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.	**:**	**4-2872-01-02/07**
Type identification	**:**	**Silverthrone (FAD-3232021-BV)**
Applicant	**:**	**Sony Ericsson Mobile Computing**
FCC ID	**:**	**PY7F3232021**
IC Certification No	**:**	**4170B-F3232021**
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 1.5. 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:

2008-02-28	**Detlev Gillmann**	
Date	Name	Signature

Technical responsibility for area of testing:

2008-02-28	**Stefan Bös**	
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 Computing**
Street:	**Research Triangle Park, NC 27709**
Town:	**7001 Development Drive PO BOX 13969**
Country:	**USA**
Telephone:	**+1 919 472 1431**
Fax:	**+1 919 472 6030**
Contact:	**Mr. Louis Le**
E-mail:	**Louis.le@sonyericcon.com**
Telephone:	**+1 919 472 1431**

1.4 Application details

Date of receipt of order:	**2008-02-05**
Date of receipt of test item:	**2008-02-06**
Date of start test:	**2008-02-20**
Date of end test	**2008-02-28**

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 AB**
Street:	**Nya Vattentornet**
Town:	**Lund 22188**
Country:	**Sweden**

3.1.1 Test item

Kind of test item	:	**Silverthrone – USB stick with GSM/UMTS**
Type identification	:	**Silverthrone (FAD-3232021-BV)**
Frequency Bands	:	**1850 – 1910 MHz / 824 – 849 MHz**
Type of modulation	:	**GMSK / 8PSK / QPSK**
Emisson Designator	:	**300KGXW / 300KG7W / 5M00F9W**
Number of channels	:	**300 (PCS1900) / 125 (GSM850) / 103 (FDD V) / 278 (FDD II)**
Antenna Type	:	**Integrated antenna**
Power supply (normal)	:	**4.0 V DC by Li-Polymer battery**
Output power GSM 850 / GMSK	:	**cond.: 32.5 dBm Peak** **ERP: 28:7 dBm (Burst)**
Output power GSM 1900 / GMSK	:	**cond : 29.1 dBm Peak** **EIRP: 28:8 dBm (Burst)**
Output power GSM 850 / 8-PSK	:	**cond.: 30:8 dBm Peak // 27.5 dBm AV** **ERP: 28.1 dBm (Burst)**
Output power GSM 1900 / 8-PSK	:	**cond : 29.0 dBm Peak // 25.8 dBm AV** **EIRP: 28.3 dBm (Burst)**
Output power UMTS 850 / WCDMA	:	**cond.: 26.4 dBm Peak // 23.1 dBm AV** **ERP: 26.1 dBm (Burst)**
Output power UMTS 1900 / WCDMA	:	**cond : 26.6 dBm Peak // 23.6 dBm AV** **EIRP: 25.9 dBm (Burst)**
Output power UMTS 850 / HSDPA	:	**cond.: 26.3 dBm Peak // 23.1 dBm AV** **ERP: 26.1 dBm (Burst)**
Output power UMTS 1900 / HSDPA	:	**cond : 26.6 dBm Peak // 23.5 dBm AV** **EIRP: 25.8 dBm (Burst)**
Transmitter Spurious (worst case)		**Nothing found**
FCC ID	:	**PY7F3232021**
Certification No. IC	:	**4170B-F3232021**
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:

2008-02-28 **Detlev Gillmann**

Date Name Signature

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 PCS 1900

Section in this Report	Test Name	Verdict
5.1.1	RF Power Output	pass
5.1.2	Frequency Stability	pass
5.1.3	Radiated Emissions	pass
5.1.4	Receiver Radiated Emissions	pass
5.1.5	Conducted Spurious Emissions	pass
5.1.6	Block Edge Compliance	pass
5.1.7	Occupied Bandwidth	pass

4.1.2 GSM 850

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

4.1.3 UMTS FDD II

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

4.1.4 UMTS FDD V

Section in This Report	Test Name	Verdict
5.4.1	RF Power Output	pass
5.4.2	Frequency Stability	pass
5.4.3	Radiated Emissions	pass
5.4.4	Receiver Radiated Emissions	pass
5.4.5	Conducted Spurious Emissions	pass
5.4.6	Block Edge Compliance	pass
5.4.7	Occupied Bandwidth	pass

4.2 Test item(s) and test configuration

No.: 1	Lap top: ACER; Travel Mate C310 Model No.: MS 2161 S/N: LXT 870E032526004AFKS00 and AC/DC Adapter Model: SADP- 65KB D	with	**Silverthrone (FAD-3232021-BV)**
No.: 2	Lap top: IBM // Type: 2628 –G2G S/N: 5589FK9 - 102 AC/DC Adapter Model: IBM P/N02K6747	with	**Silverthrone (FAD-3232021-BV)**
No.: 3	Lap top: SONY Model: PCG-9E3M S/N: 4-664-150-31 AC/DC Adapter Model: SONY S/N: 0213 AB 0001062	with	**Silverthrone (FAD-3232021-BV)**

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 PCS 1900

5.1.1 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

(Set-up No.: 02)

Test Results: Output Power (conducted) GMSK Mode

Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (dBm)
1850.2	29.1	29.0
1880.0	28.7	28.6
1909.8	28.6	28.5
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	28.7	25.5
1909.8	28.5	25.3
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

Set-up No.: 01

Test Results: Output Power (radiated) GMSK Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	28.8
1880.0	28.7
1909.8	28.7
Measurement uncertainty	±1.5 dB

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

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	28.3
1880.0	28.1
1909.8	28.1
Measurement uncertainty	±1.5 dB

Sample Calculation:

Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1850.2	132.3	23.7	8.4	0.0	3.3	28.8			

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

Set-up No.: 02

Test Results: Output Power (radiated) GMSK Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	28.4
1880.0	28.6
1909.8	28.5
Measurement uncertainty	±1.5 dB

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

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	28.0
1880.0	28.2
1909.8	28.2
Measurement uncertainty	±1.5 dB

Sample Calculation:

Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1880.0	130.2	23.5	8.4	0.0	3.3	28.6			

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

Set-up No.: 03

Test Results: Output Power (radiated) GMSK Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	28.6
1880.0	28.8
1909.8	28.5
Measurement uncertainty	±1.5 dB

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

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	28.1
1880.0	28.3
1909.8	27.9
Measurement uncertainty	±1.5 dB

Sample Calculation:

Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1880.0	130.1	23.7	8.4	0.0	3.3	28.8			

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

5.1.2 Frequency Stability

Reference

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

Method of Measurement:

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

Measurement Limit:

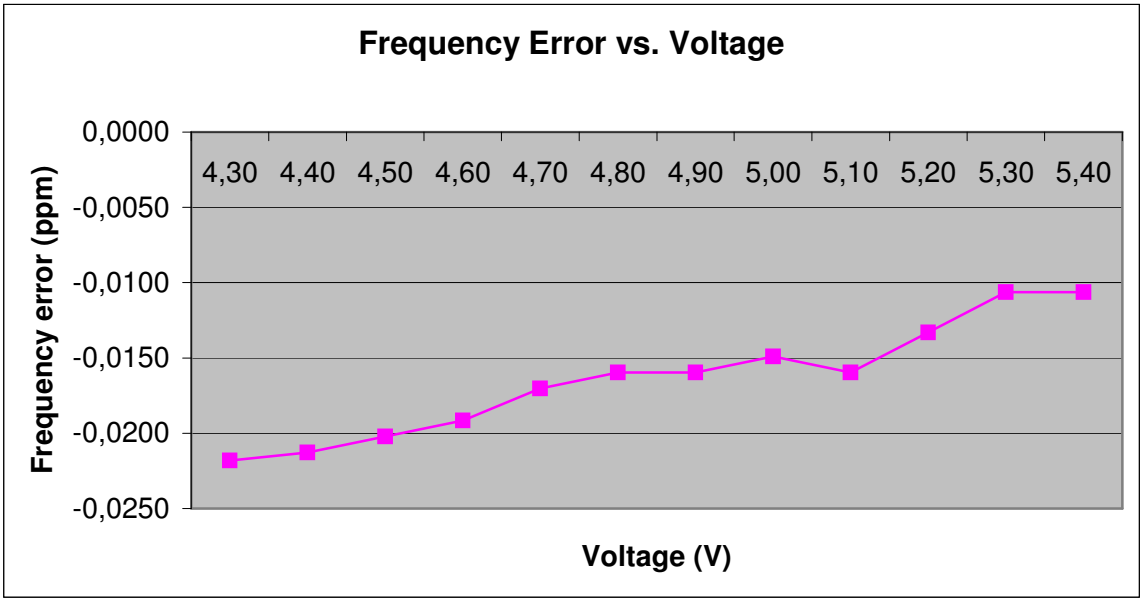
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission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

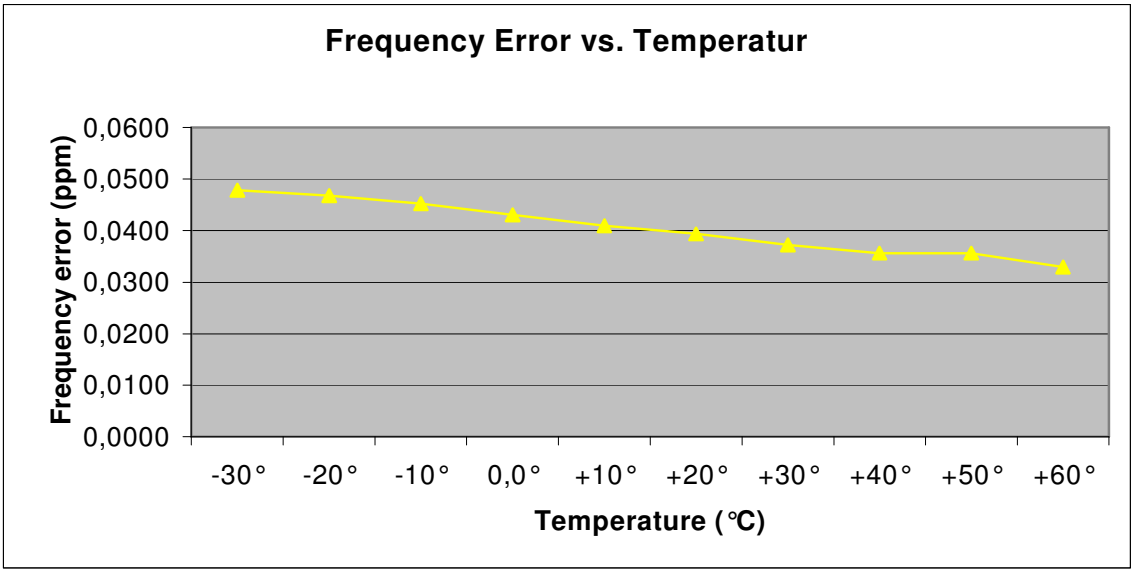
Test Results: AFC FREQ ERROR vs. VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
4.3	-41	-0,00000218	-0,0218
4.4	-40	-0,00000213	-0,0213
4.5	-38	-0,00000202	-0,0202
4.6	-36	-0,00000191	-0,0191
4.7	-32	-0,00000170	-0,0170
4.8	-30	-0,00000160	-0,0160
4.9	-30	-0,00000160	-0,0160
5.0	-28	-0,00000149	-0,0149
5.1	-30	-0,00000160	-0,0160
5.2	-25	-0,00000133	-0,0133
5.3	-20	-0,00000106	-0,0106
5.4	-20	-0,00000106	-0,0106

Test Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	90	0,00000479	0,0479
-20	88	0,00000468	0,0468
-10	85	0,00000452	0,0452
±0.0	81	0,00000431	0,0431
+10	77	0,00000410	0,0410
+20	74	0,00000394	0,0394
+30	70	0,00000372	0,0372
+40	67	0,00000356	0,0356
+50	67	0,00000356	0,0356
+60	62	0,00000330	0,0330


Frequency Error vs. Voltage
Frequency error (ppm)
0,0000
-0,0050
-0,0100
-0,0150
-0,0200
-0,0250
4,30 4,40 4,50 4,60 4,70 4,80 4,90 5,00 5,10 5,20 5,30 5,40
Voltage (V)


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

5.1.3 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	No critical peaks	3760	No critical peaks	3819.6	No critical peaks
3	5550.6		5640		5729.4	
4	7400.8		7520		7639.2	
5	9251.0		9400		9549.0	
6	11101.2		11280		11458.8	
7	12951.4		13160		13368.6	
8	14801.6		15040		15278.4	
9	16651.8		16920		17188.2	
10	18502.0		18800		19098.0	

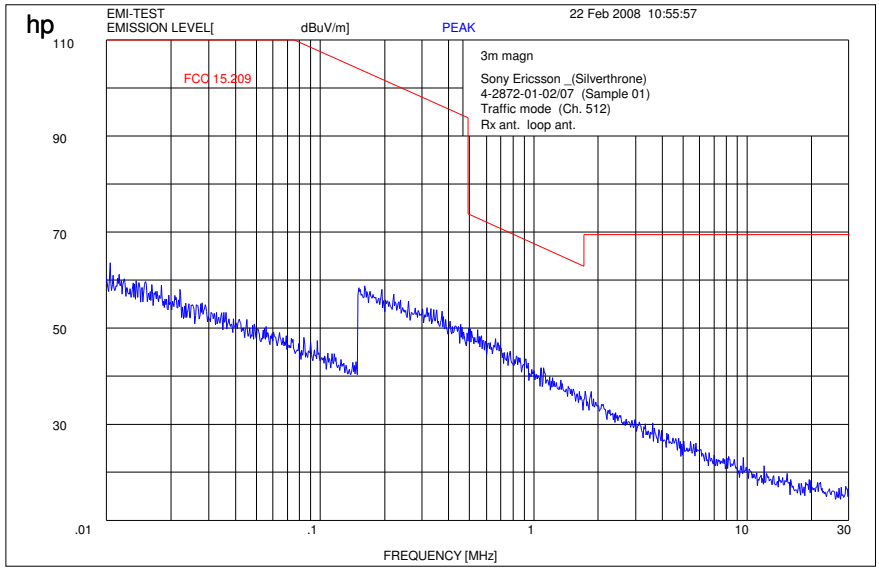
No peaks found < 20 dB below limit.

Sample calculation:

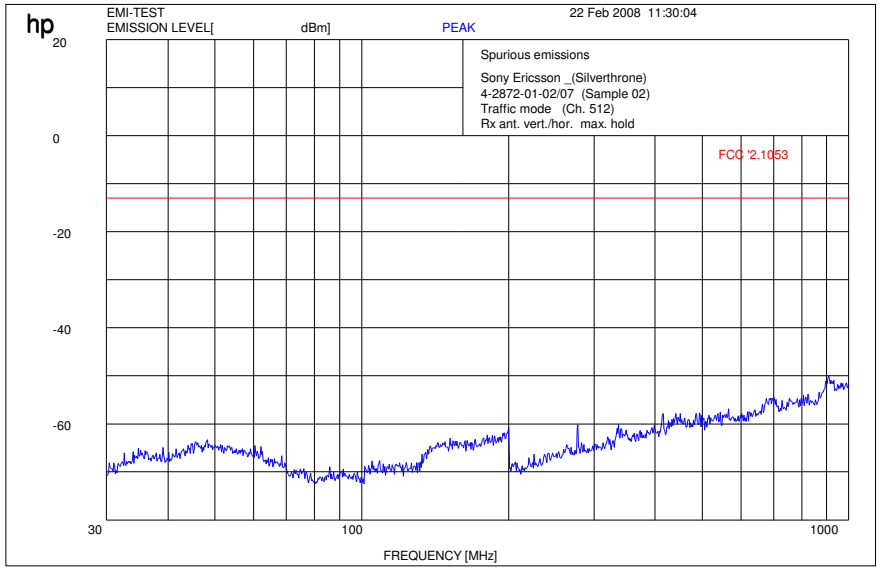
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1850.2	132.3	23.7	8.4	0.0	3.3	28.8			

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

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

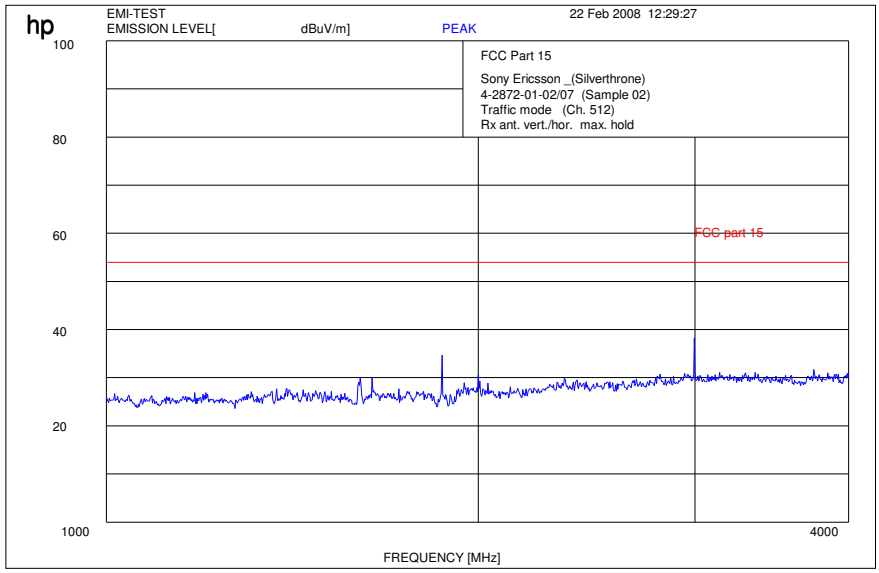


Channel 512 (30 MHz - 1 GHz)



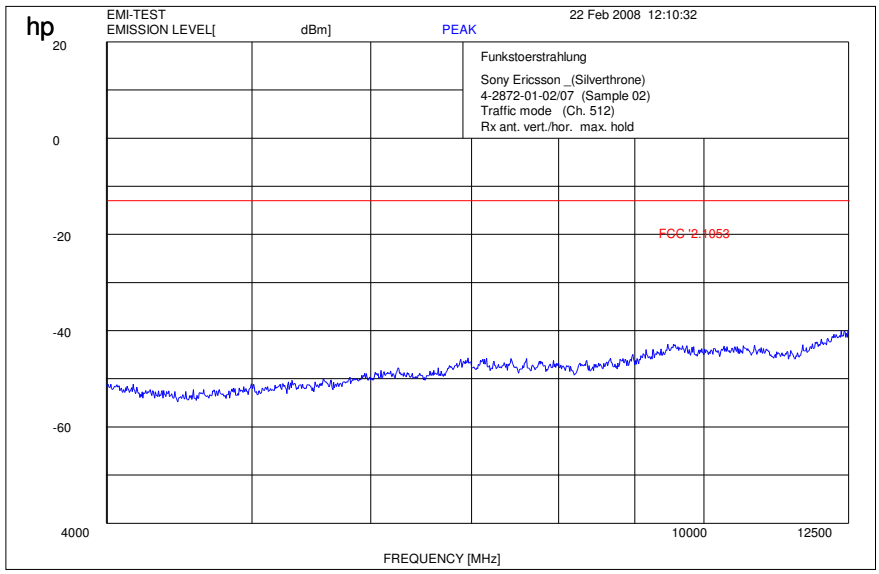
f < 1 GHz : RBW/VBW: 100 kHz

Channel 512 (1 GHz - 4 GHz)



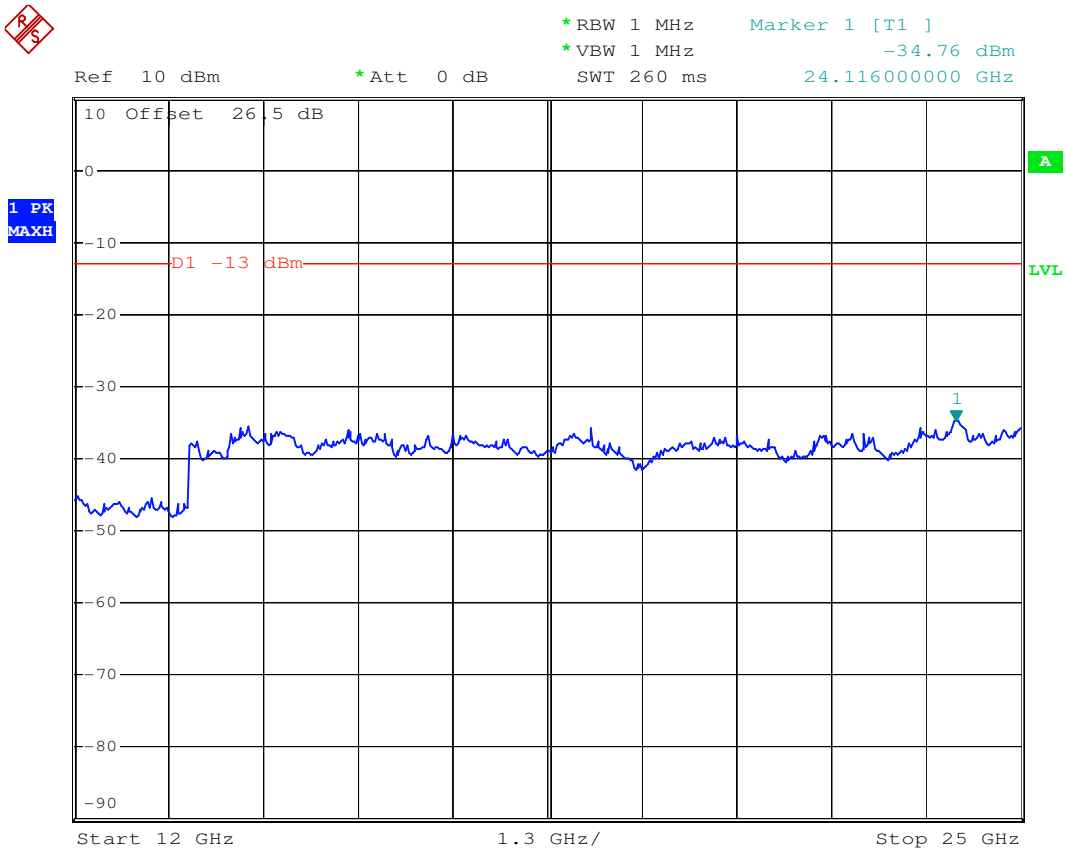
f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 512 (4 GHz – 12.5 GHz)



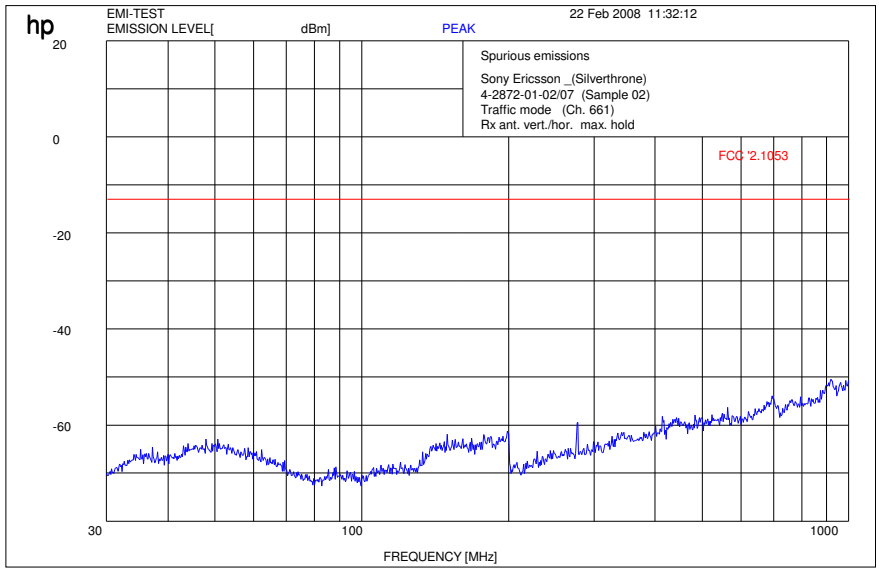
f ≥ 1GHz : RBW / VBW 1 MHz

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



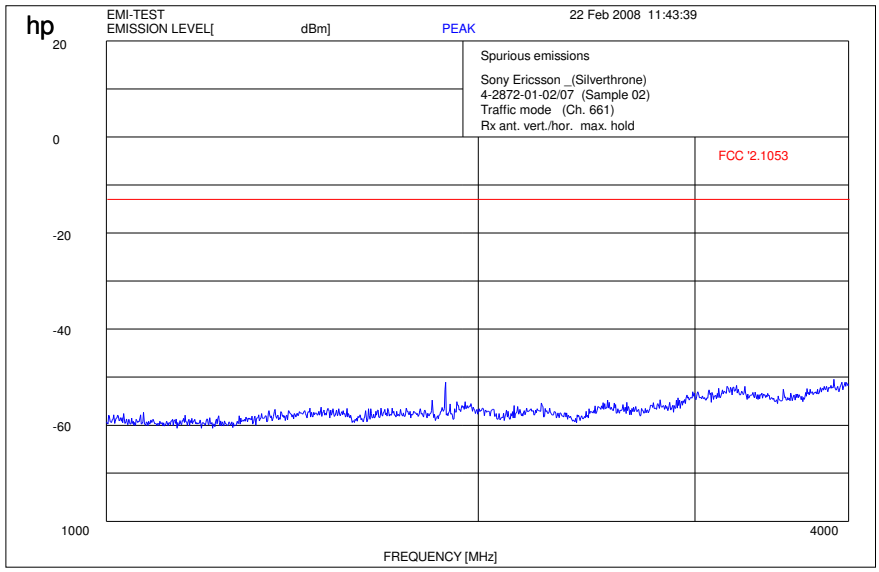
Date: 25.FEB.2008 10:51:27

Channel 661 (30 MHz - 1 GHz)



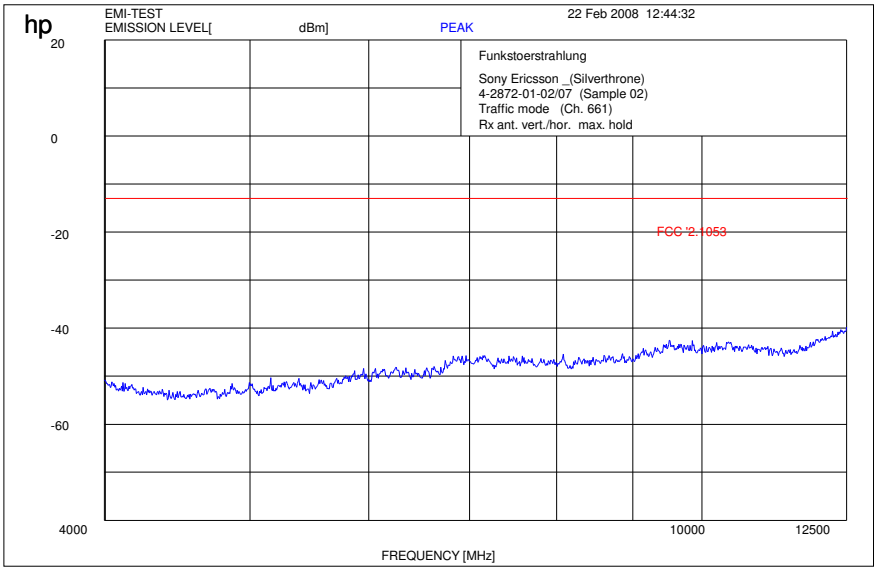
f < 1 GHz : RBW/VBW: 100 kHz

Channel 661 (1 GHz - 4 GHz)



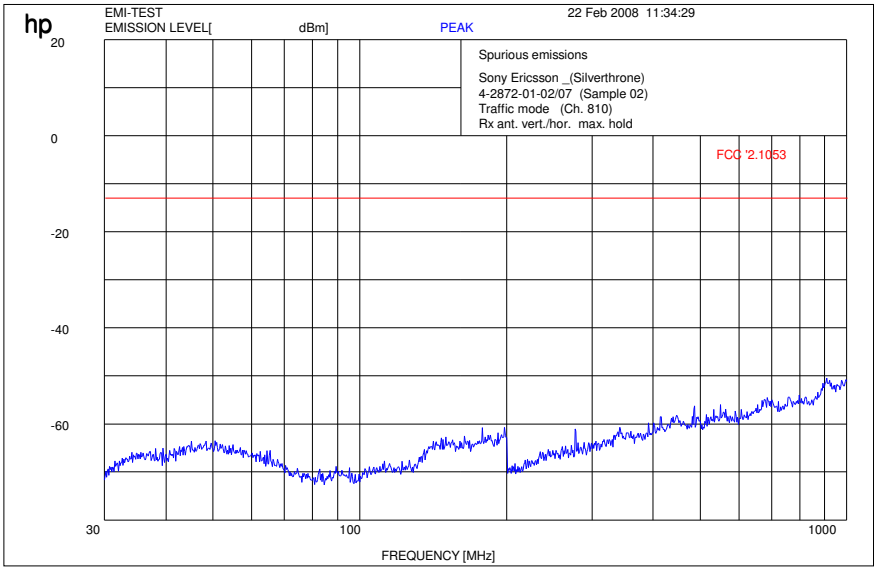
f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 661 (4 GHz – 12.5 GHz)



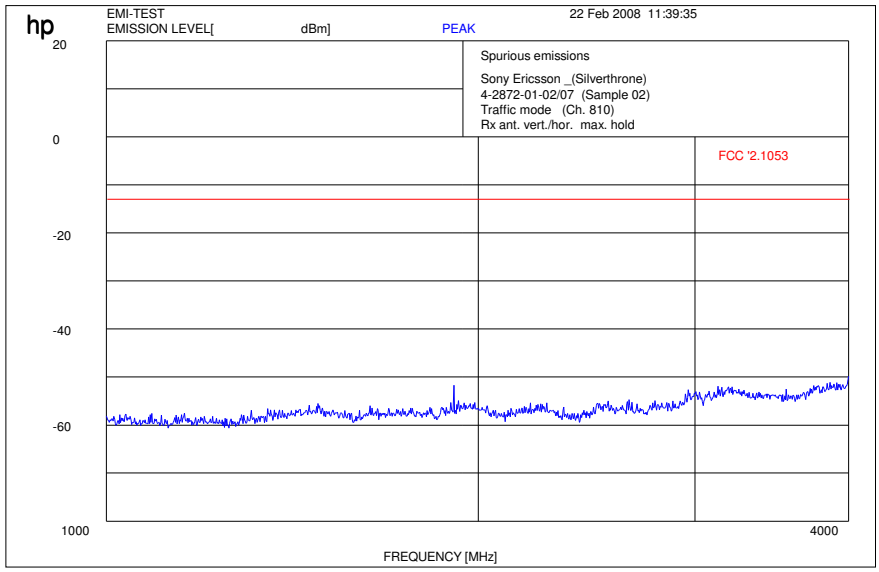
f ≥ 1GHz : RBW / VBW 1 MHz

Channel 810 (30 MHz - 1 GHz)



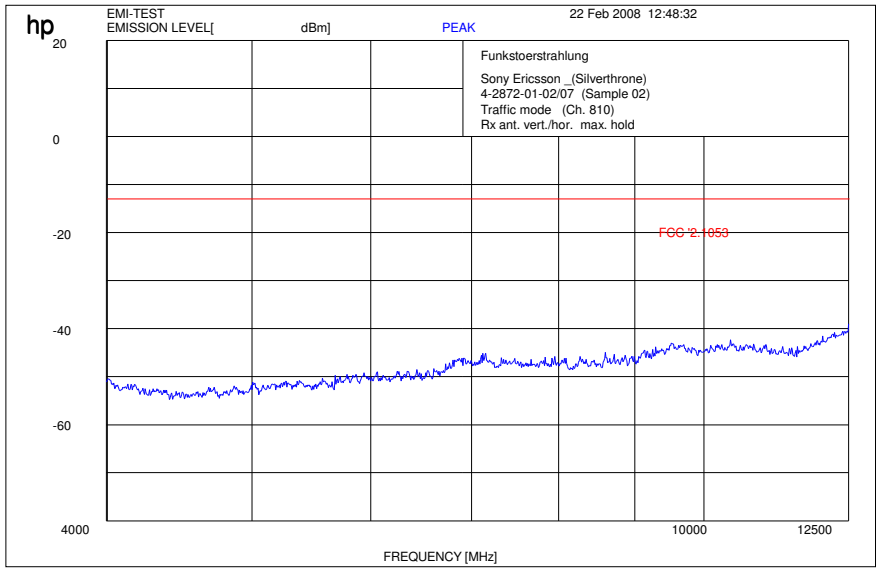
f < 1 GHz : RBW/VBW: 100 kHz

Channel 810 (1 GHz - 4 GHz)



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

Channel 810 (4 GHz – 12.5 GHz)



f ≥ 1GHz : RBW / VBW 1 MHz

5.1.4 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)
No critical peaks			-	-	-	-	-	-
			-	-	-	-	-	-
			-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
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 (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

Idle Mode (30 MHz - 1 GHz)

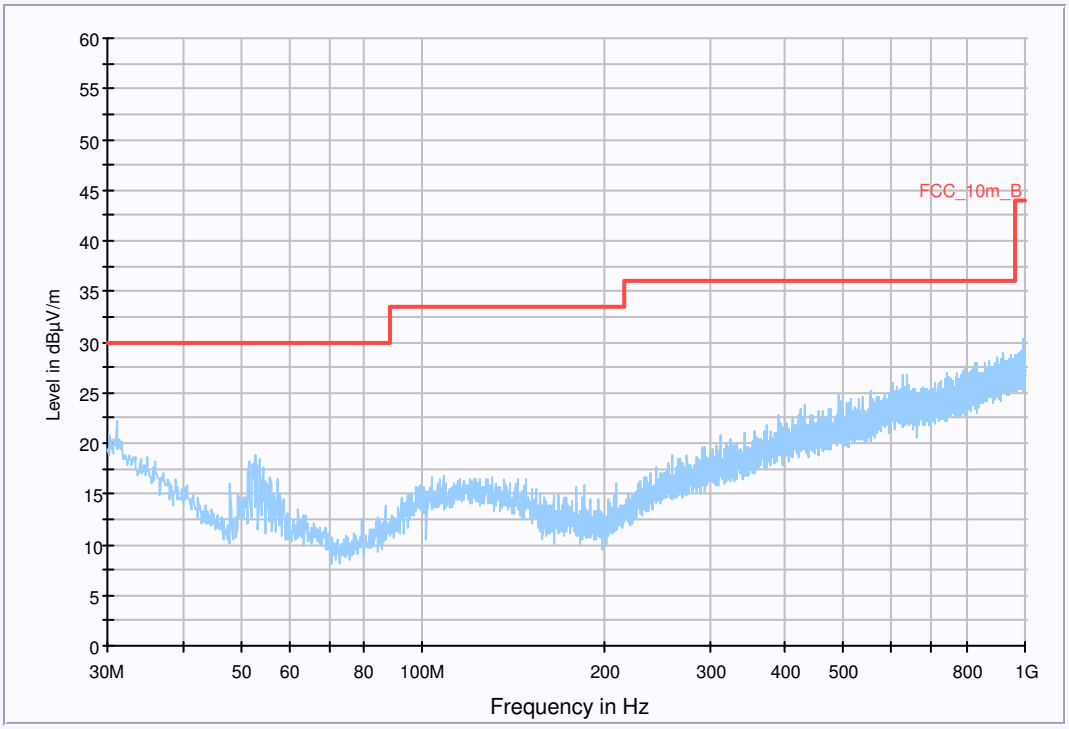
EUT:	FAD-3232021-BV with MD300
Serial Number:	Silverthrone (FAD-3232021-BV)
Test Description:	FCC class B @ 10m
Operating Conditions:	IDLE
Operator Name:	WAL
Comment:	connect to Laptop

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_10m_Fast_1GHz (B)

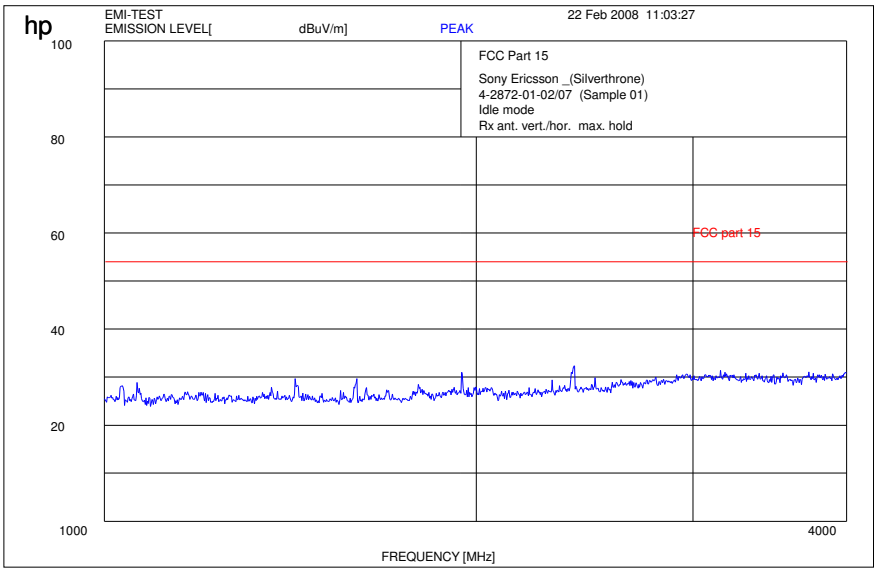


Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

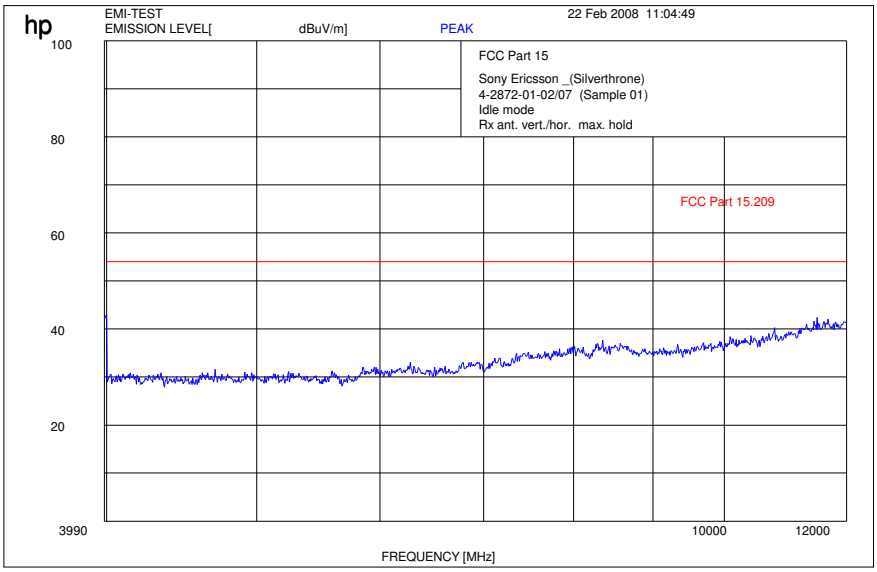
Frequency Range:	30MHz - 2GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch FW 1.0
Antenna:	Chase Broadband BiLog Antenna CBL 6112 SN 2110, FW A, CAL 07.01.2009 Correction Table (vertical): Chase Broadband BiLog Antenna CBL 6112 Correction Table (horizontal): Chase Broadband BiLog Antenna CBL 6112 Correction Table: Cabel with switch (1007)
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)



