CETECOM ICT Services GmbH
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RSC-Laboratory

Deutscher Akkreditierungs Rat DAR

# Accredited testing-laboratory

**DAR registration number: DAT-P-176/94-D1**

**Federal Motor Transport Authority (KBA)**
**DAR registration number: KBA-P 00070-97**

**Recognized by the Federal Communications Commission**
**Anechoic chamber registration no.: 90462 (FCC)**
**Anechoic chamber registration no.: 3463A-1 (IC)**
**Certification ID: DE 0001**
**Accreditation ID: DE 0002**

**Accredited Bluetooth® Test Facility (BQTF)**



| | | |
|---|---|---|
| **Test report no.** | **:** | **2-4883-59-02/08** |
| **Type identification** | **:** | **AAC-1052151-BV** |
| **Applicant** | **:** | **Sony Ericsson Mobile Communications AB** |
| **FCC ID** | **:** | **PY7A1052151** |
| **IC Certification No** | **:** | **4170B-A1052151** |
| **Test standards** | **:** | **47 CFR Part 2** |
| | | **47 CFR Part 22** |
| | | **47 CFR Part 24** |
| | | **RSS - 132 Issue 2** |
| | | **RSS - 133 Issue 4** |

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# 1 General information

## 1.1 Notes

The test results of this test report relate exclusively to the test item specified in 3.1.1. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

**Test laboratory manager:**

| **2008-09-22** | **Jakob Reschke** | |
|---|---|---|
| Date | Name | Signature |

**Technical responsibility for area of testing:**

| **2008-09-22** | **Michael Berg** | |
|---|---|---|
| Date | Name | Signature |

## 1.2 Testing laboratory

**CETECOM ICT Services GmbH**

**Untertürkheimer Straße 6 - 10**
**66117 Saarbrücken**
**Germany**
**Phone: + 49 681 5 98 - 0**
**Fax: + 49 681 5 98 - 9075**
**e-mail: info@ICT.cetecom.de**
**Internet: http://www.cetecom-ict.de**

**State of accreditation:** **The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025**
**DAR registration number: DAT-P-176/94-D1**

**Accredited by:** **Federal Motor Transport Authority (KBA)**
**DAR registration number: KBA-P 00070-97**

**Testing location, if different from CETECOM ICT Services GmbH:**

**Name :**
**Street :**
**Town :**
**Country :**
**Phone :**
**Fax :**

## 1.3 Details of applicant

| | |
|---|---|
| **Name:** | **Sony Ericsson Mobile Communications AB** |
| **Street:** | **Nya Vattentornet** |
| **Town:** | **22188 Lund** |
| **Country:** | **Sweden** |
| **Telephone:** | **+46-46-19-3000** |
| **Fax:** | **+46-46-19-3295** |
| **Contact:** | **Peter Lindeborg** |
| **E-mail:** | **peter.lindeborg@sonyericsson.com** |
| **Telephone:** | **+46-46-212-6180** |

## 1.4 Application details

| | |
|---|---|
| **Date of receipt of order:** | **2008-09-10** |
| **Date of receipt of test item:** | **2008-09-20** |
| **Date of start test:** | **2008-09-20** |
| **Date of end test:** | **2008-09-22** |
| **Persons(s) who have been present during the test:** | **-/-** |

## 2 Test standard/s:

| | | |
|---|---|---|
| **47 CFR Part 2** | **2006-10** | **Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission<br>Frequency allocations and radio treaty matters; general rules and regulations** |
| **47 CFR Part 22** | **2006-10** | **Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission<br>subchapter B - common carrier services, Part 22-Public mobile services** |
| **47 CFR Part 24** | **2006-10** | **Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission<br>subchapter B - common carrier services, Part 24-Personal communications services** |
| **RSS - 132 Issue 2** | **2005-09** | **Spectrum Management and Telecommunications Policy - Radio Standards Specifications<br>Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz** |
| **RSS - 133 Issue 4** | **2008-02** | **Spectrum Management and Telecommunications Policy - Radio Standards Specifications<br>2 GHz Personal Communication Services** |

# 3 Technical tests

## 3.1 Details of manufacturer

| | |
|---|---|
| Name: | **Sony Ericsson Mobile Communications AB** |
| | |
| | |
| Street: | **Nya Vattentornet** |
| Town: | **22188 Lund** |
| Country: | **Sweden** |

### 3.1.1 Test item

| | | |
|---|---|---|
| Kind of test item | : | **GSM Mobile 850/900/1800/1900; EDGE; BT** |
| Type identification | : | **AAC-1052151-BV** |
| | | |
| Serial Number | : | **Rad. CB5A0RS3FU**<br>**Cond. CB5A0RS3PL** |
| Frequency | : | **1850.2 – 1909.8 MHz and 824.2 – 848.8 MHz** |
| Type of modulation | : | **GMSK; 8-PSK** |
| Emission Designator for GSM 1900 | : | **GMSK: 282KGXW**<br>**8-PSK: 288KG7W** |
| Emission Designator for GSM 850 | : | **GMSK: 284KGXW**<br>**8-PSK: 280KG7W** |
| Number of channels | : | **300 (PCS1900) and 125 (PCS850)** |
| Antenna Type | : | **Integrated antenna** |
| Power supply (normal) | : | **DC by Li-Polymer Battery (BST-38) and Power Supply** |
| Output power GSM 850 / GMSK | : | **cond.: 33.80 dBm**<br>**ERP: 32.93 dBm** |
| Output power GSM 1900 / GMSK | : | **cond : 30.70 dBm**<br>**EIRP: 30.00 dBm** |
| Output power GSM 850 / 8-PSK | : | **cond.: 27.68 dBm**<br>**ERP: 26.82 dBm** |
| Output power GSM 1900 / 8-PSK | : | **cond : 24.92 dBm**<br>**EIRP: 24.95 dBm** |
| Transmitter Spurious (worst case) | : | **-47.30 dBm** |
| Receiver Spurious (worst case) | : | **199 µV/m @ 3 m (noise floor)** |
| FCC ID | : | **PY7A1052151** |
| Certification No. IC | : | **4170B-A1052151** |
| Open Area Test Site IC No. | : | **IC 3463A-1** |
| IC Standards | : | **RSS132, Issue 2, RSS133, Issue 4** |

**ATTESTATION:**
**DECLARATION OF COMPLIANCE:**

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

**Laboratory Manager:**

| | | |
|---|---|---|
| **2008-09-22** | **Jakob Reschke** | |
| Date | Name | Signature |

## 3.2 Test Setup

| | | |
|---|---|---|
| Hardware | : | A |
| Software | : | R1AA050 prg1211-0565_DEV-SE |

| | | |
|---|---|---|
| Mobile; (cond. measurements) | : | CB5A0RS3PL |
| Mobile; (rad. measurements) | : | CB5A0RS3FU |

The radiated measurements were performed with Standard world wide charger.

# 4 Statement of Compliance

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

## 4.1 Summary of Measurement Results

☒ **No deviations from the technical specifications were ascertained**

☐ There were deviations from the technical specifications ascertained

### 4.1.1 Labeling requirements

| Section in this Report | Test Name | Verdict |
|---|---|---|
| 5.1 | Labeling | pass |

### 4.1.2 PCS 1900

| Section in this Report | Test Name | Verdict |
|---|---|---|
| 5.2.1 | RF Power Output | pass |
| 5.2.2 | Frequency Stability | pass |
| 5.2.3 | Radiated Emissions | pass |
| 5.2.4 | Conducted Spurious Emissions | pass |
| 5.2.5 | Block Edge Compliance | pass |
| 5.2.6 | Occupied Bandwidth | pass |

### 4.1.3 GSM 850

| Section in this Report | Test Name | Verdict |
|---|---|---|
| 5.3.1 | RF Power Output | pass |
| 5.3.2 | Frequency Stability | pass |
| 5.3.3 | Radiated Emissions | pass |
| 5.3.4 | Conducted Spurious Emissions | pass |
| 5.3.5 | Block Edge Compliance | pass |
| 5.3.6 | Occupied Bandwidth | pass |

### 4.1.4 Receiver

| Section in this Report | Test Name | Verdict |
|---|---|---|
| 5.4.1 | Receiver Radiated emissions | pass |

# 5 Measurements and results

## 5.1 Labeling

Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:

(1) FCC Identifier consisting of the two elements in the exact order specified in § 2.926. The FCC Identifier shall be preceded by the term *FCC ID* in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification.

*Example:* FCC ID XXX123. XXX—Grantee
Code 123—Equipment Product Code

**Verification:**

The labeling of the EUT is shown in the photo documentation in the annex.

**Result:**

| | |
|---|---|
| Labeling as described in Part 2.925: | PASS |

## 5.2 PART PCS 1900

For Part 24/22 we use the substitution method (TIA/EIA 603).
All measurements in this report are done in GSM mode. The device is able to transmit data in GPRS mode also. But because the current measurements are performed in PEAK mode no other results from GPRS mode are possible. The only different is the modulation average power, which is 3 dB higher (by using 2 timeslots in the Up-link). All relevant tests have been repeated in 8-PSK Modulation if EDGE Mode is supported.

### 5.2.1 RF Power Output

**Reference**

| | |
|---|---|
| FCC: | CFR Part 24.232, 2.1046 |
| IC: | RSS 133, Issue 4, Section 4.3 |

**Summary:**

This paragraph contains both average/peak output power and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

**Method of Measurements:**

The mobile was set up for the max. output power with pseudo random data modulation.
The power was measured with R&S Signal Analyzer FSIQ 26 (peak and average)
These measurements were done at 3 frequencies, 1850.2 MHz, 1880.0 MHz and 1909.8 MHz (bottom, middle and top of operational frequency range).

**Limits:**

| Nominal Peak Output Power (dBm) |
|---|
| +33 |

| 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. |
|---|

**Test Results: Output Power (conducted) GMSK Mode**

| **Frequency (MHz)** | **Average Output Power (dBm)** | **Peak-to-Average Ratio (dB)** |
|---|---|---|
| 1850.2 | 30.70 | 0.10 |
| 1880.0 | 30.64 | 0.10 |
| 1909.8 | 30.66 | 0.10 |
| Measurement uncertainty | ±0.5 dB | |

**Test Results: Output Power (conducted) 8-PSK Mode**

| **Frequency (MHz)** | **Average Output Power (dBm)** | **Peak-to-Average Ratio (dB)** |
|---|---|---|
| 1850.2 | 24.85 | 3.30 |
| 1880.0 | 24.91 | 3.20 |
| 1909.8 | 24.92 | 3.20 |
| Measurement uncertainty | ±0.5 dB | |

**EIRP Measurements**

**Description:**

This is the test for the maximum radiated power from the phone.
Rule Part 24.232(b) specifies that "Mobile/portable stations are limited to 2 watts e.i.r.p. peak power…" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method
(a) The measurements were performed with full rf output power and modulation.
(b) Test was performed at listed 3m test site (listed with FCC, IC).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(f) Set the EMI Receiver and #2 as follows:
Center Frequency: test frequency
Resolution BW: 100 kHz
Video BW: same
Detector Mode: positive
Average: off
Span: 3 x the signal bandwidth
(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
(l) Repeat for all different test signal frequencies

**Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method**

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:
Center Frequency : equal to the signal source
Resolution BW : 10 kHz
Video BW : same
Detector Mode : positive
Average : off
Span : 3 x the signal bandwidth
(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(c) Select the frequency and E-field levels for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antennas (substitution antenna): DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz}.
(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) Use one of the following antenna as a receiving antenna: .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.
(g) If the DIPOLE antenna is used, tune its elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:
P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1
Where: P: Actual RF Power fed into the substitution antenna port after corrected.
P1: Power output from the signal generator
P2: Power measured at attenuator A input
P3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction
(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

**Limits:**

| Nominal Peak Output Power (dBm) |
|---|
| +33 |

**Test Results: Output Power (radiated) GMSK Mode**

| **Frequency (MHz)** | **Average EIRP (dBm)** |
|---|---|
| 1850.2 | 30.00 |
| 1880.0 | 29.61 |
| 1909.8 | 29.82 |
| Measurement uncertainty | ±1.5 dB |

**Test Results: Output Power (radiated) 8-PSK Mode**

| **Frequency (MHz)** | **Average EIRP (dBm)** |
|---|---|
| 1850.2 | 24.95 |
| 1880.0 | 24.77 |
| 1909.8 | 24.88 |
| Measurement uncertainty | ±1.5 dB |

**Sample Calculation:**

| Freq | SA Reading | SG Setting | Ant. gain | Dipol gain | Cable loss | EIRP Result | | | |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBµV | dBm | dBi | dBi | dB | dBm | | | |
| 1909.8 | 132.3 | 24.6 | 8.4 | 0.0 | 3.3 | 29.7 | | | |

EIRP = SG (dBm) - Cable Loss (dB) + Ant. gain (dBi)

### 5.2.2 Frequency Stability

**Reference**

| | |
|---|---|
| FCC: | CFR Part 24.235, 2.1055 |
| IC: | RSS 133, Issue 4, Section 4.2 |

**Method of Measurement:**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMU 200 DIGITAL RADIOCOMMUNICATION TESTER.
1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with Vnom, connected to the CMU 200 and in a simulated call on channel 661 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10 C increments from -30 C to +60 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
5. Re-measure carrier frequency at room temperature with Vnom. Vary supply voltage from Vmin to Vmax, in 12 steps re-measuring carrier frequency at each voltage. Pause at Vnom for 1 1/2 hours un-powered, to allow any self heating to stabilize, before continuing.
6. Subject the mobile station to overnight soak at +60 C.
7. With the mobile station, powered with Vnom, connected to the CMU 200 and in a simulated call on channel 661(center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
8. Repeat the above measurements at 10 C increments from +60 C to -30 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

**Measurement Limit:**

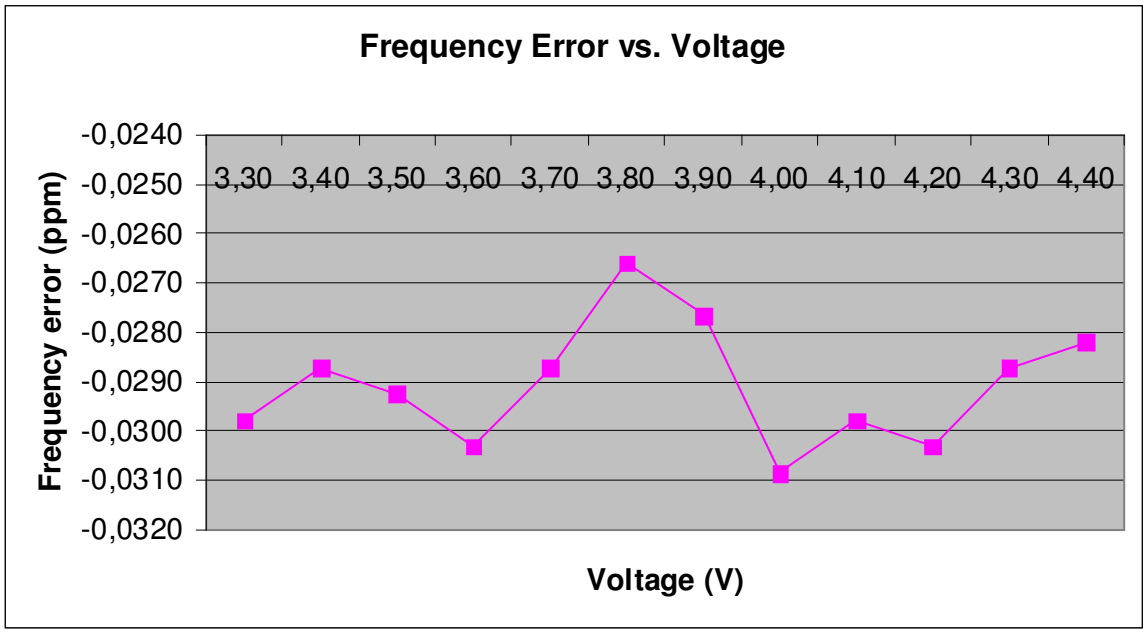
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

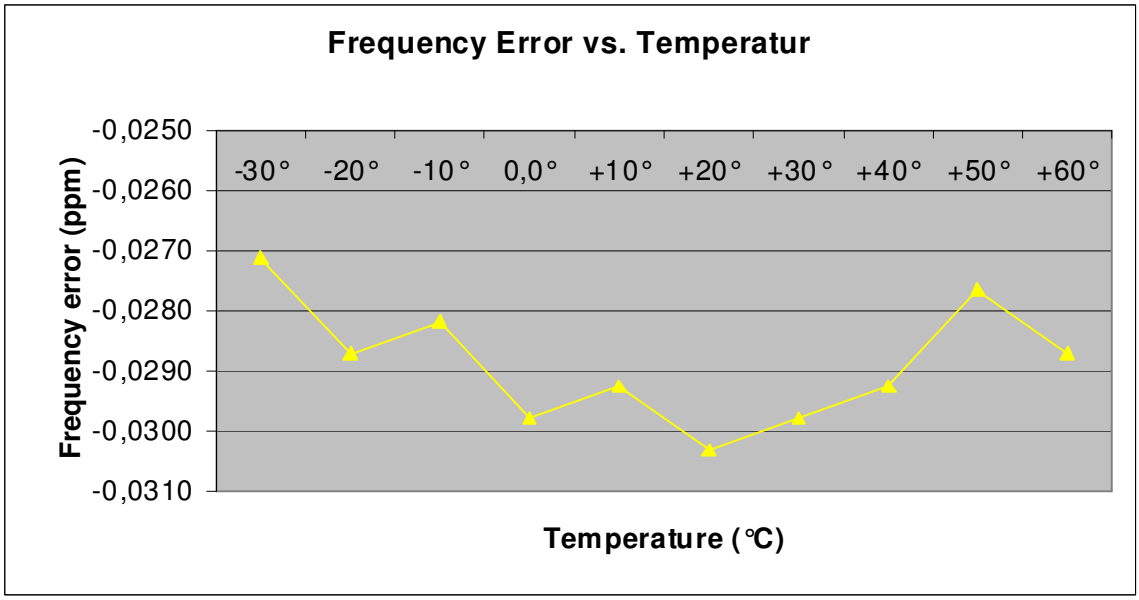
**Test Results: AFC FREQ ERROR vs. VOLTAGE**

| Voltage (V) | Frequency Error (Hz) | Frequency Error (%) | Frequency Error (ppm) |
|---|---|---|---|
| 3.3 | -56 | -0,00000298 | -0,0298 |
| 3.4 | -54 | -0,00000287 | -0,0287 |
| 3.5 | -55 | -0,00000293 | -0,0293 |
| 3.6 | -57 | -0,00000303 | -0,0303 |
| 3.7 | -54 | -0,00000287 | -0,0287 |
| 3.8 | -50 | -0,00000266 | -0,0266 |
| 3.9 | -52 | -0,00000277 | -0,0277 |
| 4.0 | -58 | -0,00000309 | -0,0309 |
| 4.1 | -56 | -0,00000298 | -0,0298 |
| 4.2 | -57 | -0,00000303 | -0,0303 |
| 4.3 | -54 | -0,00000287 | -0,0287 |
| 4.4 | -53 | -0,00000282 | -0,0282 |

**Test Results: AFC FREQ ERROR vs. TEMPERATURE**

| TEMPERATURE (°C) | Frequency Error (Hz) | Frequency Error (%) | Frequency Error (ppm) |
|---|---|---|---|
| -30 | -51 | -0,00000271 | -0,0271 |
| -20 | -54 | -0,00000287 | -0,0287 |
| -10 | -53 | -0,00000282 | -0,0282 |
| ±0.0 | -56 | -0,00000298 | -0,0298 |
| +10 | -55 | -0,00000293 | -0,0293 |
| +20 | -57 | -0,00000303 | -0,0303 |
| +30 | -56 | -0,00000298 | -0,0298 |
| +40 | -55 | -0,00000293 | -0,0293 |
| +50 | -52 | -0,00000277 | -0,0277 |
| +60 | -54 | -0,00000287 | -0,0287 |


Frequency Error vs. Voltage
Frequency error (ppm)
-0,0240
-0,0250
-0,0260
-0,0270
-0,0280
-0,0290
-0,0300
-0,0310
-0,0320
3,30 3,40 3,50 3,60 3,70 3,80 3,90 4,00 4,10 4,20 4,30 4,40
Voltage (V)


Frequency Error vs. Temperatur
Frequency error (ppm)
-0,0250
-0,0260
-0,0270
-0,0280
-0,0290
-0,0300
-0,0310
-30° -20° -10° 0,0° +10° +20° +30° +40° +50° +60°
Temperature (°C)

### 5.2.3 Radiated Emissions

**Reference**

| | |
|---|---|
| FCC: | CFR Part 24.238, 2.1053 |
| IC: | RSS 133, Issue 4, Section 4.4 |

**Measurement Procedure:**

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2003 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. This was rounded up to 20 GHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

The final open field emission (here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:

a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
b) The antenna output was terminated in a 50 ohm load.
c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and I MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.
e) Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603.

**Measurement Limit:**

Sec. 24.238 Emission Limits.
(a) On any frequency outside a licensee' s frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB.
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

**Measurement Results: Radiated Emissions**

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (1850.2 MHz, 1880.0 MHz and 1909.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

The final open field radiated levels are presented on the next table.

