

TEST REPORT

Applicant: Shenzhen Huatai Electronics Co., Ltd
Address: Room 1703, Building A, Yonghuayuan Business Building, No. 6 Baotian Second Road, Chengtian Community, Xixiang Street, Shenzhen, Guangdong Province, China
Equipment Type: mmWave Reversing Radar
Model Name: RA2 (refer to section 2.3)
Brand Name: N/A
FCC ID: 2BDGIRA2
Test Standard: 47 CFR Part 15 Subpart C (refer to section 3.1)
Sample Arrival Date: Apr. 30, 2026
Test Date: May 26, 2026 - May 27, 2026
Date of Issue: Jun. 12, 2026

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

**Tested by:** Alex Zheng**Checked by:** Li Ganming**Approved by:** Tolan Tu

(Testing Director)

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Jun. 12, 2026</u>	<u>Initial Issue</u>

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	601, Building 2, Intelligent Connected Vehicle Industrial Park, No.55, Xiangshan Road, Luotian Community, Yanluo Sub-district, Bao'an District, Shenzhen
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☒ Building 2, Intelligent Connected Vehicle Industrial Park, No.55, Xiangshan Road, Luotian Community, Yanluo Sub-district, Bao'an District, Shenzhen, Guangdong
	☐ 1/F., Building B, Ganghongji High-Tech Intelligent Industrial Park, No.1008, Songbai Road, Yangguang Community, Xili Subdistrict, Nanshan District, Shenzhen, Guangdong
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Shenzhen Huatai Electronics Co., Ltd
Address	Room 1703, Building A, Yonghuayuan Business Building, No. 6 Baotian Second Road, Chengtian Community, Xixiang Street, Shenzhen, Guangdong Province, China

2.2 Manufacturer Information

Manufacturer	Shenzhen Huatai Electronics Co., Ltd
Address	Room 1703, Building A, Yonghuayuan Business Building, No. 6 Baotian Second Road, Chengtian Community, Xixiang Street, Shenzhen, Guangdong Province, China

2.3 General Description for Equipment under Test (EUT)

EUT Name	mmWave Reversing Radar
Model Name Under Test	RA2
Series Model Name	RA3, RA4, RA5
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name and shell color. (this information provided by the applicant)
Hardware Version	V1.0
Software Version	V1.0
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.4 Technical Information

Network and Wireless connectivity	FMCW, 433MHz
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The requirement for the following technical information of the EUT was tested in this report:

Modulation Type	FSK
Product Type	☐ Mobile ☐ Portable ☒ Fix Location
Operating Frequency	433.92 MHz
Antenna Type	Integral Antenna
Antenna Gain	-5.04 dBi

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C	Intentional Radiators
2	ANSI C63.10-2020	American National Standard for Procedures for Compliance Testing of Unlicensed Wireless Devices

3.2 Test Verdict

No.	Description	FCC Part No.	Test Result	Verdict
1	Antenna Requirement	15.203	--	Pass ^{Note1}
2	Conducted Emission	15.207	ANNEX A.1	N/A ^{Note2}
3	20 dB Bandwidth	15.231(c)	ANNEX A.2	Pass
4	Duty Cycle	15.35	ANNEX A.3	Pass
5	Field Strength of Fundamental Emissions	15.231(b)	ANNEX A.4	Pass
6	Radiated Emissions	15.209 15.231(b)	ANNEX A.5	Pass
7	Transmitting Time	15.231(a)	ANNEX A.6	Pass

Note 1: Please refer to section 5.1.

Note 2: The EUT is a vehicle equipment, so the Conducted Emission test is not applicable.

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	49% to 65%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+22.1°C to +25.1°C
Working Voltage of the EUT	NV (Normal Voltage)	12 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	KEYSIGHT	N9020A	MY54432240	2026.03.24	2027.03.23
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	00884	2025.03.01	2028.02.29
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	01631	2025.02.22	2028.02.21
Anechoic Chamber	EMC Electronic Co, Ltd	9m*6m*6m	213	2026.03.03	2028.03.02