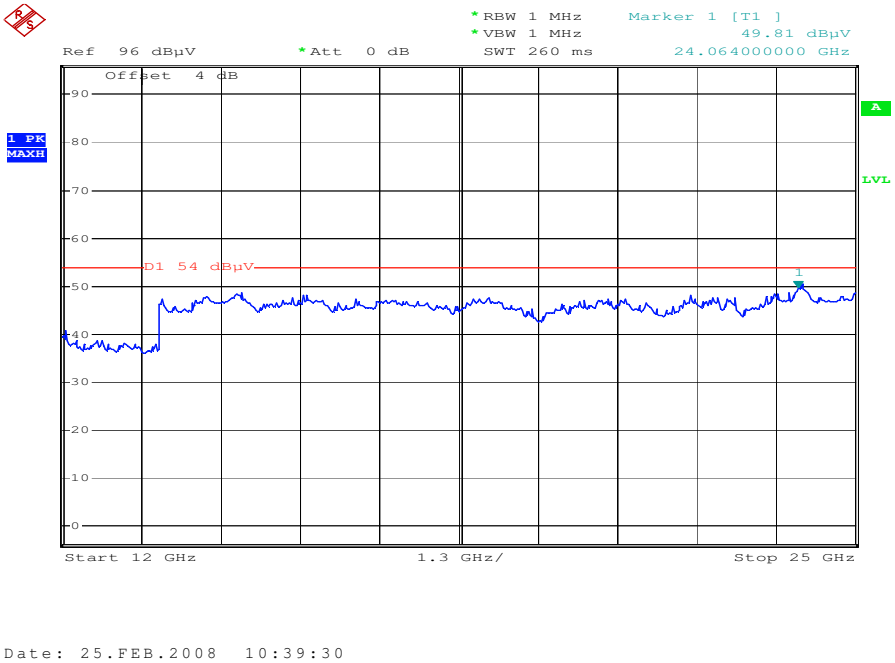
f ≥ 1GHz : RBW / VBW 1 MHz

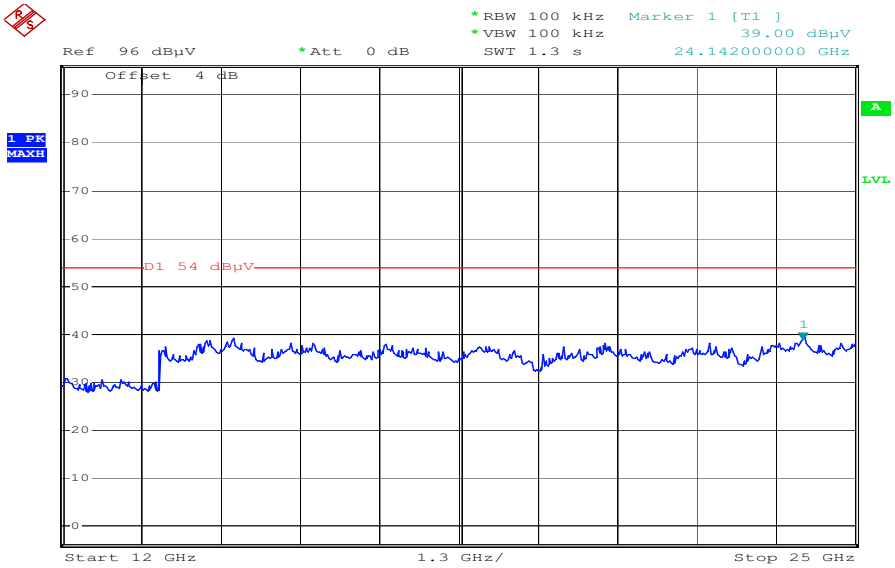
Idle Mode (4 GHz – 12.0 GHz)



f ≥ 1GHz : RBW / VBW 1 MHz

Idle-Mode (12 GHz - 25 GHz)





Date: 25.FEB.2008 10:39:57

5.1.5 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

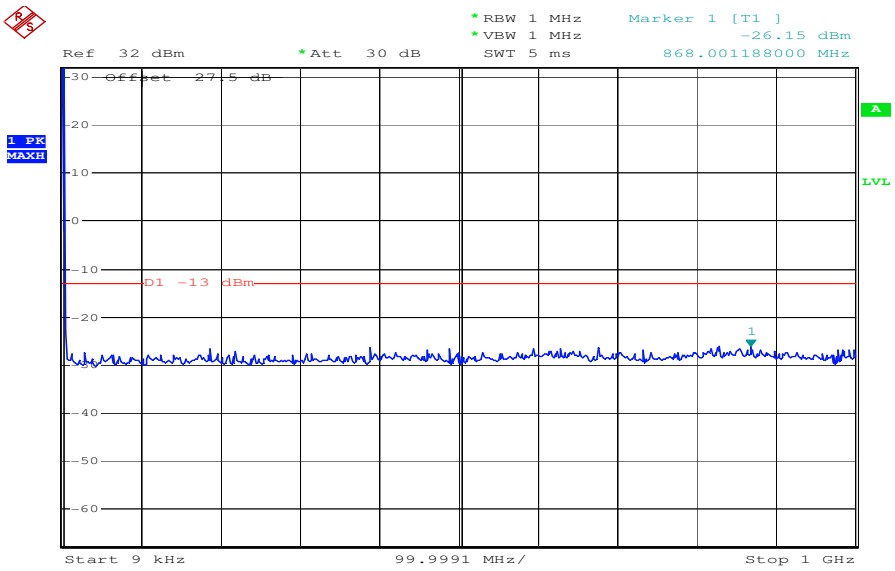
Measurement Limit:

(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:

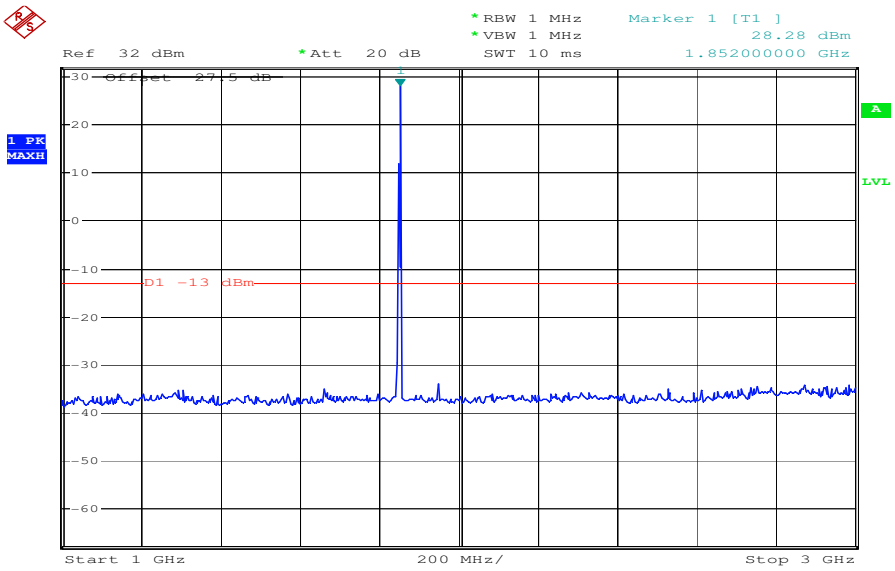
Harmonic	Tx ch.-512 Freq. (MHz)	Level (dBm)	Tx ch.-661 Freq. (MHz)	Level (dBm)	Tx ch.-810 Freq. (MHz)	Level (dBm)
2	3700.4	No critical peaks	3760	No critical peaks	3819.6	No critical peaks
3	5550.6		5640		5729.4	
4	7400.8		7520		7639.2	
5	9251.0		9400		9549.0	
6	11101.2		11280		11458.8	
7	12951.4		13160		13368.6	
8	14801.6		15040		15278.4	
9	16651.8		16920		17188.2	
10	18502.0		18800		19098.0	

Channel: 512



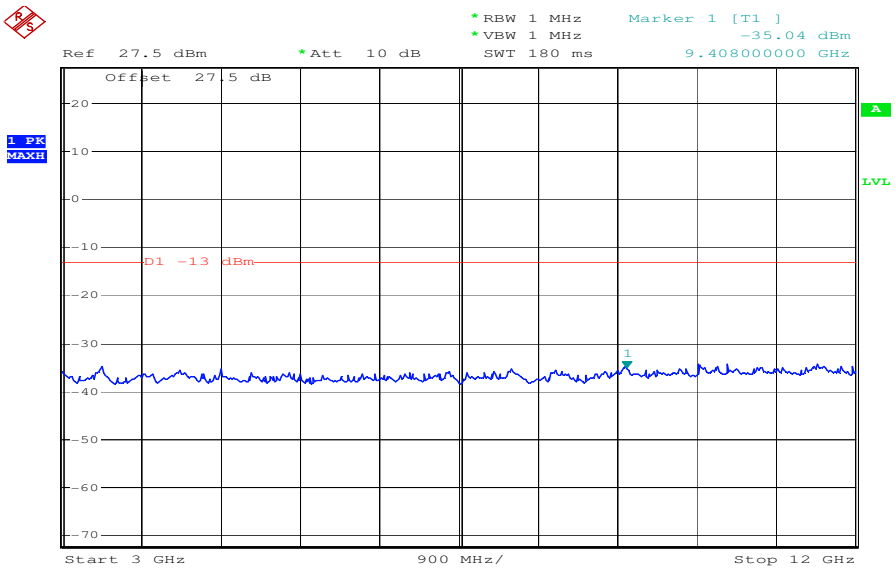
Date: 19.FEB.2008 11:44:10

Channel: 512



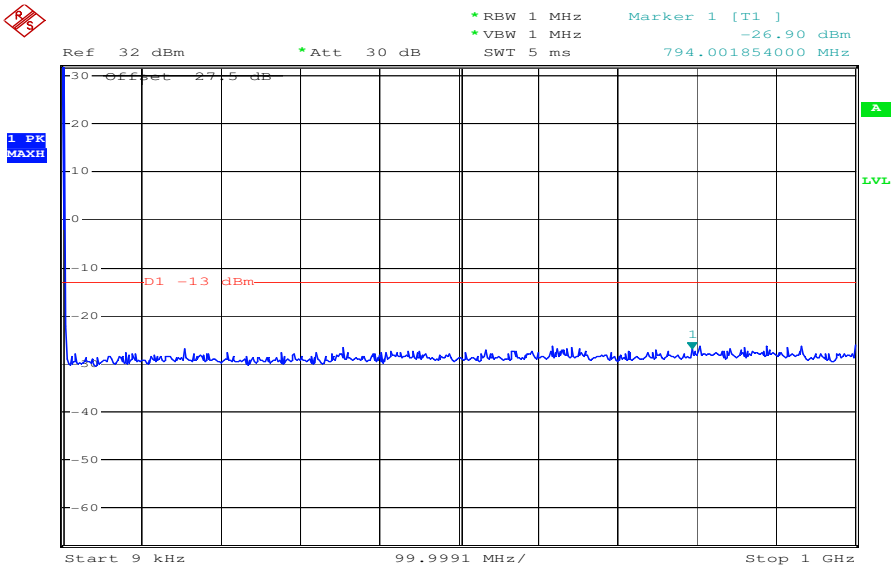
Date: 19.FEB.2008 11:48:56

Channel: 512



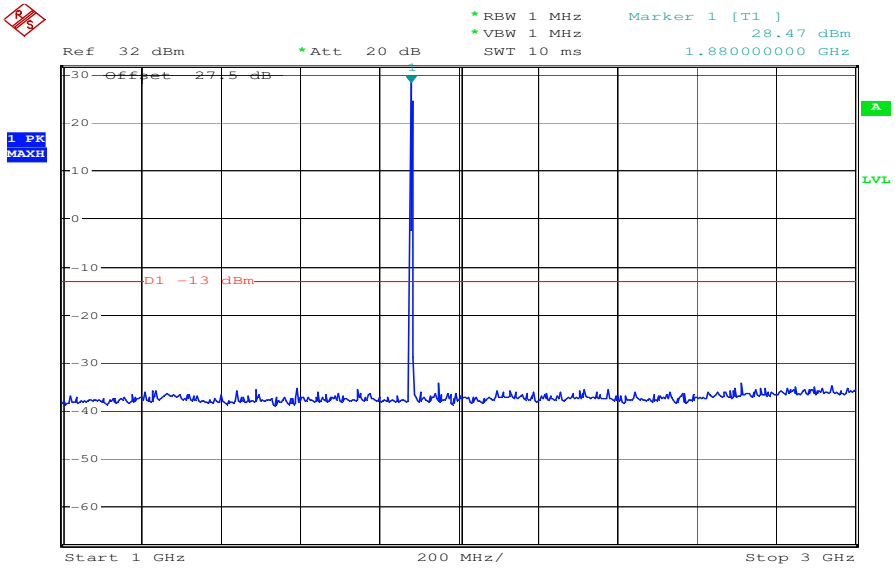
Date: 19.FEB.2008 13:42:03

Channel 661



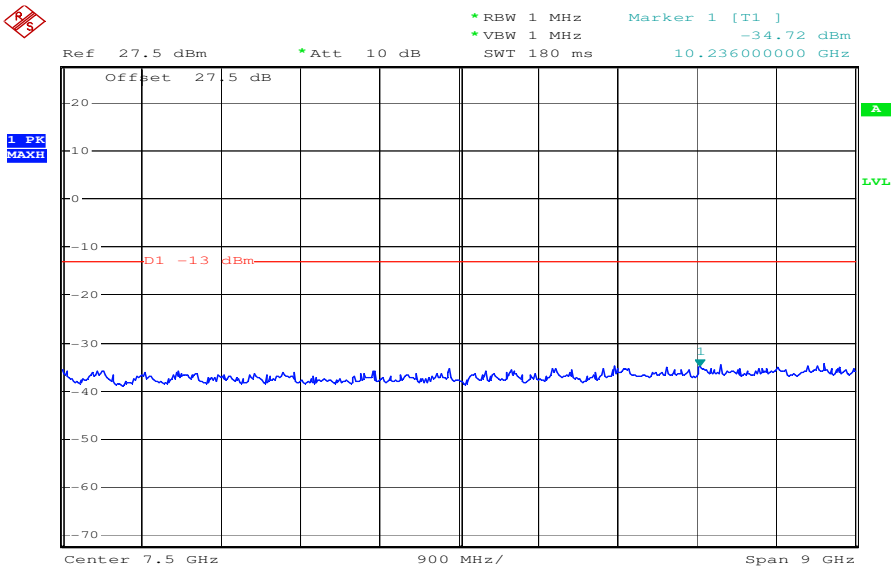
Date: 19.FEB.2008 11:45:04

Channel 661



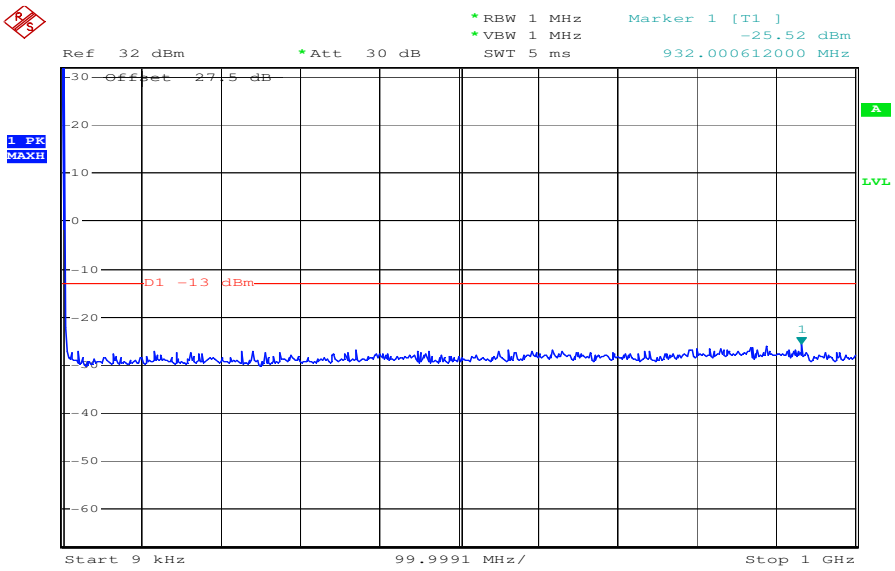
Date: 19.FEB.2008 11:49:26

Channel 661



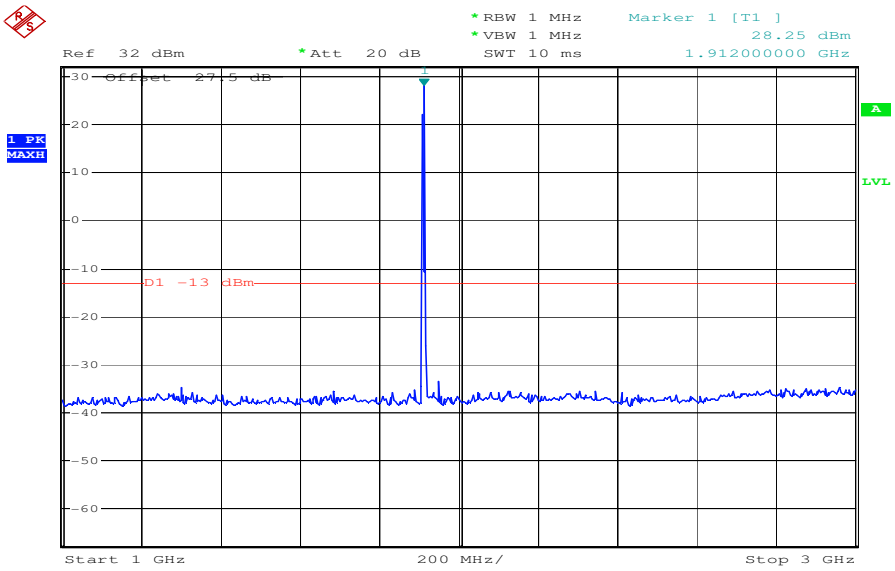
Date: 19.FEB.2008 13:40:43

Channel 810



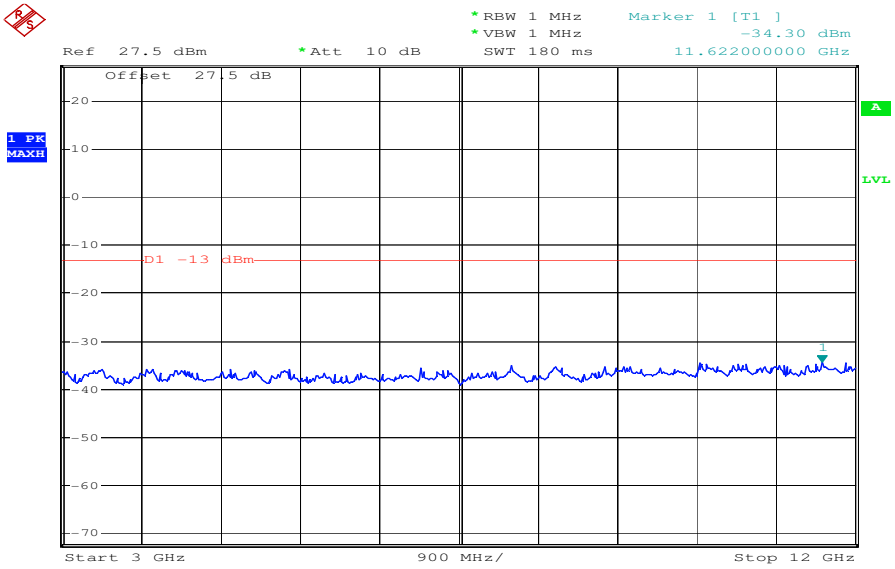
Date: 19.FEB.2008 11:47:00

Channel 810



Date: 19.FEB.2008 13:44:16

Channel 810



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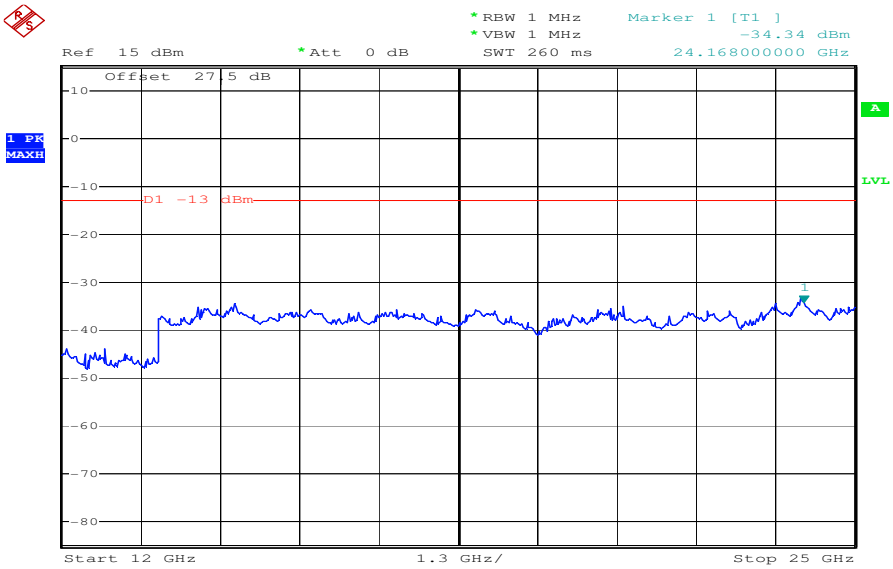
Channel 810



Date: 19.FEB.2008 13:50:07

5.1.6 Block Edge Compliance

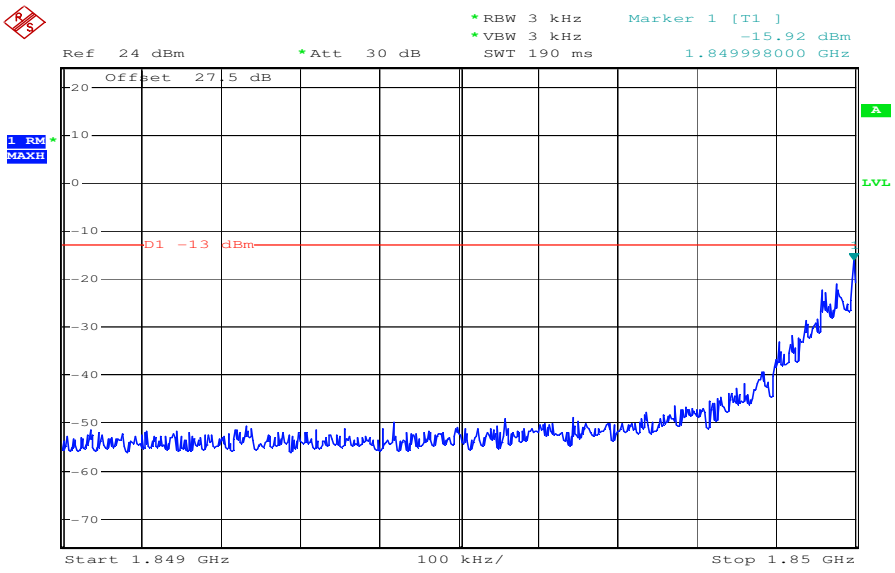
Reference

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

Measurement Limit:

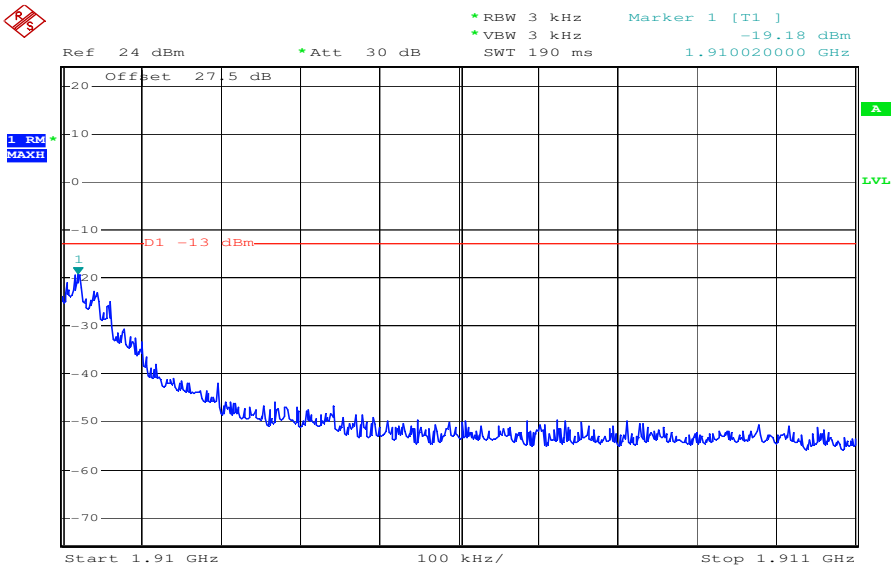
(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

Channel 512 GMSK- Mode



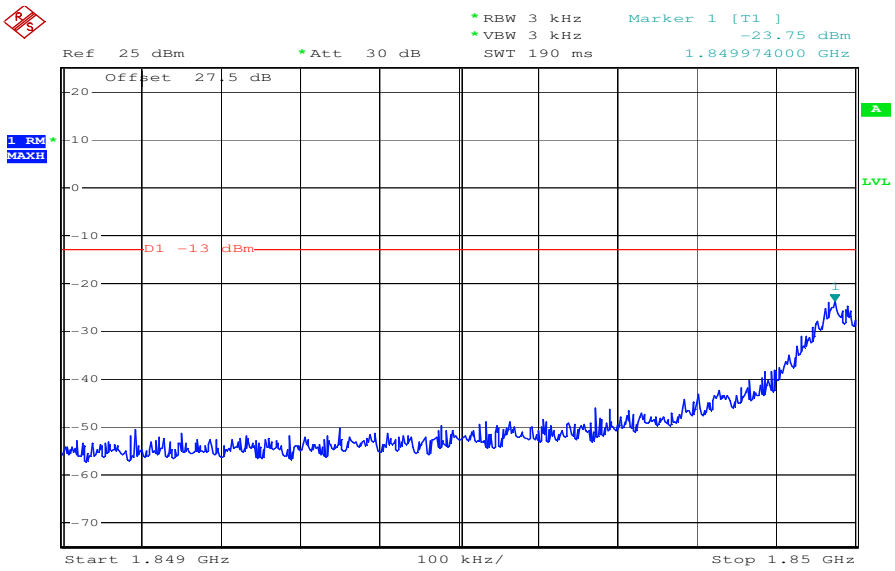
Date: 19.FEB.2008 14:47:50

Channel 810 GMSK- Mode



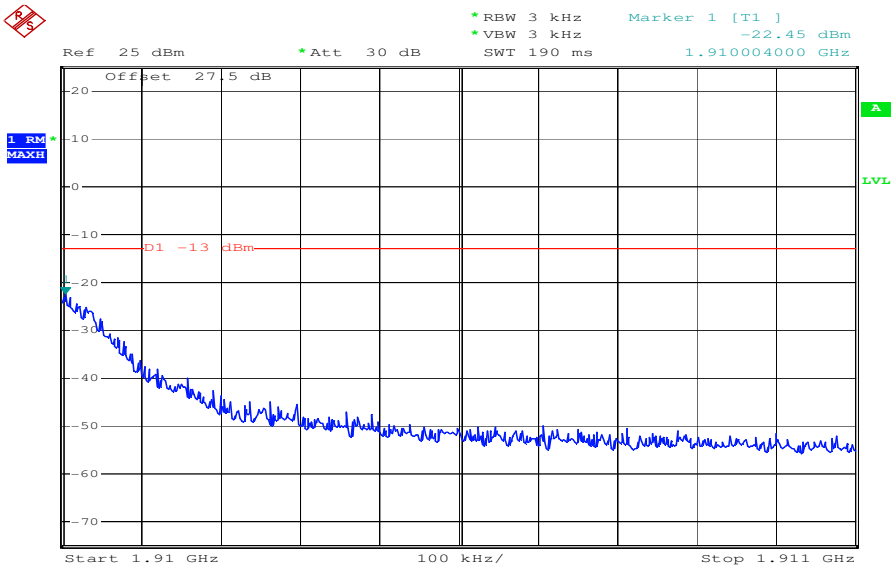
Date: 19.FEB.2008 14:46:56

Channel 512 8-PSK Mode



Date: 20.FEB.2008 13:11:22

Channel 810 8-PSK Mode



Date: 20.FEB.2008 13:10:38

5.1.7 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.

GMSK mode

Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1850.2 MHz	266.0	308.0
1880.0 MHz	262.0	310.0
1909.8 MHz	270.0	310.0

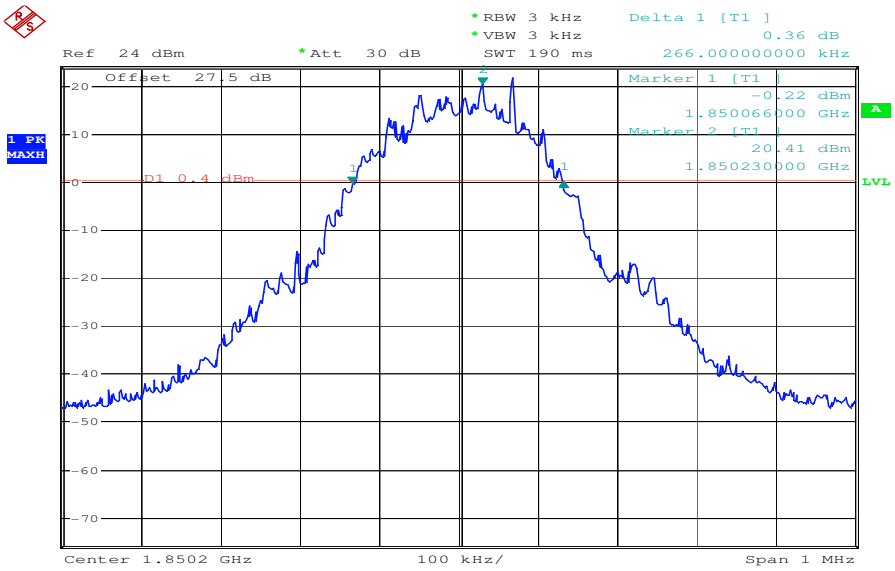
8-PSK mode

Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1850.2 MHz	286.0	320.0
1880.0 MHz	282.0	316.0
1909.8 MHz	282.0	320.0

