



RF MEASUREMENT REPORT

FCC ID: 2A64B-FM24A9

Applicant: Ecovacs Home Service Robotics Co., Ltd.

Product: RTK Reference Station

Model No.: FM24A9

FCC Classification: Digital Transmission System (DTS)

FCC Rule Part(s): Part 15 Subpart C (Section 15.247)

Result: Complies

Received Date: 2024-11-18

Test Date: 2024-12-12 ~ 2025-01-22

Reviewed By:

Denise Zhou

Approved By:

Robin Wu



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2411RSU034-U1	V01	Initial Report	2025-02-18	Valid
2411RSU034-C1	V02	Add description of Band-edge Data	2025-04-02	Valid

CONTENTS

Description	Page
1. General Information	5
1.1. Applicant	5
1.2. Manufacturer	5
1.3. Testing Facility	5
1.4. Product Information.....	6
1.5. Radio Specification under Test	6
1.6. Working Frequencies	6
2. Test Configuration	7
2.1. Test Mode.....	7
2.2. Test System Connection Diagram.....	7
2.3. Test Software	8
2.4. Applied Standards.....	9
2.5. Test Environment Condition	9
3. Antenna Requirements	10
4. Measuring Instrument	11
5. Decision Rules and Measurement Uncertainty	12
5.1. Decision Rules	12
5.2. Measurement Uncertainty	12
6. Test Result.....	13
6.1. Summary	13
6.2. 6dB Bandwidth Measurement.....	14
6.2.1. Test Limit	14
6.2.2. Test Procedure	14
6.2.3. Test Setting	14
6.2.4. Test Setup	14
6.2.5. Test Result	14
6.3. Output Power Measurement	15
6.3.1. Test Limit	15
6.3.2. Test Procedure	15
6.3.3. Test Setting	15
6.3.4. Test Setup	15
6.3.5. Test Result	15
6.4. Power Spectral Density Measurement	16
6.4.1. Test Limit	16
6.4.2. Test Procedure	16

6.4.3.	Test Setting	16
6.4.4.	Test Setup	16
6.4.5.	Test Result	16
6.5.	Conducted Band Edge and Out-of-Band Emissions Measurement	17
6.5.1.	Test Limit	17
6.5.2.	Test Procedure	17
6.5.3.	Test Setting	17
6.5.4.	Test Setup	18
6.5.5.	Test Result	18
6.6.	Radiated Spurious Emission Measurement.....	19
6.6.1.	Test Limit	19
6.6.2.	Test Procedure	19
6.6.3.	Test Setting	19
6.6.4.	Test Setup	21
6.6.5.	Test Result	22
6.7.	Radiated Restricted Band Edge Measurement	23
6.7.1.	Test Limit	23
6.7.2.	Test Procedure	24
6.7.3.	Test Setting	24
6.7.4.	Test Setup	25
6.7.5.	Test Result	25
6.8.	AC Conducted Emissions Measurement	26
6.8.1.	Test Limit	26
6.8.2.	Test Setup	26
6.8.3.	Test Result	26
Appendix A	- Test Result.....	27
A.1	6dB Bandwidth Test Result	27
A.2	Output Power Test Result	28
A.3	Power Spectral Density Test Result.....	29
A.4	Conducted Band Edge and Out-of-Band Emissions Test Result.....	30
A.5	Radiated Spurious Emission Test Result.....	32
A.6	Radiated Restricted Band Edge Test Result.....	35
A.7	AC Conducted Emissions Test Result	35
Appendix B	- Test Setup Photograph	51
Appendix C	- EUT Photograph	52

1. General Information

1.1. Applicant

Ecovacs Home Service Robotics Co., Ltd.

No.518 Songwei Road, Wusongjiang industry Park, Guoxiang Street, Wuzhong District, Suzhou, 215100
Jiangsu, P.R. China

1.2. Manufacturer

Ecovacs Home Service Robotics Co., Ltd.

No.518 Songwei Road, Wusongjiang industry Park, Guoxiang Street, Wuzhong District, Suzhou, 215100
Jiangsu, P.R. China

1.3. Testing Facility

☒	Test Site – MRT Suzhou Laboratory
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
	Laboratory Location (Suzhou - SIP) 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China
	Laboratory Location (Suzhou - Wujiang) Building 1, No.1 Xingdong Road, Wujiang, Suzhou, Jiangsu, People's Republic of China
	Laboratory Accreditations
	A2LA: 3628.01 CNAS: L10551 FCC: CN1166 ISED: CN0001
	VCCI: ☐ R-20025 ☐ G-20034 ☐ C-20020 ☐ T-20020 ☐ R-20141 ☐ G-20134 ☐ C-20103 ☐ T-20104
☐	Test Site – MRT Shenzhen Laboratory
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China
	Laboratory Accreditations
	A2LA: 3628.02 CNAS: L10551 FCC: CN1284 ISED: CN0105
☐	Test Site – MRT Taiwan Laboratory
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
	Laboratory Accreditations
	TAF: 3261 FCC: 291082, TW3261 ISED: TW3261

1.4. Product Information

Product Name	RTK Reference Station
Model No.	FM24A9
Serial No.	316233708002471800001
Lora Specification	902.75 ~ 920.95MHz
GNSS Specification	GPS, Galileo, BDS, GLONASS
Antenna Information	Refer to section 1.5
Power Type	By Adapter & Base Station
Accessory	
Adapter	Model: GMA18-050100-1C Input: 100-240V ~ 50/60Hz 1.0A Output: 5V=1.0A
Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Radio Specification under Test

Frequency Range	902.75 ~ 920.95MHz
Channel Number	10
Type of modulation	FSK
Antenna Type	PIFA Antenna
Antenna Gain	0.5 dBi

1.6. Working Frequencies

Channel	Frequency	Channel	Frequency	Channel	Frequency
00	902.75MHz	01	904.15MHz	02	906.25MHz
03	908.35MHz	04	910.45MHz	05	912.55MHz
06	914.65MHz	07	916.75MHz	08	918.85MHz
09	920.95MHz	--	--	--	--

2. Test Configuration

2.1. Test Mode

Mode 1: Transmit by Lora using Adapter.

Mode 2: Transmit by Lora using Base Station #1.

Mode 3: Transmit by Lora using Base Station #2.

Note 1: Base Station #1: model CH2491, output is DC37.8V, 3A.

Base Station #2: model CH2492B, output is DC21V, 3A.

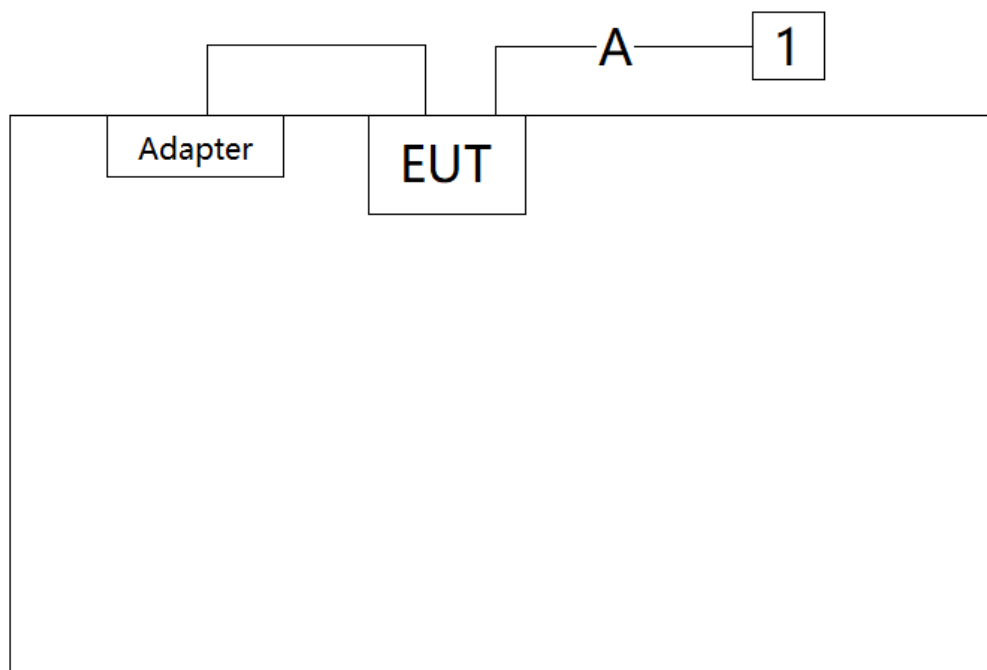
Note 2: The test modes are specified by the manufacturer.

2.2. Test System Connection Diagram

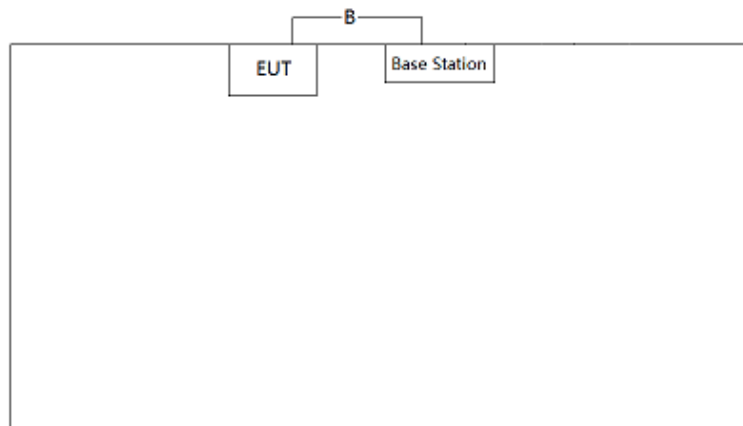
The device was tested per the guidance ANSI C63.10: 2013 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.

Connection Diagram

Mode 1



Mode 2&3



Cable Type		Cable Description	Length
A	Serial Cable	Non-Shielded	1.5m
B	Power Cable	Non-Shielded	0.5m
Product		Manufacturer	Model No.
1	Notebook	ThinkPad	E14 Gen 5

2.3. Test Software

The test utility software used during testing was “Putty” and commands were provided by the manufacturer.

2.4. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15.247
- KDB 558074 D01v05r02
- ANSI C63.10-2013

2.5. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20 ~ 75%RH

3. Antenna Requirements

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 antenna of the device is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

4. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2025-12-05	SIP-AC3
Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2025-05-08	SIP-AC3
Horn Antenna	R&S	HF907	MRTSUE06611	1 year	2025-07-07	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06619	1 year	2025-10-16	SIP-AC3
Preamplifier	EMCI	EMC012645SE	MRTSUE06642	1 year	2025-01-11	SIP-AC3
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06646	1 year	2025-07-29	SIP-AC3
Active Loop Antenna	Schwarzbeck	FMZB 1519-60 D	MRTSUE07075	1 year	2025-11-19	SIP-AC3
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2025-12-20	SIP-AC3
USB Power Sensor	Keysight	U2021XA	MRTSUE06596	1 year	2025-07-23	SIP-TR1
Signal Analyzer	Keysight	N9010B	MRTSUE07028	1 year	2025-10-13	SIP-TR1
Thermohygrometer	testo	608-H1	MRTSUE11022	1 year	2025-10-16	SIP-TR1
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2025-05-08	SIP-SR2
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2025-05-08	SIP-SR2
Thermohygrometer	testo	608-H1	MRTSUE06621	1 year	2025-10-29	SIP-SR2
Shielding Room	MIX-BEP	SIP-SR2	MRTSUE06949	5 years	2029-10-13	SIP-SR2

Software	Version	Function
e3	230711	EMI Test Software
Controller_MF 7802BS	1.02	RE Antenna & Turntable
Agilent Power Analyzer/Agilent Power Panel	V R03.09.00	Power

5. Decision Rules and Measurement Uncertainty

5.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2.
(Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.2. Measurement Uncertainty

Where relevant, the following test 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 $k = 2$.

AC Conducted Emission Measurement
The maximum measurement uncertainty is evaluated as: 9kHz~150kHz: 3.58dB 150kHz~30MHz: 3.20dB
Radiated Emission Measurement
The maximum measurement uncertainty is evaluated as: Coaxial: 9kHz~30MHz: 2.61dB Coplanar: 9kHz~30MHz: 2.62dB Horizontal: 30MHz~200MHz: 3.79dB 200MHz~1GHz: 3.91dB 1GHz~40GHz: 4.99dB Vertical: 30MHz~200MHz: 4.06dB 200MHz~1GHz: 5.21dB 1GHz~40GHz: 4.90dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 2.2dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 1.4dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 2.2dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 2.7%

6. Test Result

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
15.247(a)(2)	6dB Bandwidth	Conducted	Pass
15.247(b)(3)	Output Power		Pass
15.247(e)	Power Spectral Density		Pass
15.247(d)	Band Edge / Out-of-Band Emissions		Pass
15.205 15.209	General Field Strength (Restricted Bands and Radiated Emission)	Radiated	Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	Pass

Notes:

1. The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2. For radiated emission tests, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.

