

FCC Part 22H & 24E Measurement and Test Report

For

Worldwide telecom limited

2F Block C; Shenfang Building, Zhen Hualu, Futian, Shenzhen.

FCC ID: 2ARO3-WF99

| FCC Rules: | FCC Part 22H, FCC Part 24E | | | |
|---|--|--|--|--|
| Product Description: | Mobile phone | | | |
| Tested Model: | <u>WF99</u> | | | |
| Report No.: | <u>WTX19X07051158W-1</u> | | | |
| Sample Receipt Date: | <u>2019-07-26</u> | | | |
| Tested Date: | 2019-07-26 to 2019-08-26 | | | |
| Issued Date: | <u>2019-08-27</u> | | | |
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM Test Technology Co., Ltd.



TABLE OF CONTENTS

| 1. GENERAL INFORMATION | 4 |
|---|----|
| 1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) | |
| 1.2 TEST STANDARDS 1.3 TEST METHODOLOGY | |
| 1.4 Test Facility | |
| 1.5 EUT SETUP AND TEST MODE | |
| 1.6 Measurement Uncertainty | 7 |
| 1.7 Test Equipment List and Details | 8 |
| 2. SUMMARY OF TEST RESULTS | 10 |
| 3. RF EXPOSURE | 11 |
| 3.1 Standard Applicable | |
| 3.2 TEST RESULT | 11 |
| 4. RF OUTPUT POWER | 12 |
| 4.1 Standard Applicable | |
| 4.2 Test Procedure | |
| 4.3 SUMMARY OF TEST RESULTS/PLOTS | |
| 5. PEAK-TO-AVERAGE RATIO (PAR) OF TRANSMITTER | |
| 5.1 STANDARD APPLICABLE | |
| 5.2 TEST PROCEDURE 5.3 SUMMARY OF TEST RESULTS | |
| | |
| 6. EMISSION BANDWIDTH | |
| 6.1 STANDARD APPLICABLE | |
| 6.2 Test Procedure 6.3 Summary of Test Results/Plots | |
| | |
| 7. OUT OF BAND EMISSIONS AT ANTENNA TERMINAL | |
| 7.1 STANDARD APPLICABLE | |
| 7.2 TEST PROCEDURE 7.3 SUMMARY OF TEST RESULTS/PLOTS | |
| | |
| 8. SPURIOUS RADIATED EMISSIONS | |
| 8.1 STANDARD APPLICABLE | |
| 8.2 Test Procedure | |
| 9. FREQUENCY STABILITY | |
| 9.1 Standard Applicable | |
| 9.1 STANDARD APPLICABLE 9.2 Test Procedure | |
| 9.2 TEST PROCEDURE 9.3 SUMMARY OF TEST RESULTS/PLOTS | |
| 10. MODULATION CHARACTERISTICS | |
| 10.1 Standard Applicable | |
| 10.1 STANDARD AFFLICABLE | |
| 10.3 Summary of Test Results/Plots | |



Report version

| Version No. | Date of issue | Description | |
|-------------|---------------|-------------|--|
| Rev.00 | 2019-08-27 | Original | |
| / | / | / | |



1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

| Client Information | |
|--------------------------|--|
| Applicant: | Worldwide telecom limited |
| Address of applicant: | 2F Block C; Shenfang Building, Zhen Hualu, Futian, |
| | Shenzhen. |
| Manufacturer: | Worldwide telecom limited |
| Address of manufacturer: | 2F Block C; Shenfang Building, Zhen Hualu, Futian, |
| | Shenzhen. |

| General Description of EUT: | | |
|-----------------------------|---|--|
| Product Name: | Mobile phone | |
| Brand Name: | WOLKI | |
| Model No.: | WF99 | |
| Adding Model(s): | / | |
| Rated Voltage: | DC3.7V | |
| Battery: | / | |
| Adapter Model: | WCH03 Input: AC100-240V, 50/60Hz, 0.15A; Output: DC5V, 500mA | |
| Software Version: | / | |
| Hardware Version: | / | |

Note: The test data is gathered from a production sample provided by the manufacturer.

| Technical Characteristics of EUT: | | |
|-----------------------------------|-------------------------------------|--|
| 2G | | |
| Support Networks: | GSM, GPRS | |
| Support Band: | GSM850/PCS1900 | |
| Uplink Frequency: | GSM/GPRS 850: 824~849MHz | |
| Oplink Frequency. | GSM/GPRS 1900: 1850~1910MHz | |
| | GSM/GPRS 850: 869~894MHz | |
| Downlink Frequency: | GSM/GPRS 1900: 1930~1990MHz | |
| Max RF Output Power: | GSM850: 32.19dBm, GSM1900: 29.81dBm | |
| Type of Emission: | GSM850: 250KGXW, GSM1900: 248KGXW | |
| Type of Modulation: | GMSK | |
| Type of Antenna: | Integral Antenna | |
| Antenna Gain: | GSM850: 0.6dBi; GSM1900: 0.8dBi | |
| GPRS Class: | Class 12 | |



1.2 Test Standards

The tests were performed according to following standards:

 FCC Rules Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS
 FCC Rules Part 22: PRIVATE LAND MOBILE RADIO SERVICES.
 FCC Rules Part 24: PUBLIC MOBILE SERVICES
 TIA/EIA 603 E March 2016: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
 ANSI C63.26-2015: American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
 KDB 971168 D01 Power Meas License Digital Systems v03r01: MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with TIA/EIA 603 E/ KDB 971168/ ANSI C63.26 The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

1.4 Test Facility

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

| Test Mode List | | | | |
|----------------|-------------|----------------------------|--|--|
| Test Mode | Description | Remark | | |
| TM1 | GSM 850 | Low, Middle, High Channels | | |
| TM2 | GPRS 850 | Low, Middle, High Channels | | |
| TM3 | GSM 1900 | Low, Middle, High Channels | | |
| TM4 | GPRS 1900 | Low, Middle, High Channels | | |

| Testing Configure | | | |
|--------------------------|--------------------------------|------------------------------|-----------------------------|
| Support Band | Support Standard | Channel Frequency(MHz) | Channel Number |
| | | 824.2 | 128 |
| GSM 850 | GSM/GPRS | 836.6 | 190 |
| | | 848.8 | 251 |
| | | 1850.2 | 512 |
| PCS 1900 | GSM/GPRS | 1880.0 | 661 |
| | | 1909.8 | 810 |
| Note: the transmitter ha | s been tested on the communica | tions mode of GSM, GPRS, com | pliance test and record the |
| worst case. | | | |

| Test Conditions | | | |
|--------------------|-----------|--|--|
| Temperature: | 22~25 °C | | |
| Relative Humidity: | 50~55 %. | | |
| ATM Pressure: | 1019 mbar | | |

| EUT Cable List and Details | | | | |
|----------------------------|------------|---------------------|------------------------|--|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite | |
| / | / | / | / | |

| Special Cable List and Details | | | | |
|--------------------------------|------------|---------------------|------------------------|--|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite | |
| / | / | / | / | |

| Auxiliary Equipment List and Details | | | |
|--------------------------------------|--------------|-------|---------------|
| Description | Manufacturer | Model | Serial Number |
| / | / | / | / |



1.6 Measurement Uncertainty

| Measurement uncertainty | | |
|--------------------------------|------------|-------------------|
| Parameter | Conditions | Uncertainty |
| RF Output Power | Conducted | ± 0.42 dB |
| Occupied Bandwidth | Conducted | $\pm 1.5\%$ |
| Frequency Stability | Conducted | 2.3% |
| Transmitter Spurious Emissions | Conducted | ± 0.42 dB |
| | | 30-200MHz ±4.52dB |
| Transmitter Sourious Emissions | Radiated | 0.2-1GHz ±5.56dB |
| Transmitter Spurious Emissions | Kaulated | 1-6GHz ±3.84dB |
| | | 6-18GHz ±3.92dB |



