

# **FCC RADIO TEST REPORT**

## **FCC ID: 2ARWCCSH-0301**

**Product:** Global Hub

**Trade Mark:** N/A

**Model No.:** CSH-0301

**Family Model:** N/A

**Report No.:** S18110600304E004

**Issue Date:** 28 Nov. 2018

### **Prepared for**

Coolr Group Inc

14100 Parke Long Ct, Suite I, Chantilly, VA – 20151,  
United States

### **Prepared by**

Shenzhen NTEK Testing Technology Co., Ltd.  
1/F, Building E, Fenda Science Park, Sanwei Community,  
Xixiang Street Bao'an District, Shenzhen P.R. China

Tel.: +86-755-6115 6588

Fax.: +86-755-6115 6599

Website:<http://www.ntek.org.cn>

## TABLE OF CONTENTS

|          |                                                                      |           |
|----------|----------------------------------------------------------------------|-----------|
| <b>1</b> | <b>TEST RESULT CERTIFICATION .....</b>                               | <b>3</b>  |
| <b>2</b> | <b>SUMMARY OF TEST RESULTS.....</b>                                  | <b>4</b>  |
| <b>3</b> | <b>FACILITIES AND ACCREDITATIONS .....</b>                           | <b>5</b>  |
| 3.1      | FACILITIES.....                                                      | 5         |
| 3.2      | LABORATORY ACCREDITATIONS AND LISTINGS .....                         | 5         |
| 3.3      | MEASUREMENT UNCERTAINTY .....                                        | 5         |
| <b>4</b> | <b>GENERAL DESCRIPTION OF EUT .....</b>                              | <b>6</b>  |
| <b>5</b> | <b>DESCRIPTION OF TEST MODES .....</b>                               | <b>8</b>  |
| <b>6</b> | <b>SETUP OF EQUIPMENT UNDER TEST .....</b>                           | <b>9</b>  |
| 6.1      | BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM.....                      | 9         |
| 6.2      | SUPPORT EQUIPMENT.....                                               | 10        |
| 6.3      | EQUIPMENTS LIST FOR ALL TEST ITEMS.....                              | 11        |
| <b>7</b> | <b>TEST REQUIREMENTS .....</b>                                       | <b>12</b> |
| 7.1      | FIELD STRENGTH OF SPURIOUS RADIATION .....                           | 12        |
| 7.2      | EFFECTIVE RADIATED POWER AND EFFECTIVE ISOTROPIC RADIATED POWER..... | 20        |
| 7.3      | CONDUCTED OUTPUT POWER.....                                          | 25        |
| 7.4      | FREQUENCY STABILITY .....                                            | 30        |
| 7.5      | PEAK-TO-AVERAGE RATIO .....                                          | 34        |
| 7.6      | 26DB BANDWIDTH AND 99% OCCUPIED BANDWIDTH .....                      | 39        |
| 7.7      | CONDUCTED BAND EDGE .....                                            | 44        |
| 7.8      | CONDUCTED SPURIOUS EMISSION AT ANTENNA TERMINAL .....                | 48        |

**1 TEST RESULT CERTIFICATION**

|                                   |                                                                              |
|-----------------------------------|------------------------------------------------------------------------------|
| Applicant's name .....            | Coolr Group Inc                                                              |
| Address .....                     | 14100 Parke Long Ct, Suite I, Chantilly, VA – 20151, United States           |
| Manufacturer's Name .....         | Hatch international limited                                                  |
| Address .....                     | 14D, JiaFu Ge CaiFu building, Caitian road, Futian District, Shenzhen, China |
| Product description               |                                                                              |
| Product name .....                | Global Hub                                                                   |
| Model and/or type reference ..... | CSH-0301                                                                     |
| Family Model .....                | N/A                                                                          |

Measurement Procedure Used:

| APPLICABLE STANDARDS                                                                                                                      |             |
|-------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| APPLICABLE STANDARD/ TEST PROCEDURE                                                                                                       | TEST RESULT |
| 47 CFR Part 2, Part 22H, Part 24E<br>ANSI/TIA-603-E-2016<br>FCC KDB 971168 D01 Power Meas License Digital Systems v03<br>ANSI C63.26:2015 | Complied    |

This device described above has been tested by Shenzhen NTEK Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of Shenzhen NTEK Testing Technology Co., Ltd., this document may be altered or revised by Shenzhen NTEK Testing Technology Co., Ltd., personnel only, and shall be noted in the revision of the document.

The test results of this report relate only to the tested sample identified in this report.

Date of Test : 07 Nov. 2018 ~27 Nov. 2018

Testing Engineer : Loren Luo  
(Loren Luo)

Technical Manager : Jason chen  
(Jason Chen)

Authorized Signatory : Sam. chen  
(Sam Chen)

**2 SUMMARY OF TEST RESULTS****FCC Part22, Subpart H/ FCC Part24, Subpart E**

| FCC Rule                         | Test Item                                     | Verdict | Remark |
|----------------------------------|-----------------------------------------------|---------|--------|
| 2.1046                           | Conducted Output Power                        | PASS    |        |
| 24.232(d)                        | Peak-to-Average Ratio                         | PASS    |        |
| 2.1049<br>22.917(b)<br>24.238(b) | Occupied Bandwidth                            | PASS    |        |
| 2.1051<br>22.917(a)<br>24.238(a) | Band Edge                                     | PASS    |        |
| 22.913(a)(2)                     | Effective Radiated Power                      | PASS    |        |
| 24.232(c)                        | Equivalent Isotropic Radiated Power           | PASS    |        |
| 2.1053<br>22.917(a)<br>24.238(a) | Field Strength of Spurious Radiation          | PASS    |        |
| 2.1055<br>22.355<br>24.235       | Frequency Stability for Temperature & Voltage | PASS    |        |
| 2.1051<br>22.917(a)<br>24.238(a) | Conducted Emission                            | PASS    |        |

## Remark:

1. "N/A" denotes test is not applicable in this Test Report.
2. All test items were verified and recorded according to the standards and without any deviation during the test.
3. No modifications are made to the EUT during all test items.

### 3 FACILITIES AND ACCREDITATIONS

#### 3.1 FACILITIES

All measurement facilities used to collect the measurement data are located at 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

#### 3.2 LABORATORY ACCREDITATIONS AND LISTINGS

##### Site Description

CNAS-Lab. : The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2005)  
The Certificate Registration Number is L5516.

IC-Registration The Certificate Registration Number is 9270A-1.

FCC- Accredited Test Firm Registration Number: 463705.

Designation Number: CN1184

A2LA-Lab. The Certificate Registration Number is 4298.01

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories.

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Name of Firm : Shenzhen NTEK Testing Technology Co., Ltd.

Site Location : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China.

#### 3.3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement, where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| No. | Item                                                                     | Uncertainty |
|-----|--------------------------------------------------------------------------|-------------|
| 1   | Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2U_c(y)$ ) | 2.5dB       |
|     |                                                                          |             |
|     |                                                                          |             |
|     |                                                                          |             |
|     |                                                                          |             |
|     |                                                                          |             |
|     |                                                                          |             |

**4 GENERAL DESCRIPTION OF EUT**

| Product Feature and Specification |                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment                         | Global Hub                                                                                                                                                                                                                                                                                                                                                                                   |
| Trade Mark                        | N/A                                                                                                                                                                                                                                                                                                                                                                                          |
| FCC ID                            | 2ARWCCSH-0301                                                                                                                                                                                                                                                                                                                                                                                |
| Model No.                         | CSH-0301                                                                                                                                                                                                                                                                                                                                                                                     |
| Family Model                      | N/A                                                                                                                                                                                                                                                                                                                                                                                          |
| Model Difference                  | N/A                                                                                                                                                                                                                                                                                                                                                                                          |
| Operating Frequency               | <input checked="" type="checkbox"/> GSM850: TX824.2MHz~848.8MHz /RX869.2MHz~893.8MHz;<br><input checked="" type="checkbox"/> UMTS FDD Band V: TX826.4MHz~846.6MHz /RX871.4MHz~891.6MHz;<br><input checked="" type="checkbox"/> PCS1900: TX1850.2MHz~1909.8MHz /RX1930.2MHz~1989.8MHz;<br><input checked="" type="checkbox"/> UMTS FDD Band II: TX1852.4MHz~1907.6MHz /RX1932.4MHz~1987.6MHz; |
| Modulation                        | <input checked="" type="checkbox"/> GMSK for GSM/GPRS;<br><input type="checkbox"/> 8PSK for EGPRS;<br><input checked="" type="checkbox"/> QPSK for UMTS bands;                                                                                                                                                                                                                               |
| Number of Channels                | <input checked="" type="checkbox"/> 124 Channels for GSM850;<br><input checked="" type="checkbox"/> 102 Channels for UMTS FDD Band V;<br><input checked="" type="checkbox"/> 299 Channels for PCS1900;<br><input checked="" type="checkbox"/> 277 Channels for UMTS FDD Band II;                                                                                                             |
| GPRS Class                        | <input checked="" type="checkbox"/> Multi-Class12<br><input checked="" type="checkbox"/> Only 4 timeslots are used for GPRS                                                                                                                                                                                                                                                                  |
| SIM CARD                          | The EUT has one SIM Card socket                                                                                                                                                                                                                                                                                                                                                              |
| Antenna Type                      | FPCB Antenna                                                                                                                                                                                                                                                                                                                                                                                 |
| Antenna Gain                      | GSM850: 0.21dBi; PCS1900: 0.47dBi; Band II: -1.04dBi; Band V: 0.32dBi                                                                                                                                                                                                                                                                                                                        |
| Power supply                      | <input checked="" type="checkbox"/> DC supply:<br>DC 3.7V/1500mAh from battery or DC 5V from USB Port.                                                                                                                                                                                                                                                                                       |
|                                   | <input type="checkbox"/> Adapter supply:                                                                                                                                                                                                                                                                                                                                                     |
| HW Version                        | Q51_M_V2.0                                                                                                                                                                                                                                                                                                                                                                                   |
| SW Version                        | Q51_COMMON_V01_20181019                                                                                                                                                                                                                                                                                                                                                                      |

Note: Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual. The High Voltage 4.2V and Low Voltage 3.4V was declared by manufacturer, The EUT couldn't be operate normally with higher or lower voltage.

## Revision History

| Report No.       | Version | Description             | Issued Date  |
|------------------|---------|-------------------------|--------------|
| S18110600304E004 | Rev.01  | Initial issue of report | Nov 28, 2018 |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |
|                  |         |                         |              |

## 5 DESCRIPTION OF TEST MODES

During the testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication Tester(CMU 200) to ensure max power transmission and proper modulation. Three channels (The low channel, the middle channel and the high channel) were chosen for testing on both GSM/GPRS 850/1900 and WCDMA/HSDPA/HSUPA Band II/V frequency band.

Note: GSM/GPRS 850, GSM/GPRS 1900, WCDMA/HSDPA/HSUPA band II, WCDMA/HSDPA/HSUPA band V modes have been tested during the test. the worst condition (GSM850, GSM1900 RMC 12.2k) be recorded in the test report if no other modes test data.

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

1. 30 MHz to 10th harmonic for GSM850/UMTS FDD Band V.
2. 30 MHz to 10th harmonic for GSM1900/UMTS FDD Band II.

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

| Test Modes   |                          |                         |
|--------------|--------------------------|-------------------------|
| Band         | For Conducted Test Cases | For Radiated Test Cases |
| GSM 850      | GSM Link                 | GSM Link                |
| GSM 1900     | GSM Link                 | GSM Link                |
| UMTS Band II | RMC 12.2Kbps Link        | RMC 12.2Kbps Link       |
| UMTS Band V  | RMC 12.2Kbps Link        | RMC 12.2Kbps Link       |

Test Frequency and Channels:

| Frequency Band | <input checked="" type="checkbox"/> GSM 850 |                 | <input checked="" type="checkbox"/> GSM 1900 |                 | <input checked="" type="checkbox"/> UMTS Band II |                 | <input checked="" type="checkbox"/> UMTS Band V |                 |
|----------------|---------------------------------------------|-----------------|----------------------------------------------|-----------------|--------------------------------------------------|-----------------|-------------------------------------------------|-----------------|
|                | Channel                                     | Frequency (MHz) | Channel                                      | Frequency (MHz) | Channel                                          | Frequency (MHz) | Channel                                         | Frequency (MHz) |
| CH_H           | 251                                         | 848.8           | 810                                          | 1909.8          | 9538                                             | 1907.6          | 4233                                            | 846.6           |
| CH_M           | 190                                         | 836.6           | 661                                          | 1880.0          | 9400                                             | 1880.0          | 4183                                            | 836.6           |
| CH_L           | 128                                         | 824.2           | 512                                          | 1850.2          | 9262                                             | 1852.4          | 4132                                            | 826.4           |

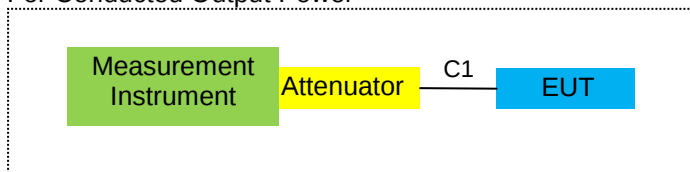
## 6 SETUP OF EQUIPMENT UNDER TEST

### 6.1 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM

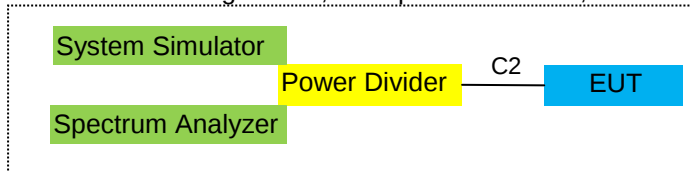
For Radiated Test Cases



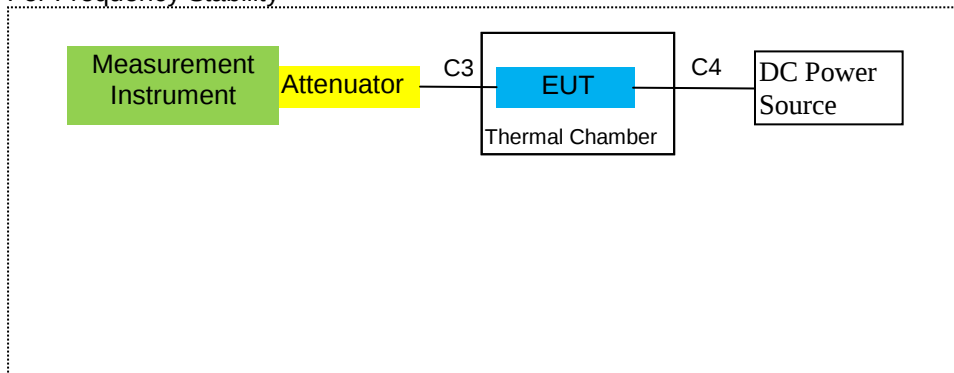
For Conducted Output Power



For Peak-to Average Ratio, Occupied Bandwidth, Conducted Band edge and Conducted Spurious Emission



For Frequency Stability



## 6.2 SUPPORT EQUIPMENT

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

| Item | Equipment | Mfr/Brand | Model/Type No. | Series No. | Note |
|------|-----------|-----------|----------------|------------|------|
|      |           |           |                |            | EUT  |
|      |           |           |                |            |      |
|      |           |           |                |            |      |
|      |           |           |                |            |      |
|      |           |           |                |            |      |

| Item | Cable Type | Shielded Type | Ferrite Core | Length |
|------|------------|---------------|--------------|--------|
| C-1  | RF Cable   | YES           | NO           | 0.1m   |
| C-2  | RF Cable   | YES           | NO           | 0.1m   |
| C-3  | RF Cable   | YES           | NO           | 0.1m   |
| C-4  | DC Cable   | NO            | NO           | 1.0m   |
|      |            |               |              |        |
|      |            |               |              |        |
|      |            |               |              |        |
|      |            |               |              |        |

### Notes:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

### 6.3 EQUIPMENTS LIST FOR ALL TEST ITEMS

| Item | Kind of Equipment     | Manufacturer | Type No.    | Serial No.   | Last calibration | Calibrated until | Calibration period |
|------|-----------------------|--------------|-------------|--------------|------------------|------------------|--------------------|
| 1    | MXA Signal Analyzer   | Agilent      | N9020A      | MY49100060   | 2018.10.08       | 2019.10.07       | 1 year             |
| 2    | Test Receiver         | R&S          | ESPI        | 101318       | 2018.05.19       | 2019.05.18       | 1 year             |
| 3    | Bilog Antenna         | TESEQ        | CBL6111D    | 31216        | 2018.04.08       | 2019.04.07       | 1 year             |
| 4    | 50Ω Coaxial Switch    | Anritsu      | MP59B       | 6200983705   | 2018.05.19       | 2019.05.18       | 1 year             |
| 5    | Horn Antenna          | EM           | EM-AH-10180 | 2011071402   | 2018.05.19       | 2019.05.18       | 1 year             |
| 6    | Horn Ant              | Schwarzbeck  | BBHA 9170   | 9170-181     | 2018.04.08       | 2019.04.07       | 1 year             |
| 7    | Amplifier             | EM           | EM-30180    | 060538       | 2018.08.05       | 2019.08.04       | 1 year             |
| 8    | Loop Antenna          | ARA          | PLA-1030/B  | 1029         | 2018.05.19       | 2019.05.18       | 1 year             |
| 9    | Power Meter           | R&S          | NRVS        | 100696       | 2018.08.05       | 2019.08.04       | 1 year             |
| 10   | Power Sensor          | R&S          | URV5-Z4     | 0395.1619.05 | 2018.05.19       | 2019.05.18       | 1 year             |
| 11   | Test Cable            | N/A          | R-01        | N/A          | 2017.04.21       | 2020.04.20       | 3 year             |
| 12   | Test Cable            | N/A          | R-02        | N/A          | 2017.04.21       | 2020.04.20       | 3 year             |
| 13   | Test Cable            | N/A          | R-03        | N/A          | 2017.04.21       | 2020.04.20       | 3 year             |
| 14   | Test Receiver         | R&S          | ESCI        | 101160       | 2018.05.19       | 2019.05.18       | 1 year             |
| 15   | LISN                  | R&S          | ENV216      | 101313       | 2018.04.19       | 2019.04.18       | 1 year             |
| 16   | LISN                  | EMCO         | 3816/2      | 00042990     | 2018.05.19       | 2019.05.18       | 1 year             |
| 17   | 50Ω Coaxial Switch    | Anritsu      | MP59B       | 6200264417   | 2018.05.19       | 2019.05.18       | 1 year             |
| 18   | Passive Voltage Probe | R&S          | ESH2-Z3     | 100196       | 2017.04.21       | 2020.04.20       | 3 year             |
| 19   | Test Cable            | N/A          | C01         | N/A          | 2017.04.21       | 2020.04.20       | 3 year             |
| 20   | Test Cable            | N/A          | C02         | N/A          | 2017.04.21       | 2020.04.20       | 3 year             |
| 21   | Test Cable            | N/A          | C03         | N/A          | 2017.04.21       | 2020.04.20       | 3 year             |
| 22   | Attenuator            | MCE          | 24-10-34    | BN9258       | 2018.04.09       | 2019.04.08       | 1 year             |
| 23   | Spectrum Analyzer     | agilent      | e4440a      | us44300399   | 2018.05.19       | 2019.05.18       | 1 year             |
| 24   | test receiver         | R&S          | ESCI        | a0304218     | 2018.05.19       | 2019.05.18       | 1 year             |
| 25   | Communication Tester  | R&S          | CMU200      | A0304247     | 2018.10.08       | 2019.10.07       | 1 year             |
| 26   | Thermal Chamber       | Ten Billion  | TTC-B3C     | TBN-960502   | 2018.05.19       | 2019.05.18       | 1 year             |
| 27   | DC Power Source       | N/A          | PS-6005D    | 20170402923  | 2017.06.06       | 2020.06.05       | 3 year             |

Note: Each piece of equipment is scheduled for calibration once a year except the Test Cable& DC Power Source which is scheduled for calibration every 3 years.