6.2. 6dB Bandwidth Measurement

6.2.1. Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

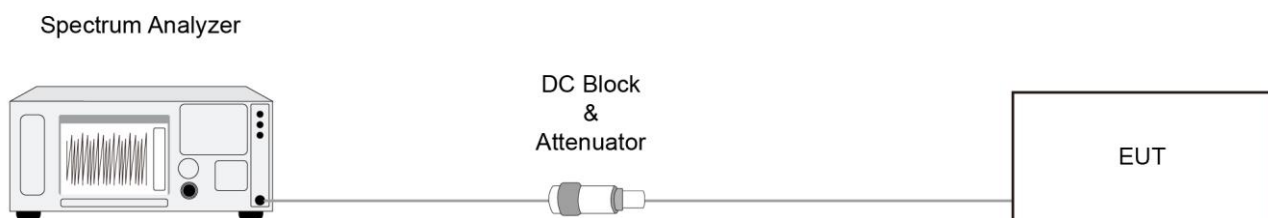
6.2.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.8

6.2.3. Test Setting

1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to $X = 6$. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. $VBW \geq 3 \times RBW$
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace to stabilize.

6.2.4. Test Setup



6.2.5. Test Result

Refer to Appendix A.1.

6.3. Output Power Measurement

6.3.1. Test Limit

The maximum output power shall be less 1 Watt (30dBm).

The conducted output power limit specified in paragraph FCC Part 15.247(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs FCC Part 15.247(b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.3.2. Test Procedure

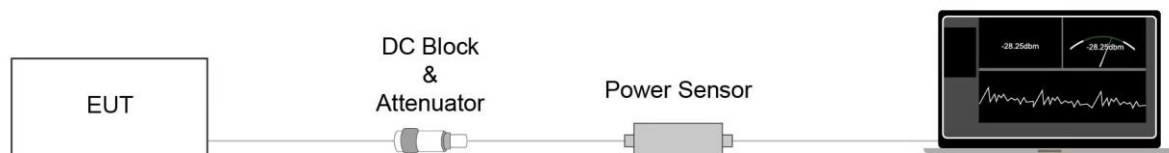
ANSI C63.10 - 2013 - Section 11.9.2.3.2

6.3.3. Test Setting

Average Power Measurement

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

6.3.4. Test Setup



6.3.5. Test Result

Refer to Appendix A.2.

6.4. Power Spectral Density Measurement

6.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

The same method of determining the conducted output power shall be used to determine the power spectral density.

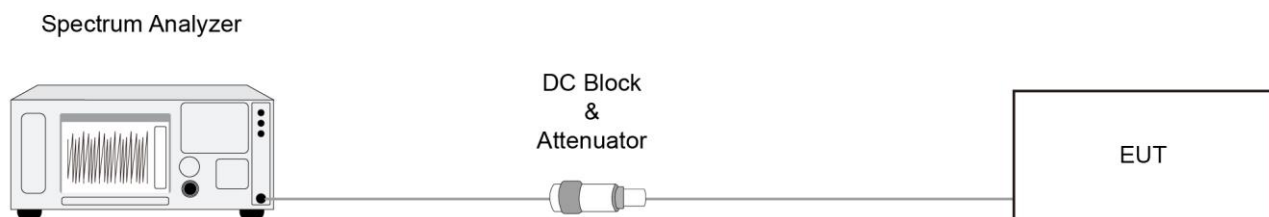
6.4.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.10.2

6.4.3. Test Setting

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.3.

6.5. Conducted Band Edge and Out-of-Band Emissions Measurement

6.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

6.5.2. Test Procedure

ANSI C63.10-2013 - Section 11.11

6.5.3. Test Setting

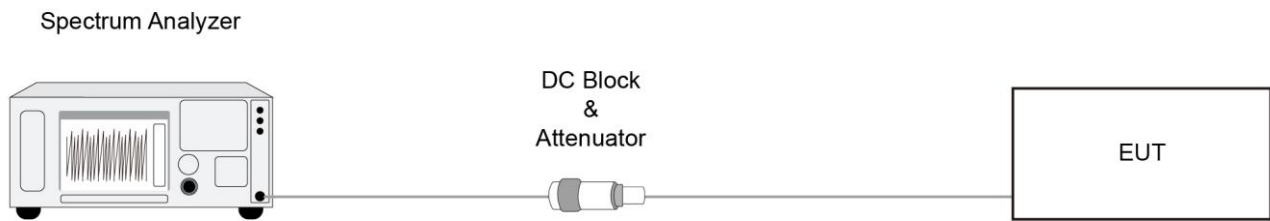
Reference level measurement

1. Set instrument center frequency to DTS channel center frequency
2. Set the span to ≥ 1.5 times the DTS bandwidth
3. Set the RBW = 100 kHz
4. Set the VBW $\geq 3 \times$ RBW
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Allow trace to fully stabilize

Emission level measurement

1. Set the center frequency and span to encompass frequency range to be measured
2. RBW = 100kHz
3. VBW = 300kHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

6.5.4. Test Setup



6.5.5. Test Result

Refer to Appendix A.4.

6.6. Radiated Spurious Emission Measurement

6.6.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

6.6.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.11 & 11.12

ANSI C63.10 - 2013 - Section 6.3 (General Requirements)

ANSI C63.10 - 2013 - Section 6.4 (Standard test method below 30MHz)

ANSI C63.10 - 2013 - Section 6.5 (Standard test method above 30MHz to 1GHz)

ANSI C63.10 - 2013 - Section 6.6 (Standard test method above 1GHz)

6.6.3. Test Setting

Table 1 - RBW as a function of frequency

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000MHz	1MHz

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Peak
5. Sweep time = Auto couple
6. Trace mode = Max hold
7. Trace was allowed to stabilize

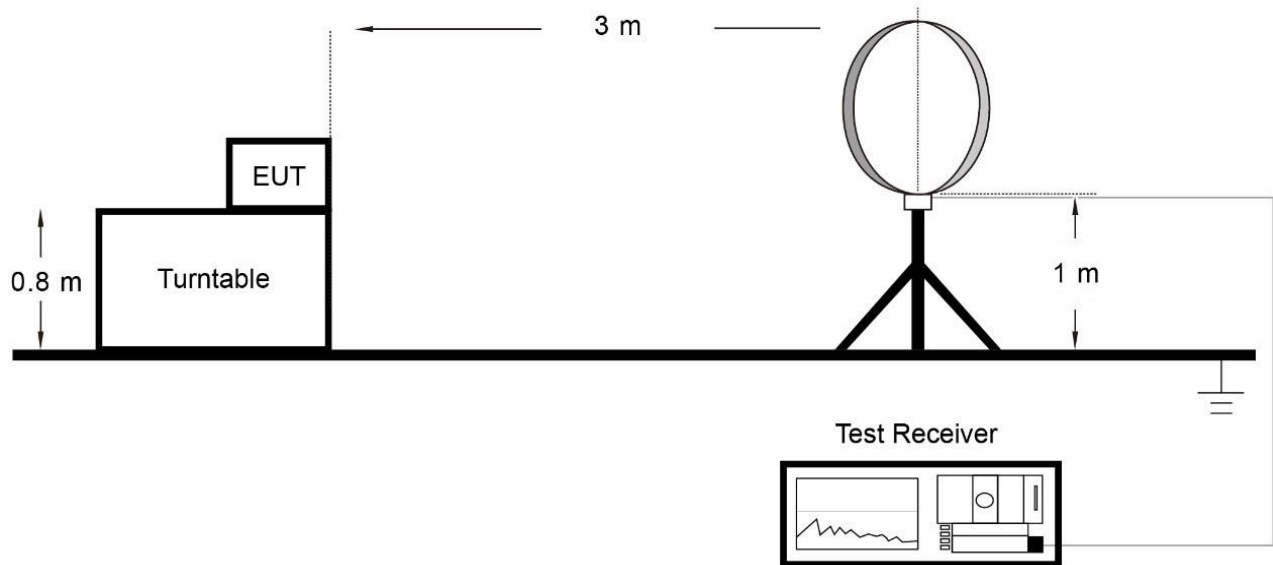
Average Measurements above 1GHz (Method VB)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; if the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10Hz

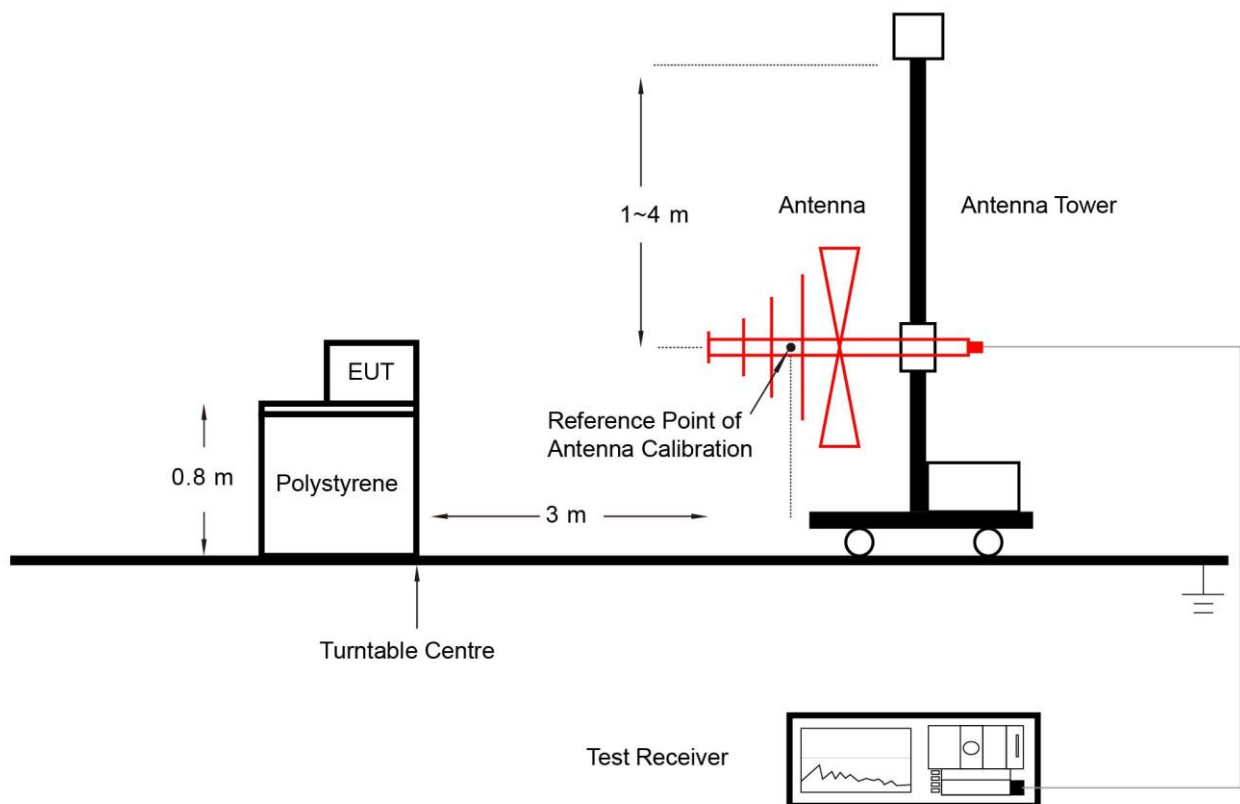
If the EUT duty cycle is $< 98\%$, set $\text{VBW} \geq 1/T$. T is the minimum transmission duration.
4. As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode
5. Detector = Peak
6. Sweep time = Auto
7. Trace mode = Max hold
8. Trace was allowed to stabilize

6.6.4. Test Setup

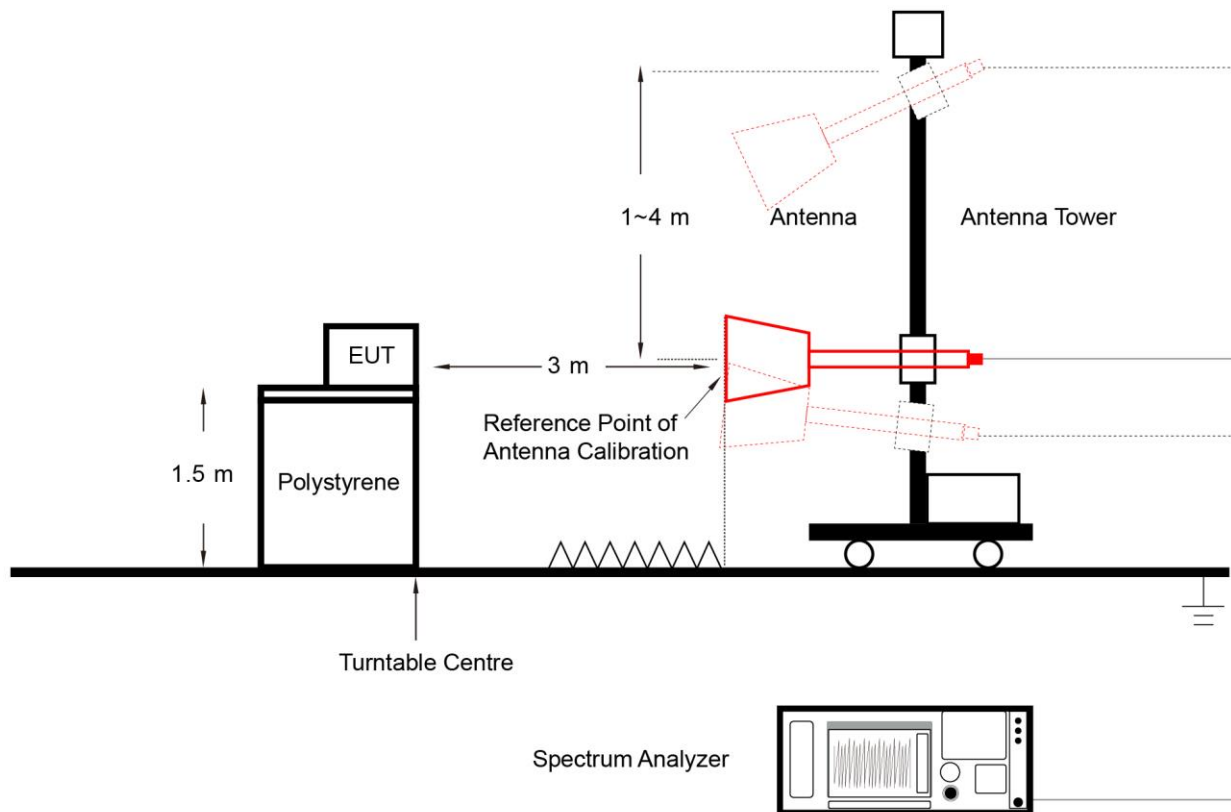
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.6.5. Test Result

Refer to Appendix A.5.

