# FCC Test Report

Report No.:AGC03175180502FE02

| | | |
|---|---|---|
| **FCC ID** | : | 2AF6M3396993S51 |
| **APPLICATION PURPOSE** | : | Original Equipment |
| **PRODUCT DESIGNATION** | : | MOBILE PHONE |
| **BRAND NAME** | : | Cellacom |
| **MODEL NAME** | : | S51_lite, S51_pro |
| **CLIENT** | : | Mobile Commodity Corporation |
| **DATE OF ISSUE** | : | June 21, 2018 |
| **STANDARD(S)** | : | FCC Part 22H & 24E Rules |
| **REPORT VERSION** | : | V1.0 |

*A*ttestation of *G*lobal *C*ompliance (Shenzhen) Co., Ltd.

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# REPORT REVISE RECORD

| Report Version | Revise Time | Issued Date | Valid Version | Notes |
|---|---|---|---|---|
| V1.0 | / | June 21, 2018 | Valid | Original Report |

# TABLE OF CONTENTS

**1.VERIFICATION OF COMPLIANCE ..... 5**
**2. GENERAL INFORMATION ..... 6**
2.1 PRODUCT DESCRIPTION ..... 6
2.2RELATED SUBMITTAL(S) / GRANT (S) ..... 7
2.3 TEST METHODOLOGY ..... 8
2.4 TEST FACILITY ..... 9
2.6 SPECIAL ACCESSORIES ..... 10
2.7 EQUIPMENT MODIFICATIONS ..... 10
**3. SYSTEM TEST CONFIGURATION ..... 11**
3.1 EUT CONFIGURATION ..... 11
3.2 EUT EXERCISE ..... 11
3.3 CONFIGURATION OF EUT SYSTEM ..... 11
**4. SUMMARY OF TEST RESULTS ..... 12**
**5. DESCRIPTION OF TEST MODES ..... 13**
**6. OUTPUT POWER ..... 14**
6.1 CONDUCTED OUTPUT POWER ..... 14
6.2 RADIATED OUTPUT POWER ..... 20
6.2.1 MEASUREMENT METHOD ..... 20
6.2.2 PROVISIONS APPLICABLE ..... 21
6.3. PEAK-TO-AVERAGE RATIO ..... 24
6.3.1 MEASUREMENT METHOD ..... 24
6.3.2 PROVISIONS APPLICABLE ..... 24
6.3.3 MEASUREMENT RESULT ..... 25
**7. OCCUPIED BANDWIDTH ..... 26**
7.1 MEASUREMENT METHOD ..... 26
7.2 PROVISIONS APPLICABLE ..... 26
7.3 MEASUREMENT RESULT ..... 27
**8. BAND EDGE ..... 33**
8.1 MEASUREMENT METHOD ..... 33
8.2 PROVISIONS APPLICABLE ..... 33
8.3 MEASUREMENT RESULT ..... 34
**9. SPURIOUS EMISSION ..... 37**
9.1 CONDUCTED SPURIOUS EMISSION ..... 37
9.2 RADIATED SPURIOUS EMISSION ..... 52
9.2.2 TEST SETUP ..... 53
**10. FREQUENCY STABILITY ..... 58**
10.1 MEASUREMENT METHOD ..... 58

10.2 PROVISIONS APPLICABLE ..... 59
10.3 MEASUREMENT RESULT ..... 60
**APPENDIX A: PHOTOGRAPHS OF TEST SETUP ..... 68**

## 1.VERIFICATION OF COMPLIANCE

| | |
|---|---|
| **Applicant** | Mobile Commodity Corporation |
| **Address** | 20955 Pathfinder Road, Suite 200, Diamond Bar, CA 91765, USA |
| **Manufacturer** | Cellacom Incorporation |
| **Address** | 20955 Pathfinder Road, Suite 100, Diamond Bar, CA 91765, USA |
| **Product Designation** | MOBILE PHONE |
| **Brand Name** | N/A |
| **Test Model** | S51_lite |
| **Serial Model** | S51_pro |
| **Difference Description** | All the same except the model name. |
| **Date of test** | May. 28, 2018~June 19, 2018 |
| **Deviation** | None |
| **Condition of Test Sample** | Normal |

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance(Shenzhen) Co., Ltd. The data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI/TIA-603-E-2016. The sample tested as described in this report is in compliance with the FCC Rules Part 22H and 24E.

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

Tested By Nice.xie

Nice Xie(Xie xiaosong) June 21, 2018

Reviewed By Bart Xie

Bart Xie(Xie Xiaobin) June 21, 2018

Approved By Forrest Lei

Forrest Lei(Lei Yonggang)
Authorized Officer June 21, 2018

# 2. GENERAL INFORMATION

## 2.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

| | |
|---|---|
| Product Designation: | MOBILE PHONE |
| Hardware version: | L71_M_V3.0 |
| Software version: | S51_Lite_V1.0 |
| Frequency Bands: | ☒GSM 850 ☒PCS1900 (U.S. Bands)<br>☒GSM 900 ☒DCS 1800 (Non-U.S. Bands)<br>☒UMTS FDD Band II ☐UMTS FDD Band IV<br>☒UMTS FDD Band V (U.S. Bands)<br>☐UMTS FDD Band I ☐UMTS FDD Band VIII (Non-U.S. Bands) |
| Antenna Type | PIFA Antenna |
| Type of Modulation | GSM / GPRS :GMSK<br>EGPRS: GMSK/8PSK<br>WCDMA : QPSK |
| Antenna gain(GSM): | GSM850:1.25dBi; PCS1900: 1.15dBi;<br>WCDMA850: 1.14dBi; WCDMA1900:1.10dBi |
| Power Supply: | DC 3.8V by battery |
| Battery parameter: | DC3.8V/2000mAh |
| Dual Card: | GSM /WCDMA/LTE Card Slot |
| GPRS Class | 12 |
| Extreme Vol. Limits: | DC3.4 V to 4.35 V (Normal: DC3.8 V) |
| Extreme Temp. Tolerance | -10℃ to +50℃ |
| *** Note: 1. The High Voltage DC4.35V and Low Voltage DC3.4V were declared by manufacturer<br>2. The EUT couldn't be operating normally with higher or lower voltage. | |

***** Note:**1.The maximum power levels are GSM for MCS-4：GMSK link, and RMC 12.2kbps mode for WCDMA band II, WCDMA band V, only these modes were used for all tests.

2. We found out the test mode with the highest power level after we analyze all the data rates. So we chose worst caseas a representative.

**GSM/WCDMA Card1 Slot :**

| | Maximum ERP/EIRP (dBm) | Max. Conducted Power (dBm) | Max. Average Burst Power (dBm) |
|---|---|---|---|
| GSM 850 | 31.67 | 32.16 | 31.12 |
| PCS 1900 | 27.16 | 29.29 | 28.77 |
| UMTS BAND II | 21.46 | 23.67 | 22.69 |
| UMTS BAND V | 21.14 | 23.77 | 21.72 |

**GSM/WCDMA Card2 Slot :**

| | Maximum ERP/EIRP (dBm) | Max. Conducted Power (dBm) | Max. Average Burst Power (dBm) |
|---|---|---|---|
| GSM 850 | 31.25 | 31.86 | 30.78 |
| PCS 1900 | 26.89 | 28.99 | 28.31 |
| UMTS BAND II | 21.33 | 23.13 | 22.19 |
| UMTS BAND V | 20.84 | 23.45 | 21.55 |

## 2.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID:2AF6M3396993S51**, filing to comply with the FCC Part 22H&24E requirements.

## 2.3 TEST METHODOLOGY

The radiated emission testing was performed according to the procedures of ANSI/TIA-603-E-2016, and KDB 971168 D01 Power Means License Digital Systems V03R01.

