DEKRA Testing and Certification (Suzhou) Co., Ltd.
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Test report No:
2510546R-RF-US-P06V01

FCC & ISED TEST REPORT

Product Name	electronic shelf label
Trademark	HanShow
Model and /or type reference(For FCC)	Nebular Pro-154Q-N, Nebular-154R-N, Nebular Pro-154H-N, Nebular Pro-154QP-N, Nebular Pro-154QO-N
Model and /or type reference(For ISED)	Nebular Pro-154Q-N C3HW2, Nebular Pro-154Q-N C3HW
FCC ID	2AYMH-NQ154
IC	26866-NQ154
Applicant´s name / address	Hanshow Technology Co., Ltd. The 1st Floor Podium and Floor 4 of Building 1, Floor 7 of Building 5, Jiaxing Photovoltaic Technology Innovation Park, No.1288, Kanghe Road, Xiuzhou District, Jiaxing City, Zhejiang Prov.
Test method requested, standard	FCC CFR Title 47 Part 15 Subpart C Section 15.249 ANSI C63.10: 2013 RSS-Gen Issue 5 Amendment 2/ RSS-210 Issue 11 ANSI C63.10-2020 Cor1: 2023
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Tim Cao/Project Manager 
Approved by (name / position & signature)	Frank He/ Technical Manager 
Date of issue	2025-03-14
Report Version	V2.0
Report template No	Template_FCC Part 15C-RF-V1.0

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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.
In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Jan. 17, 2025
Date (start test)	Feb. 10, 2025
Date (finish test)	Feb. 21, 2025

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT : Equipment Under Test
QP : Quasi-Peak
CAV : CISPR Average
AV : Average
CDN : Coupling Decoupling Network
SAC : Semi-Anechoic Chamber
OATS : Open Area Test Site
BW : Bandwidth
AM : Amplitude Modulation
PM : Pulse Modulation
HCP : Horizontal Coupling Plane
VCP : Vertical Coupling Plane
U_N : Nominal voltage
*T*x : Transmitter
*R*x : Receiver
N/A : Not Applicable
N/M : Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2510546R-RF-US-P06V01	V1.0	Initial issue of report.	2025-03-06
2510546R-RF-US-P06V01	V2.0	Page 10: Update model difference. (The test report No.: 2510546R-RF-US-P06V01 V2.0 is to replace the test report No.: 2510546R-RF-US-P06V01 V1.0, and test report 2510546R-RF-US-P06V01 V1.0 is obsoleted.)	2025-03-14

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with FCC 47CFR §15.247, ANSI C63.10: 2013, RSS-Gen Issue 5 Amendment 2 and RSS-210 Issue 11, ANSI C63.10-2020 Cor 1: 2023.
3. The only change this time is to add Thread function through software update. After verification, there is no degradation of Bluetooth functions, so only Thread test report is provided this time.
4. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
5. The test results presented in this report relate only to the object tested.
6. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
7. This report will not be used for social proof function in China market.
8. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
    - Chapter 1.1 General Description of the Item(s);
    - Chapter 1.2 Antenna Informaion;
    - Chapter 1.3 Channel List.

USED EQUIPMENT

Emissions in non-restricted frequency bands/ Occupied Bandwidth/ Fundamental emission output power Power Spectral Density / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal.Date	Next Cal. Date	Firmware Version	Software version
Wireless Connectivity Tester	R&S	CMW 270	102593	2024.05.15	2025.05.14	V 4.0.60	N/A
Coaxial Cable	N/A	N/A	2477	2024.06.11	2025.06.10	N/A	N/A
Coaxial Cable	N/A	N/A	2478	2024.06.11	2025.06.10	N/A	N/A
High and low temperature and fast temperature change test box	ASTUOD	ASTD-FBT-225K	N/A	2024.04.21	2025.04.20	N/A	N/A
Temperature/Humidity Meter	RTS	RTS-8S	RF08	2024.07.11	2025.07.10	N/A	N/A
Test system							
Instrument	Manufacturer	Model No.	Serial No.	Cal.Date	Next Cal. Date	Firmware Version	Software version
MAX Signal Analyzer	Keysight	N9010A	MY48030494	2024.10.26	2025.10.25	A.14.03	N/A
RF Control Unit	Tonscend	JS0806-2	22G8060594	2025.01.26	2026.01.25	N/A	N/A
MXG-B RF Vector Signal Generator	Keysight	N5182B	MY61252529	2024.05.12	2025.05.11	B.01.96	N/A
Frequency extender for EXG or MXG	Keysight	N5182BX07	MY59362500	2024.05.12	2025.05.11	N/A	N/A
EXG-B MW Analog Signal Generator	Keysight	N5173B	MY61252566	2024.07.06	2025.07.05	B.01.95	N/A
Test Software	Tonscend	TS1120	JS1120-3	N/A	N/A	N/A	V3.0.22

Radiated Emission(30MHz-1GHz) / AC3

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date	Firmware Version	Software version
EMI Test Receiver	R&S	ESCI	100573	2025.01.11	2026.01.10	4.42 SP3	N/A
Loop Antenna	R&S	HFH2-Z2E	101149	2024.03.27	2025.03.26	N/A	N/A
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2024.03.20	2025.03.19	N/A	N/A
Temperature/Humidity Meter	RTS	RTS-8S	AC3-TH	2024.07.04	2025.07.03	N/A	N/A
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC3-C	2024.04.27	2025.04.26	N/A	N/A
Dekra test software	Dekra	N/A	N/A	N/A	N/A	N/A	3

Radiated Emission / AC5(1GHz-40GHz)(Chamber details)

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date	Firmware Version	Software version
EXA Spectrum Analyzer	Keysight	N9020B	MY60112218	2024.11.02	2025.11.01	A.31.05	N/A
Pre-Amplifier	SKET	LNPA_0118G-45	SK2021090101	2024.04.27	2025.04.26	N/A	N/A
Preamplifier	CHENGYI	EMC184045SE	980263	2024.07.06	2025.07.05	N/A	N/A
DRG Horn	ETS-Lindgren	3117	123988	2024.11.24	2025.11.23	N/A	N/A
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2024.05.30	2025.05.29	N/A	N/A
Filter Switch Box	MVE	MSW-F196	C070001S	2024.04.20	2025.04.19	N/A	N/A
Temperature/Humidity Meter	RTS	RTS-1909	THM-024	2024.05.17	2025.05.16	N/A	N/A
Coaxial Cable	ROSENBERGER	LA1-C011-2000/3000	AC5-40G	2025.01.18	2026.01.17	N/A	N/A
Coaxial Cable	ROSENBERGER	LA1-C011-2000/3000	AC5-40G-2	2024.05.26	2025.05.25	N/A	N/A
Cable	Rosenberger	LA1-C390-2000	0001	2024.05.26	2025.05.25	N/A	N/A
Cable	Rosenberger	LA1-C390-2000	0002	2024.05.26	2025.05.25	N/A	N/A
Dekra test software	Dekra	N/A	N/A	N/A	N/A	N/A	3

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95% .

Test item	Uncertainty
Radiated Emission(30MHz~1GHz)	Horizontal: 30MHz~200MHz: 3.50 dB 300MHz~1GHz: 3.60 dB Vertical: 30MHz~200MHz: 3.60 dB 300MHz~1GHz: 3.50 dB
Radiated Emission(1GHz~26.5GHz)	Horizontal: 1GHz~18GHz: 5.00 dB Vertical: 1GHz~18GHz: 4.80 dB
The fundamental field strength and the harmonics	± 1.27dB
Radiated Emission Band Edge	± 3.9 dB
Occupied Bandwidth	±1kHz

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name ..... :	electronic shelf label
Model No(for FCC). ..... :	Nebular Pro-154Q-N, Nebular-154R-N, Nebular Pro-154H-N, Nebular Pro-154QP-N, Nebular Pro-154QO-N
Model No(for ISED). ..... :	Nebular Pro-154Q-N C3HW2, Nebular Pro-154Q-N C3HW
Trademark ..... :	HanShow
FCC ID ..... :	2AYMH-NQ154
IC ..... :	26866-NQ154
Hardware version ..... :	HSEL4Q_01_54M_39
Software version ..... :	ROM74
Manufacturer ..... :	Hanshow Technology Co., Ltd.
Manufacturer address ..... :	The 1st Floor Podium and Floor 4 of Building 1, Floor 7 of Building 5, Jiaxing Photovoltaic Technology Innovation Park, No.1288, Kanghe Road, Xiuzhou District, Jiaxing City, Zhejiang Prov.
Model Difference(s) for FCC ..... :	The only difference between models is the region where they are sold.
Model Difference(s) for ISED ..... :	The only difference between the different models is the screen display Color，Nebular Pro-154Q-N C3HW2 is black, white, red,yellow,orange,gray, Nebular Pro-154Q-N C3HW is black,white,red,yellow, other than that, everything else is the same.

Wireless specifiction..... :	SRD 2.4G
Operating frequency range(s)	2402~2480MHz
Type of Modulation..... :	GFSK
Number of channel..... :	157
Channel separation ..... :	0.5MHz

Rated power supply ..... :	Voltage and Frequency	
	☐	AC: 220 – 240 Vac, 50/60 Hz
	☐	AC: 110 – 130 Vac, 50/60 Hz
	☐	DC: ……
	☒	Battery: 3Vdc
	☐	PoE: ……
Mounting position ..... :	☒	Table top equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Hand-held equipment
	☐	Other: …….

1.2 Antenna Information

Antenna model / type number ..... :	HSEL4Q_01_54M_39			
Antenna serial number ..... :	N/A			
Antenna Delivery ..... :	☒	1TX + 1RX		
	☐	2TX + 2RX		
	☐	Others:……		
Antenna technology ..... :	☒	SISO		
	☐	MIMO	☐	CDD
			☐	Beam-forming
Antenna Type ..... :	☐	External	☐	Dipole
			☐	Sectorized
	☒	Internal	☐	Ceramic Chip
			☐	PIFA
			☒	PCB
			☐	Others……..
Antenna Gain ..... :	-0.7 dBi			

1.3 Channel List

Working Frequency of Each Channel:							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
4	2402	44	2422	84	2442	124	2462
5	2402.5	45	2422.5	85	2442.5	125	2462.5
6	2403	46	2423	86	2443	126	2463
7	2403.5	47	2423.5	87	2443.5	127	2463.5
8	2404	48	2424	88	2444	128	2464
9	2404.5	49	2424.5	89	2444.5	129	2464.5
10	2405	50	2425	90	2445	130	2465
11	2405.5	51	2425.5	91	2445.5	131	2465.5
12	2406	52	2426	92	2446	132	2466
13	2406.5	53	2426.5	93	2446.5	133	2466.5
14	2407	54	2427	94	2447	134	2467
15	2407.5	55	2427.5	95	2447.5	135	2467.5
16	2408	56	2428	96	2448	136	2468
17	2408.5	57	2428.5	97	2448.5	137	2468.5
18	2409	58	2429	98	2449	138	2469
19	2409.5	59	2429.5	99	2449.5	139	2469.5
20	2410	60	2430	100	2450	140	2470
21	2410.5	61	2430.5	101	2450.5	141	2470.5
22	2411	62	2431	102	2451	142	2471
23	2411.5	63	2431.5	103	2451.5	143	2471.5
24	2412	64	2432	104	2452	144	2472
25	2412.5	65	2432.5	105	2452.5	145	2472.5
26	2413	66	2433	106	2453	146	2473
27	2413.5	67	2433.5	107	2453.5	147	2473.5
28	2414	68	2434	108	2454	148	2474
29	2414.5	69	2434.5	109	2454.5	149	2474.5
30	2415	70	2435	110	2455	150	2475
31	2415.5	71	2435.5	111	2455.5	151	2475.5
32	2416	72	2436	112	2456	152	2476
33	2416.5	73	2436.5	113	2456.5	153	2476.5
34	2417	74	2437	114	2457	154	2477
35	2417.5	75	2437.5	115	2457.5	155	2477.5
36	2418	76	2438	116	2458	156	2478
37	2418.5	77	2438.5	117	2458.5	157	2478.5
38	2419	78	2439	118	2459	158	2479
39	2419.5	79	2439.5	119	2459.5	159	2479.5
40	2420	80	2440	120	2460	160	2480
41	2420.5	81	2440.5	121	2460.5	-	-
42	2421	82	2441	122	2461	-	-

43	2421.5	83	2441.5	123	2461.5	-	-

Note: The General Description of the Item , antenna information and Channel List for the EUT in clause 1 are provided and confirmed by the client.

