

TEST REPORT

Bureau Veritas CPS Korea Tech Limited
(Annyeong-dong) 26, 28, 30, Seja-ro
406beon-gil, Hwaseong-si, Gyeonggi-do,
Republic of Korea
Tel:031-222-4251, Fax: -

Report No.: KST-FCR-250007



1. Applicant

- Name : Digital Edge Solutions, Inc.
- Address : A-#1605, Pyeongchon Smartbay, 123, Beolmal-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Republic of Korea

2. Test Item

- Product Name: 60 GHz in-cabin Radar
- Model Name: DEOR
- Brand: -
- FCC ID: 2BPBA-DEOR

3. Manufacturer

- Name : Digital Edge Solutions, Inc.
- Address : A-#1605, Pyeongchon Smartbay, 123, Beolmal-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Republic of Korea

4. Date of Test : 2025. 06. 18. ~ 2025. 06. 19.

KDB 364244

5. Test Method Used : FCC CFR 47, Part 15. Subpart C
ANSI C 63.10-2013

6. Test Result : Compliance

7. Note: -

Supplementary Information

The device bearing the brand name and FCC ID specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with measurement procedures specified in ANSI C 63.10-2013.

We attest to the accuracy of data and all measurements reported herein were performed by KOSTEC Co., Ltd. and were made under Chief Engineer's supervision. We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test report is not related to KOLAS accreditation.

Affirmation	Tested by Name : Park, Jae-Hyeon (Signature)	Technical Manager Name : Choo, Kwang-Yeol (Signature)
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2025. 06. 30.

Bureau Veritas CPS Korea Tech Limited

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1. GENERAL INFORMATION

1.1 Test Facility

Test laboratory and address

Bureau Veritas CPS Korea Tech Limited

(Annyeong-dong) 26, 28, 30, Seja-ro 406beon-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea

Telephone Number: 82-31-222-4251

Facsimile Number: -

Registration information

KOLAS No.: KT232

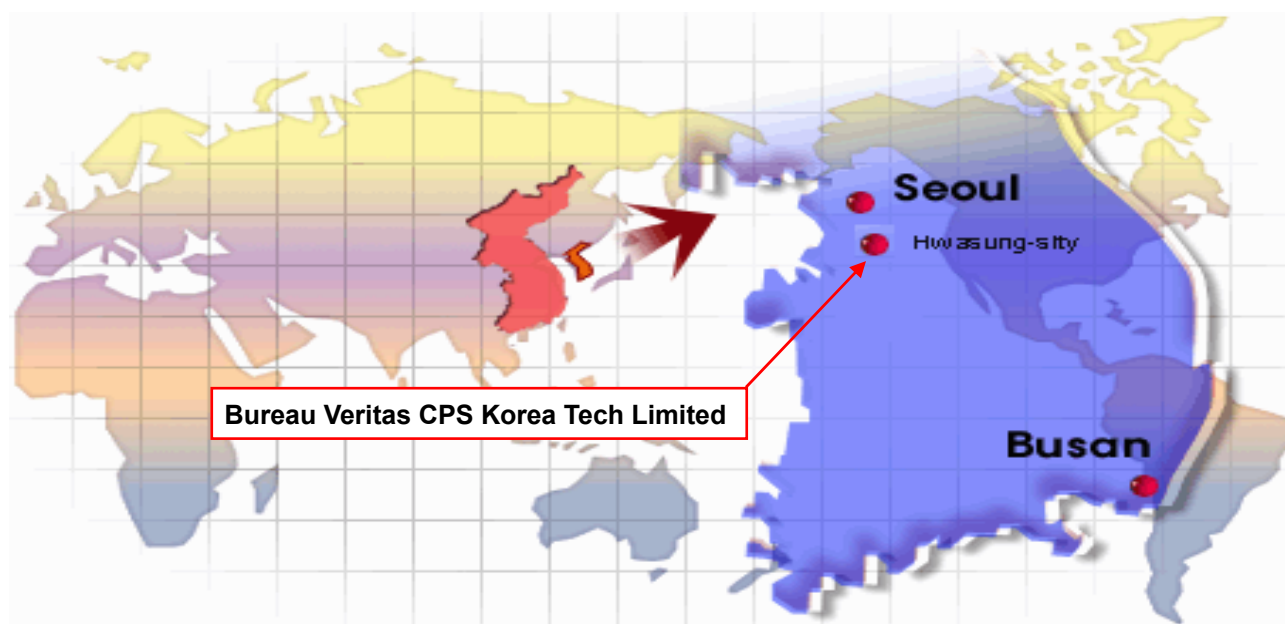
RRA (National Radio Research Agency): KR0041

FCC Designation No.: KR0041

IC Designation No.: KR0041

VCCI Membership No.: 2005

1.2 Location



1.3 Revision History of test report

Rev.	Revisions	Effect page	Reviewed	Date
-	Initial issue	All	Choo, Kwang-Yeol	2025. 06. 30.

2. EQUIPMENT DESCRIPTION

The product specification described herein was declared by manufacturer. And refer to user's manual for the details.

Equipment Name	60 GHz in-cabin Radar
Model No	DEOR
Usage	60 GHz in-cabin Radar
Serial Number	Proto type
Modulation type	FMCW
Maximum output power(e.i.r.p)	12.93 dBm
Operated Frequency	57 GHz ~ 64 GHz
Channel Number	1
Operation temperature	-20 °C ~ 85 °C
Power Source	DC 12 V
Antenna Description	Patch Antenna(Fixed), gain : 5.61 dBi
Remark	1. The device was operating at its maximum output power for all measurements. 2. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case (Y) is shown in the report. 3. The above DUT's information was declared by manufacturer. Please refer to the specifications or user manual for more detailed description.
FCC ID	2BPBA-DEOR

3. SYSTEM CONFIGURATION FOR TEST

3.1 Characteristics of equipment

The Equipment Under Test (EUT) contains the following capabilities: This equipment is 60 GHz in-cabin Radar. The detailed explanation is refer as user manual.

3.2 Used peripherals list

Description	Model No.	Serial No.	Manufacture	Remark
Notebook	P90F005	4N3K6A01	Dell	-

3.3 Product Modification

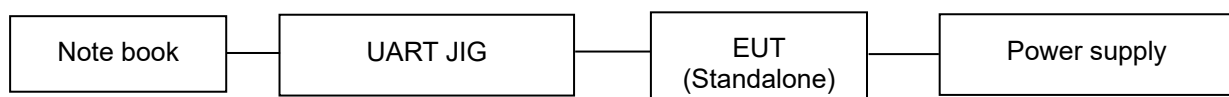
N/A

3.4 Operating Mode

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

3.5 Test Setup of EUT

The measurements were taken in continuous transmit mode using the test mode which controlled by DE_ROA. The test Jig and cables were provided by the applicant.



