

FCC RADIO TEST REPORT

Applicant..... : Hui Zhou Gaoshengda Technology Co., LTD

Address..... : NO.75 Zhongkai Development Area, Huizhou, Guangdong,China

Manufacturer..... : Hui Zhou Gaoshengda Technology Co., LTD

Address..... : NO.75 Zhongkai Development Area, Huizhou, Guangdong,China

Factory..... : Hui Zhou Gaoshengda Technology Co., LTD

Address..... : NO.75 Zhongkai Development Area, Huizhou, Guangdong,China

Product Name..... : WIFI+BT Module

Brand Name..... : GSD

Model No. : WCT28M2701

FCC ID..... : 2AC23-WCT28

Measurement Standard..... : 47 CFR FCC Part 15, Subpart C (Section 15.247)

Receipt Date of Samples..... : February 23, 2023

Date of Tested..... : February 23, 2023 to February 28, 2023

Date of Report..... : March 16, 2023

This report shows that above equipment is technically compliant with the requirements of the standards above. All test results in this report apply only to the tested sample(s). Without prior written approval of Dongguan Nore Testing Center Co., Ltd, this report shall not be reproduced except in full.



Prepared by

Rose Hu / Project Engineer



Approved by

Lori Fan / Authorized Signatory

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Revision History

1. Summary of Test Result

FCC Rules	Description of Test	Result	Remarks
§15.247(a)(1)	Channel Separation test	N/A ¹	---
§15.247(a)(1)	20dB Bandwidth	N/A ¹	---
§15.247(a)(1)(iii)	Hopping Channel Number	N/A ¹	---
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	N/A ¹	---
§15.247(b)	Max Peak output Power test	N/A ¹	---
§15.247(d)	Band edge test	N/A ¹	---
§15.207 (a)	AC Power Conducted Emission	N/A ¹	---
§15.247(d),§15.209, §15.205	Radiated Emission	PASS	---
§15.203	Antenna Requirement	PASS	---
§15.247(d)	Conducted Spurious Emission	N/A ¹	---

Note 1: The manufacturer added an optional antenna. We have retested the Radiated Spurious Emissions item.

The other test items were not affected, thus, the other test data were continued to be referenced, details refer to the report 21EFSS06094 06101 published by Dongguan Shuoxin Electronic Technology Co., LTD on August 12, 2021.

2. General Description of EUT

Product Information	
Product name:	WIFI+BT Module
Main Model Name:	WCT28M2701
Additional Model Name:	N/A
Model Difference:	N/A
S/N:	2302010010000
Brand Name	GSD
Hardware version:	V1.0
Software version:	V1.0
Rating:	DC 3.3V
Classification:	Class B
Typical arrangement:	Tabletop
I/O Port:	Refer to the user manual.
Accessories Information	
Adapter:	N/A
Cable:	N/A
Other:	N/A
Additional Information	
Note:	N/A
Remark:	All the information above are provided by the manufacturer. More detailed feature of the EUT please refers to the user manual.

Technical Specification	
Bluetooth Version:	V5.1
Frequency Range:	2402-2480MHz
Modulation Type:	GFSK, $\pi/4$ -DQPSK, 8DPSK
Number of Channel:	79 (refer to following channel list for details)
Channel Space:	1MHz
Antenna Type:	Copper tube antenna*1
Antenna Gain:	2.71dBi (Declared by manufacturer)
Note: This report only replies to BDR+EDR of the EUT.	

Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	21	2422	41	2442	61	2462
2	2403	22	2423	42	2443	62	2463
3	2404	23	2424	43	2444	63	2464
4	2405	24	2425	44	2445	64	2465
5	2406	25	2426	45	2446	65	2466
6	2407	26	2427	46	2447	66	2467
7	2408	27	2428	47	2448	67	2468
8	2409	28	2429	48	2449	68	2469
9	2410	29	2430	49	2450	69	2470
10	2411	30	2431	50	2451	70	2471
11	2412	31	2432	51	2452	71	2472
12	2413	32	2433	52	2453	72	2473
13	2414	33	2434	53	2454	73	2474
14	2415	34	2435	54	2455	74	2475
15	2416	35	2436	55	2456	75	2476
16	2417	36	2437	56	2457	76	2477
17	2418	37	2438	57	2458	77	2478
18	2419	38	2439	58	2459	78	2479
19	2420	39	2440	59	2460	79	2480
20	2421	40	2441	60	2461	---	---

3. Test Channels and Modes Detail

No.	Mode	Channel	Frequency (MHz)	Modulation
1	TX	Hopping	2402-2480	GFSK/ $\pi/4$ -DQPSK /8DPSK
2	TX	Low	2402	GFSK/ $\pi/4$ -DQPSK /8DPSK
3	TX	Mid	2441	GFSK/ $\pi/4$ -DQPSK /8DPSK
4	TX	High	2480	GFSK/ $\pi/4$ -DQPSK /8DPSK
5.	BT Link	---	---	---

Note: TX mode means that the EUT was programmed to be in continuously transmitting mode.

