Test Report

FCC ID: 2AWB9-K101

Product Name:	Tablet pc
Trademark:	N/A
Model Name :	K101 T10K, KT107, CX1011, K102, T10N Plus, K88, T7K PLUS, K708
Prepared For : Address :	shen zhen langweishun technology co., Ltd 2F, building C, Number 4 of 1RD, Shang Xue technology Park, Bantian, Longgang, Shenzhen, China.
Prepared By : Address :	Shenzhen BCTC Testing Co., Ltd. BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China
Test Date:	Nov. 12, 2019 – Mar. 31, 2020
Date of Report :	Mar. 31, 2020
Report No.:	BCTC1911000685-1E

TEST RESULT CERTIFICATION

Applicant's name ..... :	shen zhen langweishun technology co., Ltd
Address ..... :	2F, building C, Number 4 of 1RD, Shang Xue technology Park, Bantian, Longgang, Shenzhen, China.
Manufacture's Name..... :	shen zhen langweishun technology co., Ltd
Address ..... :	2F, building C, Number 4 of 1RD, Shang Xue technology Park, Bantian, Longgang, Shenzhen, China.
Product description	
Product name ..... :	Tablet pc
Trademark ..... :	N/A
Model and/or type reference :	K101 T10K, KT107, CX1011, K102, T10N Plus, K88, T7K PLUS, K708
Standards ..... :	FCC Part15.247 ANSI C63.10:2013 KDB 558074 D01 15.247 Meas Guidance v05r02

This device described above has been tested by BCTC, 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.

This report shall not be reproduced except in full, without the written approval of BCTC, this document may be altered or revised by BCTC, personal only, and shall be noted in the revision of the document.

Prepared by(Engineer):	Willem Wang	Willem Wang
Reviewer(Supervisor):	Eric Yang	Eric Yang
Approved(Manager):	Zero Zhou	

Page

Table of Contents

1 . SUMMARY OF TEST RESULTS 5
1.1 TEST FACILITY 6
1.2 MEASUREMENT UNCERTAINTY 6
2 . GENERAL INFORMATION 7
2.1 GENERAL DESCRIPTION OF EUT 7
2.2 DESCRIPTION OF TEST MODES 8
2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED 8
2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE) 9
2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS 10
3 . EMC EMISSION TEST 12
3.1 CONDUCTED EMISSION MEASUREMENT 12
3.1.1 POWER LINE CONDUCTED EMISSION LIMITS 12
3.1.2 TEST PROCEDURE 12
3.1.3 DEVIATION FROM TEST STANDARD 12
3.1.4 TEST SETUP 13
3.1.5 EUT OPERATING CONDITIONS 13
3.1.6 TEST RESULTS 13
3.2 RADIATED EMISSION MEASUREMENT 16
3.2.1 RADIATED EMISSION LIMITS 16
3.2.2 TEST PROCEDURE 17
3.2.3 DEVIATION FROM TEST STANDARD 17
3.2.4 TEST SETUP 18
3.2.5 EUT OPERATING CONDITIONS 19
3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ) 20
3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ) 21
3.3 RADIATED BAND EMISSION MEASUREMENT 24
3.3.1 TEST REQUIREMENT: 24
3.3.2 TEST PROCEDURE 24
3.3.3 DEVIATION FROM TEST STANDARD 25
3.3.4 TEST SETUP 25
3.3.5 EUT OPERATING CONDITIONS 25
4 . POWER SPECTRAL DENSITY TEST 27
4.1 APPLIED PROCEDURES / LIMIT 27
4.1.1 TEST PROCEDURE 27

Page

Table of Contents

4.1.2 DEVIATION FROM STANDARD 27
4.1.3 TEST SETUP 27
4.1.4 EUT OPERATION CONDITIONS 27
4.1.5 TEST RESULTS 28

5 . BANDWIDTH TEST 30

5.1 APPLIED PROCEDURES / LIMIT 30
5.1.1 TEST PROCEDURE 30
5.1.2 DEVIATION FROM STANDARD 30
5.1.3 TEST SETUP 30
5.1.4 EUT OPERATION CONDITIONS 30
5.1.5 TEST RESULTS 31

6 . PEAK OUTPUT POWER TEST 33

6.1 APPLIED PROCEDURES / LIMIT 33

6.1.1 TEST PROCEDURE 33
6.1.2 DEVIATION FROM STANDARD 33
6.1.3 TEST SETUP 33
6.1.4 EUT OPERATION CONDITIONS 33
6.1.5 TEST RESULTS 34

7 . 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE 35
7.1 APPLICABLE STANDARD 35
7.2 TEST PROCEDURE 35
7.3 DEVIATION FROM STANDARD 35
7.4 TEST SETUP 35
7.5 EUT OPERATION CONDITIONS 35

8 . ANTENNA REQUIREMENT 38

8.1 STANDARD REQUIREMENT 38

8.2 EUT ANTENNA 38

9 . EUT TEST PHOTO 39

10 . EUT PHOTO 41
APPENDIX-PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS

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 (a)(2)	6dB Bandwidth	PASS	
15.247 (b)	Peak Output Power	PASS	
15.247 (d)	Radiated Spurious Emission	PASS	
15.247 (e)	Power Spectral Density	PASS	
15.205	Restricted Band of Operation	PASS	
15.247(d)	Band Edge (Out of Band Emissions)	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

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

1.1 TEST FACILITY

Shenzhen BCTC Testing Co., Ltd.
Add.: BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 712850
IC Registered No.: 23583

1.2 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(30MHz-1GHz)	U=4.3dB
2	3m chamber Radiated spurious emission(1GHz-18GHz)	U=4.5dB
3	3m chamber Radiated spurious emission(18GHz-40GHz)	U=3.34dB
4	Conducted Adjacent channel power	U=1.38dB
5	Conducted output power uncertainty Above 1G	U=1.576dB
6	Conducted output power uncertainty below 1G	U=1.28dB
7	humidity uncertainty	U=5.3%
8	Temperature uncertainty	U=0.59 ℃

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Tablet pc
Trade Name	N/A
Model Name	K101 T10K, KT107, CX1011, K102, T10N Plus, K88, T7K PLUS, K708
Model Difference	All the model are the same circuit and RF module, except model names .
Product Description	The EUT is a Tablet pc Operation Frequency: 2402-2480 MHz Modulation Type: GFSK Number Of Channel 40CH Antenna Designation: Please see Note 3. Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.
Channel List	Please refer to the Note 2.
Ratings	DC 3.7V
Adapter	Model: JHD-AP024U-120200BA-A INPUT: 100-240V~50/60Hz 0.45A OUTPUT: 12V 2000mA
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	11	2422	21	2442
02	2404	12	2424	22	2444
03	2406	13	2426	23	2446
~	~	~	~	~	~
09	2418	19	2438	39	2478
10	2420	20	2440	40	2480

3.

Table for FPCB Antenna

Ant.	Brand	Model Name	Antenna Type	Gain (dBi)
1	N/A	N/A	FPCB antenna	1

2.2 DESCRIPTION OF TEST MODES

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

For All Mode	Description	Modulation Type
Mode 1	CH01	GFSK
Mode 2	CH20	
Mode 3	CH40	
Mode 4	Link mode(conducted emission and Radiated emission)	

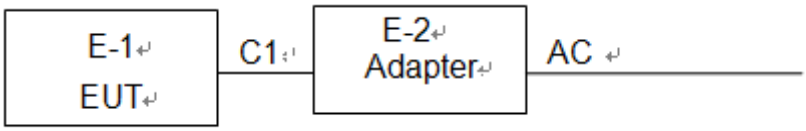
Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

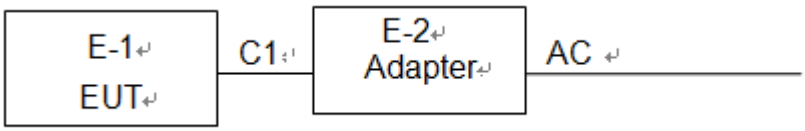
(2) Fully-charged battery is used during the test

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission



Radiated Spurious Emission



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.

