



47 CFR PART 15B, 24E

# TEST REPORT

of

## GSM Mobile Phone Watch

Model Name: M500  
Brand Name: WATCHFONE  
Report No.: SZ07030048E01  
FCC ID: U8RM500

*prepared for*

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*prepared by*  
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## 1. TEST CERTIFICATION

Equipment under Test: GSM Mobile Phone Watch

Application Type: Certification

FCC ID: U8RM500

Model Name: M500

Brand Name: WATCHFONE

Applicant Information: SMS Technology Australia PTY Ltd.

Address: Suite 8 Harbour Point,  
Marina Shopping Village Santa Barbara Road,  
Hope Island Queensland 4212, Australia

Contact: Gavin Hutcheson

Tel.: +61755 109 111

Fax: +61755 109 211

E-mail: ghutcheson@smstech.com.au

Emission Designator: 300KGXW

Rated Power: 1Watt for PCS 1900MHz band

Test Standards: 47 CFR Part 2, 15B, 24E

Test Date(s): April 20, 2007 - April 22, 2007

Test Result: PASS

### \* We Hereby Certify That:

The equipment was tested by Shenzhen Electronic Product Quality Testing Center Morlab Laboratory. The test results of this report only apply for the sample equipment identified above. The test data, data evaluation, test procedures and equipment configurations shown in this report were made according to the requirements of related FCC rules. The test report shall be invalid without all the signatures of the test engineer, the reviewer and the approver.

Tested by:

*Ni Yong*

Ni Yong

Dated:

2007. 4. 23

Reviewed by:

*Zhang Weimin*

Zhang Weimin

Dated:

2007. 4. 23

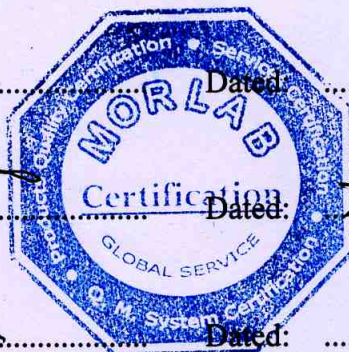
Approved by:

*Shu Luan*

Shu Luan

Dated:

2007. 4. 23



## 2. GENERAL INFORMATION

### 2.1 Test Sample Information

For the test sample received from/supplied by the applicant, we summarized as below:

#### 1. Equipment under Test (EUT)

EUT Description.....: GSM Mobile Phone Watch  
Model Name.....: M500  
Manufacturer.....: ELECA (HK) LTD  
59<sup>th</sup> Floor, Diwang Commercial Centr 5002 ShenNan Road, Shenzhen,  
P. R. China  
Serial No.....: (n.a., marked #1 by test site)  
IMEI.....: (n.a.)  
Hardware Version.....: V1.0  
Software Version.....: V0.0.1  
Modulation(s).....: GMSK  
Frequency Range.....: Tx: 1850.20 - 1909.80MHz  
Rx: 1930.20 - 1989.80MHz  
Power Supply.....: Battery  
Model Name: M500  
Brand Name: ELECA  
Manufacturer: ELECA POWER TECH. LTD.  
Serial No.: (n.a., marked #1 by test site)  
Capacitance: 400mAh  
Voltage: Rated Normal Voltage: 3.7VDC  
Lowest Extreme Voltage: 3.5VDC  
Highest Extreme Voltage: 4.2VDC

#### 2. Ancillary Equipments (AE)

AE-1.....: AC Adapter (Charger for Battery)  
Model Name: (n.a.)  
Brand Name: ELECA  
Manufacturer: HUAYE NEW LTD.  
Serial No.: (n.a. marked #1 by test site)  
Rated Input: ~ 110-240V, 50-60Hz  
Rated Output: = 5.5V, 400mA  
Wire Length: 150cm  
AE-2.....: Bluetooth Earphone

Model Name: (n.a.)  
Brand Name: (n.a.)  
Manufacturer: (n.a.)  
Serial No.: (n.a., marked #1 by test site)

### 3. Additional Information

- (a) The Test Sample (EUT), containing the GSM Module (EUT\_GSMmodule) and the Bluetooth Module (EUT\_BTmodule), is classified as a "Class B digital device". The EUT\_GSMmodule is mainly considered and tested in this test report.
- (b) The transmitter frequency arrangement of the PCS 1900MHz band of the EUT\_GSMmodule can be represented with the formula  $F_{1900\text{MHz}}(N)=1850.2+0.2*(N-512)$ ,  $N \in [512, 810]$ ; the lowest, middle and highest channel numbers used and tested in this report are separately 512 (1850.2MHz), 661 (1880.0MHz) and 810 (1909.8MHz).
- (c) For more detailed description about the Test Sample (EUT), please refer to specification or user's manual supplied by the applicant and/or manufacturer.



## 2.2 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 2, Part 15 and Part 24 for the FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 2 (10-1-05 Edition)	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 15 (10-1-05 Edition)	Radio Frequency Devices
4	47 CFR Part 24 (10-1-05 Edition)	Personal Communications Services

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

No.	Section	Description	Result	Date of Test
FCC Part 15 Requirement				
1	15.107	Conducted Emissions	PASS	2007-4-22
2	15.109	Radiated Emissions	PASS	2007-4-22
FCC Part 24 Requirements				
1	2.106 24.229	Frequencies	PASS	2007-4-21
2	2.1046	Conducted RF Output Power	PASS	2007-4-21
3	2.1049	20dB Occupied Bandwidth	(n.a.)	2007-4-21
4	2.1055 24.235	Frequency Stability	PASS	2007-4-21
5	2.1051, 2.1057 24.238	Conducted Out of Band Emissions	PASS	2007-4-21
6	2.1051, 2.1057 24.238	Band Edge	PASS	2007-4-21
7	24.232	Transmitter Radiated Power (EIPR/ERP)	PASS	2007-4-21
8	2.1053, 2.1057 24.238	Radiated Out of Band Emissions	PASS	2007-4-22

## **2.3 Facilities and Accreditations**

### **2.3.1 Facilities**

Shenzhen Electronic Product Quality Testing Center Morlab Laboratory is a testing organization accredited by China National Accreditation Board for Laboratories (CNAL) according to ISO/IEC 17025. The accreditation certificate number is L1659.

All measurement facilities used to collect the measurement data are located at Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen 518055 CHINA. The test site is constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22; the FCC registration number is 741109.

### **2.3.2 Test Environment Conditions**

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

Temperature (°C):	20 - 25
Relative Humidity (%):	40 - 60
Atmospheric Pressure (kPa):	960



### 3. 47 CFR PART 15B REQUIREMENT

#### 3.1 Test Mode(s)

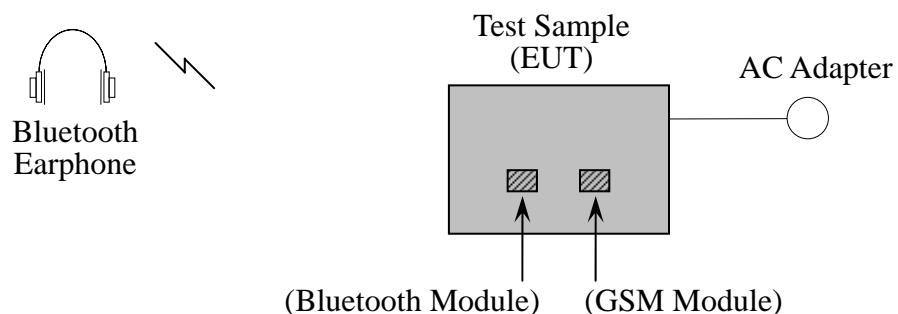
According to the description of Test Sample Configuration in section 2.1 of this test report, several test mode(s) are employed to perform tests as below for the actual application:

##### 1. Call Test Mode

The EUT\_GSMmodule of the Test Sample (EUT), allocated a traffic channel, operates on the middle channel of the PCS 1900MHz band under the condition of its maximum output power. The EUT\_BTmodule is activated and the audio link of the EUT\_GSMmodule is routed to the Bluetooth Earphone (AE-2) via the EUT\_BTmodule.

The Test Sample (EUT) is powered by the Battery, which is charged with the AC Adapter (AE-1) powered by 120V 60Hz AC mains supply.

The figure below is the test configuration for the Test Sample (EUT) employed in this test report under this test mode:



## 3.2 Conducted Emissions

### 3.2.1 Requirement

According to FCC section 15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/50Ohm line impedance stabilization network (LISN).

Frequency Range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quai-Peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

NOTE:

- a) The limit subjects to the Class B digital device.
- b) The lower limit shall apply at the band edges.
- c) The limit decreases linearly with the logarithm of the frequency in the range from 0.15MHz to 0.50MHz.

### 3.2.2 Test Procedure

- (a) The test frequency range is from 150kHz to 30MHz.
- (b) The Peak (PK) detector is employed to sweep the conducted interference over the test frequency range.
- (c) For the swept signals that are more than or have narrow negative margins beyond the Average (AV) and Quasi-peak (QP) limit lines, the AV and QP detectors are employed to measure these suspect signals to find their maximum QP and AV readings.
- (d) Both L Phase and N Phase lines of the power mains connected to the Test Sample (EUT) are employed to perform this test.
- (e) All Test Modes for the Test Sample (EUT) listed in section 3.1 are employed to perform this test.

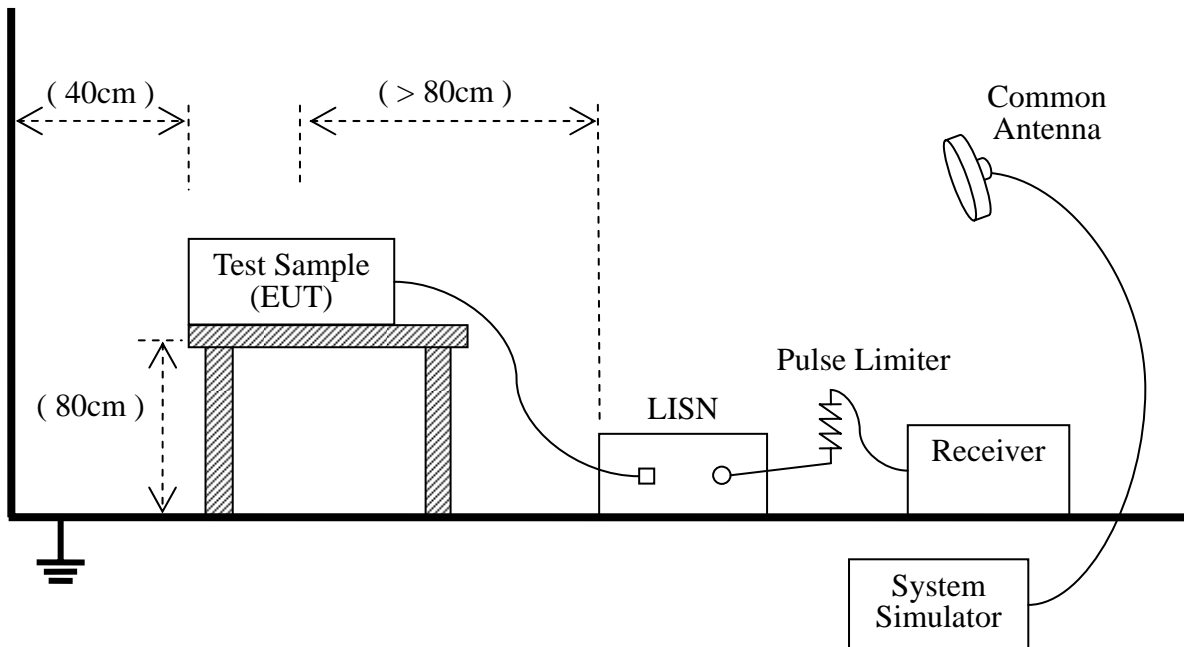
### 3.2.3 Test Setup

#### 1. Test Setup Sketch

The Test Sample (EUT) is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The Test Sample (EUT) is connected to the power mains through a LISN which provides 50 $\mu$ H/50Ohm of coupling

impedance for the measuring instrument of a Receiver. A Pulse Limiter is employed to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

The Test Sample (EUT) works together with a System Simulator via a Common Antenna.



## 2. Equipments List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2006.07	1year
LISN	Schwarzbeck	NSLK 8127	812744	2006.08	1year
Pulse Limiter (20dB)	Schwarzbeck	VTSD 9561-D	9391	(n.a.)	(n.a.)
System Simulator	Agilent	E5515C	GB43130131	2006.06	1year
Common Antenna	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)

### 3.2.4 Test Result

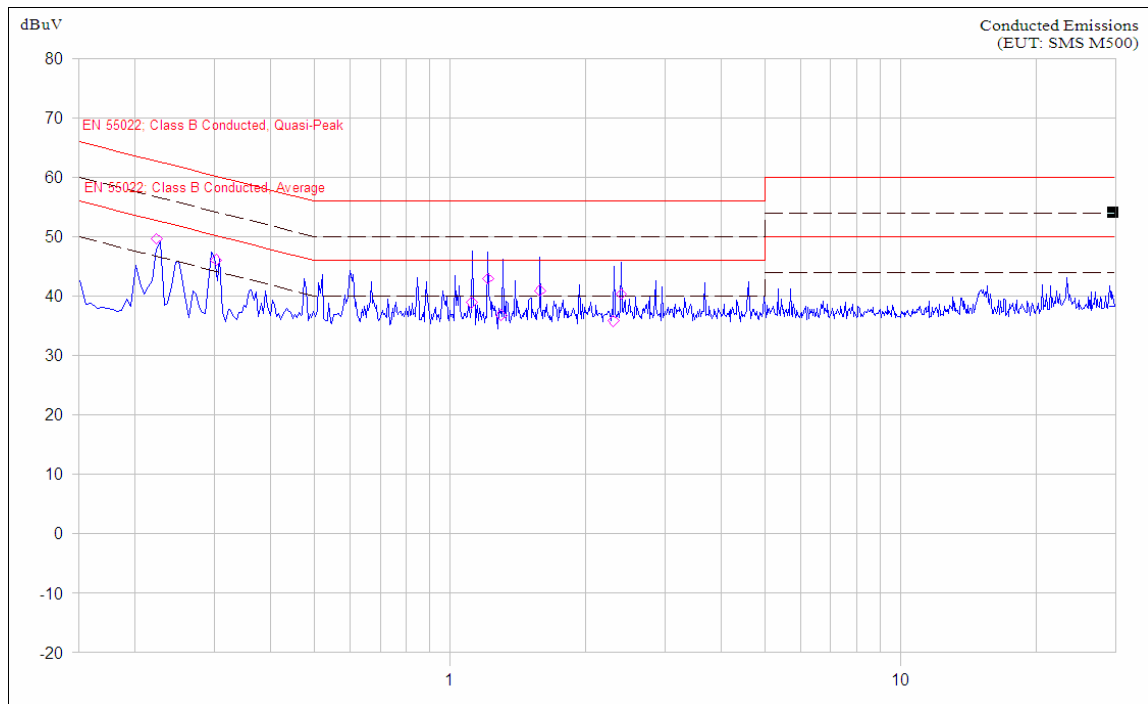
#### 1. Call Test Mode

##### a) Test Verdict Recorded for Suspect Points

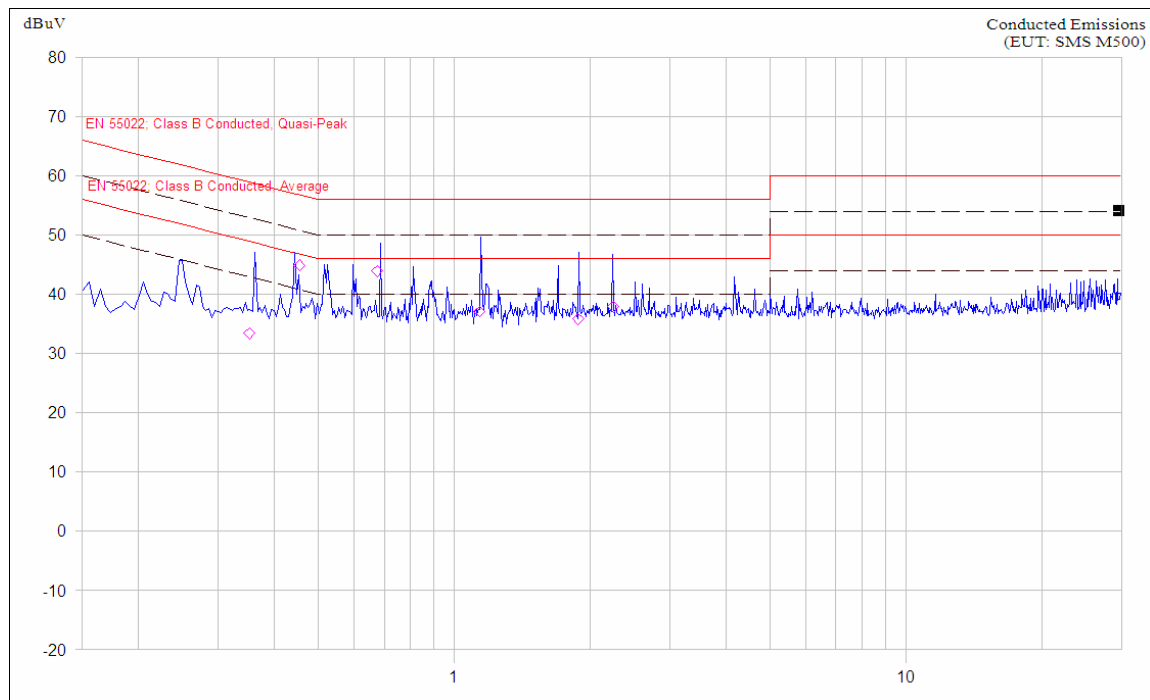
No.	@Frequency (MHz)	Suspect Emission Levels (dBμV)				Limit (dBμV)		Verdict
		PK	QP	AV	Phase	QP	AV	
1	0.352	33.4	29.0	22.4	N	58.9	48.9	PASS
2	0.454	44.9	41.2	26.0	N	56.8	46.8	PASS
3	0.675	43.9	37.3	23.6	N	56.0	46.0	PASS