All measurements were done in horizontal and vertical polarization; the plots show the worst case.
The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked, too. The found values are stated in the table below.
As can be seen from this data, the emissions from the test item were within the specification limit.

| Harmonic | Tx ch.-512 Freq. (MHz) | Level (dBm) | Tx ch.-661 Freq. (MHz) | Level (dBm) | Tx ch.-810 Freq. (MHz) | Level (dBm) |
|---|---|---|---|---|---|---|
| 2 | 3700.4 | **-** | 3760 | **-** | 3819.6 | **-** |
| 3 | 5550.6 | - | 5640 | - | 5729.4 | - |
| 4 | 7400.8 | - | 7520 | - | 7639.2 | - |
| 5 | 9251.0 | - | 9400 | - | 9549.0 | - |
| 6 | 11101.2 | - | 11280 | - | 11458.8 | - |
| 7 | 12951.4 | - | 13160 | - | 13368.6 | - |
| 8 | 14801.6 | - | 15040 | - | 15278.4 | - |
| 9 | 16651.8 | - | 16920 | - | 17188.2 | - |
| 10 | 18502.0 | - | 18800 | - | 19098.0 | - |

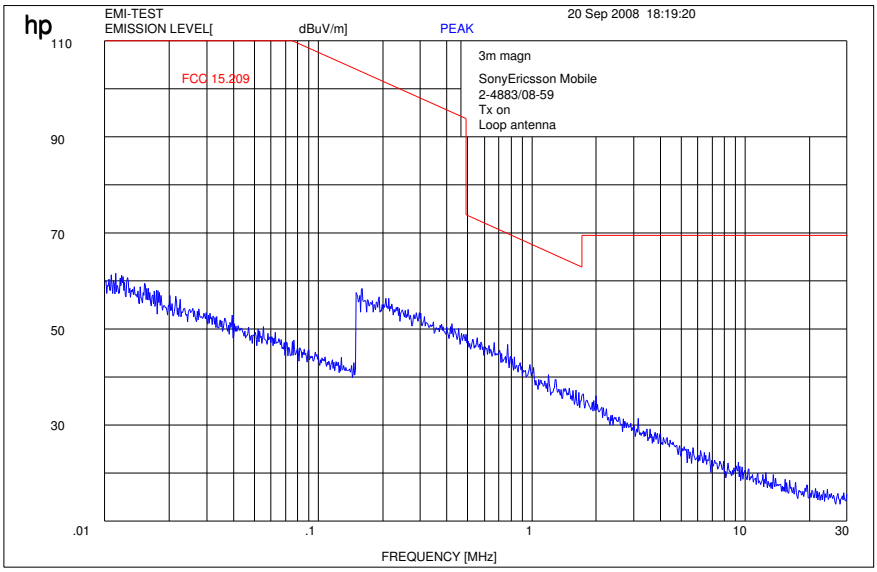
**No peaks found < 20 dB below limit.**

**Sample calculation:**

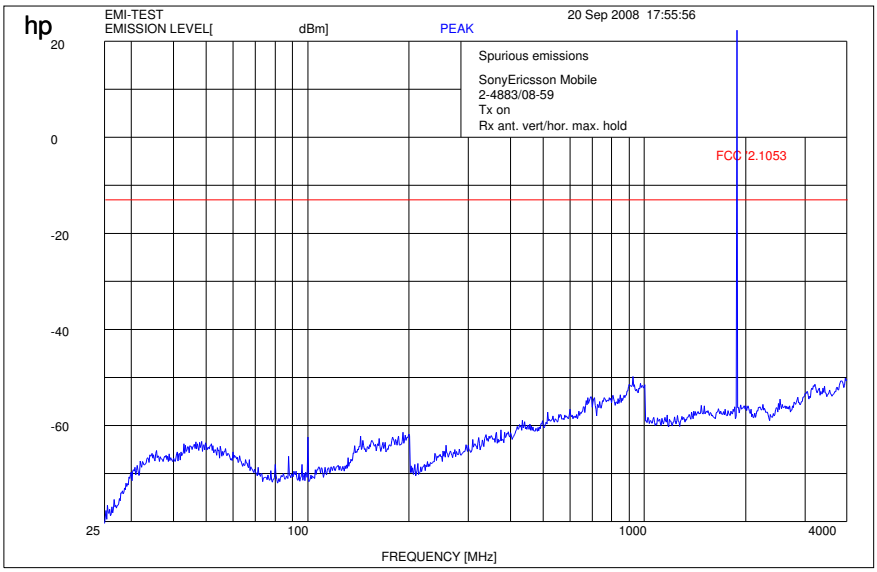
| Freq | SA Reading | SG Setting | Ant. gain | Dipol gain | Cable loss | EIRP Result | | | |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBµV | dBm | dBi | dBi | dB | dBm | | | |
| 1909.8 | 132.3 | 24.6 | 8.4 | 0.0 | 3.3 | 29.7 | | | |

EIRP = SG (dBm) - Cable Loss (dB) + Ant. gain (dBi)

**Channel 661 (Traffic mode up to 30 MHz)**

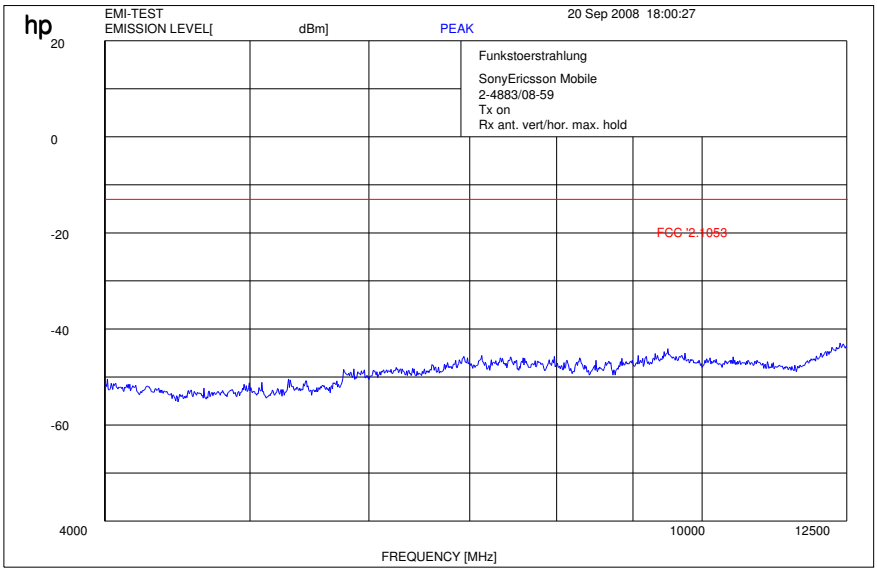



**Channel 661 (30 MHz - 4 GHz)**



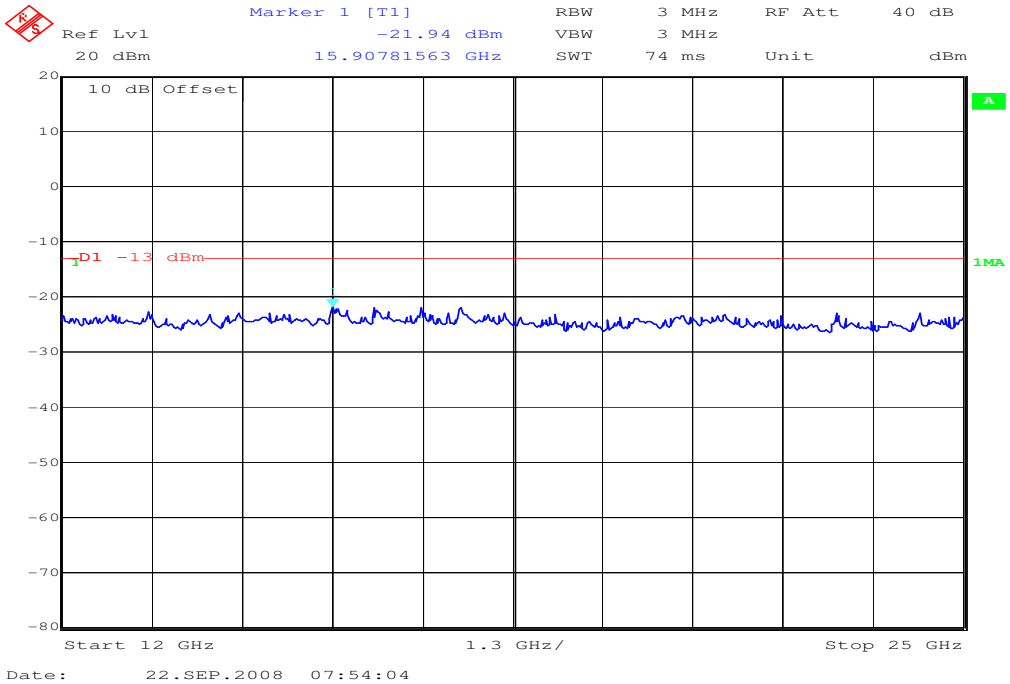

f < 1 GHz : RBW/VBW: 100 kHz  f ≥ 1GHz : RBW / VBW 1 MHz

**Channel 661 (4 GHz – 12.5 GHz)**




f < 1 GHz : RBW/VBW: 100 kHz  f ≥ 1GHz : RBW / VBW 1 MHz

**Channel 661 (12 GHz - 25 GHz) valid for all 3 channels**




f < 1 GHz : RBW/VBW: 100 kHz  f ≥ 1GHz : RBW / VBW 1 MHz

### 5.2.4 Conducted Spurious Emissions

**Reference**

| | |
|---|---|
| FCC: | CFR Part 24.238, 2.10.51 |
| IC: | RSS 133, Issue 4, Section 4.4 |

**Measurement Procedure:**

The following steps outline the procedure used to measure the conducted emissions from the mobile station.
1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.
For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.
2. Determine mobile station transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

USPCS Transmitter Channel Frequency:
512 1850.2 MHz
661 1880.0 MHz
810 1909.8 MHz

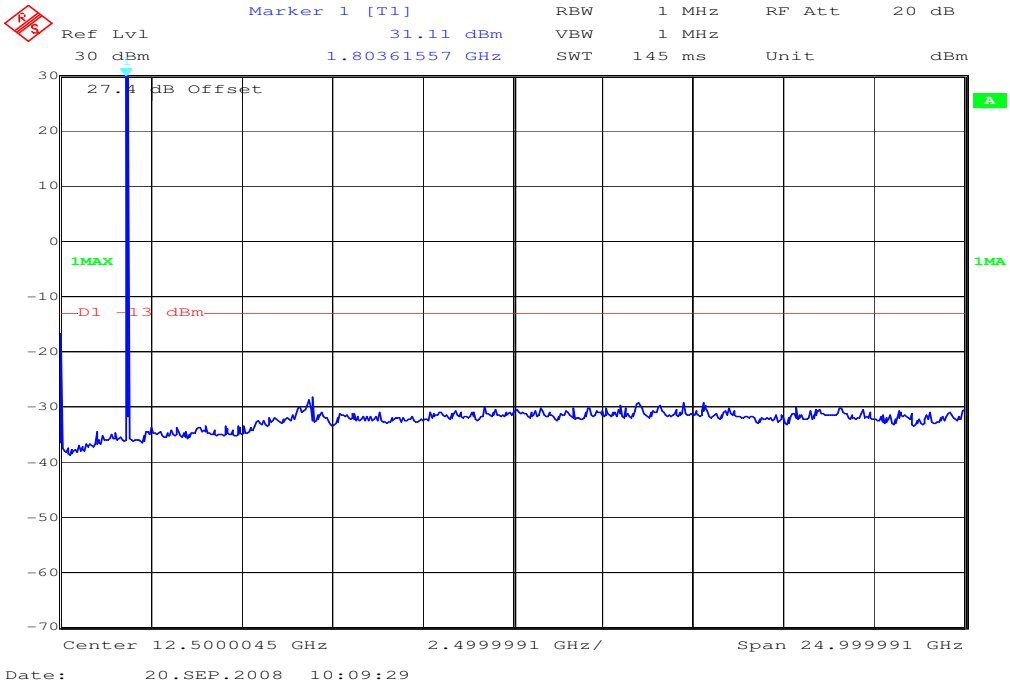
**Measurement Limit:**

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

**Measurement Results:**

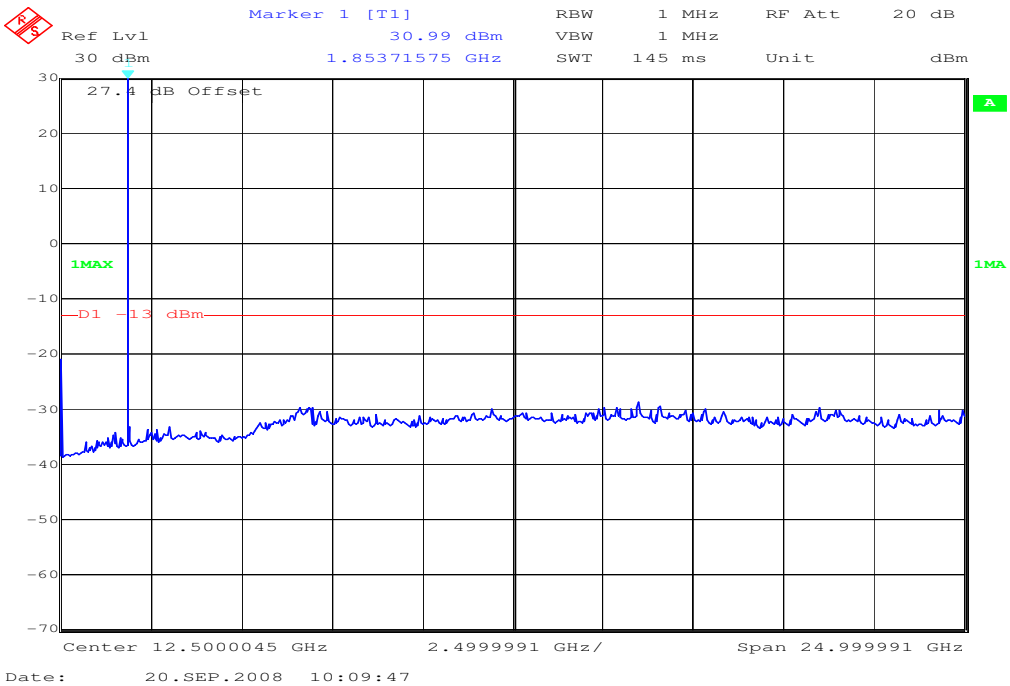
| Harmonic | Tx ch.-512 Freq. (MHz) | Level (dBm) | Tx ch.-661 Freq. (MHz) | Level (dBm) | Tx ch.-810 Freq. (MHz) | Level (dBm) |
|---|---|---|---|---|---|---|
| 2 | 3700.4 | - | 3760 | - | 3819.6 | - |
| 3 | 5550.6 | - | 5640 | - | 5729.4 | - |
| 4 | 7400.8 | - | 7520 | - | 7639.2 | - |
| 5 | 9251.0 | - | 9400 | - | 9549.0 | - |
| 6 | 11101.2 | - | 11280 | - | 11458.8 | - |
| 7 | 12951.4 | - | 13160 | - | 13368.6 | - |
| 8 | 14801.6 | - | 15040 | - | 15278.4 | - |
| 9 | 16651.8 | - | 16920 | - | 17188.2 | - |
| 10 | 18502.0 | - | 18800 | - | 19098.0 | - |

**Channel 512**



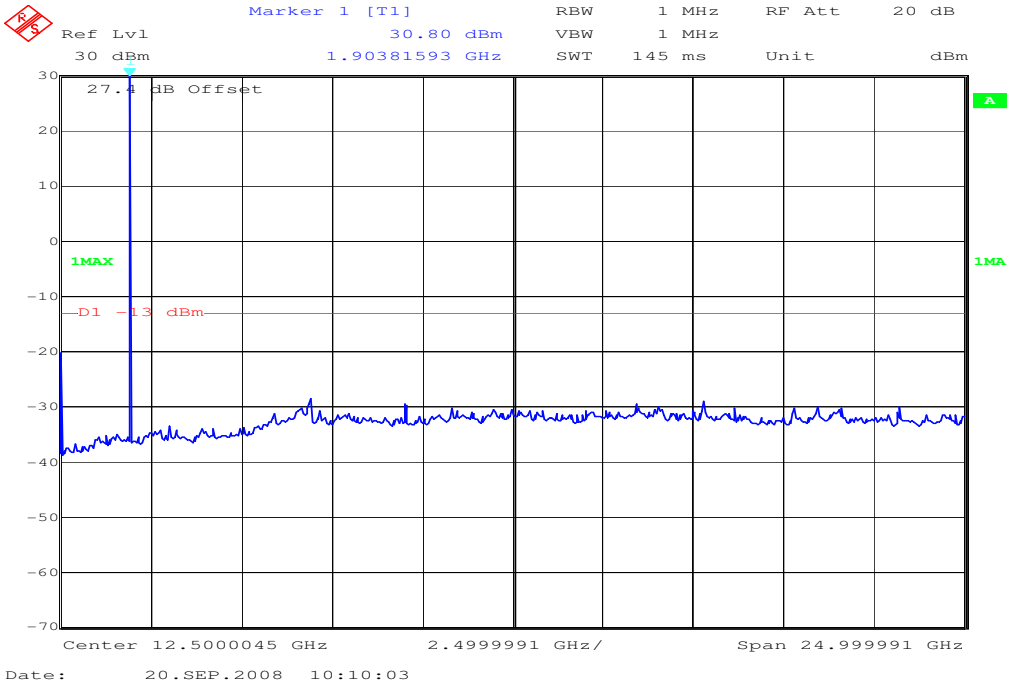

*The peak at the beginning of the Plot is the LO from the measuring spectrum Analyzer and not from the EUT.*

**Channel 661**




*The peak at the beginning of the Plot is the LO from the measuring spectrum Analyzer and not from the EUT.*

**Channel 810**




*The peak at the beginning of the Plot is the LO from the measuring spectrum Analyzer and not from the EUT.*

### 5.2.5 Block Edge Compliance

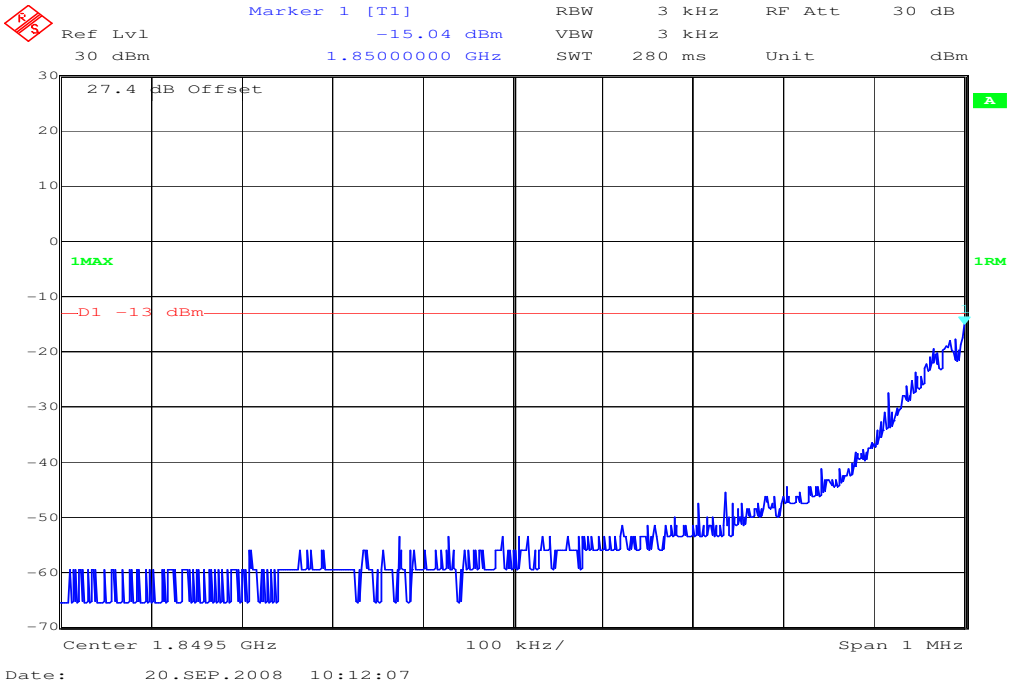
**Reference**

| | |
|---|---|
| FCC: | CFR Part 24.238 |
| IC: | RSS 133, Issue 4, Section 6.5 |