1.7 Test Equipment List and Details

| No. | Description | Manufacturer | Model | Serial No. | Cal Date | Due. Date |
|--------------|----------------------|----------------------|-----------------------|-------------------|------------|------------|
| SEMT 1075 | Communication | Rohde & | CMW500 | 149650 | 2019-04-30 | 2020 04 20 |
| SEMT-1075 | Tester | Schwarz | CMW500 | 148650 | 2019-04-30 | 2020-04-29 |
| SEMT-1063 | GSM Tester | Rohde & | CMU200 | 114403 | 2019-04-30 | 2020-04-29 |
| SEM1-1005 | USM Tester | Schwarz | CM0200 | 114403 | 2019-04-30 | 2020-04-29 |
| SEMT-1072 | Spectrum | Agilent | E4407B | MY41440400 | 2019-04-30 | 2020-04-29 |
| SEM1-1072 | Analyzer | Aglicit | E4407B | 11111111111111111 | 2019-04-30 | 2020-04-29 |
| SEMT-1079 | Spectrum | Agilent | N9020A | US47140102 | 2019-04-30 | 2020-04-29 |
| | Analyzer | 8 | | | | |
| SEMT-1080 | Signal | Agilent | 83752A | 3610A01453 | 2019-04-30 | 2020-04-29 |
| | Generator | | | | | |
| SEMT-1081 | Vector Signal | Agilent | N5182A | MY47070202 | 2019-04-30 | 2020-04-29 |
| GED (TE 1020 | Generator | | 15064 | D (204 | 2010 04 20 | 2020.04.20 |
| SEMT-1028 | Power Divider | Weinschel | 1506A | PM204 | 2019-04-30 | 2020-04-29 |
| SEMT-1082 | Power Divider | RF-Lambda | RFLT4W5M18G | 14110400027 | 2019-04-30 | 2020-04-29 |
| SEMT-1031 | Spectrum | Rohde & | FSP30 | 836079/035 | 2019-04-30 | 2020-04-29 |
| | Analyzer | Schwarz | | | | |
| SEMT-1007 | EMI Test Receiver | Rohde & Schwarz | ESVB | 825471/005 | 2019-04-30 | 2020-04-29 |
| SEMT-1008 | Amplifier | Agilent | 8447F | 3113A06717 | 2019-04-30 | 2020-04-29 |
| SEMT-1008 | Amplifier | C&D | PAP-1G18 | 2002 | 2019-04-30 | 2020-04-29 |
| SEMT-1043 | Loop Antenna | Schwarz beck | FMZB 1516 | 9773 | 2019-04-30 | 2020-04-29 |
| SLWI-1007 | Broadband | Senwarz beek | 1 WIZD 1510 | 7113 | 2017-05-05 | 2021-03-04 |
| SEMT-1068 | Antenna | Schwarz beck | VULB9163 | 9163-333 | 2019-05-05 | 2021-05-04 |
| SEMT-1042 | Horn Antenna | ETS | 3117 | 00086197 | 2019-05-05 | 2021-05-04 |
| SEMT-1121 | Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA9170582 | 2019-05-05 | 2021-05-04 |
| SEMT-1168 | Pre-amplifier | Direction | PAP-0126 | 14141-12838 | 2019-04-30 | 2020-04-29 |
| SEMIT 1100 | | Systems Inc. | 1111 0120 | 1111112030 | 2019 01 30 | 2020 01 29 |
| SEMT-1169 | Pre-amplifier | Direction | PAP-2640 | 14145-14153 | 2019-04-30 | 2020-04-29 |
| | - | Systems Inc. | | | | |
| SEMT-1163 | Spectrum | Rohde & | FSP40 | 100612 | 2019-04-30 | 2020-04-29 |
| | Analyzer | Schwarz | | | | |
| SEMT-1170 | DRG Horn | A.H. | SAS-574 | 571 | 2019-05-05 | 2021-05-04 |
| | Antenna | SYSTEMS | NOACO | N 1145 450075 | 2010 04 20 | 2020.04.20 |
| SEMT-1166 | Power Limiter | Agilent | N9356B | MY45450376 | 2019-04-30 | 2020-04-29 |
| SEMT-1055 | RF Limiter | ATTEN | AT-BSF-0820~0920 | / | 2019-04-30 | 2020-04-29 |
| SEMT-1056 | RF Limiter | ATTEN | AT-BSF-1710~1910 | / | 2019-04-30 | 2020-04-29 |
| SEMT-1076 | RF Switcher | Top Precision | RCS03-A2 | / | 2019-04-30 | 2020-04-29 |
| SEMT-C001 | Cable | Zheng DI Zheng DI | LL142-07-07-10M(A) | / | 2019-03-18 | 2020-03-17 |
| SEMT-C002 | Cable | Zheng DI | ZT40-2.92J-2.92J-6M | / | 2019-03-18 | 2020-03-17 |
| SEMT-C003 | Cable | Zheng DI | ZT40-2.92J-2.92J-2.5M | / | 2019-03-18 | 2020-03-17 |



| SEMT-C004 | Cable | Zheng DI | 2M0RFC | / | 2019-03-18 | 2020-03-17 |
|-----------|-------|----------|--------|---|------------|------------|
| SEMT-C005 | Cable | Zheng DI | 1M0RFC | / | 2019-03-18 | 2020-03-17 |
| SEMT-C006 | Cable | Zheng DI | 1M0RFC | / | 2019-03-18 | 2020-03-17 |

| Software List | | | | |
|-----------------------|--------------|----------|----------------|--|
| Description | Manufacturer | Model | Version | |
| EMI Test Software | Fored | EZ-EMC | RA-03A1 | |
| (Radiated Emission)* | Farad | EZ-EIVIC | KA-05A1 | |
| EMI Test Software | David | | DA 0241 | |
| (Conducted Emission)* | Farad | EZ-EMC | RA-03A1 | |

*Remark: indicates software version used in the compliance certification testing

2. SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test Item | Result |
|--------------------------|--|-----------|
| §1.1307, §2.1093 | RF Exposure | Compliant |
| §22.913(a), §24.232(c) | RF Output Power | Compliant |
| §24.51 | Peak-to-average Ratio (PAR) of Transmitter | Compliant |
| \$22.917(b), \$24.238(b) | Emission Bandwidth | Compliant |
| §22.917(a), §24.238(a) | Spurious Emissions at Antenna Terminal | Compliant |
| §22.917(a), §24.238(a) | Spurious Radiation Emissions | Compliant |
| §22.917(a), §24.238(a) | Out of Band Emissions | Compliant |
| §22.355, §24.235 | Frequency Stability | Compliant |



3. RF Exposure

3.1 Standard Applicable

According to §1.1307 and §2.1093, the portable transmitter must comply the RF exposure requirements.

3.2 Test Result

This product complied with the requirement of the RF exposure, please see the SAR report.



4. RF Output Power

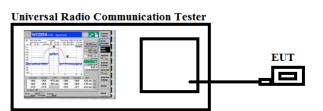
4.1 Standard Applicable

According to §22.913(a)(2), the ERP of mobile and portable stations transmitters and auxiliary test transmitters must not exceed 7 Watts.

According to \$24.232 (c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

4.2 Test Procedure

Conducted output power test method:



- Radiated power test method:
- 1. The setup of EUT is according with per ANSI/TIA Standard 603E and ANSI C63.26 measurement procedure.
- 2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
- 3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
- 4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

4.3 Summary of Test Results/Plots



> Max. Radiated Power

| Mode | Channel | Antenna Polar | ERP (dBm) | Limit (dBm) | Result |
|---------|---------|---------------|-----------|-------------|--------|
| | 129 | V | 28.14 | | |
| | 128 | Н | 21.25 | | |
| CSM850 | 100 | V | 28.03 | -29.45 | Daga |
| GSM850 | 190 | Н | 21.42 | <38.45 | Pass |
| | 251 | V | 28.35 | | |
| | | Н | 21.78 | | |
| | 100 | V | 29.12 | | |
| | 128 | Н | 22.42 | | |
| GPRS850 | 190 | V | 29.74 | -29.45 | Decc |
| GFK5850 | 251 | Н | 22.40 | <38.45 | Pass |
| | | V | 29.38 | | |
| | 231 | Н | 22.28 | | |

| Mode | Channel | Antenna Polar | EIRP (dBm) | Limit (dBm) | Result |
|----------------|---------|---------------|------------|-------------|--------|
| | 512 | V | 27.47 | | |
| | 512 | Н | 20.62 | | |
| DCS1000 | 661 | V | 27.85 | -22.00 | Daga |
| PCS1900 | 661 | Н | 20.14 | <33.00 | Pass |
| | 810 | V | 27.36 | | |
| | | Н | 20.63 | | |
| | 510 | V | 27.41 | | |
| | 512 | Н | 20.85 | | |
| CDDS1000 | 661 | V | 27.08 | -22.00 | Pass |
| GPRS1900 | 810 | Н | 20.39 | <33.00 | Pass |
| | | V | 27.11 | | |
| | 810 | Н | 20.48 | | |



> Max. Conducted Power (Average power)

| Conducted Average power (dBm) | | | | | | |
|-------------------------------|--------|----------------------|-------|---------|---------|---------|
| Band | GSM850 | | | | PCS1900 | |
| Channel | 128 | 128 190 251 | | | 661 | 810 |
| Frequency(MHz) | 824.20 | 824.20 836.60 848.80 | | 1850.20 | 1880.00 | 1909.80 |
| GSM | 31.89 | 32.05 | 32.13 | 29.71 | 29.17 | 28.51 |
| GPRS(1Slot) | 31.86 | 32.11 | 32.19 | 29.81 | 29.29 | 28.44 |



5. Peak-to-average Ratio (PAR) of Transmitter

5.1 Standard Applicable

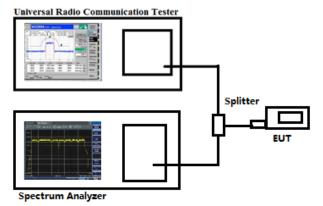
According to \$24.232(d), power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of \$24.51, in measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

5.2 Test Procedure

According with KDB 971168

- 1. The signal analyzer's CCDF measurement profile is enabled
- 2. Frequency = carrier center frequency
- 3. Measurement BW > Emission bandwidth of signal
- 4. The signal analyzer was set to collect one million samples to generate the CCDF curve
- 5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal " RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the " on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Configuration for the emission bandwidth testing:



5.3 Summary of Test Results

| PCS1900 | | | | |
|--------------|---------|-----------------|----------|------------|
| Test Mode | Channel | Frequency (MHz) | PAR (dB) | Limit (dB) |
| GSM | 661 | 1850.2 | 4.58 | 13 |
| GPRS(1 Slot) | 661 | 1850.2 | 4.32 | 13 |

Note: Only the worst case was selected to record.



6. Emission Bandwidth

6.1 Standard Applicable

According to §22.917(b), the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

According to §24.238(b), the emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

6.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 10kHz for GSM mode and 100kHz for WCDMA mode, VBW shall be at least 3 times the RBW, and the 26dB bandwidth was recorded.

