

Dates of Tests: Aug 21, 2025 ~ Sep 22, 2025
Test Report S/N: LR500112510A
Test Site : LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID.

WLD-VB60

APPLICANT

DUNAN. Co., Ltd.

Equipment Class	:	Security/Remote Control Transmitter (DSC)
Manufacturing Description	:	VelluxBell
Manufacturer	:	DUNAN. Co., Ltd.
Model name	:	VB60
Variant Model name	:	VB20 / VBS10 / VBS112 / VBS10
Test Device Serial No.:	:	Identical prototype
Rule Part(s)	:	FCC Part 15 Subpart C ; ANSI C63.10 - 2020
Frequency Range	:	433.05 MHz ~ 434.79 MHz
Max. Output Power	:	Max 78.57 dBuV/m – Radiated
Data of issue	:	Oct 01, 2025

This test report is issued under the authority of:



Eun-Hwan Jung, Manager

The test was supervised by:



In-Sun Lee, Test Engineer

Revision history

Revision	Date of issue	Description	Revised by
--	Oct 01 ,2025	Initial	-

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1. General information

1-1 Test Performed

Company name : LTA Co., Ltd.
 Address : 243, Jubug-ri, Yangji-Myeon, Youngin-Si, Kyunggi-Do, Korea. 17159
 Web site : <http://www.ltalab.com>
 E-mail : chahn@ltalab.com
 Telephone : +82-31-323-6008
 Facsimile : +82-31-323-6010

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competents of calibration and testing laboratory”.

1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
RRA	KOREA	KR0049	-	EMC accredited Lab.
FCC	U.S.A	649054	2027-03-29	FCC CAB
VCCI	JAPAN	C-4948,	2026-09-10	VCCI registration
VCCI	JAPAN	T-2416,	2026-09-10	VCCI registration
VCCI	JAPAN	R-4483(10 m),	2026-10-15	VCCI registration
VCCI	JAPAN	G-847	2025-12-13	VCCI registration
IC	CANADA	5799A-1	2026-08-15	IC filing

2. Information about test item

2-1 Client & Manufacturer

Client Company name : DUNAN. Co., Ltd.
 Address : B-1303, Woolim Lions Valley 5th, 302, Galmachi-ro, Jungwon-gu,
 Seongnam-si, Gyeonggi-do, South Korea 462-739
 Tel / Fax : +82-31-715-4513 / +82-31-715-4531
 Manufacturer : DUNAN. Co., Ltd.
 Address : B-1303, Woolim Lions Valley 5th, 302, Galmachi-ro, Jungwon-gu,
 Seongnam-si, Gyeonggi-do, South Korea 462-739
 Tel / Fax : +82-31-715-4513 / +82-31-715-4531

2-2 Equipment Under Test (EUT)

Model name : VB60
 Variant Model name : VB20 / VBS10 / VBS112 / VBS10
 Serial number : Identical prototype
 Date of receipt : Aug 21, 2025
 EUT condition : Pre-production, not damaged
 Antenna type : PCB Antenna (Max Gain : 0.63 dBi)
 Frequency Range : 433.05 MHz ~ 434.79 MHz
 RF output power : Max 78.57 dBuV/m – Radiated
 Type of Modulation : FSK
 Power Source : DC 12 V

2-3 Tested frequency

	LOW	MID	HIGH
Frequency (MHz)	433.05	433.92	434.79

2-4 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
-	-	-	-

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	Parameter	Test Condition	Status (note 1)
15.231(a)	Automatically Deactivate	Conducted	C
15.231(c)	20 dB Bandwidth		C
15.209, 15.231(b)	Radiated Spurious Emissions	Radiated	C
15.207	AC Conducted Emissions	Conducted	N/A
15.203	Antenna requirement	-	C

N/A : This product is only operated with DC voltage.

The above equipment was tested by LTA Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10-2020 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2 and Part 15.231 The test results of this report relate only to the tested sample identified in this report.

→ Antenna Requirement

DUNAN. Co., Ltd. FCC ID: WLD-VB60 unit complies with the requirement of §15.203.

The antenna type is PCB Antenna

3.2 Technical Characteristics Test

3.2.1 Automatically Deactivate

Procedure:

The transmitter output was conneted to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement. Set to the maximum power setting and enable the EUT transmit continuously.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz

Span = 0

VBW = 3 X RBW

Sweep = auto

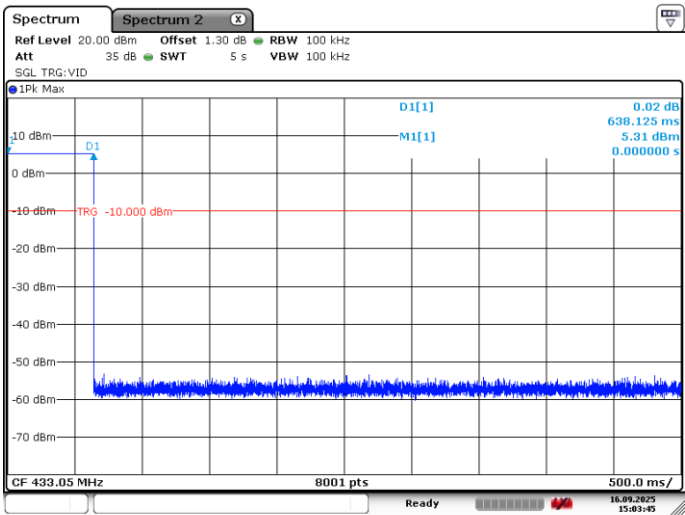
Trace = Single

Detector function = peak

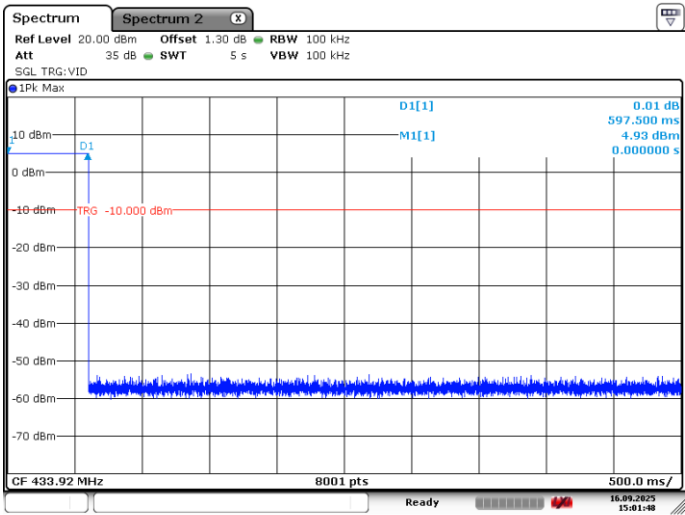
Measurement Data : Complies

Time of Transmitting [sec]	Limit [sec]	Result
0.638	5.000	Pass
0.598	5.000	Pass
0.647	5.000	Pass

