Shenzhen Global Test Service Co.,Ltd.
No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.....:	**GTS20190329001-1-38**
FCC ID..... :	**2AQAA-EZBOXZ8**
Compiled by (position+printed name+signature)..:	File administrators Jimmy Wang
Supervised by (position+printed name+signature)..:	Test Engineer Aaron Tan
Approved by (position+printed name+signature)..:	Manager Jason Hu
Date of issue.....:	Jun.18, 2019
Representative Laboratory Name .:	**Shenzhen Global Test Service Co.,Ltd.**
Address.....:	No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong
Applicant's name.....:	**SHENZHEN JUMPER TECHNOLOGY CO.,LTD**
Address .....:	101,102,201,301 No.13-2 Pingxi South Rd.,Pingxi Community,Pingdi Street,Longgang District, Shenzhen, China
Test specification .....:	
Standard .....:	**FCC Part 15.247**
TRF Originator.....:	Shenzhen Global Test Service Co.,Ltd.
Master TRF.....:	Dated 2014-12

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Test item description .....:	**MINI PC**
Trade Mark .....:	**/**
Manufacturer .....:	SHENZHEN JUMPER TECHNOLOGY CO.,LTD
Model/Type reference.....:	EZbox Z8
Listed Models .....:	**/**
Modulation Type .....:	GFSK
Operation Frequency.....:	From 2402MHz to 2480MHz
Hardware Version .....:	N/A
Software Version .....:	N/A
Rating .....:	DC 12V from adapter
Result.....:	**PASS**

T E S T R E P O R T

Test Report No. :	GTS20190329001-1-38	Jun. 18, 2019 Date of issue

Equipment under Test	:	**MINI PC**
Model /Type	:	EZbox Z8
Listed Models	:	/
Applicant	:	SHENZHEN JUMPER TECHNOLOGY CO.,LTD
Address	:	101,102,201,301 No.13-2 Pingxi South Rd.,Pingxi Community,Pingdi Street,Longgang District, Shenzhen, China
Manufacturer	:	SHENZHEN JUMPER TECHNOLOGY CO.,LTD
Address	:	101,102,201,301 No.13-2 Pingxi South Rd.,Pingxi Community,Pingdi Street,Longgang District, Shenzhen, China

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices
KDB558074 D01 v05r02: Guidance for Compliance Measurements on Digital Transmission Systems (DTS) ,Frequency Hopping Spread Spectrum System(HFSS), and Hybrid System Devices Operating Under §15.247 of The FCC rules.

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	May. 25, 2019
Testing commenced on	:	Jun. 12, 2019
Testing concluded on	:	Jun. 18, 2019

2.2. Product Description

Product Name:	**MINI PC**
Trade Mark:	/
Model/Type reference:	EZbox Z8
Antenna Type	FPC antenna
Power supply:	DC 12V from adapter
Adapter information:	Model: JHD-AP024U-120200BA-A Input: AC 100-240V～50/60Hz 0.45A Output:DC 12V/2A
WIFI	
WLAN	Supported 802.11 a/b/g/n
Modulation Type	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
Operation frequency	IEEE 802.11a:5180-5240MHz,5745-5825MHz IEEE 802.11b:2412-2472MHz IEEE 802.11g:2412-2472MHz IEEE 802.11n HT20:2412-2472MHz, 5180-5240MHz,5745-5825MHz IEEE 802.11n HT40:2422-2462MHz, 5190-5230MHz,5755-5795MHz
Antenna gain	1.82dBi for 2.4G WIFI/1.23dBi for 5G WIFI
BT/EDR	
Modulation Type	GFSK,8DPSK,π/4-DQPSK
Operation frequency	2402-2480MHz
Antenna gain	1.82dBi Max
BLE	
Modulation Type	GFSK
Operation frequency	2402-2480MHz
Antenna gain	1.82dBi Max

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	○	120V / 60Hz
		●	12 V DC	○	24 V DC
		○	Other (specified in blank below)		

2.4. Short description of the Equipment under Test (EUT)

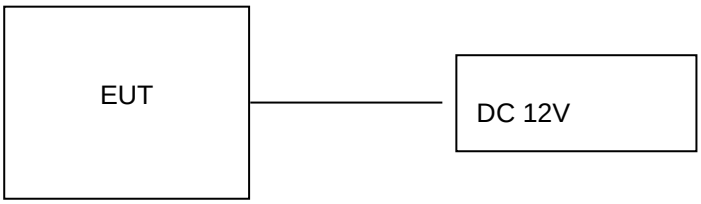
This is a **MINI PC**.

2.5. EUT operation mode

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 40 channels provided to the EUT. Channel 00/19/39 was selected to test.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
0	**2402**	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	**2440**	**39**	**2480**

2.6. Block Diagram of Test Setup



2.7. Special Accessories

Manufacturer	Description	Model	Serial Number	Certificate
AOC	HDMI display	Satellite S40Dt-A	D26T	DOC

2.8. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AQAA-EZBOXZ8** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.9. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.
No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS (No. CNAS L8169)
Shenzhen Global Test Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2019 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)
Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

3.3. Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Test Description

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(e)	Power spectral density	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.247(b)(1)	Maximum output power	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒ ☒ ☒	☐	☐	☐	complies
§15.247(d)	Band edge compliance conducted	GFSK	☒ Lowest ☒ Highest	GFSK	☒ Lowest ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.205	Band edge compliance radiated	GFSK	☒ Lowest ☒ Highest	GFSK	☒ Lowest ☒ Highest	☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions conducted	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions radiated	GFSK	☒ Lowest ☒ Middle ☒ Highest	GFSK	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	☒	☐	☐	☐	complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	GFSK	-/-	GFSK	-/-	☒	☐	☐	☐	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	GFSK	-/-	GFSK	-/-	☒	☐	☐	☐	complies

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Global Test Service Co.,Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.
Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

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

3.6. Equipments Used during the Test

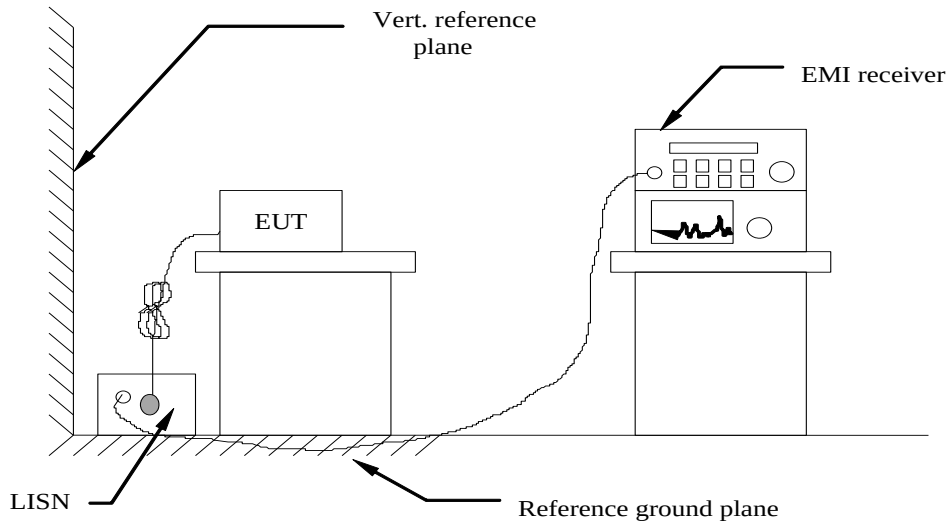
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.08	2018/09/28	2019/09/27
LISN	R&S	ESH2-Z5	893606/008	2018/09/27	2019/09/26
By-log Antenna	SCHWARZBECK	VULB9163	000976	2018/09/29	2019/09/28
EMI Test Receiver	R&S	ESCI	101102	2018/09/26	2019/09/25
Spectrum Analyzer	Agilent	N9020A	MY48010425	2018/09/17	2019/09/16
Spectrum Analyzer	R&S	FSV40-N	101800	2018/09/17	2019/09/16
Controller	EM Electronics	Controller EM 1000	N/A	2018/09/21	2019/09/20
Double Ridged Horn Antenna (1~18GHz)	SCHWARZBECK	BBHA 9120D	01622	2018/09/19	2019/09/18
Double Ridged Horn Antenna	Rohde&Schwarz	HF907	100265	2018/09/19	2019/09/18
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2018/09/19	2019/09/18
Horn Antenna (18GHz~40GHz)	ETS	3116	00086467	2018/12/29	2019/12/28
Amplifier (26.5GHz~40GHz)	EMCI	EMC2654045	980028	2018/09/18	2019/09/17
Amplifier (0.1GHz~26.5GHz)	EMCI	EMC012645SE	980355	2018/09/19	2019/09/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2018/09/20	2019/09/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2018/09/20	2019/09/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2018/09/20	2019/09/19
Data acquisition card	Agilent	U2531A	TW53323507	2018/09/20	2019/09/19
Power Sensor	Agilent	U2021XA	MY5365004	2018/09/20	2019/09/19
RF Cable	HUBER+SUHNER	RG214	N/A	2018/09/20	2019/09/19
Conducted Emission Test Software	ES-K1	V1.71	N/A	N/A	N/A
Radiated Emission Test Software	JS32-RE	V2.5.0.9	N/A	N/A	N/A