3.6 Used Test Equipment List

No.	Instrument	Model	S/N	Manufacturer	Next Cal Date	Cal interval	used
1	T & H Chamber	PL-3J	15003623	ESPEC CORP	2025.08.13	1 year	☐
2	T & H Chamber	SH-662	93000067	ESPEC CORP	2025.08.13	1 year	☐
3	T & H Chamber	SH-642	93011406	ESPEC CORP	2025.08.13	1 year	☒
4	Spectrum Analyzer	8563EC	3046A00527	Agilent Technology	2026.01.08	1 year	☐
5	Spectrum Analyzer	FSV30	104029	Rohde & Schwarz	2025.08.12	1 year	☐
6	Spectrum Analyzer	FSV30	20-353063	Rohde & Schwarz	2026.01.08	1 year	☐
7	Spectrum Analyzer	FSV40	101727	Rohde & Schwarz	2025.08.12	1 year	☐
8	Signal Analyzer	FSW43	101294	Rohde & Schwarz	2026.01.08	1 year	☐
9	Signal Analyzer	FSW85	101602	Rohde & Schwarz	2025.07.03	1 year	☒
10	EMI Test Receiver	ESCI7	100823	Rohde & Schwarz	2026.01.07	1 year	☐
11	EMI Test Receiver	ESPI	100488	Rohde & Schwarz	2026.01.06	1 year	☐
12	EMI Test Receiver	ESI	837514/004	Rohde & Schwarz	2025.08.12	1 year	☒
13	Vector Signal Analyzer	89441A	3416A02620	Agilent Technology	2026.01.09	1 year	☐
14	Network Analyzer	8753ES	US39170869	AGILENT	2025.08.13	1 year	☐
15	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2026.01.08	1 year	☐
16	RF Power Sensor	E9300A	MY41496631	Agilent Technology	2026.01.08	1 year	☐
17	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2026.01.06	1 year	☐
18	Audio Analyzer	8903B	3514A16919	Agilent Technology	2026.01.06	1 year	☐
19	Audio Telephone Analyzer	DD-5601CID	520010281	CREDIX	2026.01.06	1 year	☐
20	Modulation Analyzer	8901A	3041A05716	H.P	2026.01.08	1 year	☐
21	Digital storage Oscilloscope	TDS3052	B015962	Tektronix	2025.08.13	1 year	☐
22	ESG-D Series Signal Generator	E4436B	US39260458	Agilent Technology	2026.01.09	1 year	☐
23	Vector Signal Generator	SMBV100A	257557	Rohde & Schwarz	2026.01.09	1 year	☐
24	GNSS Signal Generator	TC-2800A	2800A000494	TESCOM CO., LTD.	2026.01.09	1 year	☐
25	Signal Generator	SMB100A	179628	Rohde & Schwarz	2026.01.09	1 year	☒
26	Signal Generator	N5173B	MY57280148	KEYSIGHT	2026.03.27	1 year	☒
27	SLIDAC	None	0207-4	Myoung sung Ele.	2026.01.06	1 year	☐
28	DC Power supply	DDPS-3K	U03-109	Digitech Power	2026.01.07	1 year	☐
29	DC Power supply	E3610A	KR24104505	Agilent Technology	2026.01.06	1 year	☐
30	DC Power supply	UP-3005T	68	Unicon Co.,Ltd	2026.01.06	1 year	☐
31	DC Power Supply	SM 3400-D	114701000117	DELTAELEKTRONIKA	2026.01.06	1 year	☐
32	DC Power supply	6632B	MY43004005	Agilent Technology	2026.01.06	1 year	☐
33	DC Power Supply	6632B	MY43004137	Agilent Technology	2026.01.06	1 year	☒
34	Termination	1433-3	LM718	WEINSCHEL	2026.01.08	1 year	☐
35	Termination	1432-3	QR946	AEROFLEX/WEINSCHEL	2026.01.08	1 year	☐
36	Attenuator	8498A	3318A09485	HP	2026.01.08	1 year	☐
37	Step Attenuator	8494B	3308A32809	HP	2026.01.08	1 year	☐
38	RF Step Attenuator	RSP	100091	Rohde & Schwarz	2026.01.09	1 year	☐
39	Attenuator	18B50W-20F	64671	INMET	2026.01.09	1 year	☐
40	Attenuator	10 dB	1	Rohde & Schwarz	2026.01.08	1 year	☐
41	Attenuator	54A-10	74564	WEINSCHEL	2025.08.19	1 year	☐
42	Attenuator	56-10	66920	WEINSCHEL	2026.01.08	1 year	☐
43	Attenuator	SA18N100-20	001	FAIRVIEW MICROWAVE	2025.08.12	1 year	☐
44	Attenuator	SA26B-10	33464/2134	FAIRVIEW MICROWAVE	2025.08.19	1 year	☐
45	Attenuator	SA4018-10	DC 2126	FAIRVIEW MICROWAVE	2025.08.19	1 year	☐
46	Power divider	11636B	51212	HP	2026.01.08	1 year	☐
47	3Way Power divider	KPDSU3W	00070365	KMW	2025.08.12	1 year	☐
48	4Way Power divider	70052651	173834	KRYTAR	2026.01.08	1 year	☐
49	3Way Power divider	1580	SQ361	WEINSCHEL	2026.01.08	1 year	☐
50	OSP	OSP120	101577	Rohde & Schwarz	2026.01.09	1 year	☐
51	White noise audio filter	ST31EQ	101902	SoundTech	2025.08.13	1 year	☐