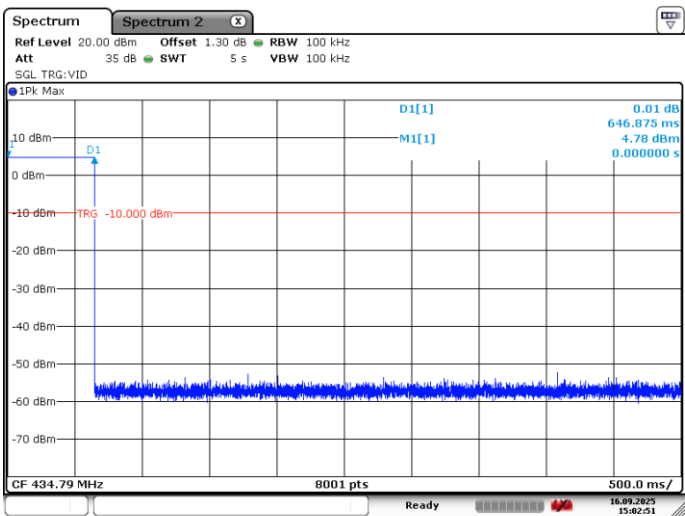
[LOW]



[MID]



[HIGH]



Minimum Standard:

not more than 5 seconds

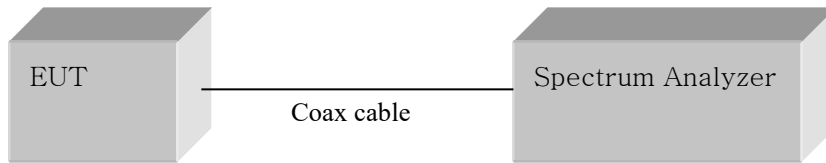
Measurement Setup

Figure 1: Measurement setup for the carrier frequency separation

3.2.2 20 dB Bandwidth

Procedure:

The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement. Set to the maximum power setting and enable the EUT transmit continuously

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW $\geq$ 1 % of the 20 dB bandwidth

Span $\geq$ 3 X RBW

VBW $\geq$ RBW

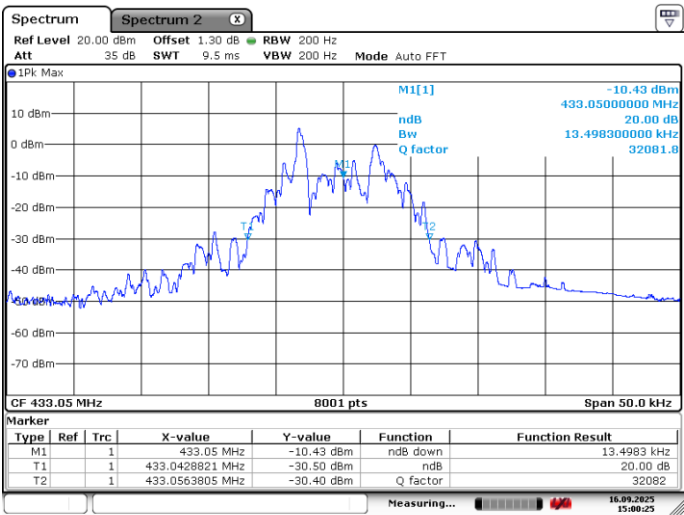
Sweep = auto

Detector function = peak

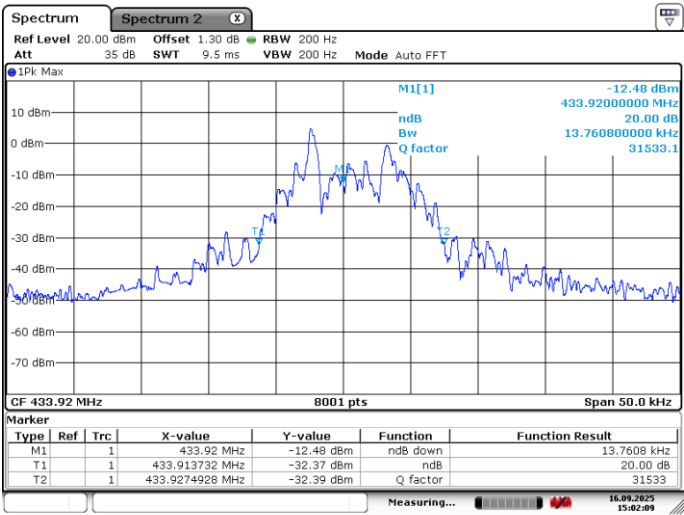
Measurement Data : Complies

Frequency [MHz]	20 dB Bandwidth [kHz]	Limit [kHz]	Result
433.05	13.50	108.26	Pass
433.92	13.76	108.48	Pass
434.79	14.07	108.70	Pass

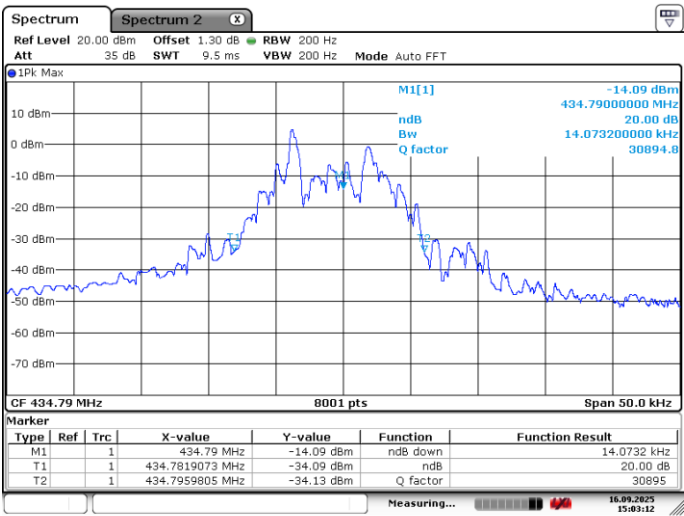
[LOW]



[MID]



[HIGH]



Minimum Standard:

The bandwidth of the emission shall be no wider than 0.25 % of the center frequency.
--

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

3.2.3 Radiated Spurious Emissions

Procedure:

Radiated emissions from 30 MHz to 25 GHz were measured according to the methods defines in ANSI C63.10-2020.

The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.

The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = 9 kHz ~ 10th harmonic.

