



# FCC Part 15C Test Report

## FCC ID: 2AJUGSP-148BT

Product Name:	PORTABLE BLUETOOTH SPEAKER WITH USB PORT AND LED LIGHT AND RADIO
Trademark:	Dolphin
Model Name :	SP-148BT SP-99BT, SP-88BT, SP-215BT, SP-195BT, SP-194BT
Prepared For :	Guangzhou baiyun zunbao Digital Audio Factory
Address :	Jinggang Industrial Zone, Shenshan Town, Baiyun District, Guangzhou City, China
Prepared By :	Shenzhen BCTC Technology Co., Ltd.
Address :	No.101, Yousong Road, Longhua New District, Shenzhen, China
Test Date:	Aug. 29 – Sep. 06, 2016
Date of Report :	Sep. 06, 2016
Report No.:	BCTC-LH160810661E



## TEST RESULT CERTIFICATION

**Applicant's name** ..... : Guangzhou baiyun zunbao Digital Audio Factory  
**Address** ..... : Jinggang Industrial Zone, Shenshan Town, Baiyun District, Guangzhou City, China  
**Manufacture's Name** ..... : Guangzhou baiyun zunbao Digital Audio Factory  
**Address** ..... : Jinggang Industrial Zone, Shenshan Town, Baiyun District, Guangzhou City, China

**Product description**

**Product name** ..... : PORTABLE BLUETOOTH SPEAKER WITH USB PORT AND LED LIGHT AND RADIO

**Trademark** ..... : Dophin

**Model and/or type reference** ..... : SP-148BT  
SP-99BT, SP-88BT, SP-215BT, SP-195BT, SP-194BT

**Standards** ..... : FCC Part15.249  
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.

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Testing Engineer : \_\_\_\_\_

*Eric Yang*

Eric Yang

Reviewer  
Supervisor : \_\_\_\_\_

*Jade Yang*

Jade Yang

Approved &  
Authorized  
Manager : \_\_\_\_\_





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## 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 Registered 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	PORTABLE BLUETOOTH SPEAKER WITH USB PORT AND LED LIGHT AND RADIO													
Trade Name	Dophin													
Model Name	SP-148BT SP-99BT, SP-88BT, SP-215BT, SP-195BT, SP-194BT													
Model Difference	The product's different for model name and outlook color.													
Product Description	<p>The EUT is a PORTABLE BLUETOOTH SPEAKER WITH USB PORT AND LED LIGHT AND RADIO</p> <table border="1"><tr><td>Operation Frequency:</td><td>2402~2480 MHz</td></tr><tr><td>Modulation Type:</td><td>GFSK, PI/4 DPSK, 8DPSK</td></tr><tr><td>Bit Rate of Transmitter</td><td>1/2/3Mbps</td></tr><tr><td>Number Of Channel</td><td>79 CH</td></tr><tr><td>Antenna type:</td><td>PCB Antenna</td></tr><tr><td>Antenna Gain (dBi)</td><td>0dBi</td></tr></table> <p>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.</p>		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 type:	PCB Antenna	Antenna Gain (dBi)	0dBi
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 type:	PCB Antenna													
Antenna Gain (dBi)	0dBi													
Channel List	Please refer to the Note 2.													
Power	AC 120V/60Hz													
hardware version	--													
Software version	--													
Serial number	--													
Connecting I/O Port(s)	Please refer to the User's Manual													

Note:

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



2.

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
~	~	~	~	~	~
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
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		

## 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		

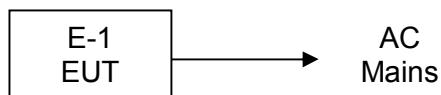
Note:

- (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

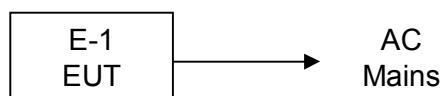


## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted 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	PORATABLE BLUETOOTH SPEAKER WITH USB PORT AND LED LIGHT AND RADIO	Dolphin	SP-148BT	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	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer	Agilent	E4407B	MY45109572	2016.08.24	2017.08.23
2	Test Receiver	R&S	ESPI	101396	2016.08.24	2017.08.23
3	Bilog Antenna	SCHWARZBECK	VULB9160	VULB9160-3 369	2016.08.24	2017.08.23
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2016.07.06	2017.07.05
5	Spectrum Analyzer	Agilent	N9020A	MY5051041	2016.07.06	2017.07.05
6	Horn Antenna	SCHWARZBECK	9120D	9120D-1275	2016.08.24	2017.08.23
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2016.07.06	2017.07.05
8	Amplifier	SCHWARZBECK	BBV9718	9718-270	2016.08.24	2017.08.23
9	Amplifier	SCHWARZBECK	BBV9743	9743-119	2016.08.24	2017.08.23
10	Loop Antenna	ARA	PLD4030/B	1029	2016.07.06	2017.07.05
11	Power Meter	R&S	NRVS	100696	2016.07.06	2017.07.05
12	Power Sensor	R&S	URV5-Z4	0395.1619.0 5	2016.07.06	2017.07.05
13	RF cables	R&S	N/A	N/A	2016.07.06	2017.07.05
14	966 Chamber	ChengYu	966 Room	966	2016.07.06	2017.07.05

### 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	2016.08.24	2017.08.23
2	LISN	R&S	NSLK81 26	8126466	2016.08.24	2017.08.23
3	LISN	R&S	NSLK81 26	8126487	2016.08.24	2017.08.23
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2016.08.24	2017.08.23
5	RF cables	R&S	R204	R20X	2016.08.24	2017.08.23



### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

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

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	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

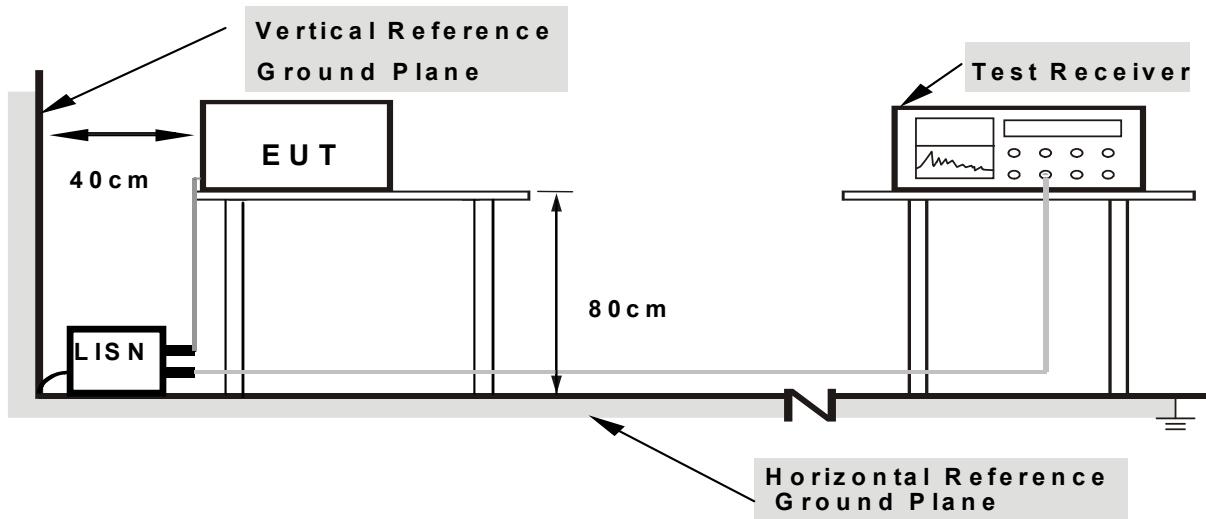
#### 3.1.2 TEST PROCEDURE

- 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 cm from other units and other metal planes

