

TEST REPORT

Report No.: 8330EU010607W1
Applicant: Shenzhen Qianyan Technology LTD
Address: No. 3301, Block C, Section 1, Chuangzhi Yuncheng Building, Liuxian Avenue, Xili Community, Xili Street, Nanshan District, Shenzhen, China
Product Name: Govee Smart Outdoor String Lights
Model No.: H7025, H8025
Trademark: Govee
FCC ID: 2A7VD-H7025
Test Standard(s): 47 CFR Part 15 Subpart C
Date of Receipt: May 06, 2025
Test Date: May 06 – May 13, 2025
Date of Issue: Jun. 16, 2025

ISSUED BY:

SHENZHEN EU TESTING LABORATORY LIMITED



Prepared by:



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2 General Information

2.1 Applicant Information

Applicant	Shenzhen Qianyan Technology LTD
Address	No. 3301, Block C, Section 1, Chuangzhi Yuncheng Building, Liuxian Avenue, Xili Community, Xili Street, Nanshan District, Shenzhen, China

2.2 Manufacturer Information

Manufacturer	Shenzhen Qianyan Technology LTD
Address	No. 3301, Block C, Section 1, Chuangzhi Yuncheng Building, Liuxian Avenue, Xili Community, Xili Street, Nanshan District, Shenzhen, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description of E.U.T.

Product Name	Govee Smart Outdoor String Lights
Original model under test	H7025
C2PC model under test	H8025
Description of Model differentiation	Please refer to "Product Change Description_Variant template" in detail.
Rating(s)	Input: 24.0V---1.0A 24.0W (Adapter Input: 200-240V~, 50/60Hz, 0.4A Max.; Output: 24.0V---1.0A 24.0W)
Adapter:	Model No.: BI24G-240100-AdU2 Input: 100-240V~, 50/60Hz 0.8A Output: 24V--- 1.0A Manufacturer: Dong Guan Royal Intelligent Co., Ltd
Product Type	<input checked="" type="checkbox"/> Mobile <input type="checkbox"/> Portable <input type="checkbox"/> Fix Location
Test Sample No.	-1/2(Normal Sample), -2/2(Engineering Sample)
Hardware Version	V0.1
Software Version	6.5.01
Remark	For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



2.5 Technical Information of E.U.T.

Network and Wireless Connectivity	Bluetooth (BLE) WiFi 2.4G: 802.11b, 802.11g, 802.11n(HT20)
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The requirement for the following technical information of the EUT was tested in this report:

Technology	Bluetooth
Operation Mode	<input checked="" type="checkbox"/> BLE
Modulation Type	GFSK
Operating Frequency	2402-2480MHz
Transfer Rate	1 Mbps
Number of Channel	40
Antenna Type	PCB Antenna
Antenna Gain(Peak)	2.42 dBi
Remark	The above information are declared by the applicant, EU-LAB is not responsible for the information accuracy provided by the applicant.

All channel was listed on the following table:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
00	2402	08	2418	16	2434	24	2450	32	2466
01	2404	09	2420	17	2436	25	2452	33	2468
02	2406	10	2422	18	2438	26	2454	34	2470
03	2408	11	2424	19	2440	27	2456	35	2472
04	2410	12	2426	20	2442	28	2458	36	2474
05	2412	13	2428	21	2444	29	2460	37	2476
06	2414	14	2430	22	2446	30	2462	38	2478
07	2416	15	2432	23	2448	31	2464	39	2480



3 Test Summary

3.1 Test Standard

The tests were performed according to following standards:

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C	Intentional radiators of radio frequency equipment
2	ANSI C63.10-2020	American National Standard for Testing Unlicensed Wireless Devices
3	KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules

Remark:

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product maybe which result in lowering the emission/immunity should be checked to ensure compliance has been maintained.

3.2 Test Verdict

No.	Description	FCC Part No.	Channel	Verdict	Remark
1	Antenna Requirement	15.203	N/A	Pass	Note ¹
2	Conducted Emission at AC Power Line	15.207	Low/Middle/High	Pass	--
3	Occupied Bandwidth	15.247(a)(2)	Low/Middle/High	Pass	--
4	Maximum Conducted Output Power	15.247(b)(3)	Low/Middle/High	Pass	--
5	Power spectral density (PSD)	15.247(e)	Low/Middle/High	Pass	--
6	Emissions in Non-restricted Frequency Bands (Conducted)	15.247(d)	Low/Middle/High	Pass	--
7	Band Edge Emissions (Restricted frequency bands)	15.209 15.247(d)	Low/High	Pass	--
8	Radiated Spurious Emission	15.209 15.247(d)	Low/Middle/High	Pass	--

Note ¹: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.

Note ²: This is a Class II Permissive Change(C2PC) testing report.

Note ³: Compared with the original test reports of EUT: 8235EU012704W1 which were issued by SHENZHEN EU TESTING LABORATORY LIMITED. dated on Mar. 11, 2025, the difference between original and H8025 are as below:

1. Add a model number H8025.
2. The light string and the light string's PCB board of H8025 are different from those of H7025.

All others are the same in electrical parameters and internal circuit structure. Therefore, re-tested conducted emissions, radiated emissions, the rest test item please refer to the original report 8235EU012704W1.

3.3 Test Laboratory

Test Laboratory	Shenzhen EU Testing Laboratory Limited
Address	101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China
Designation Number	CN1368
Test Firm Registration Number	952583



4 Test Configuration

4.1 Test Environment

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

Relative Humidity	30% to 60%		
Atmospheric Pressure	86 kPa to 106 kPa		
Temperature	NT (Normal Temperature)		+15°C to +35°C
Working Voltage of the EUT	NV (Normal Voltage)		120VAC, 60Hz for adapter

4.2 Test Equipment

Conducted Emission at AC power line

Equipment	Manufacturer	Model No	Serial No	Cal Date	Cal Due Date
L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	EE-004	2025/01/08	2026/01/07
EMI Test Receiver	Rohde & Schwarz	ESCI	EE-005	2025/01/08	2026/01/07
Test Software	Farad	EZ-EMC	EE-014	N.C.R	N.C.R

Radiated Emission and RF Test

Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
EMI Test Receiver	ROHDE & SCHWARZ	ESPI	EE-006	2025/01/08	2026/01/07
Bilog Broadband Antenna	SCHWARZBECK	VULB 9163	EE-007	2023/01/14	2026/01/13
Double Ridged Horn Antenna	A-INFOMW	LB-10180-NF	EE-008	2023/01/12	2026/01/11
Pre-amplifier	Agilent	8447D	EE-009	2025/01/08	2026/01/07
Pre-amplifier	Agilent	8449B	EE-010	2025/01/08	2026/01/07
MXA Signal Analyzer	Agilent	N9020A	EE-011	2025/01/08	2026/01/07
MXG RF Vector Signal Generator	Agilent	N5182A	EE-012	2025/01/08	2026/01/07
Test Software	Farad	EZ-EMC	EE-015	N.C.R	N.C.R
MIMO Power Measurement Module	TSTPASS	TPSPS 2023R	EE-016	2025/01/08	2026/01/07
RF Test Software	TSTPASS	TS32893 V2.0	EE-017	N.C.R	N.C.R
Antenna Mast	TOP Precision	TPBAM-4	EE-306	N.C.R	N.C.R
Wideband Radio Communication Tester	ROHDE & SCHWARZ	CMW500	EE-402	2025/02/14	2026/02/13
Loop Antenna	TESEQ	HLA6121	EE-403	2025/02/14	2026/02/13
MXG RF Analog Signal Generator	Agilent	N5181A	EE-406	2025/02/14	2026/02/13
DRG Horn Antenna	SCHWARZBECK	BBHA 9170	EE-410	2025/02/14	2026/02/13
Pre-amplifier	SKET	LNPA-1840-50	EE-411	2025/02/14	2026/02/13
Power Meter	Anritsu	ML2495A	EE-416	2025/02/14	2026/02/13
Constant Temperature Humidity Chamber	Guangxin	GXP-401	ES-002	2024/07/30	2025/07/29



4.3 Description of Support Unit

No.	Title	Manufacturer	Model No.	Serial No.
1	Adapter	refer to clause 2.4	refer to clause 2.4	N/A
2	Govee Outdoor Clear Bulb String Lights	Same as applicant	H7025	N/A
3	Govee Outdoor Clear Bulb String Lights	Same as applicant	H8025	N/A

4.4 Test Mode

No.	Test Modes	Description
TM1	TX-GFSK	Keep the EUT connect to AC power line and works in continuously transmitting mode with GFSK modulation with 1 Mbps rate.

4.5 Description of Calculation

4.5.1. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS (\text{dBuV/m}) = RA (\text{dBuV}) + AF (\text{dB/m}) + CL (\text{dB}) - AG (\text{dB})$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

4.5.2. Disturbance Calculation

The AC mains conducted disturbance is calculated by adding the 10dB Pulse Limiter and Cable Factor and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$CD (\text{dBuV}) = RA (\text{dBuV}) + PL (\text{dB}) + CL (\text{dB})$$

Where CD = Conducted Disturbance	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	PL = 10 dB Pulse Limiter Factor

4.6 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.

Test Item	Measurement Uncertainty
Conducted Emission	2.64 dB
Occupied Channel Bandwidth	70 kHz
RF output power, conducted	1.04 dB
Power Spectral Density, conducted	0.91 dB
Time of Occupancy (Dwell Time)	1.8 %
Unwanted Emissions, conducted	2.72 dB
Radiated Emission (9kHz- 30MHz)	Ur = 2.50 dB
Radiated Emission (30MHz- 1GHz)	Ur = 2.70 dB (Horizontal)
	Ur = 2.70 dB (Vertical)
Radiated Emission (1GHz- 18GHz)	Ur = 3.50 dB (Horizontal)
	Ur = 3.50 dB (Vertical)
Radiated Emission (18GHz- 40GHz)	Ur = 5.15 dB (Horizontal)
	Ur = 5.24 dB (Vertical)
Temperature	0.8°C
Humidity	4%

4.7 Deviation from Standards

None.