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 GMSK Mode

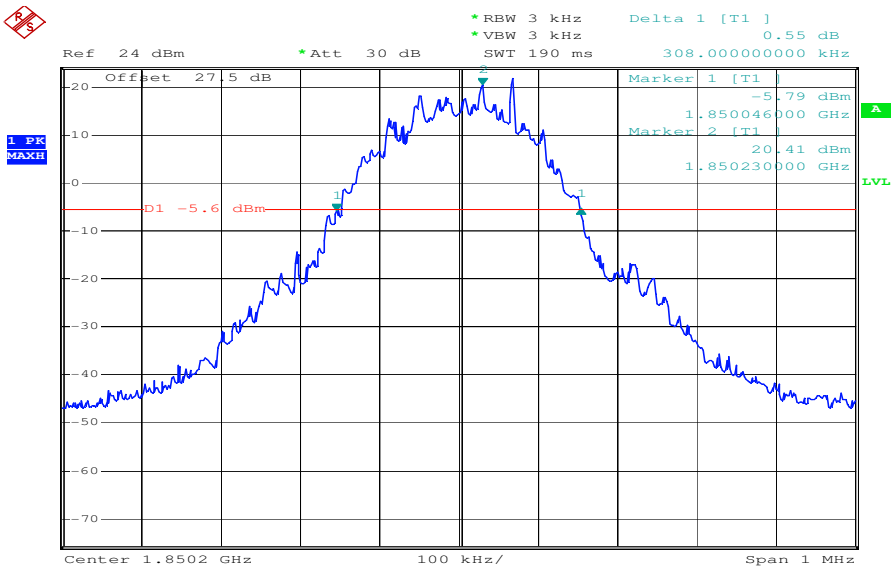
99% (-20 dB) Occupied Bandwidth



Date: 19.FEB.2008 14:38:59

Channel 512 GMSK Mode

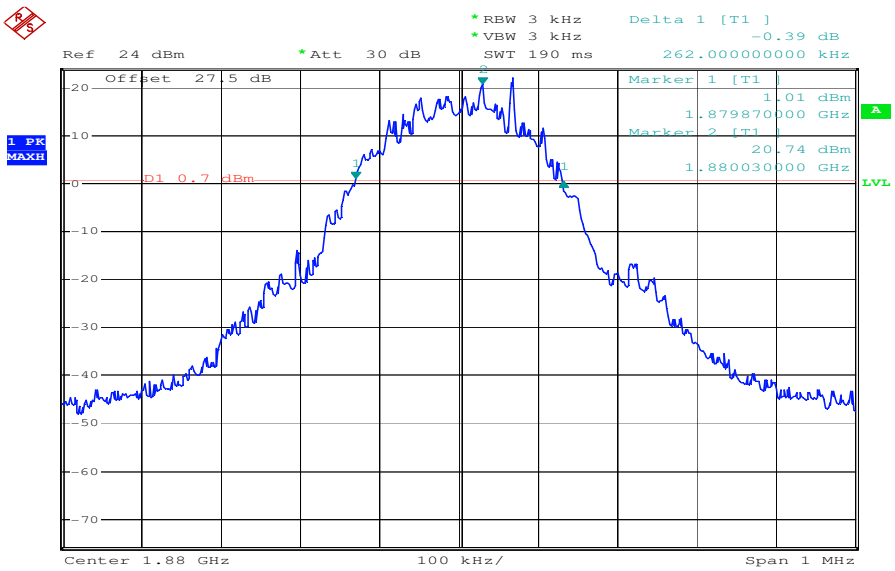
-26 dBc Bandwidth



Date: 19.FEB.2008 14:39:55

Channel 661 GMSK Mode

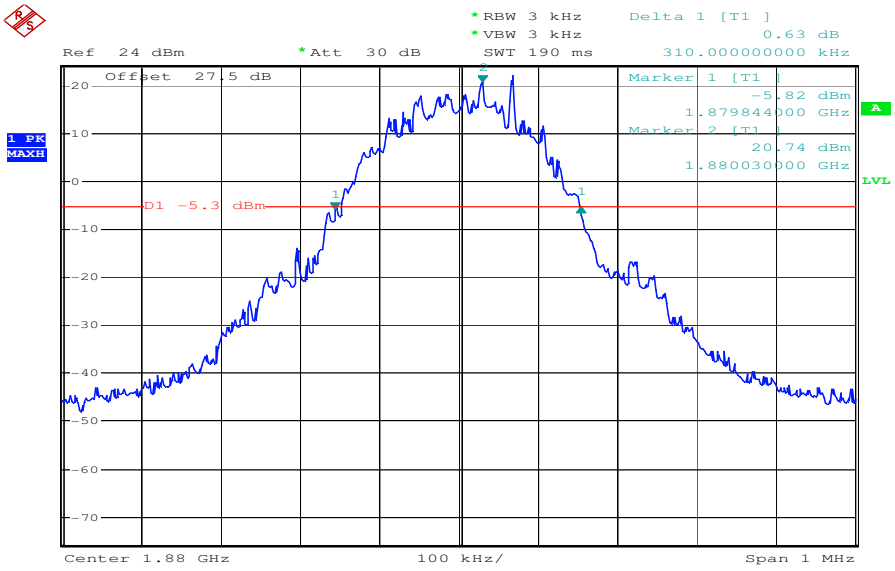
99% (-20 dB) Occupied Bandwidth



Date: 19.FEB.2008 14:42:04

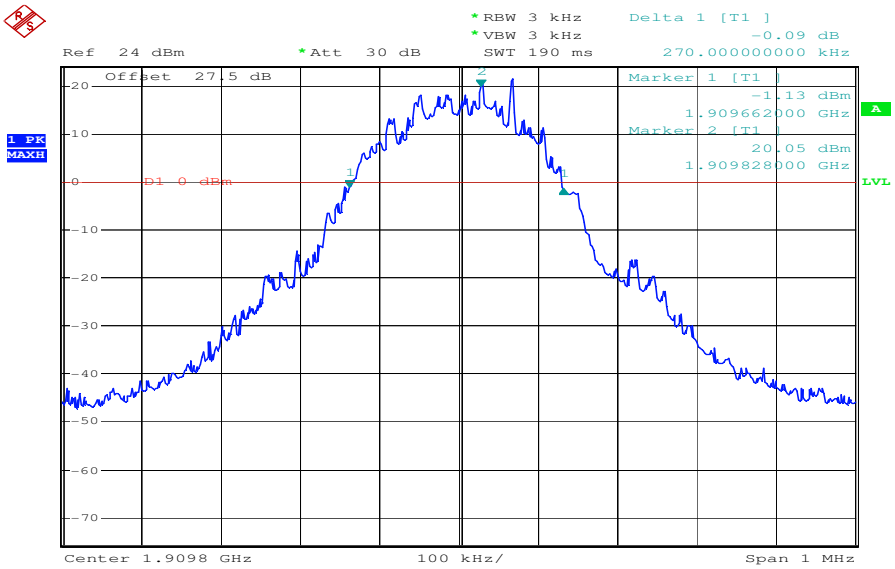
Channel 661 GMSK Mode

-26 dBc Bandwidth



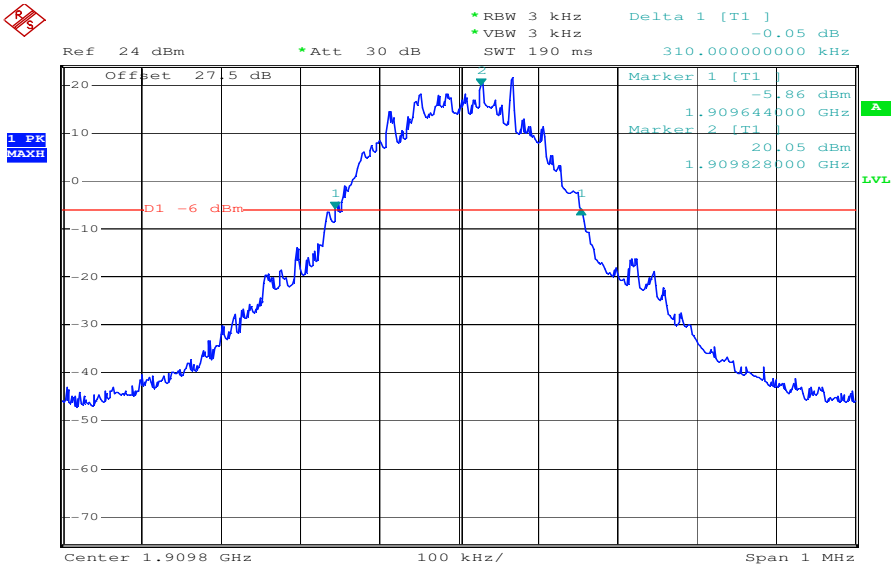
Date: 19.FEB.2008 14:42:36

Channel 810 GMSK Mode
99% (-20 dB) Occupied Bandwidth



Date: 19.FEB.2008 14:45:00

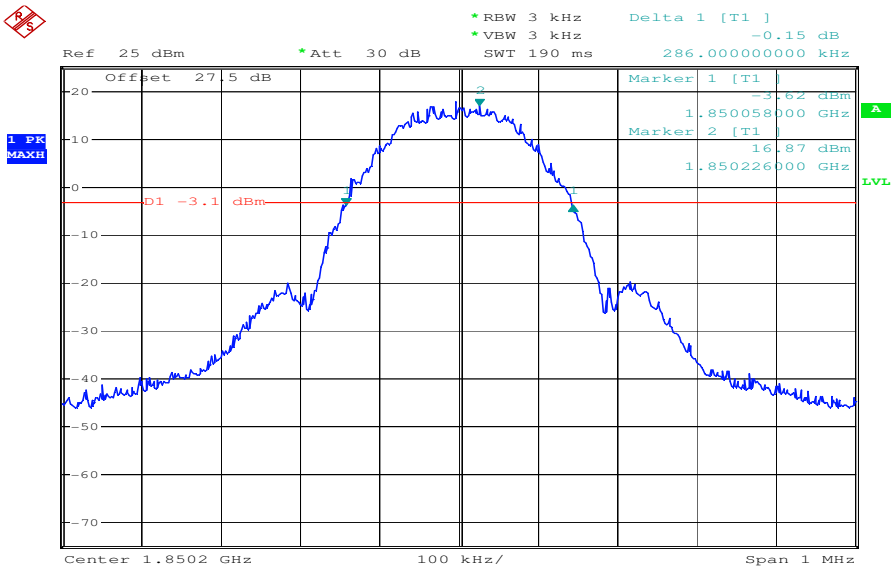
Channel 810 GMSK Mode
-26 dBc Bandwidth



Date: 19.FEB.2008 14:45:36

Channel 512 8-PSK Mode

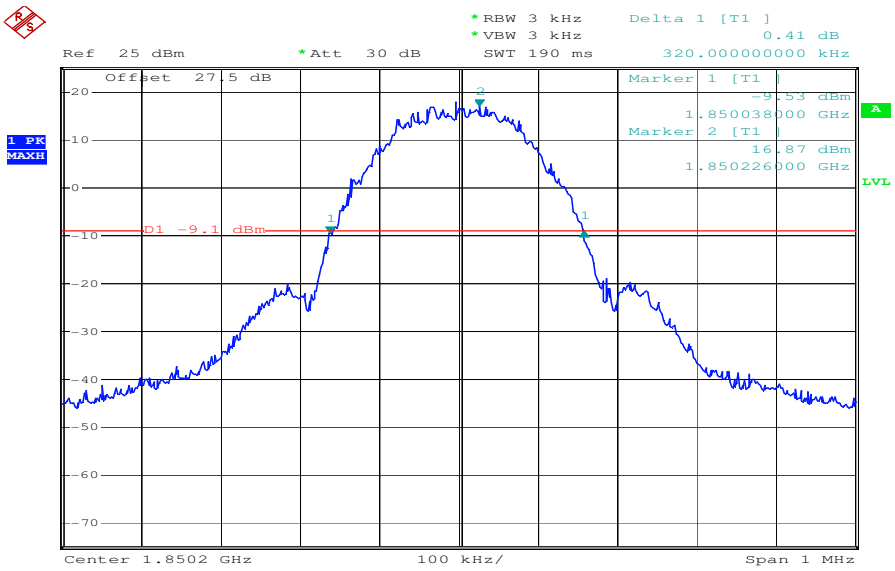
99% (-20 dB) Occupied Bandwidth



Date: 20.FEB.2008 12:57:50

Channel 512 8-PSK Mode

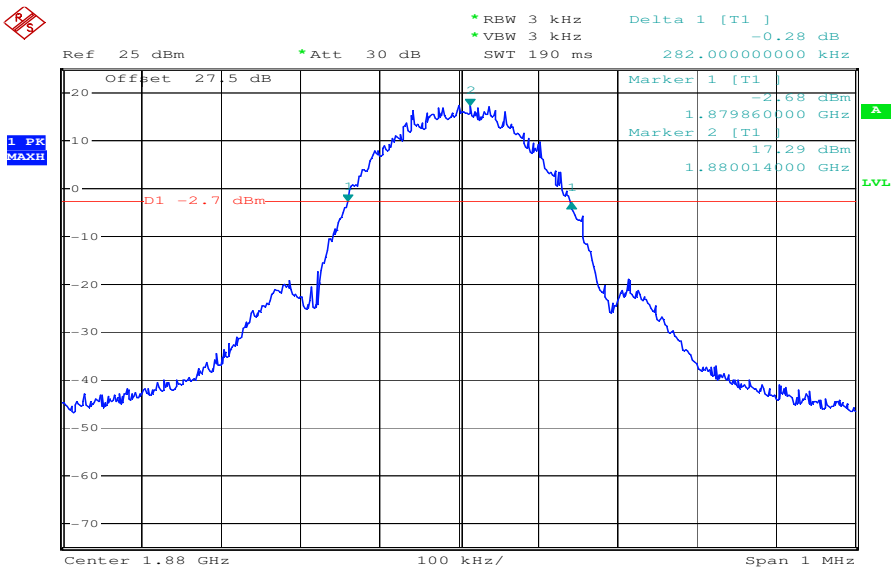
-26 dBc Bandwidth



Date: 20.FEB.2008 12:58:35

Channel 661 8-PSK Mode

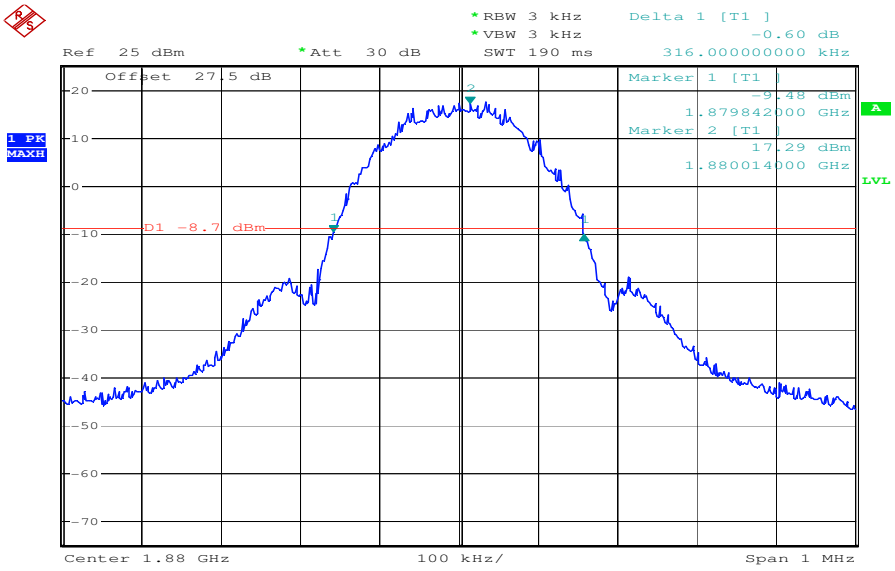
99% (-20 dB) Occupied Bandwidth



Date: 20.FEB.2008 13:02:52

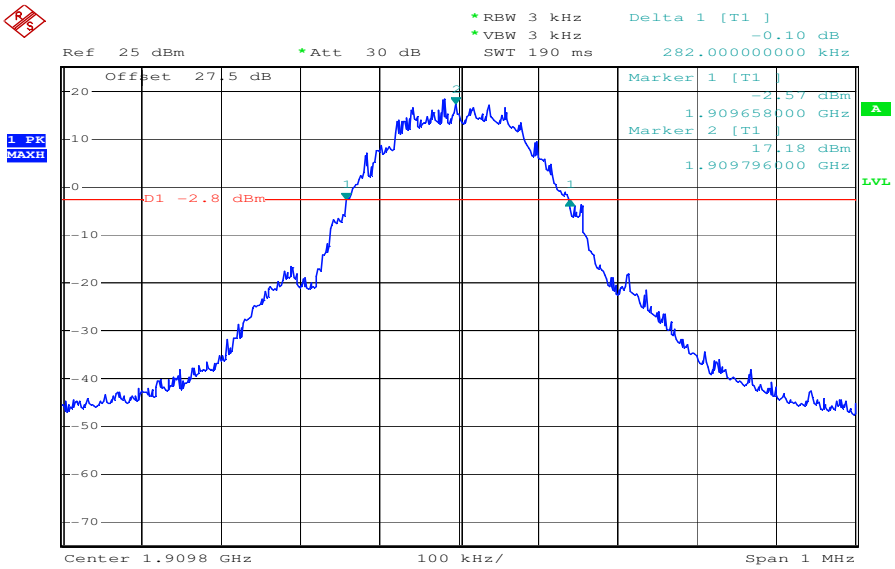
Channel 661 8-PSK Mode

-26 dBc Bandwidth



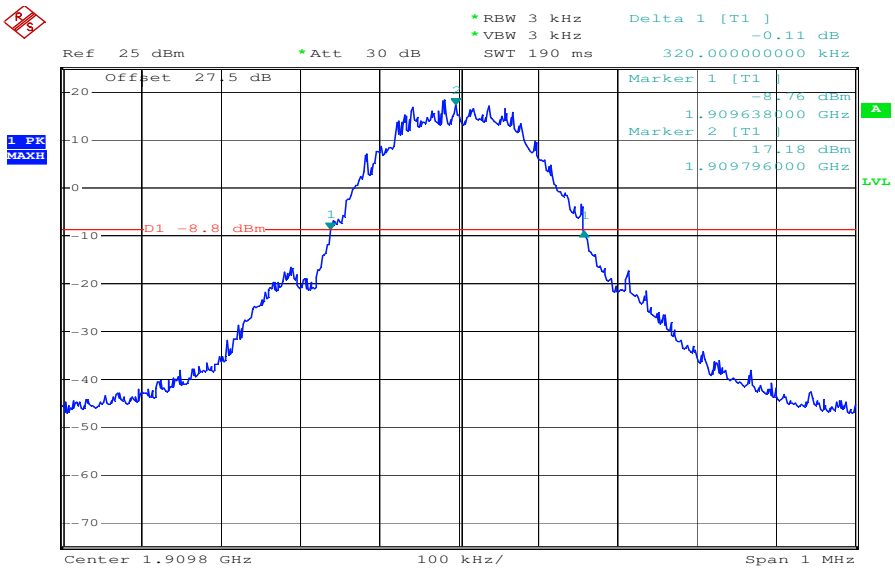
Date: 20.FEB.2008 13:03:38

Channel 810 8-PSK Mode
99% (-20 dB) Occupied Bandwidth



Date: 20.FEB.2008 13:06:39

Channel 810 8-PSK Mode
-26 dBc Bandwidth



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5.2 PART GSM 850

5.2.1 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	32.2	32.1
836.4	32.2	32.1
848.8	32.5	32.4
Measurement uncertainty	±1.5 dB	

Measurements Results Output Power (conducted) 8-PSK Mode

Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (dBm)
824.2	30.5	27.2
836.4	30.7	27.4
848.8	30.8	27.5
Measurement uncertainty	±1.5 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

Set-up No.: 01

Measurement Results Output Power (Radiated) GMSK Mode

Frequency (MHz)	Burst Peak (dBm)
824.2	28.1
836.4	28.4
848.8	28.5
Measurement uncertainty	±1.5 dB

Measurement Results Output Power (Radiated) 8-PSK Mode

Frequency (MHz)	Burst Peak (dBm)
824.2	27.7
836.4	27.8
848.8	27.8
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	dBd	dB	dBm	
848.8	135.2	23.4	8.4	0.0	3.3	28.5	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

Set-up No.: 02

Measurement Results Output Power (Radiated) GMSK Mode

Frequency (MHz)	Burst Peak (dBm)
824.2	28.5
836.4	28.4
848.8	28.7
Measurement uncertainty	±1.5 dB

Measurement Results Output Power (Radiated) 8-PSK Mode

Frequency (MHz)	Burst Peak (dBm)
824.2	27.9
836.4	27.9
848.8	28.1
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	dBd	dB	dBm	
848.8	135.4	23.6	8.4	0.0	3.3	28.7	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

Set-up No.: 03

Measurement Results Output Power (Radiated) GMSK Mode

Frequency (MHz)	Burst Peak (dBm)
824.2	28.3
836.4	28.1
848.8	28.4
Measurement uncertainty	±1.5 dB

Measurement Results Output Power (Radiated) 8-PSK Mode

Frequency (MHz)	Burst Peak (dBm)
824.2	27.7
836.4	27.5
848.8	27.8
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	dBd	dB	dBm	
848.8	132.3	23.3	8.4	0.0	3.3	28.4	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

5.2.2 Frequency Stability

Reference

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

Method of Measurement:

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

Measurement Limit:

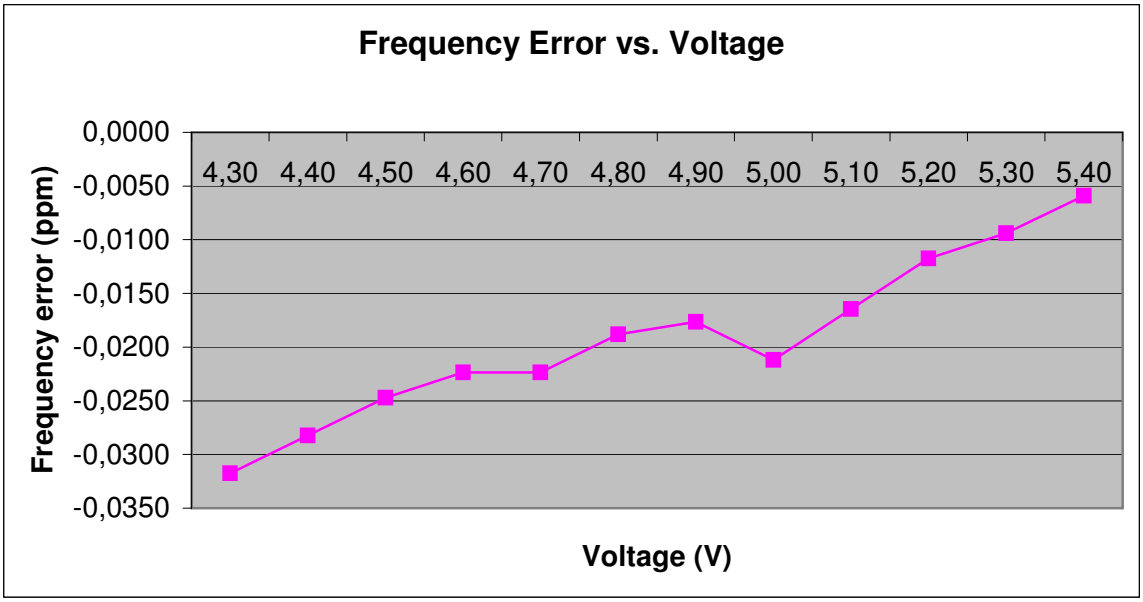
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 22.355, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission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

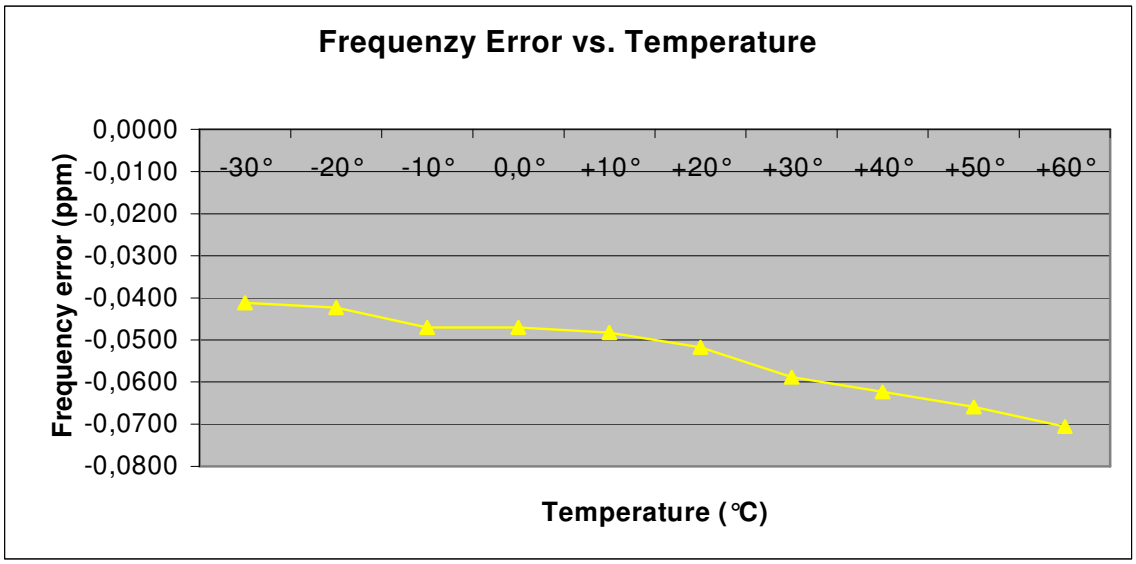
Measurement Results: AFC FREQ ERROR vs. VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
4.3	-25	-0,00000133	-0,0133
4.4	-27	-0,00000318	-0,0318
4.5	-24	-0,00000282	-0,0282
4.6	-21	-0,00000247	-0,0247
4.7	-19	-0,00000224	-0,0224
4.8	-19	-0,00000224	-0,0224
4.9	-16	-0,00000188	-0,0188
5.0	-15	-0,00000176	-0,0176
5.1	-18	-0,00000212	-0,0212
5.2	-14	-0,00000165	-0,0165
5.3	-10	-0,00000118	-0,0118
5.4	-8	-0,00000094	-0,0094

Measurement Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-35	-0,00000412	-0,0412
-20	-36	-0,00000424	-0,0424
-10	-40	-0,00000471	-0,0471
±0.0	-40	-0,00000471	-0,0471
+10	-41	-0,00000482	-0,0482
+20	-44	-0,00000518	-0,0518
+30	-50	-0,00000588	-0,0588
+40	-53	-0,00000624	-0,0624
+50	-56	-0,00000659	-0,0659
+60	-60	-0,00000706	-0,0706


Frequency Error vs. Voltage
0,0000
-0,0050
-0,0100
-0,0150
-0,0200
-0,0250
-0,0300
-0,0350
Frequency error (ppm)
4,30 4,40 4,50 4,60 4,70 4,80 4,90 5,00 5,10 5,20 5,30 5,40
Voltage (V)


Frequenzy Error vs. Temperature
0,0000
-0,0100
-0,0200
-0,0300
-0,0400
-0,0500
-0,0600
-0,0700
-0,0800
Frequency error (ppm)
-30° -20° -10° 0,0° +10° +20° +30° +40° +50° +60°
Temperature (°C)

5.2.3 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.

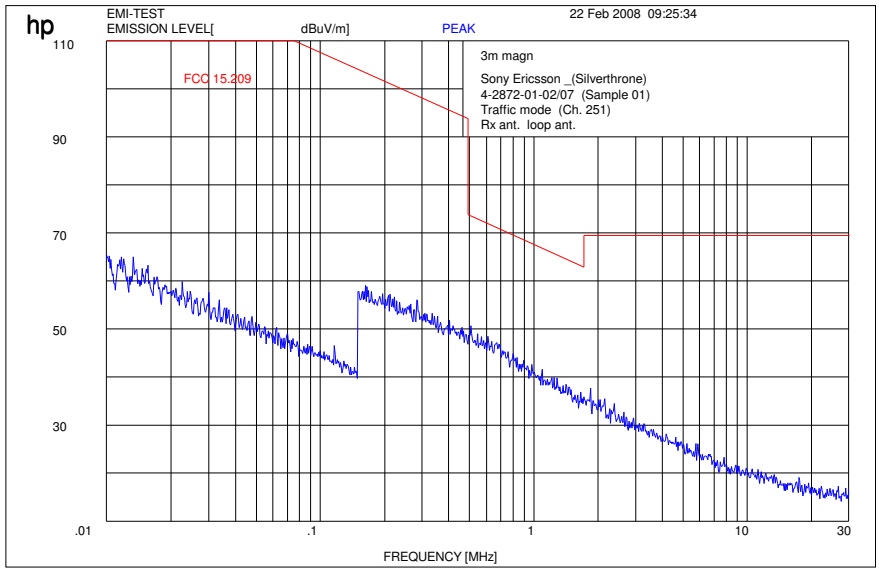
Harmonic	Tx ch.-128 Freq. (MHz)	Level (dBm)	Tx ch.-189 Freq. (MHz)	Level (dBm)	Tx ch.-251 Freq. (MHz)	Level (dBm)
2	1648.4	No critical peaks	1672.8	No critical peaks	1697.6	No critical peaks
3	2472.6		2509.2		2546.4	
4	3296.8		3345.6		3395.2	
5	4121.0		4182.0		4244.0	
6	4945.2		5018.4		5092.8	
7	5769.4		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:

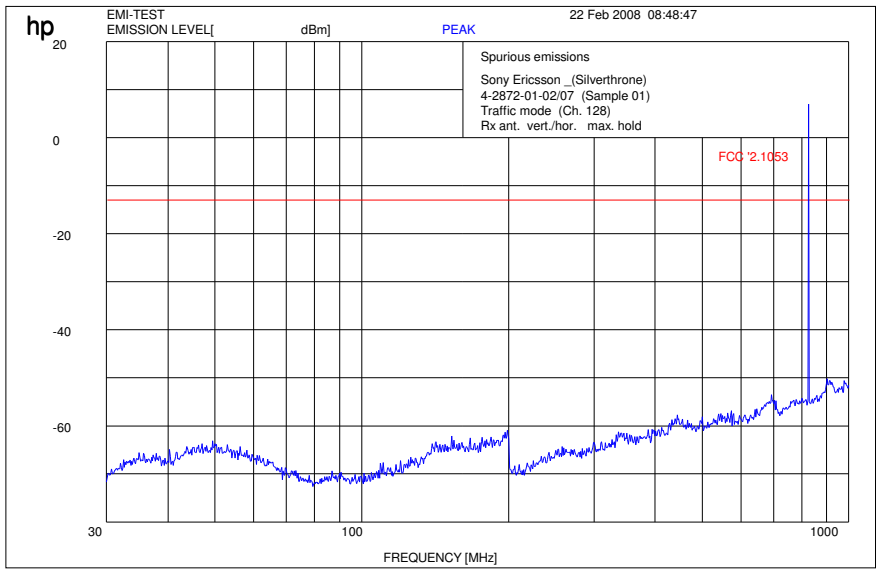
Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERP	Substitution Antenna
MHz	dBµV	dBm	dBi	dBd	dB	dBm	
848.8	135.4	23.6	8.4	0.0	3.3	28.7	UHAP Schwarzbeck S/N 460

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)

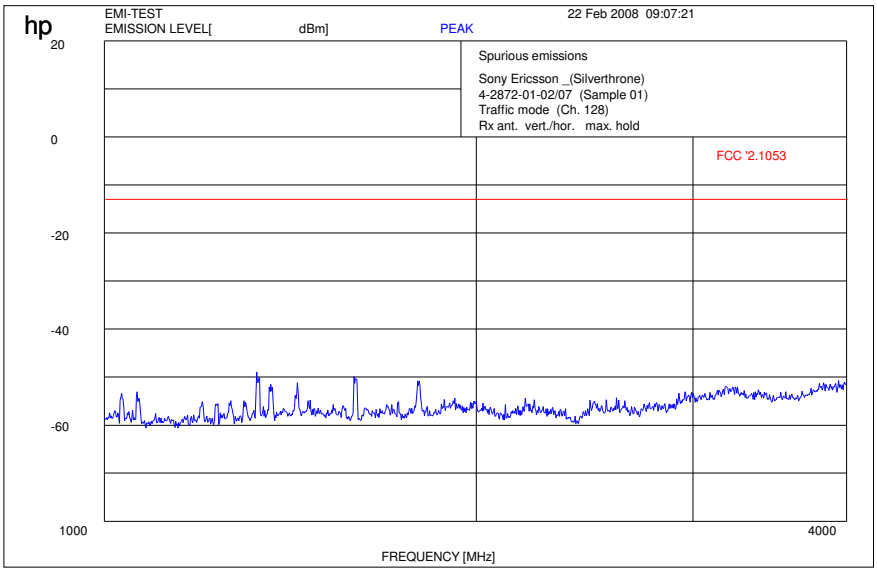


Channel 128 (30 MHz - 1 GHz)



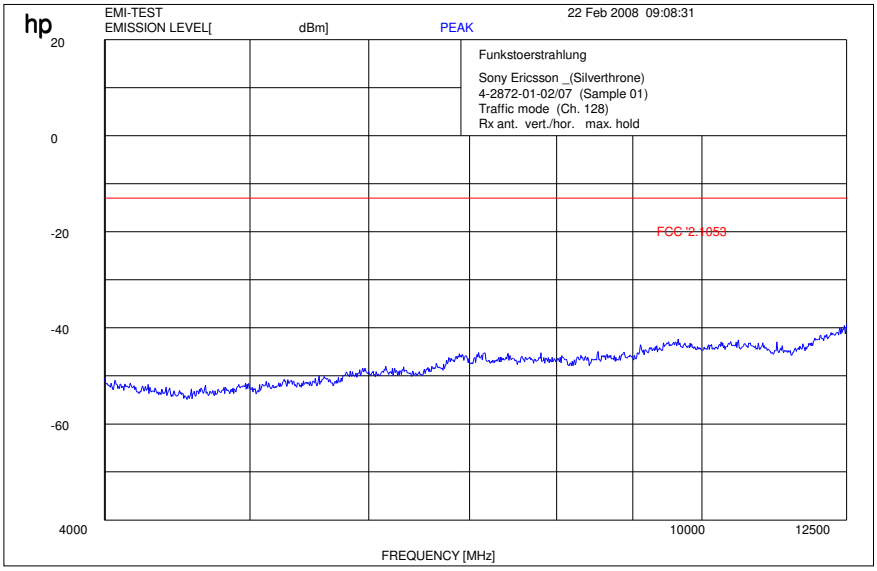
f < 1 GHz : RBW/VBW: 100 kHz

Channel 128 (1 GHz - 4 GHz)



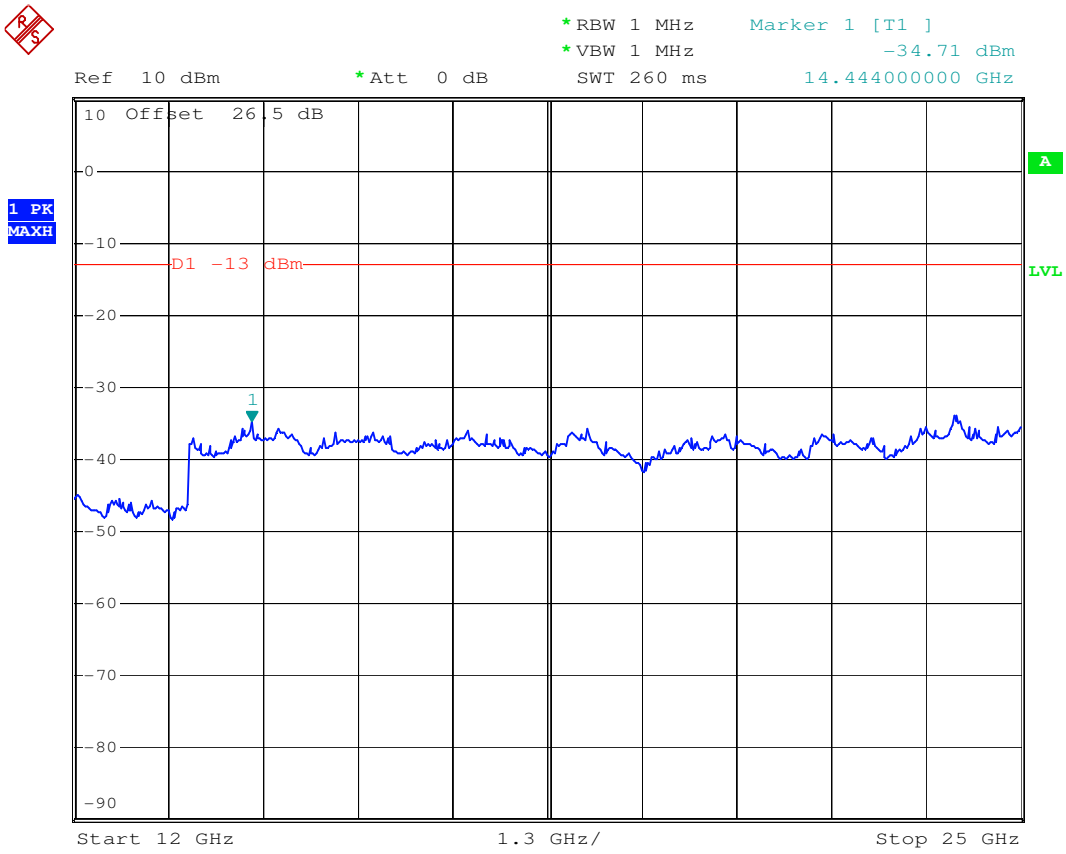
f ≥ 1GHz : RBW / VBW 1 MHz

Channel 128 (4 GHz – 12.5 GHz)



f ≥ 1GHz : RBW / VBW 1 MHz

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



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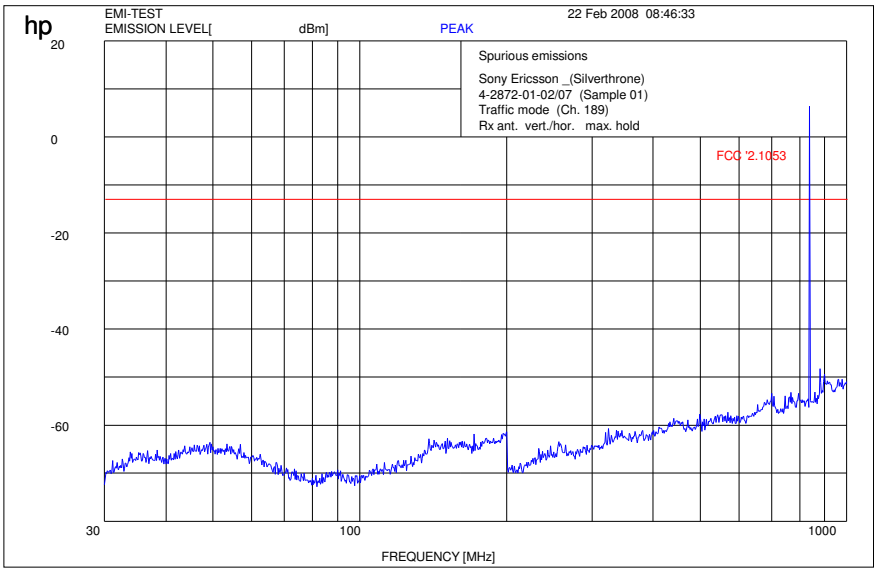
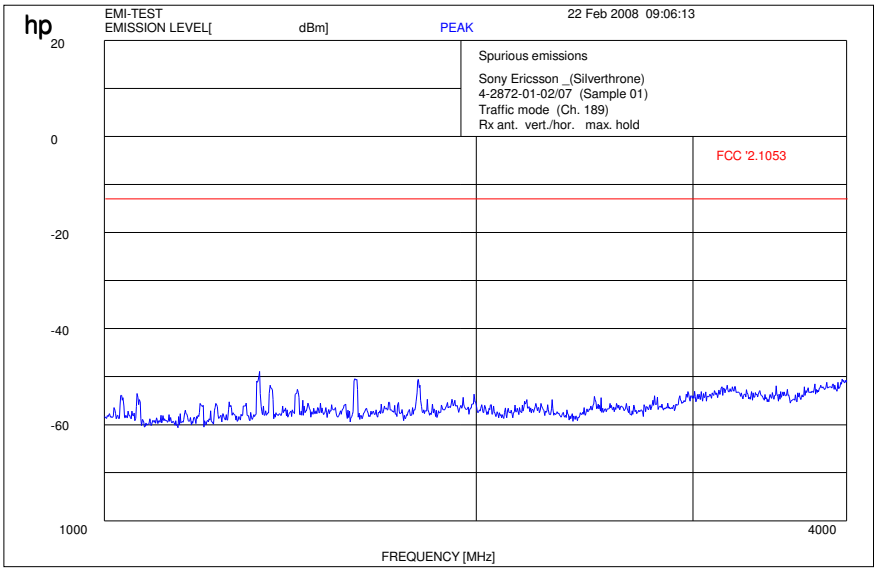
Channel 189 (30 MHz - 1 GHz)



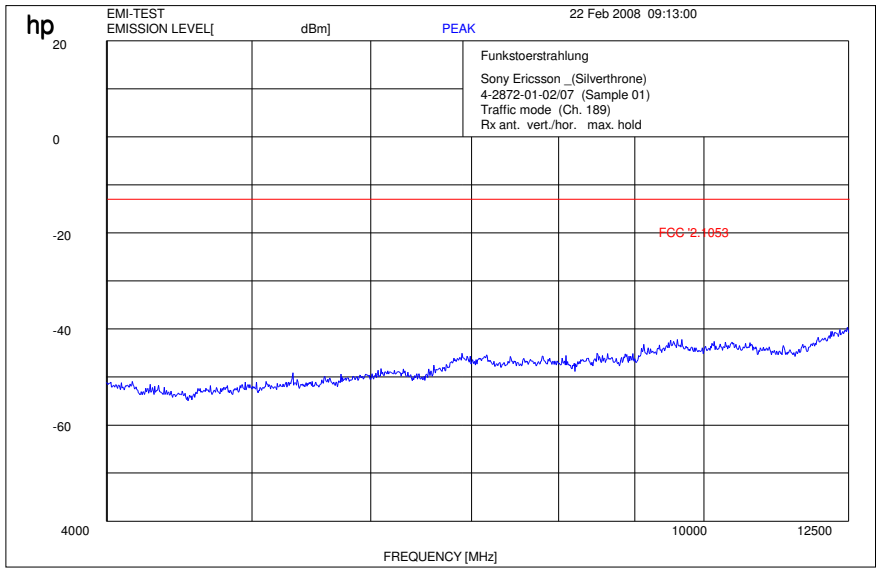
f < 1 GHz : RBW/VBW: 100 kHz

Channel 189 (1 GHz - 4 GHz)



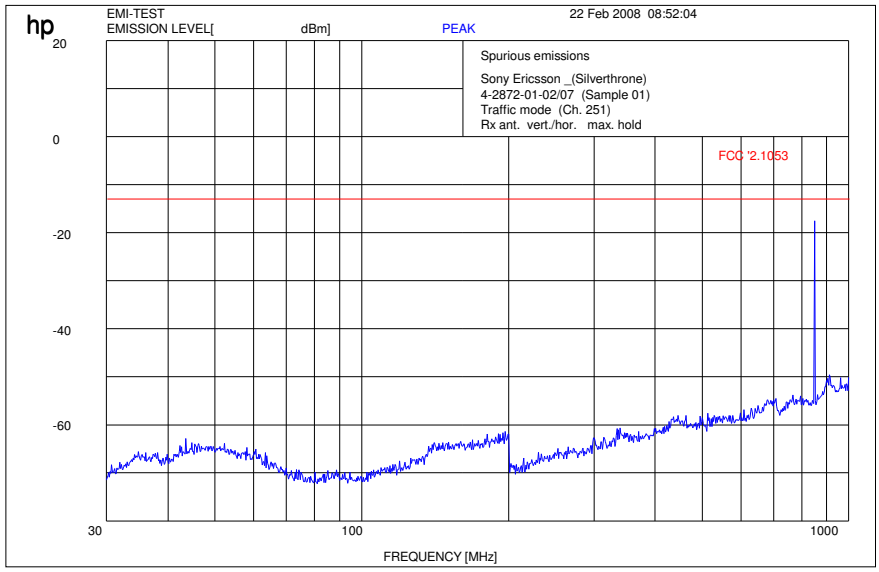
f ≥ 1GHz : RBW / VBW 1 MHz

Channel 189 (4 GHz – 12.5 GHz)



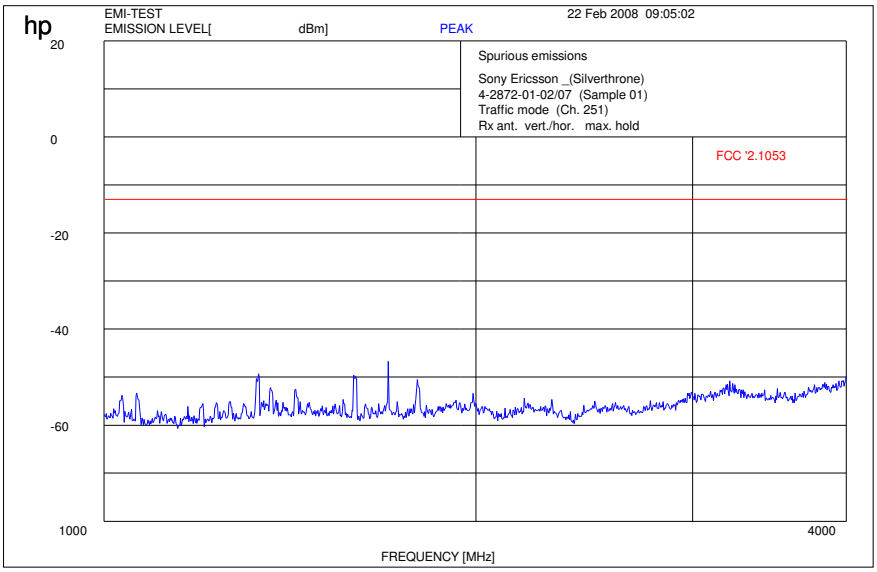
f ≥ 1GHz : RBW / VBW 1 MHz

Channel 251 (30 MHz - 1 GHz)



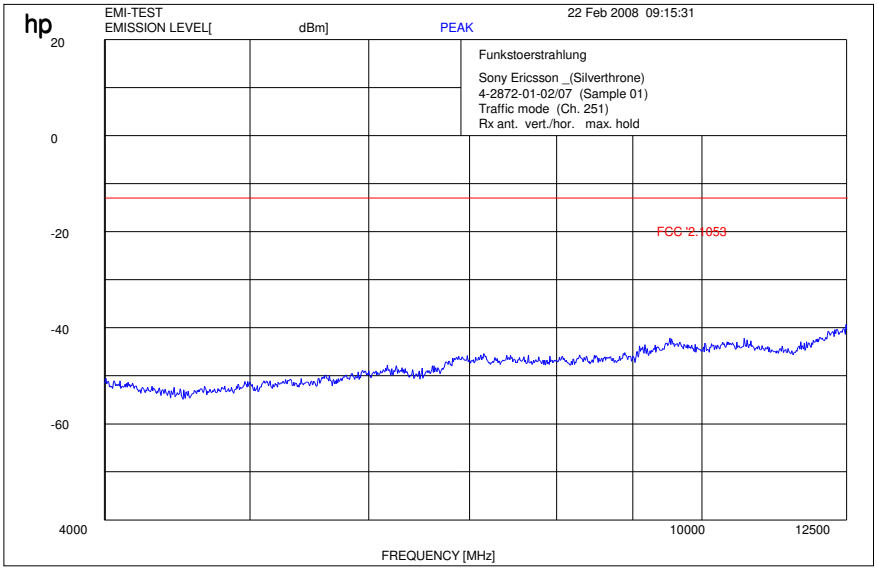
f < 1 GHz : RBW/VBW: 100 kHz
Carrier suppressed with a rejection filter

Channel 251 (1 GHz - 4 GHz)



f ≥ 1GHz : RBW / VBW 1 MHz

Channel 251 (4 GHz – 12.5 GHz)



f ≥ 1GHz : RBW / VBW 1 MHz

5.2.4 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)
No critical peaks			-	-	-	-	-	-
			-	-	-	-	-	-
			-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
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 (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

Idle Mode (30 MHz - 1 GHz)

