



TESTING LABORATORY  
CERTIFICATE #4820.01



# FCC PART 22H, PART 24E, PART 27 MEASUREMENT AND TEST REPORT

For

**electronics hub llc**

3560 NW, 72nd Avenue 33122 miami Florida United States

**FCC ID: 2AT5LL283G**

|                                                                                                                                                                                                                                                                               |                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| <b>Report Type:</b><br>Original Report                                                                                                                                                                                                                                        | <b>Product Type:</b><br>Mobile Phone |
| <b>Report Number:</b> RDG191016001-00C                                                                                                                                                                                                                                        |                                      |
| <b>Report Date:</b> 2019-10-25                                                                                                                                                                                                                                                |                                      |
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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

|                                              |                |                                                                                                                                                                                                                                                            |
|----------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EUT Name:</b>                             |                | Mobile Phone                                                                                                                                                                                                                                               |
| <b>EUT Model:</b>                            |                | L28                                                                                                                                                                                                                                                        |
| <b>Operation modes:</b>                      |                | GSM Voice, GPRS Data,<br>WCDMA( R99 (Voice+Data), HSDPA/HSUPA/HSPA+)                                                                                                                                                                                       |
| <b>Operation Frequency:</b>                  |                | GSM 850: 824-849 MHz(TX); 869-894 MHz(RX)<br>PCS 1900: 1850-1910 MHz(TX); 1930-1990 MHz(RX)<br>WCDMA Band 2: 1850-1910 MHz(TX); 1930-1990 MHz(RX)<br>WCDMA Band 4: 1710-1755 MHz(TX) ; 2110-2155 MHz(RX)<br>WCDMA Band 5: 824-849 MHz(TX); 869-894 MHz(RX) |
| <b>Maximum Output Power:<br/>(Conducted)</b> |                | GSM 850 : 31.55dBm; PCS 1900: 30.21 dBm<br>WCDMA Band 2: 22.88 dBm;<br>WCDMA Band 4: 22.71 dBm;<br>WCDMA Band 5: 22.37 dBm                                                                                                                                 |
| <b>Modulation Type:</b>                      |                | GMSK, QPSK, 16QAM                                                                                                                                                                                                                                          |
| <b>Rated Input Voltage:</b>                  |                | 3.8V DC from battery or 5V DC from adapter                                                                                                                                                                                                                 |
| <b>Adapter<br/>Information</b>               | <b>Model:</b>  | JHC-A20UL50100                                                                                                                                                                                                                                             |
|                                              | <b>Input:</b>  | 100-240V 50/60Hz 0.3A Max                                                                                                                                                                                                                                  |
|                                              | <b>Output:</b> | 5.0Vdc 1000mA                                                                                                                                                                                                                                              |
| <b>External Dimension:</b>                   |                | 132mm(L) * 63mm(W) * 21mm(H)                                                                                                                                                                                                                               |
| <b>Serial Number:</b>                        |                | 191016001                                                                                                                                                                                                                                                  |
| <b>EUT Received Date:</b>                    |                | 2019.10.16                                                                                                                                                                                                                                                 |
| <b>EUT Status:</b>                           |                | Good                                                                                                                                                                                                                                                       |

### Objective

This report is prepared on behalf of **electronics hub llc** in accordance with: Part 2-Subpart J, Part 22-Subpart H, Part 24-Subpart E, Part 27 of the Federal Communications Commission's rules.

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

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

FCC Part 15B JBP submissions with FCC ID: 2AT5LL283G  
FCC Part 15C DSS submissions with FCC ID: 2AT5LL283G

## Test Methodology

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

Part 22 Subpart H - Public Mobile Services  
Part 24 Subpart E - Personal Communication Services  
Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA/EIA 603-D-2010.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp.(Dongguan).

## Measurement Uncertainty

| Parameter                     | Measurement Uncertainty                      |
|-------------------------------|----------------------------------------------|
| Occupied Channel Bandwidth    | ±5 %                                         |
| RF output power, conducted    | ±0.61dB                                      |
| Unwanted Emissions, radiated  | 30MHz ~ 1GHz: 5.85 dB<br>1G~26.5GHz: 5.23 dB |
| Unwanted Emissions, conducted | ±1.5 dB                                      |
| Temperature                   | ±1 °C                                        |
| Humidity                      | ±5%                                          |
| DC and low frequency voltages | ±0.4%                                        |
| Duty Cycle                    | 1%                                           |

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

## **Declarations**

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '\*'. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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## SYSTEM TEST CONFIGURATION

### Justification

The EUT was configured for testing according to TIA/EIA-603-D 2010.

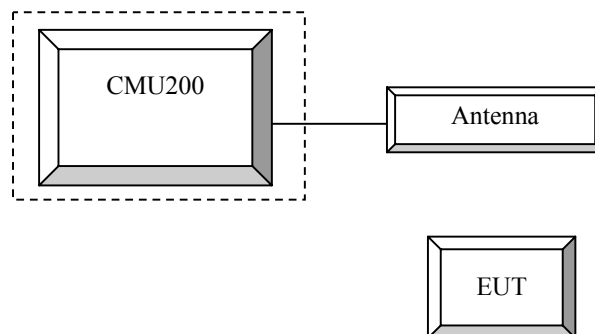
### Equipment Modifications

No modification was made to the EUT.

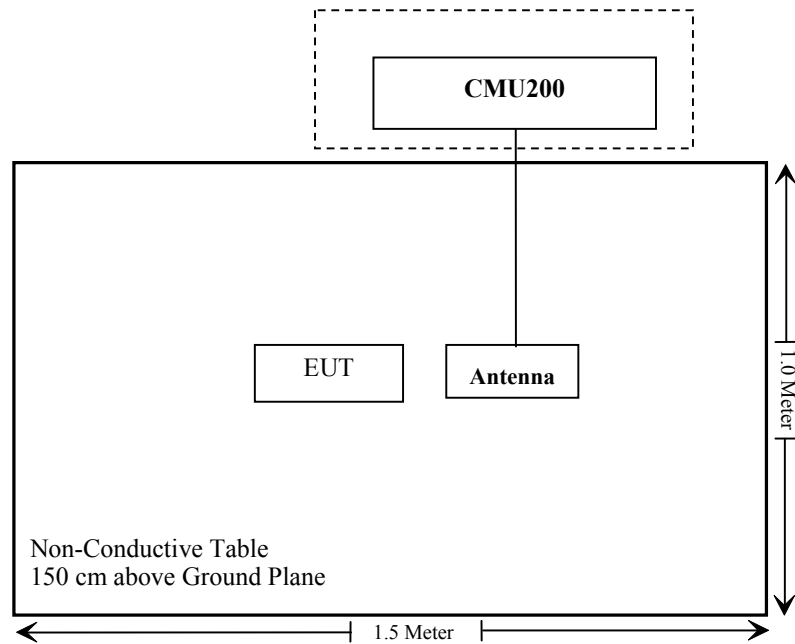
### Support Equipment List and Details

| Manufacturer | Description                          | Model    | Serial Number |
|--------------|--------------------------------------|----------|---------------|
| R&S          | Universal Radio Communication Tester | CMU200   | 106 891       |
| Un-Known     | ANTENNA                              | Un-Known | Un-Known      |

### Configuration of Test Setup



## Block Diagram of Test Setup





**SUMMARY OF TEST RESULTS**

| Rules                                                  | Description of Test                                                    | Result         |
|--------------------------------------------------------|------------------------------------------------------------------------|----------------|
| FCC§1.1310, §2.1093                                    | RF Exposure                                                            | Compliance     |
| FCC§2.1046; § 22.913 (a);<br>§ 24.232 (c); §27.50      | RF Output Power                                                        | Compliance     |
| FCC§ 2.1047                                            | Modulation Characteristics                                             | Not Applicable |
| FCC§ 2.1049; § 22.905<br>§ 22.917; § 24.238; §27.53    | Occupied Bandwidth                                                     | Compliance     |
| FCC§ 2.1051,<br>§ 22.917 (a); § 24.238 (a);<br>§27.53; | Spurious Emissions at Antenna Terminal                                 | Compliance     |
| FCC§ 2.1053<br>§ 22.917 (a); § 24.238 (a);<br>§27.53   | Field Strength of Spurious Radiation                                   | Compliance     |
| FCC§ 22.917 (a); § 24.238<br>(a); §27.53;              | Out of band emission, Band Edge                                        | Compliance     |
| FCC§ 2.1055<br>§ 22.355; § 24.235; §27.54              | Frequency stability vs. temperature<br>Frequency stability vs. voltage | Compliance     |

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## **FCC §1.1310 & §2.1093- RF EXPOSURE**

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### **Applicable Standard**

FCC§1.1310 and §2.1093.

### **Test Result**

Compliance, please refer to the SAR report: RDG191016001-20.

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## **FCC §2.1047 - MODULATION CHARACTERISTIC**

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

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**FCC § 2.1046, § 22.913 (a) & § 24.232 (c) & § 27.50- RF OUTPUT POWER**

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**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), 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.

According to §24.232 (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.

According to §27.50

(b)(10) Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

(c) (10) Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

(d), (4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

(h),(2) Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

## Test Procedure

### GSM/GPRS/EGPRS

Function: Menu select > GSM Mobile Station > GSM 850/1900

Press Connection control to choose the different menus

Press RESET > choose all the reset all settings

Connection Press Signal Off to turn off the signal and change settings

Network Support > GSM + GPRS or GSM + EGSM

Main Service > Packet Data

Service selection > Test Mode A – Auto Slot Config. off

MS Signal Press Slot Config Bottom on the right twice to select and change the number of time slots and power setting

> Slot configuration > Uplink/Gamma

> 33 dBm for GPRS 850

> 30 dBm for GPRS 1900

> 27 dBm for EGPRS 850

> 26 dBm for EGPRS 1900

BS Signal Enter the same channel number for TCH channel (test channel) and BCCH channel

Frequency Offset > + 0 Hz

Mode > BCCH and TCH

BCCH Level > -85 dBm (May need to adjust if link is not stable)

BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]

Channel Type > Off

P0 > 4 dB

Slot Config > Unchanged (if already set under MS signal)

TCH > choose desired test channel

Hopping > Off

Main Timeslot > 3

Network Coding Scheme > CS4 (GPRS) and MCS5 (EGPRS)

Bit Stream > 2E9-1 PSR Bit Stream

AF/RF Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input

Connection Press Signal on to turn on the signal and change settings

### WCDMA-Release 99

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification. The EUT has a nominal maximum output power of 24dBm (+1.7/-3.7).

|                                   |                         |              |
|-----------------------------------|-------------------------|--------------|
| <b>WCDMA<br/>General Settings</b> | Loopback Mode           | Test Mode 1  |
|                                   | Rel99 RMC               | 12.2kbps RMC |
|                                   | Power Control Algorithm | Algorithm2   |
|                                   | $\beta_c$ / $\beta_d$   | 8/15         |

**WCDMA HSDPA**

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

|                               | Mode                            | HSDPA        | HSDPA | HSDPA | HSDPA |
|-------------------------------|---------------------------------|--------------|-------|-------|-------|
|                               | Subset                          | 1            | 2     | 3     | 4     |
| WCDMA<br>General<br>Settings  | Loopback Mode                   | Test Mode 1  |       |       |       |
|                               | Rel99 RMC                       | 12.2kbps RMC |       |       |       |
|                               | HSDPA FRC                       | H-Set1       |       |       |       |
|                               | Power Control Algorithm         | Algorithm2   |       |       |       |
|                               | $\beta_c$                       | 2/15         | 12/15 | 15/15 | 15/15 |
|                               | $\beta_d$                       | 15/15        | 15/15 | 8/15  | 4/15  |
|                               | $\beta_d$ (SF)                  | 64           |       |       |       |
|                               | $\beta_c / \beta_d$             | 2/15         | 12/15 | 15/8  | 15/4  |
|                               | $\beta_{hs}$                    | 4/15         | 24/15 | 30/15 | 30/15 |
|                               | MPR(dB)                         | 0            | 0     | 0.5   | 0.5   |
| HSDPA<br>Specific<br>Settings | DACK                            | 8            |       |       |       |
|                               | DNAK                            | 8            |       |       |       |
|                               | DCQI                            | 8            |       |       |       |
|                               | Ack-Nack repetition factor      | 3            |       |       |       |
|                               | CQI Feedback                    | 4ms          |       |       |       |
|                               | CQI Repetition Factor           | 2            |       |       |       |
|                               | $A_{hs} = \beta_{hs} / \beta_c$ | 30/15        |       |       |       |

**WCDMA HSUPA**

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

|                                | Mode                             | HSUPA                                                                                                                                        | HSUPA                                                | HSUPA                                                                                                                                      | HSUPA                                                                                                                                        | HSUPA                                                                                                                                        |
|--------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
|                                | Subset                           | 1                                                                                                                                            | 2                                                    | 3                                                                                                                                          | 4                                                                                                                                            | 5                                                                                                                                            |
| <b>WCDMA General Settings</b>  | Loopback Mode                    | Test Mode 1                                                                                                                                  |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
|                                | Rel99 RMC                        | 12.2kbps RMC                                                                                                                                 |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
|                                | HSDPA FRC                        | H-Set1                                                                                                                                       |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
|                                | HSUPA Test                       | HSUPA Loopback                                                                                                                               |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
|                                | Power Control Algorithm          | Algorithm2                                                                                                                                   |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
|                                | $\beta_c$                        | 11/15                                                                                                                                        | 6/15                                                 | 15/15                                                                                                                                      | 2/15                                                                                                                                         | 15/15                                                                                                                                        |
|                                | $\beta_d$                        | 15/15                                                                                                                                        | 15/15                                                | 9/15                                                                                                                                       | 15/15                                                                                                                                        | 0                                                                                                                                            |
|                                | $\beta_{ec}$                     | 209/225                                                                                                                                      | 12/15                                                | 30/15                                                                                                                                      | 2/15                                                                                                                                         | 5/15                                                                                                                                         |
|                                | $\beta_c/\beta_d$                | 11/15                                                                                                                                        | 6/15                                                 | 15/9                                                                                                                                       | 2/15                                                                                                                                         | -                                                                                                                                            |
|                                | $\beta_{hs}$                     | 22/15                                                                                                                                        | 12/15                                                | 30/15                                                                                                                                      | 4/15                                                                                                                                         | 5/15                                                                                                                                         |
|                                | CM(dB)                           | 1.0                                                                                                                                          | 3.0                                                  | 2.0                                                                                                                                        | 3.0                                                                                                                                          | 1.0                                                                                                                                          |
|                                | MPR(dB)                          | 0                                                                                                                                            | 2                                                    | 1                                                                                                                                          | 2                                                                                                                                            | 0                                                                                                                                            |
| <b>HSDPA Specific Settings</b> | DACK                             | 8                                                                                                                                            |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
|                                | DNAK                             | 8                                                                                                                                            |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
|                                | DCQI                             | 8                                                                                                                                            |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
|                                | Ack-Nack repetition factor       | 3                                                                                                                                            |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
|                                | CQI Feedback                     | 4ms                                                                                                                                          |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
|                                | CQI Repetition Factor            | 2                                                                                                                                            |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
|                                | $A_{hs}=\beta_{hs}/\beta_c$      | 30/15                                                                                                                                        |                                                      |                                                                                                                                            |                                                                                                                                              |                                                                                                                                              |
| <b>HSUPA Specific Settings</b> | DE-DPCCH                         | 6                                                                                                                                            | 8                                                    | 8                                                                                                                                          | 5                                                                                                                                            | 7                                                                                                                                            |
|                                | DHARQ                            | 0                                                                                                                                            | 0                                                    | 0                                                                                                                                          | 0                                                                                                                                            | 0                                                                                                                                            |
|                                | AG Index                         | 20                                                                                                                                           | 12                                                   | 15                                                                                                                                         | 17                                                                                                                                           | 21                                                                                                                                           |
|                                | ETFCI                            | 75                                                                                                                                           | 67                                                   | 92                                                                                                                                         | 71                                                                                                                                           | 81                                                                                                                                           |
|                                | Associated Max UL Data Rate kbps | 242.1                                                                                                                                        | 174.9                                                | 482.8                                                                                                                                      | 205.8                                                                                                                                        | 308.9                                                                                                                                        |
|                                | Reference E_FCI                  | E-TFCI 11 E<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO23<br>E-TFCI 75<br>E-TFCI PO26<br>E-TFCI 81<br>E-TFCI PO 27 | E-TFCI 11<br>E-TFCI PO4<br>E-TFCI 92<br>E-TFCI PO 18 | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO23<br>E-TFCI 75<br>E-TFCI PO26<br>E-TFCI 81<br>E-TFCI PO 27 | E-TFCI 11 E<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO23<br>E-TFCI 75<br>E-TFCI PO26<br>E-TFCI 81<br>E-TFCI PO 27 | E-TFCI 11 E<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO23<br>E-TFCI 75<br>E-TFCI PO26<br>E-TFCI 81<br>E-TFCI PO 27 |