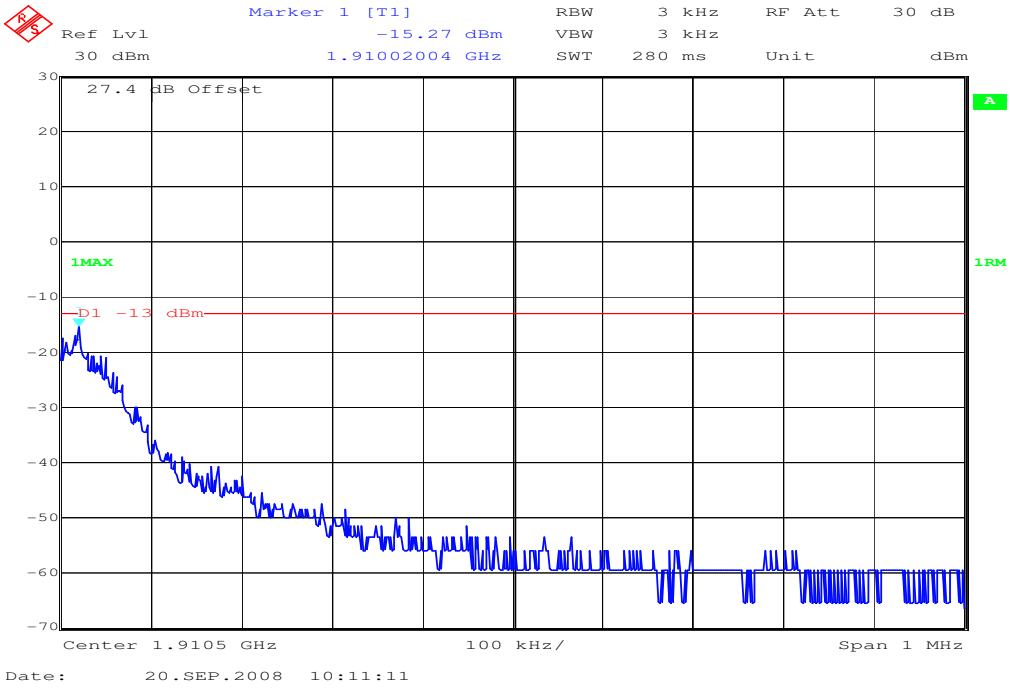
**Measurement Limit:**

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

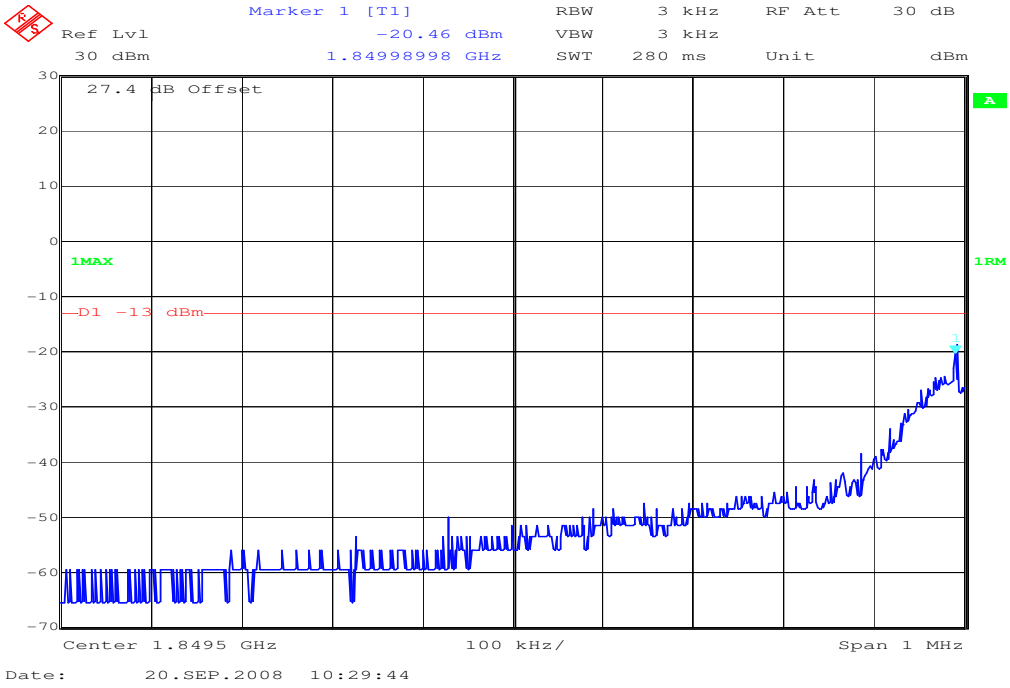
**Block 1 Channel 512**



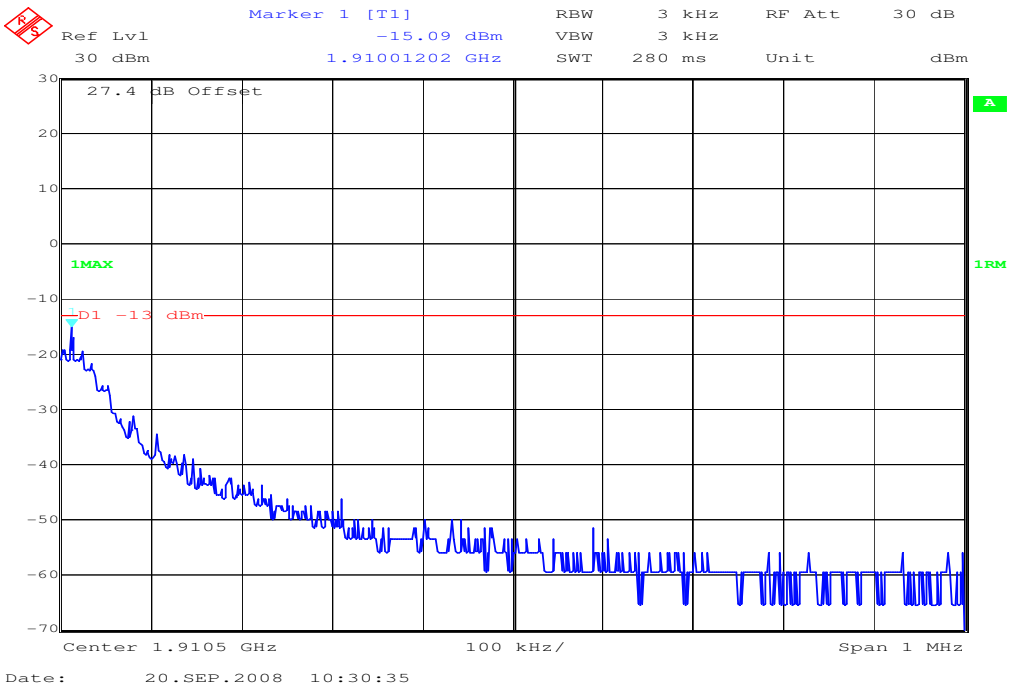

**Block 6 Channel 810**



**Block 1 Channel 512 (EDGE)**




**Block 6 Channel 810 (EDGE)**



### 5.2.6 Occupied Bandwidth

**Reference**

| | |
|---|---|
| FCC: | CFR Part 24.238, 2.1049 |
| IC: | RSS 133, Issue 4, Section 6.5 |

**Occupied Bandwidth Results**

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table 8.2 below lists the measured 99% power and -26dBC occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Normal mode

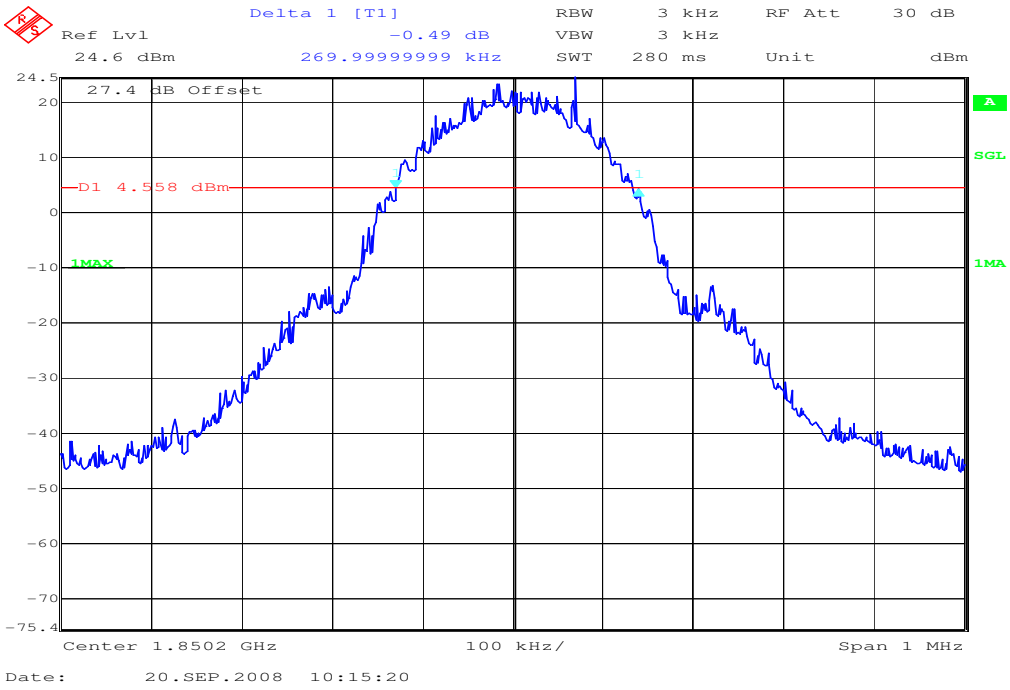
| Frequency | 99% Occupied Bandwidth kHz | -26 dBc Bandwidth kHz |
|---|---|---|
| 1850.2 MHz | 270 | 308 |
| 1880.0 MHz | 276 | 314 |
| 1909.8 MHz | 282 | 316 |

EDGE mode

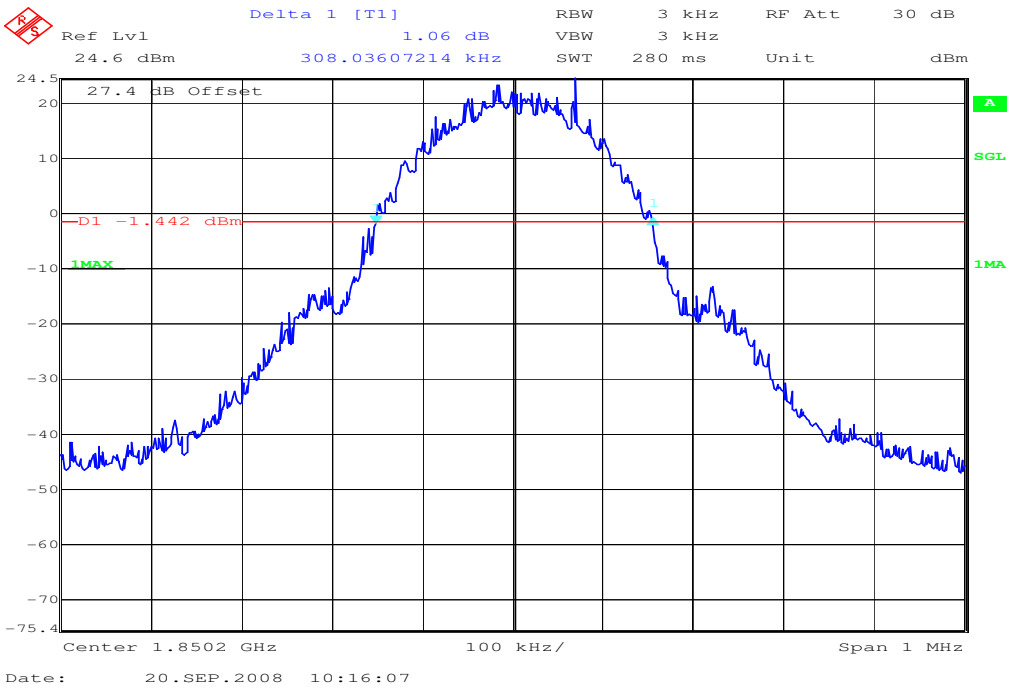
| Frequency | 99% Occupied Bandwidth kHz | -26 dBc Bandwidth kHz |
|---|---|---|
| 1850.2 MHz | 280 | 308 |
| 1880.0 MHz | 280 | 310 |
| 1909.8 MHz | 288 | 316 |

Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 300.0 kHz, this equates to a resolution bandwidth of at least 3.0 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

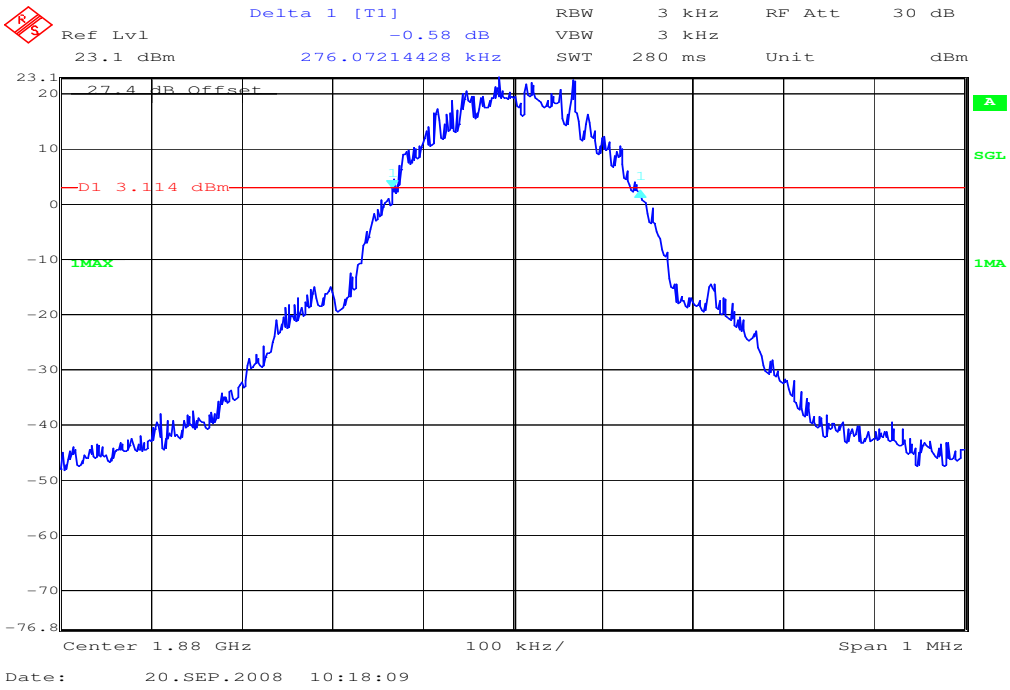
**Channel 512**
**99% (-20 dB) Occupied Bandwidth**



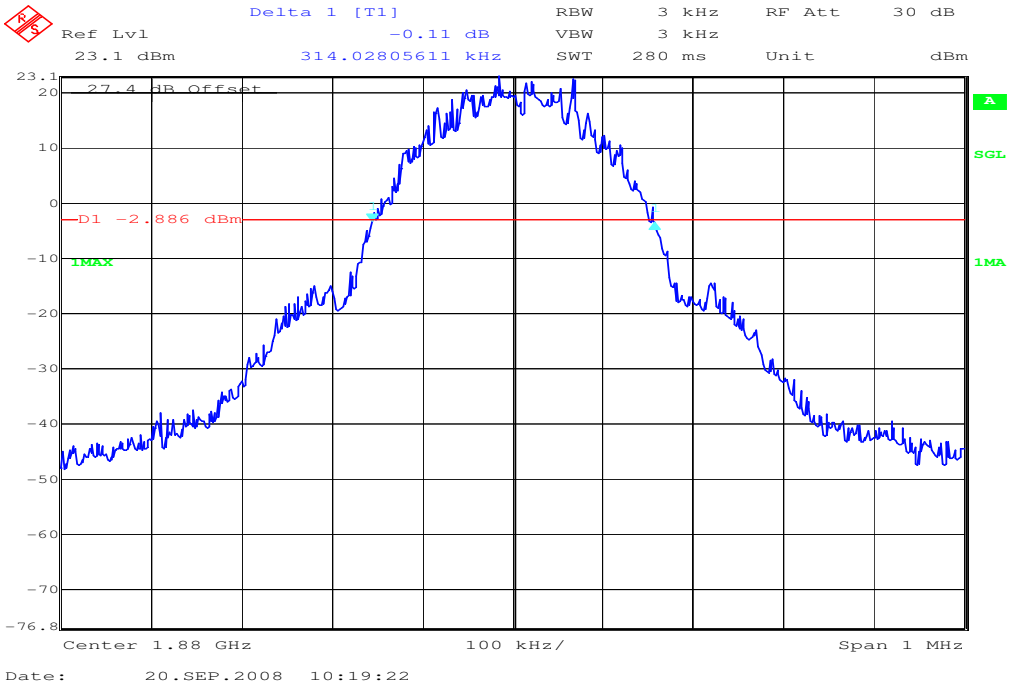

**Channel 512**
**-26 dBc Bandwidth**



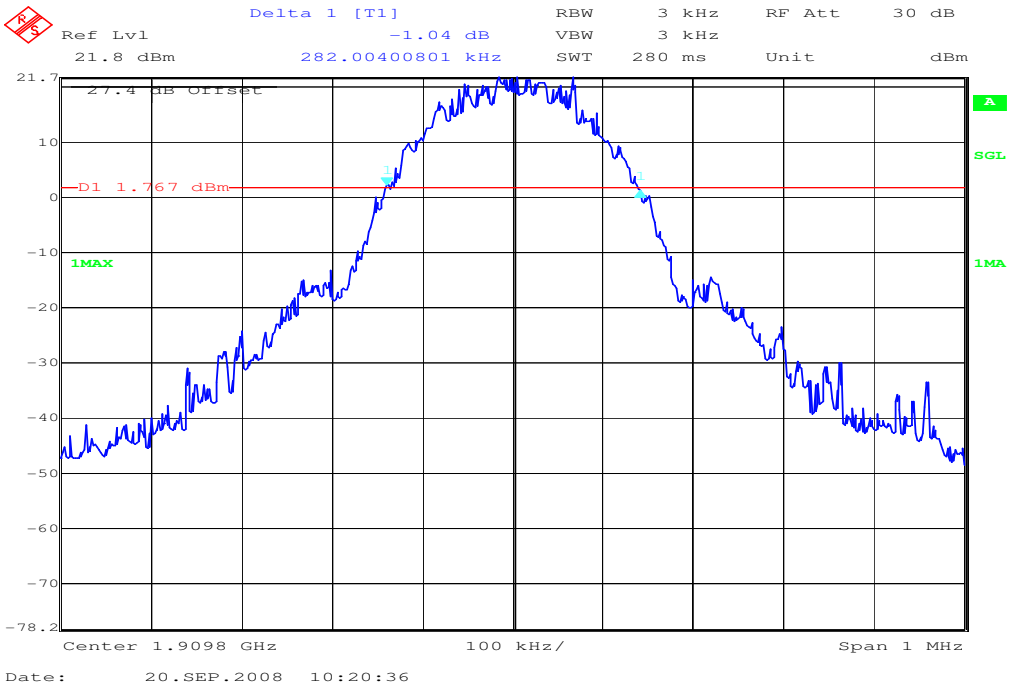
**Channel 661**
**99% (-20 dB) Occupied Bandwidth**



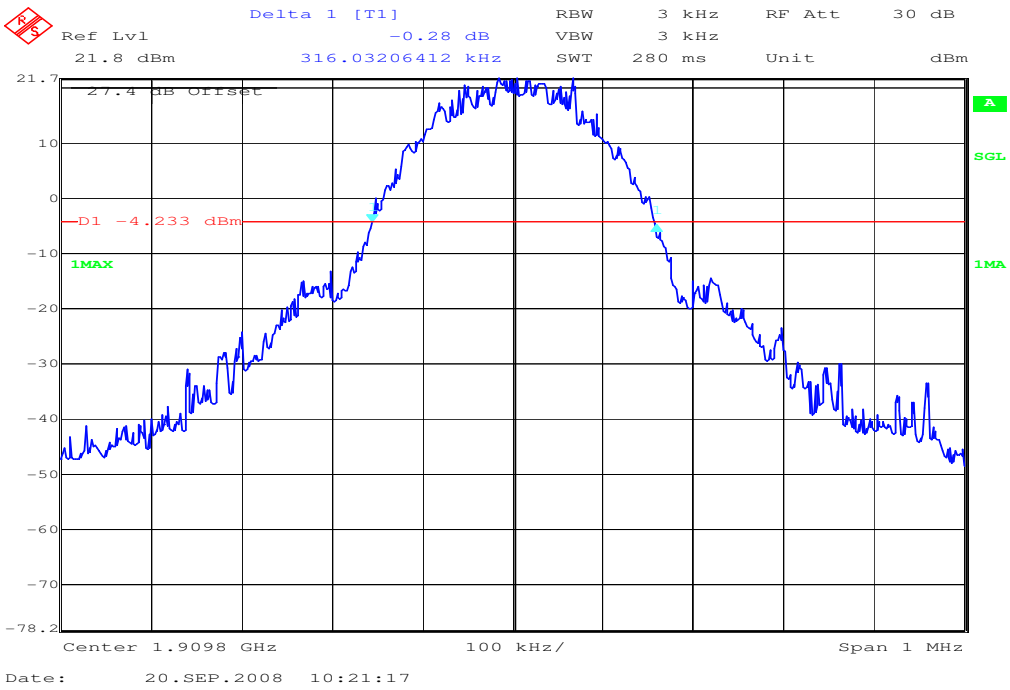

**Channel 661**
**-26 dBc Bandwidth**



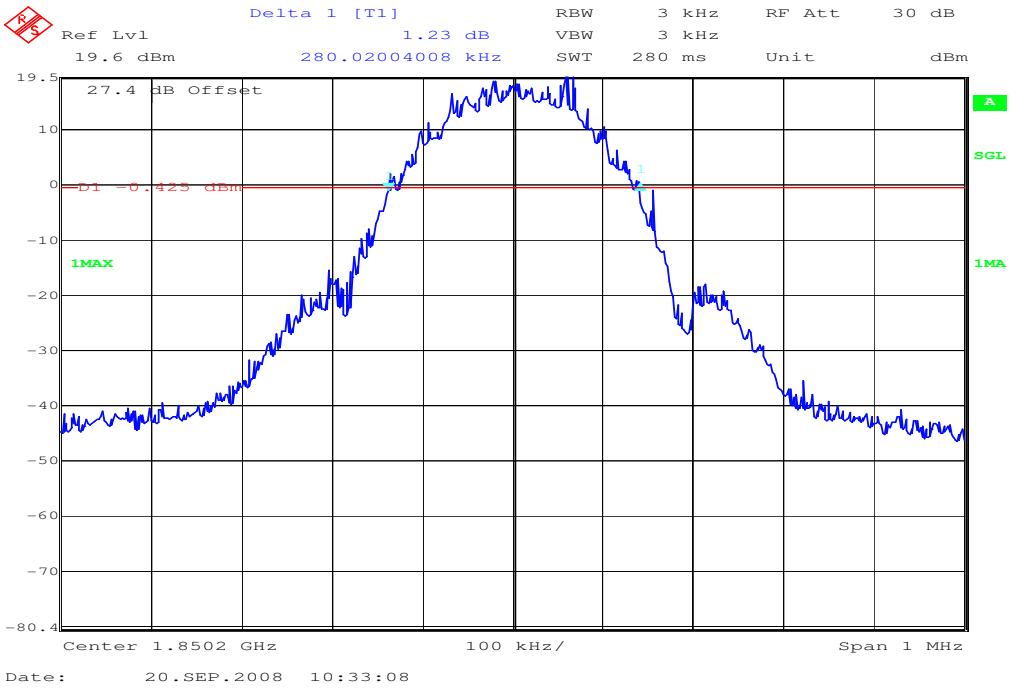
**Channel 810**
**99% (-20 dB) Occupied Bandwidth**



