

FCC Part 15C Test Report

FCC ID: 2AMRRBS100DB

Product Name:	Bluetooth Wireless Transformers Speaker
Trademark:	SWORDFISH
Model Name :	SFT-BS100DB SFT-BS100AB, SFT-BS100AY, SFT-BS100DG
Prepared For :	SWORDFISH TECH, LLC
Address :	3917 SCHAEFER AVENUE CHINO, CA 91710, USA
Test Date:	Jun.28 - Jul. 02, 2017
Date of Report :	Jul. 02, 2017
Report No.:	BCTC-17050052

VERIFICATION OF COMPLIANCE

Applicant's name..... : SWORDFISH TECH, LLC

Address..... : 3917 SCHAEFER AVENUE CHINO, CA 91710, USA

Manufacture's Name..... : SWORDFISH TECH, LLC

Address..... : 3917 SCHAEFER AVENUE CHINO, CA 91710, USA

Product description

Product name.....: Bluetooth Wireless Transformers Speaker

Trademark: SWORDFISH

Model Name: SFT-BS100DB
SFT-BS100AB, SFT-BS100AY, SFT-BS100DG

Test procedure FCC Part15.249

Standards 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 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.

Test Result..... : **Pass**

Testing Engineer : 
(Eric Yang)

Technical Manager : 
(Sophia Lee)

Authorized Signatory : 
(Carson. Zhang)

1 . SUMMARY OF TEST RESULTS	4
1.1 TEST FACILITY	4
1.2 MEASUREMENT UNCERTAINTY	4
2 . GENERAL INFORMATION	5
2.1 GENERAL DESCRIPTION OF EUT	5
2.2 DESCRIPTION OF TEST MODES	6
2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING	7
2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	7
2.5 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)	7
2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS	8
3 . EMC EMISSION TEST	9
3.1 CONDUCTED EMISSION MEASUREMENT	9
3.1.1 POWER LINE CONDUCTED EMISSION LIMITS	9
3.1.2 TEST PROCEDURE	9
3.1.3 DEVIATION FROM TEST STANDARD	9
3.1.4 TEST SETUP	10
3.1.5 EUT OPERATING CONDITIONS	10
3.1.6 TEST RESULTS	11
3.2 RADIATED EMISSION MEASUREMENT	13
3.2.1 RADIATED EMISSION LIMITS	13
3.2.2 TEST PROCEDURE	14
3.2.3 DEVIATION FROM TEST STANDARD	14
3.2.4 TEST SETUP	15
3.2.5 EUT OPERATING CONDITIONS	16
3.2.6 TEST RESULTS	17
3.3 RADIATED BAND EMISSION MEASUREMENT	23
3.3.1 TEST REQUIREMENT:	23
3.3.2 TEST PROCEDURE	23
3.3.3 DEVIATION FROM TEST STANDARD	23
3.3.4 TEST SETUP	24
3.3.5 EUT OPERATING CONDITIONS	24
4 . BANDWIDTH TEST	28
4.1 APPLIED PROCEDURES / LIMIT	28
4.1.1 TEST PROCEDURE	28
4.1.2 DEVIATION FROM STANDARD	28
4.1.3 TEST SETUP	28
4.1.4 EUT OPERATION CONDITIONS	28
4.1.5 TEST RESULTS	29
5 . ANTENNA REQUIREMENT	34
5.1 STANDARD REQUIREMENT	34
5.2 EUT ANTENNA	34
6 . EUT TEST PHOTO	35
7 . EUT PHOTOS	37

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.249) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.249	Radiated Spurious Emission	PASS	
15.249	Bandwidth	PASS	
15.205	Band Edge Emission	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 Technology Co., Ltd.

Add.:No.101,Yousong Road,Longhua New District, Shenzhen,China

FCC Registration No.:187086

1.2 MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
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	Bluetooth Wireless Transformers Speaker	
Trade Name	SWORDFISH	
Model Name	SFT-BS100DB SFT-BS100AB, SFT-BS100AY, SFT-BS100DG	
Model Difference	The product's different for model number and appearance color.	
Product Description	The EUT is a Bluetooth Wireless Transformers Speaker	
	Operation Frequency:	2402~2480 MHz
	Modulation Type:	GFSK, PI/4 DPSK, 8DPSK
	Bit Rate of Transmitter	1/2/3Mbps
	Number Of Channel	79 CH
	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.	
Adapter	DC 5V from adapter input AC 120V/60Hz	
Battery	DC 3.7V	
Connecting I/O Port(s)	Please refer to the User's Manual	
hardware version	V01	
Software version	S01	
Serial number	01	

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	Connector	Gain (dBi)	NOTE
1	N/A	N/A	Internal Antenna	N/A	0	

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.

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

Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

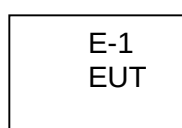
2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

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

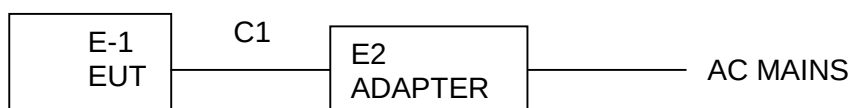
Frequency	2402 MHz	2441 MHz	2480 MHz
Channel	Low	Middle	High

2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Emission Test



2.5 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	Bluetooth Wireless Transformers Speaker	N/A	MX9	01	EUT
E-2	Adapter	SAMSUNG	EP-TA20CBC	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
C1	NO	NO	0.5M	

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Test Receiver	R&S	ESCI	1166.5950K03-101165-ha	2017.06.06	2018.06.05
2	LISN	R&S	NSLK8126	8126466	2017.06.06	2018.06.05
3	LISN	R&S	NSLK8126	8126487	2017.06.06	2018.06.05
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2017.06.06	2018.06.05
5	RF cables	R&S	R204	R20X	2017.06.06	2018.06.05

Radiation test, Band-edge test and 20db bandwidth test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2016.07.06	2017.07.05
2	Test Receiver	R&S	ESPI	101318	2017.06.06	2018.06.05
3	Bilog Antenna	R&S	VULB 9168	VULB9168-438	2016.07.06	2017.07.05
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2016.07.06	2017.07.05
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2016.07.06	2017.07.05
6	Horn Antenna	R&S	HF906	10027	2016.07.06	2017.07.05
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2016.07.06	2017.07.05
8	Amplifier	R&S	BBV9743	9743-019	2017.06.06	2018.06.05
9	Loop Antenna	ARA	PLA-1030/B	1029	2014.06.08	2015.06.07
10	RF cables	R&S	R203	R20X	2016.07.06	2017.07.05
11	Antenna connector	Florida RFLabs	Lab-Fle	RF 01#	2016.07.06	2017.07.05

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

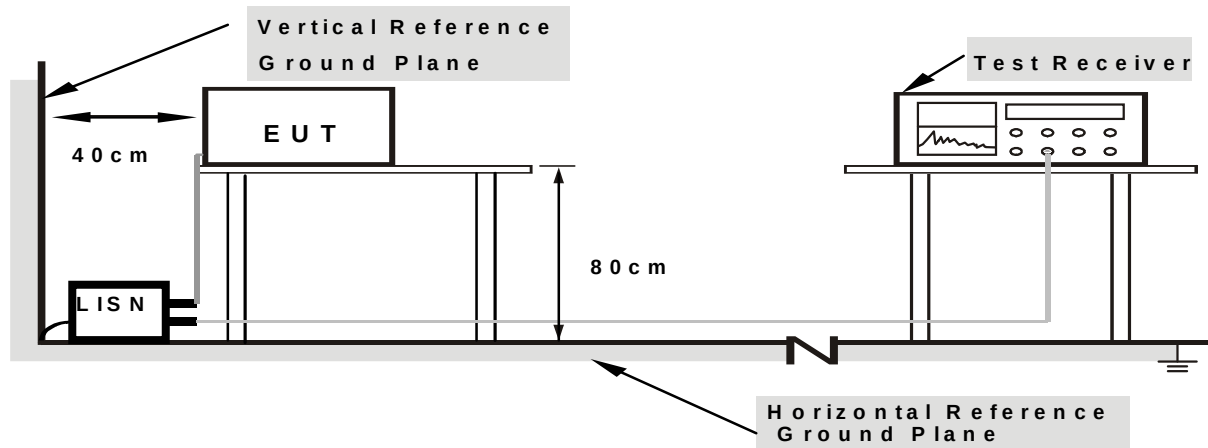
3.1.2 TEST PROCEDURE

- 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.

The data only show the worst mode.

