

TEST REPORT

Applicant: Sonoc Corp.
Address: 8F.-3, No.1071, Zhongzheng Rd., Taoyuan Dist., Taiwan
Equipment Type: LoRaWAN Gateway
Model Name: SL100 (refer section 2.4)
Brand Name: SONoC
FCC ID: 2A7JX-SL100
ISED Number: 28690-SL100
Test Standard: 47 CFR Part 15 Subpart C
RSS-Gen Issue 5
RSS-247 Issue 2
(refer section 3.1)
Test Date: Jul. 05, 2022- Jul. 14, 2022
Date of Issue: Jul. 22, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Julie zhu**Checked by:** Ye Hongji**Approved by:** Liao Jianming
(Technical Director)

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Jul. 22, 2022</u>	<u>Initial Issue</u>

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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A.
Description	All measurement facilities used to collect the measurement data are located at Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Sonoc Corp.
Address	8F.-3, No.1071, Zhongzheng Rd., Taoyuan Dist., Taiwan

2.2 Manufacturer Information

Manufacturer	Sonoc Corp.
Address	8F.-3, No.1071, Zhongzheng Rd., Taoyuan Dist., Taiwan

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	LoRaWAN Gateway
Model Name Under Test	SL100
Series Model Name	SL100-US915, SL100-AS923, SL100-AU915
Description of Model name differentiation	Software configuration is different (nothing to do with wireless)
Serial Number	112233445566A21
Hardware Version	v2.0
Software Version	1.0.0
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Technical Information

Network and Wireless connectivity	Bluetooth (BLE) WIFI 802.11b, 802.11g, 802.11n(HT20/40) LoraWAN
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The requirement for the following technical information of the EUT was tested in this report:

Modulation Technology	Frequency hopping system
Modulation Type	LoRa
Product Type	☐ Mobile ☐ Portable ☒ Fix Location
Frequency Range	The frequency range used is 902 MHz to 928 MHz.
Number of channel	64
Tested Channel	1 (902.3 MHz), 33 (908.7 MHz), 64 (914.9 MHz)
Antenna Type	PIFA Antenna
Antenna Gain	1.2 dBi (In test items related to antenna gain, the final results reflect this figure. This value is provided by the applicant.)
Antenna System(MIMO Smart Antenna)	N/A
About the Product	The EUT is supply the DTS, Frequency hopping system, only the frequency hopping system and were tested in this report.

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	902.3	17	905.5	33	908.7	49	911.9
2	902.5	18	905.7	34	908.9	50	912.1
3	902.7	19	905.9	35	909.1	51	912.3
4	902.9	20	906.1	36	909.3	52	912.5
5	903.1	21	906.3	37	909.5	53	912.7
6	903.3	22	906.5	38	909.7	54	912.9
7	903.5	23	906.7	39	909.9	55	913.1
8	903.7	24	906.9	40	910.1	56	913.3
9	903.9	25	907.1	41	910.3	57	913.5
10	904.1	26	907.3	42	910.5	58	913.7
11	904.3	27	907.5	43	910.7	59	913.9
12	904.5	28	907.7	44	910.9	60	914.1
13	904.7	29	907.9	45	911.1	61	914.3
14	904.9	30	908.1	46	911.3	62	914.5
15	905.1	31	908.3	47	911.5	63	914.7
16	905.3	32	908.5	48	911.7	64	914.9

2.6 Additional Instructions

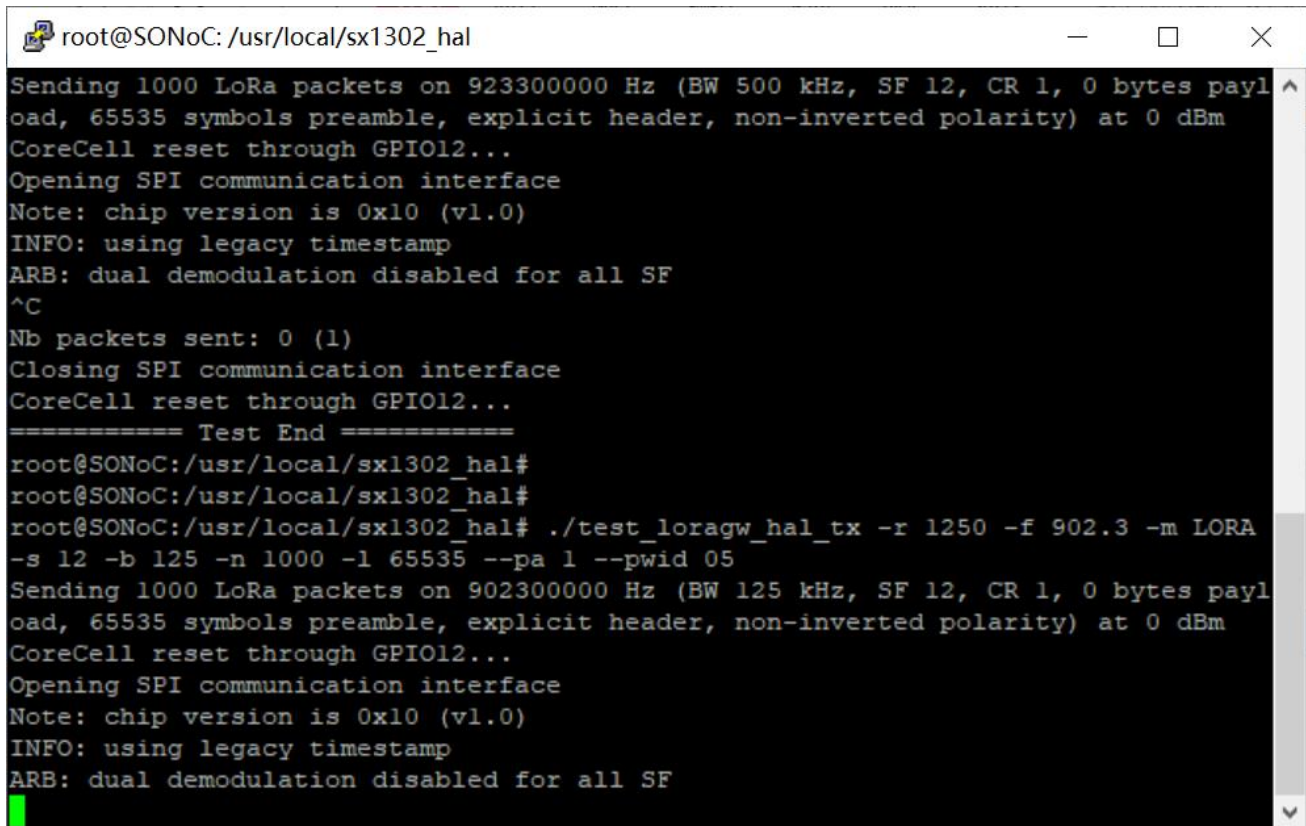
EUT Software Settings:

Mode	☒ Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.
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During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power level setup in software			
Test Software Version	Putty		
Support Units (Software installation media)	Description	Manufacturer	Model
	Notebook	HP	N/A
Mode	Channel	Frequency (MHz)	Soft Set
LoRa	1	902.3	--pa 1 pwid 05
	33	908.7	--pa 1 pwid 05
	64	914.9	--pa 1 pwid 05

Run Software:



```

root@SONoC: /usr/local/sx1302_hal

Sending 1000 LoRa packets on 923300000 Hz (BW 500 kHz, SF 12, CR 1, 0 bytes payload, 65535 symbols preamble, explicit header, non-inverted polarity) at 0 dBm
CoreCell reset through GPIO12...
Opening SPI communication interface
Note: chip version is 0x10 (v1.0)
INFO: using legacy timestamp
ARB: dual demodulation disabled for all SF
^C
Nb packets sent: 0 (1)
Closing SPI communication interface
CoreCell reset through GPIO12...
===== Test End =====
root@SONoC:/usr/local/sx1302_hal#
root@SONoC:/usr/local/sx1302_hal#
root@SONoC:/usr/local/sx1302_hal# ./test_loragw_hal_tx -r 1250 -f 902.3 -m LORA
-s 12 -b 125 -n 1000 -l 65535 --pa 1 --pwid 05
Sending 1000 LoRa packets on 902300000 Hz (BW 125 kHz, SF 12, CR 1, 0 bytes payload, 65535 symbols preamble, explicit header, non-inverted polarity) at 0 dBm
CoreCell reset through GPIO12...
Opening SPI communication interface
Note: chip version is 0x10 (v1.0)
INFO: using legacy timestamp
ARB: dual demodulation disabled for all SF
  
```

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C	Miscellaneous Wireless Communications Services
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	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
4	RSS-247 Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems(FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
5	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Test Verdict

No.	Description	FCC Part No.	ISED Part No.	Modulation Technology	Channel	Test Result	Verdict
1	Antenna Requirement	15.203	RSS-247, 5.4 (d)	N/A	N/A	--	Pass ^{Note}
2	Number of Hopping Frequencies	15.247(a)	RSS-247, 5.1 (c)	Frequency hopping system	Hopping Mode	ANNEX A.1	Pass
3	Peak Output Power	15.247(b)	RSS-247, 5.4 (a)	Frequency hopping system	Low/Middle/High	ANNEX A.2	Pass
4	Occupied Bandwidth	15.247(a)	RSS-247, 5.1 (a)	Frequency hopping system	Low/Middle/High	ANNEX A.3	Pass
5	Carrier Frequency Separation	15.247(a)	RSS-247, 5.1 (b)	Frequency hopping system	Hopping Mode	ANNEX A.4	Pass
6	Time of Occupancy (Dwell time)	15.247(a)	RSS-247, 5.1 (c)	Frequency hopping system	Hopping Mode	ANNEX A.5	Pass
7	Conducted Spurious Emission & Authorized-band band-edge	15.247(d)	RSS-247, 5.5	Frequency hopping system	Low/Middle/High, Hopping Mode	ANNEX A.6	Pass
8	Conducted Emission	15.207	RSS-GEN, 8.8	Frequency hopping system	Low/Middle/High	ANNEX A.7	Pass
9	Radiated Spurious Emission	15.209 15.247(d)	RSS-247, 5.5	Frequency hopping system	Low/Middle/High, Hopping Mode	ANNEX A.8	Pass
10	Band Edge(Restricted-band band-edge)	15.209 15.247(d)	RSS-247, 5.5	Frequency hopping system	Low/Middle/High, Hopping Mode	ANNEX A.9	Pass

Note: Please refer to section 5.1

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

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

Relative Humidity	45% to 55%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+22°C to +25°C
Working Voltage of the EUT	NV (Normal Voltage)	12.0 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	101544	2022.01.04	2023.01.03
Spectrum Analyzer	KEYSIGHT	N9020A	MY50330200	2022.05.19	2023.05.18
Signaling Unit	ROHDE&SCHWARZ	CMW500	142028	2022.05.19	2023.05.18
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2021.09.13	2022.09.12
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2021.10.10	2022.10.09
LISN	SCHWARZBECK	NSLK 8127	8127-687	2022.06.01	2023.05.31
Test Antenna- Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2021.04.16	2024.04.15
Test Antenna- Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2021.08.20	2024.08.19
Test Antenna- Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	01917	2022.06.09	2025.06.08
Test Antenna- Horn (18-40 GHz)	A-INFO	LB- 180400KF	J211060273	2021.07.02	2024.07.01
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2022.02.19	2024.09.03
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60 *7.35m	N/A	2021.08.15	2024.08.14
Shielded Enclosure	ChangNing	CN-130701	130703	--	--

4.3 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	0.82°C
Humidity	4.1%

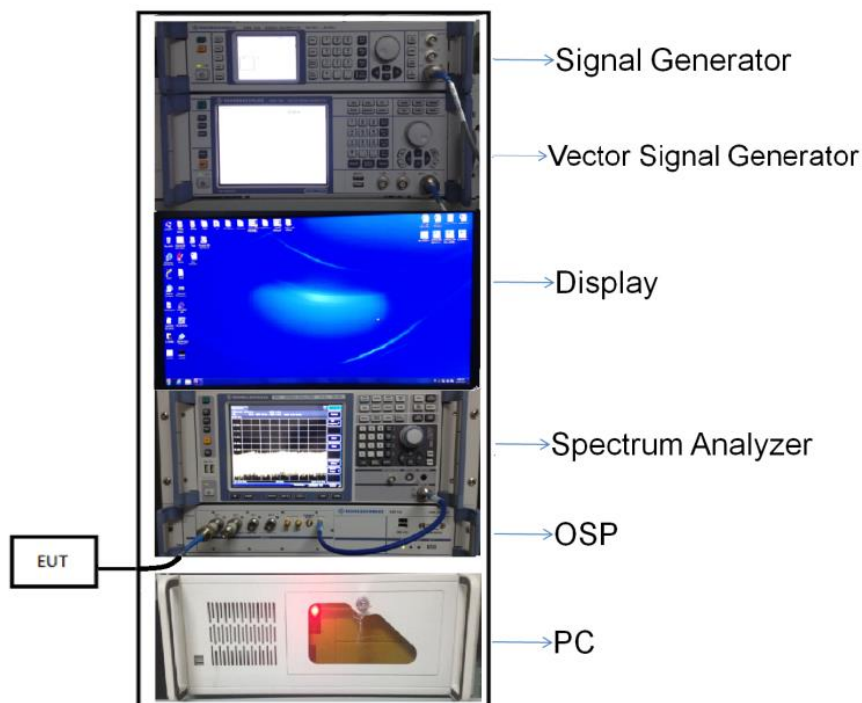
4.4 Description of Test Setup

4.4.1 For Antenna Port Test

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

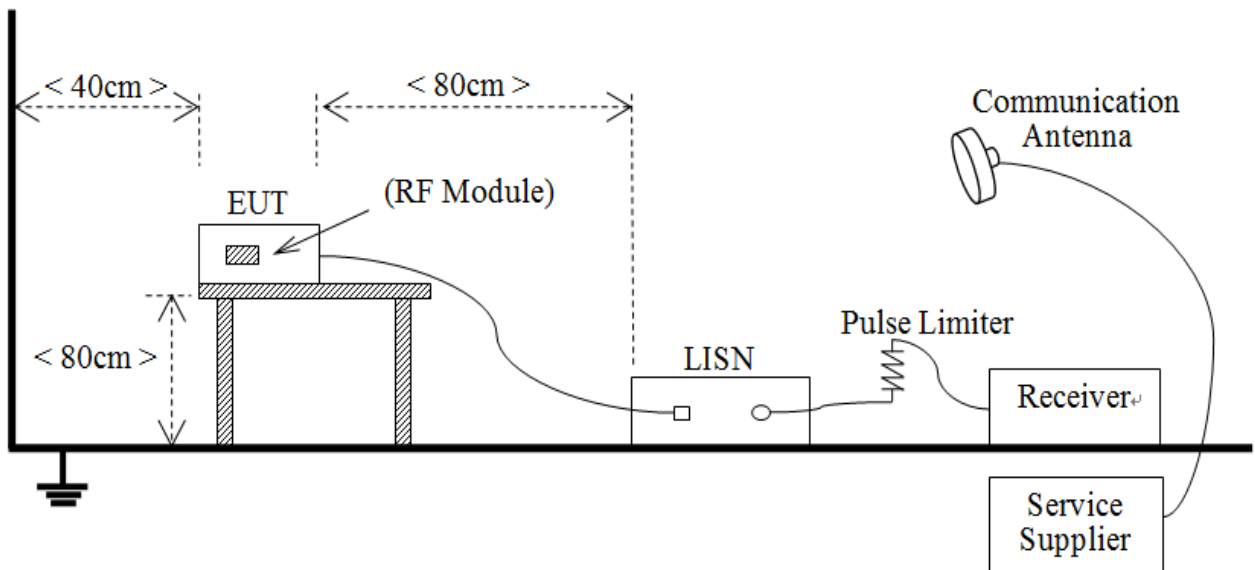
For example: the measurement value is 10 dBm and the cable 0.5dBm used, then the final result of EUT:

