



FCC Part 15C Test Report

FCC ID: 2A4T8-ST30

Applicant: Shenzhen Mumi United Intelligent Technology Co., LTD

Address: Room 334, Overseas Students Pioneer Park, Qinglin West Road, Longgang District, Shenzhen, China.

Manufacturer: Shenzhen Mumi United Intelligent Technology Co., LTD

Address: Room 334, Overseas Students Pioneer Park, Qinglin West Road, Longgang District, Shenzhen, China.

EUT: Smart Watch

Trade Mark: N/A

Model Number: ST30, ST3, ST5, ST6, ST6 Pro, ST20, ST22, HH01, BF01, U52, U57, ST50, ST60, ST70, ST80, ST90, ST100, ST7, ST8, ST9, Watch7

Date of Receipt: Feb. 18, 2022

Test Date: Feb. 18, 2022 - Feb. 24, 2022

Date of Report: Feb. 24, 2022

Prepared By: Shenzhen DL Testing Technology Co., Ltd.

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Applicable Standards: FCC PART 15 C 15.247
ANSI C63.4:2014

Test Result: Pass

Report Number: DL-20220224002-2E

Prepared (Test Engineer): Alisa Song

Reviewer (Supervisor): Jack Bu

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This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.



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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(c)	Radiated Spurious Emission	PASS	
15.205	Band Edge Emission	PASS	
15.247(b)(1)	Peak Output Power	PASS	
15.247(a)(2)	6dB Bandwidth	PASS	
15.247(d)	Power Spectral Density	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

1.1 MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 2.56\text{dB}$
2	RF power,conducted	$\pm 0.42\text{dB}$
3	Spurious emissions,conducted	$\pm 2.76\text{dB}$
4	All emissions,radiated(<1G)	$\pm 3.65\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name:	Smart Watch
Trademark	N/A
Model No.:	ST30, ST3, ST5, ST6, ST6 Pro, ST20, ST22, HH01, BF01, U52, U57, ST50, ST60, ST70, ST80, ST90, ST100, ST7, ST8, ST9, Watch7
Model Difference	All samples are the same except the model name, so we prepare " ST30" for test only.
BT Version:	5.0
Operation Frequency:	2402~2480MHz
Channel numbers:	40 Channels
Channel separation:	2M
Modulation technology:	GFSK
Antenna Type:	EDR: Internal Antenna*1 BLE: Internal Antenna*1
Antenna gain:	EDR: 0 dBi BLE: 0 dBi
Power supply:	DC 5V from charger DC 3.7V from battery

Note:

- 1.For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- 2.The EUT's all information provided by client.

2. Channel Lis

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	11	2422	23	2444
02	2404	12	2424	24	2446
~	~	~	~		
9	2418	20	2440	39	2478
10	2420	21	2442	40	2480



2.2 DESCRIPTION OF TEST MODES

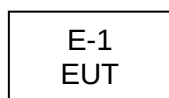
To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH01
Mode 2	CH20
Mode 3	CH40
Mode 4	Link Mode
For Conducted Emission	
Final Test Mode	Description
Mode 4	Link Mode
For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01
Mode 2	CH20
Mode 3	CH40

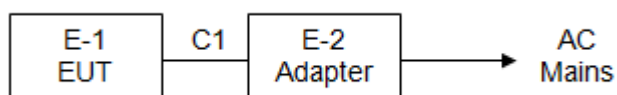
Note: 1. The measurements are performed at the highest, middle, lowest available channels.

2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Spurious Emission Test





2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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

Item	Equipment	Model/Type No.	Series No.	Note
E-1	Smart Watch	ST30	N/A	EUT
E-2	Adapter	HW-0501000E	N/A	Provide by test lab Input: AC 100-240V 50/60Hz Output: DC 5V/1A

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.5 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the end product.

Test software Version	Test program: rf_console		
Frequency	2402 MHz	2440MHz	2480 MHz
Power Setting of Softwave	10	10	10



2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation test, Band-edge test and 6db bandwidth test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4408B	MY50140780	Nov. 06, 2021	Nov. 05, 2022
2	Test Receiver (9kHz-7GHz)	R&S	ESRP7	101393	Nov. 06, 2021	Nov. 05, 2022
3	Bilog Antenna (30MHz-1GHz)	R&S	VULB9162	00306	Nov. 06, 2021	Nov. 05, 2022
4	Horn Antenna (1GHz-18GHz)	Schwarzbeck	BBHA9120D	02139	Nov. 06, 2021	Nov. 05, 2022
5	Horn Antenna (18GHz-40GHz)	A.H. Systems	SAS-574	588	Nov. 06, 2021	Nov. 05, 2022
6	Amplifier (9KHz-6GHz)	Schwarzbeck	BBV9743B	00153	Nov. 06, 2021	Nov. 05, 2022
7	Amplifier (1GHz-18GHz)	EMEC	EM01G8GA	00270	Nov. 06, 2021	Nov. 05, 2022
8	Amplifier (18GHz-40GHz)	Quanjuda	DLE-161	97	Nov. 06, 2021	Nov. 05, 2022
9	Loop Antenna (9KHz-30MHz)	Schwarzbeck	FMZB1519B	00014	Nov. 06, 2021	Nov. 05, 2022
10	RF cables1 (9kHz-1GHz)	ChengYu	966	004	Nov. 06, 2021	Nov. 05, 2022
11	RF cables2 (1GHz-40GHz)	ChengYu	966	003	Nov. 06, 2021	Nov. 05, 2022
12	Antenna connector	Florida RF Labs	N/A	RF 01#	Nov. 06, 2021	Nov. 05, 2022
13	Power probe	KEYSIGHT	U2021XA	MY55210018	Nov. 06, 2021	Nov. 05, 2022
14	Signal Analyzer 9kHz-26.5GHz	Agilent	N9020A	MY55370280	Nov. 06, 2021	Nov. 05, 2022
15	Test Receiver 20kHz-40GHz	R&S	ESU 40	100376	Nov. 06, 2021	Nov. 05, 2022
16	D.C. Power Supply	LongWei	PS-305D	010964729	Nov. 06, 2021	Nov. 05, 2022

Conduction Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	843 Shielded Room	ChengYu	843 Room	843	Nov. 25, 2019	Nov. 24, 2022
2	EMI Receiver	R&S	ESR	101421	Nov. 06, 2021	Nov. 05, 2022
3	LISN	R&S	ENV216	102417	Nov. 06, 2021	Nov. 05, 2022
4	843 Cable 1#	ChengYu	CE Cable	001	Nov. 06, 2021	Nov. 05, 2022

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	FALA	EZ_EMCC	EMC-CON 3A1.1
2	EMC radiation test system	FALA	EZ_EMCC	FA-03A2
3	RF test system	MAIWEI	MTS8310	2.0.0.0
4	RF communication test system	MAIWEI	MTS8200	2.0.0.0



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Limit (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

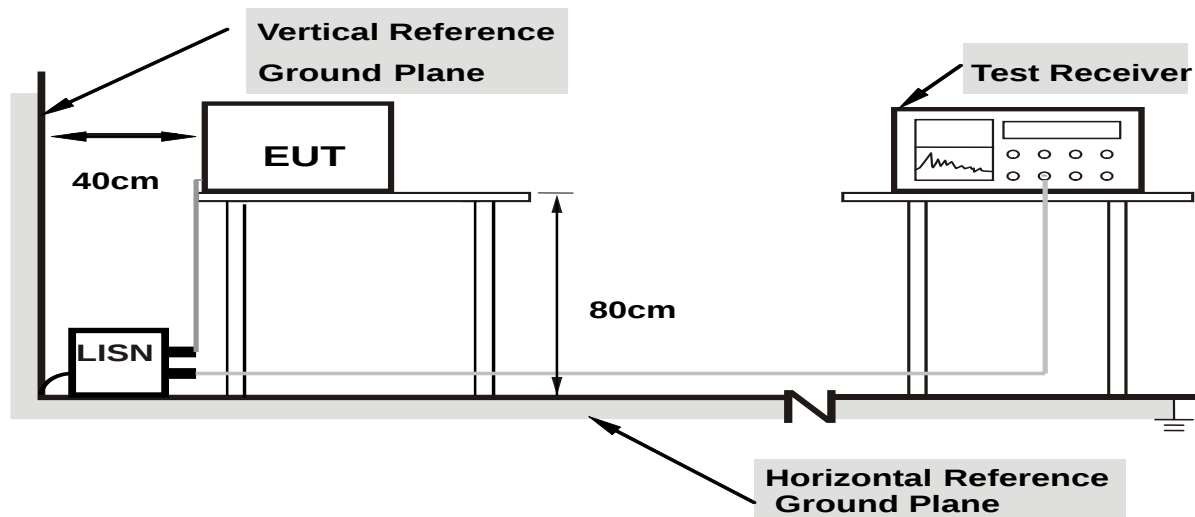
3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

