

# FCC TEST REPORT (PART 22)

**REPORT NO.:** RF950808H02

**MODEL NO.:** GPX-100

**RECEIVED:** Sep. 21, 2006

**TESTED:** Nov. 01 ~ 08, 2006

**ISSUED:** Nov. 13, 2006

**APPLICANT:** 3G Quest Technologies, Inc.

**ADDRESS:** 171 School Street, Acton, MA 01720, U.S.A.

**ISSUED BY:** Advance Data Technology Corporation

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Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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## 1 CERTIFICATION

**PRODUCT:** AVL(Automatic Vehicle Locator)

**MODEL:** GPX-100

**BRAND:** 3G Quest

**APPLICANT:** 3G Quest Technologies, Inc.

**TESTED:** Nov. 01 ~ 08, 2006

**TEST SAMPLE:** ENGINEERING SAMPLE

**TEST STANDARDS:** FCC Part 22, Subpart H  
ANSI C63.4-2003

The above equipment has been tested by **Advance Data Technology Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**PREPARED BY** : Rennie Wang , **DATE:** Nov. 13, 2006  
Rennie Wang

**TECHNICAL**  
**ACCEPTANCE** : Long Chen , **DATE:** Nov. 13, 2006  
Responsible for RF Long Chen

**APPROVED BY** : Gary Chang , **DATE:** Nov. 13, 2006  
Gary Chang / Supervisor

## 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 22 & Part 2 / IC RSS-132			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
2.1046 22.913 (a)	Maximum Peak Output Power Limit: max. 7 watts e.r.p peak power	PASS	Meet the requirement of limit. Minimum passing margin is 30.41dBm at 836.6MHz.
2.1055	Frequency Stability AFC Freq. Error vs. Voltage AFC Freq. Error vs. Temperature Limit: max. $\pm 2.5$ ppm	PASS	Meet the requirement of limit.
2.1049 (h)	Occupied Bandwidth	PASS	Meet the requirement of limit.
22.917	Band Edge Measurements	PASS	Meet the requirement of limit.
2.1051 22.917	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 22.917	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -38.86dB at 259.38MHz.

## 2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz ~ 30MHz	2.44dB
Radiated emissions	30MHz ~ 200MHz	3.59dB
	200MHz ~1000MHz	3.61dB
	1GHz ~ 18GHz	2.26dB
	18GHz ~ 40GHz	1.94dB

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

### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	AVL(Automatic Vehicle Locator)
<b>MODEL NO.</b>	GPX-100
<b>FCC ID</b>	UPEJVAS-QG01
<b>POWER SUPPLY</b>	12.0Vdc from car charger
<b>MODULATION TYPE</b>	GMSK for GSM
<b>FREQUENCY RANGE</b>	Tx: 824.2MHz ~ 848.8MHz Rx: 869.2MHz ~ 893.8MHz
<b>NUMBER OF CHANNEL</b>	124
<b>MAX. CONDUCTED PEAK OUTPUT POWER</b>	32.95dBm (1.97242W)
<b>MAX. ERP POWER</b>	30.41dBm (1.09901W)
<b>ANTENNA TYPE</b>	Dipole antenna with 0dBi gain
<b>DATA CABLE</b>	5m non-shielded GPS antenna cable with one core
<b>I/O PORTS</b>	Refer to user's manual
<b>ASSOCIATED DEVICES</b>	GPS antenna
<b>EUT EXTREME VOL. RANGE</b>	9.0Vdc to 15.0Vdc

**NOTE:**

1. The applicant defined the normal working voltage of the battery is from 9.0Vdc to 15.0Vdc.
2. The EUT is a AVL(Automatic Vehicle Locator). This report is only covered the functions of GSM850. And the PCS1900 mobile phone function is covered in another test report, which standard used is FCC Part 24.
3. The EUT was operated with following car charger:

<b>BRAND:</b>	COMING DATA
<b>MODEL:</b>	CP1210
<b>INPUT:</b>	100-240Vac, 50-60Hz, 0.5A
<b>OUTPUT:</b>	12Vdc, 1A
<b>POWER LINE:</b>	DC 1.5m non-shielded cable with one core

4. IMEI code: 352823-01-003867.
5. Hardware version: 1.0.
6. Software version: 1.0.
7. The above EUT information was declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or User's Manual.

### 3.2 DESCRIPTION OF TEST MODES

124 channels are provided to this EUT in the GSM850 band. Therefore, the low, middle and high channels are chosen for testing.

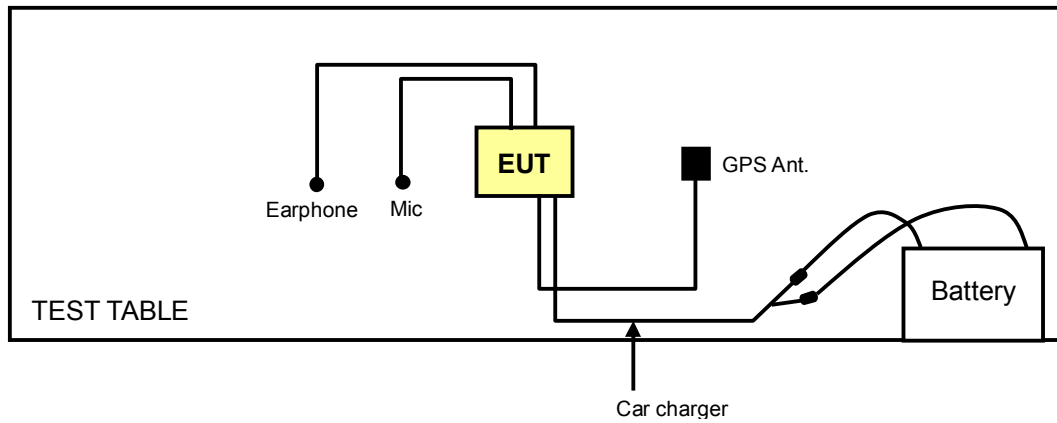
	CHANNEL	FREQUENCY	MODE
LOW	128	824.2 MHz	GSM
MIDDLE	190	836.6 MHz	GSM
HIGH	251	848.8 MHz	GSM

**NOTE:**

1. Below 1 GHz, the channel 128, 190, and 251 were pre-tested in chamber. The channel 128 was chosen for final test.
2. Above 1 GHz, the channel 128, 190, and 251 were tested individually.
3. When the Power Control Level set 5, the worst case, was chosen for final test.
4. The channel space is 0.2MHz.
5. The EUT was pre-tested on the positioned of each 3 axis. The worst case was found when positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.



### 3.2.1 CONFIGURATION OF SYSTEM UNDER TEST



### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO							DESCRIPTION
	OP	FS	OB	BE	CE	RE<1G	RE≥1G	
-	√	√	√	√	√	√	√	-

Where **OP**: Output power **FS**: Frequency stability  
**OB**: Occupied bandwidth **BE**: Band edge  
**CE**: Conducted spurious emissions **RE<1G**: Radiated emission below 1GHz  
**RE≥1G**: Radiated emission above 1GHz

#### **OUTPUT POWER MEASUREMENT:**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, xyz axis and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	AXIS
128 to 251	128, 190, 251	GSM	X

#### **FREQUENCY STABILITY MEASUREMENT:**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY
128 to 251	128	GSM

#### **OCCUPIED BANDWIDTH MEASUREMENT:**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY
128 to 251	128, 190, 251	GSM

### **BAND EDGE MEASUREMENT:**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY
128 to 251	128, 251	GSM

### **CONDUCTED SPURIOUS EMISSIONS MEASUREMENT:**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY
128 to 251	128, 190, 251	GSM

### **RADIATED EMISSION MEASUREMENT (BELOW 1 GHz):**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, xyz axis and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	AXIS
128 to 251	128	GSM	X

### **RADIATED EMISSION MEASUREMENT (ABOVE 1 GHz):**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, xyz axis and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	AXIS
128 to 251	128, 190, 251	GSM	X

### 3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a AVL(Automatic Vehicle Locator). According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 22**

**IC RSS-132**

**ANSI C63.4-2003**

**ANSI/TIA/EIA-603-A**

**NOTE:** All test items have been performed and recorded as per the above standards.

### 3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	CAL. DATE
1	Universal Radio Communication Tester	R&S	CMU200	104484	Jan. 23, 2007
2	MICROPHONE	Labtec	LVA7313	M5-010083	NA
3	EARPHONE	PHILIPS	SBC HL125	H2-010067	NA
4	DC 12V BATTERY	NA	NA	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.0m shielded cable without core
3	1.2m shielded cable without core
4	NA

**NOTE:** All power cords of the above support units are non shielded (1.8m).

## **4 TEST TYPES AND RESULTS**

### **4.1 OUTPUT POWER MEASUREMENT**

#### **4.1.1 LIMITS OF OUTPUT POWER MEASUREMENT**

The radiated peak output power shall be according to the specific rule Part 22.913 (a) that “Mobile / Portable station are limited to 7 watts e.r.p”.

#### 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESMI	839013/007 839379/002	Jan. 24, 2007
Spectrum Analyzer ROHDE & SCHWARZ	FSEK30	100049	Aug. 21, 2007
BILOG Antenna SCHWARZBECK	VULB9168	9168-153	Jan. 15, 2007
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-407	Jan. 22, 2007
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 19, 2007
Preamplifier Agilent	8449B	3008A01911	Sep. 13, 2007
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	218188/218189	Dec. 13, 2006
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Mar. 08, 2007
Software ADT.	ADT_Radiated_ V7.6.01	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA
Antenna Tower Controller EMCO	2090	NA	NA
Turn Table EMCO	2087-2.03	NA	NA
Turn Table Controller EMCO	2090	NA	NA

**NOTE:**

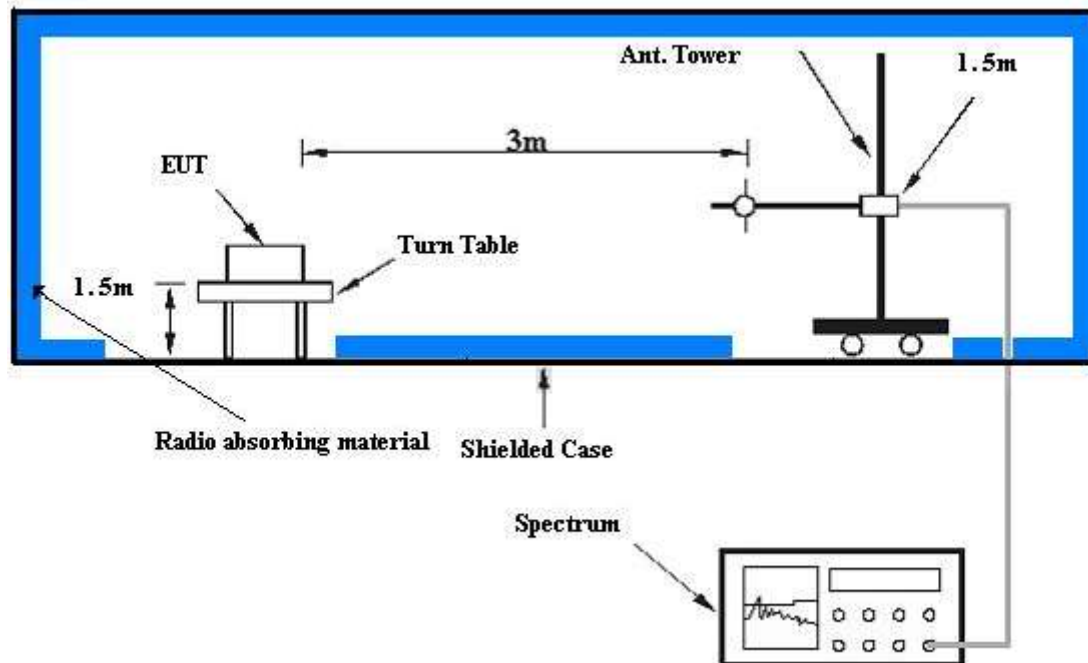
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 9.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The IC Site Registration No. is IC4924A-9.

