

Report No.SH16030055W12

FCC RF TESTREPORT

Issued to

TRIMBLE EUROPE B.V.

For

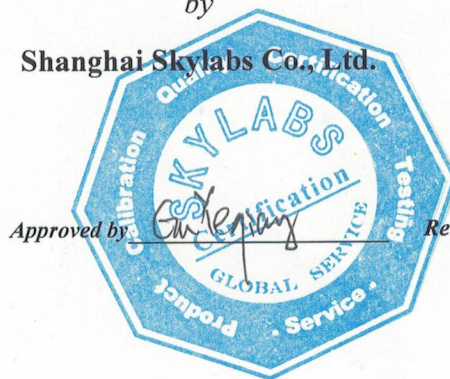
Rugged Smart Phone

Model Name : MobileMapper50_4G
Trade Name : Spectra Precision
Brand Name : Spectra Precision
Standard : 47 CFR Part 2,
47 CFR Part 22 Subpart H
47 CFR Part 24 Subpart E
RSS-132 issue 3
RSS-133 issue 6
FCC ID : NZI-10900300
IC ID : 9288A-10900300
Test date : Apr.27,2016 to May.4,2016
Issue date : Jul.12,2016

by

Shanghai Skylabs Co., Ltd.

Tested by Wu Hongfei



Approved by Guo Xinyang

Review by Leonard Bao

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Change History

| Issue | Date | Reason for change |
|-------|-------------|-------------------|
| 1.0 | May.5,2016 | First edition |
| 2.0 | Jul.12,2016 | Second edition |
| | | |
| | | |
| | | |
| | | |



1. General Information

1.1 Applicant

TRIMBLE EUROPE B.V.
European Regional Fulfilment Centre
Meerheide, 45
5521DZ Eersel
THE NETHERLANDS

1.2 Manufacturer

TRIMBLE EUROPE B.V.
European Regional Fulfilment Centre
Meerheide, 45
5521DZ Eersel
THE NETHERLANDS

1.3 Description of EUT

EUT Type: Rugged Smart Phone
Brand Name.....: MobileMapper50_4G
Trade Name: Spectra Precision
Model Name: Spectra Precision
Hardware Version: MM50.4G_V1.0
Software Version: MM50.4G.16.22.39
Antenna type.....: ABS Frame and FPC antenna
Antenna gain.....: GSM 850: -2.56 dBi
GSM 1900: 1.03 dBi
Frequency Range..... GSM 850MHz:
Tx: 824.20-848.80 MHz (at intervals of 200kHz);
Rx: 869.20-893.80 MHz (at intervals of 200kHz)
GSM 1900MHz
Tx: 1850.20-1909.80 MHz (at intervals of 200kHz);
Rx: 1930.20-1989.80 MHz (at intervals of 200kHz)
Modulation Type.....: GPRS/GSM mode with GMSK modulation
EGPRS mode with 8PSK modulation
Battery.....: 3.8V

NOTE:

(1) The transmitter (Tx) frequency arrangement of the cellular 850MHz used by the EUT can be represented with the formula $F(n)=824.2+0.2*(n-128)$, $128 \leq n \leq 251$; the lowest, middle, highest channel numbers (ARFCHs) used and tested in this report are separately 128 (824.2MHz), 190(836.6MHz) and 251 (848.8MHz); the PCS 1900MHz used by the EUT can be represented with the formula $F(n)=1850.2+0.2*(n-512)$, $512 \leq n \leq 810$; the lowest, middle, highest channel numbers



(ARFCHs) used and tested in this report are separately 512 (1850.2MHz), 661(1880.0MHz) and 810 (1909.8MHz).

(2) For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



2. Facilities and Accreditations

2.1 Test Facility

Shanghai Skylabs Co., Ltd. Skylabs Laboratory is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6644. A 9*6*6(m) fully anechoic chamber was used for the radiated spurious emissions test.

2.2 Environmental Conditions

Ambient temperature: 20~25°C

Relative humidity: 40~60%

Atmosphere pressure: 86-102kPa



2.3 List of Equipments Used

| Description | Manufacturer | Model | Serial No. | Cal. Date | Cal. Due |
|---------------------------------------|---------------------------------|----------------|--------------|------------|----------|
| System Simulator | Agilent | E5515C | GB46040102 | 2015.9.22 | 1year |
| Spectrum Analyzer | Rohde&Schwarz | FSU26 | 200880 | 2016.2.25 | 1year |
| Power Splitter | Weinschel | 1506A | NW521 | (n.a.) | (n.a.) |
| Power Splitter | Mini-Circuits | ZFRSC-183-S+ | 765001016 | (n.a.) | (n.a.) |
| Attenuator 1 | Mini-Circuits | 10dB | (n.a.) | (n.a.) | (n.a.) |
| Attenuator 2 | Resnet | 10dB | (n.a.) | (n.a.) | (n.a.) |
| Attenuator 3 | Resnet | 3dB | (n.a.) | (n.a.) | (n.a.) |
| DC Power Supply | Good Will | GPS-3030DD | EF920938 | 2015.10.12 | 2year |
| Temperature Chamber | YinHe Experimental Equip. | HL4003T | (n.a.) | 2015.9.20 | 1year |
| Full/Half-Anechoic Chamber | CHENGYU | 9.2×6.25×6.15m | SAR | 2015.9.14 | 3year |
| Singal Generator | Rohde&Schwarz | SMF100A | 101935 | 2015.9.22 | 1year |
| Broadband Trilog Antenna | Schwarzbeck | VULB 9163 | 9163-561 | 2015.9.25 | 1year |
| Substitution Broadband Trilog Antenna | Schwarzbeck | VULB 9163 | 9163-572 | 2015.9.25 | 1year |
| Broadband Horn Antenna | Schwarzbeck | BBHA 9120D | 9120D-1033 | 2015.7.25 | 1year |
| Substitution Broadband Horn Antenna | Schwarzbeck | BBHA 9120D | 9120D-1034 | 2015.7.25 | 1year |
| Broadband Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA91970171 | 2015.9.22 | 1year |
| Substitution Broadband Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA91970208 | 2015.9.22 | 1year |
| Test Antenna-Loop | Rohde&Schwarz | HFH2-Z2 | 860004/001 | 2015.9.22 | 1year |
| Temporary Antenna Connector | Farpu | SMA-K | (n.a.) | (n.a.) | (n.a.) |
| RF Cable | (n.a.) | (n.a.) | (n.a.) | (n.a.) | (n.a.) |

NOTE:

Equipments listed above have been calibrated and are in the period of validation.



3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 2, Part 22 and part 24 for the EUT FCC ID Certification:

| No. | Identity | Document Title |
|-----|-----------------|---|
| 1 | 47 CFR Part 2 | Frequency Allocations and Radio Treaty Matters; General Rules and Regulations |
| 2 | 47 CFR Part 22 | Public Mobile Services |
| 3 | 47 CFR Part 24 | Personal Communications Services |
| 4 | RSS-132 issue 3 | Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz |
| 5 | RSS-133 issue 6 | 2 GHz Personal Communications Services |

Test detailed items/section required by FCC rules& IC rules and results are as below:

| No. | FCC Rules | IC Rules | Description | Result |
|-----|--------------------------------------|--------------------------------|---------------------------------------|--------|
| 1 | 2.1046 | RSS-132 (5.4) RSS-133 (6.4) | Conducted Output Power | PASS |
| 2 | 2.1049 | RSS-GEN (6.6) | 99%/-26dB Occupied Bandwidth | PASS |
| 3 | 2.1055 22.355 24.235 | RSS-132 (5.3) RSS-133 (6.3) | Frequency Stability | PASS |
| 4 | 24.232 | RSS-133 (6.4) | Peak-to-Average Ratio | PASS |
| 5 | 2.1051 2.1057 22.917 24.238 | RSS-132 (5.5) RSS-133 (6.5) | Conducted Out of Band Emissions | PASS |
| 6 | 2.1051 2.1057 22.917 24.238 | RSS-GEN (6.6) | Band Edge | PASS |
| 7 | 22.913 24.232 | RSS-132(5.4) RSS-133 (6.4) | Transmitter Radiated Power (EIPR/ERP) | PASS |
| 8 | 2.1053 2.1057 22.917 24.238 | RSS-132 (5.5) RSS-133 (6.5) | Radiated Out of Band Emissions | PASS |

NOTE: Measurement method according to TIA/EIA 603.D-2010



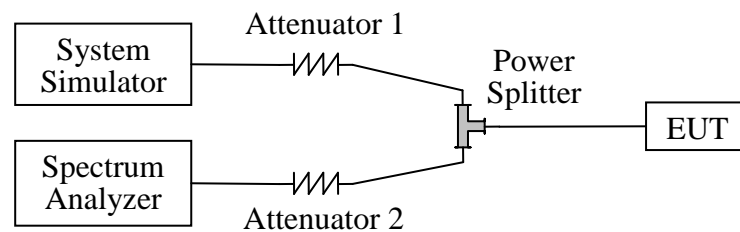
4. Test Result

4.1 Conducted Output Power

4.1.1 Requirement

According to FCC section 2.1046(a), for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC section 2.1033(c)(8).

4.1.2 Test Description



The EUT, which is powered by the DC Power Supply, is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS.



4.1.3 Test Result

Here the lowest, middle and highest channels are selected to perform testing to verify the conducted RF output power of the EUT.

| Band | Channel | Frequency (MHz) | Measured Output Power(dBm) | Limited (dBm) | Verdict |
|------------------|---------|-----------------|----------------------------|---------------|---------|
| GSM 850MHz | 128 | 824.2 | 32.13 | 38.5 | PASS |
| | 190 | 836.6 | 32.25 | 38.5 | PASS |
| | 251 | 848.8 | 32.31 | 38.5 | PASS |
| GSM 1900MHz | 512 | 1850.2 | 28.87 | 33.0 | PASS |
| | 661 | 1880 | 28.99 | 33.0 | PASS |
| | 810 | 1909.8 | 28.73 | 33.0 | PASS |
| GPRS 850MHz | 128 | 824.2 | 32.15 | 38.5 | PASS |
| | 190 | 836.6 | 32.28 | 38.5 | PASS |
| | 251 | 848.8 | 32.34 | 38.5 | PASS |
| GPRS 1900MHz | 512 | 1850.2 | 28.85 | 33.0 | PASS |
| | 661 | 1880 | 28.99 | 33.0 | PASS |
| | 810 | 1909.8 | 28.72 | 33.0 | PASS |
| EGPRS 850MHz | 128 | 824.2 | 27.15 | 38.5 | PASS |
| | 190 | 836.6 | 27.28 | 38.5 | PASS |
| | 251 | 848.8 | 27.36 | 38.5 | PASS |
| EGPRS 1900MHz | 512 | 1850.2 | 27.76 | 33.0 | PASS |
| | 661 | 1880 | 27.77 | 33.0 | PASS |
| | 810 | 1909.8 | 27.78 | 33.0 | PASS |

Note:

(1) Maximum burst average power for GSM.

(2) For the GPRS and EGPRS model, all the slots were tested and just the worst data was record in this report.



4.2 99%/-26dB Occupied Bandwidth

4.2.1 Definition

According to FCC section 2.1049, the occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Occupied bandwidth is also known as the 99% emission bandwidth.

4.2.2 Test Description

See section 4.1.1 of this report.

4.2.3 Test Results

Here the lowest, middle and highest channels are tested to record the 99% occupied bandwidth, it's about 300kHz.

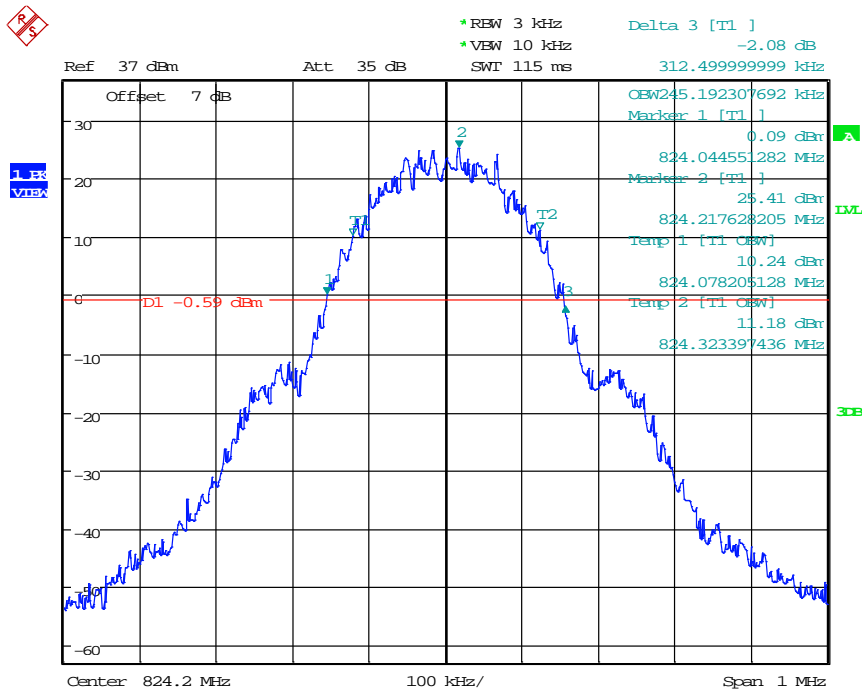
| Band | Channel | Frequency (MHz) | 99% Occupied Bandwidth (kHz) | -26dB Occupied Bandwidth (kHz) | Refer to Plot |
|---------------------|---------|-----------------|------------------------------|--------------------------------|---------------|
| GSM/GPRS 850MHz | 128 | 824.2 | 245.192 | 312.499 | A1 |
| | 189 | 836.4 | 241.987 | 314.102 | A2 |
| | 251 | 848.8 | 243.589 | 312.499 | A3 |
| GSM/GPRS 1900MHz | 512 | 1850.2 | 248.397 | 315.705 | B1 |
| | 661 | 1880 | 245.192 | 315.705 | B2 |
| | 810 | 1909.8 | 246.794 | 314.102 | B3 |
| EGPRS 850MHz | 128 | 824.2 | 245.192 | 302.884 | C1 |
| | 189 | 836.4 | 245.192 | 307.692 | C2 |
| | 251 | 848.8 | 243.589 | 312.499 | C3 |
| EGPRS 1900MHz | 512 | 1850.2 | 246.794 | 302.884 | D1 |
| | 661 | 1880 | 241.987 | 309.294 | D2 |
| | 810 | 1909.8 | 245.192 | 341.423 | D3 |

Note :

1) Both GSM/GPRS mode was tested and the worst data was record.

