

# FCC TEST REPORT

## (PART 22)

**REPORT NO.:** RF970925L05

**MODEL NO.:** DPH151

**RECEIVED:** Sep. 25, 2008

**TESTED:** Oct. 16 ~ Oct. 28, 2008

**ISSUED:** Oct. 30, 2008

**APPLICANT:** Gemtek Technology Co., Ltd.

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## 1 CERTIFICATION

**PRODUCT :** DPH151, FEMTOCELL, DUAL BAND, 2 PORT

**MODEL :** DPH151

**BRAND :** CISCO

**APPLICANT :** Gemtek Technology Co., Ltd.

**TESTED :** Oct. 16 ~ Oct. 28, 2008

**TEST SAMPLE :** ENGINEERING SAMPLE

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

The above equipment (model: DPH151) 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 :** Andrea Hsia , **DATE:** Oct. 30, 2008  
Andrea Hsia / Specialist

**TECHNICAL ACCEPTANCE :** Long Chen , **DATE:** Oct. 30, 2008  
Responsible for RF Long Chen / Senior Engineer

**APPROVED BY :** Gary Chang , **DATE:** Oct. 30, 2008  
Gary Chang / Assistant Manager

## 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 22 & Part 2			
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 6.44dBm at 891.6MHz.
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 -35.33dB at 63.05MHz.

### 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	2.44 dB
Radiated emissions	30MHz ~ 200MHz	3.19 dB
	200MHz ~1000MHz	3.21 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

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>	DPH151, FEMTOCELL, DUAL BAND, 2 PORT
<b>MODEL NO.</b>	DPH151
<b>FCC ID</b>	MXF-3GFP970926
<b>POWER SUPPLY</b>	12Vdc from power adapter
<b>MODULATION TYPE</b>	QPSK / 16QAM
<b>FREQUENCY RANGE</b>	Tx Frequency: 869MHz ~ 894MHz Rx Frequency: 824MHz ~ 849MHz
<b>MAX. ERP POWER</b>	6.44dBm (0.00441Watts)
<b>ANTENNA TYPE</b>	Printed Monopole antenna with 1.5dBi gain
<b>DATA CABLE</b>	NA
<b>I/O PORTS</b>	Refer to user's manual
<b>ASSOCIATED DEVICES</b>	Adapter

**NOTE:**

1. The EUT is a DPH151, FEMTOCELL, DUAL BAND, 2 PORT. The functions of EUT listed as below:

	TEST STANDARD	REFERENCE REPORT
<b>WCDMA 850</b>	FCC Part 22	RF970925L05
<b>WCDMA 1900</b>	FCC Part 24	RF970925L05-1

2. The EUT was operated with following power adapter:

<b>BRAND:</b>	ENG
<b>MODEL:</b>	3A-153WU12
<b>INPUT:</b>	100-120Vac, 50-60Hz, 0.4A
<b>OUTPUT:</b>	12Vdc, 1.25A
<b>POWER LINE:</b>	1.8m non-shielded cable without core

3. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 DESCRIPTION OF TEST MODES

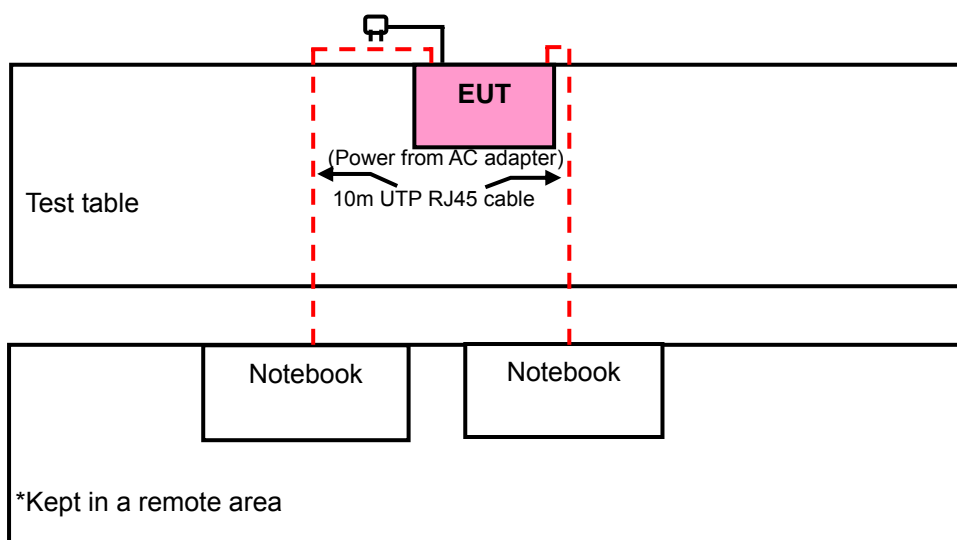
277 channels are provided to this EUT in the WCDMA850 band. Therefore, the low, middle and high channels are chosen for testing.

	CHANNEL	FREQUENCY	TX MODE
LOW	4357	871.4 MHz	WCDMA
MIDDLE	4407	881.4 MHz	WCDMA
HIGH	4458	891.6 MHz	WCDMA

**NOTE:**

1. Below 1 GHz, the channel 4357, 4407 and 4458 were pre-tested in chamber. The channel 4458 was chosen for final test.
2. Above 1 GHz, the channel 4357, 4407 and 4458 were tested individually.
3. The channel space is 5MHz.
4. Since the EUT was pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Z-plane. Therefore only the test data of this Z-plane was used for radiated emission measurement test.
5. The EUT has QPSK & 16QAM functions. After pre-testing, QPSK function is the worst case for all the emission tests.
6. After pre-testing of output power and spurious emission

#### 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 TYPE	AXIS
4357 to 4458	4357, 4407, 4458	QPSK, 16QAM	Z

#### 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 TYPE
4357 to 4458	4407	QPSK

#### 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 TYPE
4357 to 4458	4357, 4407, 4458	QPSK, 16QAM



### **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 TYPE
4357 to 4458	4357, 4458	QPSK, 16QAM

### **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 TYPE
4357 to 4458	4357, 4407, 4458	QPSK

### **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 TYPE	AXIS
4357 to 4458	4458	QPSK	Z

### **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 TYPE	AXIS
4357 to 4458	4357, 4407, 4458	QPSK	Z

### 3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a DPH151, FEMTOCELL, DUAL BAND, 2 PORT. 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**

**ANSI C63.4-2003**

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

**NOTE:** The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

**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.	FCC ID
1	NOTEBOOK	DELL	PP05L	12130898320	E2K24CLNS
2	NOTEBOOK	DELL	PP05L	9954115984	E2K24CLNS

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	10m RJ 45 cable
2	10m RJ 45 cable

**NOTE:** 1. All power cords of the above support units are non shielded (1.8m).  
2. Item 1 ~ 2 acted as a communication partner to transfer data.

## **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.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESI7	838496/016	Dec. 26, 2007	Dec. 25, 2008
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Dec. 03, 2007	Dec. 02, 2008
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Apr. 30, 2008	Apr. 29, 2009
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-408	Jan. 22, 2008	Jan. 21, 2009
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 07, 2008	Jan. 06, 2009
Preamplifier Agilent	8449B	3008A01960	Oct. 31, 2007	Oct. 30, 2008
Preamplifier Agilent	8447D	2944A10631	Nov. 01, 2007	Oct. 31, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	274397/4	Nov. 08, 2007	Nov. 07, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	283401/4	Nov. 08, 2007	Nov. 07, 2008
Software ADT.	ADT_Radiated_V7.6	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	019303	NA	NA
Turn Table ADT.	TT100.	TT93021704	NA	NA
Turn Table Controller ADT.	SC100.	SC93021704	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 4.

3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.

4. The FCC Site Registration No. is 460141.

5. The IC Site Registration No. is IC3789B-4.

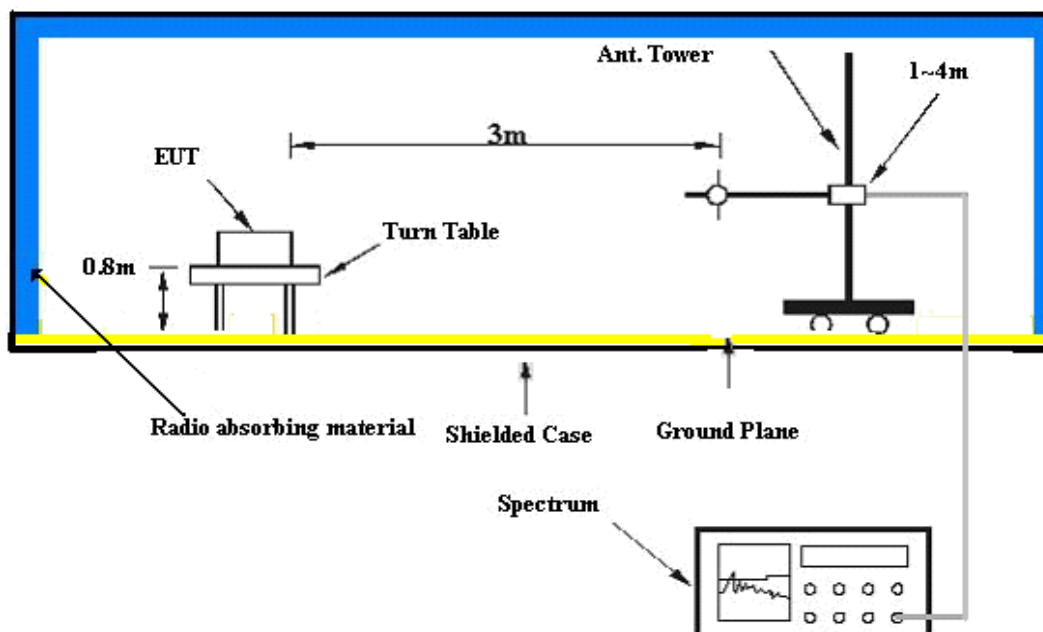
#### 4.1.3 TEST PROCEDURES

- a. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels, 4357, 4407 and 4458 (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 5MHz, 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 semi-anechoic chamber, EUT placed on the 0.8m 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 and moved height from 1m to 4m 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, E.R.P power = E.I.P.R power - 0.70dBi.

**NOTE:** The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 5MHz for Peak detection (PK)

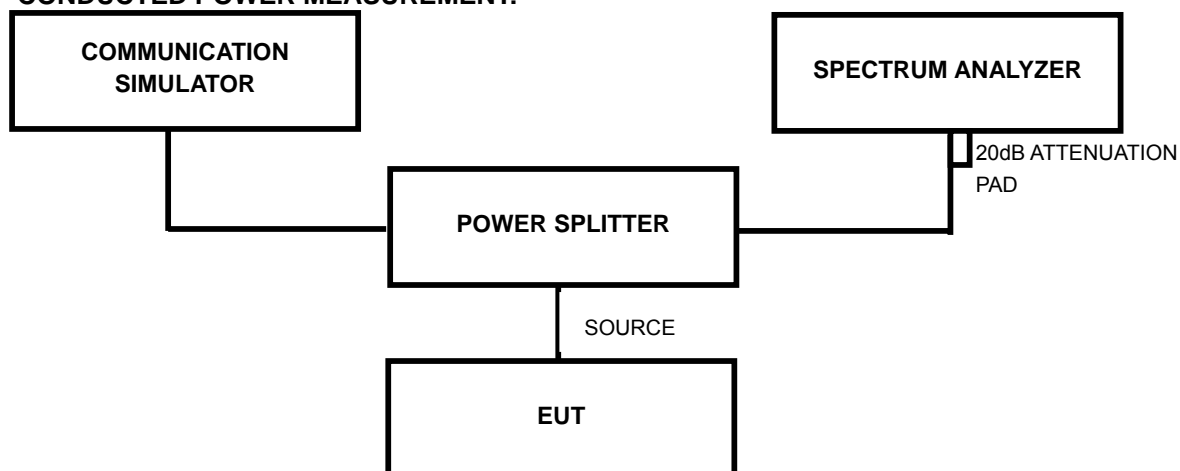
#### 4.1.4 TEST SETUP

##### 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

- Placed the EUT on a testing table.
- Prepared a notebook computer and placed it outside of testing area to act as communication partner for EUT.
- The EUT ran a test program (provided by manufacturer) to enable all functions under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.

#### 4.1.6 TEST RESULTS

##### FOR MODULATION TYPE: QPSK

MODE	TX connected	DETECTOR FUNCTION	Peak
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH, 991hPa
TESTED BY	Dean Wang		

CONDUCTED PEAK OUTPUT POWER					
CHANNEL NO.	FREQUENCY (MHz)	RAW VALUE (dBm)	CORRECTION FACTOR (dB)	PEAK OUTPUT POWER	
				dBm	Watt
4357	871.4	6.42	0.70	7.12	0.00515
4407	881.4	6.39	0.70	7.09	0.00512
4458	891.6	6.41	0.70	7.11	0.00514

**REMARKS:** 1. Peak Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).  
 2. Correction Factor (dB) = Power Splitter Loss (dB) + Cable Loss (dB).