#### 4.1.3 TEST PROCEDURES

- a. The EUT was set up for the maximum peak power with GSM link data modulation. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels: 128, 190 and 251 (low, middle and high operational frequency range).
- b. The conducted peak output power used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer. The path loss included the splitter loss, cable loss and 20dB pad loss. The spectrum set RB/VB 3MHz, then read peak power value and record to the test. (All transmitted path loss shall be considered in the test report data.)
- c. E.I.R.P peak power measurement. In the fully anechoic chamber, EUT placed on the 1.5m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- d. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the calibration antenna. Rotated the Turn Table to find the maximum radiation power. "Raw" is the spectrum reading value, "SG" is signal generator export power, "TX Gain" is calibration antenna isotropic gain value, "TX cable" is the transmitted cable loss between the calibration antenna and signal generator. The "Factor" means that the transmission path loss is equal to "SG" - "TX cable" + "TX Gain" - "Raw".
- e. Actually the real E.I.R.P peak power is equal to "Read Value" + "Factor".
- f. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,  
$$\text{E.R.P power} = \text{E.I.P.R power} - 2.15\text{dBi}.$$

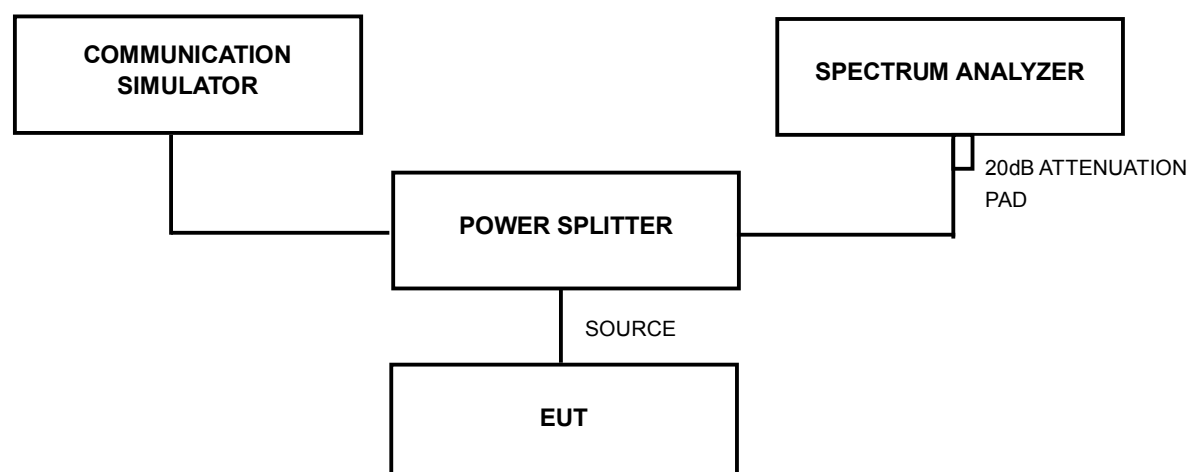
#### 4.1.4 TEST SETUP

##### EIRP POWER MEASUREMENT:



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

##### CONDUCTED POWER MEASUREMENT:



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



#### 4.1.5 EUT OPERATING CONDITIONS

- a. The EUT makes a phone call to the communication simulator.
- b. The communication simulator station system controlled an EUT to export maximum output power under transmission mode and specific channel frequency.

#### 4.1.6 TEST RESULTS

MODE	TX connected	DETECTOR FUNCTION	Average
ENVIRONMENTAL CONDITIONS	25deg°C, 70%RH, 991hPa	TESTED BY	Match Tsui

#### FOR GSM MODE (UP-LINK WITH 1 TIME SLOT)

CONDUCTED PEAK OUTPUT POWER					
CHANNEL NO.	FREQUENCY (MHz)	RAW VALUE (dBm)	CORRECTION FACTOR (dB)	PEAK OUTPUT POWER	
				dBm	Watt
128	824.2	28.29	4.50	32.79	1.90108
<b>190</b>	<b>836.6</b>	<b>28.45</b>	<b>4.50</b>	<b>32.95</b>	<b>1.97242</b>
251	848.8	28.11	4.50	32.61	1.82390

**REMARKS:** 1. Peak Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).  
 2. Correction Factor (dB) = Power Splitter Loss (dB) + Cable Loss (dB).  
 3. The value in bold is the worst.

MODE	TX connected	DETECTOR FUNCTION	Average
ENVIRONMENTAL CONDITIONS	25deg°C, 70%RH, 991hPa	TESTED BY	Match Tsui

FOR GSM MODE (UP-LINK WITH 1 TIME SLOT)

ERP POWER					
CHANNEL NO.	FREQUENCY (MHz)	RAW VALUE (dBm)	CORRECTION FACTOR (dB)	PEAK OUTPUT POWER	
				dBm	Watt
128	824.2	-9.77	40.03	30.26	1.06170
<b>190</b>	<b>836.6</b>	<b>-9.91</b>	<b>40.32</b>	<b>30.41</b>	<b>1.09901</b>
251	848.8	-10.53	40.62	30.09	1.02094

- REMARKS:** 1. Peak Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).  
2. Correction Factor (dB) = Receiver Antenna Gain (dBi) + Cable Loss (dB) + Free Space Loss (dB).  
3. The value in bold is the worst.

## 4.2 FREQUENCY STABILITY MEASUREMENT

### 4.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

According to the FCC part 2.4235 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The frequency error rate is according to the JTC standard that the frequency error rate shall be accurate to within 2.5ppm of the received frequency from the base station. The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with the 2.1055(a)(1) -30°C ~ 50°C.

### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
* ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100035	Mar. 29, 2007
* Hewlett Packard RF cable	8120-6192	01428251	NA
* Suhner RF cable	Sucoflex104	204850/4	NA
* WIT Standard Temperature & Humidity Chamber	TH-4S-C	W981030	Jul. 10, 2007

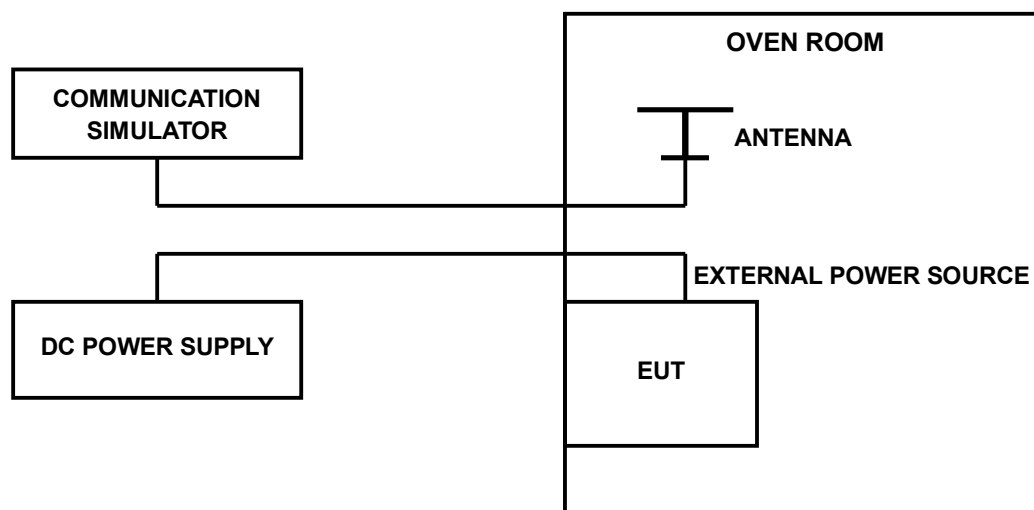
- NOTE:** 1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. "\*" = These equipments are used for the final measurement.
3. The test was performed in ADT RF OVEN room.

#### 4.2.3 TEST PROCEDURE

- a. Because of the measure the carrier frequency under the condition of the AFC lock, it shall be used the mobile station in the GSM link mode. This is accomplished with the use of the communication simulator station. The oven room could control the temperatures and humidity. The GSM link channel is the 128.
- b. Power must be removed when changing from one temperature to another or one voltage to another voltage. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- c. EUT is connected the external power supply to control the DC input power. The various Volts from the minimum 9.0Volts to 15.0 Volts. Each step shall be record the frequency error rate.
- d. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5^{\circ}\text{C}$  during the measurement testing.
- e. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

**NOTE:** The frequency error was recorded frequency error from the GSM simulator.

#### 4.2.4 TEST SETUP



#### 4.2.5 TEST RESULTS

<b>MODE</b>	Channel 128	<b>ENVIRONMENTAL CONDITIONS</b>	25deg°C, 70%RH, 991hPa
<b>TESTED BY</b>	Match Tsui		

#### FOR GSM MODE (UP-LINK WITH 1 TIME SLOT)

AFC FREQUENCY ERROR VS. VOLTAGE			
VOLTAGE (Volts)	FREQUENCY ERROR (Hz)	FREQUENCY ERROR (ppm)	LIMIT (ppm)
15	11	0.013148458	0.1
12	10	0.011953144	0.1
9	10	0.011953144	0.1

**NOTE:** The applicant defined the normal working voltage of the battery is from 9.0Vdc to 15.0Vdc.

<b>MODE</b>	Channel 128	<b>ENVIRONMENTAL CONDITIONS</b>	25deg°C, 70%RH, 991hPa
<b>TESTED BY</b>	Match Tsui		

**FOR GSM MODE (UP-LINK WITH 1 TIME SLOT)**

<b>AFC FREQUENCY ERROR VS. TEMP.</b>			
<b>TEMP. (°C)</b>	<b>FREQUENCY ERROR (Hz)</b>	<b>FREQUENCY ERROR (ppm)</b>	<b>LIMIT (ppm)</b>
50	18	0.021515659	0.1
40	16	0.019125030	0.1
30	14	0.016734401	0.1
20	8	0.009562515	0.1
10	4	0.004781257	0.1
0	10	0.011953144	0.1
-10	12	0.014343772	0.1
-20	14	0.016734401	0.1
-30	15	0.017929716	0.1

### 4.3 OCCUPIED BANDWIDTH MEASUREMENT

#### 4.3.1 LIMITS OF OCCUPIED BANDWIDTH MEASUREMENT

According to FCC 2.1049 (h) specified that emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

#### 4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
* ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100035	Mar. 29, 2007
* Mini-Circuits Power Splitter	ZAPD-4	400005	NA
* Hewlett Packard RF cable	8120-6192	01428251	NA
* JFW 20dB attenuation	50HF-020-SMA	NA	NA
* Suhner RF cable	Sucoflex104	204850/4	NA

**NOTE:** 1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.

2. "\*" = These equipments are used for the final measurement.