4. Configuration of EUT

TX Mode



5. Modification of EUT

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

6. Description of Support Device

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Equipment	Brand	M/N	S/N	Cable Specification	Remarks
1.	Laptop	Lenovo	02213DC	0A33012	Power cord, 1.8m, unshielded -----	---
2.	Power supply (Notebook)	Taida	92P1154	N/A		---
3.	Test fixture	---	---	---	----	Provide by the Manufacturer

7. Test Facility and Location

Test Site	:	Dongguan Nore Testing Center Co., Ltd. (Dongguan NTC Co., Ltd.)
Accreditations and Authorizations	:	<p>The Laboratory has been assessed and proved to be in compliance with CNAS/CL01</p> <p>Listed by CNAS, August 13, 2018</p> <p>The Certificate Registration Number is L5795.</p> <p>The Certificate is valid until August 13, 2024</p> <p>The Laboratory has been assessed and proved to be in compliance with ISO17025</p> <p>Listed by A2LA, November 01, 2017</p> <p>The Certificate Registration Number is 4429.01</p> <p>Listed by FCC, November 06, 2017</p> <p>Test Firm Registration Number: 907417</p> <p>Listed by Industry Canada, June 08, 2017</p> <p>The Certificate Registration Number. Is 46405-9743A</p>
Test Site Location	:	Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong Province, China

8. Applicable Standards and References

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

Test Standards:

47 CFR Part 15, Subpart C, 15.247

ANSI C63.10-2013

References Test Guidance:

DTS KDB 558074 D01 15.247 Meas Guidance v05r02

Remark:

The EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

9. Deviations and Abnormalities from Standard Conditions

The manufacturer added an optional antenna. We have retested the Radiated Spurious Emissions item. The other test items were not affected, thus, the other test data were continued to be referenced, details refer to the report 21EFSS06094 06101 published by Dongguan Shuoxin Electronic Technology Co., LTD on August 12, 2021.

10. Test Conditions

No.	Test Item	Test Mode	Test Voltage	Tested by	Remarks
1.	Radiated Emission	1-5	DC 3.3V	Sean	See note 1
2.	Antenna Requirement	---	---	---	See note 1

Note:

1. The testing climatic conditions for temperature, humidity, and atmospheric pressure are within: 15~35°C, 30~70%, 86~106kPa

11. Measurement Uncertainty

No.	Test Item	Frequency	Uncertainty	Remarks
1.	Conducted Emission	150KHz ~ 30MHz	±2.52 dB	---
2.	Radiated Emission Test	9kHz ~ 30MHz	±2.60 dB	
		30MHz ~ 1GHz	±4.68 dB	---
		1GHz ~ 18GHz	±5.14 dB	---
		18GHz ~ 40GHz	±5.14 dB	---
3.	RF Conducted Test	10Hz ~ 40GHz	±1.06 dB	---
4.	RF Output Power	10Hz ~ 40GHz	±0.86 dB	
5.	Power Spectral Density	10Hz ~ 40GHz	±1.06 dB	
6.	Occupied Channel Bandwidth	---	±1.42 x10-4% MHz	---

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The measurement uncertainty levels above are estimated and calculated according to CISPR 16-4-2.
3. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

12. Sample Calculations

Conducted Emission						
Freq. (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector
0.1620	38.50	10.60	49.10	65.36	-16.26	QP

Where,

Freq. = Emission frequency in MHz
 Reading Level = Spectrum Analyzer/Receiver Reading
 Corrector Factor = Insertion loss of LISN + Cable Loss + RF Switching Unit attenuation
 Measurement = Reading + Corrector Factor
 Limit = Limit stated in standard
 Margin = Measurement - Limit
 Detector = Reading for Quasi-Peak / Average / Peak

Radiated Spurious Emissions and Restricted Bands						
Freq. (MHz)	Reading Level (dBuV)	Correct Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
65.890	33.10	-7.90	25.20	40.00	-14.80	QP

Where,

Freq. = Emission frequency in MHz
 Reading Level = Spectrum Analyzer/Receiver Reading
 Corrector Factor = Antenna Factor + Cable Loss - Pre-amplifier
 Measurement = Reading + Corrector Factor
 Limit = Limit stated in standard
 Over = Margin, which calculated by Measurement - Limit
 Detector = Reading for Quasi-Peak / Average / Peak

Note: For all conducted test items, the spectrum analyzer offset or transducer is derived from RF cable loss and attenuator factor. The offset or transducer is equal to the RF cable loss plus attenuator factor.