MODE	TX connected	DETECTOR FUNCTION	Peak
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH, 991hPa
TESTED BY	Dean Wang		

ERP POWER					
CHANNEL NO.	FREQUENCY (MHz)	RAW VALUE (dBm)	CORRECTION FACTOR (dB)	PEAK OUTPUT POWER	
				dBm	Watt
4357	871.4	-27.85	33.98	6.13	0.00410
4407	881.4	-27.89	34.05	6.16	0.00413
<b>4458</b>	<b>891.6</b>	<b>-27.50</b>	<b>33.94</b>	<b>6.44</b>	<b>0.00441</b>

**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).

# FOR MODULATION TYPE: 16QAM

MODE	TX connected	DETECTOR FUNCTION	Peak
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH, 991hPa
TESTED BY	Dean Wang		

CONDUCTED PEAK OUTPUT POWER					
CHANNEL NO.	FREQUENCY (MHz)	RAW VALUE (dBm)	CORRECTION FACTOR (dB)	PEAK OUTPUT POWER	
				dBm	Watt
4357	871.4	6.31	0.70	7.01	0.00502
4407	881.4	6.28	0.70	6.98	0.00499
4458	891.6	6.27	0.70	6.97	0.00498

**REMARKS:** 1. Peak Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).  
2. Correction Factor (dB) = Power Splitter Loss (dB) + Cable Loss (dB).

MODE	TX connected	DETECTOR FUNCTION	Peak
INPUT POWER (SYSTEM)	120Vac, 60 Hz	ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH, 991hPa
TESTED BY	Dean Wang		

ERP POWER					
CHANNEL NO.	FREQUENCY (MHz)	RAW VALUE (dBm)	CORRECTION FACTOR (dB)	PEAK OUTPUT POWER	
				dBm	Watt
4357	871.4	-28.06	33.98	5.92	0.00391
4407	881.4	-28.11	34.05	5.94	0.00393
4458	891.6	-27.77	33.94	6.17	0.00414

**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).



## 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)  $-30^{\circ}\text{C} \sim 50^{\circ}\text{C}$ .

### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
* ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009
* Hewlett Packard RF cable	8120-6192	01428251	NA	NA
* Suhner RF cable	Sucoflex104	204850/4	NA	NA
* WIT Standard Temperature & Humidity Chamber	TH-4S-C	W981030	Jun. 26, 2008	Jun. 25, 2009

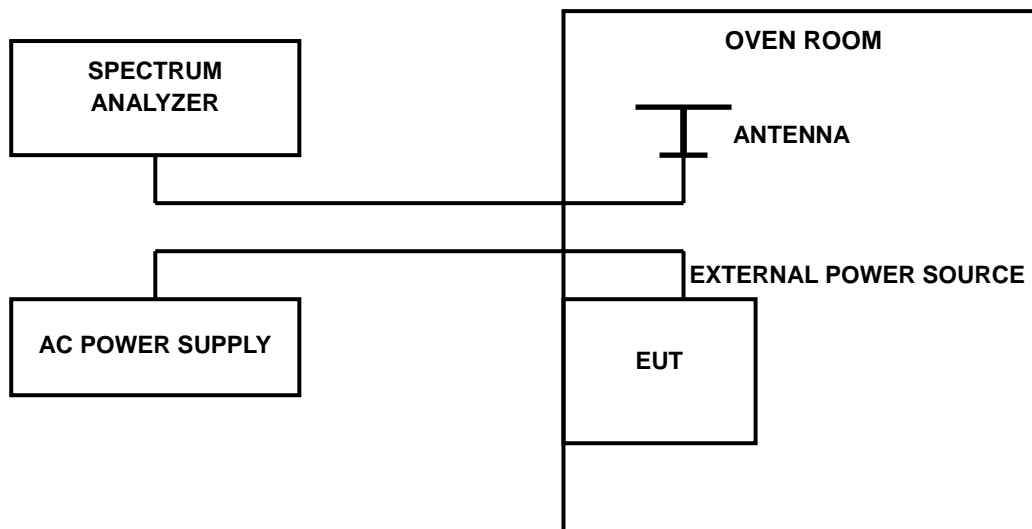
- NOTE:**
1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.
  2. "\*" = These equipments are used for the final measurement.
  3. The test was performed in ADT RF OVEN room.

#### 4.2.3 TEST PROCEDURE

- a. 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.
- b. EUT is connected the external power supply to control the DC input power. The various Volts from the minimum 93.5Volts to 126.5Volts. Each step shall be record the frequency error rate.
- c. 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.
- d. 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 EUT OPERATING CONDITIONS

Same as 4.1.5

#### 4.2.6 TEST RESULTS

<b>MODE</b>	TX channel 4407	<b>ENVIRONMENTAL CONDITIONS</b>	26deg. C, 65%RH, 991hPa
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>TESTED BY</b>	Dean Wang

AFC FREQUENCY ERROR vs. VOLTAGE			
VOLTAGE (Volts)	FREQUENCY ERROR (Hz)	FREQUENCY ERROR (ppm)	LIMIT (ppm)
126.5	14	0.0158838212	2.5
93.5	15	0.0170183799	2.5

AFC FREQUENCY ERROR vs. TEMP.			
TEMP. (°C)	FREQUENCY ERROR (Hz)	FREQUENCY ERROR (ppm)	LIMIT (ppm)
50	15	0.0170183799	2.5
40	13	0.0147492625	2.5
30	14	0.0158838212	2.5
20	13	0.0147492625	2.5
10	12	0.0136147039	2.5
0	13	0.0147492625	2.5
-10	16	0.0181529385	2.5
-20	15	0.0170183799	2.5
-30	19	0.0215566145	2.5

## 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 26 dB below the transmitter power.

### 4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
* ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009
* Mini-Circuits Power Splitter	ZAPD-4	400005	NA	NA
* Hewlett Packard RF cable	8120-6192	01428251	NA	NA
* JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
* Suhner RF cable	Sucoflex104	204850/4	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. "\*" = 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 power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels, 4357, 4407 and 4458 (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 loss and cable loss is the worst loss 0.7dB in the transmitted path track.
- c. FCC 2.1049 (h) required a measurement bandwidth is the fundamental emission below 26dB bandwidth.