## 2.4 TEST FACILITY

| | |
|---|---|
| **Site** | Attestation of Global Compliance (Shenzhen) Co., Ltd |
| **Location** | 1-2F., Bldg.2, No.1-4, ChaxiSanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District B112-B113, Bldg.12, BaoanBldg Materials Center, No.1 of Xixiang Inner Ring Road, Baoan District, Shenzhen 518012 |
| **NVLAP LAB CODE** | 600153-0 |
| **Designation Number** | CN5028 |
| **Description** | Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by National Voluntary Laboratory Accreditation program, NVLAP Code 600153-0 |

## ALL TEST EQUIPMENT LIST

| Equipment | Manufacturer | Model | S/N | Cal. Date | Cal. Due |
|---|---|---|---|---|---|
| TEST RECEIVER | R&S | ESPI | 101206 | Jun.20, 2017 | Jun.19, 2018 |
| LISN | R&S | ESH2-Z5 | 100086 | Aug.21, 2017 | Aug.20, 2018 |
| TEST RECEIVER | R&S | ESCI | 10096 | Jun.20, 2017 | Jun.19, 2018 |
| EXA Signal Analyzer | Aglient | N9010A | MY53470504 | Dec.08, 2017 | Dec.07, 2018 |
| Horn antenna | SCHWARZBECK | BBHA 9170 | #768 | Sep.20, 2017 | Sep.19, 2018 |
| preamplifier | ChengYi | EMC184045SE | 980508 | Sep.15, 2017 | Sep.14, 2018 |
| Double-Ridged Waveguide Horn | ETS LINDGREN | 3117 | 00034609 | May.18, 2017 | May.17, 2019 |
| Broadband Preamplifier | SCHWARZBECK | BBV 9718 | 9718-205 | Jun.20, 2017 | Jun.19, 2018 |
| ANTENNA | SCHWARZBECK | VULB9168 | D69250 | Sep.28, 2017 | Sep.27, 2018 |
| SIGNAL ANALYZER | Agilent | N9020A | MY52090123 | Sep. 21, 2017 | Sep. 20, 2018 |
| USB Wideband Power Sensor | Agilent | U2021XA | MY54110007 | Sep. 21, 2017 | Sep. 20, 2018 |
| Universal Radio Communication Tester | R&S | CMU200 | 120237 | Mar.01,2018 | Feb.28,2019 |
| Universal Radio Communication Tester | Agilent | 8960 | GB46200384 | July 16,2017 | July 15,2018 |
| Power Splitter | Agilent | 11636A | 34 | Sep.21,2017 | Sep.20,2018 |
| Attenuator | JFW | 50FHC-006-50 | N/A | June 20, 2017 | June 19, 2018 |

## 2.6 SPECIAL ACCESSORIES

The battery wassupplied by the applicant were used as accessories and being tested with EUT intended for FCC grant together.

## 2.7 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

# 3. SYSTEM TEST CONFIGURATION

## 3.1 EUT CONFIGURATION

The EUTconfiguration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

## 3.2 EUT EXERCISE

The Transmitter was operated in the maximum output power mode through Communication Tester. The TX frequency was fixed which was for the purpose of the measurements.

## 3.3 CONFIGURATION OF EUT SYSTEM

Fig. 2-1 Configuration of EUT System


Table 2-1 Equipment Used in EUT System

| Item | Equipment | Model No. | ID or Specification | Remark |
|---|---|---|---|---|
| 1 | MOBILE PHONE | S51_lite | 2AF6M3396993S51 | EUT |
| 3 | Battery | S51_lite | DC 3.8V/2000mAh | Accessory |
| 4 | Earphone | N/A | N/A | Accessory |

***Note: All the accessories have been used during the test. The following "EUT" in setup diagram means EUT system.

## 4. SUMMARY OF TEST RESULTS

| Item Number | Item Description | | FCC Rules | Result |
|---|---|---|---|---|
| 1 | Output Power | Conducted Output Power | 2.1046 | Pass |
| | | Radiated Output Power | 22.913(a) (2) / 24.232 (c) | |
| 2 | Peak-to-Average Ratio | Peak-to-Average Ratio | 24.232(d) | Pass |
| 3 | Spurious Emission | Conducted Spurious Emission | 2.1051/22.917/24.238 | Pass |
| | | Radiated Spurious Emission | | |
| 4 | Frequency Stability | | 2.1055/22.355/24.235 | Pass |
| 5 | Occupied Bandwidth | | 2.1049 | Pass |
| 6 | Band Edge | | 2.1051/22.917(a)/24.238(a) | Pass |

## 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 top channel, the middle channel and the bottom channel) were chosen for testing on both GSMand PCS frequency band.

*****Note:** GSM/GPRS/EGPRS 850, GSM/GPRS/EGPRS 1900, WCDMA/HSPA band II, WCDMA/HSPA band V,mode have been tested during the test.

The worst condition was recorded in the test report if no other modes test data.

# 6. OUTPUT POWER

## 6.1 CONDUCTED OUTPUT POWER

### 6.1.1 MEASUREMENT METHOD

The transmitter output port was connected to base station.

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.

Measure the maximum burst average power and average power for othermodulation signal.

The EUT was setup for the max output power with pseudo random data modulation. Power was measured with Spectrum Analyzer. The measurements were performed on all modes(GSM/GPRS/EGPRS 850, GSM/GPRS/EGPRS1900, WCDMA/HSPA band II,WCDMA/HSPA band V)at 3 typical channels(the Top Channel, the Middle Channel and the Bottom Channel) for each band.

### 6.1.2 MEASUREMENT RESULT

| Conducted Output Power Limits for GPRS/EDGE 850 band | | |
|---|---|---|
| **Mode** | **Nominal Peak Power** | **Tolerance(dB)** |
| GSM | 33 dBm (2W) | - 2 |
| EDGE | 27 dBm(0.5W) | ±2 |
| **Conducted Output Power Limits for GPRS/EDGE 1900band** | | |
| **Mode** | **Nominal Peak Power** | **Tolerance(dB)** |
| GSM | 30 dBm (1W) | - 2 |
| EDGE | 26 dBm (0.4W) | ±2 |
| **Conducted Output Power Limits for UMTS band II** | | |
| **Mode** | **Nominal Peak Power** | **Tolerance(dB)** |
| WCDMA | 24dBm (0.25W) | - 2 |
| **Conducted Output Power Limits for UMTS band V** | | |
| **Mode** | **Nominal Peak Power** | **Tolerance(dB)** |
| WCDMA | 24dBm (0.25W) | - 2 |

**GSM 850:**

| Mode | Frequency (MHz) | Reference Power | Peak Power | Tolerance | Avg.Burst Power | Duty cycle Factor(dB) | Frame Power(dBm) |
|---|---|---|---|---|---|---|---|
| GSM850 | 824.2 | 33 | **32.16** | -0.84 | 31.07 | -9 | 22.12 |
| | 836.6 | 33 | 32.15 | -0.85 | **31.12** | -9 | 22.06 |
| | 848.8 | 33 | 32.13 | -0.87 | 31.11 | -9 | 22.11 |
| GPRS850 (1 Slot) | 824.2 | 33 | 32.06 | -0.94 | 31.03 | -9 | 22.03 |
| | 836.6 | 33 | 32.09 | -0.91 | 31.05 | -9 | 22.05 |
| | 848.8 | 33 | 32.11 | -0.89 | 31.07 | -9 | 22.07 |
| GPRS850 (2 Slot) | 824.2 | 30 | 29.22 | -0.78 | 28.99 | -6 | 22.99 |
| | 836.6 | 30 | 29.64 | -0.36 | 28.46 | -6 | 22.46 |
| | 848.8 | 30 | 29.55 | -0.45 | 28.85 | -6 | 22.85 |
| GPRS850 (3 Slot) | 824.2 | 28.23 | 27.18 | -1.05 | 26.14 | -4.26 | 21.88 |
| | 836.6 | 28.23 | 27.37 | -0.86 | 26.46 | -4.26 | 22.2 |
| | 848.8 | 28.23 | 27.54 | -0.69 | 26.48 | -4.26 | 22.22 |
| GPRS850 (4 Slot) | 824.2 | 27 | 26.20 | -0.80 | 25.25 | -3 | 22.25 |
| | 836.6 | 27 | 26.46 | -0.54 | 25.28 | -3 | 22.28 |
| | 848.8 | 27 | 26.67 | -0.33 | 25.34 | -3 | 22.34 |

| Mode | Channel | Frequency (MHz) | Peak Power (dBm) | Avg.Burst Power (dBm) |
|---|---|---|---|---|
| EDGE (1 Slot) | 128 | 824.2 | 28.22 | 25.59 |
| | 190 | 836.6 | 28.62 | 25.45 |
| | 251 | 848.8 | 28.58 | 25.34 |
| EDGE (2 Slot) | 128 | 824.2 | 24.33 | 22.11 |
| | 190 | 836.6 | 24.41 | 22.34 |
| | 251 | 848.8 | 24.58 | 22.18 |
| EDGE (3 Slot) | 128 | 824.2 | 23.52 | 21.52 |
| | 190 | 836.6 | 23.34 | 21.16 |
| | 251 | 848.8 | 23.49 | 21.49 |
| EDGE (4 Slot) | 128 | 824.2 | 22.30 | 19.27 |
| | 190 | 836.6 | 22.42 | 19.14 |
| | 251 | 848.8 | 22.37 | 19.33 |

