TEST REPORT

Product	:	millimeter wave radar
Trade mark	:	CHUHANG TECH
Model/Type reference	:	ARC2.33
Serial Number	:	N/A
Report Number	:	EED32Q80639901
FCC ID	:	2A7HDARC233
Date of Issue	:	Jun. 18, 2024
Test Standards	:	47 CFR Part 2
		47 CFR Part 95 Subpart M
Test result	:	PASS

Prepared for:

Nanjing Chuhang Technology Co., Ltd.
12F, Building A, No. 9, Yunzheng Street Nanjing, China

Prepared by:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District,
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Compiled by:	Frazer Li	Reviewed by:	Tom Chen
	Frazer Li		Tom Chen
Approved by:	Aaron Ma	Date:	Jun. 18, 2024
	Aaron Ma		

Check No.:8614150524

1 Content

2 Test Summary

Test Item	Test Requirement	Result
EIRP (Effective Isotropic Radiated Power)	47 CFR Part 95, Subpart M Section 95.3367 47 CFR Part 2, Subpart J Section 2.1046	PASS
Modulation characteristics	47 CFR Part 2, Subpart J Section 2.1047	PASS
99% Occupied bandwidth	47 CFR Part 2, Subpart J Section 2.1049	PASS
Unwanted emissions	47 CFR Part 95, Subpart M Section 95.3379 (a) 47 CFR Part 2, Subpart J Section 2.1053	PASS
Frequency stability	47 CFR Part 95, Subpart M Section 95.3379 (b) 47 CFR Part 2, Subpart J Section 2.1055	PASS
Remark: Company Name and Address shown on Report, the sample(s) and sample Information were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.		

3 General Information

3.1 Client Information

Applicant:	Nanjing Chuhang Technology Co., Ltd.
Address of Applicant:	12F, Building A, No. 9, Yunzheng Street Nanjing, China
Manufacturer:	Nanjing Chuhang Technology Co., Ltd.
Address of Manufacturer:	12F, Building A, No. 9, Yunzheng Street Nanjing, China
Factory:	Anqing Chuhang Electronic Technology Co., Ltd.
Address of Factory:	Building 1, New Energy Vehicle Industrial Park, Economic and Technological Development Zone, Anqing, 246000 Anhui, P.R. China

3.2 General Description of EUT

Product Name:	millimeter wave radar
Model No.:	ARC2.33
Trade mark:	CHUHANG TECH
Product Type:	☒ Mobile ☐ Portable ☐ Fix Location
Type of Modulation:	FMCW(Frequency Modulated Continuous Wave)
Operating Frequency	77.80GHz
Test Power Grade:	Default
Test Software of EUT:	ChuHangDV1.4.10.exe
Antenna Type:	PCB Antenna
Antenna Gain:	11.90dBi
Power Supply:	DC 9.0V to DC 32.0V
Test Voltage:	DC 24V
Sample Received Date:	Jun. 04, 2024
Sample tested Date:	Jun. 05, 2024 to Jun. 06, 2024

3.3 Test Environment

Operating Environment:	
Temperature:	22~25.0 °C
Humidity:	50~55 % RH
Atmospheric Pressure:	1010mbar

3.4 Description of Support Units

The EUT has been tested with associated equipment below.

1） support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
Netbook	HP	14-ce0061TX	FCC&CE	CTI

3.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd
Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China
Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385
No tests were sub-contracted.
FCC Designation No.: CN1164

3.6 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.46dB (30MHz-1GHz)
		0.55dB (1GHz-18GHz)
3	Radiated Spurious emission test	3.3dB (9kHz-30MHz)
		4.3dB (30MHz-1GHz)
		4.5dB (1GHz-18GHz)
		3.4dB (18GHz-40GHz)
		4.62dB (40GHz-60GHz)
		4.80dB (60GHz-90GHz)
		4.90dB (90GHz-140GHz)
		5.11dB (140GHz-220GHz)
		5.14dB (220GHz-325GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	3.8%
7	DC power voltages	0.026%

4 Equipment List

3M Semi-anechoic Chamber (2)					
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Cal. Date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05-22-2022	05-21-2025
Receiver	R&S	ESCI7	100938-003	09-22-2023	09-21-2024
Spectrum Analyzer	R&S	FSV40	101200	07-25-2023	07-24-2024
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-16-2024	04-15-2025
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-618	05-18-2024	05-17-2025
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1869	04-16-2024	04-15-2025
Horn Antenna	A.H.SYSTEMS	SAS-574	374	07-02-2023	07-01-2026
Preamplifier	Agilent	11909A	12-1	03-22-2024	03-21-2025
Preamplifier	EMCI	EMC051845SE	980380	12-14-2023	12-13-2024
Preamplifier	CD	PAP-1840-60	6041.6042	07-04-2023	07-03-2024
Spectrum Analyzer	R&S	FSV3044	101509	01-17-2024	01-16-2025
Receive unit	R&S	TC-RSE60	100729	N/A	N/A
Receive unit	R&S	TC-RSE90	100721	N/A	N/A
Receive unit	R&S	TC-RSE140	101254	N/A	N/A
Receive unit	R&S	TC-RSE220	100716	N/A	N/A
Receive unit	R&S	TC-RSE325	100638	N/A	N/A

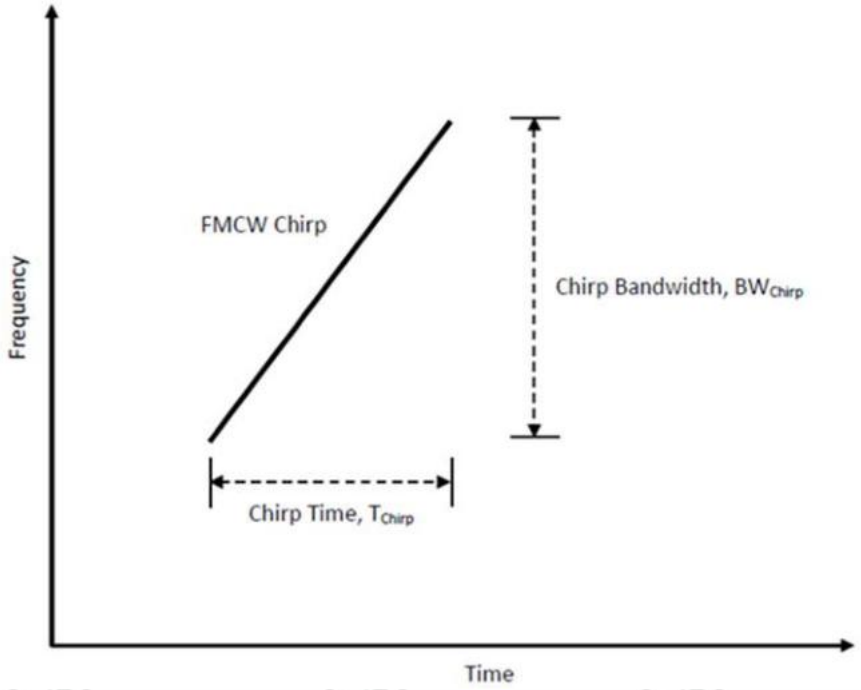
Note:
N/A:Calibrated by the equipment manufacturer.

3M full-anechoic Chamber (3)					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. Date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
RSE Automatic test software	JS Tonscend	JS36-RSE	10166	---	---
Receiver	Keysight	N9038A	MY57290136	01-09-2024	01-08-2025
Spectrum Analyzer	Keysight	N9020B	MY57111112	01-19-2024	01-18-2025
Spectrum Analyzer	Keysight	N9030B	MY57140871	01-13-2024	01-12-2025
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-1148	04-28-2024	04-27-2025
Horn Antenna	Schwarzbeck	BBHA 9170	9170-832	04-16-2024	04-15-2025
Horn Antenna	ETS-LINDGREN	3117	57407	07-04-2021	07-03-2024
Preamplifier	EMCI	EMC184055SE	980597	04-12-2024	04-11-2025
Preamplifier	EMCI	EMC001330	980563	03-08-2024	03-07-2025
Preamplifier	JS Tonscend	TAP-011858	AP21B806112	07-25-2023	07-24-2024
Communication test set	R&S	CMW500	102898	12-14-2023	12-13-2024
Temperature/ Humidity Indicator	biaozhi	GM1360	EE1186631	04-07-2024	04-06-2025
Fully Anechoic Chamber	TDK	FAC-3	---	01-09-2024	01-08-2027
Cable line	Times	SFT205-NMSM-2.50M	394812-0001	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0002	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0003	---	---
Cable line	Times	SFT205-NMSM-2.50M	393495-0001	---	---
Cable line	Times	EMC104-NMNM-1000	SN160710	---	---
Cable line	Times	SFT205-NMSM-3.00M	394813-0001	---	---
Cable line	Times	SFT205-NMNM-1.50M	381964-0001	---	---
Cable line	Times	SFT205-NMSM-7.00M	394815-0001	---	---
Cable line	Times	HF160-KMKM-3.00M	393493-0001	---	---
Spectrum Analyzer	R&S	FSV3044	100509	01-17-2024	01-16-2025
Receive unit	R&S	TC-RSE60	100729	N/A	N/A
Receive unit	R&S	TC-RSE90	100721	N/A	N/A
Receive unit	R&S	TC-RSE140	101254	N/A	N/A
Receive unit	R&S	TC-RSE220	100716	N/A	N/A
Receive unit	R&S	TC-RSE325	100638	N/A	N/A

Note:
N/A:Calibrated by the equipment manufacturer.

