



REPORT No. : SZ19120309W01

# TEST REPORT

**APPLICANT** : Shenzhen Jimi IOT Co.,Ltd

**PRODUCT NAME** : Asset GPS Tracker

**MODEL NAME** : JM-LG05, GT420D, LG05

**BRAND NAME** : Jimi

**FCC ID** : 2AMLFJM-LG05

**STANDARD(S)** : 47 CFR Part 22 Subpart H

**RECEIPT DATE** : 2019-12-26

**TEST DATE** : 2019-12-31 to 2020-04-26

**ISSUE DATE** : 2020-05-22

Edited by:

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Approved by:

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Change History		
Version	Date	Reason for change
1.0	2020-05-22	First edition

# 1. Technical Information

**Note:** Provide by applicant.

## 1.1. Applicant and Manufacturer Information

<b>Applicant:</b>	Shenzhen Jimi IOT Co.,Ltd
<b>Applicant Address:</b>	Floor 4th, Building C, Gaoxingqi Industrial Park, Liuxian 1st Road, District 67, Bao'an, Shenzhen, China
<b>Manufacturer:</b>	Shenzhen Jimi IOT Co.,Ltd
<b>ManufacturerAddress:</b>	Floor 4th, Building C, Gaoxingqi Industrial Park, Liuxian 1st Road, District 67, Bao'an, Shenzhen, China

## 1.2. Equipment Under Test (EUT) Description

<b>Product Name:</b>	Asset GPS Tracker	
<b>Hardware Version:</b>	KNT42-MAIN V2.1	
<b>Software Version:</b>	GT420D_51_61DM4_D23_R0_V02_CE_20191205_1018	
<b>Modulation Type:</b>	GSM Mode with GMSK Modulation	
<b>Operating Frequency Range:</b>	<b>GSM/GPRS 850MHz:</b> Tx: 824MHz - 849MHz Rx: 869MHz - 894MHz <b>GSM/GPRS 1900MHz:</b> Tx: 1850MHz - 1910MHz Rx: 1930MHz – 1990MHz	
<b>Antenna Type:</b>	Stents Antenna	
<b>Antenna Gain:</b>	GSM/GPRS 850:	2.00 dBi
	GSM/GPRS1900:	2.00 dBi
<b>Accessory Information:</b>	Battery	
	Brand Name:	MIYEAR
	Model No.:	M505573PL
	Capacity:	2500mAh
	Rated Voltage:	3.70V
	Charge Limit:	4.20V

- Note 1:** The transmitter (Tx) frequency arrangement of the Cellular 850MHz band used by the EUT can be represented with the formula  $F(n)=824.2+0.2*(n-128)$ ,  $128 \leq n \leq 251$ ; the lowest, middle, highest channel numbers (ARFCHs) used and tested in this report are separately 128 (824.2MHz), 190(836.6MHz) and 251 (848.8MHz).
- Note 2:** The transmitter (Tx) frequency arrangement of the PCS 1900MHz band used by the EUT can be represented with the formula  $F(n)=1850.2+0.2*(n-512)$ ,  $512 \leq n \leq 810$ ; the lowest, middle and highest channel numbers (ARFCHs) used and tested in this report are separately 512 (1850.2MHz), 661 (1880.0MHz) and 810 (1909.8MHz).
- Note 3:** For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.
- Note 4:** In the opinion of the designer, we hereby declare that the models JM-LG05, GT420D and LG05 are the same in hardware and software. The three models are just named differently. Apart from the above, the application information for JM-LG05, GT420D and LG05 are the same.

### 1.3. Maximum ERP/EIRP and Emission Designator

System	Maximum ERP/EIRP (W)	Emission Designator
GSM850	0.826	248KGXW
GSM1900	1.352	246KGXW
GPRS850	1.033	257KGXW
GPRS1900	1.321	249KGXW

## 1.4. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 2, Part 22, Part 24 for the EUT FCC ID Certification:

No	Identity	Document Title
1	47 CFR Part 2(10-1-12 Edition)	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 22(10-1-12 Edition)	Public Mobile Services
3	47 CFR Part 24(10-1-12 Edition)	Personal Communications Services

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result	Method determination/ Remark
1	2.1046	Conducted RF Output Power	Dec 31, 2019 and Apr 24, 2020	Chen Hao	PASS	No deviation
2	24.232(d)	Peak -Average Ratio	Dec 31, 2019 and Apr 24, 2020	He Dekuan	PASS	No deviation
3	2.1049	99% Occupied Bandwidth	Dec 31, 2019 and Apr 24, 2020	He Dekuan	PASS	No deviation
4	2.1055,22.355, 24.235,	Frequency Stability	Jan 6, 2020	He Dekuan	PASS	No deviation
5	2.1051,22.917(a),24.238(a),	Conducted Out of Band Emissions	Dec 31, 2019 and Apr 24, 2020	He Dekuan	PASS	No deviation
6	2.1051,22.917(a),24.238(a),	Band Edge	Dec 31, 2019 and Apr 24, 2020	He Dekuan	PASS	No deviation
7	22.913(a), 24.232(a)	Transmitter Radiated Power (EIPR/ERP)	Jan 11, and Apr 26,2020	Li Zihao	PASS	No deviation



8	2.1051,22. 917(a),24. 238(a)	Radiated Out of Band Emissions	Jan 10,and Apr 26. 2020	Gao Jian	PASS	No deviation
<p><b>Note 1:</b> The tests were performed according to the method of measurements prescribed in KDB971168 D01 v03 and ANSI/TIA-603-E-2016.</p> <p><b>Note 2:</b> The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 26.5dB contains two parts that cable loss 16.5dB and Attenuator 10dB.</p>						

## 1.5. Environmental Conditions

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

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106

## 2.47 CFR Part 2, Part 22H , 24E&27L Requirements

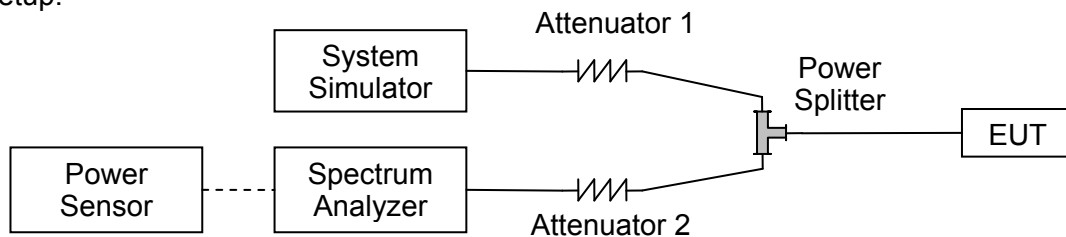
### 2.1. Conducted RF Output Power

#### 2.1.1. Requirement

According to FCC section 2.1046(a), 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).

#### 2.1.2. Test Description

Test Setup:



The EUT 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 50 Ohm; 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 i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.

**2.1.3. Test Results**

<b>GSM850</b>	<b>Average Power (dBm)</b>		
<b>TX Channel</b>	<b>128</b>	<b>190</b>	<b>251</b>
<b>Frequency (MHz)</b>	<b>824.2</b>	<b>836.6</b>	<b>848.8</b>
GSM 1 Tx slot	31.99	32.08	32.18
GPRS 1 Tx slot	32.02	32.21	32.29
GPRS 2 Tx slots	31.20	31.35	31.50
GPRS 3 Tx slots	29.27	29.30	29.26
GPRS 4 Tx slots	27.72	27.94	28.10

<b>GSM1900</b>	<b>Average Power (dBm)</b>		
<b>TX Channel</b>	<b>512</b>	<b>661</b>	<b>810</b>
<b>Frequency (MHz)</b>	<b>1850.2</b>	<b>1880</b>	<b>1909.8</b>
GSM 1 Tx slot	31.95	31.96	32.10
GPRS 1 Tx slot	29.03	29.21	28.94
GPRS 2 Tx slots	27.16	26.97	26.99
GPRS 3 Tx slots	26.37	26.24	26.27
GPRS 4 Tx slots	25.16	25.20	25.24

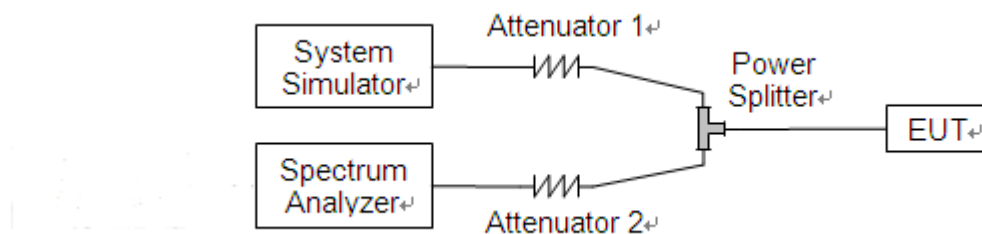
## 2.2. Peak to Average Ratio

### 2.2.1. Requirement

According to FCC 24.232(d) the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

### 2.2.2. Test Description

Test Setup:



The EUT 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 50 Ohm; 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 i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.

### 2.2.3. Test procedure

1. For GSM/GPRS operating mode:

- a. Set RBW=1MHz, VBW=3MHz, peak detector in spectrum analyzer.
- b. Set EUT in maximum output power, and triggered the burst signal.
- c. Measured respectively the peak level and mean level, and the deviation was recorded as Peak to Average ratio.

2. For UMTS operating mode:

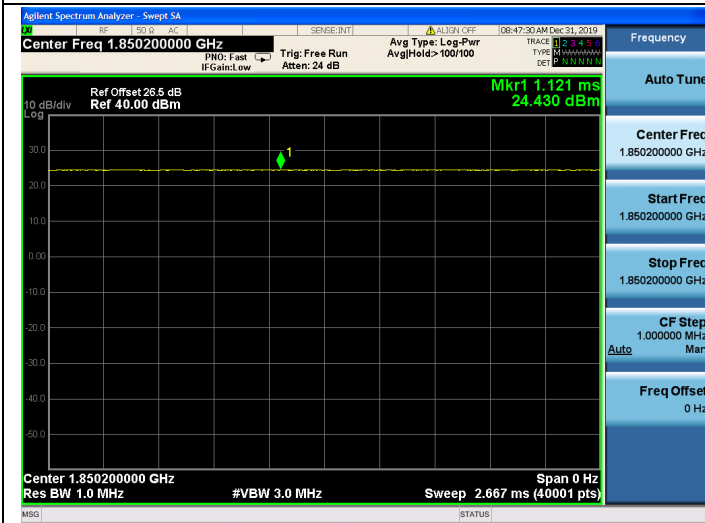
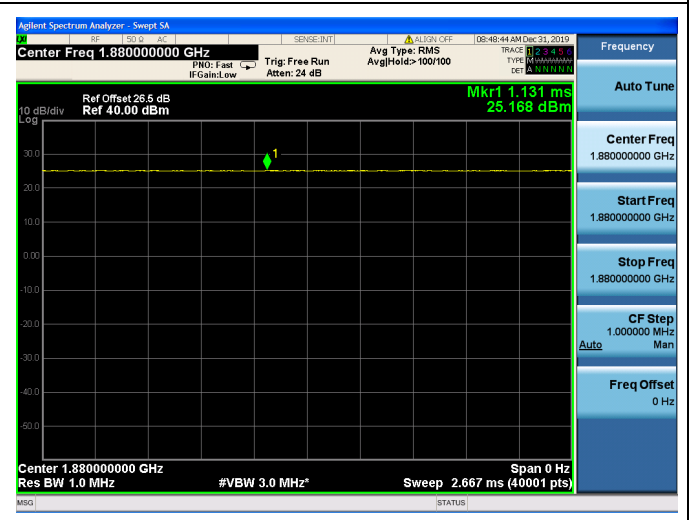
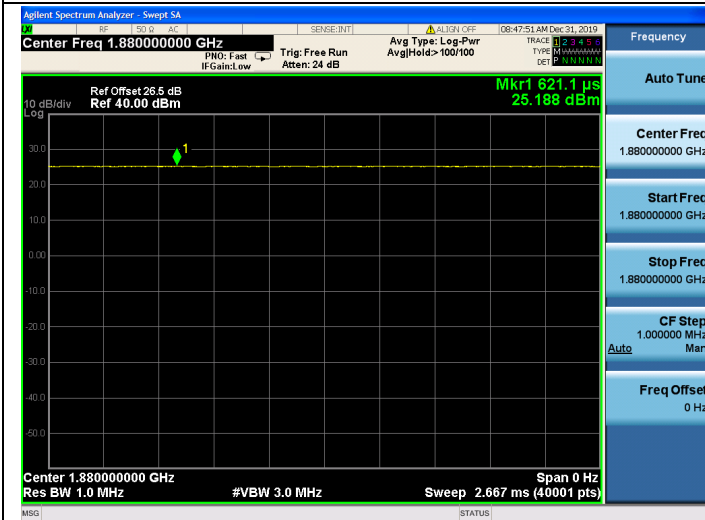
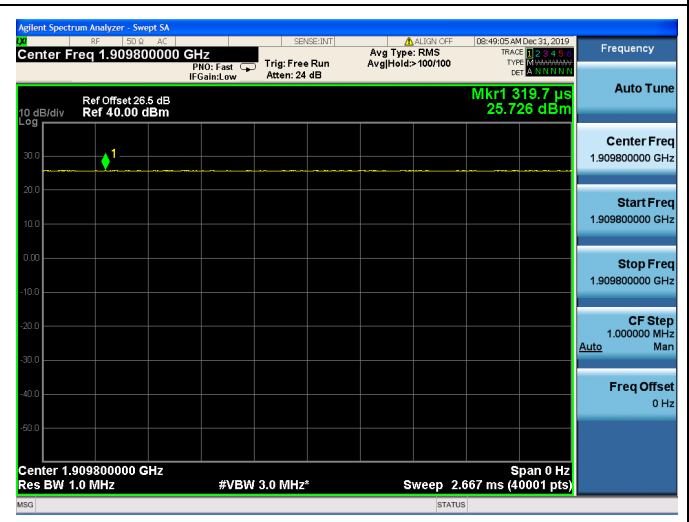
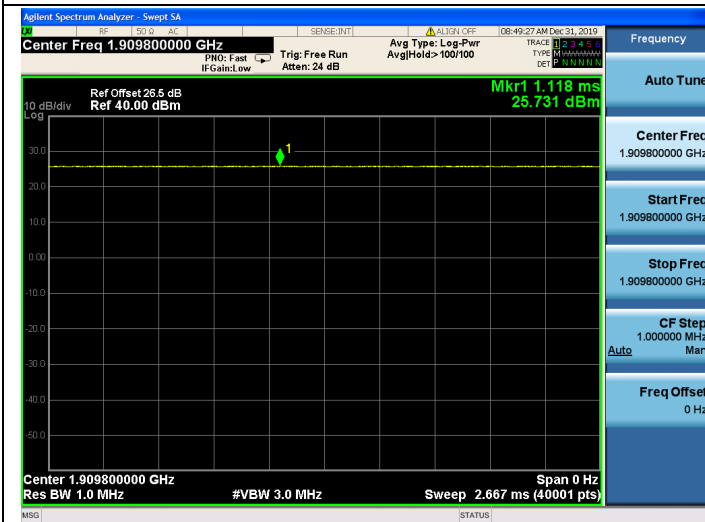
- a. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
- b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1%.

