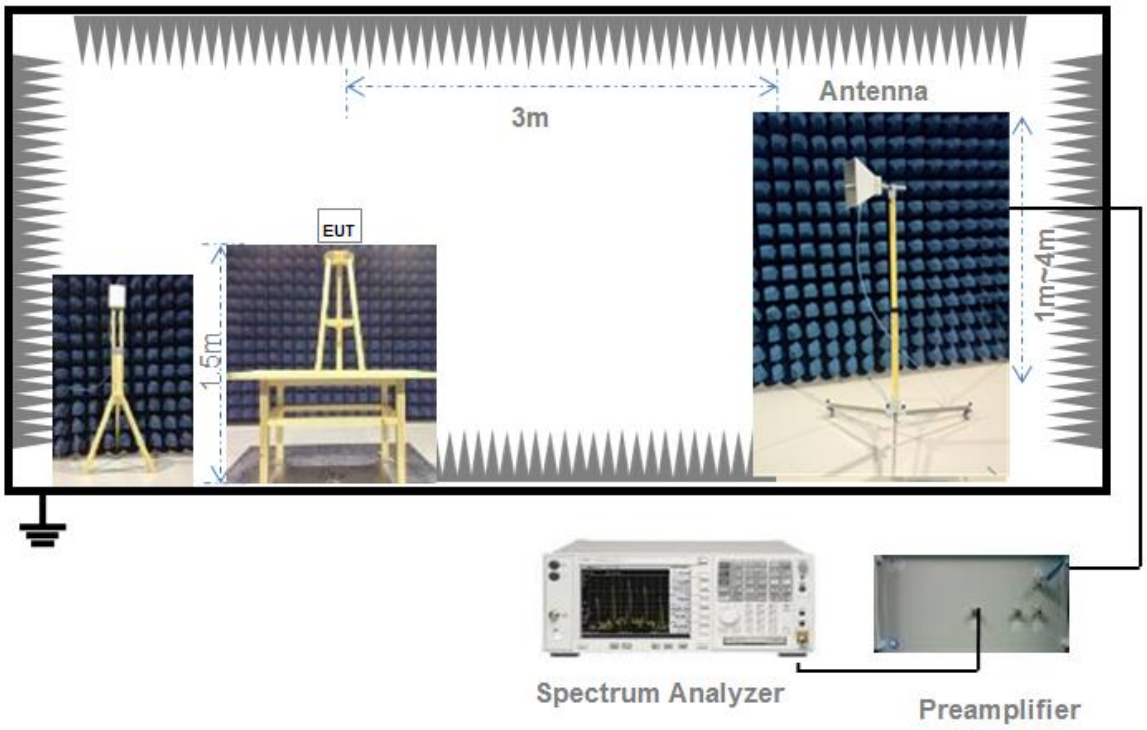
(Diagram 3)

4.5.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.5.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.6 Measurement Results Explanation Example

4.6.1 For conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Relevant Standards

FCC §15.203

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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the product	The antenna is welded on the mainboard, can’t be replaced by the consumer

Reference Documents	Item
Photo	Please refer to the EUT Photo documents.

5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

5.2 Number of Hopping Frequencies

5.2.1 Limit

FCC §15.247(a)

For FHSs in the band 902-928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20-second period. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum 20 dB bandwidth of the hopping channel shall be 500 kHz.

5.2.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

5.2.4 Test Result

Please refer to ANNEX A.1.

5.3 Peak Output Power

5.3.1 Test Limit

FCC § 15.247(b)

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

5.3.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

The Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

Use the following spectrum analyzer settings:

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

5.3.4 Test Result

Please refer to ANNEX A.2.

5.4 Occupied Bandwidth

5.4.1 Limit

FCC §15.247(a)

5.4.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW = in the range of 1% to 5% of the OBW

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate, Allow the trace to stabilize.

5.4.4 Test Result

Please refer to ANNEX A.3.

5.5 Carrier Frequency Separation

5.5.1 Limit

FCC §15.247(a)

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

5.5.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span

Video (or Average) Bandwidth (VBW) ≥ 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.

5.5.4 Test Result

Please refer to ANNEX A.4.

5.6 Time of Occupancy (Dwell time)

5.6.1 Limit

FCC §15.247(a)

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

5.6.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

5.6.4 Test Result

Please refer to ANNEX A.5

5.7 Conducted Spurious Emission & Authorized-band band-edge

5.7.1 Limit

FCC §15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

5.7.2 Test Setup

See section 4.4.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.7.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 100 kHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

5.7.4 Test Result

Please refer to ANNEX A.6 and A.7

5.8 Conducted Emission

5.8.1 Limit

FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.8.2 Test Setup

See section 4.4.2 for test setup description for the AC power supply port. The photo of test setup please refer to ANNEX B.

5.8.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.
Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.8.4 Test Result

Please refer to ANNEX A.7.

5.9 Radiated Spurious Emission

5.9.1 Limit

FCC §15.209&15.247(d)

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	902/F(kHz)	300
0.490 - 1.705	9020/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

1. Field Strength (dBμV/m) = 20*log[Field Strength (μV/m)].
2. In the emission tables above, the tighter limit applies at the band edges.
3. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
4. For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.9.2 Test Setup

See section 4.4.3 to 4.4.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.9.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

5.9.4 Test Result

Please refer to ANNEX A.8.

5.10 Band Edge (Restricted-band band-edge)

5.10.1 Limit

FCC §15.209&15.247(d)

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

5.10.2 Test Setup

See section 4.4.3 to 4.4.5 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.10.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

5.10.4 Test Result

Please refer to ANNEX A.9.

