Accredited testing-laboratory

DAR registration number: DGA-PL-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.: 3462C-1 (IC)
Certification ID: DE 0001
Accreditation ID: DE 0002

Accredited Bluetooth® Test Facility (BQTF)

Test report no.	**:**	**1-1954-23-02/10**
Type identification	**:**	**AAD-3880071-BV**
Applicant	**:**	**Sony Ericsson Mobile Communications AB**
FCC ID	**:**	**PY7A3880071**
IC Certification No	**:**	**4170B-A3880071**
Test standards	**:**	**47 CFR Part 22**
		47 CFR Part 24
		RSS - 132 Issue 2
		RSS - 133 Issue 5

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1 General information

1.1 Notes

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

Test laboratory manager:

2010-04-28	**Marco Bertolino**	
Date	Name	Signature

Technical responsibility for area of testing:

2010-04-28	**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: DGA-PL-176/94-D1**
Accredited by:	**Federal Motor Transport Authority (KBA) DAR registration number: KBA-P 00070-97**

Testing location, if different from CETECOM ICT Services GmbH:

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

1.3 Details of applicant

Name:	**Sony Ericsson Mobile Communications AB**
Street:	**Nya Vattentornet**
Town:	**22188 Lund**
Country:	**Sweden**
Telephone:	**+46-46-19-3000**
Fax:	**+46 (0) 46 19 32 95**
Contact:	**Johan Wedin**
E-mail:	**johan.wedin@sonyericsson.com**
Telephone:	**+46 (0) 707 19 57 36**

1.4 Application details

Date of receipt of order:	**2010-04-19**
Date of receipt of test item:	**2010-04-22**
Date of start test:	**2010-04-22**
Date of end test:	**2010-04-27**
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 5	**2009-02**	**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:	**22188 Lund**
Country:	**Sweden**

3.1.1 Test item

Kind of test item	:	**GSM Mobile Phone 850/900/1800/1900 UMTS FDD1/FDD2/FDD5, HSUPA/HSDPA, BT2.0+EDR, A-GPS, FM Rx, WLAN**
Type identification	:	**AAD-3880071-BV**
Serial Number	:	**Rad. CB511H8B3E** **CB511H8ARW** **Cond. CB511H8B20** **CB511H8B49**
Frequency	:	**1850.2 – 1909.8 MHz and 824.2 – 848.8 MHz**
Type of modulation	:	**GMSK; 8-PSK; QPSK; 16QAM**
Emission Designator for GSM 1900	:	**GMSK: 281KGXW** **8-PSK: 279KG7W**
Emission Designator for GSM 850	:	**GMSK: 277KGXW** **8-PSK: 275KG7W**
Emission Designator for WCDMA 1900	:	**QPSK: 4M93F9W**
Emission Designator for WCDMA 850	:	**QPSK: 4M57F9W**
Number of channels	:	**300 (PCS1900) and 125 (PCS850)** **103 (FDD V) / 278 (FDD II)**
Antenna Type	:	**Integrated PCB antenna → for more information, please take a look at the Annex report. (Photos of the EUT)**
Power supply (normal)	:	**DC by power supply / battery CBA-0002021 + charger**
Output power GSM 850 / GMSK	:	**cond.: 33.19 dBm** **ERP: 30.89 dBm**
Output power GSM 1900 / GMSK	:	**cond : 30.35 dBm** **EIRP: 29.90 dBm**
Output power GSM 850 / 8-PSK	:	**cond.: 26.77 dBm** **ERP: 24.60 dBm**
Output power GSM 1900 / 8-PSK	:	**cond : 25.46 dBm** **EIRP: 24.80 dBm**
Output power UMTS 850 / WCDMA	:	**cond.: 24.59 dBm** **ERP: 20.56 dBm**
Output power UMTS 1900 / WCDMA	:	**cond : 24.54 dBm** **EIRP: 22.79 dBm**
Transmitter Spurious (worst case)	:	**1.61 µW / -27.94 dBm**
Receiver Spurious (worst case)	:	**43.70 dBµV/m @ 3 m**
FCC ID	:	**PY7A3880071**
Certification No. IC	:	**4170B-A3880071**
Open Area Test Site IC No.	:	**IC 3462C-1**
IC Standards	:	**RSS132, Issue 2, RSS133, Issue 5**

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:

2010-04-28	Marco Bertolino	
Date	Name	Signature

3.2 Test Setup

Hardware	:	AP1.1
Software	:	1.0.A.1.27

Mobile; (cond. measurements)	:	CB511H8B20 &CB511H8B49
Mobile; (rad. measurements)	:	CB511H8B3E & CB511H8ARW

The radiated measurements were performed with Standard world wide charger.

4 Statement of Compliance

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

4.1 Summary of Measurement Results

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

☐ There were deviations from the technical specifications ascertained

4.1.1 PCS 1900

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

4.1.2 GSM 850

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

4.1.3 UMTS Band II

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

4.1.4 UMTS Band V

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

4.1.5 Receiver

Section in this Report	Test Name	Verdict
5.5.1	Receiver Radiated emissions	passed

5 Measurements and results

5.1 PART PCS 1900

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

5.1.1 RF Power Output

Reference

FCC:	CFR Part 24.232, 2.1046
IC:	RSS 133, Issue 5, Section 6.4

Summary:

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

Method of Measurements:

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

Limits:

Nominal Peak Output Power (dBm)
+33

In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

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

Frequency (MHz)	Average Output Power (dBm)	Peak-to-Average Ratio (dB)
1850.2	30.16	0.1
1880.0	30.11	0.2
1909.8	30.35	0.1
Measurement uncertainty	±0.5 dB	

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

Frequency (MHz)	Average Output Power (dBm)	Peak-to-Average Ratio (dB)
1850.2	25.46	3.2
1880.0	25.39	3.3
1909.8	25.25	3.3
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

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

Frequency (MHz)	Average EIRP (dBm)
1850.2	29.01
1880.0	29.47
1909.8	29.90
Measurement uncertainty	±3 dB

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

Frequency (MHz)	Average EIRP (dBm)
1850.2	24.31
1880.0	24.75
1909.8	24.80
Measurement uncertainty	±3 dB

Sample Calculation:

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

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

5.1.2 Frequency Stability

Reference

FCC:	CFR Part 24.235, 2.1055
IC:	RSS 133, Issue 5, Section 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 Vnom, connected to the CMU 200 and in a simulated call on channel 661 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.

4. Repeat the above measurements at 10 C increments from -30 C to +60 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.

5. Re-measure carrier frequency at room temperature with Vnom. Vary supply voltage from Vmin to Vmax, in 12 steps re-measuring carrier frequency at each voltage. Pause at Vnom for 1 1/2 hours un-powered, to allow any self heating to stabilize, before continuing.

6. Subject the mobile station to overnight soak at +60 C.

7. With the mobile station, powered with Vnom, connected to the CMU 200 and in a simulated call on channel 661(center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.

8. Repeat the above measurements at 10 C increments from +60 C to -30 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.

9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

Measurement Limit:

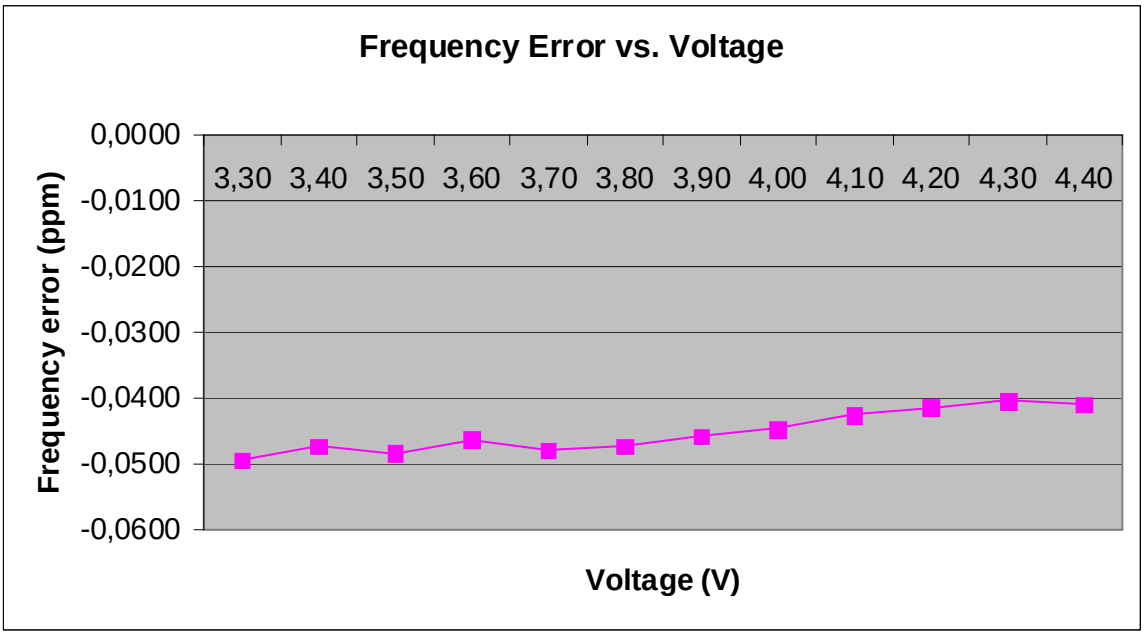
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission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

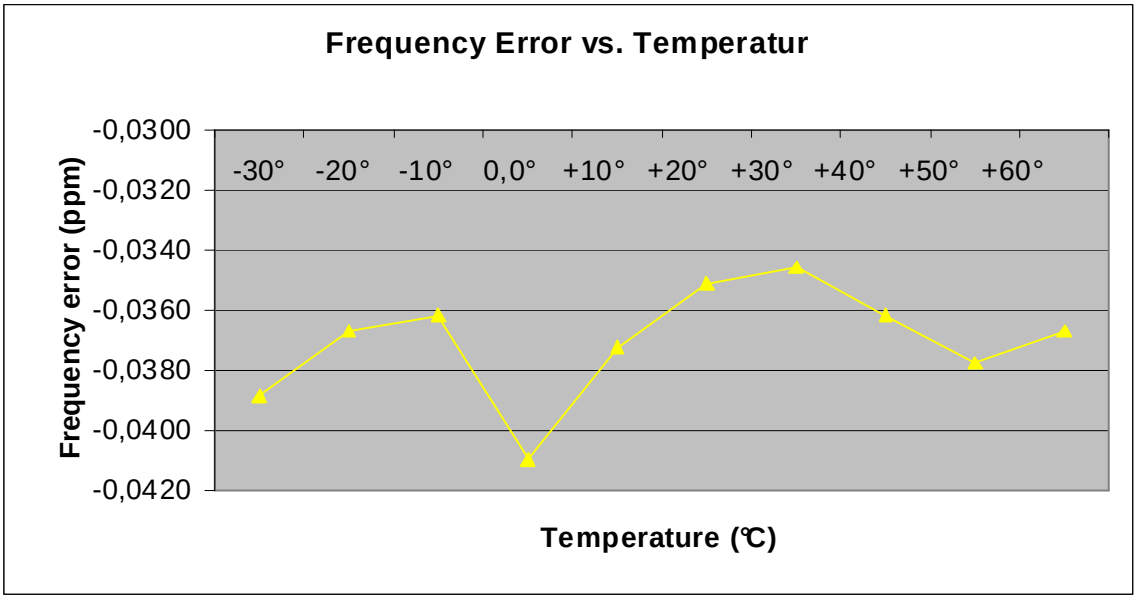
Test Results: **AFC FREQ ERROR vs. VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	-93	-0,00000495	-0,0495
3.4	-89	-0,00000473	-0,0473
3.5	-91	-0,00000484	-0,0484
3.6	-87	-0,00000463	-0,0463
3.7	-90	-0,00000479	-0,0479
3.8	-89	-0,00000473	-0,0473
3.9	-86	-0,00000457	-0,0457
4.0	-84	-0,00000447	-0,0447
4.1	-80	-0,00000426	-0,0426
4.2	-78	-0,00000415	-0,0415
4.3	-76	-0,00000404	-0,0404
4.4	-77	-0,00000410	-0,0410

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

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-73	-0,00000388	-0,0388
-20	-69	-0,00000367	-0,0367
-10	-68	-0,00000362	-0,0362
±0.0	-77	-0,00000410	-0,0410
+10	-70	-0,00000372	-0,0372
+20	-66	-0,00000351	-0,0351
+30	-65	-0,00000346	-0,0346
+40	-68	-0,00000362	-0,0362
+50	-71	-0,00000378	-0,0378
+60	-69	-0,00000367	-0,0367


Frequency Error vs. Voltage
0,0000
-0,0100
-0,0200
-0,0300
-0,0400
-0,0500
-0,0600
Frequency error (ppm)
3,30 3,40 3,50 3,60 3,70 3,80 3,90 4,00 4,10 4,20 4,30 4,40
Voltage (V)


Frequency Error vs. Temperatur
-0,0300
-0,0320
-0,0340
-0,0360
-0,0380
-0,0400
-0,0420
Frequency error (ppm)
-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 5, Section 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 a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. This was rounded up to 20 GHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

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

a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.

b) The antenna output was terminated in a 50 ohm load.

c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.

d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and I MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.

e) Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603.

Measurement Limit:

Sec. 24.238 Emission Limits.

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

Measurement Results: **Radiated Emissions**

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

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

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

Harmonic	Tx ch.-512 Freq. (MHz)	Level (dBm)	Tx ch.-661 Freq. (MHz)	Level (dBm)	Tx ch.-810 Freq. (MHz)	Level (dBm)
2	3700.4	-44.86 dBm vertical -45.84 dBm horizontal	3760	-44.42 dBm vertical -46.63 dBm horizontal	3819.6	-43.89 dBm vertical -45.82 dBm horizontal
3	5550.6	-37.43 dBm vertical -36.21 dBm horizontal	5640	-36.55 dBm vertical -35.49 dBm horizontal	5729.4	-39.24 dBm vertical -39.10 dBm horizontal
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	-

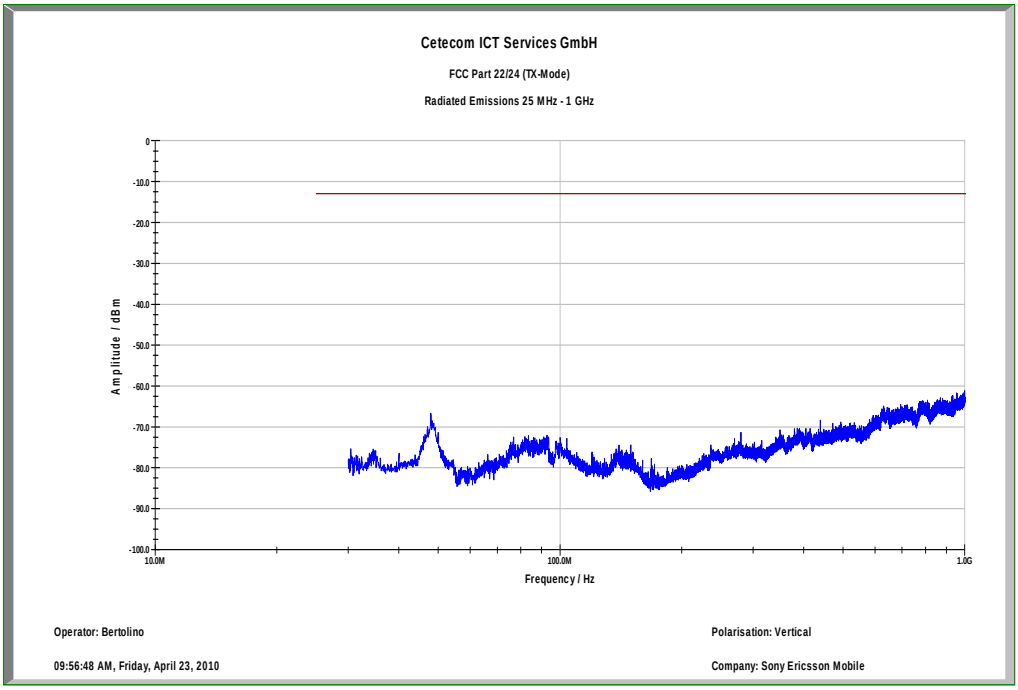
No peaks found > 20 dB below limit.

Sample calculation:

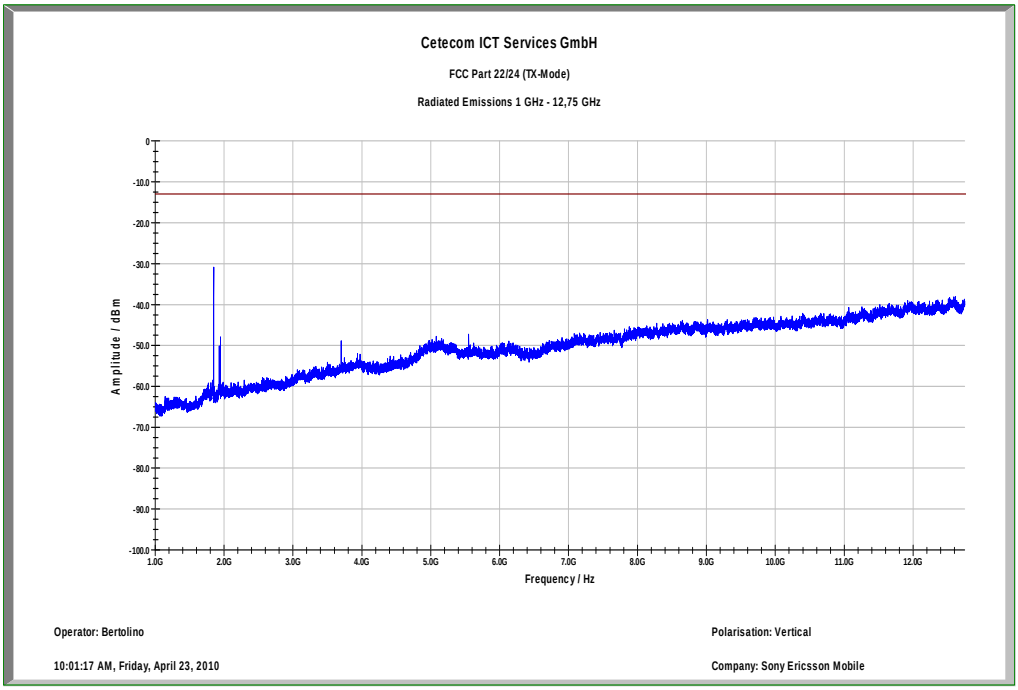
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1909.8	132.3	24.6	8.4	0.0	3.3	29.7			

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

Plot 1: TX mode, channel 512, GSM, 30 MHz – 1 GHz, vertical polarization

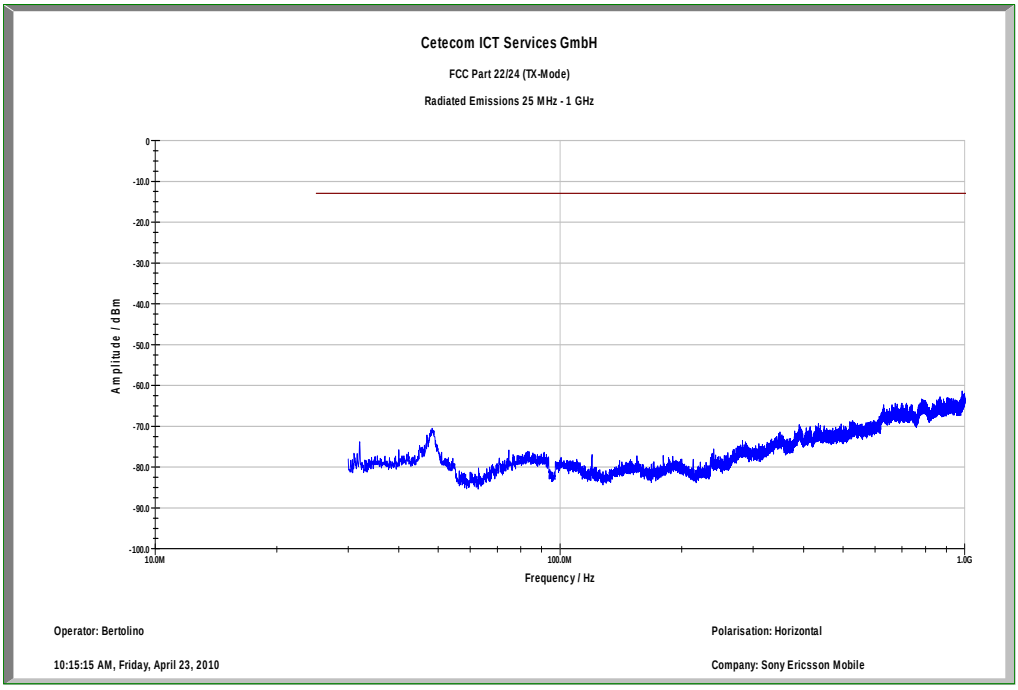


Plot 2: TX mode, channel 512, GSM, 1 GHz – 12.75 GHz, vertical polarization

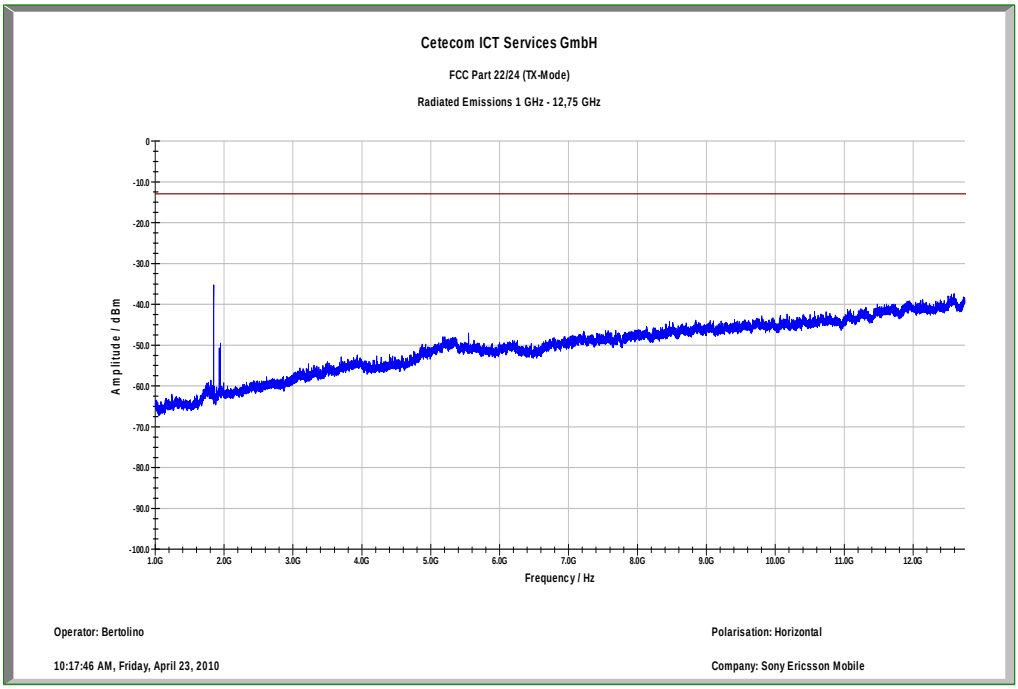


The carrier signal is notched with a 1.9 GHz band rejection filter.

Plot 3: TX mode, channel 512, GSM, 30 MHz – 1 GHz, horizontal polarization

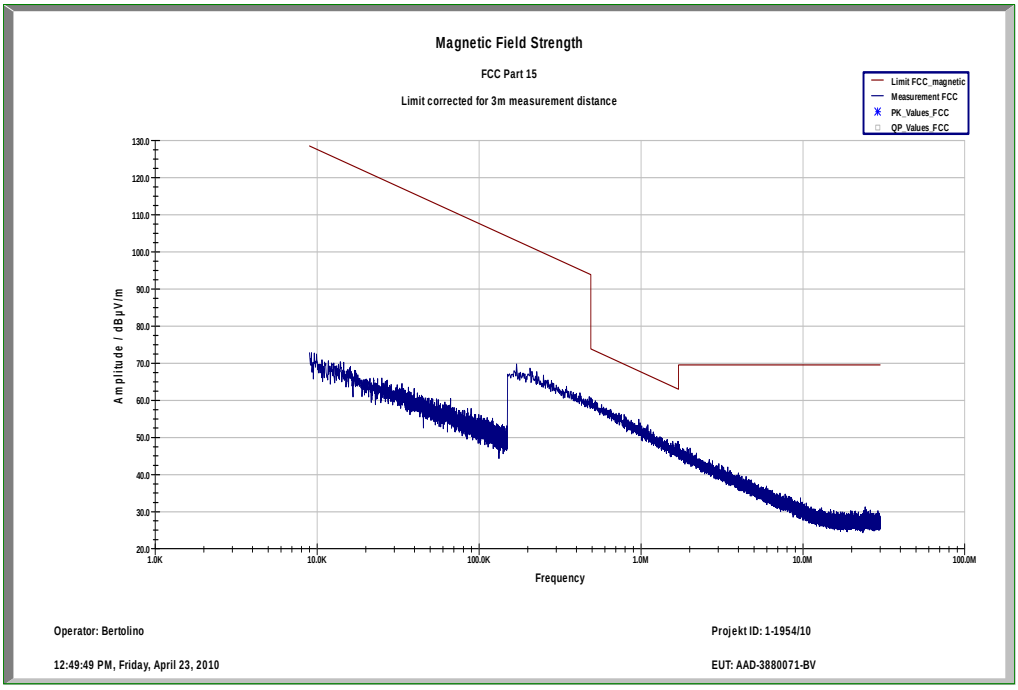


Plot 4: TX mode, channel 512, GSM, 1 GHz – 12.75 GHz, horizontal polarization

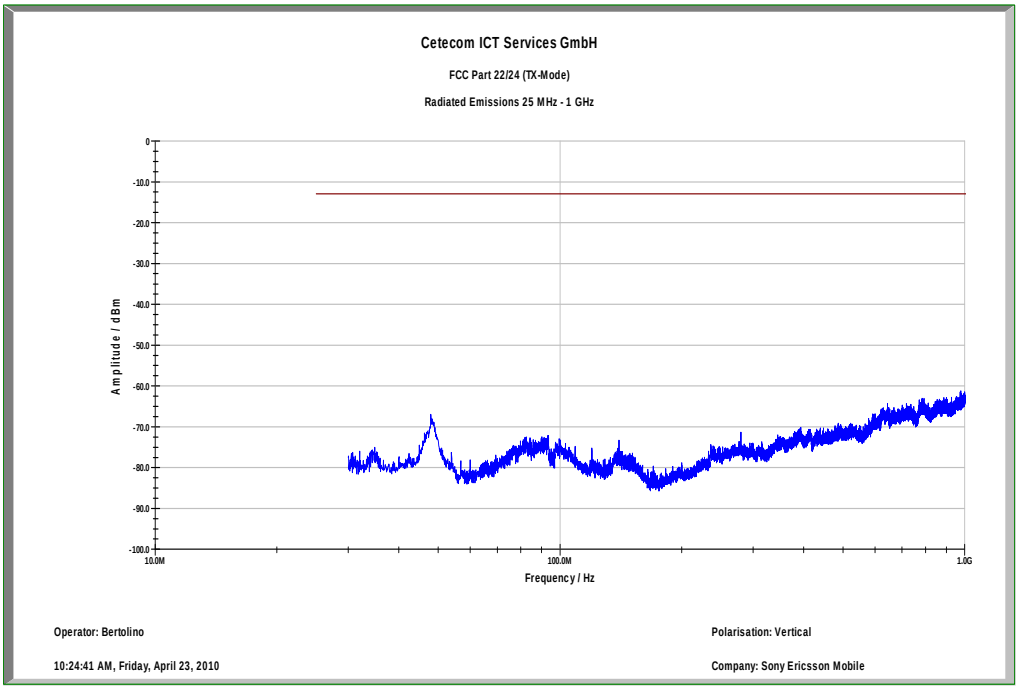


The carrier signal is notched with a 1.9 GHz band rejection filter.