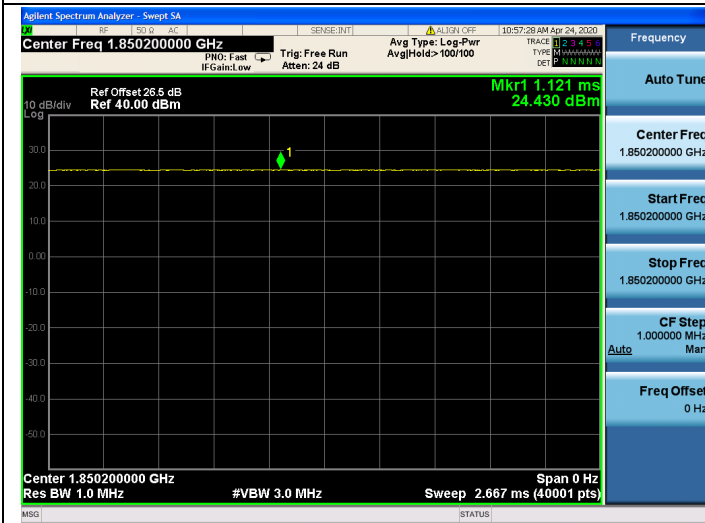
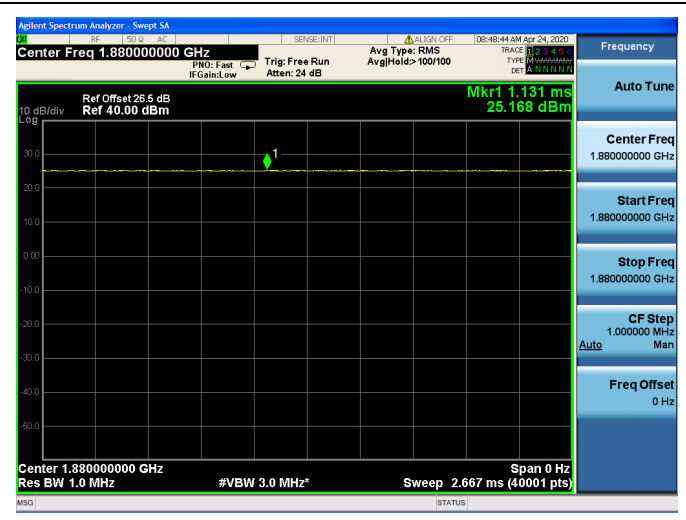
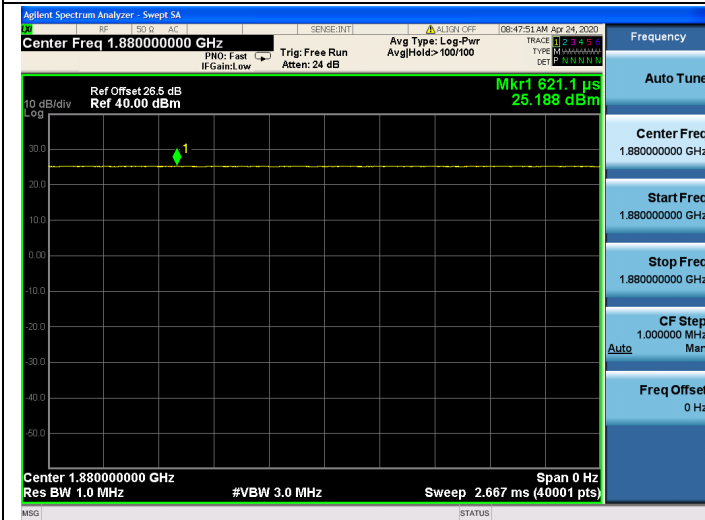
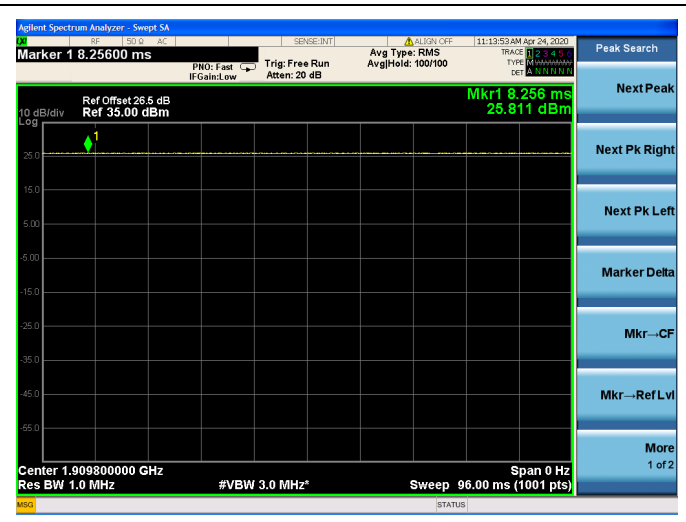
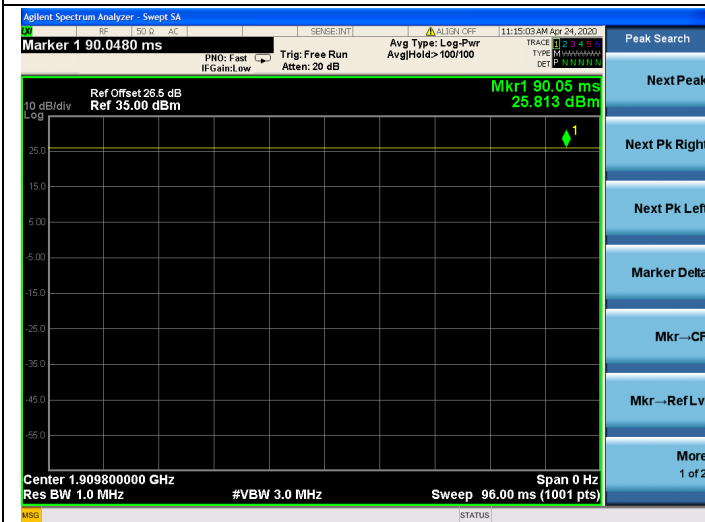
**2.2.4. Test Result**

The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

**A. Test Verdict:**

Band	Channel	Frequency (MHz)	Peak to Average ratio	Limit	Verdict
			dB	dB	
GSM 1900MHz	512	1850.2	0.004	13	PASS
	661	1880.0	0.020		PASS
	810	1909.8	0.005		PASS
GPRS 1900MHz	512	1850.2	0.003		PASS
	661	1880.0	0.020		PASS
	810	1909.8	0.002		PASS

**GSM 1900MHz CH512 1850.2MHz****GSM 1900MHz CH661 1880.0MHz****GSM 1900MHz CH810 1909.8MHz**

**GPRS 1900MHz CH512 1850.2MHz****GPRS 1900MHz CH661 1880.0MHz****GPRS 1900MHz CH810 1909.8MHz**



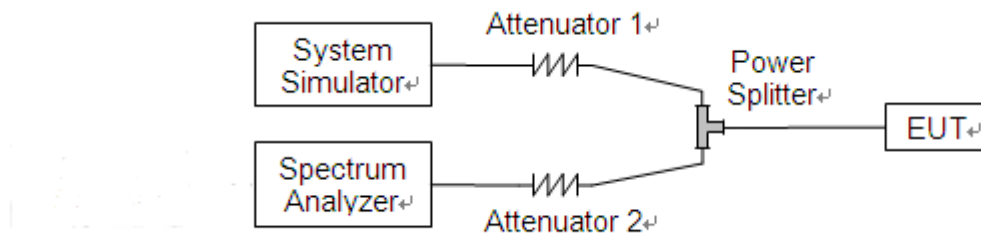
## 2.3.99% Occupied Bandwidth

### 2.3.1. Requirement

According to FCC section 2.1049, 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.

### 2.3.2. Test Description

Test Setup:



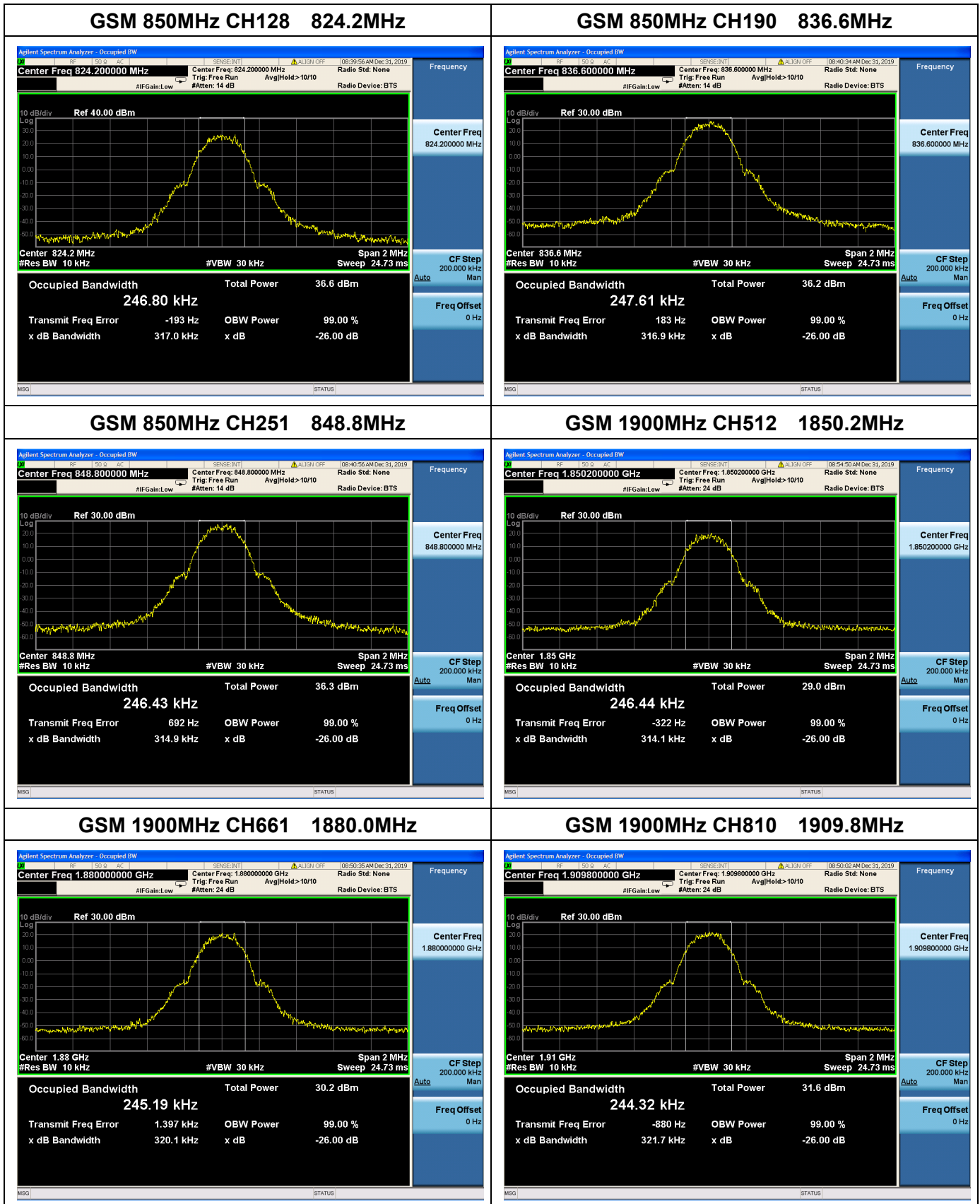
The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum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

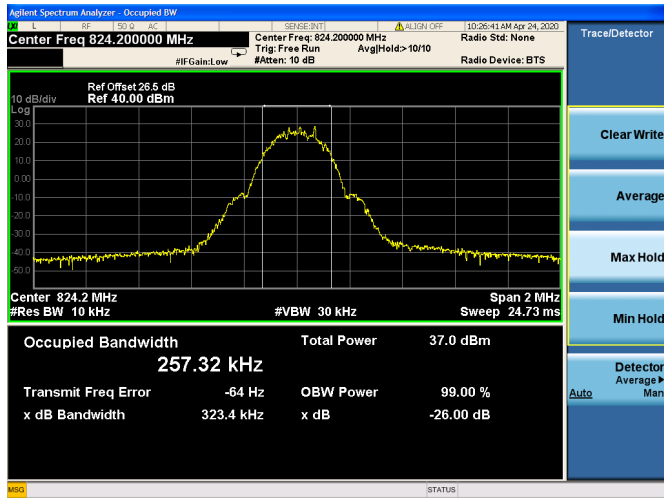
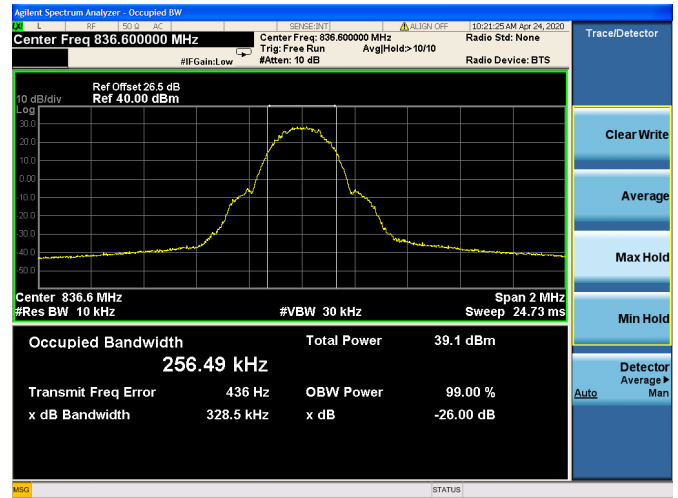
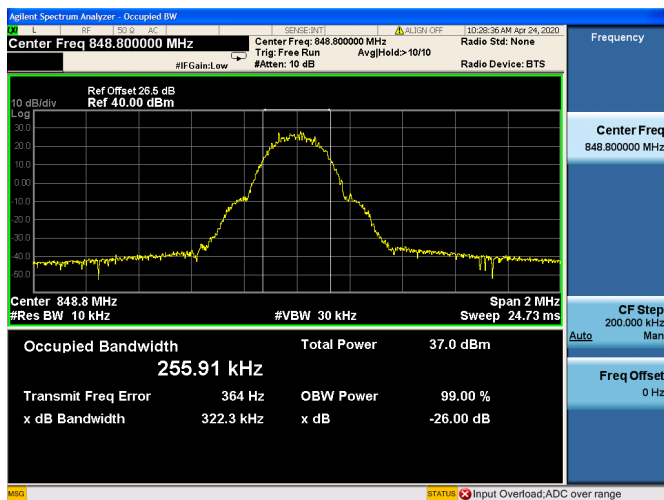
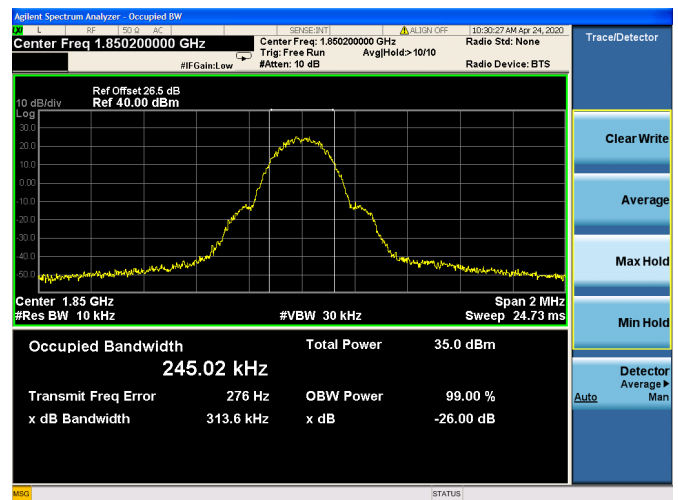
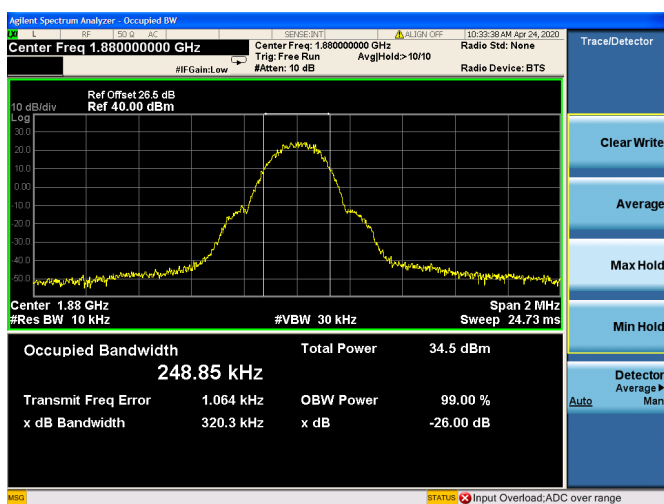
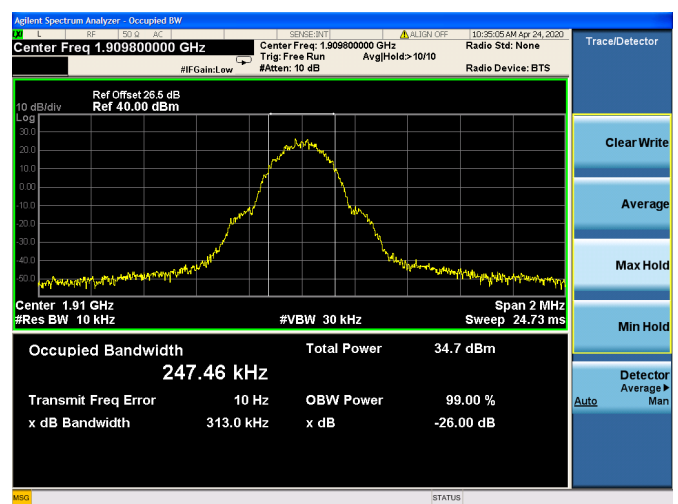
**2.3.3. Test Result**

