




TEST REPORT

For 2.4GHz devices

Report No. : **CHEW22070091** Report Verification: 

Project No..... : **SHT2203021903EW**

FCC ID..... : **2ANIV-QPRO**

Applicant's name..... : **Shenzhen Neewer Technology Co., Ltd**

Address..... : ROOM 1901-1903, Block A, LU SHAN BUILDING NO.3023
 CHUNFENG RD LUO HU DISTRICT, SHENZHEN,
 GUANGDONG, 518001, CHINA

Product Name : **TTL Wireless Flash Trigger**

Trade Mark : NEEWER

Model No. : QPro-C

Listed Model(s) : QPro-N, QPro-S

Standard : **FCC CFR Title 47 Part 15 Subpart C Section 15.249**

Date of receipt of test sample..... : Mar.21, 2022

Date of testing..... : Mar.21, 2022- Jul.19, 2022

Date of issue..... : Jul.20, 2022

Result..... : **PASS**

Compiled by
 (Position+Printed name+Signature): File administrator Echo Wei

Echo Wei

Supervised by
 (Position+Printed name+Signature): Project Engineer Kiki Kong

Kiki Kong

Approved by
 (Position+Printed name+Signature): RF Manager Hans Hu

Hans Hu

Testing Laboratory Name : **Shenzhen Huatongwei International Inspection Co., Ltd.**

Address..... : 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road,
 Tianliao, Gongming, Shenzhen, China

Shenzhen Huatongwei International Inspection Co., Ltd. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen Huatongwei International Inspection Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen Huatongwei International Inspection Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

The test report merely correspond to the test sample.

Contents

1.	TEST STANDARDS AND REPORT VERSION	3
1.1.	Test Standards	3
1.2.	Report version	3
2.	TEST DESCRIPTION	4
3.	SUMMARY	5
3.1.	Client Information	5
3.2.	Product Description	5
3.3.	Radio Specification Description	5
3.4.	Testing Laboratory Information	6
4.	TEST CONFIGURATION	7
4.1.	Test frequency list	7
4.2.	Descriptions of Test mode	7
4.3.	Test sample information	7
4.4.	Support unit used in test configuration and system	8
4.5.	Testing environmental condition	8
4.6.	Statement of the measurement uncertainty	8
4.7.	Equipment Used during the Test	9
5.	TEST CONDITIONS AND RESULTS	11
5.1.	Antenna Requirement	11
5.2.	AC Conducted Emission	12
5.3.	20dB bandwidth	13
5.4.	99% Occupied Bandwidth	15
5.5.	Radiated field strength of the fundamental signal	17
5.6.	Radiated Band edge Emission	19
5.7.	Radiated Spurious Emission	21
6.	TEST SETUP PHOTOS	26
7.	EXTERNAL AND INTERNAL PHOTOS OF THE EUT	28
7.1.	External Photos	28
7.2.	Internal Photos	30

1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:

- [FCC Rules Part 15.249](#): Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.
- [ANSI C63.10:2013](#): American National Standard for Testing Unlicensed Wireless Devices

1.2. Report version

Revision No.	Date of issue	Description
N/A	2022-07-20	Original

2. TEST DESCRIPTION

Report clause	Test Items	Standard Requirement	Result	Test Engineer
5.1	Antenna Requirement	15.203	PASS	Quanhai Deng
5.2	AC Conducted Emission	15.207	N/A	N/A
5.3	20dB Bandwidth	15.215/15.249	PASS	Quanhai Deng
5.4	99% Occupied Bandwidth	-	PASS ^{*1}	Quanhai Deng
5.5	Radiated field strength of the fundamental signal	15.249(a)	PASS	Quanhai Deng
5.6	Radiated Band Edge Emission	15.249(a)15.205/15.209	PASS	Quanhai Deng
5.7	Radiated Spurious Emission	15.249(d)15.205/15.209	PASS	Hongbin Zhong

Note:

- The measurement uncertainty is not included in the test result.
- *1: No requirement on standard, only report these test data.

3. SUMMARY

3.1. Client Information

Applicant:	Shenzhen Neewer Technology Co., Ltd
Address:	ROOM 1901-1903, Block A, LU SHAN BUILDING NO.3023 CHUNFENG RD LUO HU DISTRICT, SHENZHEN, GUANGDONG, 518001, CHINA
Manufacturer:	Shenzhen Neewer Technology Co., Ltd
Address:	ROOM 1901-1903, Block A, LU SHAN BUILDING NO.3023 CHUNFENG RD LUO HU DISTRICT, SHENZHEN, GUANGDONG, 518001, CHINA
Factory:	Shenzhen Xingyingda Industrial Co., Ltd.
Address:	401, No.2 Factory Building, Chuangweiqunxin Science and Technology Park, No.1 Baolong 6 Road, Baolong Community, Baolong Street, Longgang District, Shenzhen City, Guangdong Province, China

3.2. Product Description

Main unit information:	
Product Name:	TTL Wireless Flash Trigger
Trade Mark:	NEEWER
Model No.:	QPro-C
Listed Model(s):	QPro-N, QPro-S
Power supply:	DC 3.0V from 2* AA size battery
Hardware version:	V1.1
Software version:	V1.01

3.3. Radio Specification Description

Operation frequency:	2412.75-2464.25MHz
Channel number:	31
Modulation:	MSK
Antenna type:	FPC Antenna
Antenna gain:	3.46dBi

3.4. Testing Laboratory Information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.	
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China	
Connect information:	Phone: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn	
Qualifications	Type	Accreditation Number
	FCC	762235

4. TEST CONFIGURATION

4.1. Test frequency list

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channels which were tested. The Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the below blue front.

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
00 (CH _L)	2412.75	16	2439.25
01	2414.25	17	2441.50
02	2415.75	18	2442.75
03	2417.75	19	2444.25
04	2419.25	20	2446.50
05	2420.75	21	2447.75
06	2422.75	22	2449.25
07	2424.25	23	2451.50
08	2426.50	24	2452.75
09	2427.75	25	2454.25
10	2429.25	26	2456.50
11	2431.50	27	2457.75
12	2432.75	28	2459.25
13	2434.25	29	2461.50
14 (CH _M)	2436.00	30	2462.75
15	2437.75	31 (CH _H)	2464.25

4.2. Descriptions of Test mode

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit.
For AC power line conducted emissions:
The EUT was set to connect with large package sizes transmission.
For Radiated spurious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data Recorded in the report.