**PCS 1900:**

| Mode | Frequency (MHz) | Reference Power | Peak Power | Tolerance | Avg.Burst Power | Duty cycle Factor(dB) | Frame Power(dBm) |
|---|---|---|---|---|---|---|---|
| GSM1900 | 1850.2 | 30 | **29.29** | -0.71 | **28.77** | -9 | 19.77 |
| | 1880 | 30 | 29.10 | -0.90 | 28.69 | -9 | 19.69 |
| | 1909.8 | 30 | 29.22 | -0.78 | 28.59 | -9 | 19.59 |
| GPRS1900 (1 Slot) | 1850.2 | 30 | 28.25 | -1.75 | 27.11 | -9 | 18.11 |
| | 1880 | 30 | 28.19 | -1.81 | 27.46 | -9 | 18.46 |
| | 1909.8 | 30 | 28.34 | -1.66 | 27.53 | -9 | 18.53 |
| GPRS1900 (2 Slot) | 1850.2 | 27 | 25.77 | -1.23 | 24.34 | -6 | 18.34 |
| | 1880 | 27 | 25.47 | -1.53 | 24.49 | -6 | 18.49 |
| | 1909.8 | 27 | 25.49 | -1.51 | 24.52 | -6 | 18.52 |
| GPRS1900 (3 Slot) | 1850.2 | 25.23 | 24.52 | -0.71 | 23.58 | -4.26 | 19.32 |
| | 1880 | 25.23 | 24.42 | -0.81 | 23.79 | -4.26 | 19.53 |
| | 1909.8 | 25.23 | 24.19 | -1.04 | 23.73 | -4.26 | 19.47 |
| GPRS1900 (4 Slot) | 1850.2 | 24 | 23.25 | -0.75 | 22.69 | -3 | 19.69 |
| | 1880 | 24 | 23.85 | -0.15 | 22.77 | -3 | 19.77 |
| | 1909.8 | 24 | 23.59 | -0.41 | 22.64 | -3 | 19.64 |

| Mode | Channel | Frequency (MHz) | Peak Power (dBm) | Avg.Burst Power (dBm) |
|---|---|---|---|---|
| EDGE (1 Slot) | 512 | 1850.2 | 26.24 | 24.22 |
| | 661 | 1880 | 26.77 | 24.36 |
| | 810 | 1909.8 | 26.86 | 24.41 |
| EDGE (2 Slot) | 512 | 1850.2 | 23.52 | 21.28 |
| | 661 | 1880 | 23.69 | 21.49 |
| | 810 | 1909.8 | 23.45 | 21.28 |
| EDGE (3 Slot) | 512 | 1850.2 | 23.11 | 21.77 |
| | 661 | 1880 | 23.36 | 21.64 |
| | 810 | 1909.8 | 23.45 | 21.49 |
| EDGE (4 Slot) | 512 | 1850.2 | 22.58 | 20.35 |
| | 661 | 1880 | 22.57 | 20.46 |
| | 810 | 1909.8 | 22.99 | 20.64 |

**UMTS BAND II**

| Mode | Frequency (MHz) | Reference power | Peak Power | Tolerance | Avg.Burst Power |
|---|---|---|---|---|---|
| WCDMA1900 RMC | 1852.4 | 24 | 23.26 | -0.74 | **22.69** |
| | 1880 | 24 | **23.67** | -0.33 | 22.44 |
| | 1907.6 | 24 | 23.10 | -0.9 | 22.49 |
| WCDMA1900 AMR | 1852.4 | 24 | 23.32 | -0.68 | 22.11 |
| | 1880 | 24 | 23.44 | -0.56 | 22.13 |
| | 1907.6 | 24 | 23.37 | -0.63 | 22.25 |
| HSDPA Subtest 1 | 1852.4 | 24 | 21.45 | -2.55 | 21.11 |
| | 1880 | 24 | 21.33 | -2.67 | 21.16 |
| | 1907.6 | 24 | 21.28 | -2.72 | 21.24 |
| HSDPA Subtest 2 | 1852.4 | 24 | 22.45 | -1.55 | 20.36 |
| | 1880 | 24 | 22.49 | -1.51 | 20.49 |
| | 1907.6 | 24 | 22.52 | -1.48 | 20.77 |
| HSDPA Subtest 3 | 1852.4 | 24 | 22.33 | -1.67 | 20.11 |
| | 1880 | 24 | 22.49 | -1.51 | 20.25 |
| | 1907.6 | 24 | 22.39 | -1.61 | 20.17 |
| HSDPA Subtest 4 | 1852.4 | 24 | 22.28 | -1.72 | 20.23 |
| | 1880 | 24 | 22.27 | -1.73 | 20.42 |
| | 1907.6 | 24 | 22.19 | -1.81 | 20.28 |
| HSUPA Subtest 1 | 1852.4 | 24 | 22.20 | -1.8 | 20.46 |
| | 1880 | 24 | 21.13 | -2.87 | 20.33 |
| | 1907.6 | 24 | 22.07 | -1.93 | 20.18 |
| HSUPA Subtest 2 | 1852.4 | 24 | 22.11 | -1.89 | 21.00 |
| | 1880 | 24 | 22.16 | -1.84 | 21.36 |
| | 1907.6 | 24 | 22.33 | -1.67 | 21.25 |
| HSUPA Subtest 3 | 1852.4 | 24 | 22.25 | -1.75 | 21.22 |
| | 1880 | 24 | 22.16 | -1.84 | 21.13 |
| | 1907.6 | 24 | 21.59 | -2.41 | 21.19 |
| HSUPA Subtest 4 | 1852.4 | 24 | 22.46 | -1.54 | 21.20 |
| | 1880 | 24 | 22.18 | -1.82 | 22.19 |
| | 1907.6 | 24 | 22.16 | -1.84 | 22.07 |
| HSUPA Subtest 5 | 1852.4 | 24 | 22.64 | -1.36 | 21.16 |
| | 1880 | 24 | 22.28 | -1.72 | 21.66 |
| | 1907.6 | 24 | 22.46 | -1.54 | 21.85 |

**UMTS BAND V**

| Mode | Frequency (MHz) | Reference power | Peak Power | Tolerance | Avg.Burst Power |
|---|---|---|---|---|---|
| WCDMA850 RMC | 826.4 | 24 | 23.59 | -0.41 | 21.58 |
| | 836.4 | 24 | 23.55 | -0.45 | 21.11 |
| | 846.6 | 24 | **23.77** | -0.23 | **21.72** |
| WCDMA850 AMR | 826.4 | 24 | 23.00 | -1.00 | 21.18 |
| | 836.4 | 24 | 23.09 | -0.91 | 21.33 |
| | 846.6 | 24 | 23.11 | -0.89 | 21.15 |
| HSDPA Subtest 1 | 826.4 | 24 | 22.34 | -1.66 | 20.14 |
| | 836.4 | 24 | 22.49 | -1.51 | 19.88 |
| | 846.6 | 24 | 22.52 | -1.48 | 20.27 |
| HSDPA Subtest 2 | 826.4 | 24 | 22.29 | -1.71 | 19.95 |
| | 836.4 | 24 | 22.42 | -1.58 | 20.07 |
| | 846.6 | 24 | 22.25 | -1.75 | 20.03 |
| HSDPA Subtest 3 | 826.4 | 24 | 21.33 | -2.67 | 20.62 |
| | 836.4 | 24 | 21.44 | -2.56 | 20.26 |
| | 846.6 | 24 | 21.96 | -2.04 | 20.50 |
| HSDPA Subtest 4 | 826.4 | 24 | 22.11 | -1.89 | 20.62 |
| | 836.4 | 24 | 22.29 | -1.71 | 20.37 |
| | 846.6 | 24 | 22.34 | -1.66 | 20.51 |
| HSUPA Subtest 1 | 826.4 | 24 | 22.22 | -1.78 | 20.53 |
| | 836.4 | 24 | 22.14 | -1.86 | 21.52 |
| | 846.6 | 24 | 22.55 | -1.45 | 20.97 |
| HSUPA Subtest 2 | 826.4 | 24 | 22.03 | -1.97 | 20.85 |
| | 836.4 | 24 | 22.10 | -1.9 | 20.99 |
| | 846.6 | 24 | 22.09 | -1.91 | 21.47 |
| HSUPA Subtest 3 | 826.4 | 24 | 22.18 | -1.82 | 20.87 |
| | 836.4 | 24 | 22.13 | -1.87 | 20.61 |
| | 846.6 | 24 | 22.11 | -1.89 | 20.66 |
| HSUPA Subtest 4 | 826.4 | 24 | 22.33 | -1.67 | 20.78 |
| | 836.4 | 24 | 22.34 | -1.66 | 20.32 |
| | 846.6 | 24 | 22.32 | -1.68 | 20.87 |
| HSUPA Subtest 5 | 826.4 | 24 | 22.58 | -1.42 | 20.93 |
| | 836.4 | 24 | 22.47 | -1.53 | 20.51 |
| | 846.6 | 24 | 22.60 | -1.4 | 21.26 |

According to 3GPP 25.101 sub-clause 6.2.2 , the maximum output power is allowed to be reduced by following the table.