ANNEX A TEST RESULT

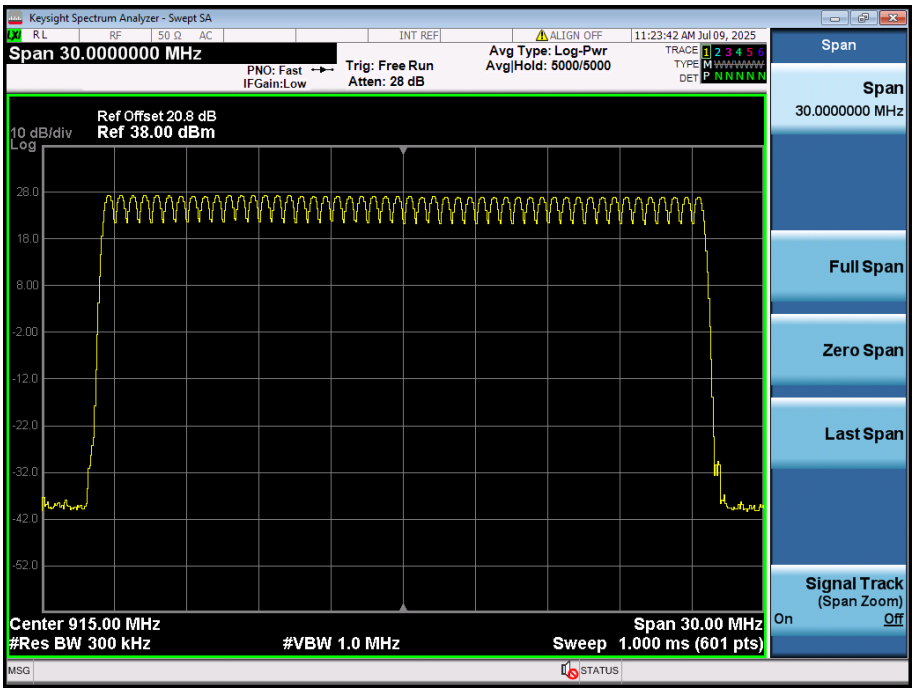
A.1 Number of Hopping Frequency

Test Data

Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
UHF	902-928	50	50	Pass

Test Plots

UHF



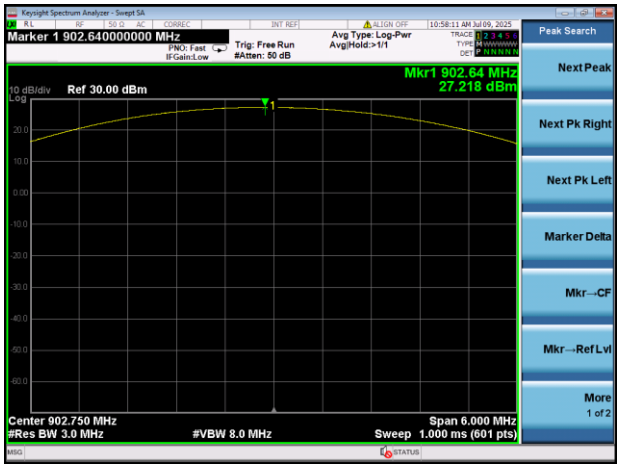
A.2 Peak Output Power

Test Data

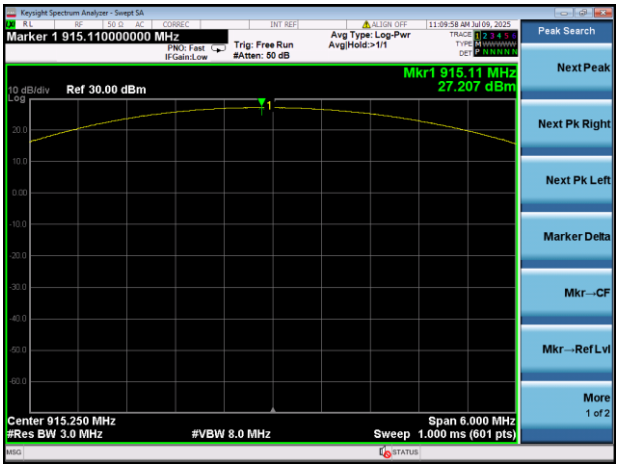
Channel	Measured Output Peak Power		Limit		Verdict
	UHF		dBm	mW	
	dBm	mW			
Low	27.22	526.99	30	1000	Pass
Middle	27.21	525.65			Pass
High	27.04	505.24			Pass

Test Plots

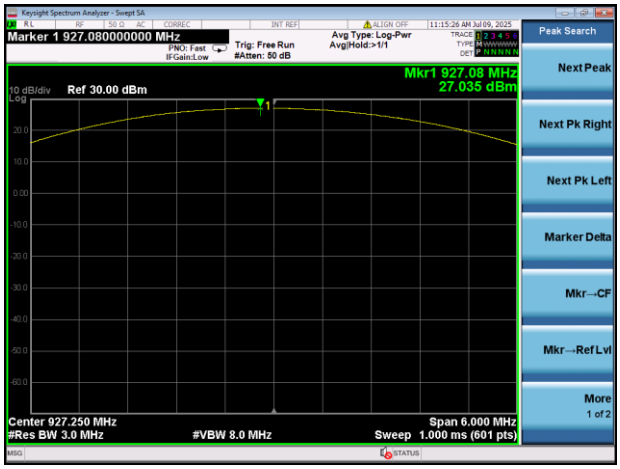
LOW CHANNEL



MIDDLE CHANNEL



HIGH CHANNEL



A.3 20 dB and 99% bandwidth

Test Data

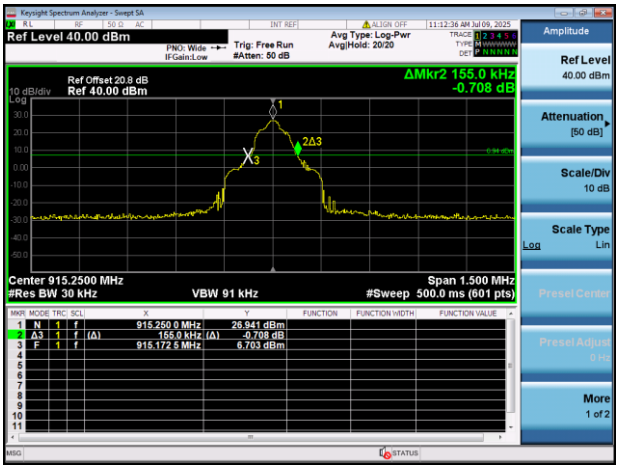
UHF			
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Verdict
Low	0.157532	0.134918	Pass
Middle	0.155029	0.139336	Pass
High	0.155029	0.127484	Pass

