NVLAP TESTING
NVLAP LAB CODE 600341-0

BACL Bay Area Compliance Labs Corp.

TEST REPORT

Applicant:	**Autel Robotics Co., Ltd.**
Address:	**601,701,801,901, Block B1, Nanshan iPark, No. 1001 Xueyuan Avenue, Nanshan District, Shenzhen, Guangdong, 518055, China**
Product Name:	**EVO Max**
FCC ID:	**2AGNTMDX240958B**
Standard(s):	**47 CFR Part 15, Subpart C(15.255) ANSI C63.10-2020 +Cor.1-2023**
Report Number:	**SZ1240322-14909E-RF-00B**
Report Date:	**2025/1/6**

The above device has been tested and found compliant with the requirement of the relative standards by Bay Area Compliance Laboratories Corp. (Dongguan).

Reviewed By: Gavin Xu	**Approved By:** Ivan Cao
Title: RF Engineer	Title: EMC Manager

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	SZ1240322-14909E-RF-00B	Original Report	2025/1/6

1. GENERAL INFORMATION

1.1 General Description of Equipment under Test

EUT Name:	EVO Max
EUT Model:	MDX
Operation Frequency Range:	62.77-63.30 GHz(Front Radar) 60.62-61.35 GHz(Top Radar) 60.06-60.50 GHz(Rear Radar)
Maximum EIRP:	14.13 dBm(Front Radar) 19.86 dBm(Top Radar) 16.70 dBm(Rear Radar)
Modulation Type:	FMCW
Emission Designator:	N0N
Rated Input Voltage:	DC 14.88V from battery
Serial Number:	2J8R-2
EUT Received Date:	2024/3/29
EUT Received Status:	Good

1.2 Accessory Information

Accessory Description	Manufacturer	Model	Parameters
Adapter	Shenzhen Esun Power Technology Co., Ltd	MDX120W	Input: AC100-240V,50/60Hz,3.0A Output: 17Vdc, 7.06A(Main) USB-C:5.0Vdc,3.0A; 9.0Vdc,3.0A;12.0Vdc from 2.5A Total Output Power:120W Max

1.3 Antenna Information Detail▲

Antenna Type	input impedance (Ohm)	Antenna Gain	Frequency Range
Integrated in chip	Unknown	7.29dBi	60-64 GHz
The Method of §15.203 Compliance: ☒Antenna must be permanently attached to the unit. ☐Antenna must use a unique type of connector to attach to the EUT. ☐Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.			

1.4 Equipment Modifications

No modifications are made to the EUT during all test items.

2. SUMMARY OF TEST RESULTS

Standard(s)/Rule(s)	Description of Test	Result
§15.207(a)	AC Line Conducted Emissions	Not Applicable
§15.255(b)(3)	Peak EIRP and Transmitter Off-times	Compliant
§15.215, §15.255 (e)	Occupied Bandwidth	Compliant
§15.205, §15.209, §15.255(d)	Radiated Spurious Emissions	Compliant
§15.255 (f)	Frequency Stability	Compliant
§15.255 (a),(b),(h)	Operation Restriction And Group Installation	Compliant
§15.203	Antenna Requirement	Compliant
Note 1: Not applicable for AC Line Conducted Emissions, the EUT was power by battery.		

3. DESCRIPTION OF TEST CONFIGURATION

3.1 EUT Operation Condition

The system was configured for testing in production version with highest transmitter activity (on time), which was provided by the manufacturer. According to 15.31(c) and KDB 364244 D01 Meas 15.255 Radars v01, the device tested at Swept mode for FMCW modulation.

The EUT have 3 Radar module operates on the frequency 60-64GHz:
Front Radar: 62.77-63.30 GHz
Top Radar: 60.62-61.35 GHz
Rear Radar: 60.06-60.50 GHz

3.2 EUT Exercise Software

No software was used in test. The EUT transmit when EUT was power up.

3.3 Support Equipment List and Details

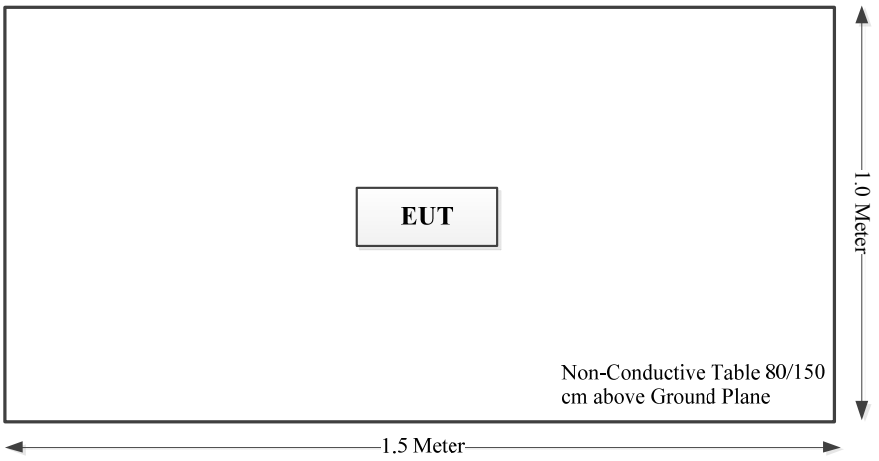
Manufacturer	Description	Model	Serial Number
/	/	/	/

3.4 Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
/	/	/	/	/	/

3.5 Block Diagram of Test Setup

Radiated Spurious emissions:



3.6 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 829273, the FCC Designation No. : CN5044.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

3.7 Measurement Uncertainty

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
Unwanted Emissions, radiated	9kHz~30MHz: 3.3dB, 30MHz~200MHz: 4.55 dB, 200MHz~1GHz: 5.92 dB, 1GHz~6GHz: 4.98 dB, 6GHz~18GHz: 5.89 dB, 18GHz~26.5GHz:5.47 dB, 26.5GHz~40GHz:5.63 dB 40~60G: 4.83dB, 60G~90G: 4.94dB, 90G-140G: 5.46dB, 140G-220G: 6.00dB, 220G-325G: 7.35dB
EIRP	4.94dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.11 dB (150 kHz to 30 MHz)

4. REQUIREMENTS TEST RESULTS

4.1 AC Line Conducted Emissions

Not Applicable, the device was powered by battery when operating.

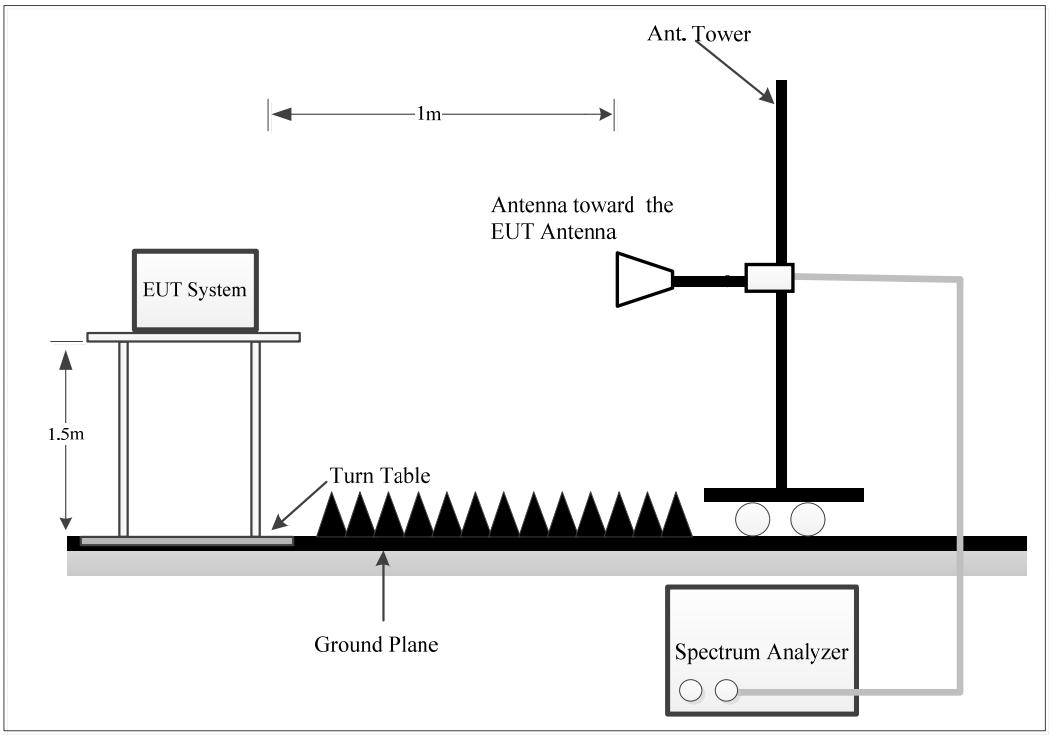
4.2 Peak EIRP And Transmitter Off-times

4.2.1 Applicable Standard

FCC §15.255(b)(3)

Field disturbance sensors/radar devices deployed on unmanned aircraft may operate within the frequency band 60 – 64 GHz, provided that the transmitter not exceed 20 dBm peak EIRP. The sum of continuous transmitter off-times of at least two milliseconds shall equal at least 16.5 milliseconds within any contiguous interval of 33 milliseconds. Operation shall be limited to a maximum of 121.92 meters (400 feet) above ground level.

4.2.2 EUT Setup



Place the measurement antenna at a measurement distance that is in the far-field of the measurement antenna, in the far-field of the EUT antenna. The EIRP test was performed at 1m distance, which was larger than the minimum test distance, please refer to section 4.4.4 for more detail.

4.2.3 Test Procedure

Refer to ANSI C63.10-2020 Clause 9.8

For radiated measurements:
1) Place the measurement antenna at a measurement distance that is in the far-field of the measurement antenna, in the far-field of the EUT antenna, and meets the measurement distance requirements for final radiated measurements as specified in 9.1.4.
2) Place the measurement antenna in the main beam of the EUT then maximize the fundamental emission using the procedures of 9.7, noting that multiple peaks can be found at different beam orientations and/or polarizations.
3) Correct the power reading from the spectrum analyzer for any external gain and/or attenuation between the measurement antenna and the spectrum analyzer. This is the power at the output of the measurement antenna
4) Calculate the EIRP from the power at the output of the measurement antenna using Equation (22), and then convert to linear form using Equation (24).

$$EIRP = 21.98 - 20\log(\lambda) + 20\log(d_{Meas}) + P - G \quad (22)$$

where

$EIRP$	is the equivalent isotropic radiated power, in dBm
λ	is the wavelength of the emission under investigation [300/f(MHz)], in m
d_{Meas}	is the measurement distance, in m
P	is the power measured at the output of the measurement antenna, in dBm
G	is the gain of the measurement antenna, in dBi

NOTE—The measured power P includes all applicable instrument correction factors up to the connection to the measurement antenna.

