FCC TEST REPORT
FCC ID:2BC5B-XX-T21

Report Number.....:	ZKT-2407097884E
Date of Test.....	Jul. 09, 2024 to Aug. 06, 2024
Date of issue.....:	Aug. 06, 2024
Total number of pages.....	41
Test Result .....:	PASS
Testing Laboratory.....:	**Shenzhen ZKT Technology Co., Ltd.**
Address .....:	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Applicant's name .....:	**Shenzhen Xinwang Pet Products Co., Ltd.**
Address .....:	298 No.168 Hengping Highway Bao'an Comm, Yuanshan St, Longgang Dist · Shenzhen Guangdong China, 518115
Manufacturer's name .....:	**Shenzhen Xinwang Pet Products Co., Ltd.**
Address .....:	298 No.168 Hengping Highway Bao'an Comm, Yuanshan St, Longgang Dist · Shenzhen Guangdong China, 518115
Test specification:	
Standard.....:	FCC CFR Title 47 Part 15 Subpart C Section 15.247 ANSI C63.10:2013
Test procedure.....:	/
Non-standard test method .....:	N/A
Test Report Form No.....:	TRF-EL-111_V0
Test Report Form(s) Originator.....:	ZKT Testing
Master TRF .....:	Dated: 2020-01-06

This device described above has been tested by ZKT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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Product name.....:	**Dog trainer (Wireless electronic fence)**
Trademark .....:	N/A
Model/Type reference.....:	XX-T21 XW-T22
Ratings.....:	Input: 5V⎓1A Battery: 3.7V, 1200mAh, 4.44Wh

Testing procedure and testing location:

Testing Laboratory.....:	**Shenzhen ZKT Technology Co., Ltd.**
Address.....:	1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China
Tested by (name + signature).....:	Jim Liu
Reviewer (name + signature).....:	Jackson Fang
Approved (name + signature).....:	Lake Xie

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1.VERSION

Report No.	Version	Description	Approved
ZKT-2407097884E	Rev.01	Initial issue of report	Aug. 06, 2024

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
FCC part 15.203/15.247 (c)	Antenna requirement	PASS	
FCC part 15.207	AC Power Line Conducted Emission	PASS	
FCC part 15.247 (b)(3)	Conducted Peak Output Power	PASS	
FCC part 15.247 (a)(2)	-6dB OCB	PASS	
FCC part 15.247 (e)	Power Spectral Density	PASS	
FCC part 15.247(d)	Band Edge	PASS	
FCC part 15.205/15.209	Spurious Emission	PASS	

NOTE:

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

2.1 TEST FACILITY

Shenzhen ZKT Technology Co., Ltd.
Add. : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 692225
Designation Number: CN1299
IC Registered No.: 27033

2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ± 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	3m camber Radiated spurious emission(9KHz-30MHz)	U=4.5dB
2	3m camber Radiated spurious emission(30MHz-1GHz)	U=4.8dB
3	3m chamber Radiated spurious emission(1GHz-6GHz)	U=4.9dB
4	3m chamber Radiated spurious emission(6GHz-40GHz)	U=5.0dB
5	Conducted disturbance	U=3.2dB
6	RF Band Edge	U=1.68dB
7	RF power conducted	U=1.86dB
8	RF conducted Spurious Emission	U=2.2dB
9	RF Occupied Bandwidth	U=1.8dB
10	RF Power Spectral Density	U=1.75dB
11	humidity uncertainty	U=5.3%
12	Temperature uncertainty	U=0.59℃

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Product Name:	Dog trainer (Wireless electronic fence)
Model No.:	XX-T21
Model Different.:	All the model are the same circuit and RF module, only the appearance color is different
Serial No.:	XW-T22
Hardware Version:	H1.0
Software Version:	S1.0
Sample(s) Status:	Engineer sample
Operation Frequency:	2410MHz-2480MHz
Modulation Type:	FSK
Antenna Type:	Cable Antenna
Antenna gain:	2dBi
Power supply:	Input: 5V⎓1A
Adapter:	N/A
Battery:	3.7V, 1200mAh, 4.44Wh

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

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2410MHz
The middle channel	2445MHz
The Highest channel	2480MHz

3.2 DESCRIPTION OF TEST MODES

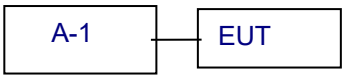
Transmitting mode	Keep the EUT in continuously transmitting mode
Charging mode	Keep the EUT in Charging mode.
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

Test Software	RF Test Tool
Power level setup	<0dBm

3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Emission

Conducted Spurious



3.4 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	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Dog trainer (Wireless electronic fence）	N/A	XX-T21	XW-T22	EUT
A-1	Adapter	N/A	GAT-0501000U	N/A	Auxiliary

Item	Shielded Type	Ferrite Core	Length	Note

Note:

(1) The support equipment was authorized by Declaration of Confirmation.

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

3.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Conducted emissions Test

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	LISN	R&S	ENV216	101471	N/A	Nov. 14, 2023	Nov. 13, 2024
2	LISN	CYBERTEK	EM5040A	E1850400149	N/A	Nov. 02, 2023	Nov. 01, 2024
3	Test Cable	N/A	C-01	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
4	Test Cable	N/A	C-02	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
5	Test Cable	N/A	C-03	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
6	EMI Test Receiver	R&S	ESCI3	101393	4.42 SP3	Nov. 02, 2023	Nov. 01, 2024
7	Triple-Loop Antenna	N/A	RF300	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
8	Absorbing Clamp	DZ	ZN23201	15034	N/A	Nov. 07, 2023	Nov. 06, 2024
9	EMC Software	Frad	EZ-EMC	Ver.EMC-CON 3A1.1	N/A	\	\

Radiation emissions & Radio Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	9020A	MY55370835	A.17.05	Nov. 02, 2023	Nov. 01, 2024
2	Spectrum Analyzer (10kHz-39.9GHz)	R&S	FSV40-N	100363	1.71 SP2	Nov. 02, 2023	Nov. 01, 2024
3	EMI Test Receiver (9kHz-7GHz)	R&S	ESCI7	100969	4.32	Nov. 02, 2023	Nov. 01, 2024
4	Bilog Antenna (30MHz-1500MHz)	Schwarzbeck	VULB9168	N/A	N/A	Nov. 13, 2023	Nov. 12, 2024
5	Horn Antenna (1GHz-18GHz)	Agilent	AH-118	071145	N/A	Nov. 13, 2023	Nov. 12, 2024
6	Horn Antenna (15GHz-40GHz)	A.H.System	SAS-574	588	N/A	Nov. 13, 2023	Nov. 12, 2024
7	Loop Antenna	TESEQ	HLA6121	58357	N/A	Nov. 16, 2023	Nov. 15, 2024
8	Amplifier (30-1000MHz)	EM Electronics	EM330 Amplifier	60747	N/A	Nov. 02, 2023	Nov. 01, 2024
9	Amplifier (1GHz-26.5GHz)	HuiPu	8449B	3008A00315	N/A	Nov. 02, 2023	Nov. 01, 2024
10	Amplifier (500MHz-40GHz)	QuanJuDa	DLE-161	097	N/A	Nov. 02, 2023	Nov. 01, 2024
11	Test Cable	N/A	R-01	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
12	Test Cable	N/A	R-02	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
13	Test Cable	N/A	R-03	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
14	Test Cable	N/A	RF-01	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
15	Test Cable	N/A	RF-02	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
16	Test Cable	N/A	RF-03	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024

17	ESG Signal Generator	Agilent	E4421B	N/A	B.03.84	Nov. 02, 2023	Nov. 01, 2024
18	Signal Generator	Agilent	N5182A	N/A	A.01.87	Nov. 02, 2023	Nov. 01, 2024
19	Magnetic Field Probe Tester	Narda	ELT-400	0-0344	N/A	Nov. 16, 2023	Nov. 15, 2024
20	Wideband Radio Communication Test	R&S	CMW500	106504	V 3.7.22	Nov. 02, 2023	Nov. 01, 2024
21	MWRF Power Meter Test system	MW	MW100-RF CB	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
22	D.C. Power Supply	LongWei	TPR-6405D	N/A	N/A	\	\
23	EMC Software	Frad	EZ-EMC	Ver.EMC-CO N 3A1.1	N/A	\	\
24	RF Software	MW	MTS8310	V2.0.0.0	N/A	\	\
25	Turntable	MF	MF-7802BS	N/A	N/A	\	\
26	Antenna tower	MF	MF-7802BS	N/A	N/A	\	\

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto

4.1.1 POWER LINE CONDUCTED EMISSION Limits

FREQUENCY (MHz)	Limit (dBuV)		Standard
	Quas-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) *Decreases with the logarithm of the frequency.

