

TEST REPORT

 element	CTK Co., Ltd. (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, 17142, Korea Tel: +82-31-339-9970 Fax: +82-31-624-9501	Report No.: CTK-2025-00860 Page (1) / (19) Pages	
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1. Applicant

- Name : SOLUM CO.,LTD.
- Address : 7F, 2354, Yonggu-daero, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea
- Date of Receipt : 2025-03-05

2. Manufacturer

- Name : SOLUM CO.,LTD.
- Address : 7F, 2354, Yonggu-daero, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea

3. Use of Report : For FCC Certification

4. Test Sample / Model : Auto Tag / CD01HFS01X

5. Date of Test : 2025-03-25

6. Test Standard(method) used : FCC 47 CFR part 15.247, RSS-247 Issue3, RSS-GEN Issue5

7. Testing Environment : refer to 7 page

8. Test Results : Compliance

9. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing (Address : 5, Dongbu-ro 221beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea)

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This report cannot be reproduced or copied without the written consent of CTK.

Approval	Tested by Seoung-uk Park: (Signature) 	Technical Manager Bong-seok Kim: (Signature) 
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2025-03-28

CTK Co., Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2025-03-28	Issued (CTK-2025-00860)	all

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1. General Description

1.1 Applicant Information

Company	SOLUM CO.,LTD.
Contact Point	7F, 2354, Yonggu-daero, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea
Contact Person	Name : Ki Dong Lee E-mail : kdlee007@solu-m.com Tel : +82-31-8006-7677

1.2 Manufacturer Information

Manufacturer	SOLUM CO.,LTD.
Address	7F, 2354, Yonggu-daero, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea
Factory #1	SOLUM VINA CO., LTD
Factory #1 Address	Plot B3, Ba Thien II Industrial Park, Thien Ke Ward, Binh Xuyen District, Vinh Phuc Province, VIETNAM

1.3 Product Information

FCC ID	2AFWN-CD01HFS01X
IC	22800-CD01HFS01X
Product Description	Auto Tag
Model name	CD01HFS01X
Variant Model name	-
Operating Frequency	1M Bandwidth : 903.5 MHz – 926.5 MHz 2M Bandwidth : 905.0 MHz – 925.0 MHz 4M Bandwidth : 906.0 MHz – 922.0 MHz
RF Output Power	Peak Power: 21.35 dBm Average Power: 14.44 dBm *Based on module test report
Antenna Specification	Antenna type: LDS Antenna Peak Gain : 1.74 dBi
Number of Channels	1M Bandwidth : 24 Channels 2M Bandwidth : 11 Channels 4M Bandwidth : 5 Channels
Type of Modulation	OFDM
Power Source	DC 3.6 V

1.4 Peripheral Devices

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2. Accreditations

2.1 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	CN : 8737A CAB ID : KR0025
KOREA	NRRA	KR0025

2.2 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

3. Test Specifications

3.1 Standards

Section in FCC	ISED Part	Requirement(s)	Status (Note 1)	Test Condition
15.247(d), 15.209, 15.205	RSS-247, 8.9	Transmitter emission	C	Radiated
<u>Note 1:</u> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable				
<u>Note 2:</u> The data in this test report are traceable to the national or international standards.				
<u>Note 3:</u> The sample was tested according to the following specification: FCC Part 15.247, ANSI C63.10-2013, RSS-247(Issue 3), RSS-GEN(Issue 5)				
<u>Note 4:</u> The conformity assessment of except for this item was confirmed by the RF module installed in the device. Please refer to test reports "HCT-RF-2502-FI006-R1". (FCC ID: 2BEK7WHM210A, IC: 32019-WHM210A)				

3.2 Testing Environment

Test Item		Test Date	Temperature (℃)	Relative Humidity (% R.H.)
Transmitter unwanted emission (Radiated)	1) below 1GHz	2025-03-25	21 ± 1	31 ± 3
	2) above 1GHz			
Receiver spurious emission (Radiated)	1) below 1GHz	2025-03-25	23 ± 1	35 ± 3
	2) above 1GHz			

3.3 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments.
 During at testing, system components were manipulated within the confines of typical usage to maximize each emission.