### 4.3.3 TEST SETUP

Same as Item 4.2.4 (Conducted Power Setup)

### 4.3.4 TEST PROCEDURES

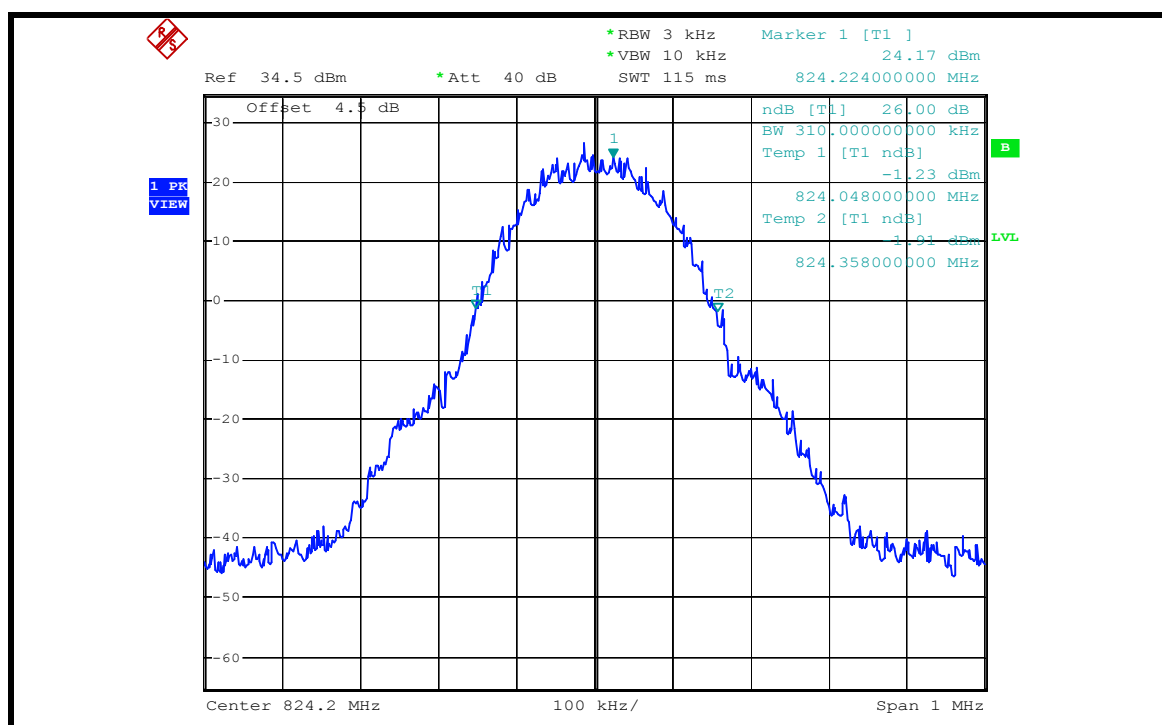
- a. The EUT makes a phone call to the communication simulator. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels: 128, 190 and 251 (low, middle and high operational frequency range).
- b. The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer. This splitter, attenuator, and cable loss is the worst loss 4.5dB in the transmitted path track.
- c. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. FCC 2.1049 (h) required a measurement bandwidth is the fundamental emission below 26dB bandwidth.

## 4.3.5 TEST RESULTS

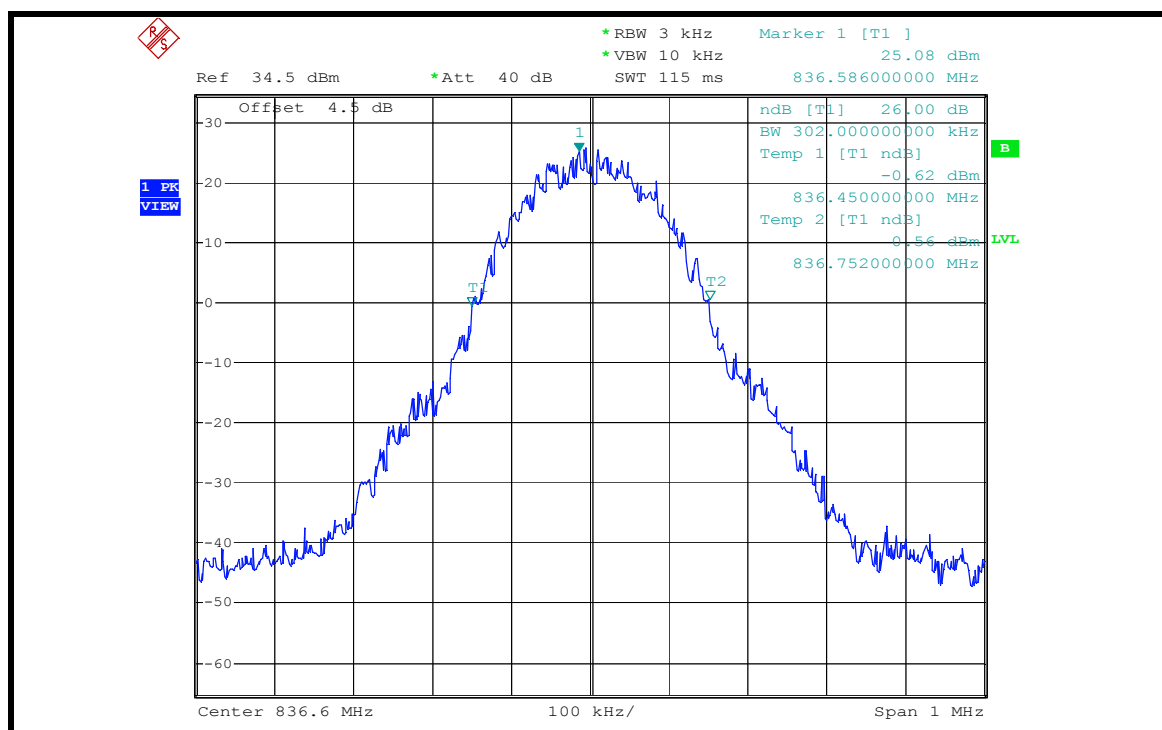
### FOR GSM MODE (UP-LINK WITH 1 TIME SLOT)

FREQUENCY (MHz)	MAX. OUTPUT POWER -26 dBc BANDWIDTH (kHz)
824.2	310
836.6	302
848.8	306

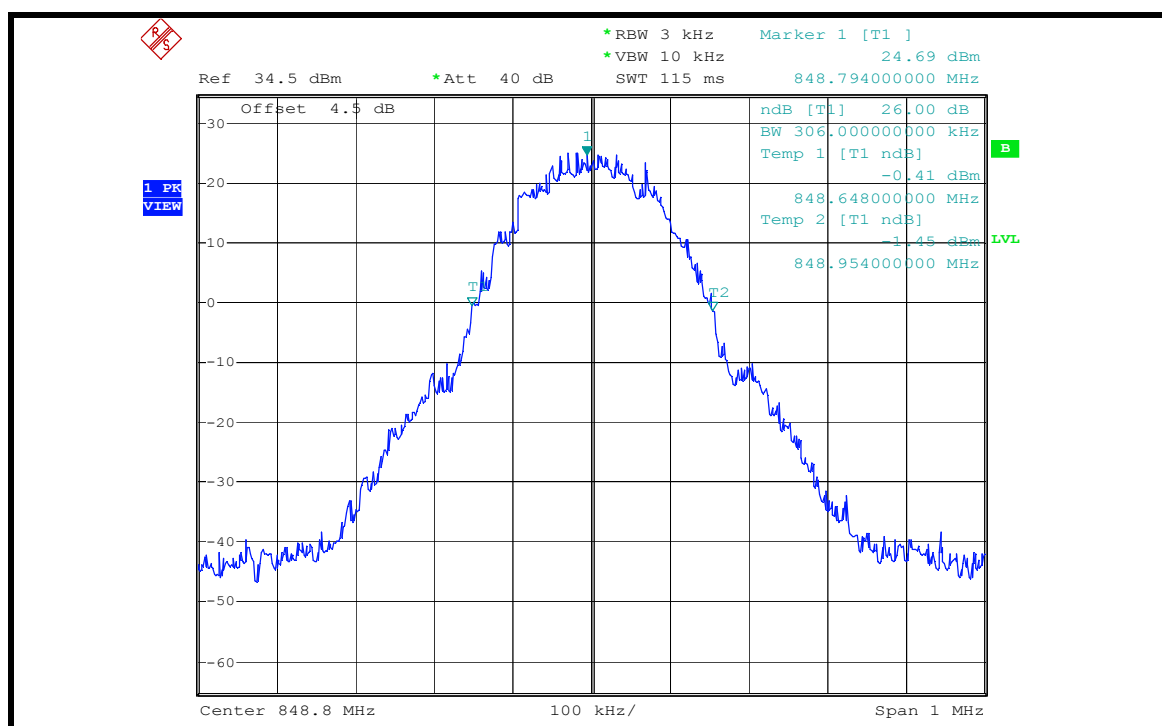
### CH 128 MAX. POWER



## CH 190 MAX. POWER



## CH 251 MAX. POWER



## 4.4 BAND EDGE MEASUREMENT

### 4.4.1 LIMITS OF BAND EDGE MEASUREMENT

According to FCC 22.917 specified that 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. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

### 4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
* ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100035	Mar. 29, 2007
* Mini-Circuits Power Splitter	ZAPD-4	400005	NA
* Hewlett Packard RF cable	8120-6192	01428251	NA
* JFW 20dB attenuation	50HF-020-SMA	NA	NA
* Suhrner RF cable	Sucoflex104	204850/4	NA

**NOTE:** 1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.

2. "\*" = These equipments are used for the final measurement.

### 4.4.3 TEST SETUP

Same as Item 4.2.4 (Conducted Power Setup)

#### 4.4.4 TEST PROCEDURES

- a. The EUT was set up for the maximum peak power with GSM link data modulation. The power was measured with R&S Spectrum Analyzer. All measurements were done at 2 channels: 128 and 251 (low and high operational frequency range).
- b. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer. This splitter, attenuator, and cable loss is the worst loss 4.5dB in the transmitted path track.
- c. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 3kHz and VB of the spectrum is 10kHz.
- d. Record the max trace plot into the test report.

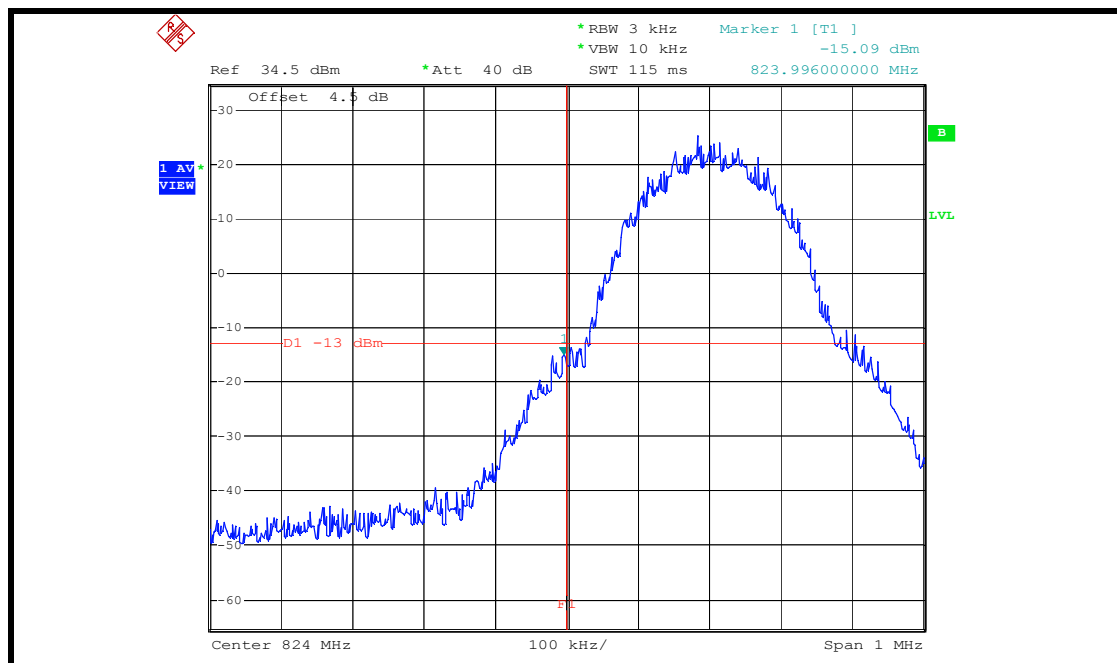
#### 4.4.5 EUT OPERATING CONDITION

- a. The EUT makes a phone call to the communication simulator.
- b. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