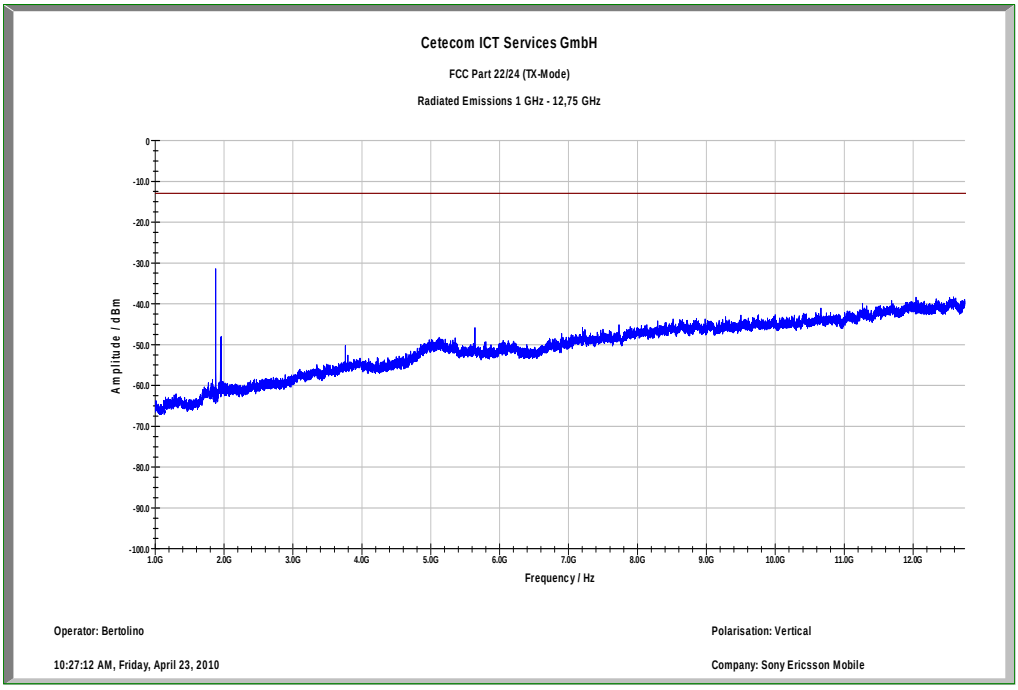
Plot 5: TX mode, channel 661, GSM, 10 kHz - 30 MHz (valid for all channels)



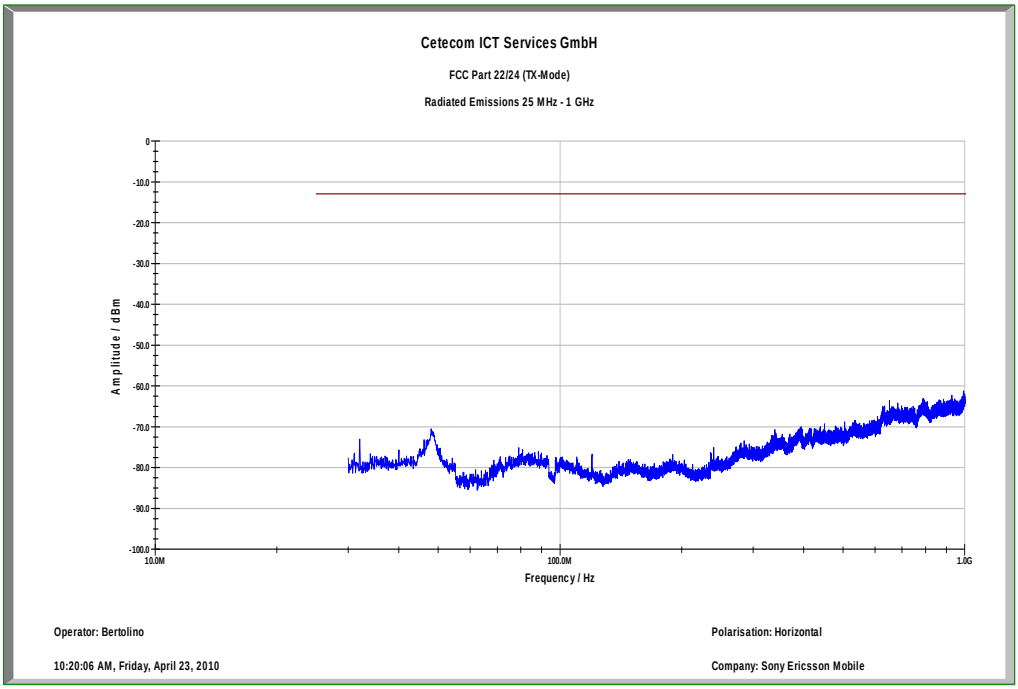
Plot 7: TX mode, channel 661, GSM, 30 MHz – 1 GHz, vertical polarization



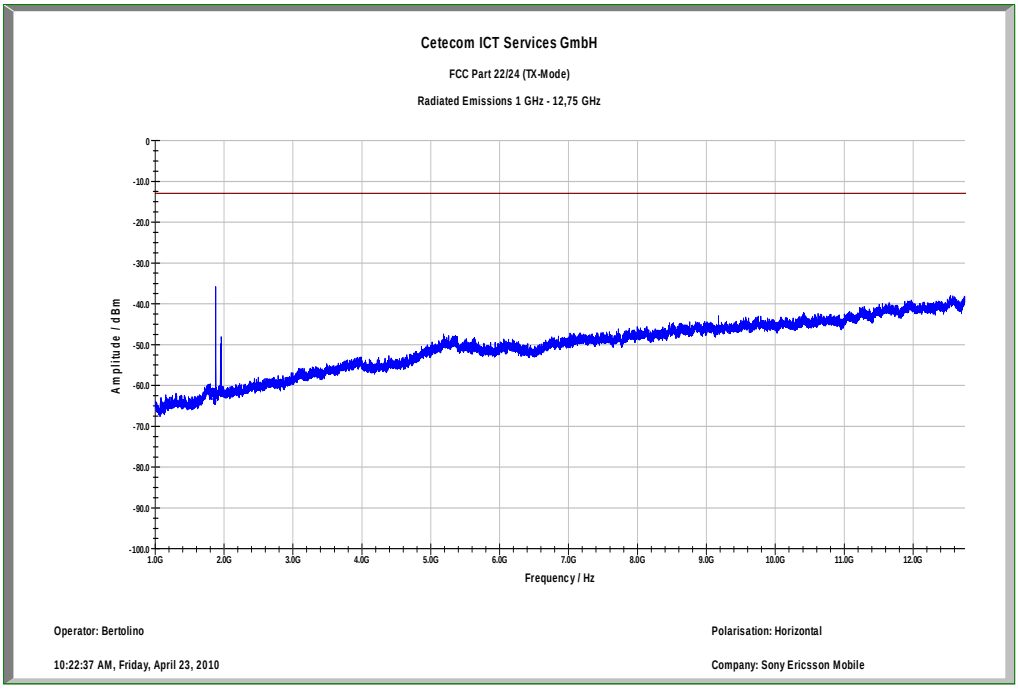
Plot 8: TX mode, channel 661, GSM, 1 GHz – 12.75 GHz, vertical polarization



Plot 9: TX mode, channel 661, GSM, 30 MHz – 1 GHz, horizontal polarization

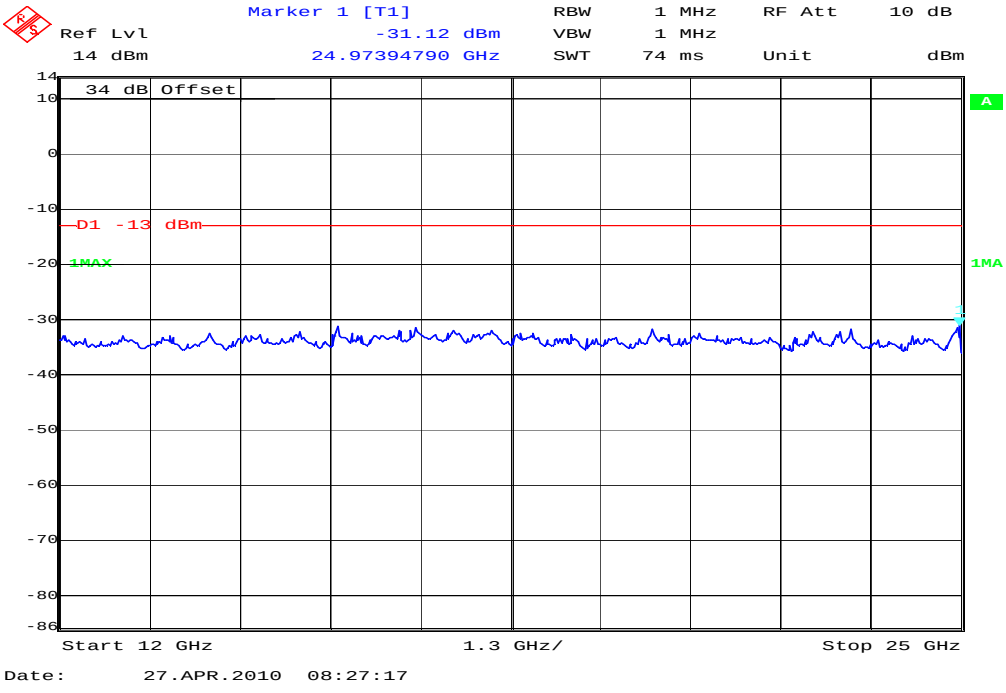


Plot 10: TX mode, channel 661, GSM, 1 GHz – 12.75 GHz, horizontal polarization

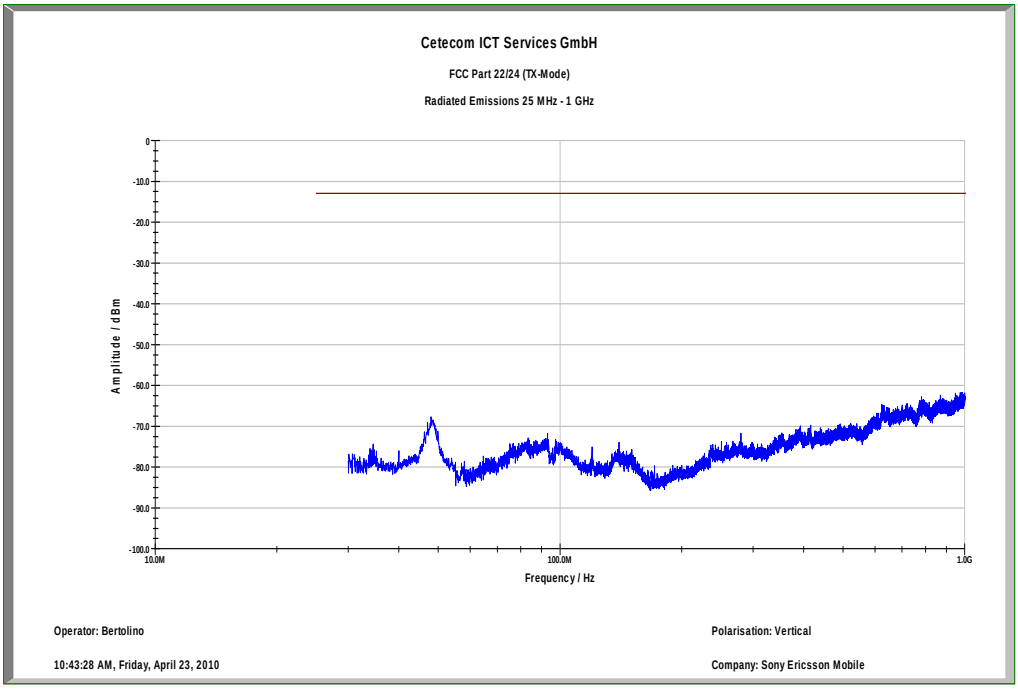


The carrier signal is notched with a 1.9 GHz band rejection filter.

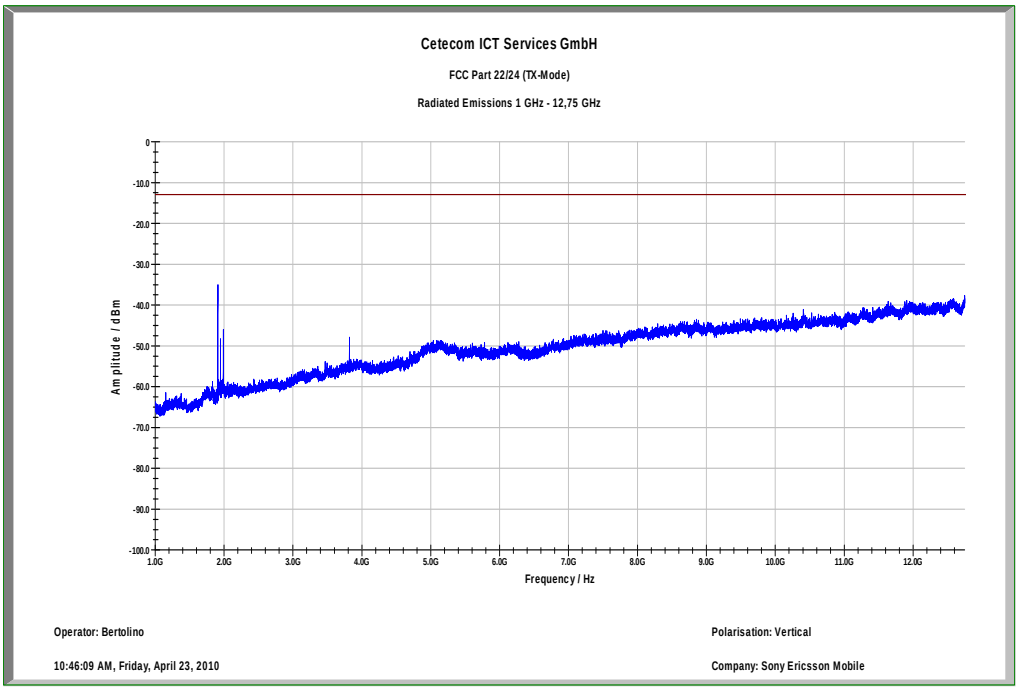
Plot 11: TX mode, channel 661, GSM, 12 GHz - 25 GHz (valid for all channels)



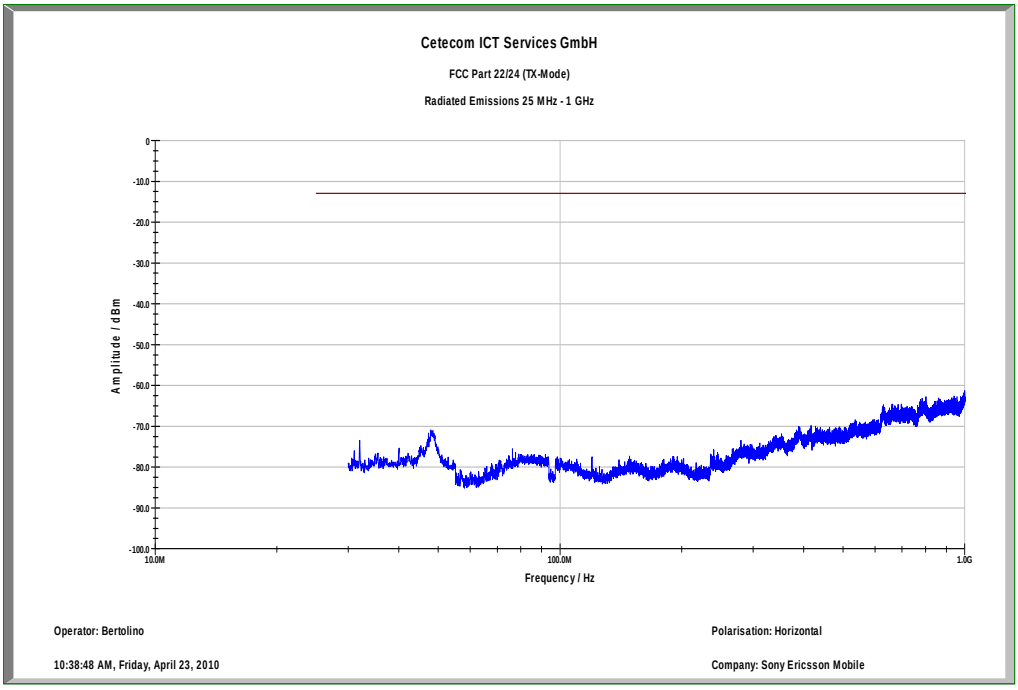
Plot 12: TX mode, channel 810, GSM, 30 MHz – 1 GHz, vertical polarization



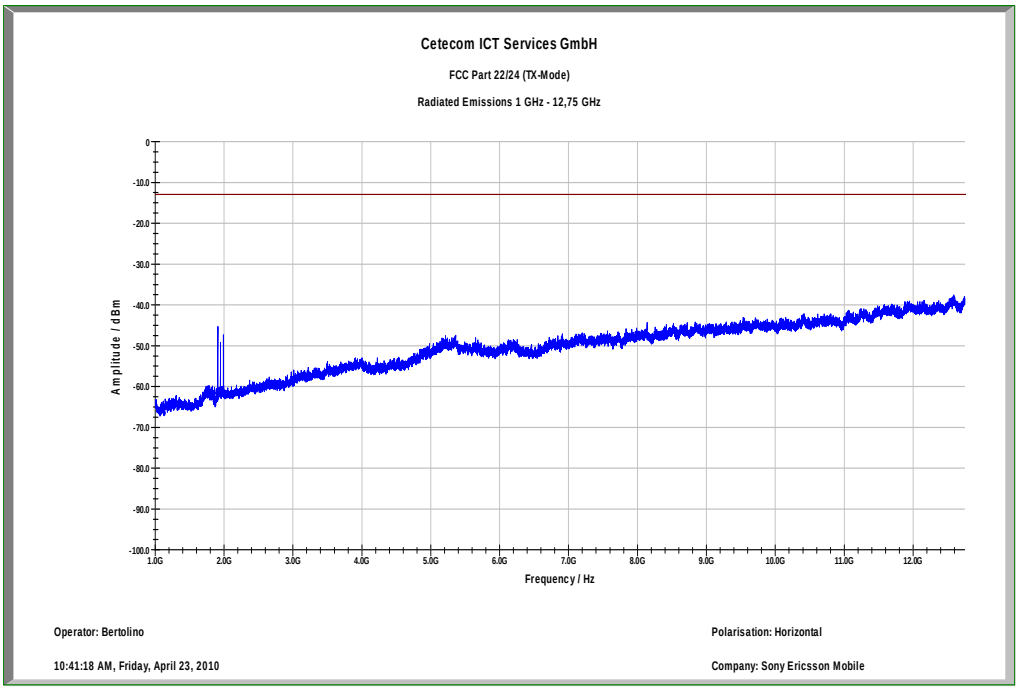
Plot 13: TX mode, channel 810, GSM, 1 GHz – 12.75 GHz, vertical polarization



Plot 14: TX mode, channel 810, GSM, 30 MHz – 1 GHz, horizontal polarization



Plot 15: TX mode, channel 810, GSM, 1 GHz – 12.75 GHz, horizontal polarization



The carrier signal is notched with a 1.9 GHz band rejection filter.

5.1.4 Conducted Spurious Emissions

Reference

FCC:	CFR Part 24.238, 2.10.51
IC:	RSS 133, Issue 5, Section 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 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:

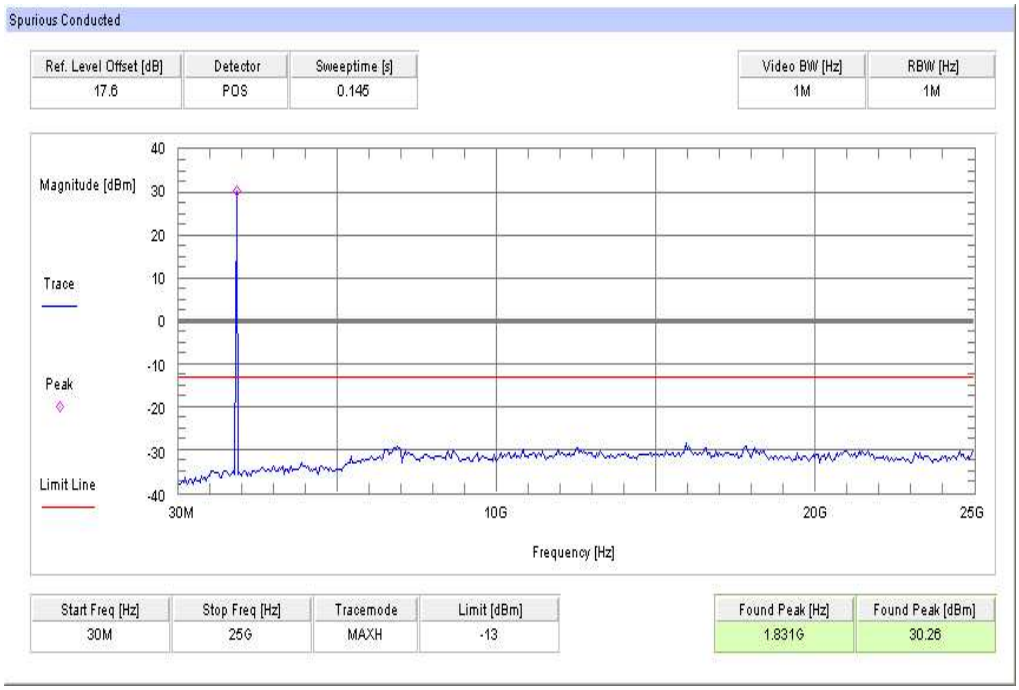
(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

Measurement Results:

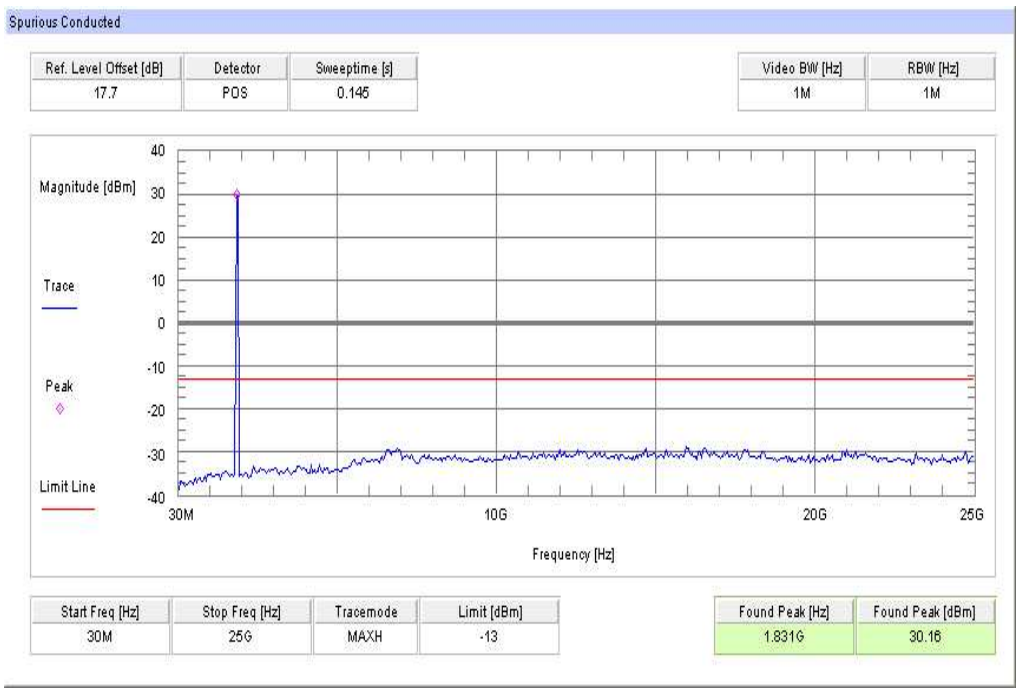
Harmonic	Tx ch.-512 Freq. (MHz)	Level (dBm)	Tx ch.-661 Freq. (MHz)	Level (dBm)	Tx ch.-810 Freq. (MHz)	Level (dBm)
2	3700.4	No harmonics detected!	3760	No harmonics detected!	3819.6	No harmonics detected!
3	5550.6		5640		5729.4	
4	7400.8		7520		7639.2	
5	9251.0		9400		9549.0	
6	11101.2		11280		11458.8	
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.

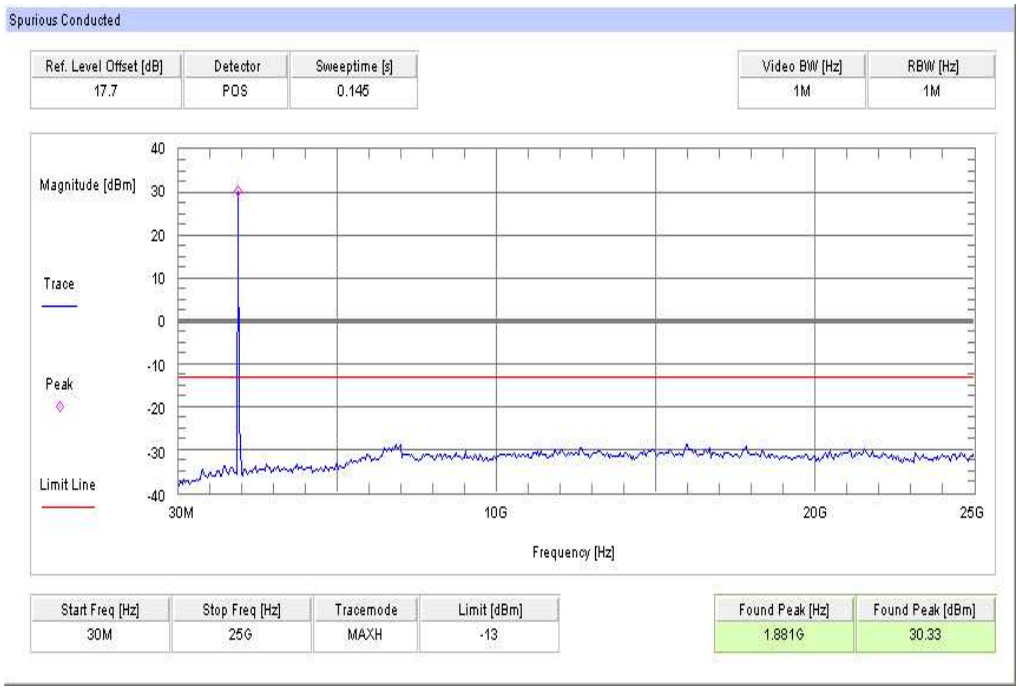
Plot 1: TX mode, channel 512, GSM, 30 MHz – 25 GHz



Plot 2: TX mode, channel 661, GSM, 30 MHz – 25 GHz



Plot 3: TX mode, channel 810, GSM, 30 MHz – 25 GHz



5.1.5 Block Edge Compliance

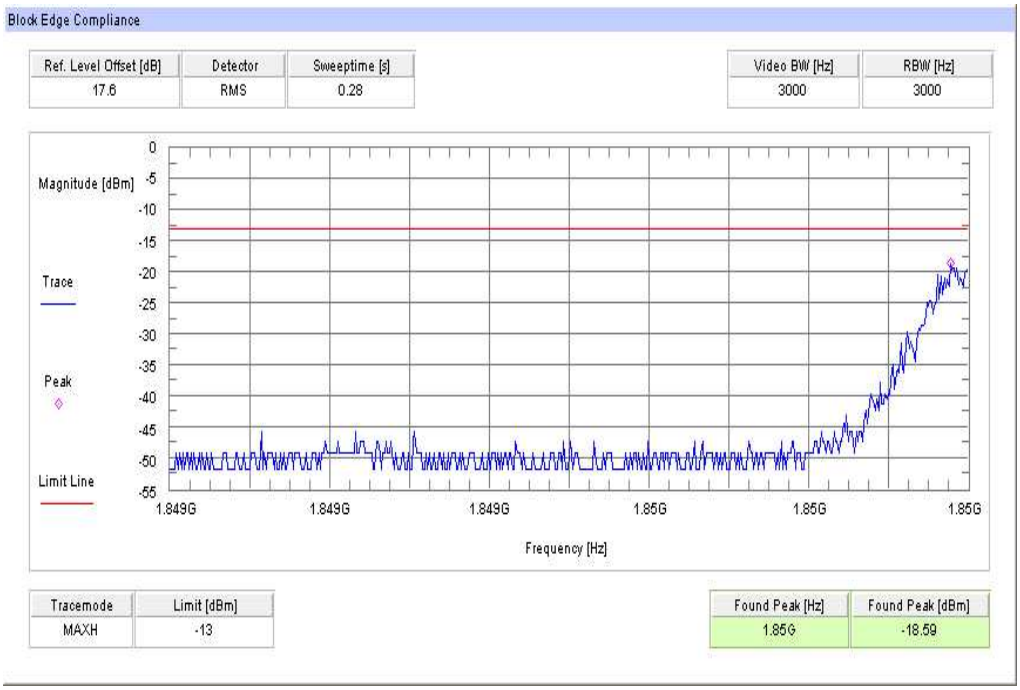
Reference

FCC:	CFR Part 24.238
IC:	RSS 133, Issue 5, Section 6.5

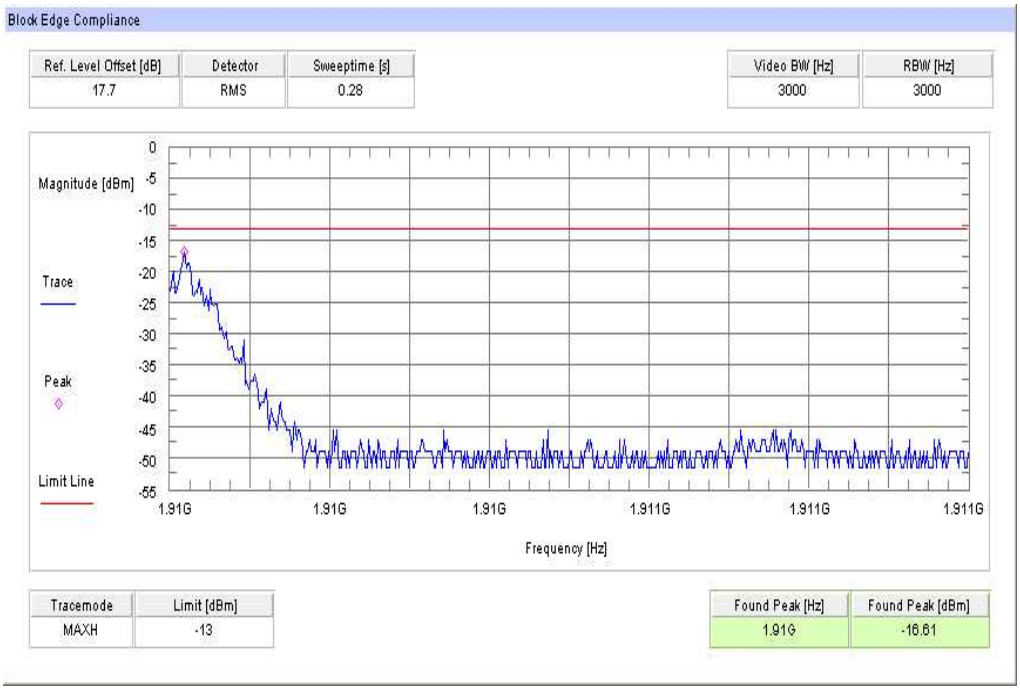
Measurement Limit:

(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+10 Log (P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

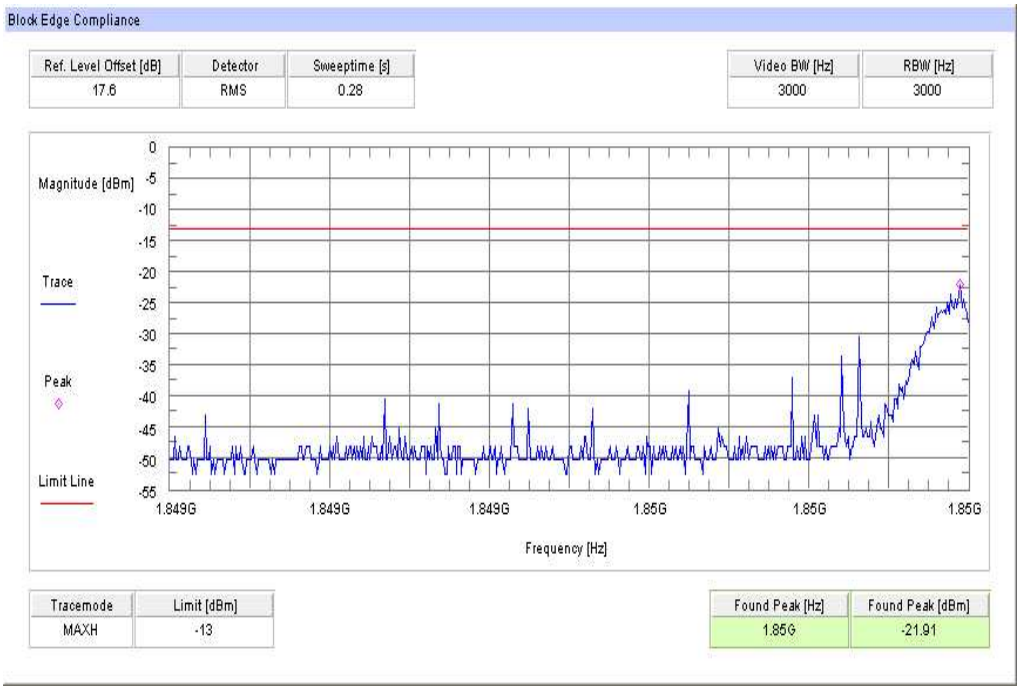
Plot 1: TX mode, channel 512, GSM, block 1



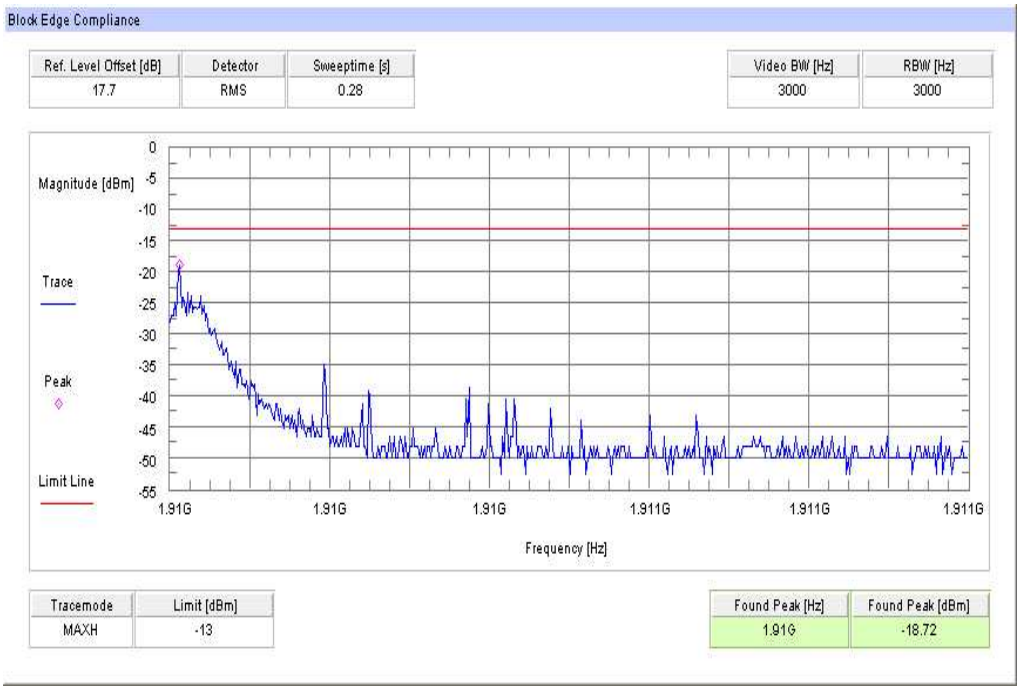
Plot 2: TX mode, channel 810, GSM, block 6



Plot 3: TX mode, channel 512, EGPRS / EDGE, block 1



Plot 4: TX mode, channel 810, EGPRS / EDGE, block 6



5.1.6 Occupied Bandwidth

Reference

FCC:	CFR Part 24.238, 2.1049
IC:	RSS 133, Issue 5, Section 6.5

Occupied Bandwidth Results

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

Normal mode

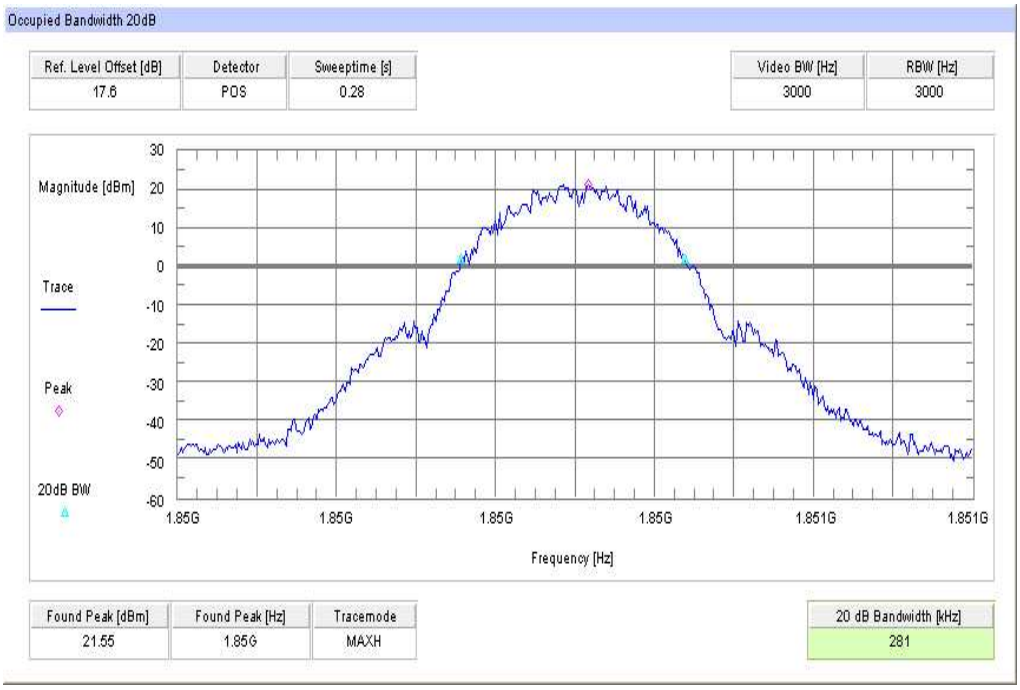
Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1850.2 MHz	281	315
1880.0 MHz	273	311
1909.8 MHz	267	313

EDGE mode

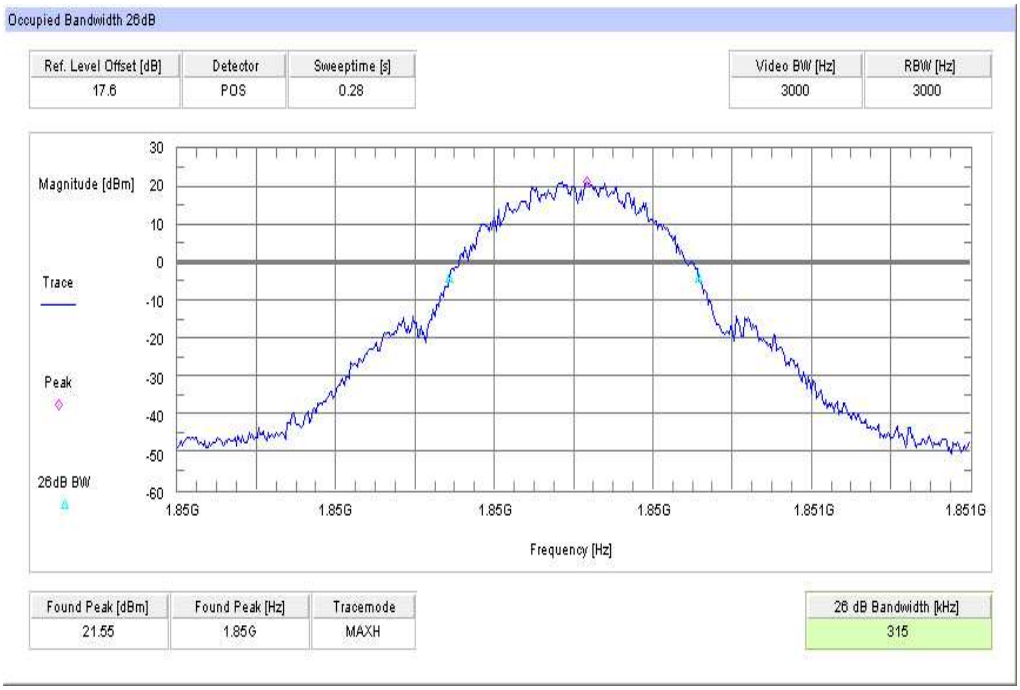
Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1850.2 MHz	279	309
1880.0 MHz	263	315
1909.8 MHz	257	317

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.