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No.	Instrument	Model	S/N	Manufacturer	Next Cal Date	Cal interval	used
52	Dual directional coupler	778D	17693	HEWLETT PACKARD	2026.01.09	1 year	☐
53	Dual directional coupler	772D	2839A00924	HEWLETT PACKARD	2026.01.09	1 year	☐
54	Band rejection filter	3TNF-0006	26	DOVER Tech	2026.01.09	1 year	☐
55	Band rejection filter	3TNF-0007	311	DOVER Tech	2026.01.09	1 year	☐
56	Band rejection filter	WTR-BRF2442-84NN	09020001	WAVE TECH Co.,LTD	2026.01.09	1 year	☒
57	Band rejection filter	WRCJV12-5695-5725-5825-5855-50SS	1	Wainwright Instruments GmbH	2026.01.09	1 year	☐
58	Band rejection filter	WRCJV12-5120-5150-5350-5380-40SS	4	Wainwright Instruments GmbH	2026.01.09	1 year	☐
59	Band rejection filter	WRCGV10-2360-2400-2500-2540-50SS	2	Wainwright Instruments GmbH	2026.01.09	1 year	☒
60	Band rejection filter	CTF-155M-S1	001	RF One Electronics	2025.08.12	1 year	☐
61	Band rejection filter	CTF-435M-S1	001	RF One Electronics	2025.08.12	1 year	☐
62	Band rejection filter	CTF-5890M-70MS1	1	RF One Electronics	2026.01.09	1 year	☐
63	Highpass Filter	WHJS1100-10EF	1	WAINWRIGHT	2026.01.08	1 year	☐
64	Highpass Filter	WHJS3000-10EF	1	WAINWRIGHT	2026.01.08	1 year	☐
65	Highpass Filter	WHNX6-5530-7000-26500-40CC	2	Wainwright Instruments GmbH	2026.01.13	1 year	☐
66	Highpass Filter	WHNX6-2370-3000-26500-40CC	4	Wainwright Instruments GmbH	2026.01.13	1 year	☐
67	WideBand Radio Communication Tester	CMW500	102276	Rohde & Schwarz	2026.01.09	1 year	☐
68	WideBand Radio Communication Tester	CMW500	117235	Rohde & Schwarz	2026.01.15	1 year	☐
69	WideBand Radio Communication Tester	MT8000A	6261987920	Anritsu	2026.01.08	1 year	☐
70	WideBand Radio Communication Tester	MT8821C	6262287695	Anritsu	2026.01.08	1 year	☐
71	Bluetooth Tester	TC-3000B	3000B6A0166	TESCOM CO., LTD.	2026.01.10	1 year	☐
72	Loop Antenna	6502	9203-0493	EMCO	2025.05.23	2 year	☐
73	Loop Antenna	FMZB1513	#374	Schwarzbeck	2027.02.11	2 year	☒
74	BiconiLog Antenna _(R)	3142C	35880	ETS-LINDGREN	2026.10.17	2 year	☒
75	Trilog-Broadband Antenna _(R)	VULB 9168	9168-606	SCHWARZBECK	2026.09.03	2 year	☐
76	Biconical Antenna _(T)	VUBA9117	9117-342	Schwarz beck	2026.01.16	2 year	☐
77	Horn Antenna	3115	9605-4834	EMCO	2026.02.21	1 year	☐
78	Horn Antenna	QMS-00208	21909	STEATITE ANTENNA	2026.03.31	1 year	☐
79	Horn Antenna _(R)	3117	00135191	ETS-LINDGREN	2026.03.24	1 year	☒
80	Horn Antenna _(T)	3115	2996	EMCO	2026.01.07	1 year	☐
81	Horn Antenna _(R)	BBHA 9170	9170-722	SCHWARZBECK	2026.01.13	1 year	☒
82	Horn Antenna _(T)	BBHA 9170	743	SCHWARZBECK	2026.01.07	1 year	☐
83	AMPLIFIER(A_10)	TK-PA01S	220109-L	TESTEK	2026.01.07	1 year	☐
84	AMPLIFIER(C_3)	TK-PA01S	200141-L	TESTEK	2025.08.12	1 year	☒
85	PREAMPLIFIER(C_3)	8449B	3008A02577	Agilent	2026.01.06	1 year	☐
86	RF PRE AMPLIFIER	SCU08F2	100762	Rohde & Schwarz	2025.08.22	1 year	☐
87	AMPLIFIER	TK-PA18	150003	TESTEK	2026.01.07	1 year	☒
88	AMPLIFIER	TK-PA1840H	160010-L	TESTEK	2026.01.06	1 year	☒
89	Horn Antenna	M19RH	T01	OML, Inc.	2026.04.03	1 year	☒
90	Horn Antenna	M12RH	T02	OML, Inc.	2026.04.03	1 year	☒
91	Horn Antenna	M08RH	T03	OML, Inc.	2026.04.10	1 year	☒
92	Horn Antenna	M05RH	T04	OML, Inc.	2026.04.10	1 year	☒
93	Horn Antenna	M03RH	T05	OML, Inc.	2026.04.10	1 year	☐
94	Harmonic Mixer	M12HWD	200529-1	OML, Inc.	2026.04.10	1 year	☒
95	Harmonic Mixer	M08HWD	200529-1	OML, Inc.	2026.04.10	1 year	☒
96	Harmonic Mixer	M05HWD	200529-1	OML, Inc.	2026.04.10	1 year	☒
97	Harmonic Mixer	M03HWD	200529-1	OML, Inc.	2026.04.10	1 year	☐
98	Source Module	S19MS-A	200529-1	OML, Inc.	2026.04.01	1 year	☒
99	Source Module	S12MS-A	200529-1	OML, Inc.	2026.04.01	1 year	☒
100	Source Module	S08MS-A	200529-1	OML, Inc.	2026.04.01	1 year	☒
101	Source Module	S05MS-A	200529-1	OML, Inc.	2026.04.01	1 year	☒
102	Source Module	S03MS-A	200529-1	OML, Inc.	2026.04.01	1 year	☐

Note: The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.
Especially, all antenna(Up to 40 GHz) for measurement is calibrated in accordance with the requirements of C 63.5.

3.7 Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the UCISPR measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Measurement uncertainty
Radiated Disturbance(Below 1 GHz)	5.06 dB (CL: Approx 95 %, $k=2$)
Radiated Disturbance(1 GHz ~ 40 GHz)	5.00 dB (CL: Approx 95 %, $k=2$)
Radiated Disturbance(Above 40 GHz)	5.59 dB (CL: Approx 95 %, $k=2$)

4. SUMMARY TEST RESULTS

Description of Test	FCC Rule	Reference Clause	Used	Test Result
Bandwidth of Signal	15.255(c)(3)	Clause 5.1	☒	Compliance
Duty cycle, Off Time Requirement	15.255(c)(2)(iii)(A)	Clause 5.2	☒	Compliance
Radiated Power	15.255(c)(2)(iii)(A)	Clause 5.3	☒	Compliance
Spurious Emissions	15.255(d), 15.209	Clause 5.4	☒	Compliance
Frequency Stability	15.255(f)	Clause 5.5	☒	Compliance
Antenna Requirement	15.203	Clause 5.6	☒	Compliance
AC Conducted emission	15.207	-	☐	N/A) ^{Note1)}
Group Installation	15.255(h)	-	☐	N/A) ^{Note2)}
Compliance/pass : The EUT complies with the essential requirements in the standard. Not Compliance : The EUT does not comply with the essential requirements in the standard. N/A : The test was not applicable in the standard. Note: 1) The test is not applicable because the EUT will be installed in vehicles and will not be connected to the public utility (AC) power line 2) The test is not applicable since there are no external phase-locking inputs in this EUT				

Procedure Reference

KDB 364244 v01r01

FCC CFR 47, Part 15. Subpart C

ANSI C 63.10-2013

5. MEASUREMENT RESULTS

5.1 Bandwidth of Signal

5.1.1 Standard Applicable [FCC §15.215(c)]

FCC

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

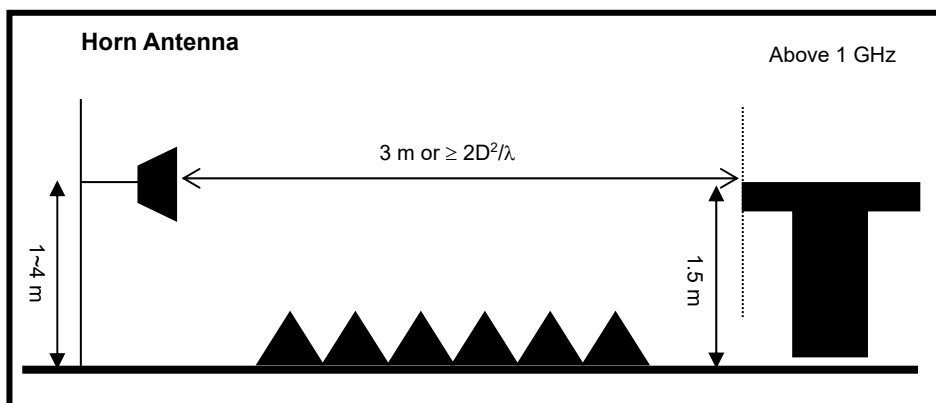
5.1.2 Test Environment conditions

- Ambient temperature : (20 ~ 21) °C • Relative Humidity : (40 ~ 43) % R.H.

