# FCC PART 22H, PART 24E

# TEST REPORT

For

# AMGOO Telecom Co., Ltd

3/F, Block R2-A(North), Gaoxin S. Ave. 4th, Hi-Tech Industrial Park,
Nanshan District, Shenzhen, China

## FCC ID:UOSAM402

| **Report Type:** | **Product Type:** |
|---|---|
| Original Report | Smartphone |

| | |
|---|---|
| **Test Engineer:** | Shawn Xiao |
| **Report Number:** | RSZ160525004-00D |
| **Report Date:** | 2016-06-07 |
| **Reviewed By:** | Candy Li<br>RF Engineer |
| **Prepared By:** | Bay Area Compliance Laboratories Corp. (Shenzhen)<br>6/F, the 3rd Phase of WanLi Industrial Building<br>ShiHua Road, FuTian Free Trade Zone<br>Shenzhen, Guangdong, China<br>Tel: +86-755-33320018<br>Fax: +86-755-33320008<br>www.baclcorp.com.cn |

# TABLE OF CONTENTS

# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

The *AMGOO Telecom Co., Ltd*'s product, model number: AM402 *(FCC ID: UOSAM402)* or the "EUT" in this report was a *Smartphone* , which was measured approximately: 12.3 cm (L) × 6.5 cm (W) × 1.1 cm(H), rated with input voltage: DC 3.7V rechargeable Li-ion battery or DC 5.0V from adapter.

Adapter Information:
Model: CH4
Input: AC 100-240V, 50/60Hz, 0.2A
Output: DC 5V, 700mA

**All measurement and test data in this report was gathered from production sample serial number: 1602340. (Assigned by Shenzhen BACL).The EUT supplied by the applicant was received on 2016-05-25.*

## Objective

This test report is prepared on behalf of *AMGOO Telecom Co., Ltd* in accordance with Part 2-Subpart J, Part 22-Subpart H and Part 24-Subpart E of the Federal Communication Commissions rules.

The objective is to determine the compliance of the EUT with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability and band edge.

## Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS, FCC Part 15.247 DTS and Part 15B JBP submissions with FCC ID: UOSAM402.

## Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2-Subpart J as well as the following parts:

Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E - Personal Communication Services

Applicable Standards: TIA/EIA 603-D.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement uncertainty with radiated emission is 5.81 dB for 30MHz-1GHz.and 4.88 dB for above 1GHz, 1.95dB for conducted measurement.

## Test Facility

The test site used by Bay Area Compliance Laboratories Corp.(Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on October 31, 2013. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

# SYSTEM TEST CONFIGURATION

## Description of Test Configuration

The EUT was configured for testing according to TIA/EIA-603-D.

The final qualification test was performed with the EUT operating at normal mode.

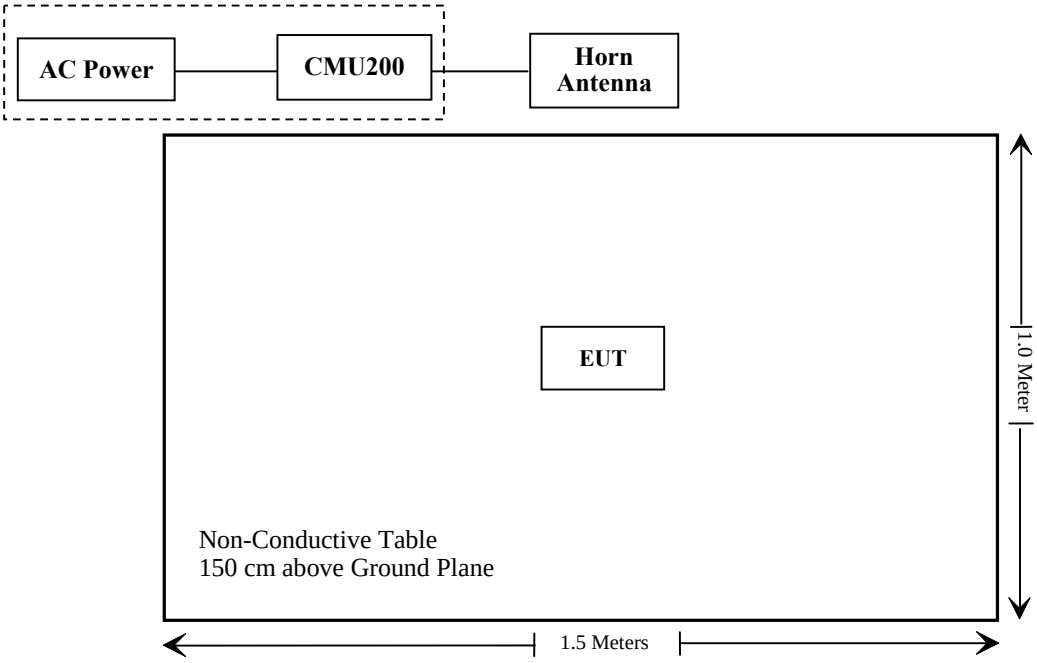
## Equipment Modifications

No modification was made to the EUT.

## Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| Rohde & Schwarz | Universal Radio Communication Tester | CMU200 | 106891 |

## Block Diagram of Test Setup



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|---|---|---|
| §1.1307, §2.1093 | RF Exposure (SAR) | Compliance* |
| §2.1046;<br>§ 22.913 (a); § 24.232 (c) | RF Output Power | Compliance |
| § 2.1047 | Modulation Characteristics | Not Applicable |
| § 2.1049; § 22.905<br>§ 22.917; § 24.238 | Bandwidth | Compliance |
| § 2.1051,<br>§ 22.917 (a); § 24.238 (a) | Spurious Emissions at Antenna Terminal | Compliance |
| § 2.1053<br>§ 22.917 (a); § 24.238 (a) | Field Strength of Spurious Radiation | Compliance |
| § 22.917 (a); § 24.238 (a) | Out of band emission, Band Edge | Compliance |
| § 2.1055<br>§ 22.355; § 24.235 | Frequency stability vs. temperature<br>Frequency stability vs. voltage | Compliance |

Compliance*: please refer to the SAR report RSZ160525004-20

# FCC §1.1307 & §2.1093 - RF EXPOSURE

## Applicable Standard

FCC§1.1310 and §2.1093.

## Test Result

Compliance, please refer to the SAR report: RSZ160525004-20.

# FCC §2.1047 - MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), Part 22H & 24E there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

# FCC § 2.1046, § 22.913 (a) & § 24.232 (c) - RF OUTPUT POWER

## Applicable Standard

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to FCC §2.1046 and §24.232 (c) (d):

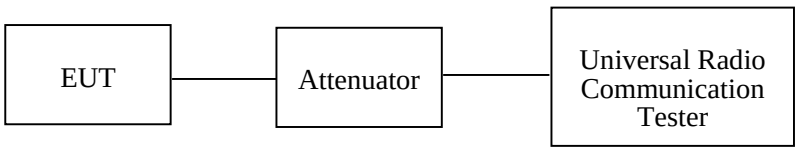
(c) Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

(d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

## Test Procedure

*Conducted method:*

The RF output of the transmitter was connected to the wireless test set and the spectrum analyzer through sufficient attenuation.




*Radiated method:*

TIA 603-D section 2.2.17

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Sunol Sciences | Horn Antenna | DRH-118 | A052604 | 2014-12-29 | 2017-12-28 |
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 8386001028 | 2015-12-11 | 2016-12-11 |
| Rohde & Schwarz | EMI Test Receiver | ESCI | 101120 | 2015-12-15 | 2016-12-14 |
| Sunol Sciences | Bi-log Antenna | JB1 | A040904-2 | 2014-12-07 | 2017-12-06 |
| HP | Synthesized Sweeper | HP 8341B | 2624A00116 | 2015-07-02 | 2016-07-01 |
| COM POWER | Dipole Antenna | AD-100 | 041000 | 2015-08-18 | 2016-08-18 |
| A.H. System | Horn Antenna | SAS-200/571 | 135 | 2015-08-18 | 2018-08-17 |
| Rohde & Schwarz | Universal Radio Communication Tester | CMU200 | 106891 | 2015-11-23 | 2016-11-23 |
| Ducommun technologies | RF Cable | UFA210A-1-4724-30050U | MFR64369 223410-001 | 2015-06-15 | 2016-06-15 |
| Ducommun technologies | RF Cable | 104PEA | 218124002 | 2015-06-15 | 2016-06-15 |
| Ducommun technologies | RF Cable | RG-214 | 1 | 2015-06-15 | 2016-06-15 |
| Ducommun technologies | RF Cable | RG-214 | 2 | 2015-06-15 | 2016-06-15 |
| Ducommun technologies | RF Cable | RG-214 | 3 | 2015-06-15 | 2016-06-15 |
| WEINSCHEL | 10dB Attenuator | 5324 | AU0709 | 2015-06-18 | 2016-06-18 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24℃ |
| **Relative Humidity:** | 54 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Shawn Xiao on 2016-06-01.*

## Conducted Power

**Cellular Band (Part 22H)**

| Mode | Channel | Frequency (MHz) | Average Output Power (dBm) | Limit (dBm) |
|---|---|---|---|---|
| GSM | 128 | 824.2 | 32.11 | 38.45 |
| | 190 | 836.6 | 32.12 | 38.45 |
| | 251 | 848.8 | 32.19 | 38.45 |

| Mode | Channel | Frequency (MHz) | Average Output Power (dBm) | | | | Limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | 1 slot | 2 slots | 3 slots | 4 slots | |
| GPRS | 128 | 824.2 | 32.11 | 30.20 | 28.42 | 26.38 | 38.45 |
| | 190 | 836.6 | 32.12 | 30.23 | 28.44 | 26.41 | 38.45 |
| | 251 | 848.8 | 32.22 | 30.30 | 28.47 | 26.42 | 38.45 |

| Mode | Test Condition | Test Mode | 3GPP Sub Test | Average Output Power (dBm) | | |
|---|---|---|---|---|---|---|
| | | | | Low Frequency | Middle Frequency | High Frequency |
| WCDMA (Band V) | Normal | RMC12.2k | | 21.78 | 21.56 | 21.60 |
| | | Rel 6 HSDPA | 1 | 20.73 | 20.51 | 20.52 |
| | | | 2 | 20.90 | 20.66 | 20.72 |
| | | | 3 | 20.67 | 20.47 | 20.57 |
| | | | 4 | 20.88 | 20.66 | 20.63 |
| | | Rel 6 HSUPA | 1 | 20.65 | 20.44 | 20.48 |
| | | | 2 | 20.81 | 20.60 | 20.71 |
| | | | 3 | 20.74 | 20.49 | 20.50 |
| | | | 4 | 20.85 | 20.66 | 20.73 |
| | | | 5 | 20.81 | 20.60 | 20.69 |

**PCS Band (Part 24E)**

| Mode | Channel | Frequency (MHz) | Average Output Power (dBm) | Limit (dBm) |
|---|---|---|---|---|
| GSM | 512 | 1850.2 | 29.20 | 33 |
| | 661 | 1880.0 | 29.35 | 33 |
| | 810 | 1909.8 | 29.54 | 33 |

| Mode | Channel | Frequency (MHz) | Average Output Power (dBm) | | | | Limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | 1 slot | 2 slots | 3 slots | 4 slots | |
| GPRS | 512 | 1850.2 | 29.22 | 27.09 | 25.54 | 23.47 | 33 |
| | 661 | 1880.0 | 29.36 | 27.20 | 25.61 | 23.52 | 33 |
| | 810 | 1909.8 | 29.56 | 27.30 | 25.69 | 23.57 | 33 |

| Mode | Test Condition | Test Mode | 3GPP Sub Test | Average Output Power (dBm) | | |
|---|---|---|---|---|---|---|
| | | | | Low Frequency | Middle Frequency | High Frequency |
| WCDMA (Band II) | Normal | RMC12.2k | | 21.17 | 21.25 | 21.04 |
| | | Rel 6 HSDPA | 1 | 20.52 | 20.41 | 20.40 |
| | | | 2 | 20.41 | 20.31 | 20.35 |
| | | | 3 | 20.35 | 20.36 | 20.46 |
| | | | 4 | 20.44 | 20.36 | 20.48 |
| | | Rel 6 HSUPA | 1 | 20.58 | 20.45 | 20.35 |
| | | | 2 | 20.34 | 20.32 | 20.37 |
| | | | 3 | 20.42 | 20.42 | 20.43 |
| | | | 4 | 20.46 | 20.38 | 20.41 |
| | | | 5 | 20.41 | 20.39 | 20.32 |

**Peak-to-average ratio (PAR)**

**Cellular Band**

| Mode | Channel | PAR (dB) | Limit (dB) |
|---|---|---|---|
| GSM | Low | 0.26 | 13 |
| | Middle | 0.27 | 13 |
| | High | 0.29 | 13 |

| Mode | Channel | PAR (dB) | Limit (dB) |
|---|---|---|---|
| WCDMA (BPSK) | Low | 3.27 | 13 |
| | Middle | 2.93 | 13 |
| | High | 3.05 | 13 |
| HSDPA (16QAM) | Low | 3.22 | 13 |
| | Middle | 3.15 | 13 |
| | High | 3.18 | 13 |
| HSUPA (BPSK) | Low | 3.12 | 13 |
| | Middle | 3.14 | 13 |
| | High | 3.14 | 13 |