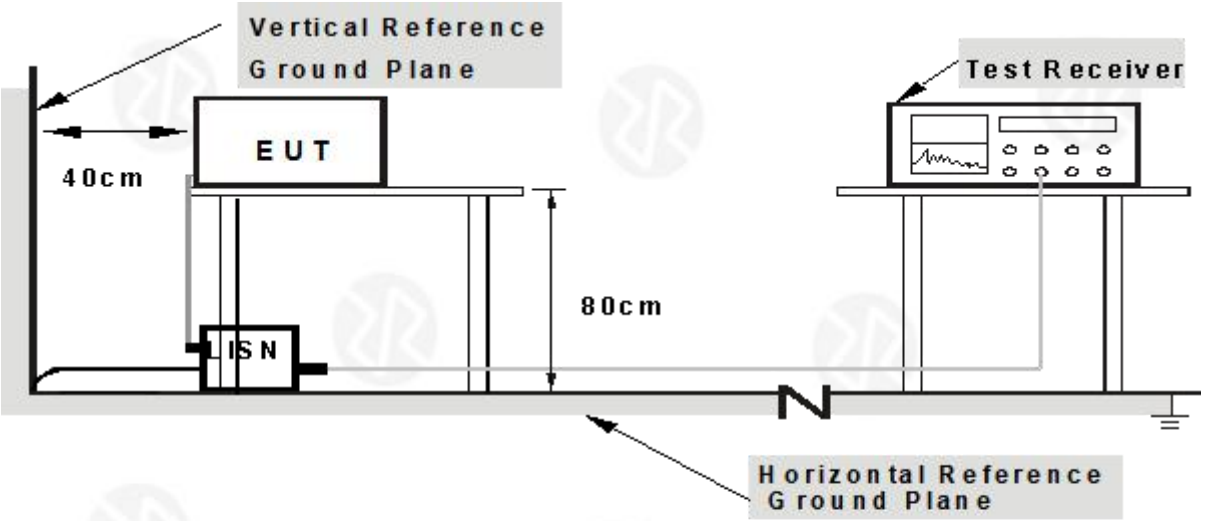
4.1.2 TEST PROCEDURE

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.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 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 from other units and other metal planes

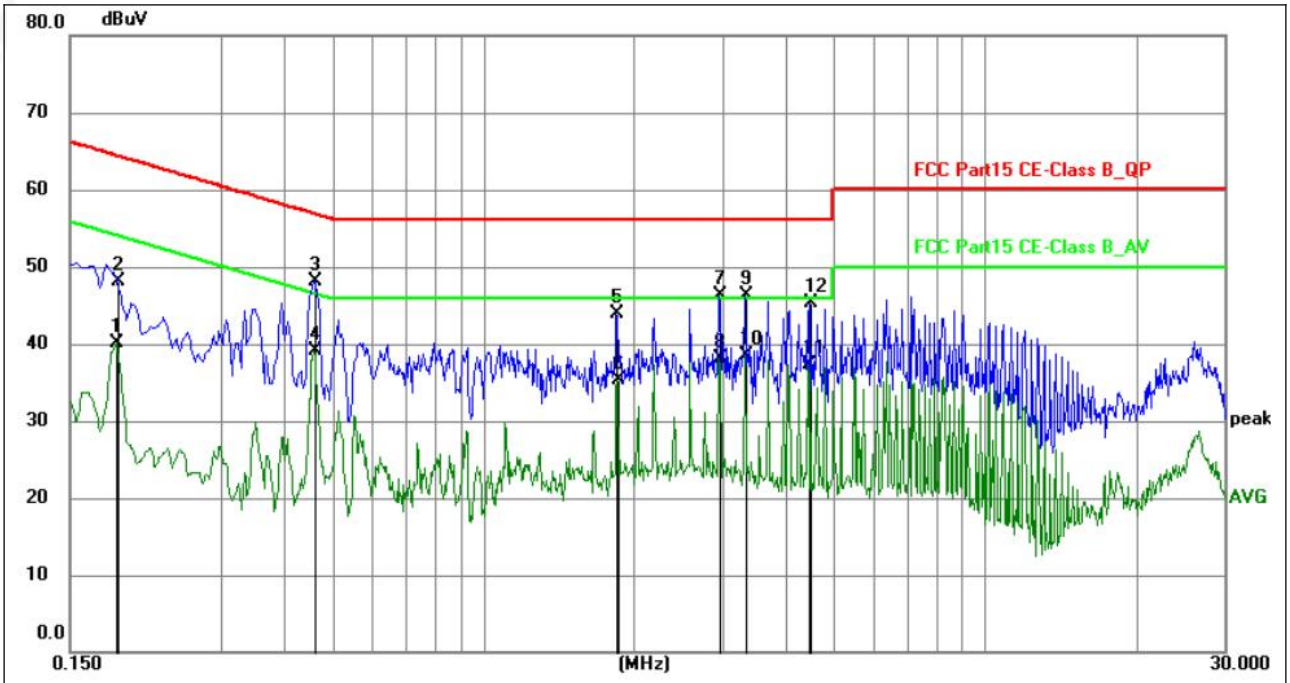
4.1.5 EUT OPERATING CONDITIONS

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

We pretest AC 120V and AC 230V, the worst voltage was AC 120V and the data recording in the report.

4.1.6 Test Result

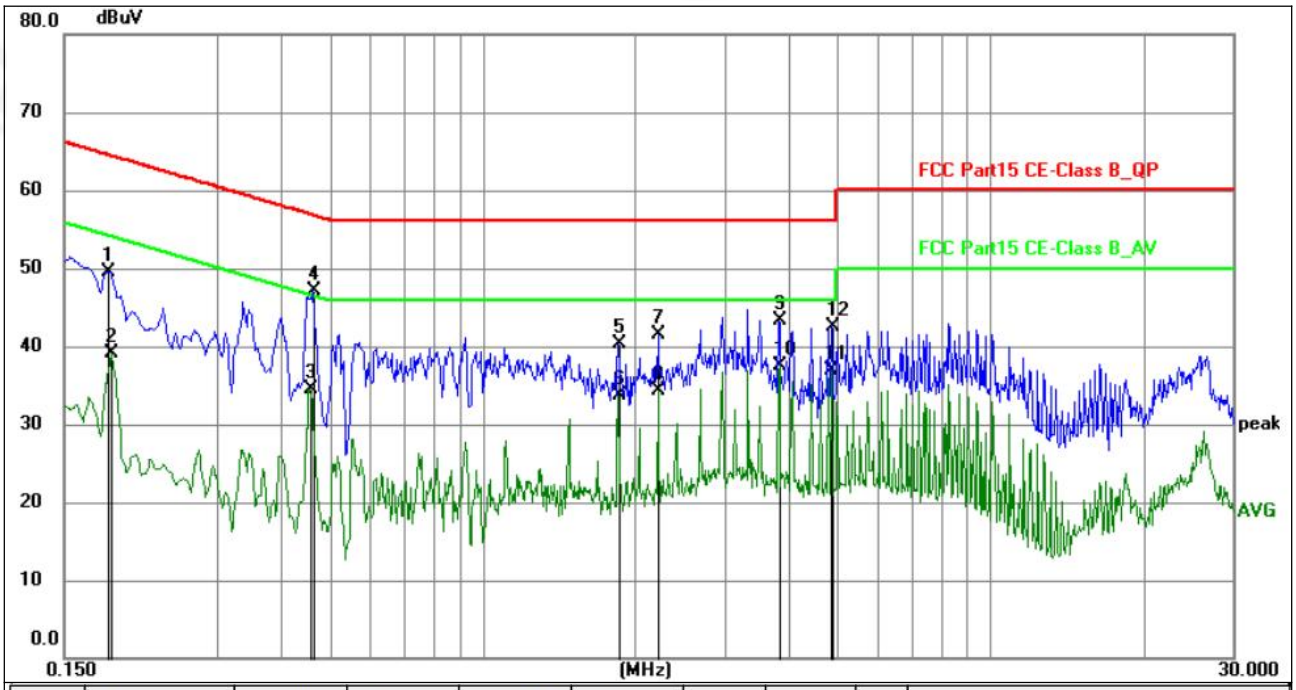
Temperature :	26℃	Relative Humidity :	54%
Pressure :	101kPa	Phase :	L
Test Voltage :	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1860	27.82	12.23	40.05	54.21	-14.16	AVG	P	
2	0.1864	35.84	12.22	48.06	64.20	-16.14	QP	P	
3	0.4605	37.46	10.72	48.18	56.68	-8.50	QP	P	
4	0.4605	28.44	10.72	39.16	46.68	-7.52	AVG	P	
5	1.8465	33.59	10.23	43.82	56.00	-12.18	QP	P	
6	1.8510	25.02	10.23	35.25	46.00	-10.75	AVG	P	
7	2.9580	36.43	9.95	46.38	56.00	-9.62	QP	P	
8	2.9580	28.15	9.95	38.10	46.00	-7.90	AVG	P	
9	3.3315	36.54	9.72	46.26	56.00	-9.74	QP	P	
10	3.3315	28.87	9.72	38.59	46.00	-7.41	AVG	P	
11	4.4385	28.21	9.01	37.22	46.00	-8.78	AVG	P	
12	4.4880	36.33	8.98	45.31	56.00	-10.69	QP	P	