Test Frequency & Test mode(worst case)

Mode	Frequency(MHz)		
1M bandwidth	903.5	915.5	926.5

Modulation Type

Modulation type
OFDM

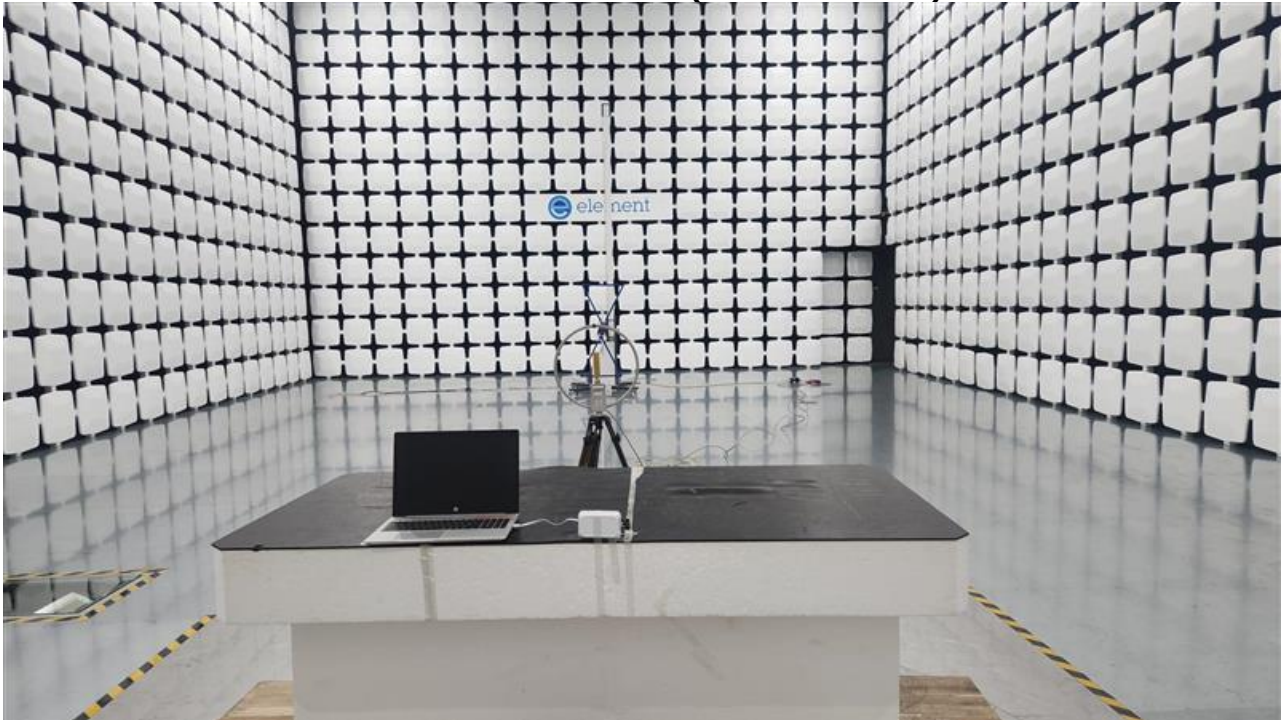
3.4 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.
 Coverage factor $k = 2$, Confidence levels of 95 %

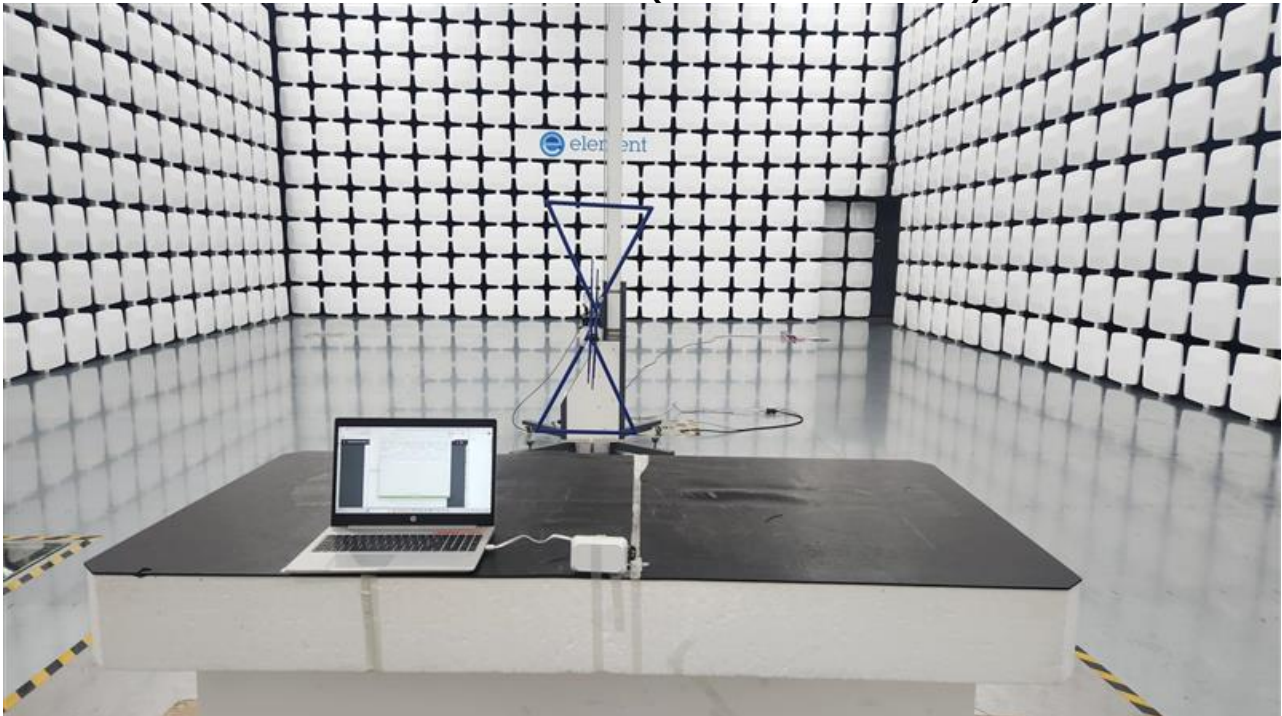
Description	Uncertainty
Radiated Emissions ($f \leq 1$ GHz)	3.88 dB (C.L.: Approx. 95 %, $k = 2$)
Radiated Emissions ($f > 1$ GHz)	4.50 dB (C.L.: Approx. 95 %, $k = 2$)

