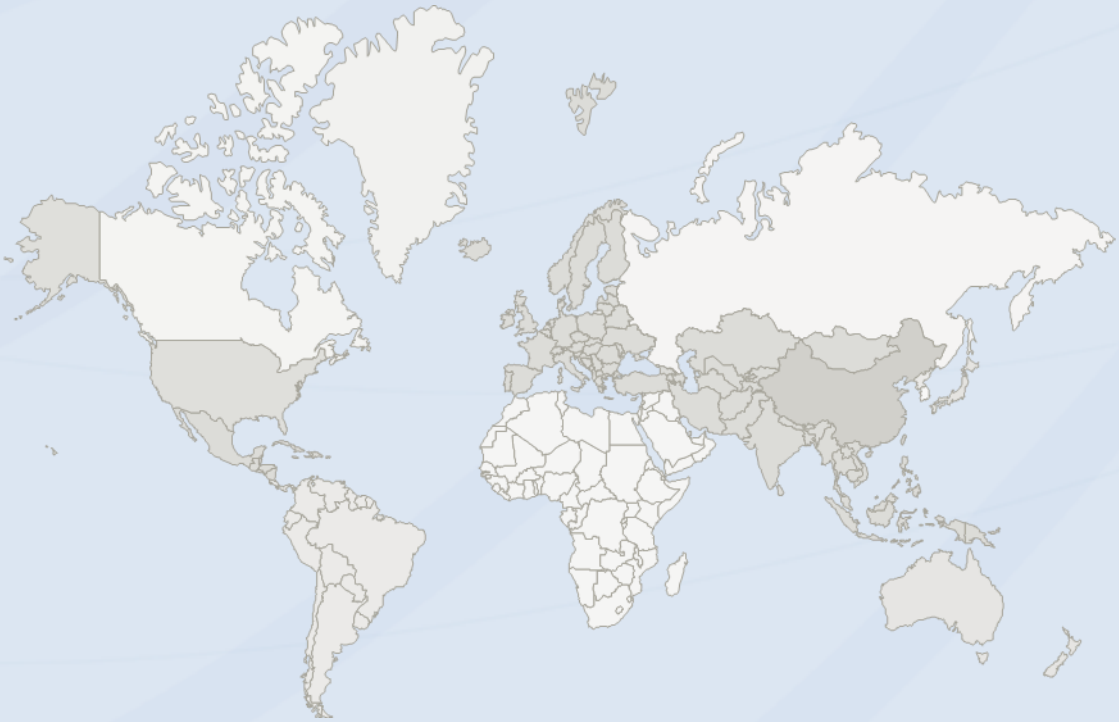
TEST REPORT

Report No. ..... : NTC-ER2012042

Applicant's name ..... : HE SHAN MINGKEDA INDUSTRIES CO., LTD

Address ..... : Head Office Mingkeda #1825 Renmin e.Rd. Heshan City, Guangdong, China



DONGGUAN NEW TESTING CENTRE CO., LTD

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TEST REPORT DECLARE

FCC ID	:	2AYK7XL-20
Applicant	:	HE SHAN MINGKEDA INDUSTRIES CO., LTD
Address	:	Head Office Mingkeda #1825 Renmin e.Rd. Heshan City, Guangdong, China
EUT Name	:	Monitor Light
Model No	:	XL-20
Trade mark	:	/
Manufacturer	:	HE SHAN MINGKEDA INDUSTRIES CO., LTD
Address	:	Head Office Mingkeda #1825 Renmin e.Rd. Heshan City, Guangdong, China
Test Laboratory	:	Dongguan New Testing Centre Co., Ltd
Address	:	3F, No. 1 the 1st North Industry Road, Songshan Lake Science &Technology Park, Dongguan, Guangdong, China, 523808

Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C: 2019, ANSI C63.10:2013.

We Declare:

The equipment described above is tested by Dongguan New Testing Centre Co., Ltd and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan New Testing Centre Co., Ltd is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above standards.

Report No.:	NTC-ER2012042		
Date of Test:	Dec.14, 2020 to Jan.30, 2021	**Date of Report**:	Jan.30, 2021

Prepared By: ***Approved By:***

Jeffrey Zhang Dave

Jeffrey Zhang/Engineer ***Dave Gao/LAB Manager***

pNote: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan New Testing Centre Co., Ltd

1. Summary of test results

Description of Test Item	Standard	Results
-20dB Bandwidth and 99% occupied bandwidth	FCC Part 15 Subpart C:2019 ANSI C63.10:2013	PASS
Conducted emission test	FCC Part 15 Subpart C:2019 ANSI C63.10:2013	PASS
Radiated emission test	FCC Part 15 Subpart C:2019 ANSI C63.10:2013	PASS
Antenna requirement	FCC 15.203; RSS-GEN	PASS
Restricted band and band-edge	FCC 15.249,15.209	PASS

2. General test information

2.1. Description of EUT

EUT* Name	:	Monitor Light
Test model	:	XL-20
EUT function description	:	Please reference user manual of this device
Power supply	:	DC 5V
Trade mark	:	/
Operation frequency	:	2402-2478MHz
Modulation Type	:	GFSK
Channel Space	:	1MHz
Channel Number	:	77
Antenna Type	:	PCB antenna
Antenna Gain	:	0 dBi
Hardware Version	:	V1.0
Software Version	:	V1.0

Note: 1,EUT is the ab. of equipment under test.

Channel List:

Channels	Frequency (MHz)	Channels	Frequency (MHz)	Channels	Frequency (MHz)
0	2402	26	2428	52	2454
1	2403	27	2429	53	2455
2	2404	28	2430	54	2456
3	2405	29	2431	55	2457
4	2406	30	2432	56	2458
5	2407	31	2433	57	2459
6	2408	32	2434	58	2460
7	2409	33	2435	59	2461
8	2410	34	2436	60	2462
9	2411	35	2437	61	2463
10	2412	36	2438	62	2464
11	2413	37	2439	63	2465
12	2414	38	2440	64	2466
13	2415	39	2441	65	2467
14	2416	40	2442	66	2468
15	2417	41	2443	67	2469
16	2418	42	2444	68	2470
17	2419	43	2445	69	2471
18	2420	44	2446	70	2472
19	2421	45	2447	71	2473
20	2422	46	2448	72	2474
21	2423	47	2449	73	2475
22	2424	48	2450	74	2476
23	2425	49	2451	75	2477
24	2426	50	2452	76	2478
25	2427	51	2453	-	-

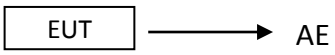
2.2. Description of test modes

The transmitter module was tested while in a continuous transmitter/receiver mode.
The EUT was tuned to a low, middle, and high channel for all tests. For all test case pre/scans were completed in all modes to determine worst case levels.

Entry test mode steps of transmitter:
After entering the test mode, press the button to select mode and frequency:
2402MHz -- > 2440 MHz -- > 2478 MHz.

Test Software Version	V1.0		
Tx power	Fixed		
Test Frequency	2402MHz	2440MHz	2478MHz

2.3. Block diagram EUT configuration for test



2.4. Test environment conditions

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

Temperature range:	21-24℃
Humidity range:	40-75%
Pressure range:	86-106kPa

2.5. Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.44dB
Uncertainty for Radiation Emission test (30MHz – 1GHz)	3.14 dB (Polarize: V)
	3.16 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz – 26GHz)	4.27 dB (Polarize: V)
	4.51 dB (Polarize: H)
Uncertainty for Radiation Emission test (26GHz – 40GHz)	4.60 dB (Polarize: V)
	4.60 dB (Polarize: H)
Bandwidth	±1.2%
Stop Transmitting Time Test	±0.5%
Frequency error	5.8×10^{-8}

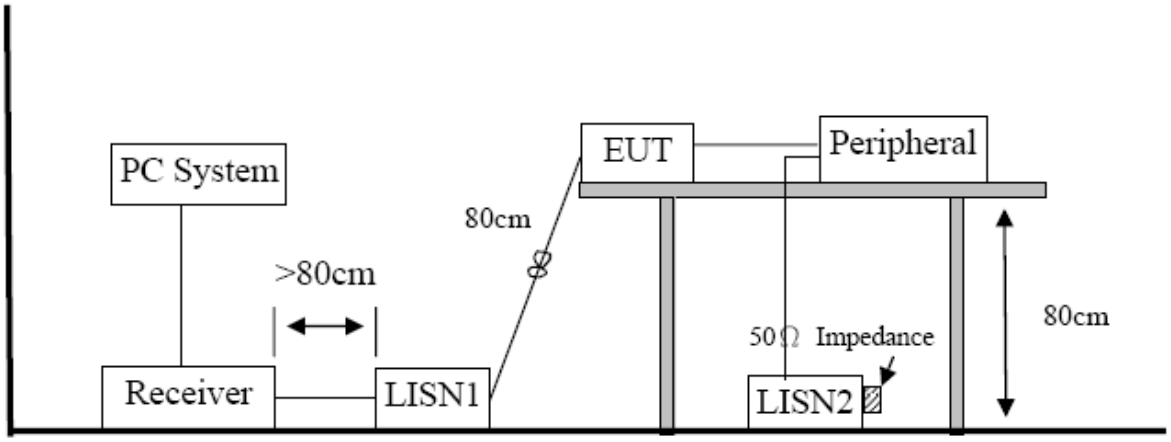
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3. Power Line Conducted Emission Test

3.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Test Receiver	R&S	ESPI	100146	2020-12-06	1 Year
2	LISN	R&S	ENV216	3650.6550.06	2020-05-25	1 Year
3	Pulse Limiter	R&S	ESH3-Z2	0357-8810.54	2020-05-25	1 Year
4	RF Cable	HUBER	SUCOFLEX100	30722/4E	2019-05-13	2 Year
5	MEASUREMENT SOFTWARE	FARAD	EZ-EMC(VER:1.1.4.2)	N/A	N/A	N/A

3.2. BLOCK DIAGRAM OF TEST SETUP



3.3. Power Line Conducted Emission Limits (Class B)

Frequency	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

3.4. Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.3 and test equipment as described in clause 3.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.3 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

