



FCC Part 15C Test Report

FCC ID: STI-R51PM

Product Name:	Powered Monitor Speakers
Trademark:	N/A
Model Name :	R-51PM
Prepared For :	Klipsch L.L.C.
Address :	3502 Woodview Trace, Suite 200 Indianapolis IN 46268, United States
Prepared By :	Shenzhen BCTC Testing Co., Ltd.
Address :	BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China
Test Date:	Jun. 04 - Jun. 12, 2018
Date of Report :	Jun. 12, 2018
Report No.:	BCTC-FY180502397-1E



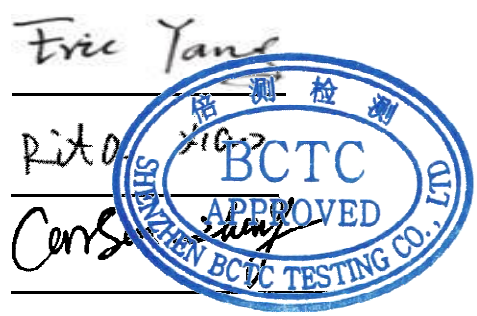
TEST RESULT CERTIFICATION

Applicant's name : **Klipsch L.L.C.**
Address : 3502 Woodview Trace, Suite 200 Indianapolis IN 46268,
United States
Manufacture's Name..... : **Klipsch L.L.C.**
Address : 3502 Woodview Trace, Suite 200 Indianapolis IN 46268,
United States
Product description
Product name..... : Powered Monitor Speakers
Trademark : N/A
Model and/or type reference : R-51PM
Standards : FCC Part15.247
ANSI C63.10-2013

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 IC requirements. And it is applicable only to the tested sample identified in the report.

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Prepared by(Engineer): Eric Yang
Reviewer(Supervisor): Rita Xiao
Approved(Manager): Carson Zhang



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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
RSS-GEN 8.8 RSS-247 3.1 15.207	Conducted Emission	PASS	
RSS-247 5.2 (a) 15.247 (a)(2)	Bandwidth	PASS	
RSS-247 5.4 (b) 15.247 (b)	equivalent isotropically radiated power	PASS	
RSS-247 5.5 15.247 (c)	Radiated Spurious Emission	PASS	
RSS-247 5.2 (b) 15.247 (d)	Power Spectral Density	PASS	
RSS-247 5.5 15.205	Band Edge Emission	PASS	
RSS-Gen.6.7 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

Test Firm Registration Number: 712850

IC Registered No.: 12655A

1.2 MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power,conducted	$\pm 0.16\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Powered Monitor Speakers	
Trade Name	N/A	
Model Name	R-51PM	
Serial Model	N/A	
Model Difference	N/A	
Product Description	Operation Frequency:	2402~2480 MHz
	Modulation Type:	GFSK,PI/4 DPSK,8DPSK
	Bit Rate of Transmitter	1M/2M/3Mbps
	Number Of Channel	79
	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.	
Power Source	AC 120V/60Hz	
Connecting I/O Port(s)	Please refer to the User's Manual	
Product SW/HW version	PSW: A1.1 PHW:H1.0	
Radio SW/HW version	RSW: V1.0 RHW:A1.1	
Test SW Version	V1.0	
RF power setting in TEST SW	3dBm	

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)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461



06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Gain (dBi)	NOTE
1	N/A	N/A	PCB Antenna	0	

2.2 DESCRIPTION OF TEST MODES

Pretest Mode	Description
Mode 1	GFSK CH00/ CH39/ CH78
Mode 2	PI/4 DPSK CH00/ CH39/ CH78
Mode 3	8DPSK CH00/ CH39/ CH78
Mode 4	Link Mode

Conducted Emission	
Final Test Mode	Description
Mode 4	Link Mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	GFSK CH00/ CH39/ CH78
Mode 2	PI/4 DPSK CH00/ CH39/ CH78
Mode 3	8DPSK CH00/ CH39/ CH78
Mode 4	Link Mode

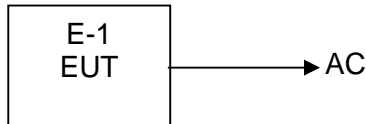
Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.



2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission / Radiated Spurious Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Powered Monitor Speakers	N/A	R-51PM	N/A	EUT

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.



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	MY45108040	2017.08.27	2018.08.26
2	Test Receiver (9kHz-7GHz)	R&S	ESPI	101318	2017.08.27	2018.08.26
3	Bilog Antenna (30MHz-1GHz)	R&S	VULB 9168	VULB91 68-438	2017.08.27	2018.08.26
4	Horn Antenna (1GHz-18GHz)	SCHWARZBECK	BBHA9120D	1201	2017.09.03	2018.09.02
5	Horn Antenna (14GHz-40GHz)	SCHWARZBECK	BBHA 9170	9170-181	2017.09.03	2018.09.02
6	Amplifier (9KHz-6GHz)	SCHWARZBECK	BBV9744	9744-0037	2017.08.27	2018.08.26
7	Amplifier (1GHz-18GHz)	SCHWARZBECK	BBV9718	9718-309	2017.08.27	2018.08.26
8	Amplifier (18GHz-40GHz)	SCHWARZBECK	BBV 9721	9721-205	2017.08.27	2018.08.26
9	Loop Antenna (9KHz-30MHz)	SCHWARZBECK	FMZB1519B	00014	2017.09.03	2018.09.02
10	RF cables1 (9kHz-1GHz)	R&S	R203	R20X	2017.08.27	2018.08.26
11	RF cables2 (1GHz-40GHz)	R&S	R204	R21X	2017.08.27	2018.08.26
12	Antenna connector	Florida RF Labs	N/A	RF 01#	2017.08.27	2018.08.26
13	Power Metter	ANRITSU	ML2487A	6K00001568	2017.08.27	2018.08.26
14	Power Sensor (AV)	ANRITSU	ML2491A	030989	2017.08.27	2018.08.26
15	Signal Analyzer 9kHz-26.5GHz	Agilent	N9010A	MY48030494	2017.08.27	2018.08.26
16	Test Receiver 20kHz-40GHz	R&S	ESU 40	100376	2017.08.27	2018.08.26
17	D.C. Power Supply	LongWei	PS-305D	010964729	2017.08.27	2018.08.26

Conduction Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Test Receiver	R&S	ESCI	1166.5950K03-1011 65-ha	2017.08.27	2018.08.26
2	LISN	SCHWARZBECK	NSLK8127	8127739	2017.08.27	2018.08.26
3	LISN	R&S	NSLK8126	8126487	2017.08.27	2018.08.26
4	RF cables	R&S	R204	R20X	2017.08.27	2018.08.26
5	Attenuator	R&S	ESH3-Z2	143206	2017.08.27	2018.08.26



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

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

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

Note:

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

The following table is the setting of the receiver

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

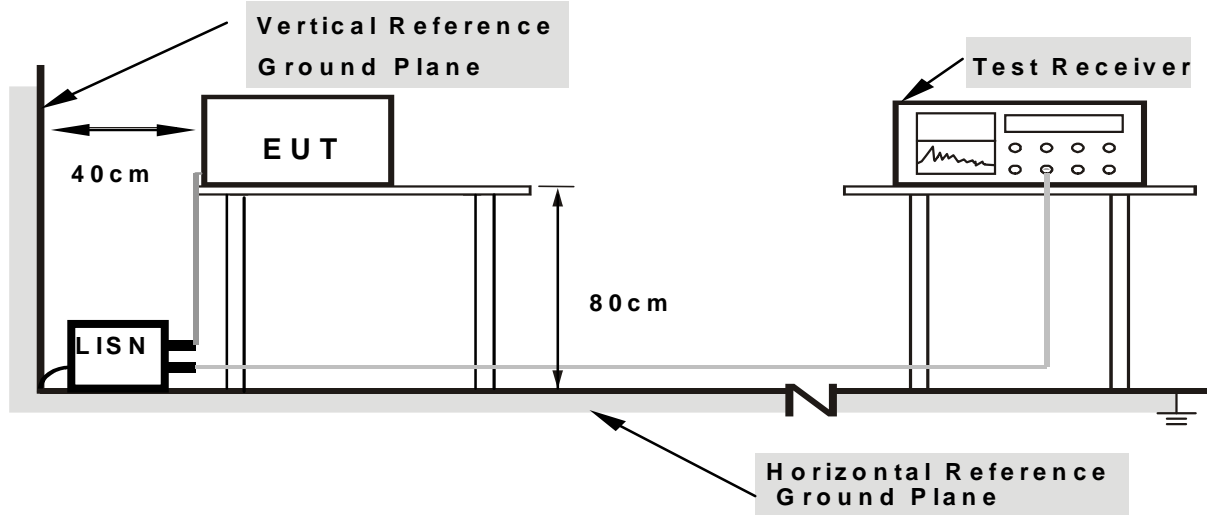
3.1.2 TEST PROCEDURE

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

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



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

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

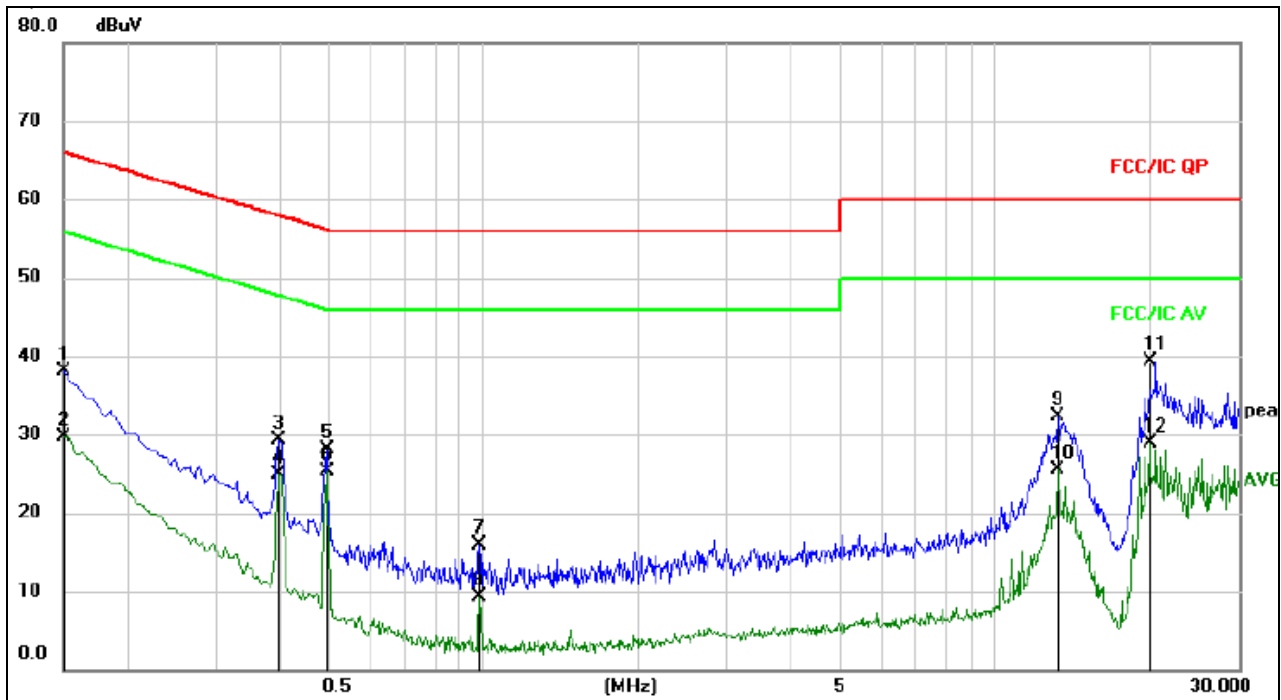
3.1.5 EUT OPERATING CONDITIONS

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

3.1.6 TEST RESULTS



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



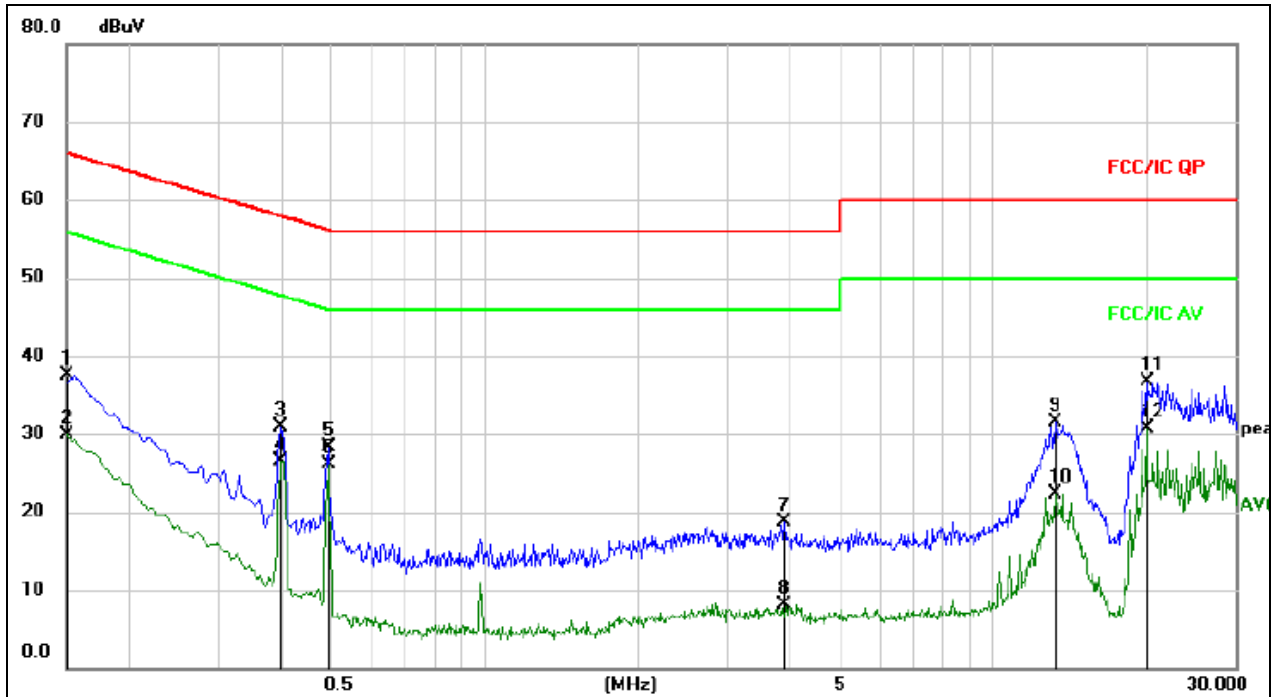
Remark:

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

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	28.24	9.77	38.01	66.00	-27.99	QP	
2		0.1500	19.99	9.77	29.76	56.00	-26.24	AVG	
3		0.3975	19.62	9.70	29.32	57.91	-28.59	QP	
4		0.3975	15.27	9.70	24.97	47.91	-22.94	AVG	
5		0.4920	18.36	9.78	28.14	56.13	-27.99	QP	
6		0.4920	15.47	9.78	25.25	46.13	-20.88	AVG	
7		0.9825	6.13	9.78	15.91	56.00	-40.09	QP	
8		0.9825	-0.44	9.78	9.34	46.00	-36.66	AVG	
9		13.2765	22.38	9.96	32.34	60.00	-27.66	QP	
10		13.2765	15.47	9.96	25.43	50.00	-24.57	AVG	
11	*	20.1615	29.14	10.09	39.23	60.00	-20.77	QP	
12		20.1615	18.85	10.09	28.94	50.00	-21.06	AVG	



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



Remark:

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

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	27.69	9.77	37.46	66.00	-28.54	QP	
2		0.1500	20.09	9.77	29.86	56.00	-26.14	AVG	
3		0.3975	21.27	9.70	30.97	57.91	-26.94	QP	
4		0.3975	16.85	9.70	26.55	47.91	-21.36	AVG	
5		0.4919	18.60	9.78	28.38	56.14	-27.76	QP	
6		0.4919	16.38	9.78	26.16	46.14	-19.98	AVG	
7		3.8849	8.80	9.86	18.66	56.00	-37.34	QP	
8		3.8849	-1.67	9.86	8.19	46.00	-37.81	AVG	
9		13.2720	21.54	9.96	31.50	60.00	-28.50	QP	
10		13.2720	12.29	9.96	22.25	50.00	-27.75	AVG	
11		20.1570	26.58	10.09	36.67	60.00	-23.33	QP	
12	*	20.1570	20.61	10.09	30.70	50.00	-19.30	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 (microrvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

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

Notes:

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

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

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

3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 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.