3.5 Test setup photo

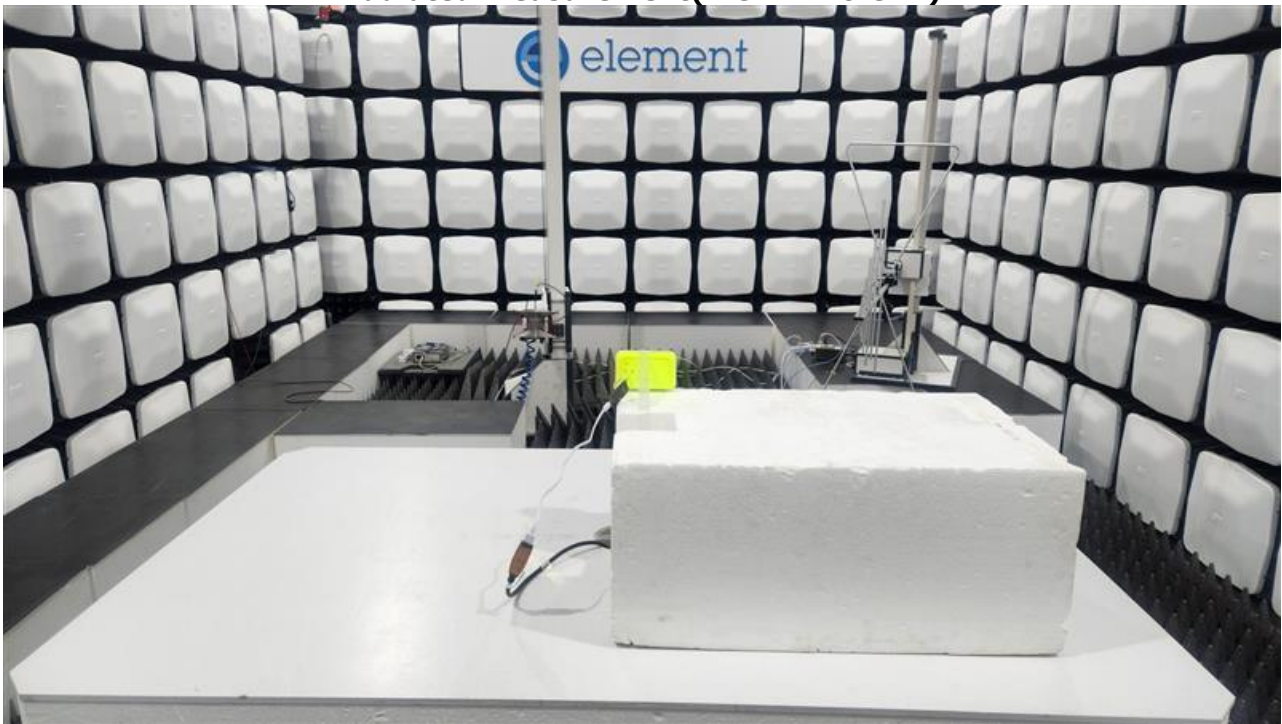
Radiated measurement(9 kHz - 30 MHz)



Radiated measurement(30 MHz - 1 000 MHz)



Radiated measurement(1 GHz –10 GHz)



4. Technical Characteristic Test

4.1 Radiated Emission

Test Location

- ☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)
☒ 3 m SAC (test distance : 3 m)

Test Procedures

ANSI C63.10-2013 – Section 6.5, 6.6

- 1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency range above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3 m away from the EUT. Test Antenna height is carried from 1 m to 4 m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

