CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10 . D-66117 Saarbrücken Phone: +49 (0) 681-598-0 Fax:-9075
RSC-Laboratory

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)

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Test report no.	**:**	**4-3049-01-02/08 A**
Type identification	**:**	**EC400 / EC400g**
Applicant	**:**	**Sony Ericsson Mobile Communications**
FCC ID	**:**	**PY7F3232012 / PY7F3232013**
IC Certification No	**:**	**4170B-F3232012 / 4170B-F3232013**
Test standards	**:**	**47 CFR Part 22**
		47 CFR Part 24
		RSS - 132 Issue 2
		RSS - 133 Issue 4

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1 General information

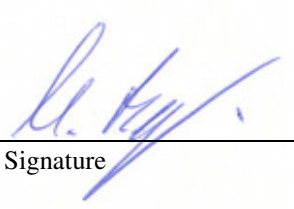
1.1 Notes

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:

2008-06-25	**Bertolino Marco**	
Date	Name	Signature

Technical responsibility for area of testing:

2008-06-25	**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**
Street:	**7001 Development Drive**
Town:	**Research Triangle Park, NC 27709**
Country:	**USA**
Telephone:	
Fax:	**+1-919-472-6030**
Contact:	**Louis Le**
E-mail:	**Louis.Le@Sonyericsson.com**
Telephone:	**+1-919-472-1431**

1.4 Application details

Date of receipt of order:	**2008-05-13**
Date of receipt of test item:	**2008-05-19**
Date of start test:	**2008-05-19**
Date of end test:	**2008-05-29**
Persons(s) who have been present during the test:	**-/-**

2 Test standard/s:

47 CFR Part 22	**2006-10**	**Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission 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 subchapter B - common carrier services, Part 24-Personal communications services**
RSS - 132 Issue 2	**2005-09**	**Spectrum Management and Telecommunications Policy - Radio Standards Specifications 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 2 GHz Personal Communication Services**

3 Technical tests

3.1 Details of manufacturer

Name:	**Sony Ericsson Mobile Communications**
Street:	**7001 Development Drive**
Town:	**Research Triangle Park, NC 27709**
Country:	**USA**

3.1.1 Test item

Product description as it marked	:	**Mobile Broadband ExpressCard**
Equipment model number	:	**EC400 / EC400g**
Classification	:	**PCS Mobile (1850-1910 MHz)** **Cellular Mobile GSM (824-849 MHz)**
Frequency	:	**1850.2 – 1909.8 MHz and 824.2 – 848.8 MHz** **1852.4 – 1907.6 MHz and 826.4 – 846.6 MHz**
Type of modulation	:	**GMSK / 8-PSK / QPSK**
Emission designator	:	**286KGXW (850 MHz - GMSK)** **270KGXW (1900 MHz - GMSK)** **288KG7W (850 MHz - 8-PSK)** **282KG7W (1900 MHz - 8-PSK)** **4M69F9W (850 MHz - WCDMA)** **4M68F9W (1900 MHz - WCDMA)**
Antenna Information	:	**The card is equipped with two integrated antennas and with two SSMB connectors for main (TX/RX) and a receive diversity port (RX only). The diversity antenna port is shared by the GPS receiver.**
Output power 850 / GMSK	:	**cond.: 32.50 dBm / 1.78 W (Peak)** **EIRP: 30.31 dBm / 1.07 W (Burst)**
Output power 1900 / GMSK	:	**cond : 30.30 dBm / 1.07 W (Peak)** **EIRP: 31.02 dBm / 1,26 W (Burst)**
Output power 850 / 8-PSK	:	**cond.: 30.30 dBm / 1.07 W (Peak)** **EIRP: 28.72 dBm / 0.74 W (Burst)**
Output power 1900 / 8-PSK	:	**cond : 29.40 dBm / 0.87 W (Peak)** **EIRP: 30.02 dBm / 1.00 W (Burst)**
Max. Output power 850 / WCDMA	:	**cond : 26.86 dBm / 0.49 W (Peak)** **EIRP: 24.64 dBm / 0.29 W (Burst)**
Max. Output power 1900 / WCDMA	:	**cond : 26.91 dBm / 0.49 W (Peak)** **EIRP: 25.47 dBm / 0.35 W (Burst)**
Transmitter Spurious (worst case)	:	**1.46 µW / -28.36 dBm**
Receiver Spurious (worst case)	:	**44.75 dBµV/m @ 3 m**
FCC ID	:	**PY7F3232012 / PY7F3232013**
Certification No. IC	:	**4170B-F3232012 / 4170B-F3232013**
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:

2008-06-25	Bertolino Marco	
Date	Name	Signature

Remark:

EC400 with FCC ID: FAD-3232012-BV is identical in hardware and software to EC400g with FCC ID: FAD-3232013-BV
The only differences between the models are: GPS is disabled via SW in EC400

3.2 Test Setup

Hardware	:	**2.0**
Software	:	**SW R1A032**

Mobile; (cond. measurements)	:	**BDX0002NL0**
Mobile; (rad. measurements)	:	**BDX0002NL0**

The conducted and the radiated measurements were performed with the same unit.
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 GSM 850

Section in this Report	Test Name	Verdict
3.2.1	RF Power Output	pass
3.2.2	Frequency Stability	pass
3.2.3	Radiated Emissions	pass
3.2.4	Receiver Radiated Emissions	pass
3.2.5	Conducted Spurious Emissions	pass
3.2.6	Block Edge Compliance	pass
3.2.7	Occupied Bandwidth	pass

4.1.2 PCS 1900

Section in this Report	Test Name	Verdict
3.1.1	RF Power Output	pass
3.1.2	Frequency Stability	pass
3.1.3	Radiated Emissions	pass
3.1.4	Receiver Radiated Emissions	pass
3.1.5	Conducted Spurious Emissions	pass
3.1.6	Block Edge Compliance	pass
3.1.7	Occupied Bandwidth	pass

4.1.3 WCDMA FDD II

Section in this Report	Test Name	Verdict
3.2.1	RF Power Output	pass
3.2.2	Frequency Stability	pass
3.2.3	Radiated Emissions	pass
3.2.4	Receiver Radiated Emissions	pass
3.2.5	Conducted Spurious Emissions	pass
3.2.6	Block Edge Compliance	pass
3.2.7	Occupied Bandwidth	pass

4.1.4 WCDMA FDD V

Section in this Report	Test Name	Verdict
3.1.1	RF Power Output	pass
3.1.2	Frequency Stability	pass
3.1.3	Radiated Emissions	pass
3.1.4	Receiver Radiated Emissions	pass
3.1.5	Conducted Spurious Emissions	pass
3.1.6	Block Edge Compliance	pass
3.1.7	Occupied Bandwidth	pass

5 Measurements and results

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.

5.1 PART GSM 850

5.1.1 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

Measurements Results Output Power (conducted)

Frequency (MHz)	**Peak Output Power (dBm)**	**Average Output Power (dBm)**
824.2	32.5	32.4
836.4	32.4	32.3
848.8	32.5	32.4
Measurement uncertainty	±0.5 dB	

Measurements Results Output Power (conducted) 8-PSK Mode

Frequency (MHz)	**Peak Output Power (dBm)**	**Average Output Power (dBm)**
824.2	30.3	27.0
836.4	30.2	27.0
848.8	30.3	27.0
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

Measurement Results Output Power (Radiated) GMSK Mode

Frequency (MHz)	**Burst Peak (dBm)**
824.2	28.68
836.4	30.31
848.8	29.38
Measurement uncertainty	±1.5 dB

Measurement Results Output Power (Radiated) 8-PSK Mode

Frequency (MHz)	**Burst Peak (dBm)**
824.2	27.38
836.4	28.72
848.8	27.16
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

5.1.2 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.

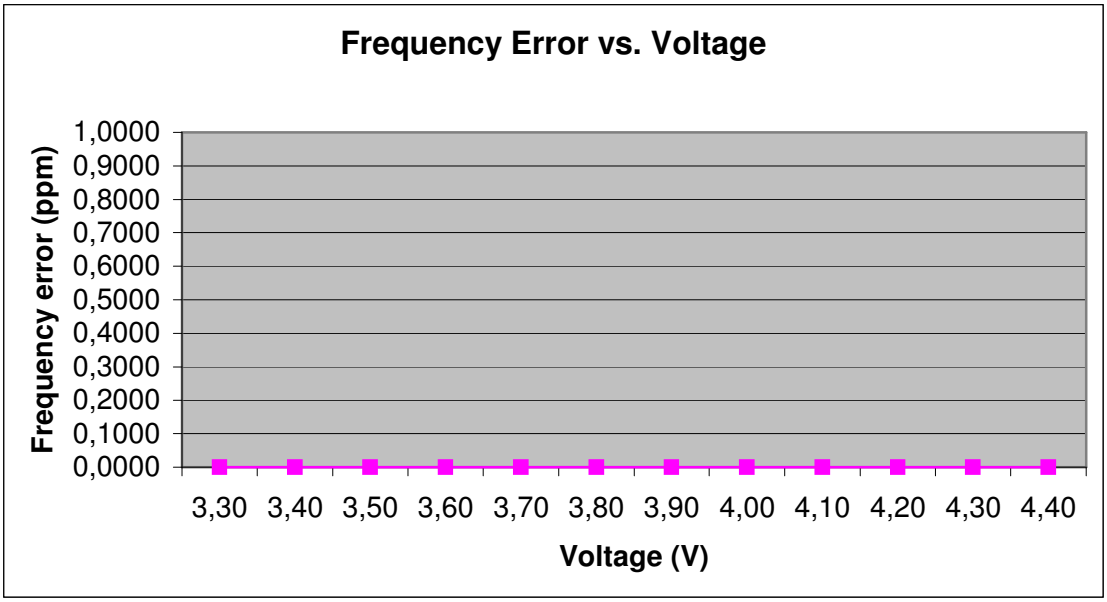
Measurement Results: **AFC FREQ ERROR vs. VOLTAGE**

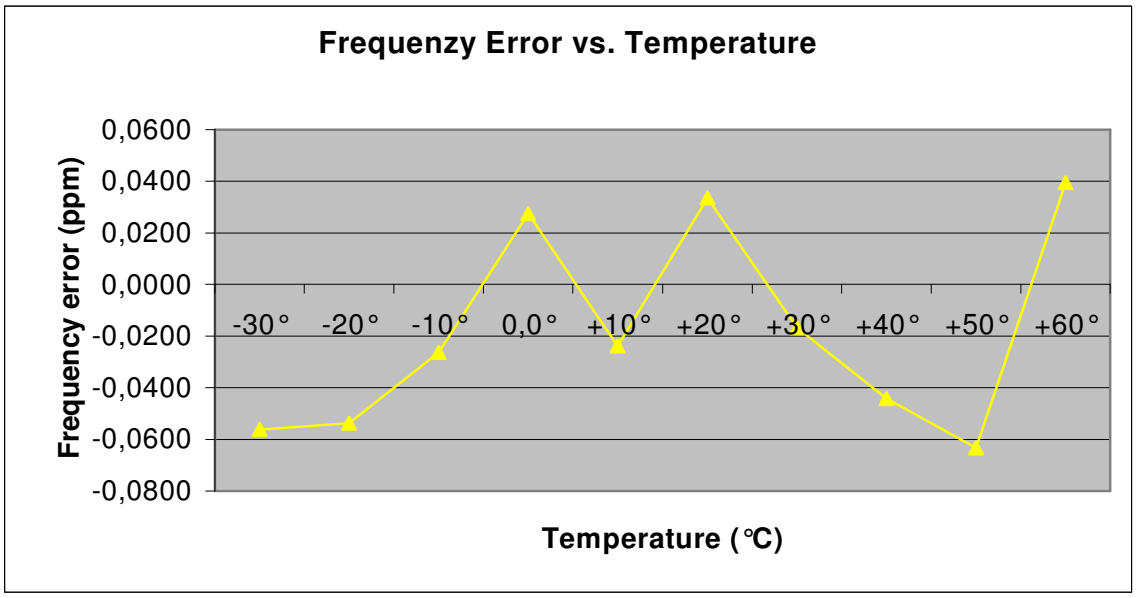
It is not possible to perform the AFC FREQ ERROR vs. VOLTAGE measurement, because the power supply is effected by the initialization board.

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	--	--	--
3.4	--	--	--
3.5	--	--	--
3.6	--	--	--
3.7	--	--	--
3.8	--	--	--
3.9	--	--	--
4.0	--	--	--
4.1	--	--	--
4.2	--	--	--
4.3	--	--	--
4.4	---	--	--

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

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-47	-0,00000562	-0,0562
-20	-45	-0,00000538	-0,0538
-10	-22	-0,00000263	-0,0263
±0.0	+23	0,00000275	0,0275
+10	-20	-0,00000239	-0,0239
+20	+28	0,00000335	0,0335
+30	-14	-0,00000167	-0,0167
+40	-37	-0,00000442	-0,0442
+50	-53	-0,00000634	-0,0634
+60	+33	0,00000395	0,0395


Frequency Error vs. Voltage
Frequency error (ppm)
1,0000
0,9000
0,8000
0,7000
0,6000
0,5000
0,4000
0,3000
0,2000
0,1000
0,0000
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
Frequency error (ppm)
0,0600
0,0400
0,0200
0,0000
-0,0200
-0,0400
-0,0600
-0,0800
-30°
-20°
-10°
0,0°
+10°
+20°
+30°
+40°
+50°
+60°
Temperature (°C)

5.1.3 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.
As can be seen from this data, the emissions from the test item were within the specification limit.

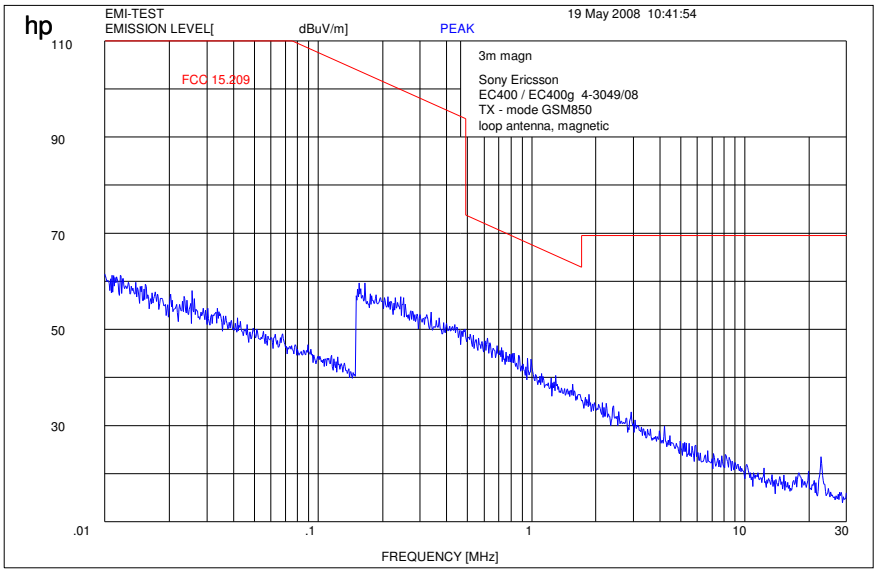
Harmonic	Tx ch.-128 Freq. (MHz)	Level (dBm)	Tx ch.-189 Freq. (MHz)	Level (dBm)	Tx ch.-251 Freq. (MHz)	Level (dBm)
2	1648.4	-	1672.8	-	1697.6	-
3	2472.6	-	2509.2	-	2546.4	-
4	3296.8	-	3345.6	-	3395.2	-
5	4121.0	-	4182.0	-	4244.0	-
6	4945.2	-	5018.4	-	5092.8	-
7	5769.4	-	5854.8	-	5941.6	-
8	6593.6	-	6691.2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

Sample calculation:

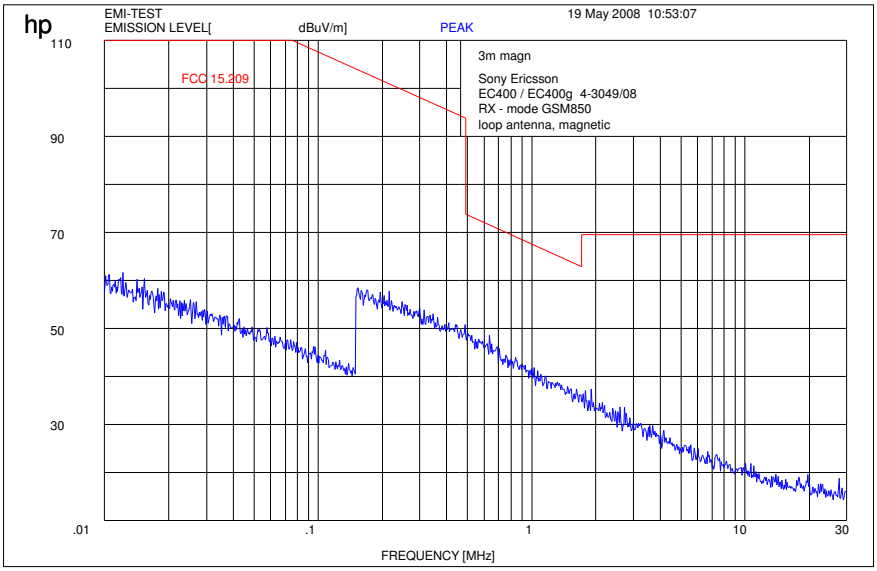
Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERP	Substitution Antenna
MHz	dBµV	dBm	dBi	dBi	dB	dBm	
848.8	137.8	26.6	8.4	0.0	3.3	31.7	UHAP Schwarzbeck S/N 460

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

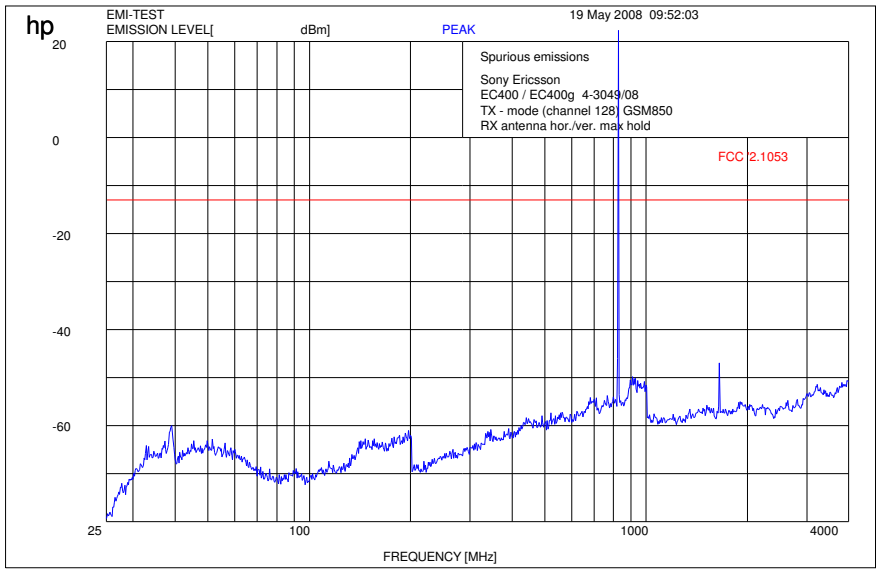
Traffic mode up to 30 MHz (Valid for all 3 channels)



Receiver mode up to 30 MHz

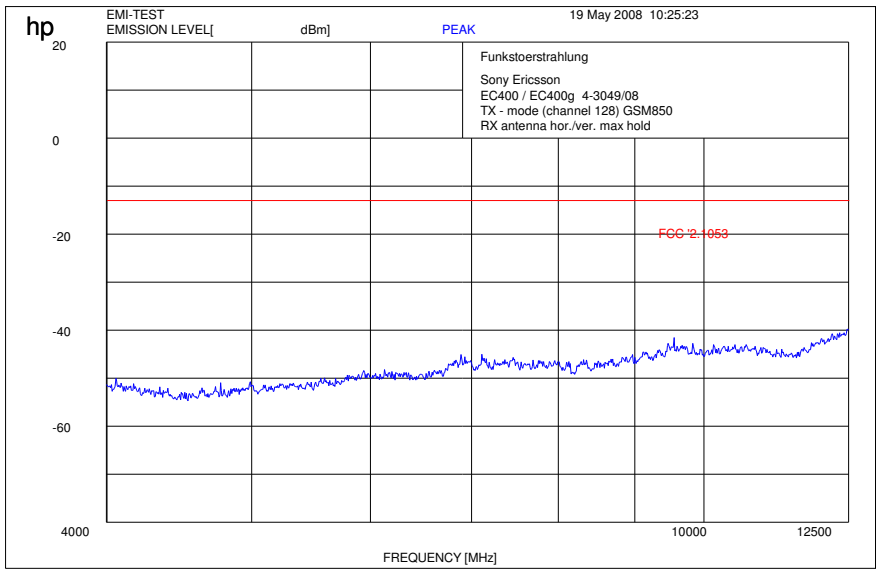


Channel 128 (30 MHz - 4 GHz)



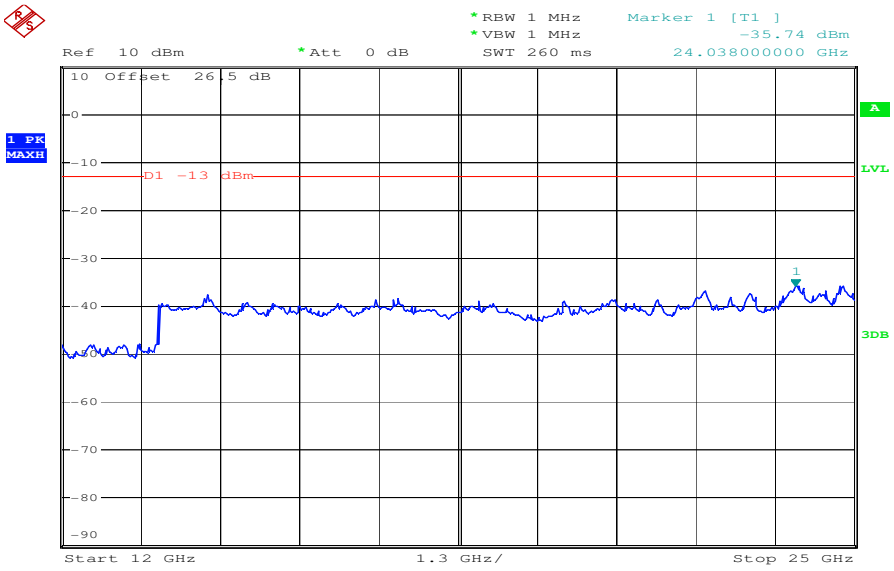
f < 1 GHz: RBW / VBW: 100 kHz f ≥ 1GHz: RBW / VBW: 1 MHz

Channel 128 (4 GHz – 12.5 GHz)



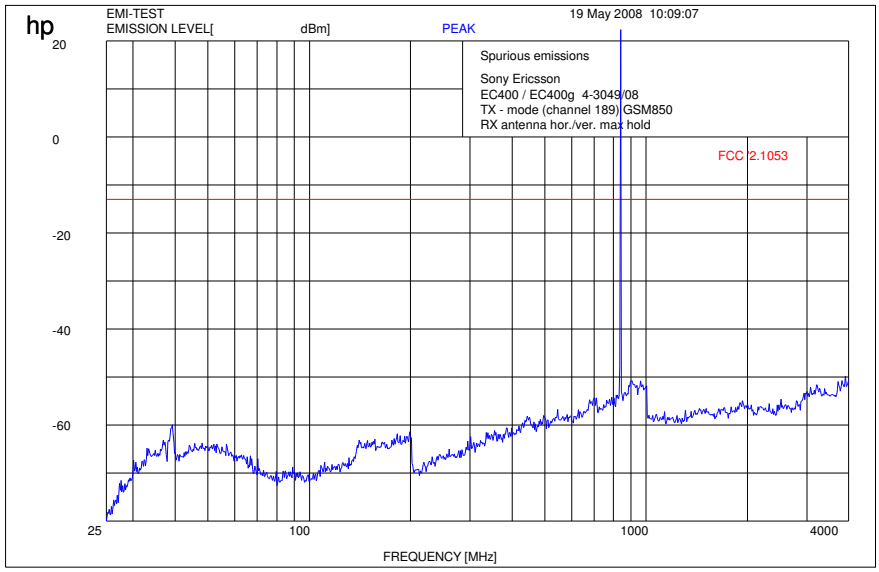
f ≥ 4GHz: RBW / VBW: 1 MHz

Channel 128 (12 GHz - 25 GHz) valid for all 3 channels



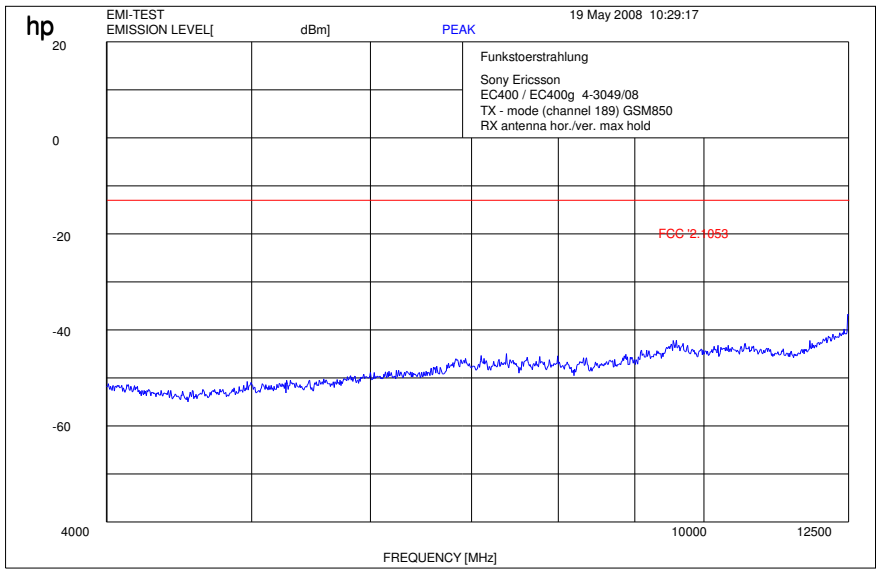
f ≥ 12GHz: RBW / VBW: 1 MHz

Channel 189 (30 MHz - 4 GHz)



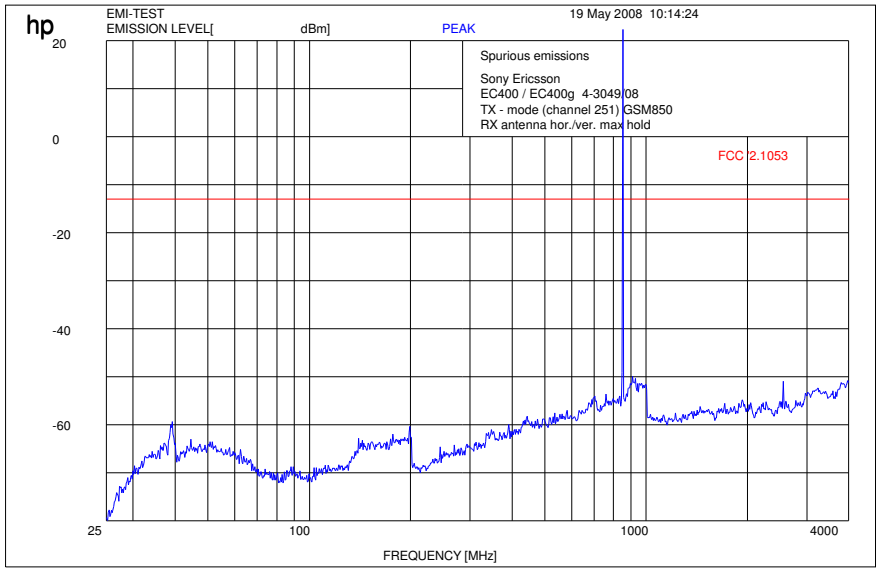
f < 1 GHz: RBW / VBW: 100 kHz f ≥ 1GHz: RBW / VBW: 1 MHz

Channel 189 (4 GHz – 12.5 GHz)



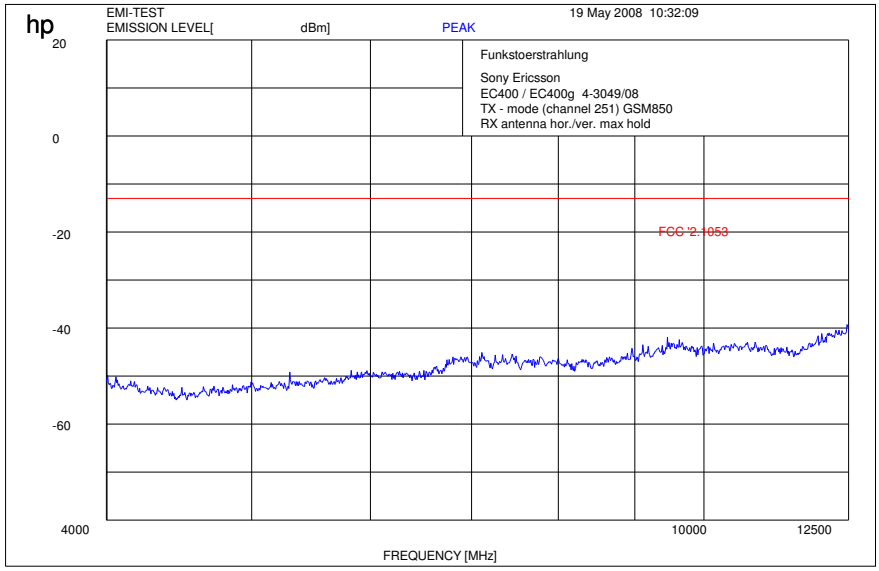
f ≥ 4GHz: RBW / VBW: 1 MHz

Channel 251 (30 MHz - 4 GHz)



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

Channel 251 (4 GHz – 12.5 GHz)



f ≥ 4GHz: RBW / VBW: 1 MHz

5.1.4 Receiver Radiated Emissions

Reference

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

SPURIOUS EMISSIONS LEVEL (µV/m)								
Idle Mode								
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
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)

Information

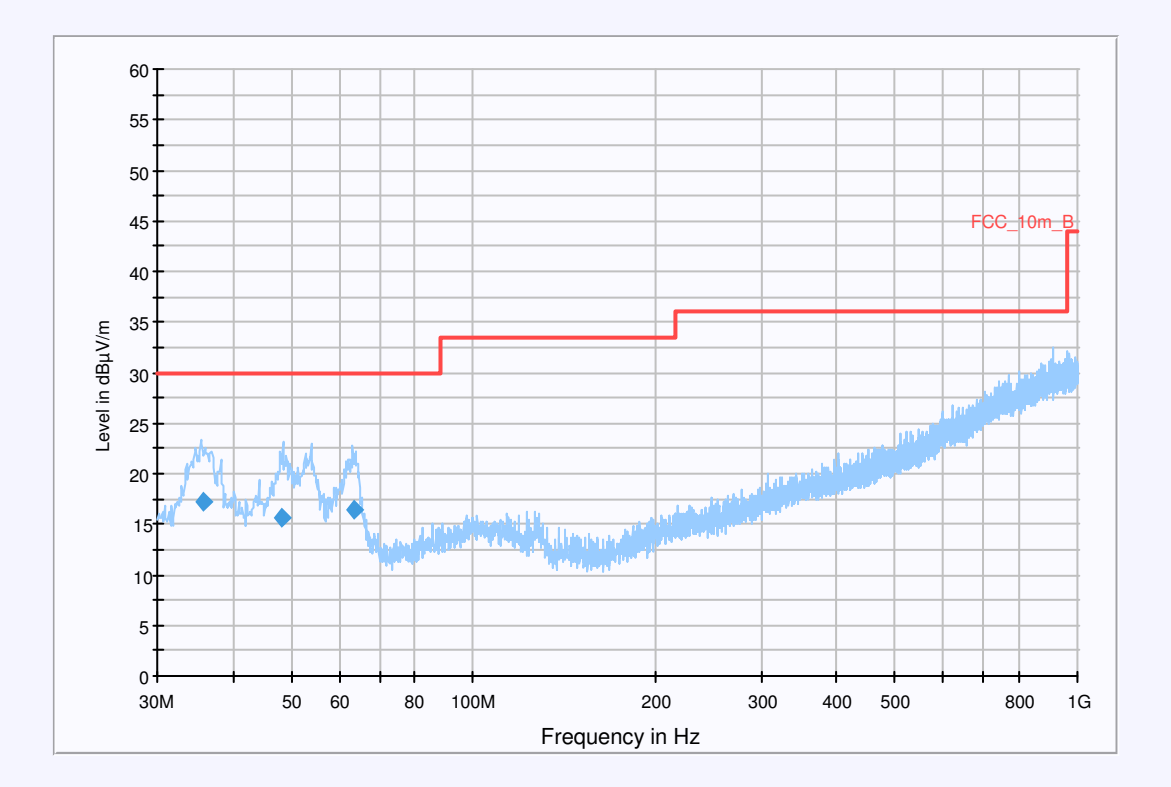
EUT:	EC400g
Serial Number:	BDX0002NL0 (IMEI: 064401071829960)
Test Description:	FCC part 15 class B @ 10 m
Operating Conditions:	idle GSM 850
Operator Name:	Hennemann
Comment:	- / -

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	EMI radiated\Electric Field (NOS)
Level Unit:	dBµV/m

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

FCC_1GHz



Final Measurement Detector 1

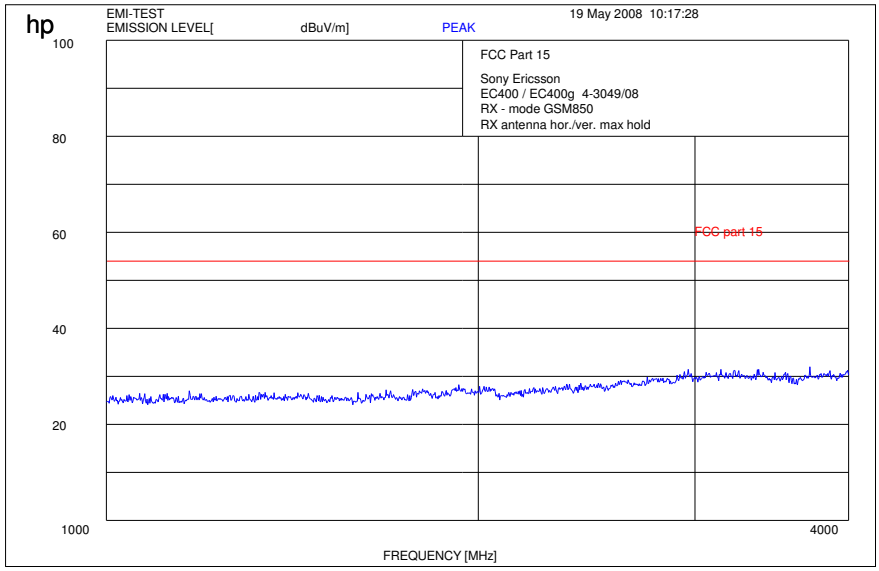
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
35.784450	17.2	1000.000	120.000	120.0	V	335.0	13.2	12.8	30.0	
48.321400	15.7	1000.000	120.000	120.0	V	221.0	13.6	14.3	30.0	
63.528200	16.4	1000.000	120.000	120.0	V	26.0	11.1	13.6	30.0	

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

Subrange 1

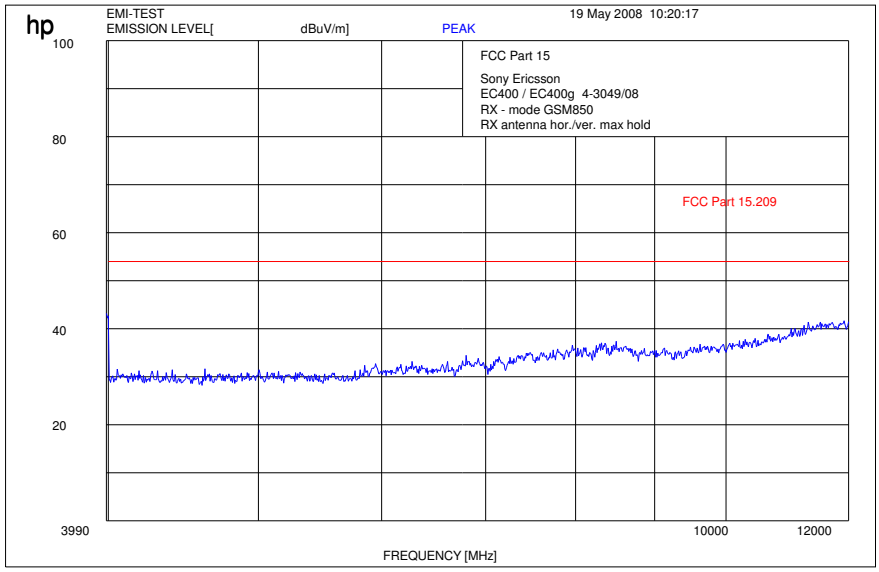
Frequency Range:	30MHz - 2GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW ---, CAL 08.04.2010 Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table: Cabel with switch (0408)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9)

Idle-Mode (1 MHz - 4 GHz)



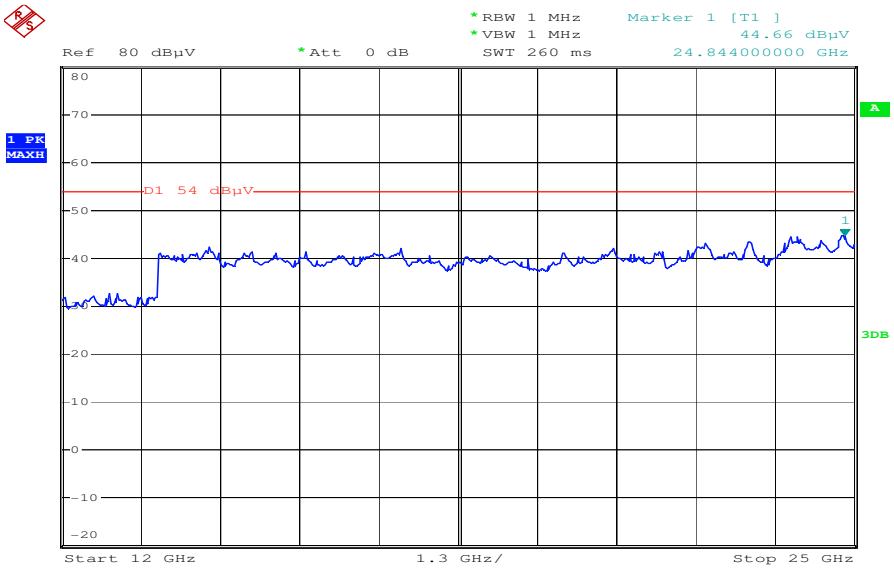
f ≥ 1GHz: RBW / VBW: 1 MHz

Idle-Mode (4 GHz – 12.0 GHz)



f ≥ 4GHz: RBW / VBW: 1 MHz

Idle-Mode (12 GHz - 25 GHz)



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5.1.5 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.

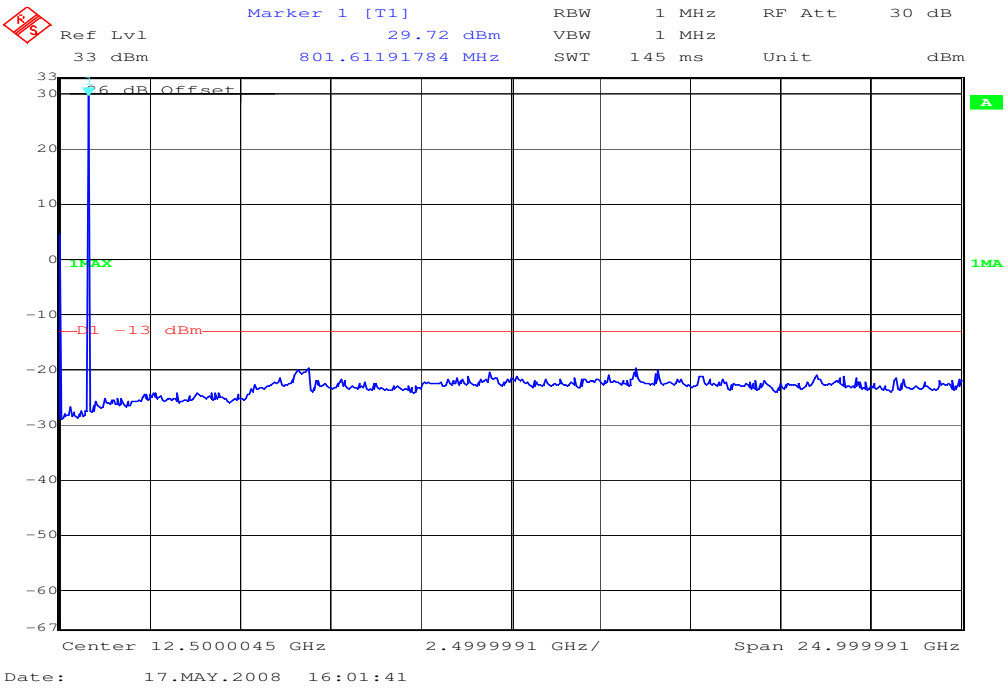
Measurement Results GSM

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	-

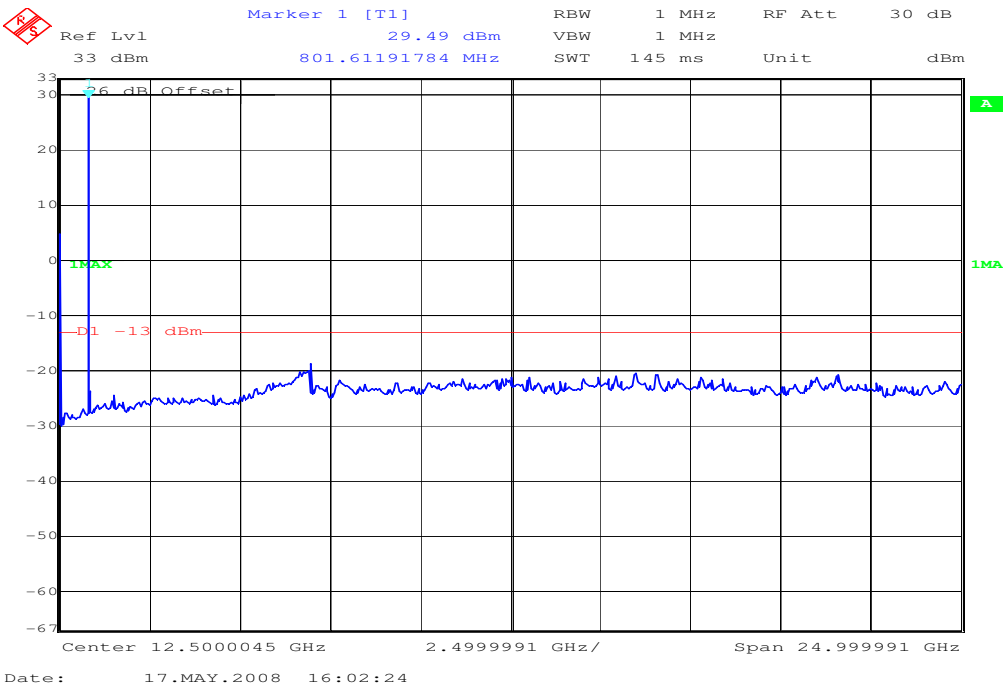
Measurement Results EGPRS / EDGE

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	-

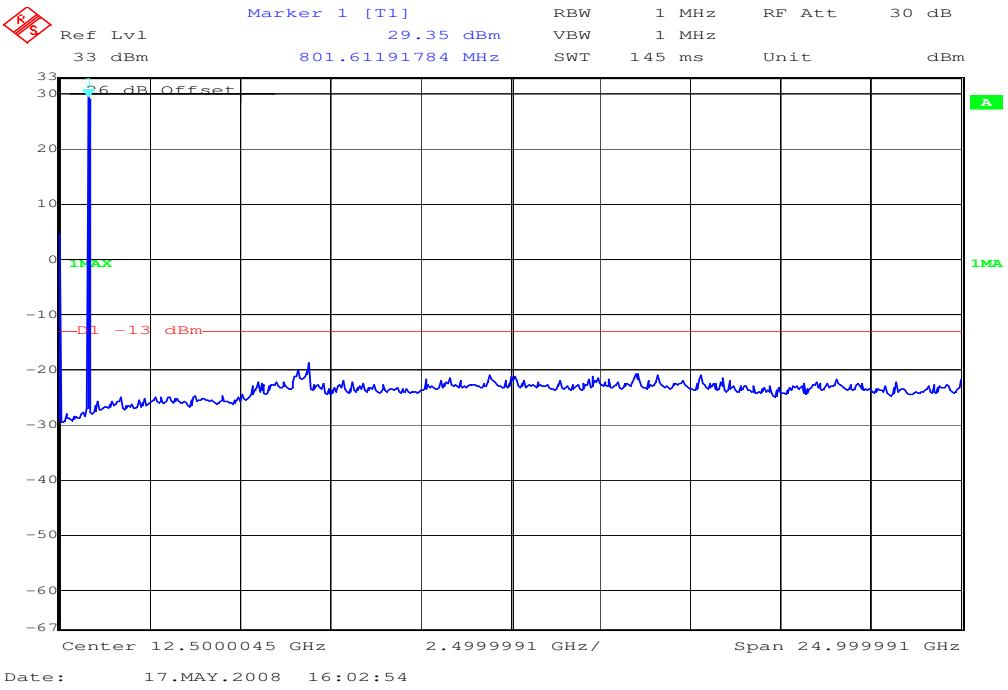
Plot 1: Channel 128 (GSM)



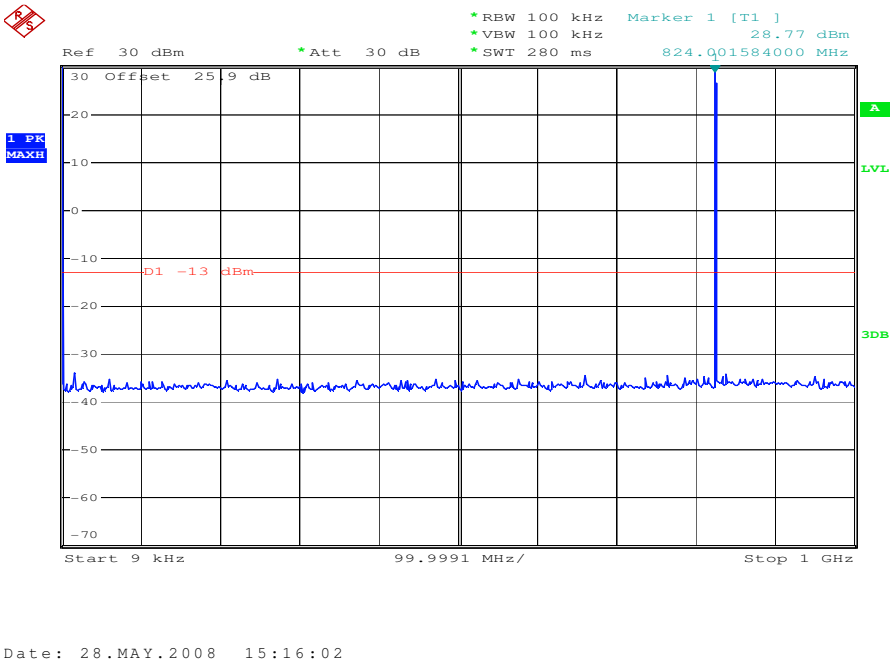
Plot 2: Channel 189 (GSM)



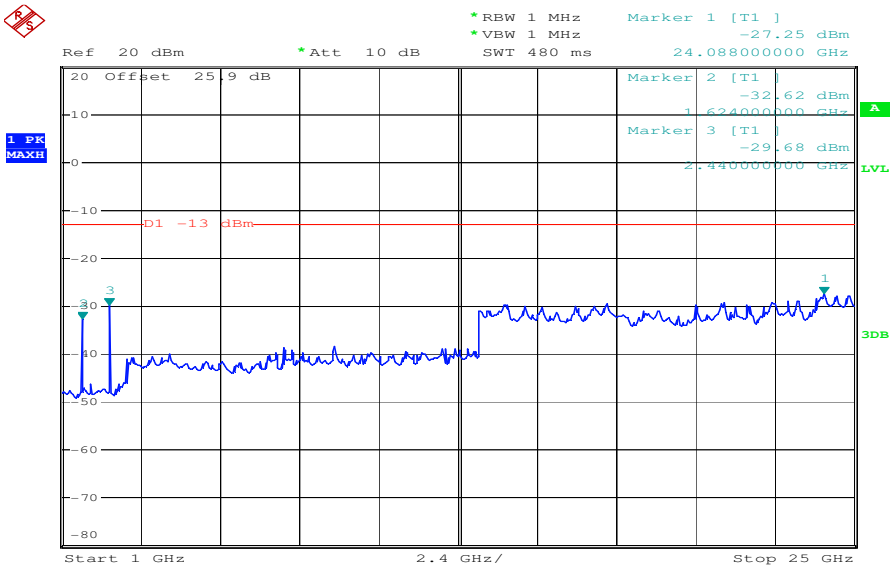
Plot 3: Channel 251 (GSM)



Plot 4: Channel 128 (EGPRS/EDGE)