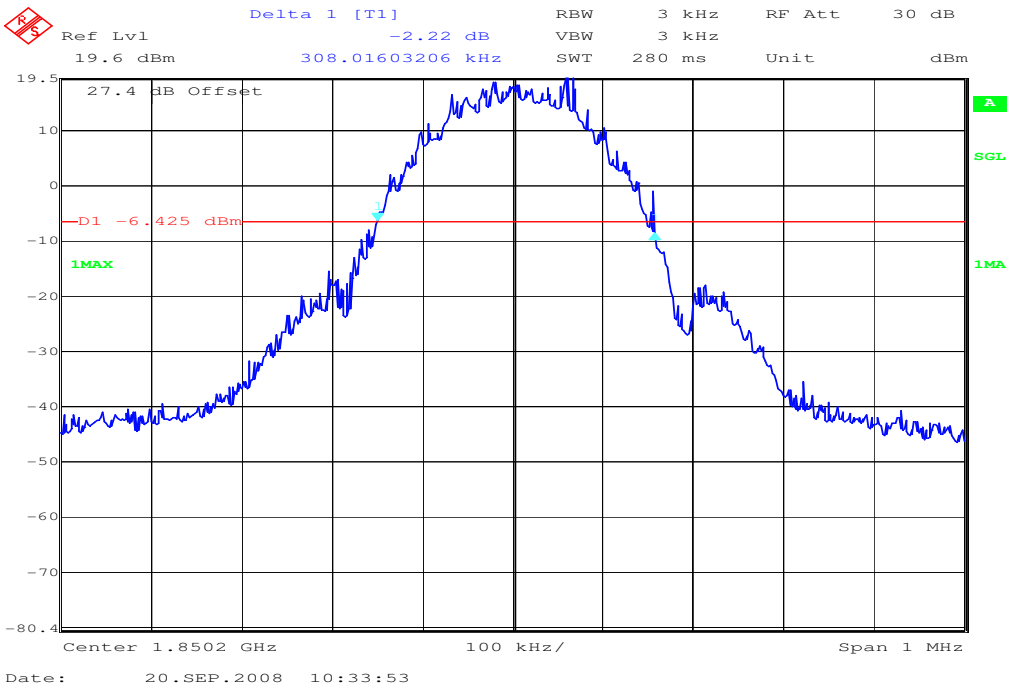

**Channel 810**
**-26 dBc Bandwidth**



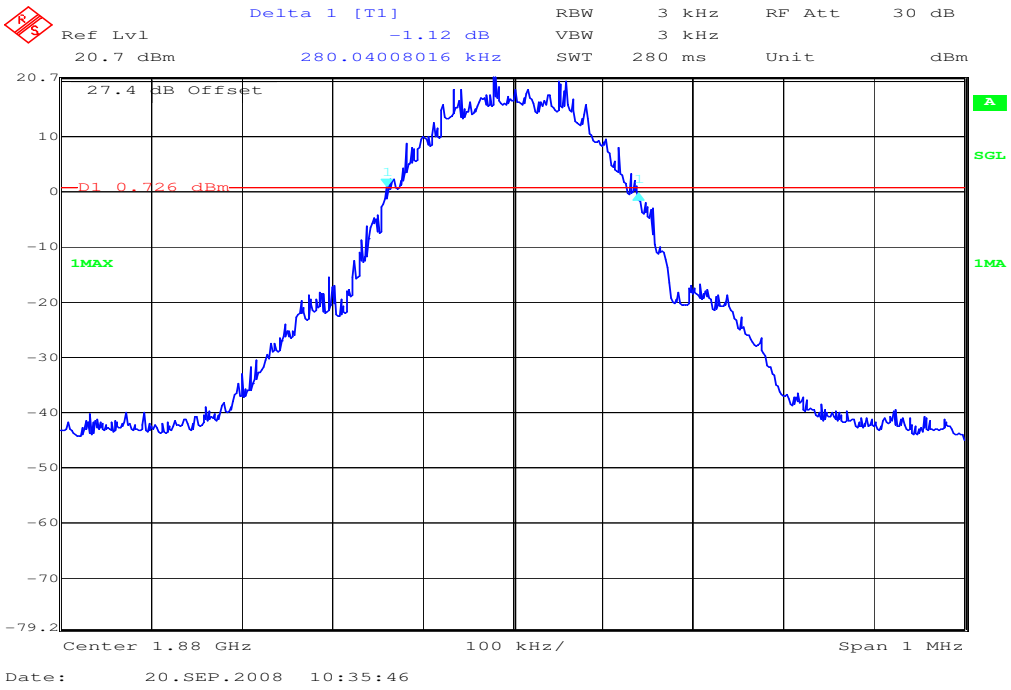
**Channel 512 (EDGE)**
**99% (-20 dB) Occupied Bandwidth**



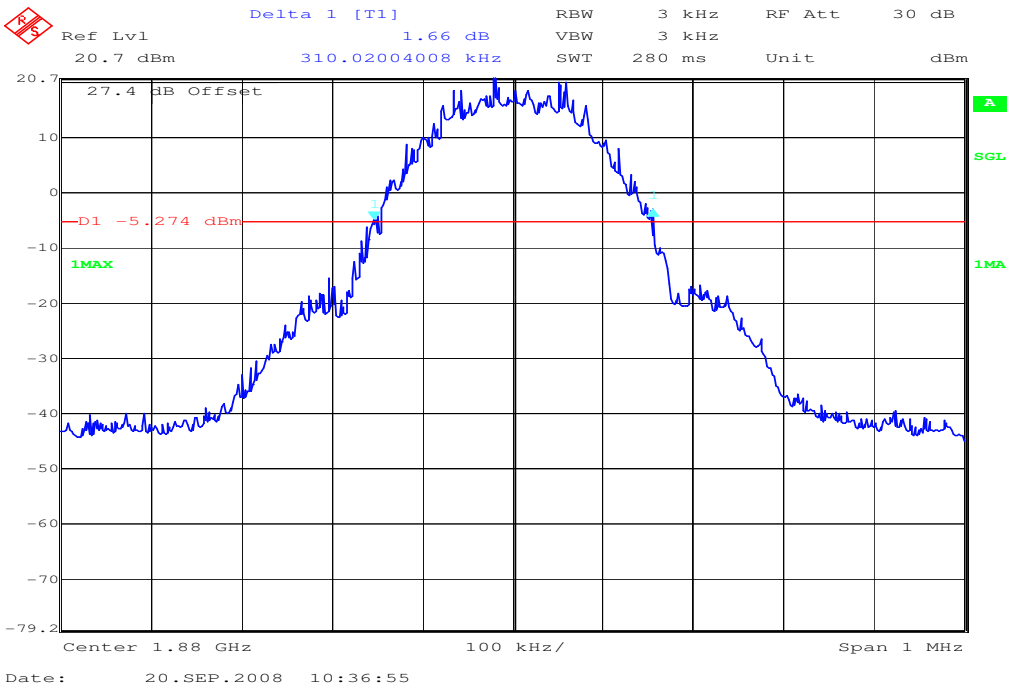

**Channel 512 (EDGE)**
**-26 dBc Bandwidth**



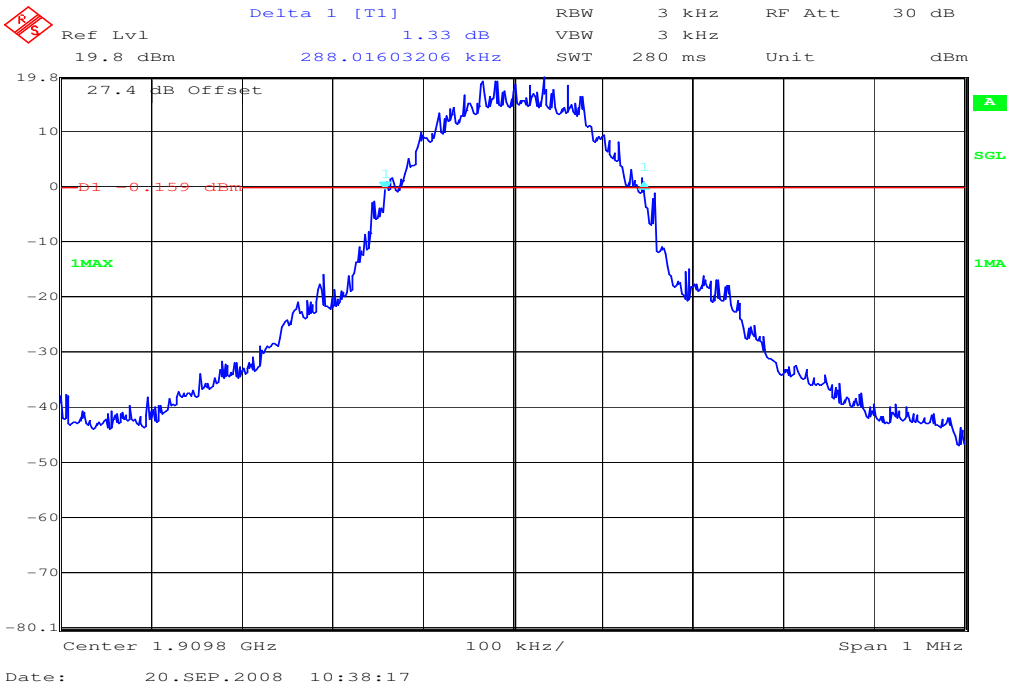
**Channel 661 (EDGE)**
**99% (-20 dB) Occupied Bandwidth**



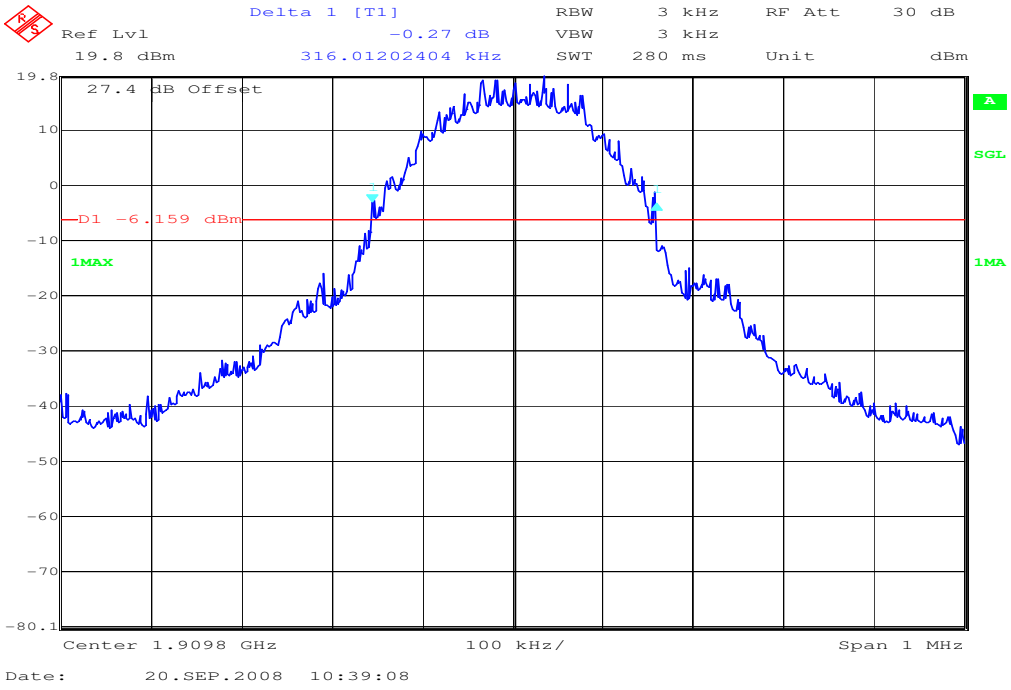

**Channel 661 (EDGE)**
**-26 dBc Bandwidth**



**Channel 810 (EDGE)**
**99% (-20 dB) Occupied Bandwidth**




**Channel 810 (EDGE)**
**-26 dBc Bandwidth**



## 5.3 PART GSM 850

### 5.3.1 RF Power Output

**Reference**

| | |
|---|---|
| FCC: | CFR Part 22.9.1.3, 2.1046 |
| IC: | RSS 132, Issue 2, Section 4.4 and 6.4 |

**Summary:**

This paragraph contains both average, peak output powers and EIRP measurements for the mobile station.
In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

**Method of Measurements:**

The mobile was set up for the max. output power with pseudo random data modulation.
The power was measured with R&S Signal Analyzer FSIQ 26 (peak and average)
These measurements were done at 3 frequencies, 824.2 MHz, 836.4 MHz and 848.8 MHz (bottom, middle and top of operational frequency range).

**Limits:**

| Nominal Peak Output Power (dBm) |
|---|
| +38.45 |

| |
|---|
| 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. |

**Test Results: Output Power (conducted) GMSK Mode**

| **Frequency (MHz)** | **Average Output Power (dBm)** | **Peak-to-Average Ratio (dB)** |
|---|---|---|
| 824.2 | 33.71 | 0.10 |
| 836.4 | 33.65 | 0.10 |
| 848.8 | 33.80 | 0.10 |
| Measurement uncertainty | ±0.5 dB | |

**Test Results: Output Power (conducted) 8-PSK Mode**

| **Frequency (MHz)** | **Average Output Power (dBm)** | **Peak-to-Average Ratio (dB)** |
|---|---|---|
| 824.2 | 27.61 | 3.20 |
| 836.4 | 27.66 | 3.20 |
| 848.8 | 27.68 | 3.20 |
| Measurement uncertainty | ±0.5 dB | |

**ERP Measurements**
Description: This is the test for the maximum radiated power from the phone.
Rule Part 22.913 specifies that "Mobile/portable stations are limited to 7 watts ERP.

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method
(a) The measurements were performed with full rf output power and modulation.
(b) Test was performed at listed 3m test site (listed with FCC, IC).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(f) Set the EMI Receiver and #2 as follows:
Center Frequency: test frequency
Resolution BW: 100 kHz
Video BW: same
Detector Mode: positive
Average: off
Span: 3 x the signal bandwidth
(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
(l) Repeat for all different test signal frequencies

**Measuring the ERP of Spurious/Harmonic Emissions using Substitution Method**

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring ERP) as follows:
Center Frequency : equal to the signal source
Resolution BW : 10 kHz
Video BW : same
Detector Mode : positive
Average : off
Span : 3 x the signal bandwidth
(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(c) Select the frequency and E-field levels for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antennas (substitution antenna): .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz}.
(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) Use one of the following antenna as a receiving antenna: .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.
(g) If the DIPOLE antenna is used, tune its elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:
P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1
Where: P: Actual RF Power fed into the substitution antenna port after corrected.
P1: Power output from the signal generator
P2: Power measured at attenuator A input
P3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction
(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

**Limits:**

| Nominal Peak Output Power (dBm) |
|---|
| +38.45 |

**Test Results: Output Power (radiated) GMSK Mode**

| **Frequency (MHz)** | **Average (dBm)** |
|---|---|
| 824.2 | 32.84 |
| 836.4 | 32.81 |
| 848.8 | 32.93 |
| Measurement uncertainty | ±1.5 dB |

**Test Results: Output Power (radiated) 8-PSK Mode**

| **Frequency (MHz)** | **Average (dBm)** |
|---|---|
| 824.2 | 26.74 |
| 836.4 | 26.82 |
| 848.8 | 26.81 |
| Measurement uncertainty | ±1.5 dB |

**Sample calculation:**

| Freg | SA Reading | SG Setting | Ant. gain | Dipol gain | Cable loss | ERP | Substitution Antenna |
|---|---|---|---|---|---|---|---|
| MHz | dBµV | dBm | dBi | dBi | dB | dBm | |
| 848.8 | 137.8 | 26.6 | 8.4 | 0.0 | 3.3 | 31.7 | UHAP Schwarzbeck S/N 460 |

ERP = SG (dBm) - Cable Loss (dB) + Ant. gain (dB)
*ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.1dBi

### 5.3.2 Frequency Stability

**Reference**

| | |
|---|---|
| FCC: | CFR Part 22.355, 2.1055 |
| IC: | RSS 132, Issue 2, Section 4.3 and 6.3 |

**Method of Measurement:**

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMU 200 DIGITAL RADIOCOMMUNICATION TESTER.
1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with 3.7 Volts, connected to the CMU 200 and in a simulated call on channel 661 (centre channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10 C increments from -30 C to +60 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal 3.7 Volts. Vary supply voltage from minimum 3.3 Volts to maximum 4.4 Volts, in 13 steps re-measuring carrier frequency at each voltage. Pause at 3.7 V ac
Volts for 1 1/2 hours un-powered, to allow any self heating to stabilize, before continuing.
6. Subject the mobile station to overnight soak at +60 C.
7. With the mobile station, powered with 3.7 Volts, connected to the CMU 200 and in a simulated call on channel 661(center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.
8. Repeat the above measurements at 10 C increments from +60 C to -30 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

**Measurement Limit:**

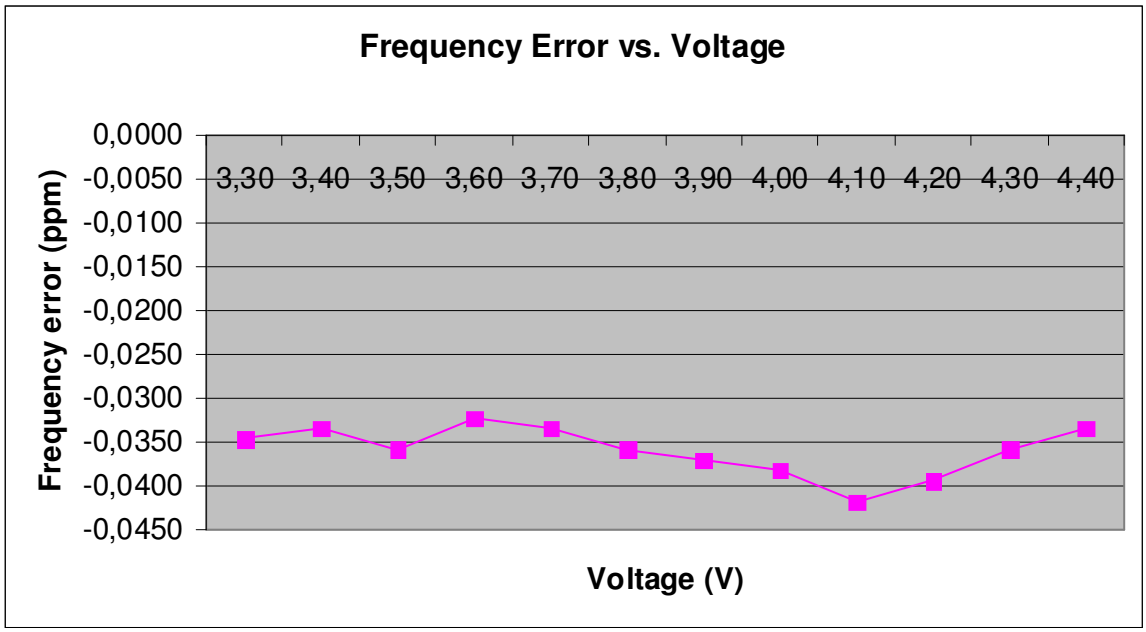
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 22.355, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. This transceiver is specified to operate with an input voltage of between 3.3 V dc and 4.4 V dc, with a nominal voltage of 3.7 V dc.