6.7. Radiated Restricted Band Edge Measurement

6.7.1. Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41	--	--	--

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

6.7.2. Test Procedure

ANSI C63.10-2013 Section 6.3 & 6.6 & 11.13

6.7.3. Test Setting

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

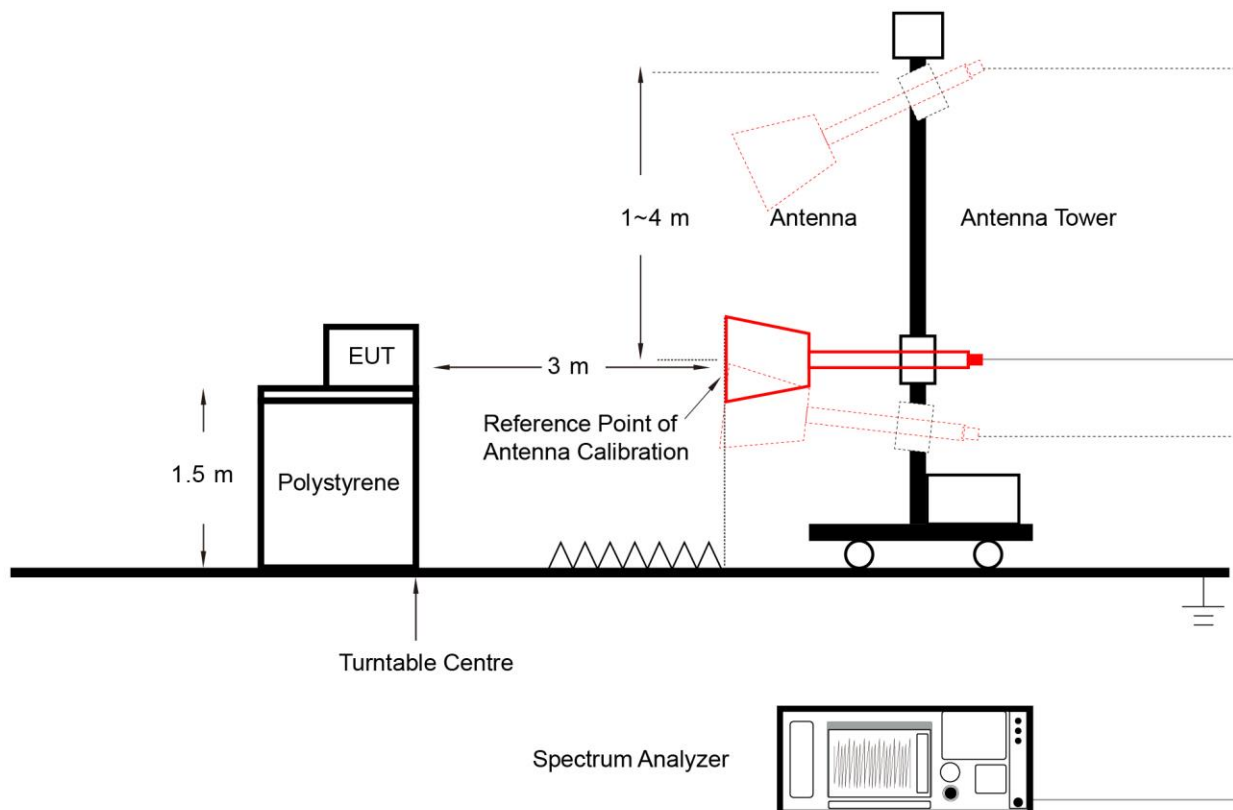
Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.

If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.

4. As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

6.7.4. Test Setup



6.7.5. Test Result

Refer to Appendix A.6.

6.8. AC Conducted Emissions Measurement

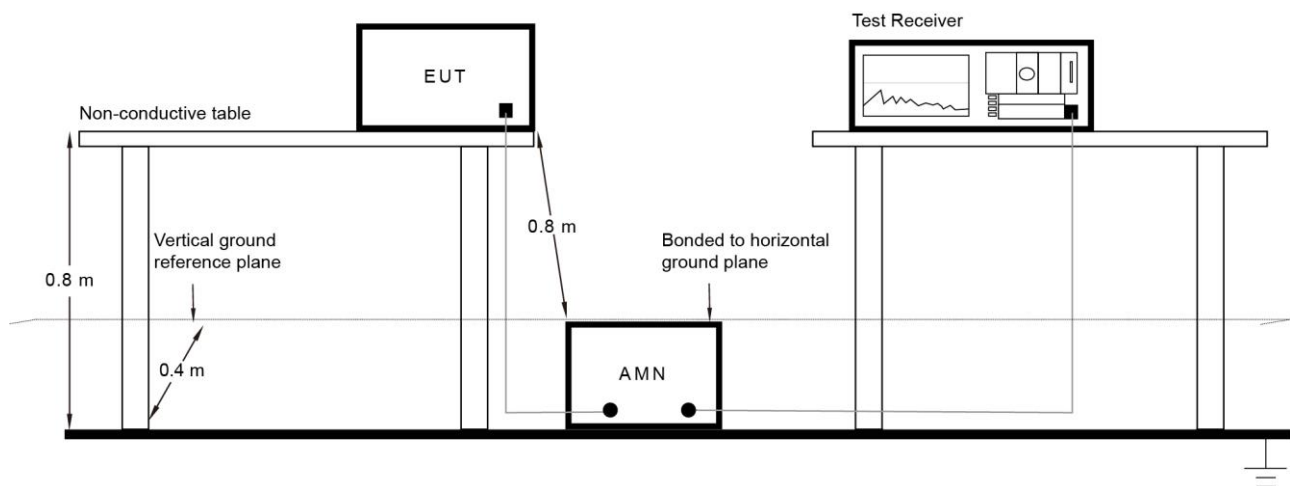
6.8.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.8.2. Test Setup



6.8.3. Test Result

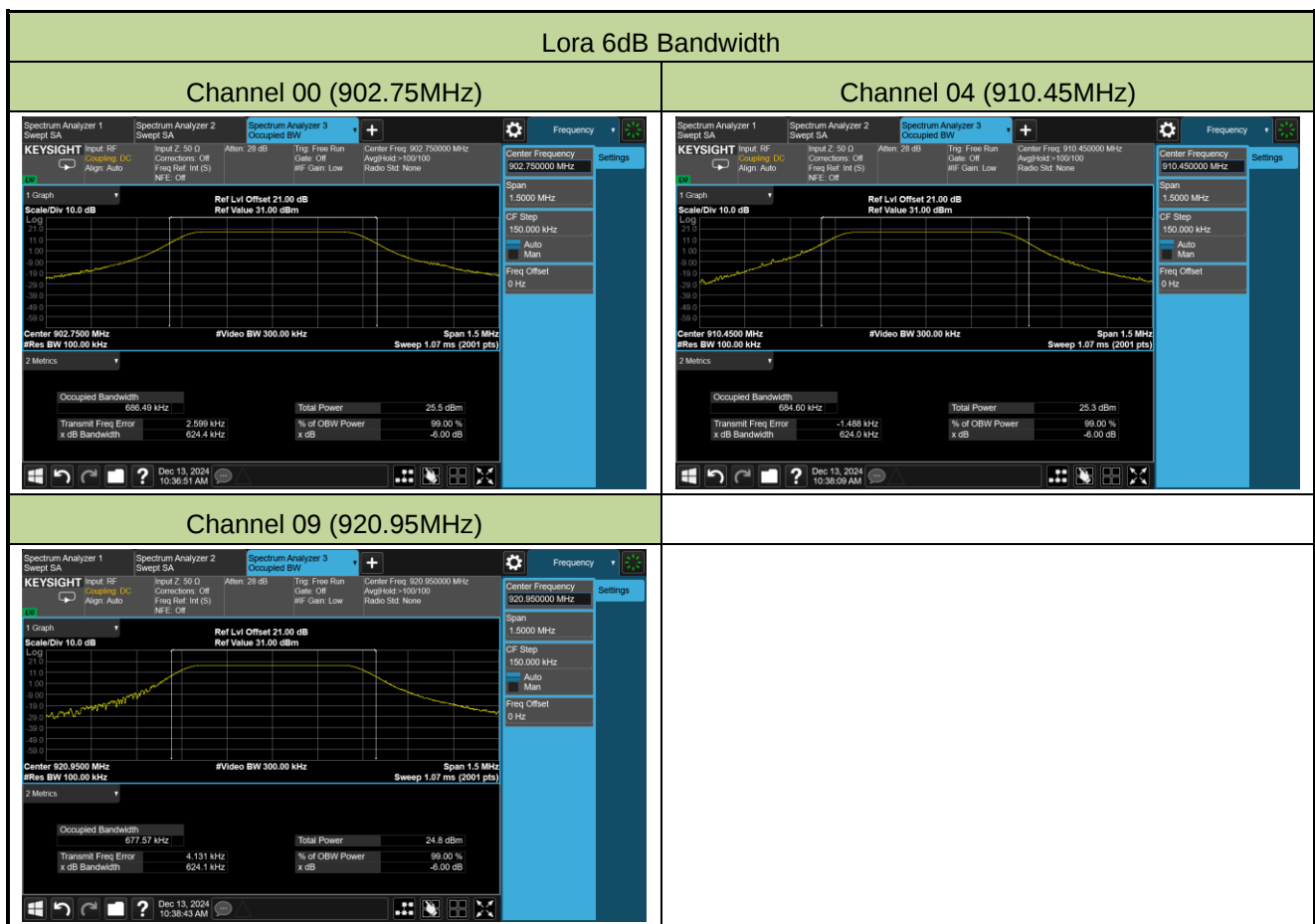
Refer to Appendix A.7.

Appendix A – Test Result

A.1 6dB Bandwidth Test Result

Test Site	SIP-TR1	Test Engineer	Ryan Wang
Test Date	2024-12-13		

Test Mode	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Mode 1	00	902.75	0.6244	≥ 0.5
	04	910.45	0.6240	≥ 0.5
	09	920.95	0.6241	≥ 0.5



A.2 Output Power Test Result

Test Site	SIP-TR1	Test Engineer	Ryan Wang
Test Date	2024-12-13		

Test Result of Peak Output Power

Test Mode	Channel No.	Freq. (MHz)	Peak Power (dBm)	Limit (dBm)
Mode 1	00	902.75	17.99	≤ 30.00
	04	910.45	17.78	≤ 30.00
	09	920.95	17.34	≤ 30.00