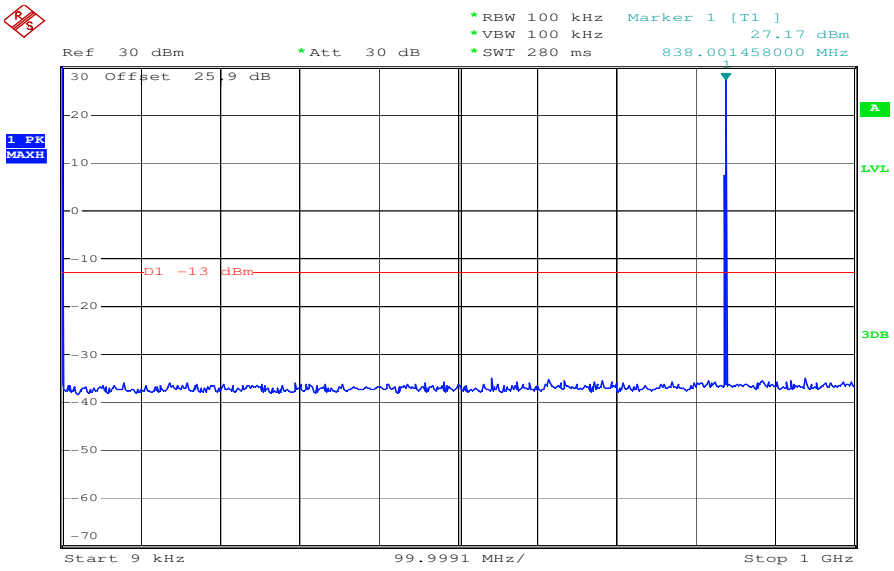


Plot 5: Channel 128 (EGPRS/EDGE)



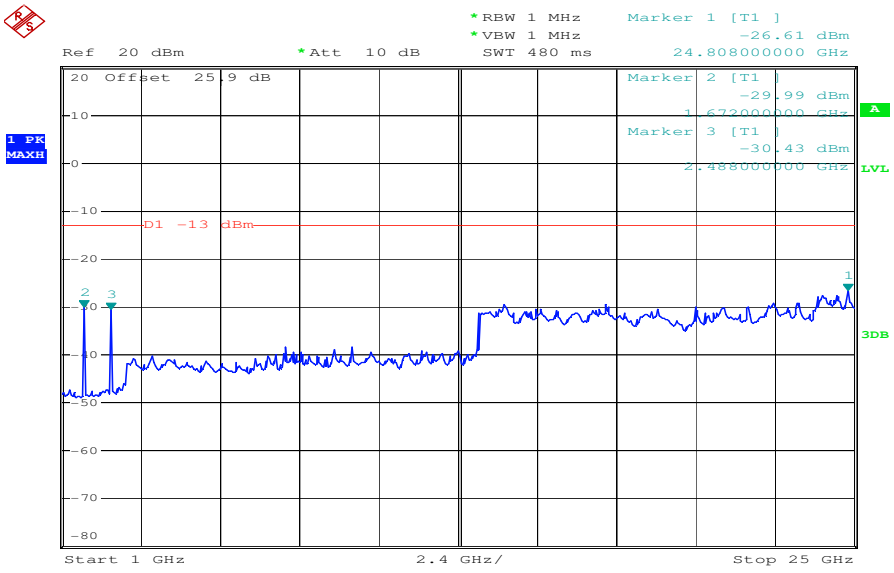
Date: 28.MAY.2008 15:21:20

Plot 6: Channel 189 (EGPRS/EDGE)



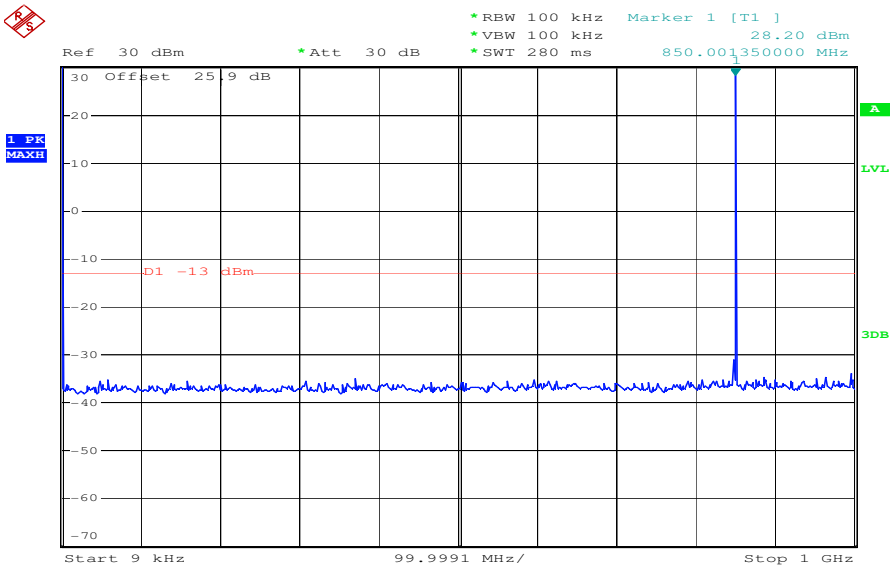
Date: 28.MAY.2008 15:16:41

Plot 7: Channel 189 (EGPRS/EDGE)



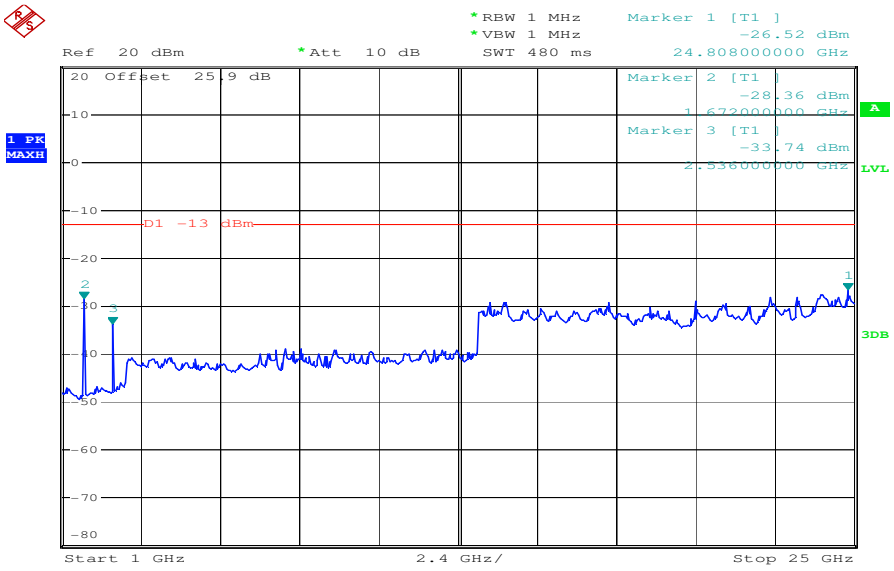
Date: 28.MAY.2008 15:22:07

Plot 8: Channel 251 (EGPRS/EDGE)



Date: 28.MAY.2008 15:17:27

Plot 9: Channel 251 (EGPRS/EDGE)



Date: 28.MAY.2008 15:23:10

5.1.6 Block Edge Compliance

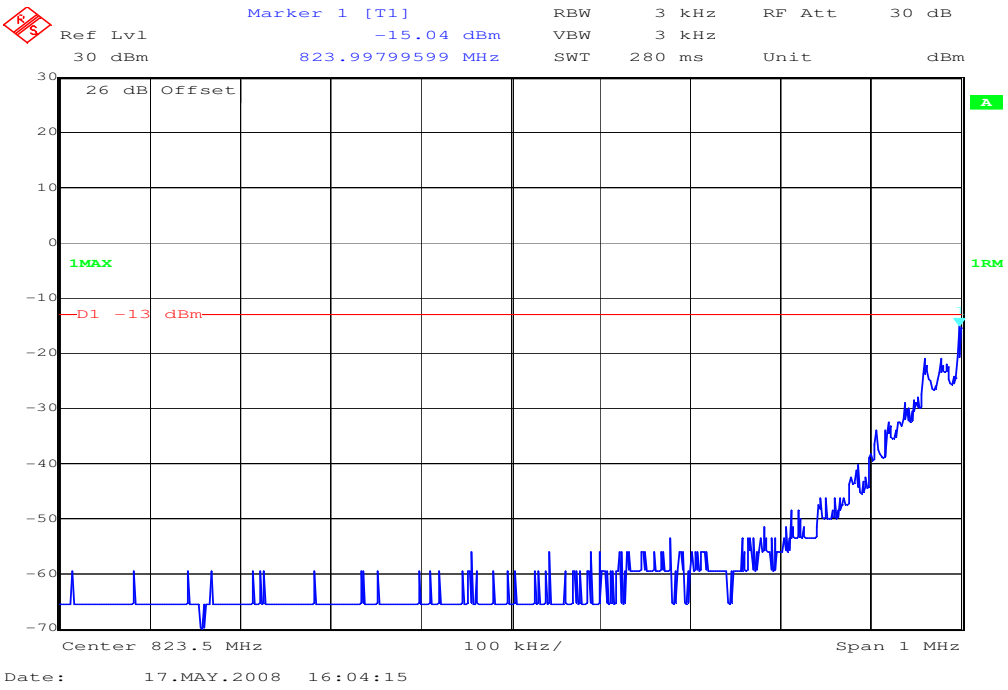
Reference

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

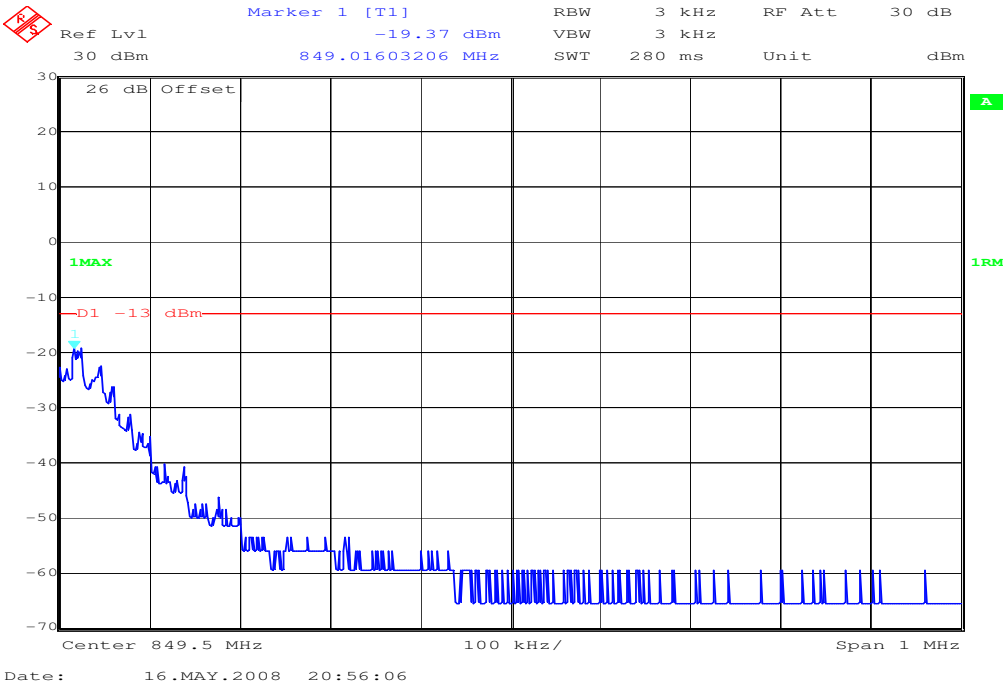
Measurement Limit:

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.

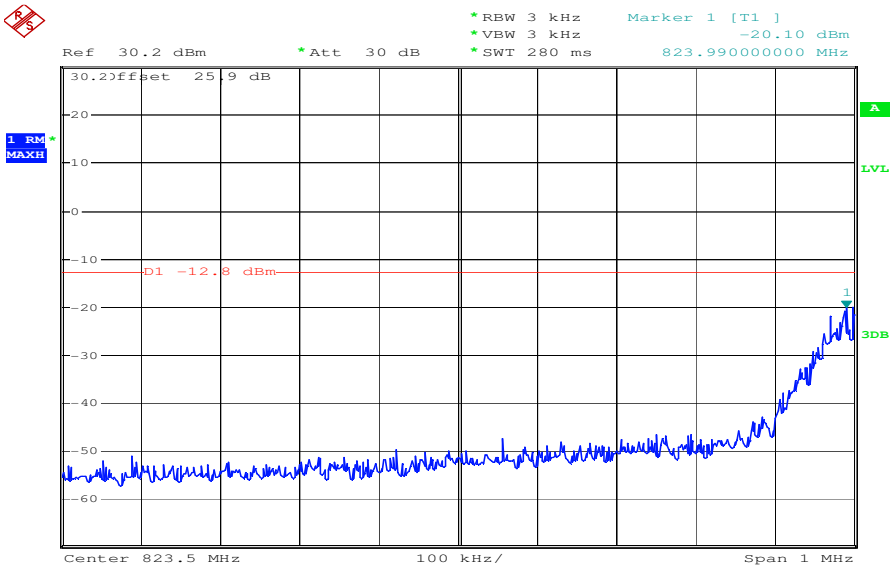
Plot 1: lower band edge (Channel 128)



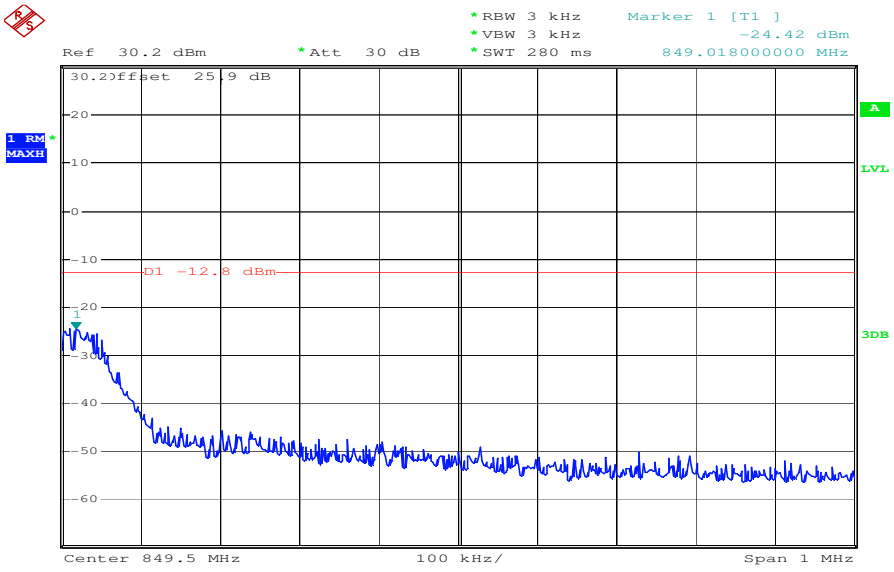
Plot 2: higher band edge (Channel 251)



Plot 3: lower band edge (Channel 128 EDGE)



Plot 4: higher band edge (Channel 251 EDGE)



5.1.7 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

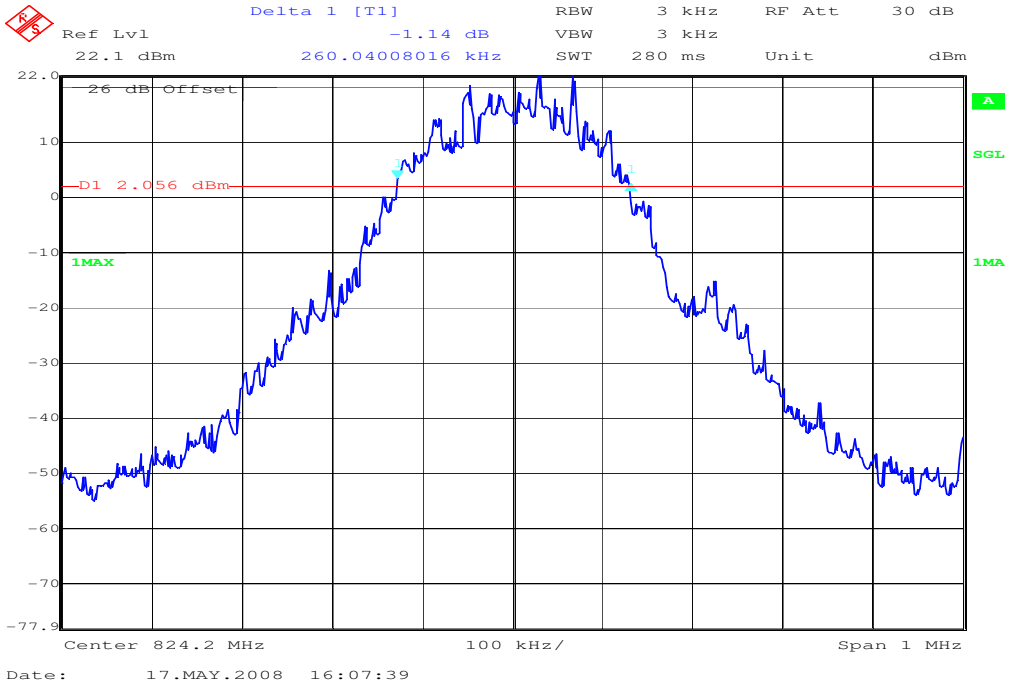
Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
824.2 MHz	260	298
836.4 MHz	286	321
848.8 MHz	260	294

EDGE mode

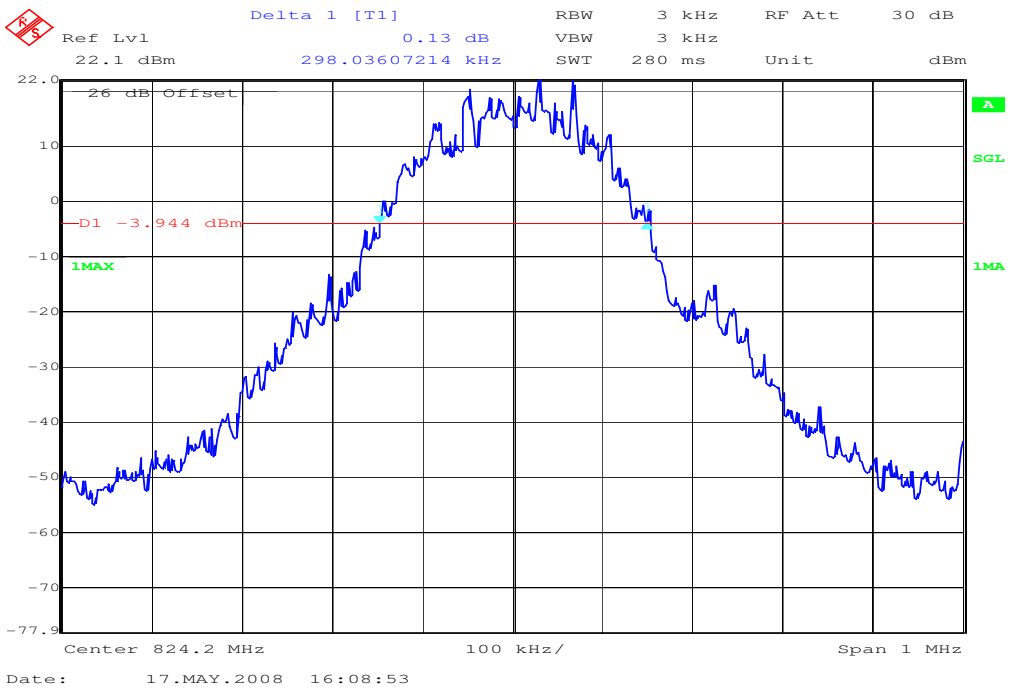
Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
824.2 MHz	280	316
836.4 MHz	282	314
848.8 MHz	288	308

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.

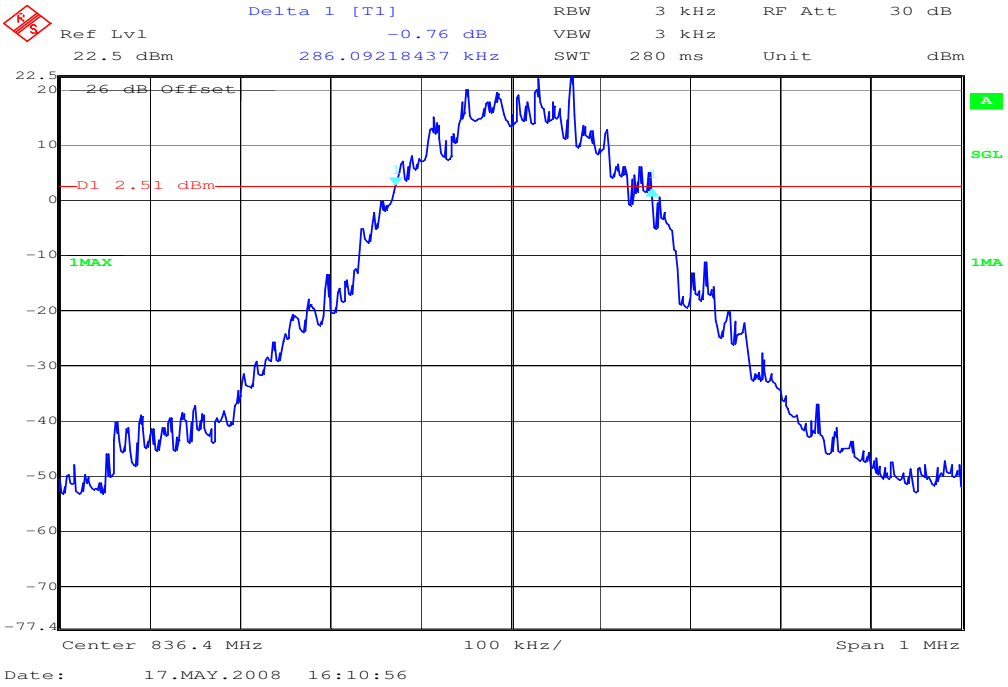
Channel 128
99% (-20 dB) Occupied Bandwidth



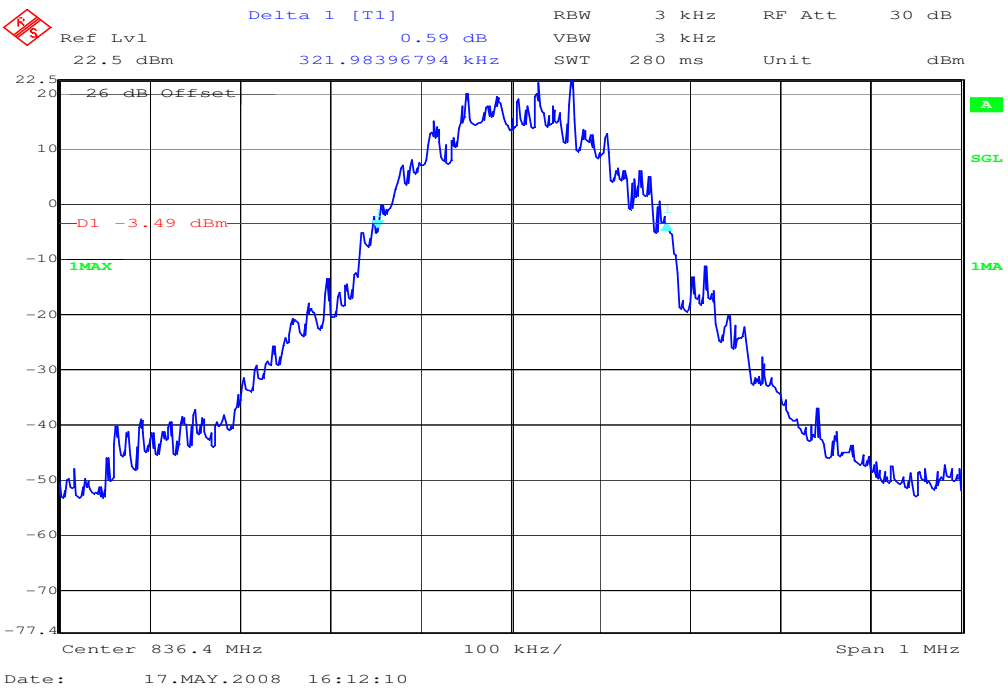
Channel 128
-26 dBc Bandwidth



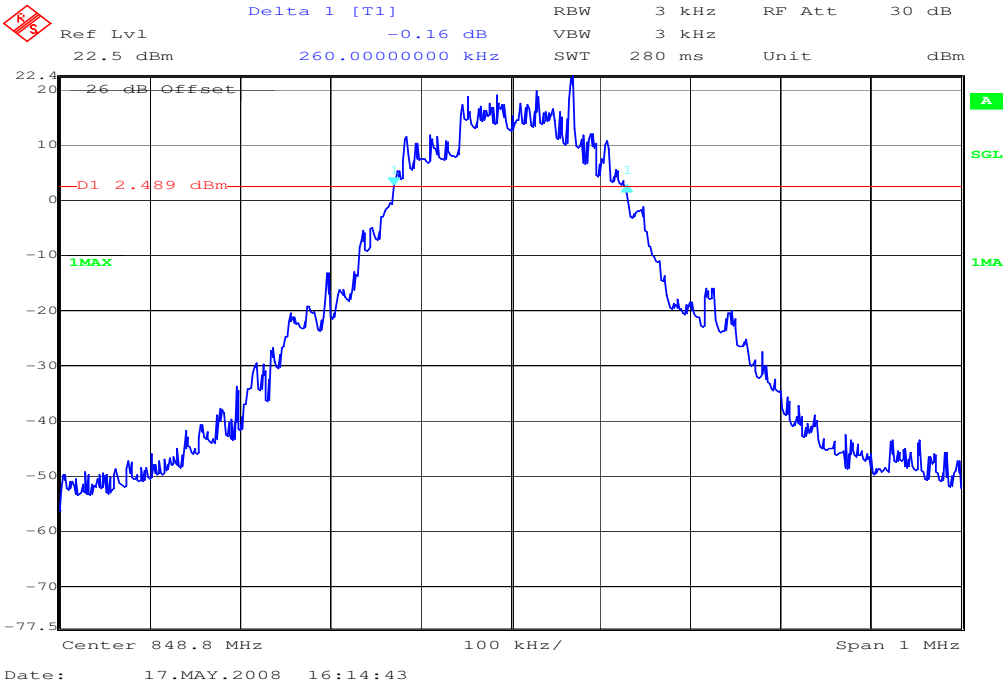
Channel 189
99% (-20 dB) Occupied Bandwidth



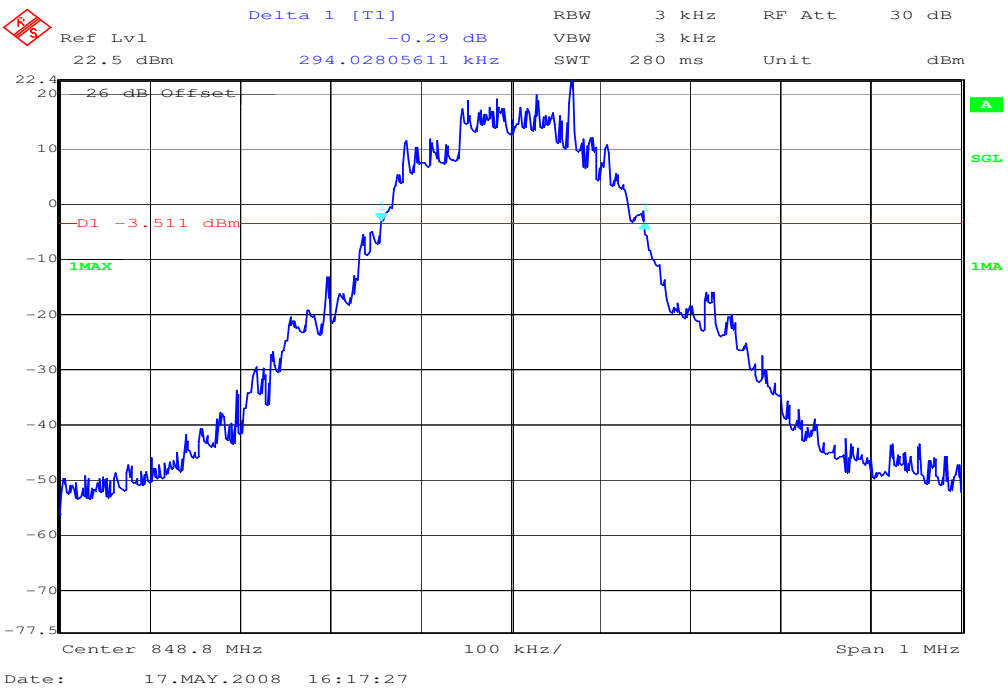
Channel 189
-26 dBc Bandwidth



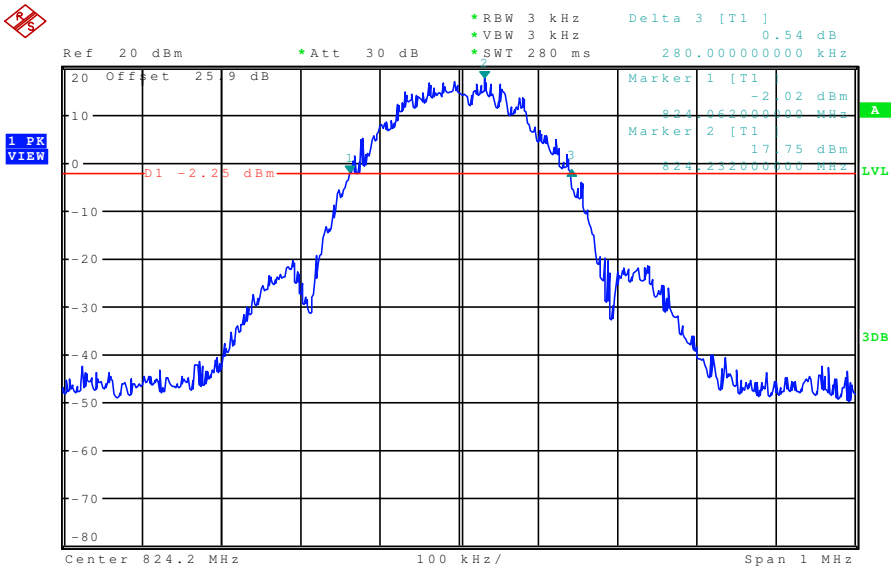
Channel 251
99% (-20 dB) Occupied Bandwidth



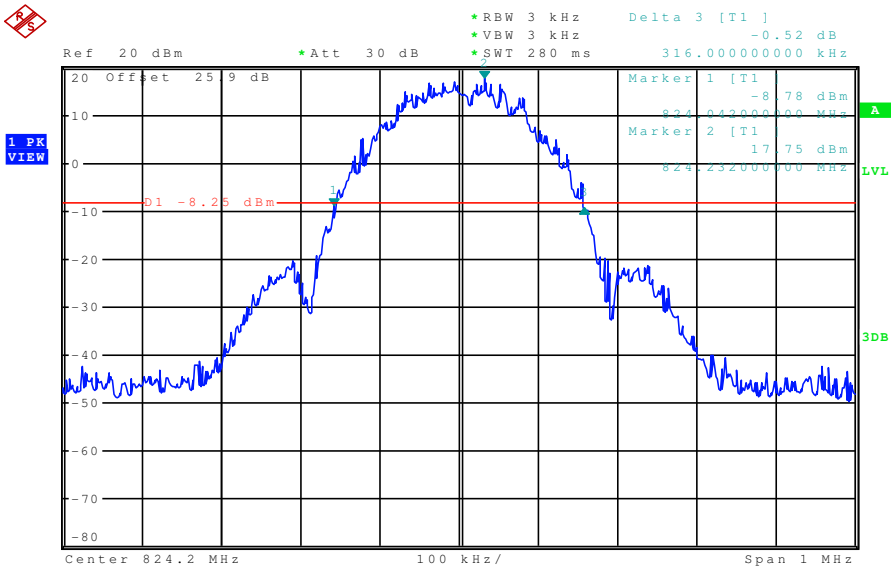
Channel 251
-26 dBc Bandwidth



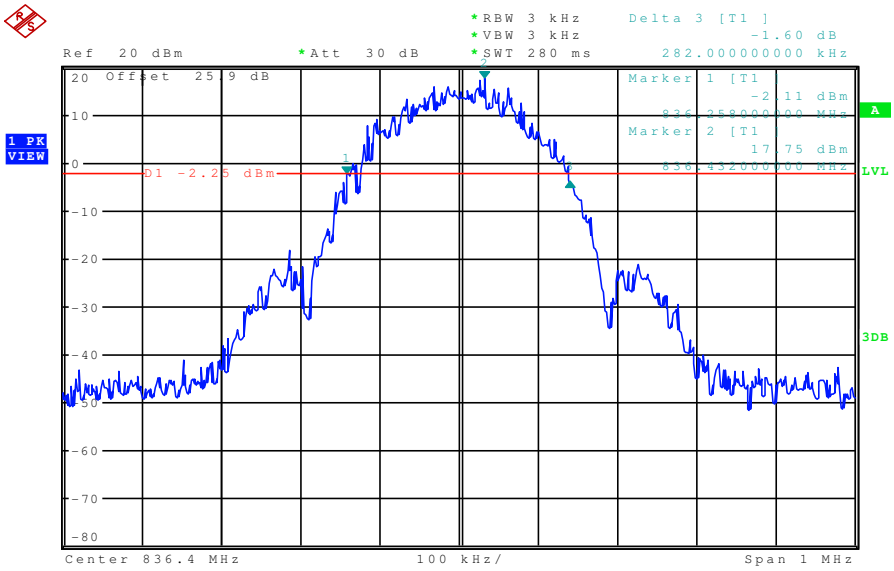
Channel 128 (EGPRS/EDGE)
99% (-20 dB) Occupied Bandwidth



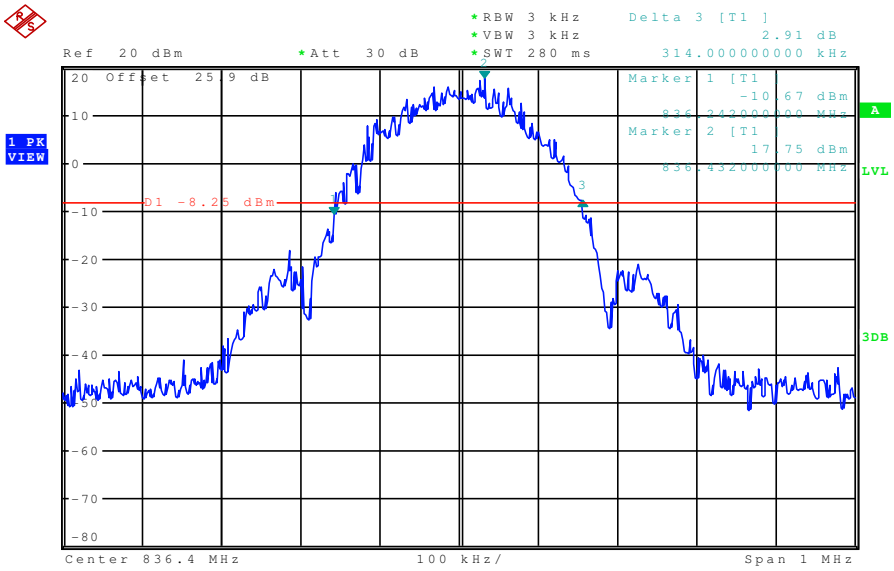
Channel 128 (EGPRS/EDGE)
-26 dBc Bandwidth



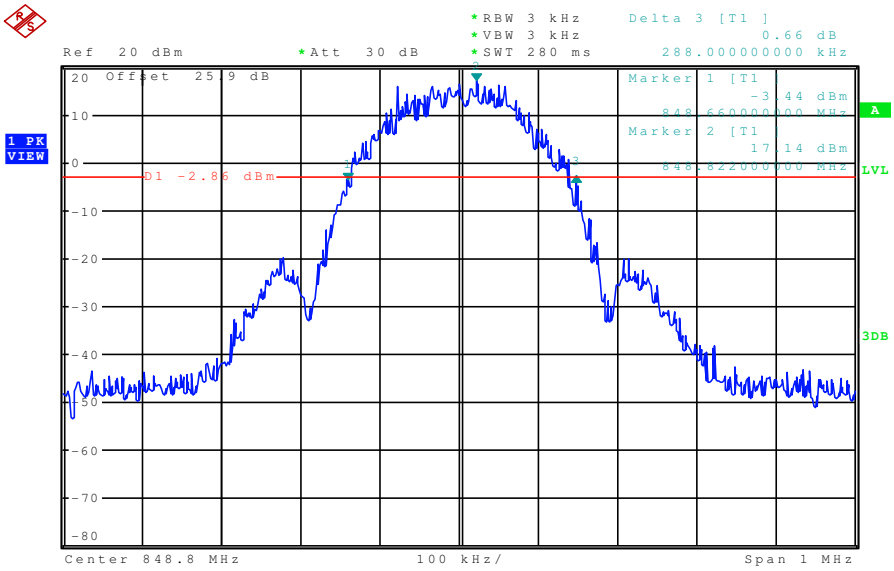
Channel 189 (EGPRS/EDGE)
99% (-20 dB) Occupied Bandwidth



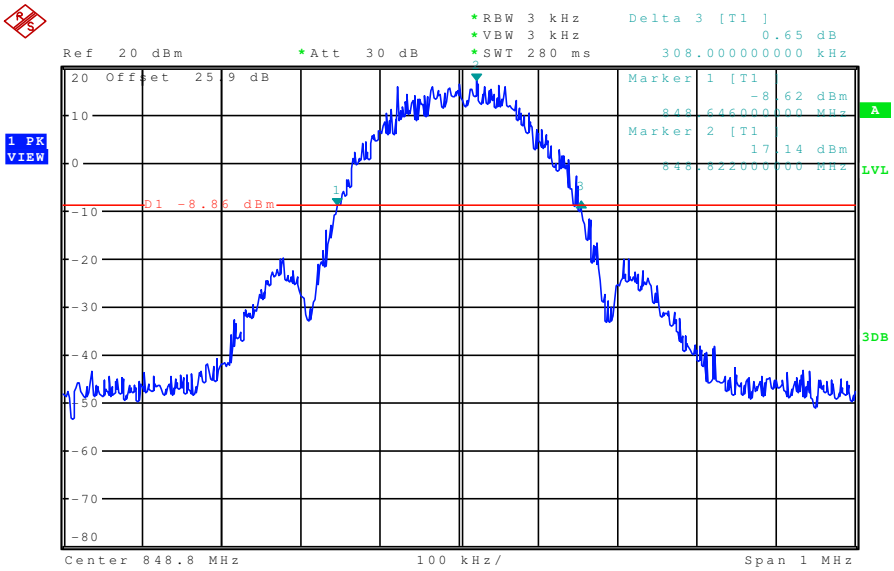
Channel 189 (EGPRS/EDGE)
-26 dBc Bandwidth



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



Channel 251 (EGPRS/EDGE)
-26 dBc Bandwidth



5.2 PART PCS 1900

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

Test Results: Output Power (conducted) GMSK Mode

Frequency (MHz)	**Peak Output Power (dBm)**	**Average Output Power (dBm)**
1850.2	30.3	30.2
1880.0	30.3	30.2
1909.8	30.2	30.1
Measurement uncertainty	±0.5 dB	

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

Frequency (MHz)	**Peak Output Power (dBm)**	**Average Output Power (dBm)**
1850.2	29.0	25.8
1880.0	29.3	26.0
1909.8	29.4	26.0
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)	**Burst Peak EIRP (dBm)**
1850.2	31.02
1880.0	30.74
1909.8	29.43
Measurement uncertainty	±1.5 dB

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

Frequency (MHz)	**Burst Peak EIRP (dBm)**
1850.2	30.02
1880.0	29.84
1909.8	29.03
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.

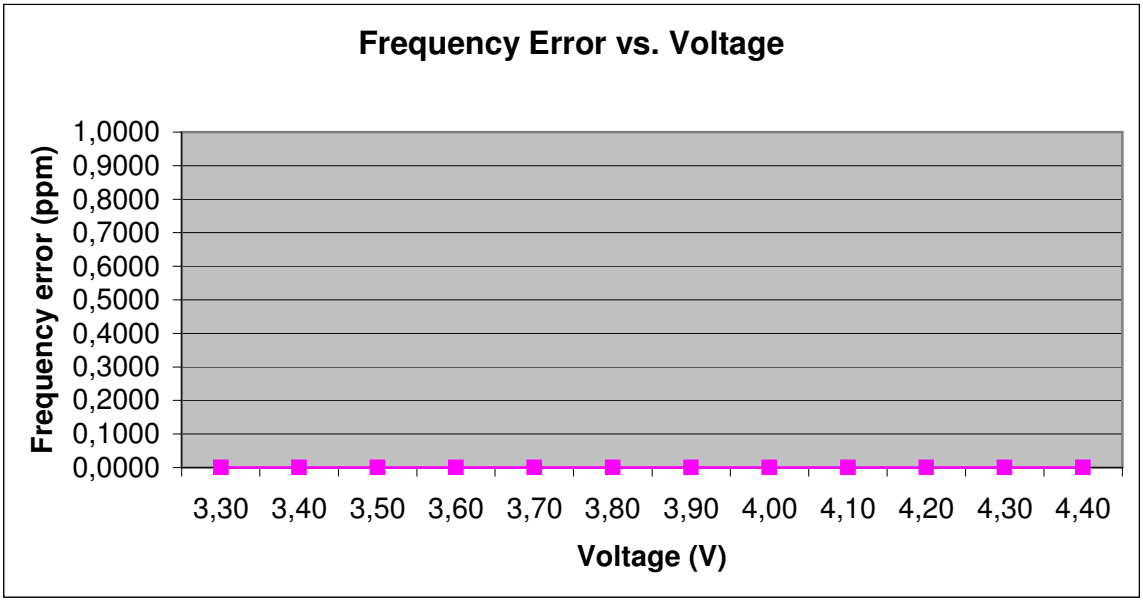
Test Results: AFC FREQ ERROR vs. VOLTAGE

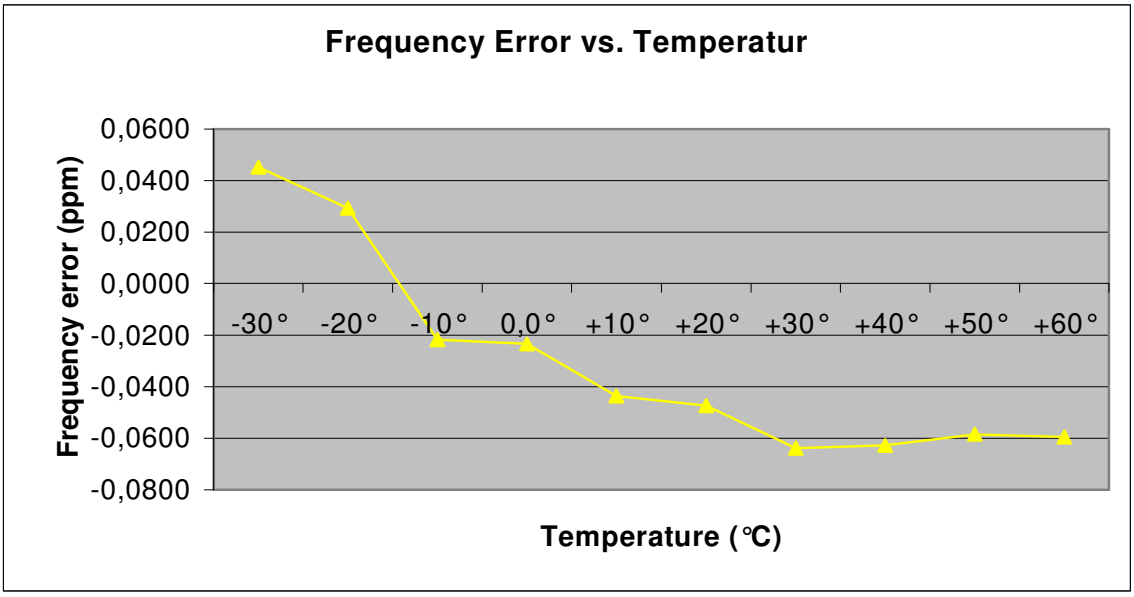
It is not possible to perform the AFC FREQ ERROR vs. VOLTAGE measurement, because the power supply is effected by the initialization board.

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	--	--	--
3.4	--	--	--
3.5	--	--	--
3.6	--	--	--
3.7	--	--	--
3.8	--	--	--
3.9	--	--	--
4.0	--	--	--
4.1	--	--	--
4.2	--	--	--
4.3	--	--	--
4.4	--	--	--

Test Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	+85	0,00000452	0,0452
-20	+55	0,00000293	0,0293
-10	-41	-0,00000218	-0,0218
±0.0	-44	-0,00000234	-0,0234
+10	-82	-0,00000436	-0,0436
+20	-89	-0,00000473	-0,0473
+30	-120	-0,00000638	-0,0638
+40	-118	-0,00000628	-0,0628
+50	-110	-0,00000585	-0,0585
+60	-112	-0,00000596	-0,0596


Frequency Error vs. Voltage
Frequency error (ppm)
1,0000
0,9000
0,8000
0,7000
0,6000
0,5000
0,4000
0,3000
0,2000
0,1000
0,0000
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)
0,0600
0,0400
0,0200
0,0000
-0,0200
-0,0400
-0,0600
-0,0800
-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.
As can be seen from this data, the emissions from the test item were within the specification limit.