13. Test Items and Results

13.1 Radiated Spurious Emissions and Restricted Bands Measurement

LIMIT

Frequency range MHz	Distance Meters	Field Strengths Limit (15.209)
		$\mu\text{V/m}$
0.009 ~ 0.490	300	2400/F(kHz)
0.490 ~ 1.705	30	24000/F(kHz)
1.705 ~ 30	30	30
30 ~ 88	3	100
88 ~ 216	3	150
216 ~ 960	3	200
Above 960	3	500

Remark: (1) Emission level (dB) $\mu\text{V} = 20 \log$ Emission level $\mu\text{V/m}$

(2) The smaller limit shall apply at the cross point between two frequency bands.

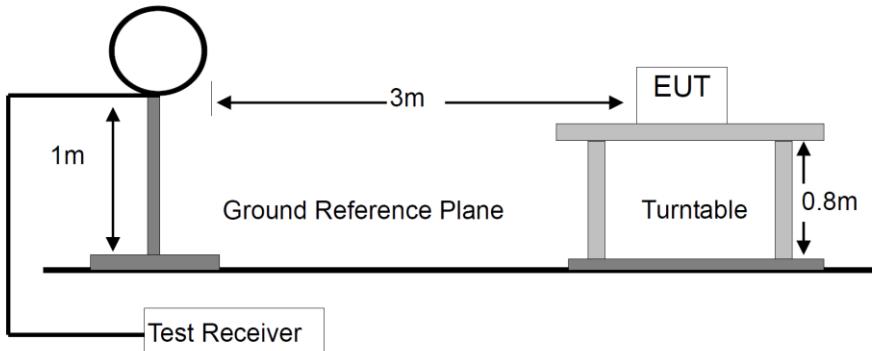
(3) As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

(4) The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

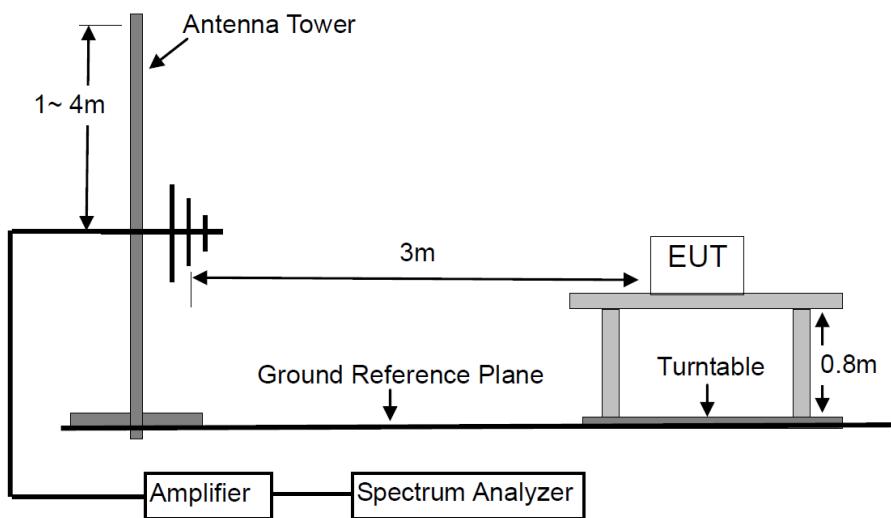
(5) §15.247(d) specifies that emissions which fall in the restricted bands, as defined in §15.205 comply with radiated emission limits specified in §15.209.