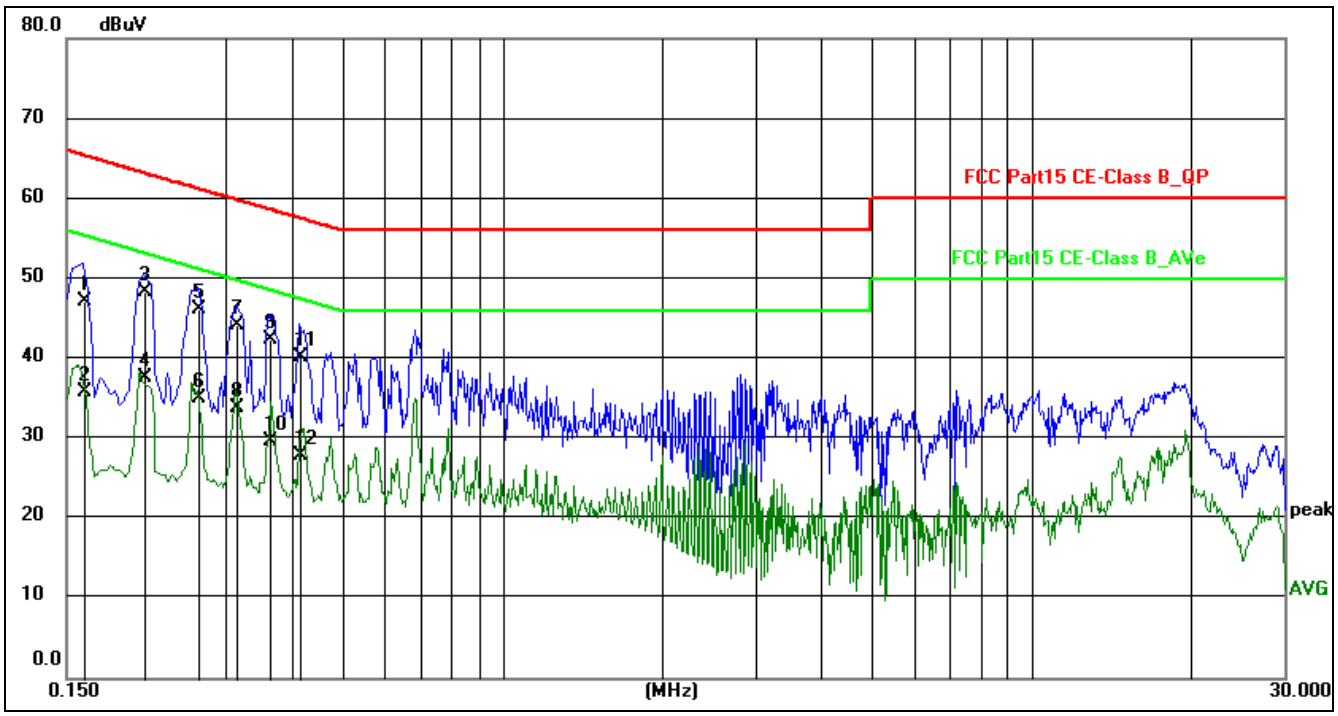
The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 KHz.

3.5. Test Result

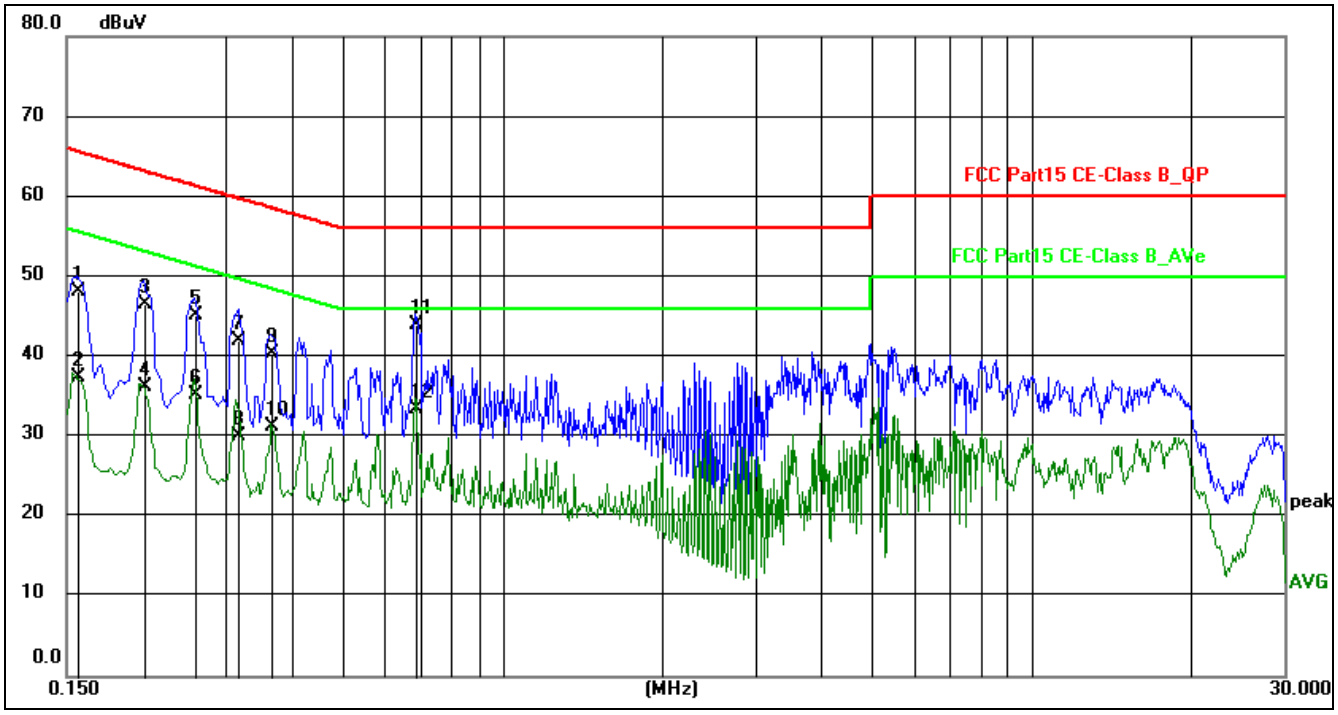
PASS. (See below detailed test result)

Note1: All emissions not reported below are too low against the prescribed limits.
Note2: "-----" means Peak detection; "-----" means Average detection.
Note3: Measurement = Reading Level + Factor, Margin= Measurement-Limit.



Site:		**Phase:L1**	**Temperature(C):24(C)**
Limit:	**FCC Part15 CE-Class B_QP**		**Humidity(%):63%**
EUT:	**Monitor Light**	**Test Time:**	**2020/12/28 15:33:36**
M/N.:	**XL-20**	**Power Rating:**	**AC120/60Hz**
Mode:	**Tx(2402MHz-Worst case)**	**Test Engineer:**	
Note:	**Controller**		

No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector	Comment
1	0.1620	37.37	9.84	47.21	65.36	-18.15	QP	
2	0.1620	25.90	9.84	35.74	55.36	-19.62	AVG	
3 *	0.2100	38.54	9.85	48.39	63.21	-14.82	QP	
4	0.2100	27.86	9.85	37.71	53.21	-15.50	AVG	
5	0.2660	36.29	9.81	46.10	61.24	-15.14	QP	
6	0.2660	25.28	9.81	35.09	51.24	-16.15	AVG	
7	0.3140	34.36	9.78	44.14	59.86	-15.72	QP	
8	0.3140	23.98	9.78	33.76	49.86	-16.10	AVG	
9	0.3620	32.71	9.76	42.47	58.68	-16.21	QP	
10	0.3620	19.98	9.76	29.74	48.68	-18.94	AVG	
11	0.4140	30.46	9.73	40.19	57.57	-17.38	QP	
12	0.4140	18.24	9.73	27.97	47.57	-19.60	AVG	



Site:		**Phase:N**	**Temperature(C):24(C)**
Limit:	**FCC Part15 CE-Class B_QP**		**Humidity(%):63%**
EUT:	**Monitor Light**	**Test Time:**	**2020/12/28 15:37:20**
M/N.:	**XL-20**	**Power Rating:**	**AC120/60Hz**
Mode:	**Tx(2402MHz-Worst case)**	**Test Engineer:**	
Note:	**Controller**		

No.	Frequency (MHz)	Reading Level(dBuV)	Factor (dB)	Measure-ment(dBuV)	Limit (dBuV)	Margin (dB)	Detector	Comment
1	0.1580	38.37	9.73	48.10	65.57	-17.47	QP	
2	0.1580	27.72	9.73	37.45	55.57	-18.12	AVG	
3	0.2100	36.88	9.71	46.59	63.21	-16.62	QP	
4	0.2100	26.52	9.71	36.23	53.21	-16.98	AVG	
5	0.2620	35.30	9.84	45.14	61.37	-16.23	QP	
6	0.2620	25.42	9.84	35.26	51.37	-16.11	AVG	
7	0.3180	32.14	9.88	42.02	59.76	-17.74	QP	
8	0.3180	20.23	9.88	30.11	49.76	-19.65	AVG	
9	0.3660	30.58	9.72	40.30	58.59	-18.29	QP	
10	0.3660	21.53	9.72	31.25	48.59	-17.34	AVG	
11 *	0.6860	34.32	9.62	43.94	56.00	-12.06	QP	
12	0.6860	23.89	9.62	33.51	46.00	-12.49	AVG	