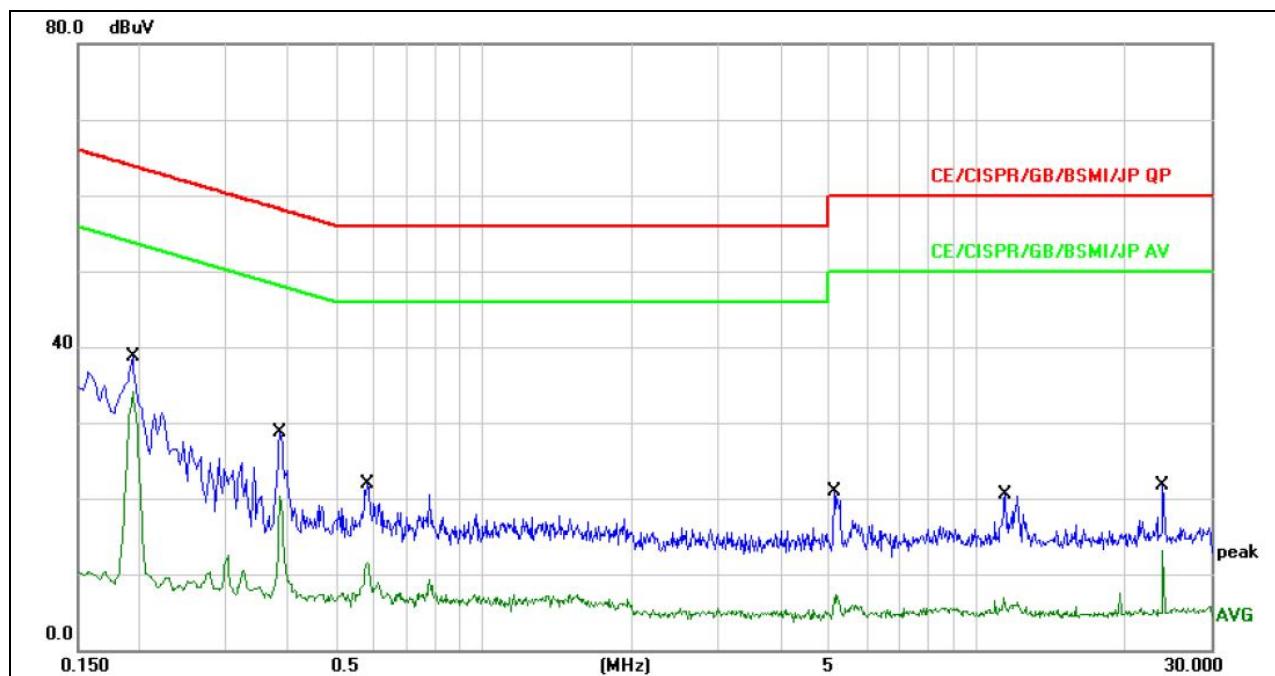
### 3.1.5 EUT OPERATING CONDITIONS

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

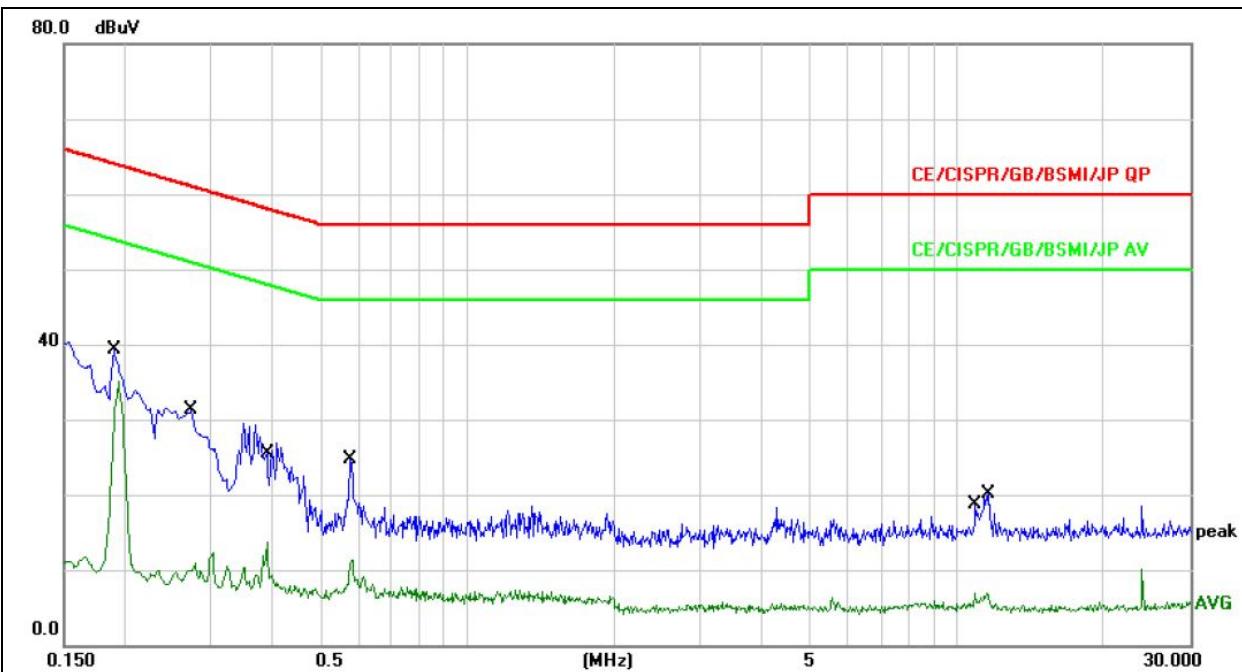
**Remark:**

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

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dB	Detector	Comment
1		0.1940	28.56	10.06	38.62	63.86	-25.24	QP
2	*	0.1940	23.96	10.06	34.02	53.86	-19.84	AVG
3		0.3860	18.51	10.10	28.61	58.15	-29.54	QP
4		0.3860	10.23	10.10	20.33	48.15	-27.82	AVG
5		0.5820	11.83	10.12	21.95	56.00	-34.05	QP
6		0.5820	1.29	10.12	11.41	46.00	-34.59	AVG
7		5.1660	10.83	10.14	20.97	60.00	-39.03	QP
8		5.1660	-2.94	10.14	7.20	50.00	-42.80	AVG
9		11.4220	10.30	10.13	20.43	60.00	-39.57	QP
10		11.4220	-3.21	10.13	6.92	50.00	-43.08	AVG
11		24.0060	11.58	10.19	21.77	60.00	-38.23	QP
12		24.0060	2.82	10.19	13.01	50.00	-36.99	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	Correct Factor	Measure- ment	Limit	Over	Detector	Comment
			dBuV	dB	dBuV	dB			
1		0.1900	29.27	10.06	39.33	64.03	-24.70	QP	
2	*	0.1900	24.96	10.06	35.02	54.03	-19.01	AVG	
3		0.2740	21.26	10.09	31.35	60.99	-29.64	QP	
4		0.2740	0.72	10.09	10.81	50.99	-40.18	AVG	
5		0.3899	16.76	10.10	26.86	58.06	-31.20	QP	
6		0.3899	3.67	10.10	13.77	48.06	-34.29	AVG	
7		0.5780	14.60	10.12	24.72	56.00	-31.28	QP	
8		0.5780	1.18	10.12	11.30	46.00	-34.70	AVG	
9		10.9060	8.55	10.13	18.68	60.00	-41.32	QP	
10		10.9060	-3.20	10.13	6.93	50.00	-43.07	AVG	
11		11.5219	9.92	10.13	20.05	60.00	-39.95	QP	
12		11.5219	-3.18	10.13	6.95	50.00	-43.05	AVG	



### 3.2 RADIATED EMISSION MEASUREMENT

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

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)	Class B (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:

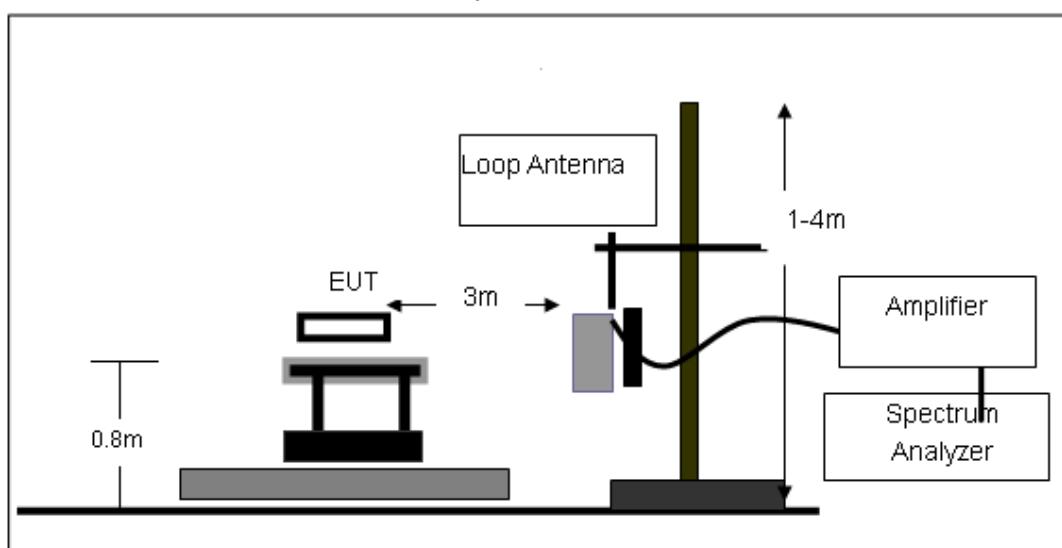
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

