

TEST REPORT

Product Name : Gravio Multi Sensor Gen 1.0
Brand Name : Gravio
Model : GMS9218
Series Model : N/A
Applicant : **Asteria Technology Pte. Ltd.**
Address : 160 ROBINSON ROAD, #19-05 SBF CENTERSINGAPORE 068914
Manufacturer : **Asteria Technology Pte. Ltd.**
Address : 160 ROBINSON ROAD, #19-05 SBF CENTERSINGAPORE 068914
Standard(s) : Article 2, paragraph 1, item 8
Date of Receipt : Mar. 04, 2025
Date of Test : Mar. 04, 2025~ Mar. 30, 2025
Issued Date : Mar. 31, 2025

Issued By: **Guangdong Asia Hongke Test Technology Limited**
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Reviewed by:

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Note: This device has been tested and found to comply with the standard(s) listed, this test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory. This report shall not be reproduced except in full, without the written approval of Guangdong Asia Hongke Test Technology Limited. If there is a need to alter or revise this document, the right belongs to Guangdong Asia Hongke Test Technology Limited, and it should give a prior written notice of the revision document. This test report must not be used by the client to claim product endorsement.

**Report Revise Record**

Report Version	Issued Date	Notes
M1	Mar. 31, 2025	Initial Release

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1 TEST SUMMARY

1.1 Test Standards

The tests were performed according to following standards:

[MIC Notice No.88 Appendix No.22-16](#)

1.2 Test Summary

Test Item	Result
Frequency Error	Pass
Occupied Bandwidth	Pass
Antenna Output Power and Output Power Tolerance	Pass
Unwanted Emission Strength	Pass
Secondary Radiated Emission Strength	Pass
Construction protection method	Pass
Interference Prevention Function	Pass
Antenna Structure	Pass

1.3 Test Facility

Test Laboratory:

Guangdong Asia Hongke Test Technology Limited

B1/F, Building 11, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

The test facility is recognized, certified or accredited by the following organizations:

FCC-Registration No.: 251906 Designation Number: CN1376

Guangdong Asia Hongke Test Technology Limited has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

IC —Registration No.: 31737 CAB identifier: CN0165

The 3m Semi-anechoic chamber of Guangdong Asia Hongke Test Technology Limited has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 31737

A2LA-Lab Cert. No.: 7133.01

Guangdong Asia Hongke Test Technology Limited has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

1.4 Measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16 - 4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the Guangdong Asia Hongke Test Technology Limited's quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Asia Hongke laboratory is reported:

Test	Measurement Uncertainty	Notes
Power Line Conducted Emission	9KHz~30MHz ± 1.20 dB	(1)
Radiated Emission	9KHz~30MHz ± 3.10 dB	(1)
Radiated Emission	30MHz~1GHz ± 3.75 dB	(1)
Radiated Emission	1GHz~18GHz ± 3.88 dB	(1)
Radiated Emission	18GHz~40GHz ± 3.88 dB	(1)
Radiated Emission	40GHz~60GHz ± 4.92 dB	(1)
Radiated Emission	60GHz~90GHz ± 5.16 dB	(1)
Radiated Emission	90GHz~100GHz ± 5.64 dB	(1)
RF power, conducted	30MHz~6GHz ± 0.16 dB	(1)
RF power density, conducted	± 0.24 dB	(1)
Spurious emissions, conducted	± 0.21 dB	(1)
Temperature	$\pm 1^{\circ}\text{C}$	(1)
Humidity	$\pm 3\%$	(1)
DC and low frequency voltages	$\pm 1.5\%$	(1)
Time	$\pm 2\%$	(1)
Duty cycle	$\pm 2\%$	(1)
Bandwidth	$\pm 1.5 \times 10^{-6}$	(1)

The report uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty Multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

2 GENGNERAL INFORMATION

2.1 Environmental conditions

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

Voltage	Normal Voltage	DC 5.0V
	High Voltage	DC 5.5V
	Low Voltage	DC 4.5V
Other	Normal Temperature	25°C
	Relative Humidity	55 %
	Air Pressure	989 hPa

2.2 General Description of EUT

Product Name:	Gravio Multi Sensor Gen 1.0
Model/Type reference:	GMS9218
Serial Model:	N/A
Power Rating:	5V/1A
Hardware Version:	N/A
Software Version:	N/A
Operation Condition:	Temperature: -20°C~+60°C Humidity:25%~85%
24G Radar	
Operation frequency band:	24.05GHz-24.25GHz
Center frequency:	24.15GHz
Modulation Type	FMCW
Antenna type:	PCB antenna
Antenna gain:	0.5dBi
Remark: The above DUT's information was declared by manufacturer. For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.	