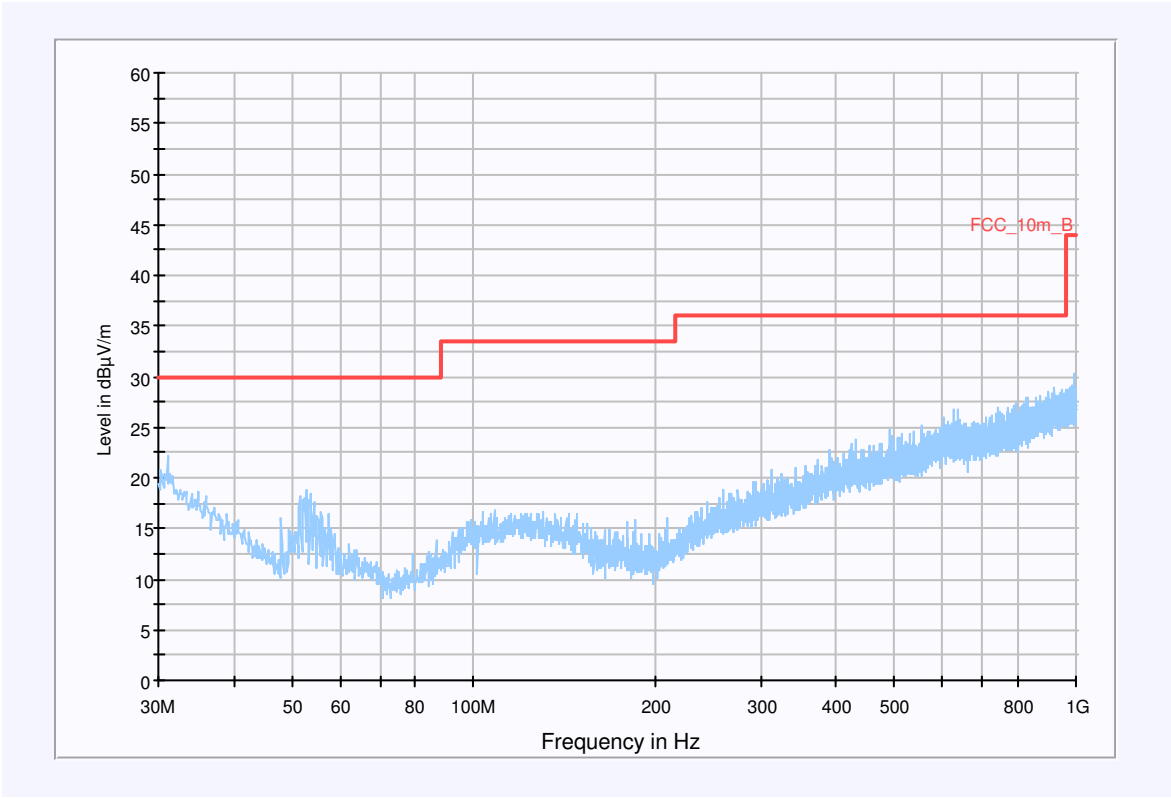
EUT:	FAD-3232021-BV with MD300
Serial Number:	Silverthrone (FAD-3232021-BV)
Test Description:	FCC class B @ 10m
Operating Conditions:	IDLE
Operator Name:	WAL
Comment:	connect to Laptop

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_10m_Fast_1GHz (B)

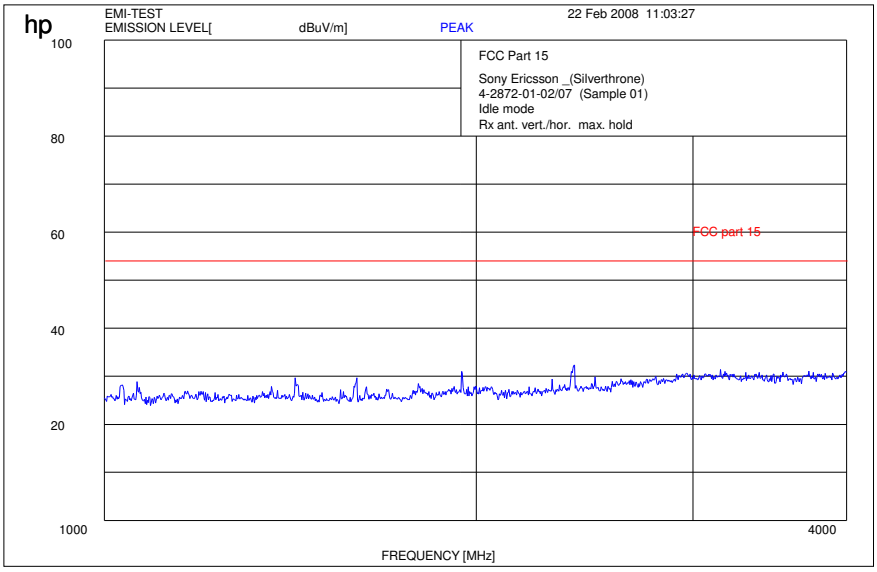


Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

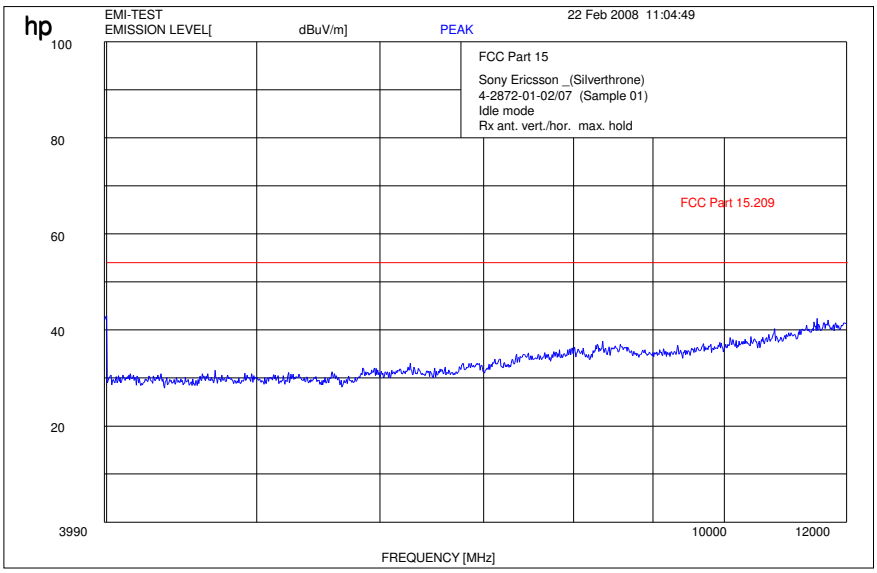
Frequency Range:	30MHz - 2GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch FW 1.0
Antenna:	Chase Broadband BiLog Antenna CBL 6112 SN 2110, FW A, CAL 07.01.2009 Correction Table (vertical): Chase Broadband BiLog Antenna CBL 6112 Correction Table (horizontal): Chase Broadband BiLog Antenna CBL 6112 Correction Table: Cabel with switch (1007)
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)



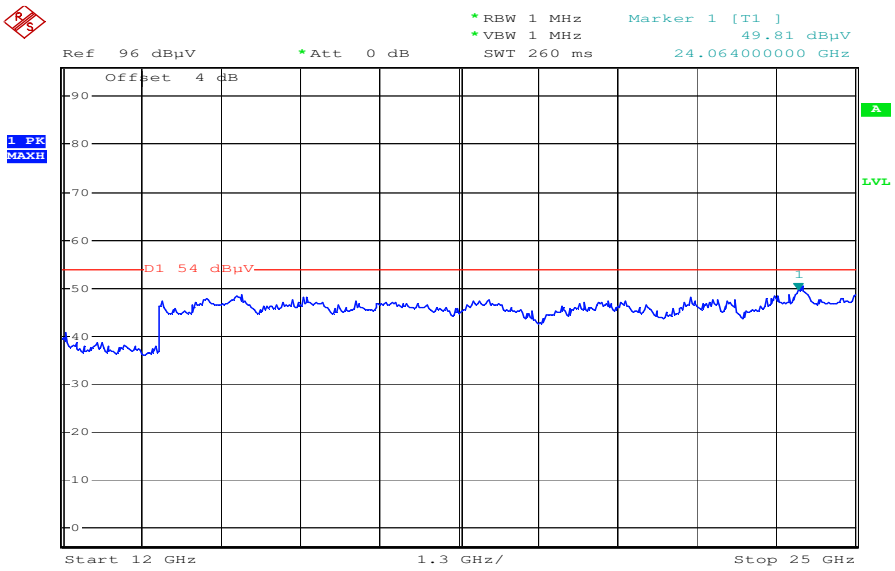
f ≥ 1GHz : RBW / VBW 1 MHz

Idle Mode (4 GHz – 12.0 GHz)



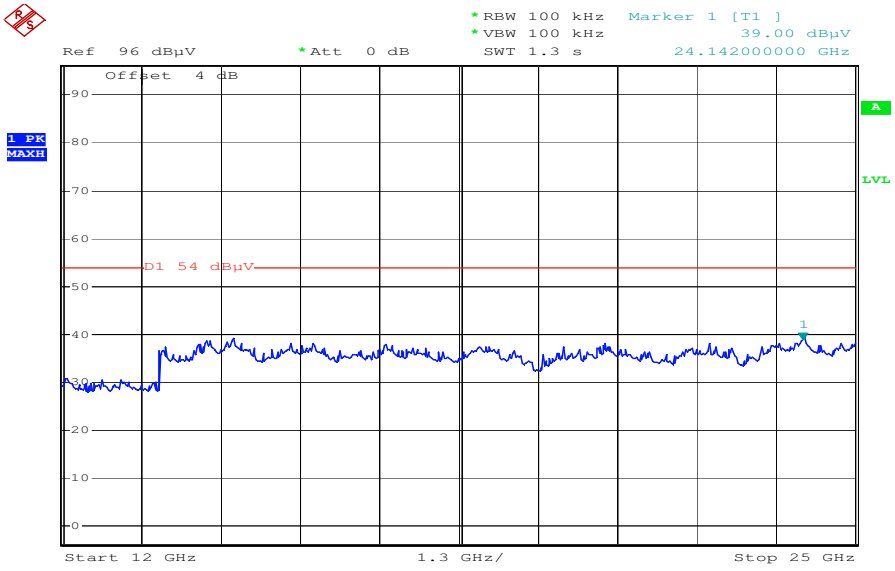
f ≥ 1GHz : RBW / VBW 1 MHz

Idle-Mode (12 GHz - 25 GHz)



Date: 25.FEB.2008 10:39:30

Idle-Mode (12 GHz - 25 GHz)



Date: 25.FEB.2008 10:39:57

5.2.5 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

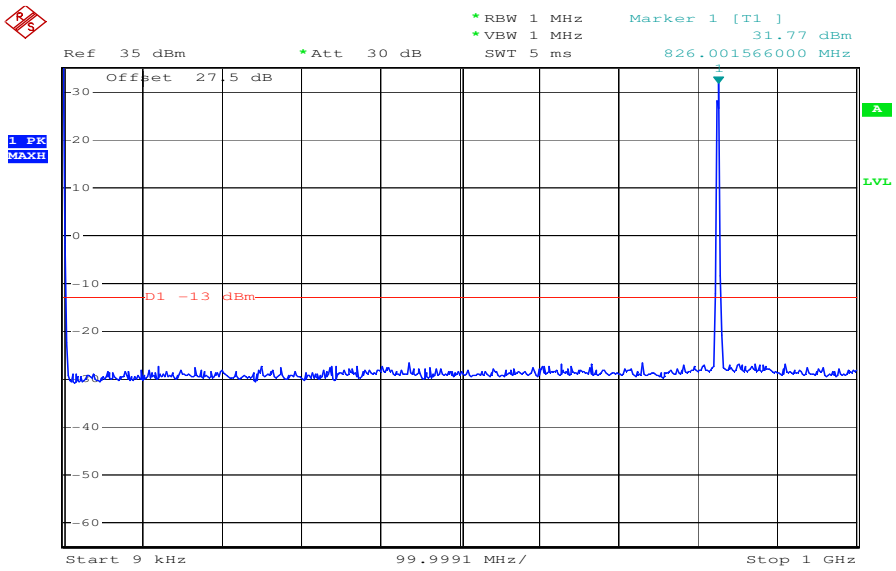
Measurement Limit

(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

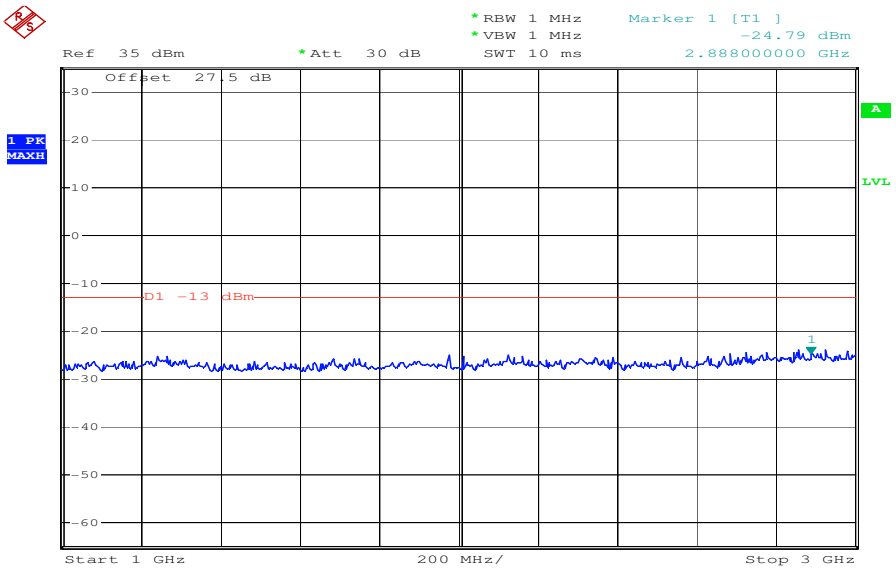
Harmonic	Tx ch.- 128 Freq. (MHz)	Level (dBm)	Tx ch.- 189 Freq. (MHz)	Level (dBm)	Tx ch.- 251 Freq. (MHz)	Level (dBm)
2	1648.4	No critical peaks	1672.8	No critical peaks	1697.6	No critical peaks
3	2472.6		2509.2		2546.4	
4	3296.8		3345.6		3395.2	
5	4121.0		4182.0		4244.0	
6	4945.2		5018.4		5092.8	
7	5769.4		5854.8		5941.6	
8	6593.6		6691.2		6790.4	
9	7417.8		7527.6		7639.2	
10	8242.0		8364.0		8488.0	

Channel: 128



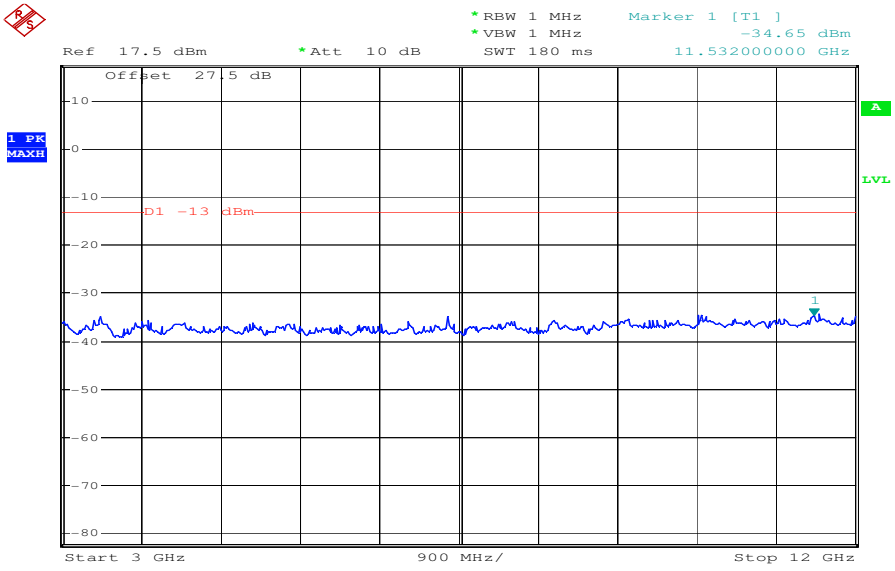
Date: 19.FEB.2008 15:02:12

Channel: 128



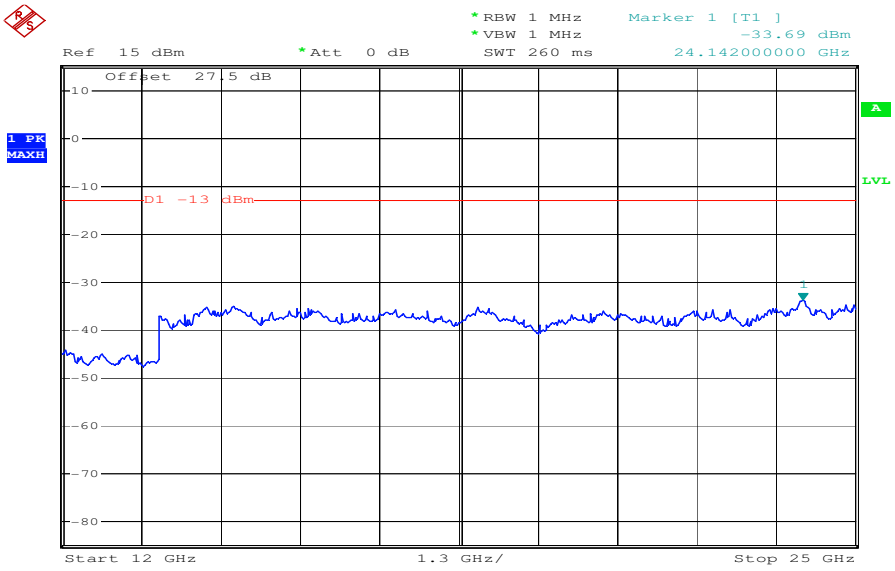
Date: 19.FEB.2008 15:03:21

Channel: 128



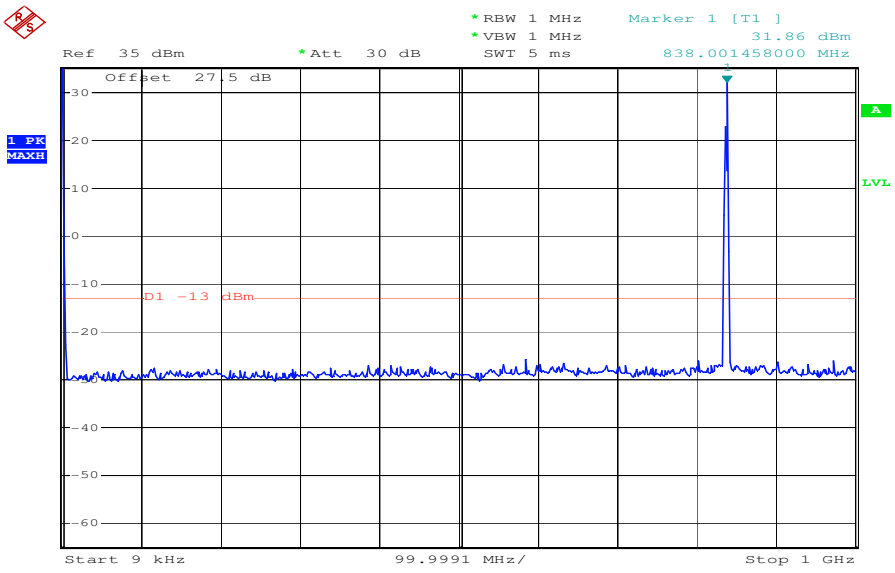
Date: 19.FEB.2008 15:06:18

Channel: 128



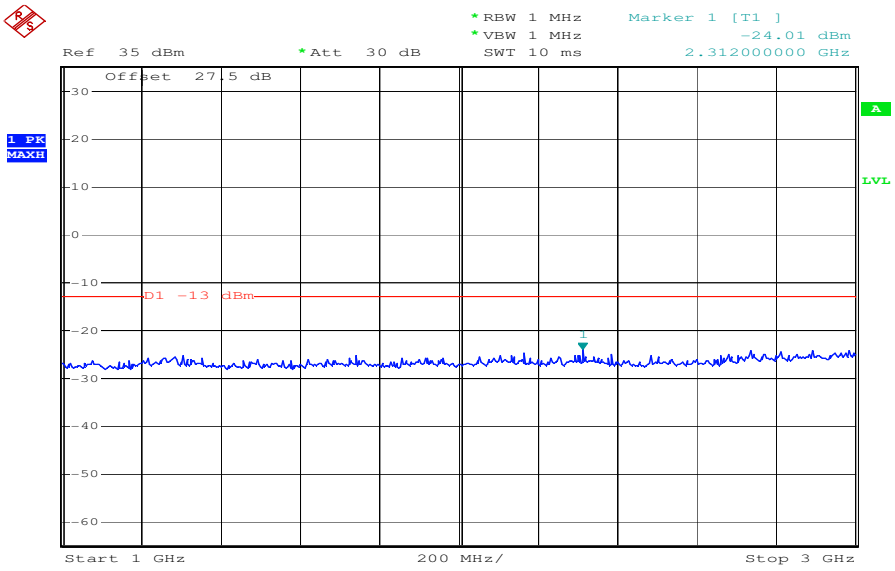
Date: 19.FEB.2008 15:08:11

Channel 189



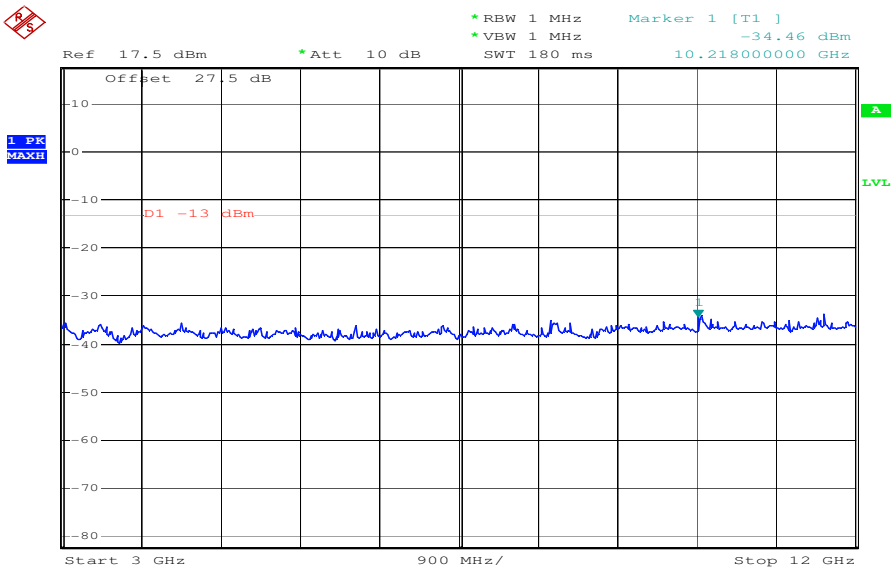
Date: 19.FEB.2008 15:01:33

Channel 189



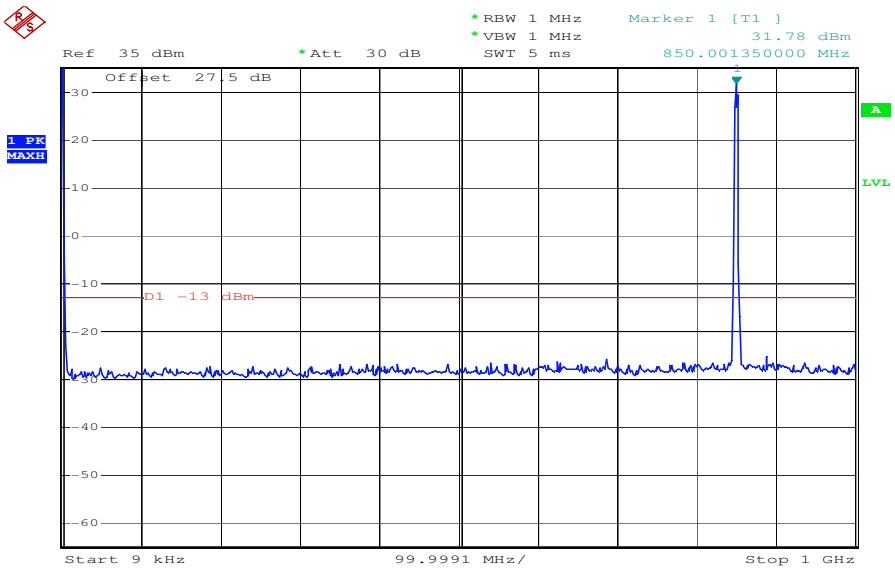
Date: 19.FEB.2008 15:04:36

Channel 189



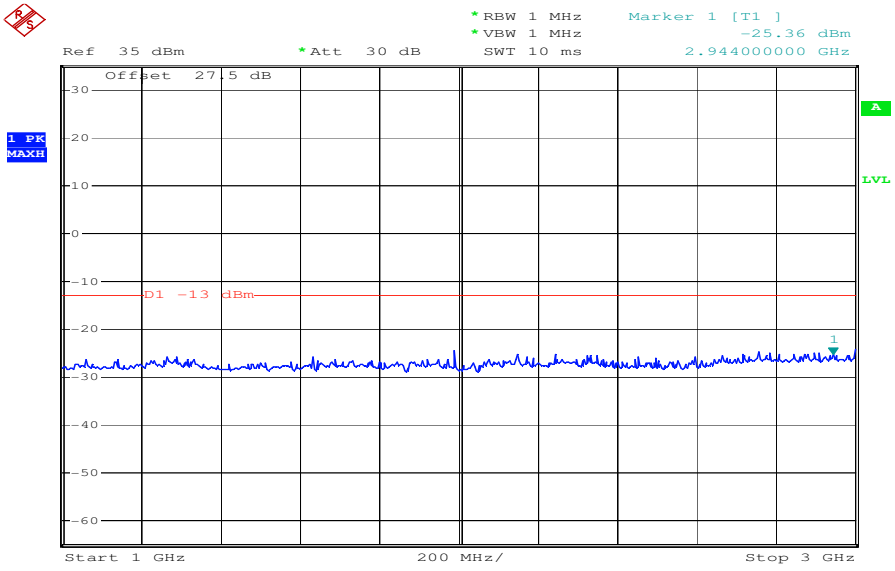
Date: 19.FEB.2008 15:06:54

Channel 251



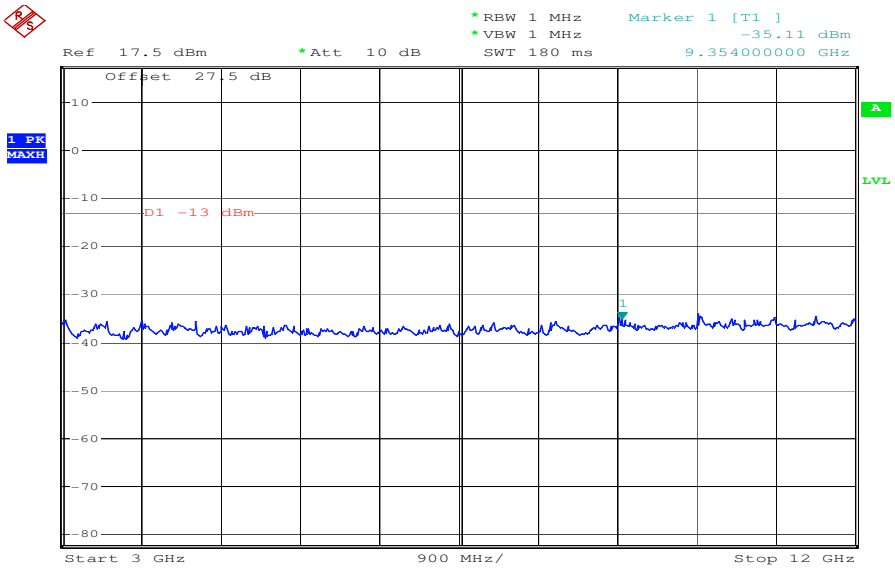
Date: 19.FEB.2008 15:00:59

Channel 251



Date: 19.FEB.2008 15:05:03

Channel 251



Date: 19.FEB.2008 15:07:22

5.2.6 Block Edge Compliance

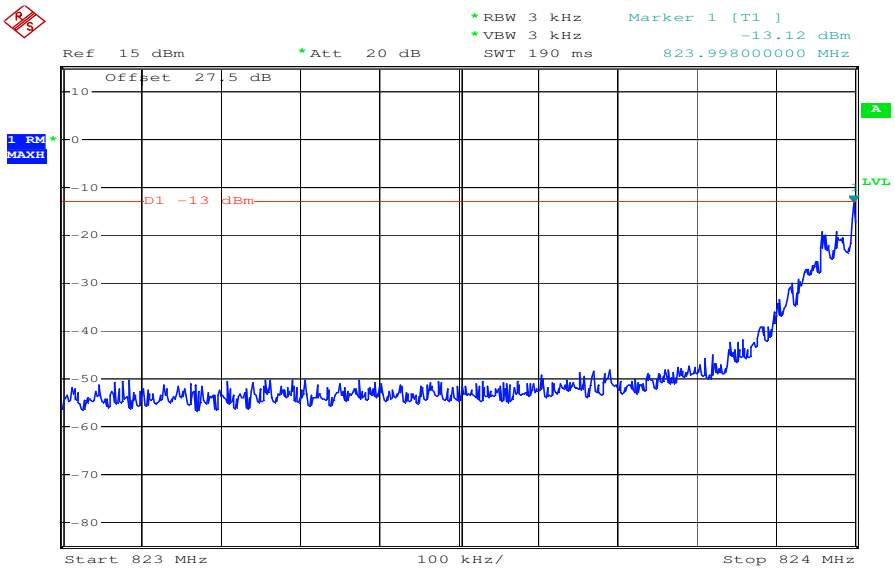
Reference

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

Measurement Limit:

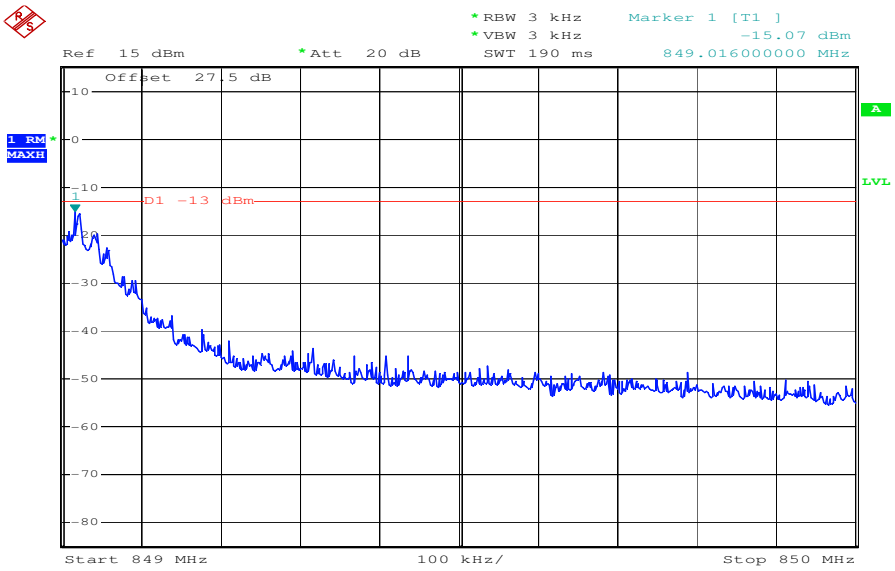
Sec. 22.917(b) Emission Limits.
(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +33 dBm to 0 dBm, this becomes a constant specification limit of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

Channel 128 GMSK mode



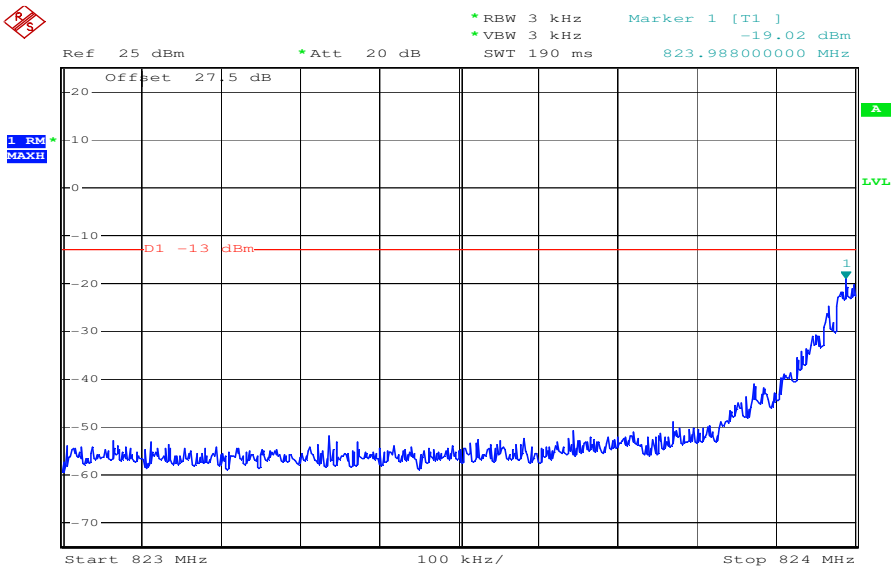
Date: 19.FEB.2008 15:21:11

Channel 251 GMSK mode



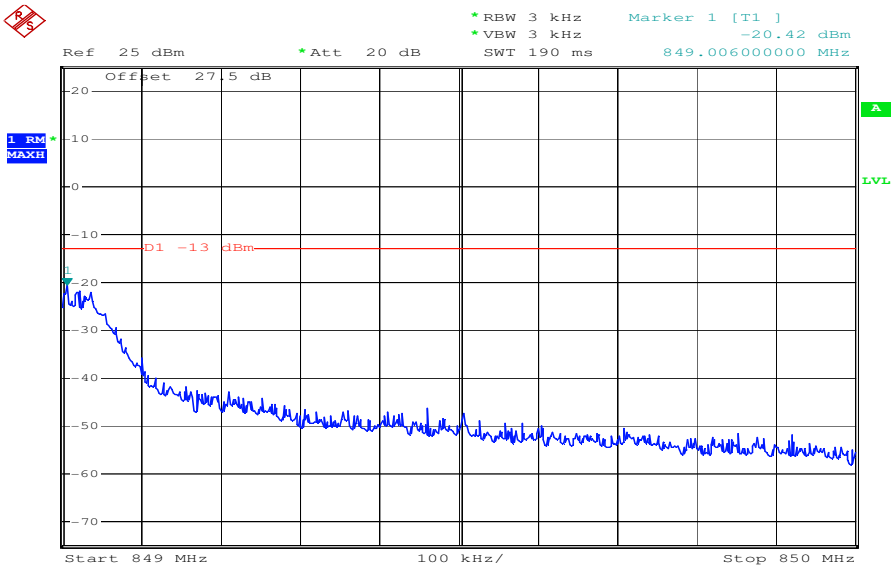
Date: 19.FEB.2008 15:17:10

Channel 128 8-PSK mode



Date: 20.FEB.2008 11:18:02

Channel 251 8-PSK mode



Date: 20.FEB.2008 11:17:20

5.2.7 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.