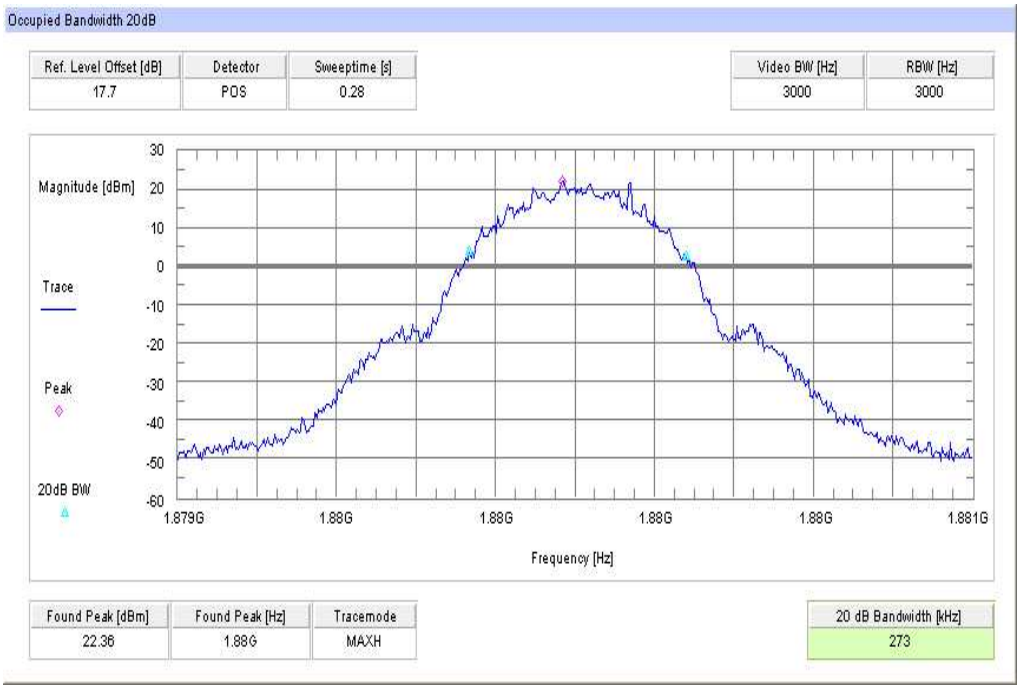
Plot 1: TX mode, channel 512, GSM, 99% (-20 dB) Occupied Bandwidth



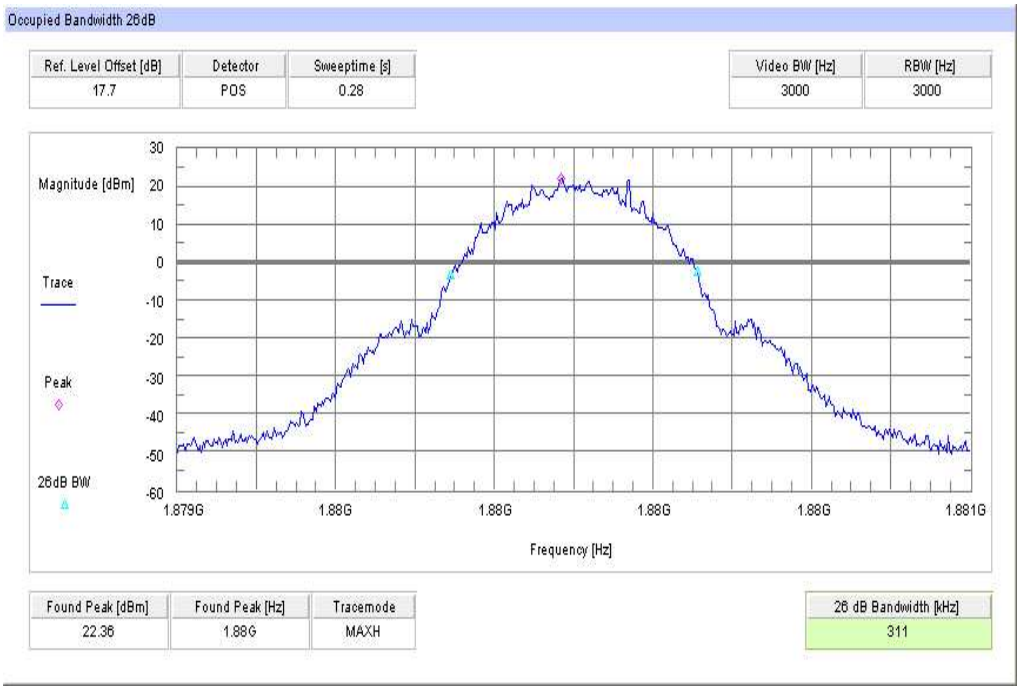
Plot 2: TX mode, channel 512, GSM, -26 dBc Bandwidth



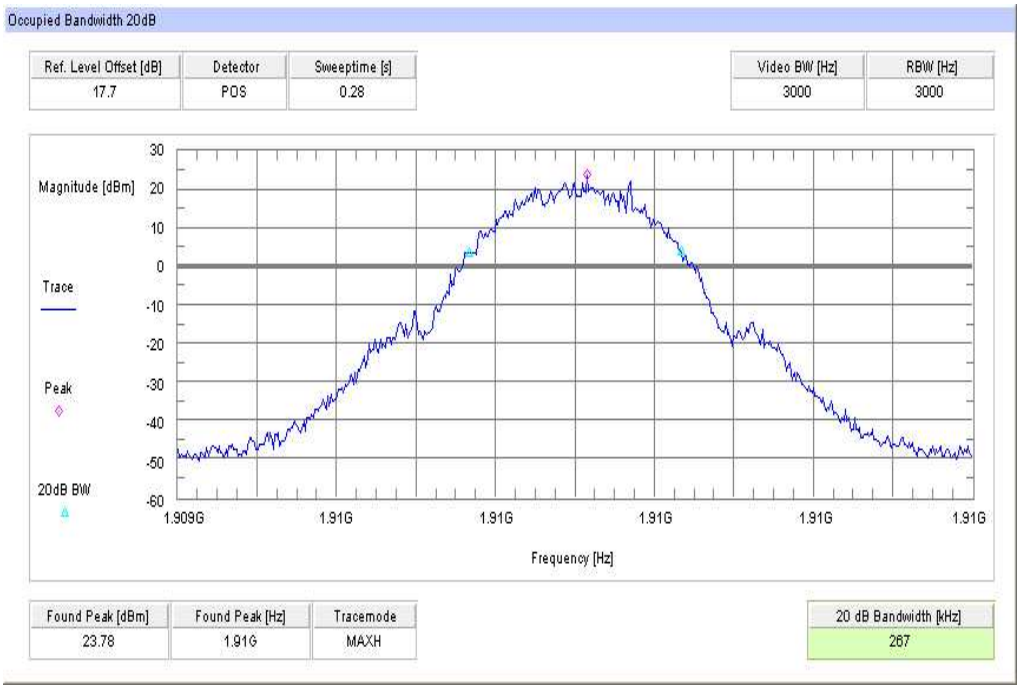
Plot 3: TX mode, channel 661, GSM, 99% (-20 dB) Occupied Bandwidth



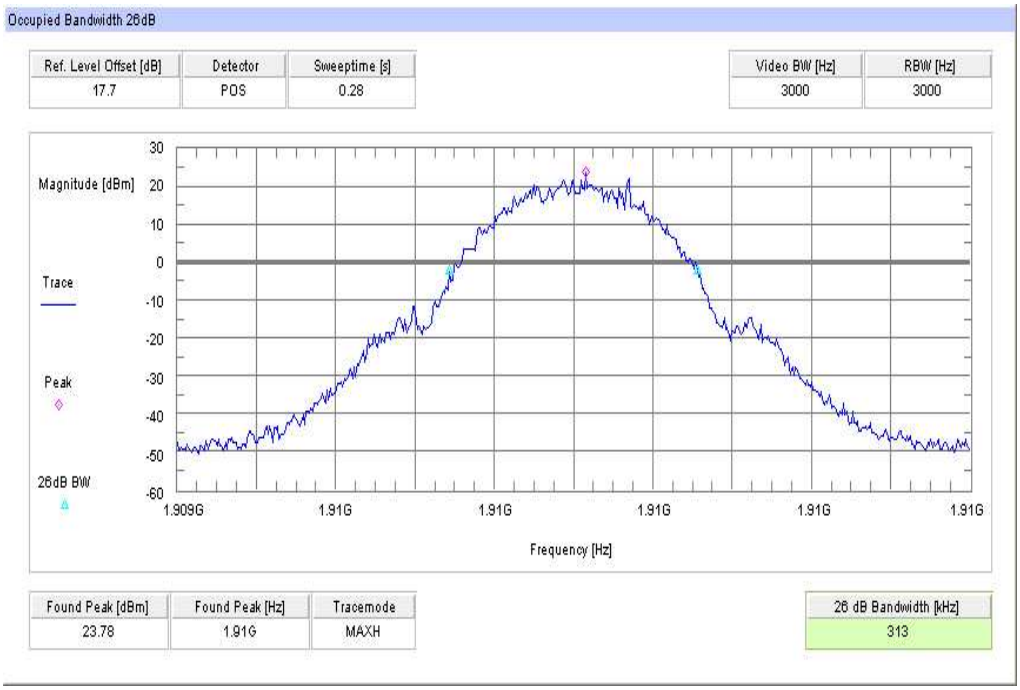
Plot 4: TX mode, channel 661, GSM, -26 dBc Bandwidth



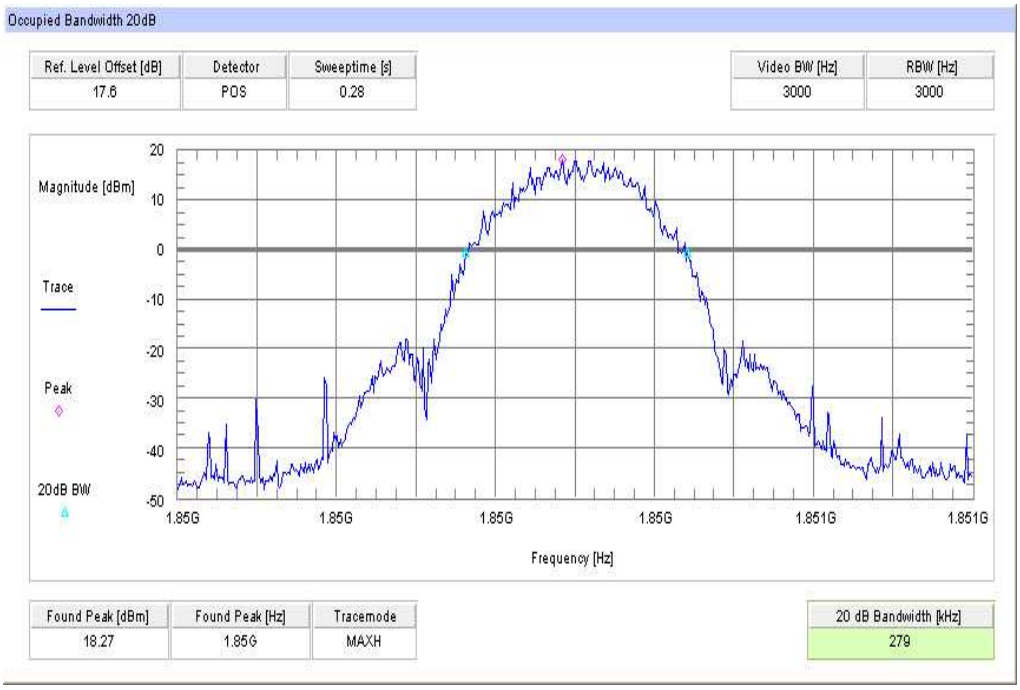
Plot 5: TX mode, channel 810, GSM, 99% (-20 dB) Occupied Bandwidth



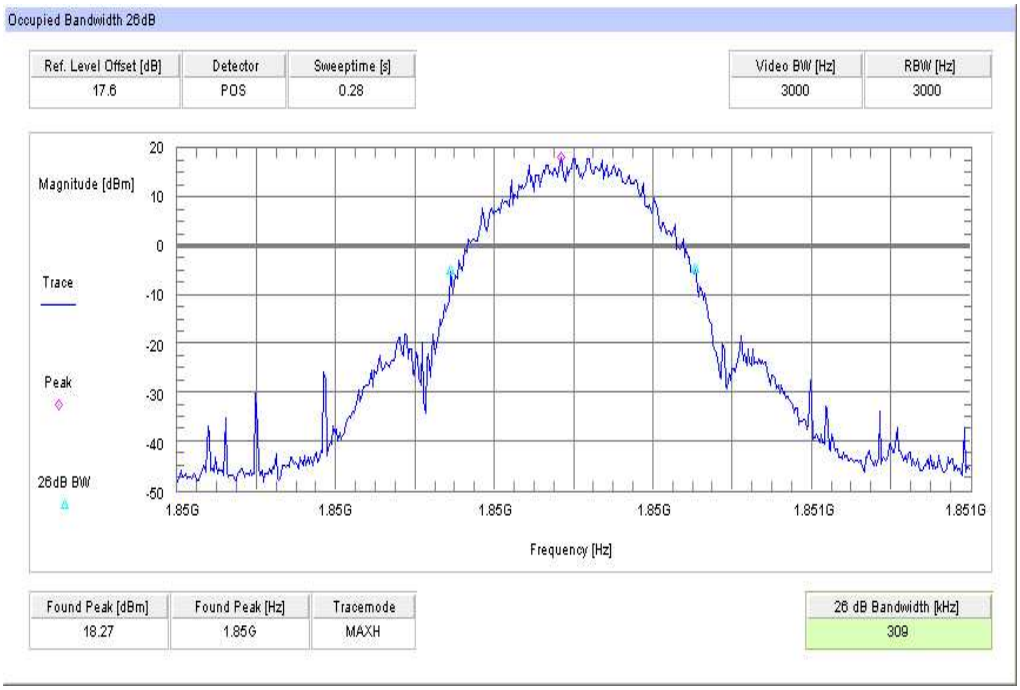
Plot 6: TX mode, channel 810, GSM, -26 dBc Bandwidth



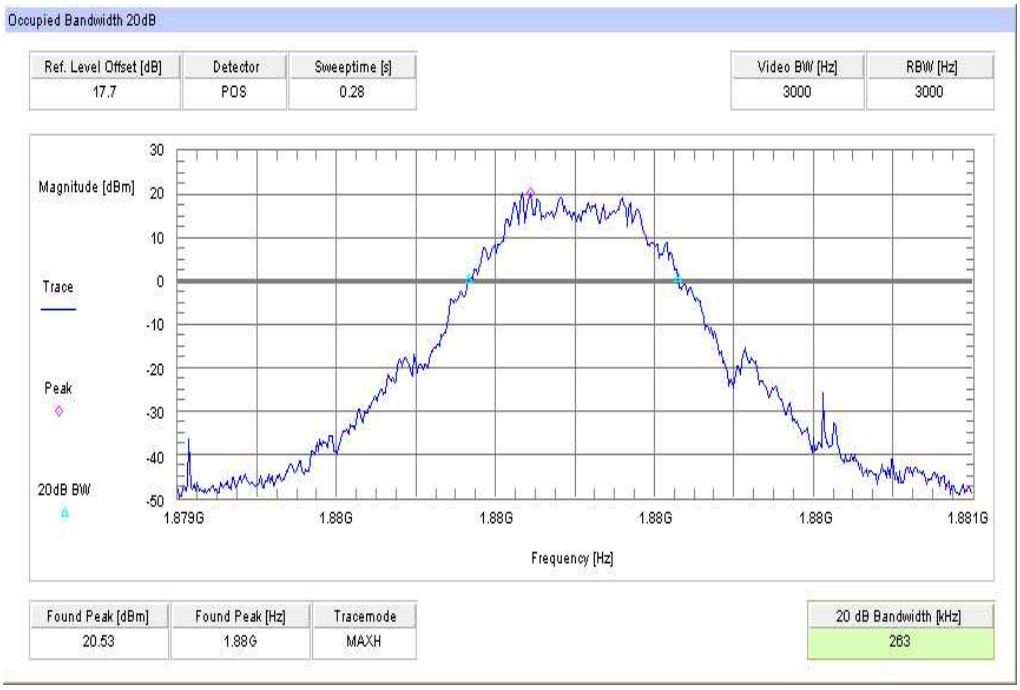
Plot 7: TX mode, channel 512, EGPRS / EDGE, 99% (-20 dB) Occupied Bandwidth



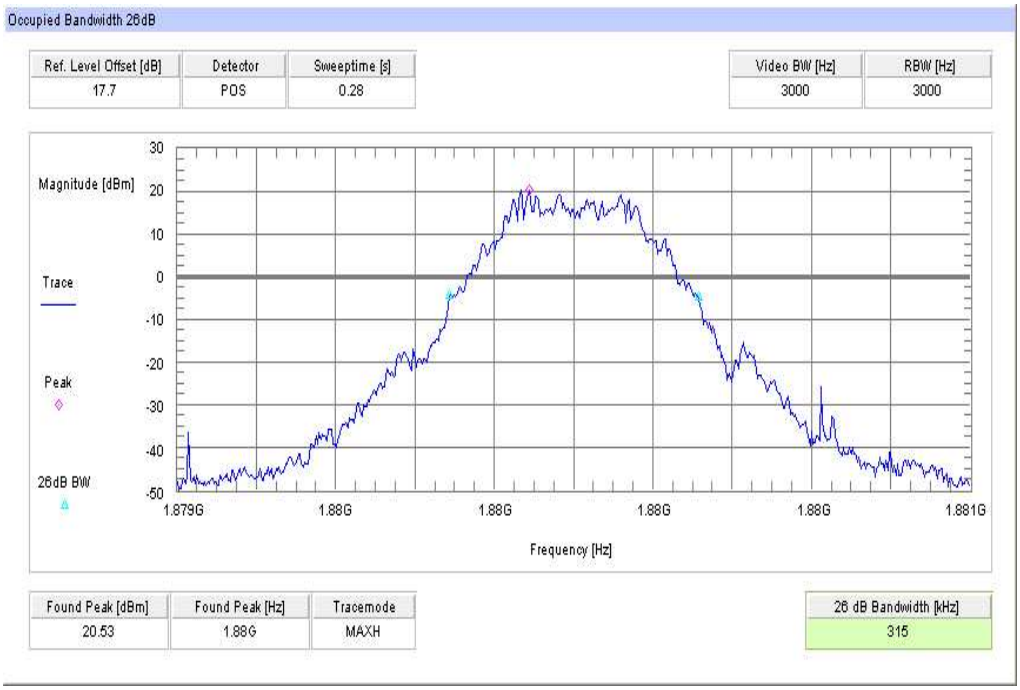
Plot 8: TX mode, channel 512, EGPRS / EDGE, -26 dBc Bandwidth



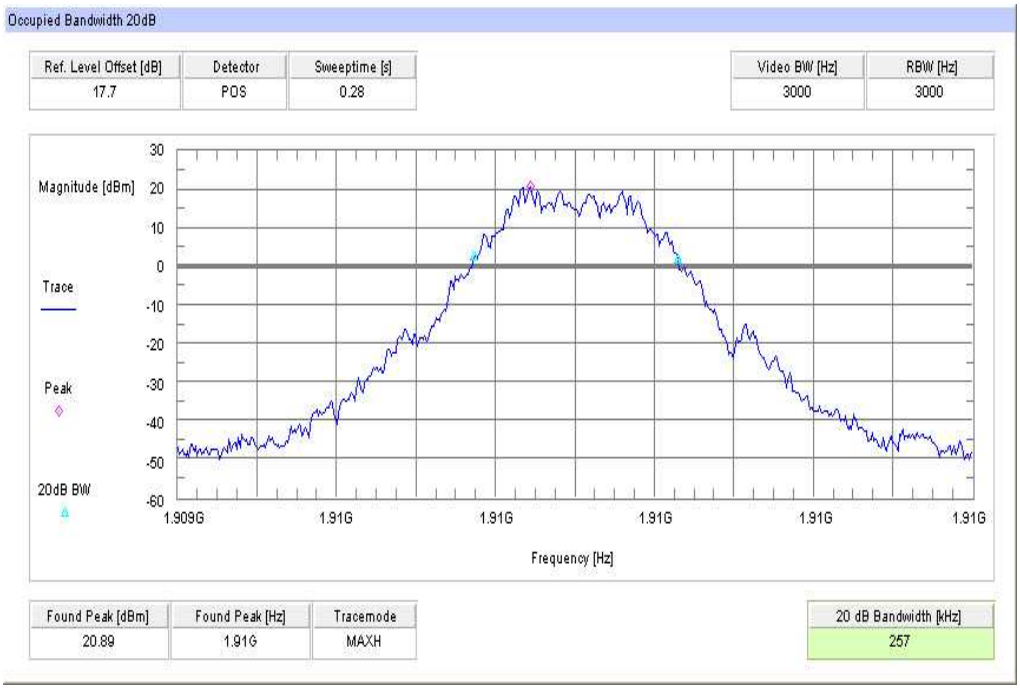
Plot 9: TX mode, channel 661, EGPRS / EDGE, 99% (-20 dB) Occupied Bandwidth



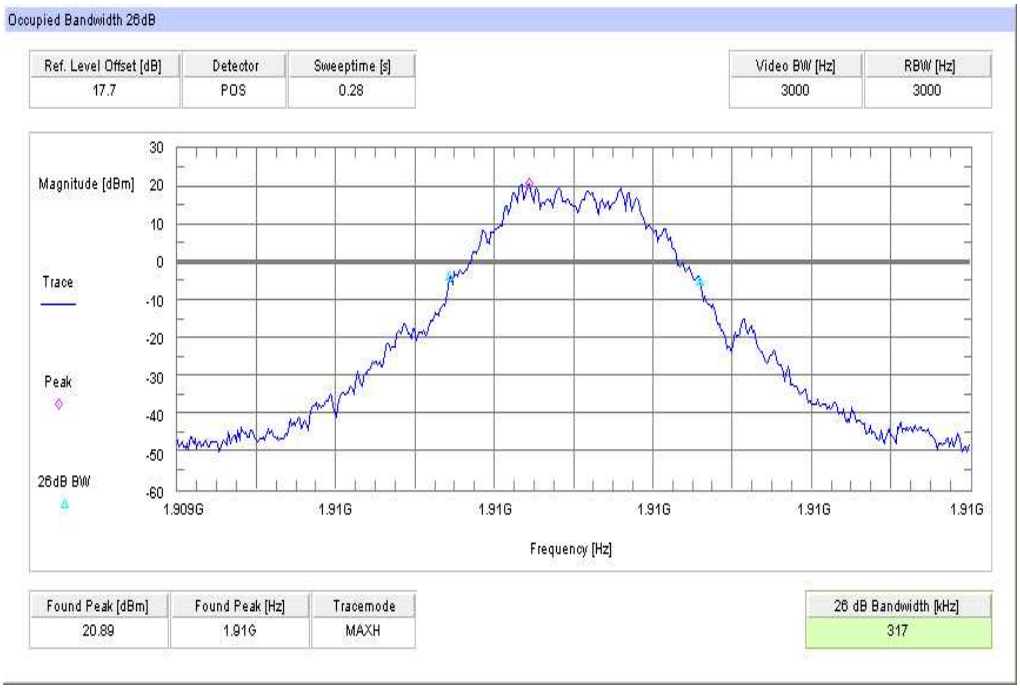
Plot 10: TX mode, channel 661, EGPRS / EDGE, -26 dBc Bandwidth



Plot 11: TX mode, channel 810, EGPRS / EDGE, 99% (-20 dB) Occupied Bandwidth



Plot 12: TX mode, channel 810, EGPRS / EDGE, -26 dBc Bandwidth



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

Test Results: Output Power (conducted) GMSK Mode

Frequency (MHz)	Average Output Power (dBm)	Peak-to-Average Ratio (dB)
824.2	33.19	0.1
836.4	32.96	0.1
848.8	32.80	0.1
Measurement uncertainty	±0.5 dB	

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

Frequency (MHz)	Average Output Power (dBm)	Peak-to-Average Ratio (dB)
824.2	26.64	3.1
836.4	26.77	3.1
848.8	26.61	3.1
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

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

Frequency (MHz)	Average (dBm)
824.2	29.47
836.4	30.24
848.8	30.89
Measurement uncertainty	±3 dB

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

Frequency (MHz)	Average (dBm)
824.2	22.82
836.4	23.95
848.8	24.60
Measurement uncertainty	±3 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	137.8	26.6	8.4	0.0	3.3	31.7	UHAP Schwarzbeck S/N 460

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

5.2.2 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:

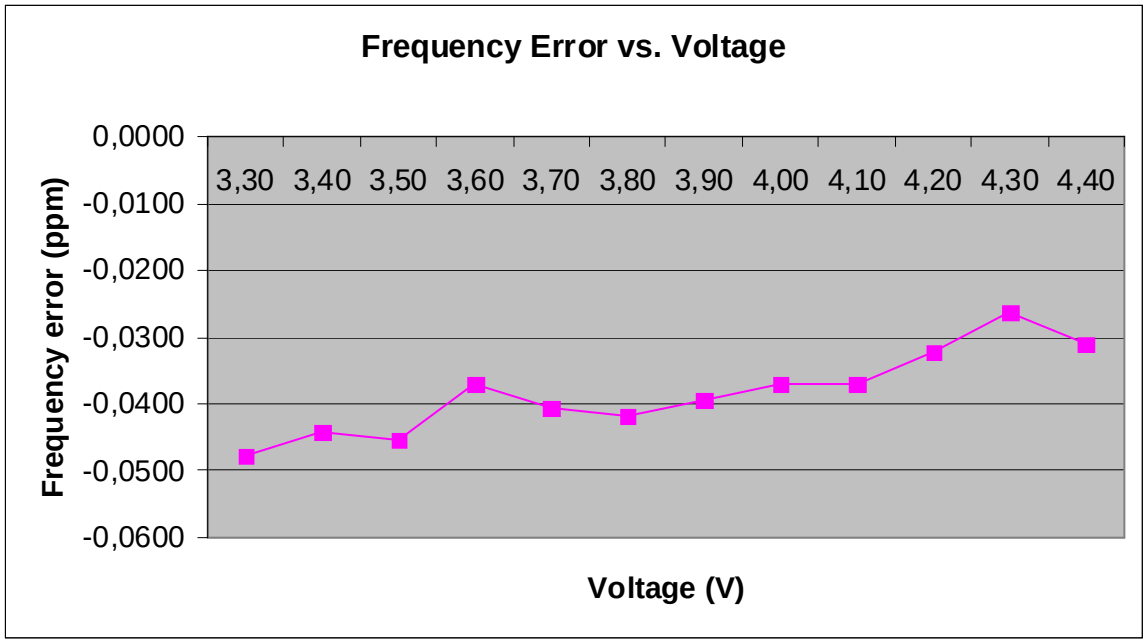
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 22.355, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission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

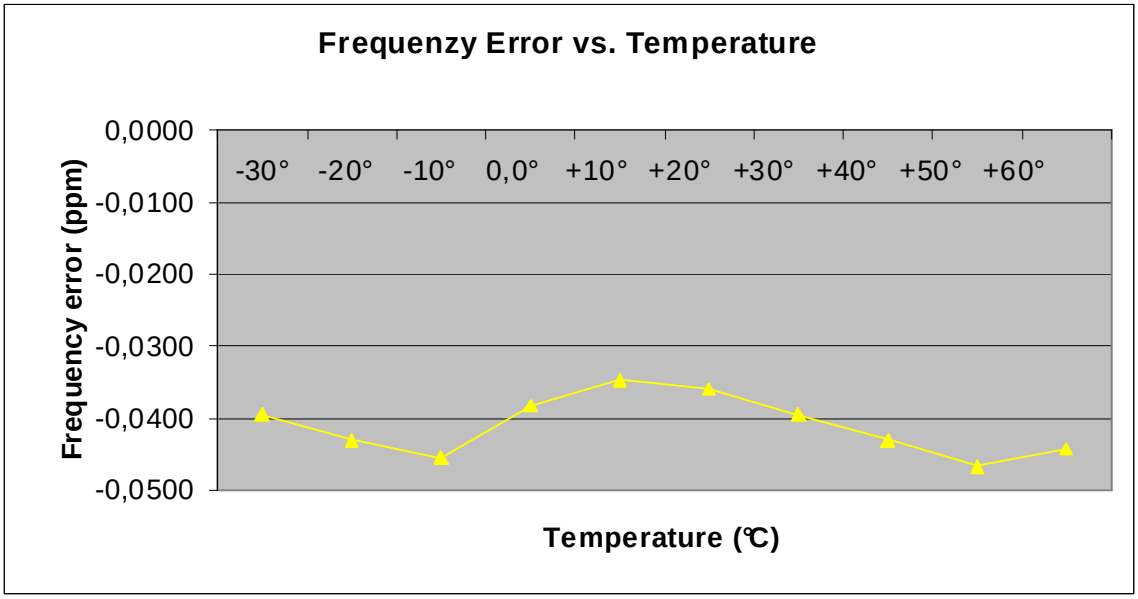
Measurement Results: **AFC FREQ ERROR vs. VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	-40	-0,00000478	-0,0478
3.4	-37	-0,00000442	-0,0442
3.5	-38	-0,00000454	-0,0454
3.6	-31	-0,00000371	-0,0371
3.7	-34	-0,00000407	-0,0407
3.8	-35	-0,00000418	-0,0418
3.9	-33	-0,00000395	-0,0395
4.0	-31	-0,00000371	-0,0371
4.1	-31	-0,00000371	-0,0371
4.2	-27	-0,00000323	-0,0323
4.3	-22	-0,00000263	-0,0263
4.4	-26	-0,00000311	-0,0311

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

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-33	-0,00000395	-0,0395
-20	-36	-0,00000430	-0,0430
-10	-38	-0,00000454	-0,0454
±0.0	-32	-0,00000383	-0,0383
+10	-29	-0,00000347	-0,0347
+20	-30	-0,00000359	-0,0359
+30	-33	-0,00000395	-0,0395
+40	-36	-0,00000430	-0,0430
+50	-39	-0,00000466	-0,0466
+60	-37	-0,00000442	-0,0442


Frequency Error vs. Voltage
0,0000
-0,0100
-0,0200
-0,0300
-0,0400
-0,0500
-0,0600
Frequency error (ppm)
3,30 3,40 3,50 3,60 3,70 3,80 3,90 4,00 4,10 4,20 4,30 4,40
Voltage (V)


Frequenzy Error vs. Temperature
0,0000
-0,0100
-0,0200
-0,0300
-0,0400
-0,0500
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 show the worst case.
The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked, too. The found values are stated in the table below.