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

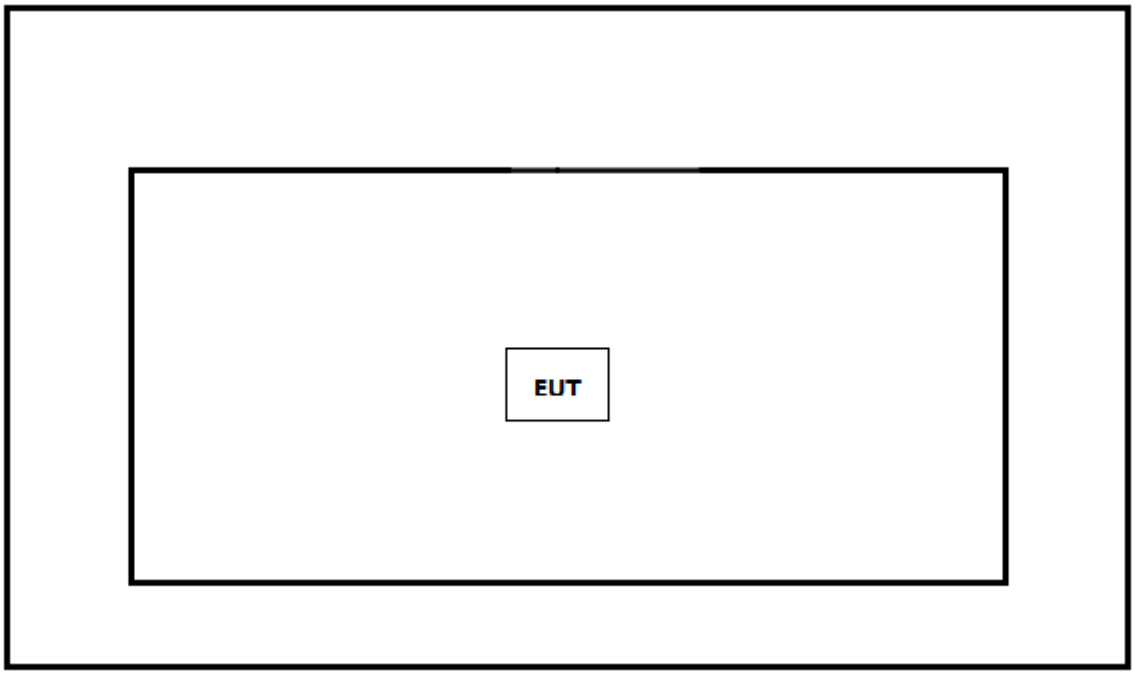
Test Mode	Mode1: Transmit

2.2 Auxiliary equipment / Test software for the EUT

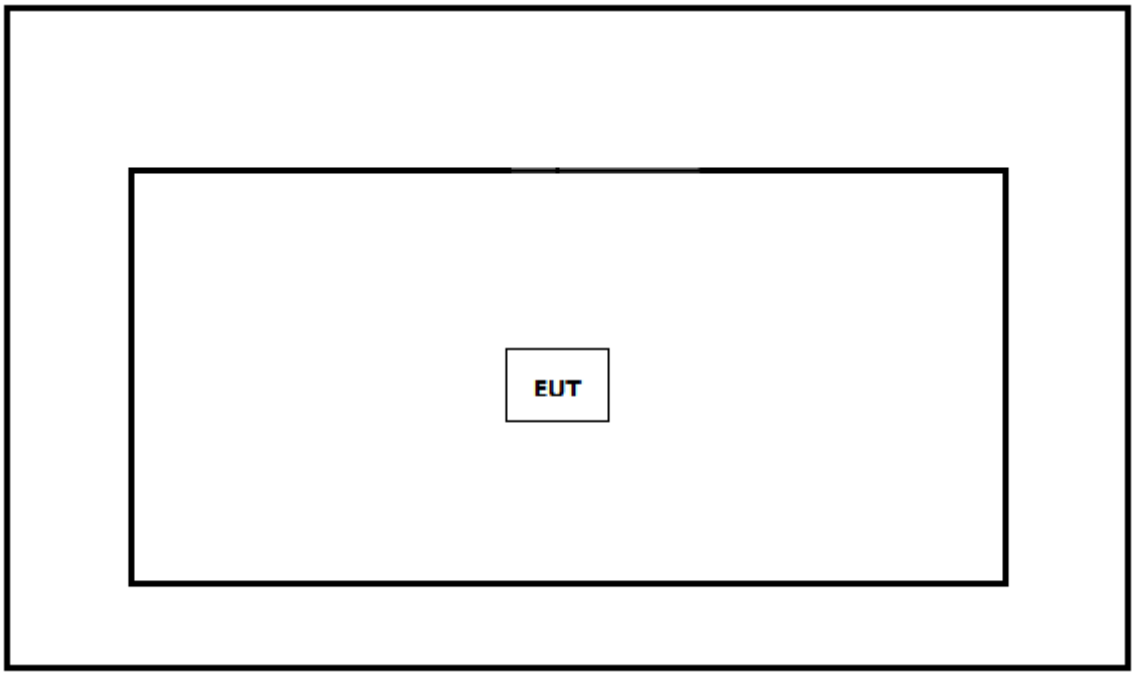
Auxiliary equipment	Type / Version	Manufacturer	Supplied by
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
software	Type / Version	Manufacturer	Supplied by
N/A	N/A	N/A	N/A

2.3 Test Configuration / Block diagram used for tests

Test setup Diagram- AC Line Conducted Emission Test



Test setup Diagram- Conducted test



2.4 Testing process

1	Setup the EUT as shown in Section 2.3.
2	Powering the EUT
3	Verify that the EUT works properly.

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
FCC CFR Title 47 Part 15 Subpart C Section 15.249	2023	Operation within the bands902–928 MHz, 2400–2483.5 MHz, and5725–5850 MHz..
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
RSS-Gen Issue 5 Amendment 2	2021	General Requirements for Compliance of Radio Apparatus
RSS-210 Issue 11	2024	Licence-Exempt Radio Apparatus: Category I Equipment
ANSI C63.10-2020 Corrigendum1	2023	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

3.2 Deviation(s) from the Standard(s) / Test Specification(s)

The following deviation(s) was / were made from the published requirements of the listed standards: N/A.

(Please define the deviations from the standard(s) if applicable)

3.3 Overview of results

For FCC

Requirement – Test case	Basic standard(s)	Verdict	Remark
AC Power Line Conducted Emission	FCC 15.207	N/A[1)]	--
The fundamental field strength and the harmonics	FCC 15.249(a)	PASS	Please refer to **Appendix A**
Radiated Emission	FCC 15.249(d), FCC 15.209,15.205	PASS	Please refer to **Appendix B**
Band Edge	FCC 15.249(d), FCC 15.209,15.205	PASS	Please refer to **Appendix C**
20dB Bandwidth	FCC 15.215(c)	PASS	Please refer to **Appendix D**
Antenna Requirement	FCC 15.203	PASS	---
Note: The product is power supplied by battery, so the AC Power Line Conducted Emission test is not applicable.			

For ISED

Requirement – Test case	Basic standard(s)	Verdict	Remark
AC Power Line Conducted Emission	RSS-Gen Issue 5 Section 8.8	N/A[1)]	--
The fundamental field strength and the harmonics	RSS-210 Issue 11 Section 8.2, 8.3	PASS	Refer to **Appendix A** for test data
Radiated Emission	RSS-210 Issue 11 Section 8.1	PASS	Refer to **Appendix B** for test data
Band Edge	RSS-210 Issue 11 Section 8.1	PASS	Refer to **Appendix C** for test data
20dB Bandwidth	RSS-Gen Issue 5 Section 6.7	PASS	Refer to **Appendix D** for test data
Antenna Requirement	RSS-Gen Issue 5 Section 6.8	PASS	---
Note: The product is power supplied by battery, so the AC Power Line Conducted Emission test is not applicable.			

3.4 Power setting in test

Mode	Channel	Frequency (MHz)	Power setting
SRD	4	2402	Default
	82	2441	Default
	160	2480	Default

3.5 Test Matrix

Test item	Model: Nebular Pro-154Q-N		
	1(#1)	2(#7)	3()
The fundamental field strength and the harmonics	☐	☒	☐
Radiated Emission	☐	☒	☐
Band Edge	☐	☒	☐
20dB Bandwidth	☒	☐	☐
Antenna Requirement	☐	☒	☐
Note1: The only difference between sample #1 and sample #7 is whether to keep the original antenna, sample #1 is a conduction test product that removes the original antenna and is equipped with SMA wires, and sample #7 is a complete product that retains the original antenna.			

3.6 Test Facility

USA	**:**	**FCC Designation Number: CN1199**
CA	**:**	**ISED CAB identifier: CN0040**

4 TEST RESULTS

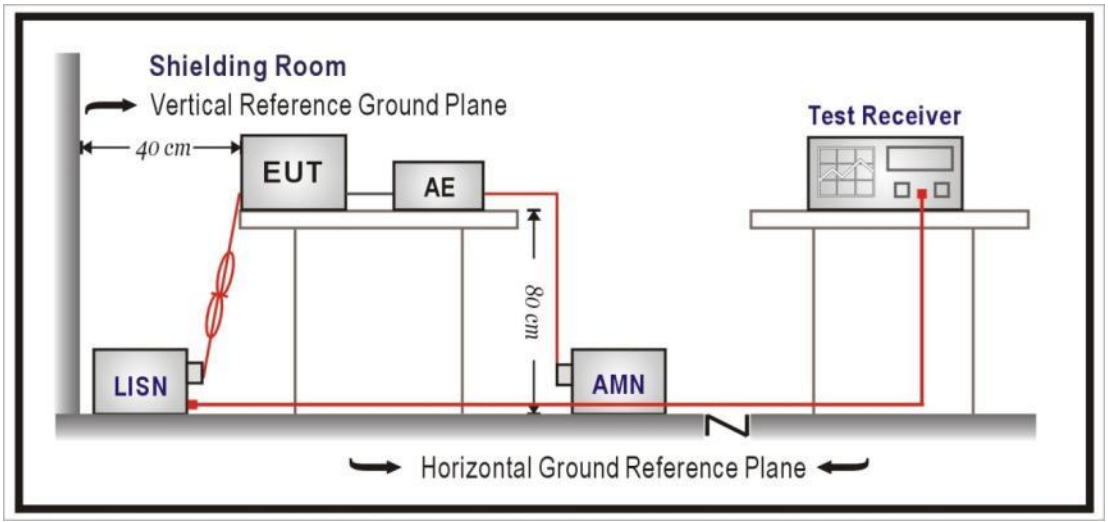
4.1 AC Power Line Conducted Emission	VERDICT: N/A

4.1.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15.207	
Frequency range [MHz]	Limit: QP [dB(μV)[1)]]	Limit: AV [dB(μV) [1)]]
0,15 - 0,50	66 – 56 [2)]	56 - 46 [2)]
0,50 - 5,0	56	46
5,0 - 30	60	50

[1)] At the transition frequency, the lower limit applies.
[2)] The limit decreases linearly with the logarithm of the frequency.
NOTE 1: The exclusion band for transmitters shall be considered for transmitters operating at frequencies below 30 MHz.
NOTE 2: Where the AC output port is directly connected (or via a circuit breaker) to the AC power input port of the EUT the AC power output port need not to be tested.