Universal Radio Communication Tester Splitter Spectrum Analyzer

Test Configuration for the emission bandwidth testing:

6.3 Summary of Test Results/Plots



| EUT Mode | Channel | Frequency (MHz) | 99% Occupy bandwidth (kHz) | -26dB bandwidth (kHz) |
|--------------------------|---------|-----------------|-------------------------------|--------------------------|
| | 128 | 824.20 | 245.1206 | 314.769 |
| GSM 850 (GMSK) | 190 | 836.60 | 248.0628 | 316.683 |
| | 251 | 848.80 | 249.5104 | 315.173 |
| | 128 | 824.20 | 246.9931 | 317.564 |
| GPRS850 (GMSK,1Slot) | 190 | 836.60 | 245.2764 | 322.093 |
| | 251 | 848.80 | 247.4083 | 319.274 |
| | 512 | 1850.20 | 246.7805 | 315.937 |
| PCS1900 (GMSK) | 661 | 1880.00 | 244.1375 | 313.992 |
| (0 | 810 | 1909.80 | 247.3424 | 317.049 |
| | 512 | 1850.20 | 246.8524 | 309.590 |
| GPRS1900 (GMSK,1Slot) | 661 | 1880.00 | 248.2552 | 318.072 |
| | 810 | 1909.80 | 247.1423 | 316.920 |



| | GSM850 |
|----------------|--|
| | Agilent R T Freq/Channel |
| | Ch Freq 824.2 MHz Trig Free Center Freq 824.200000 MHz |
| | Ref 40.5 dBm Atten 45 dB Start Freq |
| | #Peak Stop Freq Log |
| Low Channel | 0ffst 6.5 dB |
| | Center 824.2 MHz Span 1 MHz 0.00000000 Hz #Res BW 10 kHz #VBW 30 kHz Sweep 10.36 ms (1001 pts) 0.00000000 Hz |
| | Occupied Bandwidth Occ BW % Pwr 99.00 % Signal Track 245.1206 kHz x dB -26.00 dB On Off |
| | Transmit Freq Error -2.364 kHz Scale Type x dB Bandwidth 314.769 kHz Log |
| | |
| | Ch Freq 836.6 MHz Trig Free Center Freq 836.60000 MHz |
| | Start Freq 836.100000 MHz |
| | #Peak Stop Freq 10 5,7 |
| Middle Channel | dB/ CF Step 0ffst 0 6.5 0 dB 0 |
| | Center 836.6 MHz Span 1 MHz Freq Offset #Res BW 10 kHz #VBW 30 kHz Sweep 10.36 ms (1001 pts) 0.00000000 Hz |
| | Occupied Bandwidth Occ BW % Pwr 99.00 % Signal Track 248.0628 kHz x dB -26.00 dB Off |
| | Transmit Freq Error -1.786 kHz Scale Type x dB Bandwidth 316.683 kHz Log |
| | ★ Agilent R T Freq/Channel |
| | Ch Freq 848.8 MHz Trig Free Center Freq 848.800000 MHz |
| | Ref 40.5 dBm Atten 45 dB Start Freq |
| High Channel | #Peak Stop Freq Log Stop Freq 10 Stop Freq dB/ Stop Freq |
| | Offst 000000000000000000000000000000000000 |
| | Center 848.8 MHz Span 1 MHz 0.00000000 Hz #Res BW 10 kHz #VBW 30 kHz Sweep 10.36 ms (1001 pts) |
| | Occupied Bandwidth Occ BW % Pwr 99.00 % 249.5104 kHz x dB -26.00 dB |
| | Transmit Freq Error -312.961 Hz Scale Type x dB Bandwidth 315.173 kHz Log |
| | |



| | GPRS850 |
|----------------|---|
| | * Agilent R T Freq/Channel |
| | Ch Freq 824.2 MHz Trig Free Center Freq 824.20000 MHz |
| | Start Freq Ref 40.5 dBm Atten 45 dB |
| | #Peak Stop Freq Log |
| Low Channel | Offst 000000000000000000000000000000000000 |
| | Center 824.2 MHz Span 1 MHz 0.00000000 Hz #Res BW 10 kHz #VBW 30 kHz Sweep 10.36 ms (1001 pts) |
| | Occupied Bandwidth Occ BW % Pwr 99.00 % Signal Track On Off 246.9931 kHz x dB -26.00 dB Off Off |
| | Transmit Freq Error -850.922 Hz Scale Type x dB Bandwidth 317.564 kHz Log |
| | |
| | Ch Freq 836.6 MHz Trig Free Center Freq Occupied Bandwidth 836.60000 MHz |
| | Start Freq 836.100000 MHz |
| | Ref 40.5 dBm Atten 45 dB #Peak Log 10 Stop Freq 837.100000 MHz |
| Middle Channel | dB/ Offst 6.5 |
| | dB M/L Freq Offset Center 836.6 MHz Span 1 MHz 0.00000000 Hz #Res BW 10 kHz #VBW 30 kHz Sweep 10.36 ms (1001 pts) |
| | Occupied Bandwidth Occ BW % Pwr 99.00 % Signal Track On 245.2764 kHz x dB -26.00 dB On On |
| | Transmit Freq Error 311.107 Hz Scale Type x dB Bandwidth 322.093 kHz Log |
| | Addient R T recent |
| | Ch Freq 848.8 MHz Trig Free Center Freq |
| | Start Freq |
| High Channel | Ref 40.5 dBm Atten 45 dB 848.300000 MHz #Peak |
| | 10 043-300000 kHz |
| | dB Image: Content of the second |
| | #Res BW 10 kHz #VBW 30 kHz Sweep 10.36 ms (1001 pts) Occupied Bandwidth Occ BW % Pwr 99.00 % 247 4083 kHz × dB -26.00 dB |
| | 247.4083 kHz x dB -26.00 dB Scale Type Transmit Freq Error 243.358 Hz Scale Type x dB Bandwidth 319.274 kHz Log |
| | |



| | PCS1900 | |
|----------------|---|--|
| | * Agilent R T TracoView | |
| Low Channel | | |
| | Ch Freq 1.8502 GHz Trig Free Occupied Bandwidth 1 2 3 | |
| | Clear Write | |
| | #Peak Max Hold Log Annon Anno Annon A | |
| | Offst 6.5 dB | |
| | Center 1.85 GHz View #Res BW 10 kHz #VBW 30 kHz Sweep 10.36 ms (1001 pts) | |
| | Occupied Bandwidth Occ BW % Pwr 99.00 % Blank 246.7805 kHz x dB -26.00 dB | |
| | Transmit Freq Error -2.880 kHz More x dB Bandwidth 315.937 kHz 1 of 2 | |
| | | |
| Middle Channel | Agilent R T Ch Freq 1.88 GHz Trig Free | |
| | Occupied Bandwidth 1.88000000 GHz | |
| | Start Freq 1.87950000 GHz | |
| | #Peak Stop Freq Log 10 | |
| | dB/ Offst CF Step 100.000000 kHz 6.5 Auto | |
| | Center 1.88 GHz Span 1 MHz Freq Offset | |
| | #Res BW 10 kHz #VBW 30 kHz Sweep 10.36 ms (1001 pts) Signal Track Occupied Bandwidth Occ BW % Pwr 99.00 % Signal Track On Off 244.1375 kHz x dB -26.00 dB -26.00 dB Off Off | |
| | Z44. I 37 3 KHZ Scale Type Transmit Freq Error 1.143 kHz x dB Bandwidth 313.992 kHz | |
| | | |
| High Channel | * Agilent R T Trace/View | |
| | Ch Freq 1.9098 GHz Trig Free Occupied Bandwidth 1 2 3 | |
| | Clear Write Ref 40.5 dBm Atten 45 dB | |
| | #Peak Max Hold 10 4 | |
| | dB/ Offst 6.5 dB | |
| | Center 1.91 GHz Span 1 MHz #VBW 30 kHz Sweep 10.36 ms (1001 pts) | |
| | Occupied Bandwidth OccuBW % Pwr 99.00 % Blank 247.3424 kHz x dB -26.00 dB -26.00 dB | |
| | | |



| | GPRS1900 |
|----------------|--|
| | * Agilent R T Trace/View |
| Low Channel | Ch Freq 1.8502 GHz Trig Free Trace |
| | Clear Write |
| | Ref 40.5 dBm Atten 45 dB #Peak |
| | dB/ Offst 6.5 dB |
| | Center 1.85 GHz Span 1 MHz #Res BW 10 kHz #VBW 30 kHz Sweep 10.36 ms (1001 pts) |
| | Occupied Bandwidth Occ BW % Pwr 99.00 % Blank 246.8524 kHz x dB -26.00 dB |
| | Transmit Freq Error -250.867 Hz More x dB Bandwidth 309.590 kHz 1 of 2 |
| | * Agilent R T Trace/View |
| Middle Channel | Ch Freq 1.88 GHz Trig Free Trace Occupied Bandwidth 1 2 3 |
| | Clear Write |
| | Ref 40.5 dBm Atten 45 dB #Peak |
| | dB/ Offst 6.5 dB |
| | Center 1.88 GHz #Res BW 10 kHz #Res BW 10 kHz Ket WBW 30 kHz Ket W |
| | Occupied Bandwidth Occ BW % Pwr 99.00 % Blank 248.2552 kHz x dB -26.00 dB |
| | Transmit Freq Error 1.889 kHz More x dB Bandwidth 318.072 kHz 1 of 2 |
| High Channel | |
| | Ch Freq 1.9098 GHz Trig Free Center Freq Occupied Bandwidth 1.90980000 GHz |
| | Start Freq 1.90930000 GHz |
| | #Peak Stop Freq 10 1.91030000 GHz |
| | dB/ 2pr CF Step 0ffst 0000000 kHz 100.000000 kHz 6.5 0000000 kHz Auto |
| | Center 1.91 GHz System 1 MHz Freq Offset #Res BW 10 kHz #VBW 30 kHz Sweep 10.36 ms (1001 pts) Freq Offset |
| | Occupied Bandwidth Occ BW % Pwr 99.00 % Signal Track 247.1423 kHz x dB -26.00 dB On Off |
| | Transmit Freq Error -466.306 Hz x dB Bandwidth 316.920 kHz Scale Type Log Lin |



7. Out of Band Emissions at Antenna Terminal

7.1 Standard Applicable

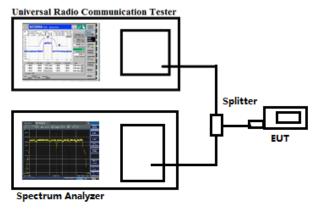
According to 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P) dB$.