**Test Equipment List and Details**

| Manufacturer   | Description                          | Model       | Serial Number | Calibration Date | Calibration Due Date |
|----------------|--------------------------------------|-------------|---------------|------------------|----------------------|
| R&S            | EMI Test Receiver                    | ESR3        | 102453        | 2019-06-26       | 2020-06-26           |
| Sunol Sciences | Antenna                              | JB3         | A060611-1     | 2017-11-10       | 2020-11-10           |
| EMCO           | Adjustable Dipole Antenna            | 3121C       | 9109-753      | N/A              | N/A                  |
| Unknown        | Coaxial Cable                        | C-NJNJ-50   | C-0400-01     | 2019-09-05       | 2020-09-05           |
| Unknown        | Coaxial Cable                        | C-NJNJ-50   | C-0075-01     | 2019-09-05       | 2020-09-05           |
| Unknown        | Coaxial Cable                        | C-NJNJ-50   | C-1400-01     | 2019-05-06       | 2020-05-06           |
| Unknown        | Coaxial Cable                        | C-NJNJ-50   | C-0200-02     | 2019-09-05       | 2020-09-05           |
| R&S            | Universal Radio Communication Tester | CMU200      | 106 891       | 2018-12-14       | 2019-12-14           |
| Agilent        | Signal Generator                     | E8247C      | MY43321350    | 2018-12-10       | 2019-12-10           |
| Agilent        | Spectrum Analyzer                    | E4440A      | SG43360054    | 2019-05-09       | 2020-05-09           |
| TDK RF         | Horn Antenna                         | HRN-0118    | 130 084       | 2018-10-12       | 2021-10-12           |
| ETS-Lindgren   | Horn Antenna                         | 3115        | 000 527 35    | 2018-10-12       | 2021-10-12           |
| Unknown        | Coaxial Cable                        | C-SJSJ-50   | C-0800-01     | 2019-09-05       | 2020-09-05           |
| Unknown        | Coaxial Cable                        | C-NJNJ-50   | C-0200-02     | 2019-09-05       | 2020-09-05           |
| Unknown        | Coaxial Cable                        | C-SJ00-0010 | C0010/03      | Each time        | N/A                  |

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

**Test Data****Environmental Conditions**

| Test Items:        | Radiation Below 1GHz | Radiation Above 1GHz | Conducted Output Power |
|--------------------|----------------------|----------------------|------------------------|
| Temperature:       | 26.5 °C              | 26.6 °C              | 25.1 °C                |
| Relative Humidity: | 47%                  | 48 %                 | 58 %                   |
| ATM Pressure:      | 100.2 kPa            | 100.2 kPa            | 100.9 kPa              |
| Tester:            | Neil Liao            | Lucy Lu              | Severn Zhu             |
| Test Date:         | 2019-10-23           | 2019-10-23           | 2019-10-18             |

Test Result: Compliance



**Conducted Output Power****Cellular Band & PCS Band**

| Band     | Channel No. | Conducted Peak Output Power (dBm) |                    |                    |                    |                    |
|----------|-------------|-----------------------------------|--------------------|--------------------|--------------------|--------------------|
|          |             | GSM                               | GPRS 1 uplink slot | GPRS 2 uplink slot | GPRS 3 uplink slot | GPRS 4 uplink slot |
| Cellular | 128         | 31.1                              | 31.32              | 29.71              | 25.92              | 25.47              |
|          | 190         | 31.5                              | 31.48              | 29.73              | 27.61              | 25.59              |
|          | 251         | 31.5                              | 31.55              | 29.82              | 27.67              | 25.58              |
| PCS      | 512         | 29.6                              | 29.56              | 27.39              | 25.67              | 23.49              |
|          | 661         | 29.7                              | 29.64              | 27.41              | 25.78              | 23.77              |
|          | 810         | 30.2                              | 30.21              | 27.69              | 25.86              | 23.92              |

**WCDMA Band 2**

| Mode          | 3GPP Sub Test | Low Channel      |          | Middle Channel   |          | High Channel     |          |
|---------------|---------------|------------------|----------|------------------|----------|------------------|----------|
|               |               | Ave. Power (dBm) | PAR (dB) | Ave. Power (dBm) | PAR (dB) | Ave. Power (dBm) | PAR (dB) |
| Rel 99        | 1             | 22.77            | 3.08     | 22.88            | 3.24     | 22.87            | 2.98     |
| HSDPA         | 1             | 22.36            | 3.91     | 22.41            | 4.42     | 22.54            | 4.07     |
|               | 2             | 22.19            | 3.87     | 22.37            | 4.38     | 22.49            | 4.05     |
|               | 3             | 22.22            | 3.85     | 22.42            | 4.34     | 22.53            | 4.09     |
|               | 4             | 22.34            | 3.92     | 22.39            | 4.43     | 22.42            | 4.06     |
| HSUPA         | 1             | 22.12            | 4.17     | 22.14            | 4.42     | 22.28            | 4.04     |
|               | 2             | 22.09            | 4.15     | 22.13            | 4.42     | 22.24            | 4.03     |
|               | 3             | 22.24            | 4.19     | 22.17            | 4.37     | 22.19            | 4.04     |
|               | 4             | 22.15            | 4.13     | 22.07            | 4.41     | 22.21            | 4.06     |
|               | 5             | 22.27            | 4.11     | 22.08            | 4.39     | 22.27            | 4.01     |
| HSPA+ (16QAM) | 1             | 22.13            | 4.12     | 22.21            | 4.43     | 22.32            | 4.11     |

**WCDMA Band 4**

| Mode          | 3GPP Sub Test | Low Channel      |          | Middle Channel   |          | High Channel     |          |
|---------------|---------------|------------------|----------|------------------|----------|------------------|----------|
|               |               | Ave. Power (dBm) | PAR (dB) | Ave. Power (dBm) | PAR (dB) | Ave. Power (dBm) | PAR (dB) |
| Rel 99        | 1             | 22.71            | 2.15     | 22.07            | 2.44     | 21.64            | 2.31     |
| HSDPA         | 1             | 21.41            | 3.43     | 21.23            | 4.04     | 20.48            | 3.72     |
|               | 2             | 22.37            | 3.41     | 21.21            | 4.01     | 20.39            | 3.69     |
|               | 3             | 22.34            | 3.47     | 21.14            | 4.03     | 20.42            | 3.74     |
|               | 4             | 22.42            | 3.44     | 21.17            | 4.05     | 20.45            | 3.71     |
| HSUPA         | 1             | 21.11            | 3.69     | 20.91            | 4.01     | 20.23            | 3.85     |
|               | 2             | 22.12            | 3.67     | 20.88            | 3.98     | 20.24            | 3.84     |
|               | 3             | 22.07            | 3.72     | 20.85            | 3.86     | 20.21            | 3.82     |
|               | 4             | 22.11            | 3.65     | 20.92            | 4.06     | 20.19            | 3.91     |
|               | 5             | 22.06            | 3.69     | 20.84            | 4.02     | 20.17            | 3.88     |
| HSPA+ (16QAM) | 1             | 22.12            | 3.51     | 21.05            | 4.07     | 20.34            | 3.94     |

**WCDMA Band 5**

| Mode          | 3GPP Sub Test | Low Channel      |          | Middle Channel   |          | High Channel     |          |
|---------------|---------------|------------------|----------|------------------|----------|------------------|----------|
|               |               | Ave. Power (dBm) | PAR (dB) | Ave. Power (dBm) | PAR (dB) | Ave. Power (dBm) | PAR (dB) |
| Rel 99        | 1             | 22.28            | 2.56     | 22.37            | 2.21     | 22.16            | 2.37     |
| HSDPA         | 1             | 20.68            | 3.88     | 20.73            | 3.59     | 20.79            | 3.94     |
|               | 2             | 20.65            | 3.83     | 20.67            | 3.54     | 20.72            | 3.92     |
|               | 3             | 20.63            | 3.87     | 20.64            | 3.55     | 20.77            | 3.94     |
|               | 4             | 20.67            | 3.88     | 20.72            | 3.59     | 20.69            | 3.91     |
| HSUPA         | 1             | 20.31            | 4.01     | 20.42            | 3.85     | 20.49            | 3.81     |
|               | 2             | 20.28            | 4.03     | 20.37            | 3.85     | 20.52            | 3.83     |
|               | 3             | 20.19            | 3.87     | 20.41            | 3.89     | 20.47            | 3.79     |
|               | 4             | 20.24            | 3.92     | 20.35            | 3.81     | 20.44            | 3.77     |
|               | 5             | 20.21            | 3.99     | 20.37            | 3.84     | 20.53            | 3.84     |
| HSPA+ (16QAM) | 1             | 20.27            | 4.05     | 20.39            | 3.88     | 20.59            | 3.89     |

## ERP &amp; EIRP

## Part 22H

| Frequency<br>(MHz)              | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                                 |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| GSM 850 Middle Channel          |                |                               |                               |                              |                    |                            |                |                |
| 836.60                          | H              | 90.21                         | 15.29                         | 0.00                         | 0.97               | 14.32                      | 38.45          | 24.13          |
| 836.60                          | V              | 102.38                        | 30.59                         | 0.00                         | 0.97               | 29.62                      | 38.45          | 8.83           |
| WCDMA R99 Band 5 middle channel |                |                               |                               |                              |                    |                            |                |                |
| 836.60                          | H              | 81.57                         | 6.65                          | 0.00                         | 0.97               | 5.68                       | 38.45          | 32.77          |
| 836.60                          | V              | 95.49                         | 23.70                         | 0.00                         | 0.97               | 22.73                      | 38.45          | 15.72          |

## Part 24E

| Frequency<br>(MHz)              | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                                 |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| PCS 1900 Middle Channel         |                |                               |                               |                              |                    |                            |                |                |
| 1880.00                         | H              | 91.91                         | 19.30                         | 11.66                        | 2.66               | 28.30                      | 33.00          | 4.70           |
| 1880.00                         | V              | 89.46                         | 16.99                         | 11.66                        | 2.66               | 25.99                      | 33.00          | 7.01           |
| WCDMA R99 Band 2 middle channel |                |                               |                               |                              |                    |                            |                |                |
| 1880.00                         | H              | 87.55                         | 14.94                         | 11.66                        | 2.66               | 23.94                      | 33.00          | 9.06           |
| 1880.00                         | V              | 87.70                         | 15.23                         | 11.66                        | 2.66               | 24.23                      | 33.00          | 8.77           |

## Part 27

| Frequency<br>(MHz)              | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                                 |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| WCDMA R99 Band 4 middle channel |                |                               |                               |                              |                    |                            |                |                |
| 1732.60                         | H              | 85.20                         | 11.15                         | 10.90                        | 2.51               | 19.54                      | 30.00          | 10.46          |
| 1732.60                         | V              | 88.34                         | 13.97                         | 10.90                        | 2.51               | 22.36                      | 30.00          | 7.64           |

Note:

- 1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
- 2) Absolute Level = Substituted Level - Cable loss + Antenna Gain
- 3) Margin = Limit-Absolute Level

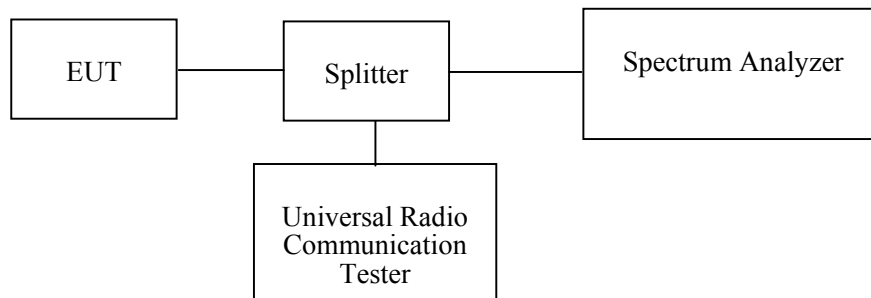
**FCC §2.1049, §22.917, §22.905 & §24.238 & §27.53- OCCUPIED BANDWIDTH****Applicable Standard**

FCC §2.1049, §22.917, §22.905, §24.238 and §27.53.

**Test Procedure**

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

The 26 dB & 99% bandwidth was recorded.