4.1.2 Test Setup



4.1.3 Test Procedure

	References Rule	Chapter	Item
☒	ANSI C63.10-2013	6.2	Standard test method for ac power-line conducted emissions from unlicensed wireless devices

4.2 The fundamental field strength and the harmonics — VERDICT: PASS

4.2.1 Limit

Fundamental and Harmonics Radiated Emissions 15.249(a) Limit

Fundamental Frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902 – 928 MHz	50	500
2400 -2483.5 MHz	50	500
5725 -5875 MHz	50	500
24.0 – 24.25 GHz	250	2500

Note: 1. RF Voltage (dBuV)=20 log Voltage(uV)

2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3. The emission limit in this paragraph os 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.

Spurous Radiated Emissions 15.249(d) Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Restricted Bands of operationfor FCC			
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
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
8.81425 – 8.81475	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	
13.36 – 13.41			

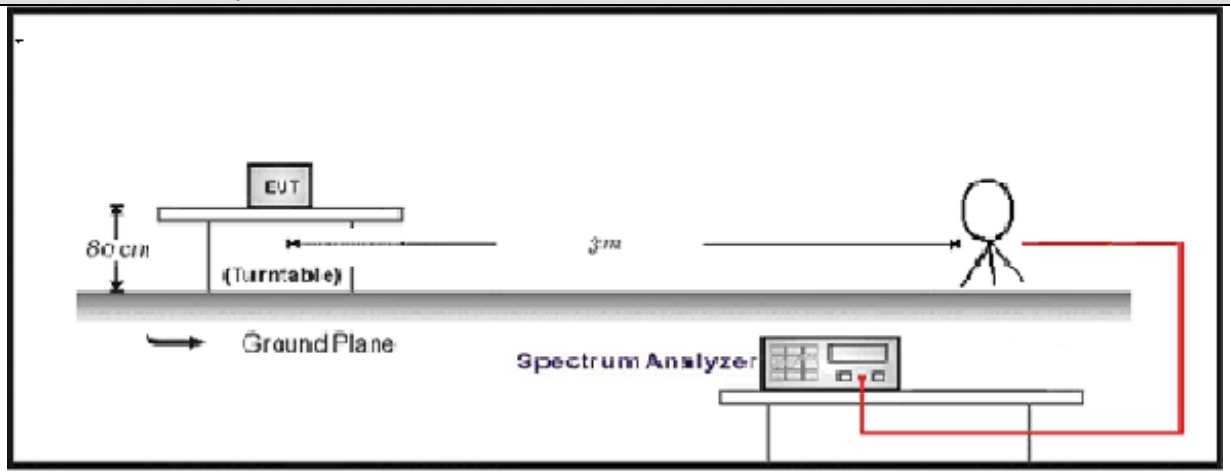
Restricted Band Emissions Limit			
Frequency (MHz)	Field strength (μV/m)	Field strength (dB μV/m)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 – 13.8	300(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30(Note 1)
1.705 - 30	30	29.5	30(Note 1)
30 -88	100	40	3(Note 2)
88-216	150	43.5	3(Note 2)
216 - 960	200	46	3(Note 2)
Above 960	500	54	3(Note 2)

Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

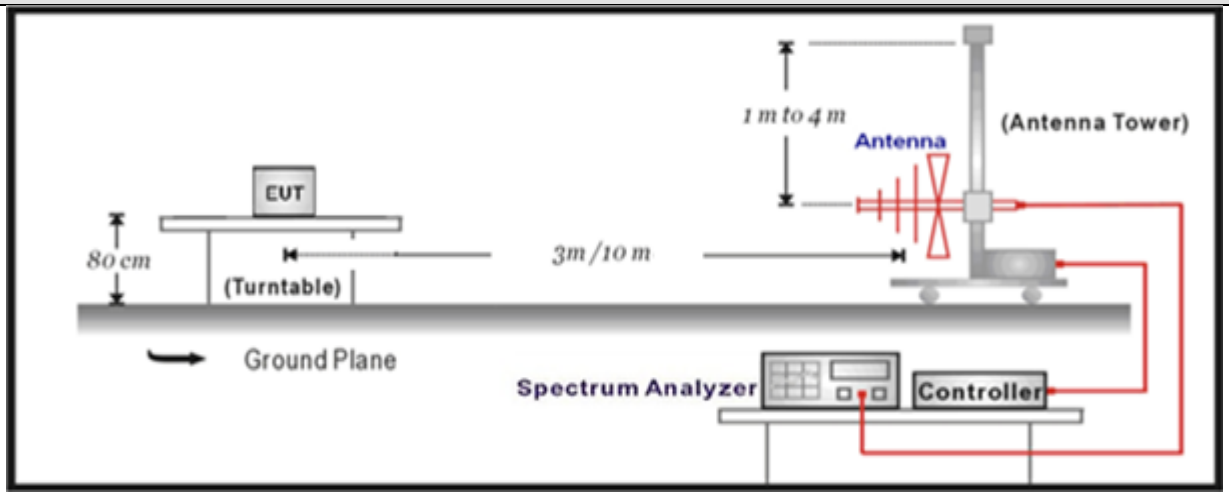
Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

4.2.2 Test Setup

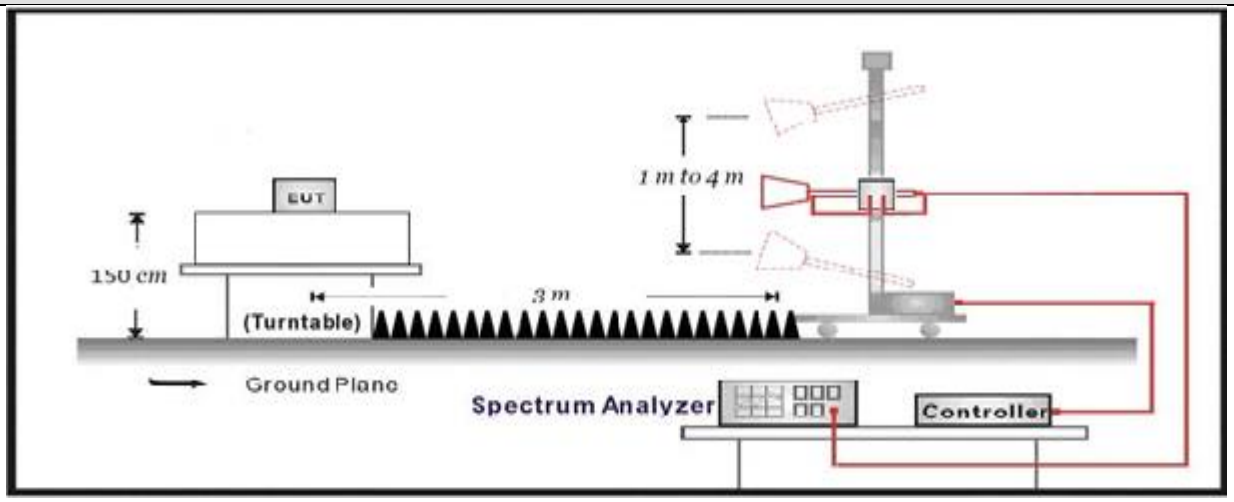
Below 30MHz Test Setup:



30MHz-1GHz Test Setup:



Above 1GHz Test Setup:



4.2.3 Test Procedure

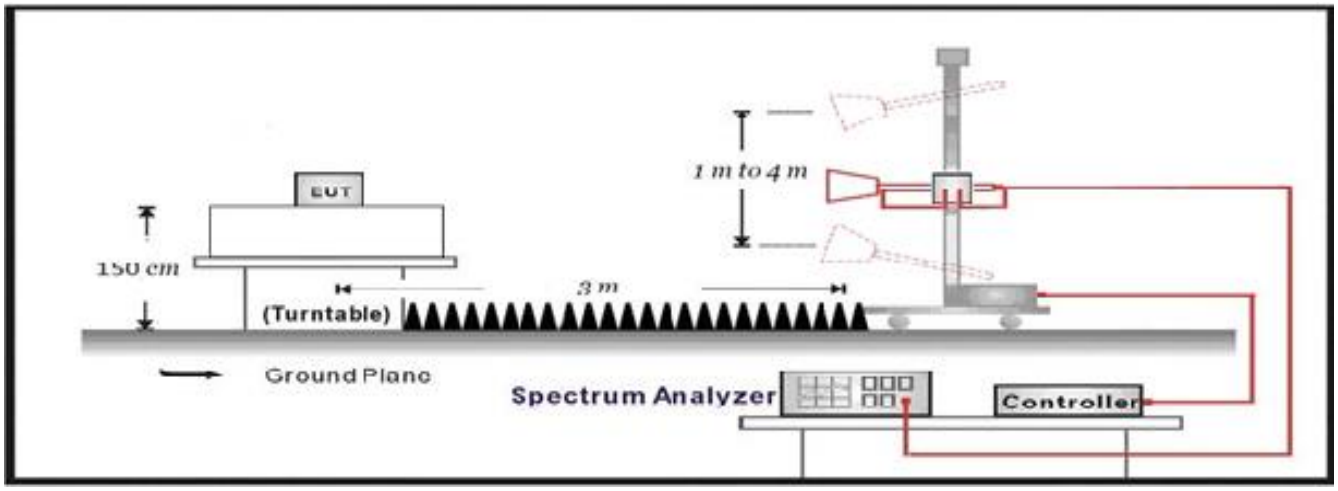
	References Rule	Chapter	Description
☒	ANSI C63.10	11.12	Emissions in restricted frequency bands
	☒ ANSI C63.10	11.12.1	Radiated emission measurements
	☒ ANSI C63.10	11.12.2.7	Radiated spurious emission test
	☒ ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
	☒ ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
	☒ ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

4.3 Band Edge — VERDICT: PASS

4.3.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15.209,15.205			
Frequency bands (MHz)	Detector	Limit (dB μ V/m)	RBW (MHz)	Distance (m)
2310-2390 2483.5-2500	PK	74	1	3
	AV	54	1	3
Standard	FCC Part 15 Subpart C Paragraph 15.249(d)			
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.				

4.3.2 Test Setup



4.3.3 Test Procedure

	References Rule			Chapter	Description
☒	ANSI C63.10			6.10	Band-edge testing
	☒	ANSI C63.10		6.10.5	Restricted-band band-edge measurements
	☐	ANSI C63.10		6.10.6	Marker-delta method
☒	ANSI C63.10			11.12	Emissions in restricted frequency bands
	☒	ANSI C63.10		11.12.2	Antenna-port conducted measurements
		☐	ANSI C63.10	11.12.2.3	Quasi-peak measurement procedure
		☒	ANSI C63.10	11.12.2.4	Peak power measurement procedure
		☒	ANSI C63.10	11.12.2.5	Average power measurement procedures

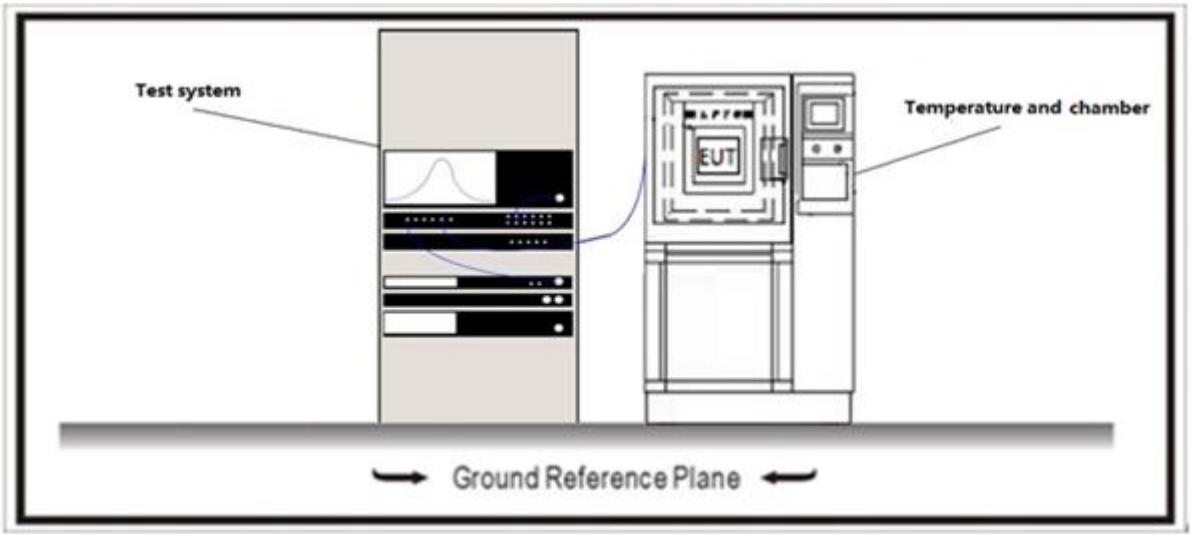
4.4 20 dB Bandwidth	VERDICT: PASS

4.4.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15.215

Contained within the frequency band designated in the rule section under which the equipment is operated.