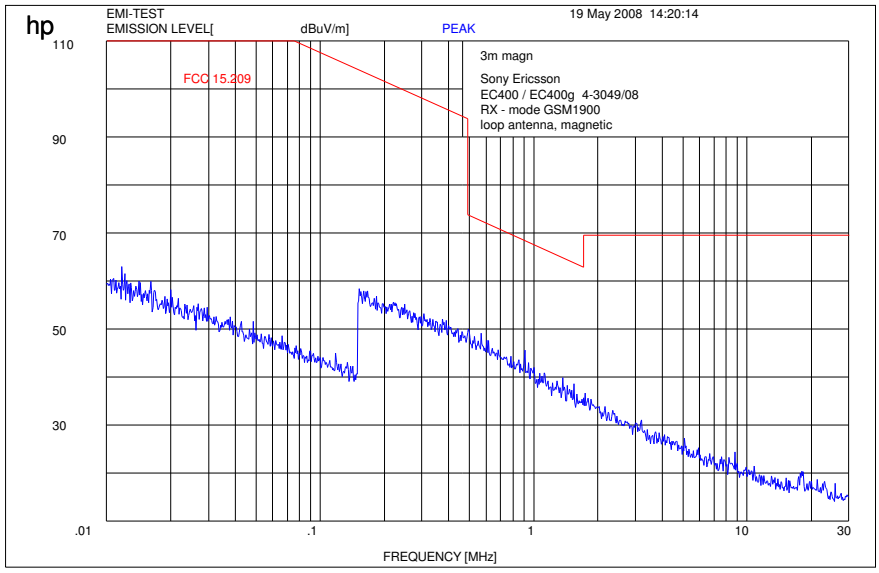
Harmonic	**Tx ch.-512 Freq. (MHz)**	**Level (dBm)**	**Tx ch.-661 Freq. (MHz)**	**Level (dBm)**	**Tx ch.-810 Freq. (MHz)**	**Level (dBm)**
2	3700.4	**-**	3760	**-**	3819.6	**-**
3	5550.6	-	5640	-	5729.4	-
4	7400.8	-	7520	-	7639.2	-
5	9251.0	-	9400	-	9549.0	-
6	11101.2	-	11280	-	11458.8	-
7	12951.4	-	13160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

Sample calculation:

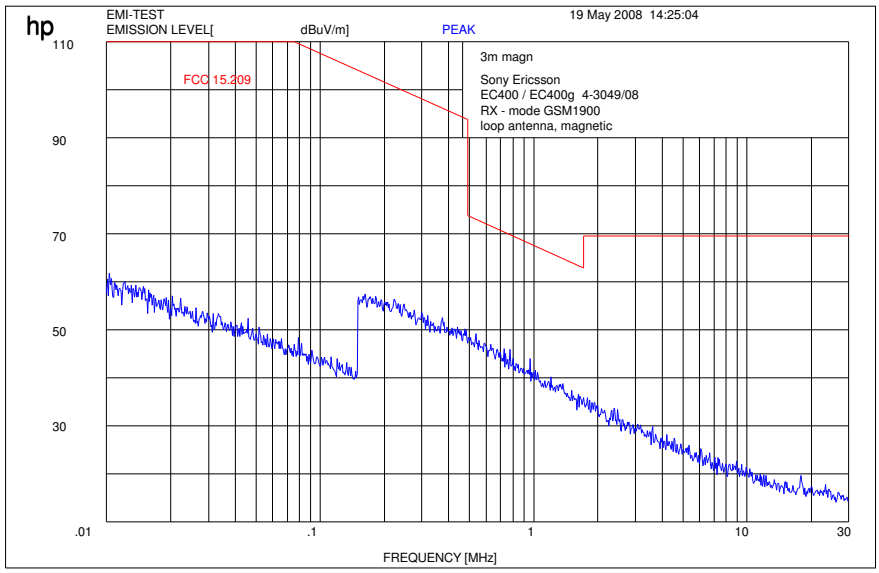
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBi	dB	dBm			
1909.8	132.3	24.6	8.4	0.0	3.3	29.7			

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

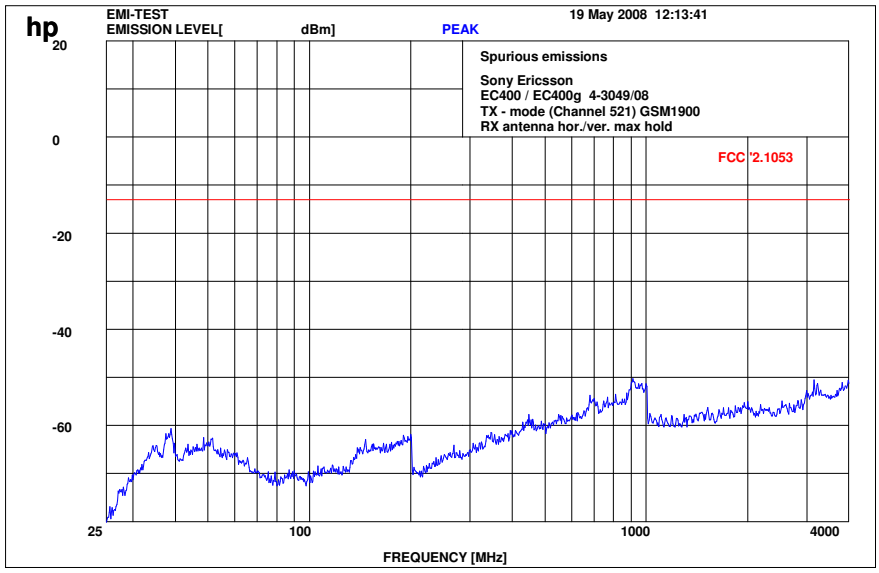
Traffic mode up to 30 MHz (Valid for all 3 channels)



Receiver mode up to 30 MHz



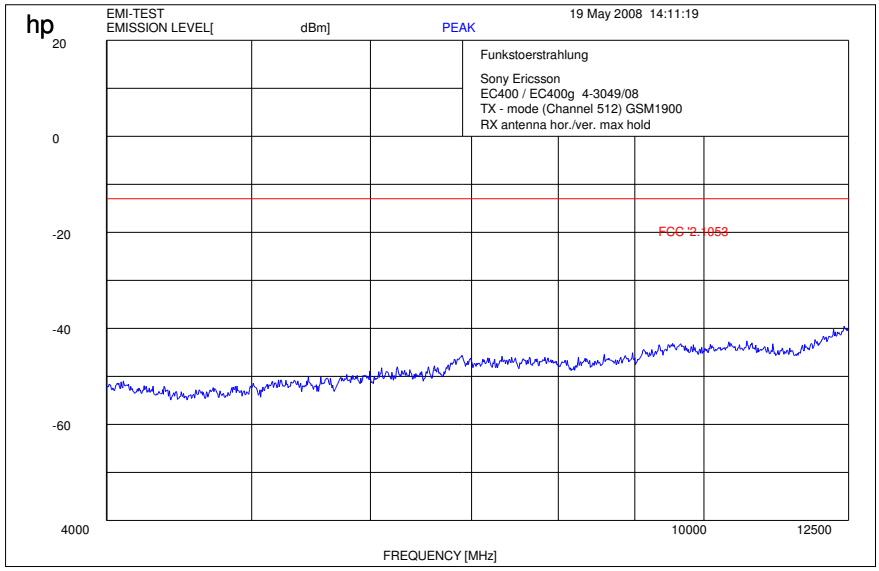
Channel 512 (30 MHz - 4 GHz)



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

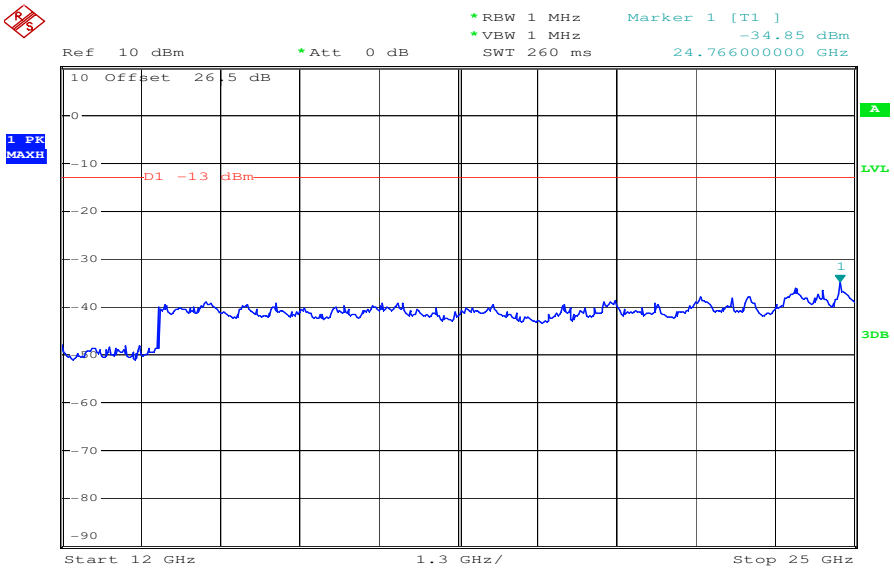
Carrier suppressed with a rejection filter

Channel 512 (4 GHz – 12.5 GHz)



f ≥ 4GHz: RBW / VBW: 1 MHz

Channel 512 (12 GHz - 25 GHz) valid for all 3 channels



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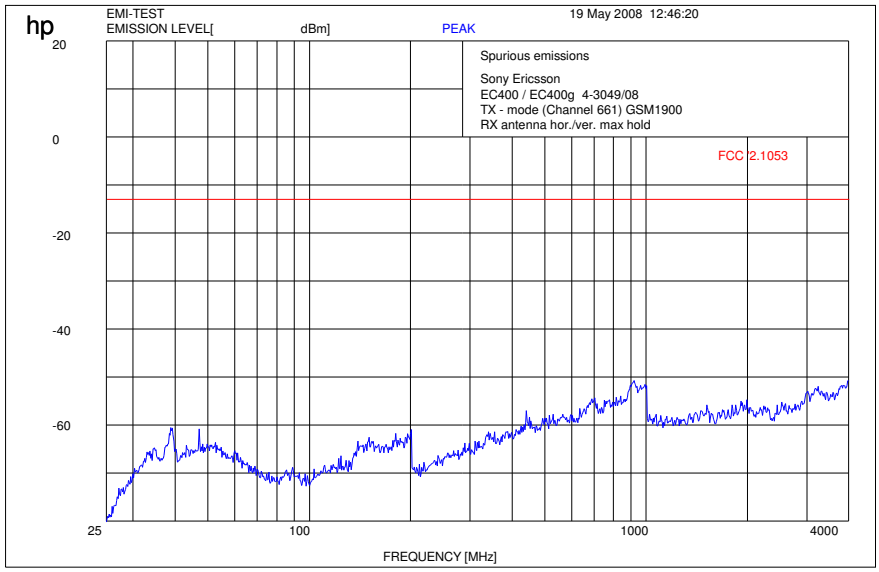
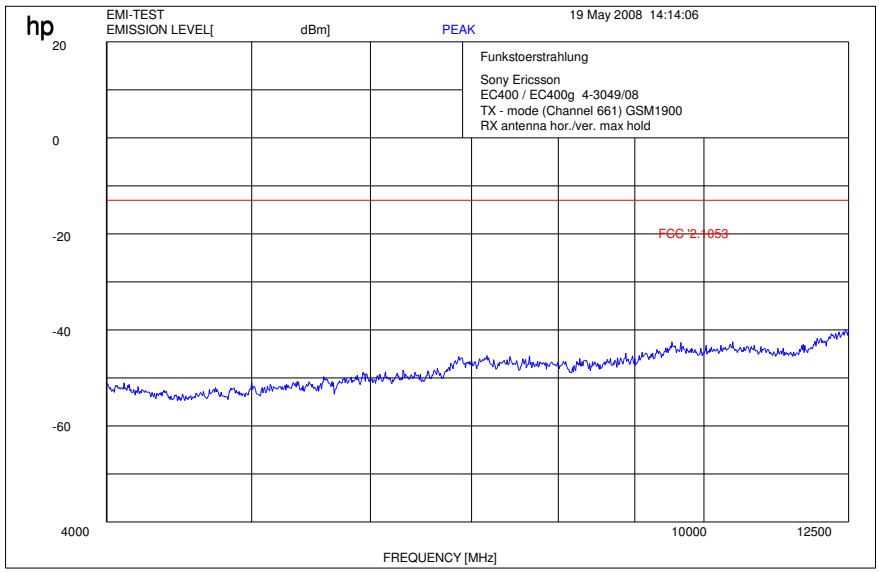
Channel 661 (30 MHz - 4 GHz)



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

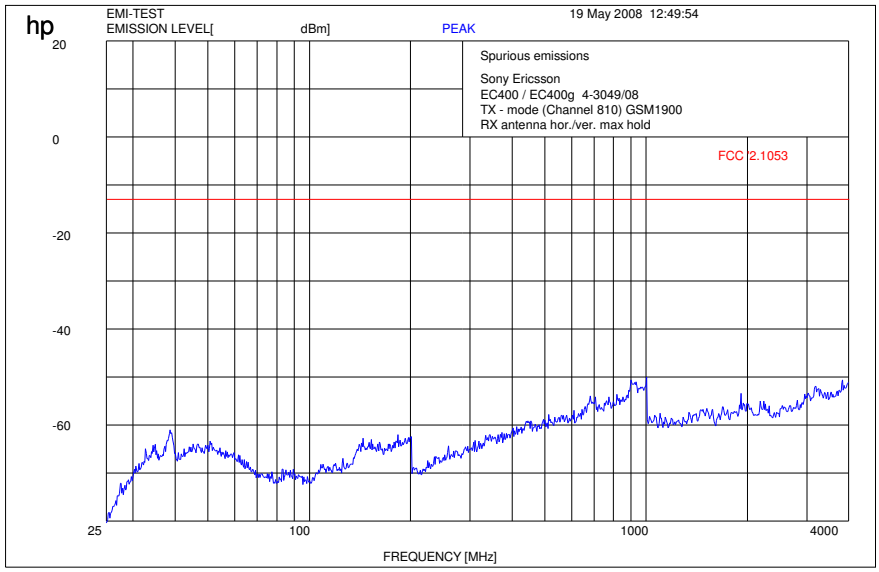
Carrier suppressed with a rejection filter

Channel 661 (4 GHz – 12.5 GHz)



f ≥ 4GHz: RBW / VBW: 1 MHz

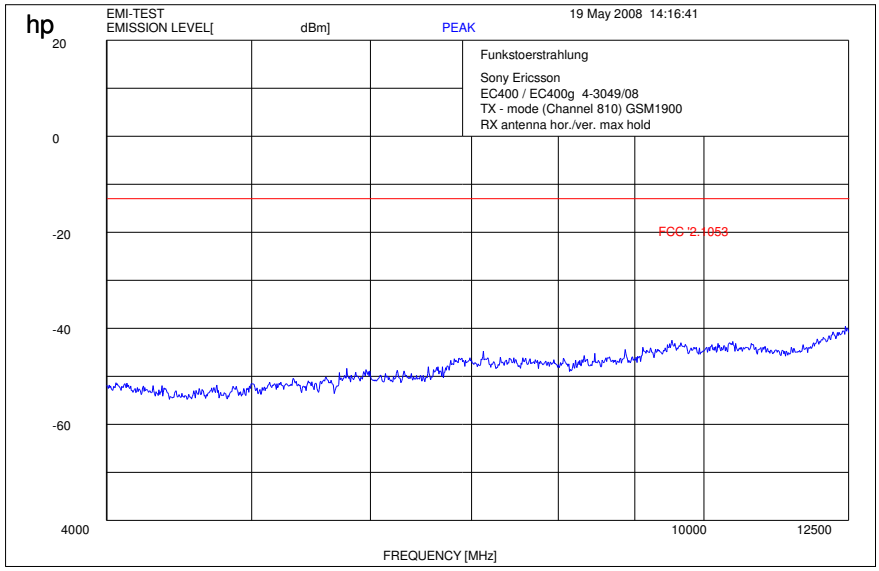
Channel 810 (30 MHz - 4 GHz)



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

Carrier suppressed with a rejection filter

Channel 810 (4 GHz – 12.5 GHz)



f ≥ 4GHz: RBW / VBW: 1 MHz

5.2.4 Receiver Radiated Emissions

Reference

FCC:	CFR Part 15.109, 2.1053
IC:	RSS 133, Issue 4, Section 4.5

Measurement Results

SPURIOUS EMISSIONS LEVEL (µV/m)								
Idle mode								
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz
H = Horizontal; V= Vertical

For measurement distance see table below

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)

Information

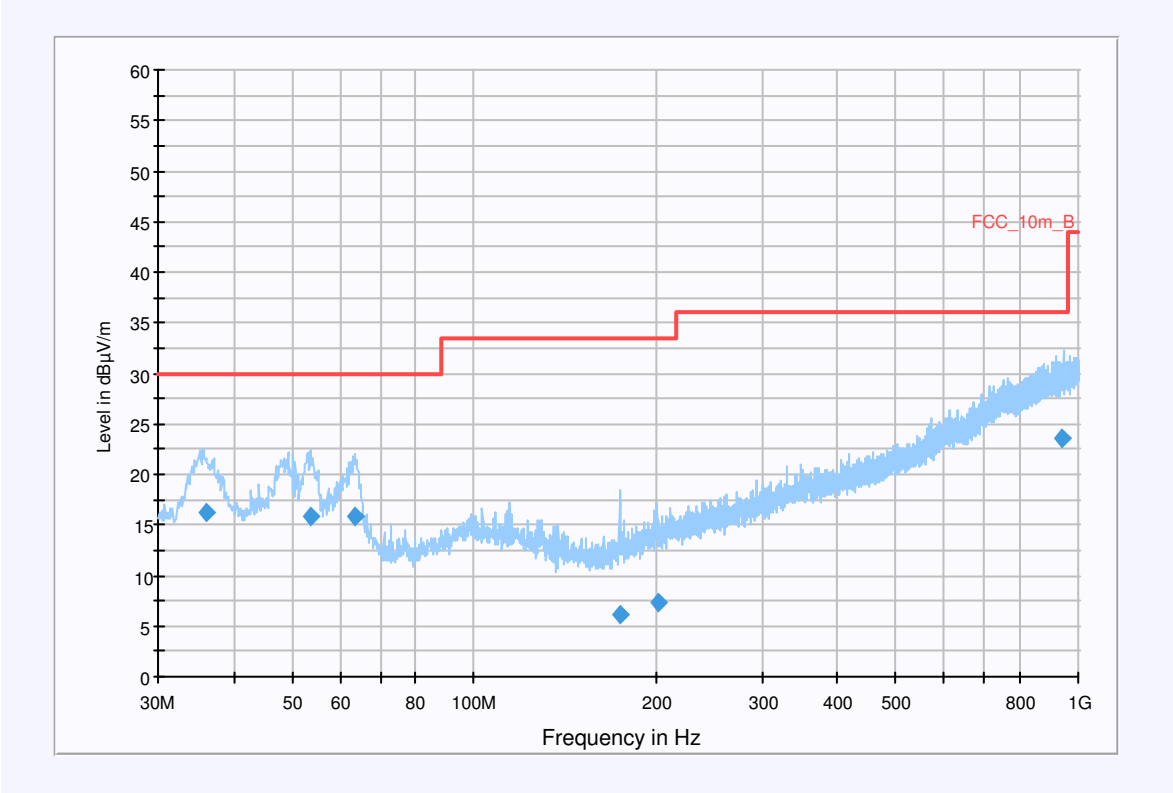
EUT:	EC400g
Serial Number:	BDX0002NL0 (IMEI: 064401071829960)
Test Description:	FCC part 15 class B @ 10 m
Operating Conditions:	idle GSM 1900
Operator Name:	Hennemann
Comment:	- / -

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	EMI radiated\Electric Field (NOS)
Level Unit:	dBµV/m

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

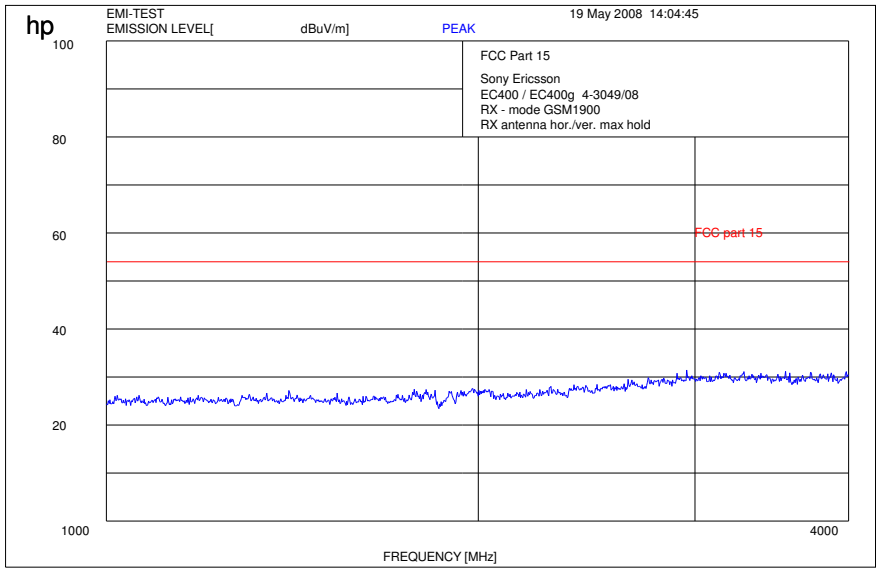
FCC_1GHz



Final Measurement Detector 1

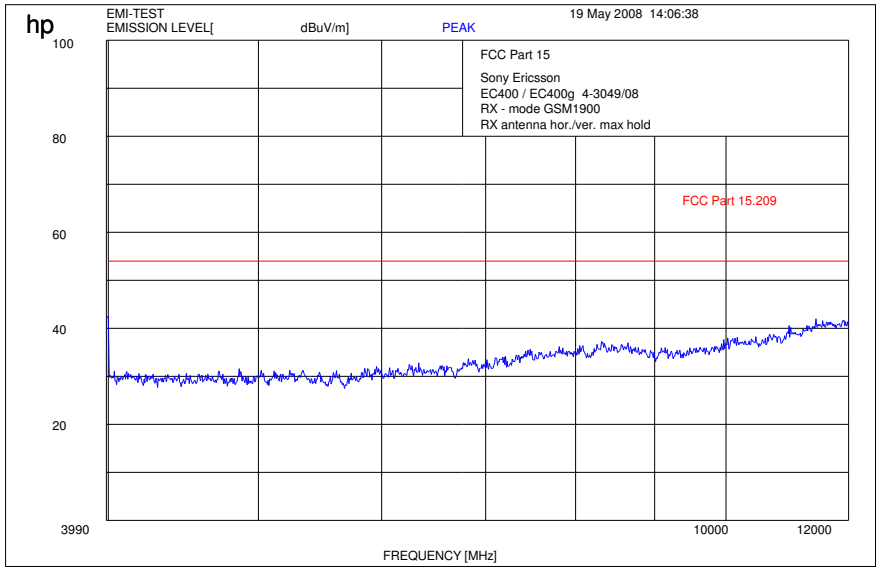
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
36.101650	16.2	1000.000	120.000	120.0	V	139.0	13.3	13.8	30.0	
53.667800	15.8	1000.000	120.000	120.0	V	218.0	13.3	14.2	30.0	
63.551400	15.9	1000.000	120.000	120.0	V	153.0	11.1	14.1	30.0	
...	...	...	...	...	...	...	...	...	...	...

Idle Mode (1 MHz - 4 GHz)



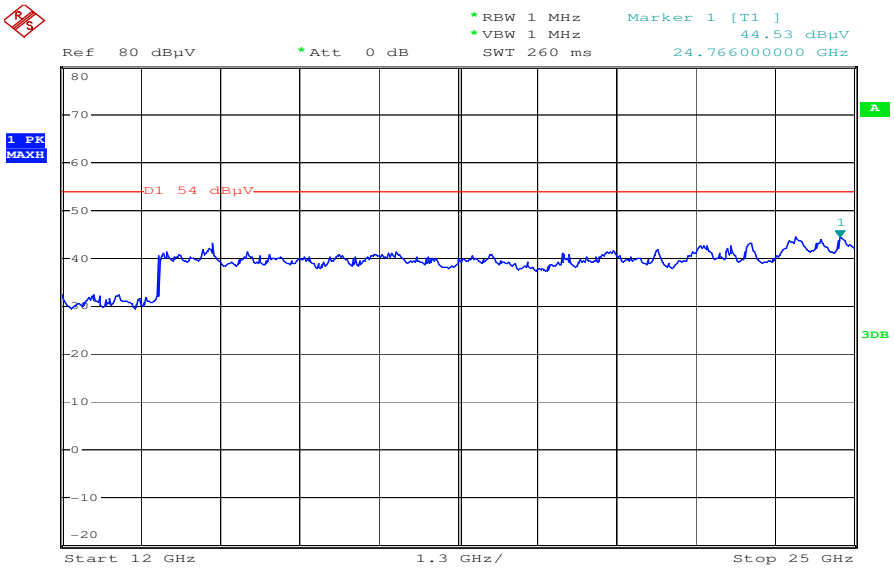
f < 1 GHz : RBW / VBW: 100 kHz f ≥ 1GHz : RBW / VBW: 1 MHz

Idle Mode (4 GHz – 12.0 GHz)



f ≥ 1GHz : RBW / VBW: 1 MHz

Idle Mode (12 GHz - 25 GHz)



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5.2.5 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.

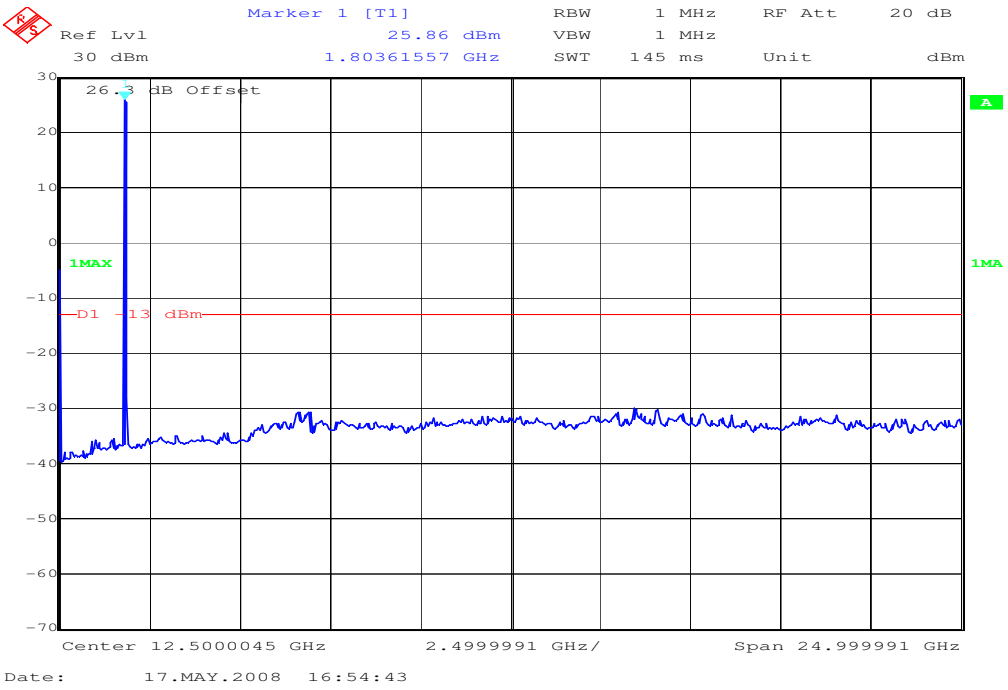
Measurement Results: GSM

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	-

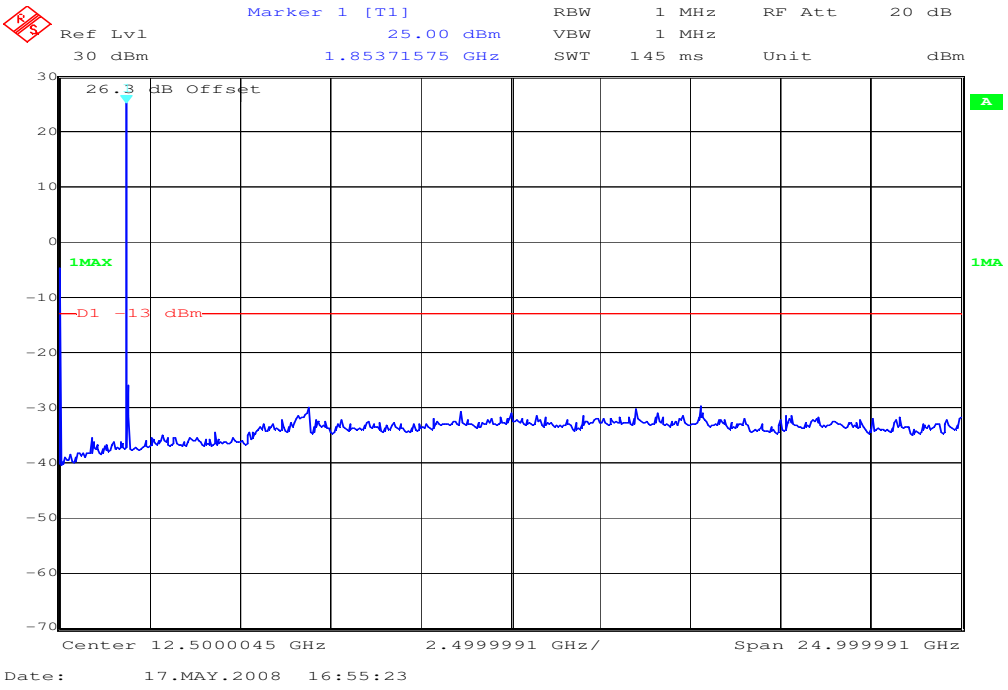
Measurement Results: EGPRS / EDGE

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	-

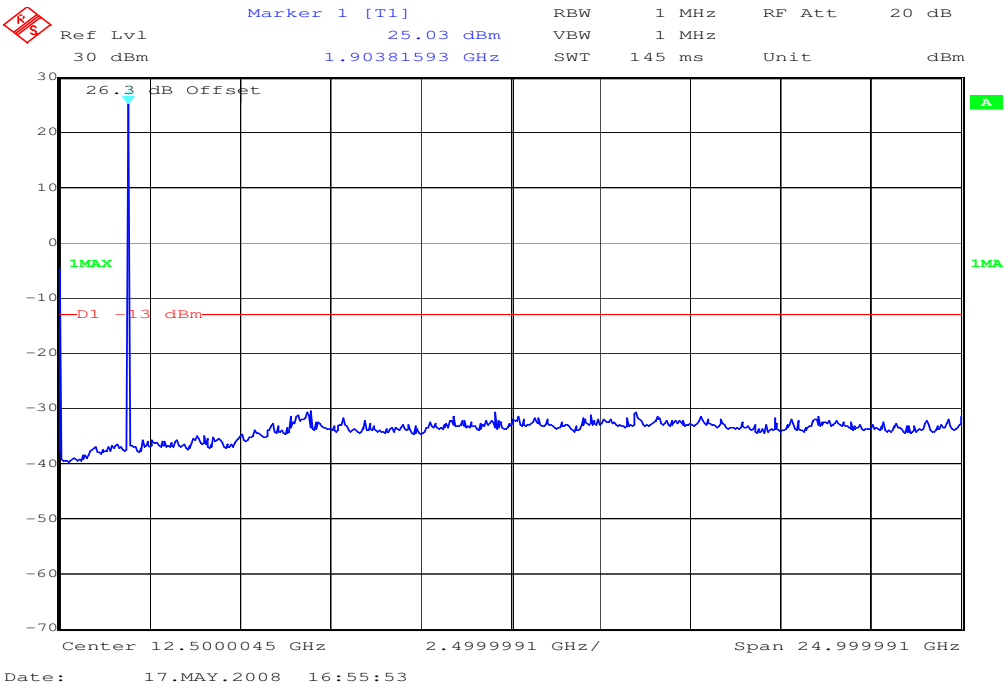
Plot 1: Channel 512 (GSM)



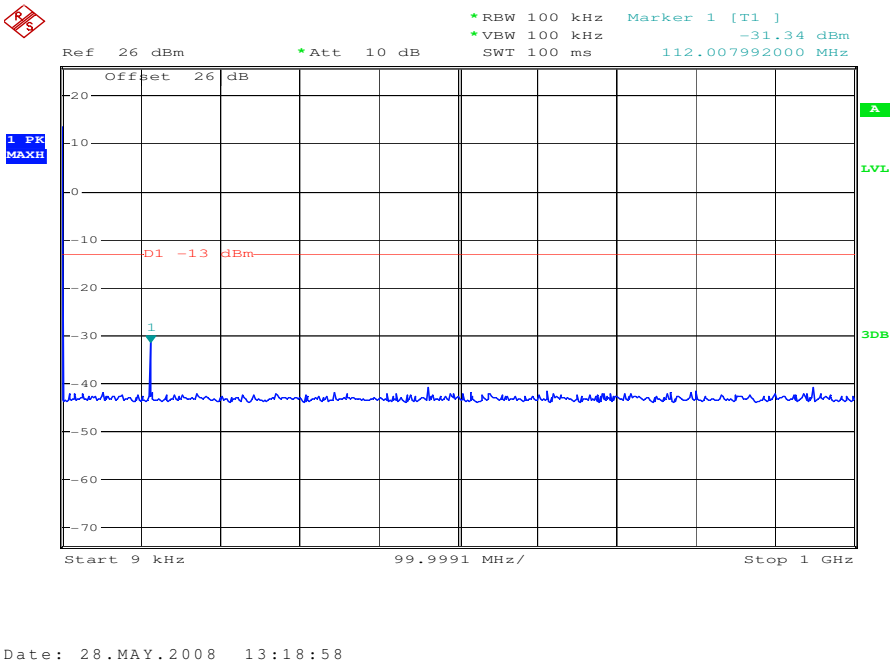
Plot 2: Channel 661 (GSM)



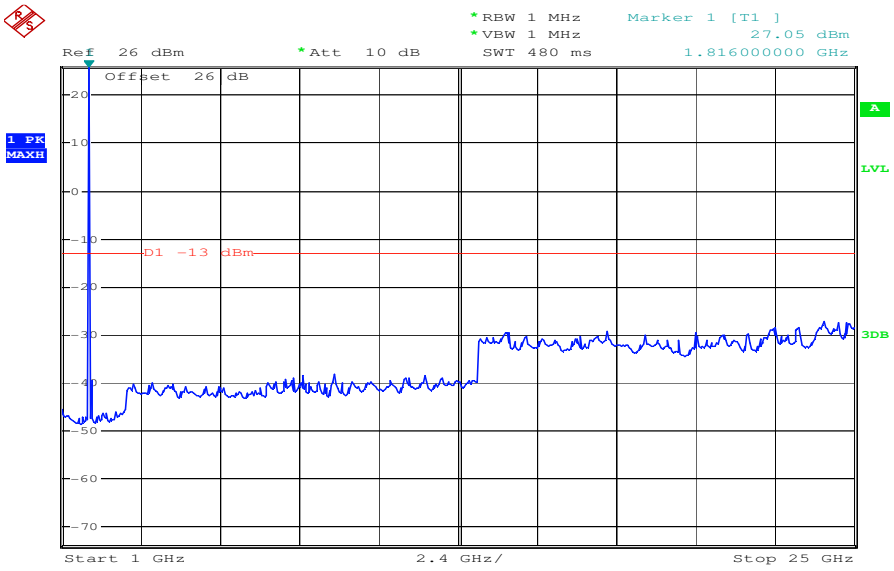
Plot 3: Channel 810 (GSM)



Plot 4: Channel 512 (EGPRS / EDGE)

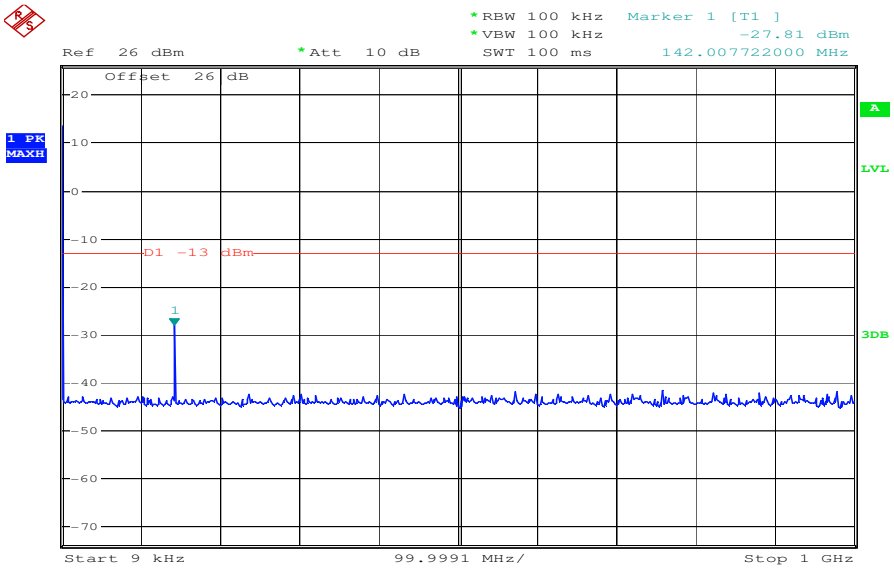


Plot 5: Channel 512 (EGPRS / EDGE)



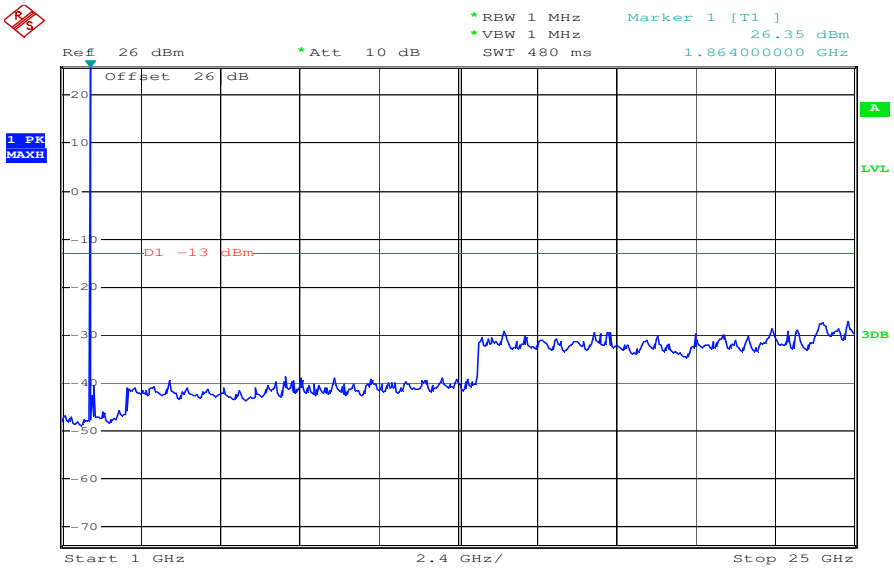
Date: 28.MAY.2008 13:24:43

Plot 6: Channel 661 (EGPRS / EDGE)



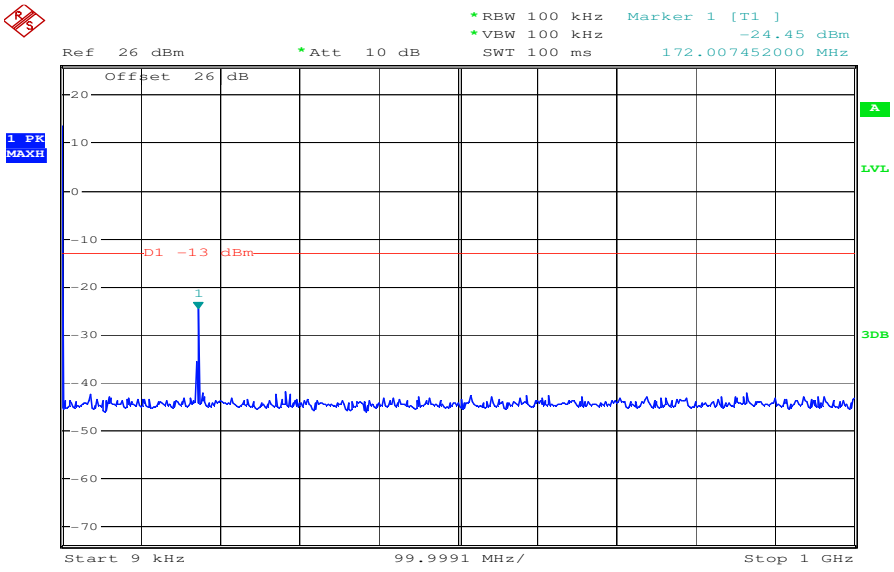
Date: 28.MAY.2008 13:19:35

Plot 7: Channel 661 (EGPRS / EDGE)



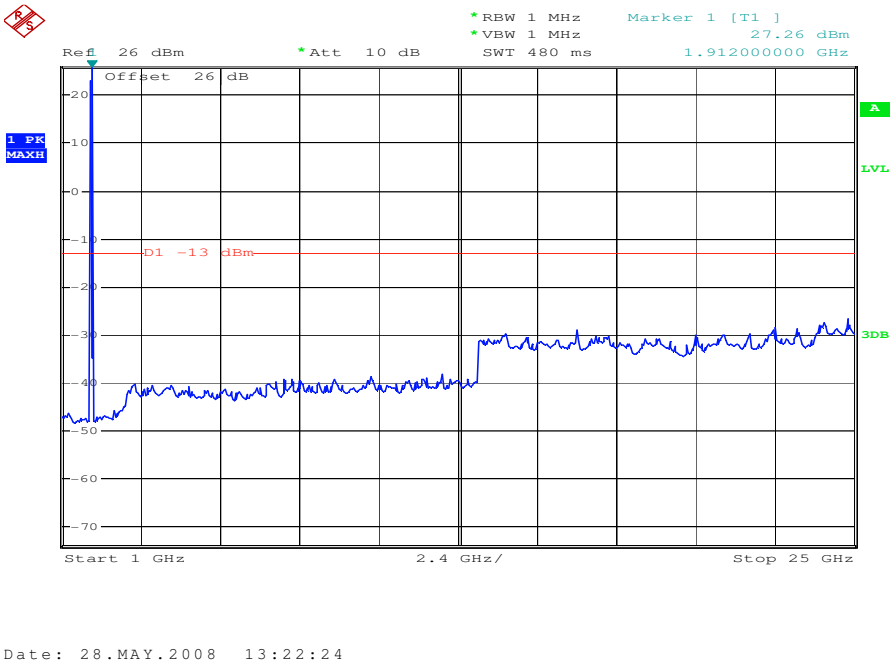
Date: 28.MAY.2008 13:23:47

Plot 8: Channel 810 (EGPRS / EDGE)



Date: 28.MAY.2008 13:20:56

Plot 9: Channel 810 (EGPRS / EDGE)



5.2.6 Block Edge Compliance

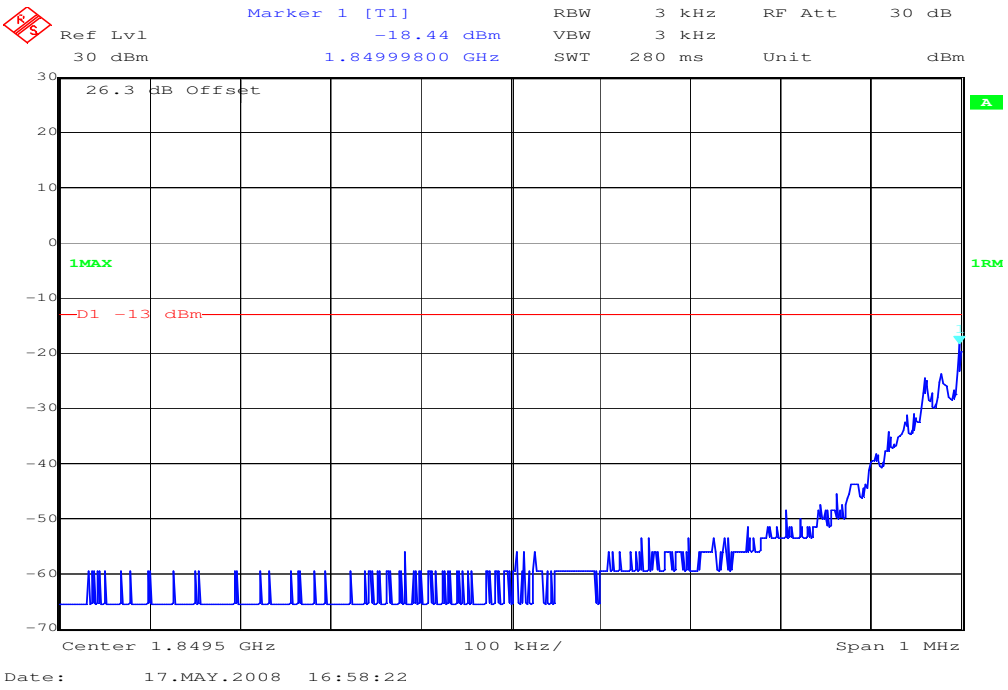
Reference

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

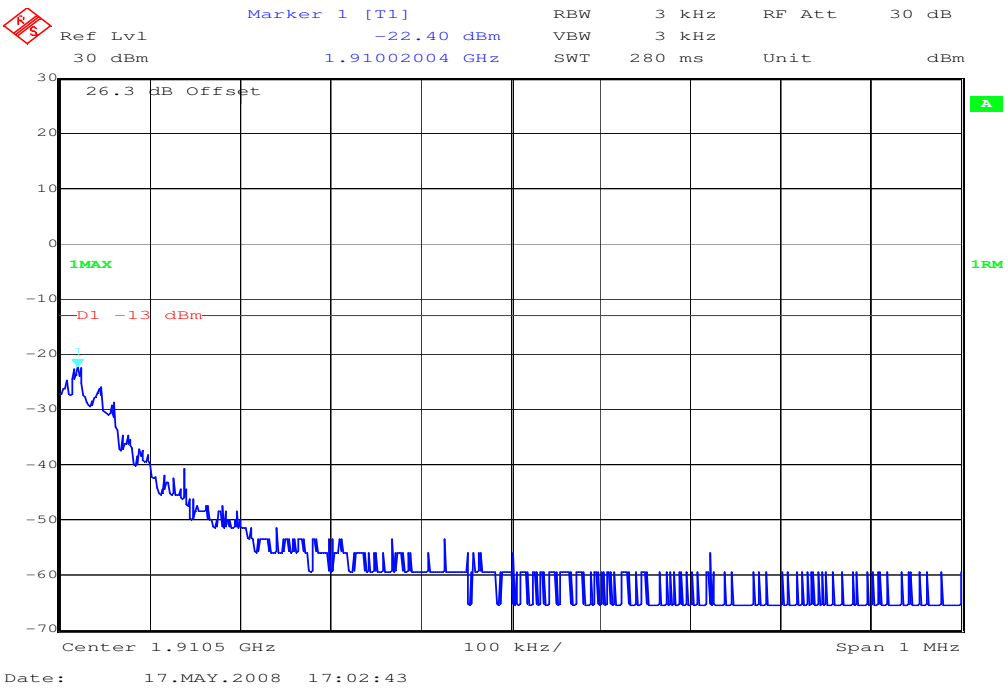
Measurement Limit:

(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.

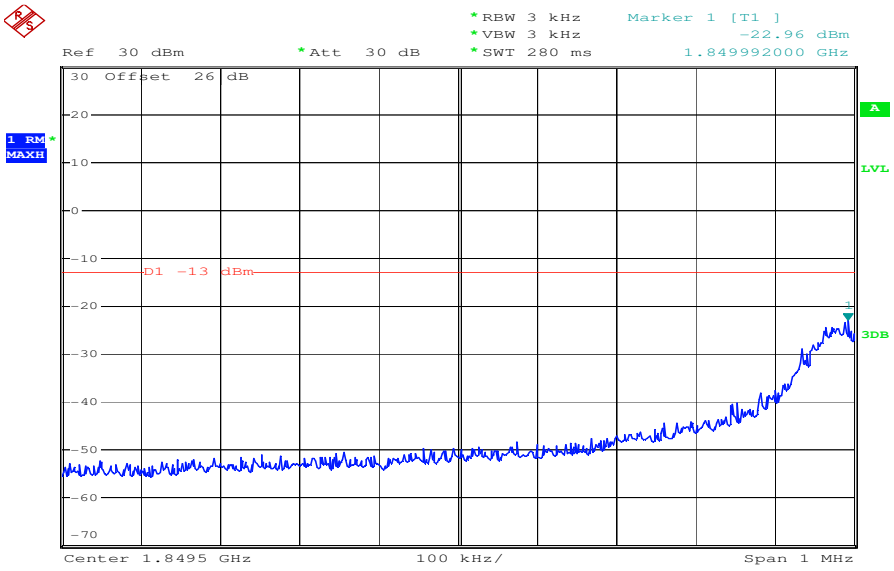
Plot 1: lower band edge (Channel 512)



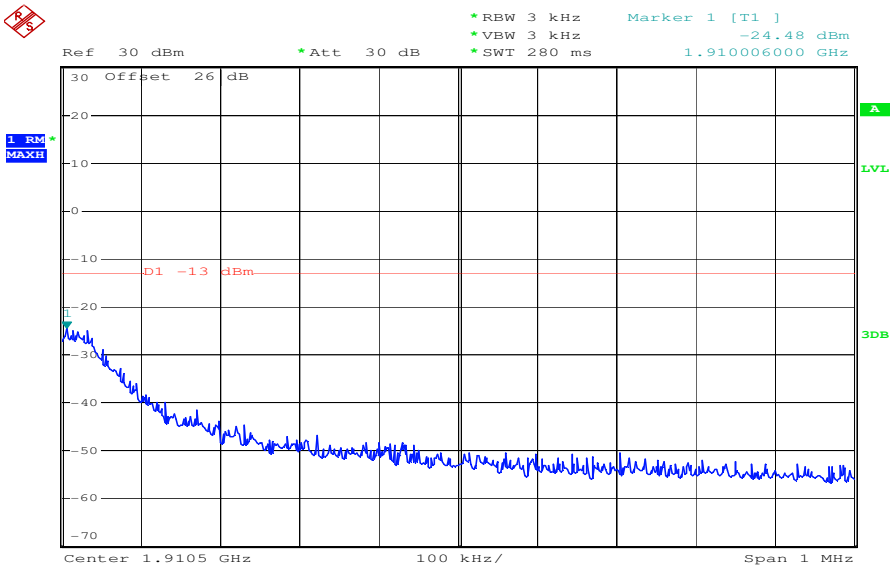
Plot 2: higher band edge (Channel 810)



Plot 3: lower band edge (Channel 512 EDGE)



Plot 4: higher band edge (Channel 810 EDGE)



5.2.7 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

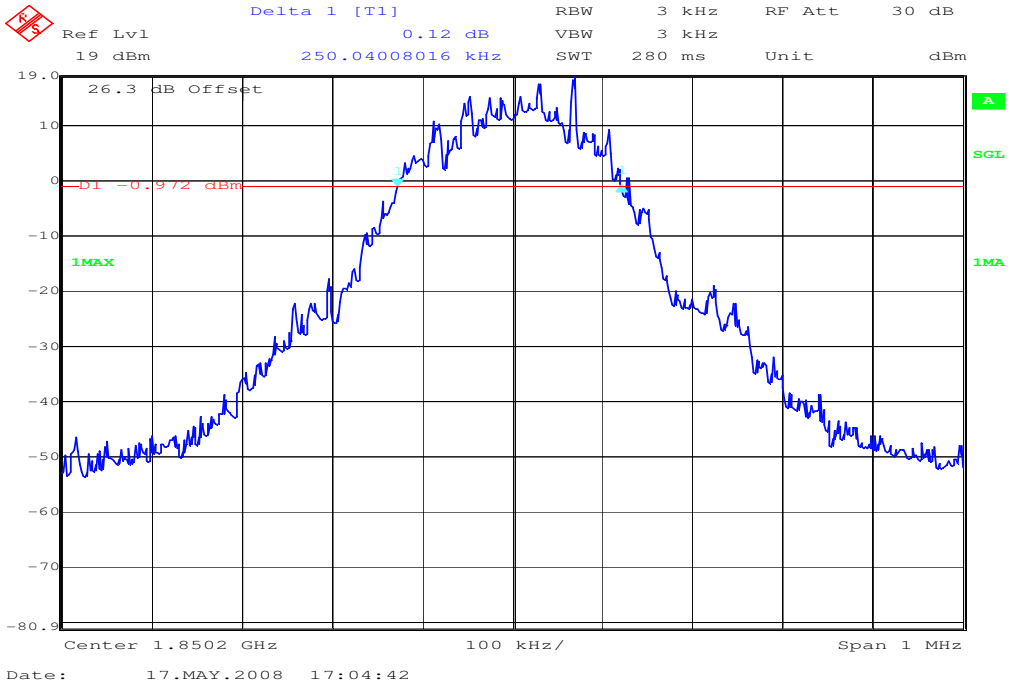
Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1850.2 MHz	250	300
1880.0 MHz	260	290
1909.8 MHz	270	300

EDGE mode

Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1850.2 MHz	282	312
1880.0 MHz	276	308
1909.8 MHz	282	310

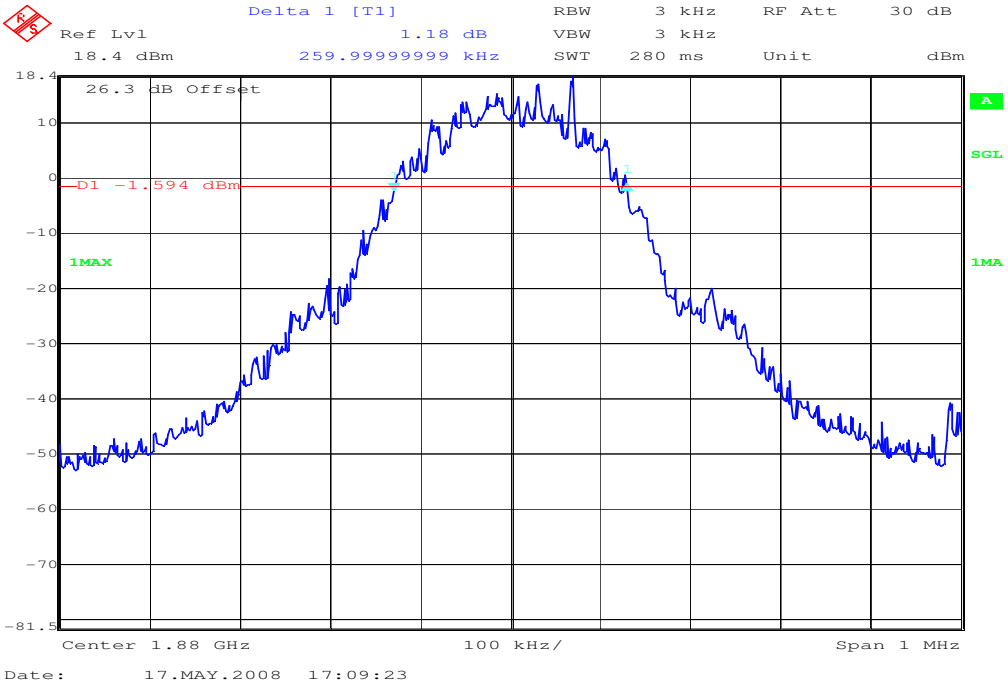
Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 300.0 kHz, this equates to a resolution bandwidth of at least 3.0 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