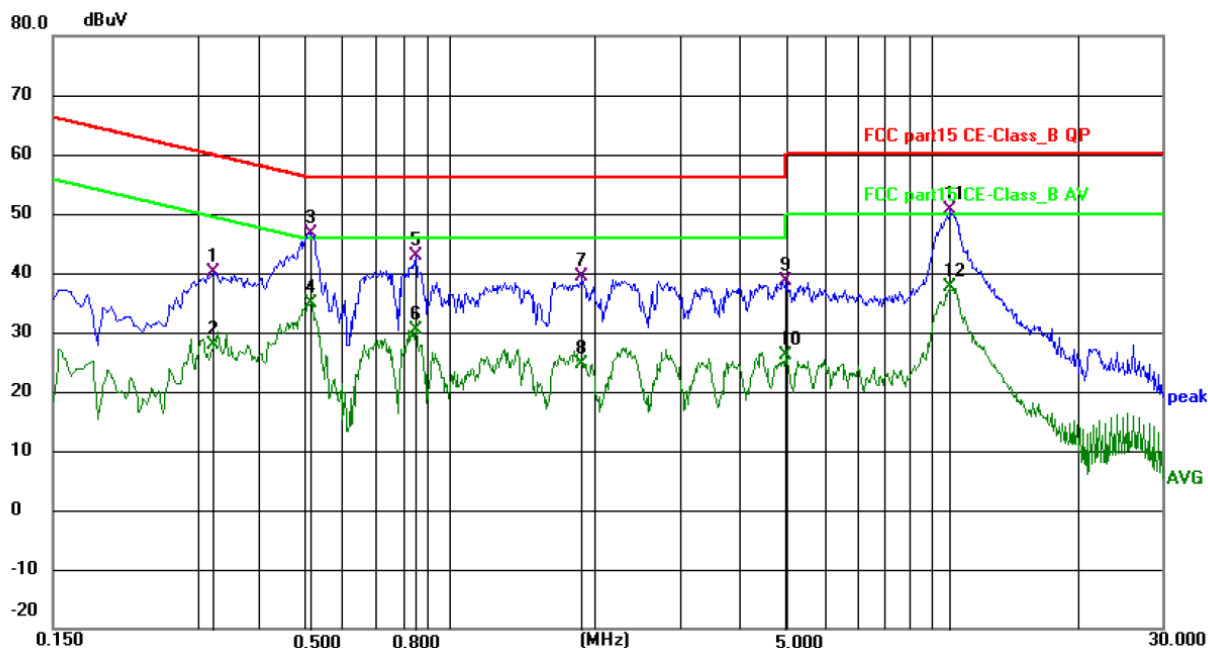
3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS



Temperature:	25 °C	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	L
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 4



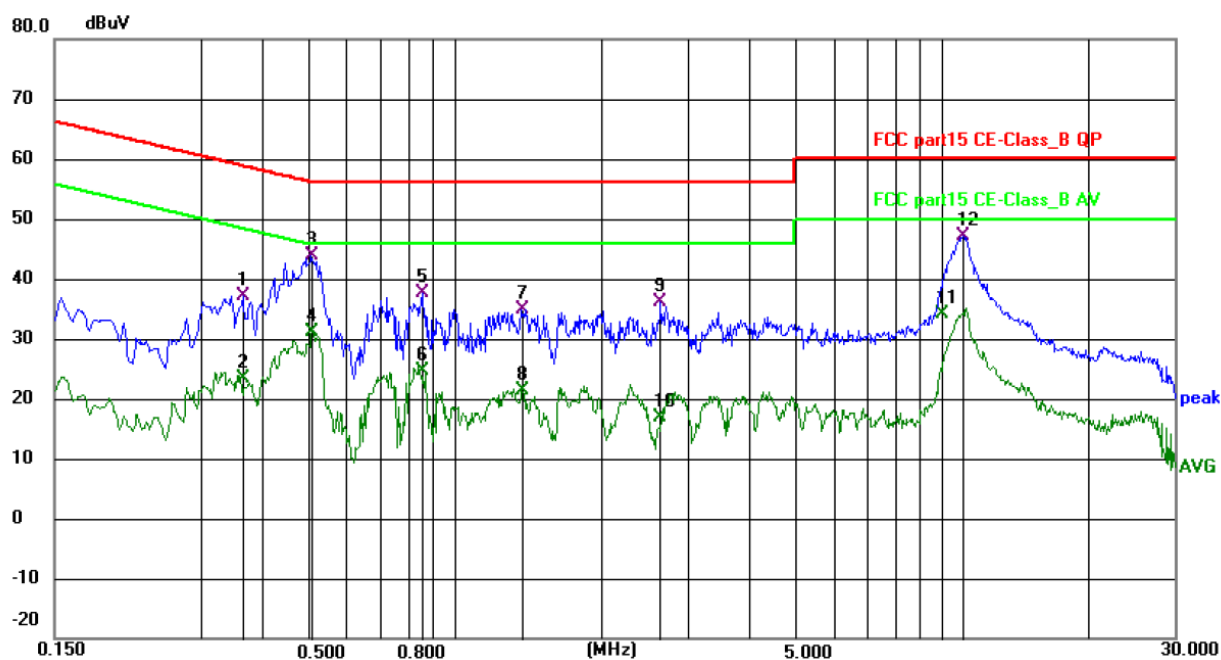
Remark:

Margin = Limit – Level, Correct Factor = Cable lose + LISN insertion loss, Level= Reading + Correct factor

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.3234	31.12	9.09	40.21	59.62	19.41	QP	P	
2	0.3234	18.72	9.09	27.81	49.62	21.81	AVG	P	
3 *	0.5143	37.36	9.36	46.72	56.00	9.28	QP	P	
4	0.5143	25.60	9.36	34.96	46.00	11.04	AVG	P	
5	0.8518	33.48	9.30	42.78	56.00	13.22	QP	P	
6	0.8518	21.09	9.30	30.39	46.00	15.61	AVG	P	
7	1.8824	29.55	9.79	39.34	56.00	16.66	QP	P	
8	1.8824	14.74	9.79	24.53	46.00	21.47	AVG	P	
9	4.9965	28.73	9.80	38.53	56.00	17.47	QP	P	
10	4.9965	16.44	9.80	26.24	46.00	19.76	AVG	P	
11	10.9452	40.58	10.11	50.69	60.00	9.31	QP	P	
12	10.9452	27.50	10.11	37.61	50.00	12.39	AVG	P	



Temperature:	25 °C	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	N
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 4



Remark:

 $\text{Margin} = \text{Limit} - \text{Level}$, Correct Factor = Cable lose + LISN insertion loss, $\text{Level} = \text{Reading} + \text{Correct factor}$

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.3659	28.05	9.08	37.13	58.59	21.46	QP	P	
2	0.3659	14.41	9.08	23.49	48.59	25.10	AVG	P	
3 *	0.5053	34.79	9.19	43.98	56.00	12.02	QP	P	
4	0.5053	21.92	9.19	31.11	46.00	14.89	AVG	P	
5	0.8564	28.30	9.33	37.63	56.00	18.37	QP	P	
6	0.8564	15.19	9.33	24.52	46.00	21.48	AVG	P	
7	1.3692	25.51	9.49	35.00	56.00	21.00	QP	P	
8	1.3692	11.93	9.49	21.42	46.00	24.58	AVG	P	
9	2.6428	27.01	9.03	36.04	56.00	19.96	QP	P	
10	2.6428	7.85	9.03	16.88	46.00	29.12	AVG	P	
11	10.0219	24.23	9.88	34.11	50.00	15.89	AVG	P	
12	11.0219	37.11	9.93	47.04	60.00	12.96	QP	P	



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	25GHz
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP



3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
- Test the EUT in the lowest channel, the middle channel, the Highest channel

Note:

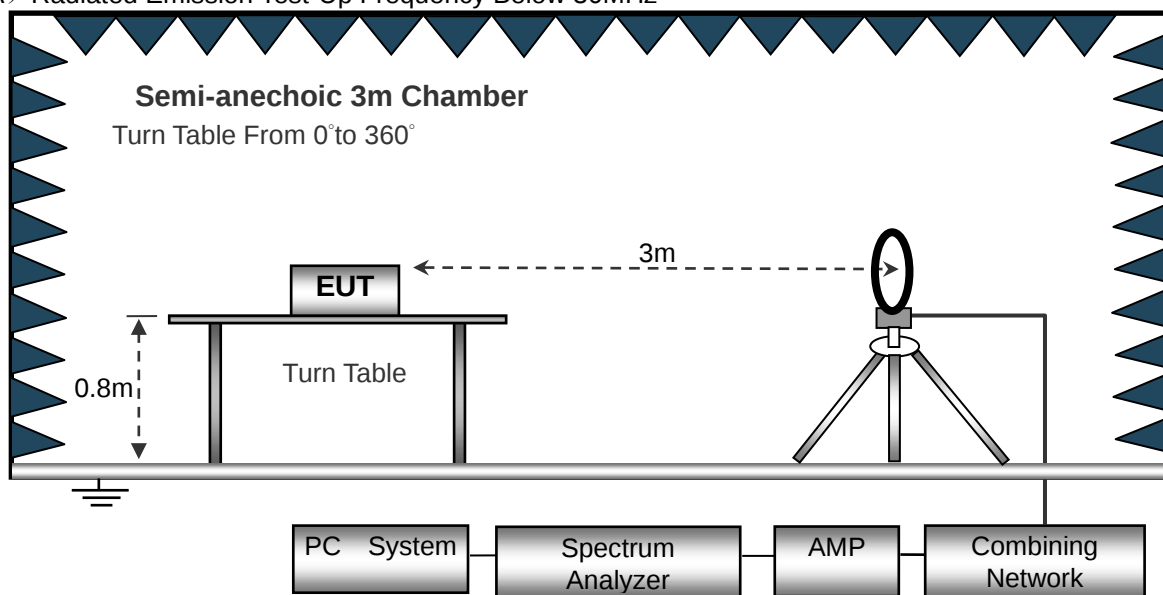
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