5 Test results and Measurement Data

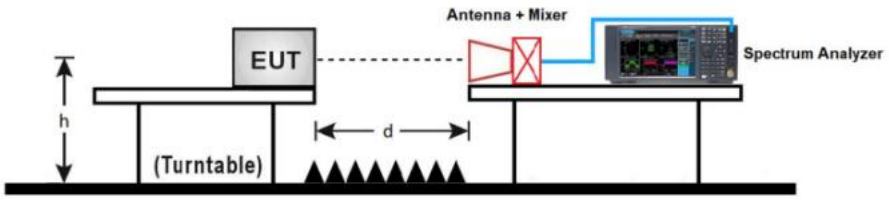
5.1 Modulation characteristics

Standard requirements:	47 CFR Part 2, Subpart J Section 2.1047 (b), KDB 653005 D01 76-81 GHz Radars v01r01 Section 3 g) 2)
	47 CFR Part 2, Subpart J Section 2.1047 requirements: (b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed. KDB 653005 D01 76-81 GHz Radars v01r01 Section 3 g) 2) requirements: g) Concerning the Section 2.1047 modulation characteristics requirement, the following information should be provided: 1) Pulsed radar: pulse width and pulse repetition frequency (if PRF is variable, then report maximum and minimum values). 2) Non-pulsed radar (e.g., FMCW): modulation type (i.e., sawtooth, sinusoid, triangle, or square wave) and sweep characteristics (sweep bandwidth, sweep rate, sweep time).
FMCW signals characteristic:	F_s=sweep width and T_s=sweep time,are designated as BW_{chirp}=Chirp Bandwidth (or Chirp BW) and T_{chirp}=Chirp Time,respectively.  **Figure L.1—Frequency-time characteristics of an FMCW chirp with linear sweep**

Conclusion
According to § 2.1047, A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed
Comments from manufacturer on modulation characteristics according to KDB:

Parameter	
Duty Cycle %:	51%
Time RF on(ms):	51
Time RF off(ms):	49
Power:	Constant during RF on
Steepness of Ramps(GHz/s):	0.0117
Calibration:	N/A
Antenna Beam Steering(TX):	±50°
Characteristics	
Type of Modulation:	FMCW(Frequency Modulated Continuous Wave)
Sweep Width(MHz):	468.75
Sweep Time(μs):	67 or 60
Chirp Bandwidth(MHz):	400
Chirp Time(μs):	40
Chirp Rate(MHz/μs):	11.718
Chirp Length(μs):	40

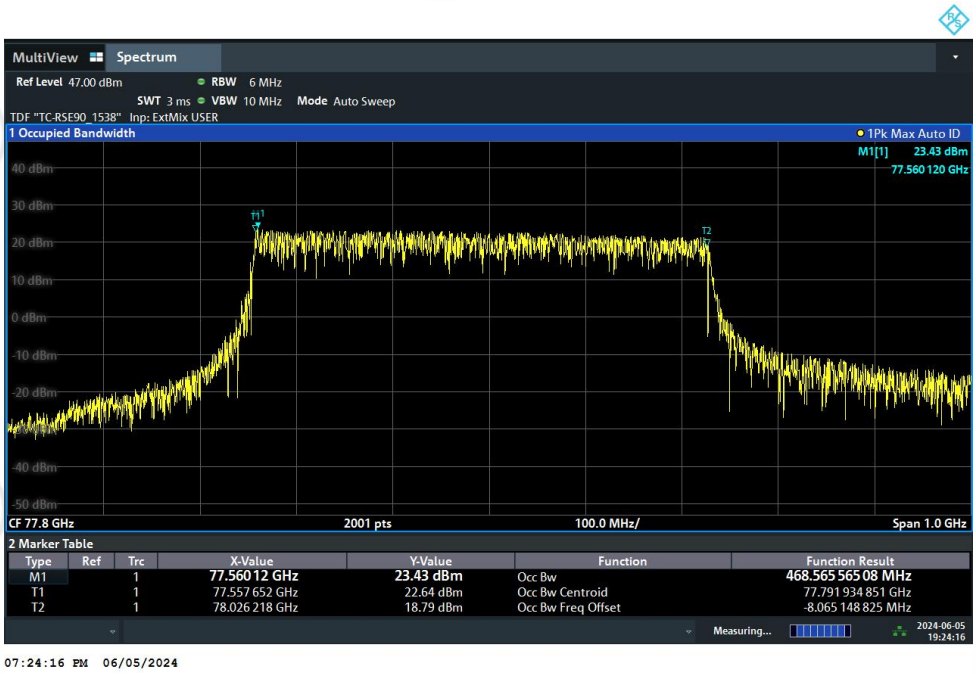
5.2 99% Occupied bandwidth

Test Requirement:	47 CFR Part 2, Subpart J Section 2.1049
Test Method:	ANSI C63.26:2015 Section 5.4
Limit:	Within the designated 76~81GHz frequency band
Test Setup:	 h=1.5m,d=1.0m
Test Procedure:	1.The signal analyzer`s automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediatepower nulls in the fundamental emission. 2.Span equal to approximately 1.5 times the OBW, centered on the carrier frequency. 3.RBW, prefer 1% to 5% of OBW, or a minimum of 1MHz if this is not possible due to a large OBW. 4.VBW approximately 3*RBW. 5.Detector = Peak. 6.Trance mode = Max hold. 7.Sweep = Auto couple. 8.The trace was allowed to stabilize. 9.If necessary, step 2~6 were repeated after changing the RBW such that it would be within 1%~5 % of the 99% occupied bandwidth observed in step 6. Note: The RBW and VBW were setting up to the limitations of the test equipment.
Test Mode:	TX mode_Make EUT continuously emit radar signals.

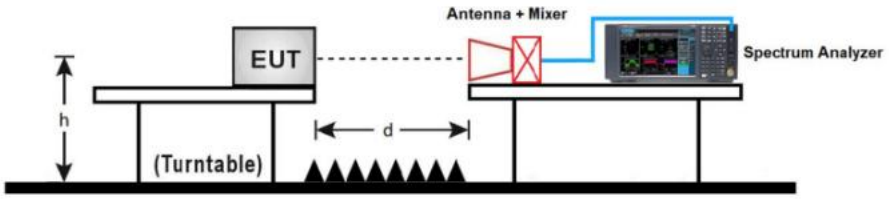
Test data:

99% emission bandwidth (MHz)	Lowest Frequency (GHz)	Highest Frequency (GHz)	Limit (GHz)	Result
468.56556508	77.557652	78.026218	76 to 81	Pass

Test graph:



5.3 EIRP(Effective Isotropic Radiated Power)

Test Requirement:	47 CFR Part 95, Subpart M Section 95.3367, KDB 653005 D01 76-81 GHz Radars v01r01 Section 4 a),b),c)
Test Method:	ANSI C63.26:2015 Section 5.2
Limit:	Peak EIRP ≤55dBm/MHz; Average EIRP ≤50dBm/MHz;
Test Setup:	 h=1.5m,d=1.0m
Test Procedure:	(1)Maximum peak power(EIRP) – Peak detector 1. Set RBW = 1MHz; 2. Set VBW ≥ 3*RBW; 3. Span to 2~3*OBW; 4. Detector = Peak; 5. Set number of points in sweep ≥ 2*Span/RBW; 6. Sweep time=Auto couple; 7. Trace = Max hold; (2)Maximum power(EIRP) – Averaging detector Note: The maximum power(averaging detector) measurements are performed using the “channel power” measurement capability and integrated over the 99% OBW to obtain the result. 1. Measurement capability of instrument = Channel power; 2. Set RBW = 1MHz; 3. Set VBW ≥ 3*RBW; 4. Span to 2~3*OBW; 5. Channel bandwidth setting of instrument ≥ OBW; 6. Detector = Power averaging (RMS); 7. Set number of points in sweep ≥ 2*Span/RBW; 8. Sweep time = Auto couple; 9. Trace = Averaging;
Test Mode:	TX mode_Make EUT continuously emit radar signals.

Test data:

Frequency (GHz)	Distance (m)	Polarity	EIRP (dBm/MHz)	FMCW Chirps Correction Factor (dB)	Corrected EIRP (dBm/MHz)	EIRP Limit (dBm/MHz)	Result	Remark
76.45	1.0	Horizontal	-7.38	7.22	-0.16	≤55.0	Pass	Peak
		Vertical	17.47	7.22	24.69	≤55.0	Pass	Peak
		Horizontal	-37.31	7.22	-30.09	≤50.0	Pass	AVG
		Vertical	-12.78	7.22	-5.56	≤50.0	Pass	AVG

Remark:
①This is a radiated test,and test distance of 1.0m was used for the fundamental emissions measurement.
②EIRP(dBm/MHz) has added free space loss of 1.0m distance.
③The FMCW Chirps Correction Factor was calculated using the formula:

$$\mathbf{CF_{chirp} = 5 * \log\left(1 + K * \left(\frac{Span}{t * RBW^2}\right)^2\right)}$$

With t being the length of the chirp and K a correction factor for the setting process of the gaussian shaped filter (~0.1947).

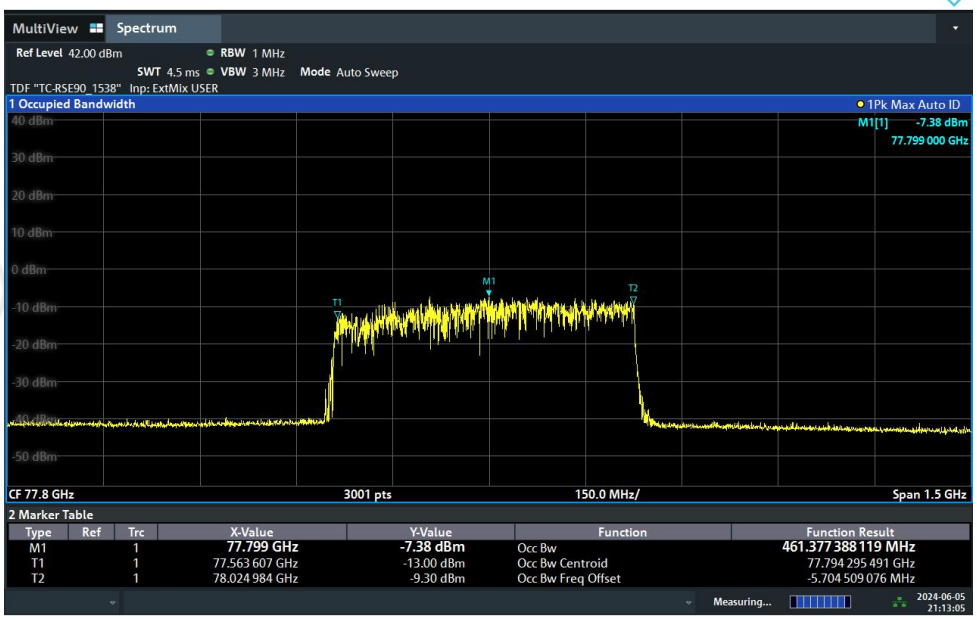
Sample calculation for FMCW chirps correction factor:

$$CF_{chirp}=5*\log_{10}(1+0.1947*(468.75MHz/(40\mu s*1MHz^2))^2=7.22dB$$

Note:Span=468.75MHz,t=40us,refer to the section of 5.1,claimed by the customer.
④Guidance for calculating the correction factor is from Application Note 1EF107-1E Rohde & Schwarz Peak and Mean Power measurements on wideband FMCW radar signals.
⑤Corrected EIRP(dBm/MHz)=EIRP(dBm/MHz)+FMCW Chirps Correction Factor(dB).
⑥Only the worst case data was recorded in the report.