5.1.3 Measurement Procedure

The test was performed according to ANSI C63.10, clause 9.3

5.1.4 Test setup



5.1.5 Measurement Result

Center Freq. (GHz)	Measured -20 dBc Frequency		20 dB Bandwidth (MHz)	Lower Limit (GHz)	Upper Limit (GHz)	Result
	Lower Result (GHz)	Upper Result (GHz)				
61.7	60.480	62.937	2 457	57	64	Compliance

Occupied Bandwidth



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5.2 Duty cycle, Off Time Requirement

5.2.1 Standard Applicable [FCC §15.255(c)(2)(iii)(A)]

FCC

(iii) 57.0–64.0 GHz:

(A) The peak EIRP shall not exceed 14 dBm, and the sum of continuous transmitter off-times of at least two milliseconds shall equal at least 25.5 milliseconds within any contiguous interval of 33 milliseconds, except as specific in paragraph (c)(2)(iii)(B) of this section;

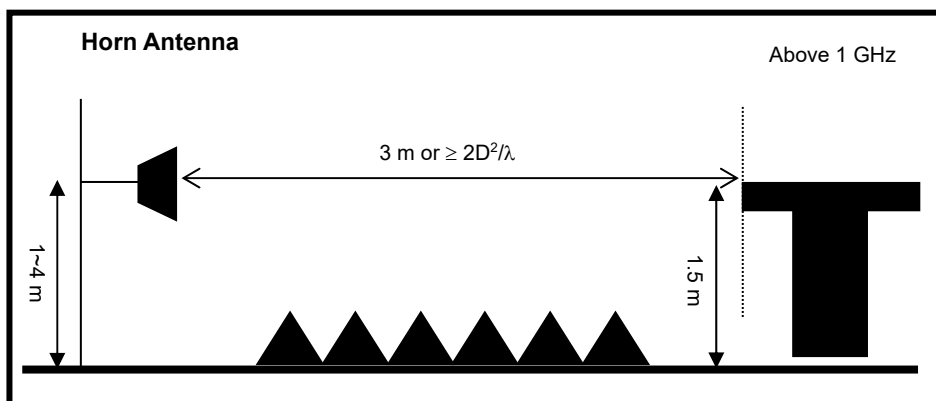
5.2.2 Test Environment conditions

- Ambient temperature : (20 ~ 21) °C • Relative Humidity : (40 ~ 43) % R.H.

5.2.3 Measurement Procedure

The test was performed according to ANSI C63.10, clause 9.5, 9.6, 9.7
The duty cycle was tested with the spectrum analyzer set to zero-span.

5.2.4 Test setup



5.2.5 Measurement Result

TX On + TX OFF Time (ms)	TX On Time (ms)	TX Off Time (ms)	Duty Result (%)	Duty Factor (dB)
200.208	5.322	194.89	2.66	-15.75

TX OFF Time Ratio (%)	Regulation Time (ms)	TX OFF Time within Regulation Time Limit (ms)	The ratio of TX OFF Time Limit (%)	Result
97.34	33.00	25.50	≥77.27	Compliance

Calculating formula:

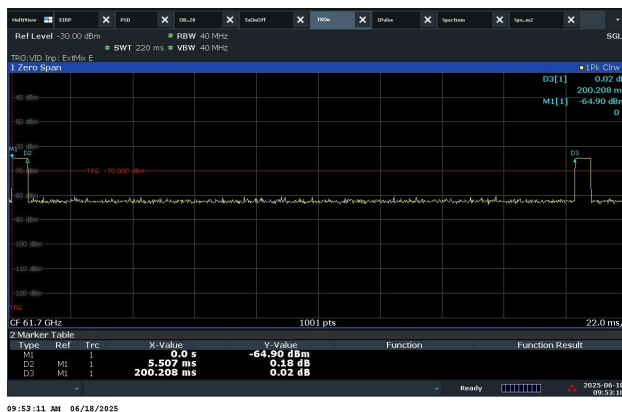
TX OFF Time = TX ON + TX OFF Time – TX ON Time

Duty = (TX ON Time / TX ON + TX OFF Time) * 100

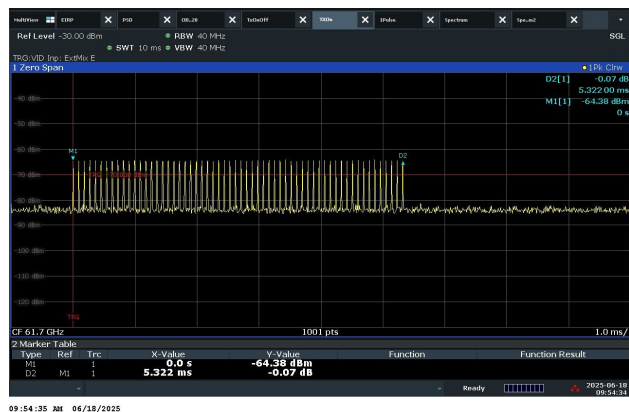
Duty factor = 10 * log(TX ON + TX OFF Time / TX ON Time)

TX OFF Time Ratio = (TX OFF Time / TX ON + TX OFF Time) * 100

TX ON + TX OFF Time



TX ON Time



5.3 Radiated Power

5.3.1 Standard Applicable [FCC §15.255(c)(2)(iii)(A)]

FCC

(c)(2)(iii)(A) The peak EIRP shall not exceed 14 dBm, and the sum of continuous transmitter off-times of at least two milliseconds shall equal at least 25.5 milliseconds within any contiguous interval of 33 milliseconds, except as specific in paragraph (c)(2)(iii)(B) of this section;

(e) Limits on transmitter conducted output power.

(1) Except as specified in paragraph (e)(2) of this section, the peak transmitter conducted output power of devices other than field disturbance sensors/radars shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the EIRP limits specified in paragraph (c) of this section.

5.3.2 Test Environment conditions

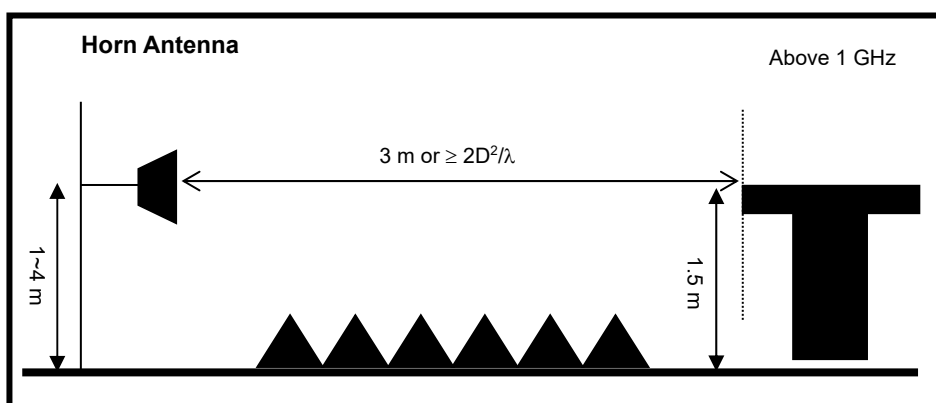
- Ambient temperature : (20 ~ 21) °C • Relative Humidity : (40 ~ 43) % R.H.