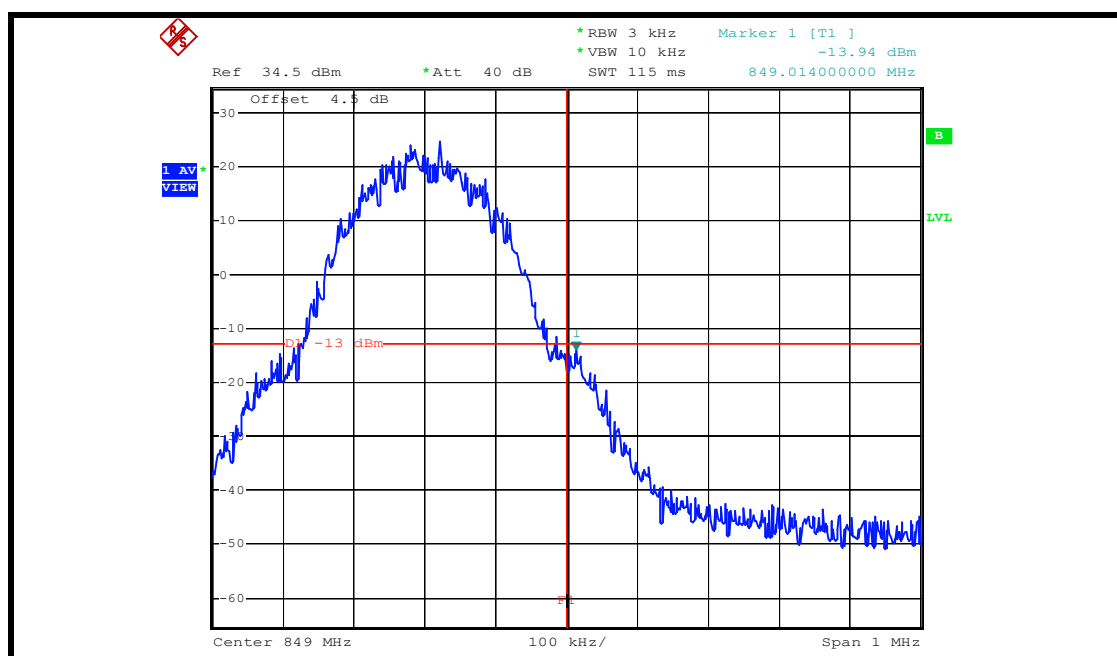
## 4.4.6 TEST RESULTS

### FOR GSM MODE (UP-LINK WITH 1 TIME SLOT)

#### LOWER BAND EDGE



#### HIGHER BAND EDGE



## 4.5 CONDUCTED SPURIOUS EMISSIONS

### 4.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

In the FCC 22.917, On any frequency outside a licensee's frequency block within GSM850 spectrum, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. The specified minimum attenuation becomes 43dB and the limit of emission equal to  $-13$  dBm.

### 4.5.2 TEST INSTRUMENTS

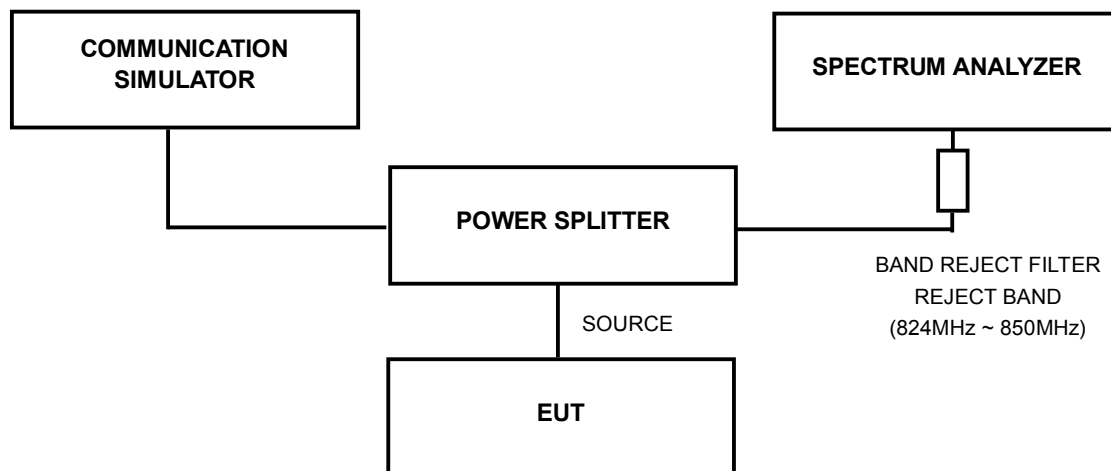
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
* ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100035	Mar. 29, 2007
* Wainwright Instruments Band Reject Filter	WRCG 824/849-810/863-6 0/9SS	SN1	NA
* Wainwright Instruments High Pass Filter	WHK1.5/15G-10ST	SN1	NA
* Mini-Circuits Power Splitter	ZAPD-4	400005	NA
* Hewlett Packard RF cable	8120-6192	01428251	NA
* JFW 20dB attenuation	50HF-020-SMA	NA	NA
* Suhner RF cable	Sucoflex104	204850/4	NA

**NOTE:** 1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.  
2. "\*" = These equipments are used for the final measurement.

#### 4.5.3 TEST PROCEDURE

- The EUT was set up for the maximum peak power with GSM link data modulation. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels: 128, 190 and 251 (low, middle and high operational frequency range).
- The conducted spurious emission used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer. This splitter loss and cable loss are the worst loss 4.5dB in the transmitted path track.
- When the spectrum scanned from 9kHz to 4GHz, it shall be connected to the band reject filter attenuated the carried frequency. The spectrum set RB/VB 1MHz.
- When the spectrum scanned from 4GHz to 9GHz, it shall be connected to the high pass filter attenuated the carried frequency. The spectrum set RB/VB 1MHz.

#### 4.5.4 TEST SETUP



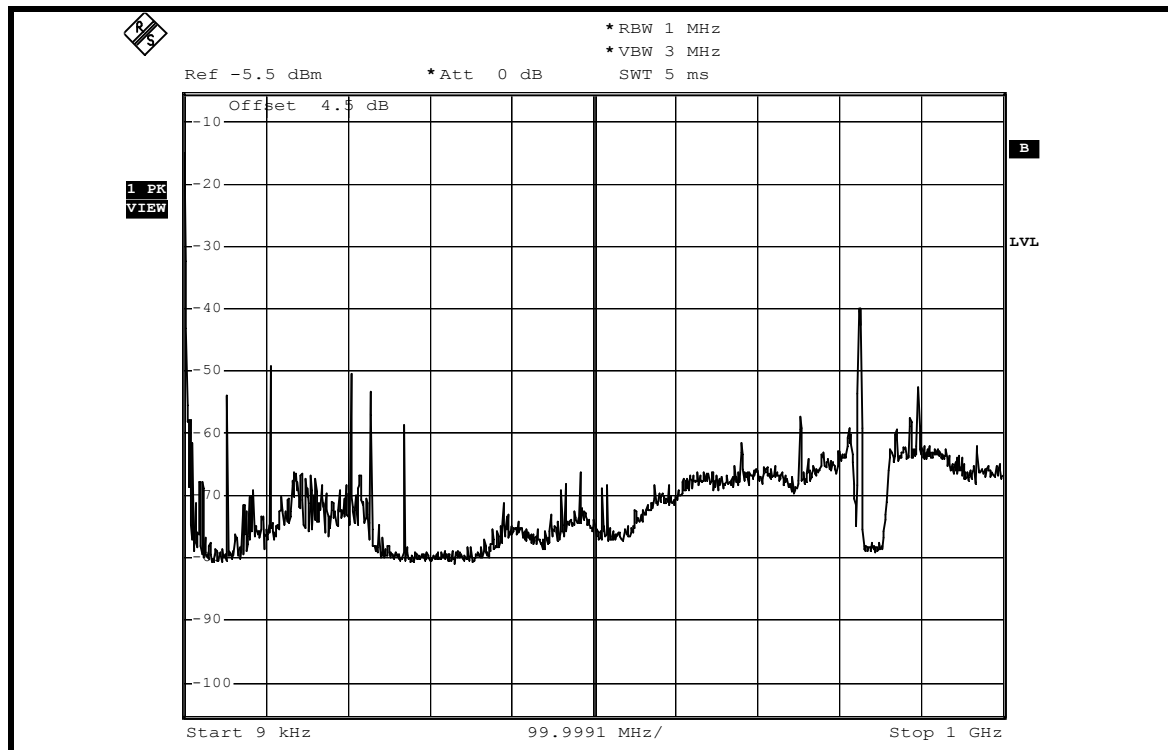
#### 4.5.5 EUT OPERATING CONDITIONS

- The EUT makes a phone call to the communication simulator
- The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