## 7 TEST REQUIREMENTS

### 7.1 FIELD STRENGTH OF SPURIOUS RADIATION

#### 7.1.1 Applicable Standard

According to FCC KDB 971168 D01 v03 Section 5.8 and ANSI/TIA-603-E-2016 Section 2.2.12

#### 7.1.2 Conformance Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

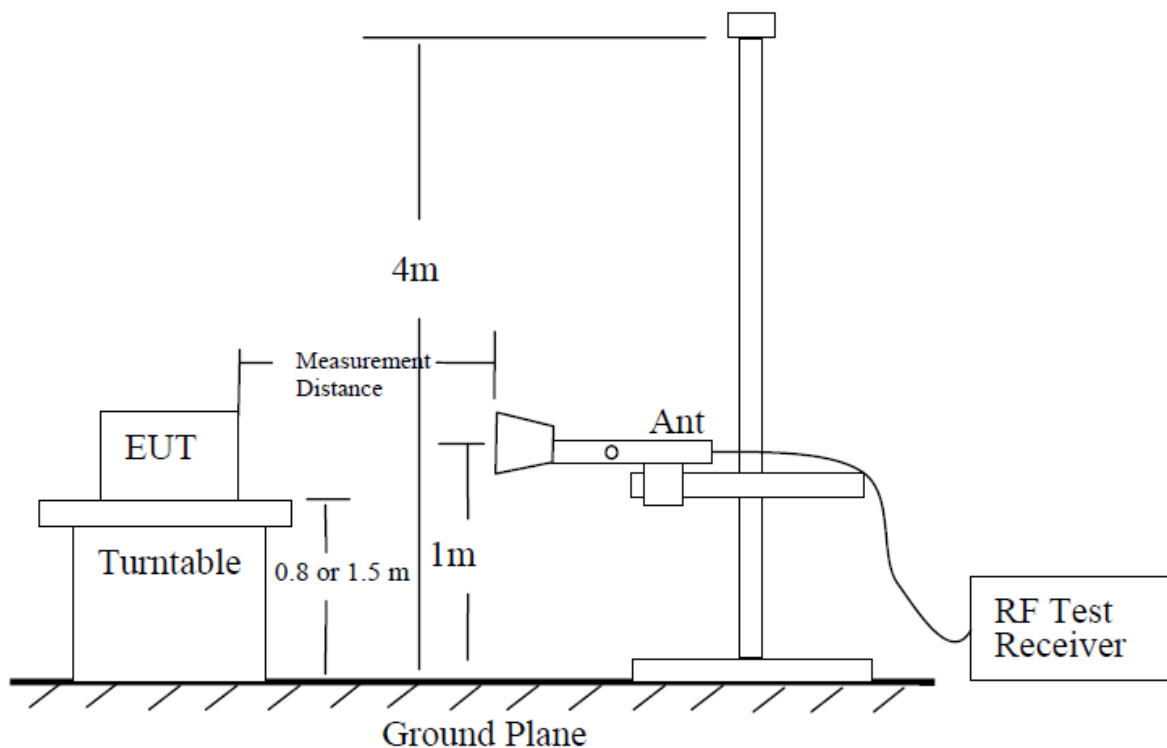
#### 7.1.3 Measuring Instruments

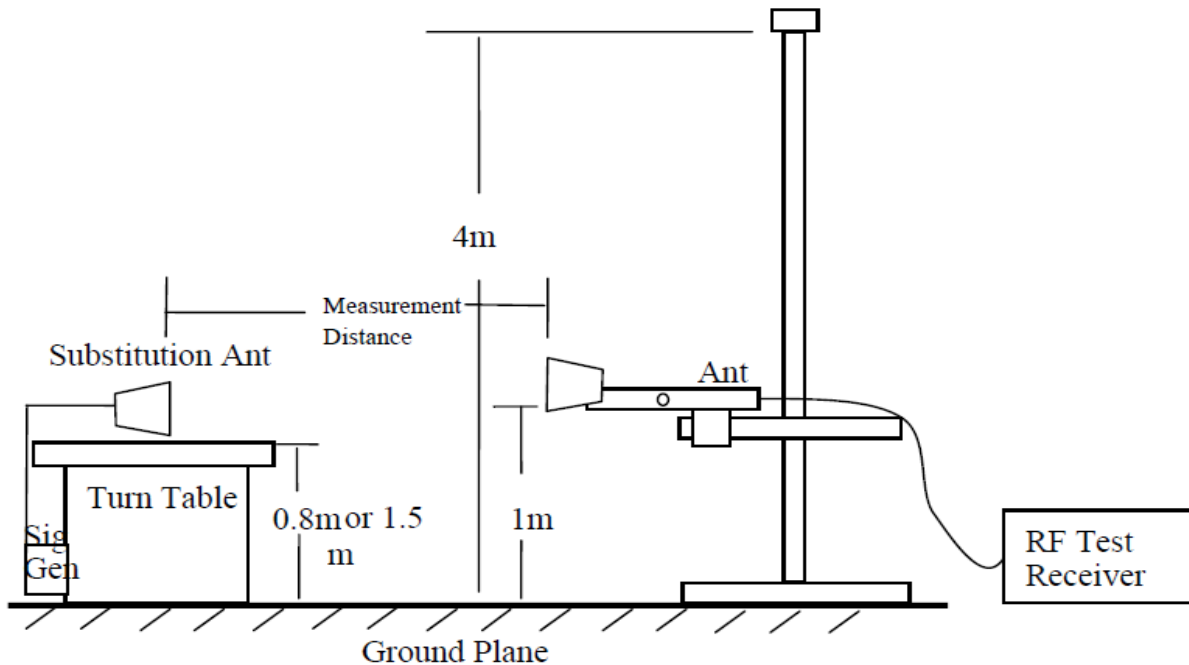
The Measuring equipment is listed in the section 6.3 of this test report.

#### 7.1.4 Test Configuration

According to the ANSI/TIA-603-E-2016 test method, The Receiver or Spectrum was scanned from 9 KHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 24.238, Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of WCDMA Band II / WCDMA Band V / GSM 850 / GSM 1900.

### TEST CONFIGURATION





#### 7.1.5 Test Procedure

1. EUT was placed on a 0.8 meter (For frequency above 1G, EUT should be placed on 1.5m) high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50 meter. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as ( $P_r$ ).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (SG Level) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source (SG Level) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Cable Loss), the Substitution Antenna Gain should be recorded after test.  
The measurement results are obtained as described below:  
 $\text{Power(EIRP)} = \text{SG Level} - \text{Cable Loss} + \text{Antenna Gain}$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .

## 7.1.6 Test Results

|              |                                                             |                    |           |
|--------------|-------------------------------------------------------------|--------------------|-----------|
| EUT:         | Global Hub                                                  | Model No.:         | CSH-0301  |
| Temperature: | 20 °C                                                       | Relative Humidity: | 48%       |
| Test Mode:   | GSM/GPRS 850/<br>GSM/GPRS 1900<br>UMTS band II/ UMTS band V | Test By:           | Loren Luo |

### ■ Radiated Spurious Emission

| GSM 850                                |          |            |              |                |       |            |            |
|----------------------------------------|----------|------------|--------------|----------------|-------|------------|------------|
| Frequency                              | SG Level | Cable Loss | Antenna Gain | Absolute Level | Limit | Over Limit | Polarity   |
| (MHz)                                  | (dBm)    | (dB)       | (dB)         | (dBm)          | (dBm) | (dBm)      |            |
| Test Results for Channel 128/824.2 MHz |          |            |              |                |       |            |            |
| 1648.4                                 | -53.25   | 2.80       | 27.50        | -28.55         | -13   | -15.55     | Vertical   |
| 1648.4                                 | -53.29   | 2.80       | 27.50        | -28.59         | -13   | -15.59     | Horizontal |
| 2472.6                                 | -52.48   | 2.91       | 27.80        | -27.59         | -13   | -14.59     | Vertical   |
| 2472.6                                 | -53.28   | 2.91       | 27.80        | -28.39         | -13   | -15.39     | Horizontal |
| 3296.8                                 | -55.18   | 4.02       | 29.87        | -29.33         | -13   | -16.33     | Vertical   |
| 3296.8                                 | -52.64   | 4.02       | 29.87        | -26.79         | -13   | -13.79     | Horizontal |
| Test Results for Channel 190/836.6 MHz |          |            |              |                |       |            |            |
| 1673.2                                 | -51.68   | 2.80       | 27.48        | -27.00         | -13   | -14.00     | Vertical   |
| 1673.2                                 | -54.27   | 2.80       | 27.48        | -29.59         | -13   | -16.59     | Horizontal |
| 2509.8                                 | -53.66   | 2.91       | 27.70        | -28.87         | -13   | -15.87     | Vertical   |
| 2509.8                                 | -53.24   | 2.91       | 27.70        | -28.45         | -13   | -15.45     | Horizontal |
| 3346.4                                 | -52.64   | 4.02       | 29.82        | -26.84         | -13   | -13.84     | Vertical   |
| 3346.4                                 | -53.75   | 4.02       | 29.82        | -27.95         | -13   | -14.95     | Horizontal |
| Test Results for Channel 251/848.8 MHz |          |            |              |                |       |            |            |
| 1697.6                                 | -53.67   | 2.80       | 27.42        | -29.05         | -13   | -16.05     | Vertical   |
| 1697.6                                 | -53.56   | 2.80       | 27.42        | -28.94         | -13   | -15.94     | Horizontal |
| 2546.4                                 | -54.18   | 2.91       | 27.68        | -29.41         | -13   | -16.41     | Vertical   |
| 2546.4                                 | -53.22   | 2.91       | 27.68        | -28.45         | -13   | -15.45     | Horizontal |
| 3395.2                                 | -53.64   | 4.02       | 29.80        | -27.86         | -13   | -14.86     | Vertical   |
| 3395.2                                 | -52.67   | 4.02       | 29.80        | -26.89         | -13   | -13.89     | Horizontal |

#### Remark:

1. We were tested all Configuration refer 3GPP TS134 121.
2. Absolute Level = SG Level- Cable Loss+ Antenna Gain
3. Over Limit= Absolute Level (dBm)-Limit(dBm)

| GPRS 850                               |          |            |              |                |       |            |            |
|----------------------------------------|----------|------------|--------------|----------------|-------|------------|------------|
| Frequency                              | SG Level | Cable Loss | Antenna Gain | Absolute Level | Limit | Over Limit | Polarity   |
| (MHz)                                  | (dBm)    | (dB)       | (dB)         | (dBm)          | (dBm) | (dBm)      |            |
| Test Results for Channel 128/824.2 MHz |          |            |              |                |       |            |            |
| 1648.4                                 | -52.61   | 2.80       | 27.50        | -27.91         | -13   | -14.91     | Vertical   |
| 1648.4                                 | -53.17   | 2.80       | 27.50        | -28.47         | -13   | -15.47     | Horizontal |
| 2472.6                                 | -52.24   | 2.91       | 27.80        | -27.35         | -13   | -14.35     | Vertical   |
| 2472.6                                 | -51.46   | 2.91       | 27.80        | -26.57         | -13   | -13.57     | Horizontal |
| 3296.8                                 | -52.57   | 4.02       | 29.87        | -26.72         | -13   | -13.72     | Vertical   |
| 3296.8                                 | -53.16   | 4.02       | 29.87        | -27.31         | -13   | -14.31     | Horizontal |
| Test Results for Channel 190/836.6 MHz |          |            |              |                |       |            |            |
| 1673.2                                 | -54.24   | 2.80       | 27.48        | -29.56         | -13   | -16.56     | Vertical   |
| 1673.2                                 | -51.47   | 2.80       | 27.48        | -26.79         | -13   | -13.79     | Horizontal |
| 2509.8                                 | -53.33   | 2.91       | 27.70        | -28.54         | -13   | -15.54     | Vertical   |
| 2509.8                                 | -52.64   | 2.91       | 27.70        | -27.85         | -13   | -14.85     | Horizontal |
| 3346.4                                 | -51.29   | 4.02       | 29.82        | -25.49         | -13   | -12.49     | Vertical   |
| 3346.4                                 | -53.34   | 4.02       | 29.82        | -27.54         | -13   | -14.54     | Horizontal |
| Test Results for Channel 251/848.8 MHz |          |            |              |                |       |            |            |
| 1697.6                                 | -52.11   | 2.80       | 27.42        | -27.49         | -13   | -14.49     | Vertical   |
| 1697.6                                 | -49.68   | 2.80       | 27.42        | -25.06         | -13   | -12.06     | Horizontal |
| 2546.4                                 | -49.54   | 2.91       | 27.68        | -24.77         | -13   | -11.77     | Vertical   |
| 2546.4                                 | -51.34   | 2.91       | 27.68        | -26.57         | -13   | -13.57     | Horizontal |
| 3395.2                                 | -53.24   | 4.02       | 29.80        | -27.46         | -13   | -14.46     | Vertical   |
| 3395.2                                 | -54.17   | 4.02       | 29.80        | -28.39         | -13   | -15.39     | Horizontal |

## Remark:

1. We were tested all Configuration refer 3GPP TS134 121.
2. Absolute Level = SG Level- Cable Loss+ Antenna Gain
3. Over Limit= Absolute Level (dBm)-Limit(dBm)

| GSM 1900                               |          |            |                |                |       |            |            |
|----------------------------------------|----------|------------|----------------|----------------|-------|------------|------------|
| Frequency                              | SG Level | Cable Loss | Antenna Factor | Absolute Level | Limit | Over Limit | Polarity   |
| (MHz)                                  | (dBm)    | (dB)       | (dB)           | (dBm)          | (dBm) | (dBm)      |            |
| Test Results for Channel 512/1850.2MHz |          |            |                |                |       |            |            |
| 3700.4                                 | -54.12   | 4.04       | 33.51          | -24.65         | -13   | -11.65     | Vertical   |
| 3700.4                                 | -55.57   | 4.04       | 33.51          | -26.10         | -13   | -13.10     | Horizontal |
| 5550.6                                 | -54.31   | 5.24       | 35.84          | -23.71         | -13   | -10.71     | Vertical   |
| 5550.6                                 | -52.25   | 5.24       | 35.84          | -21.65         | -13   | -8.65      | Horizontal |
| Test Results for Channel 661/1880.0MHz |          |            |                |                |       |            |            |
| 3760                                   | -53.68   | 4.04       | 33.56          | -24.16         | -13   | -11.16     | Vertical   |
| 3760                                   | -55.29   | 4.04       | 33.56          | -25.77         | -13   | -12.77     | Horizontal |
| 5640                                   | -54.27   | 5.24       | 35.91          | -23.60         | -13   | -10.60     | Vertical   |
| 5640                                   | -54.18   | 5.24       | 35.91          | -23.51         | -13   | -10.51     | Horizontal |
| Test Results for Channel 810/1909.8MHz |          |            |                |                |       |            |            |
| 3819.6                                 | -53.68   | 4.04       | 34.00          | -23.72         | -13   | -10.72     | Vertical   |
| 3819.6                                 | -55.21   | 4.04       | 34.00          | -25.25         | -13   | -12.25     | Horizontal |
| 5729.4                                 | -53.16   | 5.24       | 36.04          | -22.36         | -13   | -9.36      | Vertical   |
| 5729.4                                 | -53.61   | 5.24       | 36.04          | -22.81         | -13   | -9.81      | Horizontal |

Remark:

1. We were tested all Configuration refer 3GPP TS134 121.
2. Absolute Level = SG Level- Cable Loss+ Antenna Gain
3. Over Limit= Absolute Level (dBm)-Limit(dBm)

| GPRS 1900                              |          |            |                |                |       |            |            |
|----------------------------------------|----------|------------|----------------|----------------|-------|------------|------------|
| Frequency                              | SG Level | Cable Loss | Antenna Factor | Absolute Level | Limit | Over Limit | Polarity   |
| (MHz)                                  | (dBm)    | (dB)       | (dB)           | (dBm)          | (dBm) | (dBm)      |            |
| Test Results for Channel 512/1850.2MHz |          |            |                |                |       |            |            |
| 3700.4                                 | -53.24   | 4.04       | 33.51          | -23.77         | -13   | -10.77     | Vertical   |
| 3700.4                                 | -53.41   | 4.04       | 33.51          | -23.94         | -13   | -10.94     | Horizontal |
| 5550.6                                 | -52.67   | 5.24       | 35.84          | -22.07         | -13   | -9.07      | Vertical   |
| 5550.6                                 | -53.68   | 5.24       | 35.84          | -23.08         | -13   | -10.08     | Horizontal |
| Test Results for Channel 661/1880.0MHz |          |            |                |                |       |            |            |
| 3760                                   | -52.67   | 4.04       | 33.56          | -23.15         | -13   | -10.15     | Vertical   |
| 3760                                   | -53.37   | 4.04       | 33.56          | -23.85         | -13   | -10.85     | Horizontal |
| 5640                                   | -52.48   | 5.24       | 35.91          | -21.81         | -13   | -8.81      | Vertical   |
| 5640                                   | -55.64   | 5.24       | 35.91          | -24.97         | -13   | -11.97     | Horizontal |
| Test Results for Channel 810/1909.8MHz |          |            |                |                |       |            |            |
| 3819.6                                 | -53.27   | 4.04       | 34.00          | -23.31         | -13   | -10.31     | Vertical   |
| 3819.6                                 | -54.18   | 4.04       | 34.00          | -24.22         | -13   | -11.22     | Horizontal |
| 5729.4                                 | -54.89   | 5.24       | 36.04          | -24.09         | -13   | -11.09     | Vertical   |
| 5729.4                                 | -52.54   | 5.24       | 36.04          | -21.74         | -13   | -8.74      | Horizontal |

Remark:

1. We were tested all Configuration refer 3GPP TS134 121.
2. Absolute Level = SG Level- Cable Loss+ Antenna Gain
3. Over Limit= Absolute Level (dBm)-Limit(dBm)

| WCDMA Band II                           |          |            |                |                |       |            |            |
|-----------------------------------------|----------|------------|----------------|----------------|-------|------------|------------|
| Frequency                               | SG Level | Cable Loss | Antenna Factor | Absolute Level | Limit | Over Limit | Polarity   |
| (MHz)                                   | (dBm)    | (dB)       | (dB)           | (dBm)          | (dBm) | (dBm)      |            |
| Test Results for Channel 9262/1852.4MHz |          |            |                |                |       |            |            |
| 3700.8                                  | -56.38   | 4.04       | 33.51          | -26.91         | -13   | -13.91     | Vertical   |
| 3700.8                                  | -57.46   | 4.04       | 33.51          | -27.99         | -13   | -14.99     | Horizontal |
| 5551.2                                  | -55.32   | 5.24       | 35.84          | -24.72         | -13   | -11.72     | Vertical   |
| 5551.2                                  | -53.24   | 5.24       | 35.84          | -22.64         | -13   | -9.64      | Horizontal |
| Test Results for Channel 9400/1880MHz   |          |            |                |                |       |            |            |
| 3760                                    | -56.68   | 4.04       | 33.56          | -27.16         | -13   | -14.16     | Vertical   |
| 3760                                    | -54.35   | 4.04       | 33.56          | -24.83         | -13   | -11.83     | Horizontal |
| 5640                                    | -52.96   | 5.24       | 35.91          | -22.29         | -13   | -9.29      | Vertical   |
| 5640                                    | -54.37   | 5.24       | 35.91          | -23.70         | -13   | -10.70     | Horizontal |
| Test Results for Channel 9538/1907.6MHz |          |            |                |                |       |            |            |
| 3819.2                                  | -56.34   | 4.04       | 34.00          | -26.38         | -13   | -13.38     | Vertical   |
| 3819.2                                  | -52.61   | 4.04       | 34.00          | -22.65         | -13   | -9.65      | Horizontal |
| 5728.8                                  | -56.34   | 5.24       | 36.04          | -25.54         | -13   | -12.54     | Vertical   |
| 5728.8                                  | -54.57   | 5.24       | 36.04          | -23.77         | -13   | -10.77     | Horizontal |

## Remark:

1. We were tested all Configuration refer 3GPP TS134 121.
2. Absolute Level = SG Level- Cable Loss+ Antenna Gain
3. Over Limit= Absolute Level (dBm)-Limit(dBm)

| WCDMA Band V                           |          |            |              |                |       |            |            |
|----------------------------------------|----------|------------|--------------|----------------|-------|------------|------------|
| Frequency                              | SG Level | Cable Loss | Antenna Gain | Absolute Level | Limit | Over Limit | Polarity   |
| (MHz)                                  | (dBm)    | (dB)       | (dB)         | (dBm)          | (dBm) | (dBm)      |            |
| Test Results for Channel 4233/846.6MHz |          |            |              |                |       |            |            |
| 1673.2                                 | -53.26   | 2.80       | 27.50        | -28.56         | -13   | -15.56     | Vertical   |
| 1673.2                                 | -53.24   | 2.80       | 27.50        | -28.54         | -13   | -15.54     | Horizontal |
| 2509.8                                 | -51.48   | 2.91       | 27.80        | -26.59         | -13   | -13.59     | Vertical   |
| 2509.8                                 | -55.26   | 2.91       | 27.80        | -30.37         | -13   | -17.37     | Horizontal |
| 3346.4                                 | -52.24   | 4.02       | 29.87        | -26.39         | -13   | -13.39     | Vertical   |
| 3346.4                                 | -52.47   | 4.02       | 29.87        | -26.62         | -13   | -13.62     | Horizontal |
| Test Results for Channel 4182/836.6MHz |          |            |              |                |       |            |            |
| 1672.8                                 | -49.68   | 2.80       | 27.48        | -25.00         | -13   | -12.00     | Vertical   |
| 1672.8                                 | -53.34   | 2.80       | 27.48        | -28.66         | -13   | -15.66     | Horizontal |
| 2509.2                                 | -54.26   | 2.91       | 27.70        | -29.47         | -13   | -16.47     | Vertical   |
| 2509.2                                 | -52.67   | 2.91       | 27.70        | -27.88         | -13   | -14.88     | Horizontal |
| 3345.6                                 | -51.48   | 4.02       | 29.82        | -25.68         | -13   | -12.68     | Vertical   |
| 3345.6                                 | -53.37   | 4.02       | 29.82        | -27.57         | -13   | -14.57     | Horizontal |
| Test Results for Channel 4132/826.4MHz |          |            |              |                |       |            |            |
| 1652.8                                 | -57.63   | 2.80       | 27.42        | -33.01         | -13   | -20.01     | Vertical   |
| 1652.8                                 | -51.46   | 2.80       | 27.42        | -26.84         | -13   | -13.84     | Horizontal |
| 2479.2                                 | -53.34   | 2.91       | 27.68        | -28.57         | -13   | -15.57     | Vertical   |
| 2479.2                                 | -55.24   | 2.91       | 27.68        | -30.47         | -13   | -17.47     | Horizontal |
| 3305.6                                 | -54.16   | 4.02       | 29.80        | -28.38         | -13   | -15.38     | Vertical   |
| 3305.6                                 | -53.32   | 4.02       | 29.80        | -27.54         | -13   | -14.54     | Horizontal |

Remark:

1. We were tested all Configuration refer 3GPP TS134 121.
2. Absolute Level = SG Level- Cable Loss+ Antenna Gain
3. Over Limit= Absolute Level (dBm)-Limit(dBm)

## 7.2 EFFECTIVE RADIATED POWER AND EFFECTIVE ISOTROPIC RADIATED POWER

### 7.2.1 Applicable Standard

According to FCC KDB 971168 D01 v03 Section 5.2.1/ Section 5.2.2.2 and ANSI/TIA-603-E-2016 Section 2.2.17

### 7.2.2 Conformance Limit

The substitution method, in ANSI/TIA-603-E-2016, was used for ERP/EIRP measurement, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v03. The ERP of mobile transmitters must not exceed 7 Watts (Cellular Band) and the EIRP of mobile transmitters are limited to 2 Watts (PCS Band).