4.8 Abnormalities from Standard Condition

None.

5 Test Items

5.1 Antenna requirement

5.1.1 Test Requirement

Test Requirement	<p>According to 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 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.</p> <p>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.</p>
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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

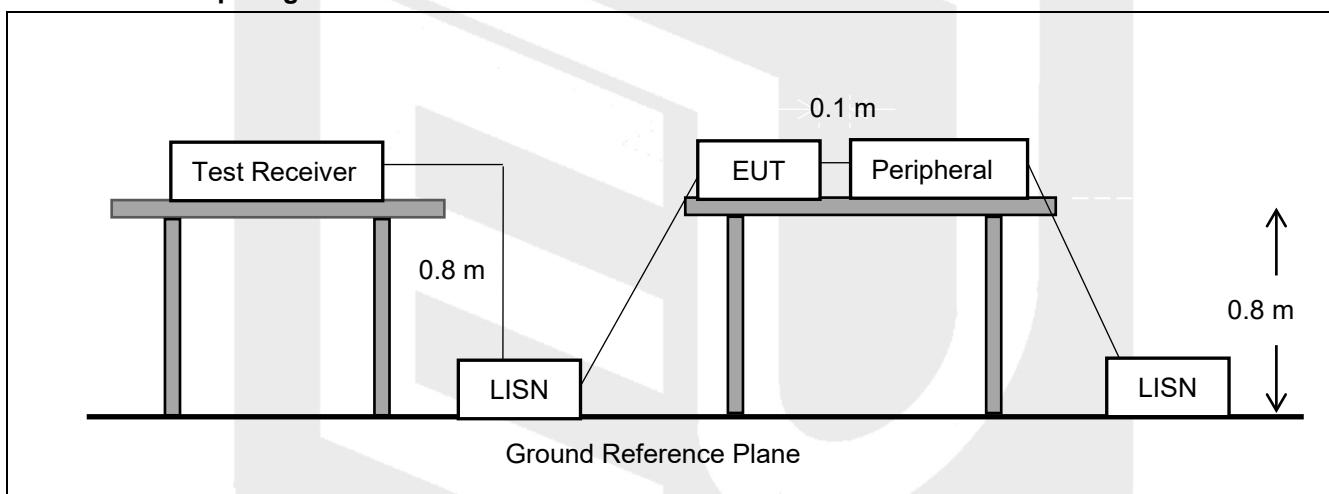
The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

5.2 Conducted Emission at AC Power Line

5.2.1 Test Requirement

Test Requirement	Except as shown in paragraphs (b) and (c) of this section, 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 or frequencies, 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 ohms line impedance stabilization network (LISN).		
Test Limit	Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average	
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
*Decreases with the logarithm of the frequency.			
Test Method	ANSI C63.10-2020 section 6.2		

5.2.2 Test Setup Diagram



5.2.3 Test Procedure

The EUT is put on the plane 0.8 m high above the ground by insulating support and connected to the AC mains through Line Impedance Stability Network (L.I.S.N). This provided a 50ohm coupling impedance for the tested equipment. Both sides of AC line are investigated to find out the maximum conducted emission according to the test standard regulations during conducted emission measurement.

The bandwidth of the field strength meter (R&S Test Receiver ESCI) is set at 9kHz in 150kHz~30MHz.

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.

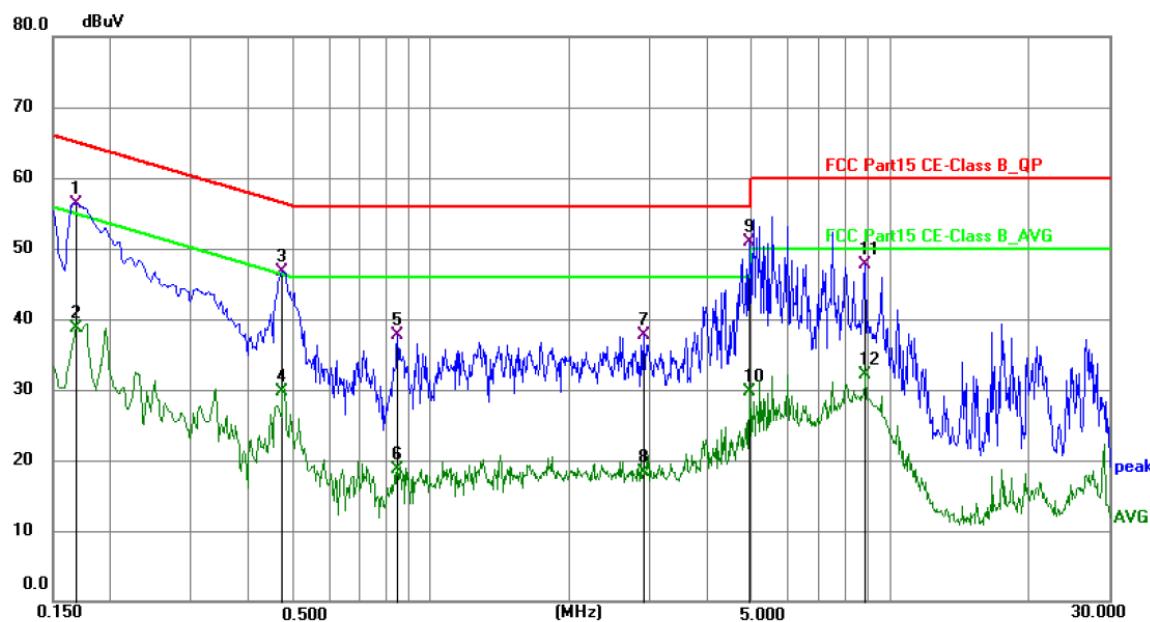
5.2.4 Test Data

PASS.

Only the worst case data was showed in the report, please to see the following pages.

Conducted Emission Test Data

Test Site: Shielded Room #1
 Test Mode: TM1/ CH Middle
 Comments: Live Line
 Model No.: H7025

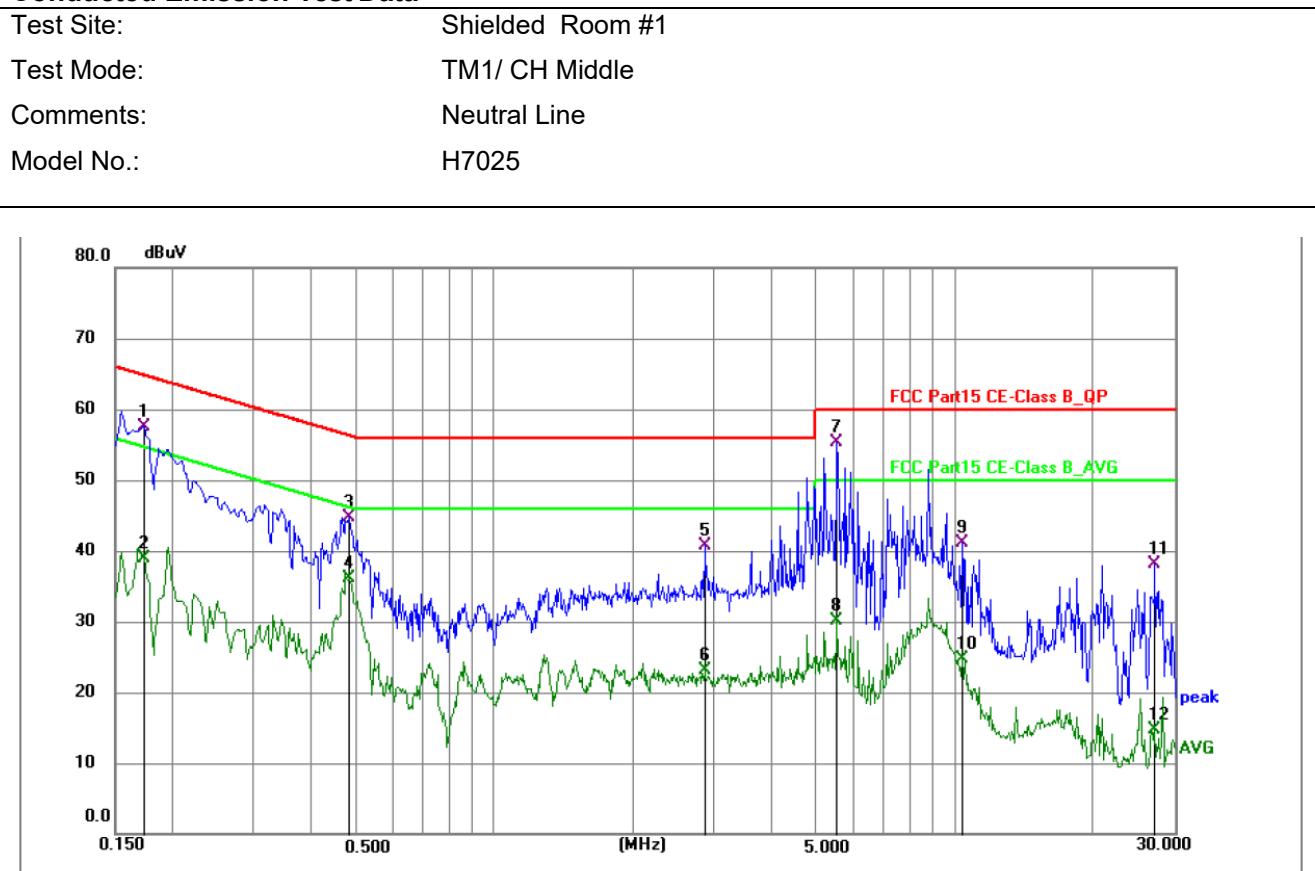


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1680	46.39	9.96	56.35	65.06	-8.71	QP	P	
2	0.1680	28.78	9.96	38.74	55.06	-16.32	AVG	P	
3	0.4740	36.71	10.04	46.75	56.44	-9.69	QP	P	
4	0.4740	19.75	10.04	29.79	46.44	-16.65	AVG	P	
5	0.8475	27.66	10.04	37.70	56.00	-18.30	QP	P	
6	0.8475	8.63	10.04	18.67	46.00	-27.33	AVG	P	
7	2.9130	27.57	10.06	37.63	56.00	-18.37	QP	P	
8	2.9130	8.33	10.06	18.39	46.00	-27.61	AVG	P	
9 *	4.9380	40.77	10.04	50.81	56.00	-5.19	QP	P	
10	4.9380	19.72	10.04	29.76	46.00	-16.24	AVG	P	
11	8.8350	37.73	9.97	47.70	60.00	-12.30	QP	P	
12	8.8350	22.08	9.97	32.05	50.00	-17.95	AVG	P	