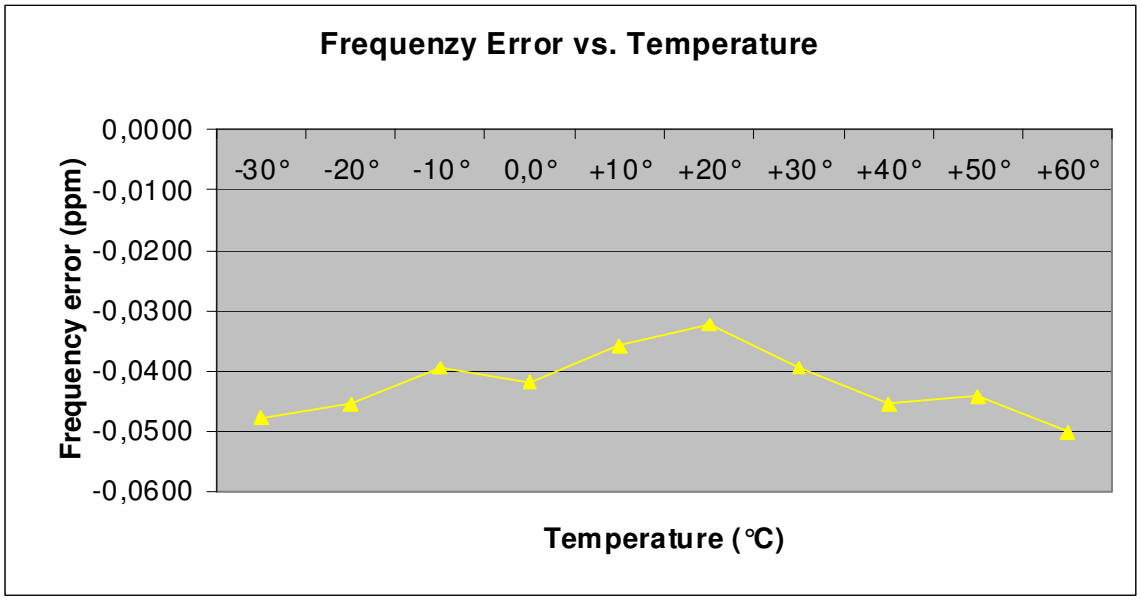
**Measurement Results: AFC FREQ ERROR vs. VOLTAGE**

| Voltage (V) | Frequency Error (Hz) | Frequency Error (%) | Frequency Error (ppm) |
|---|---|---|---|
| 3.3 | -29 | -0,00000347 | -0,0347 |
| 3.4 | -28 | -0,00000335 | -0,0335 |
| 3.5 | -30 | -0,00000359 | -0,0359 |
| 3.6 | -27 | -0,00000323 | -0,0323 |
| 3.7 | -28 | -0,00000335 | -0,0335 |
| 3.8 | -30 | -0,00000359 | -0,0359 |
| 3.9 | -31 | -0,00000371 | -0,0371 |
| 4.0 | -32 | -0,00000383 | -0,0383 |
| 4.1 | -35 | -0,00000418 | -0,0418 |
| 4.2 | -33 | -0,00000395 | -0,0395 |
| 4.3 | -30 | -0,00000359 | -0,0359 |
| 4.4 | -28 | -0,00000335 | -0,0335 |

**Measurement Results: AFC FREQ ERROR vs. TEMPERATURE**

| TEMPERATURE (°C) | Frequency Error (Hz) | Frequency Error (%) | Frequency Error (ppm) |
|---|---|---|---|
| -30 | -40 | -0,00000478 | -0,0478 |
| -20 | -38 | -0,00000454 | -0,0454 |
| -10 | -33 | -0,00000395 | -0,0395 |
| ±0.0 | -35 | -0,00000418 | -0,0418 |
| +10 | -30 | -0,00000359 | -0,0359 |
| +20 | -27 | -0,00000323 | -0,0323 |
| +30 | -33 | -0,00000395 | -0,0395 |
| +40 | -38 | -0,00000454 | -0,0454 |
| +50 | -37 | -0,00000442 | -0,0442 |
| +60 | -42 | -0,00000502 | -0,0502 |


Frequency Error vs. Voltage
0,0000
-0,0050
-0,0100
-0,0150
-0,0200
-0,0250
-0,0300
-0,0350
-0,0400
-0,0450
Frequency error (ppm)
3,30 3,40 3,50 3,60 3,70 3,80 3,90 4,00 4,10 4,20 4,30 4,40
Voltage (V)


Frequenzy Error vs. Temperature
0,0000
-0,0100
-0,0200
-0,0300
-0,0400
-0,0500
-0,0600
Frequency error (ppm)
-30° -20° -10° 0,0° +10° +20° +30° +40° +50° +60°
Temperature (°C)

### 5.3.3 Radiated Emissions

**Reference**

| | |
|---|---|
| FCC: | CFR Part 22.917, 2.1053 |
| IC: | RSS 132, Issue 2, Section 4.5 and 6.5 |

**Measurement Procedure:**

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2003 requirements and is recognized by the FCC to be in compliance for a 3 and a10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest
frequency generated within the equipment, which is the transmitted carrier that can be as high as 848.8 MHz. This was rounded up to 12 GHz. The resolution bandwidth is set as outlined in Part 22.917. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

The final open field emission (here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:

a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
b) The antenna output was terminated in a 50 ohm load.
c) A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and I MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:
e) Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603.

**Measurement Limit:**

Sec. 22.917 Emission Limits.
(a) On any frequency outside a licensee' s frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB.
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

**Measurement Results:**

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (824.2 MHz, 836.4 MHz and 848.8 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the USPCS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

The final open field radiated levels are presented on the next pages.
All measurements were done in horizontal and vertical polarization; the plots shows the worst case.
The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked, too.
The found values are stated in the table below.

As can be seen from this data, the emissions from the test item were within the specification limit.

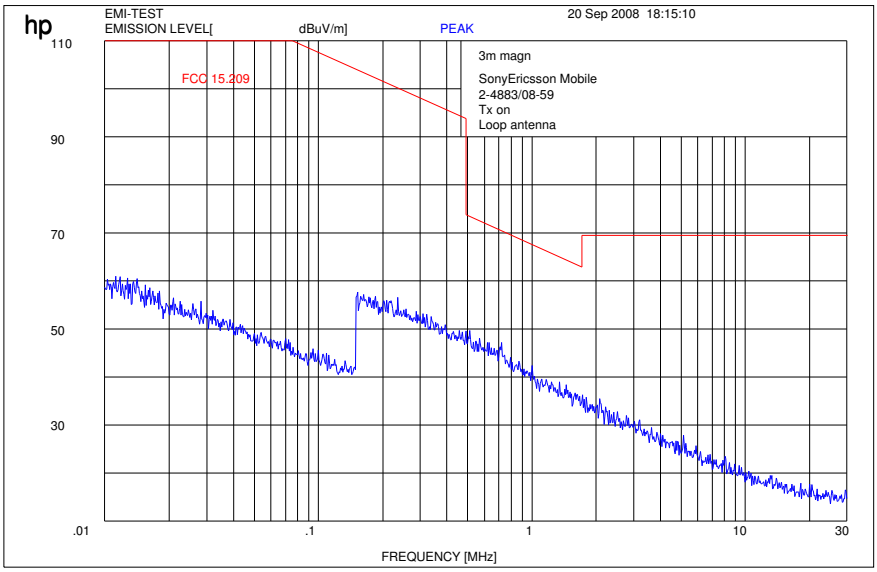
| Harmonic | Tx ch.-128 Freq. (MHz) | Level (dBm) | Tx ch.-189 Freq. (MHz) | Level (dBm) | Tx ch.-251 Freq. (MHz) | Level (dBm) |
|---|---|---|---|---|---|---|
| 2 | 1648.4 | -47.30 | 1672.8 | -48.60 | 1697.6 | -49.00 |
| 3 | 2472.6 | - | 2509.2 | - | 2546.4 | - |
| 4 | 3296.8 | - | 3345.6 | - | 3395.2 | - |
| 5 | 4121.0 | - | 4182.0 | - | 4244.0 | - |
| 6 | 4945.2 | - | 5018.4 | - | 5092.8 | - |
| 7 | 5769.4 | - | 5854.8 | - | 5941.6 | - |
| 8 | 6593.6 | - | 6691.2 | - | 6790.4 | - |
| 9 | 7417.8 | - | 7527.6 | - | 7639.2 | - |
| 10 | 8242.0 | - | 8364.0 | - | 8488.0 | - |

**Sample calculation:**

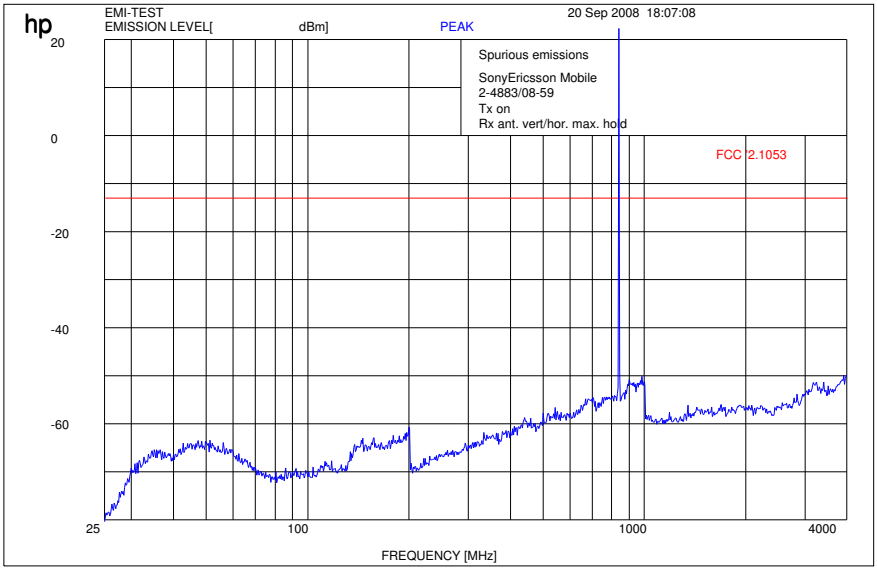
| Freg | SA Reading | SG Setting | Ant. gain | Dipol gain | Cable loss | ERP | Substitution Antenna |
|---|---|---|---|---|---|---|---|
| MHz | dBµV | dBm | dBi | dBi | dB | dBm | |
| 848.8 | 137.8 | 26.6 | 8.4 | 0.0 | 3.3 | 31.7 | UHAP Schwarzbeck S/N 460 |

ERP = SG (dBm) - Cable Loss (dB) + Ant. gain (dB)
*ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.1dBi

**Channel 189 (Traffic mode up to 30 MHz)**

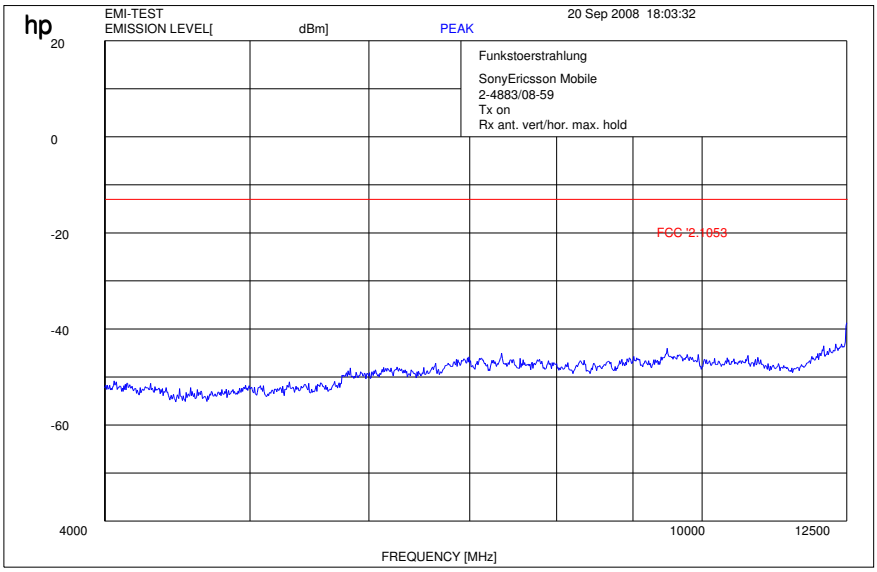



**Channel 189 (30 MHz - 4 GHz)**



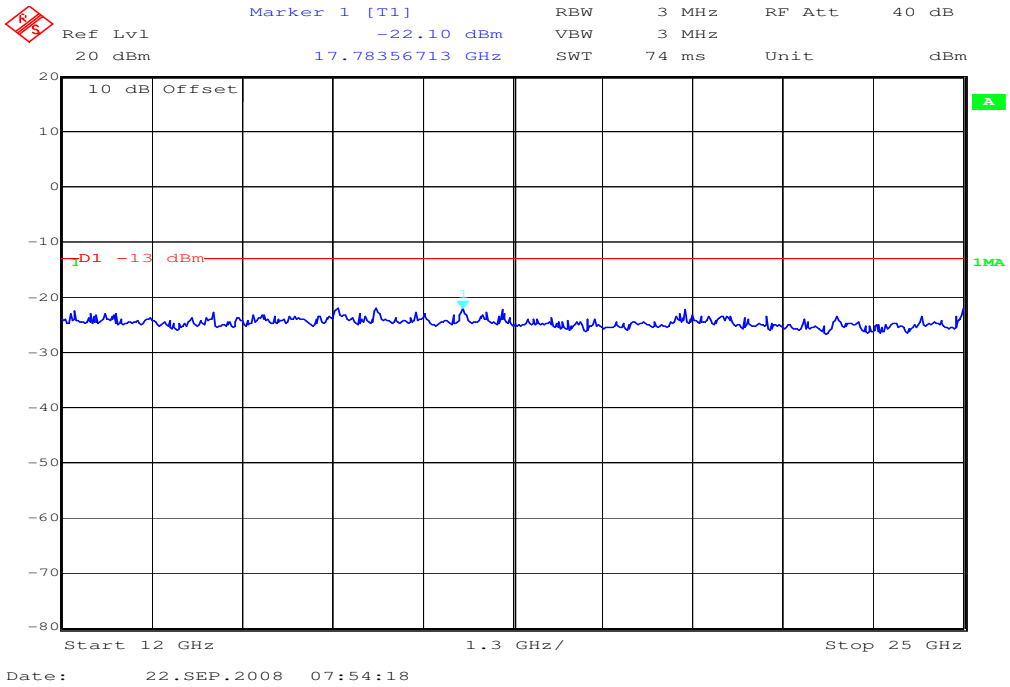

f < 1 GHz : RBW/VBW: 100 kHz  f ≥ 1GHz : RBW / VBW 1 MHz

**Channel 189 (4 GHz – 12.5 GHz)**




f < 1 GHz : RBW/VBW: 100 kHz  f ≥ 1GHz : RBW / VBW 1 MHz

**Channel 128 (12 GHz - 25 GHz)**




f < 1 GHz : RBW/VBW: 100 kHz  f ≥ 1GHz : RBW / VBW 1 MHz

### 5.3.4 Conducted Spurious Emissions

**Reference**

| | |
|---|---|
| FCC: | CFR Part 22.917, 1.1051 |
| IC: | RSS 132, Issue 2, Section 4.5 and 6.5 |

**Measurement Procedure**

The following steps outline the procedure used to measure the conducted emissions from the mobile station.
1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.
2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

USPCS Transmitter Channel Frequency
128 824.2 MHz
189 836.4 MHz
251 848.8 MHz

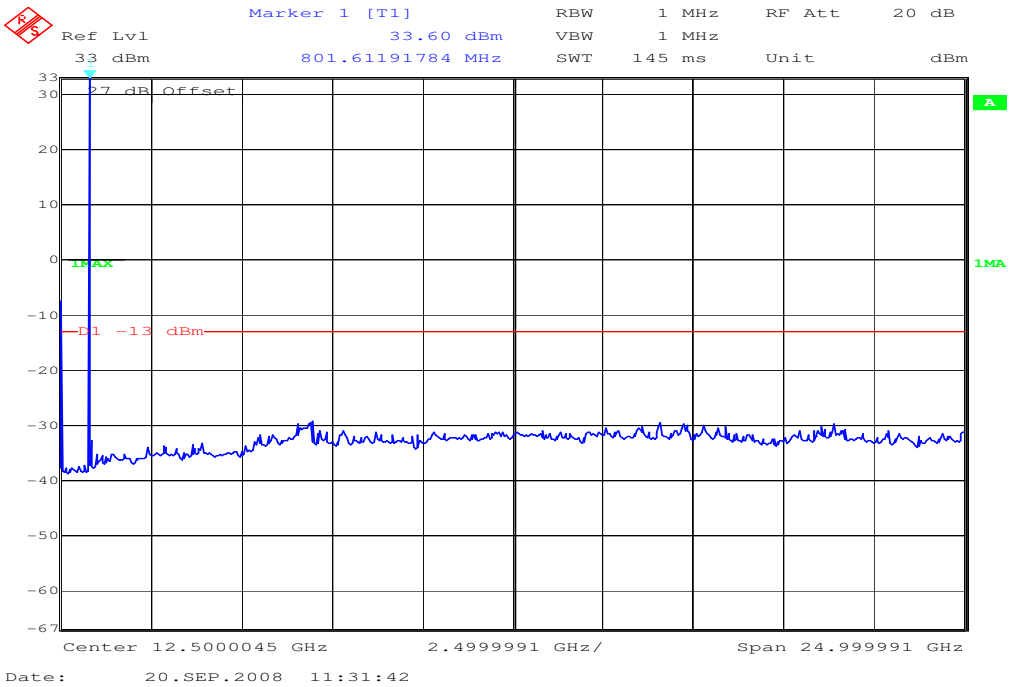
**Measurement Limit**

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

**Measurement Results**

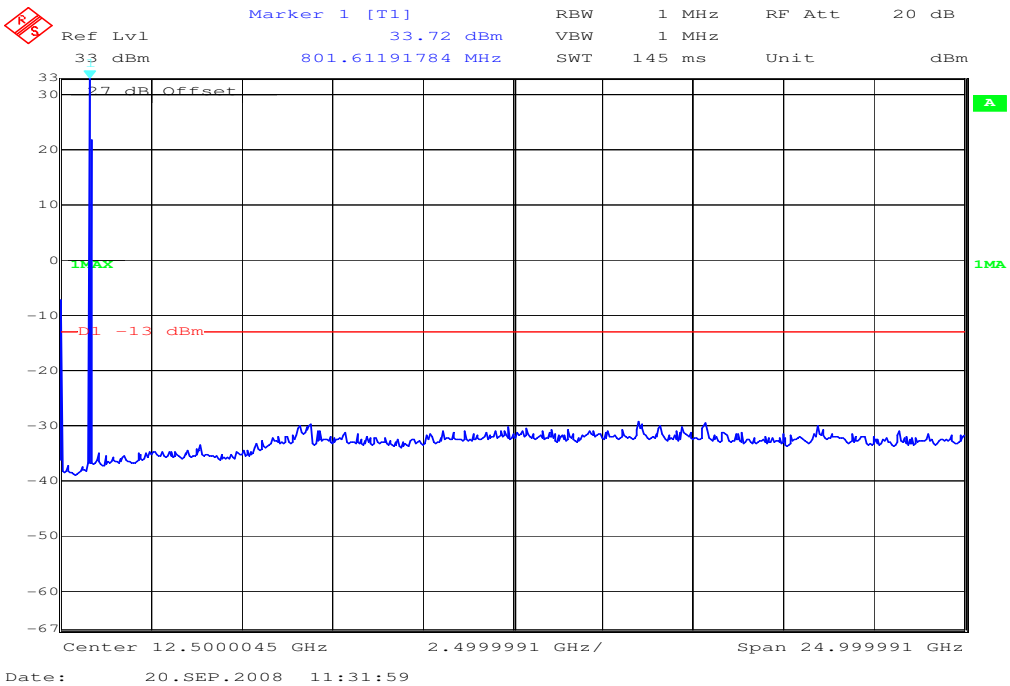
| Harmonic | Tx ch.-128 Freq. (MHz) | Level (dBm) | Tx ch.-189 Freq. (MHz) | Level (dBm) | Tx ch.-251 Freq. (MHz) | Level (dBm) |
|---|---|---|---|---|---|---|
| 2 | 1648.4 | - | 1672.8 | - | 1697.6 | - |
| 3 | 2472.6 | - | 2509.2 | - | 2546.4 | - |
| 4 | 3296.8 | - | 3345.6 | - | 3395.2 | - |
| 5 | 4121.0 | - | 4182.0 | - | 4244.0 | - |
| 6 | 4945.2 | - | 5018.4 | - | 5092.8 | - |
| 7 | 5769.4 | - | 5854.8 | - | 5941.6 | - |
| 8 | 6593.6 | - | 6691.2 | - | 6790.4 | - |
| 9 | 7417.8 | - | 7527.6 | - | 7639.2 | - |
| 10 | 8242.0 | - | 8364.0 | - | 8488.0 | - |