### 7.2.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

### 7.2.4 Test Configuration

(a) For E.R.P and E.I.R.P Measurements  
Please refer to the section 7.1.4 in this report.

### 7.2.5 Test Procedure

The measurements procedures specified in ANSI/TIA-603-E-2016 were applied.  
In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power ( $P_{in}$ ) is applied to the input of the dipole, and the power received ( $P_r$ ) at the chamber's probe antenna is recorded.

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:

$$ERP/EIRP = SGLevel - P_{cl} + G_a$$

where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as SGLevel, typically dBW or dBm);

SGLevel = Signal generator output power or PSD, in dBm or dBW;

$G_a$  = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

$P_{cl}$  = signal attenuation in the connecting cable between the transmitter and antenna, in dB.<sup>2</sup>

The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.

From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.

The EUT is then put into continuously transmitting mode at its maximum power level.

Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule 24.232 (b) and (c). The "reference path loss" from Step1 is added to this result.

This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power ( $P_{in}$ ).

ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$ .

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

Substitution antenna and Receiving Antenna:

| Item | Kind of Equipment | Manufacturer | Type No.    | Serial No. | Character  | Note                 |
|------|-------------------|--------------|-------------|------------|------------|----------------------|
| 1    | Bilog Antenna     | TESEQ        | CBL6111D    | 31216      | 30MHz~2GHz | Receiving Antenna    |
| 2    | Horn Antenna      | EM           | EM-AH-10180 | 2011071402 | 1GHz~18GHz | Receiving Antenna    |
| 3    | Bilog Antenna     | TESEQ        | CBL6111D    | 31216      | 30MHz~2GHz | Substitution antenna |
| 4    | Horn Antenna      | EM           | EM-AH-10180 | 2011071402 | 1GHz~18GHz | Substitution antenna |

Use the following spectrum analyzer settings:

|              |          |           |
|--------------|----------|-----------|
|              | GSM/GPRS | UMTS band |
| Span         | 500KHz   | 10MHz     |
| RBW          | 10KHz    | 300KHz    |
| VBW          | 30KHz    | 1MHz      |
| Detector     | RMS      | RMS       |
| Trace        | Average  | Average   |
| Average Type | Power    | Power     |
| Sweep Count  | 100      | 100       |

## 7.2.6 Test Results

|              |                                                             |                    |           |
|--------------|-------------------------------------------------------------|--------------------|-----------|
| EUT:         | Global Hub                                                  | Model No.:         | CSH-0301  |
| Temperature: | 20 °C                                                       | Relative Humidity: | 48%       |
| Test Mode:   | GSM/GPRS 850/<br>GSM/GPRS 1900<br>UMTS band II/ UMTS band V | Test By:           | Loren Luo |

## ■ Effective Radiated Power

| Radiated Power (ERP) for GSM850 |              |       |      |         |            |       |         |
|---------------------------------|--------------|-------|------|---------|------------|-------|---------|
| Frequency                       | Polarization | SG    | Pcl  | Ga      | Correction | ERP   | ERP     |
| (MHz)                           |              | Level |      | Antenna |            |       |         |
|                                 |              | (dBm) | (dB) | Gain    | (dB)       | (dBm) | (W)     |
| 824.2                           | H            | 11.23 | 2.11 | 23.84   | 2.15       | 30.81 | 1.20504 |
| 836.6                           | H            | 11.23 | 2.13 | 23.15   | 2.15       | 30.10 | 1.02329 |
| 848.8                           | H            | 11.76 | 2.13 | 23.06   | 2.15       | 30.54 | 1.13240 |
| 824.2                           | V            | 11.10 | 2.11 | 23.11   | 2.15       | 29.95 | 0.98855 |
| 836.6                           | V            | 11.54 | 2.13 | 23.07   | 2.15       | 30.33 | 1.07895 |
| 848.8                           | V            | 11.12 | 2.13 | 23.25   | 2.15       | 30.09 | 1.02094 |

| Radiated Power (ERP) for GPRS850 |              |       |      |         |            |       |         |
|----------------------------------|--------------|-------|------|---------|------------|-------|---------|
| Frequency                        | Polarization | SG    | Pcl  | Ga      | Correction | ERP   | ERP     |
| (MHz)                            |              | Level |      | Antenna |            |       |         |
|                                  |              | (dBm) | (dB) | Gain    | (dB)       | (dBm) | (W)     |
| 824.2                            | H            | 11.13 | 2.11 | 23.84   | 2.15       | 30.71 | 1.17761 |
| 836.6                            | H            | 11.05 | 2.13 | 23.15   | 2.15       | 29.92 | 0.98175 |
| 848.8                            | H            | 11.15 | 2.13 | 23.06   | 2.15       | 29.93 | 0.98401 |
| 824.2                            | V            | 11.19 | 2.11 | 23.11   | 2.15       | 30.04 | 1.00925 |
| 836.6                            | V            | 11.56 | 2.13 | 23.07   | 2.15       | 30.35 | 1.08393 |
| 848.8                            | V            | 11.31 | 2.13 | 23.25   | 2.15       | 30.28 | 1.06660 |

| Radiated Power (ERP) for UMTS band V |              |          |      |                      |            |       |         |
|--------------------------------------|--------------|----------|------|----------------------|------------|-------|---------|
| Frequency                            | Polarization | SG Level | Pcl  | Ga                   | Correction | ERP   | ERP     |
| (MHz)                                |              | (dBm)    | (dB) | Antenna Gain<br>(dB) | (dB)       | (dBm) | (W)     |
| 826.4                                | H            | 0.65     | 2.11 | 23.84                | 2.15       | 20.23 | 0.10544 |
| 836.6                                | H            | 0.74     | 2.13 | 23.15                | 2.15       | 19.61 | 0.09141 |
| 846.6                                | H            | 0.89     | 2.13 | 23.06                | 2.15       | 19.67 | 0.09268 |
| 826.4                                | V            | 1.09     | 2.11 | 23.11                | 2.15       | 19.94 | 0.09863 |
| 836.6                                | V            | 1.62     | 2.13 | 23.07                | 2.15       | 20.41 | 0.10990 |
| 846.6                                | V            | 1.34     | 2.13 | 23.25                | 2.15       | 20.31 | 0.10740 |

Note:

SG Level= Signal generator output

Pcl= cable loss

Ga= Antenna Gain

Peak EIRP(dBm)= SGLevel -Pcl +Ga

ERP(dBm)=EIRP-2.15

■ Effective Isotropic Radiated Power

| Radiated Power (E.I.R.P) for GSM1900 |              |          |      |                 |       |         |
|--------------------------------------|--------------|----------|------|-----------------|-------|---------|
| Frequency                            | Polarization | SG Level | Pcl  | Ga Antenna Gain | EIRP  | EIRP    |
| (MHz)                                |              | (dBm)    | (dB) | (dB)            | (dBm) | (W)     |
| 1850.2                               | H            | 4.62     | 3.76 | 28.24           | 29.10 | 0.81283 |
| 1880                                 | H            | 4.82     | 3.91 | 28.22           | 29.13 | 0.81846 |
| 1909.8                               | H            | 4.63     | 3.93 | 28.20           | 28.90 | 0.77625 |
| 1850.2                               | V            | 4.95     | 3.76 | 27.32           | 28.51 | 0.70958 |
| 1880                                 | V            | 5.31     | 3.91 | 27.33           | 28.73 | 0.74645 |
| 1909.8                               | V            | 5.64     | 3.93 | 27.31           | 29.02 | 0.79799 |

| Radiated Power (E.I.R.P) for GPRS1900 |              |          |      |                 |       |         |
|---------------------------------------|--------------|----------|------|-----------------|-------|---------|
| Frequency                             | Polarization | SG Level | Pcl  | Ga Antenna Gain | EIRP  | EIRP    |
| (MHz)                                 |              | (dBm)    | (dB) | (dB)            | (dBm) | (W)     |
| 1850.2                                | H            | 4.61     | 3.76 | 28.24           | 29.09 | 0.81096 |
| 1880                                  | H            | 4.82     | 3.91 | 28.22           | 29.13 | 0.81846 |
| 1909.8                                | H            | 4.68     | 3.93 | 28.20           | 28.95 | 0.78524 |
| 1850.2                                | V            | 4.63     | 3.76 | 27.32           | 28.19 | 0.65917 |
| 1880                                  | V            | 4.88     | 3.91 | 27.33           | 28.30 | 0.67608 |
| 1909.8                                | V            | 4.92     | 3.93 | 27.31           | 28.30 | 0.67608 |

| Radiated Power (E.I.R.P) for UMTS band II |              |          |      |                 |       |         |
|-------------------------------------------|--------------|----------|------|-----------------|-------|---------|
| Frequency                                 | Polarization | SG Level | Pcl  | Ga Antenna Gain | EIRP  | EIRP    |
| (MHz)                                     |              | (dBm)    | (dB) | (dB)            | (dBm) | (W)     |
| 1852.4                                    | H            | -2.05    | 3.76 | 28.24           | 22.43 | 0.17498 |
| 1880                                      | H            | -2.15    | 3.91 | 28.22           | 22.16 | 0.16444 |
| 1907.6                                    | H            | -2.13    | 3.93 | 28.20           | 22.14 | 0.16368 |
| 1852.4                                    | V            | -2.01    | 3.76 | 27.32           | 21.55 | 0.14289 |
| 1880                                      | V            | -1.88    | 3.91 | 27.33           | 21.54 | 0.14256 |
| 1907.6                                    | V            | -1.69    | 3.93 | 27.31           | 21.69 | 0.14757 |

Note:

SG Level= Signal generator output

Pcl= cable loss

Ga= Antenna Gain

Peak EIRP(dBm)= SGLevel –Pcl+Ga.

### 7.3 CONDUCTED OUTPUT POWER

#### 7.3.1 Applicable Standard

According to FCC Part 2.1046 and FCC Part 22.913(a)(2) and FCC Part 24.232(c) and FCC KDB 971168 D01 v03 Section 5.2

#### 7.3.2 Conformance Limit

Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in §22.949, the ERP of base transmitters and cellular repeaters of such systems must not exceed 1000 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts(38.5dBm).

Mobile and portable stations are limited to 2 watts (33dBm)EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications..

#### 7.3.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

#### 7.3.4 Test Setup

Please refer to Section 6.1 of this test report.

#### 7.3.5 Test Procedure

Connect the EUT to Universal Radio Communication Tester CMU200 or CMU500 via the antenna connector. A call is set up by the SS according to the generic call set up procedure on a channel with ARFCN in the ARFCN range, power control level set to Max power. The frequency band is set as selected frequency, The RF output of the transmitter was connected to base station simulator.

Set EUT at maximum average power by base station simulator.

Set RBW = 1-5% of the OBW, not to exceed 1 MHz.

Set VBW  $\geq 3 \times$  RBW.

Number of points in sweep  $\geq 2 \times \text{span} / \text{RBW}$ . (This gives bin-to-bin spacing  $\leq \text{RBW}/2$ , so that narrowband signals are not lost between frequency bins.)

Sweep time = auto.

Detector = RMS (power averaging).

Set sweep trigger to "free run".

Trace average at least 100 traces in power averaging (i.e., RMS) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the on and off periods of the transmitter.

Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

Add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add  $10 \log(1/0.25) = 6 \text{ dB}$  if the duty cycle is a constant 25%.

Measure lowest, middle, and highest channels for each bandwidth and different modulation.

Measure and record the results in the test report.

### 7.3.6 Test Results

|              |                                                             |                    |           |
|--------------|-------------------------------------------------------------|--------------------|-----------|
| EUT:         | Global Hub                                                  | Model No.:         | CSH-0301  |
| Temperature: | 20 °C                                                       | Relative Humidity: | 48%       |
| Test Mode:   | GSM/GPRS 850/<br>GSM/GPRS 1900<br>UMTS band II/ UMTS band V | Test By:           | Loren Luo |

#### Output Power for GSM850

| Mode                | Frequency<br>(MHz) | Maximum Burst-Average Output Power |
|---------------------|--------------------|------------------------------------|
| GSM850              | 824.2              | 32.47                              |
|                     | 836.6              | 32.53                              |
|                     | 848.8              | 32.48                              |
| GPRS850<br>(1 Slot) | 824.2              | 32.45                              |
|                     | 836.6              | 32.50                              |
|                     | 848.8              | 32.49                              |
| GPRS850<br>(2 Slot) | 824.2              | 29.66                              |
|                     | 836.6              | 30.00                              |
|                     | 848.8              | 30.04                              |
| GPRS850<br>(3 Slot) | 824.2              | 27.27                              |
|                     | 836.6              | 27.69                              |
|                     | 848.8              | 27.93                              |
| GPRS850<br>(4 Slot) | 824.2              | 26.62                              |
|                     | 836.6              | 26.73                              |
|                     | 848.8              | 27.08                              |

N/A: Not Applicable

## Output Power for PCS1900

| Mode                 | Frequency<br>(MHz) | Maximum Burst-Average<br>Output Power |
|----------------------|--------------------|---------------------------------------|
| GSM1900              | 1850.2             | 30.13                                 |
|                      | 1880               | 29.79                                 |
|                      | 1909.8             | 29.83                                 |
| GPRS1900<br>(1 Slot) | 1850.2             | 30.13                                 |
|                      | 1880               | 29.78                                 |
|                      | 1909.8             | 29.83                                 |
| GPRS1900<br>(2 Slot) | 1850.2             | 28.06                                 |
|                      | 1880               | 28.10                                 |
|                      | 1909.8             | 28.11                                 |
| GPRS1900<br>(3 Slot) | 1850.2             | 25.79                                 |
|                      | 1880               | 25.93                                 |
|                      | 1909.8             | 26.08                                 |
| GPRS1900<br>(4 Slot) | 1850.2             | 24.73                                 |
|                      | 1880               | 24.93                                 |
|                      | 1909.8             | 25.11                                 |

N/A: Not Applicable

## Output Power for UMTS BAND II

| Mode               | Frequency(MHz) | Maximum Burst-Average Output Power |
|--------------------|----------------|------------------------------------|
| WCDMA 1900<br>RMC  | 1852.4         | 22.44                              |
|                    | 1880           | 22.26                              |
|                    | 1907.6         | 22.40                              |
| HSDPA<br>Subtest 1 | 1852.4         | 21.43                              |
|                    | 1880           | 21.23                              |
|                    | 1907.6         | 21.43                              |
| HSDPA<br>Subtest 2 | 1852.4         | 20.94                              |
|                    | 1880           | 20.71                              |
|                    | 1907.6         | 20.90                              |
| HSDPA<br>Subtest 3 | 1852.4         | 20.92                              |
|                    | 1880           | 20.72                              |
|                    | 1907.6         | 20.87                              |
| HSDPA<br>Subtest 4 | 1852.4         | 20.89                              |
|                    | 1880           | 20.70                              |
|                    | 1907.6         | 20.86                              |
| HSUPA<br>Subtest 1 | 1852.4         | 20.89                              |
|                    | 1880           | 20.71                              |
|                    | 1907.6         | 20.91                              |
| HSUPA<br>Subtest 2 | 1852.4         | 20.85                              |
|                    | 1880           | 20.72                              |
|                    | 1907.6         | 20.88                              |
| HSUPA<br>Subtest 3 | 1852.4         | 20.86                              |
|                    | 1880           | 20.68                              |
|                    | 1907.6         | 20.85                              |
| HSUPA<br>Subtest 4 | 1852.4         | 20.92                              |
|                    | 1880           | 20.78                              |
|                    | 1907.6         | 20.83                              |
| HSUPA<br>Subtest 5 | 1852.4         | 21.43                              |
|                    | 1880           | 21.19                              |
|                    | 1907.6         | 21.36                              |

## Output Power for UMTS BAND V

| Mode               | Frequency(MHz) | Maximum Burst-Average Output Power |
|--------------------|----------------|------------------------------------|
| WCDMA 850<br>RMC   | 826.4          | 23.62                              |
|                    | 836.6          | 23.54                              |
|                    | 846.6          | 23.60                              |
| HSDPA<br>Subtest 1 | 826.4          | 22.62                              |
|                    | 836.6          | 22.64                              |
|                    | 846.6          | 22.64                              |
| HSDPA<br>Subtest 2 | 826.4          | 22.23                              |
|                    | 836.6          | 22.15                              |
|                    | 846.6          | 22.14                              |
| HSDPA<br>Subtest 3 | 826.4          | 22.23                              |
|                    | 836.6          | 22.16                              |
|                    | 846.6          | 22.13                              |
| HSDPA<br>Subtest 4 | 826.4          | 22.16                              |
|                    | 836.6          | 22.18                              |
|                    | 846.6          | 22.12                              |
| HSUPA<br>Subtest 1 | 826.4          | 22.13                              |
|                    | 836.6          | 22.18                              |
|                    | 846.6          | 22.16                              |
| HSUPA<br>Subtest 2 | 826.4          | 22.10                              |
|                    | 836.6          | 22.16                              |
|                    | 846.6          | 22.19                              |
| HSUPA<br>Subtest 3 | 826.4          | 22.18                              |
|                    | 836.6          | 22.12                              |
|                    | 846.6          | 22.08                              |
| HSUPA<br>Subtest 4 | 826.4          | 22.12                              |
|                    | 836.6          | 22.19                              |
|                    | 846.6          | 22.05                              |
| HSUPA<br>Subtest 5 | 826.4          | 22.56                              |
|                    | 836.6          | 22.62                              |
|                    | 846.6          | 22.64                              |

## 7.4 FREQUENCY STABILITY

### 7.4.1 Applicable Standard

According to FCC Part 2.1055 and FCC Part 22.355 and FCC Part 24.235 and FCC KDB 971168 D01 Section 9.0

### 7.4.2 Conformance Limit

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5\text{ppm}$ ) of the center frequency.