4.3 Measurement Uncertainty

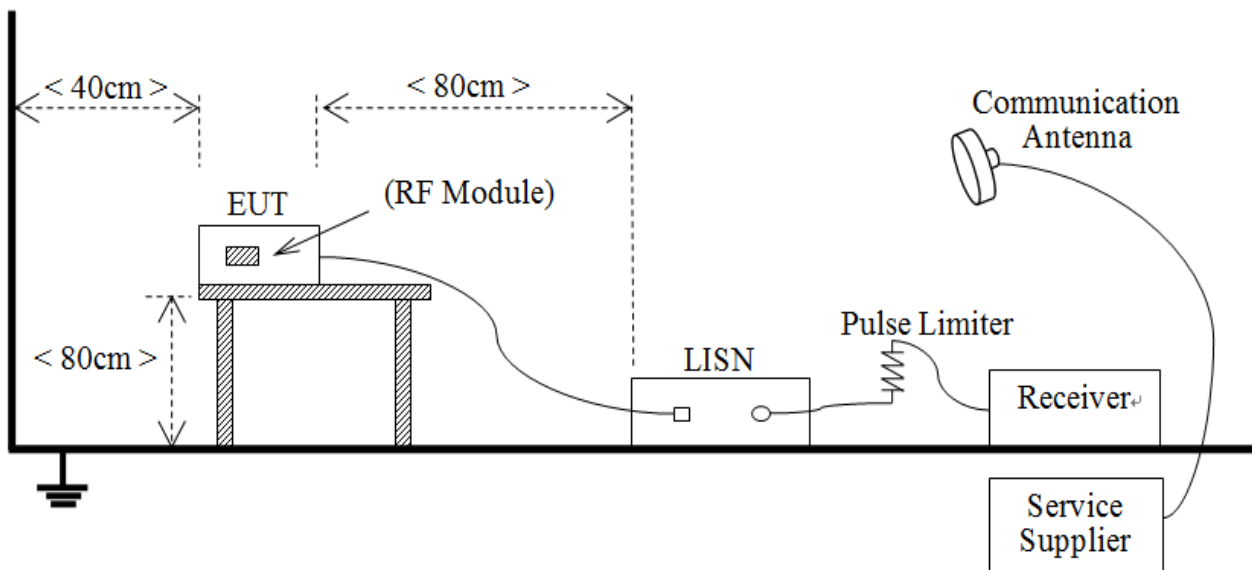
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Parameters	Uncertainty
Occupied Channel Bandwidth	2.8%
RF output power, conducted	1.28 dB
Power Spectral Density, conducted	1.30 dB
Unwanted Emissions, conducted	1.84 dB
All emissions, radiated	5.36 dB
Temperature	0.8°C
Humidity	4%

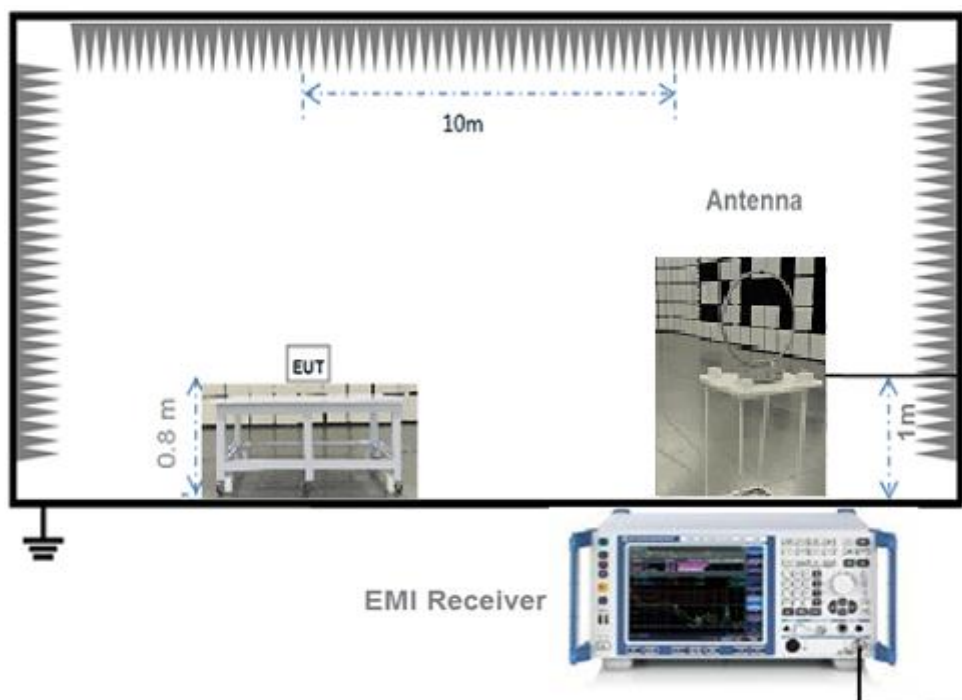
4.4 Description of Test Setup

4.4.1 For AC Power Supply Port Test



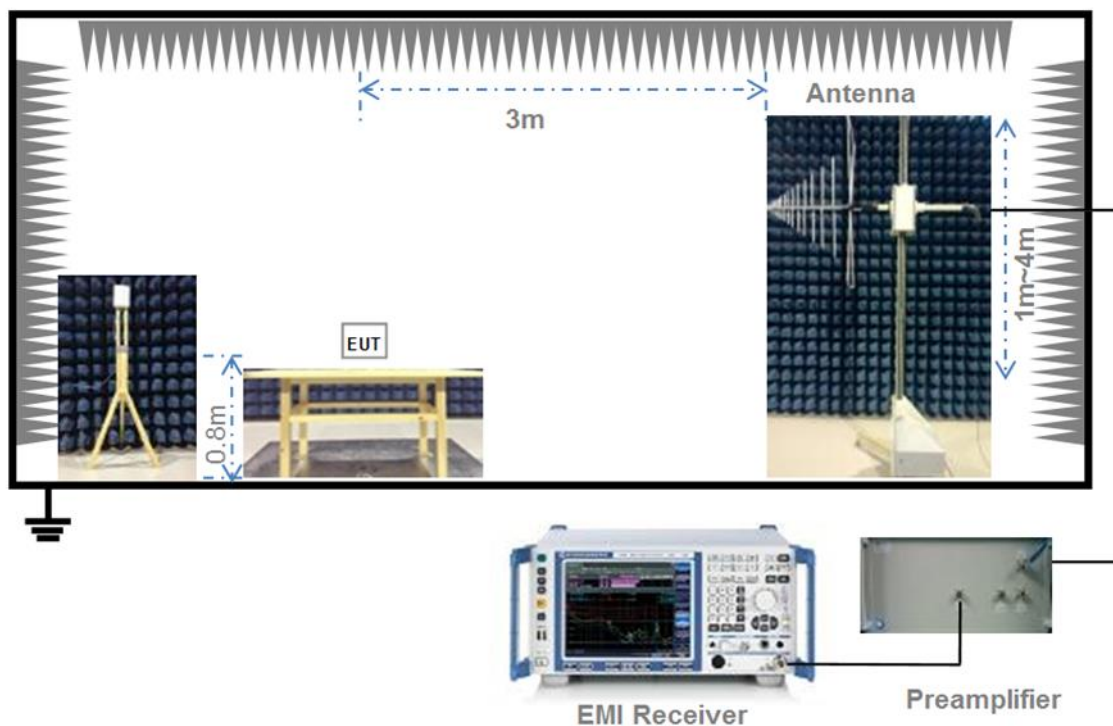
(Diagram 2)