**Channel: 128**



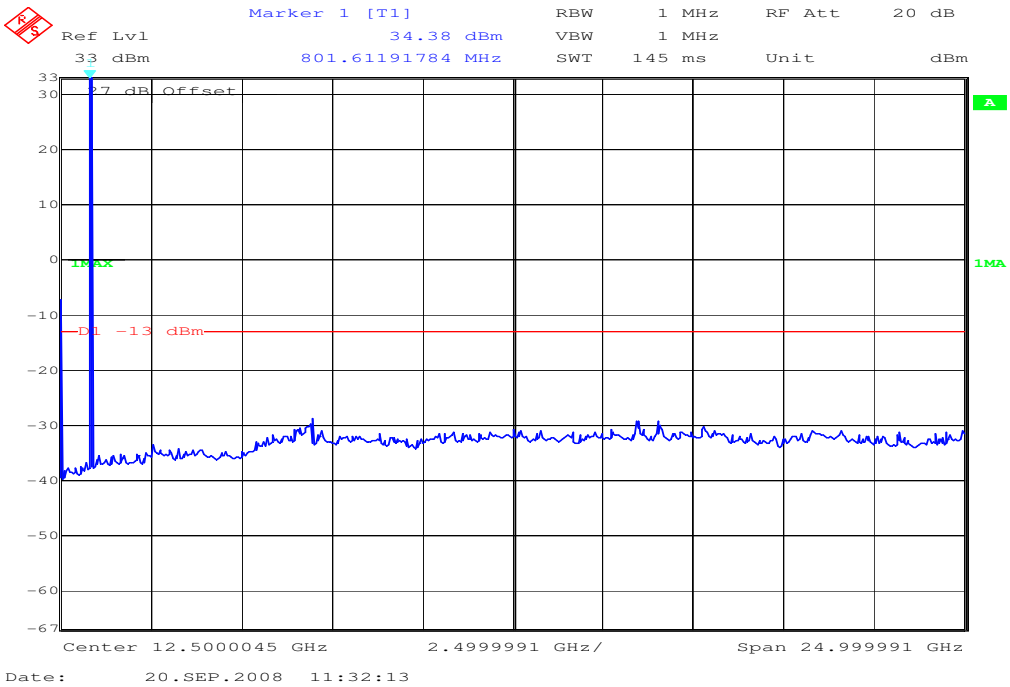

*The peak at the beginning of the Plot is the LO from the measuring spectrum Analyzer and not from the EUT.*

**Channel 189**




*The peak at the beginning of the Plot is the LO from the measuring spectrum Analyzer and not from the EUT.*

**Channel 251**




*The peak at the beginning of the Plot is the LO from the measuring spectrum Analyzer and not from the EUT.*

### 5.3.5 Block Edge Compliance

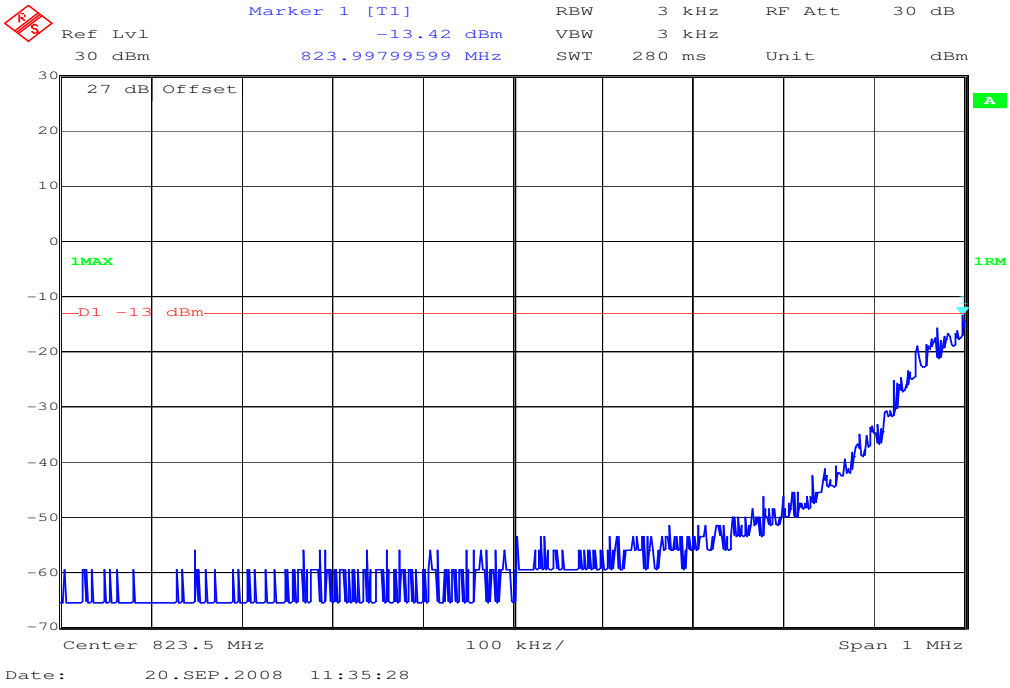
**Reference**

| | |
|---|---|
| FCC: | CFR Part 22.917 |
| IC: | RSS 132, Issue 2, Section 6.5 |

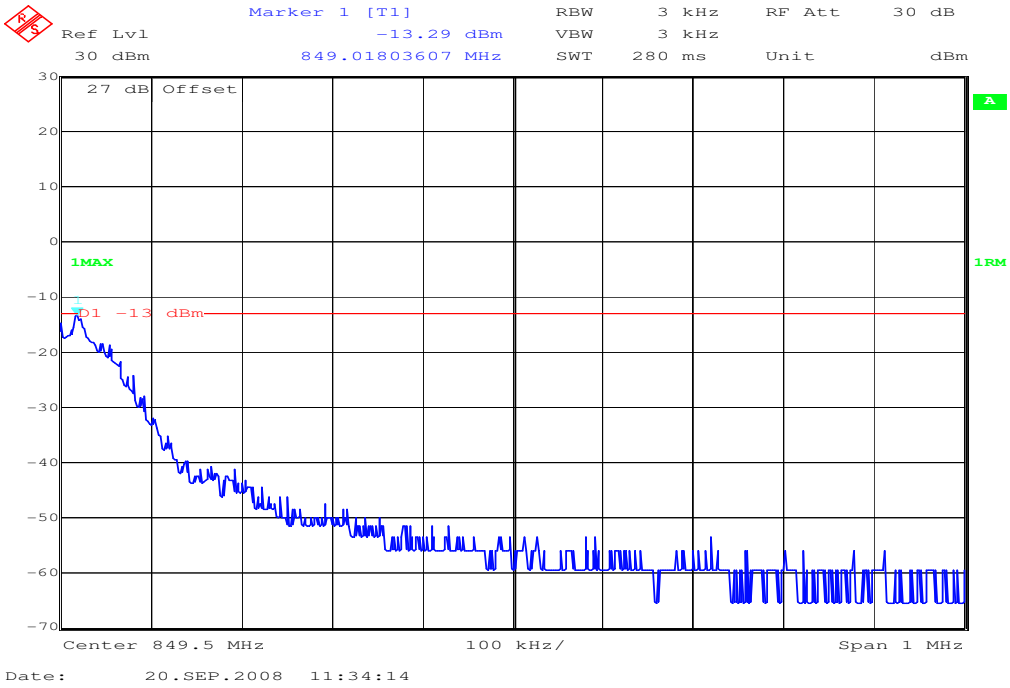
**Measurement Limit:**

Sec. 22.917(b) Emission Limits.
(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +33 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

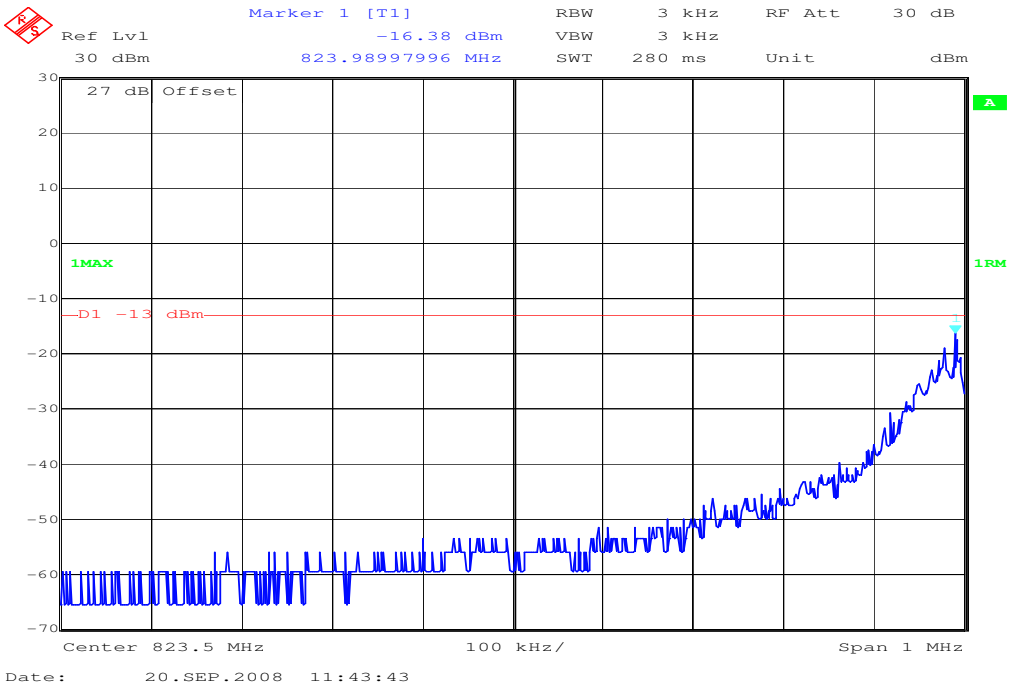
**Block 1 Channel 128**



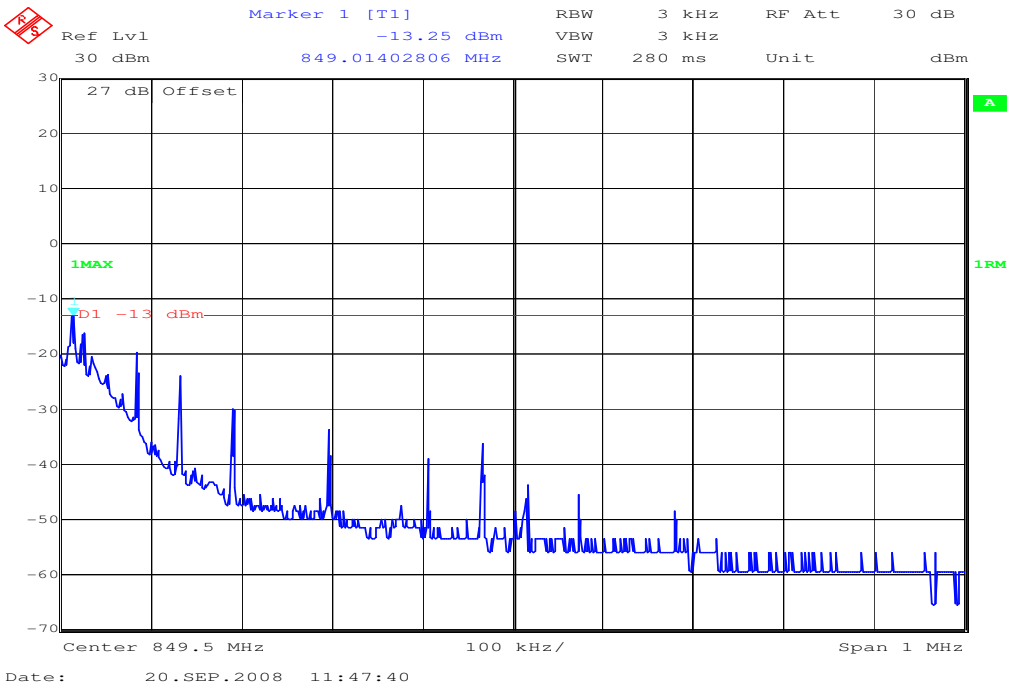

**Block 4 Channel 251**



**Block 1 Channel 128 (EDGE)**




**Block 4 Channel 251 (EDGE)**



### 5.3.6 Occupied Bandwidth

**Reference**

| | |
|---|---|
| FCC: | CFR Part 22.917, 2.1049 |
| IC: | RSS 132, Issue 2, Section 4.2 |

**Occupied Bandwidth Results**

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table below lists the measured 99% power and -26dBC occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Normal mode

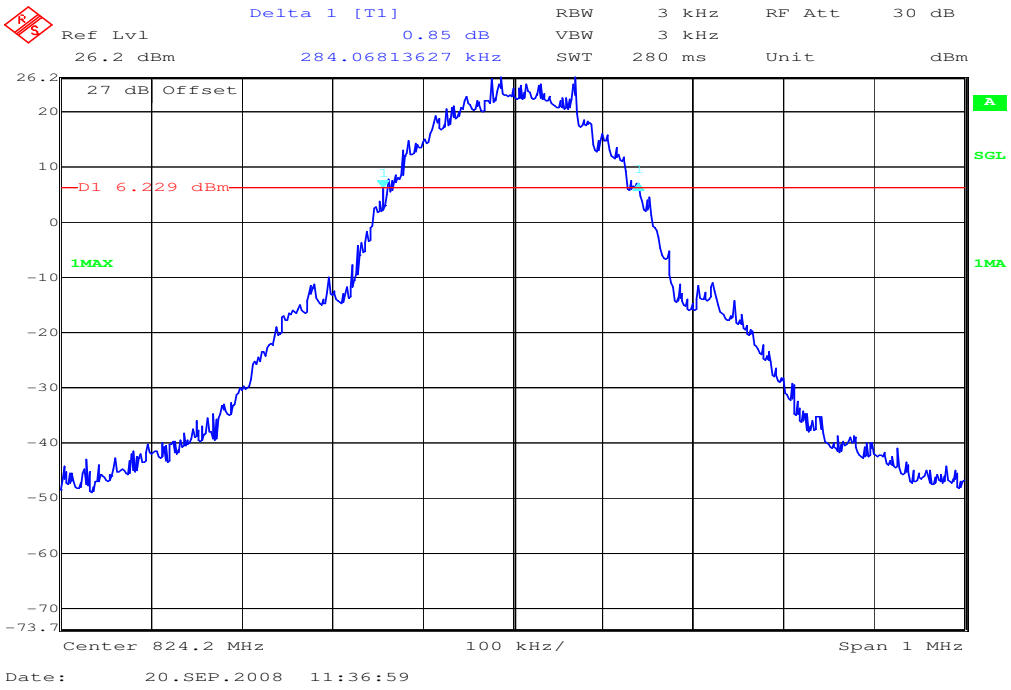
| Frequency | 99% Occupied Bandwidth (kHz) | -26 dBc Bandwidth (kHz) |
|---|---|---|
| 824.2 MHz | 284 | 312 |
| 836.4 MHz | 282 | 316 |
| 848.8 MHz | 264 | 316 |

EDGE mode

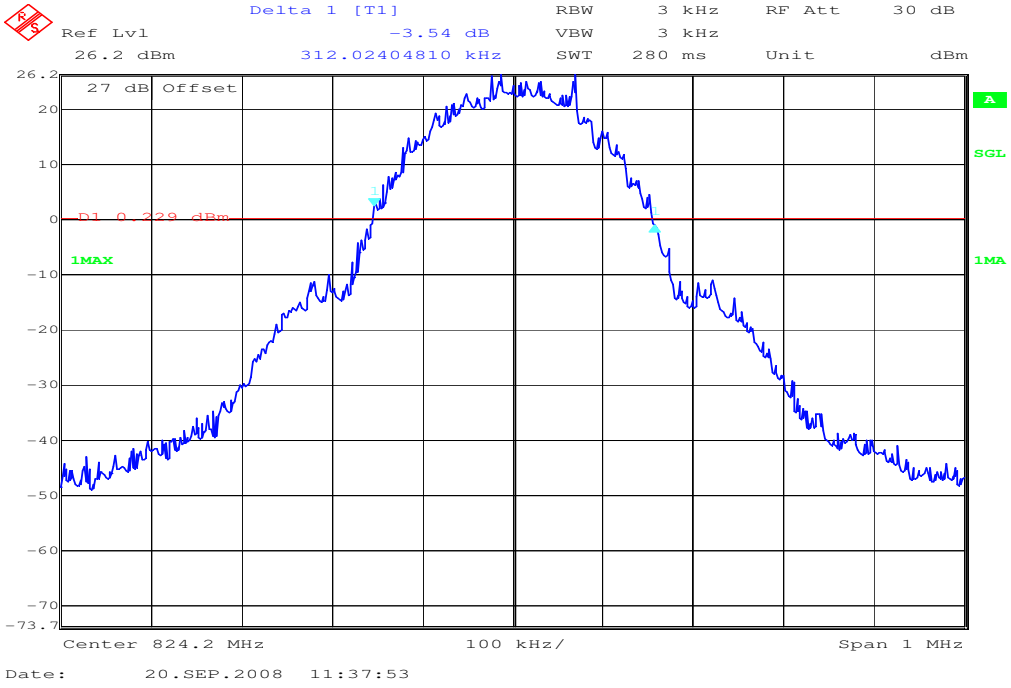
| Frequency | 99% Occupied Bandwidth (kHz) | -26 dBc Bandwidth (kHz) |
|---|---|---|
| 824.2 MHz | 272 | 312 |
| 836.4 MHz | 278 | 314 |
| 848.8 MHz | 280 | 314 |

Part 22 requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 300 kHz, this equates to a resolution bandwidth of at least 3 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

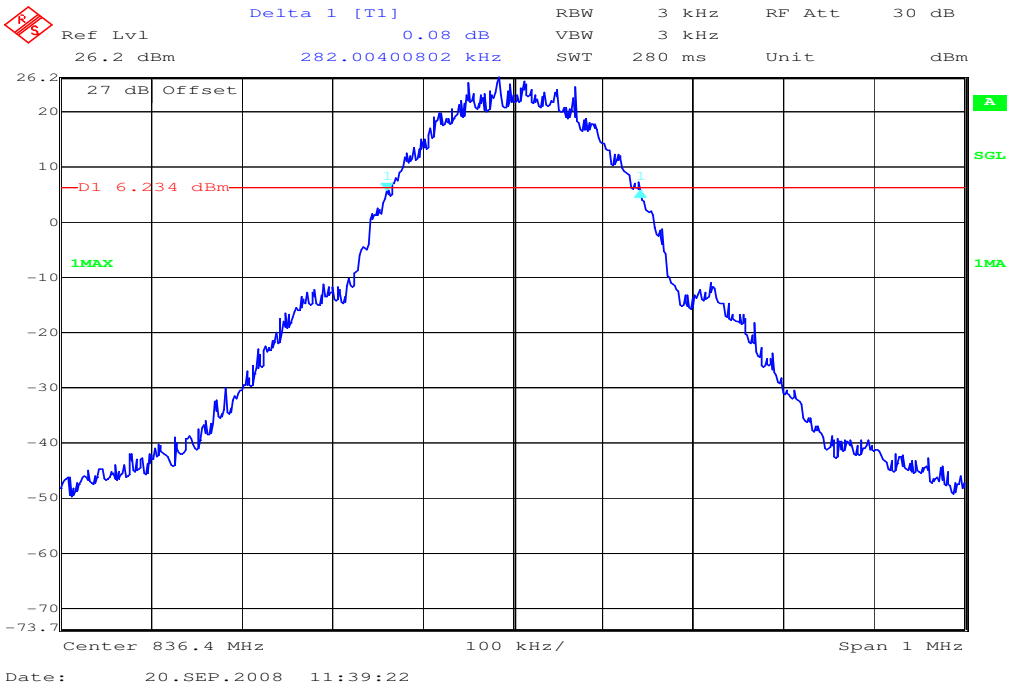
**Channel 128**
**99% (-20 dB) Occupied Bandwidth**