**Test Equipment List and Details**

| Manufacturer | Description       | Model         | Serial Number | Calibration Date | Calibration Due Date |
|--------------|-------------------|---------------|---------------|------------------|----------------------|
| R&S          | Spectrum Analyzer | FSU 26        | 200256        | 2019-05-09       | 2020-05-09           |
| yzjingcheng  | Coaxial Cable     | KTRFBU-141-50 | 41010013      | Each time        | /                    |
| Unknown      | Coaxial Cable     | C-SJ00-0010   | C0010/03      | Each time        | /                    |
| E-Microwave  | Two-way Splitter  | ODP-1-6-2S    | OE0120142     | Each time        | /                    |

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

**Test Data****Environmental Conditions**

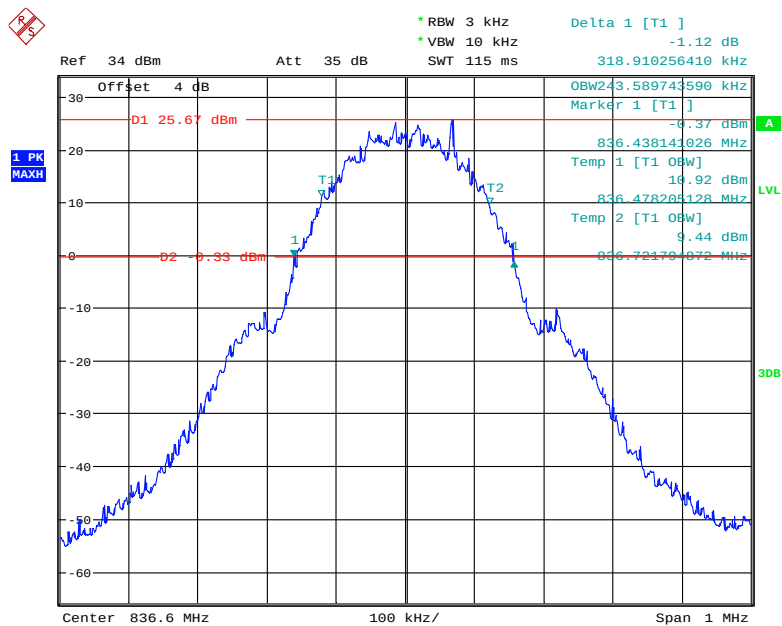
|                           |                       |
|---------------------------|-----------------------|
| <b>Temperature:</b>       | 23.5~25.1 °C          |
| <b>Relative Humidity:</b> | 47~58 %               |
| <b>ATM Pressure:</b>      | 100.9~101.6 kPa       |
| <b>Tester:</b>            | Severn Zhu            |
| <b>Test Date:</b>         | 2019-10-17~2019-10-19 |

Test Mode: Transmitting

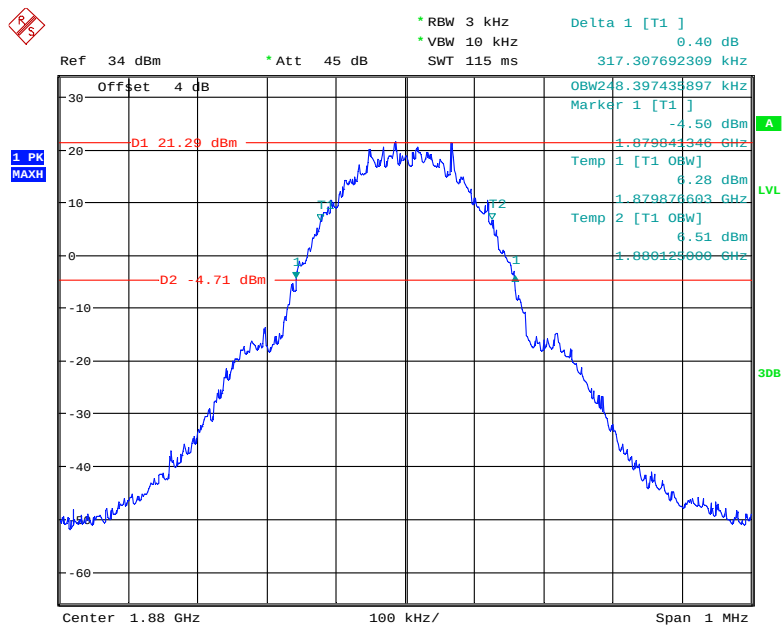
Test Result: Compliance. Please refer to the following table and plots.

| Band         | Test Channel | Mode   | 99% Occupied Bandwidth (MHz) | 26 dB Occupied Bandwidth (MHz) |
|--------------|--------------|--------|------------------------------|--------------------------------|
| Cellular     | Middle       | GSM    | 0.244                        | 0.319                          |
| PCS          |              | GSM    | 0.248                        | 0.317                          |
| WCDMA Band 2 |              | Rel 99 | 4.100                        | 4.679                          |
|              |              | HSDPA  | 4.100                        | 4.678                          |
|              |              | HSUPA  | 4.100                        | 4.696                          |
| WCDMA Band 4 |              | Rel 99 | 4.100                        | 4.712                          |
|              |              | HSDPA  | 4.102                        | 4.679                          |
|              |              | HSUPA  | 4.103                        | 4.696                          |
| WCDMA Band 5 |              | Rel 99 | 4.119                        | 4.760                          |
|              |              | HSDPA  | 4.119                        | 4.744                          |
|              |              | HSUPA  | 4.119                        | 4.760                          |