Test Plots

20 dB Bandwidth

LOW CHANNEL

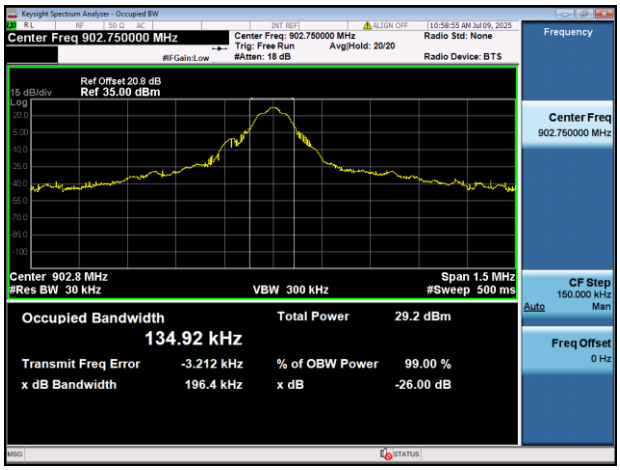
MIDDLE CHANNEL



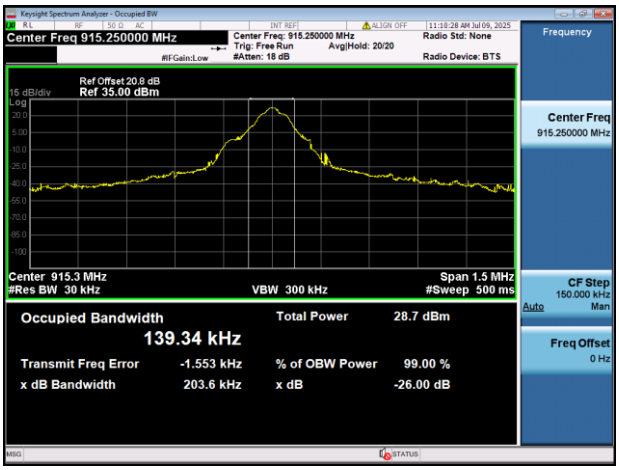
HIGH CHANNEL

99% Bandwidth

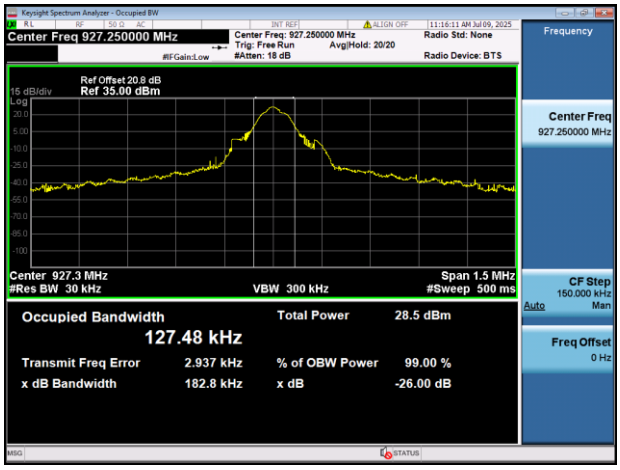
LOW CHANNEL



MIDDLE CHANNEL



HIGH CHANNEL



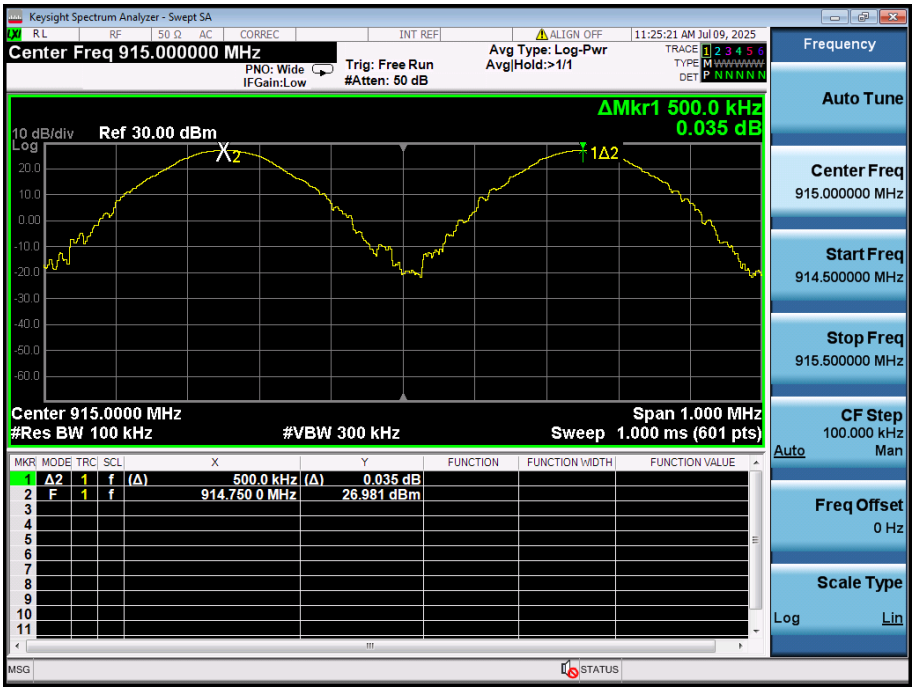
A.4 Hopping Frequency Separation

Test Data

Mode	Frequency separation (MHz)	Max 20 dB Bandwidth (MHz)	Verdict
UHF	0.500	0.158	Pass

Test Plots

UHF



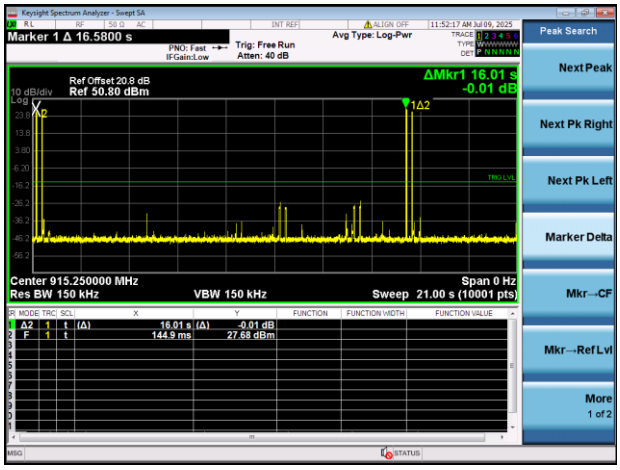
A.5 Average Time of Occupancy

Test Data

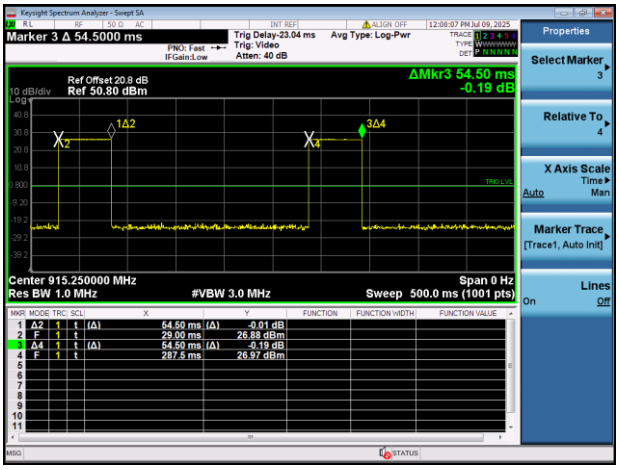
UHF			
Pulse Width (ms)	Total of Dwell (ms)	Limit (sec)	Verdict
109.00000	218.000	0.4	Pass

Test Plots

Dwell Time 1



Dwell Time 2



A.6 Conducted Spurious Emissions & Authorized-band band-edge

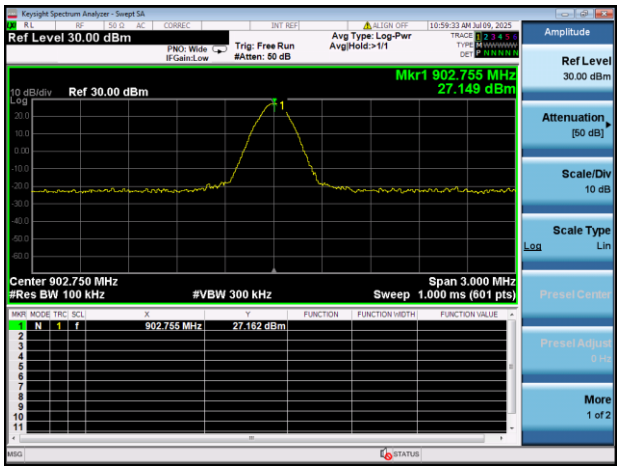
Test Data

UHF				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-6.00	27.15	7.149	Pass
Middle	-16.65	26.94	6.940	Pass
High	-15.96	26.80	6.799	Pass