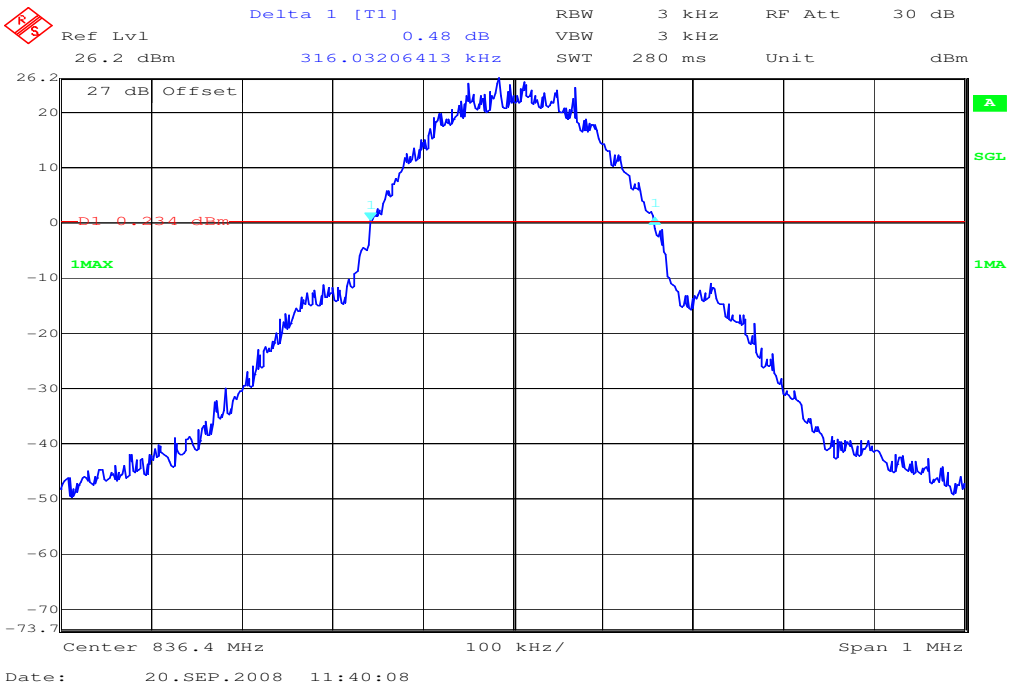

**Channel 128**
**-26 dBc Bandwidth**



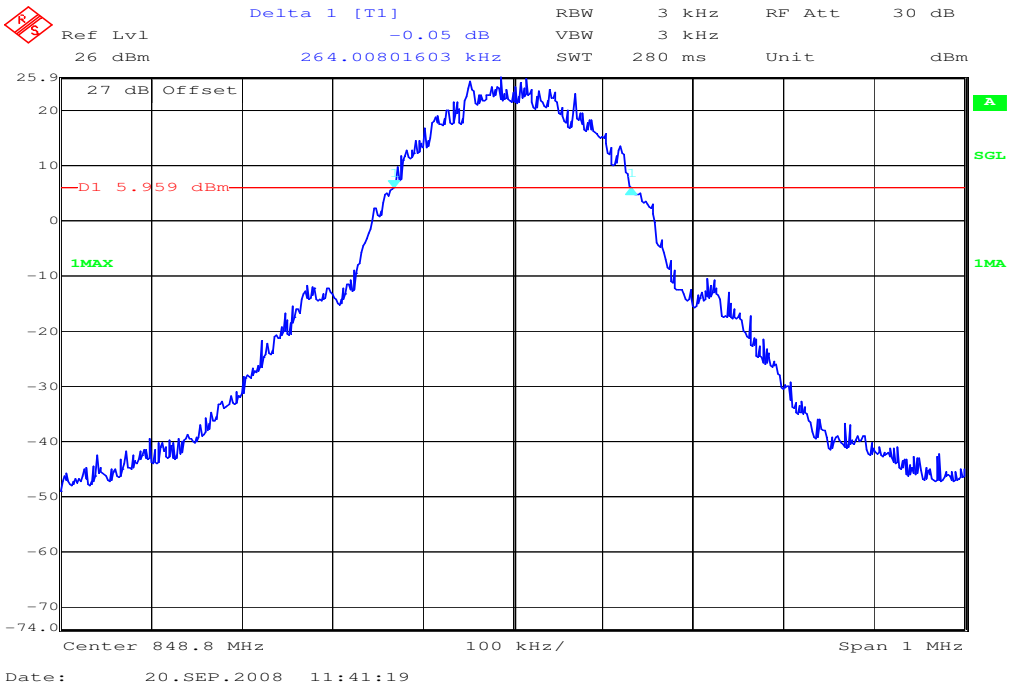
**Channel 189**
**99% (-20 dB) Occupied Bandwidth**



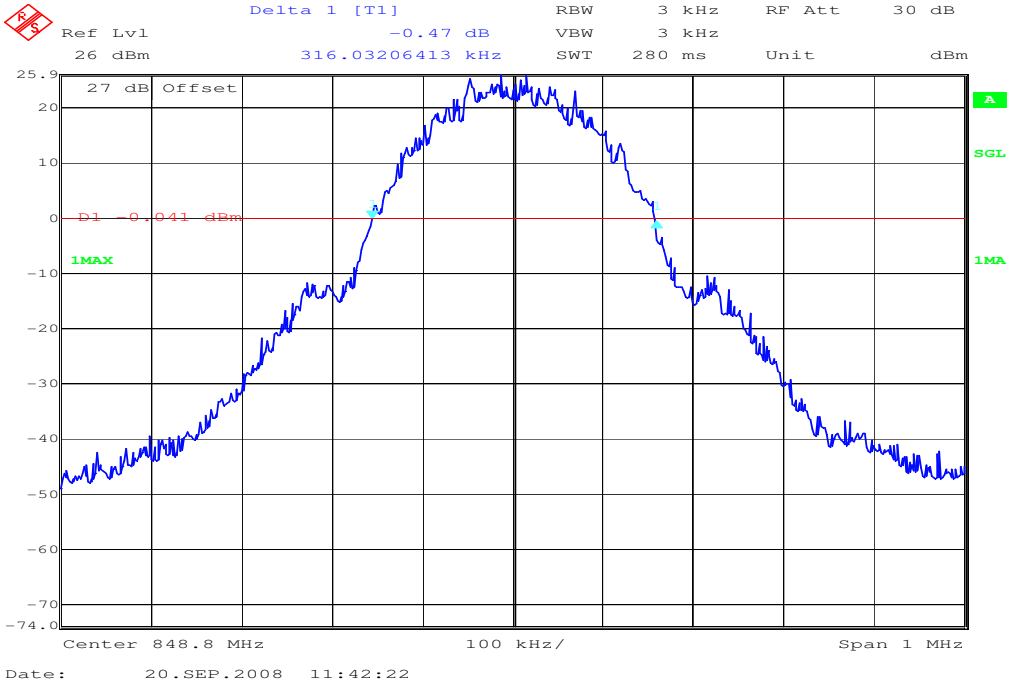

**Channel 189**
**-26 dBc Bandwidth**



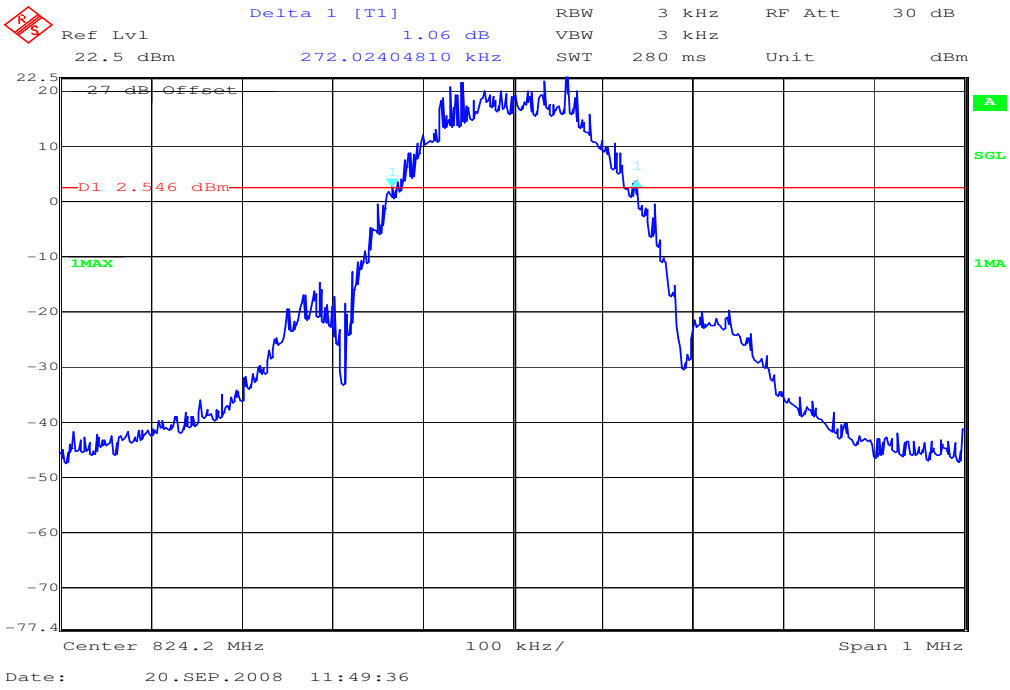
**Channel 251**
**99% (-20 dB) Occupied Bandwidth**



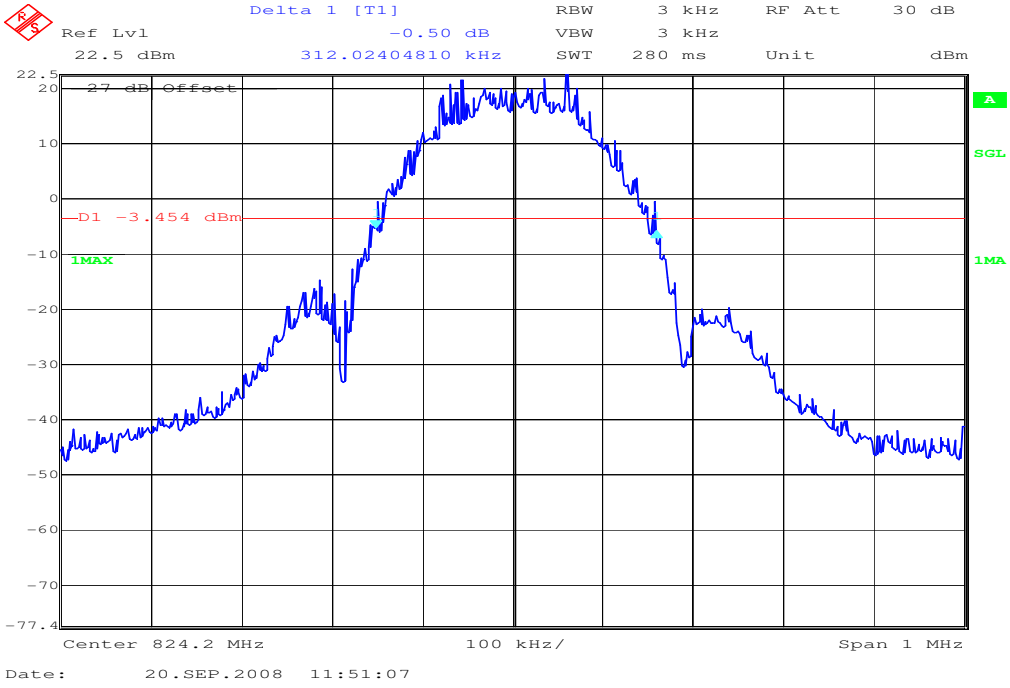

**Channel 251**
**-26 dBc Bandwidth**



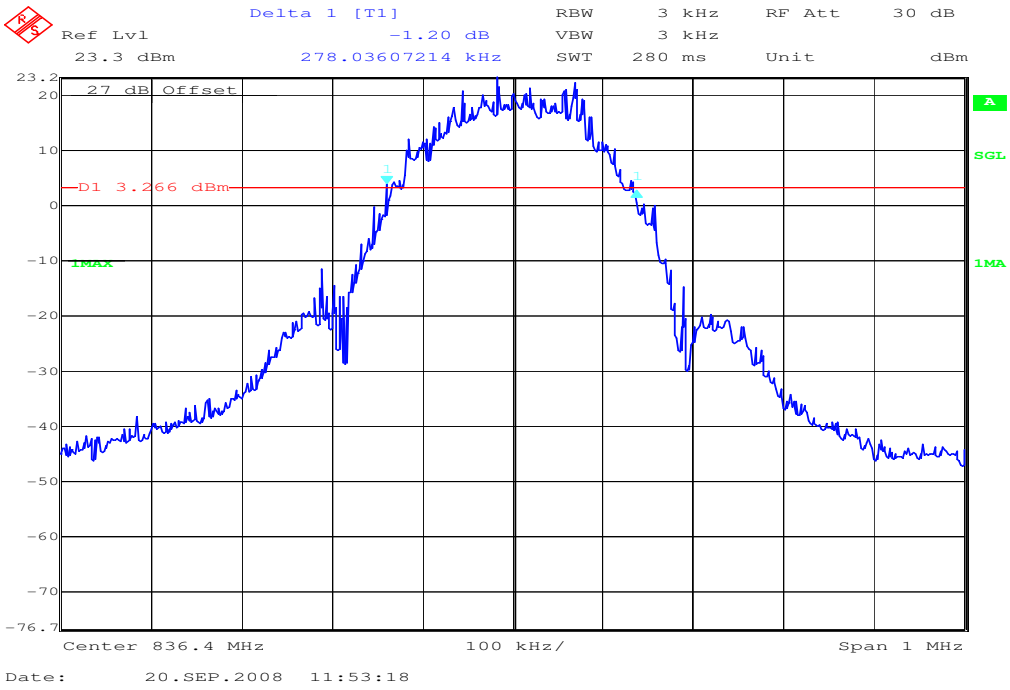
**Channel 128 (EDGE)**
**99% (-20 dB) Occupied Bandwidth**



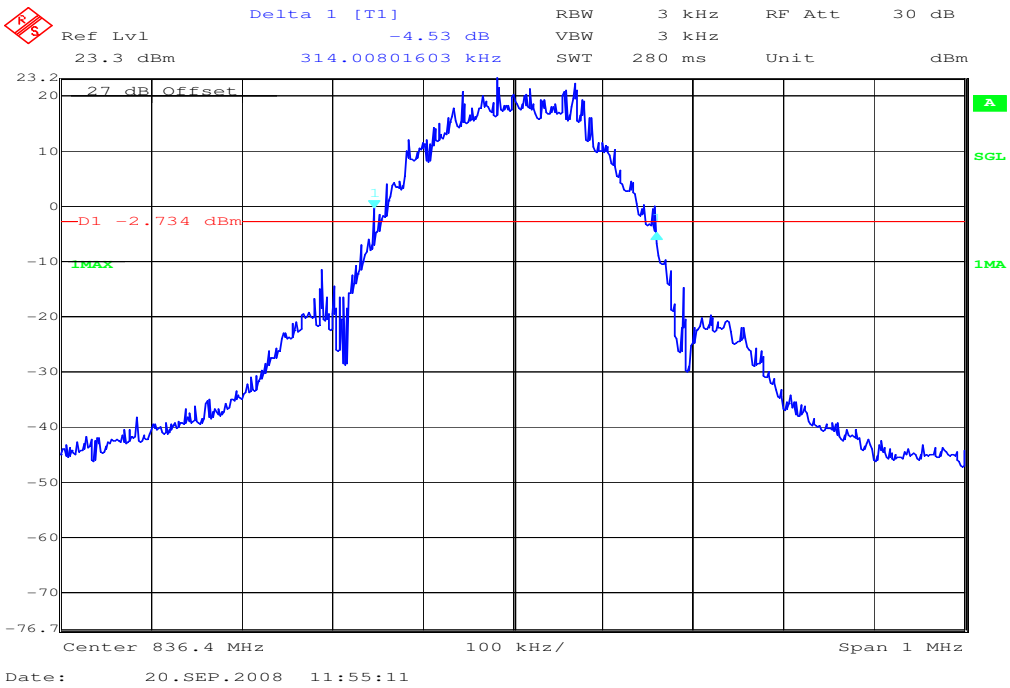

**Channel 128 (EDGE)**
**-26 dBc Bandwidth**



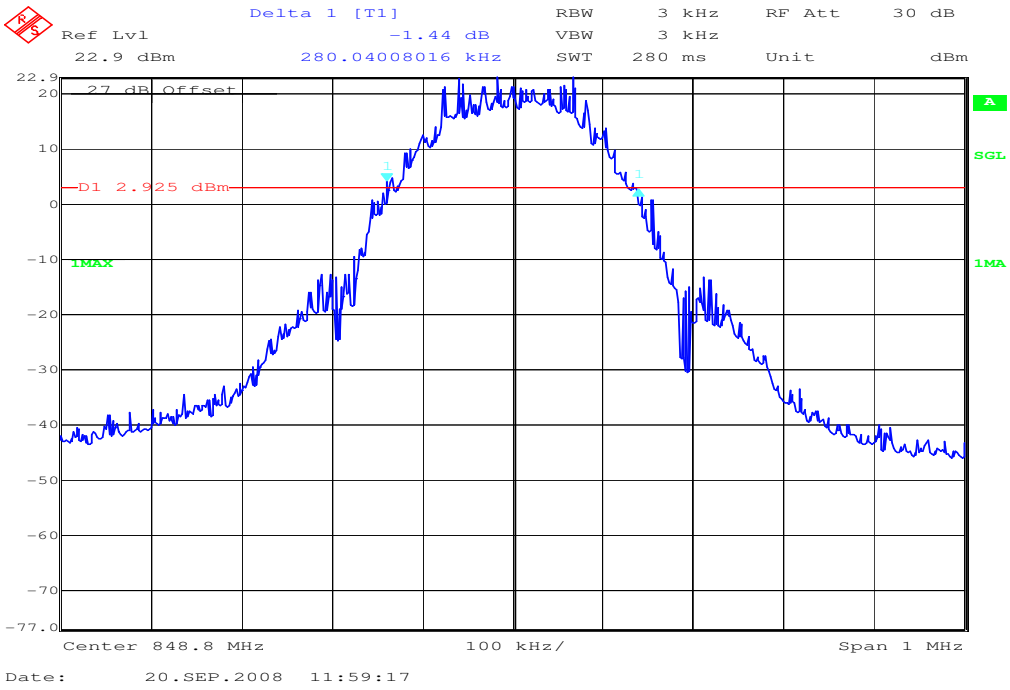
**Channel 189 (EDGE)**
**99% (-20 dB) Occupied Bandwidth**



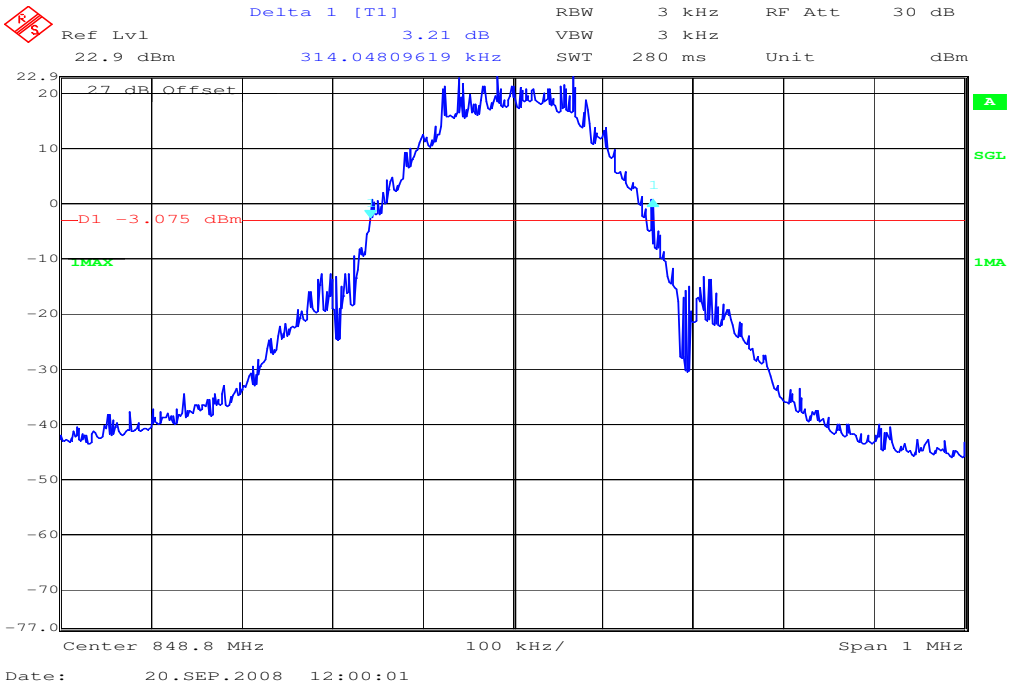

**Channel 189 (EDGE)**
**-26 dBc Bandwidth**



**Channel 251 (EDGE)**
**99% (-20 dB) Occupied Bandwidth**




**Channel 251 (EDGE)**
**-26 dBc Bandwidth**



## 5.4 Receiver

### 5.4.1 Receiver Radiated Emissions

**Reference**

| | |
|---|---|
| FCC: | CFR Part 15.109, 2.1053 |
| IC: | RSS 132, Issue 2, Section 4.6 and 6.6 |

**Method of measurement**

The measurement was performed in worst case. The EUT was not connected to the CMU 200. So the EUT perform a network search. In this case all oscillators are active.