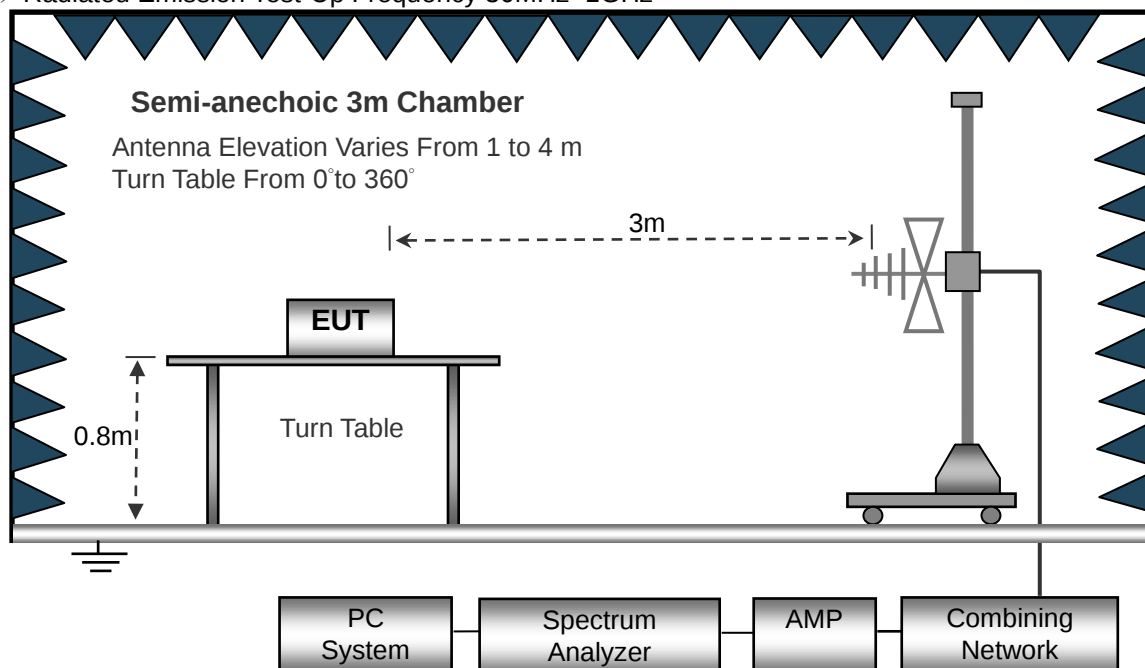
No deviation

3.2.4 TEST SETUP

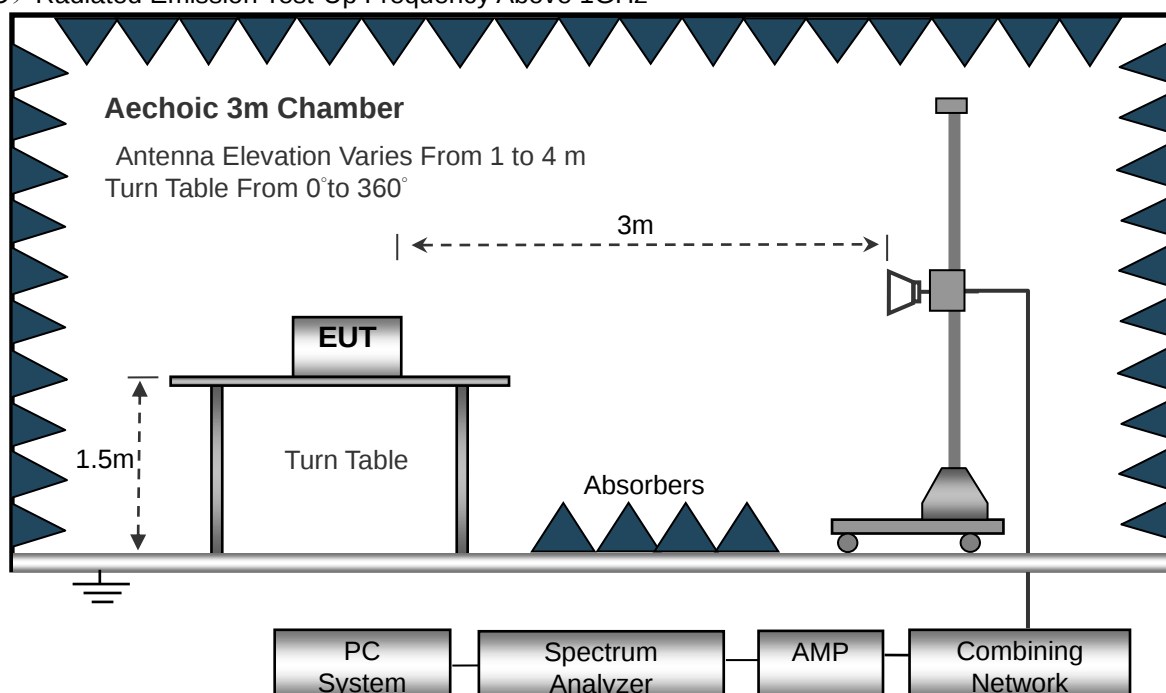
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

**3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)**

Temperature:	20℃	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 3.7V
Test Mode :	Mode 4	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

NOTE:

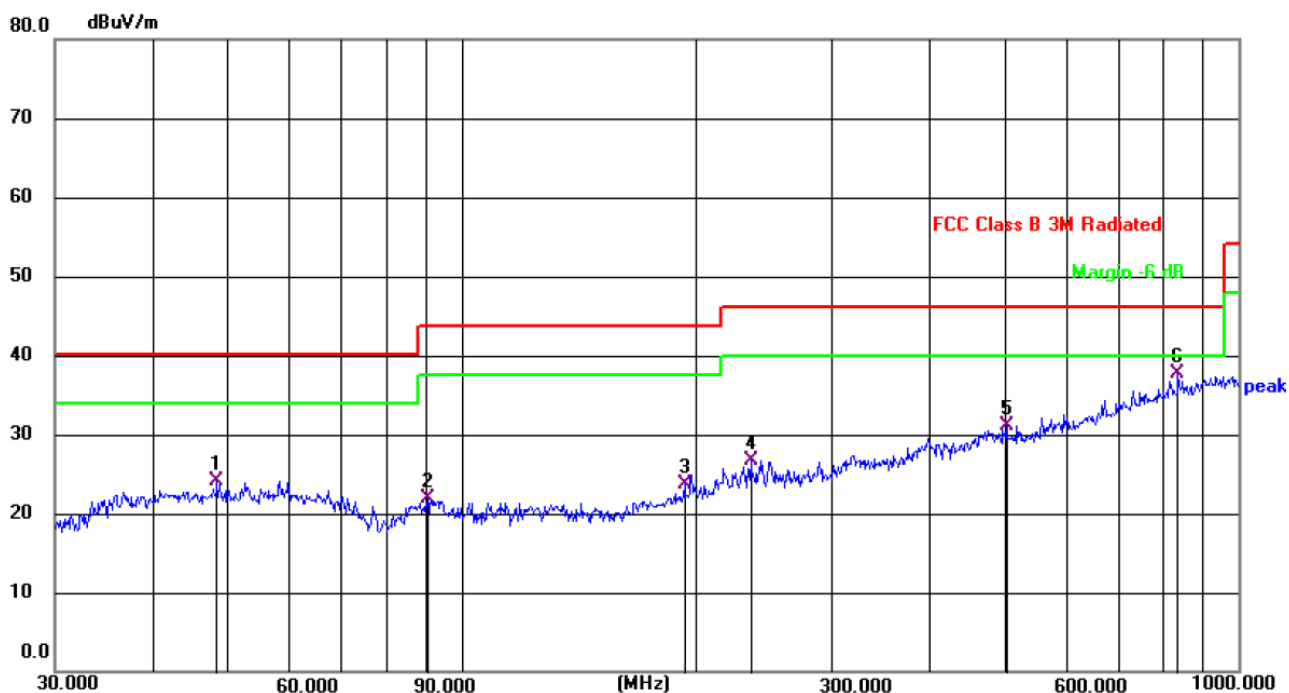
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuV) + distance extrapolation factor.