Notes:
1.An initial pre-scan was performed on the line and neutral lines with peak detector.
2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3.Mesurement Level = Reading level + Correct Factor
4.The test data shows only the worst case FSK 2480MHz mode

Temperature :	26℃	Relative Humidity :	54%
Pressure :	101kPa	Phase :	N
Test Voltage :	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1825	37.24	12.30	49.54	64.37	-14.83	QP	P	
2	0.1860	26.95	12.23	39.18	54.21	-15.03	AVG	P	
3	0.4564	23.72	10.74	34.46	46.76	-12.30	AVG	P	
4	0.4650	36.34	10.70	47.04	56.60	-9.56	QP	P	
5	1.8510	30.00	10.23	40.23	56.00	-15.77	QP	P	
6	1.8510	23.55	10.23	33.78	46.00	-12.22	AVG	P	
7	2.2244	31.32	10.13	41.45	56.00	-14.55	QP	P	
8	2.2244	24.21	10.13	34.34	46.00	-11.66	AVG	P	
9	3.8355	33.97	9.40	43.37	56.00	-12.63	QP	P	
10	3.8400	28.11	9.39	37.50	46.00	-8.50	AVG	P	
11	4.8705	28.12	8.73	36.85	46.00	-9.15	AVG	P	
12	4.8750	33.87	8.73	42.60	56.00	-13.40	QP	P	

s

Notes:
1.An initial pre-scan was performed on the line and neutral lines with peak detector.
2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3.Mesurement Level = Reading level + Correct Factor
4.The test data shows only the worst case FSK 2480MHz mode

4.2 RADIATED EMISSION MEASUREMENT

Test Requirement:	FCC Part15 C Section 15.209
Test Method:	ANSI C63.10:2013
Test Frequency Range:	9kHz to 25GHz
Test site:	Measurement Distance: 3m
Receiver setup:	

Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

4.2.1 RADIATED EMISSION LIMITS

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

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).

4.2.2 TEST PROCEDURE

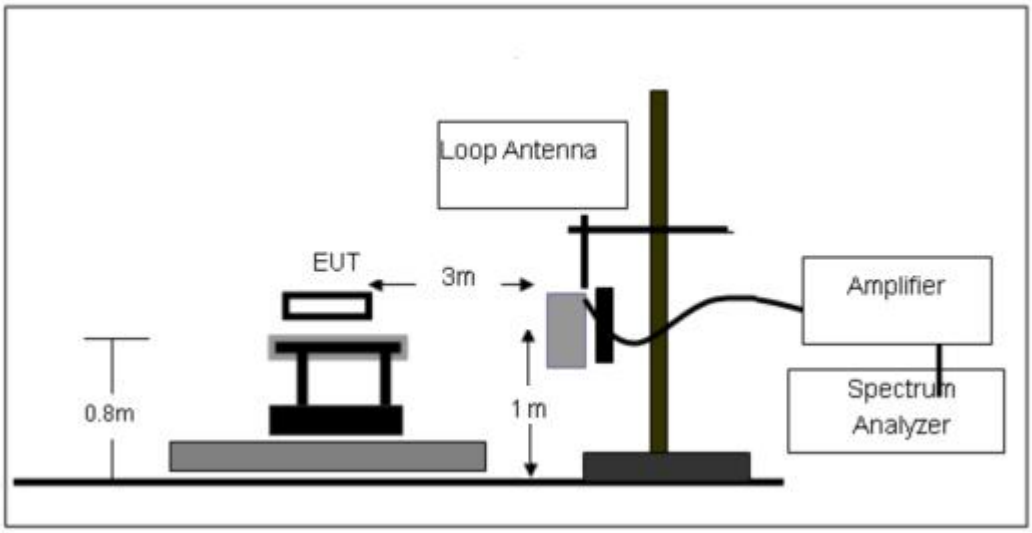
a. The measuring distance of at 3 m shall be used for measurements at frequency up to 25GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-chamber test. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8m; above 1GHz, the height was 1.5m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.
g. For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
Note:
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

4.2.3 DEVIATION FROM TEST STANDARD

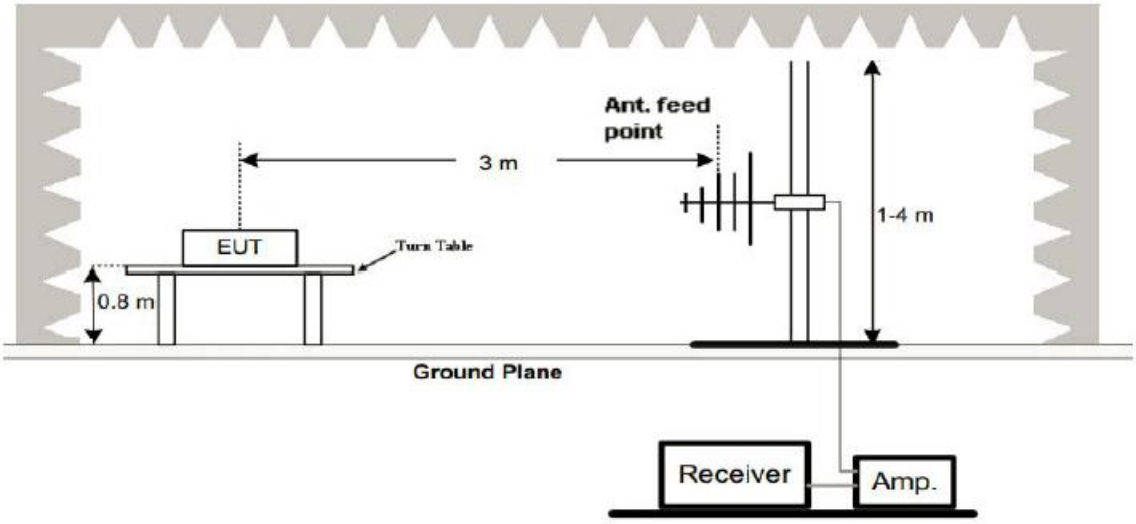
No deviation

4.2.4 TEST SETUP

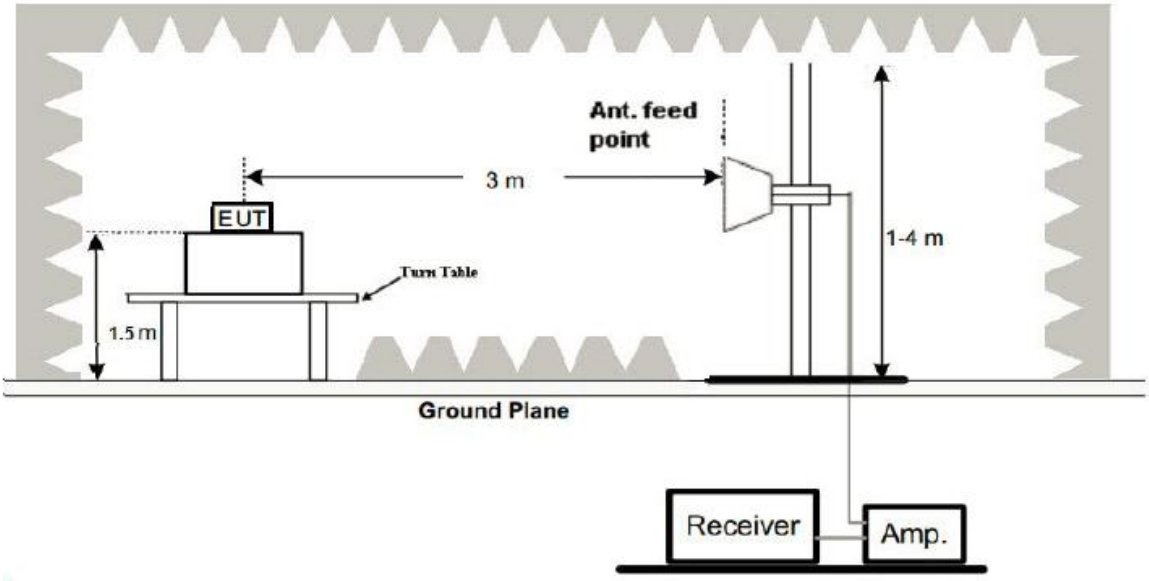
（A）Radiated Emission Test-Up Frequency Below 30MHz