GMSK mode

Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
824.2 MHz	278.0	310.0
836.4 MHz	274.0	316.0
848.8 MHz	266.0	316.0

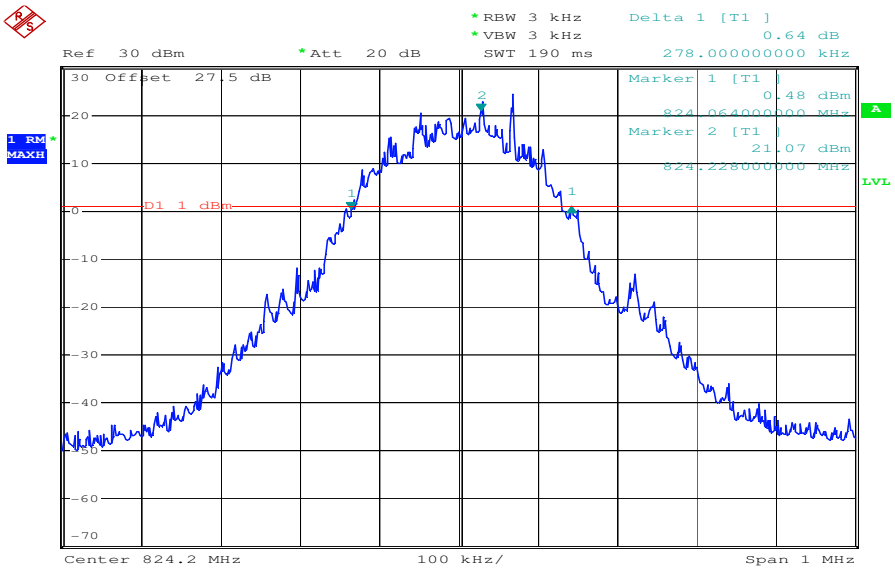
8-PSK mode

Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
824.2 MHz	274.0	318.0
836.4 MHz	284.0	316.0
848.8 MHz	286.0	314.0

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 GMSK mode

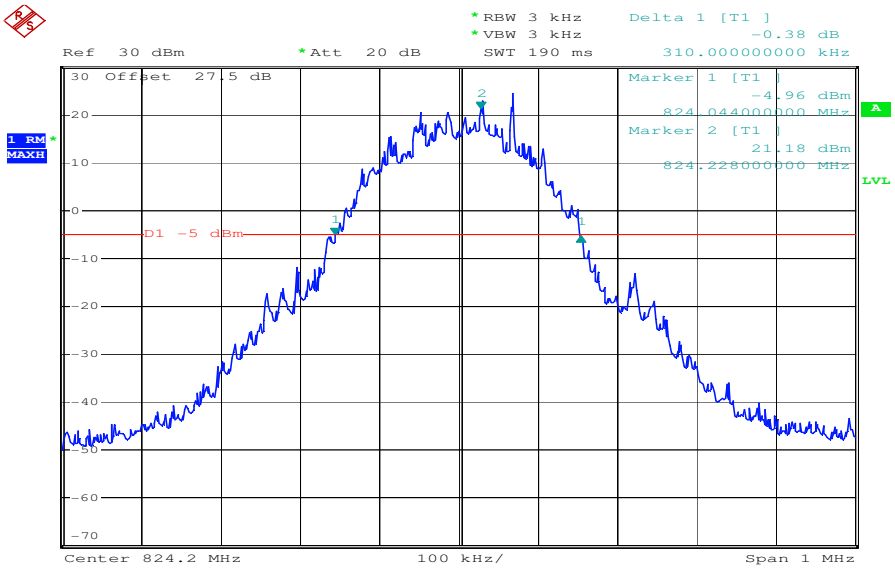
99% (-20 dB) Occupied Bandwidth



Date: 19.FEB.2008 15:36:48

Channel 128 GMSK mode

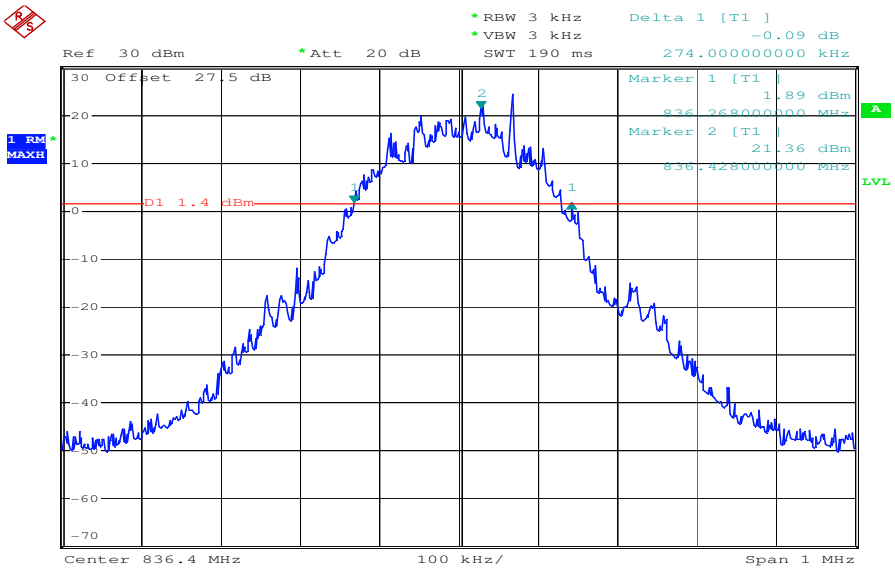
-26 dBc Bandwidth



Date: 19.FEB.2008 15:37:16

Channel 189 GMSK mode

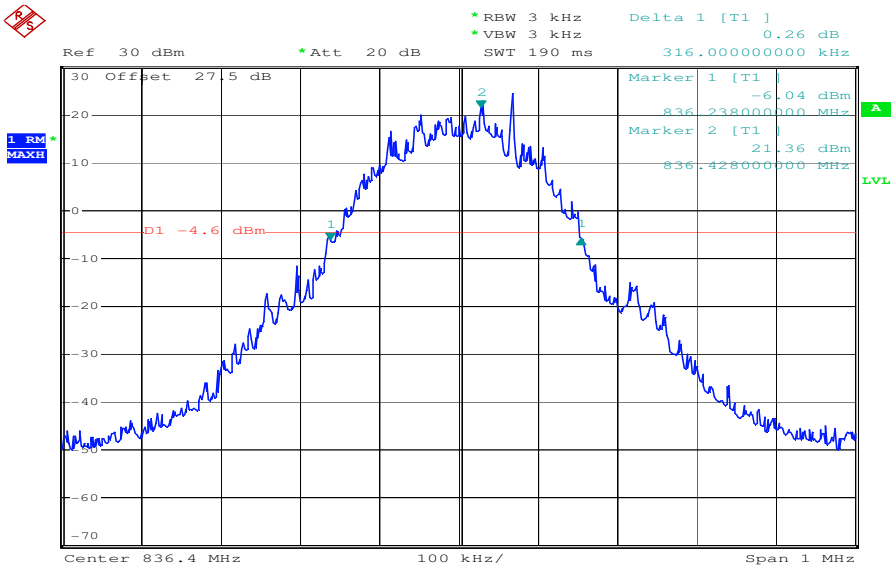
99% (-20 dB) Occupied Bandwidth



Date: 19.FEB.2008 15:39:37

Channel 189 GMSK mode

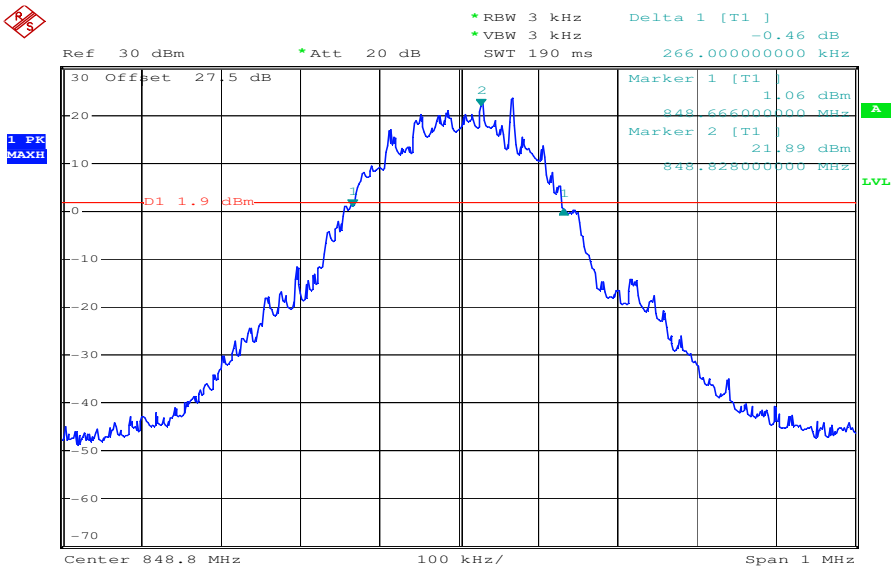
-26 dBc Bandwidth



Date: 19.FEB.2008 15:40:32

Channel 251 GMSK mode

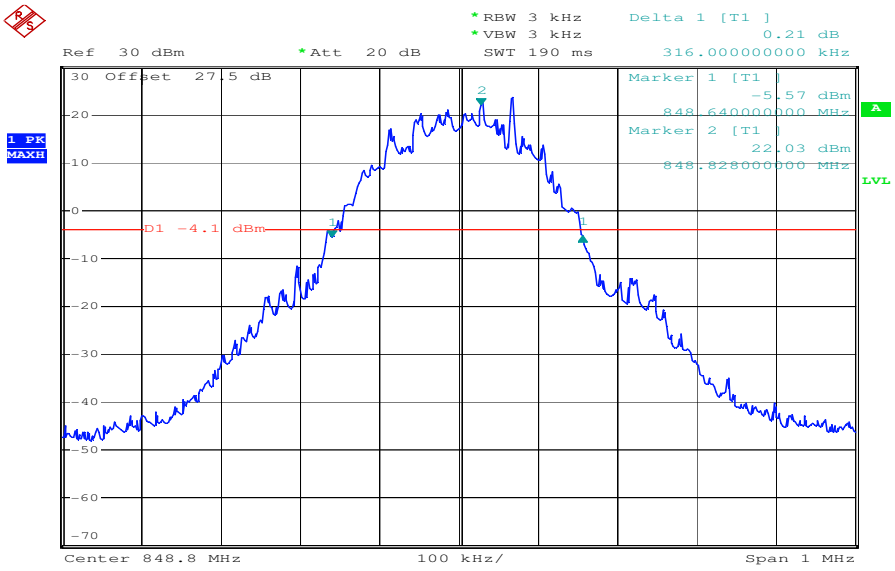
99% (-20 dB) Occupied Bandwidth



Date: 20.FEB.2008 10:44:47

Channel 251 GMSK mode

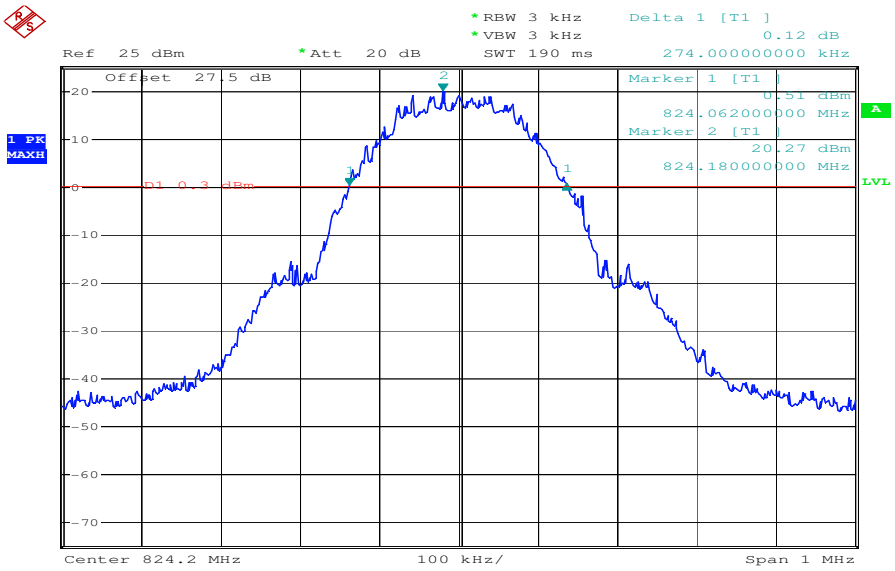
-26 dBc Bandwidth



Date: 20.FEB.2008 10:46:07

Channel 128 8-PSK mode

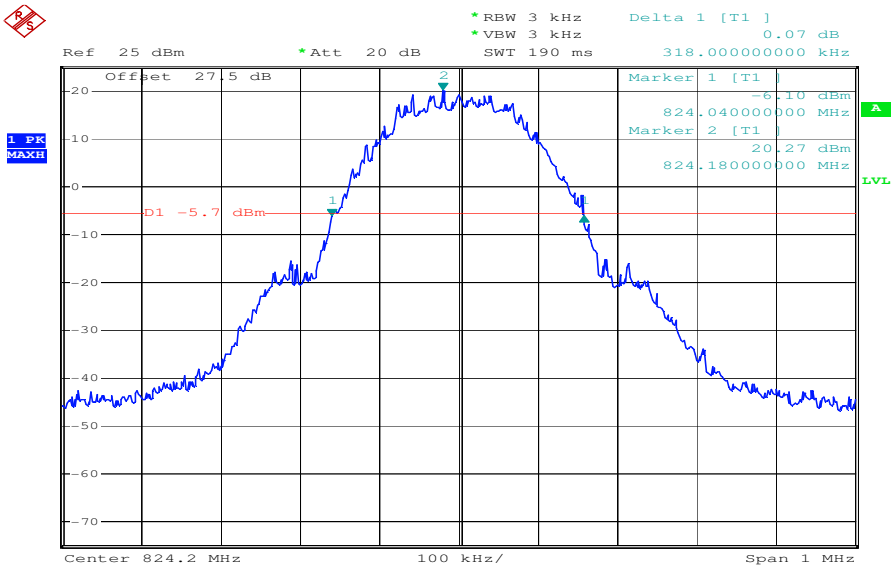
99% (-20 dB) Occupied Bandwidth



Date: 20.FEB.2008 11:02:09

Channel 128 8-PSK mode

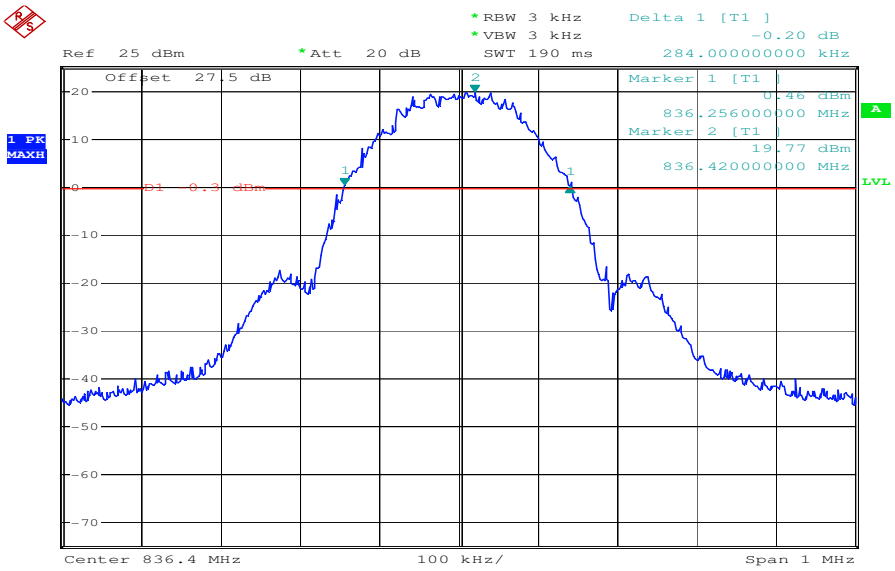
-26 dBc Bandwidth



Date: 20.FEB.2008 11:02:38

Channel 189 8-PSK mode

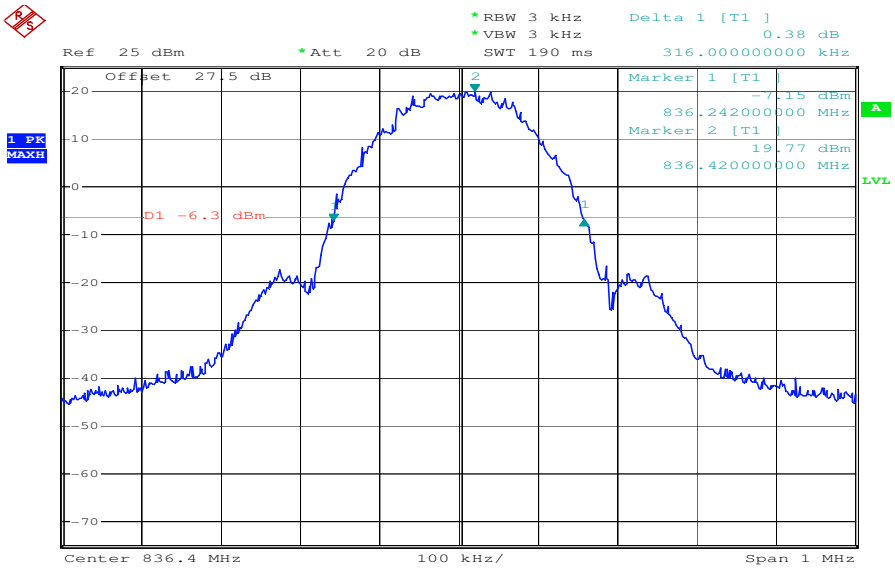
99% (-20 dB) Occupied Bandwidth



Date: 20.FEB.2008 11:07:26

Channel 189 8-PSK mode

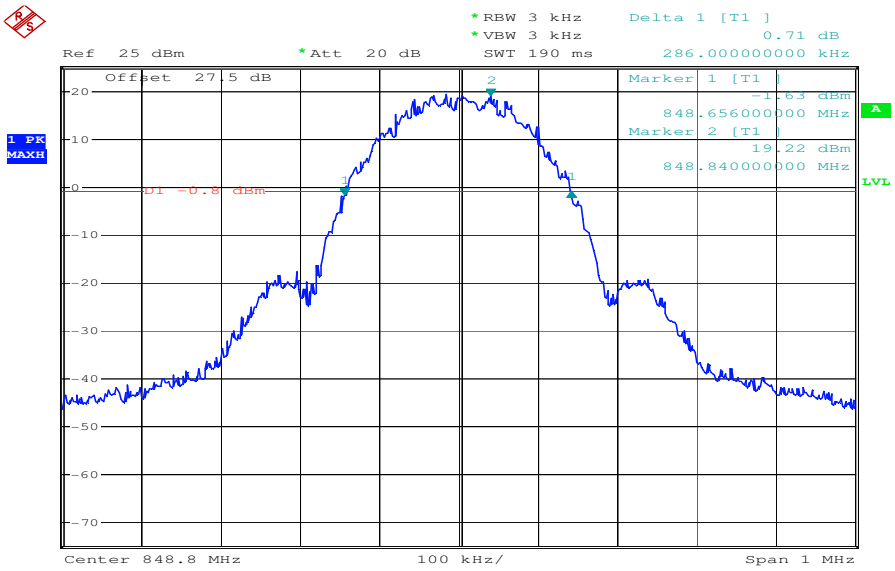
-26 dBc Bandwidth



Date: 20.FEB.2008 11:07:56

Channel 251 8-PSK mode

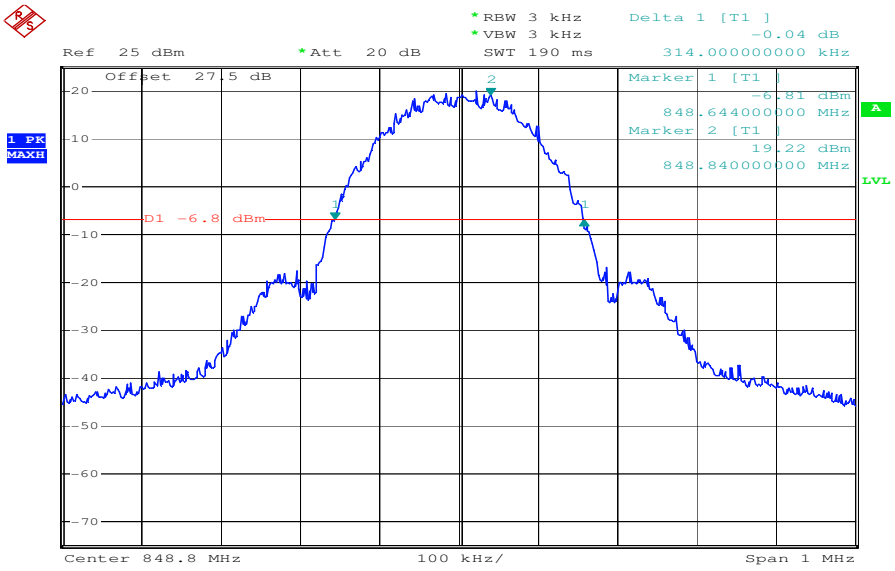
99% (-20 dB) Occupied Bandwidth



Date: 20.FEB.2008 11:13:14

Channel 251 8-PSK mode

-26 dBc Bandwidth



Date: 20.FEB.2008 11:13:46

5.3 PART UMTS Band 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).

Settings for maximum output power were used.

Limits:

Nominal Peak Output Power (dBm)
+33

Test Results: Output Power (conducted) UMTS Mode

Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (dBm)
1852.4	26.6	23.6
1880.0	26.6	23.5
1907.6	26.4	23.5
Measurement uncertainty	±0.5 dB	

Test Results: Output Power (conducted) HSDPA Mode

Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (dBm)
1852.4	26.4	23.4
1880.0	26.6	23.5
1907.6	26.3	23.3
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

(Set-up No.: 01)

Test Results: Output Power (radiated) UMTS Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	25.8
1880.0	25.7
1907.6	25.9
Measurement uncertainty	±1.5 dB

Test Results: Output Power (radiated) HSDPA Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	25.7
1880.0	25.7
1907.6	25.8
Measurement uncertainty	±1.5 dB

Sample Calculation:

Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1907.6	128.0	20.8	8.4	0.0	3.3	25.9			

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

(Set-up No.: 02)

Test Results: Output Power (radiated) UMTS Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	25.6
1880.0	25.8
1907.6	25.8
Measurement uncertainty	±1.5 dB

Test Results: Output Power (radiated) HSDPA Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	25.5
1880.0	25.8
1907.6	25.6
Measurement uncertainty	±1.5 dB

Sample Calculation:

Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1880.0	128.5	20.7	8.4	0.0	3.3	25.8			

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

(Set-up No.: 03)

Test Results: Output Power (radiated) UMTS Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	25.6
1880.0	25.9
1907.6	25.7
Measurement uncertainty	±1.5 dB

Test Results: Output Power (radiated) HSDPA Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	25.6
1880.0	25.8
1907.6	25.7
Measurement uncertainty	±1.5 dB

Sample Calculation:

Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1880.0	127.5	20.8	8.4	0.0	3.3	25.9			

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

5.3.2 Frequency Stability

Reference

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

Method of Measurement:

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

Measurement Limit:

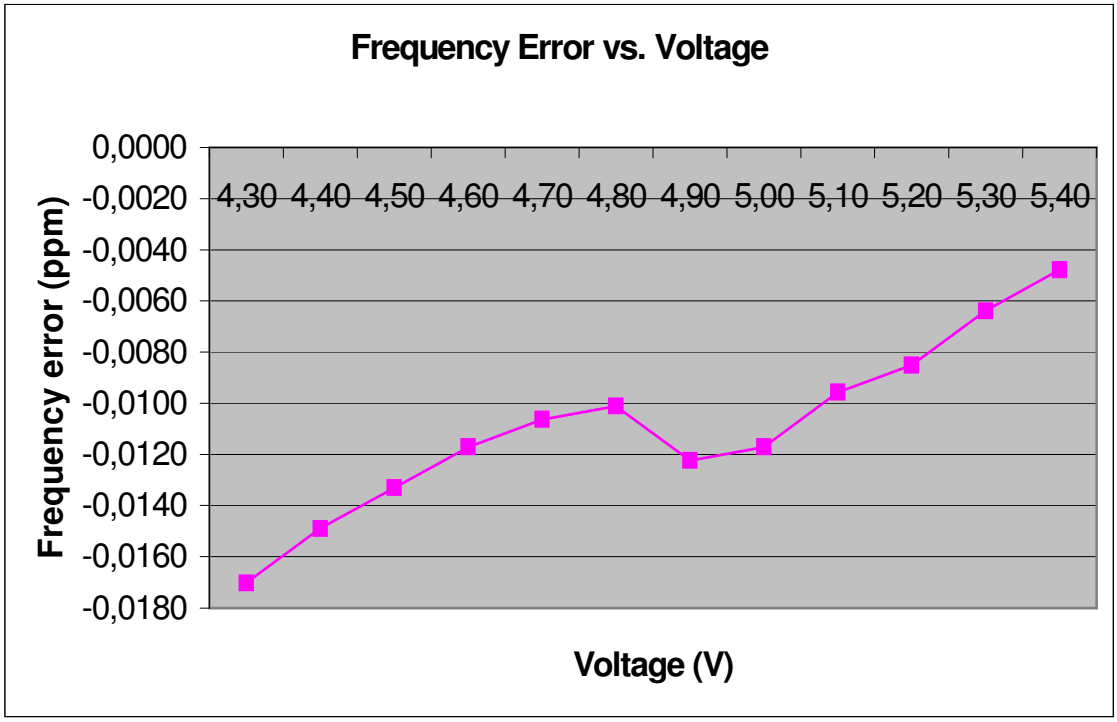
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission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

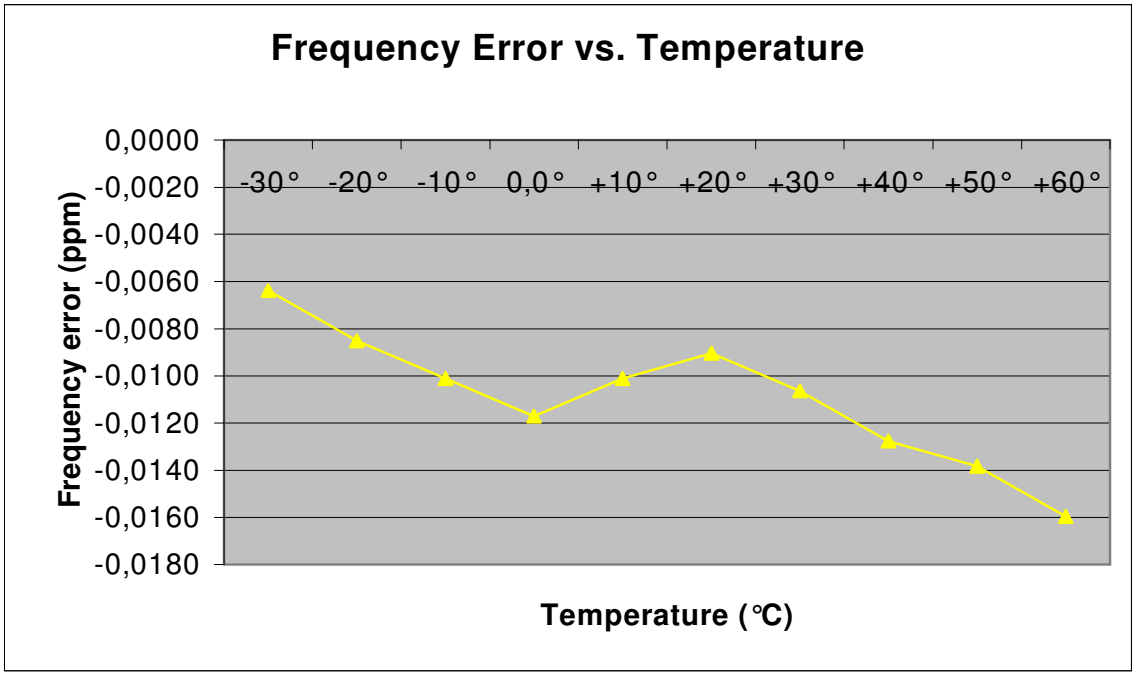
Test Results: AFC FREQ ERROR vs. VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
4.3	-30	-0,00000160	-0,0160
4.4	-32	-0,00000170	-0,0170
4.5	-28	-0,00000149	-0,0149
4.6	-25	-0,00000133	-0,0133
4.7	-22	-0,00000117	-0,0117
4.8	-20	-0,00000106	-0,0106
4.9	-19	-0,00000101	-0,0101
5.0	-23	-0,00000122	-0,0122
5.1	-22	-0,00000117	-0,0117
5.2	-18	-0,00000096	-0,0096
5.3	-16	-0,00000085	-0,0085
5.4	-12	-0,00000064	-0,0064

Test Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-12	-0,00000064	-0,0064
-20	-16	-0,00000085	-0,0085
-10	-19	-0,00000101	-0,0101
±0.0	-22	-0,00000117	-0,0117
+10	-19	-0,00000101	-0,0101
+20	-17	-0,00000090	-0,0090
+30	-20	-0,00000106	-0,0106
+40	-24	-0,00000128	-0,0128
+50	-26	-0,00000138	-0,0138
+60	-30	-0,00000160	-0,0160


Frequency Error vs. Voltage
0,0000
-0,0020
-0,0040
-0,0060
-0,0080
-0,0100
-0,0120
-0,0140
-0,0160
-0,0180
Frequency error (ppm)
4,30 4,40 4,50 4,60 4,70 4,80 4,90 5,00 5,10 5,20 5,30 5,40
Voltage (V)


Frequency Error vs. Temperature
0,0000
-0,0020
-0,0040
-0,0060
-0,0080
-0,0100
-0,0120
-0,0140
-0,0160
-0,0180
Frequency error (ppm)
-30° -20° -10° 0,0° +10° +20° +30° +40° +50° +60°
Temperature (°C)

5.3.3 Radiated Emissions

Reference

FCC:	CFR Part 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 UMTS band (1852.4 MHz, 1880.0 MHz and 1907.6 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 UMTS 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	No critical peaks	3760	No critical peaks	3815.2	No critical peaks
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	

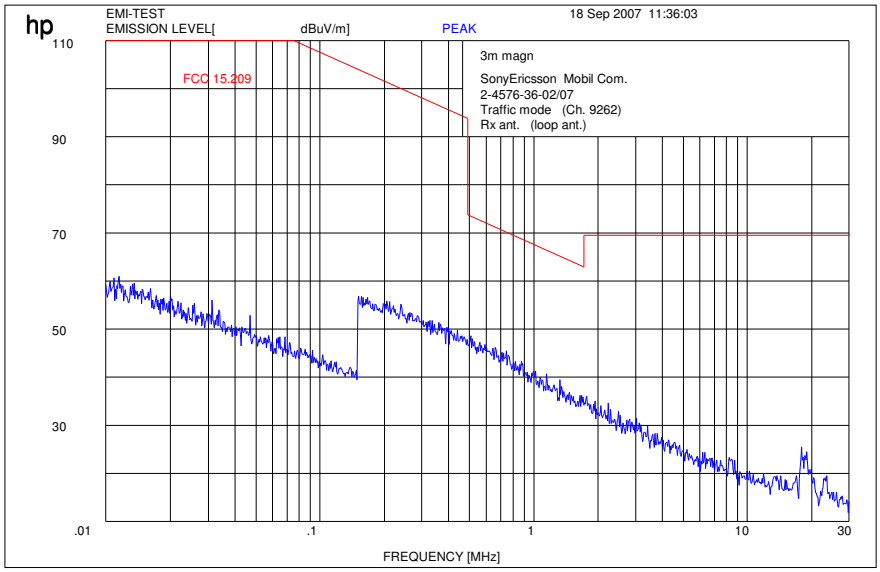
No peaks found < 20 dB below limit.

Sample calculation:

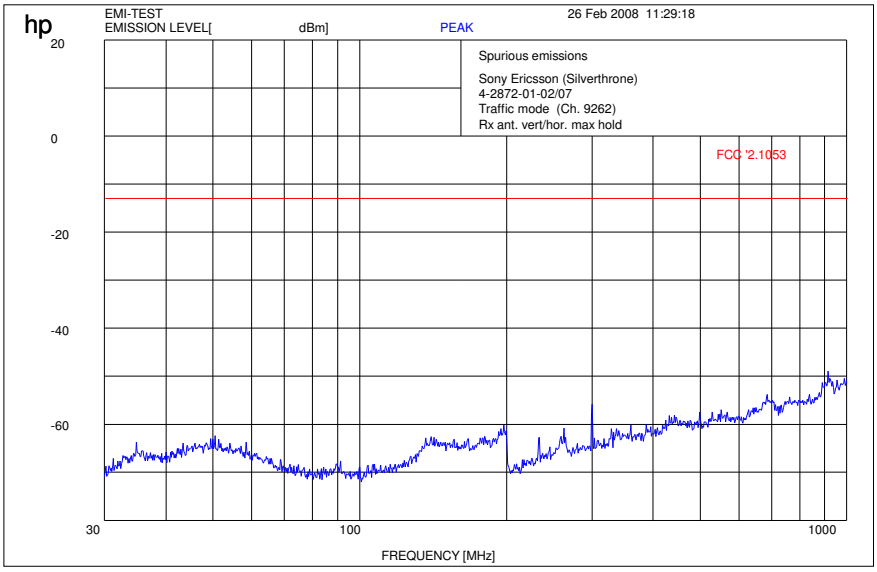
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1880.0	127.5	20.8	8.4	0.0	3.3	25.9			

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

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

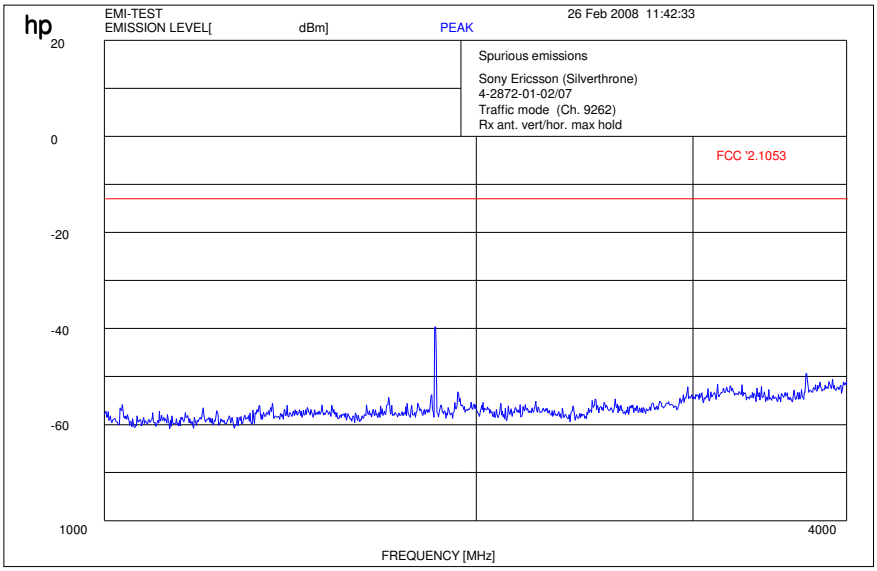


Channel 9262 (30 MHz - 1 GHz)



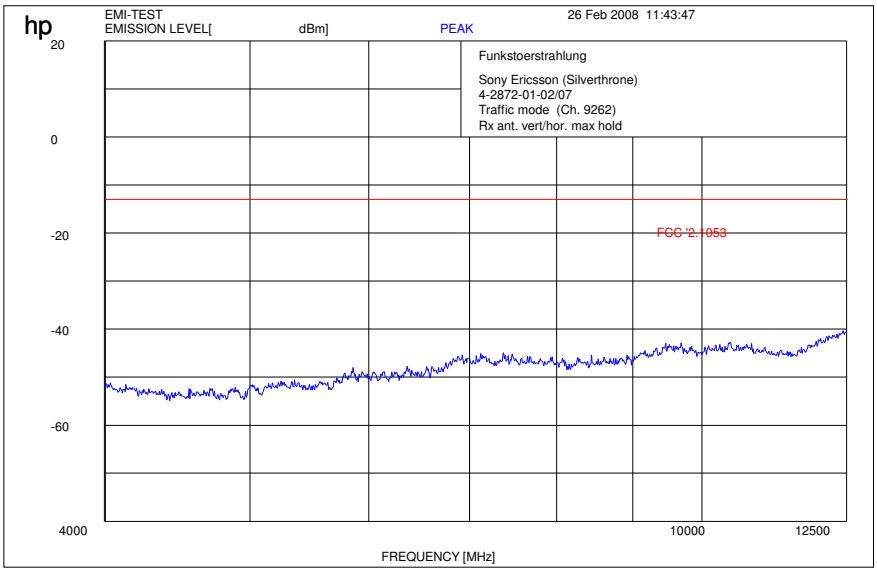
f < 1 GHz : RBW/VBW: 100 kHz

Channel 9262 (1 GHz – 4.0 GHz)



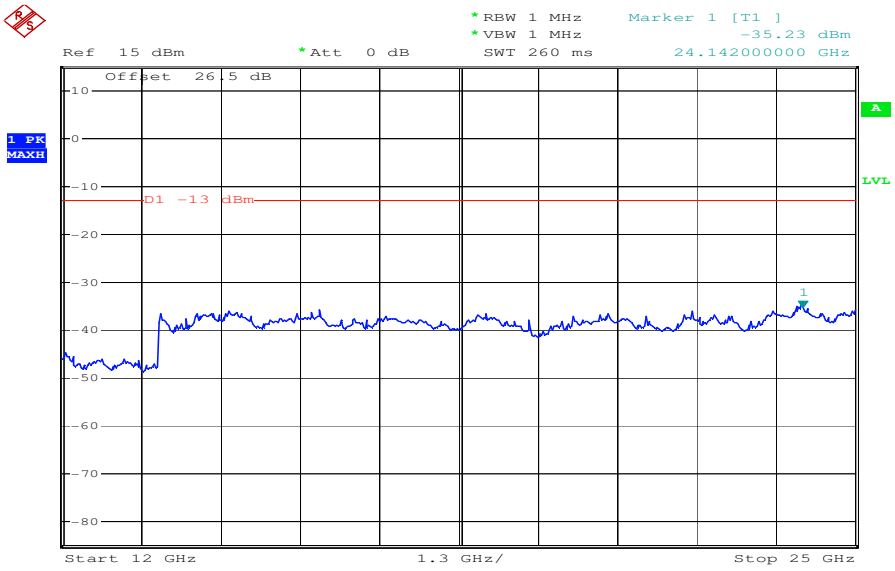
RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 9262 (4 GHz – 12.5 GHz)



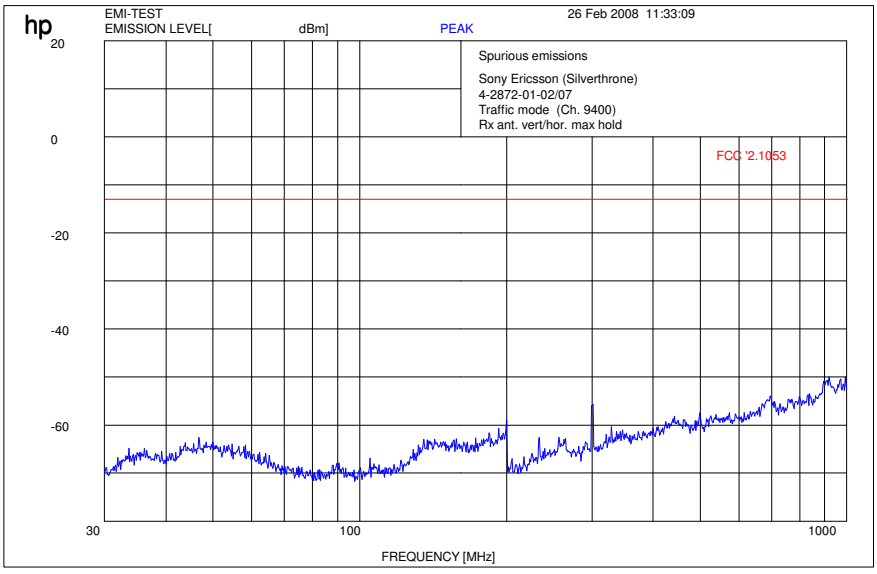
RBW / VBW 1 MHz

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



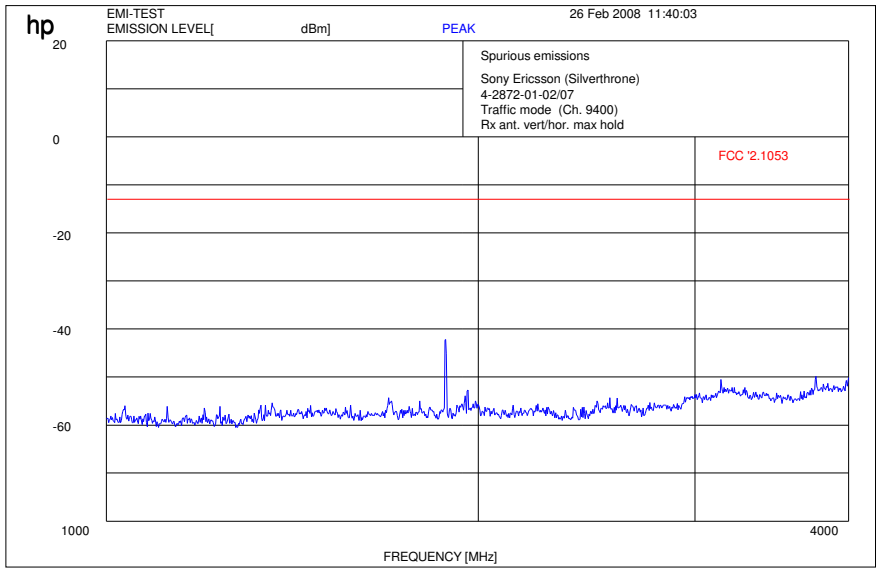
Date: 28.FEB.2008 09:53:24

Channel 9400 (30 MHz - 1 GHz)



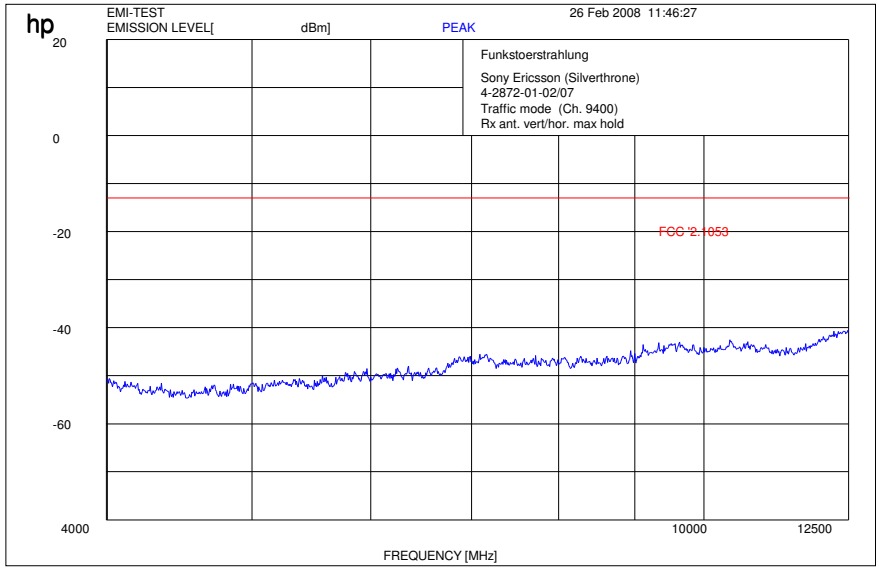
f < 1 GHz : RBW/VBW: 100 kHz

Channel 9400 (1 GHz – 4.0 GHz)



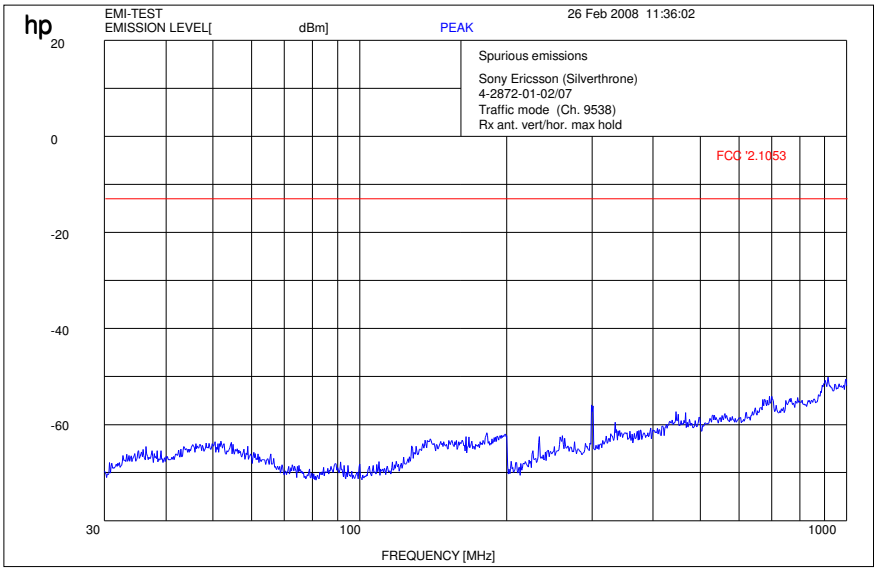
f > 1 GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 9400 (4 GHz – 12.5 GHz)