### 3.2.3 DEVIATION FROM TEST STANDARD

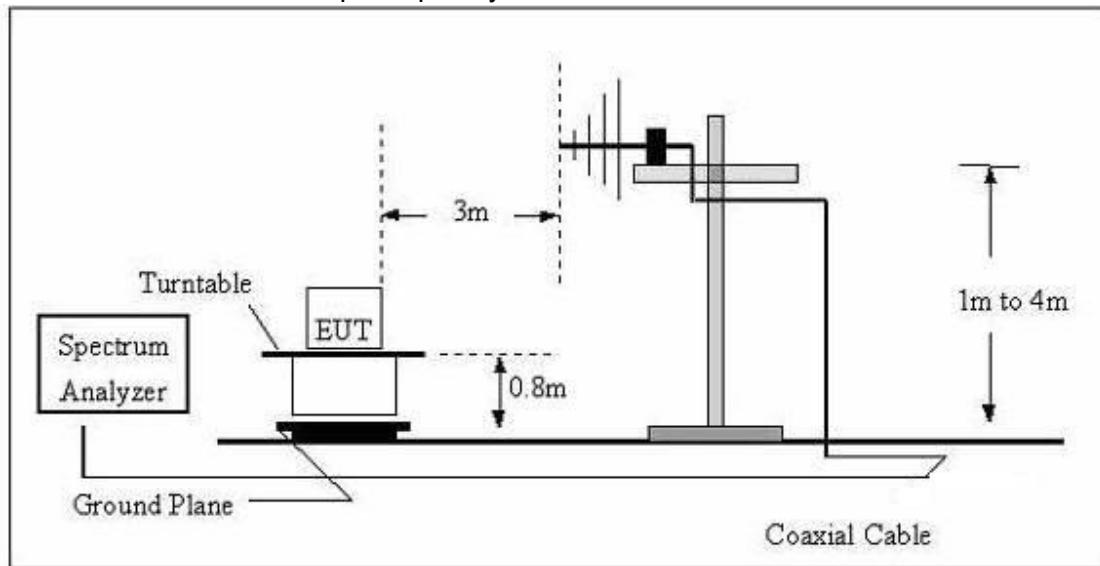
No deviation

### 3.2.4 TEST SETUP

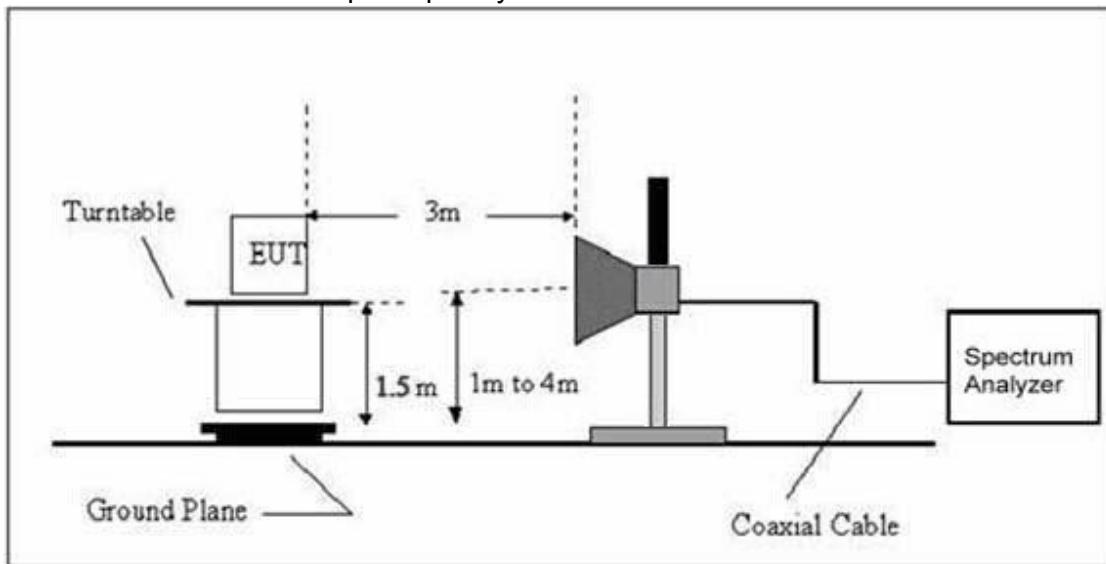
#### (A) Radiated Emission Test-Up Frequency Below 30MHz



(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 2.3 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/60Hz
Test Mode :	Mode 4	Polarization :	--

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

**NOTE:**

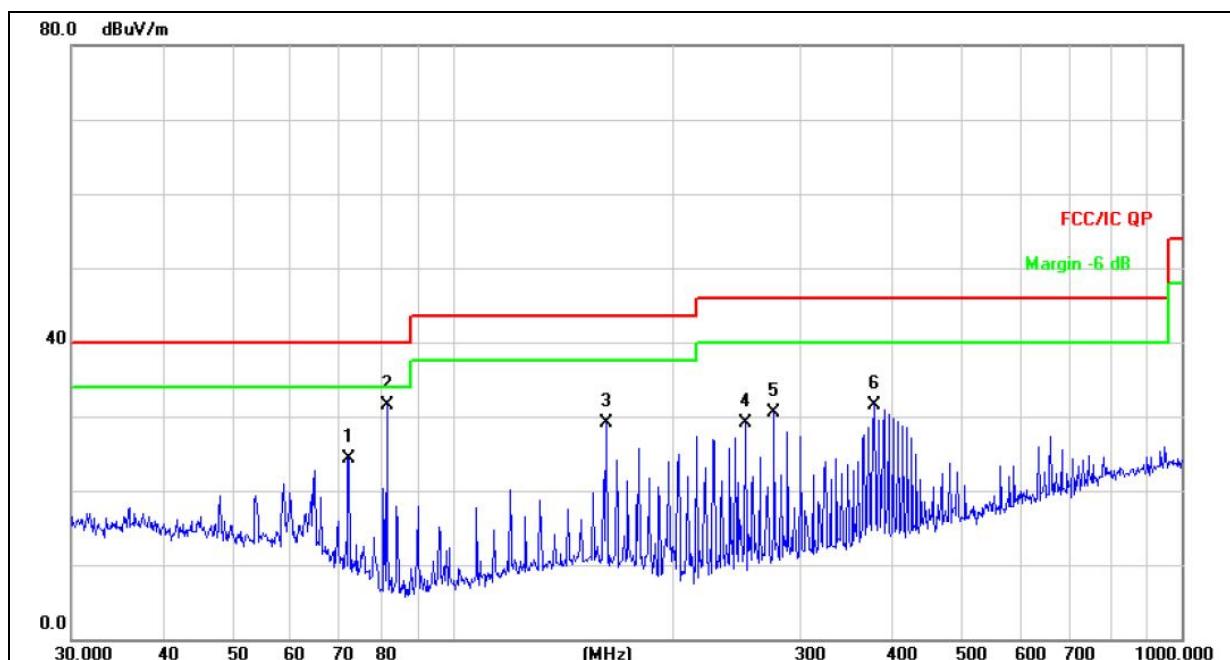
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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/60Hz		
Test Mode :	Mode 4		

**Remark:**

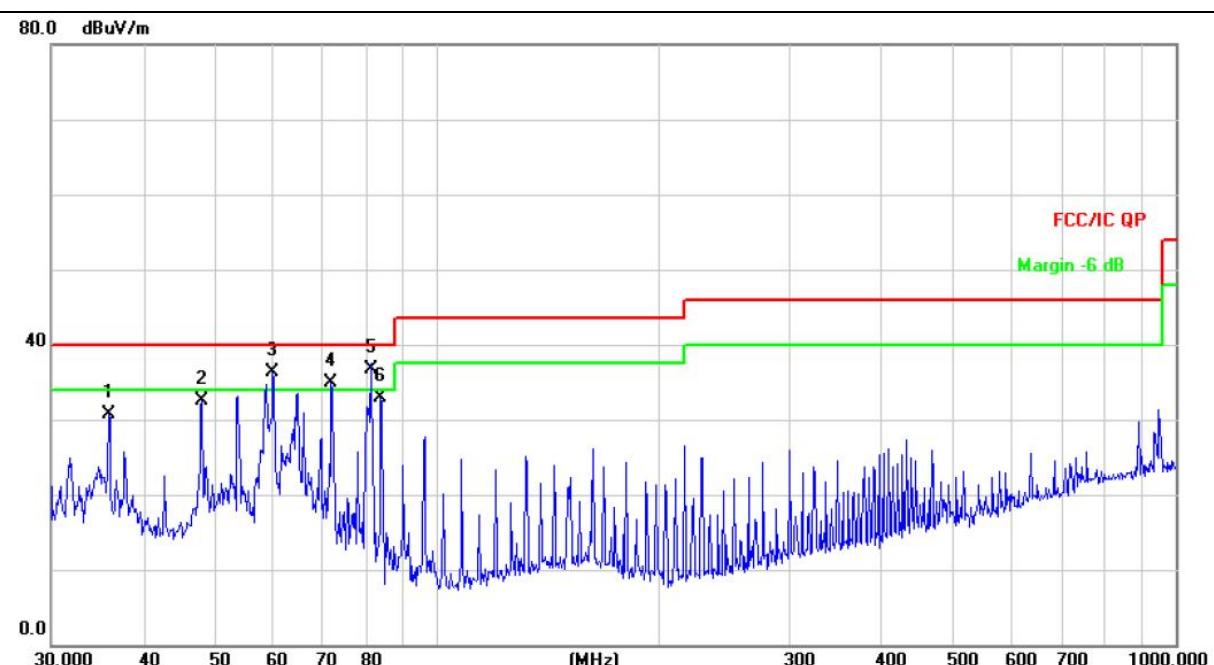
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

All interfaces was connected, and BT TX mode was link.

