



# FCC Test Report

**FCC ID: 2AJP6HB-4040G**

Product Name:	GSM Alarm Panel
Trademark:	N/A
Model Name:	HB-4040G HB-2050G, HB-5050G, HB-BJQ-560B, HB-GT200
Prepared For:	Ningbo Hengbo Telecommunication Co.,Ltd
Address:	No.1 JinQiao 8th Road,Ninghai County,Ningbo City,Zhejiang Province, China
Prepared By:	Shenzhen BCTC Technology Co., Ltd.
Address:	NO.101, Yousong Road, Longhua New District, Shenzhen, Guangdong, P.R.China
Test Date:	Aug. 28, - Sep. 05, 2016
Date of Report:	Sep. 05, 2016
Report No.:	BCTC-LH160810512E



## VERIFICATION OF COMPLIANCE

**Applicant's name**..... : Ningbo Hengbo Telecommunication Co.,Ltd

Address..... : No.1 JinQiao 8th Road,Ninghai County,Ningbo City,Zhejiang Province, China

**Manufacture's Name**..... : Ningbo Hengbo Telecommunication Co.,Ltd

Address..... : No.1 JinQiao 8th Road,Ninghai County,Ningbo City,Zhejiang Province, China

### Product description

Product name..... : GSM Alarm Panel

Trademark: N/A

Model Name: HB-4040G

HB-2050G, HB-5050G, HB-BJQ-560B, HB-GT200

FCC CFR Title 47 Part 2: 2015

Test procedure FCC CFR Title 47 Part22 Subpart H: 2015

FCC CFR Title 47 Part24 Subpart E: 2015

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

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Test Result : Pass

Testing Engineer :

Sky Huang

Sky Huang

Reviewer

Supervisor

Jade Yang

Jade Yang

Approved & Authorized

Manager:





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## 1. TEST SUMMARY

Test Items	Test Requirement	Result
RF Exposure (SAR)	Part 1.1307 Part 2.1093	Passed* (Please refer to SAR Report)
Conducted RF Output Power	2.1046	PASS
99% & -26 dB Occupied Bandwidth	2.1049, 22.917 24.238,	PASS
Peak to Average Radio	2.1055,22.355 24.235,27.54	PASS
Frequency Stability	2.1055, 22.355 24.235,	PASS
Conducted Out of Band Emissions	2.1051,2.1057 22.917, 24.238	PASS
Band Edge	2.1051,2.1057 22.917, 24.238	PASS
Transmitter Radiated Power (EIPR/ERP)	22.913, 24.232	PASS
Radiated Out of Band Emissions	2.1053,2.1057 22.917, 24.238	PASS



## 2.GENERAL PRODUCT INFORMATION

### 2.1. Product Function

Refer to Technical Construction Form and User Manual.

### 2.2. Description of Device (EUT)

Product Name:	GSM Alarm Panel
Model No.:	HB-4040G HB-2050G, HB-5050G, HB-BJQ-560B, HB-GT200
Trademark	N/A
Model Difference	The product's different for model number and outlook color.
Work band	GSM850/900/1800/1900
Operation Frequency:	GSM 850MHz: Tx: 824.20 - 848.80MHz (at intervals of 200kHz); Rx: 869.20 - 893.80MHz (at intervals of 200kHz) GSM 1900MHz: Tx: 1850.20 - 1909.80MHz (at intervals of 200kHz); Rx: 1930.20 - 1989.80MHz (at intervals of 200kHz)
Modulation technology:	GSM Mode with GMSK, 8PSK Modulation
Antenna Type:	Internal Antenna
Antenna gain:	1.0dBi (GSM850/1900) ,
Power supply:	DC 15V from adapter DC 6V
Adapter:(provide by test lab)	Model:GM26-150150-5A I/P:AC 100-240V 50/60Hz 0.4A O/P: DC 15V 1.5A DC Line: unshielded, undetachable 1.2m
GPRS Class	12



## 2.3. Difference between Model Numbers

The product are different for model, outlook color and size.

## 2.4. Independent Operation Modes

During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

Test modes		
Band	Radiated	Conducted
<b>GSM 850</b>	<b>n</b> GSM link	<b>n</b> GSM link
<b>PCS 1900</b>	<b>n</b> GSM link	<b>n</b> GSM link

Note: The maximum power levels are GSM mode for GMSK link.

The conducted average power tables are as follows:

Conducted Average Power (dBm)						
Band	GSM850			PCS1900		
Channel	128	190	251	512	661	810
Frequency (MHz)	824.20	836.60	848.80	1850.20	1880.00	1909.80
GSM	32.18	32.32	32.38	30.19	30.40	30.26



### 3. TEST SITES

#### 3.1. Test Facilities

##### Site Description

Name of Firm : Shenzhen BCTC Technology Co., Ltd.

Site Location : NO.101, Yousong Road, Longhua New District, Shenzhen, Guangdong, P.R.China

Lab Qualifications : Certificated by Industry Canada  
Registration No.: 12655A  
Date of registration: January 19, 2015

Certificated by FCC, USA  
Registration No.: 187086  
Date of registration: November 28, 2014

Certificated by CNAS China  
Registration No.: CNAS L6046  
Date of registration: February 3, 2013

##### 3.1.1. 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	$\pm 2\%$



### 3.2. List of Test and Measurement Instruments

#### 3.2.1. For conducted emission at the mains terminals test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
843 Shielded Room	ChengYu	843 Room	843	Aug. 27, 2016	Aug. 26, 2017
EMI Receiver	R&S	ESCI	101421	Aug. 27, 2016	Aug. 26, 2017
LISN	Schwarzbeck	NSLK8127	8127739	Aug. 27, 2016	Aug. 26, 2017
Attenuator	R&S	ESH3-Z2	BCTC021E	Aug. 27, 2016	Aug. 26, 2017
843 Cable 1#	FUJIKURA	843C1#	001	Aug. 27, 2016	Aug. 26, 2017

#### 3.2.2. For radiated emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Test Receiver	R&S	ESPI	101318	Aug. 27, 2016	Aug. 26, 2017
System Simulator	Agilent	E5515C	GB43130252	Aug. 27, 2016	Aug. 26, 2017
Power Splitter	Weinschel	1506A	NW534	Aug. 27, 2016	Aug. 26, 2017
Bilog Antenna	TESEQ	CBL6111D	31216	Aug. 27, 2016	Aug. 26, 2017
Bilog Antenna	TESEQ	CBL6111D	31217	Aug. 27, 2016	Aug. 26, 2017
Loop antenna	ARA	PLA-1030/B	1029	Aug. 27, 2016	Aug. 26, 2017
Spectrum Analyzer	Agilent	E4411B	MY4511235	Aug. 27, 2016	Aug. 26, 2017
Signal Amplifier	SONOMA	313	187022	Aug. 27, 2016	Aug. 26, 2017
Signal Amplifier	Agilent	8449B	3008A00213	Aug. 27, 2016	Aug. 26, 2017
RF Cable	R&S	R203	R20X	Aug. 27, 2016	Aug. 26, 2017
MULTI-DEVICE Controller	ETS-LINDGREEN	31250	126821	Aug. 27, 2016	Aug. 26, 2017
Horn Antenna	EM	EM-AH-10180	2011071402	Aug. 27, 2016	Aug. 26, 2017
Horn Antenna	EM	EM-AH-10180	2011071401	Aug. 27, 2016	Aug. 26, 2017
Horn Antenna	Schwarzbeck	BBHA 9170	9170-181	Aug. 27, 2016	Aug. 26, 2017
Spectrum Analyzer	Agilent	8593E	3911A03928	Aug. 27, 2016	Aug. 26, 2017
Spectrum Analyzer	Agilent	E4407B	MY45108040	Aug. 27, 2016	Aug. 26, 2017
Signal Amplifier	DAZE	ZN3380B	11235	Aug. 27, 2016	Aug. 26, 2017
High Pass filter	KANGMAI	WHKX1.0/1.5G-1 OSS	40	Aug. 27, 2016	Aug. 26, 2017
Filter	COM-MW	ZBSF-C836.5-25-X	BCTC042	Aug. 27, 2016	Aug. 26, 2017
Filter	COM-MW	ZBSF-C1747.5-75-X2	BCTC045	Aug. 27, 2016	Aug. 26, 2017
Filter	COM-MW	ZBSF-C1880-60-X2	BCTC047	Aug. 27, 2016	Aug. 26, 2017
DC Power Supply	LongWei	PS-305D	010965682	Aug. 29, 2016	Aug. 29, 2017
Constant temperature and humidity box	GF	GTH-800-40-2P	MAA9906-012	Aug. 29, 2016	Aug. 29, 2017
Universal radio communication tester	R&S	CMU200	115295	Aug. 29, 2016	Aug. 29, 2017
signal generators	R&S	SMU200A	112431	Aug. 29, 2016	Aug. 29, 2017
Splitter	Agilent	11435B	1125162	Aug. 29, 2016	Aug. 29, 2017



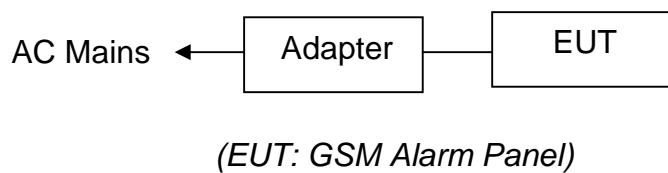
## 4. TEST SET-UP AND OPERATION MODES

### 4.1. Principle of Configuration Selection

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

### 4.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators



### 4.3. Test Environment:

Ambient conditions in the test laboratory:

Items	Actual
Temperature (°C)	21~23
Humidity (%RH)	50~65



## 5. EMISSION TEST RESULTS

### 5.1. Conducted RF Output Power

#### 5.1.1. Limit

According to FCC section 2.1046(a) , FCC part22.913(a) and FCC part24.232(b) ,for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC section 2.1033(c)(8).

#### 5.1.2. Test Setup

The EUT, which is powered by the adapter, is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power.

#### 5.1.3. Test Result

Here the lowest, middle and highest channels are selected to perform testing to verify the conducted RF output power of the EUT.