#### 4.3.5 EUT OPERATING CONDITION

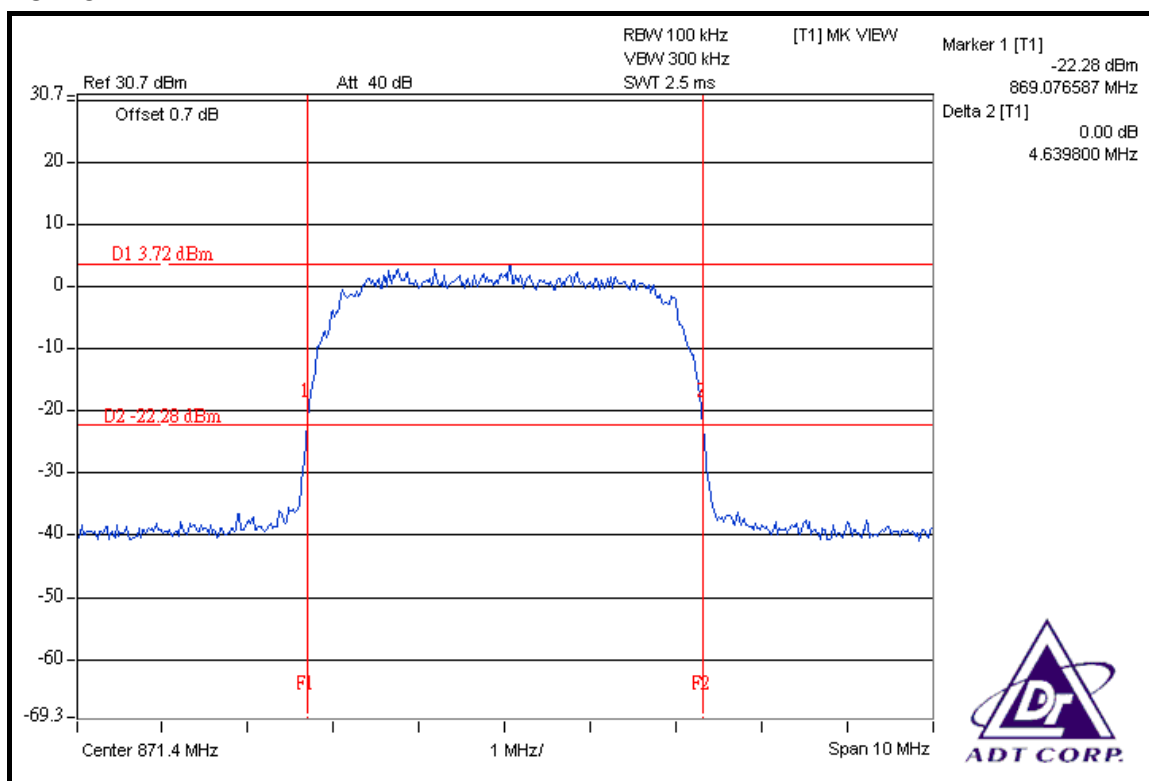
Same as 4.1.5

#### 4.3.6 TEST RESULTS

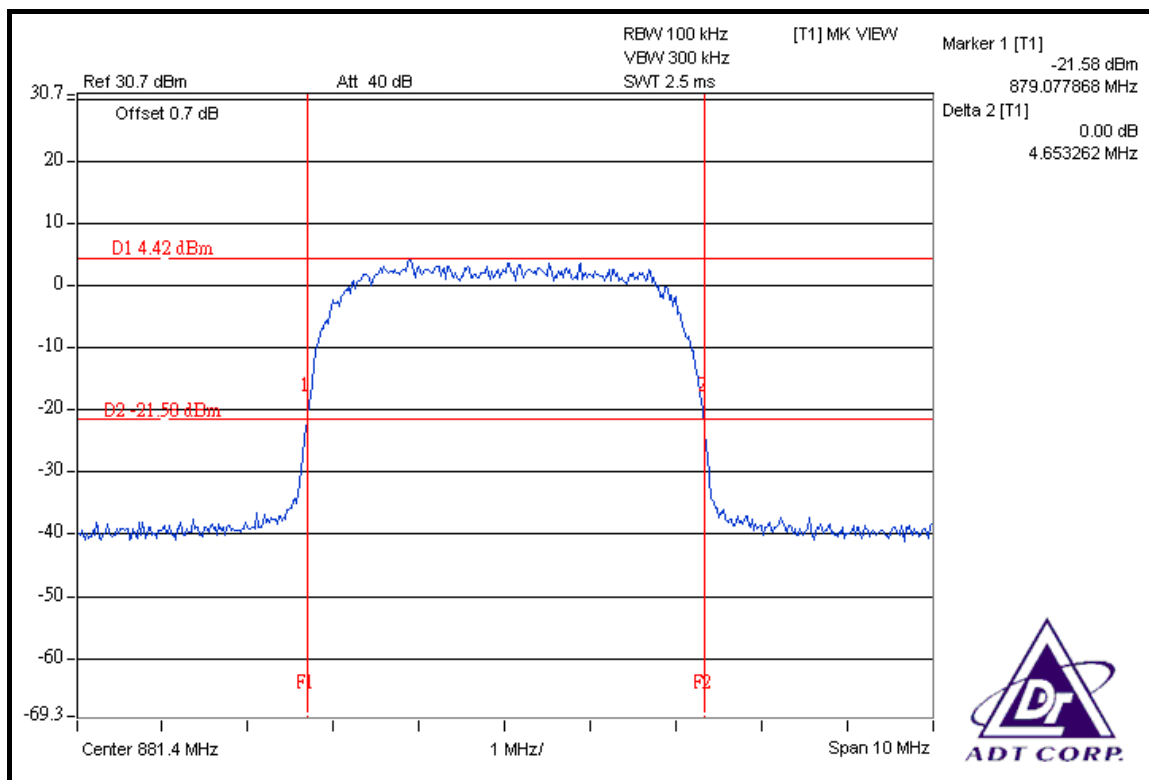
FOR MODULATION TYPE: QPSK

FREQUENCY (MHz)	MAX. OUTPUT POWER -26 dBc BANDWIDTH (MHz)
LOW	4.640
MIDDLE	4.653
HIGH	4.647

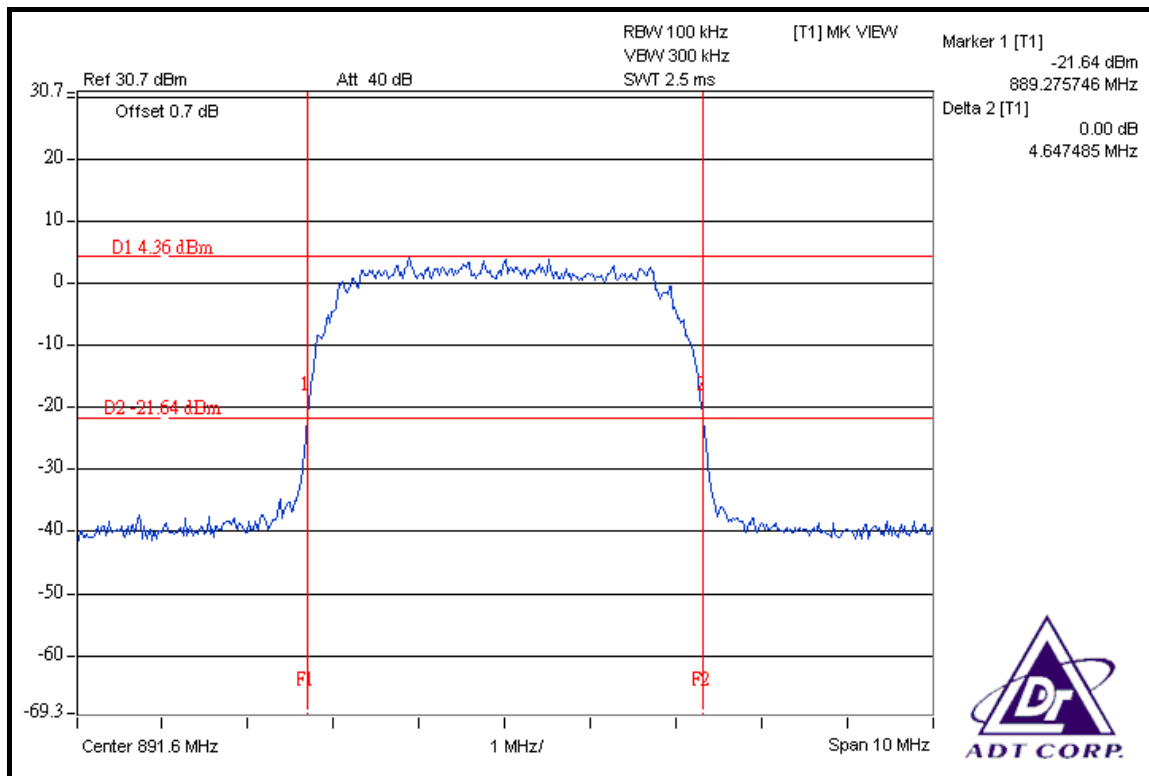
#### LOW CHANNEL



## MIDDLE CHANNEL



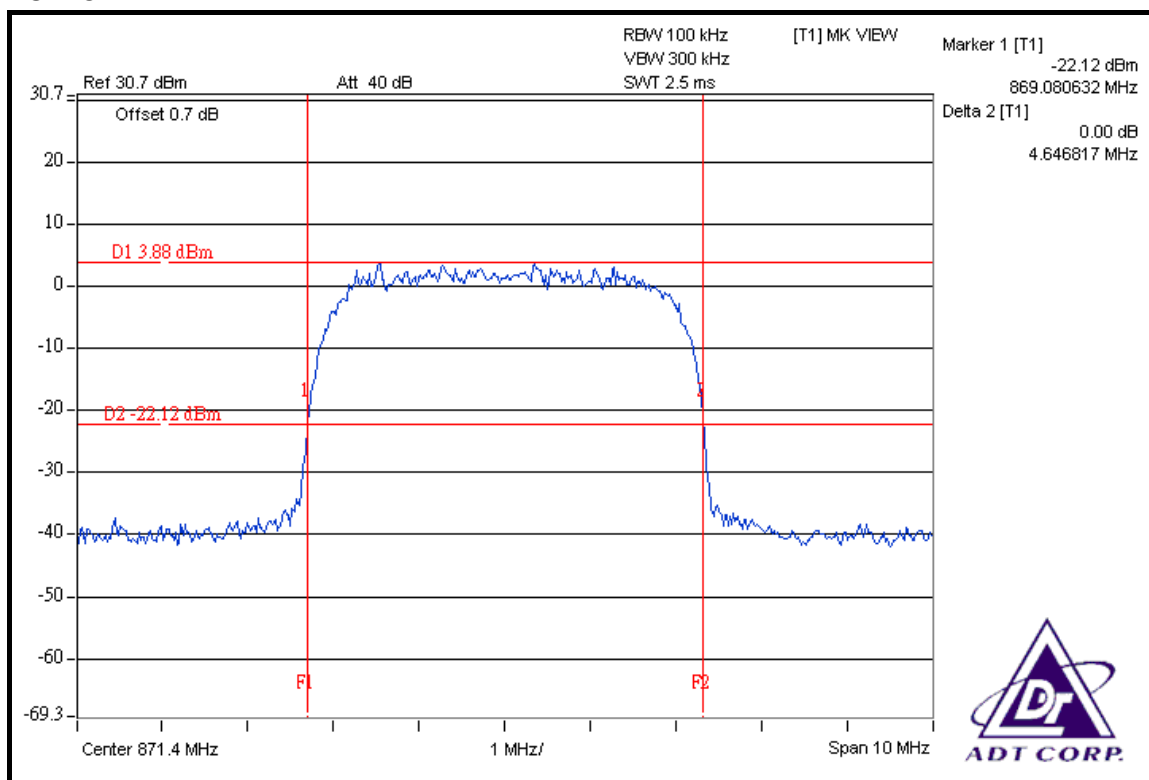
## HIGH CHANNEL



# FOR MODULATION TYPE: 16QAM

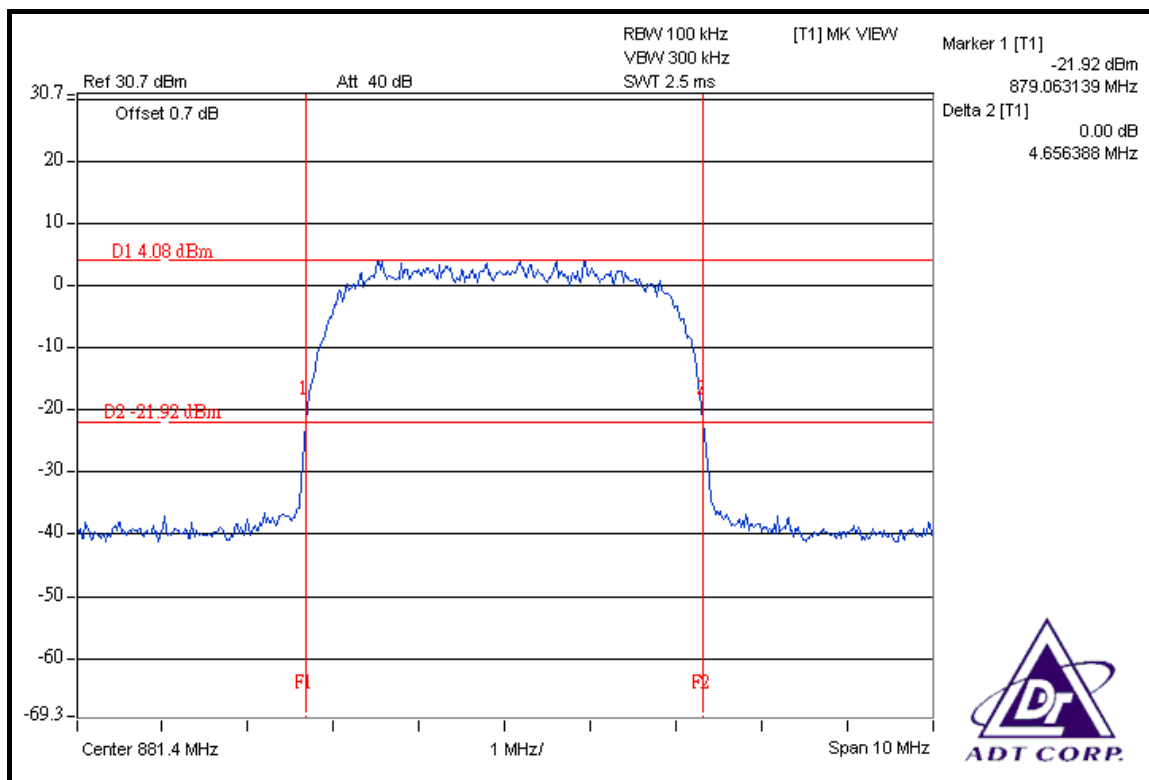
FREQUENCY (MHz)	MAX. OUTPUT POWER -26 dBc BANDWIDTH (MHz)
LOW	4.647
MIDDLE	4.656
HIGH	4.643

## LOW CHANNEL

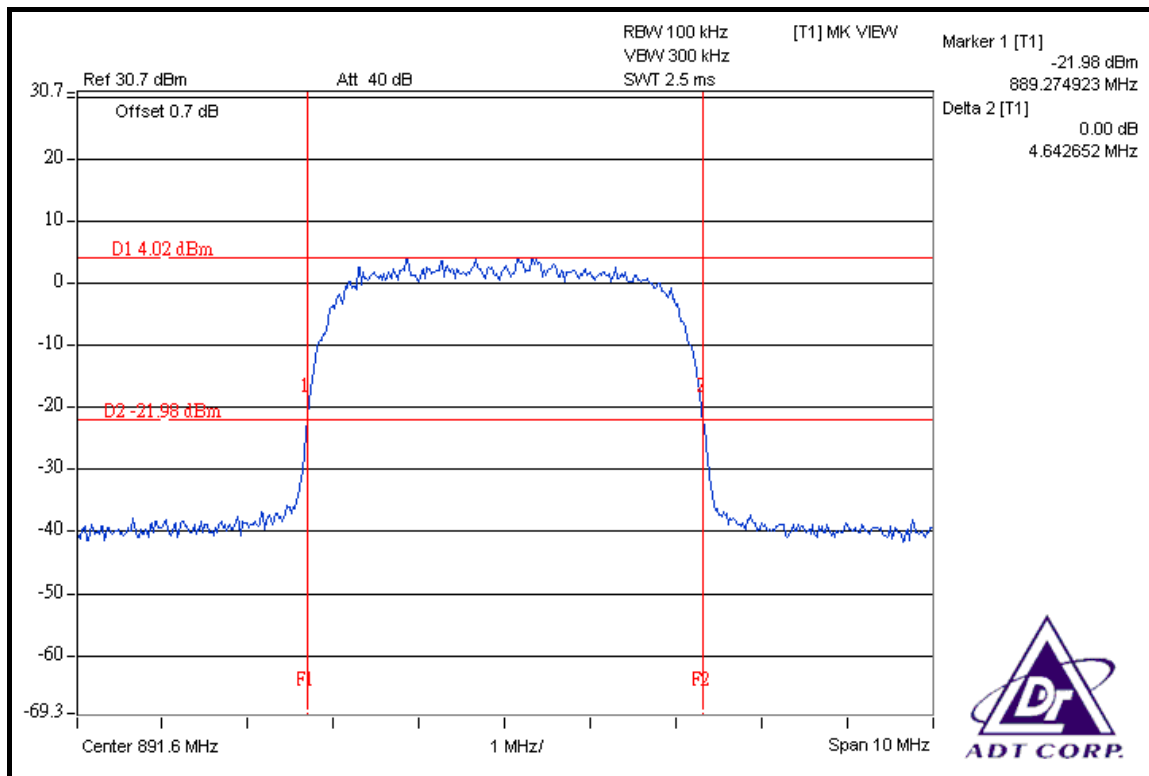




## MIDDLE CHANNEL



## HIGH CHANNEL



## 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 1 MHz 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.	DATE OF CALIBRATION	CALIBRATED UNTIL
* ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009
* Mini-Circuits Power Splitter	ZAPD-4	400005	NA	NA
* Hewlett Packard RF cable	8120-6192	01428251	NA	NA
* JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
* Suhner RF cable	Sucoflex104	204850/4	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. "\*" = 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