4.4.2 For Radiated Test (Below 30 MHz)



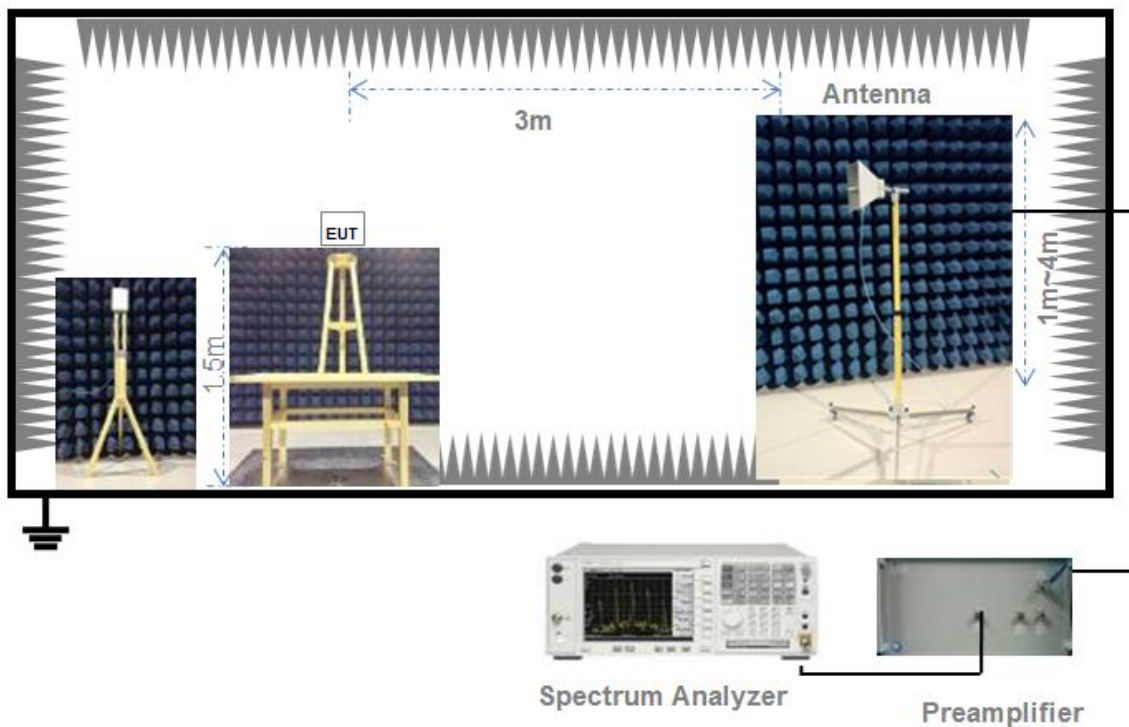
(Diagram 3)

4.4.3 For Radiated Test (30 MHz-1 GHz)



(Diagram 4)

4.4.4 For Radiated Test (Above 1 GHz)



(Diagram 5)

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Relevant Standards

FCC §15.203 & 15.247(b)

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 use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. 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 FCC rule.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the product.	An embedded-in antenna design is used.

Reference Documents	Item
Photo	Please refer to the EUT Photo documents.

5.1.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

5.2 Conducted Emission

5.2.1 Limit

FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.2.2 Test Setup

See section 4.4.1 for test setup description for the AC power supply port. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.2.4 Test Result

Please refer to ANNEX A.1.

5.3 20 dB Bandwidth

5.3.1 Limit

FCC §15.231

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

5.3.2 Test Setup

See section 4.4.3 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

Use the following spectrum analyzer settings:

Span = two times and five times the OBW

RBW = 1% to 5% of the OBW

VBW $\geq$ three times RBW

Sweep = auto

Detector function = peak

Trace = max hold

5.3.4 Test Result

Please refer to ANNEX A.2.

5.4 Field Strength of Fundamental Emissions and Radiated Emissions

5.4.1 Limit

FCC §15.231 & §15.209

According to FCC section 15.231(b), In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	¹ 1250 to 3750	125 to 375
174-260	3750	375
260-470	¹ 3750 to 12500	375 to 1250
Above 470	12500	1250

¹Linear interpolations.