No.	Device Type	Brand	Model	Series No.	Data Cable
E-1	Tablet pc	N/A	K101	N/A	EUT
E-2	Adapter	N/A	BCTC-003	N/A	Auxiliary

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	1M	DC cable unshielded

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.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4407B	MY45109572	Jun. 13, 2019	Jun. 12, 2020
2	Test Receiver (9kHz-7GHz)	R&S	ESR7	101154	Jun. 13, 2019	Jun. 12, 2020
3	Bilog Antenna (30MHz-3GHz)	SCHWARZBECK	VULB9163	VULB9163-942	Jun. 22, 2019	Jun. 21, 2020
4	Horn Antenna (1GHz-18GHz)	SCHWARZBECK	BBHA9120D	1541	Jun. 22, 2019	Jun. 21, 2020
5	Horn Antenna (18GHz-40GHz)	SCHWARZBECK	BBHA9170	822	Jun. 22, 2019	Jun. 21, 2020
6	Amplifier (9KHz-6GHz)	SCHWARZBECK	BBV9744	9744-0037	Jun. 25, 2019	Jun. 24, 2020
7	Amplifier (0.5GHz-18GHz)	SCHWARZBECK	BBV9718	9718-309	Jun. 25, 2019	Jun. 24, 2020
8	Amplifier (18GHz-40GHz)	MITEQ	TTA1840-35-HG	2034381	Jun. 17, 2019	Jun. 16, 2020
9	Loop Antenna (9KHz-30MHz)	SCHWARZBECK	FMZB1519B	014	Jul. 02, 2019	Jul. 01, 2020
10	RF cables1 (9kHz-30MHz)	Huber+Suhnar	9kHz-30MHz	B1702988-0008	Jun. 25, 2019	Jun. 24, 2020
11	RF cables2 (30MHz-1GHz)	Huber+Suhnar	30MHz-1GHz	1486150	Jun. 25, 2019	Jun. 24, 2020
12	RF cables3 (1GHz-40GHz)	Huber+Suhnar	1GHz-40GHz	1607106	Jun. 25, 2019	Jun. 24, 2020
13	Power Metter	Keysight	E4419B	\	Jun. 17, 2019	Jun. 16, 2020
14	Power Sensor (AV)	Keysight	E9 300A	\	Jun. 17, 2019	Jun. 16, 2020
15	Signal Analyzer 20kHz-26.5GHz	KEYSIGHT	N9020A	MY49100060	Jun. 13, 2019	Jun. 12, 2020
16	Spectrum Analyzer 9kHz-40GHz	Aglient	FSP40	100363	Jun. 13, 2019	Jun. 12, 2020
17	D.C. Power Supply	LongWei	TPR-6405D	\	\	\
18	Software	Frad	EZ-EMC	FA-03A2 RE	\	\

Conduction Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Test Receiver	R&S	ESR3	102075	Jun. 13, 2019	Jun. 12, 2020
2	LISN	SCHWARZBECK	NSLK8127	8127739	Jun. 13, 2019	Jun. 12, 2020
3	LISN	R&S	ENV216	101375	Jun. 13, 2019	Jun. 12, 2020
4	RF cables	Huber+Suhnar	9kHz-30MHz	B1702988-0008	Jun. 25, 2019	Jun. 24, 2020
5	Software	Frad	EZ-EMC	EMC-CON 3A1	\	\

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
	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) 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.

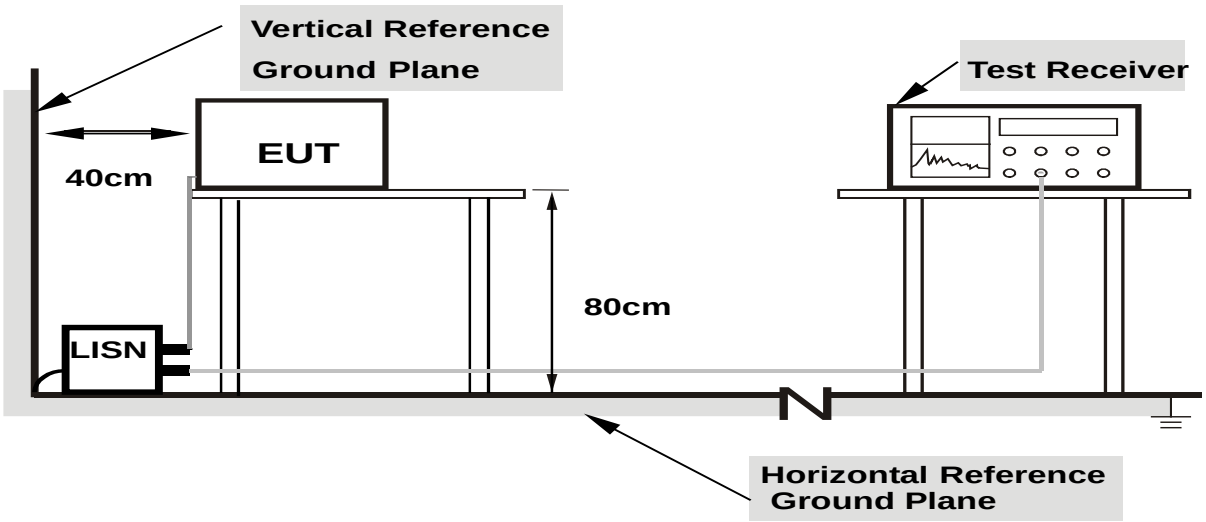
d. LISN at least 80 cm from nearest part of EUT chassis.

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 from other units and other metal planes

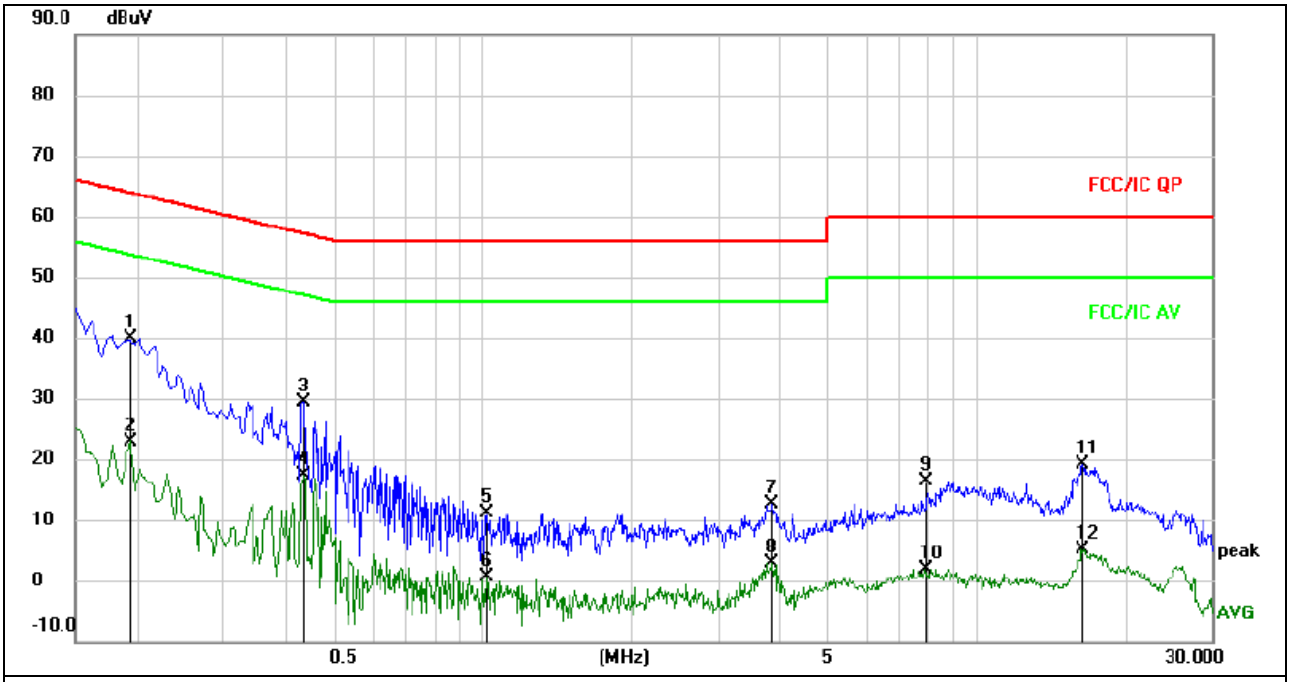
3.1.5 EUT OPERATING CONDITIONS

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.

We pretest AC 120V and AC 240V, the worst voltage was AC 120V and the data recording in the report.