RBW = 120 kHz (30 MHz ~ 1 GHz)

VBW $\geq$ RBW

= 1 MHz (1 GHz ~ 10th harmonic)

Trace = max hold

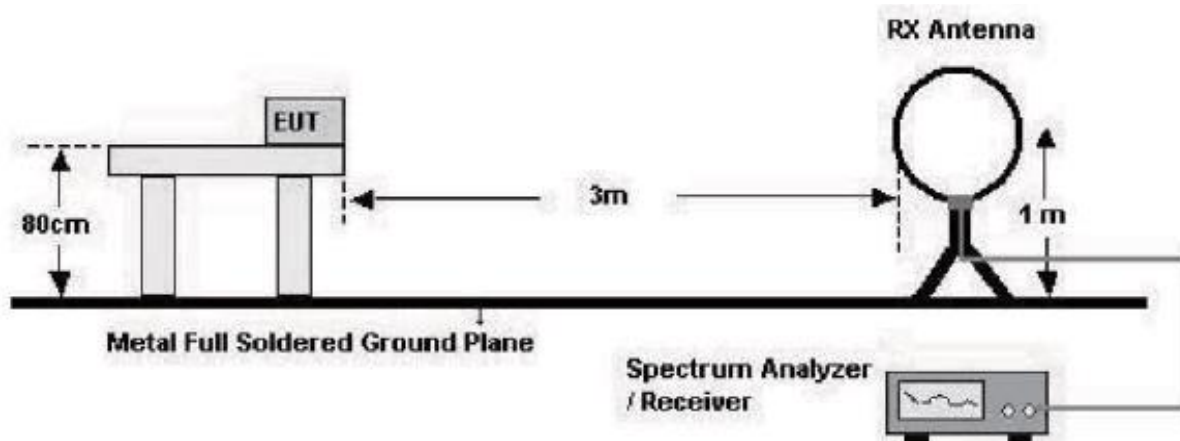
Detector function = peak

Sweep = auto

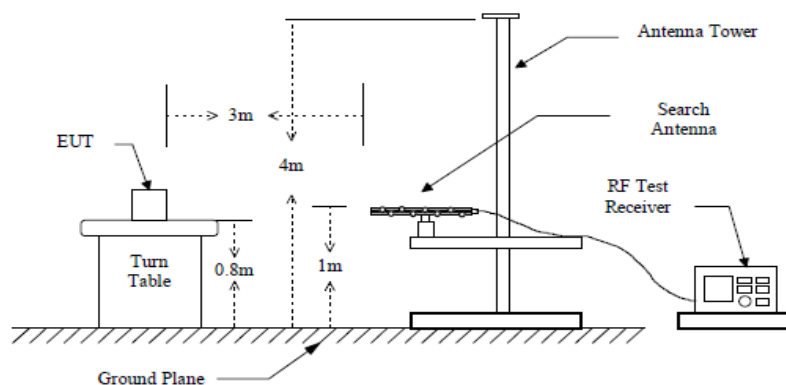
Duty cycle : 98.89 %

The EUT configureal to transmit continuously(D $\geq$ 98%)/ Duty Factor = 0

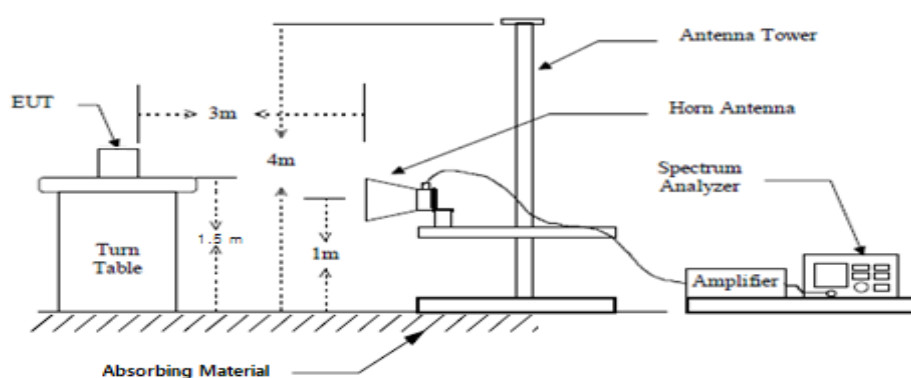
below 30 MHz



below 1 GHz (30 MHz to 1 GHz)



above 1 GHz



Measurement Data: Complies

- See next pages for actual measured data.
- No other emissions were detected at a level greater than 20 dB below limit include from 9 kHz to 30MHz.
- The test results for the worst of the various operating modes are presented in accordance with 6.3.4 of ANSI C63.10.
- Checked with a red circle is the fundamental frequency.

Minimum Standard: FCC Part 15.209(a)

Frequency (MHz)	Limit (uV/m) @ 3 m
0.009 ~ 0.490	2400/F(kHz) (@ 300 m)
0.490 ~ 1.705	24000/F(kHz) (@ 30 m)
1.705 ~ 30	30(@ 30 m)
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

FCC §15.231(b)

Limits for radiated disturbance of an intentional radiator				
Fundamental frequency (MHz)	Field strength of fundamental		Field strength of spurious emissions	
	µV/m @ 3 m	dBµV/m @ 3 m	µV/m @ 3 m	dBµV/m @ 3 m
40.66-40.70	2,250	67.00	225	47.00
70-130	1,250	61.90	125	41.90
130-174	¹ 1,250 to 3,750	61.90 to 71.50	¹ 125 to 375	41.90 to 51.50
174-260	3,750	71.50	375	51.5
260-470	¹ 3,750 to 12,500	71.50 to 81.94	¹ 375 to 1,250	51.50 to 61.94
Above 470	12,500	81.94	1,250	61.94

- Fundamental Frequency: 433.40 MHz

- Fundamental Limit: Peak 80.12 dBuV/m

- Spurious Emissions Limit: Peak 60.12 dBuV/m

Sample calculation:

Limit = Fundamental frequency range position (x-a) * Limit of Field strength(b-a) / Fundamental frequency(b-a) + Limit start position

$$= (433.42-260)*(81.94-71.50)/(470-260)+71.50 = 80.12 \text{ dBuV/m}$$

Result of PK = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1GHz) +Distance factor (above 1 GHz)} - Gain

(Amplifier)