No.	@Frequency (MHz)	Suspect Emission Levels (dB $\mu$ V)				Limit (dB $\mu$ V)		Verdict
		PK	QP	AV	Phase	QP	AV	
4	1.137	37.0	32.3	22.5	N	56.0	46.0	PASS
5	1.879	35.8	30.5	21.7	N	56.0	46.0	PASS
6	2.251	37.9	28.8	21.4	N	56.0	46.0	PASS
7	0.223	49.6	46.3	31.5	L	62.7	52.7	PASS
8	0.302	46.1	42.5	27.1	L	60.2	50.2	PASS
9	1.116	38.9	33.5	23.4	L	56.0	46.0	PASS
10	1.214	42.9	34.1	23.0	L	56.0	46.0	PASS
11	1.584	40.9	32.4	22.8	L	56.0	46.0	PASS
12	2.399	40.3	29.7	21.7	L	56.0	46.0	PASS

### b) Test Plots



(Plot A: L Phase)



(Plot B: N Phase)



### 3.3 Radiated Emissions

#### 3.3.1 Requirement

According to FCC section 15.109, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency range (MHz)	Field Strength	
	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

NOTE:

- Field Strength ( $\text{dB}\mu\text{V/m}$ ) =  $20 \cdot \log[\text{Field Strength } (\mu\text{V/m})]$ .
- In the emission tables above, the tighter limit applies at the band edges.

#### 3.3.2 Test Procedure

- The test frequency range is from 30MHz to 1GHz.
- The Test Antenna is located at 1m height. The Peak (PK) detector is employed to sweep the radiated interference over the test frequency range while the Turn Table is located separately at the degree of  $\text{DEG}_{\text{TT}}(\text{N}) = \text{N} \cdot 45$ ,  $\text{N} \in [0, 8]$ .
- For each swept signal that is more than or have narrow negative margins beyond the Quasi-peak (QP) limit line, rotate the Turn Table and vary the Test Antenna height until the emission is at its highest amplitude; then tuned the Receiver and use the QP detector to measure this suspect signal to find its maximum QP reading.
- Both the Vertical (V) and the Horizontal (H) polarizations of the Test Antenna are employed to perform this test.
- All Test Modes for the Test Sample (EUT) listed in section 3.1 are employed to perform this test.

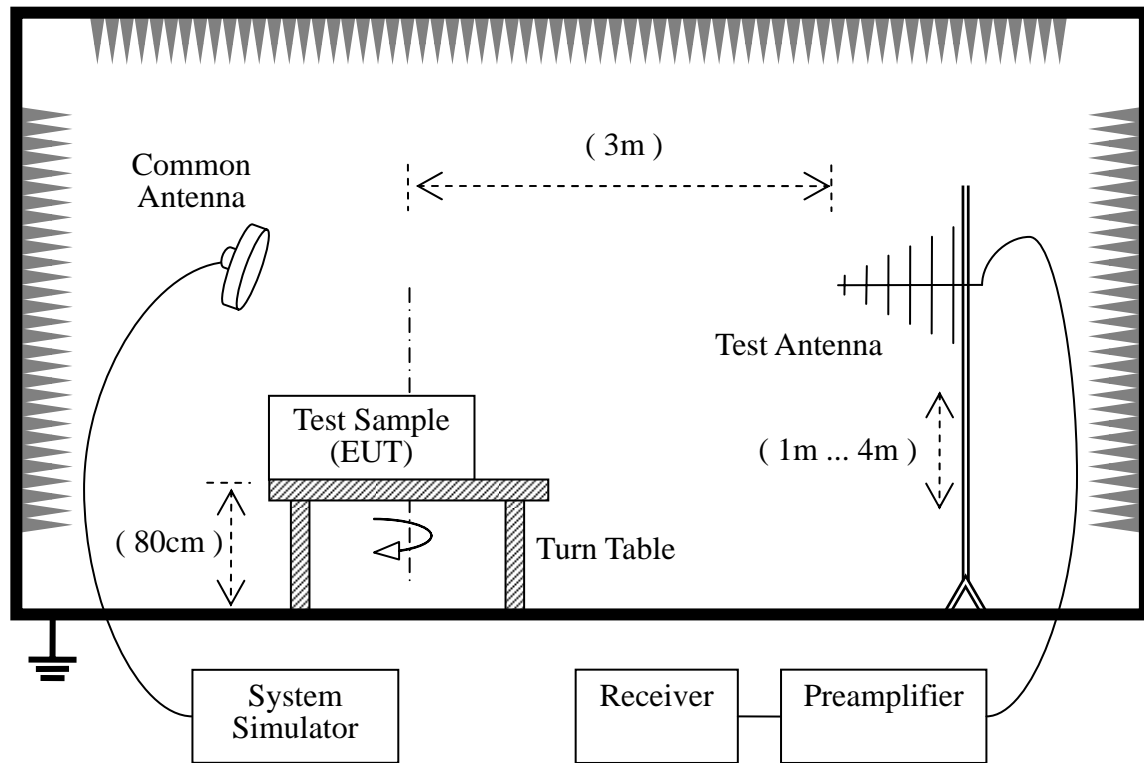
#### 3.3.3 Test Setup

##### 1. Test Setup Sketch

The test is performed in a 3m Semi-Anechoic Chamber. The Test Sample (EUT) is placed on a 0.8m high insulating Turn Table and keeps 3m away from the Test Antenna which is a Bi-Log one with working frequency range from 30MHz to 3GHz and is mounted on a variable-height antenna master

tower. If applicable, a Preamplifier is employed for the measuring instrument of a Receiver. The factors of the whole test system are calibrated to correct the reading.

The Test Sample (EUT) works together with a System Simulator (SS) via a Common Antenna.



## 2. Equipments List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Receiver	Agilent	E7405A	US44210471	2006.07	1year
Semi-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2006.08	2year
Test Antenna (Bi-Log)	Schwarzbeck	VULB 9163	9163-274	2006.07	1year
System Simulator	Agilent	E5515C	GB43130131	2006.06	1year
Preamplifier	(n.a.)	20dB	(n.a.)	(n.a.)	(n.a.)
Common Antenna	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)

### 3.3.4 Test Result

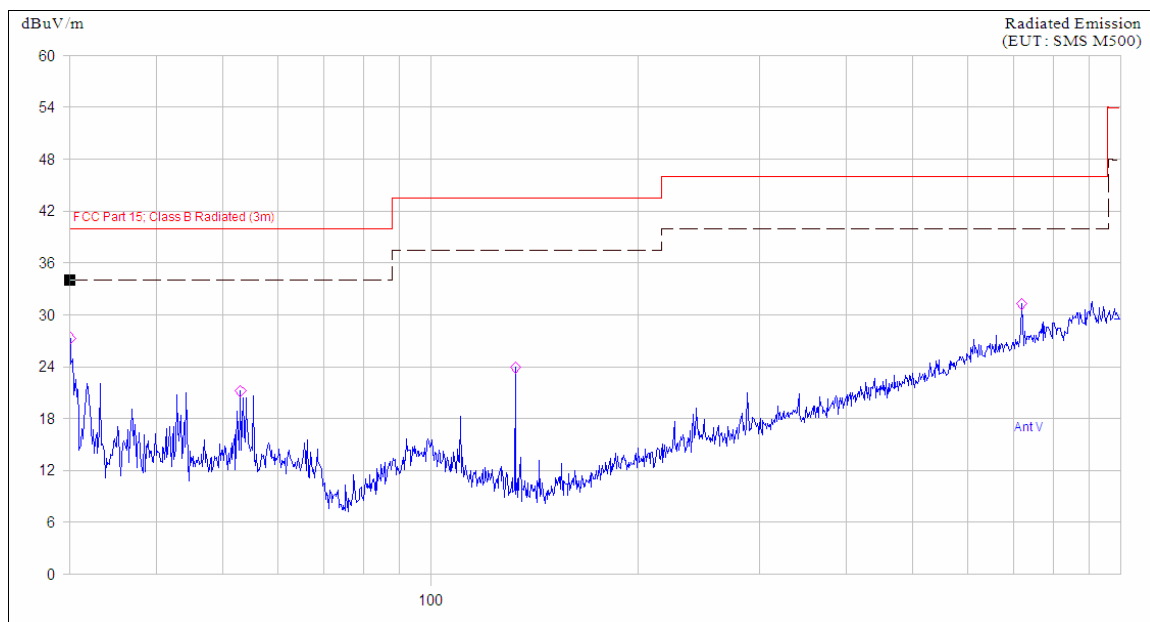
NOTE: the emissions of Test Sample (EUT) and SS carrier frequencies should be ignored.

## 1. Call Test Mode

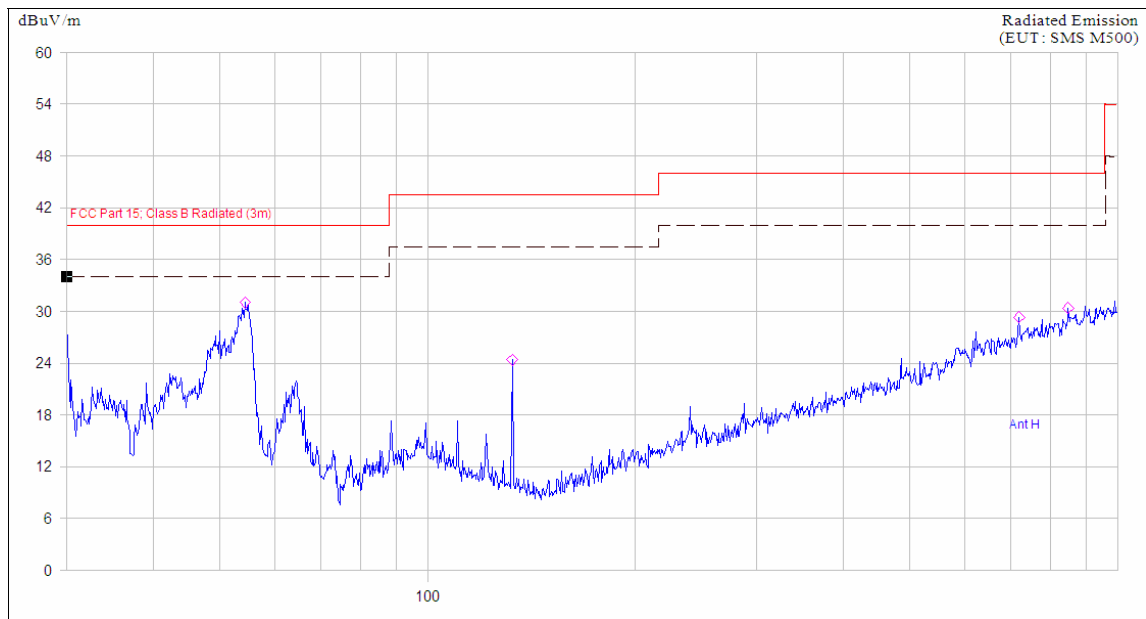
### a) Test Verdict Recorded for Suspect Points

No.	@Frequency (MHz)	Suspect Emission Levels (dBμV/m)					QP Limit (dBμV/m)	Result
		PK	QK	Turn Table (degree)	Test Antenna			
					Height (cm)	Polar.		
1	30.072	27.3	---	180	100	V	40.0	PASS
2	52.992	21.2	---	180	100	V	40.0	PASS
3	132.780	23.9	---	180	100	V	43.5	PASS
4	720.108	31.2	---	180	100	V	46.0	PASS
5	54.444	31.0	---	180	100	H	40.0	PASS
6	132.720	24.4	---	180	100	H	43.5	PASS
7	720.168	29.3	---	180	100	H	46.0	PASS
8	848.940	30.4	---	180	100	H	46.0	PASS

### b) Test Plots



(Plot A: Test Antenna Vertical)



(Plot B: Test Antenna Horizontal)

## **4. 47 CFR PART 2, PART 24E REQUIREMENTS**

### **4.1 Frequencies**

#### **4.1.1 Requirement**

According to FCC section 24.229, the frequencies available in the Broadband PCS services are listed as below, in accordance with the frequency allocations table of FCC section 2.106.

- a) The following frequency blocks are available for assignment on an MTA basis:  
Block A: 1850 - 1865MHz paired with 1930 - 1945MHz;  
Block B: 1870 - 1885MHz paired with 1950 - 1965MHz.
- b) The following frequency blocks are available for assignment on a BTA basis:  
Block C: 1895 - 1910 MHz paired with 1975 - 1990MHz;  
Block D: 1865 - 1870 MHz paired with 1945 - 1950MHz;  
Block E: 1885 - 1890 MHz paired with 1965 - 1970MHz;  
Block F: 1890 - 1895 MHz paired with 1970 - 1975MHz.

#### **4.1.2 Test Procedure**

- (a) The lowest and highest channels of the EUT\_GSMmodule are employed to perform this test.
- (b) The Spectrum Analyzer is set as below:
  - Center Frequency: The frequency of the channel under test
  - Resolution BW: 3kHz
  - Video BW: Auto
  - Frequency Span: Wide enough to cover the complete power envelope of the signal
  - Sweep Time: Suitable to capture one transmission burst
  - Detector Mode: Peak
  - Trace Mode: Max Hold
- (c) Find the peak value of the trace from the Spectrum Analyzer and record its power.

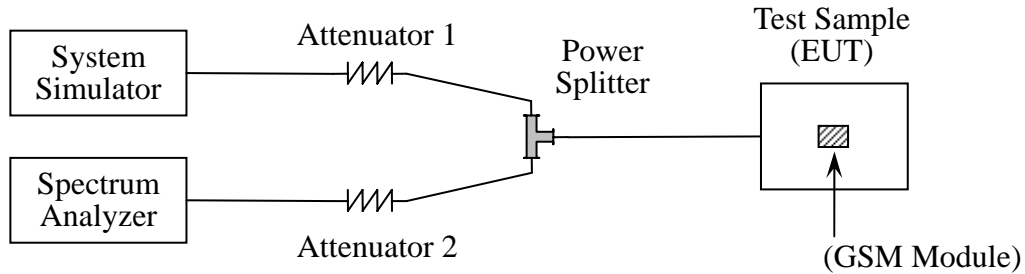
#### **4.1.3 Test Setup**

##### **1. Test Setup Sketch**

The Test Sample (EUT) with the EUT\_GSMmodule embedded, powered by the Battery, is coupled to a Spectrum Analyzer and a System Simulator with appropriate Attenuators via a Power Splitter; the RF load attached to the antenna terminal of the EUT\_GSMmodule is 50Ohm. The path loss as the factor is calibrated to correct the reading.



The EUT\_GSMmodule is allocated a traffic channel and operates at the corresponding working band under the condition of its maximum output power.



## 2. Equipments List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Agilent	E5515C	GB43130131	2006.06	1year
Spectrum Analyzer	Agilent	E7405A	US44210471	2006.07	1year
Power Splitter	Weinschel	1506A	NW521	(n.a.)	(n.a.)
Attenuator 1	Resnet	20dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 2	Resnet	3dB	(n.a.)	(n.a.)	(n.a.)