### 7.4.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

### 7.4.4 Test Setup

Please refer to Section 6.1 of this test report.

### 7.4.5 Test Procedure

Connect the EUT to Universal Radio Communication Tester CMU200 or CMU500 via the antenna connector. A call is set up by the SS according to the generic call set up procedure on a channel with ARFCN in the ARFCN range, power control level set to Max power. MS TXPWR\_MAX\_CCH is set to the maximum value supported by the Power Class of the Mobile under test.

EUT was placed at temperature chamber and connected to an external power supply.

Temperature and voltage condition shall be tested to confirm frequency stability.

For Temperature Variation

1. The testing follows FCC KDB 971168 D01 v03 Section 9.0.
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to  $-30^{\circ}\text{C}$  and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in  $10^{\circ}\text{C}$  steps up to  $50^{\circ}\text{C}$ . The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

For Voltage Variation

1. The testing follows FCC KDB 971168 D01 v03 Section 9.0.
2. The EUT was placed in a temperature chamber at  $25\pm 5^{\circ}\text{C}$  and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
4. The variation in frequency was measured for the worst case.

### 7.4.6 Test Results

|               |                                                             |                    |           |
|---------------|-------------------------------------------------------------|--------------------|-----------|
| EUT:          | Global Hub                                                  | Model No.:         | CSH-0301  |
| Temperature:  | 20 °C                                                       | Relative Humidity: | 48%       |
| Test Mode:    | GSM/GPRS 850/<br>GSM/GPRS 1900<br>UMTS band II/ UMTS band V | Test By:           | Loren Luo |
| Results: PASS |                                                             |                    |           |

| Frequency Error Against Voltage for GSM 850 band |                      |                       |
|--------------------------------------------------|----------------------|-----------------------|
| Voltage (V)                                      | Frequency Error (Hz) | Frequency Error (ppm) |
| 3.4                                              | 14                   | 0.0167                |
| 3.7                                              | 14                   | 0.0167                |
| 4.2                                              | 15                   | 0.0179                |

| Frequency Error Against Temperature for GSM 850 band |                      |                       |
|------------------------------------------------------|----------------------|-----------------------|
| Temperature (°C)                                     | Frequency Error (Hz) | Frequency Error (ppm) |
| -30                                                  | 23                   | 0.0275                |
| -20                                                  | 20                   | 0.0239                |
| -10                                                  | 16                   | 0.0191                |
| 0                                                    | 15                   | 0.0179                |
| 10                                                   | 22                   | 0.0263                |
| 20                                                   | 24                   | 0.0287                |
| 30                                                   | 24                   | 0.0287                |
| 40                                                   | 20                   | 0.0239                |
| 50                                                   | 19                   | 0.0227                |

| Frequency Error Against Voltage for GPRS850 band |                      |                       |
|--------------------------------------------------|----------------------|-----------------------|
| Voltage (V)                                      | Frequency Error (Hz) | Frequency Error (ppm) |
| 3.4                                              | 16                   | 0.0191                |
| 3.7                                              | 14                   | 0.0167                |
| 4.2                                              | 12                   | 0.0143                |

| Frequency Error Against Temperature for GPRS850 band |                      |                       |
|------------------------------------------------------|----------------------|-----------------------|
| Temperature (°C)                                     | Frequency Error (Hz) | Frequency Error (ppm) |
| -30                                                  | 18                   | 0.0215                |
| -20                                                  | 15                   | 0.0179                |
| -10                                                  | 11                   | 0.0131                |
| 0                                                    | 16                   | 0.0191                |
| 10                                                   | 21                   | 0.0251                |
| 20                                                   | 20                   | 0.0239                |
| 30                                                   | 16                   | 0.0191                |
| 40                                                   | 14                   | 0.0167                |
| 50                                                   | 11                   | 0.0131                |

Note:

1. Normal Voltage = 3.7V; Battery End Point (BEP) = 3.4V; Maximum Voltage =4.2V
2. The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.

| Frequency Error Against Voltage for PCS 1900 band |                      |                       |
|---------------------------------------------------|----------------------|-----------------------|
| Voltage (V)                                       | Frequency Error (Hz) | Frequency Error (ppm) |
| 3.4                                               | 12                   | 0.0064                |
| 3.7                                               | 14                   | 0.0074                |
| 4.2                                               | 13                   | 0.0069                |

| Frequency Error Against Temperature for PCS 1900 band |                      |                       |
|-------------------------------------------------------|----------------------|-----------------------|
| Temperature (°C)                                      | Frequency Error (Hz) | Frequency Error (ppm) |
| -30                                                   | 13                   | 0.0069                |
| -20                                                   | 14                   | 0.0074                |
| -10                                                   | 16                   | 0.0085                |
| 0                                                     | 21                   | 0.0112                |
| 10                                                    | 13                   | 0.0069                |
| 20                                                    | 13                   | 0.0069                |
| 30                                                    | 14                   | 0.0074                |
| 40                                                    | 11                   | 0.0059                |
| 50                                                    | 18                   | 0.0096                |

| Frequency Error Against Voltage for GPRS1900 band |                      |                       |
|---------------------------------------------------|----------------------|-----------------------|
| Voltage (V)                                       | Frequency Error (Hz) | Frequency Error (ppm) |
| 3.4                                               | 26                   | 0.0138                |
| 3.7                                               | 20                   | 0.0106                |
| 4.2                                               | 16                   | 0.0085                |

| Frequency Error Against Temperature for GPRS1900 band |                      |                       |
|-------------------------------------------------------|----------------------|-----------------------|
| Temperature (°C)                                      | Frequency Error (Hz) | Frequency Error (ppm) |
| -30                                                   | 14                   | 0.0074                |
| -20                                                   | 22                   | 0.0117                |
| -10                                                   | 19                   | 0.0101                |
| 0                                                     | 17                   | 0.0090                |
| 10                                                    | 15                   | 0.0080                |
| 20                                                    | 21                   | 0.0112                |
| 30                                                    | 20                   | 0.0106                |
| 40                                                    | 24                   | 0.0128                |
| 50                                                    | 25                   | 0.0133                |

Note:

1. Normal Voltage = 3.7V; Battery End Point (BEP) = 3.4V; Maximum Voltage =4.2V
2. The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.

| Frequency Error Against Voltage for UMTS band II |                      |                       |
|--------------------------------------------------|----------------------|-----------------------|
| Voltage (V)                                      | Frequency Error (Hz) | Frequency Error (ppm) |
| 3.4                                              | 13                   | 0.0069                |
| 3.7                                              | 10                   | 0.0053                |
| 4.2                                              | 14                   | 0.0074                |

| Frequency Error Against Temperature for UMTS band II |                      |                       |
|------------------------------------------------------|----------------------|-----------------------|
| Temperature (°C)                                     | Frequency Error (Hz) | Frequency Error (ppm) |
| -30                                                  | 20                   | 0.0106                |
| -20                                                  | 19                   | 0.0101                |
| -10                                                  | 17                   | 0.0090                |
| 0                                                    | 14                   | 0.0074                |
| 10                                                   | 16                   | 0.0085                |
| 20                                                   | 14                   | 0.0074                |
| 30                                                   | 15                   | 0.0080                |
| 40                                                   | 10                   | 0.0053                |
| 50                                                   | 18                   | 0.0096                |

| Frequency Error Against Voltage for UMTS band V |                      |                       |
|-------------------------------------------------|----------------------|-----------------------|
| Voltage (V)                                     | Frequency Error (Hz) | Frequency Error (ppm) |
| 3.4                                             | 13                   | 0.0155                |
| 3.7                                             | 10                   | 0.0120                |
| 4.2                                             | 17                   | 0.0203                |

| Frequency Error Against Temperature for UMTS band V |                      |                       |
|-----------------------------------------------------|----------------------|-----------------------|
| Temperature (°C)                                    | Frequency Error (Hz) | Frequency Error (ppm) |
| -30                                                 | 17                   | 0.0203                |
| -20                                                 | 13                   | 0.0155                |
| -10                                                 | 14                   | 0.0167                |
| 0                                                   | 16                   | 0.0191                |
| 10                                                  | 17                   | 0.0203                |
| 20                                                  | 22                   | 0.0263                |
| 30                                                  | 13                   | 0.0155                |
| 40                                                  | 12                   | 0.0143                |
| 50                                                  | 14                   | 0.0167                |

Note:

1. Normal Voltage = 3.7V; Battery End Point (BEP) = 3.4V; Maximum Voltage = 4.2V
2. The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.

## 7.5 PEAK-TO-AVERAGE RATIO

### 7.5.1 Applicable Standard

According to FCC 22.913 and FCC 24.232(d) and FCC KDB 971168 D01 Section 5.7.1

### 7.5.2 Conformance Limit

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

### 7.5.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

### 7.5.4 Test Setup

Please refer to Section 6.1 of this test report.

### 7.5.5 Test Procedure

The EUT was connected to Spectrum Analyzer and Base Station via power divider.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set the number of counts to a value that stabilizes the measured CCDF curve.

Set the measurement interval to 1 ms.

Record the maximum PAPR level associated with a probability of 0.1%.

a) Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;

b) Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;

c) Set the number of counts to a value that stabilizes the measured CCDF curve;

d) Set the measurement interval as follows:

1) for continuous transmissions, set to 1 ms,

2) for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.

e) Record the maximum PAPR level associated with a probability of 0.1%.

### 7.5.6 Test Results

|               |                                                              |                    |           |
|---------------|--------------------------------------------------------------|--------------------|-----------|
| EUT:          | Global Hub                                                   | Model No.:         | CSH-0301  |
| Temperature:  | 20 °C                                                        | Relative Humidity: | 48%       |
| Test Mode:    | GSM/GPRS 850/<br>GSM/GPRS 1900<br>/UMTS band II/ UMTS band V | Test By:           | Loren Luo |
| Results: PASS |                                                              |                    |           |

| Cellular Band                    |              |              |               |              |              |               |
|----------------------------------|--------------|--------------|---------------|--------------|--------------|---------------|
| Modes                            | GSM850       |              |               | GSM1900      |              |               |
| Channel                          | 128<br>(Low) | 190<br>(Mid) | 251<br>(High) | 512<br>(Low) | 661<br>(Mid) | 810<br>(High) |
| Frequency(MHz)                   | 824.2        | 836.6        | 848.8         | 1850.2       | 1880         | 1909.8        |
| Peak-to-Average<br>Ratio<br>(dB) | 2.68         | 2.66         | 2.65          | 2.66         | 2.66         | 2.66          |

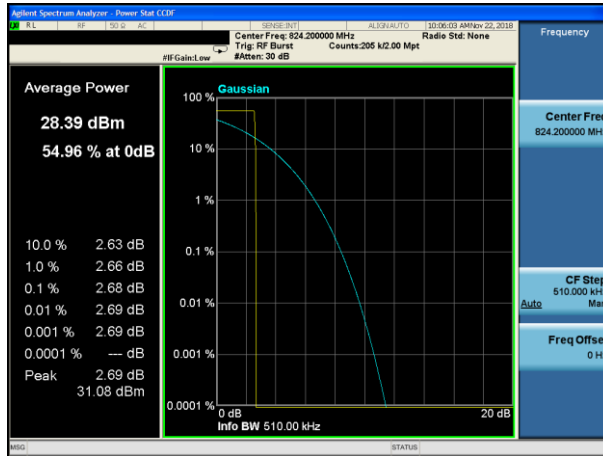
| Cellular Band                    |              |              |               |              |              |               |
|----------------------------------|--------------|--------------|---------------|--------------|--------------|---------------|
| Modes                            | GPRS850      |              |               | GPRS1900     |              |               |
| Channel                          | 128<br>(Low) | 190<br>(Mid) | 251<br>(High) | 512<br>(Low) | 661<br>(Mid) | 810<br>(High) |
| Frequency(MHz)                   | 824.2        | 836.6        | 848.8         | 1850.2       | 1880         | 1909.8        |
| Peak-to-Average<br>Ratio<br>(dB) | 2.69         | 2.69         | 2.70          | 2.66         | 2.66         | 2.67          |

| UMTS Band                        |                                 |               |                |                                |               |                |
|----------------------------------|---------------------------------|---------------|----------------|--------------------------------|---------------|----------------|
| Modes                            | WCDMA Band II<br>(RMC 12.2Kbps) |               |                | WCDMA Band V<br>(RMC 12.2Kbps) |               |                |
| Channel                          | 9262<br>(Low)                   | 9400<br>(Mid) | 9538<br>(High) | 4132<br>(Low)                  | 4175<br>(Mid) | 4233<br>(High) |
| Frequency(MHz)                   | 1852.4                          | 1880          | 1907.6         | 826.4                          | 836.6         | 846.6          |
| Peak-to-Average<br>Ratio<br>(dB) | 2.72                            | 2.76          | 2.62           | 3.18                           | 3.15          | 3.13           |

# Test plot

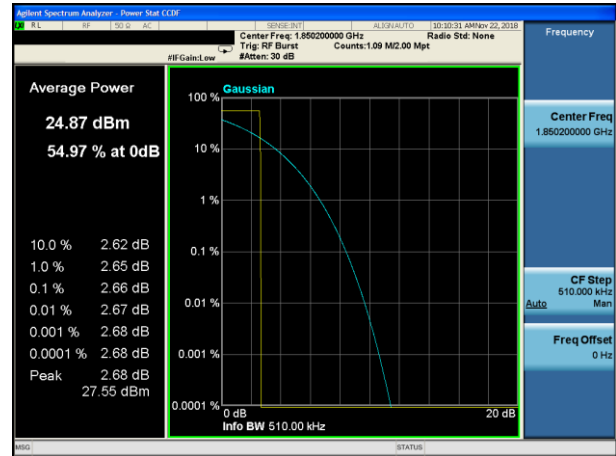
(GSM 850)

Peak-to-Average Ratio on channel 128

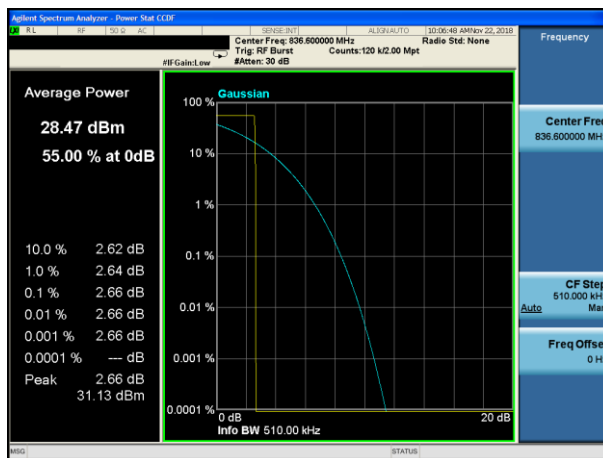


(GSM 1900)

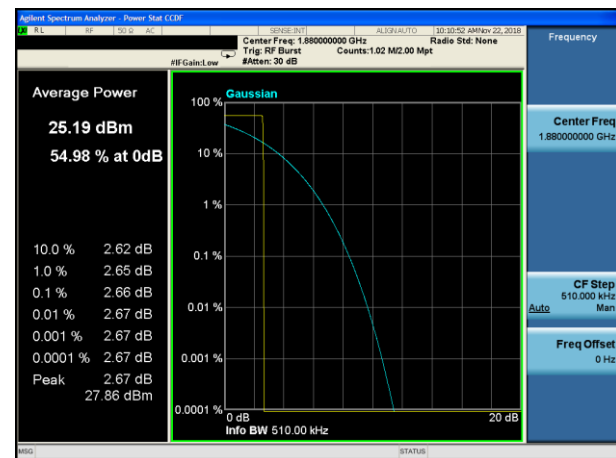
Peak-to-Average Ratio on channel 512



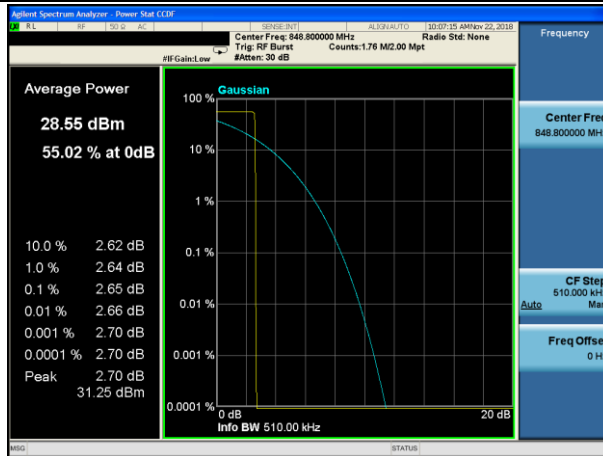
Peak-to-Average Ratio on channel 190



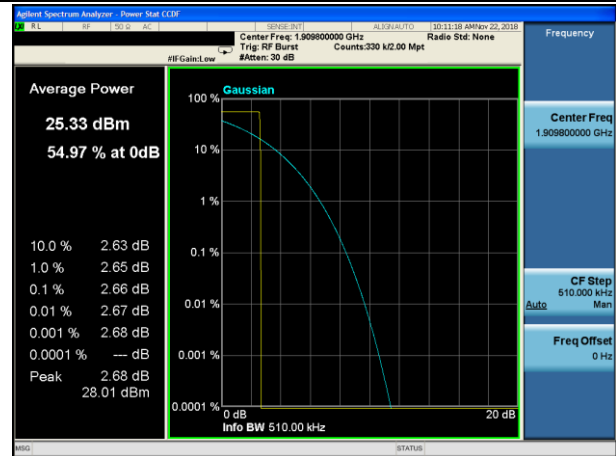
Peak-to-Average Ratio on channel 661



Peak-to-Average Ratio on channel 251



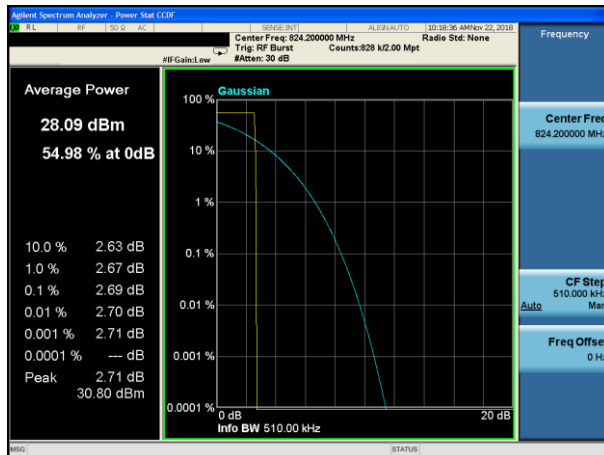
Peak-to-Average Ratio on channel 810



### Test plot

(GPRS 850)

Peak-to-Average Ratio on channel 128

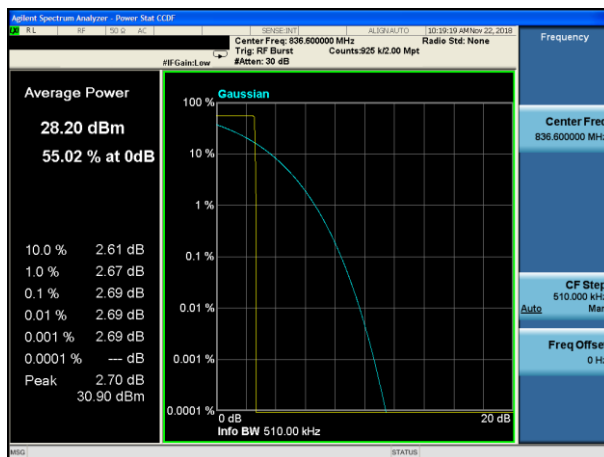


(GPRS 1900)