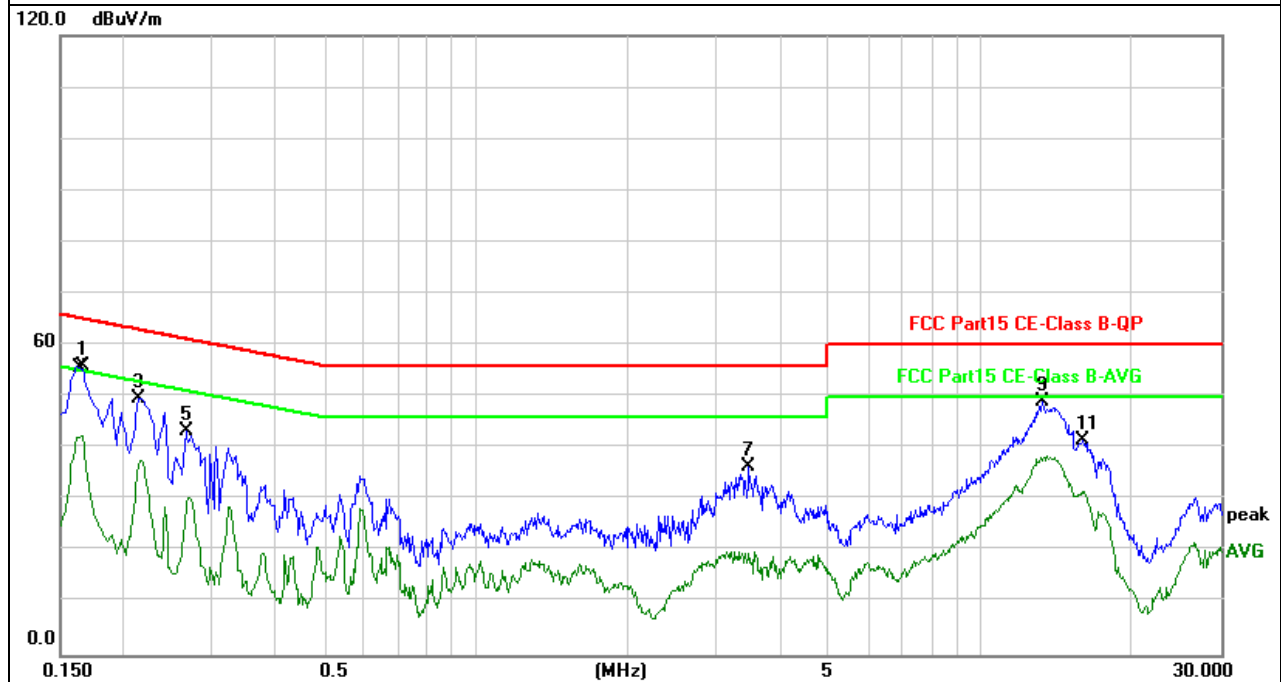
3.1.6 TEST RESULTS

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	L
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 4

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
0.1660	45.80	10.06	55.86	65.16	-9.30	QP
0.1660	32.29	10.06	42.35	55.16	-12.81	AVG
0.2140	39.69	10.07	49.76	63.05	-13.29	QP
0.2140	27.73	10.07	37.80	53.05	-15.25	AVG
0.2660	33.38	10.09	43.47	61.24	-17.77	QP
0.2660	20.30	10.09	30.39	51.24	-20.85	AVG
3.4780	26.19	10.18	36.37	56.00	-19.63	QP
3.4780	9.76	10.18	19.94	46.00	-26.06	AVG
13.3140	38.95	10.14	49.09	60.00	-10.91	QP
13.3140	28.10	10.14	38.24	50.00	-11.76	AVG
15.9780	31.33	10.15	41.48	60.00	-18.52	QP
15.9780	24.43	10.15	34.58	50.00	-15.42	AVG

Remark:

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



Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	N
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 4

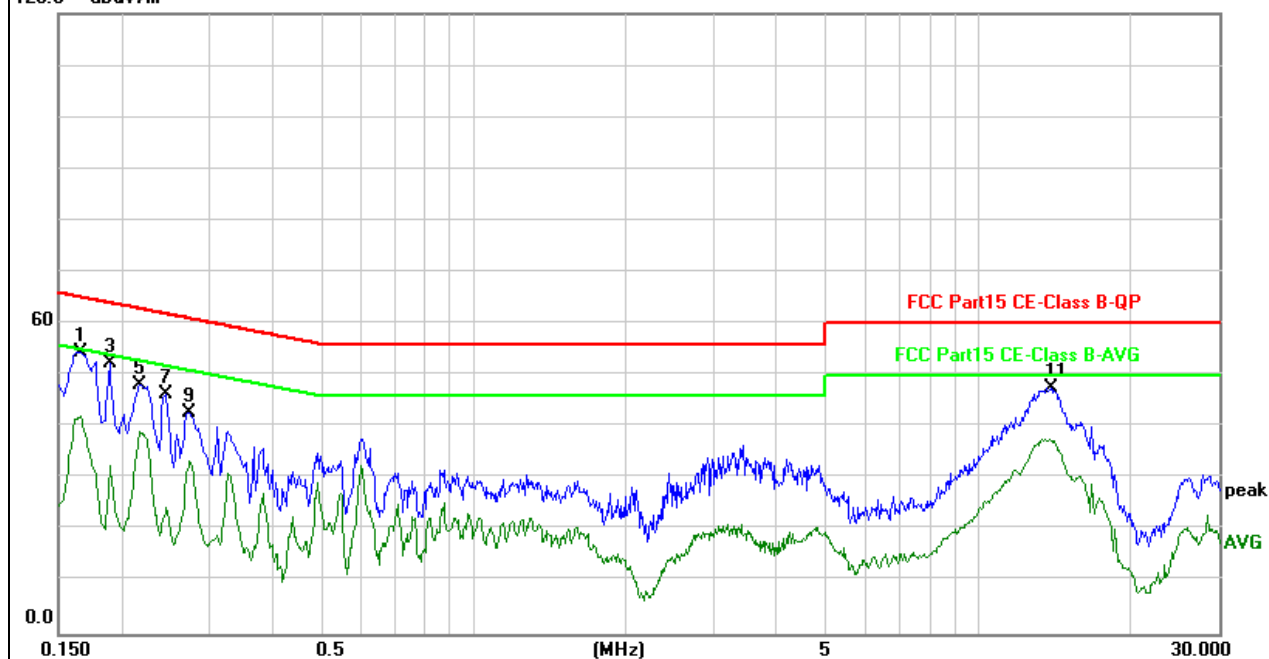
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Detector Type
0.1660	44.31	10.06	54.37	65.16	-10.79	QP
0.1660	31.95	10.06	42.01	55.16	-13.15	AVG
0.1900	42.15	10.06	52.21	64.04	-11.83	QP
0.1900	22.41	10.06	32.47	54.04	-21.57	AVG
0.2180	38.23	10.07	48.30	62.89	-14.59	QP
0.2180	28.94	10.07	39.01	52.89	-13.88	AVG
0.2460	36.27	10.08	46.35	61.89	-15.54	QP
0.2460	17.75	10.08	27.83	51.89	-24.06	AVG
0.2740	32.78	10.09	42.87	61.00	-18.13	QP
0.2740	23.31	10.09	33.40	51.00	-17.60	AVG
13.9220	37.55	10.14	47.69	60.00	-12.31	QP
13.9220	27.52	10.14	37.66	50.00	-12.34	AVG

Remark:

1. All readings are Quasi-Peak and Average values.

2. Factor = Insertion Loss + Cable Loss.

120.0 dBμV/m



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	5 th 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

- 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.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m; 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.
- 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.
- 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.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.
- 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:

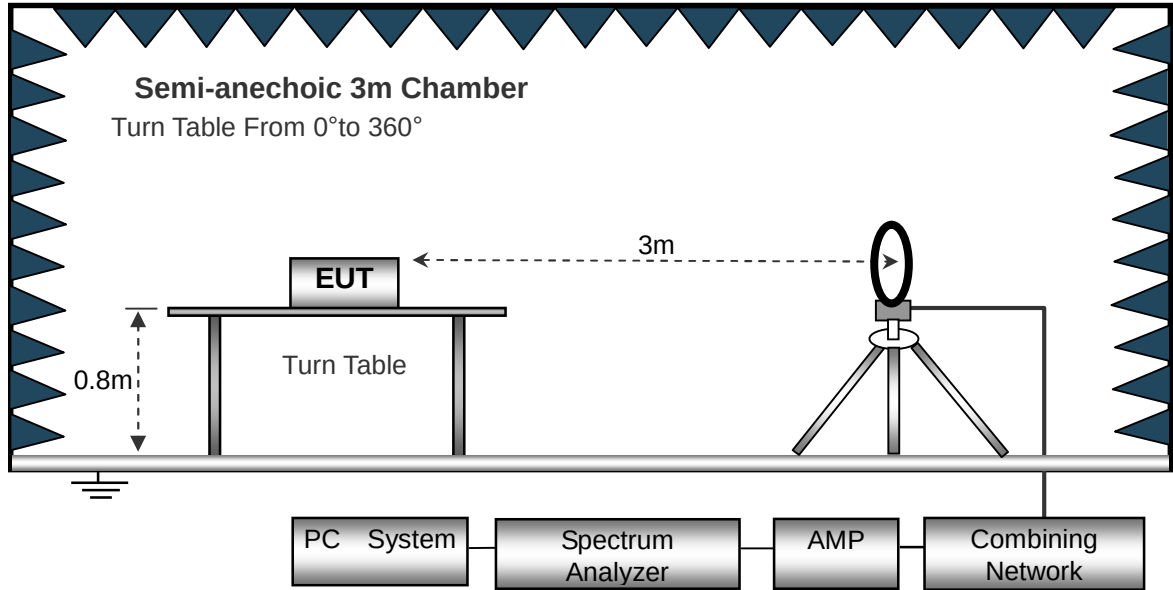
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