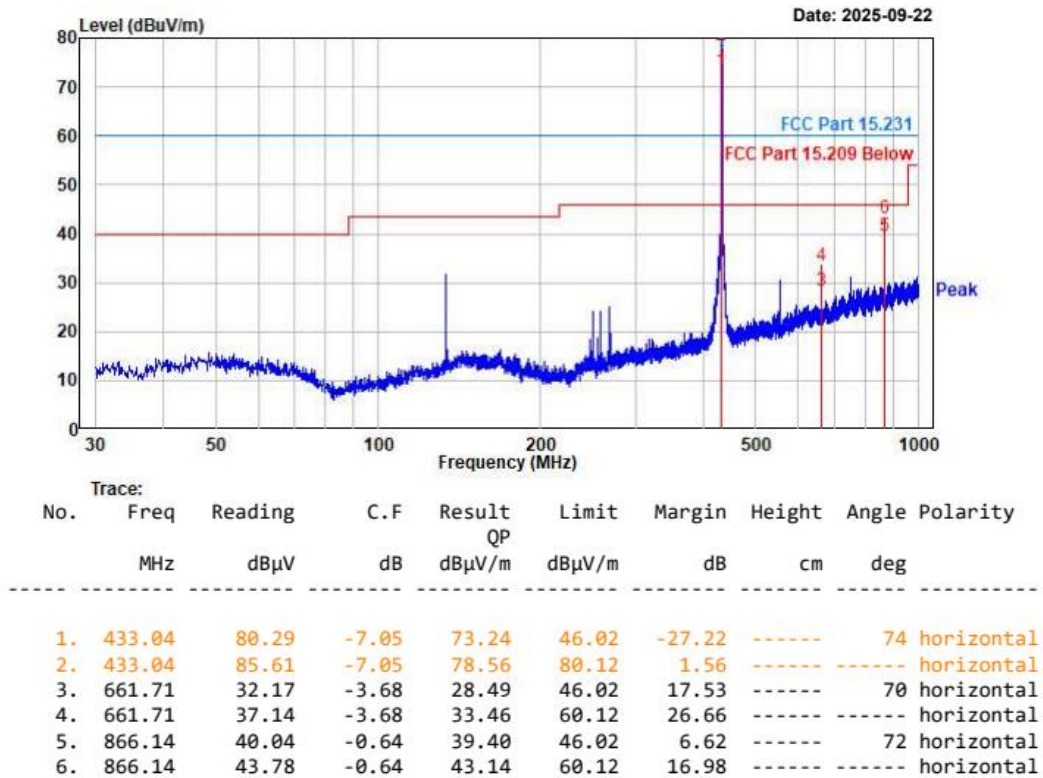
Result of PK with Duty factor = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1 GHz) +Distance factor (above 1 GHz)} - Gain (Amplifier) + Duty factor (Refer to Duty factor data sheet)

For above 1GHz : Distance Factor: $20 \times \log (4.0 \text{ m}/3.0 \text{ m}) = 2.50 \text{ dB}$

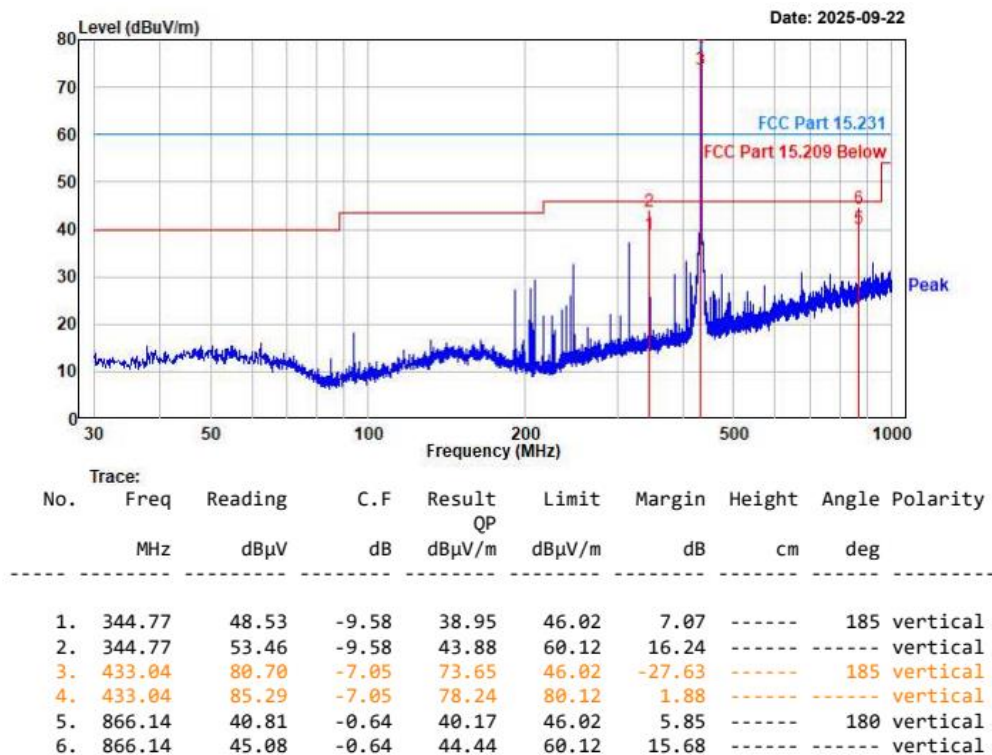
***Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).**

Average measurement : Average result = Peak result (dBuV/m) – Duty Correction Factor (dB)