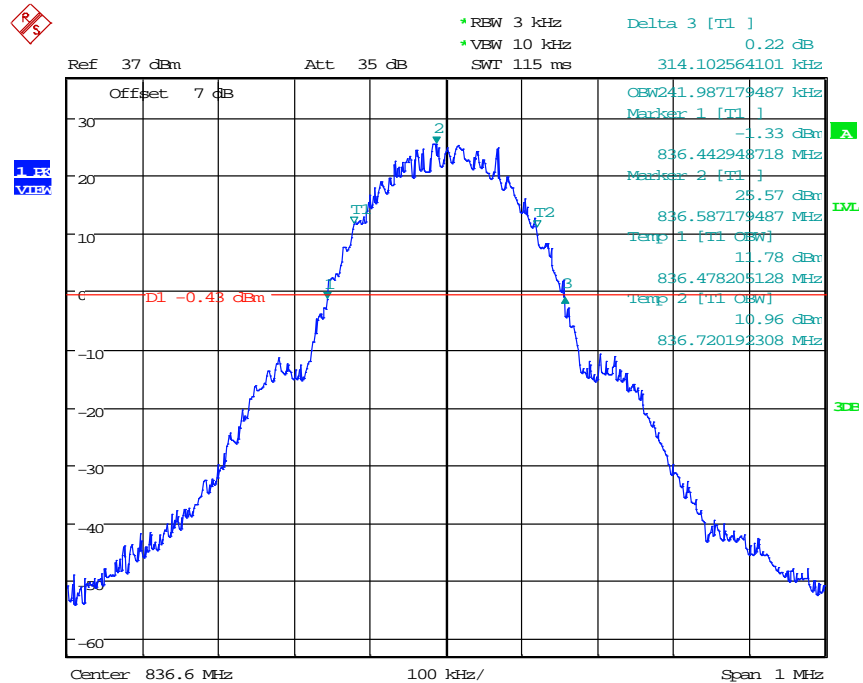


Test Plots:



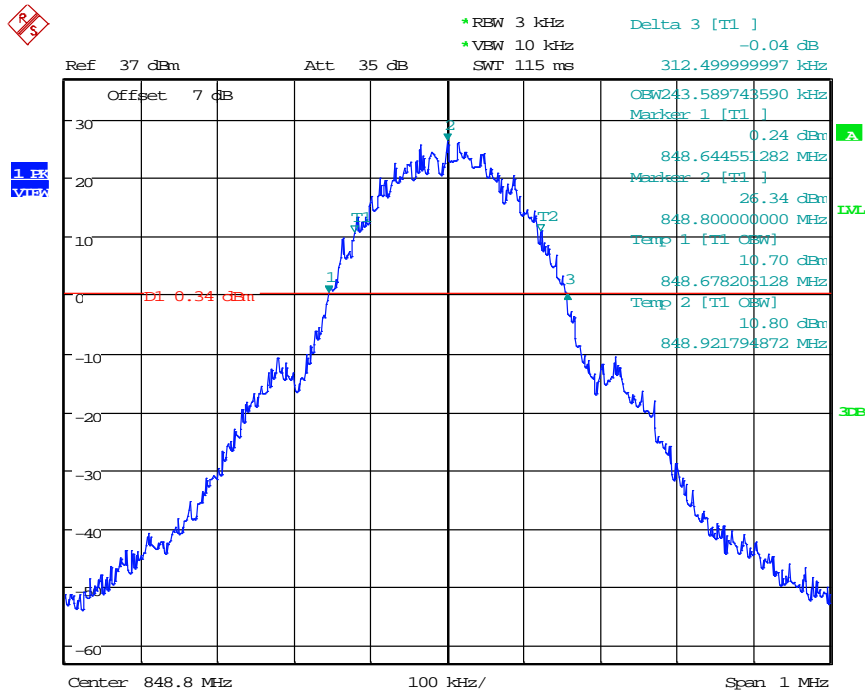
Date: 27.APR.2016 19:01:16

(Plot A1: GSM 850MHz, Channel = 128)



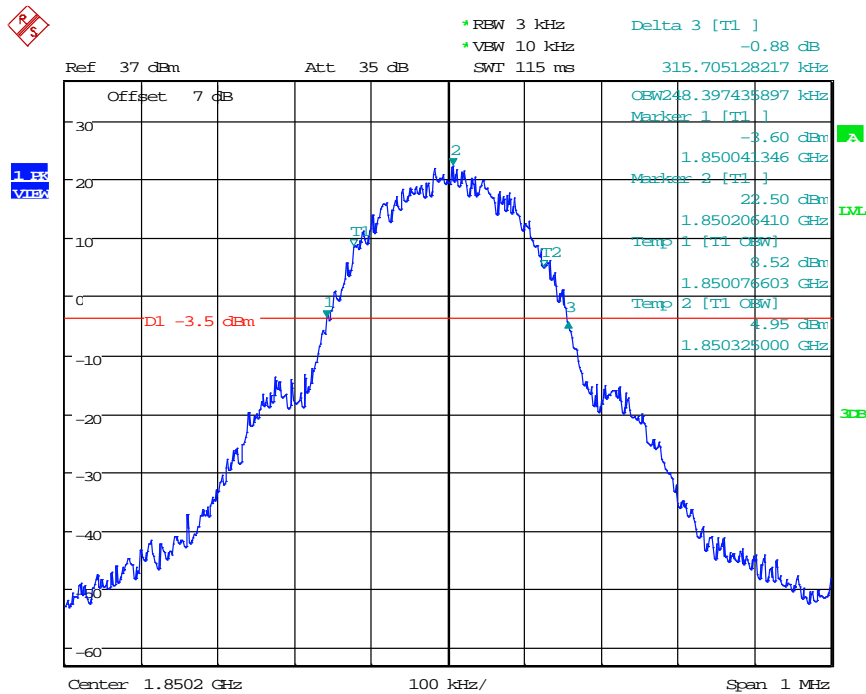
Date: 27.APR.2016 19:04:13

(Plot A2: GSM 850MHz, Channel = 189)



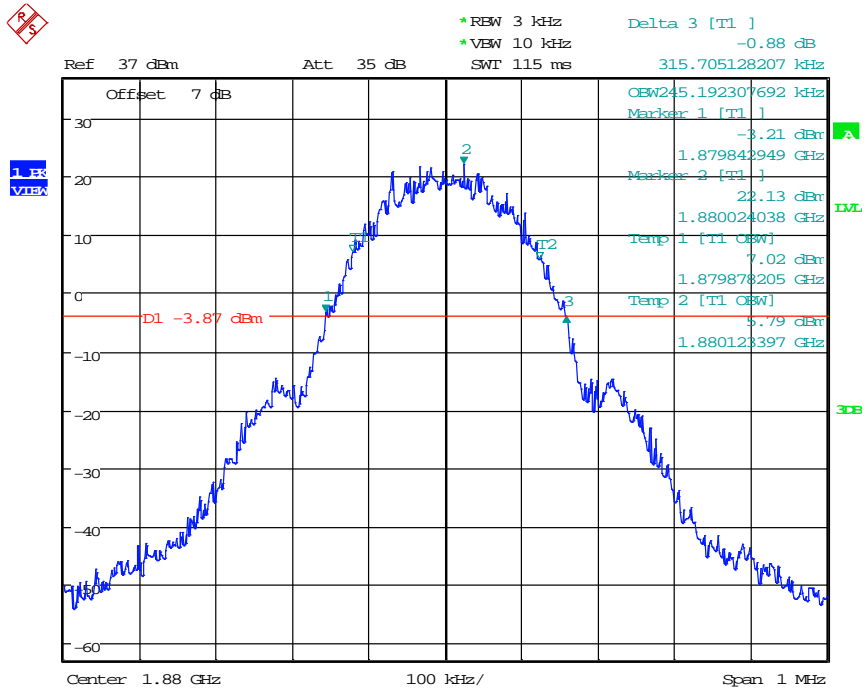
Date: 27.APR.2016 19:05:39

(Plot A3: GSM 850MHz, Channel = 251)



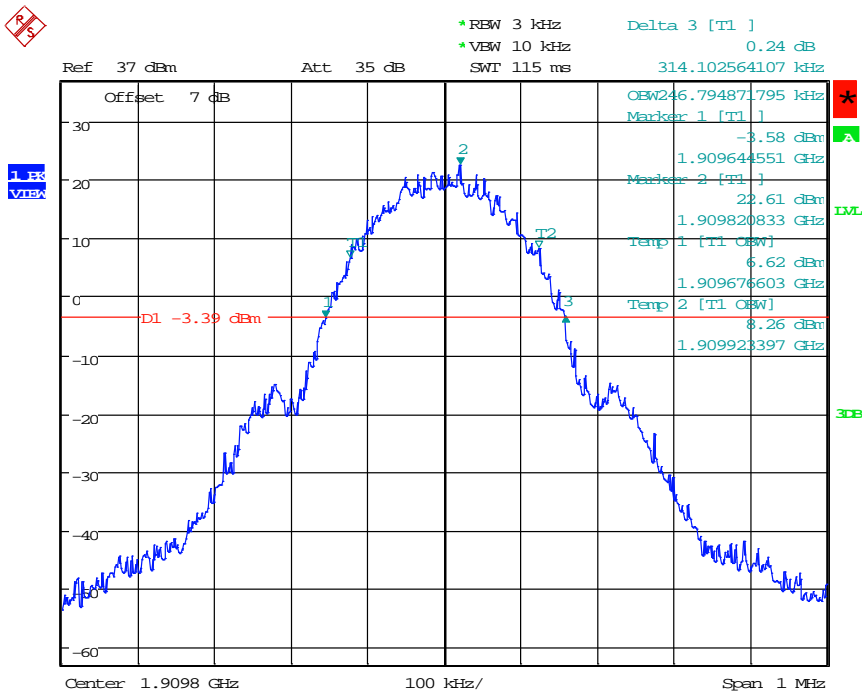
Date: 27.APR.2016 18:56:08

(Plot B1: GSM 1900MHz, Channel =512)



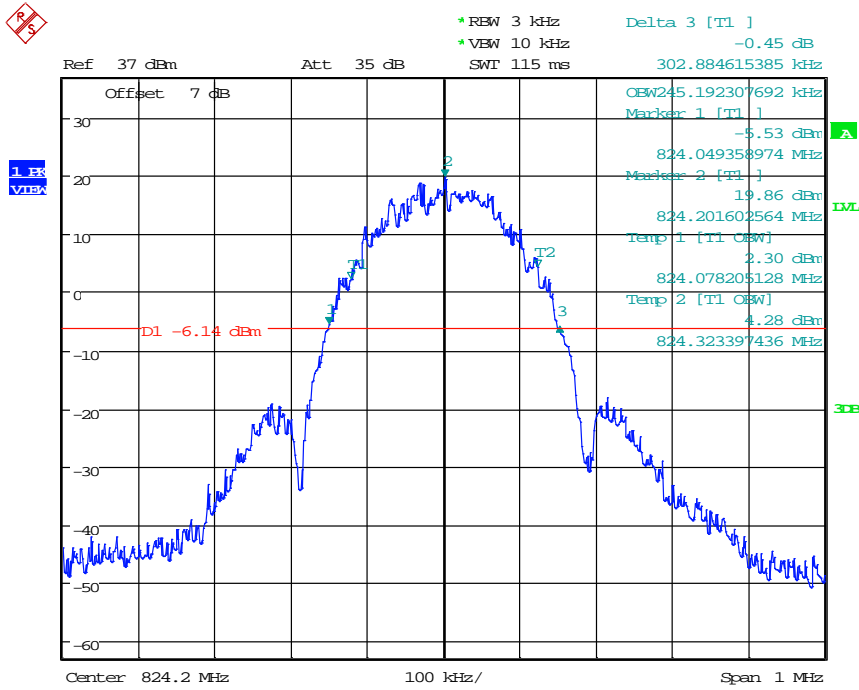
Date: 27.APR.2016 18:57:39

(Plot B2: GSM 1900MHz, Channel =661)



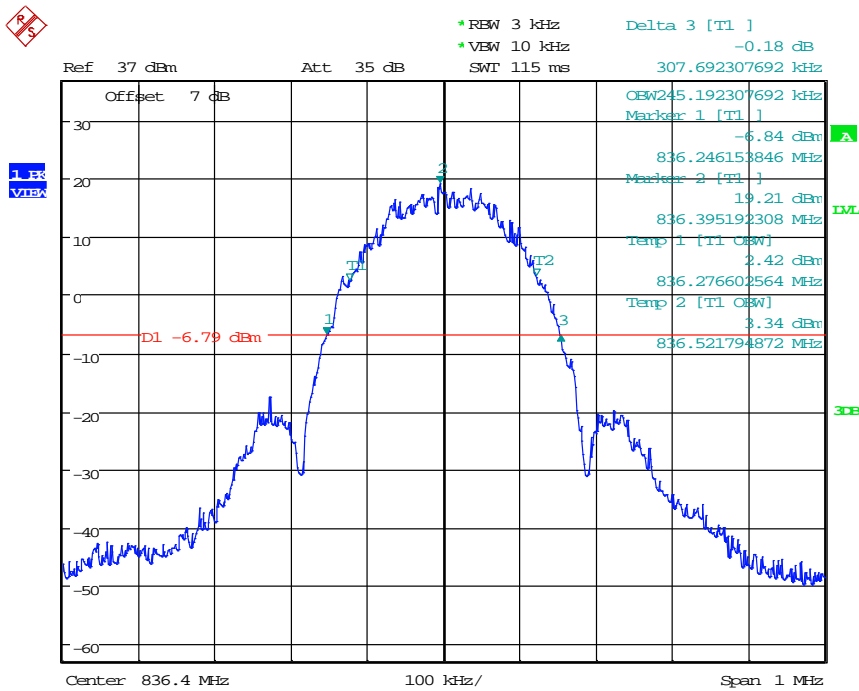
Date: 27.APR.2016 18:59:10

(Plot B3:GSM 1900MHz, Channel =810)



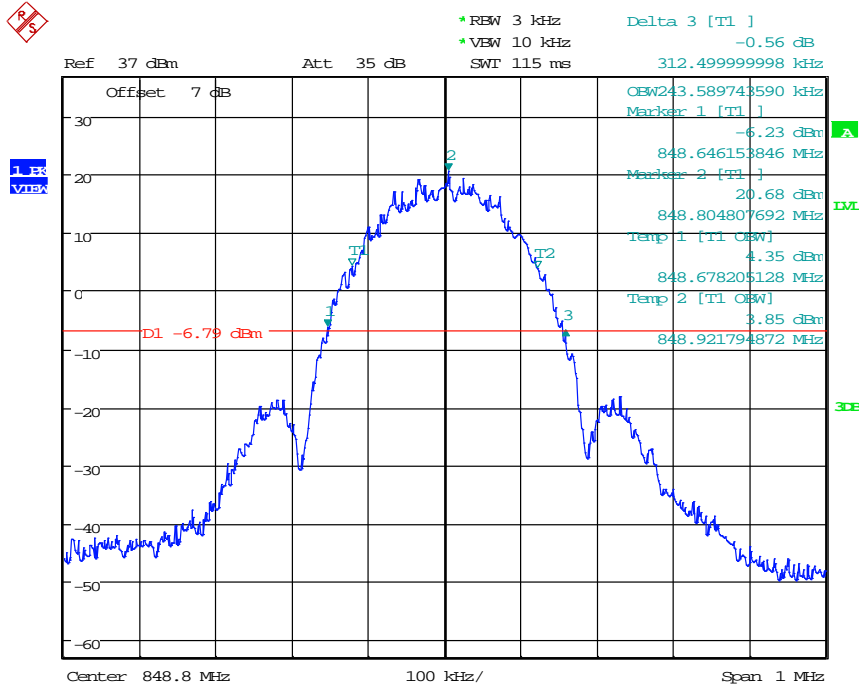
Date: 27.APR.2016 19:13:27

(Plot C1: EGPRS 850MHz, Channel = 128)



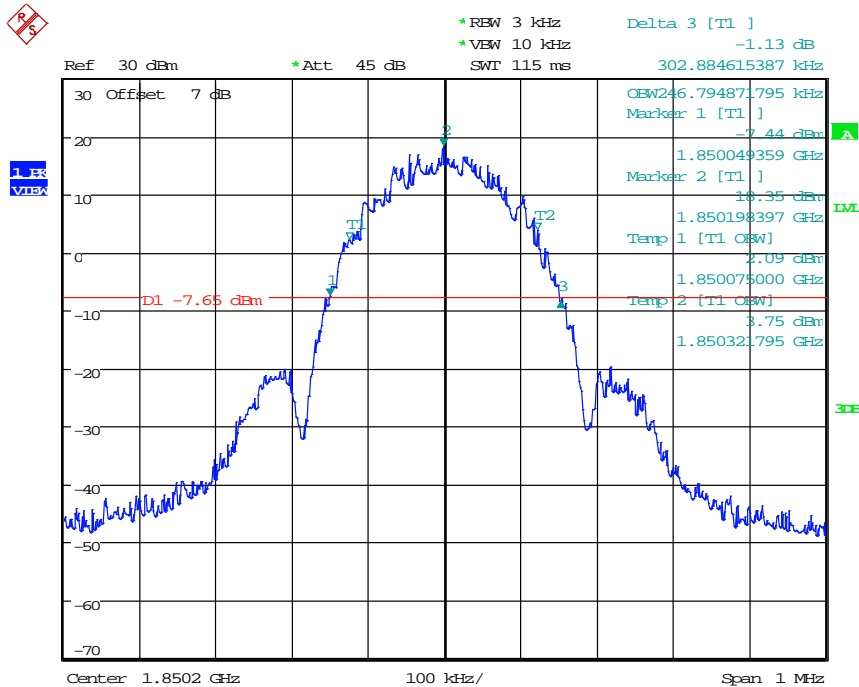
Date: 27.APR.2016 19:15:04

(Plot C2: EGPRS 850MHz, Channel = 189)