Test graph:

Peak EIRP (Horizontal)



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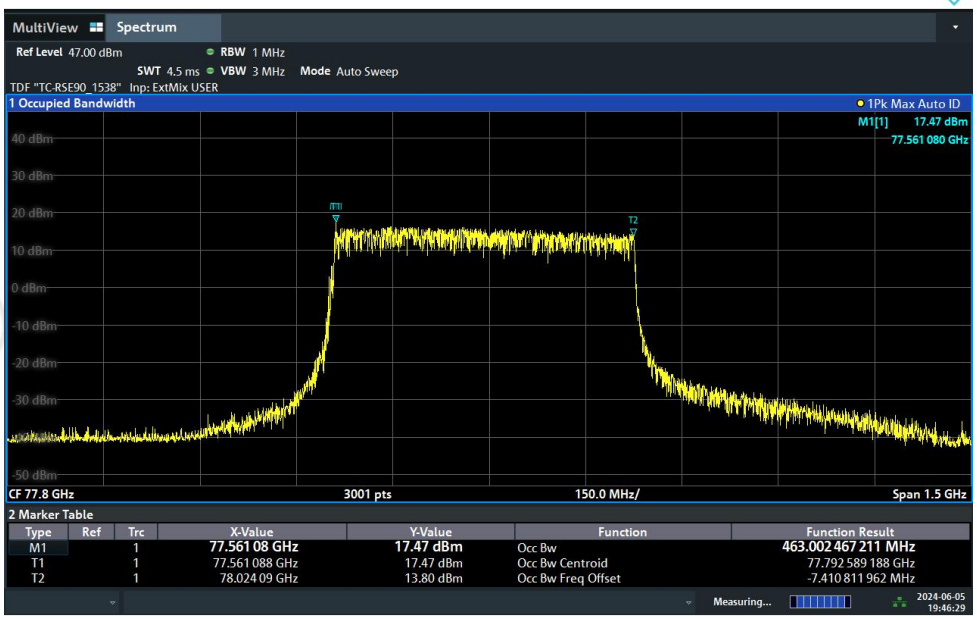
Peak EIRP (Vertical)



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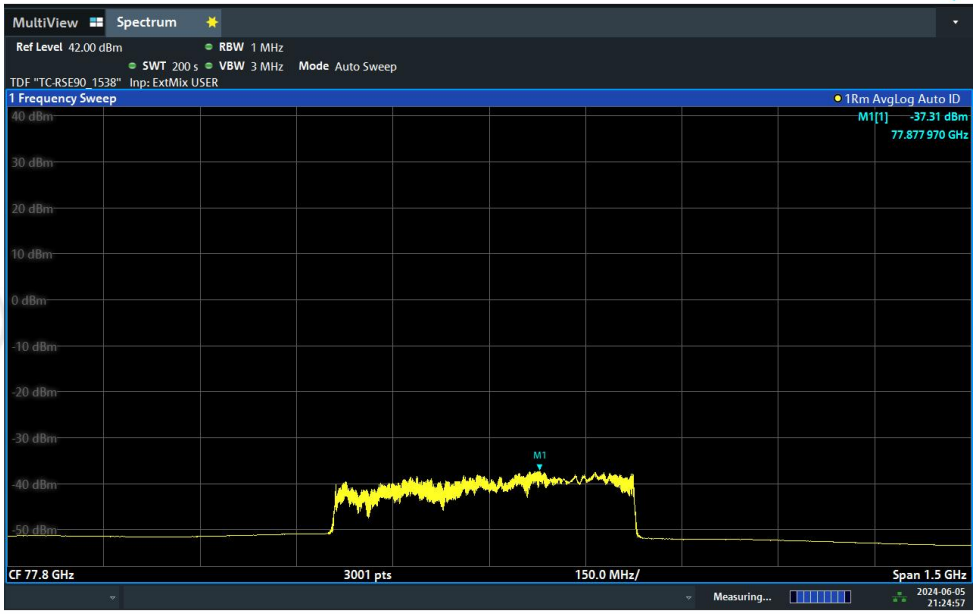
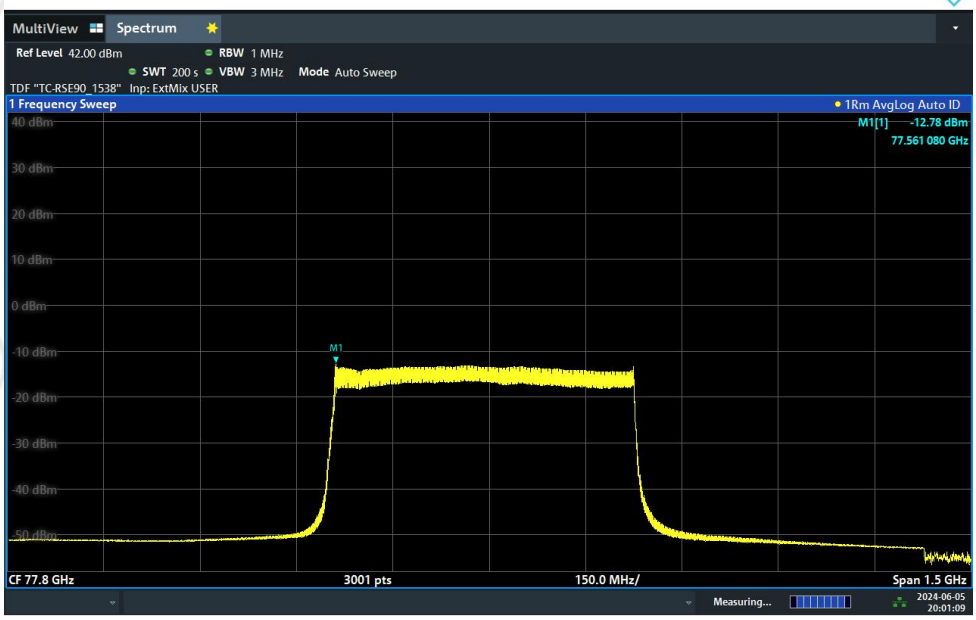
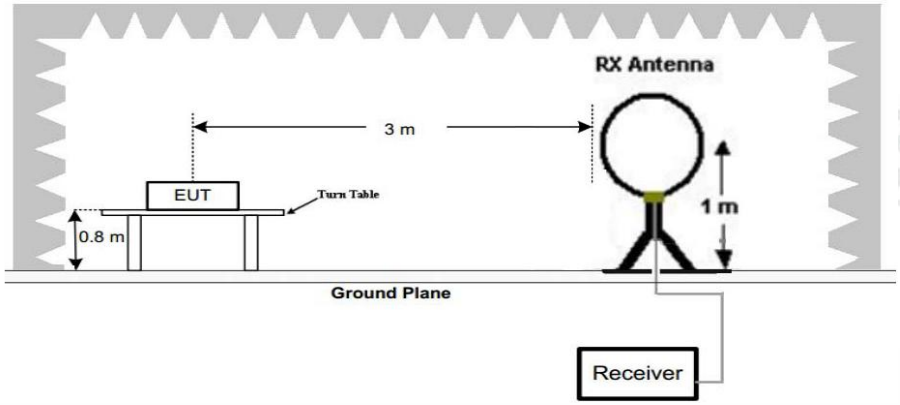
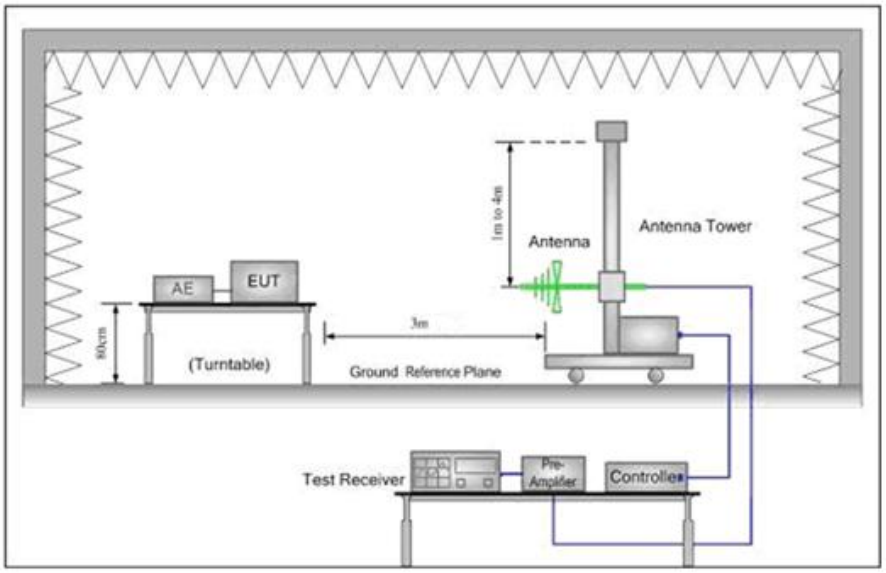
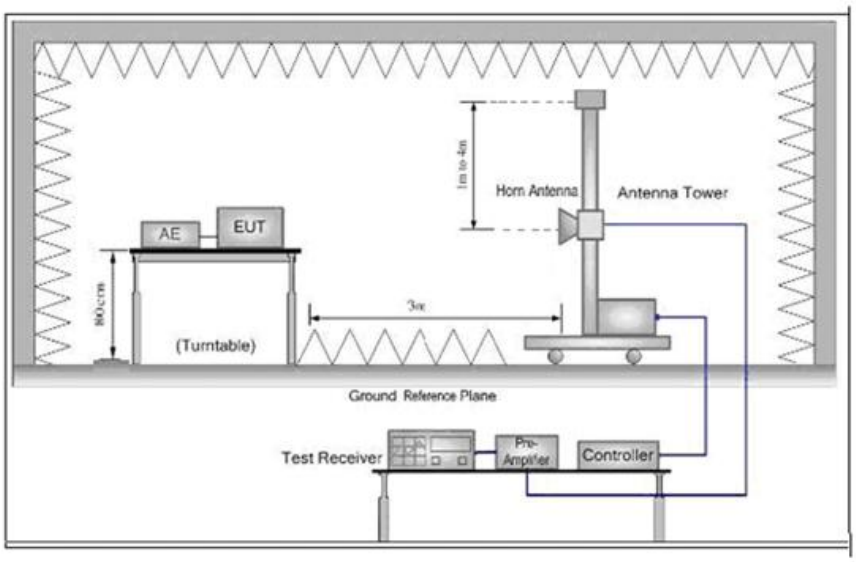
Average EIRP (Horizontal)
 09:24:57 PM 06/05/2024
Average EIRP (Vertical)
 08:01:10 PM 06/05/2024