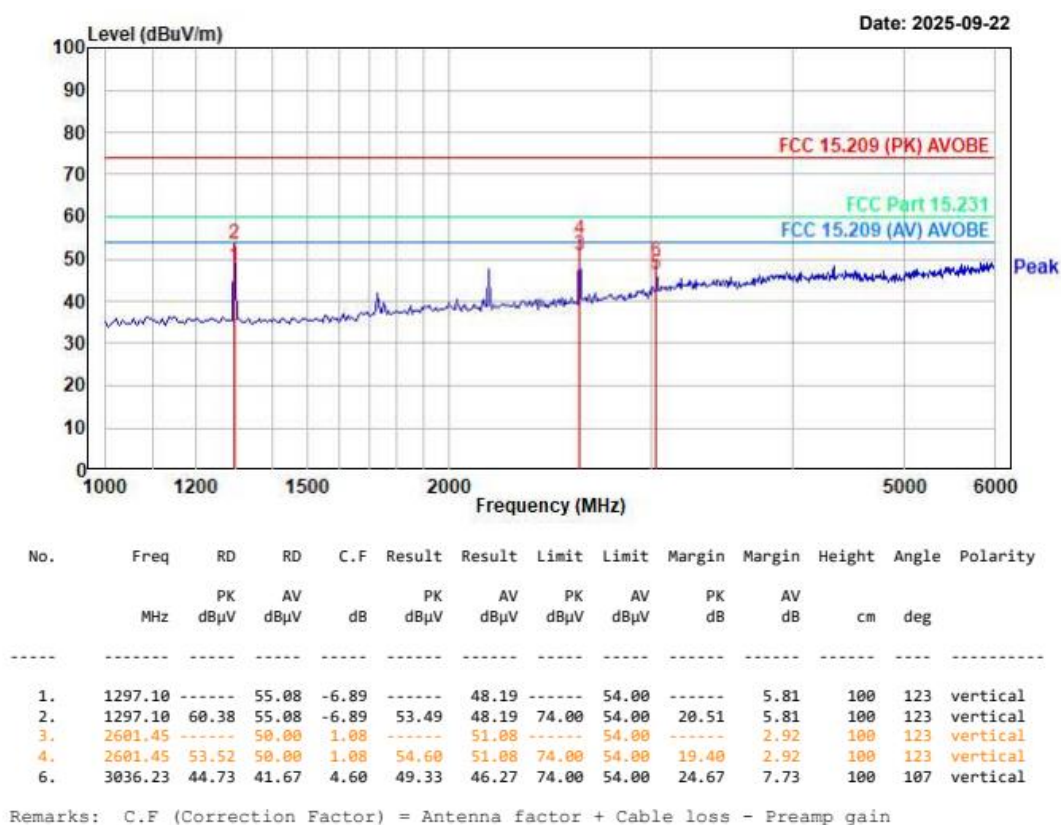
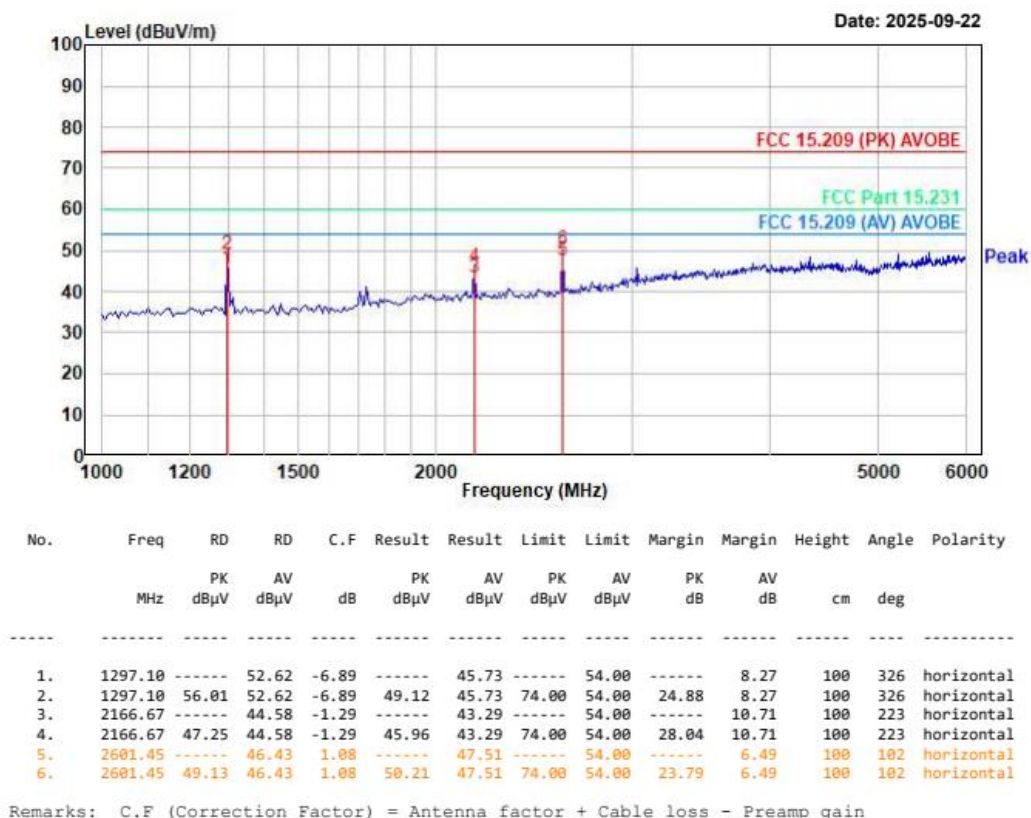
$$\text{Duty Correction Factor (dB)} = 20 \times \log (\text{On time (in 0.1s)}/0.1) = 20 \times \log (0.1/0.1) = 0 \text{ dB}$$

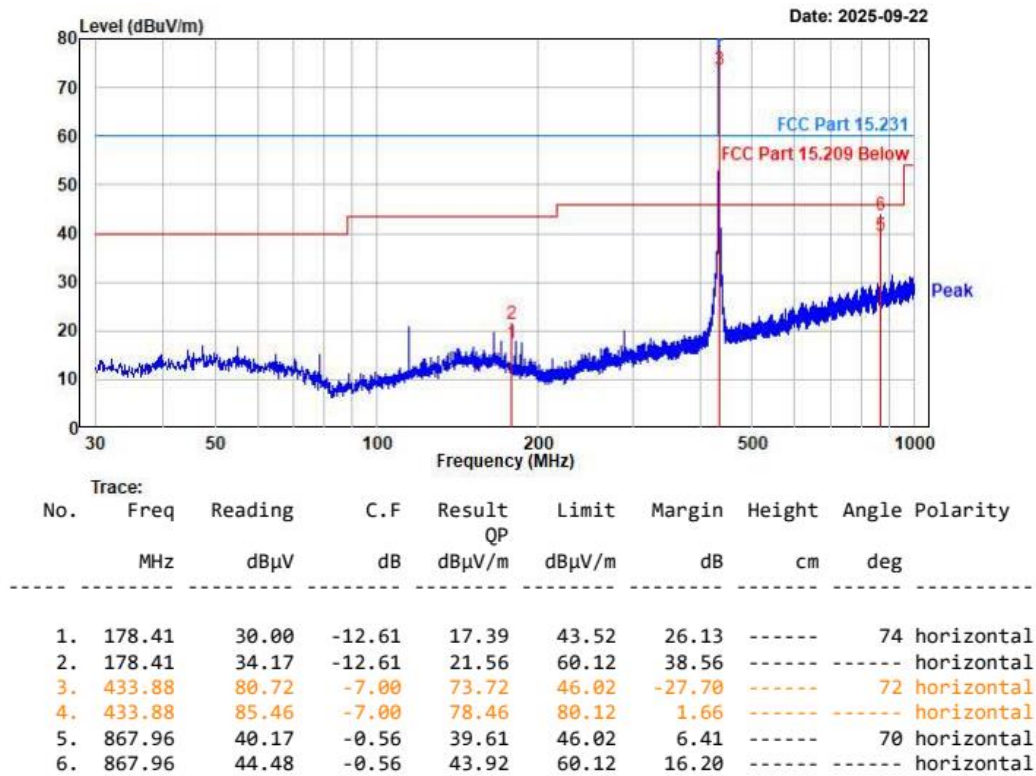
Radiated Emissions(LOW)