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

7.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 100kHz and 1MHz for the scan frequency from 30MHz to 1GHz and the scan frequency from 1GHz to up to 10th harmonic.

Test Configuration for the out of band emissions testing:

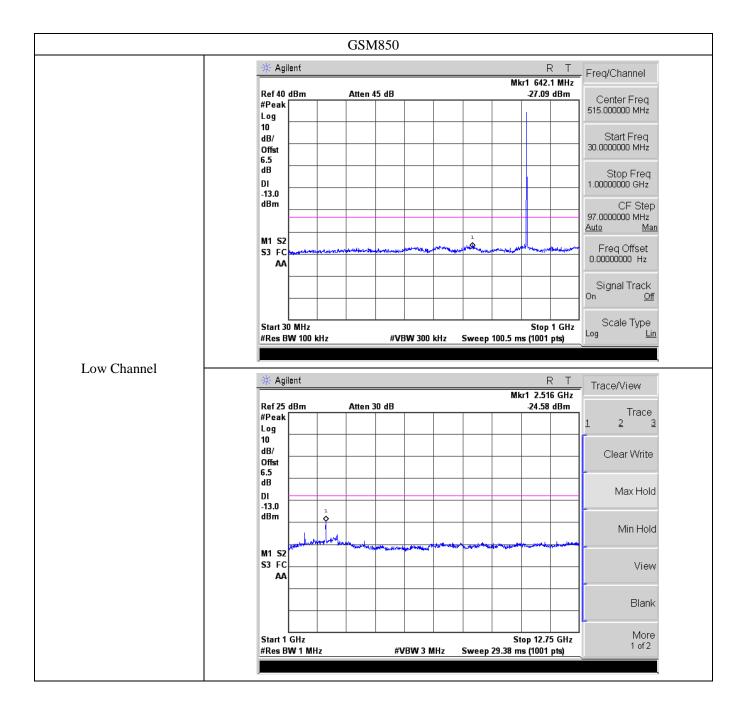


7.3 Summary of Test Results/Plots

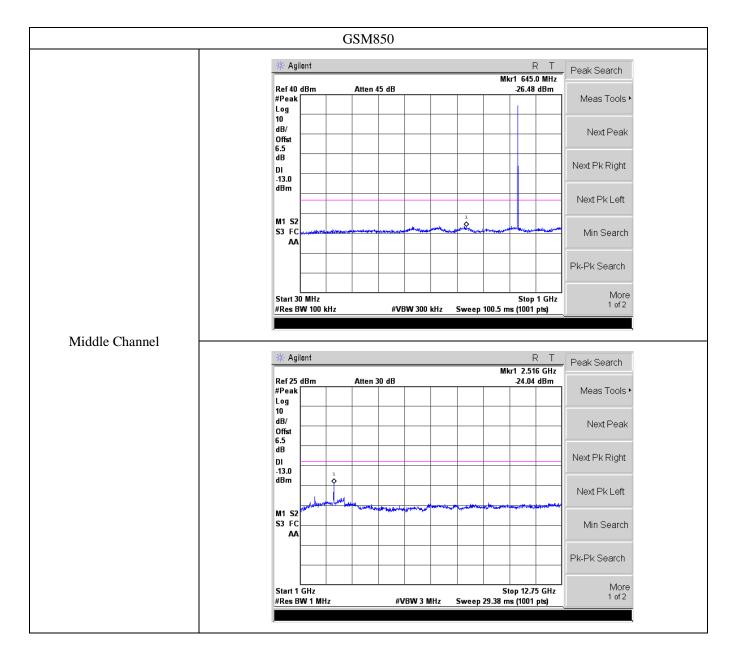
Note: Pre-scan mode WCDMA/HSDPA/HSUPA find the worst case at WCDMA mode and recorded in the test report.