Conducted value (dBm) = 10 dBm + 0.5 dB = 10.5 dBm



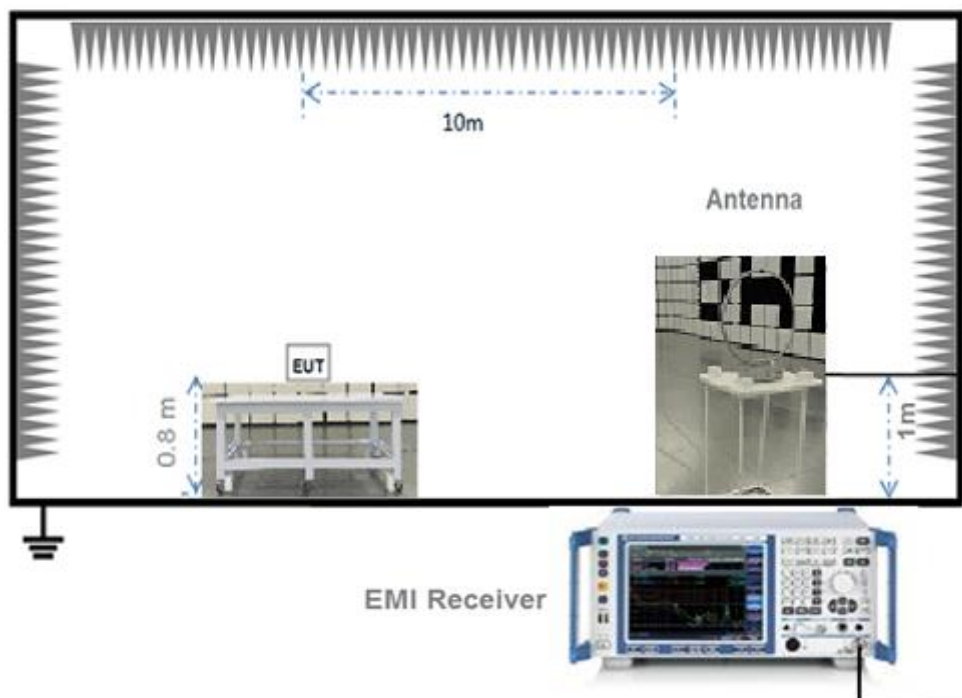
(Diagram 1)

4.4.2 For AC Power Supply Port Test



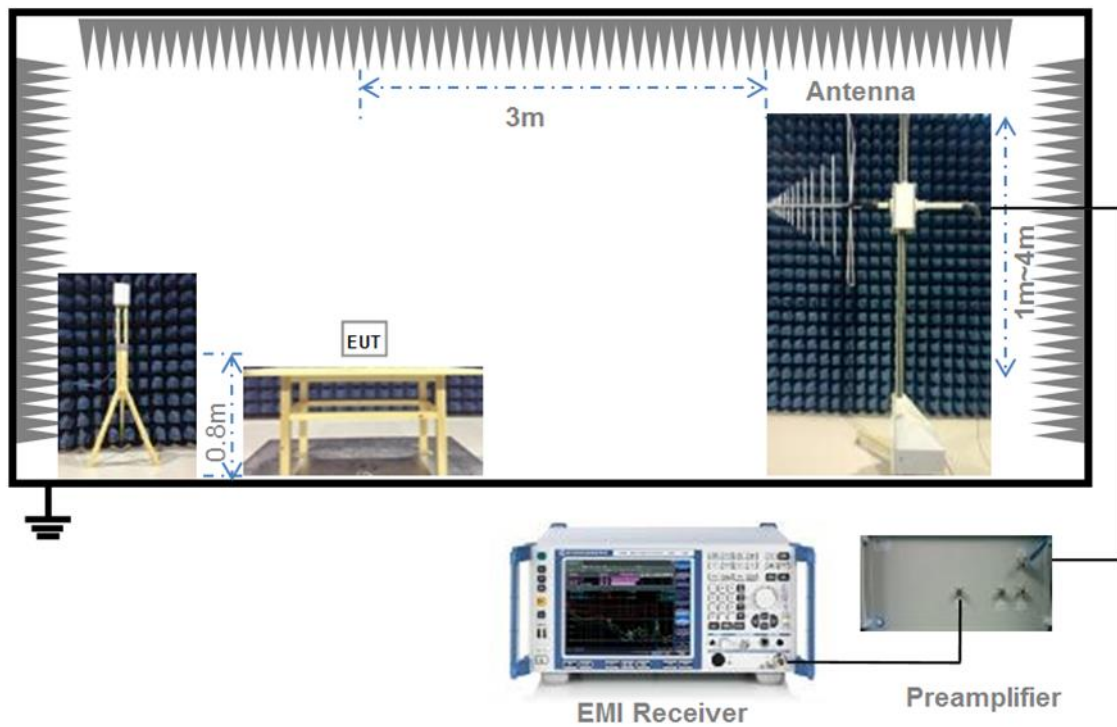
(Diagram 2)

4.4.3 For Radiated Test (Below 30 MHz)



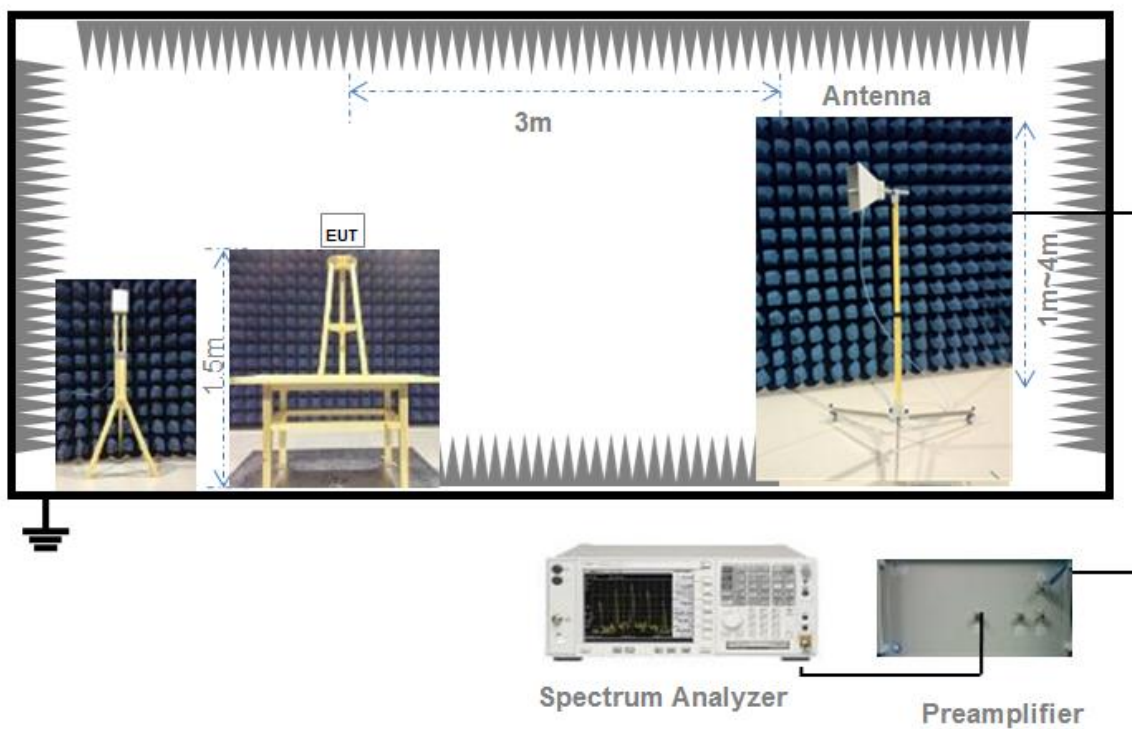
(Diagram 3)

4.4.4 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.4.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.5 Measurement Results Explanation Example

4.5.1 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; RSS-247, 5.4 (d)

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); RSS-247, 5.1 (c)

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 $\geq$ 1% of the span

VBW $\geq$ 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 and E.I.R.P

5.3.1 Test Limit

FCC § 15.247(b); RSS-247, 5.4 (a)

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.

RSS-247, 5.4 (2)

For FHSs operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W and the e.i.r.p. shall not exceed 4 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W and the e.i.r.p. shall not exceed 0.5 W if the hopset uses less than 75 hopping channels (see Section 5.4(5) for exceptions).

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 $\geq$ 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); RSS-247, 5.1 (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 $\geq$ 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); RSS-247, 5.1 (b)

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) $\geq 1\%$ of the span

Video (or Average) Bandwidth (VBW) $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

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); RSS-247, 5.1 (c)

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); RSS-247, 5.5

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 $\geq$ 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; RSS-GEN, 8.8

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 50 μ H/50 Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dB μ V)	
	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); RSS-247, 5.5

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 $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ 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); RSS-247, 5.5

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 $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ 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

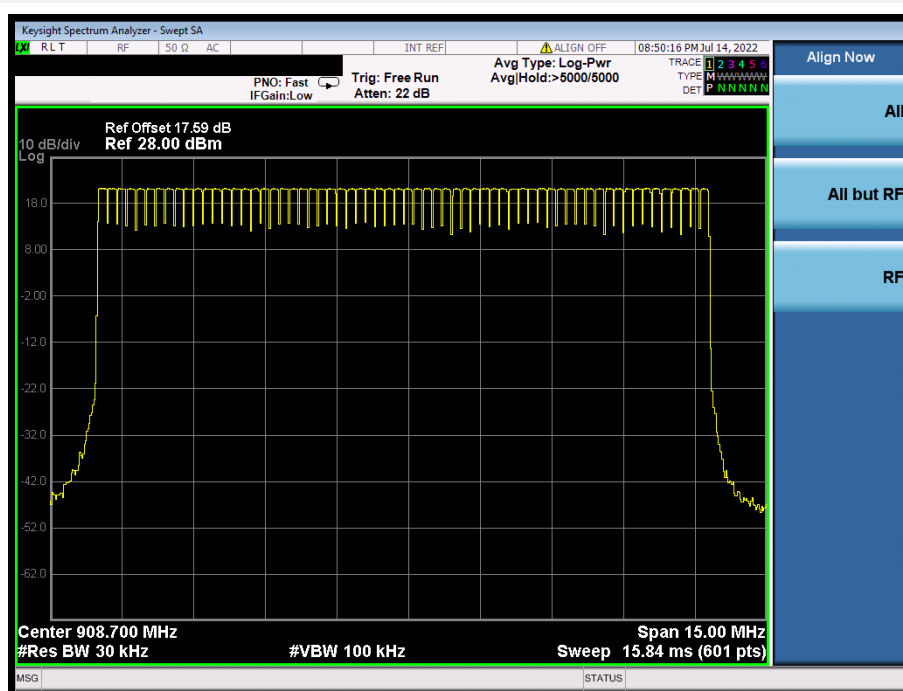
A.1 Number of Hopping Frequency

Test Data

Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
LoRa	902-928	64	50	Pass

Test Plots

LoRa



A.2 Peak Output Power

Peak Power Test Data

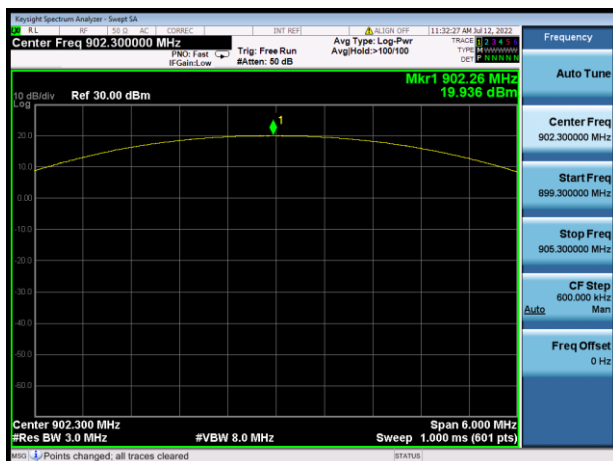
Channel	Measured Output Peak Power		Limit		Verdict
	LoRa		dBm	mW	
	dBm	mW			
Low	19.94	98.54	30	1000	Pass
Middle	19.96	99.04			Pass
High	19.97	99.29			Pass

E.I.R.P Test Data (For ISED)

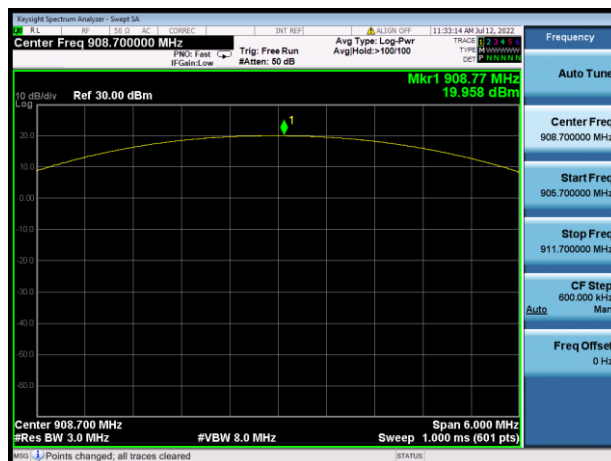
Channel	Measured Output Peak Power		Limit		Verdict
	LoRa		dBm	mW	
	dBm	mW			
Low	21.14	129.90	36	4000	Pass
Middle	21.16	130.56			Pass
High	21.17	130.89			Pass