5) Where applicable, calculate conducted output power from the EIRP using Equation (27).

For FMCW emissions, the procedures in 4.1.5.2.8 and Annex L shall be used.

4.2.4 Test Result

Serial Number:	2J8R-2	Test Date:	2024/12/22~2025/1/4
Test Site:	Chamber B	Test Mode:	Swept
Tester:	Bill Yang	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	19.6~21.1	Relative Humidity: (%)	27~29	ATM Pressure: (kPa)	102.2~102.4

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Waveguide Mixer	11970V	2521A011767	2023/2/16	2026/2/15
Flann Micowave	Horn Antenna	861V/385	736	2023/2/27	2026/2/26
Resenberger	Coaxial Cable	LU7-022-1000	0031	2024/3/1	2025/2/28
Resenberger	Coaxial Cable	LU7-022-1000	0032	2024/3/1	2025/2/28
Agilent	Spectrum Analyzer	E4440A	MY44303352	2024/10/22	2025/10/21

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Front Radar:

Frequency (GHz)	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)	E-Field@1m (dBμV/m)	Chirps Correction Factor (dB)	EIRP (dBm)	Limit (dBm)
63	71.25	PK	V	42.38	113.63	5.30	14.13	20.00

EIRP = E_{meas}+ 20log(Measurement distance) - 104.8
Measurement distance = 1m
The Mixers and it`s RF cables is compose a system for calibration.
The test data recorded was the maximum polarization.

Chirps Time▲ (μs)	BW_{Chirp} (MHz)	RBW (MHz)	Chirps Correction Factor (dB)
20	519.14	1	5.30

Refer to ANSI C63.10-2020/cor 1-2023Annex L.1. The chirps correction factor was calculated using the formula:

$$\alpha = \frac{1}{\left(1+\left[\left(\frac{2\times\ln(2)}{\pi}\right)^2\times\left(\frac{BW_{Chirp}}{T_{Chirp}\times RBW^2}\right)^2\right]\right)^{0.25}}$$

where

α	is the reduction in amplitude
BW_{Chirp}	is the FMCW Chirp Bandwidth
T_{Chirp}	is the FMCW Chirp Time

Top Radar:

Frequency (GHz)	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)	E-Field@1m (dBμV/m)	Chirps Correction Factor (dB)	EIRP (dBm)	Limit (dBm)
60.98	76.80	PK	V	42.06	118.86	5.80	19.86	20.00

EIRP = E_{meas}+ 20log(Measurement distance) - 104.8
Measurement distance = 1m
The Mixers and it`s RF cables is compose a system for calibration.
The test data recorded was the maximum polarization.

Chirps Time▲ (μs)	BW_{Chirp} (MHz)	RBW (MHz)	Chirps Correction Factor (dB)
22	717.55	1	5.80

Refer to ANSI C63.10-2020/cor 1-2023Annex L.1. The chirps correction factor was calculated using the formula:

$$\alpha = \frac{1}{\left(1+\left[\left(\frac{2\times\ln(2)}{\pi}\right)^2\times\left(\frac{BW_{Chirp}}{T_{Chirp}\times RBW^2}\right)^2\right]\right)^{0.25}}$$

where

α	is the reduction in amplitude
BW_{Chirp}	is the FMCW Chirp Bandwidth
T_{Chirp}	is the FMCW Chirp Time

Rear Radar:

Frequency (GHz)	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB/m)	E-Field@1m (dBμV/m)	Chirps Correction Factor (dB)	EIRP (dBm)	Limit (dBm)
60.28	74.69	PK	V	41.95	116.64	4.86	16.70	20.00

EIRP = E_{meas}+ 20log(Measurement distance) - 104.8
Measurement distance = 1m
The Mixers and it`s RF cables is compose a system for calibration.
The test data recorded was the maximum polarization.

Chirps Time▲ (μs)	BW_{Chirp} (MHz)	RBW (MHz)	Chirps Correction Factor (dB)
20	423.05	1	4.86

Refer to ANSI C63.10-2020/cor 1-2023Annex L.1. The chirps correction factor was calculated using the formula:

$$\alpha = \frac{1}{\left(1+\left[\left(\frac{2\times\ln(2)}{\pi}\right)^2\times\left(\frac{BW_{Chirp}}{T_{Chirp}\times RBW^2}\right)^2\right]\right)^{0.25}}$$

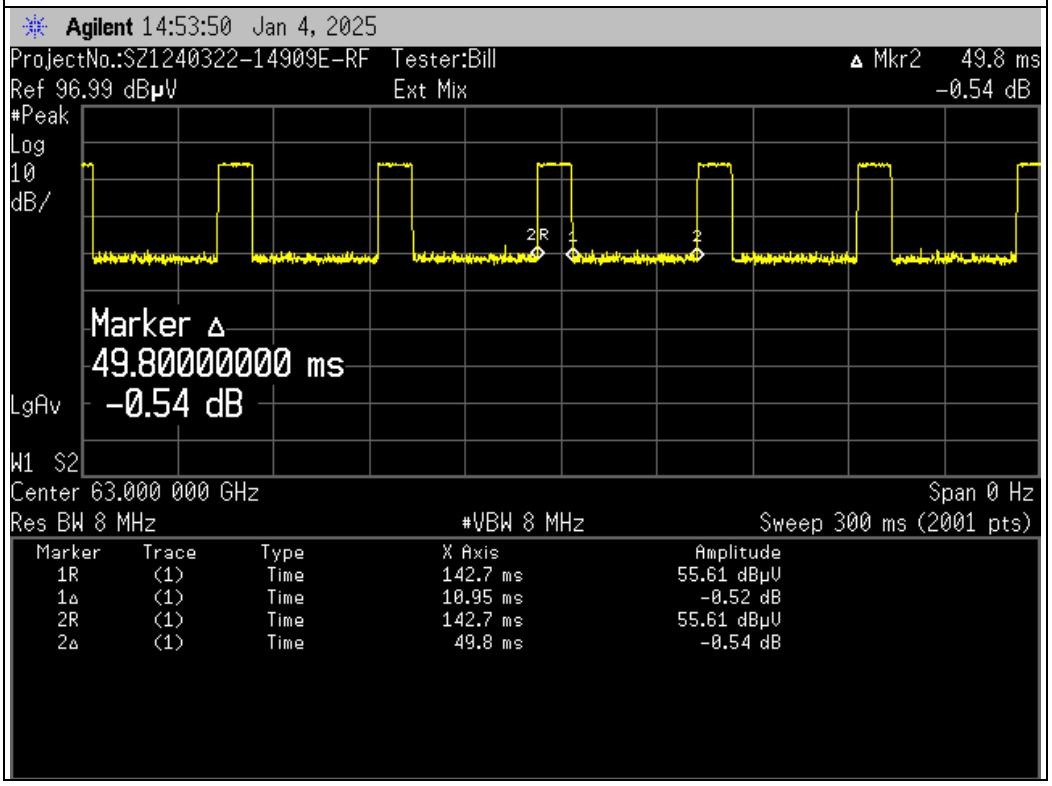
where

α	is the reduction in amplitude
BW_{Chirp}	is the FMCW Chirp Bandwidth
T_{Chirp}	is the FMCW Chirp Time

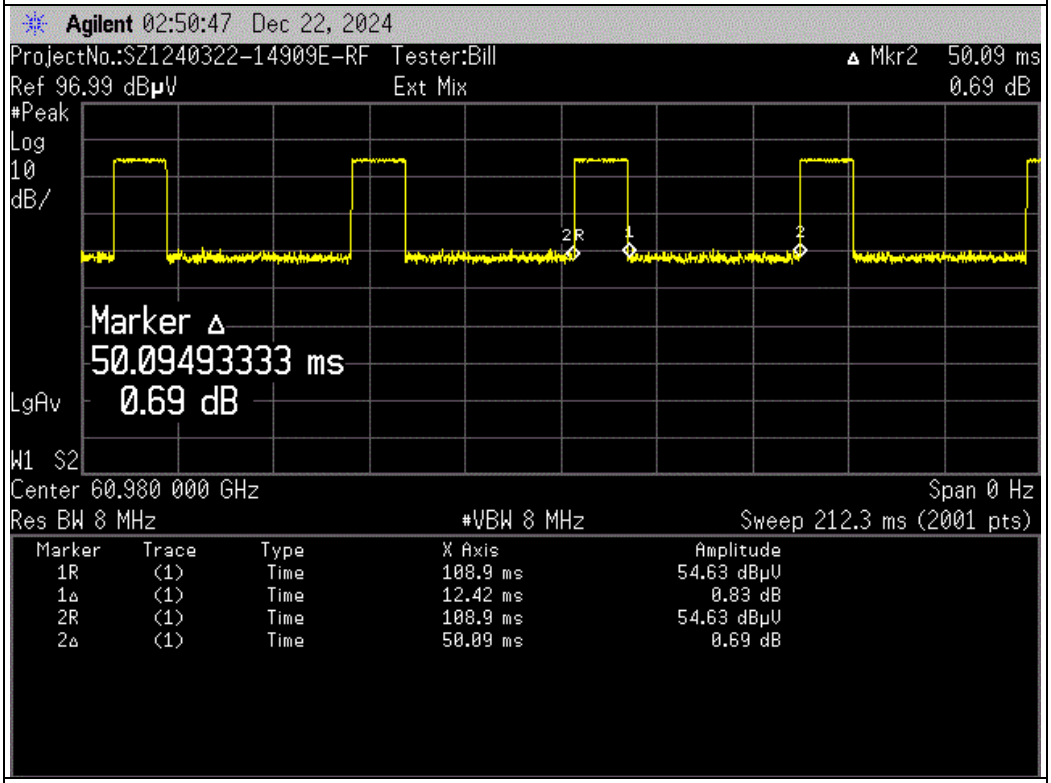
Transmitter Off-times

Radar	Test Frequency (GHz)	Transmitter On (ms)	Observation Time (ms)	sum of continuous transmitter off-times (ms)	Limit (dBm)
Front	63.00	10.95	33	22.05	≥16.5
Top	60.98	12.42	33	20.58	≥16.5
Rear	60.28	10.93	33	22.07	≥16.5
Note: Sum of Continuous Transmitter Off-times= Observation Time(33ms) - Ton					