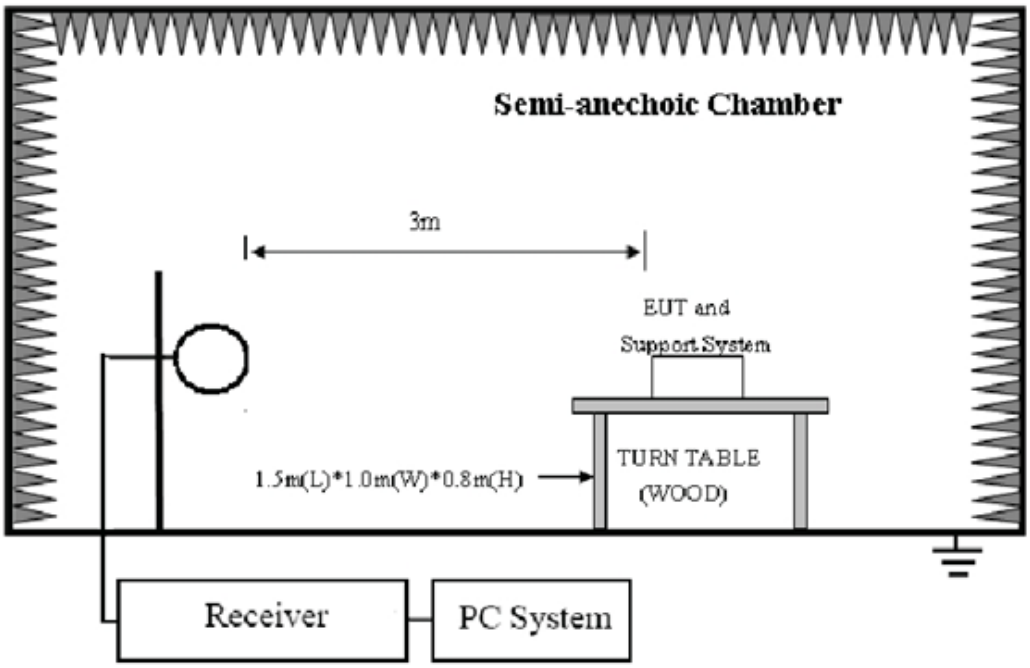
4. Radiated emission test

4.1. Test equipment

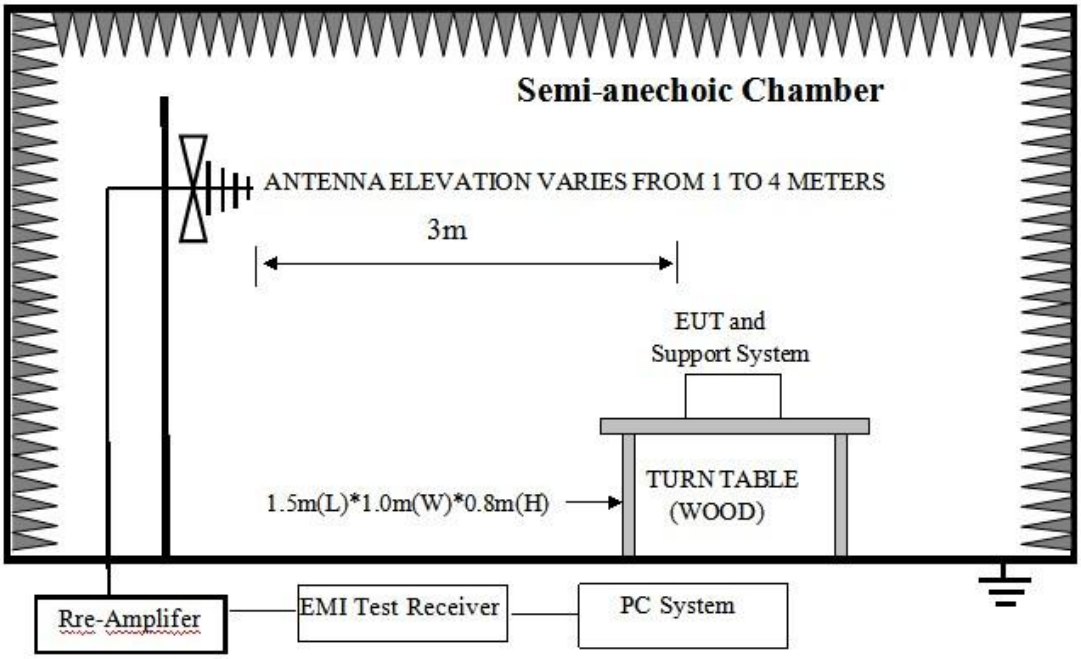
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	EMI Test Receiver	R&S	ESR	7250-304067528	2020-05-25	1 Year
2	Trilog Broadband Antenna	Schwarzbeck	VULB9168	00969	2019-03-28	2 Year
3	Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	2019-05-23	2 Year
4	Horn antenna	Schwarzbeck	BBHA9120D	453	2019-05-16	2 Year
5	Pre-amplifier	R&S	SCU18	105326	2020-05-25	1 Year
6	RF Cable	GORE	OSQ01Q01078.7	SN15458473	2019-05-23	2 Year
7	RF Cable	ESCO	ETS-LINGREN	RFC-SMS-100-SMS-340-IN	2019-05-23	2 Year
8	Measurement software	Farad	EZ-EMC(VER:1.1.4.2)	N/A	N/A	N/A

4.2. Block diagram of test setup

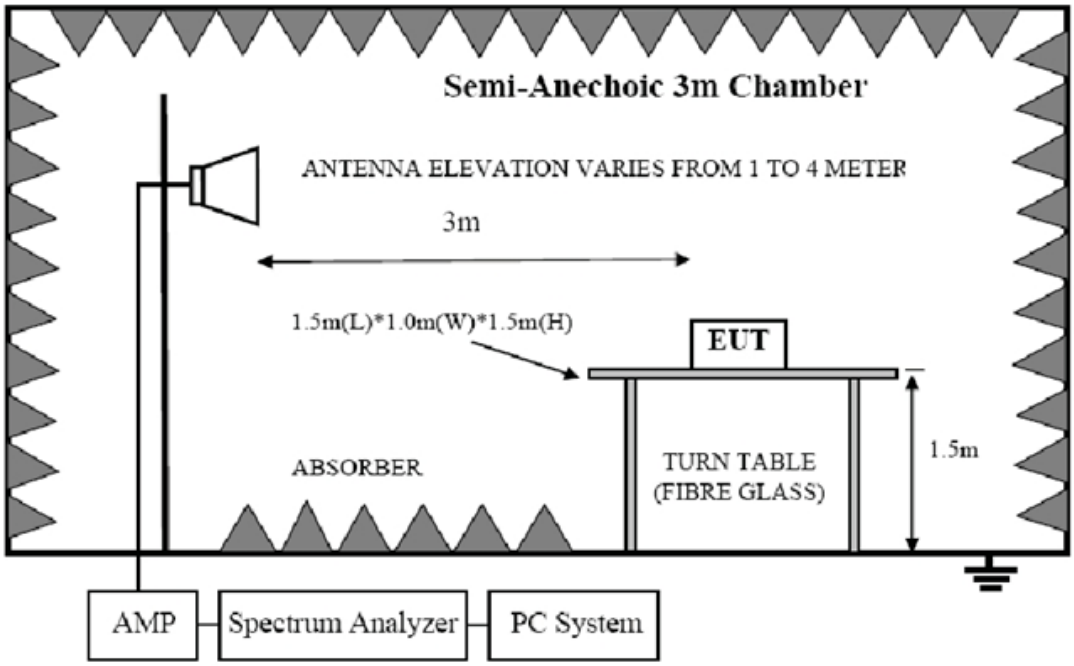
In 3m Anechoic Chamber Test Setup Diagram for 9KHz to 30MHz:



In 3m Anechoic Chamber Test Setup Diagram for 30MHz to 1GHz:



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz:



4.3. Limit

Rss-gen restricted frequency band:

Table 6 – Restricted Frequency Bands*

MHz
0.090-0.110
2.1735-2.1905
3.020-3.026
4.125-4.128
4.17725-4.17775
4.20725-4.20775
5.677-5.683
6.215-6.218
6.26775-6.26825
6.31175-6.31225
8.291-8.294
8.362-8.366
8.37625-8.38675
8.41425-8.41475
12.29-12.293
12.51975-12.52025
12.57675-12.57725
13.36-13.41
16.42-16.423
16.69475-16.69525
16.80425-16.80475
25.5-25.67
37.5-38.25
73-74.6
74.8-75.2
108-138
156.52475-156.52525
156.7-156.9

MHz
240-285
322-335.4
399.9-410
608-614
960-1427
1435-1626.5
1645.5-1646.5
1660-1710
1718.8-1722.2
2200-2300
2310-2390
2655-2900
3260-3267
3332-3339
3345.8-3358
3500-4400
4500-5150
5350-5460
7250-7750
8025-8500

GHz
9.0-9.2
9.3-9.5
10.6-12.7
13.25-13.4
14.47-14.5
15.35-16.2
17.7-21.4
22.01-23.12
23.6-24.0
31.2-31.8
36.43-36.5
Above 38.6

* Certain frequency bands listed in Table 6 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in the 200- and 300-series of RSSs, such as RSS-210 and RSS-310, which contain the requirements that apply to licence-exempt radio apparatus.

FCC 15.205 Restricted frequency band:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])

FCC 15.209 and rss-gen table 4 Limit

Frequency (MHz)	Distance (Meters)	Field Strengths Limits dB(μV)/m
30--88	3	40.0
88--216	3	43.5
216--960	3	46.0
960--1000	3	54.0
Above 1GHz	3	Peak: 74.0
	3	Average:54.0

Note: (1) The smaller limit shall apply at the cross point between two frequency bands.

(2)Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

(3)The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz and above 1000MHz.Radiated emissions limits in these three bands are based on measurements employing an average detector.

(4) At frequencies below 30MHz, measurement may be performed at a distance closer then that specified, and the limit at closer measurement distance can be extrapolated by below formula:

Limit3m(dBuV/m)= Limit30m(dBuV/m) + 40Log(30m/3m)

(5)All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

4.4. Test Procedure

Procedure of Preliminary Test

Configuration EUT to simulate typical usage as described in clause 2.3 and test equipment as described in clause 4.2 of this report.

Mains cables, telephone lines or other connections to auxiliary equipment located outside the test are shall drape to the floor, be fitted with ferrite clamps or ferrite tubes placed on the floor at the point where the cable reaches the floor and then routed to the place where they leave the turntable. No extension cords shall be used to mains receptacle.

EUT height should be 0.8m for below 1GHz and 1.5m for above 1GHz at ground with absorbers.

The antenna was placed at 3 meter away from the EUT as stated in ANSI C63.10. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.

The Analyzer / Receiver quickly scanned from 30MHz to 25GHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

The X, Y, Z three axial are tested and the report only the worst case.