Please refer to the following test plots

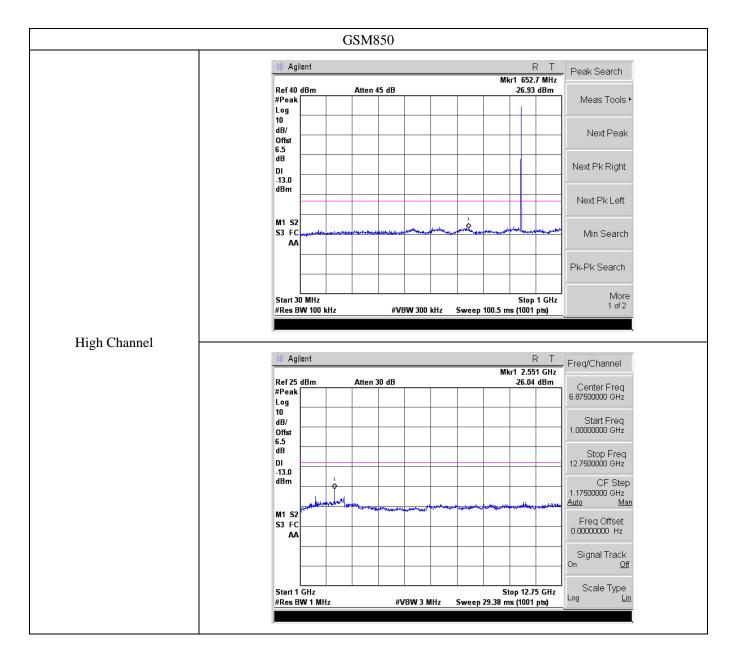




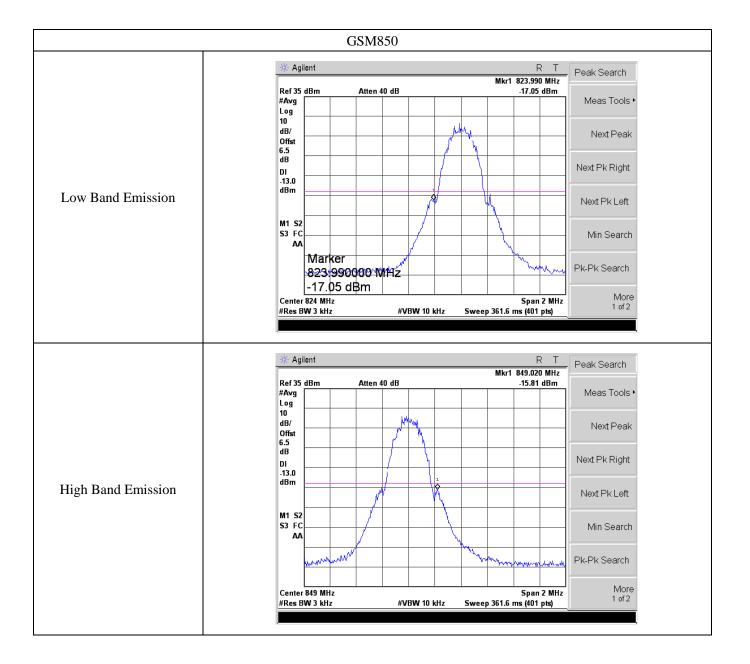




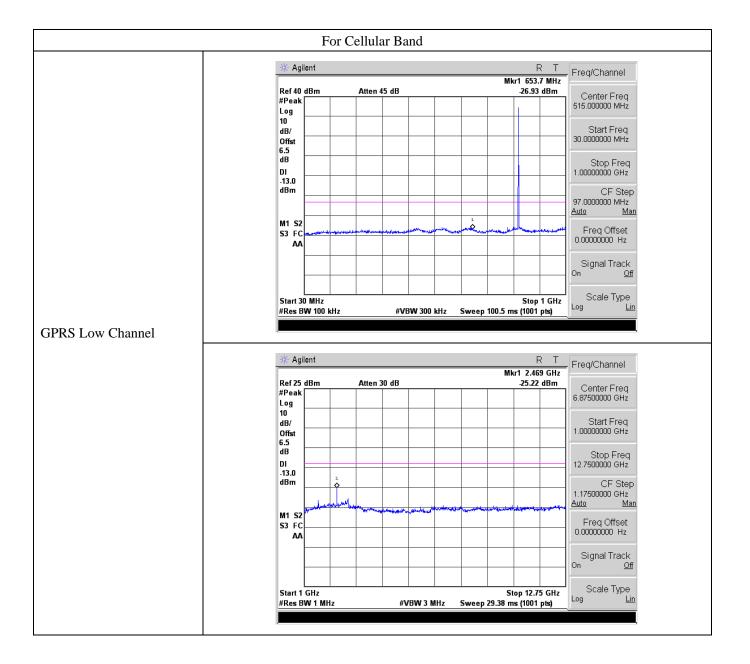




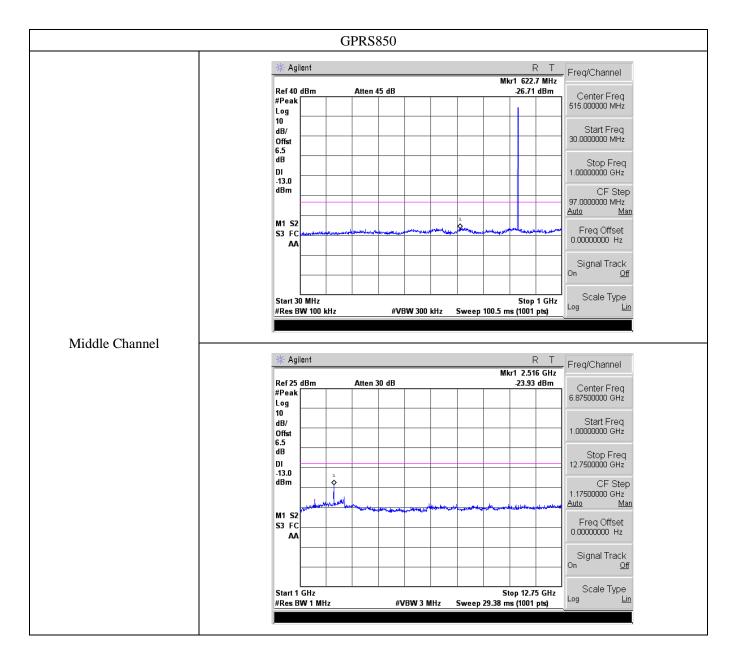






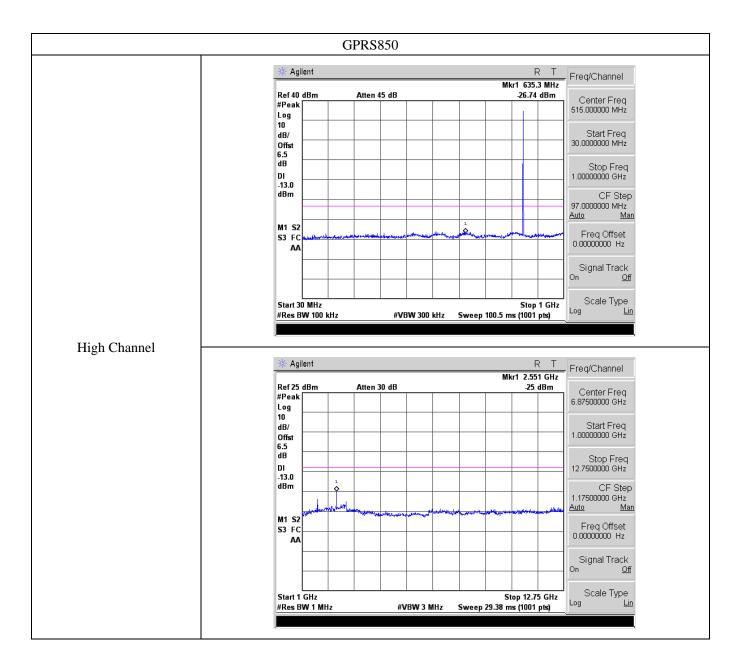




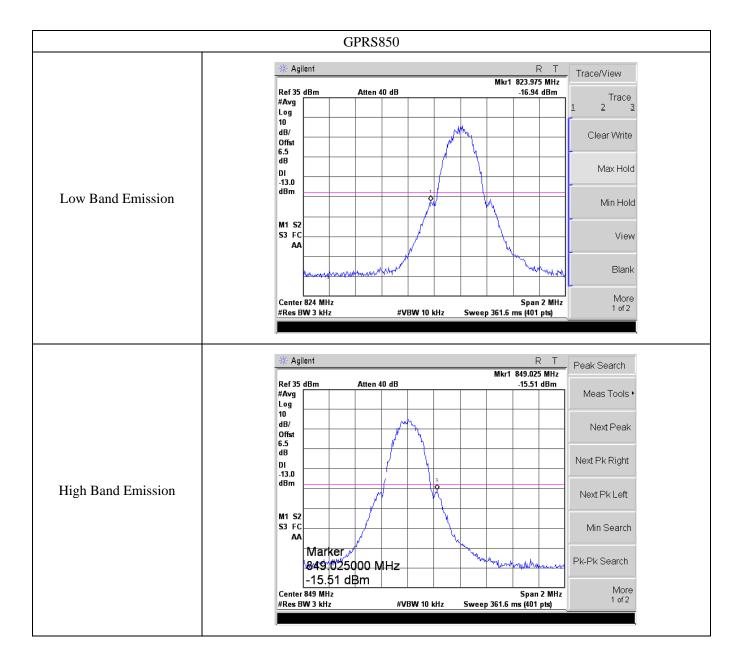




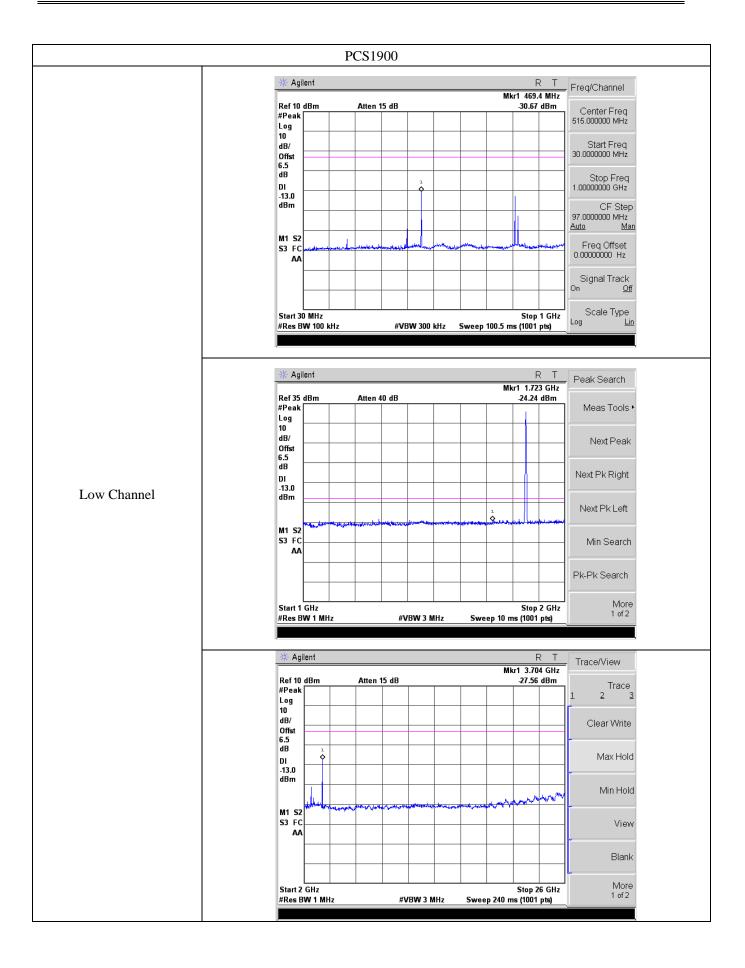




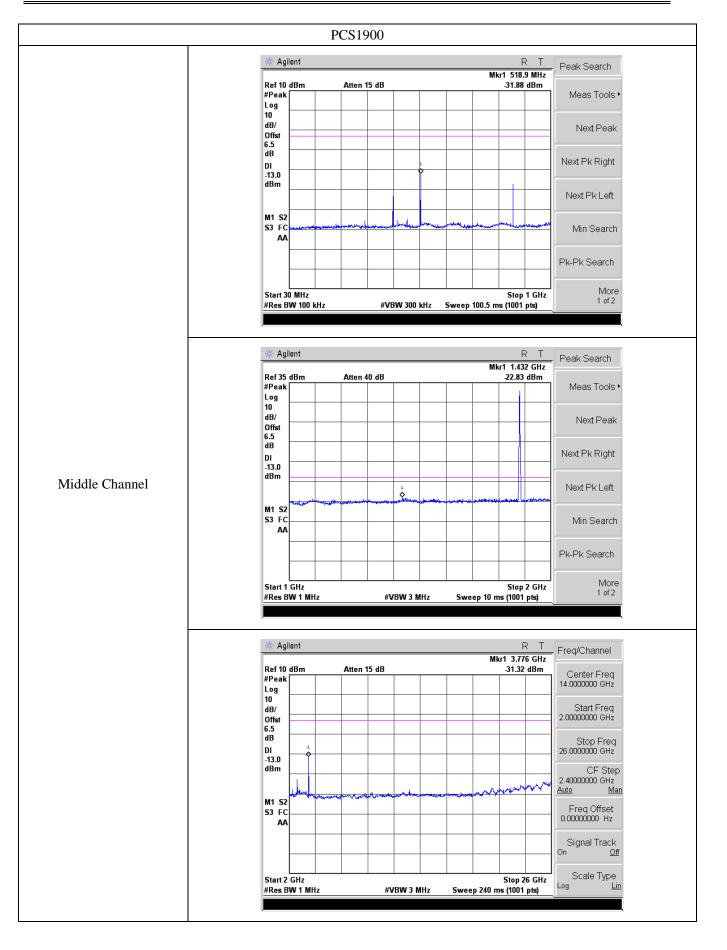




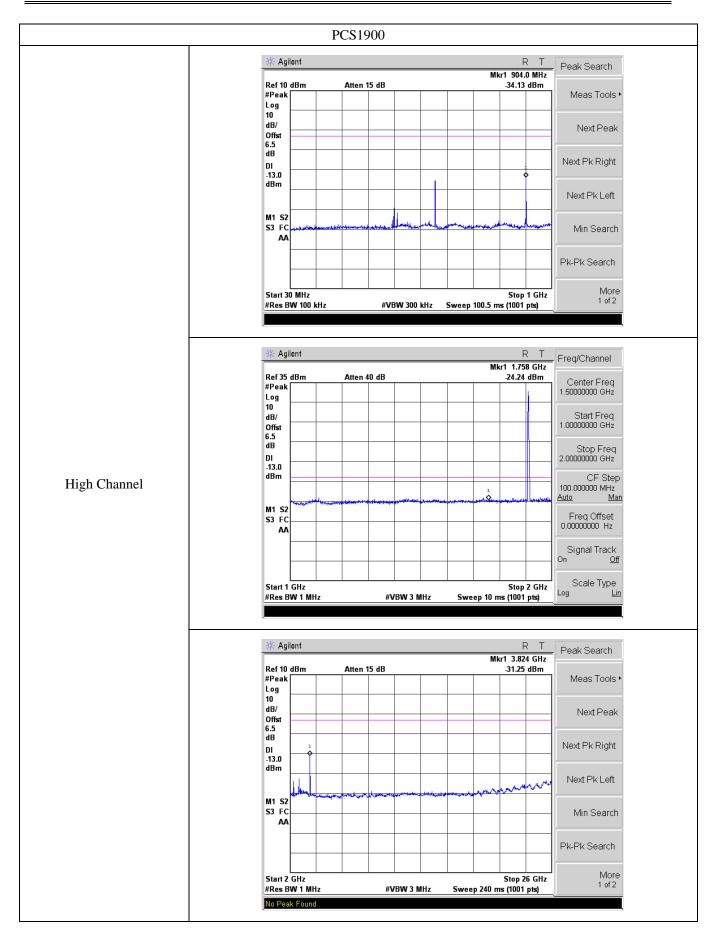




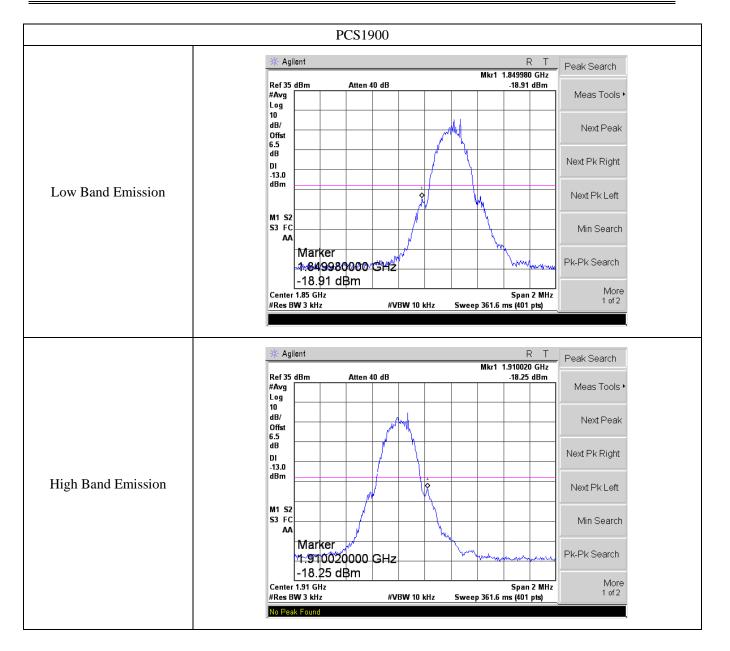




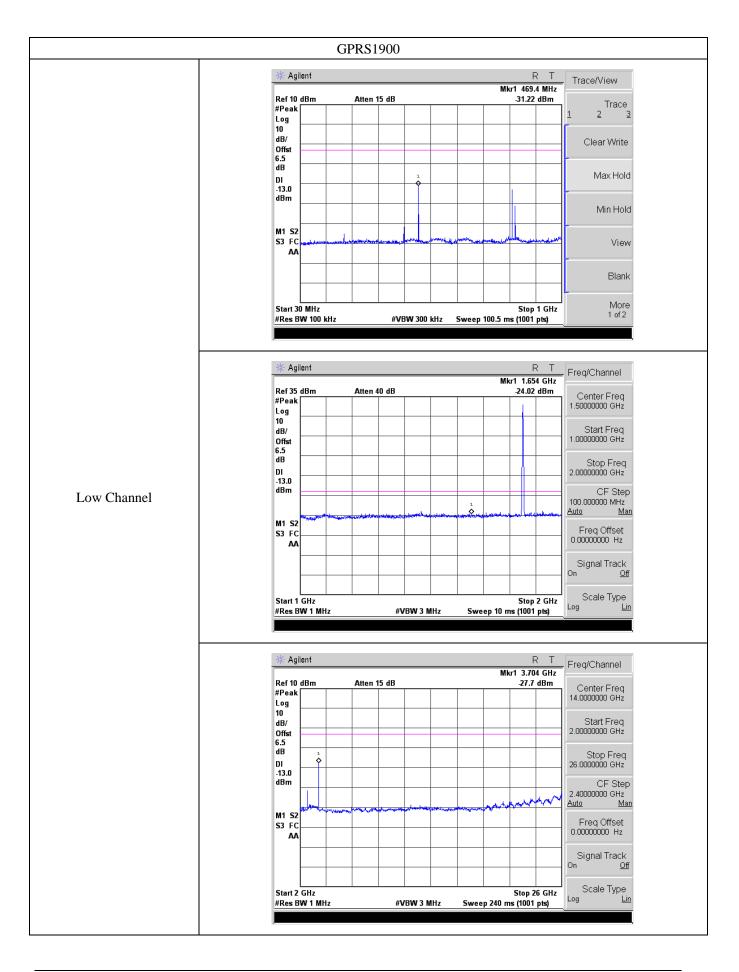




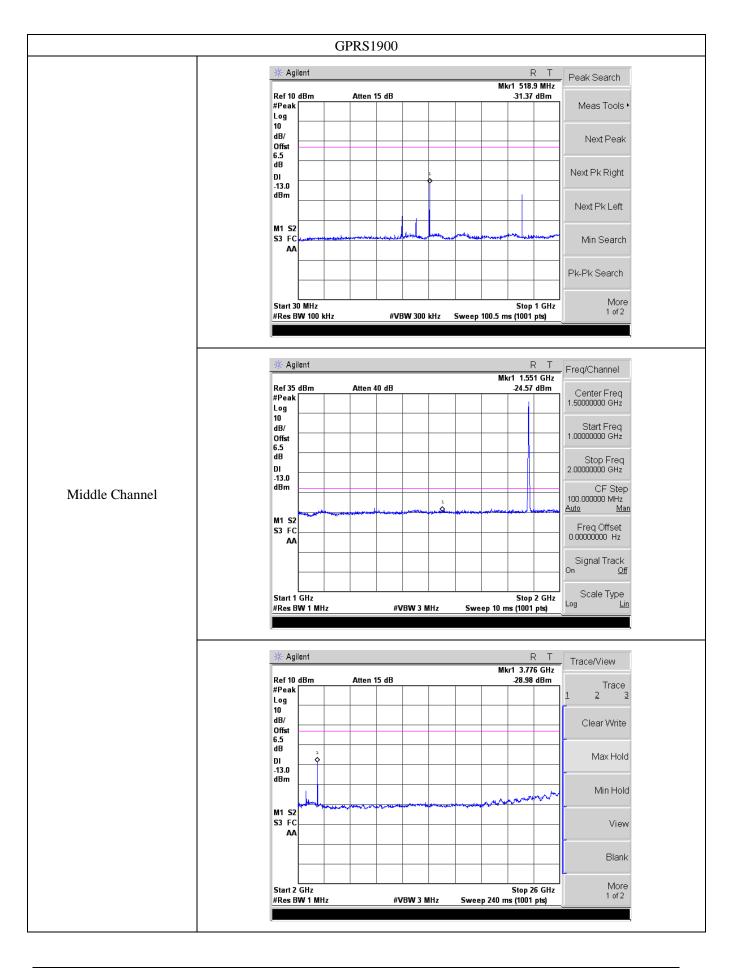




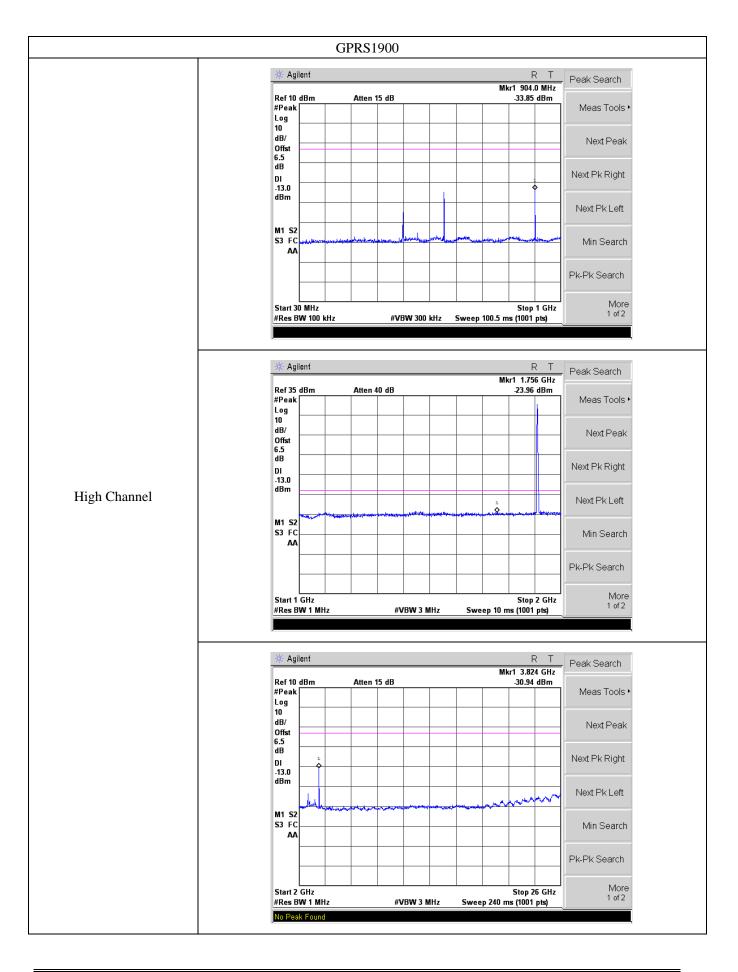
















| | GPRS1900 | |
|--------------------|---|---|
| | ∦ Agilent R Mkr1 1.849980 G | |
| | Ref 35 dBm Atten 40 dB -18.91 dB #Avg Log | |
| | 10 dB/ Offst 6.5 | Next Peak |
| | dB Di -13.0 dBm | Next Pk Right |
| Low Band Emission | | Next Pk Left |
| | M1 S2 S3 FC AA | Min Search |
| | Marker -1-849980000 CH2 -18.91 dBm | Pk-Pk Search |
| | | |
| | Center 1.85 GHz Span 2 M #Res BW 3 kHz #VBW 10 kHz Sweep 361.6 ms (401 pts | |
| | Center 1.85 GHz Span 2 M #Res BW 3 kHz #VBW 10 kHz Sweep 361.6 ms (401 pts | T Peak Search |
| | Center 1.85 GHz Span 2 M #Res BW 3 kHz #VBW 10 kHz Sweep 361.6 ms (401 pts Agilent R Ref 35 dBm Atten 40 dB -18.25 dB #Avg Log Log | T Peak Search |
| | Center 1.85 GHz Span 2 h #Res BW 3 kHz #VBW 10 kHz Sweep 361.6 ms (401 pts #Ref 35 dBm Atten 40 dB 11.910020 G #Avg | T Peak Search |
| | Center 1.85 GHz Span 2 h #Res BW 3 kHz #VBW 10 kHz Sweep 361.6 ms (401 pts #Res BW 3 kHz #VBW 10 kHz Sweep 361.6 ms (401 pts #Ref 35 dBm Atten 40 dB -18.25 dB #Avg | T Peak Search Meas Tools • |
| High Band Emission | Center 1.85 GHz Span 2 h #Res BW 3 kHz #VBW 10 kHz Sweep 361.6 ms (401 pts #Res BW 3 kHz #VBW 10 kHz Sweep 361.6 ms (401 pts #Ref 35 dBm Atten 40 dB -18.25 dB #Avg | T Peak Search Meas Tools • Next Peak |
| High Band Emission | Center 1.85 GHz Span 2 h #Res BW 3 kHz #VBW 10 kHz Sweep 361.6 ms (401 pts #Ref 35 dBm Atten 40 dB 18.25 dB #Agg 18.25 dB 18.25 dB 10 10 10 13.0 0 0 M1 S2 3 FC 0 | T Peak Search Meas Tools • Next Peak Next Pk Right |