Test Plots

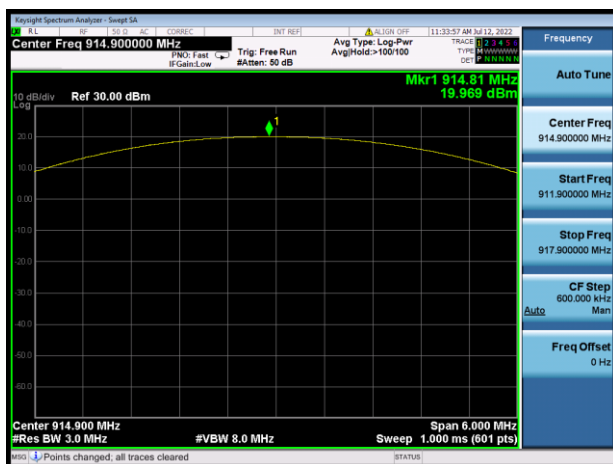
LOW CHANNEL



MIDDLE CHANNEL



HIGH CHANNEL



A.3 20 dB and 99% bandwidth

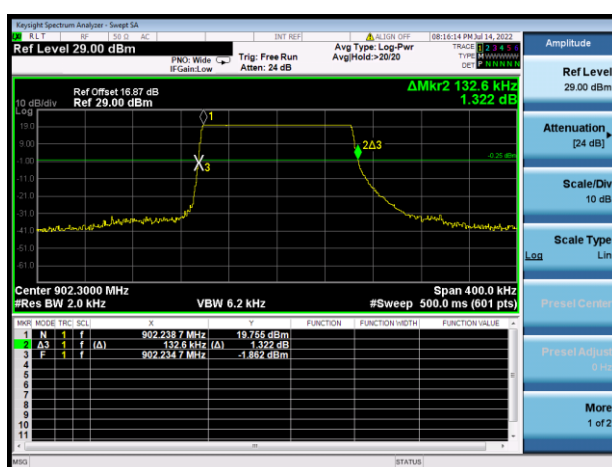
Test Data

LoRa			
Channel	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Verdict
Low	0.132600	0.124570	Pass
Middle	0.133400	0.124570	Pass
High	0.133400	0.124430	Pass

Test Plots

20 dB Bandwidth

LOW CHANNEL



MIDDLE CHANNEL

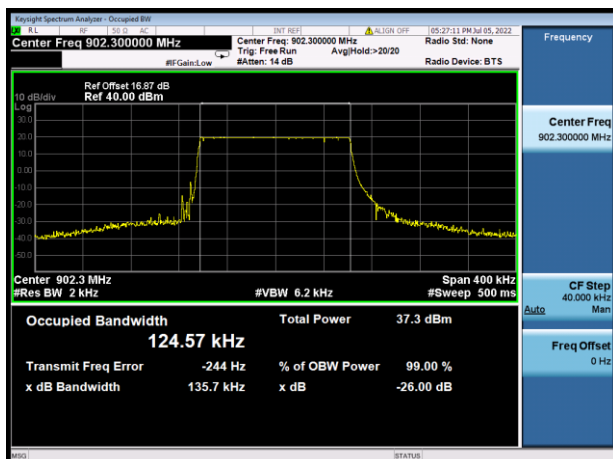


HIGH CHANNEL

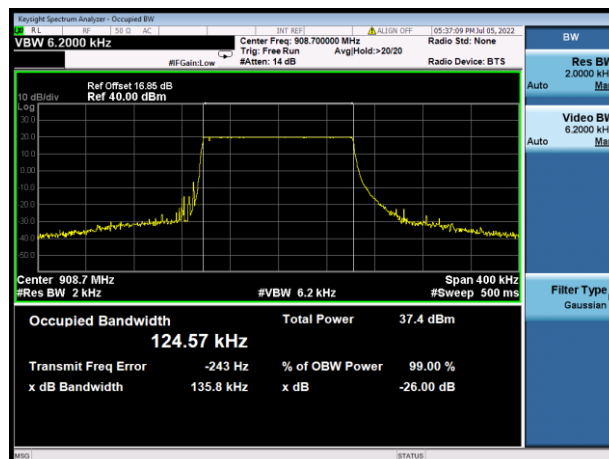


99% Bandwidth

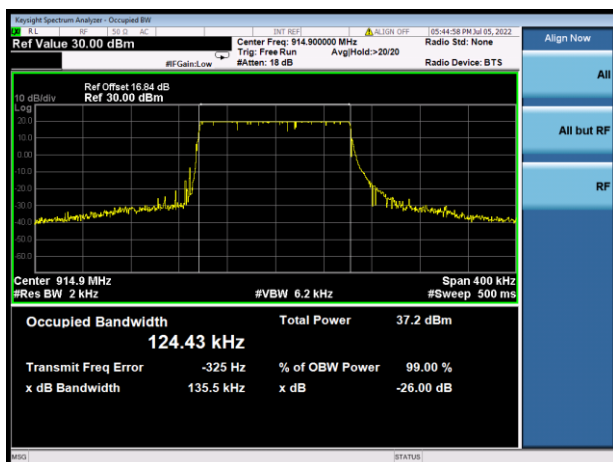
LOW CHANNEL



MIDDLE CHANNEL



HIGH CHANNEL



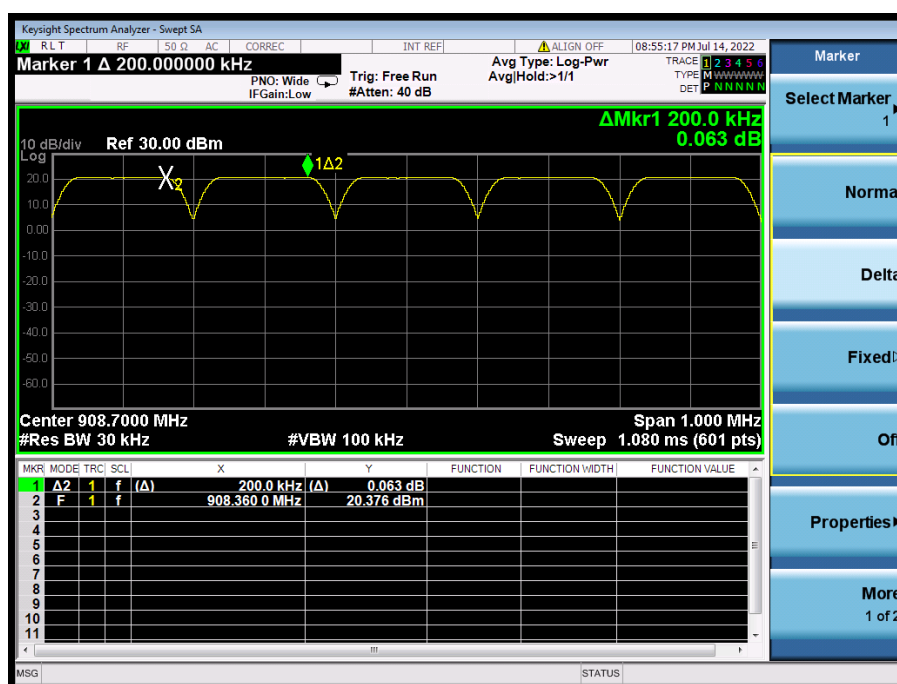
A.4 Hopping Frequency Separation

Test Data

Mode	Frequency separation (MHz)	Max 20 dB Bandwidth (MHz)	Verdict
LoRa	0.200	0.133	Pass

Test Plots

LoRa

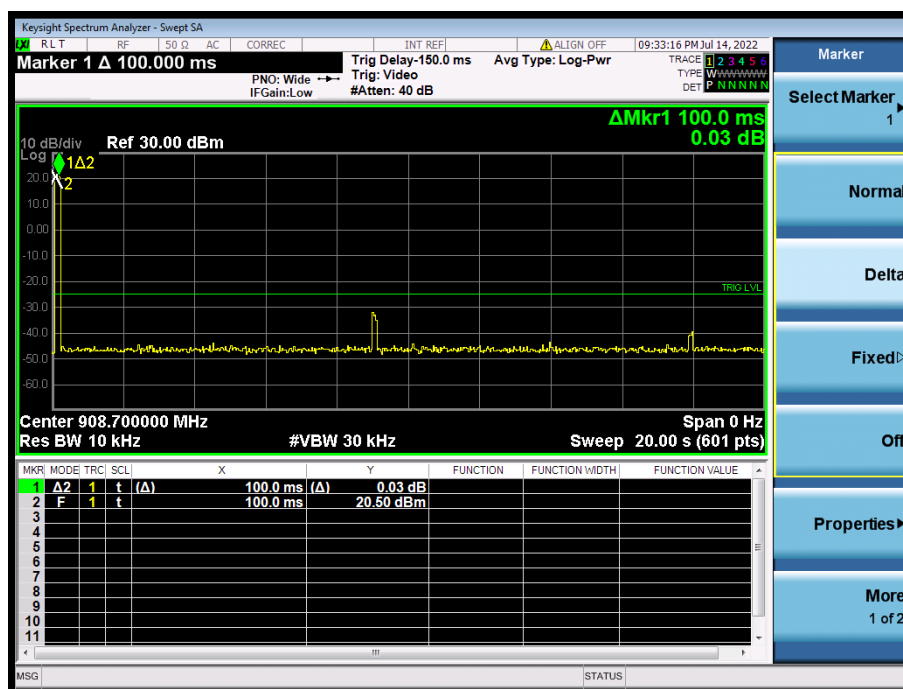


A.5 Average Time of Occupancy

Test Data

Total of Dwell (ms)	Limit (sec)	Verdict
100.000	0.4	Pass

LoRa



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

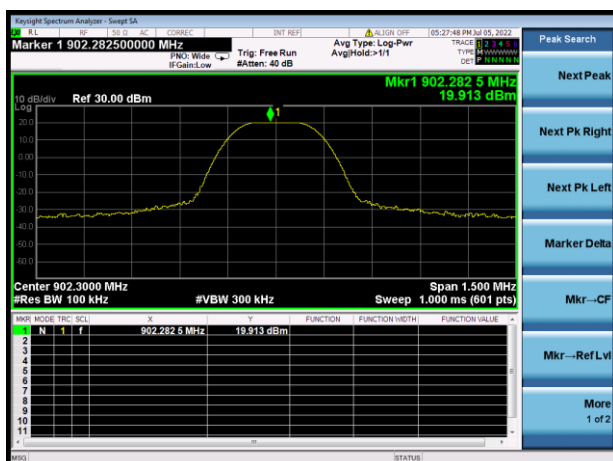
Test Data

LoRa				
Channel	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Low	-17.22	19.91	-0.09	Pass
Middle	-17.18	19.95	-0.05	Pass
High	-17.12	19.97	-0.03	Pass

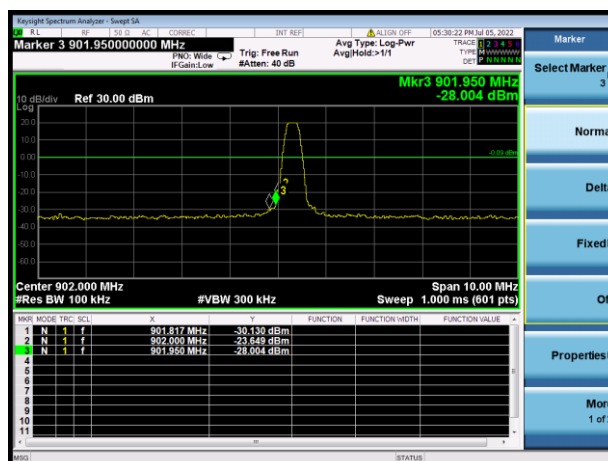
LoRa				
Mode	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
		Carrier Level	Calculated 20 dBc Limit	
Hopping	-17.33	20.56	0.56	Pass

Test Plots

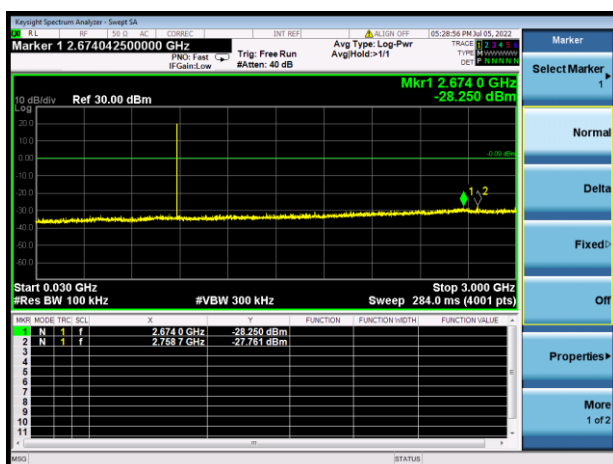
LOW CHANNEL, CARRIER LEVEL



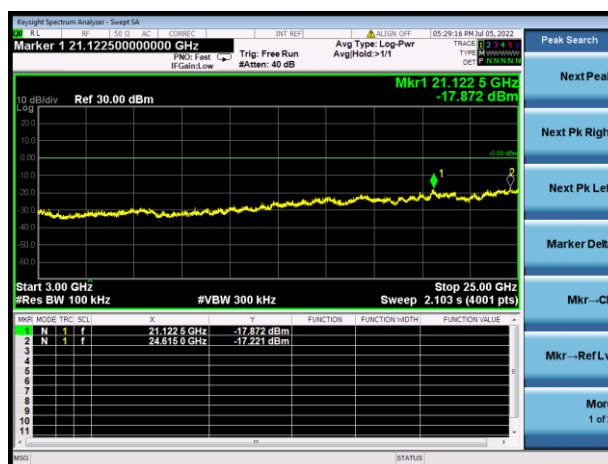
LOW CHANNEL, Band Edge



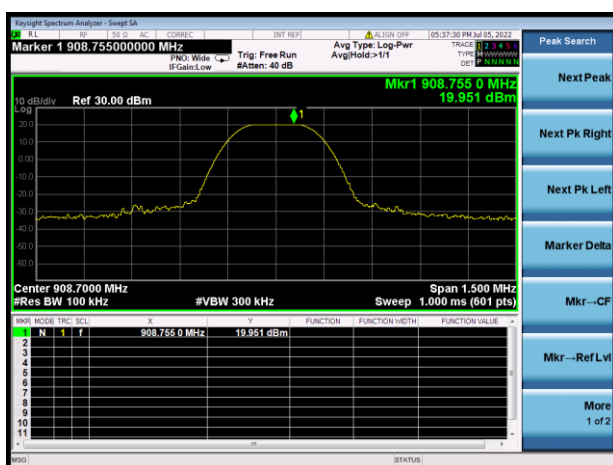
LOW CHANNEL, SPURIOUS 30 MHz ~ 3 GHz



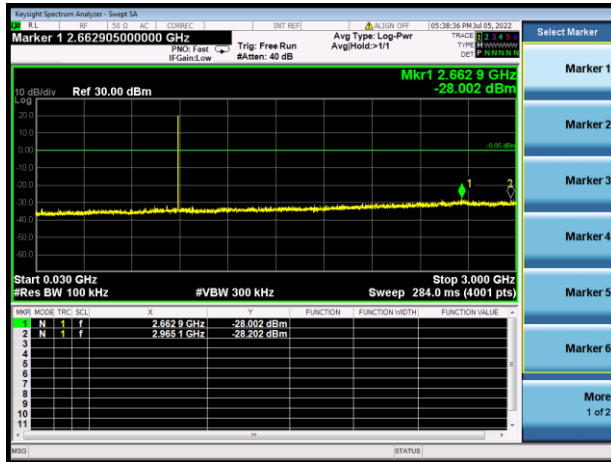
LOW CHANNEL, SPURIOUS 3 GHz ~ 25 GHz



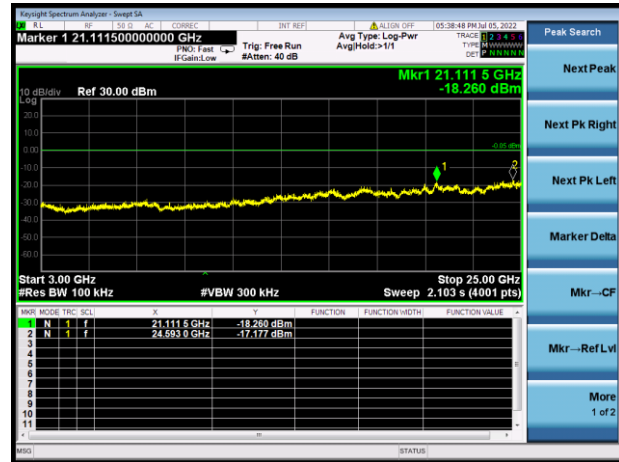
MIDDLE CHANNEL, CARRIER LEVEL



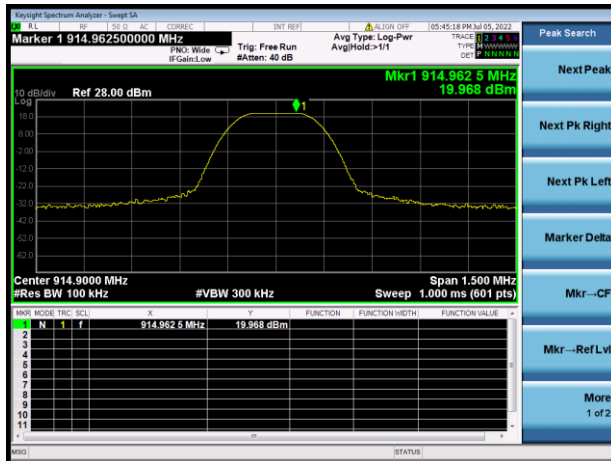
MIDDLE CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