The lowest, middle and highest channels are selected to perform testing to record the 99% occupied bandwidth.

**GSM Test Verdict:**

Band	Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26dB Bandwidth (kHz)
GSM 850MHz	128	824.2	246.80	317.0
	190	836.6	247.61	316.9
	251	848.8	246.43	314.9
GSM 1900MHz	512	1850.2	246.44	314.1
	661	1880.0	245.19	320.1
	810	1909.8	244.32	321.7
GPRS 850MHz	128	824.2	257.32	323.4
	190	836.6	256.49	328.5
	251	848.8	255.91	322.3
GPRS 1900MHz	128	824.2	245.02	313.6
	190	836.6	248.85	320.3
	251	848.8	247.46	313.0



**GPRS 850MHz CH128 824.2MHz****GPRS 850MHz CH190 836.6MHz****GPRS 850MHz CH251 848.8MHz****GPRS 1900MHz CH512 1850.2MHz****GPRS 1900MHz CH661 1880.0MHz****GPRS 1900MHz CH810 1909.8MHz**

## 2.4. Frequency Stability

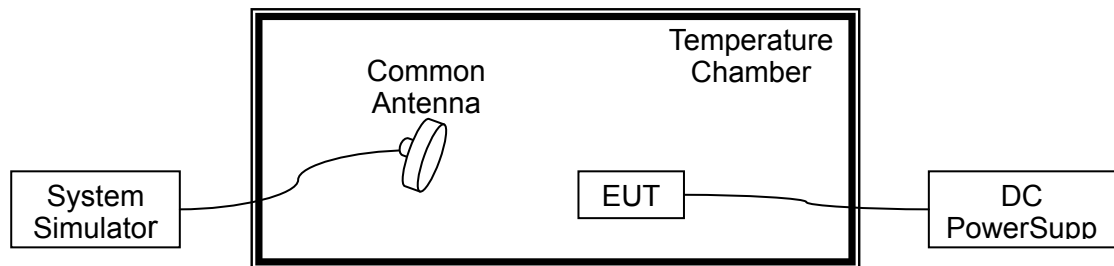
### 2.4.1. Requirement

According to FCC section 22.355, 24.235 and 27.54 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 0°C to +45°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 manufacture. 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.

### 2.4.2. Test Description

Test Setup:



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 i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS via a Common Antenna.

## 2.4.3. Test Result

## A. Test Verdict:

GSM 850MHz, Channel 190, Frequency 836.6MHz					
Limit = $\pm 2.5$ ppm					
Voltage(%)	Power(V DC)	Temp( $^{\circ}$ C)	Fre. Dev. (Hz)	Deviation (ppm)	Result
100	3.70	+20(Ref)	41	0.049	PASS
100		-20	35	0.042	
100		-10	53	0.028	
100		0	-35	-0.042	
100		+10	-58	-0.069	
100		+20	37	0.044	
100		+30	25	0.030	
100		+40	26	0.031	
100		+45	57	0.068	
115	4.26	+20	-48	-0.057	
85	3.15	+20	-16	-0.019	

GSM 1900MHz, Channel 661, Frequency 1880.0MHz					
Limit =Within Authorized Band					
Voltage(%)	Power(V DC)	Temp( $^{\circ}$ C)	Fre. Dev. (Hz)	Deviation (ppm)	Result
100	3.70	+20(Ref)	53	0.028	PASS
100		-20	48	0.026	
100		-10	-17	-0.009	
100		0	34	0.018	
100		+10	-48	-0.026	
100		+20	-73	-0.039	
100		+30	54	0.029	
100		+40	62	0.033	
100		+45	41	0.022	
115	4.20	+20	-17	-0.009	
85	3.15	+20	15	0.008	

GPRS 850MHz, Channel 190, Frequency 836.6MHz Limit =±2.5ppm					
Voltage(%)	Power(V DC)	Temp(°C)	Fre. Dev. (Hz)	Deviation (ppm)	Result
100	3.70	+20(Ref)	48	0.026	PASS
100		-20	34	0.018	
100		-10	26	0.031	
100		0	-48	-0.026	
100		+10	-73	-0.039	
100		+20	57	0.068	
100		+30	-48	-0.057	
100		+40	25	0.030	
100		+45	26	0.031	
115	4.26	+20	-17	-0.009	
85	3.15	+20	15	0.008	

GPRS 1900MHz, Channel 661, Frequency 1880.0MHz Limit =Within Authorized Band					
Voltage(%)	Power(V DC)	Temp(°C)	Fre. Dev. (Hz)	Deviation (ppm)	Result
100	3.70	+20(Ref)	53	0.028	PASS
100		-20	48	0.026	
100		-10	15	0.008	
100		0	34	0.018	
100		+10	-48	-0.026	
100		+20	53	0.028	
100		+30	54	0.029	
100		+40	62	0.033	
100		+45	25	0.030	
115	4.26	+20	26	0.031	
85	3.15	+20	-17	-0.009	

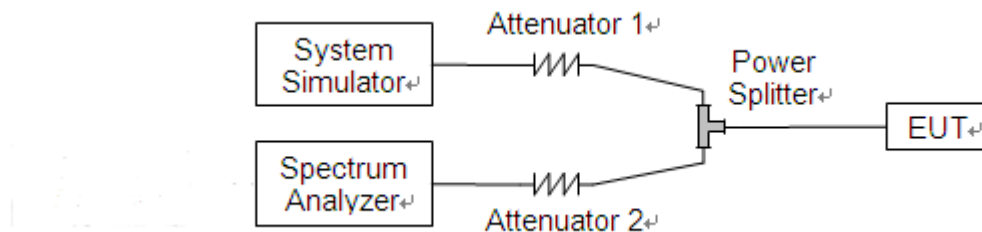
## 2.5. Conducted Out of Band Emissions

### 2.5.1. Requirement

According to FCC section 22.917(a), 24.238(a) and 27.53(h) 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.

### 2.5.2. Test Description

Test Setup:

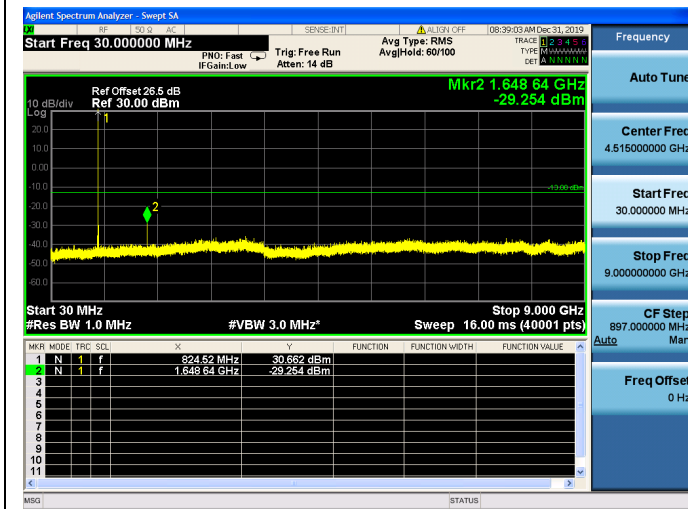
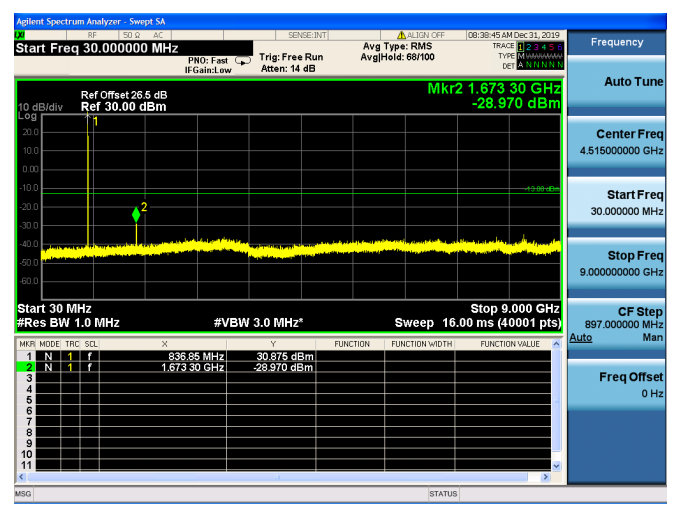
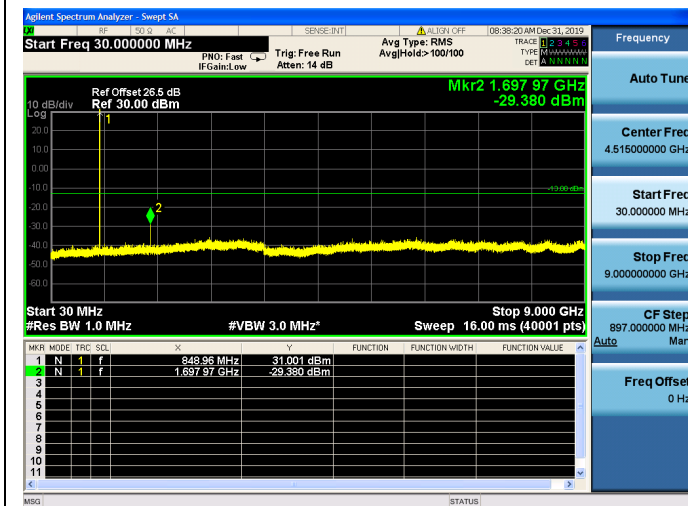
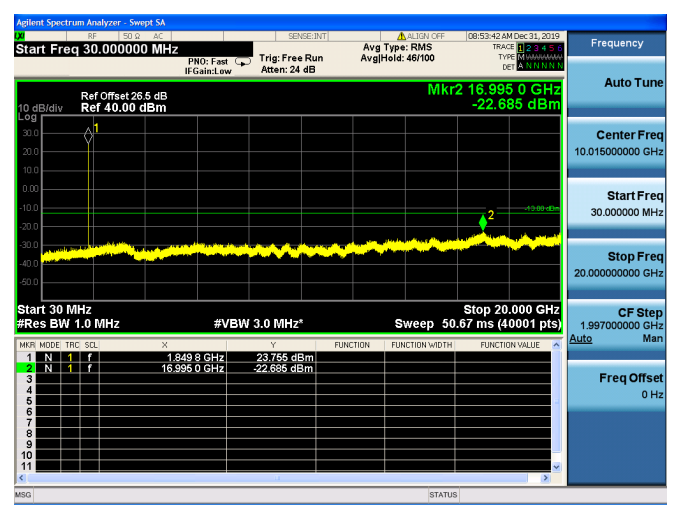
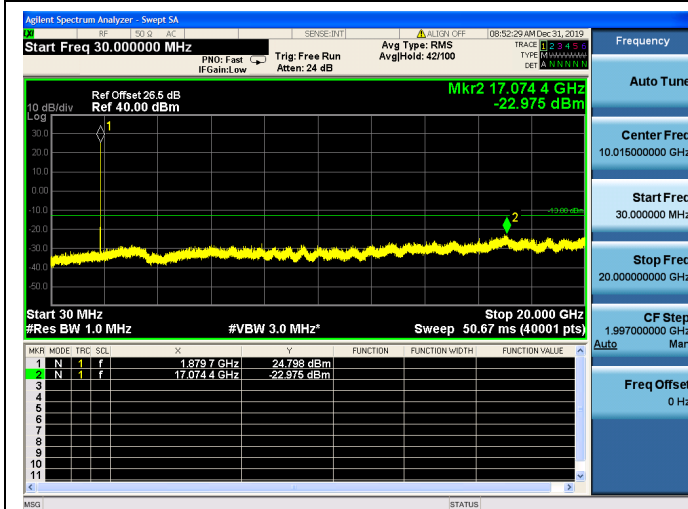
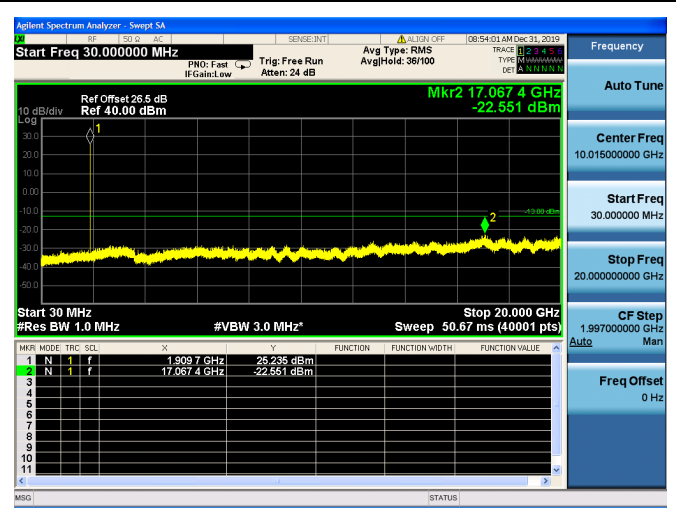