| High Band Emission | Center 1.85 GHz Span 2 h #Res BW 3 kHz #VBW 10 kHz Sweep 361.6 ms (401 pts #Ref 35 dBm Atten 40 dB 18.25 dB #Avg | T Peak Search Meas Tools • Next Peak Next Pk Right Next Pk Left |



8. Spurious Radiated Emissions

8.1 Standard Applicable

According to 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P) dB$.

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

8.2 Test Procedure

- 1. The setup of EUT is according with per ANSI/TIA Standard 603E and ANSI C63.26 measurement procedure.
- 2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
- 3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
- 4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

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

8.3 Summary of Test Results/Plots

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

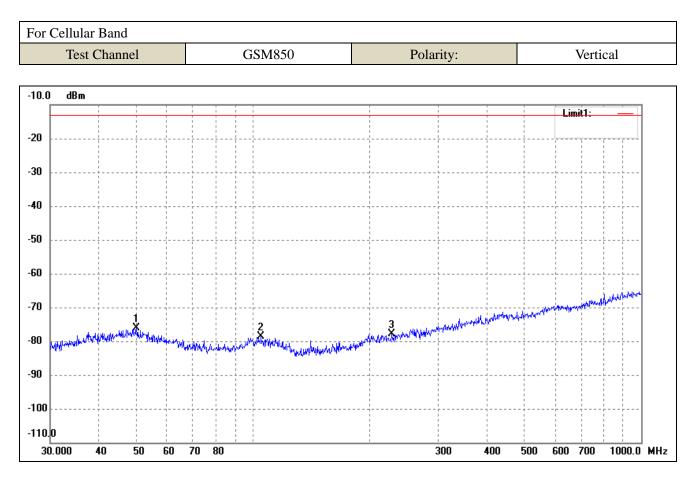


Spurious Emissions Below 1GHz

| | Test C | Channe | 1 | | | | G | SM850 | | Pola | rity: | | Horizonta | | | 1 | |
|-------|-------------------|---------------|-----------------------|----------|----------|------|----------------|-----------------|------|-------------------------|----------------|-------------------|-----------|------|------|----------------|-------|
| | | | | | | | | | | | - | | | | | | |
| -10.0 | dBm | | | | | - | - | | | | | | | _ | | | _ |
| | | | | - | | | | | | | | | | Lin | it1: | _ | - |
| -20 | | | - | | | | · | | | | · | | | | | 1 | |
| -30 | | | ; ; ; | | | | | | | | | | | | | | |
| | | | | | | | | | 1 | | | | - | | | - - - | |
| -40 | | | , , , , | | | | | | | | | | | | | | r |
| -50 | | | : : : : | | | | | | | | ¦ | | | | | | |
| | | | 1 | - | | | - | | | | | | - | | | - | |
| -60 | | | | | | | | | | | | | | | | | |
| -70 | | | , , , , , | | | | | | | | , , , | 3 | | when | hum | front | Norma |
| | with the work the | | 1 X | 1 | 1 | | | 2 X | 1 | harringing | hugedenderweet | Water Harry Marry | AND-IT | | | 1 | |
| -80 | white would be | arihunanin un | ***** | Here way | milityan | More | well | and many porced | with | Capity-the water of the | | | | | | | |
| -90 | | | | | | | | | | | | | | | | | |
| | | | | | | | - | | | | | | | | | - | |