4.4.2 Test Setup



4.4.3 Test Procedure

	Reference Rule	Chapter	Description
☒	ANSI C63.10	6.9	Occupied bandwidth tests
	☒ ANSI C63.10	6.9.2	Option 1
	☐ ANSI C63.10	6.9.3	Option 2

4.5 Antenna Requirement	VERDICT: PASS

4.5.1 Limit:	
Standard	FCC Part 15 Subpart C Paragraph 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.

4.5.2 Antenna Connector Construction:	
☒	The use of a permanently attached antenna
☐	The antenna use of a unique coupling to the intentional radiator
☐	The use of a nonstandard antenna jack or electrical connector

Please refer to the attached document “Internal Photograph” to show the antenna connector.

5 TEST SETUP PHOTO AND EUT PHOTO

Remark: The test setup photo and EUT Photo please see appendix.

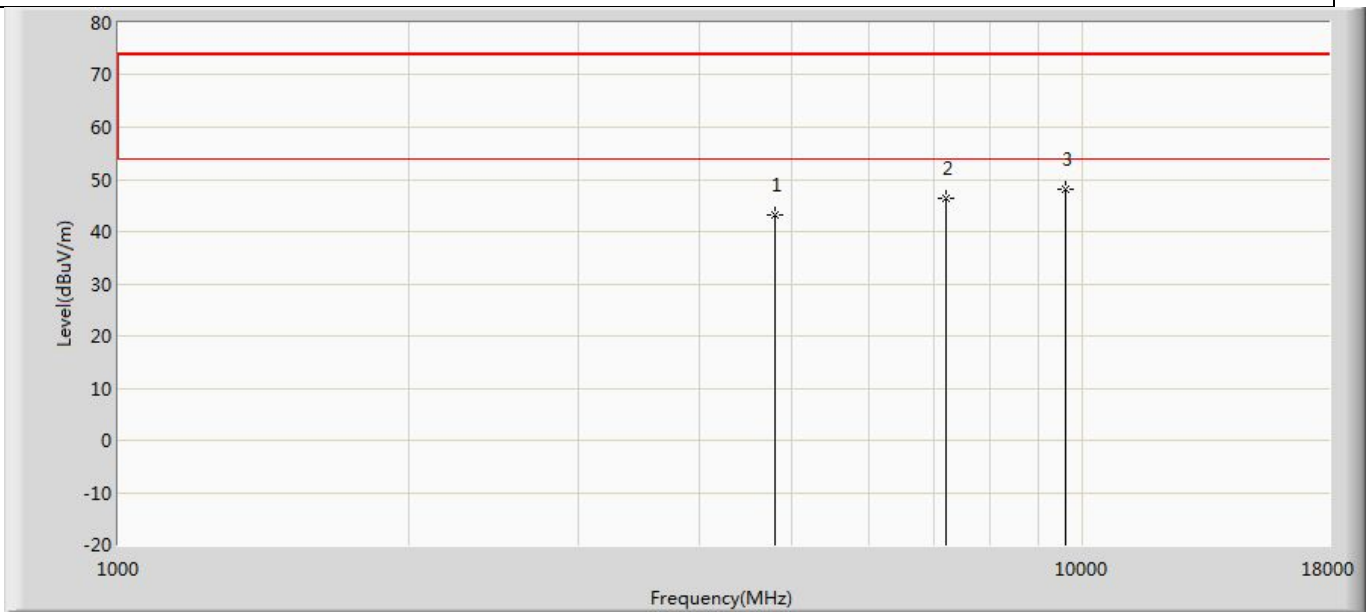
Appendix A: The fundamental field strength and the harmonics

Freq. (MHz)	Read Level (dBuV) AV/PK	Reading Level (dBuV/m)	Factor (dB)	Radiated Emissions (dB)	HORIZ/ VERT	Limits (dBuV/m) AV/PK	Margin (dB)
2402	PK	56.581	34.086	90.666	H	114	23.334
2402	AV	55.941	34.086	90.026	H	94	3.974
2402	PK	53.220	34.086	87.305	V	114	26.695
2402	AV	52.941	34.086	87.026	V	94	6.974
2441	PK	56.476	34.092	90.568	H	114	23.432
2441	AV	56.267	34.092	90.359	H	94	3.641
2441	PK	52.865	34.092	86.957	V	114	27.043
2441	AV	52.259	34.092	86.351	V	94	7.649
2480	PK	56.434	34.086	90.520	H	114	23.48
2480	AV	56.270	34.086	90.356	H	94	3.644
2480	PK	52.517	34.086	86.603	V	114	27.397
2480	AV	52.059	34.086	86.145	V	94	7.855

Note: 1. Radiated Emissions = Factor+ Reading Level
2. Margin = Limits - Radiated Emissions
3. AV Limit (dBuV/m)=20 log Voltage(uV)=20 log (50000)=94 dBuV /m
4. PK Limit (dBuV/m)= AV Limit +20dB=114 dBuV /m

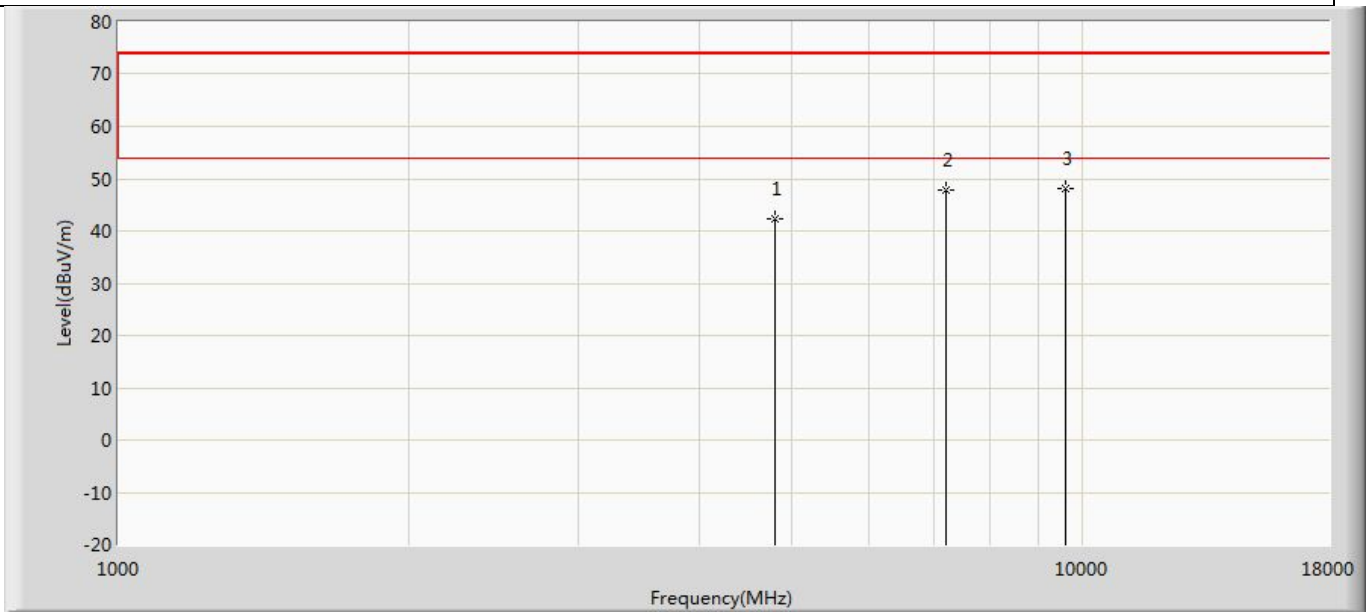
Appendix B: Radiated Emission

Profile: 2510546R	Page No.: 7
Engineer: Yu Liu	
Site: AC5	Time: 2025/02/22 - 06:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Horizontal
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 1:Transmit at 2402MHz	



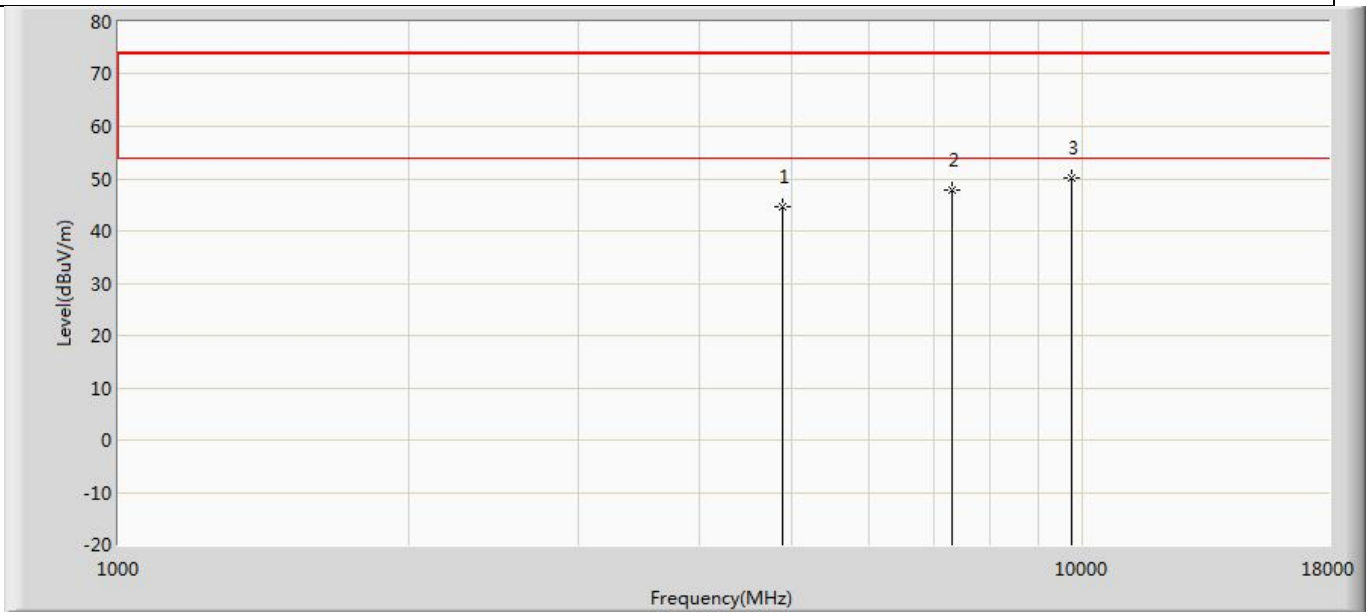
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4804.000	43.241	44.962	-30.759	74.000	-1.722	PK
2		7206.000	46.496	43.417	-27.504	74.000	3.079	PK
3	*	9608.000	48.259	42.697	-25.741	74.000	5.562	PK

Profile: 2510546R	Page No.: 8
Engineer: Yu Liu	
Site: AC5	Time: 2025/02/22 - 06:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Vertical
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 1:Transmit at 2402MHz	