Table 6.1aA: UE maximum output power with HS-DPCCH and E-DCH

| UE Transmit Channel Configuration | CM(db) | MPR(db) |
|---|---|---|
| For all combinations of ,DPDCH,DPCCH HS-DPDCH,E-DPDCH and E-DPCCH | 0≤ CM≤3.5 | MAX(CM-1,0) |
| Note: CM=1 for $\beta_c/\beta_d$=12/15, $\beta_{hs}/\beta_c$=24/15.For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference. | | |

The device supports MPR to solve linearity issues (ACLR or SEM) due to the higher peak-to average ratios (PAR) of the HSUPA signal. This prevents saturating the full range of the TX DAC inside of device and provides a reduced power output to the RF transceiver chip according to the Cubic Metric (a function of the combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH).

When E-DPDCH channels are present the beta gains on those channels are reduced firsts to try to get the power under the allowed limit. If the beta gains are lowered as far as possible, then a hard limiting is applied at the maximum allowed level.

The SW currently recalculates the cubic metric every time the beta gains on the E-DPDCH are reduced. The cubic metric will likely get lower each time this is done .However, there is no reported reduction of maximum output power in the HSUPA mode since the device also provides a compensate for the power back-off by increasing the gain of TX_AGC in the transceiver (PA) device.

The end effect is that the DUT output power is identical to the case where there is no MPR in the device.

## 6.2 RADIATED OUTPUT POWER

### 6.2.1 MEASUREMENT METHOD

The measurements procedures specified in ANSI/TIA-603-E-2016 were applied.

1. Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signal operating below 1GHz are performed using dipole antennas. Measurements on signals operating above 1GHz are performed using broadband horn antennas. All measurements are performed as RMS average measurements while the EUT operating at its maximum duty cycle, at maximum power, and at the approximate frequencies.
2. 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 (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.
3. The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established as ARpl=Pin + 2.15 - Pr. TheARpl is the attenuation of “reference path loss”, and including the gain of receive antenna, the cable loss and the air loss. The measurement results are obtained as described below: Power=PMea+ARpl
4. The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern.
5. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.
6. The EUT is then put into continuously transmitting mode at its maximum power level.
7. 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.
8. 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 (Pin).
9. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi...

### 6.2.2 PROVISIONS APPLICABLE

| Mode | FCC Part Section(s) | Nominal Peak Power |
|---|---|---|
| GSM/EDGE 850 | 22.913(a)(2) | <=38.45dBm (7W). ERP |
| GSM/EDGE 1900 | 24.232(c) | <=33dBm (2W). EIRP |
| UMTS BAND II | 24.232(c) | <=33dBm (2W),EIRP |
| UMTS BANDV | 22.913(a)(2) | <=38.45dBm (7W).ERP |

### 6.2.3 MEASUREMENT RESULT

| Radiated Power (ERP) for GSM/EDGE 850 | | | | |
|---|---|---|---|---|
| Mode | Frequency | Result | | Conclusion |
| | | Max. Peak ERP (dBm) | Polarization Of Max. ERP | |
| GSM | 824.2 | 31.55 | Horizontal | Pass |
| | 836.6 | 31.43 | Horizontal | Pass |
| | 848.8 | **31.67** | Horizontal | Pass |
| | 824.2 | 28.25 | Vertical | Pass |
| | 836.6 | 28.06 | Vertical | Pass |
| | 848.8 | 28.28 | Vertical | Pass |
| EDGE | 824.2 | 25.12 | Horizontal | Pass |
| | 836.6 | 25.32 | Horizontal | Pass |
| | 848.8 | 25.11 | Horizontal | Pass |
| | 824.2 | 23.25 | Vertical | Pass |
| | 836.6 | 23.23 | Vertical | Pass |
| | 848.8 | 23.19 | Vertical | Pass |

| Radiated Power (E.I.R.P) for GSM/EDGE 1900 | | | | |
|---|---|---|---|---|
| Mode | Frequency | Result | | Conclusion |
| | | Max. Peak E.I.R.P.(dBm) | Polarization Of Max. E.I.R.P. | |
| GSM | 1850.2 | 27.10 | Horizontal | Pass |
| | 1880.0 | 27.12 | Horizontal | Pass |
| | 1909.8 | **27.16** | Horizontal | Pass |
| | 1850.2 | 24.20 | Vertical | Pass |
| | 1880.0 | 24.33 | Vertical | Pass |
| | 1909.8 | 24.28 | Vertical | Pass |
| EDGE | 1850.2 | 23.15 | Horizontal | Pass |
| | 1880.0 | 23.26 | Horizontal | Pass |
| | 1909.8 | 23.33 | Horizontal | Pass |
| | 1850.2 | 21.19 | Vertical | Pass |
| | 1880.0 | 21.25 | Vertical | Pass |
| | 1909.8 | 21.20 | Vertical | Pass |

| Radiated Power (E.I.R.P) for UMTS band II | | | | |
|---|---|---|---|---|
| Mode | Frequency | Result | | Conclusion |
| | | Max. Peak E.I.R.P (dBm) | Polarization Of Max. E.I.R.P | |
| UMTS | 1852.4 | 21.25 | Horizontal | Pass |
| | 1880 | **21.46** | Horizontal | Pass |
| | 1907.6 | 21.33 | Horizontal | Pass |
| | 1852.4 | 19.84 | Vertical | Pass |
| | 1880 | 19.79 | Vertical | Pass |
| | 1907.6 | 19.66 | Vertical | Pass |

| Radiated Power (ERP) for UMTS band V | | | | |
|---|---|---|---|---|
| Mode | Frequency | Result | | Conclusion |
| | | Max. Peak ERP (dBm) | Polarization Of Max. ERP | |
| UMTS | 826.4 | 21.06 | Horizontal | Pass |
| | 836.4 | 21.03 | Horizontal | Pass |
| | 846.6 | **21.14** | Horizontal | Pass |
| | 826.4 | 19.20 | Vertical | Pass |
| | 836.4 | 19.34 | Vertical | Pass |
| | 846.6 | 19.26 | Vertical | Pass |

Note: Above is the worst mode data.

## 6.3. PEAK-TO-AVERAGE RATIO

### 6.3.1 MEASUREMENT METHOD

Use one of the procedures presented in 4.1 to measure the total peak power and record as PPk. Use one of the applicable procedures presented 4.2 to measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

PAPR (dB) = PPk (dBm) - PAvg (dBm).

### 6.3.2 PROVISIONS APPLICABLE

This is the test for the Peak-to-Average Ratio from the EUT.

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

### 6.3.3 MEASUREMENT RESULT

| Modes | GSM850(GSM) | | |
|---|---|---|---|
| Channel | 128 | 190 | 251 |
| | (Low) | (Mid) | (High) |
| Frequency (MHz) | 824.2 | 836.6 | 848.8 |
| Peak-To-Average Ratio (dB)/GSM | 1.16 | 1.11 | 1.19 |
| Peak-To-Average Ratio (dB)/EDGE | 1.05 | 1.09 | 1.07 |

| Modes | PCS1900 (GSM) | | |
|---|---|---|---|
| Channel | 512 | 661 | 810 |
| | (Low) | (Mid) | (High) |
| Frequency (MHz) | 1850.2 | 1880 | 1909.8 |
| Peak-To-Average Ratio (dB)/GSM | 0.77 | 0.69 | 0.70 |
| Peak-To-Average Ratio (dB)/EDGE | 1.99 | 1.87 | 2.00 |

| Modes | UMTS BAND II | | |
|---|---|---|---|
| Channel | 9663 | 9800 | 9937 |
| | (Low) | (Mid) | (High) |
| Frequency (MHz) | 1852.6 | 1880 | 1907.4 |
| Peak-To-Average Ratio (dB) | 1.09 | 1.04 | 1.08 |

| Modes | UMTS BAND V | | |
|---|---|---|---|
| Channel | 4358 | 4407 | 4457 |
| | (Low) | (Mid) | (High) |
| Frequency (MHz) | 826.6 | 836.6 | 846.4 |
| Peak-To-Average Ratio (dB) | 1.47 | 1.36 | 1.54 |

# 7. OCCUPIED BANDWIDTH

## 7.1 MEASUREMENT METHOD

1. The Occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper Frequency limits, the mean power radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

2. RBW=1~5% of the expected OBW, VBW>=3 x RBW, Detector=Peak, Trace mode=max hold, Sweep=auto couple, and the trace was allowed to stabilize.