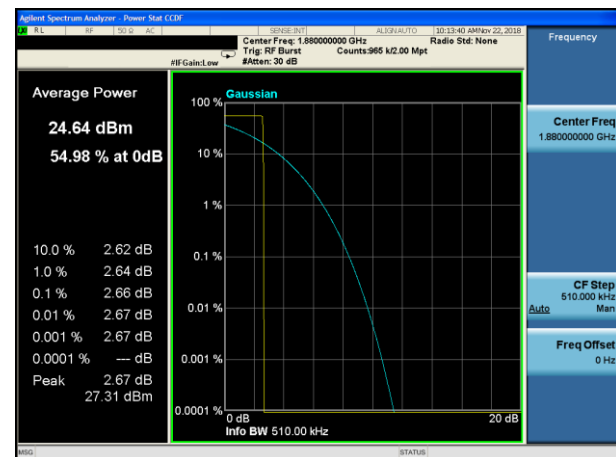
Peak-to-Average Ratio on channel 512



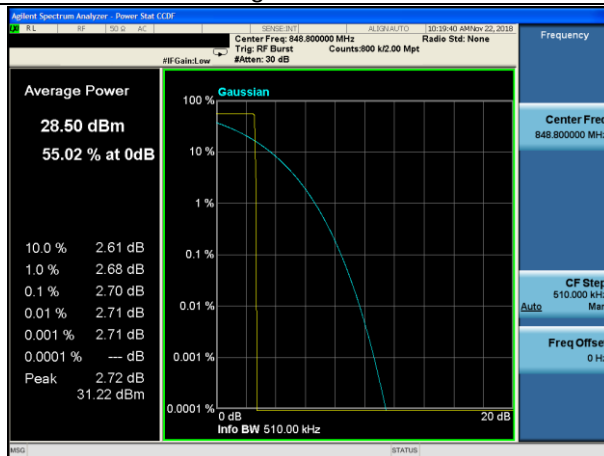
Peak-to-Average Ratio on channel 190



Peak-to-Average Ratio on channel 661



Peak-to-Average Ratio on channel 251



Peak-to-Average Ratio on channel 810



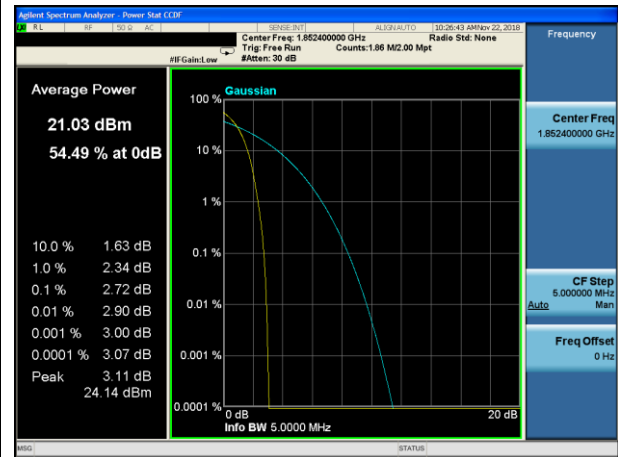
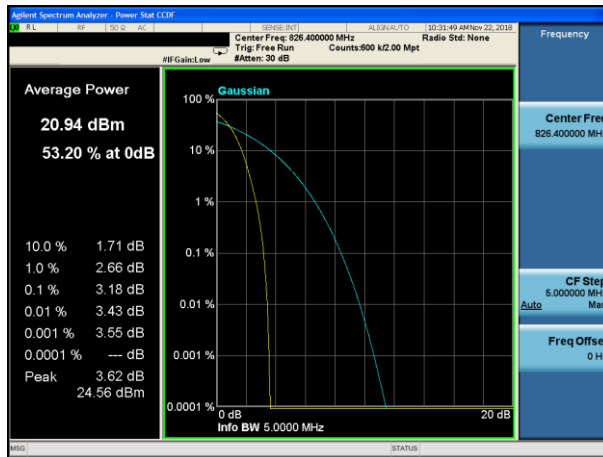
# Test plot

## UMTS Band V

## UMTS Band II

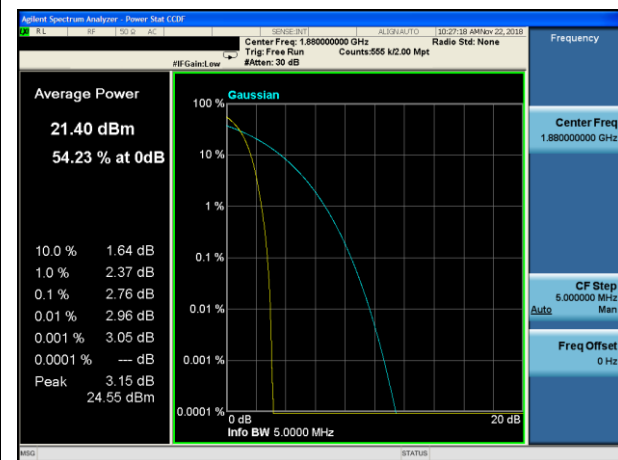
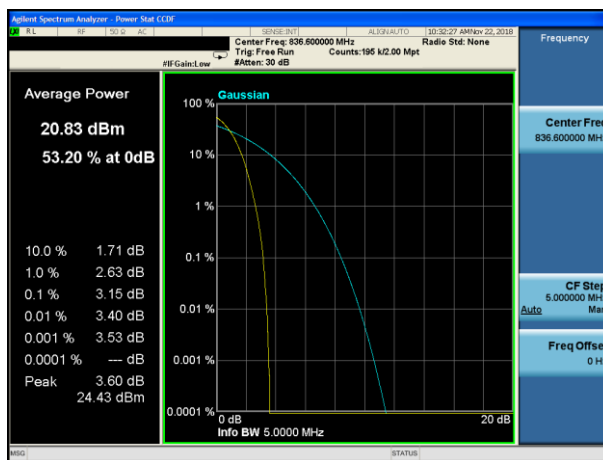
### Peak-to-Average Ratio on channel 4132

### Peak-to-Average Ratio on channel 9262



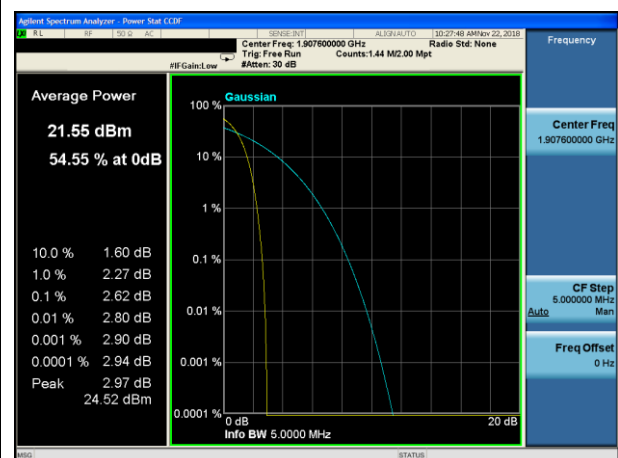
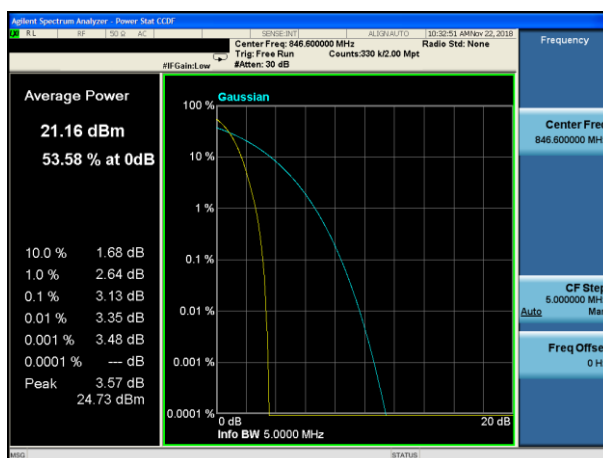
### Peak-to-Average Ratio on channel 4183

### Peak-to-Average Ratio on channel 9400



### Peak-to-Average Ratio on channel 4233

### Peak-to-Average Ratio on channel 9538



## 7.6 26DB BANDWIDTH AND 99% OCCUPIED BANDWIDTH

### 7.6.1 Applicable Standard

According to FCC Part 2.1049 and FCC Part 22H and FCC Part 24E and FCC KDB 971168 D01 Section 4.0

### 7.6.2 Conformance Limit

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

### 7.6.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

### 7.6.4 Test Setup

Please refer to Section 6.1 of this test report.

### 7.6.5 Test Procedure

The testing follows FCC KDB 971168 v03 Section 4.0.

The EUT was connected to Spectrum Analyzer and Base Station via power divider.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.

The nominal resolution bandwidth (RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.

Set the detection mode to peak, and the trace mode to max hold.

Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace.

(this is the reference value)

Determine the “-26 dB down amplitude” as equal to (Reference Value – X).

Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.

Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

## 7.6.6 Test Results

|               |                                                              |                    |           |
|---------------|--------------------------------------------------------------|--------------------|-----------|
| EUT:          | Global Hub                                                   | Model No.:         | CSH-0301  |
| Temperature:  | 20 °C                                                        | Relative Humidity: | 48%       |
| Test Mode:    | GSM/GPRS 850/<br>GSM/GPRS 1900<br>/UMTS band II/ UMTS band V | Test By:           | Loren Luo |
| Results: PASS |                                                              |                    |           |

| Operation Mode | Channel Number | Channel Frequency (MHz) | 26dB Bandwidth (kHz) | 99% Occupied Bandwidth (kHz) | Limit (kHz) | Verdict |
|----------------|----------------|-------------------------|----------------------|------------------------------|-------------|---------|
| GSM850         | 128            | 824.2                   | 313.3                | 243.41                       | N/A         | PASS    |
|                | 190            | 836.6                   | 316.9                | 241.44                       | N/A         | PASS    |
|                | 251            | 848.8                   | 315.8                | 243.59                       | N/A         | PASS    |
| GSM1900        | 512            | 1850.2                  | 313.5                | 245.68                       | N/A         | PASS    |
|                | 661            | 1880.0                  | 316.2                | 242.94                       | N/A         | PASS    |
|                | 810            | 1909.8                  | 318.6                | 242.83                       | N/A         | PASS    |
| GPRS850        | 128            | 824.2                   | 322.0                | 246.05                       | N/A         | PASS    |
|                | 190            | 836.6                   | 316.8                | 242.94                       | N/A         | PASS    |
|                | 251            | 848.8                   | 317.0                | 243.41                       | N/A         | PASS    |
| GPRS1900       | 512            | 1850.2                  | 311.1                | 241.76                       | N/A         | PASS    |
|                | 661            | 1880.0                  | 312.0                | 244.79                       | N/A         | PASS    |
|                | 810            | 1909.8                  | 324.9                | 247.84                       | N/A         | PASS    |
| UMTS Band V    | 4132           | 826.4                   | 4703                 | 4133.6                       | N/A         | PASS    |
|                | 4183           | 836.6                   | 4706                 | 4128.9                       | N/A         | PASS    |
|                | 4233           | 846.6                   | 4699                 | 4125.5                       | N/A         | PASS    |
| UMTS Band II   | 9262           | 1852.4                  | 4728                 | 4144.2                       | N/A         | PASS    |
|                | 9400           | 1880.0                  | 4737                 | 4150.2                       | N/A         | PASS    |
|                | 9538           | 1907.6                  | 4732                 | 4151.8                       | N/A         | PASS    |

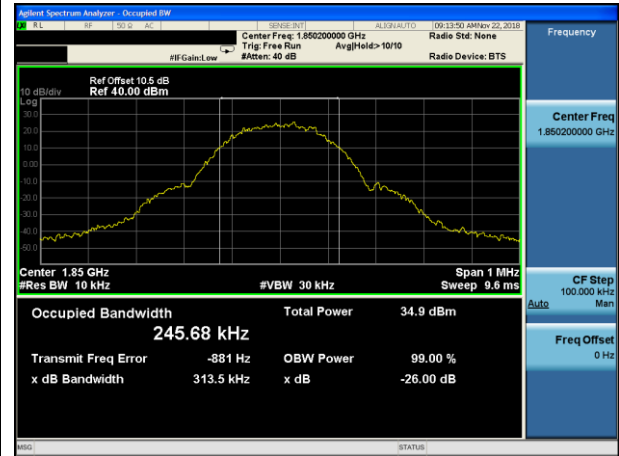
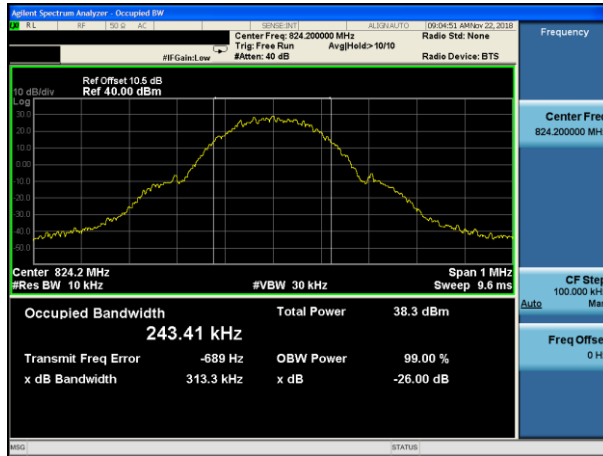
### Test plot

(GSM850)

(GSM1900)

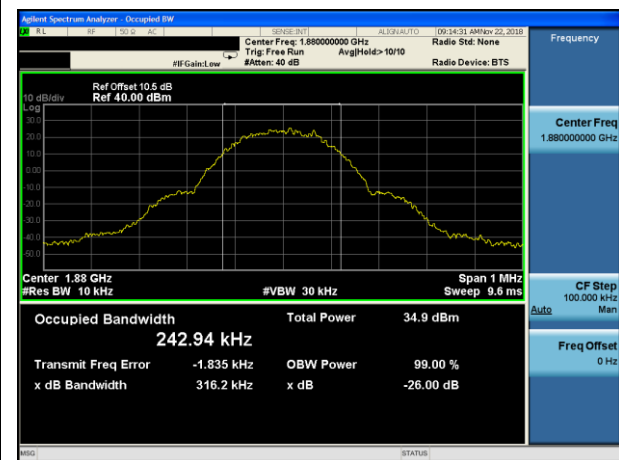
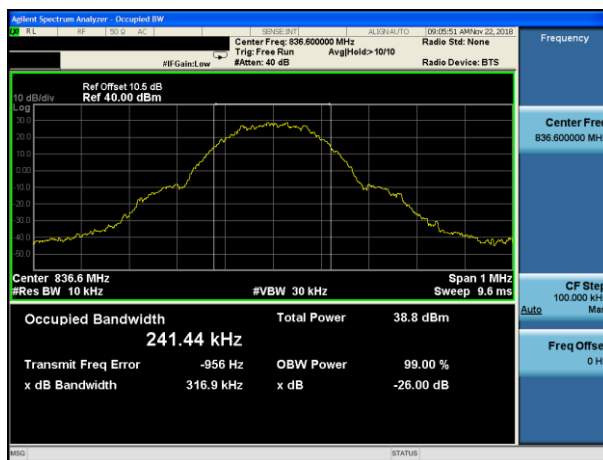
-26dB&99% Bandwidth plot on channel 128

-26dB&99% Bandwidth plot on channel 512



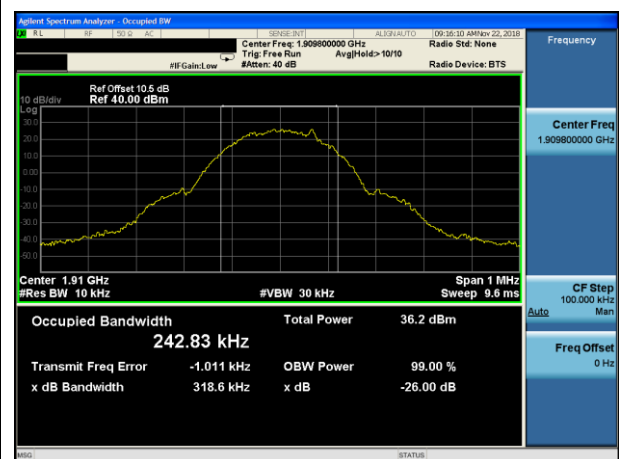
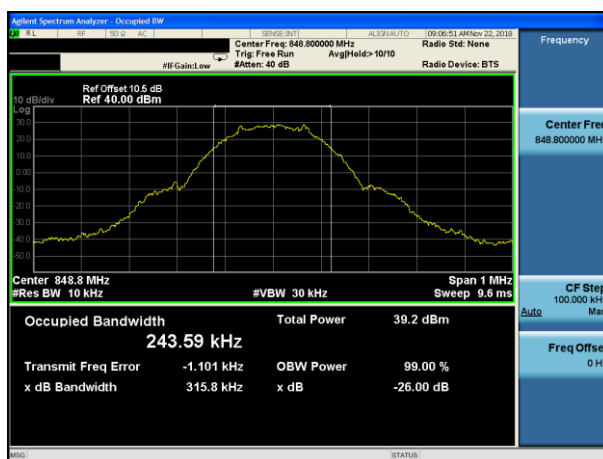
-26dB&99% Bandwidth plot on channel 190

-26dB&99% Bandwidth plot on channel 661



-26dB&99% Bandwidth plot on channel 251

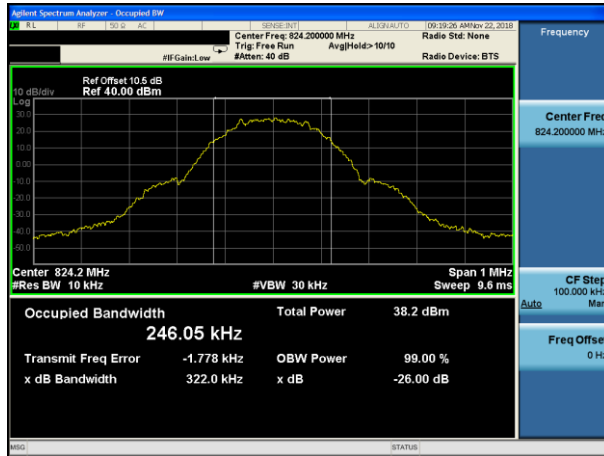
-26dB&99% Bandwidth plot on channel 810



### Test plot

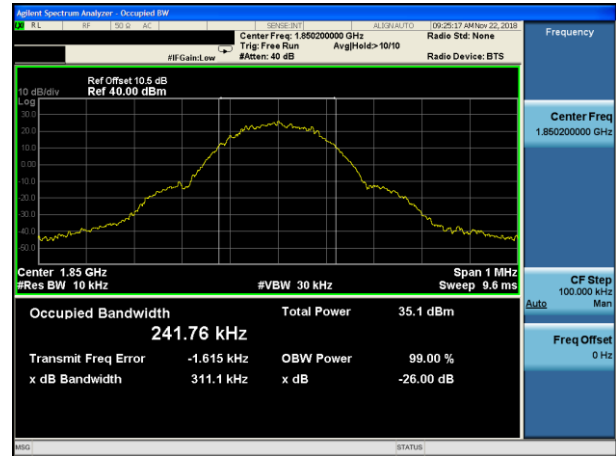
(GPRS 850)

-26dB&99% Bandwidth plot on channel 128

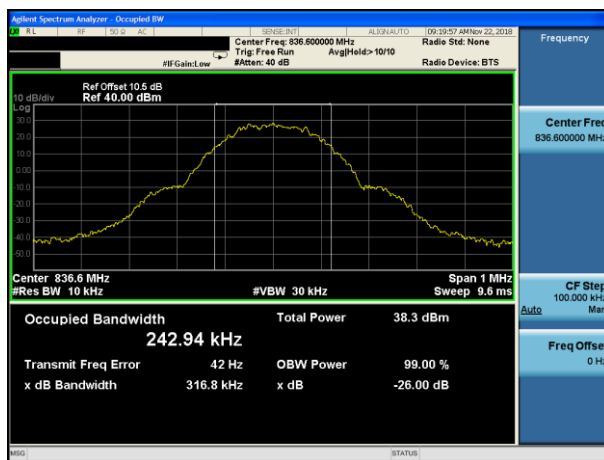


(GPRS1900)