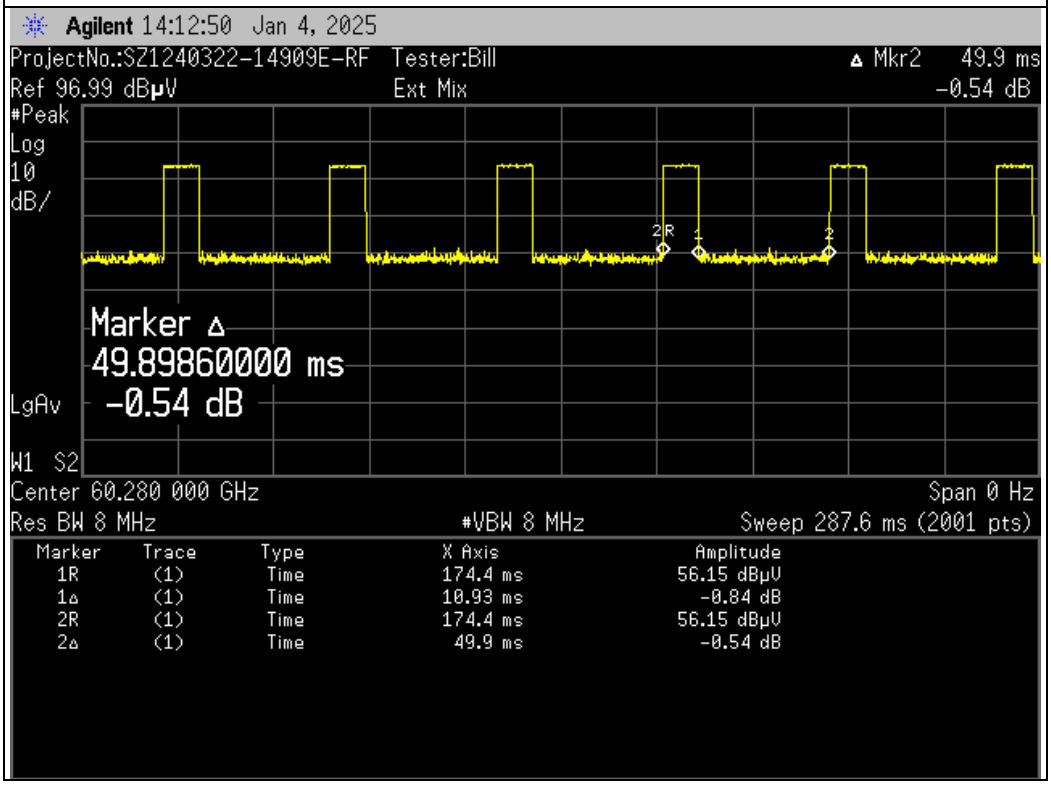
Front Radar



Top Radar



Rear Radar



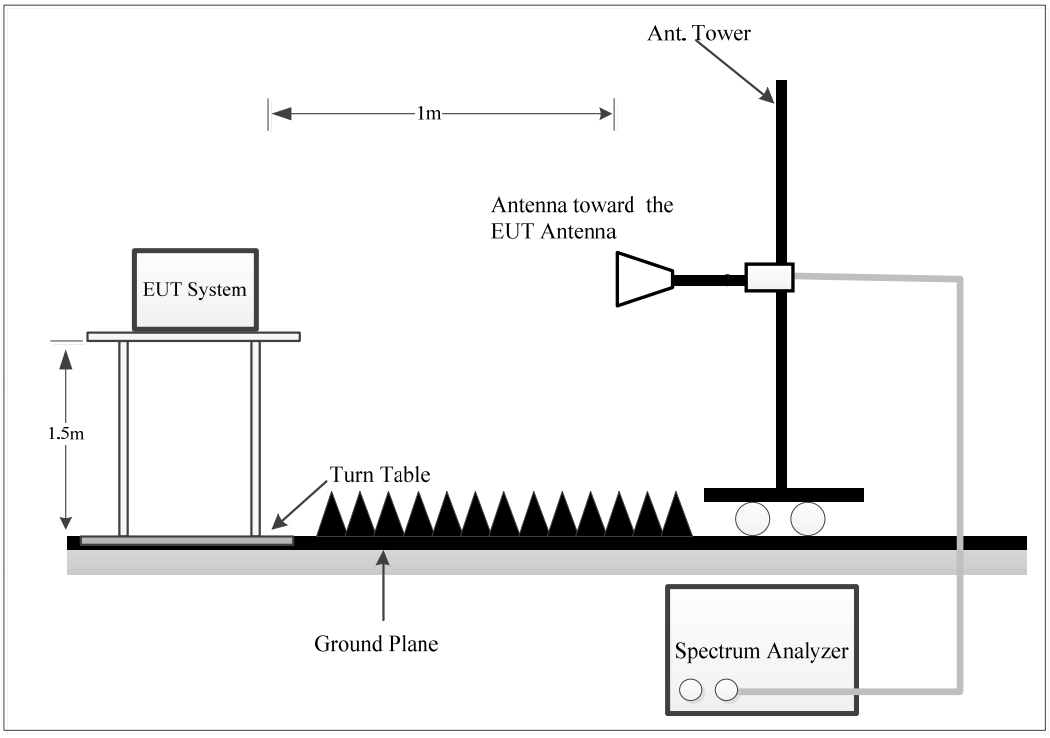
4.3 Emission Bandwidth:

4.3.1 Applicable Standard

KDB 364244 D01 Meas 15.255 Radars v01

For other than pulsed radar transmitters, the fundamental emission bandwidth is presumed to be "…*the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage β/2 of the total mean power of a given emission. Unless otherwise specified in an ITU–R Recommendation for the appropriate class of emission, the value of β/2 should be taken as 0.5%,"* as defined in §2.1(c) of the FCC rules. This is also known as the 99% occupied bandwidth (OBW).

4.3.2 EUT Setup



Place the measurement antenna in the main beam of the EUT then maximize the fundamental emission, noting that multiple peaks can be found at different beam orientations and/or polarizations.

4.3.3 Test Procedure

KDB 364244 D01 Meas 15.255 Radars v01

Clauses 9.3 and 9.4 of C63.10-2020 provide standardized procedures recognized by the FCC for measuring both the relative (-10 dB) bandwidth and the 99% OBW.

The occupied bandwidth (OBW) is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.
a) The following procedure shall be used for measuring 99% power bandwidth: Use the following spectrum analyzer settings:
1) Span equal to approximately 1.5 times the OBW, centered on the carrier frequency
2) RBW, prefer 1% to 5% of OBW, or a minimum of 1 MHz if this is not possible due to a large OBW
3) VBW approximately 3 × RBW
4) Set the reference level of the instrument as required to reduce the chance of the signal amplitude exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.1.6.
5) Sweep = No faster than coupled (auto) time.
6) Detector function = peak.
7) Trace = max-hold.
b) The EUT shall be transmitting at its maximum data rate. Allow the trace to stabilize.
c) If the instrument does not have a 99% OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5% of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5% of the total is reached and record that frequency as the upper OBW frequency. The 99% power OBW can be determined by computing the difference these two frequencies.
d) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).
e) Repeat this test for each modulation scheme using the guidance of 5.6.2.1.

4.3.4 Test Data

Serial Number:	2J8R-2	Test Date:	2024/12/22
Test Site:	Chamber B	Test Mode:	Swept
Tester:	Bill Yang	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	19.6	Relative Humidity: (%)	29	ATM Pressure: (kPa)	102.4

Test Equipment List and Details:

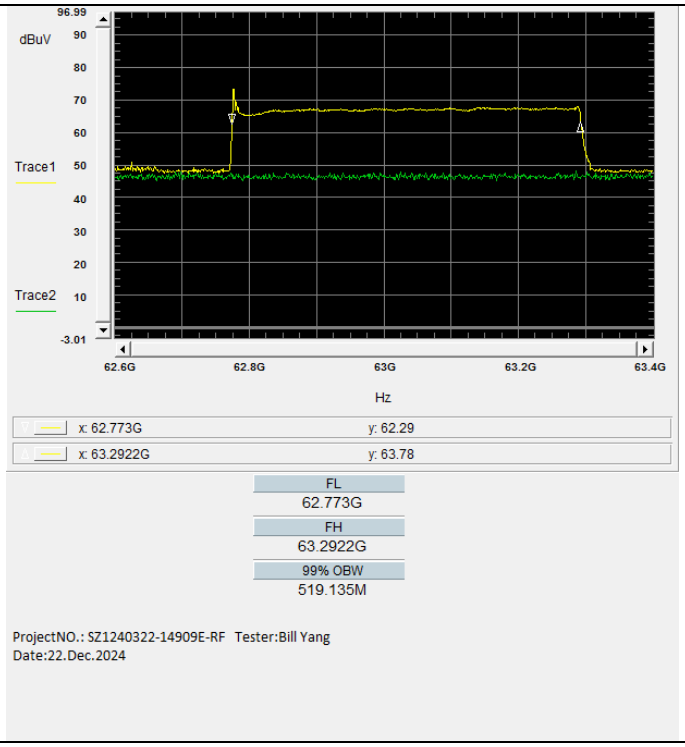
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Waveguide Mixer	11970V	2521A011767	2023/2/16	2026/2/15
Flann Micowave	Horn Antenna	861V/385	736	2023/2/27	2026/2/26
Agilent	Spectrum Analyzer	E4440A	MY44303352	2024/10/22	2025/10/21
Resenberger	Coaxial Cable	LU7-022-1000	0031	2024/3/1	2025/2/28
Resenberger	Coaxial Cable	LU7-022-1000	0032	2024/3/1	2025/2/28