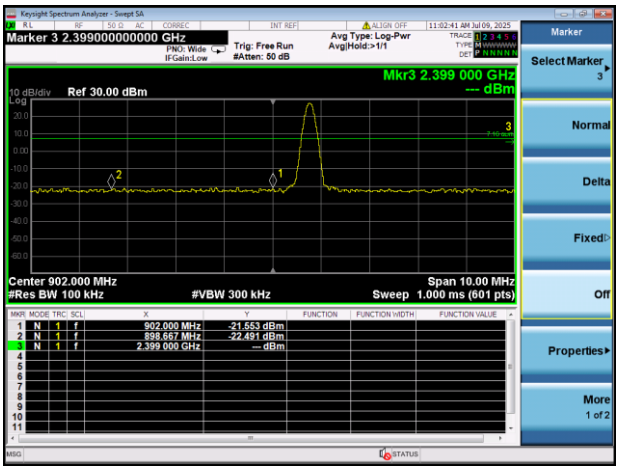
UHF				
Mode	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Hopping	-6.24	27.22	7.218	Pass

Test Plots

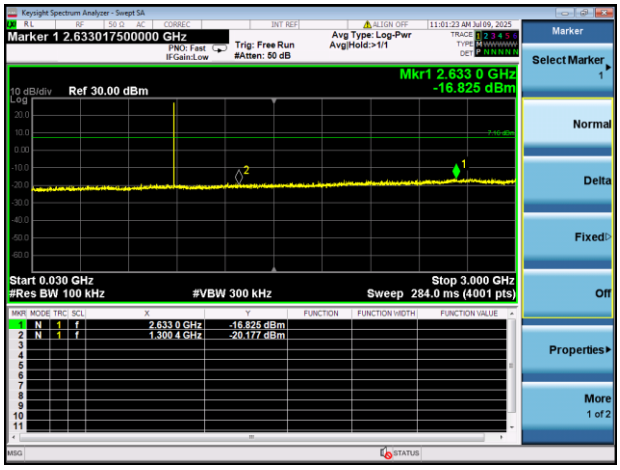
LOW CHANNEL, CARRIER LEVEL



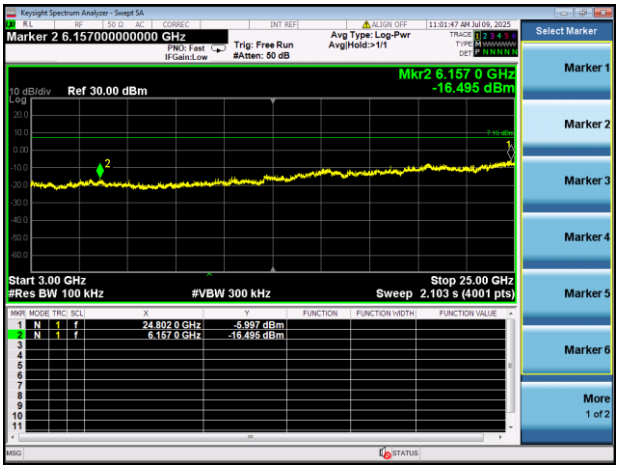
LOW CHANNEL, Band Edge



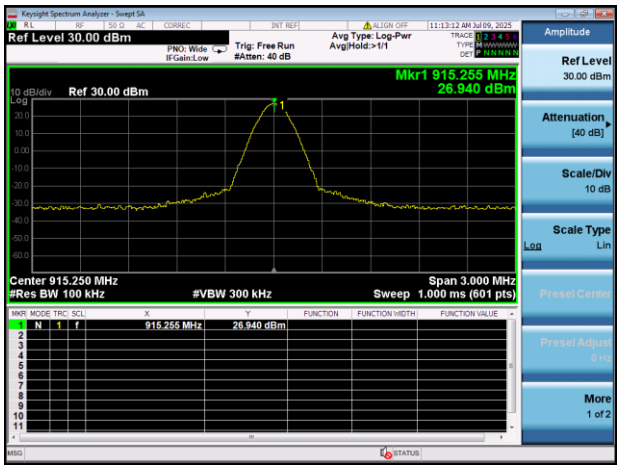
LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



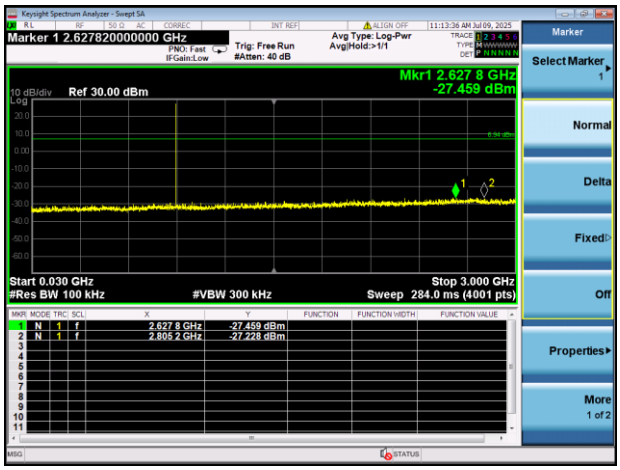
LOW CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



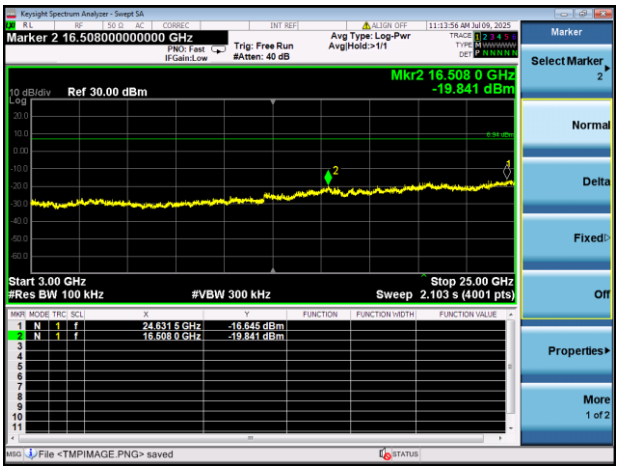
MIDDLE CHANNEL, CARRIER LEVEL



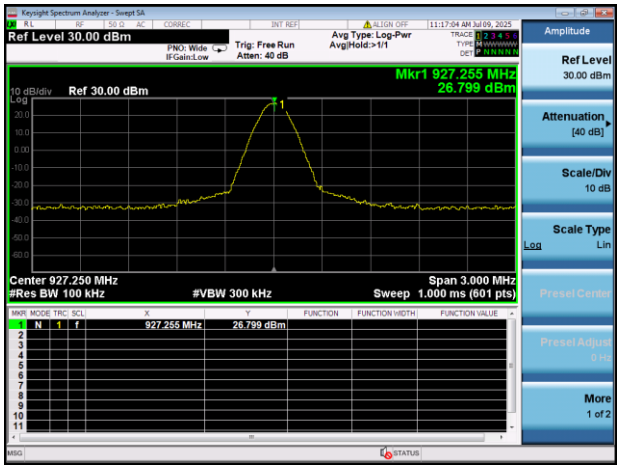
MIDDLE CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