| -100 | | | , , , , | | | | | | | | | | | | | | |
| -110. | 0 | | | 1 | 1 | | | | 1 | | | | | | | | 1 |
| 30 |).000 4 | 40 ! | 50 | 60 | 70 | 80 | | | | | 300 | 400 | 500 | 600 | 700 | 10 | DO. 0 |

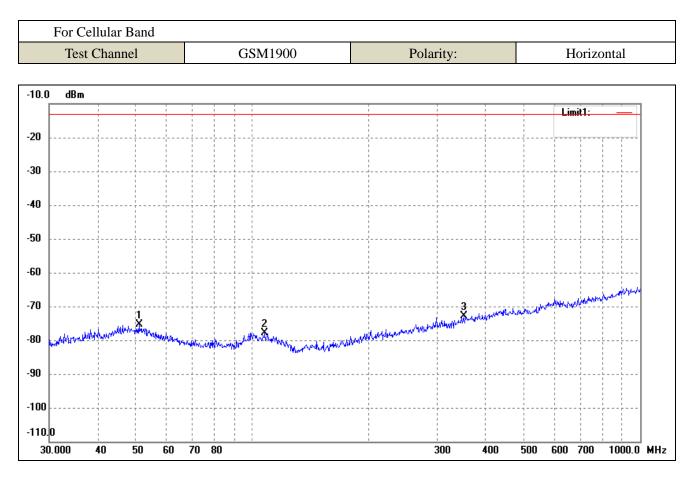
| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|-----|-----------|---------|---------|--------|--------|--------|--------|--------|--------|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | () | (cm) | |
| 1 | 51.1209 | -75.81 | 0.55 | -75.26 | -13.00 | -62.26 | 138 | 100 | peak |
| 2 | 107.8877 | -76.55 | -1.25 | -77.80 | -13.00 | -64.80 | 150 | 100 | peak |
| 3 | 426.5210 | -77.27 | 5.61 | -71.66 | -13.00 | -58.66 | 66 | 100 | peak |



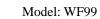


| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|-----|-----------|---------|---------|--------|--------|---------------|--------|--------|--------|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | () | (cm) | |
| 1 | 50.0566 | -76.84 | 0.80 | -76.04 | -13.00 | -63.04 | 230 | 100 | peak |
| 2 | 104.9033 | -77.37 | -1.30 | -78.67 | -13.00 | -65.67 | 337 | 100 | peak |
| 3 | 227.6906 | -77.59 | -0.37 | -77.96 | -13.00 | -64.96 | 71 | 100 | peak |

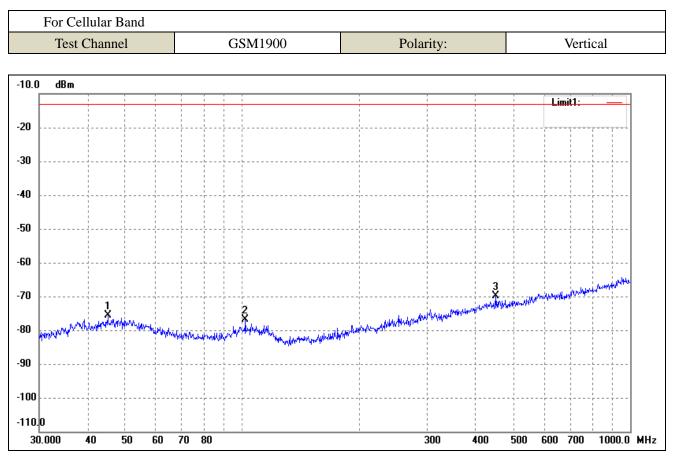




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|-----|-----------|---------|---------|--------|--------|--------|--------|--------|--------|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | () | (cm) | |
| 1 | 51.1209 | -75.81 | 0.55 | -75.26 | -13.00 | -62.26 | 348 | 100 | peak |
| 2 | 107.8877 | -76.55 | -1.25 | -77.80 | -13.00 | -64.80 | 245 | 100 | peak |
| 3 | 351.7079 | -76.57 | 3.79 | -72.78 | -13.00 | -59.78 | 63 | 100 | peak |







| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|-----|-----------|---------|---------|--------|--------|--------|--------|---------------|--------|
| | (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | () | (cm) | |
| 1 | 45.0583 | -76.16 | 0.46 | -75.70 | -13.00 | -62.70 | 247 | 100 | peak |
| 2 | 102.0014 | -75.43 | -1.34 | -76.77 | -13.00 | -63.77 | 90 | 100 | peak |
| 3 | 451.1350 | -75.36 | 5.41 | -69.95 | -13.00 | -56.95 | 323 | 100 | peak |