Channel 512
99% (-20 dB) Occupied Bandwidth

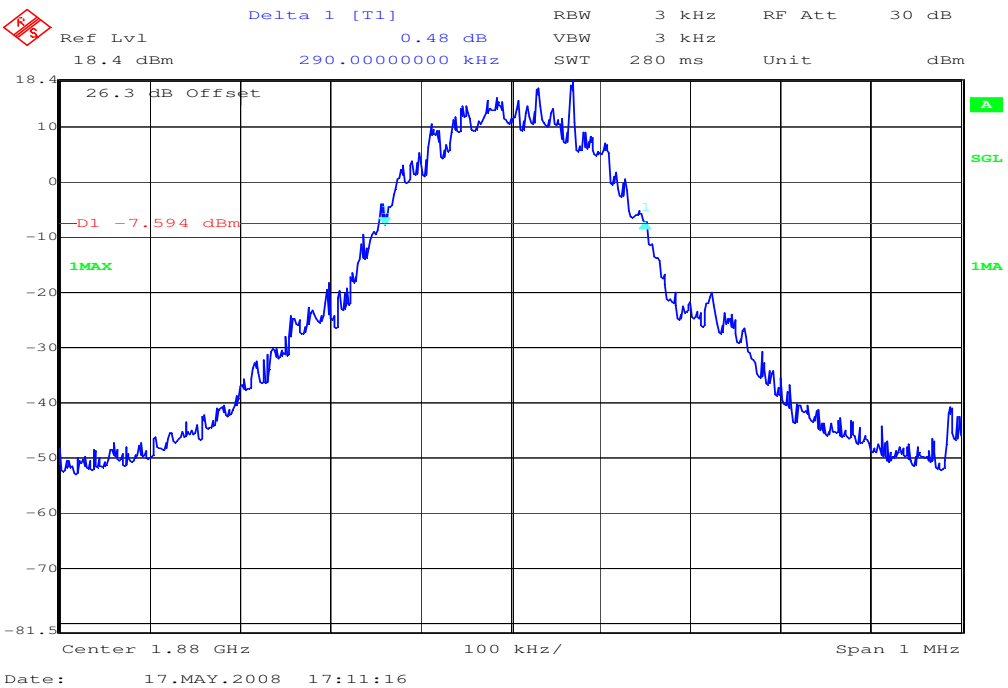


Channel 512
-26 dBc Bandwidth

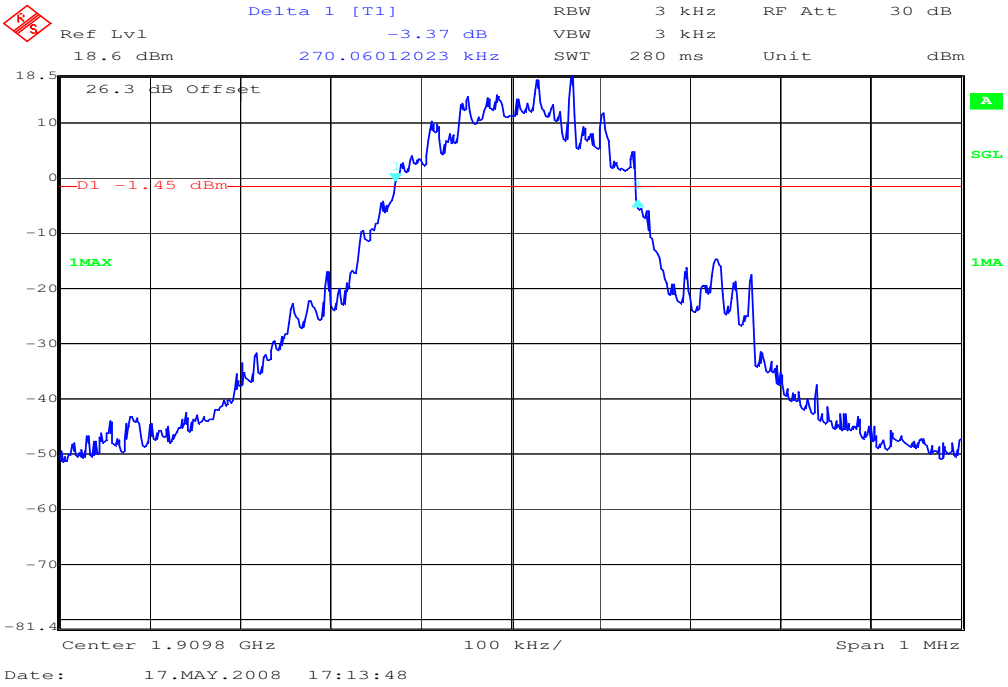
Channel 661
99% (-20 dB) Occupied Bandwidth



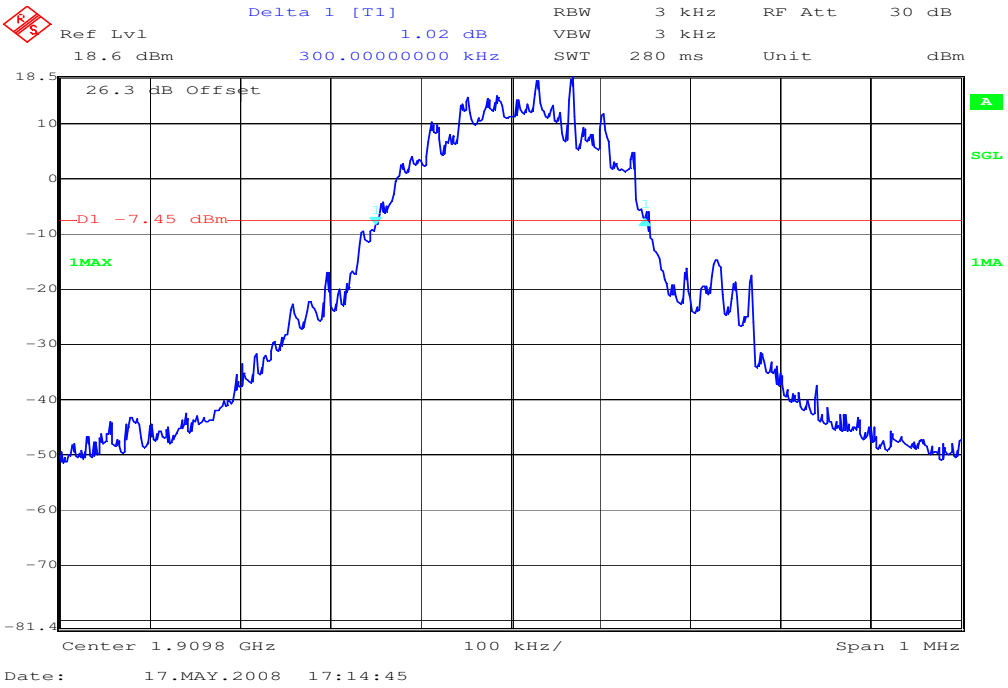
Channel 661
-26 dBc Bandwidth



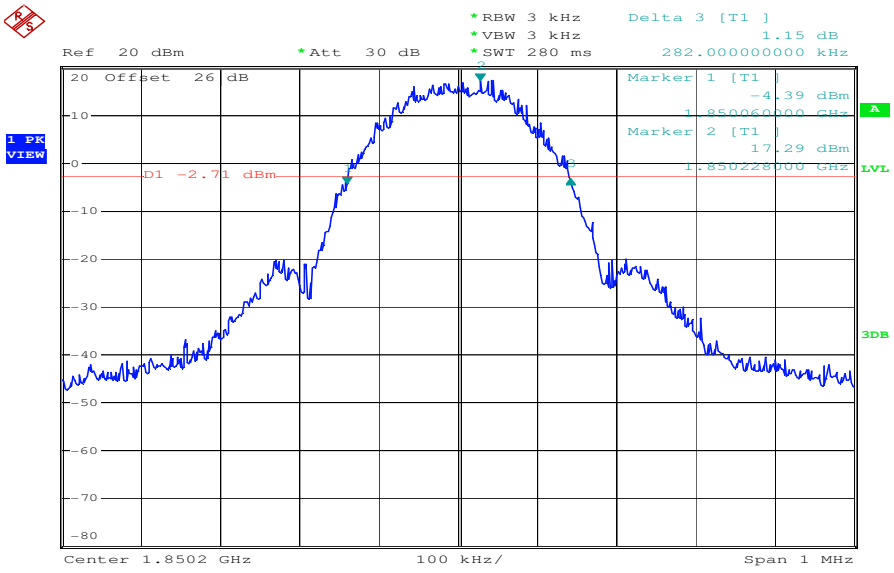
Channel 810
99% (-20 dB) Occupied Bandwidth



Channel 810
-26 dBc Bandwidth

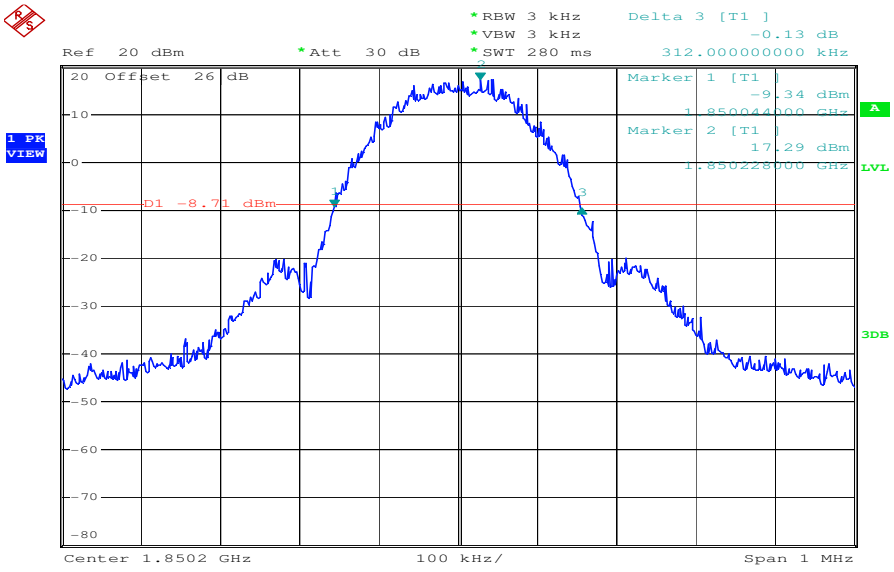


Channel 512 (EGPRS/EDGE)
99% (-20 dB) Occupied Bandwidth



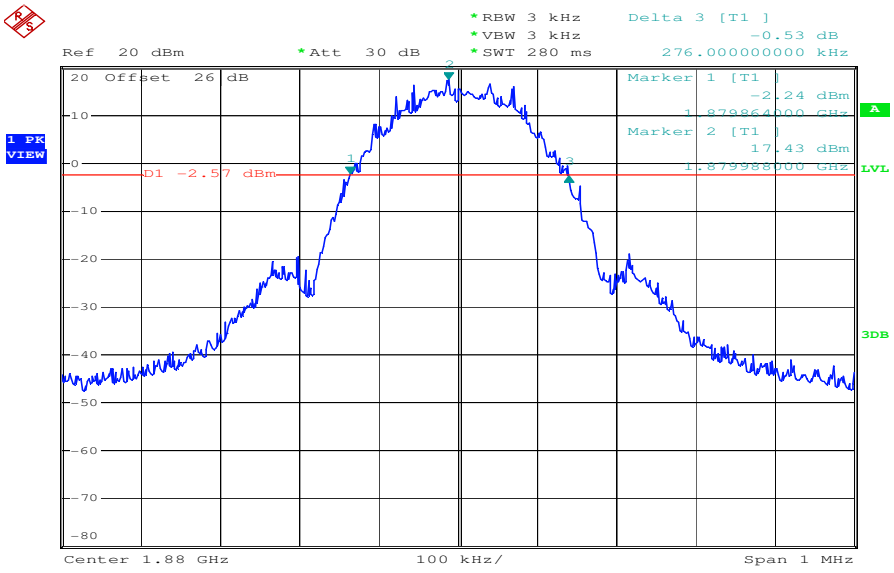
Date: 28.MAY.2008 12:36:08

Channel 512 (EGPRS/EDGE)
-26 dBc Bandwidth



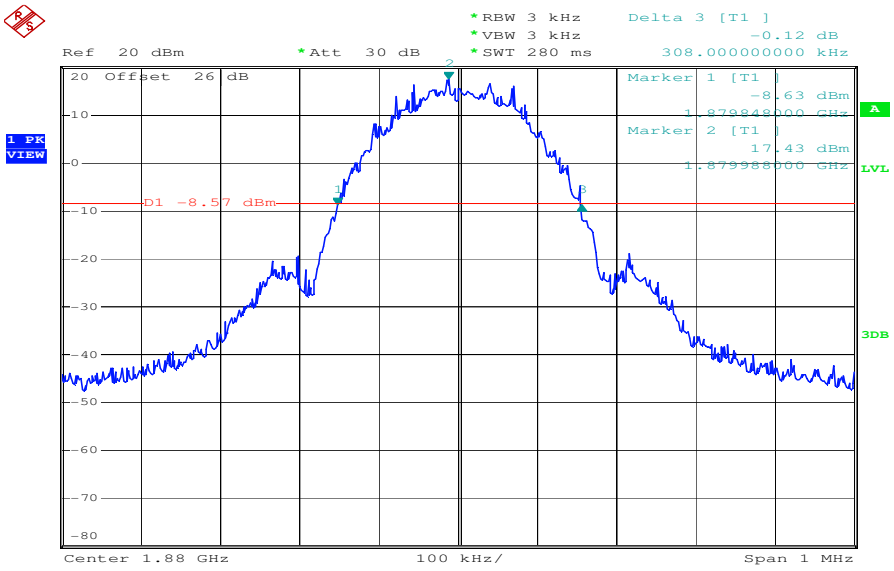
Date: 28.MAY.2008 12:36:47

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



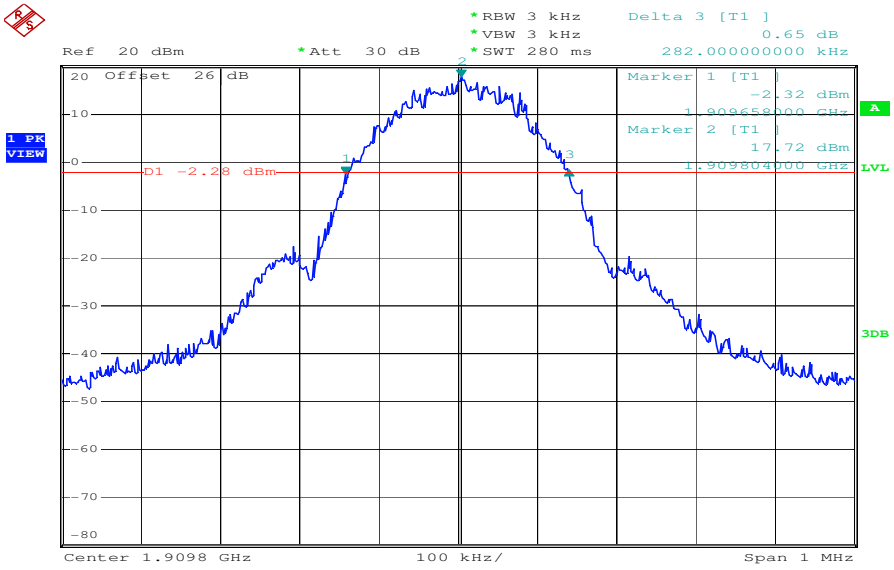
Date: 28.MAY.2008 12:39:22

Channel 661 (EGPRS/EDGE)
-26 dBc Bandwidth



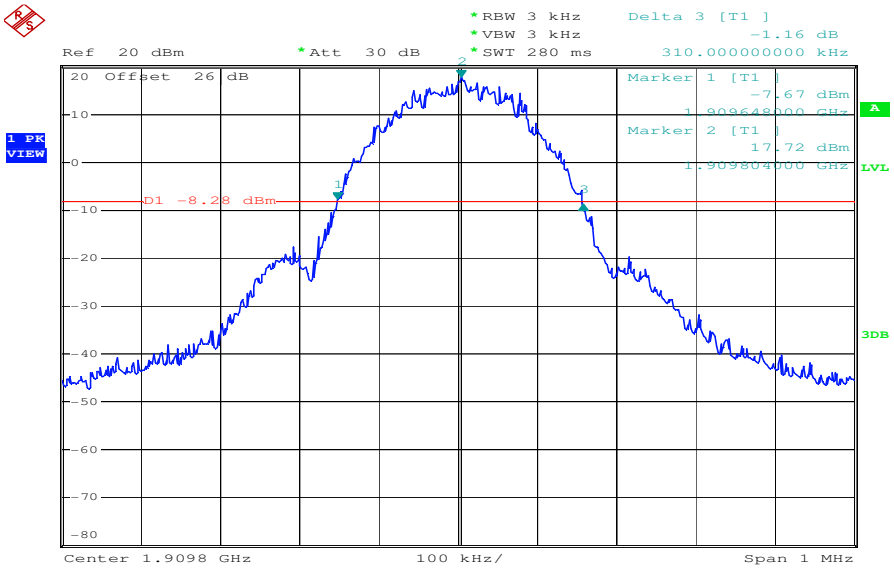
Date: 28.MAY.2008 12:39:54

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



Date: 28.MAY.2008 12:42:40

Channel 810 (EGPRS/EDGE)
-26 dBc Bandwidth



Date: 28.MAY.2008 12:43:15

5.3 WCDMA FDD II

5.3.1 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, 1852.4 MHz, 1880.0 MHz and 1907.6 MHz (bottom, middle and top of operational frequency range).

WCDMA 1900 (RMC 12.2 kBit/s)		
Channel / frequency	Max. RMS	Peak
9262 / 1852.4 MHz	**23,35** dBm	26,21 dBm
9400 / 1880.0 MHz	**23,25** dBm	26,23 dBm
9538 / 1907.6 MHz	**23,20** dBm	25,88 dBm

Table 1: Test results conducted peak power measurement WCDMA

WCDMA + HSDPA 1900			
Channel / frequency	sub-test	Max. RMS	Peak
9262 / 1852.4 MHz	1	23,58 dBm	26,36 dBm
9400 / 1880.0 MHz	1	23,48 dBm	26,30 dBm
9538 / 1907.6 MHz	1	23,38 dBm	25,89 dBm
9262 / 1852.4 MHz	2	21,77 dBm	25,93 dBm
9400 / 1880.0 MHz	2	21,46 dBm	26,91 dBm
9538 / 1907.6 MHz	2	21,88 dBm	25,74 dBm
9262 / 1852.4 MHz	3	20,83 dBm	25,56 dBm
9400 / 1880.0 MHz	3	20,56 dBm	25,90 dBm
9538 / 1907.6 MHz	3	20,59 dBm	25,63 dBm
9262 / 1852.4 MHz	4	20,56 dBm	25,33 dBm
9400 / 1880.0 MHz	4	20,38 dBm	25,52 dBm
9538 / 1907.6 MHz	4	20,37 dBm	25,87 dBm

Table 2: Test results conducted peak power measurement WCDMA + HSDPA

WCDMA + HSDPA + HSUPA 1900			
Channel / frequency	Sub-test	Max. RMS	Peak
9262 / 1852.4 MHz	1	21,86 dBm	26,56 dBm
9400 / 1880.0 MHz	1	21,89 dBm	26,41 dBm
9538 / 1907.6 MHz	1	21,88 dBm	26,19 dBm
9262 / 1852.4 MHz	2	21,26 dBm	26,84 dBm
9400 / 1880.0 MHz	2	21,23 dBm	26,76 dBm
9538 / 1907.6 MHz	2	21,24 dBm	26,49 dBm
9262 / 1852.4 MHz	3	21,82 dBm	26,78 dBm
9400 / 1880.0 MHz	3	21,65 dBm	26,70 dBm
9538 / 1907.6 MHz	3	21,73 dBm	26,46 dBm
9262 / 1852.4 MHz	4	21,01 dBm	26,41 dBm
9400 / 1880.0 MHz	4	21,00 dBm	26,49 dBm
9538 / 1907.6 MHz	4	21,03 dBm	26,08 dBm
9262 / 1852.4 MHz	5	22,18 dBm	26,32 dBm
9400 / 1880.0 MHz	5	22,10 dBm	26,23 dBm
9538 / 1907.6 MHz	5	22,06 dBm	25,82 dBm

Table 3: Test results conducted peak power measurement WCDMA + HSDPA + HSUPA

Remark: None of the HSDPA/HSUPA settings leads to conducted power values exceeding the conducted power in RMC mode by more than 0.25 dB, so SAR testing was performed in RMC mode.

5.3.2 Test set-up requirements according to 3GPP 34.121

The following HSDPA sub-tests are defined by 3GPP 34.121 (table C.10.1.4)

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM(dB) (2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 (3)	15/15 (3)	64	12/15 (3)	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5
Note 1: Δ_{ACK}, Δ_{NACK}, $\Delta_{CQI} = 8 \Leftarrow\Rightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftarrow\Rightarrow \beta_{hs} = 30/15 * \beta_c$ Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$ Note 3 : For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$						

Table 4: Subtests for UMTS Release 5 HSDPA

They were tested using the following settings for HSDPA FRC + H-Set 1 QPSK (see table C.8.1.1 of 3GPP 34.121

Parameter	Value
Nominal average inf. bit rate	534 kbit/s
Inter-TTI Distance	3 TTI's
Number of HARQ Processes	2 Processes
Information Bit Payload	3202 Bits
MAC-d PDU size	336 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	4800 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	9600 SMLs
Coding Rate	0.67
Number of Physical Channel Codes	5

Table 5: settings of required H-Set 1 QPSK in HSDPA mode

The following HSUPA sub-tests are defined by 3GPP 34.121 (table C.11.1.3)

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ec} (SF)	β_{ed} (code)	CM (2) (dB)	MPR (dB)	AG (4) Index	E-TFCI
1	11/15 (3)	15/15 (3)	64	11/15 (3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 $\beta_{ed2:}$47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (4)	15/15 (4)	64	15/15 (4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK}, $\Delta_{CQI} = 8 \Leftarrow\Rightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftarrow\Rightarrow \beta_{hs} = 30/15 * \beta_c$
Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference
Note 3 : For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$
Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$
Note 5 : Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g
Note 6 : β_{ed} can not be set directly; it is set by Absolute Grant Value

Table 6: Subtests for UMTS Release 6 HSUPA

Some HSUPA sub test settings of parameters defined in the table above cannot be set directly. Instead $\Delta_{E\text{-}DPCCH}$, Reference E-TFCI and Reference E-TFCI Power Offset were set according to table 5.2B.2 of 3GPP 34.121, and CMU200 operating manual instructions of firmware V4.52 were followed to reach a test condition with maximum output power and one E-TFCI.

Limits:

Power Step	Nominal Peak Output Power (dBm)	Tolerance (dB)
0	+33	± 2

According to the subtest settings shown in table 6 a Maximum Power Reduction of up to 2 dB can be expected in HSUPA subtest 2 – 4. The measurement results in table 3 only show a maximum reduction of 1 dB in subtests 2 and 4.

The following statement submitted by the manufacturer confirms that maximum power reduction in HSUPA subtests 2 – 4 is not exhausted:

The M365 platform implements the MPR allowance to reduce power in order to maintain ACLR and other parametric performance margin in high peak to average signal conditions. The values predicted by the cubic metric allow the designers to back-off the maximum power by up to the maximum power reduction value. The power amplifier solution used in the M365 HSPA platform is optimized to require up to the MPR value for all physical channel combinations. Generally the power reduction actually implemented is less than the MPR allowed. This implementation is on the order of a 1 dB reduction.

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) UMTS Mode

Frequency (MHz)	**Burst Peak EIRP (dBm)**
1852.4	24.13
1880.0	25.10
1907.6	24.40
Measurement uncertainty	±1.5 dB

Test Results: Output Power (radiated) HSDPA Mode

Frequency (MHz)	**Burst Peak EIRP (dBm)**
1852.4	24.58
1880.0	25.02
1907.6	24.43
Measurement uncertainty	±1.5 dB

Test Results: Output Power (radiated) HSUPA Mode

Frequency (MHz)	**Burst Peak EIRP (dBm)**
1852.4	24.73
1880.0	25.47
1907.6	24.63
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)

5.3.3 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.

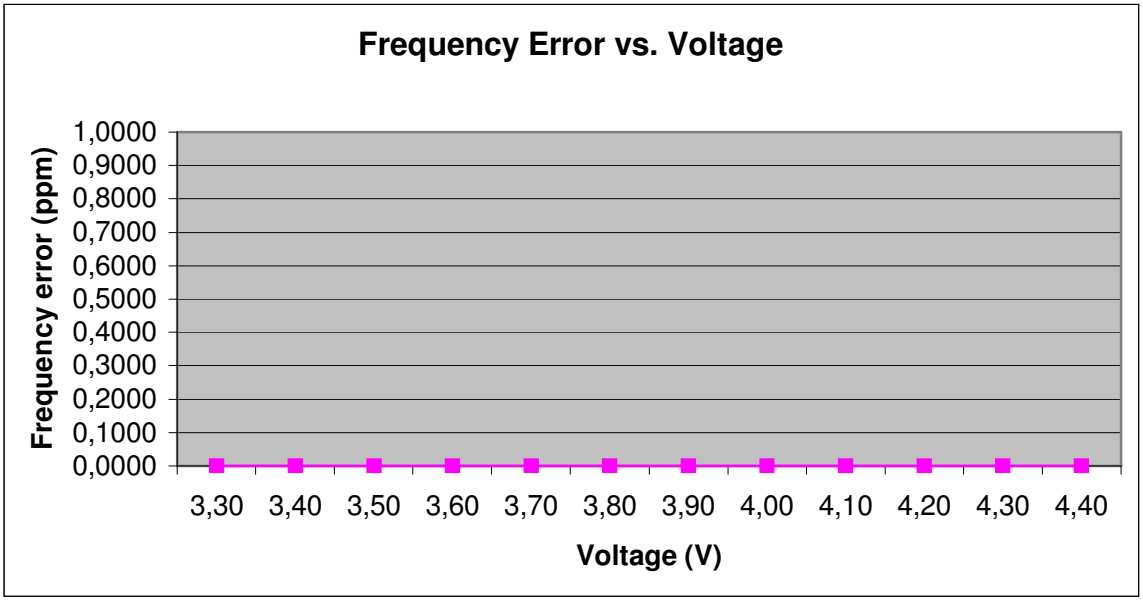
Test Results: AFC FREQ ERROR vs. VOLTAGE

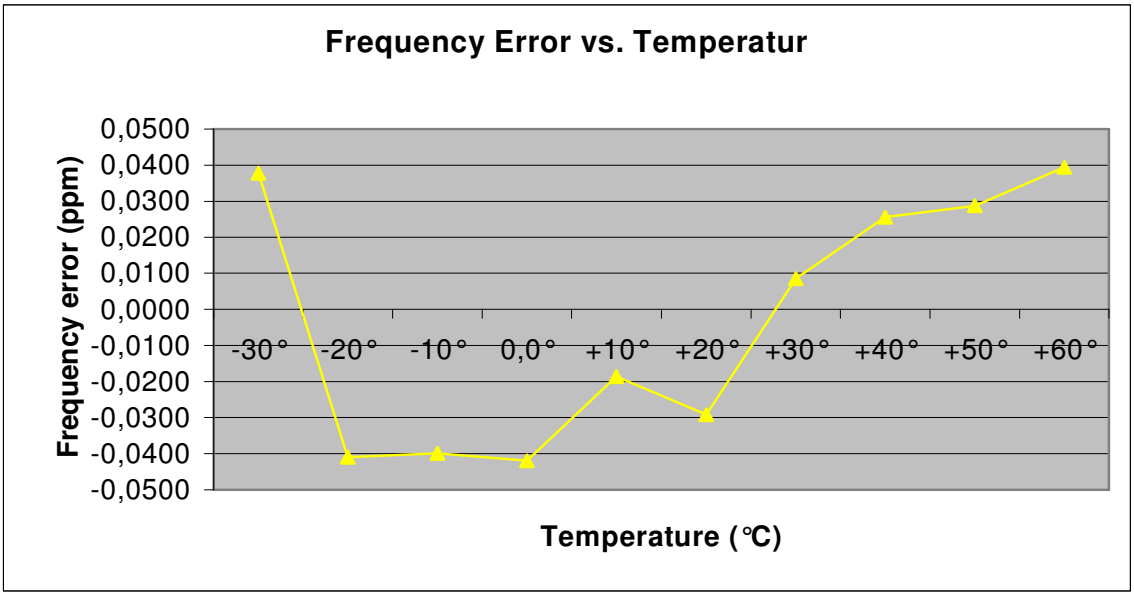
It is not possible to perform the AFC FREQ ERROR vs. VOLTAGE measurement, because the power supply is effected by the initialization board.

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	--	--	--
3.4	--	--	--
3.5	--	--	--
3.6	--	--	--
3.7	--	--	--
3.8	--	--	--
3.9	--	--	--
4.0	--	--	--
4.1	--	--	--
4.2	--	--	--
4.3	--	--	--
4.4	--	--	--

Test Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	+71	0,00000378	0,0378
-20	-77	-0,00000410	-0,0410
-10	-75	-0,00000399	-0,0399
±0.0	-79	-0,00000420	-0,0420
+10	-35	-0,00000186	-0,0186
+20	-55	-0,00000293	-0,0293
+30	+16	0,00000085	0,0085
+40	+48	0,00000255	0,0255
+50	+54	0,00000287	0,0287
+60	+74	0,00000394	0,0394


Frequency Error vs. Voltage
Frequency error (ppm)
1,0000
0,9000
0,8000
0,7000
0,6000
0,5000
0,4000
0,3000
0,2000
0,1000
0,0000
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)
0,0500
0,0400
0,0300
0,0200
0,0100
0,0000
-0,0100
-0,0200
-0,0300
-0,0400
-0,0500
-30°
-20°
-10°
0,0°
+10°
+20°
+30°
+40°
+50°
+60°
Temperature (°C)

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

Harmonic	Tx ch.-9262 Freq. (MHz)	Level (dBm)	Tx ch.-9400 Freq. (MHz)	Level (dBm)	Tx ch.-9538 Freq. (MHz)	Level (dBm)
2	3704.8	**-**	3760	**-**	3815.2	**-**
3	5557.2	-	5640	-	5722.8	-
4	7409.6	-	7520	-	7630.4	-
5	9262.0	-	9400	-	9538.0	-
6	11114.4	-	11280	-	11445.6	-
7	12966.8	-	13160	-	13353.2	-
8	14819.2	-	15040	-	15260.8	-
9	16671.6	-	16920	-	17168.4	-
10	18524.0	-	18800	-	19076.0	-

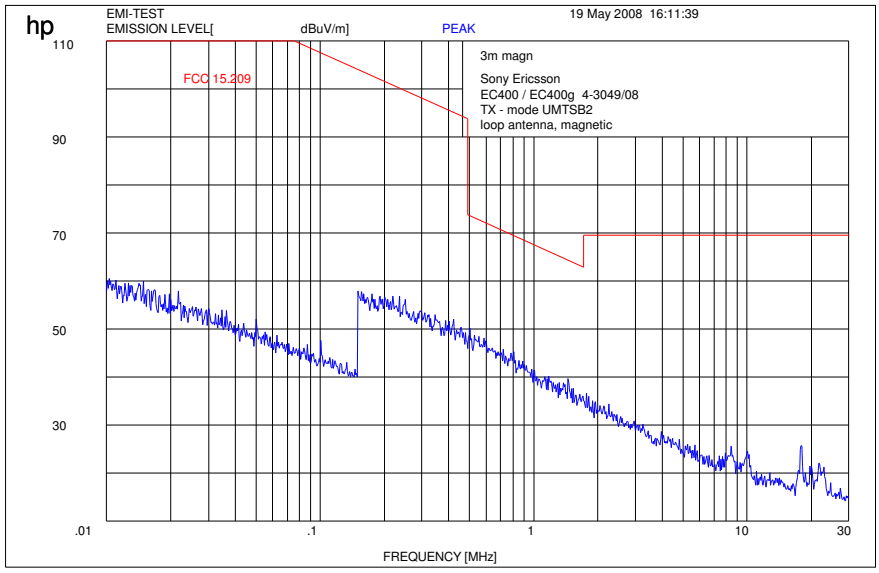
No peaks found < 20 dB below limit.

Sample calculation:

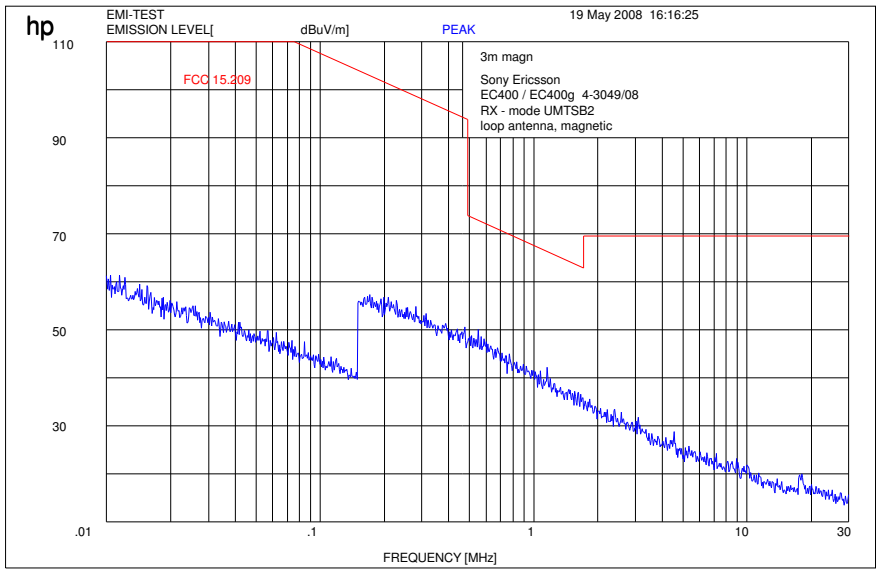
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBi	dB	dBm			
1909.8	132.3	24.6	8.4	0.0	3.3	29.7			

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

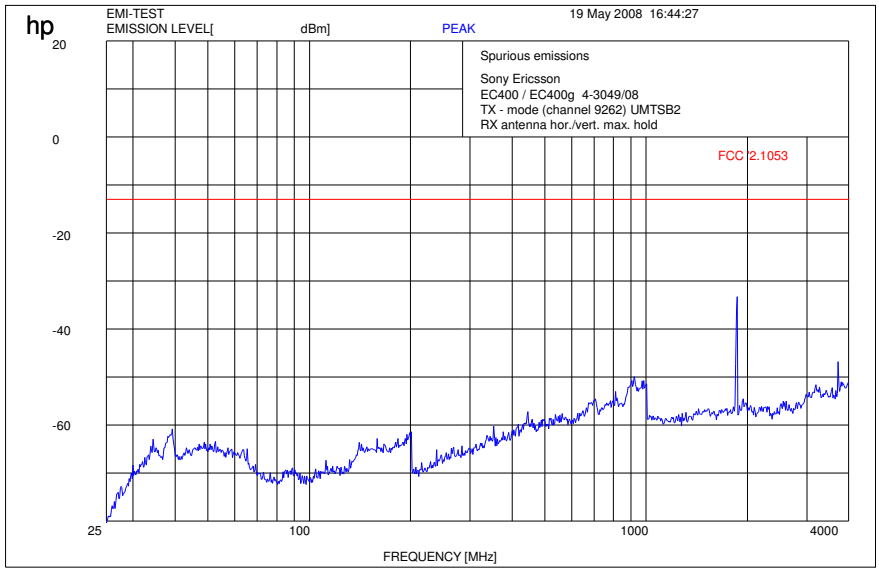
Traffic mode up to 30 MHz (Valid for all 3 channels)



Receiver mode up to 30 MHz

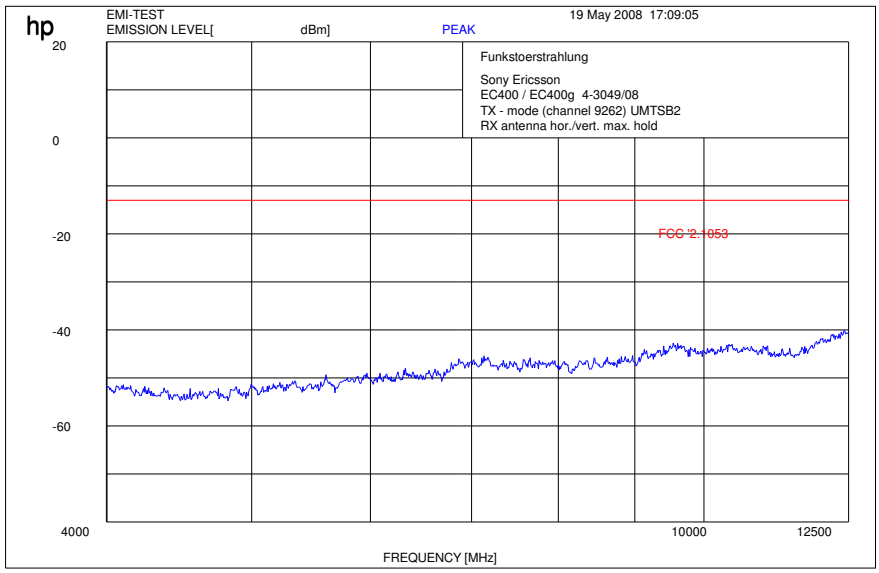


Channel 9262 (30 MHz - 4 GHz)



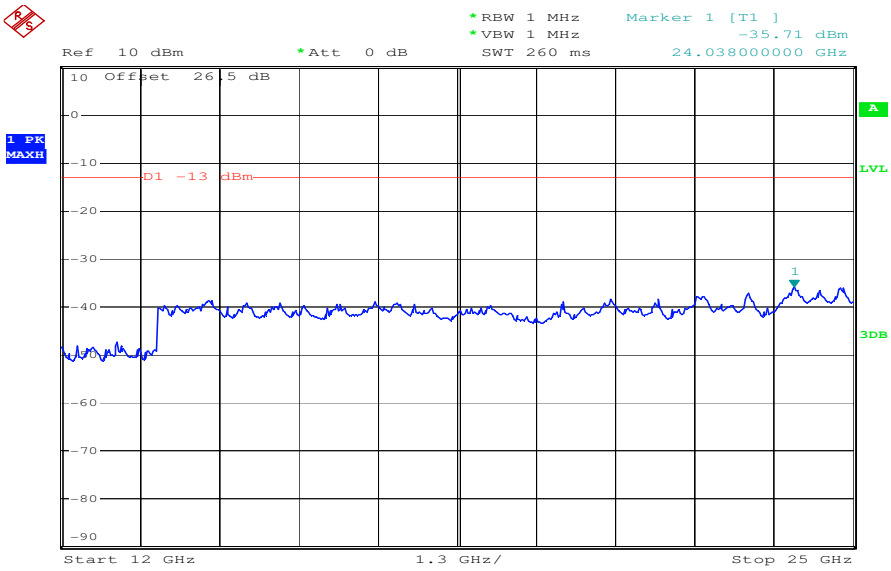
f < 1 GHz : RBW / VBW: 100 kHz f ≥ 1GHz : RBW / VBW: 1 MHz
Carrier suppressed with a rejection filter

Channel 9262 (4 GHz – 12.5 GHz)

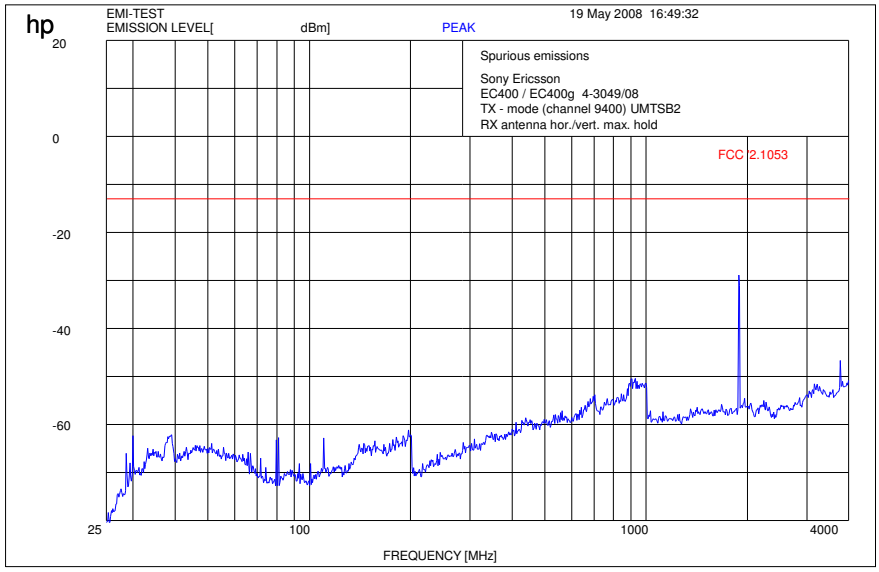


f ≥ 1GHz : RBW / VBW: 1 MHz

Channel 9262 (12 GHz - 25 GHz) valid for all 3 channels

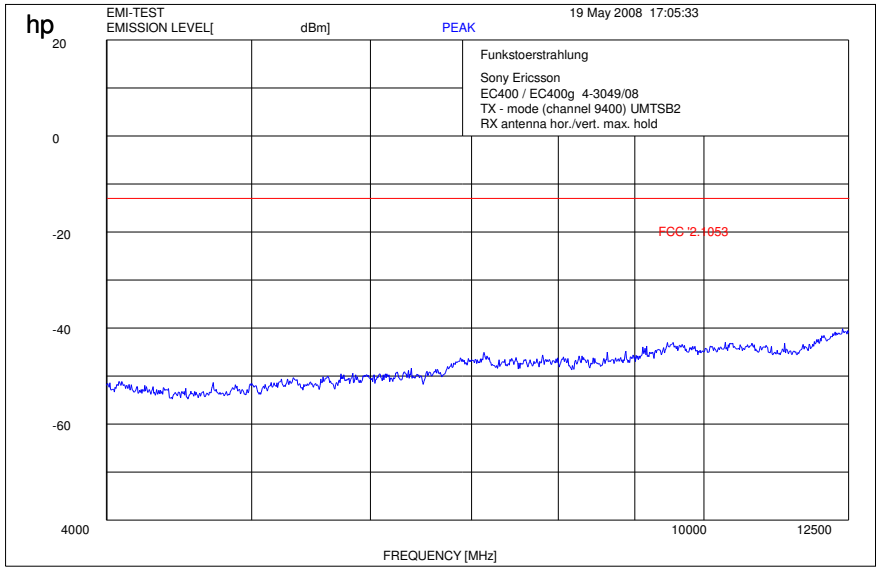


Channel 9400 (30 MHz - 4 GHz)



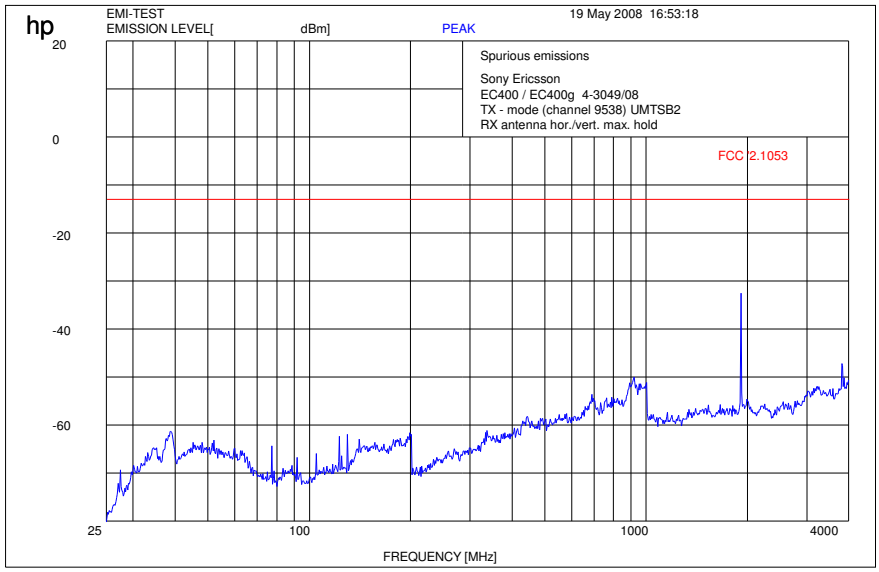
f < 1 GHz : RBW / VBW: 100 kHz f ≥ 1GHz : RBW / VBW: 1 MHz
Carrier suppressed with a rejection filter

Channel 9400 (4 GHz – 12.5 GHz)



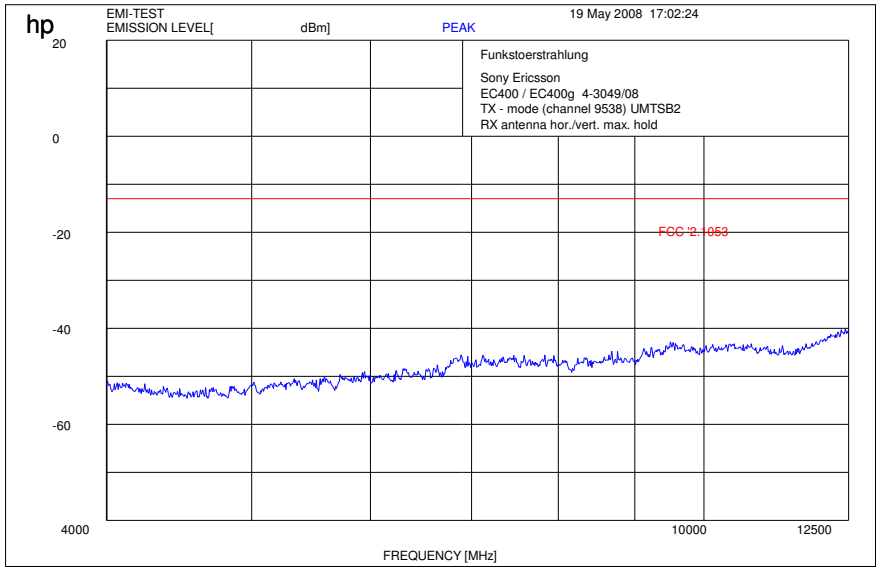
f ≥ 1GHz : RBW / VBW: 1 MHz

Channel 9538 (30 MHz - 4 GHz)



f < 1 GHz : RBW / VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1: MHz
Carrier suppressed with a rejection filter

Channel 9538 (4 GHz – 12.5 GHz)



f ≥ 1GHz : RBW / VBW: 1 MHz

5.3.5 Receiver Radiated Emissions

Reference

FCC:	CFR Part 15.109, 2.1053
IC:	RSS 133, Issue 4, Section 4.5

Measurement Results

SPURIOUS EMISSIONS LEVEL (µV/m)								
Idle mode								
f (MHz)	Detector	Level (dBµV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
1907,6	pk	49,3	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz
H = Horizontal; V= Vertical

For measurement distance see table below

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 - 4 GHz)

Information

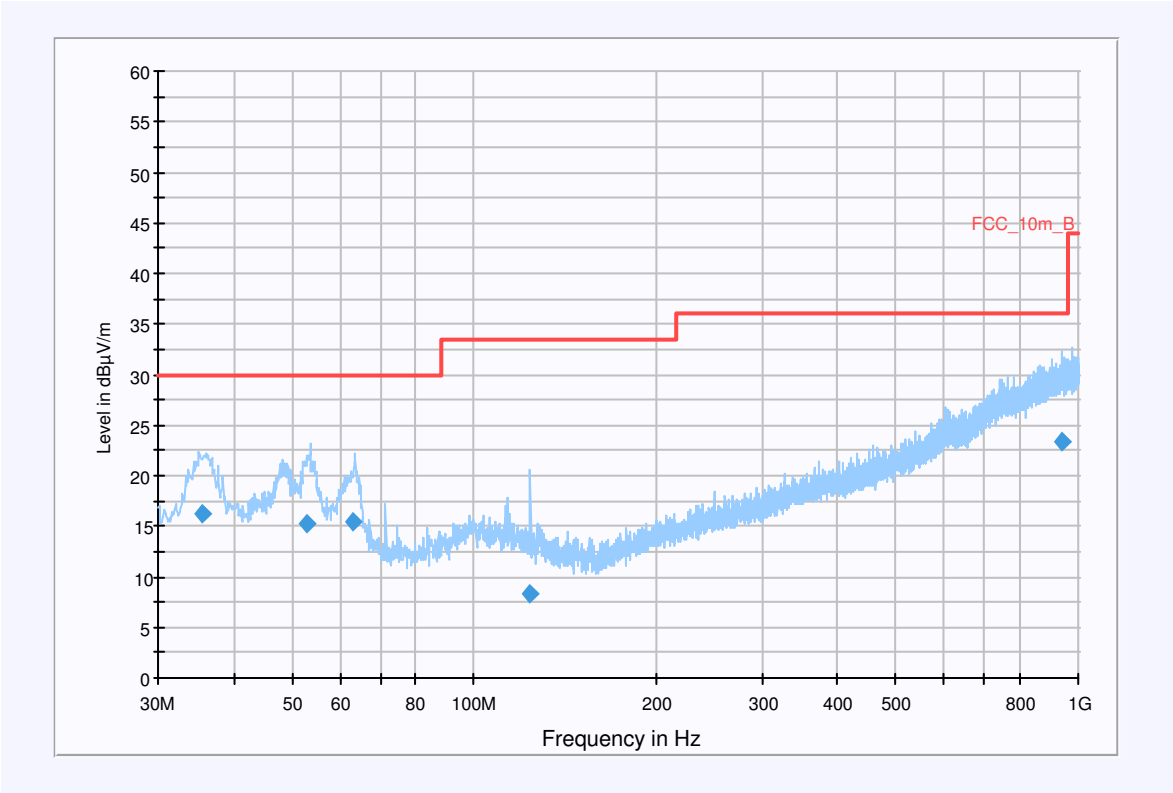
EUT:	EC400g
Serial Number:	BDX0002NL0 (IMEI: 064401071829960)
Test Description:	FCC part 15 class B @ 10 m
Operating Conditions:	idle FDD II
Operator Name:	Hennemann
Comment:	- / -

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	EMI radiated\Electric Field (NOS)
Level Unit:	dBµV/m

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

FCC_1GHz



Final Measurement Detector 1

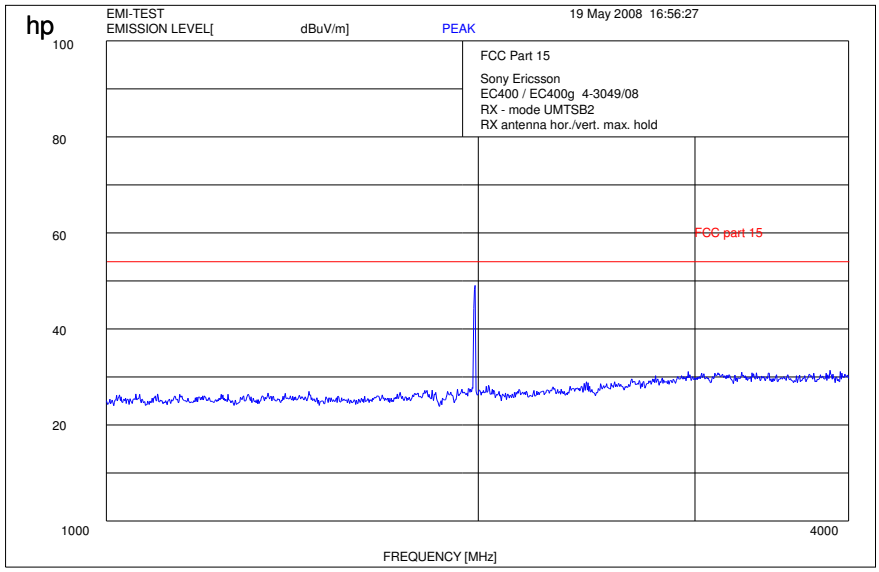
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
35.374900	16.3	1000.000	120.000	120.0	V	30.0	13.2	13.7	30.0	
53.044200	15.2	1000.000	120.000	120.0	V	-1.0	13.3	14.8	30.0	
63.017450	15.5	1000.000	120.000	120.0	V	20.0	11.2	14.5	30.0	
...	...	...	...	...	...	...	...	...	...	...