### 4.1.4 Test Result

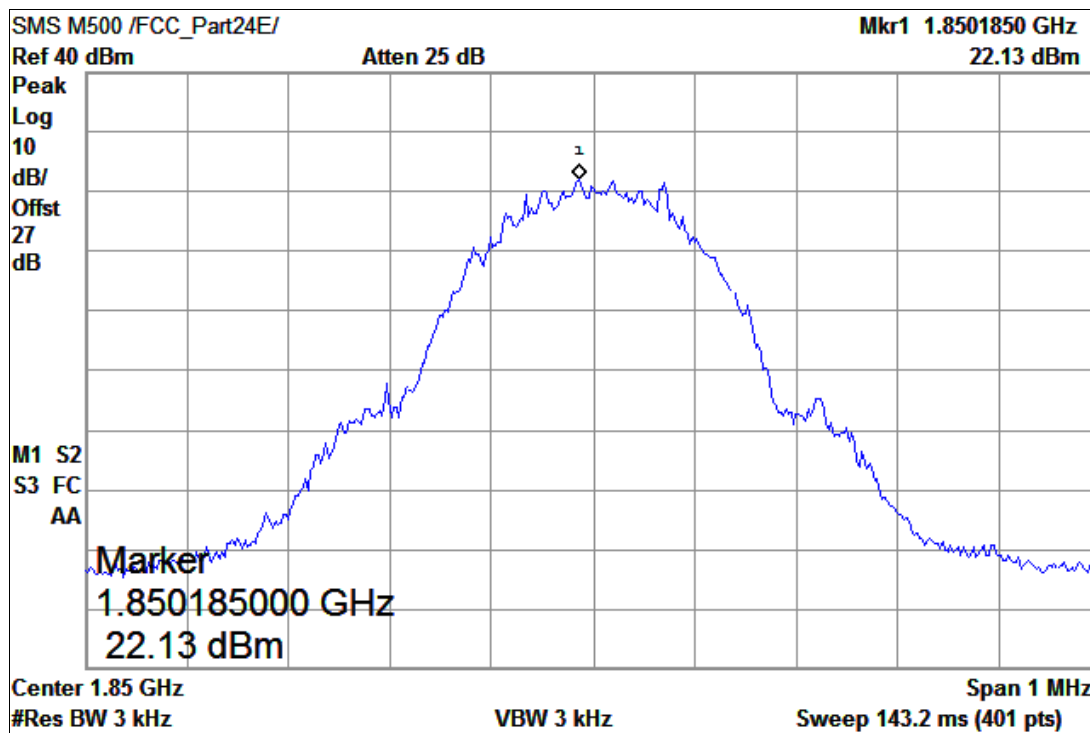
The Tx frequency arrangement of the PCS 1900MHz band employed by the EUT\_GSMmodule should be from 1850.2MHz to 1909.8MHz (the corresponding frequency block is from 1850.0MHz to 1910.0MHz).

#### a) Test Verdict

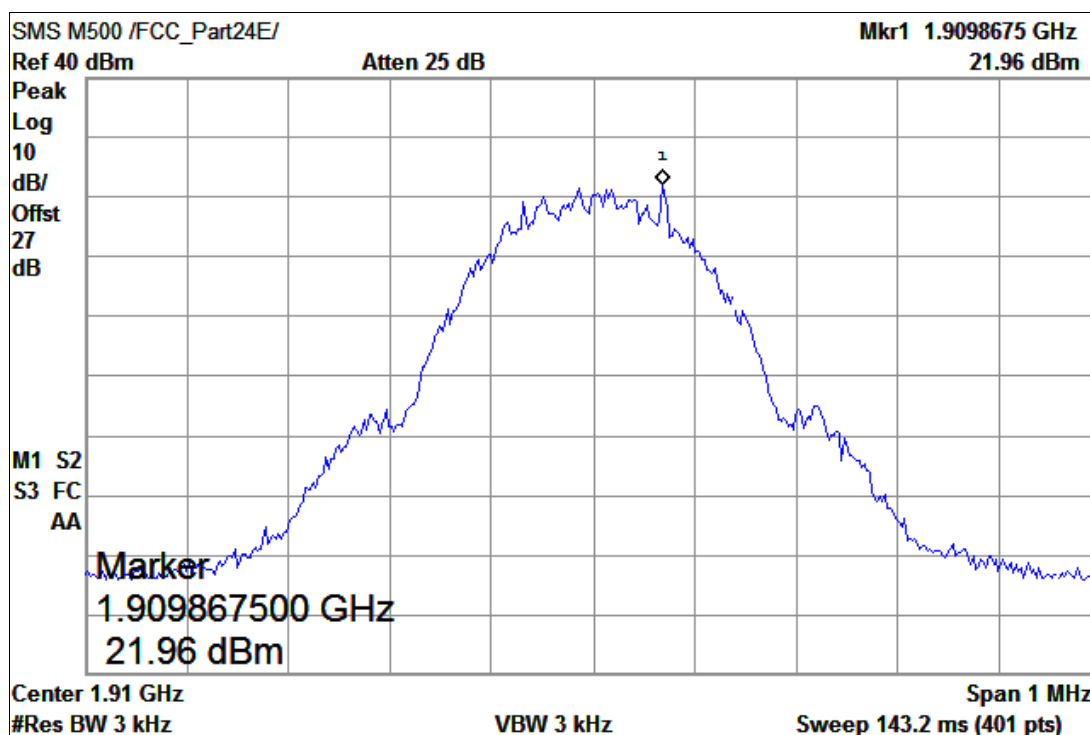
The required frequency block is employed legally, the verdict is PASS.

Channel	Frequency (MHz)	Measured Carrier (dBm)	Refer to Plot
512	1850.2	22.13	Plot A
810	1909.8	21.96	Plot B

## b) Test Plots



(Plot A: Channel = 512)



(Plot B: Channel = 810)

## **4.2 Conducted RF Output Power**

### **4.2.1 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).

For the mobile phone operates at PCS 1900MHz band under the condition of its maximum output power, the rated conducted RF output power is 30dBm within the tolerance of  $\pm 2$ dB.

### **4.2.2 Test Procedure**

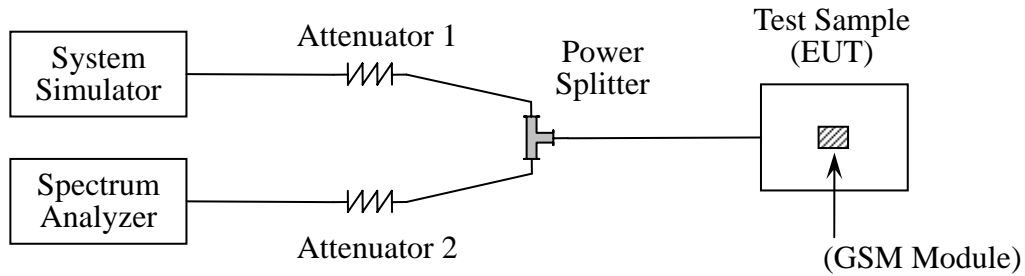
- (a) The lowest, middle and highest channels of the EUT\_GSMmodule are employed to perform this test.
- (b) The Spectrum Analyzer is set as below:
  - Center Frequency: The frequency of the channel under test
  - Resolution BW: 1MHz
  - Video BW: Auto
  - Frequency Span: Wide enough to cover the complete power envelope of the signal
  - Sweep Time: Suitable to capture one transmission burst
  - Detector Mode: Peak
  - Trace Mode: Max Hold
- (c) Find the peak value of the trace from the Spectrum Analyzer and record its power.

### **4.2.3 Test Setup**

#### **1. Test Setup Sketch**

The Test Sample (EUT) with the EUT\_GSMmodule embedded, powered by the Battery, is coupled to a Spectrum Analyzer and a System Simulator with appropriate Attenuators via a Power Splitter; the RF load attached to the antenna terminal of the EUT\_GSMmodule is 50Ohm. The path loss as the factor is calibrated to correct the reading.

The EUT\_GSMmodule is allocated a traffic channel and operates at the corresponding working band under the condition of its maximum output power.



## 2. Equipments List

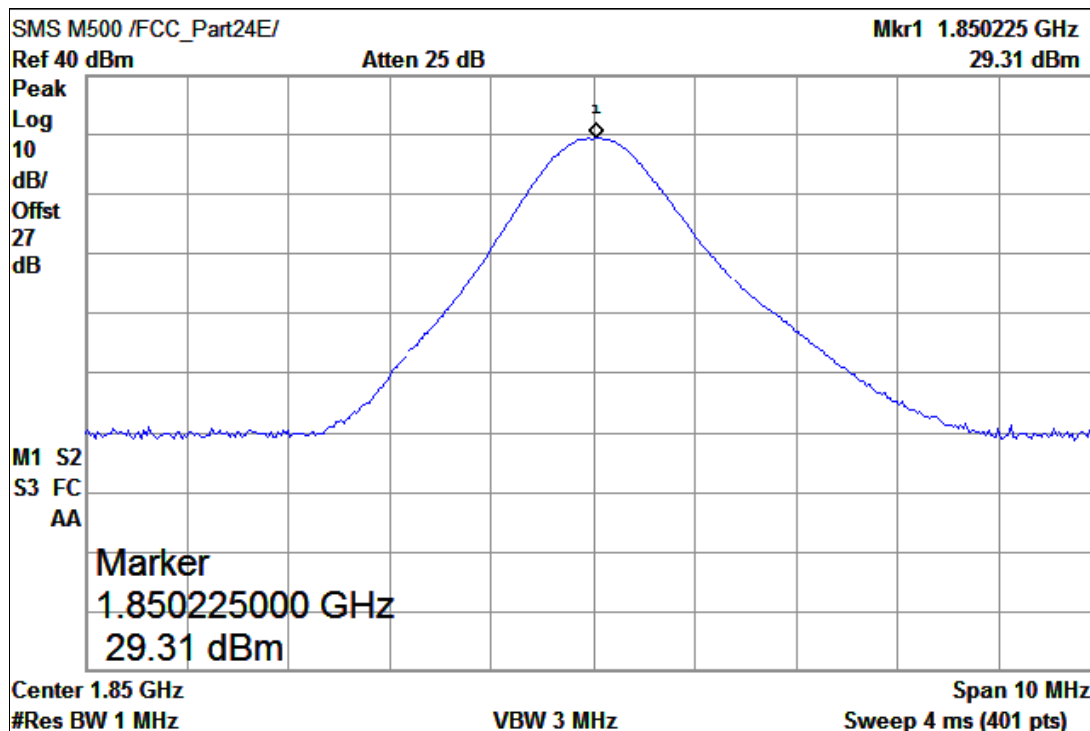
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Agilent	E5515C	GB43130131	2006.06	1year
Spectrum Analyzer	Agilent	E7405A	US44210471	2006.07	1year
Power Splitter	Weinschel	1506A	NW521	(n.a.)	(n.a.)
Attenuator 1	Resnet	20dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 2	Resnet	3dB	(n.a.)	(n.a.)	(n.a.)

### 4.2.4 Test Result

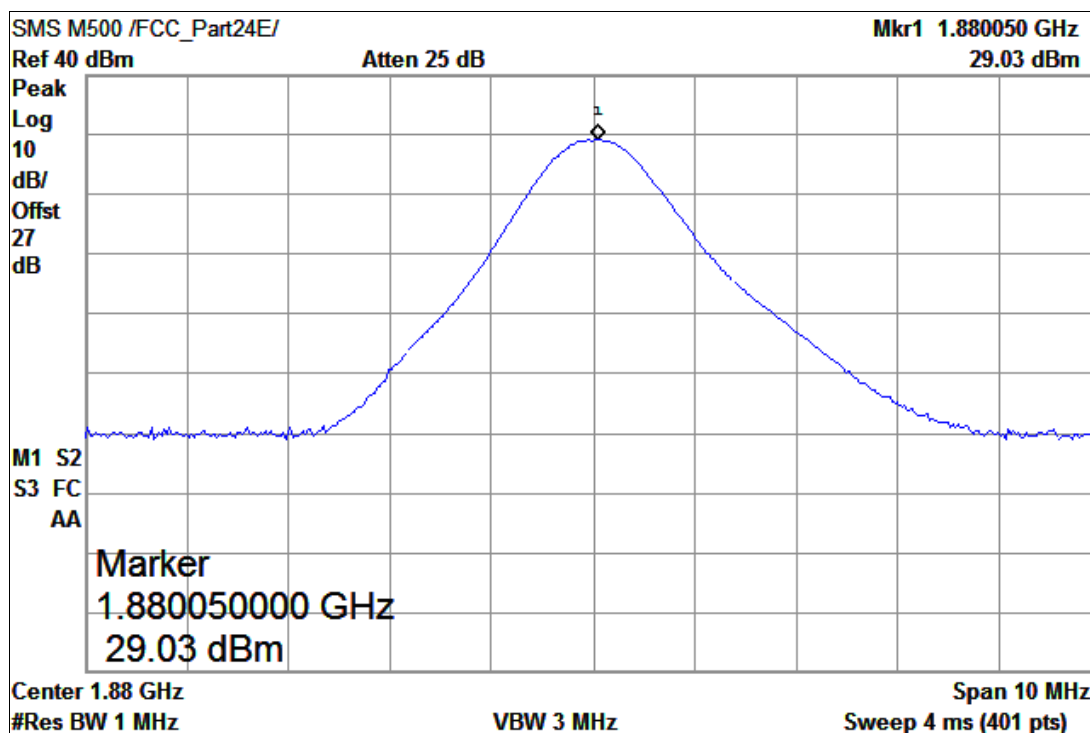
#### a) Test Verdict

Channel	Frequency (MHz)	Measured Output Power		Rated Output Power		Verdict
		dBm	Refer to Plot	dBm	Tolerance (dB)	
512	1850.2	29.31	Plot A	30	±2	PASS
661	1880.0	29.03	Plot B			PASS
810	1909.8	29.05	Plot C			PASS

## b) Test Plots

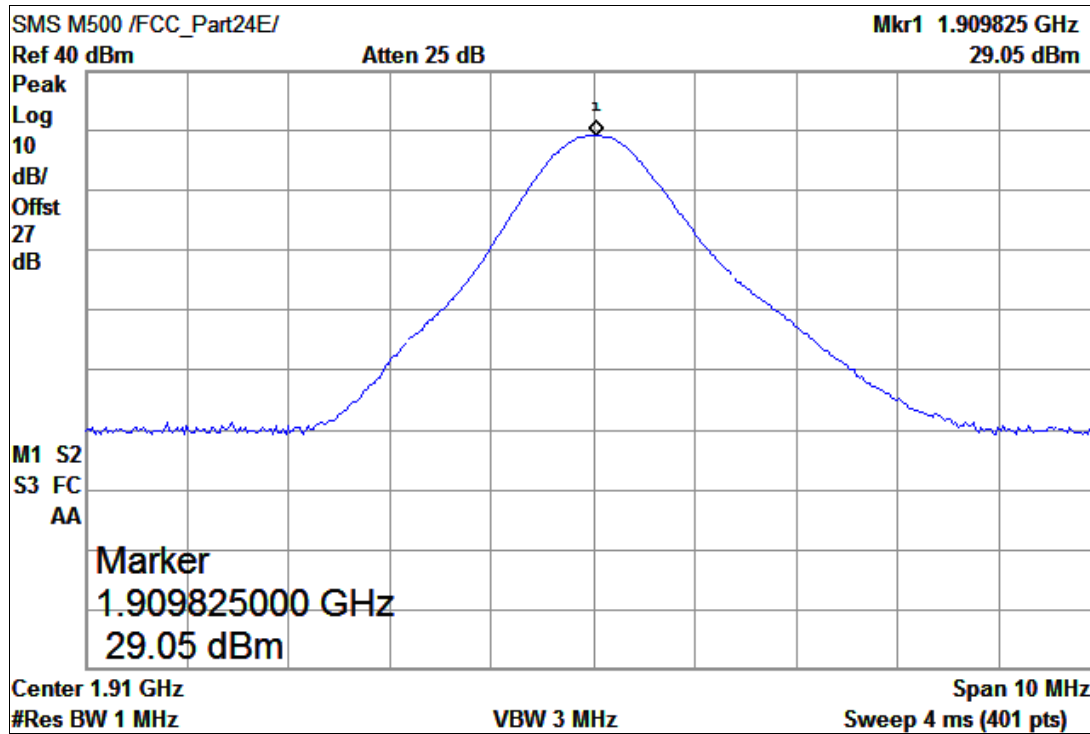


(Plot A: Channel = 512)



(Plot B: Channel = 661)





(Plot C: Channel = 810)

## 4.3 20dB Occupied Bandwidth

### 4.3.1 Definition

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, or 20dB bandwidth ( $10 \cdot \log 1\%$  equal to 20dB) taking the total RF output power as reference.

### 4.3.2 Test Procedure

- (a) The lowest, middle and highest channels of the EUT\_GSMmodule are employed to perform this test.
- (b) The Spectrum Analyzer is set as below:
  - Center Frequency: The frequency of the channel under test
  - Resolution BW: 3kHz
  - Video BW: Auto
  - Frequency Span: Wide enough to cover the complete power envelope of the signal
  - Sweep Time: Suitable to capture one transmission burst
  - Detector Mode: Peak
  - Trace Mode: Max Hold
- (c) Find the peak value of the trace and place the Spectrum Analyzer marker on this peak as marker#1.
- (d) Use a second marker of the Spectrum Analyzer and find the frequency below the operating frequency at which the level is 20dB below the power of the marker#1. This frequency is recorded as  $f_L$ .
- (e) Use a third marker (or the delta marker of the second marker) of the Spectrum Analyzer and find the frequency above the operating frequency at which the level is 20dB below the power of the marker#1. This frequency is recorded as  $f_H$ .
- (f) The difference between the frequencies measured ( $f_H - f_L$ ) is the 20dB Occupied Bandwidth.