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)
0.009 - 0.490	2400/F(kHz)
0.490 - 1.705	24000/F(kHz)
1.705 - 30.0	30
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

Note:

- For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.4.2 Test Setup

See section 4.4.2 to 4.4.4 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented. The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

5.4.4 Test Result

Please refer to ANNEX A.4 & A.5.

5.5 Transmitting Time

5.5.1 Limit

FCC §15.231

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

5.5.2 Test Setup

See section 4.4.3 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

The EUT transmitter was activated, the spectrum analyzer single sweep was triggered while a command on the EUT was activated and plots were captured

5.5.4 Test Result

Please refer to ANNEX A.6.

ANNEX A TEST RESULT

A.1 Conducted Emissions

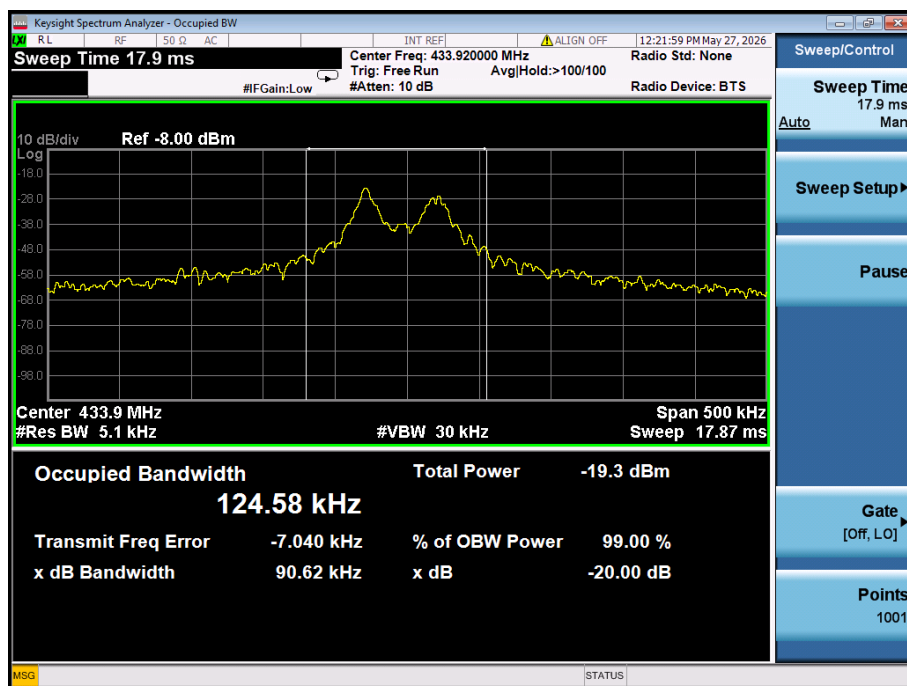
Note: Not applicable.

A.2 20 dB Bandwidth

Test Data

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Verdict
433.92	124.58	1084.8	Pass