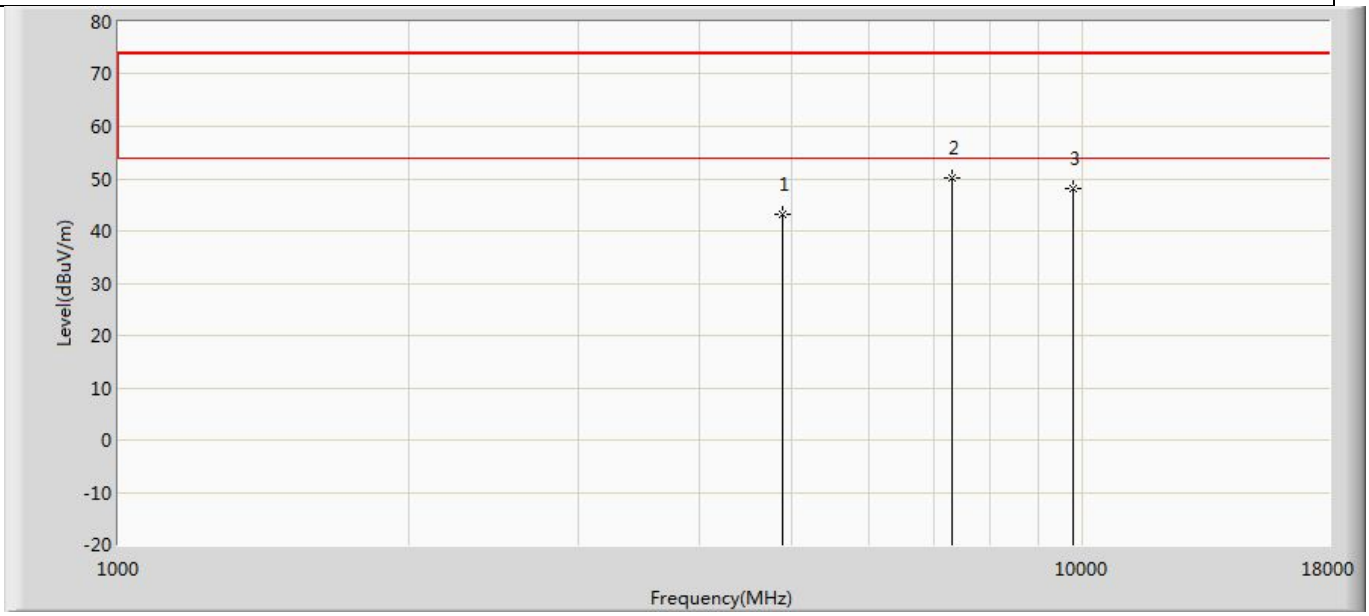
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4804.000	42.325	44.046	-31.675	74.000	-1.722	PK
2		7205.000	47.846	44.751	-26.154	74.000	3.095	PK
3	*	9608.000	48.148	42.586	-25.852	74.000	5.562	PK

Profile: 2510546R	Page No.: 9
Engineer: Yu Liu	
Site: AC5	Time: 2025/02/22 - 06:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Horizontal
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 1:Transmit at 2441MHz	



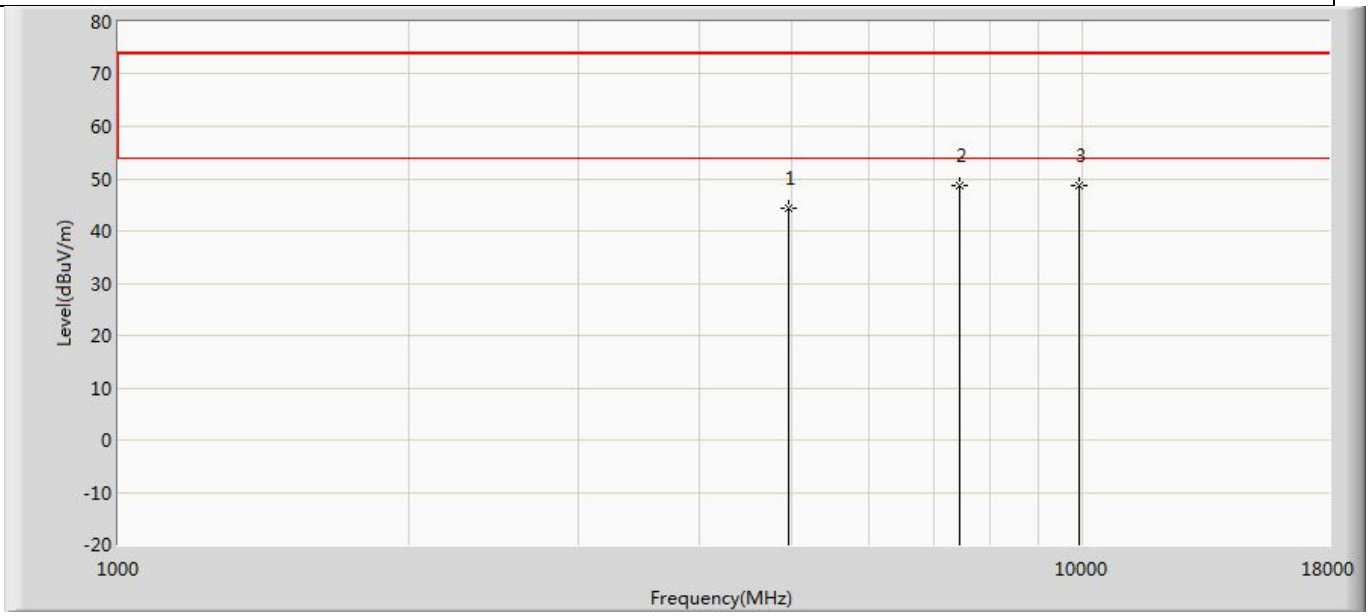
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4876.000	44.631	44.912	-29.369	74.000	-0.281	PK
2		7324.000	47.951	45.546	-26.049	74.000	2.405	PK
3	*	9755.000	50.051	44.214	-23.949	74.000	5.836	PK

Profile: 2510546R	Page No.: 10
Engineer: Yu Liu	
Site: AC5	Time: 2025/02/22 - 06:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Vertical
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 1:Transmit at 2441MHz	



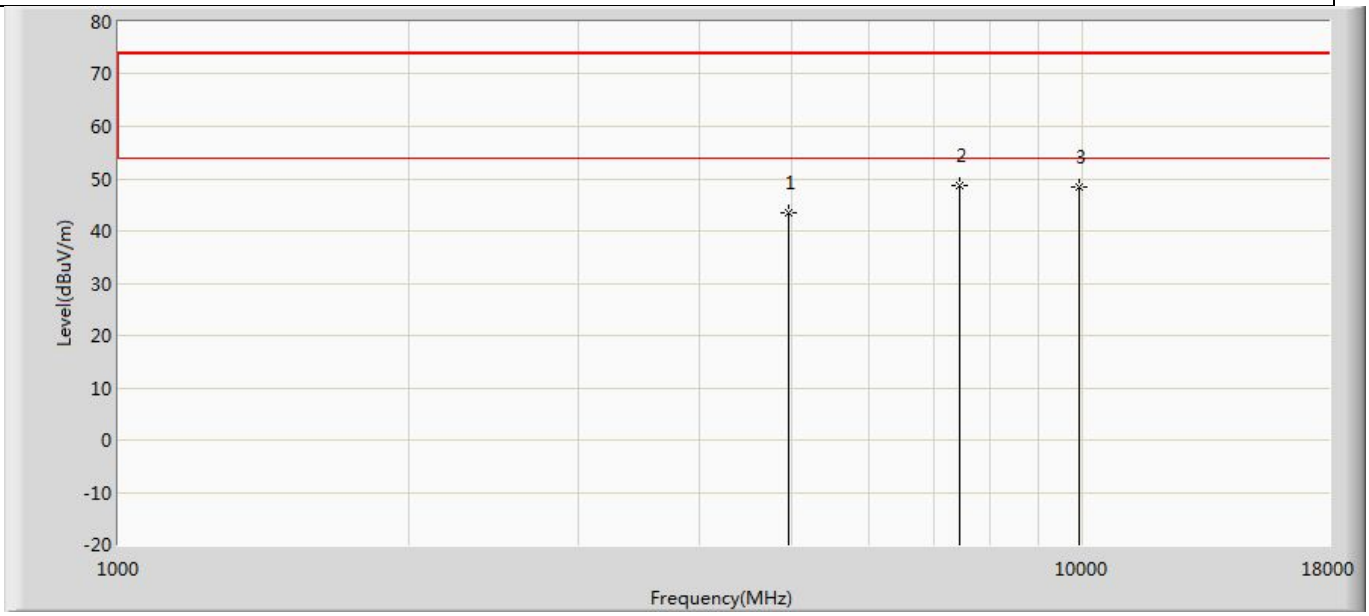
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4882.000	43.161	43.709	-30.839	74.000	-0.548	PK
2	*	7324.000	50.193	47.788	-23.807	74.000	2.405	PK
3		9764.000	48.243	42.496	-25.757	74.000	5.746	PK

Profile: 2510546R	Page No.: 11
Engineer: Yu Liu	
Site: AC5	Time: 2025/02/22 - 06:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Horizontal
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 1:Transmit at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4961.000	44.437	44.988	-29.563	74.000	-0.550	PK
2	*	7443.000	48.729	46.250	-25.271	74.000	2.480	PK
3		9920.000	48.691	41.983	-25.309	74.000	6.708	PK

Profile: 2510546R	Page No.: 12
Engineer: Yu Liu	
Site: AC5	Time: 2025/02/22 - 06:00
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Vertical
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 1:Transmit at 2480MHz	



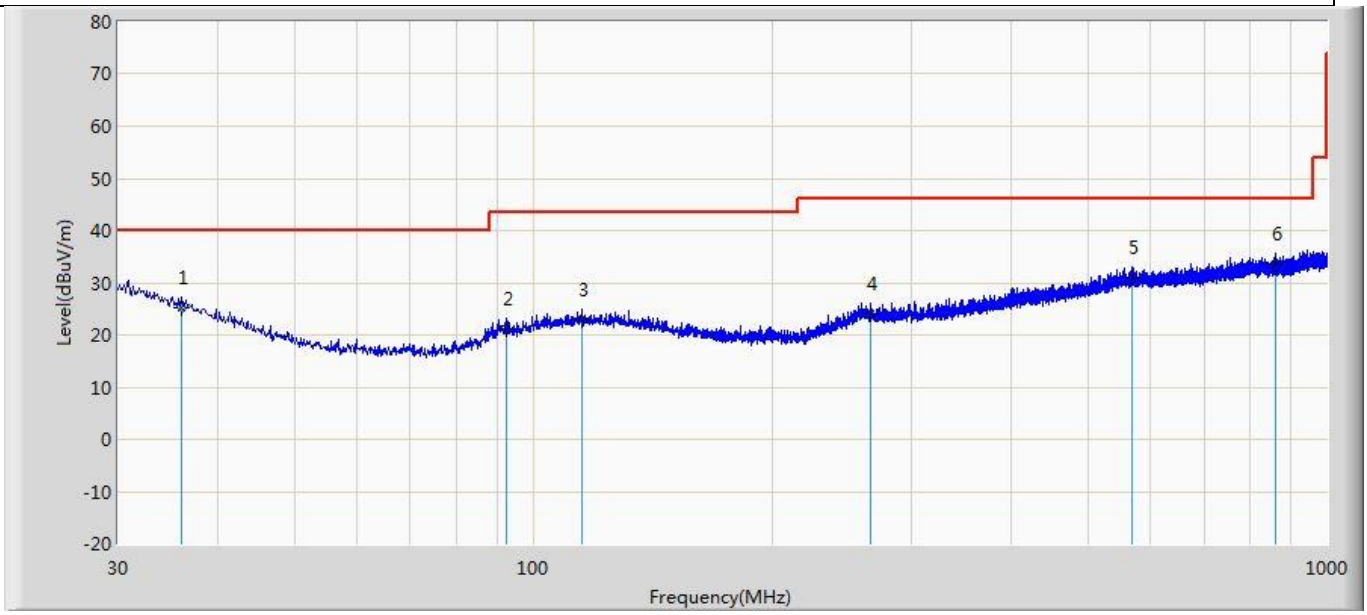
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		4960.000	43.446	44.031	-30.554	74.000	-0.586	PK
2	*	7443.000	48.722	46.243	-25.278	74.000	2.480	PK
3		9920.000	48.413	41.705	-25.587	74.000	6.708	PK

Note:

1. The test frequency range, 9kHz~30MHz and Above 18GHz worst case are at least 6dB below the limits, therefore no data appear in the report.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