Measurement data



The conducted power tables are as follows:

Band	Conducted Power (dBm)					
	GSM850			PCS1900		
Channel	128	190	251	512	661	810
Frequency	824.20	836.60	848.80	1850.20	1880.00	1909.80
GSM (GMSK, 1 TX slot)	32.18	32.32	32.38	29.19	29.40	29.26
GPRS (GMSK, 1 TX slot)	31.94	32.14	32.34	28.93	29.09	29.55
GPRS (GMSK, 2 TX slot)	31.19	31.39	31.59	28.16	28.34	28.80
GPRS (GMSK, 3 TX slot)	29.22	29.42	29.62	26.19	26.37	26.83
GPRS (GMSK, 4 TX slot)	27.12	27.32	27.52	24.09	24.27	24.73

Note: Measurement Uncertainty: ±2.6 dB.



## 5.2. -26dB and 99% Occupied Bandwidth

### 5.2.1. Limit

According to FCC section 2.1049 and FCC part22.913(a) and FCC part24.232(b), the occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Occupied bandwidth is also known as the 99% emission bandwidth,

### 5.2.2. Test Setup

The EUT, which is powered by the adapter, is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power.



### 5.2.3. Test Result

Measurement Data

EUT Mode	Channel	Frequency (MHz)	99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
GSM 850 (GSM link)	128	824.20	247.71	314.0
	190	836.60	245.03	318.2
	251	848.80	245.33	314.9
GSM 850 (GPRS 8 link)	128	824.20	247.64	320.7
	190	836.60	246.33	320.1
	251	848.80	245.46	317.3
PCS 1900 (GSM link)	512	1850.20	244.88	319.4
	661	1880.00	245.82	318.5
	810	1909.80	247.98	321.6
PCS 1900 (GPRS 8 link)	512	1850.20	247.07	320.1
	661	1880.00	244.82	323.8
	810	1909.80	246.71	308.5

Note: Measurement Uncertainty: ±20Hz.

All the modulation modes and Channels have been tested, the data of the worst mode (GSM) are recorded in the following pages.



Test plot as follows:

### GSM 850MHz Lowest channel



### GSM 850MHz Middle channel



### GSM 850MHz Highest channel:





## PCS 1900 (GSM link) Lowest channel



## PCS 1900 (GSM link) Middle channel



## PCS 1900 (GSM link) Highest channel





### 5.3. Peak to Average Radio

#### 5.3.1. Limit

According to FCC section 27.50(d)(5) , the peak to average ratio(PAR) of the transmission may not exceed 13dB.

#### 5.3.2. Test Setup

According with KDB 971168 v02r02

##### 5.7.2 Alternate procedure for PAPR

Peak power measurements with a peak power meter

The total peak output power may be measured using a broadband peak RF power meter. The power meter must have a video bandwidth that is greater than or equal to the emission bandwidth and utilize a fast-responding diode detector.

Average power measurement with average power meter

As an alternative to the use of a spectrum/signal analyzer or EMI receiver to perform a measurement of the total in-band average output power, a wideband RF average power meter with a thermocouple detector or equivalent can be used under certain conditions

If the EUT can be configured to transmit continuously (i.e., the burst duty cycle  $\geq 98\%$ ) and at all times the EUT is transmitting at its maximum output power level, then a conventional wide-band RF power meter can be used.

If the EUT cannot be configured to transmit continuously (i.e., the burst duty cycle  $< 98\%$ ), then there are two options for the use of an average power meter. First, a gated average power meter can be used to perform the

measurement if the gating parameters can be adjusted such that the power is measured only over active transmission bursts at maximum output power levels. A conventional average power meter can also be used if the measured burst duty cycle is constant (i.e., duty cycle variations are less than  $\pm 2$  percent) by performing the measurement over the on/off burst cycles and then correcting (increasing) the measured level by a factor equal to  $10\log(1/\text{duty cycle})$

#### 5.3.3. Test Result

Measurement data as follows:

Band	PCS1900			GPRS 1900		
	Low	Middle	High	Low	Middle	High
Frequency	1850.20	1880.00	1909.8	1850.20	1880.00	1909.8
Peak-to average ratio(dB)/GSM	1.78	2.34	2.16	1.98	2.17	2.08

Note: Measurement Uncertainty:  $\pm 0.2$  dB.



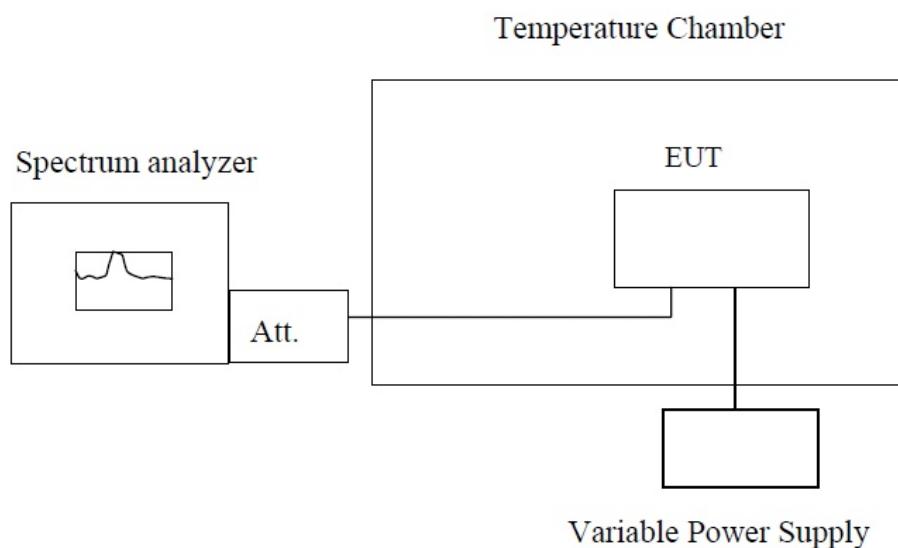
## 5.4. Frequency Stability

### 5.4.1. Limit

According to FCC section 22.355 and FCC section 24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

- (a) The temperature is varied from -30°C to +50°C at intervals of not more than 10°C.
- (b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

### 5.4.2. Test Setup



**Note :** Measurement setup for testing on Antenna connector

The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber.

The EUT is commanded by the System Simulator (SS) to operate at the maximum output power

### 5.4.3. Test Result

The nominal, highest and lowest extreme voltages are separately 15.0VDC, 17.3VDC and 12.8VDC which are specified by the applicant; the normal temperature here used is 25°C . The frequency deviation limit of 850MHz band is ±2.5ppm, and 1900MHz is ±1ppm



Normal

Test Conditions			Frequency Deviation			Result
Band	Power(Vdc)	Temperature(°C)	Frequency Error(Hz)	PPM	Limit	
GSM850 (GSM link) Middle channel=190 channel=836. 6MHz	15.0	-30	33	0.0394	±2.5	PASS
	15.0	-20	35	0.0418		
	15.0	-10	44	0.0526		
	15.0	0	33	0.0394		
	15.0	10	31	0.0371		
	15.0	20	25	0.0299		
	15.0	30	37	0.0442		
	15.0	40	49	0.0586		
	15.0	50	43	0.0514		
	17.3	25	28	0.0335		
	15.0	25	24	0.0287		
	12.8	25	47	0.0562		

Test Conditions			Frequency Deviation			Result
Band	Power(Vdc)	Temperature(°C)	Frequency Error(Hz)	PPM	Limit	
GPRS850 (GSM link) Middle channel=190 channel=836. 6MHz	15.0	-30	49	0.0586	±2.5	PASS
	15.0	-20	42	0.0502		
	15.0	-10	37	0.0442		
	15.0	0	43	0.0514		
	15.0	10	26	0.0311		
	15.0	20	31	0.0371		
	15.0	30	28	0.0335		
	15.0	40	37	0.0442		
	15.0	50	46	0.0550		
	17.3	25	33	0.0394		
	15.0	25	32	0.0383		
	12.8	25	43	0.0514		



Test Conditions			Frequency Deviation			Result
Band	Power(Vdc)	Temperature(°C)	Frequency Error(Hz)	PPM	Limit	
PCS1900 (GSM link) Middle channel=661 channel=188 0MHz	15.0	-30	87	0.0463	±1	PASS
	15.0	-20	66	0.0351		
	15.0	-10	79	0.0420		
	15.0	0	43	0.0229		
	15.0	10	57	0.0303		
	15.0	20	75	0.0399		
	15.0	30	35	0.0186		
	15.0	40	52	0.0277		
	15.0	50	42	0.0223		
	17.3	25	67	0.0356		
	15.0	25	67	0.0356		
	12.8	25	77	0.0410		

Test Conditions			Frequency Deviation			Result
Band	Power(Vdc)	Temperature(°C)	Frequency Error(Hz)	PPM	Limit	
GPRS1900 (GSM link) Middle channel=661 channel=188 0MHz	15.0	-30	68	0.0362	±1	PASS
	15.0	-20	57	0.0303		
	15.0	-10	64	0.0340		
	15.0	0	55	0.0293		
	15.0	10	49	0.0261		
	15.0	20	52	0.0277		
	15.0	30	74	0.0394		
	15.0	40	62	0.0330		
	15.0	50	87	0.0463		
	17.3	25	79	0.0420		
	15.0	25	82	0.0436		
	12.8	25	66	0.0351		

Note: Measurement Uncertainty: ±20Hz.

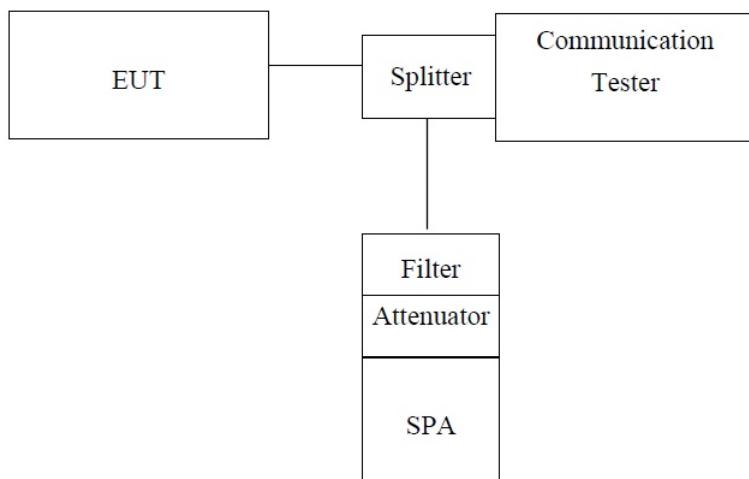


## 5.5. Conducted Spurious Emissions

### 5.5.1. Limit

According to FCC section 22.917(a) and FCC section 24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43+10\log(P)$  dB. This calculated to be -13dBm.