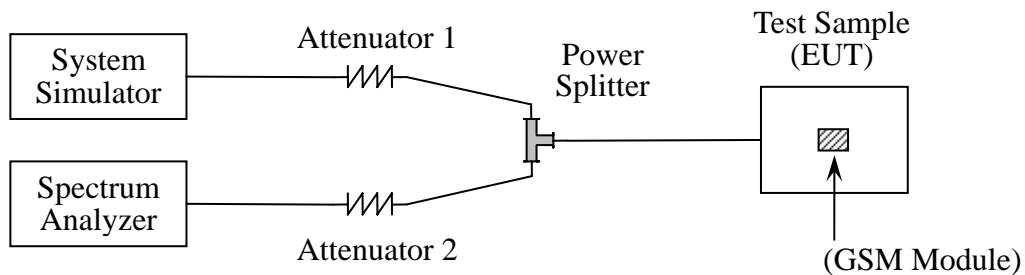
### 4.3.3 Test Setup

#### 1. Test Setup Sketch

The Test Sample (EUT) with the EUT\_GSMmodule embedded, powered by the Battery, is coupled to

a Spectrum Analyzer and a System Simulator with appropriate Attenuators via a Power Splitter; the RF load attached to the antenna terminal of the EUT\_GSMmodule is 50Ohm. The path loss as the factor is calibrated to correct the reading.

The EUT\_GSMmodule is allocated a traffic channel and operates at the corresponding working band under the condition of its maximum output power.



## 2. Equipments List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Agilent	E5515C	GB43130131	2006.06	1year
Spectrum Analyzer	Agilent	E7405A	US44210471	2006.07	1year
Power Splitter	Weinschel	1506A	NW521	(n.a.)	(n.a.)
Attenuator 1	Resnet	20dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 2	Resnet	3dB	(n.a.)	(n.a.)	(n.a.)

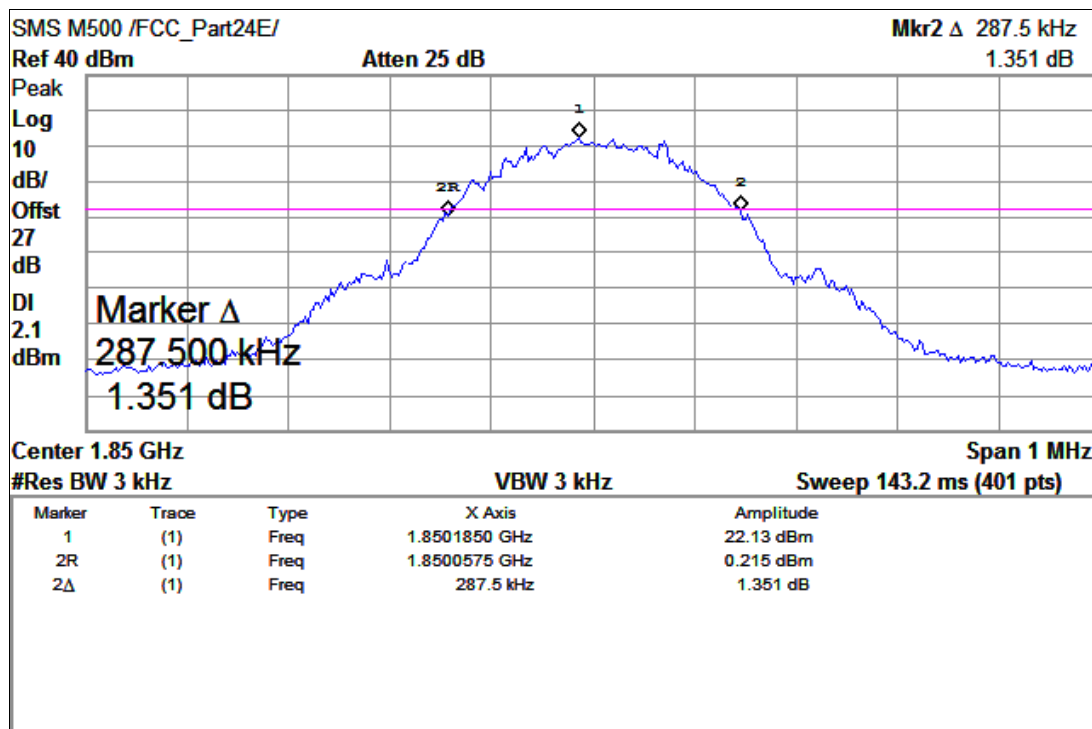
### 4.3.4 Test Result

The measured 20dB occupied bandwidth is about 300kHz.

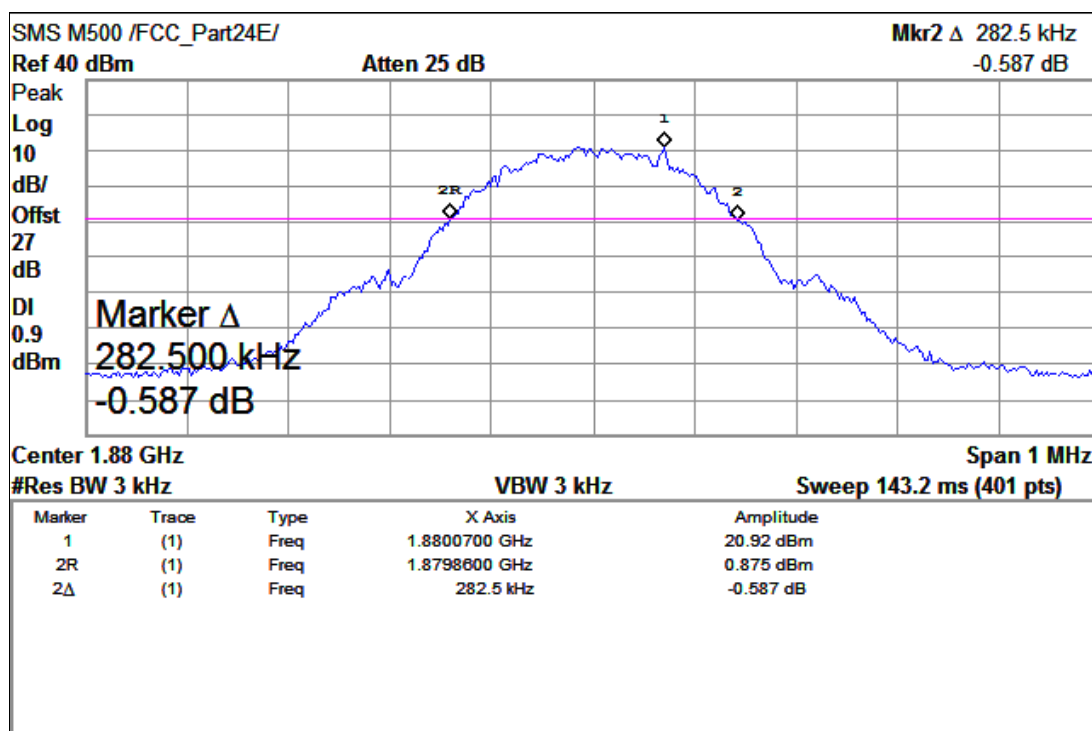
#### a) Test Verdict

Channel	Frequency (MHz)	Measured 20dB Occupied Bandwidth (kHz)	Refer to Plot
512	1850.2	287.5	Plot A
661	1880.0	282.5	Plot B
810	1909.8	272.5	Plot C

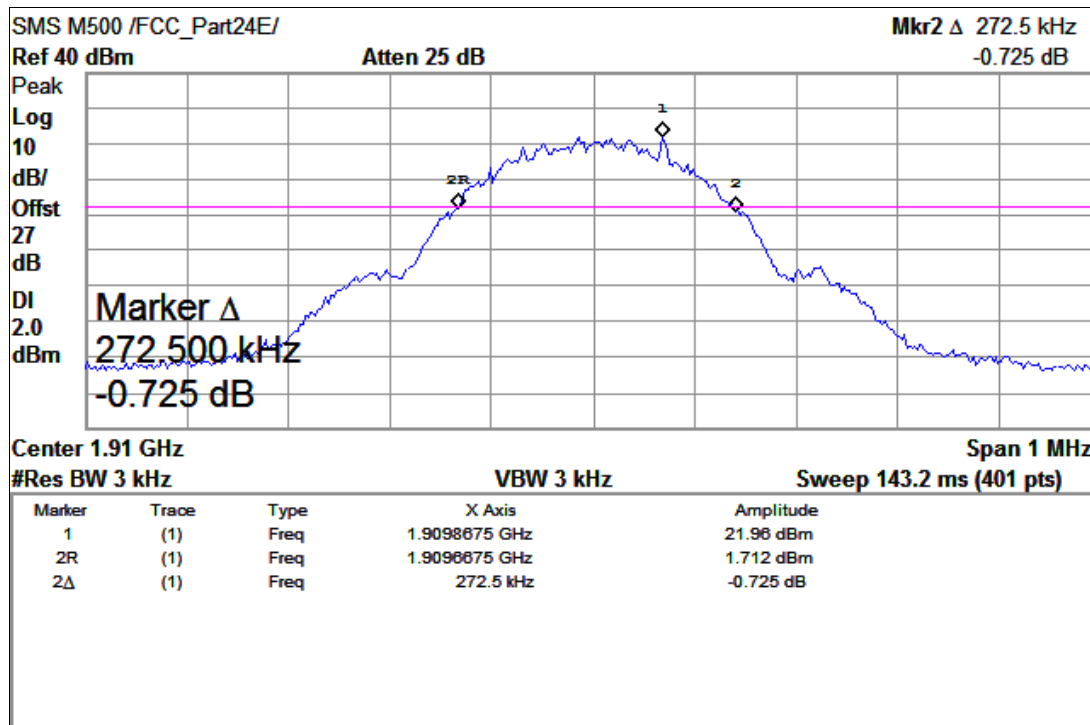
## b) Test Plots



(Plot A: Channel = 512)



(Plot B: Channel = 661)



(Plot C: Channel = 810)



## **4.4 Frequency Stability**

### **4.4.1 Requirement**

According to 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  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  at intervals of not more than  $10^{\circ}\text{C}$ .
- 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.

For the PCS 1900MHz band, the frequency deviation limit is  $\pm 1\text{ppm}$ .

### **4.4.2 Test Procedure**

- (a) The lowest, middle and highest channels of the EUT\_GSMmodule are employed to perform this test.
- (b) The normal test conditions and extreme test conditions are employed to perform this test:
  - Normal voltage (3.7VDC) and extreme temperatures ( $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  at intervals of  $10^{\circ}\text{C}$ )
  - Extreme voltages (3.5VDC and 4.2VDC) and normal temperature ( $+25^{\circ}\text{C}$ )
- (c) Find the maximum frequency deviation from the operating frequency directly via the measuring instrument of the System Simulator.

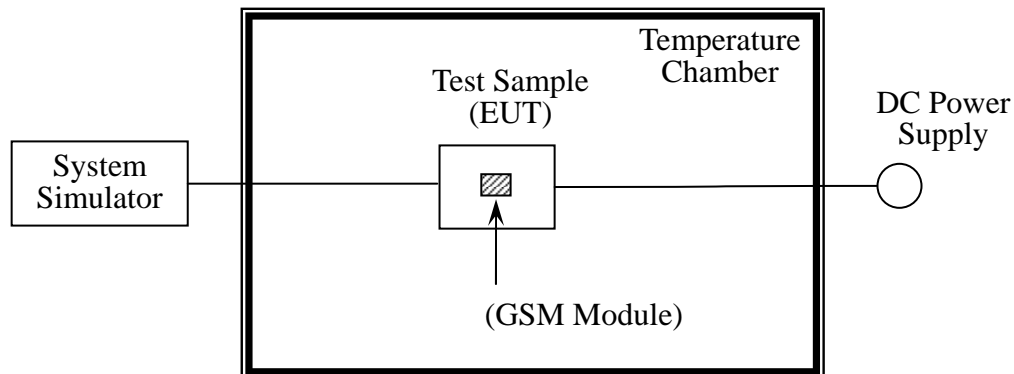
### **4.4.3 Test Setup**

#### **1. Test Setup Sketch**

The power source (Battery) of the Test Sample (EUT) with the EUT\_GSMmodule embedded is replaced by a test DC Power Supply capable of producing normal and extreme test voltages.

The Test Sample (EUT) is coupled to a System Simulator; the RF load attached to the antenna terminal of the EUT\_GSMmodule is 50Ohm. The path loss as the factor is calibrated to correct the reading.

The EUT\_GSMmodule is allocated a traffic channel and operates at the corresponding working band under the condition of its maximum output power.



## 2. Equipments List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Agilent	E5515C	GB43130131	2006.06	1year
DC Power Supply	Good Will	GPS-3030DD	EF920938	2006.06	2year
Temperature Chamber	YinHe Experimental Equip.	HL4003T	(n.a.)	2006.03	1year

### 4.4.4 Test Result

Test Conditions		Frequency Deviation						Verdict
Power (VDC)	Temperature (°C)	Channel = 512 (1850.2MHz)		Channel = 661 (1880.0MHz)		Channel = 810 (1909.8MHz)		
		Hz	Limit	Hz	Limit	Hz	Limit	
3.7	-30	-58.34	±1850.2	-39.06	±1880.0	-29.30	±1909.8	PASS
	-20	-31.98		-34.33		-20.70		
	-10	-58.70		-38.46		-25.80		
	0	-69.18		-80.51		-78.91		
	+10	-59.52		-92.31		-79.72		
	+20	-55.93		-50.33		-50.86		
	+30	-107.37		-104.69		-101.50		
	+40	-166.32		-159.58		-151.77		
	+50	-172.41		-162.90		-158.95		
4.2	+25	-60.55		-46.71		-47.35		
3.5	+25	-59.16		-52.00		-47.42		

## **4.5 Conducted Out of Band Emissions**

### **4.5.1 Requirement**

According to 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, which is calculated to be -13dBm.

### **4.5.2 Test Procedure**

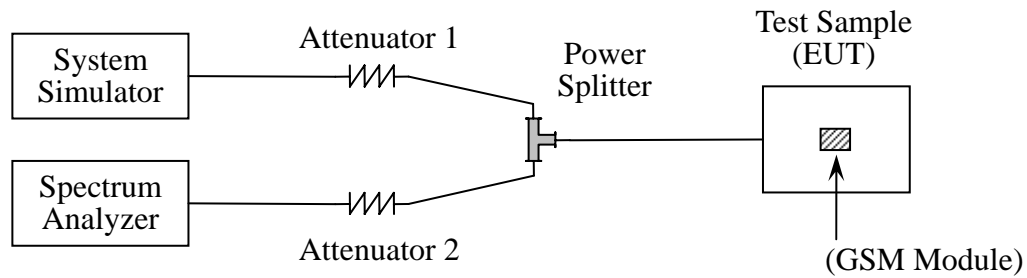
- (a) The lowest, middle and highest channels of the EUT\_GSMmodule are employed to perform this test.
- (b) The test frequency range is from 9kHz to the 10th harmonic of the fundamental frequency.
- (c) The Spectrum Analyzer is set as below:
  - Resolution BW: 1MHz
  - Video BW: Auto
  - Sweep Time: Suitable to capture one transmission burst
  - Detector Mode: Peak
  - Trace Mode: Max Hold
- (d) Adjust the frequency range to capture the highest level of the emission. The value is recorded and compared with the limit line.

### **4.5.3 Test Setup**

#### **1. Test Setup Sketch**

The Test Sample (EUT) with the EUT\_GSMmodule embedded, powered by the Battery, is coupled to a Spectrum Analyzer and a System Simulator with appropriate Attenuators via a Power Splitter; the RF load attached to the antenna terminal of the EUT\_GSMmodule is 50Ohm. The path loss as the factor is calibrated to correct the reading.

The EUT\_GSMmodule is allocated a traffic channel and operates at the corresponding working band under the condition of its maximum output power.



## 2. Equipments List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Agilent	E5515C	GB43130131	2006.06	1year
Spectrum Analyzer	Agilent	E7405A	US44210471	2006.07	1year
Power Splitter	Weinschel	1506A	NW521	(n.a.)	(n.a.)
Attenuator 1	Resnet	20dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 2	Resnet	3dB	(n.a.)	(n.a.)	(n.a.)