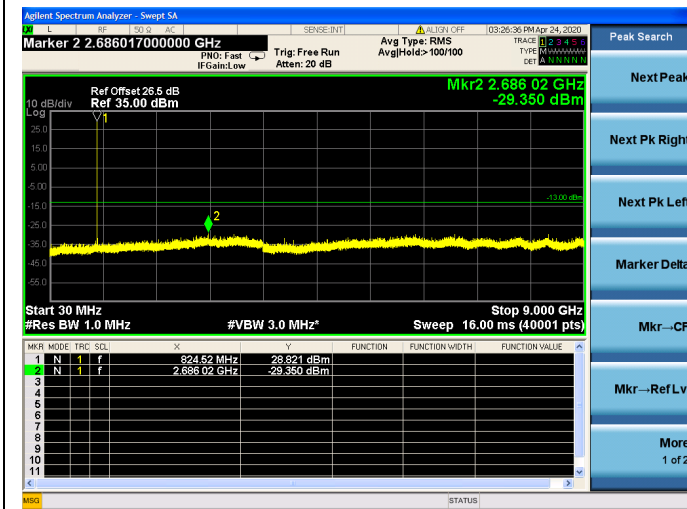
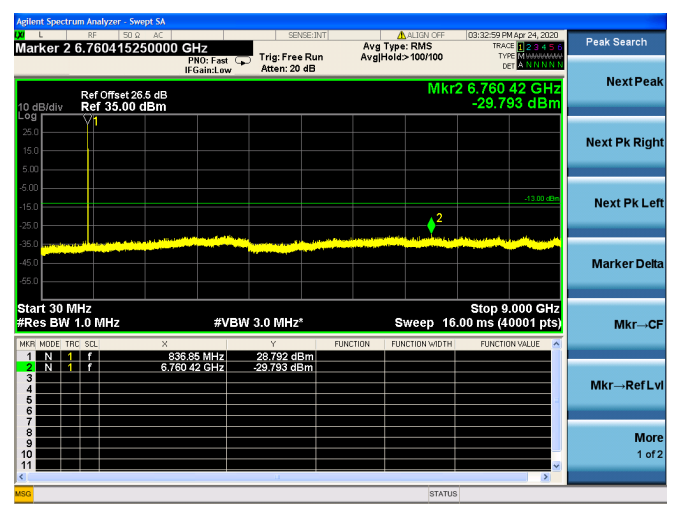
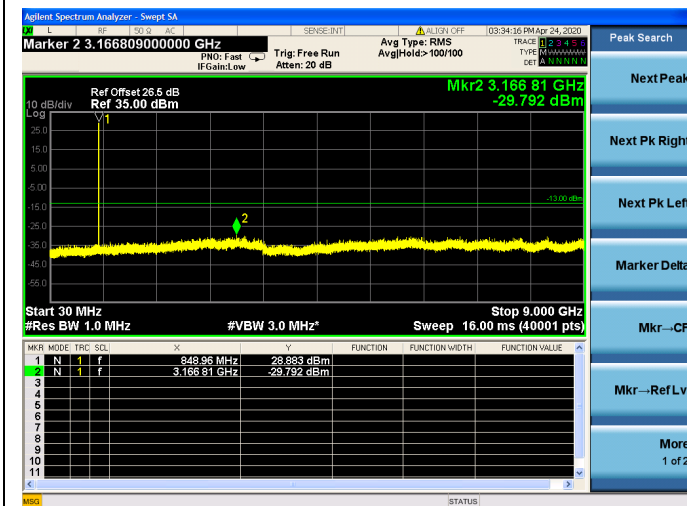
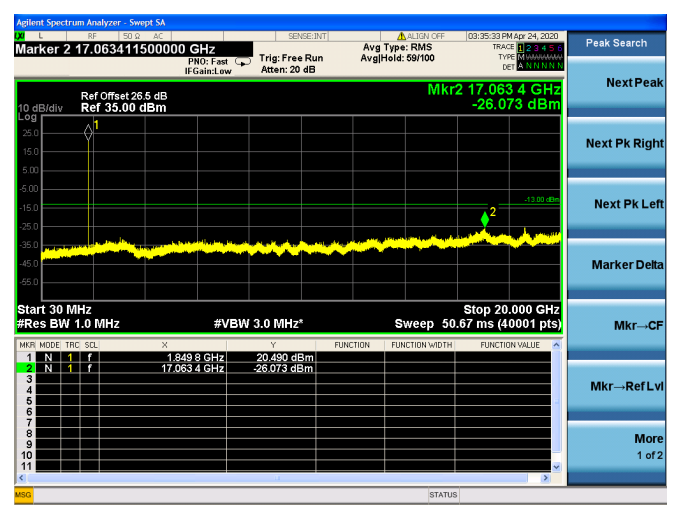
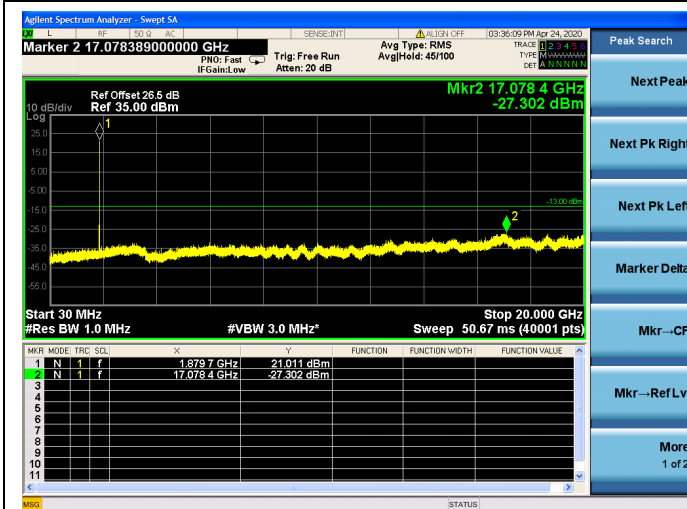
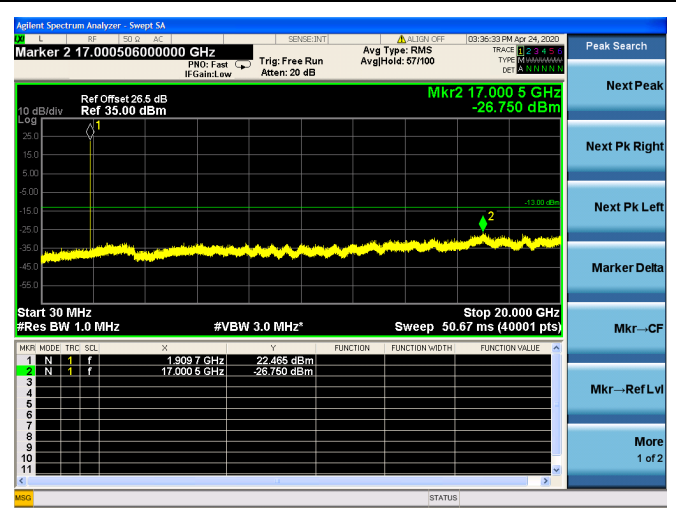
The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum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

### 2.5.3. Test Result

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



**GSM 850MHz CH128 824.2MHz****GSM 850MHz CH190 836.6MHz****GSM 850MHz CH251 848.8MHz****GSM 1900MHz CH521 1850.2MHz****GSM 1900MHz CH661 1880.0MHz****GSM 1900MHz CH810 1909.8MHz**

**GPRS 850MHz CH128 824.2MHz****GPRS 850MHz CH190 836.6MHz****GPRS 850MHz CH251 848.8MHz****GPRS 1900MHz CH512 1850.2MHz****GPRS 1900MHz CH661 1880.0MHz****GPRS 1900MHz CH810 1909.8MHz**

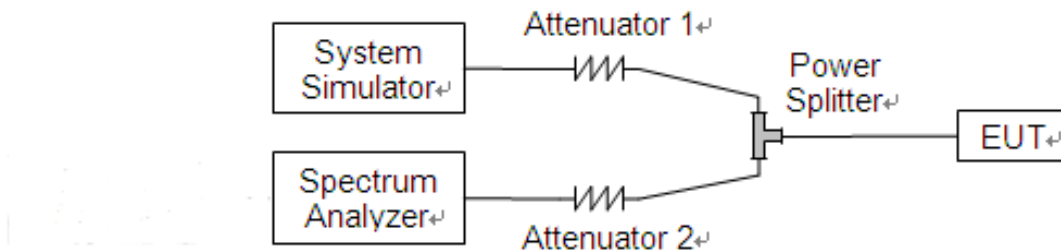
## 2.6. Band Edge

### 2.6.1. Requirement

According to FCC section 22.917(b), 24.238(b) and 27.53(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.

### 2.6.2. Test Description

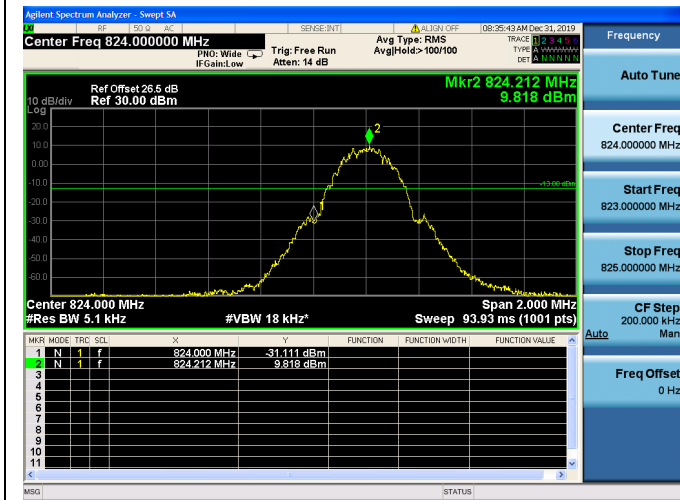
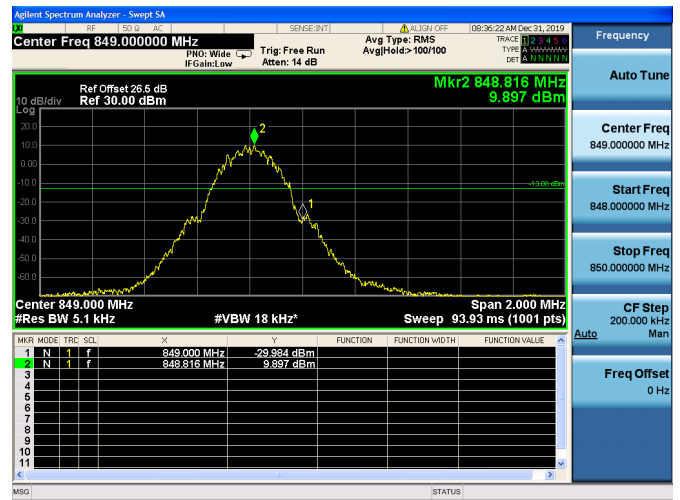
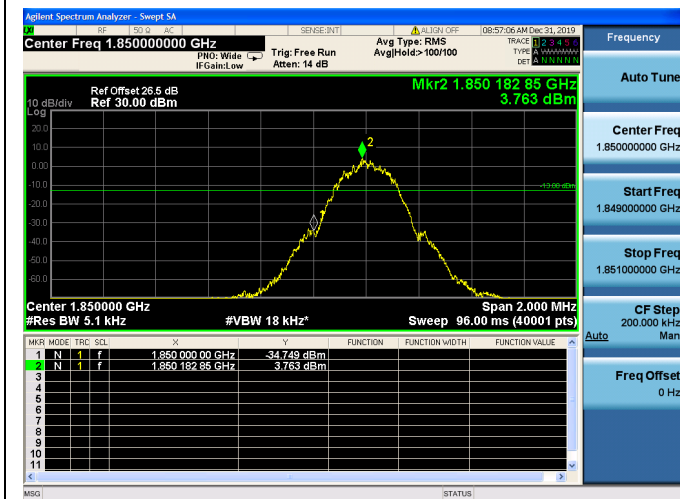
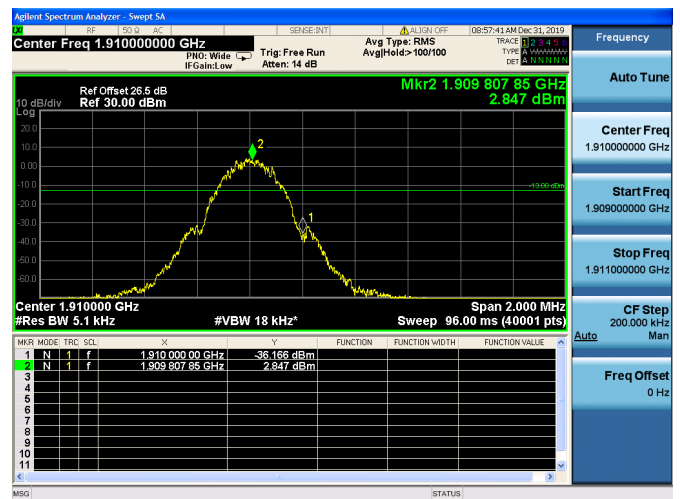
Test Setup:

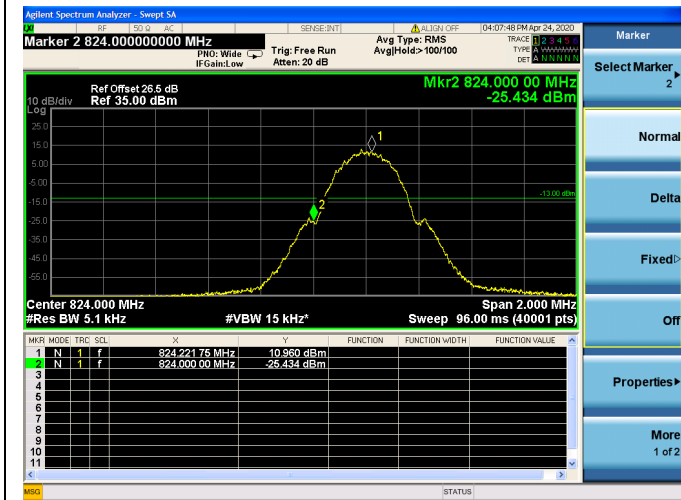
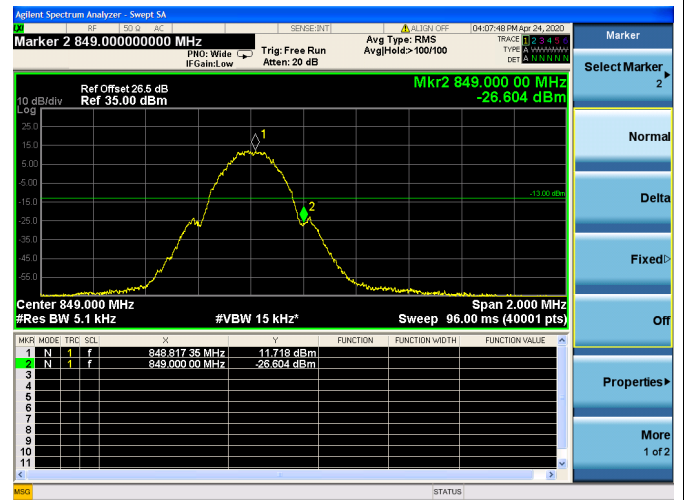
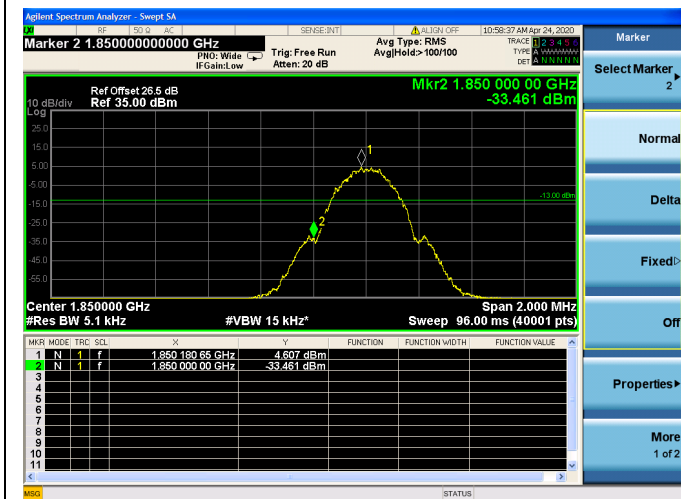
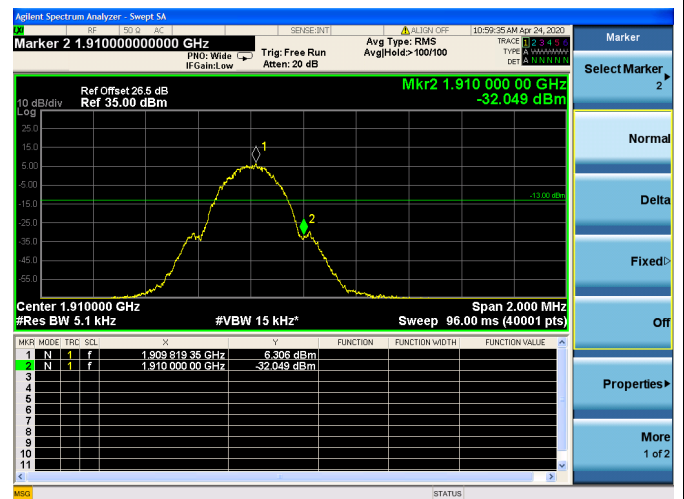


The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum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

### 2.6.3. Test Result

The lowest and highest channels are tested to verify the band edge emissions.

**GSM 850MHz CH128 824.2MHz****GSM 850MHz CH251 848.8MHz****GSM 1900MHz CH521 1850.2MHz****GSM 1900MHz CH810 1909.8MHz**

**GPRS 850MHz CH128 824.2MHz****GPRS 850MHz CH251 848.8MHz****GPRS 1900MHz CH512 1850.2MHz****GPRS 1900MHz CH810 1909.8MHz**

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

### 2.7.1. Requirement

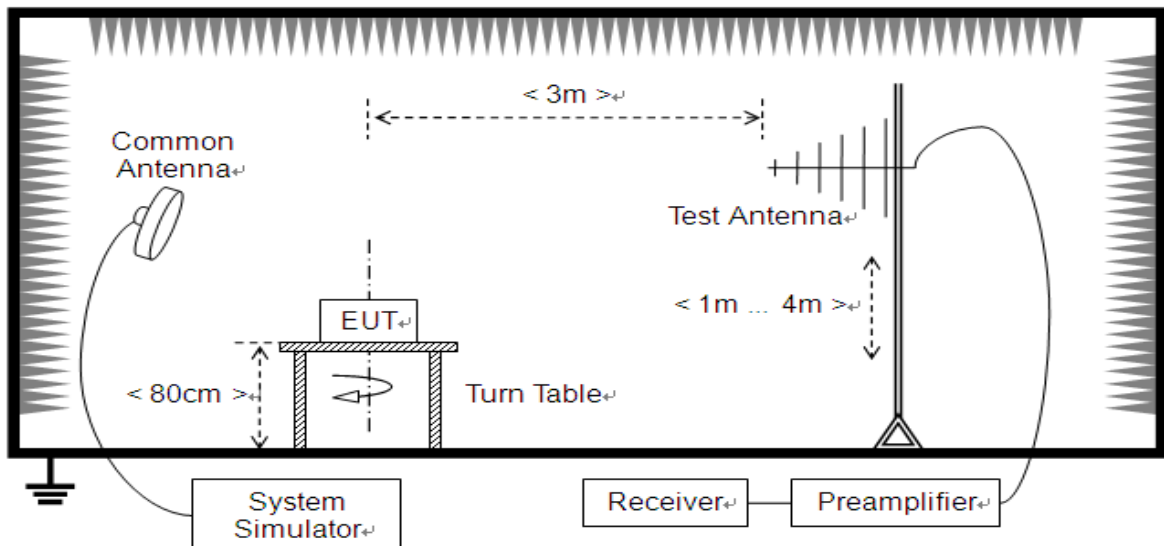
According to FCC section 22.913, the Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7Watts.

According to FCC section 24.232, the broadband PCS mobile station is limited to 2 Watts e.i.r.p. peak power.

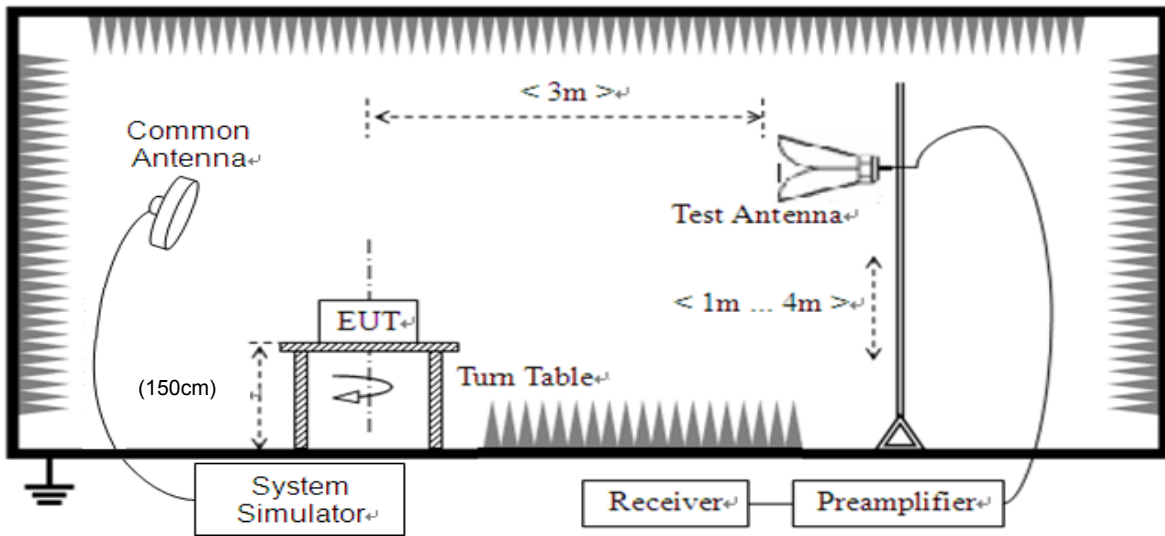
### 2.7.2. Test Description

Test Setup:

1) Below 1GHz



## 2) Above 1GHz



The EUT is located in a 3m Full-Anechoic Chamber; the cable loss, air loss and so on of the site as factors are pre-calibrated using the "Substitution" method, and calculated to correct the reading. A call is established between the EUT and the SS via a Common Antenna. The EUT is commanded by the SS to operate at the maximum and minimum output power (i.e. GSM850MHz band Power Control Level (PCL) = 5/19 and Power Class = 4, GSM1900MHz band Power Control Level (PCL) = 0/15 and Power Class = 1), and only the test result of the maximum output power was recorded. Please refer to section 2.1.3 of this report.

- Step size (dB): 3dB

The Test Antenna is a Bi-Log one (used for 30MHz to 1GHz) or a Horn one (used for above 3GHz), it's located at the same height as the EUT. The Filters consists of Notch Filters and High Pass Filter.

### 2.7.3. Test Result

The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. The lowest, middle and highest channels are tested.

The substitution corrections are obtained as described below:

$$A_{\text{SUBST}} = P_{\text{SUBST\_TX}} - P_{\text{SUBST\_RX}} - L_{\text{SUBST\_CABLES}} + G_{\text{SUBST\_TX\_ANT}}$$

$$A_{\text{TOT}} = L_{\text{CABLES}} + A_{\text{SUBST}}$$

Where  $A_{\text{SUBST}}$  is the final substitution correction including receive antenna gain.

$P_{\text{SUBST\_TX}}$  is signal generator level,

$P_{\text{SUBST\_RX}}$  is receiver level,

$L_{\text{SUBST\_CABLES}}$  is cable losses including TX cable,

$G_{\text{SUBST\_TX\_ANT}}$  is substitution antenna gain.

$A_{\text{TOT}}$  is total correction factor including cable loss and substitution correction

During the test, the data of  $A_{\text{TOT}}$  was added in the Test Spectrum Analyze, so Spectrum Analyze reading is the final values which contain the data of  $A_{\text{TOT}}$ .



**GSM Test verdict:**

Band	Channel	Frequency (MHz)	PCL	Measured ERP		Limit		Verdict
				dBm	W	dBm	W	
GSM 850MHz	128	824.20	5	29.13	0.818	38.5	7	PASS
	190	836.60	5	29.17	0.826			PASS
	251	848.80	5	28.95	0.785			PASS

**Note 1:** For the GPRS and GPRS model, all the slots were tested and just the worst data were recorded in this report.

**Note 2:** Both horizontal and vertical polarizations of the test antenna are evaluated respectively, only the worst data (horizontal) were recorded in this report.

Band	Channel	Frequency (MHz)	PCL	Measured EIRP		Limit		Verdict
				dBm	W	dBm	W	
GSM 1900MHz	512	1850.2	0	31.06	1.276	33	2	PASS
	661	1880.0	0	31.31	1.352			PASS
	810	1909.8	0	31.29	1.346			PASS

**Note 1:** For the GPRS and GPRS model, all the slots were tested and just the worst data were recorded in this report.

**Note 2:** Both horizontal and vertical polarizations of the test antenna are evaluated respectively, only the worst data (horizontal) were recorded in this report.

Band	Channel	Frequency (MHz)	PCL	Measured ERP		Limit		Verdict
				dBm	W	dBm	W	
GPRS 850MHz	128	824.20	5	29.87	0.971	38.5	7	PASS
	190	836.60	5	30.06	1.014			PASS
	251	848.80	5	30.14	1.033			PASS

**Note 1:** For the GPRS and GPRS model, all the slots were tested and just the worst data were recorded in this report.

**Note 2:** Both horizontal and vertical polarizations of the test antenna are evaluated respectively, only the worst data (horizontal) were recorded in this report.

Band	Channel	Frequency (MHz)	PCL	Measured EIRP		Limit		Verdict
				dBm	W	dBm	W	
GPRS 1900MHz	512	1850.2	0	31.03	1.268	33	2	PASS
	661	1880.0	0	31.21	1.321			PASS
	810	1909.8	0	30.94	1.242			PASS

**Note 1:** For the GPRS and GPRS model, all the slots were tested and just the worst data were recorded in this report.

**Note 2:** Both horizontal and vertical polarizations of the test antenna are evaluated respectively, only the worst data (horizontal) were recorded in this report.

## 2.8. Radiated Out of Band Emissions

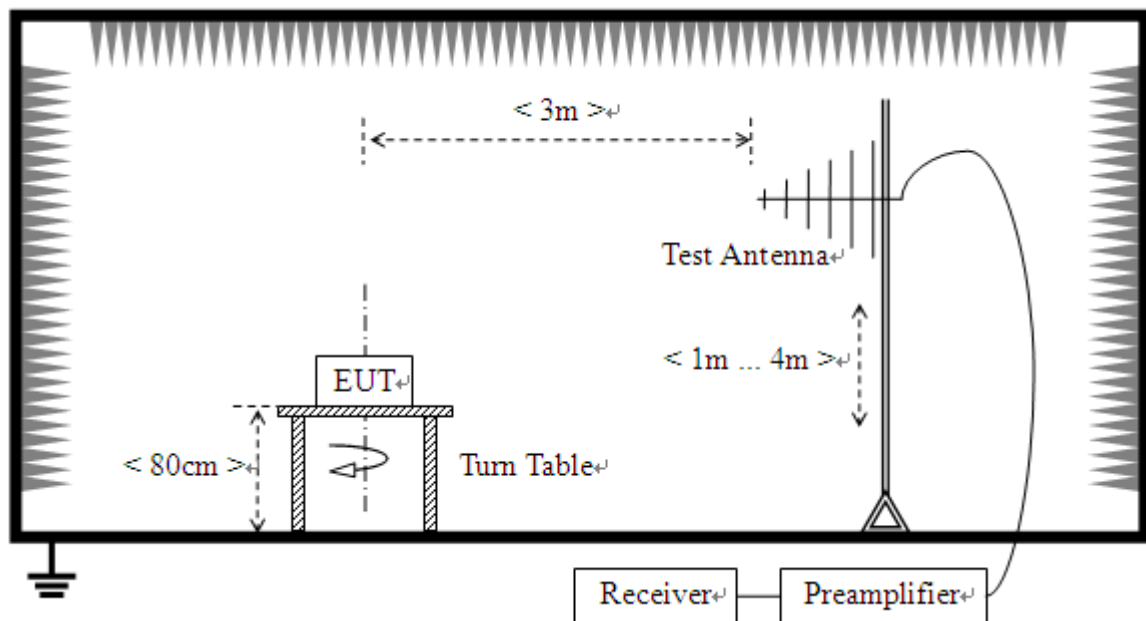
### 2.8.1. Requirement

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  $43 + 10 \cdot \log(P)$  dB. This calculated to be -13dBm.