5.3.3 Measurement Procedure

Test Settings

1. Radiated power measurements are performed using the signal analyzer's swept mode measurement capability for signals with continuous operation.
2. RBW = 1~5% of the expected OBW, The analyzer limits maximum RBW at 40 MHz.
3. VBW $\geq 3 \times$ RBW
4. Span as required, enough to observe the fundamental spike around 60.8 GHz
5. No. of sweep points $\geq 2 \times$ span / RBW
6. Detector and Trace mode = Suitable for peak and average measurements respectively over 100 sweeps
7. The trace was allowed to stabilize

5.3.4 Test setup



5.3.5 Measurement Result

Peak EIRP

Freq. (GHz)	Reading (dBm)	Pol. (H/V)	Tested Distance (m)	Factor (dB)	FMCW desensitization factor(dB)	Meas. Result (dBm)	Limit (dBm)	Margin. (dB)	Result
61.77	-68.07	V	1	81.00	0.00	12.93	14	1.07	Compliance

※Note

Wavelength = Speed of light / Measurement frequency = 30 / 6 400 = 0.0047

$R_{(Far\ Field)} = (2 * (\text{Max antenna length of EUT})^2) / \text{Wavelength} = (2 * (0.006\ 44)^2) / 0.004\ 7 = 0.017\ 7\ \text{m}$

Our measurement is performed at a minimum distance of 1 m > $R_{(Far\ field)}$

Calculation of test results

•Factor (dB): Mixer Loss(dB) + Cable Loss(dB) + FSPL(dB) - Antenna Gain(dBi)

•Meas Result (dBm): Reading(dBm) + Factor(dB)

FSPL measurement

•FSPL = TxPower - RxPower;

•RxPower = S.A Measured Level - Rx Ant Gain + Mixer Conversion Loss + Cable Loss;

•TxPower = OML Source Output + Tx Ant Gain;

These calculation results are same as results which were calculated with formulas described in the section 9 of ANSI C63.10-2013

FMCW desensitization factor

The derivation of the FMCW desensitization factor is given in Keysight Application Note 5952-1039 Appendix B.

$$\alpha = \frac{1}{\sqrt[4]{1 + \left(\frac{2\ln(2)}{\pi}\right)^2 \left(\frac{F_s}{T_s B^2}\right)^2}}$$

and

FMCW desensitization factor = 20 Log(α)

Where

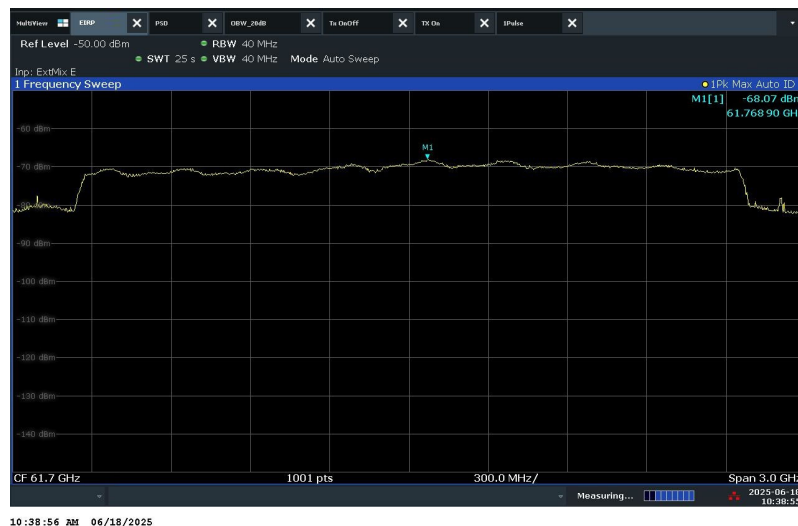
F_s = FMCW Sweep Width or Chirp Width

T_s = FMCW Sweep Time(Declared by manufacturer)

B = 3-dB bandwidth of Gaussian RBW Filter

FMCW Sweep Width (MHz)	FMCW Sweep Time (us)	3-dB bandwidth of Gaussian RBW Filter(MHz)	FMCW desensitization factor(dB)
2 500	80	40	0.0002

Peak EIRP



5.4 Spurious emissions

5.4.1 Standard Applicable [FCC §15.255(d), 15.209]

FCC

(d) Limits on spurious emissions.

- (1) The power density of any emissions outside the 57–71 GHz band shall consist solely of spurious emissions.
(2) Click to open paragraph tools Radiated emissions below 40 GHz shall not exceed the general limits in § 15.209.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- (3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm² at a distance of 3 meters.
(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

5.4.2 Test Environment conditions

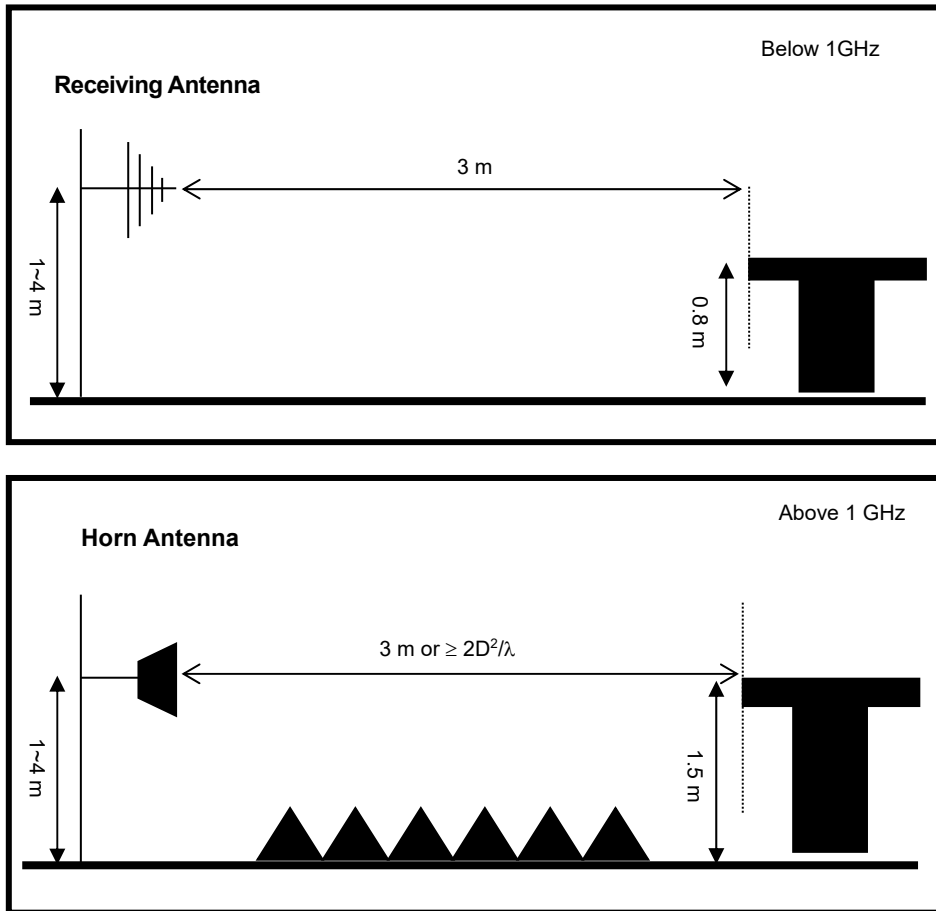
- Ambient temperature : (20 ~ 21) °C
- Relative Humidity : (40 ~ 43) % R.H.