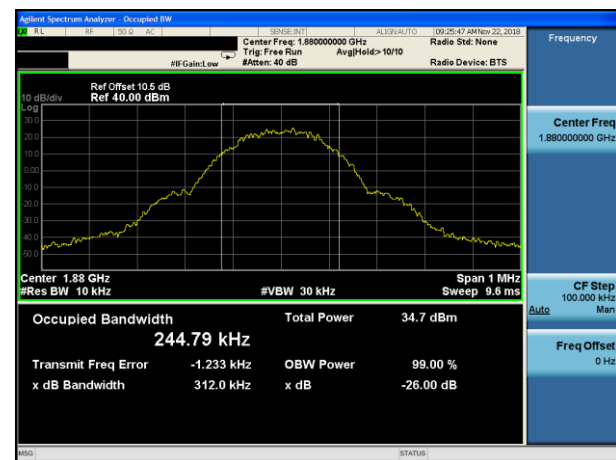
-26dB&99% Bandwidth plot on channel 512



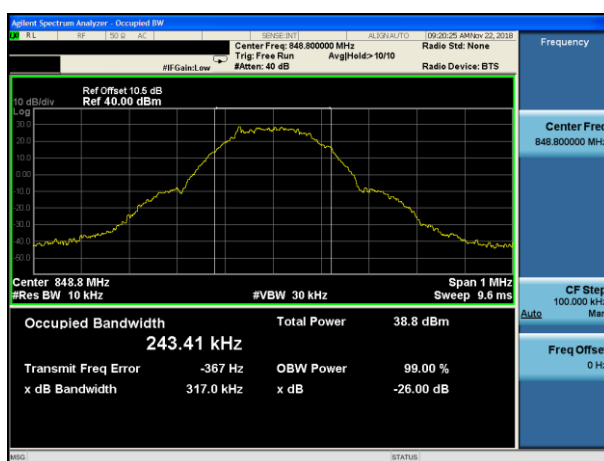
-26dB&99% Bandwidth plot on channel 190



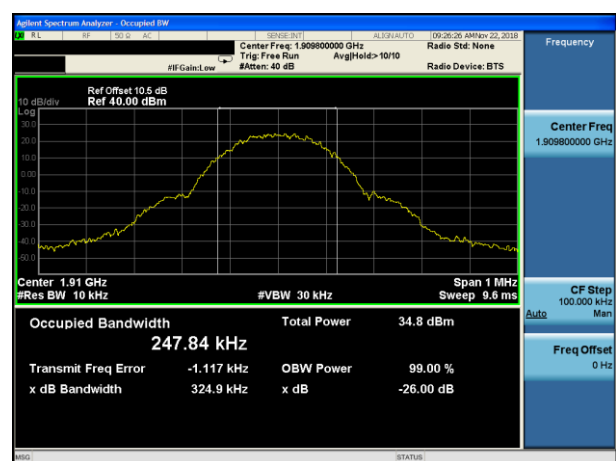
-26dB&99% Bandwidth plot on channel 661



-26dB&99% Bandwidth plot on channel 251



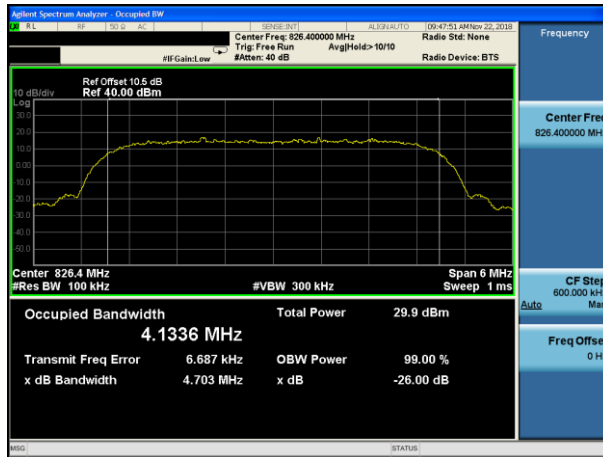
-26dB&99% Bandwidth plot on channel 810



# Test plot

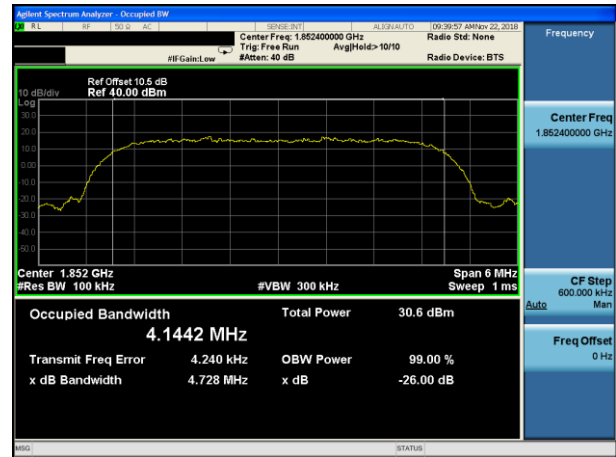
## UMTS Band V

### -26dB&99% Bandwidth plot on channel 4132

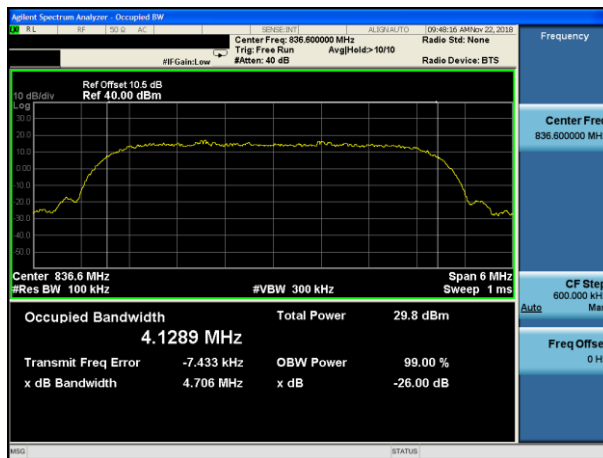


## UMTS Band II

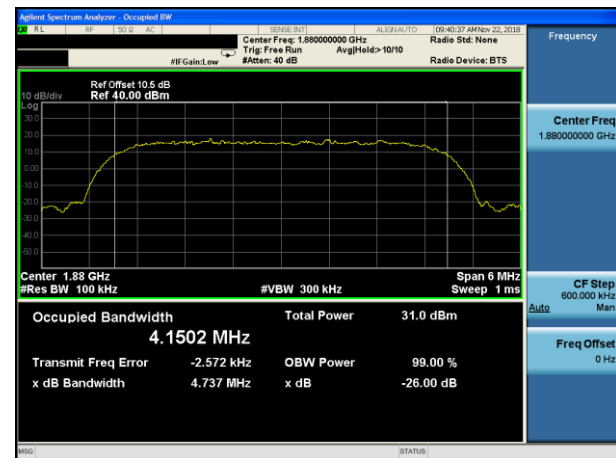
### -26dB&99% Bandwidth plot on channel 9262



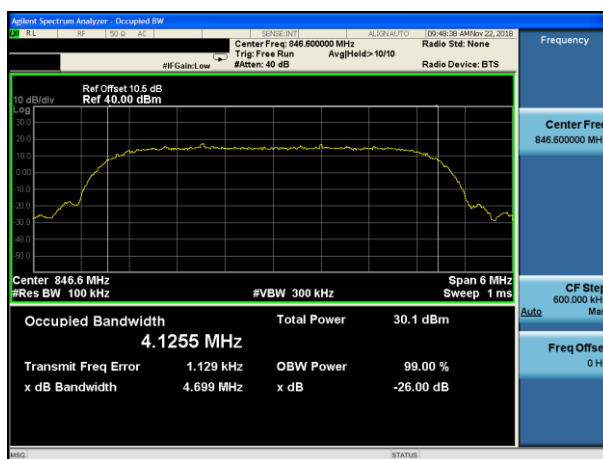
### -26dB&99% Bandwidth plot on channel 4183



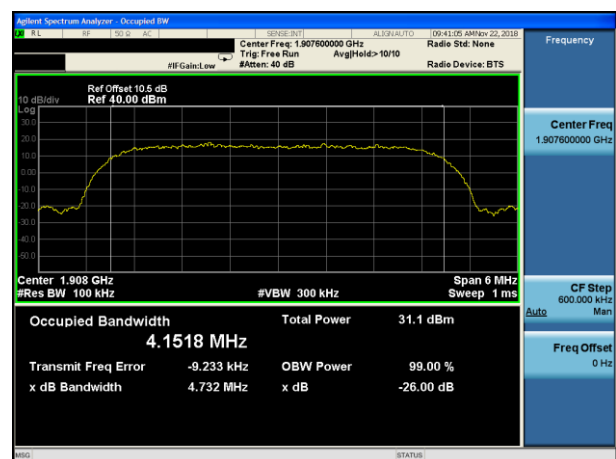
### -26dB&99% Bandwidth plot on channel 9400



### -26dB&99% Bandwidth plot on channel 4233



### -26dB&99% Bandwidth plot on channel 9538



## 7.7 CONDUCTED BAND EDGE

### 7.7.1 Applicable Standard

According to FCC Part 2.1051 and FCC Part 22.917(a) and 24.238(a) and FCC KDB 971168 D01 Section 6.0

### 7.7.2 Conformance Limit

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 7.7.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

### 7.7.4 Test Setup

Please refer to Section 6.1 of this test report.

### 7.7.5 Test Procedure

The testing follows FCC KDB 971168 v03 Section 6.0.

The EUT was connected to Spectrum Analyzer and Base Station via power divider.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

The band edges of low and high channels for the highest RF powers were measured.

The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from  $43 + 10 \log(P)$  dB below the transmitter power P(Watts)

$$= P(W) - [43 + 10 \log(P)] \text{ (dB)}$$

$$= [30 + 10 \log(P)] \text{ (dBm)} - [43 + 10 \log(P)] \text{ (dB)}$$

$$= -13 \text{ dBm.}$$

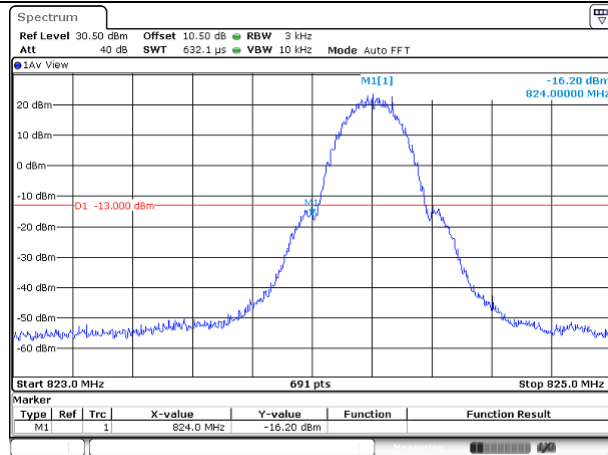
### 7.7.6 Test Results

|               |                                                              |                    |           |
|---------------|--------------------------------------------------------------|--------------------|-----------|
| EUT:          | Global Hub                                                   | Model No.:         | CSH-0301  |
| Temperature:  | 20 °C                                                        | Relative Humidity: | 48%       |
| Test Mode:    | GSM/GPRS 850/<br>GSM/GPRS 1900/<br>UMTS band II/ UMTS band V | Test By:           | Loren Luo |
| Results: PASS |                                                              |                    |           |

### Test plot For

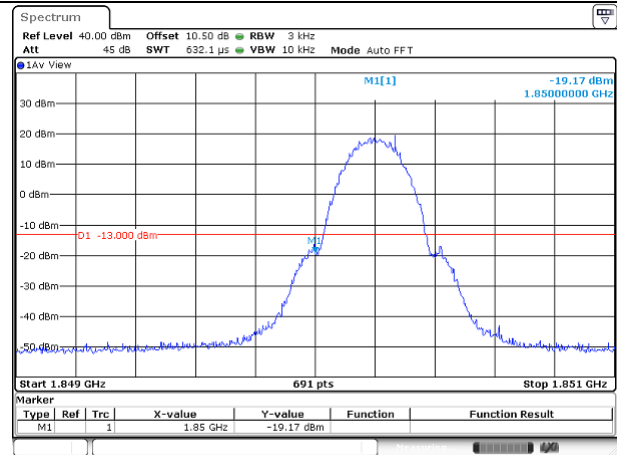
(GSM850)

Conducted Band Edge plot on channel 128

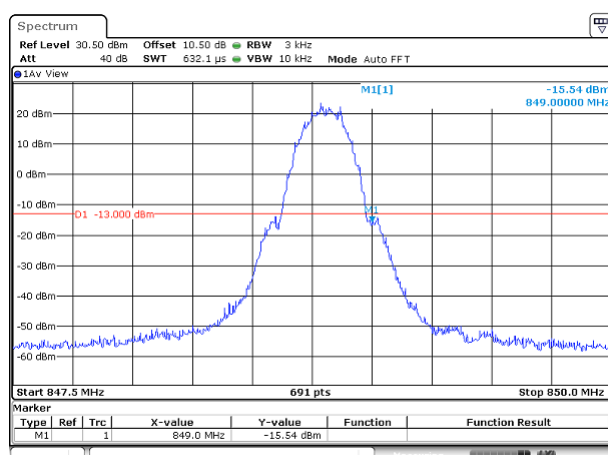


(GSM1900)

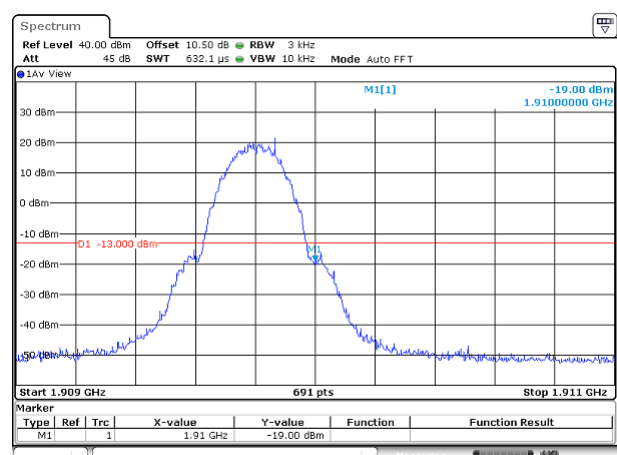
Conducted Band Edge plot on channel 512



Conducted Band Edge plot on channel 251



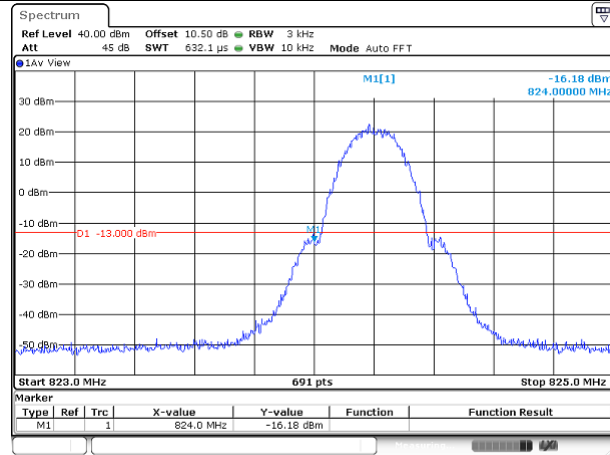
Conducted Band Edge plot on channel 810



Test plot For

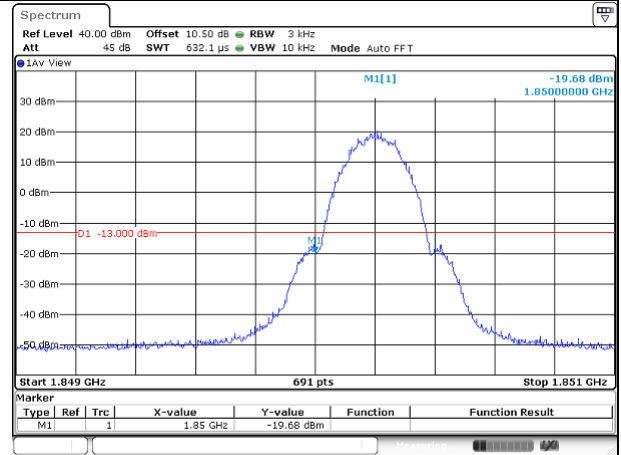
(GPRS850)

Conducted Band Edge plot on channel 128

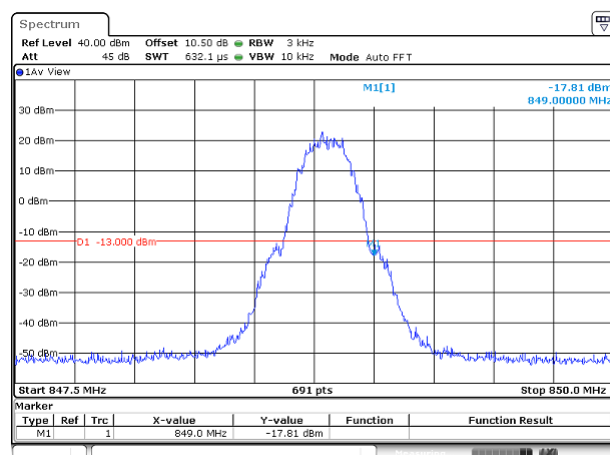


(GPRS1900)

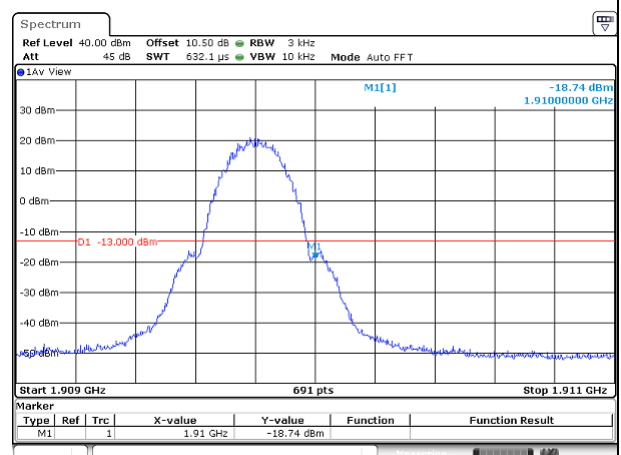
Conducted Band Edge plot on channel 512



Conducted Band Edge plot on channel 251



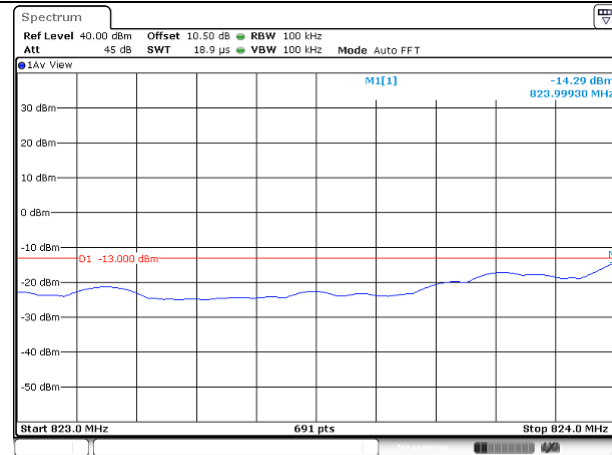
Conducted Band Edge plot on channel 810



### Test plot For

#### UMTS Band V

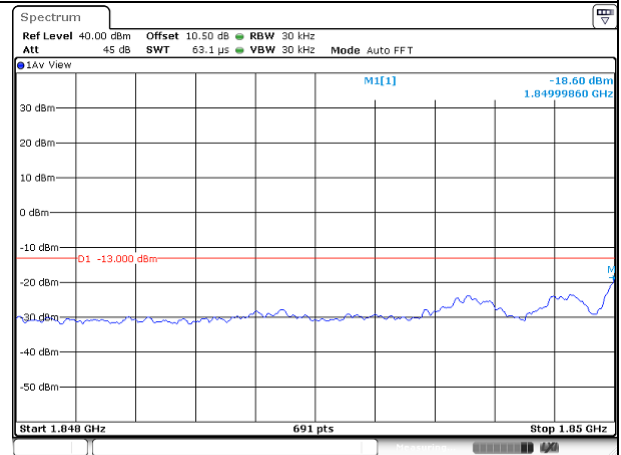
#### Conducted Band Edge plot on channel 4132



Date: 19.NOV.2018 19:06:22

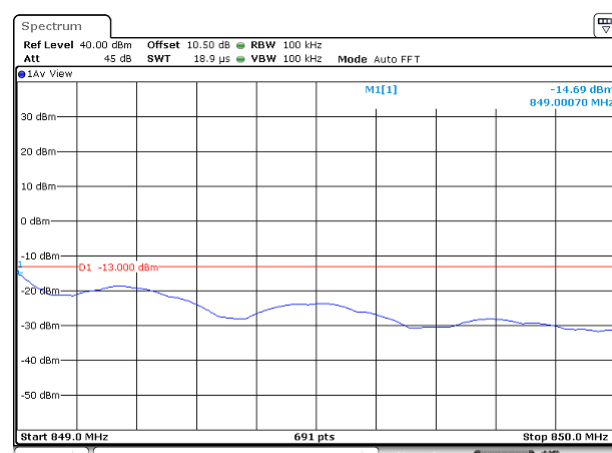
#### UMTS Band II

#### Conducted Band Edge plot on channel 9262



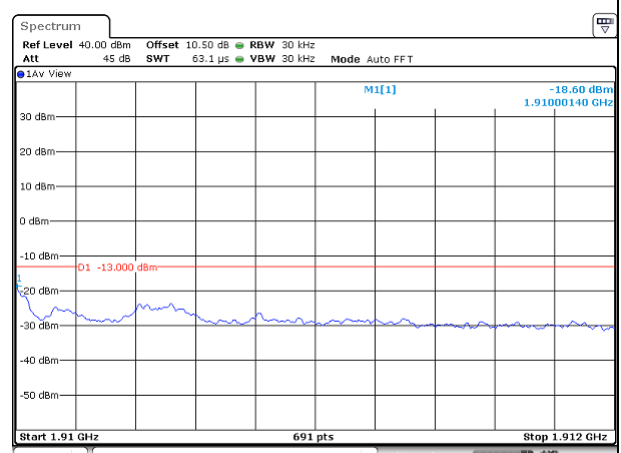
Date: 19.NOV.2018 11:27:48

#### Conducted Band Edge plot on channel 4233



Date: 19.NOV.2018 19:07:39

#### Conducted Band Edge plot on channel 9538



Date: 19.NOV.2018 11:29:39

## 7.8 CONDUCTED SPURIOUS EMISSION AT ANTENNA TERMINAL

### 7.8.1 Applicable Standard

According to FCC Part 2.1051 and FCC Part 22.917(a) and Part 24.238(a) and FCC KDB 971168 D01 Section 6.0

### 7.8.2 Conformance Limit

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

### 7.8.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

### 7.8.4 Test Setup

Please refer to Section 6.1 of this test report.