Test Settings :

Frequency Range = 9 kHz ~ 10 GHz (900 MHz 10th harmonic)

- a) RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz, 9 kHz for $f < 30$ MHz,
200 Hz for $f < 150$ kHz
- b) VBW $\geq$ RBW
- c) Sweep time = auto couple

Limit :

Unwanted emissions that do not fall within the restricted frequency bands of Table 1 shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Table 1. Restricted Frequency Bands

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
¹ 0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475-156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	² Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC Part 15 § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table 2 :

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in table 2. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 2. General Field Strength Limits for Licence-Exempt Transmitters (FCC)

Frequency(MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Deasurement Distance (meters)
0.009-0.490	2400/F(kHz)	48.5 – 13.8	300
0.490-1.705	24000/F(kHz)	33.8 – 23	30
1.705-30	30	29.5	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

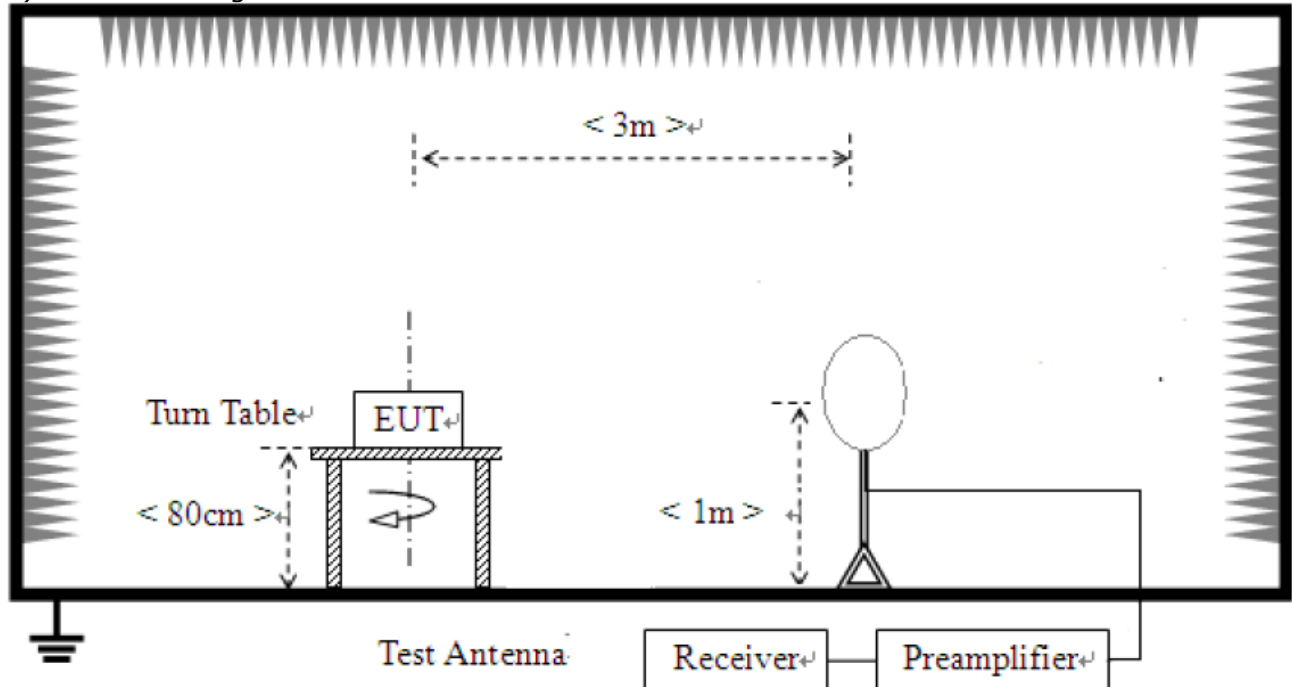
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part,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

Note :