Note: 1. The Cal.Interval was one year.

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4 The EUT received DC5V power, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

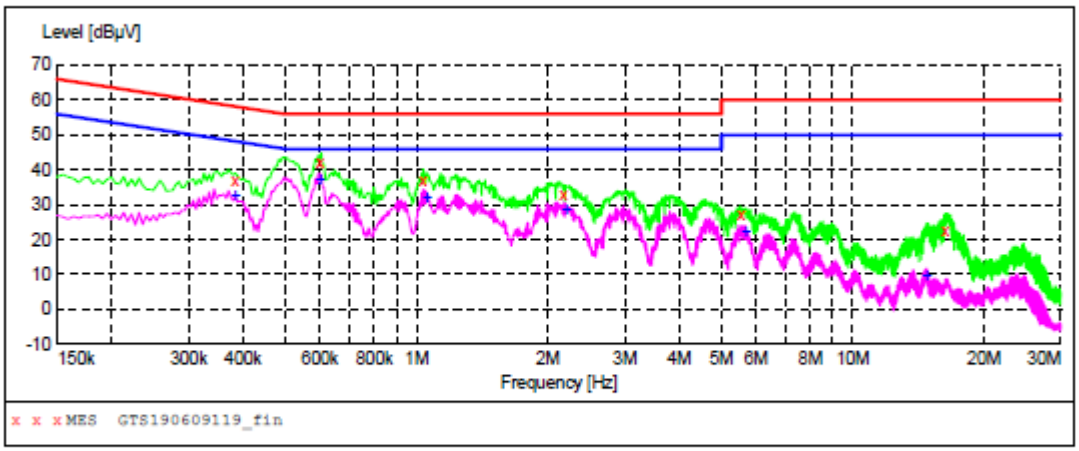
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

TEST RESULTS

Power supply:	DC 12V from adapter	Polarization	L

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "GTS190609119_fin"

6/6/2019 10:54AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.384000	36.70	9.8	58	21.5	QP	L1	GND
0.600000	42.30	9.7	56	13.7	QP	L1	GND
1.032000	36.70	9.6	56	19.3	QP	L1	GND
2.170500	33.20	9.5	56	22.8	QP	L1	GND
5.550000	27.30	9.2	60	32.7	QP	L1	GND
16.300500	22.40	7.8	60	37.6	QP	L1	GND

MEASUREMENT RESULT: "GTS190609119_fin2"

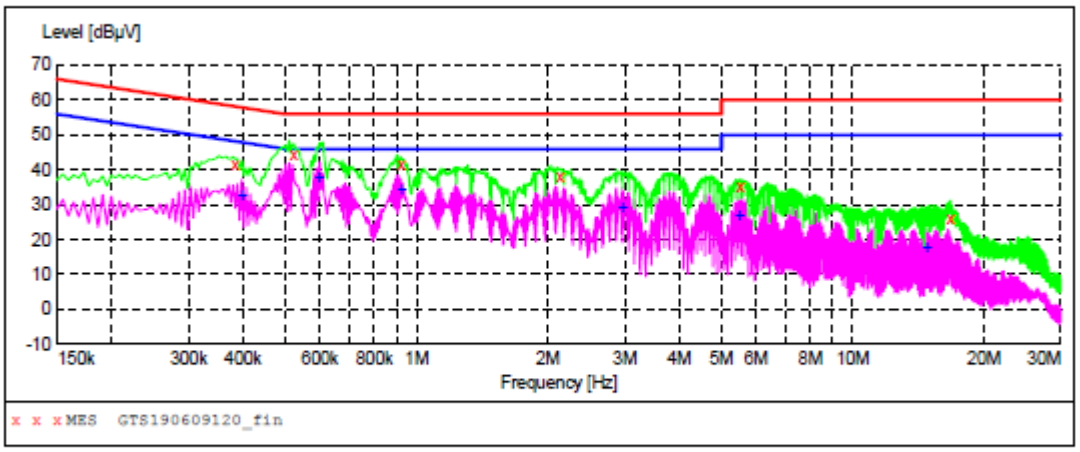
6/6/2019 10:54AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.384000	32.80	9.8	48	15.4	AV	L1	GND
0.600000	37.80	9.7	46	8.2	AV	L1	GND
1.054500	32.30	9.6	46	13.7	AV	L1	GND
2.202000	29.00	9.5	46	17.0	AV	L1	GND
5.676000	22.50	9.2	50	27.5	AV	L1	GND
14.784000	9.70	8.2	50	40.3	AV	L1	GND

Power supply:	DC 12V from adapter	Polarization	N

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "GTS190609120_fin"

6/6/2019 10:57AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.384000	41.30	9.8	58	16.9	QP	N	GND
0.523500	44.60	9.8	56	11.4	QP	N	GND
0.924000	41.30	9.6	56	14.7	QP	N	GND
2.134500	38.20	9.5	56	17.8	QP	N	GND
5.532000	35.30	9.2	60	24.7	QP	N	GND
16.746000	26.00	7.7	60	34.0	QP	N	GND

MEASUREMENT RESULT: "GTS190609120_fin2"

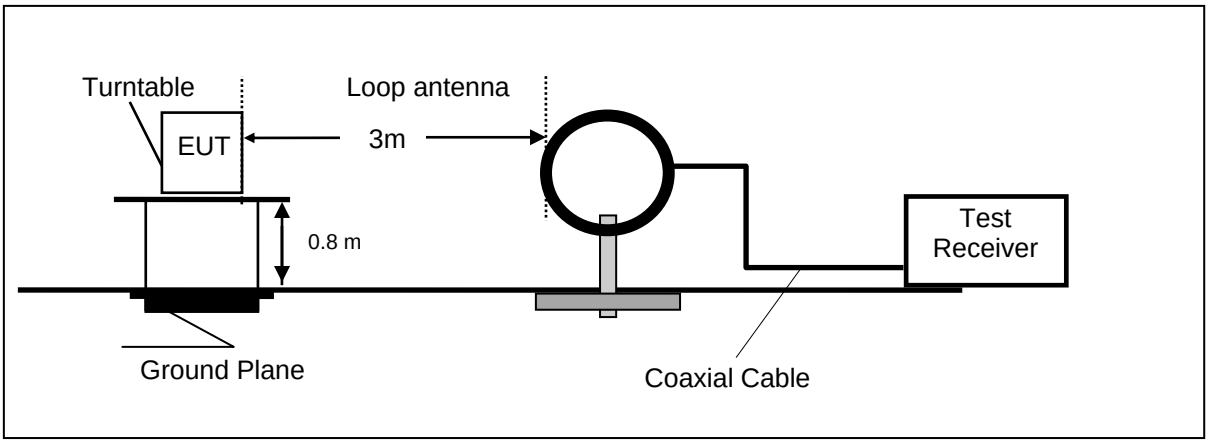
6/6/2019 10:57AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.397500	32.90	9.8	48	15.0	AV	N	GND
0.595500	38.00	9.7	46	8.0	AV	N	GND
0.924000	34.60	9.6	46	11.4	AV	N	GND
2.962500	29.70	9.5	46	16.3	AV	N	GND
5.482500	27.10	9.3	50	22.9	AV	N	GND
14.788500	18.20	8.2	50	31.8	AV	N	GND