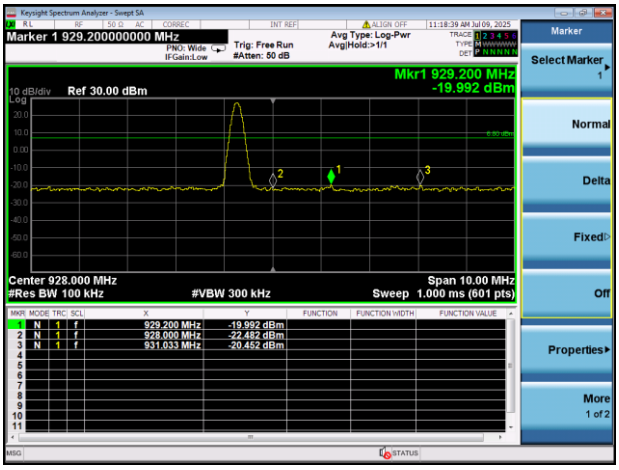
MIDDLE CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



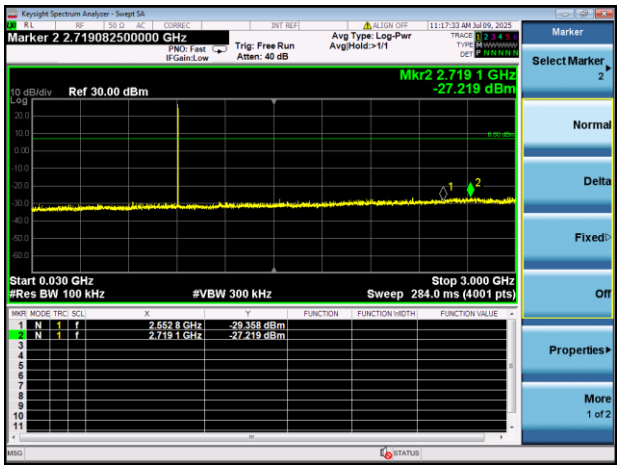
HIGH CHANNEL, CARRIER LEVEL



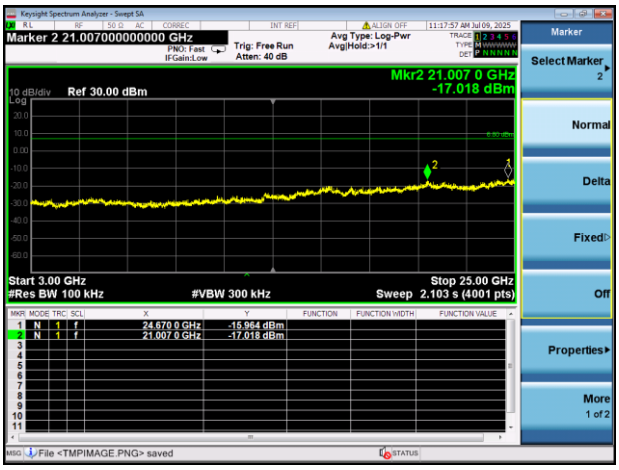
HIGH CHANNEL, BAND EDGE



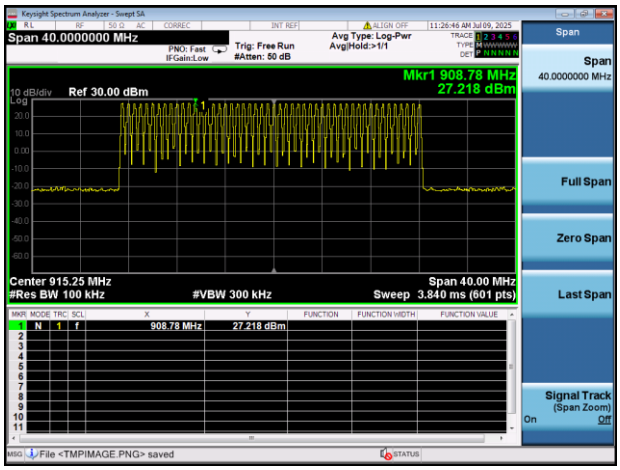
HIGH CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



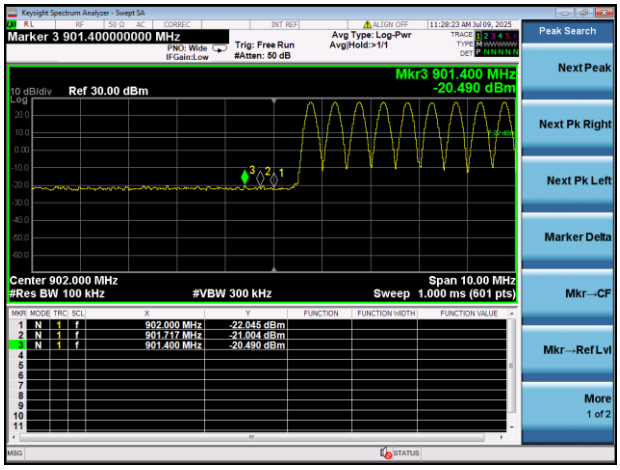
HIGH CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



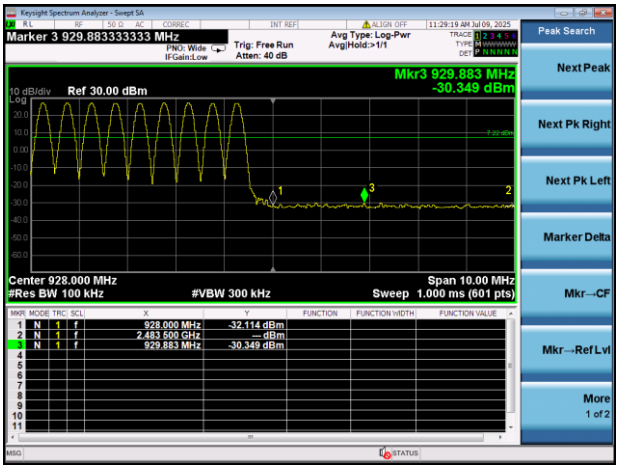
HOPPING, CARRIER LEVEL



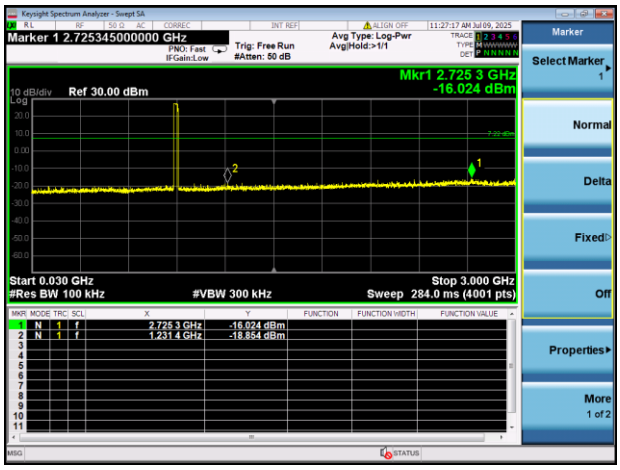
HOPPING BAND EDGE (LOW)