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

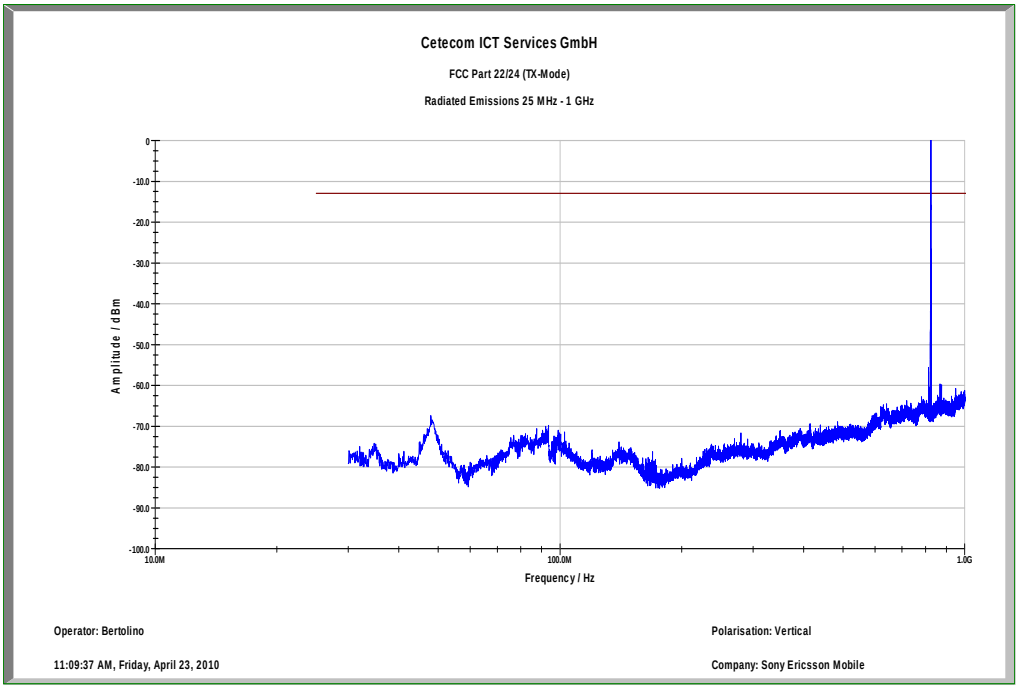
Harmonic	Tx ch.-128 Freq. (MHz)	Level (dBm)	Tx ch.-189 Freq. (MHz)	Level (dBm)	Tx ch.-251 Freq. (MHz)	Level (dBm)
2	1648.4	-40.09 dBm vertical -37.74 dBm horizontal	1672.8	-36.59 dBm vertical -37.94 dBm horizontal	1697.6	-38.56 dBm vertical -36.55 dBm horizontal
3	2472.6	-29.94 dBm vertical -33.15 dBm horizontal	2509.2	-28.71 dBm vertical -31.07 dBm horizontal	2546.4	-27.94 dBm vertical -30.40 dBm horizontal
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:

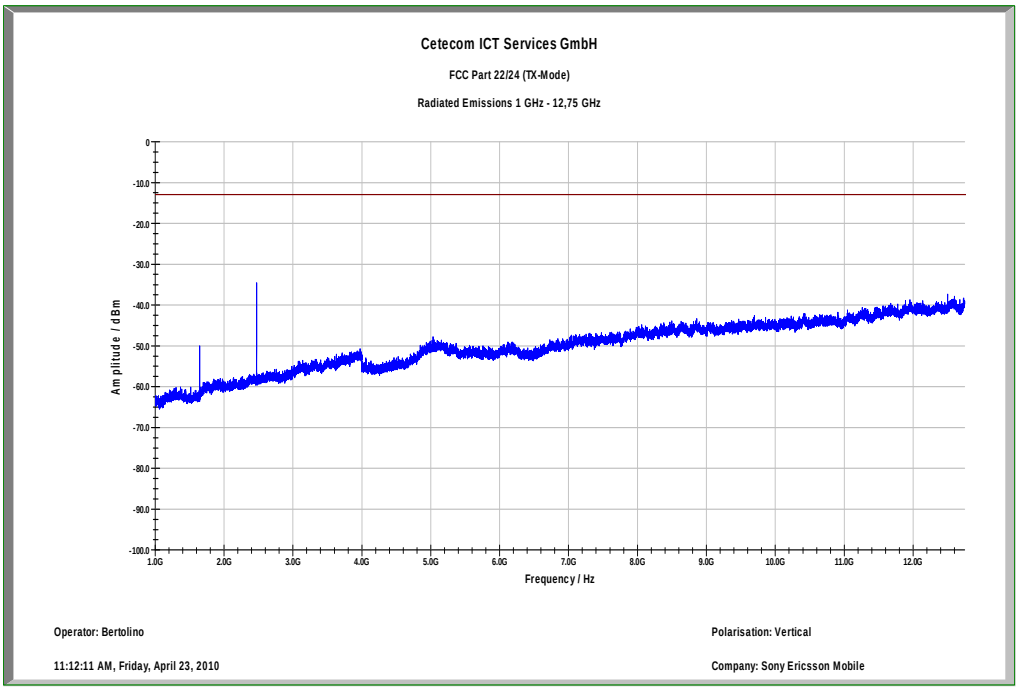
Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERP	Substitution Antenna
MHz	dBµV	dBm	dBi	dBd	dB	dBm	
848.8	137.8	26.6	8.4	0.0	3.3	31.7	UHAP Schwarzbeck S/N 460

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

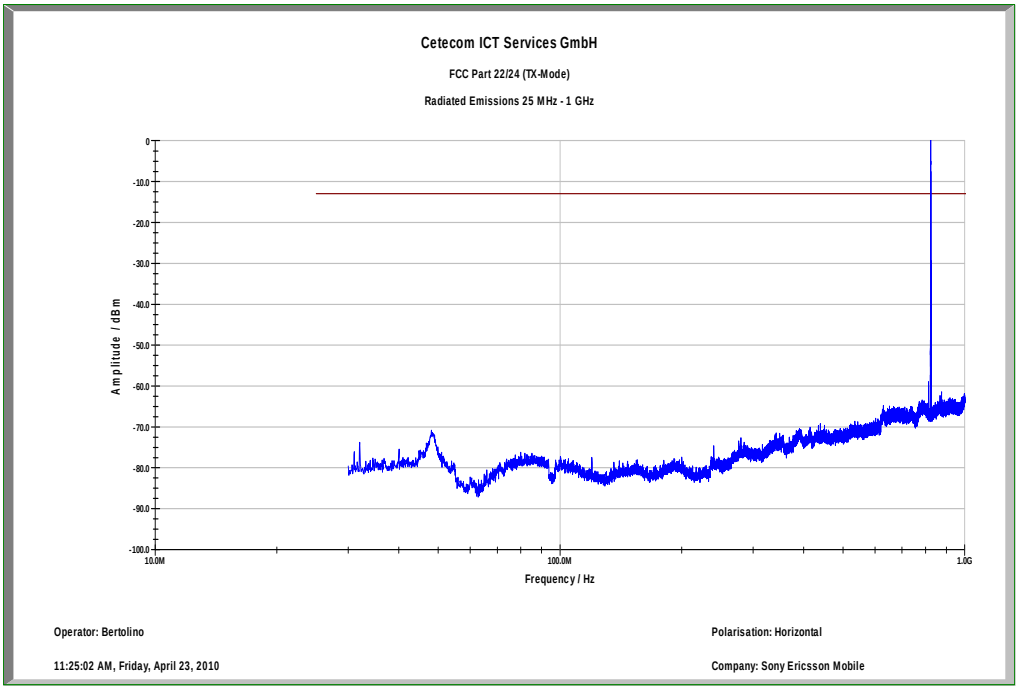
Plot 1: TX mode, channel 128, GSM, 30 MHz – 1 GHz, vertical polarization



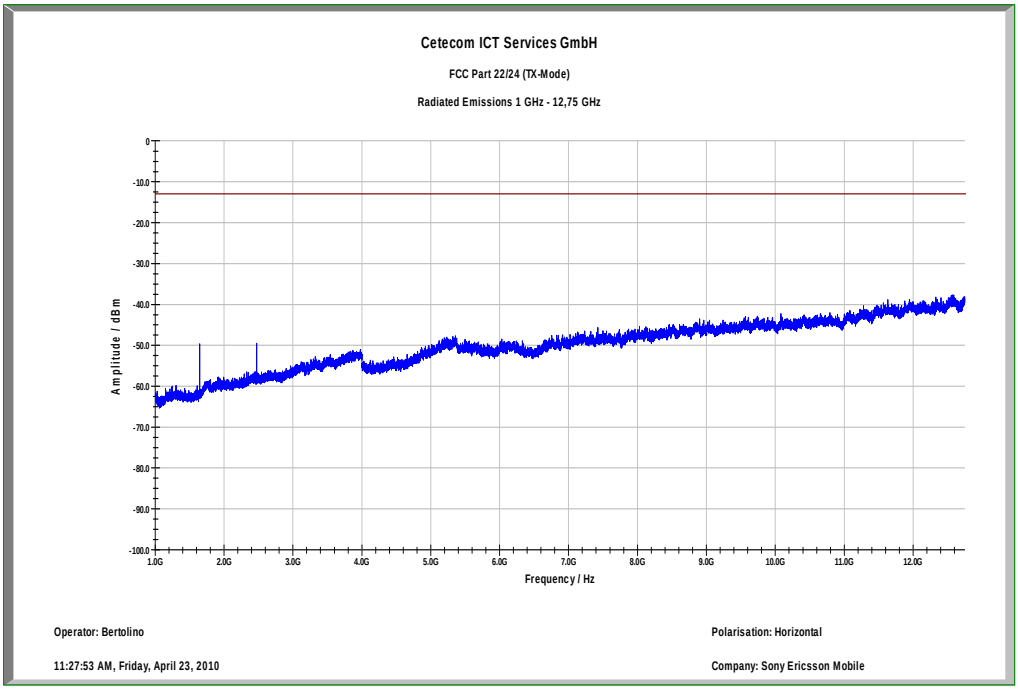
Plot 2: TX mode, channel 128, GSM, 1 GHz – 12.75 GHz, vertical polarization



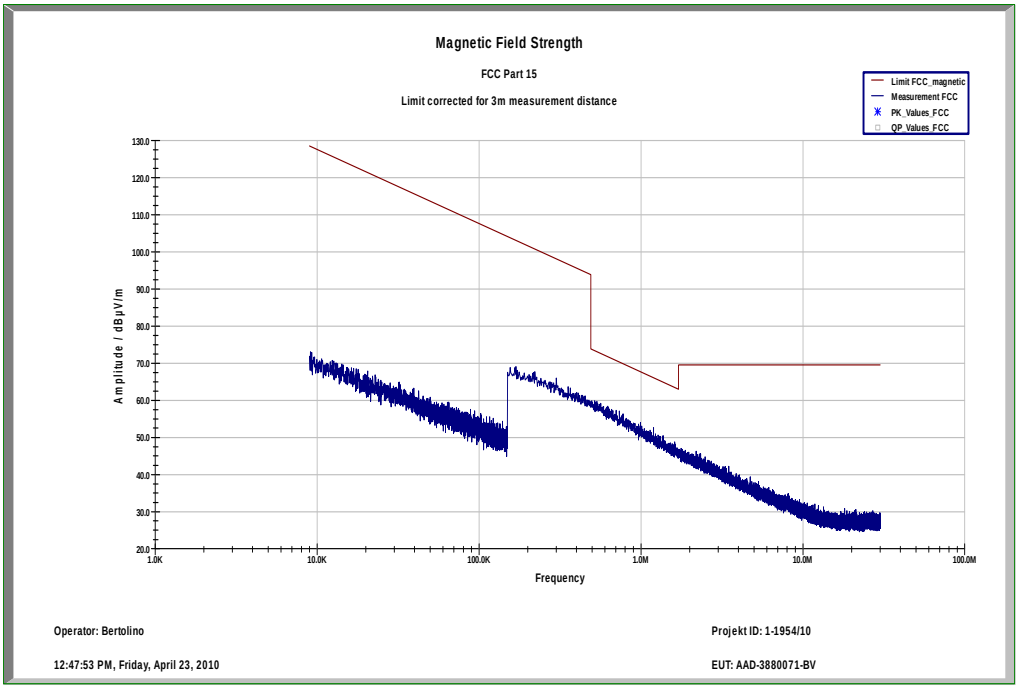
Plot 3: TX mode, channel 128, GSM, 30 MHz – 1 GHz, horizontal polarization



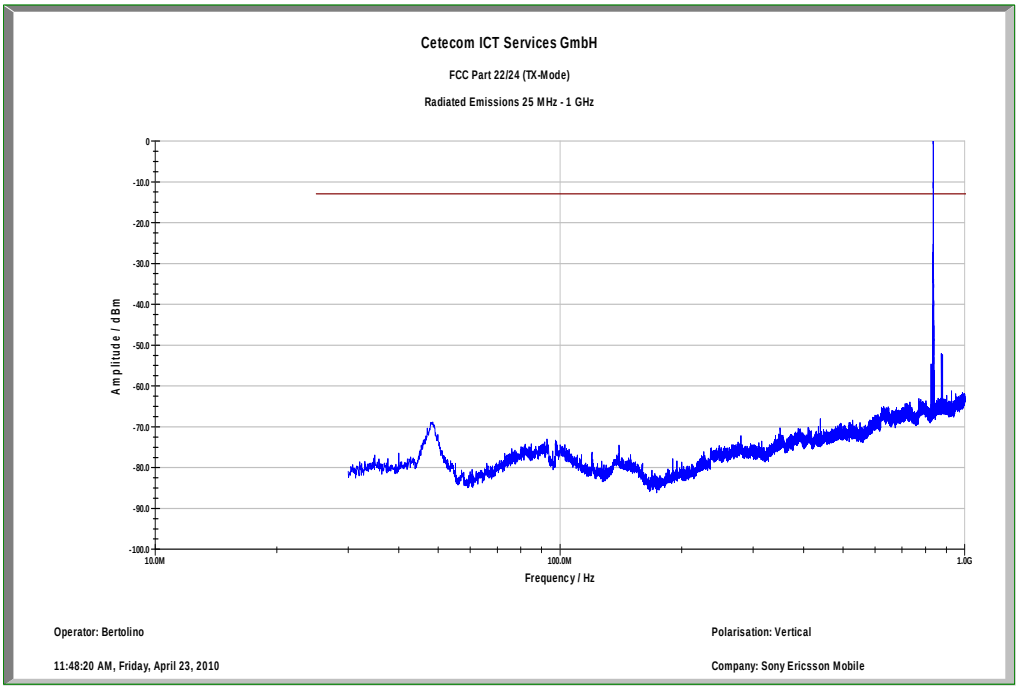
Plot 4: TX mode, channel 128, GSM, 1 GHz – 12.75 GHz, horizontal polarization



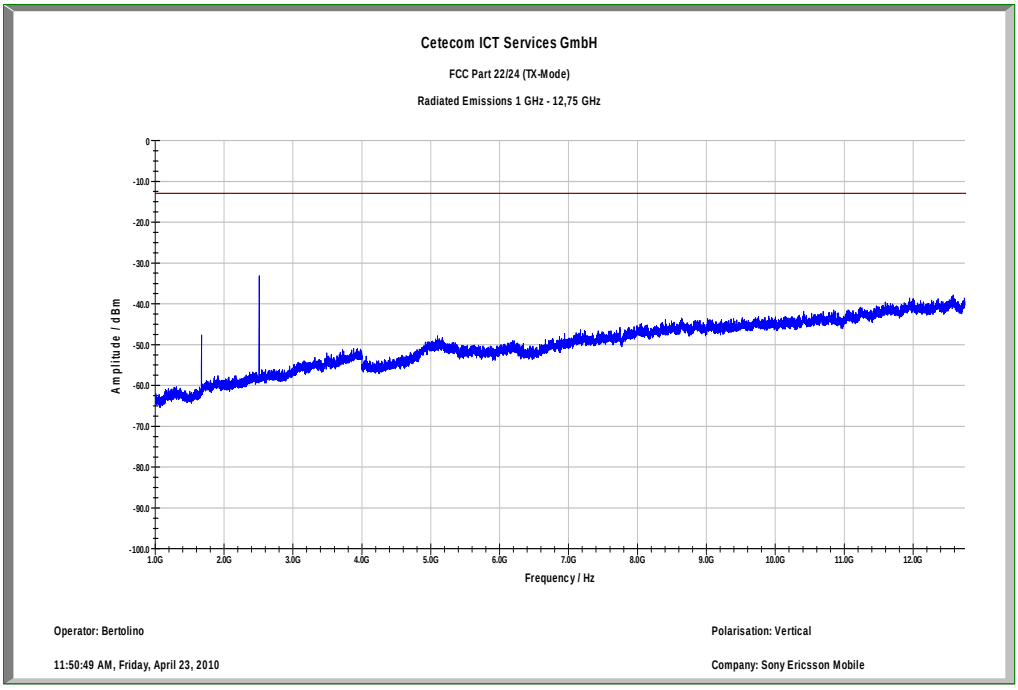
Plot 5: TX mode, channel 189, GSM, 10 kHz - 30 MHz (valid for all channels)



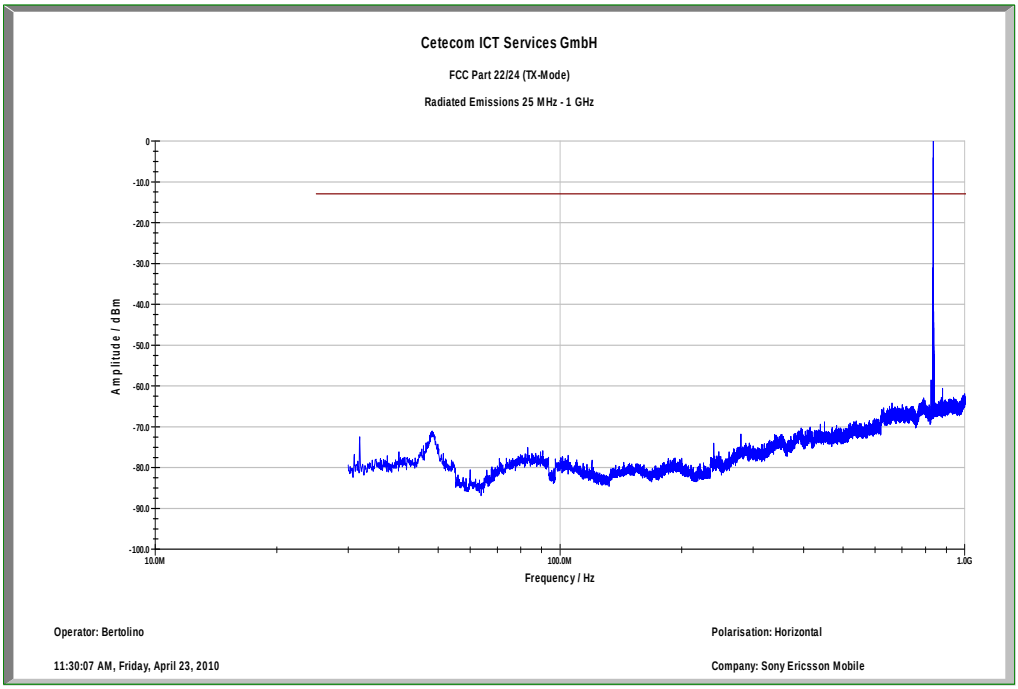
Plot 7: TX mode, channel 189, GSM, 30 MHz – 1 GHz, vertical polarization



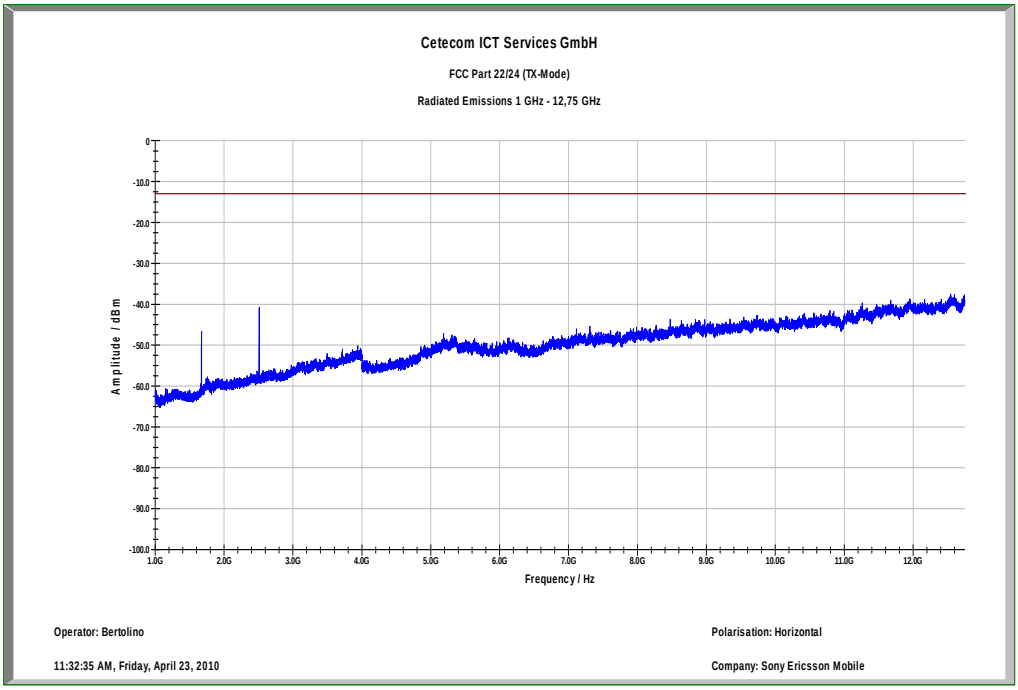
Plot 8: TX mode, channel 189, GSM, 1 GHz – 12.75 GHz, vertical polarization



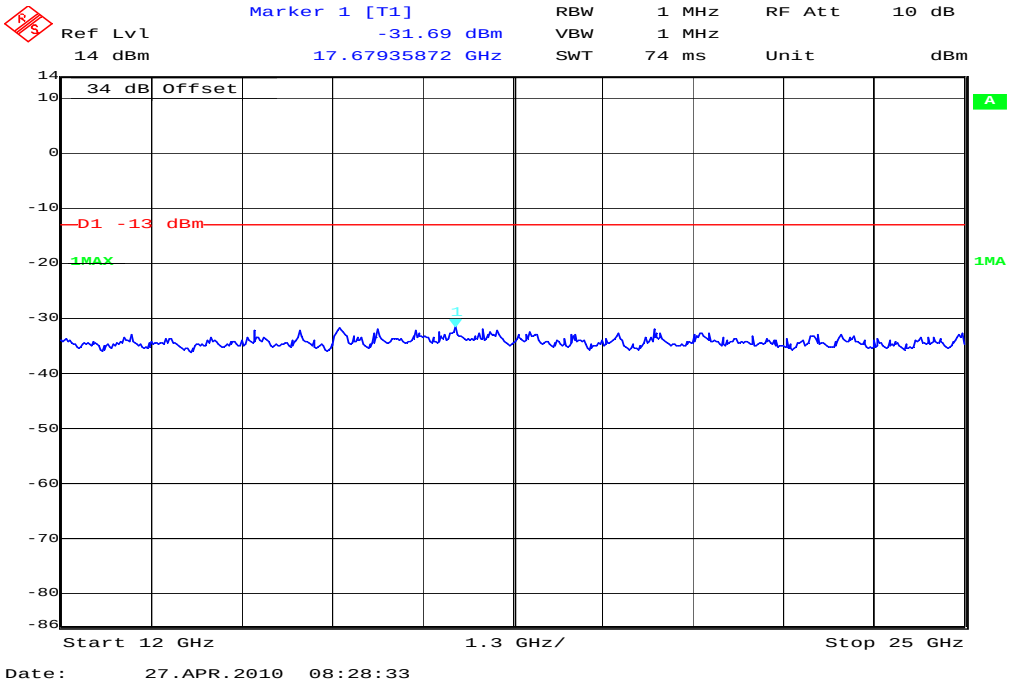
Plot 9: TX mode, channel 189, GSM, 30 MHz – 1 GHz, horizontal polarization



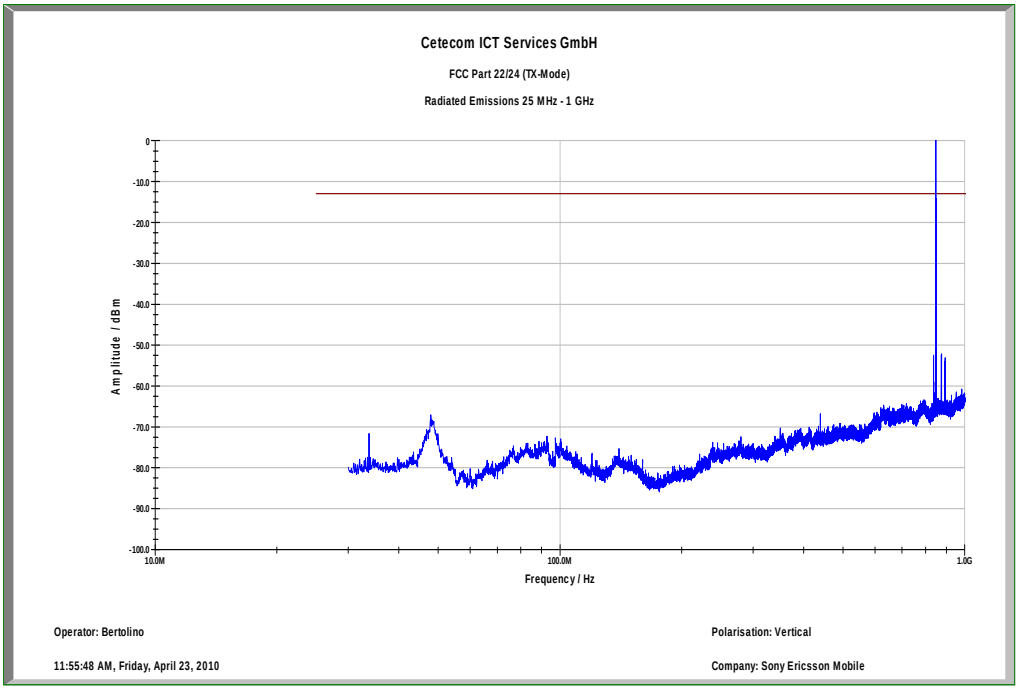
Plot 10: TX mode, channel 189, GSM, 1 GHz – 12.75 GHz, horizontal polarization



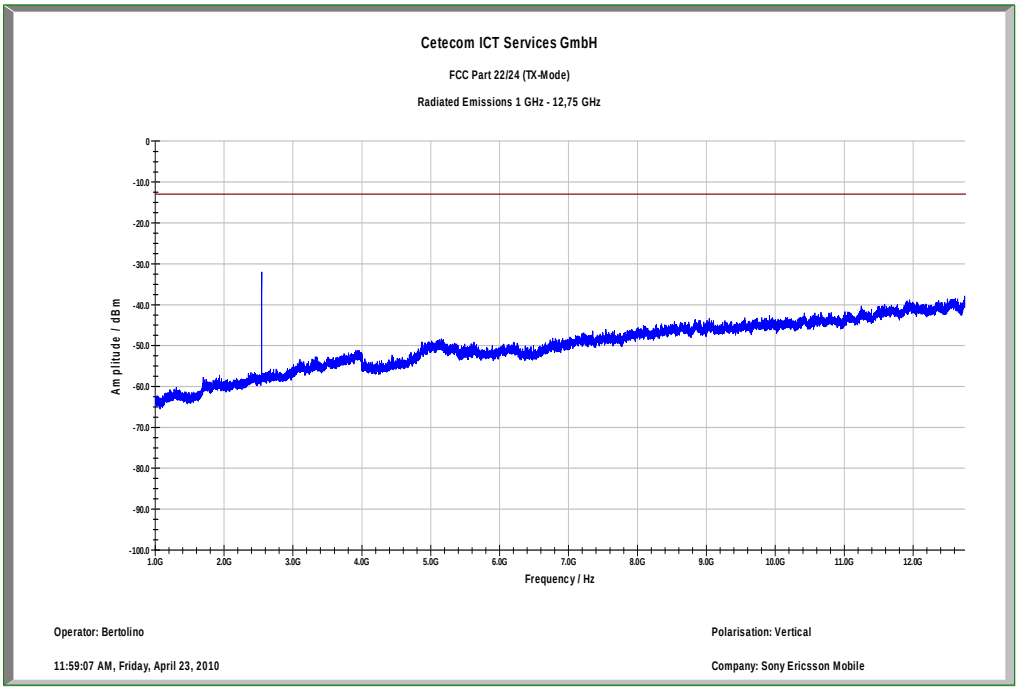
Plot 11: TX mode, channel 189, GSM, 12 GHz - 25 GHz (valid for all channels)



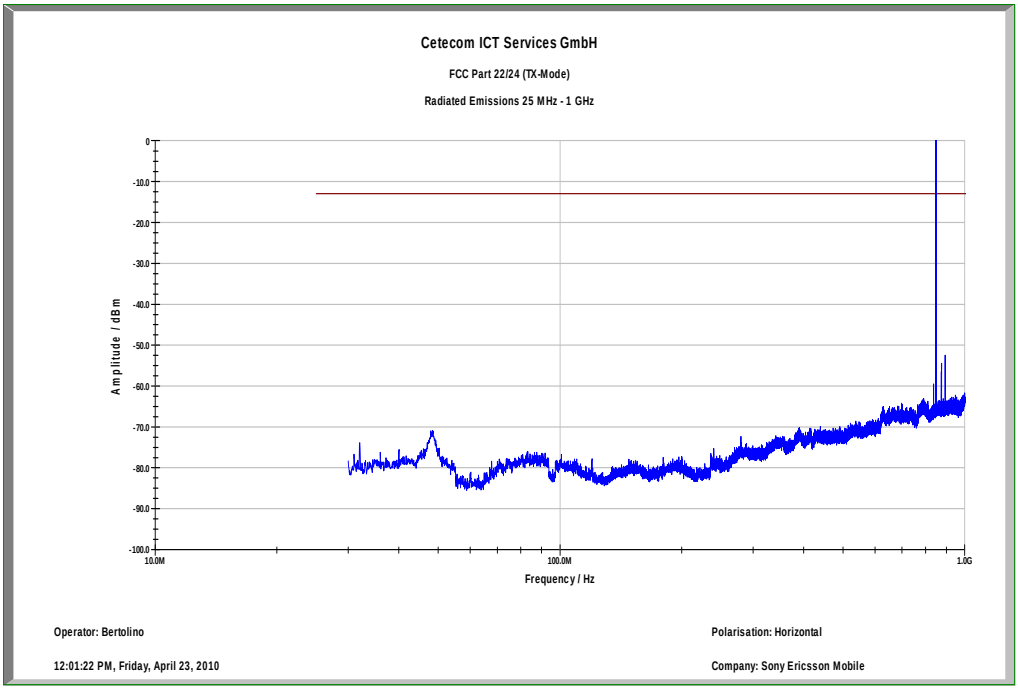
Plot 12: TX mode, channel 251, GSM, 30 MHz – 1 GHz, vertical polarization



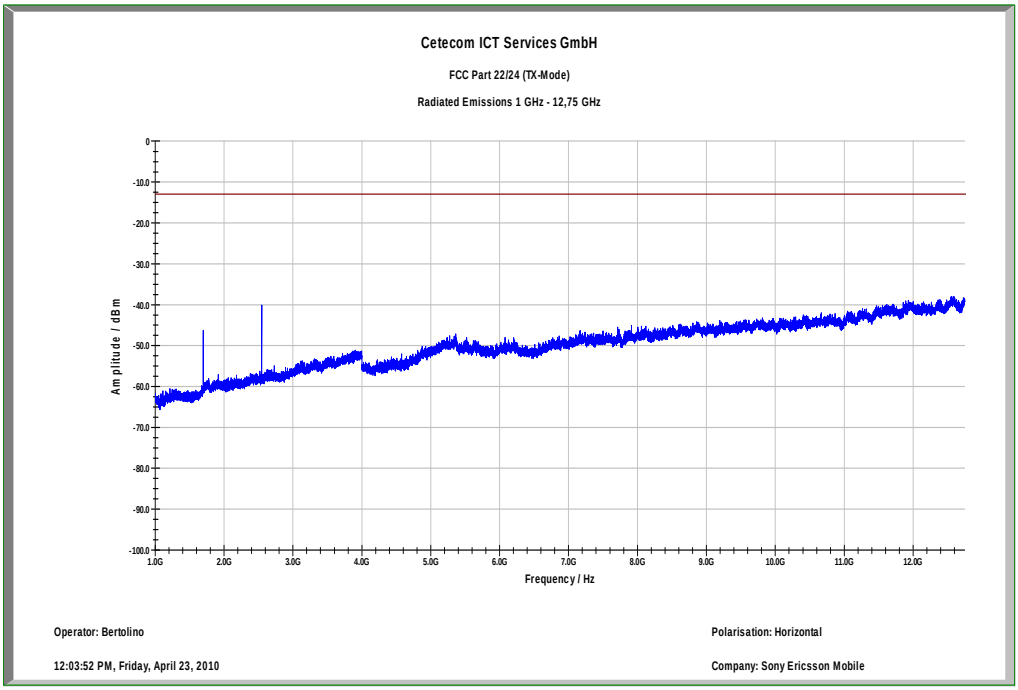
Plot 13: TX mode, channel 251, GSM, 1 GHz – 12.75 GHz, vertical polarization



Plot 14: TX mode, channel 251, GSM, 30 MHz – 1 GHz, horizontal polarization



Plot 16: TX mode, channel 251, GSM, 1 GHz – 12.75 GHz, horizontal polarization



5.2.4 Conducted Spurious Emissions

Reference

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

Measurement Procedure

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.