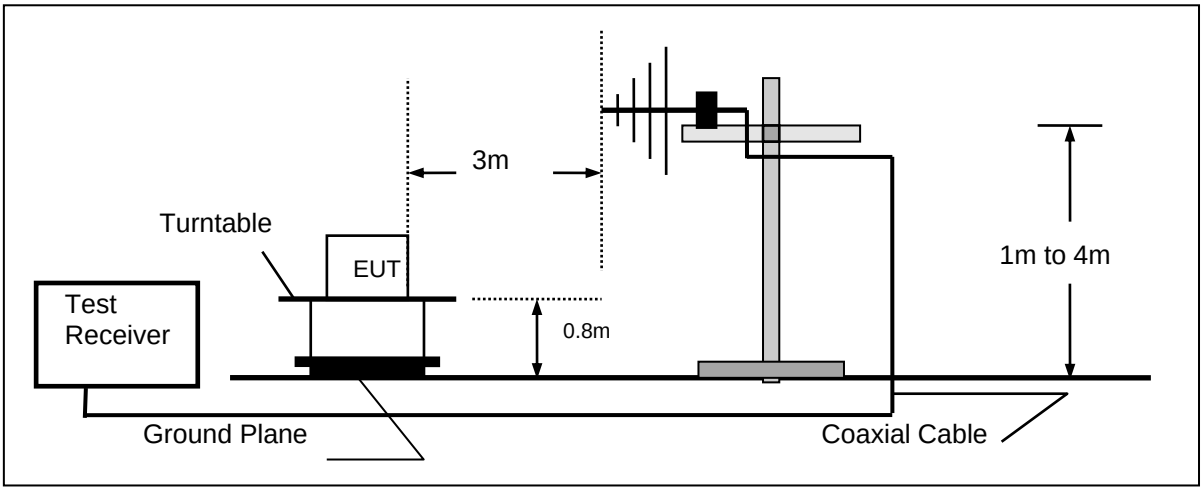
4.2. Radiated Emission

TEST CONFIGURATION

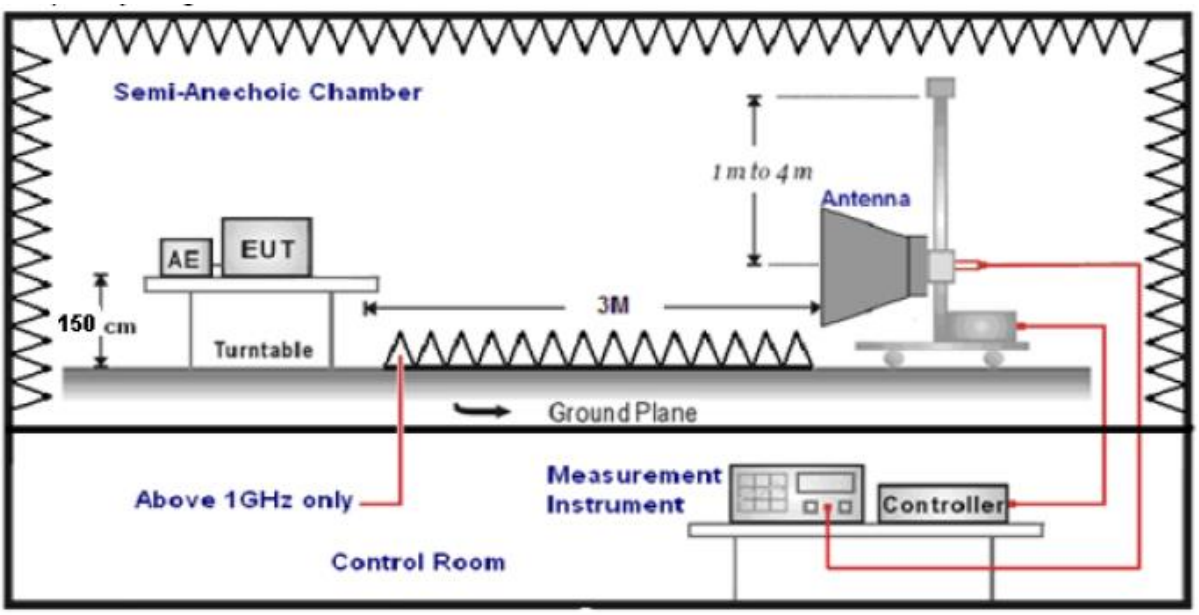
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

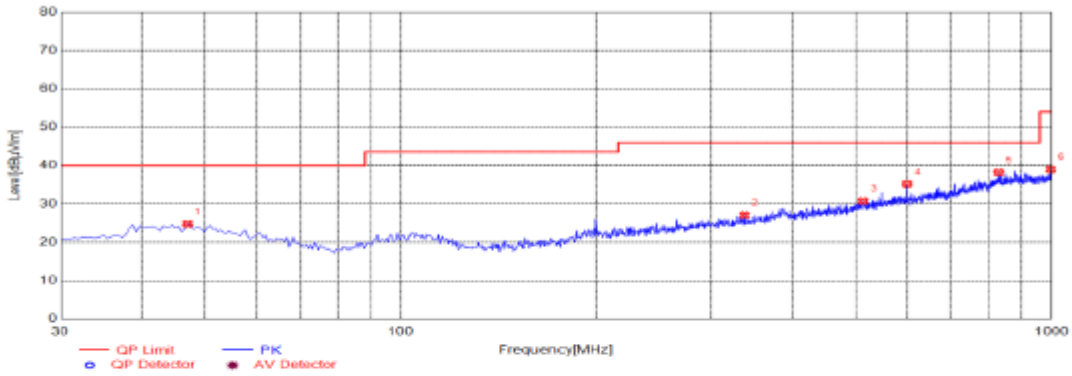
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