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

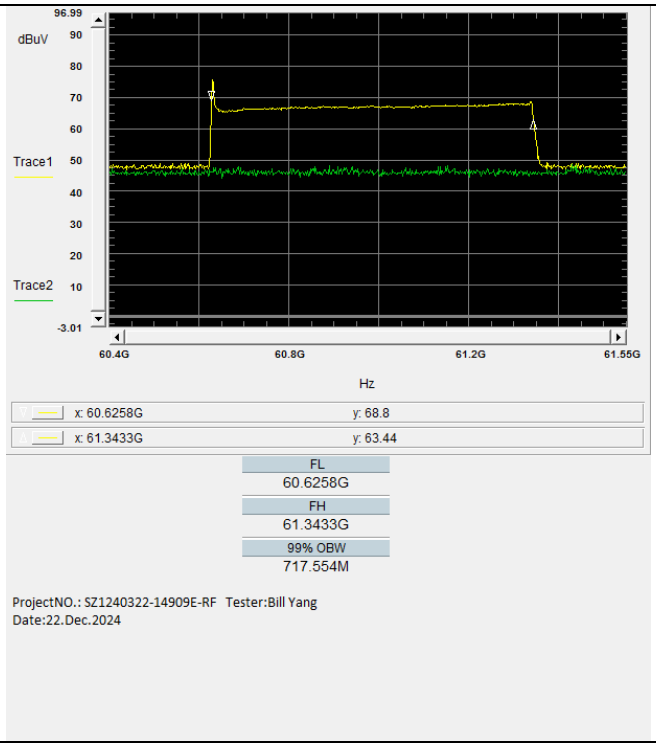
Test Data:

Radar	99% Occupied Bandwidth (MHz)	F_L (GHz)	F_L Limit (GHz)	F_H (GHz)	F_H Limit (GHz)
Front	519.135	62.7730	60	63.2922	64
Top	717.554	60.6258	60	61.3433	64
Rear	423.045	60.0697	60	60.4928	64

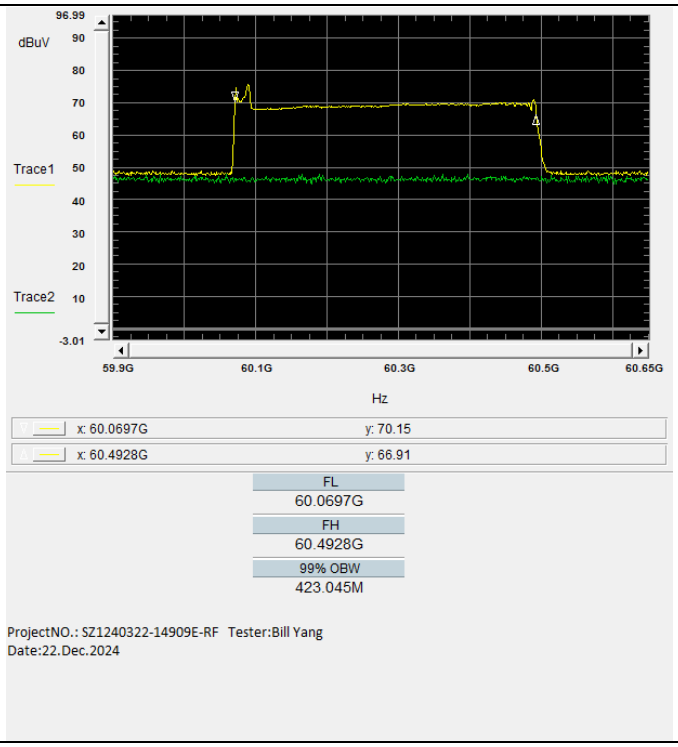
Front Radar



Top Radar



Rear Radar


96.99
dBuV
90
80
70
60
Trace1
50
40
30
20
Trace2
10
-3.01
59.9G
60.1G
60.3G
60.5G
60.65G
Hz
x: 60.0697G
y: 70.15
x: 60.4928G
y: 66.91
FL
60.0697G
FH
60.4928G
99% OBW
423.045M
ProjectNO.: SZ1240322-14909E-RF Tester:Bill Yang
Date:22.Dec.2024

4.4 Radiated Emissions

4.4.1 Applicable Standard

FCC §15.255(d)

Limits on spurious emissions:

(1) The power density of any emissions outside the 57-71 GHz band shall consist solely of spurious emissions.

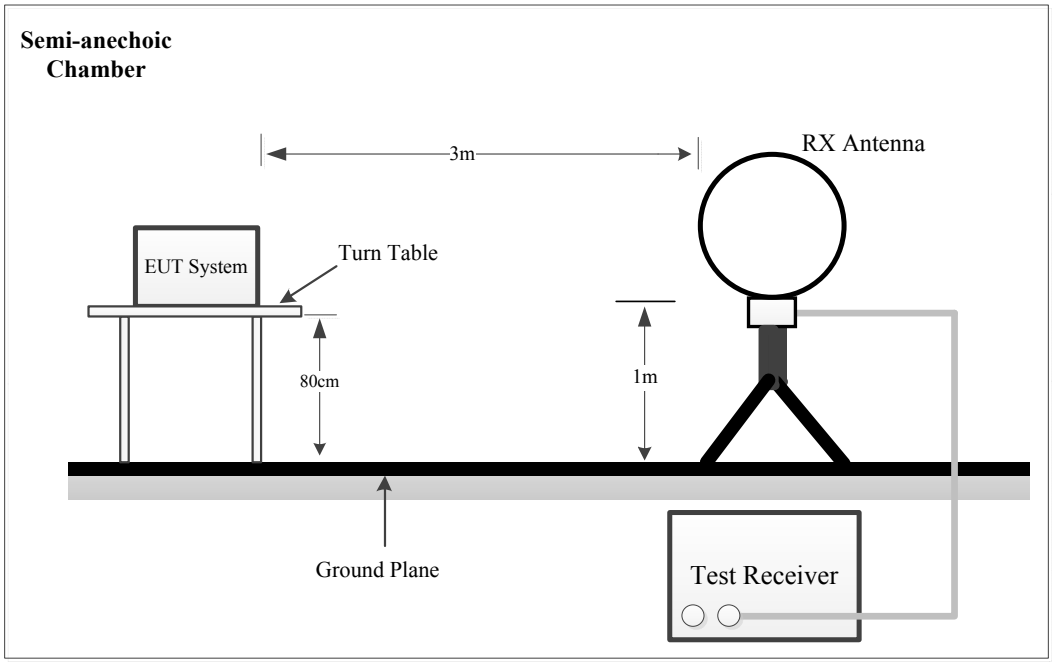
(2) Radiated emissions below 40 GHz shall not exceed the general limits in § 15.209.

(3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

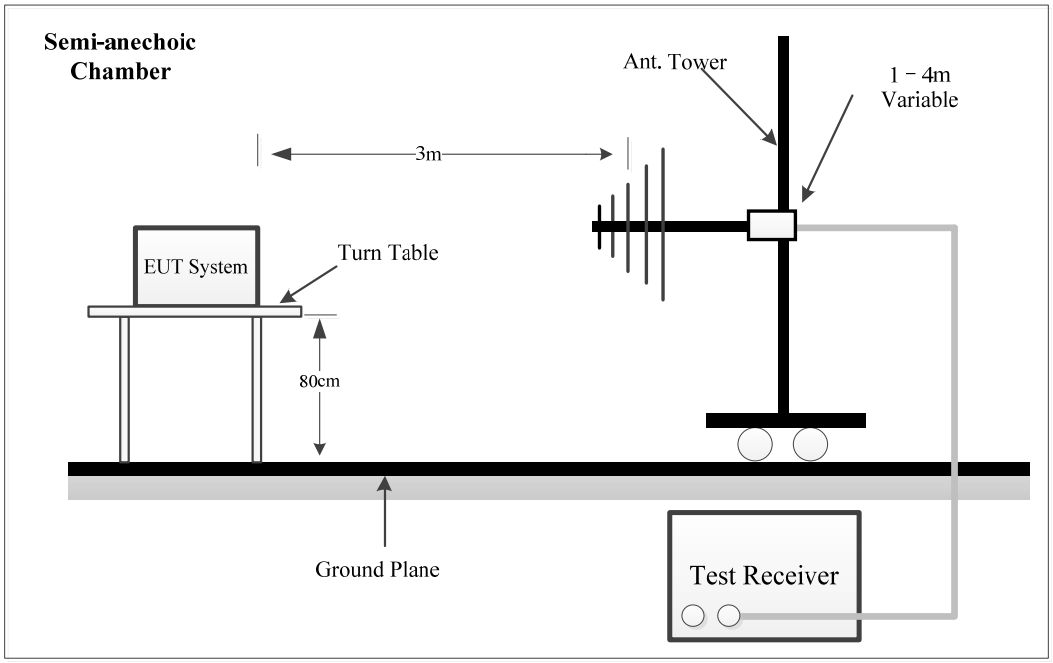
(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