2.3 Description of Test Modes and Test Frequency

The EUT has been tested under typical operating condition. The EUT stay in sweep model during the test.

Operation Frequency:

Sweep Start Frequency (MHz)	Sweep Stop Frequency (MHz)
24060	24245

2.4 Equipment List for the Test

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	EMI Measuring Receiver	R&S	ESR	101160	2024.09.25	2025.09.24
2	Spectrum Analyzer	R&S	FSV40	101470	2024.09.23	2025.09.22
3	EMI Test Receiver	R&S	ESPI	100771	2024.09.25	2025.09.24
4	LISN	R&S	NNLK 8129	8130179	2024.09.24	2025.09.23
5	LISN	R&S	ESH3-Z5	892785/016	2024.09.23	2025.09.22
6	Pulse Limiter	R&S	ESH3-Z2	102789	2024.09.24	2025.09.23
7	Low Noise Pre Amplifier	SCHWARZBECK	BBV 9745	00282	2024.09.25	2025.09.24
8	Low Noise Pre Amplifier	CESHENG	CSKJLNA23101 6A	CSKJLNA231016 A	2024.09.25	2025.09.24
9	Pre Amplifier	AT-Microwave	AT-LNA-4060	3803	2024.08.20	2025.08.19
10	Pre Amplifier	AT-Microwave	AT-LNA-5075	3825	2024.08.20	2025.08.19
11	Pre Amplifier	AT-Microwave	AT-LNA-75110	4204	2024.08.20	2025.08.19
12	Passive Loop	ETS	6512	00165355	2024.08.29	2027.08.28
13	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9168	01434	2024.08.29	2027.08.28
14	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9168	01435	2024.08.29	2027.08.28
15	Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	452	2024.08.29	2027.08.28
16	Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	453	2024.08.29	2027.08.28
17	Horn Antenna 15-40GHz	SCHWARZBECK	BBHA9170	BBHA9170367	2024.08.28	2027.08.27
18	Horn Antenna 15-40GHz	SCHWARZBECK	BBHA9170	BBHA9170368	2024.08.28	2027.08.27
19	Horn Antenna 40-60GHz	A-INFO	LB-19-25-A2	2020036000052	2024.09.25	2027.09.24
20	Horn Antenna 40-60GHz	A-INFO	LB-19-25-A2	2020036000053	2024.09.25	2027.09.24
21	Horn Antenna 60-90GHz	A-INFO	LB-12-25-A	2020026000062	2024.09.25	2027.09.24
22	Horn Antenna 60-90GHz	A-INFO	LB-12-25-A	2020026000063	2024.09.25	2027.09.24
23	Horn Antenna 90-140GHz	A-INFO	LB-8-25-A	2020016000185	2024.09.25	2027.09.24

24	Horn Antenna 90-140GHz	A-INFO	LB-8-25-A	2020016000186	2024.09.25	2027.09.24
25	6dB Attenuator	JFW	50FPE-006	4360846-949-1	2024.09.24	2025.09.23
26	Attenuator	EZLZ	AT-SAX8-4060	104	2024.08.20	2025.08.19
27	Attenuator	EZLZ	MFA-050075-A30A	111	2024.08.20	2025.08.19
28	Attenuator	EZLZ	MFA-075110-A30A	127	2024.08.20	2025.08.19
29	Harmonic Mixer	AT-Microwave	AT-SAX8-4060	101318	2024.08.20	2025.08.19
30	Harmonic Mixer	AT-Microwave	AT-SAX8-5075	101335	2024.08.20	2025.08.19
31	Harmonic Mixer	AT-Microwave	AT-SAX8-75110	101376	2024.08.20	2025.08.19
32	Const Temp. & Humidity Chamber	Eastlab	YH-HW-408L	23051109	2024.09.24	2025.09.23
33	High frequency vibration testing machine	Yuanyao Instrument	NBC-4S-100	54784166	2024.09.25	2025.09.24
34	Signal Generator	Keysight	E8257D	E8257D	2024.09.24	2025.09.23
35	DC power supply	ZHAOXIN	RXN-305D-2	28070002559	2024.09.24	2025.09.23
36	RE Software	EZ	EZ-EMC_RE	Ver.AIT-03A	N/A	N/A
37	CE Software	EZ	EZ-EMC_CE	Ver.AIT-03A	N/A	N/A
38	RF Software	TST	TSTPASS	Version 2.0	N/A	N/A
39	RF Software	cesheng	WCS-WCN	Version 2024.6.20	N/A	N/A
40	temporary antenna connector(Note)	NTS	R001	N/A	N/A	N/A