Test Plots

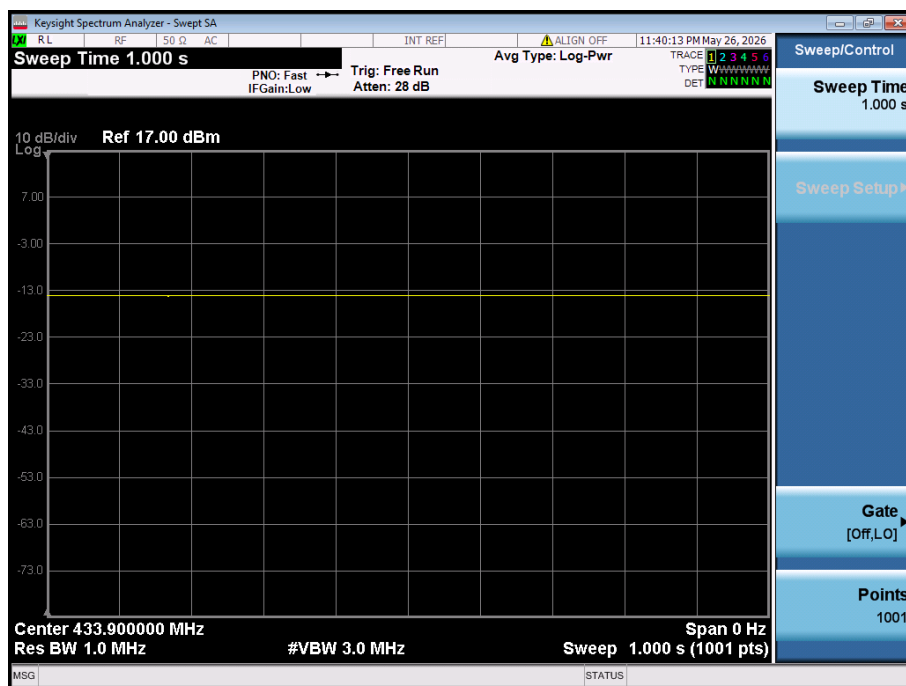


A.3 Duty cycle

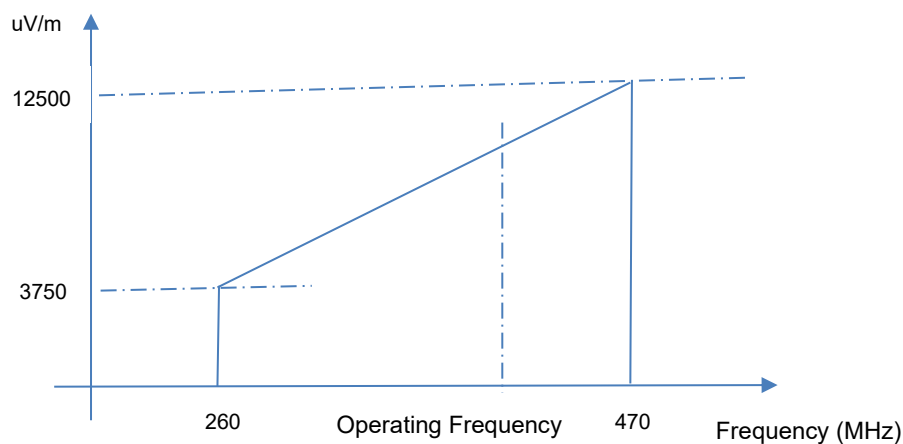
Test Data

Data Transmissions	
Duty cycle correction factor	$20 \cdot \log(1) = 0$ dB

Test Plots



A.4 Field Strength of Fundamental Emissions



The Field Strength of Fundamental Emissions (Operating Frequency) is:

$$3750 \text{ uV/m} = 20 \cdot \log(3750) \text{ dBuV/m} = 71.48 \text{ dBuV/m}$$

$$12500 \text{ uV/m} = 20 \cdot \log(12500) \text{ dBuV/m} = 81.94 \text{ dBuV/m}$$

Test Data

Field Strength of Fundamental Emissions and Field strength of spurious emissions Value					
Operating Frequency (MHz)	Field Strength (dBuV/m)	Detector	Limit @3m (dBuV/m)	Margin (dB)	Antenna
433.908	54.38	PEAK	100.8	46.42	Horizontal
	69.68	PEAK	100.8	31.12	Vertical
	54.38	AVERAGE	80.8	26.42	Horizontal
	69.68	AVERAGE	80.8	11.12	Vertical
867.789	51.62	PEAK	80.8	29.18	Horizontal
	41.15	PEAK	80.8	39.65	Vertical
	51.62	AVERAGE	60.8	9.18	Horizontal
	41.15	AVERAGE	60.8	19.65	Vertical

A.5 Radiated Emission

Note ¹: The symbol of “--” in the table which means not application.

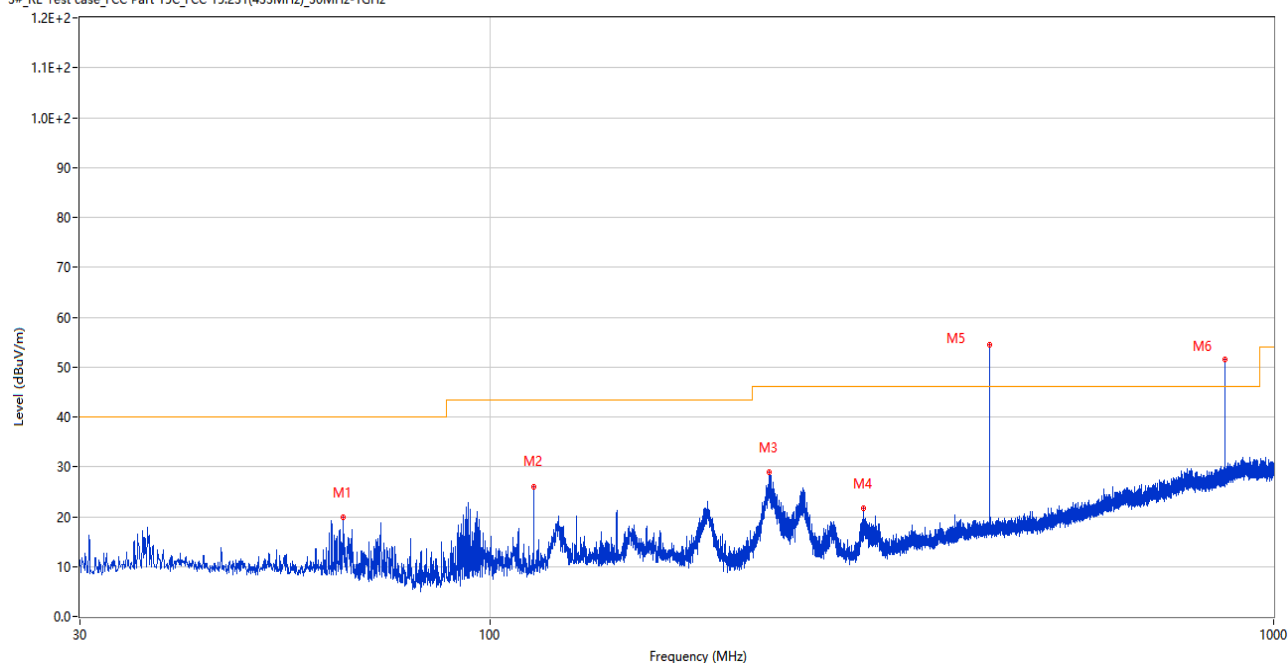
Note ²: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Note ³: The verdict please refer to the A.3 field strength of fundamental emissions and field strength of spurious emissions value.