**PCS Band**

| Mode | Channel | PAR (dB) | Limit (dB) |
|---|---|---|---|
| GSM | Low | 0.24 | 13 |
| | Middle | 0.28 | 13 |
| | High | 0.25 | 13 |

| Mode | Channel | PAR (dB) | Limit (dB) |
|---|---|---|---|
| WCDMA (BPSK) | Low | 3.62 | 13 |
| | Middle | 3.56 | 13 |
| | High | 3.38 | 13 |
| HSDPA (16QAM) | Low | 3.28 | 13 |
| | Middle | 3.35 | 13 |
| | High | 3.24 | 13 |
| HSUPA (BPSK) | Low | 3.33 | 13 |
| | Middle | 3.44 | 13 |
| | High | 3.34 | 13 |

**Radiated Power**

**ERP & EIRP**

**GSM Mode:**

| Frequency (MHz) | Receiver Reading (dBμV) | Turntable Angle Degree | Rx Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (m) | Polar (H/V) | S.G. Level (dBm) | Cable loss (dB) | Antenna Gain (dB) | | | |
| ERP for Cellular Band (Part 22H), Middle Channel | | | | | | | | | | |
| 836.6 | 100.43 | 74 | 2.1 | H | 32.4 | 0.67 | 0 | 31.73 | 38.45 | 6.72 |
| 836.6 | 97.75 | 256 | 1.8 | V | 29.8 | 0.67 | 0 | 29.13 | 38.45 | 9.32 |
| EIRP for PCS Band (Part 24E), Middle Channel | | | | | | | | | | |
| 1880.0 | 90.22 | 96 | 2.2 | H | 20.5 | 1.40 | 7.30 | 26.40 | 33 | 6.60 |
| 1880.0 | 91.61 | 104 | 2.2 | V | 21.4 | 1.40 | 7.30 | 27.30 | 33 | 5.70 |

**WCDMA Mode:**

| Frequency (MHz) | Receiver Reading (dBμV) | Turntable Angle Degree | Rx Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (m) | Polar (H/V) | S.G. Level (dBm) | Cable loss (dB) | Antenna Gain (dB) | | | |
| ERP for WCDMA Band V (Part 22H), Middle Channel | | | | | | | | | | |
| 836.6 | 89.67 | 24 | 2.5 | H | 21.7 | 0.67 | 0 | 21.03 | 38.45 | 17.42 |
| 836.6 | 88.73 | 125 | 2.2 | V | 20.7 | 0.67 | 0 | 20.03 | 38.45 | 18.42 |
| EIRP for WCDMA Band II (Part 24E), Middle Channel | | | | | | | | | | |
| 1880.0 | 82.69 | 211 | 1.7 | H | 14.0 | 1.40 | 7.30 | 19.90 | 33 | 13.10 |
| 1880.0 | 83.63 | 349 | 1.5 | V | 14.4 | 1.40 | 7.30 | 20.30 | 33 | 12.70 |

**Note:**
All above data were tested with no amplifier.
Absolute Level = SG Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

# FCC §2.1049, §22.917, §22.905 & §24.238 - OCCUPIED BANDWIDTH

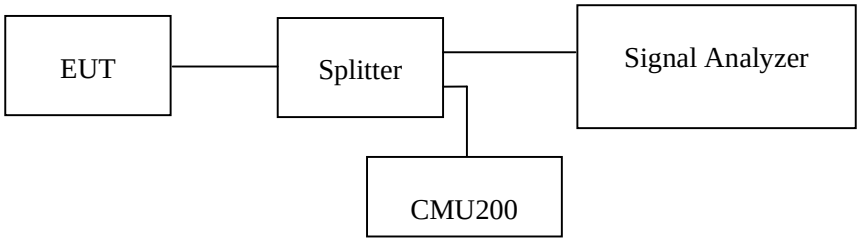
## Applicable Standards

FCC 47 §2.1049, §22.917, §22.905 and §24.238.

## Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 5 kHz (Cellular /PCS) & 100 kHz (WCDMA) and the 26 dB & 99% bandwidth was recorded.




## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 8386001028 | 2015-12-11 | 2016-12-11 |
| Rohde & Schwarz | Universal Radio Communication Tester | CMU200 | 106891 | 2015-11-23 | 2016-11-23 |
| HONOVA | Power Splitter | HPDL-2W-B-NF | N/A | 2015-06-12 | 2016-06-12 |
| Ducommun technologies | RF Cable | RG-214 | 4 | 2015-06-15 | 2016-06-15 |
| WEINSCHEL | 3dB Attenuator | 5321 | AU0709 | 2015-06-18 | 2016-06-18 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22~25 ℃ |
| **Relative Humidity:** | 48~56 % |
| **ATM Pressure:** | 101.0~101.1kPa |

*The testing was performed by Shawn Xiao from 2016-06-3 to 2016-06-04.*

*EUT operation mode: Transmitting*

*Test Result: Compliance. Please refer to the following tables and plots.*

**Cellular Band (Part 22H)**

| Mode | Frequency (MHz) | 99% Occupied Bandwidth (kHz) | 26 dB Emission Bandwidth (kHz) |
|---|---|---|---|
| GSM(GMSK) | 836.6 | 244.49 | 316.63 |

| Mode | Frequency (MHz) | 99% Occupied Bandwidth (MHz) | 26 dB Emission Bandwidth (MHz) |
|---|---|---|---|
| WCDMA (BPSK) | 836.6 | 4.108 | 4.709 |
| HSUPA (BPSK) | 836.6 | 4.148 | 4.810 |
| HSDPA (16QAM) | 836.6 | 4.148 | 4.689 |

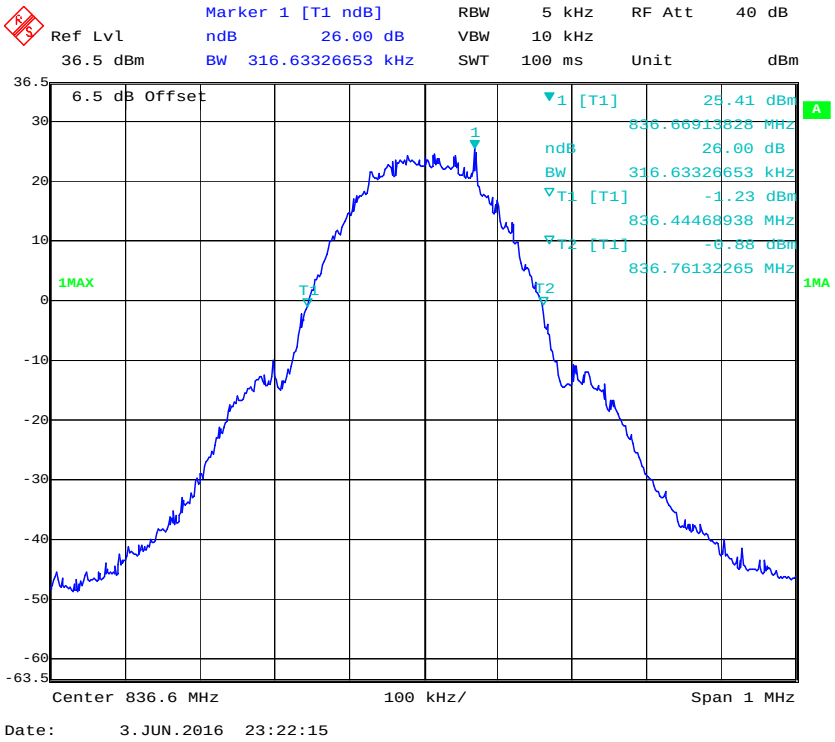
**PCS Band (Part 24E)**

| Mode | Frequency (MHz) | 99% Occupied Bandwidth (kHz) | 26 dB Emission Bandwidth (kHz) |
|---|---|---|---|
| GSM(GMSK) | 1880.0 | 242.48 | 312.62 |

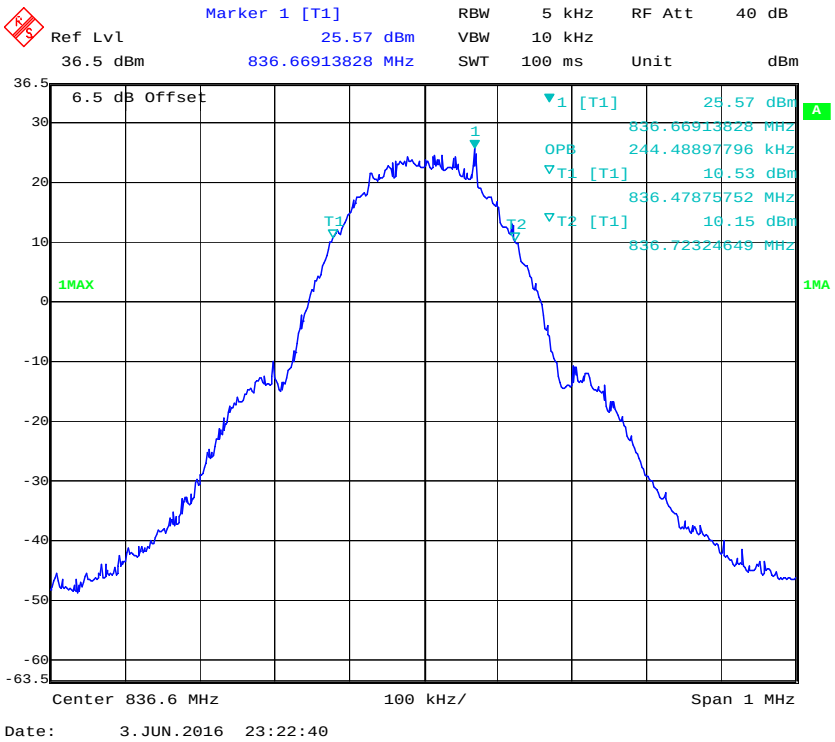
| Mode | Frequency (MHz) | 99% Occupied Bandwidth (MHz) | 26 dB Emission Bandwidth (MHz) |
|---|---|---|---|
| WCDMA (BPSK) | 1880.0 | 4.108 | 4.709 |
| HSUPA (BPSK) | 1880.0 | 4.108 | 4.669 |
| HSDPA (16QAM) | 1880.0 | 4.108 | 4.669 |