The emissions from 9KHz to 1GHz, QP or average values were measured with EMI receiver with below RBW:

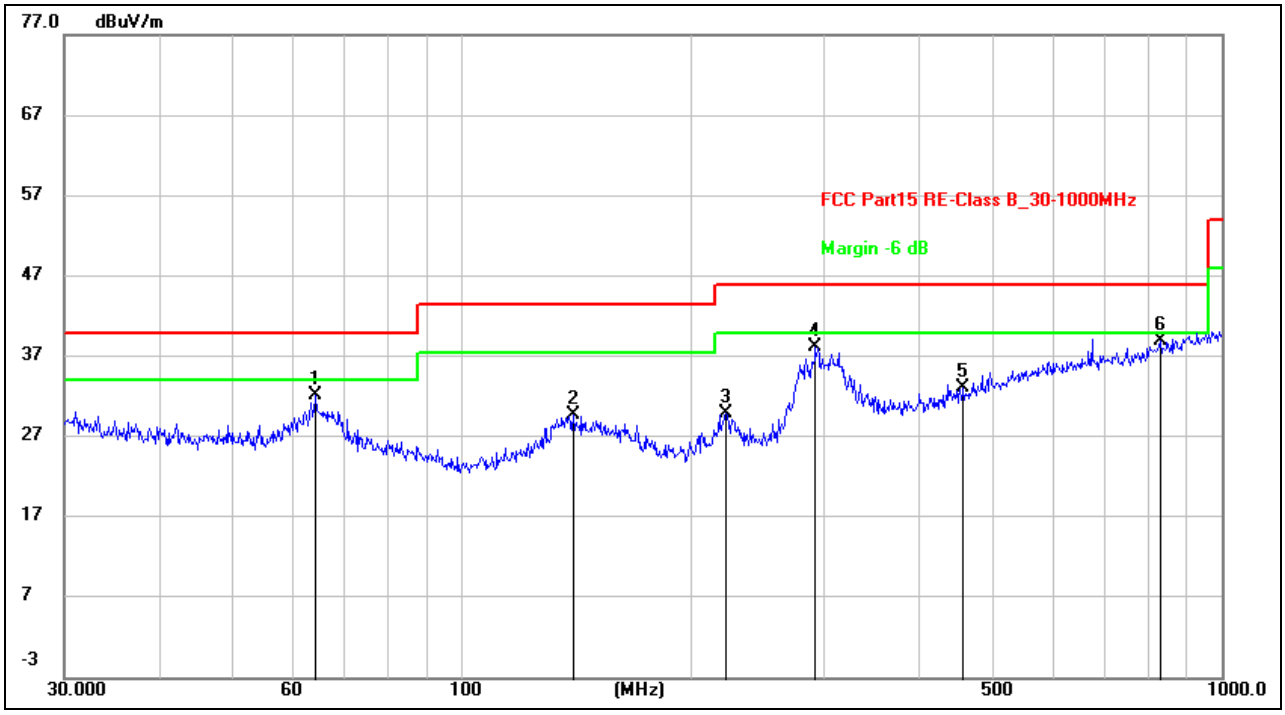
Frequency band	RBW
9KHz-150KHz	200Hz
150KHz-30MHz	9KHz
30MHz-1GHz	120KHz

For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RMS detector RBW 1MHz VBW 3MHz for Average measure.

4.5. Test result

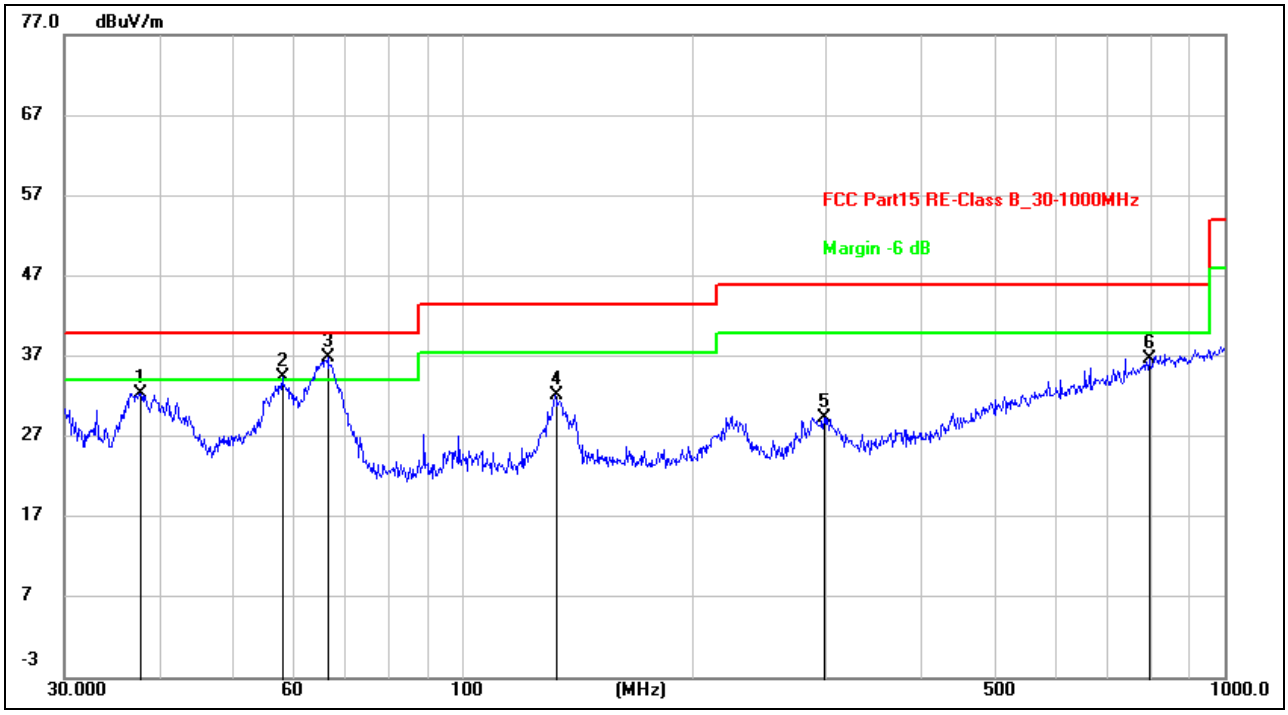
PASS. (See below detailed test result)

9K-30MHz: Emission detected are more than 20dB below the limit line.



Site:	**966LAB**	**Antenna::Horizontal**	**Temperature(C):24(C)**
Limit:	**FCC Part15 RE-Class B_30-1000MHz**		**Humidity(%):60%**
EUT:	**Monitor Light**	**Test Time:**	**2020/12/25**
M/N.:	**XL-20**	**Power Rating:**	**DC 5V from AC adapter 120V/60H**
Mode:	**Tx(2402MHz-Worst case)**	**Test Engineer:**	
Note:	**Controller**		

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)	Remark
1	64.2074	15.63	16.57	32.20	40.00	-7.80	peak	200	209	
2	140.3420	12.52	17.25	29.77	43.50	-13.73	peak	200	1	
3	222.9502	15.41	14.59	30.00	46.00	-16.00	peak	200	70	
4	292.0583	21.27	16.86	38.13	46.00	-7.87	peak	100	4	
5	457.5073	12.64	20.52	33.16	46.00	-12.84	peak	200	131	
6 *	830.4001	13.70	25.23	38.93	46.00	-7.07	peak	200	327	



Site:	**966LAB**	**Antenna::Vertical**	**Temperature(C):24(C)**
Limit:	**FCC Part15 RE-Class B_30-1000MHz**		**Humidity(%):60%**
EUT:	**Monitor Light**	**Test Time:**	**2020/12/25**
M/N.:	**XL-20**	**Power Rating:**	**DC 5V from AC adapter 120V/60H**
Mode:	**Tx(2402MHz-Worst case)**	**Test Engineer:**	
Note:	**Controller**		

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)	Remark
1	37.6798	17.25	15.24	32.49	40.00	-7.51	peak	200	110	
2 !	57.9993	21.54	13.00	34.54	40.00	-5.46	peak	100	164	
3 *	66.4989	24.13	12.69	36.82	40.00	-3.18	peak	100	211	
4	132.2206	19.43	12.80	32.23	43.50	-11.27	peak	100	342	
5	298.2681	15.27	14.15	29.42	46.00	-16.58	peak	100	357	
6	796.1830	13.12	23.53	36.65	46.00	-9.35	peak	100	357	

Site:	**966 LAB**	**Antenna::H / V**	**Temperature(C):24(C)**
Limit:	**FCC Part 15.249**		**Humidity(%):60%**
EUT:	**Monitor Light**	**Test Time:**	**2020/12/28**
M/N.:	**XL-20**	**Power Rating:**	**DC 3.7V**
Mode:	**Tx mode (2402MHz)**	**Test Engineer:**	
Note:			

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Pre-amp (dB)	Cable lost (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detect	Antenna polarization
2402.00	92.78	26.37	40.19	8.51	87.47	114.00	-26.53	Peak	H
2402.00	83.38	26.37	40.19	8.51	78.07	94.00	-15.93	AVG	H
2390.00	55.91	26.33	40.23	8.46	50.47	74.00	-23.53	Peak	H
2390.00	47.96	26.33	40.23	8.46	42.52	54.00	-11.48	AVG	H
2400.00	54.91	26.38	40.20	8.49	49.58	74.00	-24.42	Peak	H
2400.00	37.47	26.38	40.20	8.49	32.14	54.00	-21.86	AVG	H
4804.00	58.04	31.00	40.19	9.53	58.38	74.00	-15.62	Peak	H
4804.00	45.57	31.00	40.19	9.53	45.91	54.00	-8.09	AVG	H
2402.00	82.03	26.37	40.19	8.51	76.72	114.00	-37.28	Peak	V
2402.00	72.80	26.37	40.21	8.51	67.47	94.00	-26.53	AVG	V
2390.00	42.11	26.33	40.23	8.46	36.67	74.00	-37.33	Peak	V
2390.00	38.04	26.33	40.23	8.46	32.60	54.00	-21.40	AVG	V
2400.00	49.16	26.38	40.20	8.49	43.83	74.00	-30.17	Peak	V
2400.00	47.68	26.38	40.20	8.49	42.35	54.00	-11.65	AVG	V
4804.00	49.45	31.00	40.19	9.53	49.79	74.00	-24.21	Peak	V
4804.00	39.65	31.00	40.19	9.53	39.99	54.00	-14.01	AVG	V

Note: 1. Result Level = Reading Level + Antenna Factor + Cable loss – Pre-amp Factor.
2. Antenna polarization: “H” means Horizontal, “V” means Vertical.
3. Other emissions from 1 GHz to 25 GHz are considered as ambient noise. No recording in the test report.