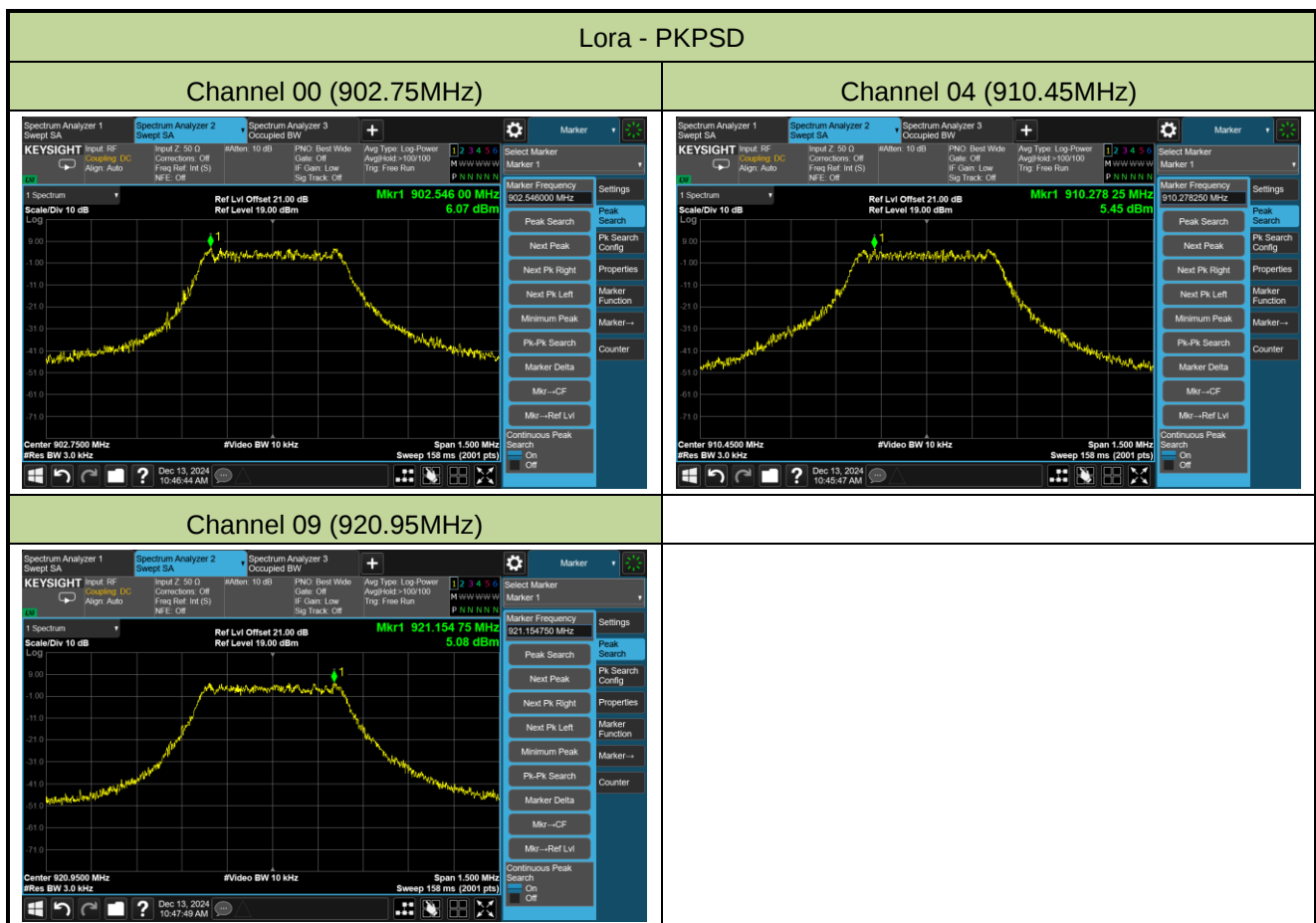
Test Result of Average Output Power (Reporting Only)

Test Mode	Channel No.	Freq. (MHz)	Average Power (dBm)	Limit (dBm)
Mode 1	00	902.75	17.01	≤ 30.00
	04	910.45	16.53	≤ 30.00
	09	920.95	16.02	≤ 30.00

A.3 Power Spectral Density Test Result

Test Site	SIP-TR1	Test Engineer	Ryan Wang
Test Date	2024-12-13		

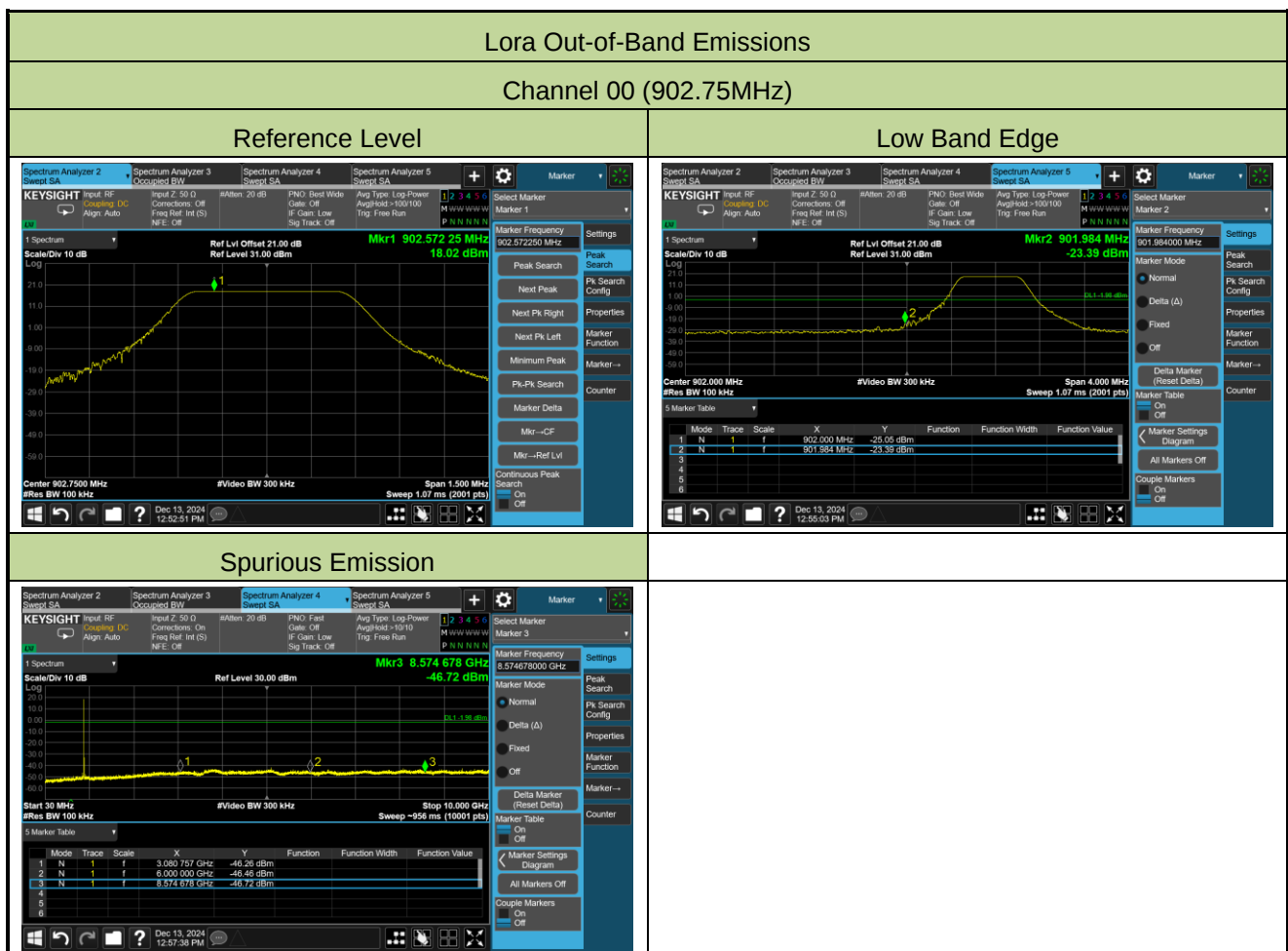
Test Mode	Channel No.	Freq. (MHz)	PSD (dBm/10kHz)	Limit (dBm/3kHz)
Mode 1	00	902.75	6.07	≤ 8.00
	04	910.45	5.45	≤ 8.00
	09	920.95	5.08	≤ 8.00



A.4 Conducted Band Edge and Out-of-Band Emissions Test Result

Test Site	SIP-TR1	Test Engineer	Ryan Wang
Test Date	2024-12-13		

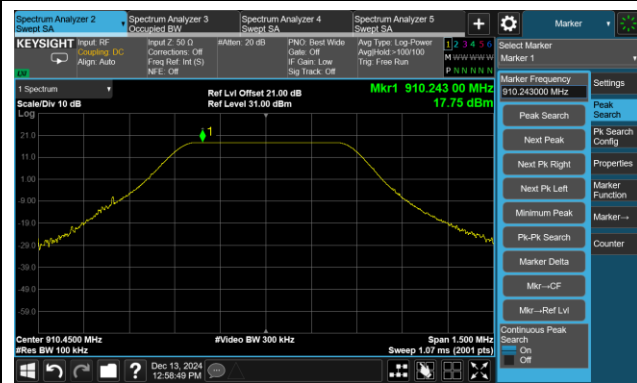
Test Mode	Channel No.	Frequency (MHz)	Limit
Mode 1	00	902.75	20dBc
	04	910.45	20dBc
	09	920.95	20dBc



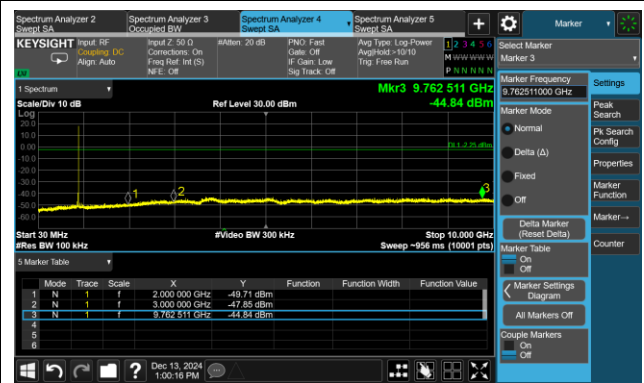
Lora Out-of-Band Emissions

Channel 04 (910.45MHz)

Reference Level

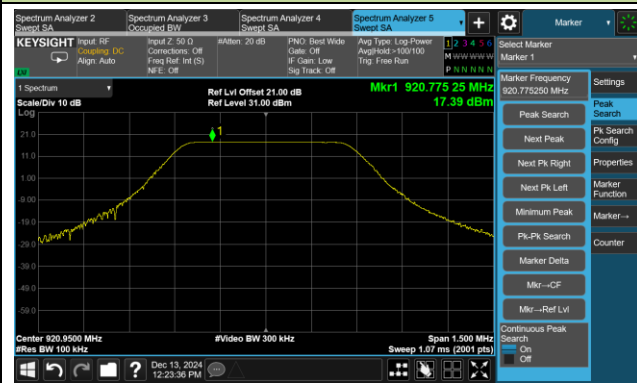


Spurious Emission

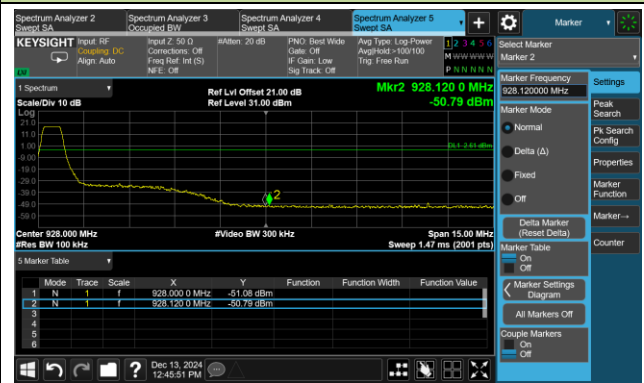


Channel 09 (920.95MHz)

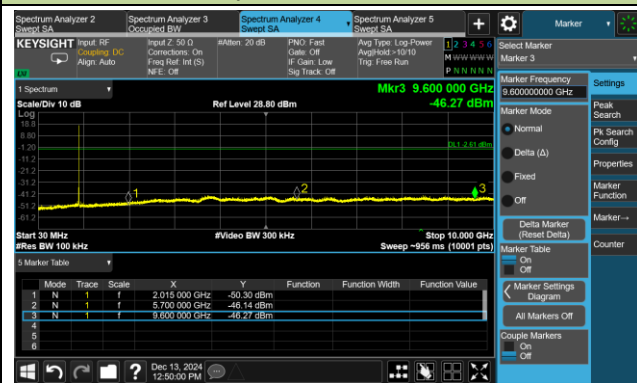
Reference Level



High Band Edge



Spurious Emission



A.5 Radiated Spurious Emission Test Result

Test Site	SIP-AC3	Test Engineer	Fusco Pan
Test Date	2024-12-13	Test Mode	Mode 1
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report.		