Above 1GHz test procedure as below:

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

Note:

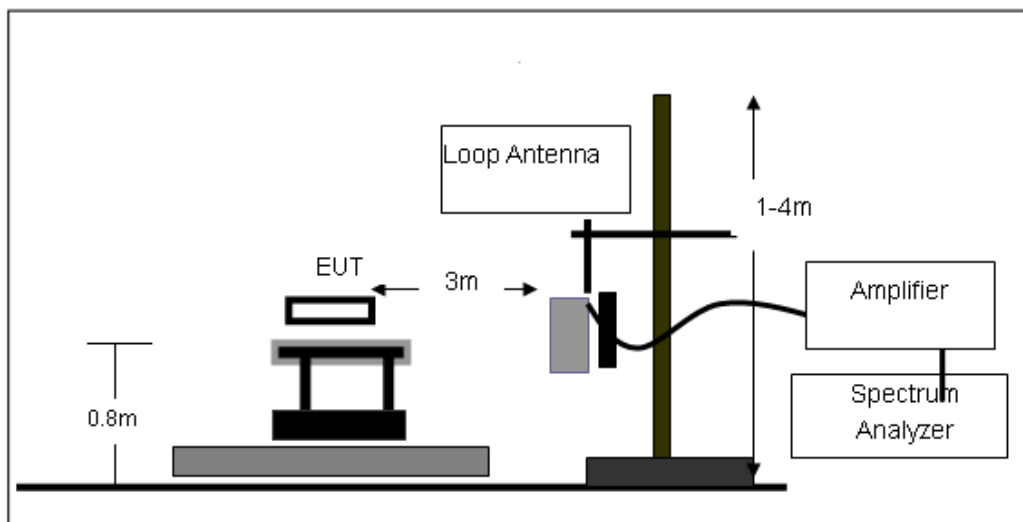
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

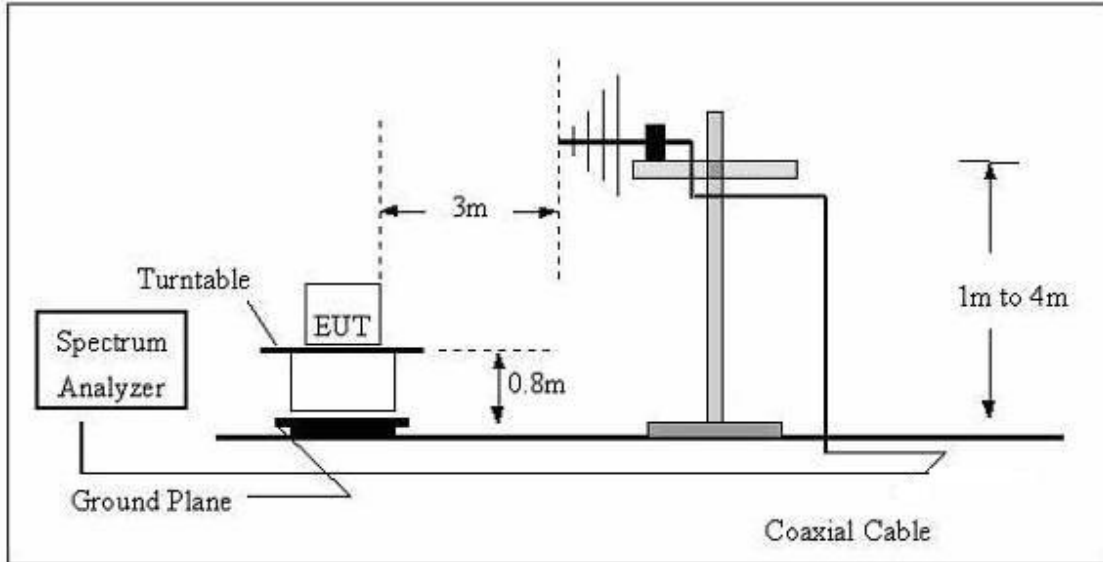
No deviation

3.2.4 TEST SETUP

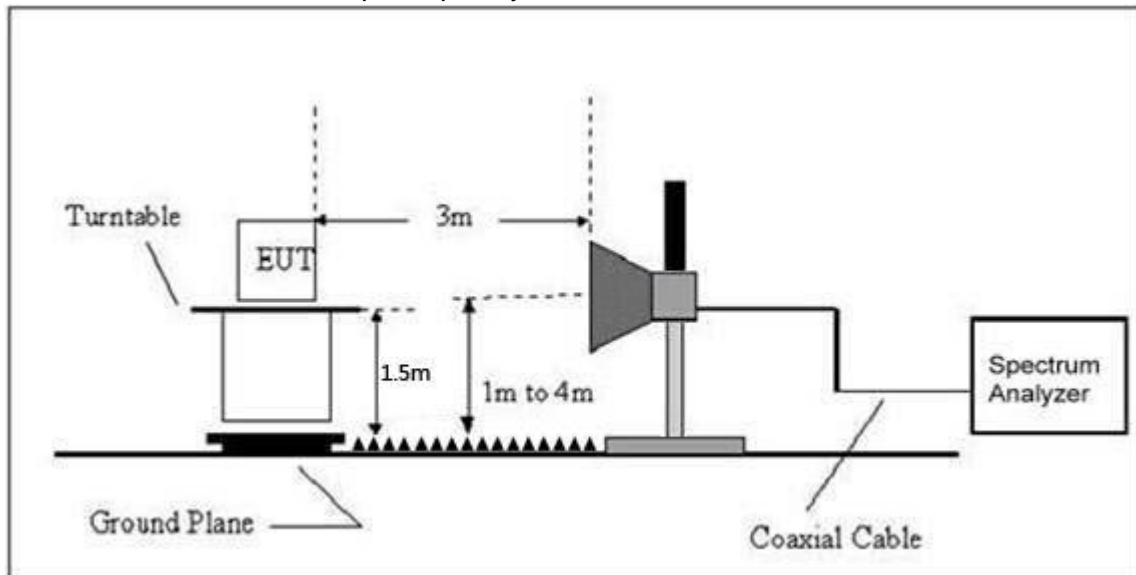
(A) Radiated Emission Test-Up Frequency Below 30MHz



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



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



3.2.5 EUT OPERATING CONDITIONS

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

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

Temperature:	20°C	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage :	AC 120V
Test Mode :	Mode 5	Polarization :	--

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

NOTE:

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

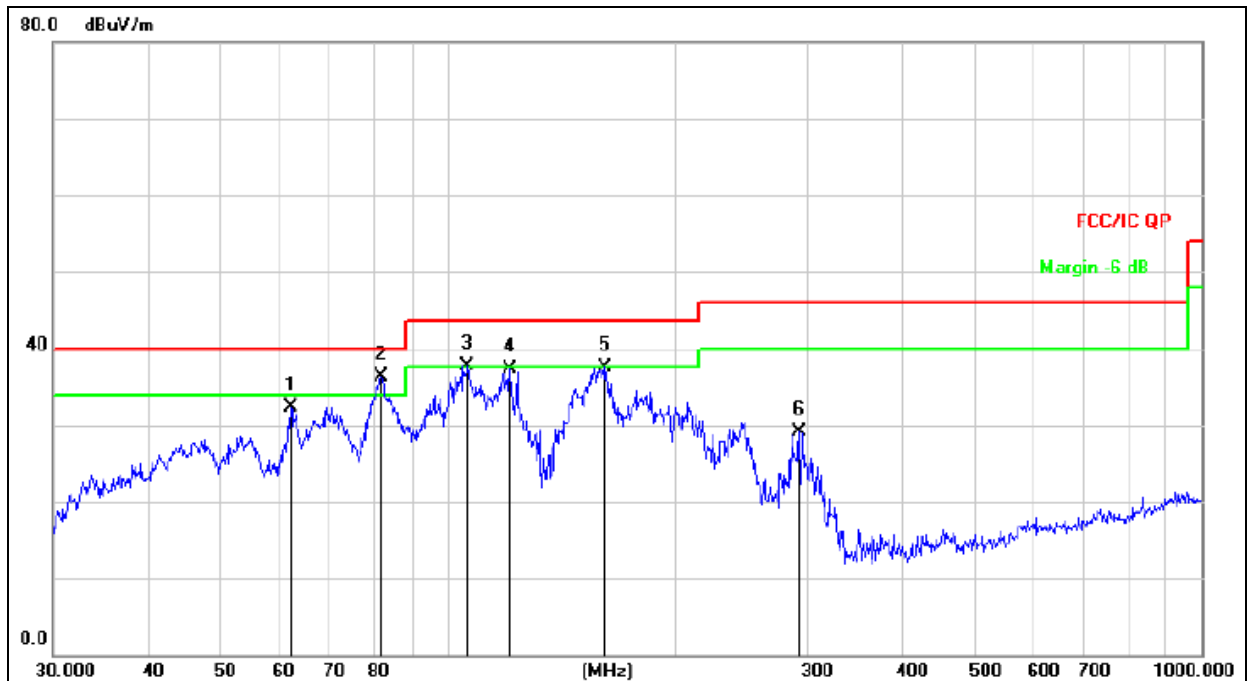
Distance extrapolation factor = $40 \log(\text{specific distance}/\text{test distance})$ (dB);

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



3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

Temperature :	26°C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Horizontal
Test Voltage :	AC 120V		
Test Mode :	Mode 4		

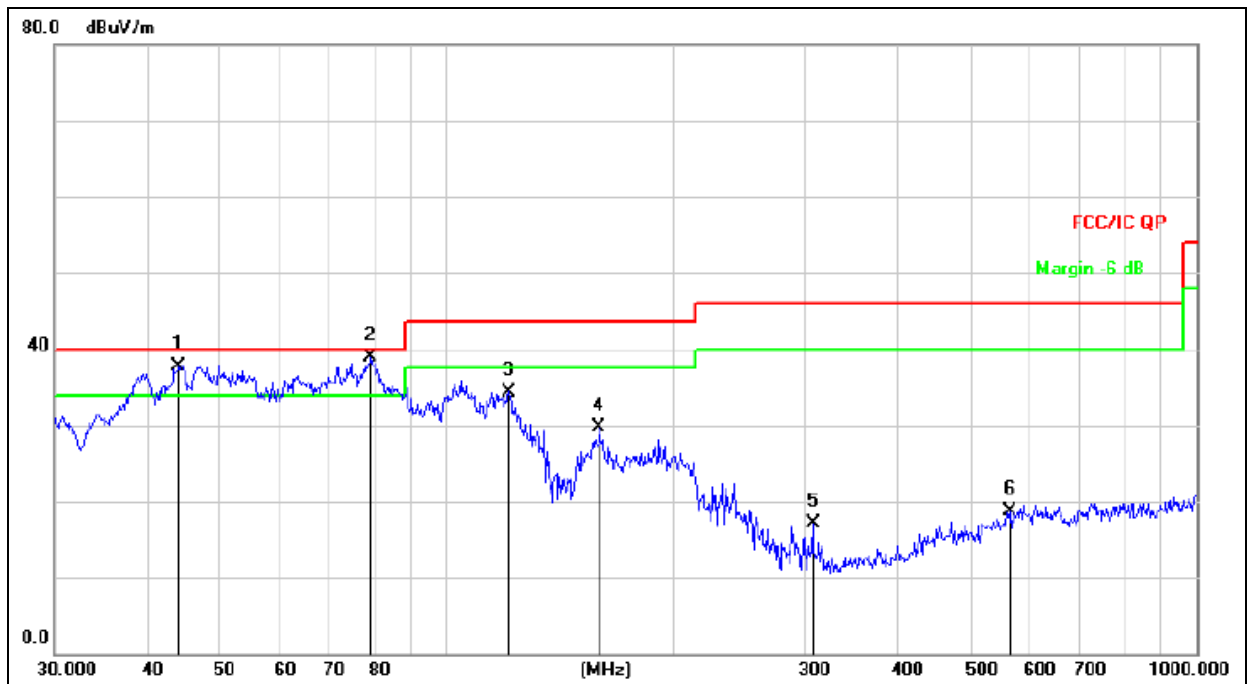


Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		61.9951	48.27	-15.99	32.28	40.00	-7.72	QP
2	*	81.7831	55.54	-19.23	36.31	40.00	-3.69	QP
3	!	106.3850	53.39	-15.68	37.71	43.50	-5.79	QP
4		121.1230	54.92	-17.63	37.29	43.50	-6.21	QP
5	!	161.4740	56.58	-19.00	37.58	43.50	-5.92	QP
6		293.0842	42.96	-13.84	29.12	46.00	-16.88	QP



Temperature :	26°C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Vertical
Test Voltage :	AC 120V		
Test Mode :	Mode 4		



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

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1	!	43.9658	51.94	-14.18	37.76	40.00	-2.24	QP
2	*	79.2425	58.36	-19.47	38.89	40.00	-1.11	QP
3		121.1230	52.03	-17.63	34.40	43.50	-9.10	QP
4		159.7844	48.71	-19.08	29.63	43.50	-13.87	QP
5		307.8312	30.66	-13.51	17.15	46.00	-28.85	QP
6		564.6389	26.42	-7.63	18.79	46.00	-27.21	QP



3.2.8 TEST RESULTS (1GHZ~25GHZ)

GFSK

Polar (H/V)	Frequency	Meter Reading	Pre-amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Low Channel:2402MHz									
V	4804.00	59.68	39.55	7.85	25.66	53.64	74.00	-20.36	PK
V	4804.00	44.98	39.55	7.85	25.66	38.94	54.00	-15.06	AV
V	7206.00	60.45	38.33	7.52	24.55	54.19	74.00	-19.81	PK
V	7206.00	45.47	38.33	7.52	24.55	39.21	54.00	-14.79	AV
V	15450.00	46.24	35.23	6.75	26.59	44.35	74.00	-29.65	PK
H	4804.00	58.31	39.55	7.85	25.66	52.27	74.00	-21.73	PK
H	4804.00	46.03	39.55	7.85	25.66	39.99	54.00	-14.01	AV
H	7206.00	60.74	38.33	7.52	23.55	53.48	74.00	-20.52	PK
H	7206.00	46.12	38.33	7.52	23.22	38.53	54.00	-15.47	AV
H	15450.00	46.17	35.45	6.75	27.88	45.35	74.00	-28.65	PK

Polar (H/V)	Frequency	Meter Reading	Pre-amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Middle Channel:2441MHz									
V	4882.00	59.56	38.89	7.57	25.45	53.69	74.00	-20.31	PK
V	4882.00	45.14	38.89	7.57	25.45	39.27	54.00	-14.73	AV
V	7323.00	59.87	38.78	7.35	24.78	53.22	74.00	-20.78	PK
V	7323.00	45.89	38.78	7.35	24.78	39.24	54.00	-14.76	AV
V	15450.00	47.40	35.89	6.42	26.47	44.40	74.00	-29.60	PK
H	4882.00	57.80	38.89	7.57	25.45	51.93	74.00	-22.07	PK
H	4882.00	46.19	38.89	7.57	25.45	40.32	54.00	-13.68	AV
H	7323.00	62.04	38.78	7.35	24.78	55.39	74.00	-18.61	PK
H	7323.00	46.32	38.78	7.35	24.78	39.67	54.00	-14.33	AV
H	15450.00	45.31	36.68	6.42	26.65	41.70	74.00	-32.30	PK

Polar (H/V)	Frequency	Meter Reading	Pre-amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
High Channel: 2480MHz									
V	4960.00	59.95	38.75	7.46	25.45	54.11	74.00	-19.89	PK
V	4960.00	45.16	38.75	7.46	25.45	39.32	54.00	-14.68	AV
V	7440.00	60.35	38.65	7.22	24.78	53.70	74.00	-20.30	PK
V	7440.00	44.91	38.65	7.22	24.78	38.26	54.00	-15.74	AV
V	15450.00	46.87	35.58	6.35	26.47	44.11	74.00	-29.89	PK
H	4960.00	56.37	38.75	7.46	25.45	50.53	74.00	-23.47	PK
H	4960.00	46.73	38.75	7.46	25.45	40.89	54.00	-13.11	AV
H	7440.00	62.45	38.65	7.22	24.78	55.80	74.00	-18.20	PK
H	7440.00	46.80	38.65	7.22	24.78	40.15	54.00	-13.85	AV
H	15450.00	44.39	36.42	6.32	26.65	40.94	74.00	-33.06	PK

Remark:

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



PI/4 DPSK

Polar (H/V)	Frequency	Meter Reading	Pre-amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Low Channel:2402MHz									
V	4804.00	59.78	39.55	7.85	25.66	53.74	74.00	-20.26	PK
V	4804.00	44.64	39.55	7.85	25.66	38.60	54.00	-15.40	AV
V	7206.00	61.76	38.33	7.52	24.55	55.50	74.00	-18.50	PK
V	7206.00	43.55	38.33	7.52	24.55	37.29	54.00	-16.71	AV
V	15450.00	48.02	35.23	6.75	26.59	46.13	74.00	-27.87	PK
H	4804.00	56.78	39.55	7.85	25.66	50.74	74.00	-23.26	PK
H	4804.00	45.85	39.55	7.85	25.66	39.81	54.00	-14.19	AV
H	7206.00	61.74	38.33	7.52	23.55	54.48	74.00	-19.52	PK
H	7206.00	46.34	38.33	7.52	23.22	38.75	54.00	-15.25	AV
H	15450.00	44.01	35.45	6.75	27.88	43.19	74.00	-30.81	PK