Site:	**966 LAB**	**Antenna::H / V**	**Temperature(C):24(C)**
Limit:	**FCC Part 15.249**		**Humidity(%):60%**
EUT:	**Monitor Light**	**Test Time:**	**2020/12/28**
M/N.:	**XL-20**	**Power Rating:**	**DC 3.7V**
Mode:	**Tx mode (2440MHz)**	**Test Engineer:**	
Note:			

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Pre-amp (dB)	Cable lost (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detect	Antenna polarization
2440.00	88.71	26.43	40.21	8.53	83.46	114.00	-30.54	Peak	H
2440.00	77.46	26.43	40.21	8.53	72.21	94.00	-21.79	AVG	H
4880.00	55.27	31.04	40.19	9.59	55.71	74.00	-18.29	Peak	H
4880.00	42.86	31.04	40.19	9.59	43.30	54.00	-10.70	AVG	H
2440.00	79.73	26.43	40.21	8.53	74.48	114.00	-39.52	Peak	V
2440.00	70.76	26.43	40.21	8.53	65.51	94.00	-28.49	AVG	V
4880.00	57.93	31.04	40.19	9.59	58.37	74.00	-15.63	Peak	V
4880.00	46.99	31.04	40.19	9.59	47.43	54.00	-6.57	AVG	V

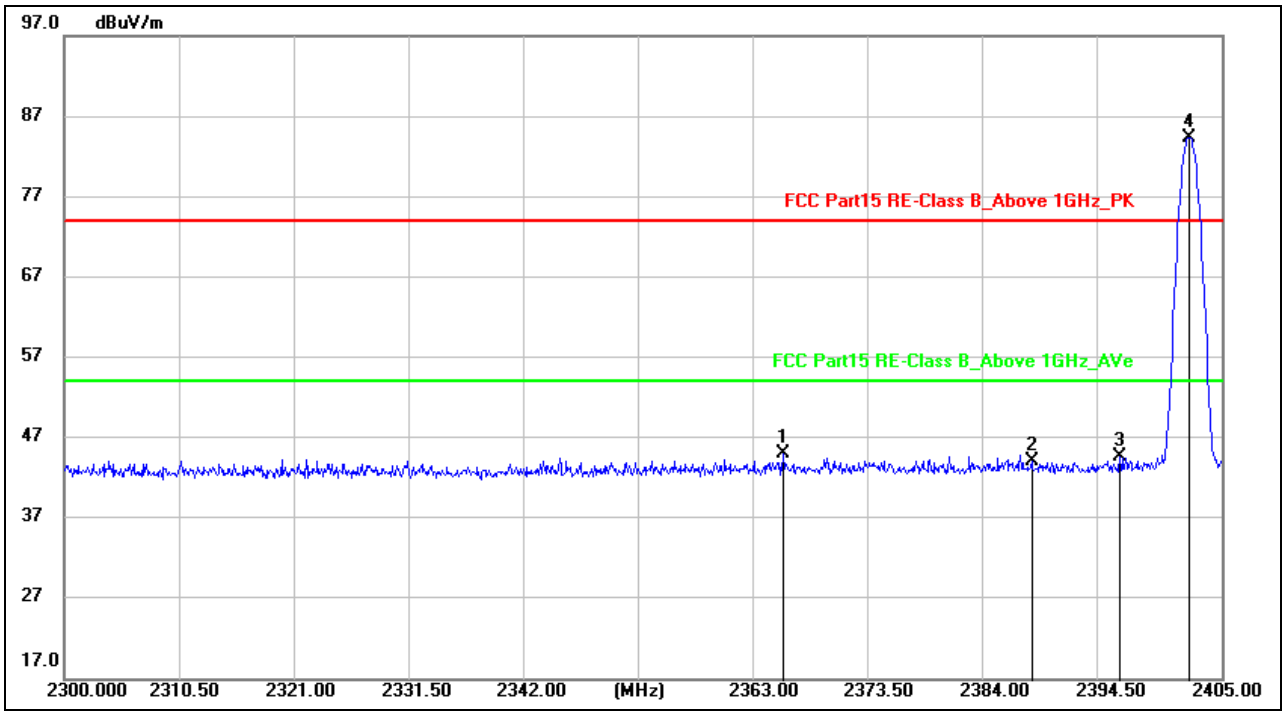
Note: 1. Result Level = Reading Level + Antenna Factor + Cable loss – Pre-amp Factor.
2. Antenna polarization: “H” means Horizontal, “V” means Vertical.
3. Other emissions from 1 GHz to 25 GHz are considered as ambient noise. No recording in the test report.

Site:	**966 LAB**	**Antenna::H / V**	**Temperature(C):24(C)**
Limit:	**FCC Part 15.249**		**Humidity(%):60%**
EUT:	**Monitor Light**	**Test Time:**	**2020/12/28**
M/N.:	**XL-20**	**Power Rating:**	**DC 3.7V**
Mode:	**Tx mode (2478MHz)**	**Test Engineer:**	
Note:			

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Pre-amp (dB)	Cable lost (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detect	Antenna polarization
2478.00	87.42	26.50	40.21	8.54	82.25	114.00	-31.75	Peak	H
2478.00	78.76	26.50	40.21	8.54	73.59	94.00	-20.41	AVG	H
2483.50	53.38	26.56	40.29	8.65	48.30	74.00	-25.70	Peak	H
2483.50	44.34	26.56	40.29	8.65	39.26	54.00	-14.74	AVG	H
4956.00	52.74	31.02	40.19	9.62	53.19	74.00	-20.81	Peak	H
4956.00	42.20	31.02	40.19	9.62	42.65	54.00	-11.35	AVG	H
2478.00	74.64	26.50	40.21	8.54	69.47	114.00	-44.53	Peak	V
2478.00	65.83	26.50	40.21	8.54	60.66	94.00	-33.34	AVG	V
2483.50	49.96	26.56	40.29	8.65	44.88	74.00	-29.12	Peak	V
2483.50	33.40	26.56	40.29	8.65	28.32	54.00	-25.68	AVG	V
4956.00	47.87	31.02	40.19	9.62	48.32	74.00	-25.68	Peak	V
4956.00	42.22	31.02	40.19	9.62	42.67	54.00	-11.33	AVG	V

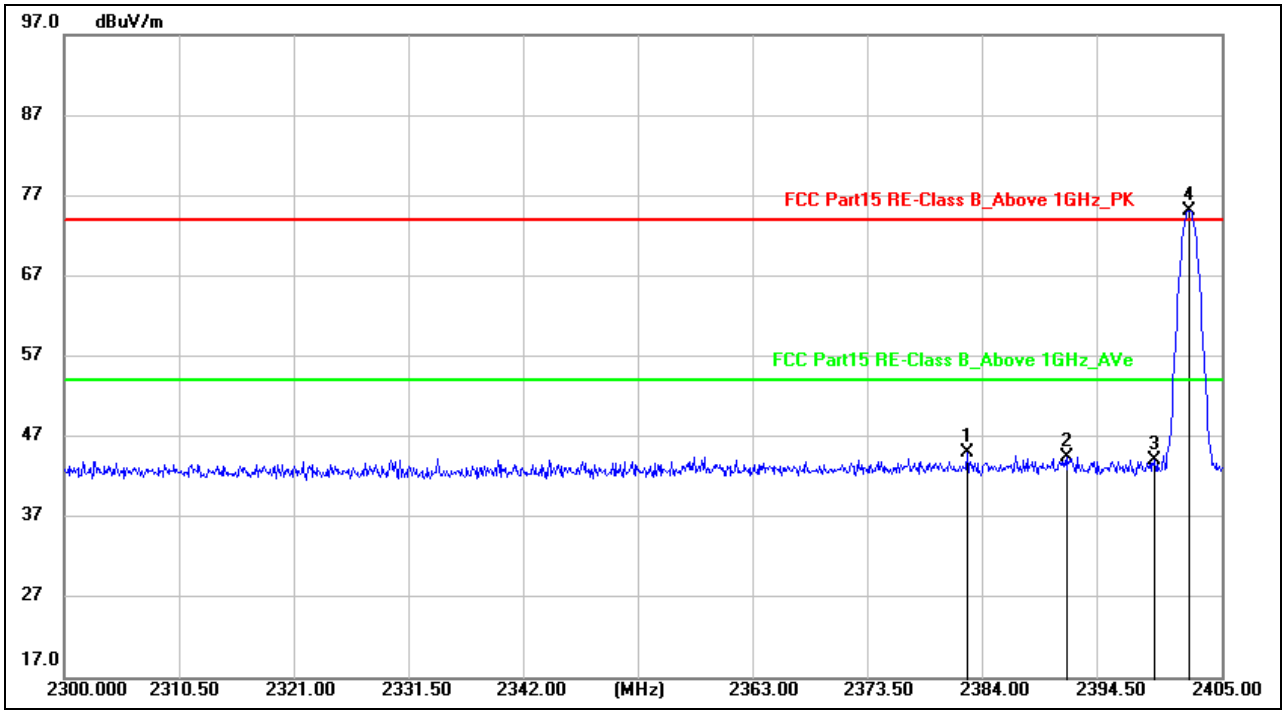
Note: 1. Result Level = Reading Level + Antenna Factor + Cable loss – Pre-amp Factor.
2. Antenna polarization: “H” means Horizontal, “V” means Vertical.
3. Other emissions from 1 GHz to 25 GHz are considered as ambient noise. No recording in the test report.