HOPPING BAND EDGE (HIGH)



HOPPING Mode, SPURIOUS 30 MHz ~ 3 GHz



Hopping Mode, SPURIOUS 3 GHz ~ 25 GHz

A.7 Conducted Emissions

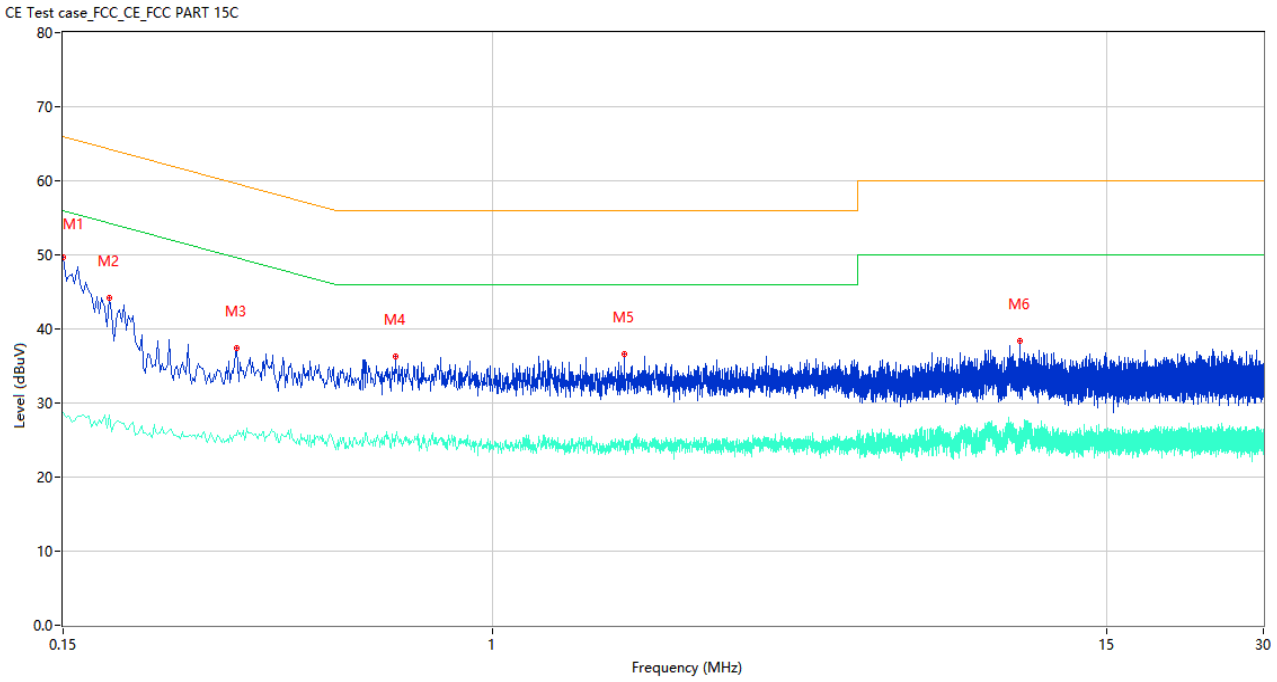
Note [1]: The EUT is working in the Normal link mode. All modes have been tested and normal link mode is worst.

Note [2]: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 60 Hz and 240 VAC, 50 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here.

Note [3]: Results (dBuV) = Original reading level of Spectrum Analyzer (dBuV) + Factor (dB)

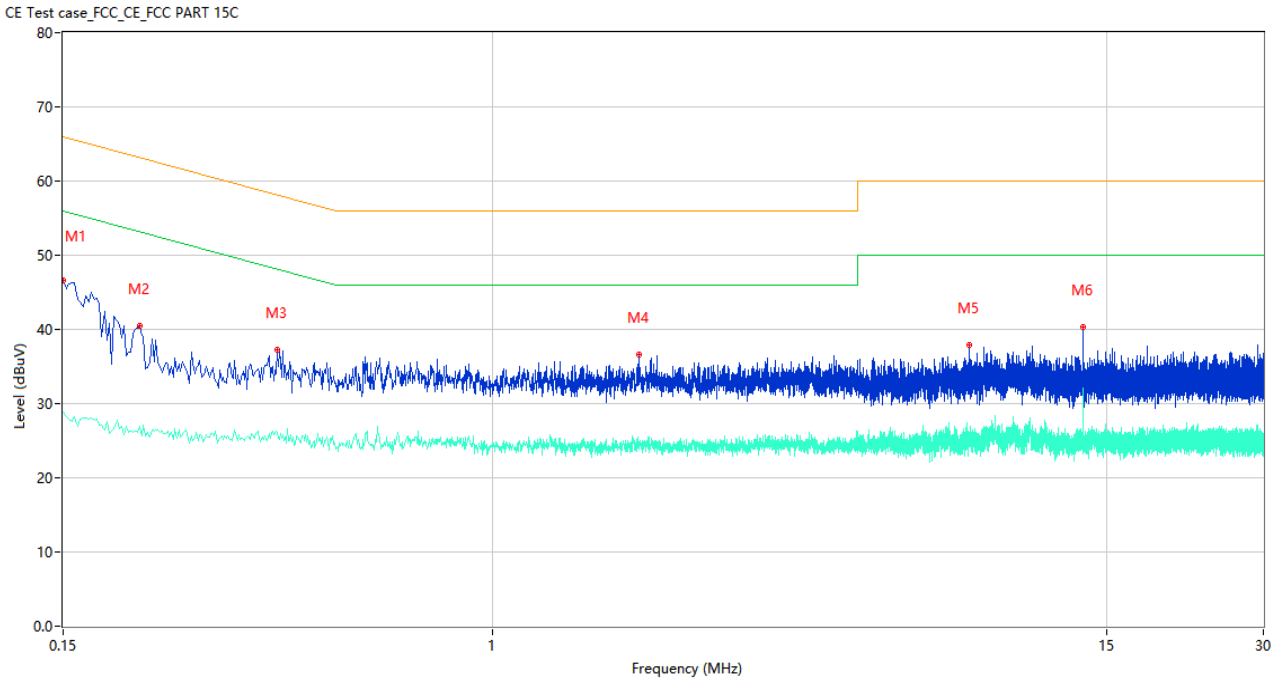
Test Data and Plots

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.150	49.70	9.86	66.00	16.30	Peak	L	Pass
1**	0.150	28.70	9.86	56.00	27.30	AV	L	Pass
2	0.184	44.12	9.84	64.30	20.18	Peak	L	Pass
2**	0.184	28.40	9.84	54.30	25.90	AV	L	Pass
3	0.322	37.36	10.26	59.66	22.30	Peak	L	Pass
3**	0.322	25.57	10.26	49.66	24.09	AV	L	Pass
4	0.650	36.35	10.27	56.00	19.65	Peak	L	Pass
4**	0.650	25.12	10.27	46.00	20.88	AV	L	Pass
5	1.786	36.55	10.24	56.00	19.45	Peak	L	Pass
5**	1.786	24.26	10.24	46.00	21.74	AV	L	Pass
6	10.218	38.38	10.60	60.00	21.62	Peak	L	Pass
6**	10.218	26.71	10.60	50.00	23.29	AV	L	Pass

PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.150	46.60	9.86	66.00	19.40	Peak	N	Pass
1**	0.150	28.91	9.86	56.00	27.09	AV	N	Pass
2	0.210	40.42	9.84	63.21	22.79	Peak	N	Pass
2**	0.210	26.91	9.84	53.21	26.30	AV	N	Pass
3	0.386	37.21	10.67	58.15	20.94	Peak	N	Pass
3**	0.386	26.12	10.67	48.15	22.03	AV	N	Pass
4	1.906	36.62	10.71	56.00	19.38	Peak	N	Pass
4**	1.906	24.87	10.71	46.00	21.13	AV	N	Pass
5	8.190	37.85	10.34	60.00	22.15	Peak	N	Pass
5**	8.190	26.15	10.34	50.00	23.85	AV	N	Pass
6	13.552	40.32	10.35	60.00	19.68	Peak	N	Pass
6**	13.552	32.13	10.35	50.00	17.87	AV	N	Pass

A.8 Radiated Spurious Emission

Note [1]: The symbol of "--" in the table which means not application.

Note [2]: For the test data above 1 GHz, according the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note [3]: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Test Data

LOW CHANNEL, 30 MHz to 1 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	54.799	18.00	40.0	22.00	Peak	340.00	100	Horizontal	Pass
2	134.771	25.39	43.5	18.11	Peak	340.00	100	Horizontal	Pass
3	220.282	32.14	43.5	11.36	Peak	267.00	300	Horizontal	Pass
4	257.704	27.83	43.5	15.67	Peak	267.00	300	Horizontal	Pass
5	457.968	26.93	46.0	19.07	Peak	110.00	200	Horizontal	Pass
6	748.653	35.75	46.0	10.25	Peak	110.00	200	Horizontal	Pass

LOW CHANNEL, 30 MHz to 1 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	54.493	23.29	40.0	16.71	Peak	238.00	200	Vertical	Pass
2	144.247	26.26	43.5	17.24	Peak	238.00	200	Vertical	Pass
3	159.395	25.93	43.5	17.57	Peak	124.00	400	Vertical	Pass
4	407.010	28.47	46.0	17.53	Peak	124.00	400	Vertical	Pass
5	637.711	33.52	46.0	12.48	Peak	156.00	200	Vertical	Pass
6	780.584	39.50	46.0	6.50	Peak	156.00	200	Vertical	Pass

MIDDLE CHANNEL, 30 MHz to 1 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	56.457	21.60	40.0	18.40	Peak	207.00	200	Horizontal	Pass
2	138.087	22.51	43.5	20.99	Peak	207.00	200	Horizontal	Pass
3	216.033	31.33	43.5	12.17	Peak	27.00	300	Horizontal	Pass
4	255.990	27.12	43.5	16.38	Peak	27.00	300	Horizontal	Pass
5	457.617	30.62	46.0	15.38	Peak	76.00	200	Horizontal	Pass
6	747.414	32.60	46.0	13.40	Peak	76.00	200	Horizontal	Pass

MIDDLE CHANNEL, 30 MHz to 1 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	53.330	25.38	40.0	14.62	Peak	271.00	100	Vertical	Pass
2	142.652	29.72	43.5	13.78	Peak	271.00	100	Vertical	Pass
3	156.495	24.20	43.5	19.30	Peak	138.00	300	Vertical	Pass
4	406.015	28.67	46.0	17.33	Peak	138.00	300	Vertical	Pass
5	640.962	33.06	46.0	12.94	Peak	194.00	200	Vertical	Pass
6	773.375	38.96	46.0	7.04	Peak	194.00	200	Vertical	Pass

HIGH CHANNEL, 30 MHz to 1 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	51.832	20.03	40.0	19.97	Peak	101.00	300	Horizontal	Pass
2	139.714	25.47	43.5	18.03	Peak	101.00	300	Horizontal	Pass
3	218.134	33.51	43.5	9.99	Peak	302.00	300	Horizontal	Pass
4	258.180	22.23	43.5	21.27	Peak	302.00	300	Horizontal	Pass
5	455.203	26.14	46.0	19.86	Peak	232.00	200	Horizontal	Pass
6	747.251	37.40	46.0	8.60	Peak	232.00	200	Horizontal	Pass

HIGH CHANNEL, 30 MHz to 1 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	52.933	19.93	40.0	20.07	Peak	160.00	100	Vertical	Pass
2	140.460	27.76	43.5	15.74	Peak	160.00	100	Vertical	Pass
3	159.723	25.29	43.5	18.21	Peak	229.00	200	Vertical	Pass
4	409.708	26.22	46.0	19.78	Peak	229.00	200	Vertical	Pass
5	633.711	30.13	46.0	15.87	Peak	323.00	200	Vertical	Pass
6	777.959	38.79	46.0	7.21	Peak	323.00	200	Vertical	Pass

LOW CHANNEL 1 GHz to 10 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1332.564	42.08	74.0	31.92	Peak	27.00	100	Horizontal	Pass
1**	1332.564	30.61	54.0	23.39	AV	27.00	100	Horizontal	Pass
2	2970.451	52.91	74.0	21.09	Peak	24.00	100	Horizontal	Pass
2**	2970.451	39.51	54.0	14.49	AV	24.00	100	Horizontal	Pass
3	4910.545	52.40	74.0	21.60	Peak	165.00	200	Horizontal	Pass
3**	4910.545	45.26	54.0	8.74	AV	165.00	200	Horizontal	Pass
4	7625.485	53.65	74.0	20.35	Peak	332.00	300	Horizontal	Pass
4**	7625.485	40.03	54.0	13.97	AV	332.00	300	Horizontal	Pass
5	12470.656	53.51	74.0	20.49	Peak	166.00	400	Horizontal	Pass
5**	12470.656	42.26	54.0	11.74	AV	166.00	400	Horizontal	Pass
6	16856.901	52.51	74.0	21.49	Peak	228.00	200	Horizontal	Pass
6**	16856.901	45.46	54.0	8.54	AV	228.00	200	Horizontal	Pass