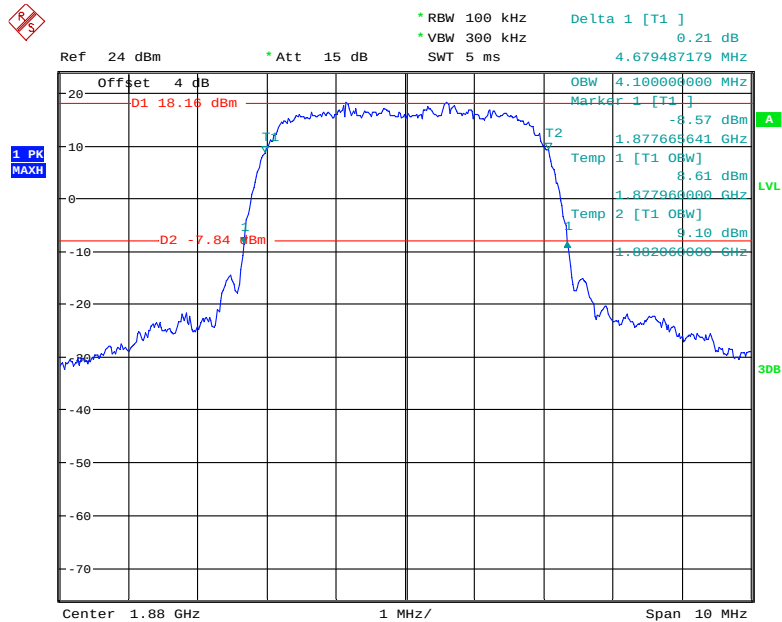
### GSM Cellular 850



Date: 17.OCT.2019 23:19:33

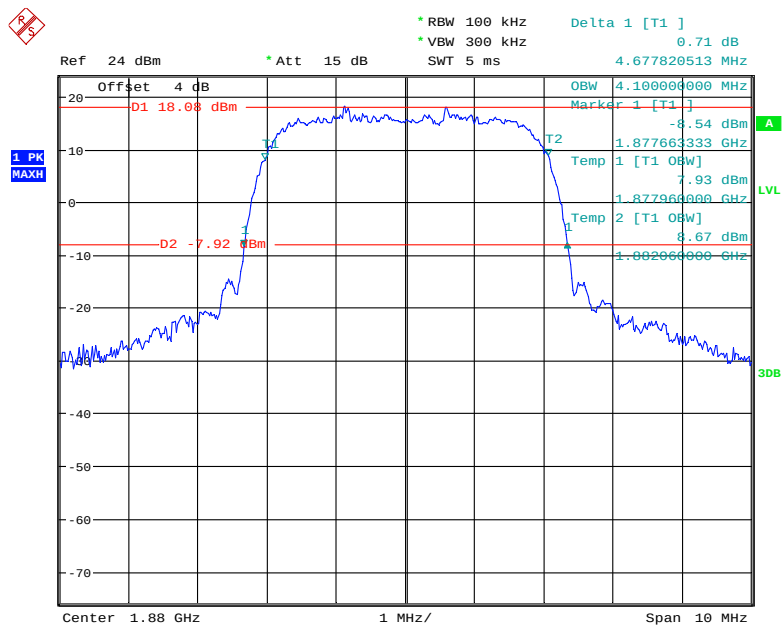
**GSM PCS 1900**

Date: 17.OCT.2019 23:33:53

**WCDMA Band 2 Rel 99**

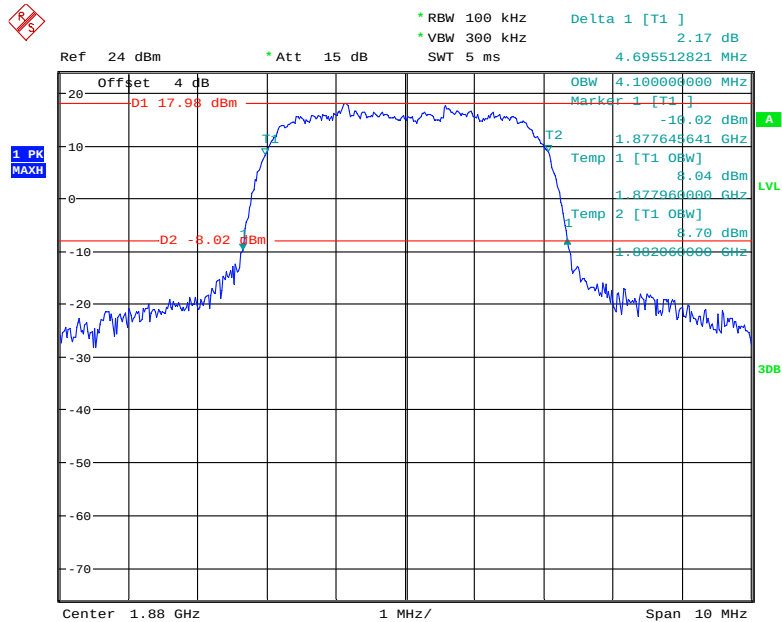
Date: 18.OCT.2019 00:48:46

## WCDMA Band 2 HSDPA



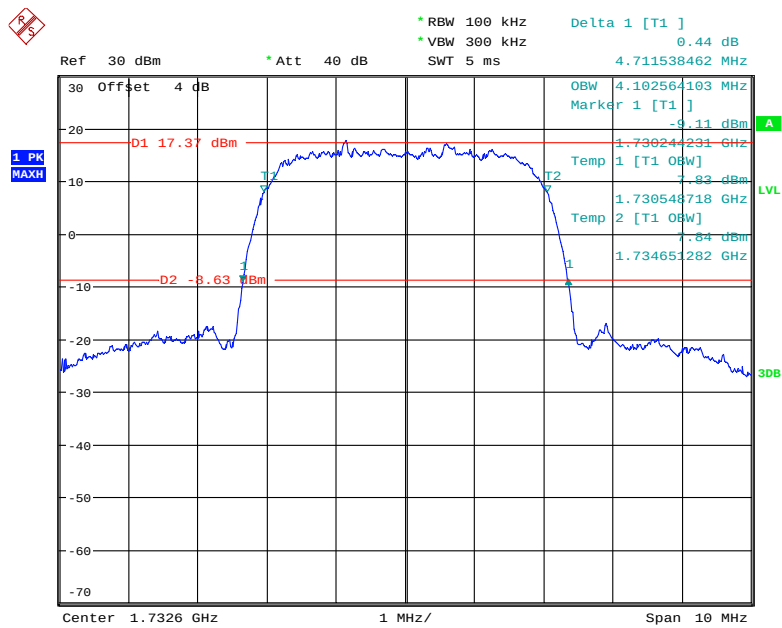
Date: 18.OCT.2019 01:00:16

## WCDMA Band 2 HSUPA



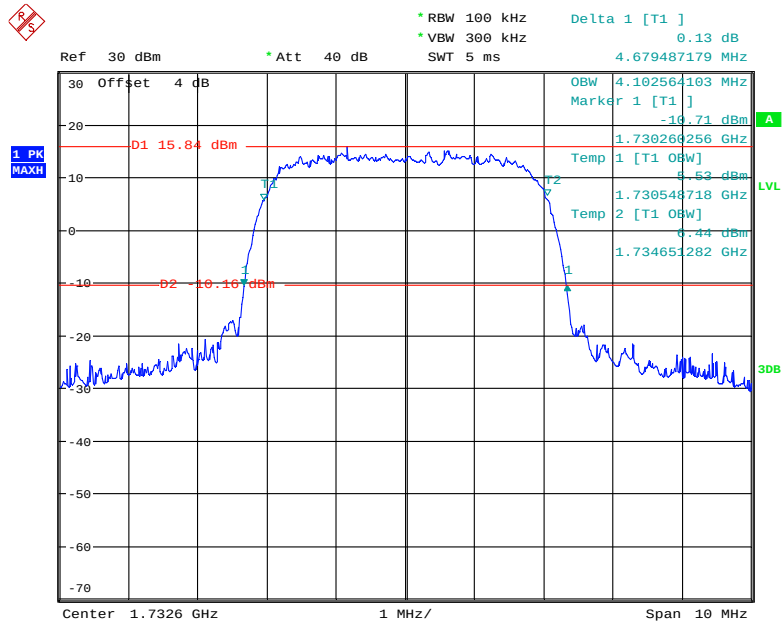
Date: 18.OCT.2019 01:17:19

## WCDMA Band 4 Rel 99



Date: 19.OCT.2019 00:59:36

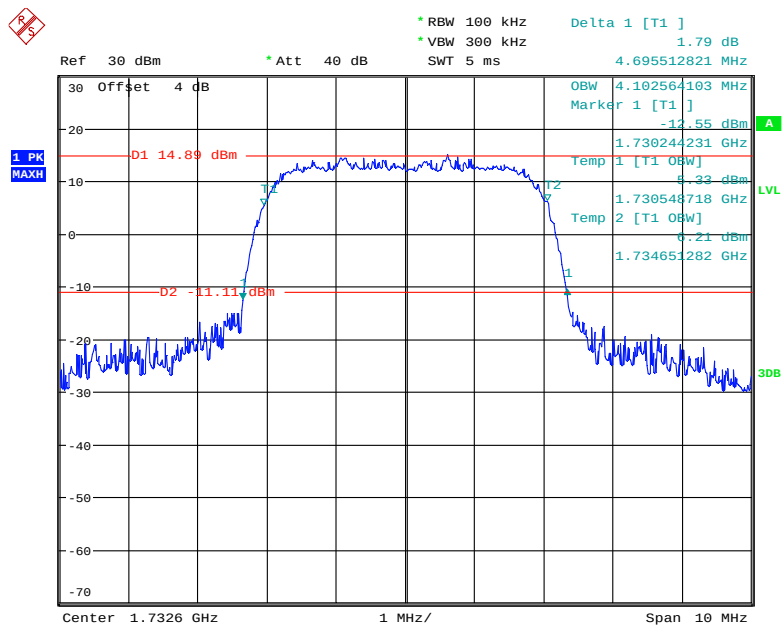
## WCDMA Band 4 HSDPA



Date: 19.OCT.2019 01:13:45

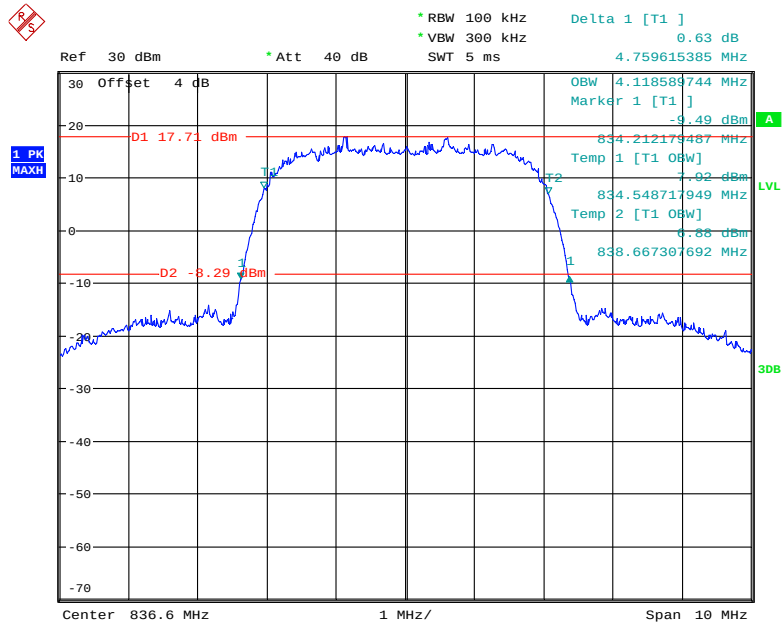


## WCDMA Band 4 HSUPA



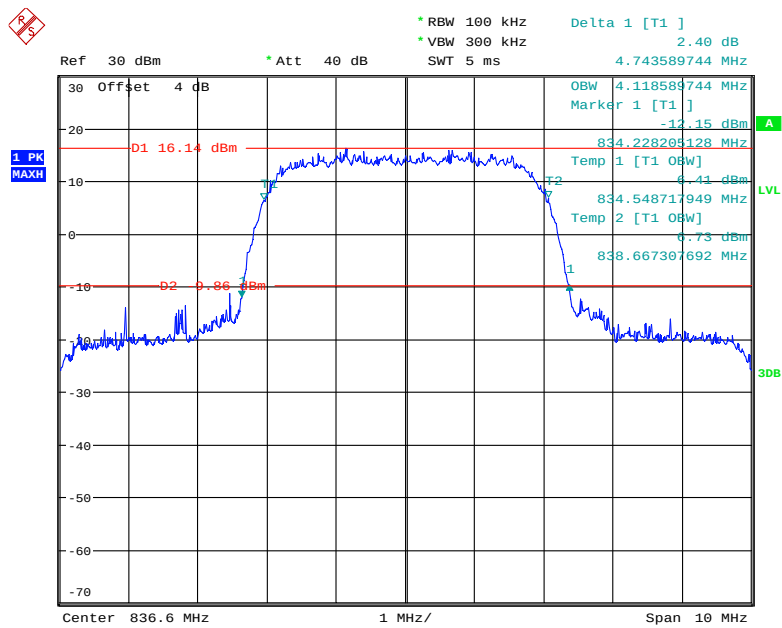
Date: 19.OCT.2019 01:15:22

## WCDMA Band 5 Rel 99



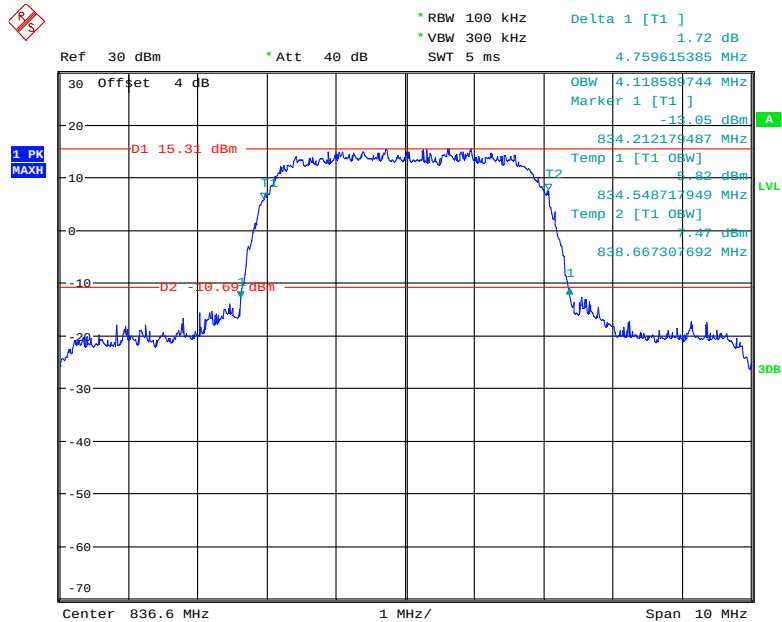
Date: 19.OCT.2019 01:38:29

### WCDMA Band 5 HSDPA



Date: 19.OCT.2019 01:41:46

### WCDMA Band 5 HSUPA



Date: 19.OCT.2019 01:40:00

## FCC §2.1051, §22.917(a) & §24.238(a) & §27.53- SPURIOUS EMISSIONS AT ANTENNA TERMINALS

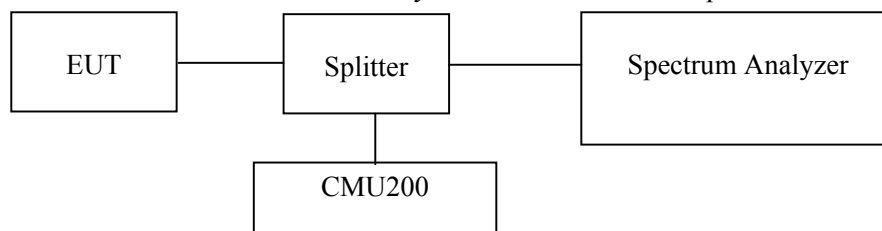
### Applicable Standard

FCC §2.1051, §22.917(a) , §24.238(a) and §27.53.

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. Sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.



### Test Equipment List and Details

| Manufacturer | Description       | Model         | Serial Number | Calibration Date | Calibration Due Date |
|--------------|-------------------|---------------|---------------|------------------|----------------------|
| R&S          | Spectrum Analyzer | FSU 26        | 200256        | 2019-05-09       | 2020-05-09           |
| yzjingcheng  | Coaxial Cable     | KTRFBU-141-50 | 41010013      | Each time        | /                    |
| Unknown      | Coaxial Cable     | C-SJ00-0010   | C0010/03      | Each time        | /                    |
| E-Microwave  | Two-way Splitter  | ODP-1-6-2S    | OE0120142     | Each time        | /                    |

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

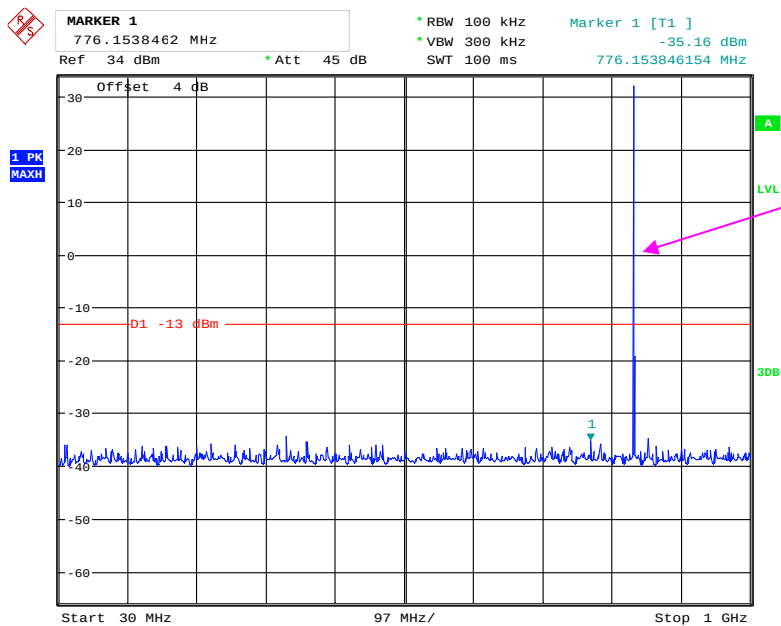
### Test Data

#### Environmental Conditions

|                    |                       |
|--------------------|-----------------------|
| Temperature:       | 23.5~25.1 °C          |
| Relative Humidity: | 47~58 %               |
| ATM Pressure:      | 100.9~101.6 kPa       |
| Tester:            | Severn Zhu            |
| Test Date:         | 2019-10-17~2019-10-19 |

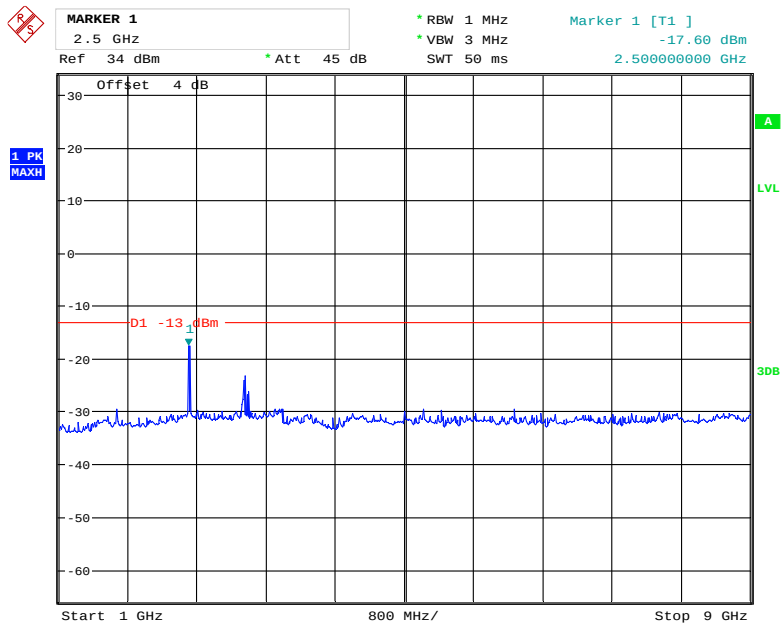
Test Result: Compliance. Please refer to the following plots.