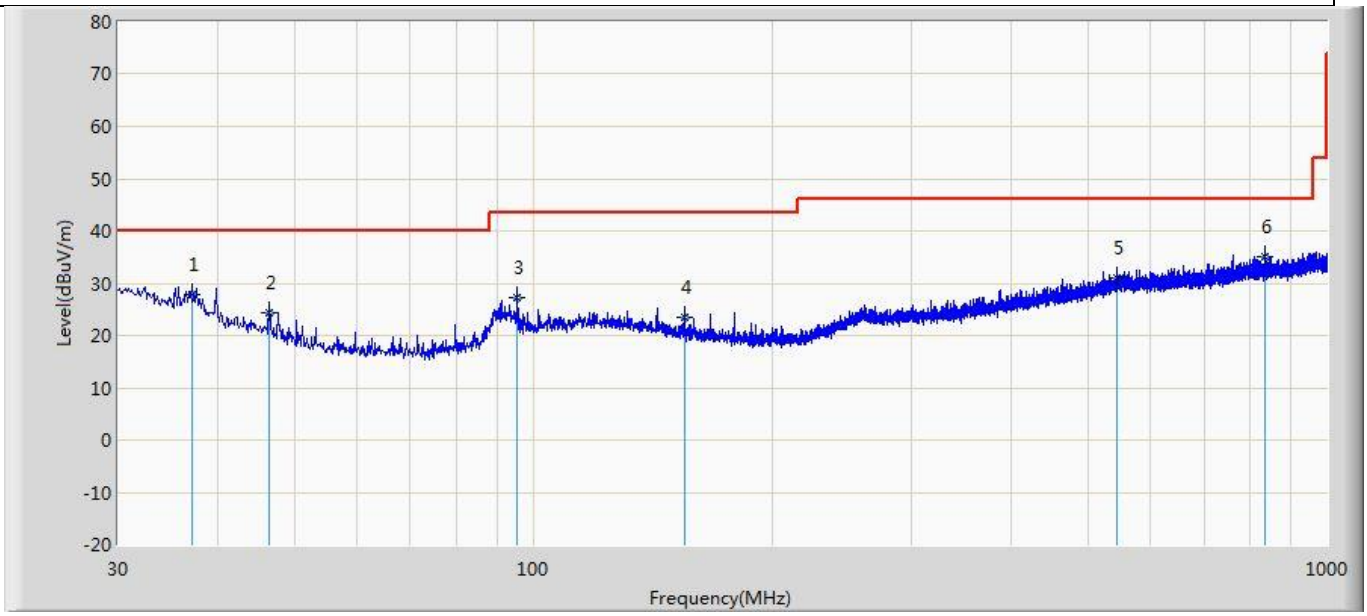
The worst case of Radiated Emission below 1GHz:

Profile: 2510546R	Page No.: 1
Engineer: Yu Liu	
Site: AC2	Time: 2025/02/22 - 06:14
Limit: FCC_Part 15.209	Margin: 0
Probe: CBL6112D_27613(30-1000MHz)	Polarity: Horizontal
EUT: electronic shelf label	Power: Battery 3Vdc
Note: mode 1:Transmit at 2402MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		36.062	25.237	3.480	-14.763	40.000	21.757	QP
2		92.565	21.267	4.779	-22.233	43.500	16.489	QP
3		115.360	22.794	3.531	-20.706	43.500	19.263	QP
4		265.953	24.085	3.542	-21.915	46.000	20.543	QP
5		568.714	30.987	3.846	-15.013	46.000	27.141	QP
6	*	862.260	33.545	4.179	-12.455	46.000	29.366	QP

Profile: 2510546R	Page No.: 2
Engineer: Yu Liu	
Site: AC2	Time: 2025/02/22 - 06:17
Limit: FCC_Part 15.209	Margin: 0
Probe: CBL6112D_27613(30-1000MHz)	Polarity: Vertical
EUT: electronic shelf label	Power: Battery 3Vdc
Note: mode 1:Transmit at 2402MHz	

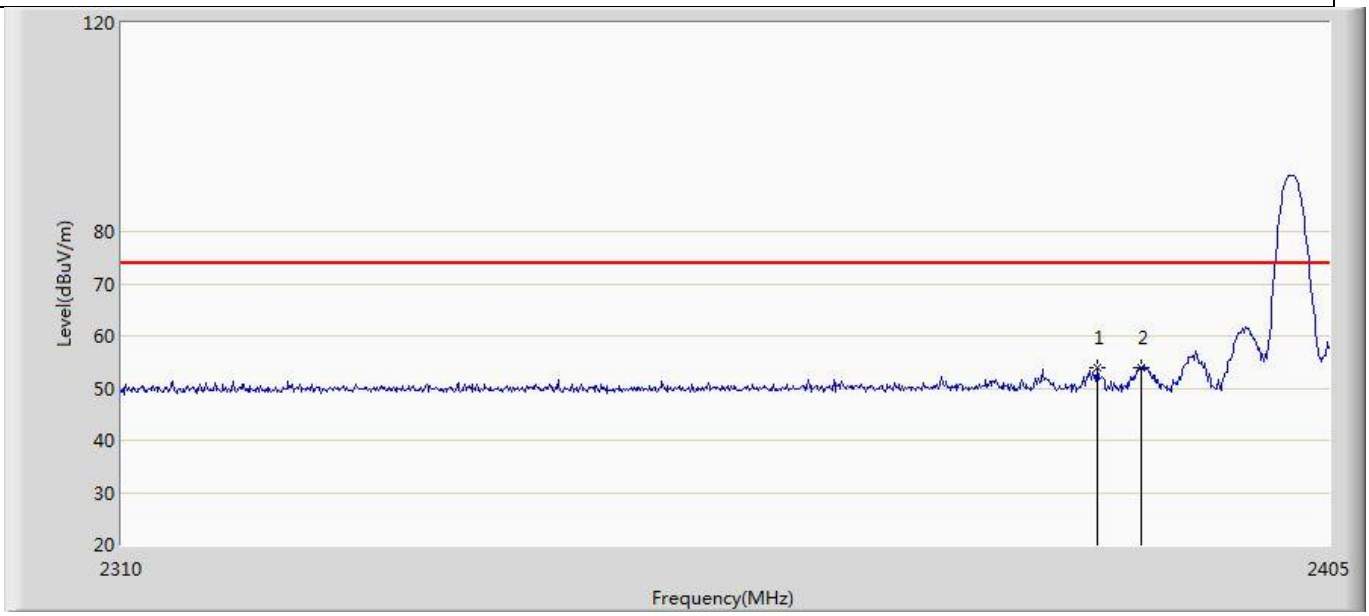


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		37.154	27.944	6.798	-12.056	40.000	21.145	QP
2		46.490	24.416	8.106	-15.584	40.000	16.310	QP
3		95.475	27.270	10.142	-16.230	43.500	17.128	QP
4		155.130	23.554	6.362	-19.946	43.500	17.192	QP
5		544.100	30.966	4.016	-15.034	46.000	26.950	QP
6	*	836.191	35.089	5.755	-10.911	46.000	29.333	QP

Note:
1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

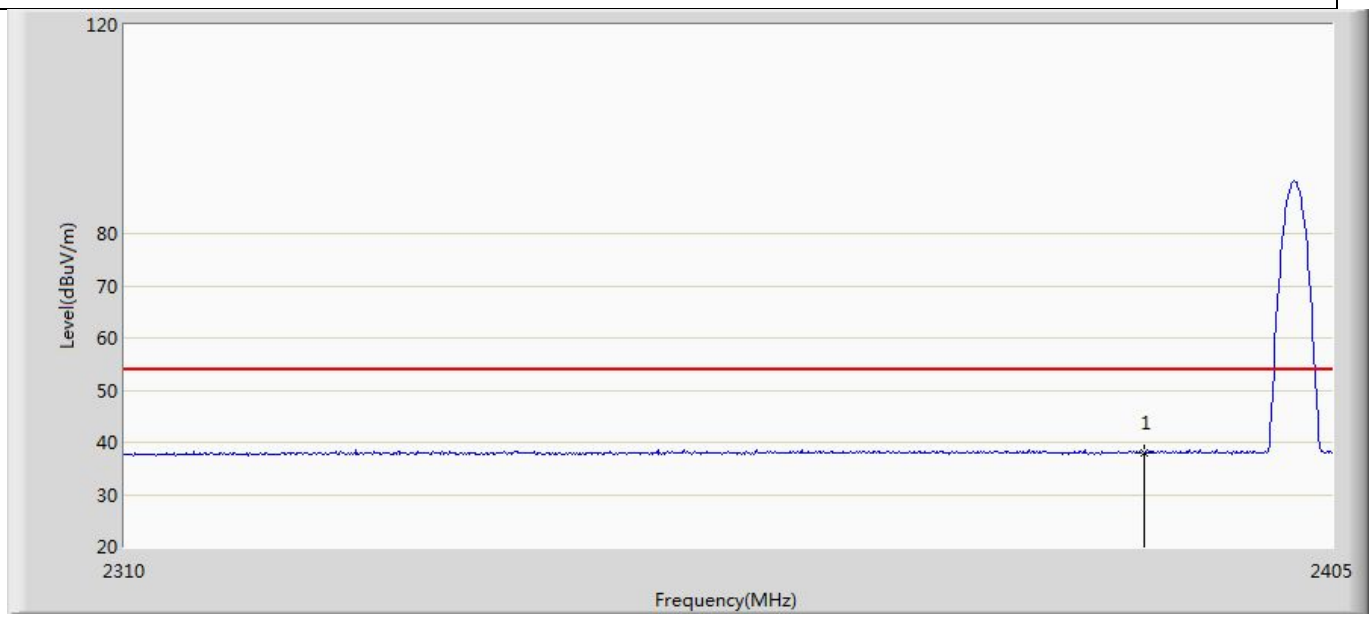
Appendix C: Radiated Emission Band Edge

Profile: 2510546R	Page No.: 1
Engineer: Yuliu	
Site: AC5	Time: 2025/02/22 - 05:16
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Horizontal
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 1：Transmit at 2402MHz	



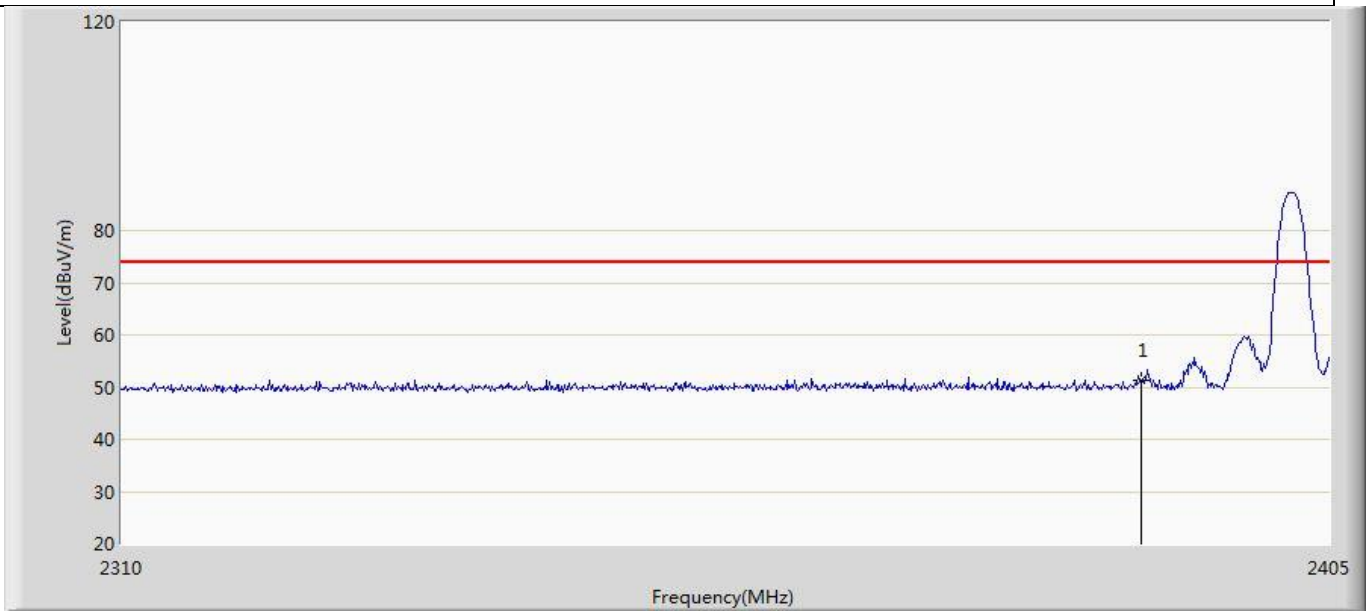
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2386.475	53.772	19.676	-20.228	74.000	34.097	PK
2	*	2390.000	53.867	19.766	-20.133	74.000	34.102	PK