Test plots for band-edge



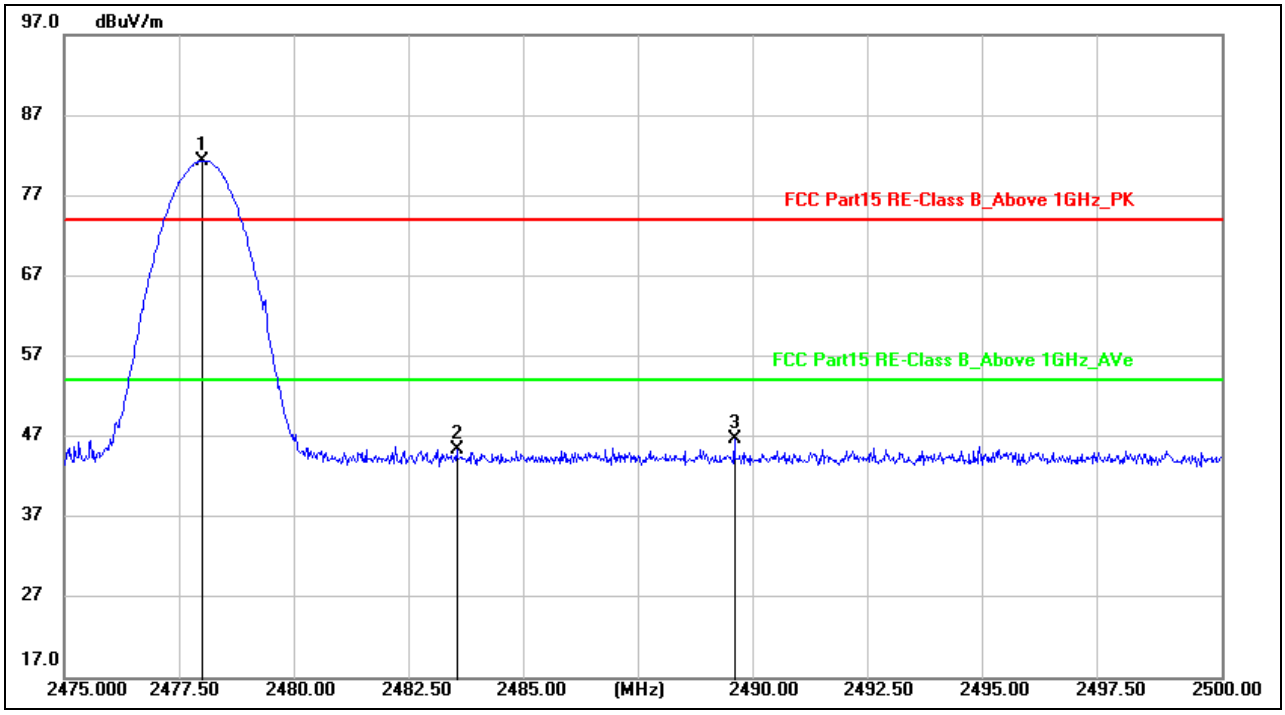
Site:		**Antenna::Horizontal**	**Temperature(C):24(C)**
Limit:	**FCC Part 15.249**		**Humidity(%):60%**
EUT:	**Monitor Light**	**Test Time:**	**2020/12/28**
M/N.:	**XL-20**	**Power Rating:**	**DC 3.7V**
Mode:	**Tx mode (2402MHz)**	**Test Engineer:**	
Note:			

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)	Remark
1	2365.205	55.93	-10.79	45.14	74.00	-28.86	peak			
2	2387.780	55.00	-10.78	44.22	74.00	-29.78	peak			
3	2395.760	55.49	-10.77	44.72	74.00	-29.28	peak			
4 *	2402.06	95.18	-10.77	84.41	114.00	-29.59	peak			



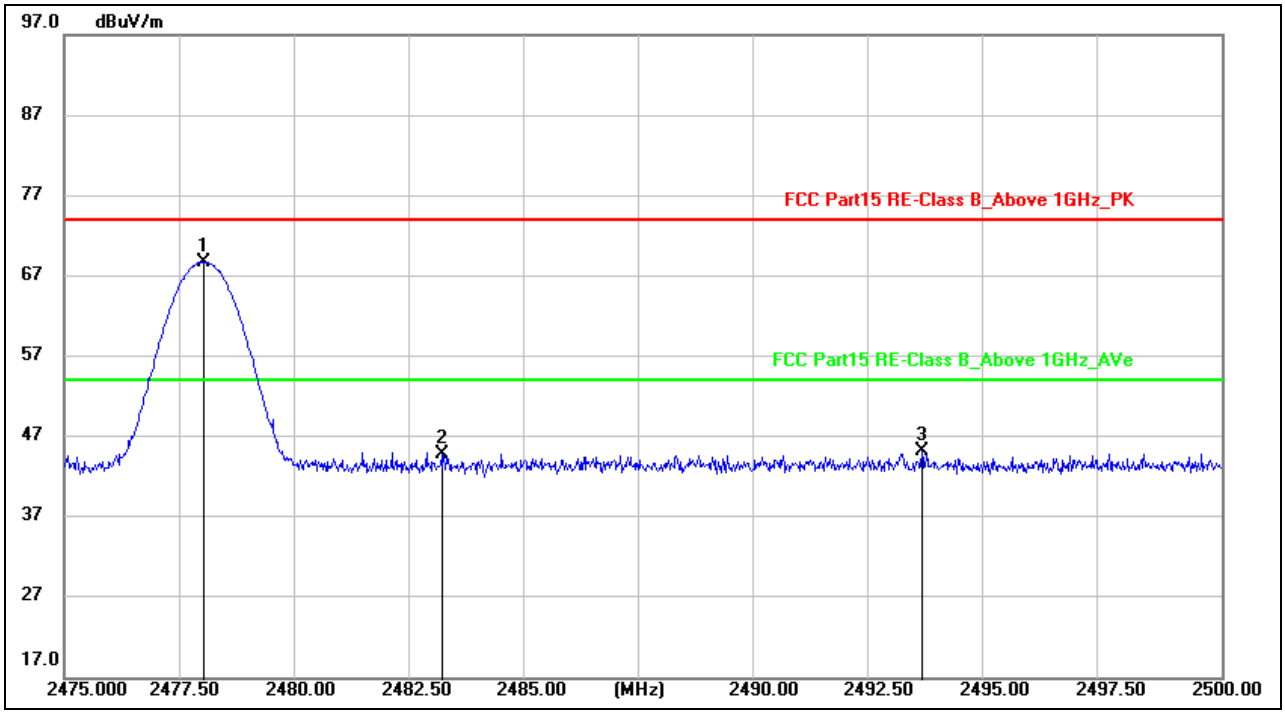
Site:		**Antenna:: Vertical**	**Temperature(C):24(C)**
Limit:	**FCC Part 15.249**		**Humidity(%):60%**
EUT:	**Monitor Light**	**Test Time:**	**2020/12/28**
M/N.:	**XL-20**	**Power Rating:**	**DC 3.7V**
Mode:	**Tx mode (2402MHz)**	**Test Engineer:**	
Note:			

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)	Remark
1	2381.900	55.84	-10.79	45.05	74.00	-28.95	peak			
2	2391.035	55.26	-10.78	44.48	74.00	-29.52	peak			
3	2398.910	54.91	-10.77	44.14	74.00	-29.86	peak			
4 *	2402.06	85.98	-10.77	75.21	114.00	-38.79	peak			



Site:		**Antenna::Horizontal**	**Temperature(C):24(C)**
Limit:	**FCC Part 15.249**		**Humidity(%):60%**
EUT:	**Monitor Light**	**Test Time:**	**2020/12/28**
M/N.:	**XL-20**	**Power Rating:**	**DC 3.7V**
Mode:	**Tx mode (2478MHz)**	**Test Engineer:**	
Note:			

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)	Remark
1 *	2477.975	92.09	-10.7	81.39	114.00	-32.61	peak			
2	2483.475	56.09	-10.70	45.39	74.00	-28.61	peak			
3	2489.475	57.46	-10.69	46.77	74.00	-27.23	peak			



Site:		**Antenna:: Vertical**	**Temperature(C):24(C)**
Limit:	**FCC Part 15.249**		**Humidity(%):60%**
EUT:	**Monitor Light**	**Test Time:**	**2020/12/28**
M/N.:	**XL-20**	**Power Rating:**	**DC 3.7V**
Mode:	**Tx mode (2478MHz)**	**Test Engineer:**	
Note:			

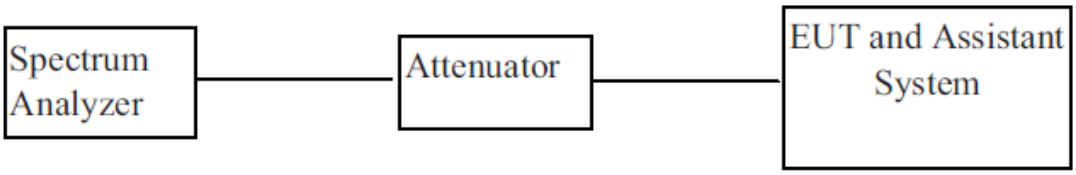
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)	Remark
1 *	2478	79.46	-10.7	68.76	114.00	-45.24	peak			
2	2483.150	55.62	-10.70	44.92	74.00	-29.08	peak			
3	2493.525	56.02	-10.69	45.33	74.00	-28.67	peak			

5. -20dB & 99% Bandwidth

5.1. Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Signal Analyzer	Agilent	N9020A	MY54510476	2020-05-25	1 Year