5.4.3 Measurement Procedure

The measurements procedure of the Spurious RF Radiated emissions is as following describe method.

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until the measurements for all frequencies are complete.

5.4.4 Test setup



All measurements were taken at a distance greater than the calculated far field as below

$$\text{Wavelength} = \text{Speed of light} / \text{Measurement frequency} = 30 / 6\,400 = 0.0047$$

$$(2 * (\text{Max antenna length of EUT})^2) / \text{Wavelength} = (2 * (0.006\,44)^2) / 0.004\,7 = 0.017\,7\,m$$

5.4.5 Measurement Result

■ Below 1 GHz

Freq. (MHz)	Reading (dB μ V/m)	Antenna			CL (dB)	AMP (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn (dB)	Result
		Height (m)	Pol. (H/V)	Fctr. (dB/m)						
222.44	25.51	1.5	H	17.29	2.17	46.45	25.51	46.00	20.49	Compliance
222.44	24.95	1.0	V	17.29	2.17	46.45	24.95	46.00	21.05	Compliance
350.74	29.13	1.5	H	21.52	2.65	46.41	29.13	46.00	16.87	Compliance
479.04	23.68	1.0	V	23.95	3.07	46.37	23.68	46.00	22.32	Compliance

Freq.(MHz) : Measurement frequency, Reading(dB μ V/m) : includes values for Antenna factor, Cable loss, and Amp gain, Antenna (Height, Pol, Fctr) : Antenna Height, Polarization and Factor, Cbl(dB) : Cable loss, Pre AMP(dB) : Preamplifier gain(dB), Meas Result (dB μ V/m) : Reading(dB μ V/m)+ Antenna factor.(dB/m) + CL(dB) - Pre AMP(dB)
 Limit(dB μ V/m): Limit value specified with FCC Rule, Mgn(dB) : FCC Limit (dB μ V/m) – Meas Result(dB μ V/m)
 • The transmitter radiated spectrum was investigated from 9 kHz to 1 GHz.
 • The spurious signals detected do not depend on the operating mode.

■ 1 GHz – 40 GHz

Freq. (GHz)	Reading (dB μ V/m)		Antenna			CL (dB)	AMP (dB)	Meas Result (dB μ V/m)		Limit (dB μ V/m)		Mgn. (dB)		Result
	PK	PK	Height (m)	Pol. (H/V)	Fctr. (dB/m)			PK	AV	PK	AV	PK	AV	
No critical peaks found														

※Note

- Above 1 GHz is measured average and peak detector mode on Spectrum analyzer in accordance with FCC Rule15.35
- Limit: 54 dB μ V/m(Average), 74 dB μ V /m(Peak), Attenuated more than 20 dB below the permissible value.
- It is not recorded on the report that the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to measured.
- The transmitter radiated spectrum was investigated from 1 GHz to 40 GHz.



■ 40 GHz – 200 GHz

Freq. (GHz)	Reading (dBm)	Pol. (H/V)	Factor (dB)	Tested Distance (m)	Meas. Result (dBm)	Limit (dBm)	Limit (pW/cm ²)	Margin. (dB)	Result
42.373	-61.71	H	46.15	0.5	-15.56	5.67	90	21.23	Compliance
63.275	-96.30	H	77.14	0.5	-19.16	5.67	90	24.83	Compliance
64.515	-95.76	H	77.18	0.5	-18.58	5.67	90	24.25	Compliance
90.729	-91.27	V	72.48	0.5	-18.79	5.67	90	24.46	Compliance
140.360	-94.65	V	96.22	0.5	1.57	5.67	90	4.10	Compliance

※ Note

Calculation of test results

- Factor (dB): Mixer Loss(dB) + Cable Loss(dB) + FSPL(dB) - Antenna Gain(dBi)
- Meas Result (dBm): Reading(dBm) + Factor(dB)

FSPL measurement

- FSPL = TxPower - RxPower;
- RxPower = S.A Measured Level - Rx Ant Gain + Mixer Conversion Loss + Cable Loss;
- TxPower = OML Source Output + Tx Ant Gain;

FCC Limit

- Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm² at a distance of 3 meters.

Notes:

$$90 \text{ pW/cm}^2 = 1 \text{ pW} = 10^{-9} \text{ mW}; 90 * 10^{-9} \text{ mW} = 9 * 10^{-8} \text{ mW}$$

$$1 \text{ mW/cm}^2 = 155.76 \text{ dBuV/m}$$

$$9 * 10^{-8} \text{ mW/cm}^2 = 85.31 \text{ dBuV/m @ 3 m}$$

$$= -9.89 \text{ dBm @ 3 m}$$

$$= -0.35 \text{ dBm @ 1 m}$$

$$= 5.67 \text{ dBm @ 0.5 m}$$

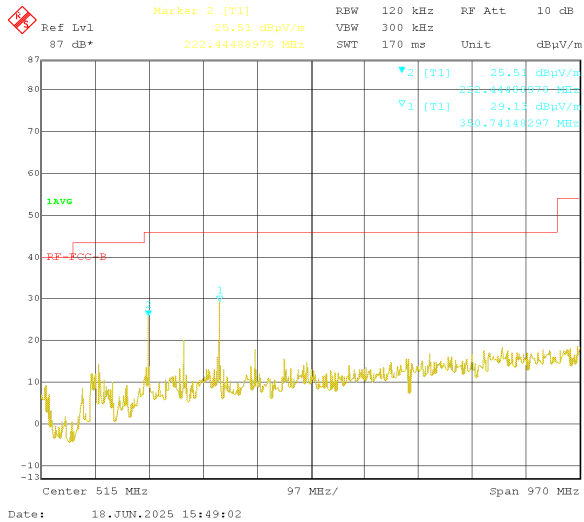
$$= 19.65 \text{ dBm @ 0.1 m}$$

5.4.6 Plots

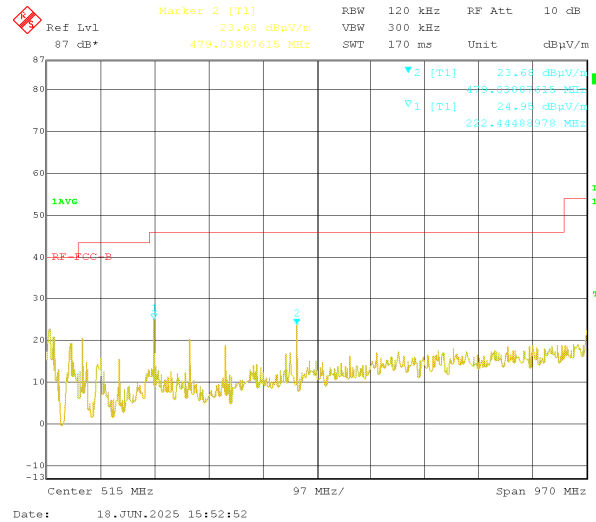
*The worst case only.