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

Subrange 1

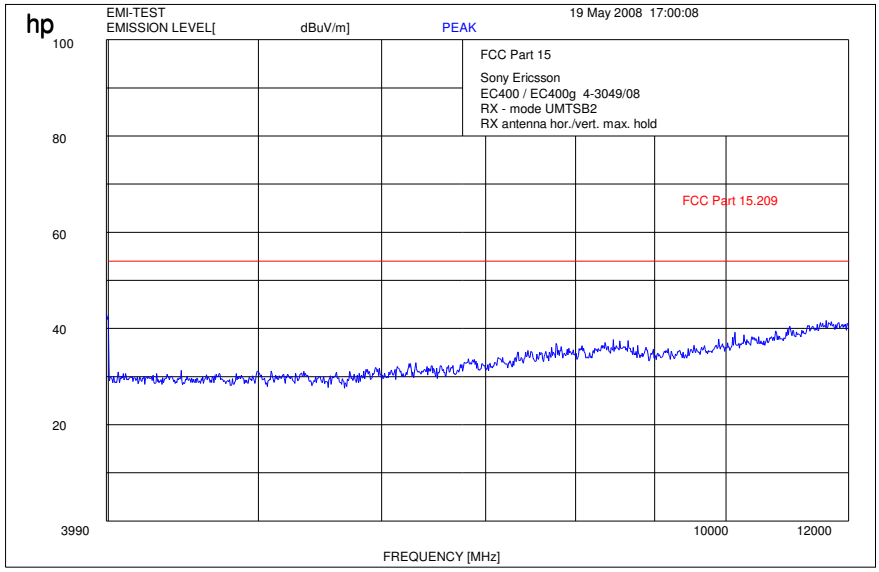
Frequency Range:	30MHz - 2GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW ---, CAL 08.04.2010 Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table: Cabel with switch (0408)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9)

Idle Mode (1 GHz - 4 GHz)



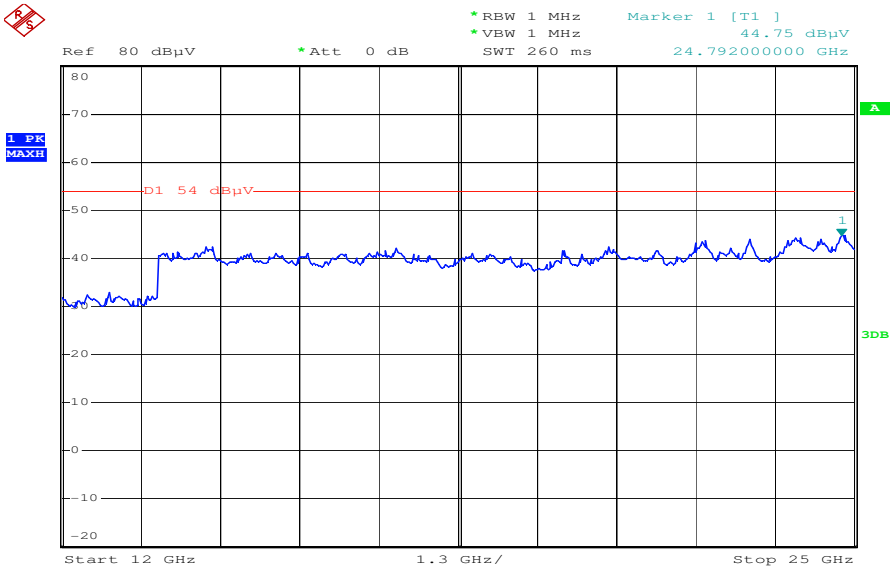
f ≥ 1GHz : RBW / VBW: 1 MHz

Idle Mode (4 GHz – 12.0 GHz)



f ≥ 1GHz : RBW / VBW: 1 MHz

Idle Mode (12 GHz - 25 GHz)



Date: 31.MAY.2008 08:49:30

5.3.6 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.

Transmitter Channel Frequency:
9262 1852.4 MHz
9400 1880.0 MHz
9538 1907.6 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: UMTS

Harmonic	Tx ch.-9262 Freq. (MHz)	Level (dBm)	Tx ch.-9400 Freq. (MHz)	Level (dBm)	Tx ch.-9538 Freq. (MHz)	Level (dBm)
2	3704.8	-	3760	-	3815.2	-
3	5557.2	-	5640	-	5722.8	-
4	7409.6	-	7520	-	7630.4	-
5	9262.0	-	9400	-	9538.0	-
6	11114.4	-	11280	-	11445.6	-
7	12966.8	-	13160	-	13353.2	-
8	14819.2	-	15040	-	15260.8	-
9	16671.6	-	16920	-	17168.4	-
10	18524.0	-	18800	-	19076.0	-

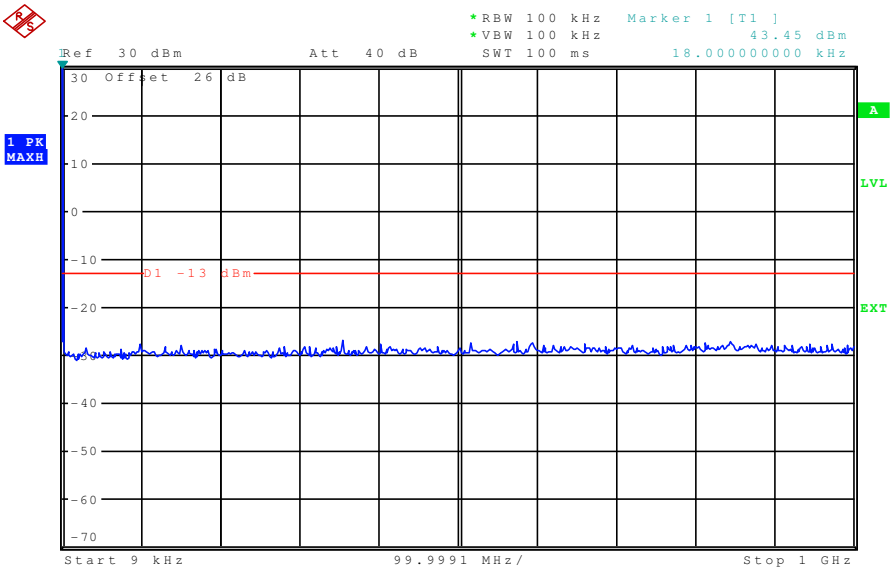
Measurement Results: HSDPA

Harmonic	Tx ch.-9262 Freq. (MHz)	Level (dBm)	Tx ch.-9400 Freq. (MHz)	Level (dBm)	Tx ch.-9538 Freq. (MHz)	Level (dBm)
2	3704.8	-	3760	-	3815.2	-
3	5557.2	-	5640	-	5722.8	-
4	7409.6	-	7520	-	7630.4	-
5	9262.0	-	9400	-	9538.0	-
6	11114.4	-	11280	-	11445.6	-
7	12966.8	-	13160	-	13353.2	-
8	14819.2	-	15040	-	15260.8	-
9	16671.6	-	16920	-	17168.4	-
10	18524.0	-	18800	-	19076.0	-

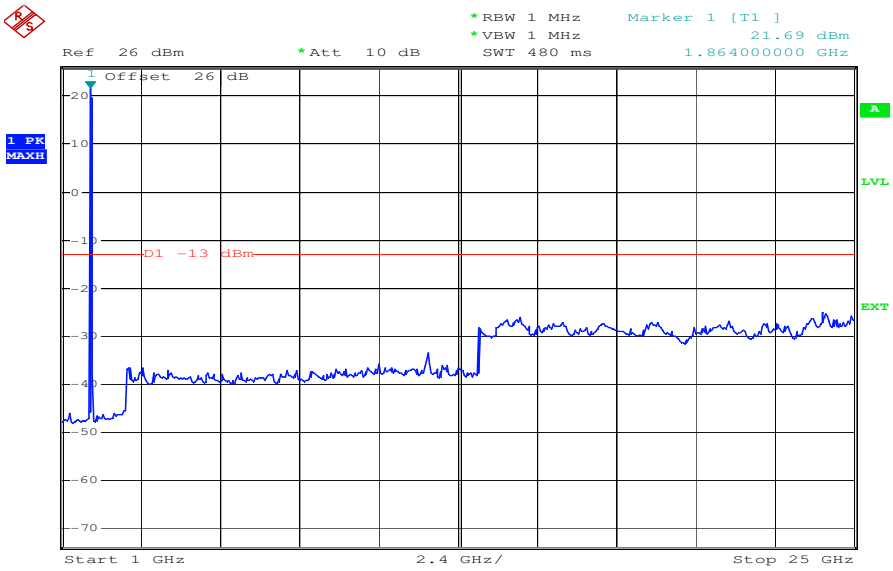
Measurement Results: HSUPA

Harmonic	Tx ch.-9262 Freq. (MHz)	Level (dBm)	Tx ch.-9400 Freq. (MHz)	Level (dBm)	Tx ch.-9538 Freq. (MHz)	Level (dBm)
2	3704.8	-	3760	-	3815.2	-
3	5557.2	-	5640	-	5722.8	-
4	7409.6	-	7520	-	7630.4	-
5	9262.0	-	9400	-	9538.0	-
6	11114.4	-	11280	-	11445.6	-
7	12966.8	-	13160	-	13353.2	-
8	14819.2	-	15040	-	15260.8	-
9	16671.6	-	16920	-	17168.4	-
10	18524.0	-	18800	-	19076.0	-

Plot 1: Channel 9262 (UMTS)

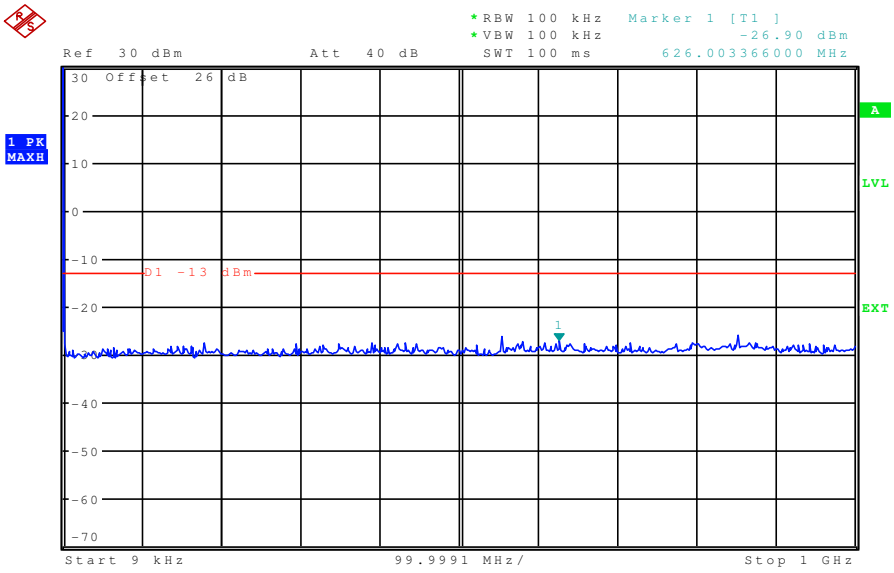


Plot 2: Channel 9262 (UMTS)

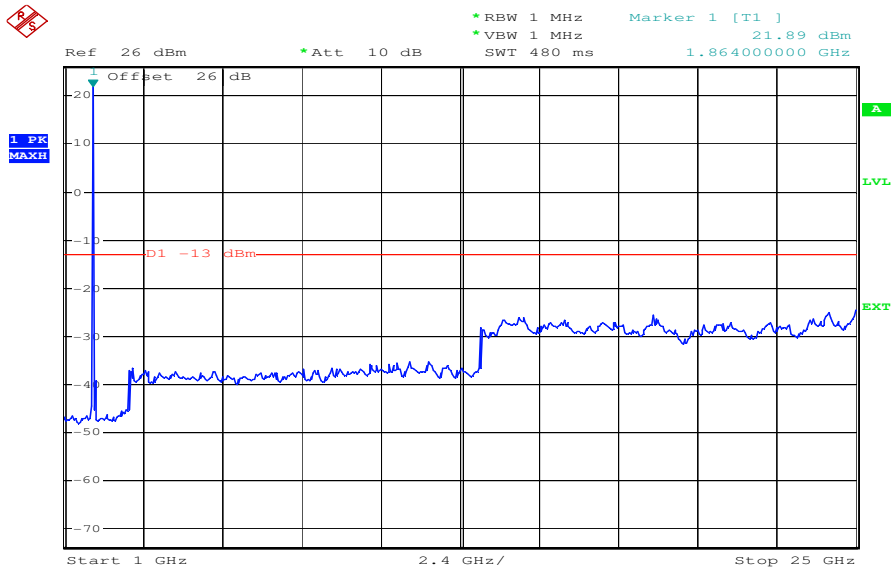


Date: 26.MAY.2008 10:17:26

Plot 3: Channel 9400 (UMTS)



Plot 4: Channel 9400 (UMTS)



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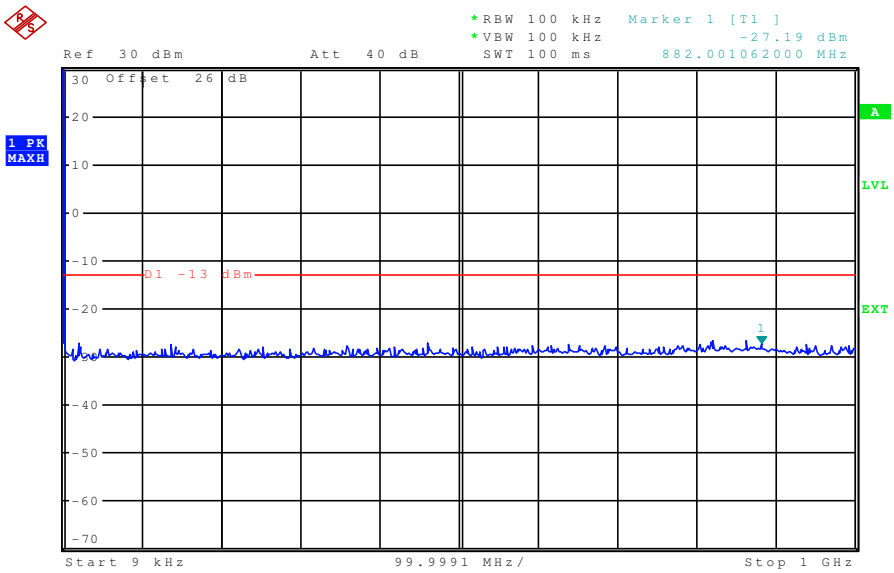
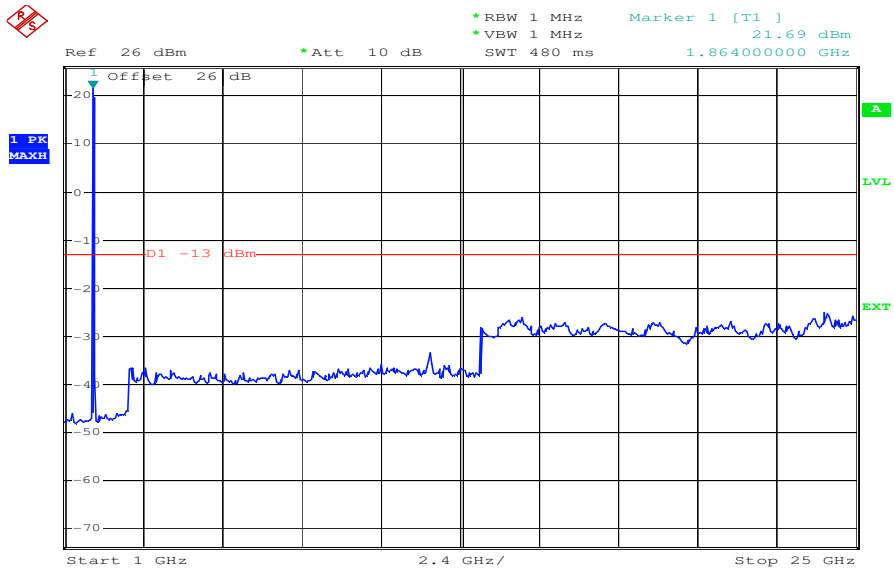
Plot 5: Channel 9538 (UMTS)

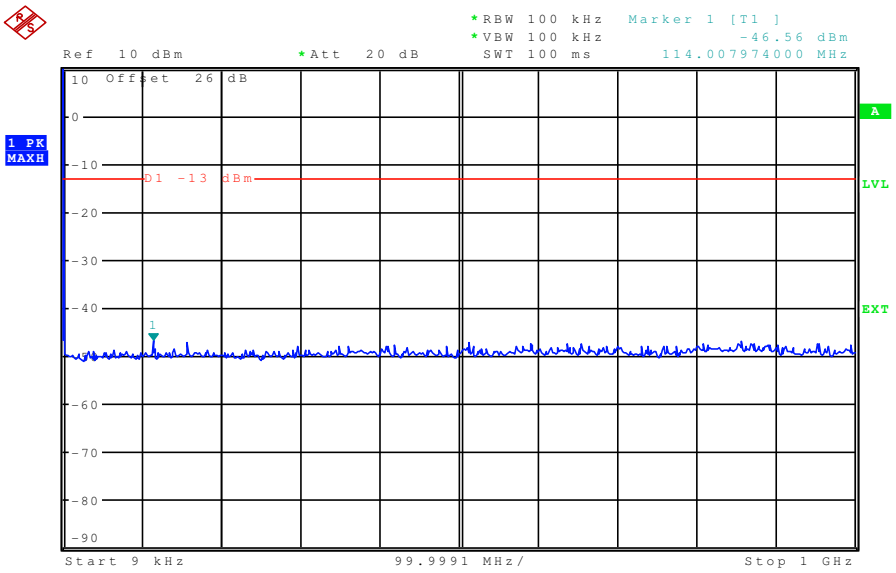


Plot 6: Channel 9538 (UMTS)

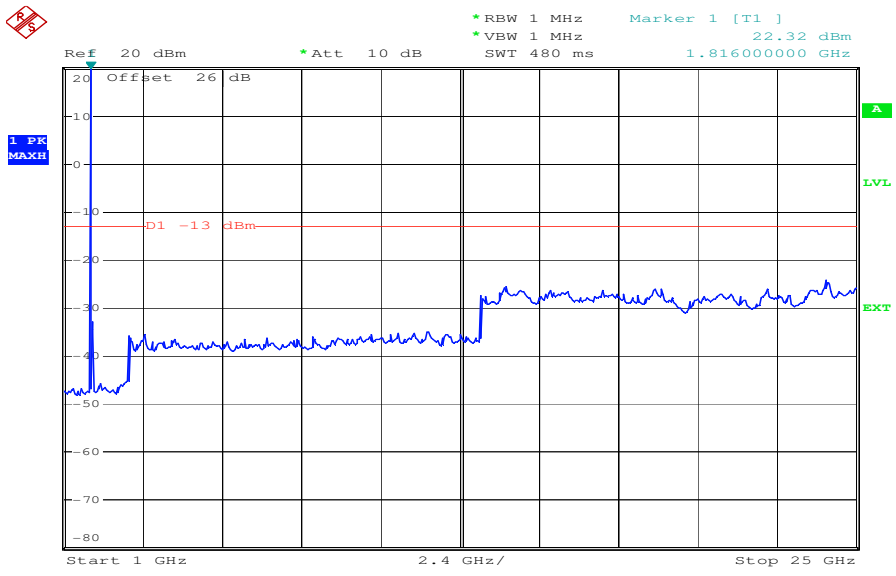


Date: 26.MAY.2008 10:17:26

Plot 7: Channel 9262 (HSDPA)

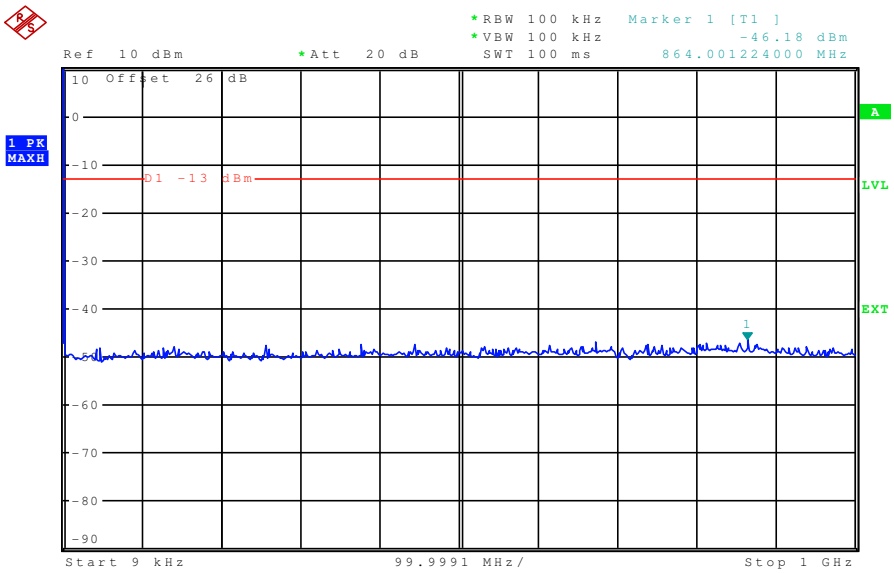


Plot 8: Channel 9262 (HSDPA)

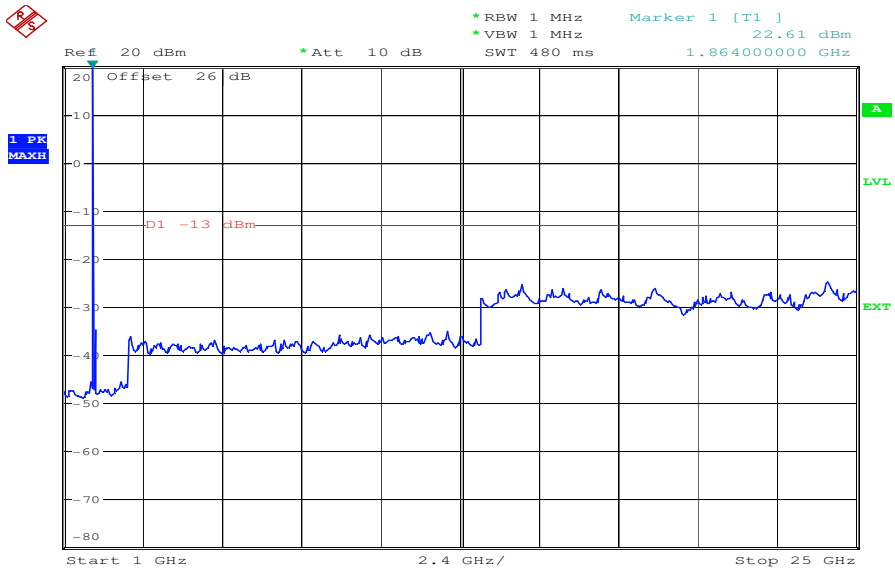


Date: 26.MAY.2008 14:25:17

Plot 9: Channel 9400 (HSDPA)

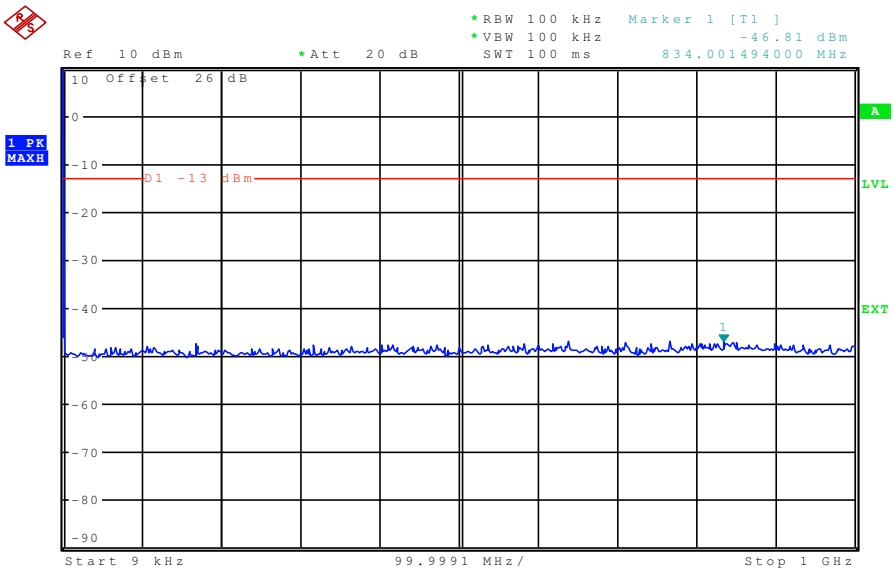


Plot 10: Channel 9400 (HSDPA)

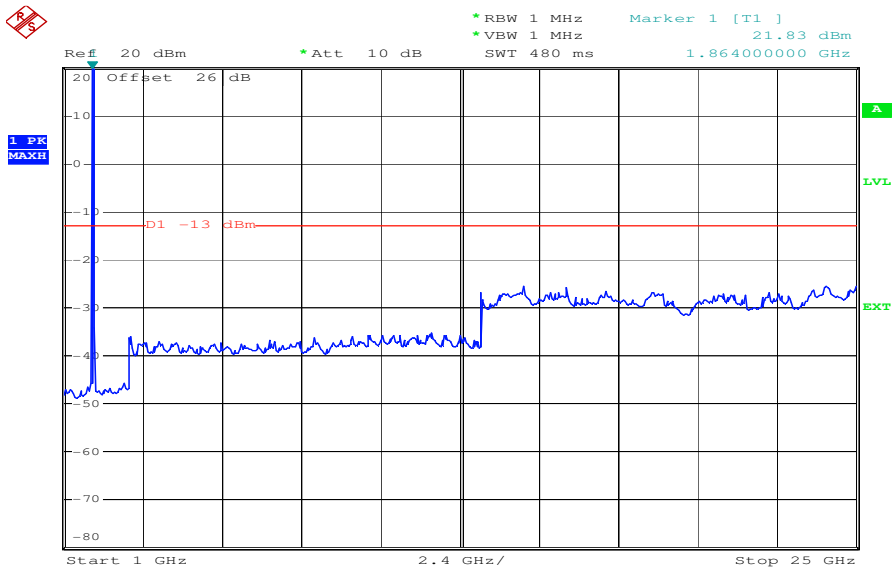


Date: 26.MAY.2008 14:27:00

Plot 11: Channel 9538 (HSDPA)

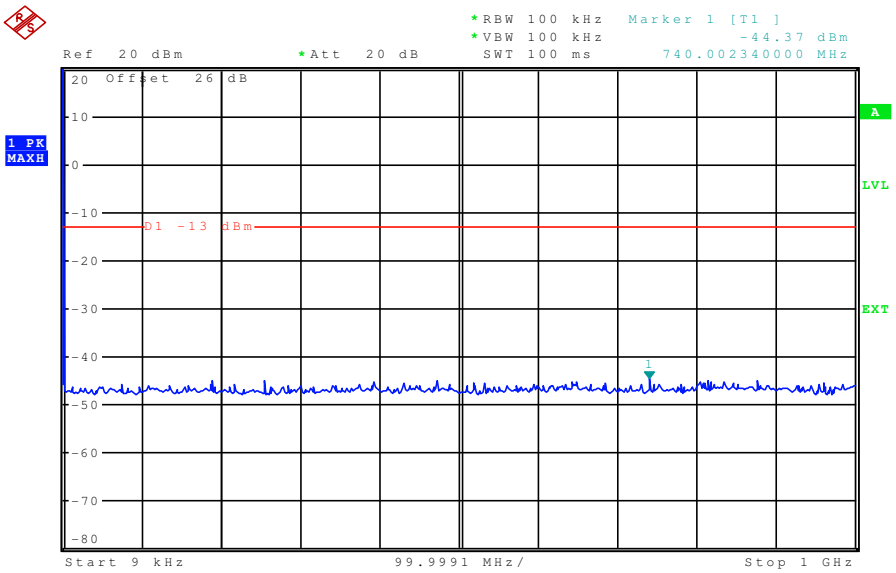


Plot 12: Channel 9538 (HSDPA)

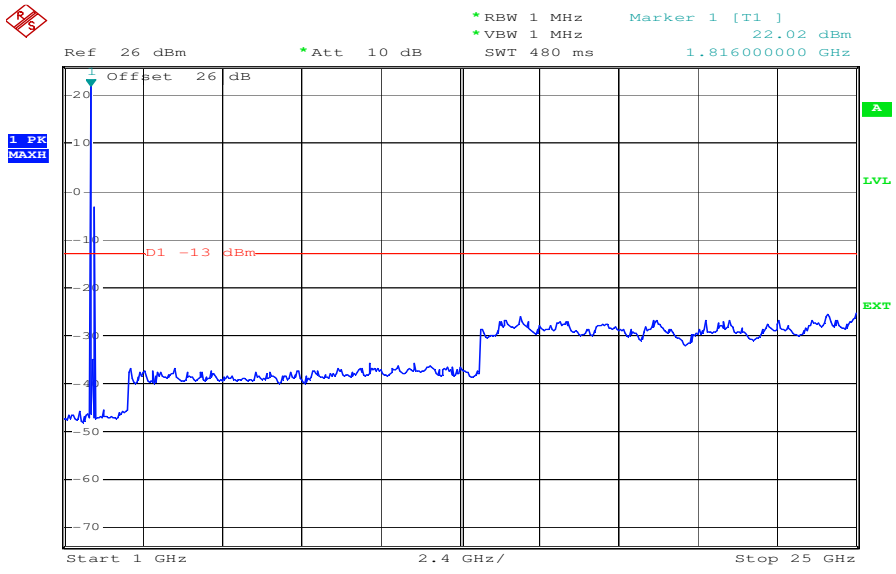


Date: 26.MAY.2008 14:28:31

Plot 13: Channel 9262 (HSUPA)

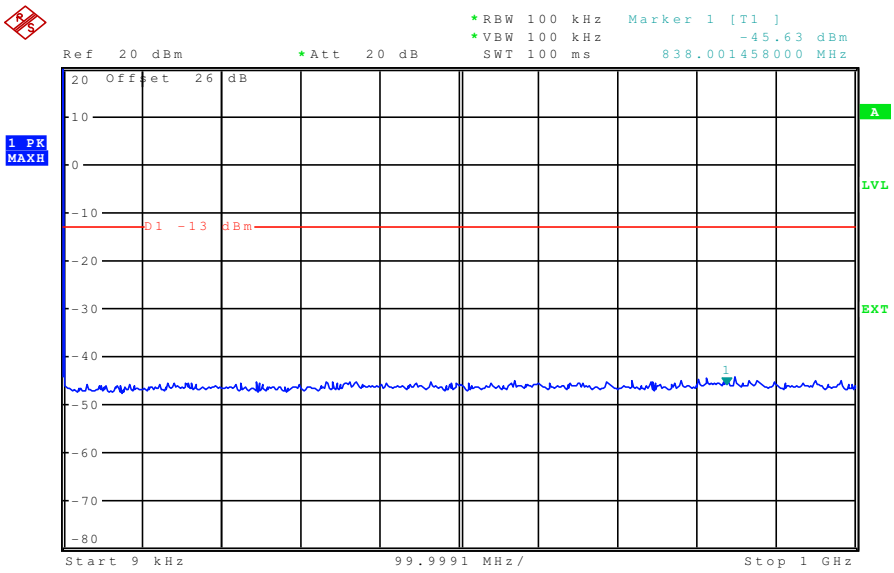


Plot 14: Channel 9262 (HSUPA)

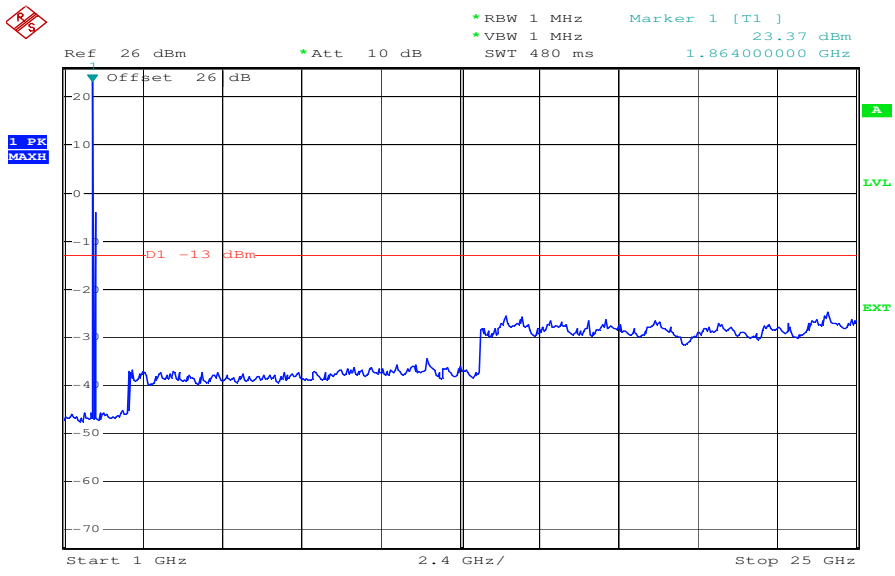


Date: 26.MAY.2008 16:23:16

Plot 15: Channel 9400 (HSUPA)

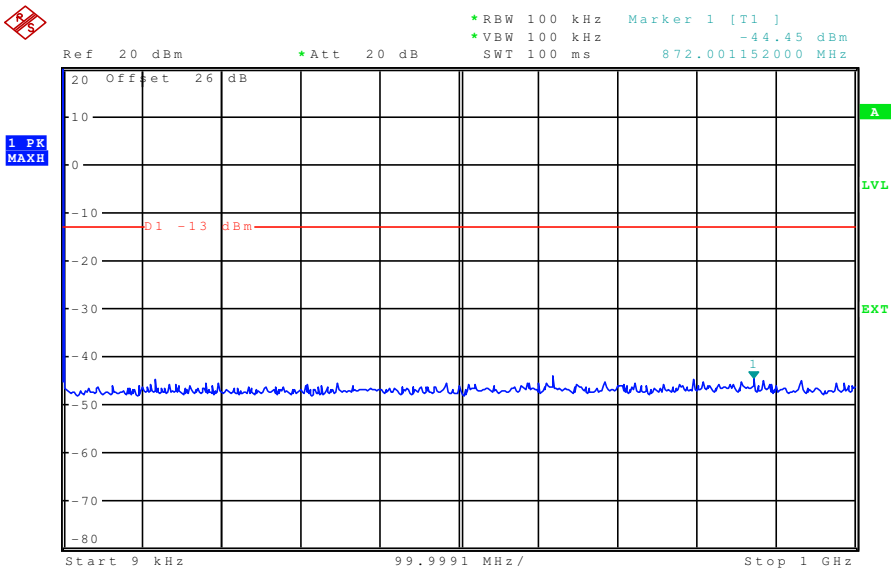


Plot 16: Channel 9400 (HSUPA)

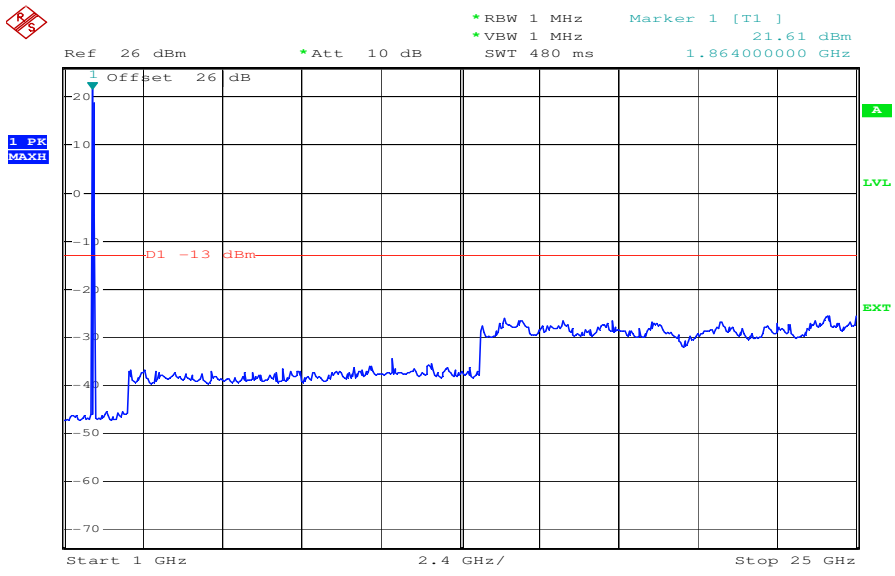


Date: 26.MAY.2008 16:21:26

Plot 17: Channel 9538 (HSUPA)



Plot 18: Channel 9538 (HSUPA)



Date: 26.MAY.2008 16:19:49

5.3.7 Block Edge Compliance

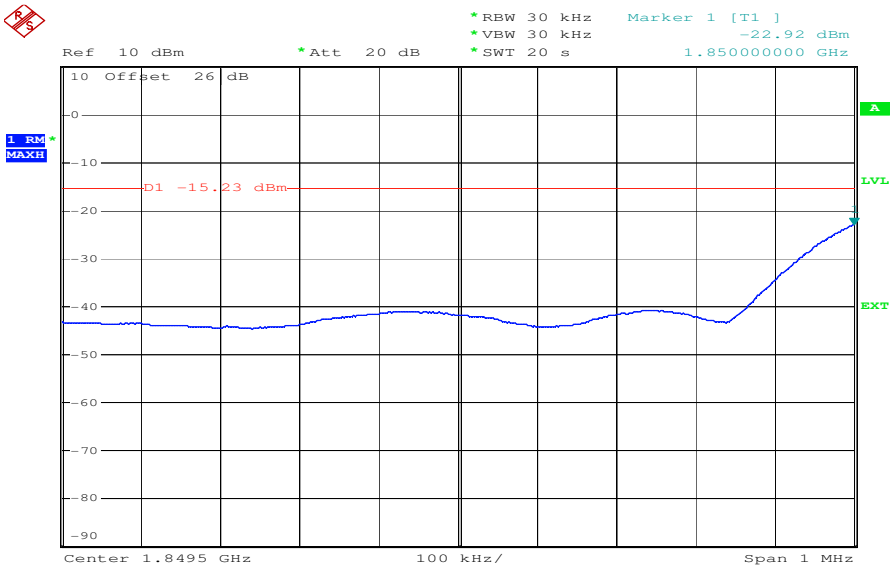
Reference

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

Measurement Limit:

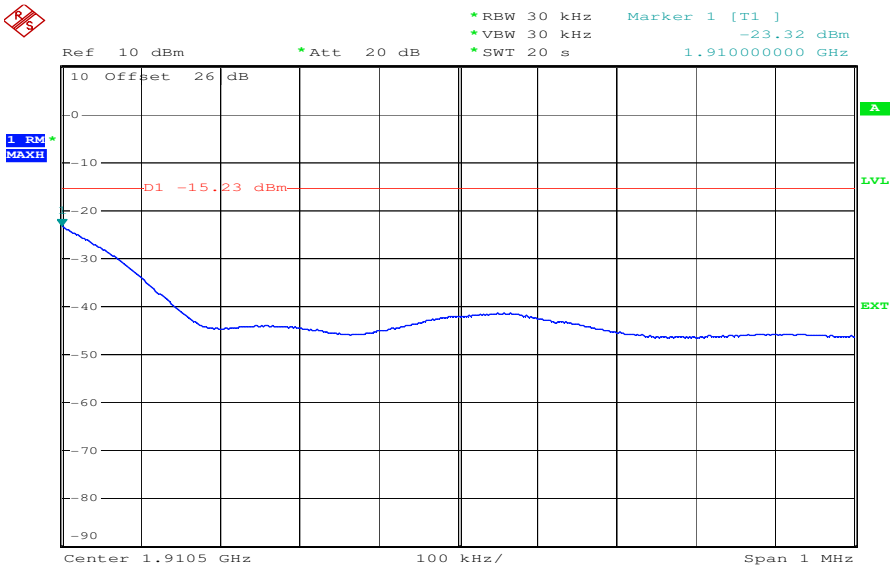
(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

Plot 1: lower band edge (Channel 9262 UMTS)



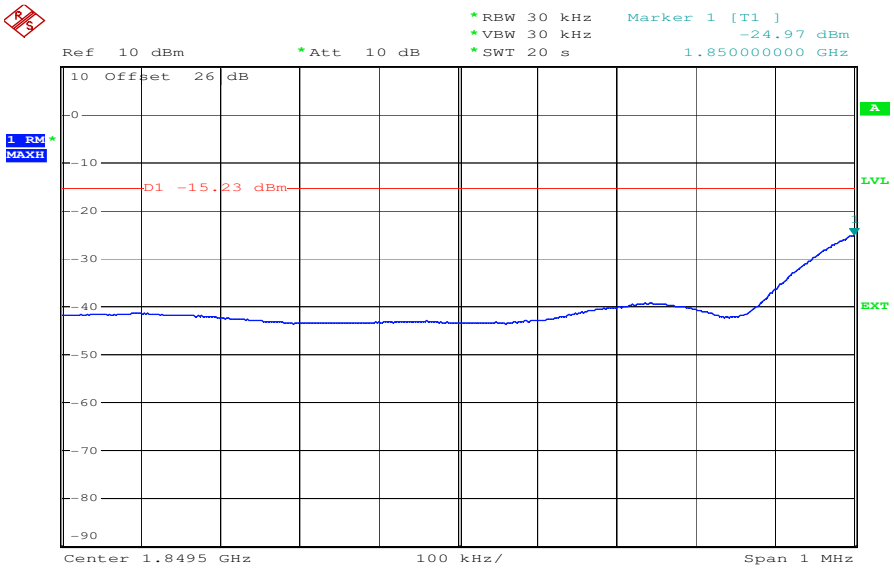
Date: 26.MAY.2008 16:48:28

Plot 2: higher band edge (Channel 9538 UMTS)



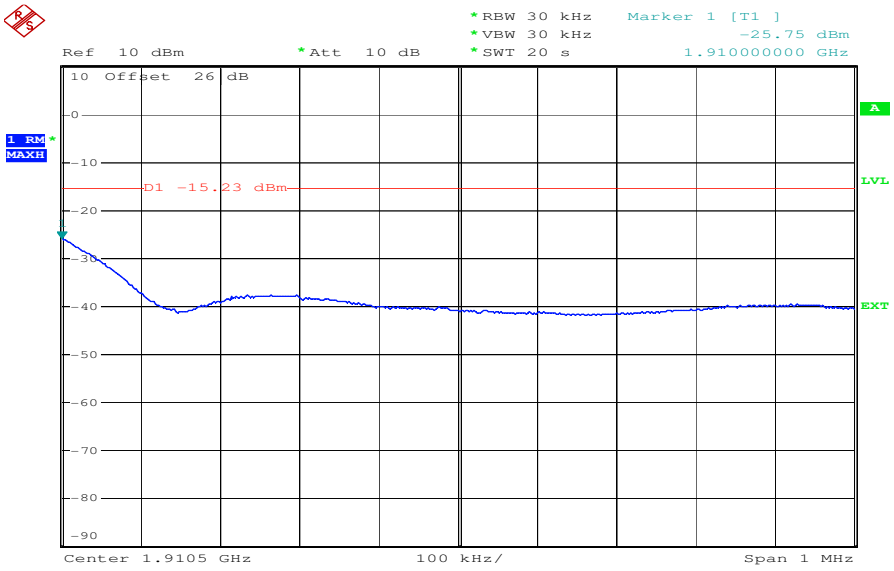
Date: 26.MAY.2008 16:50:09

Plot 3: lower band edge (Channel 9262 HSDPA)



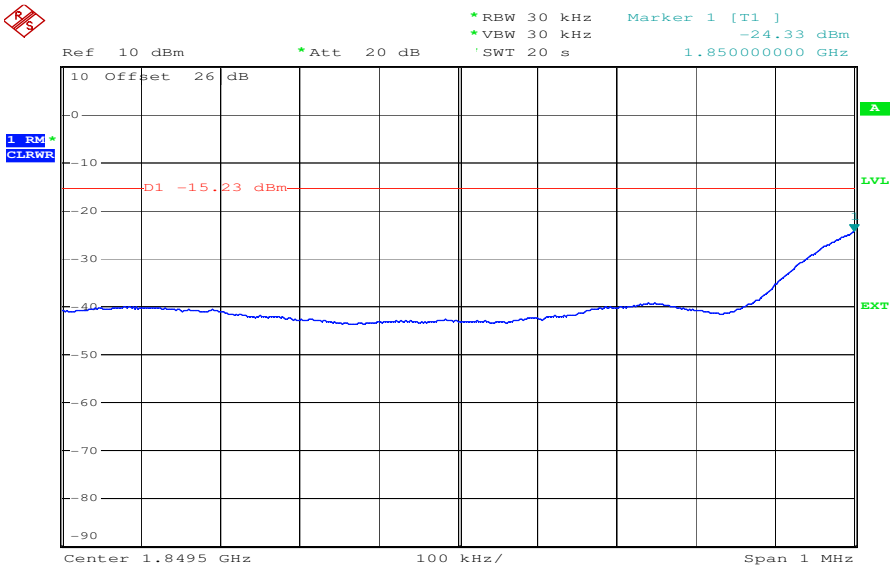
Date: 26.MAY.2008 12:46:20

Plot 4: higher band edge (Channel 9538 HSDPA)



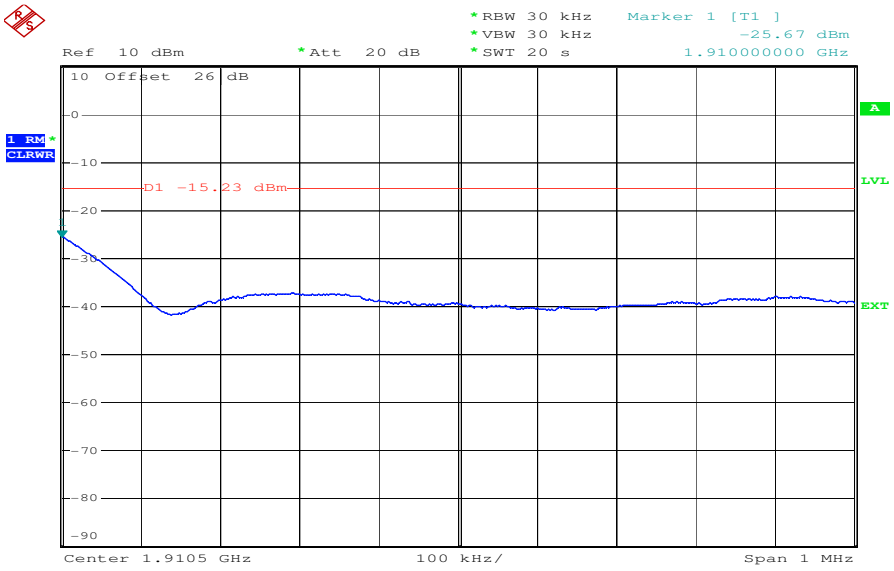
Date: 26.MAY.2008 12:48:30

Plot 5: lower band edge (Channel 9262 HSUPA)



Date: 26.MAY.2008 15:13:09

Plot 6: higher band edge (Channel 9538 HSUPA)



Date: 26.MAY.2008 15:16:36

5.3.8 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.