For 30MHz to 1000MHz

Horizontal

Test Graph

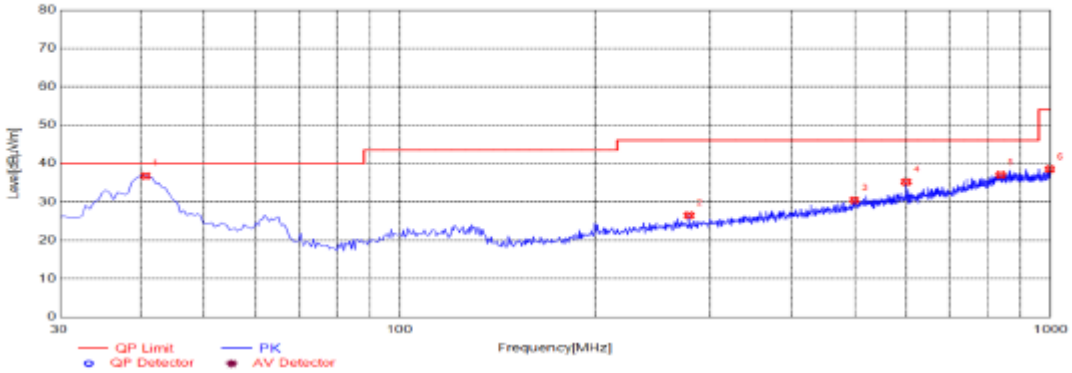


Suspected List

NO.	Freq. [MHz]	Polarity	Height [cm]	Angle [°]	Limit [dBμV/m]	Level [dBμV/m]	Factor [dB]	Reading[dBμV/m]	Margin [dB]
1	46.9750	Horizontal	100	34	40.00	24.79	-14.80	39.59	15.21
2	337.490	Horizontal	100	86	46.00	27.01	-13.30	40.31	18.99
3	513.545	Horizontal	100	345	46.00	30.73	-9.34	40.07	15.27
4	600.360	Horizontal	100	112	46.00	35.16	-7.92	43.08	10.84
5	829.765	Horizontal	100	13	46.00	38.18	-4.04	42.22	7.82
6	997.575	Horizontal	100	103	54.00	39.00	-3.16	42.16	15.00

Vertical

Test Graph



Suspected List

NO.	Freq. [MHz]	Polarity	Height [cm]	Angle [°]	Limit [dBμV/m]	Level [dBμV/m]	Factor [dB]	Reading[dBμV/m]	Margin [dB]
1	40.6700	Vertical	100	6	40.00	36.80	-15.79	52.59	3.20
2	278.320	Vertical	100	4	46.00	26.48	-14.49	40.97	19.52
3	499.480	Vertical	100	181	46.00	30.48	-9.74	40.22	15.52
4	600.360	Vertical	100	204	46.00	35.22	-7.92	43.14	10.78
5	838.495	Vertical	100	347	46.00	37.06	-4.48	41.54	8.94
6	997.575	Vertical	100	123	54.00	38.56	-3.16	41.72	15.44

For 1GHz to 25GHz

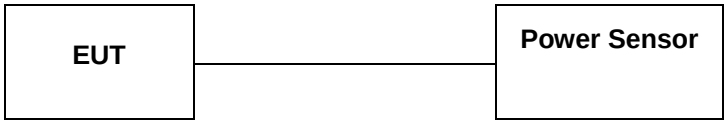
Frequency	Meter Reading	Antenna Factor	Cable loss	Preamp factor	Emission Level	Limits	Margin	Detector Type	Comment
(MHz)	(dBμV)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
TX-2402									
4804	45.93	32.44	30.25	7.95	56.07	74	-17.93	Pk	Vertical
4804	35.05	32.44	30.25	7.95	45.19	54	-8.81	AV	Vertical
4804	39.73	32.44	30.25	7.95	49.87	74	-24.13	Pk	Horizontal
4804	31.86	32.44	30.25	7.95	42	54	-12	AV	Horizontal
TX-2440									
4880	45.67	32.52	30.31	8.12	56	74	-18	Pk	Vertical
4880	34.08	32.52	30.31	8.12	44.41	54	-9.59	AV	Vertical
4880	39.26	32.52	30.31	8.12	49.59	74	-24.41	Pk	Horizontal
4880	29.72	32.52	30.31	8.12	40.05	54	-13.95	AV	Horizontal
TX-2480									
4960	45.57	32.68	30.27	7.88	55.86	74	-18.14	Pk	Vertical
4960	34.11	32.68	30.27	7.88	44.4	54	-9.6	AV	Vertical
4960	40.4	32.68	30.27	7.88	50.69	74	-23.31	Pk	Horizontal
4960	31.83	32.68	30.27	7.88	42.12	54	-11.88	AV	Horizontal

REMARKS:

1. Emission level (dBuV/m) = Meter Reading+ antenna Factor+ cable loss- preamp factor
2. Margin value = Emission level-Limits
3. -- Mean the PK detector measured value is below average limit.
4. The other emission levels were very low against the limit.
5. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power,9.1.2.
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

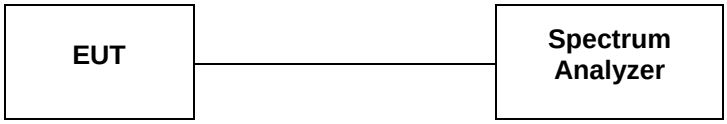
TEST RESULTS

Type	Channel	Peak Output power (dBm)	Limit (dBm)	Result
GFSK	0	0.0	30	Pass
	19	-0.5		
	39	-1.0		

Note: 1.The test results including the cable lose.

4.4. Power Spectral Density

TEST CONFIGURATION



TEST PROCEDURE

1.Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2.Set the RBW =3 kHz.
3.Set the VBW =10 KHz.
4.Set the span to 1.5 times the DTS channel bandwidth.
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 power level.
10.If measured value exceeds limit,reduce RBW(no less than 3 kHz)and repeat.
11.The resulting peak PSD level must be 8 dBm.