Polar (H/V)	Frequency	Meter Reading	Pre-amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Middle Channel:2441MHz									
V	4882.00	60.26	38.89	7.57	25.45	54.39	74.00	-19.61	PK
V	4882.00	44.18	38.89	7.57	25.45	38.31	54.00	-15.69	AV
V	7323.00	60.42	38.78	7.35	24.78	53.77	74.00	-20.23	PK
V	7323.00	43.82	38.78	7.35	24.78	37.17	54.00	-16.83	AV
V	15450.00	47.60	35.89	6.42	26.47	44.60	74.00	-29.40	PK
H	4882.00	57.70	38.89	7.57	25.45	51.83	74.00	-22.17	PK
H	4882.00	44.35	38.89	7.57	25.45	38.48	54.00	-15.52	AV
H	7323.00	61.72	38.78	7.35	24.78	55.07	74.00	-18.93	PK
H	7323.00	45.15	38.78	7.35	24.78	38.50	54.00	-15.50	AV
H	15450.00	43.53	36.68	6.42	26.65	39.92	74.00	-34.08	PK

Polar (H/V)	Frequency	Meter Reading	Pre-amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
High Channel: 2480MHz									
V	4960.00	60.75	38.75	7.46	25.45	54.91	74.00	-19.09	PK
V	4960.00	44.76	38.75	7.46	25.45	38.92	54.00	-15.08	AV
V	7440.00	60.06	38.65	7.22	24.78	53.41	74.00	-20.59	PK
V	7440.00	43.70	38.65	7.22	24.78	37.05	54.00	-16.95	AV
V	15450.00	46.83	35.58	6.35	26.47	44.07	74.00	-29.93	PK
H	4960.00	57.78	38.75	7.46	25.45	51.94	74.00	-22.06	PK
H	4960.00	44.85	38.75	7.46	25.45	39.01	54.00	-14.99	AV
H	7440.00	60.59	38.65	7.22	24.78	53.94	74.00	-20.06	PK
H	7440.00	46.73	38.65	7.22	24.78	40.08	54.00	-13.92	AV
H	15450.00	43.06	36.42	6.32	26.65	39.61	74.00	-34.39	PK

Remark:

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



8DPSK

Polar (H/V)	Frequency	Meter Reading	Pre-amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Low Channel:2402MHz									
V	4804.00	59.46	39.55	7.85	25.66	53.42	74.00	-20.58	PK
V	4804.00	45.18	39.55	7.85	25.66	39.14	54.00	-14.86	AV
V	7206.00	61.28	38.33	7.52	24.55	55.02	74.00	-18.98	PK
V	7206.00	43.79	38.33	7.52	24.55	37.53	54.00	-16.47	AV
V	15450.00	46.39	35.23	6.75	26.59	44.50	74.00	-29.50	PK
H	4804.00	58.37	39.55	7.85	25.66	52.33	74.00	-21.67	PK
H	4804.00	43.67	39.55	7.85	25.66	37.63	54.00	-16.37	AV
H	7206.00	61.08	38.33	7.52	23.55	53.82	74.00	-20.18	PK
H	7206.00	47.14	38.33	7.52	23.22	39.55	54.00	-14.45	AV
H	15450.00	43.27	35.45	6.75	27.88	42.45	74.00	-31.55	PK

Polar (H/V)	Frequency	Meter Reading	Pre-amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Middle Channel:2441MHz									
V	4882.00	60.52	38.89	7.57	25.45	54.65	74.00	-19.35	PK
V	4882.00	45.04	38.89	7.57	25.45	39.17	54.00	-14.83	AV
V	7323.00	62.46	38.78	7.35	24.78	55.81	74.00	-18.19	PK
V	7323.00	42.45	38.78	7.35	24.78	35.80	54.00	-18.20	AV
V	15450.00	47.04	35.89	6.42	26.47	44.04	74.00	-29.96	PK
H	4882.00	57.58	38.89	7.57	25.45	51.71	74.00	-22.29	PK
H	4882.00	44.71	38.89	7.57	25.45	38.84	54.00	-15.16	AV
H	7323.00	60.13	38.78	7.35	24.78	53.48	74.00	-20.52	PK
H	7323.00	46.85	38.78	7.35	24.78	40.20	54.00	-13.80	AV
H	15450.00	44.26	36.68	6.42	26.65	40.65	74.00	-33.35	PK

Polar (H/V)	Frequency	Meter Reading	Pre-amplifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
High Channel: 2480MHz									
V	4960.00	61.64	38.75	7.46	25.45	55.80	74.00	-18.20	PK
V	4960.00	46.58	38.75	7.46	25.45	40.74	54.00	-13.26	AV
V	7440.00	61.09	38.65	7.22	24.78	54.44	74.00	-19.56	PK
V	7440.00	44.01	38.65	7.22	24.78	37.36	54.00	-16.64	AV
V	15450.00	45.83	35.58	6.35	26.47	43.07	74.00	-30.93	PK
H	4960.00	58.29	38.75	7.46	25.45	52.45	74.00	-21.55	PK
H	4960.00	44.21	38.75	7.46	25.45	38.37	54.00	-15.63	AV
H	7440.00	61.65	38.65	7.22	24.78	55.00	74.00	-19.00	PK
H	7440.00	47.75	38.65	7.22	24.78	41.10	54.00	-12.90	AV
H	15450.00	43.56	36.42	6.32	26.65	40.11	74.00	-33.89	PK

Remark:

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



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. 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:

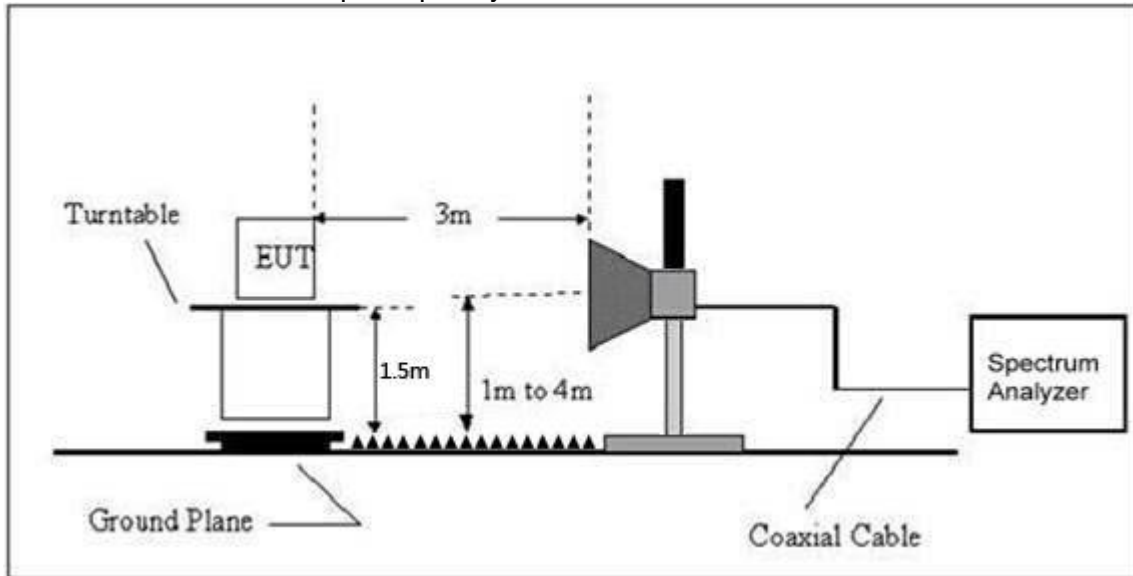
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

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 level (dBuV/m)	Limits (dBuV/m)		Result
							PK	PK	AV	
GFSK	Low Channel 2402MHz									
	H	2390.00	56.67	38.06	7.42	20.15	46.18	74.00	54.00	PASS
	H	2400.00	58.79	38.06	7.42	20.15	48.30	74.00	54.00	PASS
	V	2390.00	59.95	38.06	7.42	20.15	49.46	74.00	54.00	PASS
	V	2400.00	58.08	38.06	7.42	20.15	47.59	74.00	54.00	PASS
	High Channel 2480MHz									
	H	2483.50	57.87	38.17	7.45	20.54	47.69	74.00	54.00	PASS
	H	2485.50	56.59	38.17	7.45	20.54	46.41	74.00	54.00	PASS
	V	2483.50	57.77	38.20	7.45	20.54	47.56	74.00	54.00	PASS
	V	2485.50	57.78	38.20	7.45	20.54	47.57	74.00	54.00	PASS
PI/4 DPSK	Low Channel 2402MHz									
	H	2390.00	56.40	38.06	7.42	20.15	45.91	74.00	54.00	PASS
	H	2400.00	56.49	38.06	7.42	20.15	46.00	74.00	54.00	PASS
	V	2390.00	57.60	38.06	7.42	20.15	47.11	74.00	54.00	PASS
	V	2400.00	55.81	38.06	7.42	20.15	45.32	74.00	54.00	PASS
	High Channel 2480MHz									
	H	2483.50	55.60	38.17	7.45	20.54	45.42	74.00	54.00	PASS
	H	2485.50	55.35	38.17	7.45	20.54	45.17	74.00	54.00	PASS
	V	2483.50	55.50	38.20	7.45	20.54	45.29	74.00	54.00	PASS
	V	2485.50	55.52	38.20	7.45	20.54	45.31	74.00	54.00	PASS
8DPSK	Low Channel 2402MHz									
	H	2390.00	56.27	38.06	7.42	20.15	45.78	74.00	54.00	PASS
	H	2400.00	56.99	38.06	7.42	20.15	46.50	74.00	54.00	PASS
	V	2390.00	56.77	38.06	7.42	20.15	46.28	74.00	54.00	PASS
	V	2400.00	56.63	38.06	7.42	20.15	46.14	74.00	54.00	PASS
	High Channel 2480MHz									
	H	2483.50	56.40	38.17	7.45	20.54	46.22	74.00	54.00	PASS
	H	2485.50	55.21	38.17	7.45	20.54	45.03	74.00	54.00	PASS
	V	2483.50	55.83	38.20	7.45	20.54	45.62	74.00	54.00	PASS
	V	2485.50	56.33	38.20	7.45	20.54	46.12	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

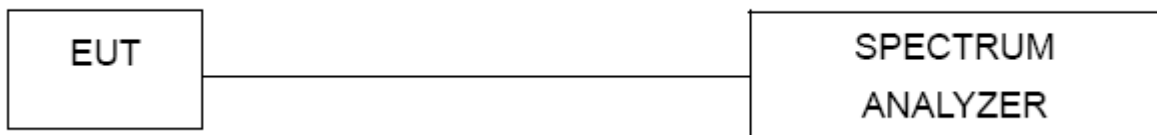
4.1.1 TEST PROCEDURE

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: $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
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

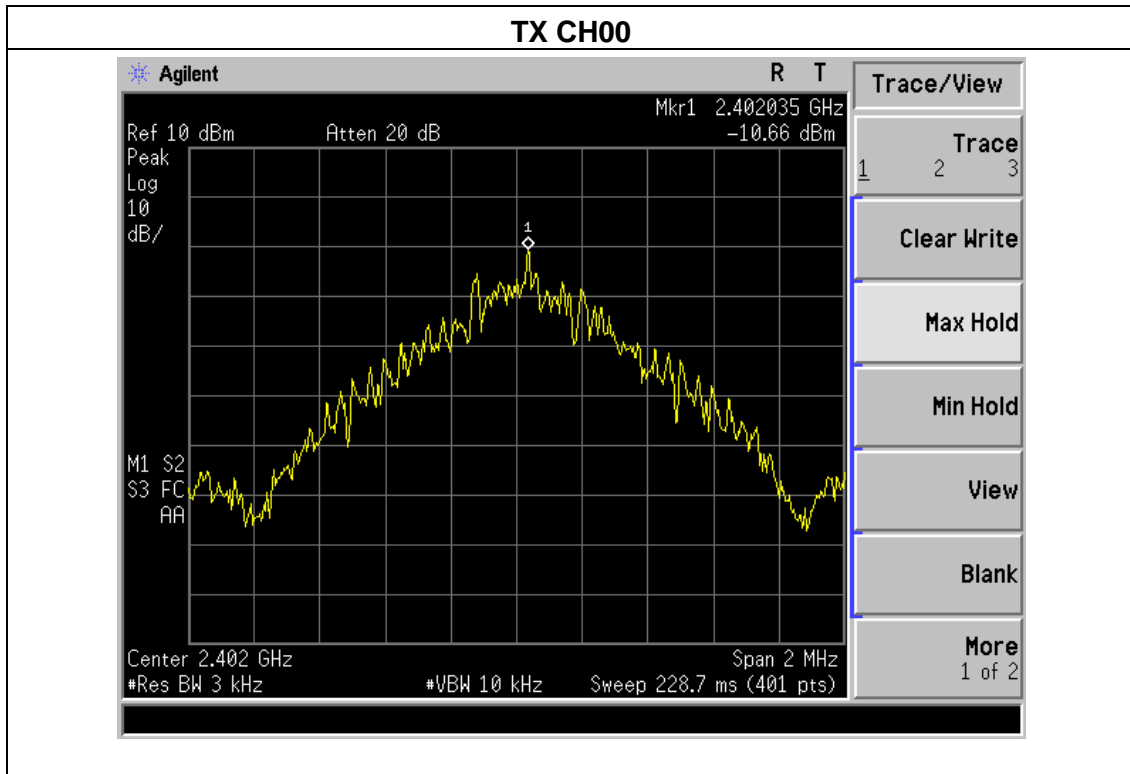
The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.

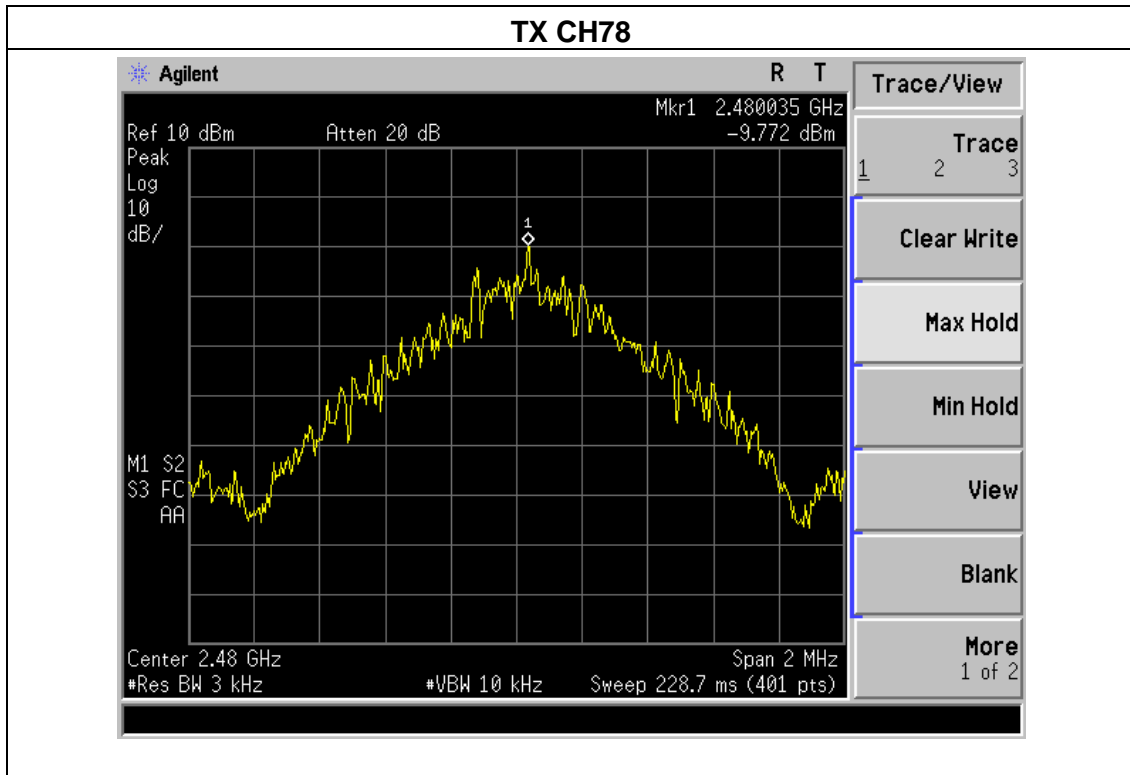
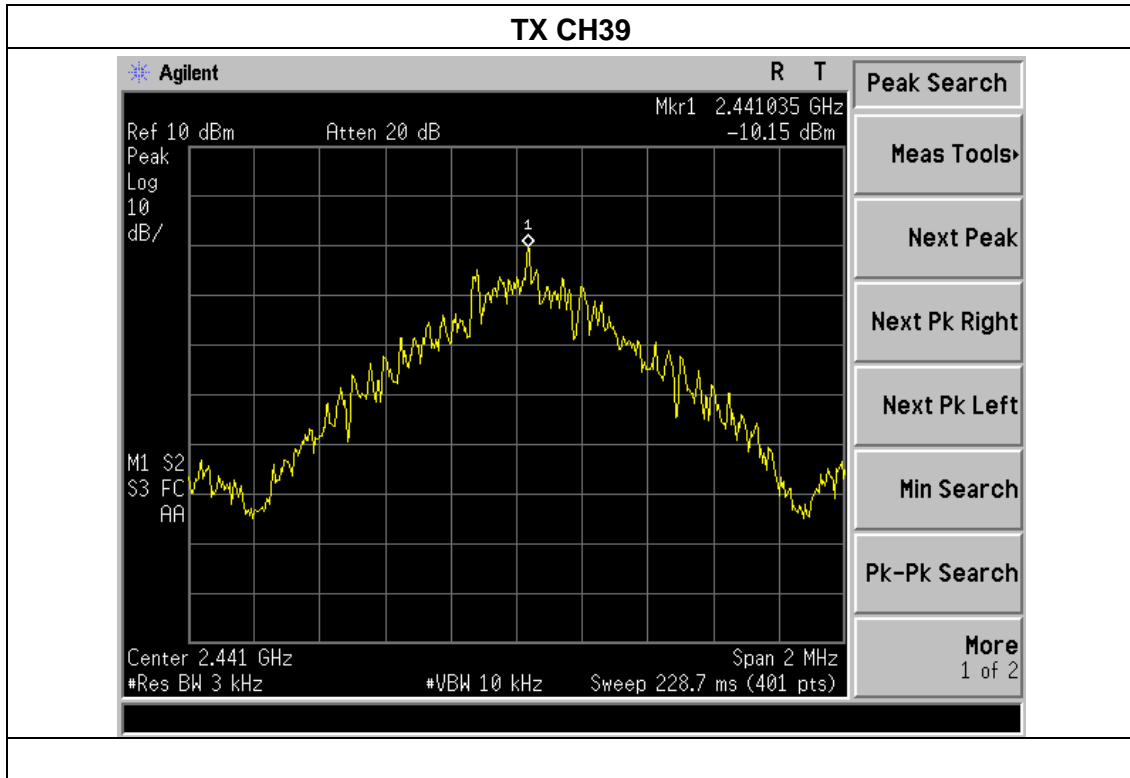