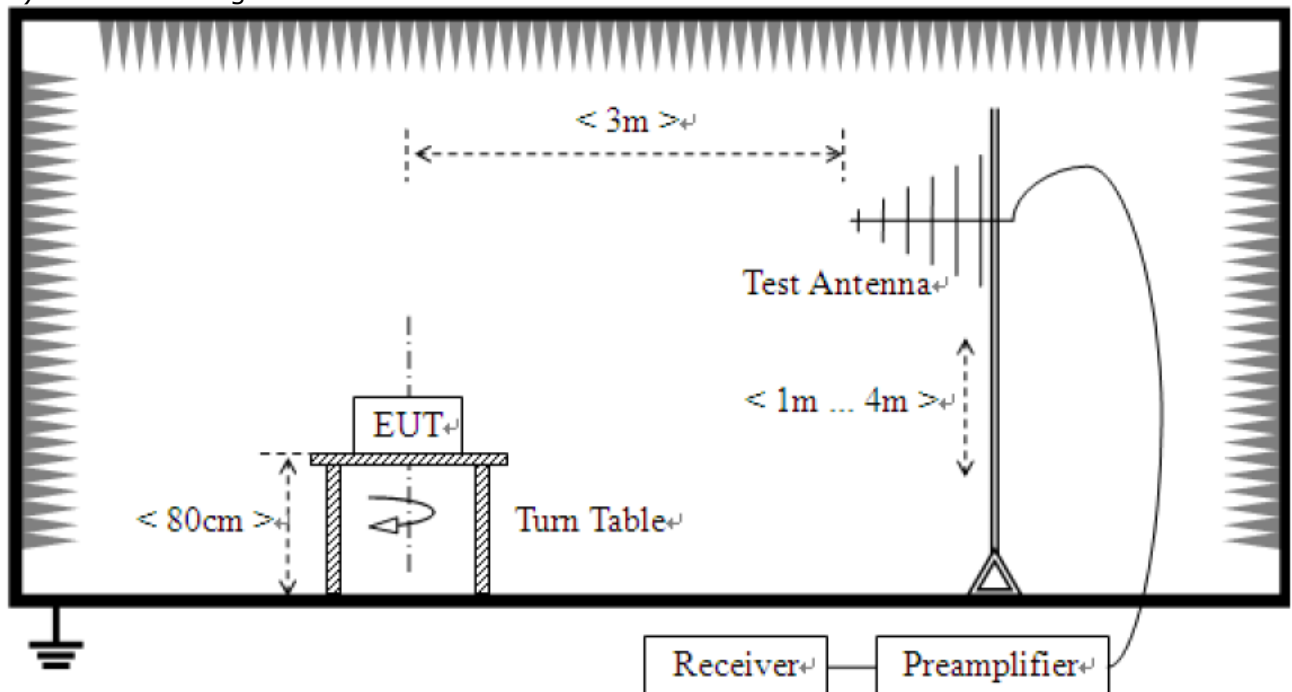
- 1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- 2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3 m (AV) and 74 dBuV/m@3 m (PK)
- 3) For measurement above 1 GHz, the resolution bandwidth is set to 1 MHz and video bandwidth is set to 3 MHz for peak measurement.

Test Setup:

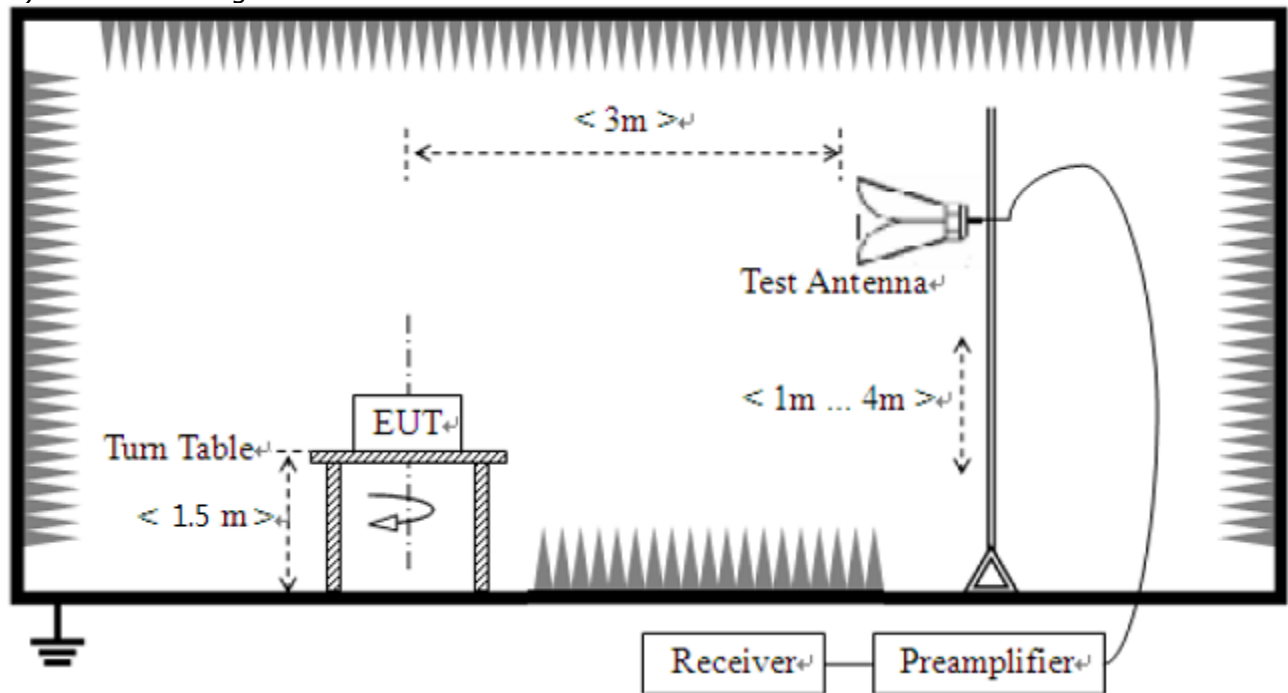
1) For field strength of emissions from 9 kHz to 30 MHz