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



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



4.2.5 EUT OPERATING CONDITIONS

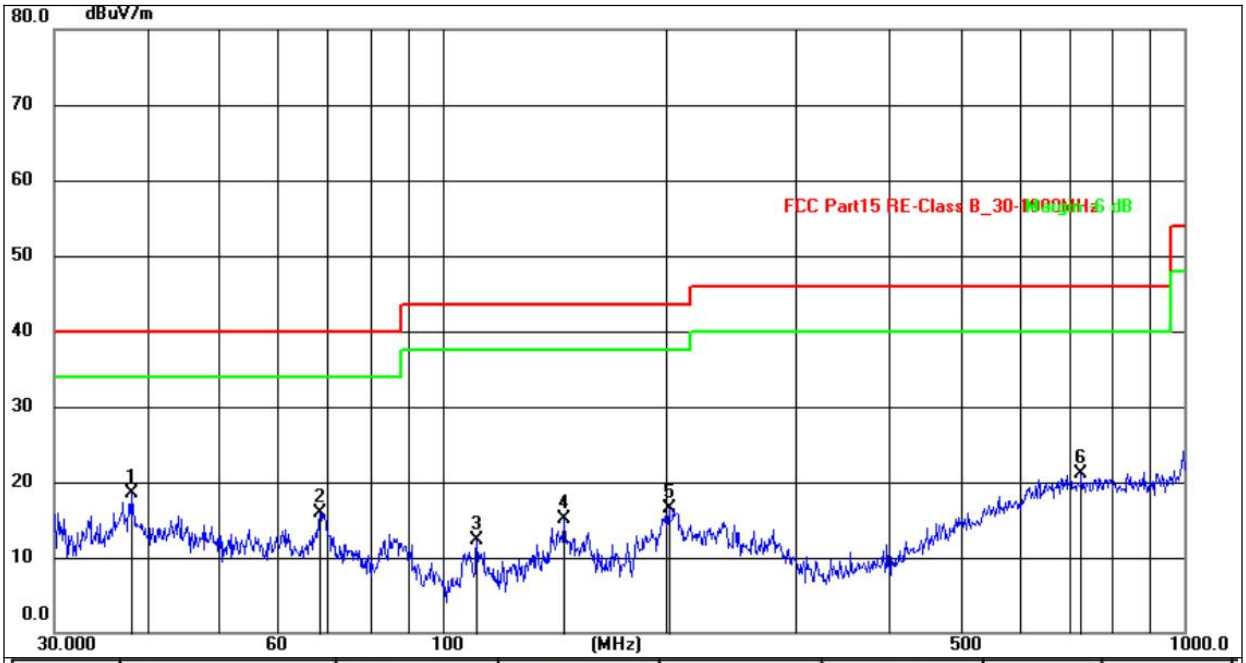
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.2.6 TEST RESULTS (Between 9KHz – 30 MHz)

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

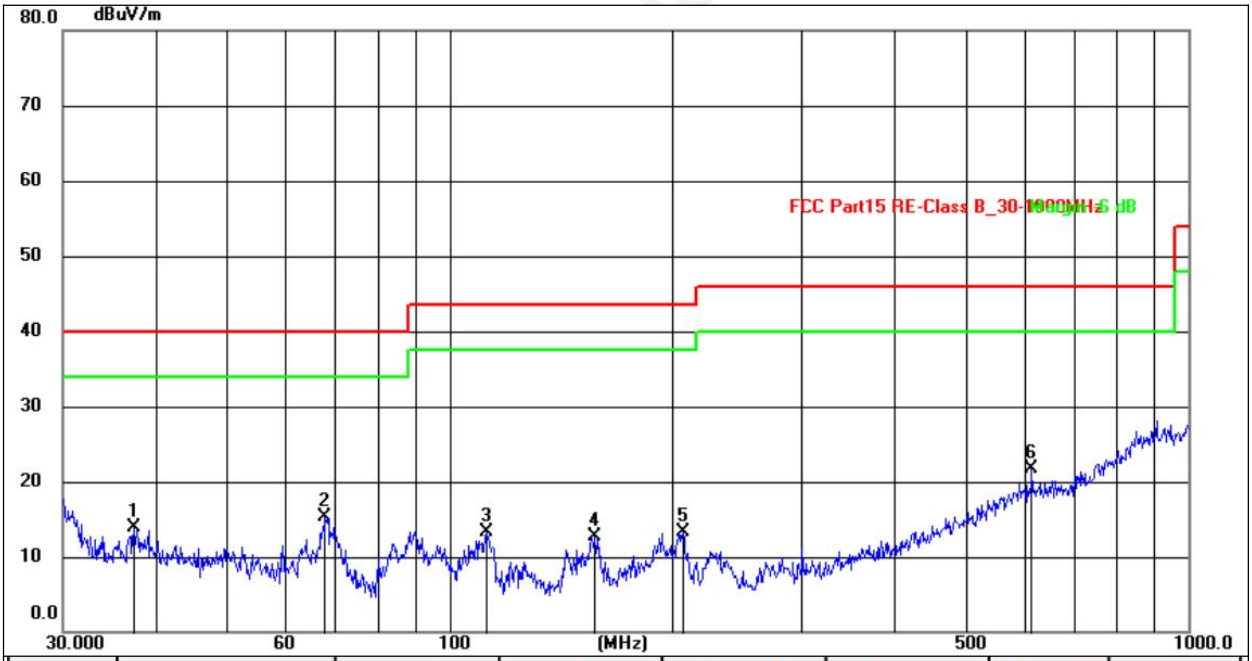
Between 30MHz – 1GHz

Temperature:	26℃	Relative Humidity:	54%
Pressure:	101 kPa	Polarization:	Horizontal
Test Voltage:	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	38.0782	32.93	-14.48	18.45	40.00	-21.55	QP
2	68.3908	32.45	-16.46	15.99	40.00	-24.01	QP
3	111.3468	31.52	-19.12	12.40	43.50	-31.10	QP
4	145.8611	31.87	-16.71	15.16	43.50	-28.34	QP
5	202.1004	35.22	-18.70	16.52	43.50	-26.98	QP
6	726.8052	27.96	-6.77	21.19	46.00	-24.81	QP

Temperature:	26℃	Relative Humidity:	54%
Pressure:	101kPa	Polarization:	Vertical
Test Voltage:	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	37.4164	31.17	-17.25	13.92	40.00	-26.08	QP
2	67.9128	34.52	-19.13	15.39	40.00	-24.61	QP
3	112.1304	34.63	-21.32	13.31	43.50	-30.19	QP
4	157.5588	33.03	-20.28	12.75	43.50	-30.75	QP
5	207.1225	33.86	-20.59	13.27	43.50	-30.23	QP
6	614.2142	29.52	-7.75	21.77	46.00	-24.23	QP

Remarks:
1.Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2.The emission levels of other frequencies are very lower than the limit and not show in test report.
3.The test data shows only the worst case FSK 2480MHz mode

1GHz~25GHz

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel:2410MHz									
V	4820.00	52.37	30.55	5.77	24.66	52.25	74.00	-21.75	Pk
V	4820.00	43.33	30.55	5.77	24.66	43.21	54.00	-10.79	AV
V	7230.00	52.94	30.33	6.32	24.55	53.48	74.00	-20.52	Pk
V	7230.00	43.52	30.33	6.32	24.55	44.06	54.00	-9.94	AV
V	9640.00	52.83	30.85	7.45	24.69	54.12	74.00	-19.88	Pk
V	9640.00	43.45	30.85	7.45	24.69	44.74	54.00	-9.26	AV
V	12050.00	52.39	31.02	8.99	25.57	55.93	74.00	-18.07	Pk
V	12050.00	43.56	31.02	8.99	25.57	47.10	54.00	-6.90	AV
H	4820.00	52.82	30.55	5.77	24.66	52.70	74.00	-21.30	Pk
H	4820.00	43.30	30.55	5.77	24.66	43.18	54.00	-10.82	AV
H	7230.00	52.68	30.33	6.32	24.55	53.22	74.00	-20.78	Pk
H	7230.00	43.99	30.33	6.32	24.55	44.53	54.00	-9.47	AV
H	9640.00	50.37	30.85	7.45	24.69	51.66	74.00	-22.34	Pk
H	9640.00	43.54	30.85	7.45	24.69	44.83	54.00	-9.17	AV
H	12050.00	53.86	31.02	8.99	25.57	57.40	74.00	-16.60	Pk
H	12050.00	43.35	31.02	8.99	25.57	46.89	54.00	-7.11	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Middle Channel:2445MHz									
V	4890.00	50.88	30.55	5.77	24.66	50.76	74.00	-23.24	Pk
V	4890.00	43.91	30.55	5.77	24.66	43.79	54.00	-10.21	AV
V	7335.00	53.30	30.33	6.32	24.55	53.84	74.00	-20.16	Pk
V	7335.00	43.00	30.33	6.32	24.55	43.54	54.00	-10.46	AV
V	9780.00	51.06	30.85	7.45	24.69	52.35	74.00	-21.65	Pk
V	9780.00	43.61	30.85	7.45	24.69	44.90	54.00	-9.10	AV
V	12225.00	52.70	31.02	8.99	25.57	56.24	74.00	-17.76	Pk
V	12225.00	43.33	31.02	8.99	25.57	46.87	54.00	-7.13	AV
H	4890.00	50.77	30.55	5.77	24.66	50.65	74.00	-23.35	Pk
H	4890.00	43.90	30.55	5.77	24.66	43.78	54.00	-10.22	AV
H	7335.00	54.29	30.33	6.32	24.55	54.83	74.00	-19.17	Pk
H	7335.00	43.92	30.33	6.32	24.55	44.46	54.00	-9.54	AV
H	9780.00	53.47	30.85	7.45	24.69	54.76	74.00	-19.24	Pk
H	9780.00	43.54	30.85	7.45	24.69	44.83	54.00	-9.17	AV
H	12225.00	54.78	31.02	8.99	25.57	58.32	74.00	-15.68	Pk
H	12225.00	43.21	31.02	8.99	25.57	46.75	54.00	-7.25	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
High Channel:2480MHz									
V	4960.00	54.28	30.55	5.77	24.66	54.16	74.00	-19.84	Pk
V	4960.00	43.63	30.55	5.77	24.66	43.51	54.00	-10.49	AV
V	7440.00	54.38	30.33	6.32	24.55	54.92	74.00	-19.08	Pk
V	7440.00	43.21	30.33	6.32	24.55	43.75	54.00	-10.25	AV
V	9920.00	54.43	30.85	7.45	24.69	55.72	74.00	-18.28	Pk
V	9920.00	43.91	30.85	7.45	24.69	45.20	54.00	-8.80	AV
V	12400.00	53.21	31.02	8.99	25.57	56.75	74.00	-17.25	Pk
V	12400.00	43.53	31.02	8.99	25.57	47.07	54.00	-6.93	AV
H	4960.00	51.92	30.55	5.77	24.66	51.80	74.00	-22.20	Pk
H	4960.00	43.15	30.55	5.77	24.66	43.03	54.00	-10.97	AV
H	7440.00	54.44	30.33	6.32	24.55	54.98	74.00	-19.02	Pk
H	7440.00	43.01	30.33	6.32	24.55	43.55	54.00	-10.45	AV
H	9920.00	52.36	30.85	7.45	24.69	53.65	74.00	-20.35	Pk
H	9920.00	43.14	30.85	7.45	24.69	44.43	54.00	-9.57	AV
H	12400.00	51.28	31.02	8.99	25.57	54.82	74.00	-19.18	Pk
H	12400.00	43.97	31.02	8.99	25.57	47.51	54.00	-6.49	AV