## 7.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power

## 7.3 MEASUREMENT RESULT

**Test Results**

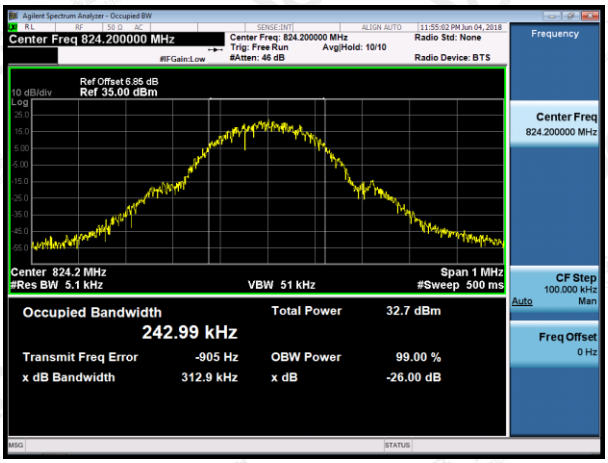
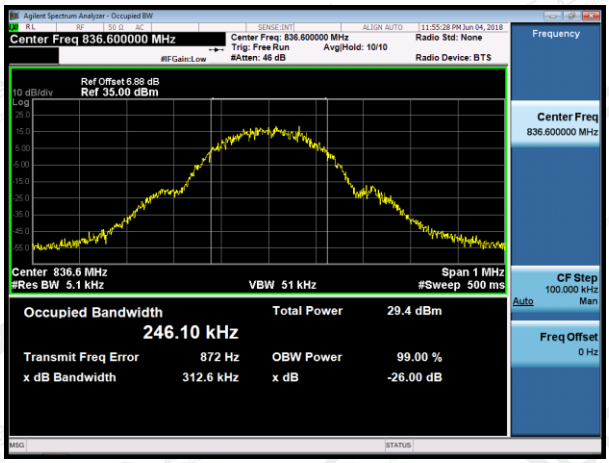
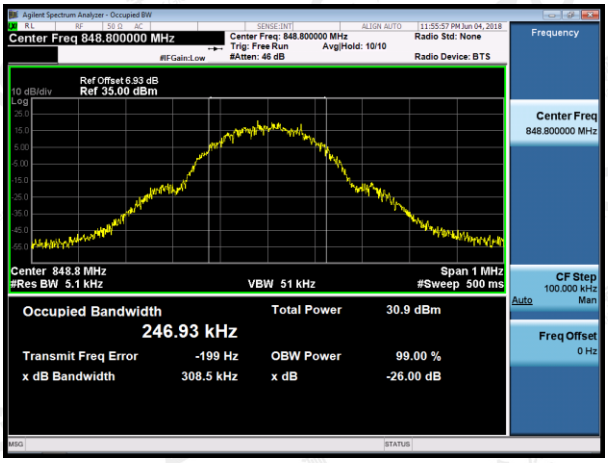
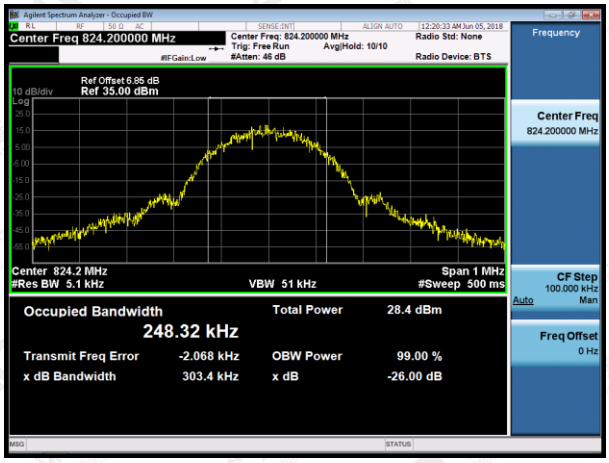
| Test Band | Test Mode | Test Channel | Occupied Bandwidth (KHZ) | Emission Bandwidth (KHZ) | Verdict |
|---|---|---|---|---|---|
| GSM850 | GSM | LCH | 243.0 | 312.9 | PASS |
| | | MCH | 246.1 | 312.6 | PASS |
| | | HCH | 246.9 | 308.5 | PASS |
| | EDGE | LCH | 248.3 | 303.4 | PASS |
| | | MCH | 248.3 | 313.7 | PASS |
| | | HCH | 253.3 | 309.5 | PASS |

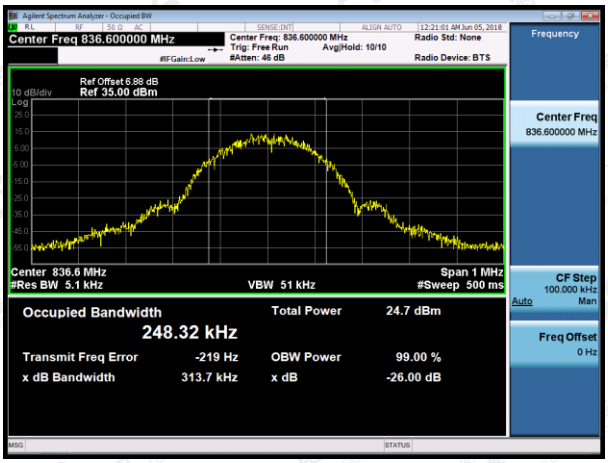
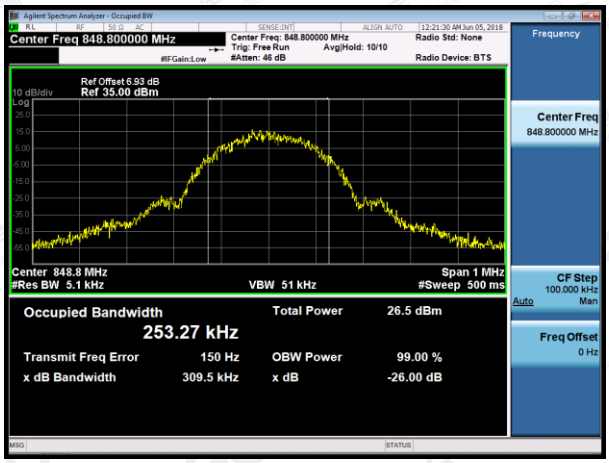
| Test Band | Test Mode | Test Channel | Occupied Bandwidth (KHZ) | Emission Bandwidth (KHZ) | Verdict |
|---|---|---|---|---|---|
| GSM1900 | GSM | LCH | 250.7 | 316.6 | PASS |
| | | MCH | 249.4 | 309.8 | PASS |
| | | HCH | 251.0 | 318.8 | PASS |
| | EDGE | LCH | 249.6 | 319.4 | PASS |
| | | MCH | 253.0 | 315.9 | PASS |
| | | HCH | 254.8 | 317.6 | PASS |

## For GSM

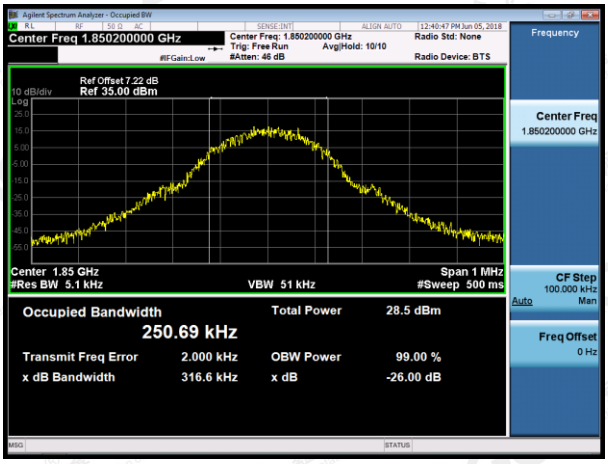
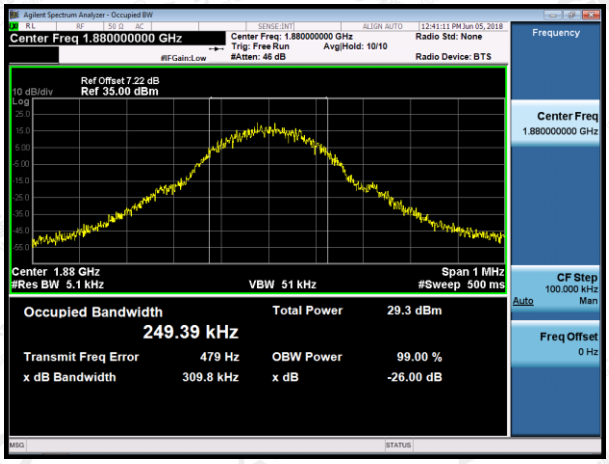
### Test Band=GSM850/PCS1900