3.1.6 TEST RESULTS

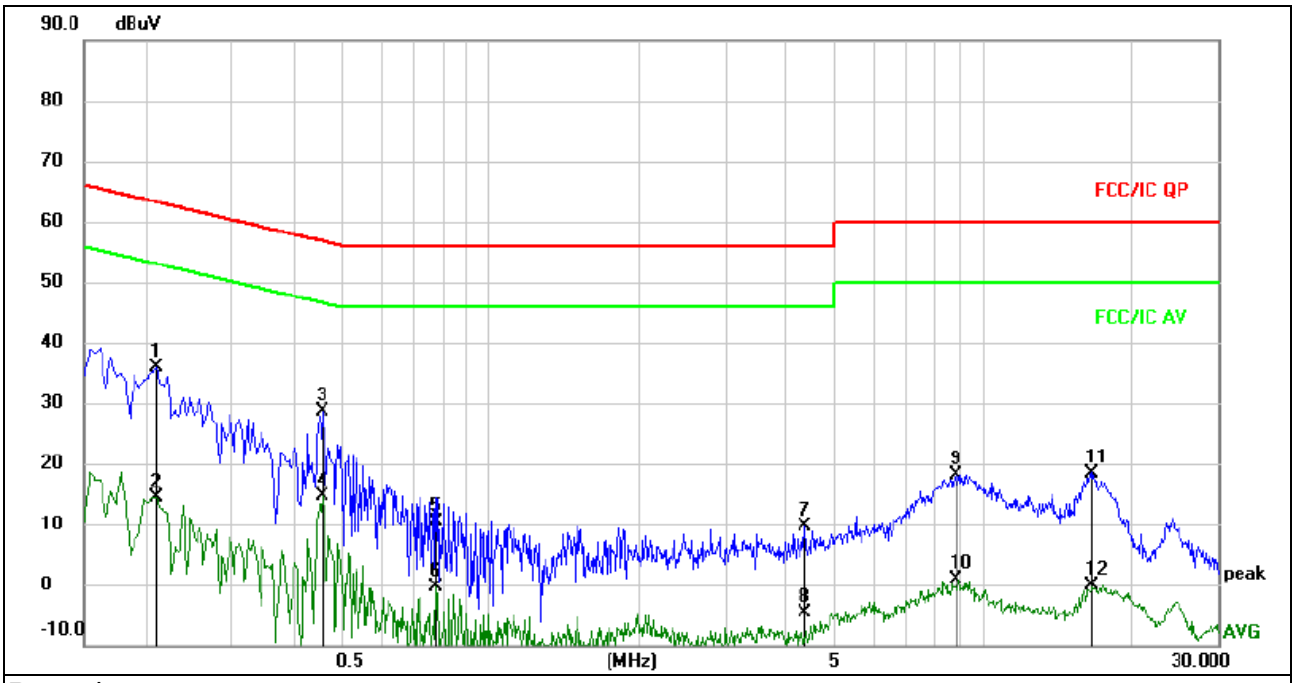
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Phase：	L
Test Voltage ：	AC120V 60Hz	Test Mode：	Mode 4



Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV		dBuV	dBuV	dB	Detector	Comment
1	*	0.1940	30.40	9.47	39.87	63.86	-23.99	QP	
2		0.1940	13.53	9.47	23.00	53.86	-30.86	AVG	
3		0.4340	19.93	9.53	29.46	57.18	-27.72	QP	
4		0.4340	7.73	9.53	17.26	47.18	-29.92	AVG	
5		1.0260	1.51	9.57	11.08	56.00	-44.92	QP	
6		1.0260	-8.91	9.57	0.66	46.00	-45.34	AVG	
7		3.8740	2.85	9.72	12.57	56.00	-43.43	QP	
8		3.8740	-6.81	9.72	2.91	46.00	-43.09	AVG	
9		7.8660	6.77	9.71	16.48	60.00	-43.52	QP	
10		7.8660	-7.76	9.71	1.95	50.00	-48.05	AVG	
11		16.3940	9.49	9.72	19.21	60.00	-40.79	QP	
12		16.3940	-4.56	9.72	5.16	50.00	-44.84	AVG	

Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	101kPa	Phase：	N
Test Voltage ：	AC120V 60Hz	Test Mode：	Mode 4



Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV		dBuV	dBuV	dB	Detector	Comment
1	*	0.2100	26.36	9.47	35.83	63.21	-27.38	QP	
2		0.2100	4.99	9.47	14.46	53.21	-38.75	AVG	
3		0.4580	19.10	9.55	28.65	56.73	-28.08	QP	
4		0.4580	5.18	9.55	14.73	46.73	-32.00	AVG	
5		0.7780	0.66	9.63	10.29	56.00	-45.71	QP	
6		0.7780	-9.99	9.63	-0.36	46.00	-46.36	AVG	
7		4.3580	-0.18	9.76	9.58	56.00	-46.42	QP	
8		4.3580	-14.36	9.76	-4.60	46.00	-50.60	AVG	
9		8.8500	8.46	9.70	18.16	60.00	-41.84	QP	
10		8.8500	-8.89	9.70	0.81	50.00	-49.19	AVG	
11		16.7300	8.77	9.73	18.50	60.00	-41.50	QP	
12		16.7300	-9.96	9.73	-0.23	50.00	-50.23	AVG	

3.2 RADIATED EMISSION MEASUREMENT

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

20dBc in any 100 kHz bandwidth outside the operating frequency band. 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).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
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

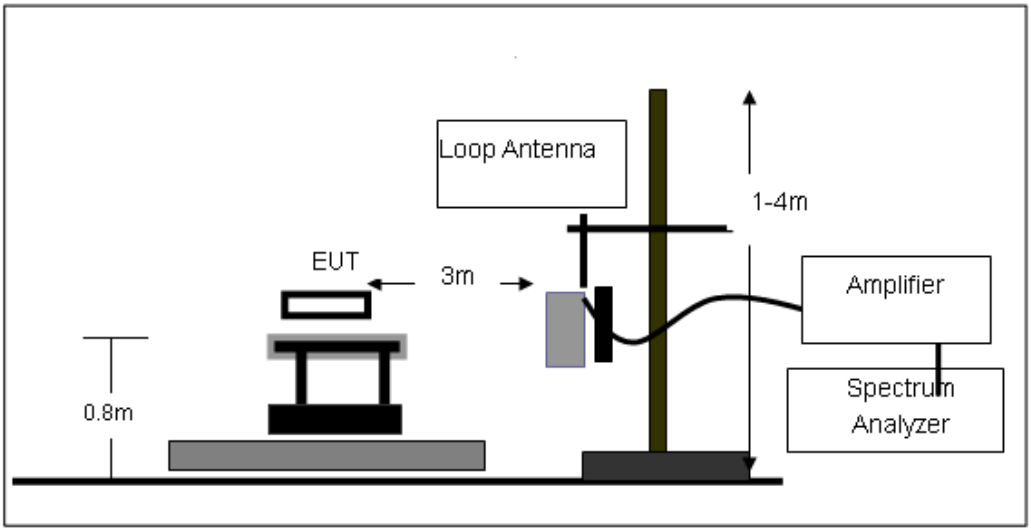
a. The measuring distance of at 3 m shall be used for measurements at frequency up to 25GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-chamber test. The table was rotated 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