### 5.5.2. Test Setup



*Note: Measurement setup for testing on Antenna connector*

### 5.5.3. Measurement Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

For the out of band: Set the RBW, VBW = 100KHz, Start=30MHz, Stop= 10th harmonic.

Limit = -13dBm

### 5.5.4. Test Result

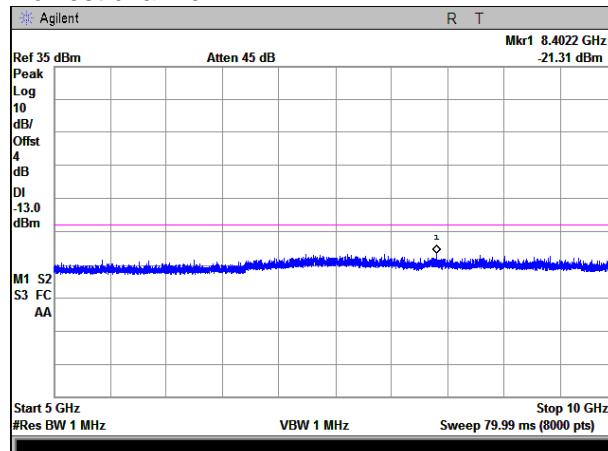
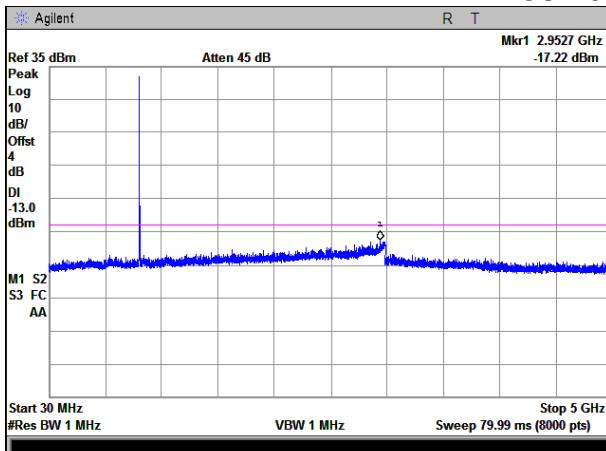
The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the out of band emissions.

All the modulation modes and Channels have been tested, the data of the worst mode (GSM) are recorded in the following pages.

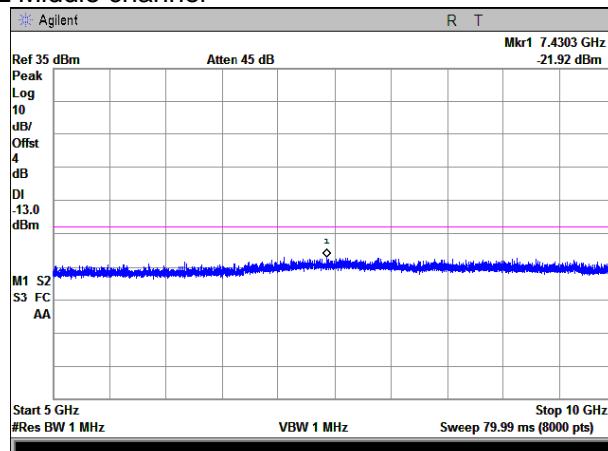
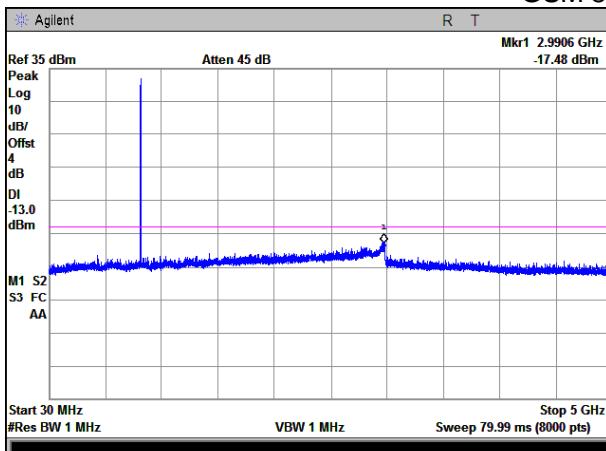
Test plot as follows:



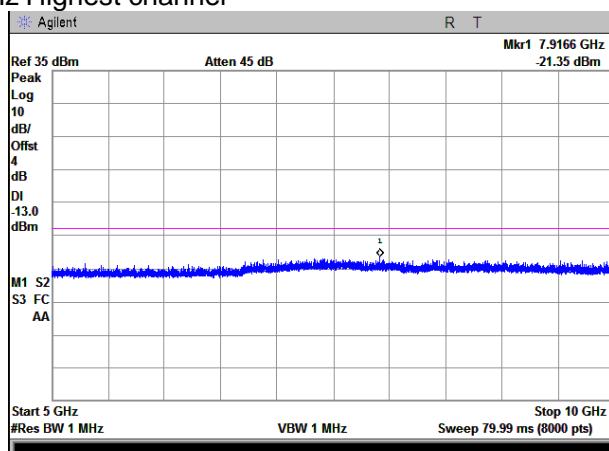
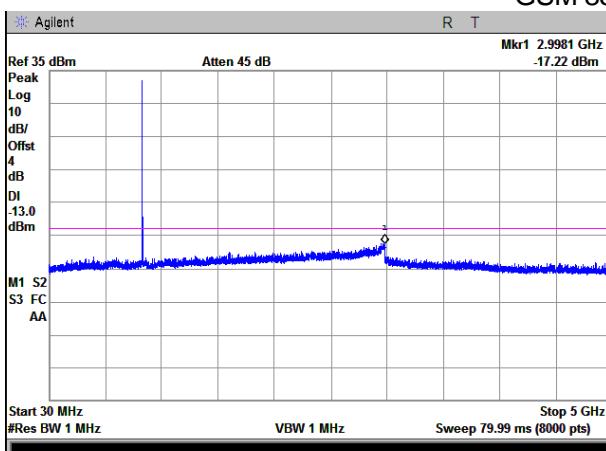
## GSM 850MHz Lowest channel



## GSM 850MHz Middle channel

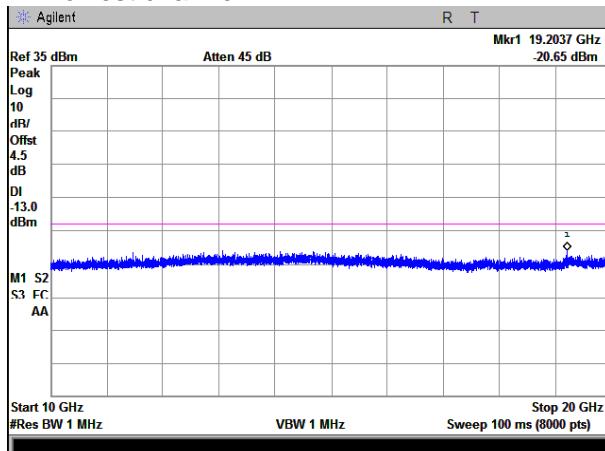
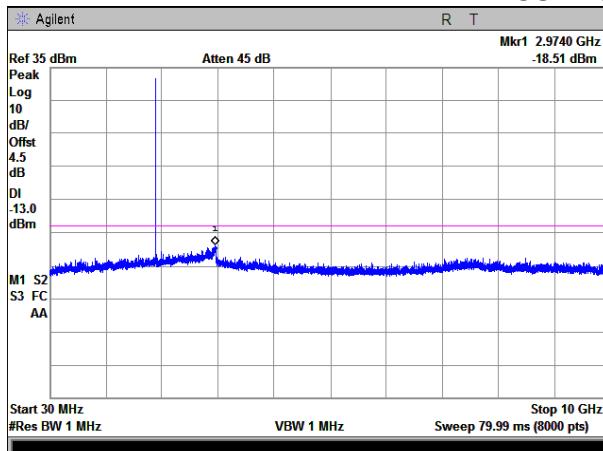


## GSM 850MHz Highest channel

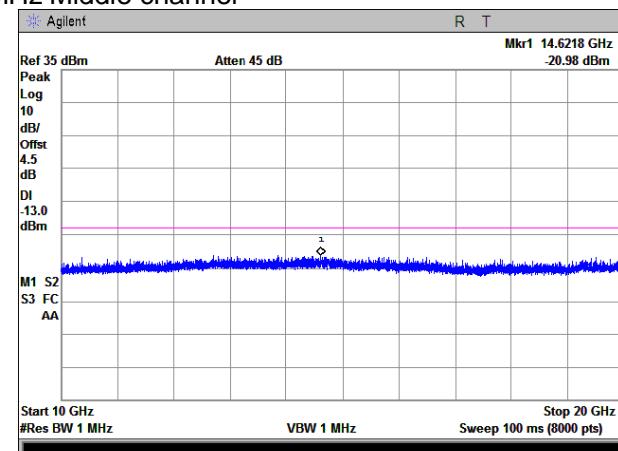
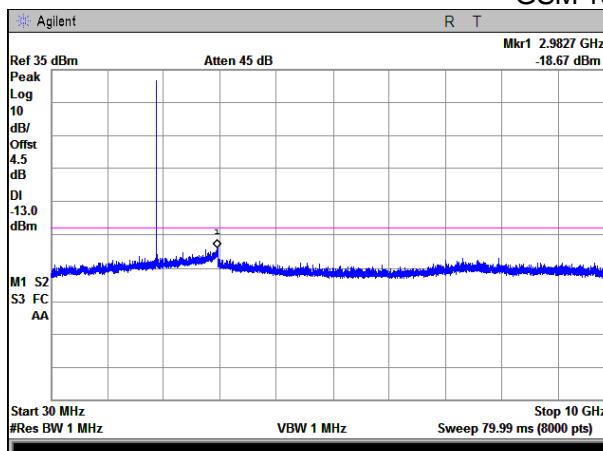