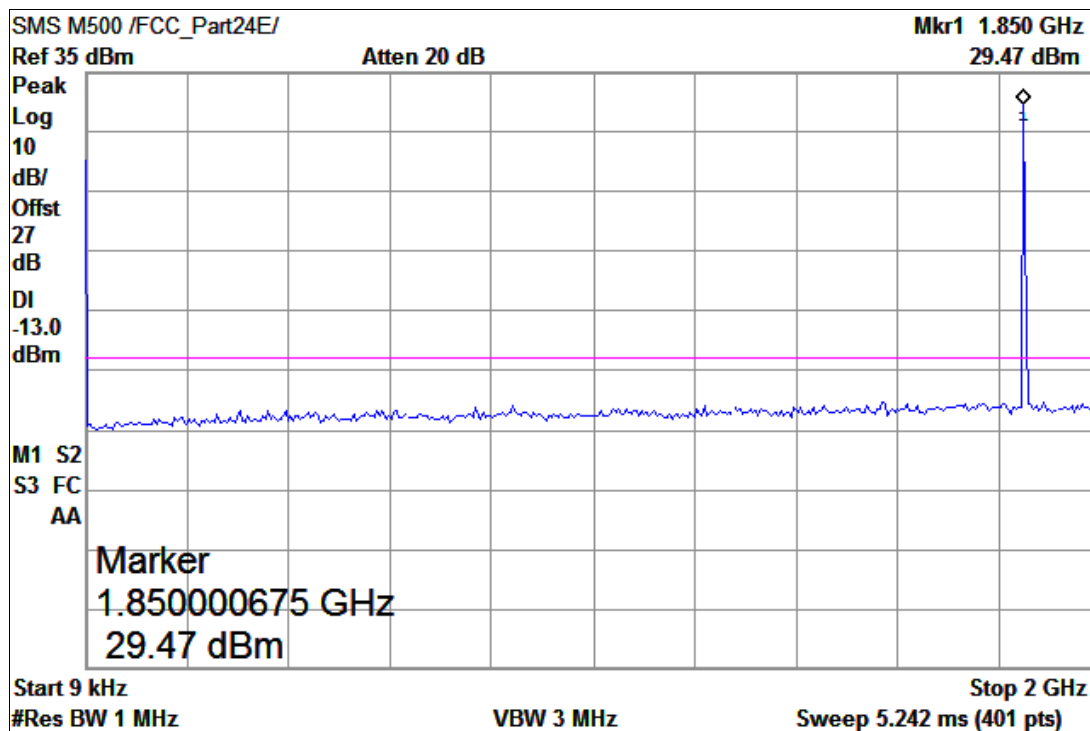
### 4.5.4 Test Result

NOTE: the emissions of Test Sample (EUT) and SS carrier frequencies should be ignored.

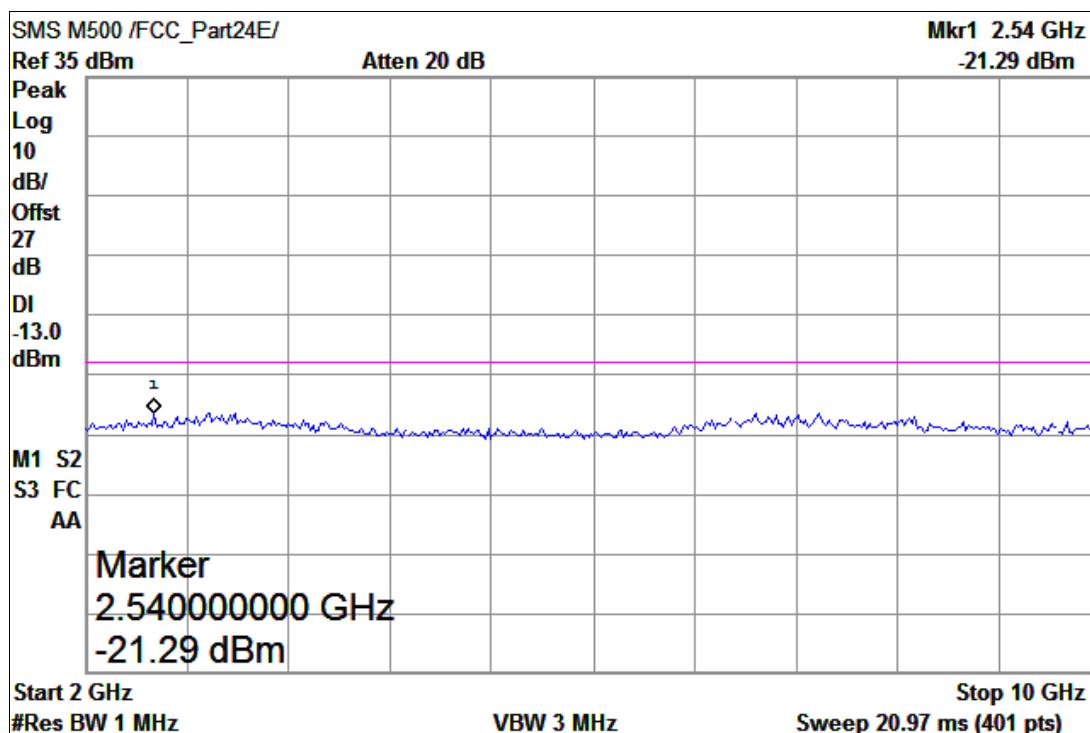
#### a) Test Verdict

Channel	Frequency (MHz)	Measured Max. Spurious Emission (dBm)	Refer to Plot	Limit (dBm)	Verdict
512	1850.2	---	Plot A.1 to A.3	-13	PASS
661	1880.0	---	Plot B.1 to B.3		PASS
810	1909.8	---	Plot C.1 to C.3		PASS

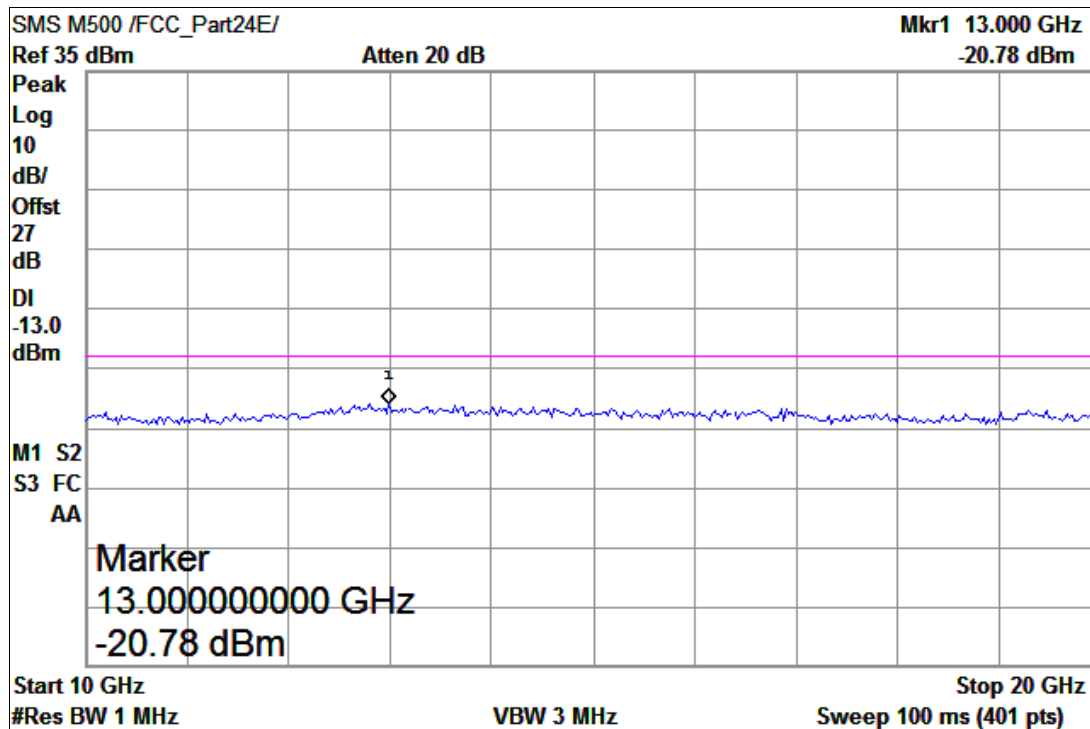
## b) Test Plots for the Whole Measurement Frequency Range



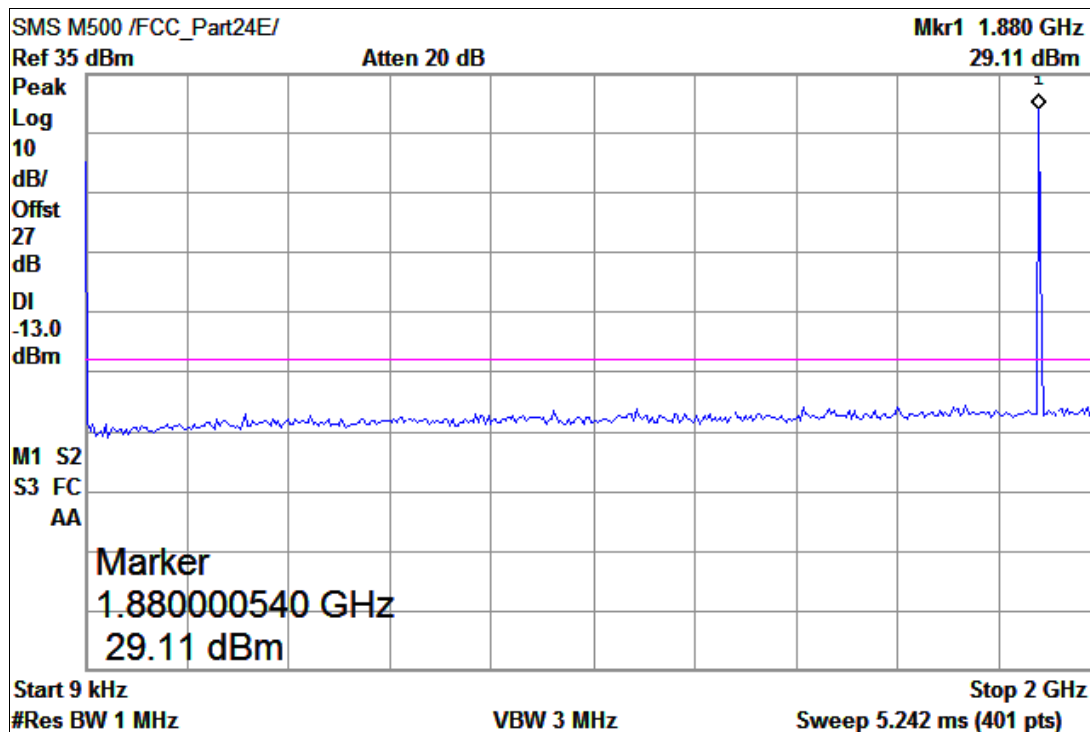
(Plot A.1: Channel = 512, 9kHz to 2GHz)



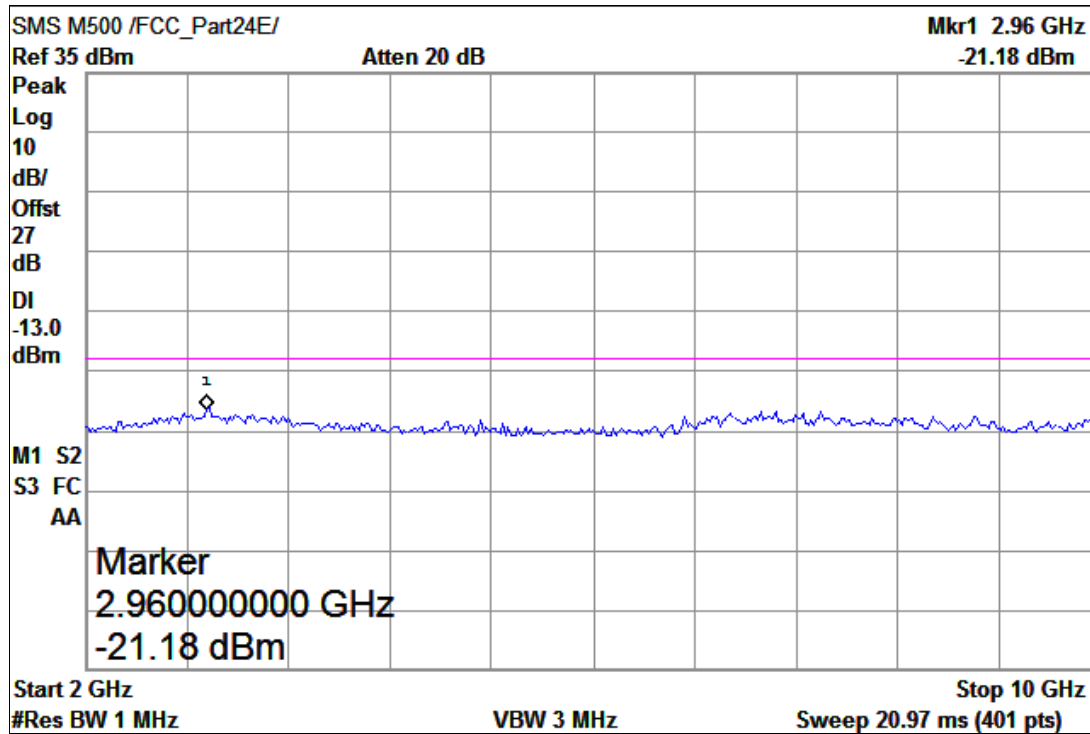
(Plot A.2: Channel = 512, 2GHz to 10GHz)



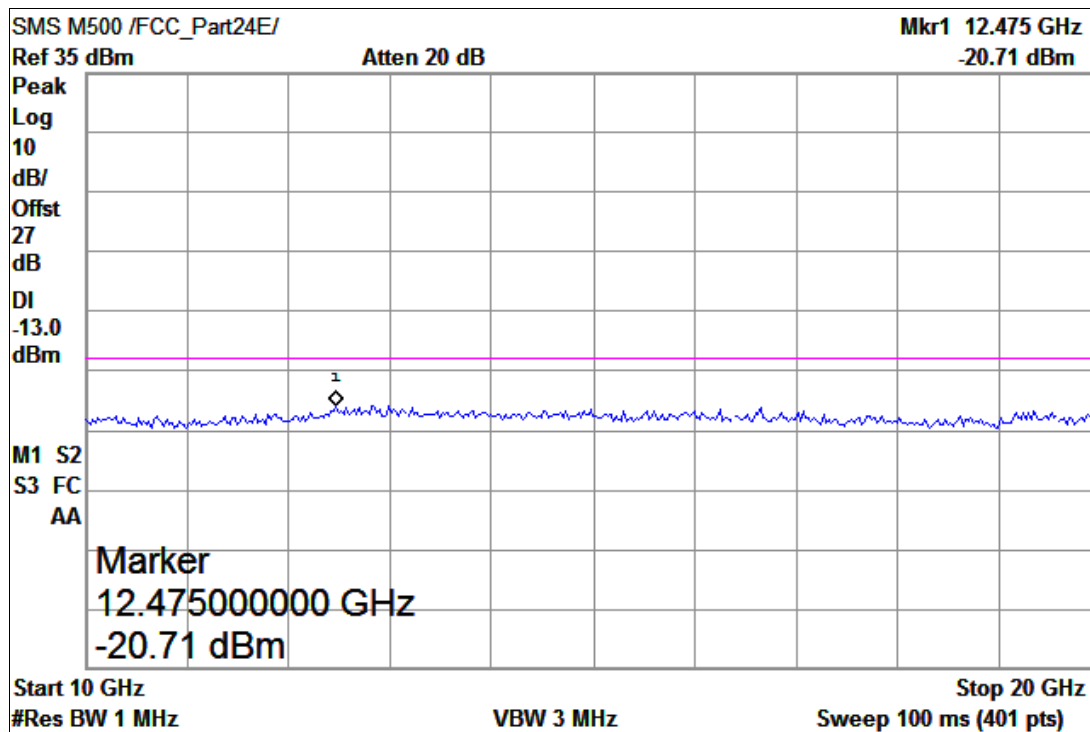
(Plot A.3: Channel = 512, 10GHz to 20GHz)