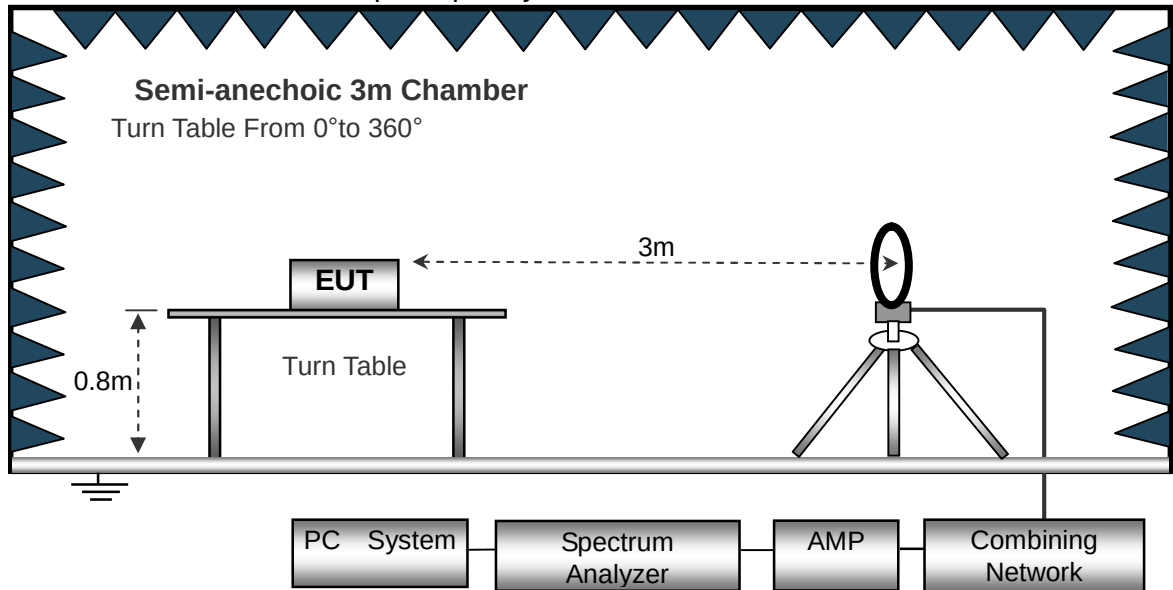
No deviation

3.2.4 TEST SETUP

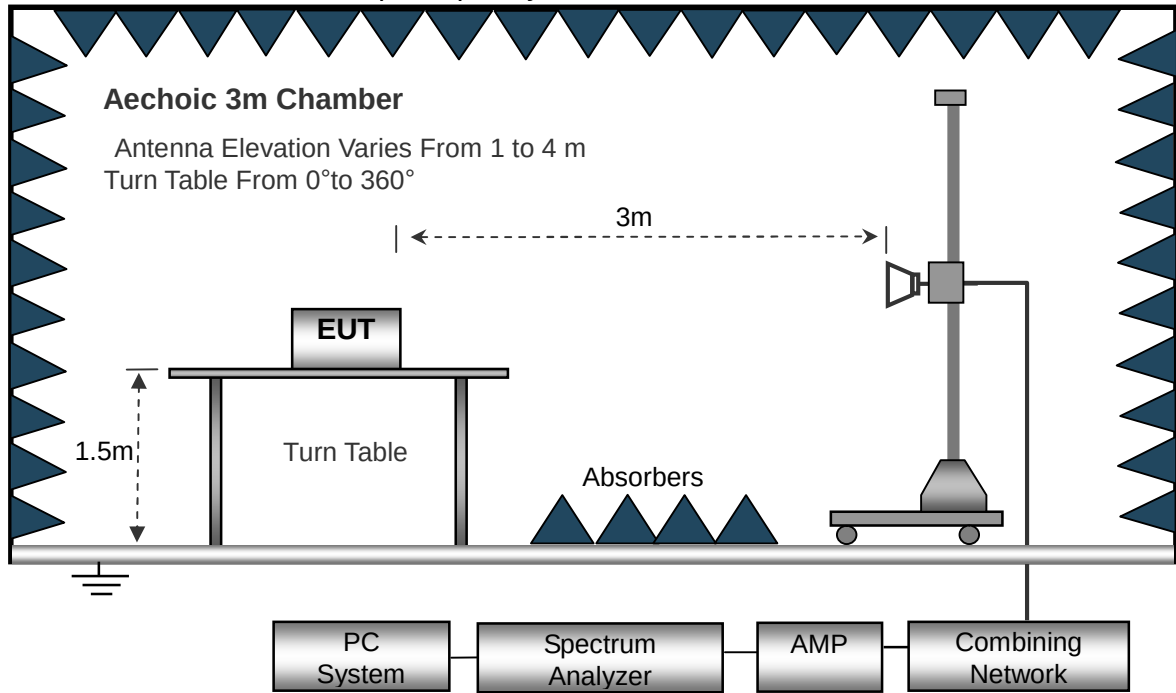
(A) Radiated Emission Test-Up Frequency Below 30MHz



(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

Radiated Spurious Emission (Below 30MHz)

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

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

NOTE:

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

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

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

Radiated Spurious Emission (Between 30MHz – 1GHz)

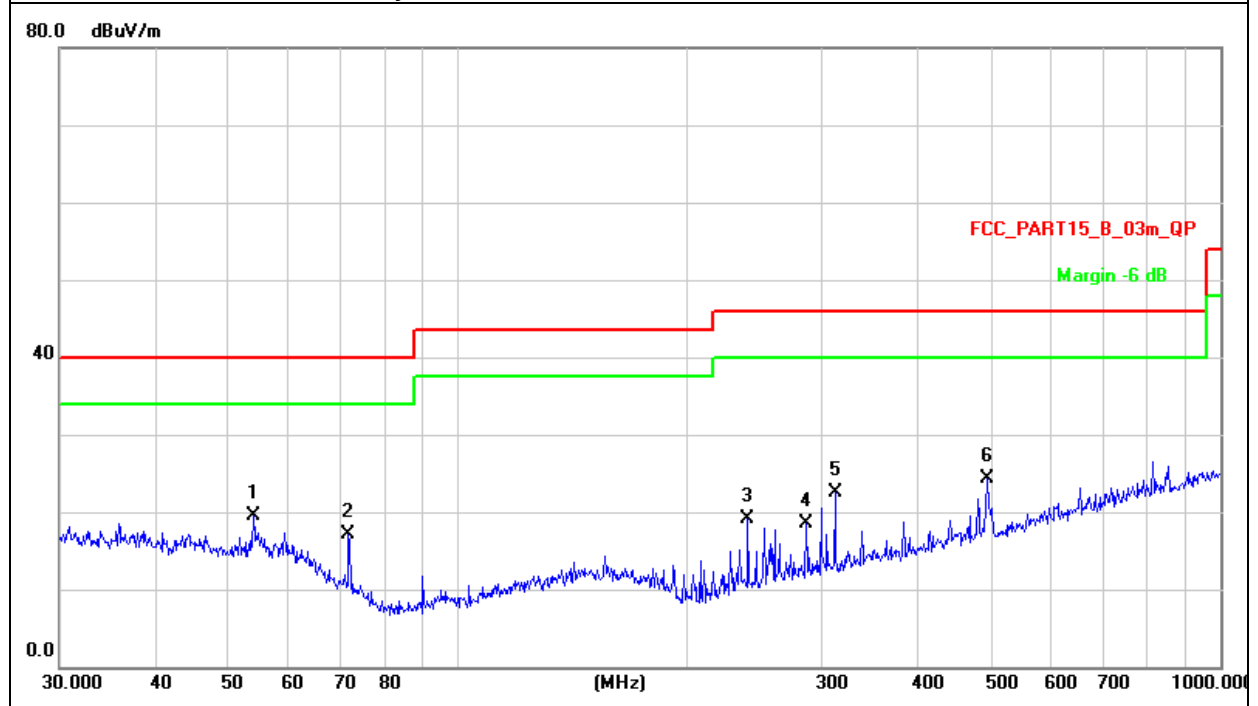
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Horizontal
Test Voltage :	DC 3.7V		
Test Mode :	Mode 4		

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
53.8817	30.47	-10.93	19.54	40.00	-20.46	QP
71.8319	32.35	-15.19	17.16	40.00	-22.84	QP
239.9874	33.61	-14.49	19.12	46.00	-26.88	QP
285.9778	31.42	-12.94	18.48	46.00	-27.52	QP
312.1793	34.70	-12.27	22.43	46.00	-23.57	QP
494.1983	32.63	-8.27	24.36	46.00	-21.64	QP

Remark:

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

Pretest all mode, the data only show the worst mode.