2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

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

Measurement Limit:

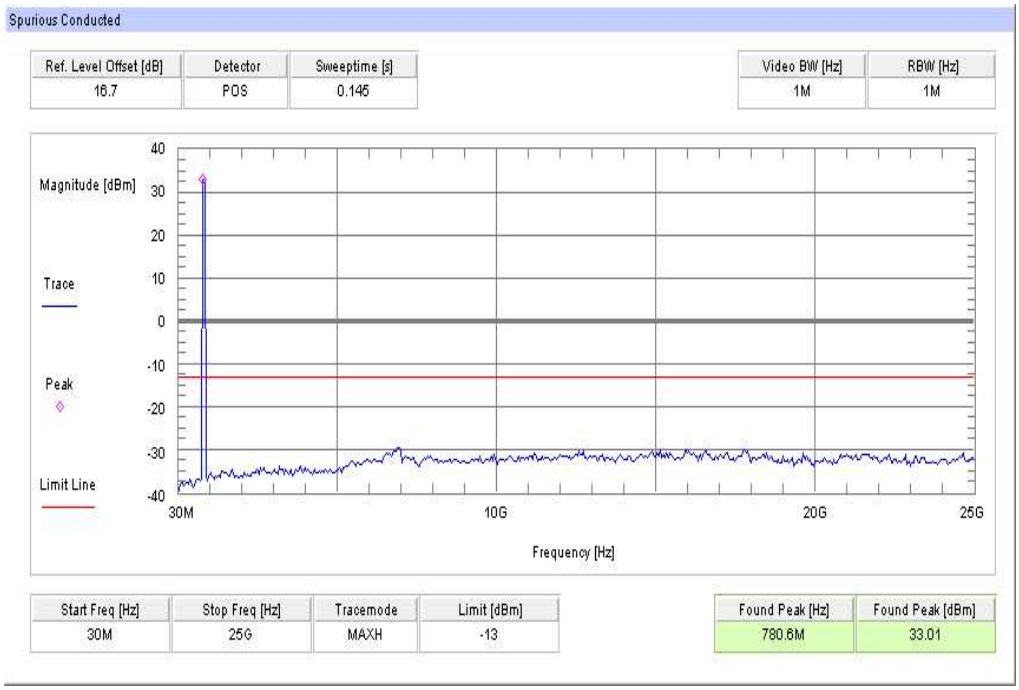
(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log (P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

Measurement Results:

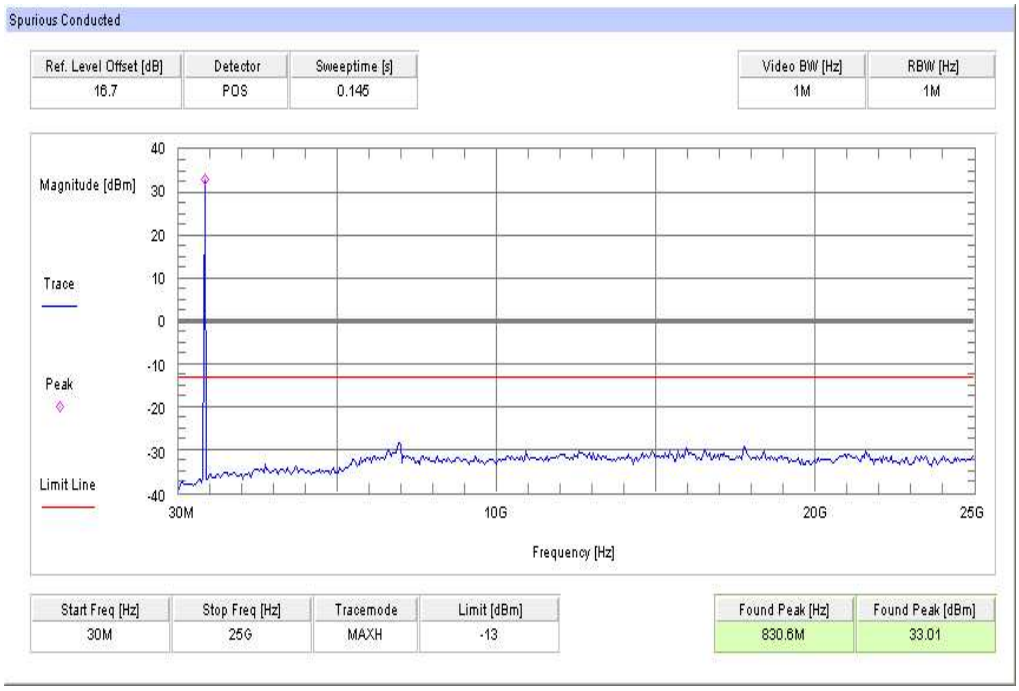
Harmonic	Tx ch.-128 Freq. (MHz)	Level (dBm)	Tx ch.-189 Freq. (MHz)	Level (dBm)	Tx ch.-251 Freq. (MHz)	Level (dBm)
2	1648.4	No harmonics detected!	1672.8	No harmonics detected!	1697.6	No harmonics detected!
3	2472.6		2509.2		2546.4	
4	3296.8		3345.6		3395.2	
5	4121.0		4182.0		4244.0	
6	4945.2		5018.4		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	

No peaks found > 20 dB below limit.

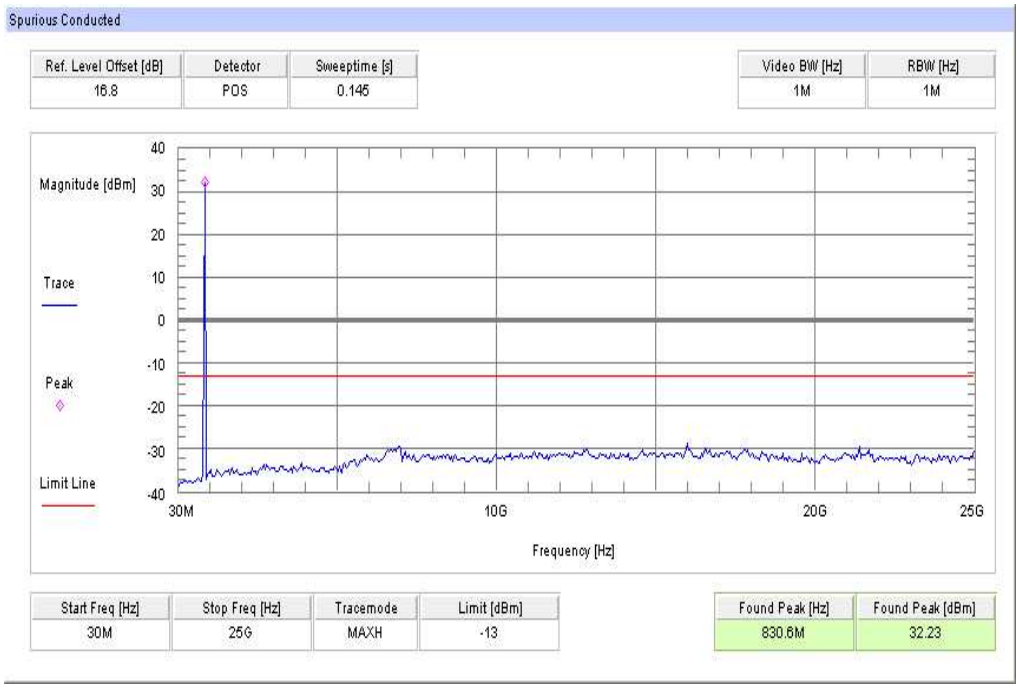
Plot 1: TX mode, channel 128, GSM, 30 MHz – 25 GHz



Plot 2: TX mode, channel 189, GSM, 30 MHz – 25 GHz



Plot 3: TX mode, channel 251, GSM, 30 MHz – 25 GHz



5.2.5 Block Edge Compliance

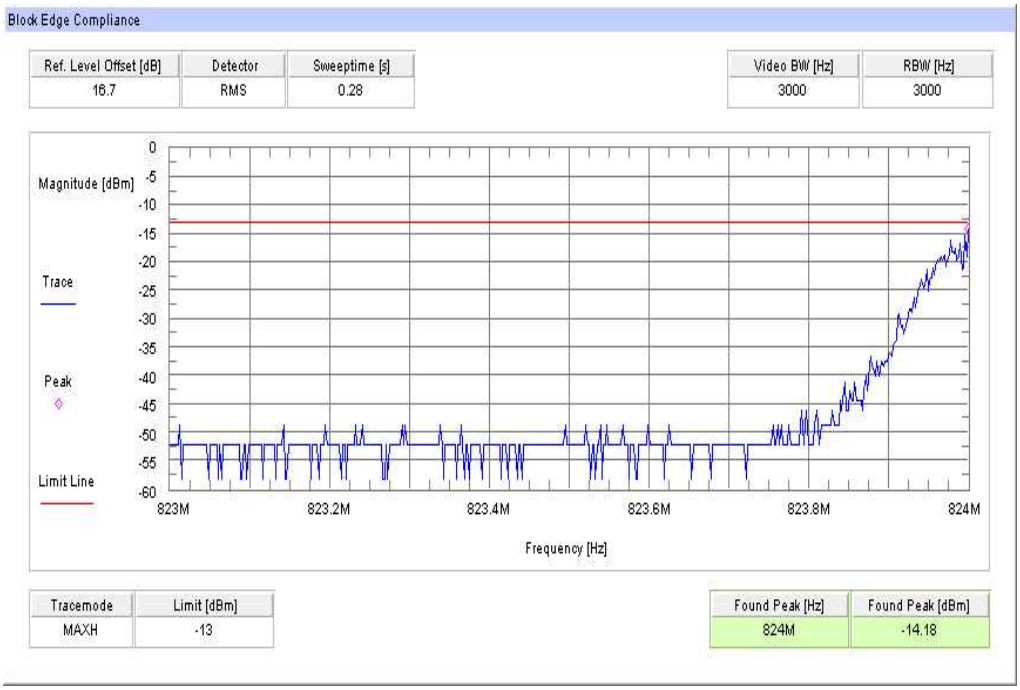
Reference

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

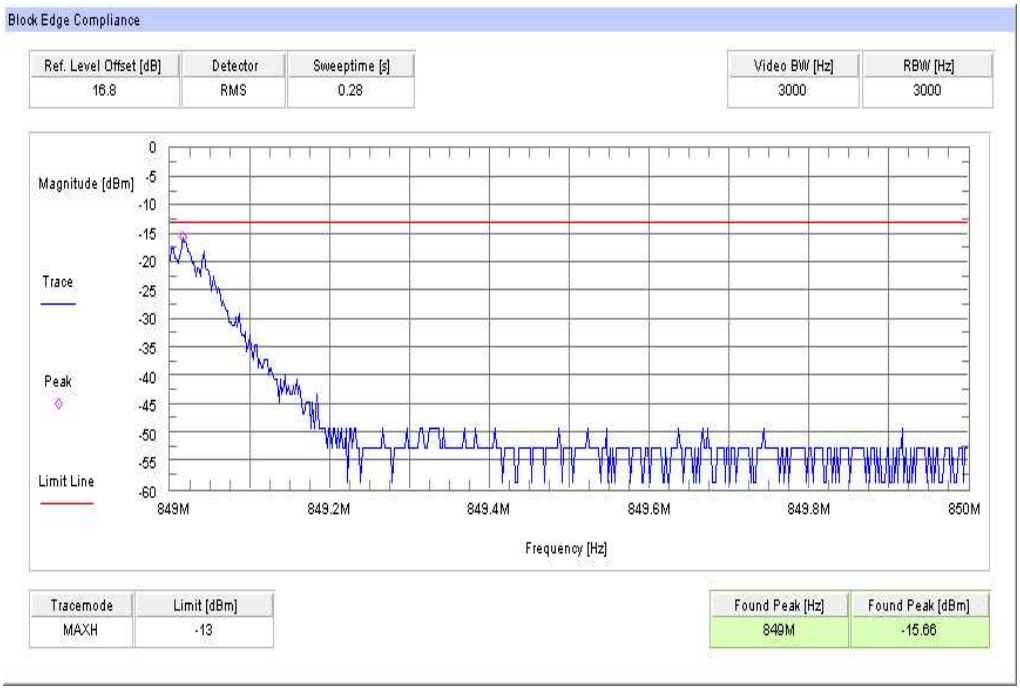
Measurement Limit:

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

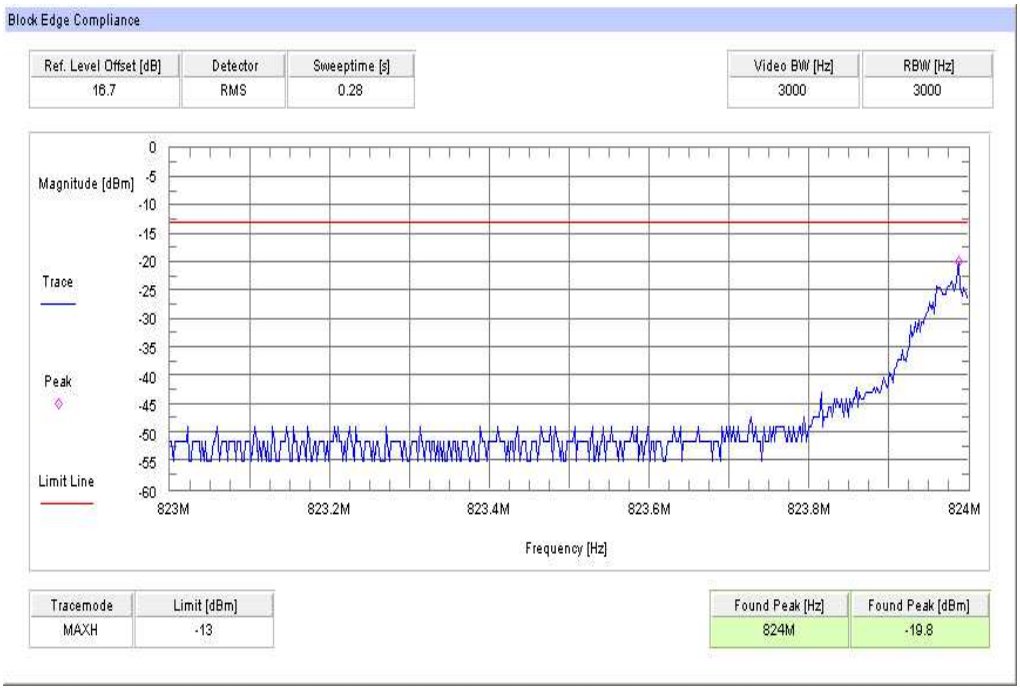
Plot 1: TX mode, channel 128, GSM, block 1



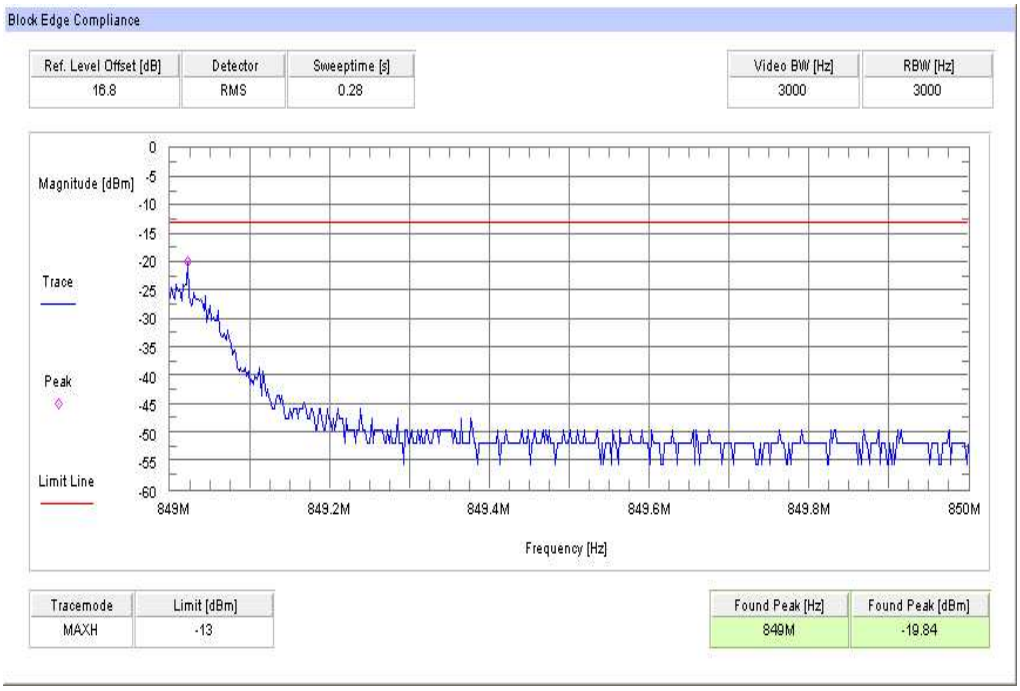
Plot 2: TX mode, channel 251, GSM, block 6



Plot 3: TX mode, channel 128, EGPRS / EDGE, block 1



Plot 4: TX mode, channel 251, EGPRS / EDGE, block 6



5.2.6 Occupied Bandwidth

Reference

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

Occupied Bandwidth Results

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

Normal mode

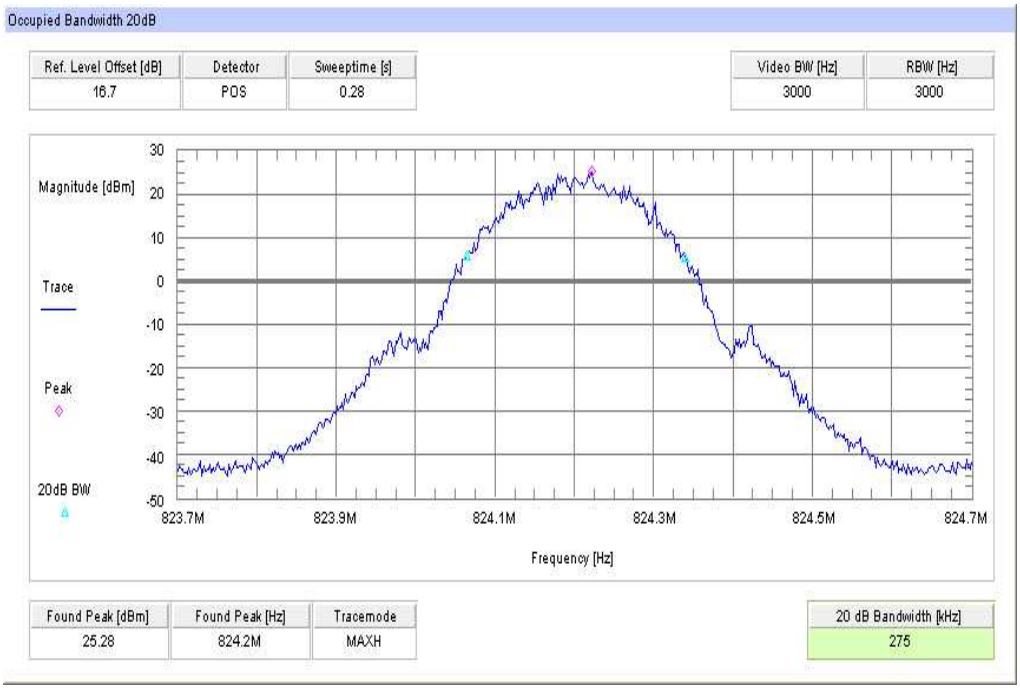
Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
824.2 MHz	275	313
836.4 MHz	277	313
848.8 MHz	273	315

EDGE mode

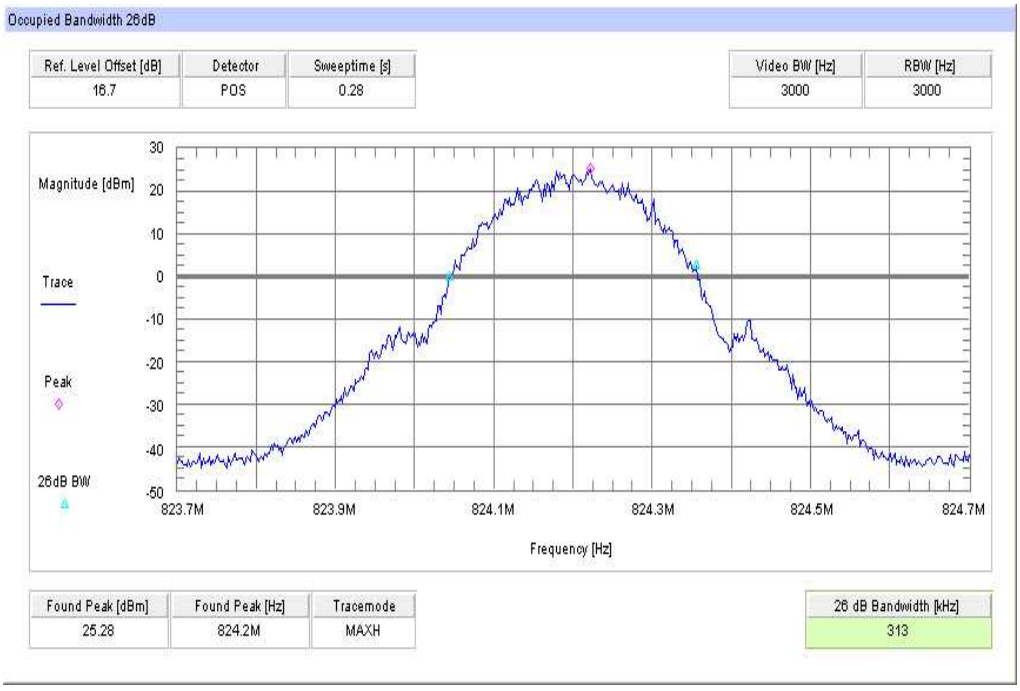
Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
824.2 MHz	275	311
836.4 MHz	257	319
848.8 MHz	251	319

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.

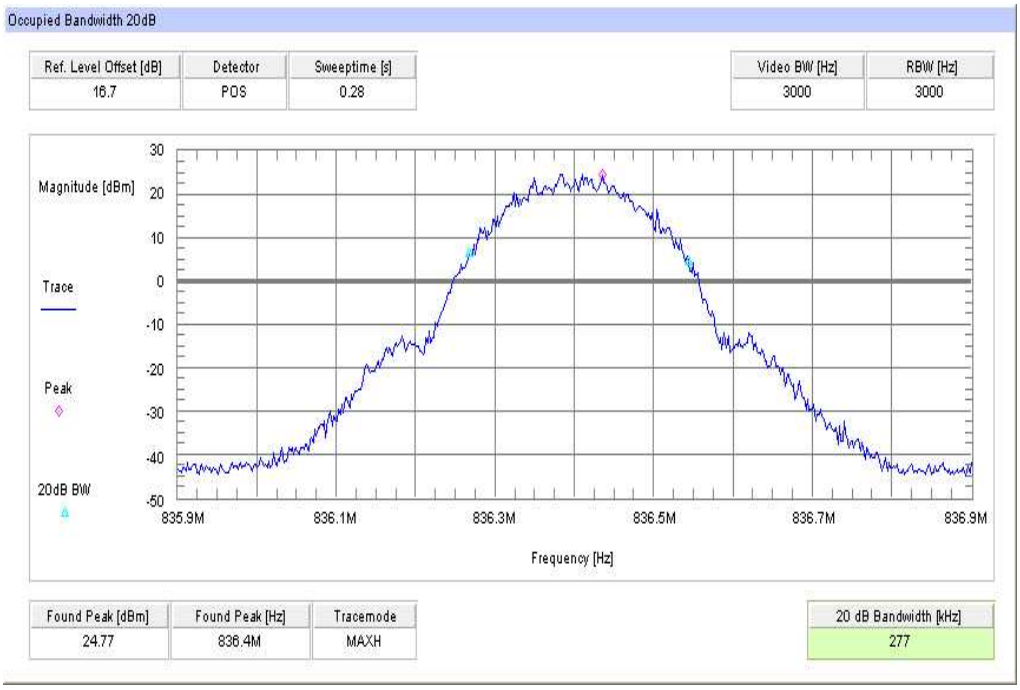
Plot 1: TX mode, channel 128, GSM, 99% (-20 dB) Occupied Bandwidth



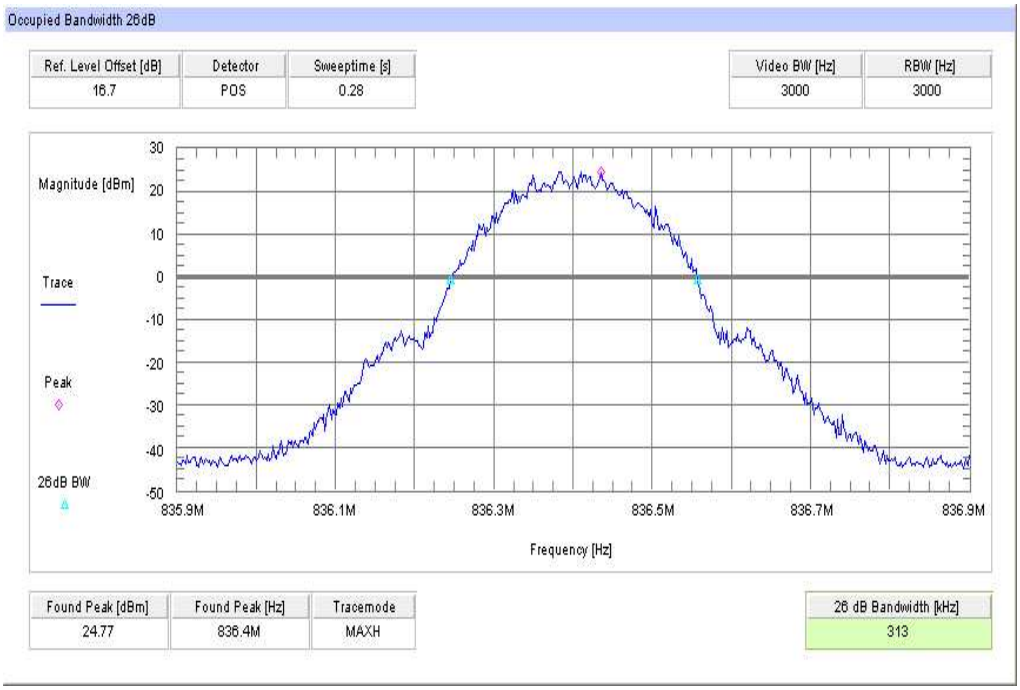
Plot 2: TX mode, channel 128, GSM, -26 dBc Bandwidth



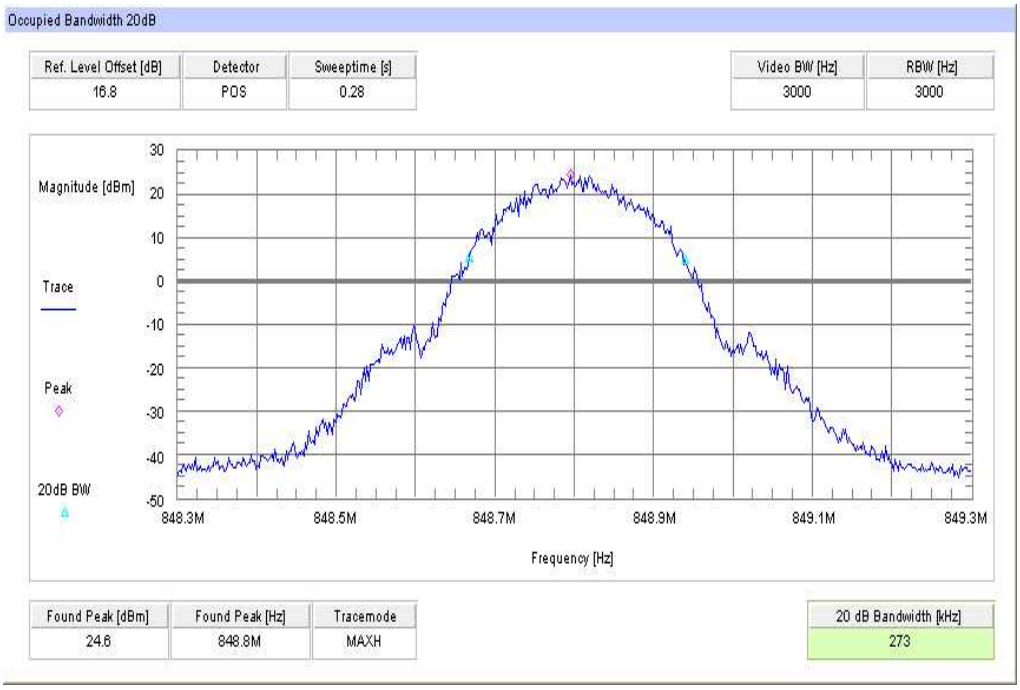
Plot 3: TX mode, channel 189, GSM, 99% (-20 dB) Occupied Bandwidth