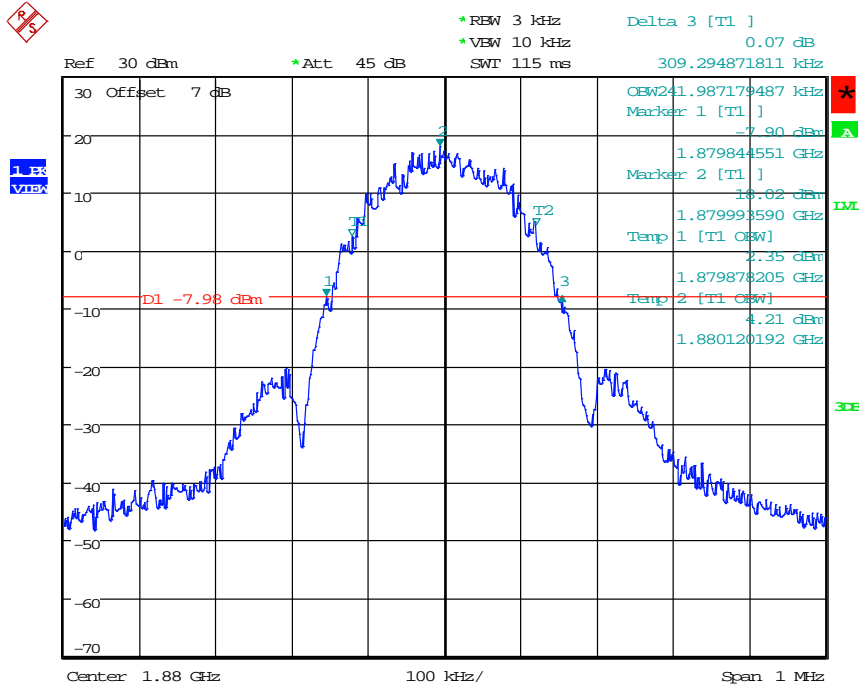
Date: 27.APR.2016 19:16:43

(Plot C3: EGPRS 850MHz, Channel = 251)



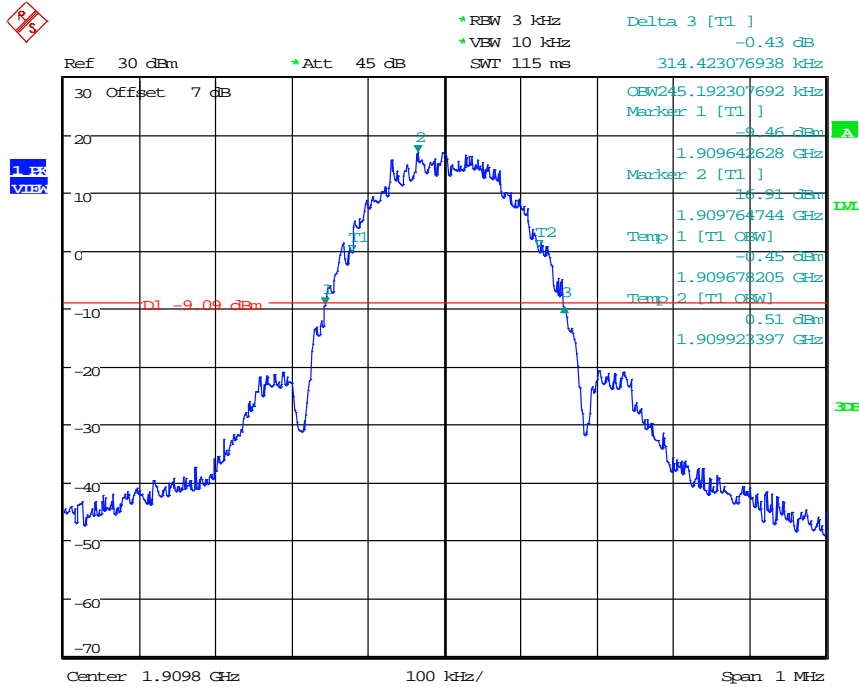
Date: 27.APR.2016 19:23:29

(Plot D1: EGPRS 1900MHz, Channel =512)



Date: 27.APR.2016 19:21:52

(Plot D2: EGPRS 1900MHz, Channel =661)



Date: 27.APR.2016 19:19:16

(Plot D3: EGPRS 1900MHz, Channel =810)



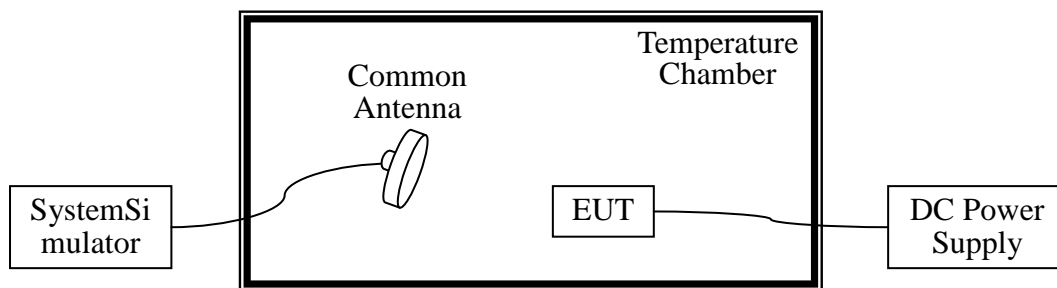
4.3 Frequency Stability

4.3.1 Requirement

According to FCC section 22.355 and FCC section 24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

- (a) The temperature is varied from -30°C to $+50^{\circ}\text{C}$ at intervals of not more than 10°C .
- (b) For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

4.3.2 Test Description



4.3.3 Test Setup

The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power i.e. Power Control Level (PCL) = 5 and Power Class = 4. A call is established between the EUT and the SS via a Common Antenna.



4.3.4 Test Results

For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer; the normal temperature here used is 25°C. The frequency deviation limit is ±2.5ppm.

GSM/GPRS mode

| Band | Test Conditions | | Frequency Deviation | | | | | | Limit/Verdict |
|--------------------------|-----------------|-----------|---------------------|-----------------|----------------|-----------------|---------------|-----------------|---------------------------|
| | Power (VDC) | Temp (°C) | Low Channel | | Middle Channel | | High Channel | | ±2.5ppm 850 ±1ppm 1900 |
| | | | Dev. Freq. Hz | Deviation (ppm) | Dev. Freq. Hz | Deviation (ppm) | Dev. Freq. Hz | Deviation (ppm) | |
| 850 MHz GSM/ GPRS | 3.8 | -30 | --- | --- | --- | --- | --- | --- | PASS |
| | | -20 | 17 | 0.021 | -13 | -0.015 | -16 | -0.019 | |
| | | -10 | -4 | -0.004 | 0 | 0.001 | 1 | 0.002 | |
| | | 0 | 10 | 0.012 | -9 | -0.011 | -9 | -0.010 | |
| | | 10 | -5 | -0.006 | 9 | 0.010 | -4 | -0.004 | |
| | | 20 | 18 | 0.022 | -13 | -0.016 | 0 | 0.000 | |
| | | 30 | -14 | -0.017 | 3 | 0.003 | 8 | 0.009 | |
| | | 40 | -4 | -0.005 | 6 | 0.007 | -16 | -0.019 | |
| | | 50 | 17 | 0.021 | 18 | 0.022 | -1 | -0.001 | |
| | | 60 | 11 | 0.013 | 19 | 0.022 | 8 | 0.010 | |
| | 70 | --- | --- | --- | --- | --- | --- | | |
| | 4.2 | 25 | -9 | -0.011 | -8 | -0.009 | 19 | 0.022 | |
| 3.6 | 25 | -6 | -0.007 | -13 | -0.016 | -4 | -0.005 | | |
| 1900 MHz GSM/ GPRS | 3.8 | -30 | --- | --- | --- | --- | --- | --- | PASS |
| | | -20 | 13 | 0.007 | 13 | 0.007 | 8 | 0.004 | |
| | | -10 | 8 | 0.004 | 2 | 0.002 | -7 | -0.004 | |
| | | 0 | -16 | -0.009 | -3 | -0.004 | 1 | 0.000 | |
| | | 10 | 14 | 0.008 | 16 | 0.019 | 10 | 0.005 | |
| | | 20 | 14 | 0.008 | -10 | -0.012 | 9 | 0.005 | |
| | | 30 | -11 | -0.006 | -15 | -0.018 | -11 | -0.006 | |
| | | 40 | 1 | 0.000 | -16 | -0.019 | -18 | -0.010 | |
| | | 50 | 14 | 0.007 | -1 | -0.001 | 11 | 0.006 | |
| | | 60 | -15 | -0.008 | -4 | -0.005 | 15 | 0.008 | |
| | 70 | --- | --- | --- | --- | --- | --- | | |
| | 4.2 | 25 | 2 | 0.001 | 2 | 0.002 | -6 | -0.003 | |
| 3.6 | 25 | -8 | -0.004 | 4 | 0.004 | -5 | -0.002 | | |



EGPRS mode

| Band | Test Conditions | | Frequency Deviation | | | | | | Limit/Verdict |
|----------------|-----------------|-----------|---------------------|-----------------|----------------|-----------------|---------------|-----------------|---------------------------|
| | Power (VDC) | Temp (°C) | Low Channel | | Middle Channel | | High Channel | | ±2.5ppm 850 ±1ppm 1900 |
| | | | Dev. Freq. Hz | Deviation (ppm) | Dev. Freq. Hz | Deviation (ppm) | Dev. Freq. Hz | Deviation (ppm) | |
| 850 MHz EGPRS | 3.8 | -30 | --- | --- | --- | --- | --- | --- | PASS |
| | | -20 | -8 | -0.010 | -6 | -0.007 | 11 | 0.013 | |
| | | -10 | -17 | -0.021 | -7 | -0.008 | -2 | -0.003 | |
| | | 0 | 16 | 0.019 | -8 | -0.010 | 14 | 0.016 | |
| | | 10 | 9 | 0.011 | -7 | -0.008 | 15 | 0.017 | |
| | | 20 | 18 | 0.021 | -18 | -0.022 | 9 | 0.011 | |
| | | 30 | -3 | -0.003 | 2 | 0.002 | -12 | -0.015 | |
| | | 40 | 12 | 0.015 | 13 | 0.015 | -15 | -0.017 | |
| | | 50 | 16 | 0.019 | 16 | 0.020 | 1 | 0.001 | |
| | | 60 | -9 | -0.011 | 11 | 0.013 | 0 | 0.000 | |
| | 70 | --- | --- | --- | --- | --- | --- | | |
| | 4.2 | 25 | 7 | 0.009 | 17 | 0.020 | -14 | -0.016 | |
| 3.6 | 25 | 19 | 0.022 | -1 | -0.001 | 1 | 0.001 | | |
| 1900 MHz EGPRS | 3.8 | -30 | --- | --- | --- | --- | --- | --- | PASS |
| | | -20 | 11 | 0.006 | 17 | 0.009 | -15 | -0.008 | |
| | | -10 | -8 | -0.004 | 10 | 0.012 | -15 | -0.008 | |
| | | 0 | -11 | -0.006 | 4 | 0.005 | 4 | 0.002 | |
| | | 10 | -14 | -0.007 | 10 | 0.012 | -7 | -0.004 | |
| | | 20 | 15 | 0.008 | -1 | -0.002 | 2 | 0.001 | |
| | | 30 | 3 | 0.002 | 13 | 0.015 | 1 | 0.000 | |
| | | 40 | 1 | 0.001 | -2 | -0.003 | 11 | 0.006 | |
| | | 50 | 13 | 0.007 | 15 | 0.018 | 16 | 0.009 | |
| | | 60 | -17 | -0.009 | 8 | 0.010 | 12 | 0.006 | |
| | 70 | --- | --- | --- | --- | --- | --- | | |
| | 4.2 | 25 | 0 | 0.000 | -11 | -0.013 | 15 | 0.008 | |
| 3.6 | 25 | 4 | 0.002 | -3 | -0.003 | 15 | 0.008 | | |

NOTE:

- (1) The EUT stops transmitting at temperatures -30°C, 70°C
- (2) The manufacturer declared that the EUT could work properly between temperatures -20°C~60°C.
- (3) Normal Voltage = 3.8V; Max Voltage= 4.2V; Min Voltage=3.6V.

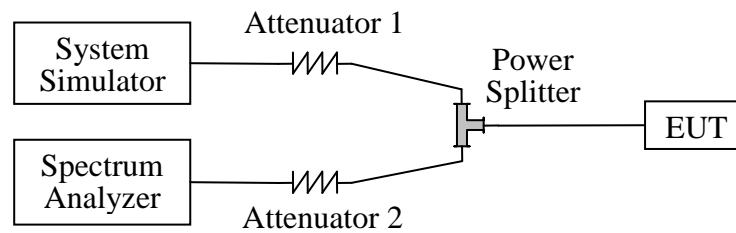


4.4 Peak-to-Average Ratio

4.4.1 Requirement

According to FCC section 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.

4.4.2 Test Description

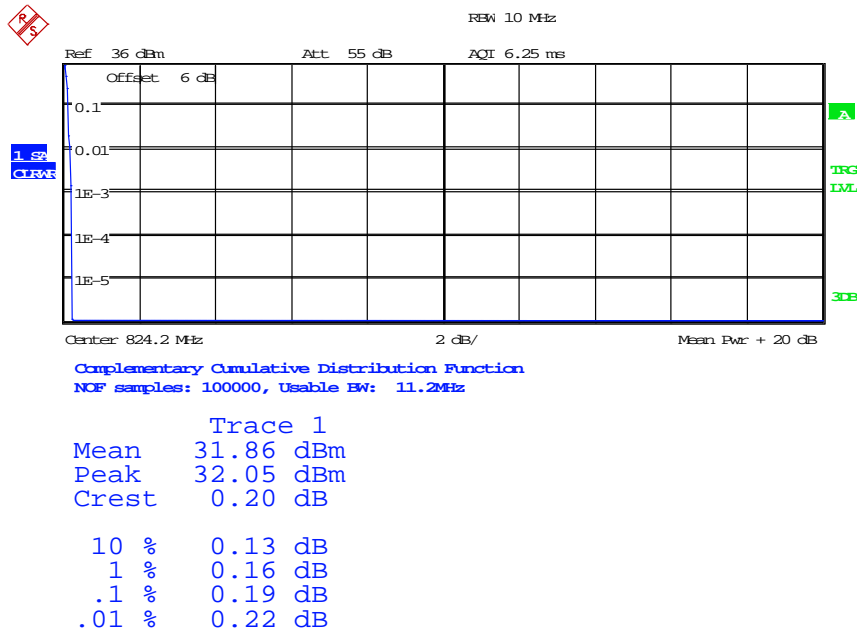


4.4.3 Test Result

| Band | Channel | Frequency (MHz) | Peak-to-Average Ratio (dB) | Refer to Plot |
|---------------------|---------|-----------------|----------------------------|---------------|
| GSM/GPRS 850MHz | 128 | 824.2 | 0.22 | A1 |
| | 189 | 836.4 | 0.22 | A2 |
| | 251 | 848.8 | 0.26 | A3 |
| GSM/GPRS 1900MHz | 512 | 1850.2 | 0.29 | B1 |
| | 661 | 1880 | 0.29 | B2 |
| | 810 | 1909.8 | 0.26 | B3 |
| EGPRS 850MHz | 128 | 824.2 | 3.27 | C1 |
| | 189 | 836.4 | 3.27 | C2 |
| | 251 | 848.8 | 3.40 | C3 |
| EGPRS 1900MHz | 512 | 1850.2 | 3.37 | D1 |
| | 661 | 1880 | 3.62 | D2 |
| | 810 | 1909.8 | 3.56 | D3 |