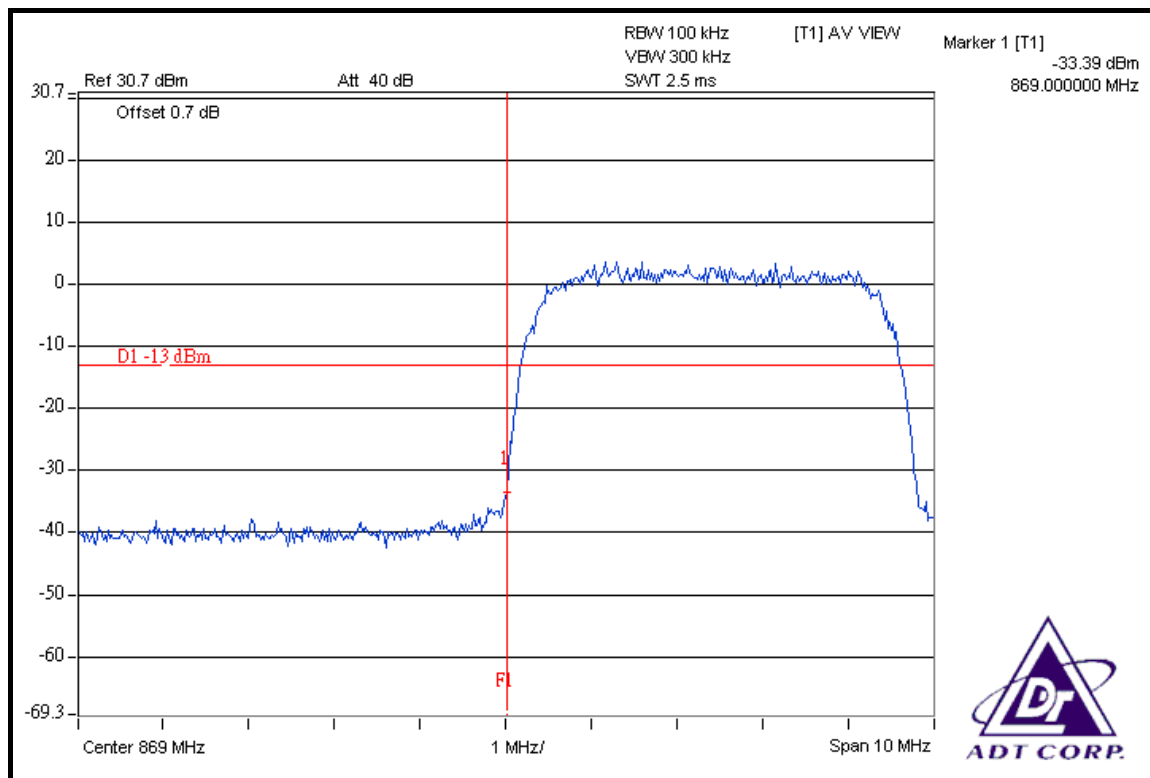
- a. The power was measured with R&S Spectrum Analyzer. All measurements were done at 2 channels, 4357 and 4458 (low and high operational frequency range.)
- b. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer. This splitter loss and cable loss is the worst loss 0.7dB in the transmitted path track.
- c. The center frequency of spectrum is the band edge frequency and span is 10 MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz.
- d. Record the max trace plot into the test report.

#### 4.4.5 EUT OPERATING CONDITION

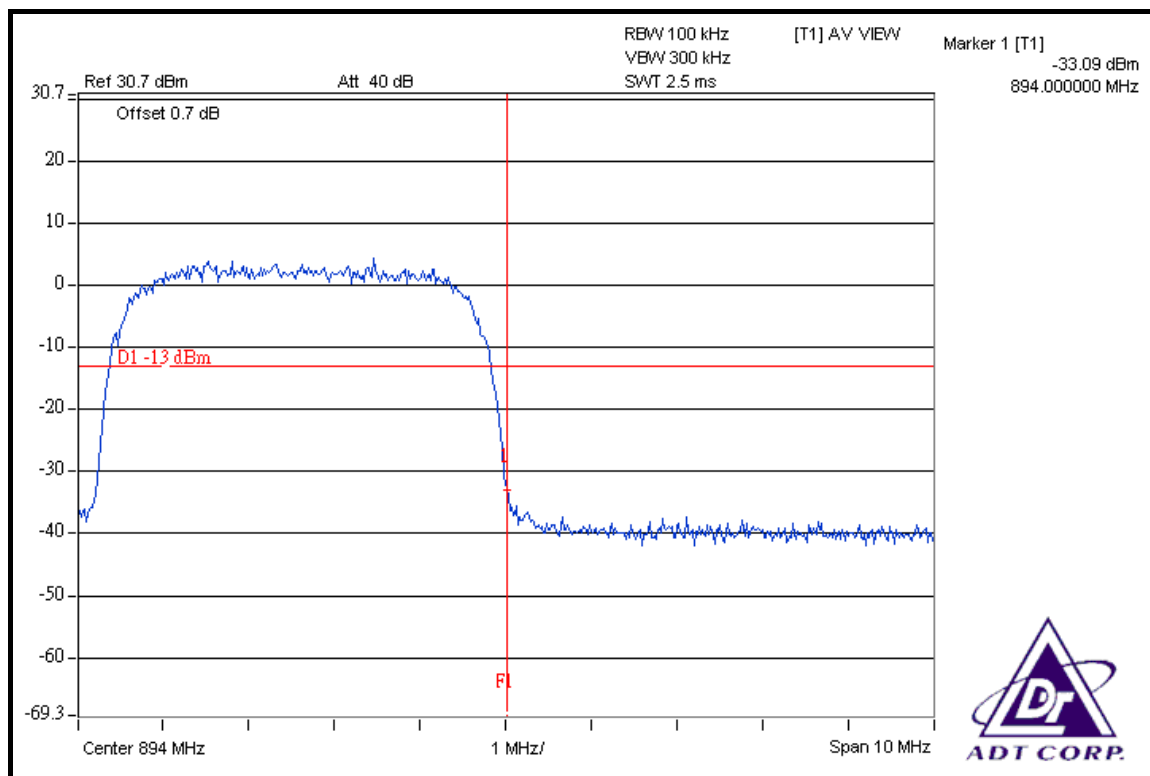
Same as 4.1.5

## 4.4.6 TEST RESULTS

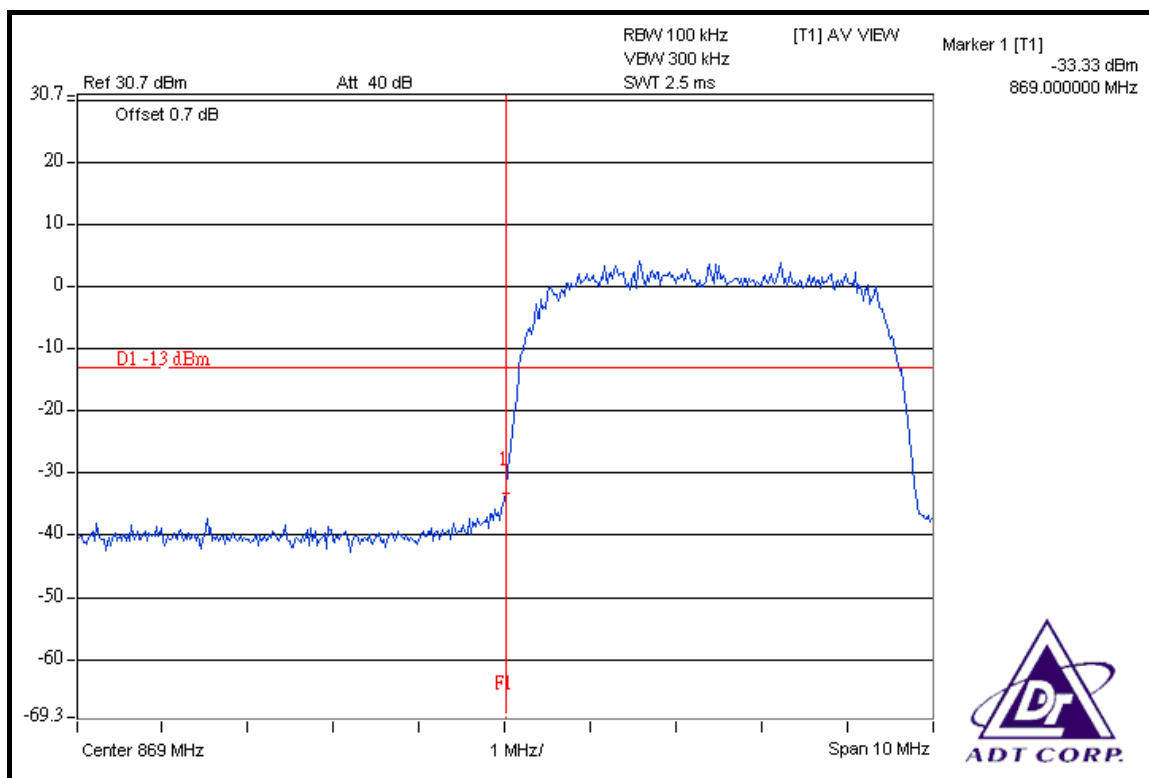
### FOR MODULATION TYPE: QPSK LOWER BAND EDGE



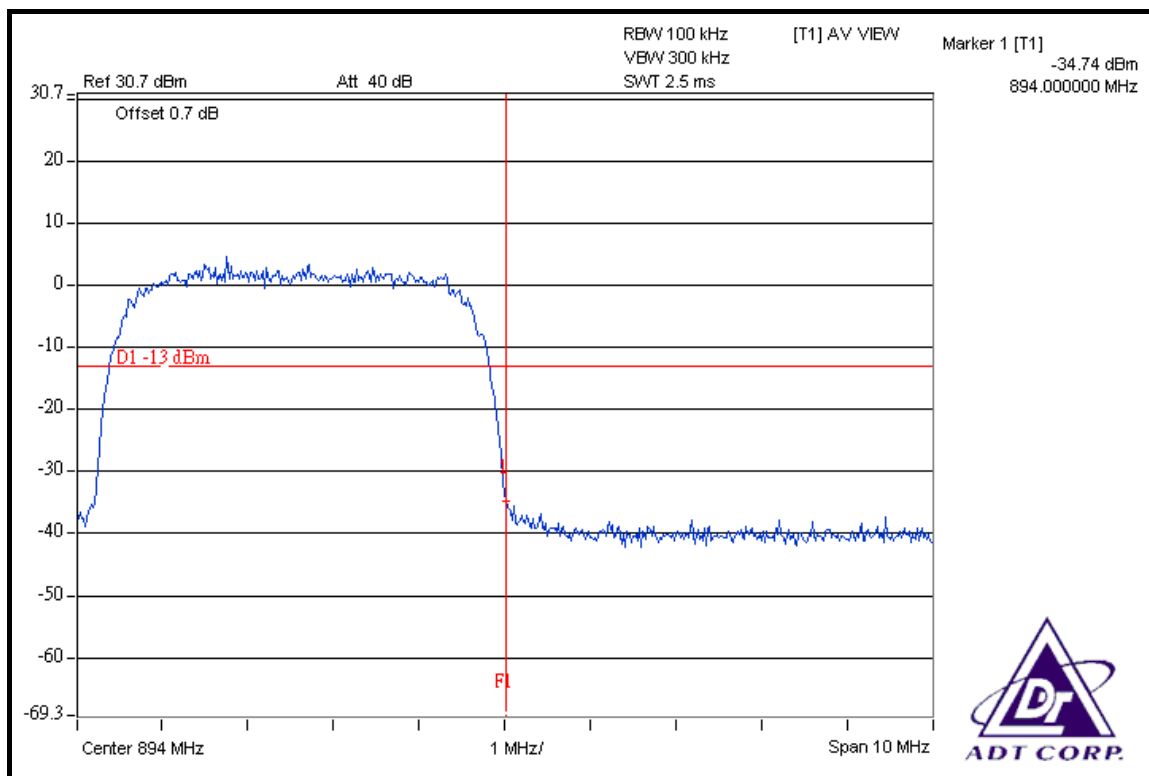
### HIGHER BAND EDGE



# **FOR MODULATION TYPE: 16QAM** **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 GSM spectrum, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. The limit of emission equal to  $-13\text{dBm}$ .