Note: Level = Reading + Factor

Margin = Level - Limit

Conducted Emission Test Data



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1725	47.58	9.98	57.56	64.84	-7.28	QP	P	
2	0.1725	28.94	9.98	38.92	54.84	-15.92	AVG	P	
3	0.4830	34.66	10.07	44.73	56.29	-11.56	QP	P	
4	0.4830	26.05	10.07	36.12	46.29	-10.17	AVG	P	
5	2.8590	30.57	10.05	40.62	56.00	-15.38	QP	P	
6	2.8590	13.06	10.05	23.11	46.00	-22.89	AVG	P	
7 *	5.5500	45.33	10.04	55.37	60.00	-4.63	QP	P	
8	5.5500	20.10	10.04	30.14	50.00	-19.86	AVG	P	
9	10.3695	31.08	10.01	41.09	60.00	-18.91	QP	P	
10	10.3695	14.78	10.01	24.79	50.00	-25.21	AVG	P	
11	27.2445	28.00	10.20	38.20	60.00	-21.80	QP	P	
12	27.2445	4.57	10.20	14.77	50.00	-35.23	AVG	P	

Note: Level = Reading + Factor

Margin = Level - Limit

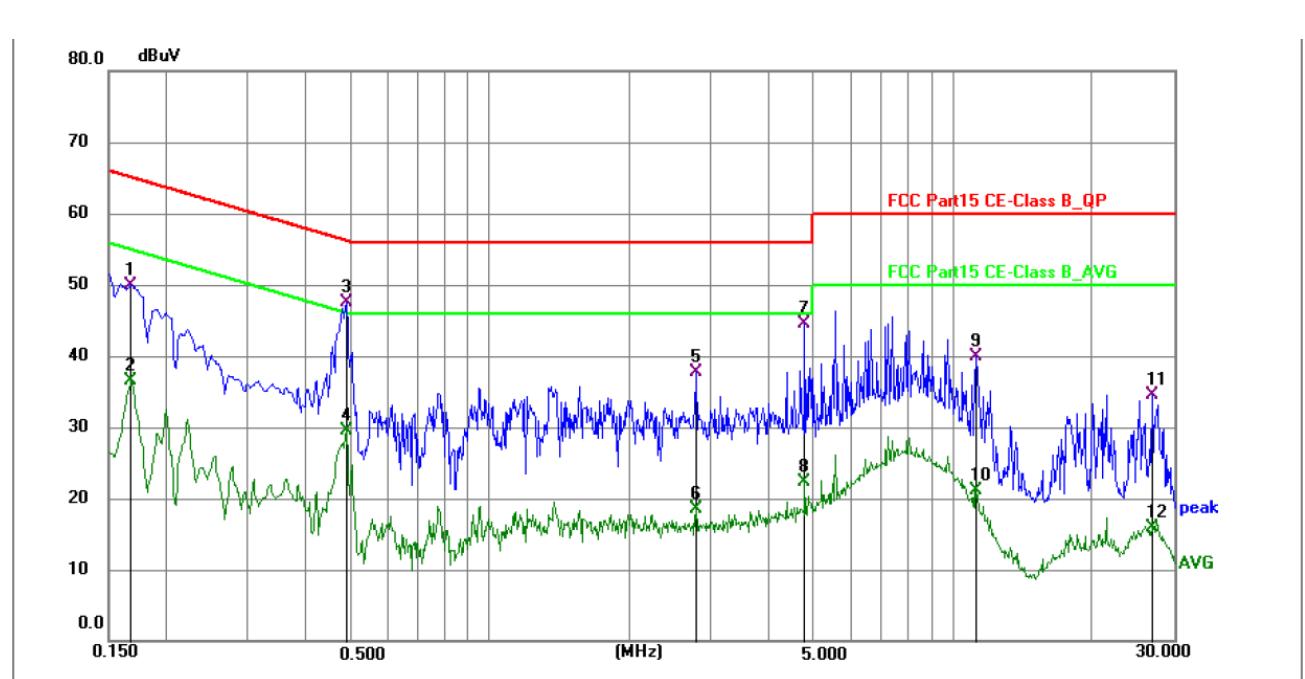
Conducted Emission Test Data

Test Site: Shielded Room #1

Test Mode: TM1/ CH Middle

Comments: Live Line

Model No.: H8025

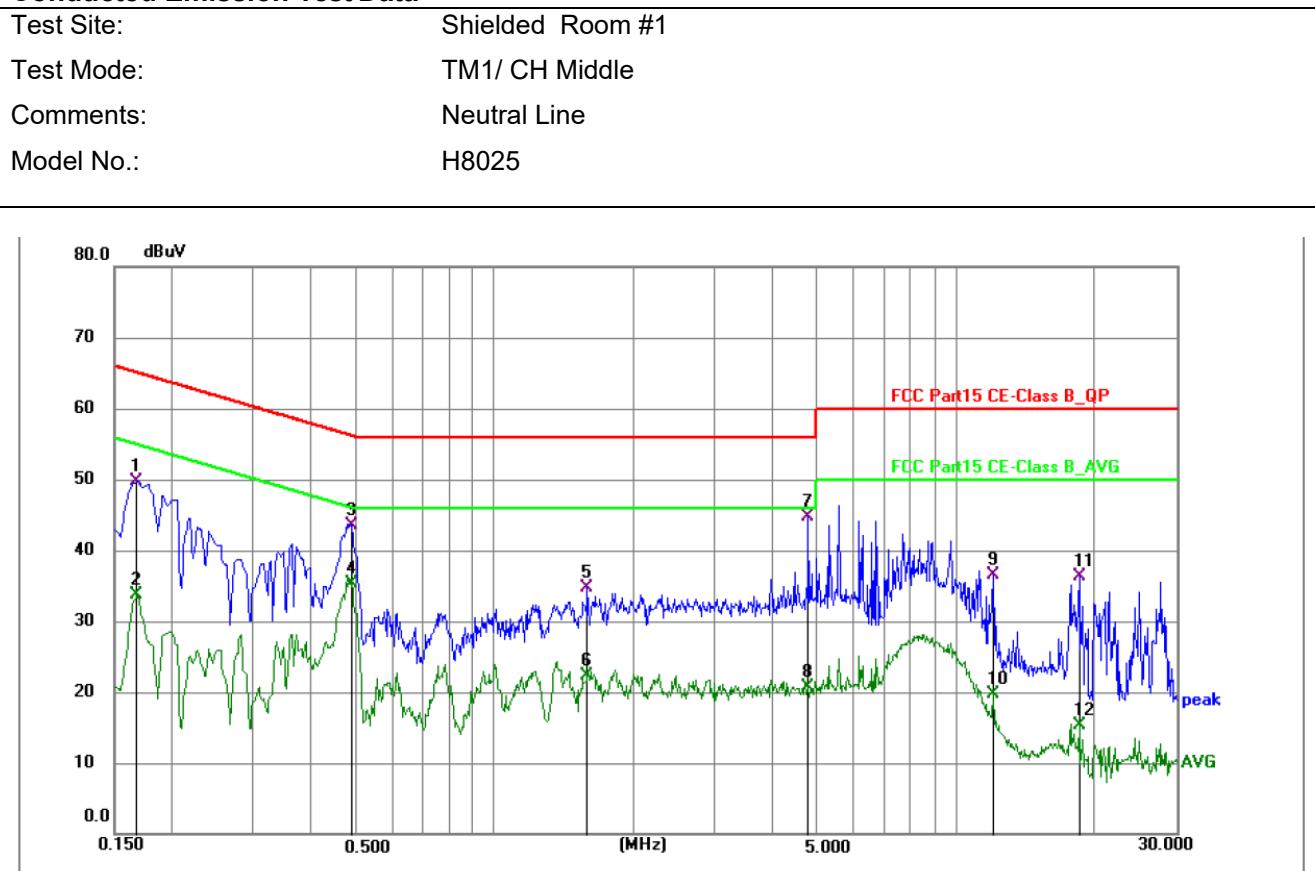


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1677	39.94	9.96	49.90	65.07	-15.17	QP	P	
2	0.1677	26.54	9.96	36.50	55.07	-18.57	AVG	P	
3 *	0.4875	37.41	10.04	47.45	56.21	-8.76	QP	P	
4	0.4875	19.42	10.04	29.46	46.21	-16.75	AVG	P	
5	2.7825	27.75	10.05	37.80	56.00	-18.20	QP	P	
6	2.7825	8.38	10.05	18.43	46.00	-27.57	AVG	P	
7	4.7940	34.41	10.04	44.45	56.00	-11.55	QP	P	
8	4.7940	12.31	10.04	22.35	46.00	-23.65	AVG	P	
9	11.2020	29.88	9.96	39.84	60.00	-20.16	QP	P	
10	11.2020	11.21	9.96	21.17	50.00	-28.83	AVG	P	
11	26.9250	24.26	10.21	34.47	60.00	-25.53	QP	P	
12	26.9250	5.78	10.21	15.99	50.00	-34.01	AVG	P	