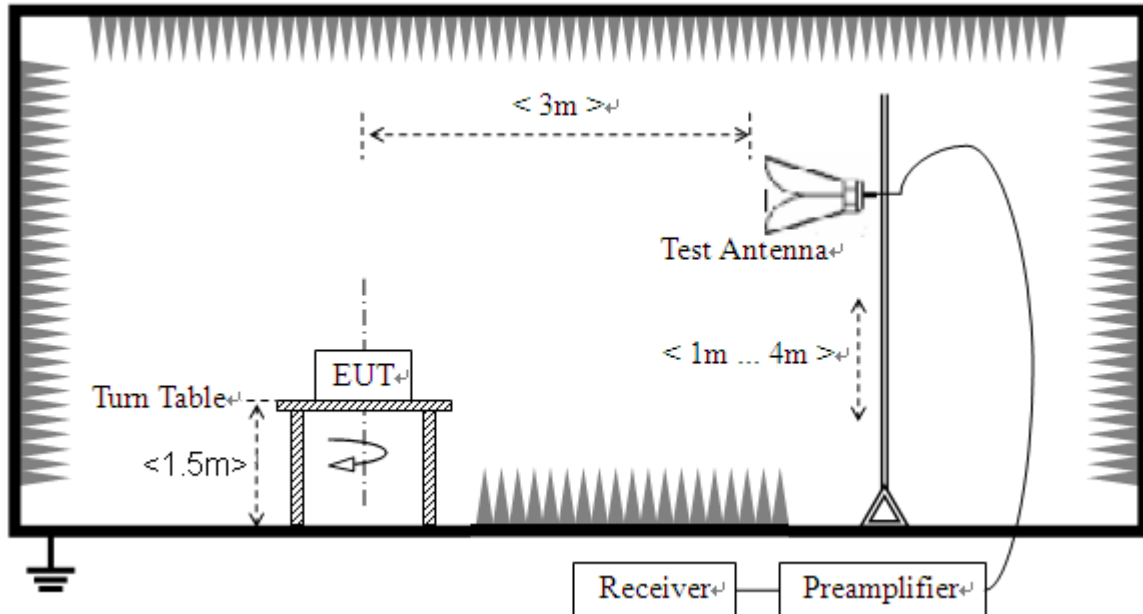
### 2.8.2. Test Description

Test Setup:

- 1) Below 1GHz



## 2) Above 1GHz



The EUT is located in a 3m Full-Anechoic Chamber, the cable loss, air loss and so on of the site as factors are pre-calibrated using the "Substitution" method, and calculated to correct the reading. A call is established between the EUT and the SS via a Common Antenna. The EUT is commanded by the SS to operate at the maximum and minimum output power (i.e. GSM850MHz band Power Control Level (PCL) = 5/19 and Power Class = 4, GSM1900MHz band Power Control Level (PCL) = 0/15 and Power Class = 1), and only the test result of the maximum output power was recorded. Please refer to section 2.1.3 of this report.

- Step size (dB): 3dB

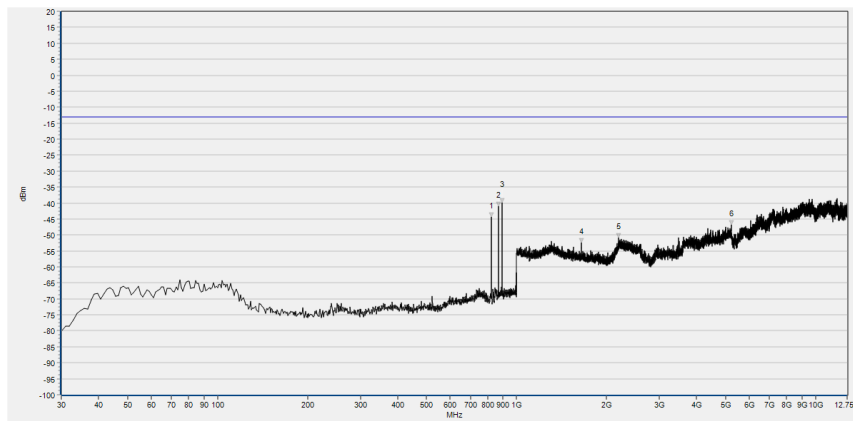
The Test Antenna is a Bi-Log one (used for 30MHz to 1GHz) and a Horn one (used for above 3GHz), it's located at the same height as the EUT. The Filters consists of Notch Filters and High Pass Filter.

Note: when doing measurements above 1GHz, the EUT has been within the 3dB cone width of the horn antenna during horizontal antenna.

### 2.8.3. Test Result

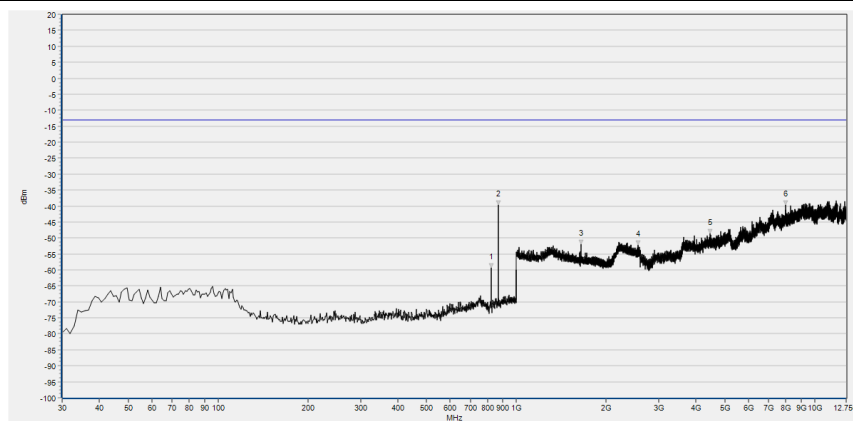
The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. The lowest, middle and highest channels are tested to verify the out of band emissions. The power of the EUT transmitting frequency should be ignored.

Band	Channel	Frequency (MHz)	Measured Max. Spurious Emission (dBm)		Limit (dBm)	Verdict
			Test Antenna Horizontal	Test Antenna Vertical		
GSM 850MHz	128	824.2	< -25	< -25	-13	PASS
	190	836.6	< -25	< -25		PASS
	251	848.8	< -25	< -25		PASS
GSM 1900MHz	512	1850.2	< -25	< -25	-13	PASS
	661	1880.0	< -25	< -25		PASS
	810	1909.8	< -25	< -25		PASS
GPRS 850MHz	128	824.2	< -25	< -25	-13	PASS
	190	836.6	< -25	< -25		PASS
	251	848.8	< -25	< -25		PASS
GPRS 1900MHz	512	1850.2	< -25	< -25	-13	PASS
	661	1880.0	< -25	< -25		PASS
	810	1909.8	< -25	< -25		PASS
<b>Note 1:</b> All test mode and condition mentioned were considered and evaluated respectively by performing full test, only the worst data were recorded and reported.						
<b>Note 2:</b> All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.						



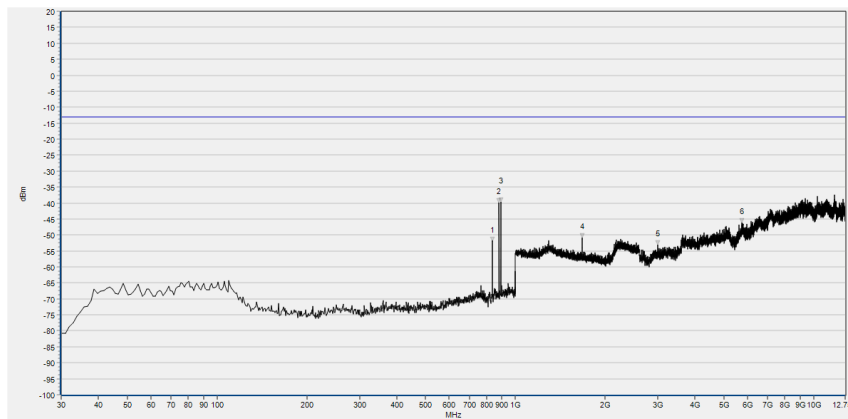
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	824.430	-44.25	-13.00	Horizontal	NA
2	869.050	-41.09	-13.00	Horizontal	NA
3	893.300	-39.91	-13.00	Horizontal	NA
4	1648.579	-52.47	-13.00	Horizontal	PASS
5	2195.358	-50.80	-13.00	Horizontal	PASS
6	5219.176	-46.77	-13.00	Horizontal	PASS

(GSM 850MHz, Channel = 128, Horizontal)



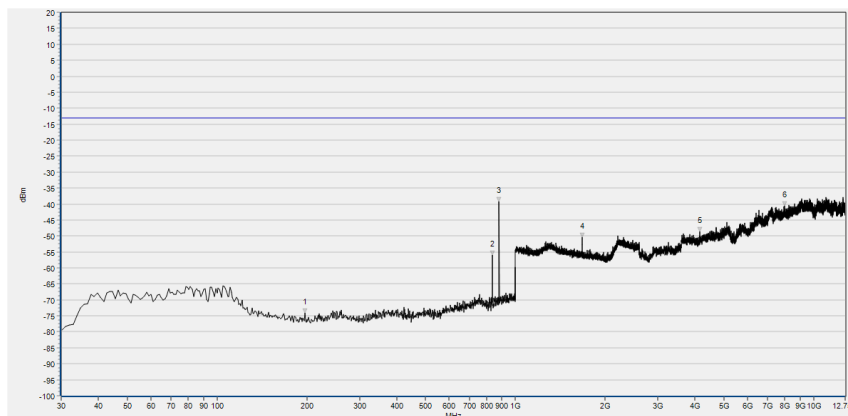
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	824.430	-59.33	-13.00	Vertical	NA
2	869.050	-39.71	-13.00	Vertical	NA
3	1647.939	-52.02	-13.00	Vertical	PASS
4	2550.700	-52.26	-13.00	Vertical	PASS
5	4451.328	-48.63	-13.00	Vertical	PASS
6	8002.628	-39.67	-13.00	Vertical	PASS

(GSM 850MHz, Channel = 128, Vertical)



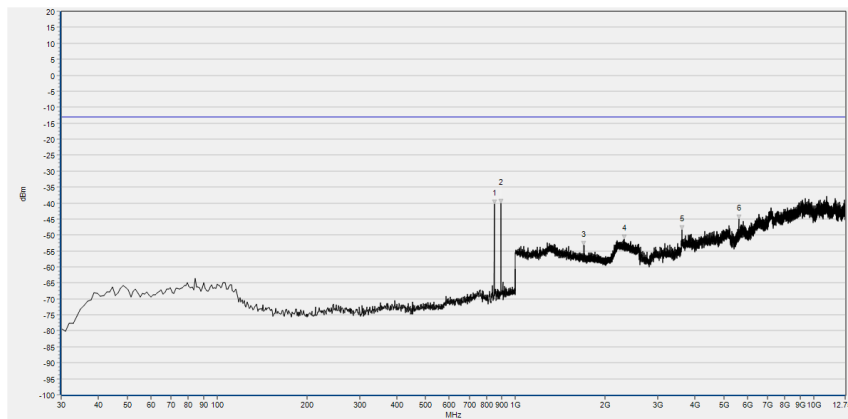
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	836.070	-51.98	-13.00	Horizontal	NA
2	881.660	-39.93	-13.00	Horizontal	NA
3	893.300	-39.65	-13.00	Horizontal	NA
4	1672.909	-50.80	-13.00	Horizontal	PASS
5	3002.382	-53.07	-13.00	Horizontal	PASS
6	5739.689	-46.06	-13.00	Horizontal	PASS

(GSM850MHz, Channel = 190, Horizontal)



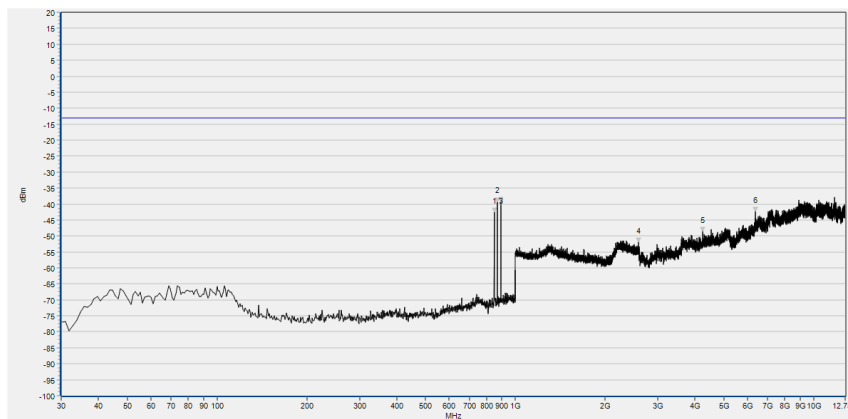
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	196.840	-74.15	-13.00	Vertical	PASS
2	836.070	-56.07	-13.00	Vertical	NA
3	881.660	-39.14	-13.00	Vertical	NA
4	1672.909	-50.35	-13.00	Vertical	PASS
5	4141.235	-48.52	-13.00	Vertical	PASS
6	7993.399	-40.49	-13.00	Vertical	PASS

(GSM 850MHz, Channel = 190, Vertical)



Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	848.680	-40.28	-13.00	Horizontal	NA
2	893.300	-40.14	-13.00	Horizontal	NA
3	1697.239	-53.21	-13.00	Horizontal	PASS
4	2311.244	-51.30	-13.00	Horizontal	PASS
5	3609.647	-48.49	-13.00	Horizontal	PASS
6	5603.101	-45.12	-13.00	Horizontal	PASS

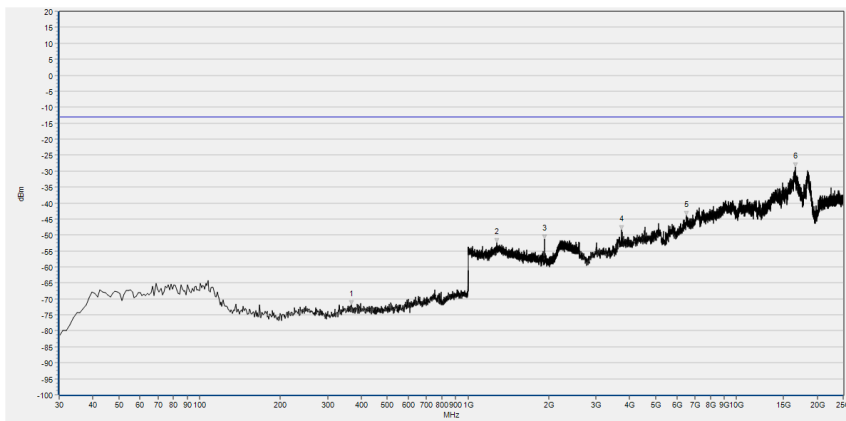
(GSM 850MHz, Channel = 251,Horizontal)



Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	848.680	-42.65	-13.00	Vertical	NA
2	869.050	-39.51	-13.00	Vertical	NA
3	894.270	-39.16	-13.00	Vertical	NA
4	2587.195	-52.03	-13.00	Vertical	PASS
5	4246.445	-48.55	-13.00	Vertical	PASS
6	6370.949	-42.37	-13.00	Vertical	PASS