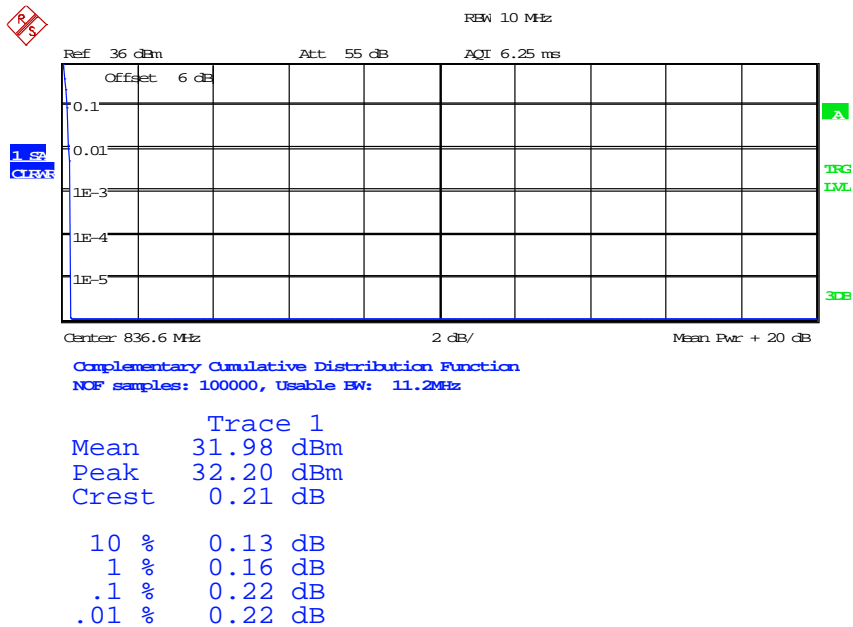


Test Plots:



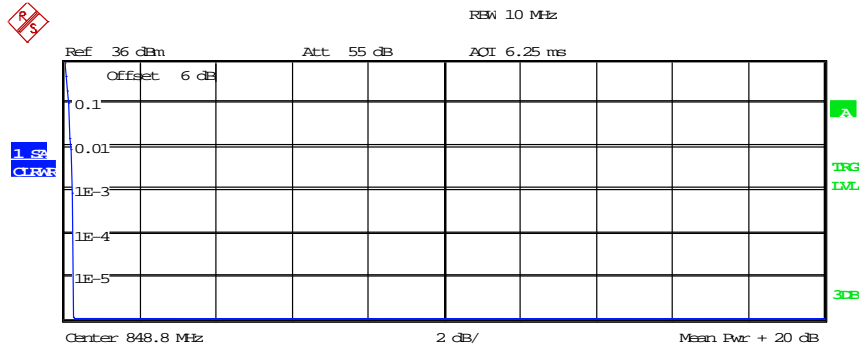
Date: 28.APR.2016 13:30:26

(Plot A1: GSM 850MHz, Channel =128)



Date: 28.APR.2016 13:30:58

(Plot A2: GSM 850MHz, Channel =189)

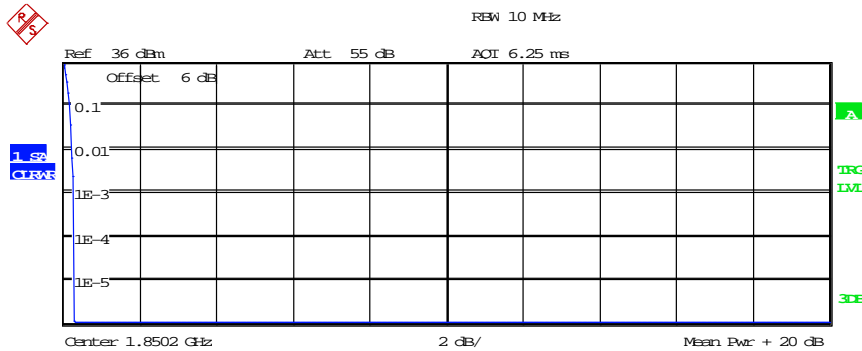


Complementary Cumulative Distribution Function
 NOF samples: 100000, Usable BW: 11.2MHz

| Trace 1 | |
|---------|-----------|
| Mean | 32.06 dBm |
| Peak | 32.29 dBm |
| Crest | 0.23 dB |
| 10 % | 0.13 dB |
| 1 % | 0.19 dB |
| .1 % | 0.22 dB |
| .01 % | 0.26 dB |

Date: 28.APR.2016 13:31:52

(Plot A3: GSM 850MHz, Channel =251)

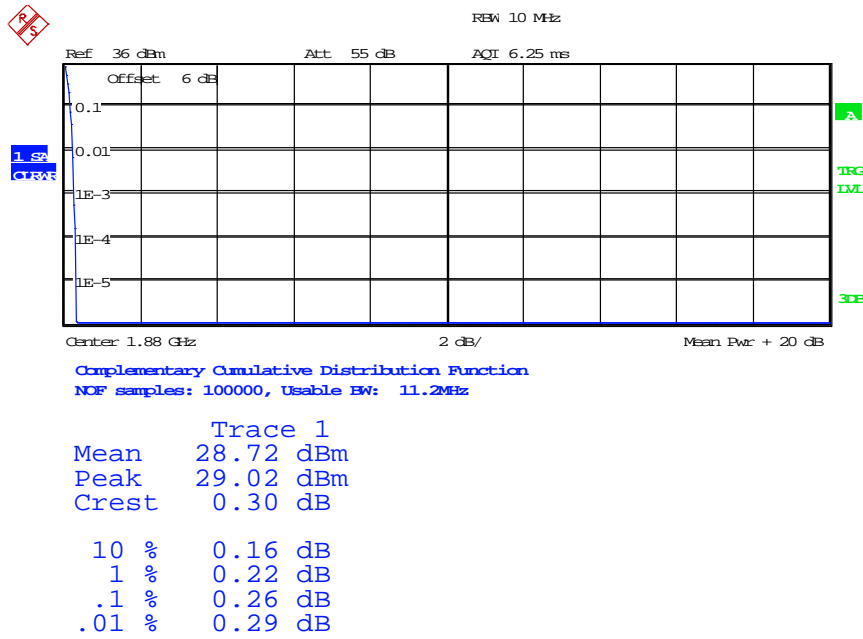


Complementary Cumulative Distribution Function
 NOF samples: 100000, Usable BW: 11.2MHz

| Trace 1 | |
|---------|-----------|
| Mean | 28.67 dBm |
| Peak | 28.95 dBm |
| Crest | 0.27 dB |
| 10 % | 0.16 dB |
| 1 % | 0.22 dB |
| .1 % | 0.29 dB |
| .01 % | 0.29 dB |

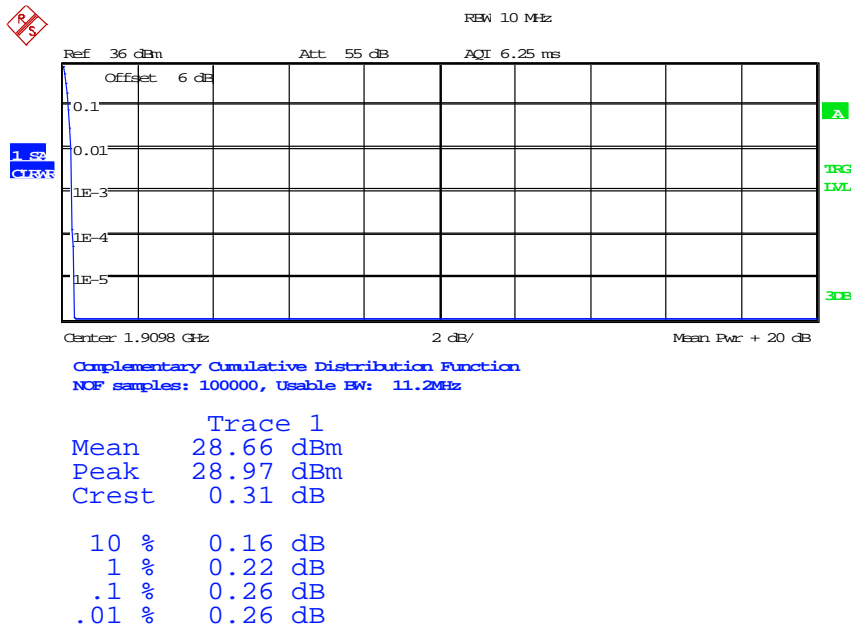
Date: 28.APR.2016 13:16:28

(Plot B1: GSM 1900MHz, Channel =512)



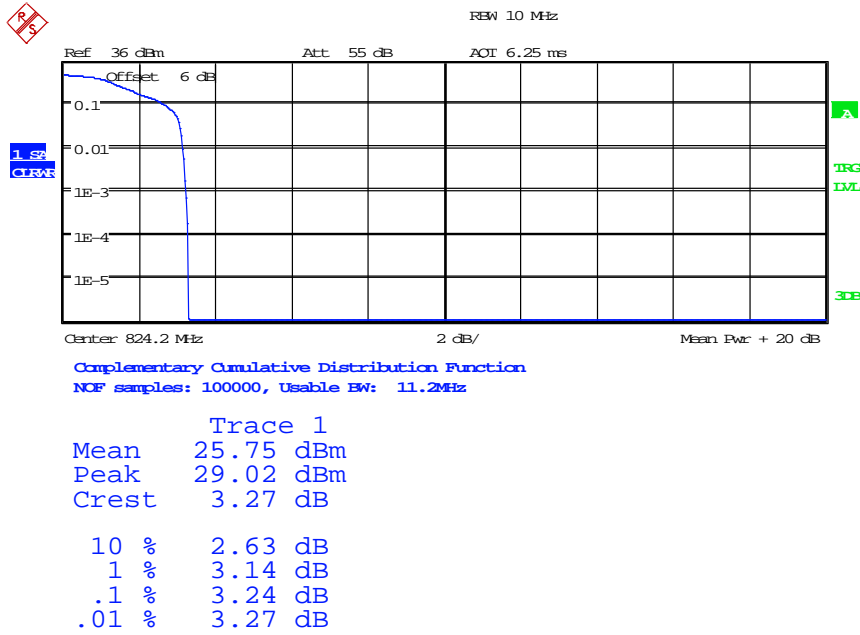
Date: 28.APR.2016 13:17:01

(Plot B2: GSM 1900MHz, Channel =661)



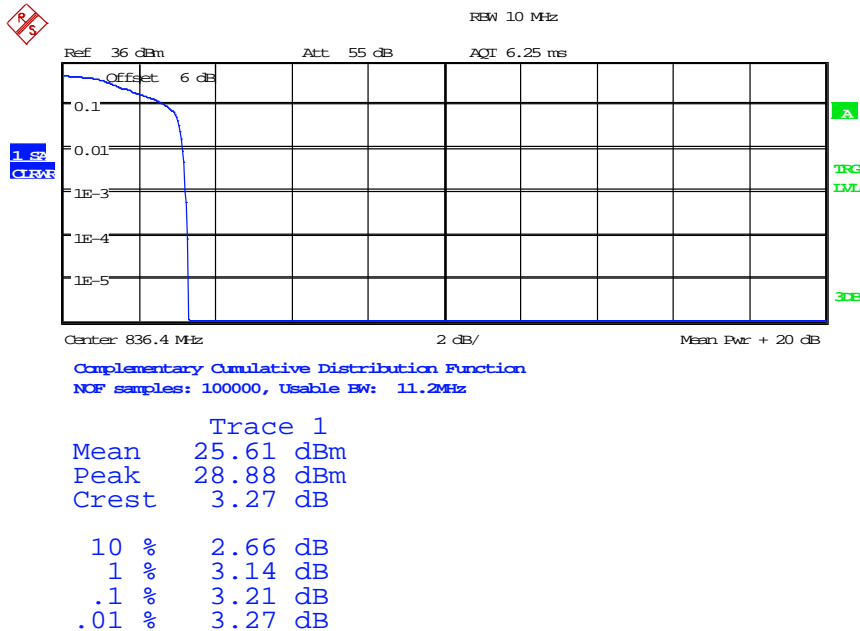
Date: 28.APR.2016 13:17:54

(Plot B3: GSM 1900MHz, Channel =810)



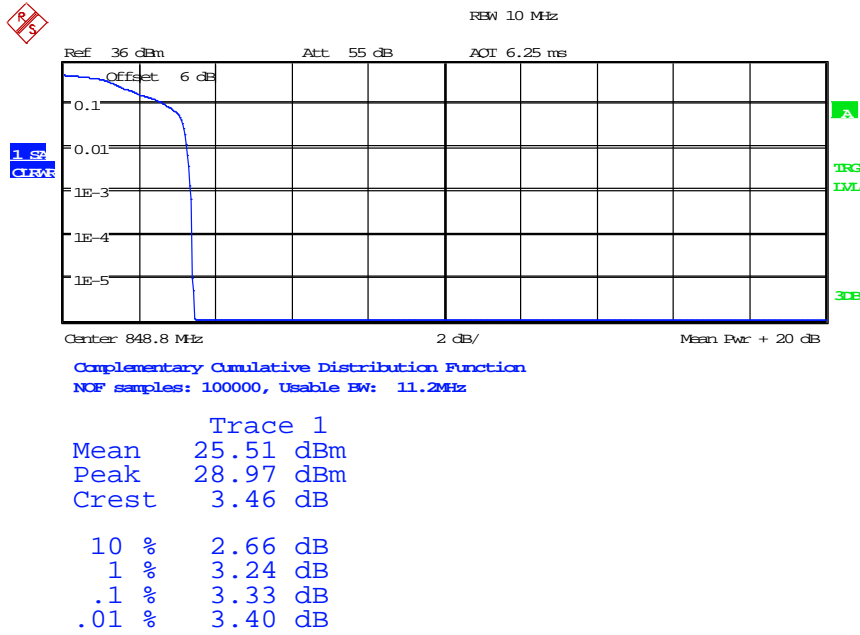
Date: 28.APR.2016 13:35:10

(Plot C1: EGPRS 850MHz, Channel =128)



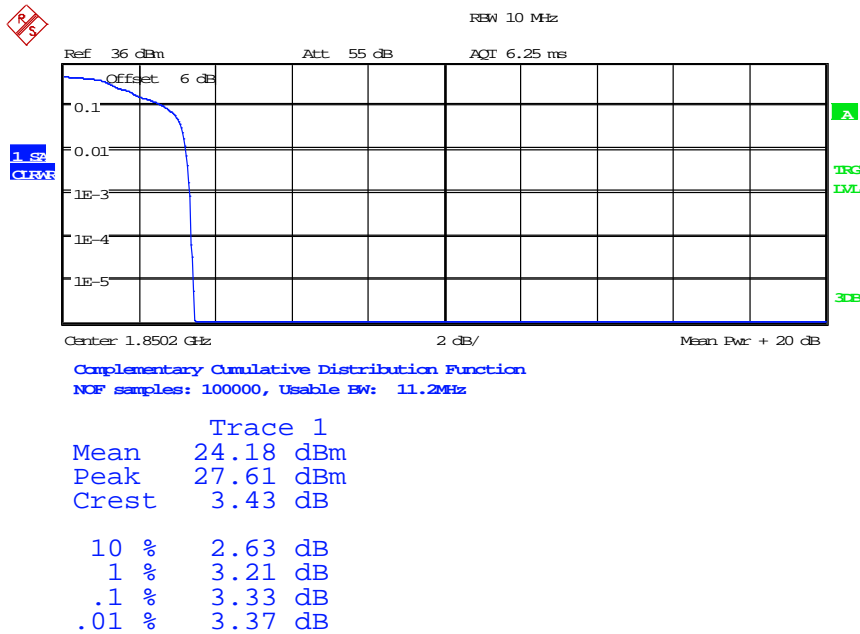
Date: 28.APR.2016 13:35:34

(Plot C2: EGPRS 850MHz, Channel =189)



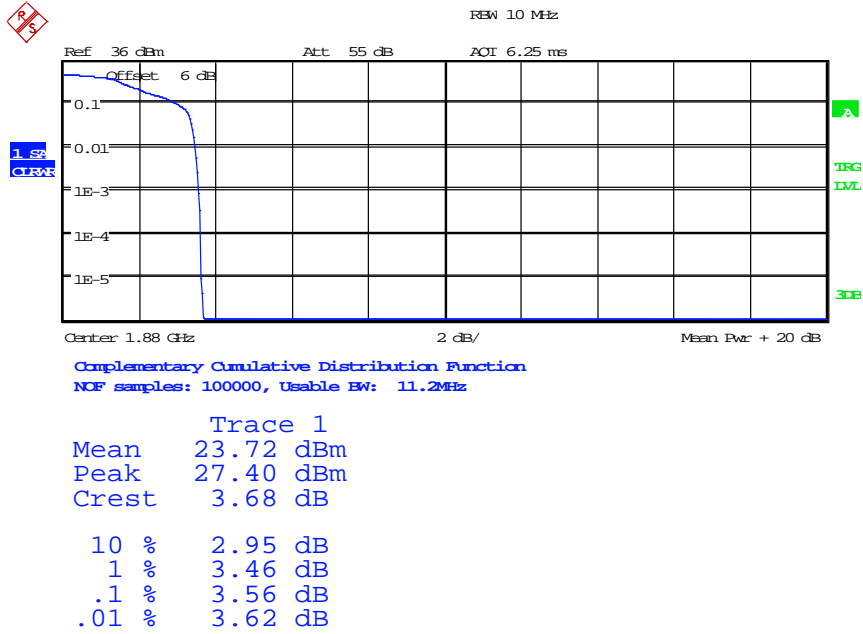
Date: 28.APR.2016 13:36:02

(Plot C3: EGPRS 850MHz, Channel =251)