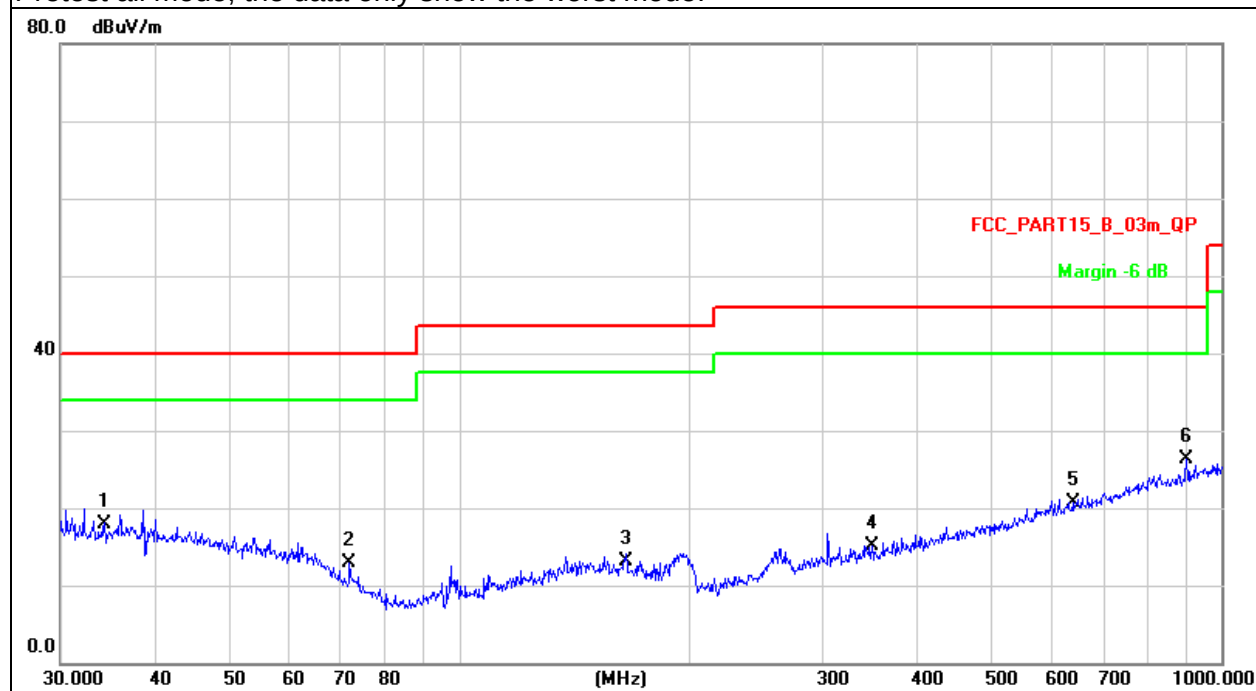
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Vertical
Test Voltage :	DC 3.7V		
Test Mode :	Mode 4		

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
34.2760	26.47	-8.47	18.00	40.00	-22.00	QP
71.8320	28.09	-15.19	12.90	40.00	-27.10	QP
164.9075	26.28	-13.16	13.12	43.50	-30.38	QP
348.0274	26.45	-11.42	15.03	46.00	-30.97	QP
638.3686	26.05	-5.29	20.76	46.00	-25.24	QP
900.1474	27.79	-1.45	26.34	46.00	-19.66	QP

Remark:

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

Pretest all mode, the data only show the worst mode.



Radiated Spurious Emission (1GHz to 10th harmonics)

GFSK

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2402							
V	2402.00	88.21	13.85	102.06	114.00	-11.94	PK
V	2402.00	72.91	13.85	86.76	94.00	-7.24	AV
V	4804.00	39.43	19.34	58.77	74.00	-15.23	PK
V	4804.00	25.77	19.34	45.11	54.00	-8.89	AV
V	16128.00	29.97	21.89	51.86	74.00	-22.14	PK
H	2402.00	88.18	13.85	102.03	114.00	-11.97	PK
H	2402.00	73.52	13.85	87.37	94.00	-6.63	AV
H	4804.00	40.25	19.34	59.59	74.00	-14.41	PK
H	4804.00	25.66	19.34	45.00	54.00	-9.00	AV
H	16128.00	29.72	21.89	51.61	74.00	-22.39	PK
operation frequency:2441							
V	2441.00	88.73	13.94	102.67	114.00	-11.33	PK
V	2441.00	73.05	13.94	86.99	94.00	-7.01	AV
V	4882.00	40.35	19.42	59.77	74.00	-14.23	PK
V	4882.00	25.81	19.42	45.23	54.00	-8.77	AV
V	16128.00	28.23	21.89	50.12	74.00	-23.88	PK
H	2441.00	88.75	13.94	102.69	114.00	-11.31	PK
H	2441.00	73.92	13.94	87.86	94.00	-6.14	AV
H	4882.00	41.42	19.42	60.84	74.00	-13.16	PK
H	4882.00	26.54	19.42	45.96	54.00	-8.04	AV
H	16128.00	29.89	21.89	51.78	74.00	-22.22	PK
operation frequency:2480							
V	2480.00	88.78	14.02	102.80	114.00	-11.20	PK
V	2480.00	73.15	14.02	87.17	94.00	-6.83	AV
V	4960.00	41.16	19.51	60.67	74.00	-13.33	PK
V	4960.00	26.08	19.51	45.59	54.00	-8.41	AV
V	16128.00	30.10	21.89	51.99	74.00	-22.01	PK
H	2480.00	88.81	14.02	102.83	114.00	-11.17	PK
H	2480.00	73.00	14.02	87.02	94.00	-6.98	AV
H	4960.00	41.38	19.51	60.89	74.00	-13.11	PK
H	4960.00	26.11	19.51	45.62	54.00	-8.38	AV
H	16128.00	30.42	21.89	52.31	74.00	-21.69	PK
Remark: 1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit 2. If peak below the average limit, the average emission was no test. 3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.							

PI/4 DPSK

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2402							
V	2402.00	88.14	13.85	101.99	114.00	-12.01	PK
V	2402.00	72.85	13.85	86.70	94.00	-7.30	AV
V	4804.00	39.39	19.34	58.73	74.00	-15.27	PK
V	4804.00	25.75	19.34	45.09	54.00	-8.91	AV
V	16128.00	29.94	21.89	51.83	74.00	-22.17	PK
H	2402.00	88.11	13.85	101.96	114.00	-12.04	PK
H	2402.00	73.46	13.85	87.31	94.00	-6.69	AV
H	4804.00	40.21	19.34	59.55	74.00	-14.45	PK
H	4804.00	25.64	19.34	44.98	54.00	-9.02	AV
H	16128.00	29.69	21.89	51.58	74.00	-22.42	PK
operation frequency:2441							
V	2441.00	88.66	13.94	102.60	114.00	-11.40	PK
V	2441.00	72.99	13.94	86.93	94.00	-7.07	AV
V	4882.00	40.31	19.42	59.73	74.00	-14.27	PK
V	4882.00	25.79	19.42	45.21	54.00	-8.79	AV
V	16128.00	28.21	21.89	50.10	74.00	-23.90	PK
H	2441.00	88.68	13.94	102.62	114.00	-11.38	PK
H	2441.00	73.86	13.94	87.80	94.00	-6.20	AV
H	4882.00	41.40	19.42	60.82	74.00	-13.18	PK
H	4882.00	26.52	19.42	45.94	54.00	-8.06	AV
H	16128.00	29.86	21.89	51.75	74.00	-22.25	PK
operation frequency:2480							
V	2480.00	88.71	14.02	102.73	114.00	-11.27	PK
V	2480.00	73.09	14.02	87.11	94.00	-6.89	AV
V	4960.00	41.13	19.51	60.64	74.00	-13.36	PK
V	4960.00	26.06	19.51	45.57	54.00	-8.43	AV
V	16128.00	30.07	21.89	51.96	74.00	-22.04	PK
H	2480.00	88.74	14.02	102.76	114.00	-11.24	PK
H	2480.00	72.94	14.02	86.96	94.00	-7.04	AV
H	4960.00	41.35	19.51	60.86	74.00	-13.14	PK
H	4960.00	26.09	19.51	45.60	54.00	-8.40	AV
H	16128.00	30.39	21.89	52.28	74.00	-21.72	PK
Remark: 1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit 2. If peak below the average limit, the average emission was no test. 3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.							