BLOCK DIAGRAM OF TEST SETUP

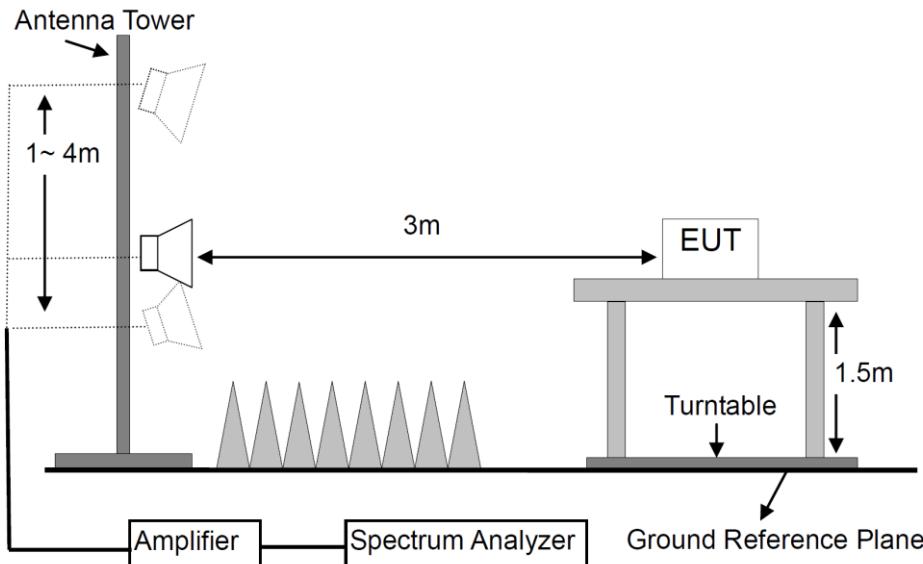
For Radiated Emission below 30MHz



For Radiated Emission 30-1000MHz



For Radiated Emission Above 1000MHz.



TEST PROCEDURES

a. Below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters semi- anechoic chamber room.

b. For the radiated emission test above 1GHz:

The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meters full anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode.

f. A Quasi-peak measurement was then made for that frequency point for below 1GHz test. PK and AV for above 1GHz emission test.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Band (MHz)	Detector	Resolution Bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	3 MHz
	Average	1 MHz	10 Hz

TEST RESULTS

PASS

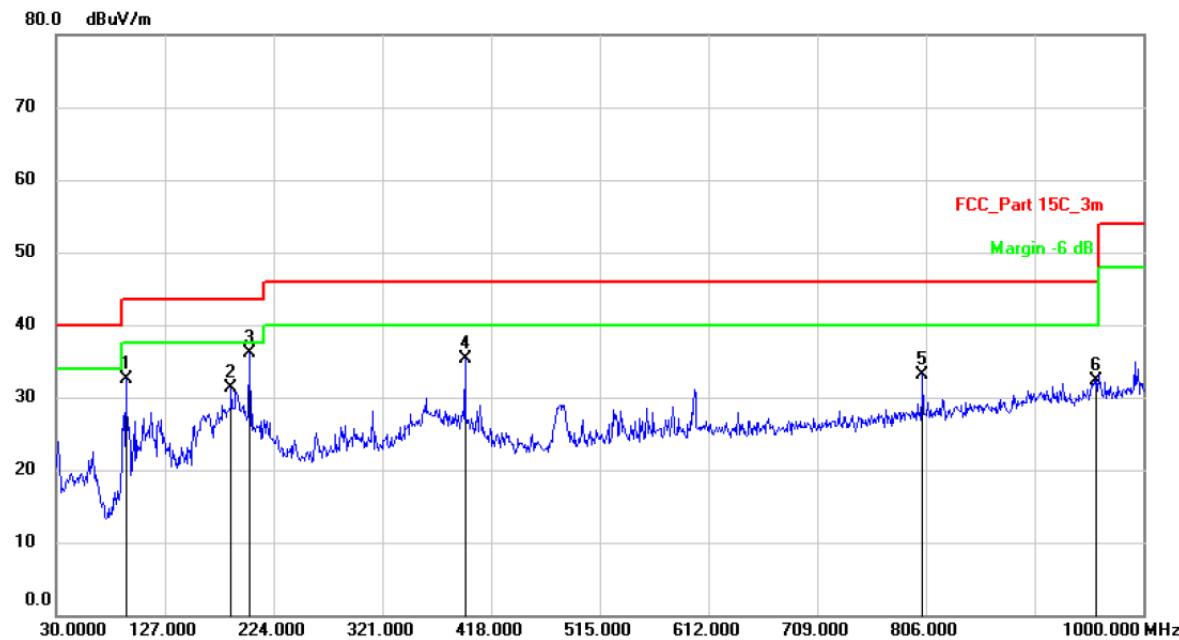
Please refer to the following pages.