UMTS mode

Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1852.4 MHz	4684	4828
1880.0 MHz	4656	4836
1907.6 MHz	4668	4836

HSDPA mode

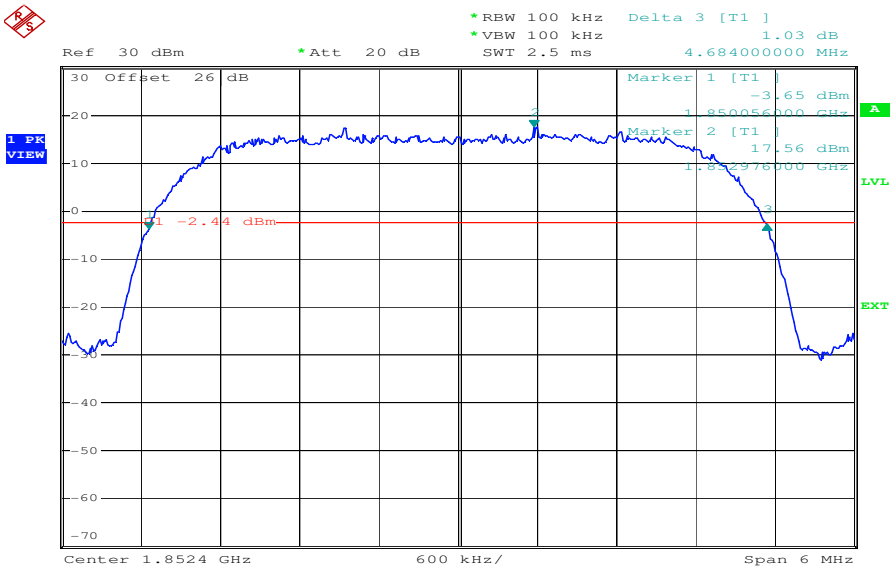
Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1852.4 MHz	4668	4836
1880.0 MHz	4656	4824
1907.6 MHz	4680	4812

HSUPA mode

Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1852.4 MHz	4668	4848
1880.0 MHz	4668	4836
1907.6 MHz	4644	4824

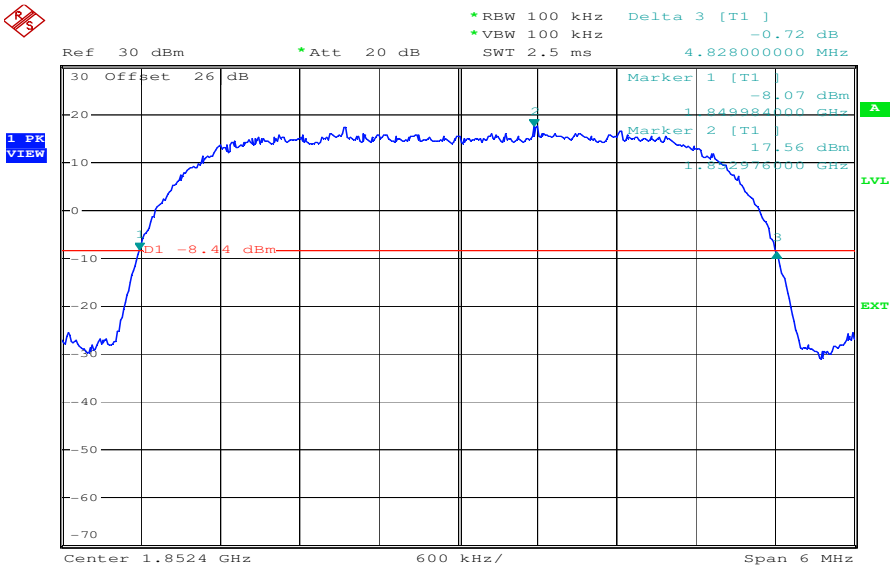
Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 300.0 kHz, this equates to a resolution bandwidth of at least 3.0 kHz. For this testing, a resolution bandwidth 100 kHz was used.

Channel 9262 UMTS
99% (-20 dBc) Bandwidth



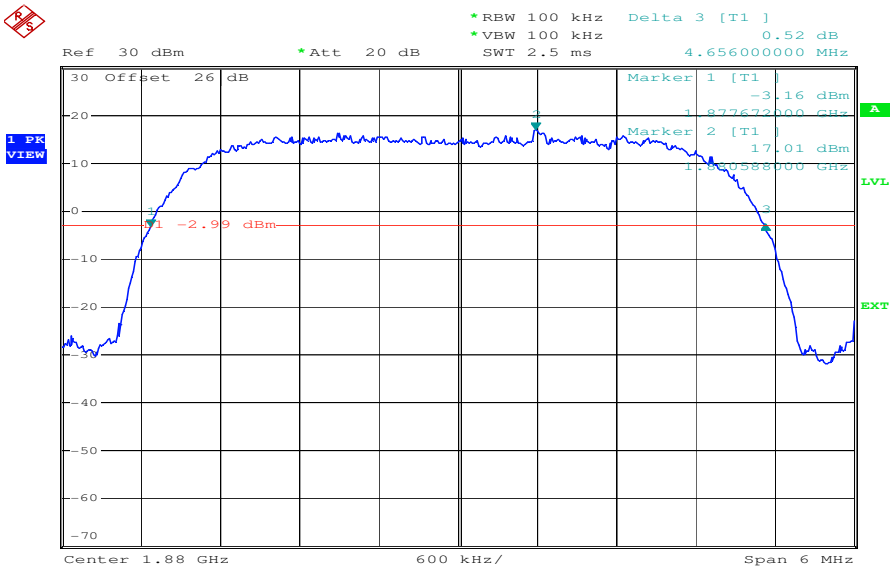
Date: 26.MAY.2008 16:53:39

Channel 9262 UMTS
-26 dBc Bandwidth



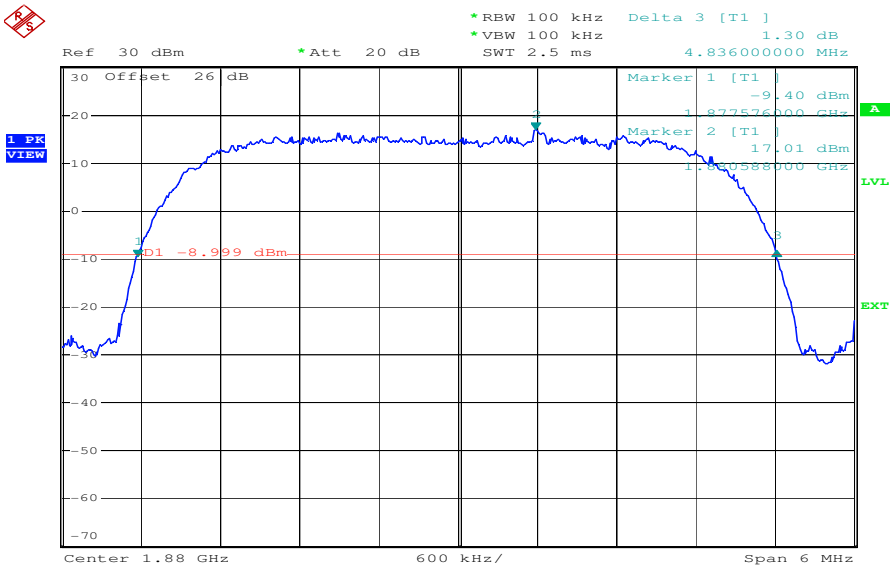
Date: 26.MAY.2008 16:54:55

Channel 9400 UMTS
99% (-20 dBc) Bandwidth



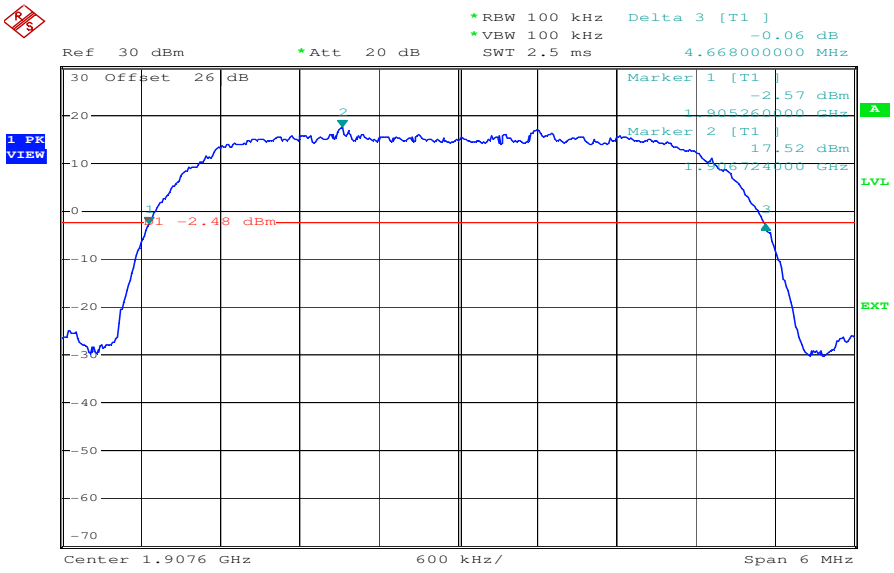
Date: 26.MAY.2008 16:57:12

Channel 9400 UMTS
-26 dBc Bandwidth



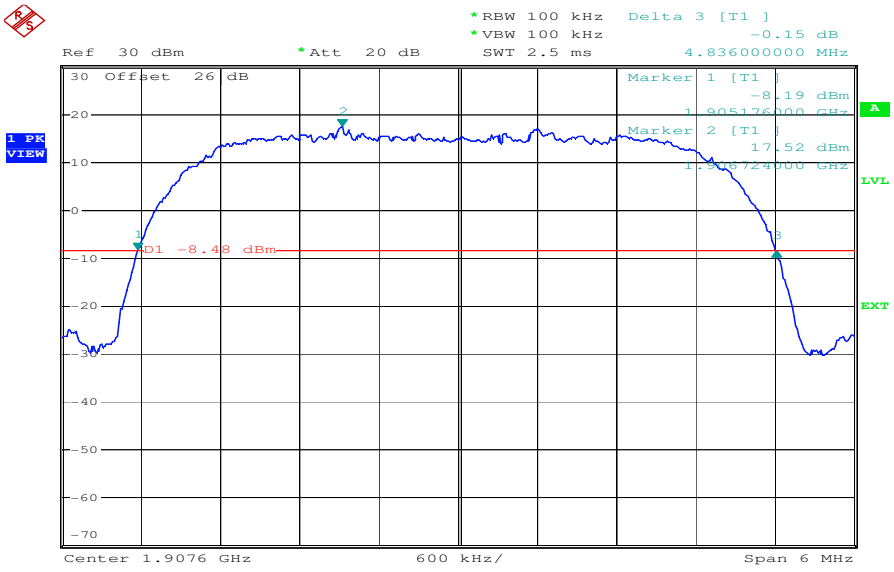
Date: 26.MAY.2008 16:58:00

Channel 9538 UMTS
99% (-20 dBc) Bandwidth



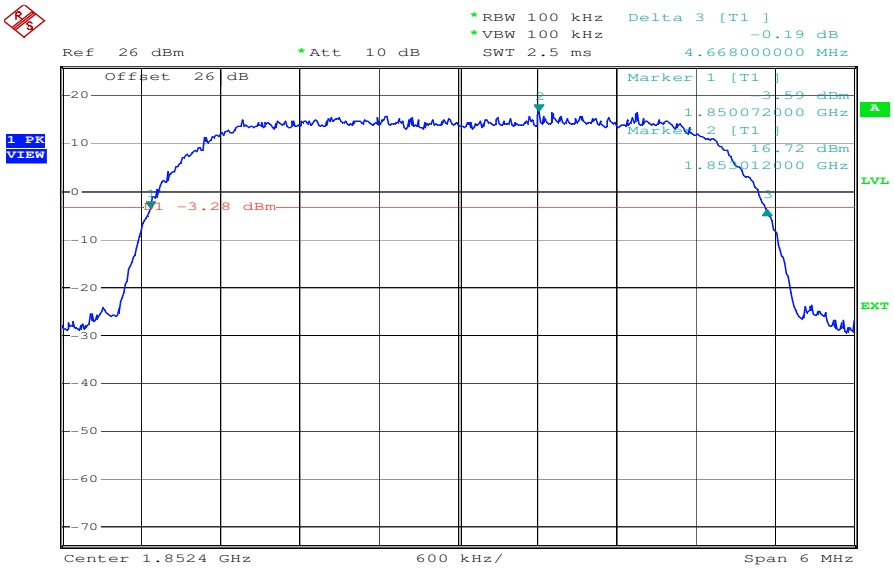
Date: 26.MAY.2008 17:03:35

Channel 9538 UMTS
-26 dBc Bandwidth



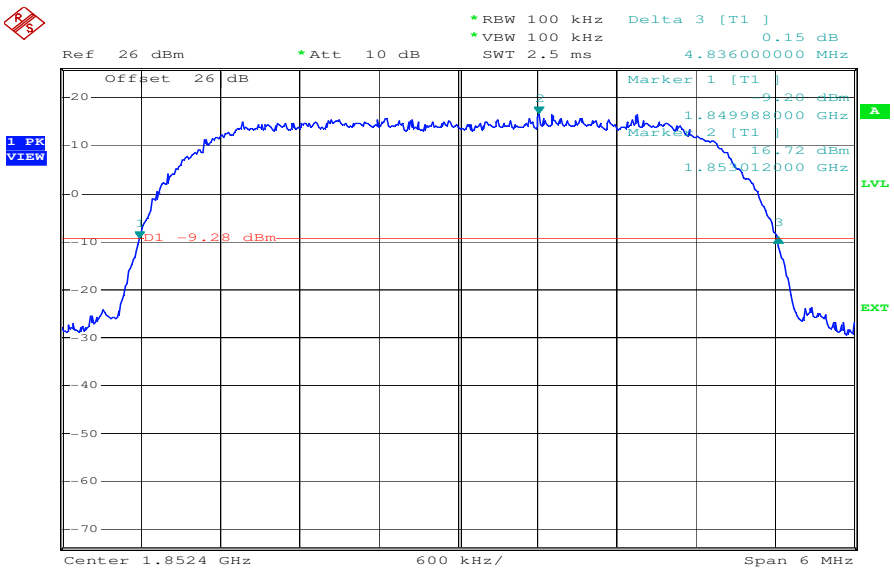
Date: 26.MAY.2008 17:04:30

Channel 9262 HSDPA
99% (-20 dBc) Bandwidth



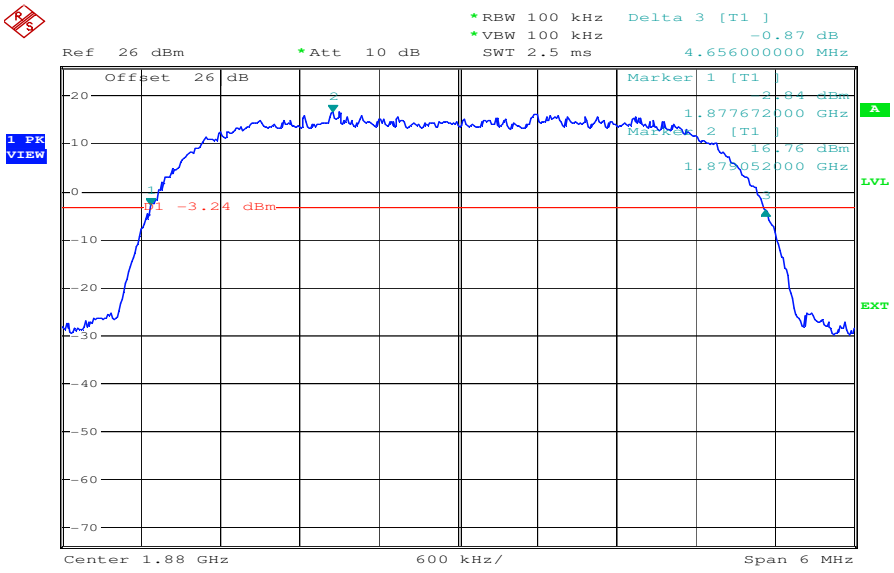
Date: 26.MAY.2008 13:50:50

Channel 9262 HSDPA
-26 dBc Bandwidth



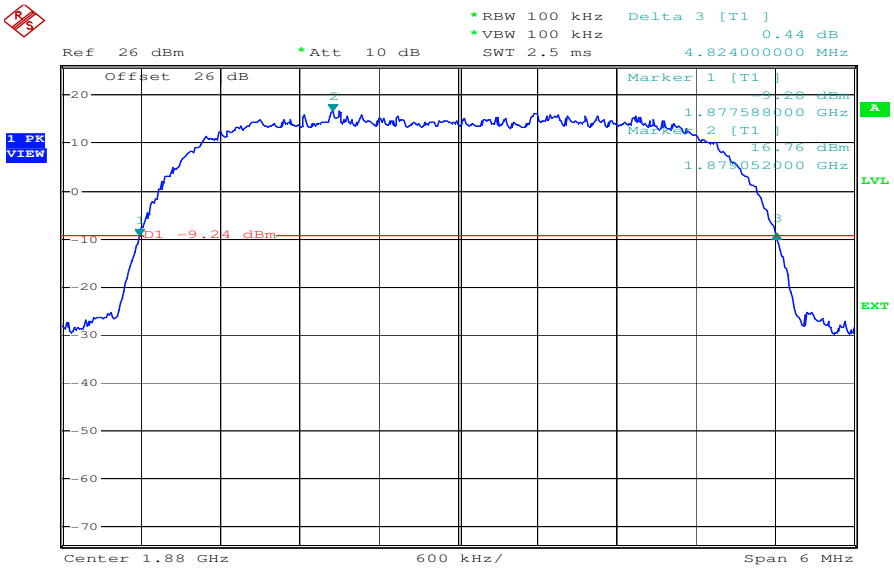
Date: 26.MAY.2008 13:52:12

Channel 9400 HSDPA
99% (-20 dBc) Bandwidth



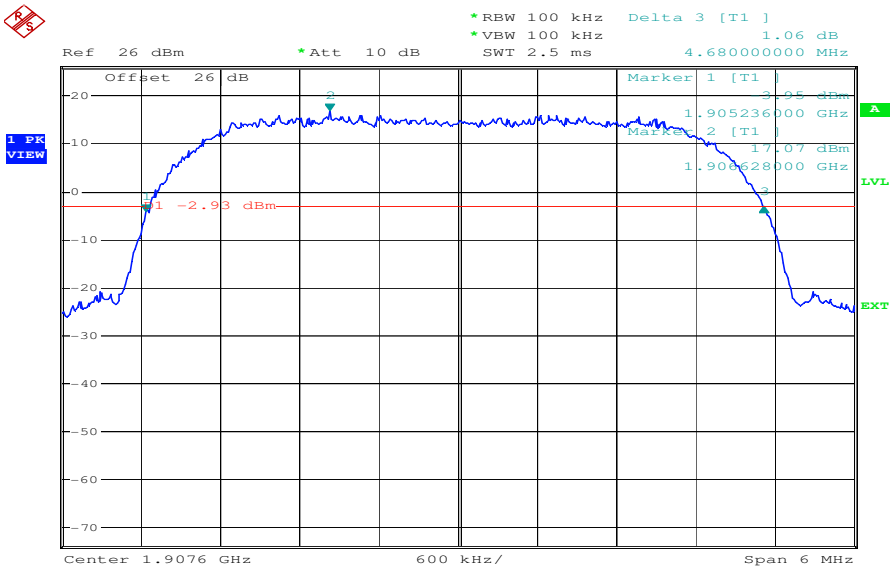
Date: 26.MAY.2008 14:01:03

Channel 9400 HSDPA
-26 dBc Bandwidth



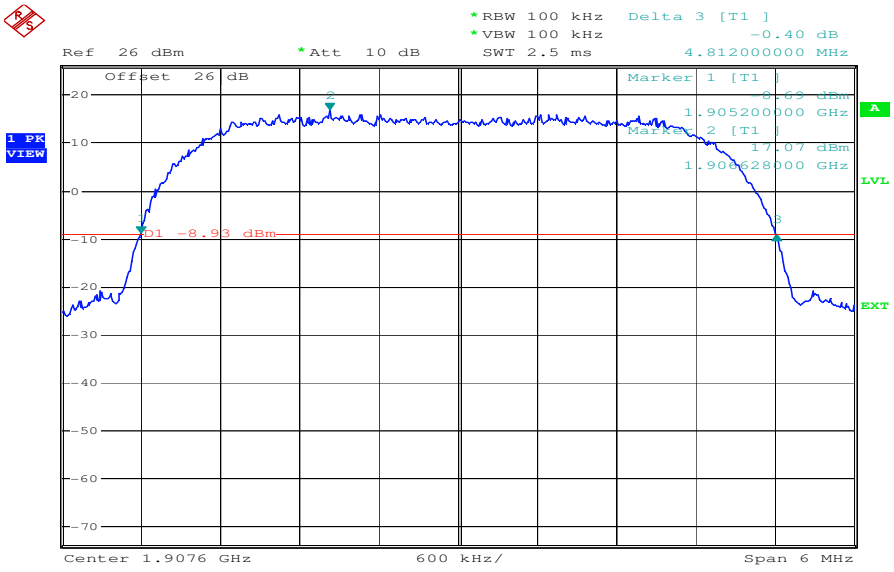
Date: 26.MAY.2008 14:02:01

Channel 9538 HSDPA
99% (-20 dBc) Bandwidth



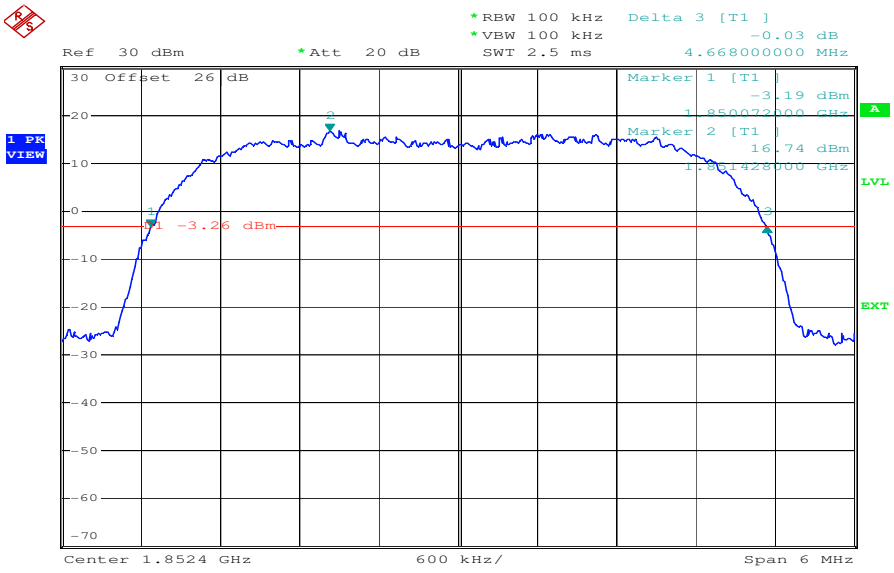
Date: 26.MAY.2008 14:10:22

Channel 9538 HSDPA
-26 dBc Bandwidth



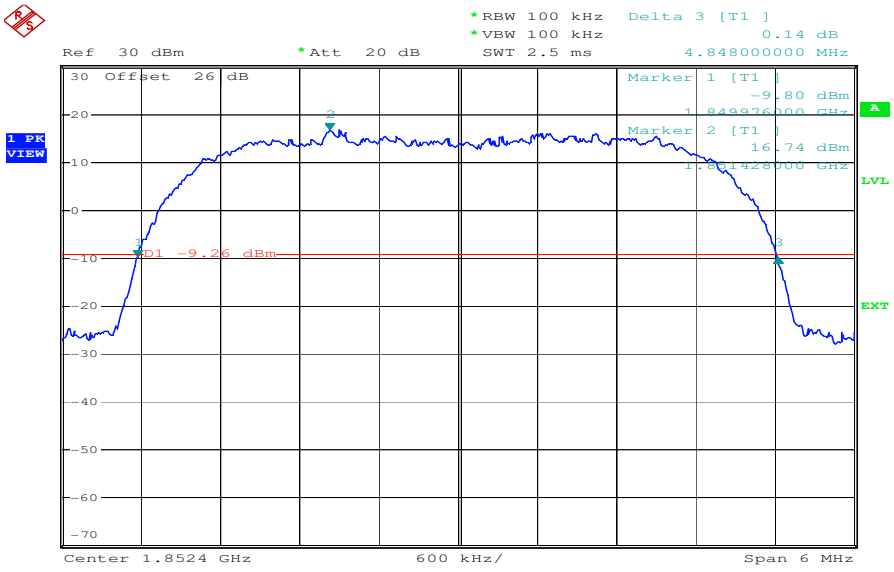
Date: 26.MAY.2008 14:11:14

Channel 9262 HSUPA
99% (-20 dBc) Bandwidth



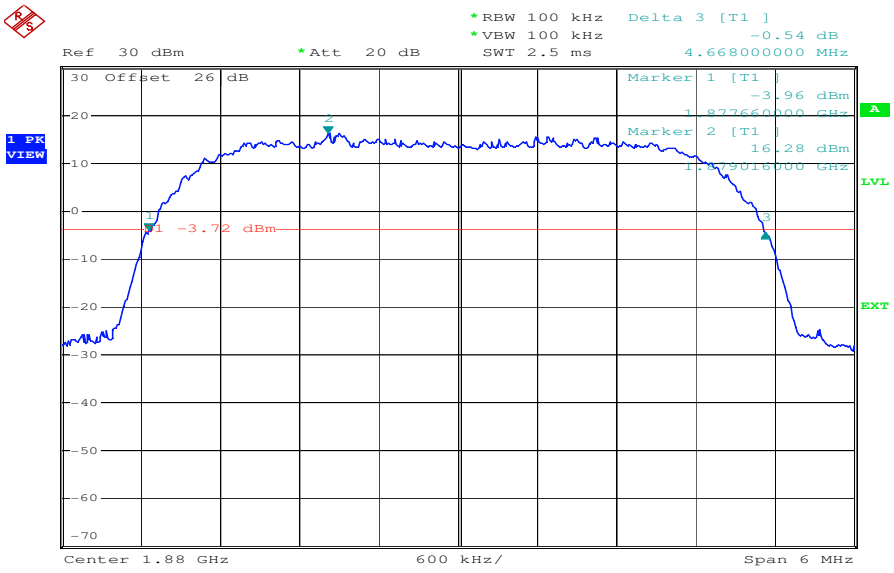
Date: 26.MAY.2008 15:33:33

Channel 9262 HSUPA
-26 dBc Bandwidth



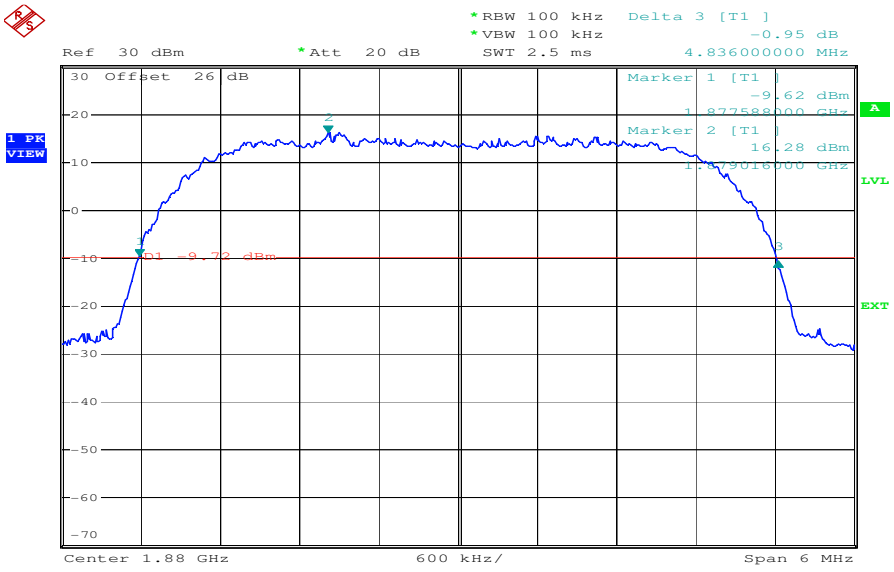
Date: 26.MAY.2008 15:34:43

Channel 9400 HSUPA
99% (-20 dBc) Bandwidth



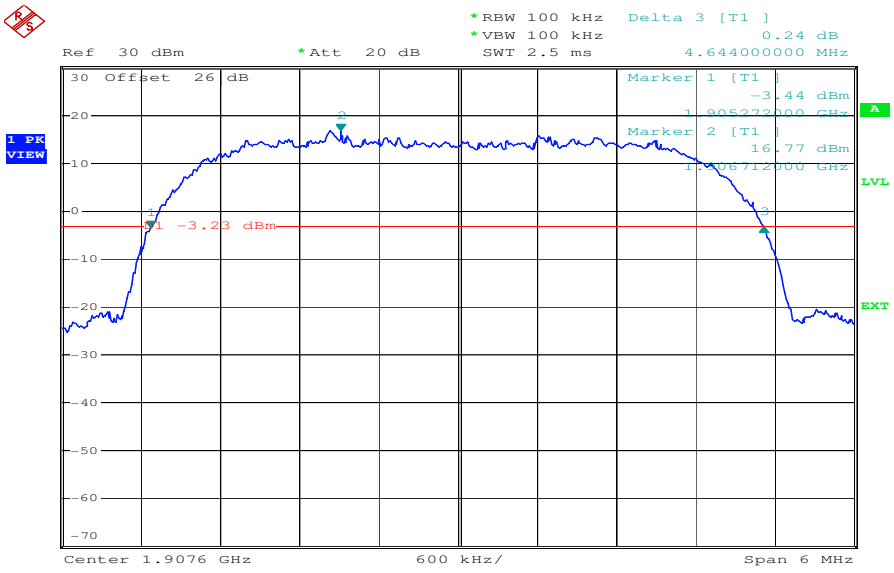
Date: 26.MAY.2008 16:01:40

Channel 9400 HSUPA
-26 dBc Bandwidth



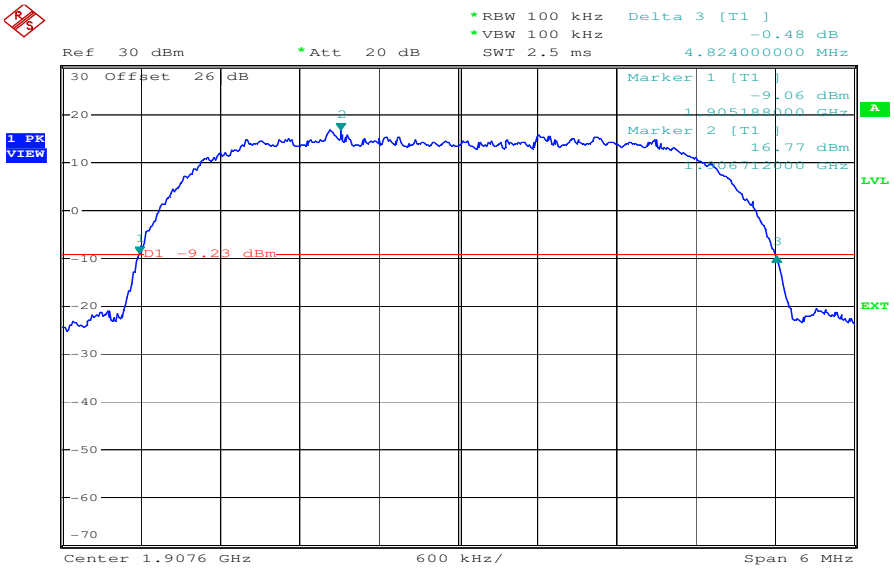
Date: 26.MAY.2008 16:02:34

Channel 9538 HSUPA
99% (-20 dBc) Bandwidth



Date: 26.MAY.2008 16:05:32

Channel 9538 HSUPA
-26 dBc Bandwidth



Date: 26.MAY.2008 16:06:57

5.4 WCDMA FDD V

5.4.1 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, 826.4 MHz, 836.6 MHz and 846.6 MHz (bottom, middle and top of operational frequency range).

WCDMA 850 (RMC 12.2 kBit/s)		
Channel / frequency	Max. RMS	Peak
4132 / 826.4 MHz	**23,08** dBm	25,79 dBm
4182 / 836.6 MHz	**23,09** dBm	25,90 dBm
4233 / 846.6 MHz	**23,10** dBm	25,67 dBm

Table 1: Test results conducted peak power measurement WCDMA

WCDMA + HSDPA 850			
Channel / frequency	sub-test	Max. RMS	Peak
4132 / 826.4 MHz	1	23,18 dBm	25,65 dBm
4182 / 836.6 MHz	1	23,14 dBm	25,81 dBm
4233 / 846.6 MHz	1	23,14 dBm	25,53 dBm
4132 / 826.4 MHz	2	21,45 dBm	25,33 dBm
4182 / 836.6 MHz	2	21,17 dBm	25,75 dBm
4233 / 846.6 MHz	2	21,10 dBm	25,91 dBm
4132 / 826.4 MHz	3	20,95 dBm	25,61 dBm
4182 / 836.6 MHz	3	20,61 dBm	25,73 dBm
4233 / 846.6 MHz	3	20,06 dBm	24,94 dBm
4132 / 826.4 MHz	4	20,37 dBm	24,71 dBm
4182 / 836.6 MHz	4	20,46 dBm	24,92 dBm
4233 / 846.6 MHz	4	20,00 dBm	24,73 dBm

Table 2: Test results conducted peak power measurement WCDMA + HSDPA

WCDMA + HSDPA + HSUPA 850			
Channel / frequency	Sub-test	Max. RMS	Peak
4132 / 826.4 MHz	1	21,37 dBm	25,51 dBm
4182 / 836.6 MHz	1	21,33 dBm	25,62 dBm
4233 / 846.6 MHz	1	21,24 dBm	25,23 dBm
4132 / 826.4 MHz	2	21,46 dBm	26,41 dBm
4182 / 836.6 MHz	2	21,61 dBm	24,82 dBm
4233 / 846.6 MHz	2	21,02 dBm	25,62 dBm
4132 / 826.4 MHz	3	21,42 dBm	26,12 dBm
4182 / 836.6 MHz	3	21,37 dBm	26,23 dBm
4233 / 846.6 MHz	3	21,27 dBm	25,04 dBm
4132 / 826.4 MHz	4	20,74 dBm	25,74 dBm
4182 / 836.6 MHz	4	19,78 dBm	25,24 dBm
4233 / 846.6 MHz	4	20,47 dBm	25,35 dBm
4132 / 826.4 MHz	5	21,89 dBm	25,74 dBm
4182 / 836.6 MHz	5	21,73 dBm	25,81 dBm
4233 / 846.6 MHz	5	21,63 dBm	25,42 dBm

Table 3: Test results conducted peak power measurement WCDMA + HSDPA + HSUPA

Remark: None of the HSDPA/HSUPA settings leads to conducted power values exceeding the conducted power in RMC mode by more than 0.25 dB, so SAR testing was performed in RMC mode.

The M365 platform implements the MPR allowance to reduce power in order to maintain ACLR and other parametric performance margin in high peak to average signal conditions. The values predicted by the cubic metric allow the designers to back-off the maximum power by up to the maximum power reduction value. The power amplifier solution used in the M365 HSPA platform is optimized to require up to the MPR value for all physical channel combinations. Generally the power reduction actually implemented is less than the MPR allowed. This implementation is on the order of a 1 dB reduction.

5.4.2 Test set-up requirements according to 3GPP 34.121

The following HSDPA sub-tests are defined by 3GPP 34.121 (table C.10.1.4)

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM(dB) (2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 (3)	15/15 (3)	64	12/15 (3)	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5
Note 1: Δ_{ACK}, Δ_{NACK}, $\Delta_{CQI} = 8 \Leftarrow\Rightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftarrow\Rightarrow \beta_{hs} = 30/15 * \beta_c$ Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$ Note 3 : For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$						

Table 4: Subtests for UMTS Release 5 HSDPA

They were tested using the following settings for HSDPA FRC + H-Set 1 QPSK (see table C.8.1.1 of 3GPP 34.121

Parameter	Value
Nominal average inf. bit rate	534 kbit/s
Inter-TTI Distance	3 TTI's
Number of HARQ Processes	2 Processes
Information Bit Payload	3202 Bits
MAC-d PDU size	336 Bits
Number Code Blocks	1 Block
Binary Channel Bits Per TTI	4800 Bits
Total Available SMLs in UE	19200 SMLs
Number of SMLs per HARQ Process	9600 SMLs
Coding Rate	0.67
Number of Physical Channel Codes	5

Table 5: settings of required H-Set 1 QPSK in HSDPA mode

The following HSUPA sub-tests are defined by 3GPP 34.121 (table C.11.1.3)

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ec} (SF)	β_{ed} (code)	CM (2) (dB)	MPR (dB)	AG (4) Index	E-TFCI
1	11/15 (3)	15/15 (3)	64	11/15 (3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}:47/15 $\beta_{ed2:}$47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (4)	15/15 (4)	64	15/15 (4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK}, $\Delta_{CQI} = 8 \Leftarrow\Rightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftarrow\Rightarrow \beta_{hs} = 30/15 * \beta_c$
Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference
Note 3 : For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$
Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$
Note 5 : Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g
Note 6 : β_{ed} can not be set directly; it is set by Absolute Grant Value

Table 6: Subtests for UMTS Release 6 HSUPA

Some HSUPA sub test settings of parameters defined in the table above cannot be set directly. Instead $\Delta_{E\text{-}DPCCH}$, Reference E-TFCI and Reference E-TFCI Power Offset were set according to table 5.2B.2 of 3GPP 34.121, and CMU200 operating manual instructions of firmware V4.52 were followed to reach a test condition with maximum output power and one E-TFCI.

Limits:

Power Step	Nominal Peak Output Power (dBm)	Tolerance (dB)
0	+38.45	$\pm$ 2

According to the subtest settings shown in table 6 a Maximum Power Reduction of up to 2 dB can be expected in HSUPA subtest 2 – 4. The measurement results in table 3 only show a maximum reduction of 1 dB in subtests 2 and 4.

The following statement submitted by the manufacturer confirms that maximum power reduction in HSUPA subtests 2 – 4 is not exhausted :

The M365 platform implements the MPR allowance to reduce power in order to maintain ACLR and other parametric performance margin in high peak to average signal conditions. The values predicted by the cubic metric allow the designers to back-off the maximum power by up to the maximum power reduction value. The power amplifier solution used in the M365 HSPA platform is optimized to require up to the MPR value for all physical channel combinations. Generally the power reduction actually implemented is less than the MPR allowed. This implementation is on the order of a 1 dB reduction.

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

Measurement Results Output Power (Radiated) UMTS Mode

Frequency (MHz)	**Burst Peak (dBm)**
826.4	23.37
836.0	24.31
846.6	23.45
Measurement uncertainty	±1.5 dB

Measurement Results Output Power (Radiated) HSDPA Mode

Frequency (MHz)	**Burst Peak (dBm)**
826.4	23.23
836.0	24.22
846.6	23.31
Measurement uncertainty	±1.5 dB

Measurement Results Output Power (Radiated) HSUPA Mode

Frequency (MHz)	**Burst Peak (dBm)**
826.4	23.70
836.0	24.64
846.6	22.82
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

5.4.3 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.

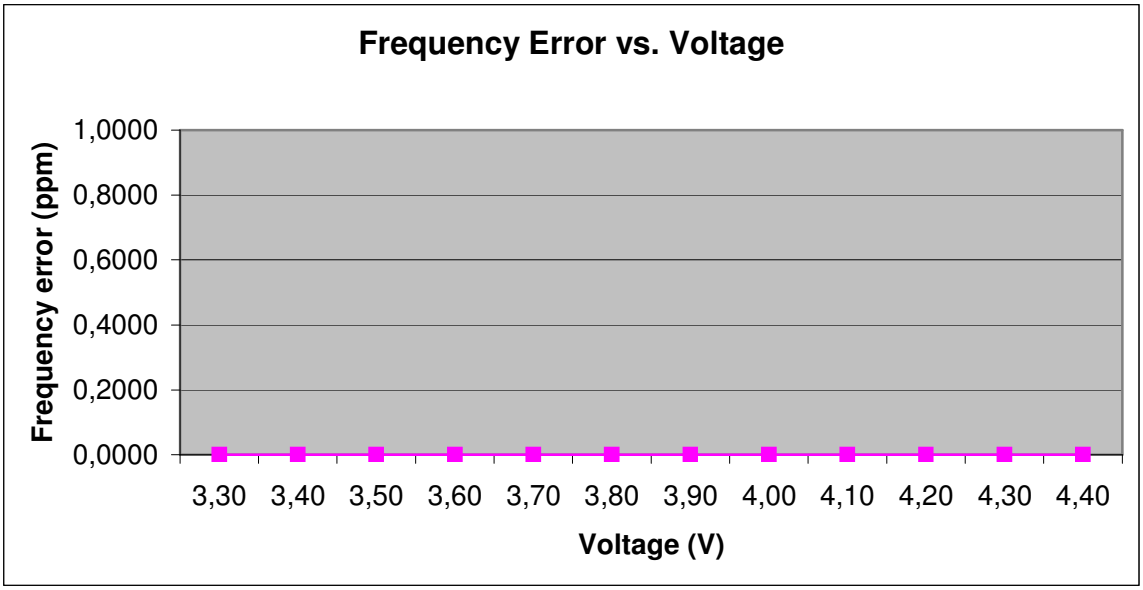
Measurement Results: AFC FREQ ERROR vs. VOLTAGE

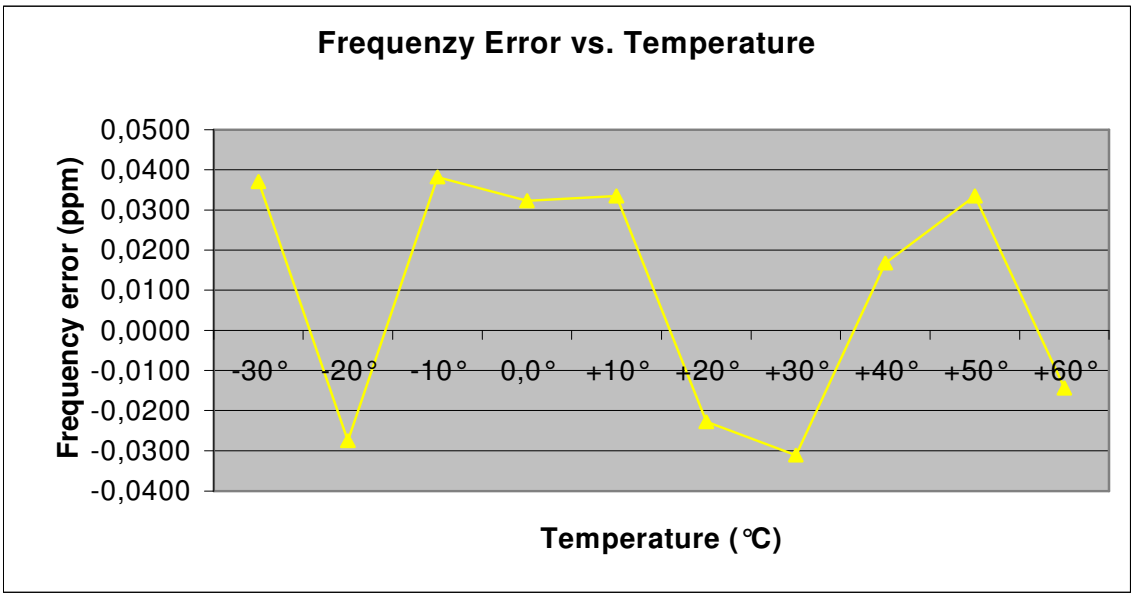
It is not possible to perform the AFC FREQ ERROR vs. VOLTAGE measurement, because the power supply is effected by the initialization board.