Note: Level = Reading + Factor

Margin = Level - Limit

Conducted Emission Test Data



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1677	39.74	9.98	49.72	65.07	-15.35	QP	P	
2	0.1677	23.66	9.98	33.64	55.07	-21.43	AVG	P	
3	0.4875	33.51	10.07	43.58	56.21	-12.63	QP	P	
4 *	0.4875	25.14	10.07	35.21	46.21	-11.00	AVG	P	
5	1.5900	24.63	10.07	34.70	56.00	-21.30	QP	P	
6	1.5900	12.31	10.07	22.38	46.00	-23.62	AVG	P	
7	4.7940	34.59	10.05	44.64	56.00	-11.36	QP	P	
8	4.7940	10.56	10.05	20.61	46.00	-25.39	AVG	P	
9	12.0390	26.55	10.00	36.55	60.00	-23.45	QP	P	
10	12.0390	9.61	10.00	19.61	50.00	-30.39	AVG	P	
11	18.4290	26.17	10.05	36.22	60.00	-23.78	QP	P	
12	18.4290	5.16	10.05	15.21	50.00	-34.79	AVG	P	

Note: Level = Reading + Factor

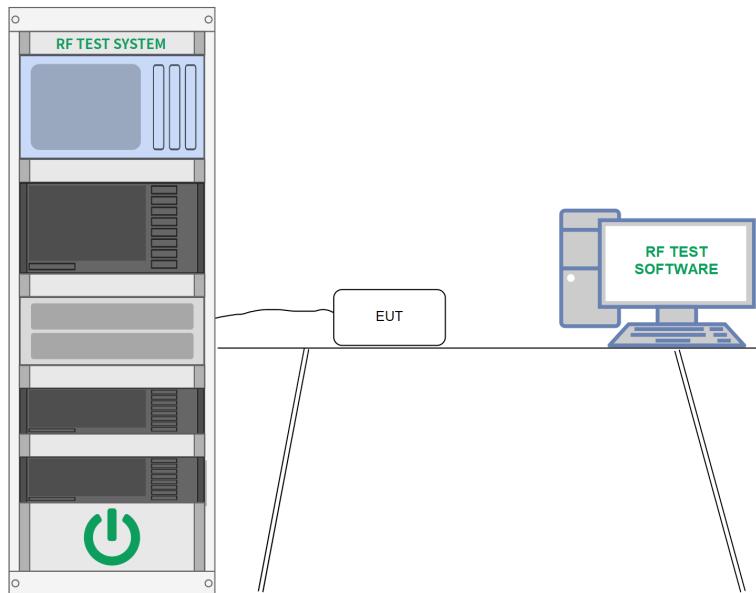
Margin = Level - Limit

5.3 DTS Bandwidth

5.3.1 Test Requirement

Test Requirement	Systems using digital modulation techniques may operate in the 902-928 MHz, and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Test Method	ANSI C63.10-2020 section 11.8

5.3.2 Test Setup Diagram



5.3.3 Test Procedure

- a) Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.
- b) Set the VBW $\geq [3 \times \text{RBW}]$.
- c) Detector = peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

5.3.4 Test Data

N/A.

The EUT is part of the C2PC program, so there is no need to re-conduct this test item.

5.4 Maximum Conducted Output Power

5.4.1 Test Requirement

Test Requirement	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
Test Method	ANSI C63.10-2020 section 11.9

5.4.2 Test Setup Diagram

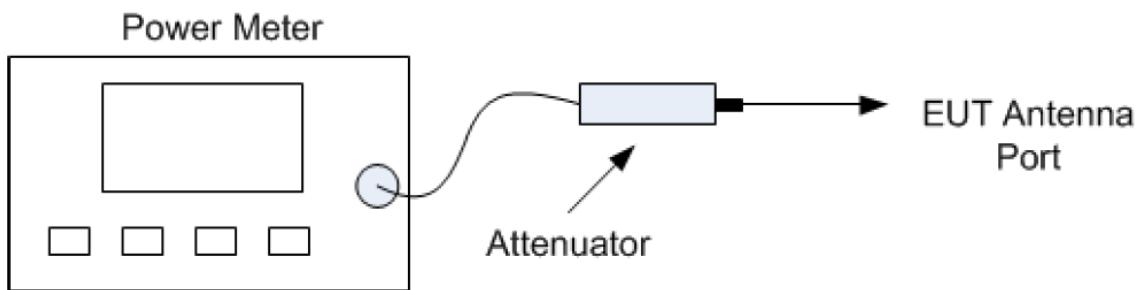


Figure 24—Example of a power meter conducted test setup

5.4.3 Test Procedure

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast responding diode detector.

5.4.4 Test Data

Test Results

Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
1M	SISO	2402	-1.92	<=30	Pass
		2440	-1.84	<=30	Pass
		2480	-1.87	<=30	Pass

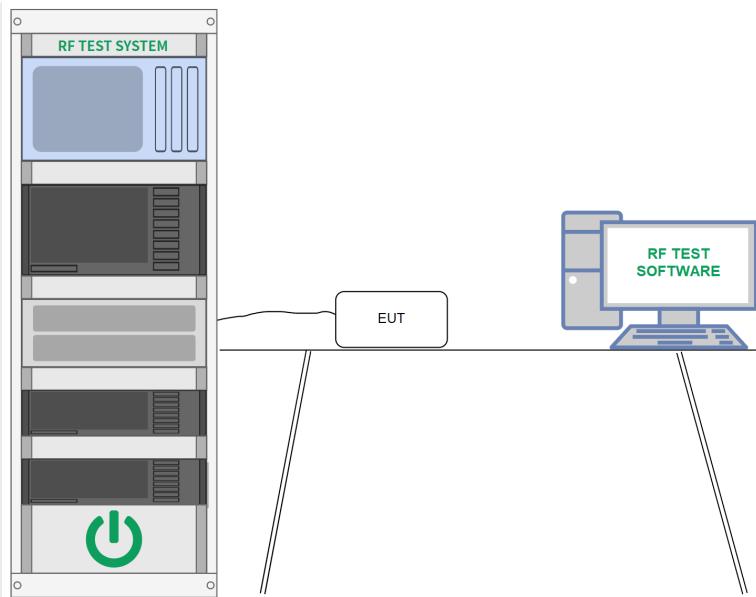
Note: Since the PCB board without any change, all power results are refer to the original report 8235EU012704W1.

5.5 Power Spectral Density

5.5.1 Test Requirement

Test Requirement	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
Test Method	ANSI C63.10-2020 section 11.10

5.5.2 Test Setup Diagram



5.5.3 Test Procedure

Set analyzer center frequency to DTS channel center frequency.
 Set the span to 1.5 times the DTS bandwidth.
 Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
 Set the VBW $\geq 3 \text{ RBW}$.
 Detector = peak.
 Sweep time = auto couple.
 Trace mode = max hold.
 Allow trace to fully stabilize.
 Use the peak marker function to determine the maximum amplitude level within the RBW.
 If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.5.4 Test Data

N/A.

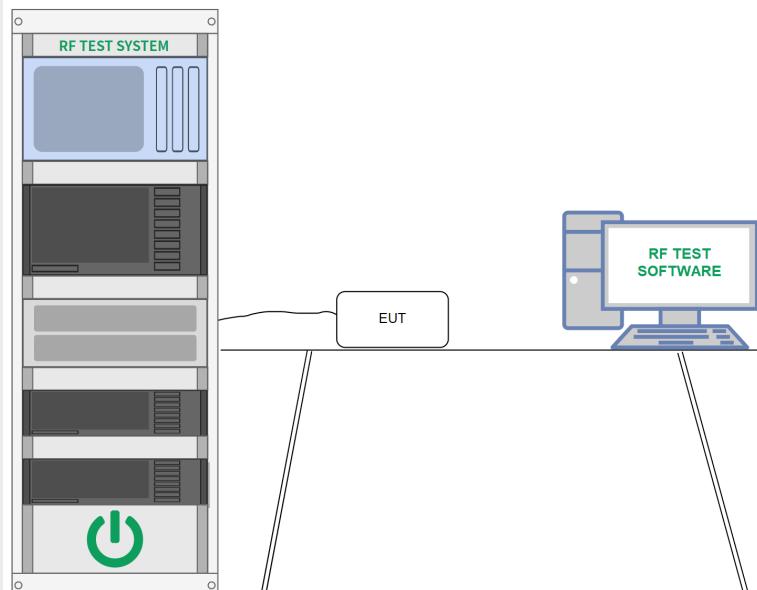
The EUT is part of the C2PC program, so there is no need to re-conduct this test item.

5.6 Emissions in Non-restricted Frequency Bands (Conducted)

5.6.1 Test Requirement

Test Requirement	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Test Method	ANSI C63.10-2020 section 11.11

5.6.2 Test Setup Diagram





5.6.3 Test Procedure

The following procedures may be used to determine the peak or average field strength or power of an unwanted emission that is within 2 MHz of the authorized band edge. If a peak detector is utilized, use the procedure described in 13.2.1. Use the procedure described in 13.2.2 when using an average detector and the EUT can be configured to transmit continuously (i.e., duty cycle $\geq 98\%$). Use the procedure described in 13.2.3 when using an average detector and the EUT cannot be configured to transmit continuously but the duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent). Use the procedure described in 13.2.4 when using an average detector for those cases where the EUT cannot be configured to transmit continuously and the duty cycle is not constant (duty cycle variations equal or exceed 2 percent).