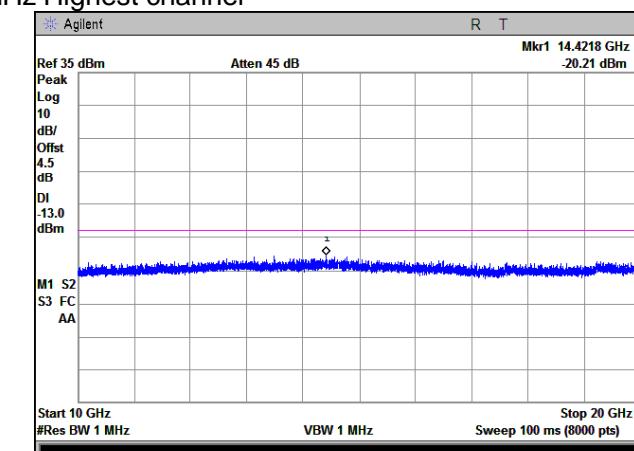
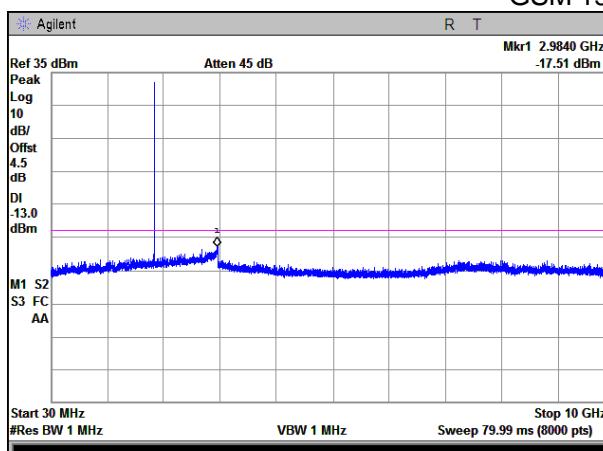
## GSM 1900MHz Lowest channel

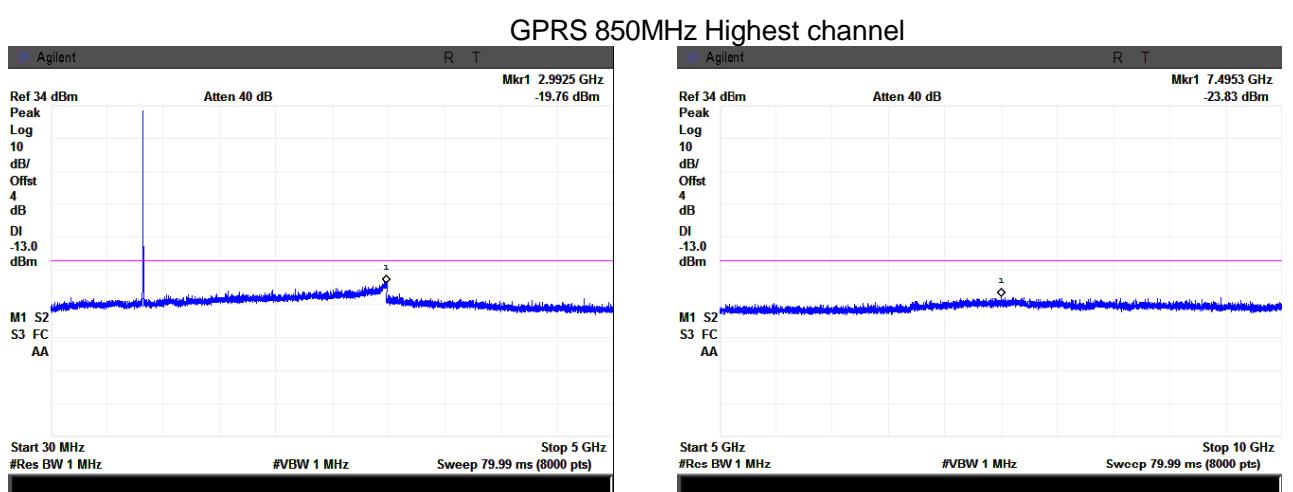
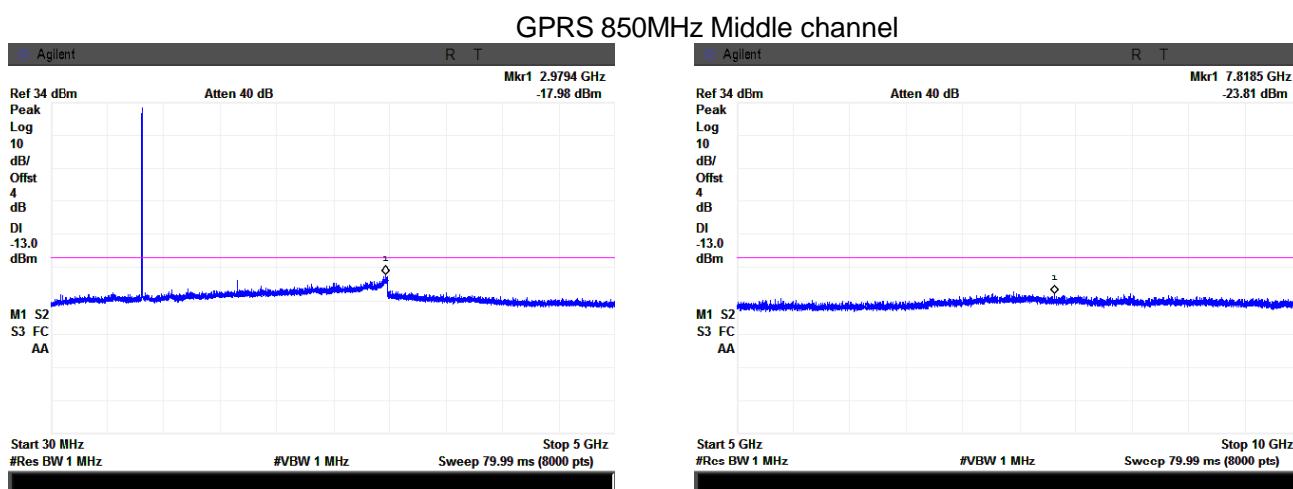
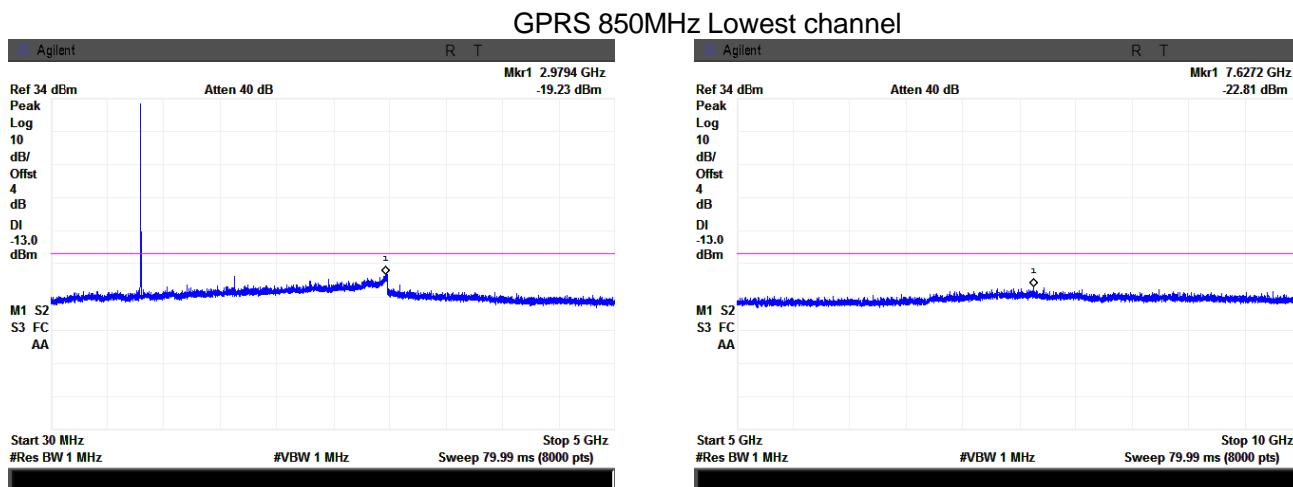


## GSM 1900MHz Middle channel



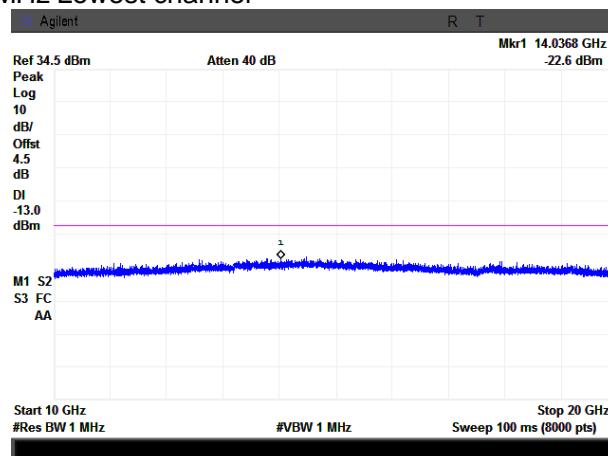
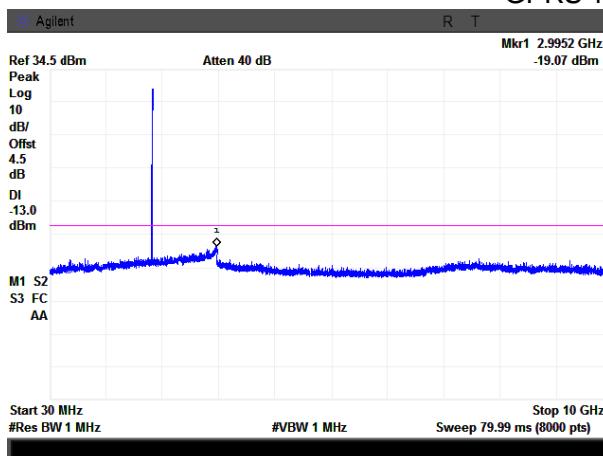
## GSM 1900MHz Highest channel