8DPSK

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2402							
V	2402.00	87.70	13.85	101.55	114.00	-12.45	PK
V	2402.00	72.49	13.85	86.34	94.00	-7.66	AV
V	4804.00	39.20	19.34	58.54	74.00	-15.46	PK
V	4804.00	25.62	19.34	44.96	54.00	-9.04	AV
V	16128.00	29.80	21.89	51.69	74.00	-22.31	PK
H	2402.00	87.67	13.85	101.52	114.00	-12.48	PK
H	2402.00	73.09	13.85	86.94	94.00	-7.06	AV
H	4804.00	40.01	19.34	59.35	74.00	-14.65	PK
H	4804.00	25.51	19.34	44.85	54.00	-9.15	AV
H	16128.00	29.54	21.89	51.43	74.00	-22.57	PK
operation frequency:2441							
V	2441.00	88.20	13.94	102.14	114.00	-11.86	PK
V	2441.00	72.62	13.94	86.56	94.00	-7.44	AV
V	4882.00	40.11	19.42	59.53	74.00	-14.47	PK
V	4882.00	25.66	19.42	45.08	54.00	-8.92	AV
V	16128.00	28.07	21.89	49.96	74.00	-24.04	PK
H	2441.00	88.22	13.94	102.16	114.00	-11.84	PK
H	2441.00	73.51	13.94	87.45	94.00	-6.55	AV
H	4882.00	41.19	19.42	60.61	74.00	-13.39	PK
H	4882.00	26.39	19.42	45.81	54.00	-8.19	AV
H	16128.00	29.71	21.89	51.60	74.00	-22.40	PK
operation frequency:2480							
V	2480.00	88.25	14.02	102.27	114.00	-11.73	PK
V	2480.00	72.72	14.02	86.74	94.00	-7.26	AV
V	4960.00	40.92	19.51	60.43	74.00	-13.57	PK
V	4960.00	25.94	19.51	45.45	54.00	-8.55	AV
V	16128.00	29.92	21.89	51.81	74.00	-22.19	PK
H	2480.00	88.29	14.02	102.31	114.00	-11.69	PK
H	2480.00	72.58	14.02	86.60	94.00	-7.40	AV
H	4960.00	41.14	19.51	60.65	74.00	-13.35	PK
H	4960.00	25.97	19.51	45.48	54.00	-8.52	AV
H	16128.00	30.24	21.89	52.13	74.00	-21.87	PK
Remark: 1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit 2. If peak below the average limit, the average emission was no test. 3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.							

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:

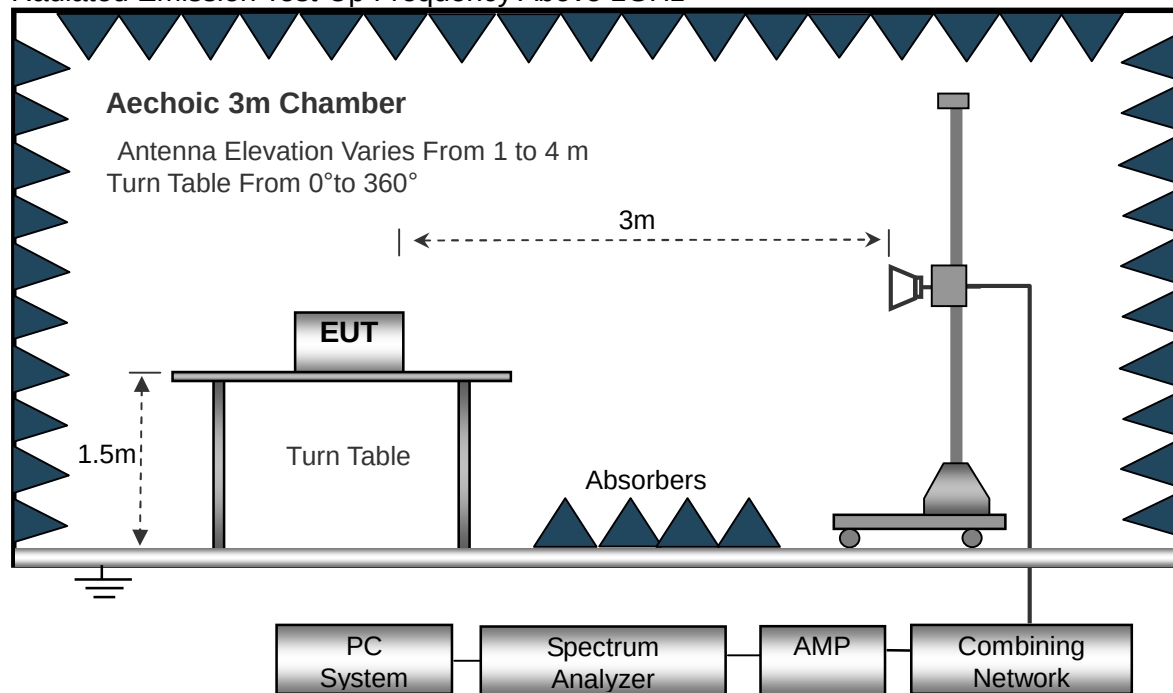
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

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

GFSK

Polar (H/V)	Frequency	Meter Rea ing	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2402							
V	2390.00	37.57	13.83	51.40	74.00	-22.60	PK
V	2390.00	26.11	13.83	39.94	54.00	-14.06	AV
V	2400.00	37.78	13.85	51.63	74.00	-22.37	PK
V	2400.00	25.68	13.85	39.53	54.00	-14.47	AV
H	2390.00	37.87	13.83	51.70	74.00	-22.30	PK
H	2390.00	26.14	13.83	39.97	54.00	-14.03	AV
H	2400.00	37.73	13.85	51.58	74.00	-22.42	PK
H	2400.00	26.08	13.85	39.93	54.00	-14.07	AV

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2480							
V	2483.50	37.78	14.02	51.80	74.00	-22.20	PK
V	2483.50	26.37	14.02	40.39	54.00	-13.61	AV
V	2500.00	37.72	14.06	51.78	74.00	-22.22	PK
V	2500.00	25.78	14.06	39.84	54.00	-14.16	AV
H	2483.50	37.91	14.02	51.93	74.00	-22.07	PK
H	2483.50	26.41	14.02	40.43	54.00	-13.57	AV
H	2500.00	37.53	14.06	51.59	74.00	-22.41	PK
H	2500.00	26.65	14.06	40.71	54.00	-13.29	AV

Remark:

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

PI/4 DPSK

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2402							
V	2390.00	37.46	13.83	51.29	74.00	-22.71	PK
V	2390.00	26.02	13.83	39.85	54.00	-14.15	AV
V	2400.00	37.66	13.85	51.51	74.00	-22.49	PK
V	2400.00	25.59	13.85	39.44	54.00	-14.56	AV
H	2390.00	37.75	13.83	51.58	74.00	-22.42	PK
H	2390.00	26.05	13.83	39.88	54.00	-14.12	AV
H	2400.00	37.61	13.85	51.46	74.00	-22.54	PK
H	2400.00	25.99	13.85	39.84	54.00	-14.16	AV

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2480							
V	2483.50	37.66	14.02	51.68	74.00	-22.32	PK
V	2483.50	26.28	14.02	40.30	54.00	-13.70	AV
V	2500.00	37.60	14.06	51.66	74.00	-22.34	PK
V	2500.00	25.69	14.06	39.75	54.00	-14.25	AV
H	2483.50	37.79	14.02	51.81	74.00	-22.19	PK
H	2483.50	26.32	14.02	40.34	54.00	-13.66	AV
H	2500.00	37.41	14.06	51.47	74.00	-22.53	PK
H	2500.00	26.56	14.06	40.62	54.00	-13.38	AV

Remark:

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

8DPSK

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2402							
V	2390.00	37.40	13.83	51.23	74.00	-22.77	PK
V	2390.00	25.98	13.83	39.81	54.00	-14.19	AV
V	2400.00	37.60	13.85	51.45	74.00	-22.55	PK
V	2400.00	25.56	13.85	39.41	54.00	-14.59	AV
H	2390.00	37.69	13.83	51.52	74.00	-22.48	PK
H	2390.00	26.01	13.83	39.84	54.00	-14.16	AV
H	2400.00	37.56	13.85	51.41	74.00	-22.59	PK
H	2400.00	25.95	13.85	39.80	54.00	-14.20	AV

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
operation frequency:2480							
V	2483.50	37.60	14.02	51.62	74.00	-22.38	PK
V	2483.50	26.23	14.02	40.25	54.00	-13.75	AV
V	2500.00	37.55	14.06	51.61	74.00	-22.39	PK
V	2500.00	25.65	14.06	39.71	54.00	-14.29	AV
H	2483.50	37.73	14.02	51.75	74.00	-22.25	PK
H	2483.50	26.28	14.02	40.30	54.00	-13.70	AV
H	2500.00	37.35	14.06	51.41	74.00	-22.59	PK
H	2500.00	26.52	14.06	40.58	54.00	-13.42	AV

Remark:

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

4. BANDWIDTH TEST

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.249) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.249	Bandwidth	(20dB bandwidth)	2400-2483.5	PASS

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	100KHz
VB	$\geq$ RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting : RBW= 100KHz, VBW $\geq$ RBW, Sweep time = Auto.