Test Data and Plots

30 MHz to 1 GHz, ANT H

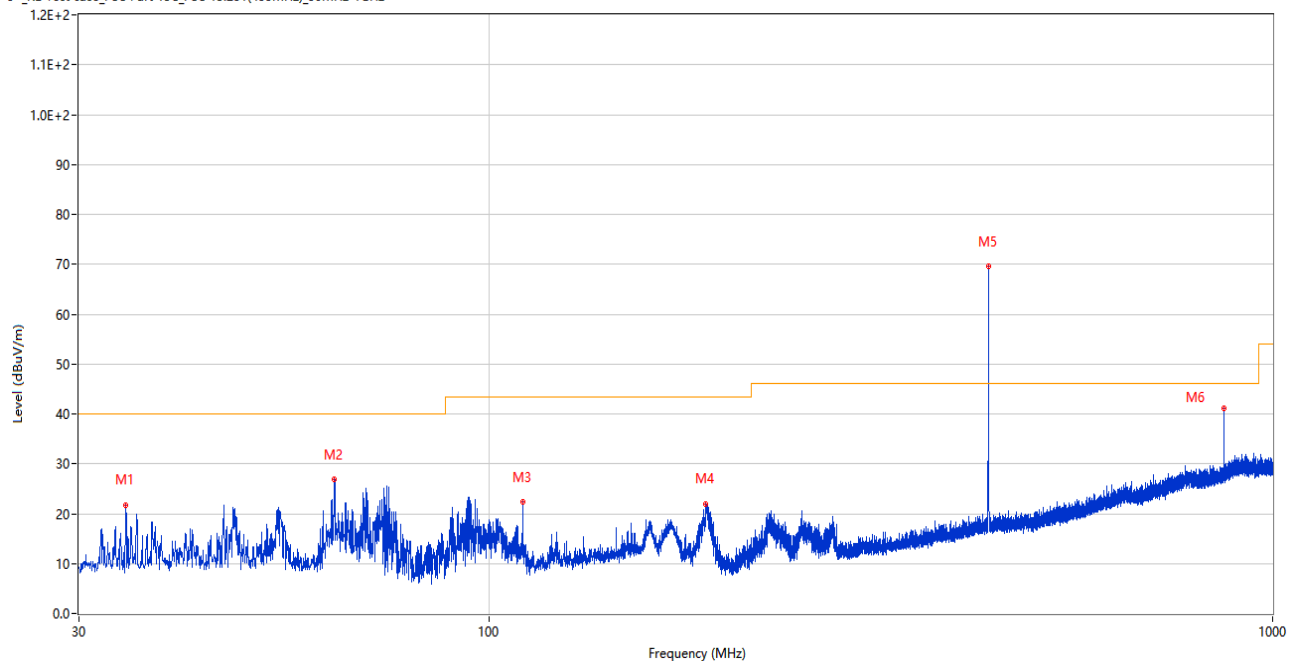
3#_RE Test case_FCC Part 15C_FCC 15.231(433MHz)_30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	65.066	19.96	40.0	20.04	Peak	107.00	150	Horizontal	Pass
2	113.759	26.09	43.5	17.41	Peak	126.00	150	Horizontal	Pass
3	227.007	28.93	46.0	17.07	Peak	126.00	150	Horizontal	Pass
4	300.097	21.68	46.0	24.32	Peak	229.00	150	Horizontal	Pass
5	433.908	54.38	100.8	46.42	Peak	333.00	150	Horizontal	Pass
5*	433.908	54.38	80.8	26.42	AV	333.00	150	Horizontal	Pass
6	867.789	51.62	80.8	29.18	Peak	224.00	150	Horizontal	Pass
6*	867.789	51.62	60.8	9.18	AV	224.00	150	Horizontal	Pass