LOW CHANNEL 1 GHz to 10 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1546.040	45.13	74.0	28.87	Peak	59.00	100	Vertical	Pass
1**	1546.040	34.52	54.0	19.48	AV	59.00	100	Vertical	Pass
2	2233.097	48.10	74.0	25.90	Peak	154.00	200	Vertical	Pass
2**	2233.097	38.82	54.0	15.18	AV	154.00	200	Vertical	Pass
3	4920.032	48.99	74.0	25.01	Peak	249.00	200	Vertical	Pass
3**	4920.032	42.35	54.0	11.65	AV	249.00	200	Vertical	Pass
4	7964.292	54.66	74.0	19.34	Peak	196.00	200	Vertical	Pass
4**	7964.292	42.84	54.0	11.16	AV	196.00	200	Vertical	Pass
5	3.186	1.82	0.0	-1.82	Peak	197.00	200	Vertical	Pass
5**	3.186	0.50	0.0	-0.50	AV	197.00	200	Vertical	Pass
6	8124.588	49.38	74.0	24.62	Peak	354.00	200	Vertical	Pass
6**	8124.588	41.02	54.0	12.98	AV	354.00	200	Vertical	Pass

MIDDLE CHANNEL 1 GHz to 10 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1333.108	40.19	74.0	33.81	Peak	164.00	100	Horizontal	Pass
1**	1333.108	27.57	54.0	26.43	AV	164.00	100	Horizontal	Pass
2	2971.996	52.21	74.0	21.79	Peak	341.00	100	Horizontal	Pass
2**	2971.996	39.59	54.0	14.41	AV	341.00	100	Horizontal	Pass
3	4912.792	53.62	74.0	20.38	Peak	82.00	200	Horizontal	Pass
3**	4912.792	41.19	54.0	12.81	AV	82.00	200	Horizontal	Pass
4	7625.832	55.78	74.0	18.22	Peak	306.00	400	Horizontal	Pass
4**	7625.832	39.75	54.0	14.25	AV	306.00	400	Horizontal	Pass
5	12472.897	50.60	74.0	23.40	Peak	27.00	300	Horizontal	Pass
5**	12472.897	45.63	54.0	8.37	AV	27.00	300	Horizontal	Pass
6	16858.340	52.92	74.0	21.08	Peak	199.00	100	Horizontal	Pass
6**	16858.340	43.27	54.0	10.73	AV	199.00	100	Horizontal	Pass

MIDDLE CHANNEL 1 GHz to 10 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1469.116	41.74	74.0	32.26	Peak	223.00	400	Vertical	Pass
1**	1469.116	30.61	54.0	23.39	AV	223.00	400	Vertical	Pass
2	2989.676	48.47	74.0	25.53	Peak	24.00	200	Vertical	Pass
2**	2989.676	42.42	54.0	11.58	AV	24.00	200	Vertical	Pass
3	4922.619	53.73	74.0	20.27	Peak	58.00	200	Vertical	Pass
3**	4922.619	40.54	54.0	13.46	AV	58.00	200	Vertical	Pass
4	7968.969	55.27	74.0	18.73	Peak	318.00	100	Vertical	Pass
4**	7968.969	43.29	54.0	10.71	AV	318.00	100	Vertical	Pass
5	12443.056	52.51	74.0	21.49	Peak	154.00	400	Vertical	Pass
5**	12443.056	43.64	54.0	10.36	AV	154.00	400	Vertical	Pass
6	17459.382	54.66	74.0	19.34	Peak	13.00	400	Vertical	Pass
6**	17459.382	45.81	54.0	8.19	AV	13.00	400	Vertical	Pass

HIGH CHANNEL 1 GHz to 10 GHz, ANT H

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1335.171	45.33	74.0	28.67	Peak	316.00	100	Horizontal	Pass
1**	1335.171	29.77	54.0	24.23	AV	316.00	100	Horizontal	Pass
2	2977.244	53.34	74.0	20.66	Peak	158.00	200	Horizontal	Pass
2**	2977.244	40.89	54.0	13.11	AV	158.00	200	Horizontal	Pass
3	4911.958	54.02	74.0	19.98	Peak	115.00	200	Horizontal	Pass
3**	4911.958	40.81	54.0	13.19	AV	115.00	200	Horizontal	Pass
4	7624.781	52.85	74.0	21.15	Peak	33.00	200	Horizontal	Pass
4**	7624.781	37.81	54.0	16.19	AV	33.00	200	Horizontal	Pass
5	12473.370	51.65	74.0	22.35	Peak	246.00	200	Horizontal	Pass
5**	12473.370	41.84	54.0	12.16	AV	246.00	200	Horizontal	Pass
6	16853.090	54.71	74.0	19.29	Peak	101.00	200	Horizontal	Pass
6**	16853.090	42.97	54.0	11.03	AV	101.00	200	Horizontal	Pass

HIGH CHANNEL 1 GHz to 10 GHz, ANT V

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1467.959	46.00	74.0	28.00	Peak	161.00	300	Vertical	Pass
1**	1467.959	28.14	54.0	25.86	AV	161.00	300	Vertical	Pass
2	2988.794	49.05	74.0	24.95	Peak	282.00	300	Vertical	Pass
2**	2988.794	39.74	54.0	14.26	AV	282.00	300	Vertical	Pass
3	4920.298	51.58	74.0	22.42	Peak	143.00	200	Vertical	Pass
3**	4920.298	40.51	54.0	13.49	AV	143.00	200	Vertical	Pass
4	7965.830	57.60	74.0	16.40	Peak	224.00	300	Vertical	Pass
4**	7965.830	44.84	54.0	9.16	AV	224.00	300	Vertical	Pass
5	12440.898	51.64	74.0	22.36	Peak	222.00	200	Vertical	Pass
5**	12440.898	42.39	54.0	11.61	AV	222.00	200	Vertical	Pass
6	17454.533	54.59	74.0	19.41	Peak	303.00	400	Vertical	Pass
6**	17454.533	46.03	54.0	7.97	AV	303.00	400	Vertical	Pass

A.9 Band Edge (Restricted-band band-edge)

Note [1]: The lowest and highest channels are tested to verify the band edge emissions. Please refer to the following the plots for emissions values.

Note [2]: The test data all are tested in the vertical and horizontal antenna which the trace is max hold. So these plots have shown the worst case.

Note [3]: According the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note [4]: The Level (dBuV/m) has been corrected by factor.

Test Data

LOW CHANNEL

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	608.948	42.43	54.0	11.57	Peak	302.00	200	Horizontal	Pass
2	610.367	44.71	54.0	9.29	Peak	133.00	200	Horizontal	Pass

HIGH CHANNEL

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	960.270	45.1	54.0	8.90	Peak	48.00	100	Horizontal	Pass
2	963.720	43.72	54.0	10.28	Peak	242.00	200	Horizontal	Pass

HIGH CHANNEL

No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1164.084	46.81	54.0	7.19	Peak	254.00	100	Horizontal	Pass
2	1000.080	45.16	54.0	8.84	Peak	129.00	200	Horizontal	Pass

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2551267-AR-1.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2551267-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2551267-AI.PDF”.

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--END OF REPORT--