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



4.1.4 EUT OPERATION CONDITIONS

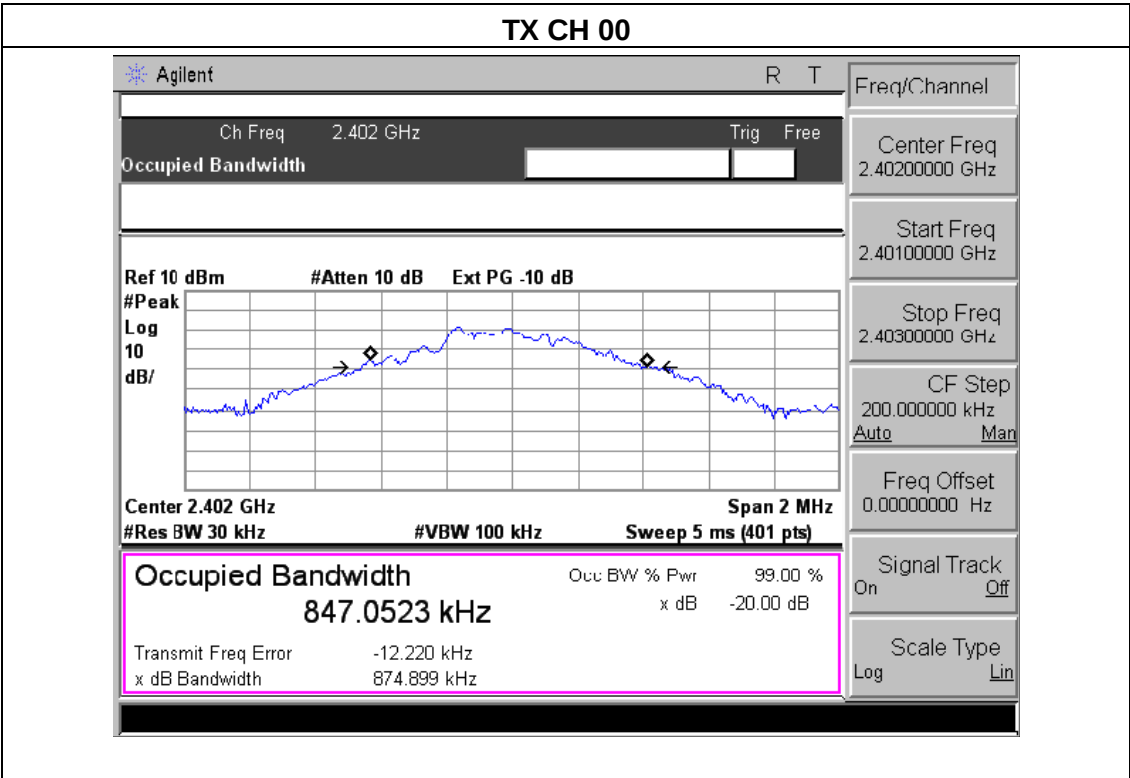
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.5 TEST RESULTS

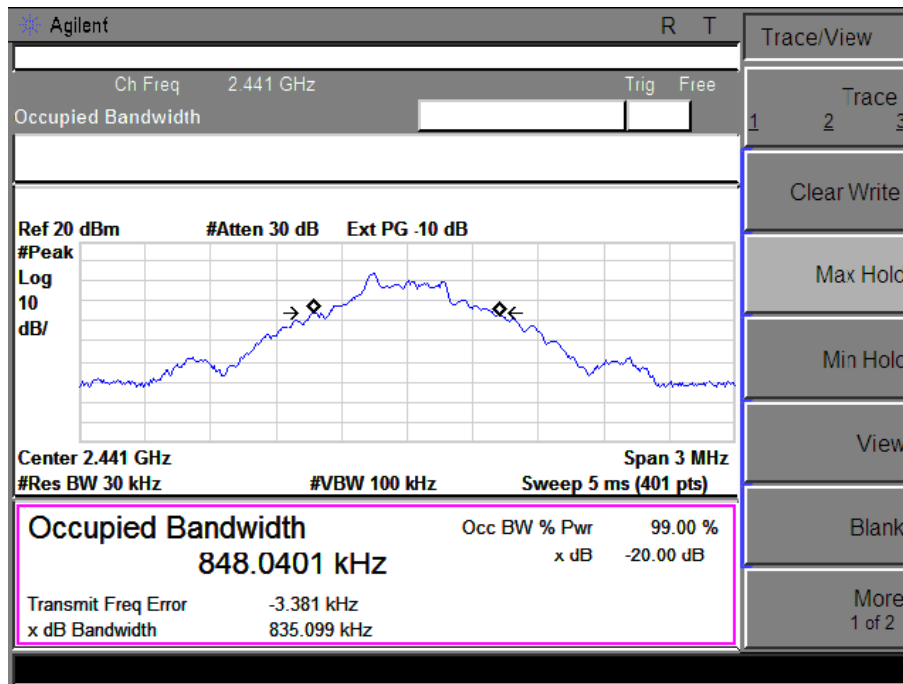
Temperature :	25 °C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	DC 3.7V
Test Mode :	CH00 / CH39 /C78		

	Frequency (MHz)	20dB bandwidth (MHz)	Result
GFSK	2402	0.875	Pass
	2441	0.835	Pass
	2480	0.833	Pass
PI/4 DPSK	2402	1.120	Pass
	2441	1.130	Pass
	2480	1.130	Pass
8DPSK	2402	1.169	Pass
	2441	1.170	Pass
	2480	1.172	Pass