2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz



Test results

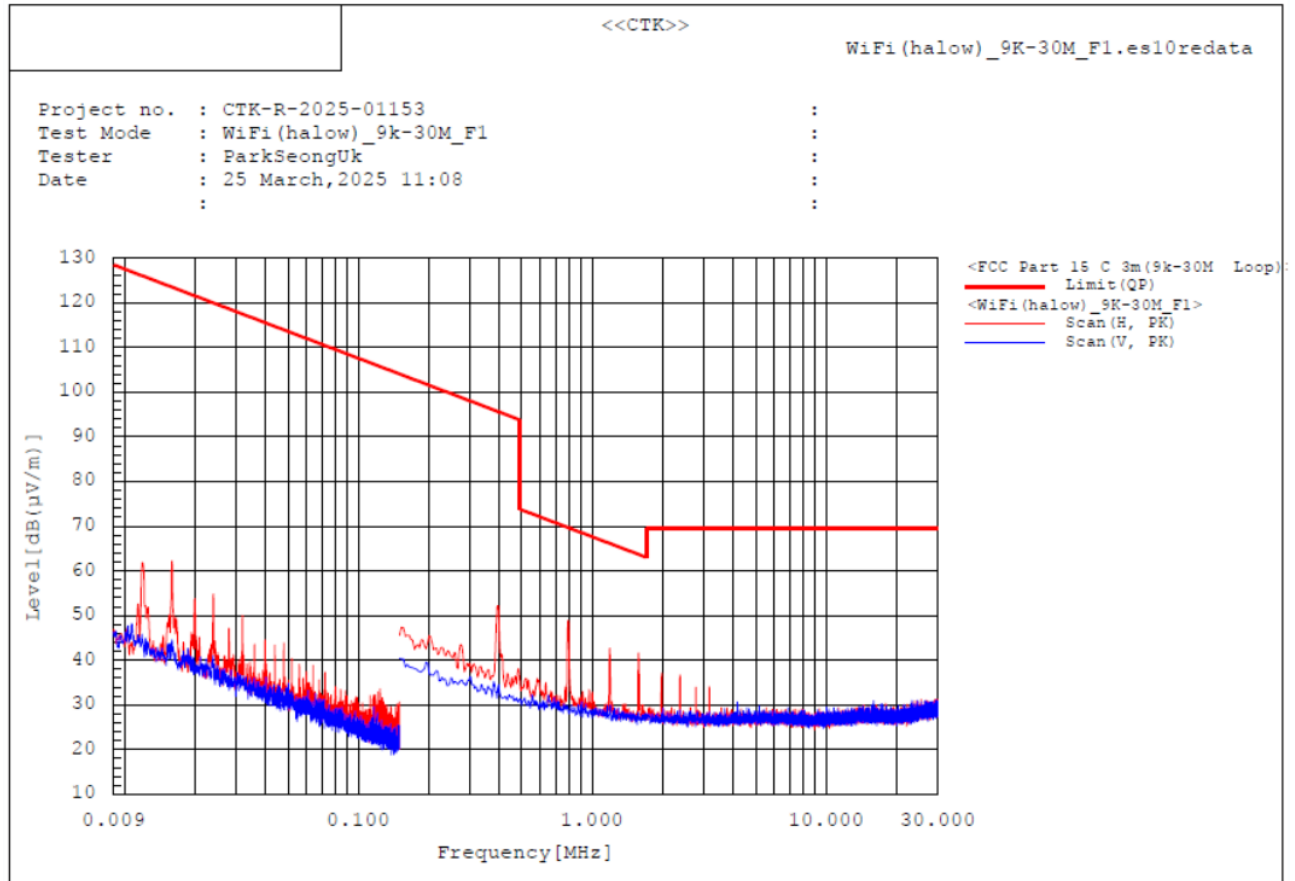
1) 9 kHz to 30 MHz

Test mode : 1 M Bandwidth_903.5 MHz (Worst case)

The requirements are:

☒ Complies

Test Data



Result : There are more than 20 dB of margin compared to the reference value.