4.3. Test sample information

Test item	HTW sample no.
RF Conducted test items	YPHT22030219002
RF Radiated test items	YPHT22030219002
EMI test items	YPHT22030219002

Note:

RF Conducted test items: 20dB Bandwidth,99% Occupied Bandwidth,

RF Radiated test items: Radiated Band Edge Emission, Radiated Spurious Emission, Radiated field strength of the fundamental signal

EMI test items : AC Conducted Emission

4.4. Support unit used in test configuration and system

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following peripheral devices and interface cables were connected during the measurement:

Whether support unit is used?			
✓ No			
Item	Equipment	Trade Name	Model No.
1			
2			

4.5. Testing environmental condition

Type	Requirement	Actual
Temperature:	15~35°C	25°C
Relative Humidity:	25~75%	50%
Air Pressure:	860~1060mbar	1000mbar

4.6. Statement of the measurement uncertainty

Test Item	Measurement Uncertainty
AC Conducted Emission (150kHz~30MHz)	3.00 dB
Radiated Emission (30MHz~1000MHz)	4.36 dB
Radiated Emissions (1GHz~25GHz)	5.10 dB
Peak Output Power	0.77dB
Power Spectral Density	0.77dB
Conducted Spurious Emission	0.77dB
6dB Bandwidth	70Hz for <1GHz 130Hz for >1GHz

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4.7. Equipment Used during the Test

● Conducted Emission							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Shielded Room	Albatross projects	HTWE0114	N/A	N/A	2018/09/28	2023/09/27
●	EMI Test Receiver	R&S	HTWE0111	ESCI	101247	2021/09/14	2022/09/13
●	Artificial Mains	SCHWARZBECK	HTWE0113	NNLK 8121	573	2021/09/17	2022/09/16
●	Pulse Limiter	R&S	HTWE0193	ESH3-Z2	101447	2021/09/16	2022/09/15
●	RF Connection Cable	HUBER+SUHNER	HTWE0113-02	ENVIROFLE X_142	EF-NM-BNCM-2M	2021/09/17	2022/09/16
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-6th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0127	SAC-3m-02	C11121	2018/09/30	2022/09/29
●	EMI Test Receiver	R&S	HTWE0099	ESCI	100900	2021/09/14	2022/09/13
●	Loop Antenna	R&S	HTWE0170	HFH2-Z2	100020	2021/04/06	2024/04/05
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0123	VULB9163	538	2021/04/06	2024/04/05
●	Pre-Amplifier	SCHWARZBECK	HTWE0295	BBV 9742	N/A	2021/11/05	2022/11/04
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-01	N/A	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-02	SUCOFLEX104	501184/4	2022/02/25	2023/02/24
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-7th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0122	SAC-3m-01	C11121	2018/09/27	2022/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2021/09/13	2022/09/12
●	Horn Antenna	SCHWARZBECK	HTWE0126	9120D	1011	2020/04/01	2023/03/31
●	Broadband Horn Antenna	SCHWARZBECK	HTWE0103	BBHA9170	BBHA9170472	2020/04/27	2023/04/26
●	Pre-amplifier	CD	HTWE0071	PAP-0102	12004	2021/11/05	2022/11/04
●	Broadband Pre-amplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2022/02/28	2023/02/27
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-01	6m 18GHz S Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-02	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0119-05	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-04	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	Test Software	Audix	N/A	E3	N/A	N/A	N/A

● RF Conducted Method						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Signal and spectrum Analyzer	R&S	FSV40	100048	2021/09/13	2022/09/12
●	Spectrum Analyzer	Agilent	N9020A	MY50510187	2021/09/13	2022/09/12
●	Power Meter	Anritsu	ML249A	N/A	2021/09/13	2022/09/12
○	Radio communication tester	R&S	CMW500	137688-Lv	2021/09/13	2022/09/12

5. TEST CONDITIONS AND RESULTS

5.1. Antenna Requirement

REQUIREMENT

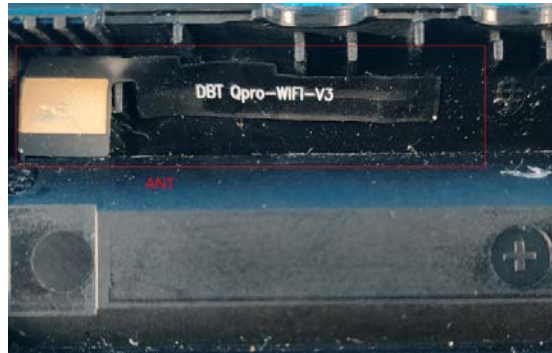
FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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, 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.

TEST RESULT

Passed **Not Applicable**

The antenna type is a FPC antenna, the directional gain of the antenna less than 6 dBi, please refer to the below antenna photo.



5.2. AC Conducted Emission

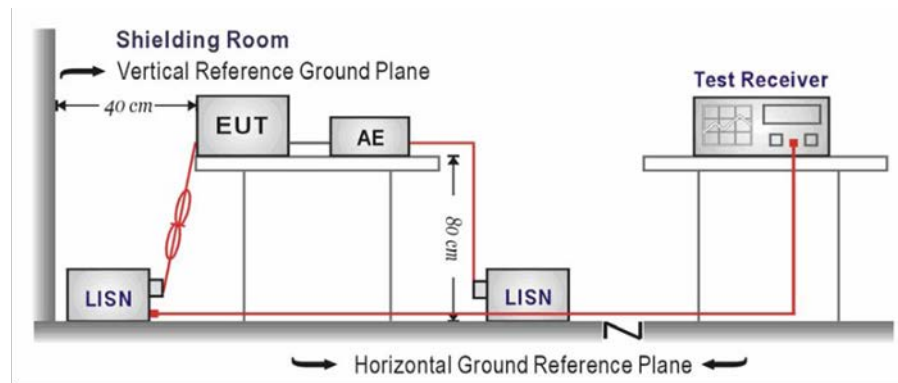
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	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 CONFIGURATION



TEST PROCEDURE

1. The EUT was setup according to ANSI C63.10 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST MODE

Please refer to the clause 4.2

TEST RESULT

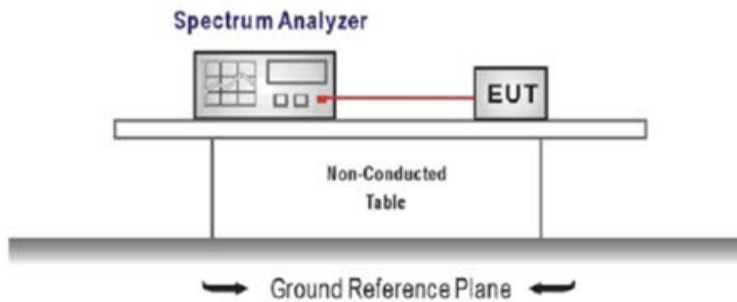
Passed Not Applicable

5.3. 20dB bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).
Center Frequency = channel center frequency
Span= approximately 2 to 3 times the 20 dB bandwidth
RBW = 100 kHz, VBW $\geq 3 \times$ RBW
Sweep time= auto couple
Detector = Peak
Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
4. 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 20 dB relative to the maximum level measured in the fundamental emission, and record the pertinent measurements.