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

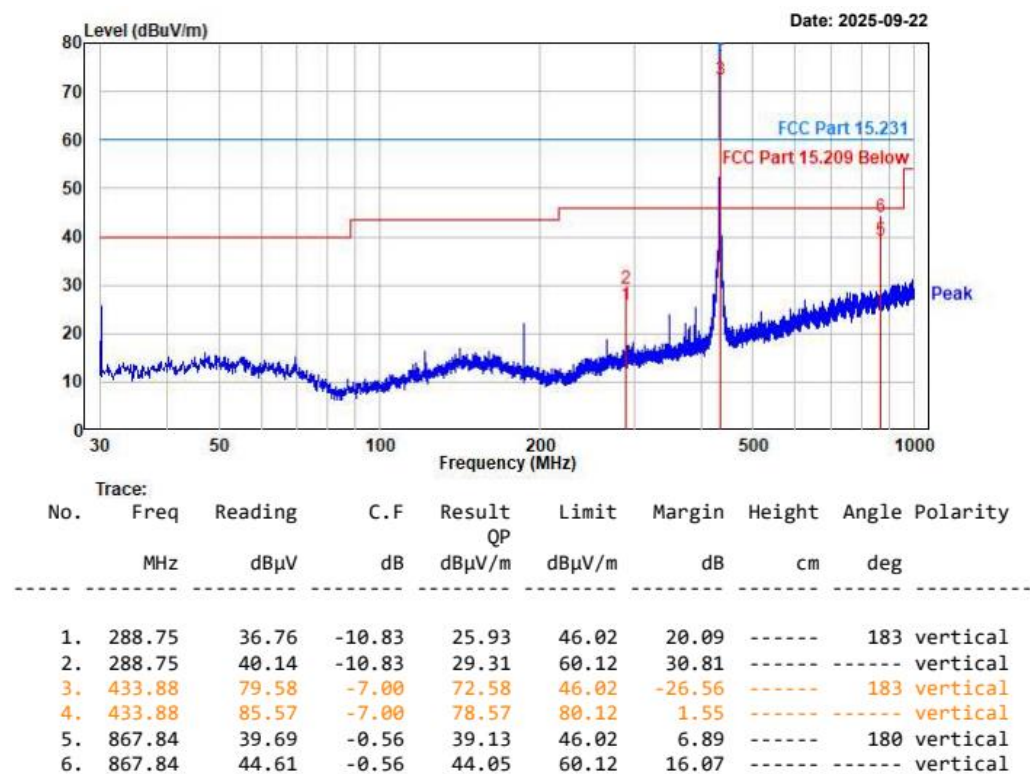


Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

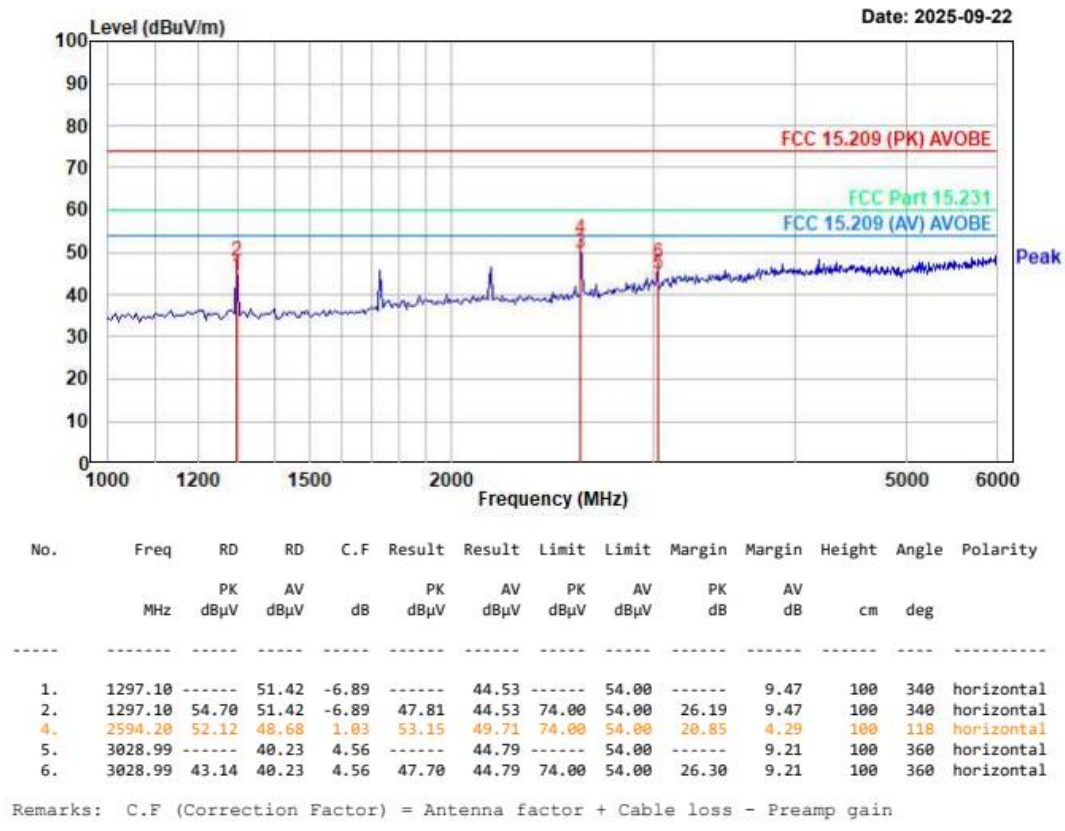


Radiated Emissions(MID)