4.1.5 TEST RESULTS

Temperature :	25°C	Relative Humidity :	60%
Pressure :	1015 hPa	Test Voltage :	AC 120V
Test Mode :	GFSK		

Frequency	Power Spectral Density(dBm)	Limit (dBm)	Result
2402 MHz	-10.66	8	PASS
2441 MHz	-10.15	8	PASS
2480 MHz	-9.77	8	PASS

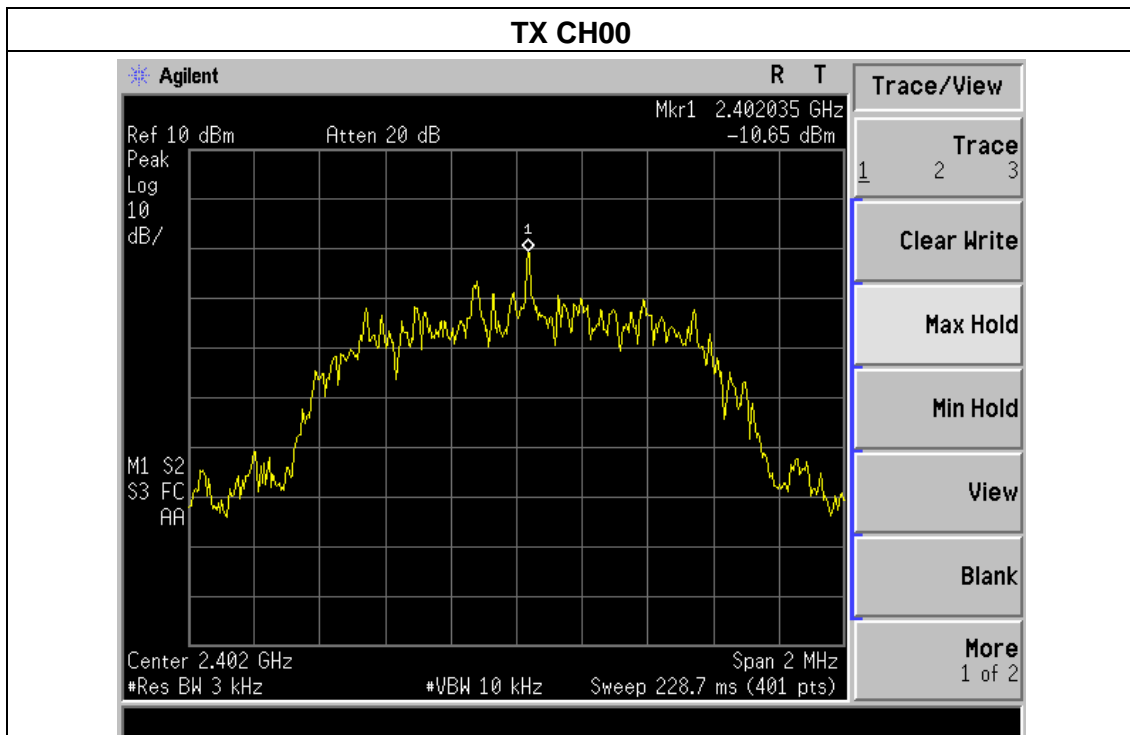


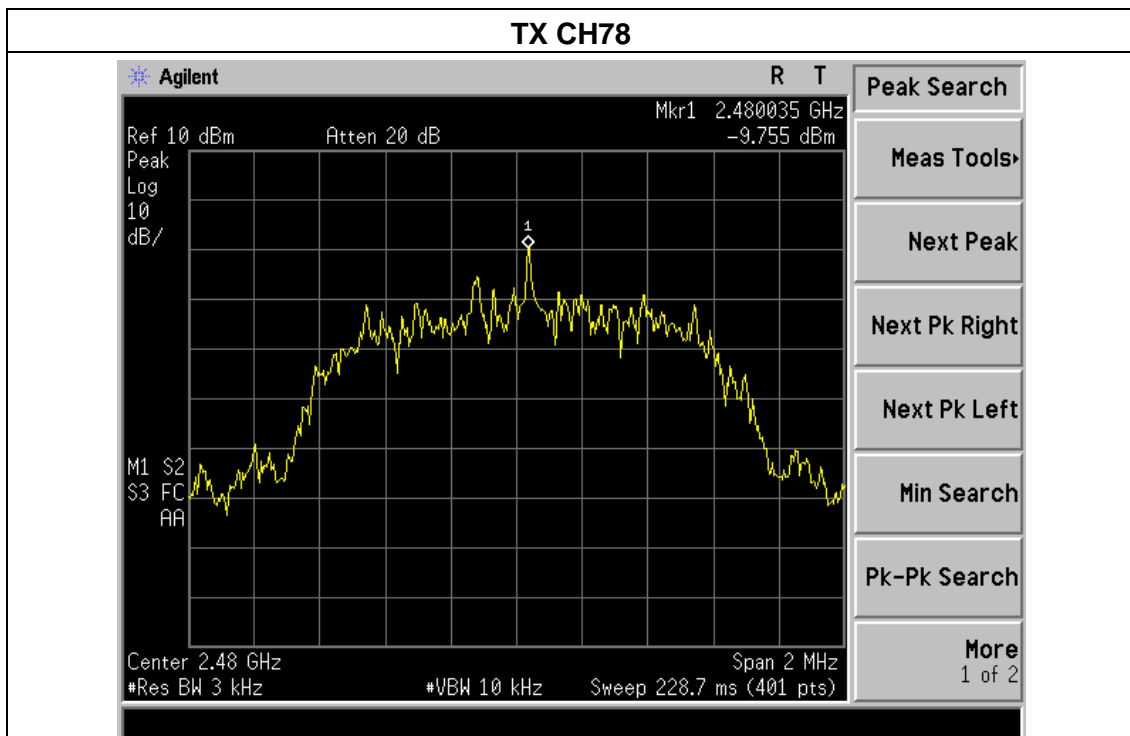
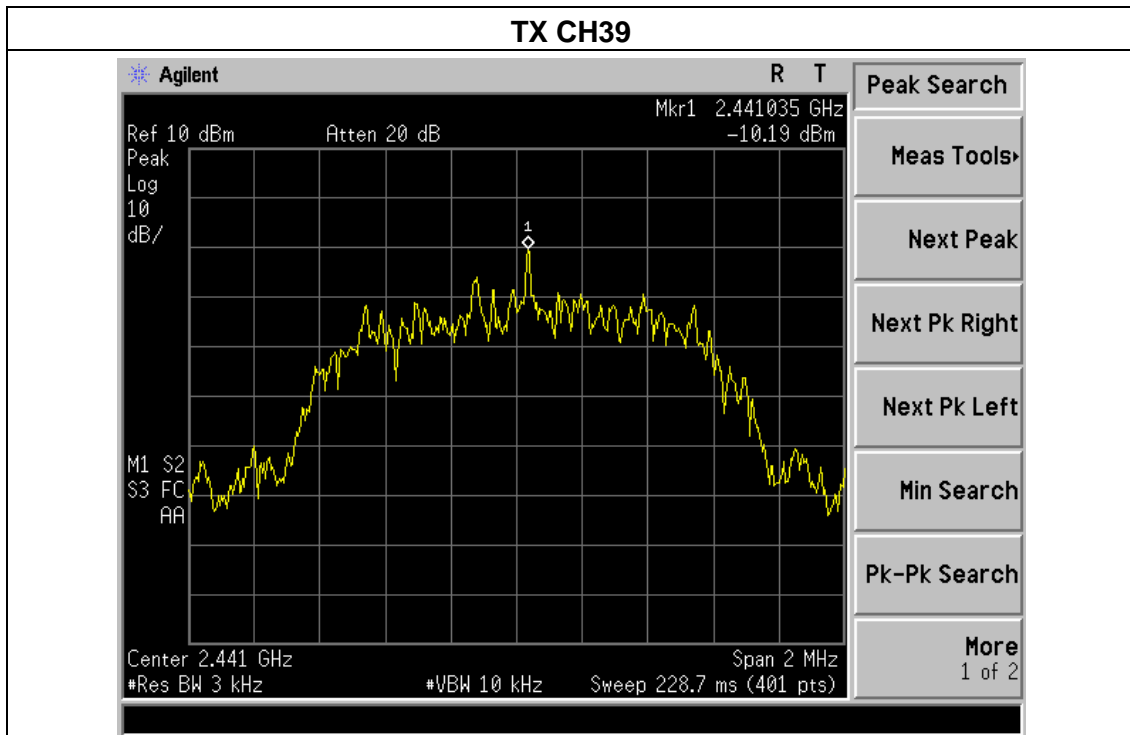




Temperature :	25°C	Relative Humidity :	60%
Pressure :	1015 hPa	Test Voltage :	AC 120V
Test Mode :	PI/4 DPSK		

Frequency	Power Spectral Density(dBm)	Limit (dBm)	Result
2402 MHz	-10.65	8	PASS
2441 MHz	-10.19	8	PASS
2480 MHz	-9.76	8	PASS

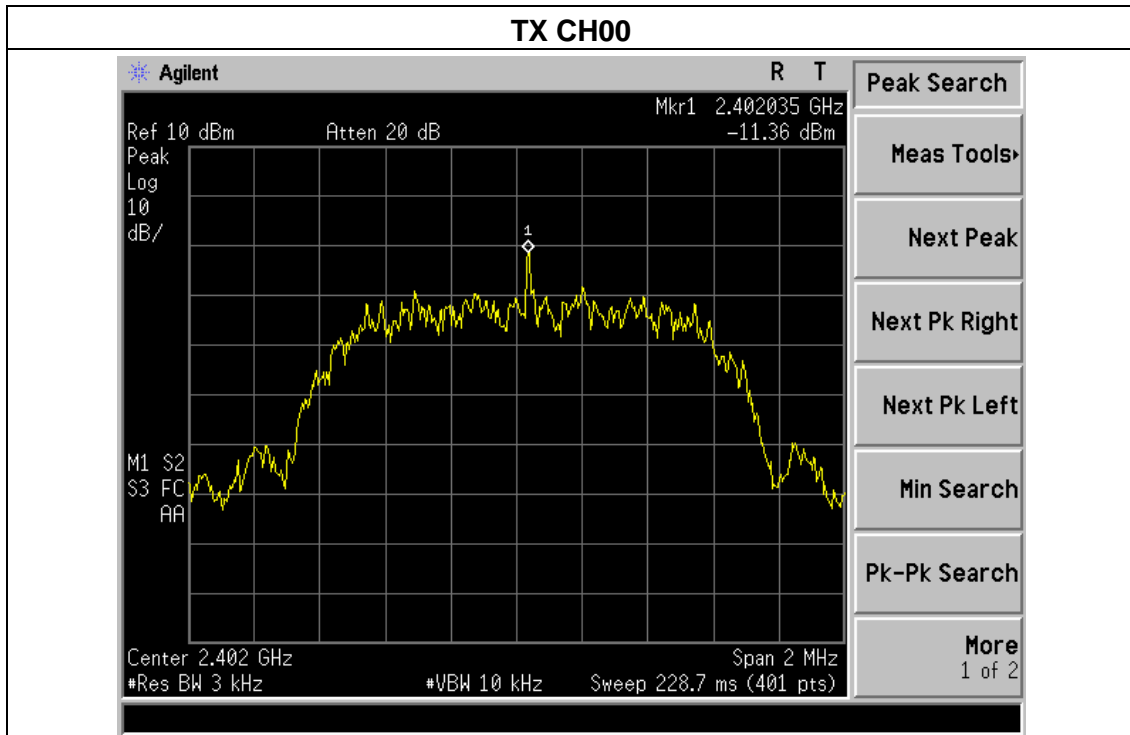


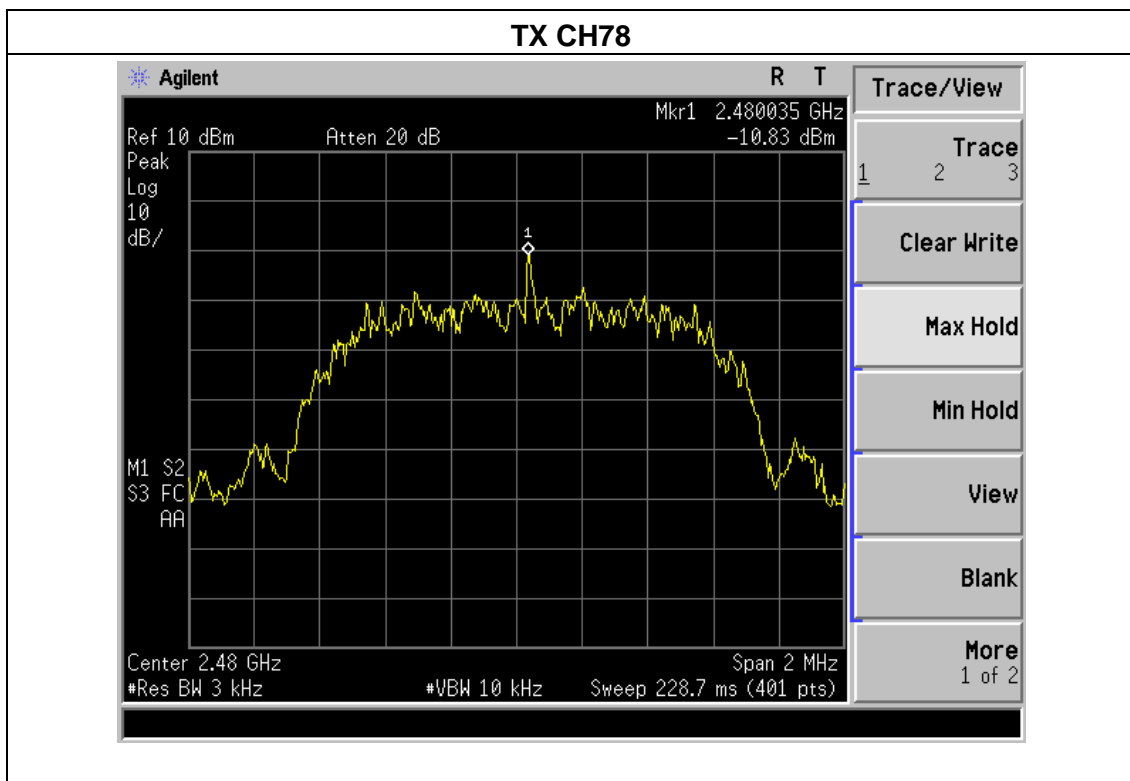
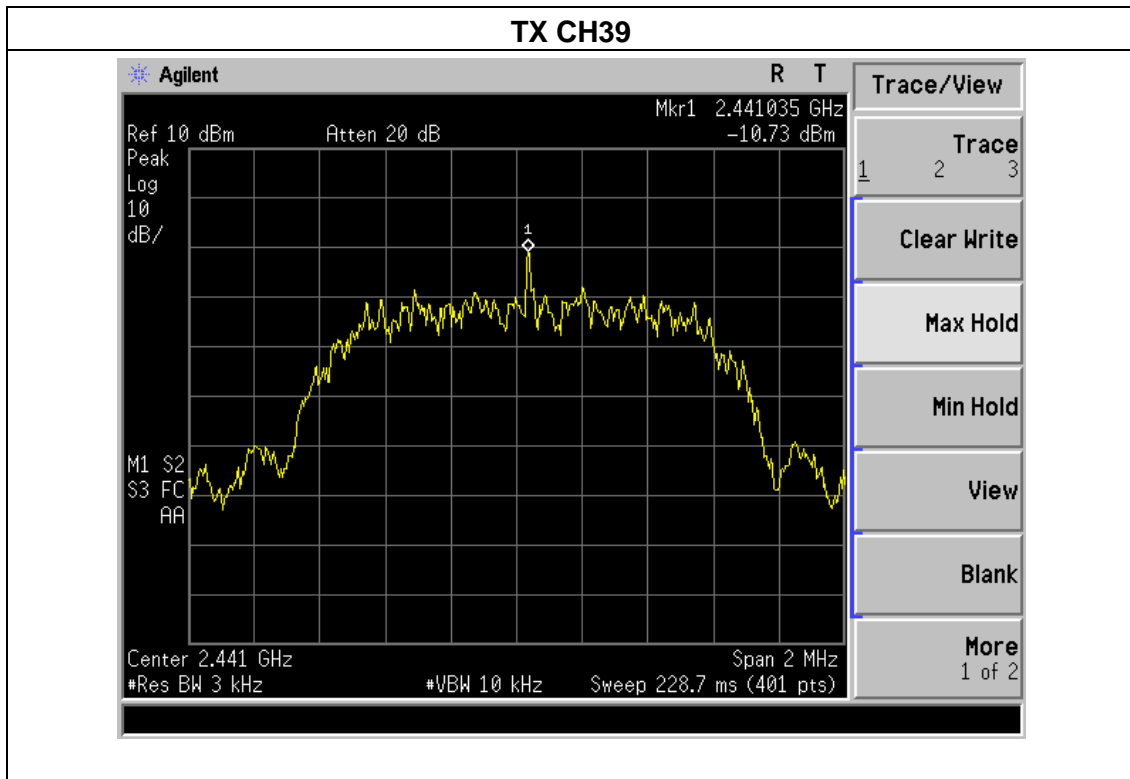