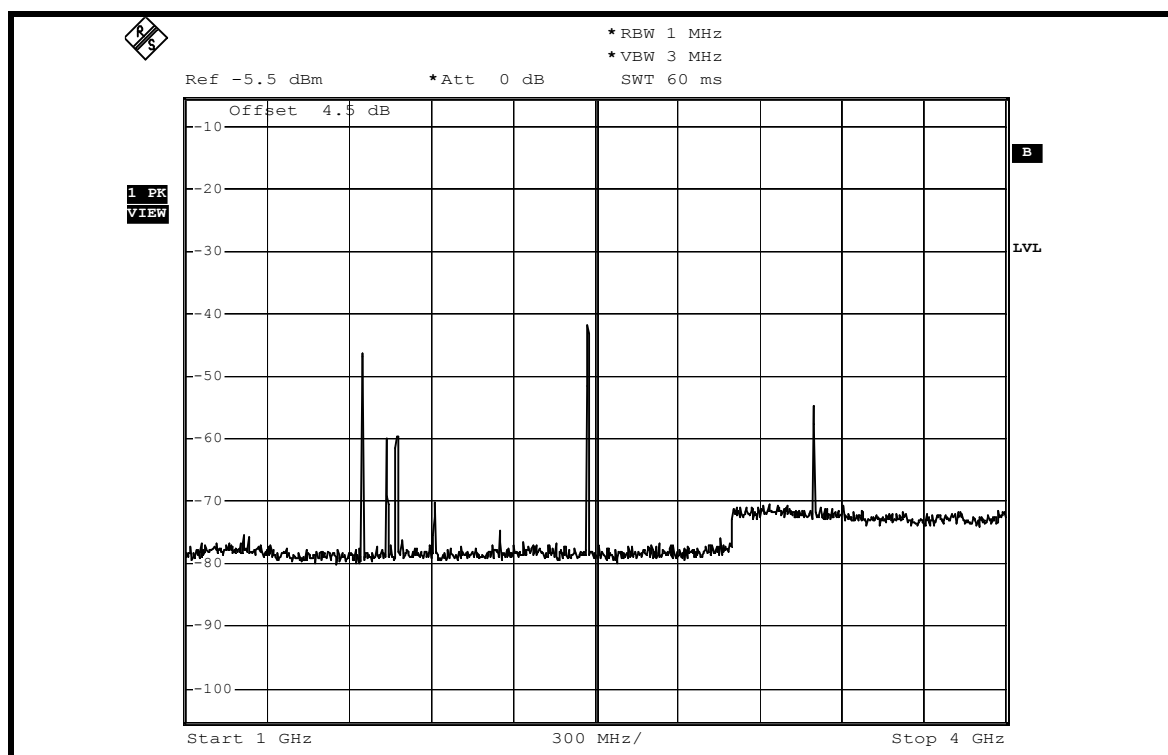


## 4.5.6 TEST RESULTS

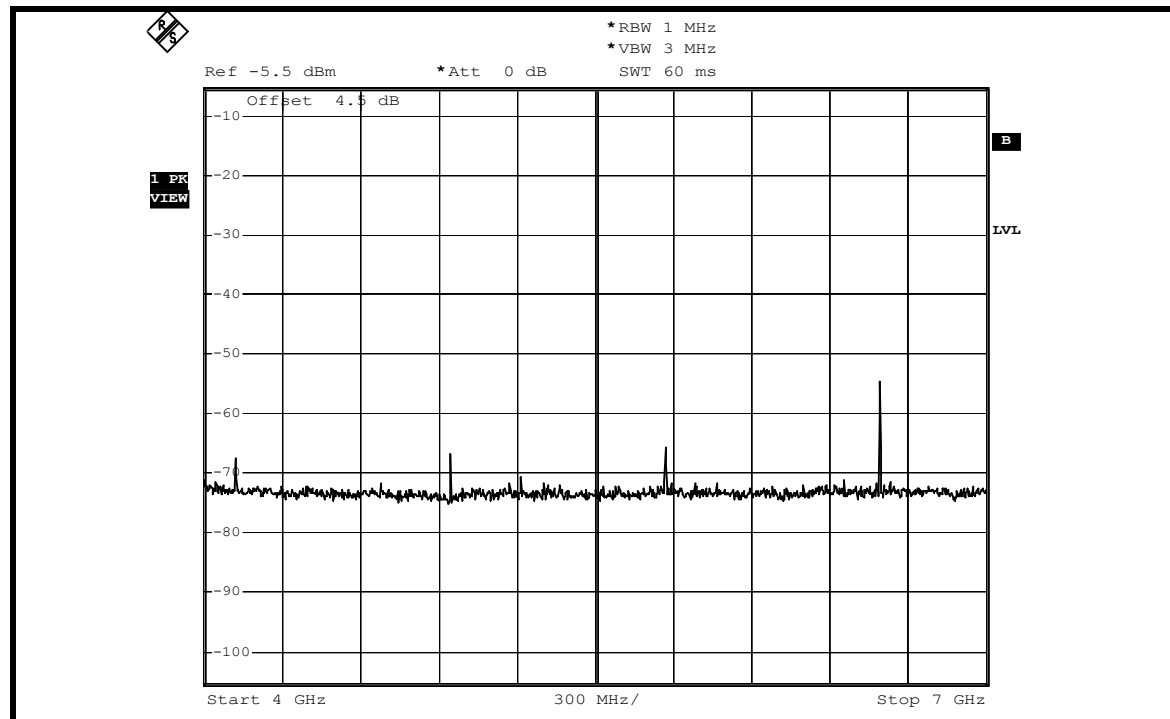
CH 128: 9kHz ~ 1GHz:



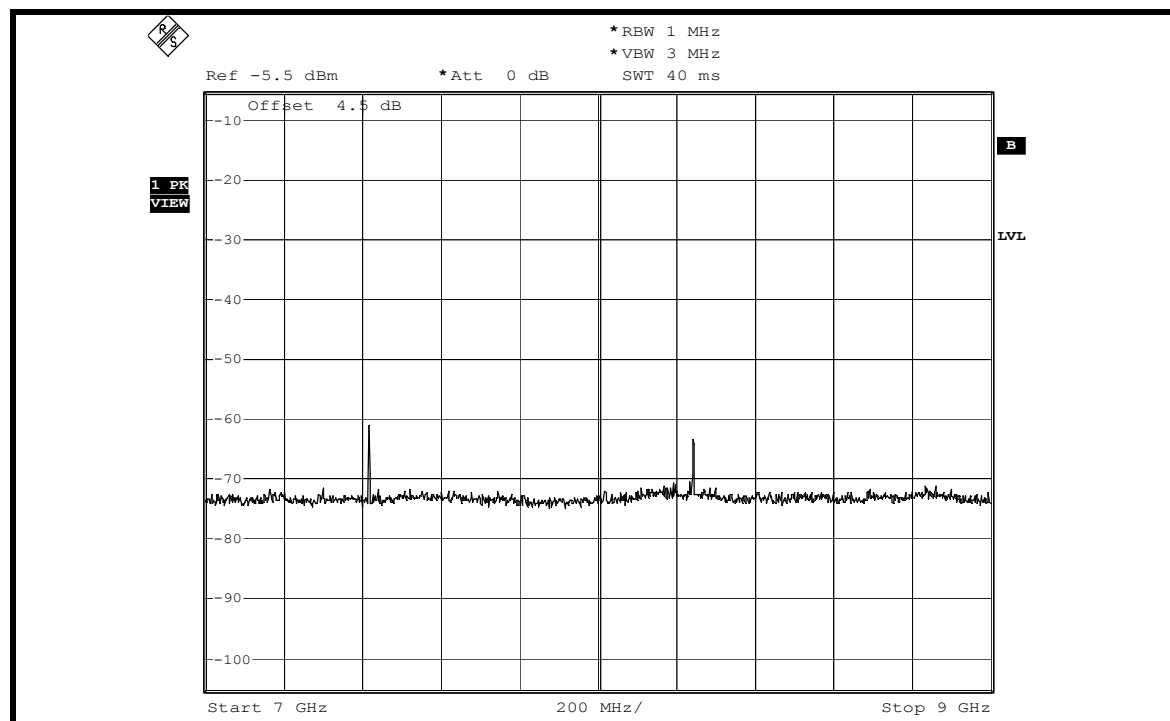
1GHz ~ 4GHz:



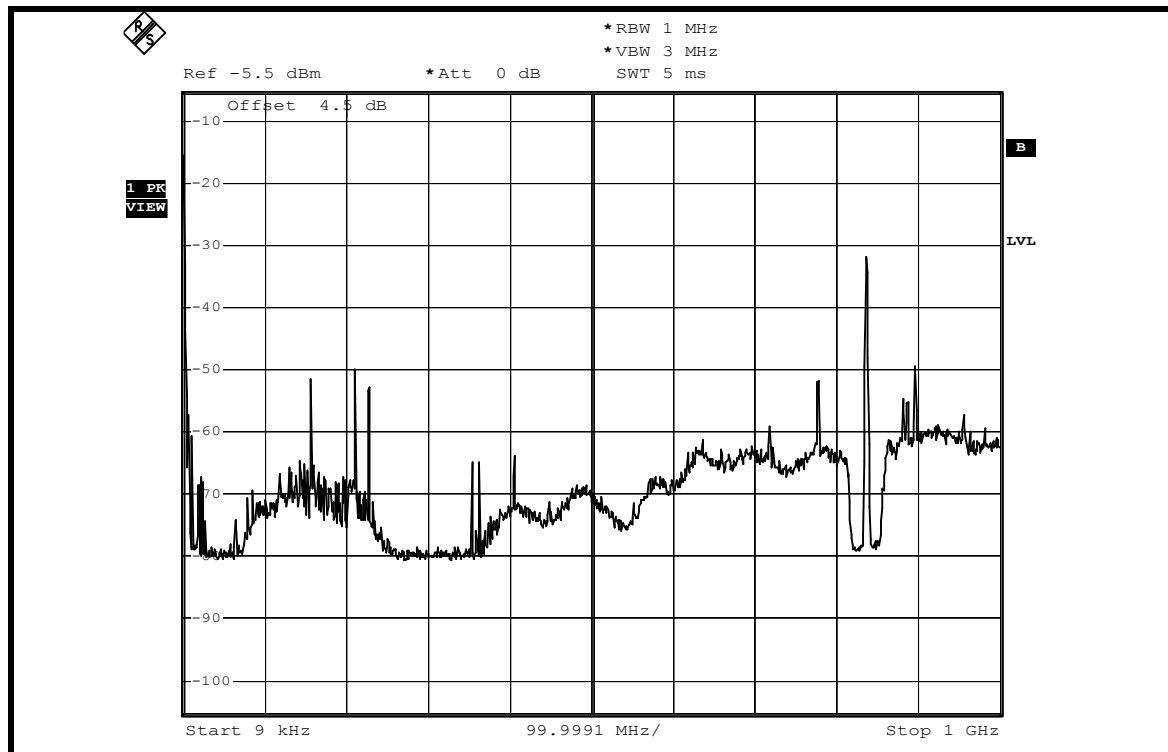
4GHz ~ 7GHz:



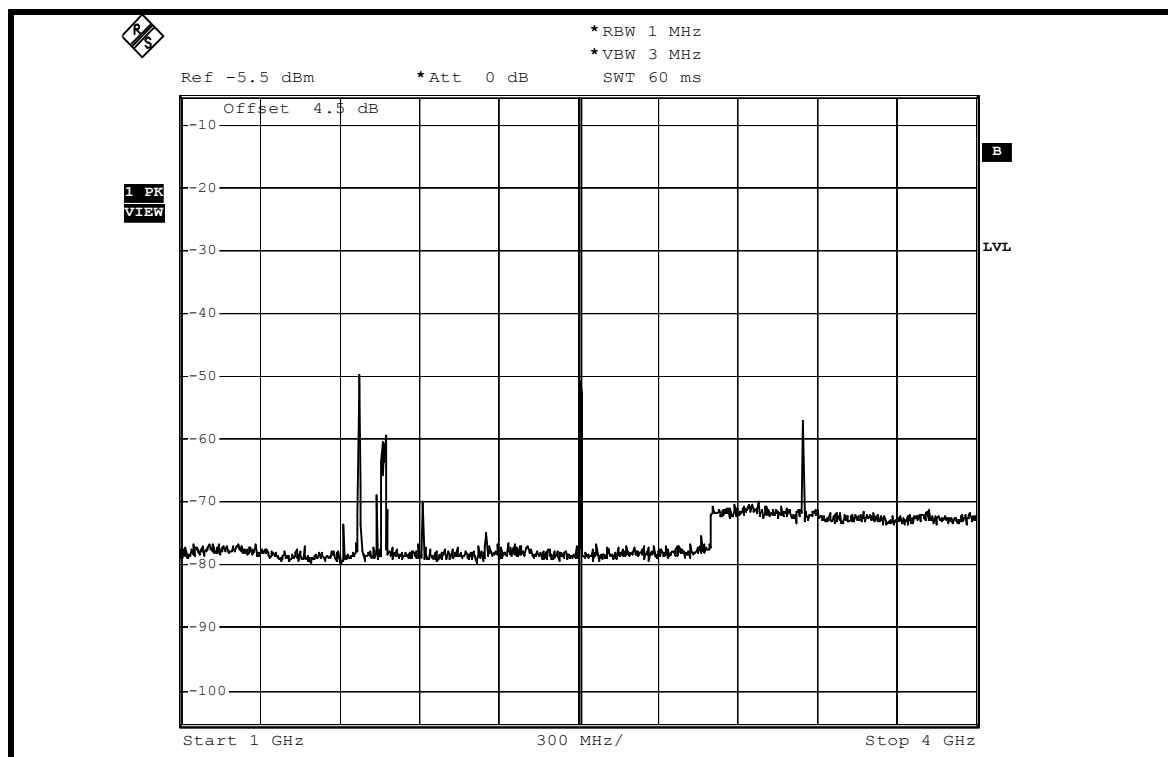
7GHz ~ 9GHz:



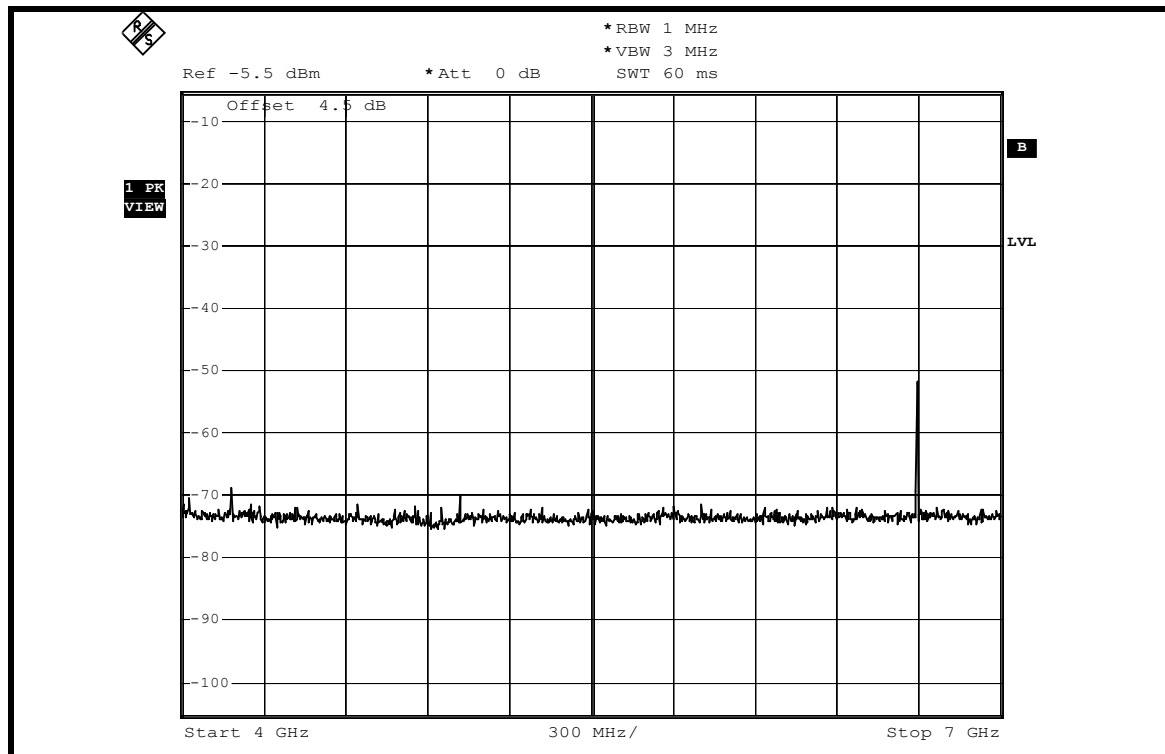
### CH 190: 9kHz ~ 1GHz:



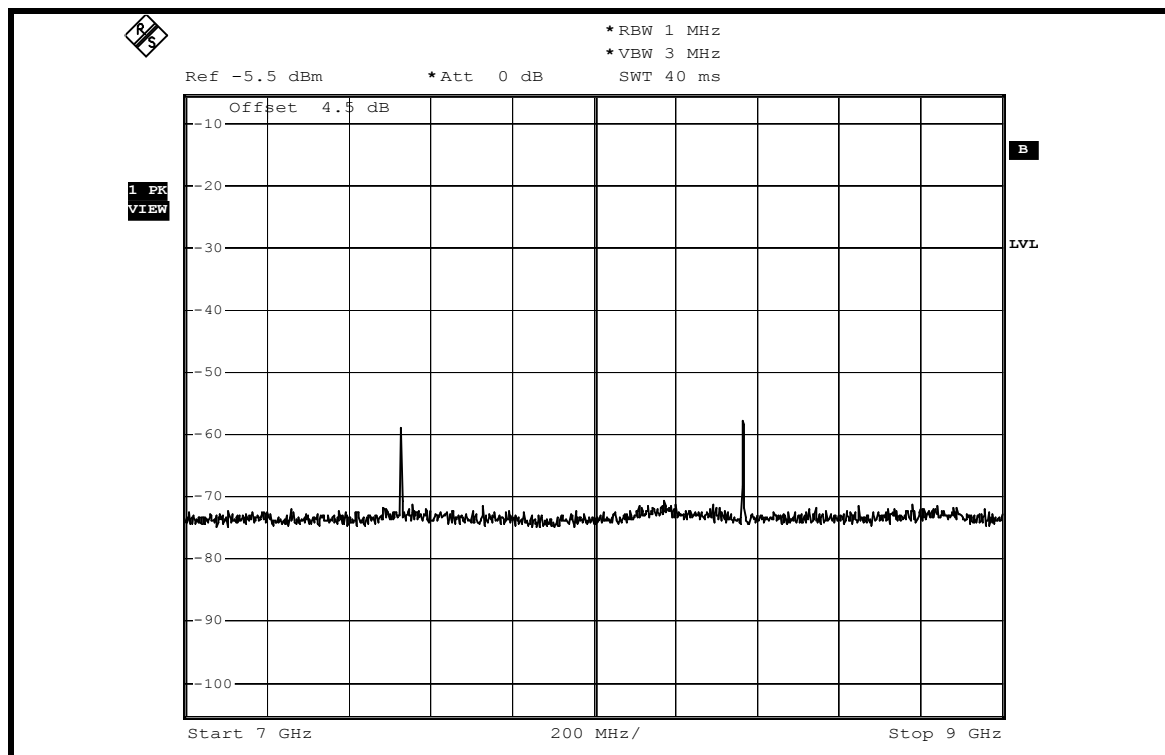
### 1GHz ~ 4GHz:



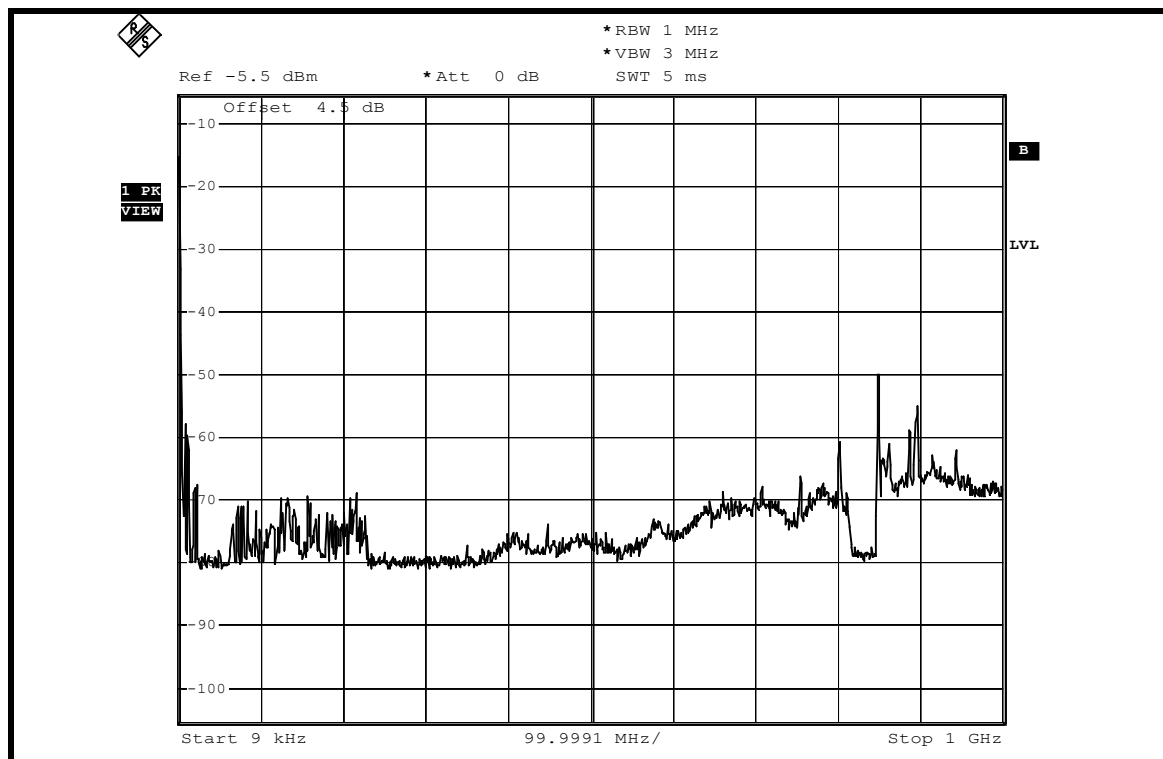
4GHz ~ 7GHz:



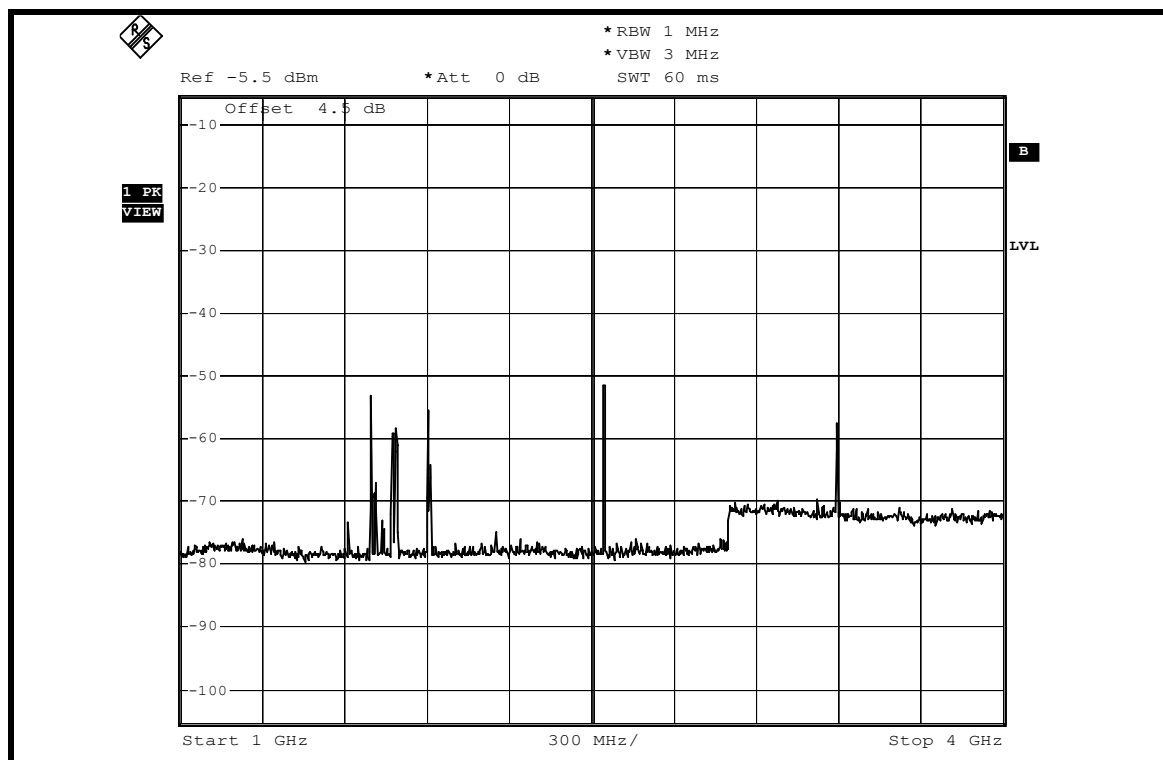
7GHz ~ 9GHz:



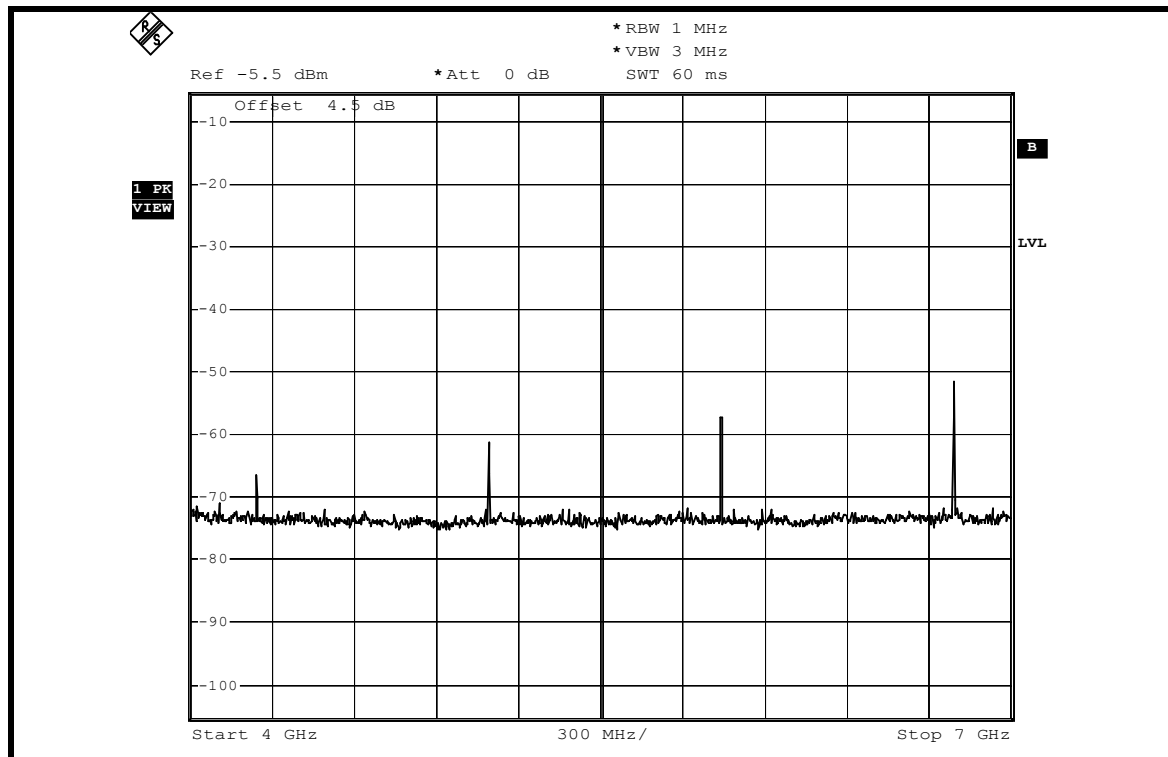
# CH 251: 9kHz ~ 1GHz:



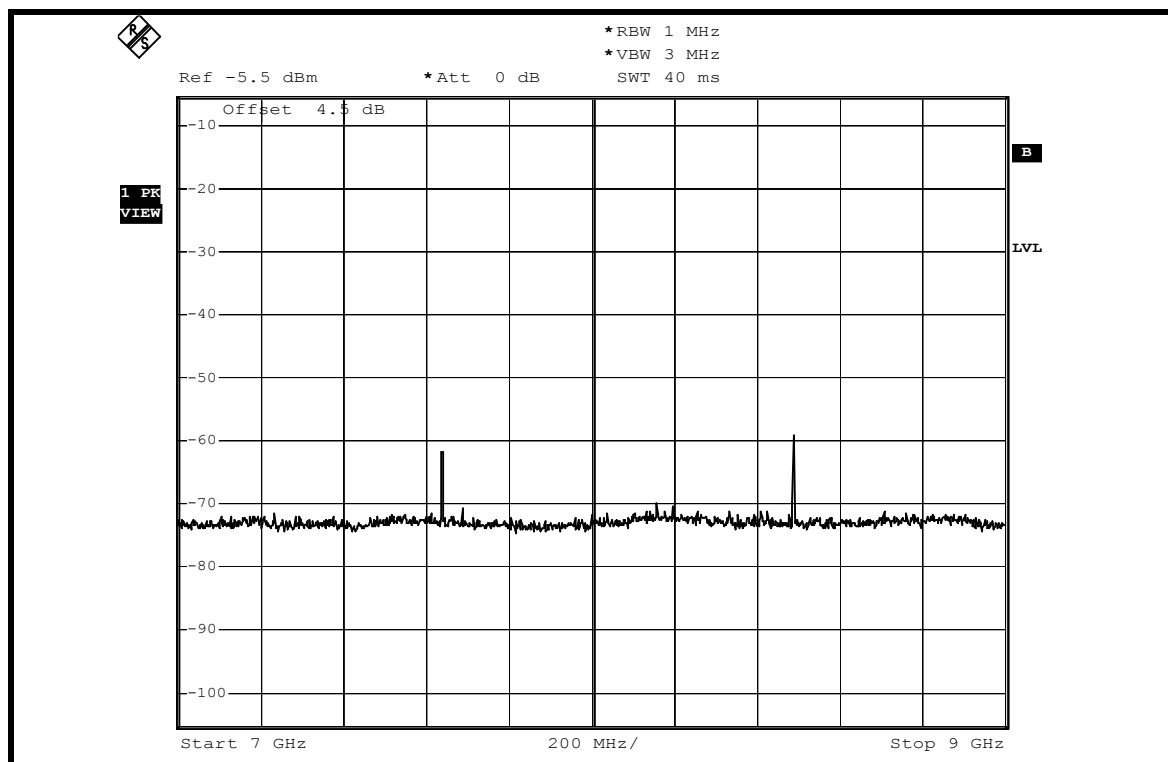
# 1GHz ~ 4GHz:



4GHz ~ 7GHz:



7GHz ~ 9GHz:



## 4.6 RADIATED EMISSION MEASUREMENT (BELOW 1GHz)

### 4.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

In the FCC 22.917, On any frequency outside a licensee's frequency block within GSM850 spectrum, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. The specified minimum attenuation becomes 43dB and the limit of emission equal to  $-13$  dBm. So the limit of emission is the same absolute specified line.

LIMIT (dBm)	EQUIVALENT FIELD STRENGTH AT 3m (dBuV/m) (NOTE)
-13	82.22

**NOTE:** The following formula is used to convert the equipment radiated power to field strength.

$$E = [1000000\sqrt{(30P)}] / 3 \text{ uV/m, where P is Watts.}$$

#### 4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESMI	839013/007 839379/002	Jan. 24, 2007
Spectrum Analyzer ROHDE & SCHWARZ	FSEK30	100049	Aug. 21, 2007
BILOG Antenna SCHWARZBECK	VULB9168	9168-153	Jan. 15, 2007
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-407	Jan. 22, 2007
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 19, 2007
Preamplifier Agilent	8449B	3008A01911	Sep. 13, 2007
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	218188/218189	Dec. 13, 2006
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Mar. 08, 2007
Software ADT.	ADT_Radiated_ V7.6.01	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA
Antenna Tower Controller EMCO	2090	NA	NA
Turn Table EMCO	2087-2.03	NA	NA
Turn Table Controller EMCO	2090	NA	NA

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  2. The test was performed in HwaYa Chamber 9.
  3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  4. The IC Site Registration No. is IC4924A-9.



#### 4.6.3 TEST PROCEDURES

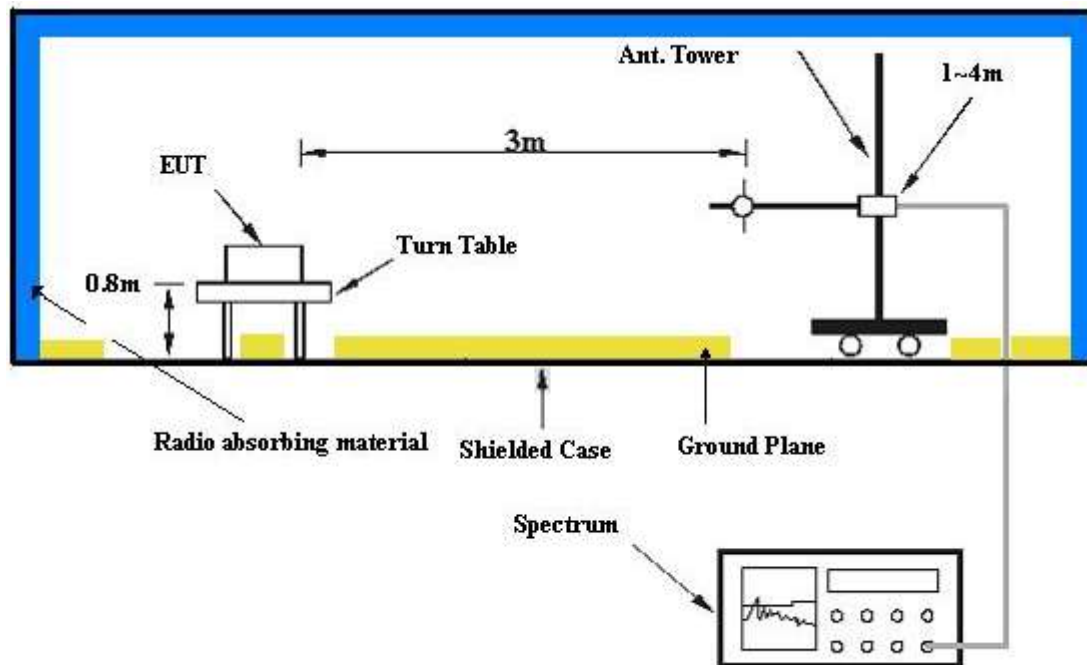
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the receiving antenna, which was mounted on antenna tower and its position at 0.8 m above the ground.
- c. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading and recorded the value.
- d. Repeat step a ~ c for horizontal polarization.

**NOTE:** The resolution bandwidth of spectrum analyzer is 1MHz and the video bandwidth is 3MHz.

#### 4.6.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.6.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

#### 4.6.6 EUT OPERATING CONDITIONS

- The EUT makes a phone call to the communication simulator.
- The communication simulator station system controlled an EUT to export maximum output power under transmission mode and specific channel frequency.