5.2. BLOCK DIAGRAM OF TEST SETUP



5.3. Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

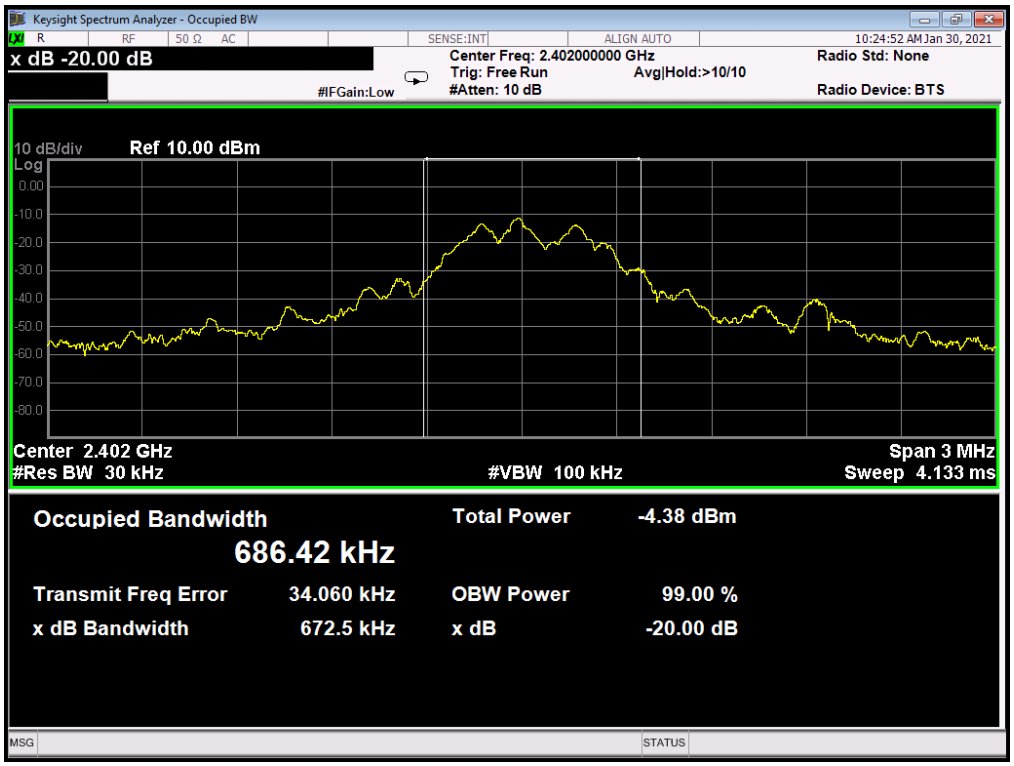
5.4. Test Procedure

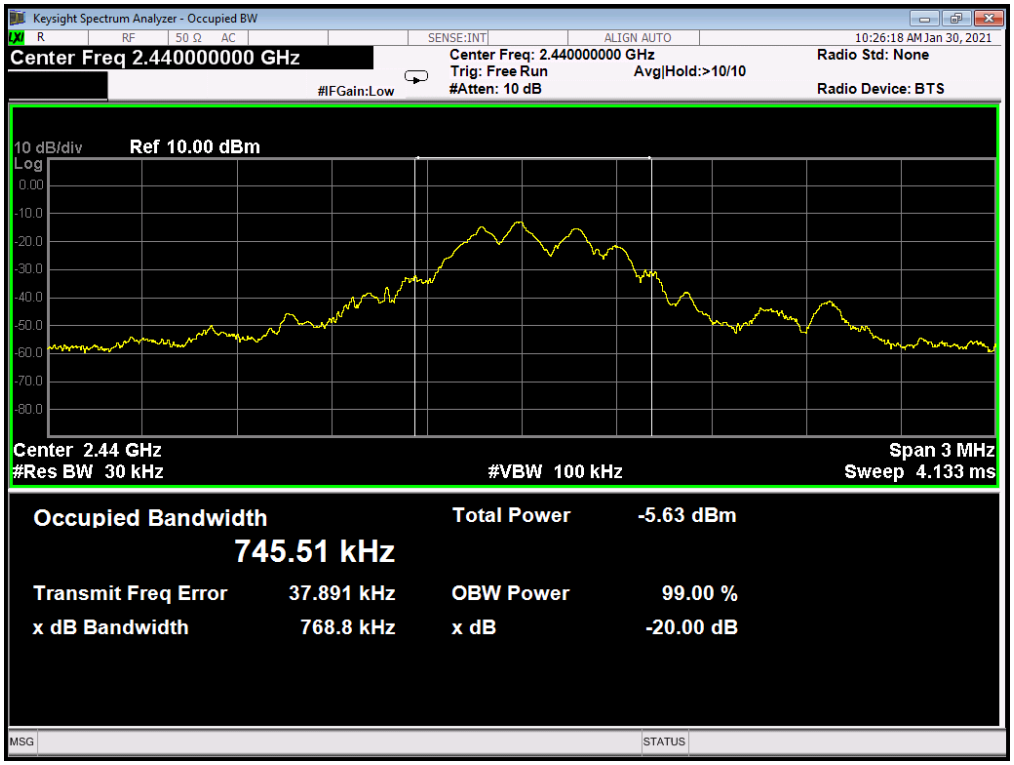
(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

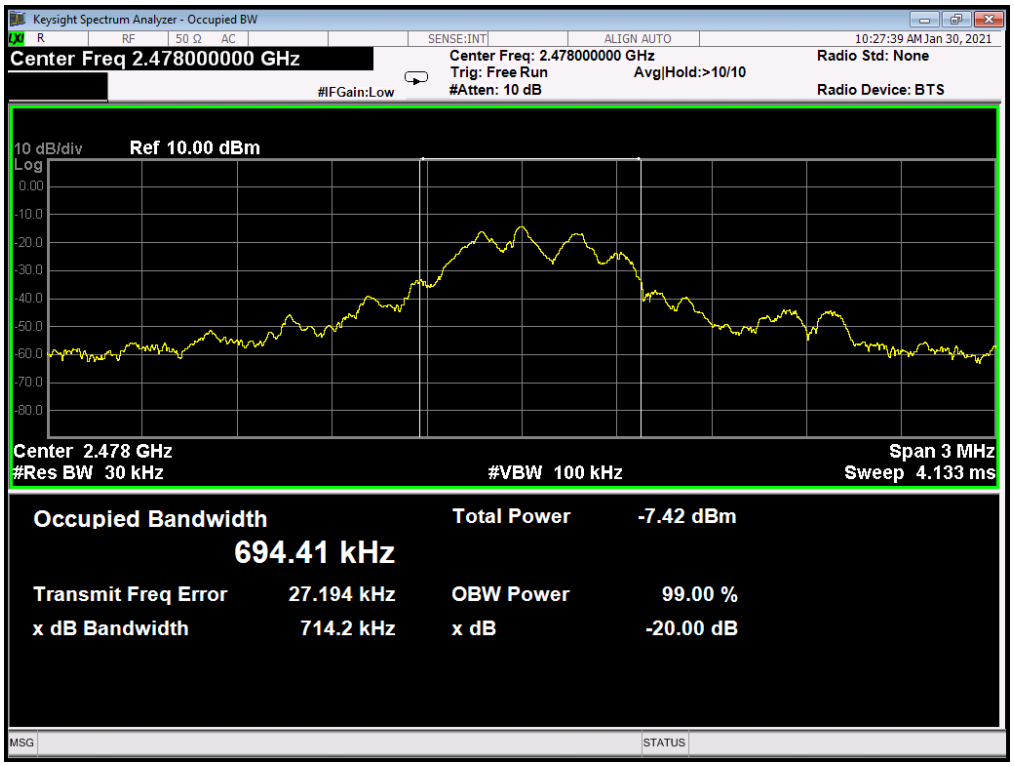
(2) The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 kHz RBW and 100 kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

5.5. Test result

Frequency (MHz)	99% OBW (KHz)	-20 dB Bandwidth (KHz)	Verdict
2402	686.42	672.5	Pass
2440	745.51	768.8	Pass
2478	694.41	714.2	Pass




Keysight Spectrum Analyzer - Occupied BW
R RF 50 Ω AC SENSE:INT ALIGN AUTO 10:26:18 AM Jan 30, 2021
Center Freq 2.440000000 GHz
Center Freq: 2.440000000 GHz
Trig: Free Run Avg|Hold:>10/10
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
10 dB/div Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.44 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
745.51 kHz
Total Power -5.63 dBm
Transmit Freq Error 37.891 kHz
OBW Power 99.00 %
x dB Bandwidth 768.8 kHz
x dB -20.00 dB
MSG
STATUS


Keysight Spectrum Analyzer - Occupied BW
R RF 50 Ω AC SENSE:INT ALIGN AUTO 10:27:39 AM Jan 30, 2021
Center Freq 2.478000000 GHz
Center Freq: 2.478000000 GHz
Trig: Free Run Avg|Hold:>10/10
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
10 dB/div Ref 10.00 dBm
Log
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 2.478 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
694.41 kHz
Total Power -7.42 dBm
Transmit Freq Error 27.194 kHz
OBW Power 99.00 %
x dB Bandwidth 714.2 kHz
x dB -20.00 dB
MSG
STATUS

6. Antenna Requirements

6.1. Limit

For intentional device, according to FCC 47 CFR Section 15.203 and RSS-GEN, 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. And according to FCC 47 CFR Section 15.249 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

6.2. Result

The EUT has an internal PCB antenna permanently soldering on the printed circuit board, which complied with 15.203 and RSS-GEN, the maximum gain was 0 dBi.