**Cellular Band (Part 22H)**

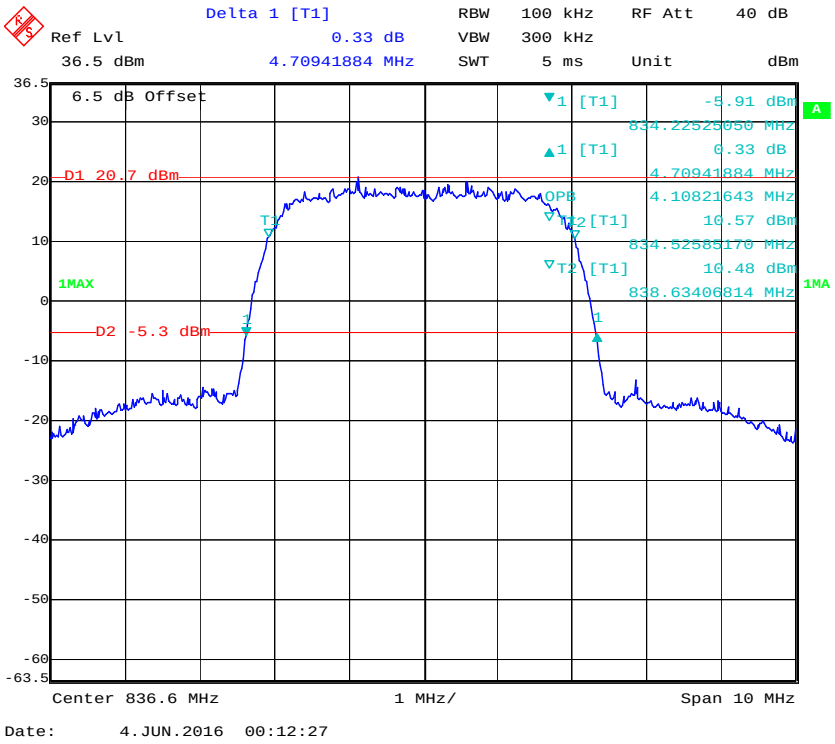
**26 dB Bandwidth for GSM (GMSK) Mode**



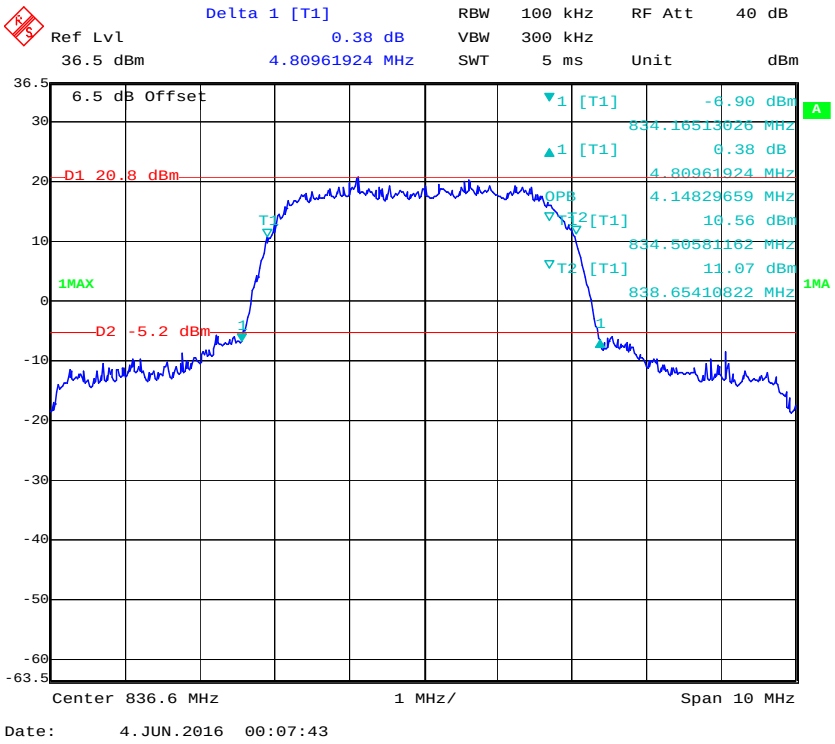

**99% Occupied Bandwidth for GSM (GMSK) Mode**



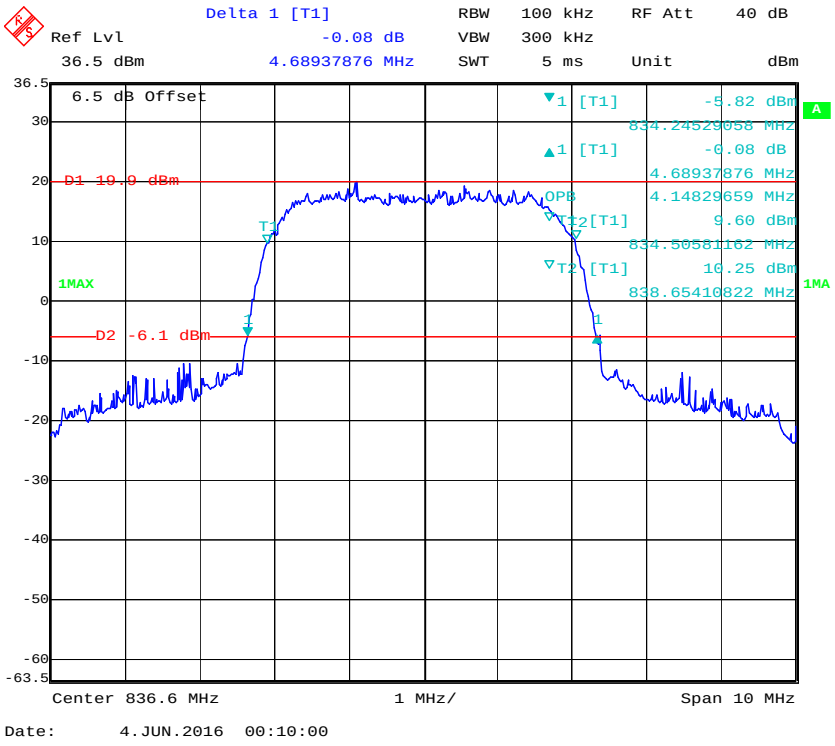
## 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (BPSK) Mode




## 99% Occupied&26 dB Emissions Bandwidth for HSUPA (BPSK) Mode

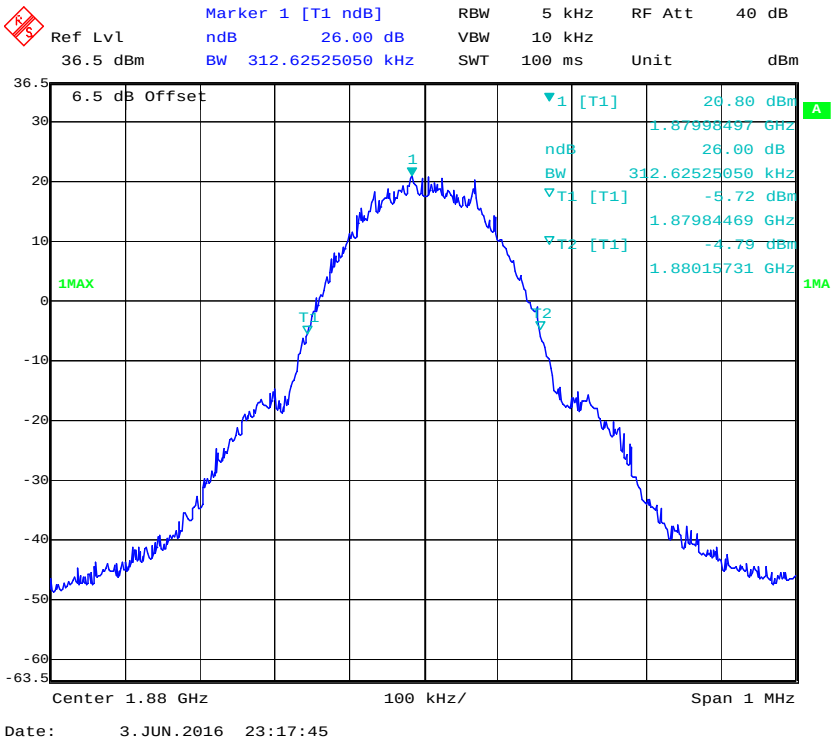


### 99% Occupied & 26 dB Emissions Bandwidth for HSDPA (16QAM) Mode

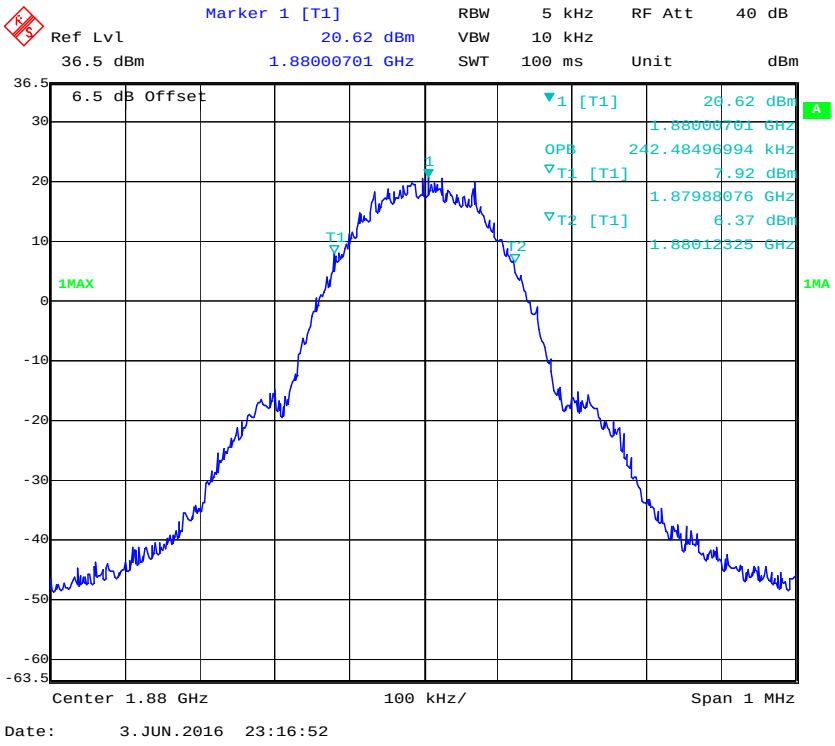



## PCS Band (Part 24E)

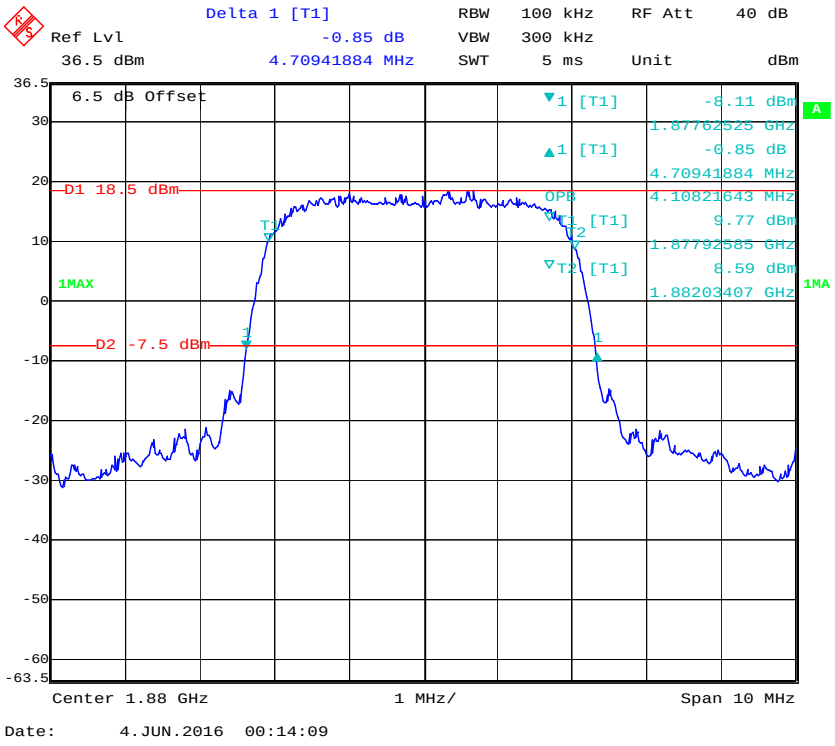
### 26 dB Emissions Bandwidth for GSM (GMSK) Mode



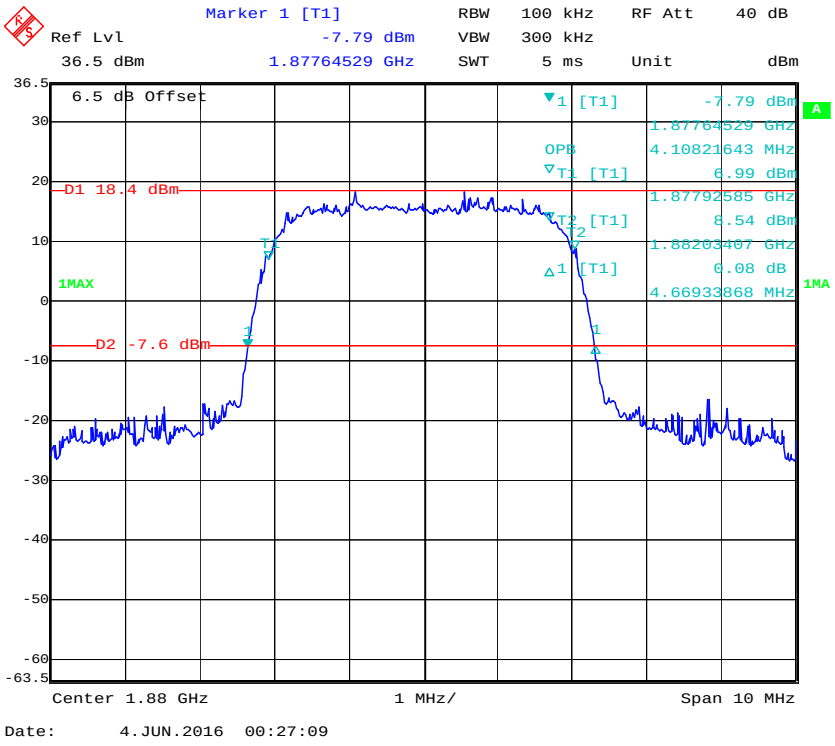
## 99% Occupied Emissions Bandwidth for GSM (GMSK) Mode



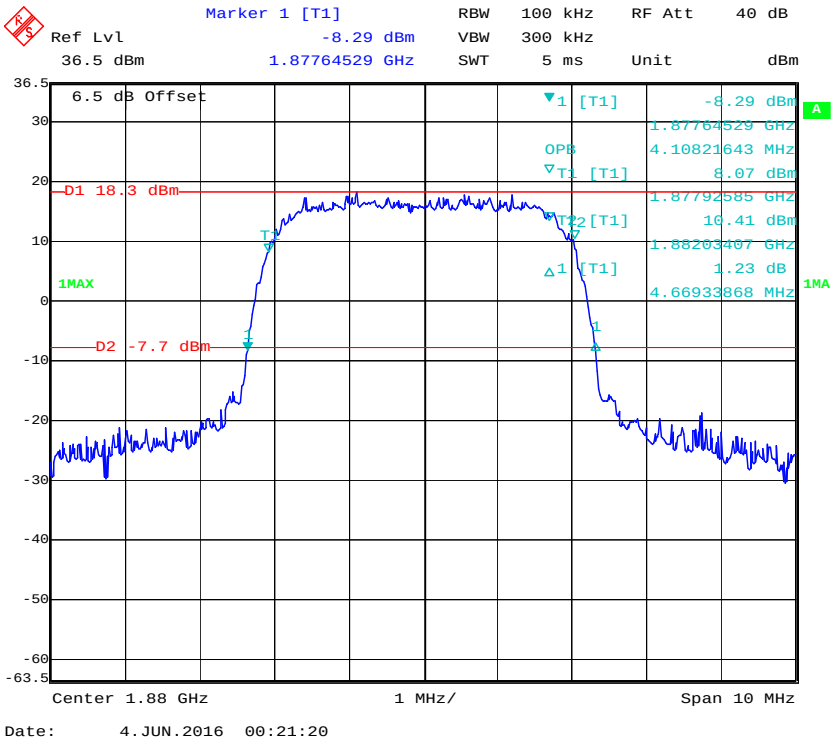

## 99% Occupied & 26 dB Emissions Bandwidth for WCDMA (BPSK) Mode



## 99% Occupied & 26 dB Emissions Bandwidth for HSUPA (BPSK) Mode




## 99% Occupied & 26 dB Emissions Bandwidth for HSDPA (16QAM) Mode



# FCC §2.1051, §22.917(a) & §24.238(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

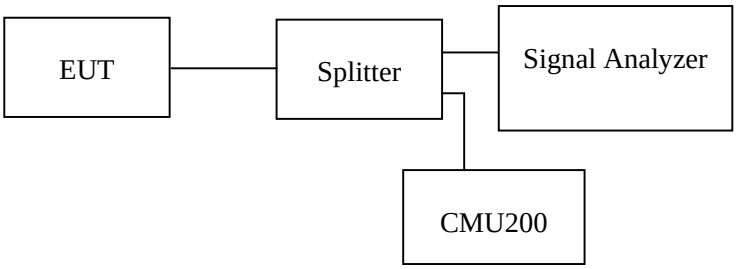
## Applicable Standards

FCC §2.10511, §22.917(a) and §24.238(a).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

## Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1 GHz and 1 MHz for above 1 GHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.