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

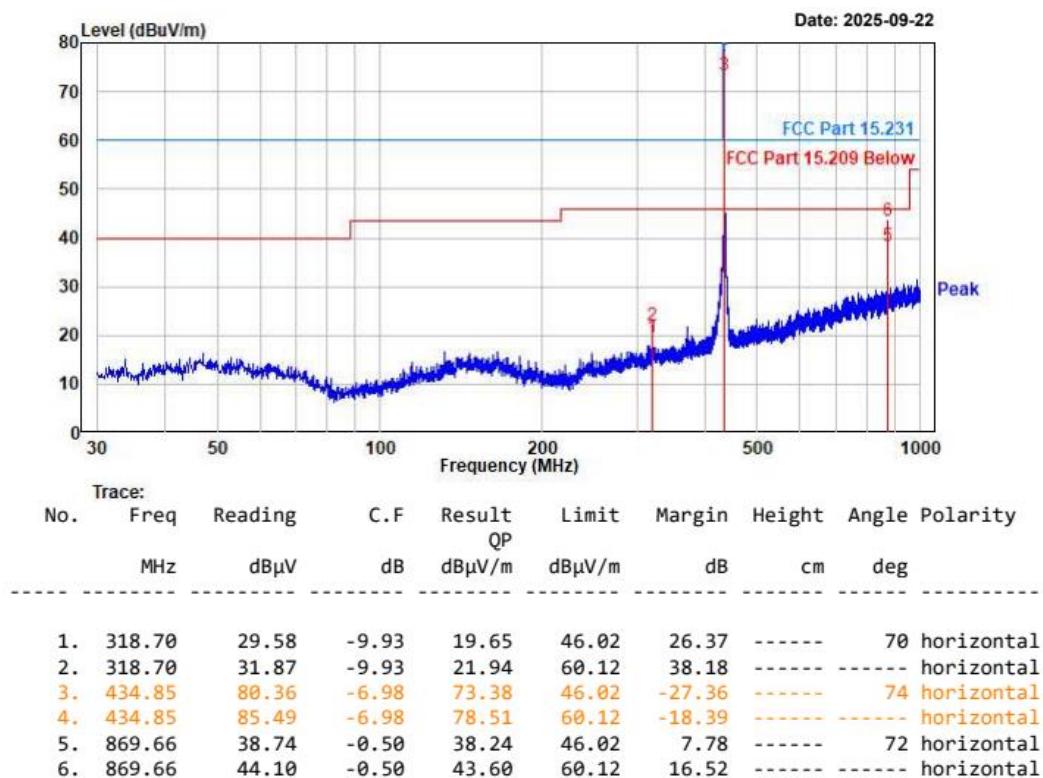


Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

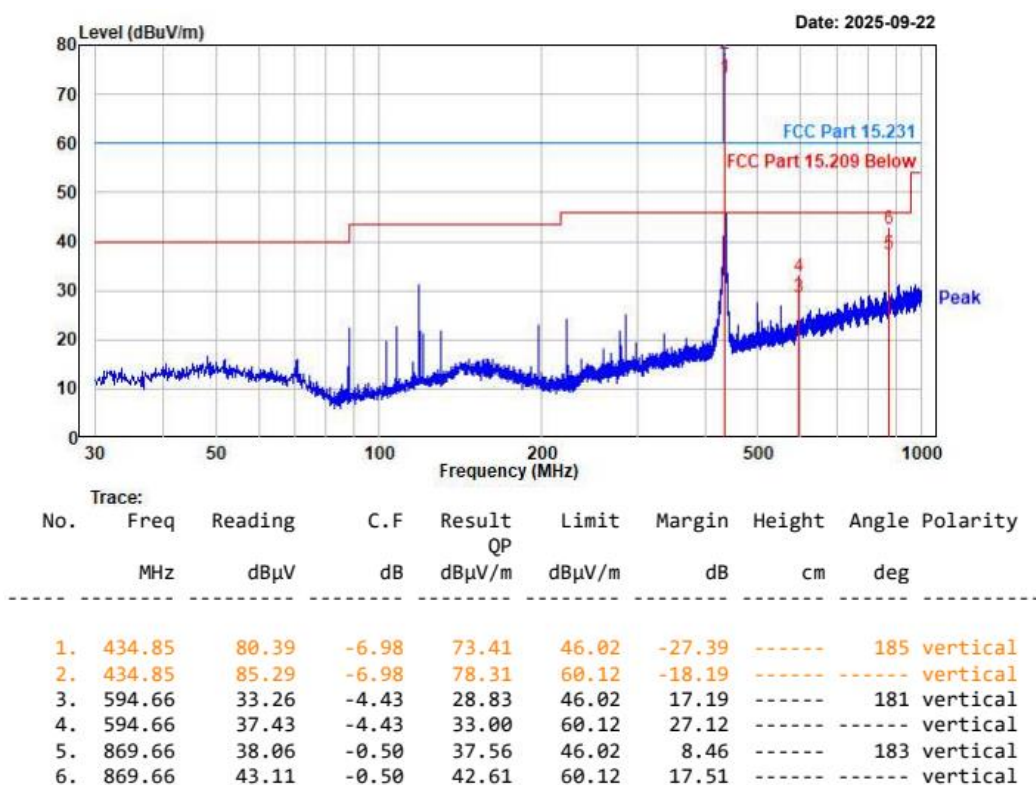


Level (dBuV/m)