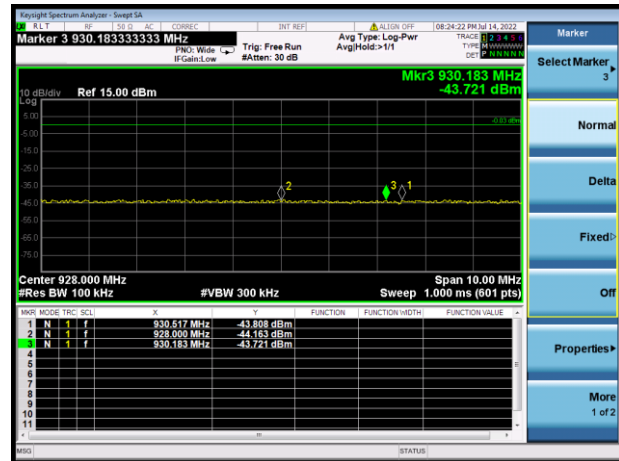
MIDDLE CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



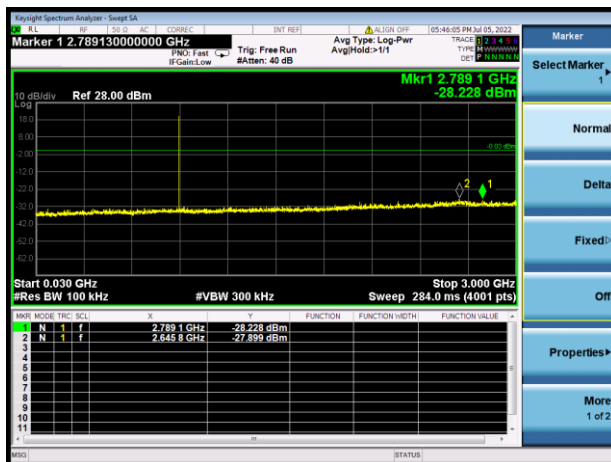
HIGH CHANNEL, CARRIER LEVEL



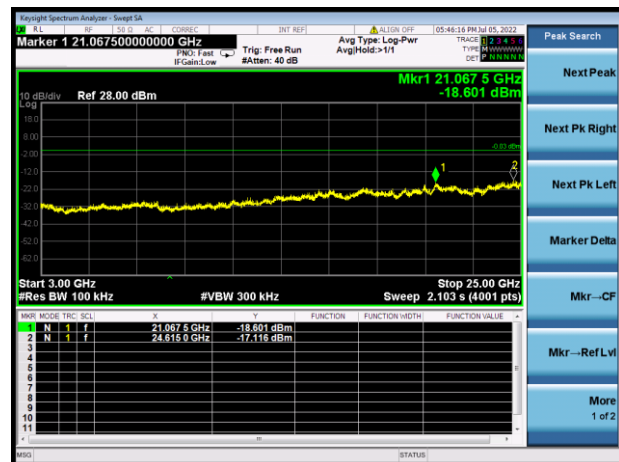
HIGH CHANNEL , BAND EDGE



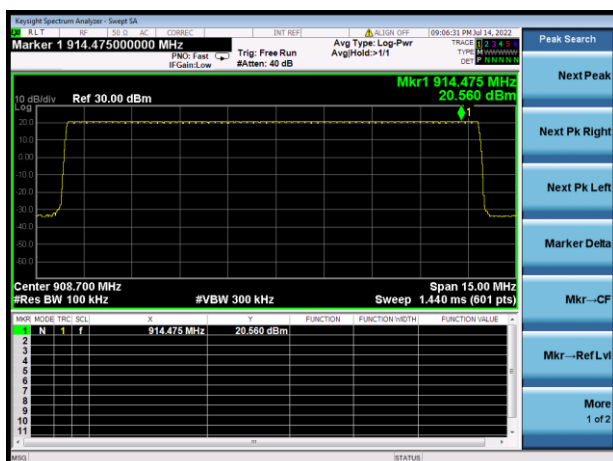
HIGH CHANNEL , SPURIOUS 30 MHz ~ 3 GHz



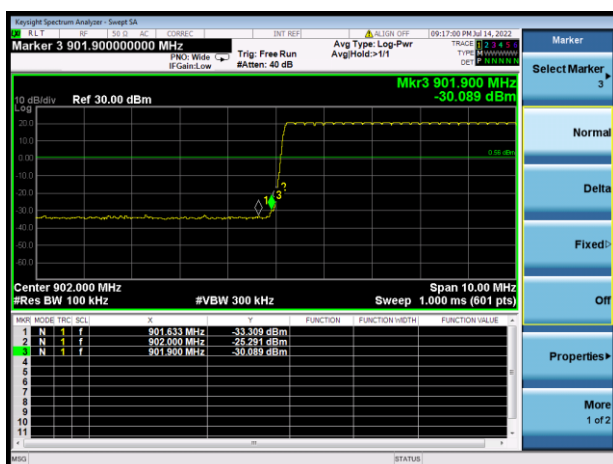
HIGH CHANNEL , SPURIOUS 3 GHz ~ 25 GHz



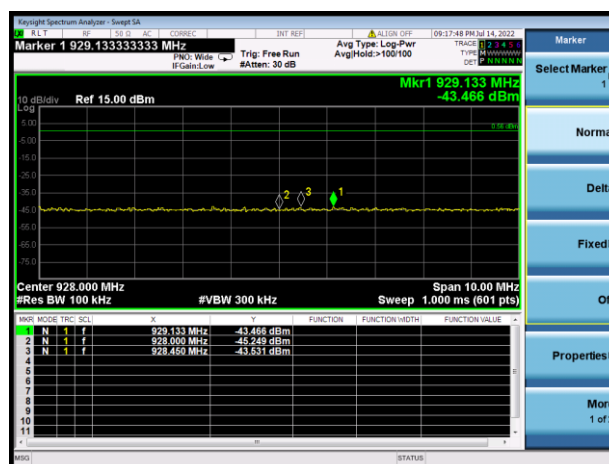
HOPPING, CARRIER LEVEL



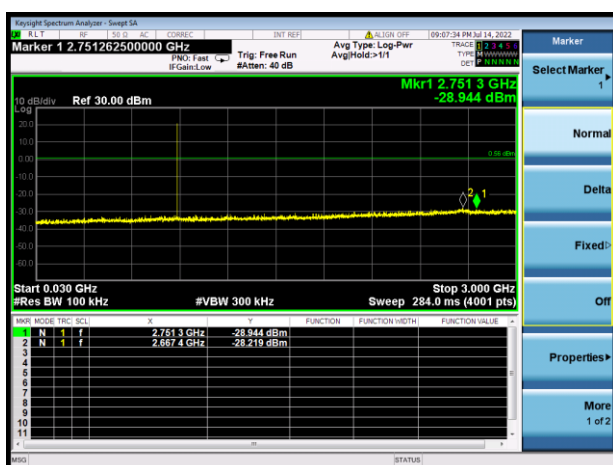
HOPPING BAND EDGE (LOW)



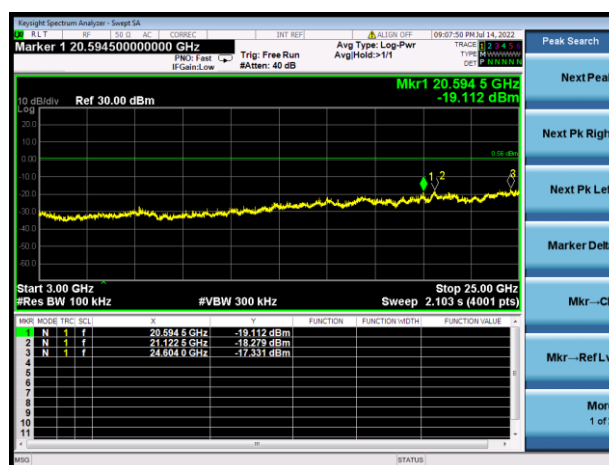
HOPPING BAND EDGE (HIGH)



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.

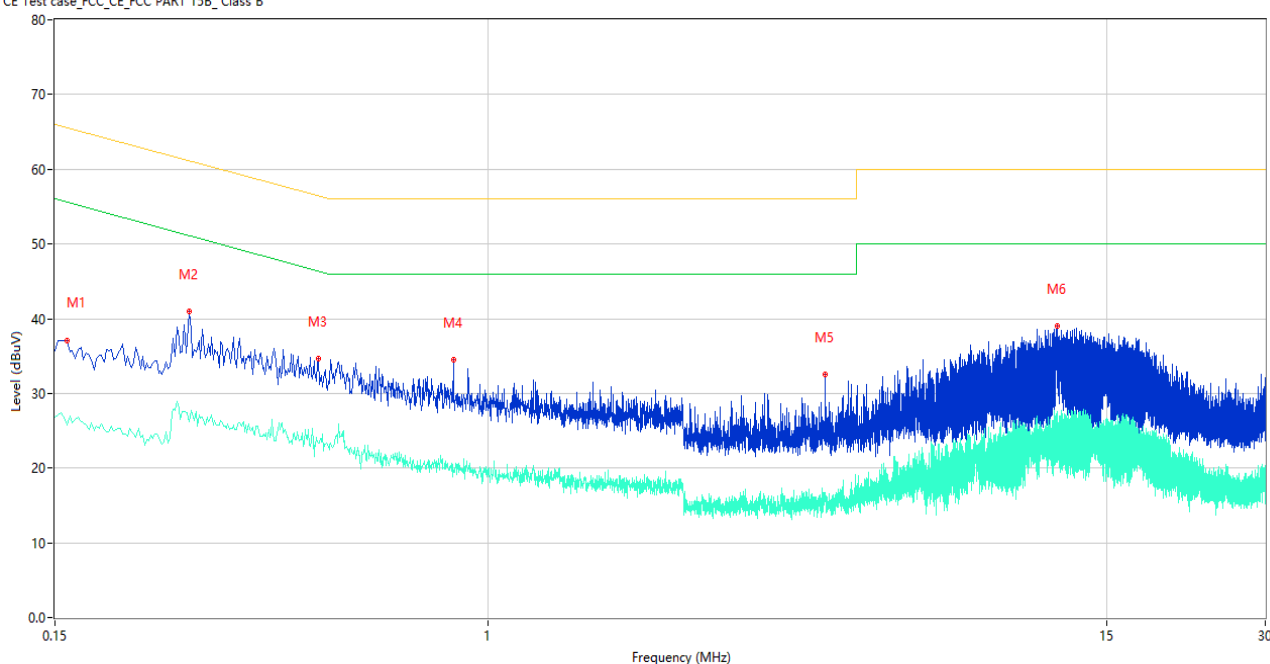
Note ²: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 60 Hz and 240 VAC, 50 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration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

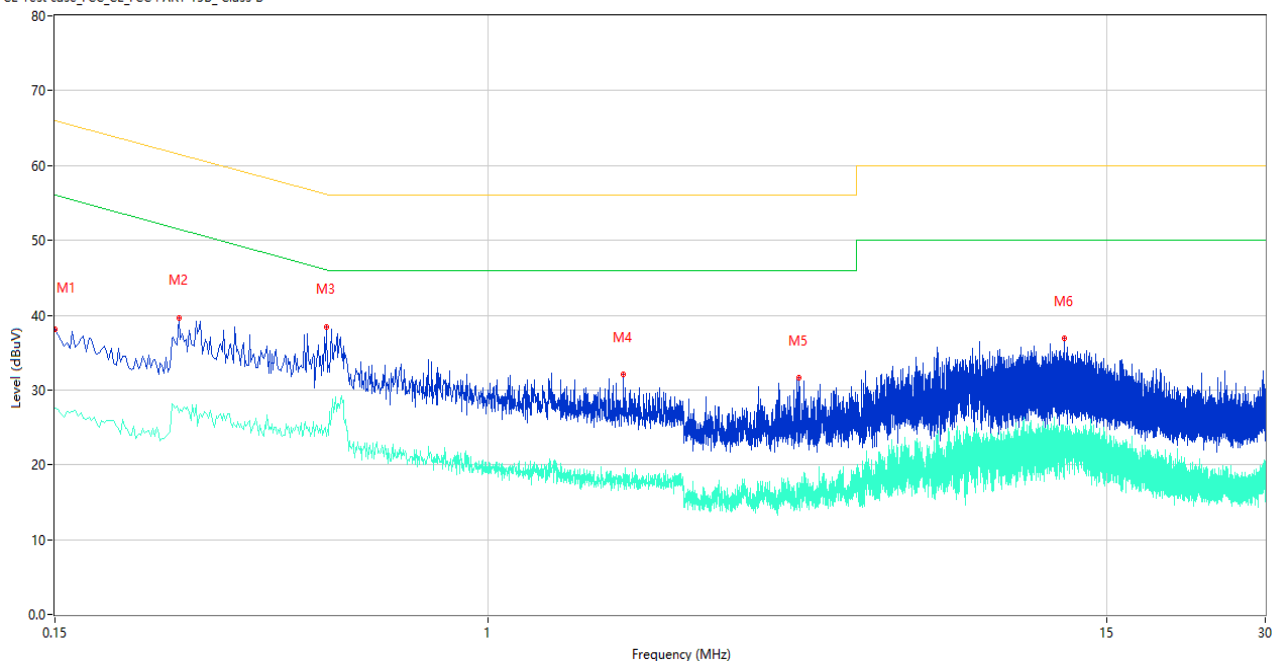
CE Test case_FCC_CE_FCC PART 15B_Class B