TEST MODE

Please refer to the clause 4.2

TEST RESULT

Passed Not Applicable

Test Channel	20dB Bandwidth (KHz)	Limit (KHz)	Result
CH _L	768.5	-	Pass
CH _M	768.5	-	Pass
CH _H	764.1	-	Pass

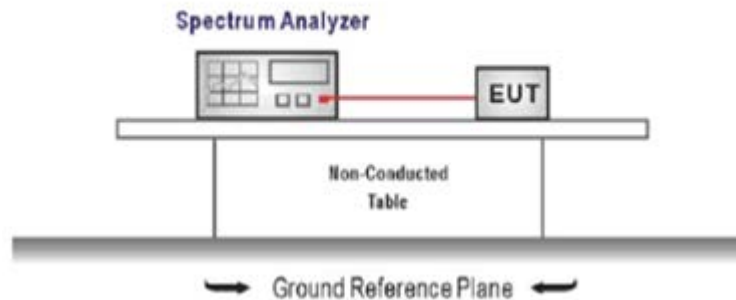
<p>CH_L</p>	 <p>CF 2.41275 GHz 691 pts Span 3.0 MHz</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-value</th> <th>Y-value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.4124418 GHz</td> <td>-19.01 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4120281 GHz</td> <td>2.06 dBm</td> <td></td> <td></td> </tr> <tr> <td>D3</td> <td>M1</td> <td>1</td> <td>768.5 kHz</td> <td>2.95 dB</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date 21 APR 2022 15:37:30</p>	Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.4124418 GHz	-19.01 dBm			M2	1		2.4120281 GHz	2.06 dBm			D3	M1	1	768.5 kHz	2.95 dB		
Type	Ref	Trc	X-value	Y-value	Function	Function Result																							
M1	1		2.4124418 GHz	-19.01 dBm																									
M2	1		2.4120281 GHz	2.06 dBm																									
D3	M1	1	768.5 kHz	2.95 dB																									
<p>CH_M</p>	 <p>CF 2.436 GHz 691 pts Span 3.0 MHz</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-value</th> <th>Y-value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.4356918 GHz</td> <td>-18.79 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4350701 GHz</td> <td>2.26 dBm</td> <td></td> <td></td> </tr> <tr> <td>D3</td> <td>M1</td> <td>1</td> <td>768.5 kHz</td> <td>1.44 dB</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date 21 APR 2022 15:55:53</p>	Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.4356918 GHz	-18.79 dBm			M2	1		2.4350701 GHz	2.26 dBm			D3	M1	1	768.5 kHz	1.44 dB		
Type	Ref	Trc	X-value	Y-value	Function	Function Result																							
M1	1		2.4356918 GHz	-18.79 dBm																									
M2	1		2.4350701 GHz	2.26 dBm																									
D3	M1	1	768.5 kHz	1.44 dB																									
<p>CH_H</p>	 <p>CF 2.46425 GHz 691 pts Span 3.0 MHz</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-value</th> <th>Y-value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.4639418 GHz</td> <td>-17.41 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4643238 GHz</td> <td>2.03 dBm</td> <td></td> <td></td> </tr> <tr> <td>D3</td> <td>M1</td> <td>1</td> <td>768.5 kHz</td> <td>1.08 dB</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date 21 APR 2022 15:34:35</p>	Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.4639418 GHz	-17.41 dBm			M2	1		2.4643238 GHz	2.03 dBm			D3	M1	1	768.5 kHz	1.08 dB		
Type	Ref	Trc	X-value	Y-value	Function	Function Result																							
M1	1		2.4639418 GHz	-17.41 dBm																									
M2	1		2.4643238 GHz	2.03 dBm																									
D3	M1	1	768.5 kHz	1.08 dB																									

5.4. 99% Occupied Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).
 Center Frequency = channel center frequency
 Span $\geq 1.5 \times$ OBW
 RBW = 1%~5%OBW
 VBW $\geq 3 \times$ RBW
 Sweep time = auto couple
 Detector = Peak
 Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.




TEST MODE

Please refer to the clause 4.2

TEST RESULT

Passed Not Applicable

Test Channel	99% Occupied Bandwidth (KHz)	Limit (KHz)	Result
CH _L	768.45	-	Pass
CH _M	768.45	-	Pass
CH _H	768.45	-	Pass

<p>CH_L</p>	 <p>Spectrum Ref Level 20.00 dBm Offset 1.00 dB BW 10 kHz Att 35 dB SWI 100.6 μs VBW 30 kHz Mode Auto FFT 2PK Max M1 2.41275 GHz 2.26 dBm T1 2.4124273 GHz -22.14 dBm Occ BW 798.842257598 kHz T2 2.4122787 GHz -19.90 dBm CF 2.41275 GHz 691 pts Span 3.0 MHz Date 21 APR 2022 15:30:20</p> <table border="1"><thead><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr></thead><tbody><tr><td>M1</td><td>1</td><td></td><td>2.41275 GHz</td><td>2.26 dBm</td><td></td><td></td></tr><tr><td>T1</td><td>1</td><td></td><td>2.4124273 GHz</td><td>-22.14 dBm</td><td>Occ BW</td><td>798.842257598 kHz</td></tr><tr><td>T2</td><td>1</td><td></td><td>2.4122787 GHz</td><td>-19.90 dBm</td><td></td><td></td></tr></tbody></table>	Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.41275 GHz	2.26 dBm			T1	1		2.4124273 GHz	-22.14 dBm	Occ BW	798.842257598 kHz	T2	1		2.4122787 GHz	-19.90 dBm		
Type	Ref	Trc	X-value	Y-value	Function	Function Result																							
M1	1		2.41275 GHz	2.26 dBm																									
T1	1		2.4124273 GHz	-22.14 dBm	Occ BW	798.842257598 kHz																							
T2	1		2.4122787 GHz	-19.90 dBm																									
<p>CH_M</p>	 <p>Spectrum Ref Level 20.00 dBm Offset 1.00 dB BW 10 kHz Att 35 dB SWI 100.6 μs VBW 30 kHz Mode Auto FFT 2PK Max M1 2.436 GHz 2.26 dBm T1 2.4359175 GHz -19.03 dBm Occ BW 768.451519537 kHz T2 2.4364602 GHz -17.52 dBm CF 2.436 GHz 691 pts Span 3.0 MHz Date 21 APR 2022 15:31:24</p> <table border="1"><thead><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr></thead><tbody><tr><td>M1</td><td>1</td><td></td><td>2.436 GHz</td><td>2.26 dBm</td><td></td><td></td></tr><tr><td>T1</td><td>1</td><td></td><td>2.4359175 GHz</td><td>-19.03 dBm</td><td>Occ BW</td><td>768.451519537 kHz</td></tr><tr><td>T2</td><td>1</td><td></td><td>2.4364602 GHz</td><td>-17.52 dBm</td><td></td><td></td></tr></tbody></table>	Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.436 GHz	2.26 dBm			T1	1		2.4359175 GHz	-19.03 dBm	Occ BW	768.451519537 kHz	T2	1		2.4364602 GHz	-17.52 dBm		
Type	Ref	Trc	X-value	Y-value	Function	Function Result																							
M1	1		2.436 GHz	2.26 dBm																									
T1	1		2.4359175 GHz	-19.03 dBm	Occ BW	768.451519537 kHz																							
T2	1		2.4364602 GHz	-17.52 dBm																									
<p>CH_H</p>	 <p>Spectrum Ref Level 20.00 dBm Offset 1.00 dB BW 10 kHz Att 35 dB SWI 100.6 μs VBW 30 kHz Mode Auto FFT 2PK Max M1 2.46425 GHz 3.10 dBm T1 2.46394175 GHz -17.13 dBm Occ BW 768.451519537 kHz T2 2.4647402 GHz -20.18 dBm CF 2.46425 GHz 691 pts Span 3.0 MHz Date 21 APR 2022 15:32:25</p> <table border="1"><thead><tr><th>Type</th><th>Ref</th><th>Trc</th><th>X-value</th><th>Y-value</th><th>Function</th><th>Function Result</th></tr></thead><tbody><tr><td>M1</td><td>1</td><td></td><td>2.46425 GHz</td><td>3.10 dBm</td><td></td><td></td></tr><tr><td>T1</td><td>1</td><td></td><td>2.46394175 GHz</td><td>-17.13 dBm</td><td>Occ BW</td><td>768.451519537 kHz</td></tr><tr><td>T2</td><td>1</td><td></td><td>2.4647402 GHz</td><td>-20.18 dBm</td><td></td><td></td></tr></tbody></table>	Type	Ref	Trc	X-value	Y-value	Function	Function Result	M1	1		2.46425 GHz	3.10 dBm			T1	1		2.46394175 GHz	-17.13 dBm	Occ BW	768.451519537 kHz	T2	1		2.4647402 GHz	-20.18 dBm		
Type	Ref	Trc	X-value	Y-value	Function	Function Result																							
M1	1		2.46425 GHz	3.10 dBm																									
T1	1		2.46394175 GHz	-17.13 dBm	Occ BW	768.451519537 kHz																							
T2	1		2.4647402 GHz	-20.18 dBm																									