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree	Comment
1		72.0843	39.56	-15.27	24.29	40.00	-15.71	QP		
2	*	81.2117	49.69	-18.10	31.59	40.00	-8.41	QP		
3		162.6106	42.10	-13.02	29.08	43.50	-14.42	QP		
4		252.0627	43.21	-14.14	29.07	46.00	-16.93	QP		
5		276.1235	43.78	-13.27	30.51	46.00	-15.49	QP		
6		378.5843	42.30	-10.70	31.60	46.00	-14.40	QP		



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

**Remark:**

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

All interfaces was connected, and BT TX mode was link.

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		35.8746	39.25	-8.58	30.67	40.00	-9.33	QP			
2		47.9940	42.43	-9.96	32.47	40.00	-7.53	QP			
3	!	59.8588	47.87	-11.50	36.37	40.00	-3.63	QP			
4	!	71.8320	50.04	-15.19	34.85	40.00	-5.15	QP			
5	*	81.2116	54.78	-18.10	36.68	40.00	-3.32	QP			
6		83.8156	50.99	-18.13	32.86	40.00	-7.14	QP			



### 3.2.8 TEST RESULTS (1GHZ~25GHZ)

GFSK

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2402							
V	2402.00	88.18	13.85	102.03	114.00	-11.97	PK
V	2402.00	72.88	13.85	86.73	94.00	-7.27	AV
V	4804.00	39.41	19.34	58.75	74.00	-15.25	PK
V	4804.00	25.76	19.34	45.10	54.00	-8.90	AV
V	16128.00	29.96	21.89	51.85	74.00	-22.15	PK
H	2402.00	88.15	13.85	102.00	114.00	-12.00	PK
H	2402.00	73.49	13.85	87.34	94.00	-6.66	AV
H	4804.00	40.24	19.34	59.58	74.00	-14.42	PK
H	4804.00	25.65	19.34	44.99	54.00	-9.01	AV
H	16128.00	29.71	21.89	51.60	74.00	-22.40	PK
operation frequency:2441							
V	2441.00	88.68	13.94	102.62	114.00	-11.38	PK
V	2441.00	73.02	13.94	86.96	94.00	-7.04	AV
V	4882.00	40.34	19.42	59.76	74.00	-14.24	PK
V	4882.00	25.80	19.42	45.22	54.00	-8.78	AV
V	16128.00	28.21	21.89	50.10	74.00	-23.90	PK
H	2441.00	88.70	13.94	102.64	114.00	-11.36	PK
H	2441.00	73.90	13.94	87.84	94.00	-6.16	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	29.88	21.89	51.77	74.00	-22.23	PK
operation frequency:2480							
V	2480.00	88.73	14.02	102.75	114.00	-11.25	PK
V	2480.00	73.12	14.02	87.14	94.00	-6.86	AV
V	4960.00	41.14	19.51	60.65	74.00	-13.35	PK
V	4960.00	26.08	19.51	45.59	54.00	-8.41	AV
V	16128.00	30.09	21.89	51.98	74.00	-22.02	PK
H	2480.00	88.76	14.02	102.78	114.00	-11.22	PK
H	2480.00	72.97	14.02	86.99	94.00	-7.01	AV
H	4960.00	41.36	19.51	60.87	74.00	-13.13	PK
H	4960.00	26.11	19.51	45.62	54.00	-8.38	AV
H	16128.00	30.41	21.89	52.30	74.00	-21.70	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 (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
V	2402.00	88.11	13.85	101.96	114.00	-12.04	PK
V	2402.00	72.82	13.85	86.67	94.00	-7.33	AV
V	4804.00	39.37	19.34	58.71	74.00	-15.29	PK
V	4804.00	25.74	19.34	45.08	54.00	-8.92	AV
V	16128.00	29.93	21.89	51.82	74.00	-22.18	PK
H	2402.00	88.08	13.85	101.93	114.00	-12.07	PK
H	2402.00	73.43	13.85	87.28	94.00	-6.72	AV
H	4804.00	40.20	19.34	59.54	74.00	-14.46	PK
H	4804.00	25.63	19.34	44.97	54.00	-9.03	AV
H	16128.00	29.68	21.89	51.57	74.00	-22.43	PK
operation frequency:2441							
V	2441.00	88.61	13.94	102.55	114.00	-11.45	PK
V	2441.00	72.96	13.94	86.90	94.00	-7.10	AV
V	4882.00	40.30	19.42	59.72	74.00	-14.28	PK
V	4882.00	25.78	19.42	45.20	54.00	-8.80	AV
V	16128.00	28.19	21.89	50.08	74.00	-23.92	PK
H	2441.00	88.63	13.94	102.57	114.00	-11.43	PK
H	2441.00	73.84	13.94	87.78	94.00	-6.22	AV
H	4882.00	41.38	19.42	60.80	74.00	-13.20	PK
H	4882.00	26.50	19.42	45.92	54.00	-8.08	AV
H	16128.00	29.85	21.89	51.74	74.00	-22.26	PK
operation frequency:2480							
V	2480.00	88.66	14.02	102.68	114.00	-11.32	PK
V	2480.00	73.06	14.02	87.08	94.00	-6.92	AV
V	4960.00	41.11	19.51	60.62	74.00	-13.38	PK
V	4960.00	26.06	19.51	45.57	54.00	-8.43	AV
V	16128.00	30.06	21.89	51.95	74.00	-22.05	PK
H	2480.00	88.69	14.02	102.71	114.00	-11.29	PK
H	2480.00	72.91	14.02	86.93	94.00	-7.07	AV
H	4960.00	41.33	19.51	60.84	74.00	-13.16	PK
H	4960.00	26.09	19.51	45.60	54.00	-8.40	AV
H	16128.00	30.38	21.89	52.27	74.00	-21.73	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 (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
<b>operation frequency:2402</b>							
V	2402.00	87.67	13.85	101.52	114.00	-12.48	PK
V	2402.00	72.46	13.85	86.31	94.00	-7.69	AV
V	4804.00	39.18	19.34	58.52	74.00	-15.48	PK
V	4804.00	25.61	19.34	44.95	54.00	-9.05	AV
V	16128.00	29.79	21.89	51.68	74.00	-22.32	PK
H	2402.00	87.64	13.85	101.49	114.00	-12.51	PK
H	2402.00	73.06	13.85	86.91	94.00	-7.09	AV
H	4804.00	40.00	19.34	59.34	74.00	-14.66	PK
H	4804.00	25.50	19.34	44.84	54.00	-9.16	AV
H	16128.00	29.52	21.89	51.41	74.00	-22.59	PK
<b>operation frequency:2441</b>							
V	2441.00	88.17	13.94	102.11	114.00	-11.89	PK
V	2441.00	72.59	13.94	86.53	94.00	-7.47	AV
V	4882.00	40.10	19.42	59.52	74.00	-14.48	PK
V	4882.00	25.65	19.42	45.07	54.00	-8.93	AV
V	16128.00	28.05	21.89	49.94	74.00	-24.06	PK
H	2441.00	88.19	13.94	102.13	114.00	-11.87	PK
H	2441.00	73.48	13.94	87.42	94.00	-6.58	AV
H	4882.00	41.17	19.42	60.59	74.00	-13.41	PK
H	4882.00	26.37	19.42	45.79	54.00	-8.21	AV
H	16128.00	29.70	21.89	51.59	74.00	-22.41	PK
<b>operation frequency:2480</b>							
V	2480.00	88.22	14.02	102.24	114.00	-11.76	PK
V	2480.00	72.69	14.02	86.71	94.00	-7.29	AV
V	4960.00	40.89	19.51	60.40	74.00	-13.60	PK
V	4960.00	25.94	19.51	45.45	54.00	-8.55	AV
V	16128.00	29.91	21.89	51.80	74.00	-22.20	PK
H	2480.00	88.24	14.02	102.26	114.00	-11.74	PK
H	2480.00	72.55	14.02	86.57	94.00	-7.43	AV
H	4960.00	41.12	19.51	60.63	74.00	-13.37	PK
H	4960.00	25.97	19.51	45.48	54.00	-8.52	AV
H	16128.00	30.23	21.89	52.12	74.00	-21.88	PK
<b>Remark:</b>							
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)	Class B (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