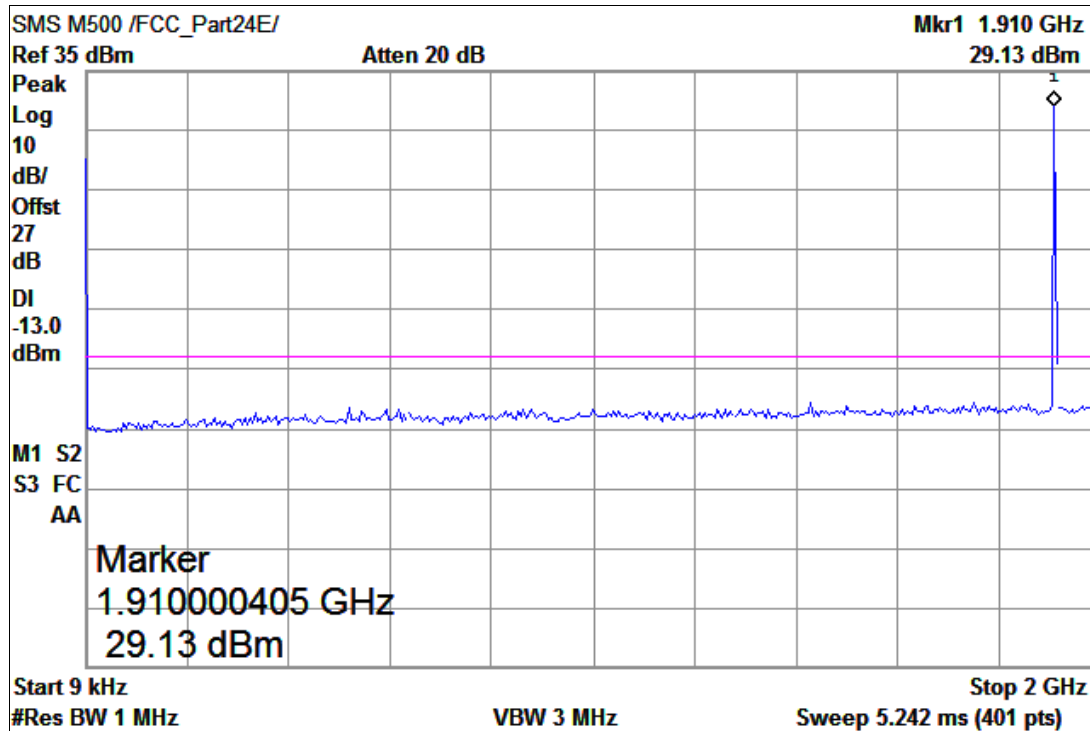
(Plot B.1: Channel = 661, 9kHz to 2GHz)



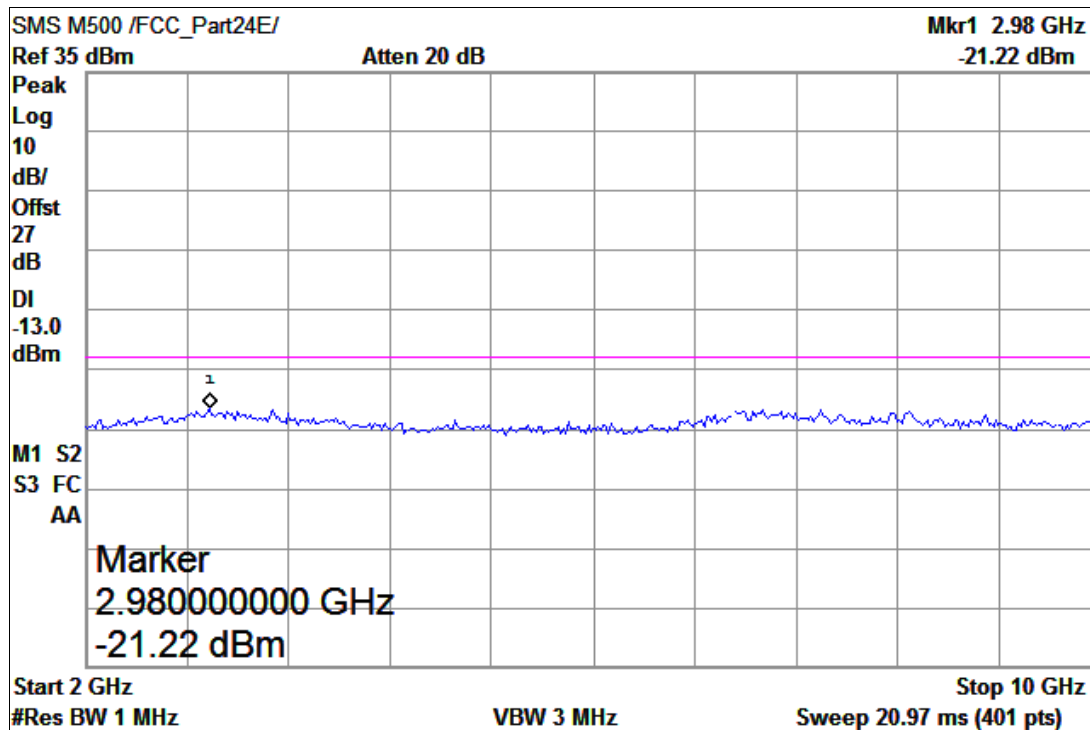
(Plot B.2: Channel = 661, 2GHz to 10GHz)



(Plot B.3: Channel = 661, 10GHz to 20GHz)

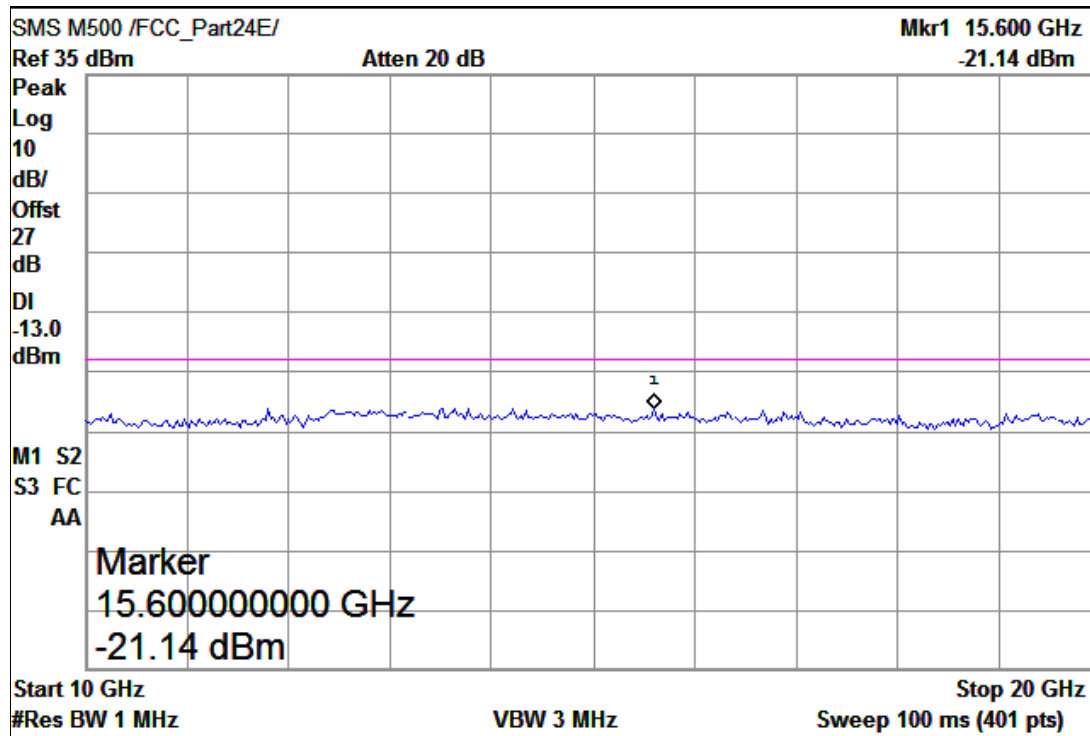


(Plot C.1: Channel = 810, 9kHz to 2GHz)



(Plot C.2: Channel = 810, 2GHz to 10GHz)





(Plot C.3: Channel = 810, 10GHz to 20GHz)

## **4.6 Band Edge**

### **4.6.1 Requirement**

According to FCC section 24.238(b), 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.

### **4.6.2 Test Procedure**

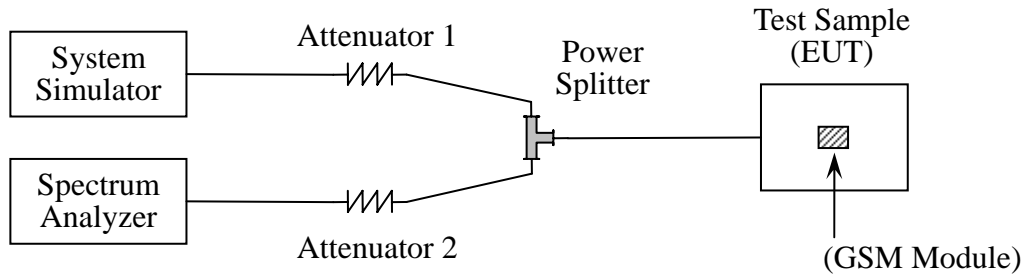
- (a) The lowest and highest channels of the EUT\_GSMmodule are employed to perform this test.
- (b) The Spectrum Analyzer is set as below:
  - Frequency Range: 1MHz bands immediately outside and adjacent to the frequency block
  - Resolution BW: 3kHz
  - Video BW: 3kHz
  - Sweep Time: Suitable to capture one transmission burst
  - Detector Mode: Peak
  - Trace Mode: Max Hold
- (c) Find the peak value of the trace from the Spectrum Analyzer over the test frequency range and record its power.

### **4.6.3 Test Setup**

#### **1. Test Setup Sketch**

The Test Sample (EUT) with the EUT\_GSMmodule embedded, powered by the Battery, is coupled to a Spectrum Analyzer and a System Simulator with appropriate Attenuators via a Power Splitter; the RF load attached to the antenna terminal of the EUT\_GSMmodule is 50Ohm. The path loss as the factor is calibrated to correct the reading.

The EUT\_GSMmodule is allocated a traffic channel and operates at the corresponding working band under the condition of its maximum output power.



## 2. Equipments List

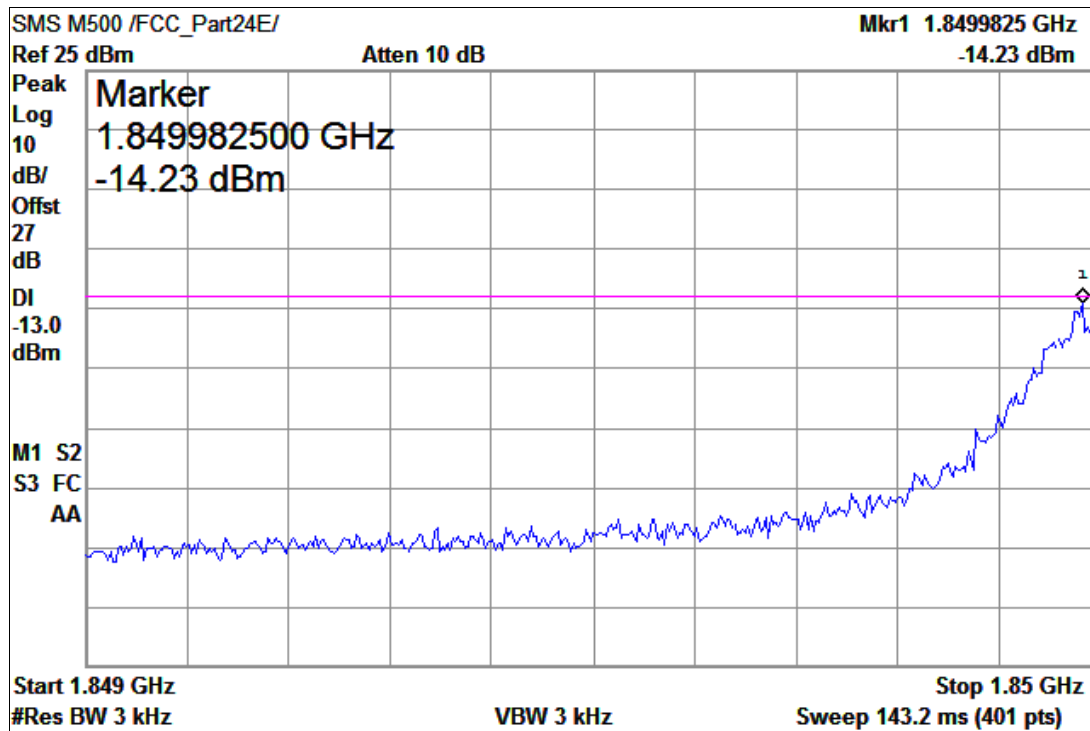
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
System Simulator	Agilent	E5515C	GB43130131	2006.06	1year
Spectrum Analyzer	Agilent	E7405A	US44210471	2006.07	1year
Power Splitter	Weinschel	1506A	NW521	(n.a.)	(n.a.)
Attenuator 1	Resnet	20dB	(n.a.)	(n.a.)	(n.a.)
Attenuator 2	Resnet	3dB	(n.a.)	(n.a.)	(n.a.)

### 4.6.4 Test Result

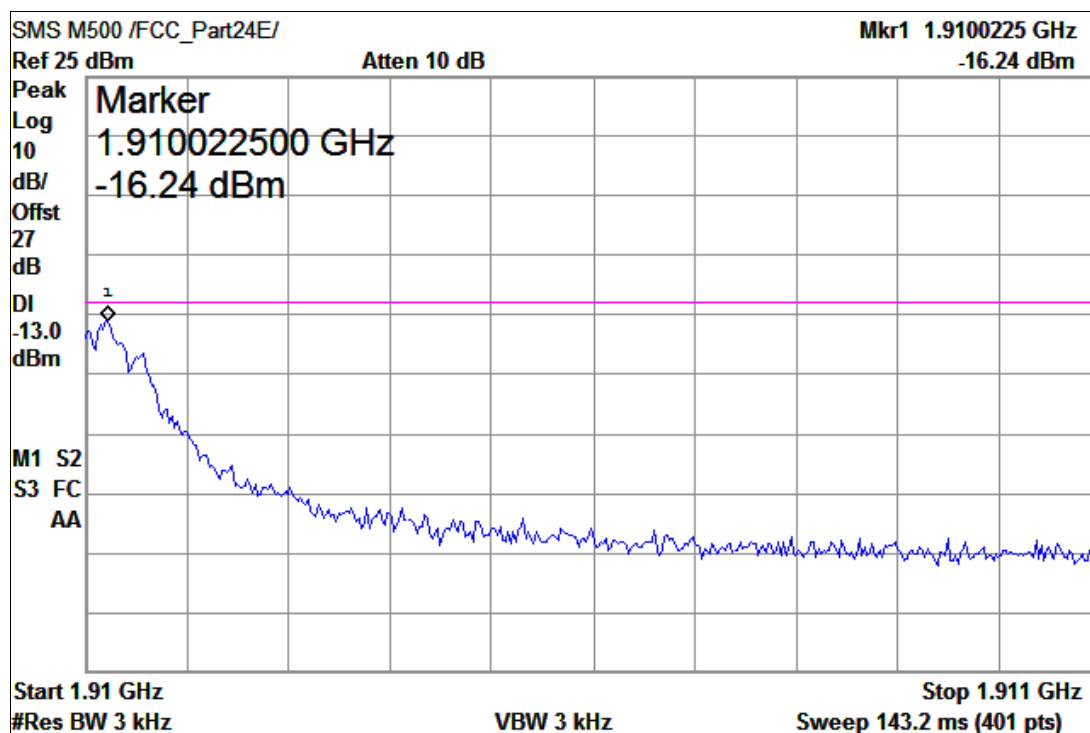
#### a) Test Verdict

Channel	Frequency (MHz)	Measured Max. Band Edge Emission (dBm)	Refer to Plot	Limit (dBm)	Verdict
512	1850.2	-14.23	Plat A	-13	PASS
810	1909.8	-16.24	Plot B		PASS

## b) Test Plots



(Plot A: Channel = 512)



(Plot B: Channel = 810)

## **4.7 Transmitter Radiated Power (EIRP/ERP)**

### **4.7.1 Requirement**

According to FCC section 24.232, the broadband PCS mobile station is limited to 2Watts E.I.R.P. peak power.

### **4.7.2 Test Procedure**

- (a) The lowest, middle and highest channels of the EUT\_GSMmodule are employed to perform this test.
- (b) The Spectrum Analyzer is set as below:
  - Center Frequency: The frequency of the channel under test
  - Resolution BW: 1MHz
  - Video BW: Auto
  - Frequency Span: Wide enough to cover the complete power envelope of the signal
  - Sweep Time: Suitable to capture one transmission burst
  - Detector Mode: Peak
  - Trace Mode: Max Hold
- (c) Rotate the Turn Table and vary the polarization of the Test Antenna to find the peak value of the trace from the Spectrum Analyzer and record its power as the maximum radiated power.