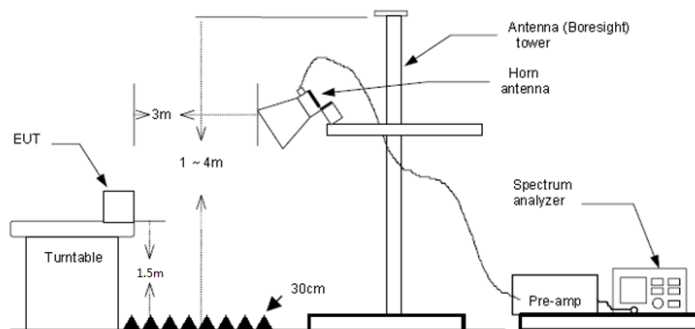
5.5. Radiated field strength of the fundamental signal

LIMIT

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50 (94dBuV/m @3m)	500 (54dBuV/m @3m)
2400-2483.5 MHz	50 (94dBuV/m @3m)	500 (54dBuV/m @3m)
5725-5875 MHz	50 (94dBuV/m @3m)	500 (54dBuV/m @3m)
24.0-24.25 GHz	250 (108dBuV/m @3m)	2500 (68dBuV/m @3m)

Frequencies above 1000 MHz, the field strength limits are based on average limits

TEST CONFIGURATION



TEST PROCEDURE

- The EUT was setup and tested according to ANSI C63.10:2013 requirements.
- The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
- The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
- The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
- Use the following spectrum analyzer settings:
 - Span shall wide enough to fully capture the emission being measured
 - Set RBW=100kHz for <1GHz, VBW=3*RBW, Sweep time=auto, Detector=peak, Trace=max hold
 - Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement

For average measurement:

 - VBW=10Hz, When duty cycle is no less than 98 percent
 - VBW \geq 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation, so refer to this clause 5.6 duty cycle.

TEST MODE

Please refer to the clause 4.2

TEST RESULTS

Passed Not Applicable

Note:

- Level= Reading + Factor; Factor =Antenna Factor+ Cable Loss- Preamp Factor
- Margin = Limit – Level

Test channel		CH _L			Polarization			Horizontal		
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2412.86	54.03	27.65	6.21	0.00	87.89	114.00	-26.11	Peak	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2412.96	53.53	27.65	6.21	0.00	87.39	94.00	-6.61	Average	

Test channel		CH _L			Polarization			Vertical		
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2412.82	56.66	27.65	6.21	0.00	90.52	114.00	-23.48	Peak	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2412.90	56.13	27.65	6.21	0.00	89.99	94.00	-4.01	Average	

Test channel		CH _M			Polarization			Horizontal		
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2436.08	55.18	27.56	6.19	0.00	88.93	114.00	-25.07	Peak	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2435.92	53.87	27.56	6.19	0.00	87.62	94.00	-6.38	Average	

Test channel		CH _M			Polarization			Vertical		
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2436.12	56.35	27.56	6.19	0.00	90.10	114.00	-23.90	Peak	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2436.14	55.75	27.56	6.19	0.00	89.50	94.00	-4.50	Average	

Test channel		CH _H			Polarization			Horizontal		
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2464.24	54.87	27.47	6.17	0.00	88.51	114.00	-25.49	Peak	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2464.48	54.62	27.47	6.17	0.00	88.26	94.00	-5.74	Average	

Test channel		CH _H			Polarization			Vertical		
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2464.24	56.53	27.47	6.17	0.00	90.17	114.00	-23.83	Peak	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2464.68	54.33	27.47	6.17	0.00	87.97	94.00	-6.03	Average	

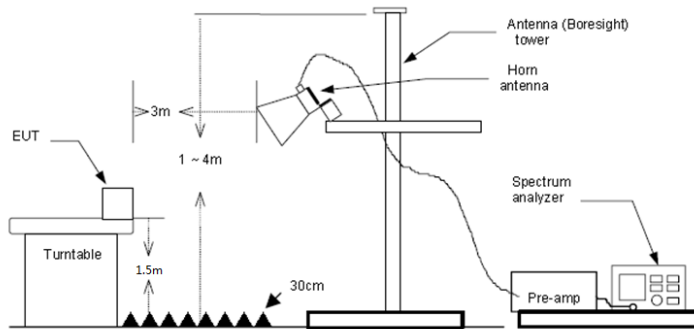
5.6. Radiated Band edge Emission

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, Radiated Emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the Radiated Emissions limits specified in §15.209(a) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10 .
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10 on radiated measurement.
5. Use the following spectrum analyzer settings:
 - a) Span shall wide enough to fully capture the emission being measured
 - b) Set RBW=100kHz for <1GHz, VBW=3*RBW, Sweep time=auto, Detector=peak, Trace=max hold
 - c) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement

For average measurement:

 - VBW=10Hz, When duty cycle is no less than 98 percent
 - VBW \geq 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation, so refer to this clause 5.6 duty cycle.