### 7.8.5 Test Procedure

The testing follows FCC KDB 971168 v03 Section 6.0.

The EUT was connected to Spectrum Analyzer and Base Station via power divider.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

The middle channel for the highest RF power within the transmitting frequency was measured.

The conducted spurious emission for the whole frequency range was taken.

The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from  $43 + 10\log(P)$  dB below the transmitter power P(Watts)

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$

$$= -13\text{dBm}.$$

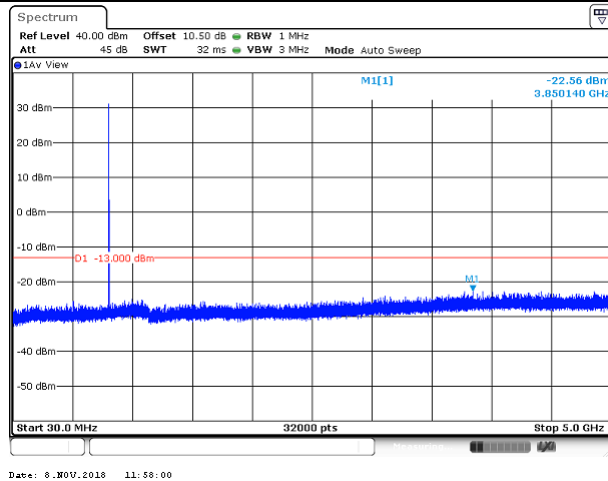
### 7.8.6 Test Results

|               |                                                              |                    |           |
|---------------|--------------------------------------------------------------|--------------------|-----------|
| EUT:          | Global Hub                                                   | Model No.:         | CSH-0301  |
| Temperature:  | 20 °C                                                        | Relative Humidity: | 48%       |
| Test Mode:    | GSM/GPRS 850/<br>GSM/GPRS 1900/<br>UMTS band II/ UMTS band V | Test By:           | Loren Luo |
| Results: PASS |                                                              |                    |           |

# Test Plot

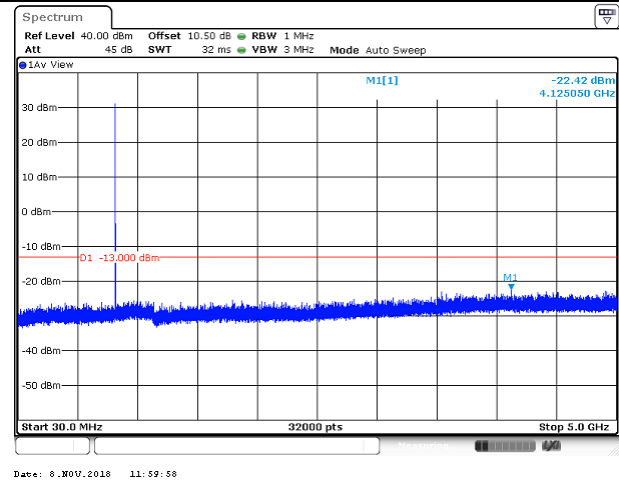
GSM850

Conducted Emission Transmitting Mode CH 128  
30MHz – 5GHz

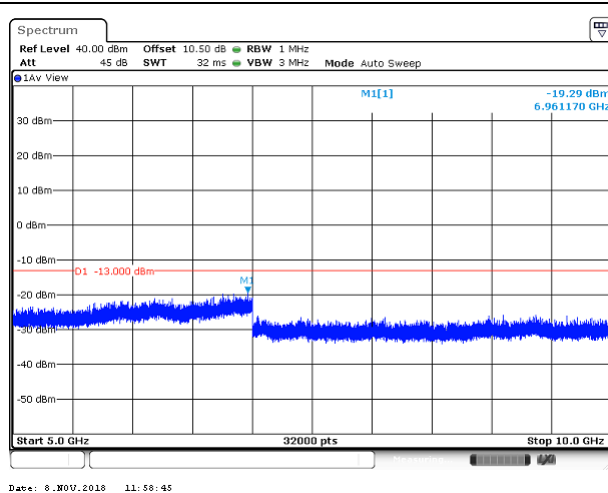


GSM850

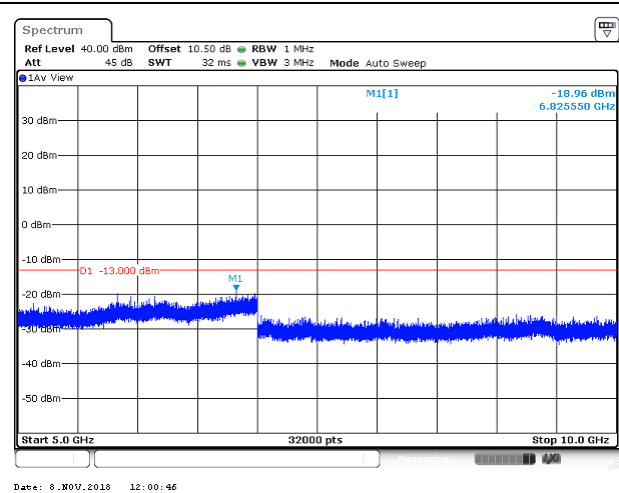
Conducted Emission Transmitting Mode CH 190  
30MHz – 5GHz



Conducted Emission Transmitting Mode CH 128  
5GHz – 10GHz



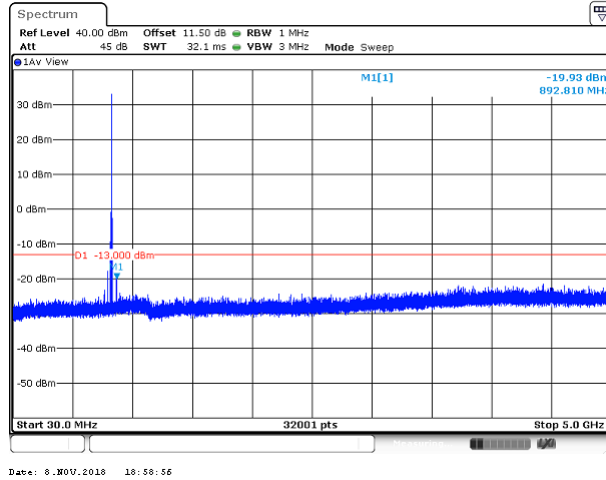
Conducted Emission Transmitting Mode CH 190  
5GHz – 10GHz



### Test Plot

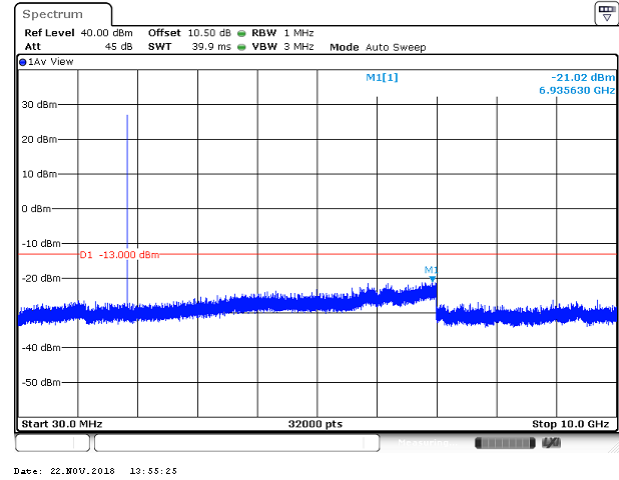
#### GSM850

#### Conducted Emission Transmitting Mode CH 251 30MHz – 5GHz

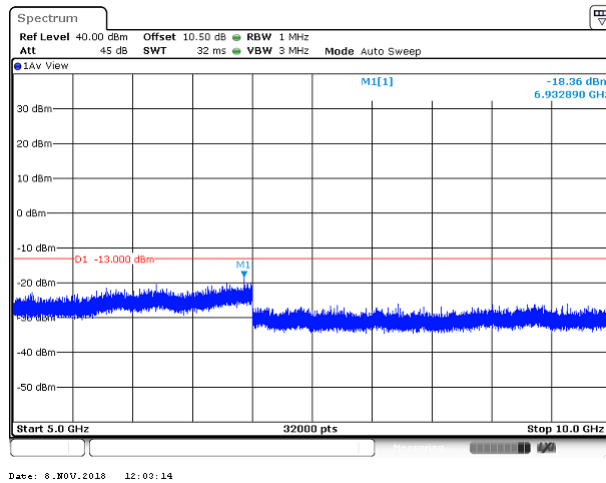


#### GSM1900

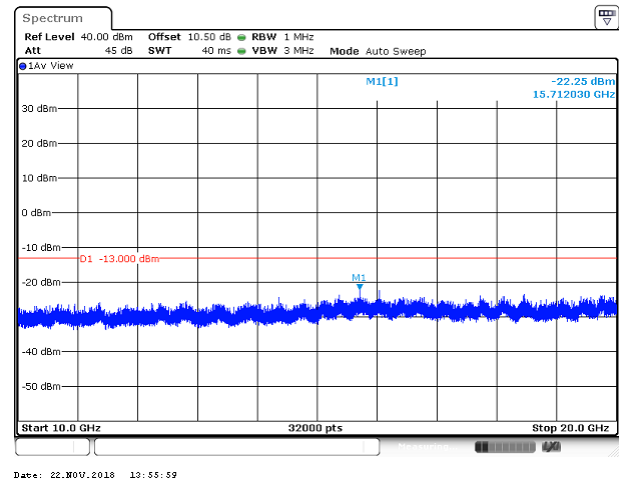
#### Conducted Emission Transmitting Mode CH 512 30MHz – 10GHz



#### Conducted Emission Transmitting Mode CH 251 5GHz – 10GHz



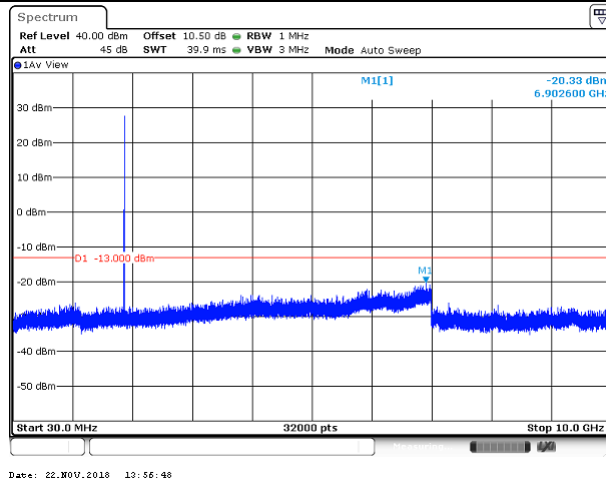
#### Conducted Emission Transmitting Mode CH 512 10GHz – 20GHz



### Test Plot

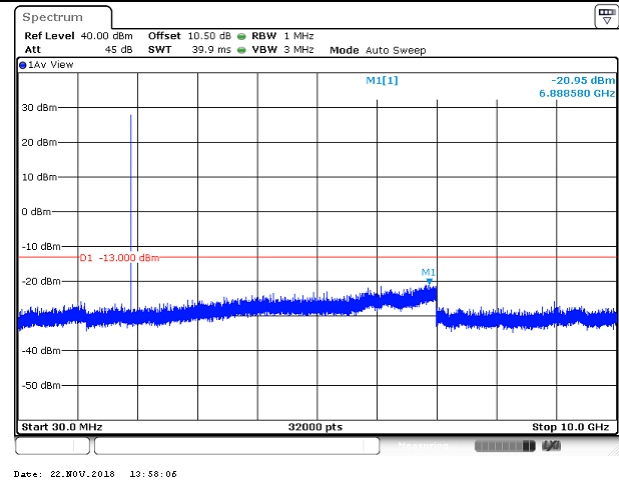
GSM1900

Conducted Emission Transmitting Mode CH 661  
30MHz – 10GHz

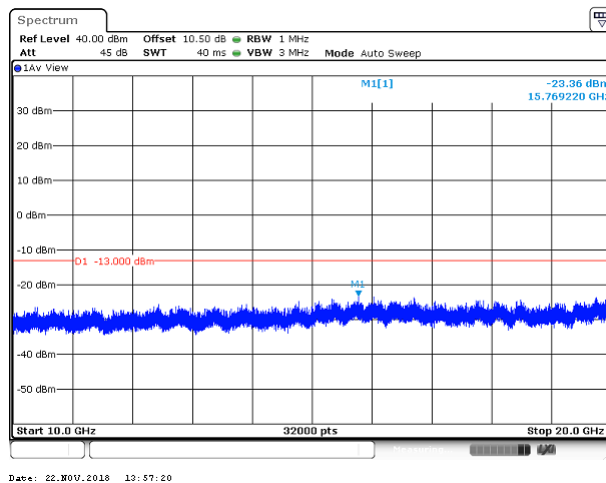


GSM1900

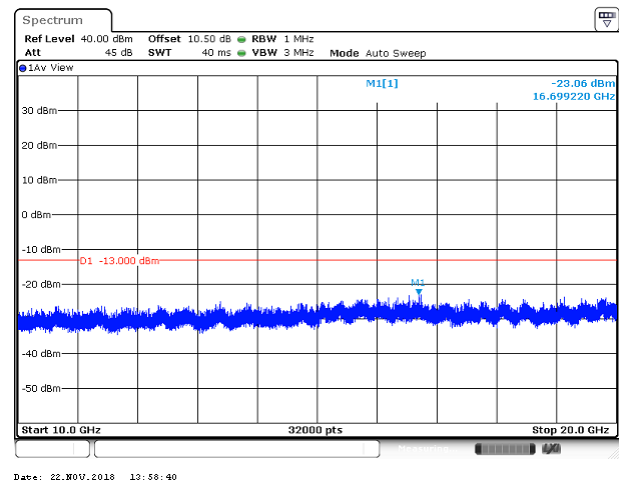
Conducted Emission Transmitting Mode CH 810  
30MHz – 10GHz



Conducted Emission Transmitting Mode CH 661  
10GHz – 20GHz



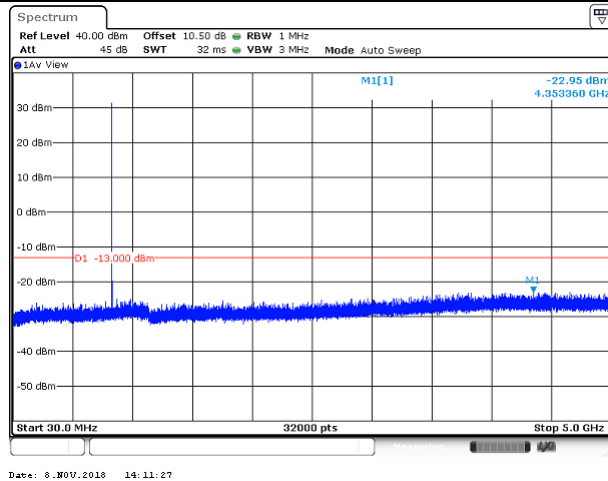
Conducted Emission Transmitting Mode CH 810  
10GHz – 20GHz



Test Plot

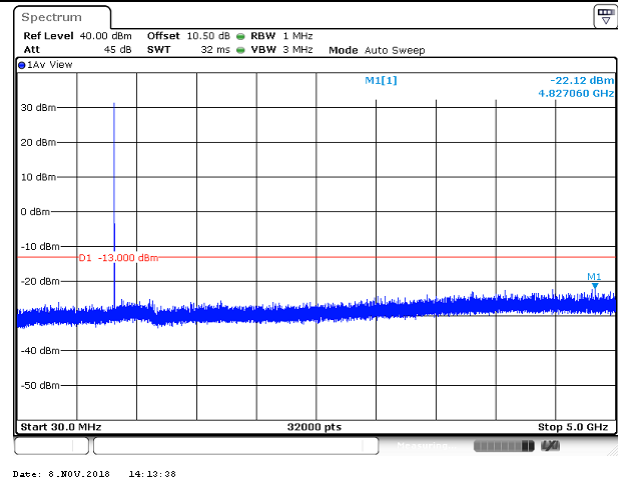
GPRS850

Conducted Emission Transmitting Mode CH 128  
30MHz – 5GHz

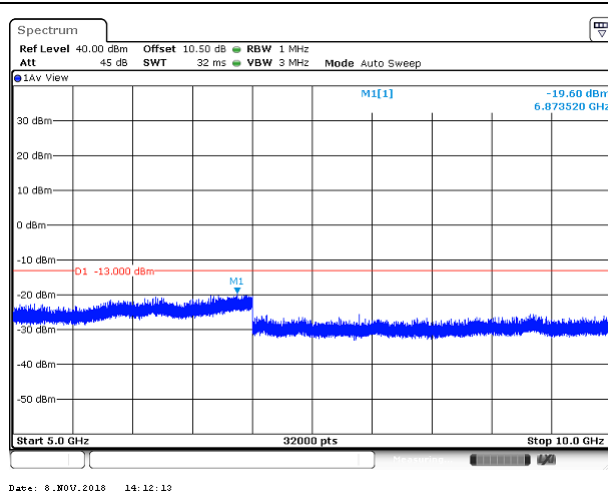


GPRS850

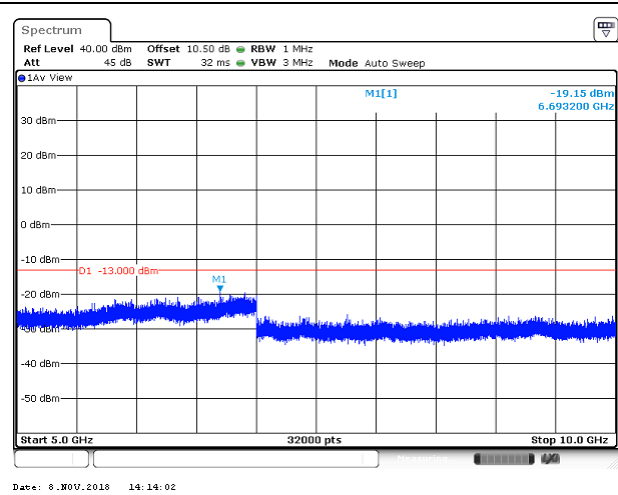
Conducted Emission Transmitting Mode CH 190  
30MHz – 5GHz



Conducted Emission Transmitting Mode CH 128  
5GHz – 10GHz



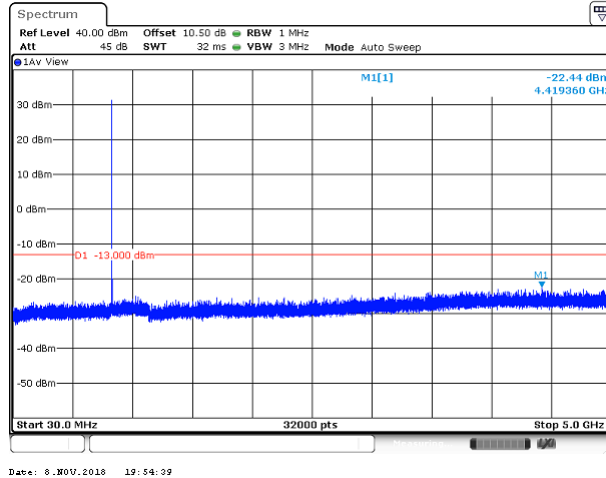
Conducted Emission Transmitting Mode CH 190  
5GHz – 10GHz