Remark :

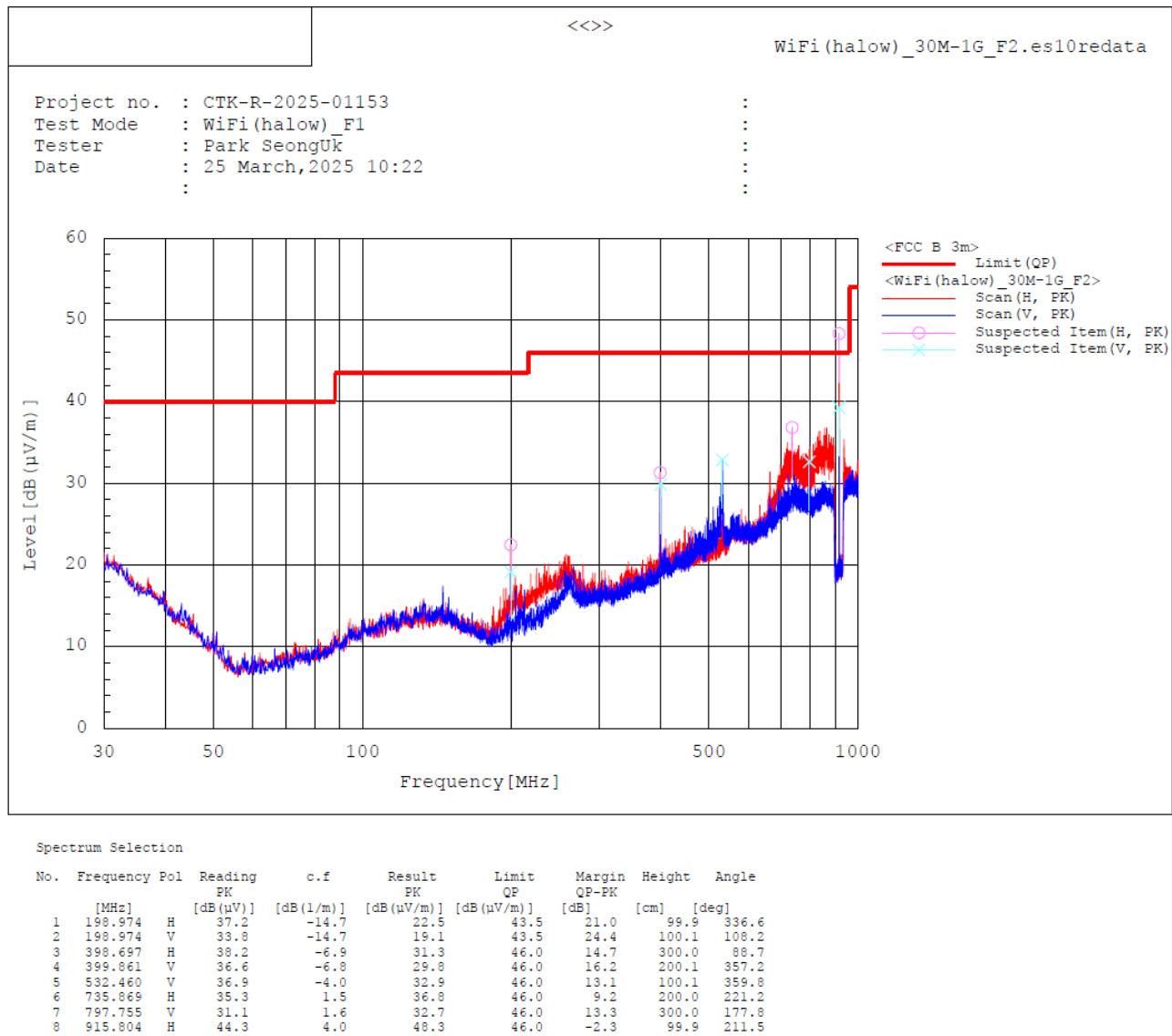
1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
4. This data is the Peak(PK) value.

2) 30 MHz to 1 GHz

Test mode : 1 M Bandwidth_915.5 MHz (Worst case)

The requirements are:
☒ Complies

Test Data



Remark :