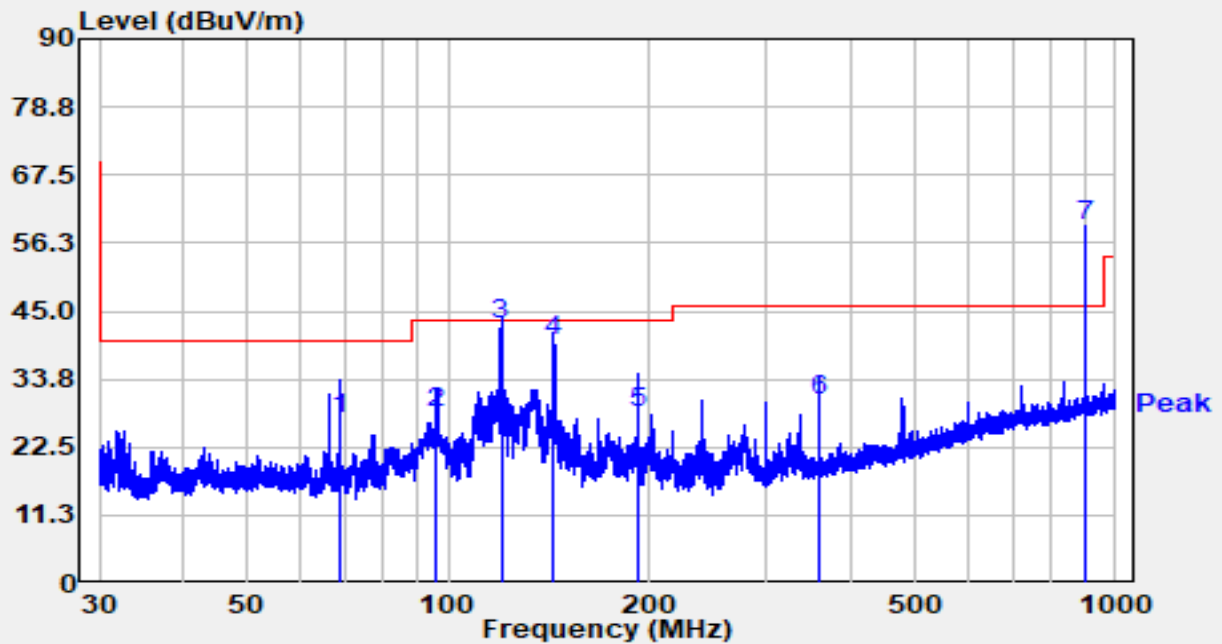
Test Channel	Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
00	1805.5	60.3	-14.3	46.0	74.0	-28.0	Peak	Horizontal
	7220.8	57.1	-2.3	54.8	74.0	-19.2	Peak	Horizontal
	7220.8	51.0	-2.3	48.7	54.0	-5.3	Average	Horizontal
	9801.1	46.9	2.5	49.4	74.0	-24.6	Peak	Horizontal
	6319.0	50.1	-3.6	46.5	74.0	-27.5	Peak	Vertical
	7223.5	51.9	-2.3	49.6	74.0	-24.4	Peak	Vertical
	9823.6	46.4	2.4	48.8	74.0	-25.2	Peak	Vertical
04	6373.0	52.7	-3.5	49.2	74.0	-24.8	Peak	Horizontal
	7282.9	49.8	-2.3	47.5	74.0	-26.5	Peak	Horizontal
	9766.9	46.2	2.3	48.5	74.0	-25.5	Peak	Horizontal
	5004.1	49.0	-3.9	45.1	74.0	-28.9	Peak	Vertical
	6373.9	52.4	-3.5	48.9	74.0	-25.1	Peak	Vertical
	9807.4	46.1	2.6	48.7	74.0	-25.3	Peak	Vertical
09	5146.3	49.1	-4.5	44.6	74.0	-29.4	Peak	Horizontal
	7368.4	49.5	-2.5	47.0	74.0	-27.0	Peak	Horizontal
	9784.9	45.6	2.4	48.0	74.0	-26.0	Peak	Horizontal
	6556.6	48.4	-2.9	45.5	74.0	-28.5	Peak	Vertical
	7779.7	48.4	-1.5	46.9	74.0	-27.1	Peak	Vertical
	9853.3	46.7	2.5	49.2	74.0	-24.8	Peak	Vertical

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

The Result of Radiated Emission below 1GHz:

Site	SIP-AC3	Test Date	2024-12-24
Temperature	17.3°C	Humidity	39.2%
Limit	FCC_Part 15.209_RSE(3m)_QP	Test Engineer	Fusco Pan
Factor	VULB 9168_00997_25-2000MHz	Polarity	Horizontal
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Mode 1, Transmit by Lora at 902.75MHz		

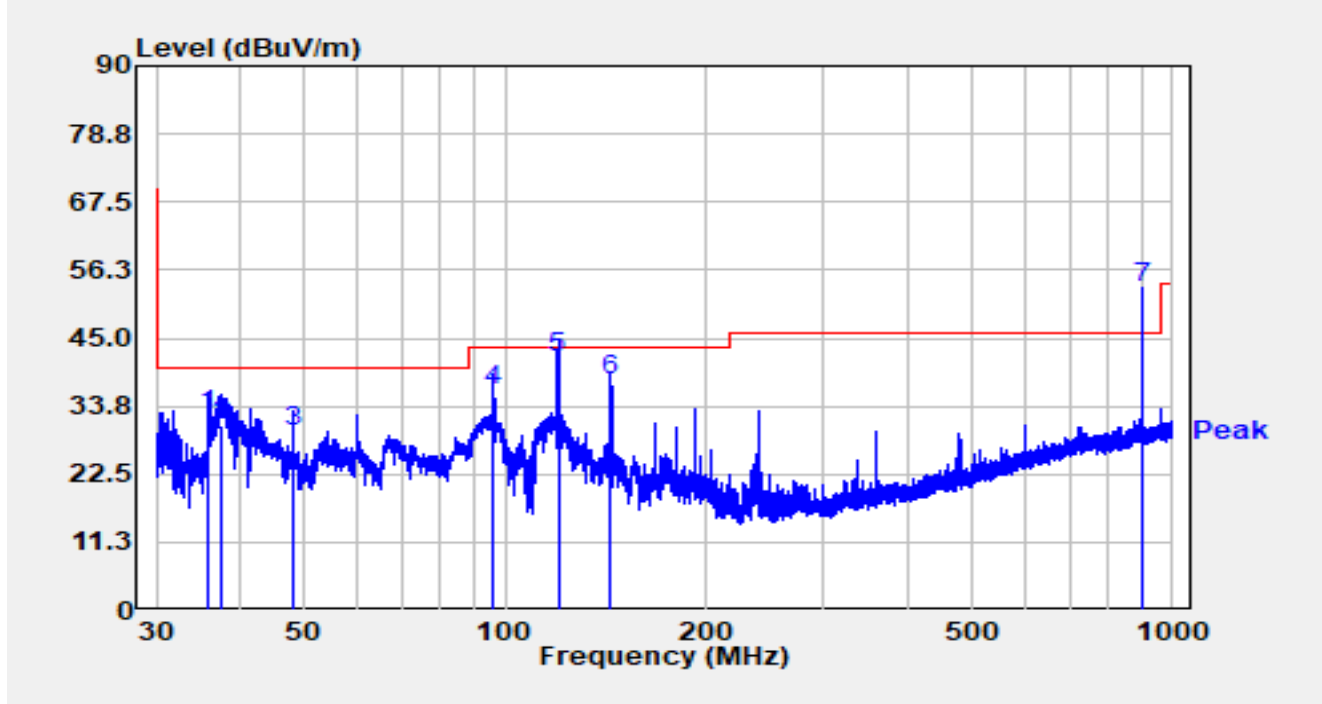


No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB/m)	Measurement (dBμV/m)	Margin (dB)	Limit (dBμV/m)	Detector
1		68.751	10.50	16.57	27.07	-12.93	40.00	QP
2		96.099	14.80	13.30	28.10	-15.40	43.50	QP
3	*	119.982	26.70	16.15	42.85	-0.65	43.50	QP
4		144.031	21.80	18.16	39.96	-3.54	43.50	QP
5		192.149	12.87	15.43	28.30	-15.20	43.50	QP
6		360.069	10.33	19.96	30.29	-15.71	46.00	QP
7		902.993	29.29	29.79	59.08	N/A	N/A	Peak

Notes:

1. " * ", means this data is the worst emission level.
2. C.F (dB/m) = Antenna Factor (dB/m)+ Cable Loss (dB).
3. Measurement (dBμV/m) = Reading (dBμV) + C.F (dB/m).
4. The point (7) is Lora fundamental frequency that is not evaluated in this standard.
5. The amplitude of radiated emissions (frequency range from 9kHz to 30MHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in this report.

Site	SIP-AC3	Test Date	2024-12-24
Temperature	17.3°C	Humidity	39.2%
Limit	FCC_Part 15.209_RSE(3m)_QP	Test Engineer	Fusco Pan
Factor	VULB 9168_00997_25-2000MHz	Polarity	Vertical
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Mode 1, Transmit by Lora at 902.75MHz		



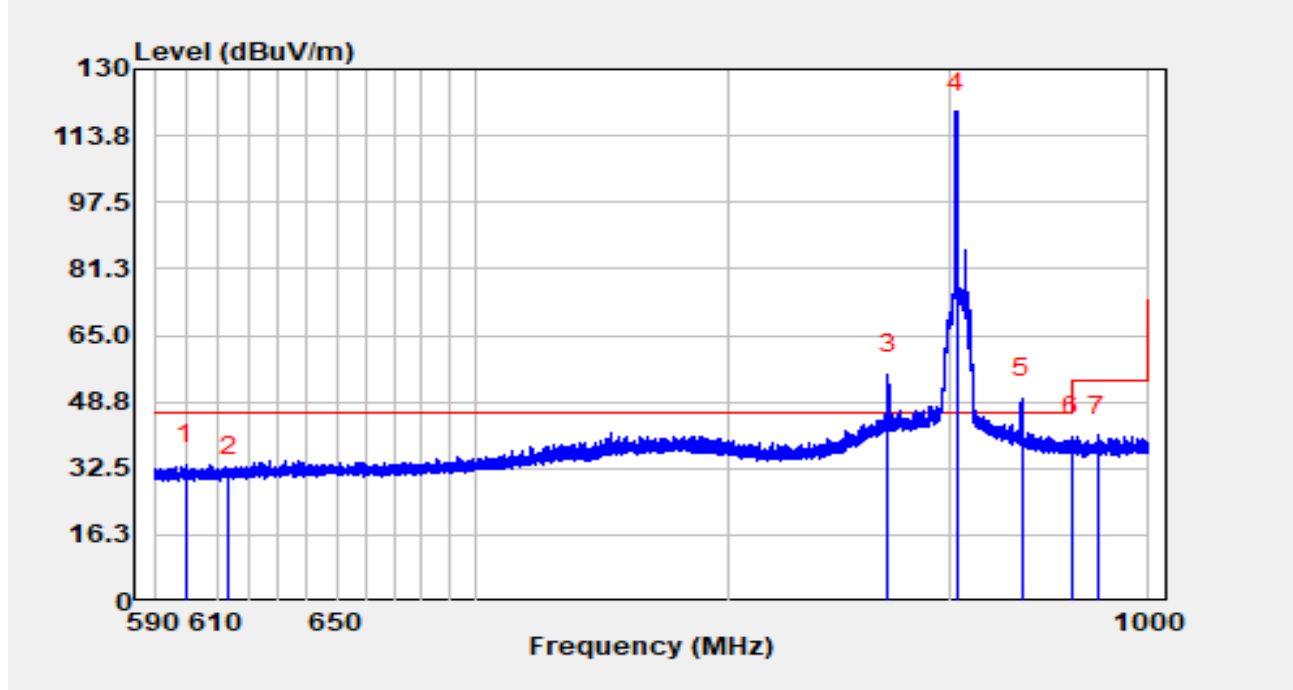
No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB/m)	Measurement (dBμV/m)	Margin (dB)	Limit (dBμV/m)	Detector
1		36.001	14.90	17.52	32.42	-7.58	40.00	QP
2		37.443	12.90	17.73	30.63	-9.37	40.00	QP
3		47.994	11.00	18.64	29.64	-10.36	40.00	QP
4		96.065	23.00	13.29	36.29	-7.21	43.50	QP
5	*	119.982	25.50	16.15	41.65	-1.85	43.50	QP
6		144.031	20.00	18.16	38.16	-5.34	43.50	QP
7		902.993	23.46	29.79	53.25	N/A	N/A	Peak

Notes:

- " * ", means this data is the worst emission level.
- C.F (dB/m) = Antenna Factor (dB/m)+ Cable Loss (dB).
- Measurement (dBμV/m) = Reading (dBμV) + C.F (dB/m).
- The point (7) is Lora fundamental frequency that is not evaluated in this standard.
- The amplitude of radiated emissions (frequency range from 9kHz to 30MHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value. Therefore, the data is not presented in this report.

A.6 Radiated Restricted Band Edge Test Result

Site	SIP-AC3	Test Date	2024-12-12
Temperature	17.3°C	Humidity	39.2%
Limit	FCC_Part 15.209_RSE(3m)_PK	Test Engineer	Fusco Pan
Factor	VULB 9168_00997_25-2000MHz	Polarity	Horizontal
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Transmit by lora at 902.75MHz		