**3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)**

Temperature:	26℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Horizontal
Test Voltage :	DC 3.7V		
Test Mode :	Mode 4		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		48.5015	35.48	-11.32	24.16	40.00	15.84	QP
2		90.5374	36.92	-14.96	21.96	43.50	21.54	QP
3		193.7726	37.20	-13.46	23.74	43.50	19.76	QP
4		235.8163	38.20	-11.53	26.67	46.00	19.33	QP
5		502.9395	36.94	-5.81	31.13	46.00	14.87	QP
6	*	836.2441	38.42	-0.78	37.64	46.00	8.36	QP

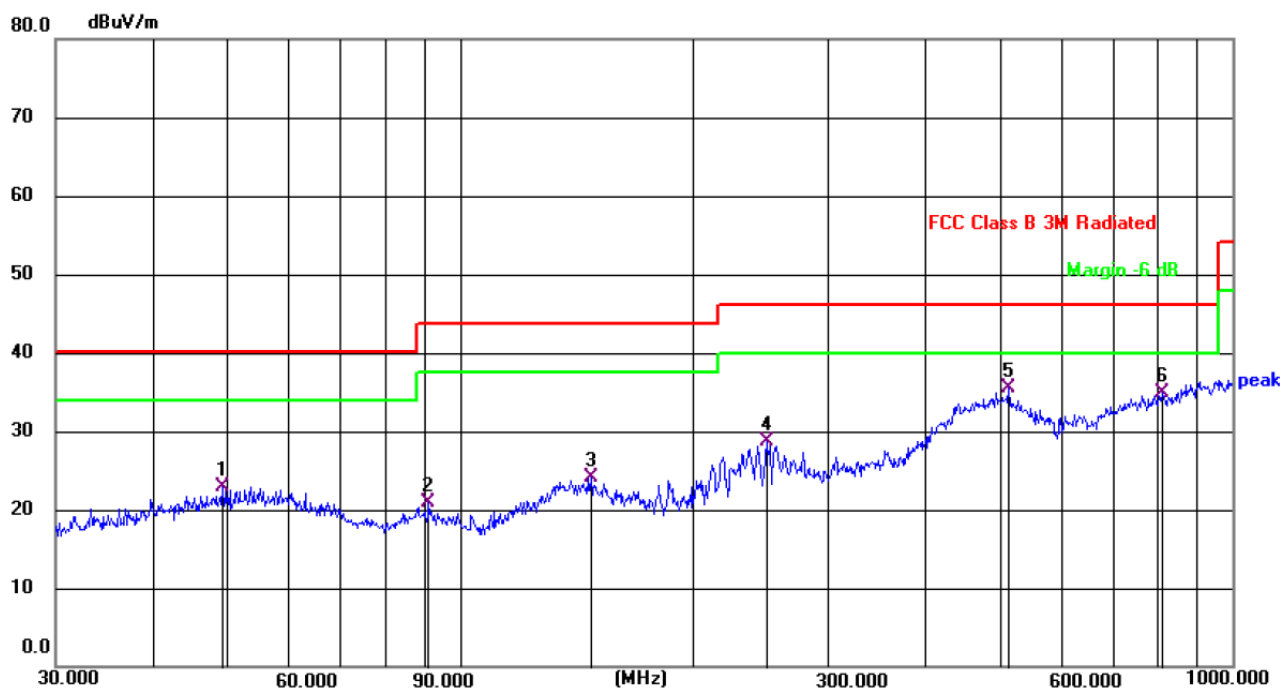
Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;



Temperature:	26°C	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Vertical
Test Voltage :	DC 3.7V		
Test Mode :	Mode 4		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		49.3594	34.38	-11.54	22.84	40.00	17.16	QP
2		91.1744	36.43	-15.58	20.85	43.50	22.65	QP
3		147.9214	40.45	-16.26	24.19	43.50	19.31	QP
4		249.4250	40.42	-11.77	28.65	46.00	17.35	QP
5	*	513.6331	42.05	-6.61	35.44	46.00	10.56	QP
6		810.2653	36.95	-2.09	34.86	46.00	11.14	QP

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

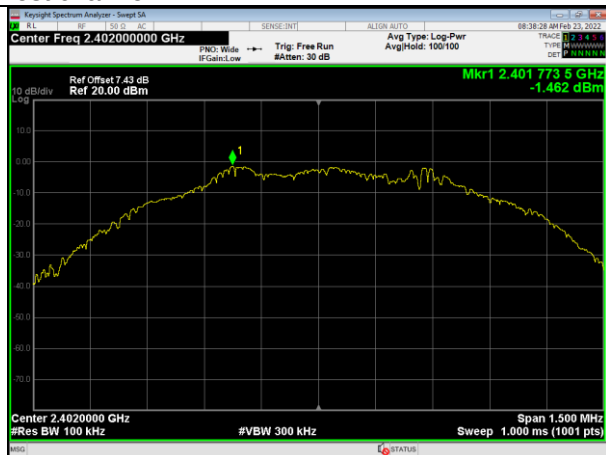
**3.2.8 TEST RESULTS (1GHZ~25GHZ)**

Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2402									
V	4804.00	62.19	51.74	3.08	31.25	44.78	74.00	-29.22	PK
V	4804.00	46.24	51.74	3.08	31.25	28.83	54.00	-25.17	AV
V	7236.00	69.27	49.98	7.16	36.63	63.08	74.00	-10.92	PK
V	7236.00	53.40	49.98	7.16	36.63	47.21	54.00	-6.79	AV
V	16087.00	49.22	51.53	11.34	41.52	50.55	74.00	-23.45	PK
H	4804.00	62.19	51.74	3.08	31.25	44.78	74.00	-29.22	PK
H	4804.00	46.24	51.74	3.08	31.25	28.83	54.00	-25.17	AV
H	7236.00	67.51	49.98	7.16	36.63	61.32	74.00	-12.68	PK
H	7236.00	53.44	49.98	7.16	36.63	47.25	54.00	-6.75	AV
H	16087.00	49.18	51.53	11.34	41.52	50.51	74.00	-23.49	PK
operation frequency:2440									
V	4880.00	61.42	51.77	3.03	31.34	44.02	74.00	-29.98	PK
V	4880.00	45.60	51.77	3.03	31.34	28.20	54.00	-25.80	AV
V	7311.00	69.47	50.02	7.24	36.63	63.32	74.00	-10.68	PK
V	7311.00	53.50	50.02	7.24	36.63	47.35	54.00	-6.65	AV
V	16087.00	48.85	51.53	11.34	41.52	50.18	74.00	-23.82	PK
H	4880.00	61.42	51.77	3.03	31.34	44.02	74.00	-29.98	PK
H	4880.00	45.60	51.77	3.03	31.34	28.20	54.00	-25.80	AV
H	7311.00	69.56	50.02	7.24	36.63	63.41	74.00	-10.59	PK
H	7311.00	53.61	50.02	7.24	36.63	47.46	54.00	-6.54	AV
H	16087.00	48.81	51.53	11.34	41.52	50.14	74.00	-23.86	PK
operation frequency:2480									
V	4960.00	62.18	51.69	3.05	31.39	44.93	74.00	-29.07	PK
V	4960.00	46.22	51.69	3.05	31.39	28.97	54.00	-25.03	AV
V	7386.00	69.26	50.11	7.25	36.58	62.98	74.00	-11.02	PK
V	7386.00	53.39	50.11	7.25	36.58	47.11	54.00	-6.89	AV
V	16087.00	49.2	51.53	11.34	41.52	50.53	74.00	-23.47	PK
H	4960.00	62.18	51.69	3.05	31.39	44.93	74.00	-29.07	PK
H	4960.00	46.22	51.69	3.05	31.39	28.97	54.00	-25.03	AV
H	7386.00	67.49	50.11	7.25	36.58	61.21	74.00	-12.79	PK
H	7386.00	54.42	50.11	7.25	36.58	48.14	54.00	-5.86	AV
H	16087.00	49.16	51.53	11.34	41.52	50.49	74.00	-23.51	PK
Remark:									
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit									
2. If peak below the average limit, the average emission was no test.									
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.									