TEST MODE

Please refer to the clause 4.2

TEST RESULT

Passed Not Applicable

Note:

- 3) Level= Reading + Factor; Factor =Antenna Factor+ Cable Loss- Preamp Factor
- 4) Over Limit = Level- Limit
- 5) Average measurement was not performed if peak level is lower than average limit(54 dBuV/m).

Test channel		CH _L			Polarity			Horizontal		
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2310.00	37.91	27.96	5.43	37.56	53.74	74.00	-20.26	Peak	
2	2390.01	37.79	27.72	5.53	37.45	53.59	74.00	-20.41	Peak	
3	2399.99	37.51	27.70	5.54	37.41	53.34	74.00	-20.66	Peak	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2310.00	26.77	27.96	5.43	37.56	42.60	54.00	-11.40	Average	
2	2390.01	26.92	27.72	5.53	37.45	42.72	54.00	-11.28	Average	
3	2399.99	26.88	27.70	5.54	37.41	42.71	54.00	-11.29	Average	

Test channel		CH _L			Polarity			Vertical		
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2310.00	39.35	27.96	5.43	37.56	55.18	74.00	-18.82	Peak	
2	2390.01	38.56	27.72	5.53	37.45	54.36	74.00	-19.64	Peak	
3	2399.99	37.66	27.70	5.54	37.41	53.49	74.00	-20.51	Peak	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark	
1	2310.00	27.11	27.96	5.43	37.56	42.94	54.00	-11.06	Average	
2	2390.01	27.04	27.72	5.53	37.45	42.84	54.00	-11.16	Average	
3	2399.99	26.95	27.70	5.54	37.41	42.78	54.00	-11.22	Average	

Test channel		CH _H			Polarity			Horizontal		
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Aux dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.49	37.36	27.43	6.16	37.26	20.00	53.69	74.00	-20.31	Peak
2	2500.00	37.69	27.40	6.15	37.26	20.00	53.98	74.00	-20.02	Peak
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Aux dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.49	26.55	27.43	6.16	37.26	20.00	42.88	54.00	-11.12	Average
2	2500.00	26.40	27.40	6.15	37.26	20.00	42.69	54.00	-11.31	Average

Test channel		CH _H			Polarity			Vertical		
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Aux dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.49	36.93	27.43	6.16	37.26	20.00	53.26	74.00	-20.74	Peak
2	2500.00	37.43	27.40	6.15	37.26	20.00	53.72	74.00	-20.28	Peak
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Aux dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.49	26.62	27.43	6.16	37.26	20.00	42.95	54.00	-11.05	Average
2	2500.00	26.21	27.40	6.15	37.26	20.00	42.50	54.00	-11.50	Average

5.7. Radiated Spurious Emission

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

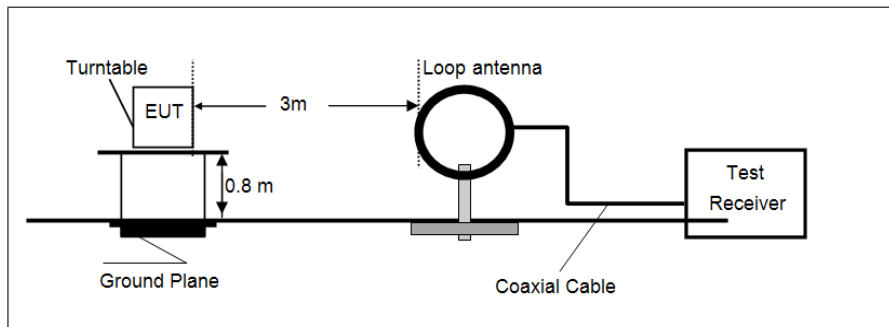
Frequency	Limit (dBuV/m)	Value
0.009 MHz ~0.49 MHz	2400/F(kHz) @300m	Quasi-peak
0.49 MHz ~ 1.705 MHz	24000/F(kHz) @30m	Quasi-peak
1.705 MHz ~30 MHz	30 @30m	Quasi-peak

Note: Limit dBuV/m @3m = Limit dBuV/m @300m + 40*log(300/3)= Limit dBuV/m @300m +80,
 Limit dBuV/m @3m = Limit dBuV/m @30m +40*log(30/3)= Limit dBuV/m @30m + 40.

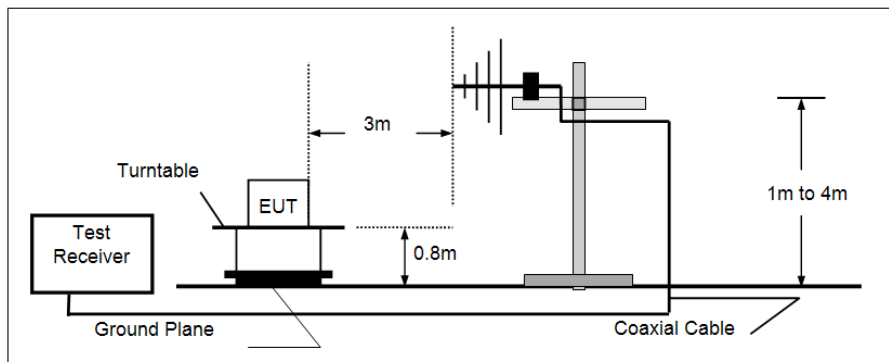
Frequency	Limit (dBuV/m @3m)	Value
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz~1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

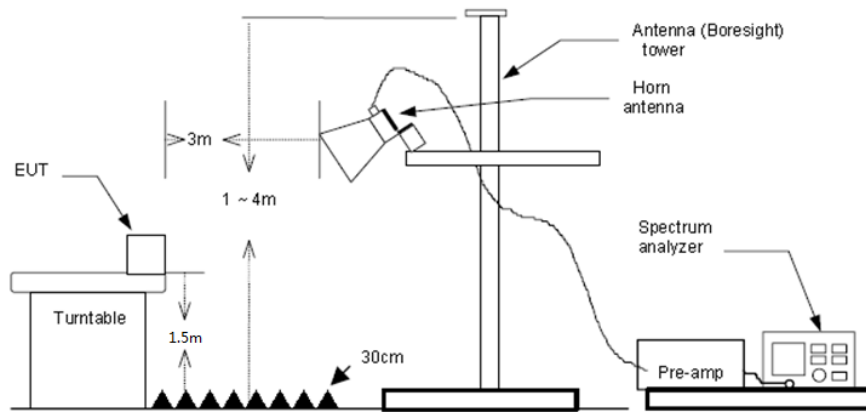
- 9 kHz ~ 30 MHz



- 30 MHz ~ 1 GHz



- Above 1 GHz



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10 .
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
 - a) Span shall wide enough to fully capture the emission being measured;
 - b) Below 1 GHz:
 - RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
 - 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.
 - c) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement
 - For average measurement:
 - VBW=10Hz, When duty cycle is no less than 98 percent
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation, so refer to this clause 5.6 duty cycle.