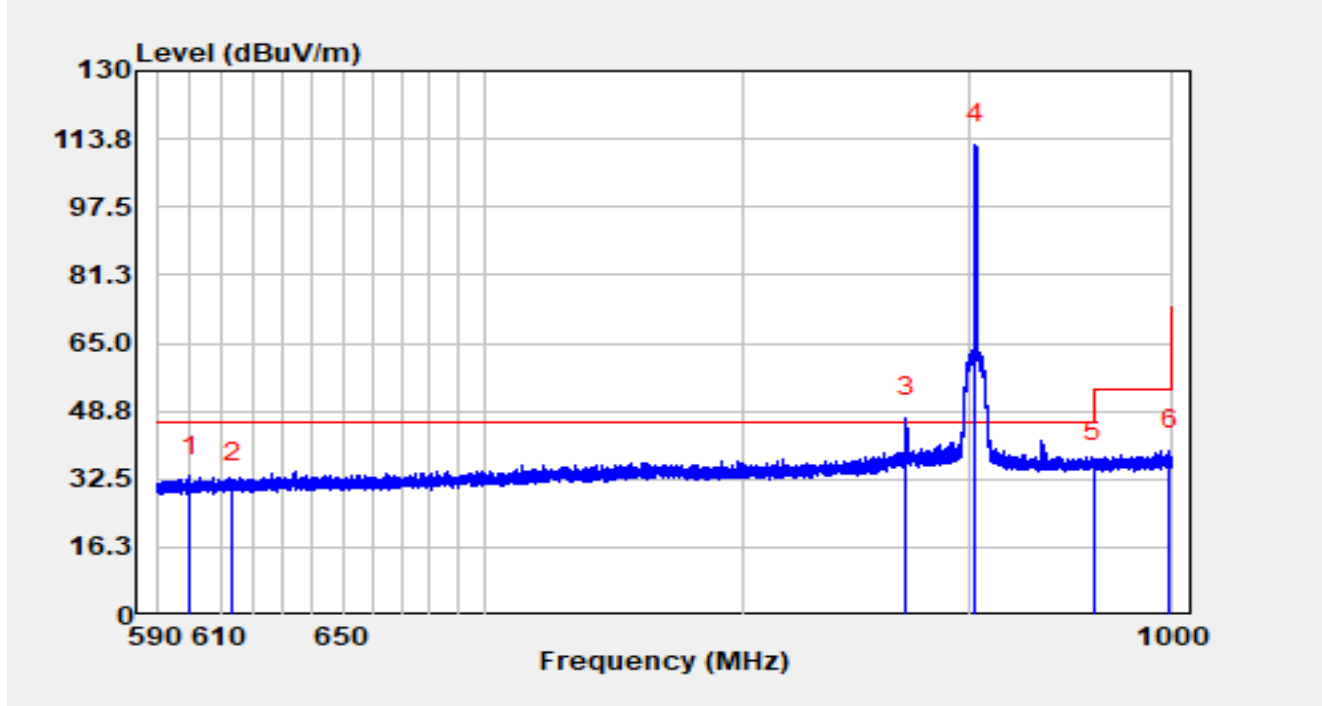


No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB/m)	Measurement (dBμV/m)	Margin (dB)	Limit (dBμV/m)	Detector
1		599.983	7.90	25.66	33.55	-12.45	46.00	Peak
2		614.000	4.58	26.01	30.59	-15.41	46.00	Peak
3		870.844	26.16	29.41	55.57	N/A	N/A	Peak
4		902.990	89.75	29.79	119.54	N/A	N/A	Peak
5		934.693	19.38	30.16	49.55	N/A	N/A	Peak
6	*	960.000	10.10	30.27	40.37	-5.63	46.00	Peak
7		973.501	10.41	30.20	40.61	-13.39	54.00	Peak

Notes:

1. " *", means this data is the worst emission level.
2. C.F (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB).
3. Measurement (dBμV/m) = Reading (dBμV) + C.F (dB/m).
4. The point (3, 5) is not in restricted bands, and the limit is value of the fundamental frequency below -20dB or 74 dBμV/m, which is higher.

Site	SIP-AC3	Test Date	2024-12-12
Temperature	17.3°C	Humidity	39.2%
Limit	FCC_Part 15.209_RSE(3m)_PK	Test Engineer	Fusco Pan
Factor	VULB 9168_00997_25-2000MHz	Polarity	Vertical
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Transmit by lora at 902.75MHz		

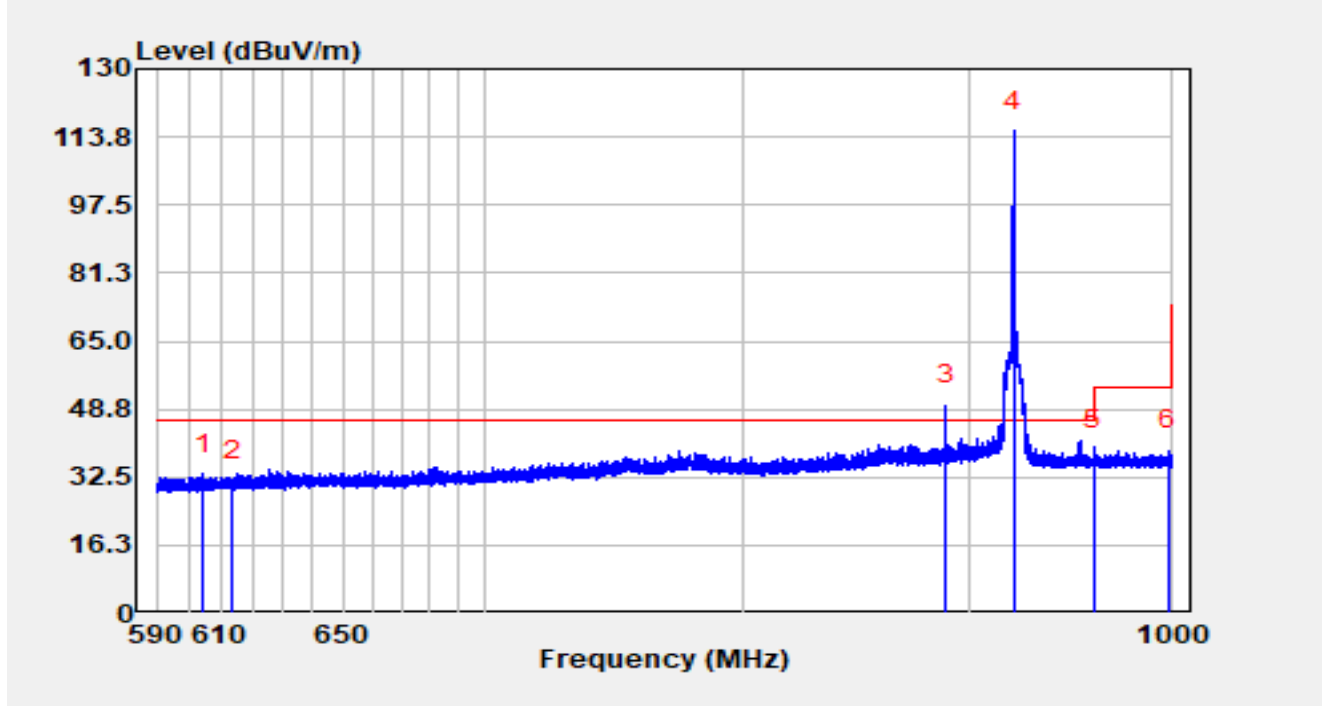


No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB/m)	Measurement (dBμV/m)	Margin (dB)	Limit (dBμV/m)	Detector
1		600.268	7.56	25.66	33.22	-12.78	46.00	Peak
2		614.000	5.73	26.01	31.74	-14.26	46.00	Peak
3		870.890	17.83	29.41	47.24	N/A	N/A	Peak
4		902.704	82.69	29.79	112.49	N/A	N/A	Peak
5	*	960.000	6.39	30.27	36.67	-9.33	46.00	Peak
6		998.418	8.73	30.61	39.35	-14.65	54.00	Peak

Notes:

1. " *", means this data is the worst emission level.
2. C.F (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB).
3. Measurement (dBμV/m) = Reading (dBμV) + C.F (dB/m).
4. The point (3) is not in restricted bands, and the limit is value of the fundamental frequency below -20dB or 74 dBμV/m, which is higher.

Site	SIP-AC3	Test Date	2024-12-12
Temperature	17.3°C	Humidity	39.2%
Limit	FCC_Part 15.209_RSE(3m)_PK	Test Engineer	Fusco Pan
Factor	VULB 9168_00997_25-2000MHz	Polarity	Horizontal
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Transmit by lora at 920.95MHz		

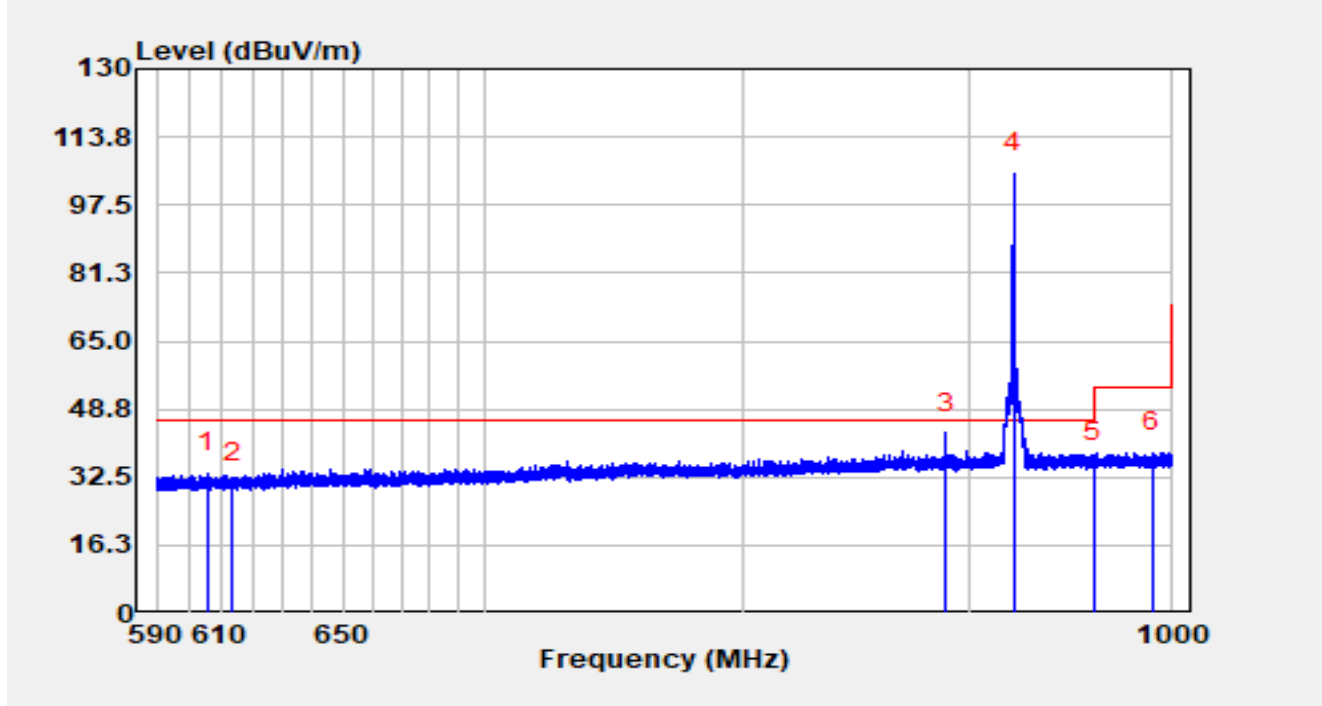


No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB/m)	Measurement (dBμV/m)	Margin (dB)	Limit (dBμV/m)	Detector
1		604.368	7.38	25.74	33.12	-12.88	46.00	Peak
2		614.000	5.62	26.01	31.63	-14.37	46.00	Peak
3		888.809	19.97	29.67	49.63	N/A	N/A	Peak
4		920.937	85.22	30.02	115.24	N/A	N/A	Peak
5	*	960.000	8.62	30.27	38.90	-7.10	46.00	Peak
6		997.944	8.21	30.61	38.82	-15.18	54.00	Peak

Notes:

1. " *", means this data is the worst emission level.
2. C.F (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB).
3. Measurement (dBμV/m) = Reading (dBμV) + C.F (dB/m).
4. The point (3) is not in restricted bands, and the limit is value of the fundamental frequency below -20dB or 74 dBμV/m, which is higher.

Site	SIP-AC3	Test Date	2024-12-12
Temperature	17.3°C	Humidity	39.2%
Limit	FCC_Part 15.209_RSE(3m)_PK	Test Engineer	Fusco Pan
Factor	VULB 9168_00997_25-2000MHz	Polarity	Vertical
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Transmit by lora at 920.95MHz		



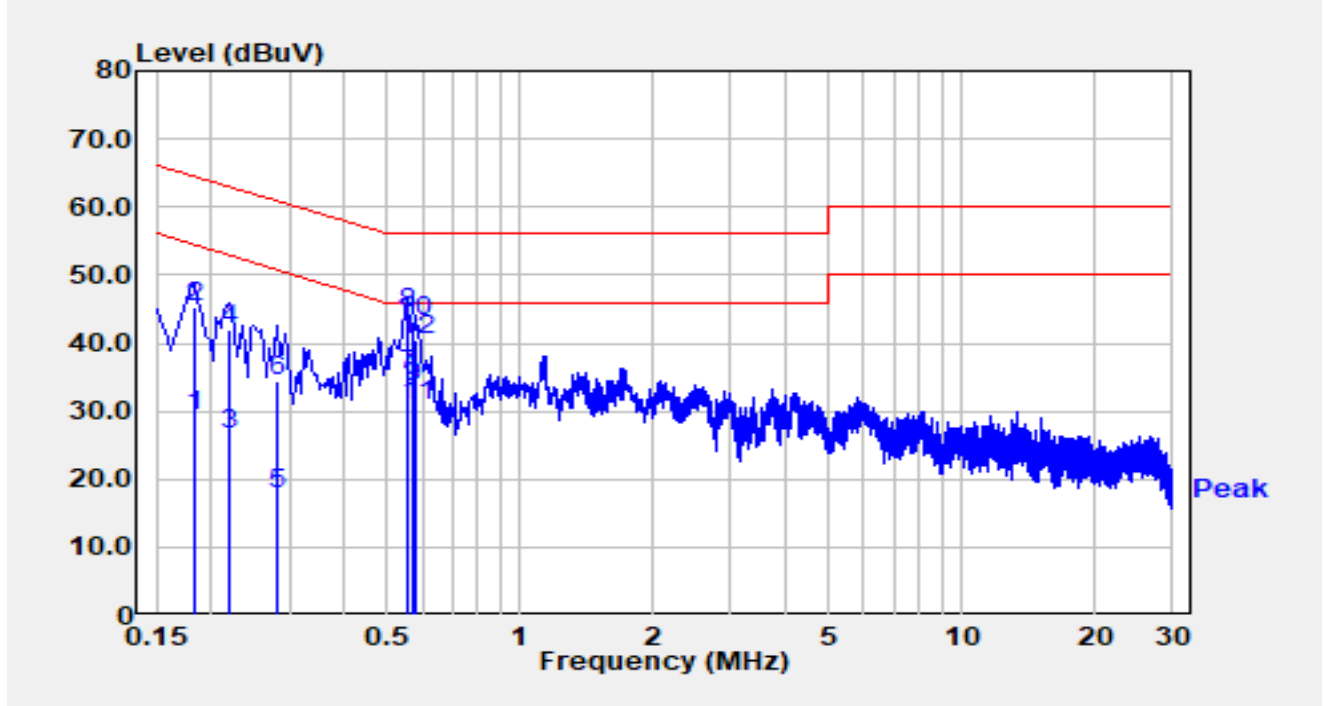
No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB/m)	Measurement (dBμV/m)	Margin (dB)	Limit (dBμV/m)	Detector
1		605.708	7.73	25.77	33.51	-12.49	46.00	Peak
2		614.000	4.96	26.01	30.96	-15.04	46.00	Peak
3		889.090	13.31	29.67	42.98	N/A	N/A	Peak
4		920.791	75.01	30.01	105.02	N/A	N/A	Peak
5	*	960.000	5.78	30.27	36.05	-9.95	46.00	Peak
6		989.294	7.98	30.35	38.33	-15.67	54.00	Peak

Notes:

1. " *", means this data is the worst emission level.
2. C.F (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB).
3. Measurement (dBμV/m) = Reading (dBμV) + C.F (dB/m).
4. The point (3) is not in restricted bands, and the limit is value of the fundamental frequency below -20dB or 74 dBμV/m, which is higher.