## Test Equipment List and Details

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| HONOVA | Power Splitter | HPDL-2W-B-NF | N/A | 2015-06-12 | 2016-06-12 |
| WEINSCHEL | 3dB Attenuator | 5321 | AU0709 | 2015-06-18 | 2016-06-18 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

# Test Data

## Environmental Conditions

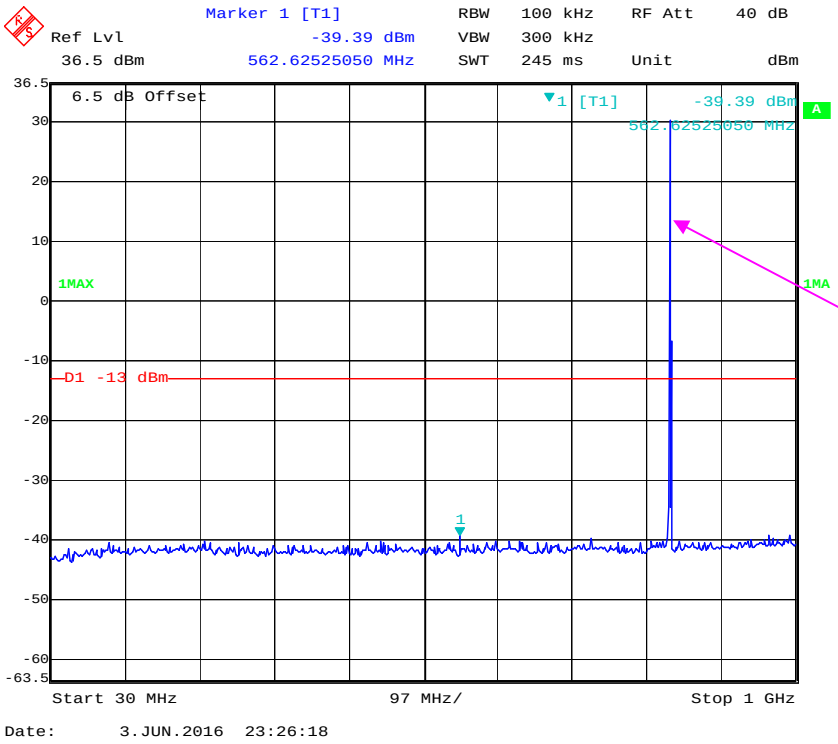
| | |
|---|---|
| **Temperature:** | 23 ℃ |
| **Relative Humidity:** | 52% |
| **ATM Pressure:** | 101.0kPa |