3.2.3 DEVIATION FROM TEST STANDARD

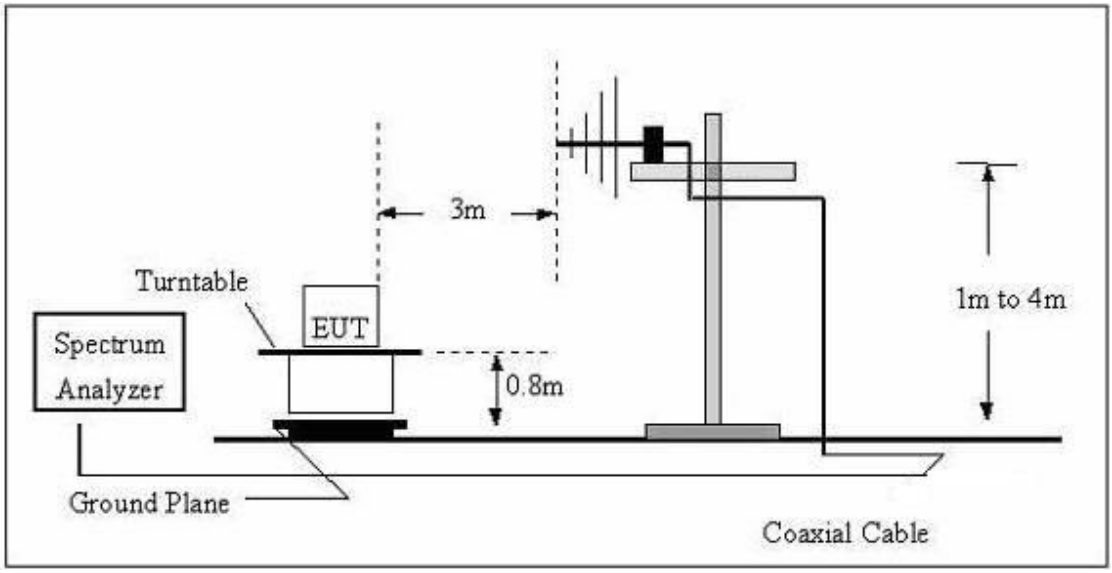
No deviation

3.2.4 TEST SETUP

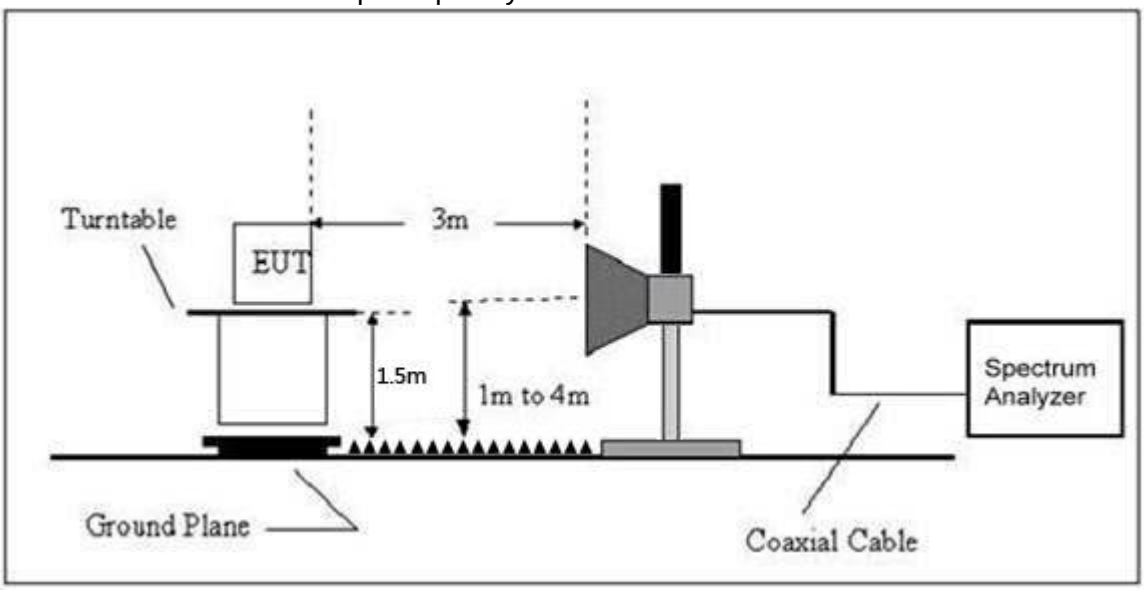
（A）Radiated Emission Test-Up Frequency Below 30MHz



（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 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

Temperature：	26℃	Relative Humidtity：	54%
Pressure：	101 kPa	Test Voltage ：	AC120V 60Hz
Test Mode ：	Mode 4	Polarization :	--

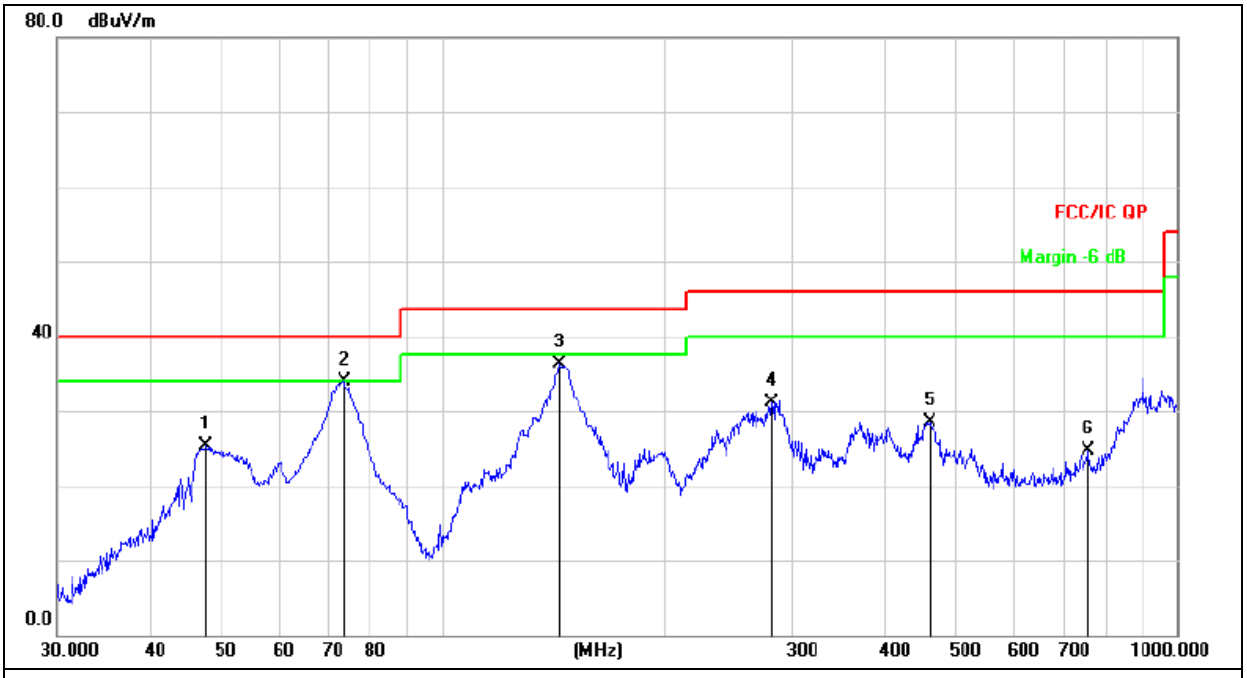
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

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 (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

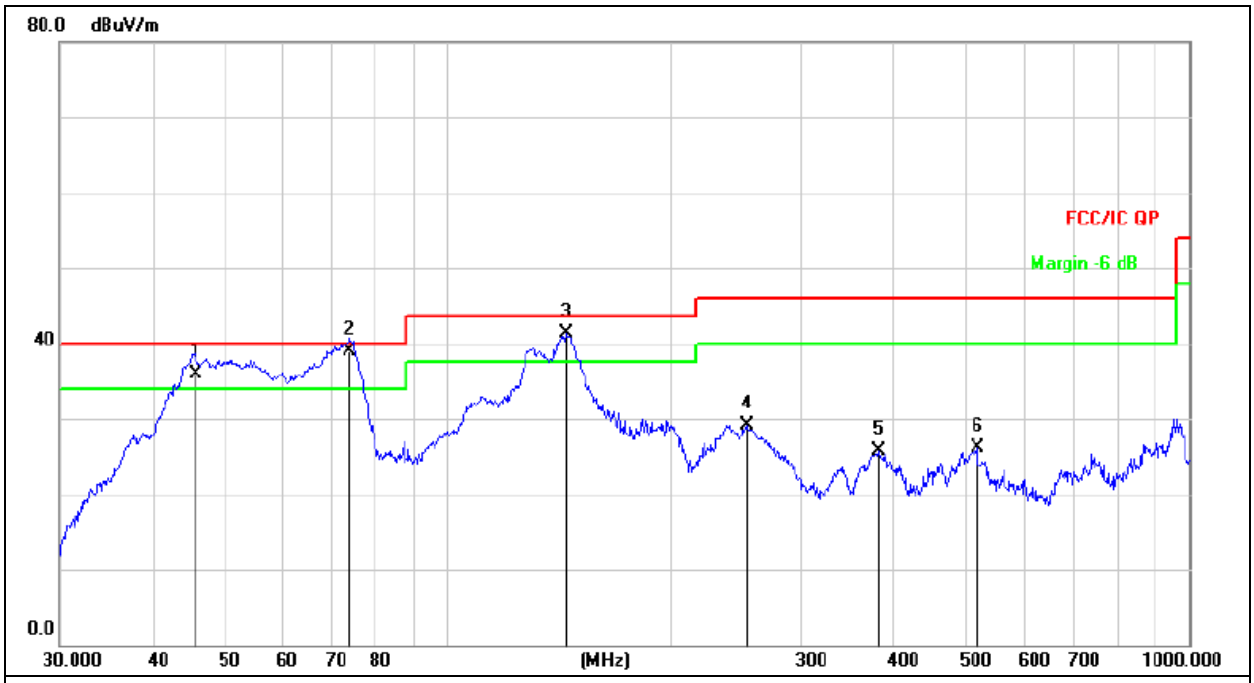
Temperature :	26℃	Relative Humidity :	54%
Pressure :	101 kPa	Polarization :	Horizontal
Test Voltage :	AC120V 60Hz		
Test Mode :	Mode 4		



Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		47.8260	40.22	-14.97	25.25	40.00	-14.75	QP
2	*	73.6170	52.84	-18.99	33.85	40.00	-6.15	QP
3		144.3348	55.36	-19.14	36.22	43.50	-7.28	QP
4		281.0075	45.24	-14.19	31.05	46.00	-14.95	QP
5		460.7271	38.29	-9.75	28.54	46.00	-17.46	QP
6		755.3873	28.89	-4.26	24.63	46.00	-21.37	QP

Temperature：	26℃	Relative Humidity：	54%
Pressure：	101kPa	Polarization：	Vertical
Test Voltage ：	AC120V 60Hz		
Test Mode ：	Mode 4		



Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	!	45.6917	50.98	-15.09	35.89	40.00	-4.11	QP
2	*	73.4630	57.91	-18.96	38.95	40.00	-1.05	QP
3	!	144.3348	60.44	-19.14	41.30	43.50	-2.20	QP
4		252.9482	44.17	-15.06	29.11	46.00	-16.89	QP
5		379.9141	37.21	-11.55	25.66	46.00	-20.34	QP
6		517.2480	34.61	-8.51	26.10	46.00	-19.90	QP

Remark:
Test all the modes and only worst case was reported.