M/N: WCT28M2701	Testing Voltage: DC 3.3V
Polarization: Horizontal	Detector: QP
Test Mode: 5(the worst case)	Distance: 3m

Radiated Emission Measurement

Date: 2023/2/27

Time: 10:29:35



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dB	Detector	Comment
1		92.0800	41.42	-8.91	32.51	43.50	-10.99	QP
2		186.1700	39.89	-8.63	31.26	43.50	-12.24	QP
3	*	202.6600	43.79	-7.68	36.11	43.50	-7.39	QP
4		394.7200	38.79	-3.45	35.34	46.00	-10.66	QP
5		803.0900	29.09	4.02	33.11	46.00	-12.89	QP
6		958.2900	26.10	6.29	32.39	46.00	-13.61	QP

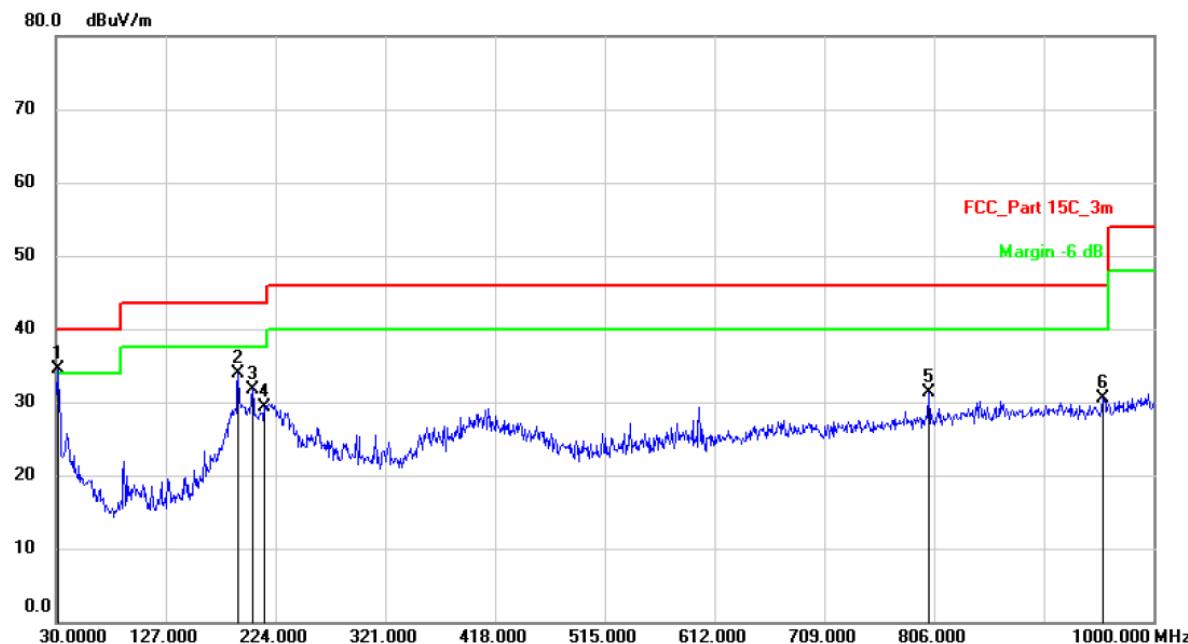
Note: Below 30MHz, the emissions are lower than 20dB below the allowable limit.

M/N: WCT28M2701	Testing Voltage: DC 3.3V
Polarization: Vertical	Detector: QP
Test Mode: 5(the worst case)	Distance: 3m

Radiated Emission Measurement

Date: 2023/2/27

Time: 10:23:32



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dB	Detector	Comment
1	*	31.9400	44.12	-9.60	34.52	40.00	-5.48	QP
2		191.0200	43.05	-9.06	33.99	43.50	-9.51	QP
3		203.6300	40.49	-8.69	31.80	43.50	-11.70	QP
4		214.3000	37.83	-8.52	29.31	43.50	-14.19	QP
5		801.1500	27.40	3.99	31.39	46.00	-14.61	QP
6		955.3800	25.44	5.10	30.54	46.00	-15.46	QP

Note: Below 30MHz, the emissions are lower than 20dB below the allowable limit.