### Test Plot

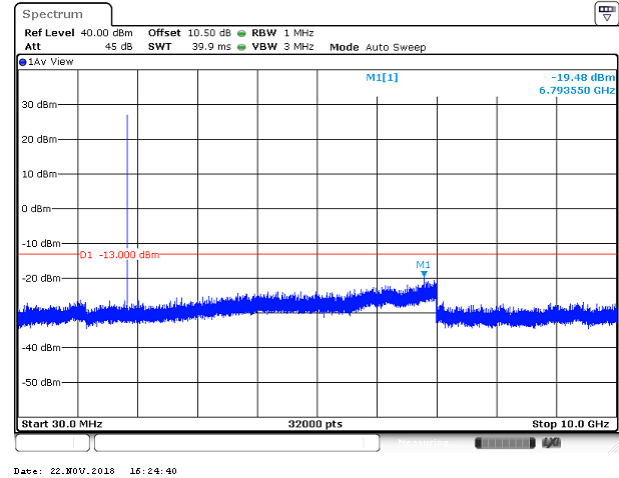
#### GPRS850

#### Conducted Emission Transmitting Mode CH 251 30MHz – 5GHz

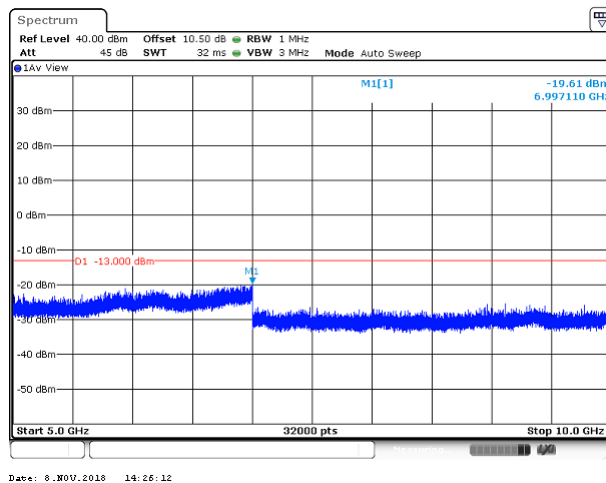


#### GPRS1900

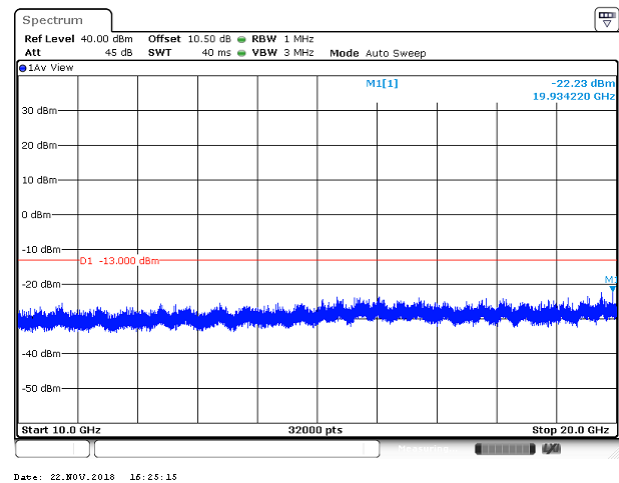
#### Conducted Emission Transmitting Mode CH 512 30MHz – 10GHz



#### Conducted Emission Transmitting Mode CH 251 5GHz – 10GHz



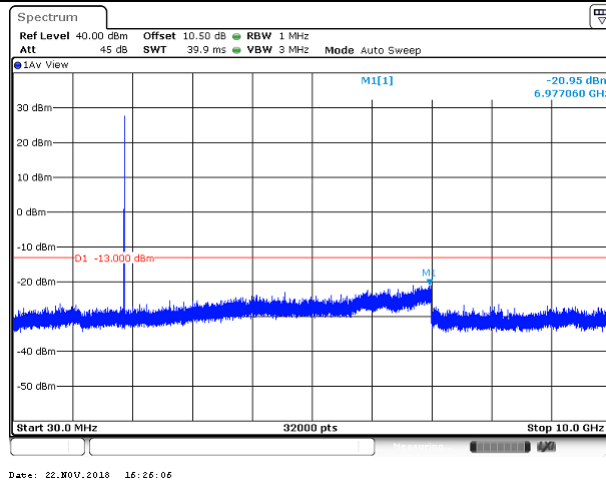
#### Conducted Emission Transmitting Mode CH 512 10GHz – 20GHz



### Test Plot

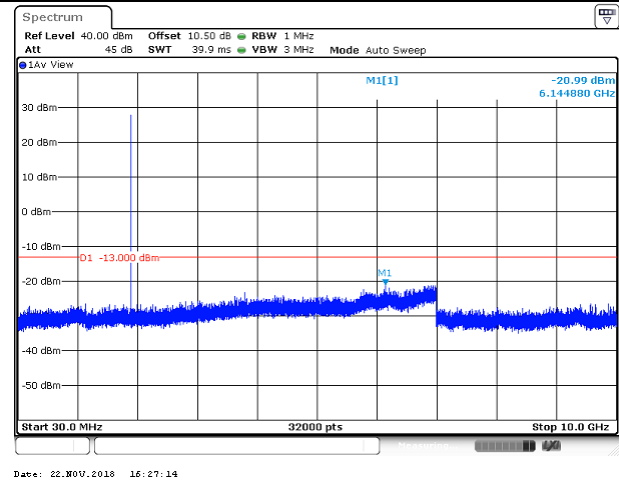
GPRS1900

Conducted Emission Transmitting Mode CH 661  
30MHz – 10GHz

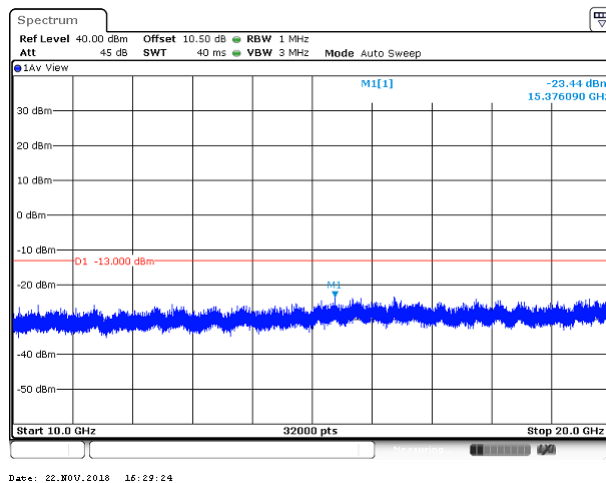


GPRS1900

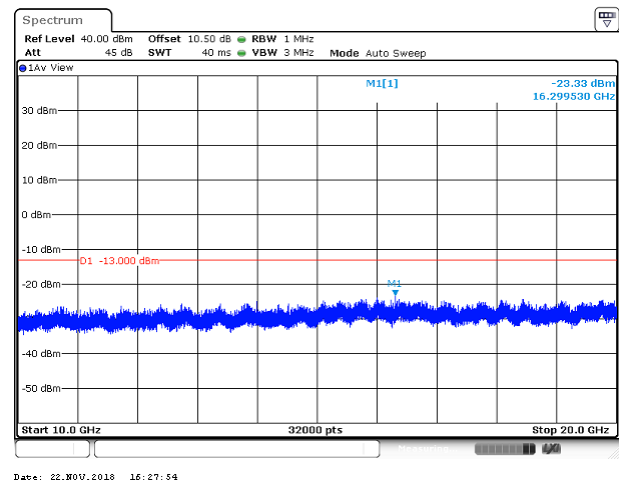
Conducted Emission Transmitting Mode CH 810  
30MHz – 10GHz



Conducted Emission Transmitting Mode CH 661  
10GHz – 20GHz



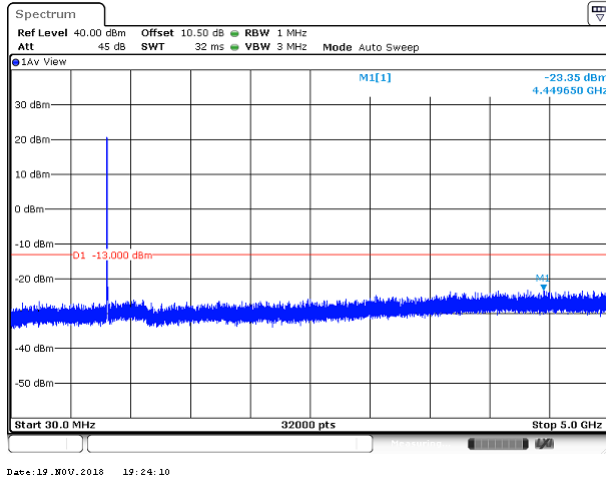
Conducted Emission Transmitting Mode CH 810  
10GHz – 20GHz



### Test Plot

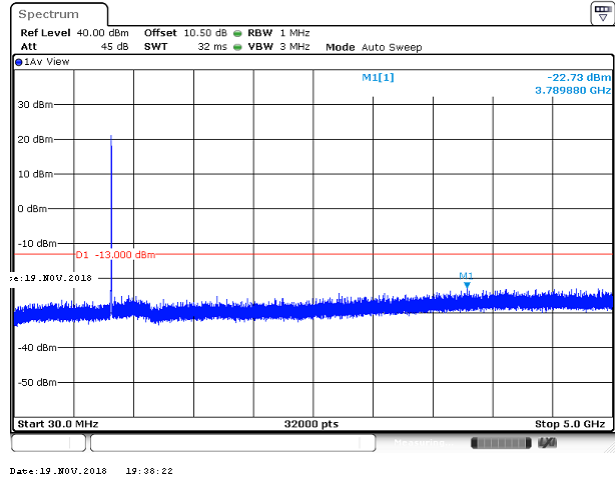
UMTS band V

Conducted Emission Transmitting Mode CH 4132  
30MHz – 5GHz

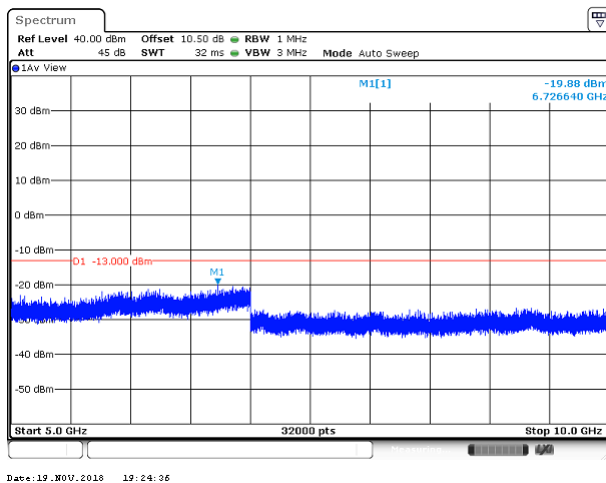


UMTS band V

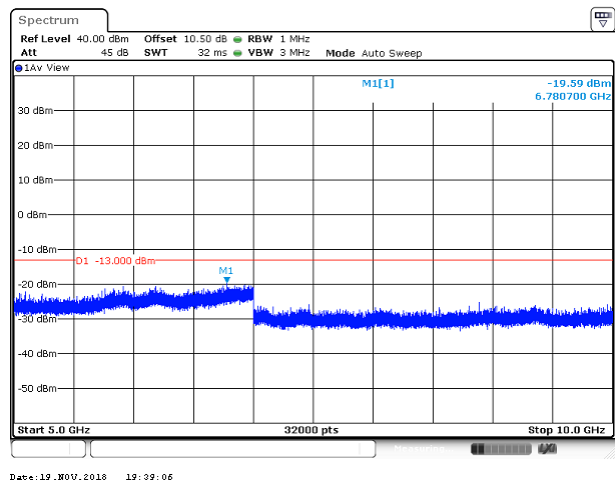
Conducted Emission Transmitting Mode CH 4183  
30MHz – 5GHz



Conducted Emission Transmitting Mode CH 4132  
5GHz – 10GHz



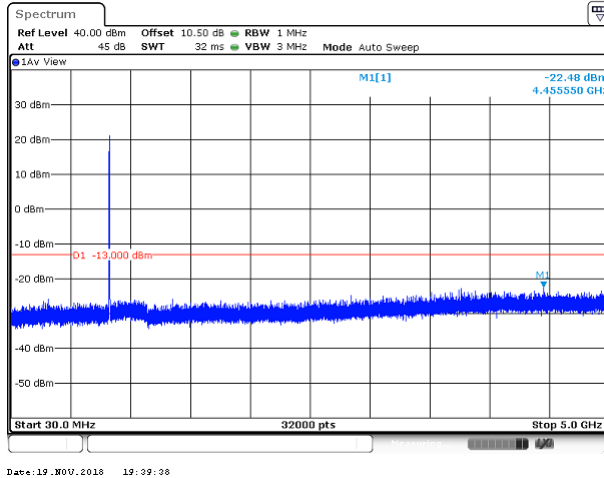
Conducted Emission Transmitting Mode CH 4183  
5GHz – 10GHz



### Test Plot

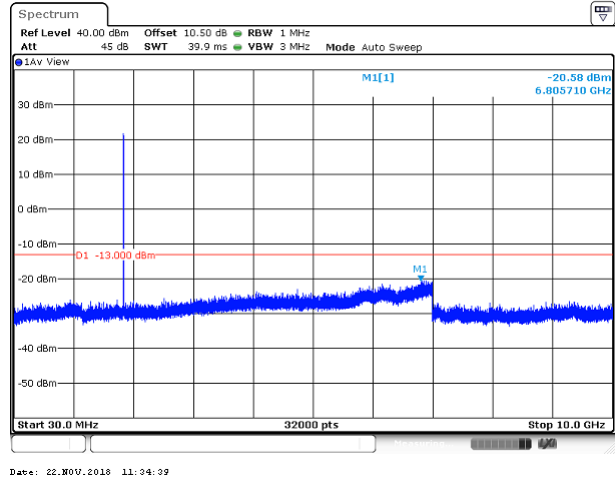
#### UMTS band V

#### Conducted Emission Transmitting Mode CH 4233 30MHz – 5GHz

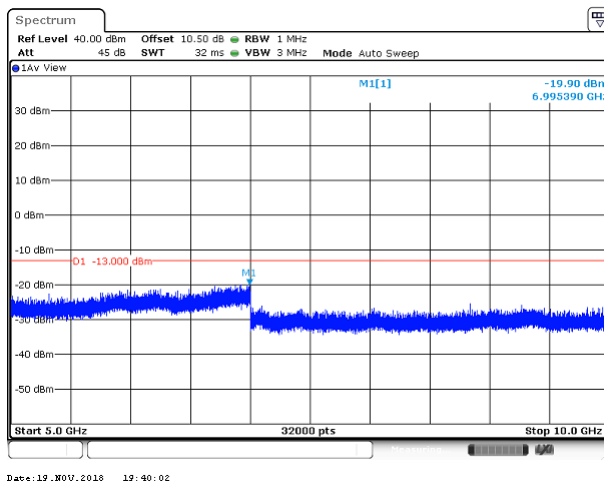


#### UMTS band II

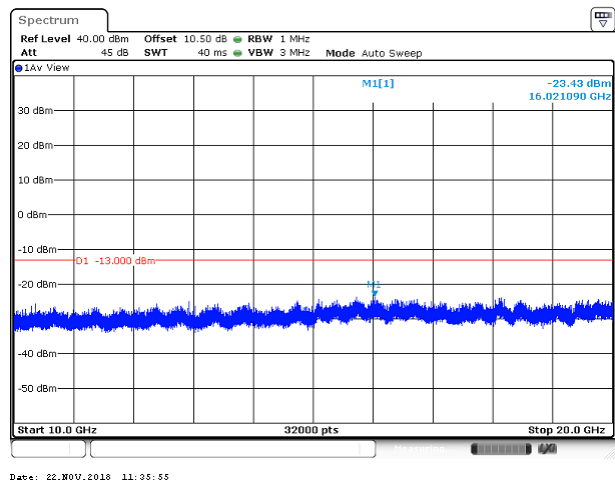
#### Conducted Emission Transmitting Mode CH 9262 30MHz – 10GHz



#### Conducted Emission Transmitting Mode CH 4233 5GHz – 10GHz



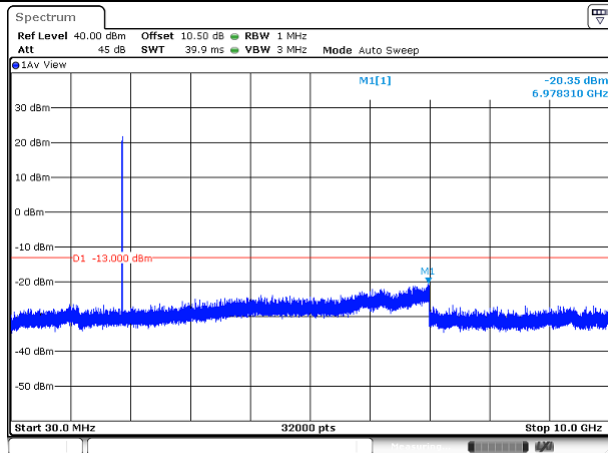
#### Conducted Emission Transmitting Mode CH 9262 10GHz – 20GHz



### Test Plot

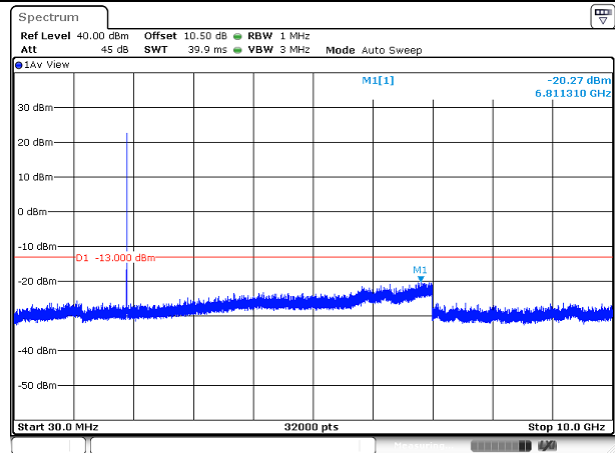
UMTS band II

Conducted Emission Transmitting Mode CH 9400  
30MHz – 10GHz

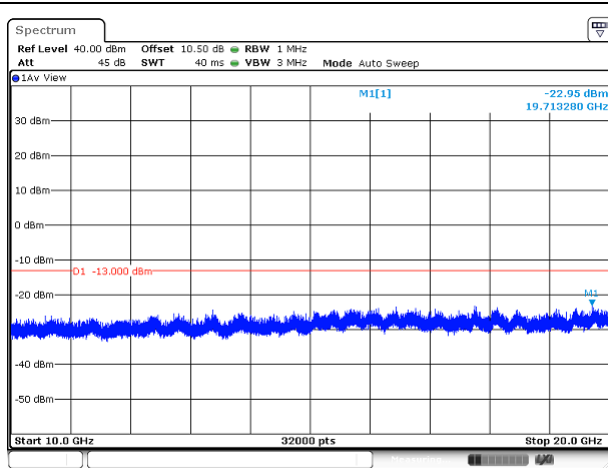


UMTS band II

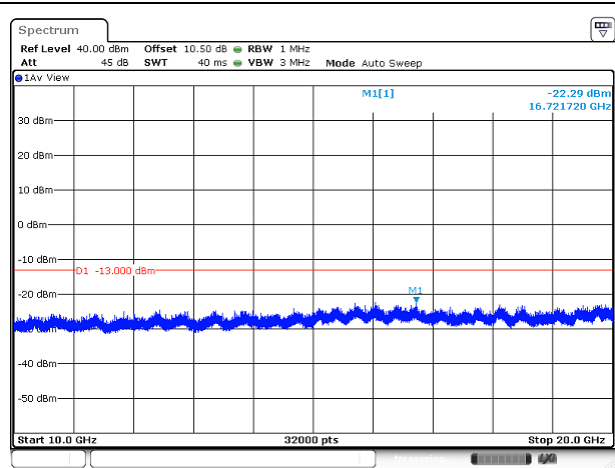
Conducted Emission Transmitting Mode CH 9538  
30MHz – 10GHz



Conducted Emission Transmitting Mode CH 9400  
10GHz – 20GHz



Conducted Emission Transmitting Mode CH 9538  
10GHz – 20GHz



END OF REPORT