### 4.5.2 TEST INSTRUMENTS

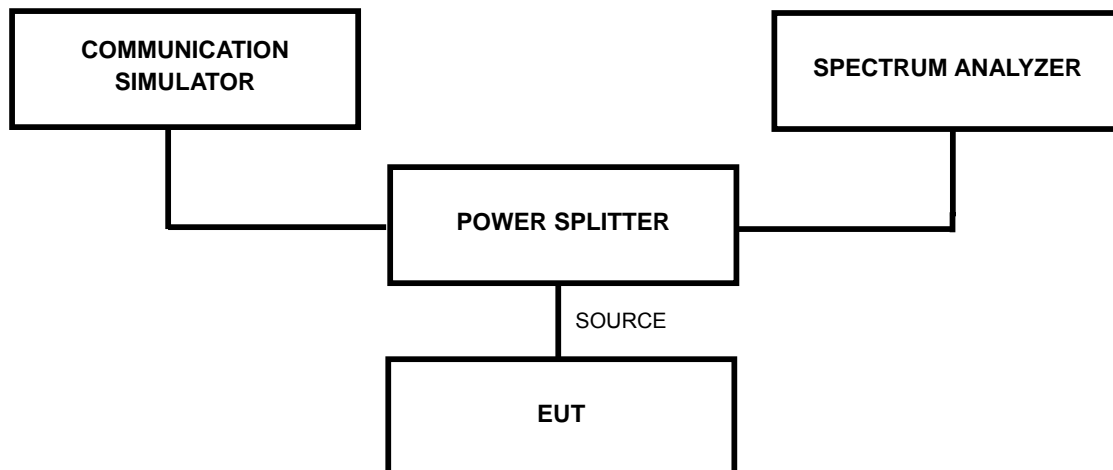
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
* ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009
* Wainwright Instruments Band Reject Filter	WRCG1850/1910-183 0/1930-60/10SS	SN1	NA	NA
* Wainwright Instruments High Pass Filter	WHK3.1/18G-10SS	SN1	NA	NA
* Mini-Circuits Power Splitter	ZAPD-4	400005	NA	NA
* Hewlett Packard RF cable	8120-6192	01428251	NA	NA
* JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
* Suhner RF cable	Sucoflex104	204850/4	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. "\*" = These equipments are used for the final measurement.

#### 4.5.3 TEST PROCEDURE

- a. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels, 4357, 4407 and 4458 (low, middle and high operational frequency range.)
- b. 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 0.7dB in the transmitted path track.
- c. When the spectrum scanned from 9kHz to 1GHz. The spectrum set 1MHz/3MHz.
- d. When the spectrum scanned from 1GHz to 9GHz, it shall be connected to the high pass filter attenuated the carried frequency. The spectrum set 1MHz/3MHz.