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.

5.RADIATED BAND EMISSION MEASUREMENT

5.1 TEST REQUIREMENT:

Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2013
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.
Test site:	Measurement Distance: 3m
Receiver setup:	

Frequency	Detector	RBW	VBW	Value
Above 1GHz	Peak	1MHz	3MHz	Peak
	Average	1MHz	3MHz	Average

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).

5.2 TEST PROCEDURE

Above 1GHz test procedure as below:

a. 1. 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.

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

c. 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.

d. 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.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. 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.

g. Test the EUT in the lowest channel,the Highest channel

Note:

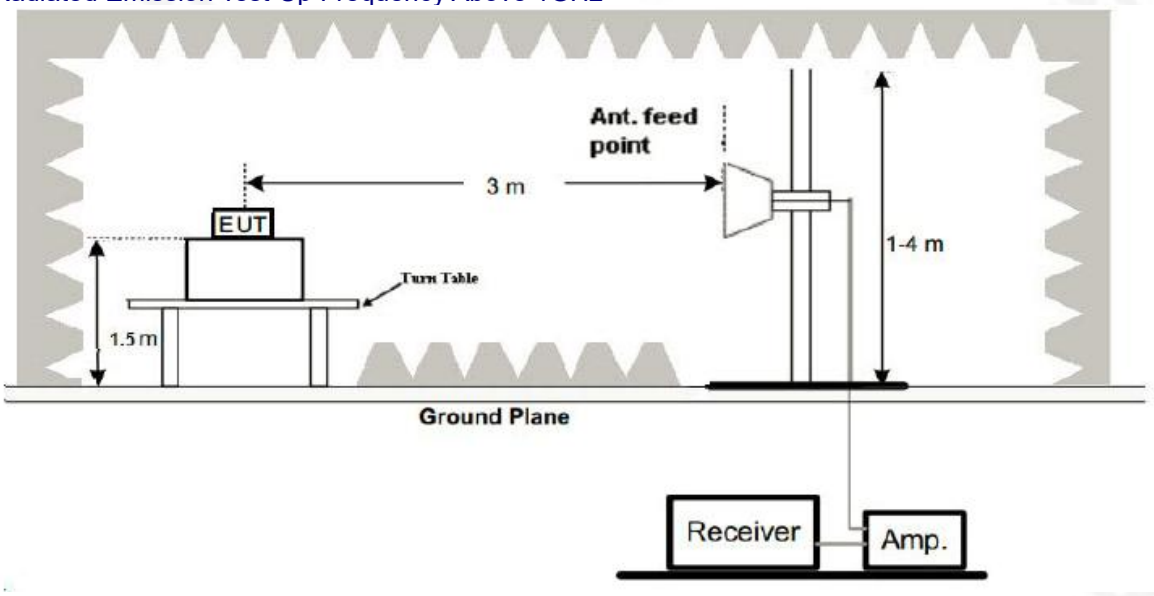
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

5.3 DEVIATION FROM TEST STANDARD

No deviation

5.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz



5.5 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.

5.6 TEST RESULT

	Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Detector Type	Result
FSK	Low Channel: 2410MHz									
	H	2390.00	53.82	30.22	4.85	23.98	52.43	74.00	PK	PASS
	H	2390.00	44.24	30.22	4.85	23.98	42.85	54.00	AV	PASS
	H	2400.00	54.01	30.22	4.85	23.98	52.62	74.00	PK	PASS
	H	2400.00	44.37	30.22	4.85	23.98	42.98	54.00	AV	PASS
	V	2390.00	53.75	30.22	4.85	23.98	52.36	74.00	PK	PASS
	V	2390.00	44.40	30.22	4.85	23.98	43.01	54.00	AV	PASS
	V	2400.00	53.73	30.22	4.85	23.98	52.34	74.00	PK	PASS
	V	2400.00	45.00	30.22	4.85	23.98	43.61	54.00	AV	PASS
	High Channel: 2480MHz									
	H	2483.50	53.63	30.22	4.85	23.98	52.24	74.00	53.60	PASS
	H	2483.50	44.06	30.22	4.85	23.98	42.67	54.00	44.89	PASS
	H	2500.00	54.32	30.22	4.85	23.98	52.93	74.00	54.46	PASS
	H	2500.00	44.90	30.22	4.85	23.98	43.51	54.00	44.58	PASS
	V	2483.50	54.91	30.22	4.85	23.98	53.52	74.00	53.73	PASS
	V	2483.50	44.09	30.22	4.85	23.98	42.70	54.00	44.34	PASS
	V	2500.00	54.46	30.22	4.85	23.98	53.07	74.00	53.23	PASS
	V	2500.00	44.84	30.22	4.85	23.98	43.45	54.00	44.02	PASS

Remark:
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit

6.POWER SPECTRAL DENSITY TEST

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	KDB558074 D0115.247 Meas Guidance v05r02

6.1 APPLIED PROCEDURES / LIMIT

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

6.2 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP

6.5 EUT OPERATION CONDITIONS

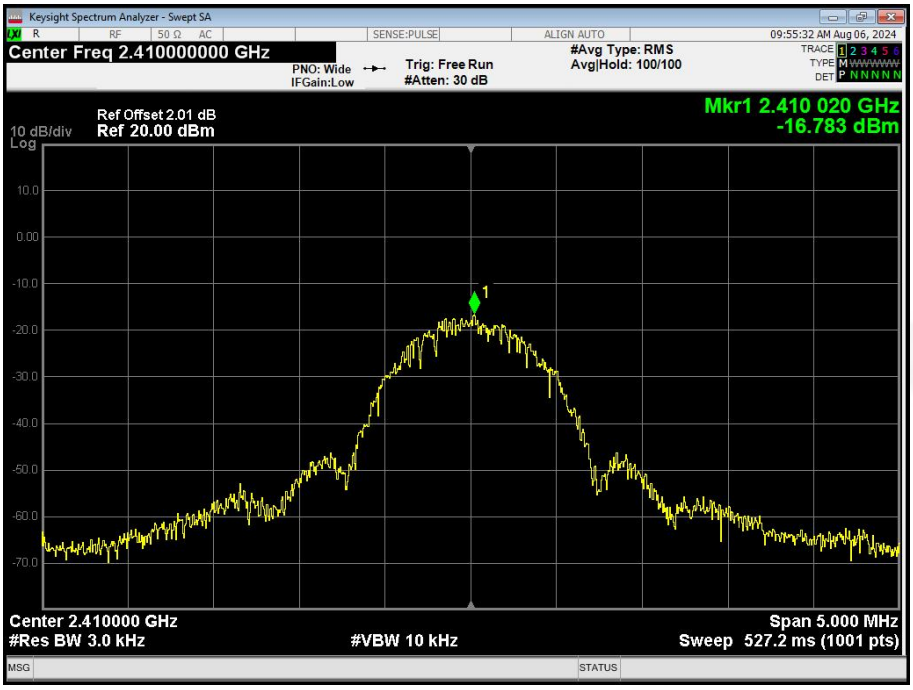
The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.