TEST MODE

Please refer to the clause 4.2

TEST RESULT

Passed **Not Applicable**

Note:

- 1) Level= Reading + Factor/Transd; Factor/Transd =Antenna Factor+ Cable Loss- Preamp Factor
- 2) Over Limit = Level– Limit
- 3) Average measurement was not performed if peak level is lower than average limit(54 dBuV/m) for above 1GHz.

For 9 kHz ~ 30 MHz

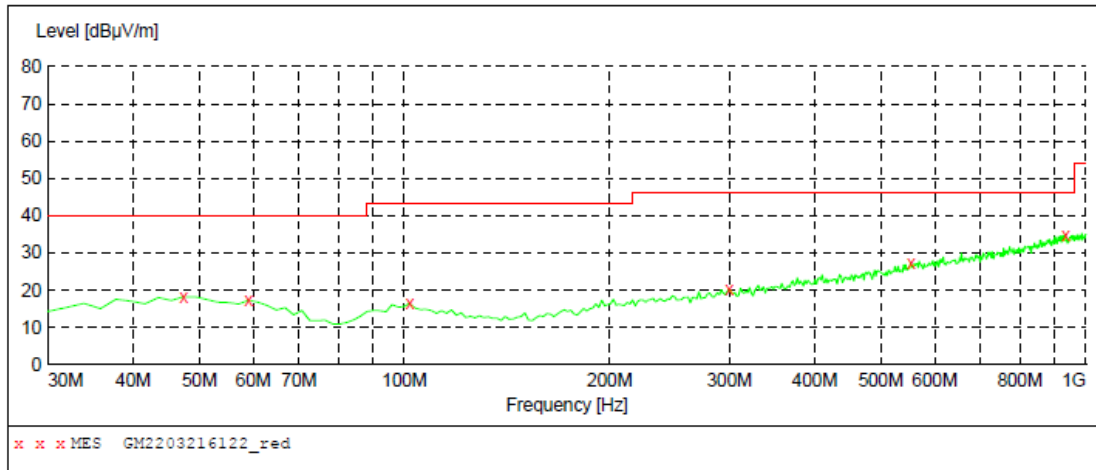
The EUT was pre-scanned this frequency band, found the radiated level 20dB lower than the limit, so don't show data on this report.

For 30 MHz ~ 1000 MHz

Have pre-scan all test channel, found CH_M which it was worst case, so only show the worst case's data on this report.

Polarization:

Horizontal



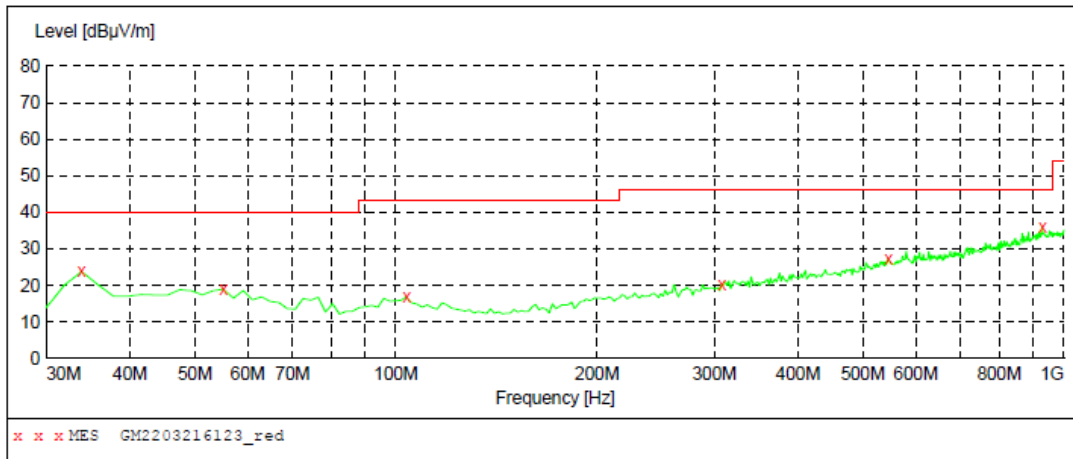
MEASUREMENT RESULT: "GM2203216122_red"

3/22/2022 12:01AM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	18.30	-9.2	40.0	21.7	QP	100.0	130.00	HORIZONTAL
59.100000	17.30	-9.9	40.0	22.7	QP	100.0	96.00	HORIZONTAL
101.780000	16.50	-10.9	43.5	27.0	QP	100.0	190.00	HORIZONTAL
299.660000	20.10	-7.3	46.0	25.9	QP	100.0	96.00	HORIZONTAL
553.800000	27.10	0.0	46.0	18.9	QP	100.0	73.00	HORIZONTAL
934.040000	34.90	7.4	46.0	11.1	QP	100.0	73.00	HORIZONTAL

Polarization:

Vertical



MEASUREMENT RESULT: "GM2203216123_red"

3/22/2022 12:03AM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
33.880000	23.80	-11.4	40.0	16.2	QP	100.0	140.00	VERTICAL
55.220000	19.00	-9.5	40.0	21.0	QP	100.0	293.00	VERTICAL
103.720000	16.80	-11.1	43.5	26.7	QP	100.0	257.00	VERTICAL
307.420000	20.30	-7.0	46.0	25.7	QP	100.0	327.00	VERTICAL
546.040000	27.30	-0.2	46.0	18.7	QP	100.0	234.00	VERTICAL
928.220000	36.00	7.3	46.0	10.0	QP	100.0	245.00	VERTICAL

For 1 GHz ~ 25 GHz

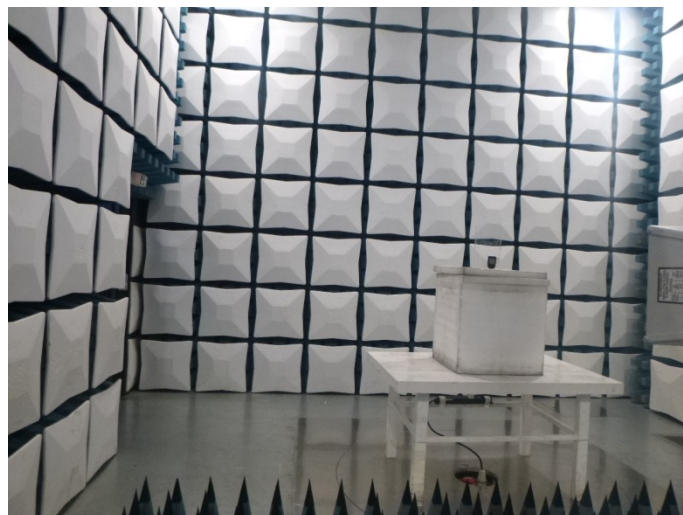
Test channel				CH _L					
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1768.59	61.17	25.27	5.23	37.09	54.58	74.00	-19.42	Peak
2	1768.59	45.62	25.28	5.23	37.09	39.04	54.00	-14.96	Average
3	2827.20	43.46	28.51	6.60	37.30	41.27	74.00	-32.73	Peak
4	4821.76	41.83	31.40	9.01	35.24	47.00	74.00	-27.00	Peak
5	9251.58	34.06	39.01	13.96	36.13	50.90	74.00	-23.10	Peak
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1772.48	60.65	25.29	5.24	37.08	54.10	74.00	-19.90	Peak
2	1772.48	45.49	25.29	5.24	37.08	38.94	54.00	-15.06	Average
3	2880.50	42.10	28.60	6.68	37.37	40.01	74.00	-33.99	Peak
4	5099.49	36.39	32.20	9.36	35.48	42.47	74.00	-31.53	Peak
5	8725.48	33.44	37.70	13.90	34.75	50.29	74.00	-23.71	Peak