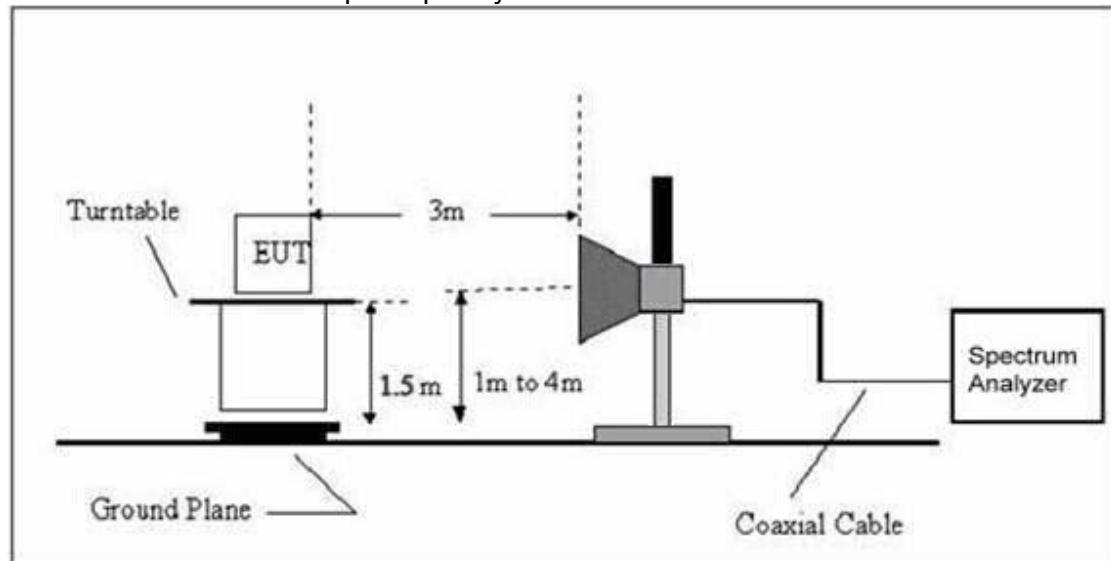


### 3.3.3 DEVIATION FROM TEST STANDARD

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 (MHz)	Meter Reading	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
		(dBuV)		(dB)			
operation frequency:2402							
V	2390.00	37.55	13.83	51.38	74.00	-22.62	PK
V	2390.00	26.11	13.83	39.94	54.00	-14.06	AV
V	2400.00	37.76	13.85	51.61	74.00	-22.39	PK
V	2400.00	25.67	13.85	39.52	54.00	-14.48	AV
H	2390.00	37.85	13.83	51.68	74.00	-22.32	PK
H	2390.00	26.14	13.83	39.97	54.00	-14.03	AV
H	2400.00	37.71	13.85	51.56	74.00	-22.44	PK
H	2400.00	26.08	13.85	39.93	54.00	-14.07	AV

Polar (H/V)	Frequency (MHz)	Meter Reading	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
		(dBuV)		(dB)			
operation frequency:2480							
V	2483.50	37.76	14.02	51.78	74.00	-22.22	PK
V	2483.50	26.35	14.02	40.37	54.00	-13.63	AV
V	2500.00	37.70	14.06	51.76	74.00	-22.24	PK
V	2500.00	25.77	14.06	39.83	54.00	-14.17	AV
H	2483.50	37.89	14.02	51.91	74.00	-22.09	PK
H	2483.50	26.39	14.02	40.41	54.00	-13.59	AV
H	2500.00	37.51	14.06	51.57	74.00	-22.43	PK
H	2500.00	26.63	14.06	40.69	54.00	-13.31	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 (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
V	2390.00	37.44	13.83	51.27	74.00	-22.73	PK
V	2390.00	26.02	13.83	39.85	54.00	-14.15	AV
V	2400.00	37.64	13.85	51.49	74.00	-22.51	PK
V	2400.00	25.58	13.85	39.43	54.00	-14.57	AV
H	2390.00	37.73	13.83	51.56	74.00	-22.44	PK
H	2390.00	26.05	13.83	39.88	54.00	-14.12	AV
H	2400.00	37.59	13.85	51.44	74.00	-22.56	PK
H	2400.00	25.99	13.85	39.84	54.00	-14.16	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
V	2483.50	37.64	14.02	51.66	74.00	-22.34	PK
V	2483.50	26.26	14.02	40.28	54.00	-13.72	AV
V	2500.00	37.58	14.06	51.64	74.00	-22.36	PK
V	2500.00	25.68	14.06	39.74	54.00	-14.26	AV
H	2483.50	37.77	14.02	51.79	74.00	-22.21	PK
H	2483.50	26.30	14.02	40.32	54.00	-13.68	AV
H	2500.00	37.39	14.06	51.45	74.00	-22.55	PK
H	2500.00	26.54	14.06	40.60	54.00	-13.40	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 (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
V	2390.00	37.38	13.83	51.21	74.00	-22.79	PK
V	2390.00	25.98	13.83	39.81	54.00	-14.19	AV
V	2400.00	37.58	13.85	51.43	74.00	-22.57	PK
V	2400.00	25.55	13.85	39.40	54.00	-14.60	AV
H	2390.00	37.67	13.83	51.50	74.00	-22.50	PK
H	2390.00	26.01	13.83	39.84	54.00	-14.16	AV
H	2400.00	37.54	13.85	51.39	74.00	-22.61	PK
H	2400.00	25.95	13.85	39.80	54.00	-14.20	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
V	2483.50	37.58	14.02	51.60	74.00	-22.40	PK
V	2483.50	26.23	14.02	40.25	54.00	-13.75	AV
V	2500.00	37.53	14.06	51.59	74.00	-22.41	PK
V	2500.00	25.64	14.06	39.70	54.00	-14.30	AV
H	2483.50	37.71	14.02	51.73	74.00	-22.27	PK
H	2483.50	26.26	14.02	40.28	54.00	-13.72	AV
H	2500.00	37.34	14.06	51.40	74.00	-22.60	PK
H	2500.00	26.50	14.06	40.56	54.00	-13.44	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
15.249	Bandwidth

#### 4.1.1 TEST PROCEDURE

1. Set RBW = 30 kHz.
2. Set the video bandwidth (VBW)  $\geq$ 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 20 dB relative to the maximum level measured in the fundamental emission.