3.2.8 TEST RESULTS (1ghz~25ghz)

GFSK

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:2402MHz									
V	4804.00	51.46	39.55	7.15	25.66	44.72	74.00	-29.28	PK
V	4804.00	43.94	39.55	7.15	25.66	37.20	54.00	-16.80	AV
V	7206.00	52.18	38.33	8.05	24.55	46.45	74.00	-27.55	PK
V	7206.00	43.87	38.33	8.05	24.55	38.14	54.00	-15.86	AV
H	4804.00	52.10	39.55	7.15	25.66	45.36	74.00	-28.64	PK
H	4804.00	43.33	39.55	7.15	25.66	36.59	54.00	-17.41	AV
H	7206.00	50.33	38.33	8.05	24.55	44.60	74.00	-29.40	PK
H	7206.00	43.87	38.33	8.05	24.55	38.14	54.00	-15.86	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:2440MHz									
V	4880.00	54.29	38.89	7.30	25.45	48.15	74.00	-25.85	PK
V	4880.00	43.35	38.89	7.30	25.45	37.21	54.00	-16.79	AV
V	7320.00	50.01	38.78	8.23	24.54	44.00	74.00	-30.00	PK
V	7320.00	43.11	38.78	8.23	24.54	37.10	54.00	-16.90	AV
H	4880.00	53.13	38.89	7.30	25.45	46.99	74.00	-27.01	PK
H	4880.00	43.54	38.89	7.30	25.45	37.40	54.00	-16.60	AV
H	7320.00	53.72	38.78	8.23	24.54	47.71	74.00	-26.29	PK
H	7320.00	43.29	38.78	8.23	24.54	37.28	54.00	-16.72	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	54.77	38.75	7.35	25.41	48.78	74.00	-25.22	PK
V	4960.00	43.67	38.75	7.35	25.41	37.68	54.00	-16.32	AV
V	7440.00	54.12	38.65	8.40	24.52	48.39	74.00	-25.61	PK
V	7440.00	43.67	38.65	8.40	24.52	37.94	54.00	-16.06	AV
H	4960.00	50.57	38.75	7.35	25.41	44.58	74.00	-29.42	PK
H	4960.00	43.03	38.75	8.40	25.41	38.09	54.00	-15.91	AV
H	7440.00	50.09	38.65	8.40	24.52	44.36	74.00	-29.64	PK
H	7440.00	43.19	38.65	8.40	24.52	37.46	54.00	-16.54	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.

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:

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:

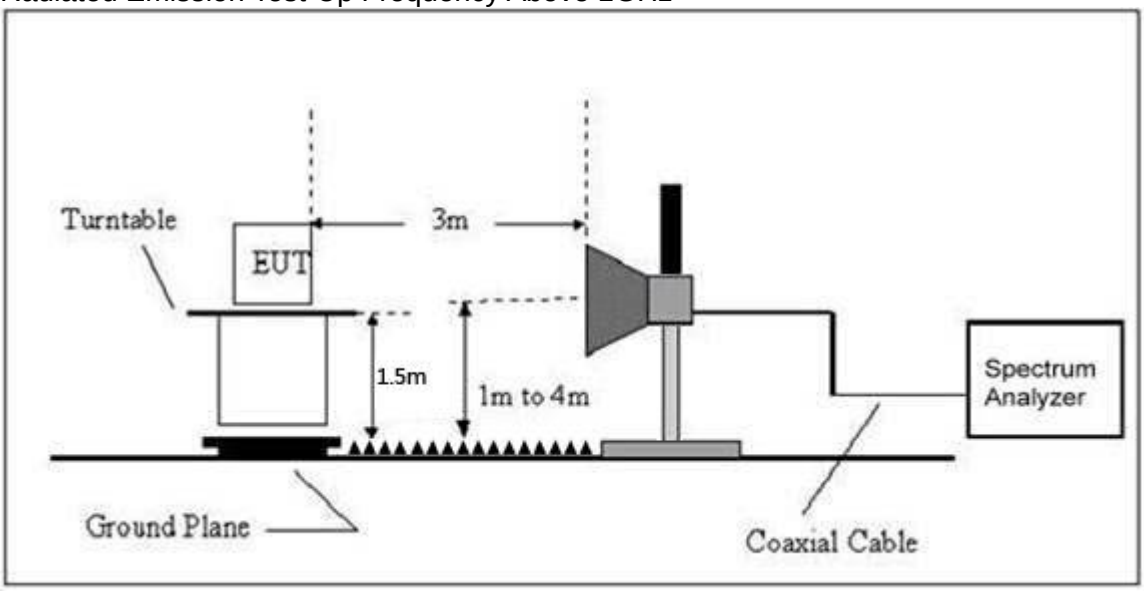
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

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 (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission evel (dBuV/m)	Limits (dBuV/m)		Result
							PK	□PK	AV	
GFSK	**Low Channel 2402MHz**									
	H	2390.00	60.88	38.06	7.42	20.15	50.39	74.00	54.00	PASS
	H	2400.00	55.57	38.06	7.42	20.15	45.08	74.00	54.00	PASS
	V	2390.00	61.05	38.06	7.42	20.15	50.56	74.00	54.00	PASS
	V	2400.00	51.12	38.06	7.42	20.15	40.63	74.00	54.00	PASS
	High Channel 2480MHz									
	H	2483.50	61.07	38.17	7.45	20.54	50.89	74.00	54.00	PASS
	H	2485.50	51.79	38.17	7.45	20.54	41.61	74.00	54.00	PASS
	V	2483.50	59.72	38.2	7.45	20.54	49.51	74.00	54.00	PASS
	V	2485.50	53.51	38.2	7.45	20.54	43.30	74.00	54.00	PASS

Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit
2. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

4. POWER SPECTRAL DENSITY TEST

4.1 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

4.1.1 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.

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP

4.1.4 EUT OPERATION CONDITIONS

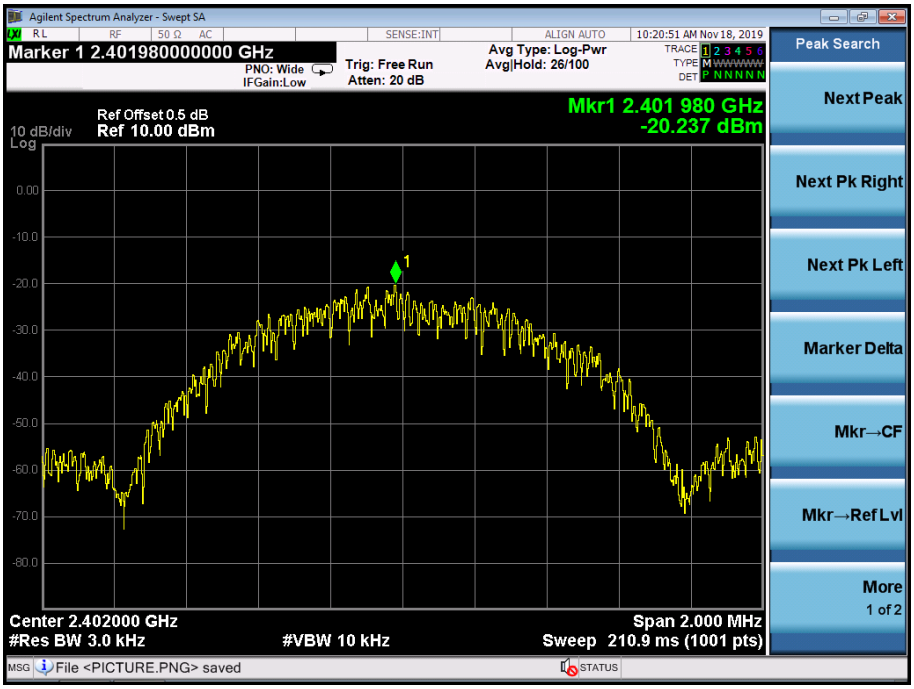
The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.
Note: Power Spectral Density(dBm)=Reading+Cable Loss