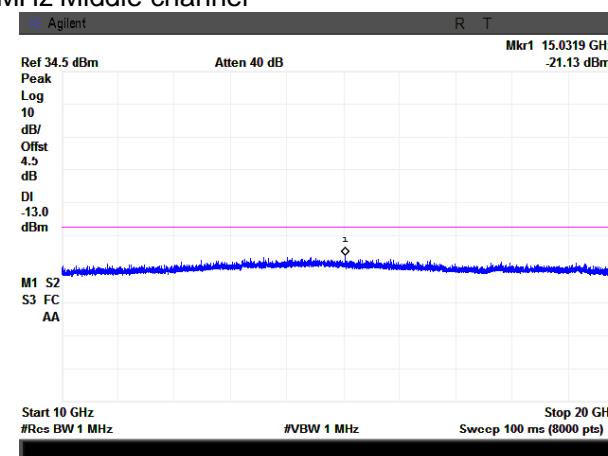
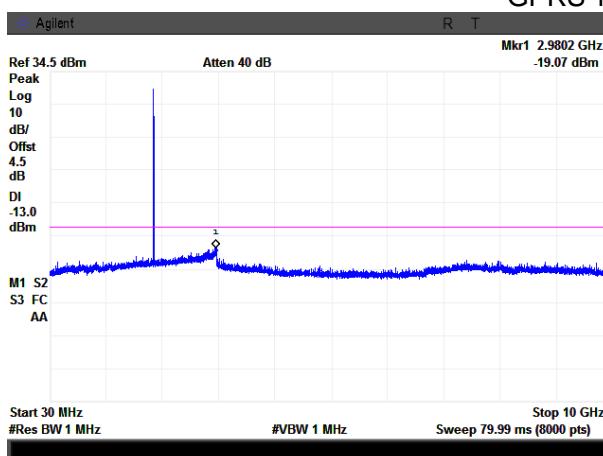




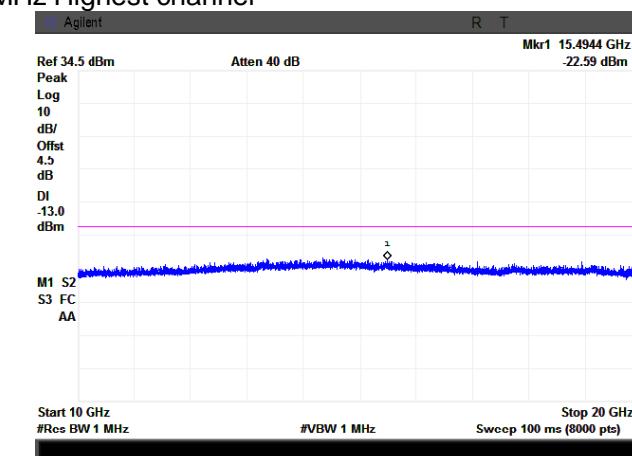
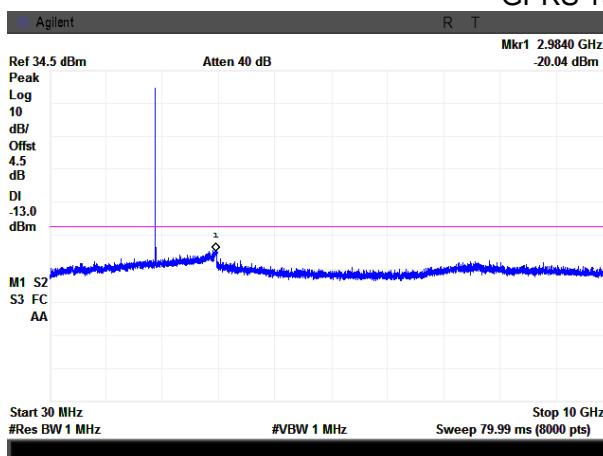
## GPRS 1900MHz Lowest channel



## GPRS 1900MHz Middle channel



## GPRS 1900MHz Highest channel



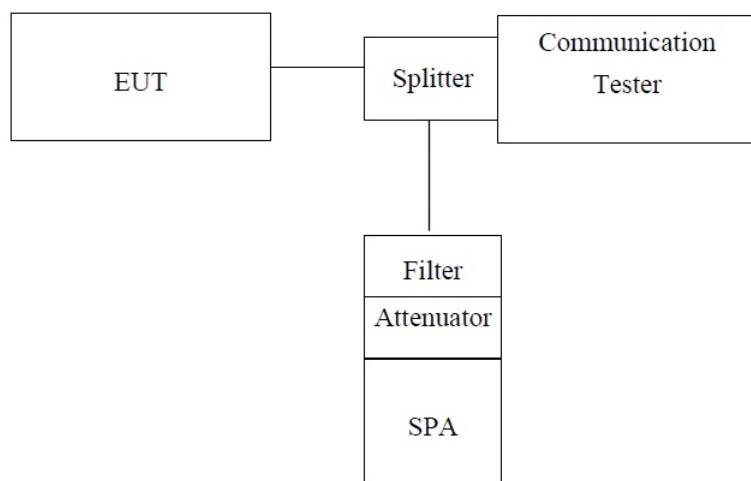


## 5.6. Conducted Out of Band Emissions

### 5.6.1. Limit

According to FCC section 22.917(b) and FCC section 24.238(b), 27.53(g)(h) in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth (26dB emission bandwidth) of the fundamental emission of the transmitter may be employed.

### 5.6.2. Test Setup



*Note: Measurement setup for testing on Antenna connector*

### 5.6.3. Measurement Procedure

The EUT, which is powered by the adapter, is coupled to the Spectrum Analyzer and the System Simulator with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the System Simulator to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the System Simulator.

### 5.6.4. Test Result

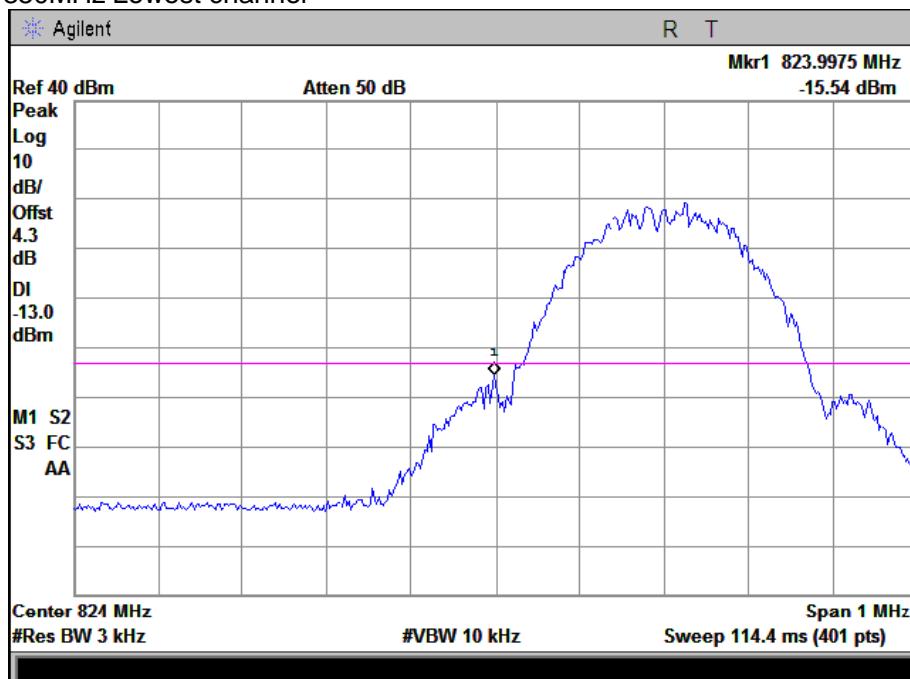
The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the out of band emissions.

All the modulation modes and Channels have been tested, the data of the worst mode (GSM) are recorded in the following pages.

Test plot as follows:

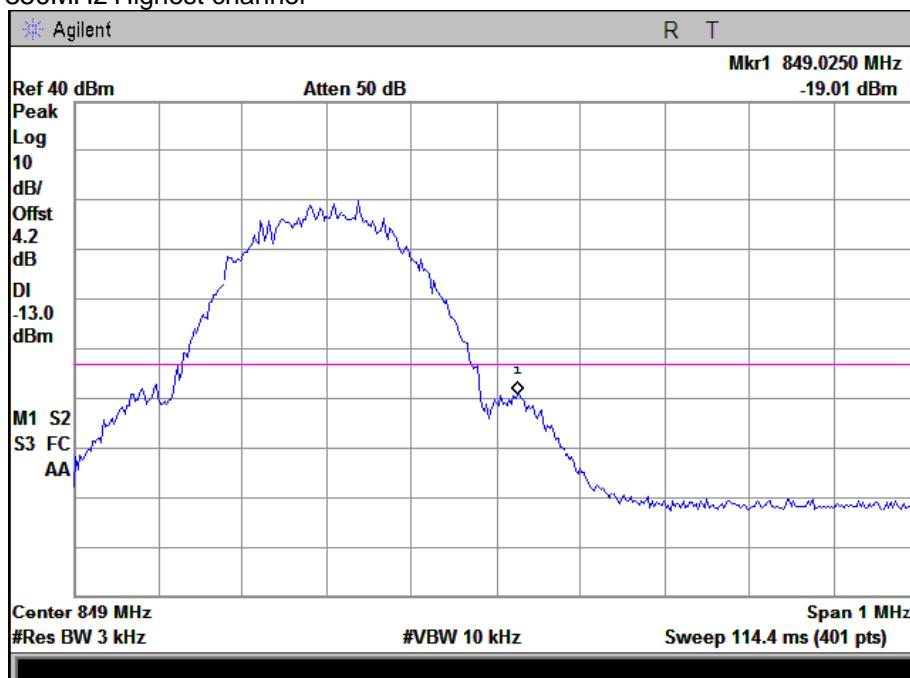


## GSM 850MHz Lowest channel



Note: Offset=Cable loss (4.0) + 10log(3.14/3)=4.0+0.3=4.3dB

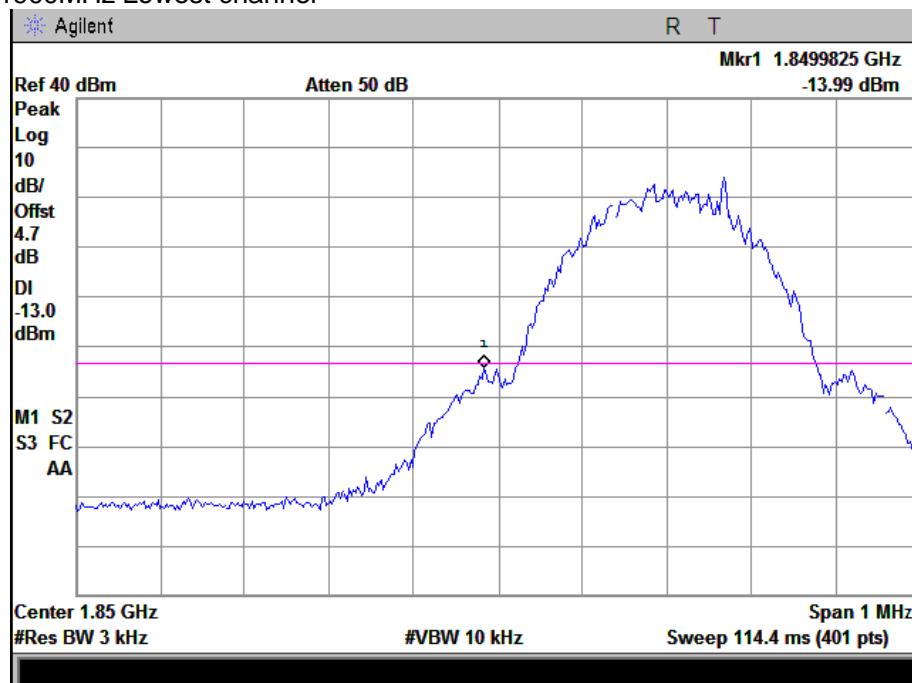
## GSM 850MHz Highest channel



Note: Offset=Cable loss (4.0) + 10log(3.15/3)=4.0+0.2=4.2dB

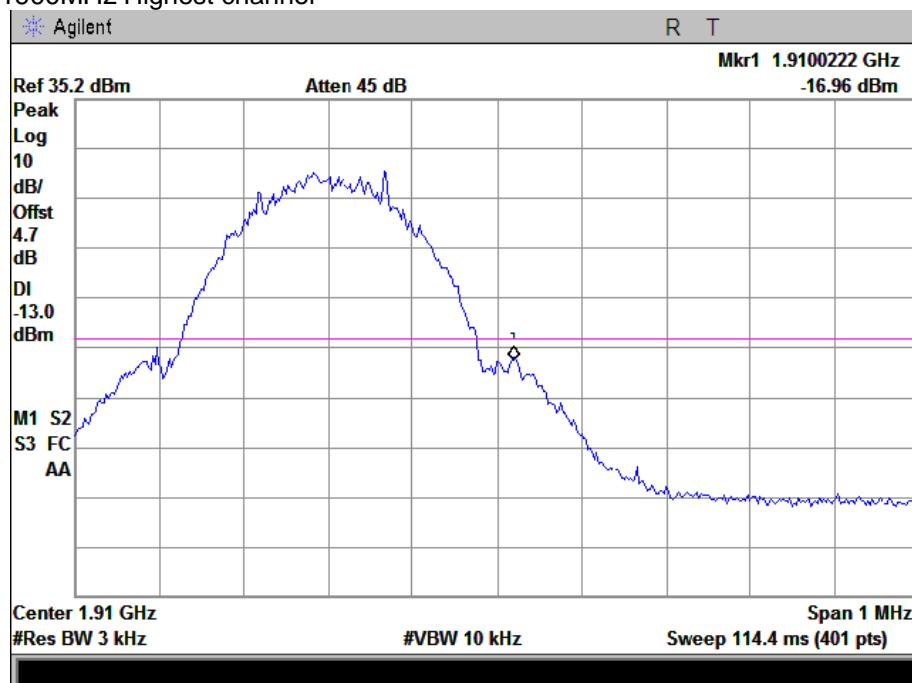


## GSM 1900MHz Lowest channel



Note: Offset=Cable loss (4.5) + 10log (3.19/3)=4.5+0.2=4.7dB

## GSM 1900MHz Highest channel



Note: Offset=Cable loss (4.5) + 10log(3.22/3)=4.5+0.2=4.7dB

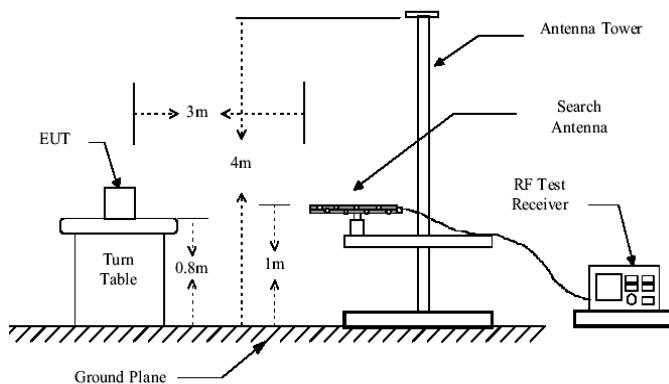
## 5.7. Transmitter Radiated Power (EIRP/ERP)

### 5.7.1. Limit

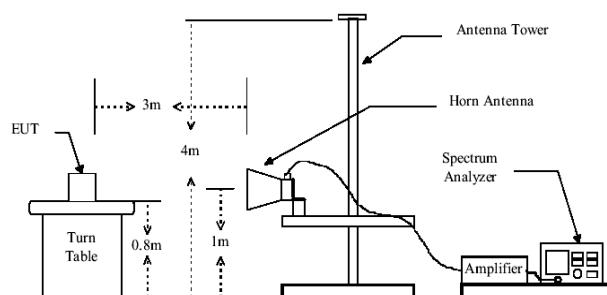
According to FCC section 22.913, the Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7Watts, and FCC section 24.232, the broadband PCS mobile station is limited to 2 Watts e.i.r.p. peak power.

### 5.7.2. Test Setup

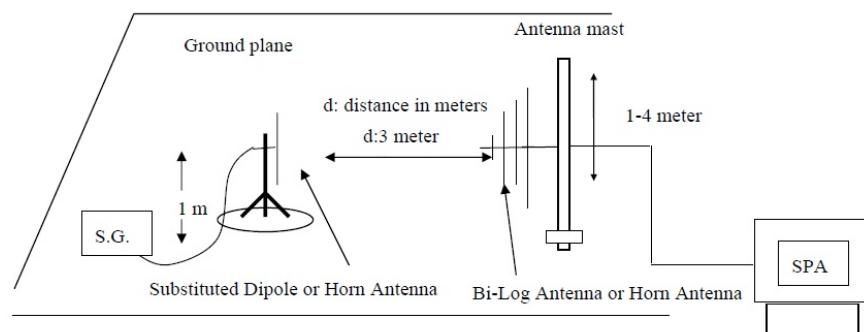
Below 1GHz



Above 1GHz



Substituted method:





### 5.7.3. Measurement Procedure

The EUT was placed on an non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer. all test in Full-Anechoic Chamber.

During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dB<sub>V/m</sub>) was calculated.

ERP in frequency band 824.2 –848.80.8MHz were measured using a substitution method. The EUT was replaced by dipole antenna connected, the S.G. output was recorded and ERP was calculated as follows:

EIRP in frequency band 1850.2 –1909.8MHz were measured using a substitution method. The EUT was replaced by or horn antenna connected, the S.G. output was recorded and EIRP was calculated as follows:

$$\text{ERP} = \text{S.G. output (dBm)} + \text{Antenna Gain (dBi)} - \text{Cable Loss (dB)}$$

$$\text{EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain (dBi)} - \text{Cable Loss (dB)}$$

### 5.7.4. Test Result



EUT mode	Channel	Antenna Pol.	S.G. output (dBm)	Antenna Gain (dBd)	Cable Loss (dB)	ERP (dBm)	Limit (dBm)	Result
GSM850 (GSM link)	Lowest	V	16.98	15.68	1.65	31.01	38.45	Pass
		H	15.01	15.68	1.65	29.04		
	Middle	V	17.54	15.70	1.67	31.57	38.45	Pass
		H	15.42	15.70	1.67	29.45		
	Highest	V	<b>18.20</b>	<b>15.70</b>	<b>1.71</b>	<b>32.19</b>	38.45	Pass
		H	14.98	15.70	1.71	28.97		

GPRS850	Lowest	V	16.82	15.68	1.65	30.85	38.45	Pass
		H	14.87	15.68	1.65	28.90		
	Middle	V	17.37	15.70	1.67	31.40	38.45	Pass
		H	15.27	15.70	1.67	29.30		
	Highest	V	<b>18.03</b>	<b>15.70</b>	<b>1.71</b>	<b>32.02</b>	38.45	Pass
		H	14.84	15.70	1.71	28.83		



EUT mode	Channel	Antenna Pol.	S.G. output (dBm)	Antenna Gain (dBd)	Cable Loss (dB)	ERP (dBm)	Limit (dBm)	Result
PCS1900 (GSM link)	Lowest	V	12.57	19.35	2.54	29.38	38.45	Pass
		H	10.65	19.35	2.54	27.46		
	Middle	V	<b>13.50</b>	<b>19.51</b>	<b>2.62</b>	<b>30.39</b>	38.45	Pass
		H	11.34	19.51	2.62	28.23		
	Highest	V	12.77	19.96	2.69	30.04	38.45	Pass
		H	9.73	19.96	2.69	27.00		

GPRS19 00	Lowest	V	12.45	19.35	2.54	29.26	38.45	Pass
		H	10.55	19.35	2.54	27.36		
	Middle	V	<b>13.37</b>	<b>19.51</b>	<b>2.62</b>	<b>30.26</b>	38.45	Pass
		H	11.23	19.51	2.62	28.12		
	Highest	V	12.65	19.96	2.69	29.92	38.45	Pass
		H	9.64	19.96	2.69	26.91		



## 5.8. Radiated Out of Band Emissions

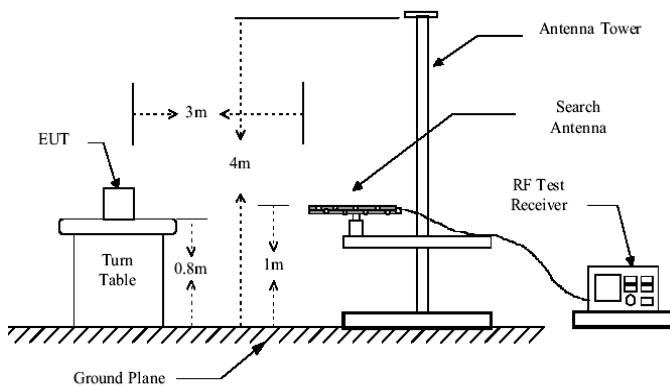
### 5.8.1. Limit

According to FCC section 22.917(a) and section 24.238(a), 27.53(g) the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43+10\log(P)$  dB. This calculated to be -13dBm.