Temperature :	25°C	Relative Humidity :	60%
Pressure :	1015 hPa	Test Voltage :	AC 120V
Test Mode :	8DPSK		

Frequency	Power Spectral Density(dBm)	Limit (dBm)	Result
2402 MHz	-11.36	8	PASS
2441 MHz	-10.73	8	PASS
2480 MHz	-10.83	8	PASS





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	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

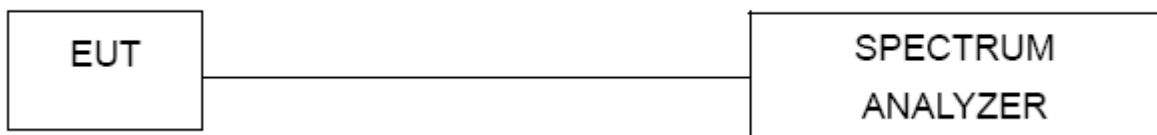
5.1.1 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Set RBW = 300 kHz 99%
4. Set the video bandwidth (VBW) = 1MHz 99%
5. Detector = Peak.
6. Trace mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize.
9. 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

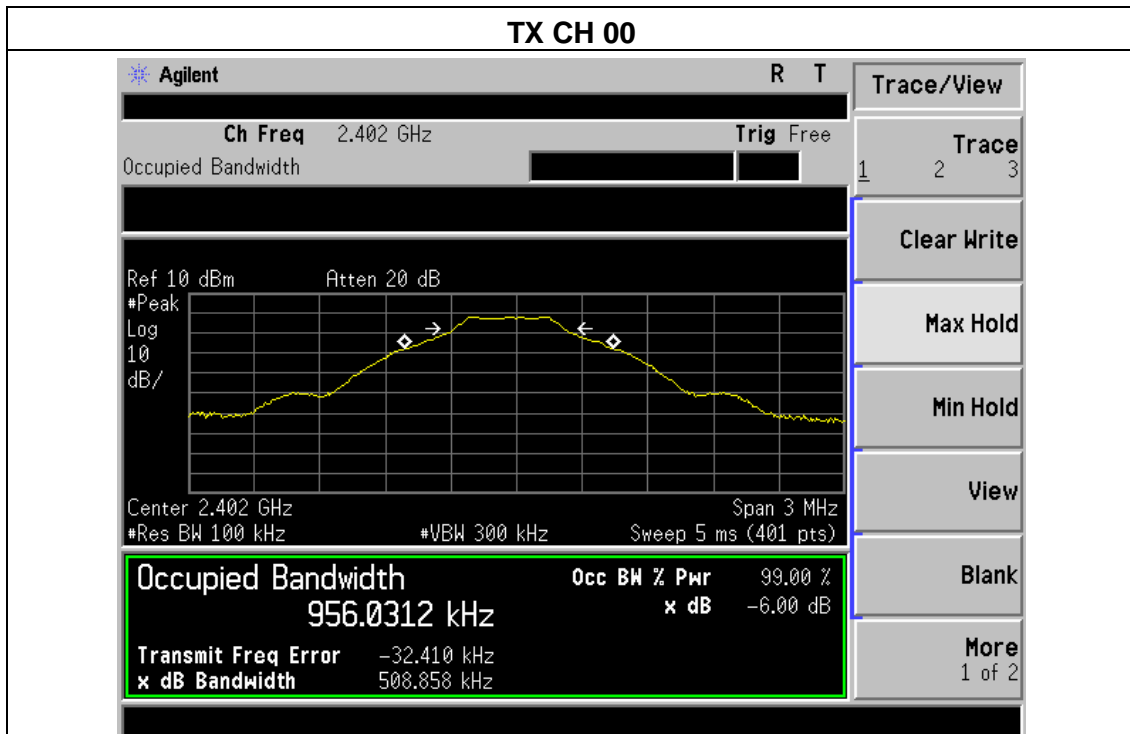
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

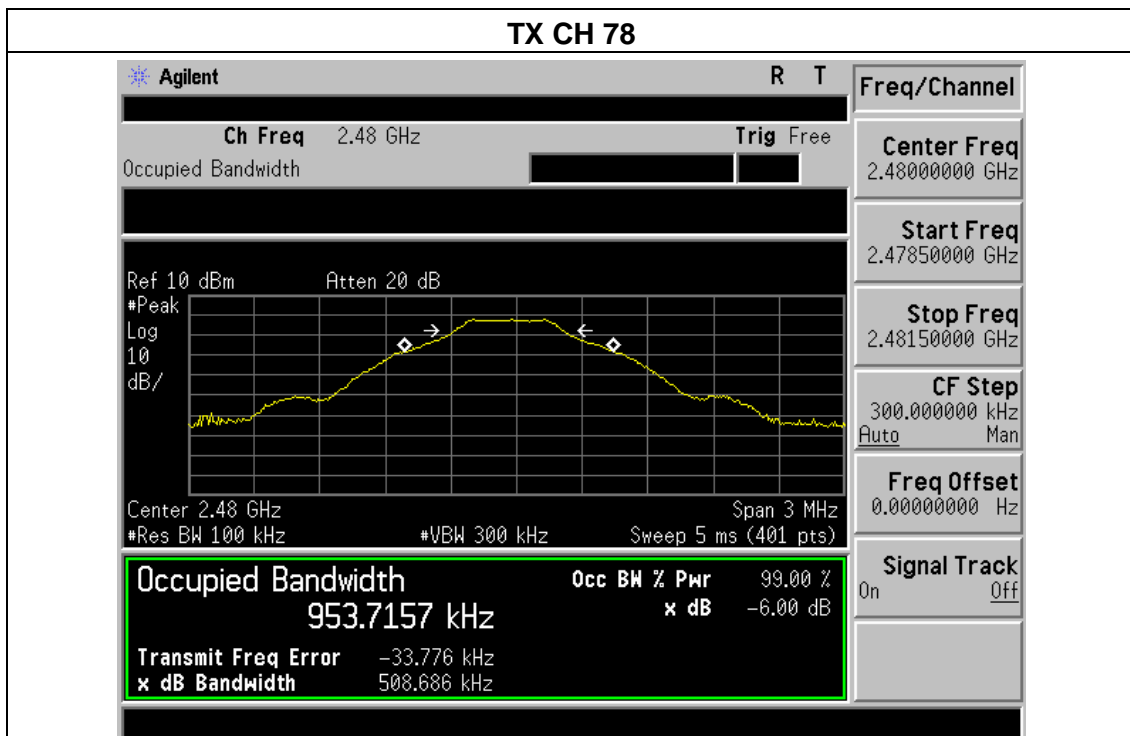
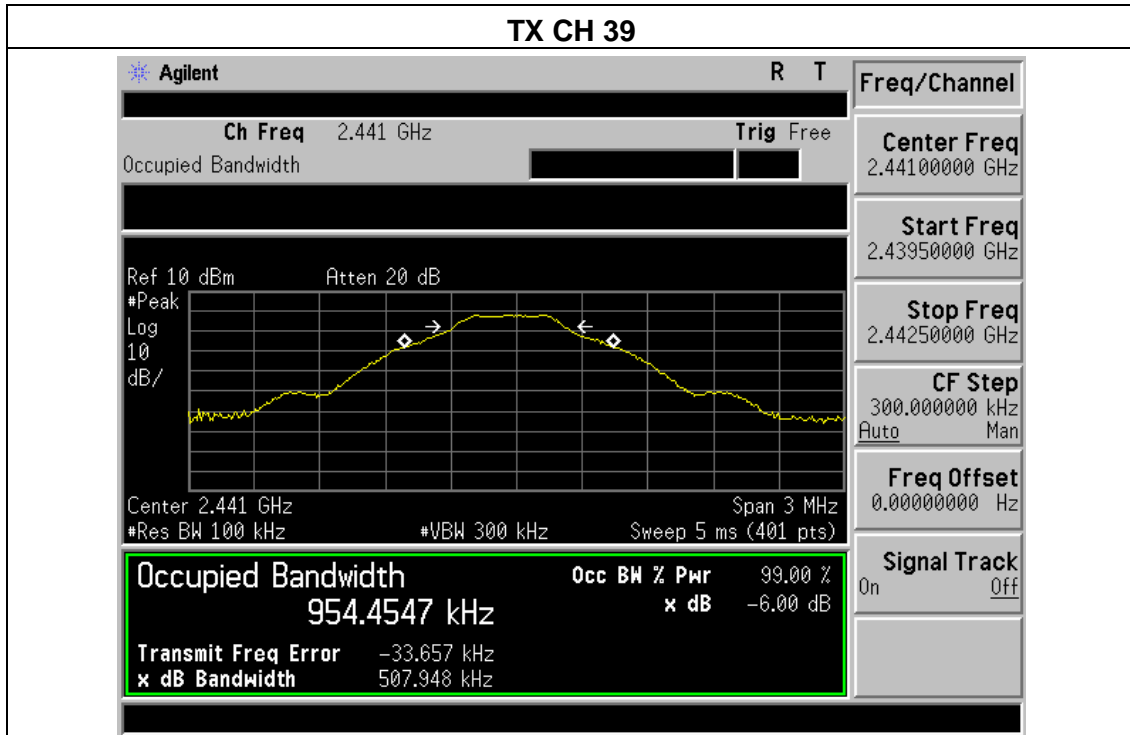


5.1.5 TEST RESULTS

Temperature :	25°C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	AC 120V
Test Mode :	GFSK		

Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
2402	0.509	500	Pass
2441	0.508	500	Pass
2480	0.509	500	Pass