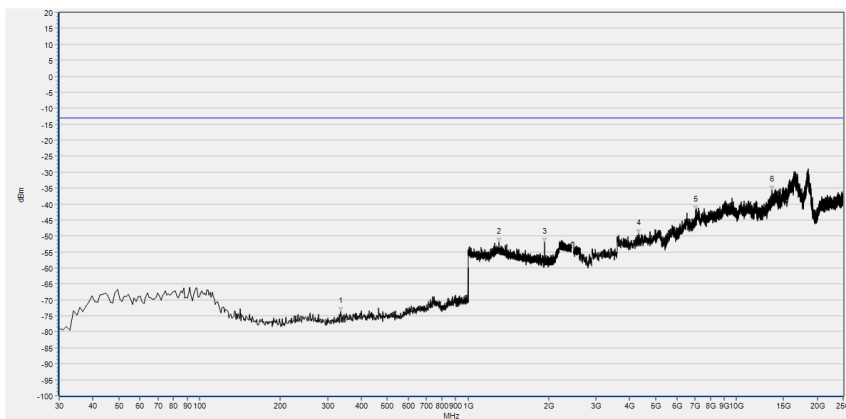
(GSM 850MHz, Channel = 251, Vertical)





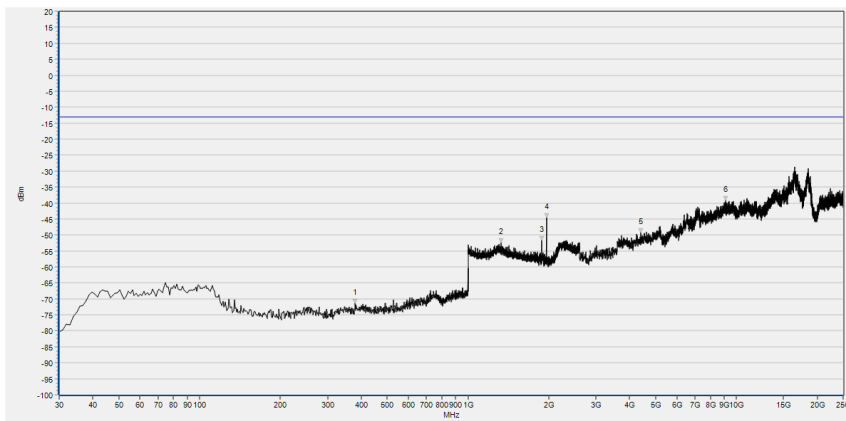
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	367.560	-71.82	-13.00	Horizontal	PASS
2	1277.871	-52.30	-13.00	Horizontal	PASS
3	1930.292	-51.28	-13.00	Horizontal	NA
4	3732.424	-48.39	-13.00	Horizontal	PASS
5	6530.897	-43.98	-13.00	Horizontal	PASS
6	16588.289	-28.62	-13.00	Horizontal	PASS

(GSM 1900MHz, Channel = 512, Horizontal)



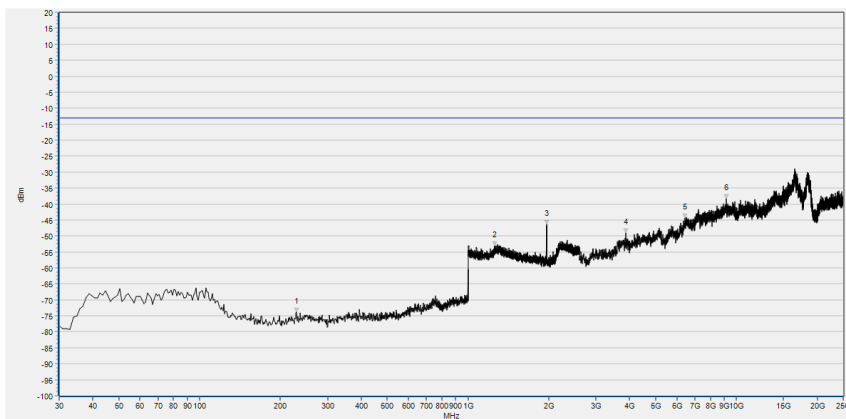
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	335.550	-73.55	-13.00	Vertical	PASS
2	1302.841	-52.04	-13.00	Vertical	PASS
3	1930.292	-51.95	-13.00	Vertical	NA
4	4319.003	-49.18	-13.00	Vertical	PASS
5	7048.227	-41.91	-13.00	Vertical	PASS
6	13582.069	-35.64	-13.00	Vertical	PASS

(GSM 1900MHz, Channel = 512, Vertical)



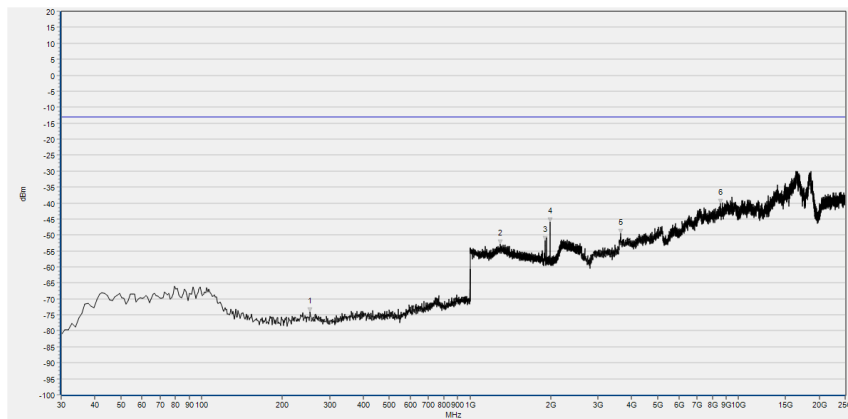
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	380.170	-71.45	-13.00	Horizontal	PASS
2	1328.451	-52.34	-13.00	Horizontal	PASS
3	1879.712	-51.81	-13.00	Horizontal	NA
4	1959.744	-44.59	-13.00	Horizontal	NA
5	4408.620	-49.27	-13.00	Horizontal	PASS
6	9093.108	-39.15	-13.00	Horizontal	PASS

(GSM 1900MHz, Channel = 661, Horizontal)



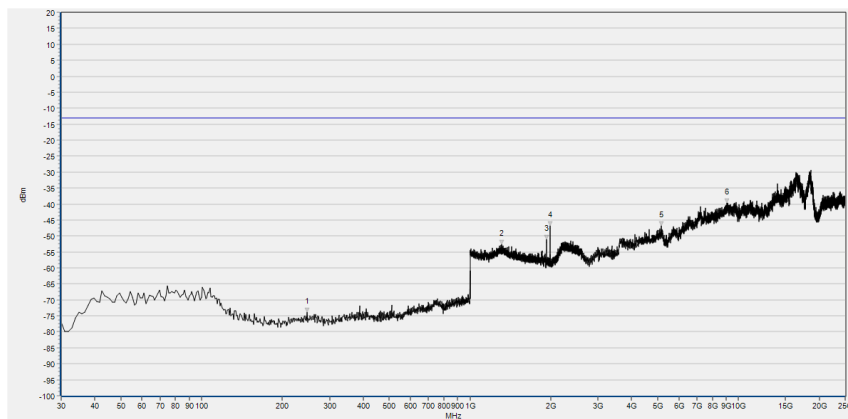
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	229.820	-73.75	-13.00	Vertical	PASS
2	1258.663	-53.05	-13.00	Vertical	PASS
3	1959.744	-46.27	-13.00	Vertical	NA
4	3870.922	-48.94	-13.00	Vertical	PASS
5	6420.913	-44.45	-13.00	Vertical	PASS
6	9162.357	-38.27	-13.00	Vertical	PASS

(GSM 1900MHz, Channel = 661, Vertical)



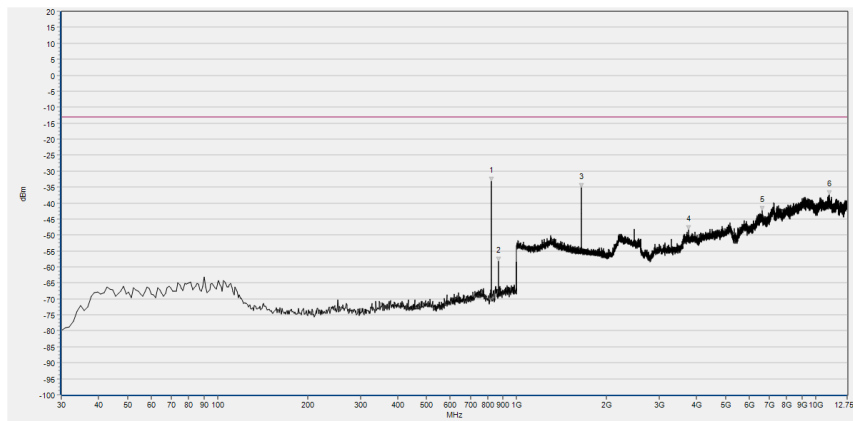
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	254.070	-74.12	-13.00	Horizontal	PASS
2	1298.359	-52.95	-13.00	Horizontal	PASS
3	1909.804	-51.74	-13.00	Horizontal	NA
4	1989.836	-45.99	-13.00	Horizontal	NA
5	3646.881	-49.53	-13.00	Horizontal	PASS
6	8575.777	-40.19	-13.00	Horizontal	PASS

(GSM 1900MHz, Channel = 810, Horizontal)



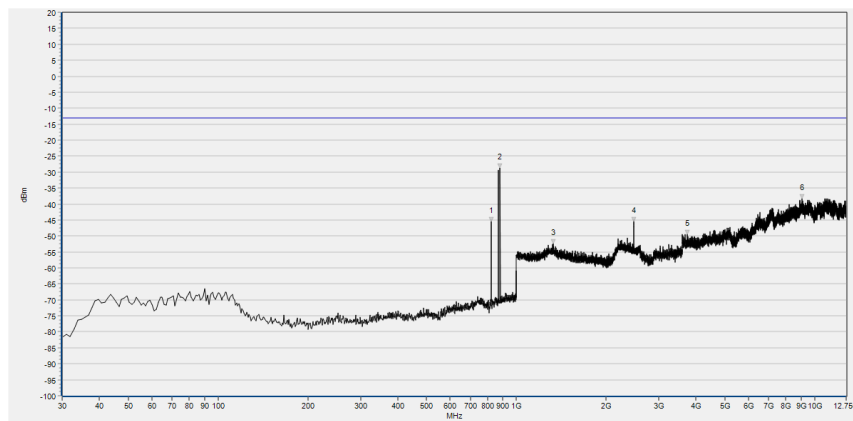
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	247.280	-73.92	-13.00	Vertical	PASS
2	1316.287	-52.66	-13.00	Vertical	PASS
3	1930.292	-51.12	-13.00	Vertical	NA
4	1989.836	-46.82	-13.00	Vertical	NA
5	5162.211	-46.83	-13.00	Vertical	PASS
6	9064.594	-39.76	-13.00	Vertical	PASS

(GSM 1900MHz, Channel = 810, Vertical)



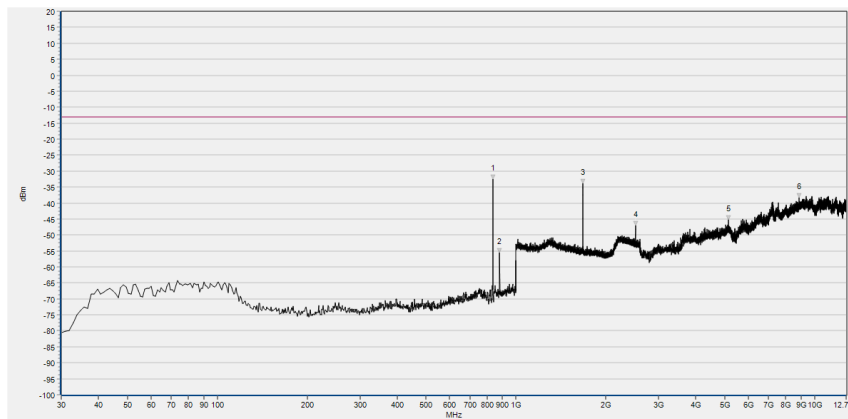
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	824.430	-33.18	-13.00	Horizontal	NA
2	869.050	-58.11	-13.00	Horizontal	NA
3	1648.579	-35.23	-13.00	Horizontal	PASS
4	3764.694	-48.35	-13.00	Horizontal	PASS
5	6642.280	-42.42	-13.00	Horizontal	PASS
6	11127.550	-37.45	-13.00	Horizontal	PASS

(GPRS 850MHz, Channel = 128, Horizontal)



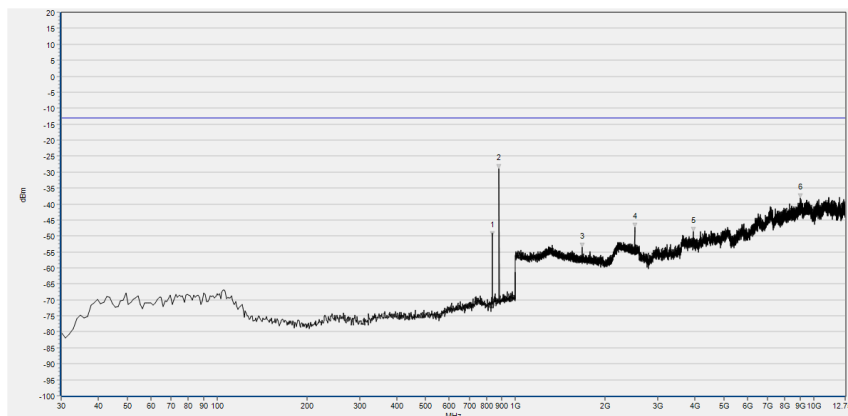
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	824.430	-45.39	-13.00	Vertical	NA
2	881.660	-28.69	-13.00	Vertical	NA
3	1327.171	-52.36	-13.00	Vertical	PASS
4	2472.589	-45.39	-13.00	Vertical	PASS
5	3746.236	-49.58	-13.00	Vertical	PASS
6	9060.266	-38.34	-13.00	Vertical	PASS

(GPRS 850MHz, Channel = 128, Vertical)



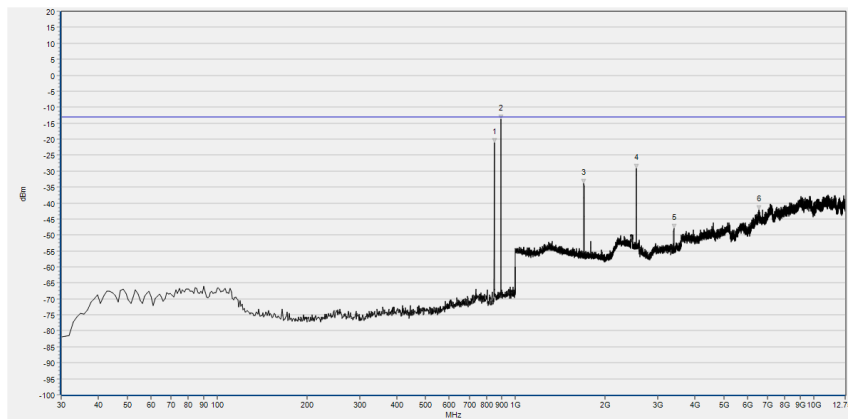
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	836.070	-32.52	-13.00	Horizontal	NA
2	881.660	-55.52	-13.00	Horizontal	NA
3	1672.909	-33.91	-13.00	Horizontal	PASS
4	2509.724	-47.14	-13.00	Horizontal	PASS
5	5145.345	-45.31	-13.00	Horizontal	PASS
6	8866.458	-38.34	-13.00	Horizontal	PASS

(GPRS850MHz, Channel = 190, Horizontal)