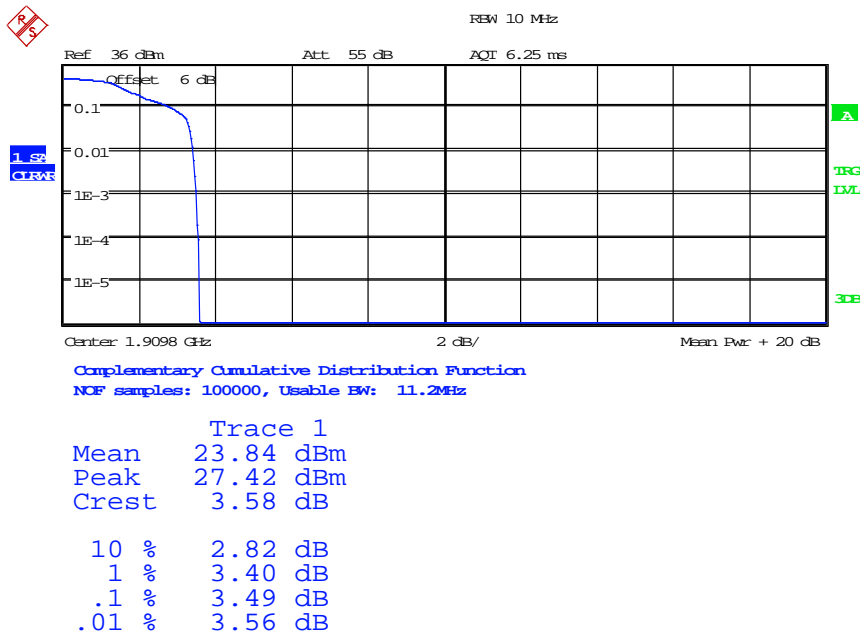
Date: 28.APR.2016 13:22:25

(Plot D1: EGPRS 1900MHz, Channel =512)



Date: 28.APR.2016 13:28:06

(Plot D2: EGPRS 1900MHz, Channel =661)



Date: 28.APR.2016 13:28:31

(Plot D3: EGPRS 1900MHz, Channel =810)



4.5 Conducted Out of Band Emissions

4.5.1 Requirement

According to FCC section 22.917(a) and FCC section 24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \cdot \log(P)$ dB. This calculated to be -13dBm.

4.5.2 Test Description

See section 4.2.1 of this report.

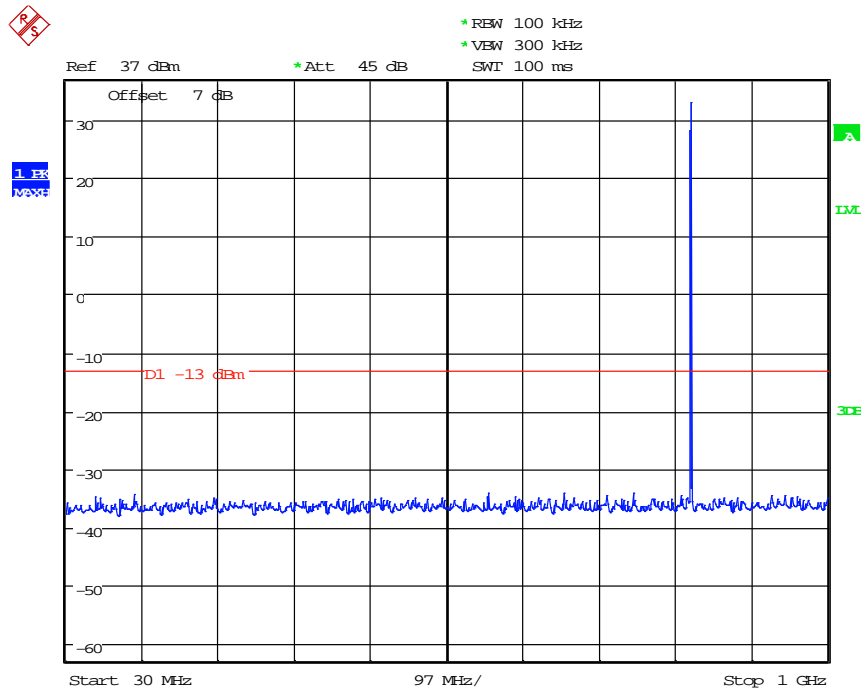
4.5.3 Test Results

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the out of band emissions.

Test Plots:

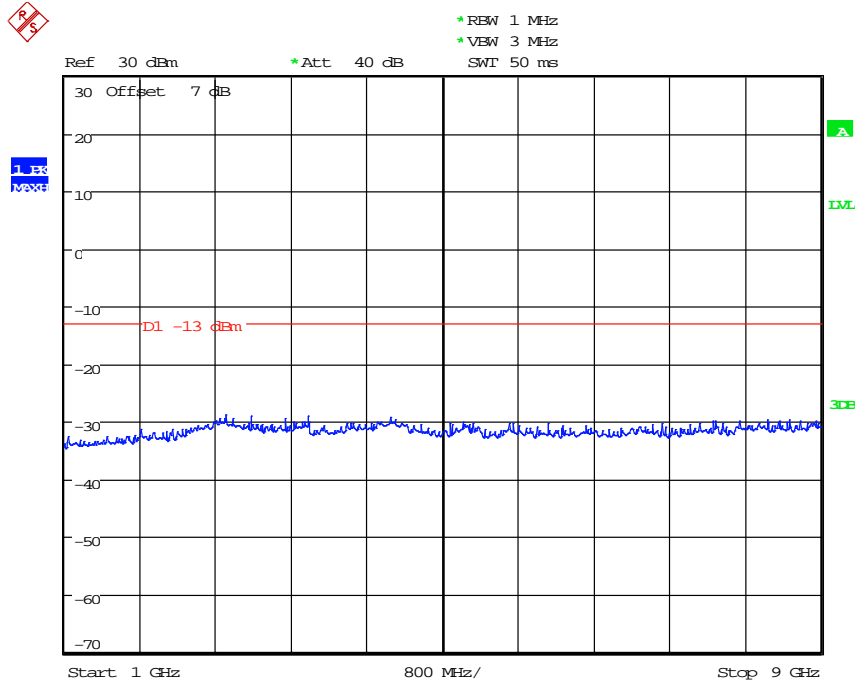
NOTE:

The power of the EUT transmitting frequency should be ignored.



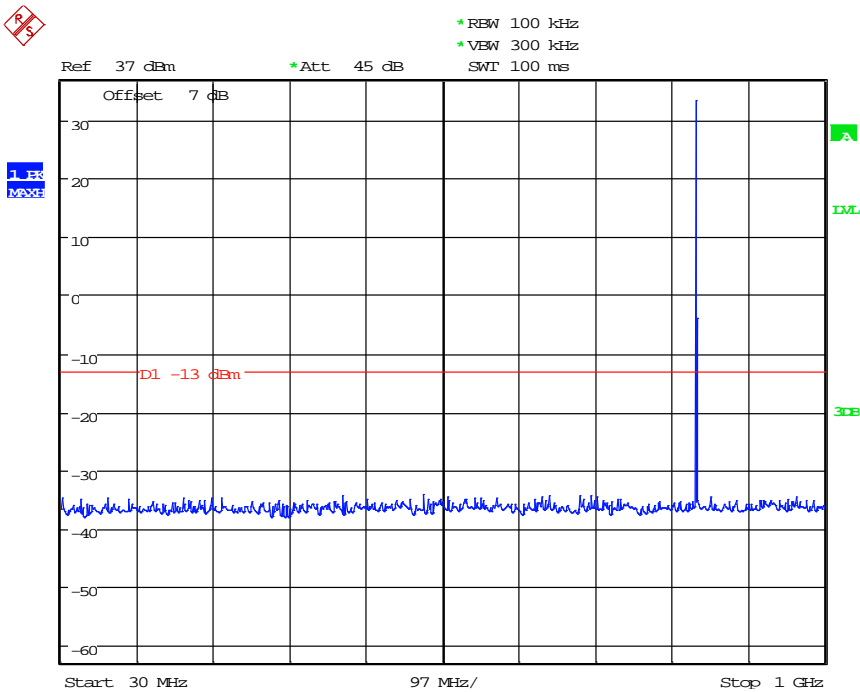
Date: 27.APR.2016 19:39:11

(GSM 850MHz, Channel = 128, 30MHz to 1GHz)



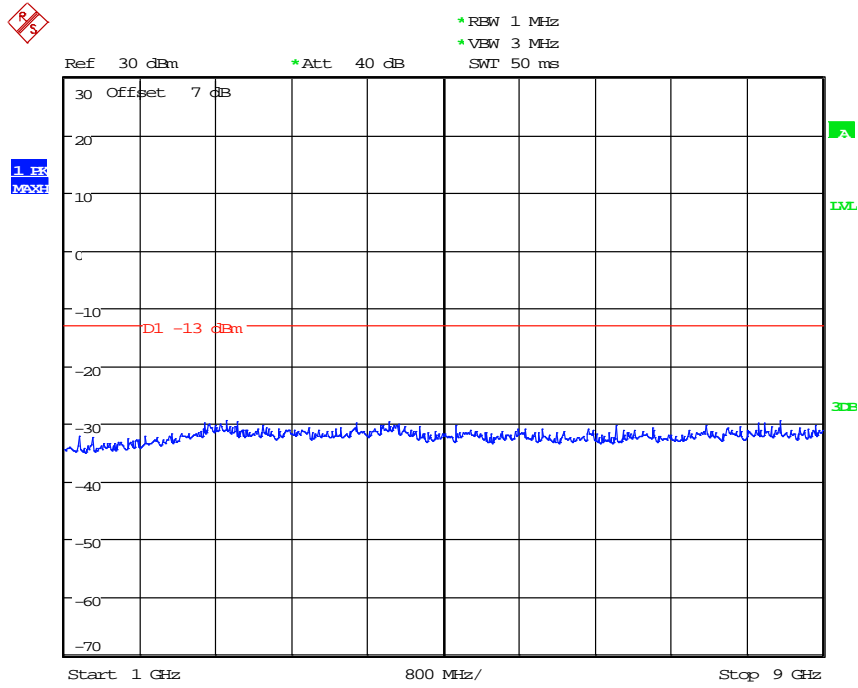
Date: 4.MAY.2016 19:05:59

(GSM 850MHz, Channel = 128, 1GHz to 9GHz)



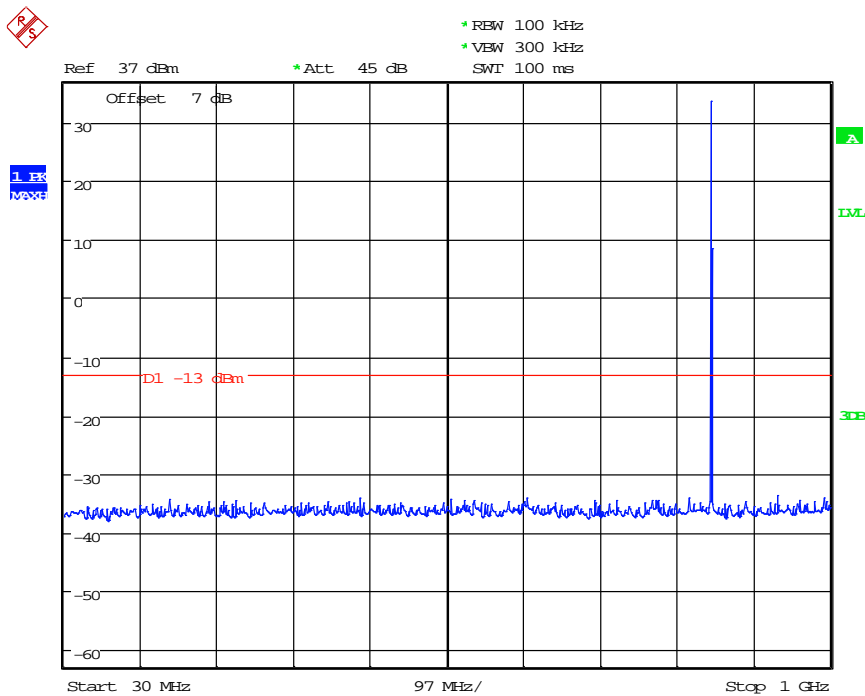
Date: 27.APR.2016 19:38:46

(GSM 850MHz, Channel = 190, 30MHz to 1GHz)



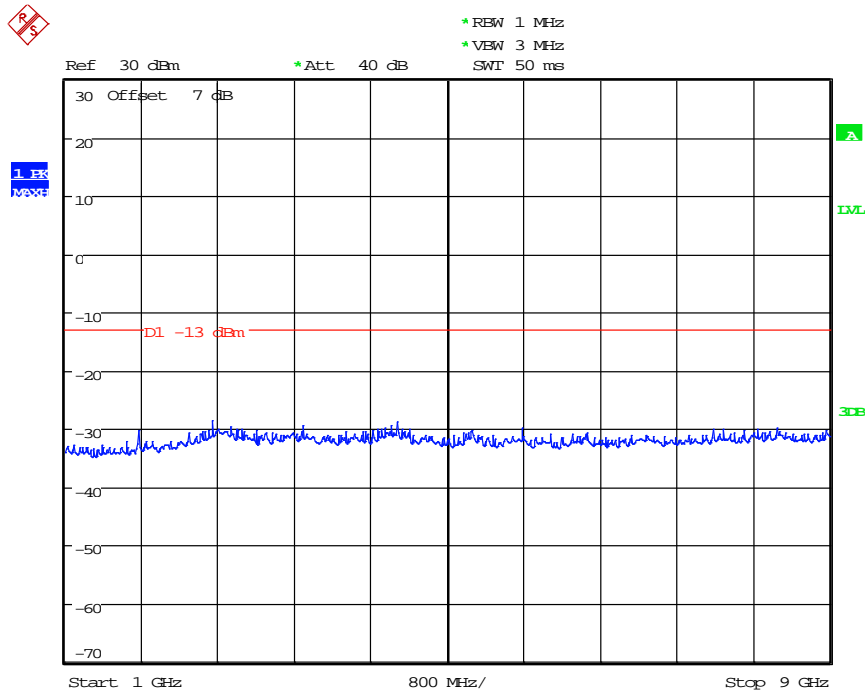
Date: 4.MAY.2016 19:06:09

(GSM 850MHz, Channel = 190, 1GHz to 9GHz)