- Below 1 GHz

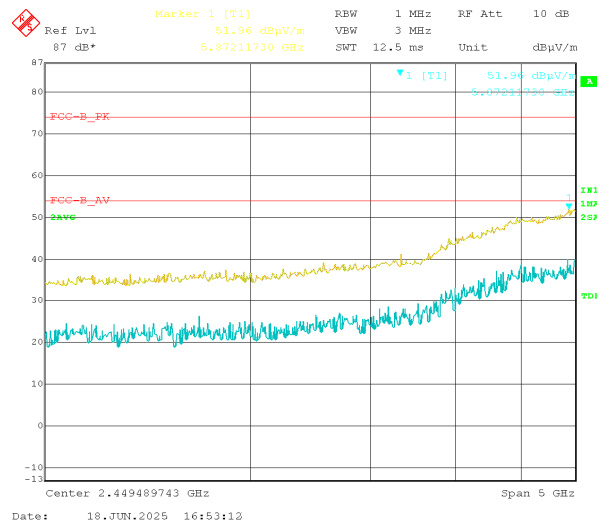
Horizontal



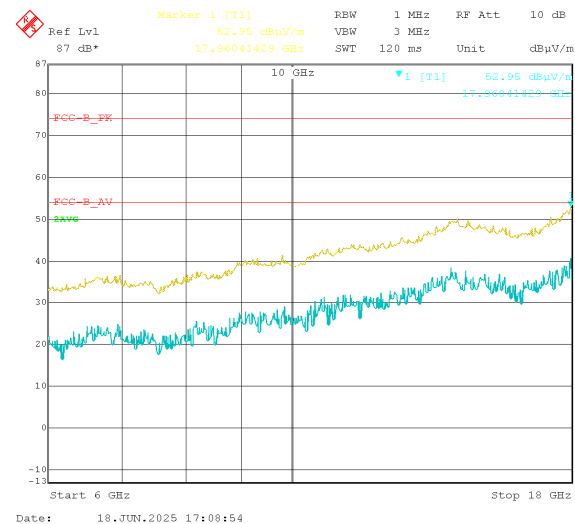
Vertical



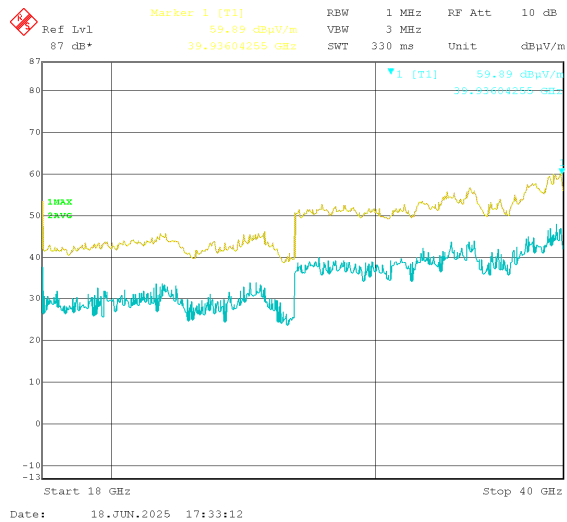
- 1 GHz ~ 6 GHz



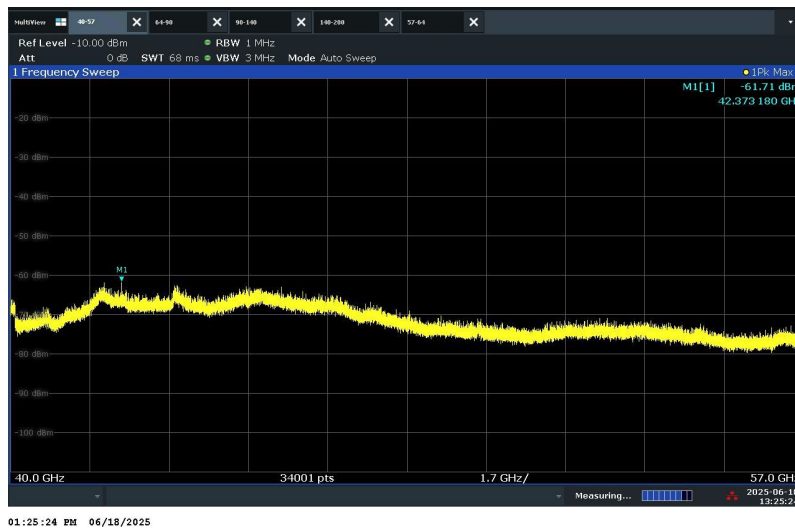
- 6 GHz ~ 18 GHz



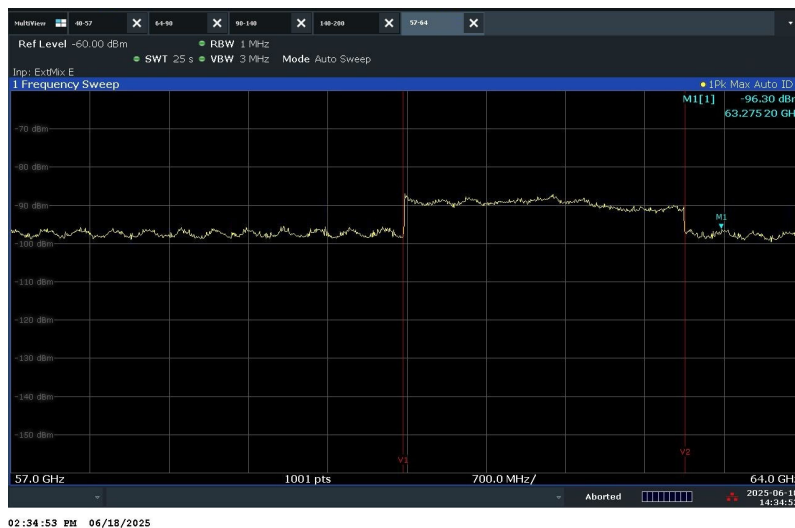
▪ 18 GHz ~ 40 GHz



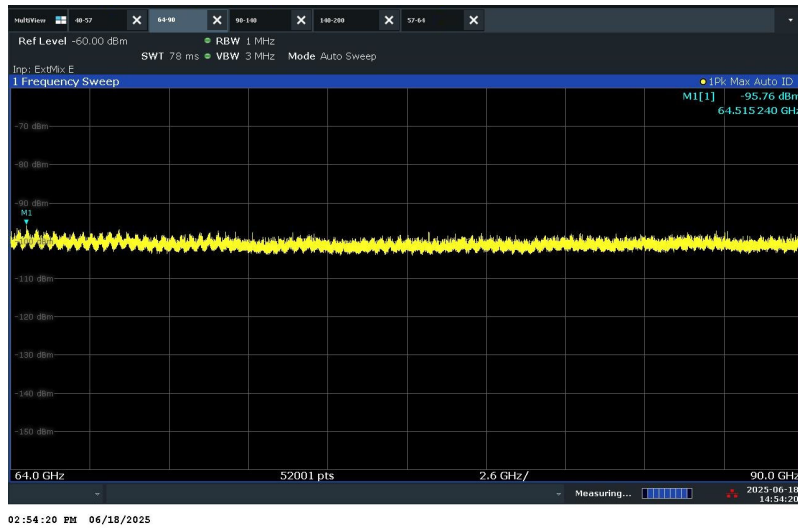
▪ 40 GHz ~ 57 GHz



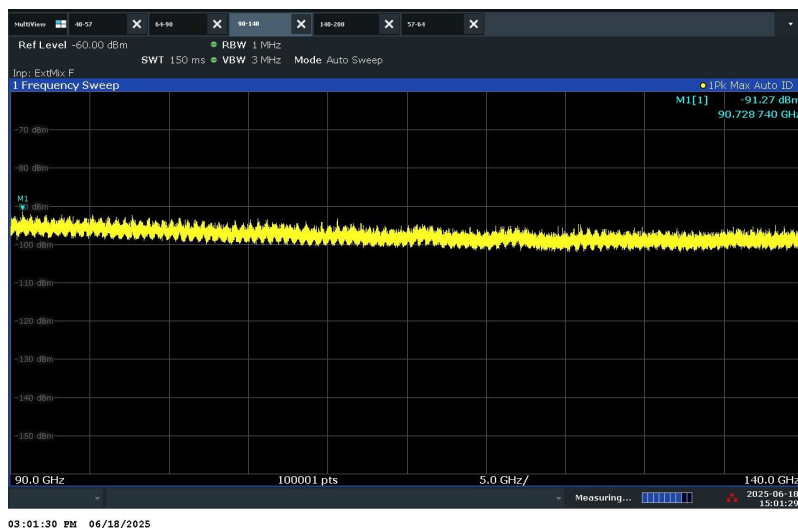
▪ 57 GHz ~ 64 GHz(Allowed frequency band)



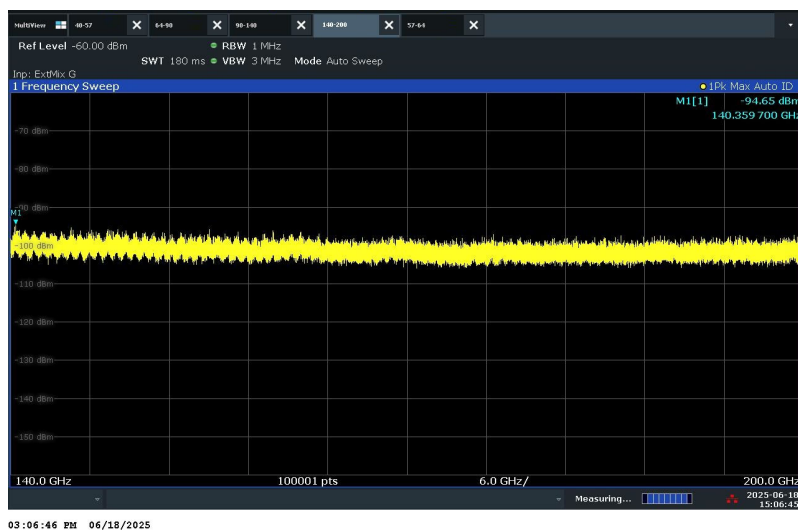
▪ 64 GHz ~ 90 GHz



▪ 90 GHz ~ 140 GHz



▪ 140 GHz ~ 200 GHz



5.5 Frequency Stability

5.5.1 Standard Applicable [FCC §15.255(f)]

FCC

(f) Frequency stability. Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

5.5.2 Test Environment conditions

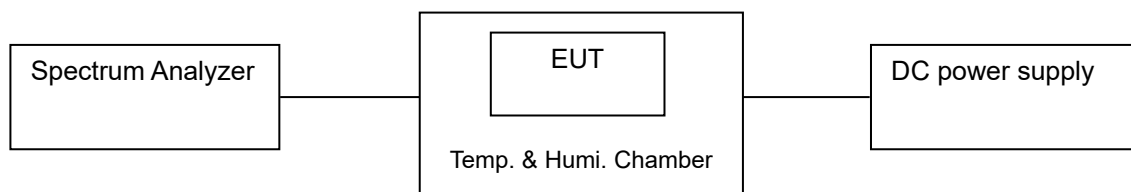
- Ambient temperature : (21 ~ 22) °C
- Relative Humidity : (41 ~ 44) % R.H.

5.5.3 Measurement Procedure

The spectrum analyzer is set to the as follows :

- Set the RBW: 1 % to 3 % of the 99 % bandwidth.
- Set the VBW: $\geq 3 \times$ RBW.
- Detector = Peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- The frequency drift was investigated for every 10 °C increment until the unit is stabilized then recorded the reading in tabular format with the temperature range of -20 °C to 85 °C. (Manufacturer declaration)