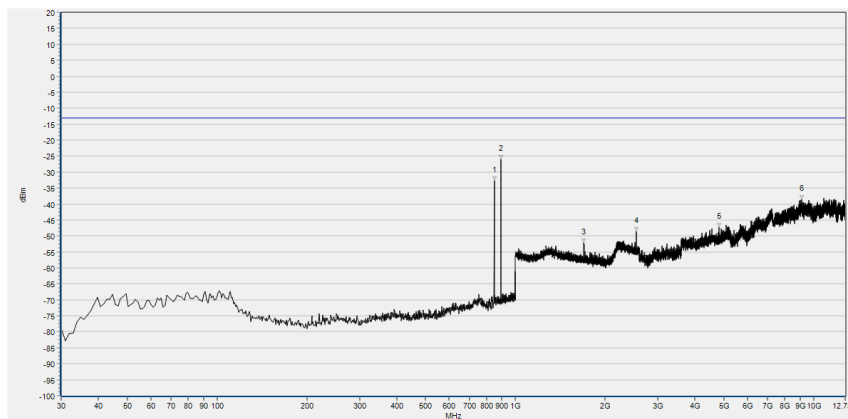
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	837.040	-49.90	-13.00	Vertical	NA
2	881.660	-29.03	-13.00	Vertical	NA
3	1672.909	-53.48	-13.00	Vertical	PASS
4	2509.724	-47.37	-13.00	Vertical	PASS
5	3940.044	-48.62	-13.00	Vertical	PASS
6	9025.195	-38.21	-13.00	Vertical	PASS

(GPRS 850MHz, Channel = 190, Vertical)



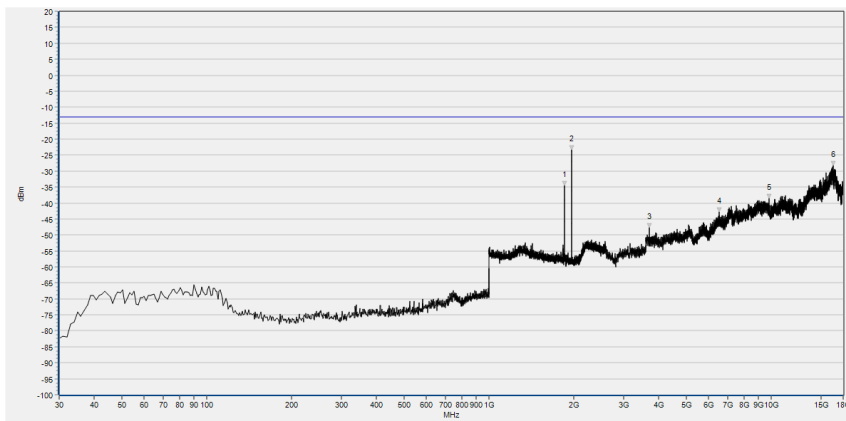
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	848.680	-21.07	-13.00	Horizontal	NA
2	893.300	-13.77	-13.00	Horizontal	NA
3	1697.239	-33.76	-13.00	Horizontal	PASS
4	2546.218	-29.22	-13.00	Horizontal	PASS
5	3395.536	-47.96	-13.00	Horizontal	PASS
6	6566.603	-42.02	-13.00	Horizontal	PASS

(GPRS 850MHz, Channel = 251,Horizontal)



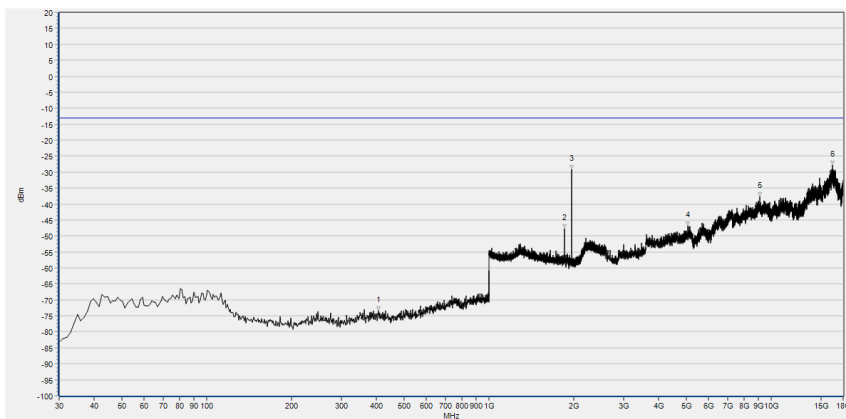
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	848.680	-32.69	-13.00	Vertical	NA
2	894.270	-26.09	-13.00	Vertical	NA
3	1697.239	-52.16	-13.00	Vertical	PASS
4	2546.218	-48.50	-13.00	Vertical	PASS
5	4822.331	-47.21	-13.00	Vertical	PASS
6	9104.564	-38.64	-13.00	Vertical	PASS

(GPRS 850MHz, Channel = 251, Vertical)



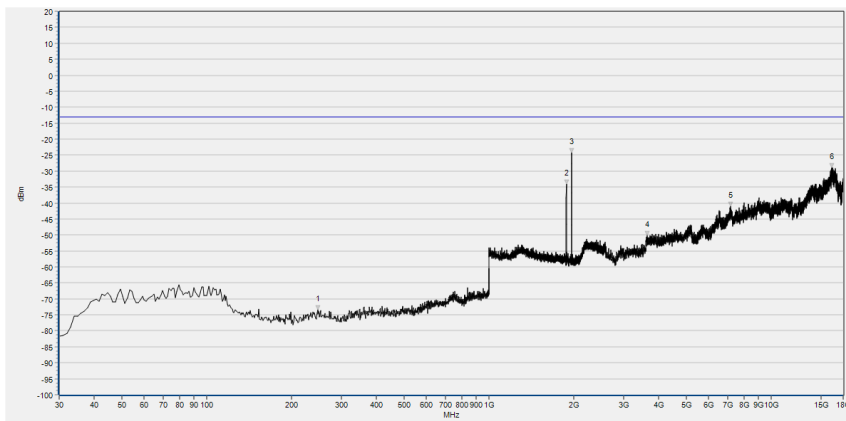
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	1850.260	-34.45	-13.00	Horizontal	NA
2	1959.744	-23.26	-13.00	Horizontal	NA
3	3700.600	-47.79	-13.00	Horizontal	PASS
4	6548.718	-42.82	-13.00	Horizontal	PASS
5	9844.917	-38.51	-13.00	Horizontal	PASS
6	16557.738	-28.36	-13.00	Horizontal	PASS

(GPRS 1900MHz, Channel = 512, Horizontal)



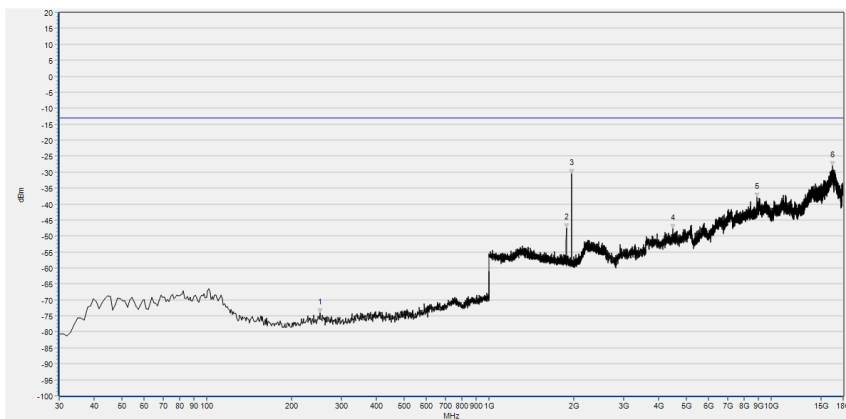
Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	406.360	-73.30	-13.00	Vertical	PASS
2	1850.260	-47.81	-13.00	Vertical	NA
3	1959.744	-29.13	-13.00	Vertical	NA
4	5067.249	-46.83	-13.00	Vertical	PASS
5	9097.181	-37.60	-13.00	Vertical	PASS
6	16535.334	-27.84	-13.00	Vertical	PASS

(GPRS 1900MHz, Channel = 512, Vertical)



Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	247.280	-73.48	-13.00	Horizontal	PASS
2	1879.712	-34.13	-13.00	Horizontal	NA
3	1959.744	-24.33	-13.00	Horizontal	NA
4	3630.587	-50.11	-13.00	Horizontal	PASS
5	7173.231	-40.90	-13.00	Horizontal	PASS
6	16392.508	-28.98	-13.00	Horizontal	PASS

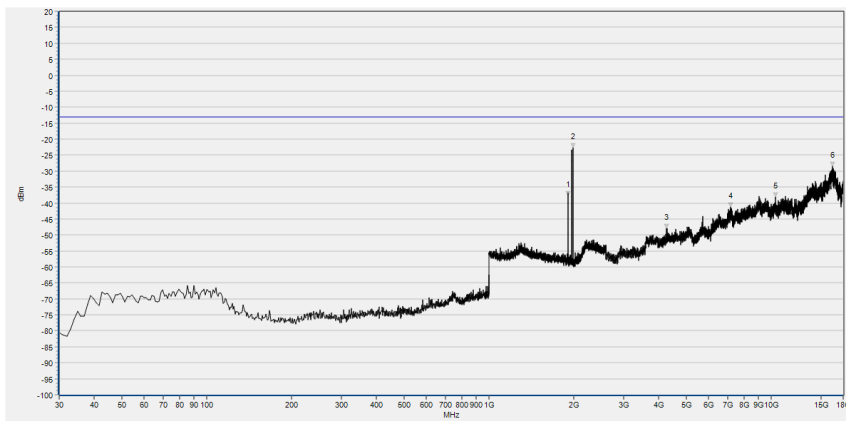
(GPRS 1900MHz, Channel = 661, Horizontal)



Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	252.130	-74.16	-13.00	Vertical	PASS
2	1879.712	-47.54	-13.00	Vertical	NA
3	1959.744	-30.61	-13.00	Vertical	NA
4	4473.541	-47.65	-13.00	Vertical	PASS
5	8917.949	-37.79	-13.00	Vertical	PASS
6	16456.919	-28.07	-13.00	Vertical	PASS

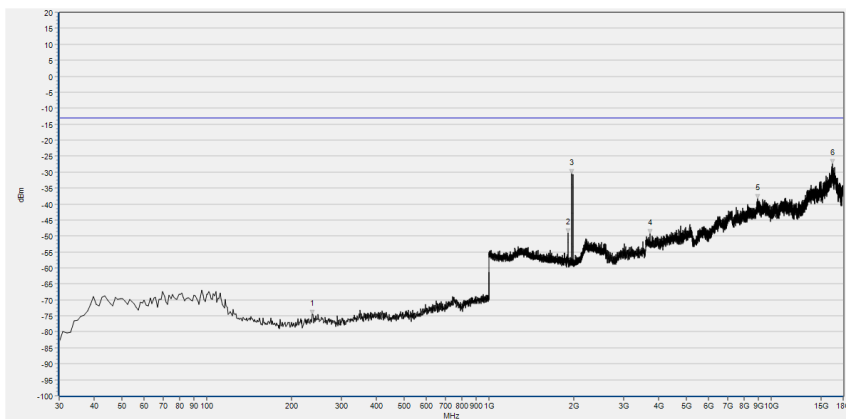
(GPRS 1900MHz, Channel = 661, Vertical)





Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	1909.164	-37.62	-13.00	Horizontal	NA
2	1989.836	-22.76	-13.00	Horizontal	NA
3	4260.702	-48.02	-13.00	Horizontal	PASS
4	7178.833	-41.33	-13.00	Horizontal	PASS
5	10360.211	-38.09	-13.00	Horizontal	PASS
6	16448.518	-28.53	-13.00	Horizontal	PASS

(GPRS 1900MHz, Channel = 810, Horizontal)



Num	Freq(MHz)	PK	limit PK	Antenna	Verdict
1	236.610	-74.53	-13.00	Vertical	PASS
2	1909.804	-48.97	-13.00	Vertical	NA
3	1959.744	-30.51	-13.00	Vertical	NA
4	3728.605	-49.38	-13.00	Vertical	PASS
5	8931.951	-38.43	-13.00	Vertical	PASS
6	16540.935	-27.44	-13.00	Vertical	PASS

(GPRS 1900MHz, Channel = 810, Vertical)

## Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test items	Uncertainty
Output Power	$\pm 2.22\text{dB}$
Bandwidth	$\pm 5\%$
Conducted Spurious Emission	$\pm 2.77\text{ dB}$
Radiated Emission	$\pm 2.95\text{dB}$

This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$

## Annex B Testing Laboratory Information

### 1. Identification of the Responsible Testing Laboratory

<b>Laboratory Name:</b>	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
<b>Laboratory Address:</b>	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, Guangdong Province, P. R. China
<b>Telephone:</b>	+86 755 36698555
<b>Facsimile:</b>	+86 755 36698525

### 2. Identification of the Responsible Testing Location

<b>Name:</b>	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
<b>Address:</b>	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, Guangdong Province, P. R. China

### 3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.

#### 4. Test Equipments Utilized

##### 4.1 Conducted Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Power Splitter	NW521	1506A	Weinschel	2020.04.15	2021.04.14
Attenuator 1	(N/A.)	10dB	Resnet	2020.04.15	2021.04.14
Attenuator 2	(N/A.)	3dB	Resnet	2020.04.15	2021.04.14
EXA Signal Analyzer	MY51511149	N9020A	Agilent	2019.07.29	2020.07.28
Wireless synthesizer	MY48364176	8960 -E5515C	Agilent	2020.04.16	2021.04.15
RF cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial cable	CB02	RF02	Morlab	N/A	N/A
SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A
Temperature Chamber	(N/A)	HUT705P	CHONGQING HANBA EXPERIMENTAL EQUIPMENT CO.,LTD	2020.03.25	2021.03.24
Computer	T430i	Think Pad	Lenovo	N/A	N/A

**4.2 Radiated Test Equipments**

<b>Equipment Name</b>	<b>Serial No.</b>	<b>Type</b>	<b>Manufacturer</b>	<b>Cal. Date</b>	<b>Cal.Due</b>
System Simulator	152038	CMW500	R&S	2020.01.13	2021.01.12
Receiver	MY54130016	N9038A	Agilent	2019.07.29	2020.07.28
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2019.07.26	2022.07.25
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2019.05.24	2022.05.23
Coaxial cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
1-18GHz pre-Amplifier	S020180L3203	N/A	Dongsheng	2019.07.29	2020.07.28
18-26.5GHz pre-Amplifier	S10M100L3802	N/A	Dongsheng	2019.07.29	2020.07.28
Notch Filter	N/A	WRCG-GSM 850	Wainwright	2019.12.01	2020.11.30
Notch Filter	N/A	WRCG-GSM 1900	Wainwright	2019.12.01	2020.11.30
Notch Filter	N/A	WRCGV-W Band V	Wainwright	2019.12.01	2020.11.30
Notch Filter	N/A	WRCGV-W Band II	Wainwright	2019.12.01	2020.11.30
Notch Filter	N/A	WRCGV-W Band IV	Wainwright	2019.12.01	2020.11.30
Anechoic Chamber	N/A	9m*6m*6m	CRT	2019.07.13	2022.07.12

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