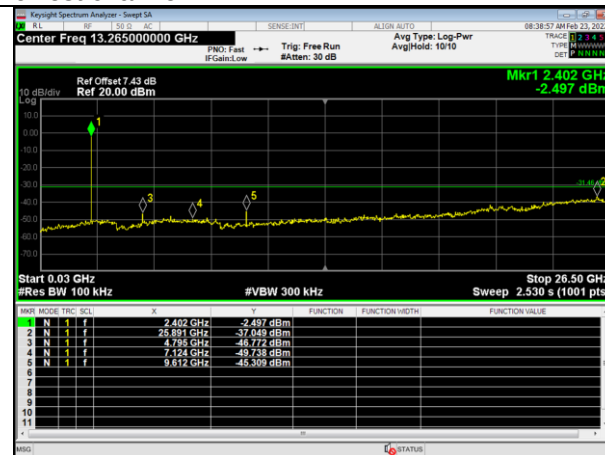


For Conducted

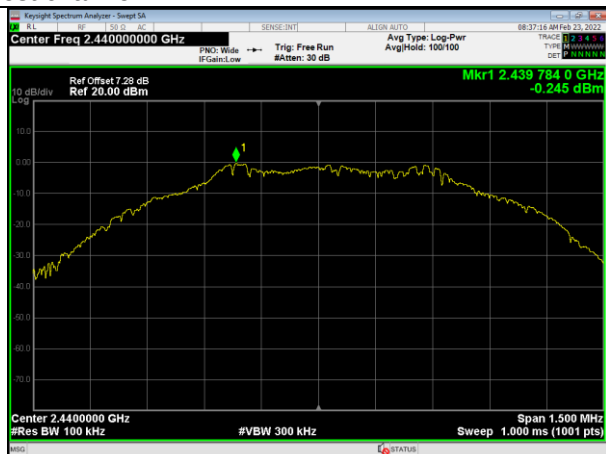
Test channel:



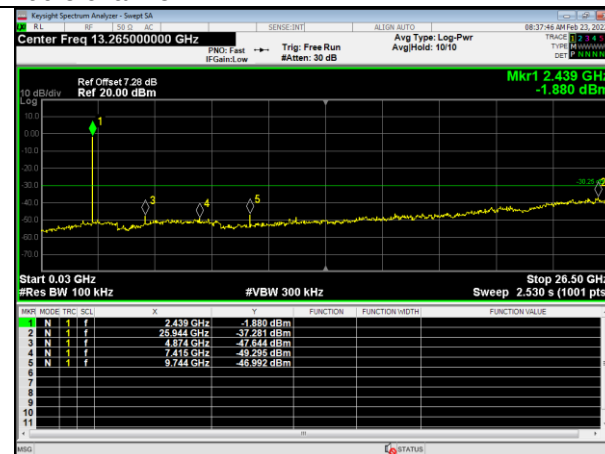
Lowest channel



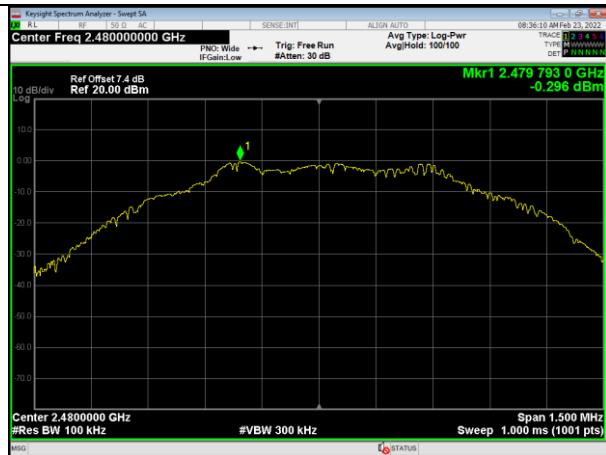
Test channel:



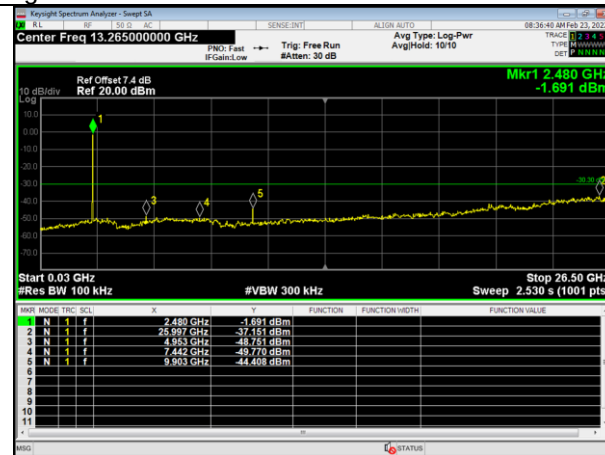
Middle channel



Test channel:



Highest channel





3.3 RADIATED BAND EMISSION MEASUREMENT

3.3.1 TEST REQUIREMENT:

FCC Part15 C Section 15.209 and 15.205

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

3.3.2 TEST PROCEDURE

Above 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- Test the EUT in the lowest channel,the Highest channel

Note:

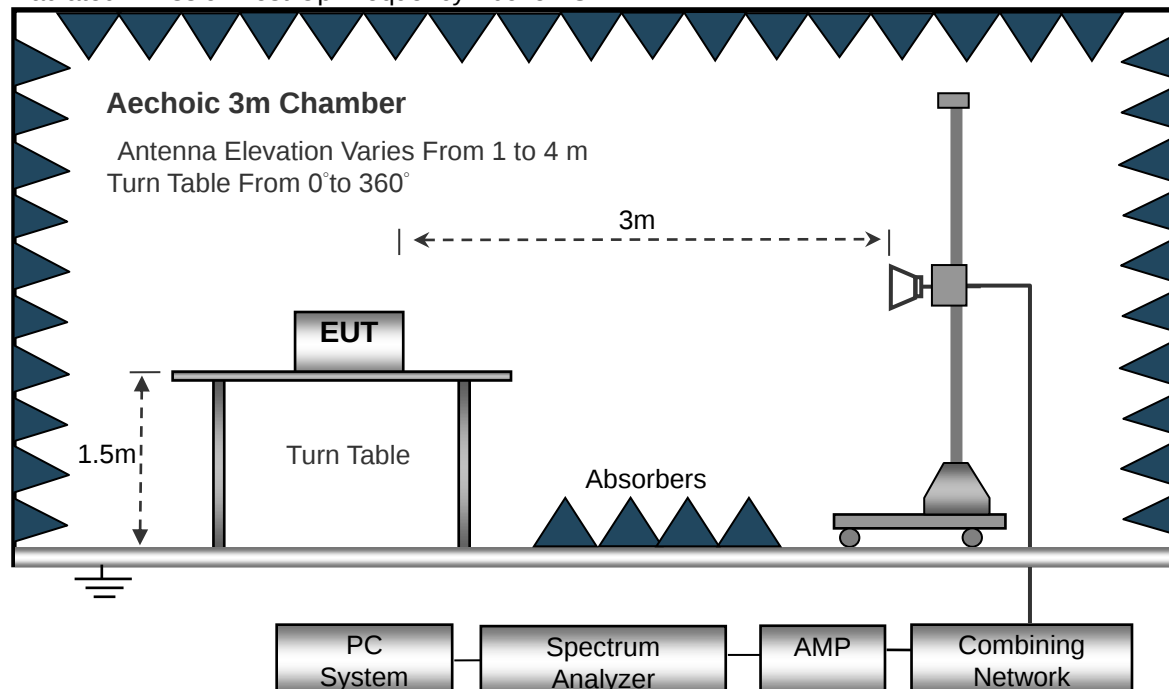
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

3.3.3 DEVIATION FROM TEST STANDARD

No deviation

3.3.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz



3.3.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



3.3.6 TEST RESULT

Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2402									
V	2390.00	76.46	52.12	2.73	27.38	54.45	74.00	-19.55	PK
V	2390.00	65.21	52.12	2.73	27.38	43.20	54.00	-10.80	AV
V	2400.00	76.67	52.16	2.78	27.41	54.70	74.00	-19.30	PK
V	2400.00	64.80	52.16	2.78	27.41	42.83	54.00	-11.17	AV
H	2390.00	76.75	52.12	2.73	27.38	54.74	74.00	-19.26	PK
H	2390.00	65.24	52.12	2.73	27.38	43.23	54.00	-10.77	AV
H	2400.00	76.62	52.16	2.78	27.41	54.65	74.00	-19.35	PK
H	2400.00	65.18	52.16	2.78	27.41	43.21	54.00	-10.79	AV