A.7 AC Conducted Emissions Test Result

Site	SIP-SR2	Test Date	2024-12-24
Temperature	16.1°C	Humidity	39.3%
Limit	FCC Part15B_Class B_CE_	Test Engineer	Henry Wang
Factor	SIP-SR2-ENV216_101684_E	Polarity	Line
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Mode 1, Transmit by Lora at 902.75MHz		

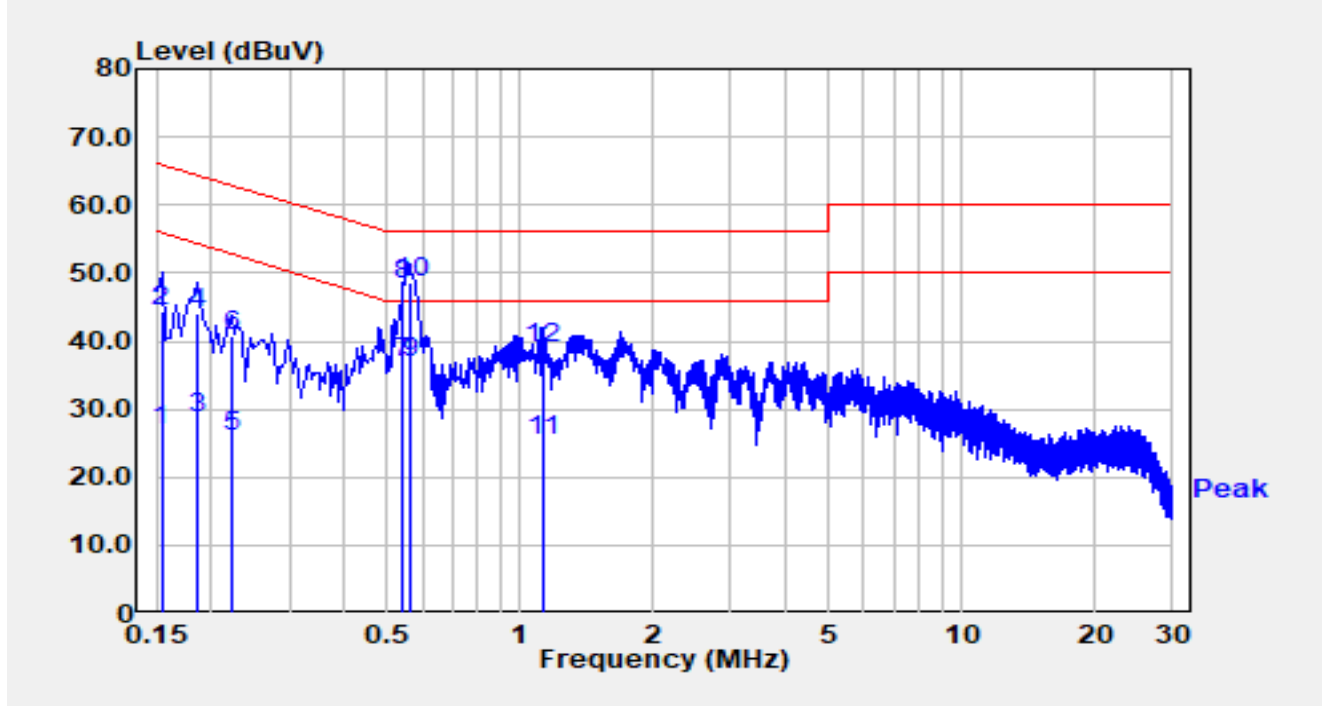


No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB)	Measurement (dBμV)	Margin (dB)	Limit (dBμV)	Detector
1		0.182	19.66	9.74	29.40	-24.99	54.39	Average
2		0.182	35.68	9.74	45.42	-18.97	64.39	QP
3		0.218	16.80	9.79	26.58	-26.31	52.89	Average
4		0.218	32.21	9.79	42.00	-20.90	62.89	QP
5		0.282	7.99	9.80	17.80	-32.96	50.76	Average
6		0.282	24.55	9.80	34.35	-26.41	60.76	QP
7	*	0.558	25.46	9.84	35.30	-10.70	46.00	Average
8		0.558	34.55	9.84	44.39	-11.61	56.00	QP
9		0.574	23.55	9.84	33.39	-12.61	46.00	Average
10		0.574	33.26	9.84	43.10	-12.90	56.00	QP
11		0.582	20.83	9.84	30.67	-15.33	46.00	Average
12		0.582	30.52	9.84	40.36	-15.64	56.00	QP

Notes:

1. " *", means this data is the worst emission level.
2. C.F (dB) = LISN Factor (dB) + Cable Loss (dB).
3. Measurement (dB μ V) = Reading (dB μ V) + C.F (dB).

Site	SIP-SR2	Test Date	2024-12-24
Temperature	16.1°C	Humidity	39.3%
Limit	FCC Part15B_Class B_CE_	Test Engineer	Henry Wang
Factor	SIP-SR2-ENV216_101684_E	Polarity	Neutral
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Mode 1, Transmit by Lora at 902.75MHz		

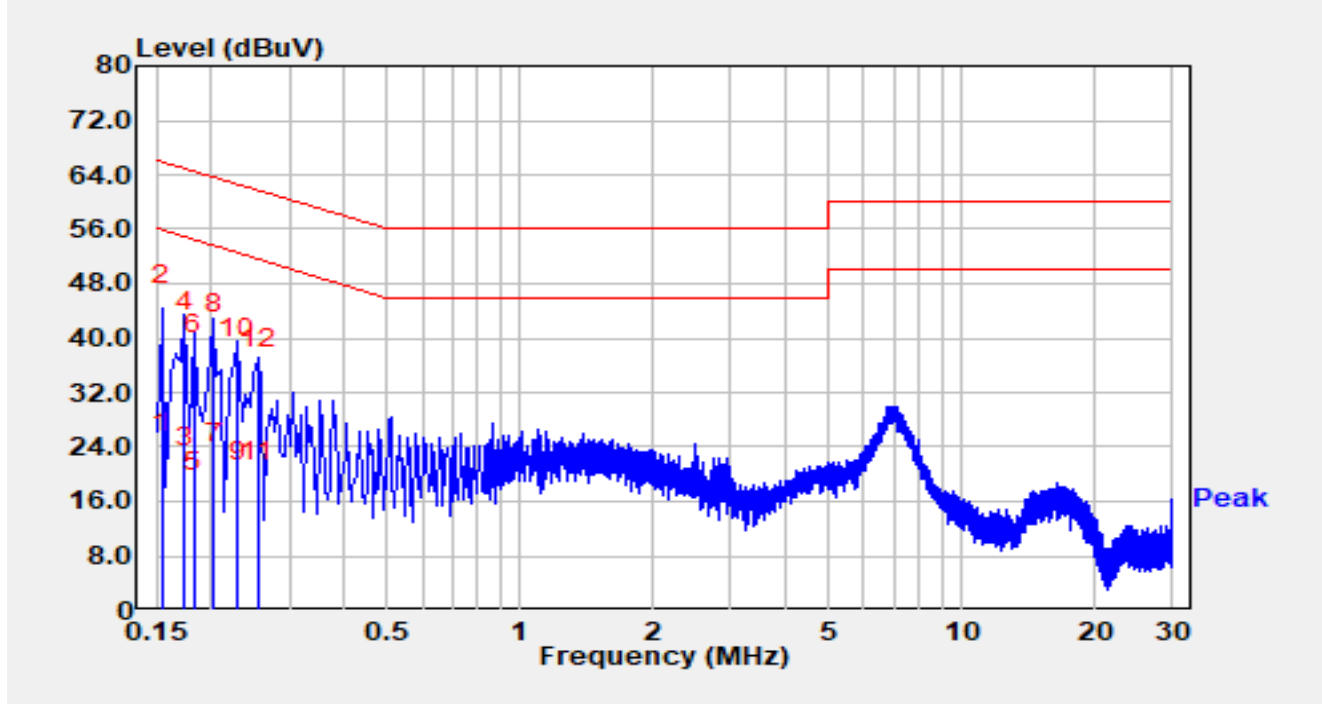


No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB)	Measurement (dBμV)	Margin (dB)	Limit (dBμV)	Detector
1		0.154	17.07	9.71	26.78	-29.00	55.78	Average
2		0.154	34.60	9.71	44.31	-21.47	65.78	QP
3		0.186	18.90	9.73	28.63	-25.59	54.21	Average
4		0.186	34.20	9.73	43.92	-20.29	64.21	QP
5		0.222	16.27	9.77	26.04	-26.71	52.74	Average
6		0.222	31.02	9.77	40.78	-21.96	62.74	QP
7		0.542	26.92	9.81	36.73	-9.27	46.00	Average
8		0.542	38.42	9.81	48.23	-7.77	56.00	QP
9		0.562	26.92	9.82	36.74	-9.26	46.00	Average
10	*	0.562	38.65	9.82	48.47	-7.53	56.00	QP
11		1.121	15.48	9.86	25.34	-20.66	46.00	Average
12		1.121	29.04	9.86	38.89	-17.11	56.00	QP

Notes:

1. " *", means this data is the worst emission level.
2. C.F (dB) = LISN Factor (dB) + Cable Loss (dB).
3. Measurement (dB μ V) = Reading (dB μ V) + C.F (dB).

Site	SIP-SR2	Test Date	2025-01-22
Temperature	19.5°C	Humidity	35.3%
Limit	FCC Part 15.207_CE_Mains	Test Engineer	Henry Wang
Factor	ENV216_101684_C	Polarity	Line
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Mode 2, Transmit by Lora at 902.75MHz		



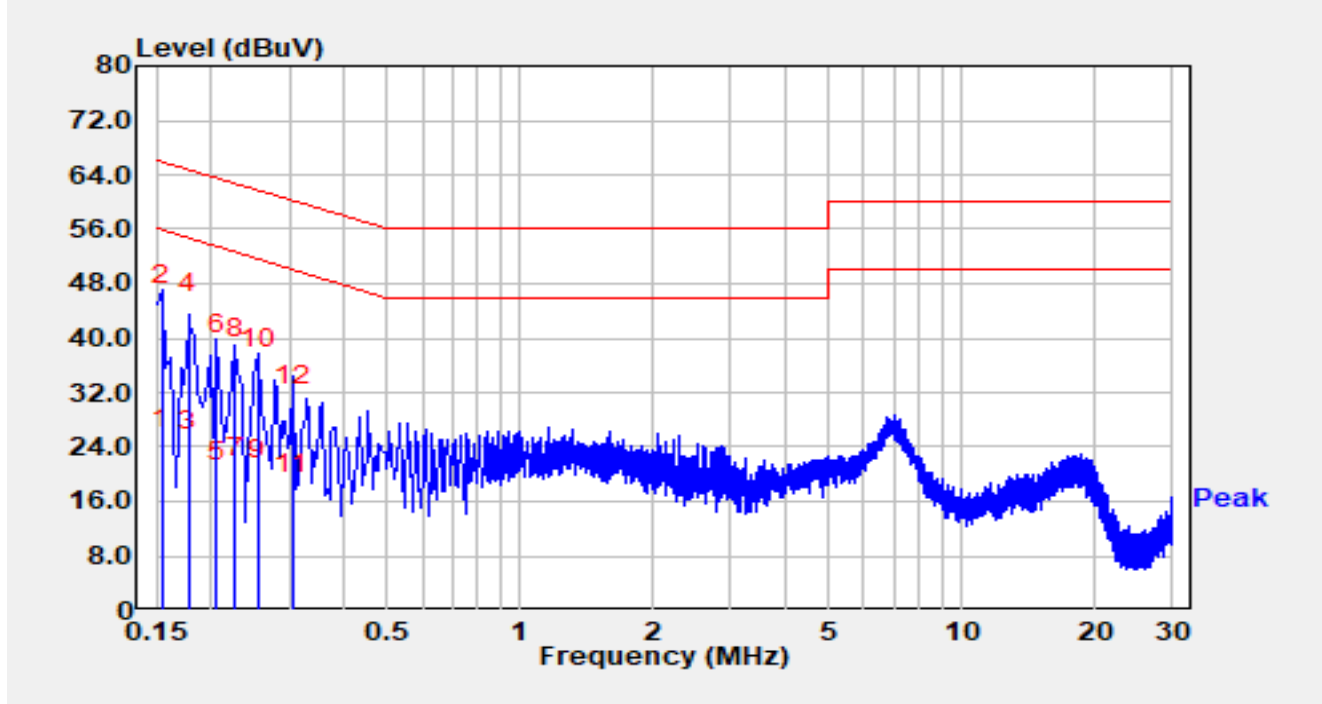
No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB)	Measurement (dBμV)	Margin (dB)	Limit (dBμV)	Detector
1		0.154	13.38	9.65	23.04	-32.75	55.78	Average
2	*	0.154	35.07	9.65	44.72	-21.06	65.78	QP
3		0.174	11.29	9.66	20.95	-33.82	54.77	Average
4		0.174	31.26	9.66	40.92	-23.85	64.77	QP
5		0.182	7.68	9.66	17.34	-37.05	54.39	Average
6		0.182	28.02	9.66	37.68	-26.71	64.39	QP
7		0.202	11.81	9.69	21.49	-32.03	53.53	Average
8		0.202	31.00	9.69	40.69	-22.84	63.53	QP
9		0.230	9.16	9.71	18.88	-33.57	52.45	Average
10		0.230	27.34	9.71	37.05	-25.40	62.45	QP
11		0.254	9.05	9.72	18.77	-32.86	51.63	Average
12		0.254	25.77	9.72	35.49	-26.14	61.63	QP