6.6 TEST RESULT

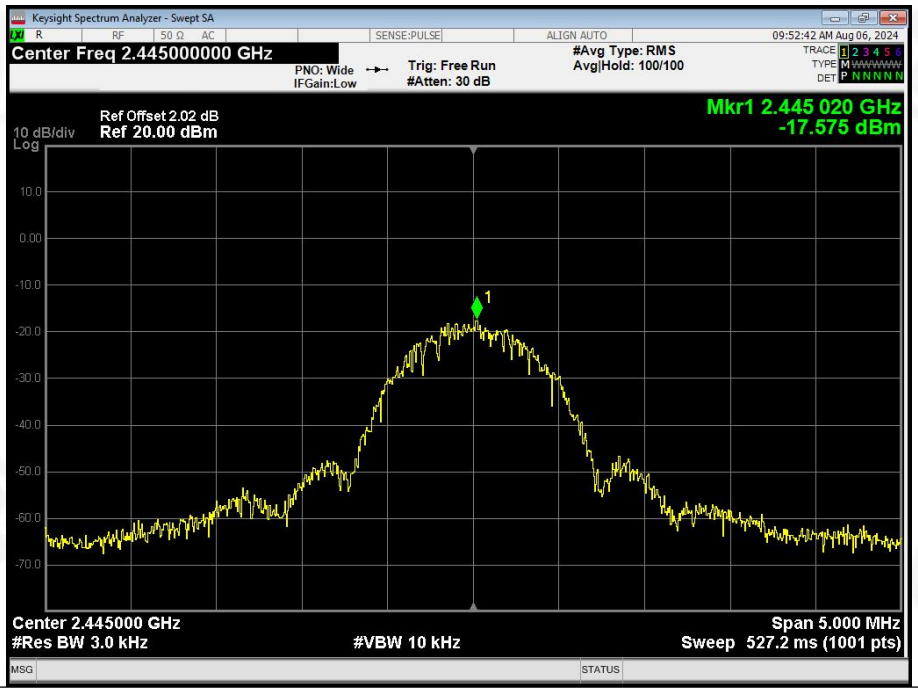
Temperature：	26℃	Relative Humidity：	54%
Test Mode ：	FSK	Test Voltage ：	DC 3.7V

Frequency	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2410 MHz	-16.783	8	PASS
2445MHz	-17.575	8	PASS
2480 MHz	-18.11	8	PASS

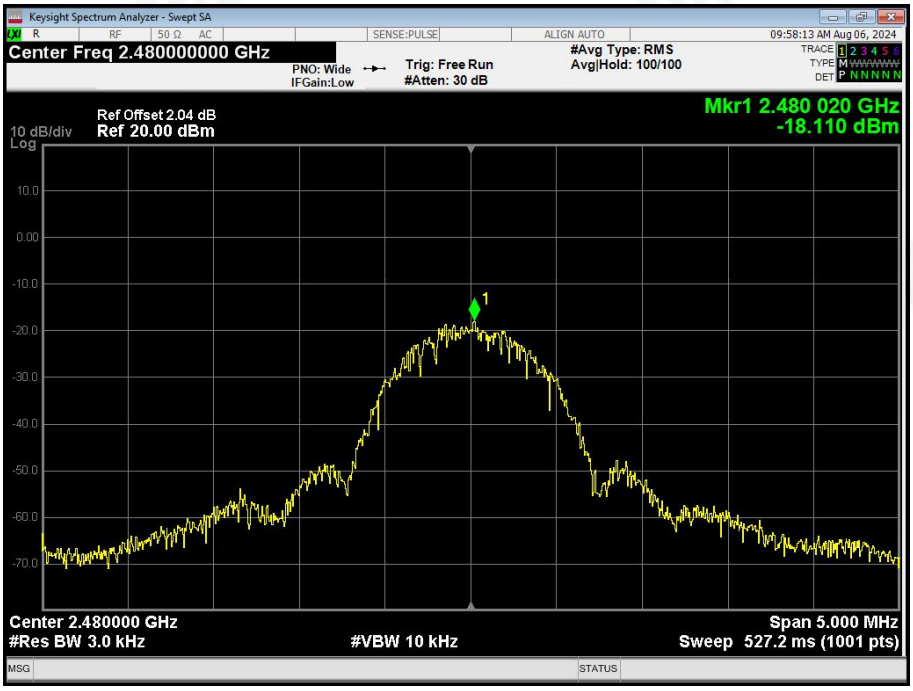
CH01



CH20


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.445000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
09:52:42 AM Aug 06, 2024
Ref Offset 2.02 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.445 020 GHz
-17.575 dBm
Center 2.445000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 5.000 MHz
Sweep 527.2 ms (1001 pts)

CH40


Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 100/100
09:58:13 AM Aug 06, 2024
Ref Offset 2.04 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.480 020 GHz
-18.110 dBm
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 5.000 MHz
Sweep 527.2 ms (1001 pts)

7. CHANNEL BANDWIDTH

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	KDB558074 D0115.247 Meas Guidance v05r02

7.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

7.2 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x 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 6 dB relative to the maximum level measured in the fundamental emission.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP

7.5 EUT OPERATION CONDITIONS

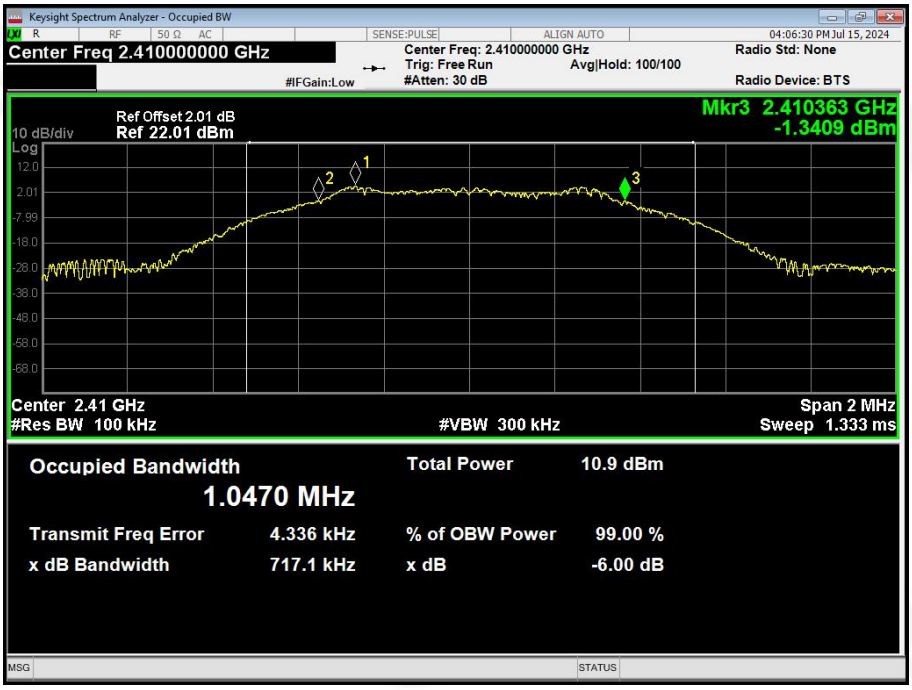
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

7.6 TEST RESULT

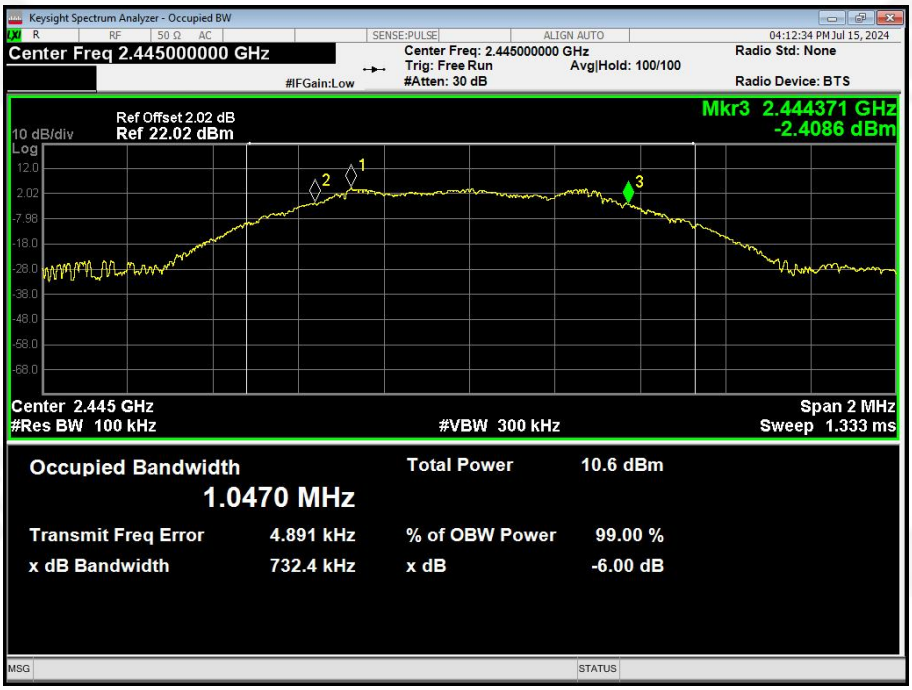
Temperature：	26℃	Relative Humidity：	54%
Test Mode ：	FSK	Test Voltage ：	DC 3.7V