#### 4.5.4 TEST SETUP

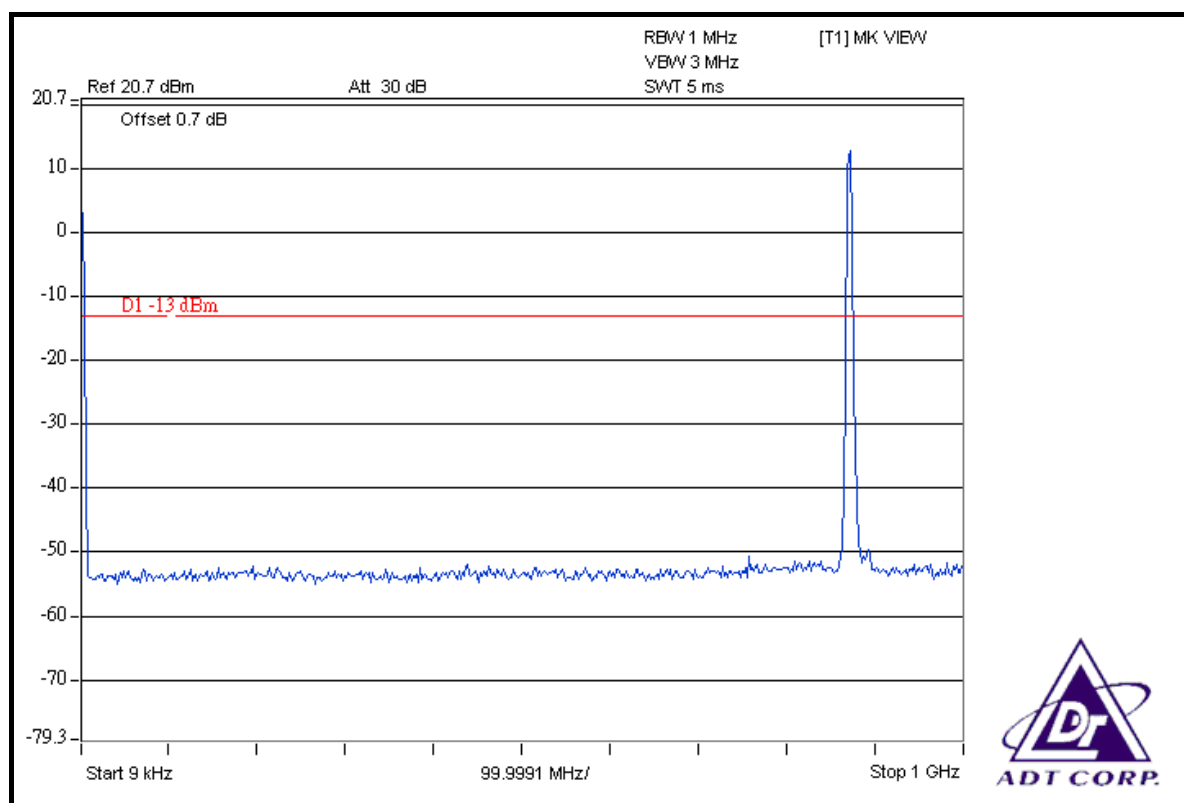


#### 4.5.5 EUT OPERATING CONDITIONS

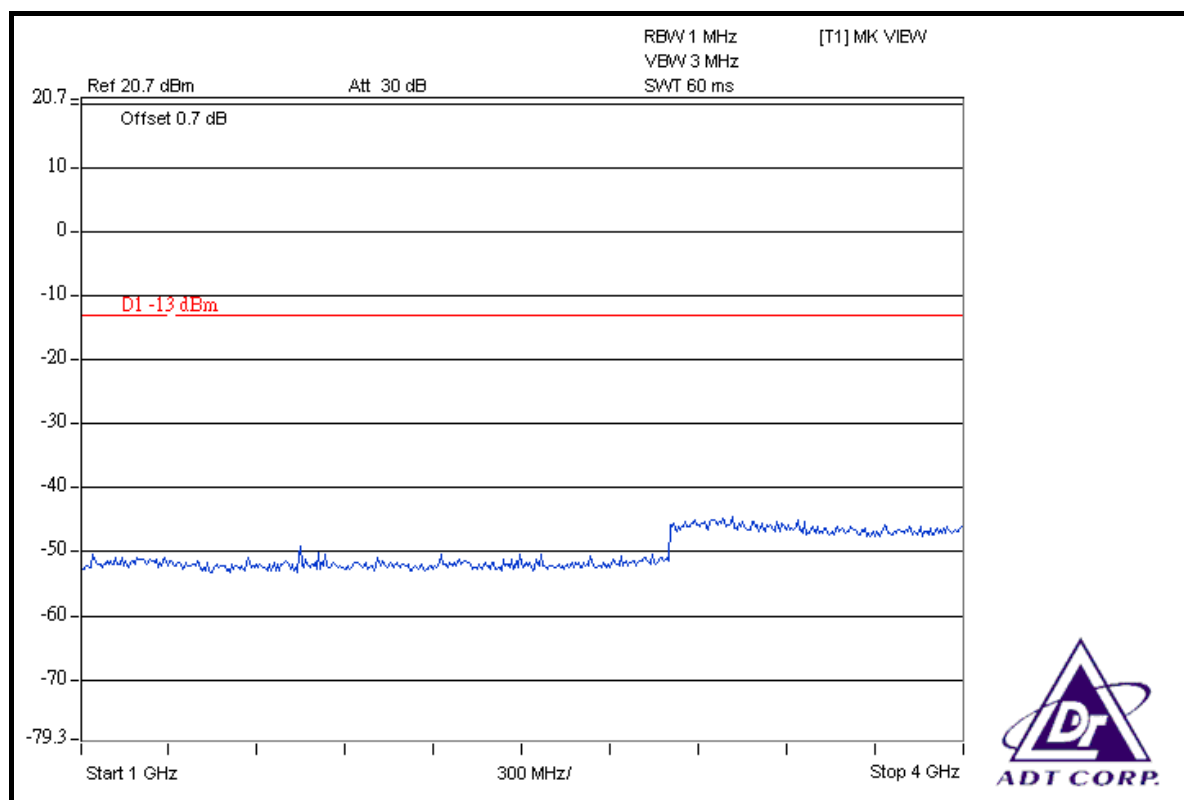
Same as 4.1.5

## 4.5.6 TEST RESULTS

**CH 4357: 9kHz ~ 1GHz**

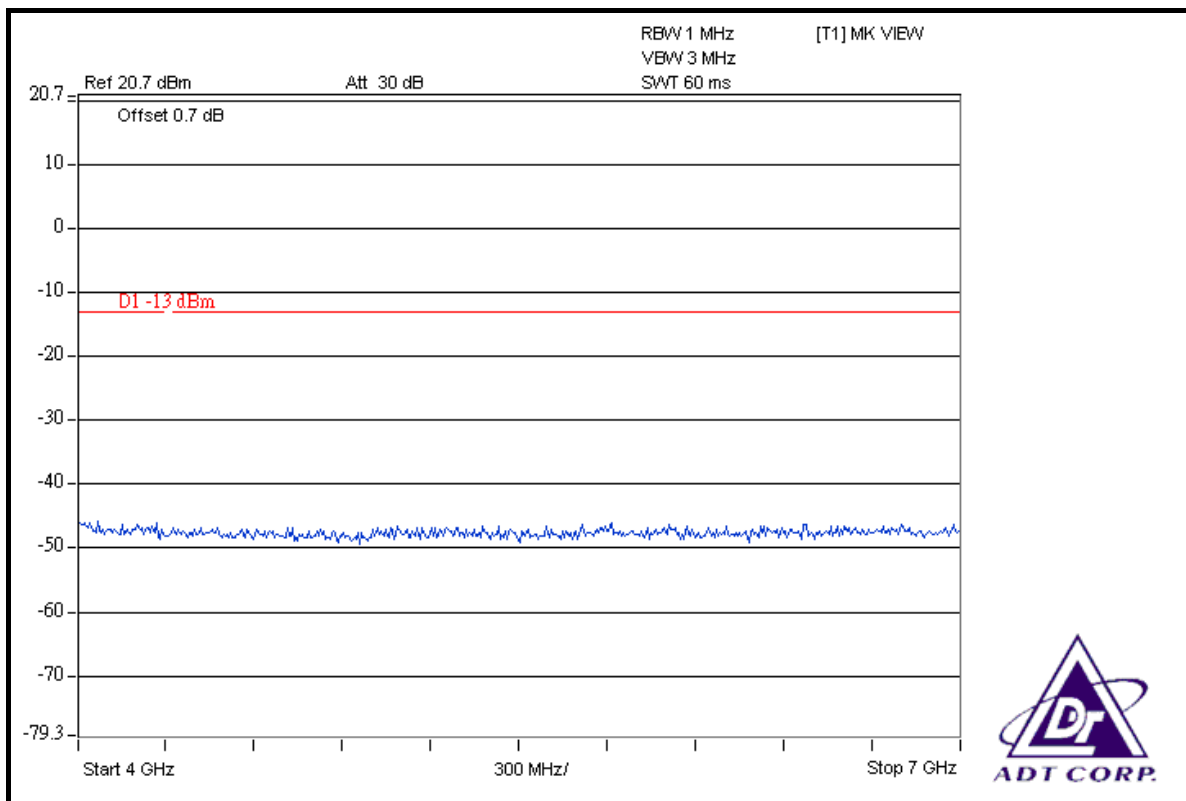


**1GHz ~ 4GHz**

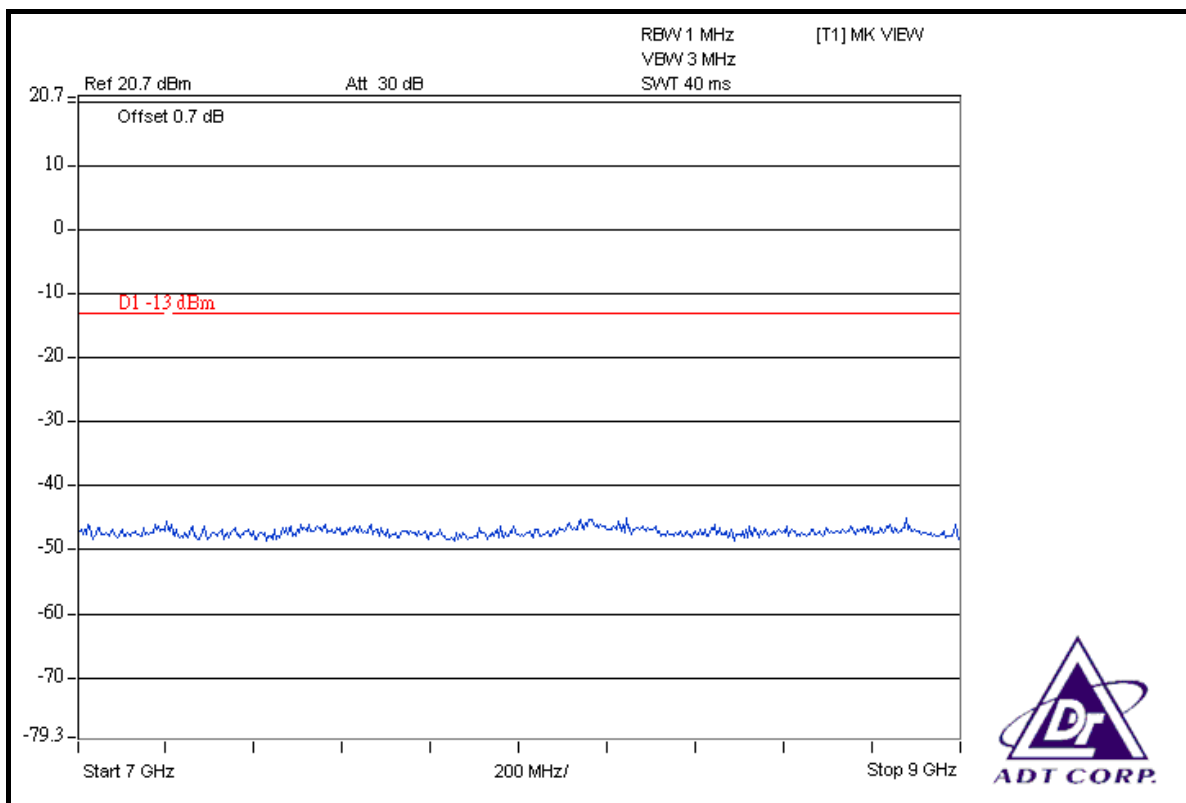




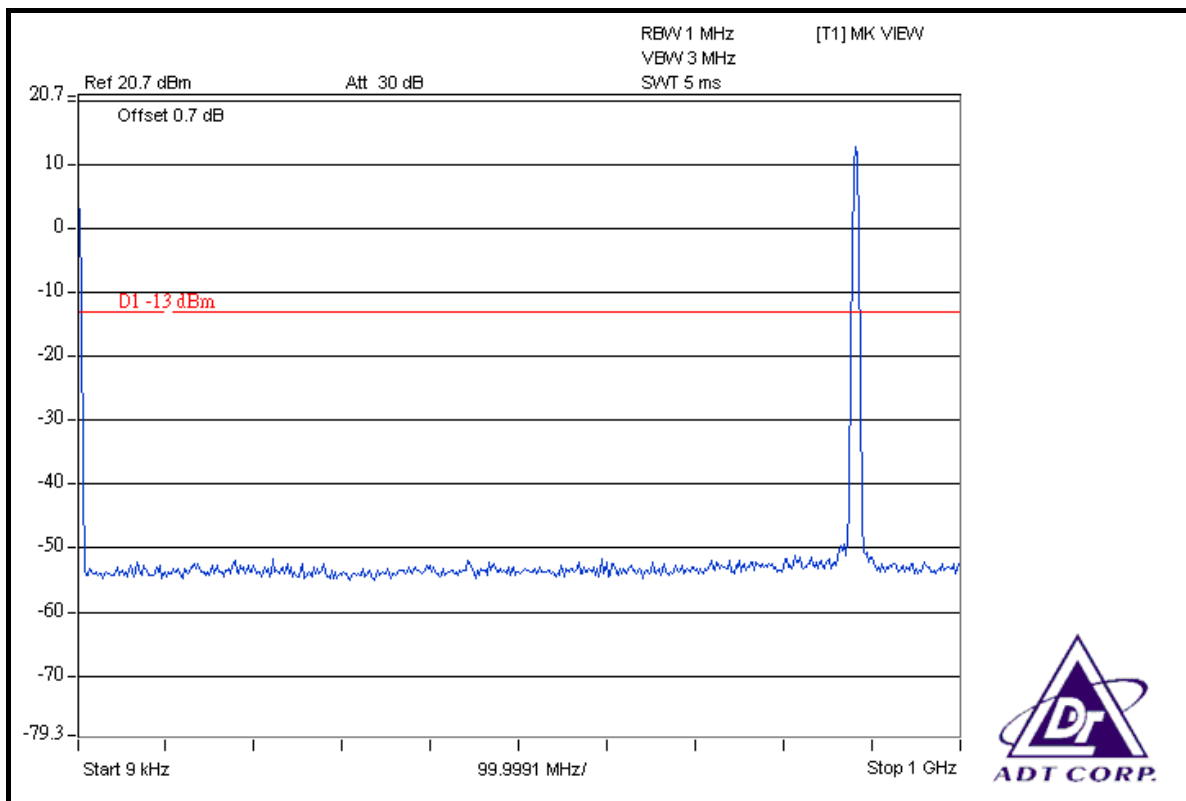
#### 4GHz ~ 7GHz



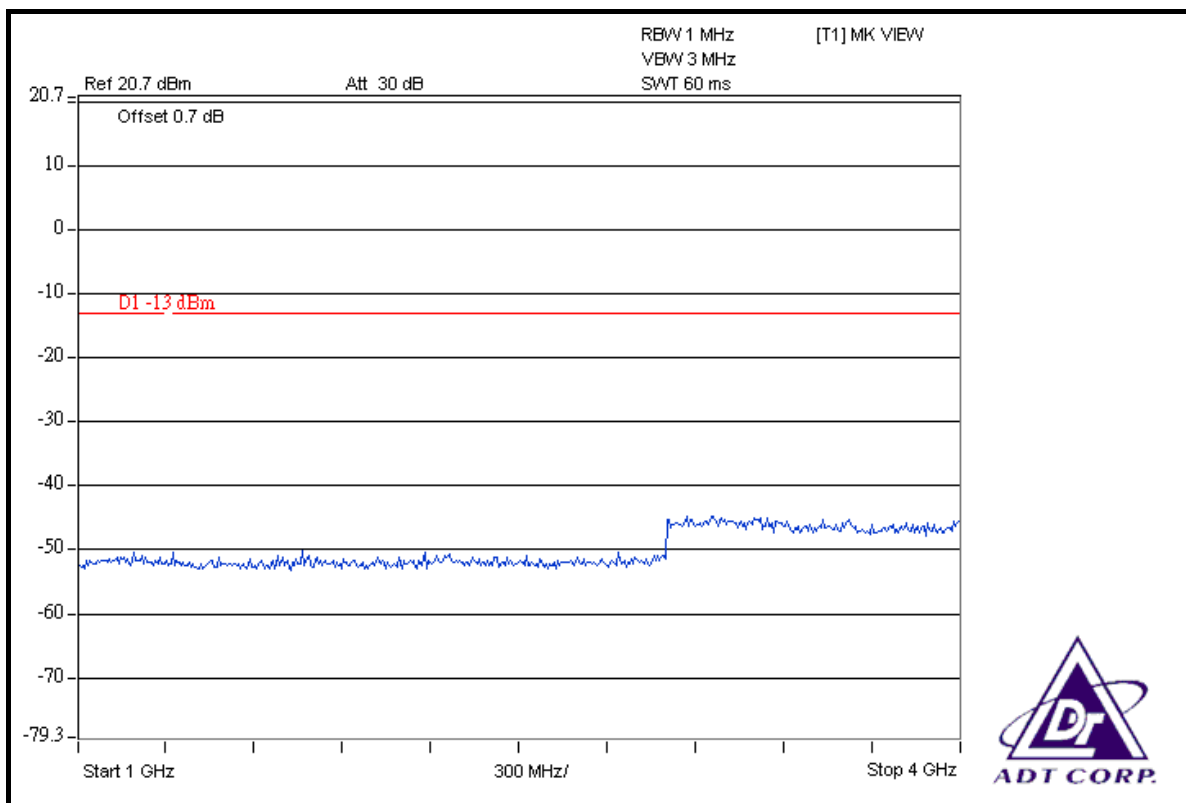
#### 7GHz ~ 9GHz



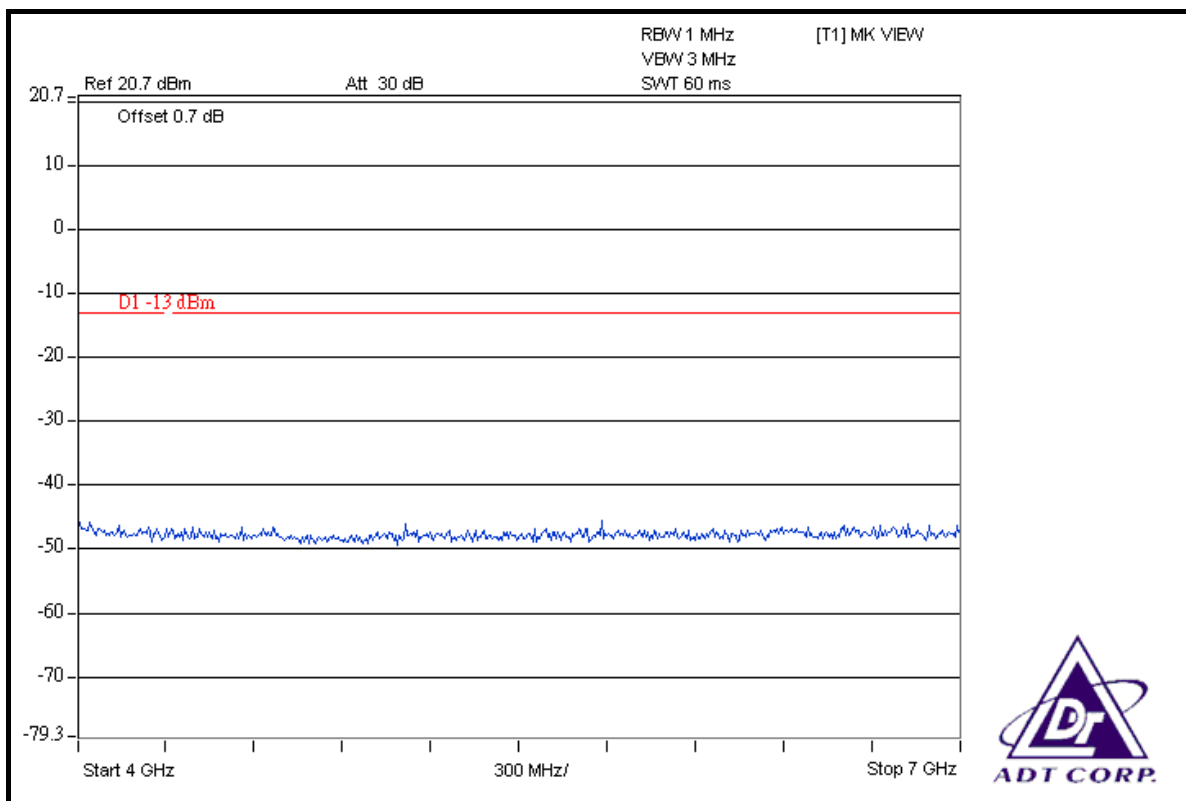
# CH 4407: 9kHz ~ 1GHz



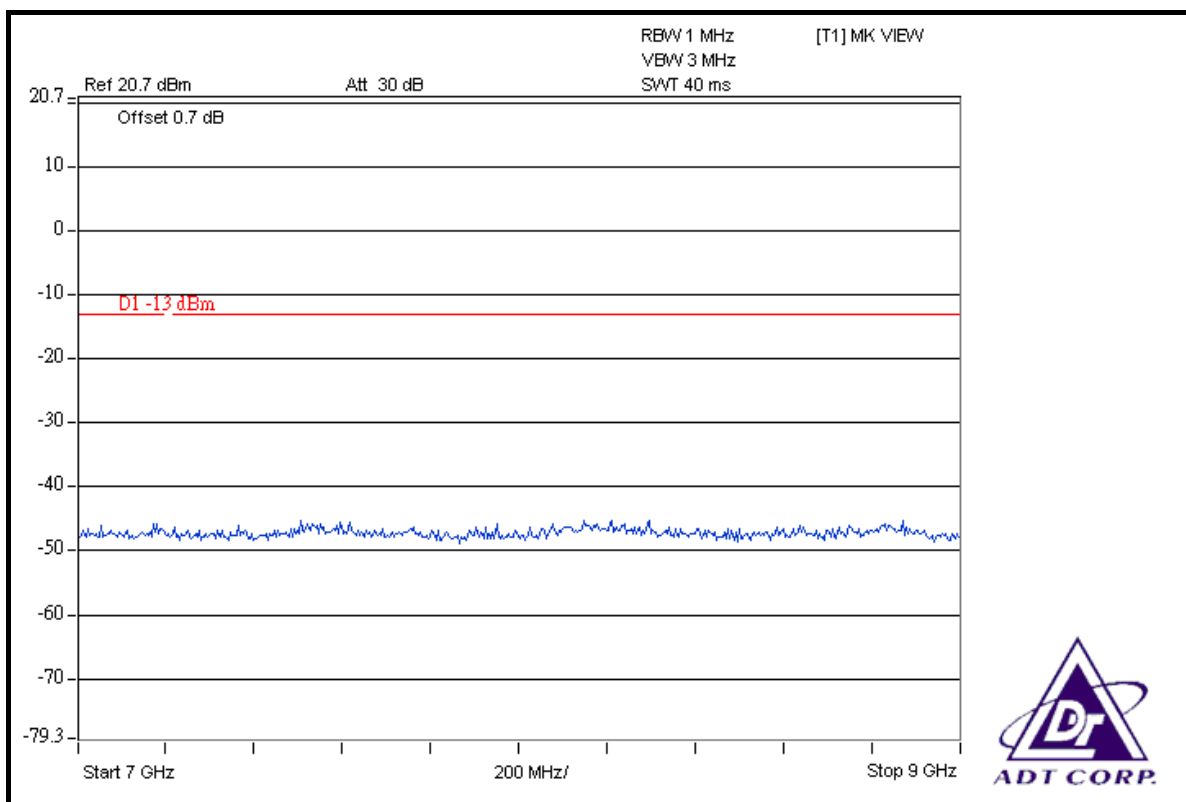
# 1GHz ~ 4GHz



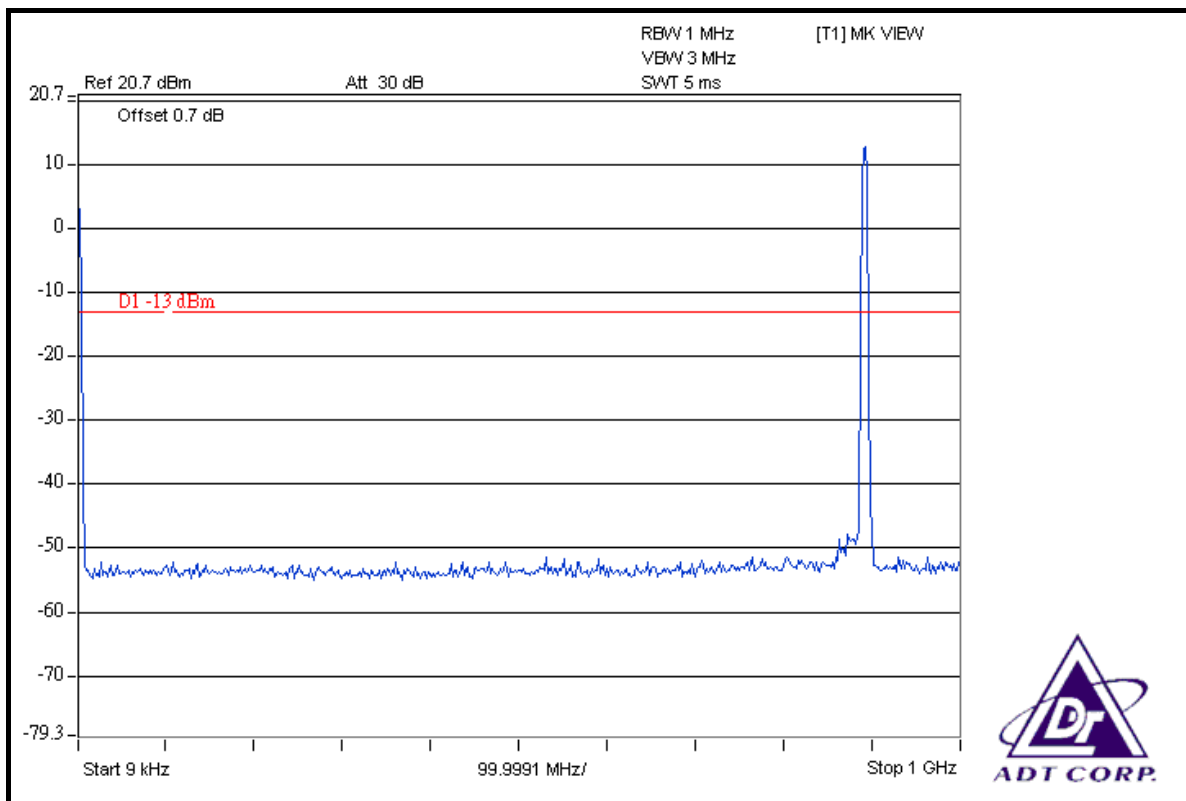
## 4GHz ~ 7GHz



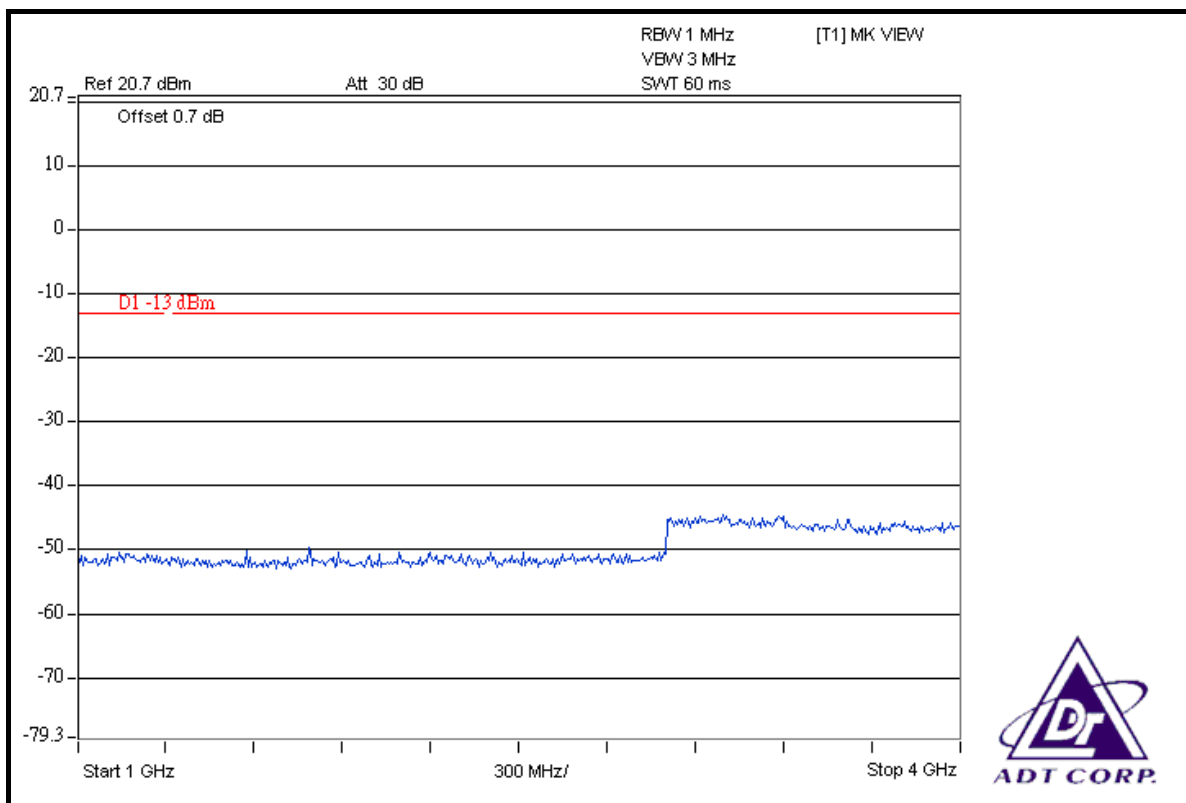
## 7GHz ~ 9GHz



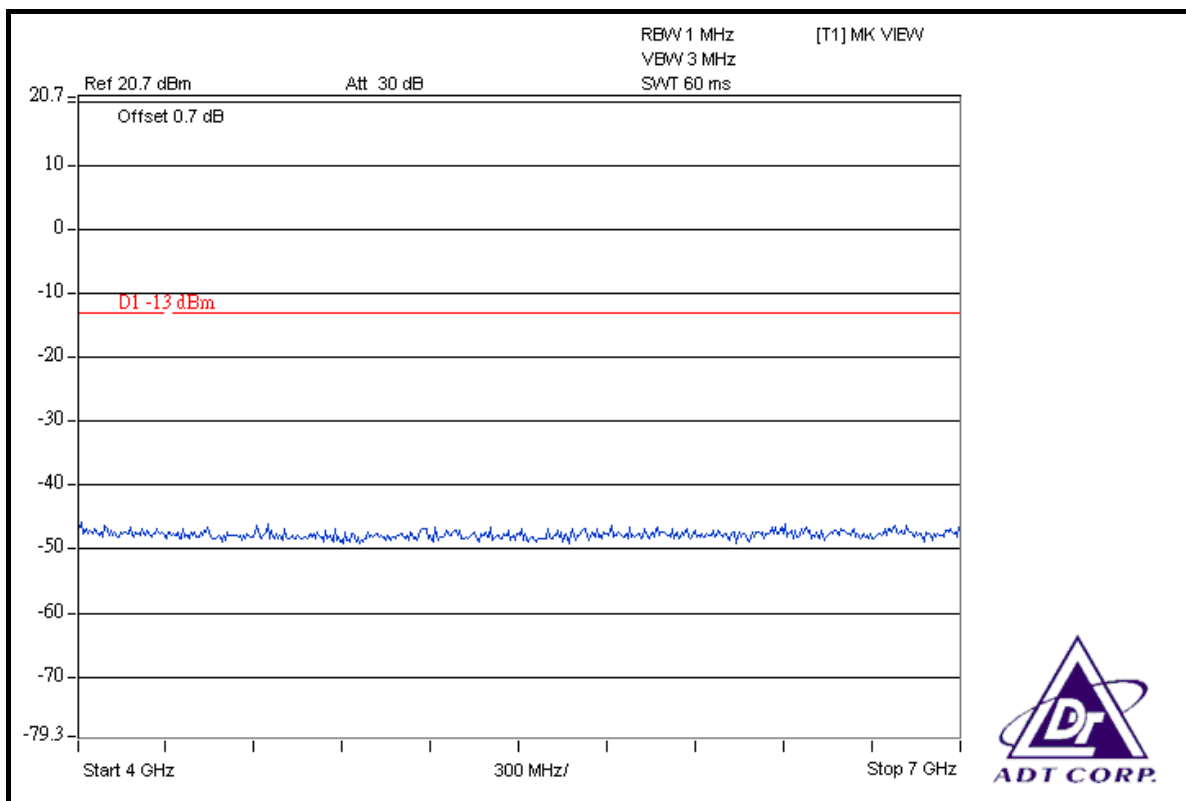
# CH 4458: 9kHz ~ 1GHz



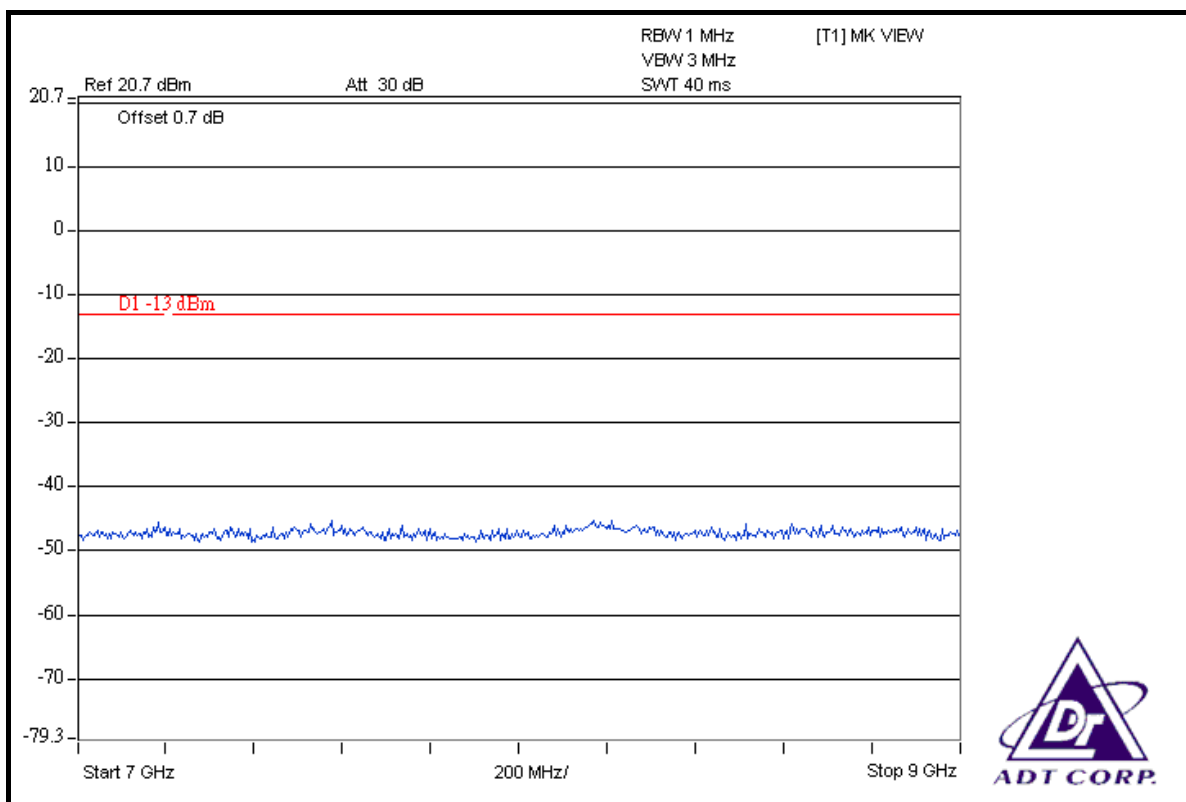
# 1GHz ~ 4GHz



#### 4GHz ~ 7GHz



#### 7GHz ~ 9GHz



## 4.6 RADIATED EMISSION MEASUREMENT (BELOW 1GHz)

### 4.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

n the FCC 24.238(a), On any frequency outside a licensee's frequency block within USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. The emission limit 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.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESI7	838496/016	Dec. 26, 2007	Dec. 25, 2008
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Dec. 03, 2007	Dec. 02, 2008
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Apr. 30, 2008	Apr. 29, 2009
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-408	Jan. 22, 2008	Jan. 21, 2009
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 07, 2008	Jan. 06, 2009
Preamplifier Agilent	8449B	3008A01960	Oct. 31, 2007	Oct. 30, 2008
Preamplifier Agilent	8447D	2944A10631	Nov. 01, 2007	Oct. 31, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	274397/4	Nov. 08, 2007	Nov. 07, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	283401/4	Nov. 08, 2007	Nov. 07, 2008
Software ADT.	ADT_Radiated_V7.6	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	019303	NA	NA
Turn Table ADT.	TT100.	TT93021704	NA	NA
Turn Table Controller ADT.	SC100.	SC93021704	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 4.

3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.

4. The FCC Site Registration No. is 460141.

5. The IC Site Registration No. is IC3789B-4.

#### 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 and the receiving antenna was moved height from 1m to 4m to find the maximum reading and recorded the value.
- d. Repeat step a ~ c for horizontal polarization.

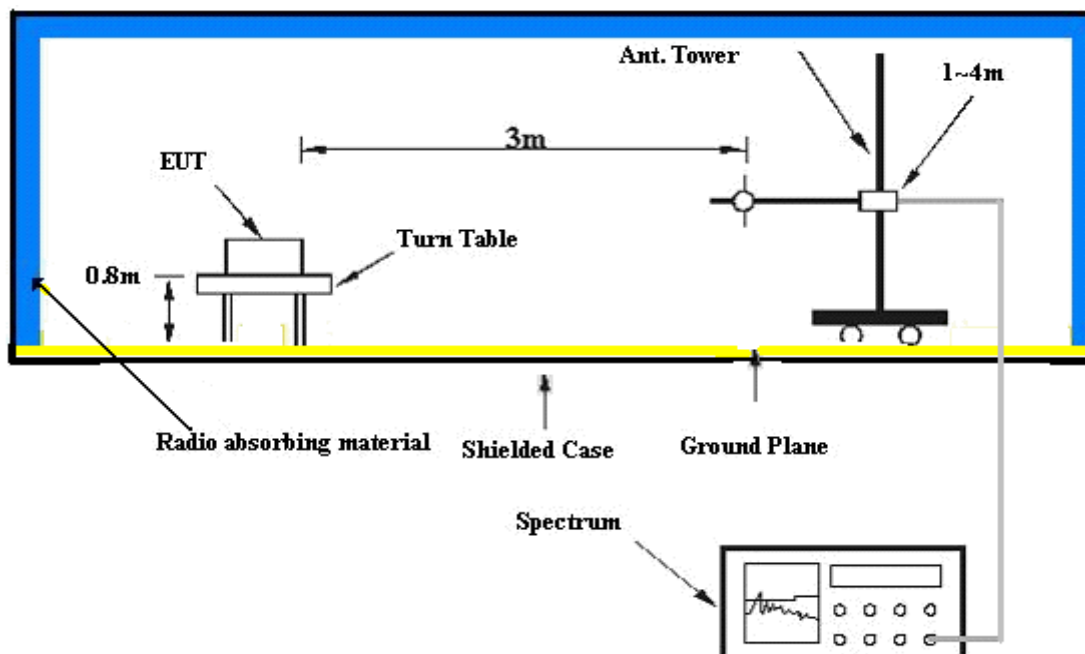
**NOTE:** The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 1 MHz.

#### 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

Same as 4.1.5