Profile: 2510546R	Page No.: 2
Engineer: Yuliu	
Site: AC5	Time: 2025/02/22 - 05:18
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Horizontal
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 1：Transmit at 2402MHz	



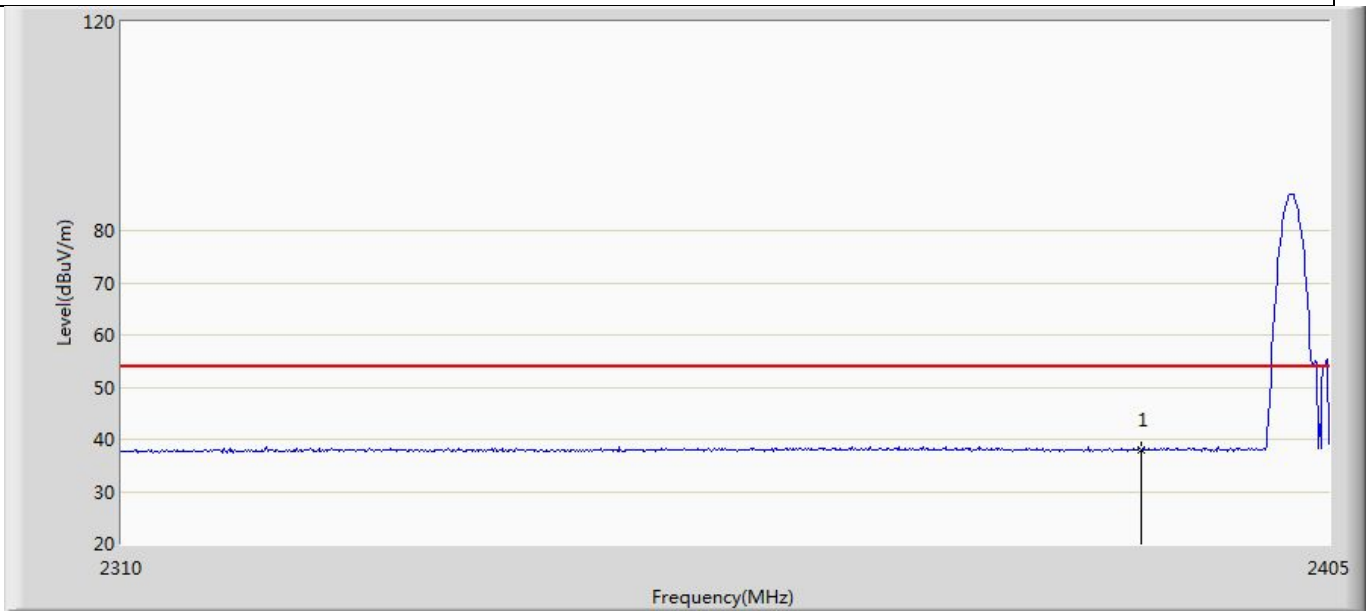
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2390.000	37.997	3.896	-16.003	54.000	34.102	AV

Profile: 2510546R	Page No.: 3
Engineer: Yuliu	
Site: AC5	Time: 2025/02/22 - 05:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Vertical
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 1：Transmit at 2402MHz	



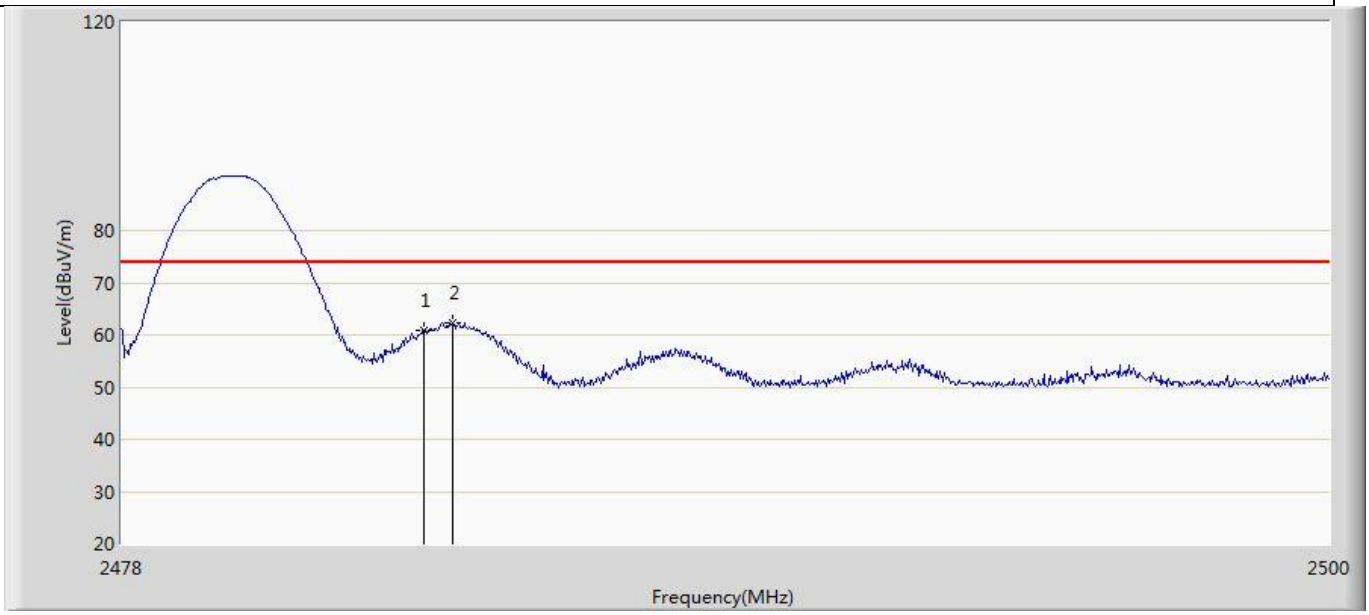
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2390.000	51.202	17.101	-22.798	74.000	34.102	PK

Profile: 2510546R	Page No.: 4
Engineer: Yuliu	
Site: AC5	Time: 2025/02/22 - 05:25
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Vertical
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 1：Transmit at 2402MHz	



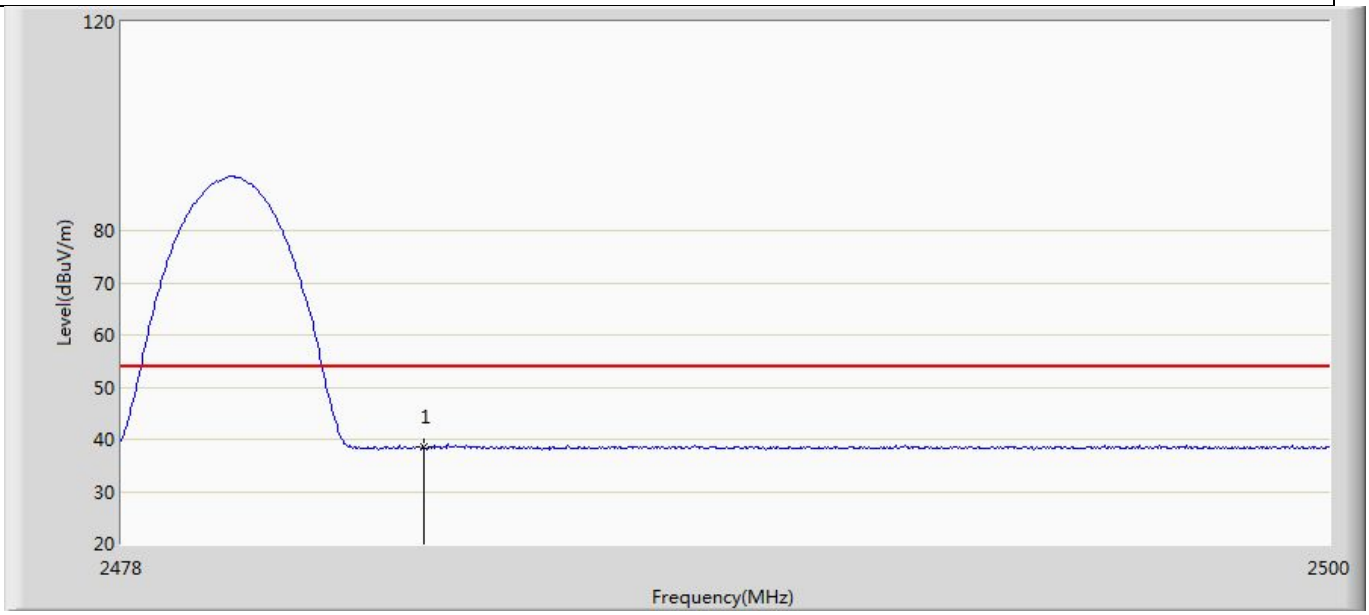
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2390.000	37.966	3.865	-16.034	54.000	34.102	AV

Profile: 2510546R	Page No.: 5
Engineer: Yuliu	
Site: AC5	Time: 2025/02/22 - 05:27
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Horizontal
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 2：Transmit at 2480MHz	



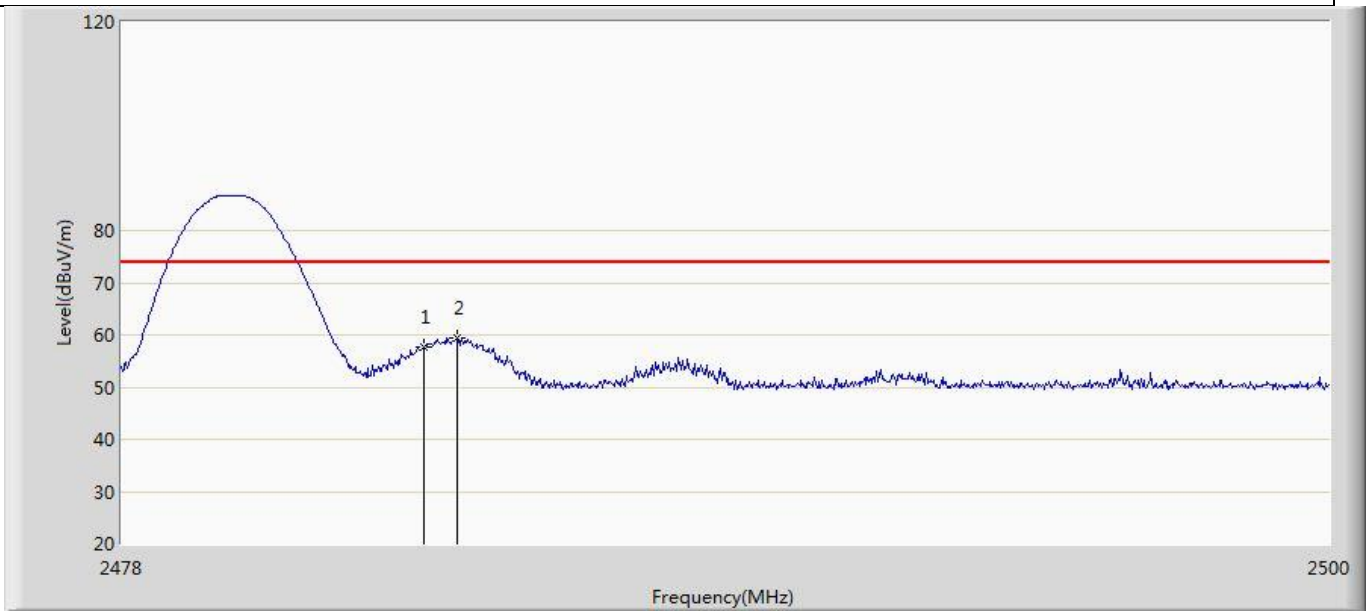
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2483.500	60.792	26.679	-13.208	74.000	34.114	PK
2	*	2484.006	62.444	28.327	-11.556	74.000	34.117	PK