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	--	--	--
3.4	--	--	--
3.5	--	--	--
3.6	--	--	--
3.7	--	--	--
3.8	--	--	--
3.9	--	--	--
4.0	--	--	--
4.1	--	--	--
4.2	--	--	--
4.3	--	--	--
4.4	--	--	--

Measurement Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	+31	0,00000371	0,0371
-20	-23	-0,00000275	-0,0275
-10	+32	0,00000383	0,0383
±0.0	+27	0,00000323	0,0323
+10	+28	0,00000335	0,0335
+20	-19	-0,00000227	-0,0227
+30	-26	-0,00000311	-0,0311
+40	+14	0,00000167	0,0167
+50	+28	0,00000335	0,0335
+60	-12	-0,00000143	-0,0143


Frequency Error vs. Voltage
Frequency error (ppm)
1,0000
0,8000
0,6000
0,4000
0,2000
0,0000
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
Frequency error (ppm)
0,0500
0,0400
0,0300
0,0200
0,0100
0,0000
-0,0100
-0,0200
-0,0300
-0,0400
-30°
-20°
-10°
0,0°
+10°
+20°
+30°
+40°
+50°
+60°
Temperature (°C)

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

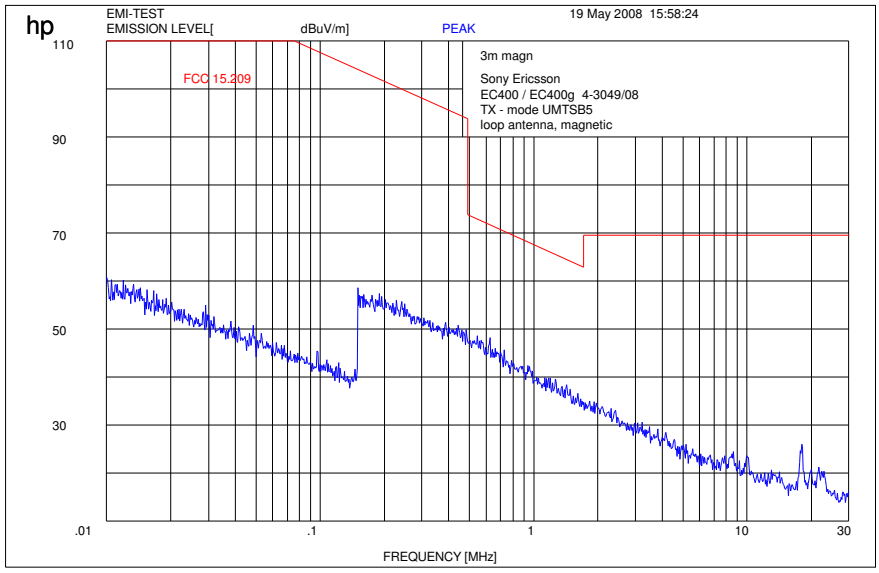
Harmonic	Tx ch.-4132 Freq. (MHz)	Level (dBm)	Tx ch.-4180 Freq. (MHz)	Level (dBm)	Tx ch.-4233 Freq. (MHz)	Level (dBm)
2	1652.8	-	1672.8	-	1693.2	-
3	2479.2	-	2509.2	-	2539.8	-
4	3305.6	-	3345.6	-	3386.4	-
5	4132.0	-	4182.0	-	4233.0	-
6	4958.4	-	5018.4	-	5079.6	-
7	5784.8	-	5854.8	-	5926.2	-
8	6611.2	-	6691.2	-	6772.8	-
9	7437.6	-	7527.6	-	7619.4	-
10	8264.0	-	8364.0	-	8466.0	-

Sample calculation:

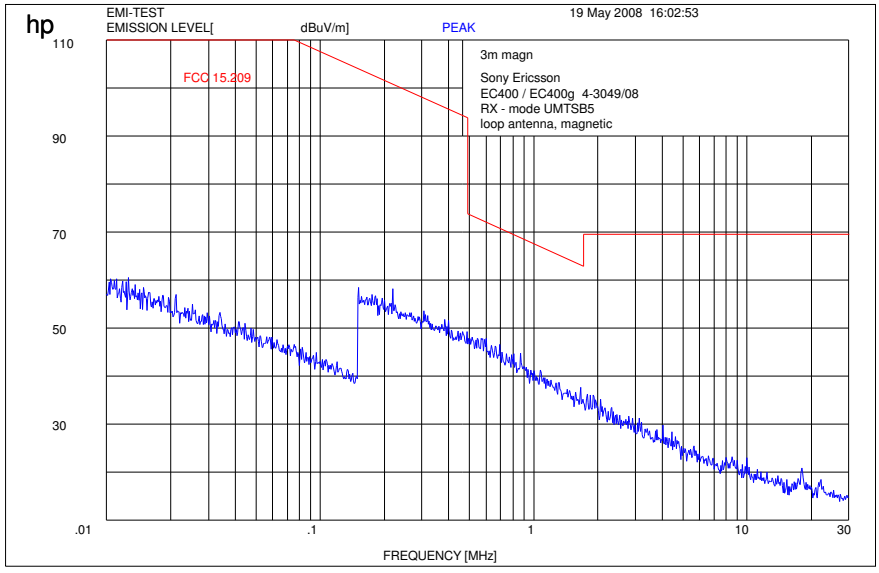
Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERP	Substitution Antenna
MHz	dBµV	dBm	dBi	dBi	dB	dBm	
848.8	137.8	26.6	8.4	0.0	3.3	31.7	UHAP Schwarzbeck S/N 460

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

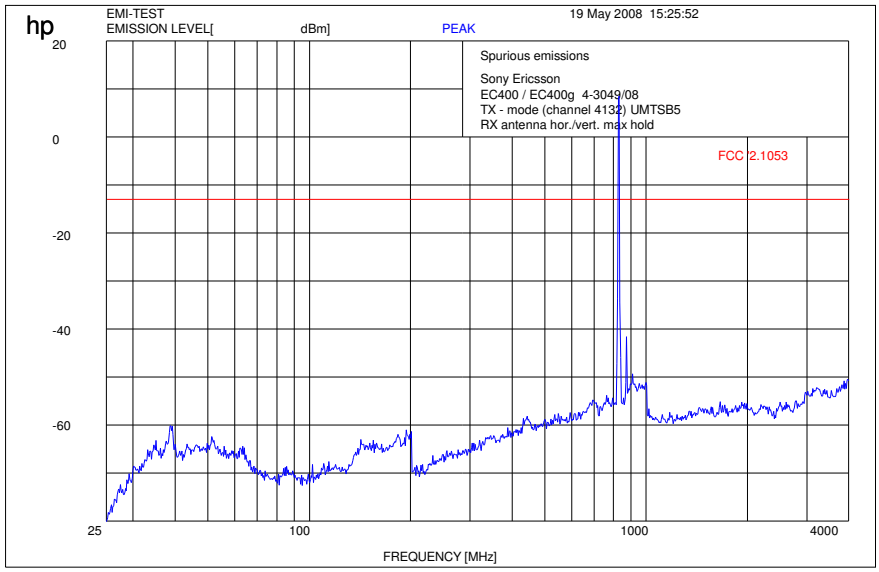
Traffic mode up to 30 MHz (Valid for all 3 channels)



Receiver mode up to 30 MHz

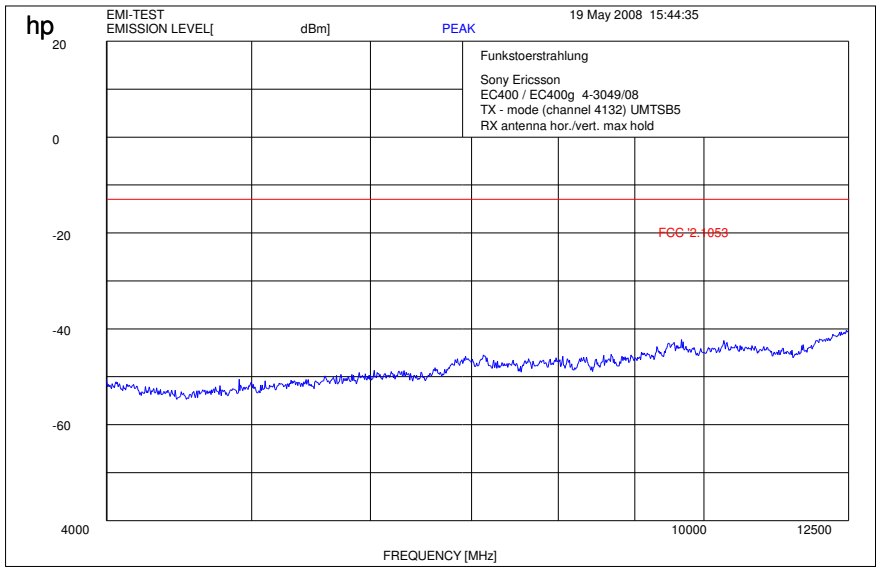


Channel 4132 (25 MHz - 4 GHz)



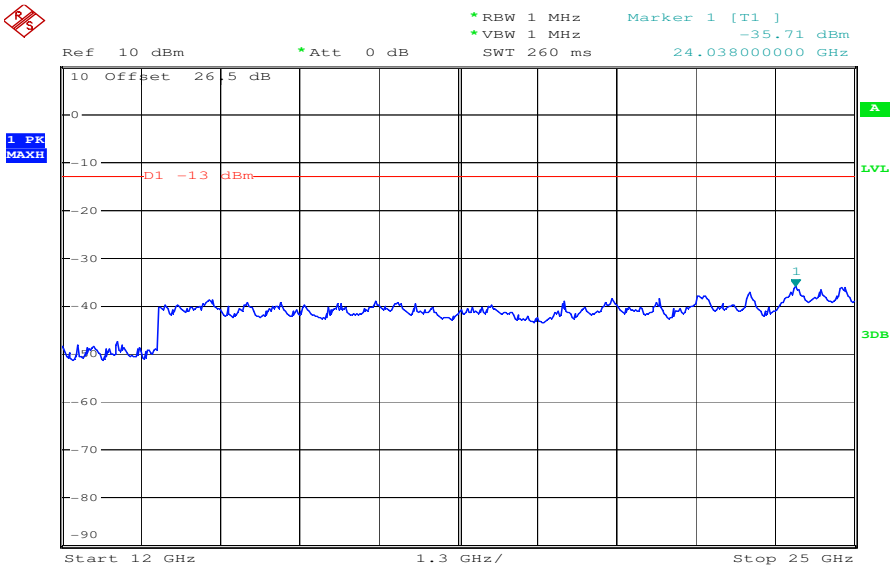
f < 1 GHz : RBW / VBW: 100 kHz f ≥ 1GHz : RBW / VBW: 1 MHz

Channel 4132 (4 GHz – 12.5 GHz)

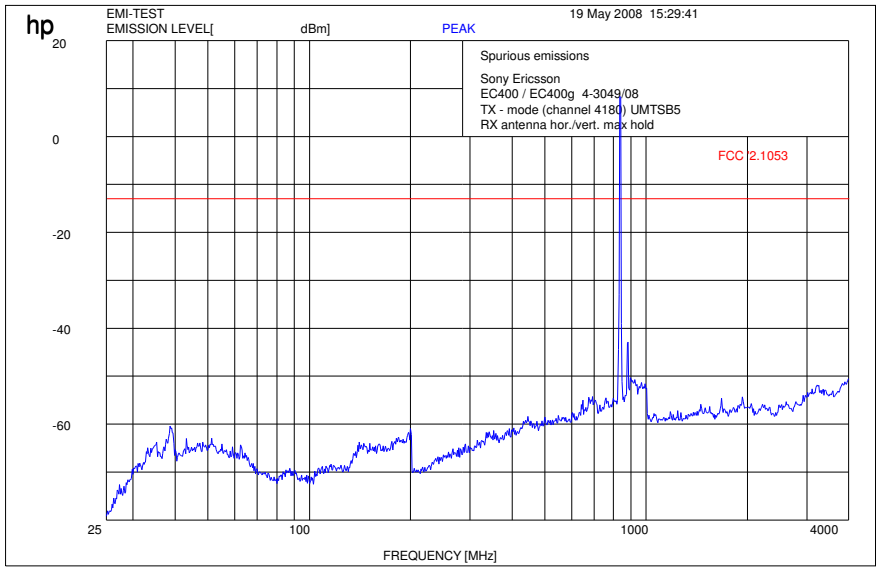


f ≥ 1GHz : RBW / VBW: 1 MHz

Channel 4132 (12 GHz - 25 GHz) valid for all 3 channels

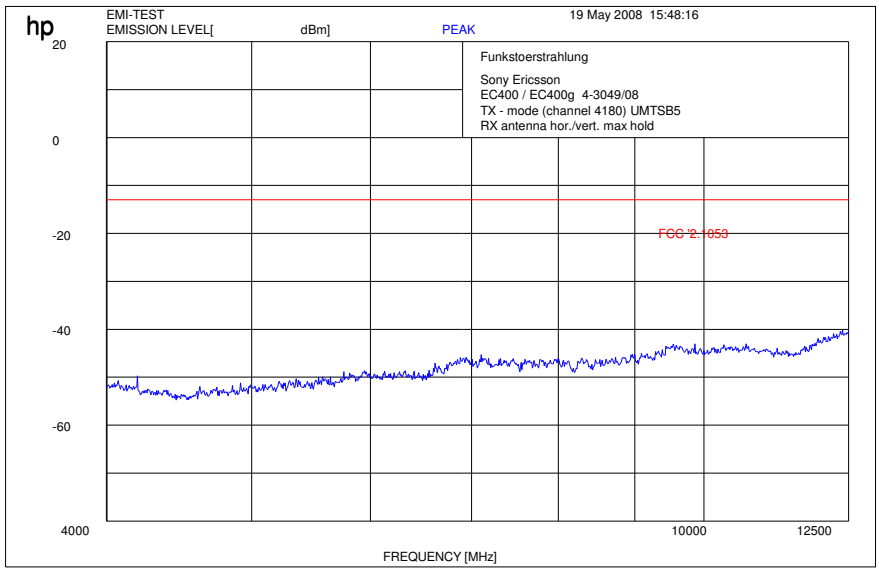


Channel 4180 (25 MHz - 4GHz)



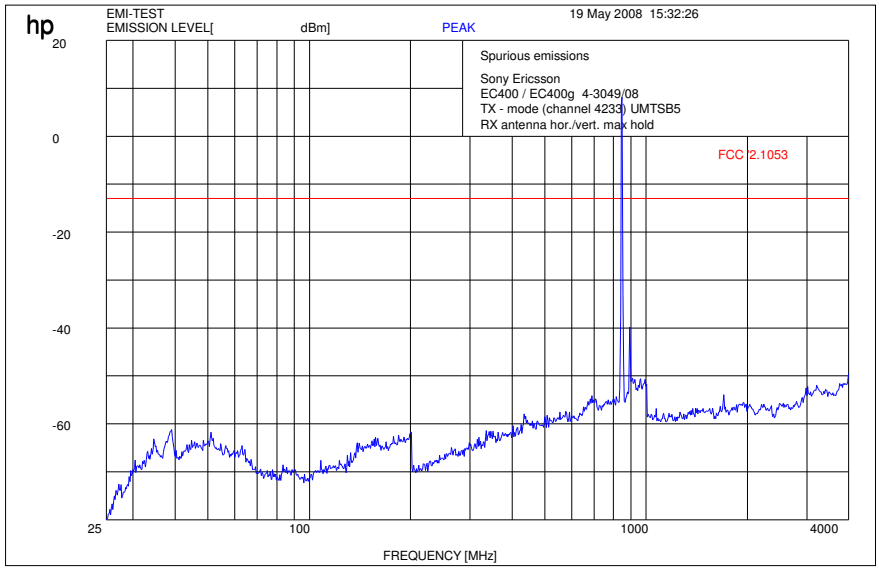
f < 1 GHz : RBW / VBW: 100 kHz f ≥ 1GHz : RBW / VBW: 1 MHz

Channel 4180 (4 GHz – 12.5 GHz)



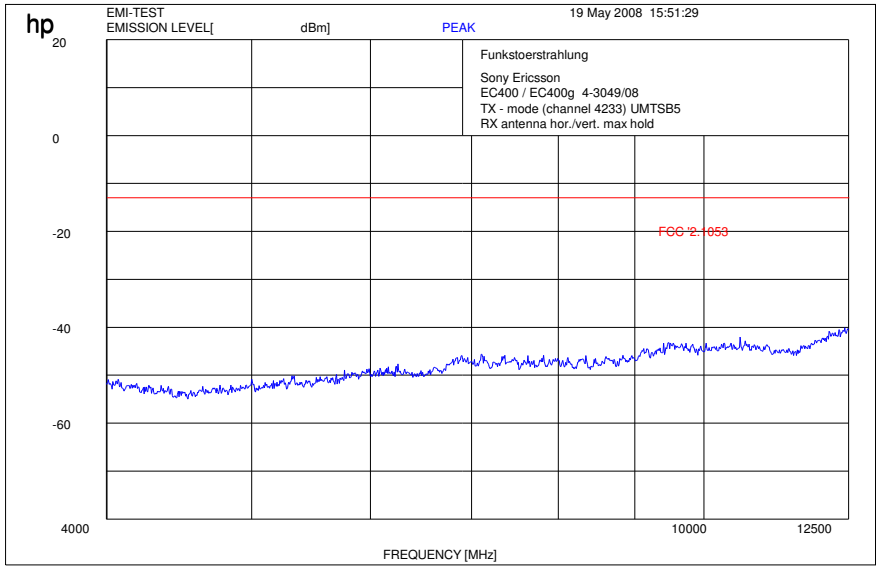
f ≥ 1GHz : RBW / VBW: 1 MHz

Channel 4233 (25 MHz - 4 GHz)



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

Channel 4233 (4 GHz – 12.5 GHz)



f ≥ 1GHz : RBW / VBW: 1 MHz

5.4.5 Receiver Radiated Emissions

Reference

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

SPURIOUS EMISSIONS LEVEL (µV/m)								
Idle Mode								
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
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)

Information

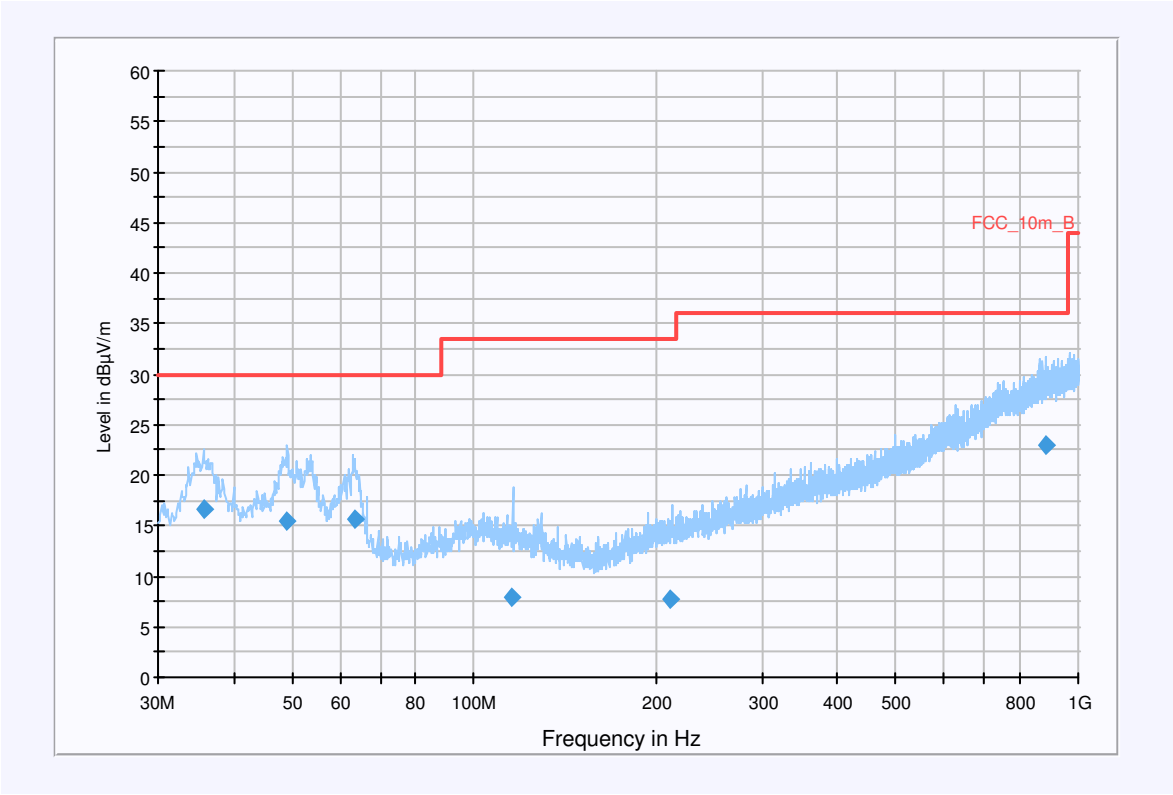
EUT:	EC400g
Serial Number:	BDX0002NLO (IMEI: 064401071829960)
Test Description:	FCC part 15 class B @ 10 m
Operating Conditions:	idle FDD V
Operator Name:	Hennemann
Comment:	-/-

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	EMI radiated\Electric Field (NOS)
Level Unit:	dBµV/m

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

FCC_Short_1GHz



Final Measurement Detector 1

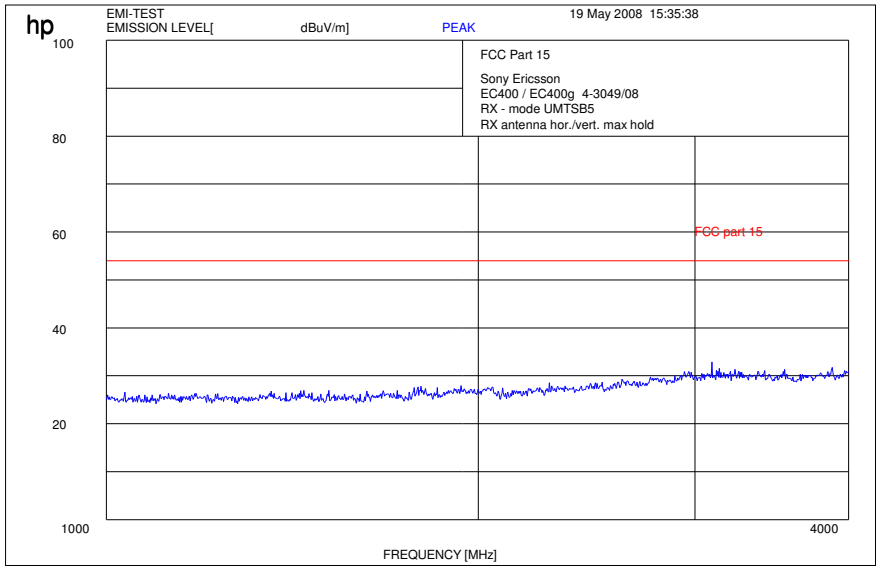
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
35.682850	16.6	1000.000	120.000	120.0	V	268.0	13.2	13.4	30.0	
49.141100	15.4	1000.000	120.000	120.0	V	232.0	13.6	14.6	30.0	
63.419800	15.7	1000.000	120.000	120.0	V	-1.0	11.1	14.3	30.0	
115.454300	7.9	1000.000	120.000	120.0	V	0.0	11.0	25.6	33.5	
212.040850	7.7	1000.000	120.000	120.0	H	21.0	12.3	25.8	33.5	
884.116050	23.0	1000.000	120.000	120.0	V	111.0	25.9	13.0	36.0	

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

Subrange 1

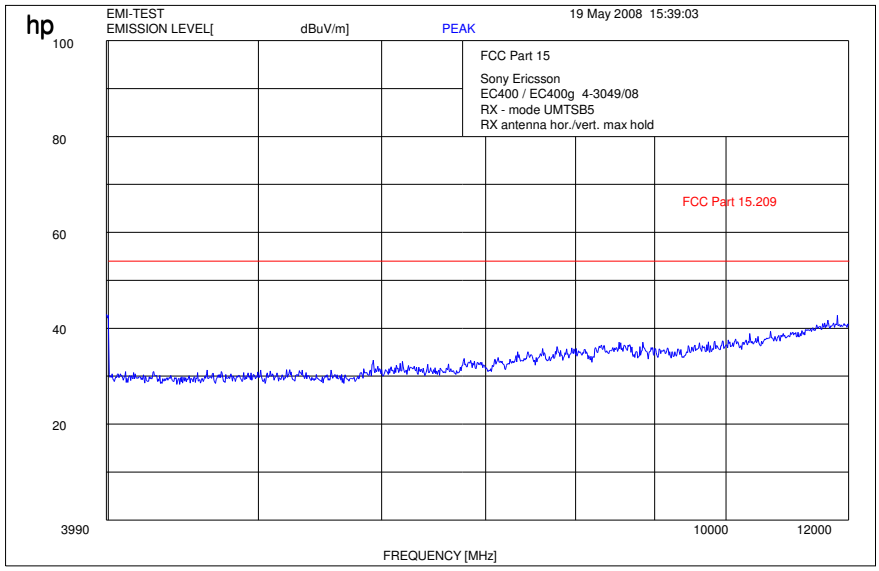
Frequency Range:	30MHz - 2GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW ---, CAL 08.04.2010 Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table: Cabel with switch (0408)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9)

Idle-Mode (30 MHz - 4 GHz)



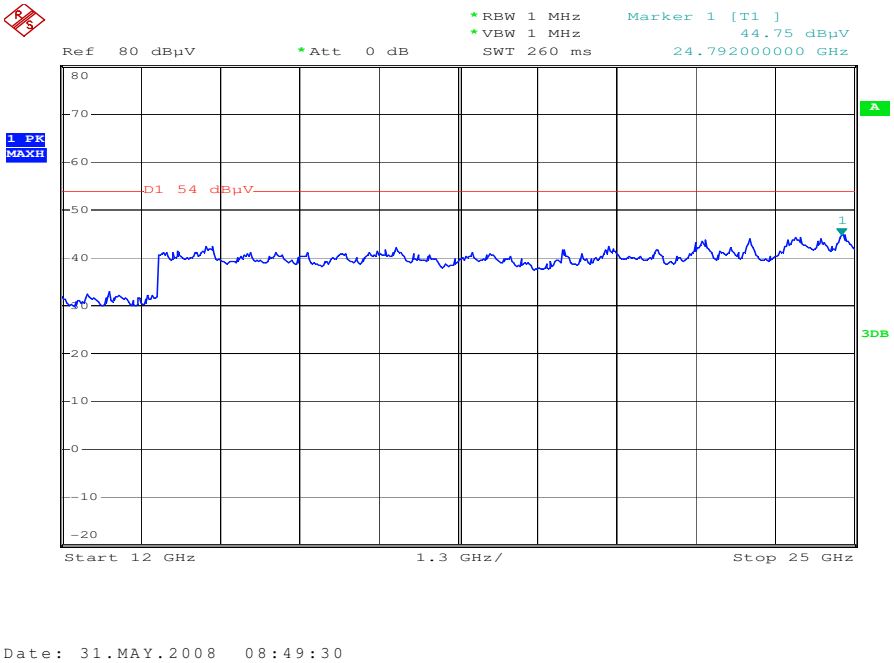
f < 1 GHz : RBW / VBW: 100 kHz f ≥ 1GHz : RBW / VBW: 1 MHz

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)



5.4.6 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.

Transmitter Channel Frequency
4132 826.4 MHz
4180 836.0 MHz
4233 846.6 MHz

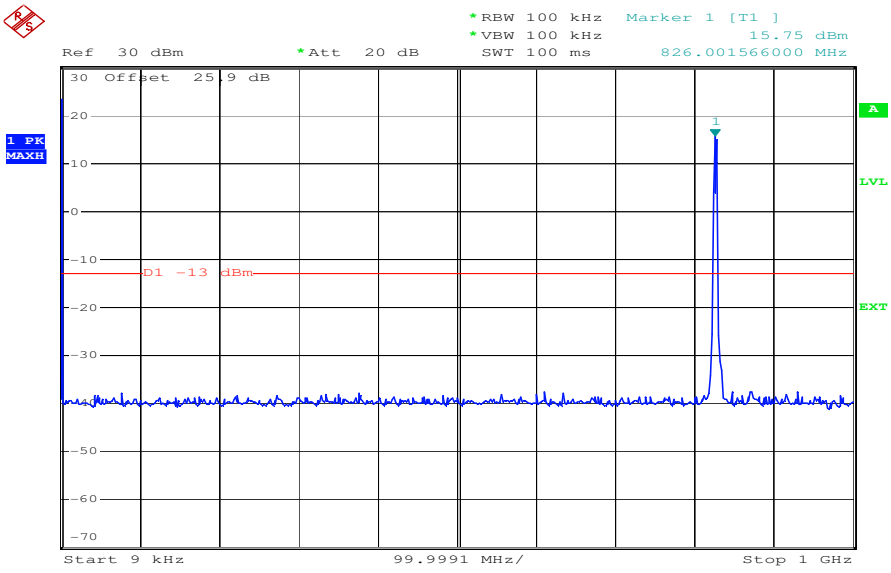
Measurement Limit

(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

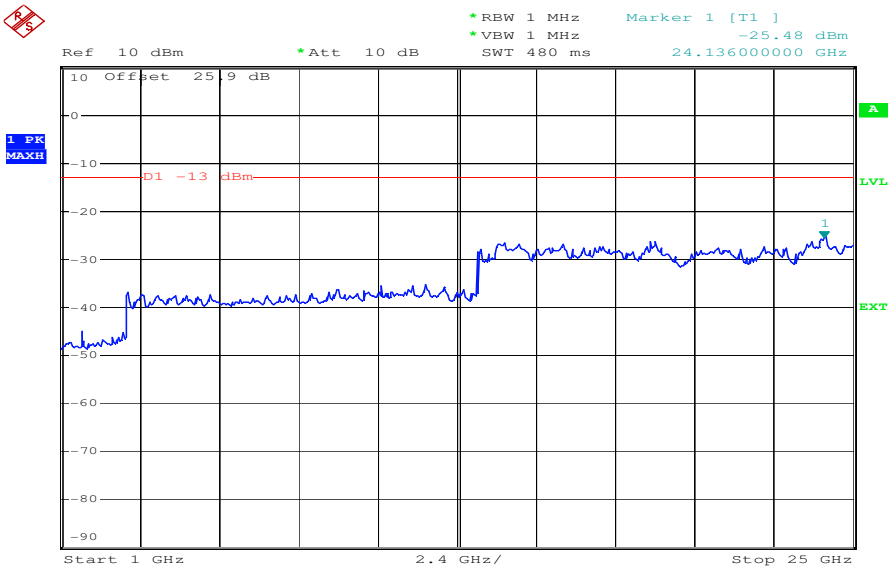
Harmonic	Tx ch.-4132 Freq. (MHz)	Level (dBm)	Tx ch.-4180 Freq. (MHz)	Level (dBm)	Tx ch.-4233 Freq. (MHz)	Level (dBm)
2	1652.8	-	1672.0	-	1693.2	-
3	2479.2	-	2508.0	-	2539.8	-
4	3305.6	-	3344.0	-	3386.4	-
5	4132.0	-	4180.0	-	4233.0	-
6	4958.4	-	5016.0	-	4079.6	-
7	5784.8	-	5852.0	-	5926.2	-
8	6611.2	-	6688.0	-	6772.8	-
9	7437.6	-	7524.0	-	7619.4	-
10	8264.0	-	8360.0	-	8466.0	-

Plot 1: Channel 4132 UMTS



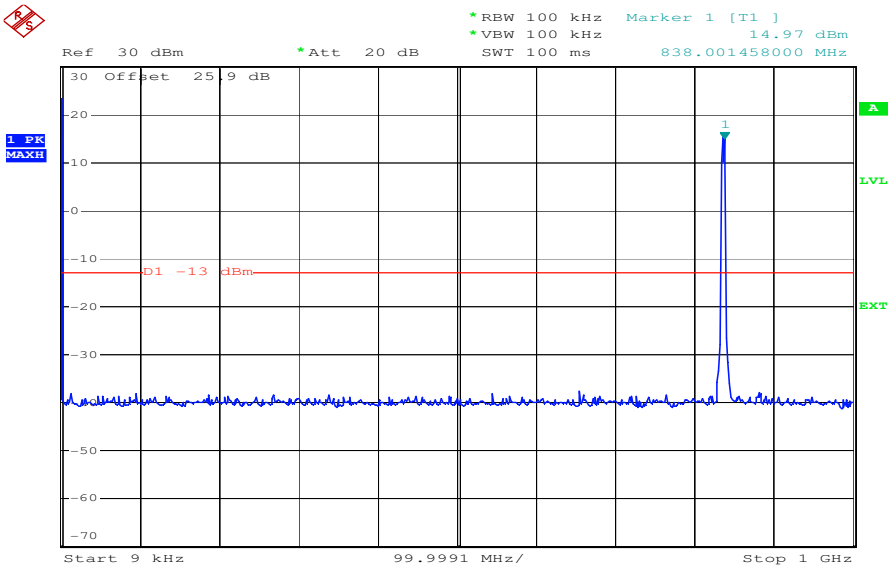
Date: 27.MAY.2008 09:33:29

Plot 2: Channel 4132 UMTS



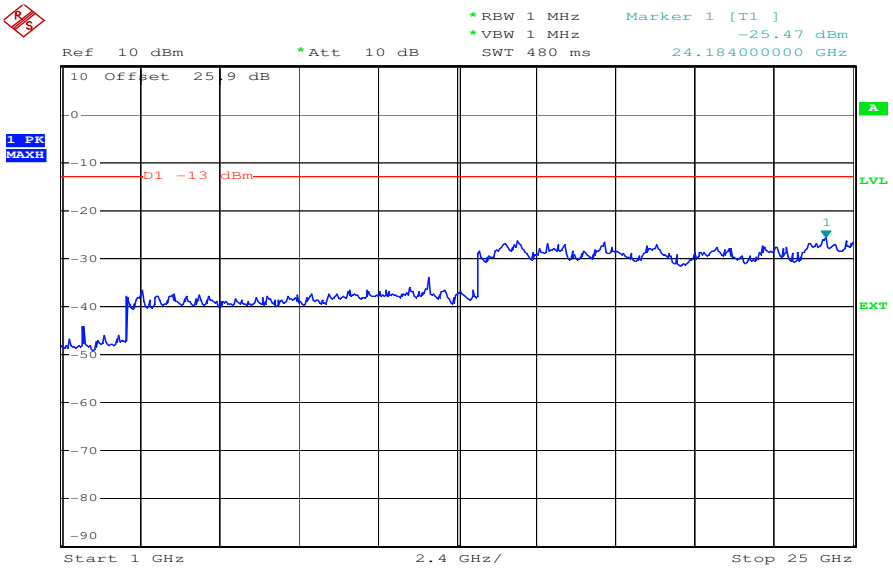
Date: 27.MAY.2008 09:40:23

Plot 3: Channel 4180 UMTS



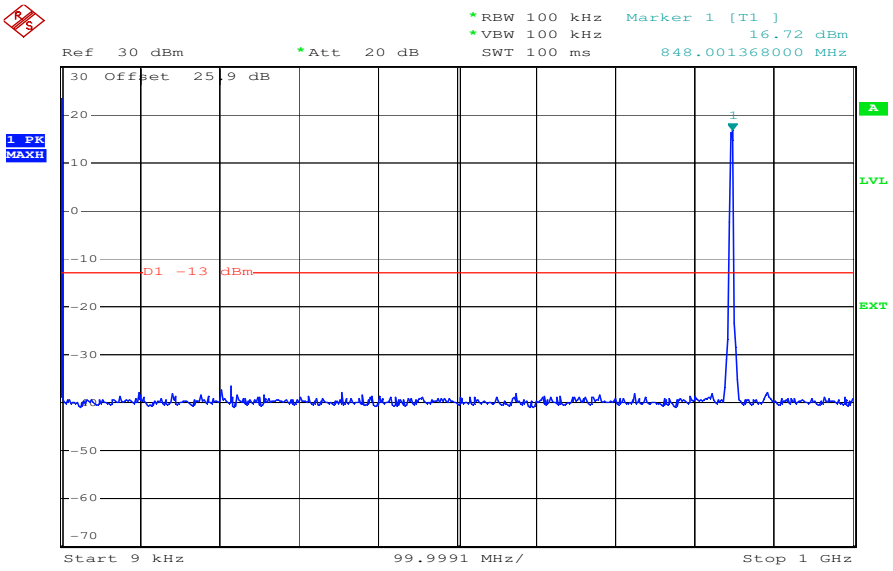
Date: 27.MAY.2008 09:34:30

Plot 4: Channel 4180 UMTS



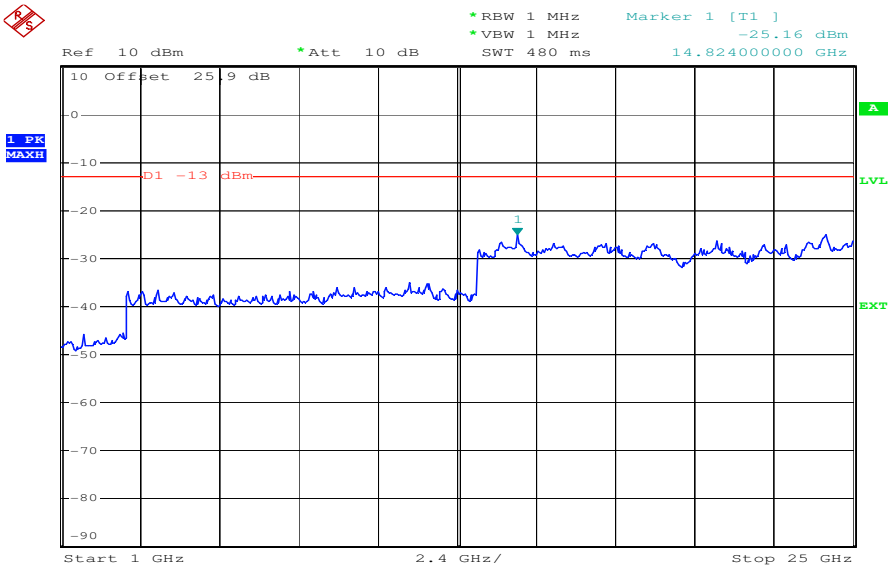
Date: 27.MAY.2008 09:39:11

Plot 5: Channel 4233 UMTS



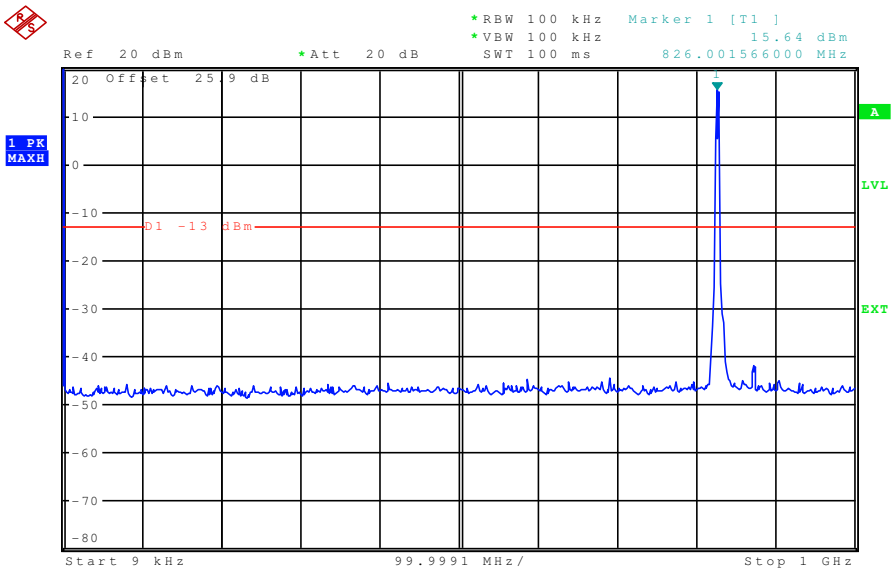
Date: 27.MAY.2008 09:35:32

Plot 6: Channel 4233 UMTS

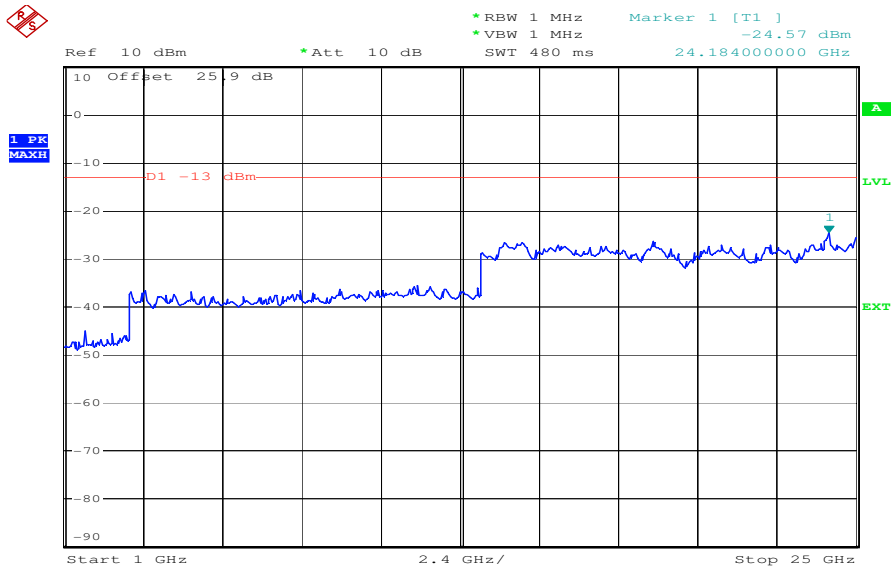


Date: 27.MAY.2008 09:38:22

Plot 7: Channel 4132 HSDPA

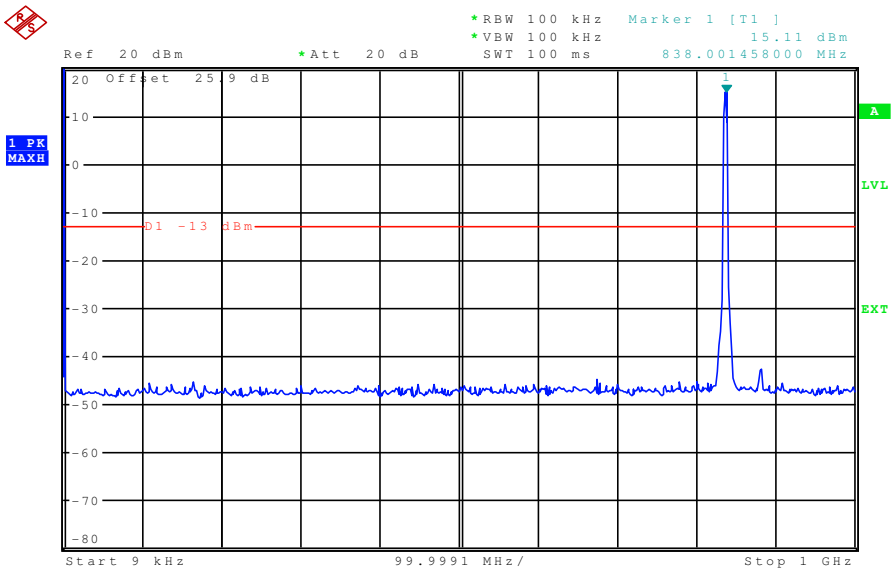


Plot 8: Channel 4132 HSDPA

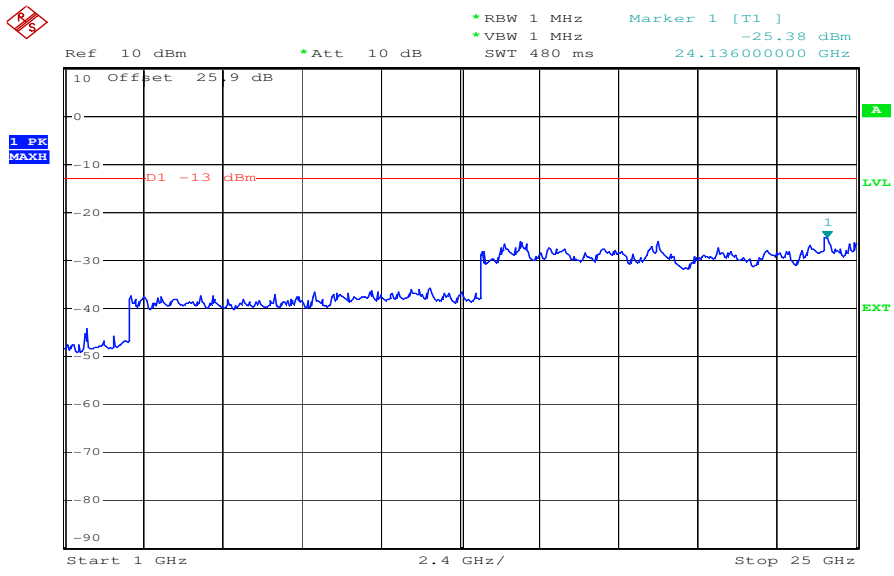


Date: 27.MAY.2008 11:15:57

Plot 9: Channel 4180 HSDPA

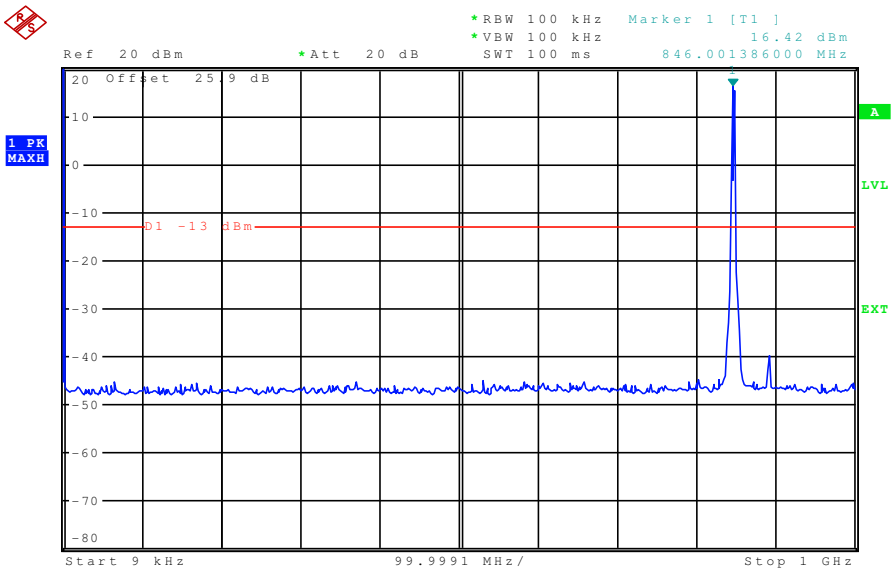


Plot 10: Channel 4180 HSDPA

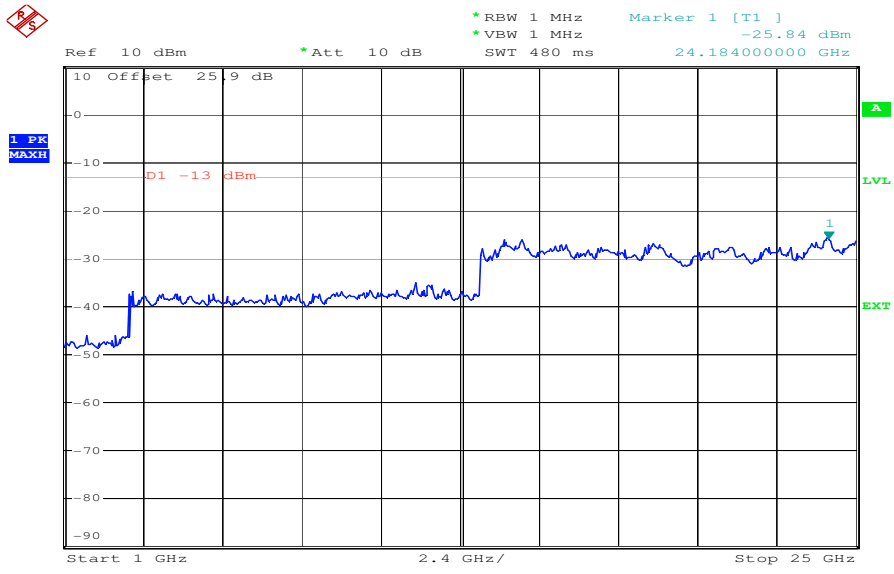


Date: 27.MAY.2008 11:10:45

Plot 11: Channel 4233 HSDPA

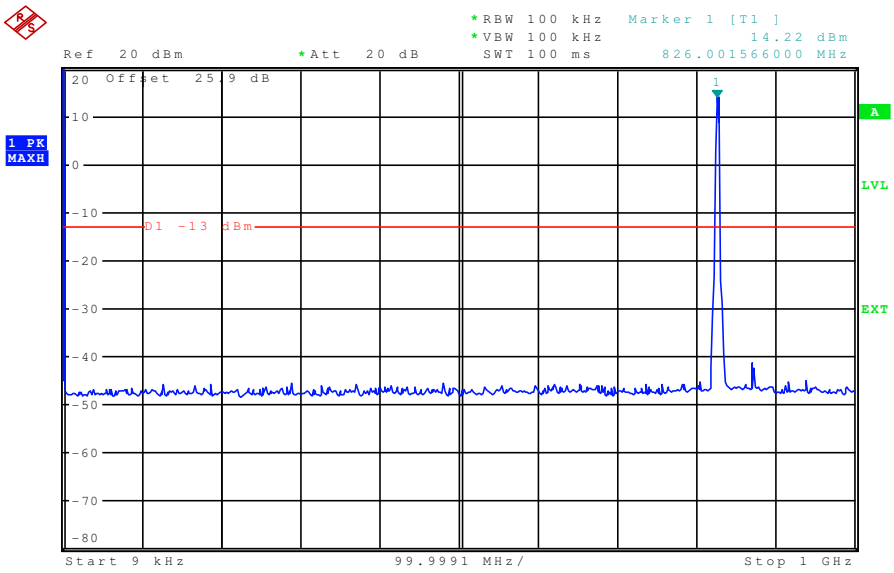


Plot 12: Channel 4233 HSDPA

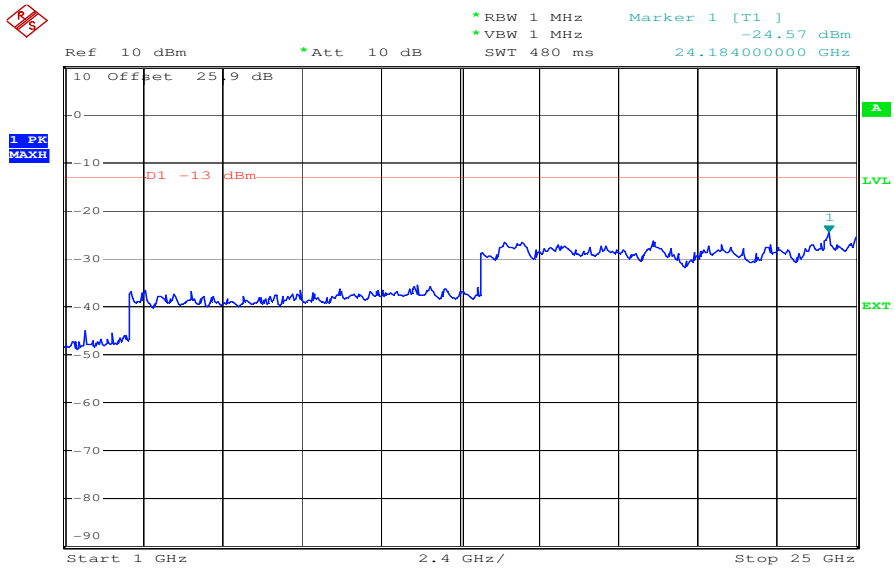


Date: 27.MAY.2008 11:11:50

Plot 13: Channel 4132 HSUPA

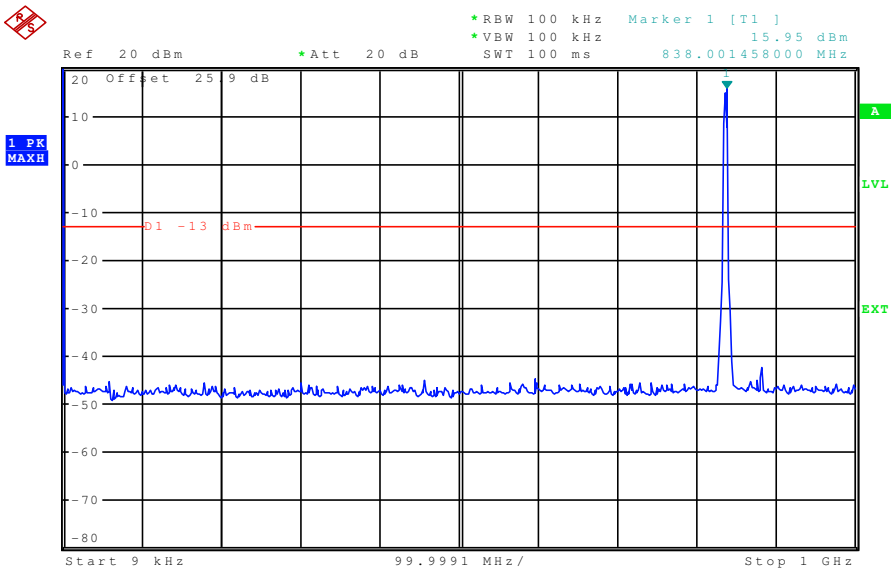


Plot 14: Channel 4132 HSUPA

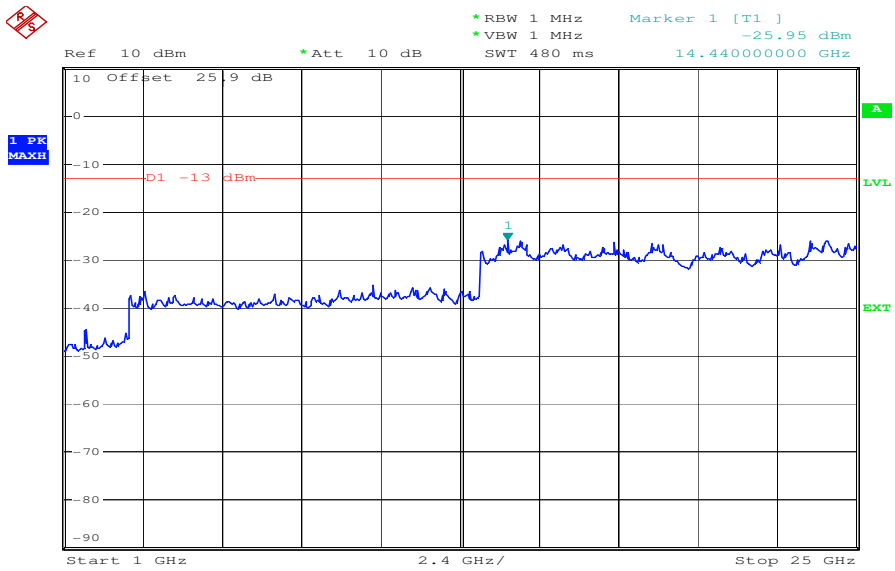


Date: 27.MAY.2008 11:15:57

Plot 15: Channel 4180 HSUPA

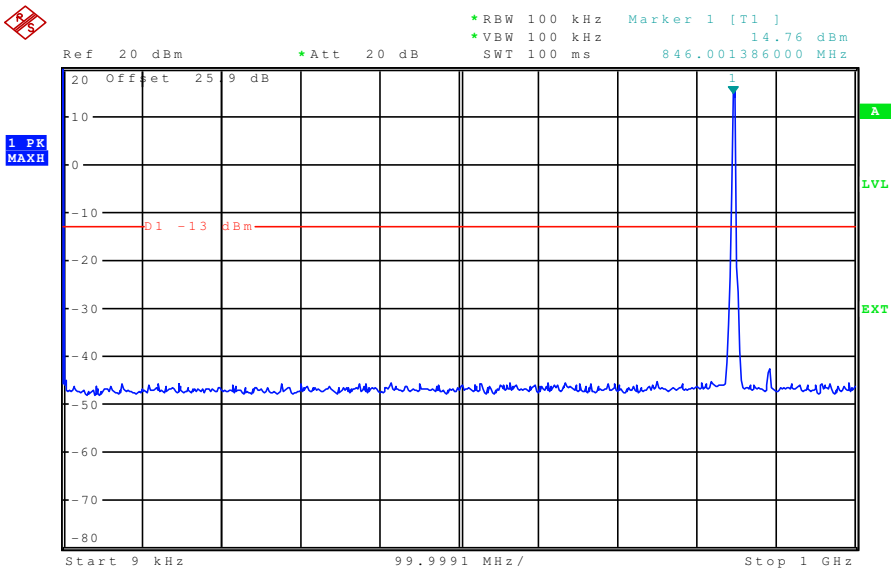


Plot 16: Channel 4180 HSUPA

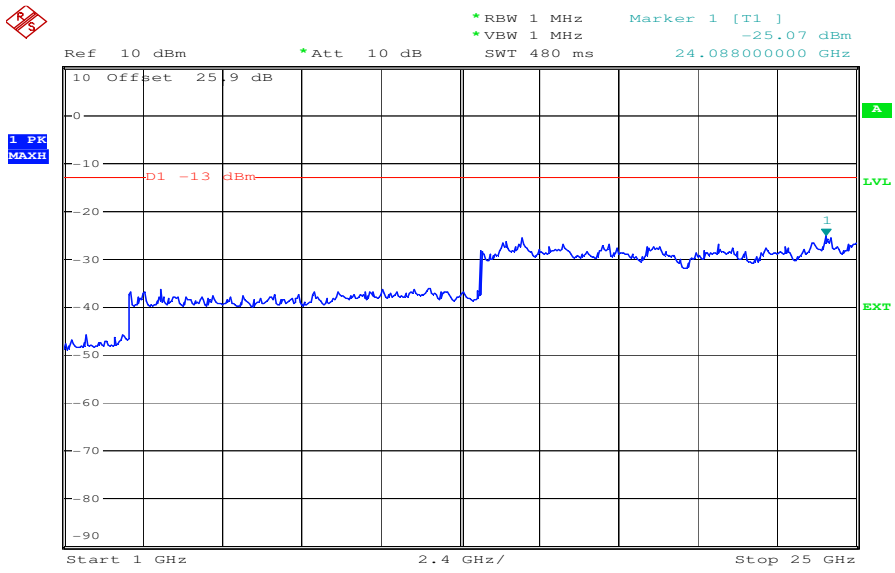


Date: 27.MAY.2008 11:16:51

Plot 17: Channel 4233 HSUPA



Plot 18: Channel 4233 HSUPA



Date: 27.MAY.2008 11:18:00

5.4.7 Block Edge Compliance

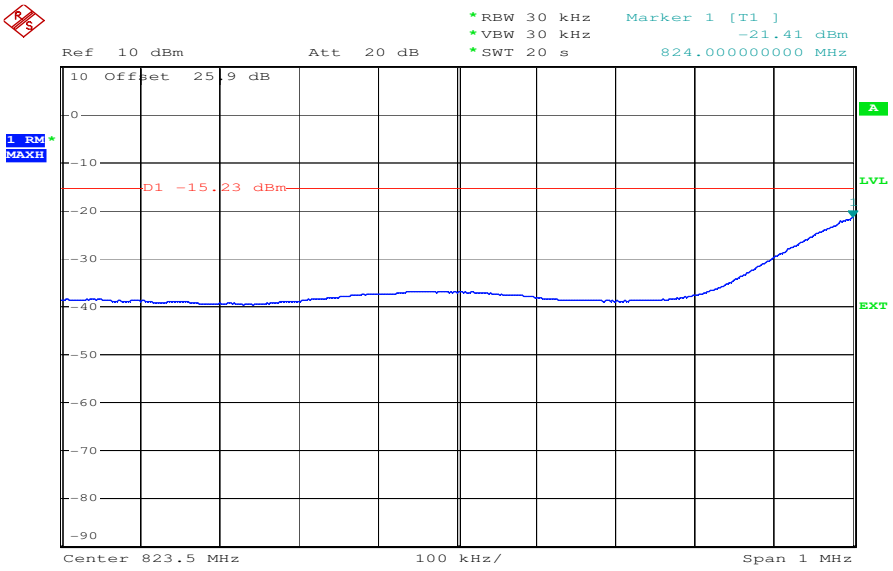
Reference

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

Measurement Limit:

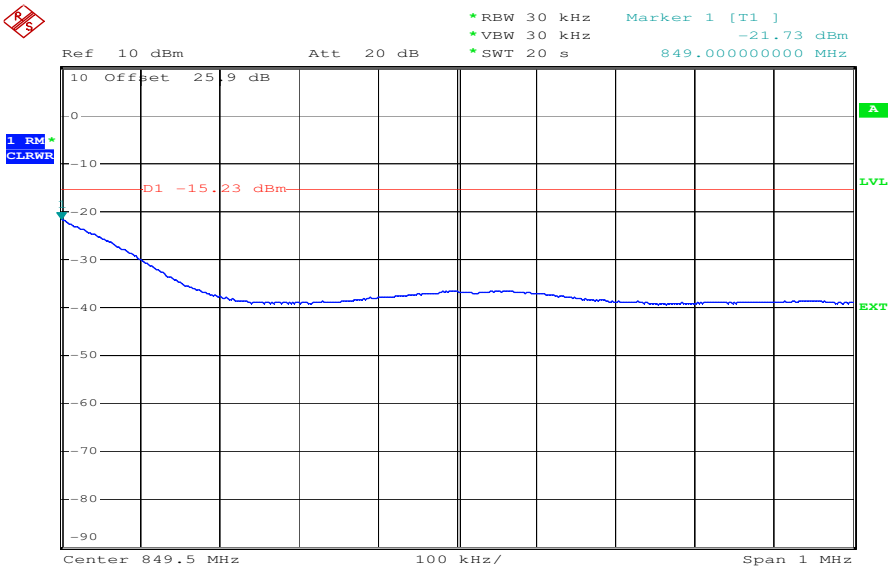
Sec. 22.917(b) Emission Limits.
(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +33 dBm to 0 dBm, this becomes a constant specification limit of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

Plot 1: lower band edge (Channel 4132 UMTS)



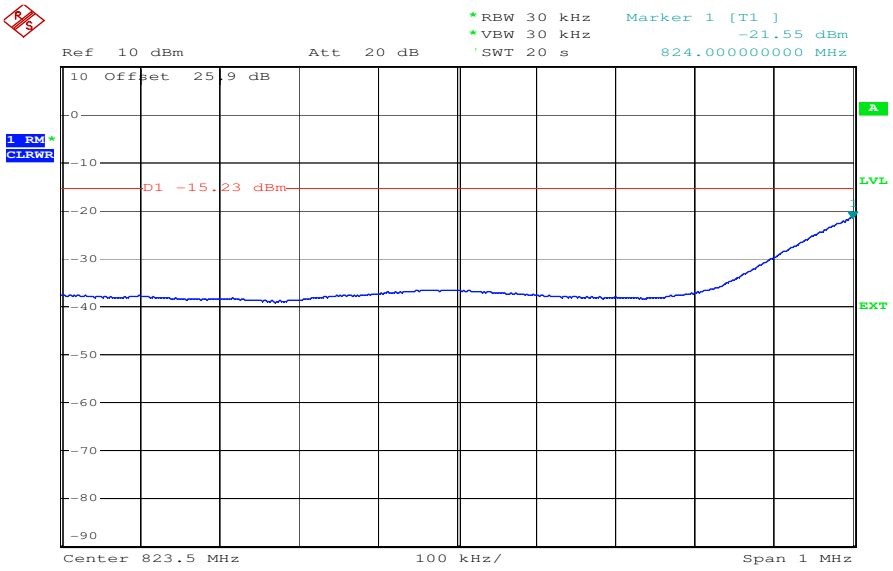
Date: 27.MAY.2008 08:36:23

Plot 2: higher band edge (Channel 4233 UMTS)



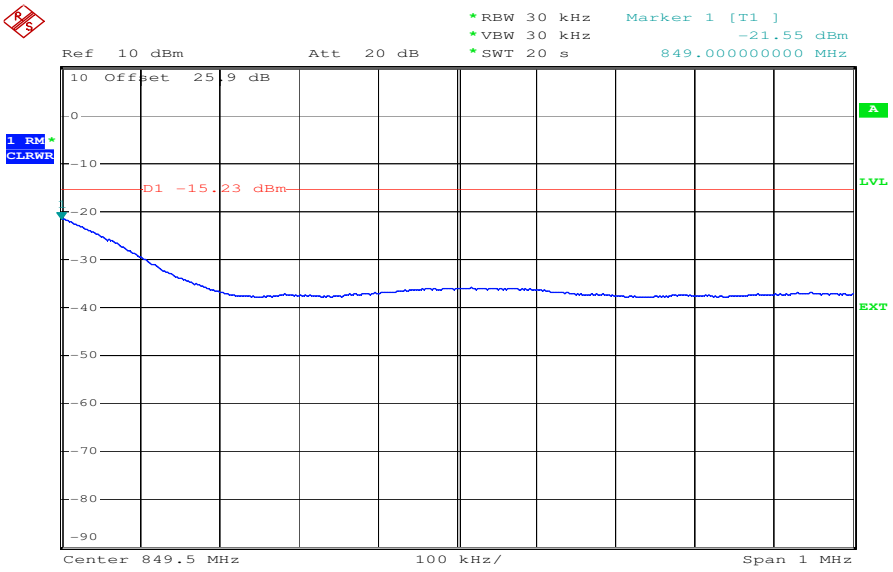
Date: 27.MAY.2008 08:38:31

Plot 5: lower band edge (Channel 4132 HSDPA)



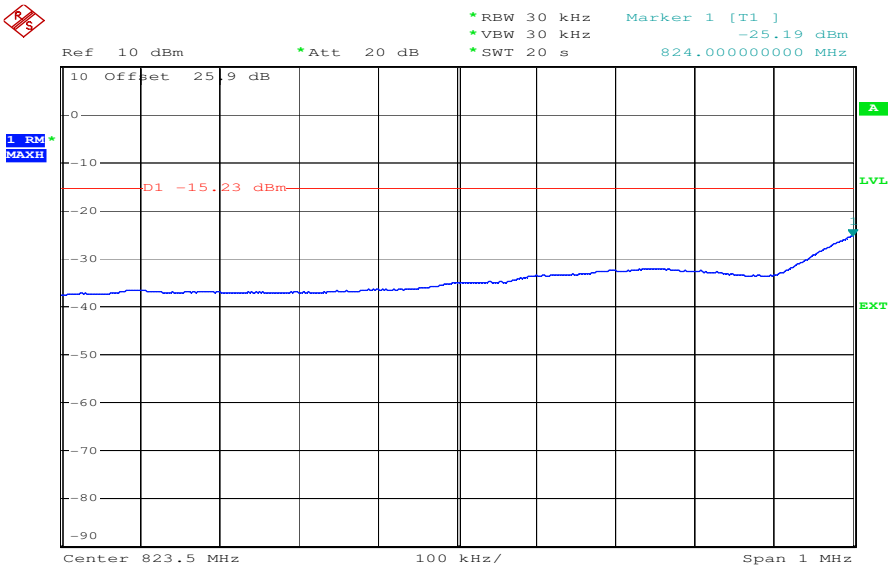
Date: 27.MAY.2008 10:20:05

Plot 6: higher band edge (Channel 4233 HSDPA)



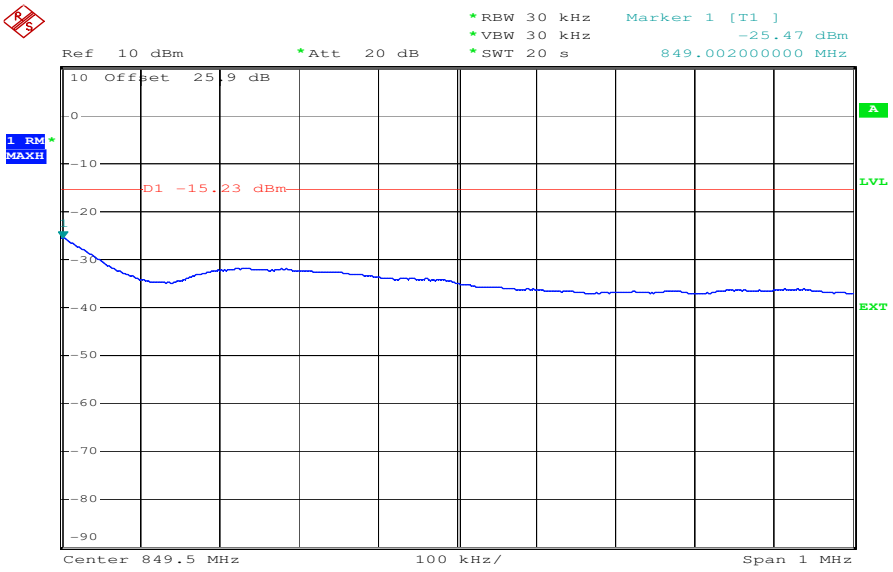
Date: 27.MAY.2008 10:32:46

Plot 5: lower band edge (Channel 4132 HSUPA)



Date: 27.MAY.2008 11:53:32

Plot 6: higher band edge (Channel 4233 HSUPA)



Date: 27.MAY.2008 11:55:39

5.4.8 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.

UMTS mode

Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
826.4 MHz	4684	4864
836.0 MHz	4668	4848
846.6 MHz	4704	4872

HSDPA mode

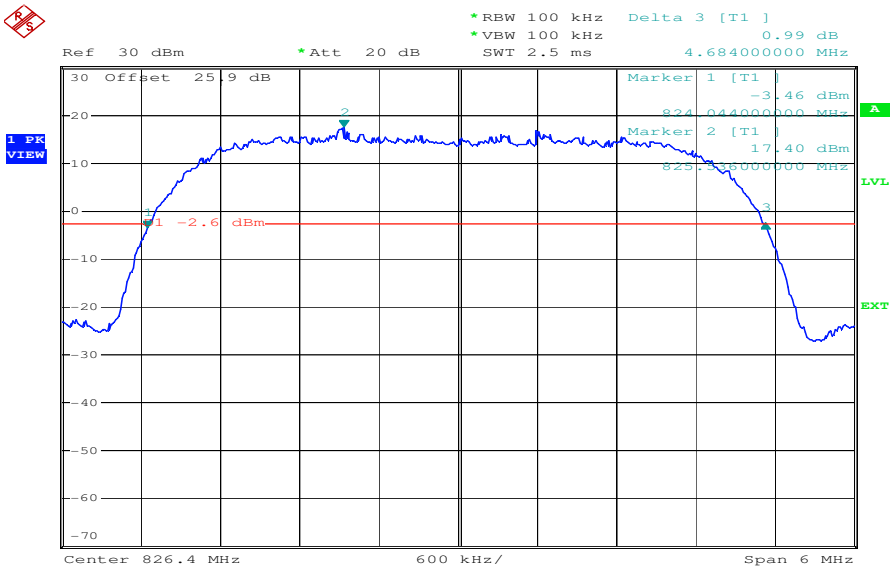
Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
826.4 MHz	4692	4872
836.0 MHz	4692	4872
846.6 MHz	4704	4872

HSUPA mode

Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
826.4 MHz	4608	4824
836.0 MHz	4656	4836
846.6 MHz	4644	4836

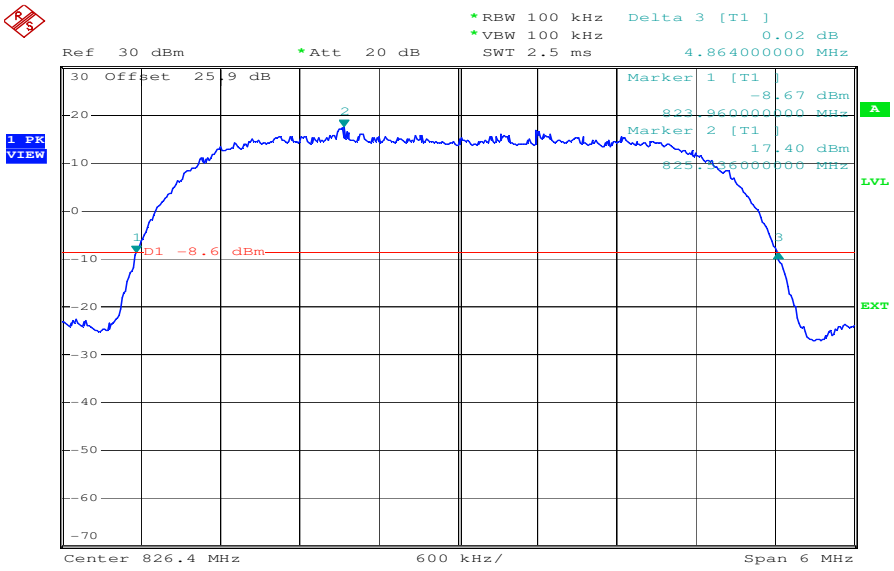
Part 22 requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 300 kHz, this equates to a resolution bandwidth of at least 3 kHz. For this testing, a resolution bandwidth 100 kHz was used.

Channel 4132 UMTS
99% (-20 dBc) Bandwidth



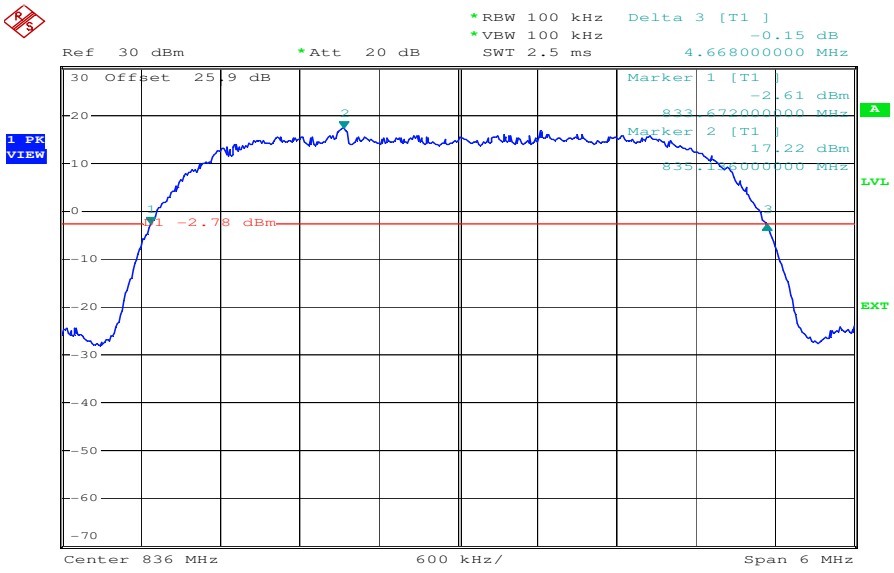
Date: 27.MAY.2008 08:42:06

Channel 4132 UMTS
-26 dBc Bandwidth



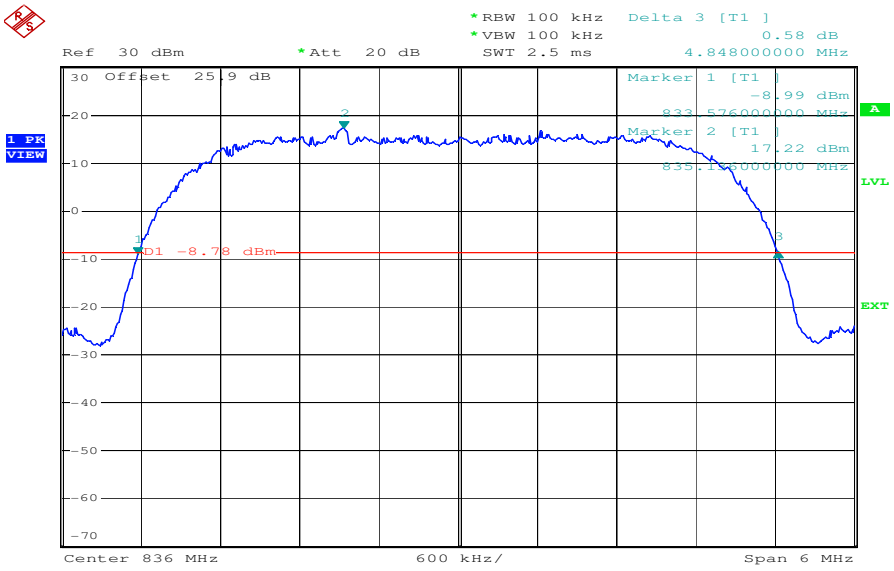
Date: 27.MAY.2008 08:42:56

Channel 4180 UMTS
99% (-20 dBc) Bandwidth



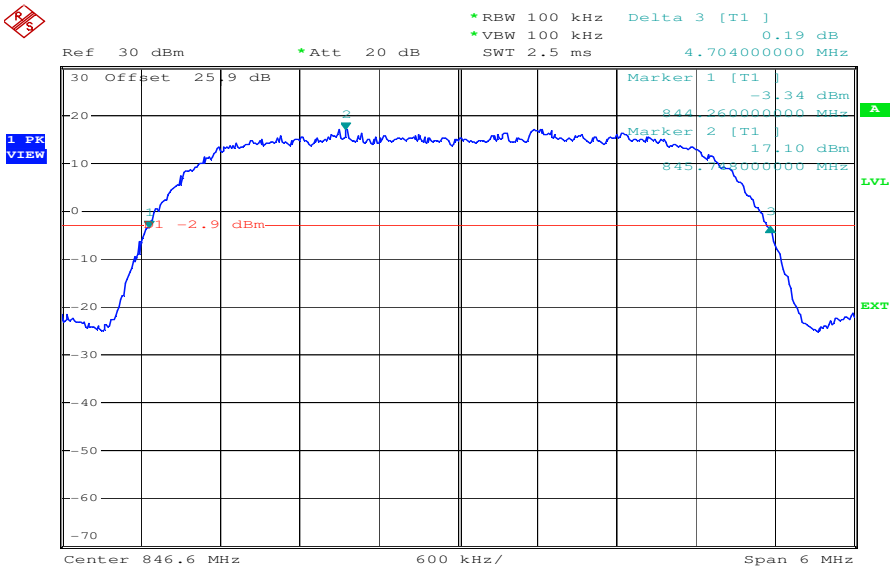
Date: 27.MAY.2008 08:45:01

Channel 4180 UMTS
-26 dBc Bandwidth



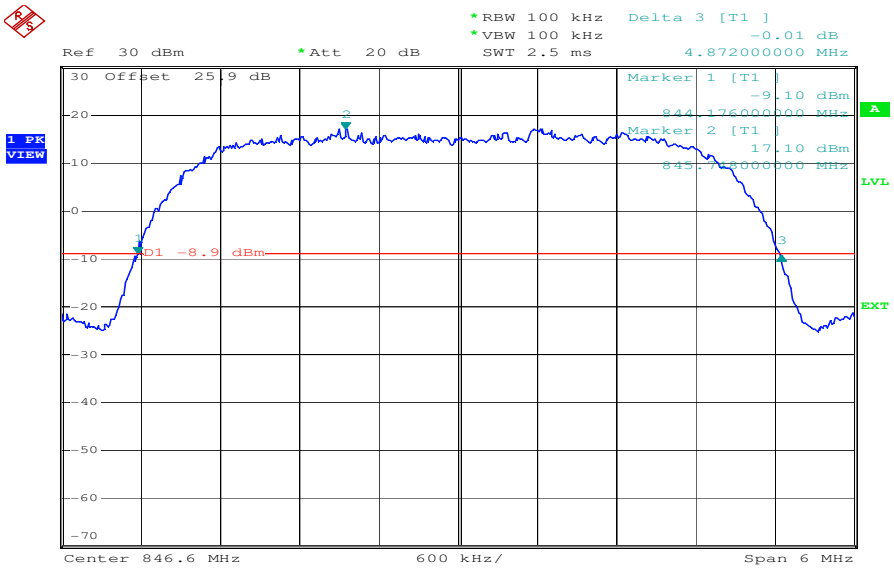
Date: 27.MAY.2008 08:45:53

Channel 4233 UMTS
99% (-20 dBc) Bandwidth



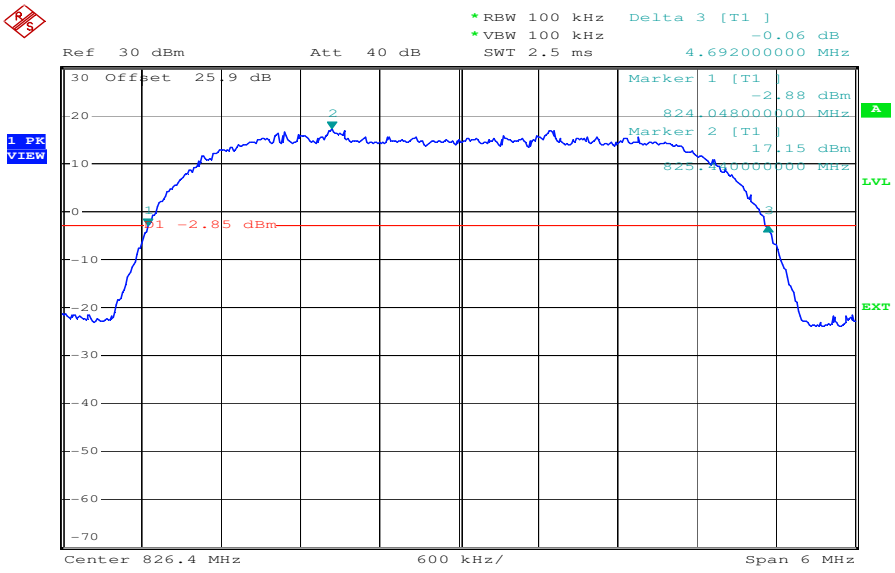
Date: 27.MAY.2008 09:28:45

Channel 4233 UMTS
-26 dBc Bandwidth



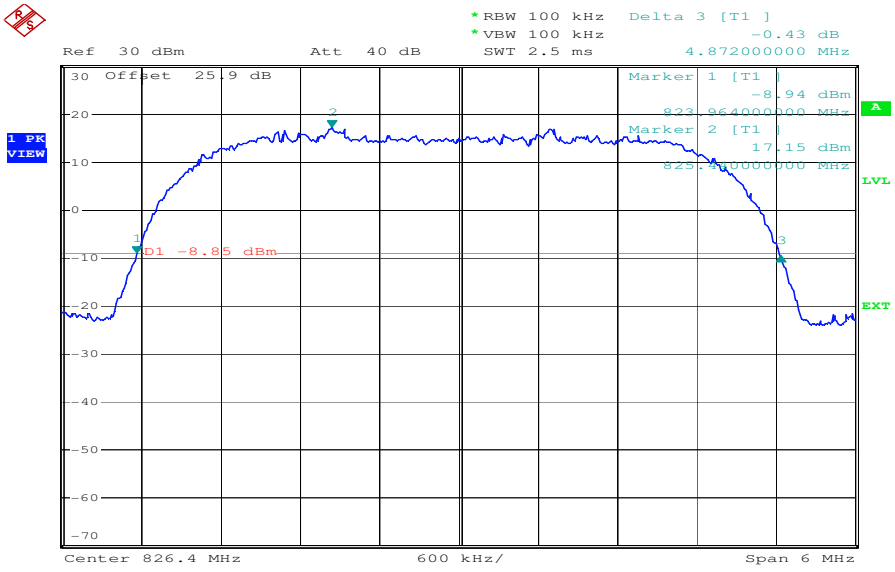
Date: 27.MAY.2008 09:29:34

Channel 4132 HSDPA
99% (-20 dBc) Bandwidth



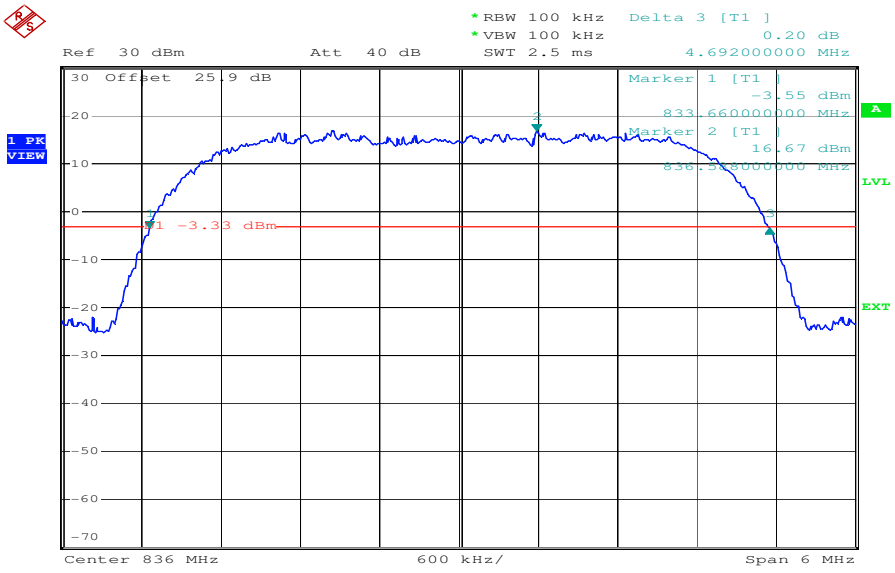
Date: 27.MAY.2008 10:38:56

Channel 4132 HSDPA
-26 dBc Bandwidth



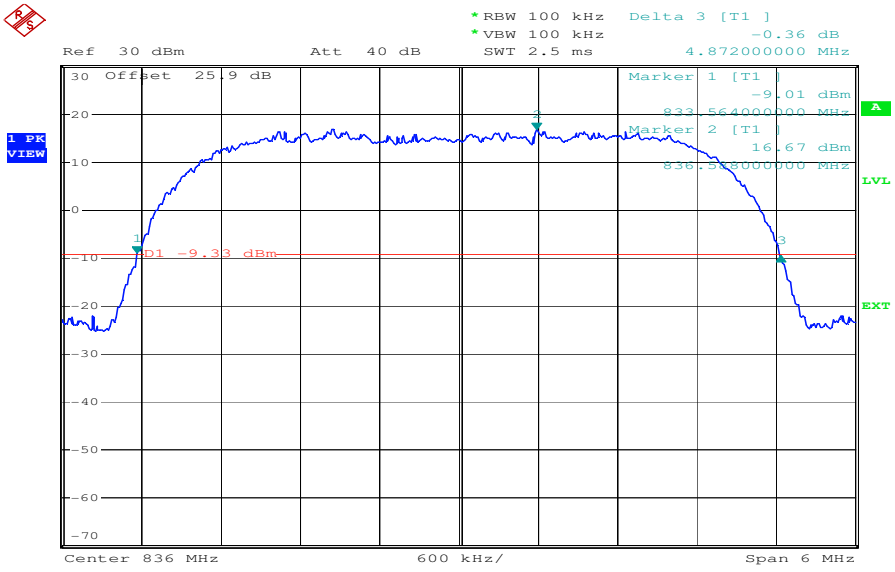
Date: 27.MAY.2008 10:54:57

Channel 4180 HSDPA
99% (-20 dBc) Bandwidth



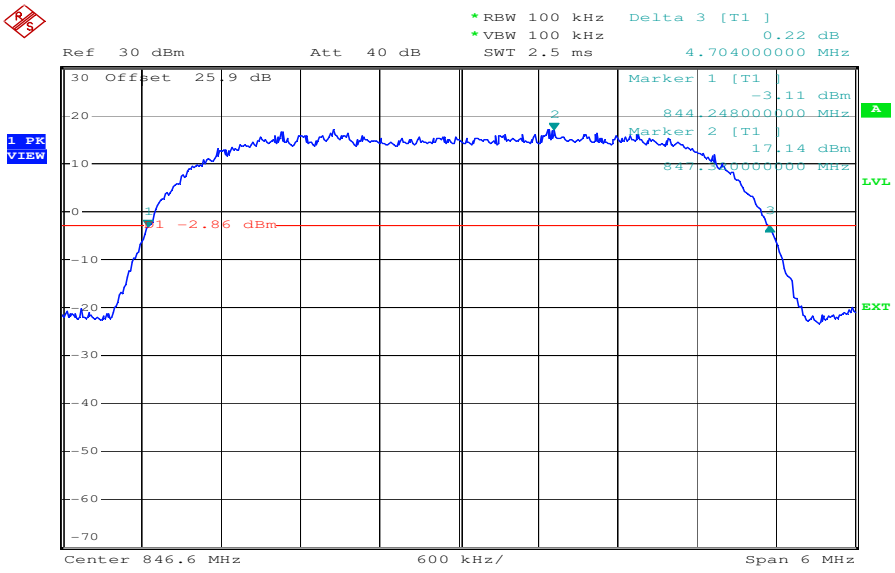
Date: 27.MAY.2008 10:57:35

Channel 4180 HSDPA
-26 dBc Bandwidth



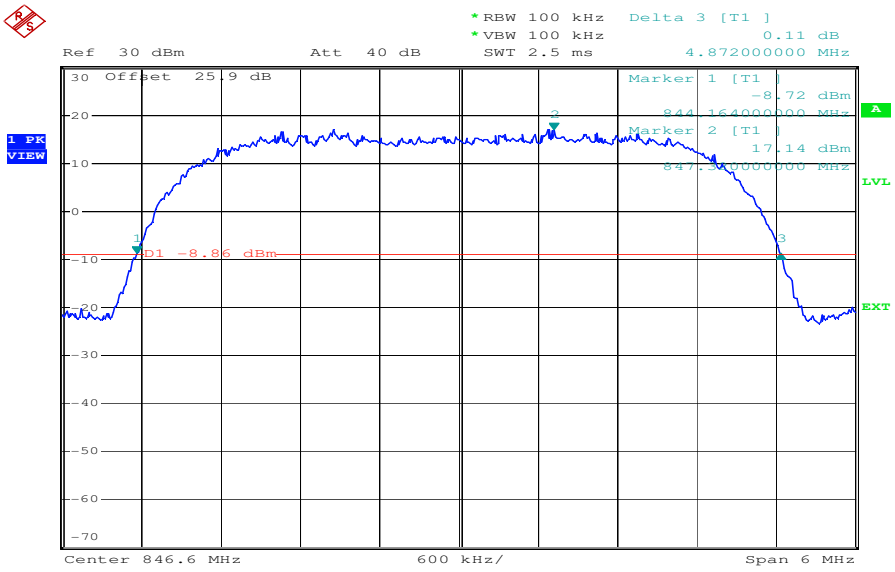
Date: 27.MAY.2008 10:58:27

Channel 4233 HSDPA
99% (-20 dBc) Bandwidth



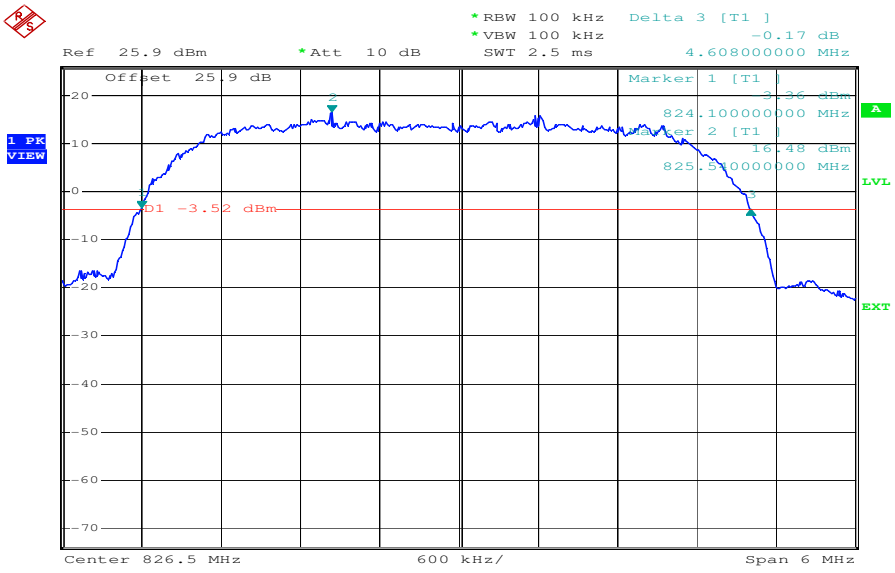
Date: 27.MAY.2008 11:01:06

Channel 4233 HSDPA
-26 dBc Bandwidth



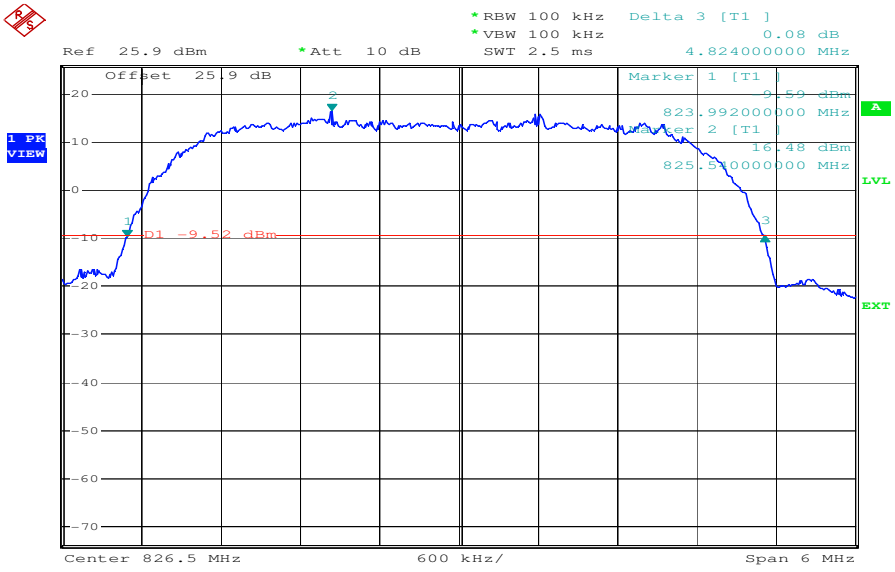
Date: 27.MAY.2008 11:01:49

Channel 4132 HSUPA
99% (-20 dBc) Bandwidth



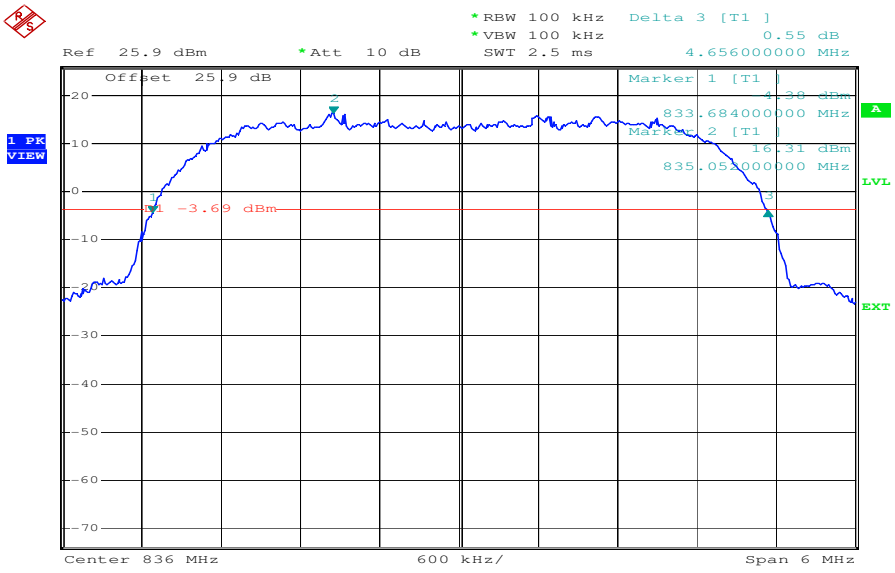
Date: 27.MAY.2008 12:00:21

Channel 4132 HSUPA
-26 dBc Bandwidth



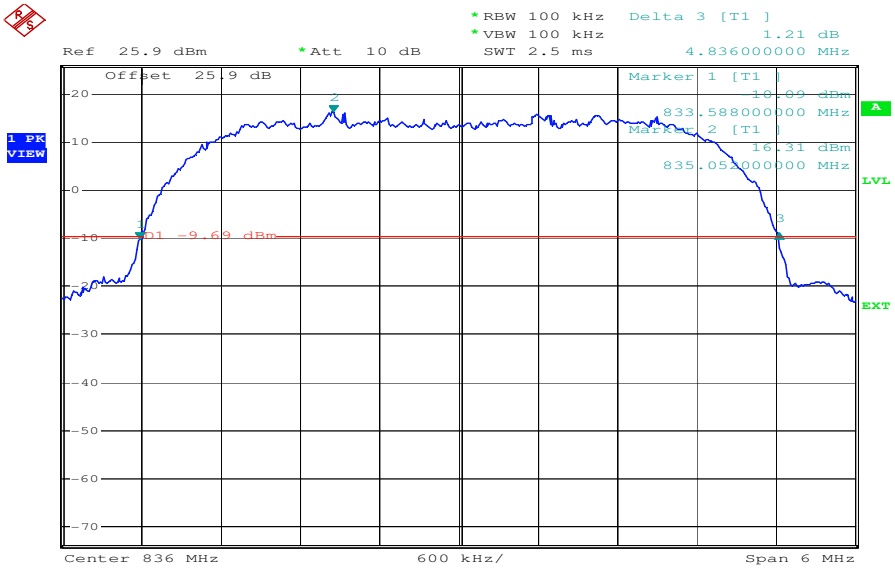
Date: 27.MAY.2008 12:01:27

Channel 4180 HSUPA
99% (-20 dBc) Bandwidth



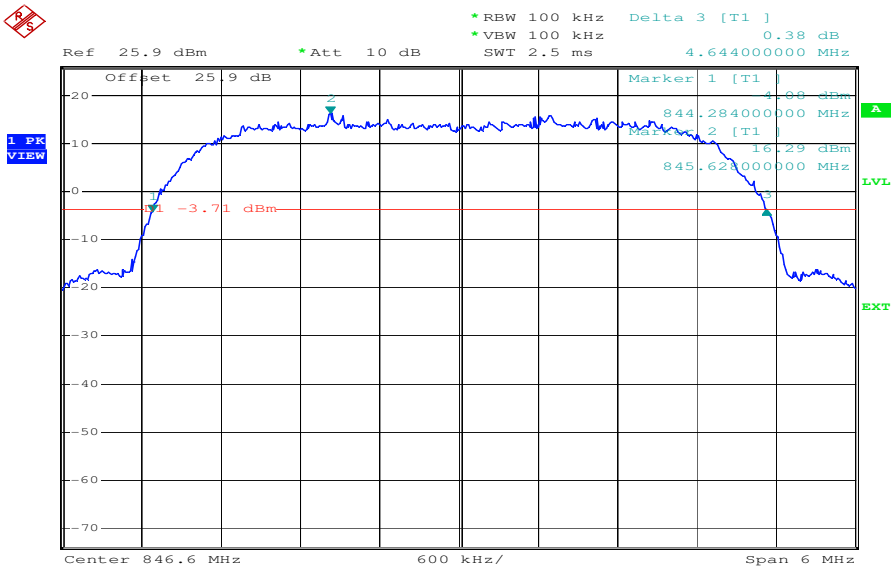
Date: 27.MAY.2008 12:04:11

Channel 4180 HSUPA
-26 dBc Bandwidth



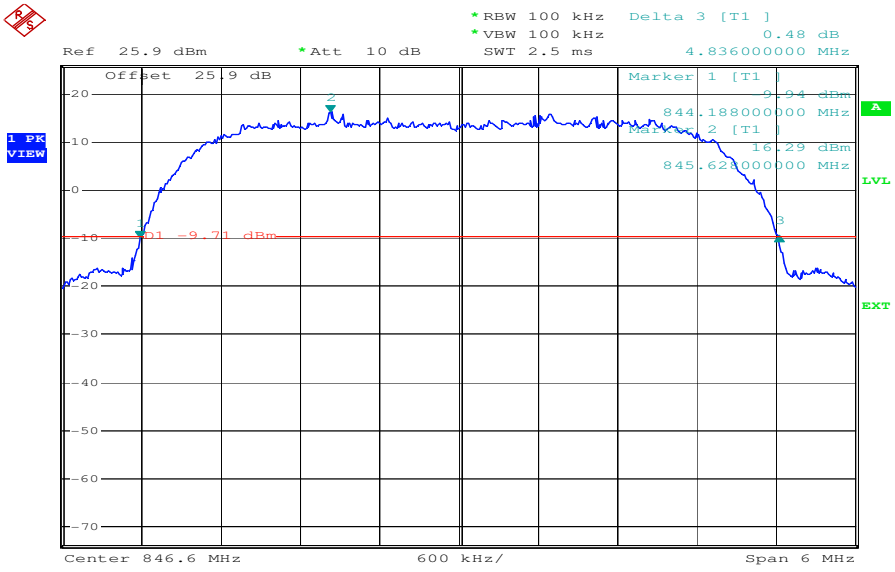
Date: 27.MAY.2008 12:05:13

Channel 4233 HSUPA
99% (-20 dBc) Bandwidth



Date: 27.MAY.2008 12:07:58

Channel 4233 HSUPA
-26 dBc Bandwidth



Date: 27.MAY.2008 12:09:00

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.

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	2747A05306	300001000	05.10.2006	24	05.10.2008
5	Spektrum Analyzer Display 85662A	HP	2816A16541	300002297	05.10.2006	24	05.10.2008
6	Quasi-Peak-Adapter 85650A	HP	2811A01131	300000999	05.10.2006	24	05.10.2008
7	RF-Preselector 85685A	HP	2837A00779	300000218	08.11.2006	24	08.11.2008
8	PC Vectra VL	HP		300001688	n.a.		
9	Software EMI	HP		300000983	n.a.		
10	Measurement System 2						
11	FSP 30	R&S	100623	ICT 300003464	05.10.2007	24	15.10.2009
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.)		

System Rack Room 005:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	FSP 30	R&S		300003575	02.04.2007	24	02.04.2009
2	CBT	R&S	100313	300003516	24.10.2006	24	24.10.2008
3	Switch Matrix	HP		300000929	n.a.		
4	Power Supply	HP	3041A00544	300002270	13.05.2007	36	13.05.2010
5	Signal Generator	R&S	836206/0092	300002680	30.05.2007	36	30.05.2010

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

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			
38	Climatic box VT 4002	Heraeus Vötsch	58566046820010	300003019	11.05.2007	24	11.05.2009
39	Signaling Unit CMU200	R&S	832221/0055	300002862	12.01.2006	24	12.01.2008
40	Power Splitter 6005-3	Inmet Corp.	none	300002841	23.12.2006	24	23.12.2008
41	SMA Cables SPS-1151-985-SPS	Insulated Wire	different	different	n.a.		
42	CBT32 with EDR Signaling Unit	R&S					
43	Coupling unit	Narda	N/A	--	n.a.		
44	2xSwitch Matrix PSU	R&S	872584/021	300001329	n.a.		
45	RF-cable set	R&S	N/A	different	n.a.		
46	IEEE-cables	R&S	N/A	--	n.a.		

Anmerkung: 3000002681-00xx als Systeme inventarisiert

SRD Laboratory Room 005:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Spektrum Analyzer 8566B	HP	2747A05275	300000219	08.11.2006	24	08.11.2008
2	Spektrum Analyzer Display 85662A	HP	2816A16497	300001690	08.11.2006	24	08.11.2008
3	Quasi-Peak-Adapter 85650A	HP	2811A01135	300000216	08.11.2006	24	08.11.2008
4	Power Supply	Heiden	003202	300001187	12.05.2007	36	12.05.2010
5	Power Supply	Heiden	1701	300001392	12.05.2007	36	12.05.2010

Anechoic chamber F:

No.	Instrument/Ancillary	Manufacturer	Type	Serial-No.	Internal identification
	Radiated emission in chamber F				
F-1	Control Computer	F+W		FW0502032	300003303
F-2	Bilog antenna	Chase	CBL 6112A	2110	300000573
F-3a	Amplifier	Veritech Microwave Inc.	0518C-138	- / -	- / -
F-4b	Switch	HP	3488A	- / -	300000368
F-5	EMI Test receiver	R&S	ESCI	100083	300003312
F-6	Turntable Controller	EMCO	1061 3M	1218	300000661
F-7	Tower Controller	EMCO	1051 Controller	1262	300000625
F-8	Tower	EMCO	1051 Tower	1262	300000625
F-9	Ultra Notch-Filter Rejected band Ch. 62	WRCD		9	
	Radiated immunity in chamber F				
F-10	Control Computer	F+W		FW0502032	300003303
F-11	Signal Generator	R&S	SML 03	102519	300003407
F-12	RF-Amplifier	ar	50W1000	12932	300001438
F-13	Directional Coupler	ar	DC 3010	12708	300001428
F-14	Logper Antenna	R&S	HL023A1	323704/016	300001476
F-15	RF-Amplifier	ar	60S1G3	313649	300003410
F-16	Directional Coupler	ar	DC7144A	312786	300003411
F-17	Horn Antenna	ar	AT 4002	19739	300000633
F-18	Power Meter	R&S	NRV	860327/024	F033
F-19	Power sensor	R&S	URV5-Z2	839080/005	300002844.02
F-20	Power sensor	R&S	URV5-Z2	830755/057	F032
	Harmonics and flicker in front of chamber F				
F-21	Flicker and Harmonics Test System	Spitzenberger & Spies	PHE4500/B I PHE4500/B II	B5983 B5984	300000210
F-22	Control Unit	Spitzenberger & Spies	STE	B5980	300000210
F-23	Power Amplifier	Spitzenberger & Spies	EP 4500/B	B5976	300000210
F-24	Conect Panel	Spitzenberger & Spies	Conect panel	B5982	300000210
F-25	Power Supply	Spitzenberger & Spies	NT-EP 4500	B3977	300000210
F-26	Additional transformer	Spitzenberger & Spies	UT-EP 4500	B5978	300000210
F-27	Analyzer Reference System	Spitzenberger & Spies	ARS 16/1	A3509 07/0 0205	300003314
F-26	Power Supply	Hewlett Packard	6032 A	2920 A 04466	300000580