Test channel	6dB bandwidth (kHz)	Limit(KHz)	Result
Lowest	717.1	>500	Pass
Middle	732.4		
Highest	672.0		

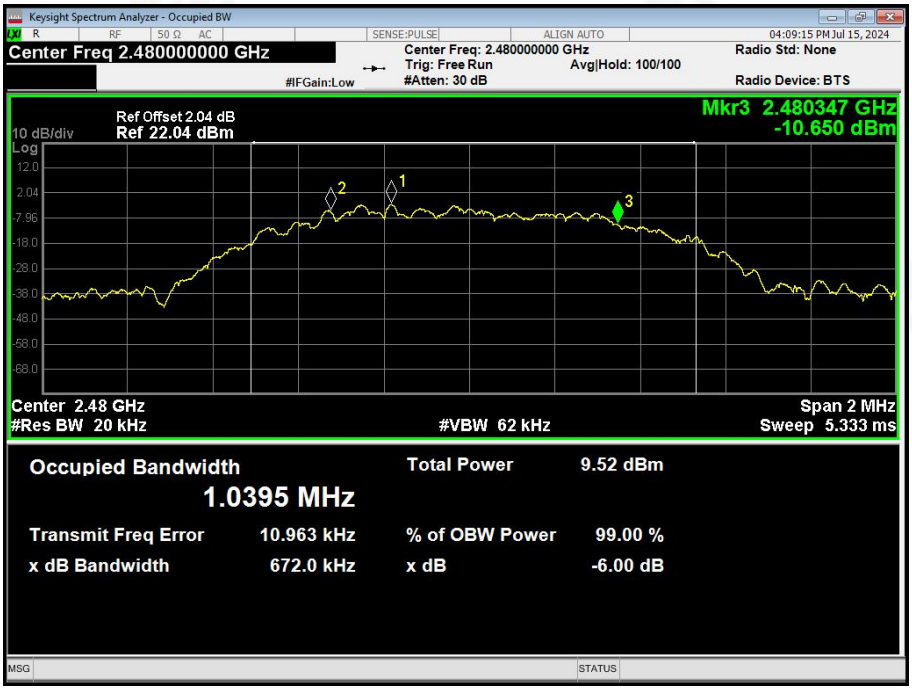
CH 01



CH02


Keysight Spectrum Analyzer - Occupied BW
Center Freq 2.445000000 GHz
Center Freq: 2.445000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
04:12:34 PM Jul 15, 2024
Ref Offset 2.02 dB
10 dB/div
Ref 22.02 dBm
Mkr3 2.444371 GHz
-2.4086 dBm
Center 2.445 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 2 MHz
Sweep 1.333 ms
Occupied Bandwidth
1.0470 MHz
Total Power 10.6 dBm
Transmit Freq Error 4.891 kHz
% of OBW Power 99.00 %
x dB Bandwidth 732.4 kHz
x dB -6.00 dB

CH03


Keysight Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
04:09:15 PM Jul 15, 2024
Ref Offset 2.04 dB
10 dB/div
Ref 22.04 dBm
Mkr3 2.480347 GHz
-10.650 dBm
Center 2.48 GHz
#Res BW 20 kHz
#VBW 62 kHz
Span 2 MHz
Sweep 5.333 ms
Occupied Bandwidth
1.0395 MHz
Total Power 9.52 dBm
Transmit Freq Error 10.963 kHz
% of OBW Power 99.00 %
x dB Bandwidth 672.0 kHz
x dB -6.00 dB

8.PEAK OUTPUT POWER TEST

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	KDB558074 D0115.247 Meas Guidance v05r02

8.1 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

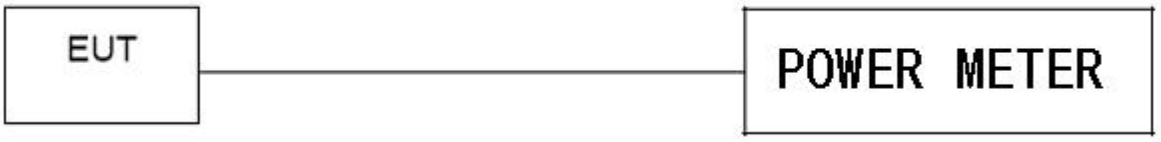
8.2 TEST PROCEDURE

a. The EUT was directly connected to the Power meter

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 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.

8.6 TEST RESULT

Temperature：	26℃	Relative Humidity：	54%
Test Mode ：	FSK	Test Voltage ：	DC 3.7V

Test channel	Peak Output Power (dBm)	Limit(dBm)	Result
Lowest	2.478	30.00	Pass
Middle	2.253		
Highest	1.998		

9. CONDUCTED BAND EDGE AND SPURIOUS EMISSION

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	KDB558074 D0115.247 Meas Guidance v05r02

9.1 APPLICABLE STANDARD

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

9.2 TEST PROCEDURE

Using the following spectrum analyzer setting:

A) Set the RBW = 100KHz.
B) Set the VBW = 300KHz.
C) Sweep time = auto couple.
D) Detector function = peak.
E) Trace mode = max hold.
F) Allow trace to fully stabilize.

9.3 DEVIATION FROM STANDARD

No deviation.

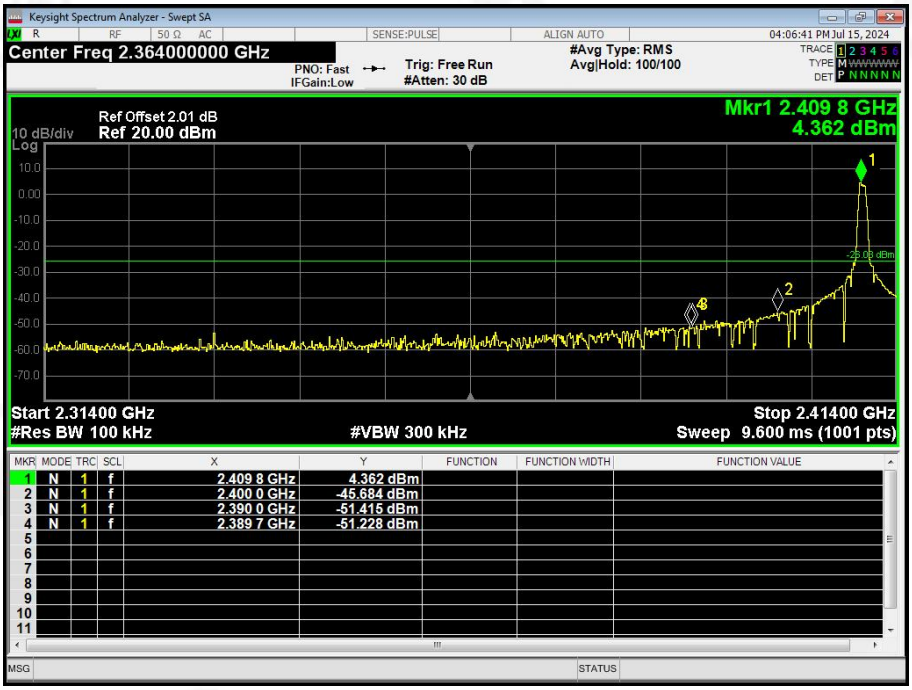
9.4 TEST SETUP

9.5 EUT OPERATION CONDITIONS

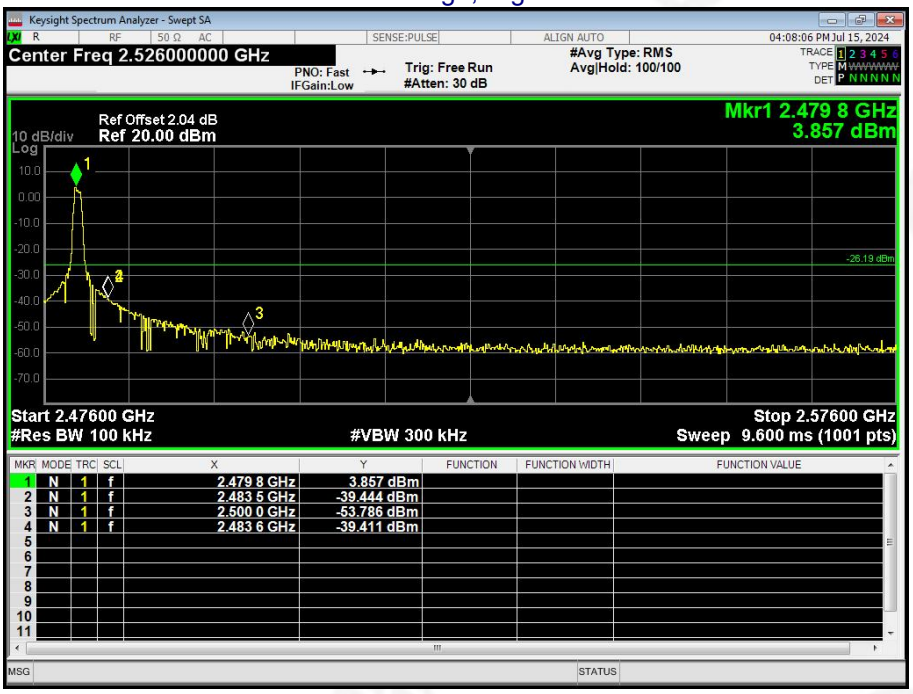
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