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.158	37.13	10.18	65.57	-28.44	Peak	L	Pass
1**	0.158	25.81	10.18	55.57	-29.76	AV	L	Pass
2	0.270	40.99	10.08	61.12	-20.13	Peak	L	Pass
2**	0.270	26.20	10.08	51.12	-24.92	AV	L	Pass
3	0.476	34.64	10.11	56.41	-21.77	Peak	L	Pass
3**	0.476	23.37	10.11	46.41	-23.04	AV	L	Pass
4	0.858	34.46	10.05	56.00	-21.54	Peak	L	Pass
4**	0.858	19.80	10.05	46.00	-26.20	AV	L	Pass
5	4.372	32.55	10.03	56.00	-23.45	Peak	L	Pass
5**	4.372	16.17	10.03	46.00	-29.83	AV	L	Pass
6	12.062	39.05	10.12	60.00	-20.95	Peak	L	Pass
6**	12.062	27.57	10.12	50.00	-22.43	AV	L	Pass

PHASE N

CE Test case_FCC_CE_FCC PART 15B_Class B

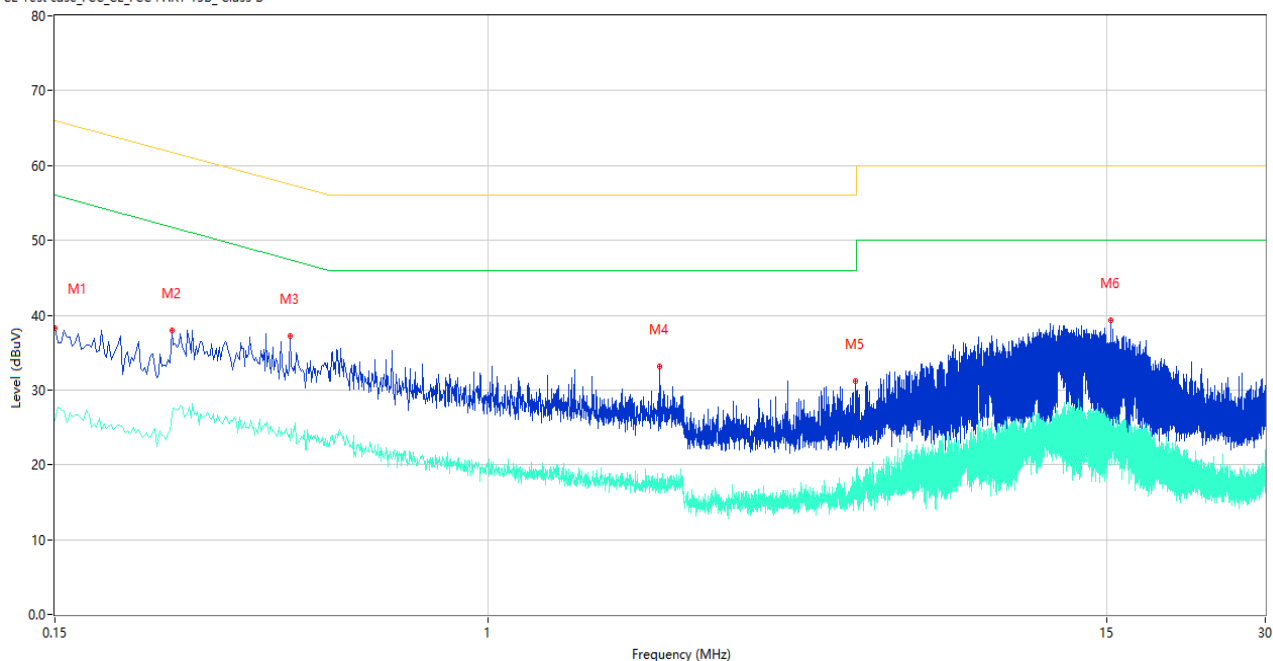


No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.150	38.18	10.19	66.00	-27.82	Peak	N	Pass
1**	0.150	27.62	10.19	56.00	-28.38	AV	N	Pass
2	0.258	39.67	10.08	61.50	-21.83	Peak	N	Pass
2**	0.258	26.96	10.08	51.50	-24.54	AV	N	Pass
3	0.492	38.49	10.11	56.13	-17.64	Peak	N	Pass
3**	0.492	23.80	10.11	46.13	-22.33	AV	N	Pass
4	1.806	32.02	9.89	56.00	-23.98	Peak	N	Pass
4**	1.806	18.87	9.89	46.00	-27.13	AV	N	Pass
5	3.890	31.61	10.09	56.00	-24.39	Peak	N	Pass
5**	3.890	16.81	10.09	46.00	-29.19	AV	N	Pass
6	12.450	36.91	10.11	60.00	-23.09	Peak	N	Pass
6**	12.450	23.07	10.11	50.00	-26.93	AV	N	Pass

HOPPING

PHASE L

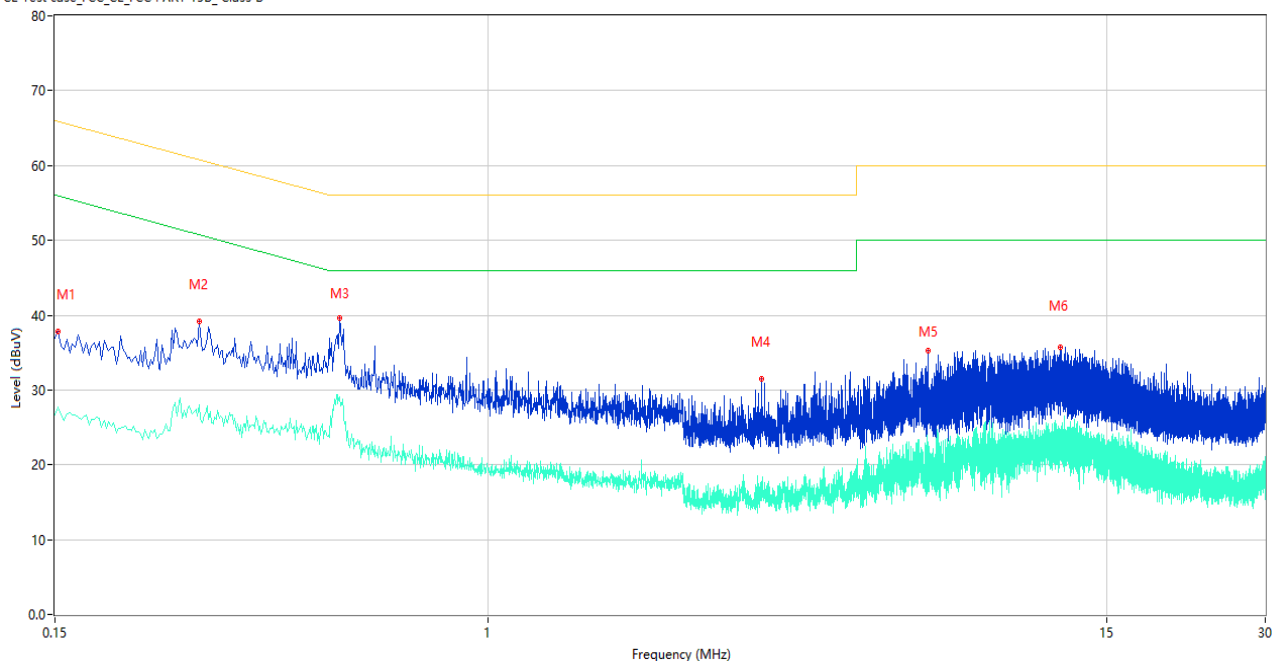
CE Test case_FCC_CE_FCC PART 15B_Class B



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.150	38.33	10.19	66.00	-27.67	Peak	L	Pass
1**	0.150	25.90	10.19	56.00	-30.10	AV	L	Pass
2	0.250	37.96	10.08	61.76	-23.80	Peak	L	Pass
2**	0.250	26.87	10.08	51.76	-24.89	AV	L	Pass
3	0.420	37.25	10.09	57.45	-20.20	Peak	L	Pass
3**	0.420	23.13	10.09	47.45	-24.32	AV	L	Pass
4	2.116	33.07	9.88	56.00	-22.93	Peak	L	Pass
4**	2.116	17.30	9.88	46.00	-28.70	AV	L	Pass
5	4.998	31.14	9.93	56.00	-24.86	Peak	L	Pass
5**	4.998	17.37	9.93	46.00	-28.63	AV	L	Pass
6	15.276	39.34	10.15	60.00	-20.66	Peak	L	Pass
6**	15.276	22.69	10.15	50.00	-27.31	AV	L	Pass

PHASE N

CE Test case_FCC_CE_FCC PART 15B_Class B



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.152	37.75	10.19	65.89	-28.14	Peak	N	Pass
1**	0.152	27.69	10.19	55.89	-28.20	AV	N	Pass
2	0.282	39.16	10.07	60.76	-21.60	Peak	N	Pass
2**	0.282	28.07	10.07	50.76	-22.69	AV	N	Pass
3	0.522	39.68	10.11	56.00	-16.32	Peak	N	Pass
3**	0.522	29.12	10.11	46.00	-16.88	AV	N	Pass
4	3.314	31.49	10.08	56.00	-24.51	Peak	N	Pass
4**	3.314	17.44	10.08	46.00	-28.56	AV	N	Pass
5	6.870	35.20	9.86	60.00	-24.80	Peak	N	Pass
5**	6.870	21.56	9.86	50.00	-28.44	AV	N	Pass
6	12.238	35.74	10.11	60.00	-24.26	Peak	N	Pass
6**	12.238	23.06	10.11	50.00	-26.94	AV	N	Pass

A.8 Radiated Spurious Emission

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

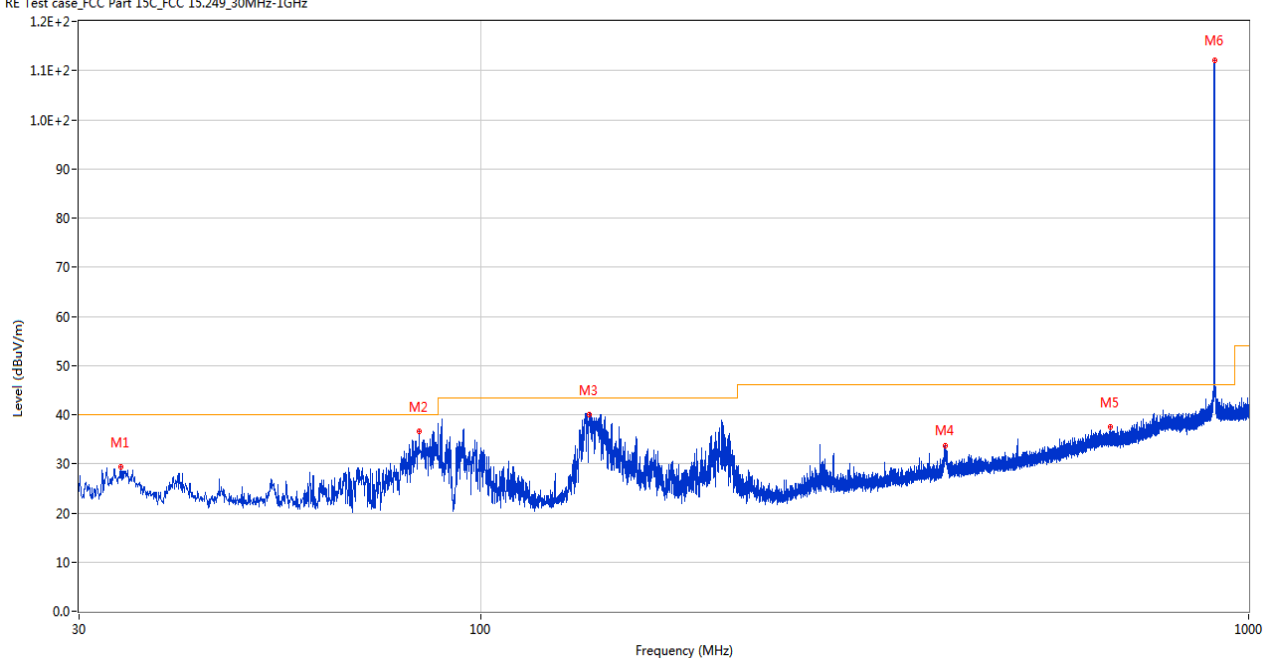
Note ²: For the test data above 1 GHz, according the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

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 and Plots

LOW CHANNEL 30 MHz to 1 GHz, ANT H

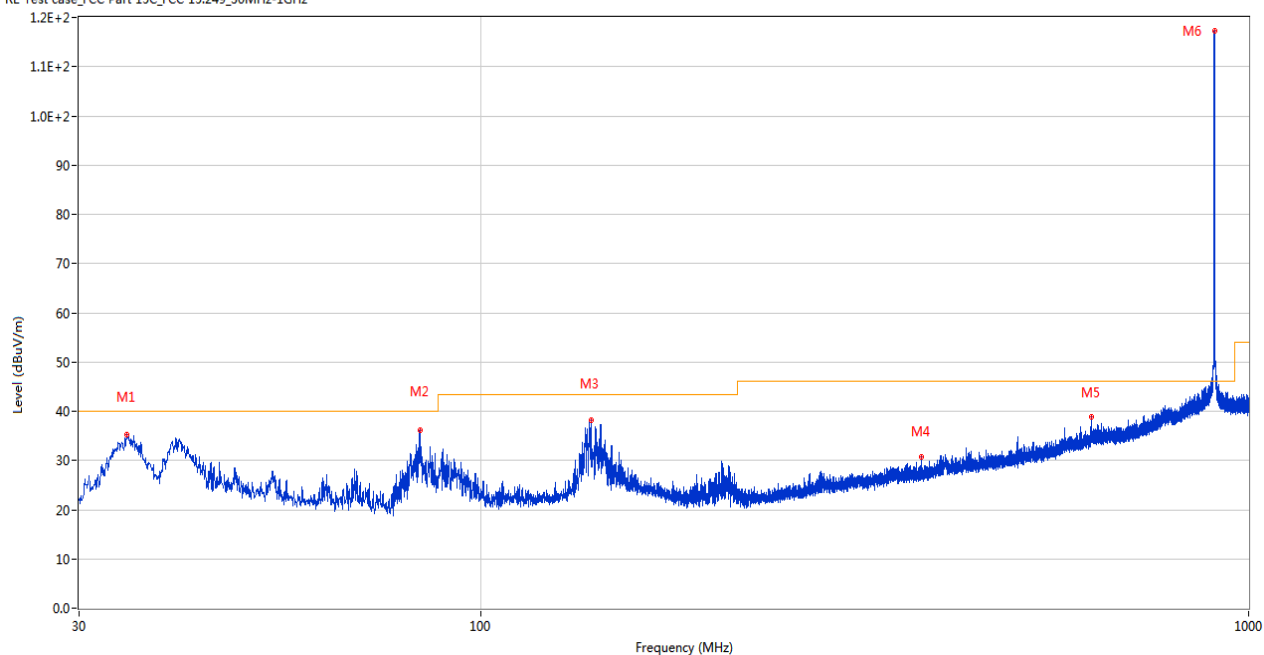
RE Test case_FCC Part 15C_FCC 15.249_30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	33.977	29.34	-14.67	40.0	-10.66	Peak	106.00	200	Horizontal	Pass
2	83.156	36.85	-17.79	40.0	-3.15	Peak	27.00	200	Horizontal	Pass
3	138.640	40.43	-13.12	43.5	-3.07	Peak	195.00	200	Horizontal	Pass
4	402.383	33.56	-8.98	46.0	-12.44	Peak	68.00	100	Horizontal	Pass
5	661.227	37.50	-1.46	46.0	-8.50	Peak	312.00	100	Horizontal	Pass
6	902.321	112.01	4.25	46.0	66.01	Peak	53.00	100	Horizontal	N/A