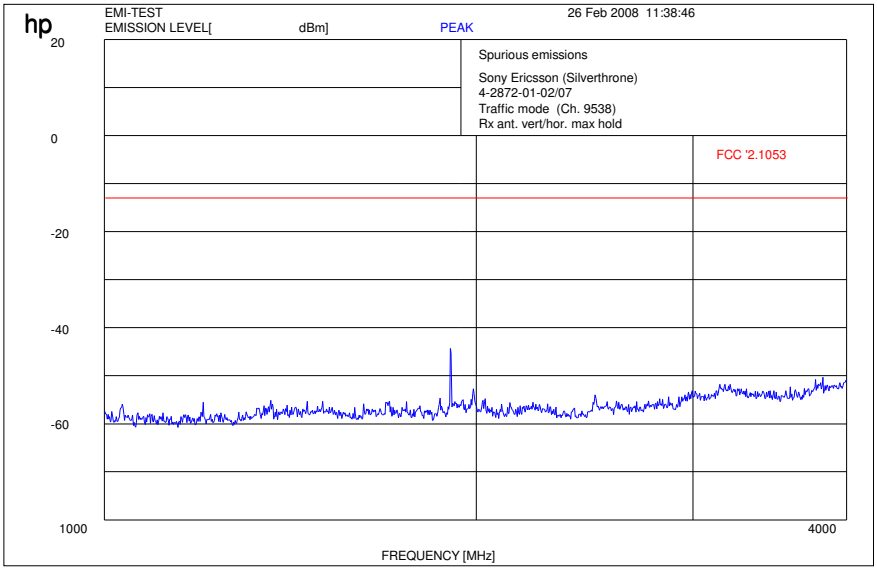
RBW / VBW 1 MHz

Channel 9538 (30 MHz - 1 GHz)



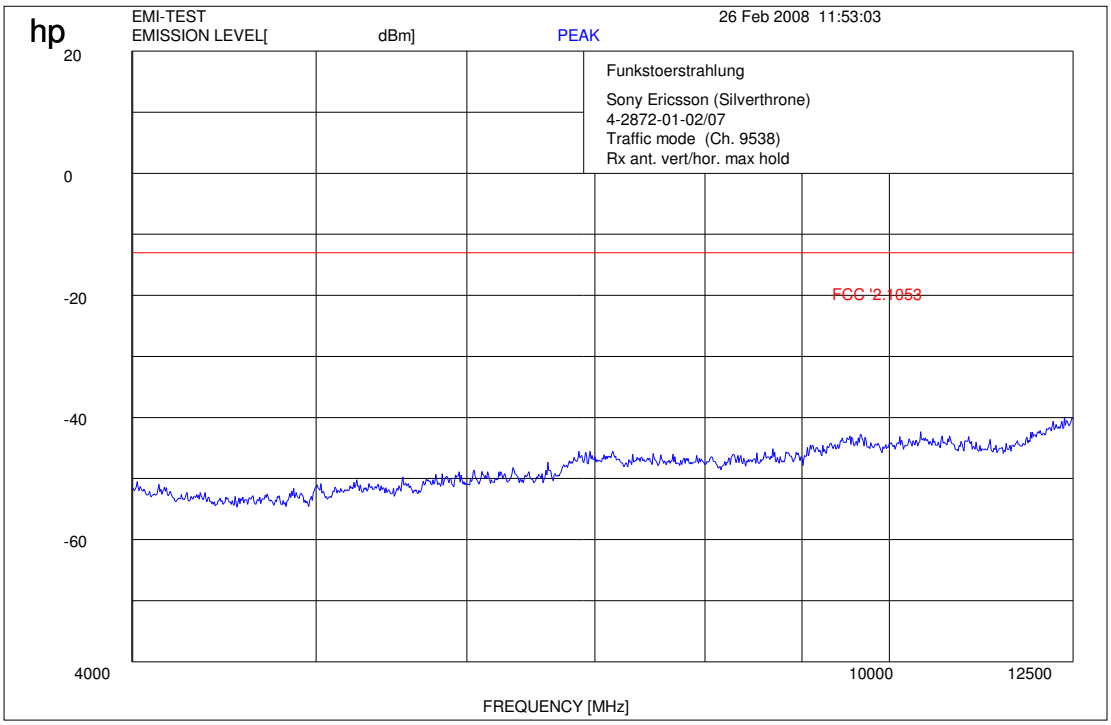
f < 1 GHz : RBW/VBW: 100 kHz

Channel 9538 (1.0 MHz – 4.0 GHz)



f > 1 GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 9538 (4 GHz – 12.5 GHz)



RBW / VBW 1 MHz

5.3.4 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)
No critical peaks found			-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

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

For measurement distance see table below

Limits: § 15.109

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

Idle Mode (30 MHz - 1 GHz)

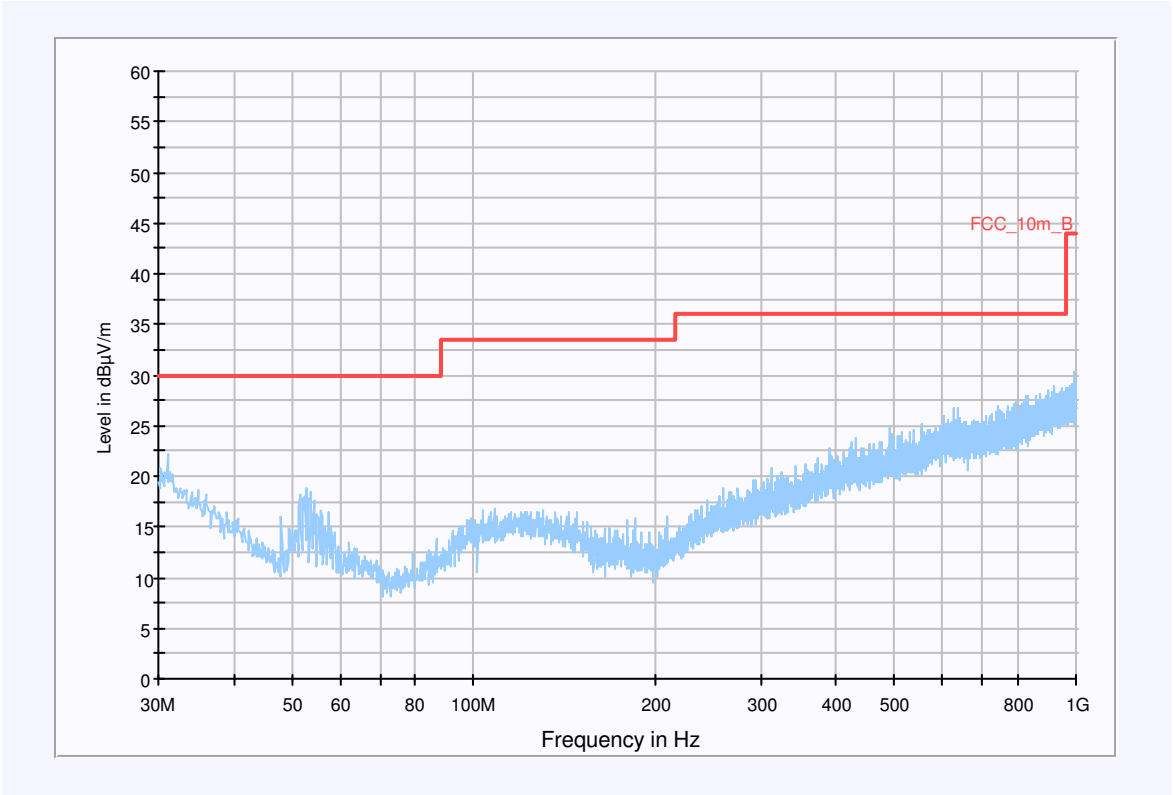
EUT:	FAD-3232021-BV with MD300
Serial Number:	Silverthrone (FAD-3232021-BV)
Test Description:	FCC class B @ 10m
Operating Conditions:	IDLE
Operator Name:	WAL
Comment:	connect to Laptop

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_10m_Fast_1GHz (B)

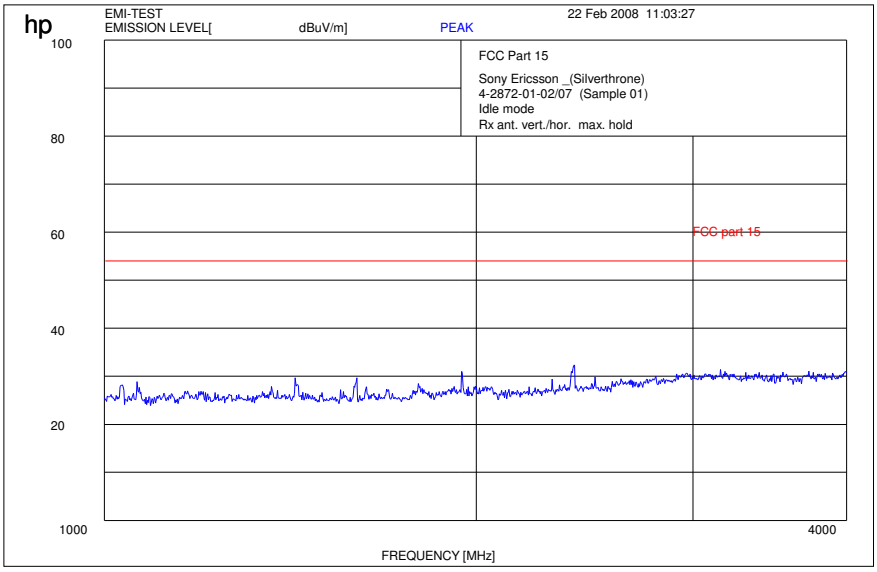


Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

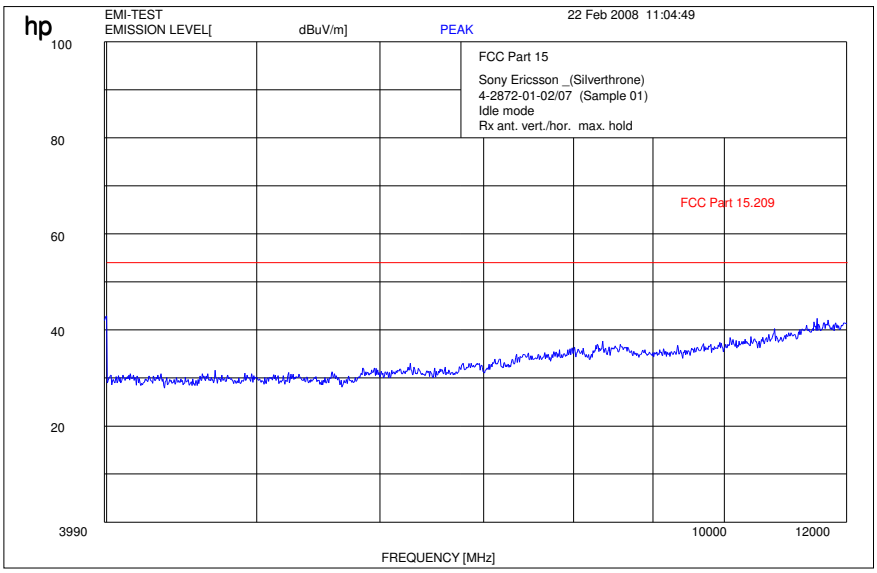
Frequency Range:	30MHz - 2GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch FW 1.0
Antenna:	Chase Broadband BiLog Antenna CBL 6112 SN 2110, FW A, CAL 07.01.2009 Correction Table (vertical): Chase Broadband BiLog Antenna CBL 6112 Correction Table (horizontal): Chase Broadband BiLog Antenna CBL 6112 Correction Table: Cabel with switch (1007)
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)



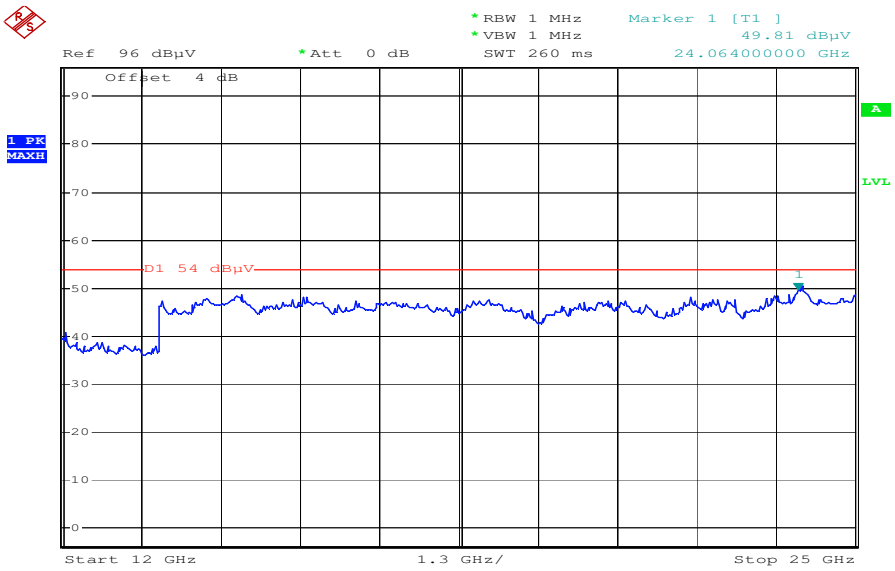
f ≥ 1GHz : RBW / VBW 1 MHz

Idle Mode (4 GHz – 12.0 GHz)



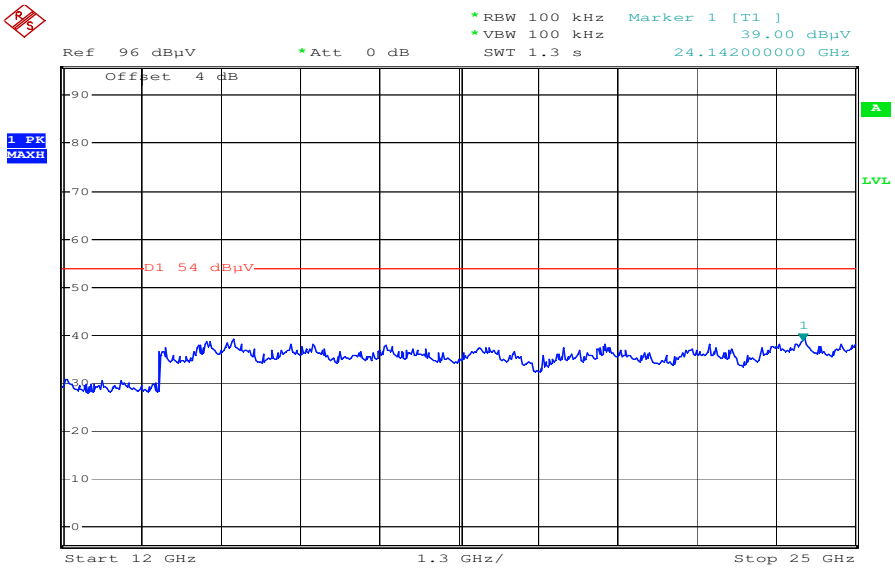
f ≥ 1GHz : RBW / VBW 1 MHz

Idle-Mode (12 GHz - 25 GHz)



Date: 25.FEB.2008 10:39:30

Idle-Mode (12 GHz - 25 GHz)



Date: 25.FEB.2008 10:39:57

5.3.5 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.

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

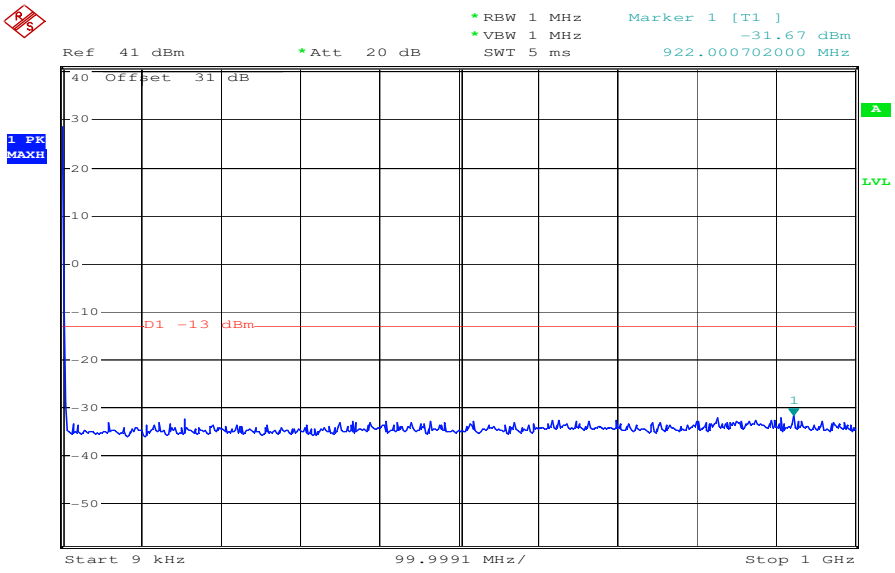
Measurement Limit:

(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:

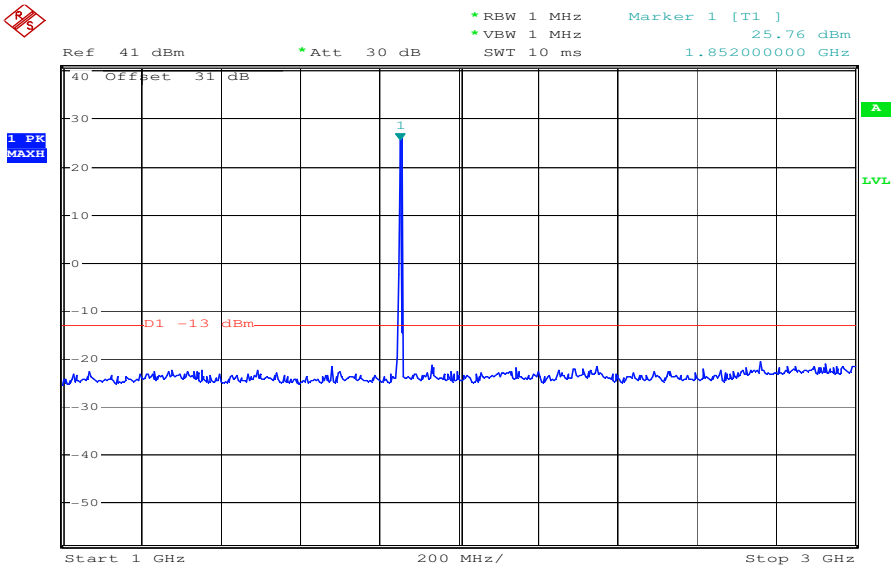
Harmonic	Tx ch.- 9262 Freq. (MHz)	Level (dBm)	Tx ch.-9400 Freq. (MHz)	Level (dBm)	Tx ch.-9538 Freq. (MHz)	Level (dBm)
2	3704.8	-	3760	-	3815.2	-
3	5557.2	-	5640	-	5722.8	-
4	7409.6	-	7520	-	7630.4	-
5	9262.0	-	9400	-	9538.0	-
6	11114.4	-	11280	-	11445.6	-
7	12966.8	-	13160	-	13353.2	-
8	14819.2	-	15040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

Channel 9262: (30 MHz – 1 GHz)



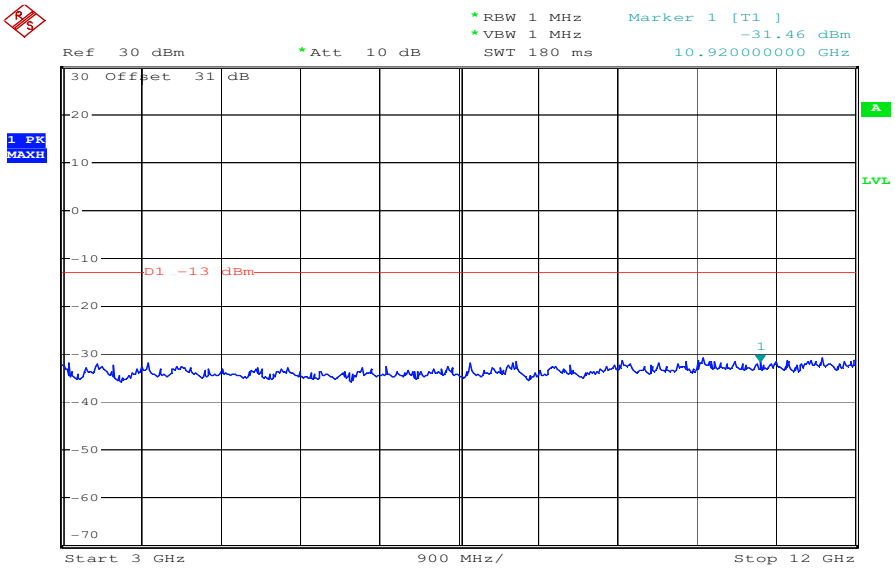
Date: 28.FEB.2008 08:18:36

Channel 9262: (1 GHz – 3 GHz)



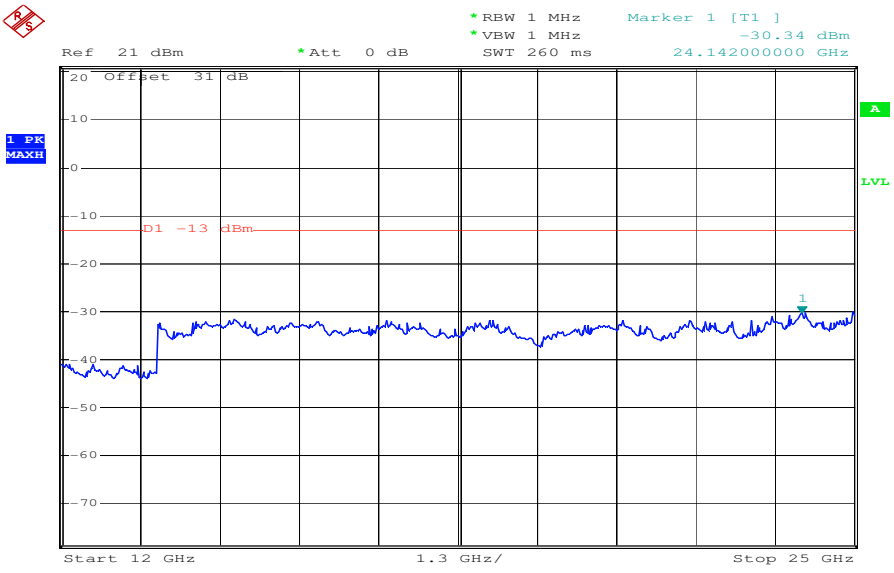
Date: 28.FEB.2008 08:17:58

Channel 9262: (3 GHz – 12 GHz)



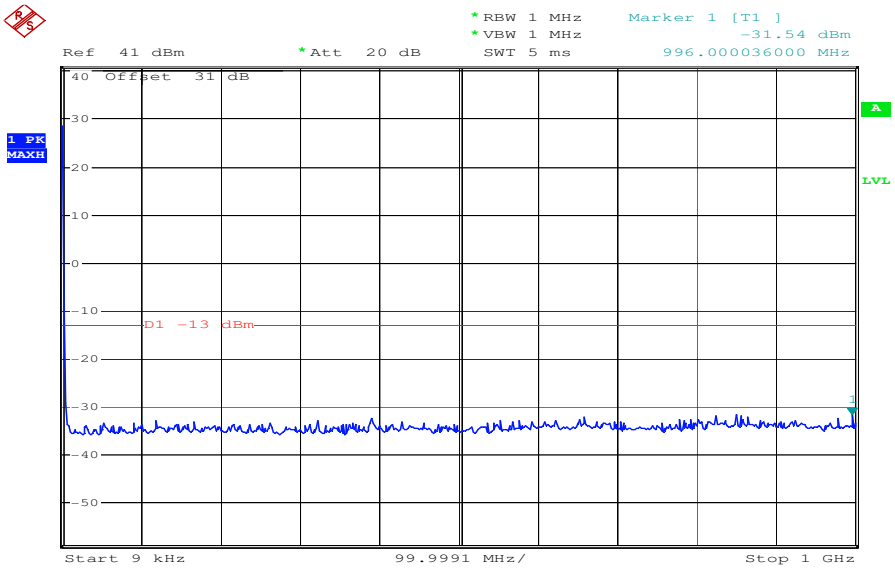
Date: 28.FEB.2008 08:20:44

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



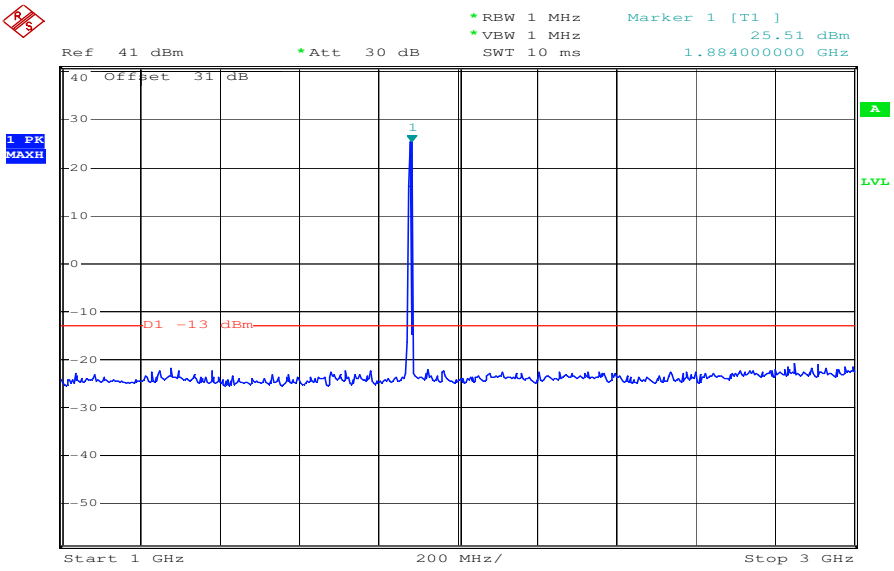
Date: 28.FEB.2008 08:23:27

Channel 9400: (30 MHz – 1 GHz)



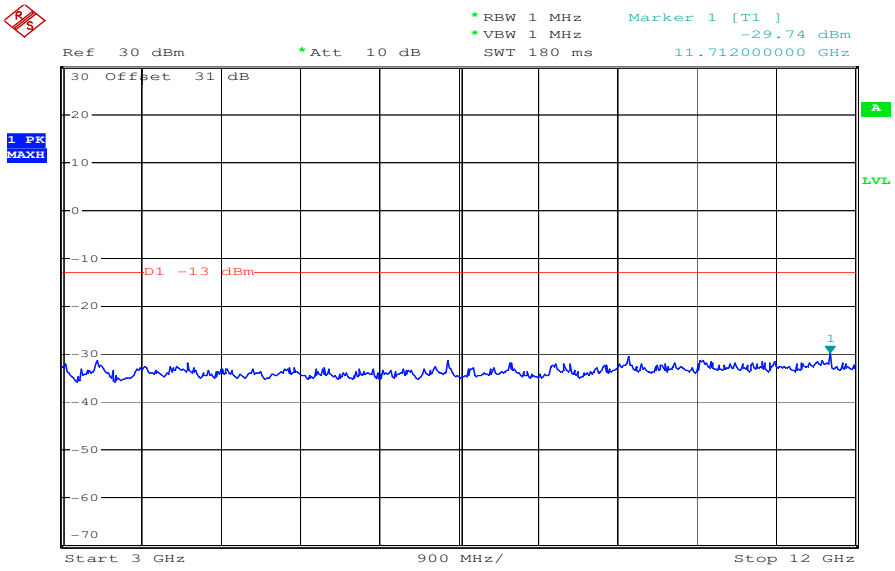
Date: 28.FEB.2008 08:19:01

Channel 9400: (1 GHz – 3 GHz)



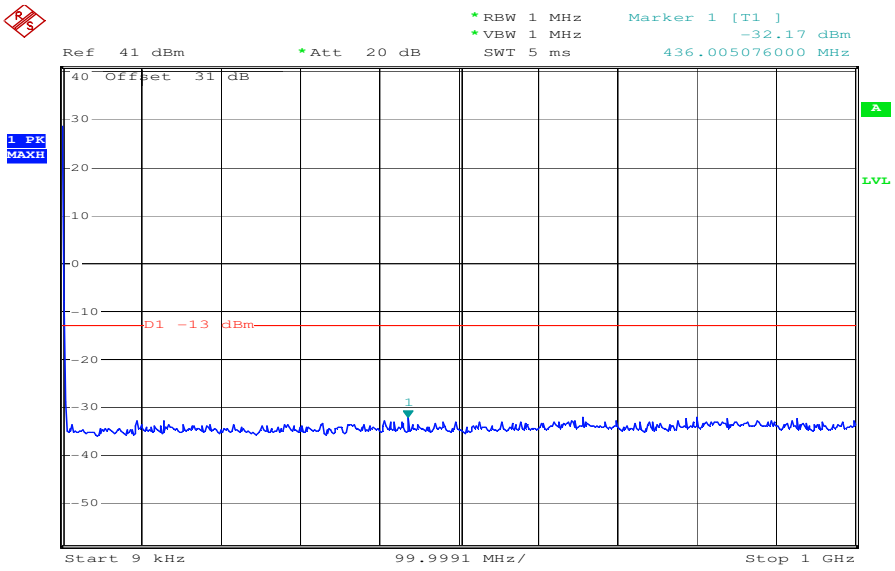
Date: 28.FEB.2008 08:16:19

Channel 9262: (3 GHz – 12 GHz)



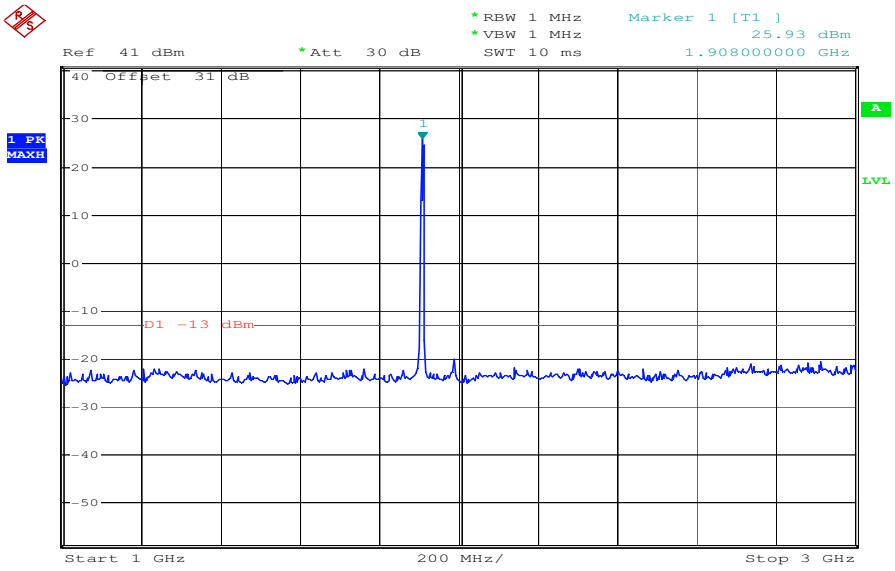
Date: 28.FEB.2008 08:21:13

Channel 9538: (30 MHz – 1 GHz)



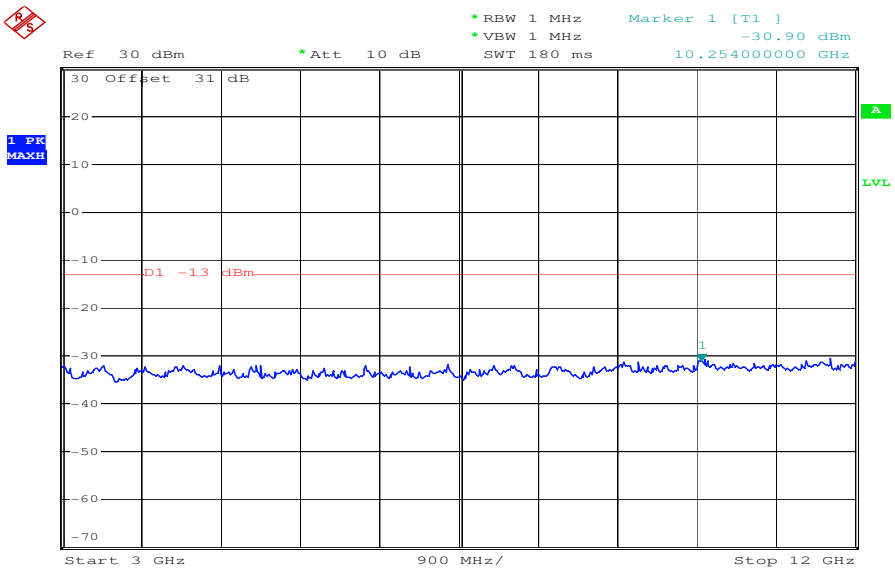
Date: 28.FEB.2008 08:19:32

Channel 9538: (1 GHz – 3 GHz)



Date: 28.FEB.2008 08:17:18

Channel 9538: (3 GHz – 12 GHz)



Date: 28.FEB.2008 08:22:36

5.3.6 Block Edge Compliance

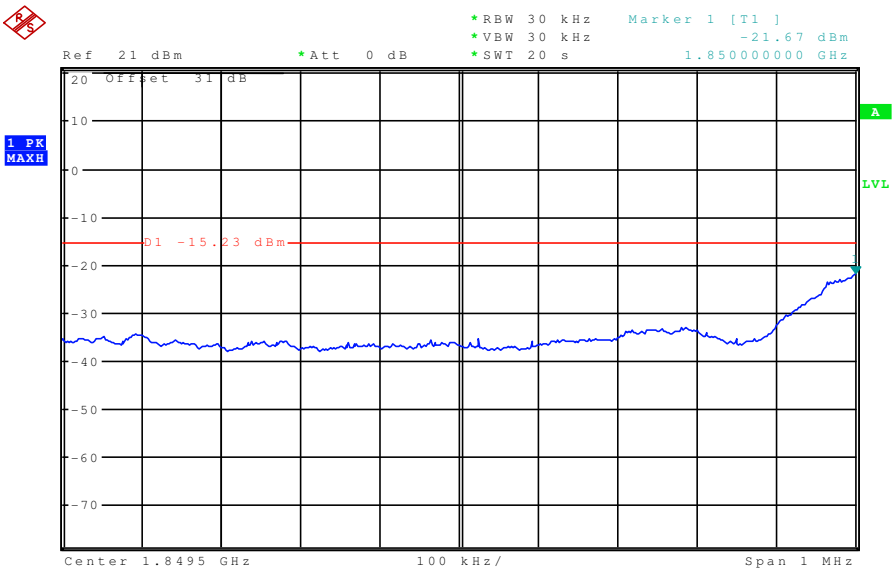
Reference

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

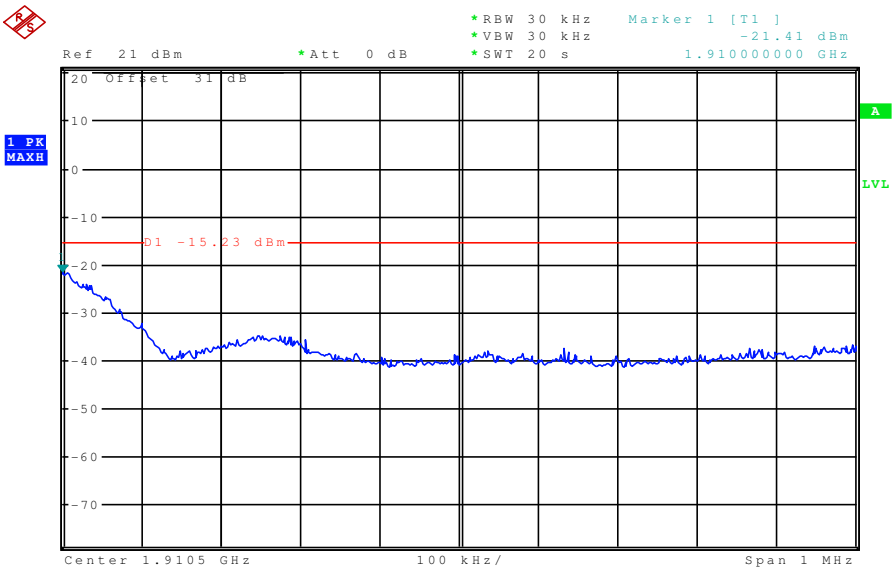
Measurement Limit:

(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.