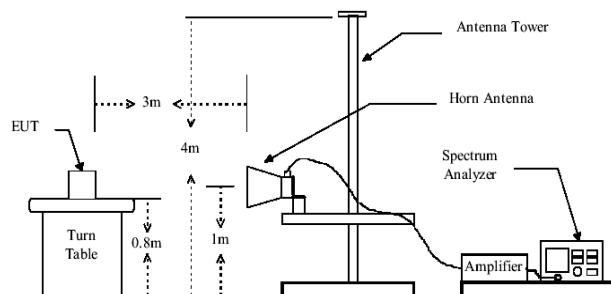
The spurious emission with frequency band 1900 according to FCC section 2.1057.

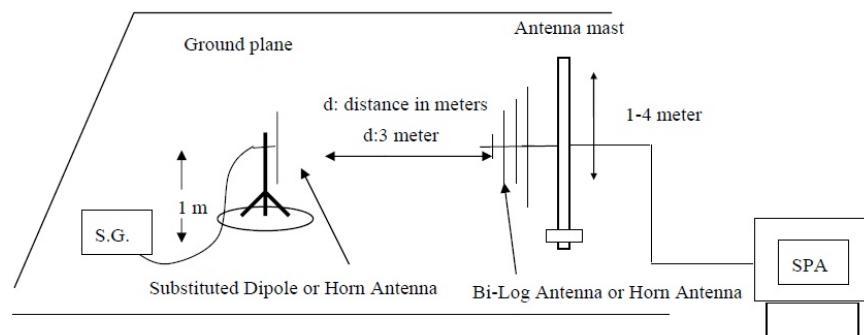
### 5.8.2. Test Setup

Below 1GHz



Above 1GHz



**Substituted method:**

### 5.8.3. Measurement Procedure

The EUT was placed on a non-conductive, The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations. all test in Full-Anechoic Chamber.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequency (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

$$\text{EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain(dBi)} - \text{Cable Loss (dB)}$$

Note: Measurement Uncertainty:  $\pm 3.6$  dB.



Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	Level (dBm)		
GSM 850 Lowest	88.12	Vertical	-75.44	3.35	0.38	-72.47	-13	PASS
	1648.40	Vertical	-29.20	6.51	1.35	-24.04		
	2472.60	Vertical	-35.38	6.88	2.53	-31.03		
	3296.80	Vertical	-37.23	7.61	3.67	-33.29		
	4121.00	Vertical	-45.32	8.67	4.06	-40.71		
	4945.20	Vertical	-39.88	9.35	4.38	-34.91		
	138.89	Horizontal	-75.56	4.12	0.51	-71.95		
	2472.40	Horizontal	-33.93	6.88	1.35	-28.40		
	3296.80	Horizontal	-37.17	7.61	3.67	-33.23		
	4121.00	Horizontal	-45.78	8.67	4.06	-41.17		
	4945.20	Horizontal	-49.06	9.35	4.38	-44.09		
	5769.40	Horizontal	-43.30	9.94	4.87	-38.23		

Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	Level (dBm)		
GSM 850 Middle	88.53	Vertical	-75.39	3.35	0.38	-72.42	-13	PASS
	1648.70	Vertical	-32.14	6.51	1.35	-26.98		
	2472.10	Vertical	-32.68	6.88	2.53	-28.33		
	3296.50	Vertical	-40.14	7.61	3.67	-36.20		
	4121.30	Vertical	-47.69	8.67	4.06	-43.08		
	4945.70	Vertical	-43.21	9.35	4.38	-38.24		
	138.87	Horizontal	-75.88	4.12	0.51	-72.27		
	2472.10	Horizontal	-29.47	6.88	1.35	-23.94		
	3296.20	Horizontal	-32.13	7.61	3.67	-28.19		
	4121.70	Horizontal	-48.38	8.67	4.06	-43.77		
	4945.00	Horizontal	-49.77	9.35	4.38	-44.80		
	5769.60	Horizontal	-39.81	9.94	4.87	-34.74		



Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBr)	Cable Loss (dB)	Level (dBm)		
GSM 850 Highest	88.03	Vertical	-75.07	3.35	0.38	-72.10	-13	PASS
	1648.30	Vertical	-31.04	6.51	1.35	-25.88		
	2472.10	Vertical	-32.94	6.88	2.53	-28.59		
	3296.50	Vertical	-36.09	7.61	3.67	-32.15		
	4121.40	Vertical	-41.40	8.67	4.06	-36.79		
	4945.20	Vertical	-46.81	9.35	4.38	-41.84		
	137.92	Horizontal	-76.07	4.12	0.51	-72.46		
	2472.90	Horizontal	-29.86	6.88	1.35	-24.33		
	3296.30	Horizontal	-32.74	7.61	3.67	-28.80		
	4121.20	Horizontal	-38.45	8.67	4.06	-33.84		
	4945.70	Horizontal	-47.06	9.35	4.38	-42.09		
	5769.60	Horizontal	-53.28	9.94	4.87	-48.21		

Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBr)	Cable Loss (dB)	Level (dBm)		
GPRS 850 Lowest	88.08	Vertical	-75.52	3.35	0.38	-72.55	-13	PASS
	1648.40	Vertical	-29.23	6.51	1.35	-24.07		
	2472.60	Vertical	-35.42	6.88	2.53	-31.07		
	3296.80	Vertical	-37.27	7.61	3.67	-33.33		
	4121.00	Vertical	-45.37	8.67	4.06	-40.76		
	4945.20	Vertical	-39.92	9.35	4.38	-34.95		
	138.46	Horizontal	-75.64	4.12	0.51	-72.03		
	2472.40	Horizontal	-33.97	6.88	1.35	-28.44		
	3296.80	Horizontal	-37.21	7.61	3.67	-33.27		
	4121.00	Horizontal	-45.83	8.67	4.06	-41.22		
	4945.20	Horizontal	-49.11	9.35	4.38	-44.14		
	5769.40	Horizontal	-43.35	9.94	4.87	-38.28		



Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBr)	Cable Loss (dB)	Level (dBm)		
GPRS 850 Middle	88.39	Vertical	-75.47	3.35	0.38	-72.50	-13	PASS
	1648.70	Vertical	-32.18	6.51	1.35	-27.02		
	2472.10	Vertical	-32.72	6.88	2.53	-28.37		
	3296.50	Vertical	-40.18	7.61	3.67	-36.24		
	4121.30	Vertical	-47.74	8.67	4.06	-43.13		
	4945.70	Vertical	-43.26	9.35	4.38	-38.29		
	138.52	Horizontal	-75.96	4.12	0.51	-72.35		
	2472.10	Horizontal	-29.50	6.88	1.35	-23.97		
	3296.20	Horizontal	-32.17	7.61	3.67	-28.23		
	4121.70	Horizontal	-48.43	8.67	4.06	-43.82		
	4945.00	Horizontal	-49.82	9.35	4.38	-44.85		
	5769.60	Horizontal	-39.85	9.94	4.87	-34.78		

Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBr)	Cable Loss (dB)	Level (dBm)		
GPRS 850 Highest	88.35	Vertical	-75.15	3.35	0.38	-72.18	-13	PASS
	1648.30	Vertical	-31.07	6.51	1.35	-25.91		
	2472.10	Vertical	-32.98	6.88	2.53	-28.63		
	3296.50	Vertical	-36.13	7.61	3.67	-32.19		
	4121.40	Vertical	-41.45	8.67	4.06	-36.84		
	4945.20	Vertical	-46.86	9.35	4.38	-41.89		
	137.63	Horizontal	-76.15	4.12	0.51	-72.54		
	2472.90	Horizontal	-29.89	6.88	1.35	-24.36		
	3296.30	Horizontal	-32.78	7.61	3.67	-28.84		
	4121.20	Horizontal	-38.49	8.67	4.06	-33.88		
	4945.70	Horizontal	-47.11	9.35	4.38	-42.14		
	5769.60	Horizontal	-53.34	9.94	4.87	-48.27		



Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	Level (dBm)		
PCS190 0 Lowest	87.54	Vertical	-75.86	3.35	0.38	-72.89	-13	PASS
	3700.40	Vertical	-46.43	7.76	3.75	-42.42		
	5550.60	Vertical	-47.55	9.84	4.94	-42.65		
	7400.80	Vertical	-39.95	10.21	5.32	-35.06		
	9251.00	Vertical	-43.34	11.36	6.02	-38.00		
	11101.20	Vertical	-44.89	14.52	6.68	-37.05		
	138.22	Horizontal	-75.98	4.12	0.51	-72.37		
	3700.40	Horizontal	-48.65	7.76	3.75	-44.64		
	5550.60	Horizontal	-47.92	9.84	4.94	-43.02		
	7400.80	Horizontal	-42.56	10.21	5.32	-37.67		
	9251.00	Horizontal	-47.81	11.36	6.02	-42.47		
	11101.20	Horizontal	-47.59	14.52	6.68	-39.75		

Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	Level (dBm)		
PCS1900 Middle	87.49	Vertical	-75.86	3.35	0.38	-72.89	-13	PASS
	3760.00	Vertical	-47.76	7.76	3.75	-43.75		
	5640.00	Vertical	-47.36	9.84	4.94	-42.46		
	7520.00	Vertical	-42.95	10.21	5.32	-38.06		
	9400.00	Vertical	-42.35	11.36	6.02	-37.01		
	11280.00	Vertical	-46.33	14.52	6.68	-38.49		
	138.31	Horizontal	-75.98	4.12	0.51	-72.37		
	3760.00	Horizontal	-46.18	7.76	3.75	-42.17		
	5640.00	Horizontal	-46.92	9.84	4.94	-42.02		
	7520.00	Horizontal	-39.54	10.21	5.32	-34.65		
	9400.00	Horizontal	-43.45	11.36	6.02	-38.11		
	11280.00	Horizontal	-45.34	14.52	6.68	-37.50		



Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	Level (dBm)		
PCS190 0 Highest	87.42	Vertical	-75.90	3.35	0.38	-72.93	-13	PASS
	3819.60	Vertical	-47.41	7.79	3.53	-43.15		
	5729.40	Vertical	-41.83	9.88	5.02	-36.97		
	7639.20	Vertical	-38.01	10.25	5.54	-33.30		
	9549.00	Vertical	-44.91	11.38	6.16	-39.69		
	11458.80	Vertical	-47.36	14.56	6.72	-39.52		
	138.63	Horizontal	-76.02	4.12	0.51	-72.41		
	3819.60	Horizontal	-45.76	7.79	3.53	-41.50		
	5729.40	Horizontal	-41.74	9.88	5.02	-36.88		
	7639.20	Horizontal	-37.38	10.25	5.54	-32.67		
	9549.00	Horizontal	-42.99	11.38	6.16	-37.77		
	11458.80	Horizontal	-44.91	14.56	6.72	-37.07		

Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	Level (dBm)		
GPRS 1900 Lowest	87.41	Vertical	-75.94	3.35	0.38	-72.97	-13	PASS
	3700.40	Vertical	-46.48	7.76	3.75	-42.47		
	5550.60	Vertical	-47.60	9.84	4.94	-42.70		
	7400.80	Vertical	-39.99	10.21	5.32	-35.10		
	9251.00	Vertical	-43.39	11.36	6.02	-38.05		
	11101.20	Vertical	-44.94	14.52	6.68	-37.10		
	138.62	Horizontal	-76.06	4.12	0.51	-72.45		
	3700.40	Horizontal	-48.70	7.76	3.75	-44.69		
	5550.60	Horizontal	-47.97	9.84	4.94	-43.07		
	7400.80	Horizontal	-42.61	10.21	5.32	-37.72		
	9251.00	Horizontal	-47.86	11.36	6.02	-42.52		
	11101.20	Horizontal	-47.64	14.52	6.68	-39.80		



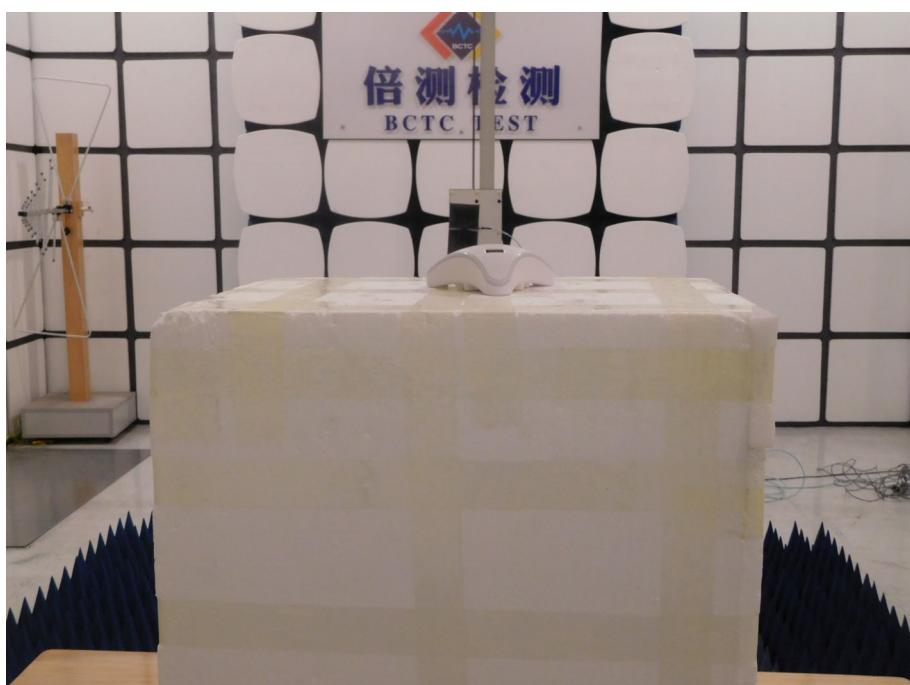
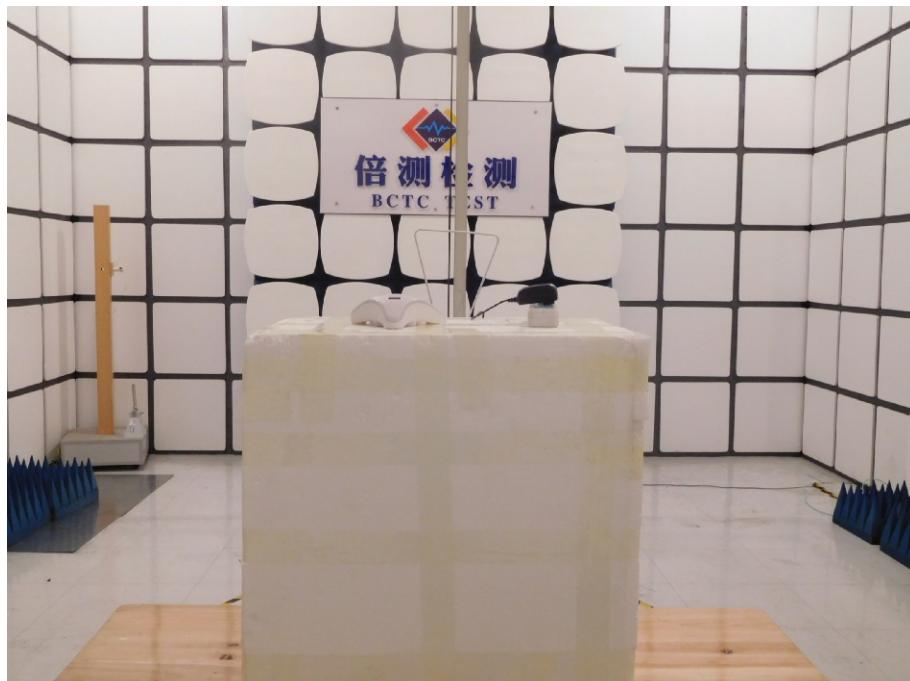
Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	Level (dBm)		
GPRS 1900 Middle	87.22	Vertical	-75.94	3.35	0.38	-72.97	-13	PASS
	3760.00	Vertical	-47.81	7.76	3.75	-43.80		
	5640.00	Vertical	-47.41	9.84	4.94	-42.51		
	7520.00	Vertical	-43.00	10.21	5.32	-38.11		
	9400.00	Vertical	-42.40	11.36	6.02	-37.06		
	11280.00	Vertical	-46.38	14.52	6.68	-38.54		
	138.29	Horizontal	-76.06	4.12	0.51	-72.45		
	3760.00	Horizontal	-46.23	7.76	3.75	-42.22		
	5640.00	Horizontal	-46.97	9.84	4.94	-42.07		
	7520.00	Horizontal	-39.58	10.21	5.32	-34.69		
	9400.00	Horizontal	-43.50	11.36	6.02	-38.16		
	11280.00	Horizontal	-45.39	14.52	6.68	-37.55		

Band	Frequency (MHz)	Spurious Emission					Limit (dBm)	Result
		Polarization	S.G. output (dBm)	Antenna Gain (dBi)	Cable Loss (dB)	Level (dBm)		
GPRS 1900 Highest	87.16	Vertical	-75.98	3.35	0.38	-73.01	-13	PASS
	3819.60	Vertical	-47.46	7.79	3.53	-43.20		
	5729.40	Vertical	-41.88	9.88	5.02	-37.02		
	7639.20	Vertical	-38.05	10.25	5.54	-33.34		
	9549.00	Vertical	-44.96	11.38	6.16	-39.74		
	11458.80	Vertical	-47.41	14.56	6.72	-39.57		
	138.53	Horizontal	-76.10	4.12	0.51	-72.49		
	3819.60	Horizontal	-45.81	7.79	3.53	-41.55		
	5729.40	Horizontal	-41.79	9.88	5.02	-36.93		
	7639.20	Horizontal	-37.42	10.25	5.54	-32.71		
	9549.00	Horizontal	-43.04	11.38	6.16	-37.82		
	11458.80	Horizontal	-44.96	14.56	6.72	-37.12		



## 6. PHOTOGRAPHS OF TEST SET-UP

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## 7. PHOTOGRAPHS OF THE EUT

EUT Photo 1



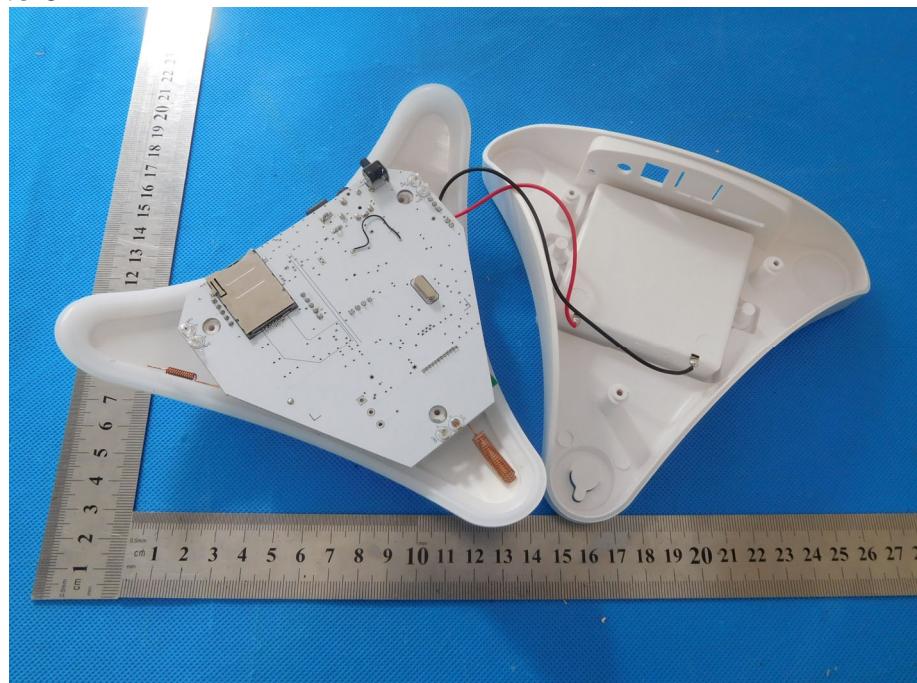
EUT Photo 2



**EUT Photo 3****EUT Photo 4**



**EUT Photo 5**



※※※※ END OF REPORT ※※※※