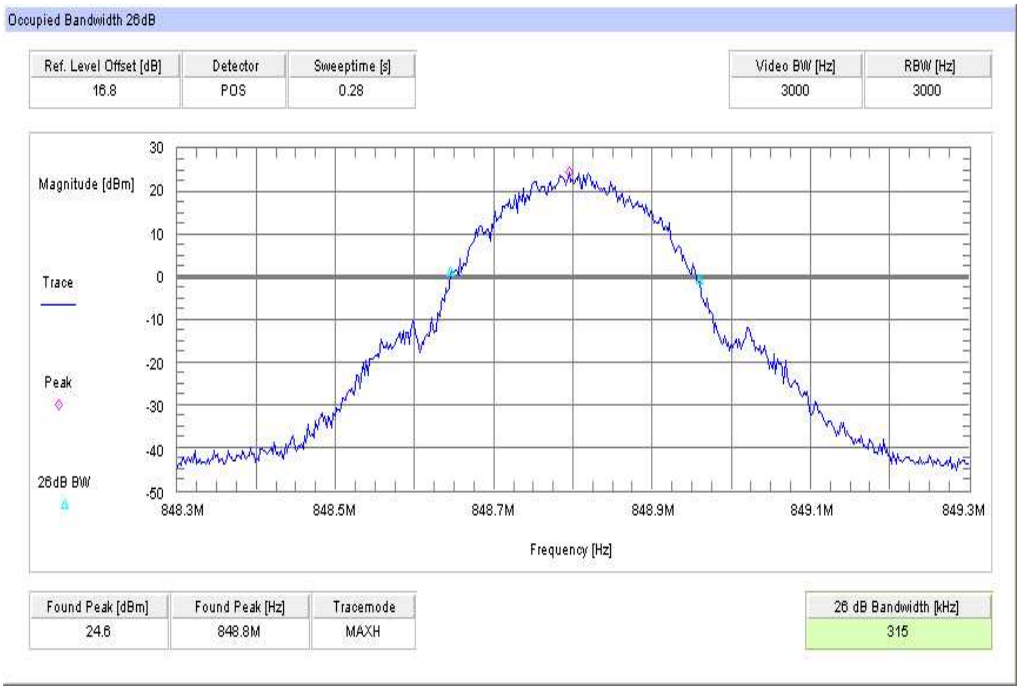
Plot 4: TX mode, channel 189, GSM, -26 dBc Bandwidth



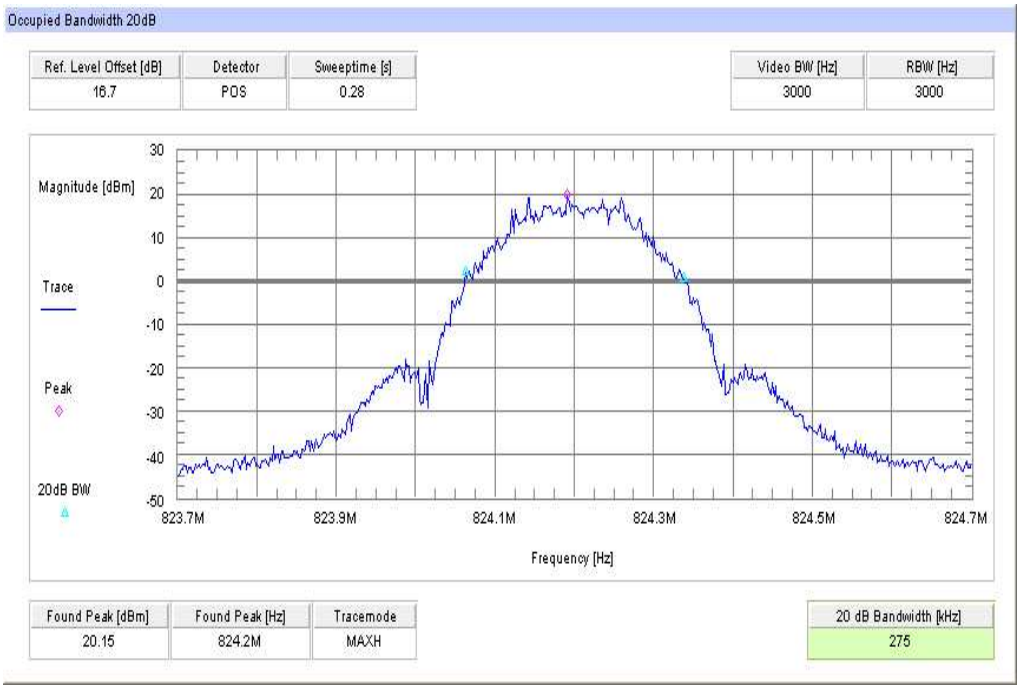
Plot 5: TX mode, channel 251, GSM, 99% (-20 dB) Occupied Bandwidth



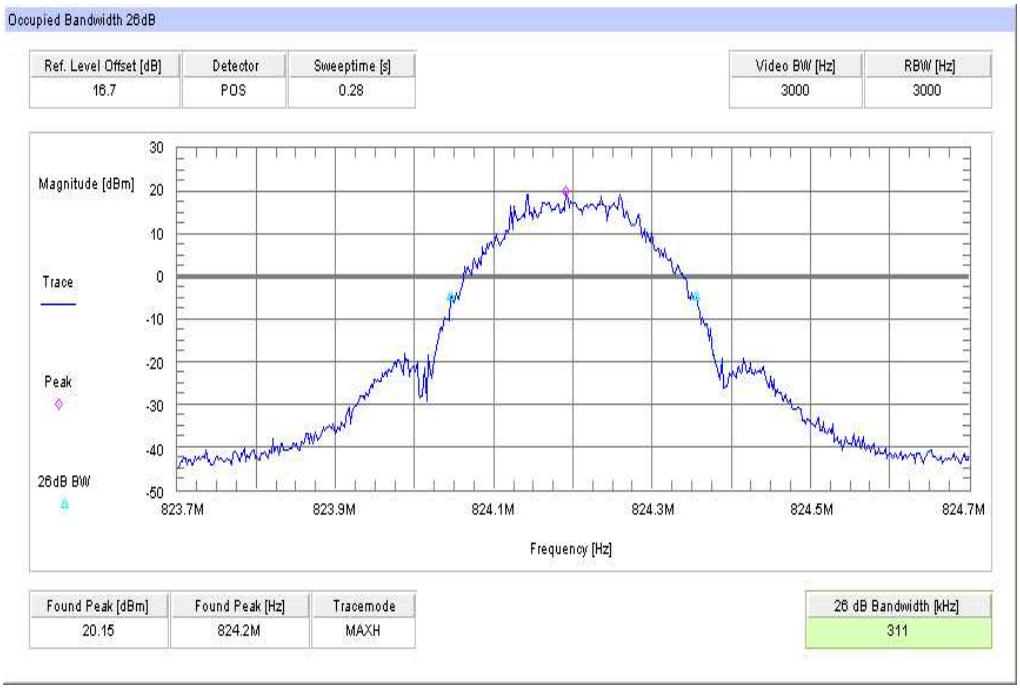
Plot 6: TX mode, channel 251, GSM, -26 dBc Bandwidth



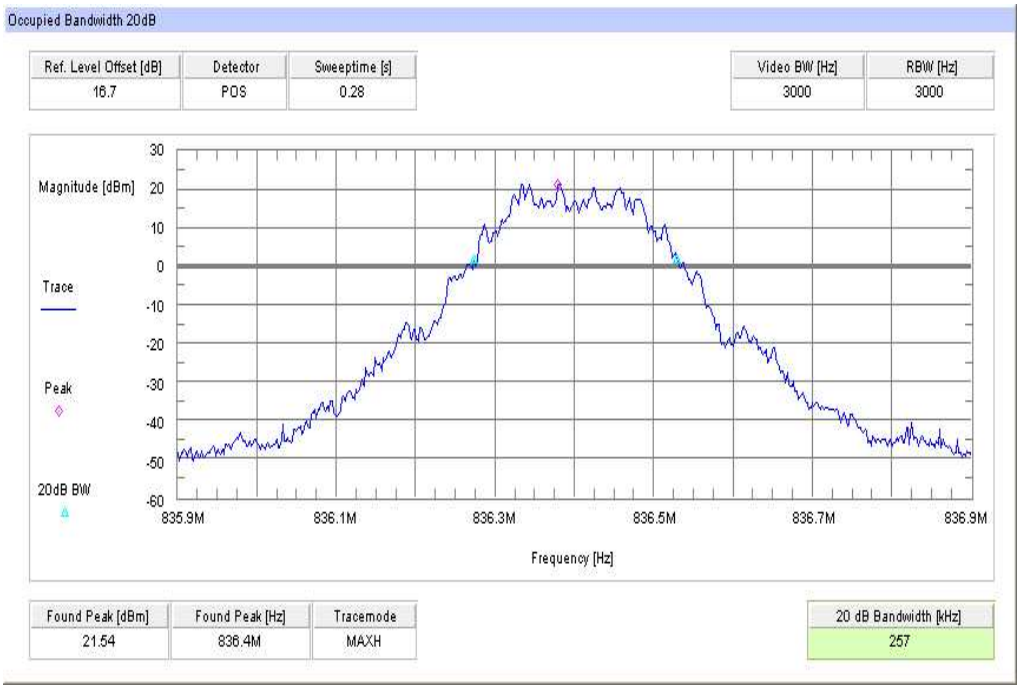
Plot 7: TX mode, channel 128, EGPRS / EDGE, 99% (-20 dB) Occupied Bandwidth



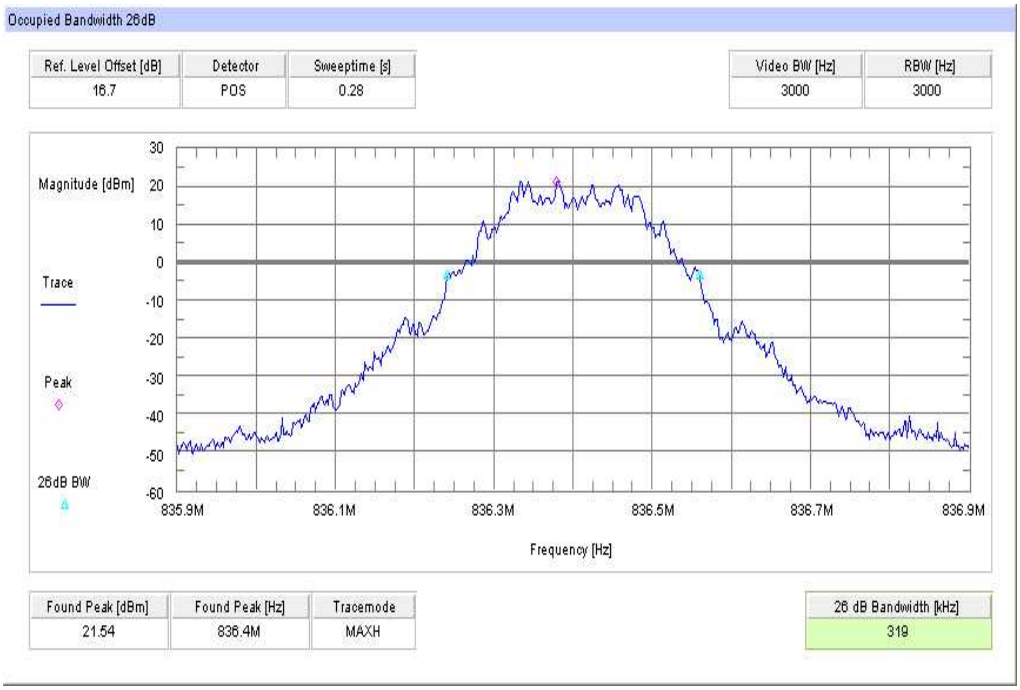
Plot 8: TX mode, channel 128, EGPRS / EDGE, -26 dBc Bandwidth



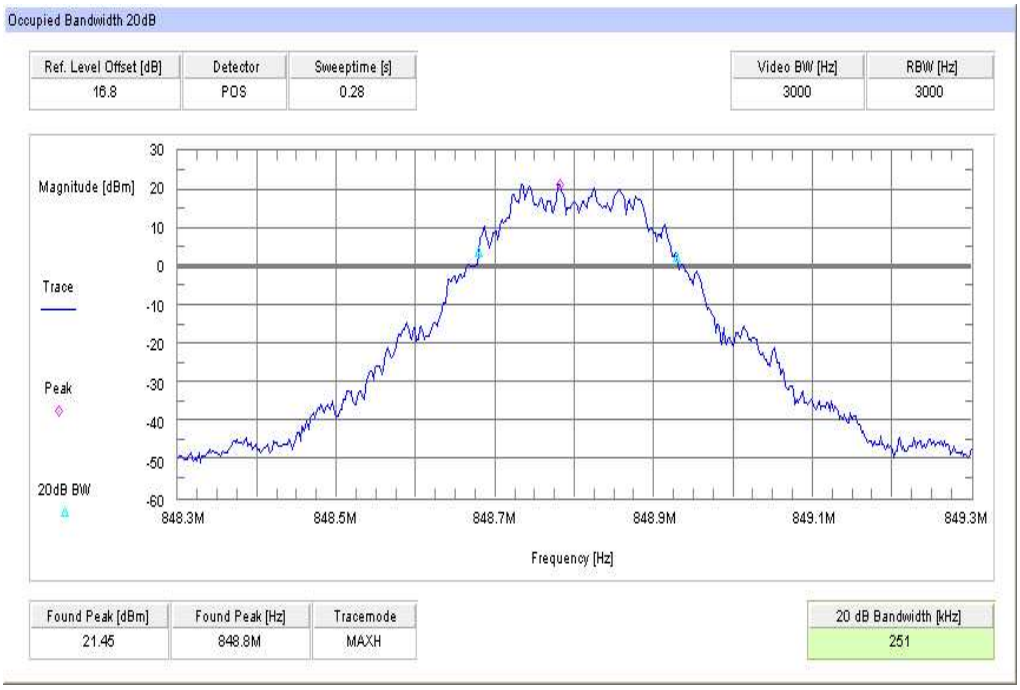
Plot 9: TX mode, channel 189, EGPRS / EDGE, 99% (-20 dB) Occupied Bandwidth



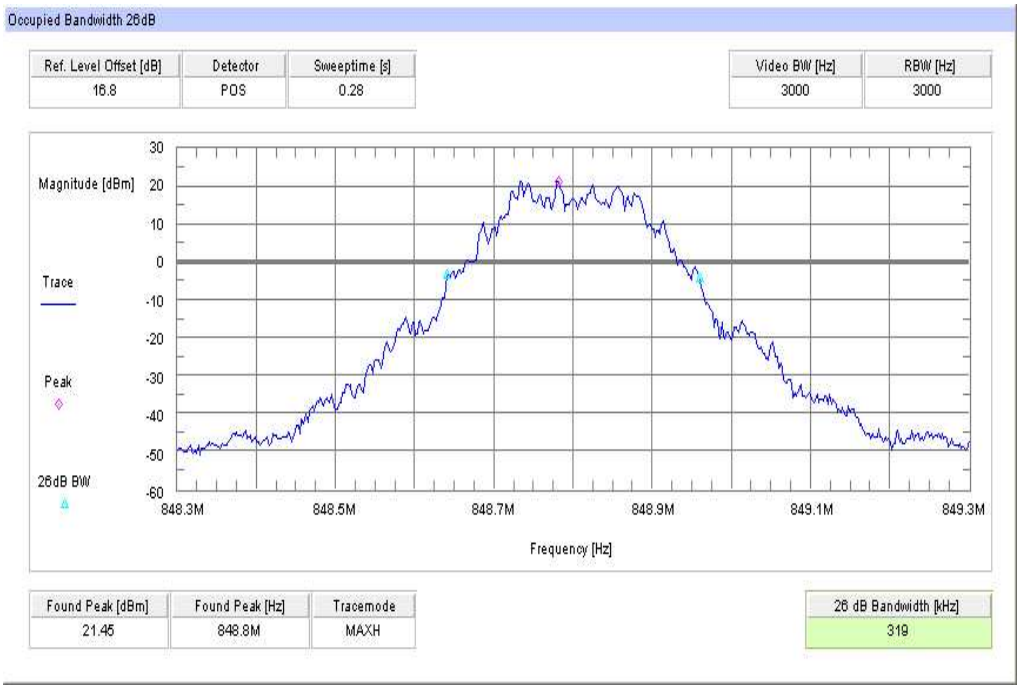
Plot 10: TX mode, channel 189, EGPRS / EDGE, -26 dBc Bandwidth



Plot 11: TX mode, channel 251, EGPRS / EDGE, 99% (-20 dB) Occupied Bandwidth



Plot 12: TX mode, channel 251, EGPRS / EDGE, -26 dBc Bandwidth



5.3 PART UMTS Band II

5.3.1 RF Power Output

Reference

FCC:	CFR Part 24.232, 2.1046
IC:	RSS 133, Issue 5, Section 6.4

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

In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

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

Frequency (MHz)	Average Output Power (dBm)	Peak-to-Average Ratio (dB)
1852.4	24.54	3.0
1880.0	24.30	2.9
1907.6	24.20	2.9
Measurement uncertainty	±0.5 dB	

EIRP Measurements

Description:

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

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) The measurements were performed with full rf output power and modulation.

(b) Test was performed at listed 3m test site (listed with FCC, IC).

(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)

(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.

(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(f) Set the EMI Receiver and #2 as follows:
Center Frequency: test frequency
Resolution BW: 100 kHz
Video BW: same
Detector Mode: positive
Average: off
Span: 3 x the signal bandwidth

(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.

(h) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.

(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.

(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.

(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.

(l) Repeat for all different test signal frequencies

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:
Center Frequency : equal to the signal source
Resolution BW : 10 kHz
Video BW : same
Detector Mode : positive
Average : off
Span : 3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(c) Select the frequency and E-field levels for ERP/EIRP measurements.

(d) Substitute the EUT by a signal generator and one of the following transmitting antennas (substitution antenna): DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz}.

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.

(f) Use one of the following antenna as a receiving antenna: .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.

(g) If the DIPOLE antenna is used, tune its elements to the frequency as specified in the calibration manual.

(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.

(i) Tune the EMI Receivers to the test frequency.

(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.

(k) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.

(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.

(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.

(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:
P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1
Where: P: Actual RF Power fed into the substitution antenna port after corrected.
P1: Power output from the signal generator
P2: Power measured at attenuator A input
P3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction

(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)

(p) Repeat step (d) to (o) for different test frequency

(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.

(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

Limits:

Nominal Peak Output Power (dBm)
+33

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

Frequency (MHz)	Average EIRP (dBm)
1852.4	21.55
1880.0	21.95
1907.6	22.79
Measurement uncertainty	±3 dB

Sample Calculation:

Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1852.4	125.8	22.6	8.4	0.0	3.3	27.7			

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 5, Section 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 Vnom, connected to the CMU 200 and in a simulated call on channel 661 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.

4. Repeat the above measurements at 10 C increments from -30 C to +60 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.

5. Re-measure carrier frequency at room temperature with Vnom. Vary supply voltage from Vmin to Vmax, in 12 steps re-measuring carrier frequency at each voltage. Pause at Vnom for 1 1/2 hours un-powered, to allow any self heating to stabilize, before continuing.

6. Subject the mobile station to overnight soak at +60 C.

7. With the mobile station, powered with Vnom, connected to the CMU 200 and in a simulated call on channel 661(center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the mobile station, to prevent significant self warming.

8. Repeat the above measurements at 10 C increments from +60 C to -30 C. Allow at least 1 1/2 hours at each temperature, un-powered, before making measurements.

9. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

Measurement Limit:

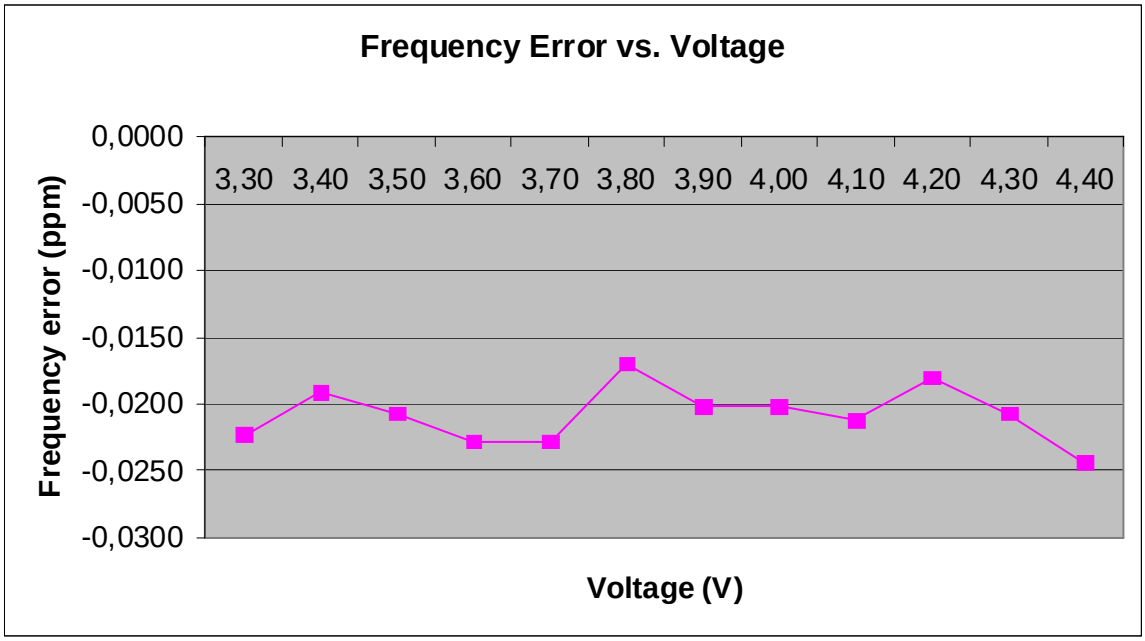
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission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

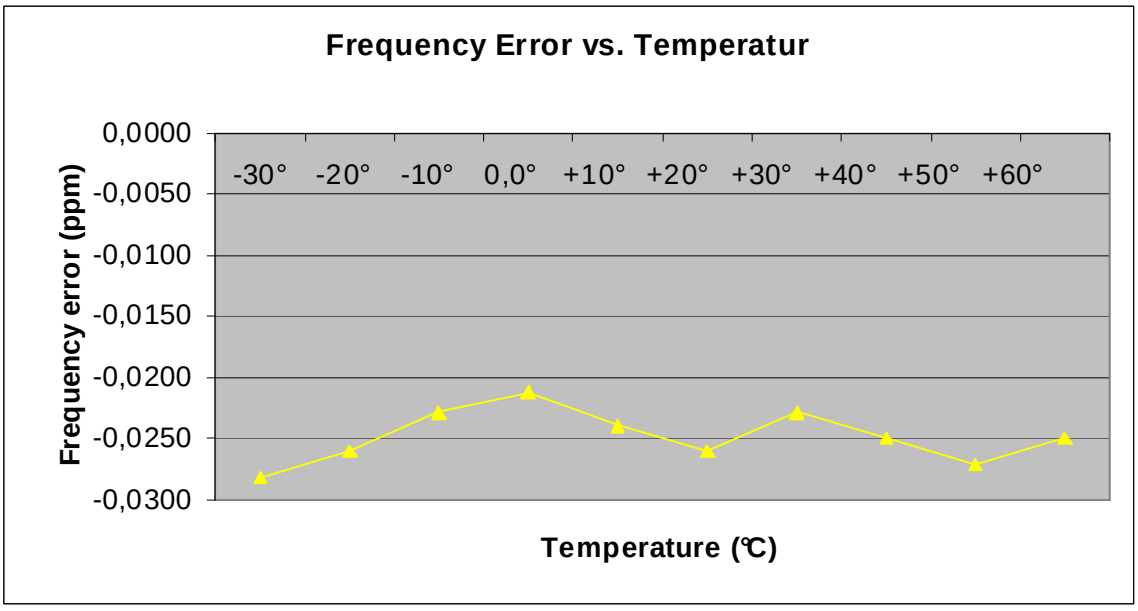
Test Results: **AFC FREQ ERROR vs. VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	-42	-0,00000223	-0,0223
3.4	-36	-0,00000191	-0,0191
3.5	-39	-0,00000207	-0,0207
3.6	-43	-0,00000229	-0,0229
3.7	-43	-0,00000229	-0,0229
3.8	-32	-0,00000170	-0,0170
3.9	-38	-0,00000202	-0,0202
4.0	-38	-0,00000202	-0,0202
4.1	-40	-0,00000213	-0,0213
4.2	-34	-0,00000181	-0,0181
4.3	-39	-0,00000207	-0,0207
4.4	-46	-0,00000245	-0,0245

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

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-53	-0,00000282	-0,0282
-20	-49	-0,00000261	-0,0261
-10	-43	-0,00000229	-0,0229
±0.0	-40	-0,00000213	-0,0213
+10	-45	-0,00000239	-0,0239
+20	-49	-0,00000261	-0,0261
+30	-43	-0,00000229	-0,0229
+40	-47	-0,00000250	-0,0250
+50	-51	-0,00000271	-0,0271
+60	-47	-0,00000250	-0,0250


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


Frequency Error vs. Temperatur
0,0000
-0,0050
-0,0100
-0,0150
-0,0200
-0,0250
-0,0300
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 5, Section 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 a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. This was rounded up to 20 GHz. The resolution bandwidth is set as outlined in Part 24.238. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

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

a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.

b) The antenna output was terminated in a 50 ohm load.

c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.

d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and I MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.

e) Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603.

Measurement Limit:

Sec. 24.238 Emission Limits.

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

Measurement Results: **Radiated Emissions**

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

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

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

Harmonic	Tx ch.-9262 Freq. (MHz)	Level (dBm)	Tx ch.-9400 Freq. (MHz)	Level (dBm)	Tx ch.-9538 Freq. (MHz)	Level (dBm)
2	3704.8	No harmonics detected.	3760	No harmonics detected.	3815.2	No harmonics detected.
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	

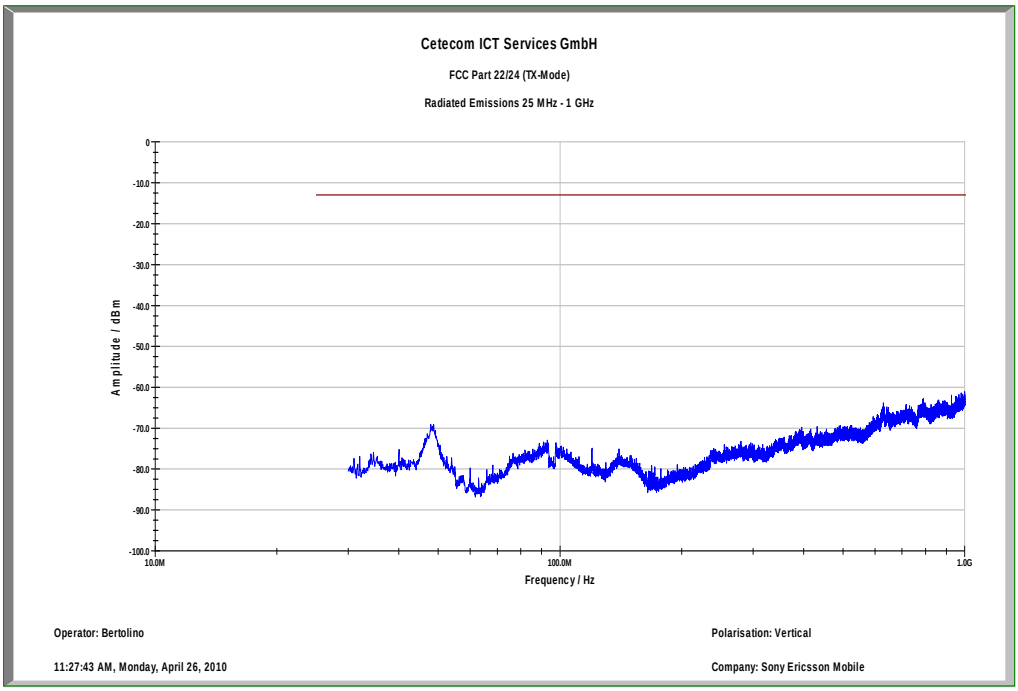
No peaks found < 20 dB below limit.