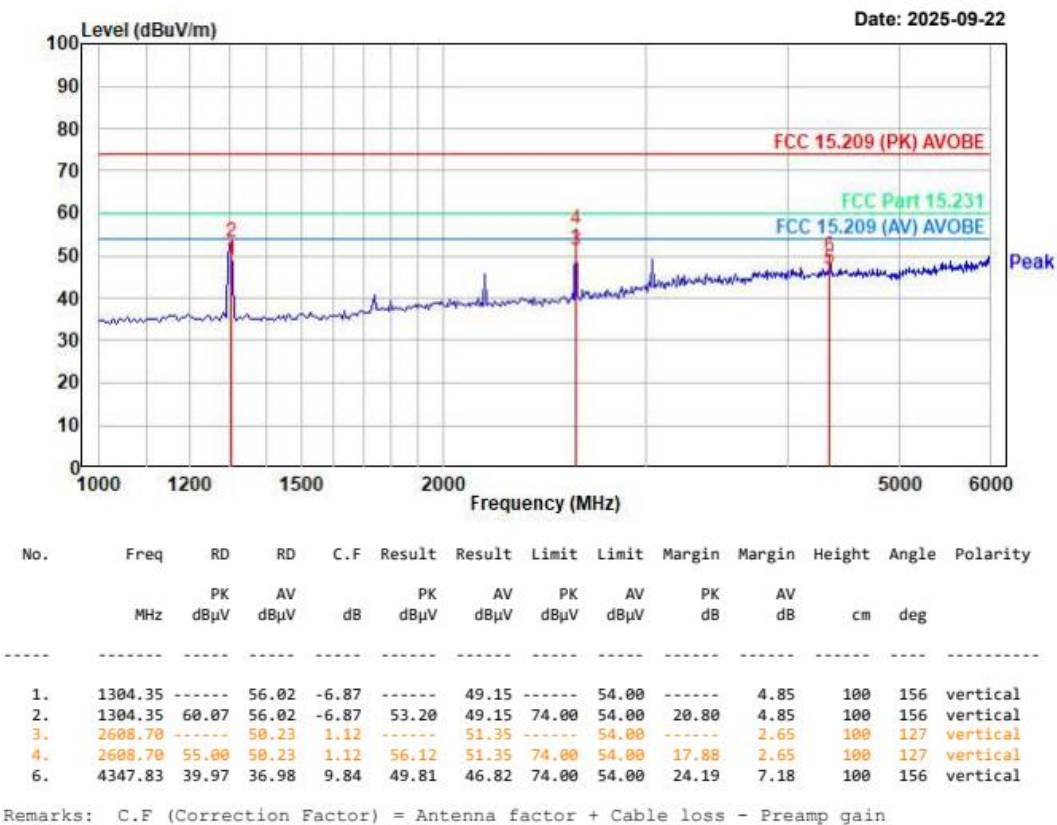
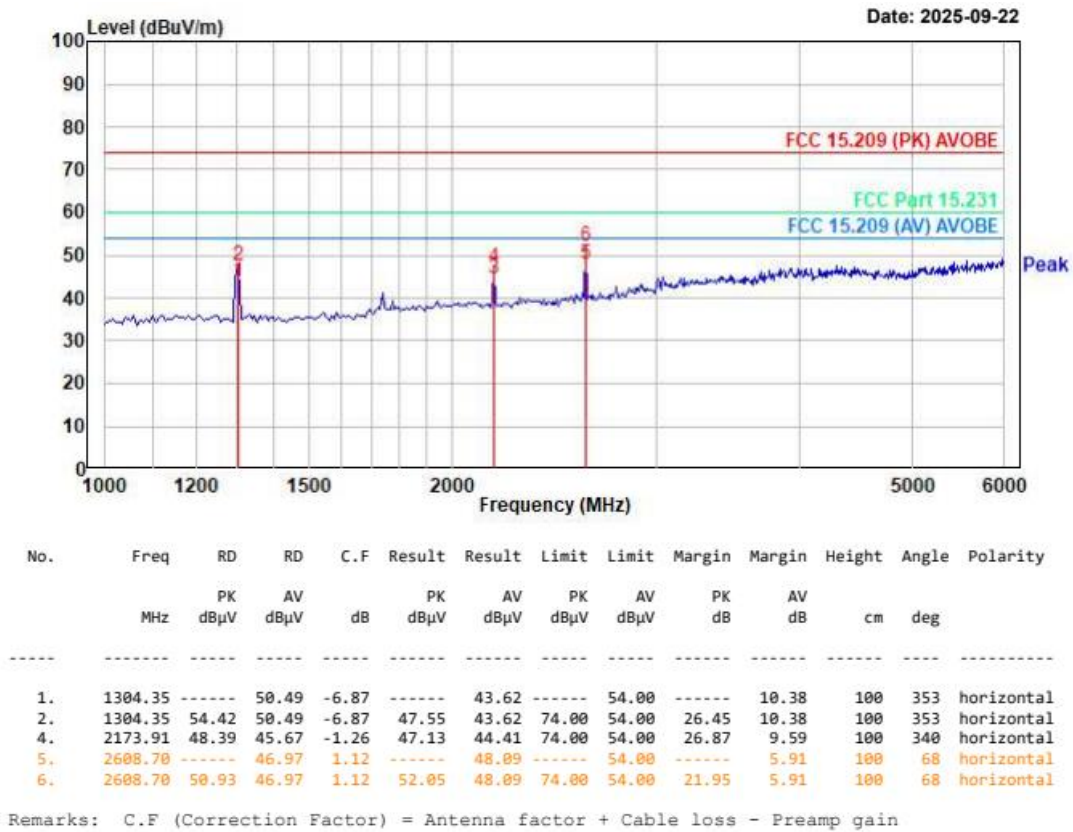
Date: 2025-09-22

Radiated Emissions(HIGH)

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



3.2.4 AC Conducted Emissions

Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

Minimum Standard: FCC Part 15.207(a) / EN 55022

Measurement Data: N/A

Class B

Frequency Range	quasi-peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

APPENDIX

TEST EQUIPMENT USED FOR TESTS

	Use	Description	Model No.	Serial No.	Manufacturer	Interval	Next Cal. Date
1		ATTENUATOR	48-40-34	BM2360	WEINSCHTEL	1 year	2026-03-05
2		ATTENUATOR	CL5418	66-30-33	AEROFLEX/WEINSCHTEL	1 year	2026-08-19
3		POWER DIVIDER	1506A	TU981	WEINSCHTEL	1 year	2026-03-06
4		Digital Multi Meter	34401A	US36062141	H.P	1 year	2026-03-06
5	■	DC Power Supply	E3632A	KR7530599 8	H.P	1 year	2026-08-18
6		DC POWER SUPPLY	6674A	3637A01657	AGILENT	1 year	2026-08-18
7		AC Power Supply	HK-80	LR001	—	1 year	2026-08-18
8	■	Power Meter	EPM-441A	GB3248170 2	H.P	1 year	2026-03-05
9	■	Power Sensor	8481A	3318A94972	H.P	1 year	2026-08-18
10		SIGNAL GENERATOR	83711B	US34490456	H.P	1 year	2026-03-05
11	■	VECTOR SIGNAL GENERATOR	SMBV100A	255081	ROHDE&SCHWARZ	1 year	2026-03-05
14		Drop tester	DT-1800	LS06053	LTA	—	N/A
15		TEMP HUMIDITY CHAMBER	NONE	LTAS06041	—	1 year	2026-03-05
16		Constant Temp & Humidity Test Chamber	SJ-503H	SJ10051301	—	1 year	2026-08-18
17	■	SIGNAL ANALYZER (10 Hz ~ 40 GHz)	FSV40	101259	ROHDE&SCHWARZ	1 year	2026-03-06
18		SIGNAL ANALYZER (10 Hz~40 GHz)	FSV40	101367	ROHDE&SCHWARZ	1 year	2026-03-06
20		WIDEBAND RADIO COMMUNICATION TESTER	CMW500	122216	ROHDE&SCHWARZ	1 year	2026-03-05
21		Active Loop Antenna	HFH2-Z2	—	ROHDE&SCHWARZ	2 year	2027-01-14
22	■	Signal Generator (~3.2 GHz)	8648C	3623A02597	HP	1 year	2026-03-05
23	■	EMI Test Receiver (~7 GHz)	ESCI7	100772	R&S	1 year	2026-08-18
24	■	RF Amplifier (~1.3 GHz)	8447D OPT 010	2944A07684	HP	—	N/A
25	■	RF Amplifier (1~26.5 GHz)	8449B	3008A02126	HP	1 year	2026-03-05
26	■	Horn Antenna (1~18 GHz)	3115	00055005	ETS	1 year	2026-03-10
27	■	DRG Horn (Small)	3116B	81109	ETS-Lindgren	2 year	2027-03-19

28	■	TRILOG Antenna	VULB 9160	9160-3237	SCHWARZBECK	—	N/A
29		Mini-Circuits Splitter	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
30		Audio Analyzer	8903B	3729A18901	HP	1 year	2026-08-18
31		Modulation Analyzer	8901B	3749A05878	HP	1 year	2026-08-19
32		LISN	KNW-407	8-1430-1	Kyoritsu	1 year	2026-08-18
33		UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	1 year	2026-03-06
34		Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	1 year	2026-03-06
35		Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	1 year	2026-03-06
36		OSP120 BASE UNIT	OSP120	101230	R&S	1 year	2026-03-06
37	■	Cable	RG400	-	HUBER SUHNER	1 year	2025-10-31