LOW CHANNEL 30 MHz to 1 GHz, ANT V

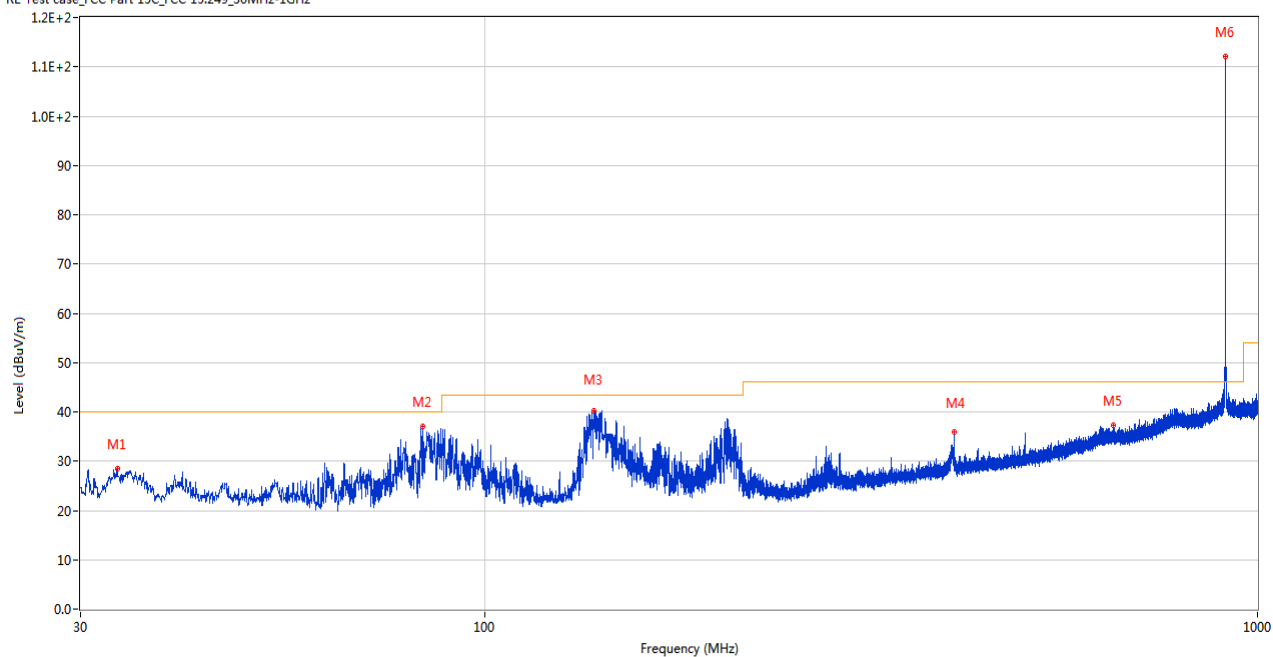
RE Test case_FCC Part 15C_FCC 15.249_30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	34.608	35.32	-14.62	40.0	-4.68	Peak	97.00	100	Vertical	Pass
2	83.301	36.12	-17.79	40.0	-3.88	Peak	125.00	200	Vertical	Pass
3	139.270	38.20	-13.06	43.5	-5.30	Peak	139.00	200	Vertical	Pass
4	374.981	30.83	-9.75	46.0	-15.17	Peak	202.00	100	Vertical	Pass
5	624.998	38.80	-1.53	46.0	-7.20	Peak	233.00	100	Vertical	Pass
6	902.273	117.22	4.25	46.0	71.22	Peak	0.00	100	Vertical	N/A

MIDDEL CHANNEL 30 MHz to 1 GHz, ANT H

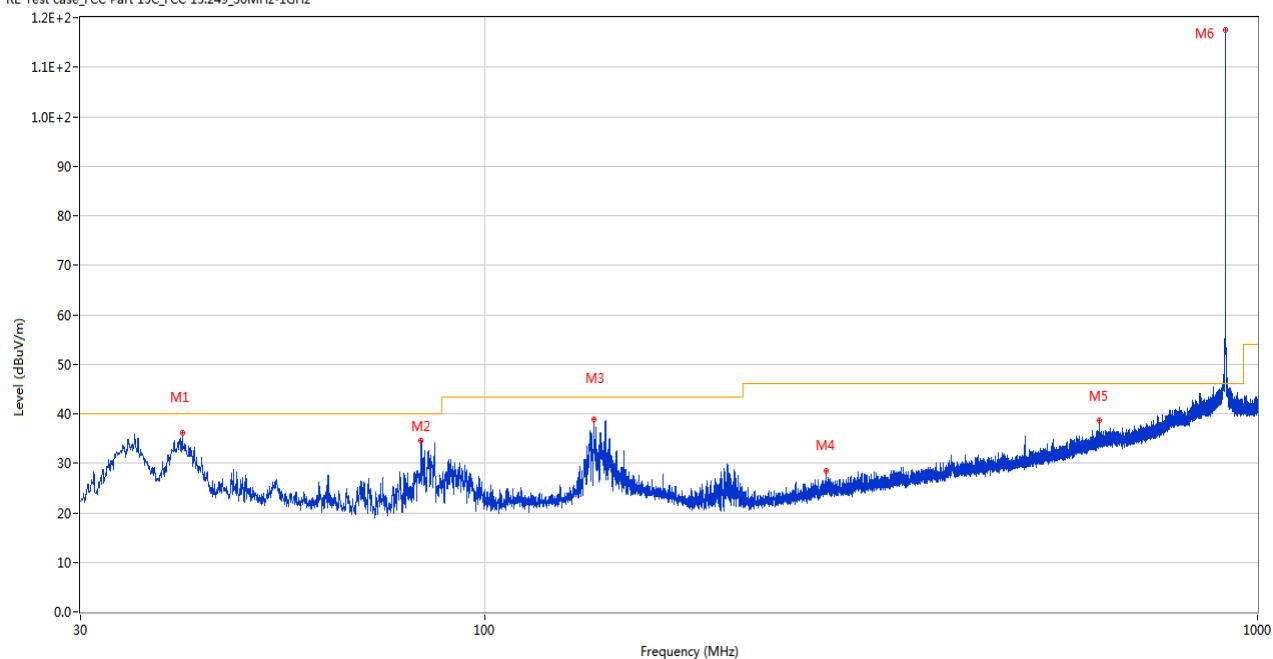
RE Test case_FCC Part 15C_FCC 15.249_30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	33.492	28.48	-14.73	40.0	-11.52	Peak	64.00	100	Horizontal	Pass
2	83.156	36.98	-17.79	40.0	-3.02	Peak	56.00	200	Horizontal	Pass
3	138.689	40.21	-13.11	43.5	-3.29	Peak	191.00	200	Horizontal	Pass
4	405.002	35.89	-8.89	46.0	-10.11	Peak	140.00	100	Horizontal	Pass
5	651.334	37.22	-1.33	46.0	-8.78	Peak	318.00	100	Horizontal	Pass
6	908.723	112.15	4.29	46.0	66.15	Peak	77.00	100	Horizontal	N/A

MIDDEL CHANNEL 30 MHz to 1 GHz, ANT V

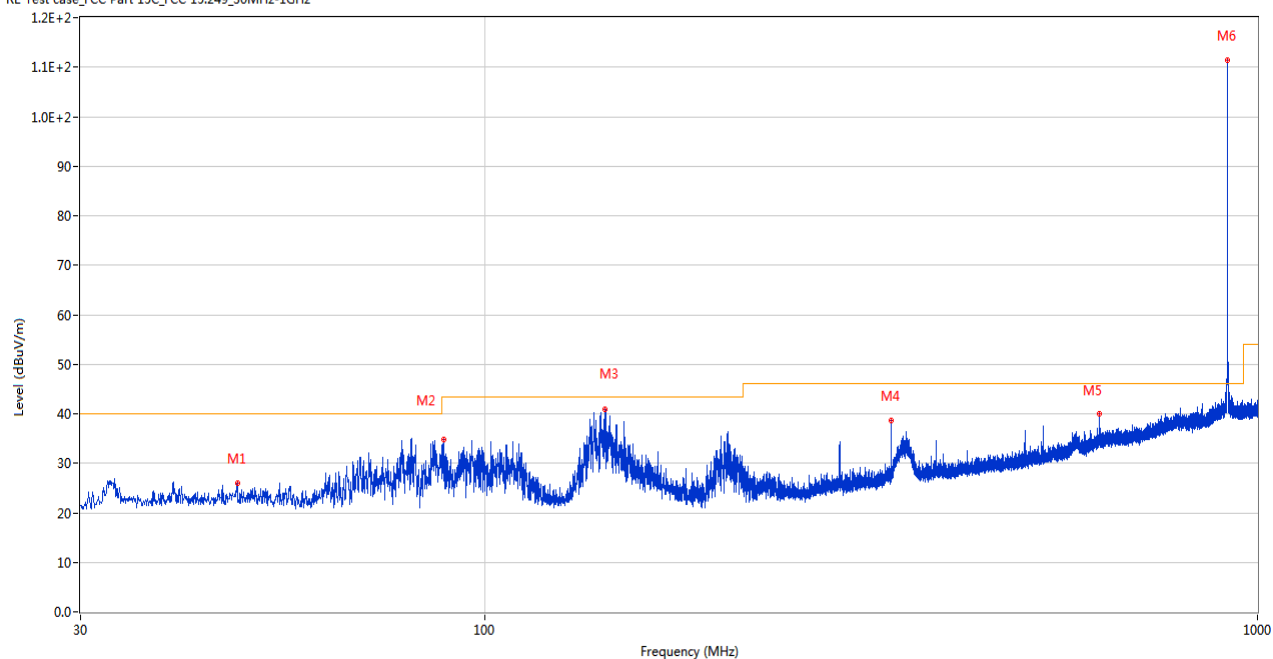
RE Test case_FCC Part 15C_FCC 15.249_30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	40.670	36.22	-13.78	40.0	-3.78	Peak	263.00	100	Vertical	Pass
2	82.768	34.66	-17.80	40.0	-5.34	Peak	92.00	100	Vertical	Pass
3	138.446	38.97	-13.13	43.5	-4.53	Peak	144.00	200	Vertical	Pass
4	276.574	28.58	-12.53	46.0	-17.42	Peak	336.00	200	Vertical	Pass
5	624.998	38.64	-1.53	46.0	-7.36	Peak	240.00	100	Vertical	Pass
6	908.723	117.43	4.29	46.0	71.43	Peak	0.00	100	Vertical	N/A

HIGH CHANNEL 30 MHz to 1 GHz, ANT H

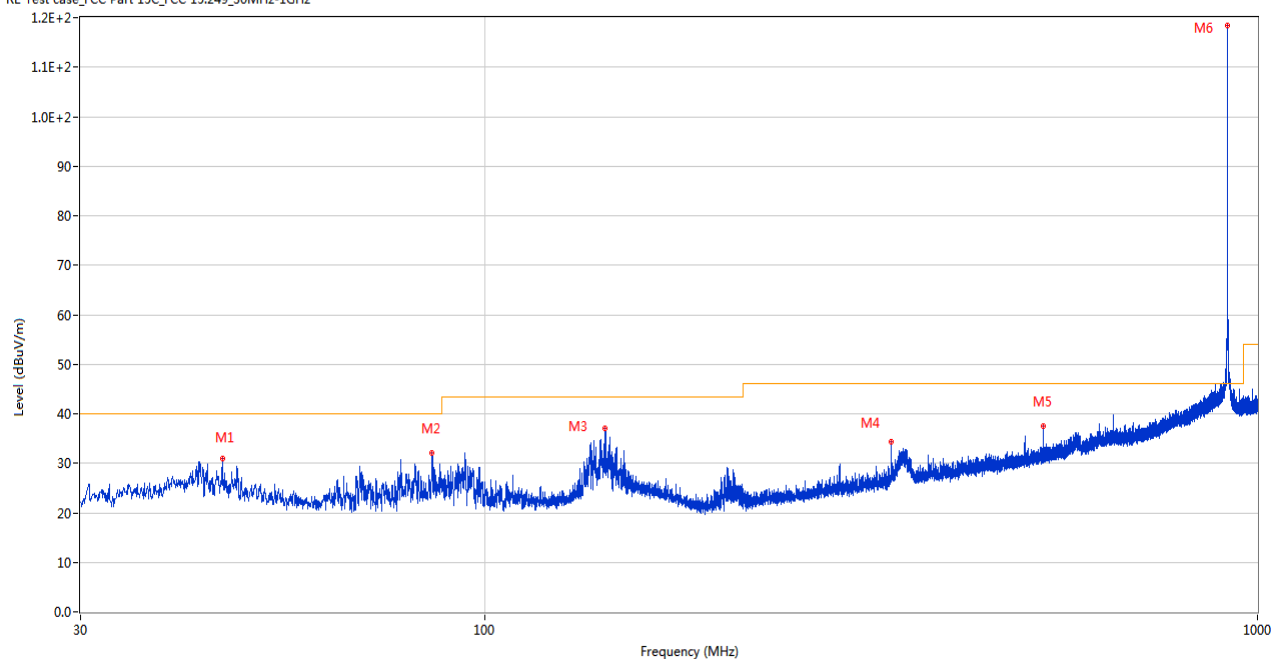
RE Test case_FCC Part 15C_FCC 15.249_30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	47.848	26.07	-14.09	40.0	-13.93	Peak	100.00	200	Horizontal	Pass
2	88.442	34.80	-17.63	43.5	-8.70	Peak	167.00	200	Horizontal	Pass
3	143.248	40.88	-12.70	43.5	-2.62	Peak	203.00	200	Horizontal	Pass
4	336.035	38.62	-10.63	46.0	-7.38	Peak	262.00	100	Horizontal	Pass
5	624.998	40.07	-1.53	46.0	-5.93	Peak	255.00	100	Horizontal	Pass
6	914.931	111.43	4.30	46.0	65.43	Peak	67.00	100	Horizontal	N/A