7. Test setup photograph

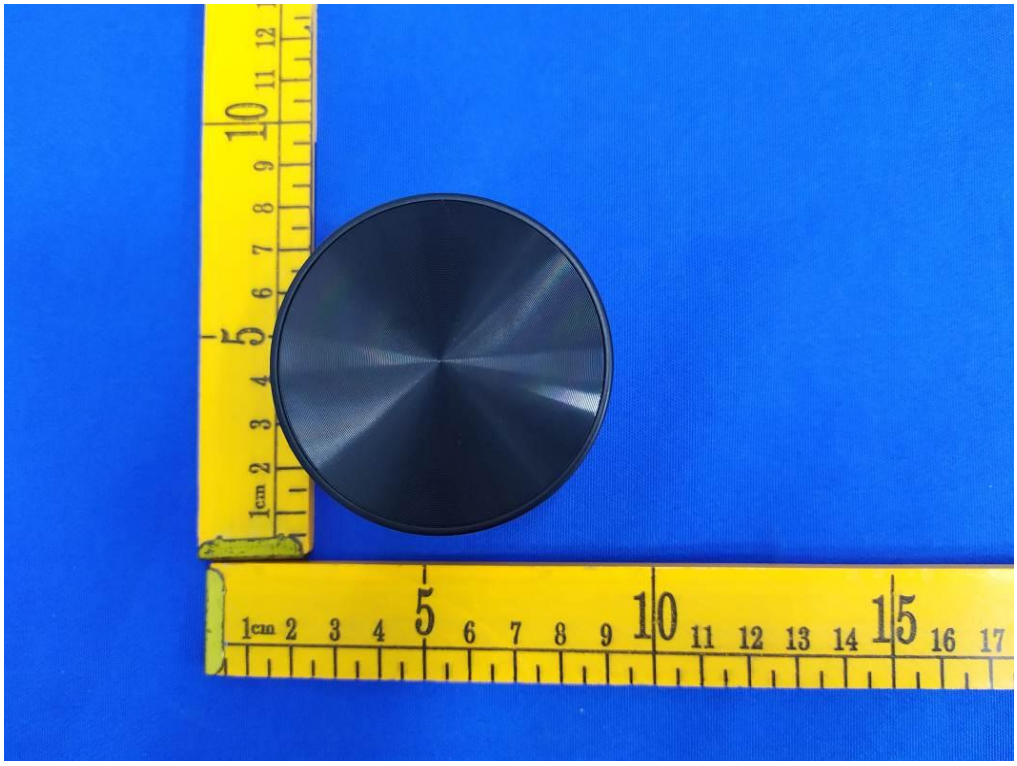
7.1. Photos of radiated emission test

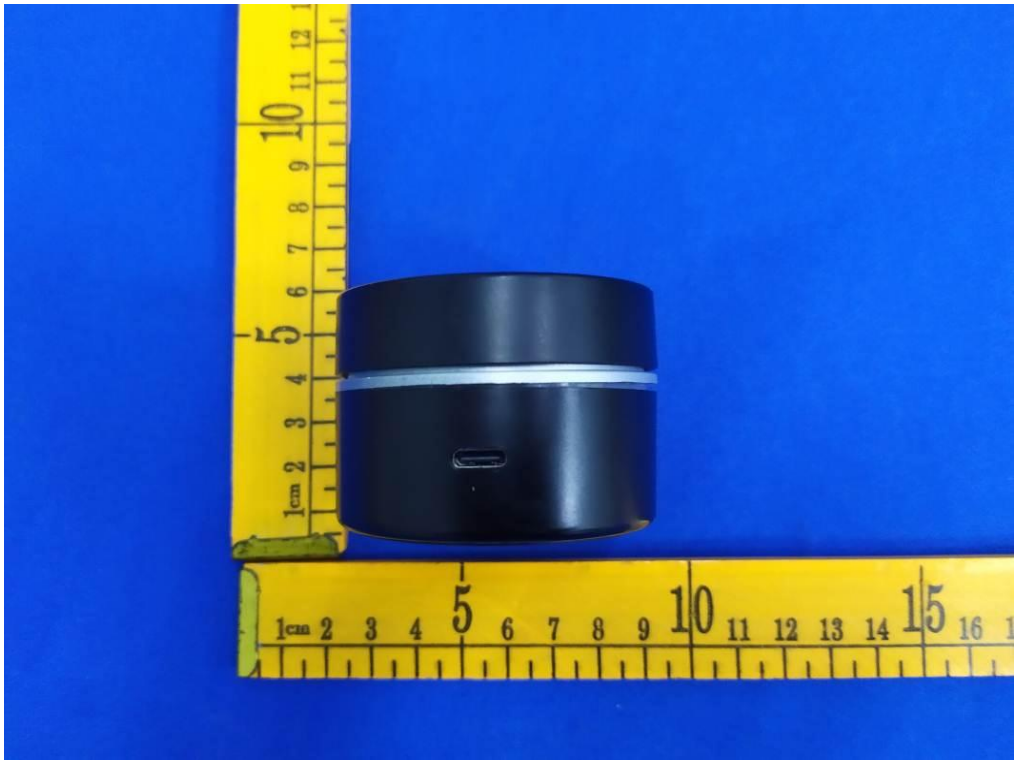
7.2. Photos of radiated emission test

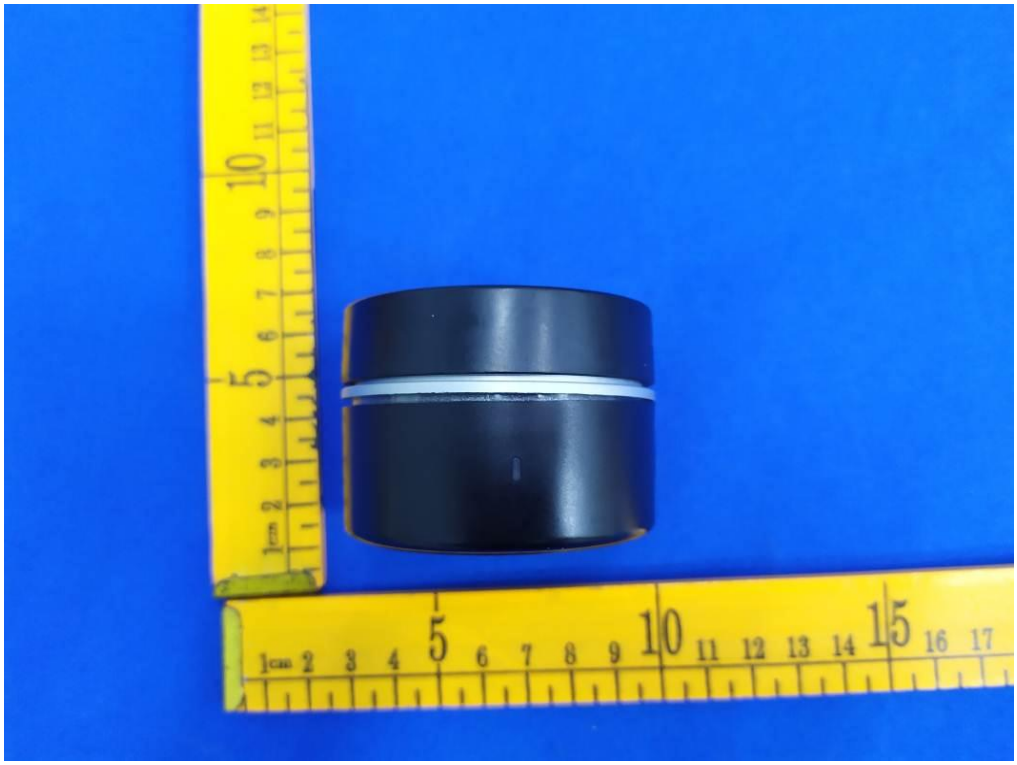
30MHz – 1GHz

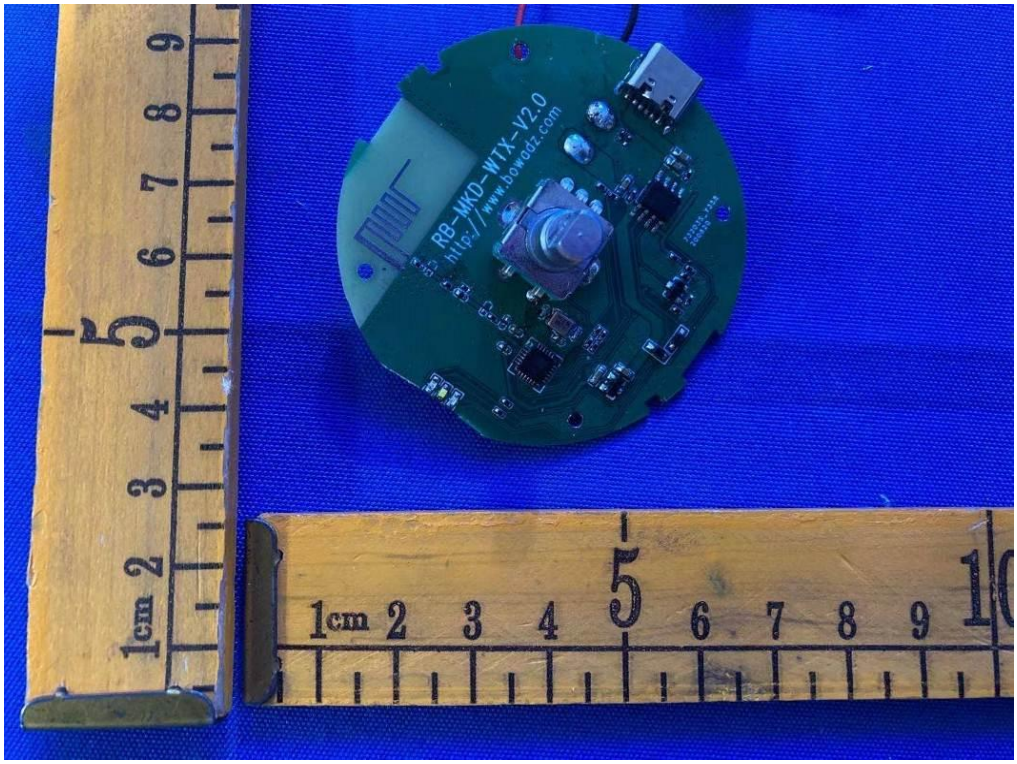
Above 1GHz

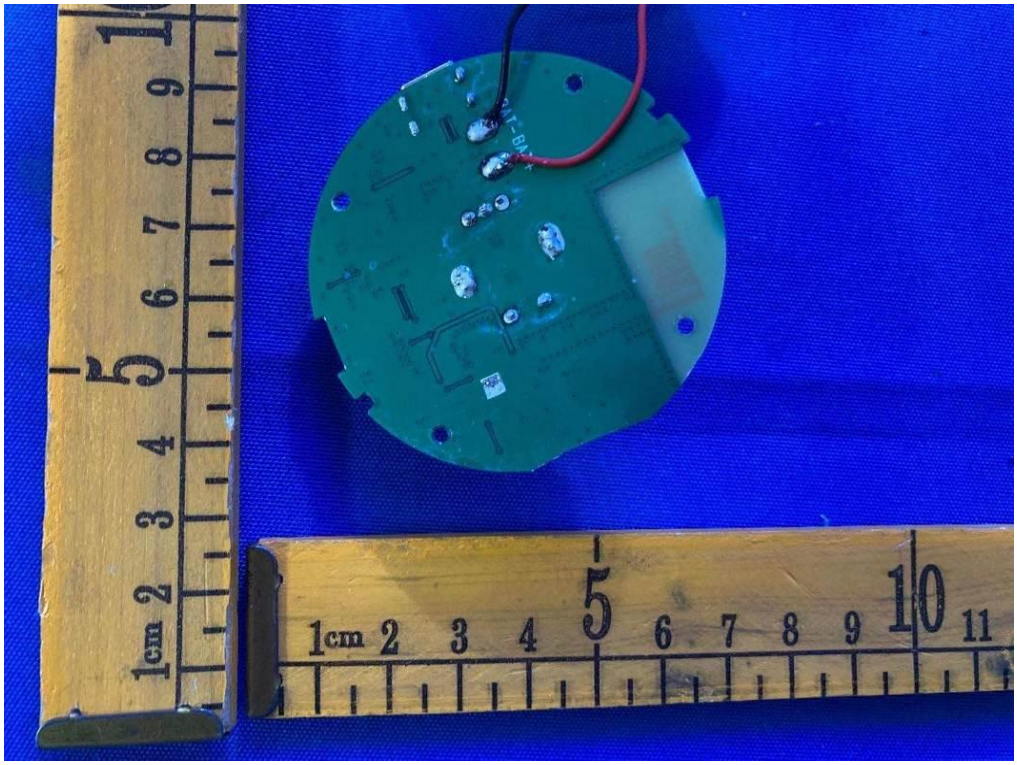
8. Photos of the EUT








RB-MKD-WTX-V2.0
http://www.bowodz.com



--END OF REPORT--