### Test Mode=GSM/EDGE

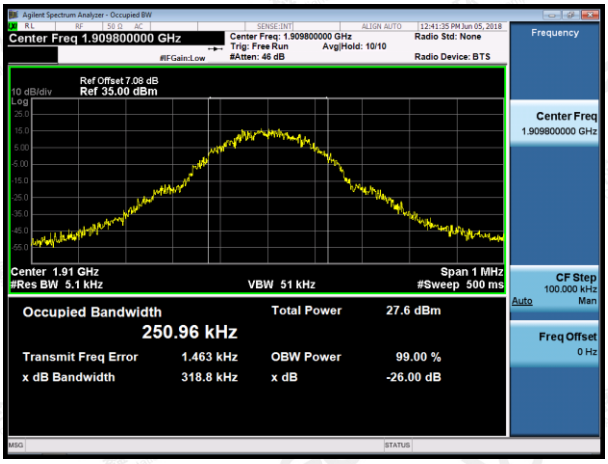
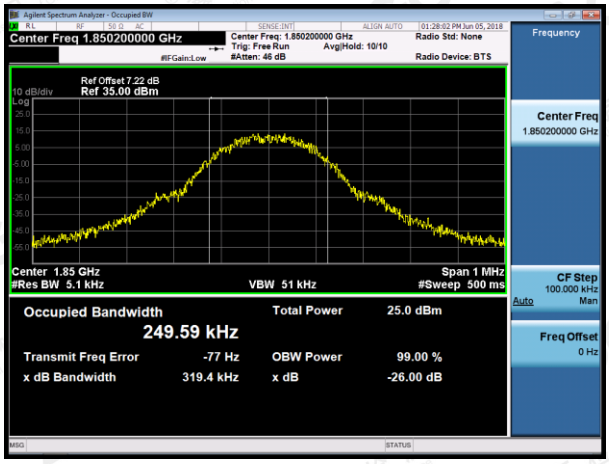
| GSM 850-LCH-GSM | GSM 850-MCH-GSM |
|---|---|
|  |  |
| **GSM 850-HCH-GSM** | **GSM 850-LCH-EDGE** |
|  |  |

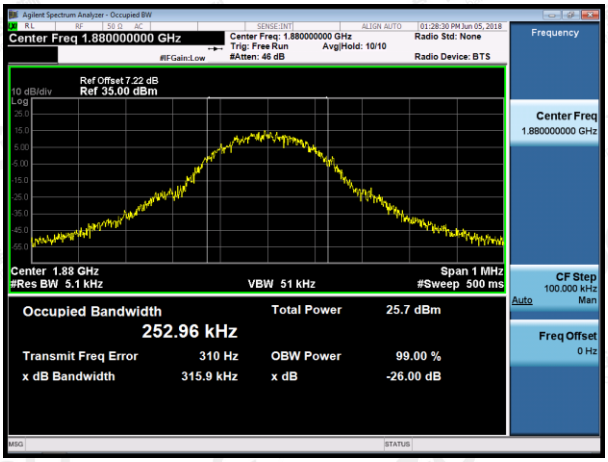
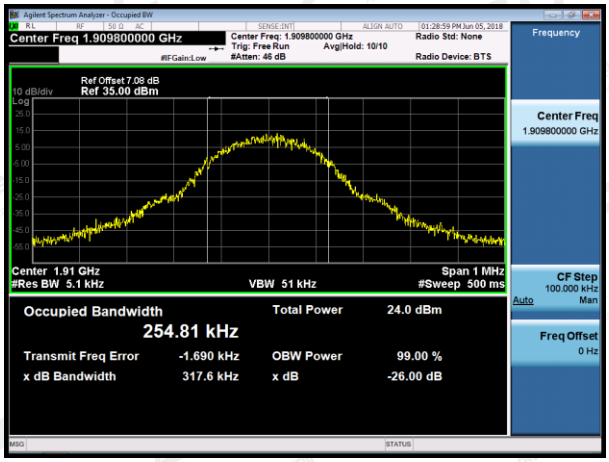
| GSM 850-MCH-EDGE | GSM 850-HCH-EDGE |
|---|---|
|  |  |



| GSM 1900-LCH-GSM | GSM 1900-MCH-GSM |
|---|---|
|  |  |



| GSM 1900-HCH-GSM | GSM 1900-LCH-EGPRS |
|---|---|
|  |  |

| GSM 1900-MCH-EGPRS | GSM 1900-HCH-EGPRS |
| --- | --- |
|  |  |

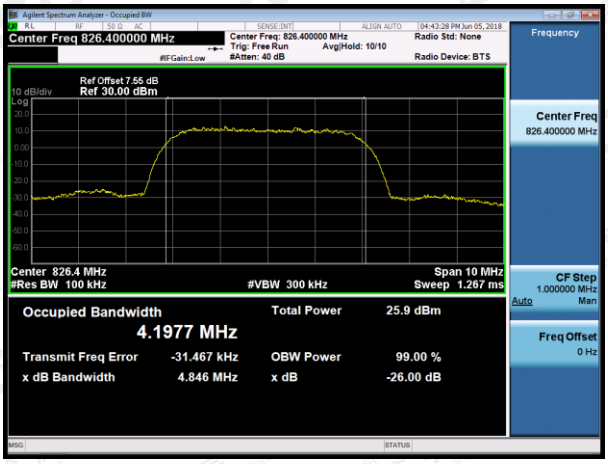
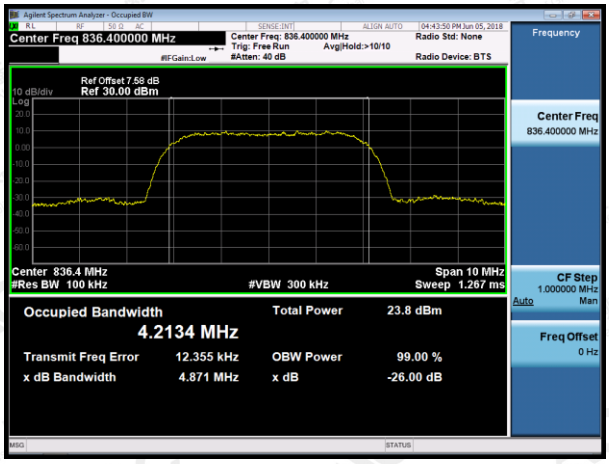
| Test Band | Test Mode | Test Channel | Occupied Bandwidth (KHZ) | Emission Bandwidth (KHZ) | Verdict |
|---|---|---|---|---|---|
| WCDMA 850 | UMTS | LCH | 4197.7 | 4846 | PASS |
| | | MCH | 4213.4 | 4871 | PASS |
| | | HCH | 4216.3 | 4875 | PASS |

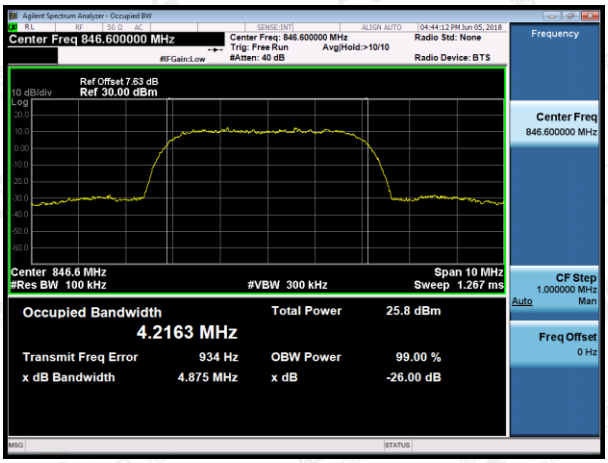
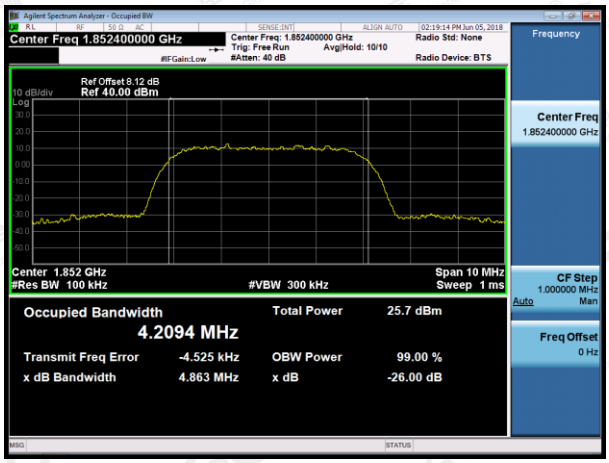
| Test Band | Test Mode | Test Channel | Occupied Bandwidth (KHZ) | Emission Bandwidth (KHZ) | Verdict |
|---|---|---|---|---|---|
| WCDMA 1900 | UMTS | LCH | 4209.4 | 4863 | PASS |
| | | MCH | 4214.0 | 4871 | PASS |
| | | HCH | 4219.3 | 4879 | PASS |

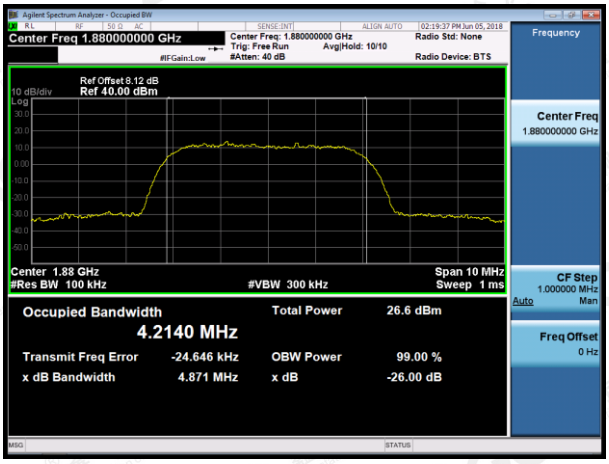
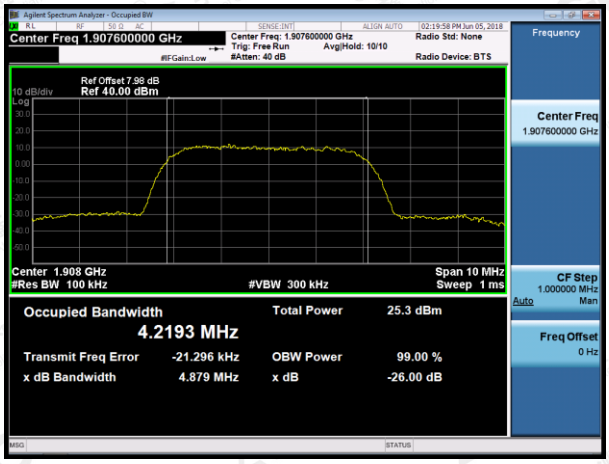
**For WCDMA**