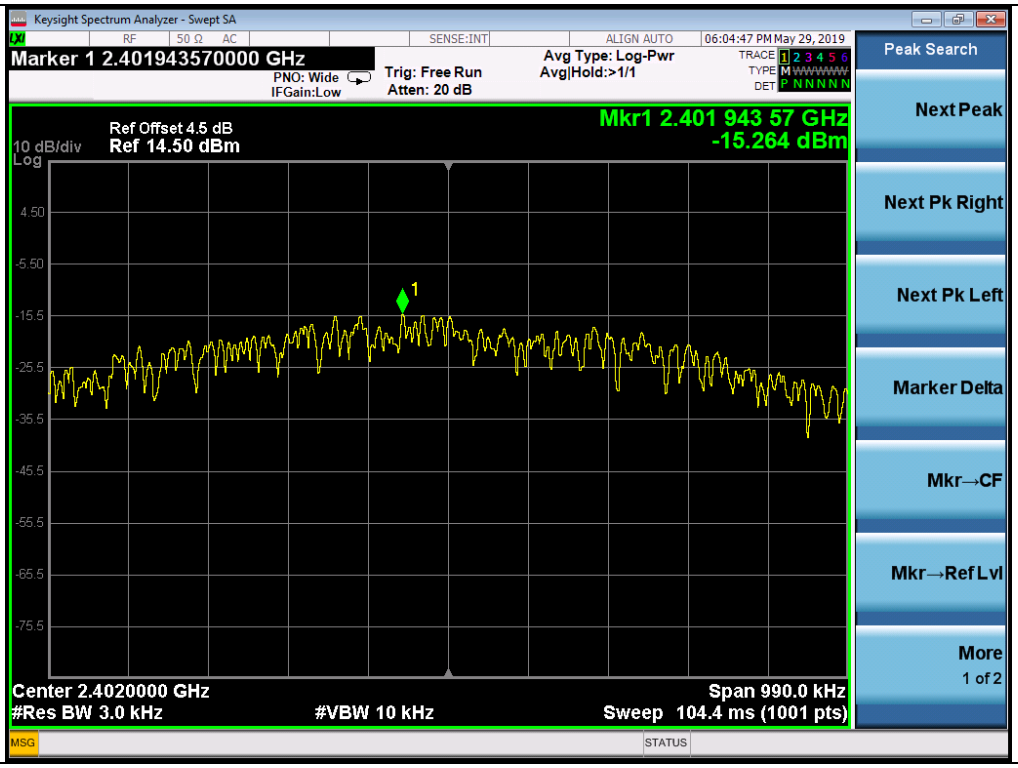
LIMIT

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

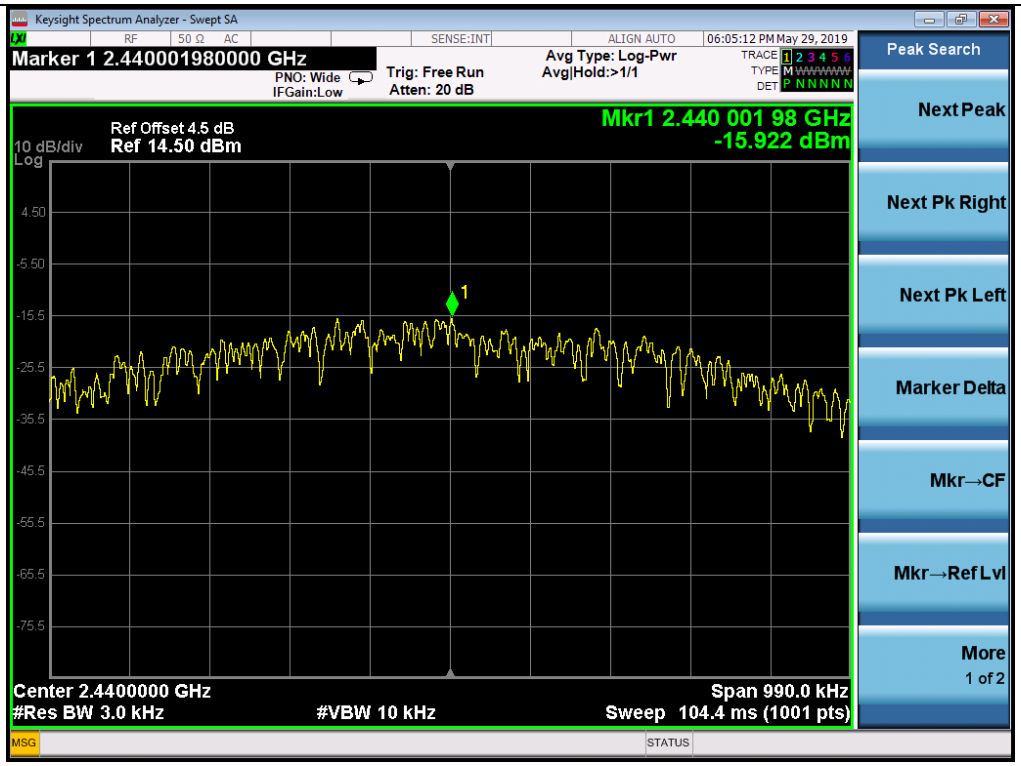
TEST RESULTS

Type	Channel	Power Spectral Density	Limit (dBm/3KHz)	Result
GFSK	0	-15.264	8.00	Pass
	19	-15.922		
	39	-17.221		

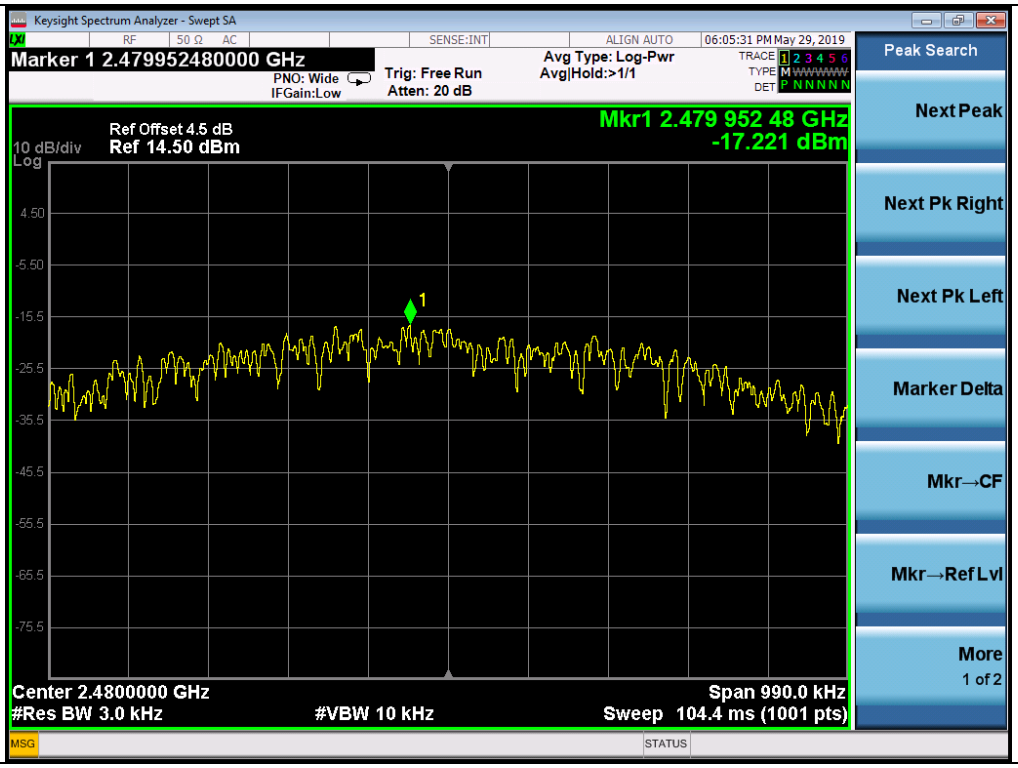
CH00


Keysight Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
06:04:47 PM May 29, 2019
Marker 1 2.401943570000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>1/1
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 4.5 dB
10 dB/div Ref 14.50 dBm
Log
Mkr1 2.401 943 57 GHz
-15.264 dBm
4.50
-5.50
-15.5
-25.5
-35.5
-45.5
-55.5
-65.5
-75.5
Center 2.4020000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 990.0 kHz
Sweep 104.4 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

CH19

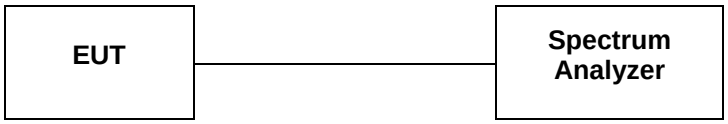

Keysight Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
06:05:12 PM May 29, 2019
Marker 1 2.440001980000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>1/1
TRACE 1 2 3 4 5 6
TYPE M
DET P N N N N N
Ref Offset 4.5 dB
10 dB/div Ref 14.50 dBm
Log
Mkr1 2.440 001 98 GHz
-15.922 dBm
4.50
-5.50
-15.5
-25.5
-35.5
-45.5
-55.5
-65.5
-75.5
Center 2.4400000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 990.0 kHz
Sweep 104.4 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

CH39


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.479952480000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>1/1
06:05:31 PM May 29, 2019
Ref Offset 4.5 dB
10 dB/div
Ref 14.50 dBm
Log
Mkr1 2.479 952 48 GHz
-17.221 dBm
Center 2.4800000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 990.0 kHz
Sweep 104.4 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

4.5. 6dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz.
The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.
According to KDB558074 D01 V03 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 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.