Modulation: GFSK (the worst case)				Test Result: PASS			Test frequency range: 1-25GHz				
Freq. (MHz)	Ant. Pol. (H/V)	Reading Level(dBuV)		Factor (dB/m)	Emission Level (dBuV/m)		Limit 3m (dBuV/m)		Margin (dB)		
		PK	AV		PK	AV	PK	AV	PK	AV	
Operation Mode: TX Mode (Low)											
4804	V	45.55	33.95	6.30	51.85	40.25	74.00	54.00	-22.15	-13.75	
7206	V	43.41	30.81	10.44	53.85	41.25	74.00	54.00	-20.15	-12.75	

4804	H	47.58	35.23	6.30	53.88	41.53	74.00	54.00	-20.12	-12.47	
7206	H	43.91	32.58	10.44	54.35	43.02	74.00	54.00	-19.65	-10.98	

Operation Mode: TX Mode (Mid)											
4882	V	45.63	34.51	6.60	52.23	41.11	74.00	54.00	-21.77	-12.89	
7323	V	43.70	32.50	10.55	54.25	43.05	74.00	54.00	-19.75	-10.95	

4882	H	46.51	35.55	6.60	53.11	42.15	74.00	54.00	-20.89	-11.85	
7323	H	44.50	33.32	10.55	55.05	43.87	74.00	54.00	-18.95	-10.13	

Operation Mode: TX Mode (High)											
4960	V	45.16	34.87	6.89	52.05	41.76	74.00	54.00	-21.95	-12.24	
7440	V	44.73	32.65	10.60	55.33	43.25	74.00	54.00	-18.67	-10.75	

4960	H	45.86	34.68	6.89	52.75	41.57	74.00	54.00	-21.25	-12.43	
7440	H	44.05	32.65	10.60	54.65	43.25	74.00	54.00	-19.35	-10.75	

Spurious Emission in restricted band:											
2390.000	V	49.56	33.03	0.09	49.65	33.12	74.00	54.00	-24.35	-20.88	
2390.000	H	50.23	33.48	0.09	50.32	33.57	74.00	54.00	-23.68	-20.43	
2483.500	V	50.43	33.78	0.34	50.77	34.12	74.00	54.00	-23.23	-19.88	
2483.500	H	50.91	34.32	0.34	51.25	34.66	74.00	54.00	-22.75	-19.34	
Remark: Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits.											

13.2 Antenna Requirement

STANDARD APPLICABLE

According to of FCC part 15C section 15.203 and 15.247:

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, 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.

ANTENNA CONNECTED CONSTRUCTION

The antenna is Copper tube antenna that no antenna other than furnished by the responsible party shall be used with the device, and the best case gain of the antenna is 2.71 dBi, Therefore, the antenna is consider meet the requirement.

14. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI7	100837	Mar. 13, 2022	1 Year
2.	Antenna	Schwarzbeck	VULB9162	9162-010	Mar. 23, 2022	1 Year
3.	Spectrum Analyzer	Rohde & Schwarz	FSU26	200409/026	Mar. 13, 2022	1 Year
4.	Spectrum Analyzer	Keysight	N9020A	MY54200831	Mar. 13, 2022	1 Year
5.	Spectrum Analyzer	Rohde & Schwarz	FSV40	101094	Mar. 13, 2022	1 Year
6.	Horn Antenna	Schwarzbeck	BBHA9170	9170-172	Mar. 23, 2022	2 Year
7.	Power Sensor	DARE	RPR3006W	15I00041SNO 64	Mar. 13, 2022	1 Year
8.	Horn Antenna	COM-Power	AH-118	071078	Mar. 23, 2022	1 Year
9.	Pre-Amplifier	HP	HP 8449B	3008A00964	Mar. 13, 2022	1 Year
10.	Pre-Amplifier	HP	HP 8447D	1145A00203	Mar. 13, 2022	1 Year
11.	Loop Antenna	Schwarzbeck	FMZB 1513	1513-272	Mar. 23, 2022	1 Year
12.	Test Receiver	Rohde & Schwarz	ESCI	101152	Mar. 13, 2022	1 Year
13.	L.I.S.N	Rohde & Schwarz	ENV 216	101317	Mar. 13, 2022	1 Year
14.	RF Switching Unit	Compliance Direction Systems Inc.	RSU-M2	38311	Mar. 13, 2022	1 Year
15.	Temporary antenna connector	TESCOM	SS402	N/A	N/A	N/A
16.	Test Software	EZ	EZ_EMU	N/A	N/A	N/A

Note: For photographs of EUT and measurement, please refer to appendix in separate documents.

---End---