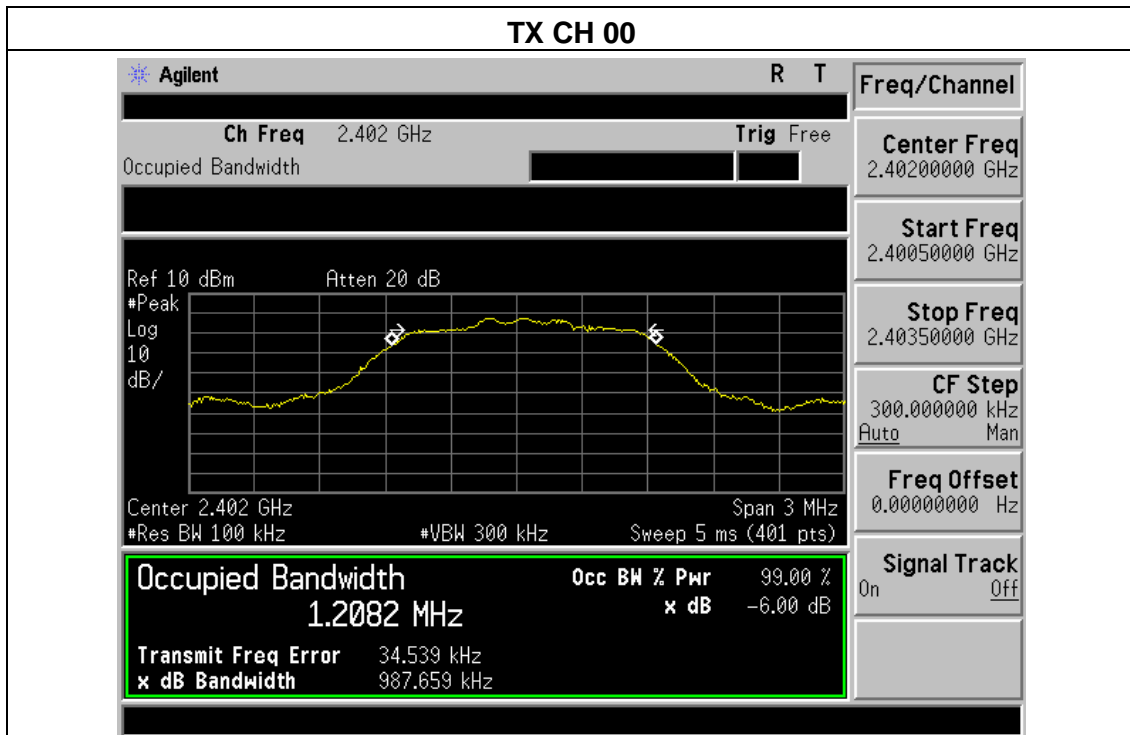


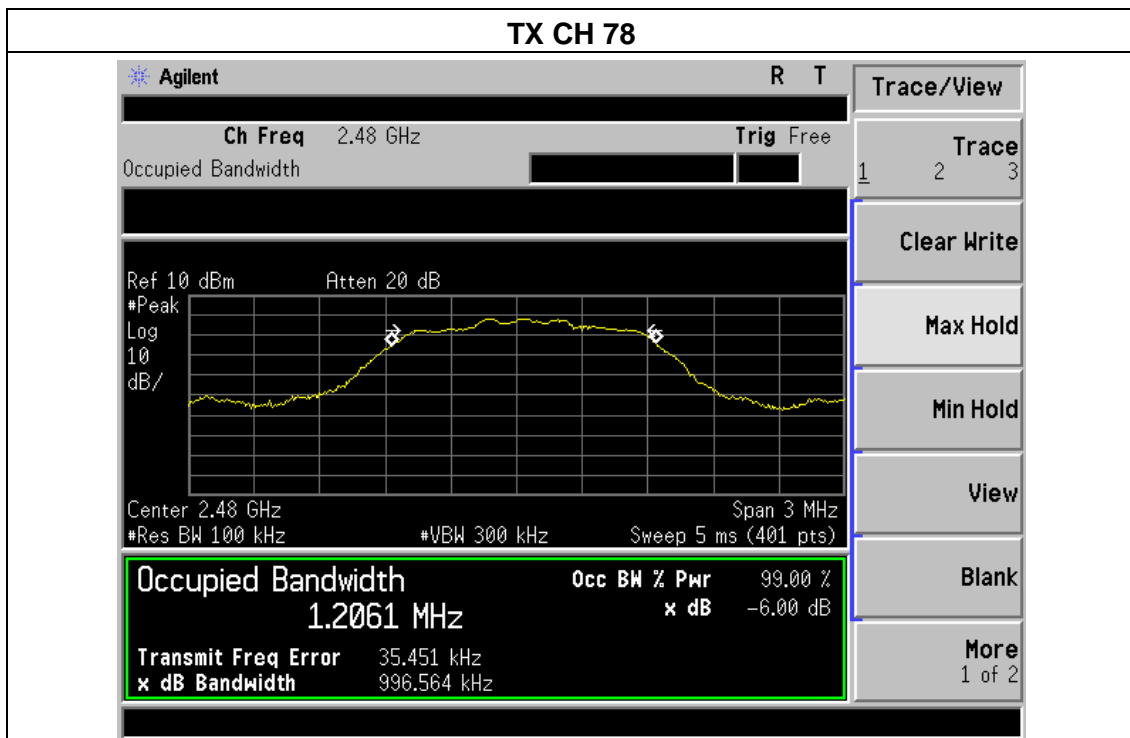
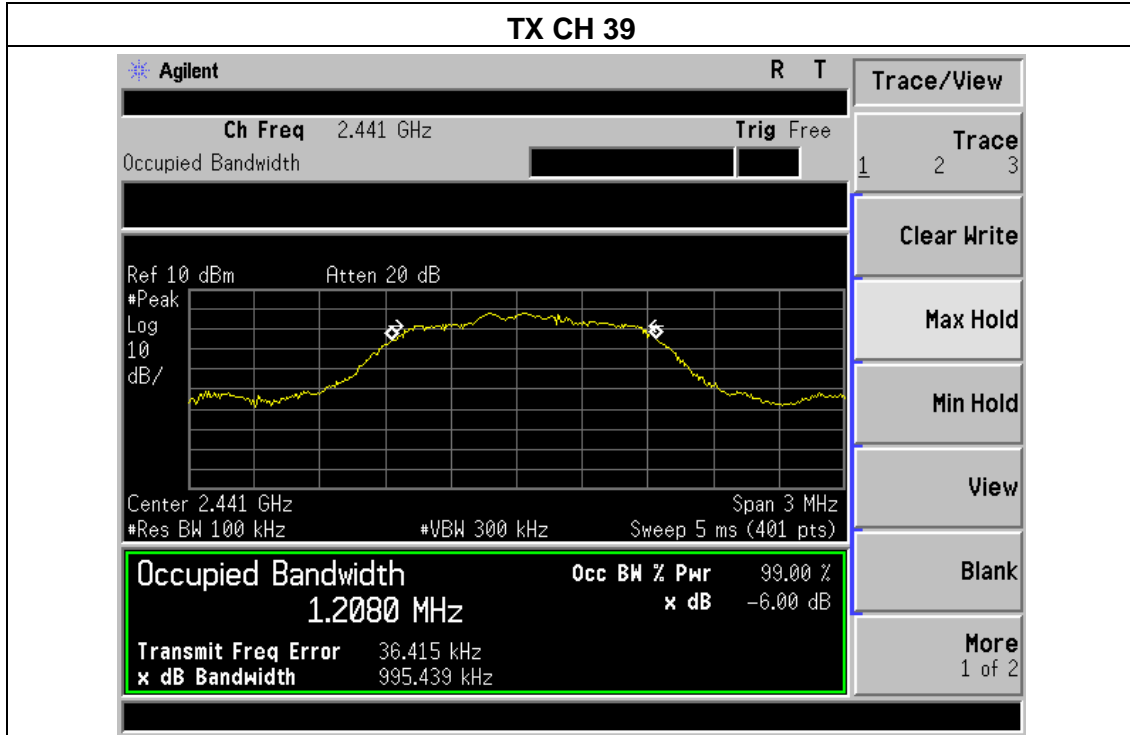




Temperature :	25°C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	AC 120V
Test Mode :	PI/4 DPSK		

Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
2402	0.988	500	Pass
2441	0.995	500	Pass
2480	0.997	500	Pass

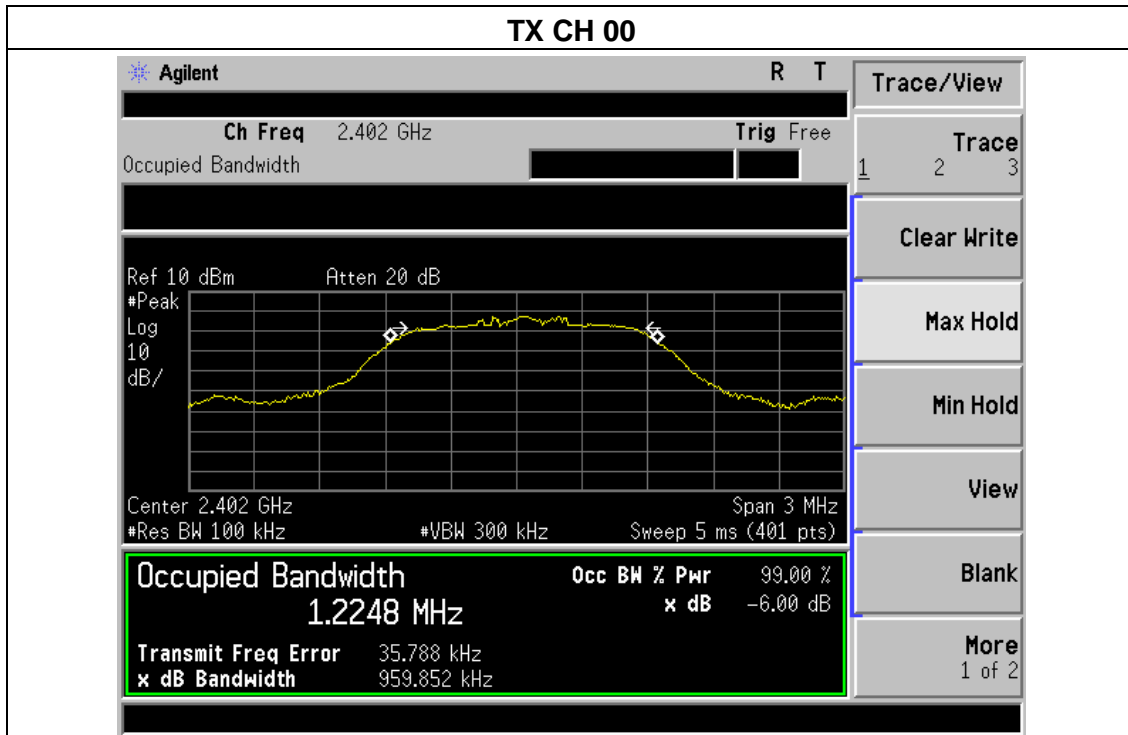


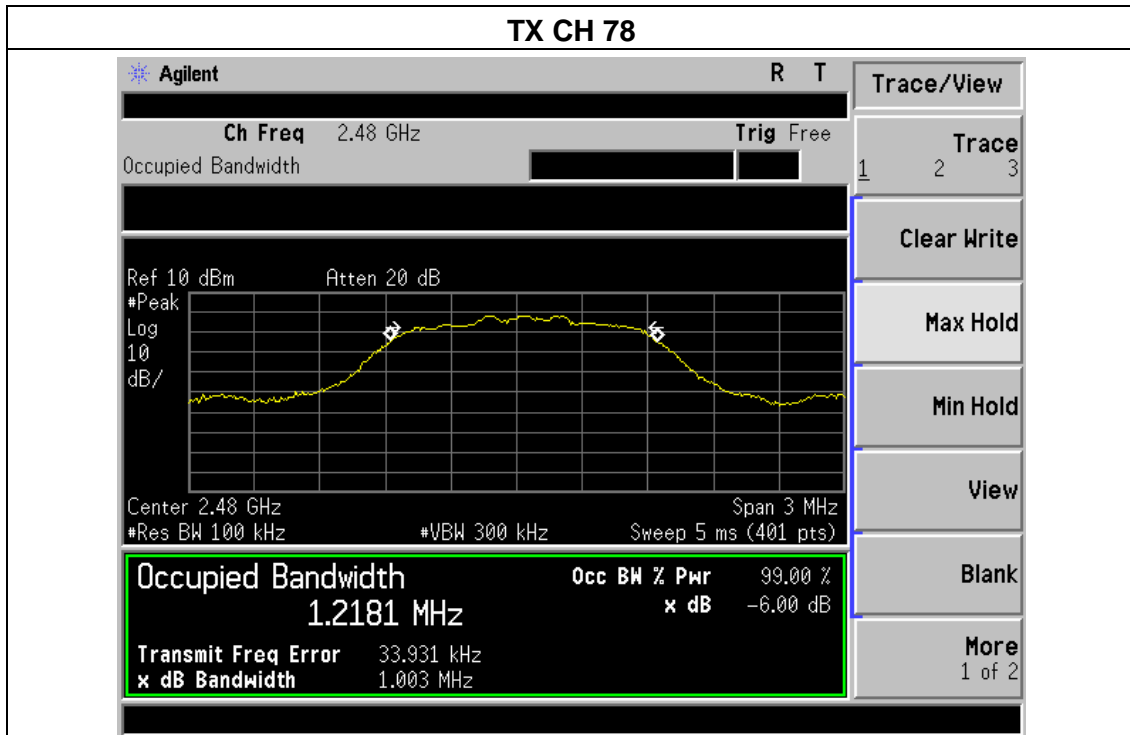
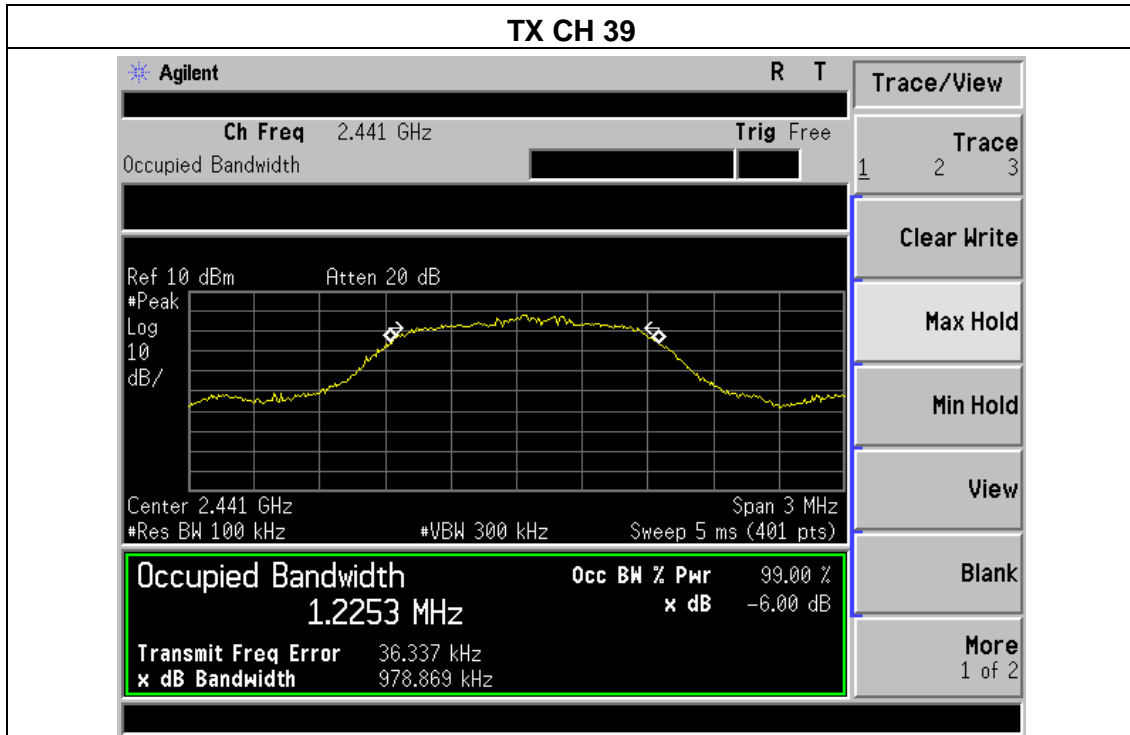




Temperature :	25°C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	AC 120V
Test Mode :	8DPSK		

Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
2402	0.960	500	Pass
2441	0.979	500	Pass
2480	1.003	500	Pass







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 :	25°C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	AC 120V

	Frequency	Maximum Conducted Output Power(PK)	LIMIT
	(MHz)	(dBm)	dBm
GFSK	2402	3.54	30
	2441	3.42	30
	2480	3.34	30
PI/4 DPSK	2402	3.41	30
	2441	3.56	30
	2480	3.47	30
8DPSK	2402	3.52	30
	2441	3.65	30
	2480	3.26	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

- a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- c) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- d) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- e) Repeat above procedures until all measured frequencies were complete.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



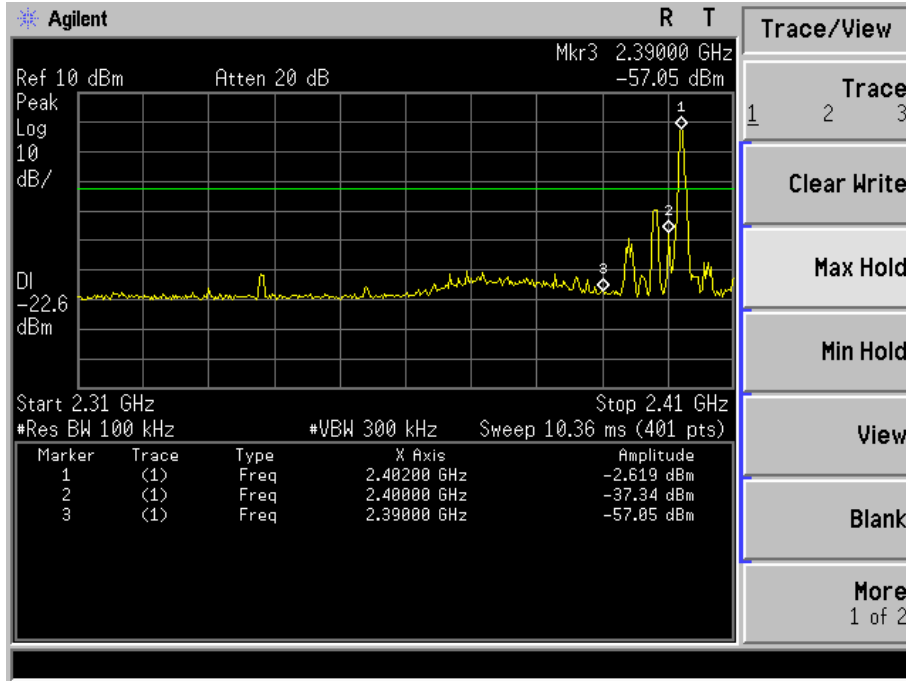
7.5 EUT OPERATION CONDITIONS

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.