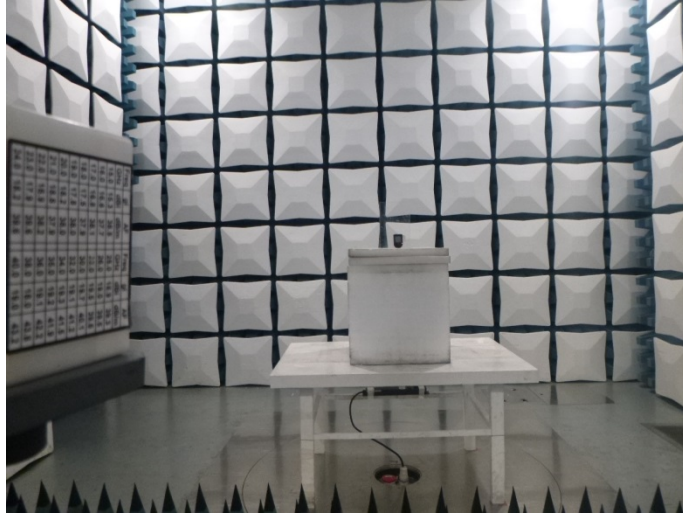
Test channel				CH _M					
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1768.59	61.17	25.27	5.23	37.09	54.58	74.00	-19.42	Peak
2	1768.59	45.62	25.28	5.23	37.09	39.04	54.00	-14.96	Average
3	2827.20	43.46	28.51	6.60	37.30	41.27	74.00	-32.73	Peak
4	4908.44	41.91	31.42	9.15	35.22	47.26	74.00	-26.74	Peak
5	9298.80	33.89	39.20	13.88	36.31	50.66	74.00	-23.34	Peak
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1772.48	60.65	25.29	5.24	37.08	54.10	74.00	-19.90	Peak
2	1772.48	45.49	25.29	5.24	37.08	38.94	54.00	-15.06	Average
3	2880.50	42.10	28.60	6.68	37.37	40.01	74.00	-33.99	Peak
4	5034.99	35.62	32.11	9.34	35.34	41.73	74.00	-32.27	Peak
5	7432.62	32.56	36.60	11.48	33.98	46.66	74.00	-27.34	Peak

Test channel				CH _H					
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1768.59	61.17	25.27	5.23	37.09	54.58	74.00	-19.42	Peak
2	1768.59	45.62	25.28	5.23	37.09	39.04	54.00	-14.96	Average
3	2827.20	43.46	28.51	6.60	37.30	41.27	74.00	-32.73	Peak
4	4933.50	42.08	31.47	9.20	35.20	47.55	74.00	-26.45	Peak
5	7376.08	33.69	36.55	11.46	34.04	47.66	74.00	-26.34	Peak
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1772.48	60.65	25.29	5.24	37.08	54.10	74.00	-19.90	Peak
2	1772.48	45.49	25.29	5.24	37.08	38.94	54.00	-15.06	Average
3	2880.50	42.10	28.60	6.68	37.37	40.01	74.00	-33.99	Peak
4	4933.50	35.95	31.47	9.20	35.20	41.42	74.00	-32.58	Peak
5	8681.17	33.52	37.62	14.00	34.83	50.31	74.00	-23.69	Peak

6. TEST SETUP PHOTOS

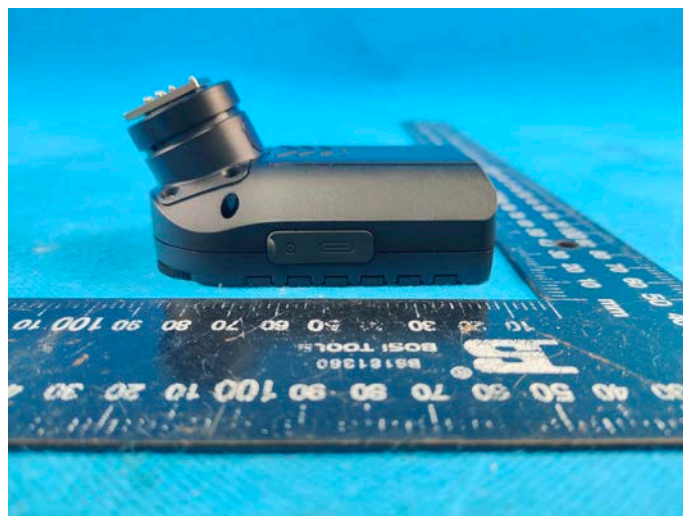
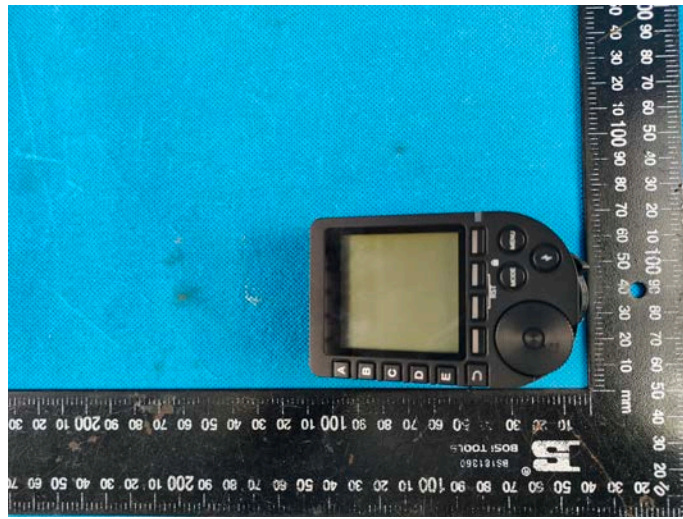
Radiated Emissions