Channel 9262



Channel 9538



5.3.7 Occupied Bandwidth

Reference

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

Occupied Bandwidth Results

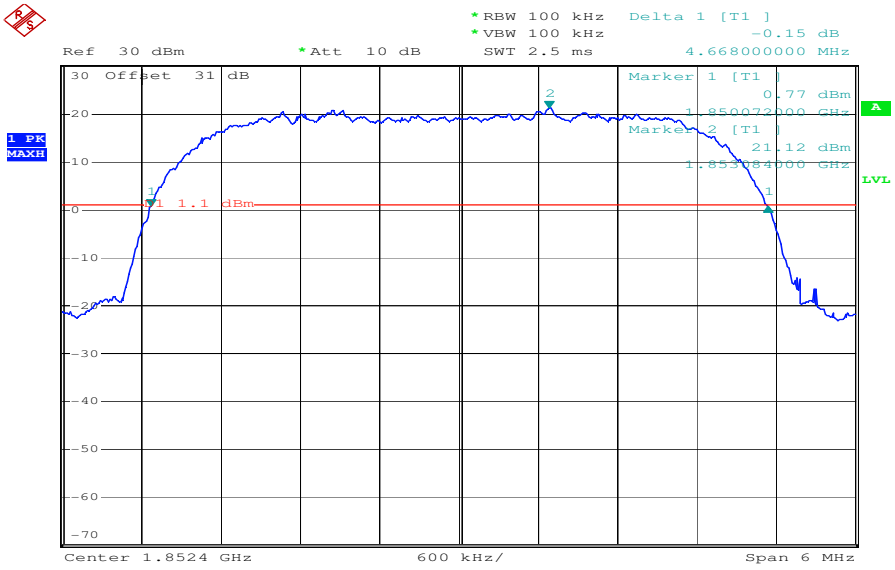
Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table 8.2 below lists the measured 99% power and -26dBC occupied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

Normal mode

Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1852.4 MHz	4668	4836
1880.0 MHz	4680	4848
1907.6 MHz	4668	4848

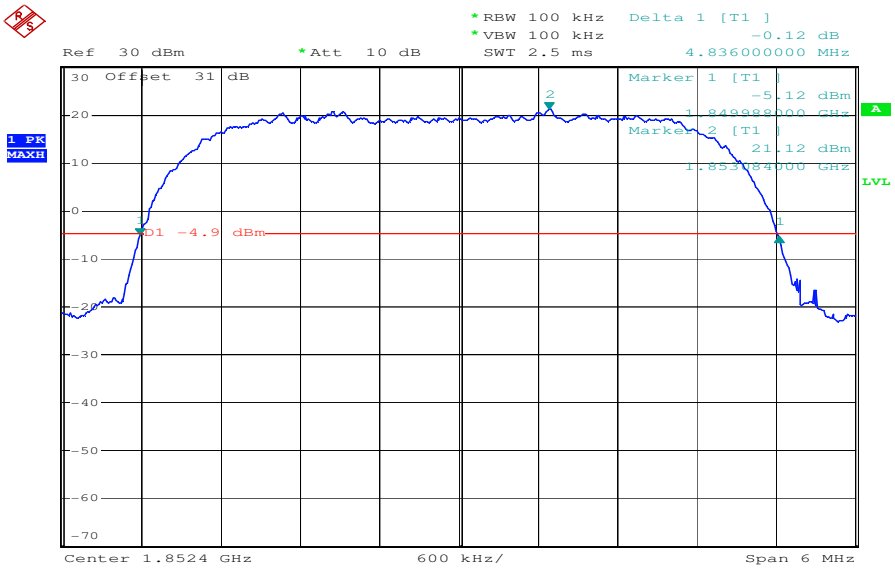
Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 300.0 kHz, this equates to a resolution bandwidth of at least 3.0 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

Channel 9262
99% (-20 dB) Occupied Bandwidth



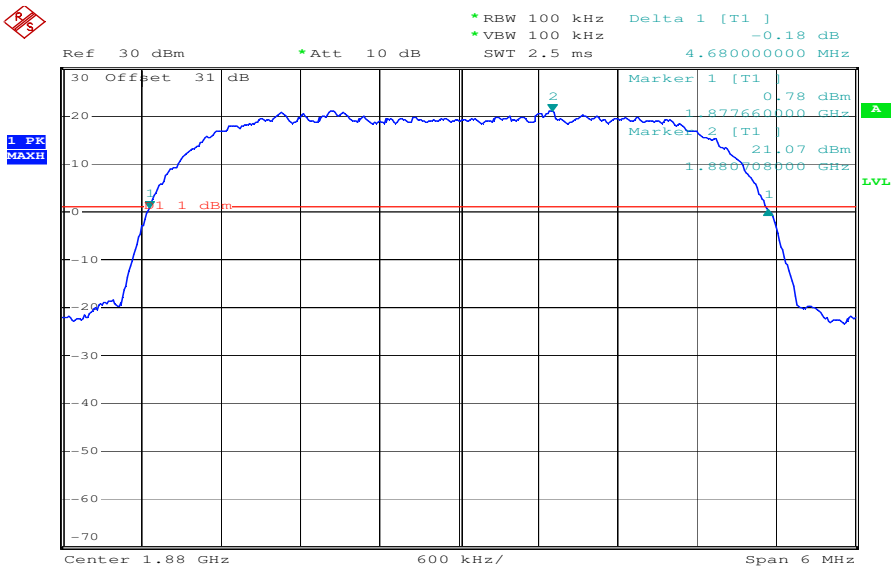
Date: 28.FEB.2008 09:13:10

Channel 9262
-26 dBc Bandwidth



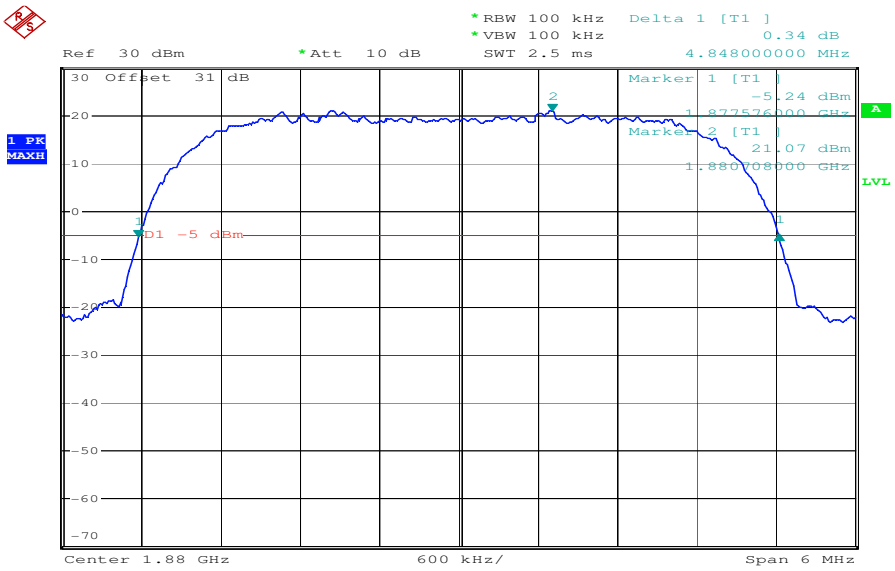
Date: 28.FEB.2008 09:14:12

Channel 9400
99% (-20 dB) Occupied Bandwidth



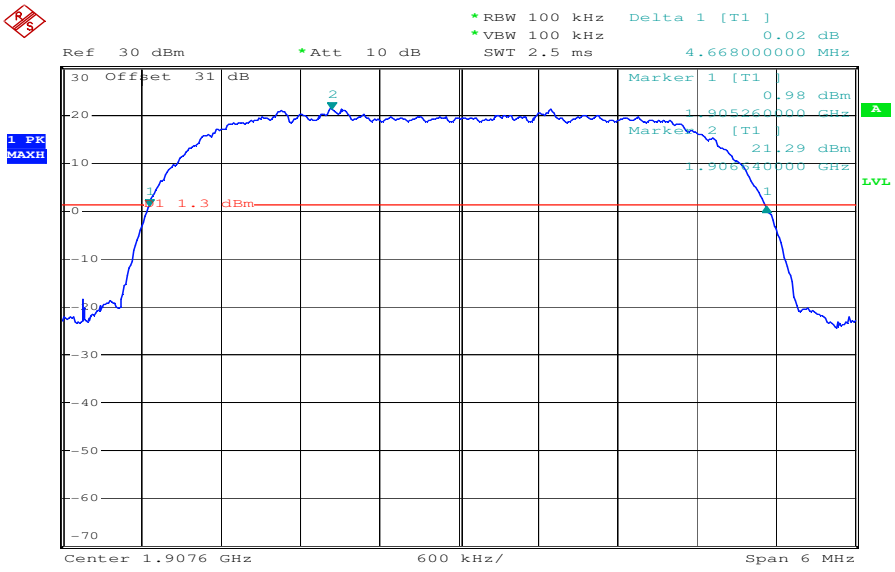
Date: 28.FEB.2008 09:19:50

Channel 9400
-26 dBc Bandwidth



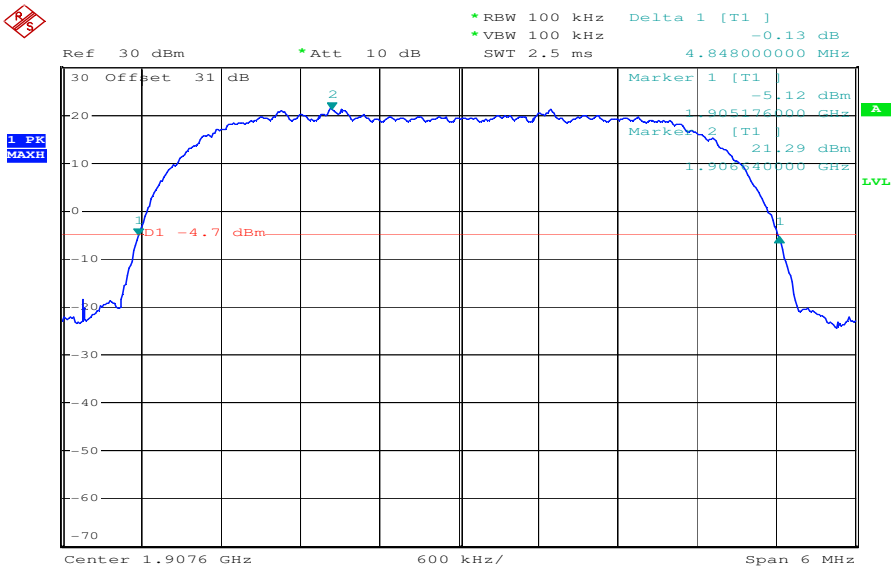
Date: 28.FEB.2008 09:20:27

Channel 9538
99% (-20 dB) Occupied Bandwidth



Date: 28.FEB.2008 09:26:07

Channel 9538
-26 dBc Bandwidth



Date: 28.FEB.2008 09:26:50

5.4 PART UMTS Band 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, 836.0 MHz and 846.6 MHz (bottom, middle and top of operational frequency range).

Settings for maximum output power were used.

Limits:

Nominal Peak Output Power (dBm)
+38.45

Measurements Results Output Power UMTS (conducted)

Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (dBm)
826.4	26.1	23.0
836.0	26.4	23.1
846.6	26.2	23.1
Measurement uncertainty	±0.5 dB	

Measurements Results Output Power (conducted) HSDPA Mode

Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (dBm)
826.4	26.1	23.0
836.0	26.3	23.1
846.6	26.3	23.1
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

Set-up No.: 01

Measurement Results Output Power (Radiated) UMTS Mode

Frequency (MHz)	BURST Peak (dBm)
826.4	26.0
836.0	25.8
846.6	26.0
Measurement uncertainty	±1.5 dB

Measurement Results Output Power (Radiated) HSDPA Mode

Frequency (MHz)	BURST Peak (dBm)
826.4	25.9
836.0	25.7
846.6	26.0
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	dBd	dB	dBm	
846.6	134.2	20.9	8.4	0.0	3.3	26.0	UHAP Schwarzbeck S/N 460

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

Set-up No.: 02

Measurement Results Output Power (Radiated) UMTS Mode

Frequency (MHz)	BURST Peak (dBm)
826.4	25.8
836.0	26.1
846.6	26.0
Measurement uncertainty	±1.5 dB

Measurement Results Output Power (Radiated) HSDPA Mode

Frequency (MHz)	BURST Peak (dBm)
826.4	25.7
836.0	26.1
846.6	26.0
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	dBd	dB	dBm	
836.0	133.1	21.0	8.4	0.0	3.3	26.1	UHAP Schwarzbeck S/N 460

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

Set-up No.: 03

Measurement Results Output Power (Radiated) UMTS Mode

Frequency (MHz)	BURST Peak (dBm)
826.4	25.7
836.0	26.0
846.6	25.9
Measurement uncertainty	±1.5 dB

Measurement Results Output Power (Radiated) HSDPA Mode

Frequency (MHz)	BURST Peak (dBm)
826.4	25.7
836.0	26.0
846.6	25.8
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	dBd	dB	dBm	
836.0	133.0	20.9	8.4	0.0	3.3	26.0	UHAP Schwarzbeck S/N 460

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

5.4.2 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:

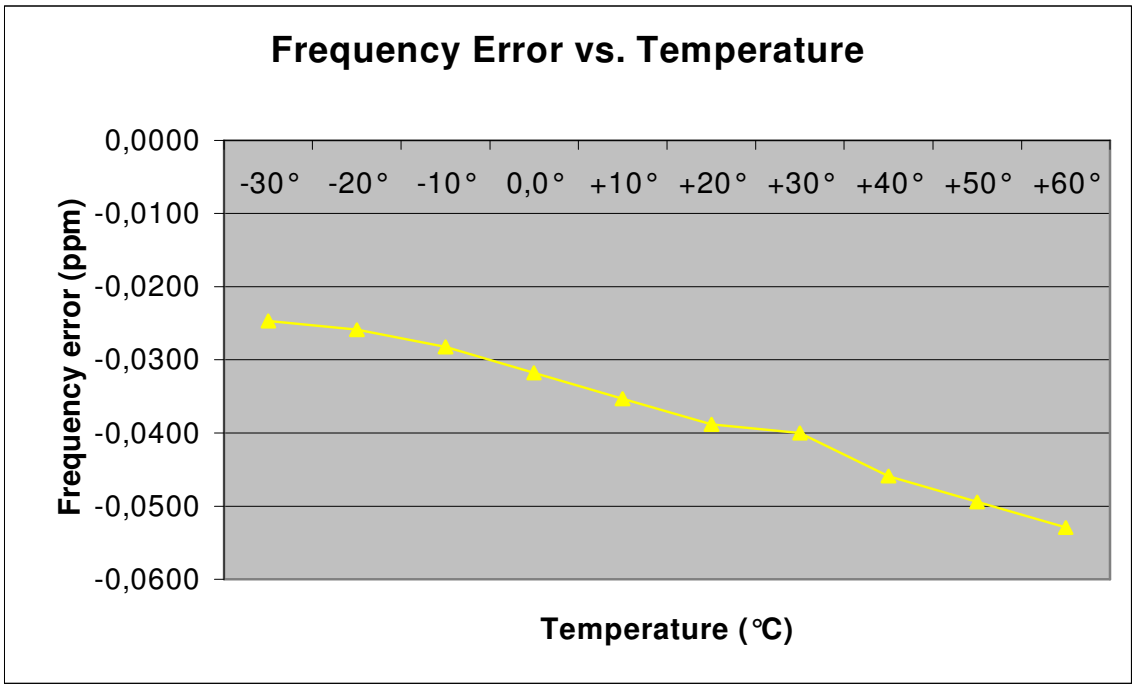
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 22.355, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission 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.

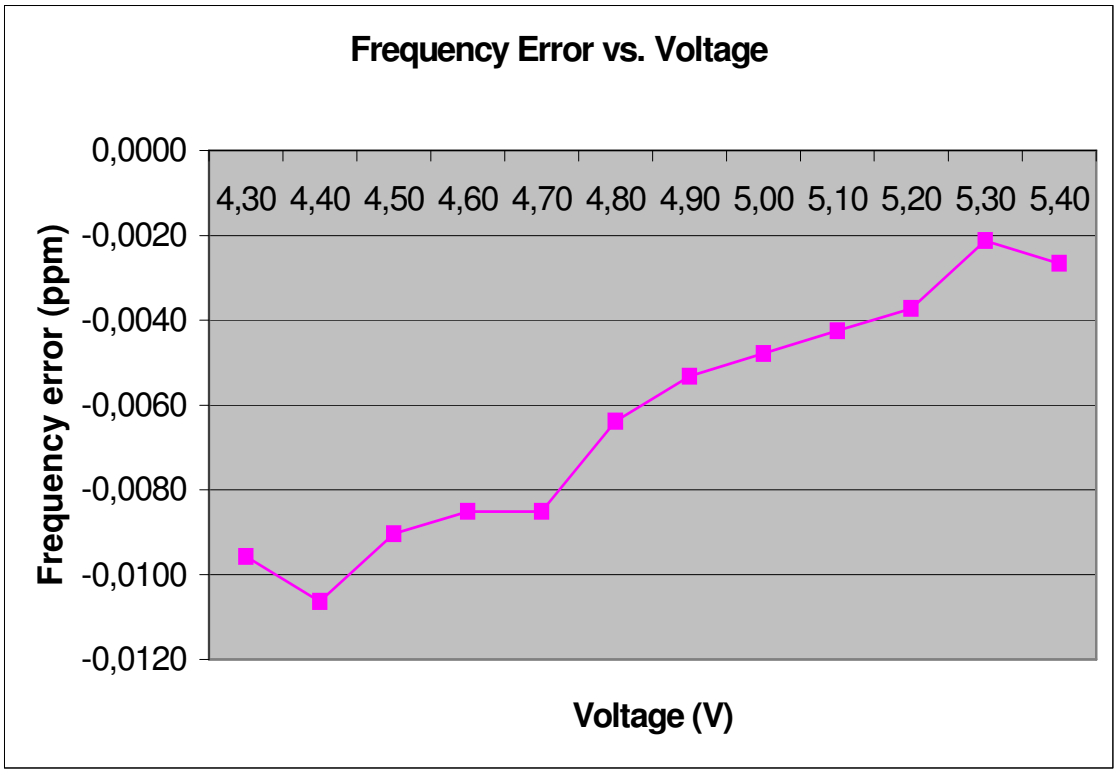
Test Results: AFC FREQ ERROR vs. VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
4.3	-21	-0,00000096	-0,0096
4.4	-18	-0,00000106	-0,0106
4.5	-20	-0,00000090	-0,0090
4.6	-17	-0,00000085	-0,0085
4.7	-16	-0,00000085	-0,0085
4.8	-16	-0,00000064	-0,0064
4.9	-12	-0,00000053	-0,0053
5.0	-10	-0,00000048	-0,0048
5.1	-9	-0,00000043	-0,0043
5.2	-8	-0,00000037	-0,0037
5.3	-7	-0,00000021	-0,0021
5.4	-4	-0,00000027	-0,0027

Test Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-21	-0,00000247	-0,0247
-20	-22	-0,00000259	-0,0259
-10	-24	-0,00000282	-0,0282
±0.0	-27	-0,00000318	-0,0318
+10	-30	-0,00000353	-0,0353
+20	-33	-0,00000388	-0,0388
+30	-34	-0,00000400	-0,0400
+40	-39	-0,00000459	-0,0459
+50	-42	-0,00000494	-0,0494
+60	-45	-0,00000529	-0,0529


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


Frequency Error vs. Voltage
0,0000
-0,0020
-0,0040
-0,0060
-0,0080
-0,0100
-0,0120
Frequency error (ppm)
4,30
4,40
4,50
4,60
4,70
4,80
4,90
5,00
5,10
5,20
5,30
5,40
Voltage (V)

5.4.3 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 UMTS 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 UMTS band (826.4 MHz, 836.0 MHz and 846.6 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 UMTS 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.

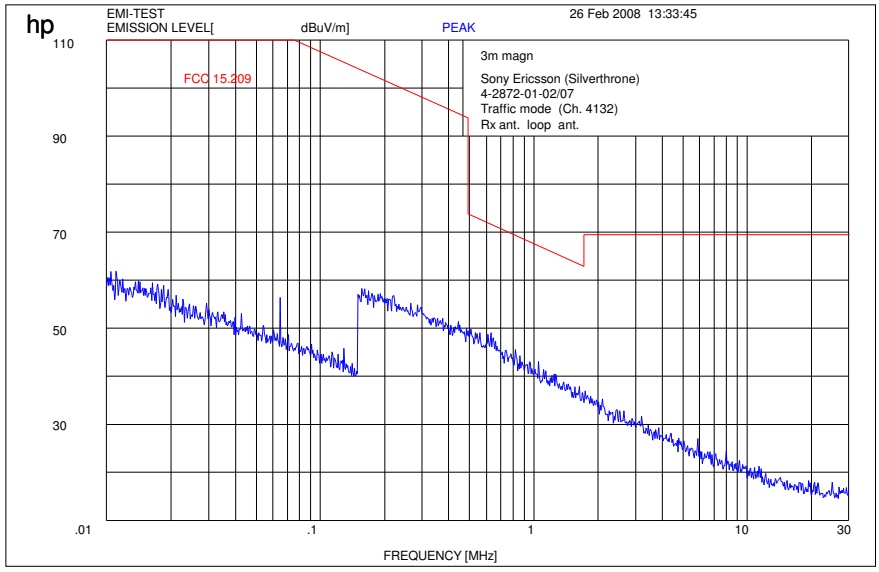
Harmonic	Tx ch.-4132 Freq. (MHz)	Level (dBm)	Tx ch.-4180 Freq. (MHz)	Level (dBm)	Tx ch.-4233 Freq. (MHz)	Level (dBm)
2	1652.8	No critical peaks	1672.0	No critical peaks	1693.2	No critical peaks
3	2479.2		2508.0		2539.8	
4	3305.6		3344.0		3386.4	
5	4132.0		4180.0		4233.0	
6	4958.4		5016.0		5079.6	
7	5784.8		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	

Sample calculation:

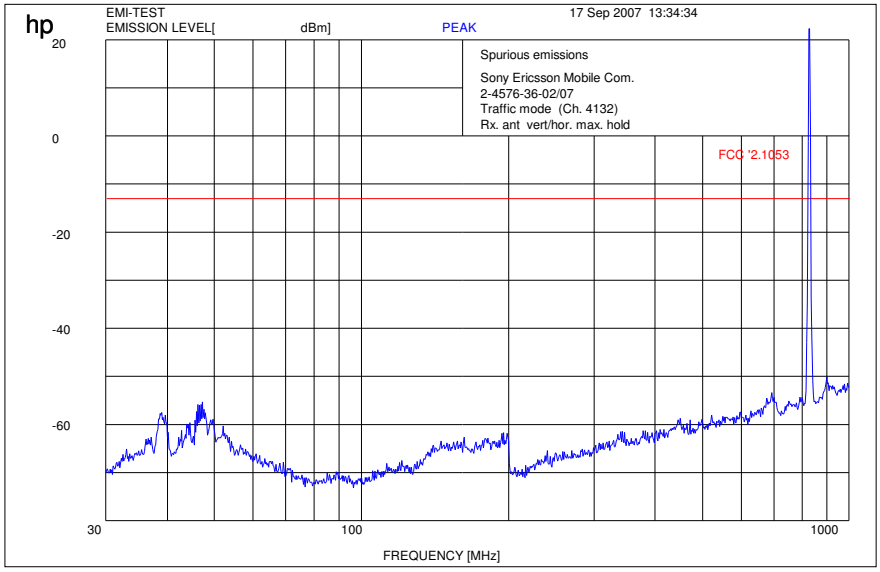
Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERP	Substitution Antenna
MHz	dBµV	dBm	dBi	dBd	dB	dBm	
836.0	133.1	21.0	8.4	0.0	3.3	26.1	UHAP Schwarzbeck S/N 460

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)

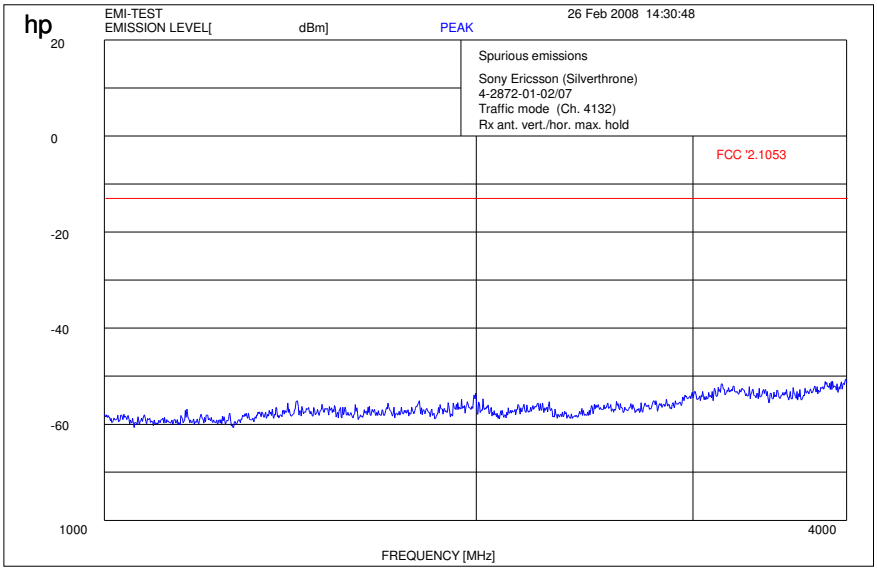


Channel 4132 (30 MHz - 1 GHz)



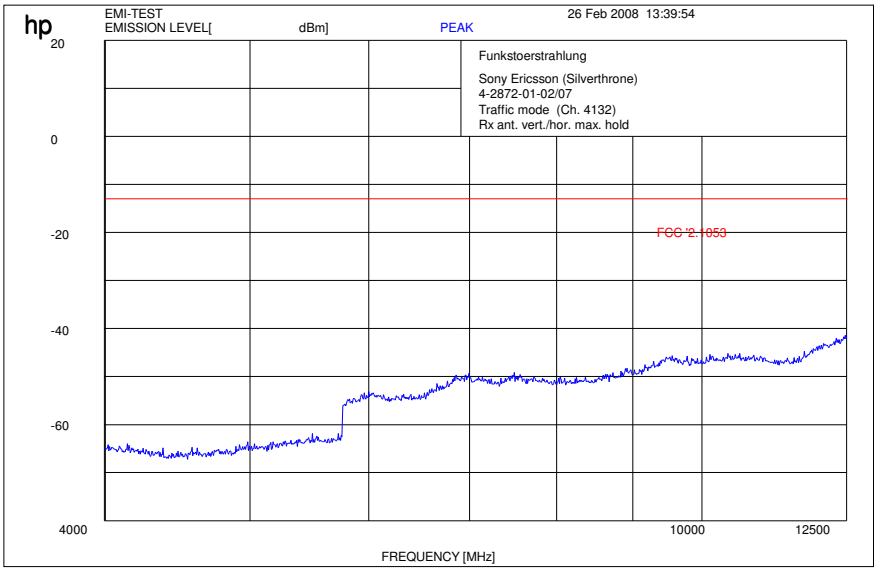
f < 1 GHz : RBW/VBW: 100 kHz

Channel 4132 (1 GHz - 4 GHz)

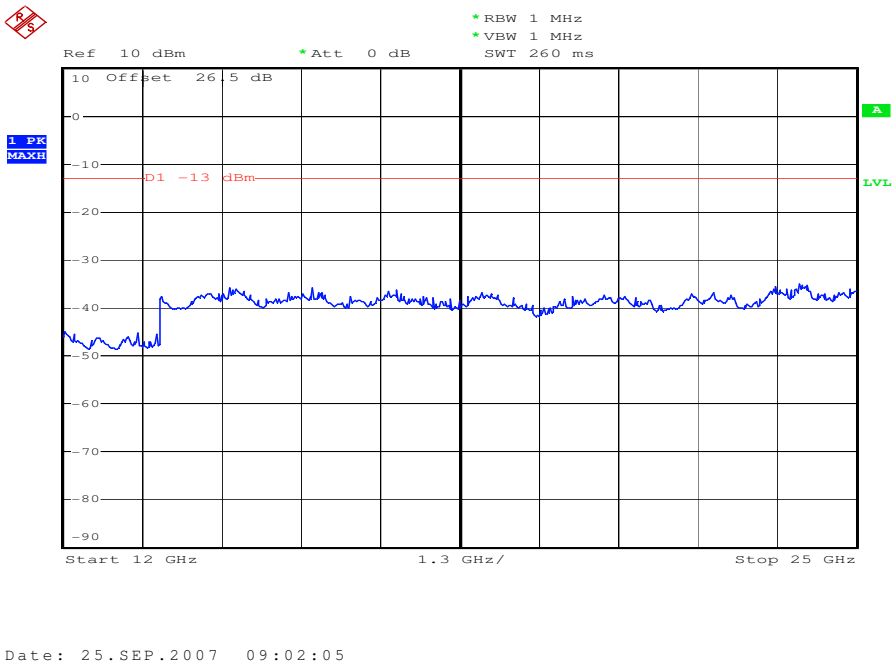


RBW / VBW 1 MHz

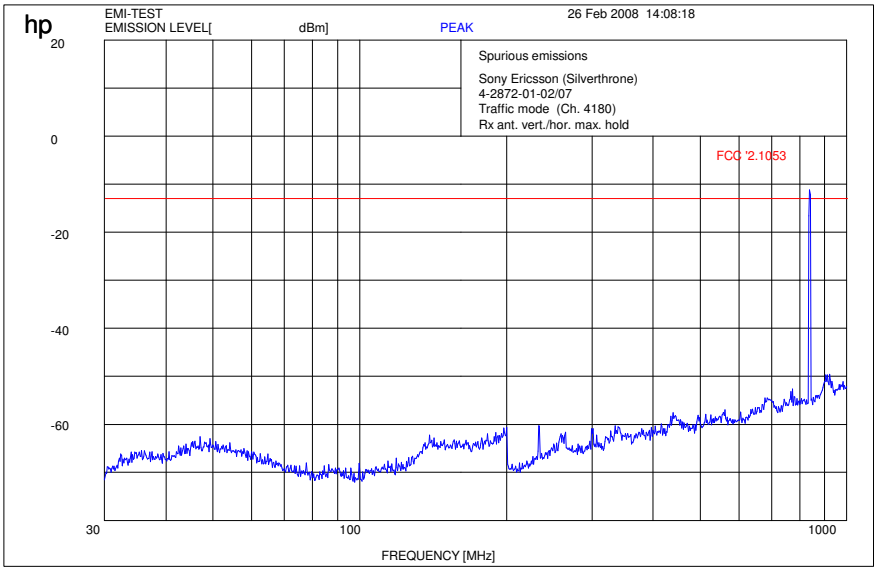
Channel 4132 (4 GHz – 12.5 GHz)



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

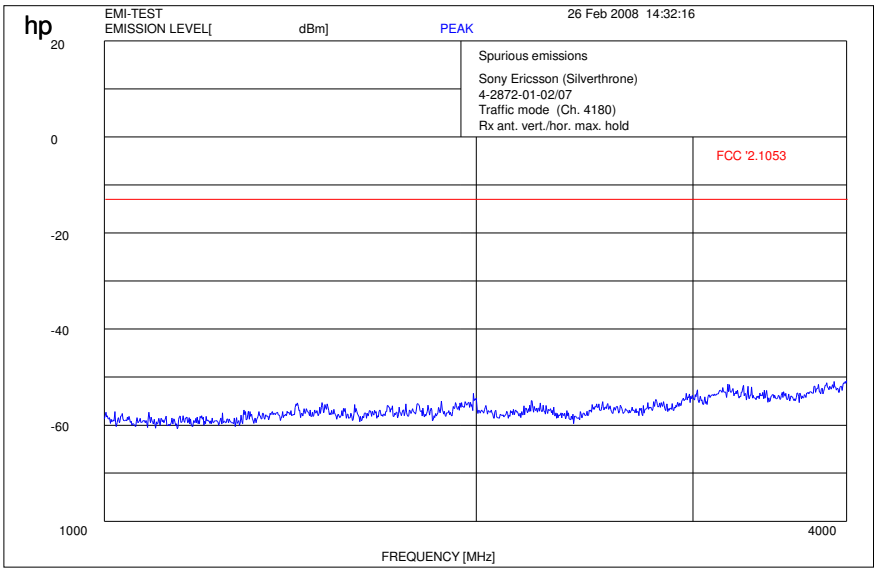


Channel 4180 (30 MHz - 1 GHz)

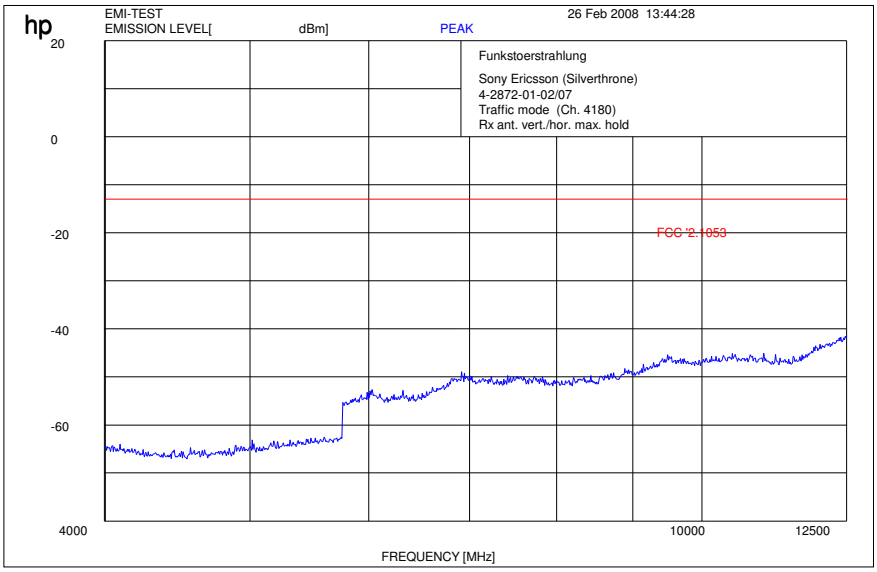


f < 1 GHz : RBW/VBW: 100 kHz

Channel 4180 (1 GHz – 4.0 GHz)

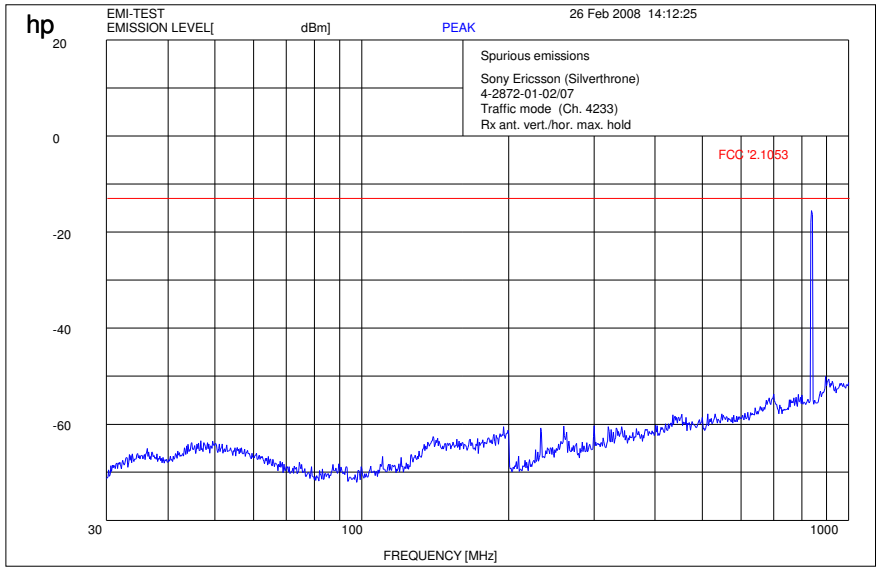


Channel 4180 (4 GHz – 12.5 GHz)



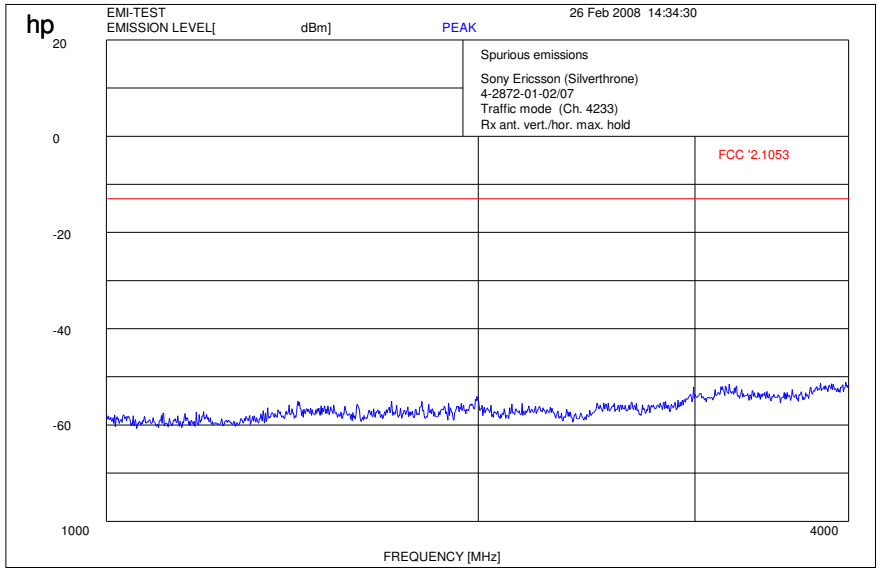
RBW / VBW 1 MHz

Channel 4233 (30 MHz - 1 GHz)



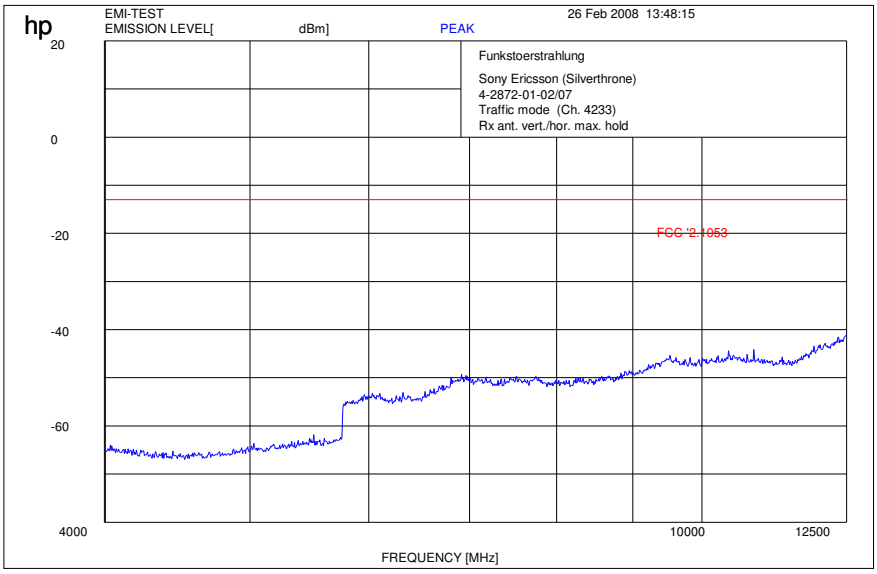
f < 1 GHz : RBW/VBW: 100 kHz

Channel 4233 (1 GHz - 4 GHz)



RBW / VBW 1 MHz

Channel 4233 (4 GHz – 12.5 GHz)



RBW / VBW 1 MHz

5.4.4 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)
No critical peaks found			-	-	-	-	-	-
			-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

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

H = Horizontal; V= Vertical

Measurement distance see table

Limits: § 15.109

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

Idle Mode (30 MHz - 1 GHz)

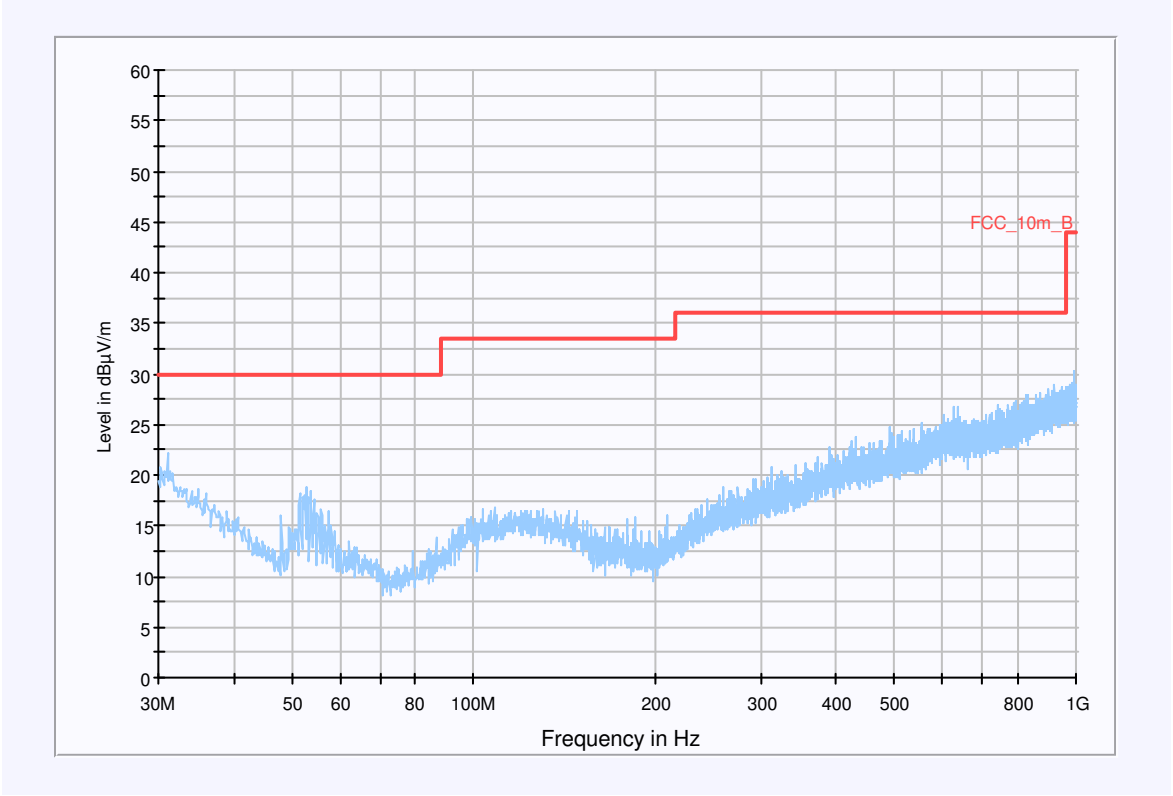
EUT:	FAD-3232021-BV with MD300
Serial Number:	Silverthrone (FAD-3232021-BV)
Test Description:	FCC class B @ 10m
Operating Conditions:	IDLE
Operator Name:	WAL
Comment:	connect to Laptop

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_10m_Fast_1GHz (B)