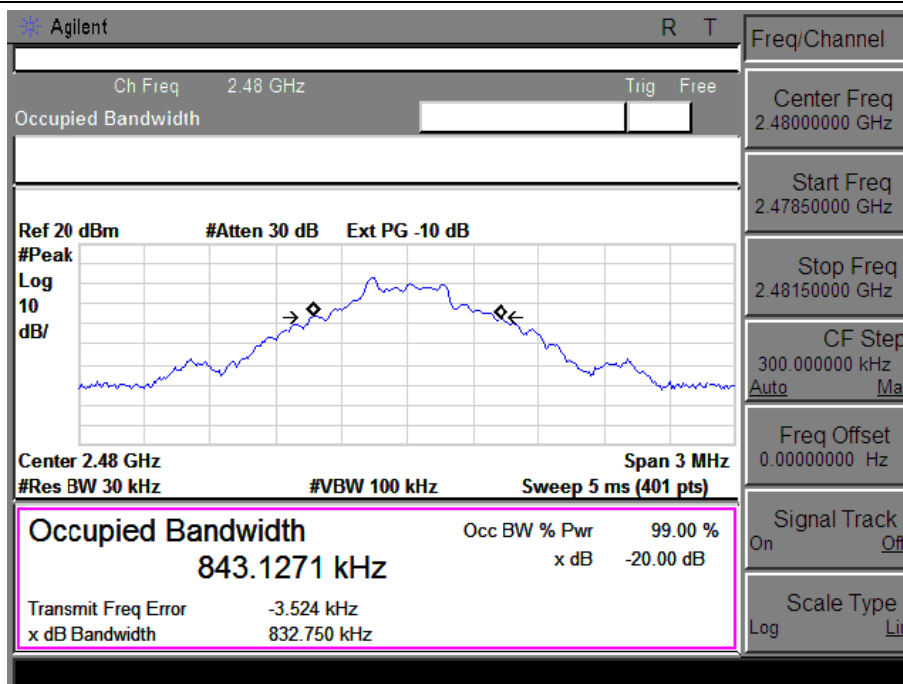
GFSK



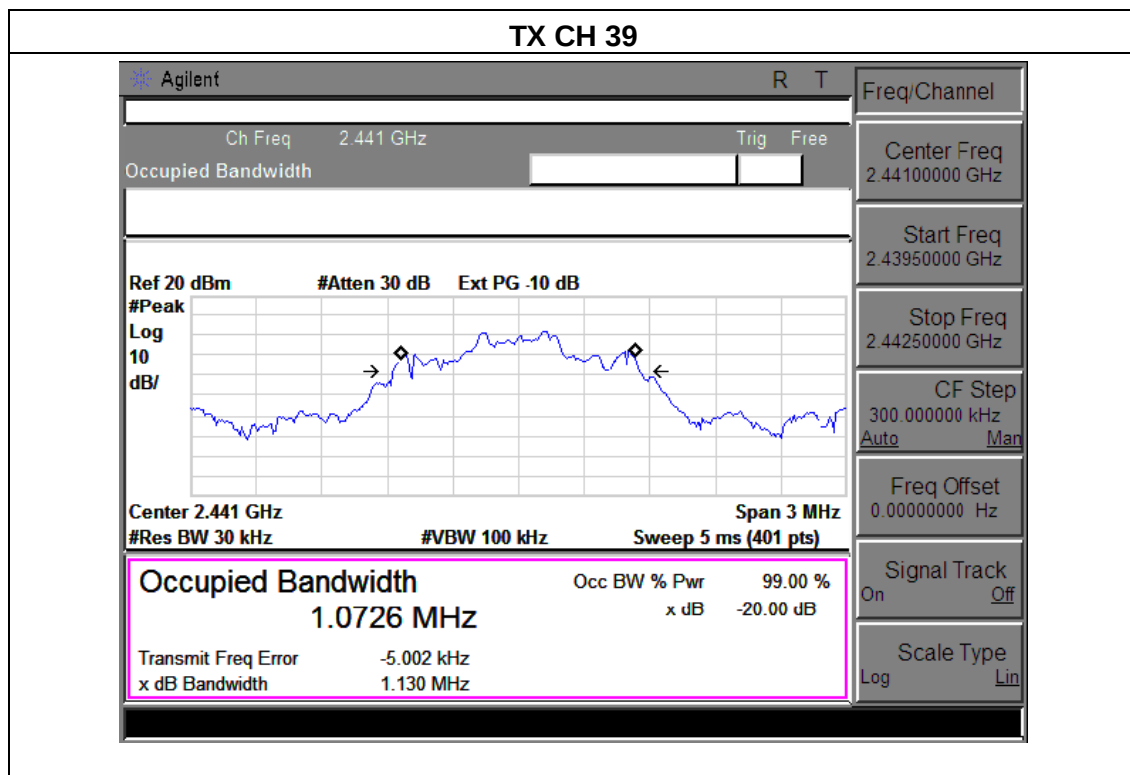
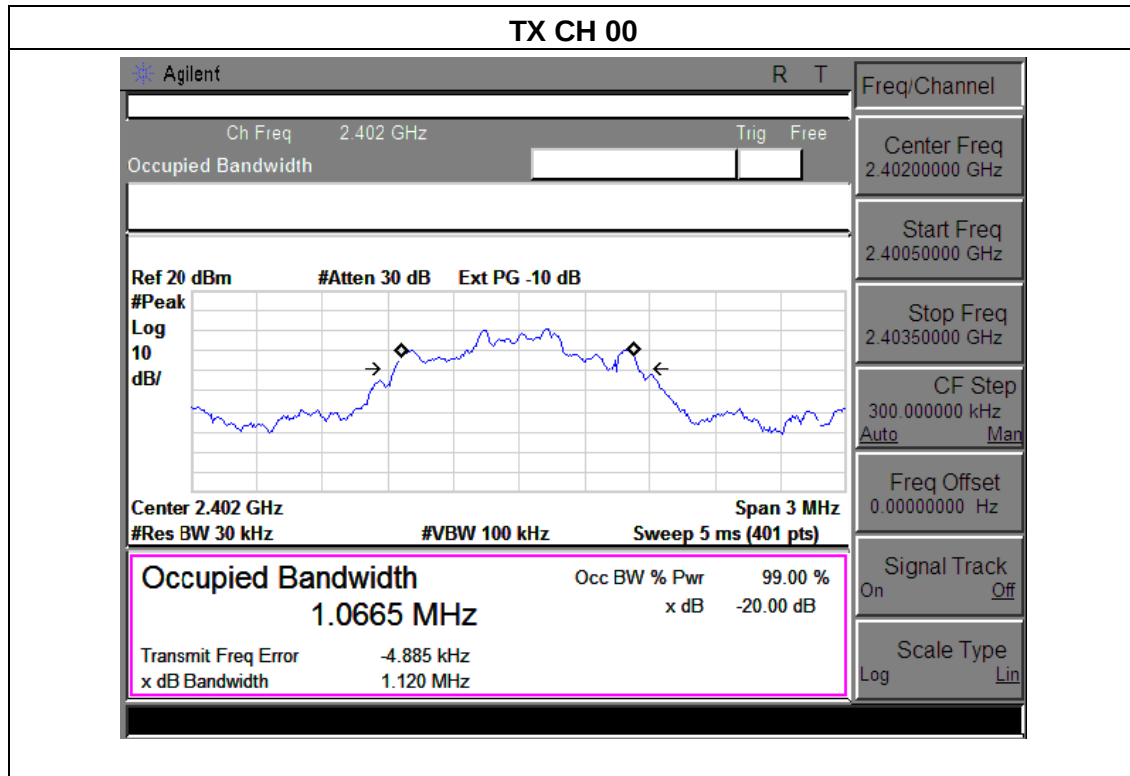
TX CH 39