*The testing was performed by Shawn Xiao on 2016-06-03.*

*Please refer to the following plots.*

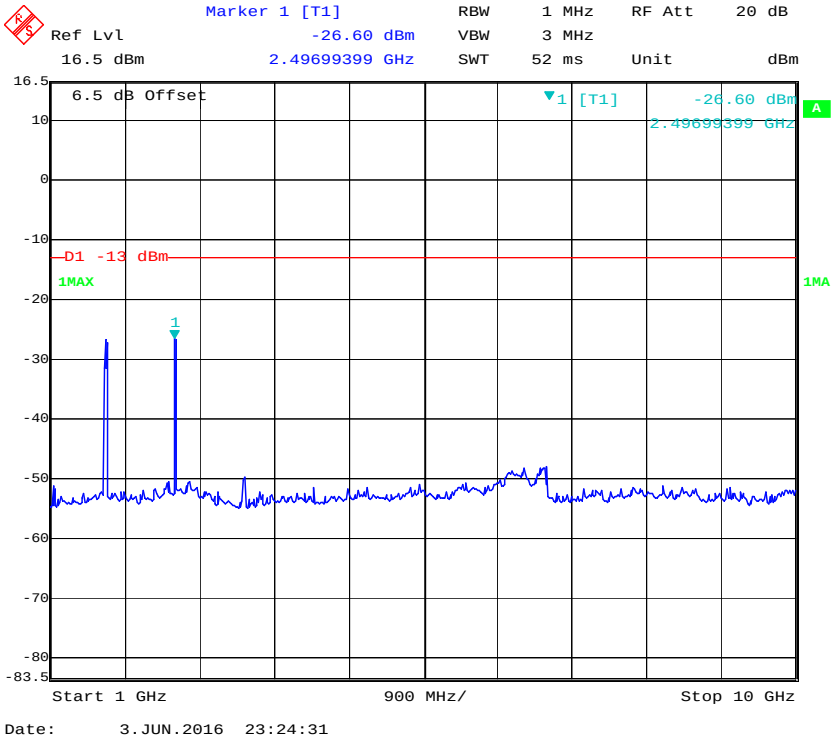
**Cellular Band (Part 22H)**

**30 MHz – 1 GHz (GSM Mode)**

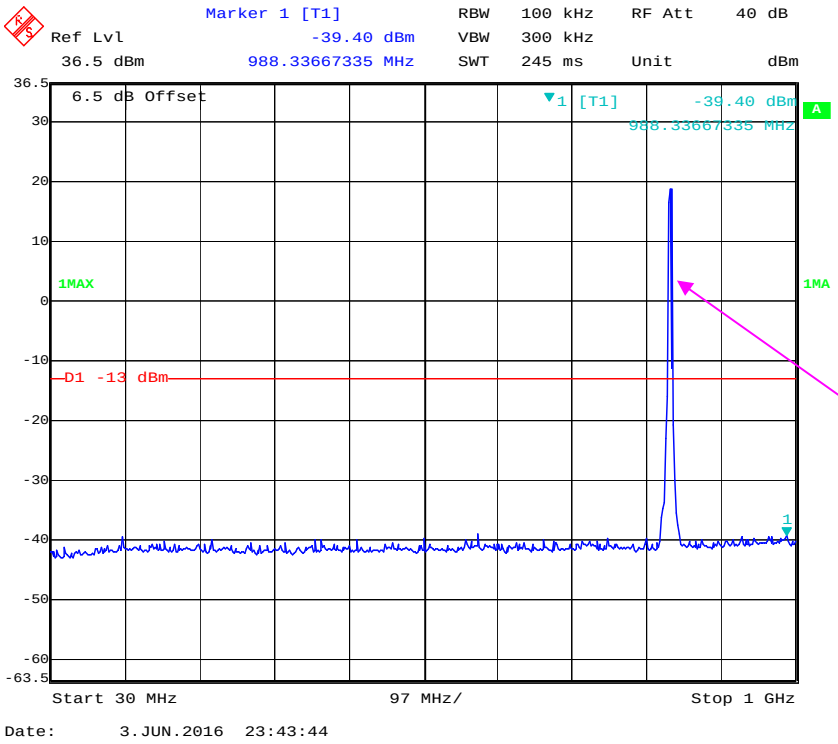



Fundamental test

**1 GHz – 10 GHz (GSM Mode)**

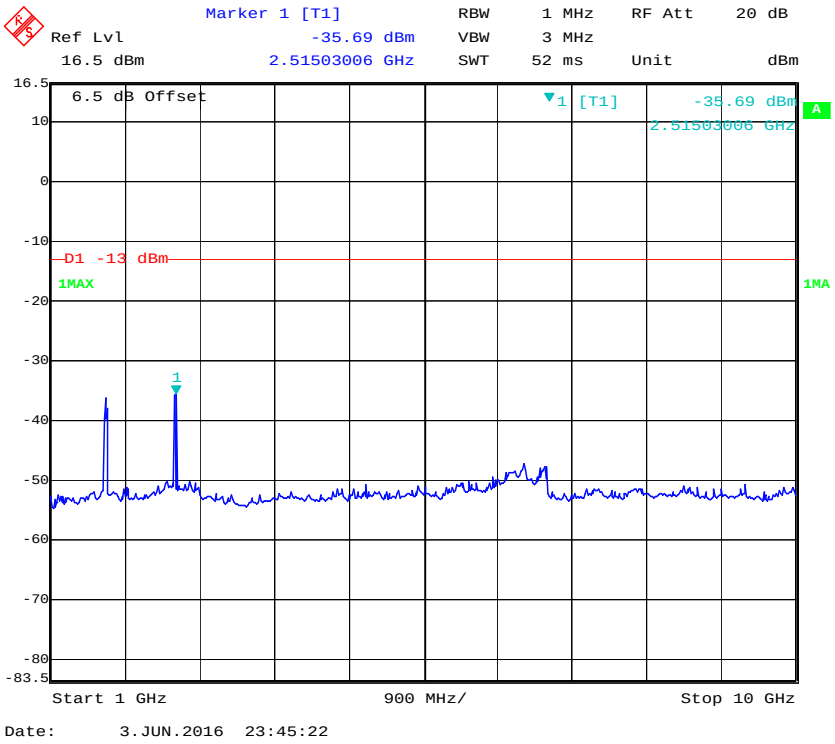


## 30 MHz – 1 GHz (WCDMA Mode)



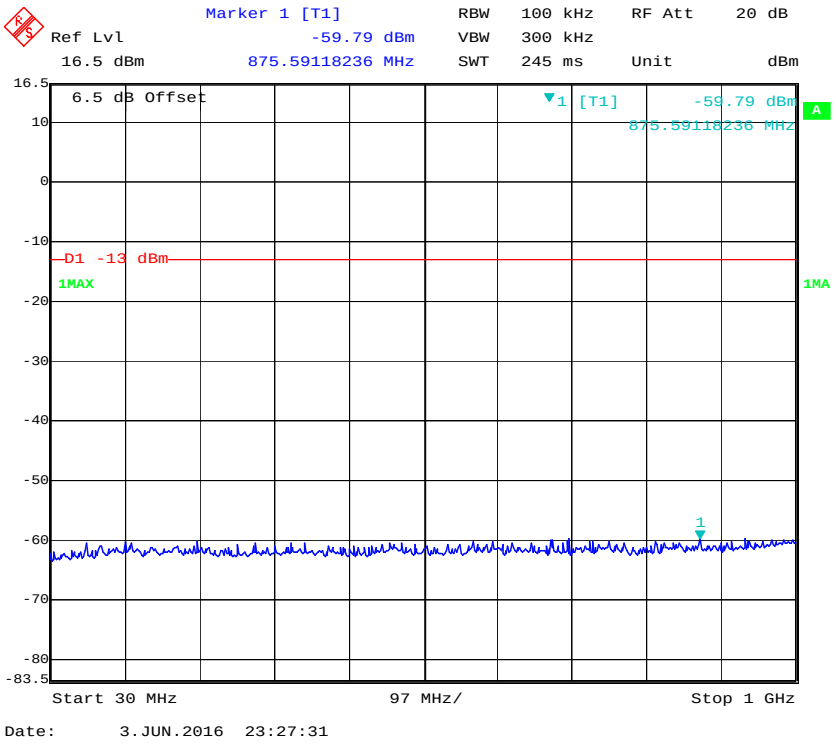

Fundamental test

## 1 GHz – 10 GHz (WCDMA Mode)



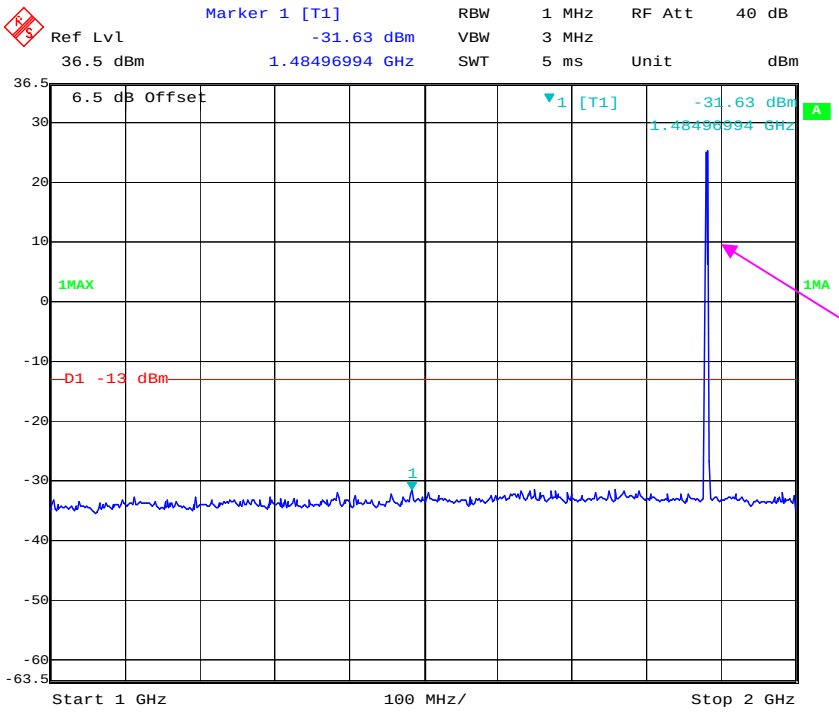
**PCS Band (Part 24E)**

**30 MHz – 1 GHz (GSM Mode)**




Date: 3.JUN.2016 23:27:31

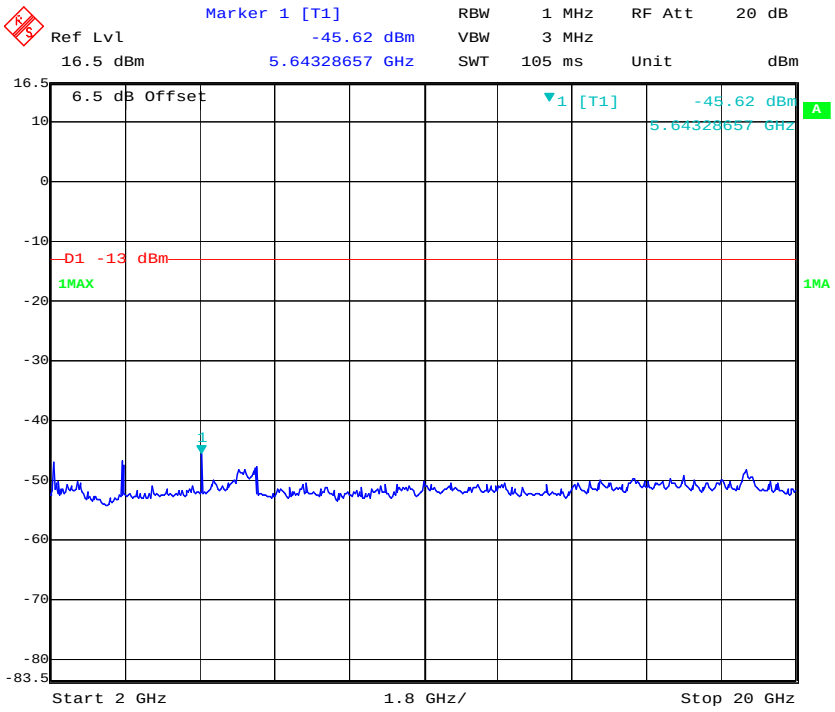
**1 GHz – 2 GHz (GSM Mode)**



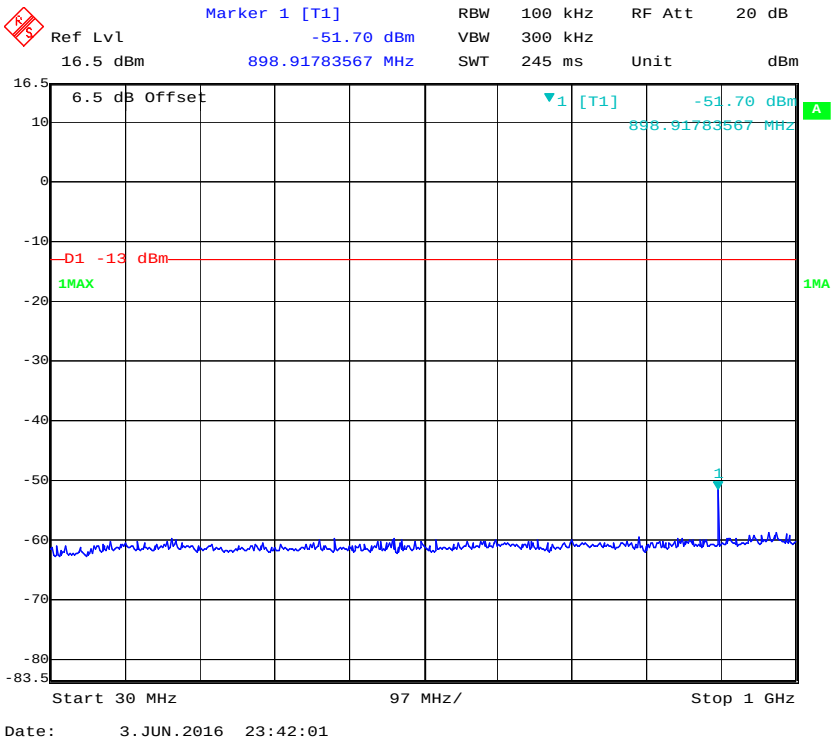

Fundamental test

Date: 3.JUN.2016 23:29:23

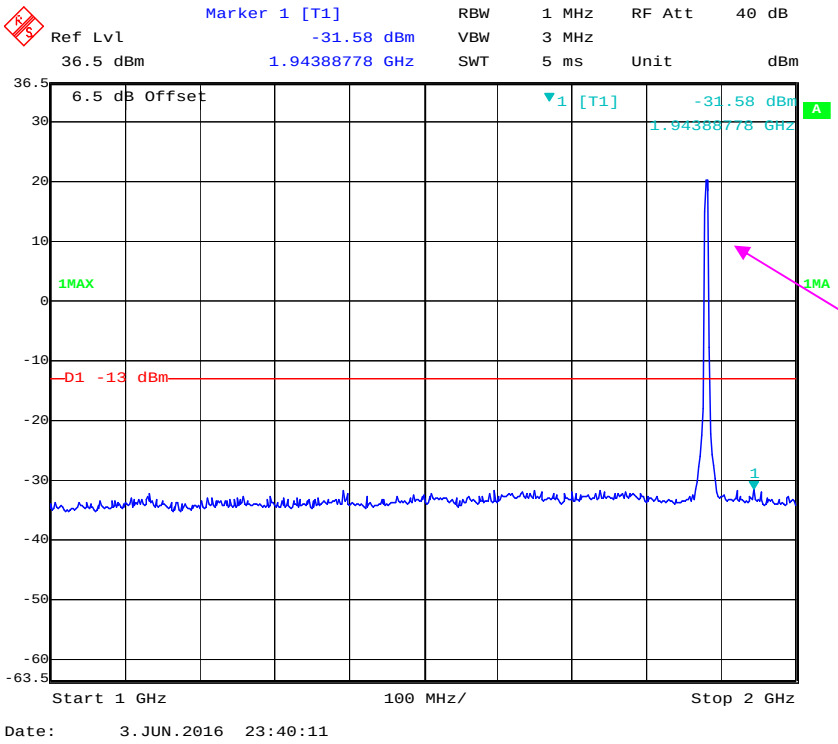
## 2 GHz – 20 GHz (GSM Mode)




## 30 MHz – 1 GHz (WCDMA Mode)

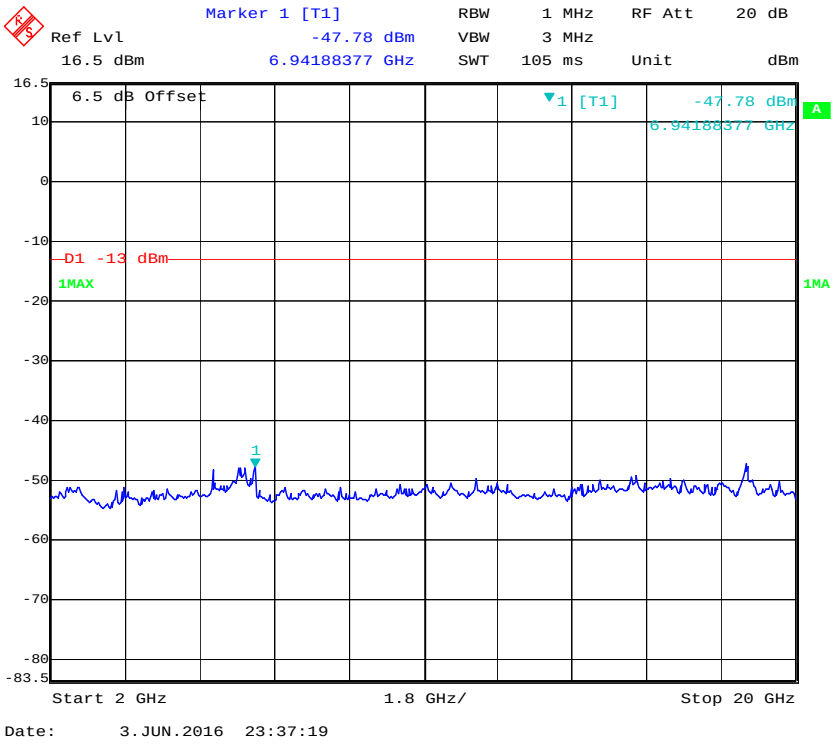


## 1 GHz – 2 GHz (WCDMA Mode)




Fundamental test

## 2 GHz – 20 GHz (WCDMA Mode)



# FCC §2.1053, §22.917 & §24.238 - SPURIOUS RADIATED EMISSIONS

## Applicable Standards

FCC § 2.1053, §22.917 and § 24.238.

## Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TX pwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 $\text{Log}_{10}$ (power out in Watts)

## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Sunol Sciences | Horn Antenna | DRH-118 | A052604 | 2014-12-29 | 2017-12-28 |
| Sunol Sciences | Bi-log Antenna | JB1 | A040904-2 | 2014-12-07 | 2017-12-06 |
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 8386001028 | 2015-12-11 | 2016-12-11 |
| Mini | Pre-amplifier | ZVA-183-S+ | 5969001149 | 2016-04-23 | 2017-04-23 |
| HP | Amplifier | HP8447E | 1937A01046 | 2016-05-06 | 2017-05-06 |
| HP | Signal Generator | HP 8341B | 2624A00116 | 2015-07-02 | 2016-07-01 |
| COM POWER | Dipole Antenna | AD-100 | 041000 | 2015-08-18 | 2016-08-18 |
| A.H. System | Horn Antenna | SAS-200/571 | 135 | 2015-08-18 | 2018-08-17 |
| Rohde & Schwarz | EMI Test Receiver | ESCI | 101120 | 2015-12-15 | 2016-12-14 |
| the electro-Mechanics Co. | Horn Antenna | 3116 | 9510-2270 | 2013-10-14 | 2016-10-13 |
| Rohde & Schwarz | Universal Radio Communication Tester | CMU200 | 106891 | 2015-11-23 | 2016-11-23 |
| Ducommun technologies | RF Cable | UFA210A-1-4724-30050U | MFR64369 223410-001 | 2015-06-15 | 2016-06-15 |
| Ducommun technologies | RF Cable | 104PEA | 218124002 | 2015-06-15 | 2016-06-15 |
| Ducommun technologies | RF Cable | RG-214 | 1 | 2015-06-15 | 2016-06-15 |
| Ducommun technologies | RF Cable | RG-214 | 2 | 2015-06-15 | 2016-06-15 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24 ℃ |
| **Relative Humidity:** | 54% |
| **ATM Pressure:** | 101.0kPa |

*The testing was performed by Shawn Xiao on 2016-06-06.*

*Test mode: Transmitting (Pre-scan with Low, Middle, High channel, and the worse case data as below)*

**30 MHz ~ 10 GHz:**

**Cellular Band (Part 22H)**

| Frequency (MHz) | Receiver Reading (dBμV) | Turntable Angle Degree | Rx Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (m) | Polar (H/V) | SG Level (dBm) | Cable Loss (dB) | Antenna Gain (dB) | | | |
| **GSM Mode** | | | | | | | | | | |
| 460.84 | 33.58 | 215 | 2.4 | H | -63.4 | 0.47 | 0 | -63.87 | -13 | 50.87 |
| 460.84 | 34.65 | 51 | 1.9 | V | -62.3 | 0.47 | 0 | -62.77 | -13 | 49.77 |
| 1673.20 | 59.11 | 21 | 2.3 | H | -48.3 | 1.60 | 6.90 | -43.00 | -13 | 30.00 |
| 1673.20 | 65.21 | 84 | 1.0 | V | -42.6 | 1.60 | 6.90 | -37.30 | -13 | 24.30 |
| 2509.80 | 59.97 | 10 | 1.4 | H | -44.6 | 1.70 | 8.60 | -37.70 | -13 | 24.70 |
| 2509.80 | 58.82 | 237 | 1.1 | V | -46.1 | 1.70 | 8.60 | -39.20 | -13 | 26.20 |
| **WCDMA Mode** | | | | | | | | | | |
| 460.84 | 34.32 | 261 | 1.7 | H | -62.7 | 0.47 | 0 | -63.17 | -13 | 50.17 |
| 460.84 | 33.95 | 152 | 2.4 | V | -63.0 | 0.47 | 0 | -63.47 | -13 | 50.47 |
| 1673.20 | 62.48 | 161 | 1.5 | H | -44.9 | 1.60 | 6.90 | -39.60 | -13 | 26.60 |
| 1673.20 | 66.31 | 358 | 1.1 | V | -41.5 | 1.60 | 6.90 | -36.20 | -13 | 23.20 |
| 2509.80 | 57.31 | 211 | 1.5 | H | -47.3 | 1.70 | 8.60 | -40.40 | -13 | 27.40 |
| 2509.80 | 58.11 | 208 | 2.5 | V | -46.8 | 1.70 | 8.60 | -39.90 | -13 | 26.90 |
| 3346.40 | 55.17 | 211 | 2.0 | H | -46.2 | 1.90 | 9.80 | -38.30 | -13 | 25.30 |
| 3346.40 | 55.75 | 345 | 2.3 | V | -46.3 | 1.90 | 9.80 | -38.40 | -13 | 25.40 |

**30 MHz ~ 20 GHz:**

**PCS Band (Part 24E)**

| Frequency (MHz) | Receiver Reading (dBμV) | Turntable Angle Degree | Rx Antenna | | Substituted | | | Absolute Level (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Height (m) | Polar (H/V) | SG Level (dBm) | Cable Loss (dB) | Antenna Gain (dB) | | | |
| **GSM Mode** | | | | | | | | | | |
| 460.84 | 34.90 | 182 | 1.8 | H | -62.1 | 0.47 | 0 | -62.57 | -13 | 49.57 |
| 460.84 | 34.02 | 198 | 1.4 | V | -63.0 | 0.47 | 0 | -63.47 | -13 | 50.47 |
| 3760.00 | 60.32 | 128 | 1.2 | H | -39.2 | 1.90 | 9.90 | -31.20 | -13 | 18.20 |
| 3760.00 | 61.71 | 350 | 1.1 | V | -37.4 | 1.90 | 9.90 | -29.40 | -13 | 16.40 |
| **WCDMA Mode** | | | | | | | | | | |
| 460.84 | 33.49 | 245 | 1.6 | H | -63.5 | 0.47 | 0 | -63.97 | -13 | 50.97 |
| 460.84 | 34.00 | 68 | 1.7 | V | -63.0 | 0.47 | 0 | -63.47 | -13 | 50.47 |
| 3760.00 | 51.94 | 83 | 2.1 | H | -47.5 | 1.90 | 9.90 | -39.50 | -13 | 26.50 |
| 3760.00 | 53.64 | 169 | 1.5 | V | -45.4 | 1.90 | 9.90 | -37.40 | -13 | 24.40 |

**Note:**
1) Absolute Level = SG Level - Cable loss + Antenna Gain
2) Margin = Limit- Absolute Level

# FCC §22.917(a) & §24.238(a) - BAND EDGES

## Applicable Standards

According to § 22.917(a), the power of any emissions 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.