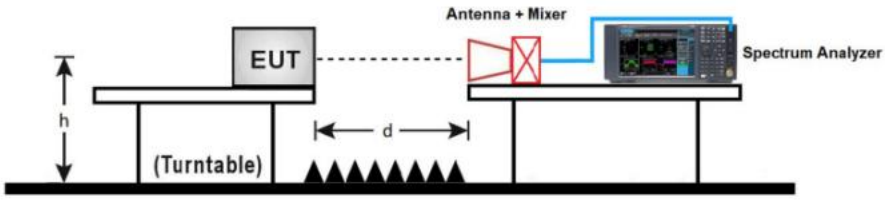
5.4 Unwanted emissions

<table>
<tr><td>Test Requirement:</td><td>47 CFR Part 95, Subpart M Section 95.3379 (a),
KDB 653005 D01 76-81 GHz Radars v01r01 Section 4 e)</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.26:2015 Section 5.5</td></tr>
<tr><td>Limit:</td><td>The power density of any emissions outside the 76GHz-81GHz band shall consist solely of spurious emissions and shall not exceed the following:
(1) Radiated emissions below 40GHz shall not exceed the field strength as shown in the following emissions table.
<table>
<tr><th>Frequency (MHz)</th><th>Field Strength (uV/m)</th><th>Measurement Distance (m)</th></tr>
<tr><td>0.009 ~ 0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490 ~ 1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705 ~ 30.0</td><td>30</td><td>30</td></tr>
<tr><td>30 ~ 88</td><td>100</td><td>3</td></tr>
<tr><td>88 ~ 216</td><td>150</td><td>3</td></tr>
<tr><td>216 ~ 960</td><td>200</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
(i) The tighter limit applies at the band edges.
(ii) The limits in the table are based on the frequency of the unwanted emissions and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
(iii) The emissions limits shown in the table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90kHz,110kHz-490kHz,and above 1000MHz.Radiated emissions limits in these three bands are based on measurements employing an average detector with a 1MHz RBW.
(2) The power density of radiated emissions outside the 76GHz-81GHz band above 40GHz shall not exceed the following,based on measurements employing an average detector with a 1MHz.
(i) For radiated emissions between 40GHz and 200GHz: 600pW/cm^2 at a distance of 3 meters from the exterior surface of the radiating structure.
(ii) For radiated emissions above 200GHz: 1000pW/cm^2 at a distance of 3 meters from the exterior surface of the radiating structure.
(3) For field disturbance sensors and radar systems operating in the 76GHz-81GHz band, the spectrum shall be investigated up to 231GHz (preferably 243GHz).</td></tr>
</table>

Test Setup:	Below 30MHz:  30MHz-1GHz:  1GHz-41GHz:



Above 41GHz:



h=1.5m,d=1.0m

Test Procedure:

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

	The measurement frequency range form 9kHz - 231GHz was investigated (preferably 243GHz).
Test Mode:	TX mode_Make EUT continuously emit radar signals.

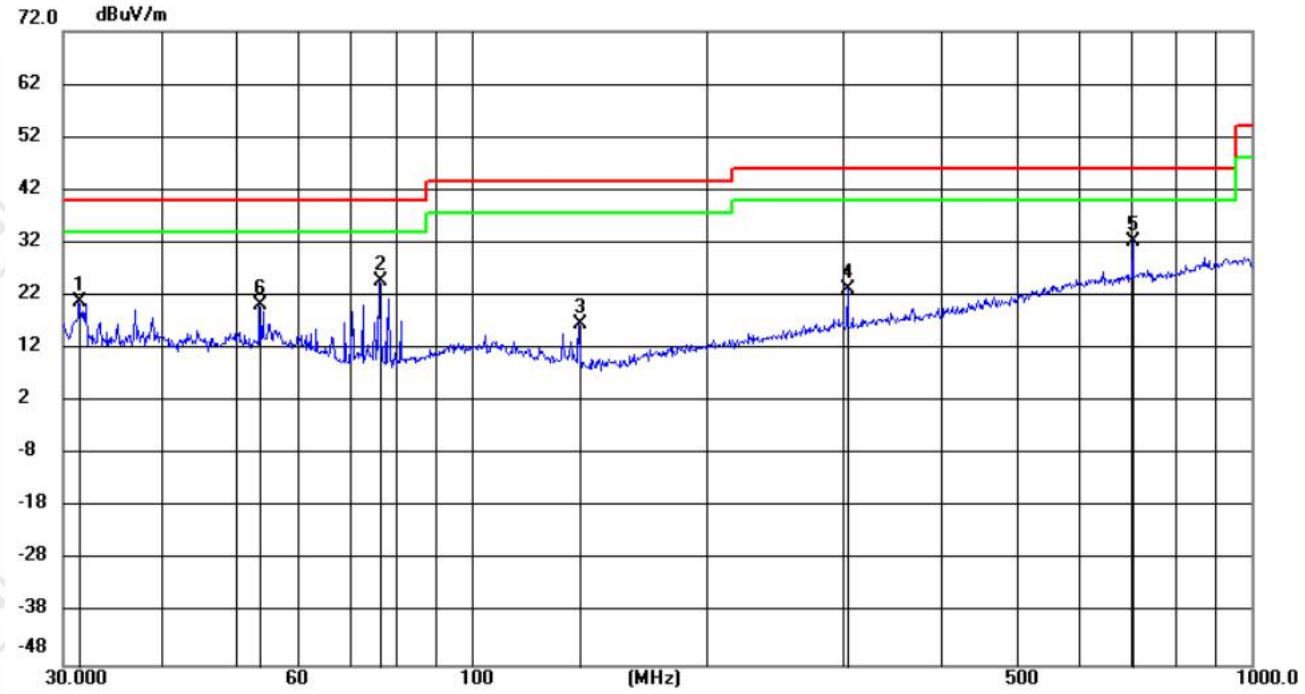
Radiated Spurious Emission below 30MHz:

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

Radiated Spurious Emission 30MHz-1GHz:

Test data:

Polarization: Horizontal



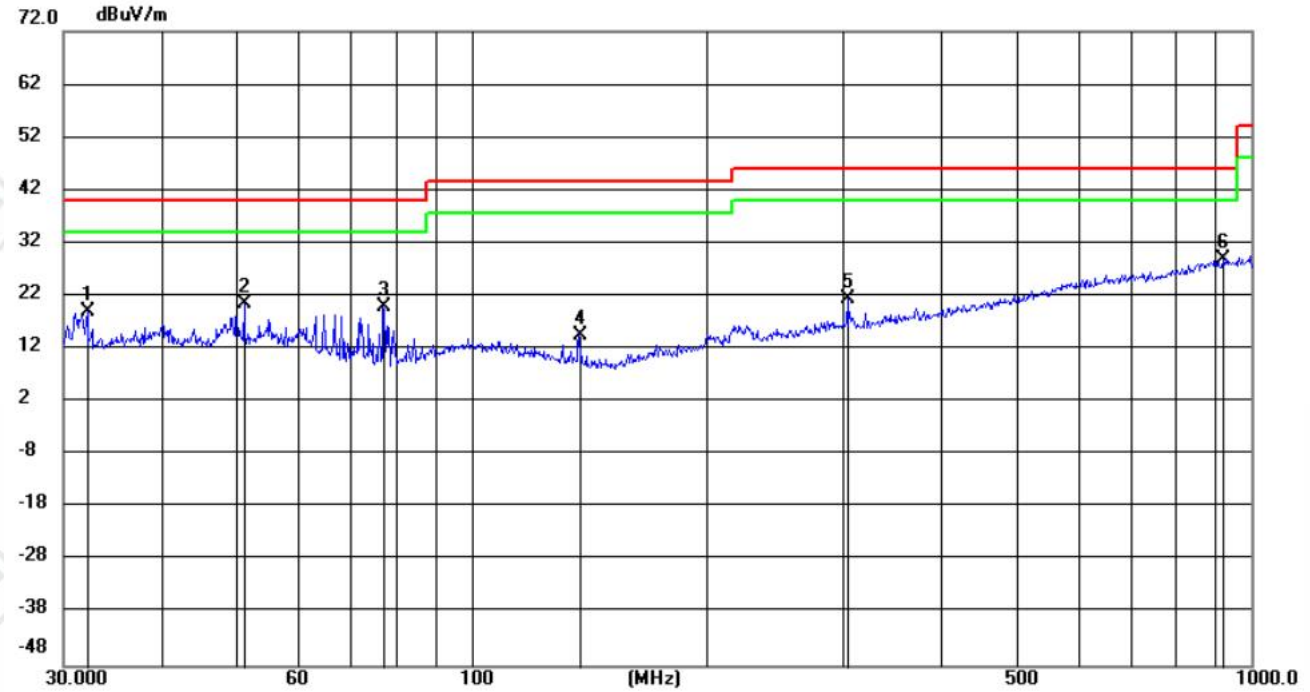
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		31.4322	8.07	12.86	20.93	40.00	-19.07	QP	399	352	
2		76.4584	14.67	10.06	24.73	40.00	-15.27	QP	299	102	
3		137.4924	6.85	9.71	16.56	43.50	-26.94	QP	299	7	
4		304.1830	6.62	16.75	23.37	46.00	-22.63	QP	399	352	
5	*	705.2145	7.86	24.29	32.15	46.00	-13.85	QP	299	7	
6		53.6461	6.30	13.84	20.14	40.00	-19.86	QP	299	7	

Note:

①Measurement(dBuV/m)=Reading Level(dBuV)+Correct Factor(dB);