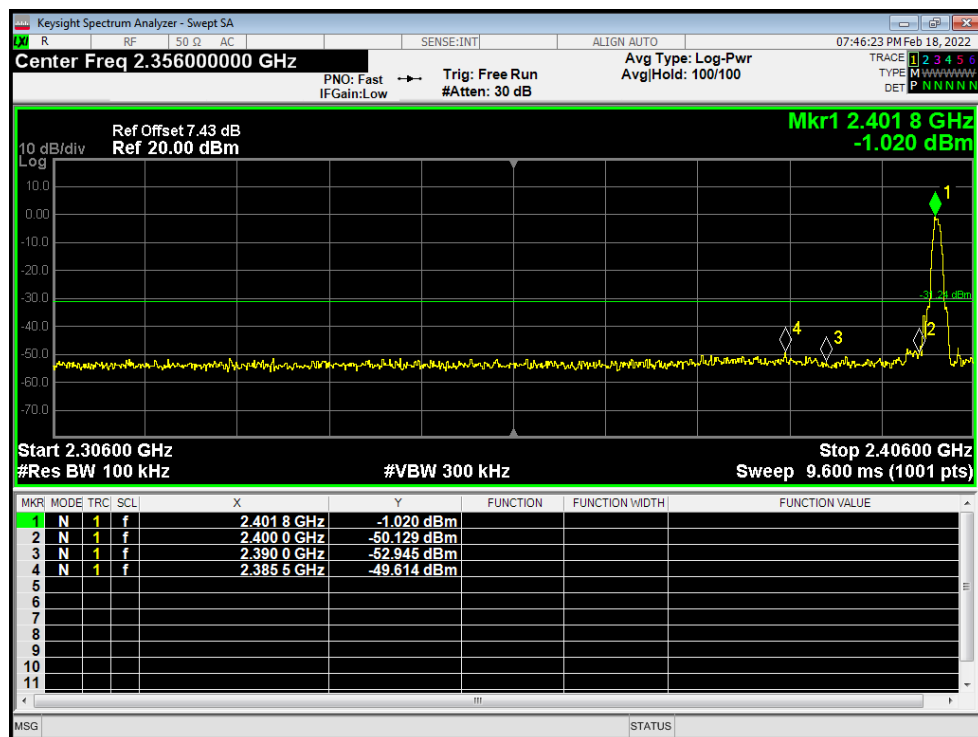
Polar (H/V)	Frequency	Meter Reading	Pre- amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2480									
V	2483.50	76.68	52.23	2.86	27.44	54.75	74.00	-19.25	PK
V	2483.50	65.46	52.23	2.86	27.44	43.53	54.00	-10.47	AV
V	2500.00	76.62	52.26	2.88	27.49	54.73	74.00	-19.27	PK
V	2500.00	64.92	52.26	2.88	27.49	43.03	54.00	-10.97	AV
H	2483.50	76.80	52.23	2.86	27.44	54.87	74.00	-19.13	PK
H	2483.50	65.50	52.23	2.86	27.44	43.57	54.00	-10.43	AV
H	2500.00	76.42	52.26	2.88	27.49	54.53	74.00	-19.47	PK
H	2500.00	65.76	52.26	2.88	27.49	43.87	54.00	-10.13	AV

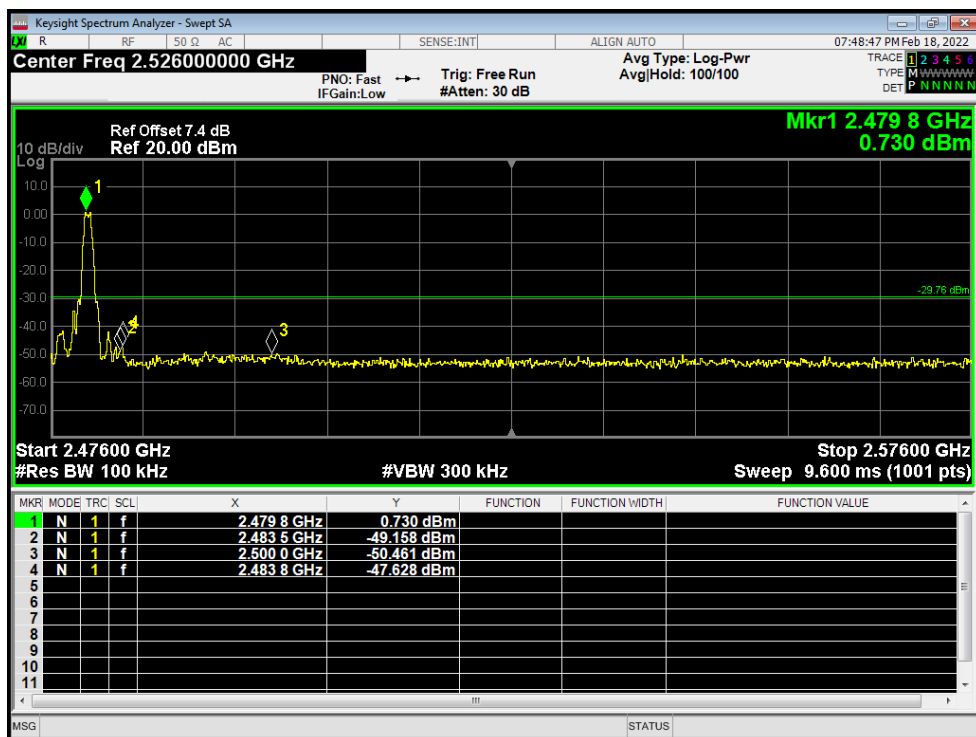
Remark:

1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



For Conducted







4. PEAK OUTPUT POWER

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

4.1.1 TEST PROCEDURE

- a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,
- b. Spectrum Setting : RBW > the 20 dB bandwidth of the emission being measured
Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
VBW $\geq$ RBW
Sweep = auto
Detector function = peak
Trace = max hold

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



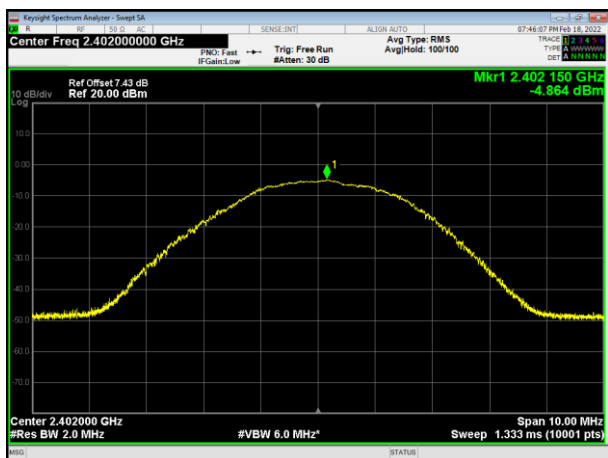
4.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

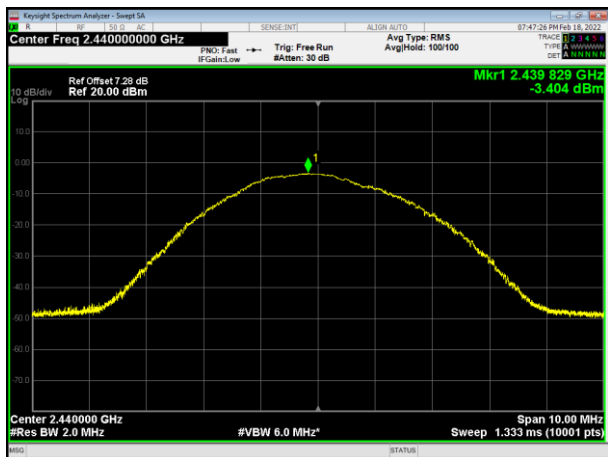
**4.1.5 TEST RESULTS**

Temperature:	25 °C	Relative Humidity:	60%
Pressure:	1012 hPa		

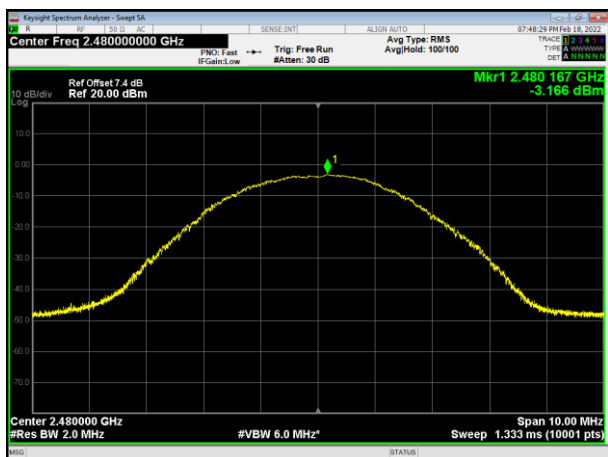
Test Channel	Peak Output Power (dBm)	LIMIT (dBm)
Low	-4.864	20.00
Moddle	-3.404	20.00
High	-3.166	20.00



2402MHz



2440MHz



2480MHz



5. POWER SPECTRAL DENSITY TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	= the frequency band of operation
RB	$RBW \geq 3kHz$
VB	$VBW \geq 3RBW$
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.1.1 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP

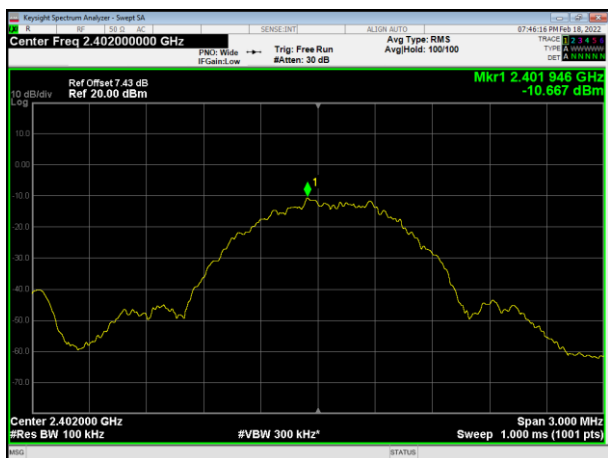


5.1.4 EUT OPERATION CONDITIONS

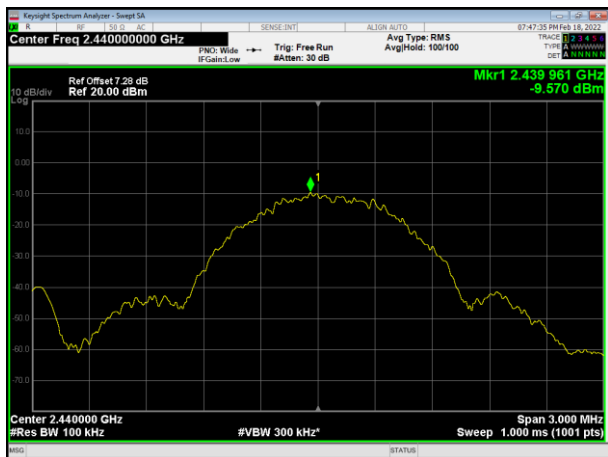
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 TEST RESULTS