4.4.2 EUT Setup

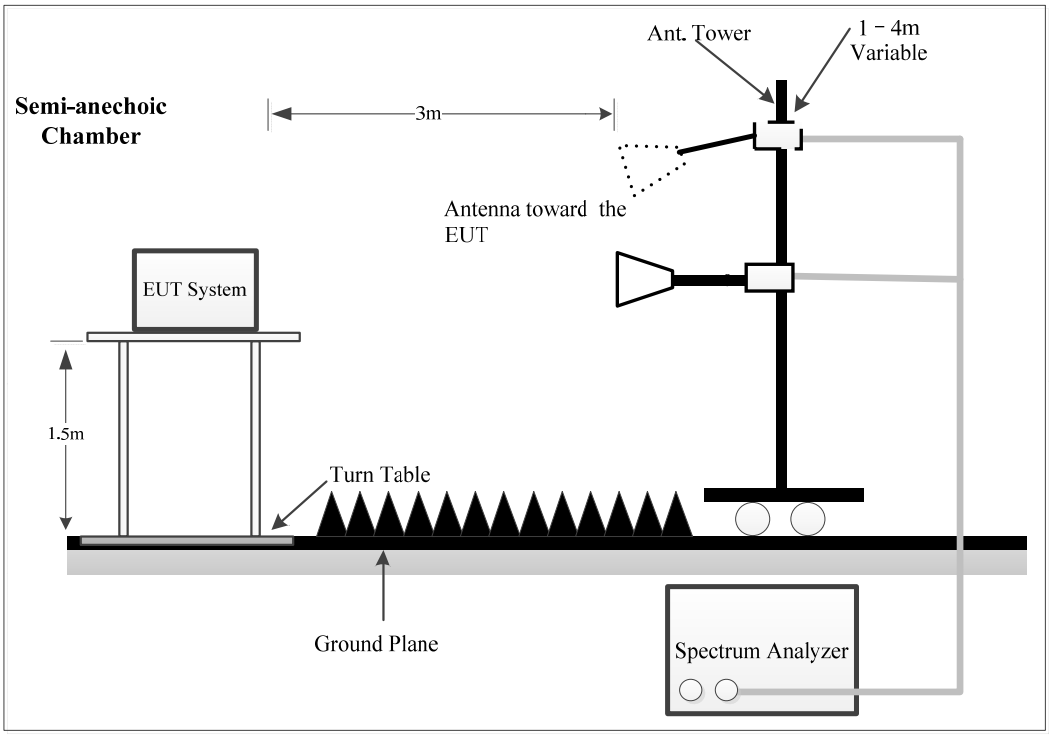
9kHz-30MHz:



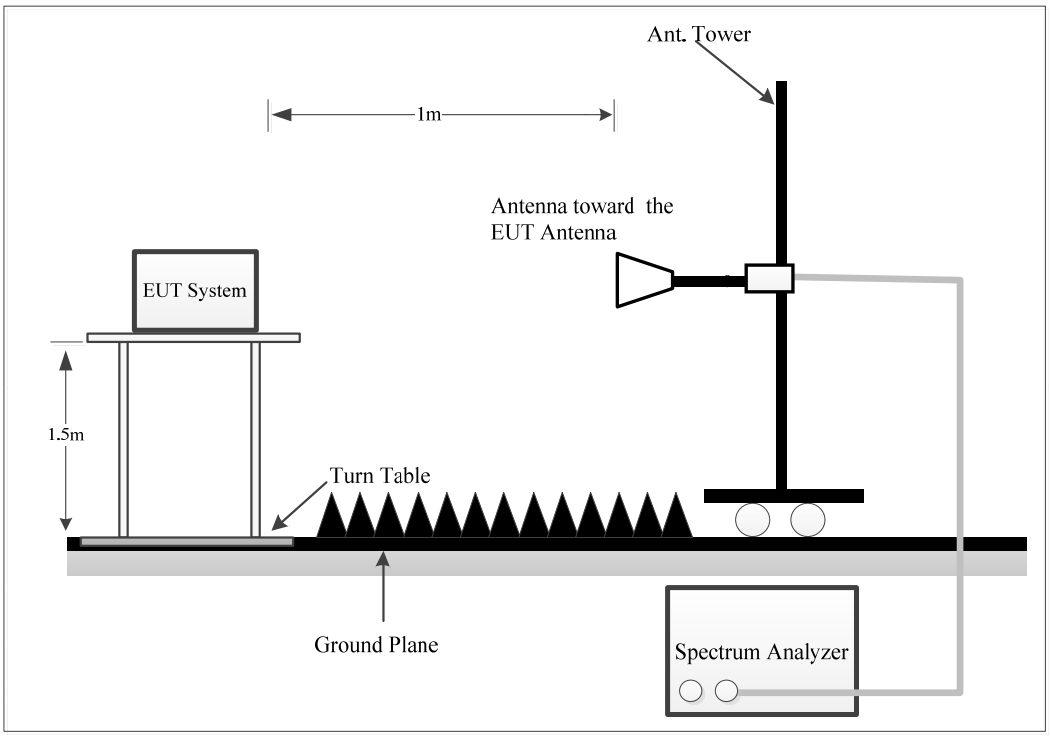
30MHz~1GHz:



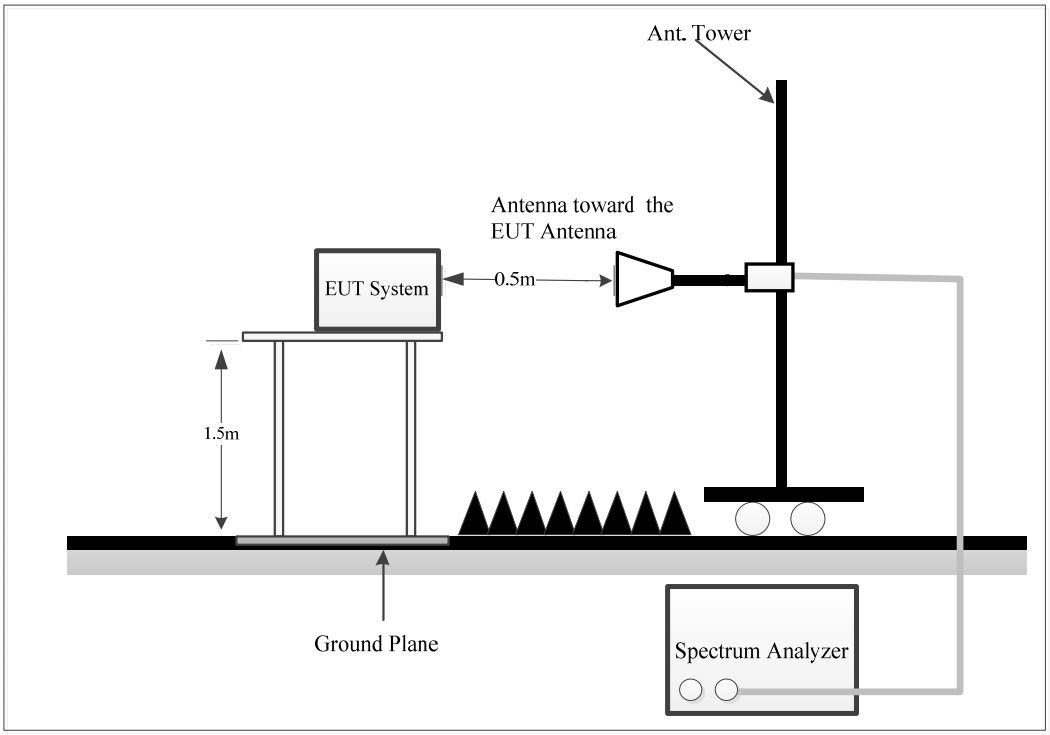
1~40 GHz:



40~90 GHz:



90~200 GHz:



Above 40GHz:

The antenna is scanned around the entire perimeter surface of the EUT, in both horizontal and vertical polarizations, at the distance of 1.0 m from 40 GHz to 90 GHz, and 0.5 m from 90 GHz to 200 GHz.

The radiated emission and out of band emission tests were performed in the 3 meters chamber, using the setup accordance with the ANSI C63.10-2020 The specification used was the FCC 15.209/15.205 and FCC 15.255 limits.

4.4.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 200 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:
9kHz-1000MHz:

Frequency Range	RBW	Video B/W	IF B/W	Measurement	Detector
9 kHz – 150 kHz	200 Hz	1 kHz	200 Hz	QP/Average	QP/Average
150 kHz – 30 MHz	9 kHz	30 kHz	9 kHz	QP/Average	QP/Average
30 MHz – 1000 MHz	/	/	120 kHz	QP	QP
	100 kHz	300 kHz	/	PK	PK

1-40GHz:
Pre-scan:

Frequency Range	Measurement	RBW	Video B/W	Detector
1-40 GHz	Peak	1MHz	3 MHz	PK
	AV	1MHz	5kHz	PK

Final measurement for emission identified during the pre-scan:

Frequency Range	Measurement	RBW	Video B/W	Detector
1-40 GHz	Peak	1MHz	3 MHz	PK
	AV	1MHz	10Hz	PK

Above 40GHz:

Frequency Range	Measurement	RBW	Video B/W	Detector
Above 40GHz	AV	1MHz	3MHz	AV

Note: Data was recorded in Quasi-peak detection mode for frequency range of 9 kHz-30MHz except 9 – 90 kHz, 110 – 490 kHz, employing an average detector.

4.4.4 Test Procedure

Refer to ANSI C63.10-2020 Clauses 9.10 and 9.11.

A Maximizing procedure was performed to ensure that the highest emissions from the EUT were actually measured in all of the Test Arrangements of the EUT and Local Support Equipment.

All emissions under the average limit and under the noise floor have not recorded in the report.

For above 40GHz:

External harmonic mixers are utilized. The antenna is scanned around the entire perimeter surface of the EUT, in both horizontal and vertical polarizations. The Mixers and it`s RF cables is compose a system for calibration, the conversion factor was added into the test Spectrum Analyzer in testing.

The far-field boundary is given in ANSI C63.10-2020:

$$R_m = 2D^2 / \lambda$$

Where:

D is the largest dimension of the antenna aperture in m and

λ is the free-space wavelength in m at the frequency of measurement.

The minimum test distance for the frequency range 40GHz-200GHz determine as below:

Model	Frequency Range (GHz)	Largest Dimension of the Horn Antenna (mm)	Minimum Test Distance R_m (m)
M19RH	40-60	46.3	0.57
M12RH	60-90	30.02	0.36
M08RH	90-140	19.7	0.23
M05RH	140-220	12.5	0.15

Note: the test distances used were 1.0 m from 40 GHz to 90 GHz, and 0.5 m from 90 GHz to 200GHz, it can be seen that the EUT was always in the Far-field of the Receive Antenna during all Radiated Emissions Tests.

4.4.5 Corrected Amplitude & Margin Calculation

The basic equation is as follows:

For 9kHz~40GHz:
The basic equation is as follows:

Result = Reading + Factor

Factor = Antenna Factor + Cable Loss- Amplifier Gain

Note: the antenna JB3 was calibrated with 6dB Attenuator, the antenna factor includes the insertion loss of the Attenuator.