②Margin(dB)=Measurement(dBuV/m)-Limit(dBuV/m);

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		32.2529	6.02	12.96	18.98	40.00	-21.02	QP	200	291	
2		51.2735	6.44	14.05	20.49	40.00	-19.51	QP	100	110	
3		77.3076	9.88	9.96	19.84	40.00	-20.16	QP	100	352	
4		137.4924	4.74	9.71	14.45	43.50	-29.05	QP	200	7	
5		304.1830	4.81	16.75	21.56	46.00	-24.44	QP	300	49	
6	*	921.3842	1.40	27.54	28.94	46.00	-17.06	QP	300	290	

Note:

①Measurement(dBuV/m)=Reading Level(dBuV)+Correct Factor(dB);

②Margin(dB)=Measurement(dBuV/m)-Limit(dBuV/m);

Radiated Spurious Emission 1GHz-18GHz:

Test data:

NO	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1997.3998	-24.22	74.11	49.89	74.00	24.11	PASS	Horizontal	PK
2	2390.6927	-22.26	63.69	41.43	74.00	32.57	PASS	Horizontal	PK
3	2657.0438	-21.10	60.87	39.77	74.00	34.23	PASS	Horizontal	PK
4	2985.7324	-19.94	61.81	41.87	74.00	32.13	PASS	Horizontal	PK
5	7196.3464	-8.27	51.26	42.99	74.00	31.01	PASS	Horizontal	PK
6	13946.9298	5.41	41.53	46.94	74.00	27.06	PASS	Vertical	PK
7	1443.1629	-26.17	61.83	35.66	74.00	38.34	PASS	Vertical	PK
8	1999.6666	-24.20	68.07	43.87	74.00	30.13	PASS	Vertical	PK
9	2663.8443	-21.08	59.25	38.17	74.00	35.83	PASS	Vertical	PK
10	5328.4886	-12.30	49.73	37.43	74.00	36.57	PASS	Vertical	PK
11	7775.5184	-4.65	46.27	41.62	74.00	32.38	PASS	Vertical	PK
12	14233.6822	6.43	40.41	46.84	74.00	27.16	PASS	Vertical	PK

Radiated Spurious Emission 18GHz-41GHz:

Test data:

NO	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	20019.4808	-23.15	61.53	38.38	74.00	35.62	PASS	Horizontal	PK
2	22225.729	-24.67	61.03	36.36	74.00	37.64	PASS	Horizontal	PK
3	25991.4397	-19.09	59.14	40.05	74.00	33.95	PASS	Horizontal	PK
4	27847.1539	-20.24	59.46	39.22	74.00	34.78	PASS	Horizontal	PK
5	32566.9427	-16.30	54.83	38.53	74.00	35.47	PASS	Horizontal	PK
6	36592.1037	-14.17	51.62	37.45	74.00	36.55	PASS	Horizontal	PK
7	40095.6038	-11.00	46.97	35.97	93.57	57.60	PASS	Horizontal	PK
8	19567.7427	-23.94	62.47	38.53	74.00	35.47	PASS	Vertical	PK
9	23304.9322	-22.97	59.63	36.66	74.00	37.34	PASS	Vertical	PK
10	26387.0555	-19.45	59.05	39.60	74.00	34.40	PASS	Vertical	PK
11	30070.8828	-19.68	57.65	37.97	74.00	36.03	PASS	Vertical	PK
12	33637.8655	-15.51	55.05	39.54	74.00	34.46	PASS	Vertical	PK
13	39094.6038	-10.79	48.53	37.74	74.00	36.26	PASS	Vertical	PK
14	40046.8419	-11.03	47.25	36.22	93.57	57.35	PASS	Vertical	PK

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
2) For 40GHz to 41GHz,the limit is 600pW/cm^2 equivalent to an electric field strength of 93.57dBuV/m@3m.
   Only the worst case data was recorded in the report.

Radiated Spurious Emission 41GHz-243GHz:

Test data:

Test Frequency (GHz)	Polarity	EIRP/1MHz (dBm)	Power density(pW/cm^2) @3m distance	Limit of Power density(pW/cm^2) @3m distance	Result
41.002750	Horizontal	-33.12	0.43	≤600	Pass
41.005750	Vertical	-33.12	0.43	≤600	Pass
60.015750	Horizontal	-32.62	0.48	≤600	Pass
63.099700	Vertical	-23.91	3.59	≤600	Pass
99.629630	Horizontal	-31.17	0.68	≤600	Pass
103.692580	Vertical	-20.72	7.49	≤600	Pass
130.210700	Horizontal	-32.91	0.45	≤600	Pass
130.894030	Vertical	-32.68	0.48	≤600	Pass
139.368790	Horizontal	-32.65	0.48	≤600	Pass
139.149800	Vertical	-32.03	0.55	≤600	Pass
140.587240	Horizontal	-37.32	0.16	≤600	Pass
140.629240	Vertical	-36.31	0.21	≤600	Pass
203.558460	Horizontal	-45.50	0.02	≤1000	Pass
202.184470	Vertical	-45.57	0.02	≤1000	Pass
222.061160	Horizontal	-40.73	0.07	≤1000	Pass
221.719670	Vertical	-40.69	0.08	≤1000	Pass
237.536980	Horizontal	-45.50	0.02	≤1000	Pass
235.018580	Vertical	-45.59	0.02	≤1000	Pass

Note:

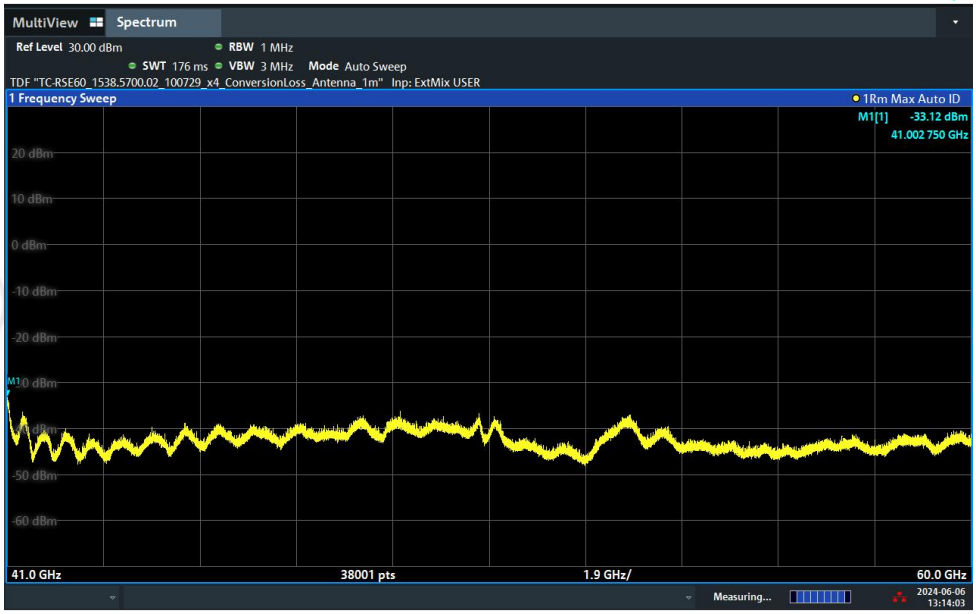
①EIRP(dBm/MHz) has added free space loss of 1.0m distance.

②Only the worst case data was recorded in the report.

③Power density(pW/cm^2)=$10^{EIRP/1MHz(dBm)÷10}$*10^9÷[4*π*(3m*100)^2];

Test graph:

41GHz-60GHz (Horizontal)



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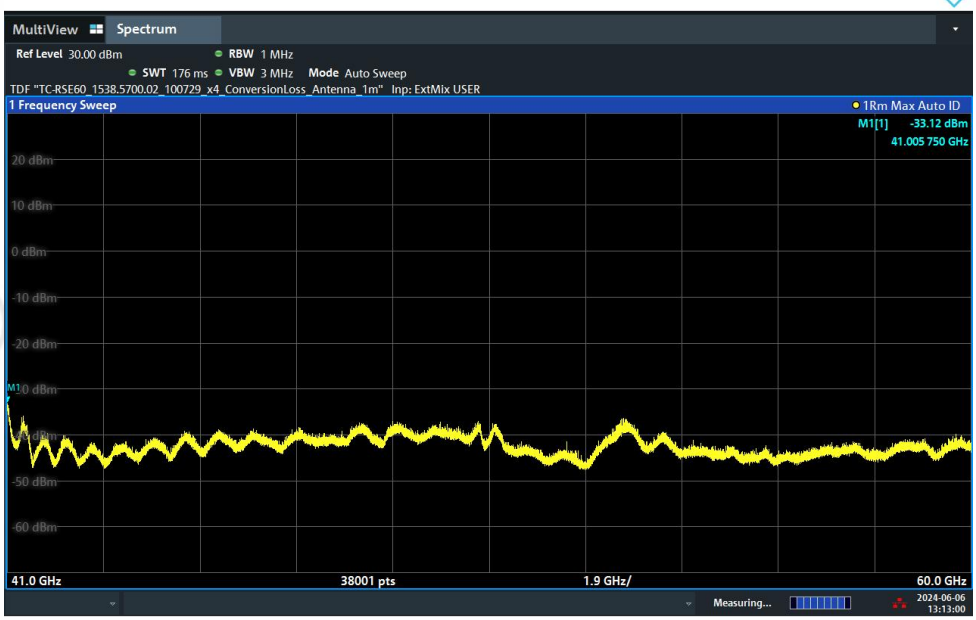
41GHz-60GHz (Vertical)