Remark:

- (a) Calibration conducted by the National institute of information and Communications Technology (NICT)in Japan (hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18 paragraph (1) in JRL.
- (b) Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Act (Act No. 51 of 1992).
- (c) Calibration conducted in countries except Japan, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1).
- (d) Calibration, etc, conducted by using measuring instruments and other equipment listed in the right column of appended table No. 3, which shall have been given any type of calibration, etc. listed above from (a) to (c)

From JRL Article 24-2, paragraph 4, Item 2

2.5 Test Voltage

POWER SUPPLY VOLTAGE FLUCTUATION TEST

Voltage Fluctuation Test	Normal Voltage	High Voltage +10% of Normal Voltage	Low Voltage -10% of Normal Voltage
Power supply	DC 5V	DC 5.5V	DC 4.5V
Output To RF Module	DC 3.30V	DC 3.30V	DC 3.30V
Voltage Variation (%)	--	--	--

Note:

Voltage Variation (%)

= (Output high or Low Voltage - Output Normal Voltage)/ Output Normal Voltage* 100

During the input supply voltage to the EUT from the external power source is varied by +/- 10%, if output voltage had been confirmed that the fluctuation of power supply to the RF circuit of EUT (excluding power source) is equal to or less than +/-1%. Exempt extremely high and low supply voltage condition test, EUT only operated in normal voltage to test all regulations.

The sample power supply was confirmed that input voltage variation at the radio unit in the radio equipment to be tested is less than +1% against a variation of +10% at the input voltage from the external power supply to the radio equipment, and the radio equipment was designed so as to be operated in a specified voltage variation limit within +10%, Radio can only test at normal Voltage.

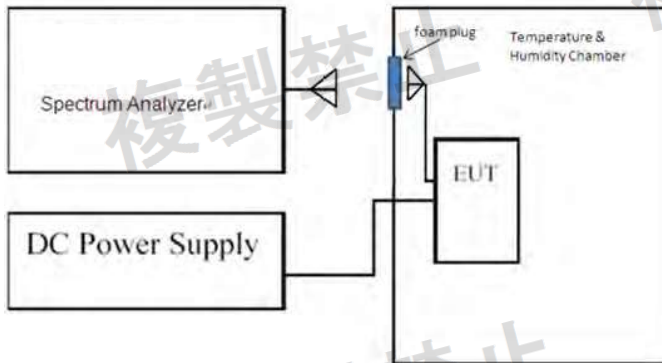
3 TEST CONDITIONS AND RESULTS

3.1 Frequency Error

LIMIT

With in 24.05-24.25GHz

TEST CONFIGURATION



TEST PROCEDURE

Vibration test

Fix the EUT on the vibration plate of the vibration testing machine by means of the installation fixture, etc., which is used to make the EUT equal to the normal installation state. Apply vibration to EUT through vibration testing machine

During the vibration excitation of the vibration tester, set the EUT to the non-action state (power off). After the vibration is excited in the vibration testing machine, the frequency of the equipment shall be tested in the normal working mode, and the frequency deviation shall be within the normal range.

Temperature test:

Place the device to be tested in the temperature and humidity tester in the non-operation state and set the temperature of the temperature and humidity tester to a low temperature while in this condition. the low temperature is 0°C, -10°C and -20°C, use the minimum value within the range of the specification of the device to be tested. the high temperature is 40°C, 50°C and 60°C, use the highest value within the range of the specification of the device to be tested.

Leave it in this condition for 1hour. Apply the prescribed power supply voltage to operate to device to be tested in the temperature and humidity tester. Test the frequency tolerance & Record the test result.