When using a peak detector to measure unwanted emissions at or near the band edge (within 2 MHz of the authorized band), the following integration procedure can be used.

Set instrument center frequency to the frequency of the emission to be measured (must be within 2 MHz of the authorized band edge).

Set span to 2 MHz

RBW = 100 kHz.

VBW $\geq 3 \times$ RBW.

Detector = peak.

Sweep time = auto.

Trace mode = max hold.

Allow sweep to continue until the trace stabilizes (required measurement time may increase for low duty cycle applications)

Compute the power by integrating the spectrum over 1 MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency (f_{emission}) ± 0.5 MHz. If the instrument does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by $f_{\text{emission}} \pm 0.5$ MHz.

Standard method (The 99% OBW of the fundamental emission is without 2 MHz of the authorized band):

Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products that fall outside of the authorized band of operation.

Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than $[10 \log (\text{OBW}/\text{RBW})]$ below the reference level. Specific guidance is given in 4.1.5.2.

Attenuation: Auto (at least 10 dB preferred).

Sweep time: Coupled.

Resolution bandwidth: 100 kHz.

Video bandwidth: 300 kHz.

Detector: Peak.

Trace: Max hold.

5.6.4 Test Data

N/A.

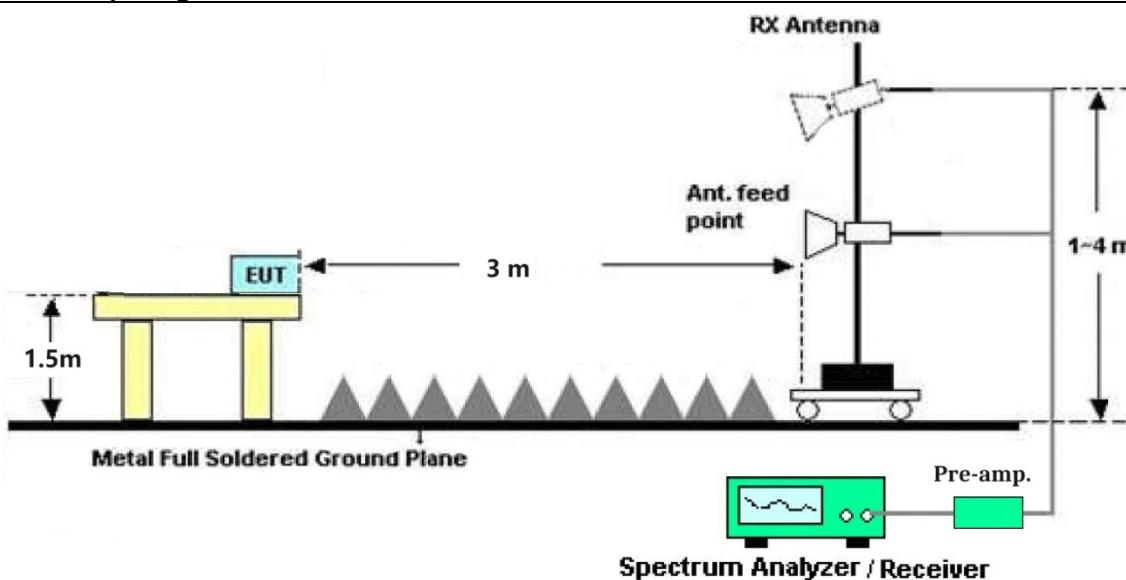
The EUT is part of the C2PC program, so there is no need to re-conduct this test item.

5.7 Band Edge Emissions (Restricted frequency bands)

5.7.1 Test Requirement

Test Requirement	In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).		
	Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
	0.009-0.490	2400/F(kHz)	300
	0.490-1.705	24000/F(kHz)	30
	1.705-30.0	30	30
	30-88	100 **	3
	88-216	150 **	3
	216-960	200 **	3
	Above 960	500	3
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.			
Test Limit	Restricted frequency bands:		
	MHz	MHz	GHz
	0.090-0.110	16.42-16.423	4.5-5.15
	0.495-0.505	16.69475-16.69525	5.35-5.46
	2.1735-2.1905	16.80425-16.80475	7.25-7.75
	4.125-4.128	25.5-25.67	8.025-8.5
	4.17725-4.17775	37.5-38.25	9.0-9.2
	4.20725-4.20775	73-74.6	9.3-9.5
	6.215-6.218	74.8-75.2	10.6-12.7
	6.26775-6.26825	108-121.94	13.25-13.4
	6.31175-6.31225	123-138	14.47-14.5
	8.291-8.294	149.9-150.05	15.35-16.2
	8.362-8.366	156.52475-156.52525	17.7-21.4
	8.37625-8.38675	156.7-156.9	22.01-23.12
	8.41425-8.41475	162.0125-167.17	23.6-24.0
	12.29-12.293	167.72-173.2	31.2-31.8
	12.51975-12.52025	240-285	36.43-36.5
	12.57675-12.57725	322-335.4	3600-4400
	13.36-13.41		
Note:			
1) Field Strength (dB μ V/m) = 20*log[Field Strength (μ V/m)].			
2) In the emission tables above, the tighter limit applies at the band edges.			
3) 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 20dB above the maximum permitted average limit.			
4) For above 1000 MHz, limit field strength of harmonics: 54dB μ V/m@3m (AV) and 74dB μ V/m@3m (PK).			
Test Method	ANSI C63.10-2020 section 6.6.4		

5.7.2 Test Setup Diagram



5.7.3 Test Procedure

The measurement frequency range is from 9 kHz 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.

5.7.4 Test Data

PASS.

Please refer to the following pages.



Band Edge Emissions (Restricted frequency bands):

Test Mode: GFSK(1Mbps)					CH Low: 2402 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
				level (dBuV/m)				
H	2310.00	46.59	-2.81	43.78	74.00	-30.22	PK	PASS
H	2390.00	46.55	-2.69	43.86	74.00	-30.14	PK	PASS
H	**2400.00	61.66	-2.68	58.98	74.00	-15.02	PK	PASS
V	2310.00	43.89	-2.81	41.08	74.00	-32.92	PK	PASS
V	2390.00	48.69	-2.69	46.00	74.00	-28.00	PK	PASS
V	**2400.00	62.33	-2.68	59.65	74.00	-14.35	PK	PASS
H	2310.00	35.61	-2.81	32.80	54.00	-21.20	AV	PASS
H	2390.00	36.98	-2.69	34.29	54.00	-19.71	AV	PASS
H	**2400.00	48.19	-2.68	45.51	54.00	-8.49	AV	PASS
V	2310.00	35.36	-2.81	32.55	54.00	-21.45	AV	PASS
V	2390.00	35.51	-2.69	32.82	54.00	-21.18	AV	PASS
V	**2400.00	49.40	-2.68	46.72	54.00	-7.28	AV	PASS

Test Mode: GFSK(1Mbps)					CH High: 2480 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
				level (dBuV/m)				
H	**2483.50	48.75	-2.56	46.19	74.00	-27.81	PK	PASS
H	2500.00	49.50	-2.54	46.96	74.00	-27.04	PK	PASS
V	**2483.50	48.63	-2.56	46.07	74.00	-27.93	PK	PASS
V	2500.00	50.20	-2.54	47.66	74.00	-26.34	PK	PASS
H	**2483.50	36.63	-2.56	34.07	54.00	-19.93	AV	PASS
H	2500.00	42.35	-2.54	39.81	54.00	-14.19	AV	PASS
V	**2483.50	36.70	-2.56	34.14	54.00	-19.86	AV	PASS
V	2500.00	41.33	-2.54	38.79	54.00	-15.21	AV	PASS

1. Emission Level = Reading + Factor, Margin= Emission Level – Limit.

5.8 Radiated Spurious Emission

5.8.1 Test Requirement

Test Requirement	In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).		
Test Limit	Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
	0.009-0.490	2400/F(kHz)	300
	0.490-1.705	24000/F(kHz)	30
	1.705-30.0	30	30
	30-88	100 **	3
	88-216	150 **	3
	216-960	200 **	3
	Above 960	500	3
	** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.		
	Note:		
	1) Field Strength (dB μ V/m) = 20*log[Field Strength (μ V/m)].		
	2) In the emission tables above, the tighter limit applies at the band edges.		
	3) 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 20dB above the maximum permitted average limit.		
	4) For above 1000 MHz, limit field strength of harmonics: 54dB μ V/m@3m (AV) and 74dB μ V/m@3m (PK).		
Test Method	ANSI C63.10-2020 section 6.6.4		