#### 4.6.7 TEST RESULTS

##### FOR MODULATION TYPE: QPSK

MODE	TX channel 4458	DETECTOR FUNCTION	Quasi-Peak
FREQUENCY RANGE	Below 1000 MHz	INPUT POWER (SYSTEM)	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	23deg. C, 67%RH, 991hPa	TESTED BY	Mark Liao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
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	107.76	40.22	82.22	-42.00	1.25 H	106	29.45	10.76
2	249.66	41.66	82.22	-40.56	1.25 H	286	27.98	13.68
3	376.01	39.61	82.22	-42.61	1.00 H	307	22.90	16.70
4	500.42	46.68	82.22	-35.54	1.50 H	307	26.18	20.50
5	640.38	45.03	82.22	-37.19	1.25 H	319	21.06	23.97
6	980.56	40.74	82.22	-41.48	1.00 H	289	7.82	26.25

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
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	63.05	46.89	82.22	-35.33	1.00 V	40	33.68	13.21
2	107.76	41.75	82.22	-40.47	1.25 V	358	30.99	10.76
3	125.25	39.53	82.22	-42.69	1.00 V	244	27.12	12.41
4	374.07	37.30	82.22	-44.92	1.00 V	10	20.64	16.66
5	500.42	44.27	82.22	-37.95	1.00 V	304	23.77	20.50
6	640.38	42.25	82.22	-39.97	2.00 V	319	18.28	23.97

#### 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 emission limit equal to  $-13\text{dBm}$ .

#### 4.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESI7	838496/016	Dec. 26, 2007	Dec. 25, 2008
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Dec. 03, 2007	Dec. 02, 2008
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Apr. 30, 2008	Apr. 29, 2009
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-408	Jan. 22, 2008	Jan. 21, 2009
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 07, 2008	Jan. 06, 2009
Preamplifier Agilent	8449B	3008A01960	Oct. 31, 2007	Oct. 30, 2008
Preamplifier Agilent	8447D	2944A10631	Nov. 01, 2007	Oct. 31, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	274397/4	Nov. 08, 2007	Nov. 07, 2008
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	283401/4	Nov. 08, 2007	Nov. 07, 2008
Software ADT.	ADT_Radiated_V7.6	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	019303	NA	NA
Turn Table ADT.	TT100.	TT93021704	NA	NA
Turn Table Controller ADT.	SC100.	SC93021704	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 4.

3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.

4. The FCC Site Registration No. is 460141.

5. The IC Site Registration No. is IC3789B-4.

#### 4.7.3 TEST PROCEDURES

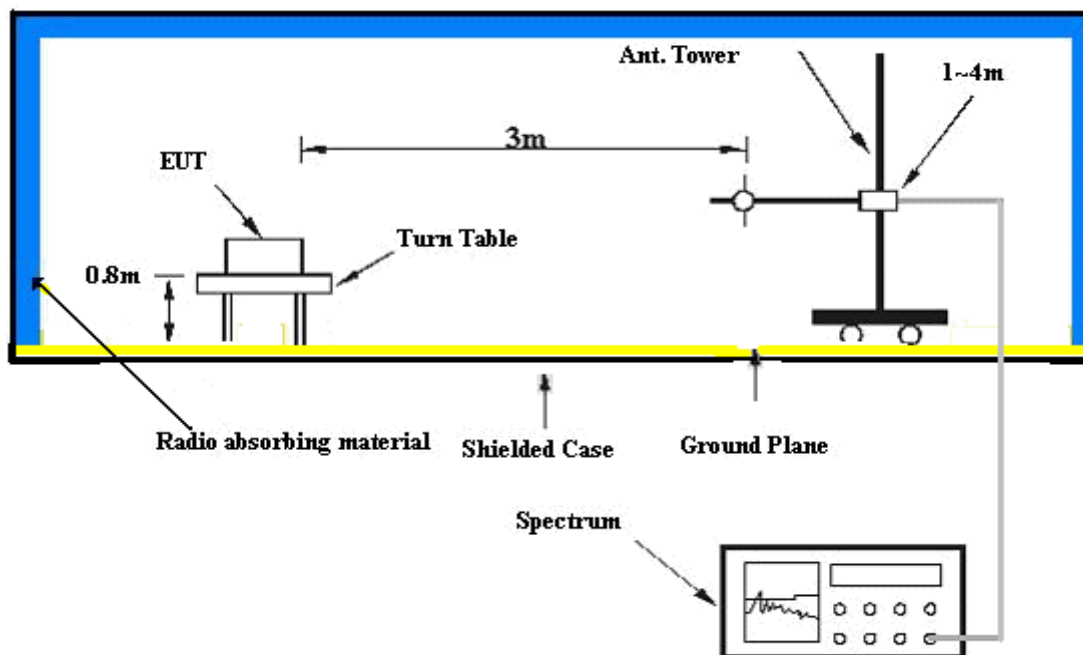
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the receiving antenna, which was mounted on antenna tower and its position at 0.8 m above the 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 and the receiving antenna was moved height from 1m to 4m 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 1 MHz and the video bandwidth is 1 MHz.