GSM850 Middle Channel



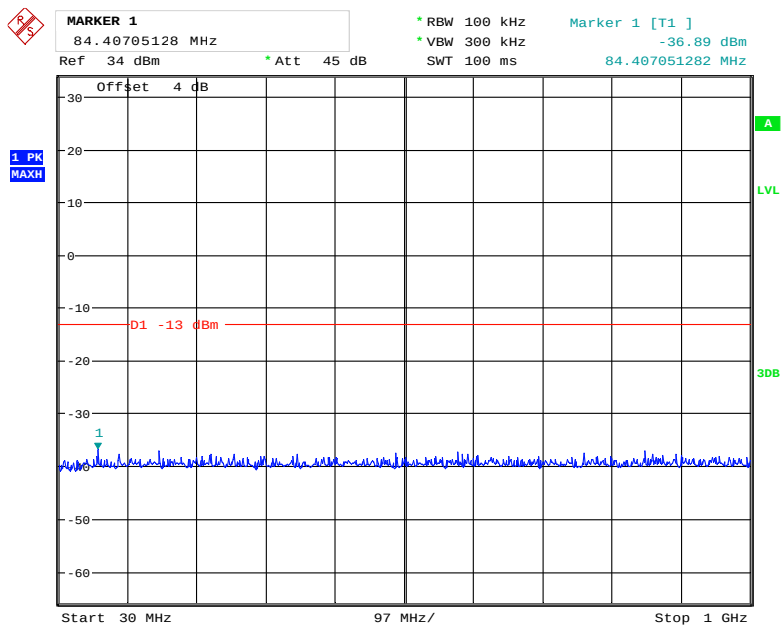
Fundamental

Date: 17.OCT.2019 23:22:08



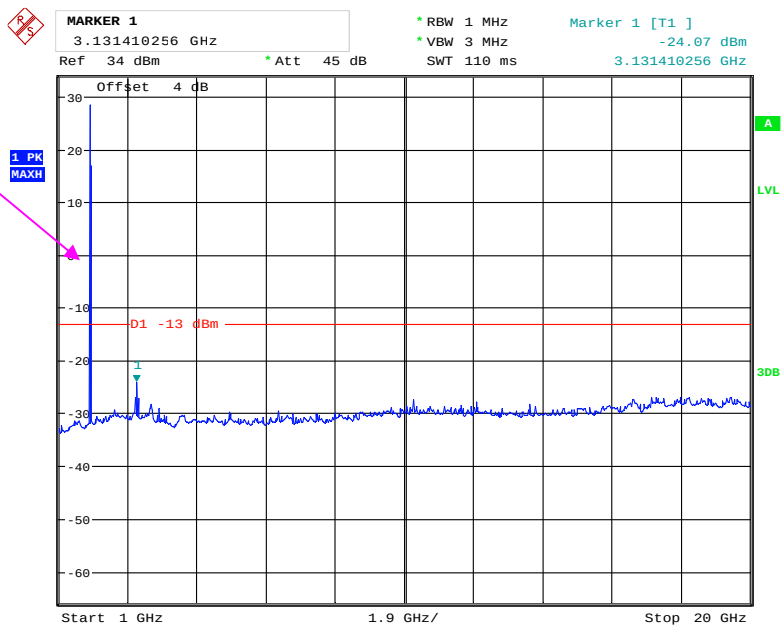
Date: 17.OCT.2019 23:22:51

PCS 1900 Middle Channel



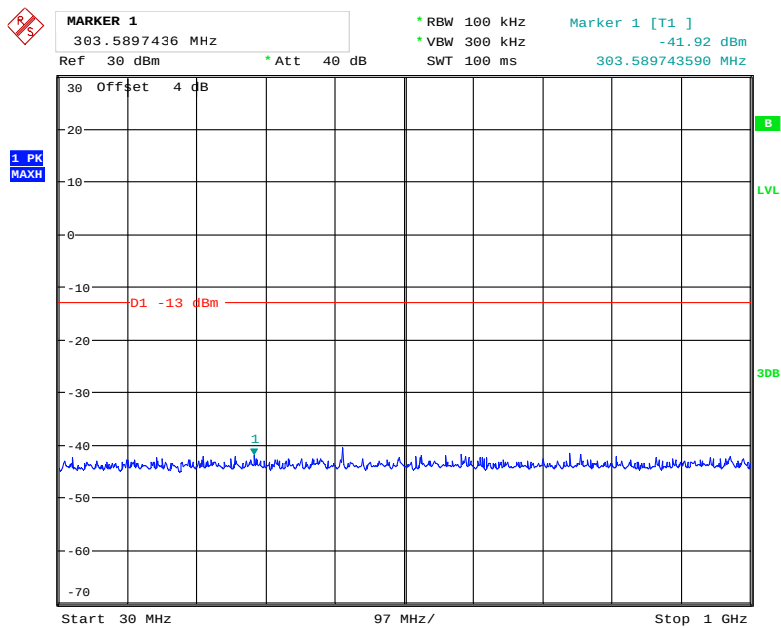
Date: 17.OCT.2019 23:31:03

Fundamental



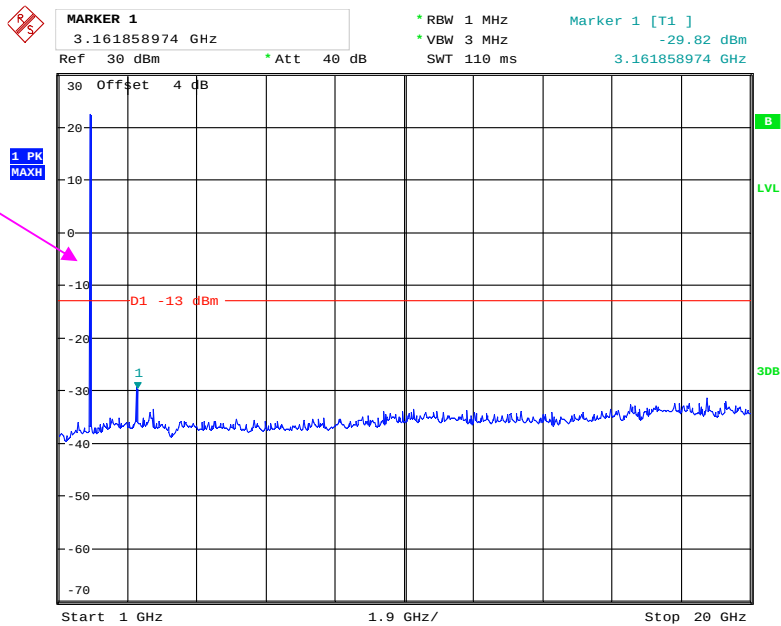
Date: 17.OCT.2019 23:29:22

WCDMA Band 2 Rel 99 Middle Channel



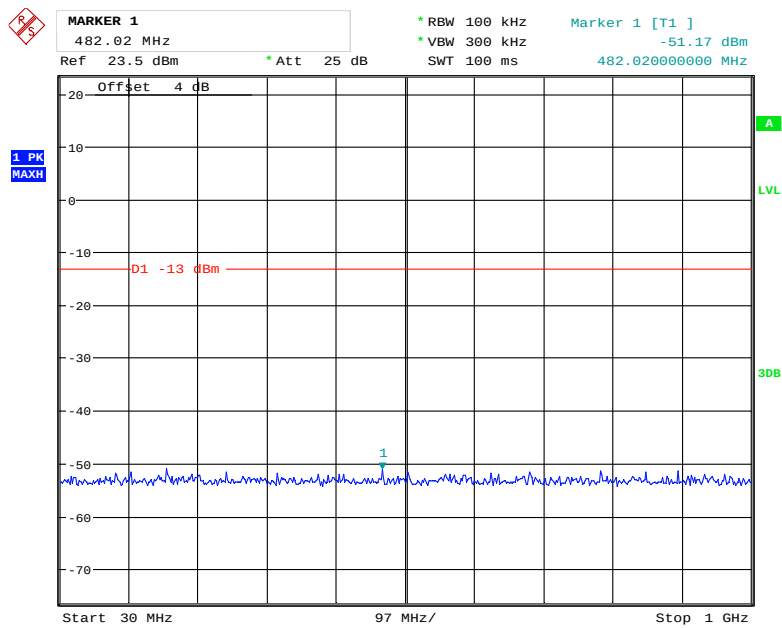
Date: 18.OCT.2019 00:45:45

Fundamental



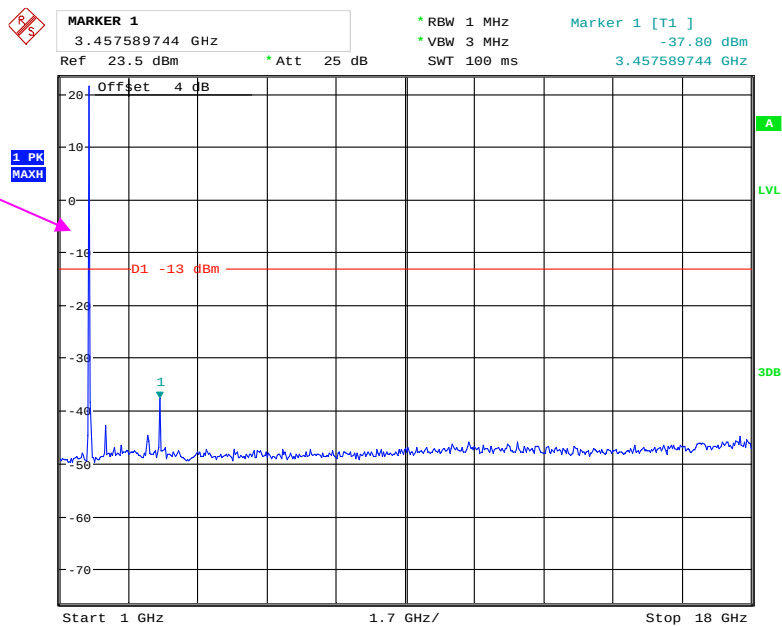
Date: 18.OCT.2019 00:46:19

### WCDMA Band 4 Rel 99 Middle Channel



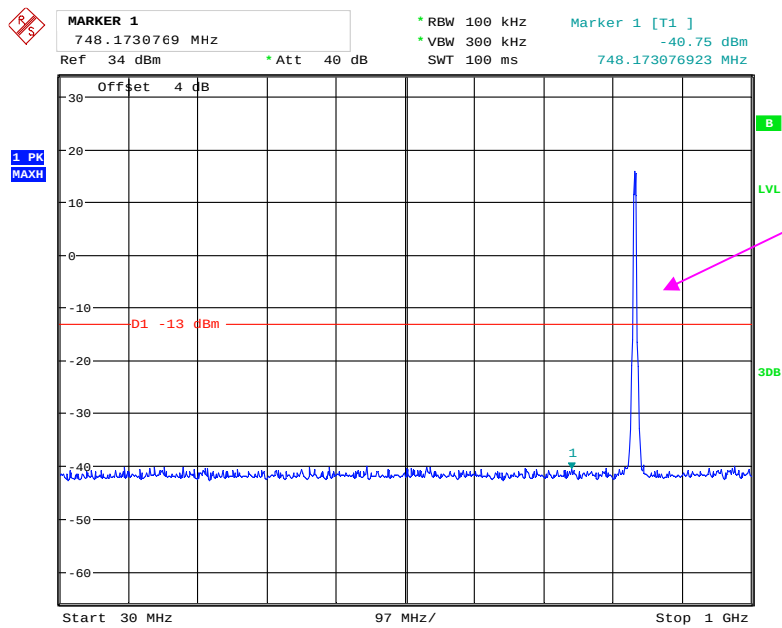
Date: 19.OCT.2019 00:23:19

Fundamental

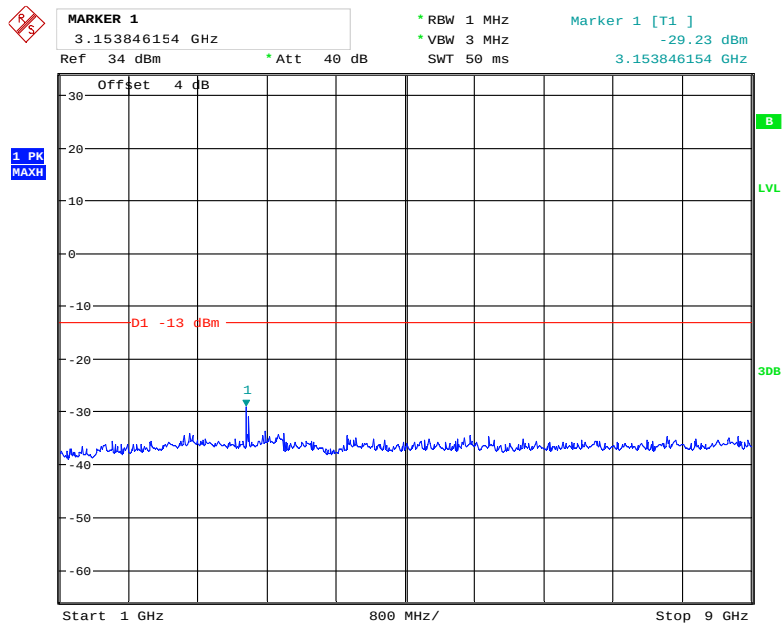


Date: 19.OCT.2019 00:24:06

### WCDMA Band 5 Rel 99 Middle Channel



Date: 19.OCT.2019 01:35:25



Date: 19.OCT.2019 01:36:01



**FCC §2.1053, §22.917 & §24.238 & §27.53- SPURIOUS RADIATED EMISSIONS**

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**Applicable Standard**

FCC § 2.1053, §22.917, § 24.238 and § 27.53;

**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 =  $10 \lg (\text{TXpwr in Watts}/0.001)$  – the absolute level

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

**Test Equipment List and Details**

| Manufacturer          | Description               | Model                   | Serial Number      | Calibration Date | Calibration Due Date |
|-----------------------|---------------------------|-------------------------|--------------------|------------------|----------------------|
| R&S                   | EMI Test Receiver         | ESCI                    | 100224             | 2018-12-10       | 2019-12-10           |
| Sunol Sciences        | Antenna                   | JB3                     | A060611-1          | 2017-11-10       | 2020-11-10           |
| EMCO                  | Adjustable Dipole Antenna | 3121C                   | 9109-753           | Not Required     | /                    |
| Unknown               | Coaxial Cable             | C-NJNJ-50               | C-0400-01          | 2019-09-05       | 2020-09-05           |
| Unknown               | Coaxial Cable             | C-NJNJ-50               | C-0075-01          | 2019-09-05       | 2020-09-05           |
| Unknown               | Coaxial Cable             | C-NJNJ-50               | C-1400-01          | 2019-05-06       | 2020-05-06           |
| Unknown               | Coaxial Cable             | C-NJNJ-50               | C-0200-02          | 2019-09-05       | 2020-09-05           |
| ETS-Lindgren          | Horn Antenna              | 3115                    | 000 527 35         | 2018-10-12       | 2021-10-12           |
| TDK RF                | Horn Antenna              | HRN-0118                | 130 084            | 2018-10-12       | 2021-10-12           |
| Unknown               | Coaxial Cable             | C-SJSJ-50               | C-0800-01          | 2019-09-05       | 2020-09-05           |
| Agilent               | Signal Generator          | E8247C                  | MY43321350         | 2018-12-10       | 2019-12-10           |
| R&S                   | Spectrum Analyzer         | FSP 38                  | 100478             | 2019-05-09       | 2020-05-09           |
| HP                    | Amplifier                 | 8447D                   | 2727A05902         | 2019-09-05       | 2020-09-05           |
| MITEQ                 | Amplifier                 | AFS42-00101800-25-S-42  | 2001271            | 2019-09-05       | 2020-09-05           |
| Ducommun Technologies | Horn Antenna              | ARH-4223-02             | 1007726-01<br>1304 | 2016-11-18       | 2019-11-18           |
| Ducommun Technologies | Horn Antenna              | ARH-4223-02             | 1007726-02<br>1304 | 2016-11-18       | 2019-11-18           |
| Quinstar              | Amplifier                 | QLW-18405536-JO         | 15964001001        | 2019-06-27       | 2020-06-27           |
| Sinoscite             | Band-stop filter          | BSF1710-1785MN-0383-003 | 0383003            | 2019-06-16       | 2020-06-16           |
| Sinoscite             | Band-stop filter          | BSF824-862MS-1438-001   | 1438001            | 2019-06-16       | 2020-06-16           |
| Sinoscite             | Band-stop filter          | BSF1850-1910MS-0935V2   | 0935V2             | 2019-06-16       | 2020-06-16           |

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

**Test Data****Environmental Conditions**

| Test Items         | Radiation Below 1GHz | Radiation Above 1GHz |
|--------------------|----------------------|----------------------|
| Temperature:       | 26.5 °C              | 26.6 °C              |
| Relative Humidity: | 47%                  | 48 %                 |
| ATM Pressure:      | 100.2 kPa            | 100.2 kPa            |
| Tester:            | Neil Liao            | Lucy Lu              |
| Test Date:         | 2019-10-23           | 2019-10-23           |

Test Result: Compliance.

*EUT Operation Mode: Transmitting***Cellular Band (PART 22H)****30 MHz-10 GHz:**

| Frequency<br>(MHz)                  | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|-------------------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                                     |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| GSM850, Frequency:836.600 MHz       |                |                               |                               |                              |                    |                            |                |                |
| 1673.200                            | H              | 57.53                         | -56.68                        | 10.6                         | 0.73               | -46.8                      | -13.0          | 33.8           |
| 1673.200                            | V              | 55.75                         | -59.06                        | 10.6                         | 0.73               | -49.2                      | -13.0          | 36.2           |
| 2509.800                            | H              | 57.49                         | -55.53                        | 13.1                         | 1.25               | -43.7                      | -13.0          | 30.7           |
| 2509.800                            | V              | 58.21                         | -54.84                        | 13.1                         | 1.25               | -43.0                      | -13.0          | 30.0           |
| 3346.400                            | H              | 44.25                         | -66.41                        | 13.8                         | 1.61               | -54.2                      | -13.0          | 41.2           |
| 3346.400                            | V              | 45.34                         | -65.37                        | 13.8                         | 1.61               | -53.2                      | -13.0          | 40.2           |
| 767.700                             | H              | 36.54                         | -63.01                        | 0.0                          | 0.93               | -63.9                      | -13.0          | 50.9           |
| 767.700                             | V              | 38.15                         | -64.74                        | 0.0                          | 0.93               | -65.7                      | -13.0          | 52.7           |
| WCDMA Band V, Frequency:836.600 MHz |                |                               |                               |                              |                    |                            |                |                |
| 1673.200                            | H              | 49.94                         | -64.27                        | 10.6                         | 0.73               | -54.4                      | -13.0          | 41.4           |
| 1673.200                            | V              | 46.57                         | -68.24                        | 10.6                         | 0.73               | -58.4                      | -13.0          | 45.4           |
| 2509.800                            | H              | 47.82                         | -65.2                         | 13.1                         | 1.25               | -53.3                      | -13.0          | 40.3           |
| 2509.800                            | V              | 49.79                         | -63.26                        | 13.1                         | 1.25               | -51.4                      | -13.0          | 38.4           |
| 3346.400                            | H              | 45.13                         | -65.53                        | 13.8                         | 1.61               | -53.3                      | -13.0          | 40.3           |
| 3346.400                            | V              | 45.24                         | -65.47                        | 13.8                         | 1.61               | -53.3                      | -13.0          | 40.3           |
| 767.700                             | H              | 36.47                         | -63.08                        | 0.0                          | 0.93               | -64.0                      | -13.0          | 51.0           |
| 767.700                             | V              | 38.59                         | -64.3                         | 0.0                          | 0.93               | -65.2                      | -13.0          | 52.2           |

**PCS Band (PART 24E)****30 MHz-20 GHz:**

| Frequency<br>(MHz)                    | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------------------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                                       |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| GSM1900, Frequency:1880.000 MHz       |                |                               |                               |                              |                    |                            |                |                |
| 3760.000                              | H              | 54.76                         | -54.04                        | 13.8                         | 1.63               | -41.9                      | -13.0          | 28.9           |
| 3760.000                              | V              | 54.16                         | -54.51                        | 13.8                         | 1.63               | -42.4                      | -13.0          | 29.4           |
| 5640.000                              | H              | 52.67                         | -53.36                        | 14.0                         | 1.31               | -40.7                      | -13.0          | 27.7           |
| 5640.000                              | V              | 56.15                         | -49.76                        | 14.0                         | 1.31               | -37.1                      | -13.0          | 24.1           |
| 767.700                               | H              | 35.81                         | -63.74                        | 0.0                          | 0.93               | -64.7                      | -13.0          | 51.7           |
| 767.700                               | V              | 38.78                         | -64.11                        | 0.0                          | 0.93               | -65.0                      | -13.0          | 52.0           |
| WCDMA Band II, Frequency:1880.000 MHz |                |                               |                               |                              |                    |                            |                |                |
| 3760.000                              | H              | 61.56                         | -47.24                        | 13.8                         | 1.63               | -35.1                      | -13.0          | 22.1           |
| 3760.000                              | V              | 65.92                         | -42.75                        | 13.8                         | 1.63               | -30.6                      | -13.0          | 17.6           |
| 5640.000                              | H              | 57.21                         | -48.82                        | 14.0                         | 1.31               | -36.1                      | -13.0          | 23.1           |
| 5640.000                              | V              | 60.73                         | -45.18                        | 14.0                         | 1.31               | -32.5                      | -13.0          | 19.5           |
| 767.700                               | H              | 36.33                         | -63.22                        | 0.0                          | 0.93               | -64.2                      | -13.0          | 51.2           |
| 767.700                               | V              | 39.70                         | -63.19                        | 0.0                          | 0.93               | -64.1                      | -13.0          | 51.1           |