HIGH CHANNEL 30 MHz to 1 GHz, ANT V

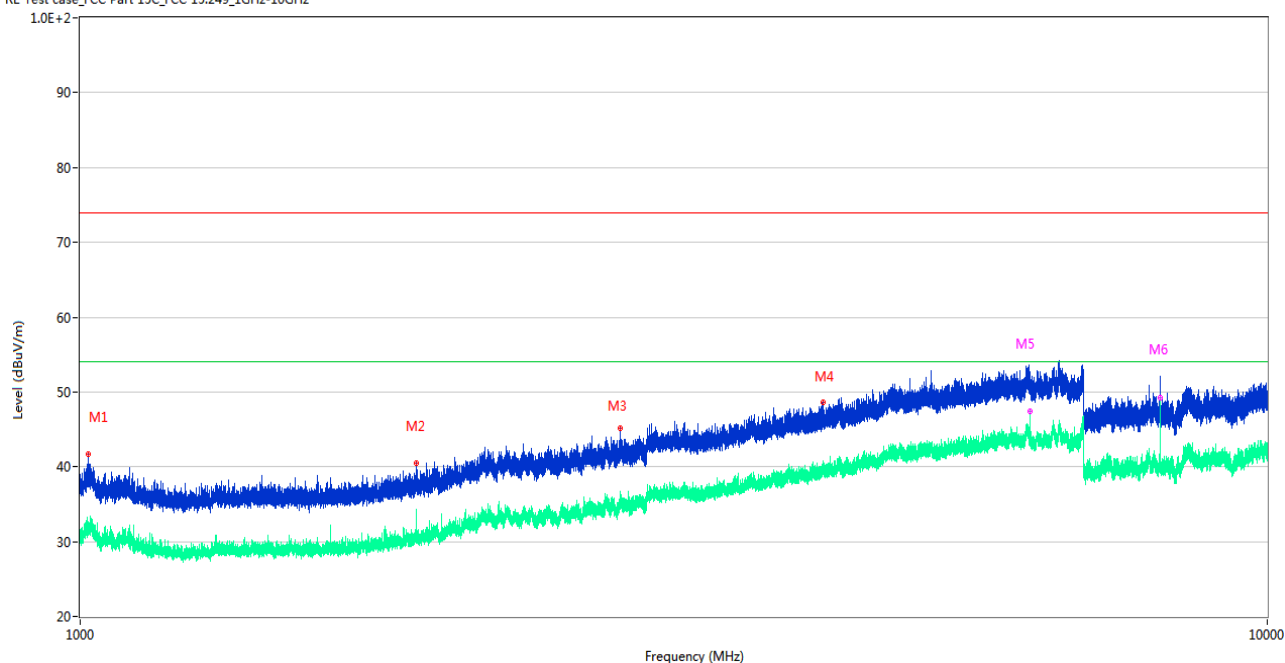
RE Test case_FCC Part 15C_FCC 15.249_30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	45.763	30.87	-14.07	40.0	-9.13	Peak	69.00	100	Vertical	Pass
2	85.533	32.09	-17.79	40.0	-7.91	Peak	230.00	200	Vertical	Pass
3	143.296	37.16	-12.70	43.5	-6.34	Peak	312.00	100	Vertical	Pass
4	336.035	34.38	-10.63	46.0	-11.62	Peak	116.00	200	Vertical	Pass
5	527.998	37.55	-5.63	46.0	-8.45	Peak	184.00	100	Vertical	Pass
6	914.882	118.45	4.29	46.0	72.45	Peak	332.00	100	Vertical	N/A

LOW CHANNEL 1 GHz to 10 GHz, ANT H

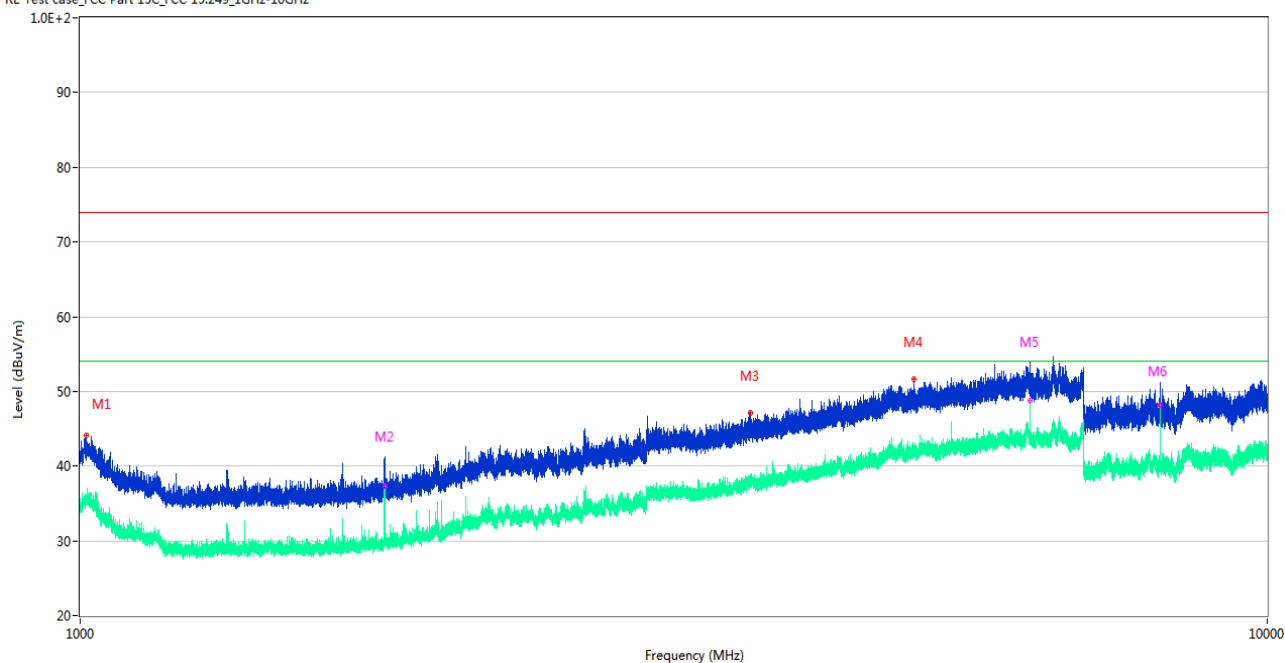
RE Test case_FCC Part 15C_FCC 15.249_1GHz-10GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1014.800	41.66	-18.00	74.0	-32.34	Peak	213.00	400	Horizontal	Pass
1**	1014.800	31.90	-18.00	54.0	-22.10	AV	213.00	400	Horizontal	Pass
2	1920.200	40.45	-16.03	74.0	-33.55	Peak	114.00	200	Horizontal	Pass
2**	1920.200	32.72	-16.03	54.0	-21.28	AV	114.00	200	Horizontal	Pass
3	2850.400	45.12	-10.35	74.0	-28.88	Peak	44.00	150	Horizontal	Pass
3**	2850.400	35.31	-10.35	54.0	-18.69	AV	44.00	150	Horizontal	Pass
4	4225.400	48.58	-4.77	74.0	-25.42	Peak	360.00	300	Horizontal	Pass
4**	4225.400	40.48	-4.77	54.0	-13.52	AV	360.00	300	Horizontal	Pass
5	6316.200	51.77	-1.53	74.0	-22.23	Peak	3.00	200	Horizontal	Pass
5**	6316.200	47.44	-1.53	54.0	-6.56	AV	3.00	200	Horizontal	Pass
6	8120.950	51.42	-2.78	74.0	-22.58	Peak	339.00	200	Horizontal	Pass
6**	8120.950	49.21	-2.78	54.0	-4.79	AV	339.00	200	Horizontal	Pass

LOW CHANNEL 1 GHz to 10 GHz, ANT V

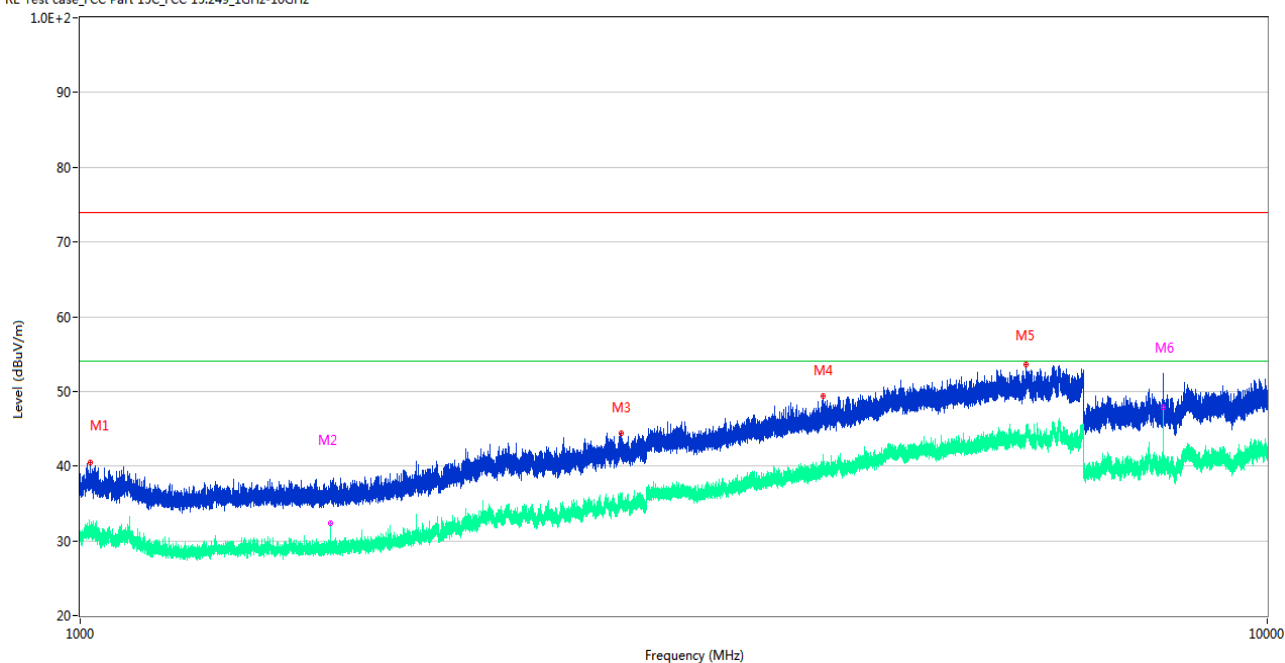
RE Test case_FCC Part 15C_FCC 15.249_1GHz-10GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1011.500	44.09	-18.07	74.0	-29.91	Peak	323.00	300	Vertical	Pass
1**	1011.500	35.39	-18.07	54.0	-18.61	AV	323.00	300	Vertical	Pass
2	1804.800	40.86	-16.88	74.0	-33.14	Peak	143.00	100	Vertical	Pass
2**	1804.800	37.26	-16.88	54.0	-16.74	AV	143.00	100	Vertical	Pass
3	3667.000	47.08	-6.85	74.0	-26.92	Peak	237.00	200	Vertical	Pass
3**	3667.000	37.45	-6.85	54.0	-16.55	AV	237.00	200	Vertical	Pass
4	5036.400	51.62	-3.11	74.0	-22.38	Peak	142.00	300	Vertical	Pass
4**	5036.400	41.76	-3.11	54.0	-12.24	AV	142.00	300	Vertical	Pass
5	6316.200	53.05	-1.53	74.0	-20.95	Peak	163.00	200	Vertical	Pass
5**	6316.200	48.75	-1.53	54.0	-5.25	AV	163.00	200	Vertical	Pass
6	8120.950	51.25	-2.78	74.0	-22.75	Peak	317.00	400	Vertical	Pass
6**	8120.950	48.21	-2.78	54.0	-5.79	AV	317.00	400	Vertical	Pass

MIDDLE CHANNEL 1 GHz to 10 GHz, ANT H

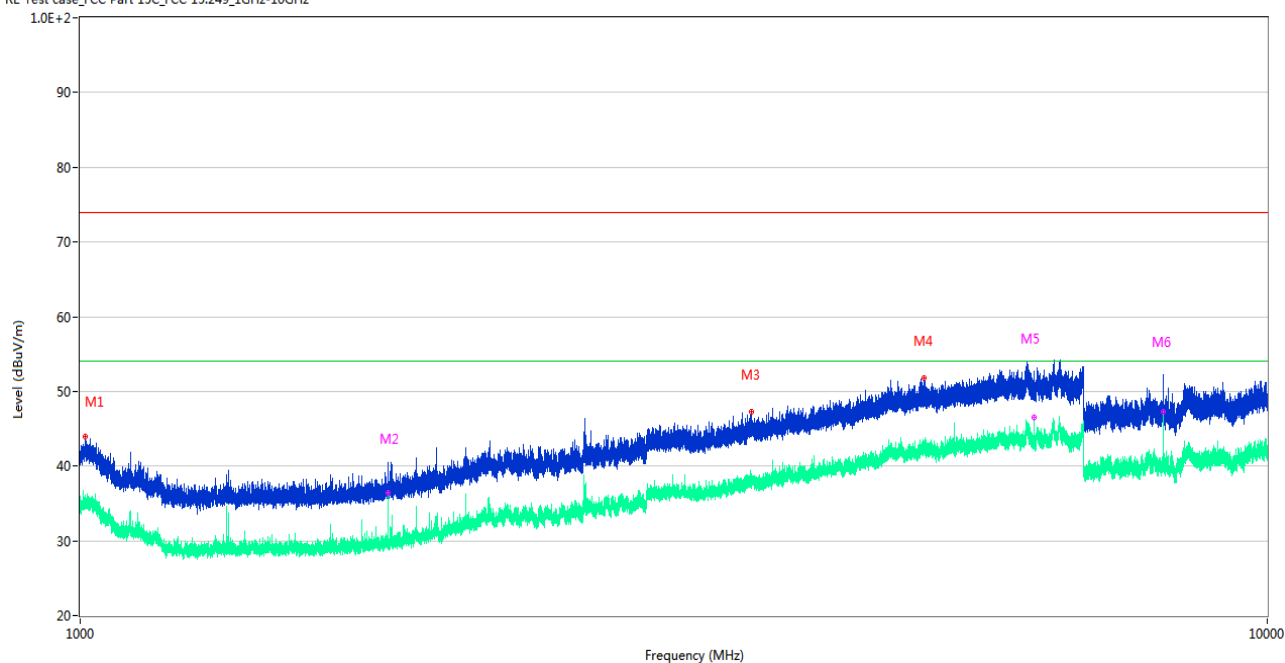
RE Test case_FCC Part 15C_FCC 15.249_1GHz-10GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1020.100	40.45	-18.39	74.0	-33.55	Peak	209.00	200	Horizontal	Pass
1**	1020.100	30.97	-18.39	54.0	-23.03	AV	209.00	200	Horizontal	Pass
2	1624.800	36.57	-17.62	74.0	-37.43	Peak	316.00	400	Horizontal	Pass
2**	1624.800	32.40	-17.62	54.0	-21.60	AV	316.00	400	Horizontal	Pass
3	2856.600	44.40	-10.14	74.0	-29.60	Peak	298.00	200	Horizontal	Pass
3**	2856.600	35.85	-10.14	54.0	-18.15	AV	298.00	200	Horizontal	Pass
4	4223.200	49.33	-4.84	74.0	-24.67	Peak	121.00	100	Horizontal	Pass
4**	4223.200	39.34	-4.84	54.0	-14.66	AV	121.00	100	Horizontal	Pass
5	6267.200	53.54	-0.52	74.0	-20.46	Peak	257.00	300	Horizontal	Pass
5**	6267.200	44.46	-0.52	54.0	-9.54	AV	257.00	300	Horizontal	Pass
6	8178.550	50.83	-3.00	74.0	-23.17	Peak	318.00	100	Horizontal	Pass
6**	8178.550	47.87	-3.00	54.0	-6.13	AV	318.00	100	Horizontal	Pass