5.8.2 Test Setup Diagram

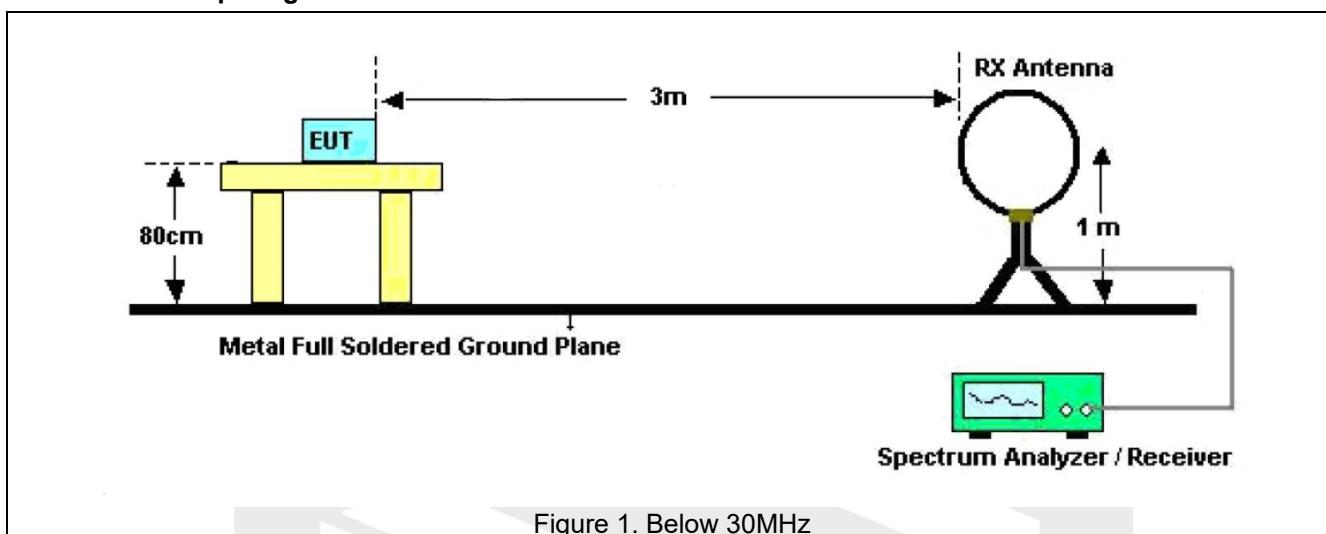


Figure 1. Below 30MHz

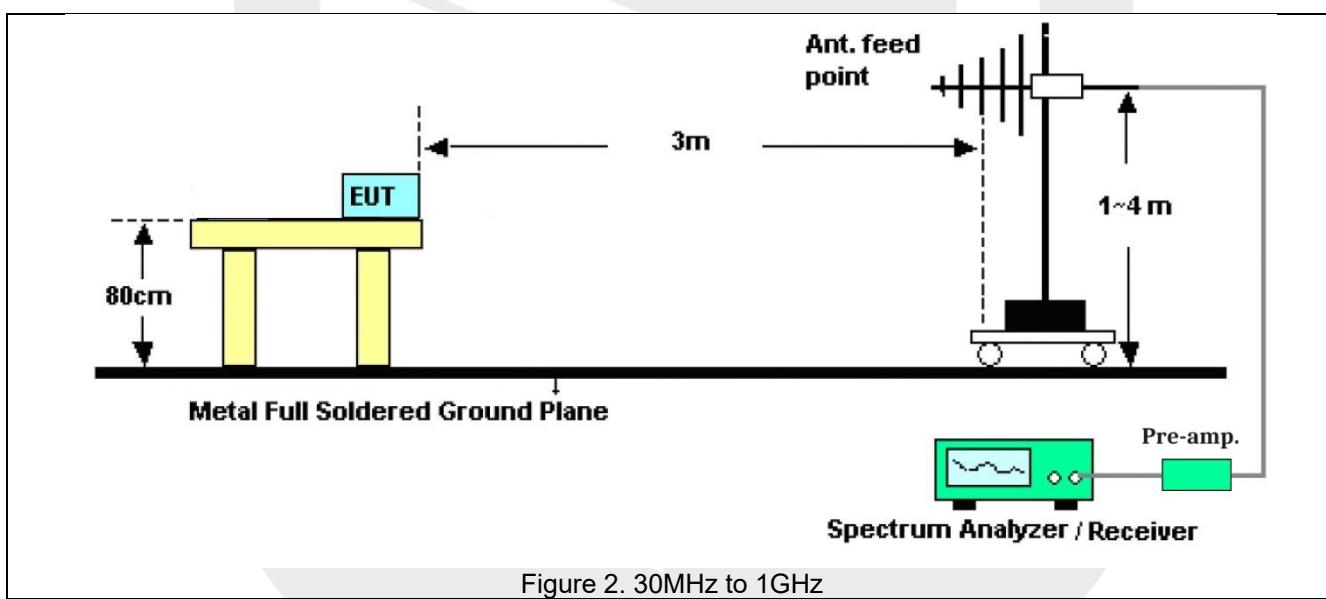


Figure 2. 30MHz to 1GHz

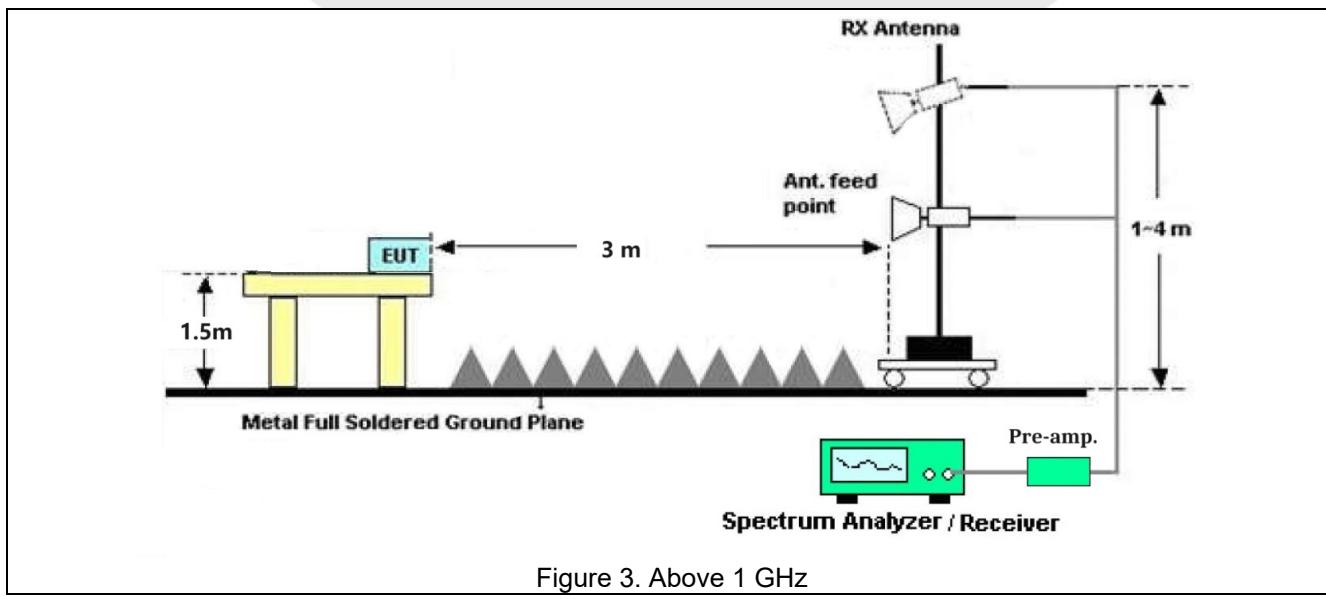


Figure 3. Above 1 GHz



5.8.3 Test Procedure

The measurement frequency range is from 9 kHz 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

For 9kHz to 150kHz, Set the spectrum analyzer as:

RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:

RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:

RBW = 100kHz, VBW =300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz, Set the spectrum analyzer as:

RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.

RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported, Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

5.8.4 Test Data

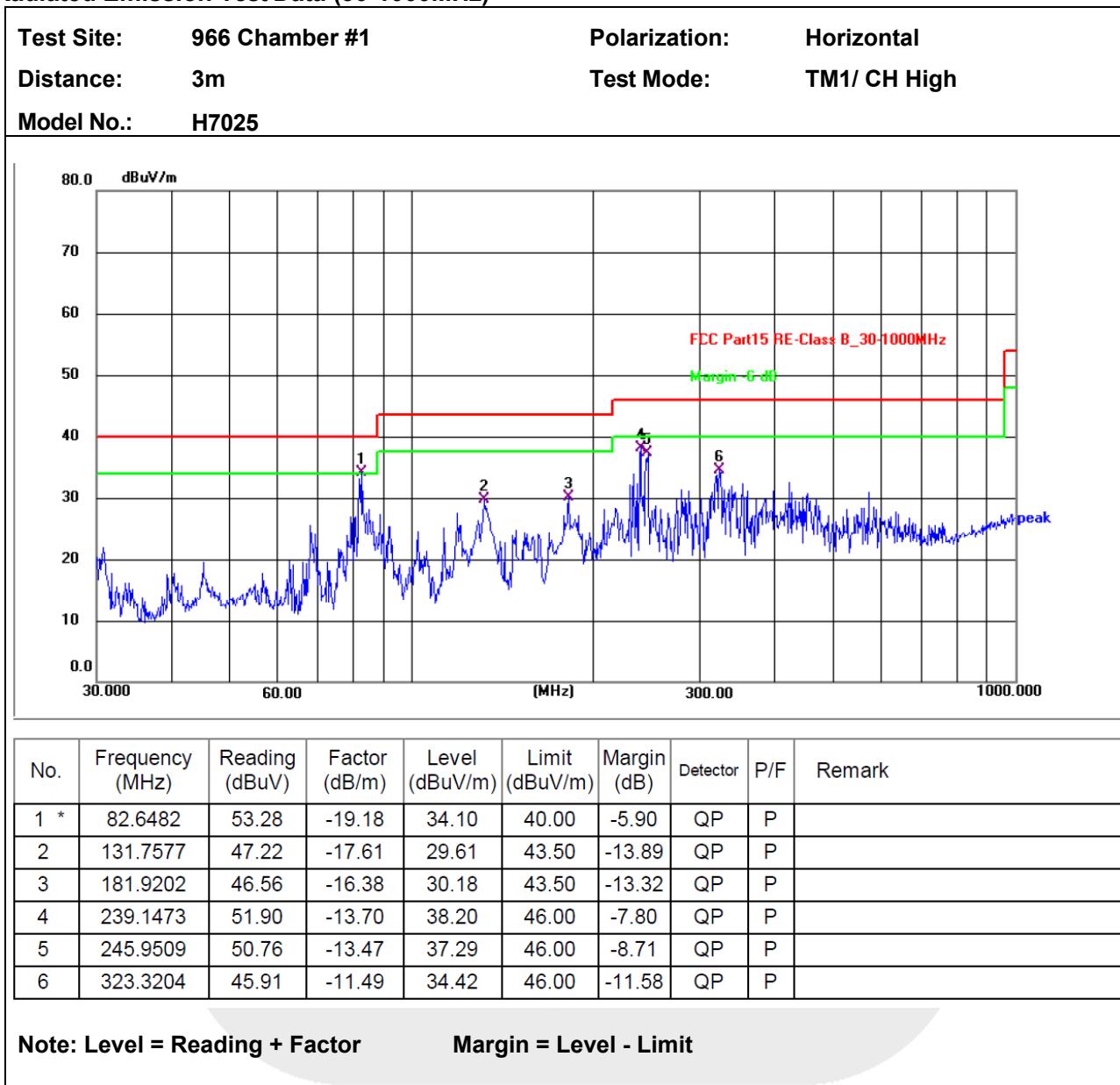
PASS.