LIMIT

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

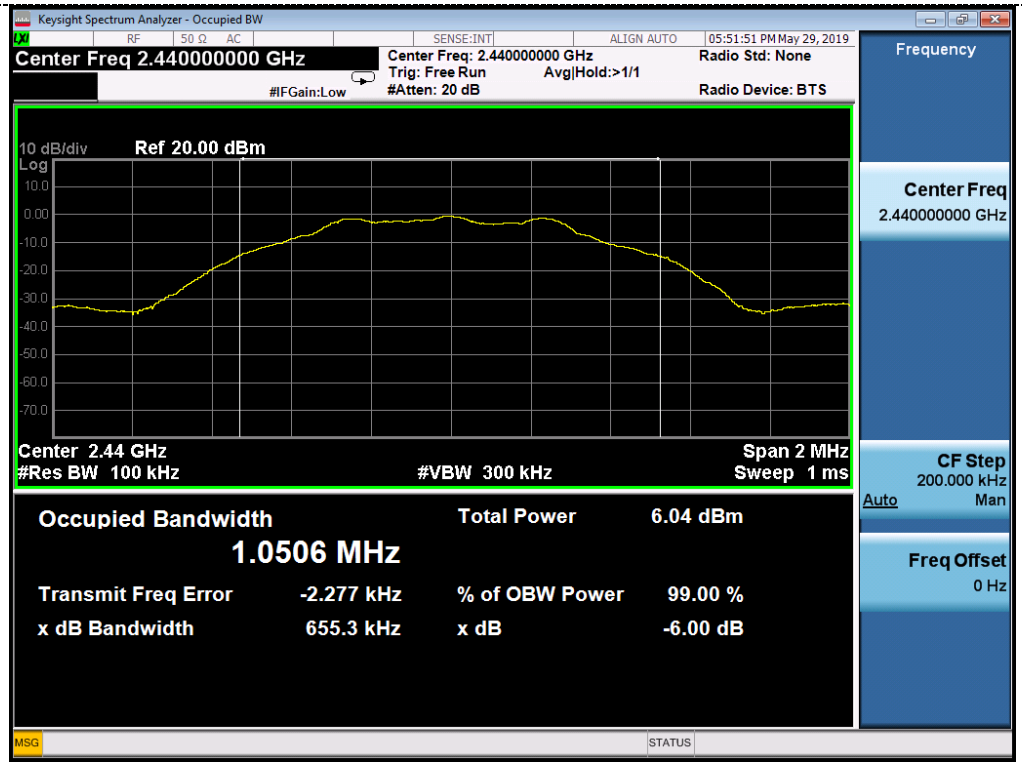
TEST RESULTS

Type	Channel	6dB Bandwidth (KHz)	Limit (KHz)	Result
GFSK	0	653.6	≥500	Pass
	19	655.3		
	39	659.8		

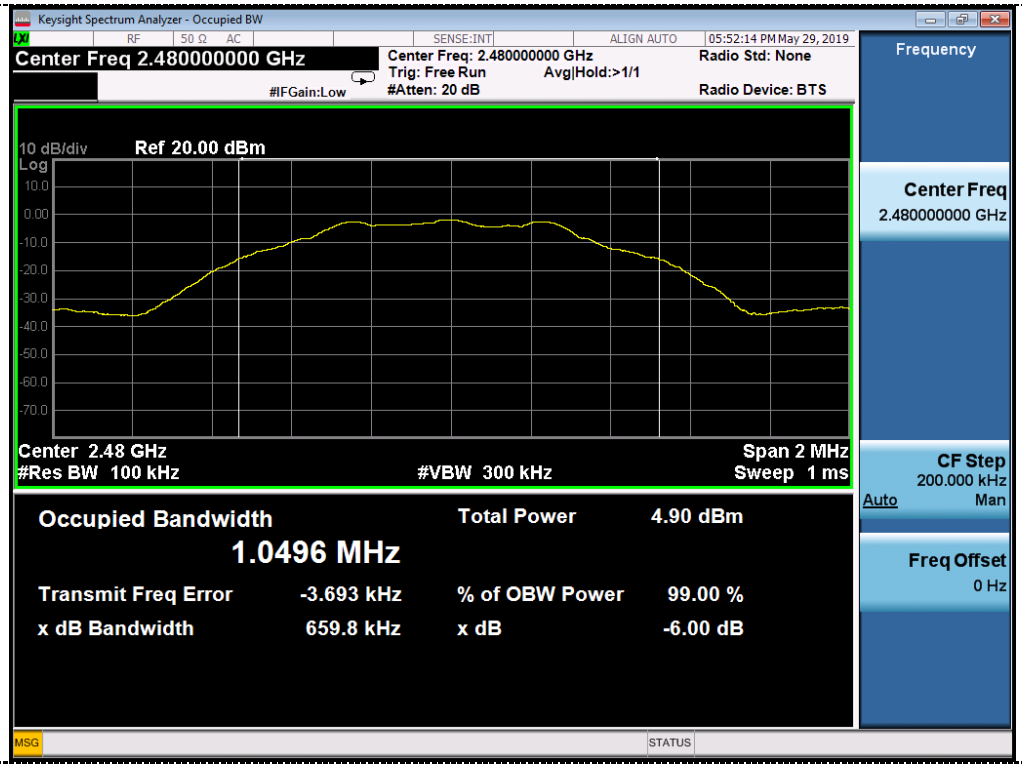
CH00

Keysight Spectrum Analyzer - Occupied BW
Center Freq 2.402000000 GHz
Center Freq: 2.402000000 GHz
Trig: Free Run
Avg|Hold:>1/1
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
05:51:14 PM May 29, 2019
#IFGain:Low
10 dB/div
Ref 20.00 dBm
Center 2.402 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 2 MHz
Sweep 1 ms
Occupied Bandwidth
1.0566 MHz
Total Power 6.53 dBm
Transmit Freq Error -3.592 kHz
% of OBW Power 99.00 %
x dB Bandwidth 653.6 kHz
x dB -6.00 dB
Trace/Detector
Clear Write
Average
Max Hold
Min Hold
Detector
Peak
Auto Man
MSG
STATUS

CH19


Keysight Spectrum Analyzer - Occupied BW
Center Freq 2.440000000 GHz
Center Freq: 2.440000000 GHz
Trig: Free Run
Avg|Hold:>1/1
#Atten: 20 dB
Radio Std: None
Radio Device: BTS
05:51:51 PM May 29, 2019
#IFGain:Low
10 dB/div
Ref 20.00 dBm
Center 2.44 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 2 MHz
Sweep 1 ms
Occupied Bandwidth
1.0506 MHz
Total Power 6.04 dBm
Transmit Freq Error -2.277 kHz
% of OBW Power 99.00 %
x dB Bandwidth 655.3 kHz
x dB -6.00 dB
Frequency
Center Freq
2.440000000 GHz
CF Step
200.000 kHz
Auto Man
Freq Offset
0 Hz
MSG
STATUS

CH39

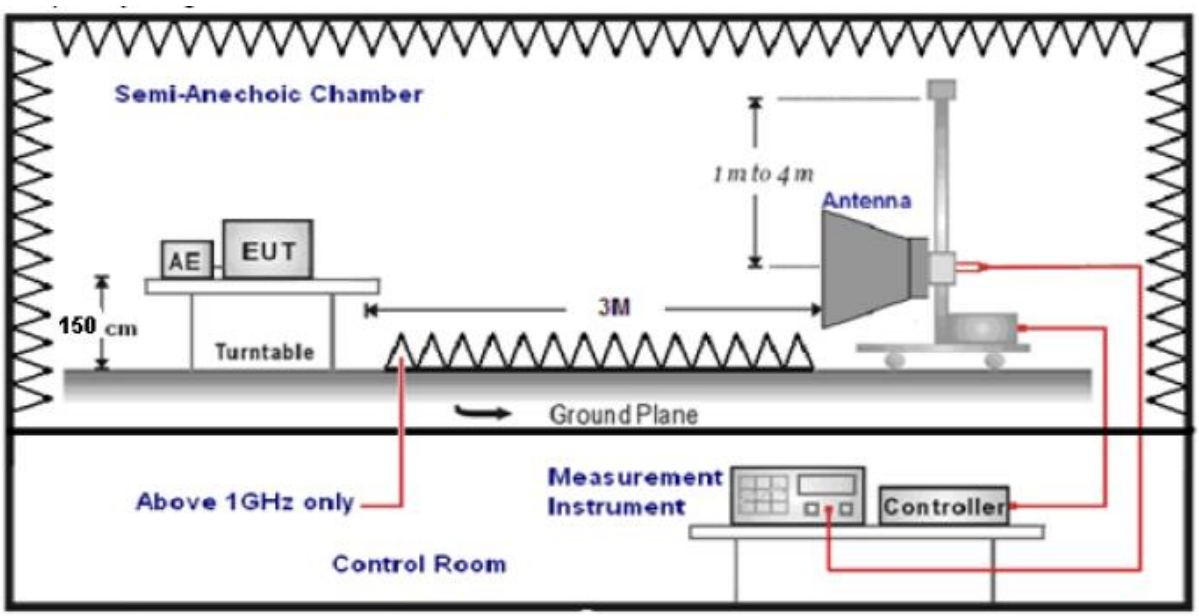

Keysight Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
05:52:14 PM May 29, 2019
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>1/1
#Atten: 20 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Frequency
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 2 MHz
Sweep 1 ms
CF Step
200.000 kHz
Auto
Man
Occupied Bandwidth
1.0496 MHz
Total Power 4.90 dBm
Transmit Freq Error -3.693 kHz
% of OBW Power 99.00 %
x dB Bandwidth 659.8 kHz
x dB -6.00 dB
Freq Offset
0 Hz
MSG
STATUS