MIDDLE CHANNEL 1 GHz to 10 GHz, ANT V

RE Test case_FCC Part 15C_FCC 15.249_1GHz-10GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1010.400	43.96	-18.04	74.0	-30.04	Peak	313.00	100	Vertical	Pass
1**	1010.400	35.80	-18.04	54.0	-18.20	AV	313.00	100	Vertical	Pass
2	1817.500	39.90	-17.10	74.0	-34.10	Peak	288.00	100	Vertical	Pass
2**	1817.500	36.41	-17.10	54.0	-17.59	AV	288.00	100	Vertical	Pass
3	3675.000	47.22	-6.55	74.0	-26.78	Peak	6.00	150	Vertical	Pass
3**	3675.000	37.87	-6.55	54.0	-16.13	AV	6.00	150	Vertical	Pass
4	5140.000	51.72	-2.42	74.0	-22.28	Peak	332.00	100	Vertical	Pass
4**	5140.000	41.95	-2.42	54.0	-12.05	AV	332.00	100	Vertical	Pass
5	6361.200	52.03	-2.11	74.0	-21.97	Peak	321.00	300	Vertical	Pass
5**	6361.200	46.47	-2.11	54.0	-7.53	AV	321.00	300	Vertical	Pass
6	8178.100	50.96	-3.03	74.0	-23.04	Peak	0.00	100	Vertical	Pass
6**	8178.100	47.29	-3.03	54.0	-6.71	AV	0.00	100	Vertical	Pass

HIGH CHANNEL 1 GHz to 10 GHz, ANT H

RE Test case_FCC Part 15C_FCC 15.249_1GHz-10GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1086.400	40.41	-18.52	74.0	-33.59	Peak	181.00	200	Horizontal	Pass
1**	1086.400	30.32	-18.52	54.0	-23.68	AV	181.00	200	Horizontal	Pass
2	1693.000	39.15	-17.37	74.0	-34.85	Peak	34.00	100	Horizontal	Pass
2**	1693.000	29.13	-17.37	54.0	-24.87	AV	34.00	100	Horizontal	Pass
3	3031.000	45.96	-8.80	74.0	-28.04	Peak	270.00	200	Horizontal	Pass
3**	3031.000	36.22	-8.80	54.0	-17.78	AV	270.00	200	Horizontal	Pass
4	5121.600	52.20	-2.27	74.0	-21.80	Peak	301.00	300	Horizontal	Pass
4**	5121.600	42.48	-2.27	54.0	-11.52	AV	301.00	300	Horizontal	Pass
5	6754.400	54.01	-0.83	74.0	-19.99	Peak	311.00	200	Horizontal	Pass
5**	6754.400	43.62	-0.83	54.0	-10.38	AV	311.00	200	Horizontal	Pass
6	8234.200	49.93	-2.01	74.0	-24.07	Peak	340.00	300	Horizontal	Pass
6**	8234.200	47.01	-2.01	54.0	-6.99	AV	340.00	300	Horizontal	Pass

HIGH CHANNEL 1 GHz to 10 GHz, ANT V

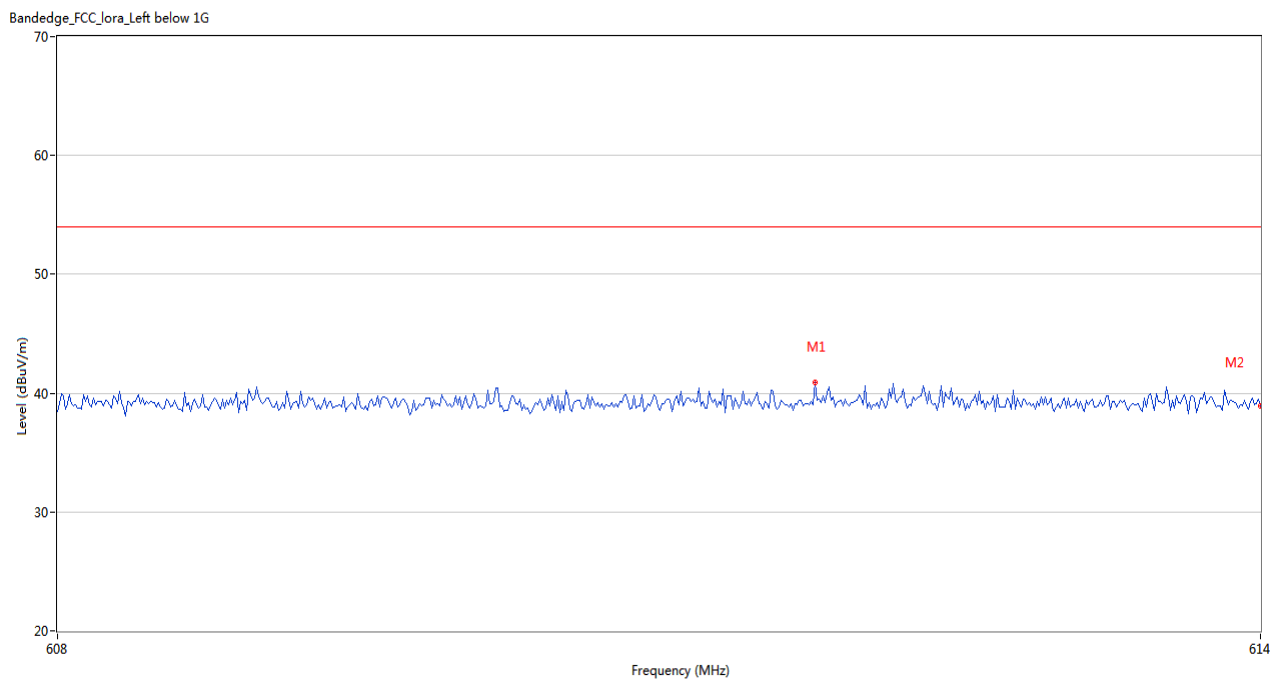
RE Test case_FCC Part 15C_FCC 15.249_1GHz-10GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1010.400	43.72	-18.04	74.0	-30.28	Peak	77.00	300	Vertical	Pass
1**	1010.400	35.33	-18.04	54.0	-18.67	AV	77.00	300	Vertical	Pass
2	1830.100	39.50	-16.66	74.0	-34.50	Peak	282.00	100	Vertical	Pass
2**	1830.100	36.65	-16.66	54.0	-17.35	AV	282.00	100	Vertical	Pass
3	3320.400	46.78	-8.18	74.0	-27.22	Peak	131.00	100	Vertical	Pass
3**	3320.400	37.17	-8.18	54.0	-16.83	AV	131.00	100	Vertical	Pass
4	4914.800	51.76	-2.34	74.0	-22.24	Peak	341.00	400	Vertical	Pass
4**	4914.800	41.83	-2.34	54.0	-12.17	AV	341.00	400	Vertical	Pass
5	6404.600	52.30	-0.80	74.0	-21.70	Peak	299.00	200	Vertical	Pass
5**	6404.600	46.97	-0.80	54.0	-7.03	AV	299.00	200	Vertical	Pass
6	8234.350	49.43	-2.00	74.0	-24.57	Peak	317.00	300	Vertical	Pass
6**	8234.350	46.45	-2.00	54.0	-7.55	AV	317.00	300	Vertical	Pass

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

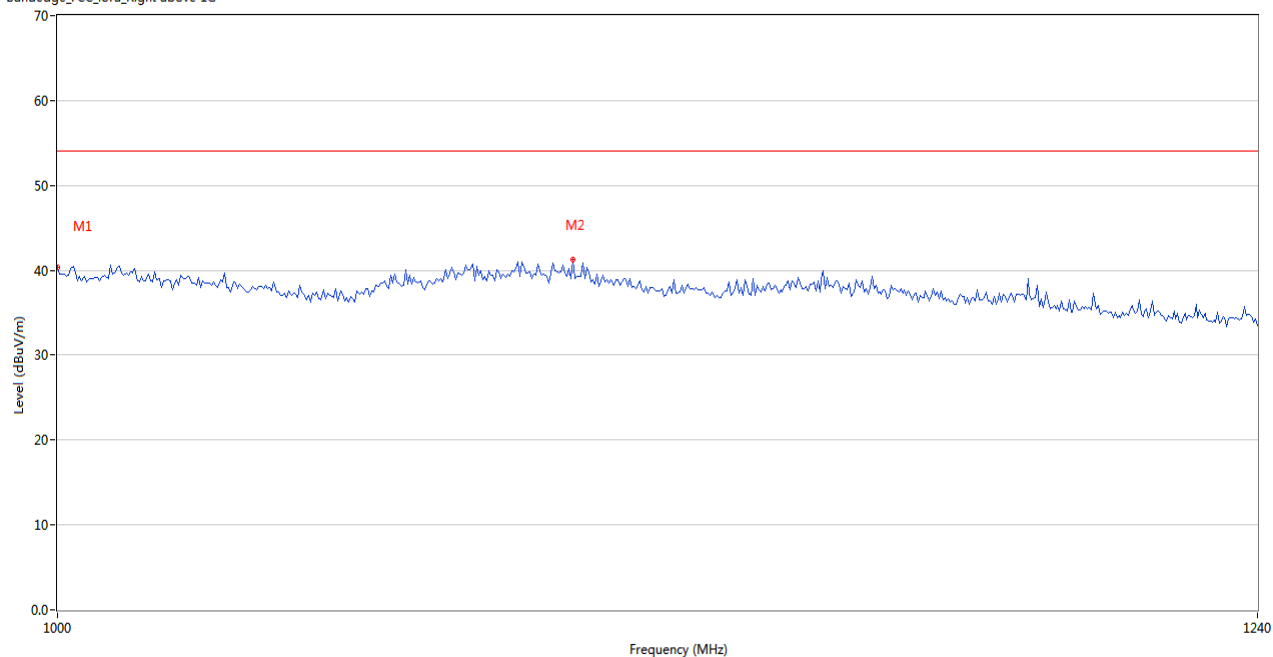
LOW CHANNEL



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	611.770	40.91	3.28	54.0	-13.09	Peak	341.00	200	Vertical	Pass
2	614.000	38.93	3.31	54.0	-15.07	Peak	217.00	200	Vertical	Pass

MIDDLE CHANNEL

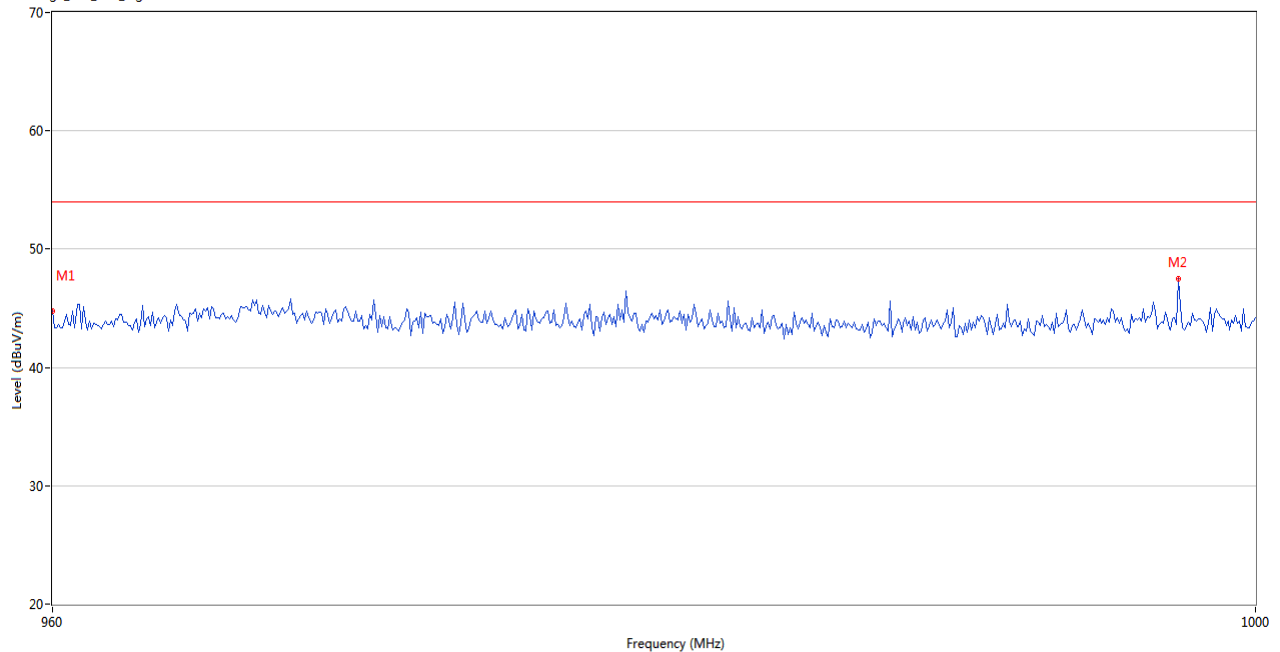
Bandedge_FCC_lora_Right above 1G



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1000.000	40.28	-18.22	54.0	-13.72	Peak	9.00	100	Vertical	Pass
2	1096.800	41.27	-18.56	54.0	-12.73	Peak	16.00	100	Vertical	Pass

HIGH CHANNEL

Bandedge_FCC_lora_Right below 1G



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	960.000	44.72	-3.60	54.0	-9.28	Peak	332.00	200	Vertical	Pass
2	997.400	47.53	-3.40	54.0	-6.47	Peak	72.00	200	Vertical	Pass

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2260818-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2260818-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2260818-AI.PDF”.

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--END OF REPORT--