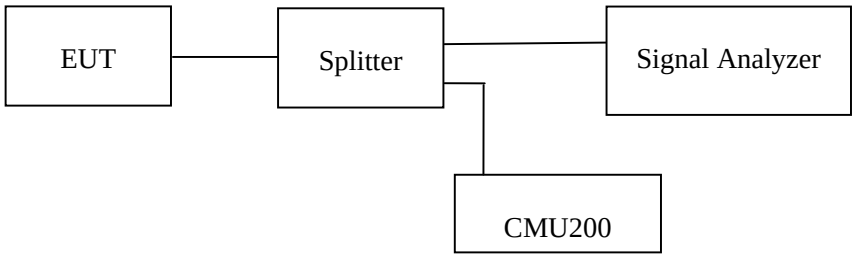
According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

## Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency




## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 8386001028 | 2015-12-11 | 2016-12-11 |
| Rohde & Schwarz | Universal Radio Communication Tester | CMU200 | 106891 | 2015-11-23 | 2016-11-23 |
| Ducommun technologies | RF Cable | RG-214 | 4 | 2015-06-15 | 2016-06-15 |
| HONOVA | Power Splitter | HPDL-2W-B-NF | N/A | 2015-06-12 | 2016-06-12 |
| WEINSCHEL | 3dB Attenuator | 5321 | AU0709 | 2015-06-18 | 2016-06-18 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

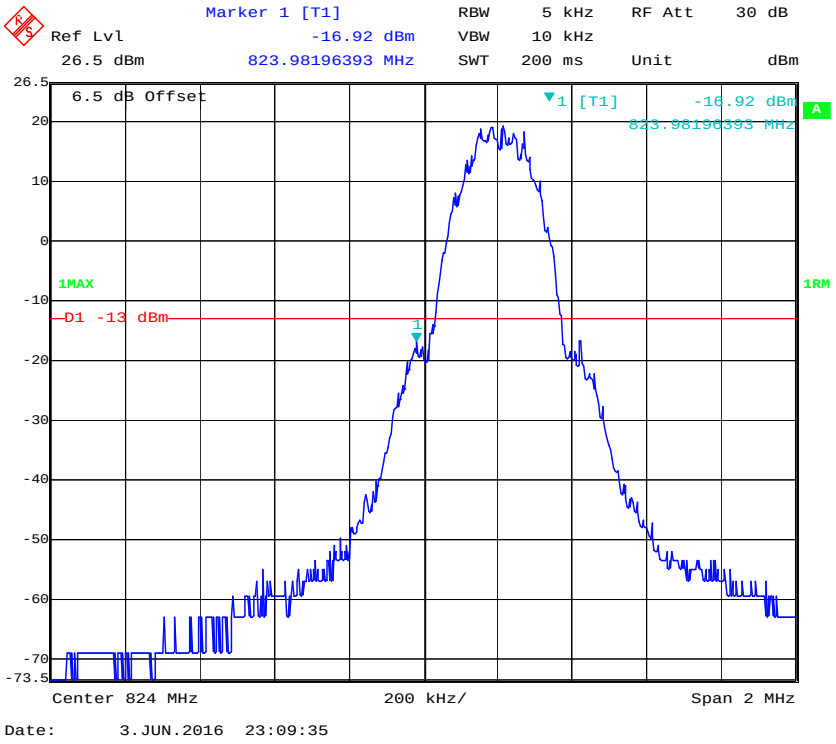
| | |
|---|---|
| **Temperature:** | 22~25 ℃ |
| **Relative Humidity:** | 48~56% |
| **ATM Pressure:** | 101.0~101.1kPa |

*The testing was performed by Shawn Xiao on 2016-06-03 and 2016-06-04.*

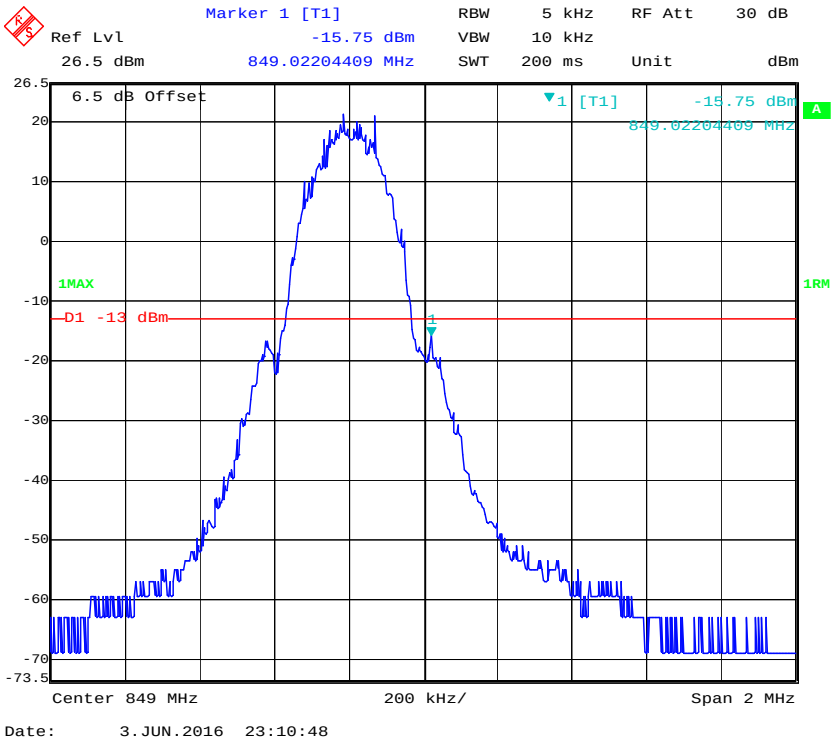
*EUT operation mode: Transmitting*

*Test Result: Compliance. Please refer to the following plots.*

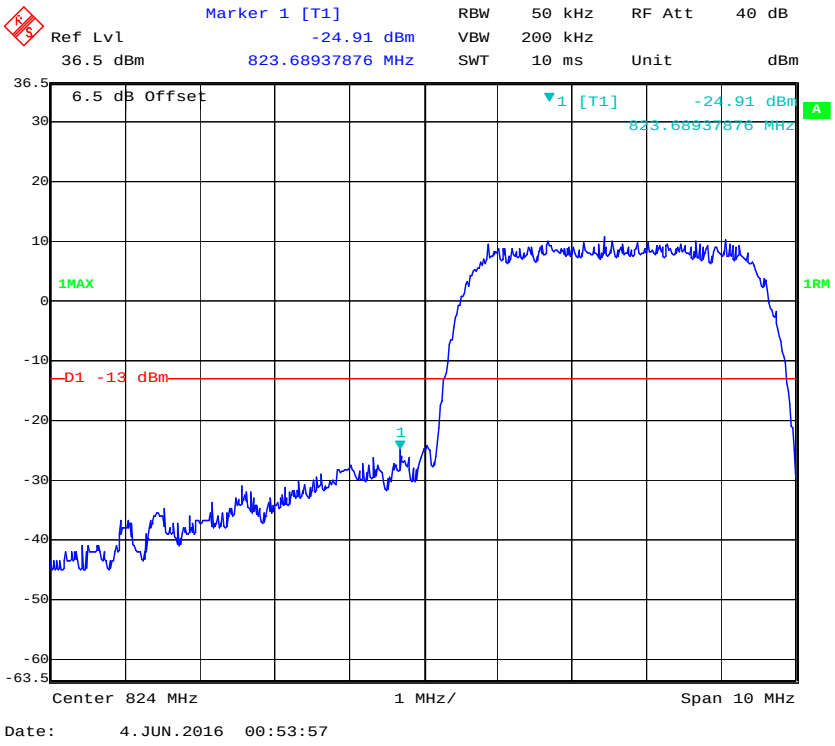
**Cellular Band, Left Band Edge for GSM (GMSK) Mode**



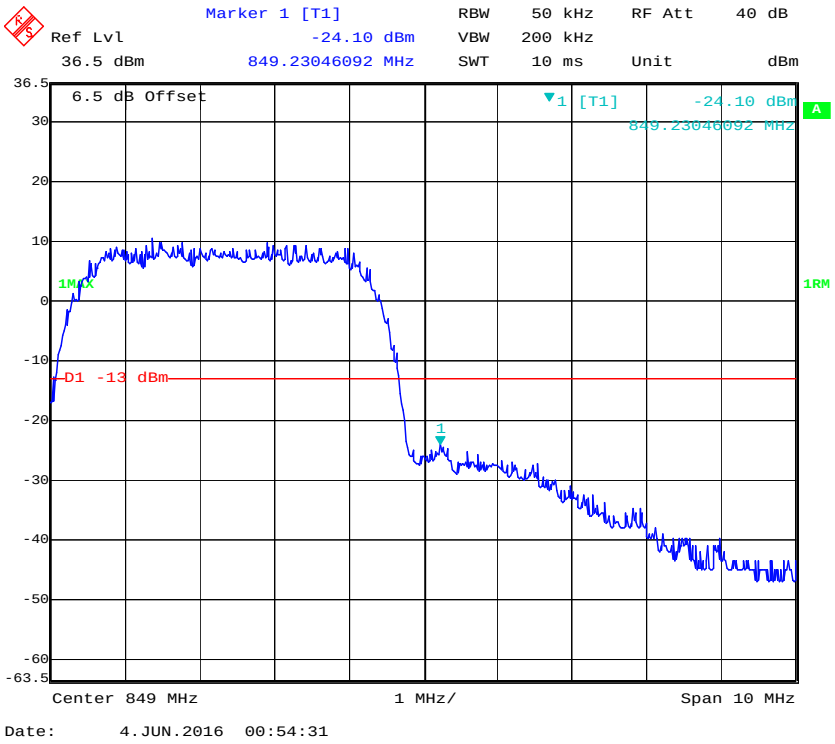
## Cellular Band, Right Band Edge for GSM (GMSK) Mode



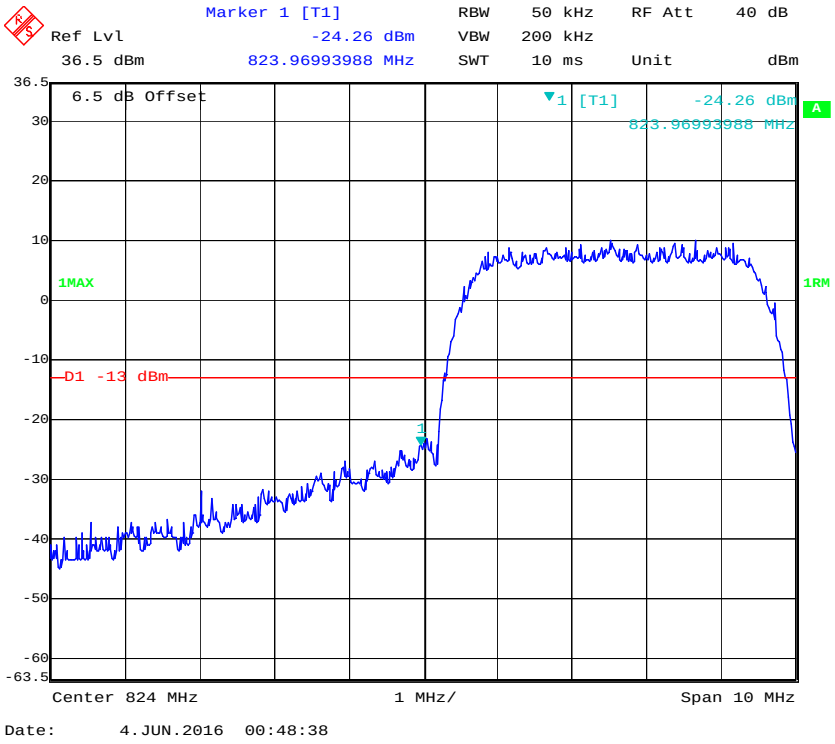

## Cellular Band, Left Band Edge for WCDMA (BPSK) Mode



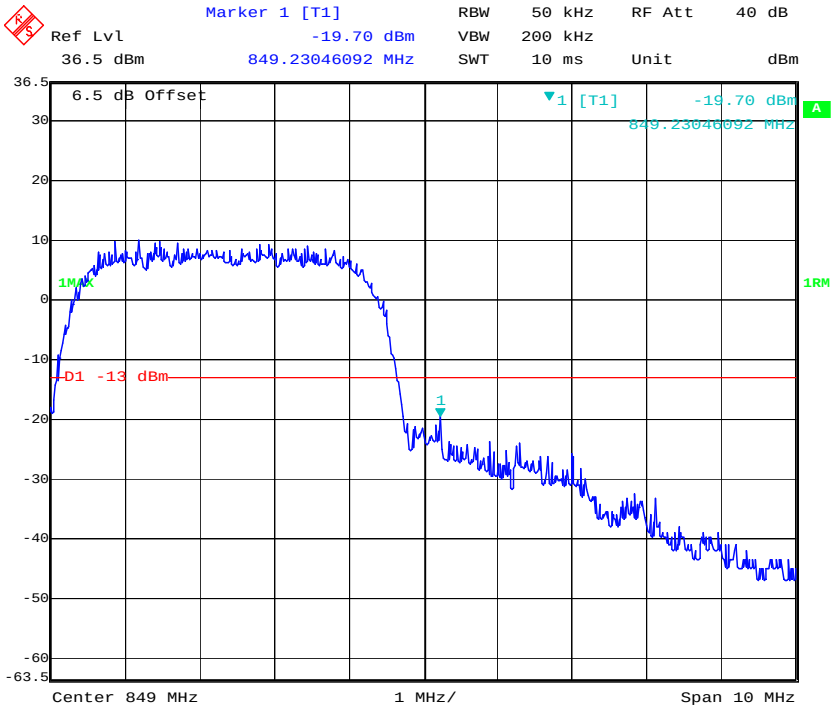
## Cellular Band, Right Band Edge for WCDMA (BPSK) Mode