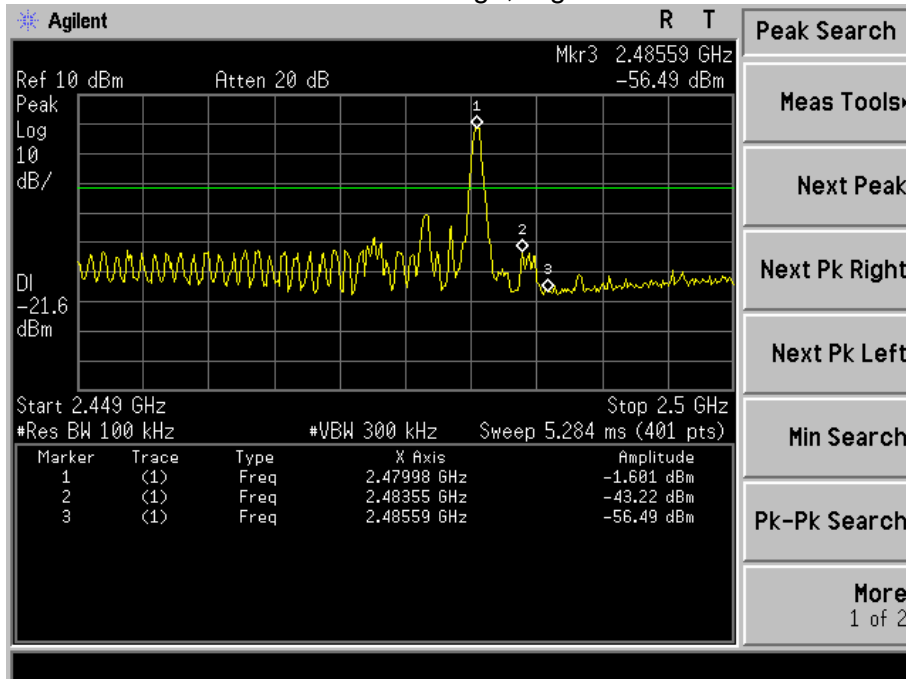
7.1 TEST RESULTS



GFSK: Band Edge, Left Side

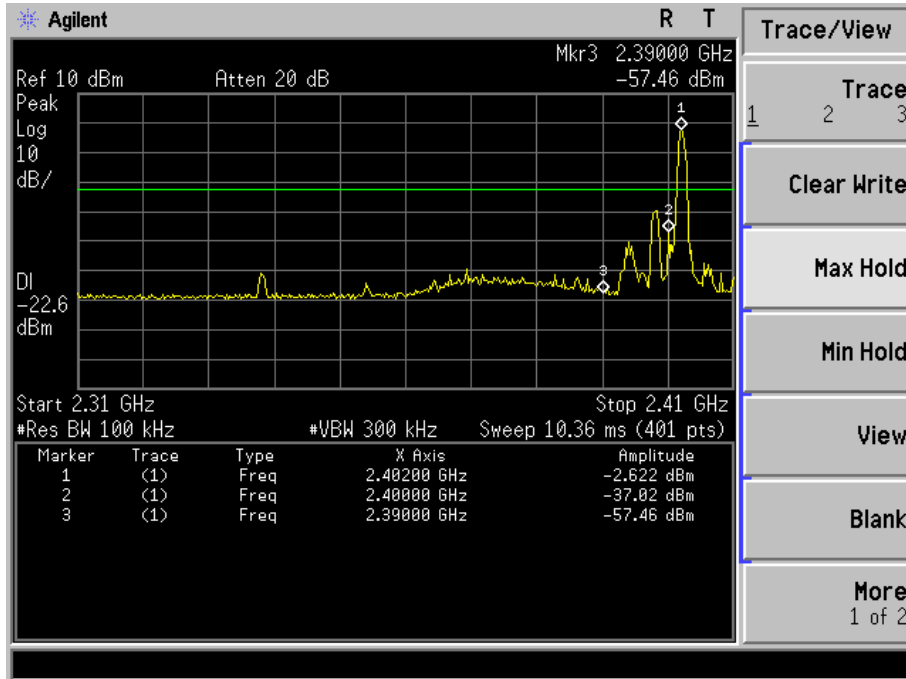


GFSK: Band Edge, Right Side

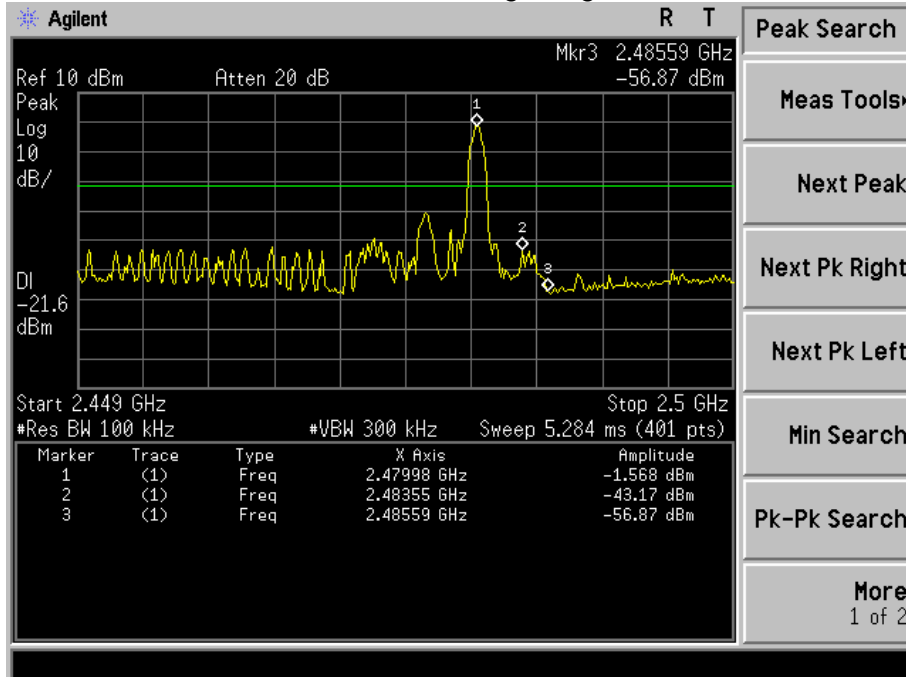




PI/4 DPSK: Band Edge, Left Side

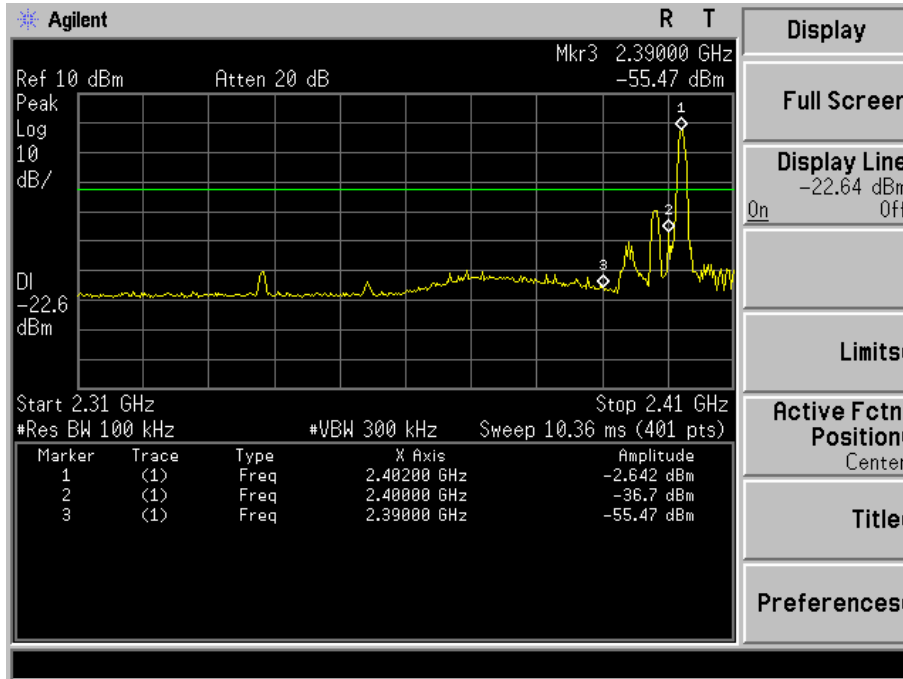


PI/4 DPSK: Band Edge, Right Side

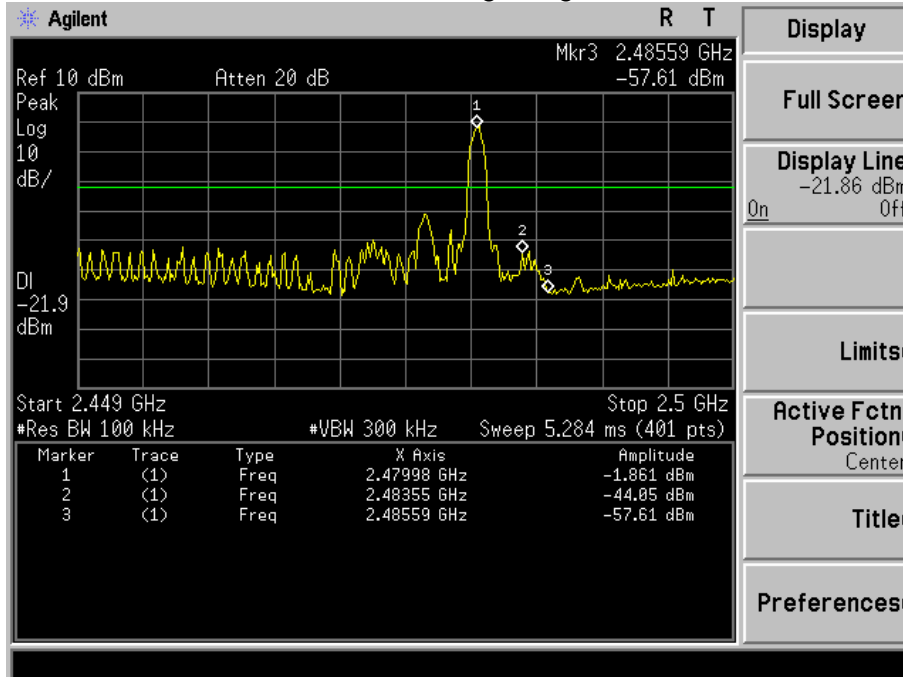




8DPSK: Band Edge, Left Side



8DPSK: Band Edge, Right Side

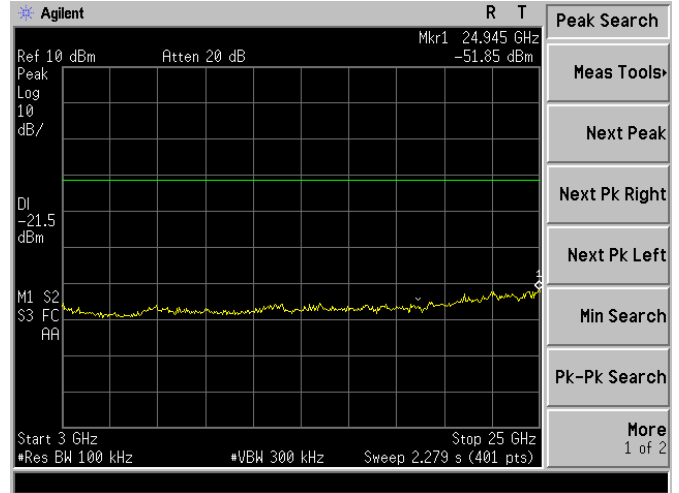
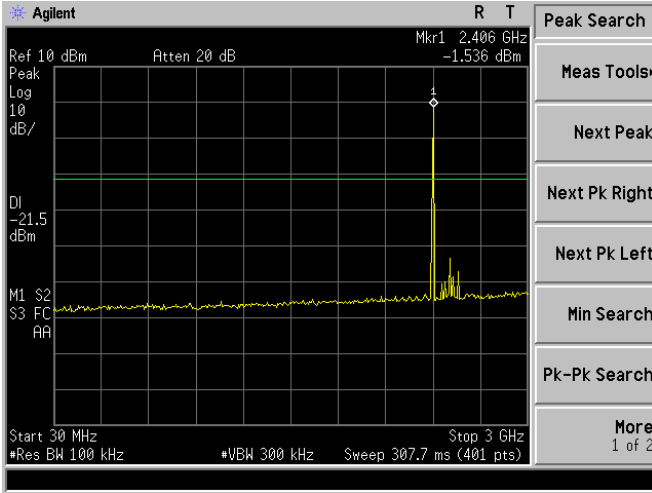




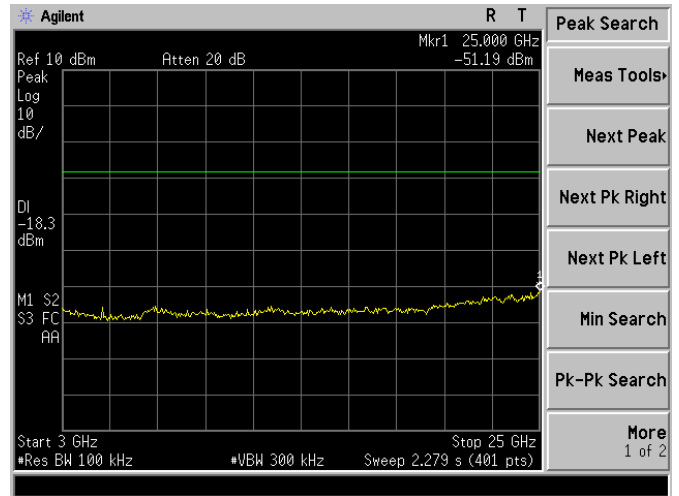
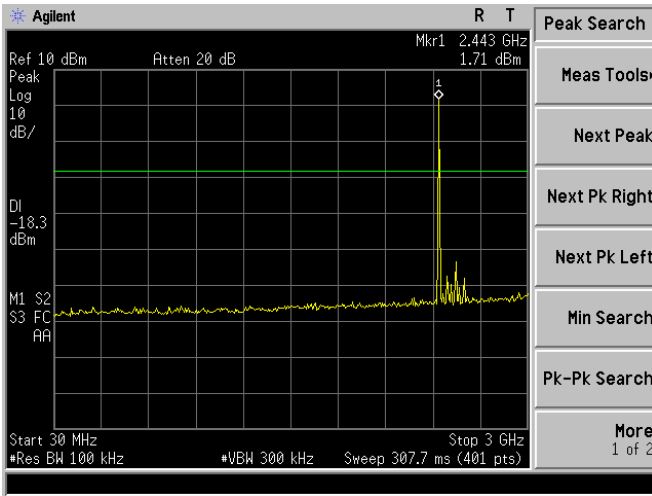
CONDUCTED EMISSION MEASUREMENT

GFSK

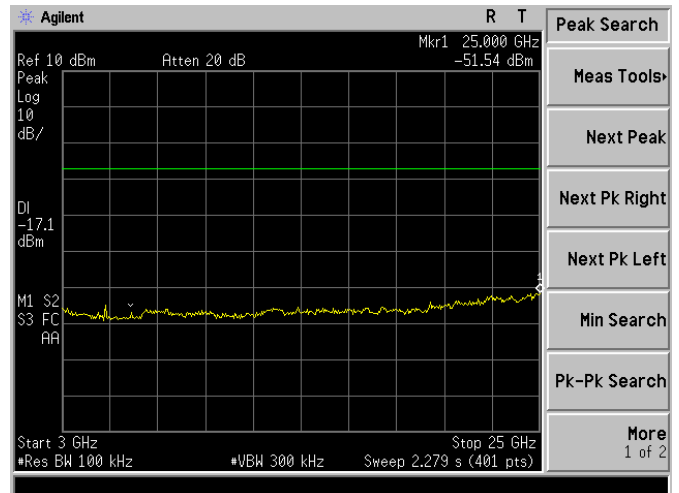
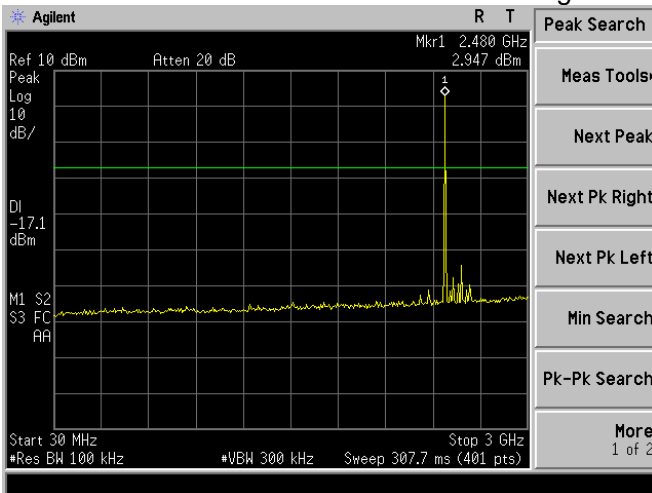
Low Channel 2402MHz



Middle Channel 2441MHz



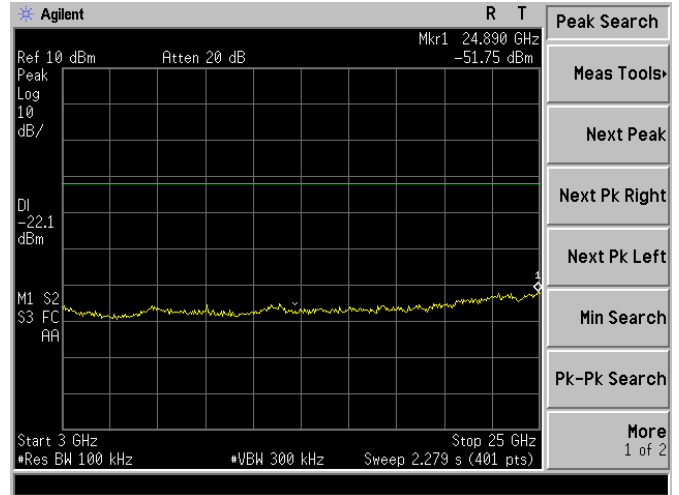
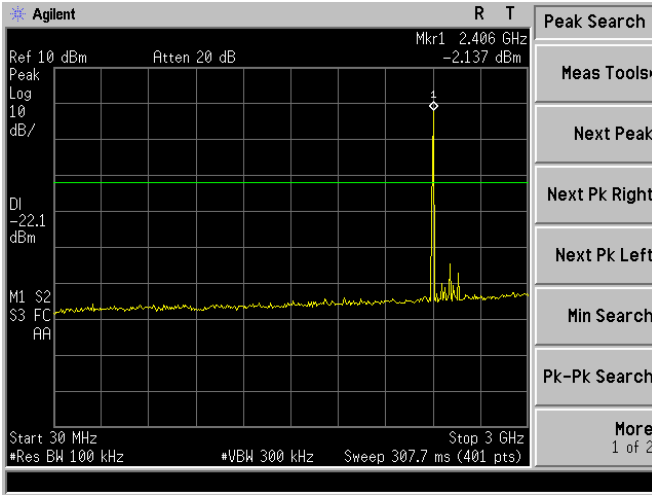
High Channel 2480MHz