30 MHz to 1 GHz, ANT V

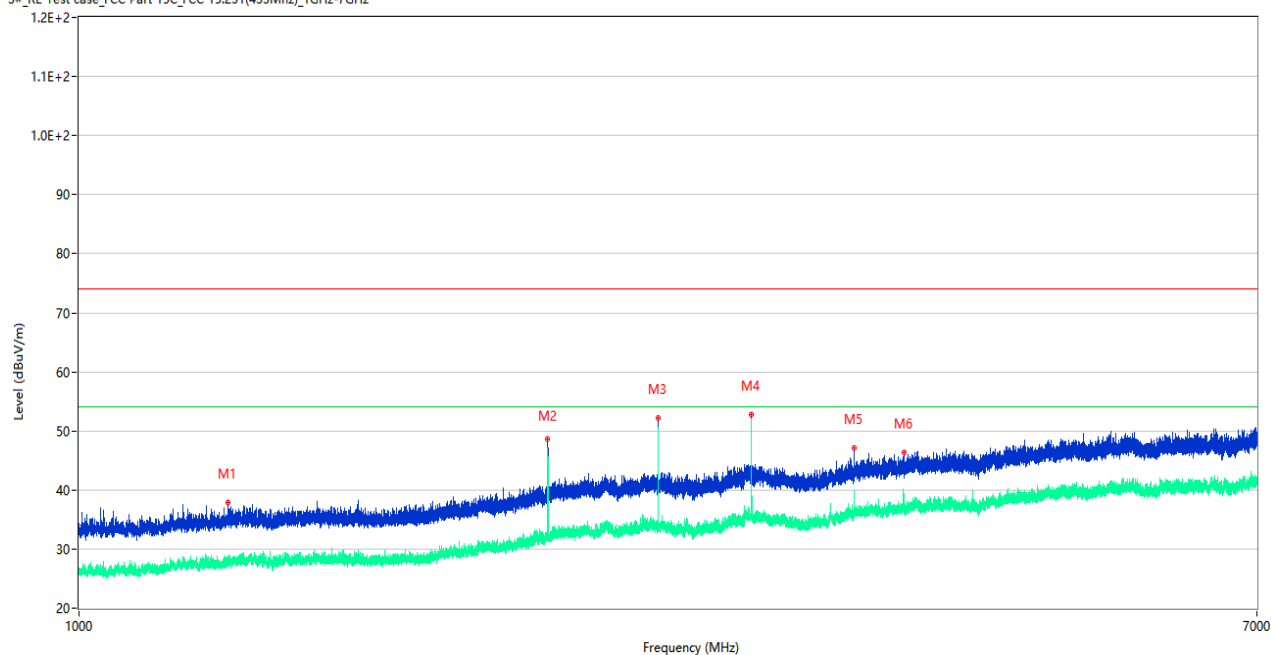
3#_RE Test case_FCC Part 15C_FCC 15.231(433MHz)_30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	34.413	21.80	40.0	18.20	Peak	142.00	150	Vertical	Pass
2	63.562	26.85	40.0	13.15	Peak	17.00	150	Vertical	Pass
3	110.413	22.35	43.5	21.15	Peak	314.00	150	Vertical	Pass
4	189.322	22.03	43.5	21.47	Peak	96.00	150	Vertical	Pass
5	433.908	69.68	100.8	31.12	Peak	316.00	150	Vertical	Pass
5*	433.908	69.68	80.8	11.12	AV	316.00	150	Vertical	Pass
6	867.789	41.15	80.8	39.65	Peak	96.00	150	Vertical	Pass
6*	867.789	41.15	60.8	19.65	AV	96.00	150	Vertical	Pass

1 GHz to 7 GHz, ANT H

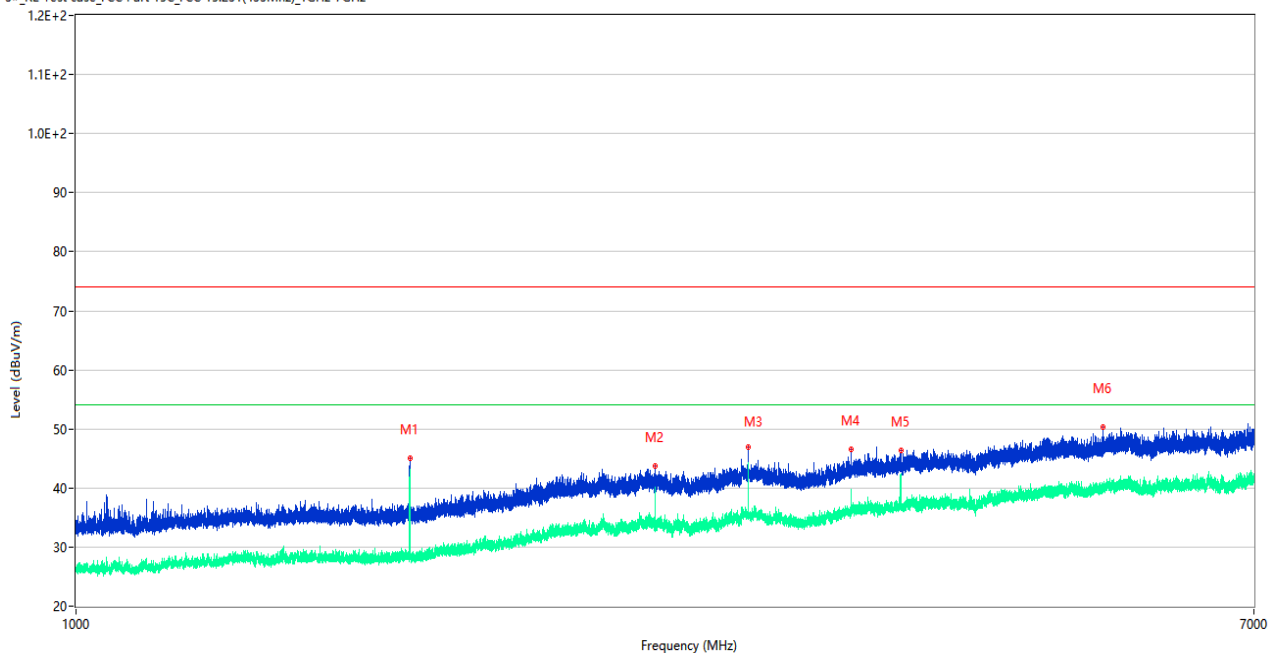
3#_RE Test case_FCC Part 15C_FCC 15.231(433MHz)_1GHz-7GHz