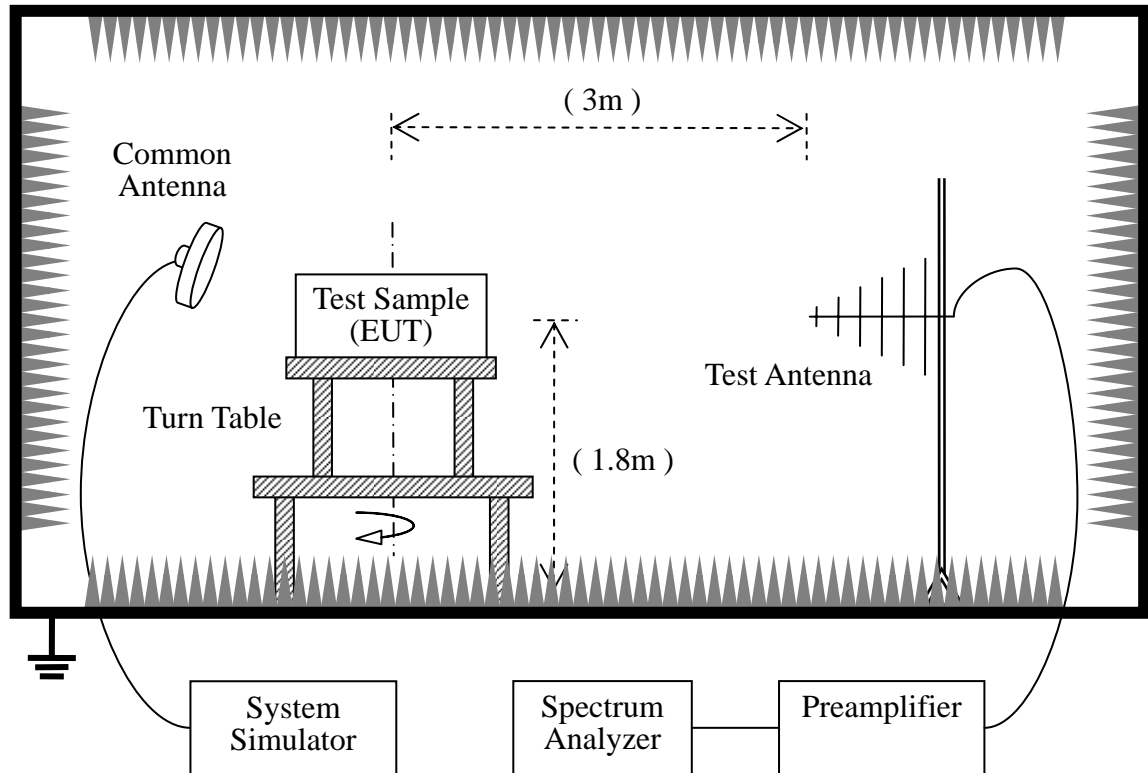
### **4.7.3 Test Setup**

#### **1. Test Setup Sketch**

The test is performed in a 3m Full-Anechoic Chamber. The Test Sample (EUT) with the EUT\_GSMmodule embedded, powered by the Battery, is placed on a 1.8m high insulating Turn Table and keeps 3m away from the Test Antenna which is a Bi-Log one with working frequency range from 30MHz to 3GHz. The Test Antenna is located at the same height as the Test Sample (EUT). If applicable, a Preamplifier is employed for the measuring instrument of Spectrum Analyzer. The factor of the whole system is pre-calibrated using the "Substitution" method and calculated to correct the reading

The EUT\_GSMmodule is allocated a traffic channel and operates at the corresponding working band under the condition of its maximum output power.

The Test Sample (EUT) works together with a System Simulator via a Common Antenna.



## 2. Equipments List

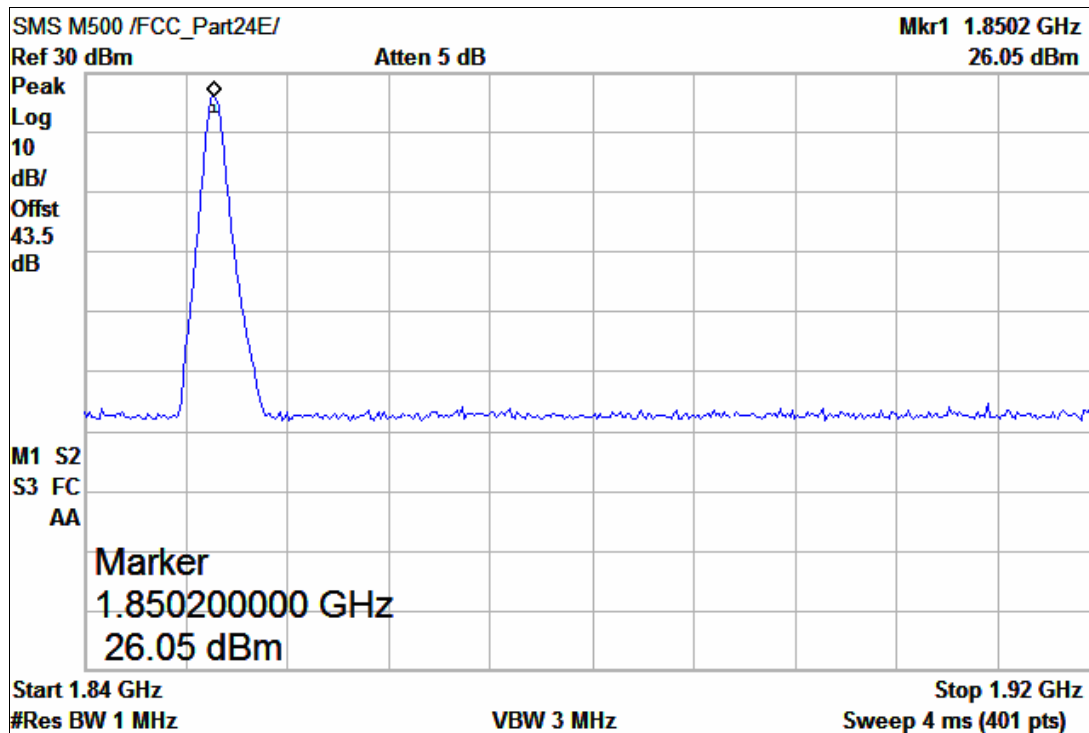
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E7405A	US44210471	2006.07	1year
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2006.08	2year
Test Antenna (Bi-Log)	Schwarzbeck	VULB 9163	9163-274	2006.07	1year
System Simulator	Agilent	E5515C	GB43130131	2006.06	1year
Preamplifier	(n.a.)	20dB	(n.a.)	(n.a.)	(n.a.)
Common Antenna	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)

## 4.7.4 Test Result

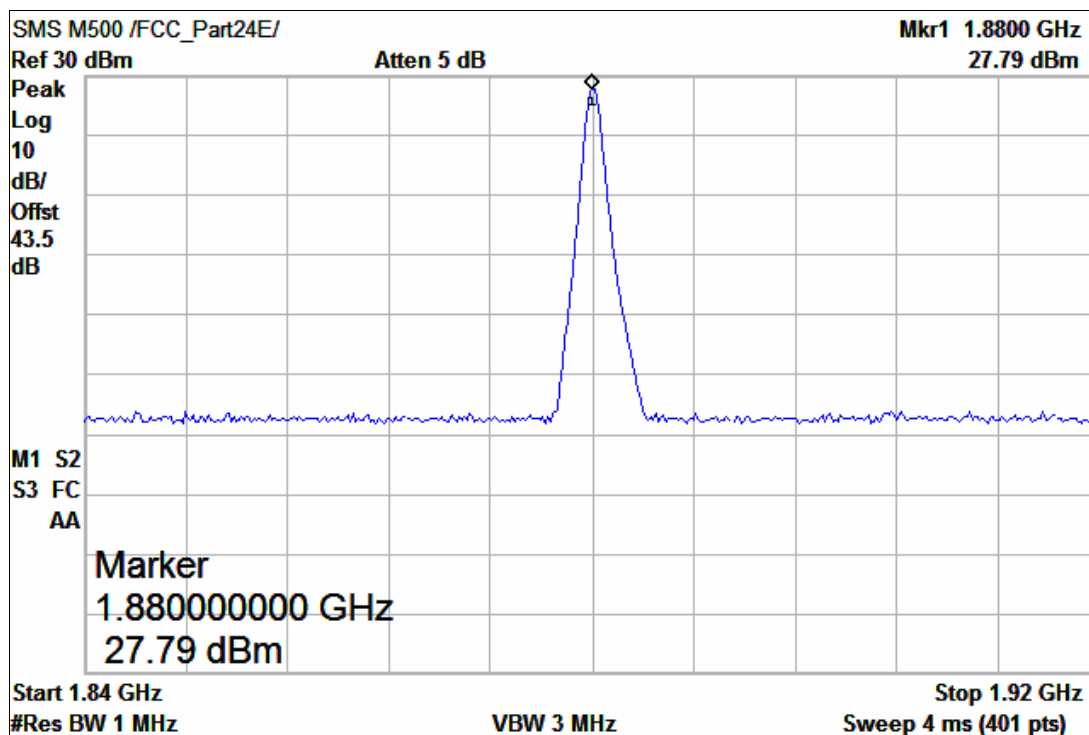
### a) Test Verdict

Channel	Frequency (MHz)	Measured EIRP			Limit		Verdict
		dBm	W	Refer to Plot	dBm	W	
512	1850.2	26.05	0.40	Plot A	33	2	PASS
661	1880.0	27.79	0.60	Plot B			PASS
810	1909.8	26.46	0.44	Plot C			PASS

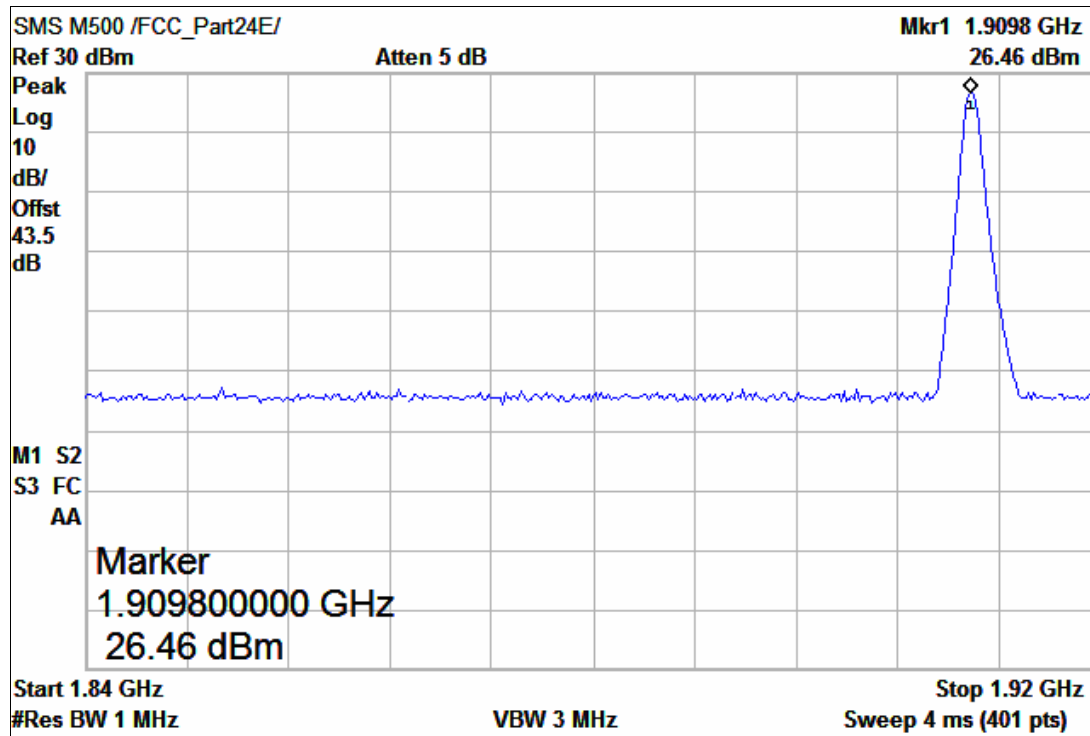
## b) Test Plots



(Plot A: Channel = 512)



(Plot B: Channel = 661)



(Plot C: Channel = 810)



## **4.8 Radiated Out of Band Emissions**

### **4.8.1 Requirement**

According to 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, which is calculated to be -13dBm.

### **4.8.2 Test Procedure**

- (a) The lowest, middle and highest channels of the EUT\_GSMmodule are employed to perform this test.
- (b) The test frequency range is from 30MHz to the 10th harmonic of the fundamental frequency.
- (c) The Spectrum Analyzer is set as below:
  - Resolution BW: 1MHz
  - Video BW: Auto
  - Sweep Time: Suitable to capture one transmission burst
  - Detector Mode: Peak
  - Trace Mode: Max Hold
- (d) Adjust the frequency range and rotate the Turn Table to capture the highest level of the emission. The value is recorded and compared with the limit line.
- (e) Both the Vertical and the Horizontal polarizations of the Test Antenna are employed to perform this test.

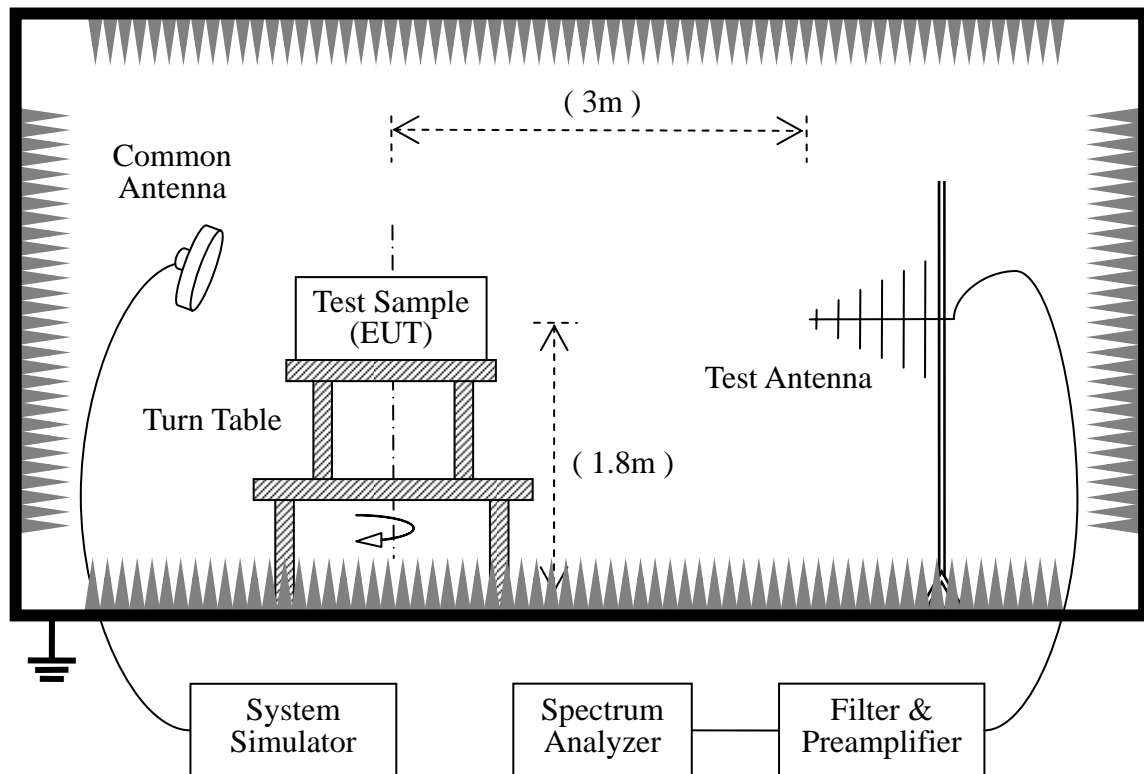
### **4.8.3 Test Setup**

#### **1. Test Setup Sketch**

The test is performed in a 3m Full-Anechoic Chamber. The Test Sample (EUT) with the EUT\_GSMmodule embedded, powered by the Battery, is placed on a 1.8m high insulating Turn Table and keeps 3m away from the Test Antenna which is a Bi-Log one with working frequency range from 30MHz to 3GHz while a Horn one with working frequency range above 3GHz. The Test Antenna is located at the same height as the Test Sample (EUT). If applicable, a Filter (Notch and High-Pass) and a Preamplifier are employed for the measuring instrument of Spectrum Analyzer. The factor of the whole system is pre-calibrated using the "Substitution" method and calculated to correct the reading

The EUT\_GSMmodule is allocated a traffic channel and operates at the corresponding working band under the condition of its maximum output power.

The Test Sample (EUT) works together with a System Simulator via a Common Antenna.



## 2. Equipments List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E7405A	US44210471	2006.07	1year
Full-Anechoic Chamber	Albatross	9m*6m*6m	(n.a.)	2006.08	2year
Test Antenna (Bi-Log)	Schwarzbeck	VULB 9163	9163-274	2006.07	1year
Test Antenna (Horn)	Schwarzbeck	BBHA 9120C	9120C-384	2006.07	1year
System Simulator	Agilent	E5515C	GB43130131	2006.06	1year
Preamplifier	(n.a.)	20dB	(n.a.)	(n.a.)	(n.a.)
Filter (Notch)	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)
Filter (High-Pass)	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)
Common Antenna	(n.a.)	(n.a.)	(n.a.)	(n.a.)	(n.a.)