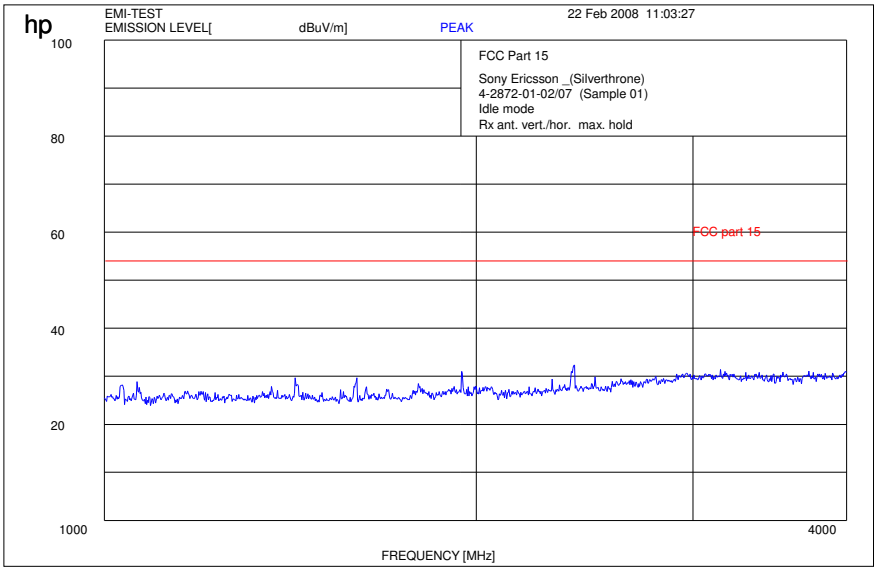


Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

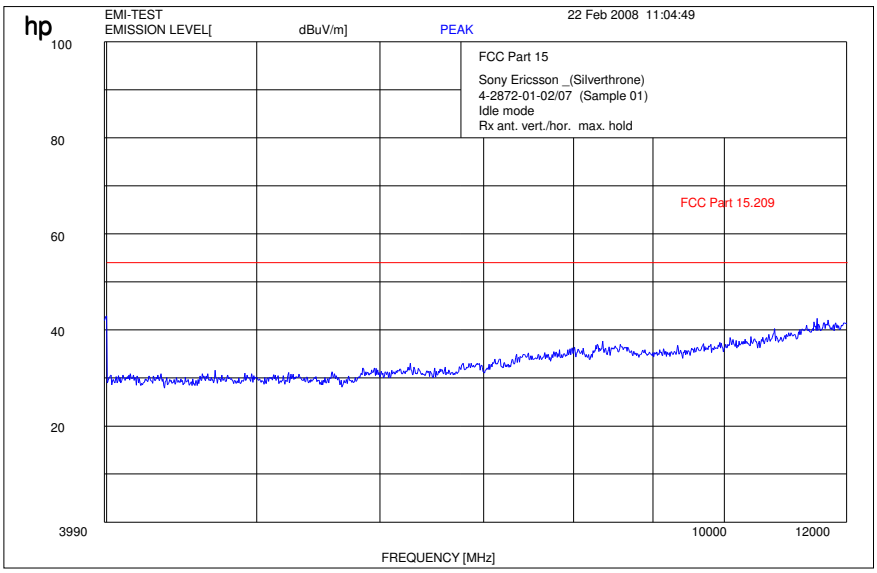
Frequency Range:	30MHz - 2GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch FW 1.0
Antenna:	Chase Broadband BiLog Antenna CBL 6112 SN 2110, FW A, CAL 07.01.2009 Correction Table (vertical): Chase Broadband BiLog Antenna CBL 6112 Correction Table (horizontal): Chase Broadband BiLog Antenna CBL 6112 Correction Table: Cabel with switch (1007)
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)



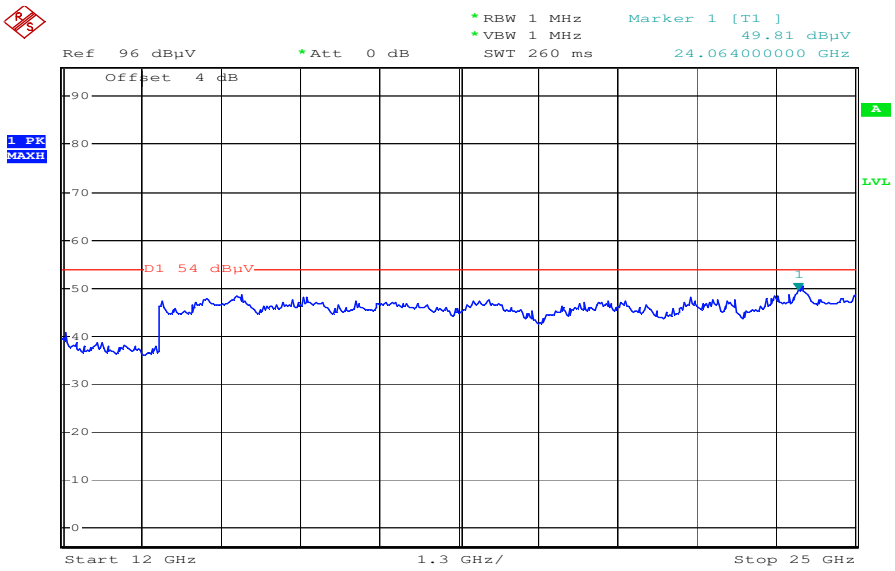
f ≥ 1GHz : RBW / VBW 1 MHz

Idle Mode (4 GHz – 12.0 GHz)



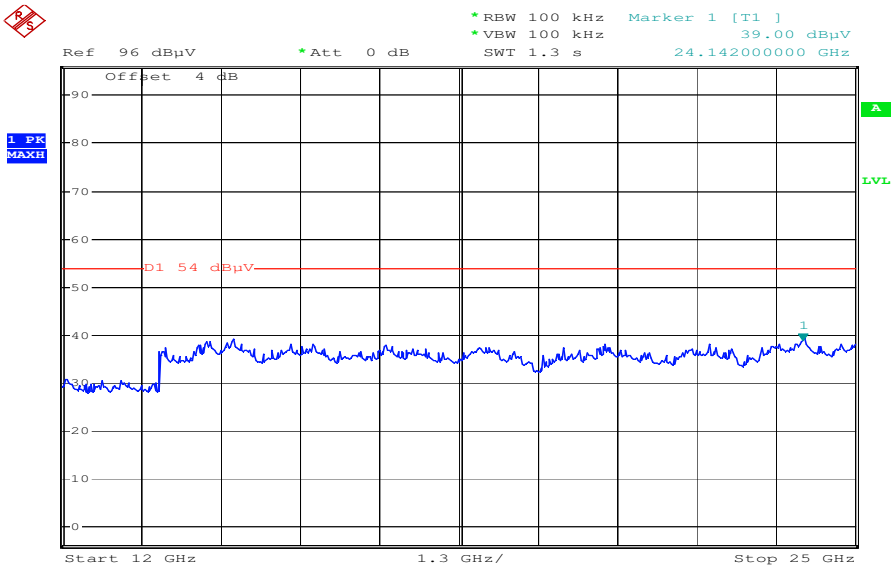
f ≥ 1GHz : RBW / VBW 1 MHz

Idle-Mode (12 GHz - 25 GHz)



Date: 25.FEB.2008 10:39:30

Idle-Mode (12 GHz - 25 GHz)



Date: 25.FEB.2008 10:39:57

5.4.5 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.

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

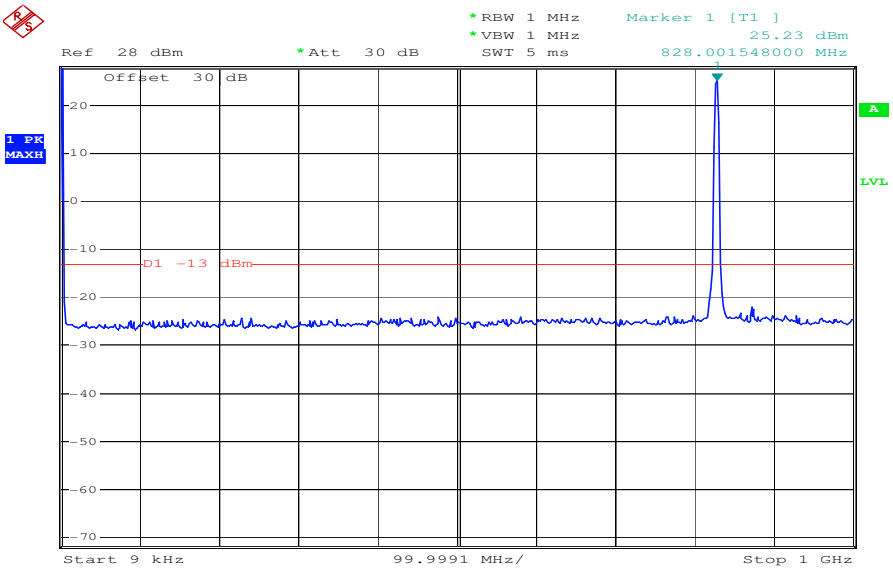
Measurement Limit

(a) On any frequency outside frequency band of the UMTS 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

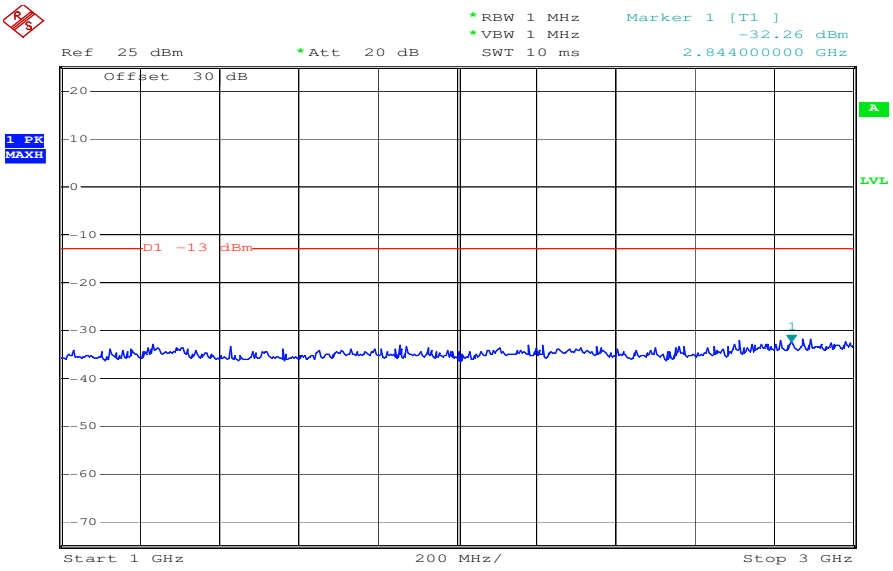
Harmonic	Tx ch.-4132 Freq. (MHz)	Level (dBm)	Tx ch.-4180 Freq. (MHz)	Level (dBm)	Tx ch.-4233 Freq. (MHz)	Level (dBm)
2	1652.8	No critical peaks	1672.0	No critical peaks	1693.2	No critical peaks
3	2479.2		2508.0		2539.8	
4	3305.6		3344.0		3386.4	
5	4132.0		4180.0		4233.0	
6	4958.4		5016.0		5079.6	
7	5784.8		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	

Channel 4132: (30 MHz – 1 GHz)



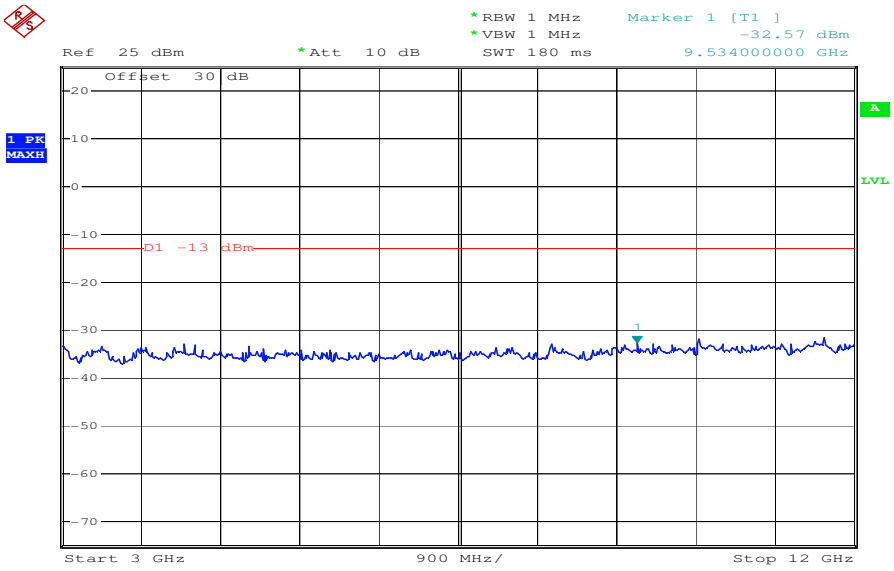
Date: 27.FEB.2008 14:17:00

Channel 4132: (1 GHz – 3 GHz)



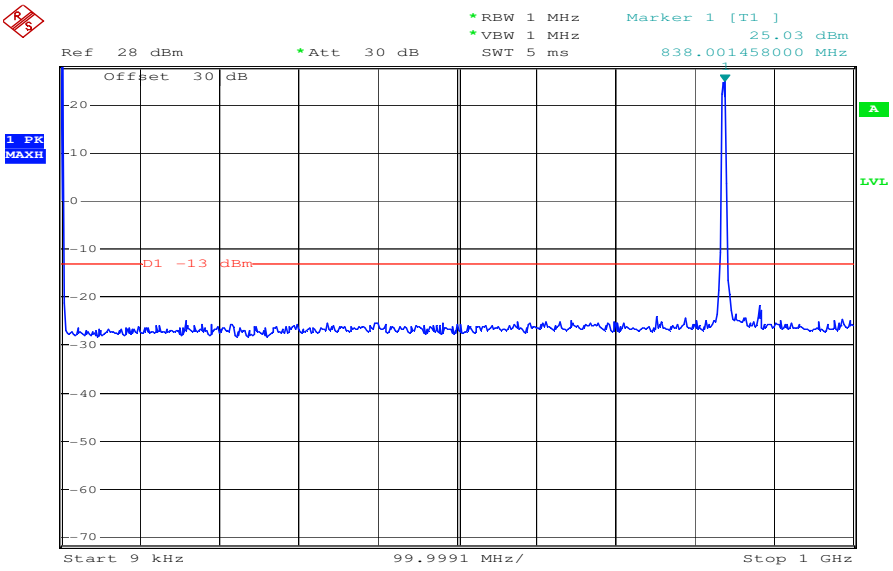
Date: 27.FEB.2008 14:22:07

Channel 4132: (3 GHz – 12 GHz)



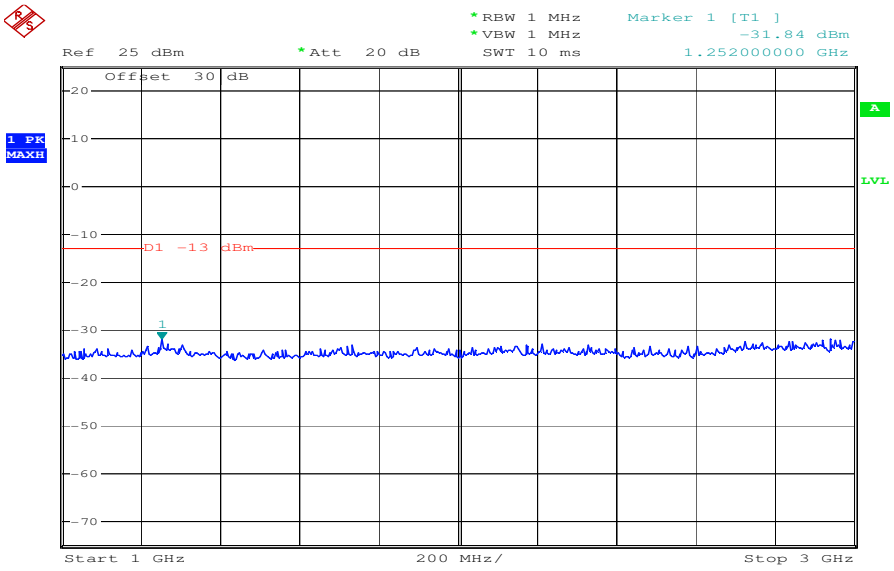
Date: 27.FEB.2008 14:21:04

Channel 4180: (30 MHz – 1 GHz)



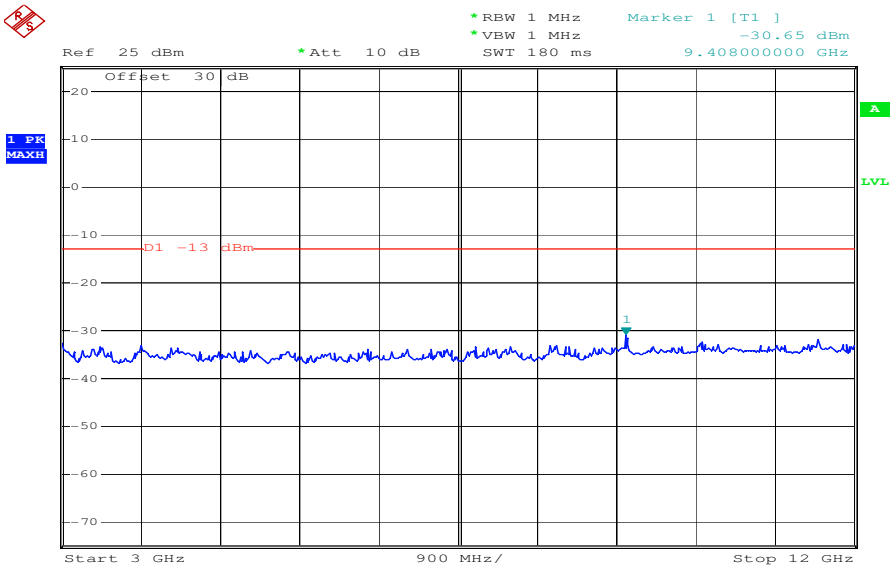
Date: 27.FEB.2008 14:17:37

Channel 4180: (1 GHz – 3 GHz)



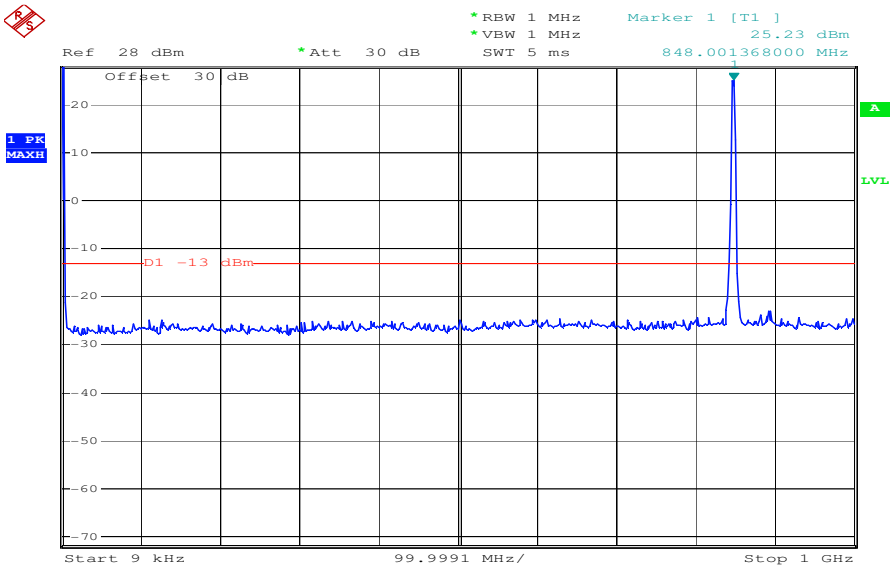
Date: 27.FEB.2008 14:22:36

Channel 4180: (3 GHz – 12 GHz)



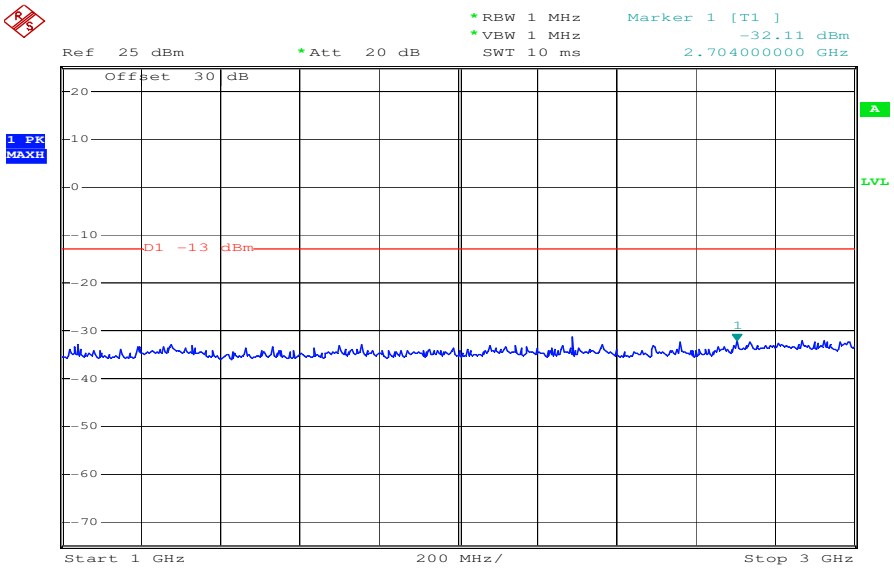
Date: 27.FEB.2008 14:20:03

Channel 4233: (30 MHz – 1 GHz)



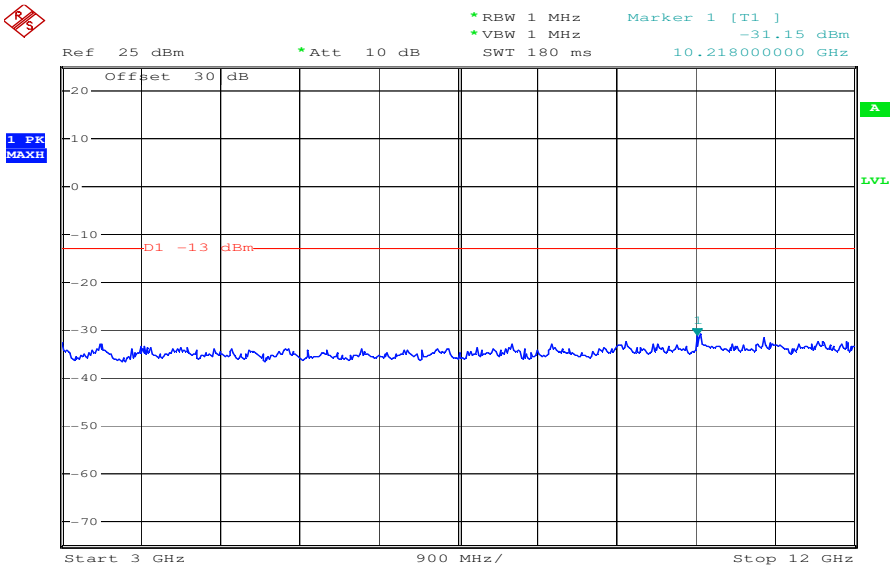
Date: 27.FEB.2008 14:18:46

Channel 4233: (1 GHz – 3 GHz)



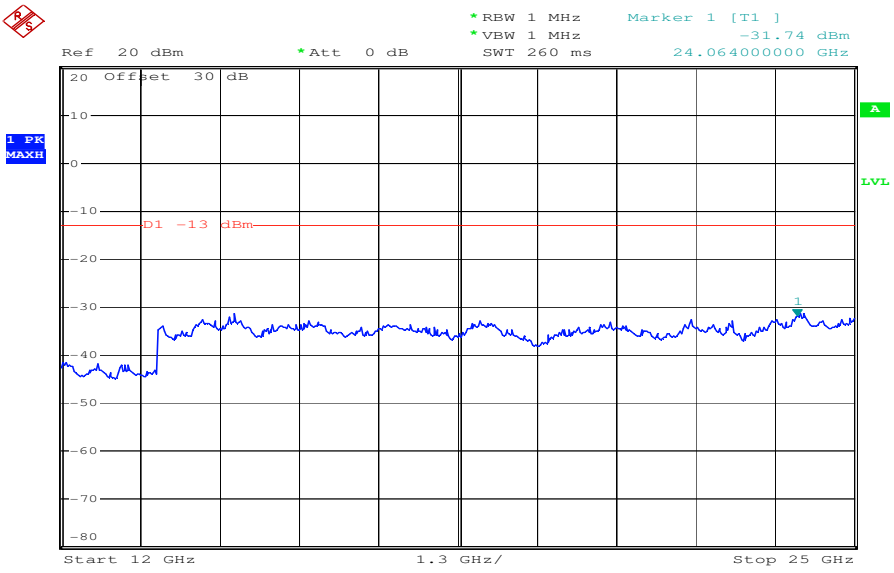
Date: 27.FEB.2008 14:23:14

Channel 4233: (3 GHz – 12 GHz)



Date: 27.FEB.2008 14:19:43

Channel 4233 (12 GHz - 25 GHz) valid for all 3 channels



Date: 27.FEB.2008 14:29:59

5.4.6 Block Edge Compliance

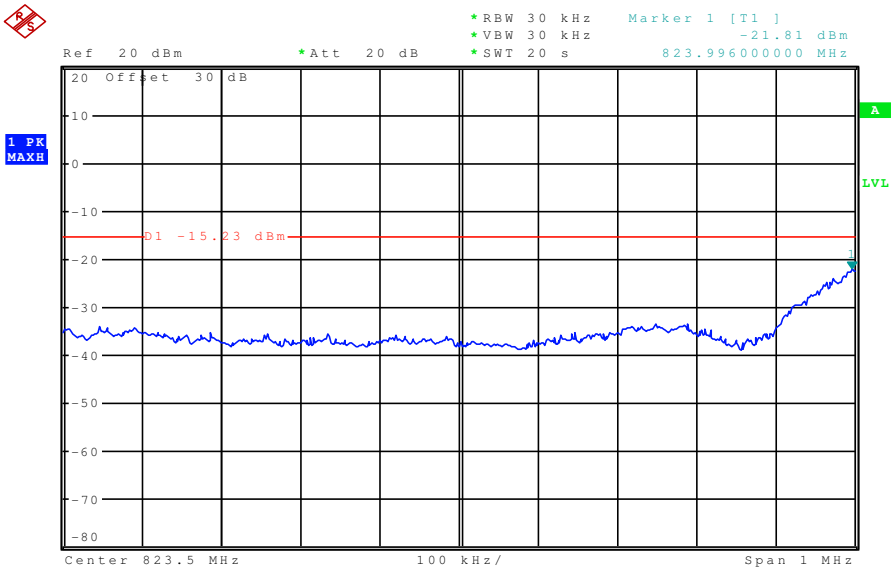
Reference

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

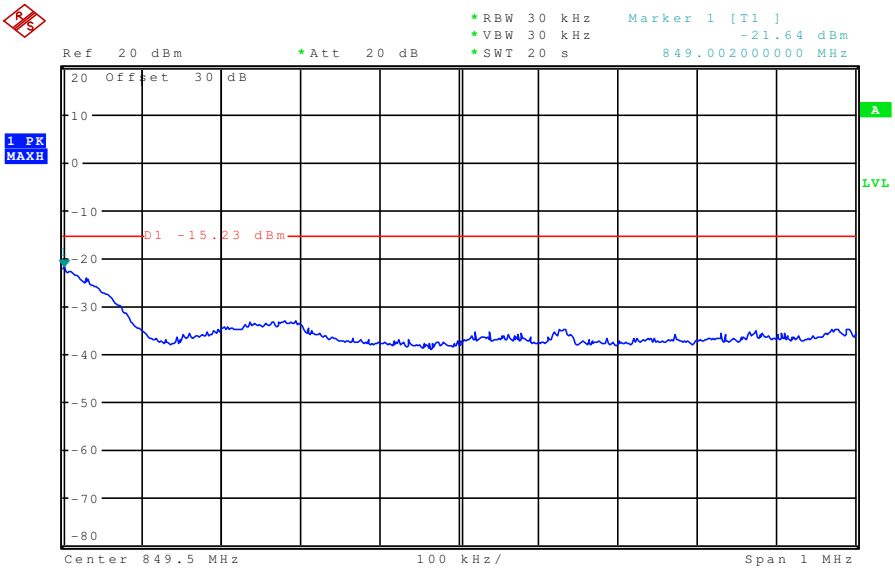
Measurement Limit:

Sec. 22.917(b) Emission Limits.
(a) On any frequency outside frequency band of the UMTS 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.

Channel 4132



Channel 4233



5.4.7 Occupied Bandwidth

Reference

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

Occupied Bandwidth Results

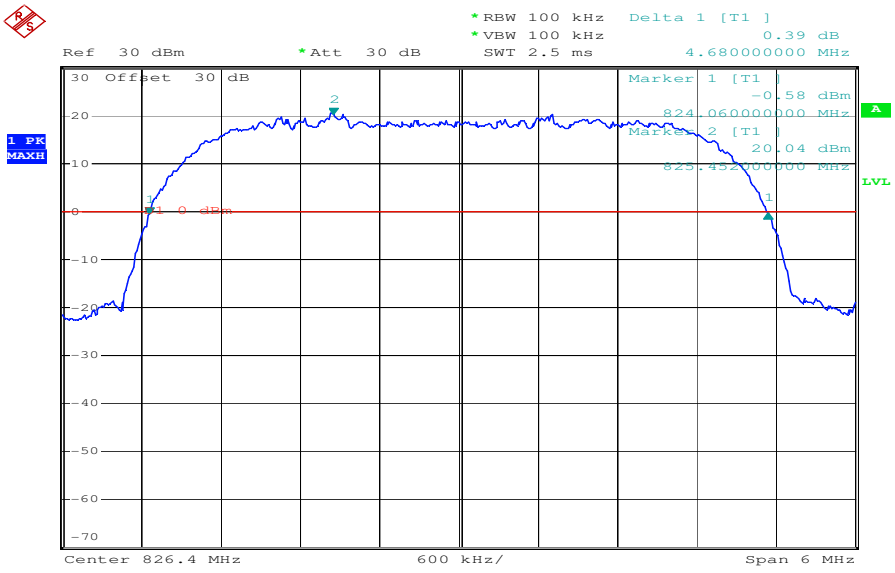
Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the UMTS frequency band. Table below lists the measured 99% power and -26dBC occupied bandwidths.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

Normal mode

Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
826.4 MHz	4680	4860
836.0 MHz	4692	4860
846.6 MHz	4680	4836

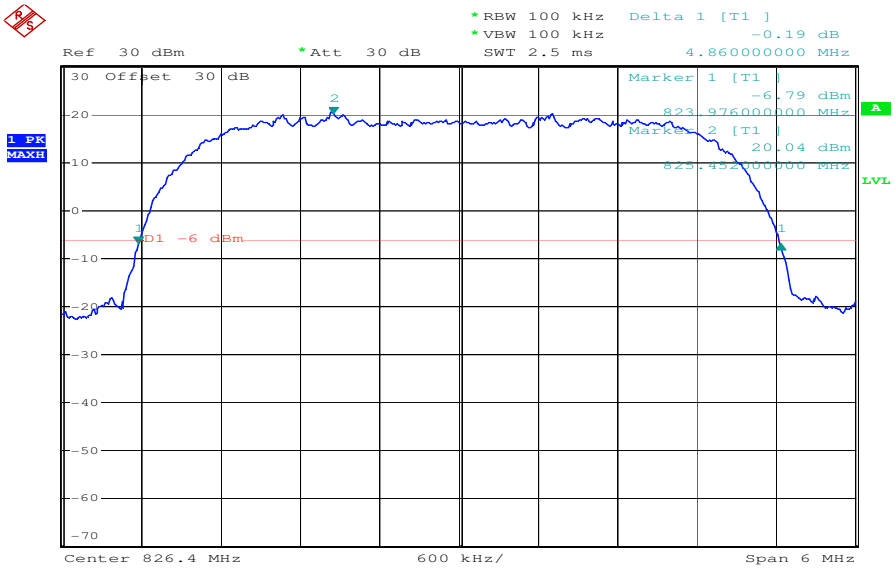
Part 22 requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 300 kHz, this equates to a resolution bandwidth of at least 3 kHz. For this testing, a resolution bandwidth 3.0 kHz was used.

Channel 4132
99% (-20 dB) Occupied Bandwidth



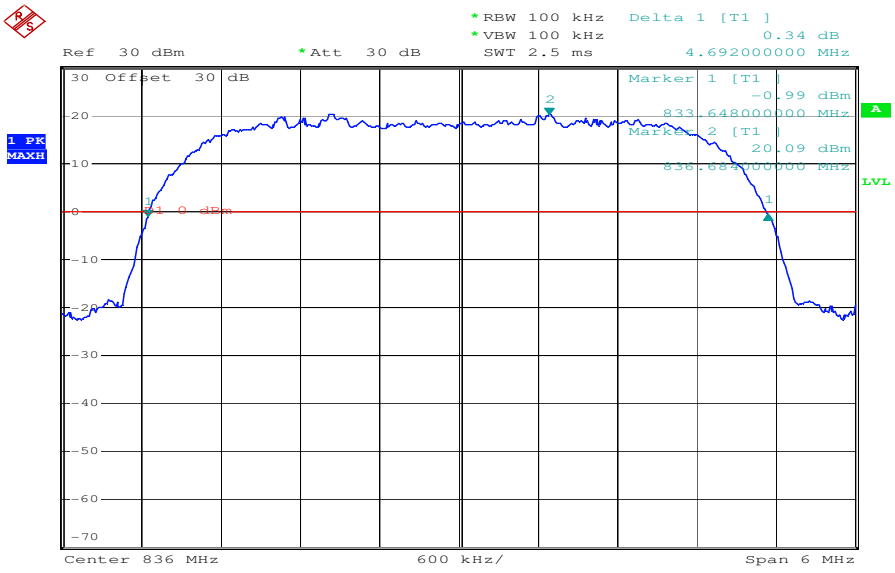
Date: 27.FEB.2008 15:12:53

Channel 4132
-26 dBc Bandwidth



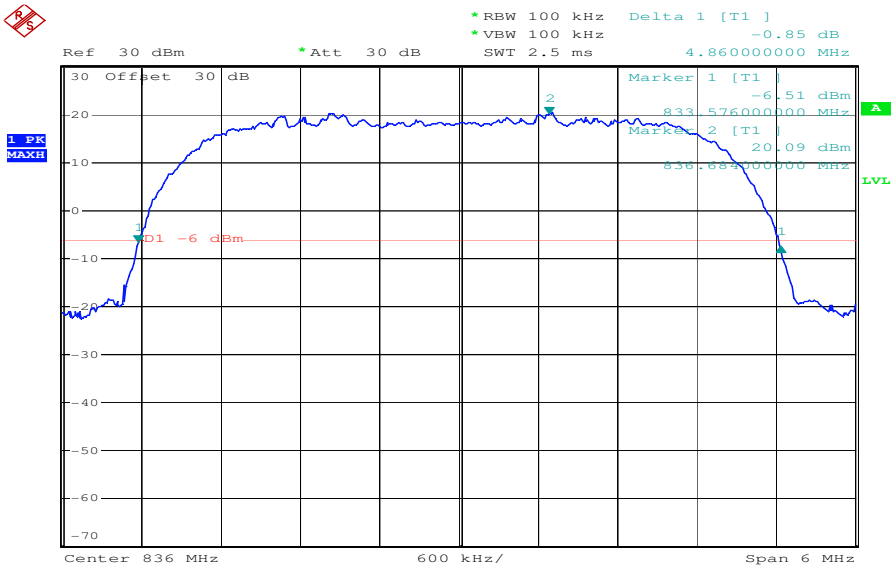
Date: 27.FEB.2008 15:13:42

Channel 4180
99% (-20 dB) Occupied Bandwidth



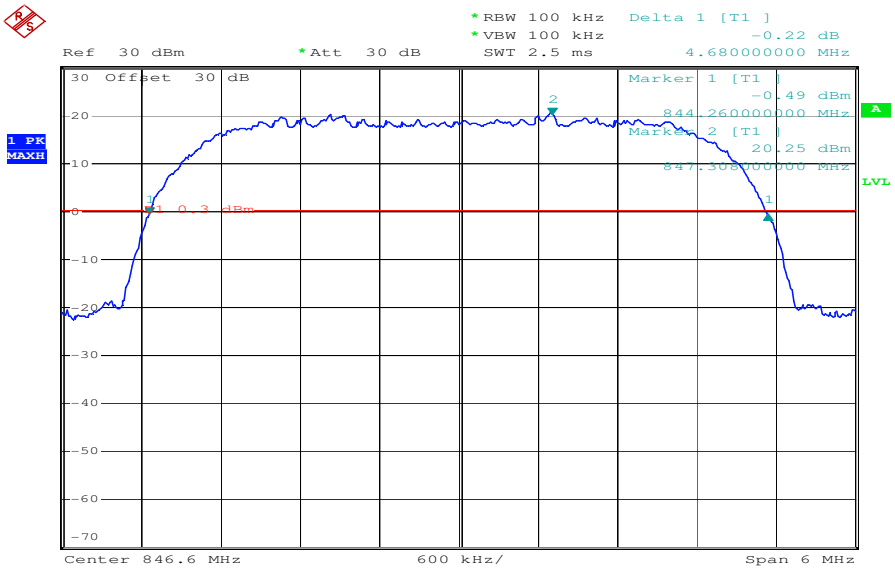
Date: 27.FEB.2008 15:16:13

Channel 4180
-26 dBc Bandwidth



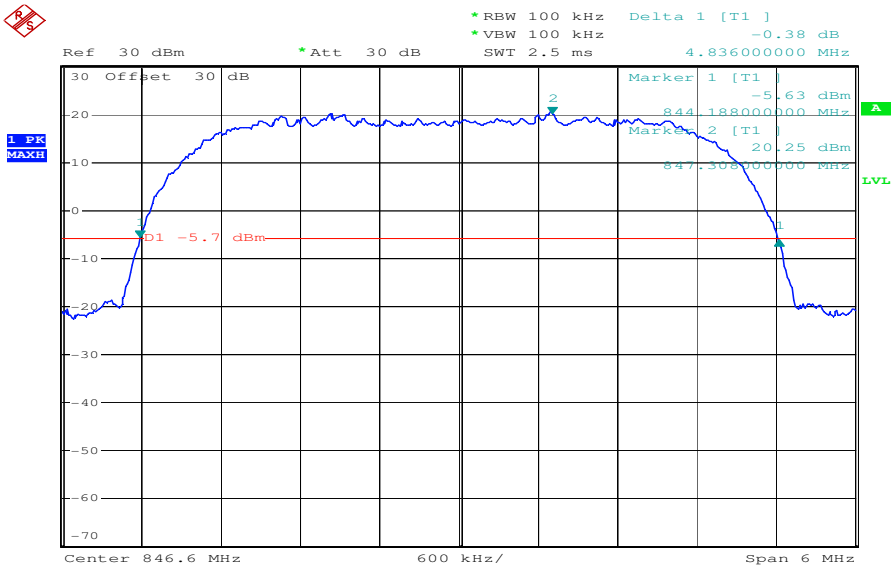
Date: 27.FEB.2008 15:17:00

Channel 4233
99% (-20 dB) Occupied Bandwidth



Date: 27.FEB.2008 15:24:07

Channel 4233
-26 dBc Bandwidth



Date: 27.FEB.2008 15:24:37

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:

o	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	26.10.2006	12	26.10.2007
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.)		

Signaling Units:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	CMU-200	R&S	103992	300003231	27.04.2007	12	27.04.2008
2	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.		