Notes:

1. " *", means this data is the worst emission level.

2. $C.F (dB) = LISN \text{ Factor } (dB) + \text{Cable Loss } (dB)$.
3. $\text{Measurement } (dB\mu V) = \text{Reading } (dB\mu V) + C.F (dB)$.

Site	SIP-SR2	Test Date	2025-01-22
Temperature	19.5°C	Humidity	35.3%
Limit	FCC Part 15.207_CE_Mains	Test Engineer	Henry Wang
Factor	ENV216_101684_C	Polarity	Neutral
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Mode 2, Transmit by Lora at 902.75MHz		



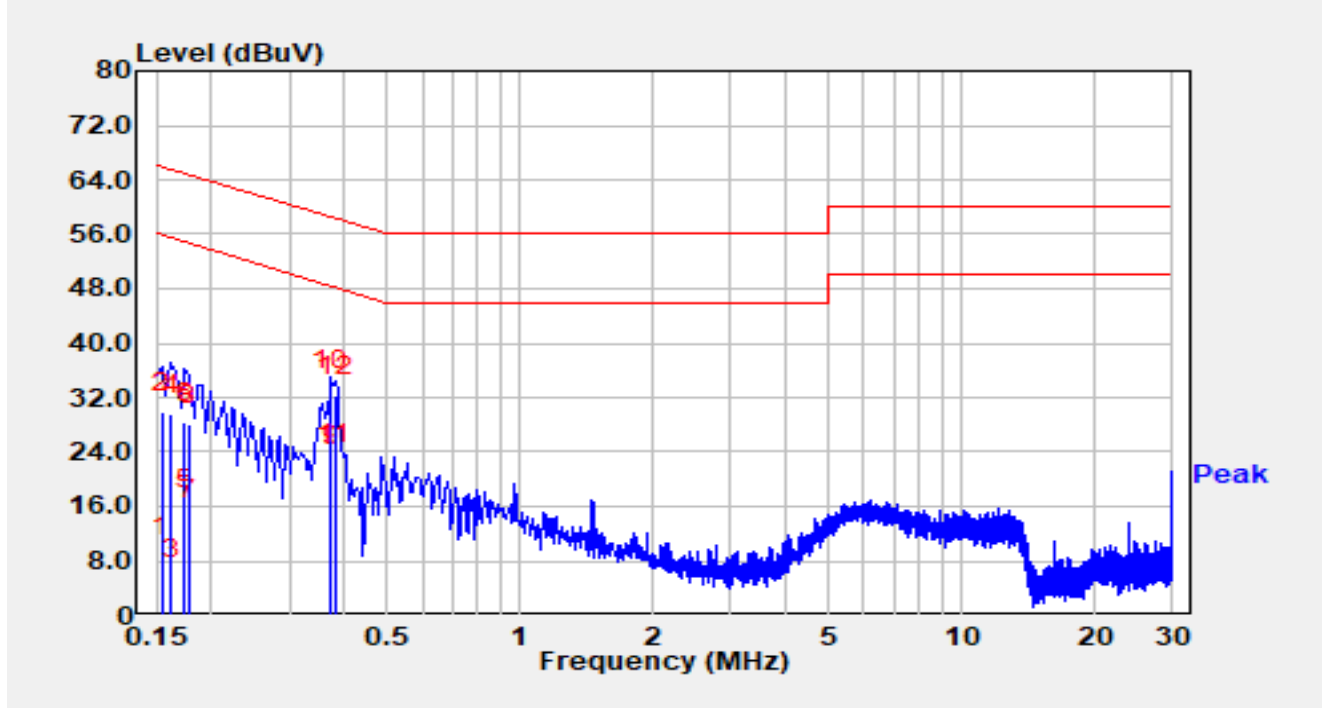
No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB)	Measurement (dBμV)	Margin (dB)	Limit (dBμV)	Detector
1		0.154	13.89	9.68	23.57	-32.21	55.78	Average
2		0.154	35.08	9.68	44.76	-21.03	65.78	QP
3		0.178	13.86	9.68	23.54	-31.04	54.58	Average
4	*	0.178	33.99	9.68	43.67	-20.91	64.58	QP
5		0.206	9.09	9.72	18.81	-34.56	53.37	Average
6		0.206	27.97	9.72	37.69	-25.68	63.37	QP
7		0.226	9.85	9.73	19.59	-33.01	52.60	Average
8		0.226	27.23	9.73	36.96	-25.64	62.60	QP
9		0.254	9.57	9.74	19.31	-32.31	51.63	Average
10		0.254	25.79	9.74	35.53	-26.09	61.63	QP
11		0.306	7.19	9.75	16.94	-33.14	50.08	Average
12		0.306	20.14	9.75	29.89	-30.19	60.08	QP

Notes:

1. " *", means this data is the worst emission level.

2. $C.F (dB) = LISN \text{ Factor } (dB) + \text{Cable Loss } (dB)$.
3. $\text{Measurement } (dB\mu V) = \text{Reading } (dB\mu V) + C.F (dB)$.

Site	SIP-SR2	Test Date	2025-01-22
Temperature	19.5°C	Humidity	35.3%
Limit	FCC Part 15.207_CE_Mains	Test Engineer	Henry Wang
Factor	ENV216_101684_C	Polarity	Line
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Mode 3, Transmit by Lora at 902.75MHz		

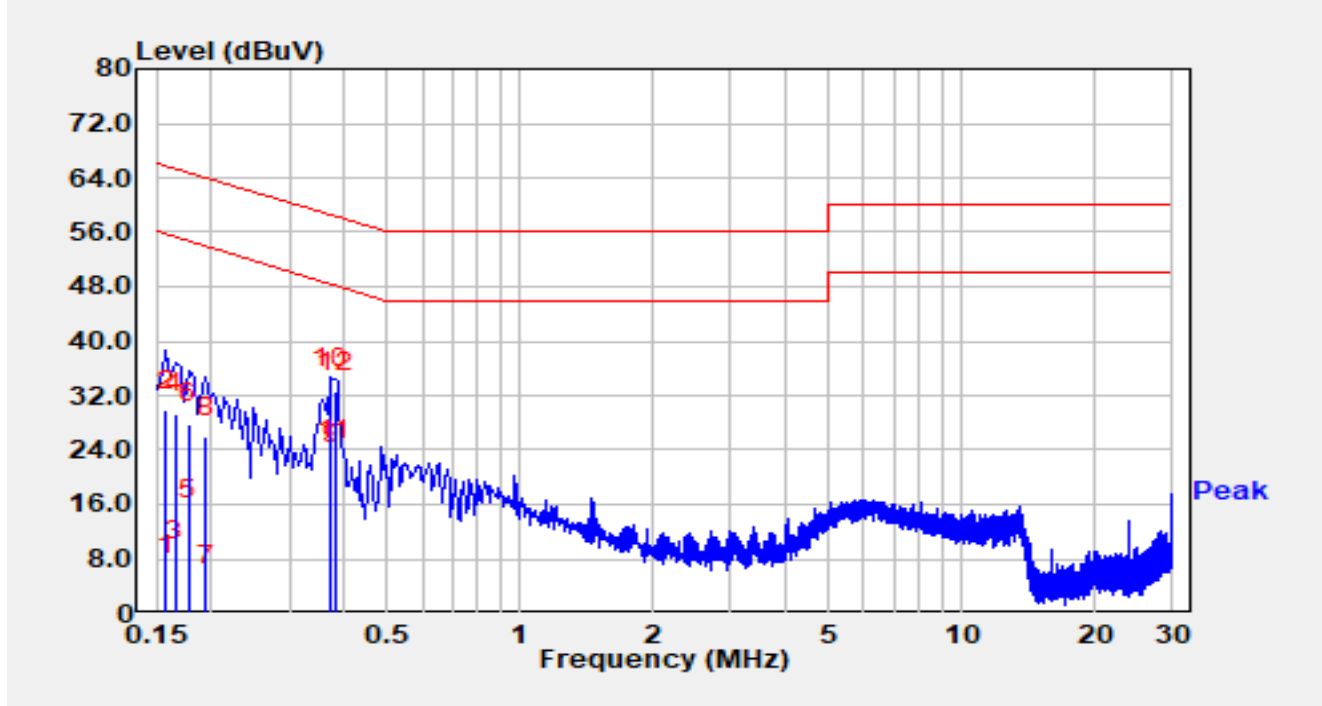


No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB)	Measurement (dBμV)	Margin (dB)	Limit (dBμV)	Detector
1		0.154	-1.19	9.65	8.47	-47.32	55.78	Average
2		0.154	20.09	9.65	29.74	-36.04	65.78	QP
3		0.162	-4.26	9.65	5.40	-49.96	55.36	Average
4		0.162	19.91	9.65	29.56	-35.80	65.36	QP
5		0.174	5.85	9.66	15.50	-39.26	54.77	Average
6		0.174	18.65	9.66	28.30	-36.46	64.77	QP
7		0.178	4.40	9.66	14.06	-40.52	54.58	Average
8		0.178	18.30	9.66	27.96	-36.62	64.58	QP
9		0.374	12.18	9.74	21.92	-26.49	48.41	Average
10	*	0.374	23.19	9.74	32.93	-25.48	58.41	QP
11		0.382	12.41	9.74	22.15	-26.09	48.24	Average
12		0.382	22.56	9.74	32.30	-25.94	58.24	QP

Notes:

1. " *", means this data is the worst emission level.
2. C.F (dB) = LISN Factor (dB) + Cable Loss (dB).
3. Measurement (dB μ V) = Reading (dB μ V) + C.F (dB).

Site	SIP-SR2	Test Date	2025-01-22
Temperature	19.5°C	Humidity	35.3%
Limit	FCC Part 15.207_CE_Mains	Test Engineer	Henry Wang
Factor	ENV216_101684_C	Polarity	Neutral
EUT	RTK Reference Station	Test Voltage	AC 120V/60Hz
Test Mode	Mode 3, Transmit by Lora at 902.75MHz		



No	Mark	Frequency (MHz)	Reading (dBμV)	C.F (dB)	Measurement (dBμV)	Margin (dB)	Limit (dBμV)	Detector
1		0.158	-4.01	9.68	5.67	-49.90	55.57	Average
2		0.158	20.08	9.68	29.76	-35.81	65.57	QP
3		0.166	-2.11	9.68	7.57	-47.59	55.16	Average
4		0.166	19.67	9.68	29.35	-35.81	65.16	QP
5		0.178	3.97	9.68	13.65	-40.93	54.58	Average
6		0.178	18.12	9.68	27.80	-36.78	64.58	QP
7		0.194	-5.73	9.70	3.97	-49.89	53.86	Average
8		0.194	16.12	9.70	25.82	-38.04	63.86	QP
9		0.374	12.15	9.76	21.91	-26.50	48.41	Average
10	*	0.374	23.28	9.76	33.04	-25.37	58.41	QP
11		0.382	12.59	9.76	22.35	-25.89	48.24	Average
12		0.382	22.76	9.76	32.51	-25.72	58.24	QP

Notes:

1. " *", means this data is the worst emission level.
2. C.F (dB) = LISN Factor (dB) + Cable Loss (dB).
3. Measurement (dB μ V) = Reading (dB μ V) + C.F (dB).

Appendix B – Test Setup Photograph

Refer to “2411RSU034-UT” file.

Appendix C – EUT Photograph

Refer to “2411RSU034-UE” file.

_____ The End _____