Humidity Test:

Place the device to be tested in the temperature and humidity tester in the non-operating state. While this condition remains, set the temperature to 35°C and the relative humidity to 95% or the maximum or the maximum humidity in the specification of the device to be tested in the temperature and humidity tester. Leave it in this condition for 4 hours. After this time, the setting of the temperature and humidity tester is changed back to the normal temperature and normal humidity and, after confirming that there is no condensation, operate the device to be tested by applying the prescribed power supply voltage. Test the frequency tolerance, Record the test result.

TEST RESULTS

Vibration test conditions	The frequency deviation is within the normal range or not
Set the vibration with a total amplitude of 3mm, from the lowest frequency to 500 times per minute, to 15 minutes at the top, bottom, left and right, front and back respectively. The scanning cycle of frequency is 10 minutes, and the scanning frequency is changed in the order of the lowest frequency, 500 times per minute and the lowest frequency. That is, 1.5 cycles of vibration frequency scanning within 15 minutes	YES/PASS
Set the vibration with a total amplitude of 1 mm and a frequency of 500 to 1800 times per minute for 15 minutes, up and down, left and right, front and back respectively. The scanning cycle of frequency is 10 minutes, and the scanning frequency changes in the order of 500 times per minute, 1800 times per minute and 500 times per minute. That is, 1.5 cycles of vibration frequency scanning shall be carried out within 15 minutes.	YES/PASS

Temperature and humidity test

Temperature or humidity test	The frequency deviation is within the normal range or not
Low temperature test-- Set the EUT in the temperature and humidity test tank as a non-action state. In this state, set the temperature in the temperature and humidity test tank to low temperature (the lowest temperature within the EUT specification range of 0 °C, - 10 °C, - 20 °C). Leave in this state for 1 hour.	YES/PASS
high temperature test--The EUT is set in the temperature and humidity test tank as a non-action state. In this state, the temperature in the temperature and humidity test tank is set to high temperature (the highest temperature within the specification range of test equipment in 40 °C, 50 °C and 60 °C) and normal humidity. Leave in this state for 1 hour.	YES/PASS
Humidity test-- (a) The EUT is set in the temperature and humidity test tank as a non-action state. Under this state, the temperature in the temperature and humidity test tank is set to 35 °C, 95% relative humidity or the maximum humidity of the test equipment specification. Put it in this state for 4 hours. After the above (i) time, restore the setting of the temperature and humidity test tank to the normal temperature and humidity state. After confirming that there is no condensation, apply the specified power supply voltage to make the test equipment operate.	YES/PASS