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. The equation for margin calculation is as follows:

Margin = Limit – Result

4.4.6 Test Data

Serial Number:	2J8R-2	Test Date:	Below 1GHz :2024/5/5 Above 1GHz(1-40 GHz) :2024/5/10 Above 1GHz (40-200GHz):2024/12/22
Test Site:	Chamber A, Chamber B	Test Mode:	Transmitting
Tester:	Zoo Zou, Colin Yang, Bill Yang	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	19.6~26.1	Relative Humidity: (%)	29~69	ATM Pressure: (kPa)	100.3~101.4

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
9kHz~1000MHz					
EMCO	Passive Loop Antenna	6512	9706-1206	2023/10/21	2026/10/20
Sunol Sciences	Hybrid Antenna	JB3	A060611-1	2023/9/6	2026/9/5
Narda	Coaxial Attenuator	779-6dB	04269	2023/9/6	2026/9/5
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2023/8/1	2024/7/31
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-04	2023/8/1	2024/7/31
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2023/8/1	2024/7/31
Sonoma	Amplifier	310N	185914	2023/8/1	2024/7/31
R&S	EMI Test Receiver	ESCI	101121	2023/10/18	2024/10/17
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Above 1GHz(1-40 GHz)					
ETS-Lindgren	Horn Antenna	3115	000 527 35	2023/9/7	2026/9/6
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-02 1304	2023/2/22	2026/2/21
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-01 1302	2023/2/22	2026/2/21
Xinhang Macrowave	Coaxial Cable	XH750A-N/J-SMA/J-10M	20231117004 #0001	2023/11/17	2024/11/16
Xinhang Macrowave	Coaxial Cable	XH360A-2.92/J-2.92/J-6M-A	20231208001 #0001	2023/12/11	2024/12/10
AH	Preamplifier	PAM-0118P	469	2023/8/19	2024/8/18
AH	Preamplifier	PAM-1840VH	191	2023/9/7	2024/9/6
R&S	Spectrum Analyzer	FSV40	101944	2023/10/18	2024/10/17
Above 1GHz(40-200GHz)					
R&S	Spectrum Analyzer	FSV40	101944	2024/9/6	2025/9/5
OML	Waveguide Mixer	WR19/M19HWD	U60313-1	2023/2/16	2026/2/15
OML	Horn Antenna	M19RH	11648-01	2023/2/27	2026/2/26
OML	Waveguide Mixer	WR12/M12HWD	E60120-1	2023/2/16	2026/2/15
OML	Horn Antenna	M12RH	E60120-2	2023/2/27	2026/2/26

OML	Waveguide Mixer	WR08/M08HWD	F60313-1	2023/2/16	2026/2/15
OML	Horn Antenna	M08RH	F60313-2	2023/2/27	2026/2/26
OML	Waveguide Mixer	WR05/M05HWD	G60106-1	2023/2/16	2026/2/15
OML	Horn Antenna	M05RH	G60106-2	2023/2/27	2026/2/26
Resenberger	Coaxial Cable	LU7-022-1000	0031	2024/3/1	2025/2/28

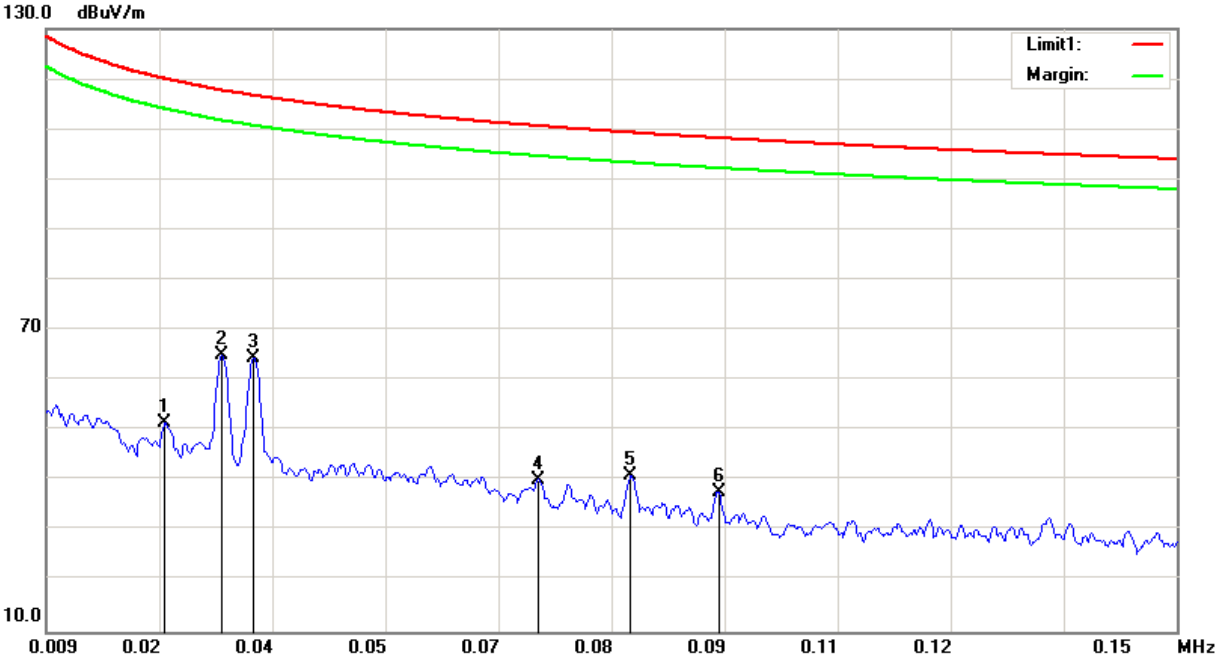
** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Please refer to the below table and plots.

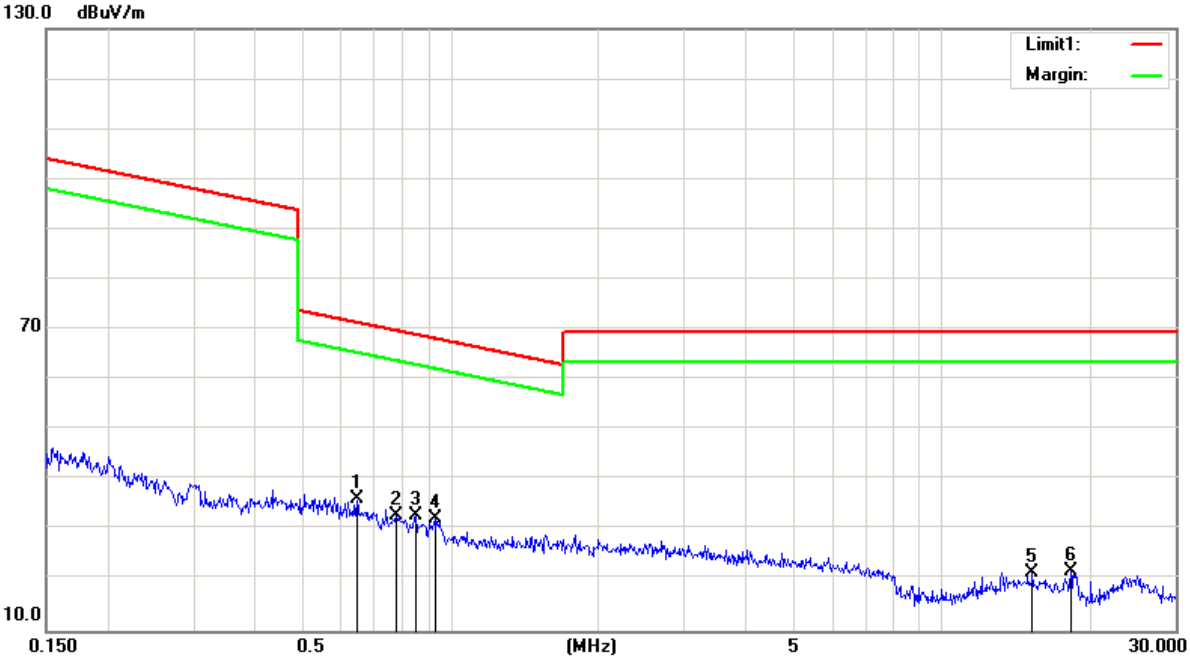
1) 9kHz~30MHz(All Radar Modules transmit simultaneously, the worst Polarization was below)

Project No:	SZ1240322-14909E-RF
Test Engineer:	Zoo Zou
Test Date:	2024-5-5
Polarization:	Parallel
Test Mode:	Transmitting
Power Source:	DC 14.88V



No.	Frequency (MHz)	Reading (dBµV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	0.0238	2.43	peak	49.09	51.52	120.07	68.55
2	0.0310	17.54	peak	47.37	64.91	117.78	52.87
3	0.0348	17.79	peak	46.69	64.48	116.77	52.29
4	0.0703	-0.24	peak	40.54	40.30	110.66	70.36
5	0.0820	2.39	peak	38.57	40.96	109.33	68.37
6	0.0928	1.09	peak	36.65	37.74	108.25	70.51