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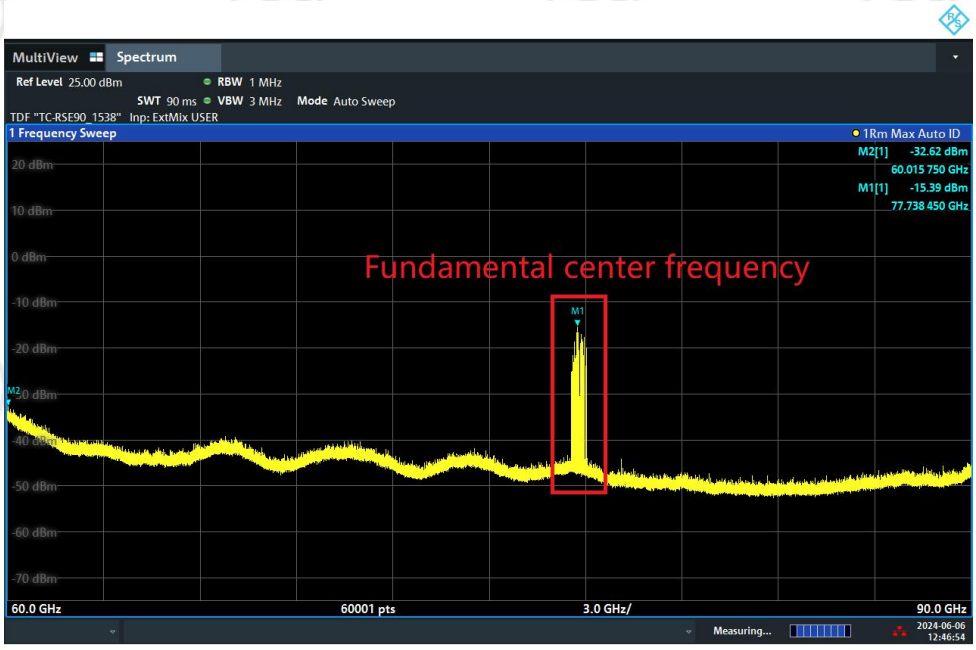
60GHz-90GHz (Horizontal)



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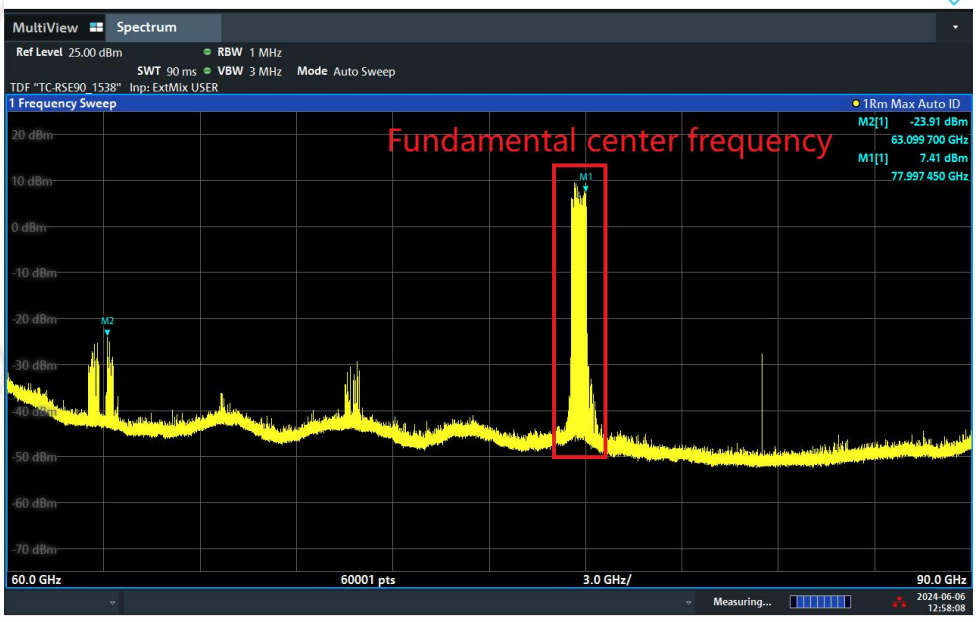
60GHz-90GHz (Vertical)



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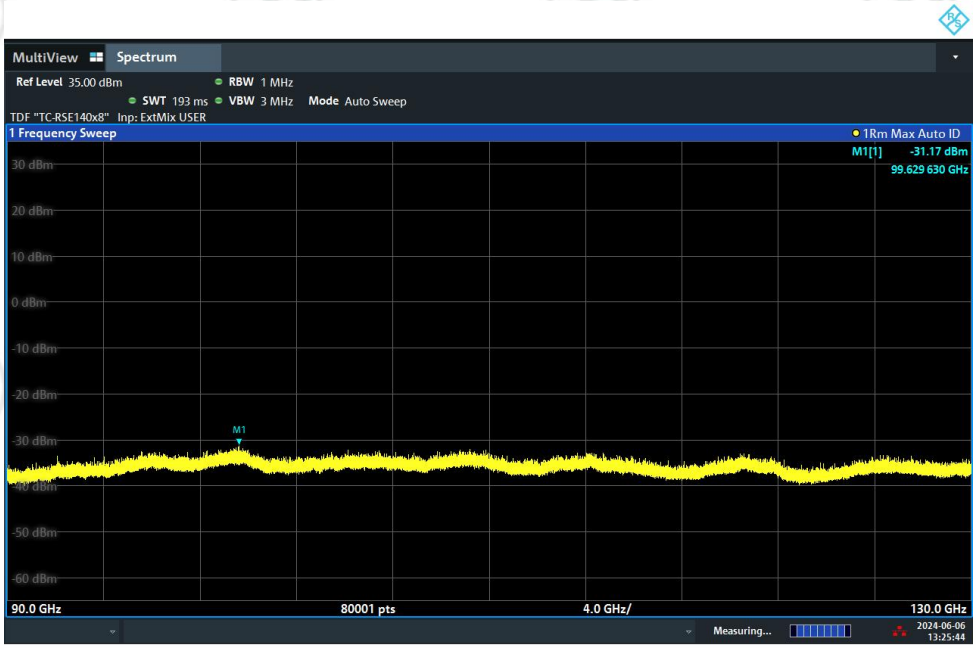
90GHz-130GHz (Horizontal)



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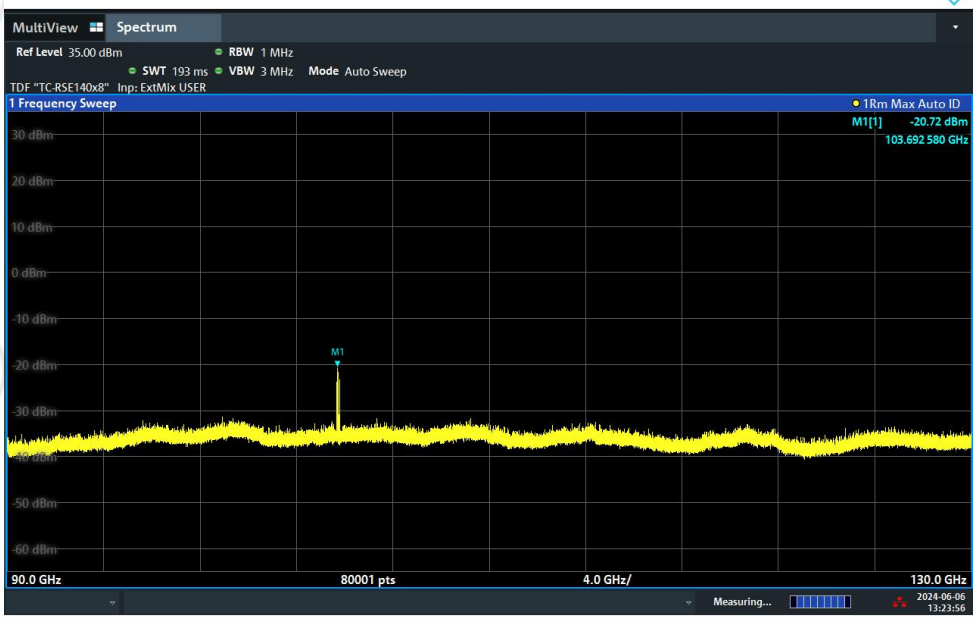
90GHz-130GHz (Vertical)



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130GHz-132GHz (Horizontal)

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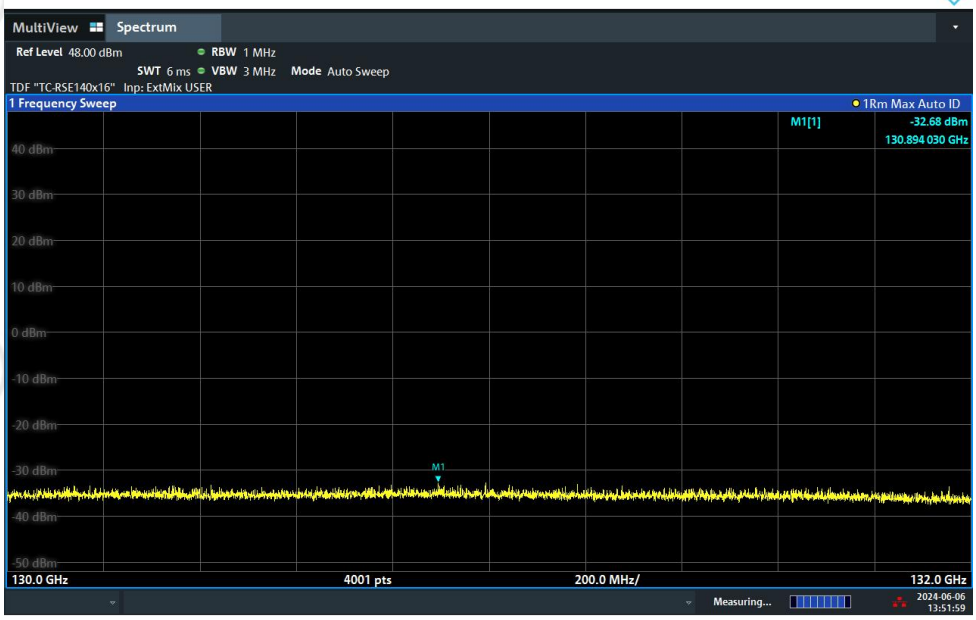
130GHz-132GHz (Vertical)