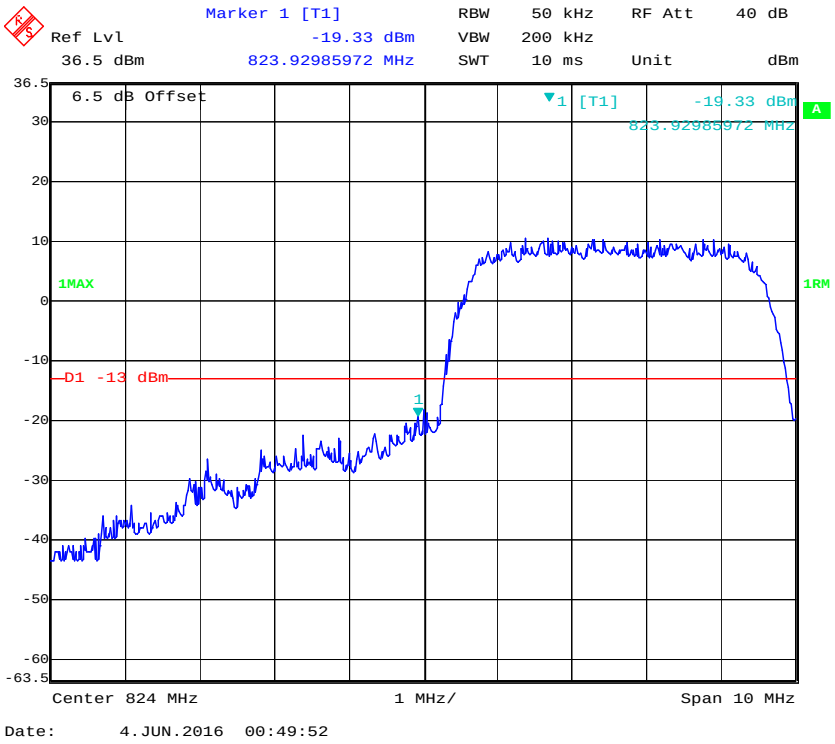

## Cellular Band, Left Band Edge for HSDPA (16QAM) Mode



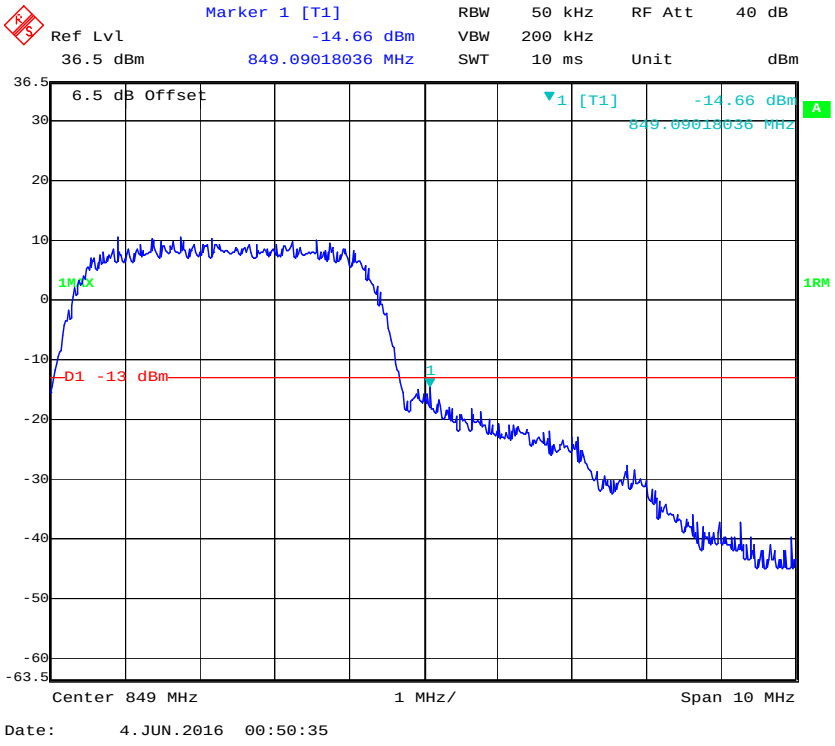
## Cellular Band, Right Band Edge for HSDPA (16QAM) Mode



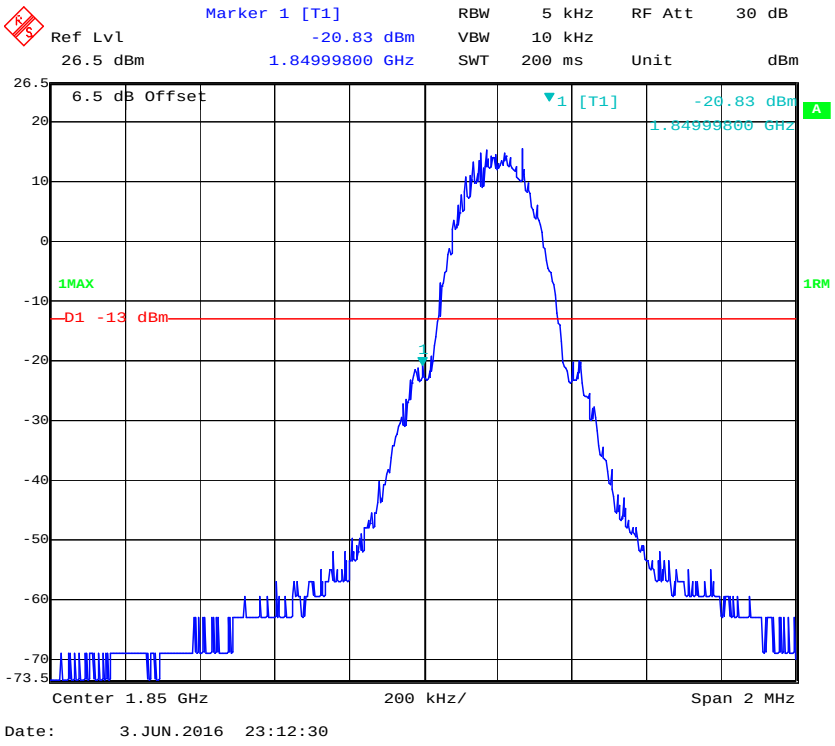

## Cellular Band, Left Band Edge for HSUPA (BPSK) Mode



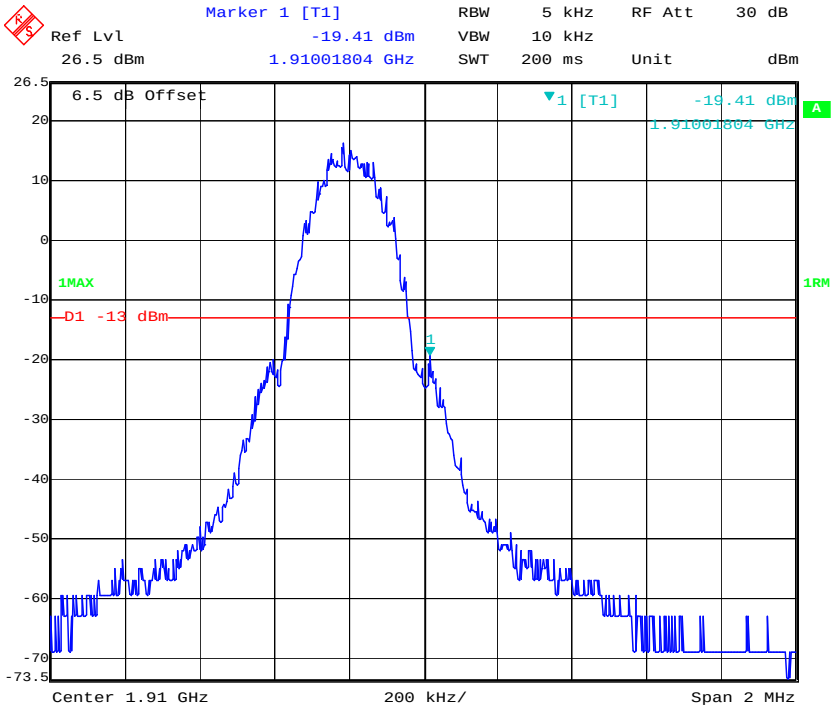
## Cellular Band, Right Band Edge for HSUPA (BPSK) Mode