Sample calculation:

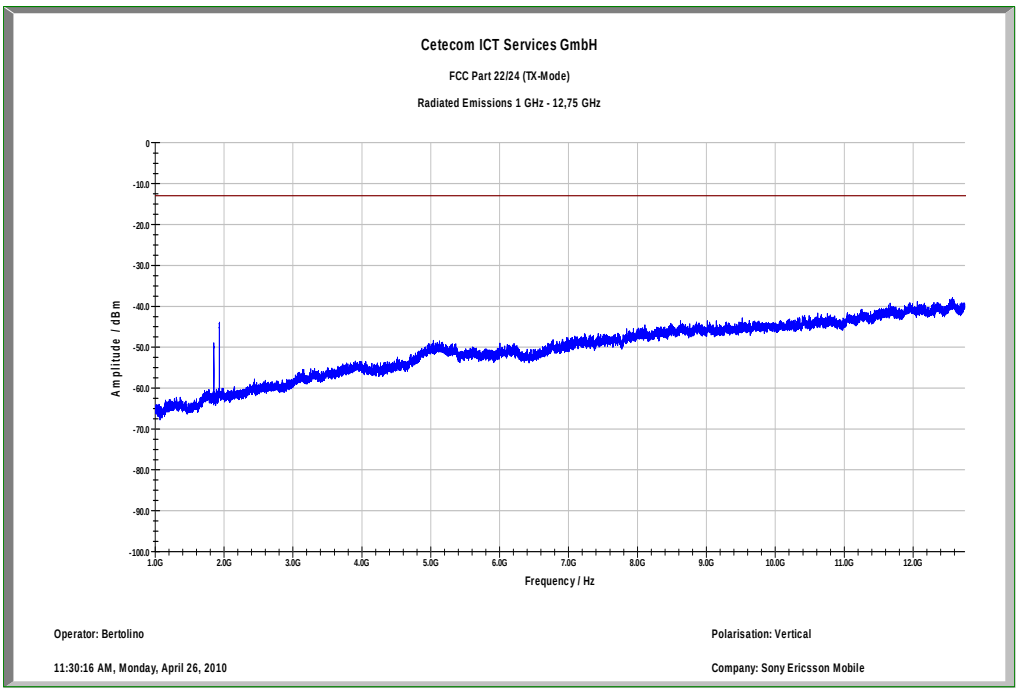
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1852.4	125.8	22.6	8.4	0.0	3.3	27.7			

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

Plot 1: TX mode, channel 9262, UMTS / WCDMA, 30 MHz – 1 GHz, vertical polarization

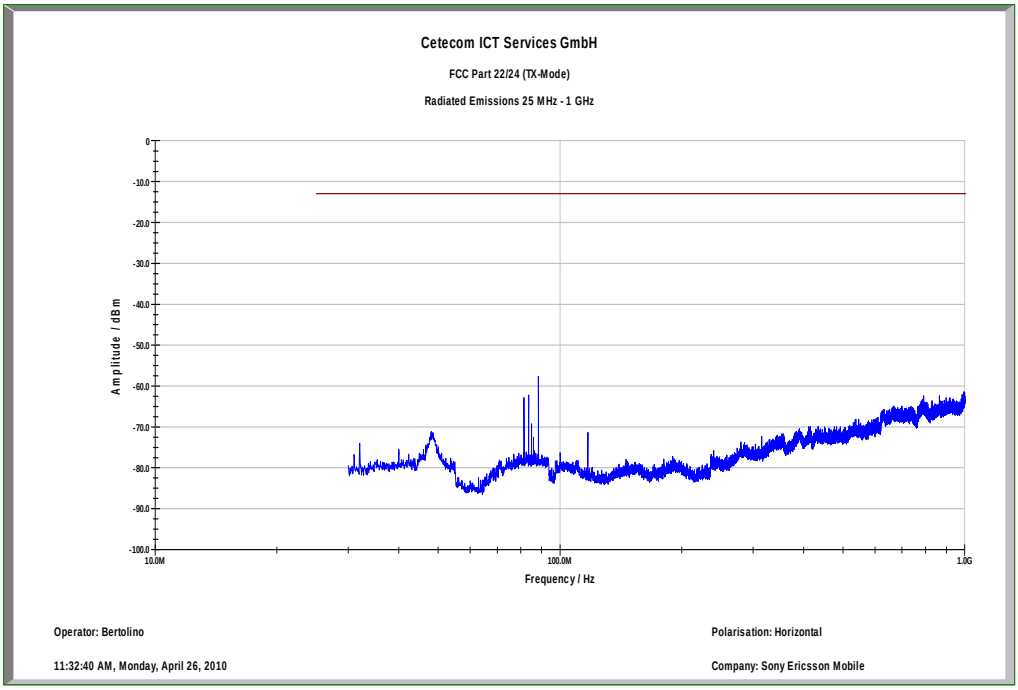


Plot 2: TX mode, channel 9262, UMTS / WCDMA, 1 GHz – 12.75 GHz, vertical polarization

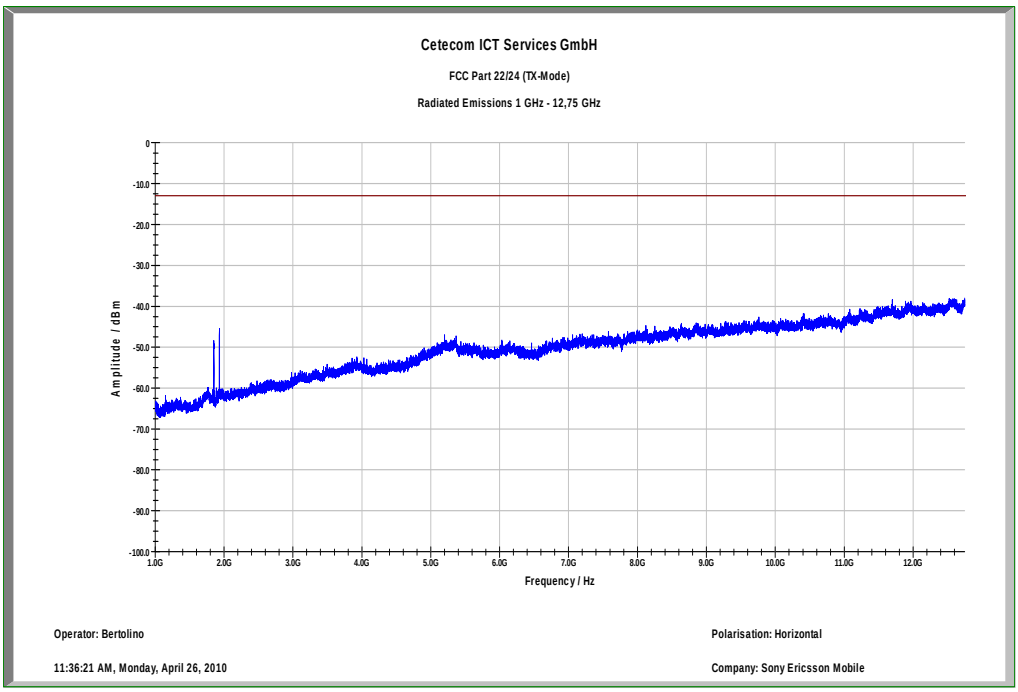


The carrier signal is notched with a 1.9 GHz band rejection filter.

Plot 3: TX mode, channel 9262, UMTS / WCDMA, 30 MHz – 1 GHz, horizontal polarization

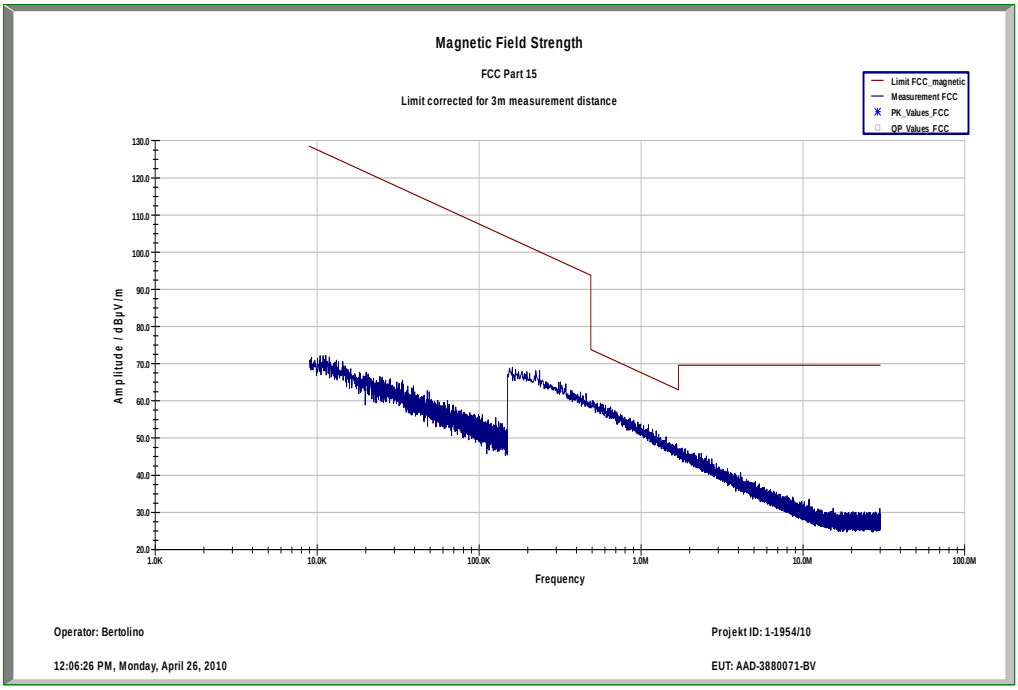


Plot 4: TX mode, channel 9262, UMTS / WCDMA, 1 GHz – 12.75 GHz, horizontal polarization

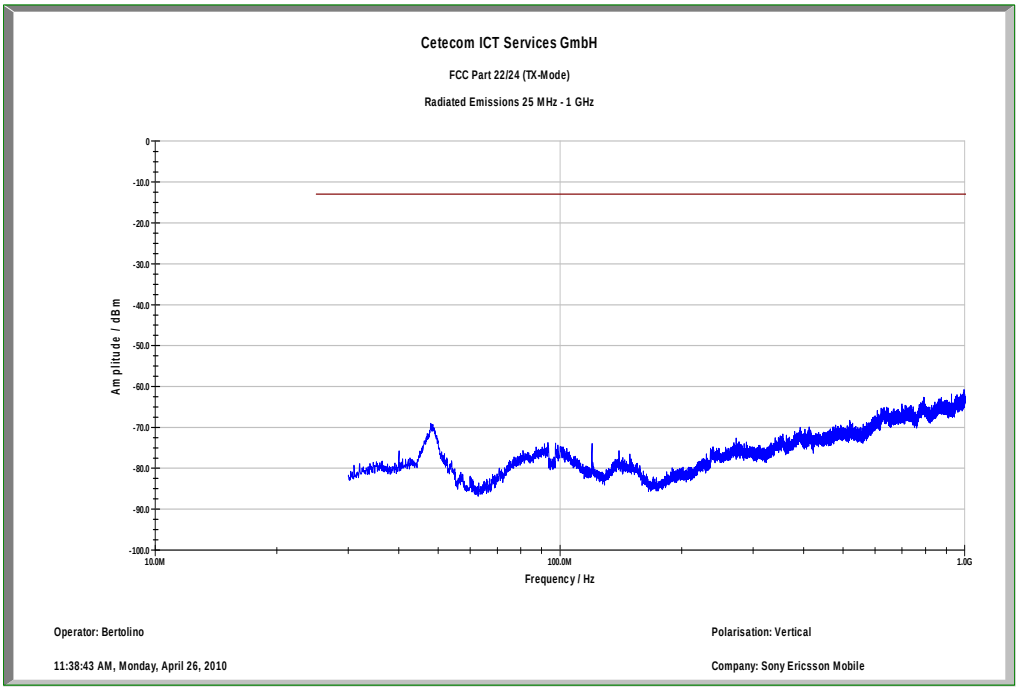


The carrier signal is notched with a 1.9 GHz band rejection filter.

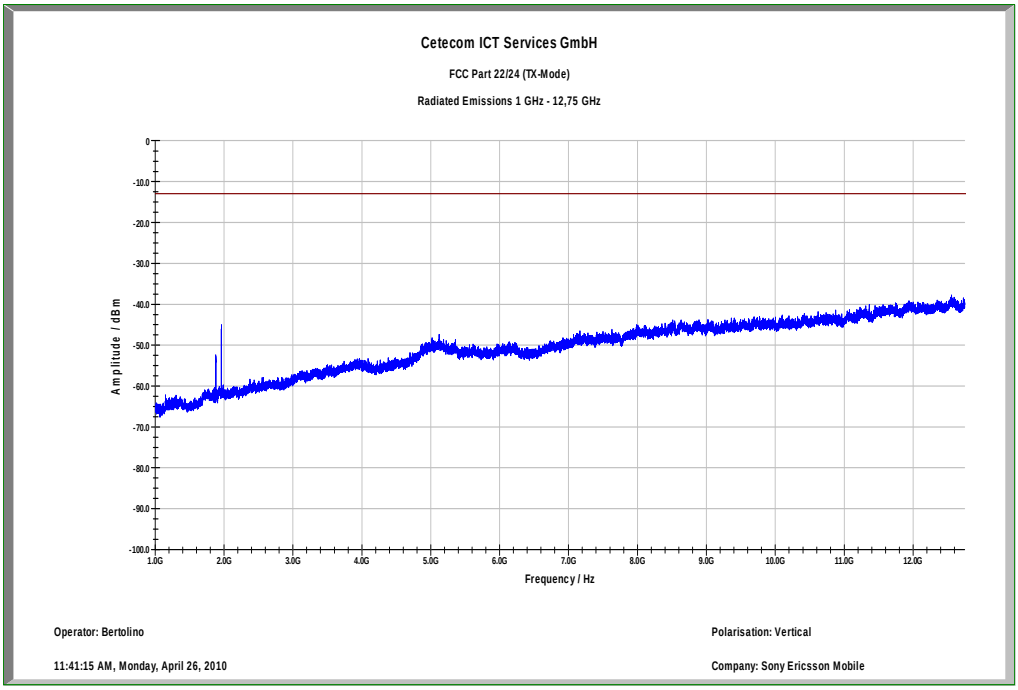
Plot 5: TX mode, channel 9400, UMTS / WCDMA, 10 kHz - 30 MHz (valid for all channels)



Plot 7: TX mode, channel 9400, UMTS / WCDMA, 30 MHz – 1 GHz, vertical polarization

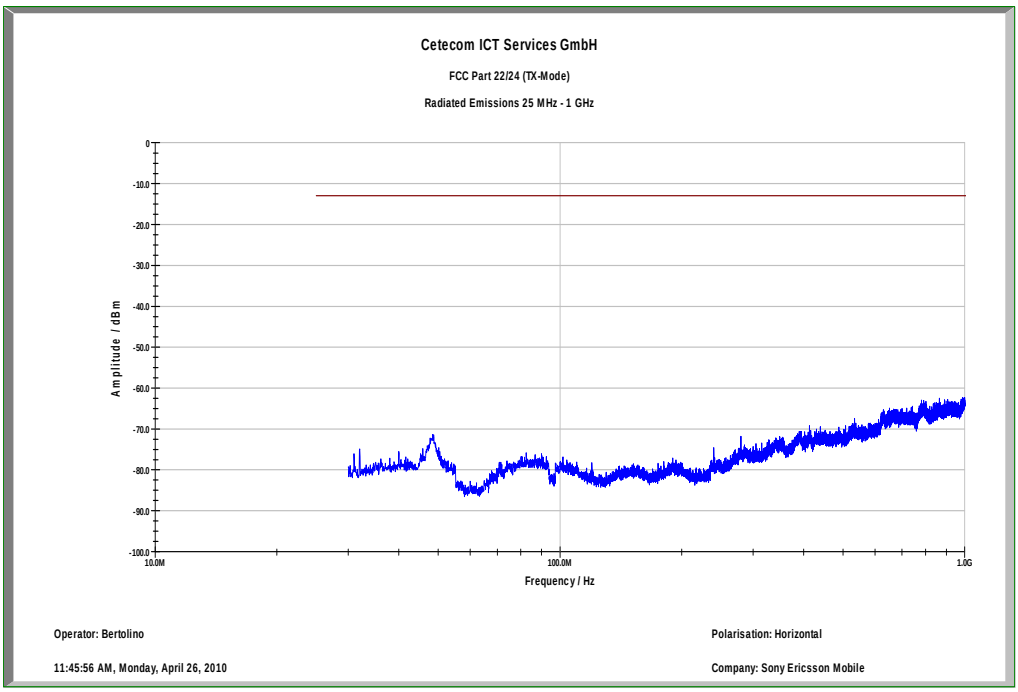


Plot 8: TX mode, channel 9400, UMTS / WCDMA, 1 GHz – 12.75 GHz, vertical polarization

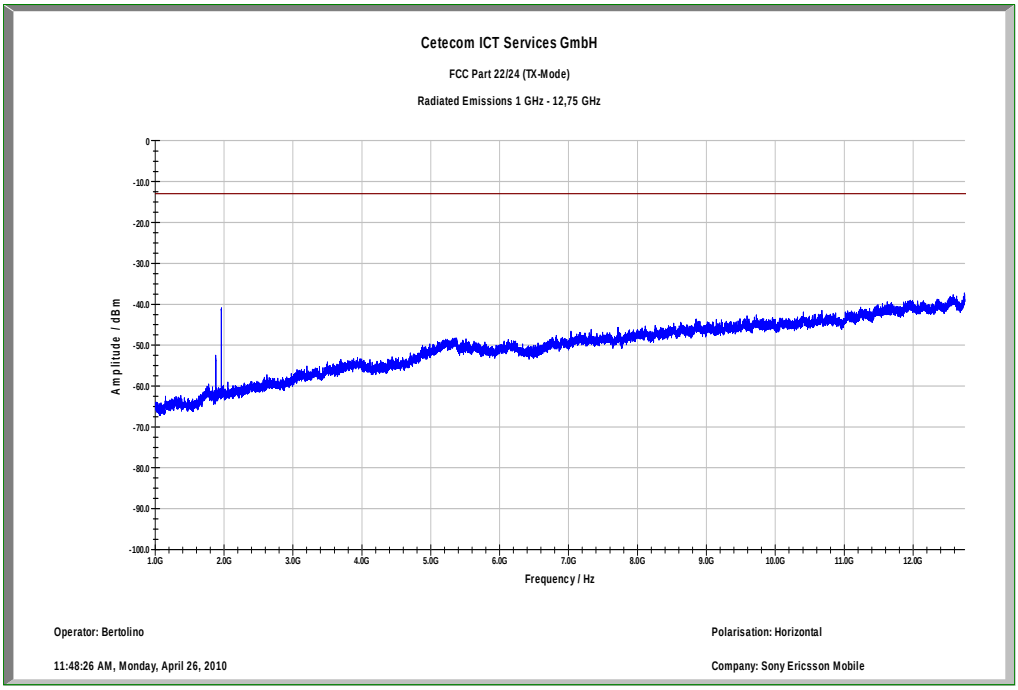


The carrier signal is notched with a 1.9 GHz band rejection filter.

Plot 9: TX mode, channel 9400, UMTS / WCDMA, 30 MHz – 1 GHz, horizontal polarization

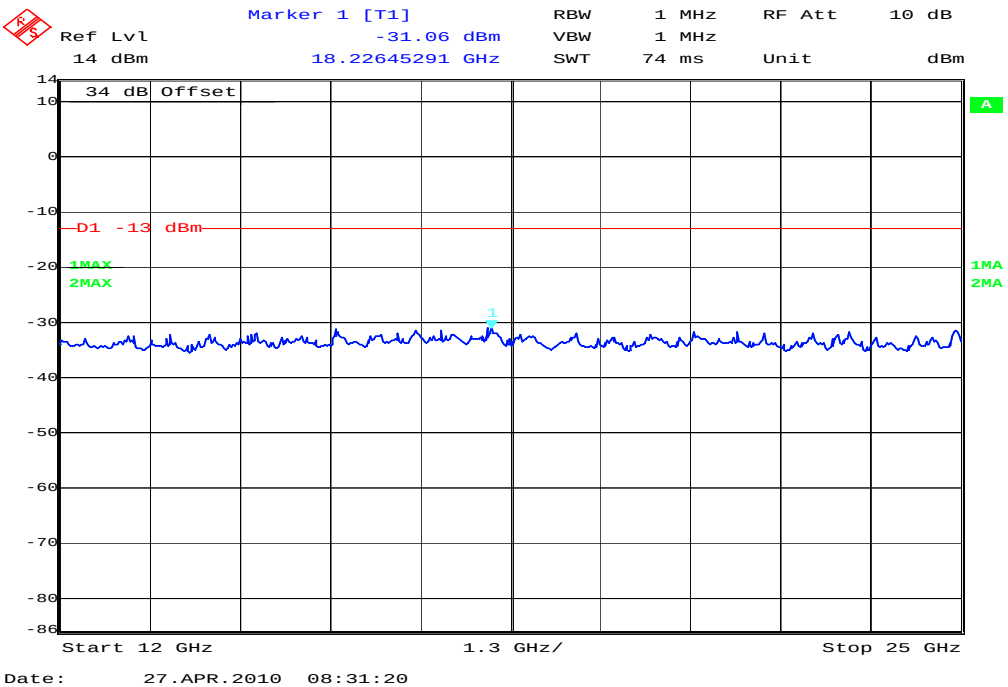


Plot 10: TX mode, channel 9400, UMTS / WCDMA, 1 GHz – 12.75 GHz, horizontal polarization

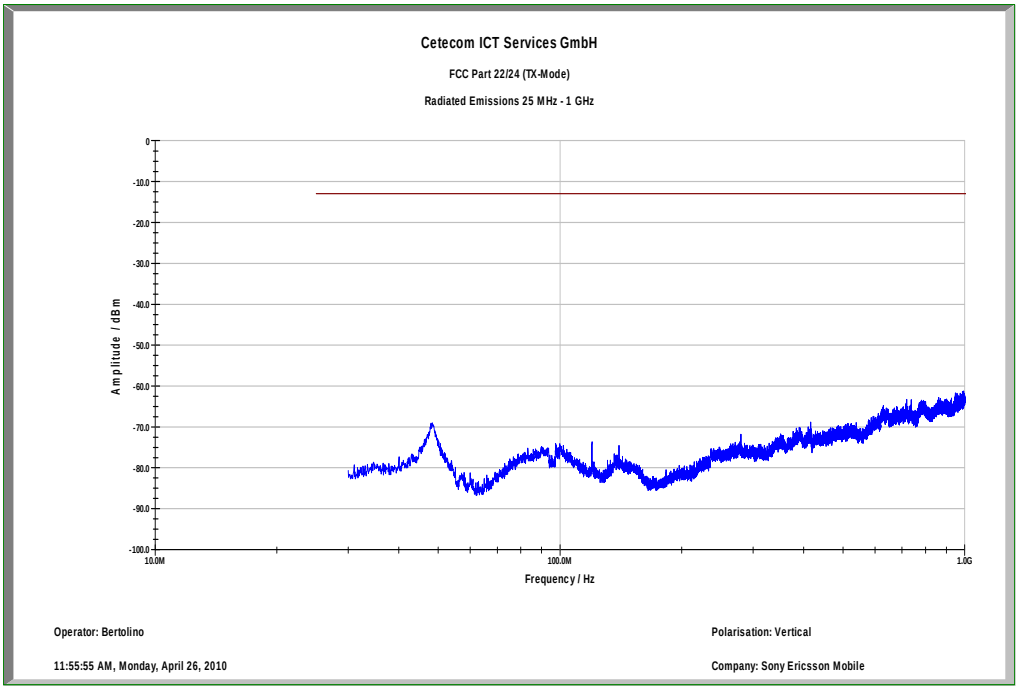


The carrier signal is notched with a 1.9 GHz band rejection filter.

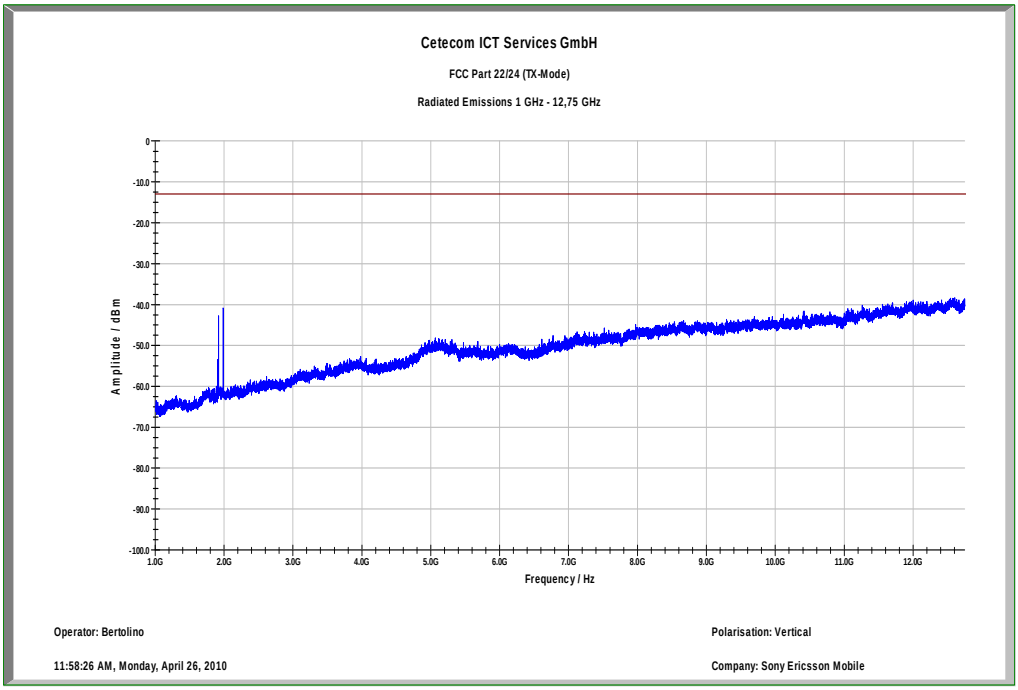
Plot 11: TX mode, channel 9400, UMTS / WCDMA, 12 GHz - 25 GHz (valid for all channels)



Plot 12: TX mode, channel 9538, UMTS / WCDMA, 30 MHz – 1 GHz, vertical polarization

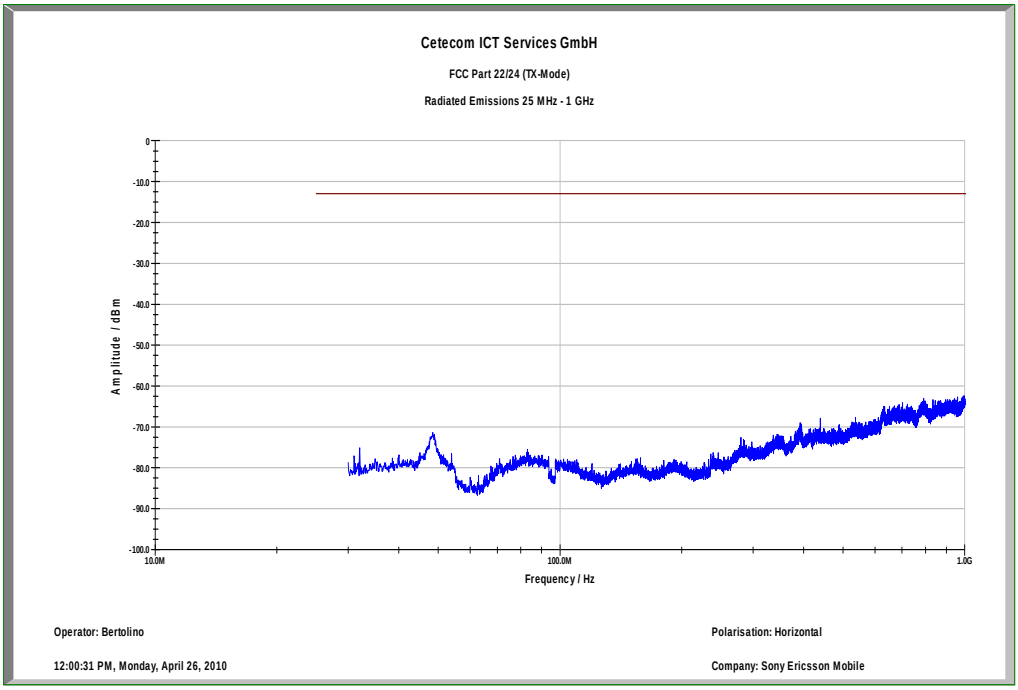


Plot 13: TX mode, channel 9538, UMTS / WCDMA, 1 GHz – 12.75 GHz, vertical polarization

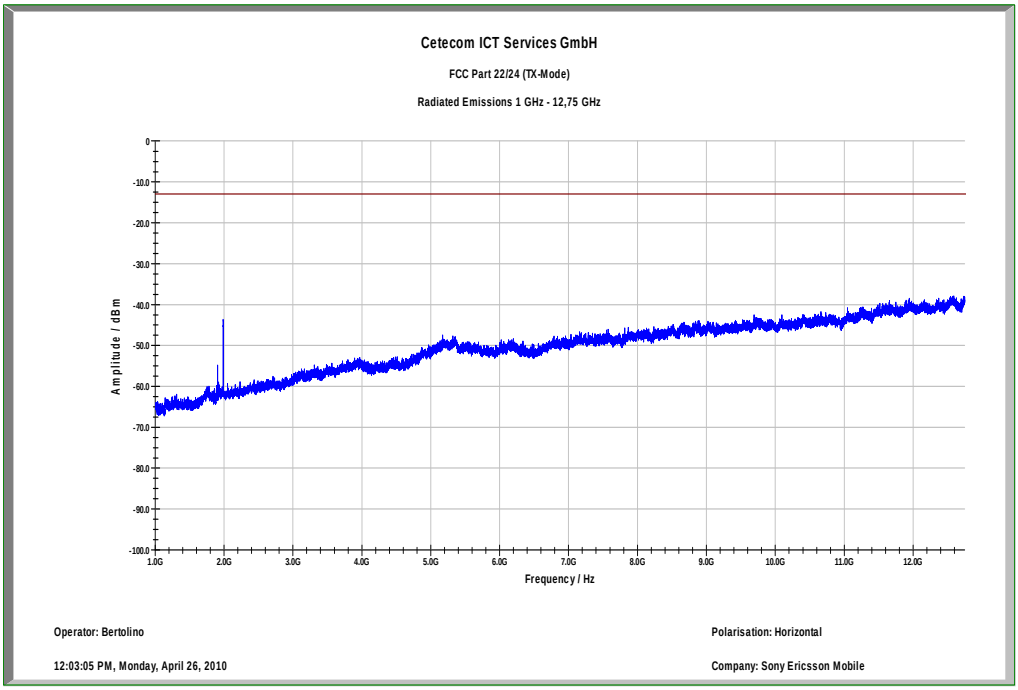


The carrier signal is notched with a 1.9 GHz band rejection filter.

Plot 14: TX mode, channel 9538, UMTS / WCDMA, 30 MHz – 1 GHz, horizontal polarization



Plot 15: TX mode, channel 9538, UMTS / WCDMA, 1 GHz – 12.75 GHz, horizontal polarization



The carrier signal is notched with a 1.9 GHz band rejection filter.

5.3.4 Conducted Spurious Emissions

Reference

FCC:	CFR Part 24.238, 2.10.51
IC:	RSS 133, Issue 5, Section 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 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:

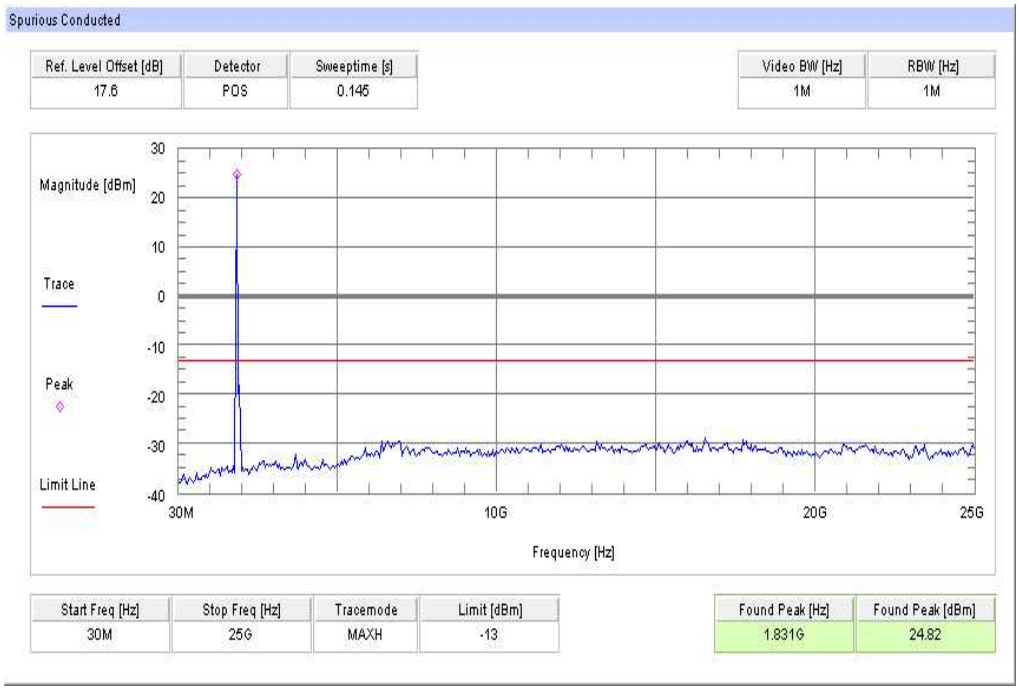
(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

Measurement Results:

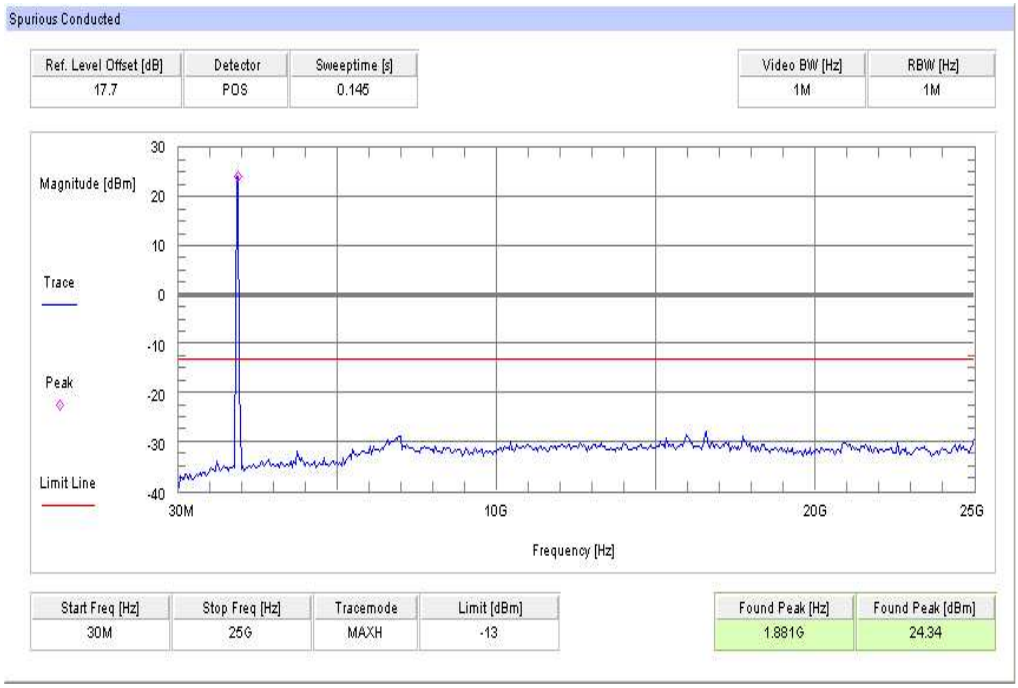
Harmonic	Tx ch.- 9262 Freq. (MHz)	Level (dBm)	Tx ch.-9400 Freq. (MHz)	Level (dBm)	Tx ch.-9538 Freq. (MHz)	Level (dBm)
2	3704.8	No harmonics detected!	3760	No harmonics detected!	3815.2	No harmonics detected!
3	5557.2		5640		5722.8	
4	7409.6		7520		7630.4	
5	9262.0		9400		9538.0	
6	11114.4		11280		11445.6	
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.