Test Channel	Result(dBm) 3kHz	Limit(dBm)	Result
Low	-10.667	8	PASS
Moddle	-9.570	8	PASS
High	-8.739	8	PASS



2402MHz



2440MHz



2480MHz



6. 6DB BANDWIDTH TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range(MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

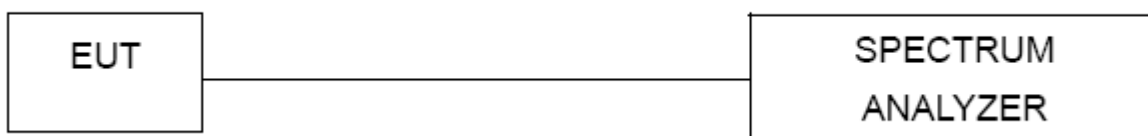
6.1.1 TEST PROCEDURE

1. Set RBW = 30 kHz.
2. Set the video bandwidth (VBW) $\geq$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. 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.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP

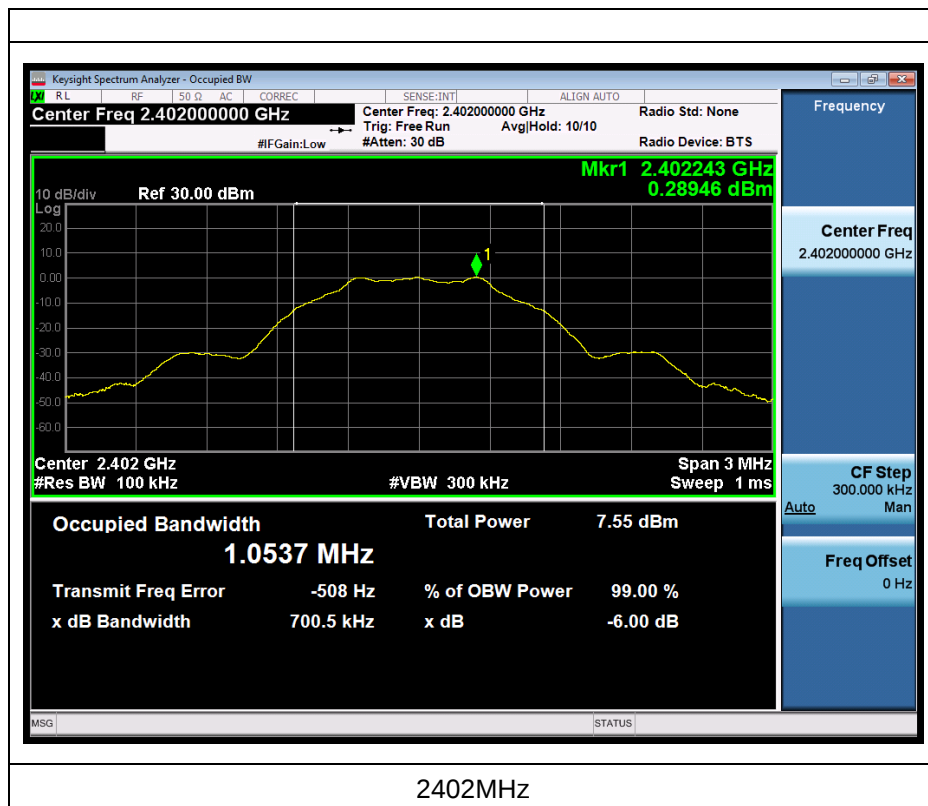


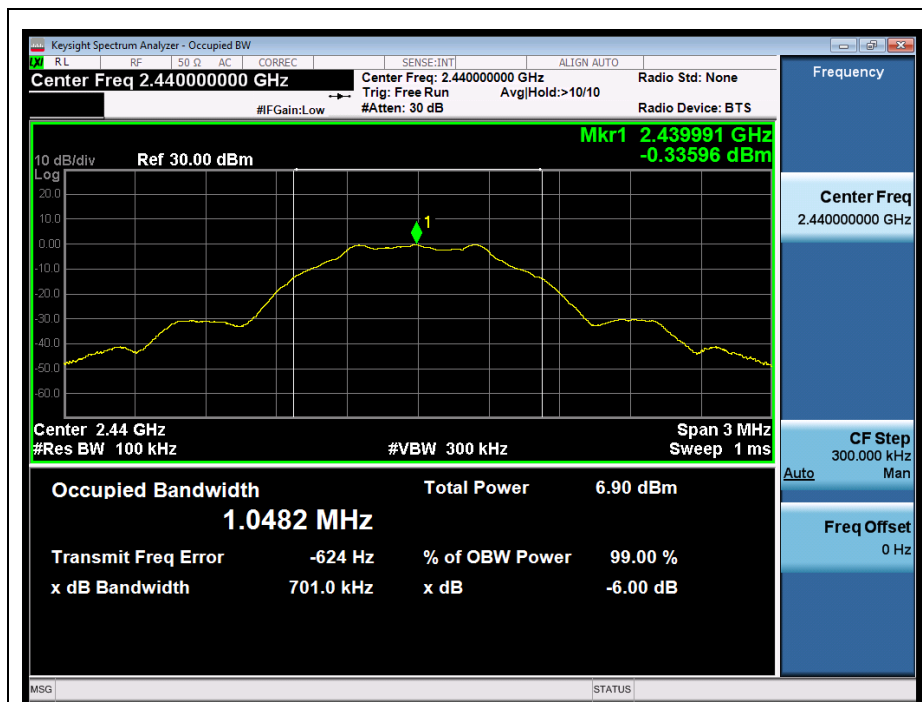
6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

6.1.5 TEST RESULTS

Test Channel	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low	0.701	0.5	Pass
Middle	0.701	0.5	Pass
High	0.708	0.5	Pass





2440MHz



2480MHz



7. ANTENNA REQUIREMENT

7.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 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.

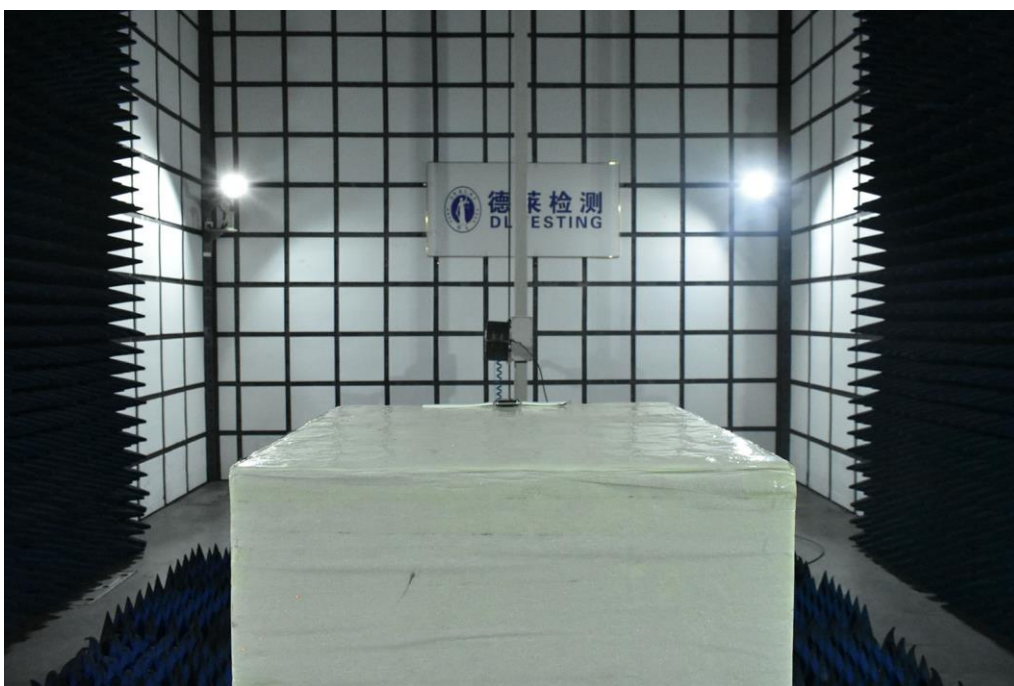
7.2 EUT ANTENNA

The EUT antenna is internal antenna,. It comply with the standard requirement.