- Voltage supplied to EUT is 12 V reference temperature was done at 20 °C.
- The voltage was varied by ± 15 % of nominal.

5.5.4 Test setup



5.5.5 Measurement Result

Temp(°C)	Power Supply	Frequency Range(GHz)	Limit(GHz)	Result
85	DC 12 (Vnom)	60.47991 ~ 62.93686	57 ~ 64	Compliance
80		60.47994 ~ 62.93695		Compliance
70		60.47989 ~ 62.93711		Compliance
60		60.47974 ~ 62.93706		Compliance
50		60.47889 ~ 62.93706		Compliance
40		60.47845 ~ 62.93699		Compliance
30		60.47859 ~ 62.93695		Compliance
20(Ref.)		60.47984 ~ 62.93701		Compliance
10		60.47995 ~ 62.93696		Compliance
0		60.47989 ~ 62.93706		Compliance
-10		60.47974 ~ 62.93715		Compliance
-20		60.47984 ~ 62.93701		Compliance
Nom Temperature	DC 10.2 (Vmin)	60.47984 ~ 62.93706		Compliance
Nom Temperature	DC 13.8 (Vmax)	60.47979 ~ 62.93701		Compliance

▪ Reference only



5.6 Antenna requirement

5.6.1 Standard applicable [FCC §15.203]

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by responsible party shall be used with the device.

The use of a permanently attached antenna or of an antenna that user 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 broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

5.6.2 Antenna details

Frequency Band	Antenna Type	Gain [dBi]	Results
57~64	Patch Antenna(Fixed)	5.61 dBi(Max.)	Compliance

※ The antennas of this E.U.T permanently attached