Profile: 2510546R	Page No.: 6
Engineer: Yuliu	
Site: AC5	Time: 2025/02/22 - 05:35
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Horizontal
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 2：Transmit at 2480MHz	



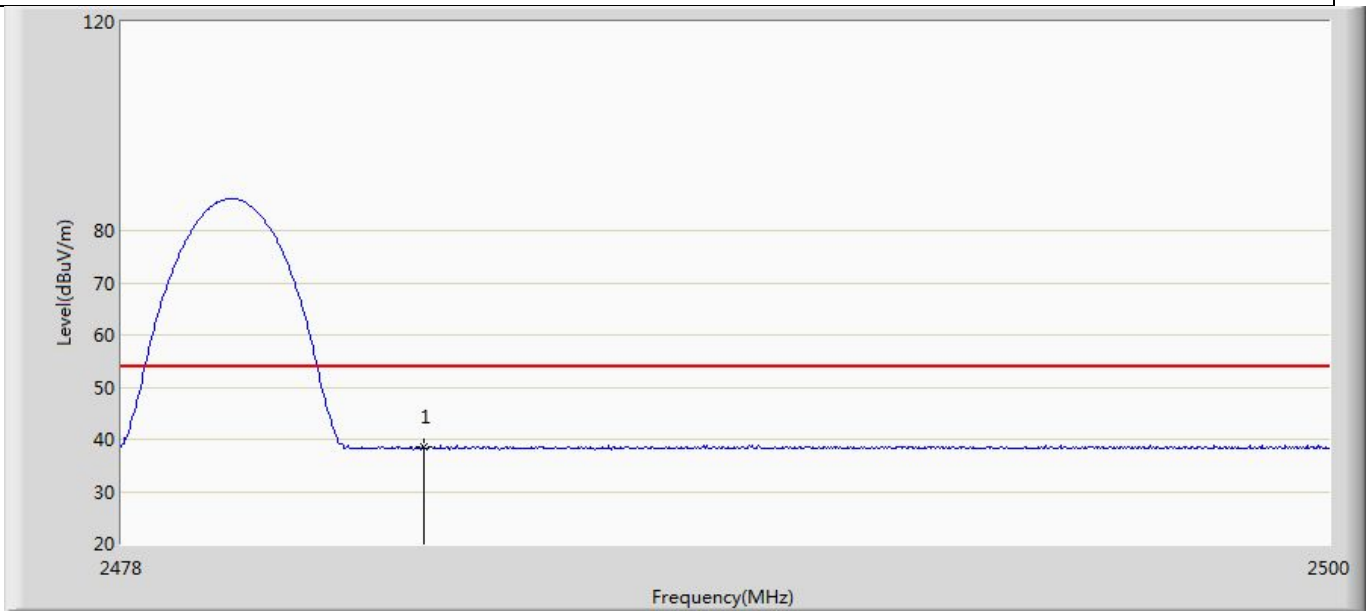
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2483.500	38.653	4.540	-15.347	54.000	34.114	AV

Profile: 2510546R	Page No.: 7
Engineer: Yuliu	
Site: AC5	Time: 2025/02/22 - 05:37
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Vertical
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 2：Transmit at 2480MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2483.500	57.565	23.452	-16.435	74.000	34.114	PK
2	*	2484.094	59.344	25.226	-14.656	74.000	34.118	PK

Profile: 2510546R	Page No.: 8
Engineer: Yuliu	
Site: AC5	Time: 2025/02/22 - 05:38
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055_(1-18GHz)	Polarity: Vertical
EUT: electronic shelf label	Power: Battery 3Vdc
Note: Mode 2：Transmit at 2480MHz	



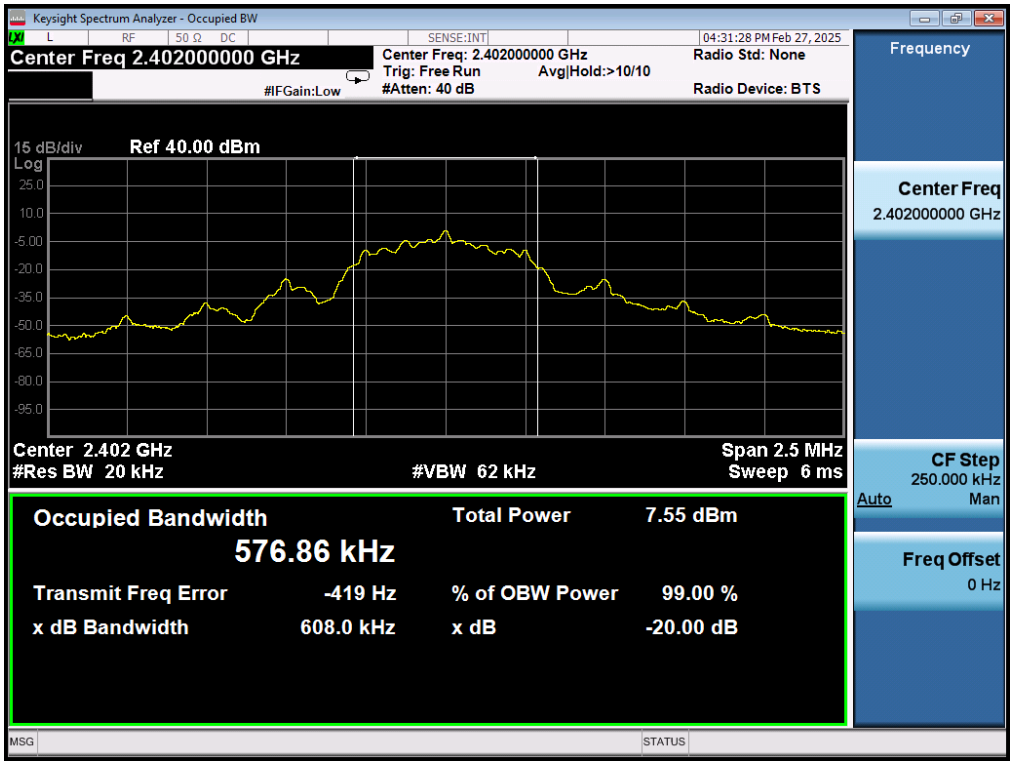
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2483.500	38.534	4.421	-15.466	54.000	34.114	AV

Note:
1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

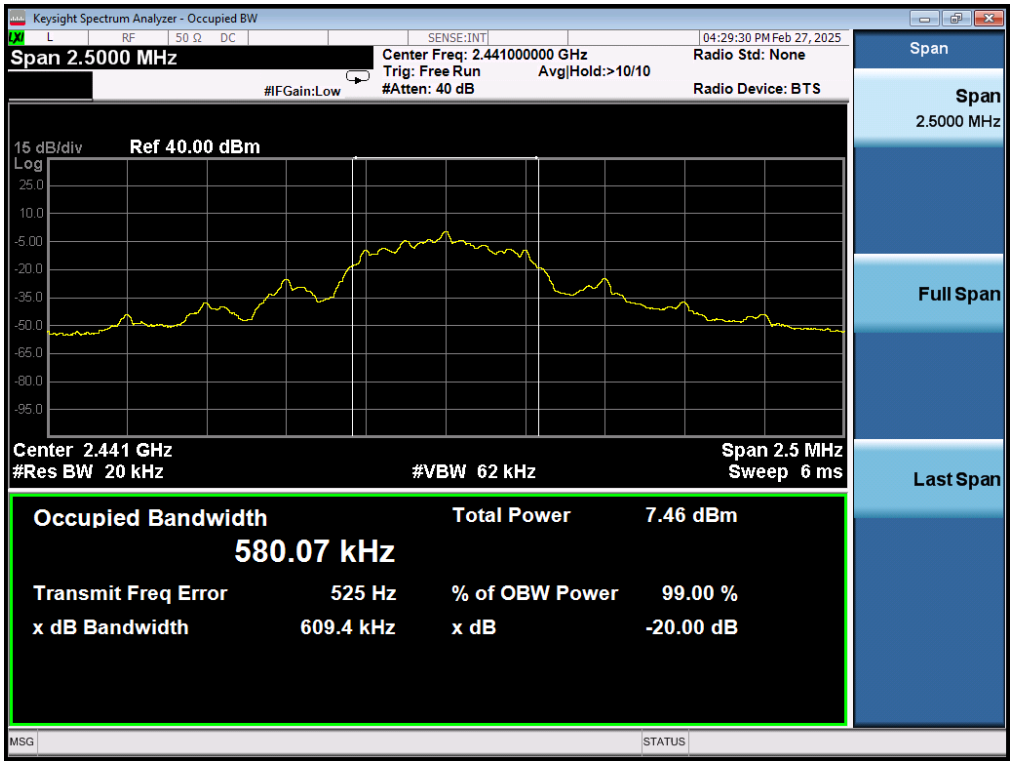
Appendix D: 20dB Bandwidth

Mode	CH.	Test Freq. (MHz)	20dB Occupied Bandwidth (kHz)	99% Occupied Bandwidth (kHz)	Limit (kHz)	Result
1	4	2402	608	576.86	Within operation in frequency band	Pass
	82	2441	609.4	580.07	Within operation in frequency band	Pass
	160	2480	604.3	573.35	Within operation in frequency band	Pass

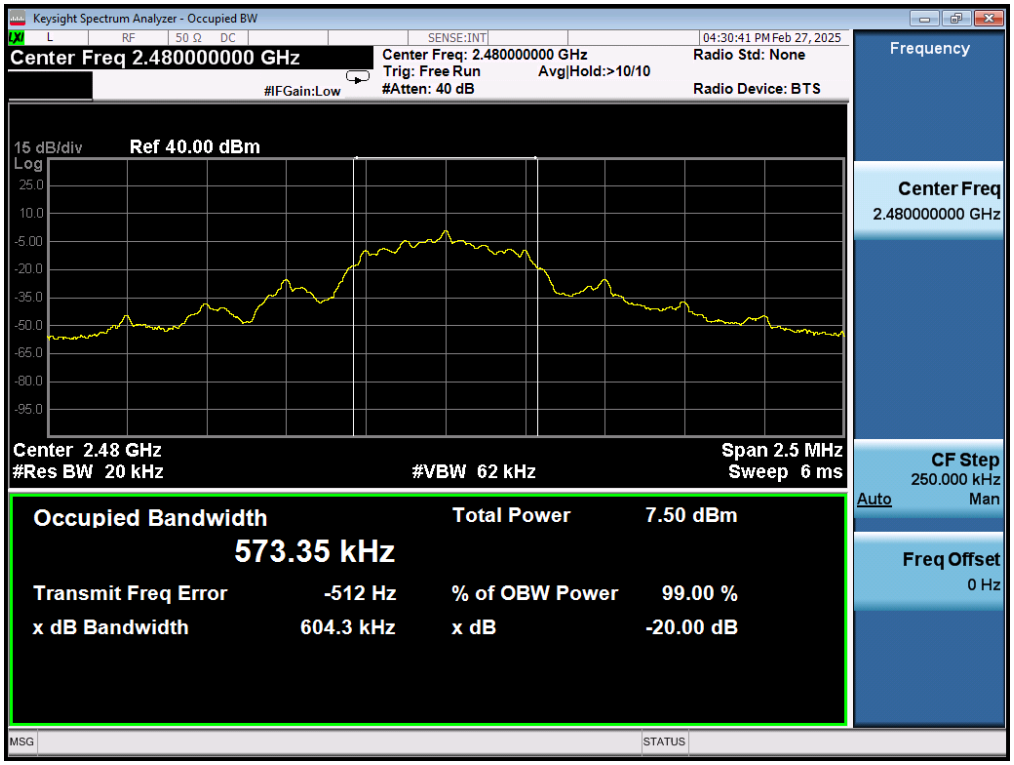
Mode 1 CH4 2402MHz



Mode 1 CH82 2441MHz



Mode 1 CH160 2480MHz



The End