8. TEST SETUP PHOTO

Radiated Measurement Photos

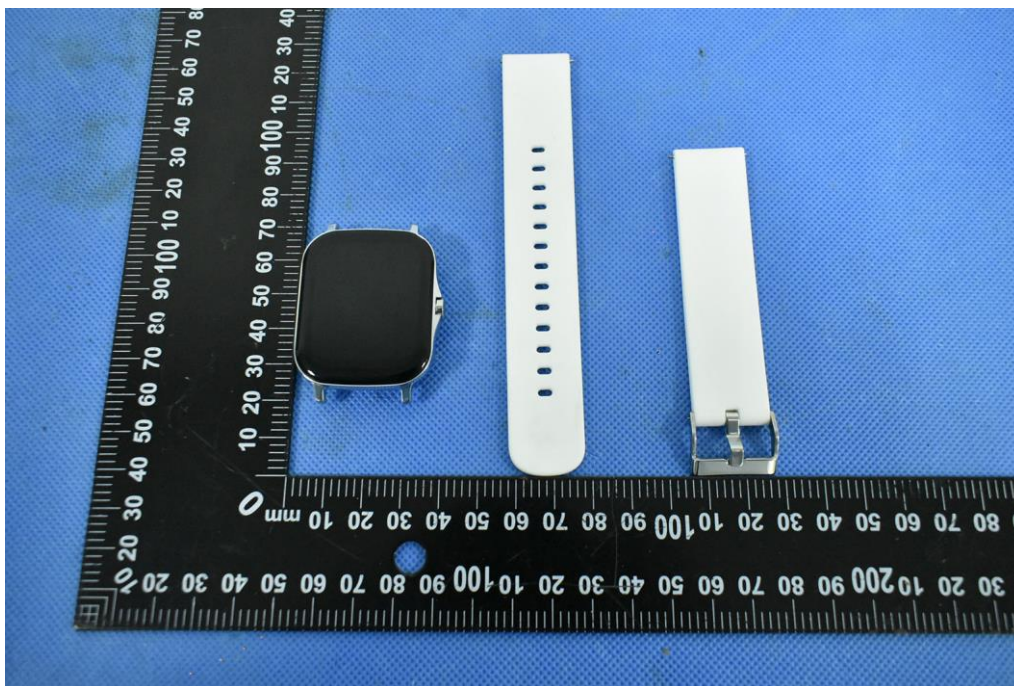


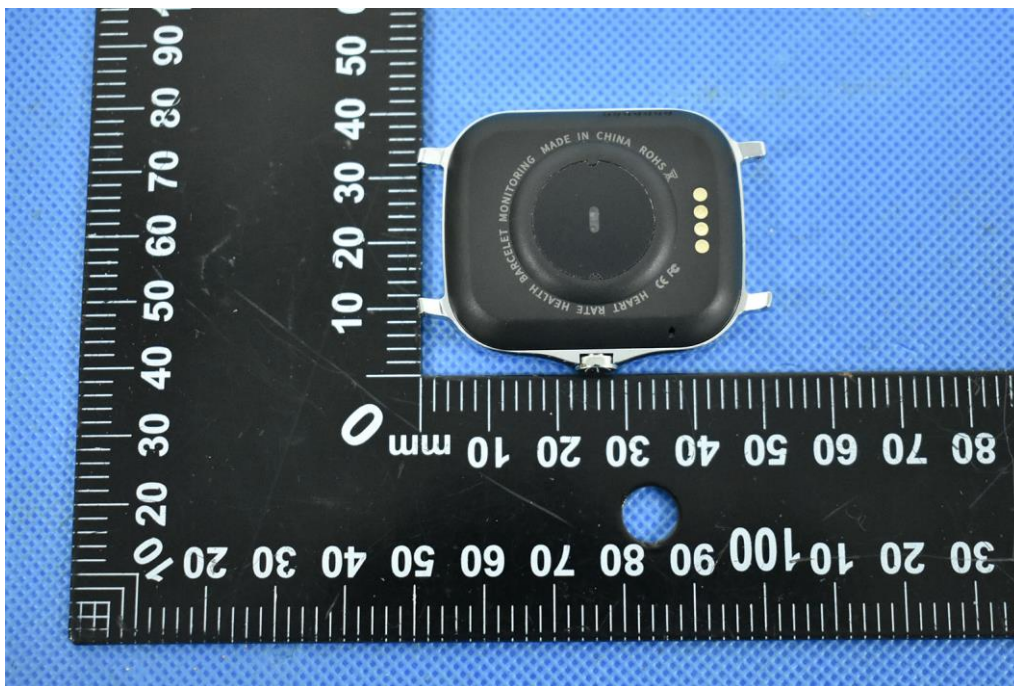
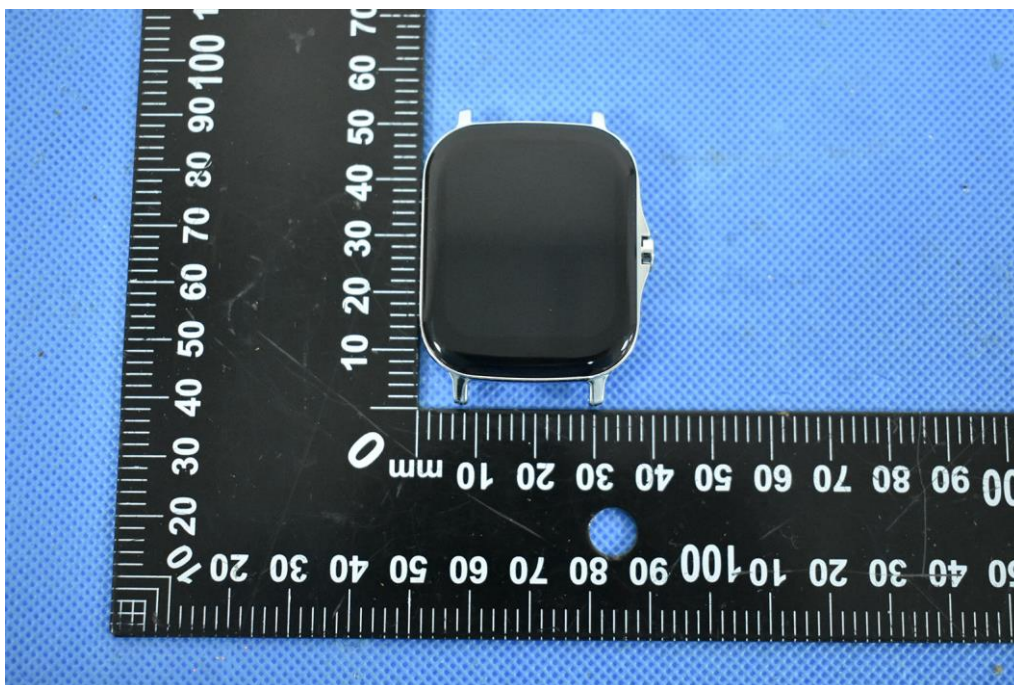


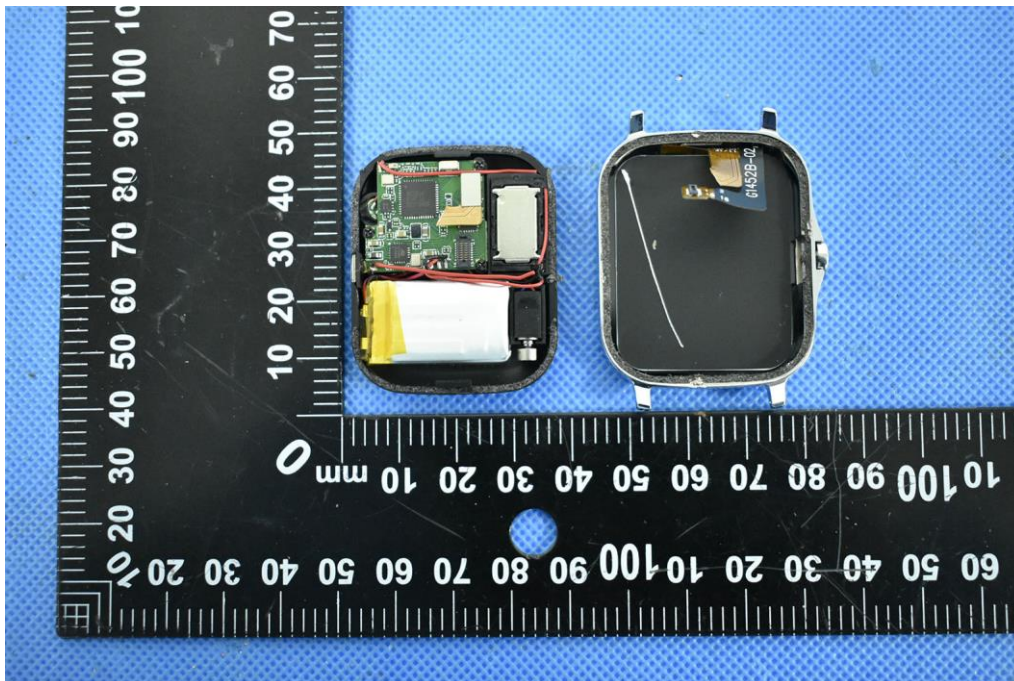
Conducted Measurement Photos



9. EUT PHOTO







***** END OF REPORT *****