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132GHz-140GHz (Horizontal)
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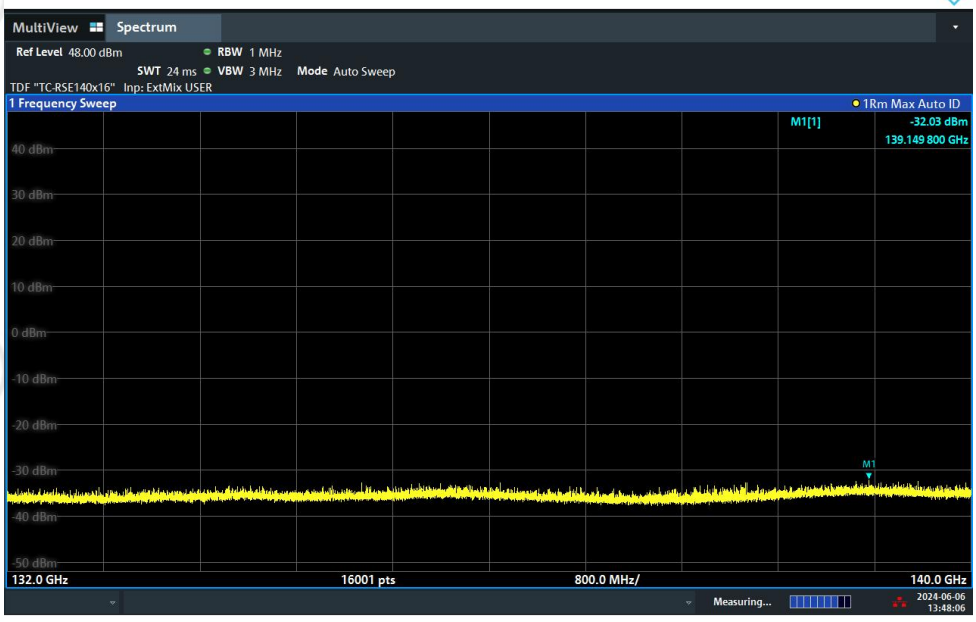
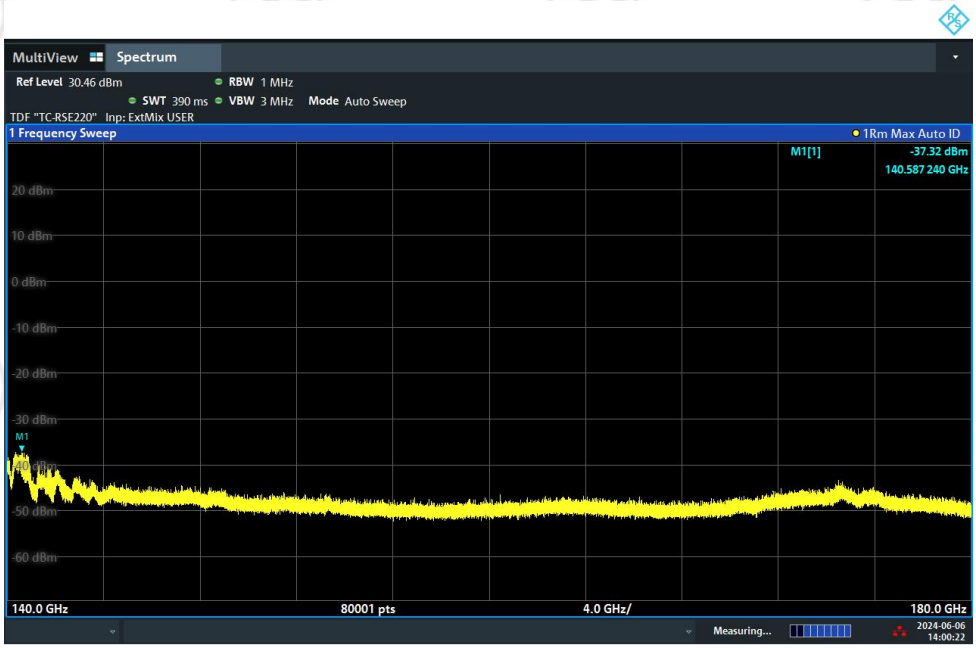
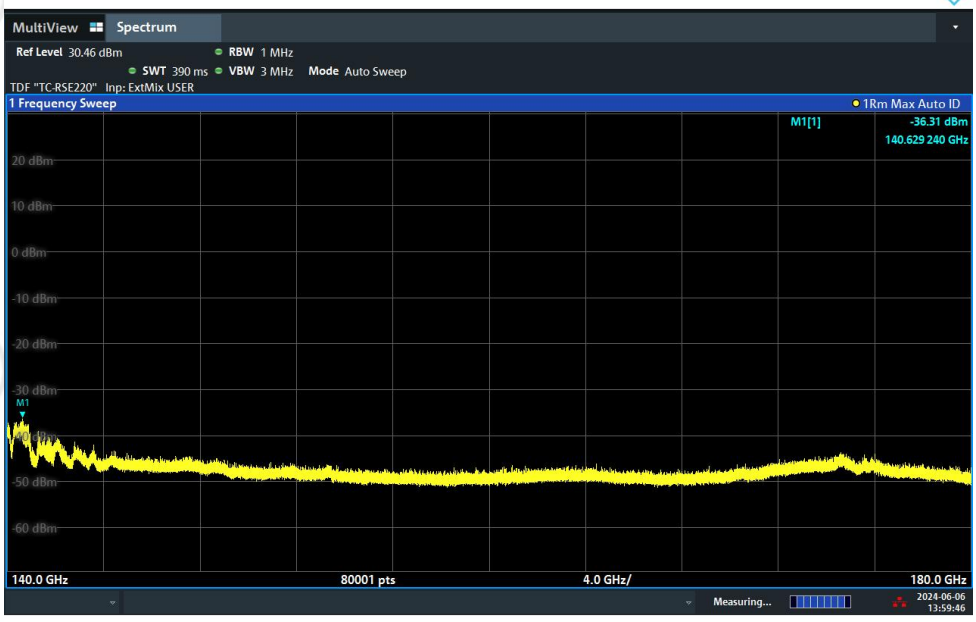
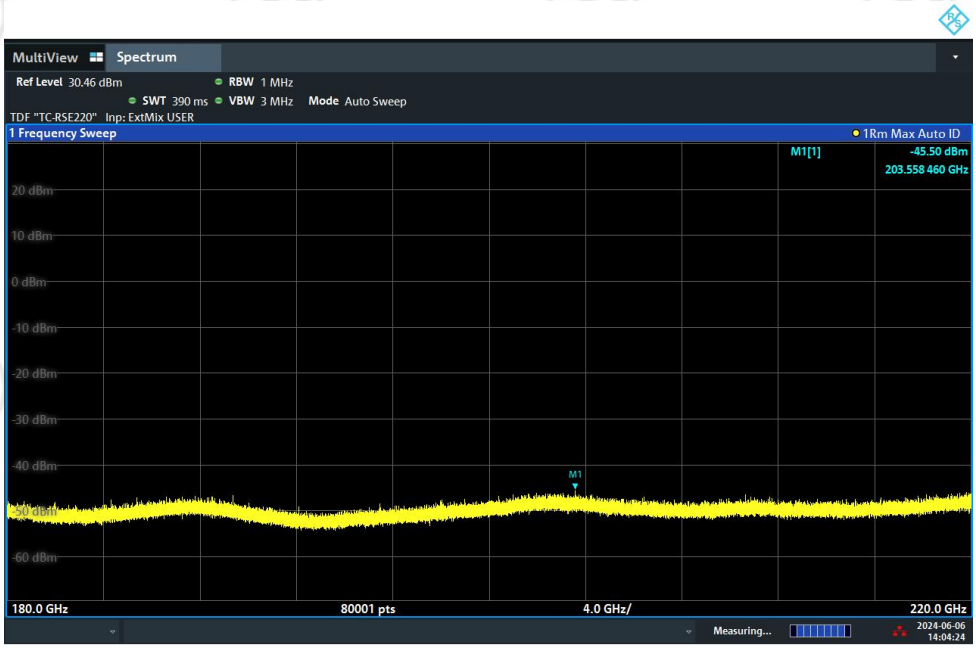
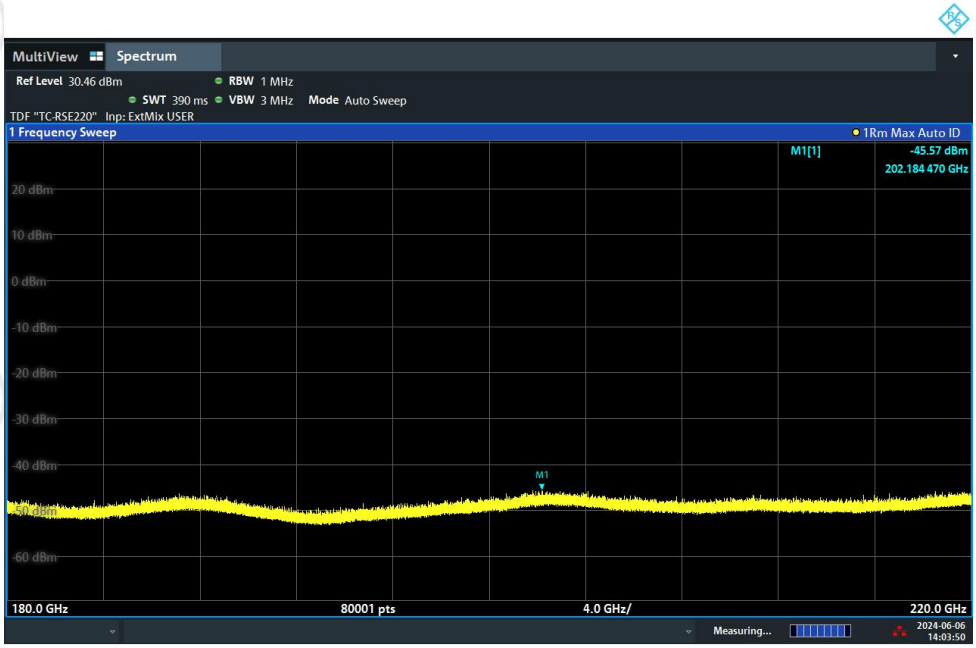
132GHz-140GHz (Vertical)
 01:48:06 PM 06/06/2024

140GHz-180GHz (Horizontal)
 02:00:22 PM 06/06/2024
140GHz-180GHz (Vertical)
 01:59:47 PM 06/06/2024

180GHz-220GHz (Horizontal)

02:04:25 PM 06/06/2024
180GHz-220GHz (Vertical)

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220GHz-231GHz (Horizontal)