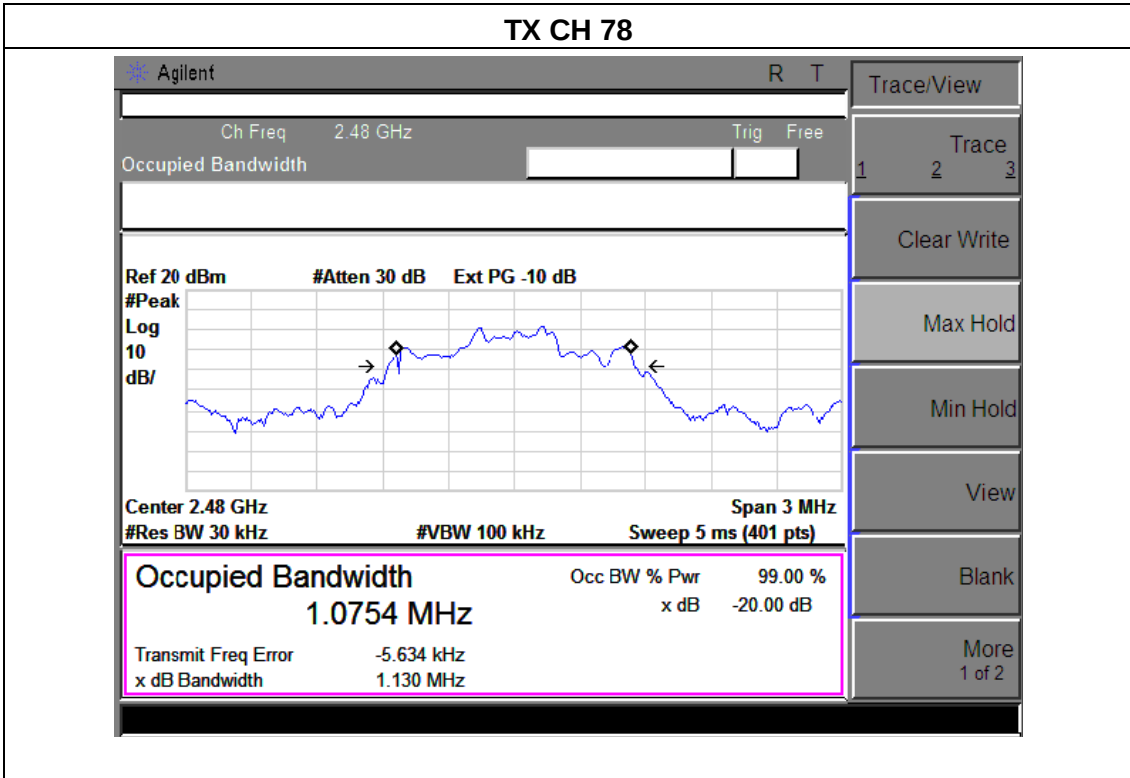


TX CH 78

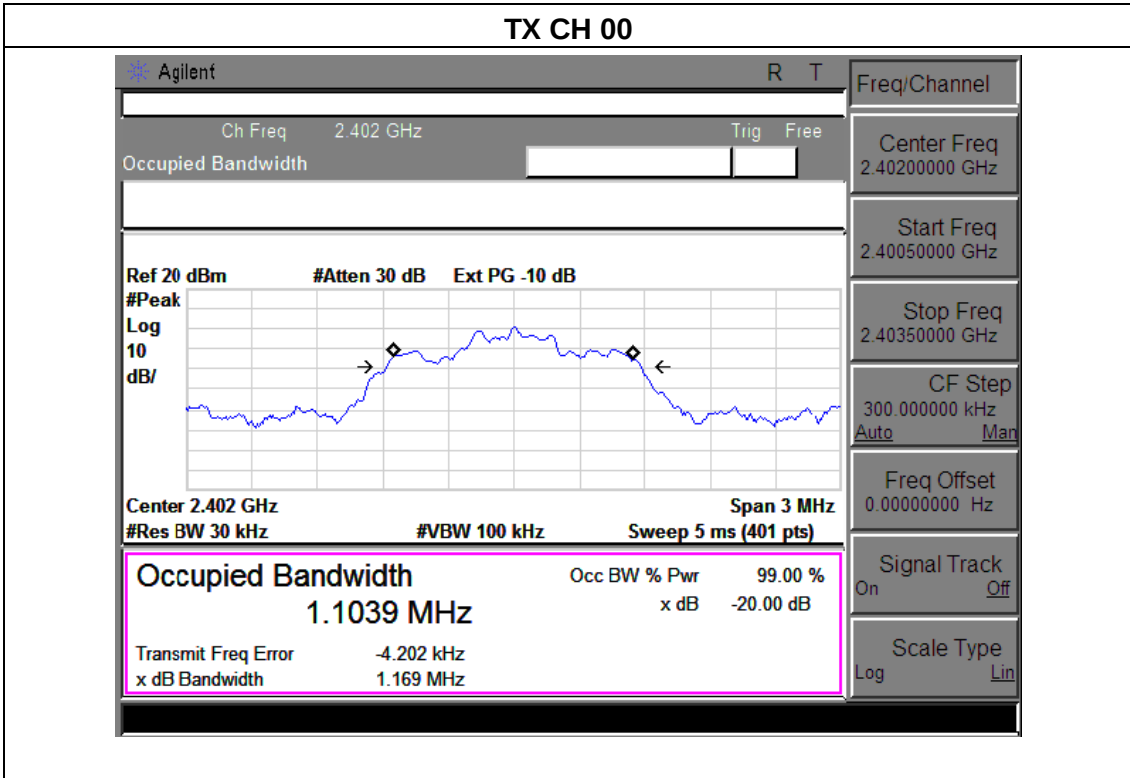


PI/4 DPSK

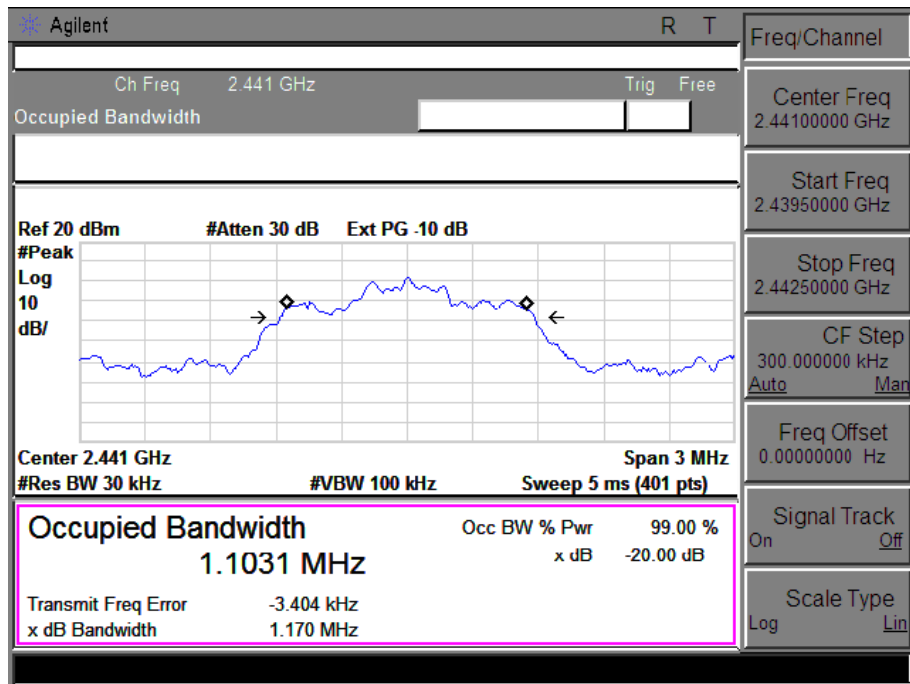




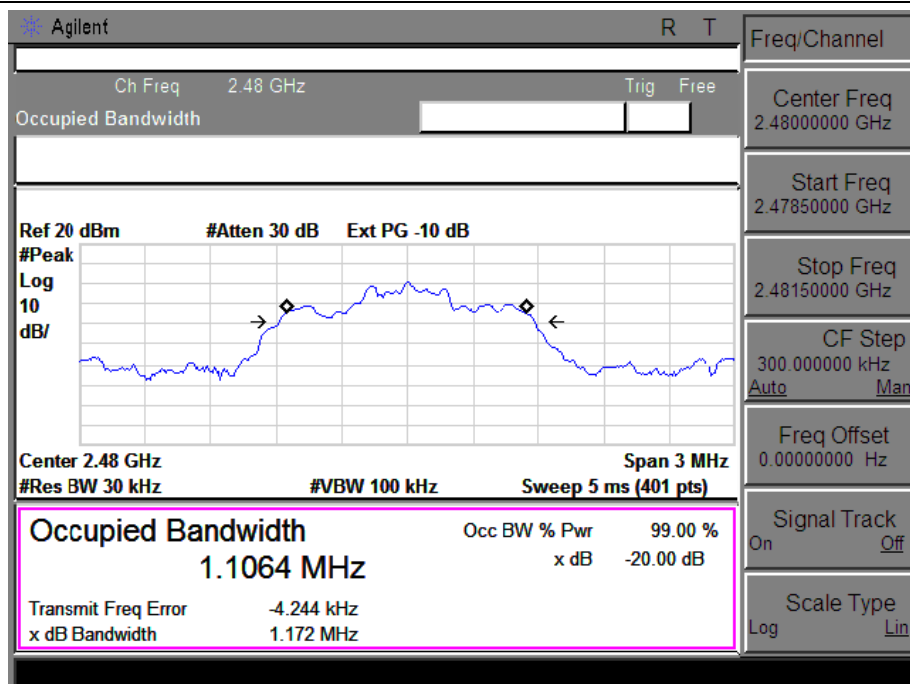
8DPSK



TX CH 39



TX CH 78



5. ANTENNA REQUIREMENT

5.1 STANDARD REQUIREMENT

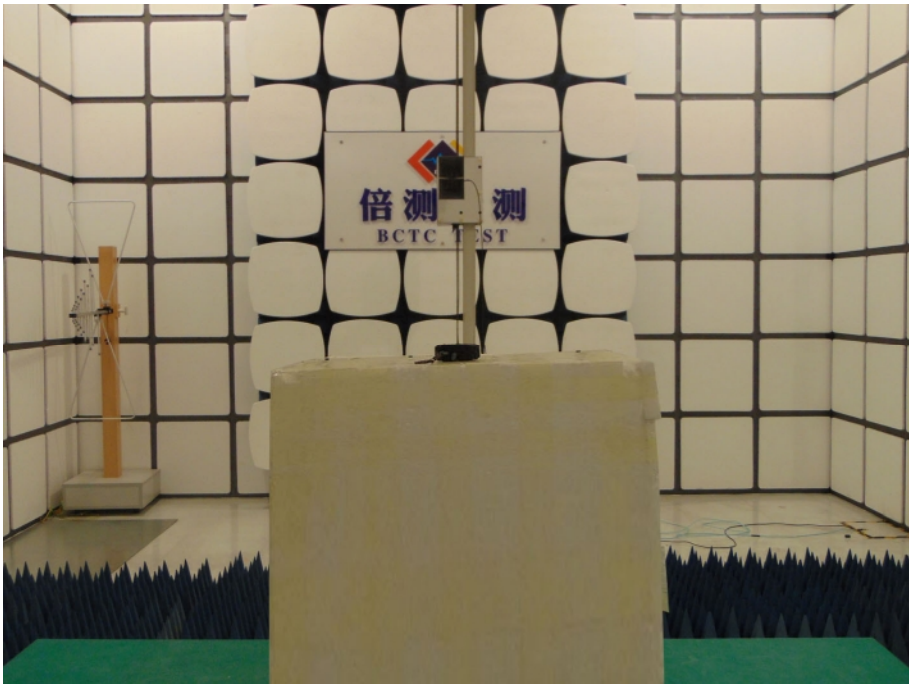
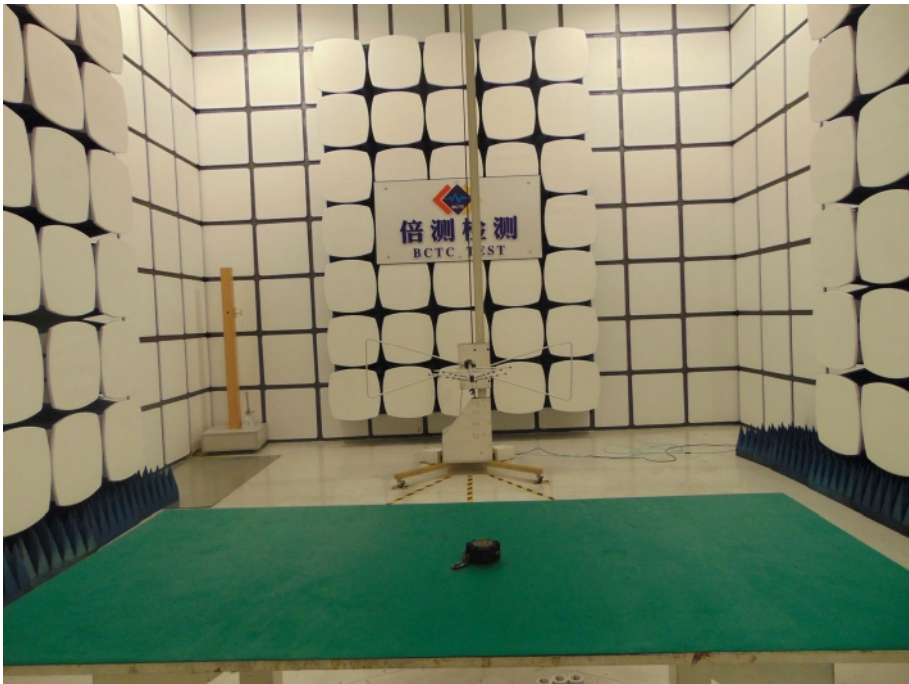
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

5.2 EUT ANTENNA

The EUT antenna is internal antenna. It complies with the standard requirement.

6. EUT TEST PHOTO

Radiated Measurement Photos



7. EUT PHOTOS