**Measurement Results**

| SPURIOUS EMISSIONS LEVEL (dBµV/m) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Idle mode | | | -/- | | | -/- | | |
| f (MHz) | Detector | Level (dBµV/m) | f (MHz) | Detector | Level (dBµV/m) | f (MHz) | Detector | Level (dBµV/m) |
| No critical peaks found | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Measurement uncertainty | | | ±3 dB | | | | | |

f < 1 GHz : RBW/VBW: 100 kHz  f ≥ 1GHz : RBW/VBW: 1 MHz

H = Horizontal; V= Vertical

Measurement distance see table

**Limits:** § 15.109

| Frequency (MHz) | Field strength (dBµV/m) | Measurement distance (m) |
|---|---|---|
| 30 - 88 | 30.0 | 10 |
| 88 - 216 | 33.5 | 10 |
| 216 - 960 | 36.0 | 10 |
| above 960 | 54.0 | 3 |

**Idle-Mode (30 MHz - 1 GHz)**

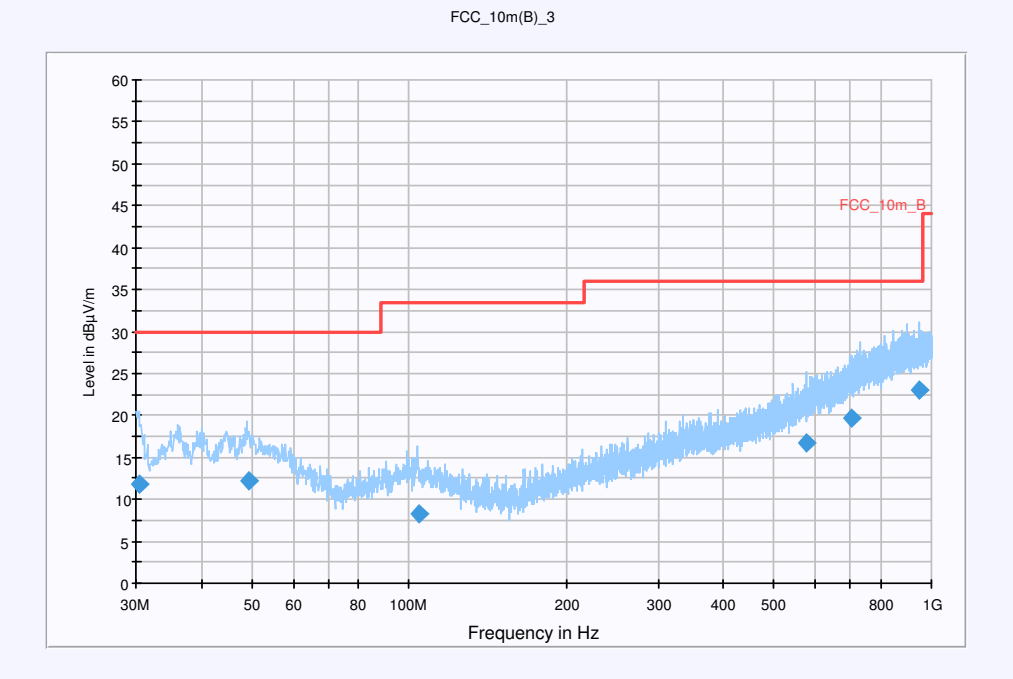
**Common Information**

| | |
|---|---|
| EUT: | AAC-1052151-BV + CAA-002001-BV |
| Serial Number: | CB5A0RS3FU + 759008W05 |
| Test Description: | FCC @ 10 m |
| Operating Conditions: | Net search |
| Operator Name: | Folz |
| Comment: | Powered with AC 115V/ 60 Hz |

**Scan Setup: FCC_Fin [EMI radiated]**

| | |
|---|---|
| Hardware Setup: | Electric Field (NOS) |
| Level Unit: | dBµV/m |

| Subrange | Detectors | IF Bandwidth | Meas. Time | Receiver |
|---|---|---|---|---|
| 30 MHz - 1 GHz | QuasiPeak | 120 kHz | 15 s | Receiver |



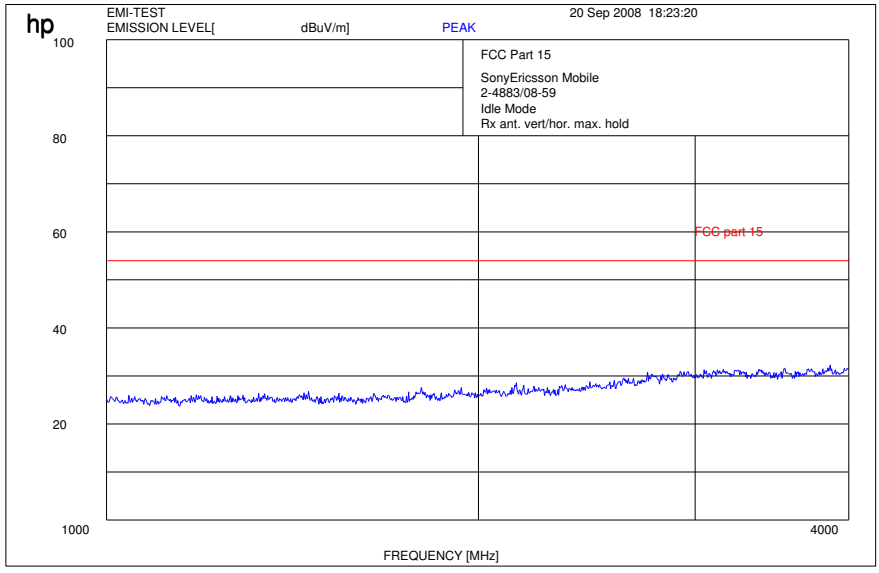

**Final Result 1**

| Frequency (MHz) | QuasiPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Antenna height (cm) | Polarity | Turntable position (deg) | Corr. (dB) | Margin (dB) | Limit (dBµV/m) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 30.537825 | 11.7 | 15000.000 | 120.000 | 136.0 | V | 296.0 | 12.7 | 18.3 | 30.0 | |
| 49.202400 | 12.3 | 15000.000 | 120.000 | 133.0 | V | 43.0 | 13.5 | 17.8 | 30.0 | |
| 104.292550 | 8.2 | 15000.000 | 120.000 | 220.0 | V | 214.0 | 11.9 | 25.3 | 33.5 | |
| 575.878300 | 16.7 | 15000.000 | 120.000 | 176.0 | V | 308.0 | 20.2 | 19.3 | 36.0 | |
| 702.852950 | 19.8 | 15000.000 | 120.000 | 127.0 | H | 77.0 | 22.7 | 16.2 | 36.0 | |
| 947.709950 | 23.1 | 15000.000 | 120.000 | 169.0 | V | 46.0 | 25.9 | 12.9 | 36.0 | |

**Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]**

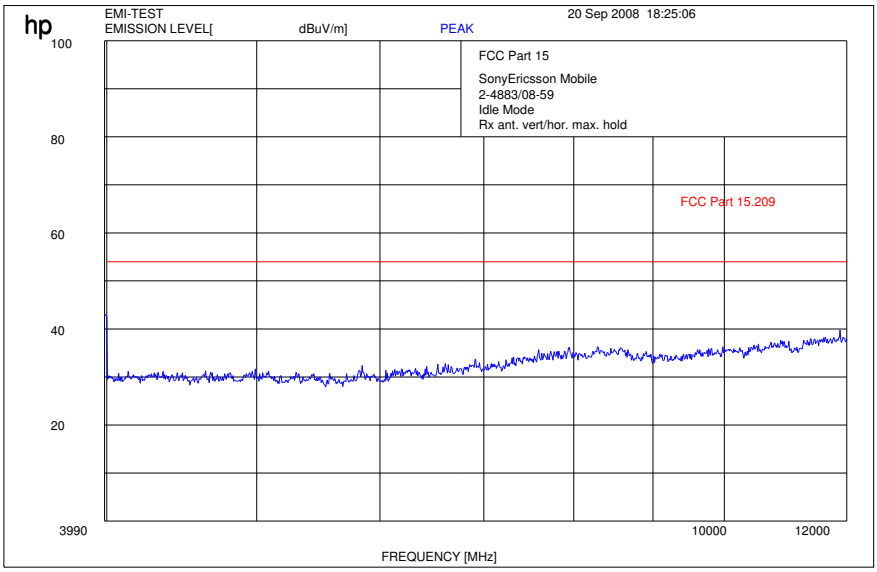
| | |
|---|---|
| Subrange 1 | |
| Frequency Range: | 30 MHz - 2 GHz |
| Receiver: | Receiver [ESCI 3]<br>@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009 |
| Signal Path: | without Notch<br>FW 1.0 |
| Antenna: | VULB 9163<br>SN 9163-295, FW ---, CAL 08.04.2010<br>Correction Table (vertical): VULP6113<br>Correction Table (horizontal): VULP6113<br>Correction Table: Cabel with switch (0908) |
| Antenna Tower: | Tower [EMCO 2090 Antenna Tower]<br>@ GPIB0 (ADR 8), FW REV 3.12 |
| Turntable: | Turntable [EMCO Turntable]<br>@ GPIB0 (ADR 9), FW REV 3.12 |

**Idle-Mode (1 GHz - 4 GHz)**



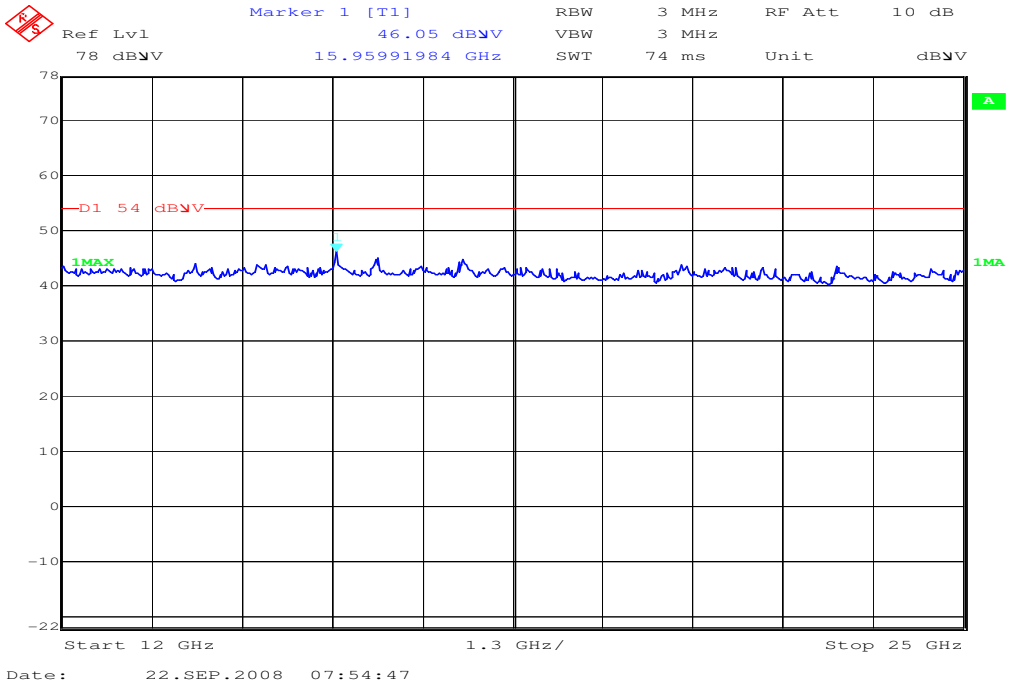

f < 1 GHz : RBW/VBW: 100 kHz  f ≥ 1GHz : RBW / VBW 1 MHz

**Idle-Mode (4 GHz – 12.0 GHz)**




f < 1 GHz : RBW/VBW: 100 kHz  f ≥ 1GHz : RBW / VBW 1 MHz

**Idle-Mode (12 GHz - 25 GHz)**




f < 1 GHz : RBW/VBW: 100 kHz  f ≥ 1GHz : RBW / VBW 1 MHz

# 6 Test equipment and ancillaries used for tests

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

All reported calibration intervals are calibrations according to the EN/ISO/IEC 17025 standard. These calibrations were performed from an accredited external calibration laboratory.
Additional to these calibrations the laboratory performed comparison measurements with other calibrated systems and performed a weekly chamber inspection.
All used devices are connected with a 10 MHz external reference.
According to the manufacturers' instruction is it possible to establish a calibration interval for the FSP unit of 24 month, if the device has an external 10 MHz reference.

***Anechoic chamber C:***

| No | Equipment/Type | Manuf. | Serial Nr. | Inv. No. Cetecom | Last Calibration | Frequency (months) | Next Calibration |
|---|---|---|---|---|---|---|---|
| 1 | Anechoic chamber | MWB | 87400/02 | 300000996 | Monthly verification | | |
| 2 | System-Rack 85900 | HP I.V. | * | 300000222 | n.a. | | |
| 3 | Measurement System 1 | | | | | | |
| 4 | Spektrum Analyzer 8566B | HP | 3138A07614 | 300001207 | 13.12.2007 | 24 | 13.12.2009 |
| 5 | Spektrum Analyzer Display 85662A | HP | 3144A28627 | 300001208 | 13.12.2007 | 24 | 13.12.2009 |
| 6 | Quasi-Peak-Adapter 85650A | HP | 2811A01204 | 300002308 | 13.12.2007 | 24 | 13.12.2009 |
| 7 | RF-Preselector 85685A | HP | 2837A00778 | 300002448 | 13.12.2007 | 24 | 13.12.2009 |
| 8 | PC Vectra VL | HP | | 300001688 | n.a. | | |
| 9 | Software EMI | HP | | 300000983 | n.a. | | |
| 10 | Measurement System 2 | | | | | | |
| 11 | FSP 30 | R&S | 100886 | 300003575 | 25.08.2008 | 24 | 25.08.2010 |
| 12 | PC | F+W | | | n.a. | | |
| 13 | TILE | TILE | | | n.a. | | |
| 14 | Biconical antenna | EMCO | S/N: 860 942/003 | | Monthly verification (System cal.) | | |
| 15 | Log. Period. Antenna 3146 | EMCO | 2130 | 300001603 | Monthly verification (System cal.) | | |
| 16 | Double Ridged Antenna HP 3115P | EMCO | 3088 | 300001032 | Monthly verification (System cal.) | | |
| 17 | Active Loop Antenna 6502 | EMCO | 2210 | 300001015 | Monthly verification (System cal.) | | |
| 18 | Power Supply 6032A | HP | 2818A03450 | 300001040 | 12.05.2007 | 36 | 12.05.2010 |
| 19 | Busisolator | Kontron | | 300001056 | n.a. | | |
| 20 | Leitungsteiler 11850C | HP | | 300000997 | Monthly verification (System cal.) | | |
| 21 | Power attenuator 8325 | Byrd | 1530 | 300001595 | Monthly verification (System cal.) | | |
| 22 | Band reject filter WRCG1855/1910 | Wainwright | 7 | 300003350 | Monthly verification (System cal.) | | |
| 23 | Band reject filter WRCG2400/2483 | Wainwright | 11 | 300003351 | Monthly verification (System cal.) | | |

***Signalling Units:***

| No | Equipment/Type | Manuf. | Serial Nr. | Inv. No. Cetecom | Last Calibration | Frequency (months) | Next Calibration |
|---|---|---|---|---|---|---|---|
| 1 | CBT | R&S | 100313 | 300003516 | 24.10.2006 | 24 | 24.10.2008 |
| 2 | CBT | R&S | 100185 | 300003416 | 21.02.2006 | 24 | 21.02.2008 |
| 3 | CMU-200 | R&S | 103992 | 300003231 | 27.04.2007 | 12 | 27.04.2008 |
| 4 | CMU-200 | R&S | 106240 | 300003321 | 02.05.2006 | 24 | 02.05.2008 |
| 5 | CMU-200 | R&S | 832221/0055 | 300002862 | 20.03.2008 | 24 | 20.03.2010 |

***Climatic Box:***

| No | Equipment/Type | Manuf. | Serial Nr. | Inv. No. Cetecom | Last Calibration | Frequency (months) | Next Calibration |
|---|---|---|---|---|---|---|---|
| 1 | Climatic box VT 4002 | Heraeus Vötsch | 58566046820010 | 300003019 | 11.05.2007 | 24 | 11.05.2009 |
| 2 | Climatic box CTS T-40/50 | CTS | 064023 | 300003540 | 03.01.2007 | 24 | 03.01.2009 |

***SRD Laboratory Room 002:***

| No | Equipment/Type | Manuf. | Serial Nr. | Inv. No. Cetecom | Last Calibration | Frequency (months) | Next Calibration |
|---|---|---|---|---|---|---|---|
| 1 | System Controller PSM 12 | R&S | 835259/007 | 3000002681-00xx | n.a. | | |
| 2 | Memory Extension PSM-K10 | R&S | To 1 | 3000002681 | n.a. | | |
| 3 | Operating Software PSM-B2 | R&S | To 1 | 3000002681 | n.a. | | |
| 4 | 19'' Monitor | | 22759020-ED | 3000002681 | n.a. | | |
| 5 | Mouse | | LZE 0095/6639 | 3000002681 | n.a. | | |
| 6 | Keyboard | | G00013834L461 | 3000002681 | n.a. | | |
| 7 | Spectrum Analyser FSIQ 26 | R&S | 835540/018 | 3000002681-0005 | 01.08.2006 | 24 | 01.08.2008 |
| 8 | Tracking Generator FSIQ-B10 | R&S | 835107/015 | 3000002681 | s.No.7 | | |
| 10 | RF-Generator SMIQ03 (B1 Signal) | R&S | 835541/056 | 3000002681-0002 | 01.08.2006 | 36 | 01.08.2009 |
| 11 | Modulation Coder SMIQ-B20 | R&S | To 10 | 3000002681 | s.No.10 | | |
| 12 | Data Generator SMIQ-B11 | R&S | To 10 | 3000002681 | s.No.10 | | |
| 13 | RF Rear Connection SMIQ-B19 | R&S | To 10 | 3000002681 | s.No.10 | | |
| 14 | Fast CPU SM-B50 | R&S | To 10 | 3000002681 | s.No.10 | | |
| 15 | FM Modulator SM-B5 | R&S | 835676/033 | 3000002681 | s.No.10 | | |
| 16 | RF-Generator SMIQ03 (B2 Signal) | R&S | 835541/055 | 3000002681-0001 | 01.08.2006 | 36 | 01.08.2009 |
| 17 | Modulation Coder SMIQ-B20 | R&S | To 16 | 3000002681 | s.No.16 | | |
| 18 | Data Generator SMIQ-B11 | R&S | To 16 | 3000002681 | s.No.16 | | |
| 19 | RF Rear Connection SMIQ-B19 | R&S | To 16 | 3000002681 | s.No.16 | | |
| 20 | Fast CPU SM-B50 | R&S | To 16 | 3000002681 | s.No.16 | | |
| 21 | FM Modulator SM-B5 | R&S | 836061/022 | 3000002681 | s.No.16 | | |
| 22 | RF-Generator SMP03 (B3 Signal) | R&S | 835133/011 | 3000002681-0003 | 01.08.2006 | 36 | 01.08.2009 |
| 23 | Attenuator SMP-B15 | R&S | 835136/014 | 3000002681 | S.No.22 | | |
| 24 | RF Rear Connection SMP-B19 | R&S | 834745/007 | 3000002681 | S.No.22 | | |
| 25 | Power Meter NRVD | R&S | 835430/044 | 3000002681-0004 | 01.08.2006 | 24 | 01.08.2008 |
| 26 | Power Sensor NRVD-Z1 | R&S | 833894/012 | 3000002681-0013 | 01.08.2006 | 24 | 01.08.2008 |
| 27 | Power Sensor NRVD-Z1 | R&S | 833894/011 | 3000002681-0010 | 01.08.2006 | 24 | 01.08.2008 |
| 28 | Rubidium Standard RUB | R&S | | 3000002681-0009 | 01.08.2006 | 24 | 01.08.2008 |
| 29 | Switching and Signal Conditioning Unit SSCU | R&S | 338864/003 | 3000002681-0006 | 01.08.2006 | 24 | 01.08.2008 |
| 30 | Laser Printer HP Deskjet 2100 | HP | N/A | 3000002681-0011 | n.a. | | |
| 31 | 19'' Rack | R&S | 11138363000004 | 3000002681 | n.a. | | |
| 32 | RF-cable set | R&S | N/A | 3000002681 | n.a. | | |
| 33 | IEEE-cables | R&S | N/A | 3000002681 | n.a. | | |
| 34 | Sampling System FSIQ-B70 | R&S | 835355/009 | 3000002681 | s.No.7 | | |
| 35 | RSP programmable attenuator | R&S | 834500/010 | 3000002681-0007 | 01.08.2006 | 24 | 01.08.2008 |
| 36 | Signalling Unit | R&S | 838312/011 | 3000002681 | n.a. | | |
| 37 | NGPE programmable Power Supply for EUT | R&S | 192.033.41 | 3000002681 | | | |
| 39 | Power Splitter 6005-3 | Inmet Corp. | none | 300002841 | 23.12.2006 | 24 | 23.12.2008 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 40 | SMA Cables SPS-1151-985-SPS | Insulated Wire | different | different | n.a. | | |
| 41 | CBT32 with EDR Signaling Unit | R&S | | | | | |
| 42 | Coupling unit | Narda | N/A | -- | n.a. | | |
| 43 | 2xSwitch Matrix PSU | R&S | 872584/021 | 300001329 | n.a. | | |
| 44 | RF-cable set | R&S | N/A | different | n.a. | | |
| 45 | IEEE-cables | R&S | N/A | -- | n.a. | | |

Note: 3000002681-00xx inventoried as a system

***Anechoic chamber F:***

| No | Equipment/Type | Manuf. | Serial Nr. | Inv. No. Cetecom | Last Calibration | Frequency (months) | Next Calibration |
|---|---|---|---|---|---|---|---|
| 1 | Control Computer | F+W | FW0502032 | 300003303 | -/- | -/- | -/- |
| 2 | Trilog Antenna | 9163-295 | -/- | -/- | 30.04.2008 | 24 | 30.04.2010 |
| 3 | Amplifier - 0518C-138 | Veritech Micro-wave Inc. | -/- | -/- | -/- | -/- | -/- |
| 4 | Switch - 3488A | HP | | 300000368 | -/- | -/- | -/- |
| 5 | EMI Test receiver - ESCI | R&S | 100083 | 300003312 | 31.01.2009 | 24 | 31.01.2009 |
| 6 | Turntable Controller - 1061 3M | EMCO | 1218 | 300000661 | -/- | -/- | -/- |
| 7 | Tower Controller 1051 Controller | EMCO | 1262 | 300000625 | -/- | -/- | -/- |
| 8 | Tower - 1051 | EMCO | 1262 | 300000625 | -/- | -/- | -/- |
| 10 | Ultra Notch-Filter Rejected band Ch. 62 | WRCD | 9 | -/- | -/- | -/- | -/- |