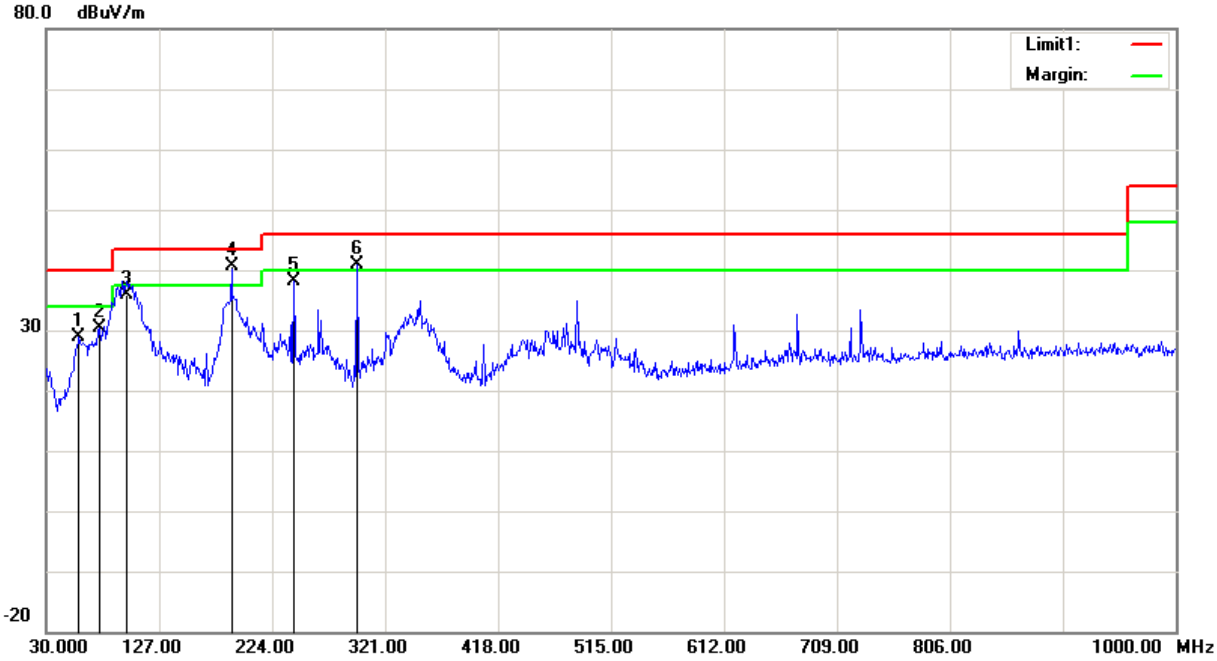
Project No:	SZ1240322-14909E-RF
Test Engineer:	Zoo Zou
Test Date:	2024-5-5
Polarization:	Parallel
Test Mode:	Transmitting
Power Source:	DC 14.88V



No.	Frequency (MHz)	Reading (dBµV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	0.6440	14.07	peak	22.03	36.10	71.42	35.32
2	0.7752	12.11	peak	20.78	32.89	69.80	36.91
3	0.8483	13.27	peak	19.59	32.86	69.01	36.15
4	0.9282	14.31	peak	18.00	32.31	68.23	35.92
5	15.3070	17.20	peak	4.45	21.65	69.54	47.89
6	18.3283	17.68	peak	4.28	21.96	69.54	47.58

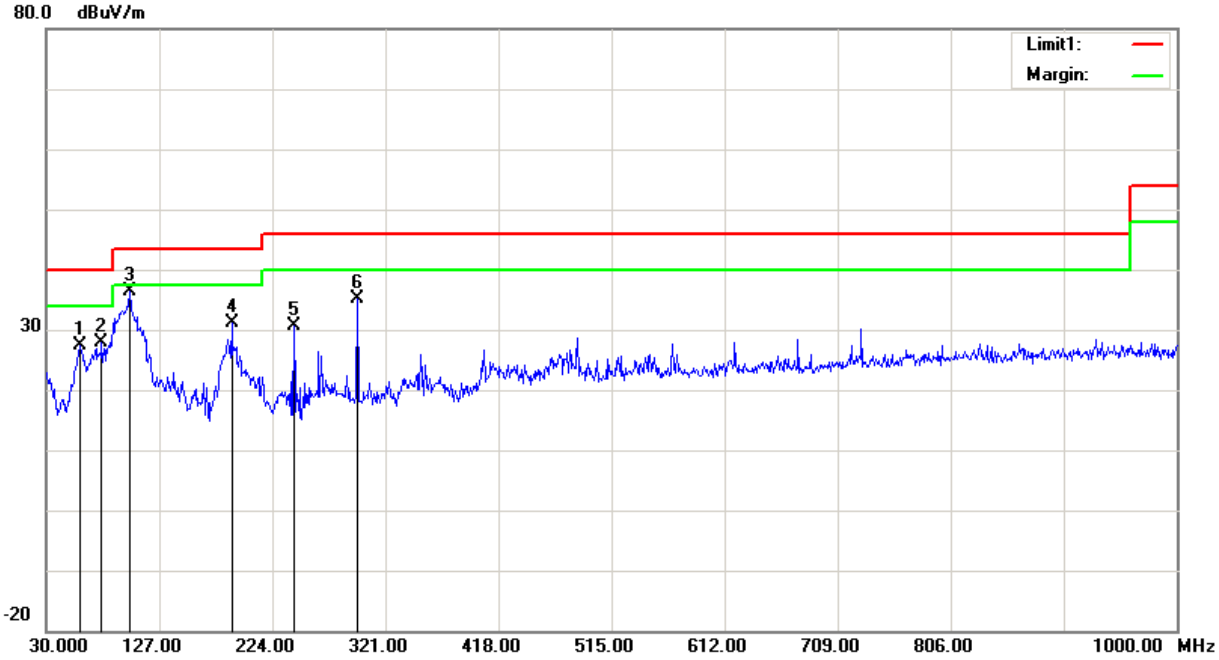
2) 30MHz-1GHz(All Radar Modules transmit simultaneously)

Project No:	SZ1240322-14909E-RF
Test Engineer:	Zoo Zou
Test Date:	2024-5-5
Polarization:	Horizontal
Test Mode:	Transmitting
Power Source:	DC 14.88V



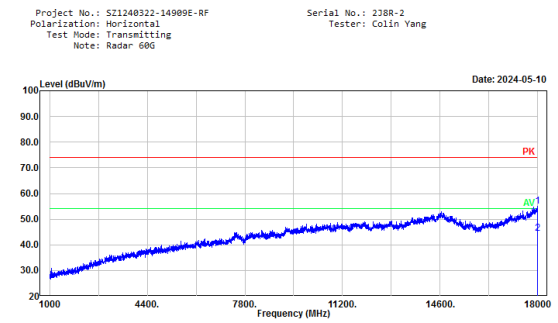
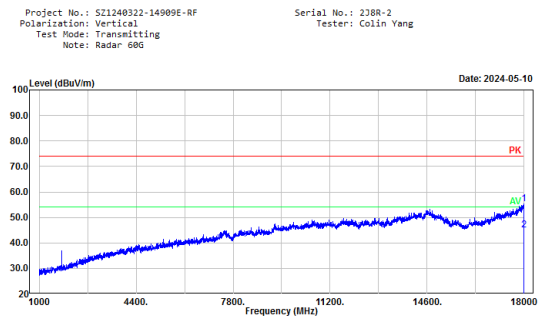
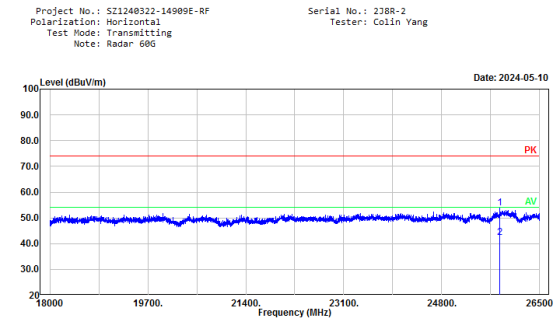
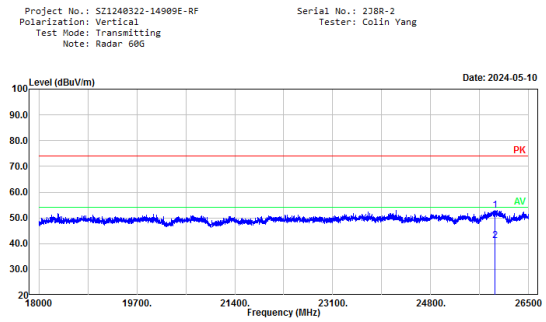
No.	Frequency (MHz)	Reading (dBµV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	58.1300	45.66	peak	-16.76	28.90	40.00	11.10
2	75.5900	46.67	peak	-16.20	30.47	40.00	9.53
3	98.8700	50.48	QP	-14.68	35.80	43.50	7.70
4	189.0800	52.89	QP	-12.19	40.70	43.50	2.80
5	242.4300	49.83	peak	-11.67	38.16	46.00	7.84
6	296.7500	50.51	QP	-9.61	40.90	46.00	5.10

Project No:	SZ1240322-14909E-RF
Test Engineer:	Zoo Zou
Test Date:	2024-5-5
Polarization:	Vertical
Test Mode:	Transmitting
Power Source:	DC 14.88V



No.	Frequency (MHz)	Reading (dBµV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	59.1000	44.10	peak	-16.70	27.40	40.00	12.60
2	77.5300	44.21	peak	-16.29	27.92	40.00	12.08
3	101.7800	50.25	peak	-13.93	36.32	43.50	7.18
4	189.0800	43.43	peak	-12.19	31.24	43.50	12.26
5	242.4300	42.30	peak	-11.67	30.63	46.00	15.37
6	296.7500	44.80	peak	-9.61	35.19	46.00	10.81

2) 1GHz-40GHz(All Radar Modules transmit simultaneously):

Horizontal	Vertical
	
	

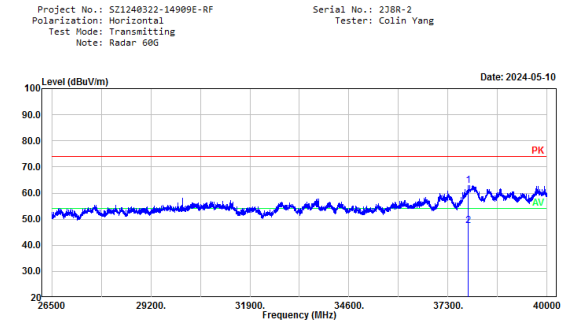
No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	17996.60	46.99	8.11	55.10	74.00	18.90	Peak
2	17996.60	36.37	8.11	44.48	54.00	9.52	Average

No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	17993.20	47.19	8.09	55.28	74.00	18.72	Peak
2	17993.20	36.83	8.09	44.92	54.00	9.08	Average

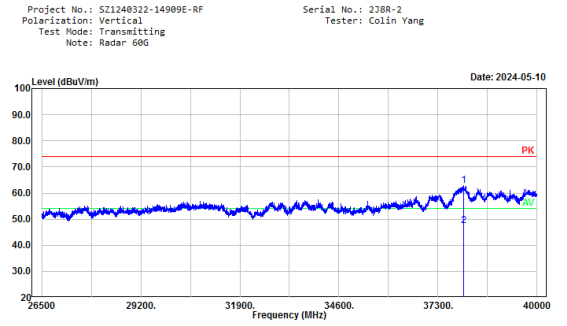
No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	25804.70	43.27	10.49	53.76	74.00	20.24	Peak
2	25804.70	31.98	10.49	42.47	54.00	11.53	Average