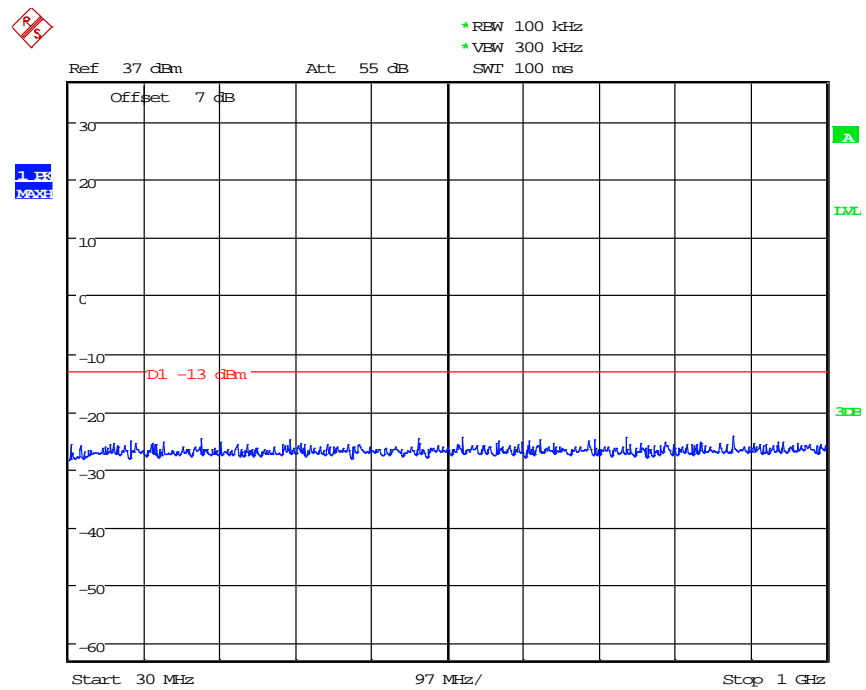
Date: 27.APR.2016 19:38:21

(GSM 850MHz, Channel = 251, 30MHz to 1GHz)



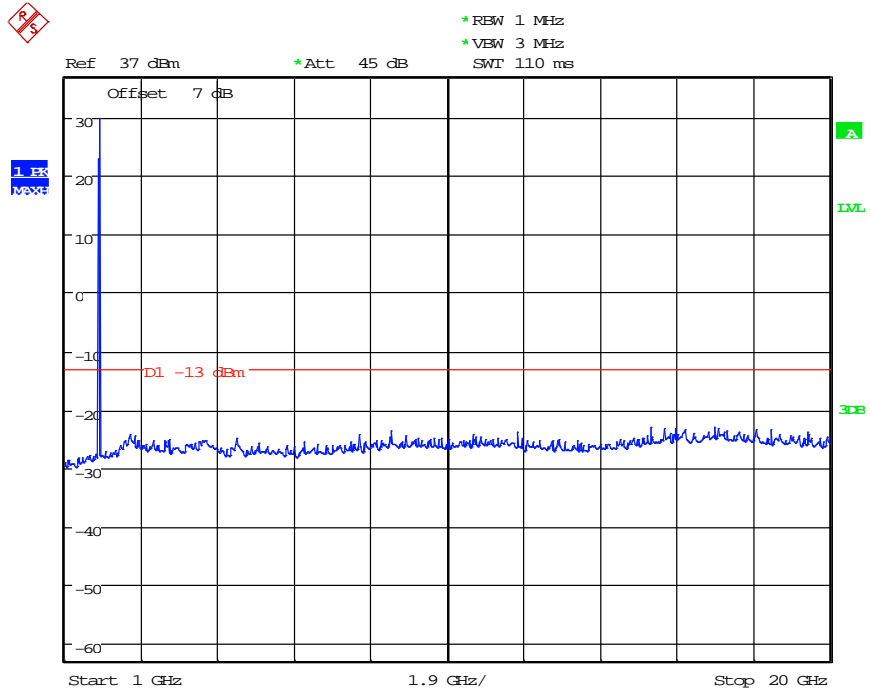
Date: 4.MAY.2016 19:06:19

(GSM 850MHz, Channel = 251, 1GHz to 9GHz)



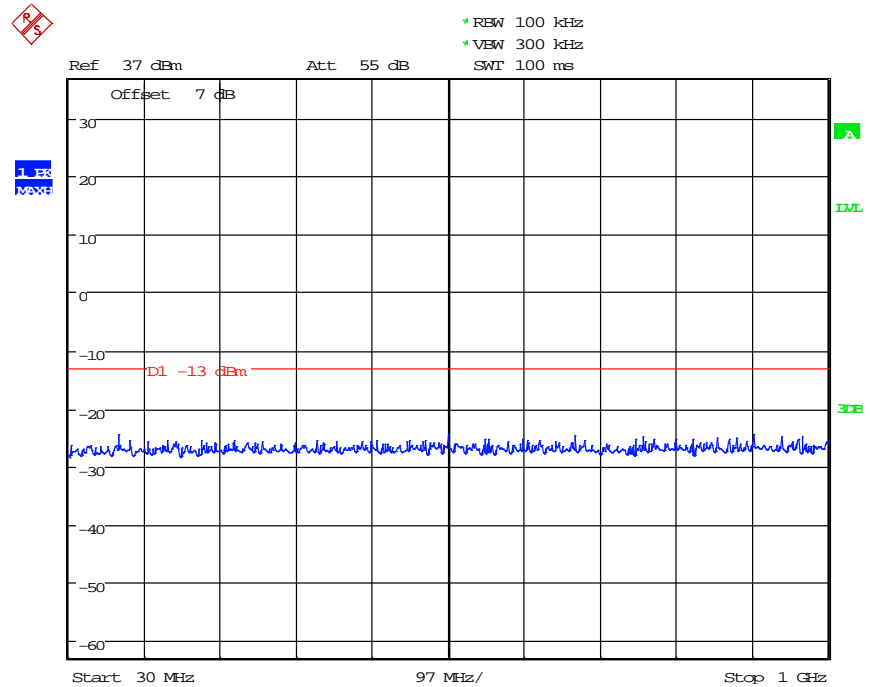
Date: 27.APR.2016 19:30:52

(GSM 1900MHz, Channel = 512, 30MHz to 1GHz)



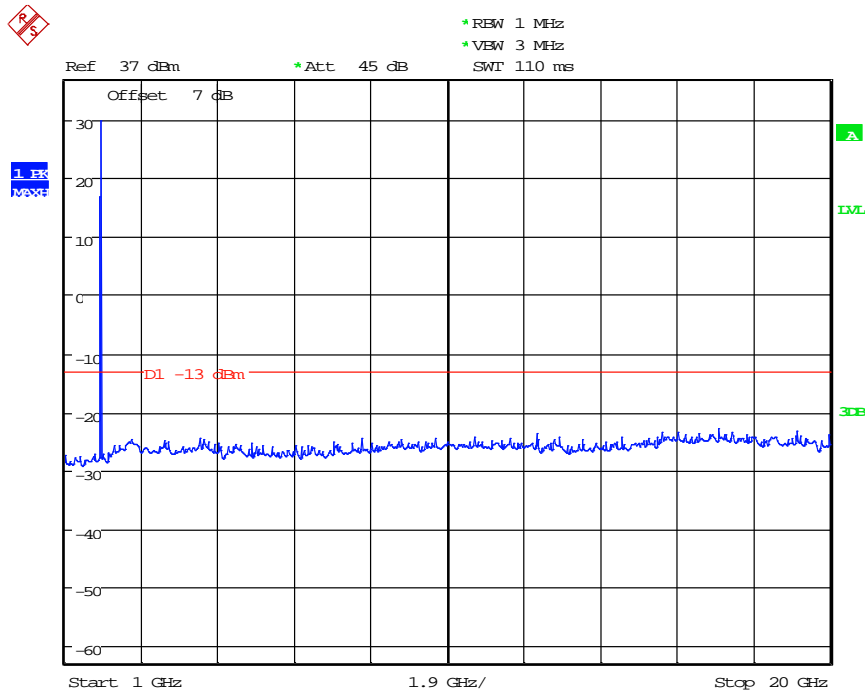
Date: 27.APR.2016 19:35:46

(GSM 1900MHz, Channel = 512, 1GHz to 20GHz)



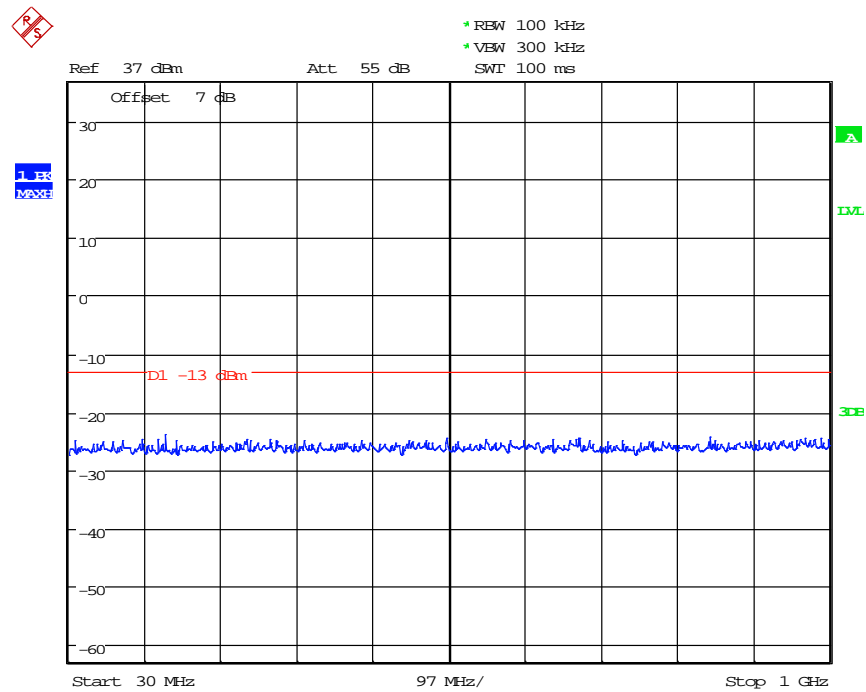
Date: 27.APR.2016 19:30:36

(GSM 1900MHz, Channel = 661, 30MHz to 1GHz)



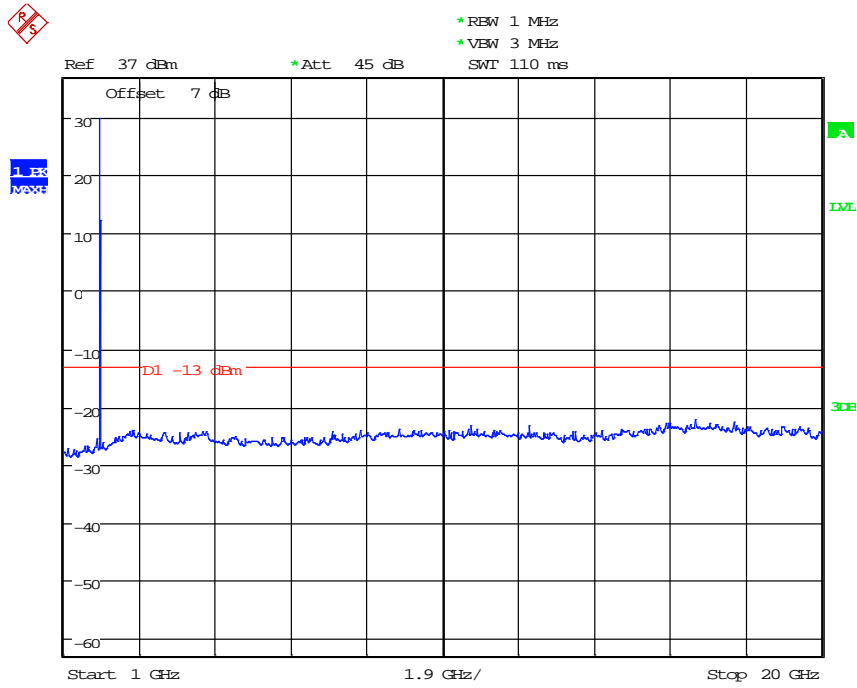
Date: 27.APR.2016 19:35:27

(GSM 1900MHz, Channel = 661, 1GHz to 20GHz)



Date: 27.APR.2016 19:30:17

(GSM 1900MHz, Channel = 810, 30MHz to 1GHz)



Date: 27.APR.2016 19:35:05

(GSM 1900MHz, Channel = 810, 1GHz to 20GHz)

NOTE:

(1) GSM/GPRS/EGRPS was tested and the worst result was reported.



4.6 Band Edge

4.6.1 Requirement

According to FCC section 22.917(b) and FCC section 24.238(b), in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth (26dB emission bandwidth) of the fundamental emission of the transmitter may be employed.

4.6.2 Test Description

See section 4.2.1 of this report.

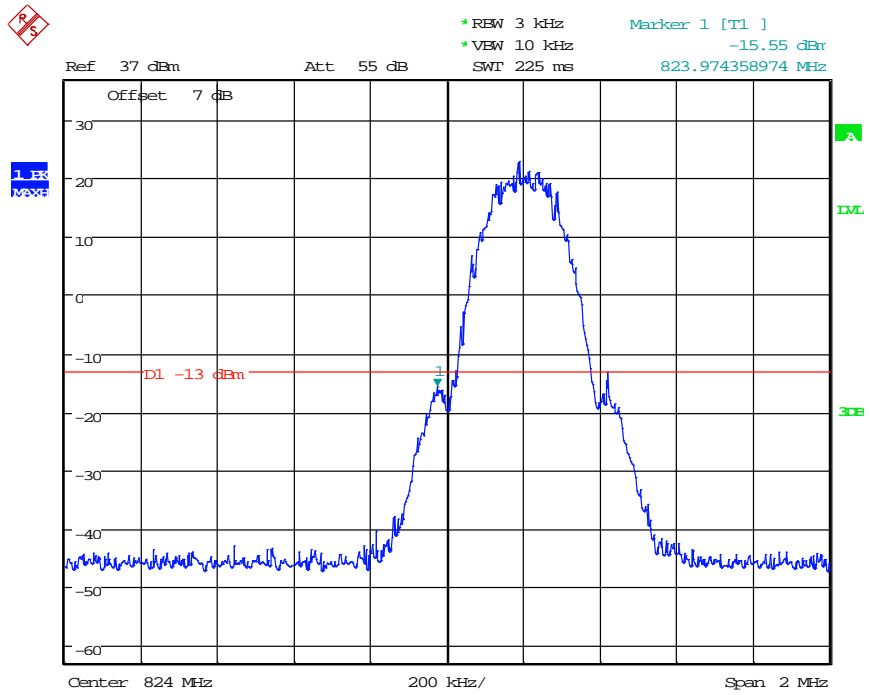
4.6.3 Test Results

The lowest and highest channels are tested to verify the band edge emissions.

| Band | Channel | Frequency (MHz) | Measured Max. Band Edge Emission (dBm) | Refer to Plot | Limit (dBm) | Verdict |
|------------------|---------|-----------------|--|---------------|-------------|---------|
| GSM 850MHz | 128 | 824.2 | -15.55 | Plat A1 | -13 | PASS |
| | 251 | 848.8 | -15.37 | Plot A2 | | PASS |
| GSM 1900MHz | 512 | 1850.2 | -14.85 | Plat B1 | | PASS |
| | 810 | 1909.8 | -16.13 | Plot B2 | | PASS |
| EGPRS 850MHz | 128 | 824.2 | -19.87 | Plat C1 | | PASS |
| | 251 | 848.8 | -19.43 | Plot C2 | | PASS |
| EGPRS 1900MHz | 512 | 1850.2 | -20.12 | Plat D1 | | PASS |
| | 810 | 1909.8 | -20.64 | Plot D2 | | PASS |

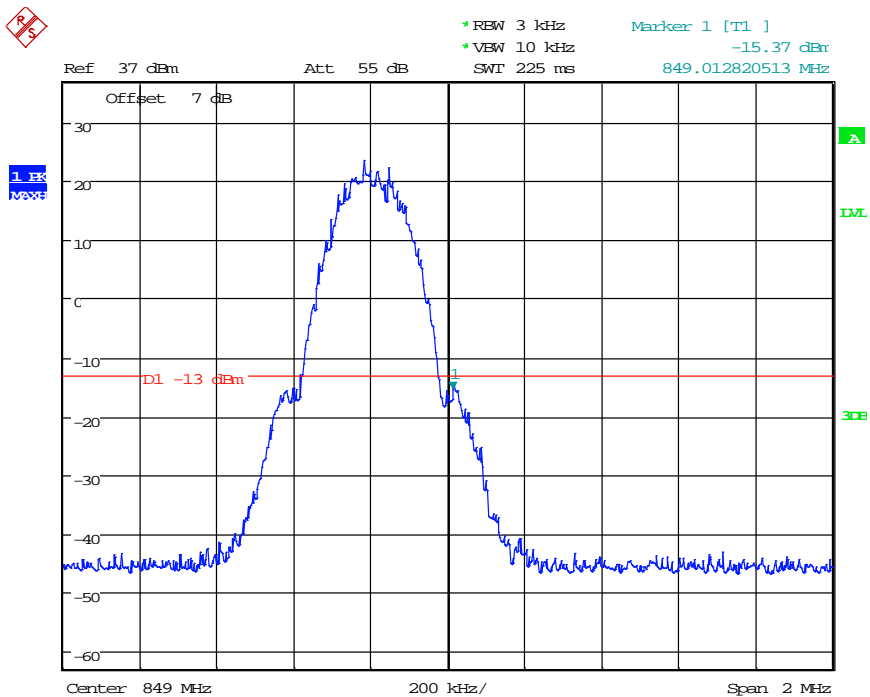


Test Plots:



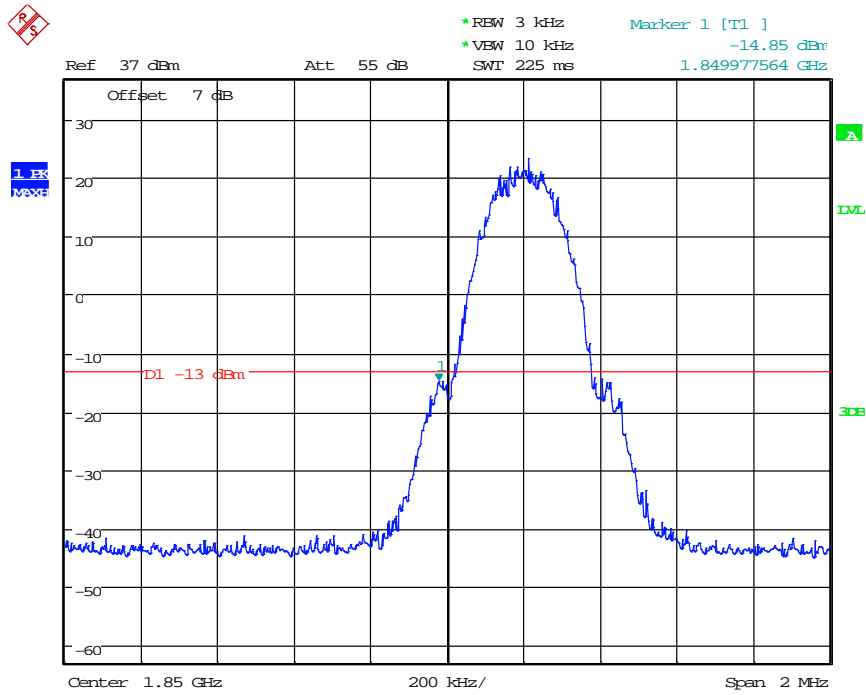
Date: 28.APR.2016 12:33:29

(Plot A1: GSM 850 Channel = 128)



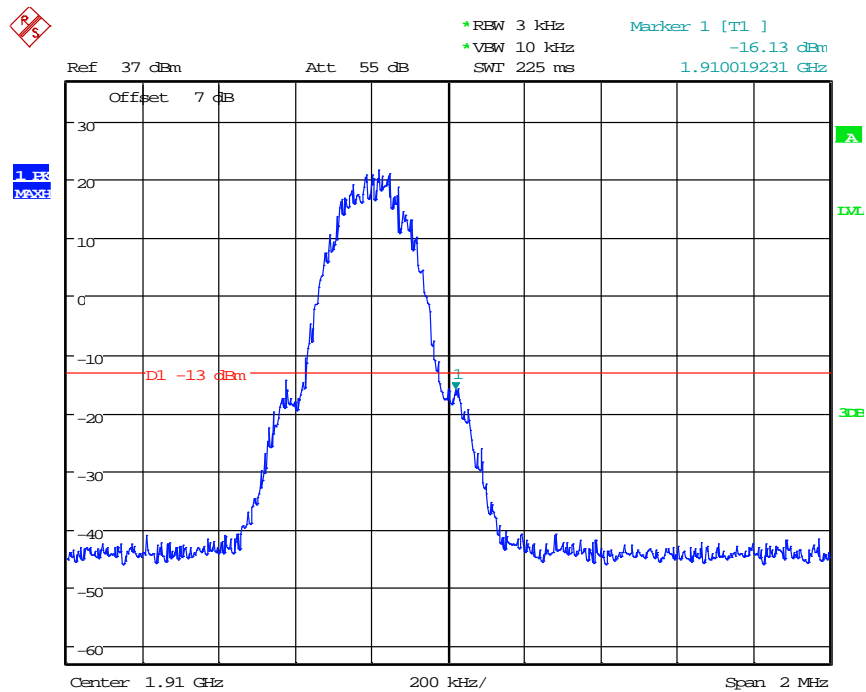
Date: 28.APR.2016 12:32:31

(Plot A2: GSM 850 Channel = 251)



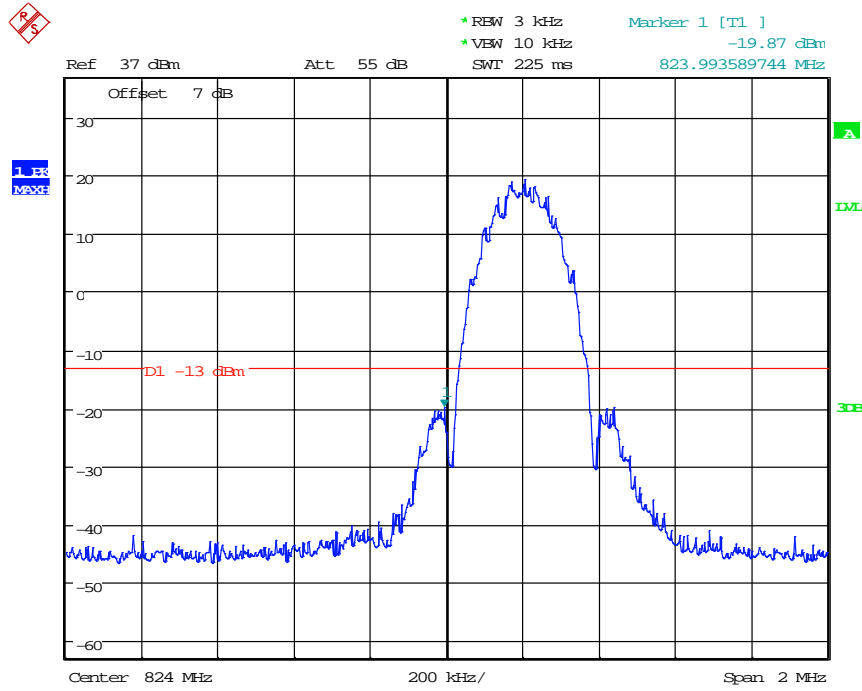
Date: 27.APR.2016 19:55:45

(Plot B1: GSM 1900 Channel = 512)



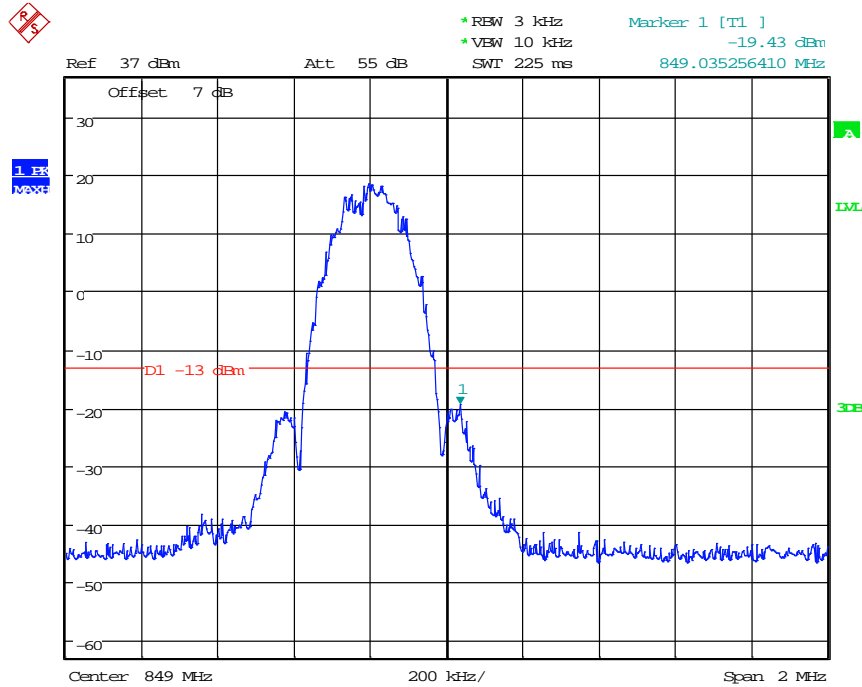
Date: 27.APR.2016 19:56:39

(Plot B2: GSM 1900 Channel = 810)



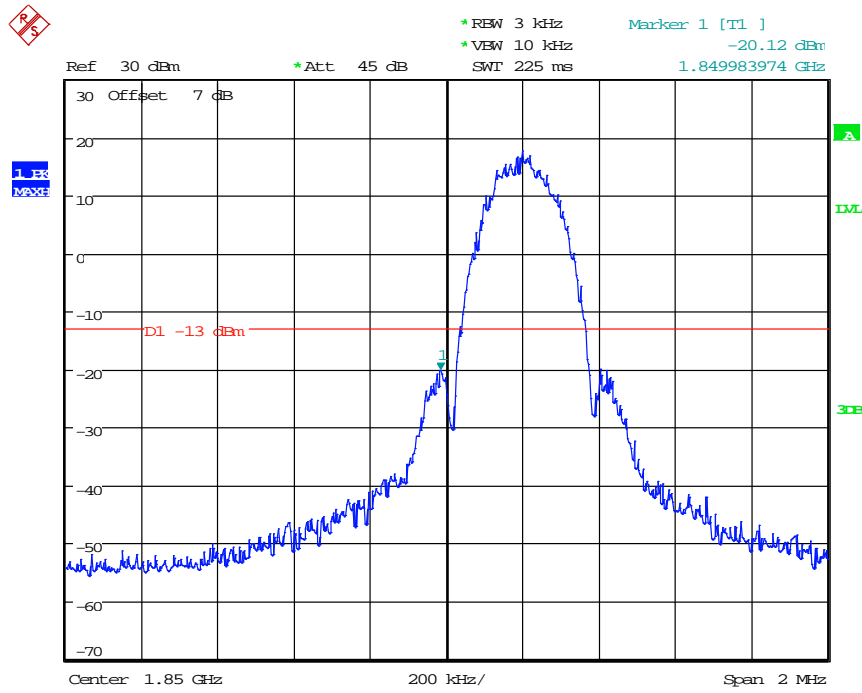
Date: 28.APR.2016 12:34:33

(Plot C1: EGPRS 850 Channel = 128)



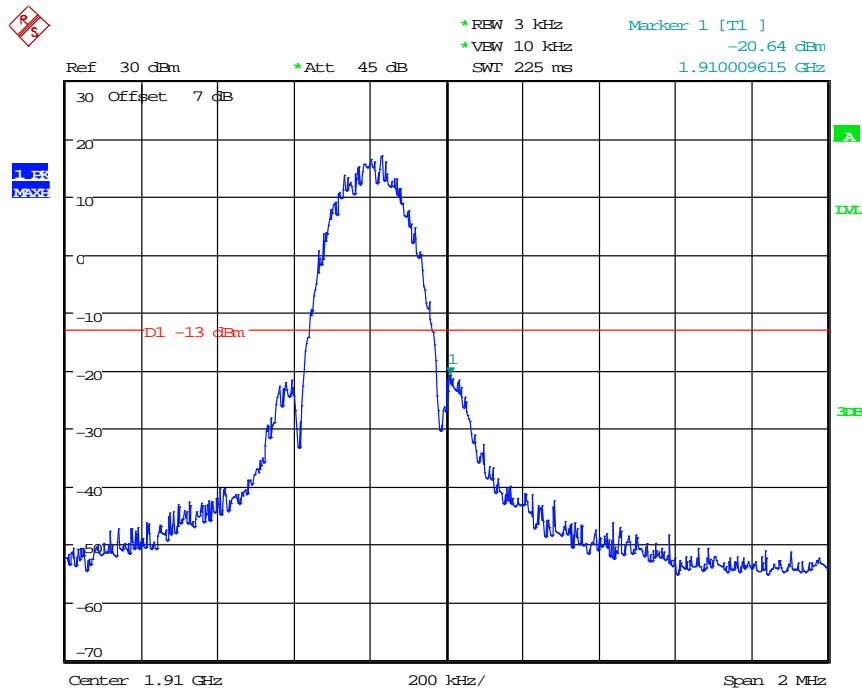
Date: 28.APR.2016 12:35:33

(Plot C2: EGPRS 850 Channel = 251)



Date: 27.APR.2016 19:59:14

(Plot D1: EGPRS 1900 Channel = 512)



Date: 27.APR.2016 19:58:19

(Plot D2: EGPRS 1900 Channel = 810)

NOTE:

(1)Both GSM/GPRS was tested and the worst result was reported.

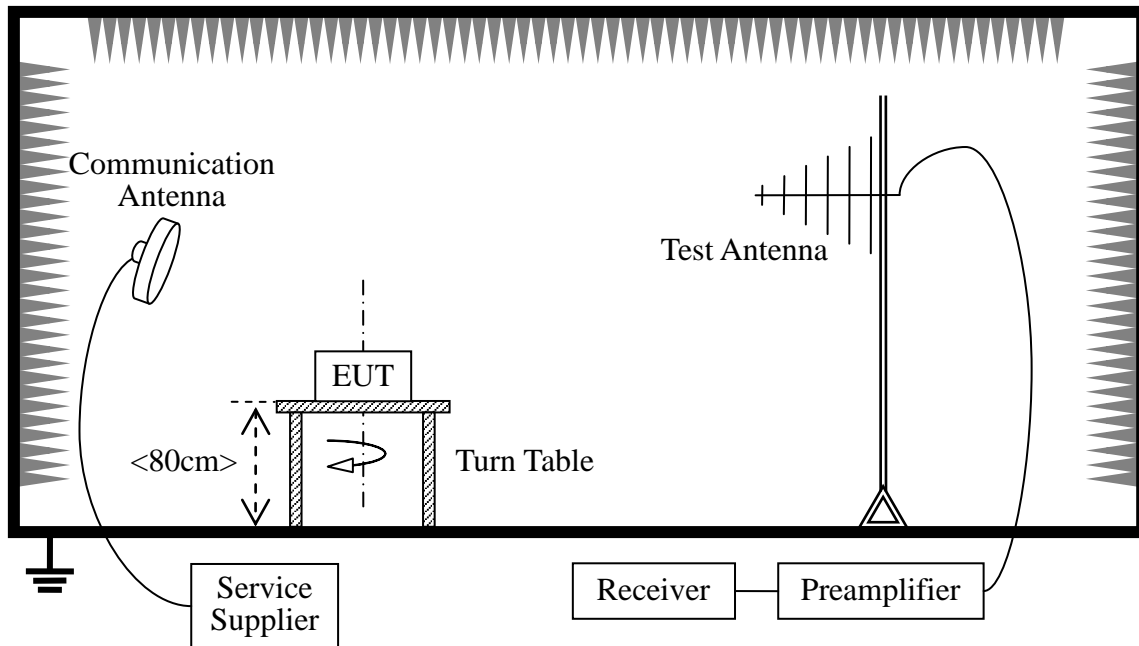


4.7 Transmitter Radiated Power (EIRP/ERP)

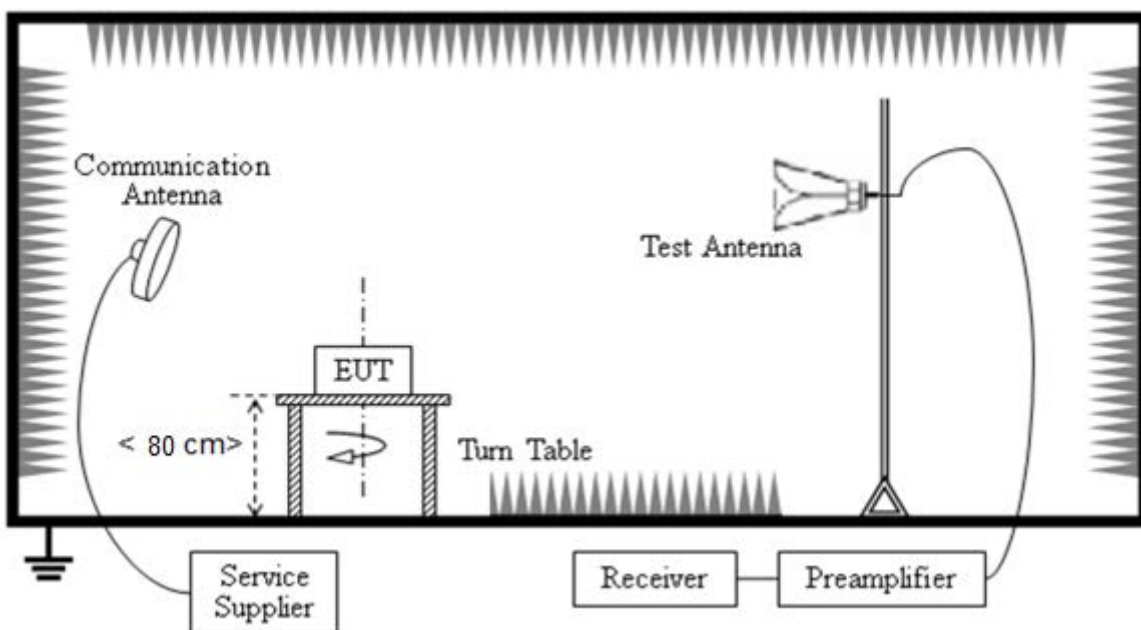
4.7.1 Requirement

According to FCC section 22.913, the Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7Watts, and FCCsection24.232, the broadband PCS mobile station is limited to 2Watts e.i.r.p. peak power.