4.1.5 TEST RESULTS

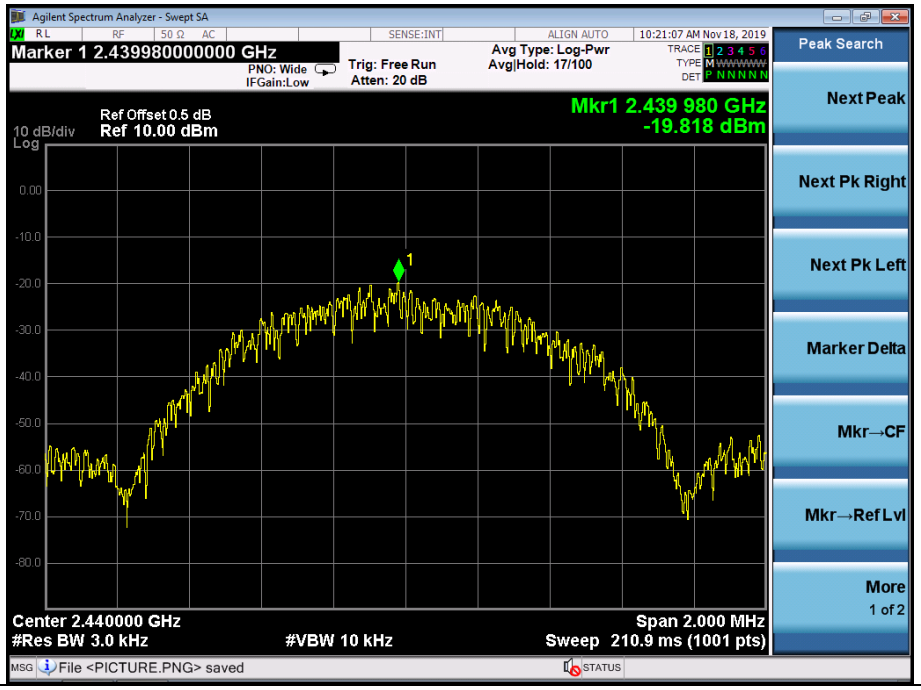
Temperature：	26℃	Relative Humidity：	54%
Test Mode ：	GFSK	Test Voltage ：	DC 3.7V

Frequency	Power Spectral Density(dBm/3kHz)	Limit (dBm/3kHz)	Result
2402 MHz	-20.237	8	PASS
2440 MHz	-19.818	8	PASS
2480 MHz	-19.617	8	PASS

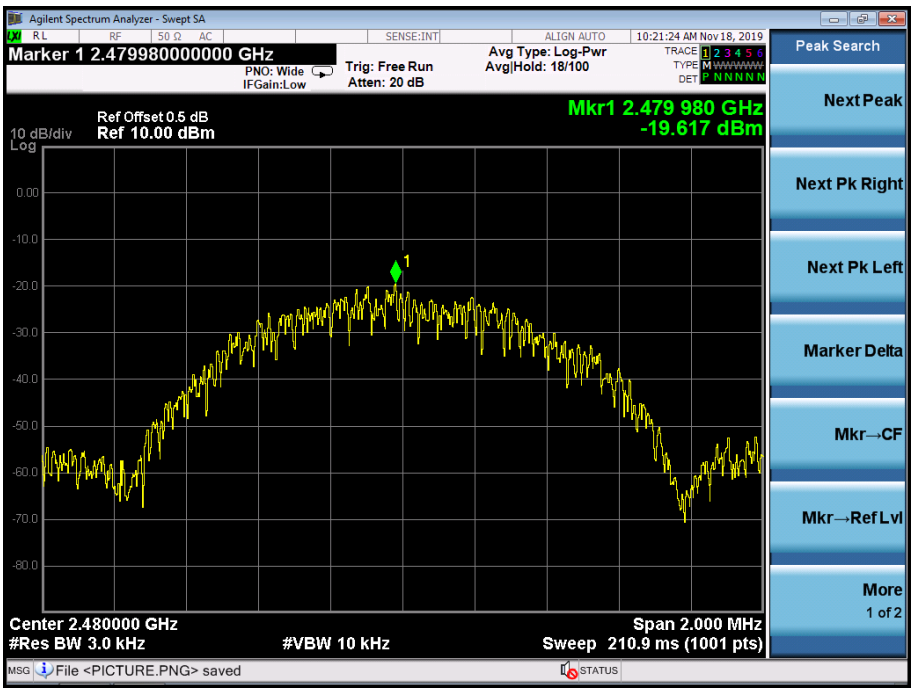
CH01



CH20


Agilent Spectrum Analyzer - Swept SA
Marker 1 2.439980000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 17/100
10:21:07 AM Nov 18, 2019
Ref Offset 0.5 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.439 980 GHz
-19.818 dBm
Center 2.440000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.000 MHz
Sweep 210.9 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
File <PICTURE.PNG> saved

CH40


Agilent Spectrum Analyzer - Swept SA
Marker 1 2.479980000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 18/100
10:21:24 AM Nov 18, 2019
Ref Offset 0.5 dB
10 dB/div
Ref 10.00 dBm
Log
Mkr1 2.479 980 GHz
-19.617 dBm
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.000 MHz
Sweep 210.9 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
File <PICTURE.PNG> saved

5. BANDWIDTH TEST

5.1 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

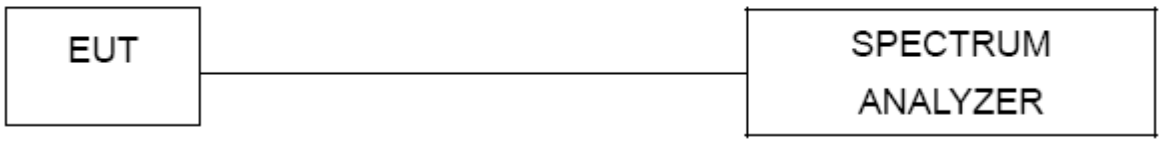
5.1.1 TEST PROCEDURE

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.

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

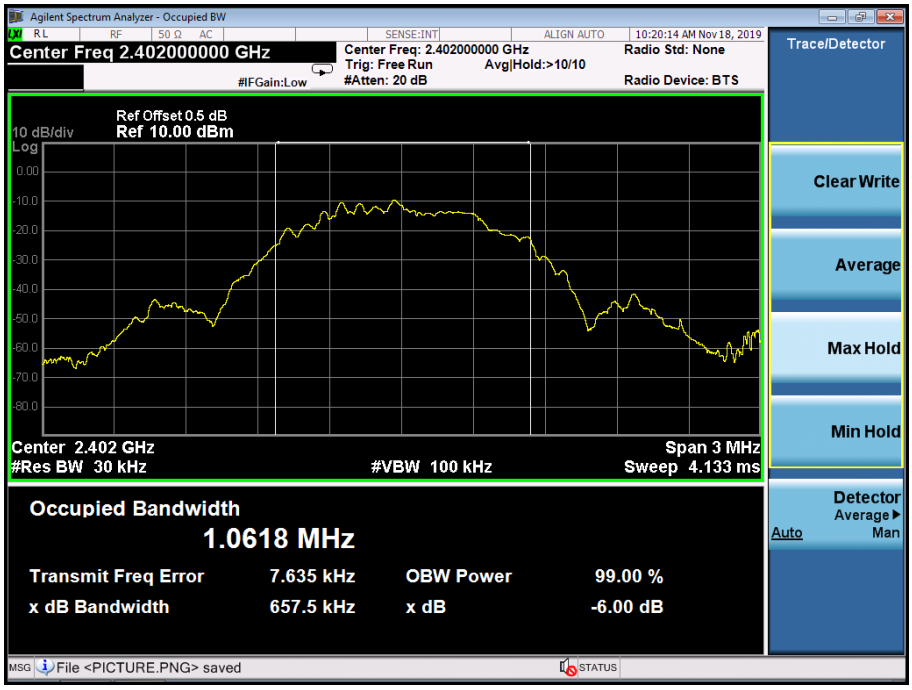
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 TEST RESULTS

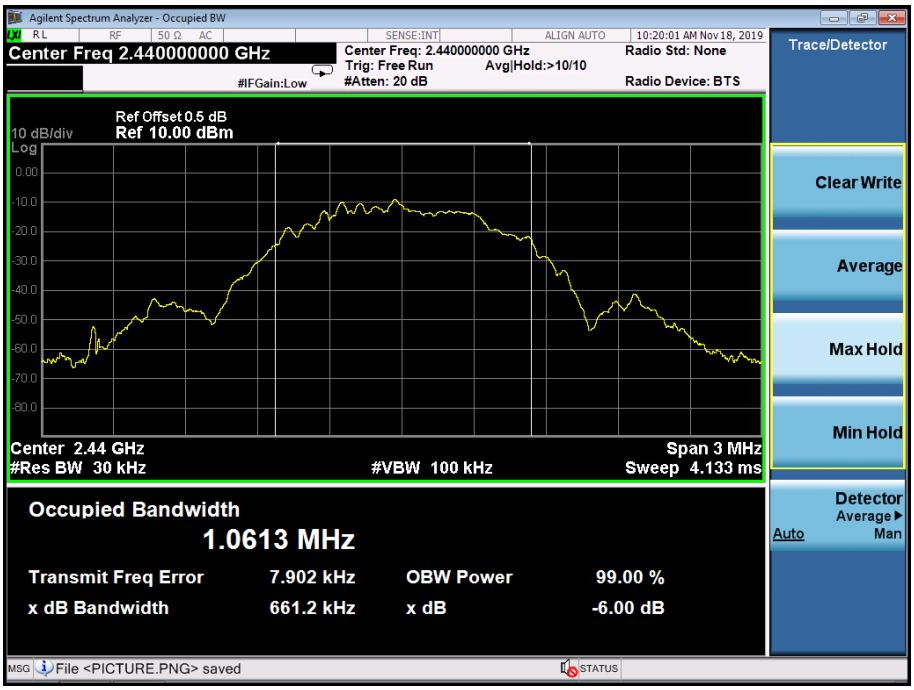
Temperature：	26℃	Relative Humidity：	54%
Test Mode ：	GFSK	Test Voltage ：	DC 3.7V

Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
2402	0.658	500	Pass
2440	0.661	500	Pass
2480	0.660	500	Pass

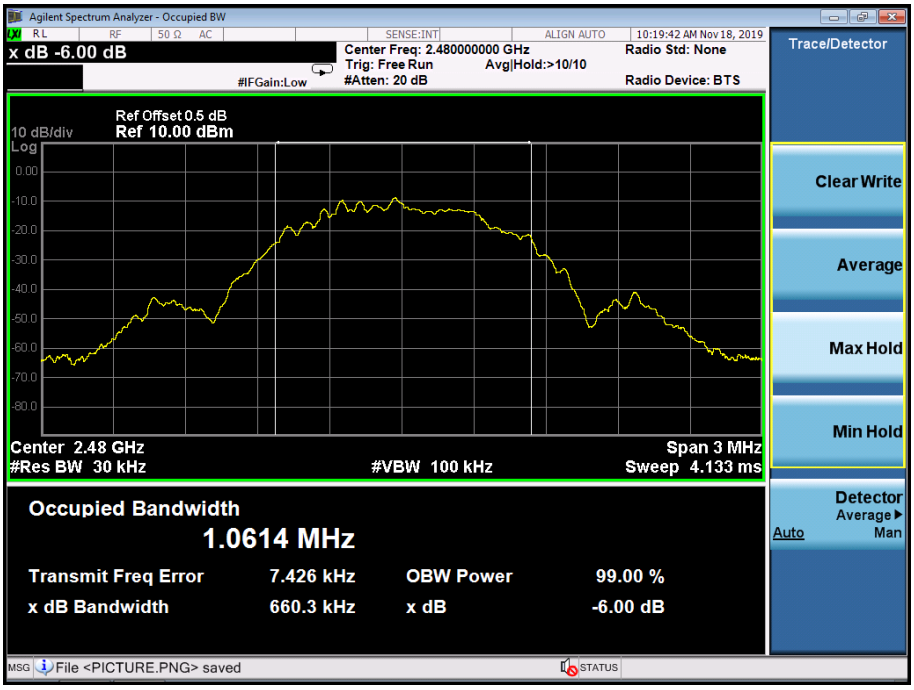
CH 01



CH20


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.440000000 GHz
Center Freq: 2.440000000 GHz
Trig: Free Run
#Atten: 20 dB
Avg|Hold:>10/10
Radio Std: None
Radio Device: BTS
10:20:01 AM Nov 18, 2019
Trace/Detector
Ref Offset 0.5 dB
10 dB/div
Ref 10.00 dBm
Log
Clear Write
Average
Max Hold
Min Hold
Center 2.44 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
1.0613 MHz
Transmit Freq Error 7.902 kHz
OBW Power 99.00 %
x dB Bandwidth 661.2 kHz
x dB -6.00 dB
Detector
Auto
Man
File <PICTURE.PNG> saved

CH40


Agilent Spectrum Analyzer - Occupied BW
x dB -6.00 dB
Center Freq: 2.480000000 GHz
Trig: Free Run
#Atten: 20 dB
Avg|Hold:>10/10
Radio Std: None
Radio Device: BTS
10:19:42 AM Nov 18, 2019
Trace/Detector
Ref Offset 0.5 dB
10 dB/div
Ref 10.00 dBm
Log
Clear Write
Average
Max Hold
Min Hold
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
1.0614 MHz
Transmit Freq Error 7.426 kHz
OBW Power 99.00 %
x dB Bandwidth 660.3 kHz
x dB -6.00 dB
Detector
Auto
Man
File <PICTURE.PNG> saved

6. PEAK OUTPUT POWER TEST

6.1 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

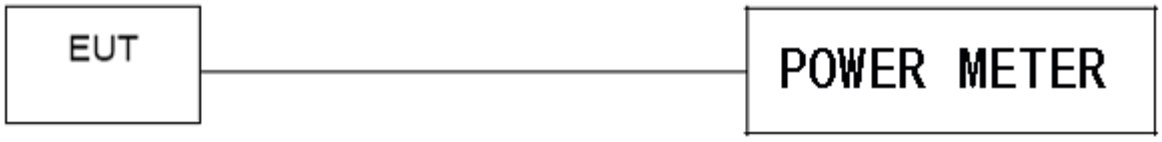
6.1.1 TEST PROCEDURE

a. The EUT was directly connected to the Power meter

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 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

6.1.5 TEST RESULTS

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

	Frequency	Maximum Conducted Output Power(PK)	Conducted Output Power Limit
	(MHz)	(dBm)	dBm
GFSK	2402	-5.05	30
	2440	-4.58	30
	2480	-4.38	30

7. 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE

7.1 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.

7.2 TEST PROCEDURE

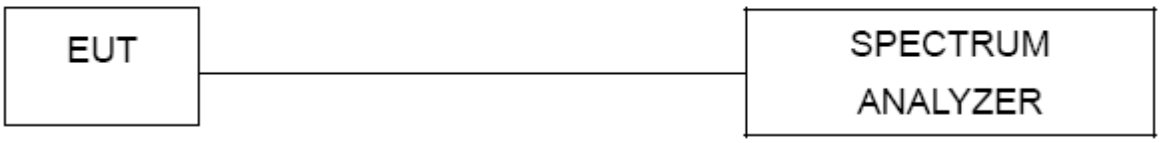
Using the following spectrum analyzer setting:

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.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP

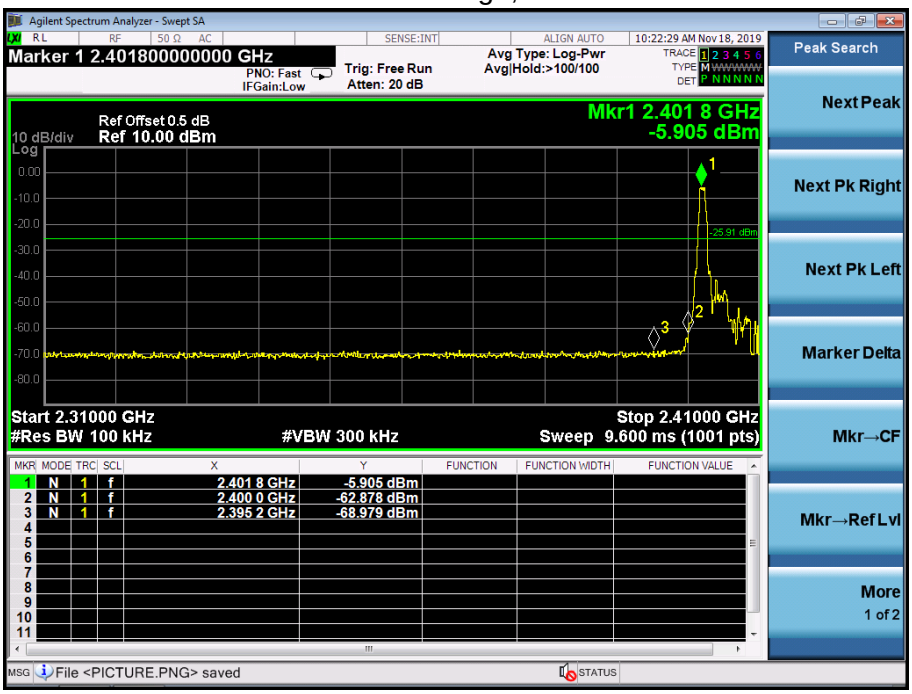


7.5 EUT OPERATION CONDITIONS

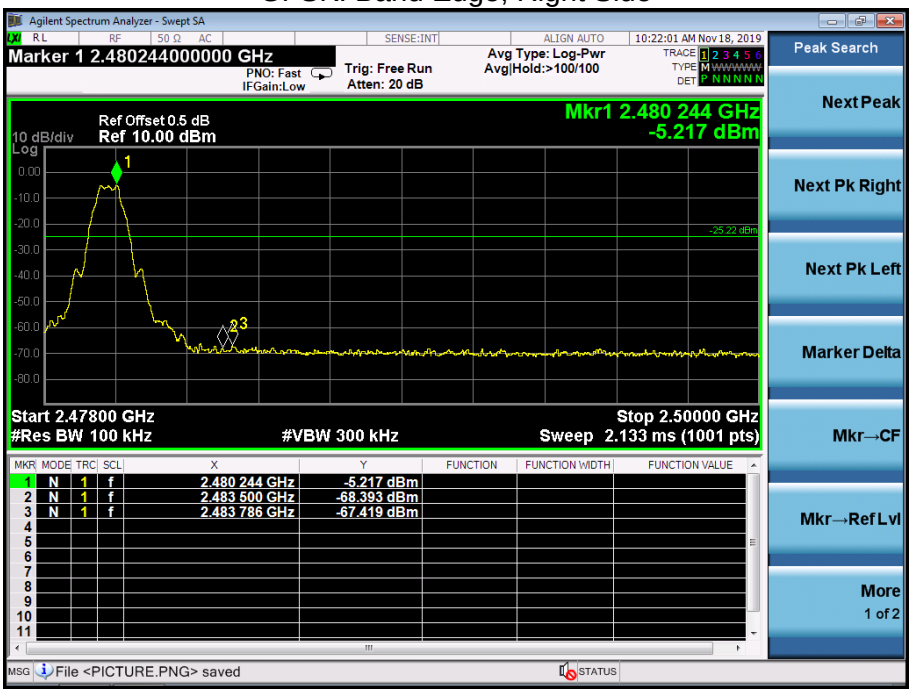
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