Please to see the following pages.

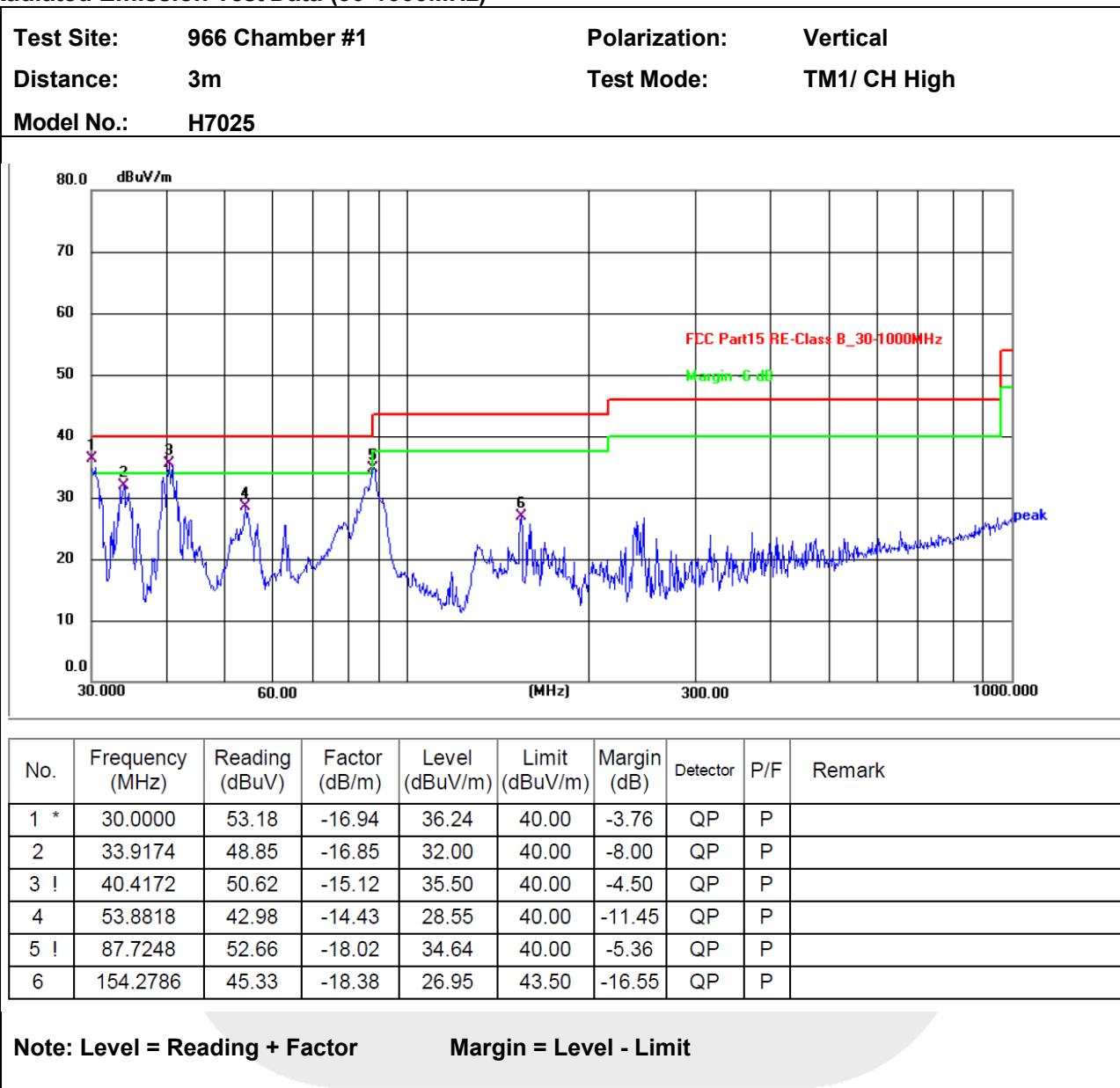
The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

For test of 30MHz-1GHz, during the test, pre-scan all test modes, and found the BLE 1M mode is worse case, the report only record this mode.

Radiated Emission Test Data (30-1000MHz)

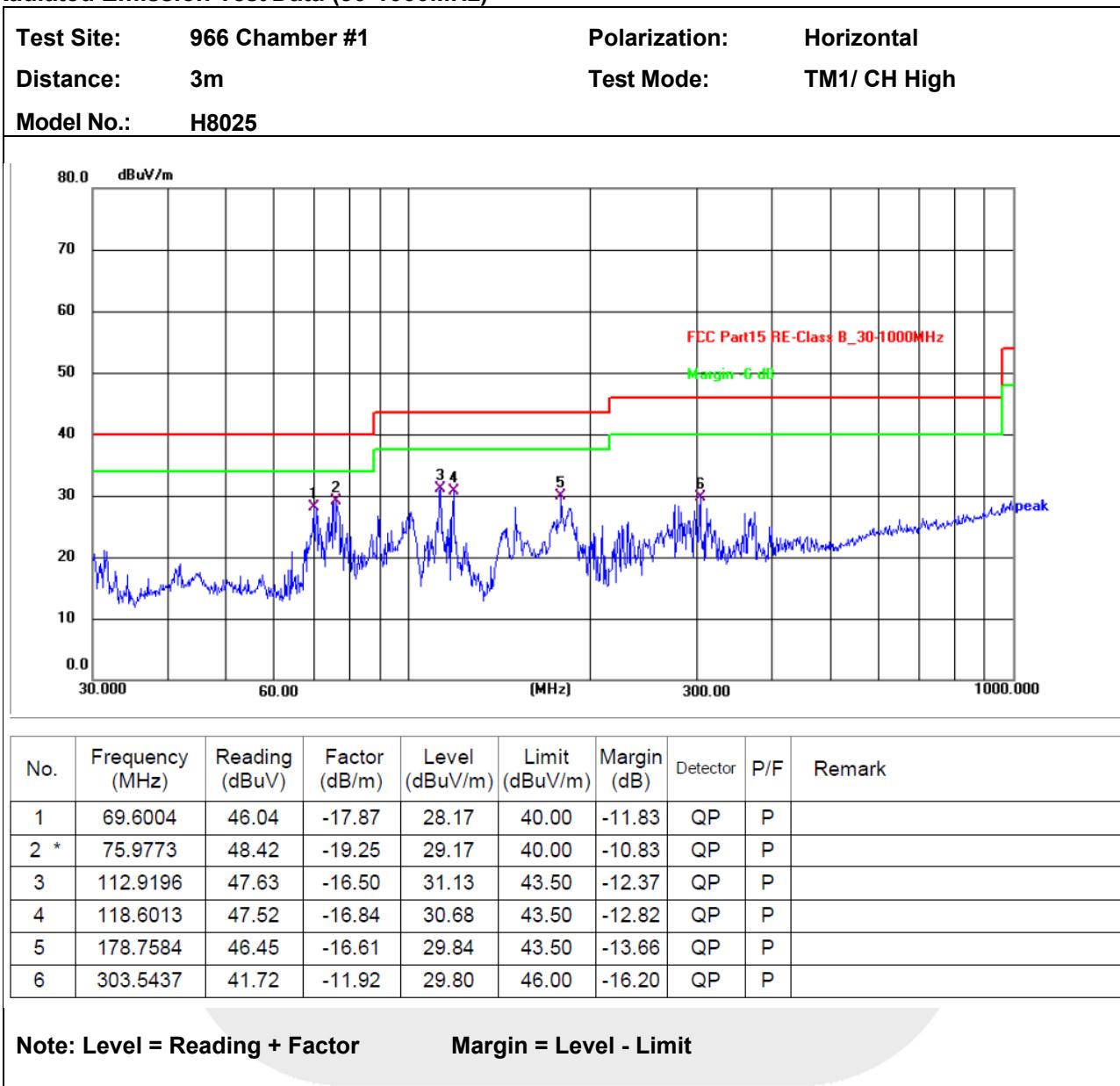


Radiated Emission Test Data (30-1000MHz)