**AWS Band (PART 27)****30 MHz-20 GHz:**

| Frequency<br>(MHz)                    | Polar<br>(H/V) | Receiver<br>Reading<br>(dBμV) | Substituted Method            |                              |                    | Absolute<br>Level<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|---------------------------------------|----------------|-------------------------------|-------------------------------|------------------------------|--------------------|----------------------------|----------------|----------------|
|                                       |                |                               | Substituted<br>Level<br>(dBm) | Antenna<br>Gain<br>(dBd/dBi) | Cable Loss<br>(dB) |                            |                |                |
| WCDMA Band IV, Frequency:1732.600 MHz |                |                               |                               |                              |                    |                            |                |                |
| 3465.200                              | H              | 52.62                         | -57.62                        | 13.9                         | 1.62               | -45.3                      | -13.0          | 32.3           |
| 3465.200                              | V              | 52.54                         | -57.73                        | 13.9                         | 1.62               | -45.5                      | -13.0          | 32.5           |
| 5197.800                              | H              | 55.63                         | -50.79                        | 14.0                         | 1.52               | -38.3                      | -13.0          | 25.3           |
| 5197.800                              | V              | 54.99                         | -51.5                         | 14.0                         | 1.52               | -39.0                      | -13.0          | 26.0           |
| 767.700                               | H              | 35.97                         | -63.58                        | 0.0                          | 0.93               | -64.5                      | -13.0          | 51.5           |
| 767.700                               | V              | 38.45                         | -64.44                        | 0.0                          | 0.93               | -65.4                      | -13.0          | 52.4           |

Note:

- 1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
- 2) Absolute Level = Substituted Level - Cable loss + Antenna Gain
- 3) Margin = Limit-Absolute Level

## FCC §22.917(a) & §24.238(a) & §27.53 - BAND EDGES

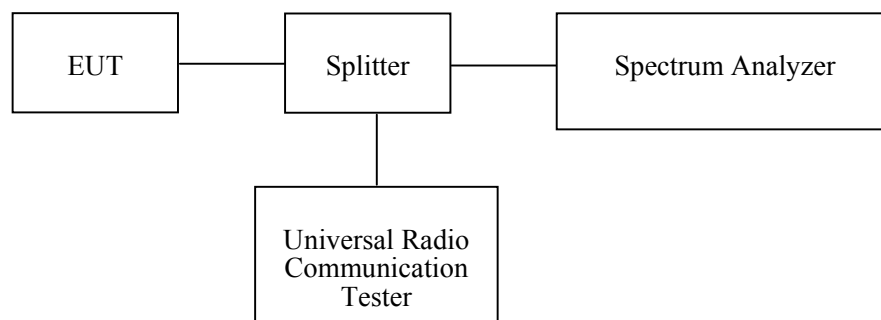
### Applicable Standard

FCC § 2.1053, §22.917, § 24.238 and § 27.53

### 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 |
|--------------|-------------------|---------------|---------------|------------------|----------------------|
| R&S          | Spectrum Analyzer | FSU 26        | 200256        | 2019-05-09       | 2020-05-09           |
| yzjingcheng  | Coaxial Cable     | KTRFBU-141-50 | 41010013      | Each time        | /                    |
| Unknown      | Coaxial Cable     | C-SJ00-0010   | C0010/03      | Each time        | /                    |
| E-Microwave  | Two-way Splitter  | ODP-1-6-2S    | OE0120142     | Each time        | /                    |

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

### Test Data

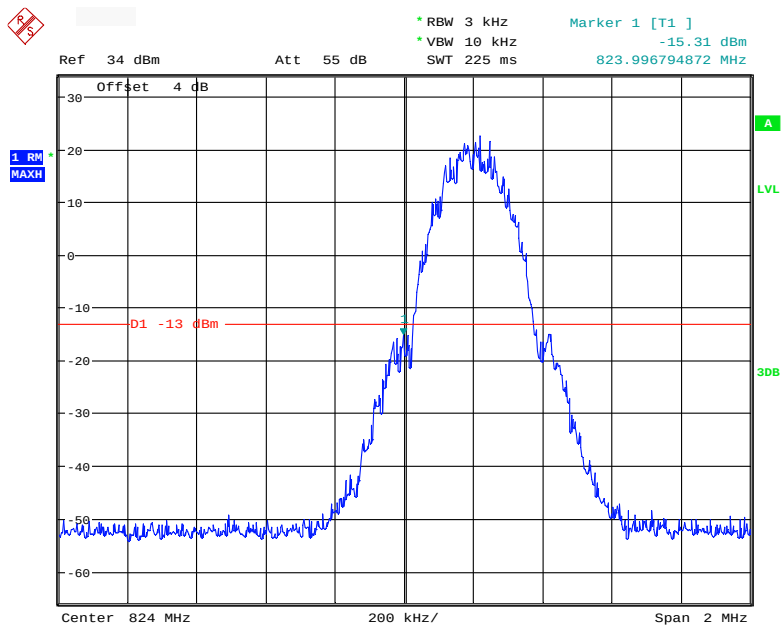
#### Environmental Conditions

|                           |                       |
|---------------------------|-----------------------|
| <b>Temperature:</b>       | 23.5~25.1 °C          |
| <b>Relative Humidity:</b> | 47~58 %               |
| <b>ATM Pressure:</b>      | 100.9~101.6 kPa       |
| <b>Tester:</b>            | Severn Zhu            |
| <b>Test Date:</b>         | 2019-10-17~2019-10-19 |

Test Mode: Transmitting

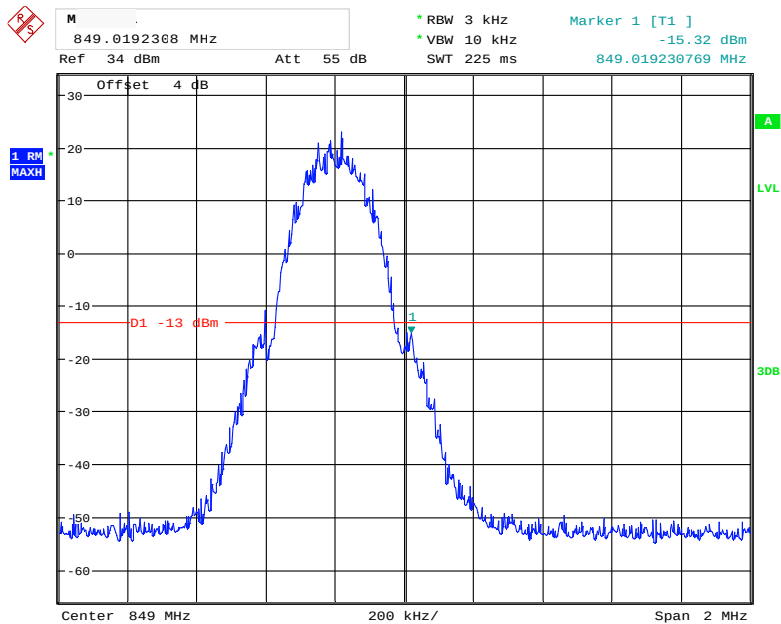
Test Result: Compliance. Please refer to the following plots.

GSM 850, Left Band Edge



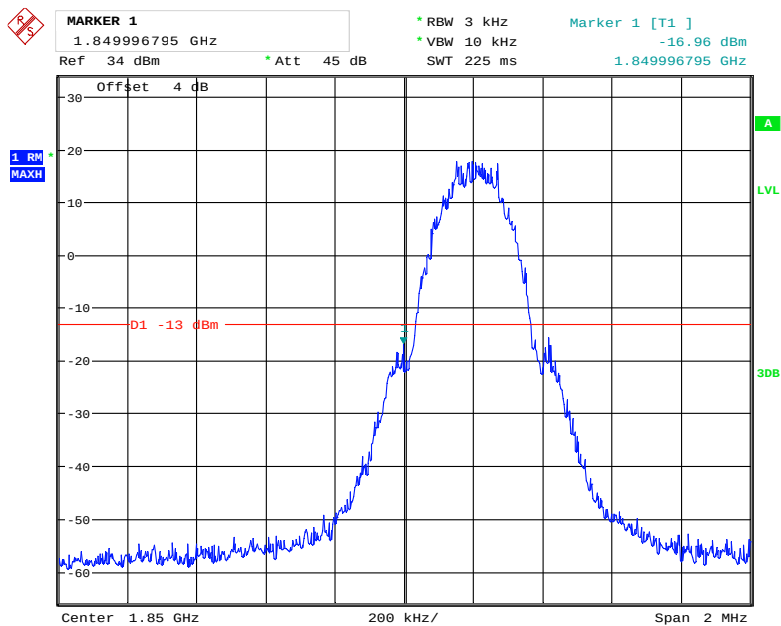
Date: 17.OCT.2019 23:15:50

GSM 850, Right Band Edge



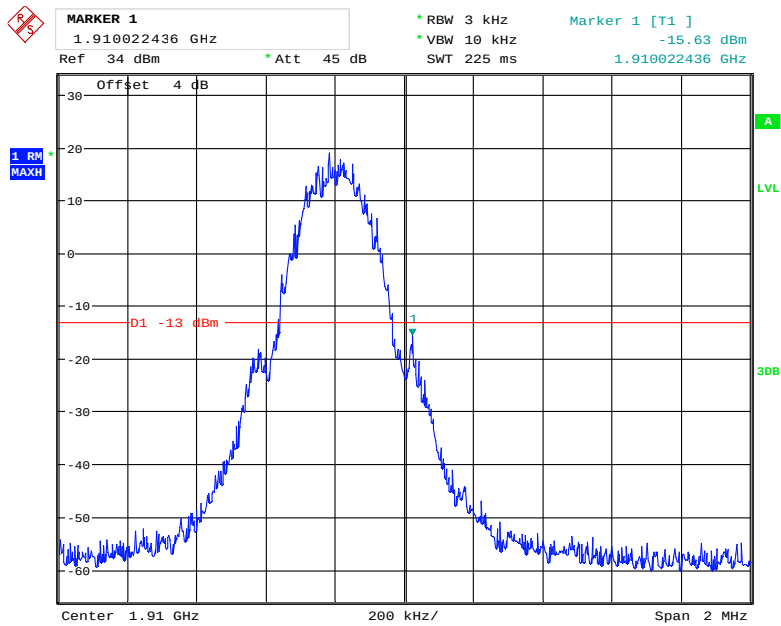
Date: 17.OCT.2019 23:16:42

GSM 1900, Left Band Edge



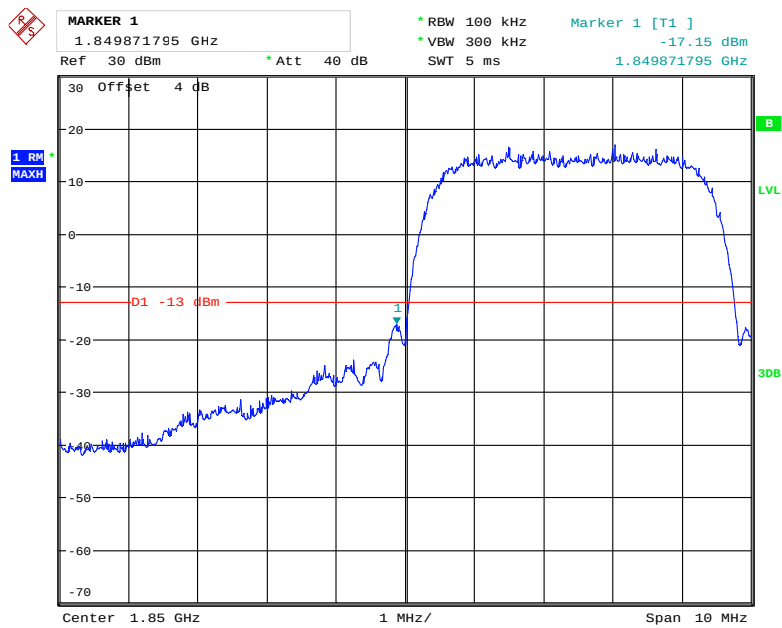
Date: 17.OCT.2019 23:37:22

GSM 1900, Right Band Edge



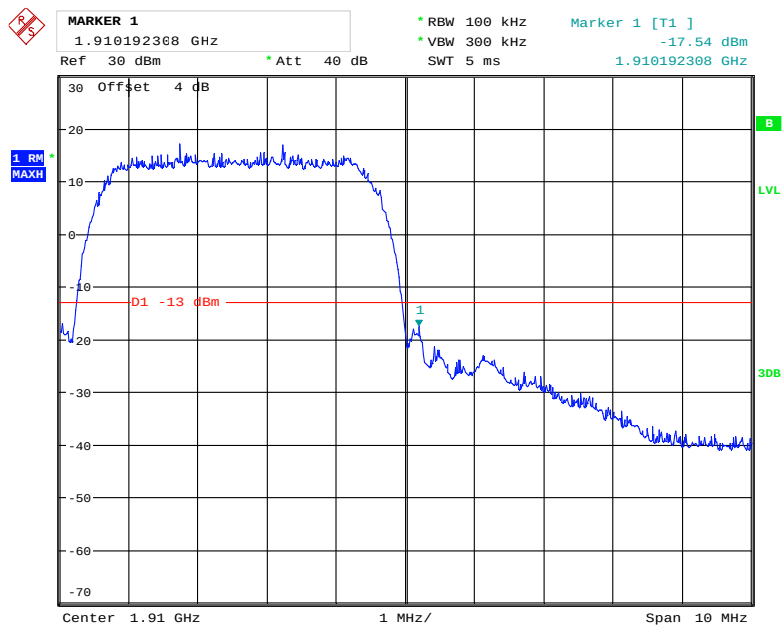
Date: 17.OCT.2019 23:38:55

### WCDMA Band 2 Rel 99, Left Band Edge



Date: 18.OCT.2019 00:41:48

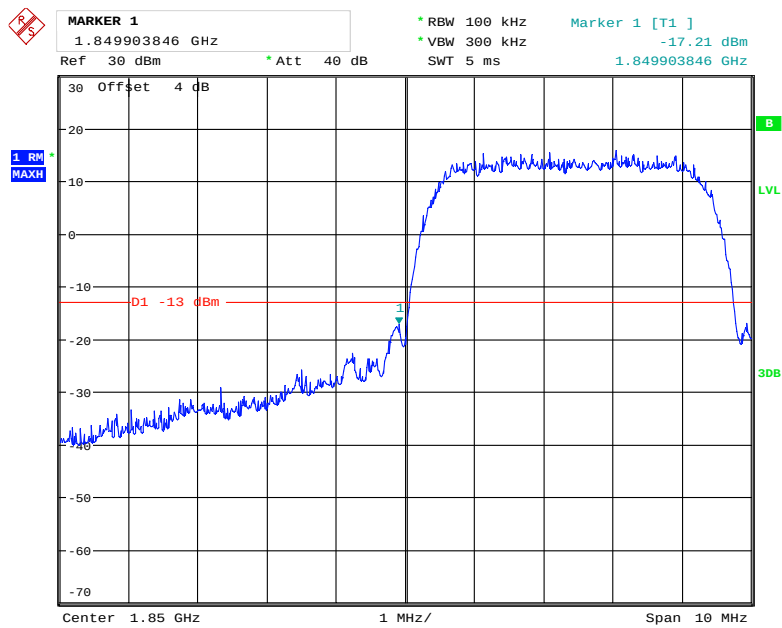
### WCDMA Band 2 Rel 99, Right Band Edge