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

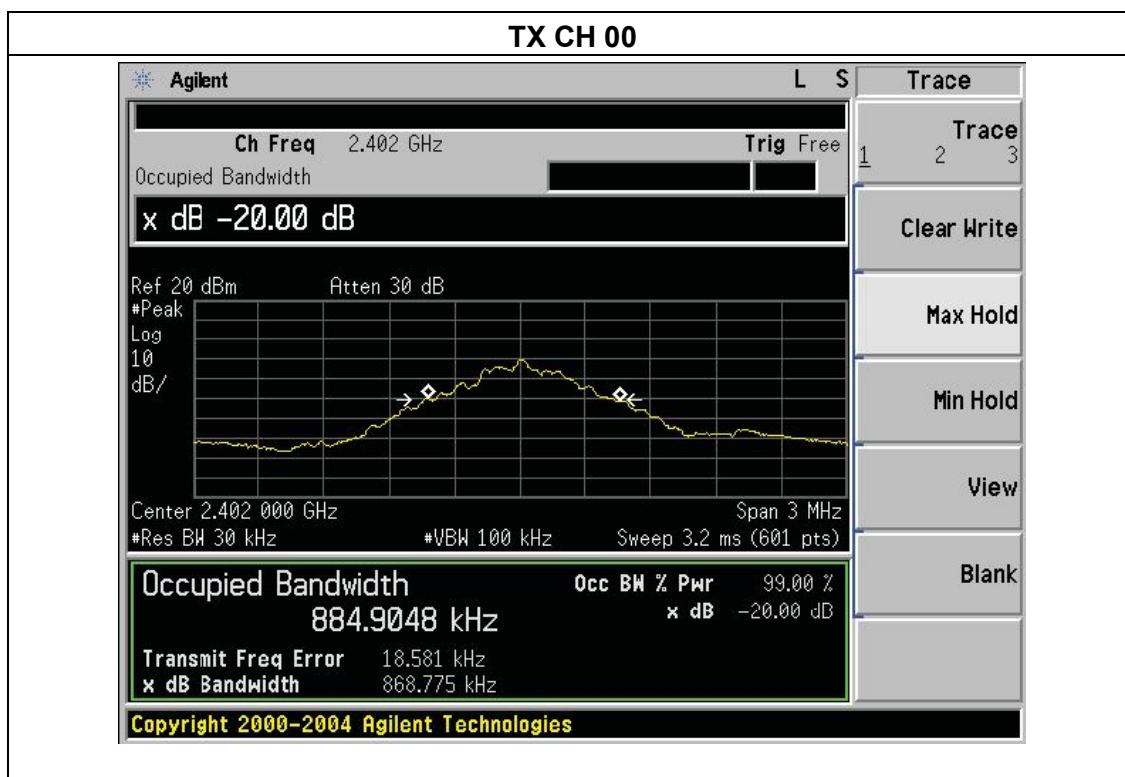


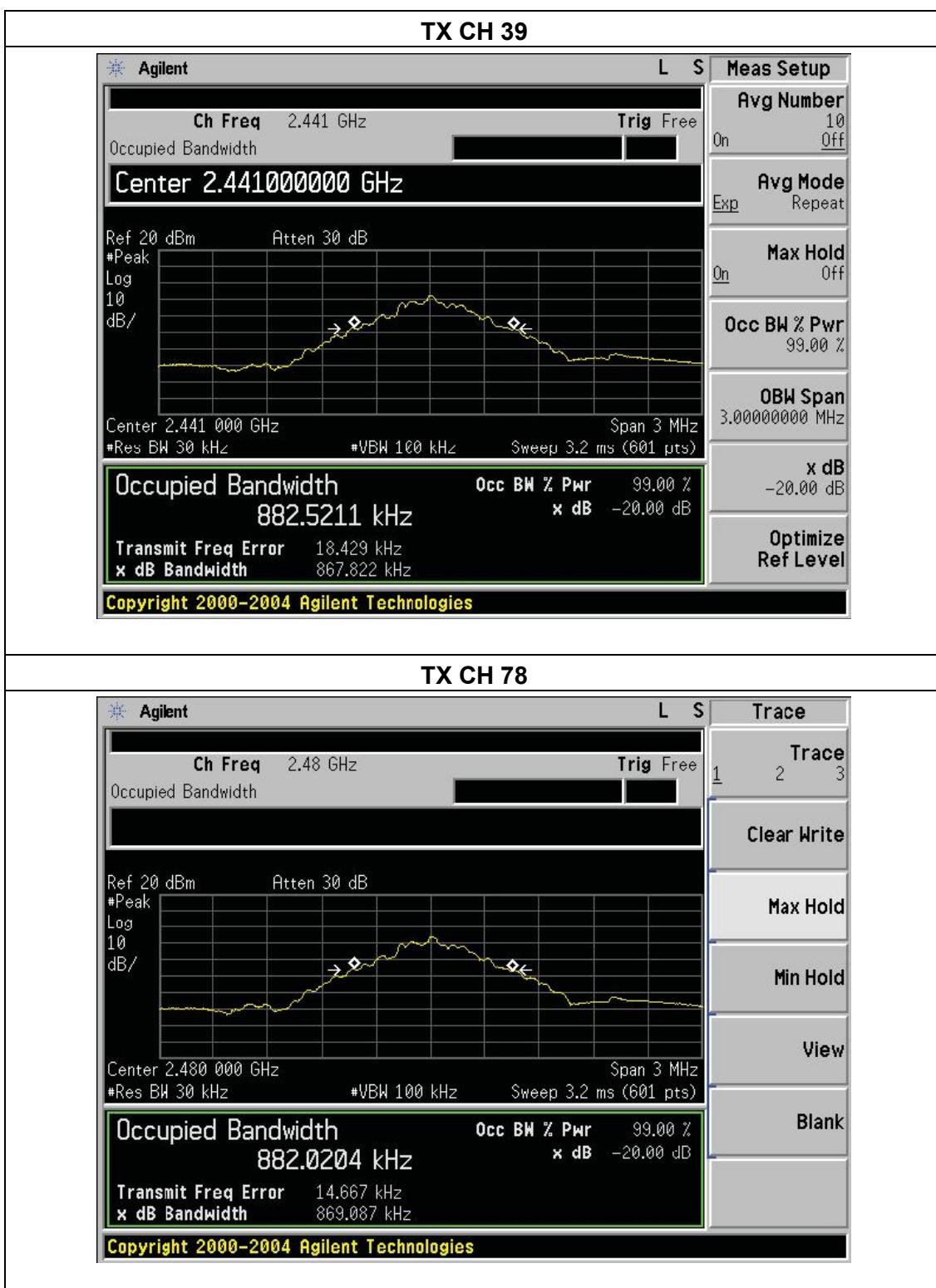
#### 4.1.5 TEST RESULTS

Temperature :	25°C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX Mode /CH00, CH39, CH78		

	Frequency (MHz)	20dB bandwidth (MHz)	Result
GFSK	2402	0.869	Pass
	2441	0.868	Pass
	2480	0.869	Pass
PI/4 DPSK	2402	1.219	Pass
	2441	1.220	Pass
	2480	1.229	Pass
8DPSK	2402	1.211	Pass
	2441	1.210	Pass
	2480	1.214	Pass

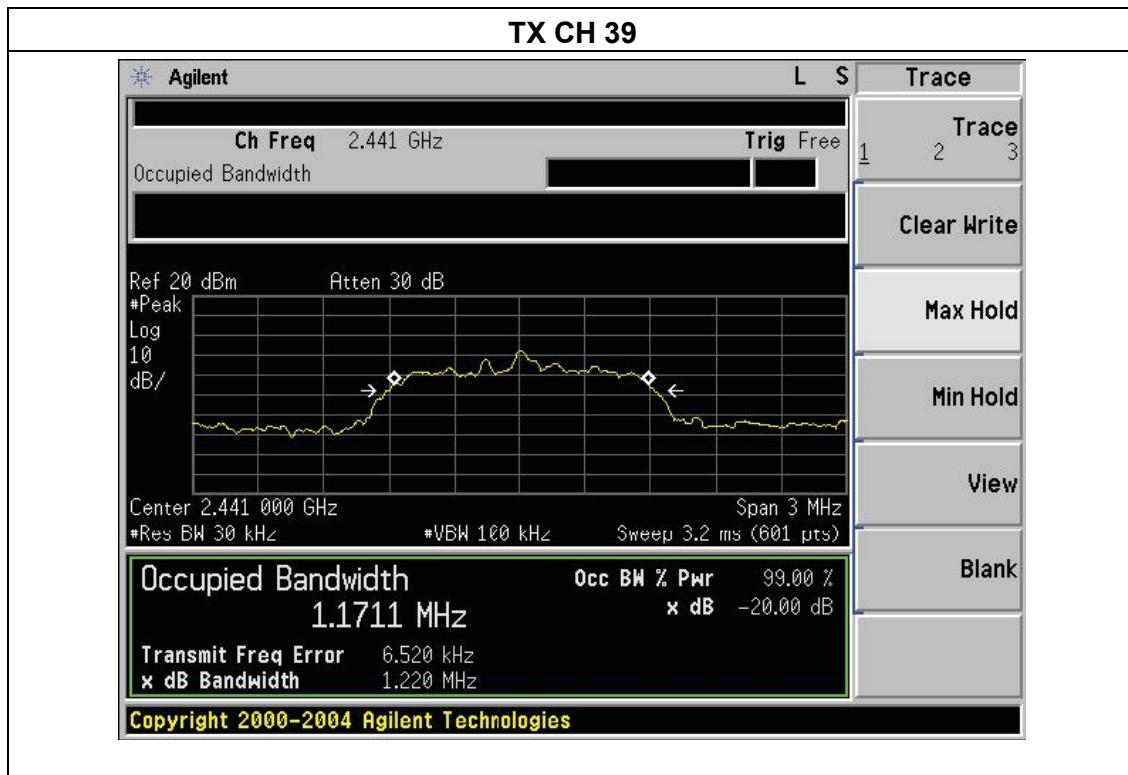
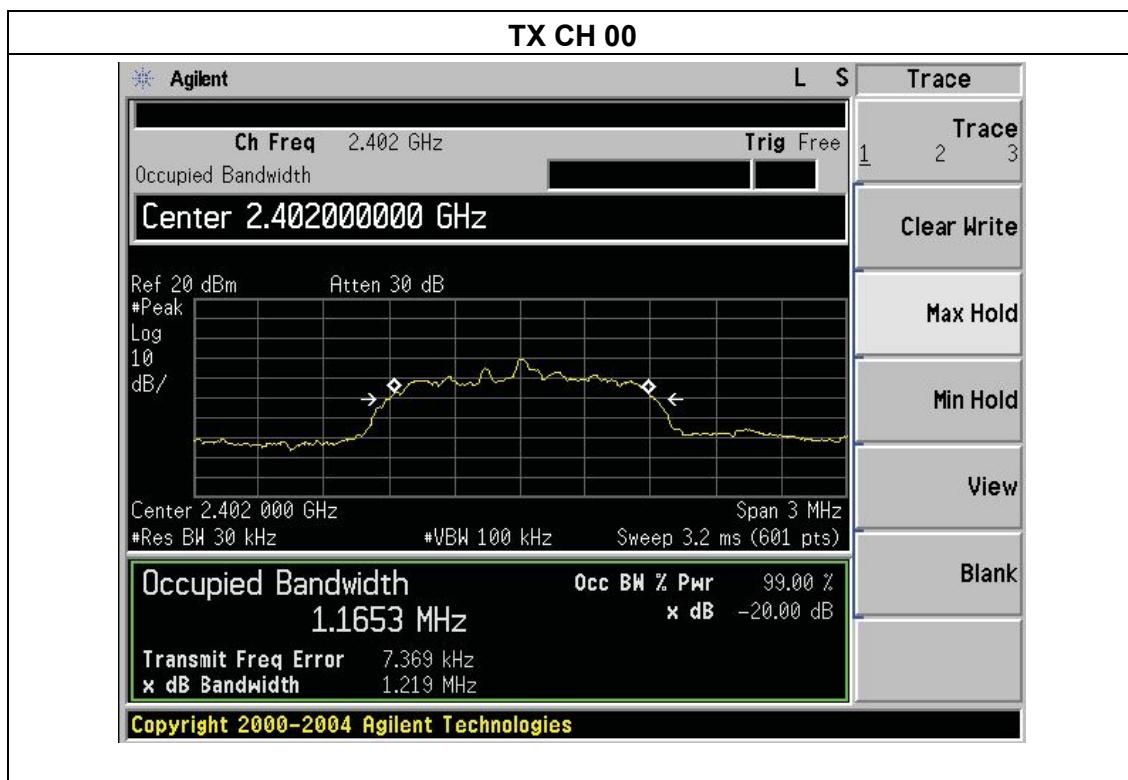
GFSK