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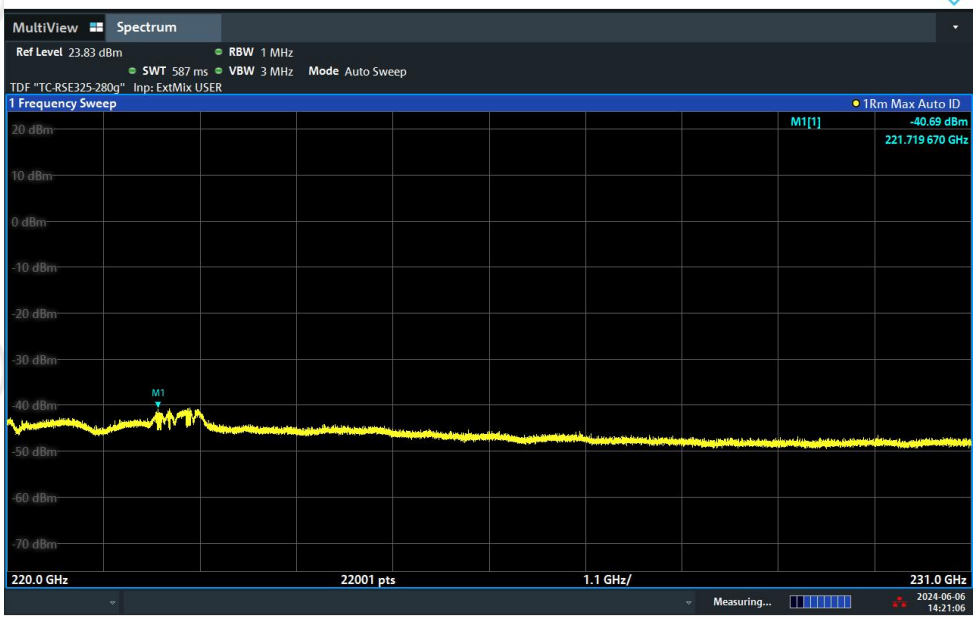
220GHz-231GHz (Vertical)



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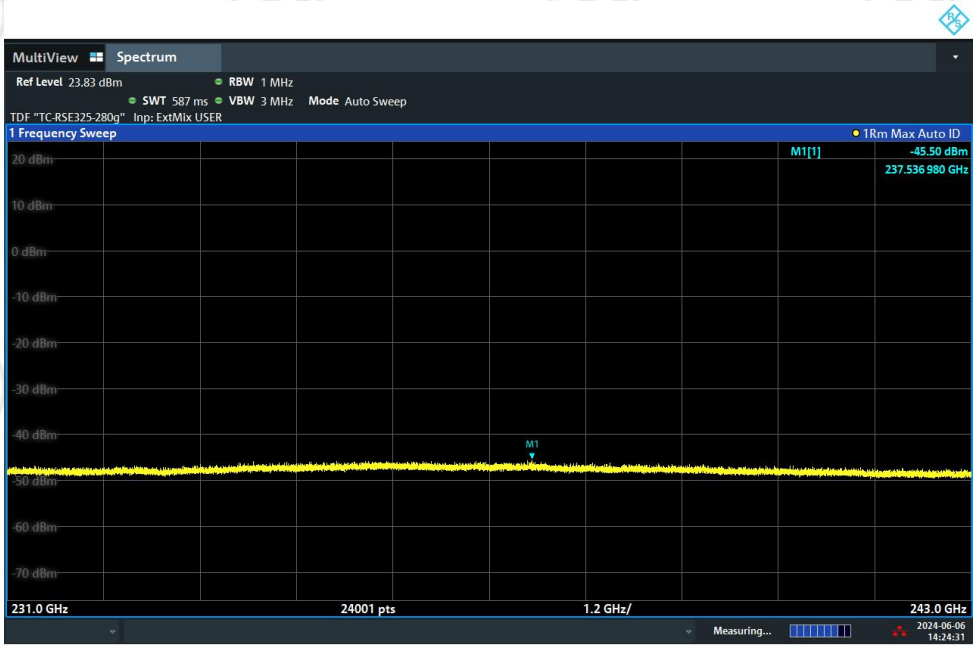
231GHz-243GHz (Horizontal)



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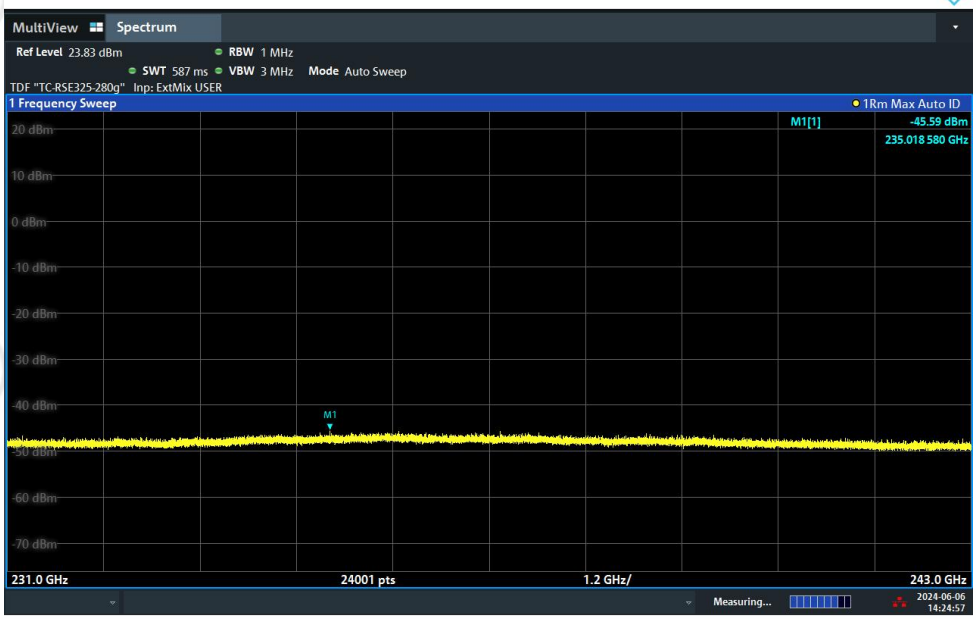
231GHz-243GHz (Vertical)



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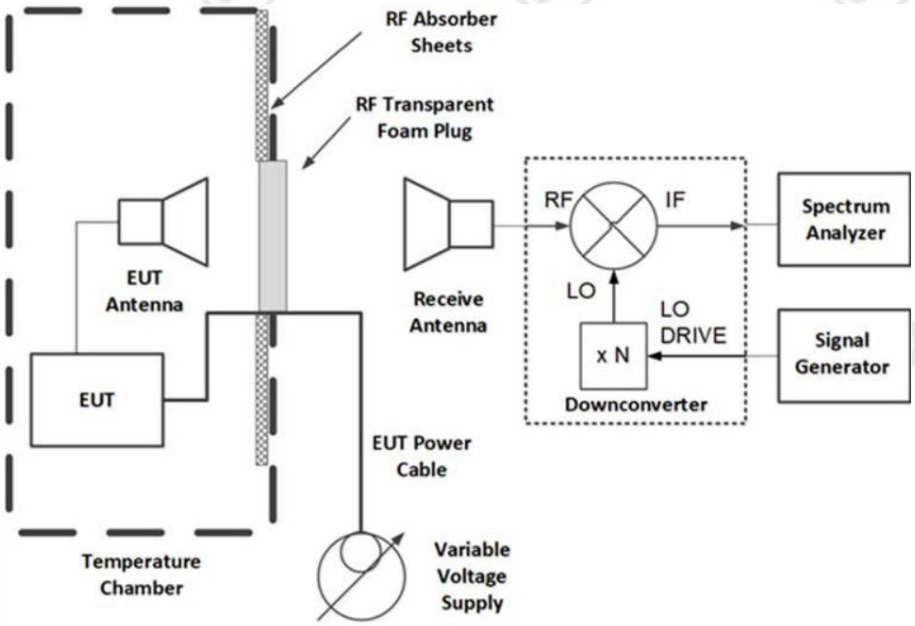
5.5 Frequency stability

Test Requirement:	47 CFR Part 95, Subpart M Section 95.3379 (b), KDB 653005 D01 76-81 GHz Radars v01r01 Section 4 d)
Test Method:	ANSI C63.26:2015 Section 5.6
Limit:	Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation.
Test Setup:	 **Figure 23—Example of a frequency stability setup configuration**
Test Procedure:	The carrier frequency of the transmitter is measured at room temperature. (20℃ to provide a reference) At 10℃ intervals of temperatures between -30℃ and +50℃ at the manufacturer's rated supply voltage, and At +20℃ temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage then the -15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage. Measurement data showing variation in transmitter output frequency from a cold start and the elapsed time necessary for the frequency to stabilize within the applicable tolerance. Tests shall be made after temperature stabilization at each of the ambient temperature levels; the lower temperature limit, 0℃ and + 30℃ with no primary power applied. Beginning at each temperature level , the frequency shall be measured within one minute after application of primary power to the transmitter and at intervals of no more than one minute thereafter until ten minutes have elapsed or until sufficient measurements are obtained to indicate clearly that the frequency has stabilized within the applicable tolerance, whichever time period is greater. During each test, the ambient temperature shall not be allowed to rise more than 10℃ above the respective beginning ambient temperature level.
Test Mode:	TX mode_Make EUT continuously emit radar signals.

Test data:

Voltage (%)	Power (V/DC)	Temperature (℃)	Frequency Left (GHz)	Frequency Right (GHz)	Limit (GHz)	Result
100	24.0	-40	77.560565	78.023927	76 to 81	Pass
		-30	77.561428	78.023837	76 to 81	Pass
		-20	77.56075	78.023505	76 to 81	Pass
		-10	77.560757	78.025142	76 to 81	Pass
		0	77.560752	78.023174	76 to 81	Pass
		+10	77.561130	78.023380	76 to 81	Pass
		+20	77.563620	78.022020	76 to 81	Pass
		+30	77.560360	78.024510	76 to 81	Pass
		+40	77.559020	78.023900	76 to 81	Pass
		+50	77.558540	78.028480	76 to 81	Pass
		+60	77.559040	78.028260	76 to 81	Pass
		+70	77.558500	78.027420	76 to 81	Pass
		+80	77.558080	78.029760	76 to 81	Pass
		+85	77.558860	78.029340	76 to 81	Pass
115	32.0	+20	77.560200	78.028360	76 to 81	Pass
85	9.0	+20	77.559040	78.028170	76 to 81	Pass

Note:The extreme voltage and extreme temperature is specified by the manufacturer.