**Test Band=WCDMA850/WCDMA1900**

**Test Mode=UMTS**

| WCDMA 850-LCH | WCDMA 850-MCH |
|---|---|
|  |  |

| WCDMA 850-HCH | WCDMA 1900-LCH |
|---|---|
|  |  |

| WCDMA 1900-MCH | WCDMA 1900-HCH |
|---|---|
|  |  |

# 8. BAND EDGE

## 8.1 MEASUREMENT METHOD

1. All out of band emissions are measured with an analyzer spectrum connected to the antenna terminal of the EUT while the EUT at its maximum duty cycle, at maximum power, and at the approximate frequencies. All data rates were investigated to determine the worst case configuration
2. The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.
3. Start and stop frequency were set such that the band edge would be placed in the center of the plot.
4. Span was set large enough so as to capture all out of band emissions near the band edge.
5. RBW>1% of the emission bandwidth, VBW >=3 x RBW, Detector=RMS, Number of points>=2 x Span/RBW, Trace mode=max hold, Sweep time=auto couple, and the trace was allowed to stabilize

## 8.2 PROVISIONS APPLICABLE

As Specified in FCC rules of 22.917(a) 、24.238(a)and KDB 971168 D1 V03R01.

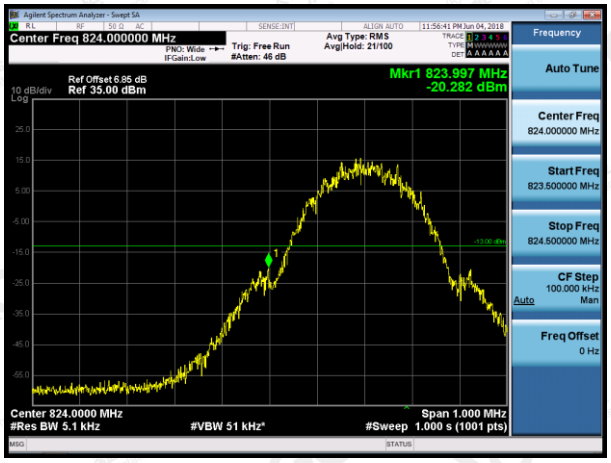
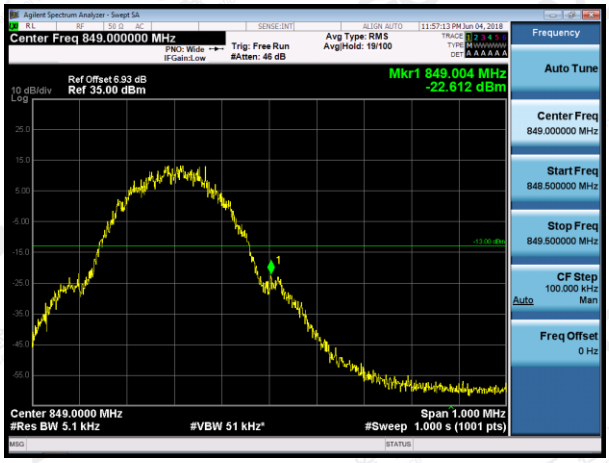
## 8.3 MEASUREMENT RESULT

**Test Results**

**For GSM**

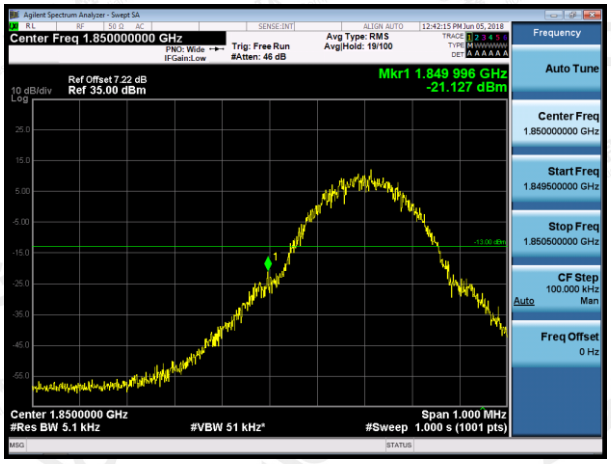
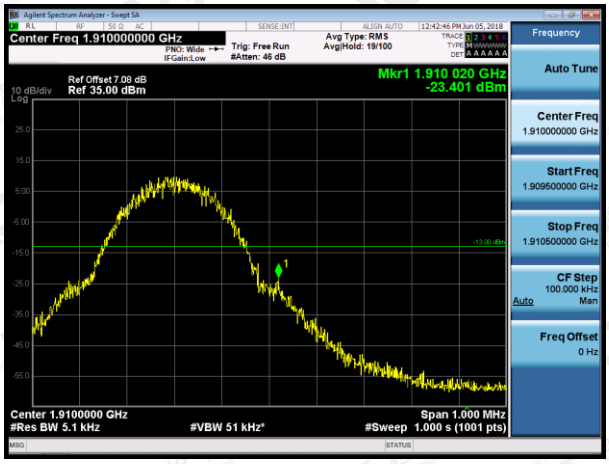
**Test Band=GSM850/GSM1900**

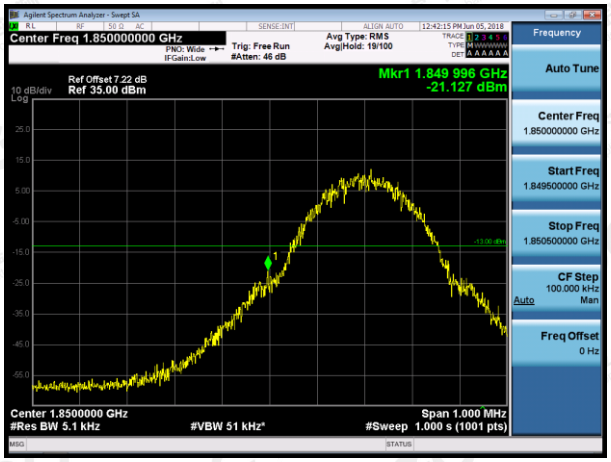
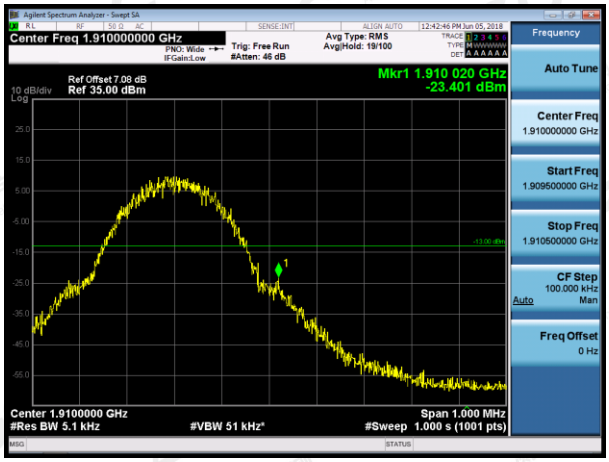
**Test Mode=GSM/EDGE**