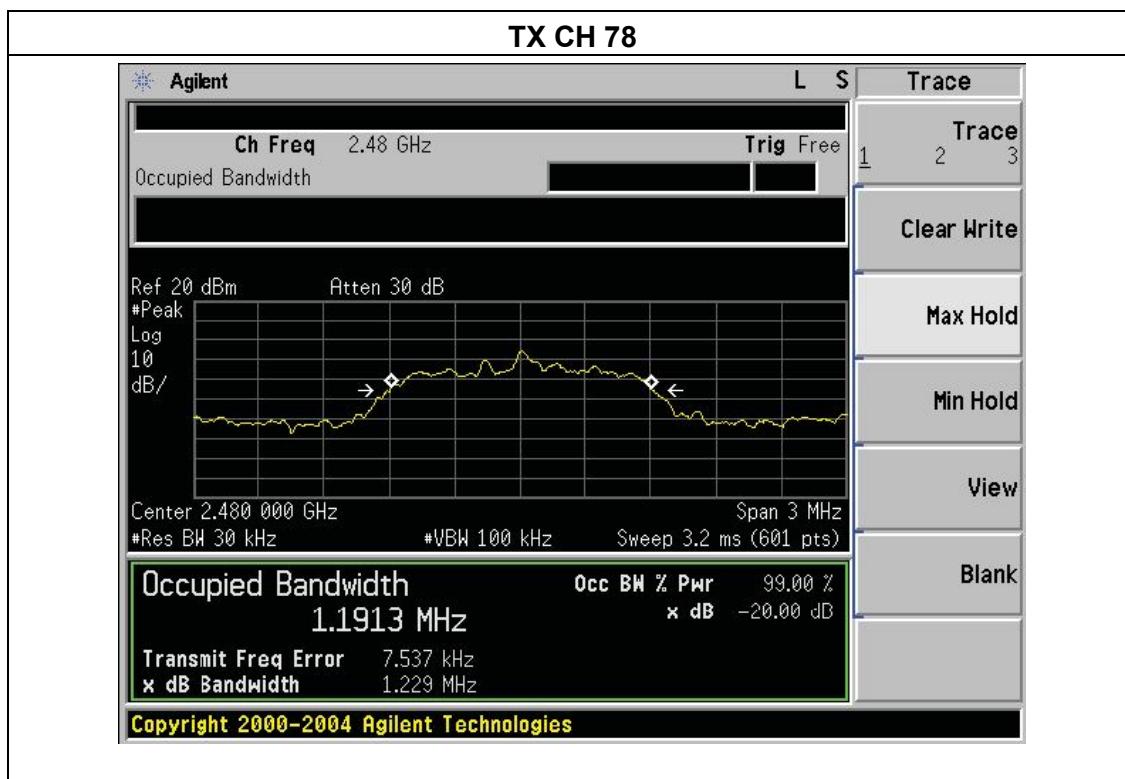




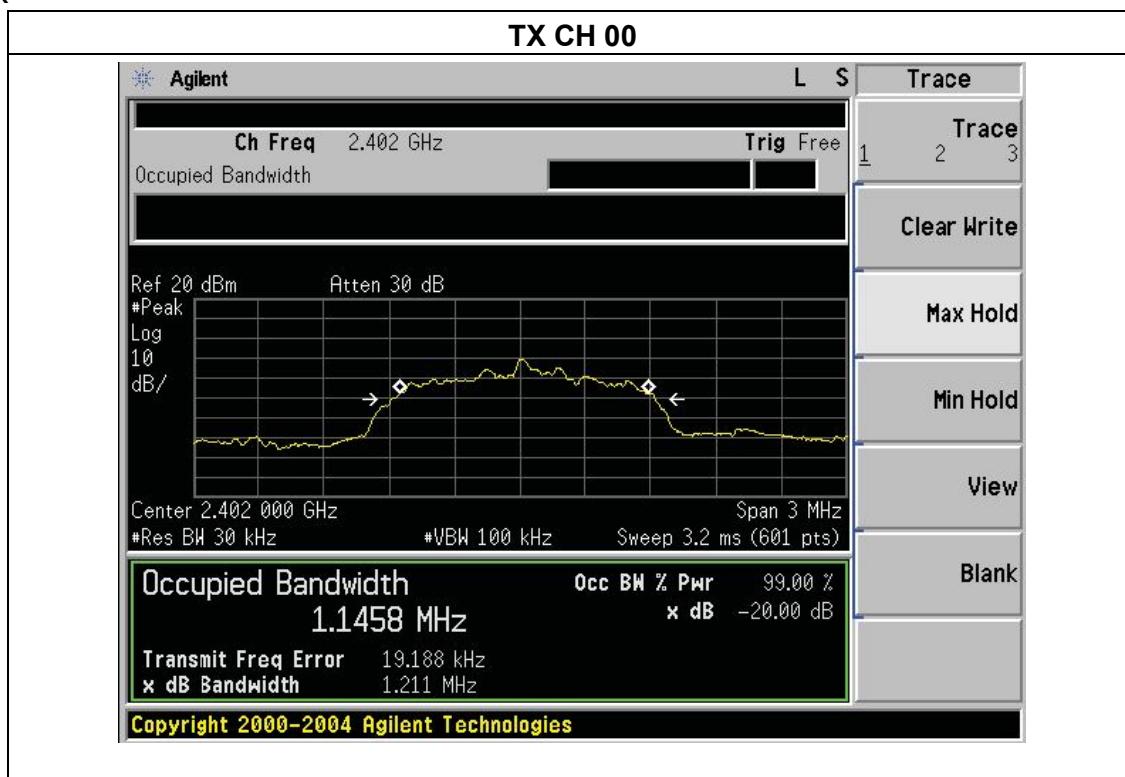


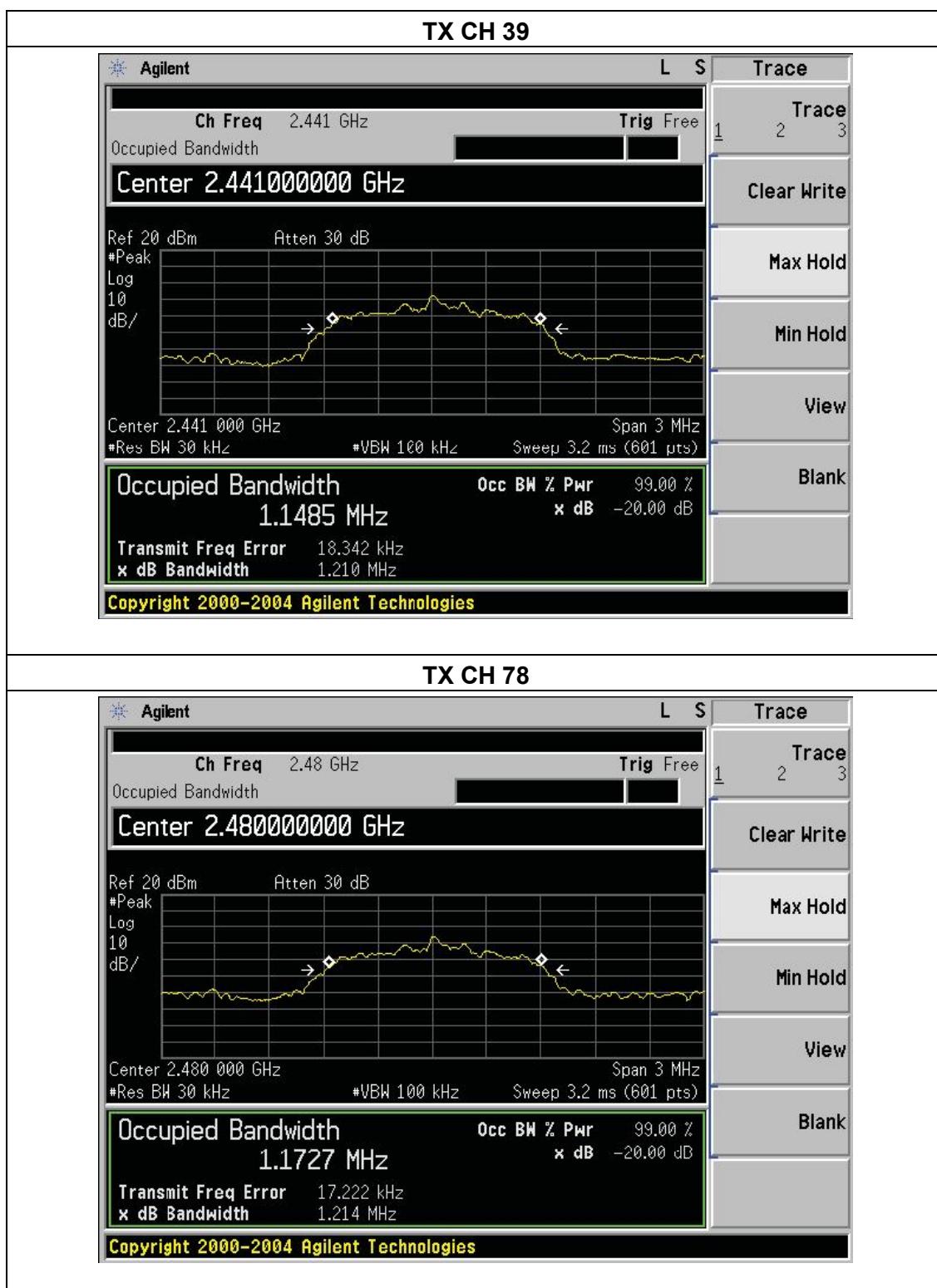
## PI/4 DPSK





8DPSK







## 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.

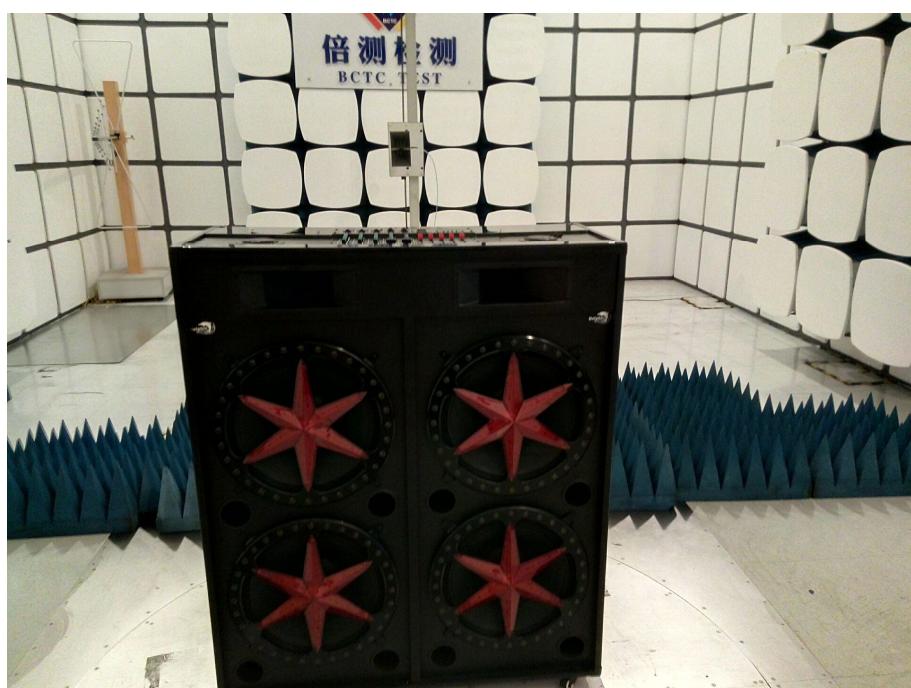