No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	25913.50	42.30	10.70	53.00	74.00	21.00	Peak
2	25913.50	30.36	10.70	41.06	54.00	12.94	Average

Horizontal	Vertical



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	37848.10	45.61	17.20	62.81	74.00	11.19	Peak
2	37848.10	30.14	17.20	47.34	54.00	6.66	Average



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	37999.30	44.95	17.93	62.88	74.00	11.12	Peak
2	37999.30	29.46	17.93	47.39	54.00	6.61	Average

3) 40GHz-200GHz:

Top Radar:

Frequency (GHz)	Receiver Reading (dBμV)	Polar (H/V)	Factor (dB/m)	Field Strength (dBμV/m)	Power Density (pW/cm^2)	Limit (pW/cm^2)
40.360	53.62	H	38.85	82.93	52.08	90.00
41.320	54.59	V	39.00	84.05	67.40	90.00
90.870	54.65	H	45.21	84.30	71.39	90.00
91.660	54.87	V	45.31	84.62	76.85	90.00

Front Radar:

Frequency (GHz)	Receiver Reading (dBμV)	Polar (H/V)	Factor (dB/m)	Field Strength (dBμV/m)	Power Density (pW/cm^2)	Limit (pW/cm^2)
40.660	52.84	H	38.89	82.19	43.92	90.00
40.150	53.62	V	38.81	82.89	51.60	90.00
90.500	53.11	H	45.17	82.72	49.62	90.00
90.810	54.08	V	45.21	83.73	62.61	90.00

Rear Radar:

Frequency (GHz)	Receiver Reading (dBμV)	Polar (H/V)	Factor (dB/m)	Field Strength (dBμV/m)	Power Density (pW/cm^2)	Limit (pW/cm^2)
40.580	53.22	H	38.88	82.56	47.83	90.00
41.650	53.14	V	39.05	82.65	48.83	90.00
90.320	54.08	H	45.15	83.67	61.75	90.00
90.180	54.60	V	45.13	84.17	69.29	90.00

Note:
Factor = Antenna Factor
Field Strength = Reading + Factor + 20log(d_{Meas}/$d_{SpecLimit}$)
d_{Meas} is the measurement distance, in m
$d_{SpecLimit}$ is the distance specified by the limit, in m

$$PD = \frac{E_{SpecLimit}^2}{377}$$

where

PD is the power density at the distance specified by the limit, in W/m^2
$E_{SpecLimit}$ is the field strength at the distance specified by the limit, in V/m

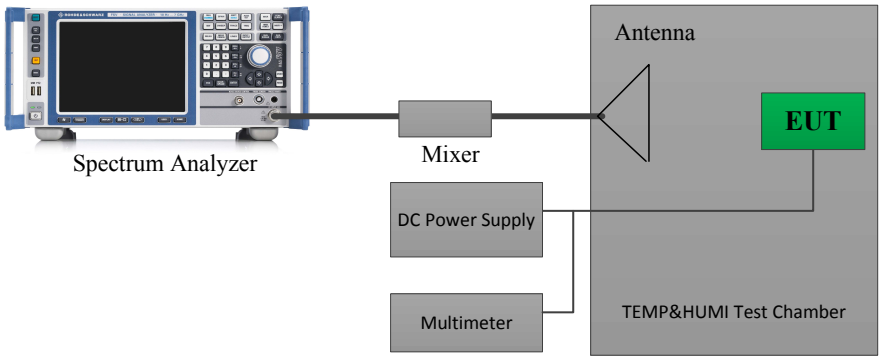
4.5 Frequency Stability

4.5.1 Applicable Standard

FCC §15.255(f)

(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.

4.5.2 EUT Setup Block Diagram



4.5.3 Test Procedure

Refer to ANSI C63.10-2020 Clauses 9.5.

The following procedure shall be used for determining frequency stability of millimeter-wave systems:

a) Arrange EUT and test equipment as shown in Figure 23. Suitable temperature chambers have a window or other opening that permits locating the receive antenna and instrumentation outside the chamber.

b) Install an RF transparent foam plug in the chamber opening.

c) As applicable, install RF absorber sheets on the inside walls of the chamber, particularly in any areas illuminated by the EUT antenna beam.

d) With the EUT at ambient temperature (approximately 25 °C) and voltage source set to the EUT nominal operating voltage (100%), record the frequency excursion of the spectrum mask of the EUT emission on the spectrum analyzer. Alternatively, if the EUT has a test mode to transmit a CW frequency, the frequency can be measured using the spectrum analyzer's internal frequency count function.

e) Follow the test methods of 6.8

e) Repeat step d) at each 10 °C increment down to −20 °C.

4.5.4 Test Result

Serial Number:	2J8R-2	Test Date:	2024/12/22
Test Site:	RF	Test Mode:	Transmitting
Tester:	Bill Yang	Test Result:	Pass

Environmental Conditions:					
Temperature: (℃)	20.8	Relative Humidity: (%)	32	ATM Pressure: (kPa)	102.4

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Waveguide Mixer	11970V	2521A011767	2023/2/16	2026/2/15
Flann Micowave	Horn Antenna	861V/385	736	2023/2/27	2026/2/26
Agilent	Spectrum Analyzer	E4440A	MY44303352	2024/10/22	2025/10/21
Resenberger	Coaxial Cable	LU7-022-1000	0031	2024/3/1	2025/2/28
Resenberger	Coaxial Cable	LU7-022-1000	0032	2024/3/1	2025/2/28
BACL	TEMP&HUMI Test Chamber	BTH-150-40	30173	2024/9/6	2025/9/5
All-sun	Clamp Meter	EM305A	8348897	2024/8/16	2025/8/15
TDK-Lambda	DC Power Supply	Z+60-14	F-08-EM038-1	N/A	N/A

** Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

Test Data:

Front Radar:

Temperature	Voltage	Frequency (GHz)			
℃	V_{DC}	f_L	f_H	f_L Limit	f_H Limit
-20	47.4	62.7732	63.2922	60	64
-10	47.4	62.7731	63.2921	60	64
0	47.4	62.7733	63.2924	60	64
10	47.4	62.7734	63.2924	60	64
20	47.4	62.7730	63.2922	60	64
30	47.4	62.7734	63.2923	60	64
40	47.4	62.7737	63.2925	60	64
50	47.4	62.7736	63.2922	60	64
20	40.3	62.7735	63.2926	60	64
20	54.5	62.7738	63.2927	60	64

Top Radar:

Temperature	Voltage	Frequency (GHz)			
℃	V_{DC}	f_L	f_H	f_L Limit	f_H Limit
-20	47.4	60.6251	61.3437	60	64
-10	47.4	60.6254	61.3435	60	64
0	47.4	60.6253	61.3433	60	64
10	47.4	60.6253	61.3437	60	64
20	47.4	60.6258	61.3433	60	64
30	47.4	60.6252	61.3437	60	64
40	47.4	60.6258	61.3434	60	64
50	47.4	60.6255	61.3433	60	64
20	40.3	60.6255	61.3432	60	64
20	54.5	60.6258	61.3438	60	64

Rear Radar:

Temperature	Voltage	Frequency (GHz)			
℃	V_{DC}	f_L	f_H	f_L Limit	f_H Limit
-20	47.4	60.0691	60.4923	60	64
-10	47.4	60.0692	60.4924	60	64
0	47.4	60.0691	60.4927	60	64
10	47.4	60.0695	60.4924	60	64
20	47.4	60.0697	60.4928	60	64
30	47.4	60.0697	60.4923	60	64
40	47.4	60.0695	60.4921	60	64
50	47.4	60.0696	60.4924	60	64
20	40.3	60.0696	60.4925	60	64
20	54.5	60.0697	60.4922	60	64

Note: The Voltage range was declared by manufacturer▲.

4.6 Operation Restriction and Group Installation

4.6.1 Applicable Standard

§15.255 (a) General. Operation under the provisions of this section is not permitted for equipment used on satellites.

§15.255 (b) Operation on aircraft. Operation on aircraft is permitted under the following conditions:

(1) When the aircraft is on the ground.

(2) While airborne, only in closed exclusive on-board communication networks within the aircraft, with the following exceptions:

(i) Equipment shall not be used in wireless avionics intra-communication (WAIC) applications where external structural sensors or external cameras are mounted on the outside of the aircraft structure.

(ii) Except as permitted in paragraph (b)(3) of this section, equipment shall not be used on aircraft where there is little attenuation of RF signals by the body/fuselage of the aircraft.

(iii) Field disturbance sensor/radar devices may only operate in the frequency band 59.3–71.0 GHz while installed in passengers' personal portable electronic equipment (e.g., smartphones, tablets) and shall comply with paragraph (b)(2)(i) of this section, and relevant requirements of paragraphs (c)(2) through (c)(4) of this section.

(3) Field disturbance sensors/radar devices deployed on unmanned aircraft may operate within the frequency band 60–64 GHz, provided that the transmitter not exceed 20 dBm peak EIRP. The sum of continuous transmitter off-times of at least two milliseconds shall equal at least 16.5 milliseconds within any contiguous interval of 33 milliseconds. Operation shall be limited to a maximum of 121.92 meters (400 feet) above ground level.

§15.255 (h) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

4.6.2 Result

15.255(a), the device is a unmanned aircraft. Not used on satellites.

15.255(b)(1), the Radar Operation on aircraft when the aircraft is on the ground.

15.255(b)(2), not applicable, the device is a unmanned aircraft.

15.255(b)(3), Operation be limited to a maximum of 121.92 meters (400 feet) above ground level. Please refer to the user manual.

§15.255 (h), No equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

4.7 Antenna Requirement

4.7.1 Applicable Standard

FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.
c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

4.7.2 Judgment

Please refer to the Antenna Information detail in Section 1.3.

APPENDIX A - EUT PHOTOGRAPHS

Please refer to the attachment SZ1240322-14909E-RF-EXP EUT external photographs and SZ1240322-14909E-RF-INP EUT internal photographs.

APPENDIX B - TEST SETUP PHOTOGRAPHS

Please refer to the attachment SZ1240322-14909E-RF-00B-TSP test setup photographs.

******* END OF REPORT *******