#### 4.6.7 TEST RESULTS

<b>MODE</b>	Channel 128	<b>DETECTOR FUNCTION</b>	Quasi-Peak
<b>FREQUENCY RANGE</b>	Below 1000MHz	<b>ENVIRONMENTAL CONDITIONS</b>	25deg°C, 68%RH, 991hPa
<b>TESTED BY</b>	Lori Chiu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3m								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	154.41	36.25 QP	82.00	-45.75	1.00 H	67.00	23.62	12.63
2	179.68	38.13 QP	82.00	-43.87	1.50 H	92.00	26.86	11.27
3	206.89	33.83 QP	82.00	-48.17	1.00 H	187.00	23.68	10.15
4	<b>259.38</b>	<b>43.14 QP</b>	<b>82.00</b>	<b>-38.86</b>	<b>1.00 H</b>	<b>30.00</b>	<b>31.63</b>	<b>11.52</b>
5	414.89	35.72 QP	82.00	-46.28	1.00 H	17.00	18.81	16.91
6	916.41	33.20 QP	82.00	-48.80	1.00 H	200.00	7.48	25.72

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3m								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	43.61	27.25 QP	82.00	-54.75	1.00 V	80.00	12.89	14.36
2	94.15	30.76 QP	82.00	-51.24	1.00 V	213.00	22.23	8.53
3	154.41	29.66 QP	82.00	-52.34	1.00 V	175.00	17.04	12.63
4	175.79	31.74 QP	82.00	-50.26	1.00 V	80.00	20.20	11.54
5	259.38	33.89 QP	82.00	-48.11	1.00 V	213.00	22.37	11.52
6	276.87	33.41 QP	82.00	-48.59	1.00 V	92.00	19.88	13.53
7	916.41	32.66 QP	82.00	-49.34	1.00 V	54.00	6.93	25.72
8	949.46	32.54 QP	82.00	-49.46	1.00 V	80.00	5.21	27.33

#### NOTE:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. This is valid for all 3 channels.

## **4.7 RADIATED EMISSION MEASUREMENT (ABOVE 1GHz)**

### **4.7.1 LIMITS OF RADIATED EMISSION MEASUREMENT**

In the FCC 22.917 (a), On any frequency outside a licensee's frequency block within GSM spectrum, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. The specified minimum attenuation becomes 43dB and the limit of emission equal to  $-13$  dBm.

#### 4.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESMI	839013/007 839379/002	Jan. 24, 2007
Spectrum Analyzer ROHDE & SCHWARZ	FSEK30	100049	Aug. 21, 2007
BILOG Antenna SCHWARZBECK	VULB9168	9168-153	Jan. 15, 2007
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-407	Jan. 22, 2007
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 19, 2007
Preamplifier Agilent	8449B	3008A01911	Sep. 13, 2007
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	218188/218189	Dec. 13, 2006
RF signal cable Worken	8D-FB	Cable-HYCH9-01	Mar. 08, 2007
Software ADT.	ADT_Radiated_ V7.6.01	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA
Antenna Tower Controller EMCO	2090	NA	NA
Turn Table EMCO	2087-2.03	NA	NA
Turn Table Controller EMCO	2090	NA	NA

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  2. The test was performed in HwaYa Chamber 9.
  3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  4. The IC Site Registration No. is IC4924A-9.

#### 4.7.3 TEST PROCEDURES

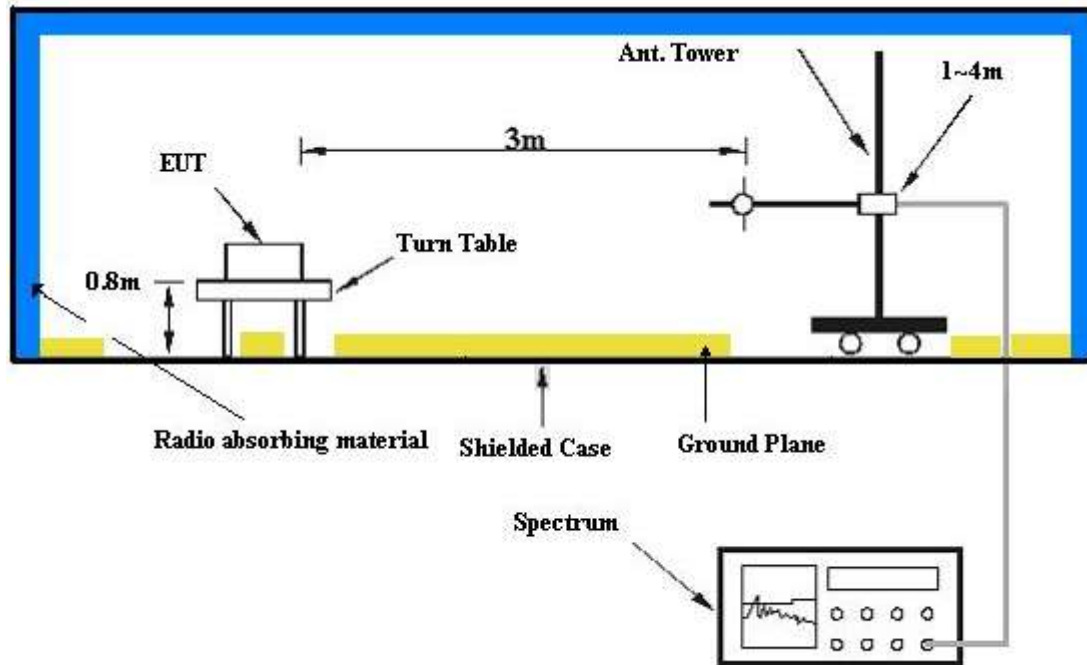
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the receiving antenna, which was mounted on antenna tower and its position at 0.8 m above the ground.
- c. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading and recorded the value.
- d. The EUT is replaced by a horn antenna connected to a signal generator tuned to the frequency of emission.
- e. The signal generator level has to be adjusted to have the same emission nature.
- f. The radiated power can be calculated via the factor and antenna gain.
- g. Repeat step a ~ f for horizontal polarization.

**NOTE:** The resolution bandwidth of spectrum analyzer is 1MHz and the video bandwidth is 3MHz.

#### 4.7.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.7.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

#### 4.7.6 EUT OPERATING CONDITIONS

- The EUT makes a phone call to the communication simulator.
- The communication simulator station system controlled an EUT to export maximum output power under transmission mode and specific channel frequency.

#### 4.7.7 TEST RESULTS

<b>MODE</b>	Channel 128	<b>FREQUENCY RANGE</b>	Above 1000MHz
<b>ENVIRONMENTAL CONDITIONS</b>	25deg°C, 70%RH, 991hPa	<b>TESTED BY</b>	Lori Chiu

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3m						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV)	LIMIT (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	POWER VALUE (dBm)
1	1648.00	66.19	-13.00	-39.16	10.12	-29.04
2	2472.00	62.87	-13.00	-43.85	11.49	-32.36
3	3296.00	50.23	-13.00	-57.50	12.50	-45.00
4	4121.00	53.63	-13.00	-55.35	13.75	-41.60
5	4945.00	49.67	-13.00	-59.47	13.91	-45.56
6	5769.00	48.82	-13.00	-60.80	14.39	-46.41
7	6593.00	62.56	-13.00	-46.55	13.88	-32.67
8	7418.00	55.83	-13.00	-52.56	13.16	-39.40
9	8242.00	63.51	-13.00	-44.63	12.91	-31.72

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3m						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV)	LIMIT (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	POWER VALUE (dBm)
1	1648.00	66.98	-13.00	-38.37	10.12	-28.25
2	2472.00	63.25	-13.00	-43.47	11.49	-31.98
3	3296.00	57.89	-13.00	-49.84	12.50	-37.34
4	4121.00	53.57	-13.00	-55.41	13.75	-41.66
5	4945.00	53.01	-13.00	-56.13	13.91	-42.22
6	5769.00	49.59	-13.00	-60.03	14.39	-45.64
7	6593.00	63.46	-13.00	-45.65	13.88	-31.77
8	7418.00	57.33	-13.00	-51.06	13.16	-37.90
9	8242.00	62.44	-13.00	-45.70	12.91	-32.79

**NOTE:** Power Value (dBm) = S.G Power Value (dBm) + Correction Factor (dB).



<b>MODE</b>	Channel 190	<b>FREQUENCY RANGE</b>	Above 1000MHz
<b>ENVIRONMENTAL CONDITIONS</b>	25deg°C, 70%RH, 991hPa	<b>TESTED BY</b>	Lori Chiu

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3m						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV)	LIMIT (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	POWER VALUE (dBm)
1	1673.00	65.41	-13.00	-39.94	10.12	-29.82
2	2510.00	60.06	-13.00	-46.66	11.49	-35.17
3	3346.00	51.52	-13.00	-56.21	12.50	-43.71
4	4183.00	51.08	-13.00	-57.85	13.7	-44.15
5	5019.00	50.20	-13.00	-58.92	13.89	-45.03
6	5856.00	48.53	-13.00	-61.09	14.39	-46.70
7	6693.00	59.66	-13.00	-49.44	13.87	-35.57
8	7529.00	53.87	-13.00	-54.51	13.15	-41.36
9	8366.00	59.36	-13.00	-48.75	12.88	-35.87

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3m						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV)	LIMIT (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	POWER VALUE (dBm)
1	1673.00	66.23	-13.00	-39.12	10.12	-29.00
2	2510.00	61.92	-13.00	-44.80	11.49	-33.31
3	3346.00	57.04	-13.00	-50.69	12.50	-38.19
4	4183.00	51.25	-13.00	-57.68	13.70	-43.98
5	5019.00	51.62	-13.00	-57.50	13.89	-43.61
6	5856.00	49.85	-13.00	-59.77	14.39	-45.38
7	6693.00	62.11	-13.00	-46.99	13.87	-33.12
8	7529.00	55.75	-13.00	-52.63	13.15	-39.48
9	8366.00	60.09	-13.00	-48.02	12.88	-35.14

**NOTE:** Power Value (dBum) = S.G Power Value (dBm) + Correction Factor (dB).

<b>MODE</b>	Channel 251	<b>FREQUENCY RANGE</b>	Above 1000MHz
<b>ENVIRONMENTAL CONDITIONS</b>	25deg°C, 70%RH, 991hPa	<b>TESTED BY</b>	Lori Chiu

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3m						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV)	LIMIT (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	POWER VALUE (dBm)
1	1698.00	63.34	-13.00	-42.06	10.17	-31.89
2	2546.00	58.47	-13.00	-48.25	11.49	-36.76
3	3395.00	51.06	-13.00	-56.73	12.56	-44.17
4	4244.00	47.63	-13.00	-61.30	13.70	-47.60
5	5093.00	51.95	-13.00	-57.19	13.91	-43.28
6	5941.00	48.75	-13.00	-60.87	14.39	-46.48
7	6790.00	62.33	-13.00	-46.20	13.30	-32.90
8	7639.00	54.57	-13.00	-53.81	13.15	-40.66
9	8488.00	58.90	-13.00	-49.24	12.91	-36.33

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3m						
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV)	LIMIT (dBm)	S.G POWER VALUE (dBm)	CORRECTION FACTOR (dB)	POWER VALUE (dBm)
1	1698.00	66.54	-13.00	-38.86	10.17	-28.69
2	2546.00	59.82	-13.00	-46.90	11.49	-35.41
3	3395.00	54.42	-13.00	-53.37	12.56	-40.81
4	4244.00	51.04	-13.00	-57.89	13.70	-44.19
5	5093.00	52.59	-13.00	-56.55	13.91	-42.64
6	5941.00	51.08	-13.00	-58.54	14.39	-44.15
7	6790.00	66.70	-13.00	-41.83	13.30	-28.53
8	7639.00	56.46	-13.00	-51.92	13.15	-38.77
9	8488.00	59.78	-13.00	-48.36	12.91	-35.45

**NOTE:** Power Value (dBum) = S.G Power Value (dBm) + Correction Factor (dB).

## 5 INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

<b>USA</b>	FCC, UL, A2LA
<b>GERMANY</b>	TUV Rheinland
<b>JAPAN</b>	VCCI
<b>NORWAY</b>	NEMKO
<b>CANADA</b>	INDUSTRY CANADA , CSA
<b>R.O.C.</b>	CNLA, BSMI, NCC
<b>NETHERLANDS</b>	Telefication
<b>SINGAPORE</b>	PSB , GOST-ASIA (MOU)
<b>RUSSIA</b>	CERTIS (MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: [www.adt.com.tw/index.5/phtml](http://www.adt.com.tw/index.5/phtml).  
If you have any comments, please feel free to contact us at the following:

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Fax: 886-3-3185050

The address and road map of all our labs can be found in our web site also.