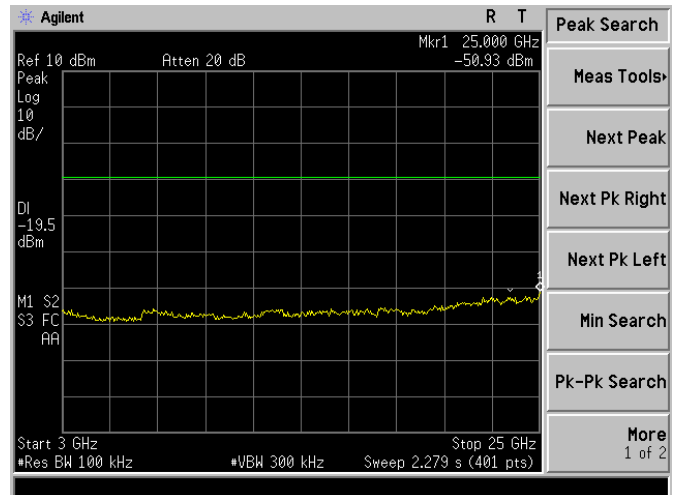
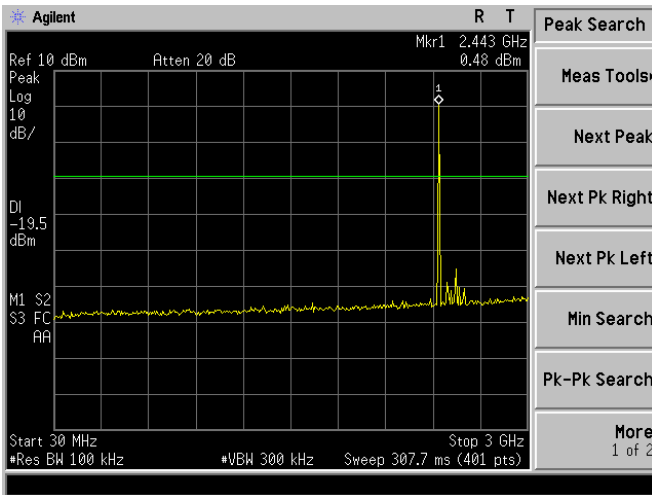


PI/4 DPSK

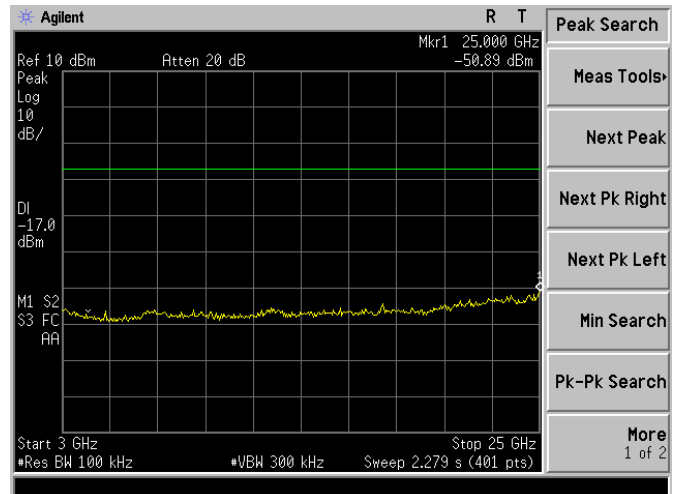
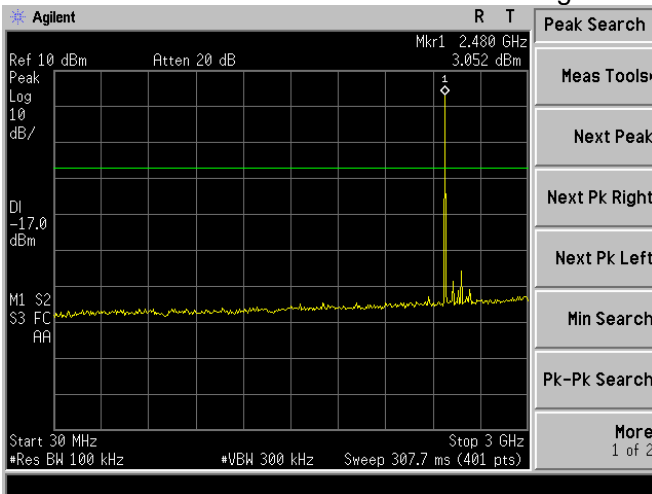
Low Channel 2402MHz



Middle Channel 2441MHz



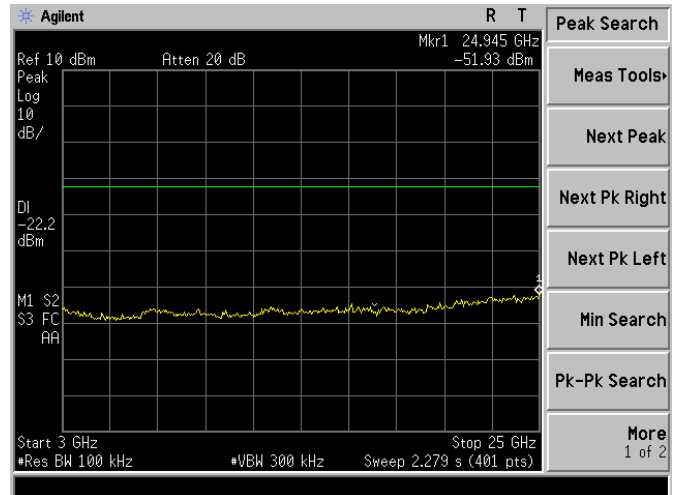
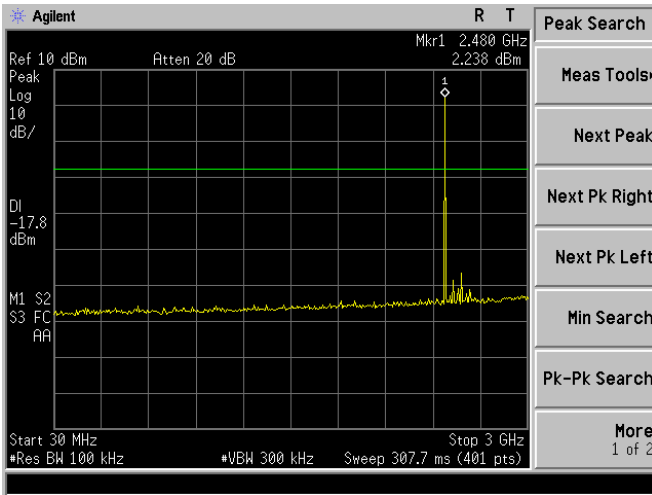
High Channel 2480MHz



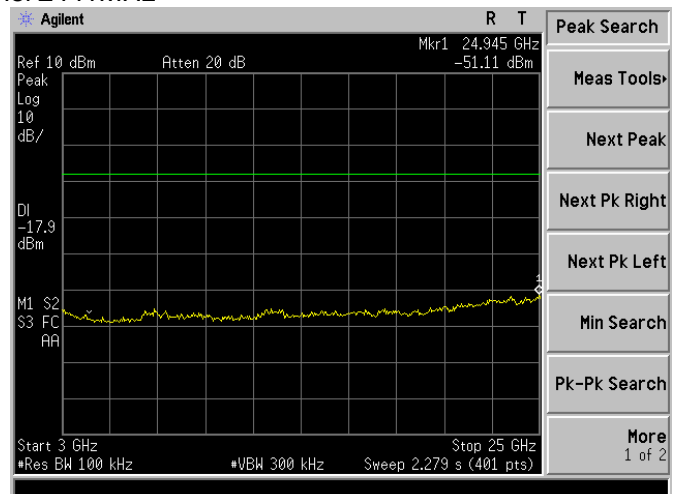
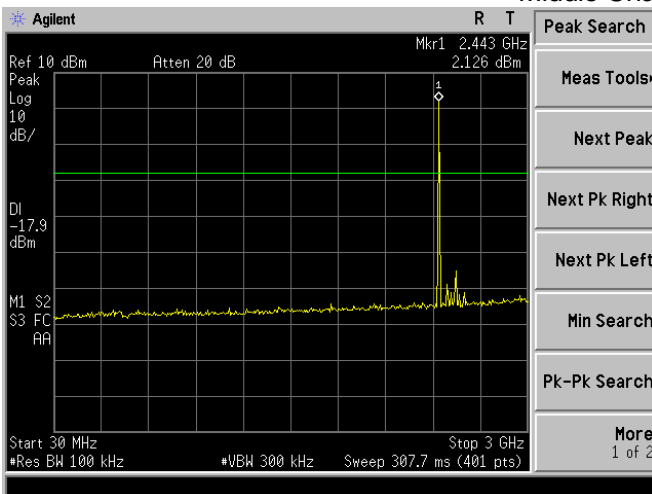


8DPSK

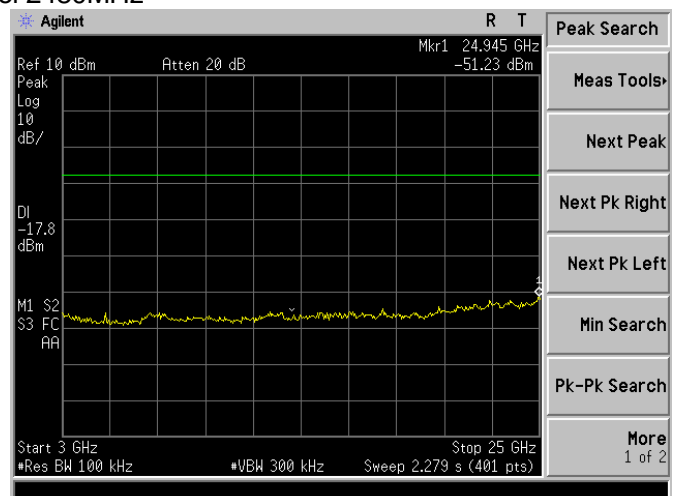
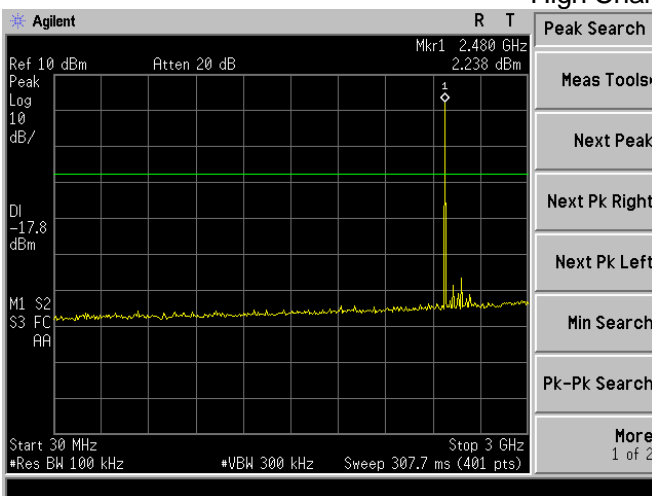
Low Channel 2402MHz



Middle Channel 2441MHz



High Channel 2480MHz





8. ANTENNA REQUIREMENT

8.1 STANDARD REQUIREMENT

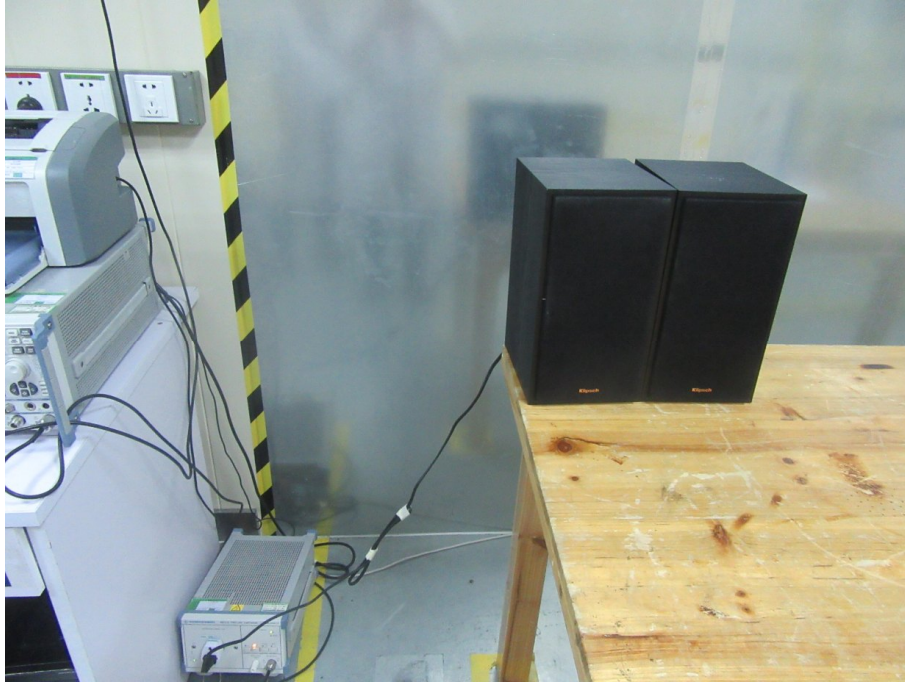
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

8.2 EUT ANTENNA

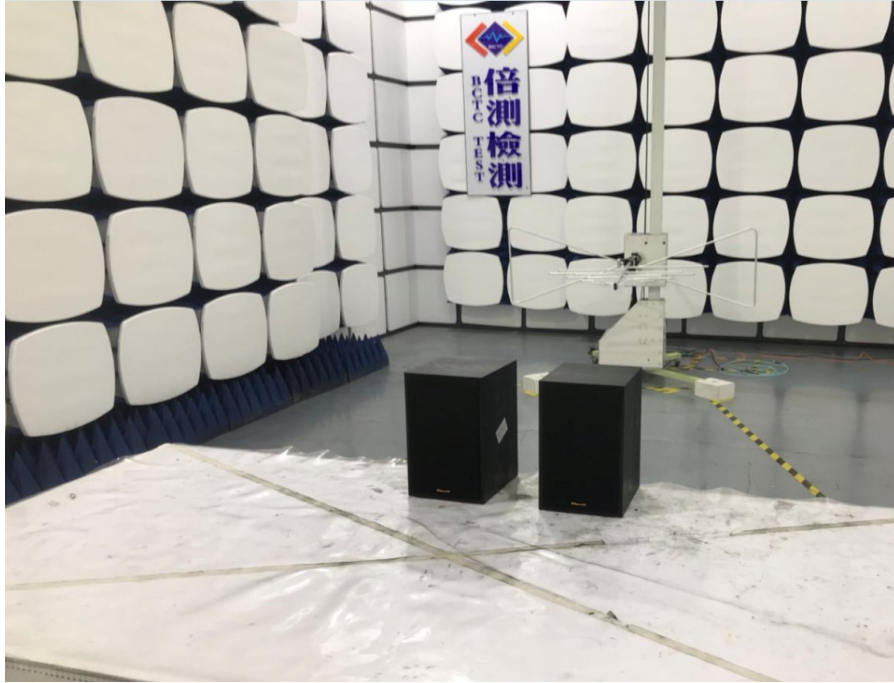
The EUT antenna is PCB Antenna, It comply with the standard requirement.

9. EUT TEST PHOTO

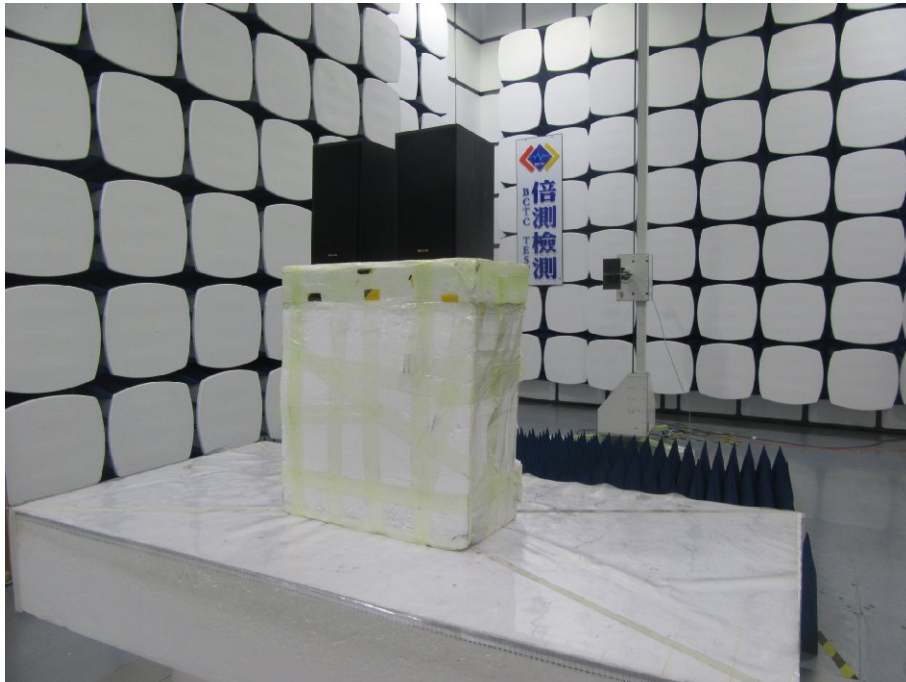
Conducted Measurement Photos



Radiated Measurement Photos



Radiated Measurement Photos



10. EUT PHOTO



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