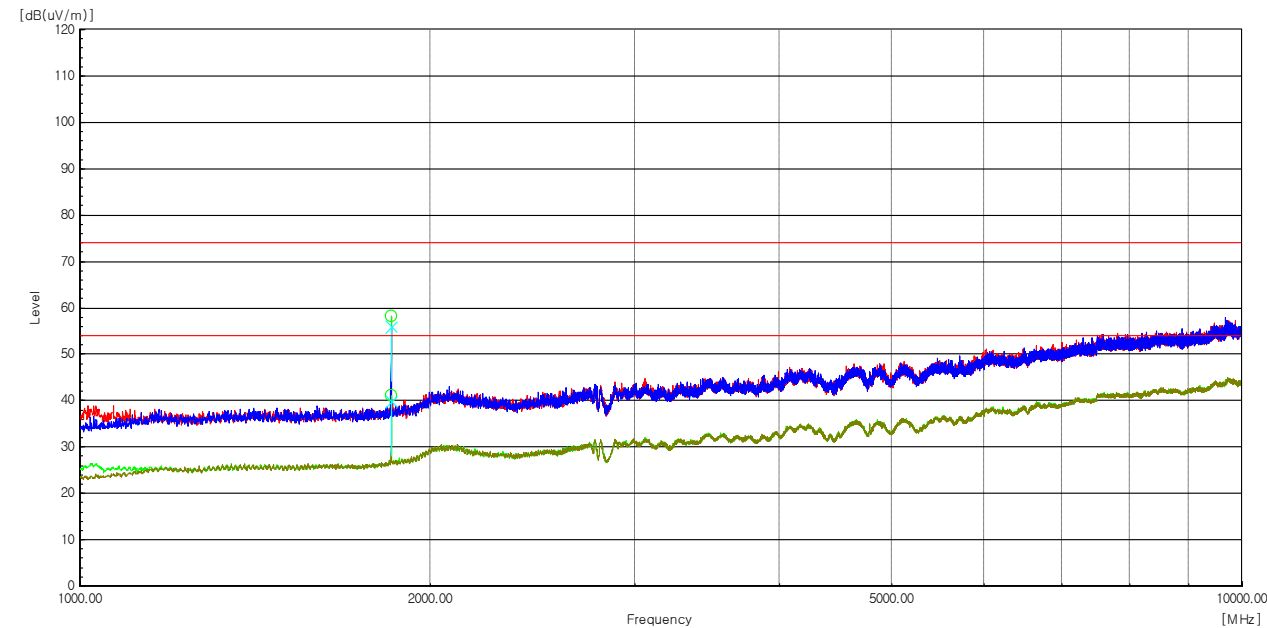
- Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
- Result = Reading + c.f(Correction factor)
- Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
- This data is the Peak(PK) value.
- Band reject filter was used.
- No.8 are the fundamental frequencies of the product.

3) 1 GHz to 10 GHz

Test mode : 1 M Bandwidth_926.5 MHz (Worst case)

The requirements are:
☒ Complies

Test Data



Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
1 852.754	H	65.5	-----	-7.3	58.2	-----	74.0	-----	15.8	-----
1 852.754	V	63.3	-----	-7.3	56.0	-----	74.0	-----	18.0	-----
1 852.754	H	-----	48.3	-7.3	-----	41.0	-----	54.0	-----	13.0
1 852.754	V	-----	47.1	-7.3	-----	39.8	-----	54.0	-----	14.2

Remarks

1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(Y axis) and the worst case was recorded.
2. Result = Reading + c.f(correction factor)
3. Correction factor = Antenna factor + Cable loss - Amp Gain
4. Band reject filter & high pass filter was used.

APPENDIX A – Test Equipment Used For Tests

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI TEST RECEIVER	Rohde & Schwarz	ESW44	102039	2024-04-29	2025-04-29
2	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2024-04-15	2026-04-15
3	Bilog Antenna	TESEQ	CBL6111D	60654	2023-08-21	2025-08-21
4	AMPLIFIER	SONOMA INSTRUMENT	310N	411011	2024-07-31	2025-07-31
5	ATTENUATOR	PASTERNAK	PE7AP006-06	L2021050400002 3	2024-07-31	2025-07-31
6	ATTENUATOR	NONE	6dB	190557	2024-09-19	2025-09-19
7	Preamplifier	Agilent	8449B	3008A00620	2024-04-11	2025-04-11
8	Double Ridged Guide Antenna	ETS-Lindgren	3115	00078895	2024-04-16	2025-04-16
9	Spectrum Analyzer	Rohde & Schwarz	FSV40	101574	2025-01-10	2026-01-10
10	High Pass Filter	K&L MICROWAVE	13SH10- 1000/U1000- N/N	00003	2024-07-10	2025-07-10
11	Band Reject Filter	Wainwright Instruments GmbH	WRCG902/930- 894/938- 50/12SS	SN1	2025-03-11	2026-03-11

No.	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable (9kHz-1GHz Radiated)	Canare Corporation	L-5D2W	N/A	2025-03-05
2	RF Cable (9kHz-1GHz Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2025-03-05
3	RF Cable (1GHz-18GHz Radiated)	Junkosha Inc.	MWX221	2008S246	2025-02-21
4	RF Cable (1GHz-18GHz Radiated)	Rosenberger	NONE	1520.9927.00	2025-02-21
5	RF Cable (1GHz-18GHz Radiated)	Sensorview Co., LTD	9S18	TPC2204060007	2025-02-21

APPENDIX B – EUT Photographs



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