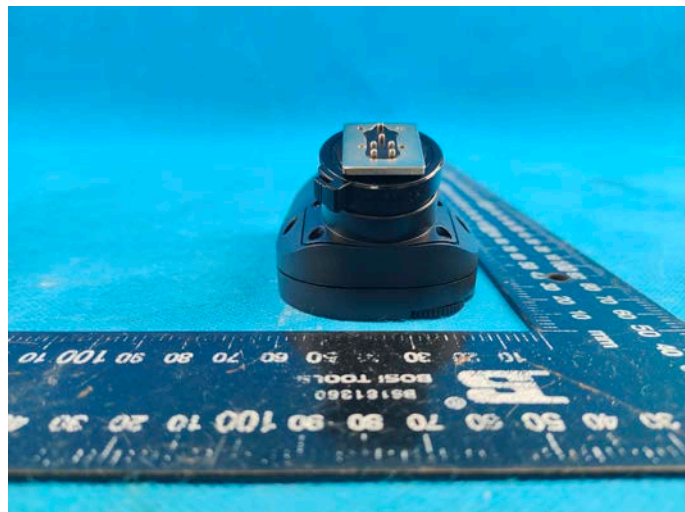
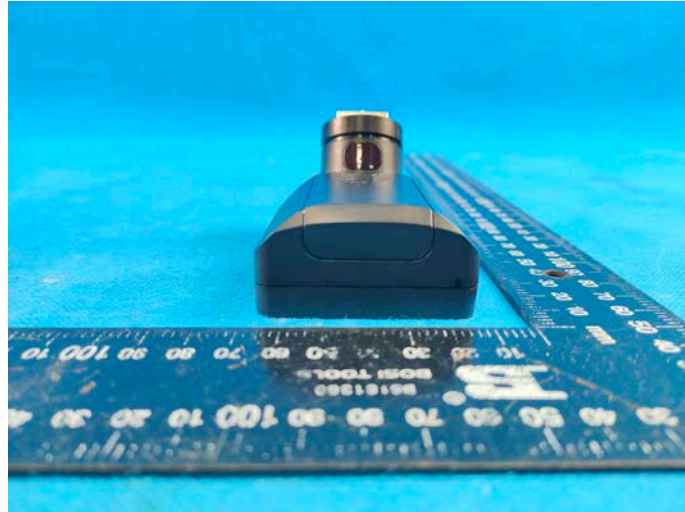




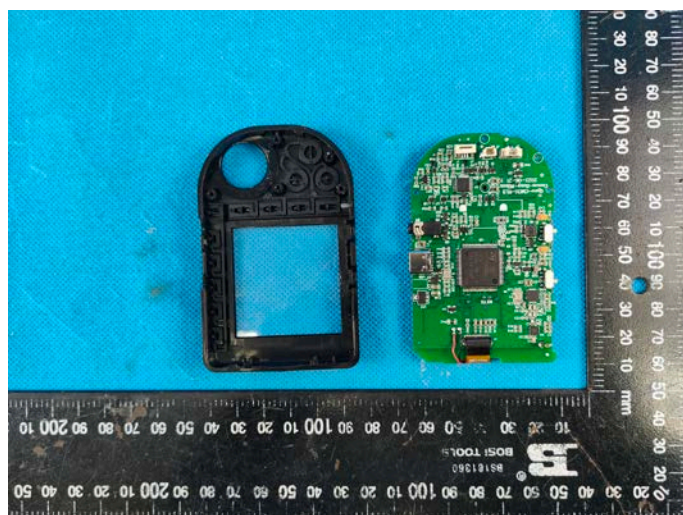
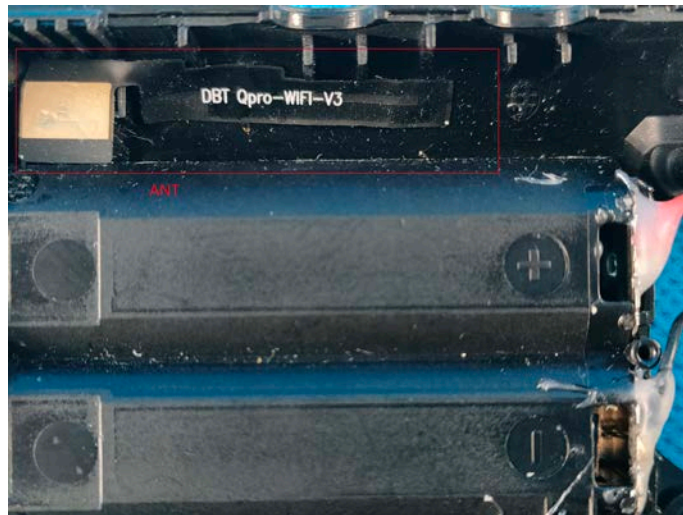
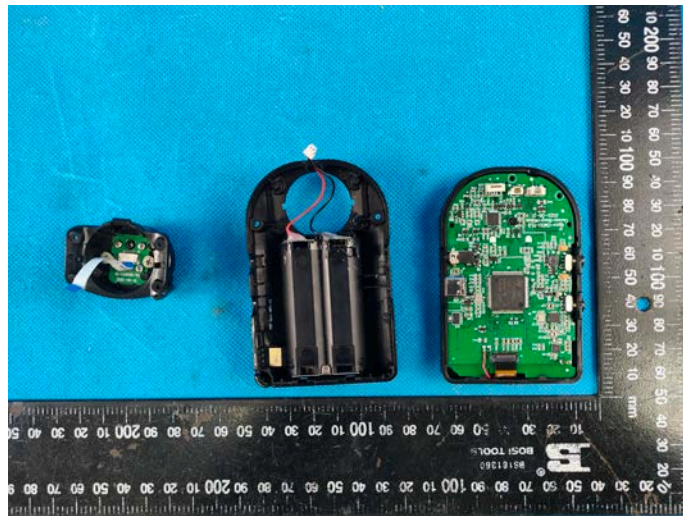
7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

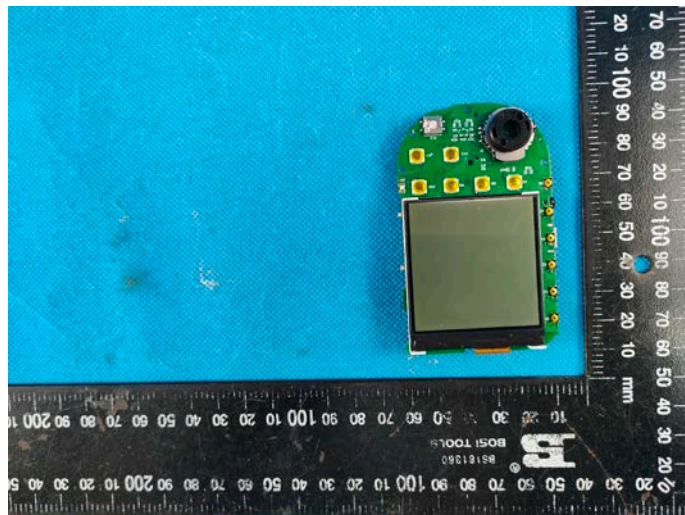
7.1. External Photos





7.2. Internal Photos





-----End of Report-----