### 5.2 EUT ANTENNA

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



## 6. TEST SEUUP PHOTO

**Radiated Measurement Photos**





### Conducted Measurement Photos

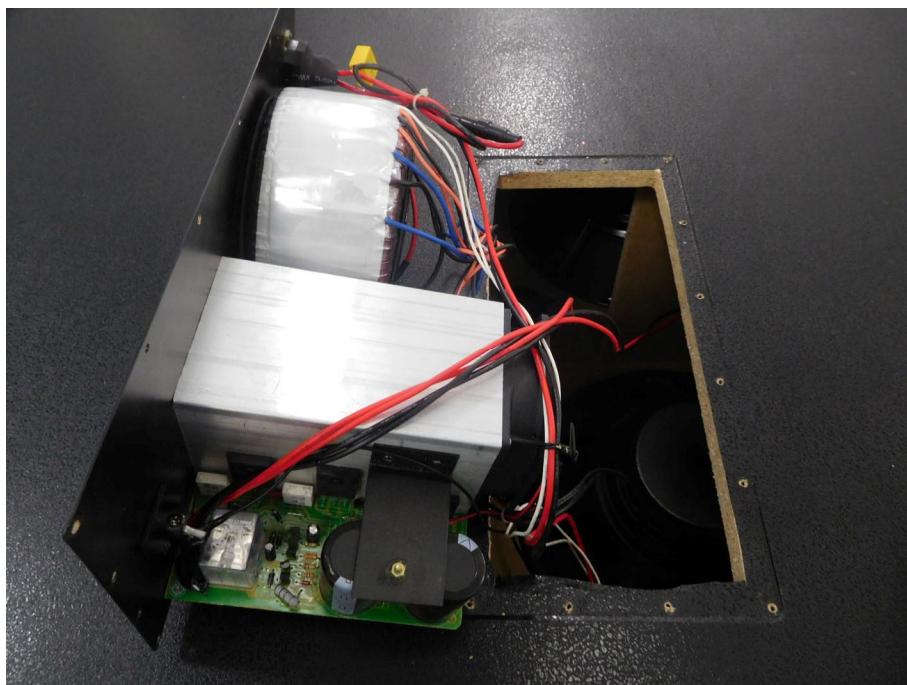
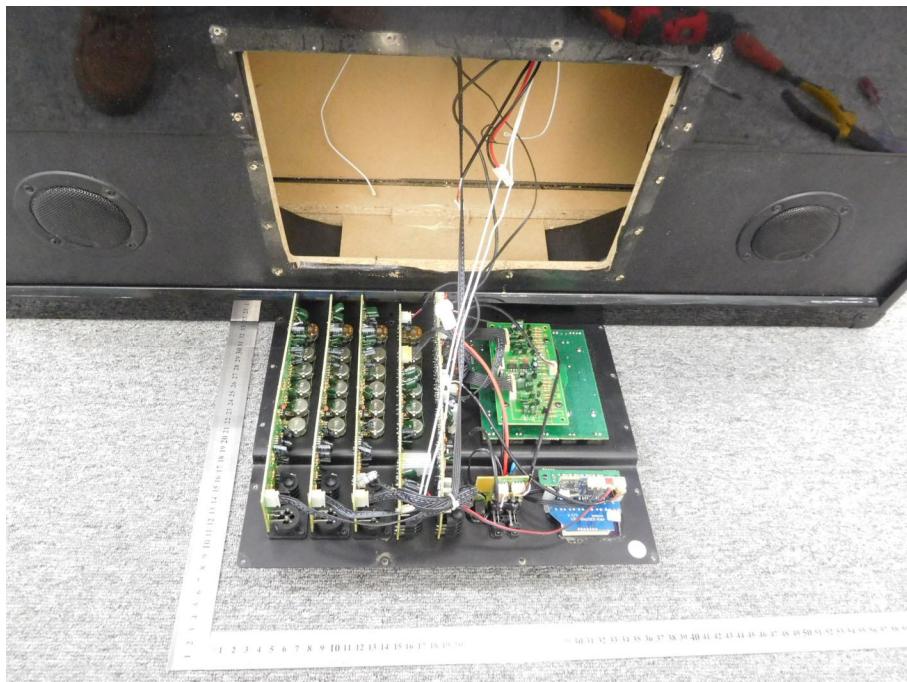




## 7. EUT PHOTO







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