Note: Margin= (Reading+ Correct)- Limit



Spurious Emissions Above 1GHz

➢ For Cellular Band_GSM850 Mode

| Frequency | Reading | Correct | Result | Limit | Margin | Polar |
|-----------|---------|---------|------------------|-------|--------|-------|
| (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | H/V |
| | | Low | Channel (824.2N | /Hz) | | |
| 1648.4 | -35.69 | 4.94 | -30.75 | -13 | -17.75 | Н |
| 2472.6 | -42.93 | 8.46 | -34.47 | -13 | -21.47 | Н |
| 1648.4 | -34.57 | 4.94 | -29.63 | -13 | -16.63 | V |
| 2472.6 | -44.93 | 8.46 | -36.47 | -13 | -23.47 | V |
| | | Middl | e Channel (836.6 | MHz) | | |
| 1673.2 | -35.24 | 5.11 | -30.13 | -13 | -17.13 | Н |
| 2509.8 | -41.96 | 8.54 | -33.42 | -13 | -20.42 | Н |
| 1673.2 | -36.58 | 5.11 | -31.47 | -13 | -18.47 | V |
| 2509.8 | -43.58 | 8.54 | -35.04 | -13 | -22.04 | V |
| | | High | Channel (848.8N | /Hz) | | |
| 1697.6 | -36.27 | 5.25 | -31.02 | -13 | -18.02 | Н |
| 2546.4 | -42.81 | 8.57 | -34.24 | -13 | -21.24 | Н |
| 1697.6 | -35.48 | 5.25 | -30.23 | -13 | -17.23 | V |
| 2546.4 | -43.12 | 8.57 | -34.55 | -13 | -21.55 | V |

➢ For PCS Band_GSM1900 Mode

| Frequency | Reading | Correct | Result | Limit | Margin | Polar |
|-----------|---------|---------|------------------|-------|---------------|-------|
| (MHz) | (dBm) | dB | (dBm) | (dBm) | (dB) | H/V |
| | | Low | Channel (1850.21 | MHz) | | |
| 3700.4 | -42.75 | 10.54 | -32.21 | -13 | -19.21 | Н |
| 5550.6 | -48.22 | 13.37 | -34.85 | -13 | -21.85 | Н |
| 3700.4 | -42.62 | 10.54 | -32.08 | -13 | -19.08 | V |
| 5550.6 | -49.93 | 13.37 | -36.56 | -13 | -23.56 | V |
| | | Midd | le Channel (1880 | MHz) | | |
| 3760.0 | -41.06 | 10.64 | -30.42 | -13 | -17.42 | Н |
| 5640.0 | -46.43 | 13.54 | -32.89 | -13 | -19.89 | Н |
| 3760.0 | -40.51 | 10.64 | -29.87 | -13 | -16.87 | V |
| 5640.0 | -48.85 | 13.54 | -35.31 | -13 | -22.31 | V |
| | | High | Channel (1909.8 | MHz) | | |
| 3819.6 | -42.63 | 10.74 | -31.89 | -13 | -18.89 | Н |
| 5729.4 | -48.9 | 13.71 | -35.19 | -13 | -22.19 | Н |
| 3819.6 | -39.29 | 10.74 | -28.55 | -13 | -15.55 | V |
| 5729.4 | -47.89 | 13.71 | -34.18 | -13 | -21.18 | V |

Note: Result=Reading+ Correct, Margin= Result- Limit

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.



9. Frequency Stability

9.1 Standard Applicable

According to §22.355, §24.235 the limit is 2.5ppm.

9.2 Test Procedure

According to §2.1055, the following test procedure was performed. The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value. The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode

9.3 Summary of Test Results/Plots

Note: 1. Worst case at GSM850/PCS1900/WCDMA B2/B5 middle channel 2. Normal Voltage NV=DC3.7V; Low Voltage LV=DC3.5V;High Voltage HV=DC4.2V



| Reference Frequency: GSM850 Middle channel=190 channel=836.6MHz | | | | | | | | | | | |
|---|-----------------------|------------------|------------------|--------------|--------|--|--|--|--|--|--|
| Power supplied (Vdc) | Temperature (°C) | Frequen | cy error | Limit (nnm) | Result | | | | | | |
| Power supplied (vdc) | Temperature (°C) | Hz | ppm | Limit (ppm) | Kesuit | | | | | | |
| | -30 | 65 | 0.0772 | | | | | | | | |
| | -20 | 61 | 0.0726 | | | | | | | | |
| | -10 | 50 | 0.0598 | | | | | | | | |
| | 0 | 45 | 0.0533 | 2.50 | | | | | | | |
| NV | 10 | 38 | 0.0451 | | Pass | | | | | | |
| | 20 | 32 | 0.0386 | | | | | | | | |
| | 30 | 40 | 0.0478 | | | | | | | | |
| | 40 | 47 | 0.0561 | | | | | | | | |
| | 50 | 52 | 0.0616 | | | | | | | | |
| Re | ference Frequency: PO | CS1900 Middle ch | annel=661 channe | l=1880MHz | | | | | | | |
| Power supplied (Vdc) | Temperature (°C) | Frequen | cy error | Limit (ppm) | Result | | | | | | |
| Power supplied (vdc) | Temperature (°C) | Hz | ppm | Linit (ppin) | Kesuit | | | | | | |
| | -30 | 61 | 0.0323 | | | | | | | | |
| | -20 | 55 | 0.0295 | | | | | | | | |
| | -10 | 45 | 0.0241 | | | | | | | | |
| | 0 | 39 | 0.0209 | | | | | | | | |
| NV | 10 | 32 | 0.0168 | 2.50 | Pass | | | | | | |
| | 20 | 25 | 0.0135 | | | | | | | | |
| | 30 | 32 | 0.0172 | | | | | | | | |
| - | 40 | 38 | 0.0200 | | | | | | | | |
| | 50 | 45 | 0.0241 | | | | | | | | |

> Frequency stability V.S. Temperature measurement



| Reference Frequency: GSM850 (GSM link) Middle channel=190 channel=836.6MHz | | | | | | | | | | |
|--|---------------------|------------------|--------------------|---------------|--------|--|--|--|--|--|
| Temperature ($^{\circ}$ C) | Power supplied | Frequen | cy error | Limit (ppm) | Result | | | | | |
| Temperature (°C) | (Vdc) | Hz | ppm | Linin (ppin) | Kesun | | | | | |
| | HV | 57 | 0.0680 | | | | | | | |
| 25 | NV | 46 | 0.0552 | 2.50 | Pass | | | | | |
| | LV | 39 | 0.0469 | | | | | | | |
| Reference | e Frequency: PCS190 | 0 (GSM link) Mid | dle channel=661 cl | hannel=1880MH | Z | | | | | |
| Tommonotiono (%) | Power supplied | Frequen | Frequency error | | Decult | | | | | |
| Temperature ($^{\circ}$ C) | (Vdc) | Hz | ppm | Limit (ppm) | Result | | | | | |
| | HV | 48 | 0.0254 | | | | | | | |
| 25 | NV | 44 | 0.0233 | 2.50 | Pass | | | | | |
| | LV | 34 | 0.0180 | | | | | | | |

➢ Frequency stability V.S. Voltage measurement



10. Modulation characteristics

10.1 Standard Applicable

According to §2.1047, measurements required: Modulation characteristics is given below:

(a) Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

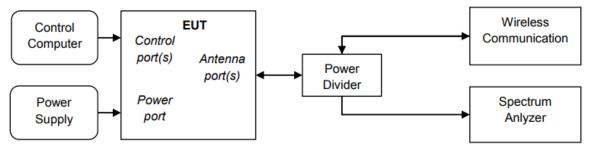
(b) Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

(c) Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power. A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of \$2.1049 for the occupied bandwidth tests.

(d) Other types of equipment. A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

10.2 Test Procedure

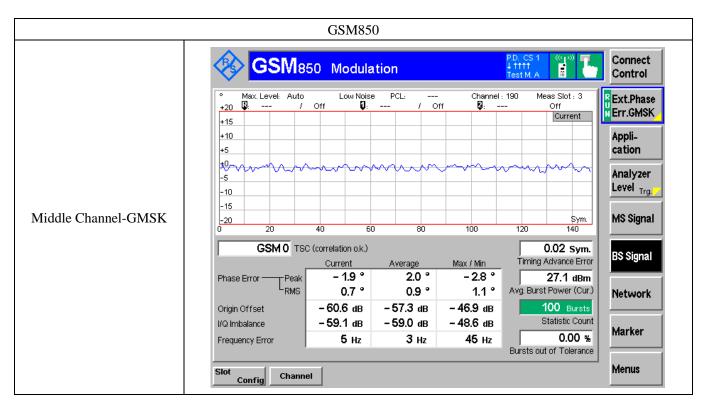
According to ANSI C63.26-2015 section 5.3.2, the following test setup was performed.

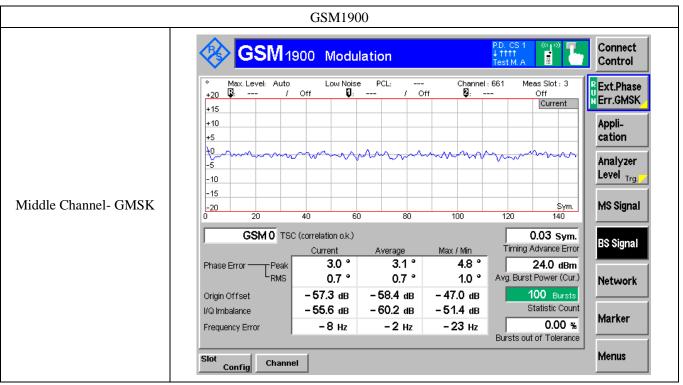


10.3 Summary of Test Results/Plots

Only the worst case was selected to record







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