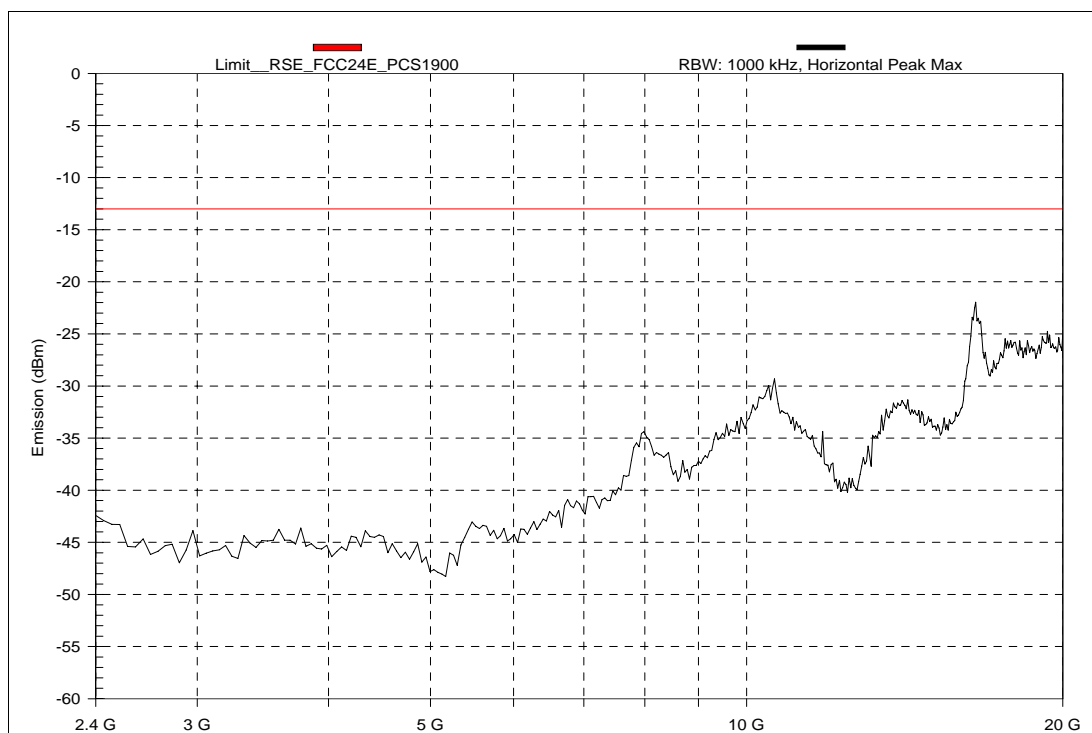
### 4.8.4 Test Result

NOTE: the emissions of Test Sample (EUT) and SS carrier frequencies should be ignored.

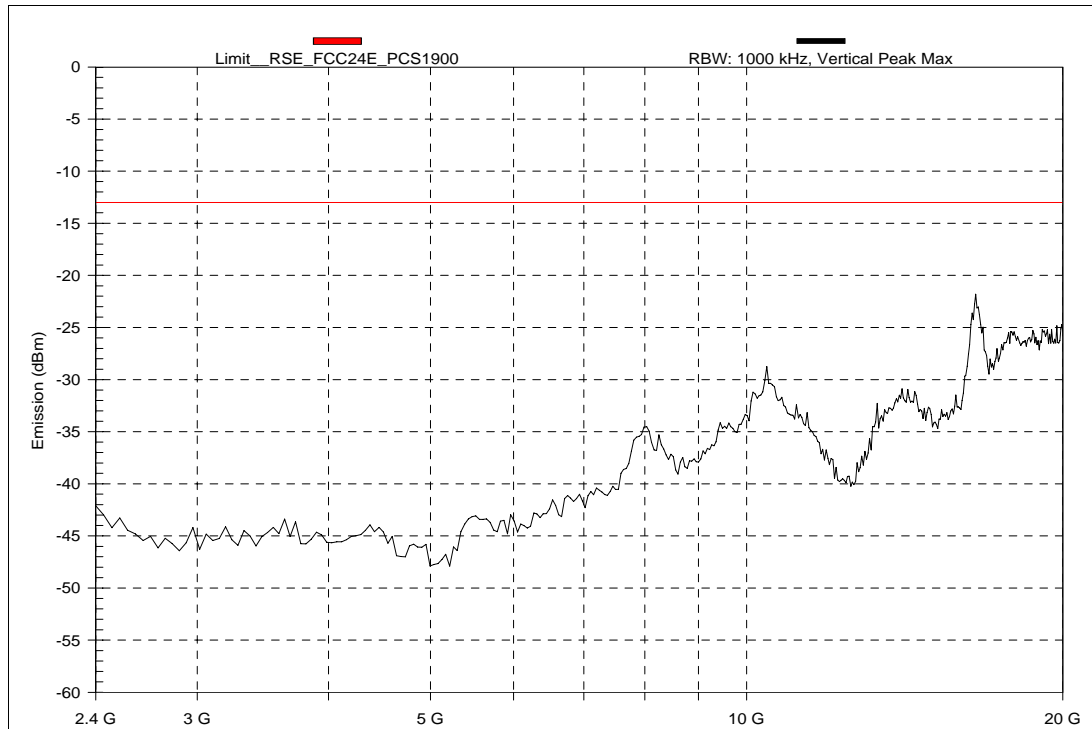
## a) Test Verdict

Channel	Frequency (MHz)	Measured Max. Spurious Emission (dBm)		Refer to Plot	Limit (dBm)	Verdict
		Test Antenna Horizontal	Test Antenna Vertical			
512	1850.2	< -20	< -20	Plot A.1/A.2	-13	PASS
661	1880.0	< -20	< -20	Plot B.1/B.2		PASS
810	1909.8	< -20	< -20	Plot C.1/C.2		PASS

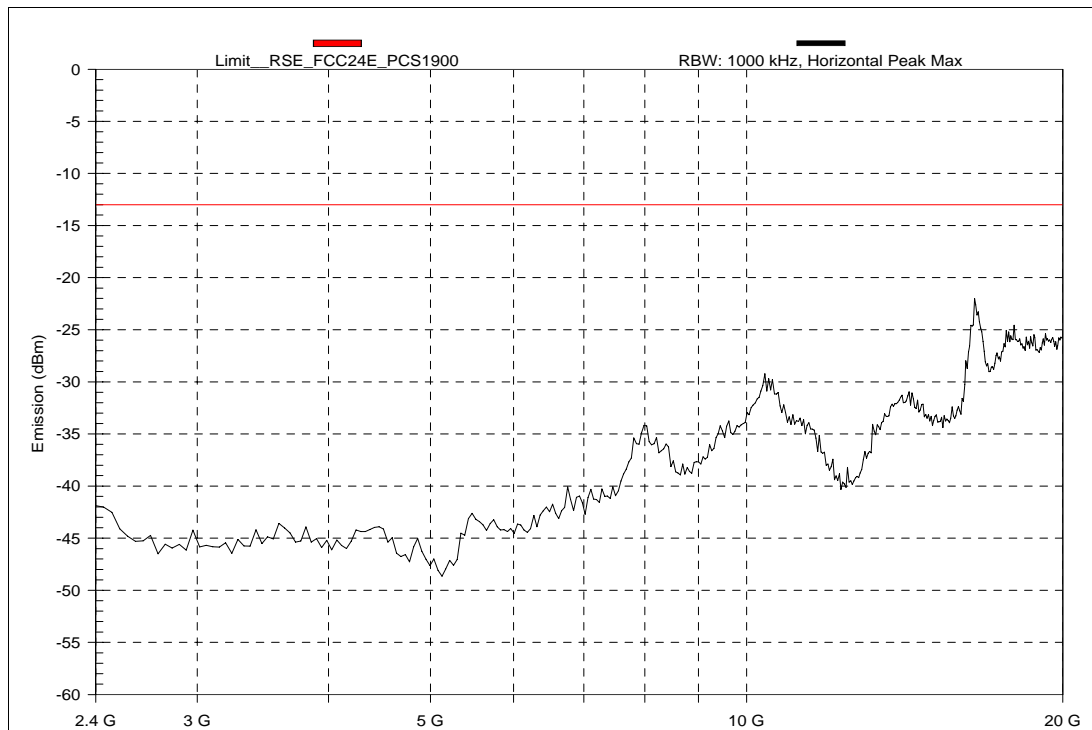
## b) Test Plots for the Whole Measurement Frequency Range



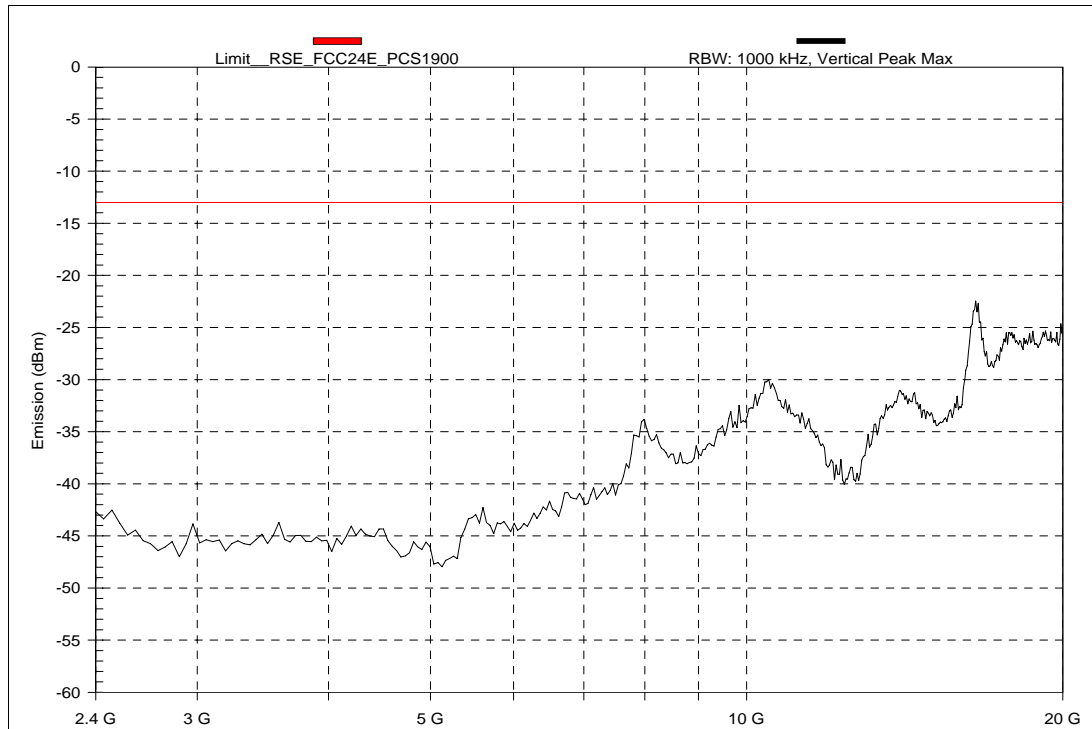
(Plot A.1: Channel = 512, Test Antenna Horizontal)



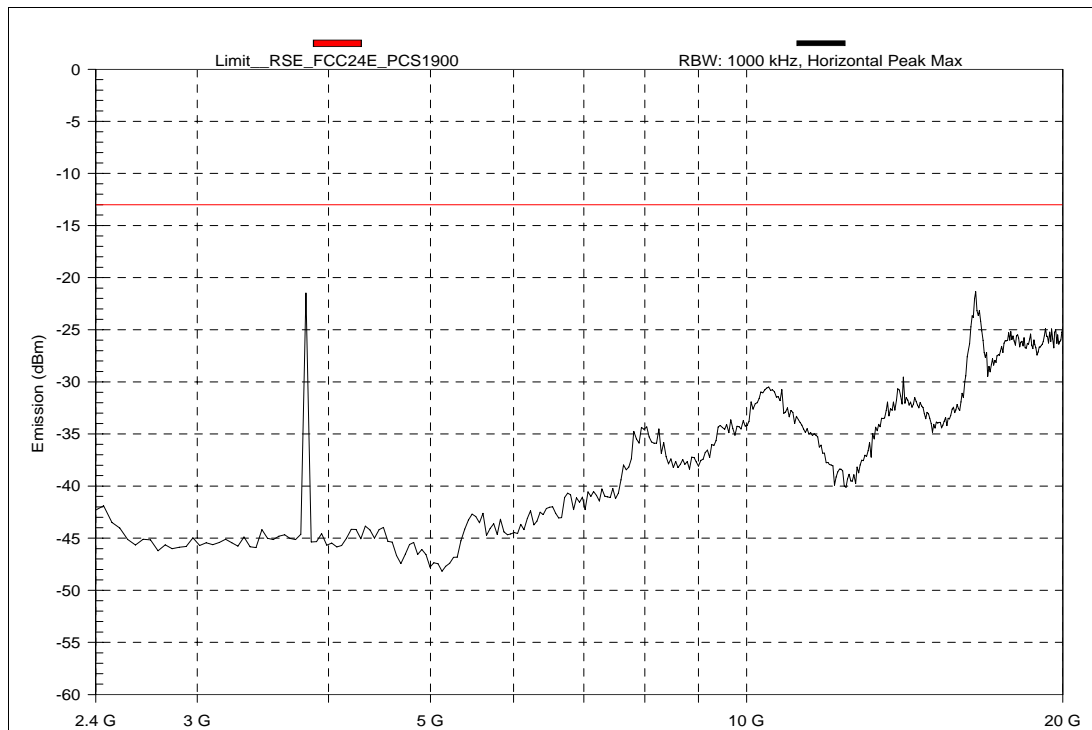
(Plot A.2: Channel = 512, Test Antenna Vertical)



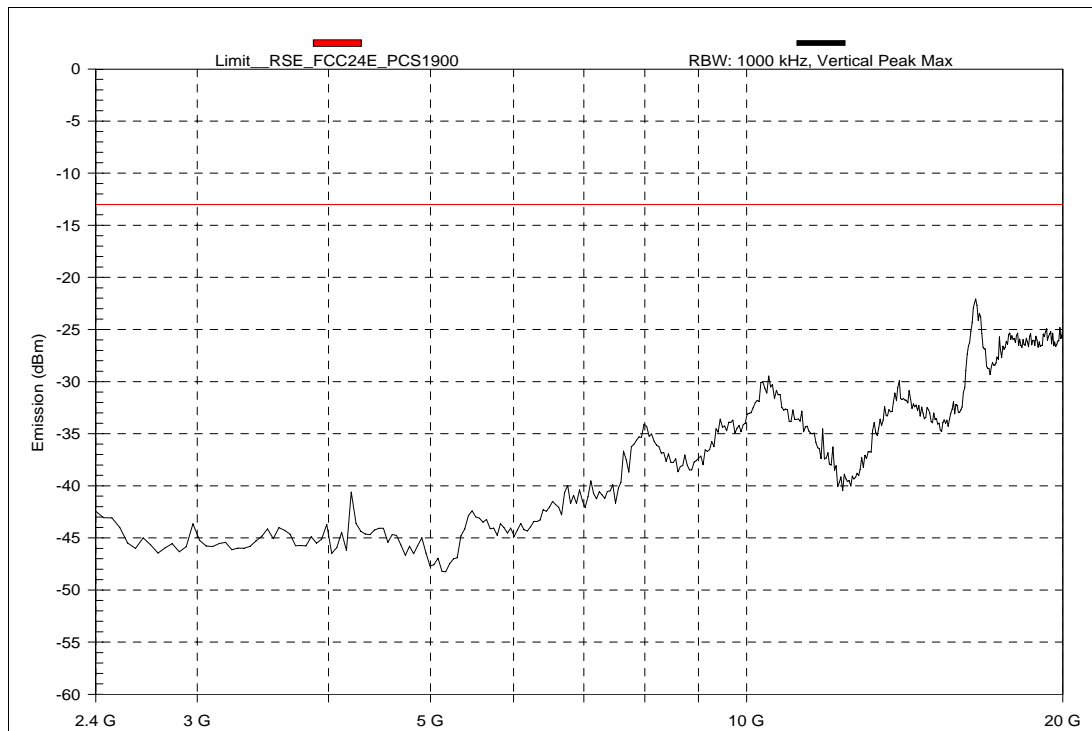
(Plot B.1: Channel = 661, Test Antenna Horizontal)



(Plot B.2: Channel = 661, Test Antenna Vertical)



(Plot C.1: Channel = 810, Test Antenna Horizontal)



(Plot C.2: Channel = 810, Test Antenna Vertical)

\*\* END OF REPORT \*\*