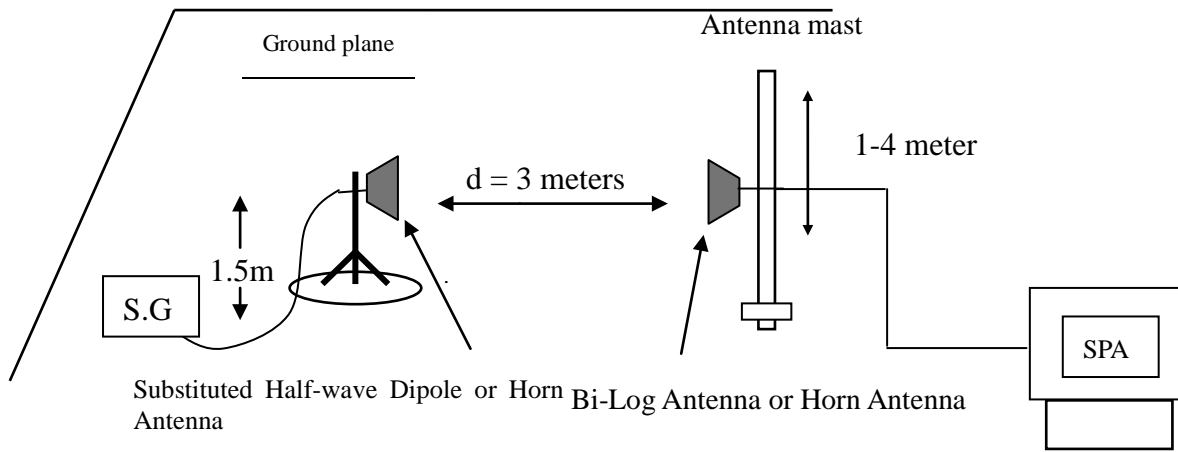
4.7.2 Test Description



Radiated Emissions 30-1000MHz



Radiated Emissions above 1000MHz



Substituted method

4.7.3 Test Procedure

The measurements procedures in TIA-603C-2004 are used.

1. EUT was placed on a 0.8 meter 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 1-4m. 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. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (P_r).
3. 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 (P_{Mea}) 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 (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
4. The cable loss (P_{cl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (G_a) should be recorded after test. The measurement results are obtained as described below:
$$\text{Power(EIRP)} = P_{Mea} + P_{cl} + G_a$$
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.



4.7.4 Test Results

The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. The lowest, middle and highest channels are tested. All modes are tested.

Limits

| Band | Burst Peak ERP (dBm) |
|-------------|----------------------|
| GSM 850MHz | ≤38.5dBm (7W) |
| GSM 1900MHz | ≤33.0dBm (2W) |

Measurement Result

| Band | Channel | Peak ERP (dBm) | Limit (dBm) | Polarization |
|-----------|---------|----------------|-------------|--------------|
| GSM 850 | 128 | 28.62 | 38.45 | Horizontal |
| | 190 | 27.43 | 38.45 | Horizontal |
| | 251 | 27.70 | 38.45 | Horizontal |
| | 128 | 26.37 | 38.45 | Vertical |
| | 190 | 27.03 | 38.45 | Vertical |
| | 251 | 26.50 | 38.45 | Vertical |
| EGPRS 850 | 128 | 22.41 | 38.45 | Horizontal |
| | 190 | 22.31 | 38.45 | Horizontal |
| | 251 | 22.70 | 38.45 | Horizontal |
| | 128 | 20.14 | 38.45 | Vertical |
| | 190 | 21.03 | 38.45 | Vertical |
| | 251 | 21.04 | 38.45 | Vertical |

| Band | Channel | Peak EIRP (dBm) | Limit (dBm) | Polarization |
|------------|---------|-----------------|-------------|--------------|
| GSM 1900 | 512 | 29.67 | 33 | Horizontal |
| | 661 | 29.43 | 33 | Horizontal |
| | 810 | 29.74 | 33 | Horizontal |
| | 512 | 28.52 | 33 | Vertical |
| | 661 | 28.43 | 33 | Vertical |
| | 810 | 28.35 | 33 | Vertical |
| EGPRS 1900 | 512 | 28.43 | 33 | Horizontal |
| | 661 | 28.96 | 33 | Horizontal |
| | 810 | 27.99 | 33 | Horizontal |
| | 512 | 25.73 | 33 | Vertical |
| | 661 | 26.59 | 33 | Vertical |
| | 810 | 26.27 | 33 | Vertical |

Remark: $ERP(dBm) = P_{Mea} + P_{cl} + G_a - 2.15$



4.8 Radiated Out of Band Emissions

4.8.1 Requirement

According to FCC section 22.917(a) and section 24.238(a), the power of any emission 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. This calculated to be -13dBm.

4.8.2 Test Description

See section 4.7.2 of this report.

4.8.3 Test Procedure

1. The lowest, middle and the highest channel were selected to perform tests respectively.
2. The EUT was placed on a rotatable non-conductive table 0.8 meters above the ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
7. A substituted antenna was in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
12. $ERP \text{ (dBm)} = EIRP - 2.15$
13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
14. The limit line is derived from $43 + 10 \log(P)$ dB below the transmitter power P(Watts)
 $= P(W) - [43 + 10 \log(P)] \text{ (dB)}$
 $= [30 + 10 \log(P)] \text{ (dBm)} - [43 + 10 \log(P)] \text{ (dB)}$
 $= -13 \text{ dBm.}$



4.8.4 Test Results

| Measured Max. Spurious Emission(dBm) | | | | | | |
|--------------------------------------|---------|--------------|-----------|------------|------------|---------|
| Band | Channel | Polarization | Frequency | Level(dBm) | Limit(dBm) | Verdict |
| GSM 850MHz | 128 | V | 1648.4 | -29.4 | -13 | Pass |
| | | V | 2472.6 | -39.1 | -13 | Pass |
| | | V | 3296.8 | -46.0 | -13 | Pass |
| | | V | 4121.0 | -45.5 | -13 | Pass |
| | | V | 4945.2 | nf | -13 | Pass |
| | | H | 1648.4 | -48.3 | -13 | Pass |
| | | H | 2472.6 | -38.3 | -13 | Pass |
| | | H | 3296.8 | -48.7 | -13 | Pass |
| | | H | 4121.0 | -49.1 | -13 | Pass |
| | | H | 4945.2 | nf | -13 | Pass |
| | 190 | V | 1673.2 | -29.3 | -13 | Pass |
| | | V | 2509.8 | -43.4 | -13 | Pass |
| | | V | 3346.4 | -46.4 | -13 | Pass |
| | | V | 4183.0 | -45.0 | -13 | Pass |
| | | V | 5019.6 | nf | -13 | Pass |
| | | H | 1673.2 | -50.3 | -13 | Pass |
| | | H | 2509.8 | -43.2 | -13 | Pass |
| | | H | 3346.4 | -47.6 | -13 | Pass |
| | | H | 4183.0 | -45.7 | -13 | Pass |
| | | H | 5019.6 | nf | -13 | Pass |
| | 251 | V | 1697.6 | -43.2 | -13 | Pass |
| | | V | 2546.4 | -46.3 | -13 | Pass |
| | | V | 3395.2 | -48.6 | -13 | Pass |
| | | V | 4244.0 | -49.2 | -13 | Pass |
| | | V | 5092.8 | nf | -13 | Pass |
| | | H | 1697.6 | -52.3 | -13 | Pass |
| | | H | 2546.4 | -42.6 | -13 | Pass |
| | | H | 3395.2 | -47.2 | -13 | Pass |
| | | H | 4244.0 | -45.1 | -13 | Pass |
| | | H | 5092.8 | nf | -13 | Pass |



| Measured Max. Spurious Emission(dBm) | | | | | | |
|--------------------------------------|---------|--------------|-----------|------------|------------|---------|
| Band | Channel | Polarization | Frequency | Level(dBm) | Limit(dBm) | Verdict |
| GSM 1900MHz | 512 | V | 3700.4 | -52.9 | -13 | Pass |
| | | V | 5550.6 | -46.7 | -13 | Pass |
| | | V | 7400.8 | -44.2 | -13 | Pass |
| | | V | 9251.0 | -39.9 | -13 | Pass |
| | | V | 11101.2 | nf | -13 | Pass |
| | | H | 3700.4 | -49.5 | -13 | Pass |
| | | H | 5550.6 | -46.6 | -13 | Pass |
| | | H | 7400.8 | -44.2 | -13 | Pass |
| | | H | 9251.0 | -40.7 | -13 | Pass |
| | | H | 11101.2 | nf | -13 | Pass |
| | 661 | V | 3760.0 | -48.2 | -13 | Pass |
| | | V | 5640.0 | -47.0 | -13 | Pass |
| | | V | 7520.0 | -43.7 | -13 | Pass |
| | | V | 9400.0 | -40.3 | -13 | Pass |
| | | V | 11280.0 | nf | -13 | Pass |
| | | H | 3760.0 | -48.3 | -13 | Pass |
| | | H | 5640.0 | -46.4 | -13 | Pass |
| | | H | 7520.0 | -44.0 | -13 | Pass |
| | | H | 9400.0 | -40.6 | -13 | Pass |
| | | H | 11280.0 | nf | -13 | Pass |
| | 810 | V | 3819.6 | -49.7 | -13 | Pass |
| | | V | 5729.4 | -47.3 | -13 | Pass |
| | | V | 7639.2 | -43.9 | -13 | Pass |
| | | V | 9549.0 | -42.5 | -13 | Pass |
| | | V | 11458.8 | nf | -13 | Pass |
| | | H | 3819.6 | -48.3 | -13 | Pass |
| | | H | 5729.4 | -47.9 | -13 | Pass |
| | | H | 7639.2 | -43.8 | -13 | Pass |
| | | H | 9549.0 | -40.9 | -13 | Pass |
| | | H | 11458.8 | nf | -13 | Pass |



| Measured Max. Spurious Emission(dBm) | | | | | | |
|--------------------------------------|---------|--------------|-----------|------------|------------|---------|
| Band | Channel | Polarization | Frequency | Level(dBm) | Limit(dBm) | Verdict |
| EGPRS 850MHz | 512 | V | 3700.4 | -50.6 | -13 | Pass |
| | | V | 5550.6 | -49.9 | -13 | Pass |
| | | V | 7400.8 | -45.7 | -13 | Pass |
| | | V | 9251.0 | -41.0 | -13 | Pass |
| | | V | 11101.2 | nf | -13 | Pass |
| | | H | 3700.4 | -50.6 | -13 | Pass |
| | | H | 5550.6 | -47.7 | -13 | Pass |
| | | H | 7400.8 | -46.5 | -13 | Pass |
| | | H | 9251.0 | -42.7 | -13 | Pass |
| | | H | 11101.2 | nf | -13 | Pass |
| | 661 | V | 3760.0 | -48.2 | -13 | Pass |
| | | V | 5640.0 | -49.3 | -13 | Pass |
| | | V | 7520.0 | -46.0 | -13 | Pass |
| | | V | 9400.0 | -41.1 | -13 | Pass |
| | | V | 11280.0 | nf | -13 | Pass |
| | | H | 3760.0 | -49.6 | -13 | Pass |
| | | H | 5640.0 | -49.5 | -13 | Pass |
| | | H | 7520.0 | -46.6 | -13 | Pass |
| | | H | 9400.0 | -42.7 | -13 | Pass |
| | | H | 11280.0 | nf | -13 | Pass |
| | 810 | V | 3819.6 | -51.1 | -13 | Pass |
| | | V | 5729.4 | -50.4 | -13 | Pass |
| | | V | 7639.2 | -45.2 | -13 | Pass |
| | | V | 9549.0 | -43.7 | -13 | Pass |
| | | V | 11458.8 | nf | -13 | Pass |
| | | H | 3819.6 | -50.4 | -13 | Pass |
| | | H | 5729.4 | -50.3 | -13 | Pass |
| | | H | 7639.2 | -45.7 | -13 | Pass |
| | | H | 9549.0 | -41.2 | -13 | Pass |
| | | H | 11458.8 | nf | -13 | Pass |



| Measured Max. Spurious Emission(dBm) | | | | | | |
|--------------------------------------|---------|--------------|-----------|------------|------------|---------|
| Band | Channel | Polarization | Frequency | Level(dBm) | Limit(dBm) | Verdict |
| EGPRS 1900MHz | 512 | V | 3700.4 | -48.0 | -13 | Pass |
| | | V | 5550.6 | -46.7 | -13 | Pass |
| | | V | 7400.8 | -47.9 | -13 | Pass |
| | | V | 9251.0 | -41.2 | -13 | Pass |
| | | V | 11101.2 | nf | -13 | Pass |
| | | H | 3700.4 | -51.4 | -13 | Pass |
| | | H | 5550.6 | -48.8 | -13 | Pass |
| | | H | 7400.8 | -46.9 | -13 | Pass |
| | | H | 9251.0 | -43.4 | -13 | Pass |
| | | H | 11101.2 | nf | -13 | Pass |
| | 661 | V | 3760.0 | -48.7 | -13 | Pass |
| | | V | 5640.0 | -49.3 | -13 | Pass |
| | | V | 7520.0 | -46.4 | -13 | Pass |
| | | V | 9400.0 | -42.7 | -13 | Pass |
| | | V | 11280.0 | nf | -13 | Pass |
| | | H | 3760.0 | -50.5 | -13 | Pass |
| | | H | 5640.0 | -48.9 | -13 | Pass |
| | | H | 7520.0 | -46.7 | -13 | Pass |
| | | H | 9400.0 | -42.8 | -13 | Pass |
| | | H | 11280.0 | nf | -13 | Pass |
| | 810 | V | 3819.6 | -51.3 | -13 | Pass |
| | | V | 5729.4 | -50.0 | -13 | Pass |
| | | V | 7639.2 | -46.3 | -13 | Pass |
| | | V | 9549.0 | -43.6 | -13 | Pass |
| | | V | 11458.8 | nf | -13 | Pass |
| | | H | 3819.6 | -48.3 | -13 | Pass |
| | | H | 5729.4 | -48.7 | -13 | Pass |
| | | H | 7639.2 | -46.1 | -13 | Pass |
| | | H | 9549.0 | -41.8 | -13 | Pass |
| | | H | 11458.8 | nf | -13 | Pass |

NOTE:

- 1) the power of the EUT transmitting frequency should be ignored.
- 2) All spurious emission tests were performed in X,Y,Z axis direction and EUT was tested in GSM and GPRS mode, Only the worst axis test condition was recored in this test report.
- 3) 'nf' means that the emission level is too low to read out from the noise floor.
- 4) The emission levels of below 1 GHz are very lower than the limit(<-40dBm) and not show in this report.



Photos of the EUT



**** END OF REPORT ****