4.6. Band Edge Compliance of RF Emission

TEST REQUIREMENT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was placed on a turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed..
5. The distance between test antenna and EUT was 3 meter:
6. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

LIMIT

Below -20dB of the highest emission level in operating band.
Radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)

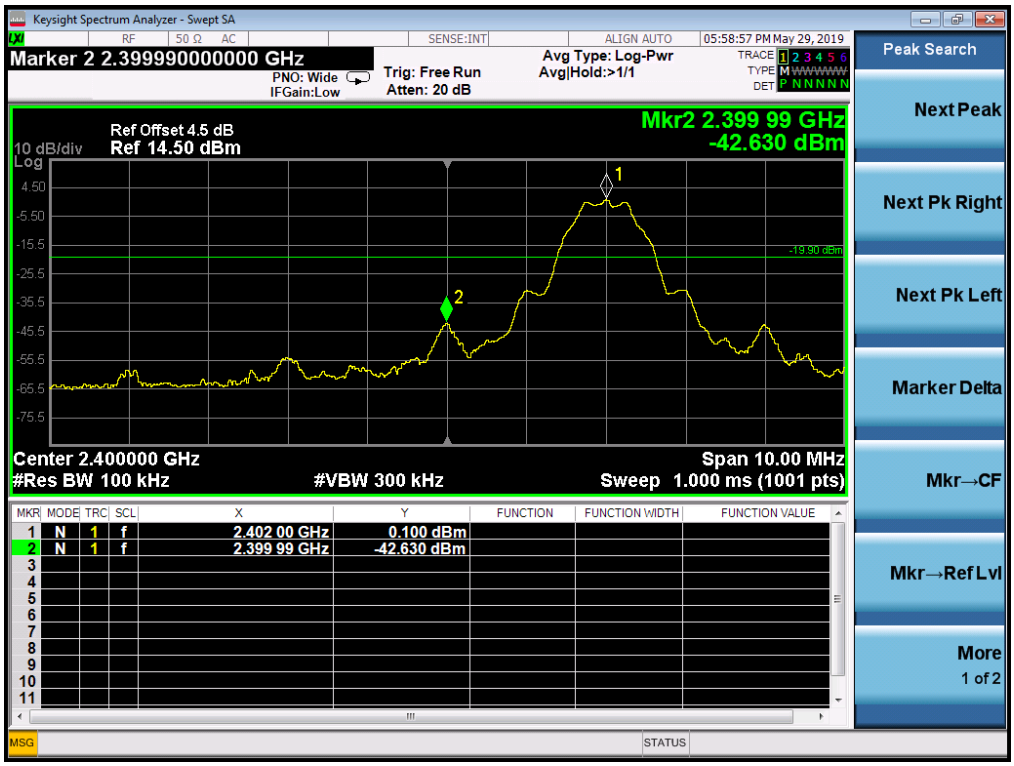
TEST RESULTS

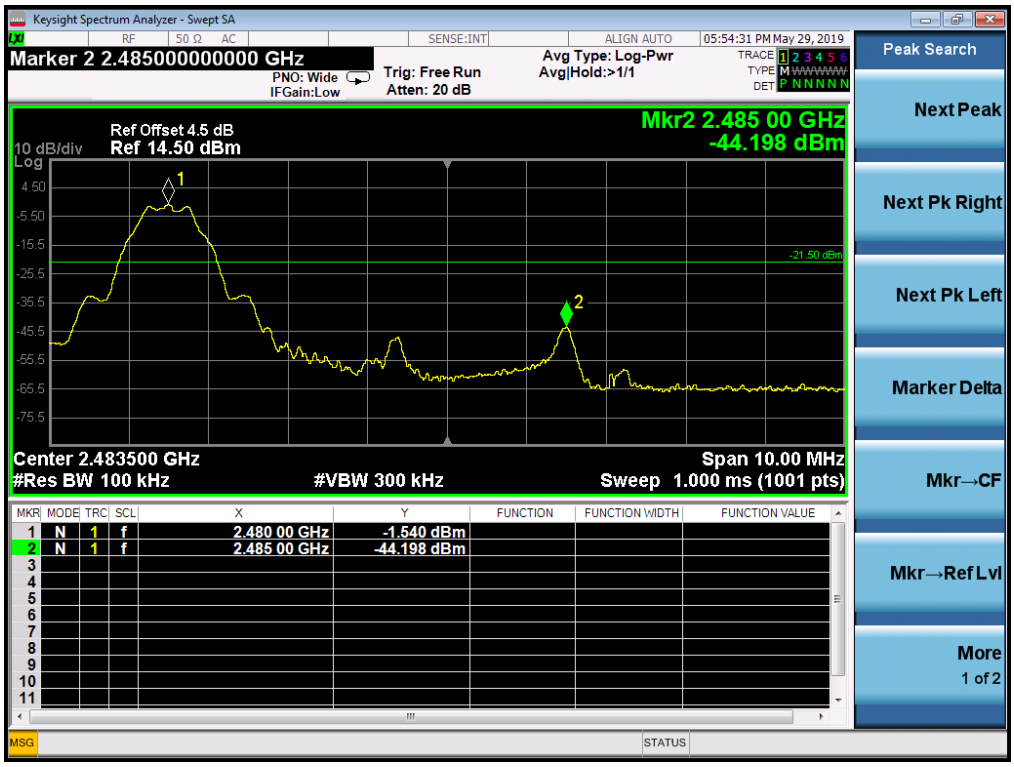
4.6.1 For Radiated Bandedge Measurement

Frequency(MHz):			**2402**			**Polarity:**			**HORIZONTAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2390	48.4	PK	74	25.6	1	163	53.71	27.49	3.32	36.12	-5.31
2390	38.52	AV	54	15.48	1	163	43.83	27.49	3.32	36.12	-5.31
Frequency(MHz):			**2402**			**Polarity:**			**VERTICAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2390	48.94	PK	74	25.06	1	295	54.25	27.49	3.32	36.12	-5.31
2390	39.22	AV	54	14.78	1	295	44.53	27.49	3.32	36.12	-5.31
Frequency(MHz):			**2480**			**Polarity:**			**HORIZONTAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2483.5	48.47	PK	74	24.67	1	110	54.19	27.45	3.38	36.55	-5.72
2483.5	38.77	AV	54	12.37	1	110	44.49	27.45	3.38	36.55	-5.72
Frequency(MHz):			**2480**			**Polarity:**			**VERTICAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
2483.5	48.67	PK	74	24.67	1	177	54.39	27.45	3.38	36.55	-5.72
2483.5	38.99	AV	54	12.37	1	177	44.71	27.45	3.38	36.55	-5.72

NOTE:
Emission level (dBuV/m) = Meter Reading+ antenna Factor+ cable loss- preamp factor
Margin value = Limits-Emission level