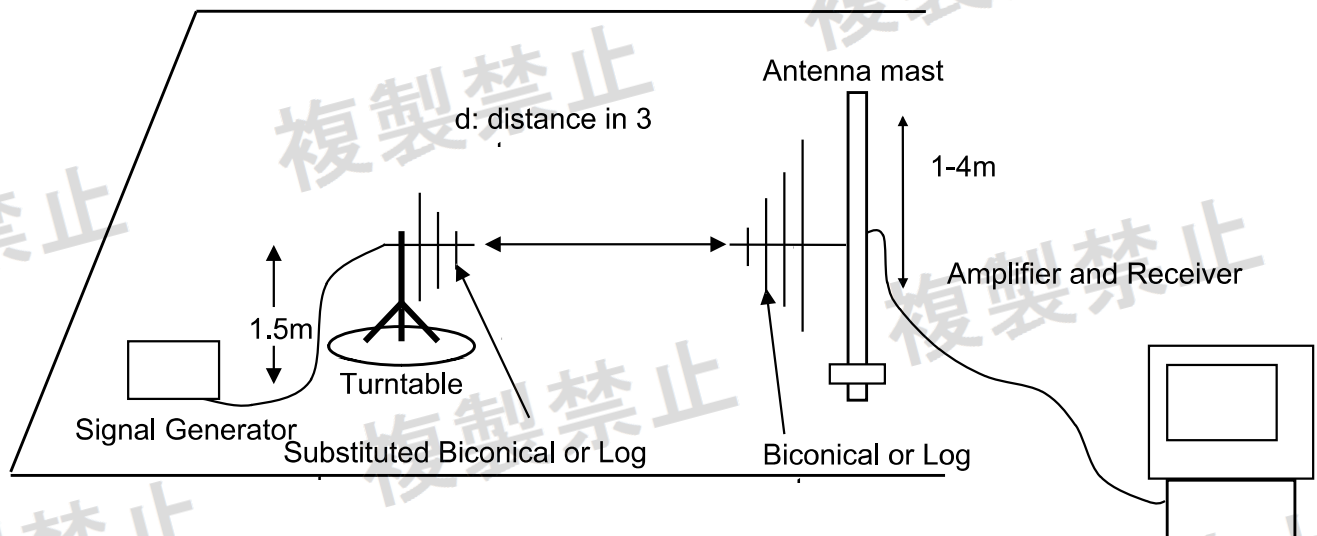
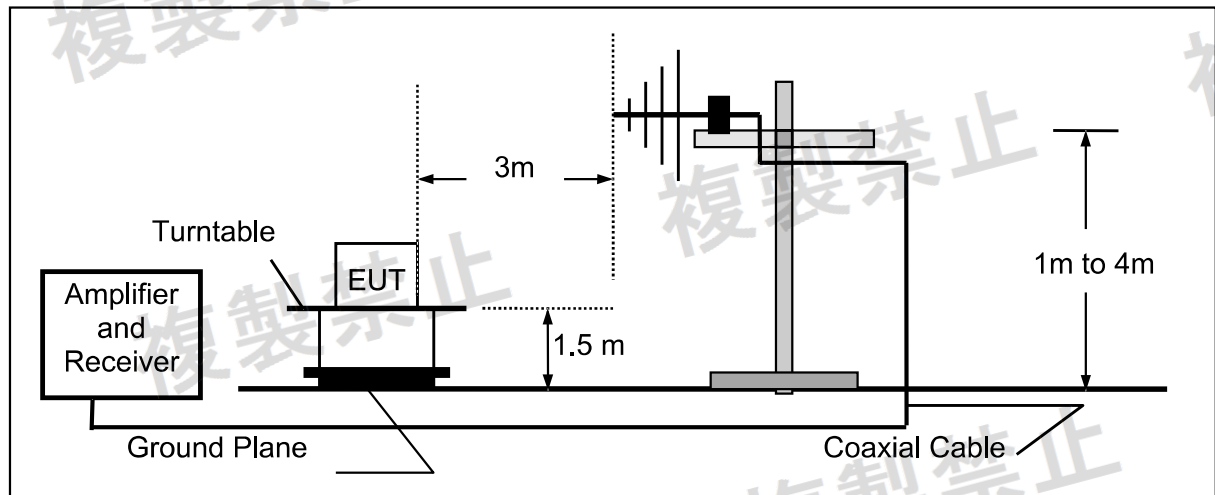
Condition		Meter reading		Limit	Verdict
		Lower Frequency [GHz]	Upper Frequency [GHz]		
high temperature	+60℃	24.064158	24.246256	Within 24.05- 24.25GHz	PASS
	+50℃	24.064254	24.246335		PASS
	+40℃	24.064325	24.246241		PASS
Low temperature	0℃	24.064471	24.246147		PASS
	-10℃	24.064542	24.246526		PASS
	-20℃	24.064158	24.246324		PASS
Normal temperature	+20℃	24.060000	24.246000		PASS
Humidity test	+35℃/95%	24.062541	24.246325		PASS
Vibration test	Front / Back	24.061254	24.246457		PASS
	Left / Right	24.064254	24.246523		PASS
	Up / Down	24.063268	24.246487		PASS

3.2 Tolerance of Antenna Power

LIMIT

Item	Limits
Antenna Power Tolerance	+ 50% ~ -50 %
Antenna Power	0.02 W (20mW, 13 dBm)

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.0m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all test transmit frequencies were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. An amplifier may be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
The measurement results are obtained as described below:
$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$

TEST RESULTS

Remark:

The field strength of radiation emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The data show in this report only with the worst case setup. After exploratory measurement the worst case of Z axis and receiver antenna at vertical polarization was reported.

Test Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dBi)	P _{Ag} (dB)	EIRP (dBm)	EIRP (W)	Limit (W)	Polarization
24.05-24.25GHz	-35.03	16.76	18.63	46.7	11.39	0.0138	<=0.02	V

Test Frequency	Antenna Power		Nominal Power (W)	Tolerance (%)		Verdict
	Measured (W)	Limit (W)		Measured	Limit	
24.05-24.25GHz	0.0138	<=0.02	0.02	-31.14%	+50%~-50%	Pass