Date: 18.OCT.2019 00:42:46

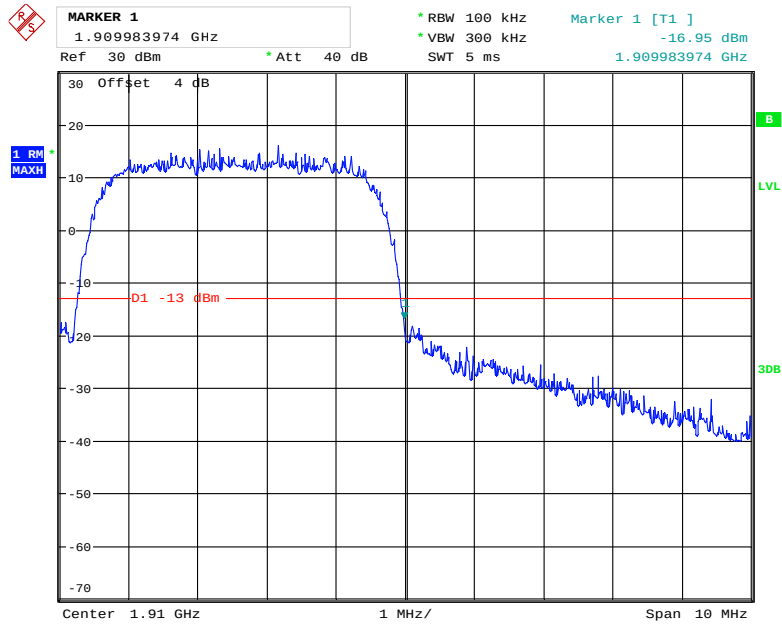


### WCDMA Band 2 HSDPA, Left Band Edge



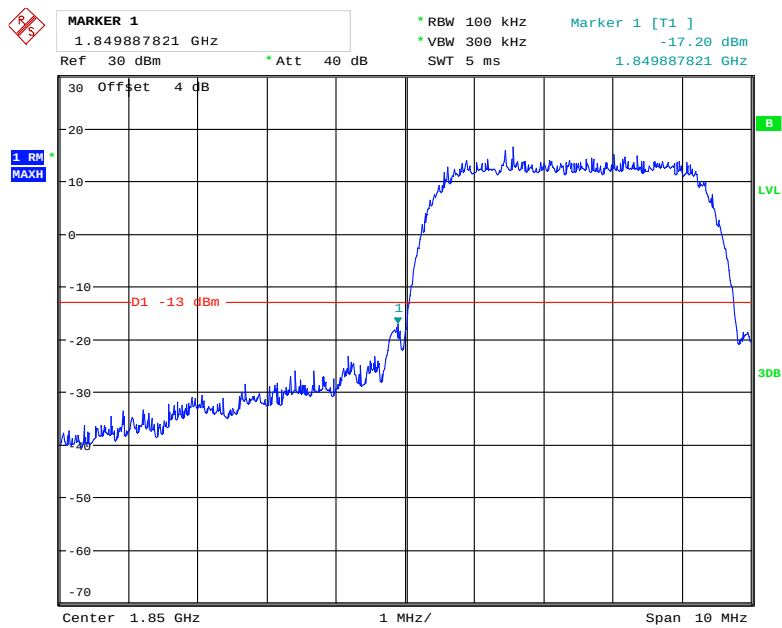
Date: 18.OCT.2019 01:06:13

### WCDMA Band 2 HSDPA, Right Band Edge



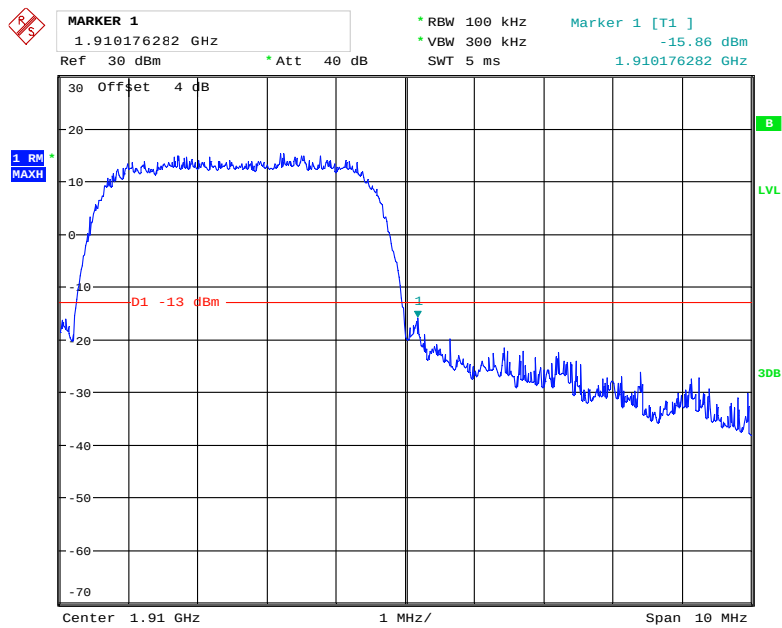
Date: 18.OCT.2019 01:06:55

### WCDMA Band 2 HSUPA, Left Band Edge



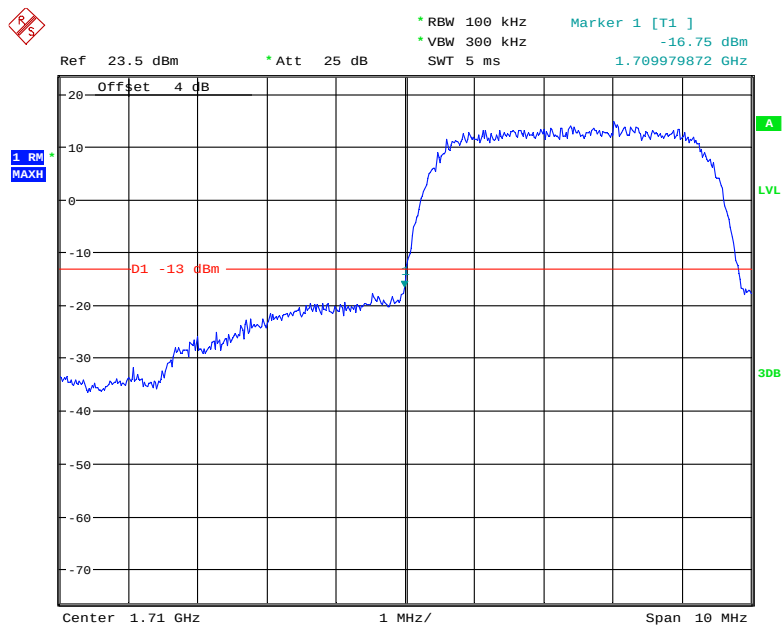
Date: 18.OCT.2019 01:11:50

### WCDMA Band 2 HSUPA, Right Band Edge



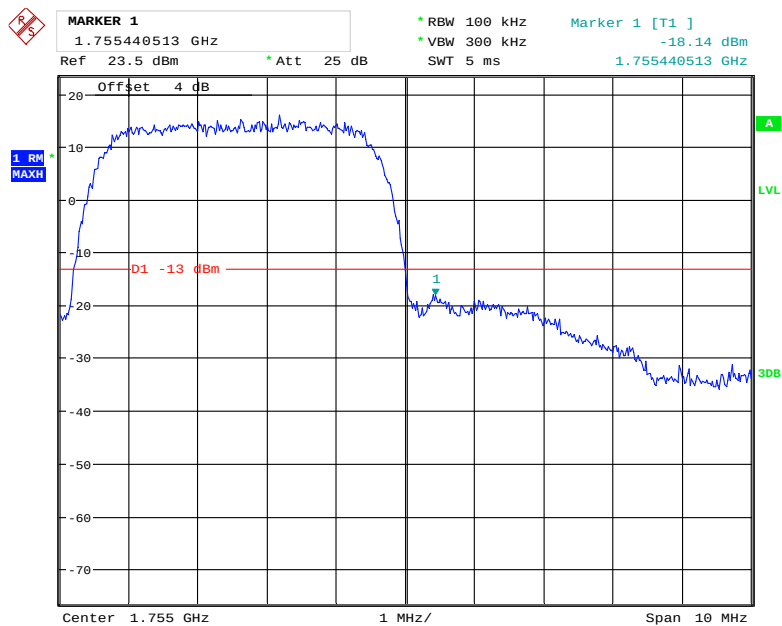
Date: 18.OCT.2019 01:11:10

### WCDMA Band 4 Rel 99, Left Band Edge



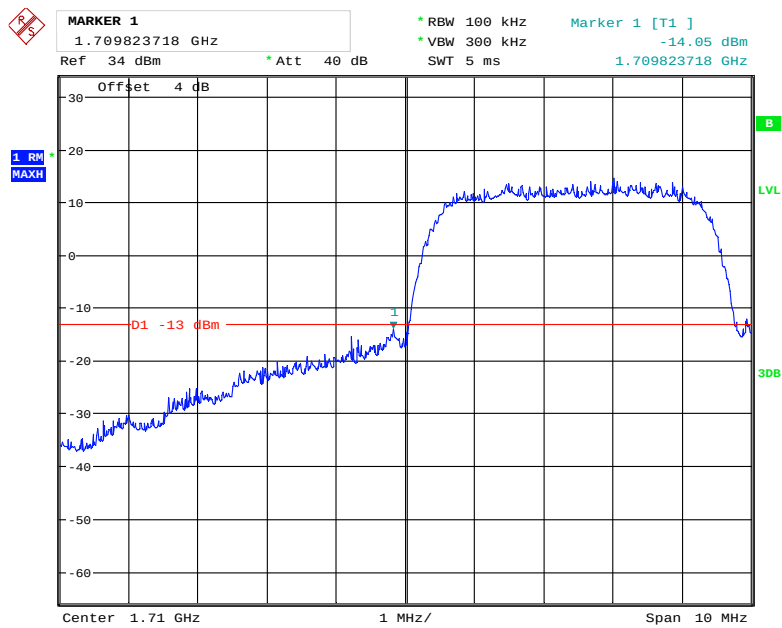
Date: 19.OCT.2019 00:19:56

### WCDMA Band 4 Rel 99, Right Band Edge



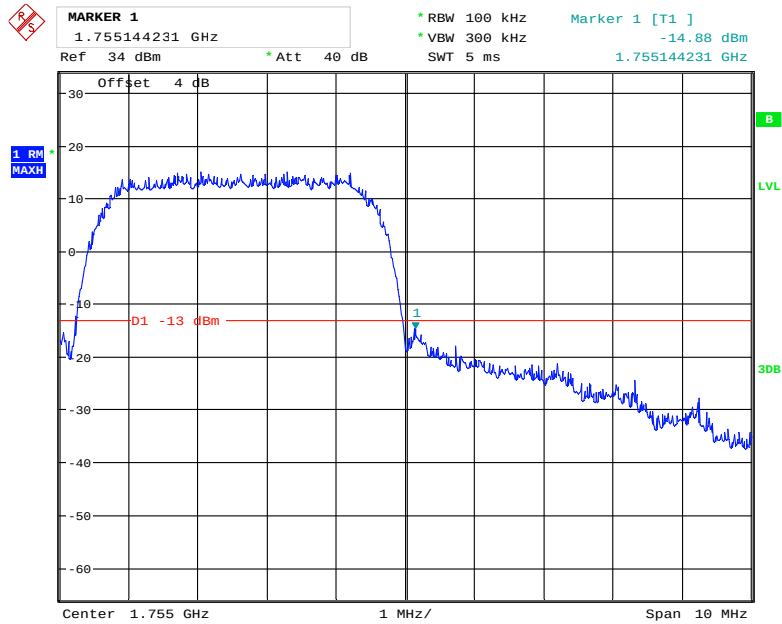
Date: 19.OCT.2019 00:20:47

### WCDMA Band 4 HSDPA, Left Band Edge



Date: 19.OCT.2019 01:10:50

### WCDMA Band 4 HSDPA, Right Band Edge



Date: 19.OCT.2019 01:09:50

Marker 1  
1.70974359 GHz  
Ref 34 dBm Att 40 dB  
RBW 100 kHz VBW 300 kHz SWT 5 ms  
Marker 1 [T1] -16.27 dBm  
1.70974359 GHz