9.6 TEST RESULTS

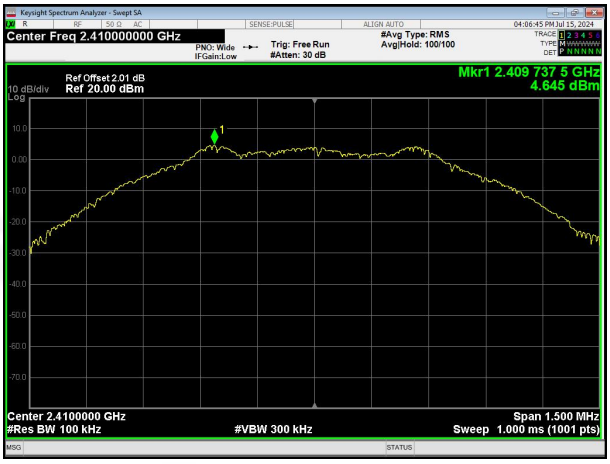
FSK: Band Edge, Left Side

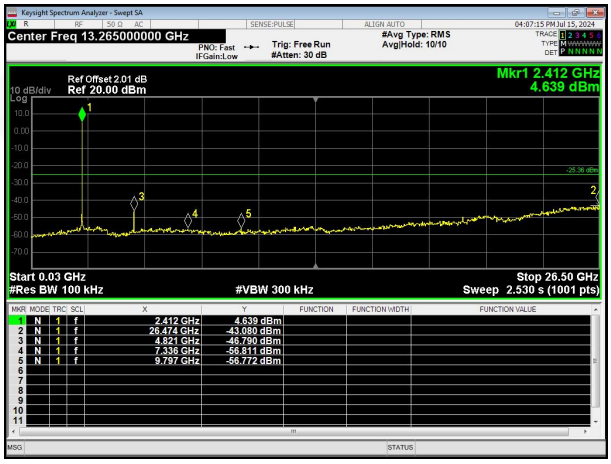


FSK: Band Edge, Right Side

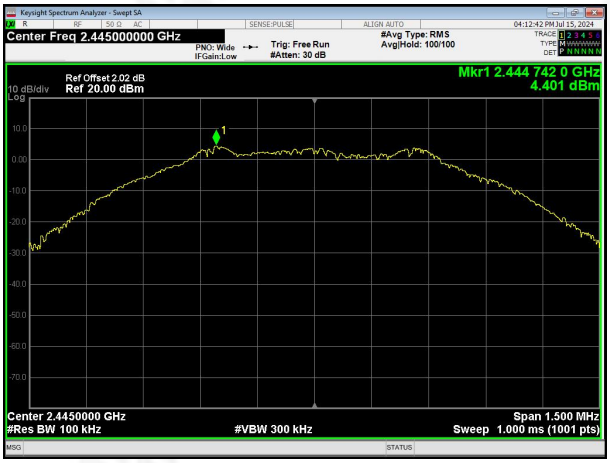


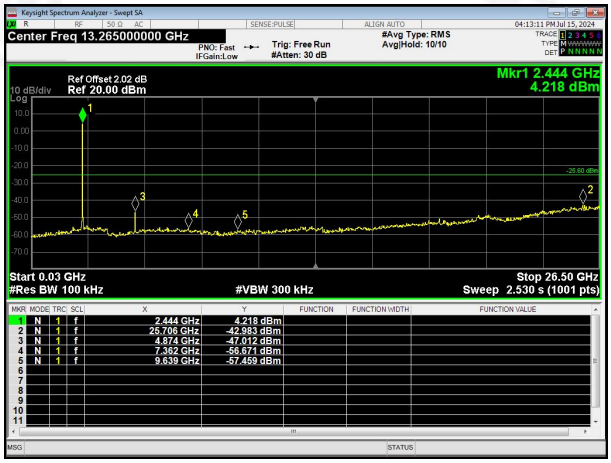
Lowest channel



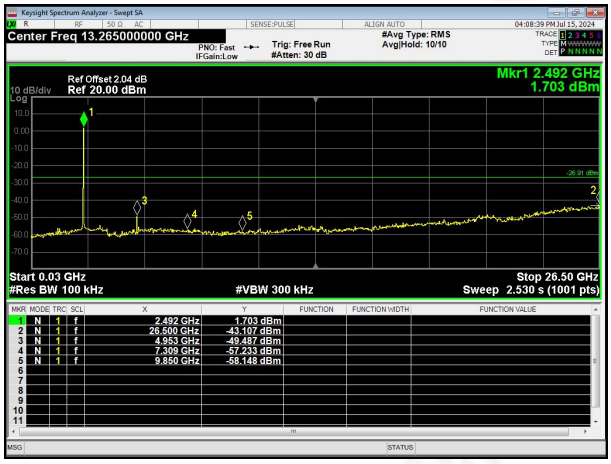


Middle channel





Highest channel



10. DUTY CYCLE

10.1 APPLIED PROCEDURES / LIMIT

Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

a) A diode detector and an oscilloscope that together have a sufficiently short response time to permit accurate measurements of the ON and OFF times of the transmitted signal.

b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:

1) Set the center frequency of the instrument to the center frequency of the transmission.

2) Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value.

3) Set VBW ≥ RBW. Set detector = peak or average.

4) The zero-span measurement method shall not be used unless both RBW and VBW are > 50/*T* and the number of sweep points across duration *T* exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if $T \leq 16.7$ µs.)

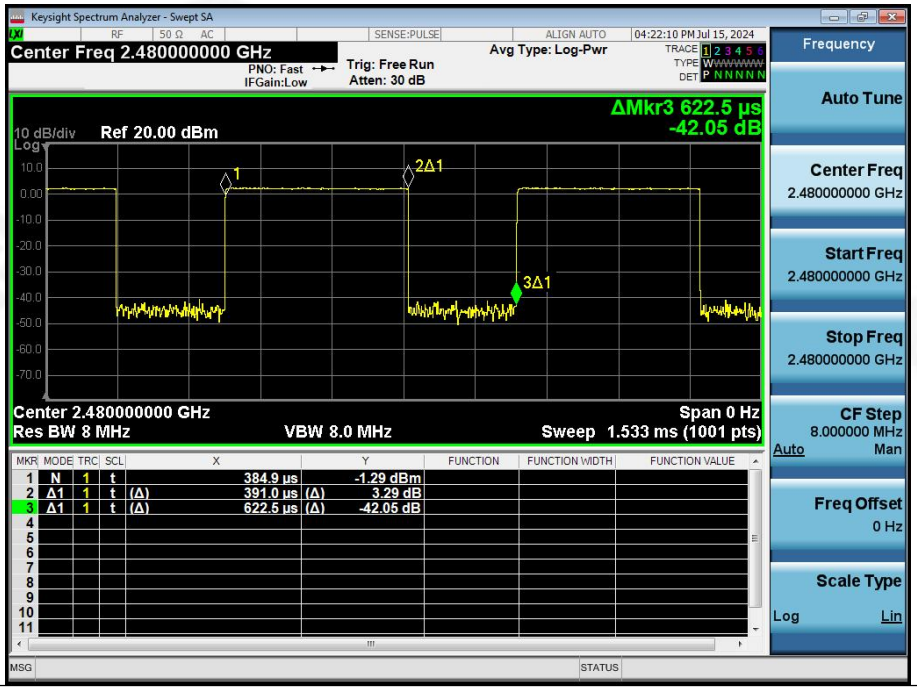
10.2 DEVIATION FROM STANDARD

No deviation.

10.3 TEST SETUP

10.4 TEST RESULTS

Mode	Frequency (MHz)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Result
FSK	2480	62.86	2	Pass



Note: All channel have been tested, and the report only record the worst case data.

Duty Cycle= Ton /Total*100%

Duty Cycle Correction Factor= 10log(1/Duty Cycle)

11.ANTENNA REQUIREMENT

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: 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. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
EUT Antenna:	
The antenna is Cable Antenna, the best case gain of the antennas is 2dBi, reference to the appendix II for details	

12. TEST SETUP PHOTO

Reference to the appendix I for details.

13. EUT CONSTRUCTIONAL DETAILS

Reference to the appendix II for details.

※※※※※ END OF REPORT ※※※※※