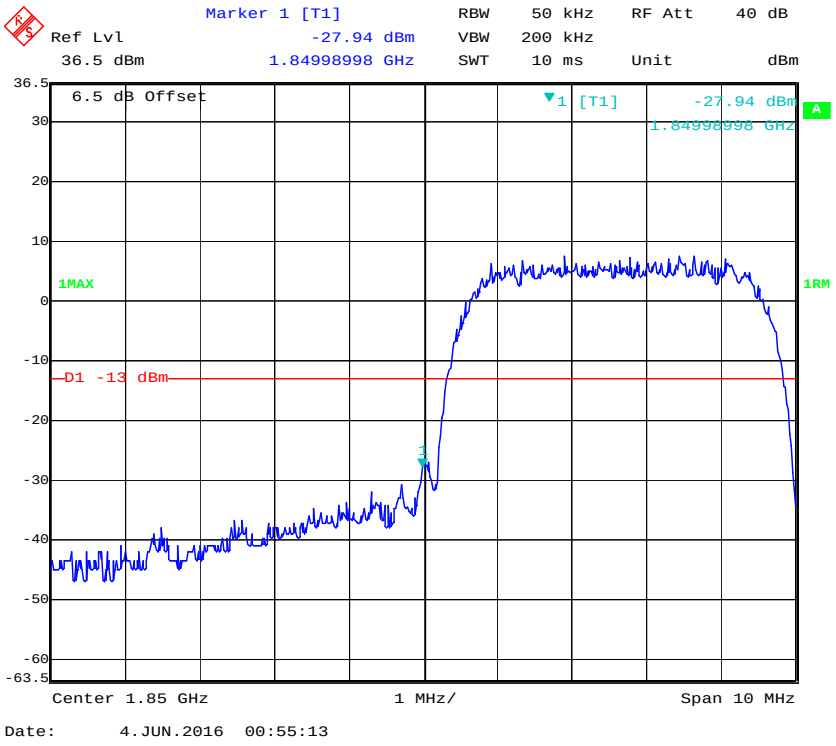

## PCS Band, Left Band Edge for GSM (GMSK) Mode



## PCS Band, Right Band Edge for GSM (GMSK) Mode

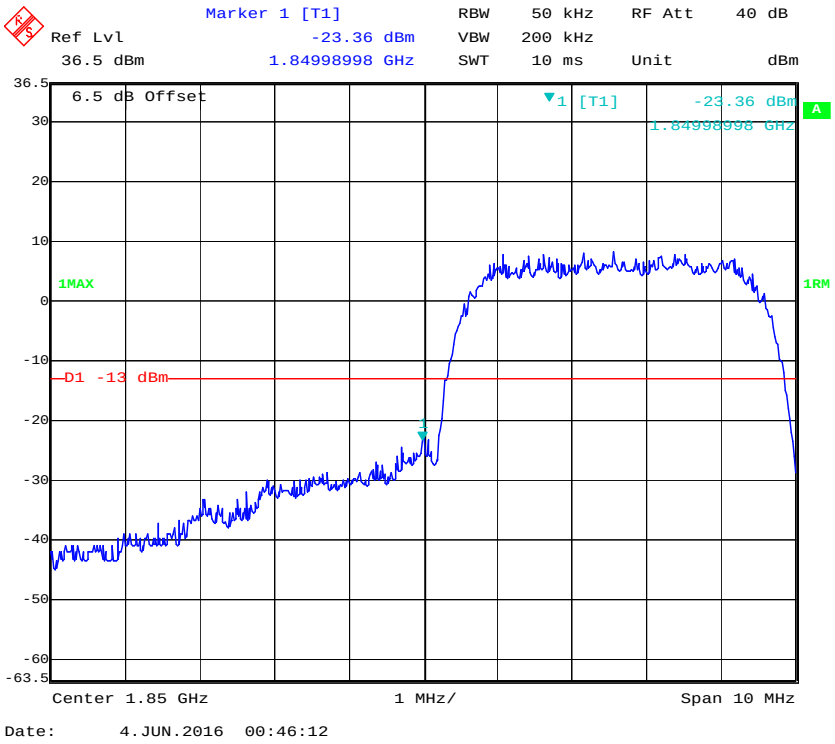



## PCS Band, Left Band Edge for WCDMA (BPSK) Mode

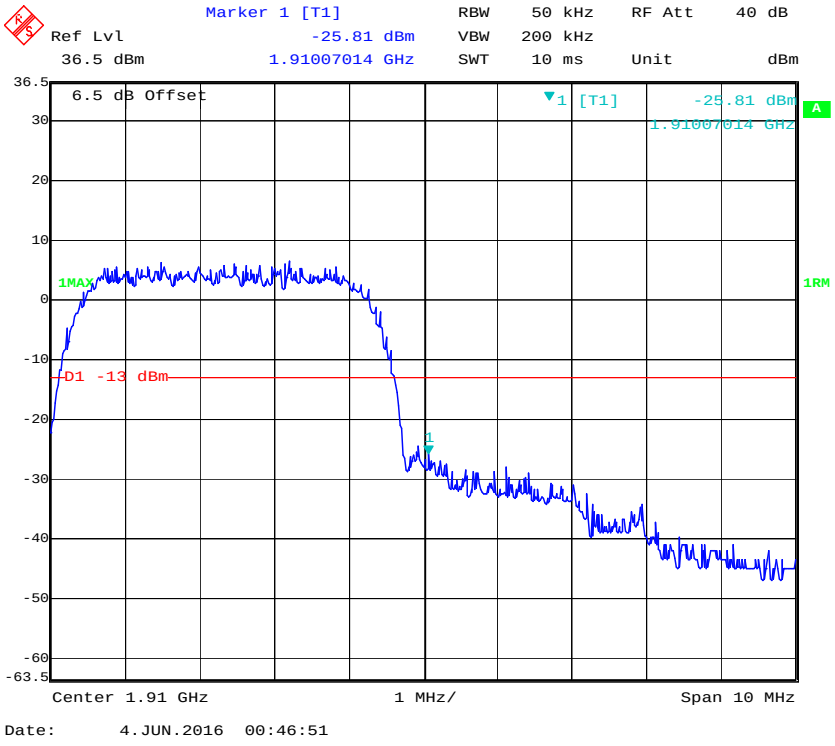


## PCS Band, Right Band Edge for WCDMA (BPSK) Mode

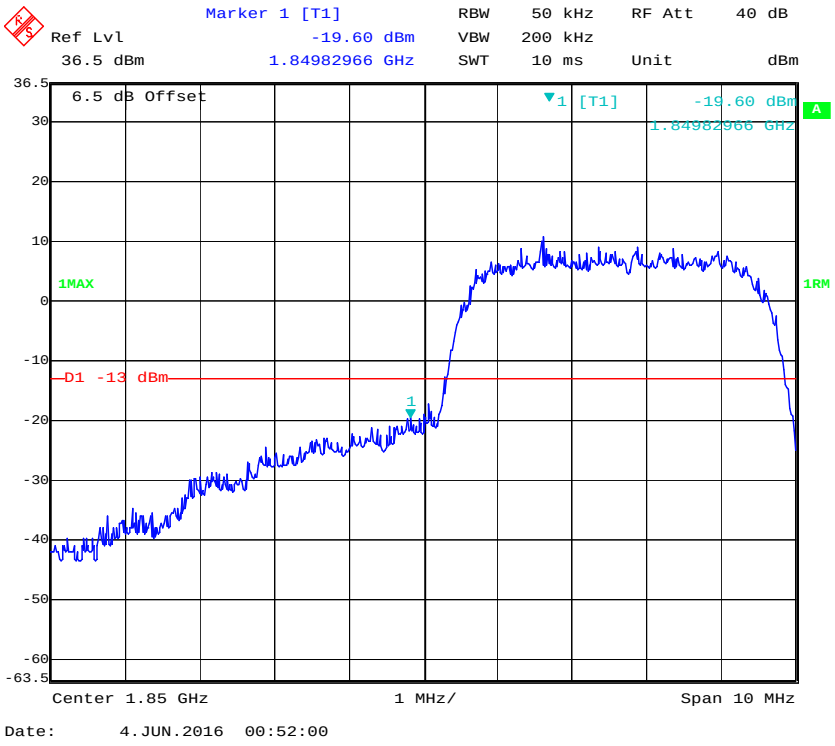

## PCS Band, Left Band Edge for HSDPA (16QAM) Mode



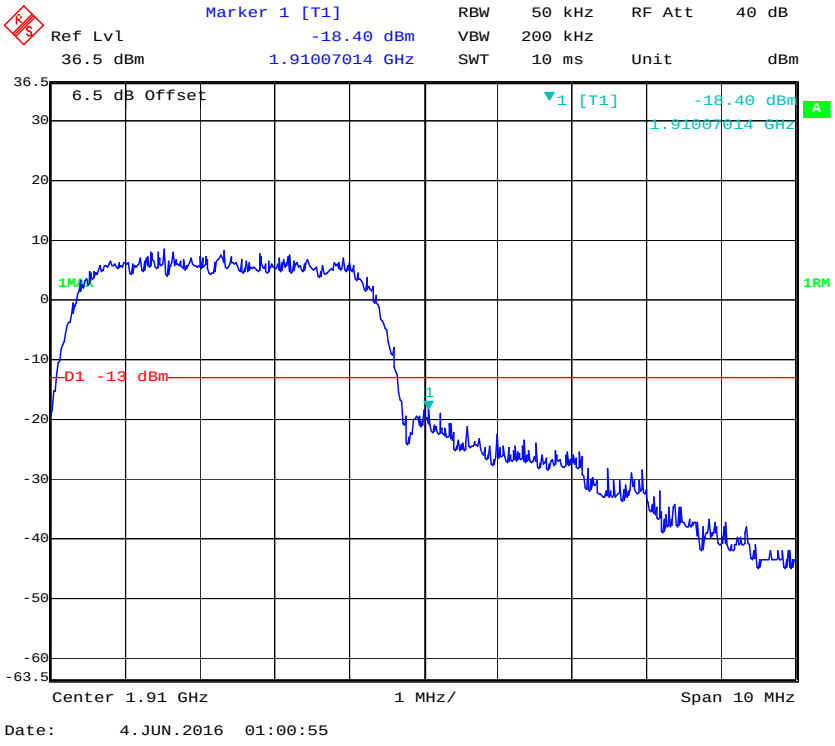
## PCS Band, Right Band Edge for HSDPA (16QAM) Mode




## PCS Band, Left Band Edge for HSUPA (BPSK) Mode



## PCS Band, Right Band Edge for HSUPA (BPSK) Mode



# FCC §2.1055, §22.355 & §24.235 - FREQUENCY STABILITY

## Applicable Standards

FCC § 2.1055, §22.355 and §24.235.

According to FCC §2.1055, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

**Frequency Tolerance for Transmitters in the Public Mobile Services**

| Frequency Range (MHz) | Base, fixed (ppm) | Mobile > 3 watts (ppm) | Mobile ≤ 3 watts (ppm) |
|---|---|---|---|
| 25 to 50 | 20.0 | 20.0 | 50.0 |
| 50 to 450 | 5.0 | 5.0 | 50.0 |
| 450 to 512 | 2.5 | 5.0 | 5.0 |
| 821 to 896 | 1.5 | 2.5 | 2.5 |
| 928 to 929. | 5.0 | N/A | N/A |
| 929 to 960. | 1.5 | N/A | N/A |
| 2110 to 2220 | 10.0 | N/A | N/A |

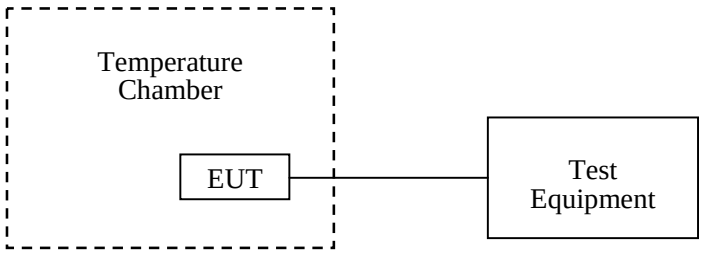
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

## Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

Frequency Stability vs. Voltage: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



## Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| ESPEC | Temperature & Humidity Chamber | EL-10KA | 09107726 | 2015-11-01 | 2016-10-31 |
| Rohde & Schwarz | Universal Radio Communication Tester | CMU200 | 106891 | 2015-11-23 | 2016-11-23 |
| Ducommun technologies | RF Cable | RG-214 | 4 | 2015-06-15 | 2016-06-15 |
| WEINSCHEL | 3dB Attenuator | 5321 | AU0709 | 2015-06-18 | 2016-06-18 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24 ℃ |
| **Relative Humidity:** | 54% |
| **ATM Pressure:** | 101.0kPa |

*The testing was performed by Shawn Xiao on 2016-06-06.*

*EUT operation mode: Transmitting*

*Test Result: Compliance. Please refer to the following tables.*

## Cellular Band (Part 22H)

### GSM Mode

| Middle Channel, $f_o$=836.6 MHz | | | | |
|---|---|---|---|---|
| **Temperature (℃)** | **Power Supplied ($V_{DC}$)** | **Frequency Error (Hz)** | **Frequency Error (ppm)** | **Limit (ppm)** |
| -30 | 3.7 | -8 | -0.0096 | 2.5 |
| -20 | | -12 | -0.0143 | 2.5 |
| -10 | | -10 | -0.0120 | 2.5 |
| 0 | | -4 | -0.0048 | 2.5 |
| 10 | | -6 | -0.0072 | 2.5 |
| 20 | | -3 | -0.0036 | 2.5 |
| 30 | | -9 | -0.0108 | 2.5 |
| 40 | | -2 | -0.0024 | 2.5 |
| 50 | | -5 | -0.0060 | 2.5 |
| 25 | V min.= 3.5 | -8 | -0.0096 | 2.5 |
| 25 | V max.= 4.2 | -4 | -0.0048 | 2.5 |

### WCDMA Mode

| Middle Channel, $f_o$=836.6 MHz | | | | |
|---|---|---|---|---|
| **Temperature (℃)** | **Power Supplied ($V_{DC}$)** | **Frequency Error (Hz)** | **Frequency Error (ppm)** | **Limit (ppm)** |
| -30 | 3.7 | 16 | 0.0191 | 2.5 |
| -20 | | 9 | 0.0108 | 2.5 |
| -10 | | -13 | -0.0155 | 2.5 |
| 0 | | -15 | -0.0179 | 2.5 |
| 10 | | -5 | -0.0060 | 2.5 |
| 20 | | -4 | -0.0048 | 2.5 |
| 30 | | 22 | 0.0263 | 2.5 |
| 40 | | 16 | 0.0191 | 2.5 |
| 50 | | -6 | -0.0072 | 2.5 |
| 25 | V min.= 3.5 | -8 | -0.0096 | 2.5 |
| 25 | V max.= 4.2 | -4 | -0.0048 | 2.5 |

## PCS Band (Part 24E)

### GSM Mode

| Middle Channel, $f_o$ =1880.0 MHz | | | | |
|---|---|---|---|---|
| Temperature (℃) | Power Supplied ($V_{DC}$) | Frequency Error (Hz) | Frequency Error (ppm) | Result |
| -30 | 3.7 | -27 | -0.0144 | pass |
| -20 | | -22 | -0.0117 | pass |
| -10 | | -16 | -0.0085 | pass |
| 0 | | -19 | -0.0101 | pass |
| 10 | | -7 | -0.0037 | pass |
| 20 | | -10 | -0.0053 | pass |
| 30 | | -32 | -0.0170 | pass |
| 40 | | -19 | -0.0101 | pass |
| 50 | | -17 | -0.0090 | pass |
| 25 | V min.= 3.5 | -18 | -0.0096 | pass |
| 25 | V max.= 4.2 | -12 | -0.0064 | pass |

### WCDMA Mode

| Middle Channel, $f_o$ =1880.0 MHz | | | | |
|---|---|---|---|---|
| Temperature (℃) | Power Supplied ($V_{DC}$) | Frequency Error (Hz) | Frequency Error (ppm) | Result |
| -30 | 3.7 | -9 | -0.0048 | pass |
| -20 | | 9 | 0.0048 | pass |
| -10 | | 13 | 0.0069 | pass |
| 0 | | -10 | -0.0053 | pass |
| 10 | | 8 | 0.0043 | pass |
| 20 | | 18 | 0.0096 | pass |
| 30 | | 15 | 0.0080 | pass |
| 40 | | -2 | -0.0011 | pass |
| 50 | | -6 | -0.0032 | pass |
| 25 | V min.= 3.5 | 11 | 0.0059 | pass |
| 25 | V max.= 4.2 | 5 | 0.0027 | pass |

******* END OF REPORT *******