Offset 4 dB

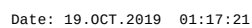
1 RM  
MAXH

D1 -13 dBm

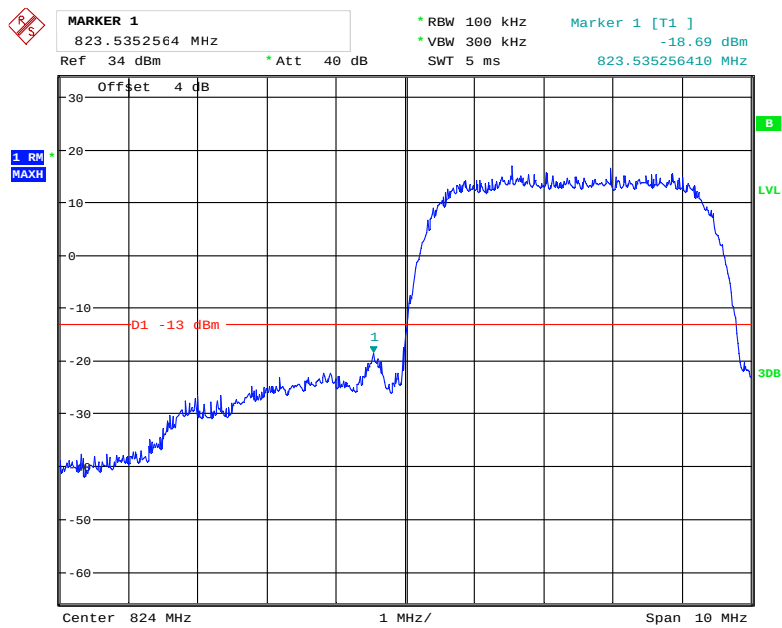
1

Center 1.71 GHz 1 MHz/ Span 10 MHz

## WCDMA Band 4 HSUPA, Right Band Edge

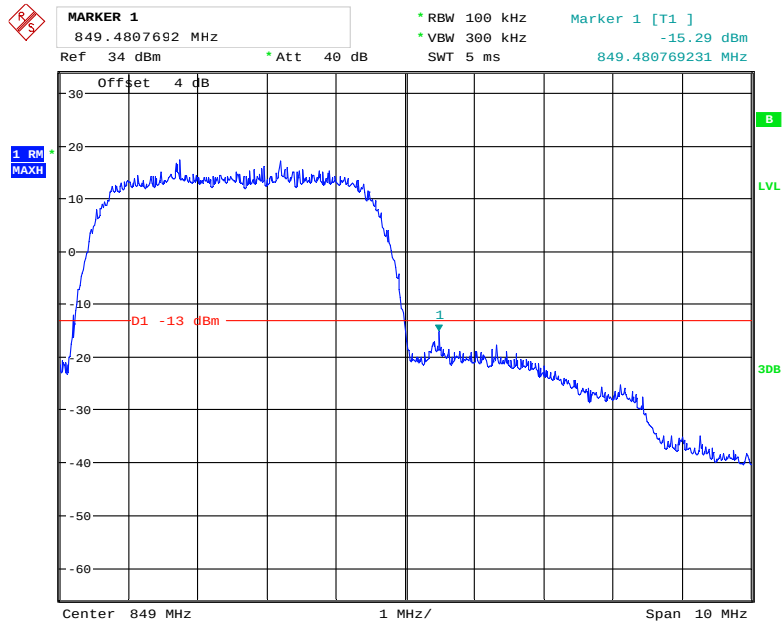


### WCDMA Band 5 Rel 99, Left Band Edge



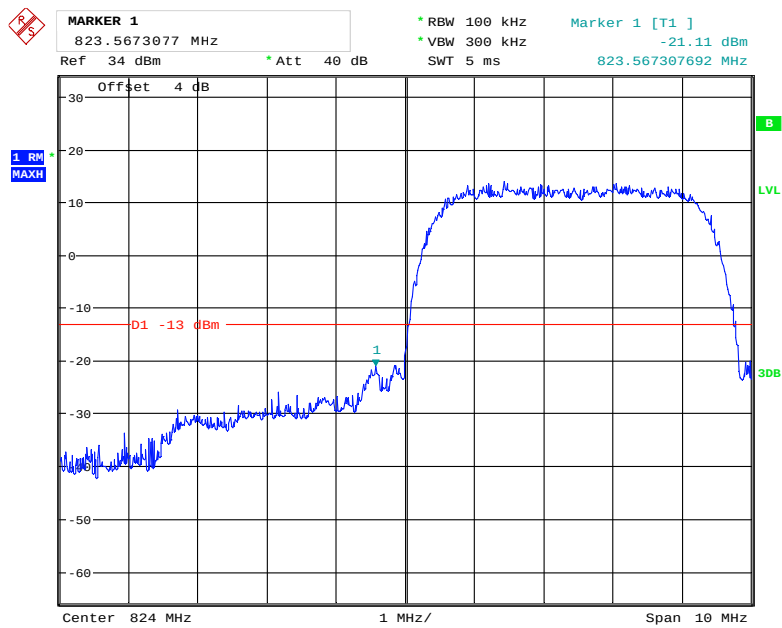
Date: 19.OCT.2019 01:32:28

### WCDMA Band 5 Rel 99, Right Band Edge



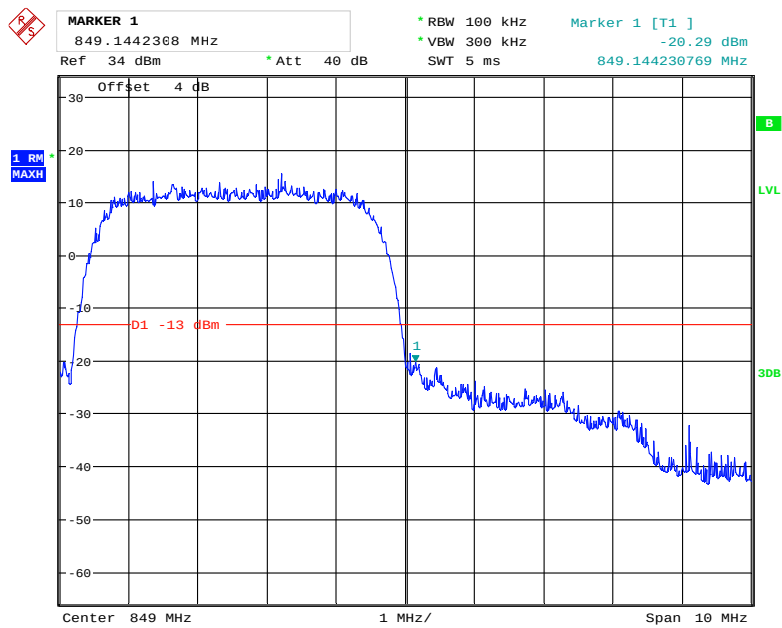
Date: 19.OCT.2019 01:33:49

### WCDMA Band 5 HSDPA, Left Band Edge



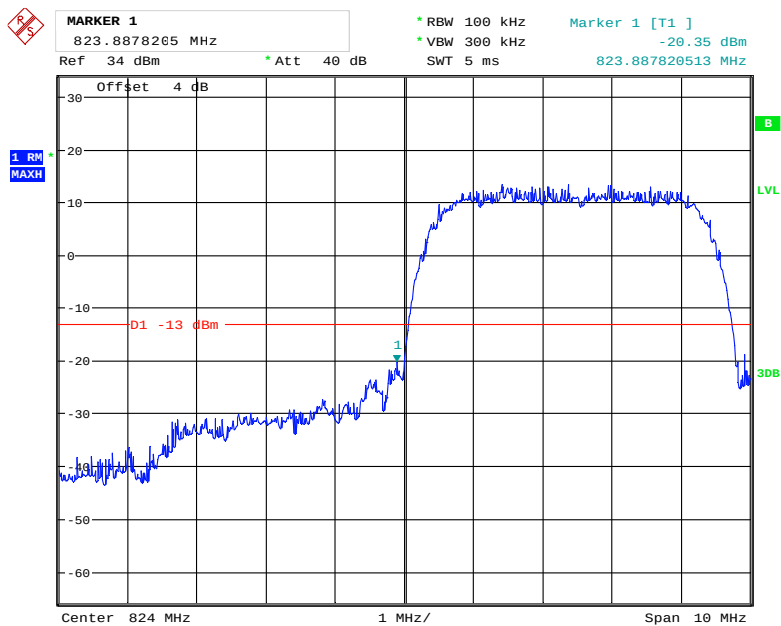
Date: 19.OCT.2019 01:29:18

### WCDMA Band 5 HSDPA, Right Band Edge



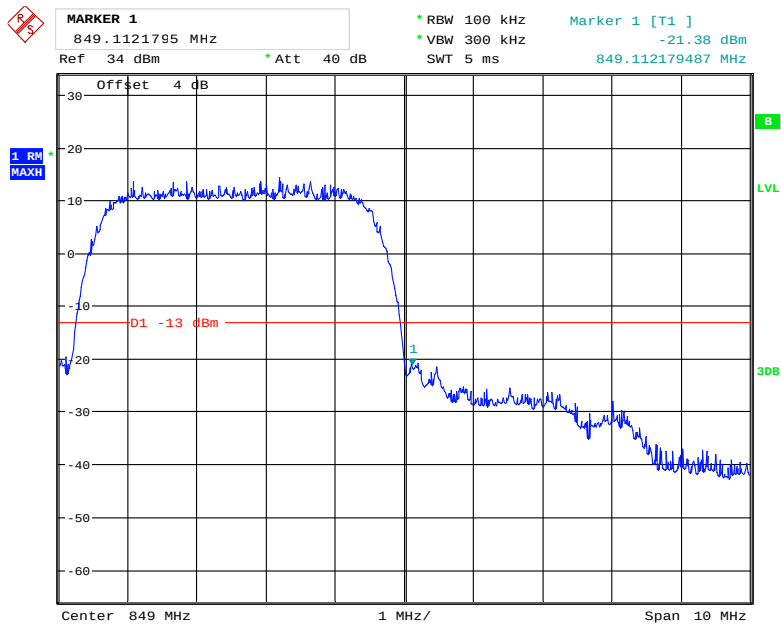
Date: 19.OCT.2019 01:29:58

WCDMA Band 5 HSUPA, Left Band Edge



Date: 19.OCT.2019 01:31:41

WCDMA Band 5 HSUPA, Right Band Edge



Date: 19.OCT.2019 01:30:59



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**FCC §2.1055, §22.355 & §24.235 & §27.54 - FREQUENCY STABILITY**

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**Applicable Standard**

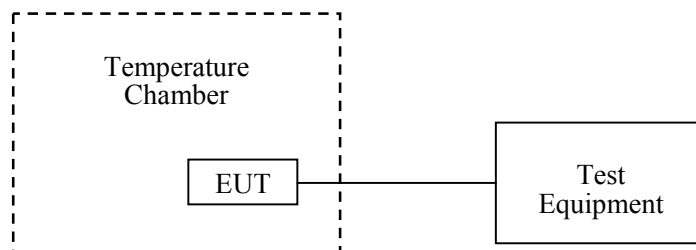
FCC § 2.1055 (a), § 2.1055 (d), §22.355, §24.235, §27.54

**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 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: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set from 85% to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.



**Test Equipment List and Details**

| Manufacturer   | Description                              | Model        | Serial Number | Calibration Date | Calibration Due Date |
|----------------|------------------------------------------|--------------|---------------|------------------|----------------------|
| R&S            | Spectrum Analyzer                        | FSU 26       | 200256        | 2019-05-09       | 2020-05-09           |
| Unknown        | Coaxial Cable                            | C-SJ00-0010  | C0010/03      | Each time        | N/A                  |
| E-Microwave    | Blocking Control                         | EMDCB-00036  | 0E01201048    | 2019-05-06       | 2020-05-06           |
| E-Microwave    | Coaxial Attenuators                      | EMCA10-5RN-6 | OE01203239    | 2019-09-06       | 2020-09-06           |
| R&S            | Universal Radio Communication Tester     | CMU200       | 106 891       | 2018-12-14       | 2019-12-14           |
| ESPEC          | Constant temperature and humidity Tester | ESX-4CA      | 018 463       | 2019-03-26       | 2020-03-26           |
| UNI-T          | Multimeter                               | UT39A        | M130199938    | 2019-07-24       | 2020-07-24           |
| Pro instrument | DC Power Supply                          | pps3300      | 3300012       | N/A              | N/A                  |

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

**Test Data****Environmental Conditions**

|                           |            |
|---------------------------|------------|
| <b>Temperature:</b>       | 25.1 °C    |
| <b>Relative Humidity:</b> | 58 %       |
| <b>ATM Pressure:</b>      | 100.9 kPa  |
| <b>Tester:</b>            | Severn Zhu |
| <b>Test Date:</b>         | 2019-10-18 |

*Test Result: Compliance.*

**Cellular Band**

| GMSK, Middle Channel, $f_c = 836.6$ MHz |                 |                 |                 |       |
|-----------------------------------------|-----------------|-----------------|-----------------|-------|
| Temperature                             | Voltage         | Frequency Error | Frequency Error | Limit |
| °C                                      | V <sub>DC</sub> | Hz              | ppm             | ppm   |
| -30                                     | 3.8             | 22              | 0.02630         | 2.5   |
| -20                                     |                 | 23              | 0.02749         |       |
| -10                                     |                 | 23              | 0.02749         |       |
| 0                                       |                 | 24              | 0.02869         |       |
| 10                                      |                 | 25              | 0.02988         |       |
| 20                                      |                 | 25              | 0.02988         |       |
| 30                                      |                 | 24              | 0.02869         |       |
| 40                                      |                 | 25              | 0.02988         |       |
| 50                                      |                 | 25              | 0.02988         |       |
| 20                                      | 3.6             | 23              | 0.02749         |       |
| 20                                      | 4.35            | 24              | 0.02869         |       |

**PCS Band**

| GMSK, Middle Channel, $f_c = 1880.0$ MHz |                 |                 |                 |         |
|------------------------------------------|-----------------|-----------------|-----------------|---------|
| Temperature                              | Voltage         | Frequency Error | Frequency Error | Results |
| °C                                       | V <sub>DC</sub> | Hz              | ppm             |         |
| -30                                      | 3.8             | 18              | 0.00957         | Pass    |
| -20                                      |                 | 18              | 0.00957         |         |
| -10                                      |                 | 19              | 0.01011         |         |
| 0                                        |                 | 20              | 0.01064         |         |
| 10                                       |                 | 19              | 0.01011         |         |
| 20                                       |                 | 20              | 0.01064         |         |
| 30                                       |                 | 20              | 0.01064         |         |
| 40                                       |                 | 21              | 0.01117         |         |
| 50                                       |                 | 19              | 0.01011         |         |
| 20                                       | 3.6             | 18              | 0.00957         |         |
| 20                                       | 4.35            | 20              | 0.01064         |         |

**WCDMA Band II: R99**

| Middle Channel, $f_c = 1880.0$ MHz |                 |                 |                 |        |
|------------------------------------|-----------------|-----------------|-----------------|--------|
| Temperature                        | Voltage         | Frequency Error | Frequency Error | Result |
| °C                                 | V <sub>DC</sub> | Hz              | ppm             |        |
| -30                                | 3.8             | 7               | 0.00372         | Pass   |
| -20                                |                 | 7               | 0.00372         |        |
| -10                                |                 | 9               | 0.00479         |        |
| 0                                  |                 | 8               | 0.00426         |        |
| 10                                 |                 | 9               | 0.00479         |        |
| 20                                 |                 | 9               | 0.00479         |        |
| 30                                 |                 | 9               | 0.00479         |        |
| 40                                 |                 | 7               | 0.00372         |        |
| 50                                 |                 | 7               | 0.00372         |        |
| 20                                 | 3.6             | 8               | 0.00426         |        |
| 20                                 | 4.35            | 8               | 0.00426         |        |

**WCDMA Band V: R99**

| Middle Channel, $f_c = 836.6$ MHz |                 |                 |                 |       |
|-----------------------------------|-----------------|-----------------|-----------------|-------|
| Temperature                       | Voltage         | Frequency Error | Frequency Error | Limit |
| °C                                | V <sub>DC</sub> | Hz              | ppm             | ppm   |
| -30                               | 3.8             | -1              | -0.00120        | 2.5   |
| -20                               |                 | 0               | 0.00000         |       |
| -10                               |                 | -1              | -0.00120        |       |
| 0                                 |                 | -2              | -0.00239        |       |
| 10                                |                 | -3              | -0.00359        |       |
| 20                                |                 | -1              | -0.00120        |       |
| 30                                |                 | -2              | -0.00239        |       |
| 40                                |                 | -3              | -0.00359        |       |
| 50                                |                 | -1              | -0.00120        |       |
| 20                                | 3.6             | -3              | -0.00359        |       |
| 20                                | 4.35            | -1              | -0.00120        |       |

**WCDMA Band IV:**

| WCDMA Band IV Rel 99 |                 |                   |                |                |                |
|----------------------|-----------------|-------------------|----------------|----------------|----------------|
| Temperature          | Voltage         | Test Result (MHz) |                | Limit (MHz)    |                |
| °C                   | V <sub>DC</sub> | F <sub>L</sub>    | F <sub>H</sub> | F <sub>L</sub> | F <sub>H</sub> |
| -30                  | 3.7             | 1710.621          | 1754.247       | 1710           | 1755           |
| -20                  |                 | 1710.722          | 1754.235       | 1710           | 1755           |
| -10                  |                 | 1710.671          | 1754.245       | 1710           | 1755           |
| 0                    |                 | 1710.682          | 1754.233       | 1710           | 1755           |
| 10                   |                 | 1710.621          | 1754.212       | 1710           | 1755           |
| 20                   |                 | 1710.681          | 1754.220       | 1710           | 1755           |
| 30                   |                 | 1710.542          | 1754.224       | 1710           | 1755           |
| 40                   |                 | 1710.612          | 1754.224       | 1710           | 1755           |
| 50                   |                 | 1710.651          | 1754.232       | 1710           | 1755           |
| 20                   | 3.5             | 1710.633          | 1754.213       | 1710           | 1755           |
| 20                   | 4.2             | 1710.612          | 1754.242       | 1710           | 1755           |

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