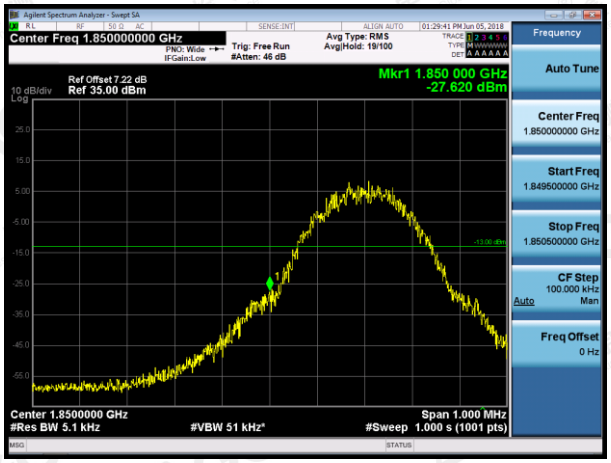
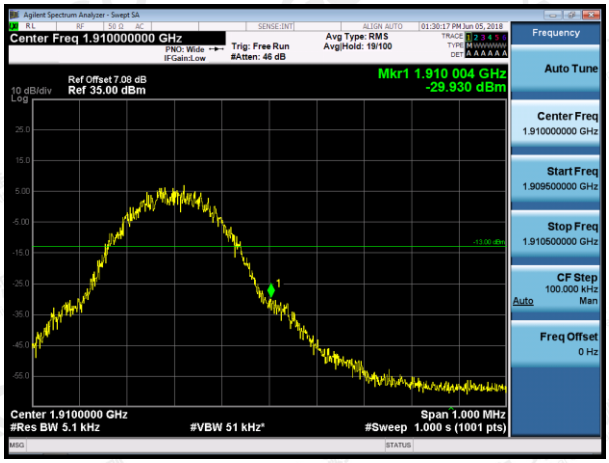
| GSM 850-LCH-GSM | GSM 850-HCH-GSM |
|---|---|
|  |  |





| GSM 850-LCH-EDGE | GSM 850-HCH-EDGE |
|---|---|
|  |  |

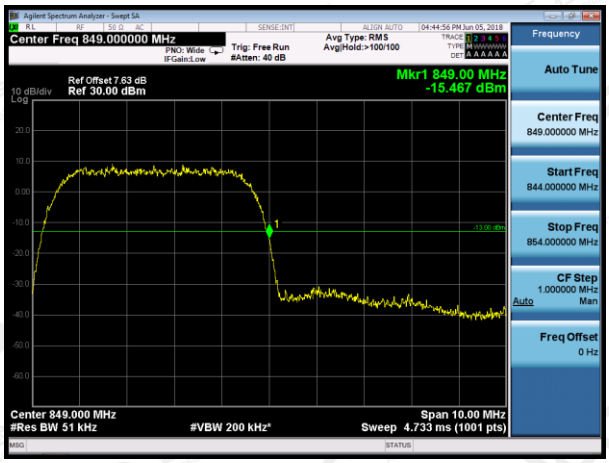
| GSM 1900-LCH-GSM | GSM 1900-HCH-GSM |
|---|---|
|  |  |

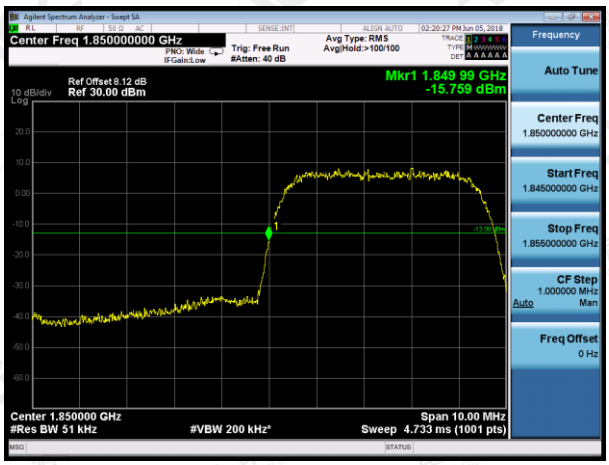
| GSM 1900-LCH-EDGE | GSM 1900-HCH-EDGE |
|---|---|
|  |  |

**For WCDMA**

**Test Band=WCDMA850/WCDMA1900**

**Test Mode=UMTS**

| WCDMA 850-LCH | WCDMA 850-HCH |
|---|---|
|  |  |

| WCDMA 1900-LCH | WCDMA 1900-HCH |
|---|---|
|  |  |

# 9. SPURIOUS EMISSION

## 9.1 CONDUCTED SPURIOUS EMISSION

### 9.1.1MEASUREMENT METHOD

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. The level of the carrier and the various conducted spurious and harmonic frequency is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its $10^{th}$ harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the approximate frequencies. All data rates were investigated to determine the worst case configuration.

2. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For GSM850, data taken from 30 MHz to 9 GHz.

3. Determine EUT transmit frequencies: the following typical channelswere chosen to conducted emissions testing.

| Typical Channels for testing of GSM 850 | |
|---|---|
| Channel | Frequency (MHz) |
| 128 | 824.2 |
| 190 | 836.6 |
| 251 | 848.8 |

| Typical Channels for testing of PCS 1900 | |
|---|---|
| Channel | Frequency (MHz) |
| 512 | 1850.2 |
| 661 | 1880.0 |
| 810 | 1909.8 |

| Typical Channels for testing of UMTS band II | |
|---|---|
| Channel | Frequency (MHz) |
| 9262 | 1852.4 |
| 9400 | 1880 |
| 9538 | 1907.6 |

| Typical Channels for testing of UMTS band V | |
|---|---|
| Channel | Frequency (MHz) |
| 9262 | 1852.4 |
| 9400 | 1880 |
| 9538 | 1907.6 |

### 9.1.2 PROVISIONS APPLICABLE

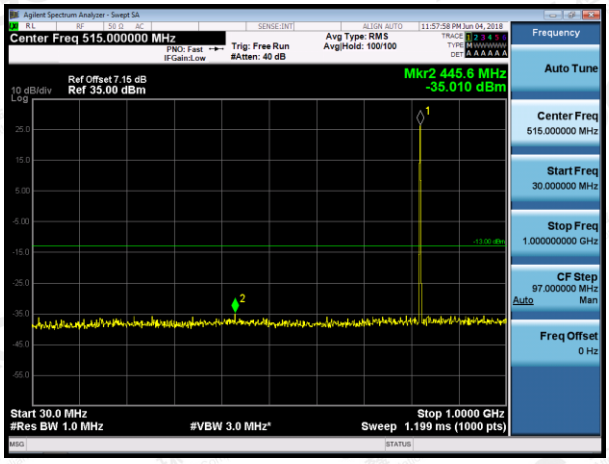
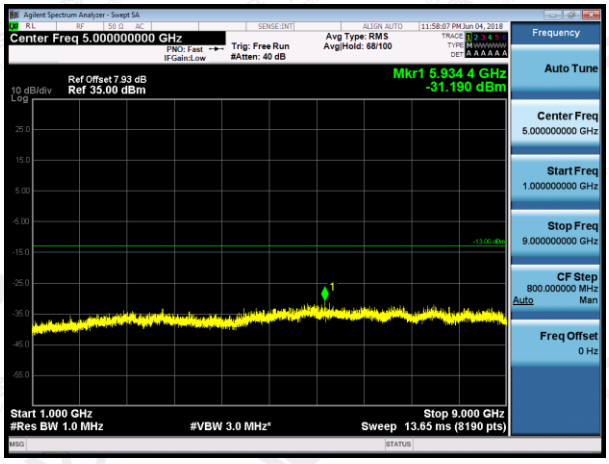
On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

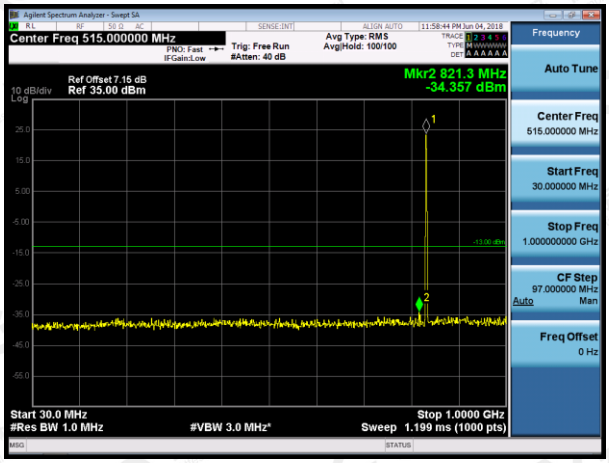
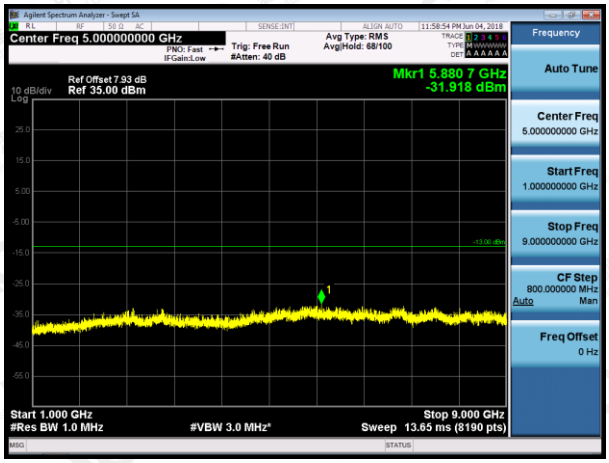
### 9.1.3MEASUREMENT RESULT

**Test Results**

**Test Band=GSM850/GSM1900**

**Test Mode=GSM**

| GSM 850-LCH-GSM | GSM 850-LCH-GSM |
|---|---|
|  |  |

| GSM 850-MCH-GSM | GSM 850-MCH-GSM |
|---|---|
|  |  |