7.6 TEST RESULTS

GFSK: Band Edge, Left Side



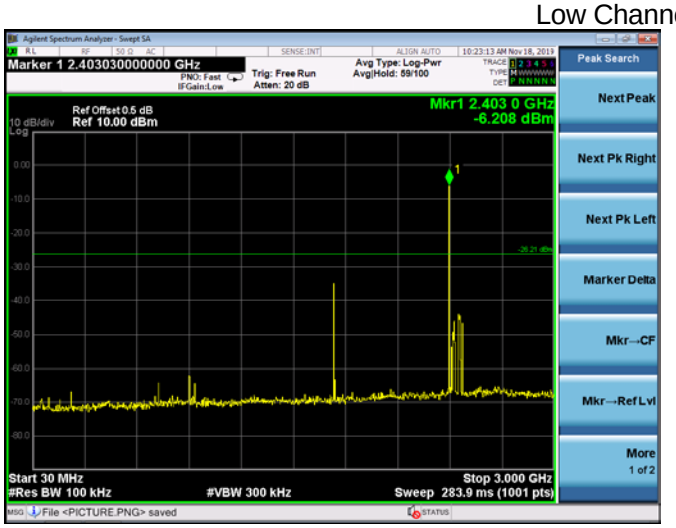
GFSK: Band Edge, Right Side



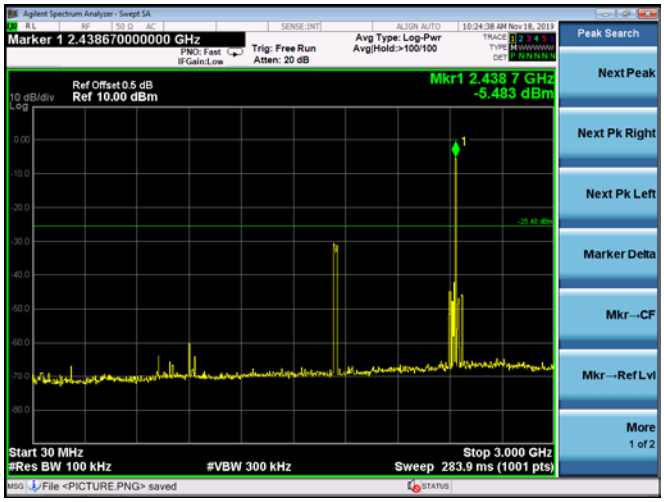
CONDUCTED EMISSION MEASUREMENT

GFSK

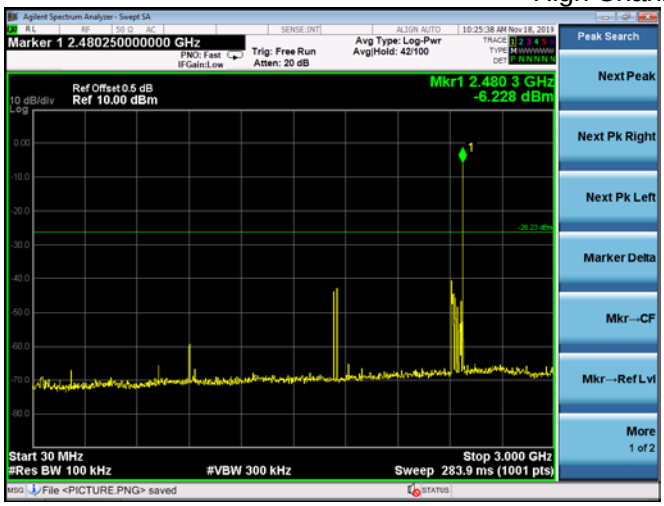
Low Channel 2402MHz



Middle Channel 2440MHz



High Channel 2480MHz



8. ANTENNA REQUIREMENT

8.1 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.

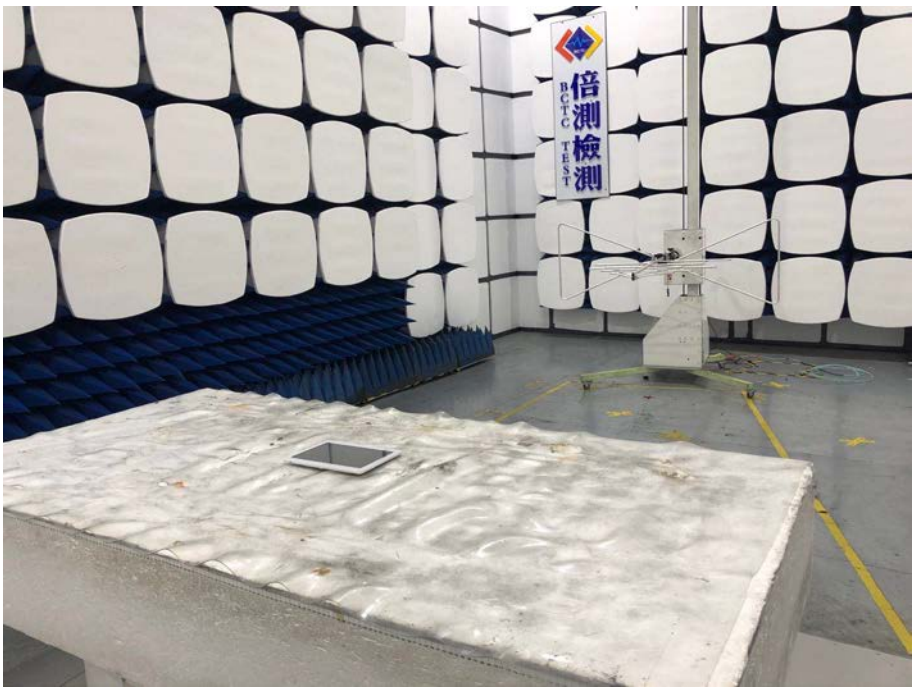
8.2 EUT ANTENNA

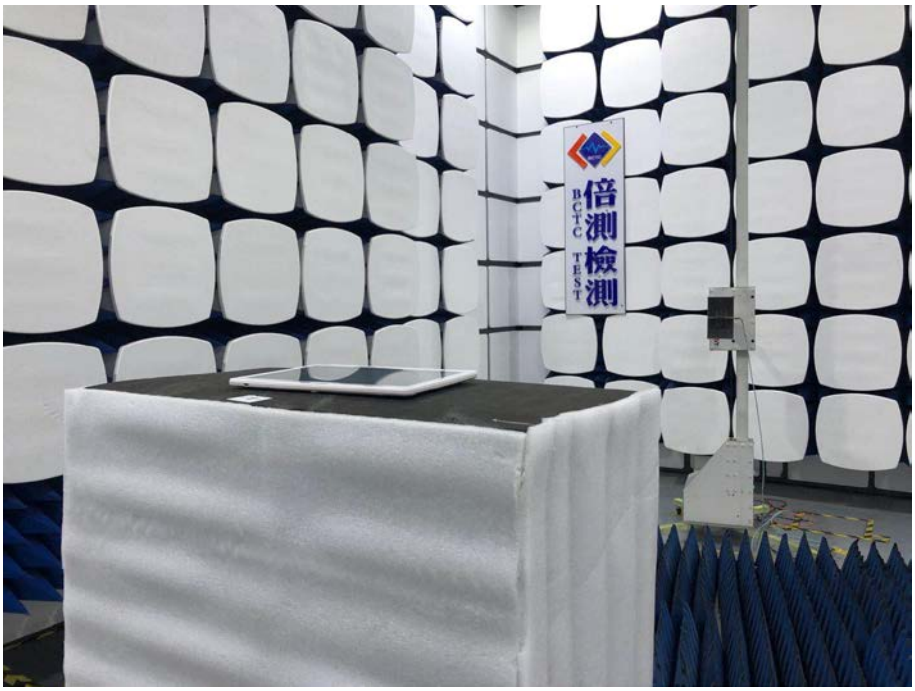
The EUT antenna is FPCB antenna, fulfill the requirement of this section.

9. EUT TEST PHOTO

Conducted Emission

Radiated Measurement Photos





10. EUT PHOTO

※※※※※ END OF REPORT ※※※※※