No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1278.400	37.83	74.0	36.17	Peak	62.00	150	Horizontal	Pass
1**	1278.400	27.21	54.0	26.79	AV	62.00	150	Horizontal	Pass
2	2169.500	48.58	80.8	32.22	Peak	123.00	150	Horizontal	Pass
2**	2169.500	48.58	60.8	12.22	AV	123.00	150	Horizontal	Pass
3	2603.200	52.18	80.8	28.62	Peak	234.00	150	Horizontal	Pass
3**	2603.200	52.18	60.8	8.62	AV	234.00	150	Horizontal	Pass
4	3037.200	52.70	80.8	28.1	Peak	212.00	150	Horizontal	Pass
4**	3037.200	52.70	60.8	8.1	AV	212.00	150	Horizontal	Pass
5	3599.800	47.03	80.8	33.77	Peak	54.00	150	Horizontal	Pass
5**	3599.800	47.03	60.8	13.77	AV	54.00	150	Horizontal	Pass
6	3906.200	46.29	80.8	34.51	Peak	313.00	150	Horizontal	Pass
6**	3906.200	46.29	60.8	14.51	AV	313.00	150	Horizontal	Pass

1 GHz to 7 GHz, ANT V

3#_RE Test case_FCC Part 15C_FCC 15.231(433Mhz)_1GHz-7GHz



No.	Frequency (MHz)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1735.700	45.03	80.8	35.77	Peak	73.00	150	Vertical	Pass
1**	1735.700	45.03	60.8	15.77	AV	73.00	150	Vertical	Pass
2	2603.300	43.65	80.8	37.15	Peak	184.00	150	Vertical	Pass
2**	2603.300	43.65	60.8	17.15	AV	184.00	150	Vertical	Pass
3	3037.400	46.85	80.8	33.95	Peak	145.00	150	Vertical	Pass
3**	3037.400	46.85	60.8	13.95	AV	145.00	150	Vertical	Pass
4	3599.800	46.64	80.8	34.16	Peak	327.00	150	Vertical	Pass
4**	3599.800	46.64	60.8	14.16	AV	327.00	150	Vertical	Pass
5	3905.600	46.42	80.8	34.38	Peak	43.00	150	Vertical	Pass
5**	3905.600	46.42	60.8	14.38	AV	43.00	150	Vertical	Pass
6	5458.400	50.41	74.0	23.59	Peak	303.00	150	Vertical	Pass
6**	5458.400	40.68	54.0	13.32	AV	303.00	150	Vertical	Pass

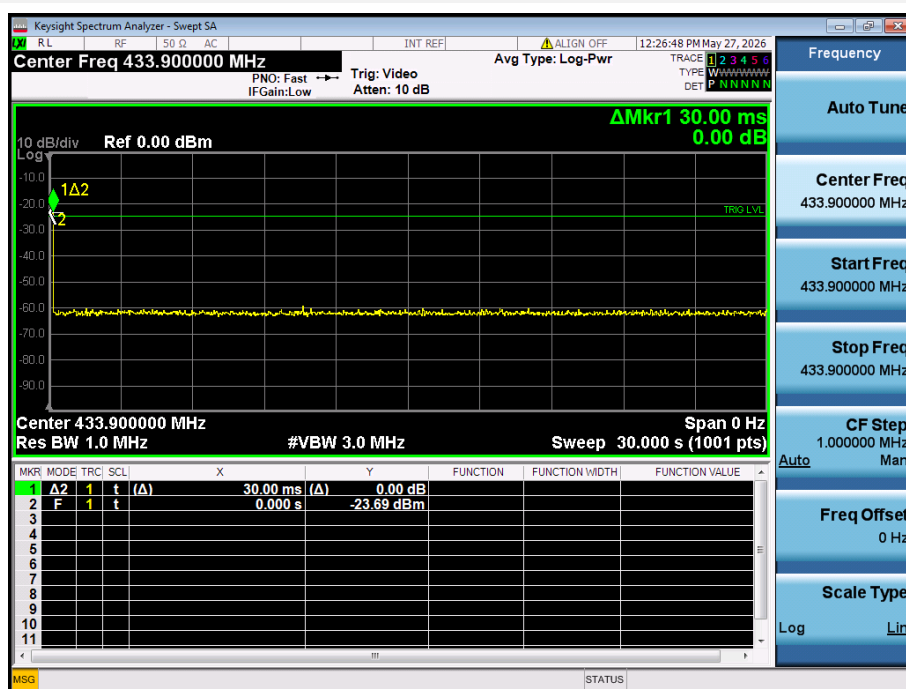
A.6 Transmitter Time

Test Plots

The active time is less than 1 seconds. 30 times the active time ($0.03 \text{ s} \times 30 = 0.9 \text{ s}$) is below 10 s, hence the silent period limit applies as 10 s.

Frequency (MHz)	Active time (s)	Limit (s)	Silent period (s)	Limit (s)	Verdict
433.90	0.03	1	29.97	10s	Pass

Active time



ANNEX B TEST SETUP PHOTOS

Please refer the document “Ti-EE26040395-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “Ti-EE26040395-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “Ti-EE26040395-AI.PDF”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
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4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the "inspection and testing dedicated stamp" or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
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7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--