4.6.2 For Conducted Bandedge Measurement





4.7. Antenna Requirement

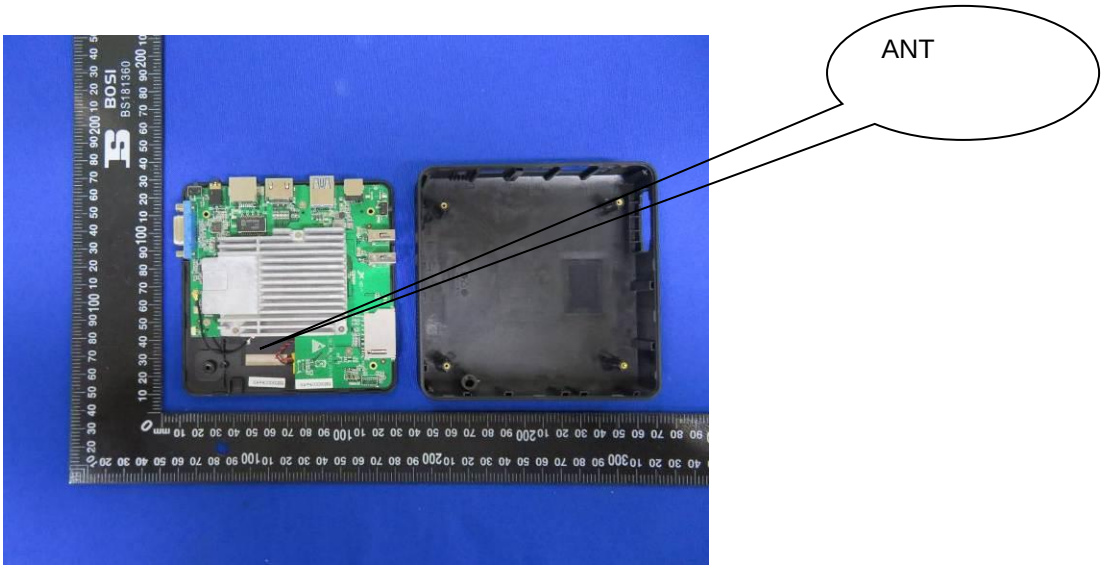
Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

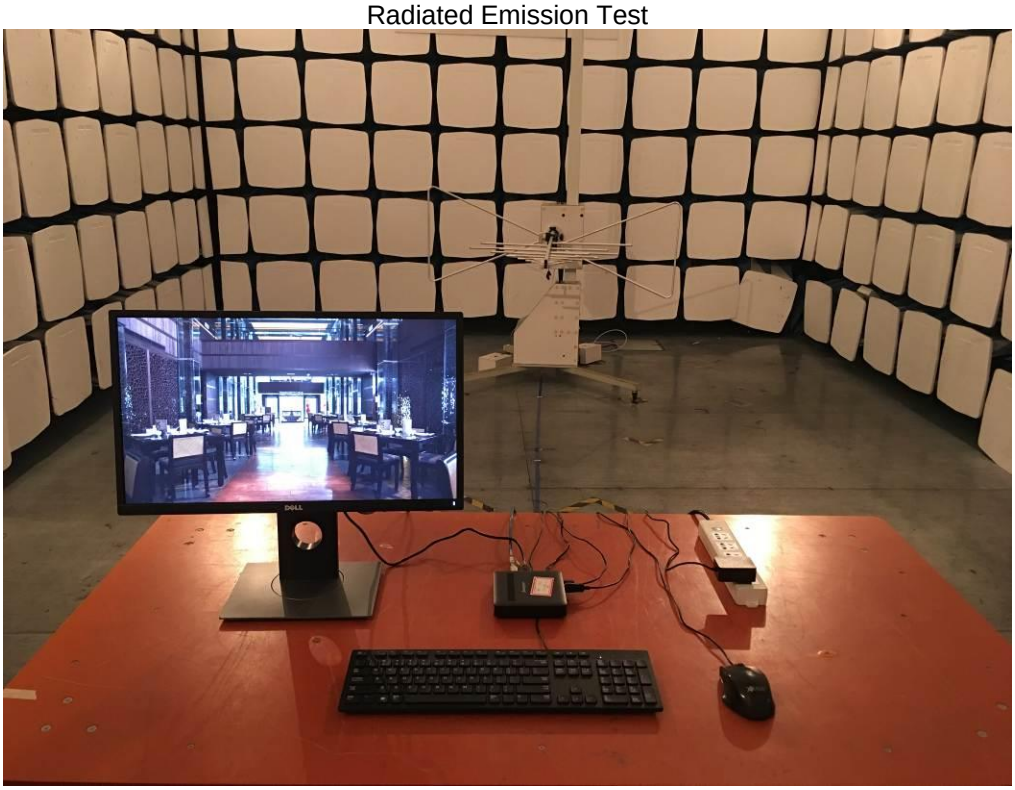
Test Result

The antenna used for this product is Internal Antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 1.82dBi.

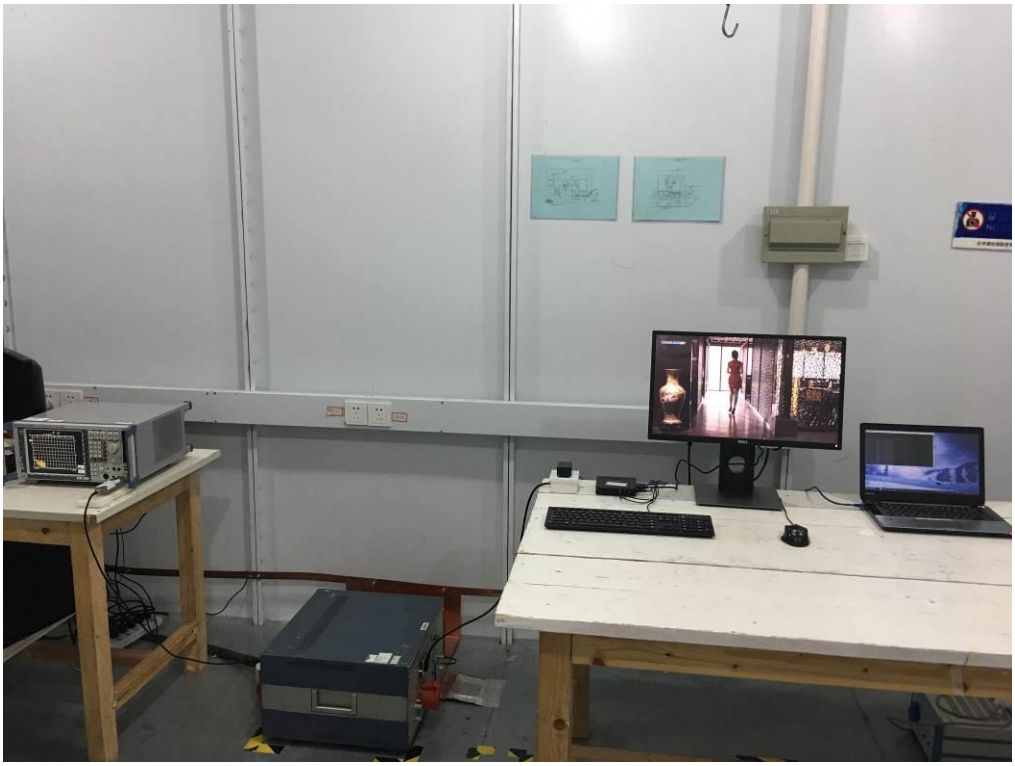


5. Test Setup Photos of the EUT

Radiated Emission Test



Conducted Emission



6. External and Internal Photos of the EUT

Reference to the test report No. GTS20190329001-1-37
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.....End of Report.....