#### 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

Same as 4.1.5

#### 4.7.7 TEST RESULTS

<b>MODE</b>	TX channel 4357	<b>FREQUENCY RANGE</b>	Above 1000 MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	25deg. C, 65%RH, 991hPa
<b>TESTED BY</b>	Dean Wang		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	1742.80	39.55	-13.00	-64.80	7.91	-56.89
2	1792.00	40.51	-13.00	-63.37	7.99	-55.38
3	2614.20	41.56	-13.00	-61.87	8.55	-53.32

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	1742.80	38.93	-13.00	-64.23	7.91	-56.32
2	1792.00	40.86	-13.00	-63.15	7.99	-55.16
3	2614.20	41.74	-13.00	-61.74	8.55	-53.19

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

<b>MODE</b>	TX channel 4407	<b>FREQUENCY RANGE</b>	Above 1000 MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	25deg. C, 65%RH, 991hPa
<b>TESTED BY</b>	Dean Wang		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	1762.80	39.19	-13.00	-63.18	7.95	-55.23
2	1792.00	40.58	-13.00	-63.12	7.99	-55.13
3	2644.20	41.69	-13.00	-61.61	8.59	-53.02

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	1762.80	39.52	-13.00	-63.23	7.95	-55.28
2	1792.00	41.03	-13.00	-61.94	7.99	-53.95
3	2644.20	41.85	-13.00	-61.46	8.59	-52.87

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



<b>MODE</b>	TX channel 4458	<b>FREQUENCY RANGE</b>	Above 1000 MHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>ENVIRONMENTAL CONDITIONS</b>	25deg. C, 65%RH, 991hPa
<b>TESTED BY</b>	Dean Wang		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	1783.20	39.02	-13.00	-63.81	7.96	-55.85
2	1792.00	40.33	-13.00	-62.25	7.99	-54.26
3	2674.80	42.07	-13.00	-61.48	8.63	-52.85

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	1783.20	39.79	-13.00	-63.15	7.96	-55.19
2	1792.00	40.80	-13.00	-62.01	7.99	-54.02
3	2674.80	41.51	-13.00	-61.75	8.63	-53.12

**NOTE:** Power Value (dBm) = 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
<b>GERMANY</b>	TUV Rheinland
<b>JAPAN</b>	VCCI
<b>NORWAY</b>	NEMKO
<b>CANADA</b>	INDUSTRY CANADA , CSA
<b>R.O.C.</b>	TAF, BSMI, NCC
<b>NETHERLANDS</b>	Telefication
<b>SINGAPORE</b>	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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**Linko RF Lab:**

Tel: 886-3-3270910

Fax: 886-3-3270892

**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

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

## **6 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No any modifications are made to the EUT by the lab during the test.

**---END---**