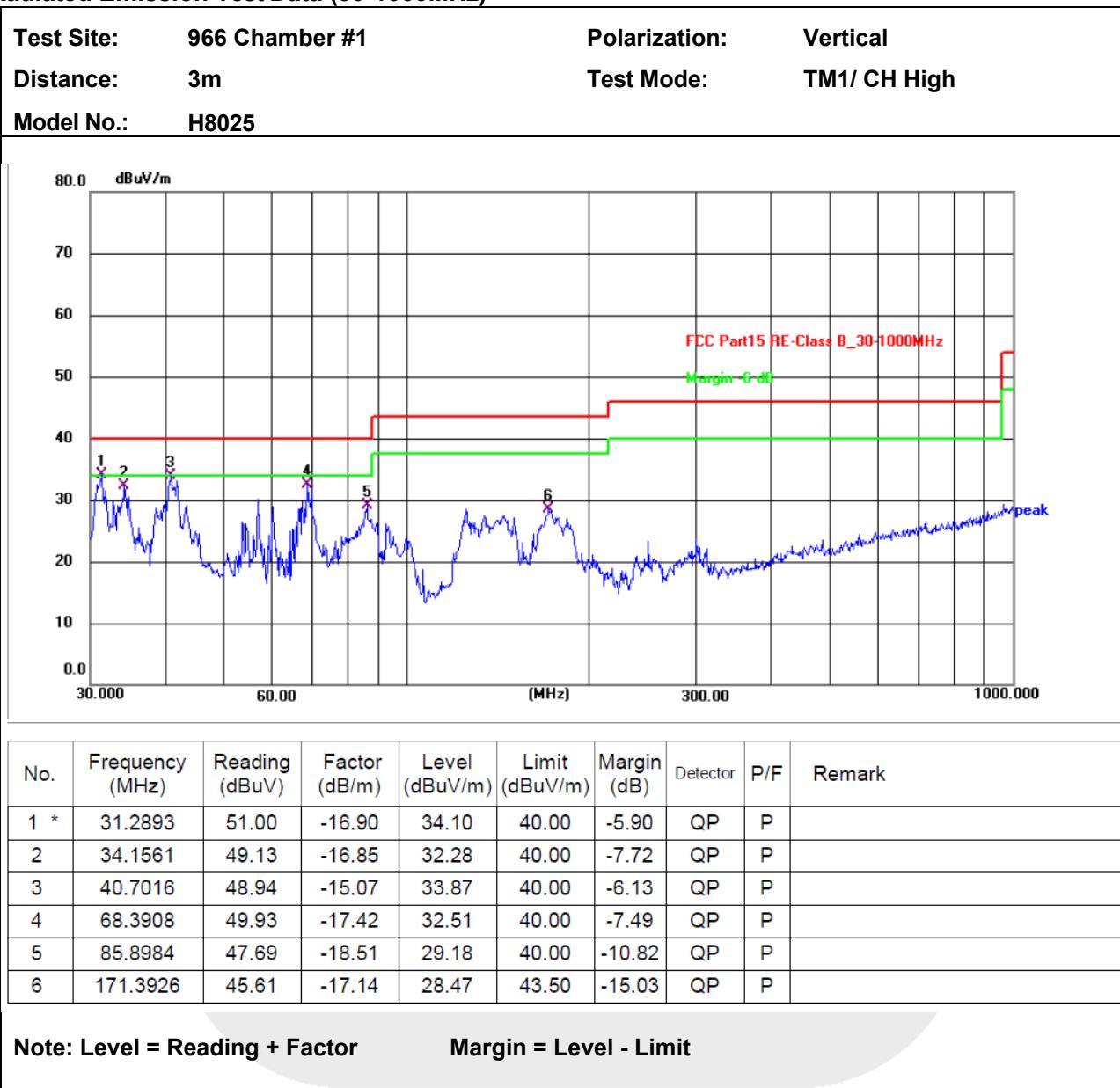




Radiated Emission Test Data (30-1000MHz)



Radiated Emission Test Data (30-1000MHz)





Radiated Spurious Emission (1GHz-25GHz)

Test Mode: TX-GFSK					CH Low: 2402 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
V	4804.66	40.74	4.68	45.42	74.00	-28.58	PK	PASS
V	7206.12	34.76	9.84	44.60	74.00	-29.40	PK	PASS
V	9608.98	28.23	13.17	41.40	74.00	-32.61	PK	PASS
V	12010.67	*	*	*	74.00	*	PK	PASS
V	14412.34	*	*	*	74.00	*	PK	PASS
V	16814.42	*	*	*	74.00	*	PK	PASS
H	4804.11	42.59	4.68	47.27	74.00	-26.74	PK	PASS
H	7206.27	33.28	9.84	43.12	74.00	-30.88	PK	PASS
H	9608.64	28.35	13.17	41.52	74.00	-32.49	PK	PASS
H	12010.16	*	*	*	74.00	*	PK	PASS
H	14412.99	*	*	*	74.00	*	PK	PASS
H	16814.31	*	*	*	74.00	*	PK	PASS
V	4804.73	30.99	4.68	35.67	54.00	-18.33	AV	PASS
V	7206.04	22.73	9.84	32.57	54.00	-21.44	AV	PASS
V	9608.98	17.19	13.17	30.36	54.00	-23.65	AV	PASS
V	12010.05	*	*	*	54.00	*	AV	PASS
V	14412.48	*	*	*	54.00	*	AV	PASS
V	16814.30	*	*	*	54.00	*	AV	PASS
H	4804.59	30.51	4.68	35.19	54.00	-18.82	AV	PASS
H	7206.27	22.31	9.84	32.15	54.00	-21.85	AV	PASS
H	9608.64	17.37	13.17	30.54	54.00	-23.46	AV	PASS
H	12010.16	*	*	*	54.00	*	AV	PASS
H	14412.99	*	*	*	54.00	*	AV	PASS
H	16814.31	*	*	*	54.00	*	AV	PASS

Remark:

1. Emission Level = Reading + Factor, Margin= Emission Level – Limit.
2. “*” means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.



Radiated Spurious Emission (1GHz-25GHz)

Test Mode: TX-GFSK					CH Middle: 2440 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
V	4880.12	40.25	4.92	45.17	74.00	-28.83	PK	PASS
V	7320.61	35.33	9.83	45.16	74.00	-28.85	PK	PASS
V	9760.03	28.94	13.22	42.16	74.00	-31.85	PK	PASS
V	12200.68	*	*	*	74.00	*	PK	PASS
V	14640.63	*	*	*	74.00	*	PK	PASS
V	17080.19	*	*	*	74.00	*	PK	PASS
H	4880.45	42.01	4.92	46.93	74.00	-27.07	PK	PASS
H	7320.43	35.38	9.83	45.21	74.00	-28.79	PK	PASS
H	9760.91	30.61	13.22	43.83	74.00	-30.17	PK	PASS
H	12200.36	*	*	*	74.00	*	PK	PASS
H	14640.41	*	*	*	74.00	*	PK	PASS
H	17080.29	*	*	*	74.00	*	PK	PASS
V	4880.48	32.33	4.92	37.25	54.00	-16.76	AV	PASS
V	7320.18	24.18	9.83	34.01	54.00	-19.99	AV	PASS
V	9760.29	18.02	13.22	31.24	54.00	-22.76	AV	PASS
V	12200.29	*	*	*	54.00	*	AV	PASS
V	14640.59	*	*	*	54.00	*	AV	PASS
V	17080.75	*	*	*	54.00	*	AV	PASS
H	4880.45	31.47	4.92	36.39	54.00	-17.61	AV	PASS
H	7320.43	23.49	9.83	33.32	54.00	-20.68	AV	PASS
H	9760.91	18.97	13.22	32.19	54.00	-21.81	AV	PASS
H	12200.36	*	*	*	54.00	*	AV	PASS
H	14640.41	*	*	*	54.00	*	AV	PASS
H	17080.29	*	*	*	54.00	*	AV	PASS

Remark:

1. Emission Level = Reading + Factor, Margin= Emission Level – Limit.
2. “*” means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.



Radiated Spurious Emission (1GHz-25GHz)

Test Mode: TX-GFSK					CH High: 2480 MHz			
Pol.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type	Result
V	4960.69	40.10	5.17	45.27	74.00	-28.74	PK	PASS
V	7440.14	35.42	9.83	45.25	74.00	-28.75	PK	PASS
V	9920.71	30.07	13.27	43.34	74.00	-30.66	PK	PASS
V	12400.57	*	*	*	74.00	*	PK	PASS
V	14880.90	*	*	*	74.00	*	PK	PASS
V	17360.98	*	*	*	74.00	*	PK	PASS
H	4960.03	41.21	5.17	46.38	74.00	-27.63	PK	PASS
H	7440.91	33.15	9.83	42.98	74.00	-31.02	PK	PASS
H	9920.24	29.19	13.27	42.46	74.00	-31.55	PK	PASS
H	12400.60	*	*	*	74.00	*	PK	PASS
H	14880.85	*	*	*	74.00	*	PK	PASS
H	17360.74	*	*	*	74.00	*	PK	PASS
V	4960.29	30.44	5.17	35.61	54.00	-18.39	AV	PASS
V	7440.67	22.67	9.83	32.50	54.00	-21.50	AV	PASS
V	9920.87	17.49	13.27	30.76	54.00	-23.24	AV	PASS
V	12400.09	*	*	*	54.00	*	AV	PASS
V	14880.38	*	*	*	54.00	*	AV	PASS
V	17360.85	*	*	*	54.00	*	AV	PASS
H	4960.03	31.54	5.17	36.71	54.00	-17.30	AV	PASS
H	7440.91	23.37	9.83	33.20	54.00	-20.80	AV	PASS
H	9920.24	17.51	13.27	30.78	54.00	-23.23	AV	PASS
H	12400.60	*	*	*	54.00	*	AV	PASS
H	14880.85	*	*	*	54.00	*	AV	PASS
H	17360.74	*	*	*	54.00	*	AV	PASS

Remark:

1. Emission Level = Reading + Factor, Margin= Emission Level – Limit.
2. ** means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

ANNEX A TEST SETUP PHOTOS

Please refer to the document "8330EU010607W-AA.PDF"

ANNEX B EXTERNAL PHOTOS

Please refer to the document "8330EU010607W-AB.PDF"

ANNEX C INTERNAL PHOTOS

Please refer to the document "8330EU010607W-AC.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.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
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.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--- End of Report ---