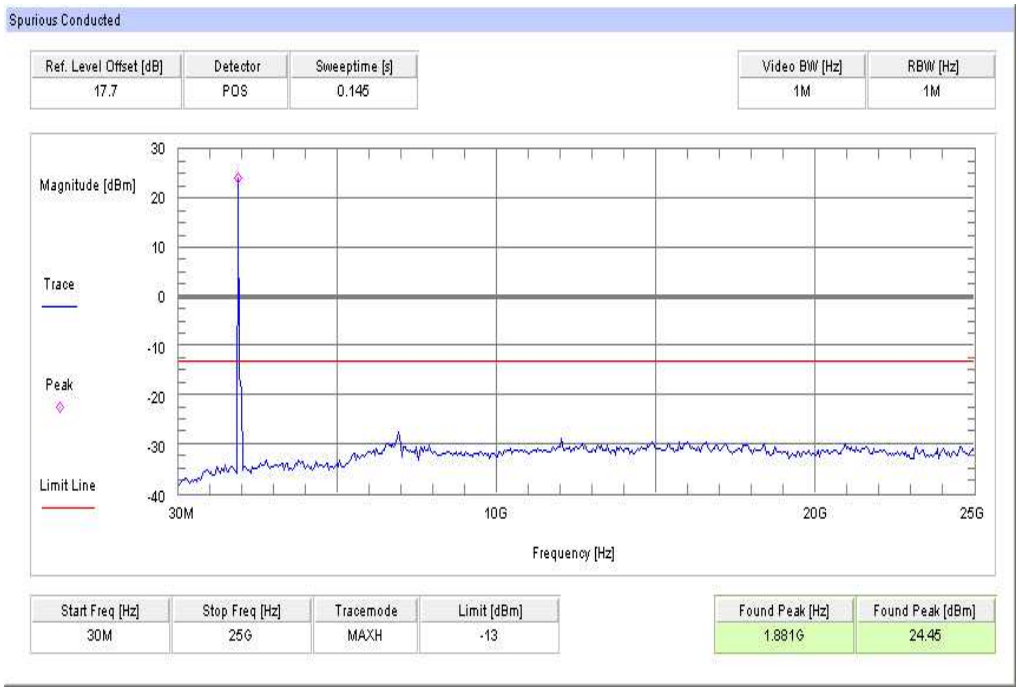
Plot 1: TX mode, channel 9262, UMTS / WCDMA, 30 MHz – 25 GHz



Plot 2: TX mode, channel 9400, UMTS / WCDMA, 30 MHz – 25 GHz



Plot 3: TX mode, channel 9538, UMTS / WCDMA, 30 MHz – 25 GHz



5.3.5 Block Edge Compliance

Reference

FCC:	CFR Part 24.238
IC:	RSS 133, Issue 5, 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.

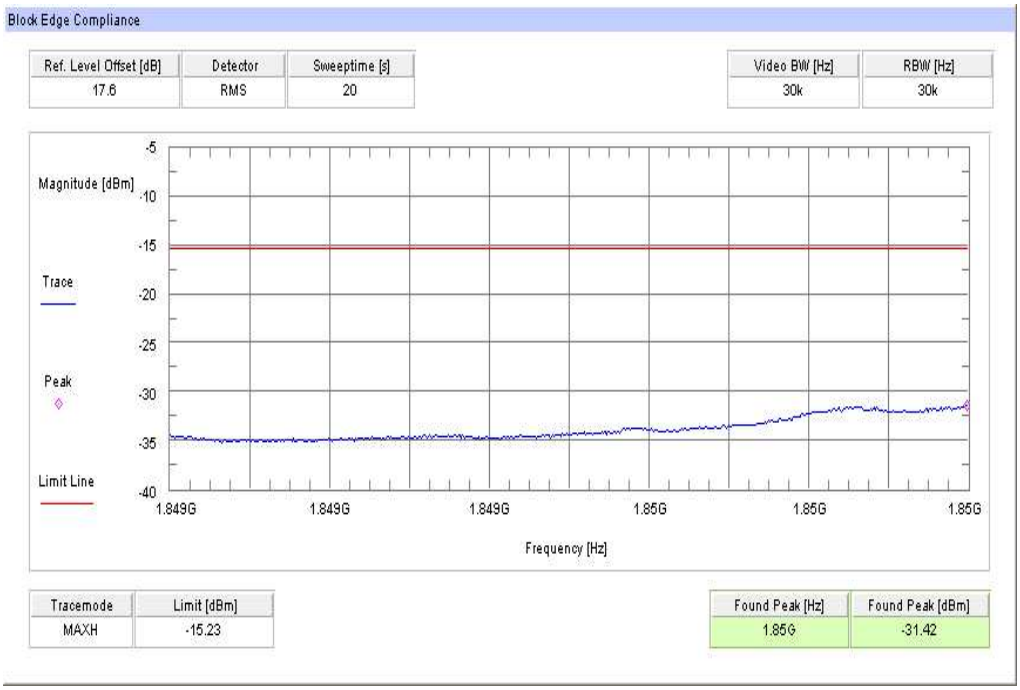
Part 22.917 specifies that "the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB."

However, in publication number 890810, The FCC Office of Engineering and Technology specified the following correction to the limits when a resolution bandwidth smaller than 1% of the emission bandwidth is used:

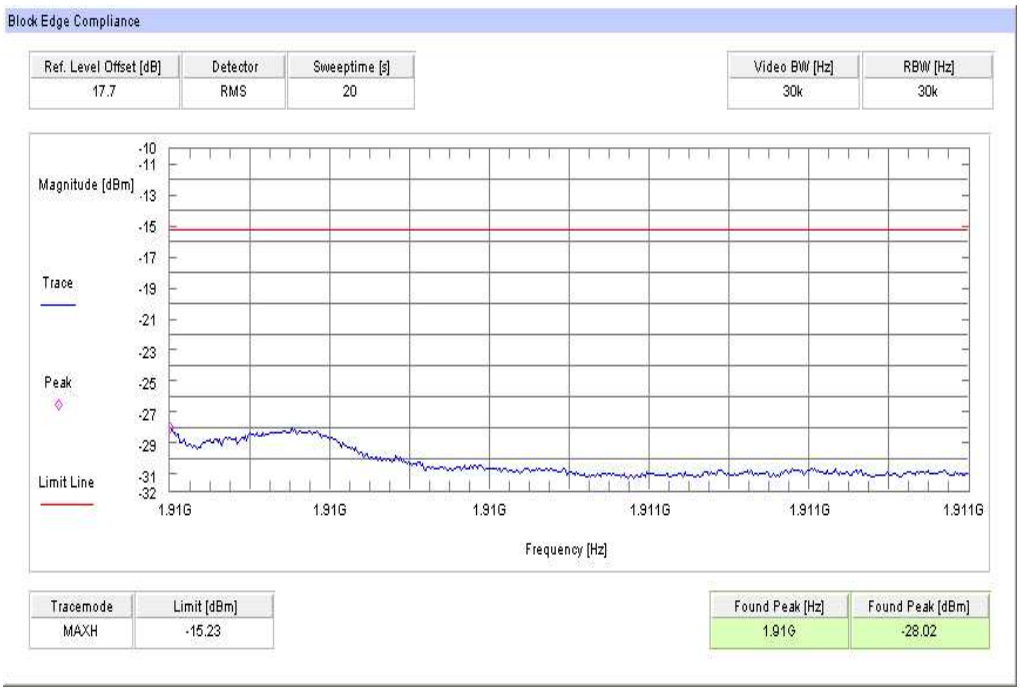
"An alternative is to add an additional correction factor of 10 Log (RBW1/ RBW2) to the 43 +10 Log (P) limit. RBW1 is the narrower measurement resolution bandwidth and RBW2 is either the 1% emissions bandwidth or 1 MHz."

When using a 30 kHz bandwidth, this yields a -2.2185 adjustment to the limit [10log(30kHz/50kHz) = -2.2185]. When this adjustment is applied to the limit, the limit becomes -15.2288.

Plot 1: TX mode, channel 9262, UMTS / WCDMA



Plot 2: TX mode, channel 9538, UMTS / WCDMA



5.3.6 Occupied Bandwidth

Reference

FCC:	CFR Part 24.238, 2.1049
IC:	RSS 133, Issue 5, Section 6.5

Occupied Bandwidth Results

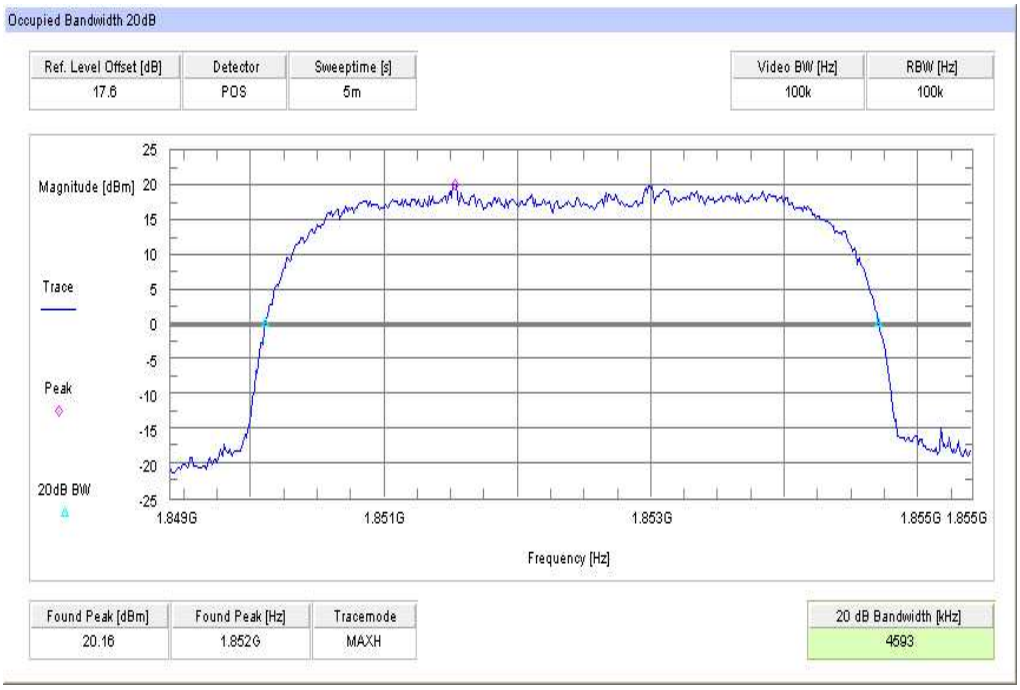
Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the USPCS frequency band. Table 8.2 below lists the measured 99% power and -26dBC occupied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

Normal mode

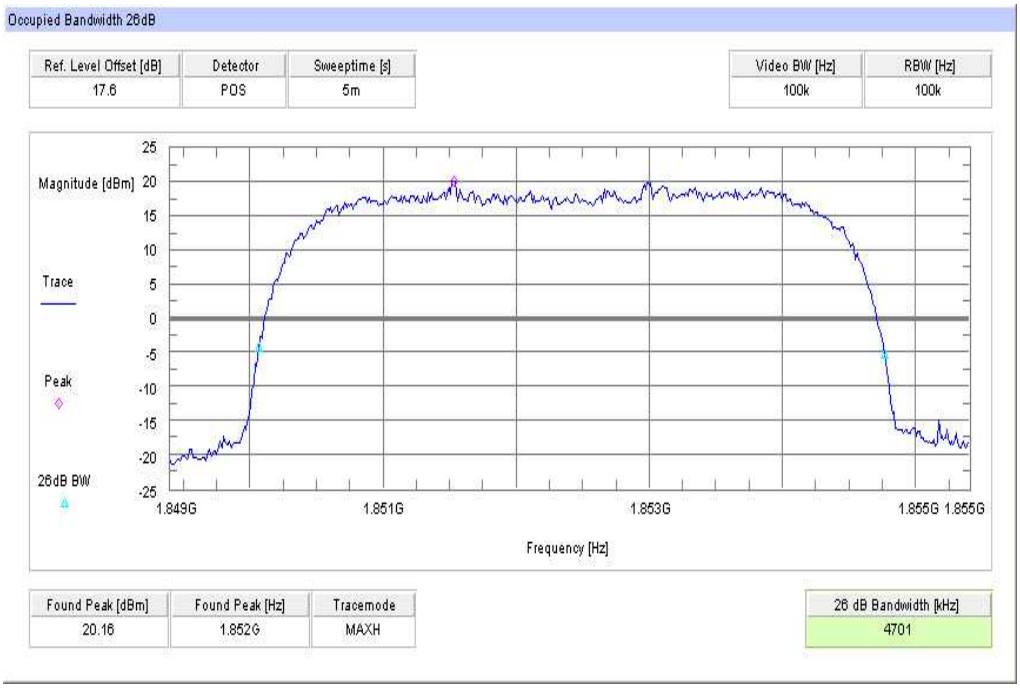
Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1852.4 MHz	4593	4701
1880.0 MHz	4581	4701
1907.6 MHz	4593	4689

Part 24.238 (a) requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 4700 kHz, this equates to a resolution bandwidth of at least 50 kHz. For this testing, a resolution bandwidth 100 kHz was used.

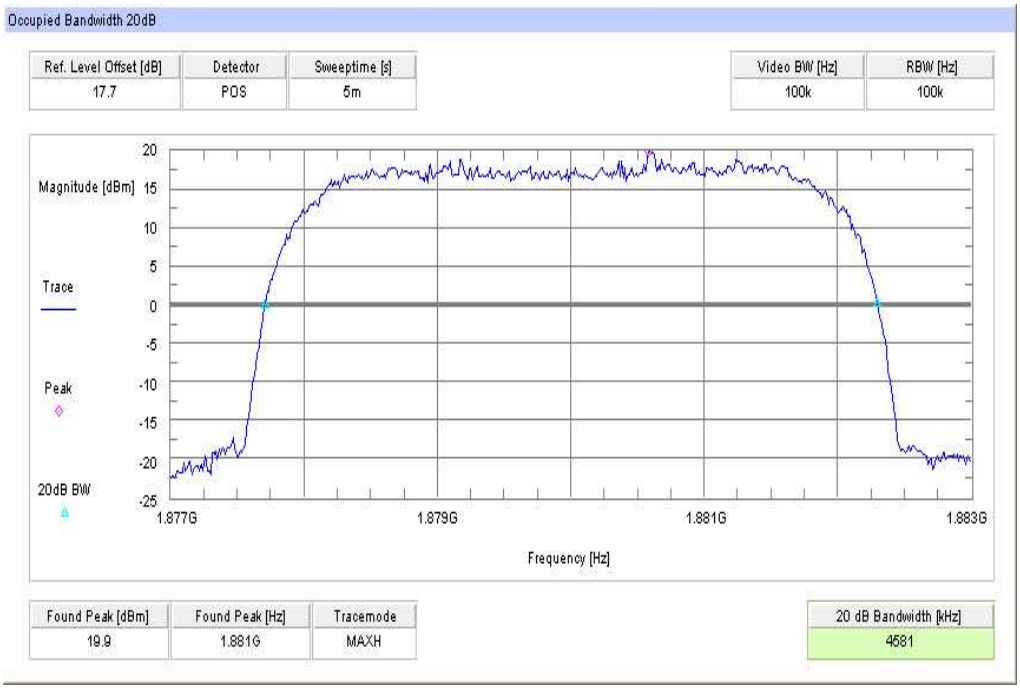
Plot 1: TX mode, channel 9262, UMTS / WCDMA, 99% (-20 dB) Occupied Bandwidth



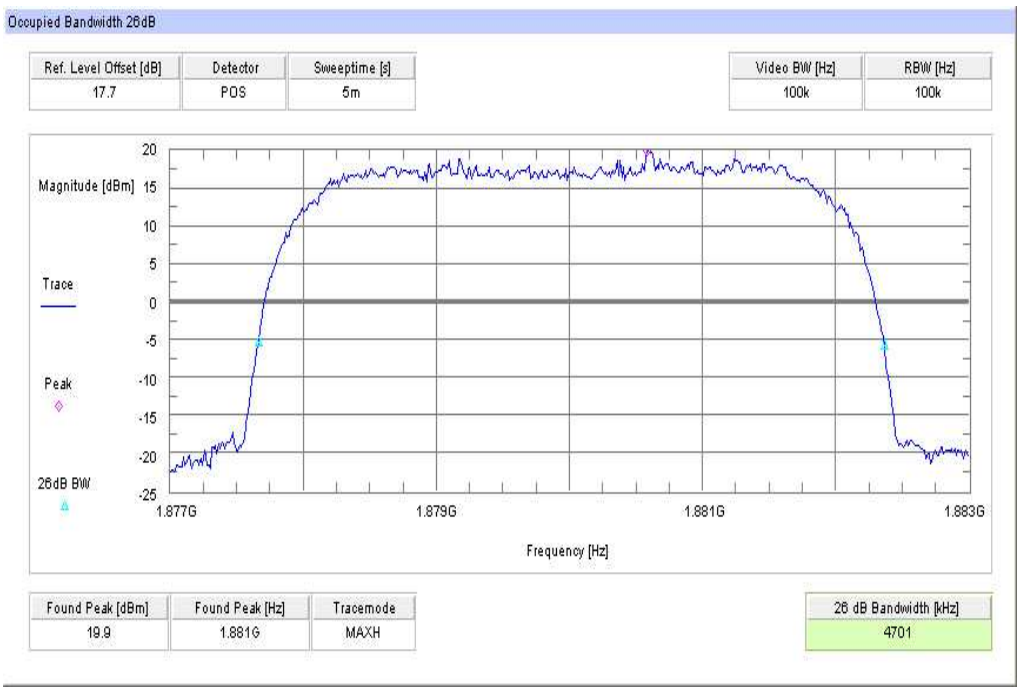
Plot 2: TX mode, channel 9262, UMTS / WCDMA, -26 dBc Bandwidth



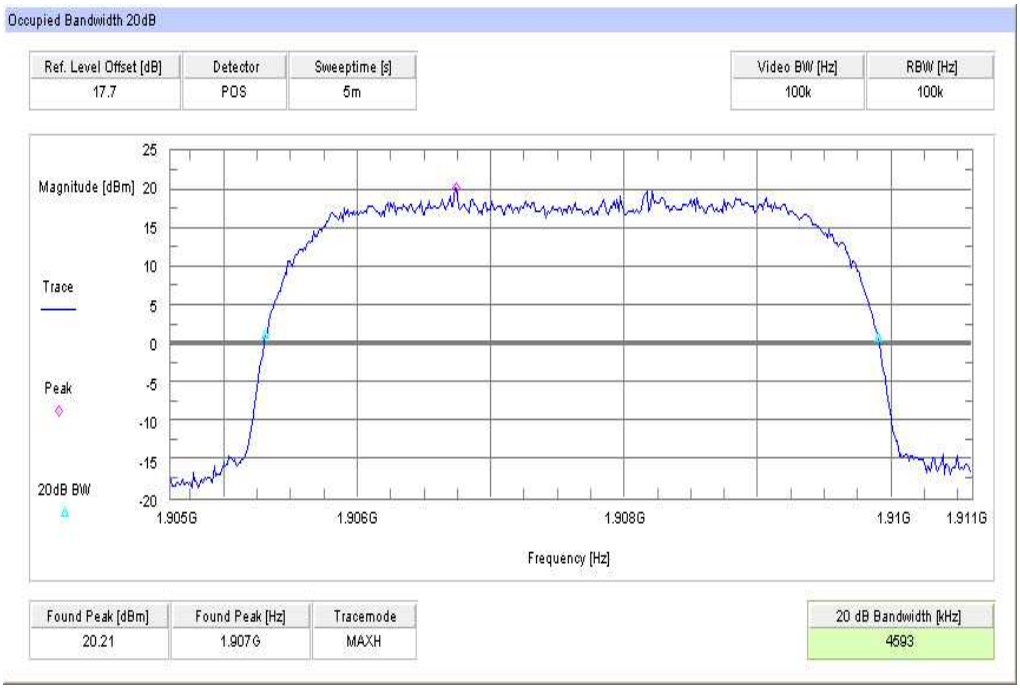
Plot 3: TX mode, channel 9400, UMTS / WCDMA, 99% (-20 dB) Occupied Bandwidth



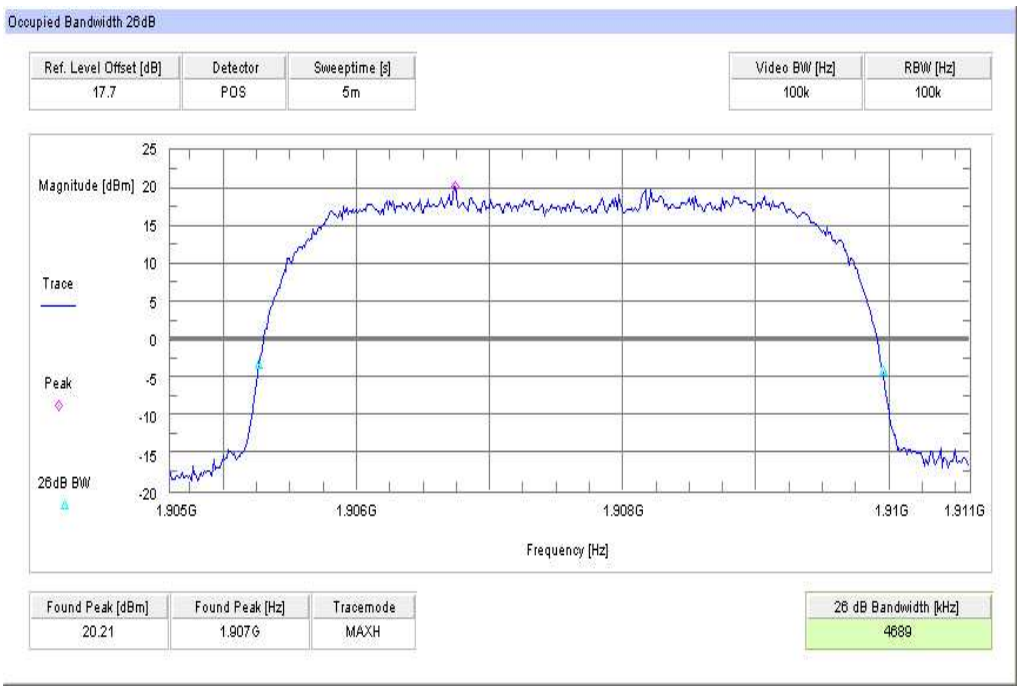
Plot 4: TX mode, channel 9400, UMTS / WCDMA, -26 dBc Bandwidth



Plot 5: TX mode, channel 9538, UMTS / WCDMA, 99% (-20 dB) Occupied Bandwidth



Plot 6: TX mode, channel 9538, UMTS / WCDMA, -26 dBc Bandwidth



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

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

Frequency (MHz)	Average Output Power (dBm)	Peak-to-Average Ratio (dB)
826.4	24.59	3.2
836.0	24.52	3.2
846.6	24.53	3.2
Measurement uncertainty	±0.5 dB	

ERP Measurements

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

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) The measurements were performed with full rf output power and modulation.

(b) Test was performed at listed 3m test site (listed with FCC, IC).

(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)

(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.

(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(f) Set the EMI Receiver and #2 as follows:
Center Frequency: test frequency
Resolution BW: 100 kHz
Video BW: same
Detector Mode: positive
Average: off
Span: 3 x the signal bandwidth

(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.

(h) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.

(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.

(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.

(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.

(l) Repeat for all different test signal frequencies

Measuring the ERP of Spurious/Harmonic Emissions using Substitution Method

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring ERP) as follows:

Center Frequency	: equal to the signal source
Resolution BW	: 10 kHz
Video BW	: same
Detector Mode	: positive
Average	: off
Span	: 3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(c) Select the frequency and E-field levels for ERP/EIRP measurements.

(d) Substitute the EUT by a signal generator and one of the following transmitting antennas (substitution antenna): .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz}.

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.

(f) Use one of the following antenna as a receiving antenna: .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.

(g) If the DIPOLE antenna is used, tune its elements to the frequency as specified in the calibration manual.

(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.

(i) Tune the EMI Receivers to the test frequency.

(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.

(k) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.

(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.

(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.

(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:
P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1
Where: P: Actual RF Power fed into the substitution antenna port after corrected.
P1: Power output from the signal generator
P2: Power measured at attenuator A input
P3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction

(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)

(p) Repeat step (d) to (o) for different test frequency

(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.

(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

Limits:

Nominal Peak Output Power (dBm)
+38.45

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

Frequency (MHz)	Average (dBm)
826.4	18.29
836.0	19.45
846.6	20.56
Measurement uncertainty	±3 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	124.9	21.5	8.4	0.0	3.3	26.3	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:

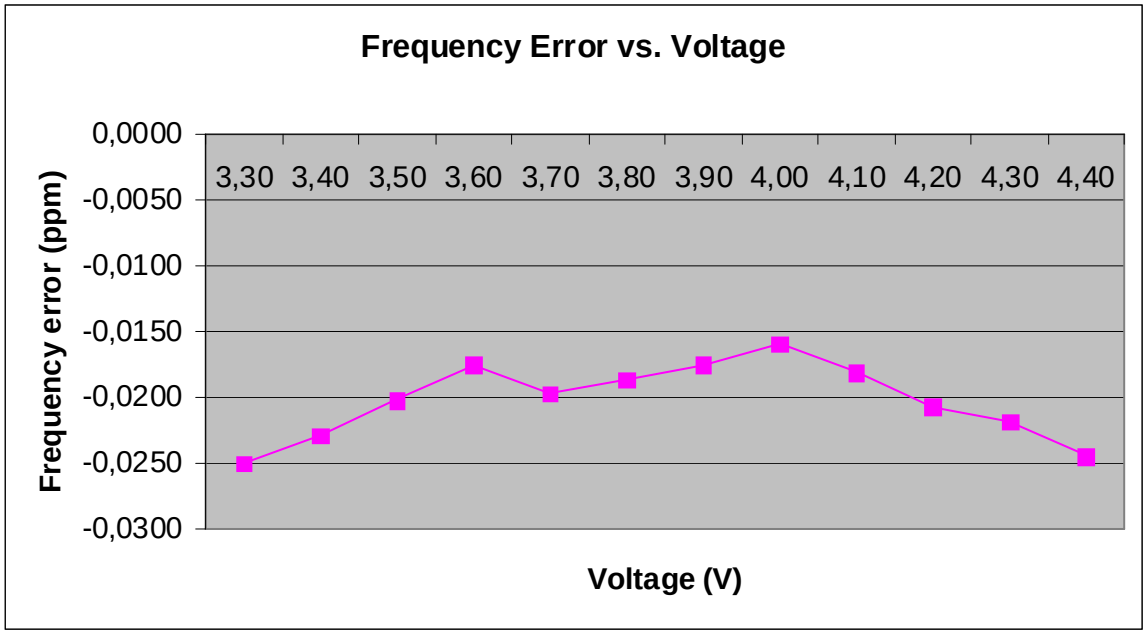
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 22.355, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission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

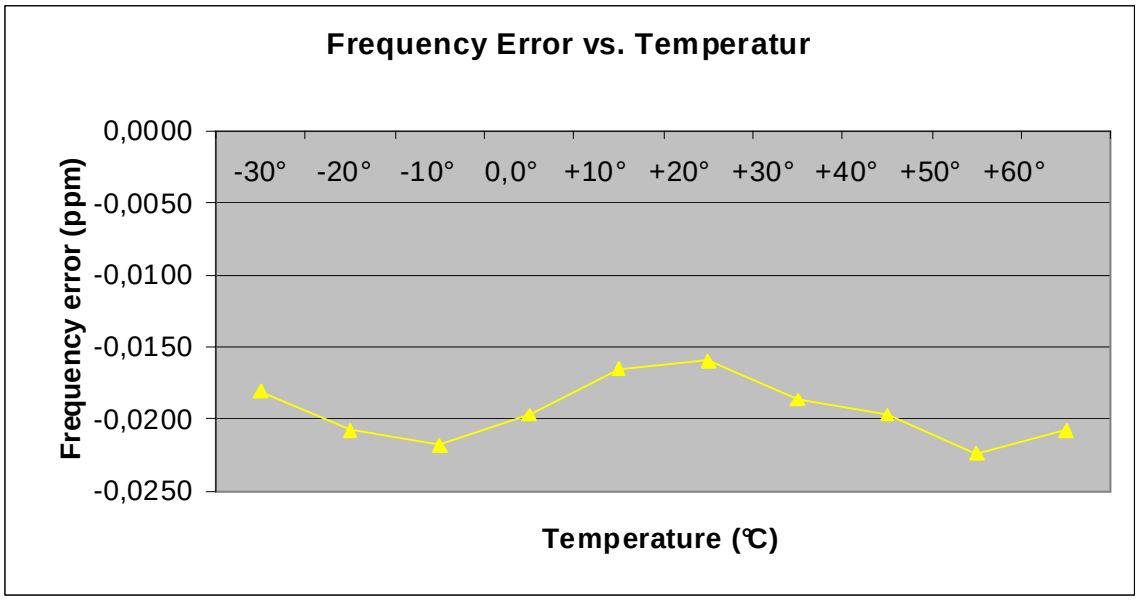
Test Results: **AFC FREQ ERROR vs. VOLTAGE**

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	-47	-0,00000250	-0,0250
3.4	-43	-0,00000229	-0,0229
3.5	-38	-0,00000202	-0,0202
3.6	-33	-0,00000176	-0,0176
3.7	-37	-0,00000197	-0,0197
3.8	-35	-0,00000186	-0,0186
3.9	-33	-0,00000176	-0,0176
4.0	-30	-0,00000160	-0,0160
4.1	-34	-0,00000181	-0,0181
4.2	-39	-0,00000207	-0,0207
4.3	-41	-0,00000218	-0,0218
4.4	-46	-0,00000245	-0,0245

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

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-34	-0,00000181	-0,0181
-20	-39	-0,00000207	-0,0207
-10	-41	-0,00000218	-0,0218
±0.0	-37	-0,00000197	-0,0197
+10	-31	-0,00000165	-0,0165
+20	-30	-0,00000160	-0,0160
+30	-35	-0,00000186	-0,0186
+40	-37	-0,00000197	-0,0197
+50	-42	-0,00000223	-0,0223
+60	-39	-0,00000207	-0,0207


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


Frequency Error vs. Temperatur
0,0000
-0,0050
-0,0100
-0,0150
-0,0200
-0,0250
Frequency error (ppm)
-30° -20° -10° 0,0° +10° +20° +30° +40° +50° +60°
Temperature (°C)

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.
All measurements were done in horizontal and vertical polarization; the plots show the worst case.
The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked,
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	-42.92 dBm vertical -43.69 dBm horizontal	1672.0	-45.10 dBm vertical -46.03 dBm horizontal	1693.2	-47.50 dBm vertical -48.43 dBm horizontal
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	-

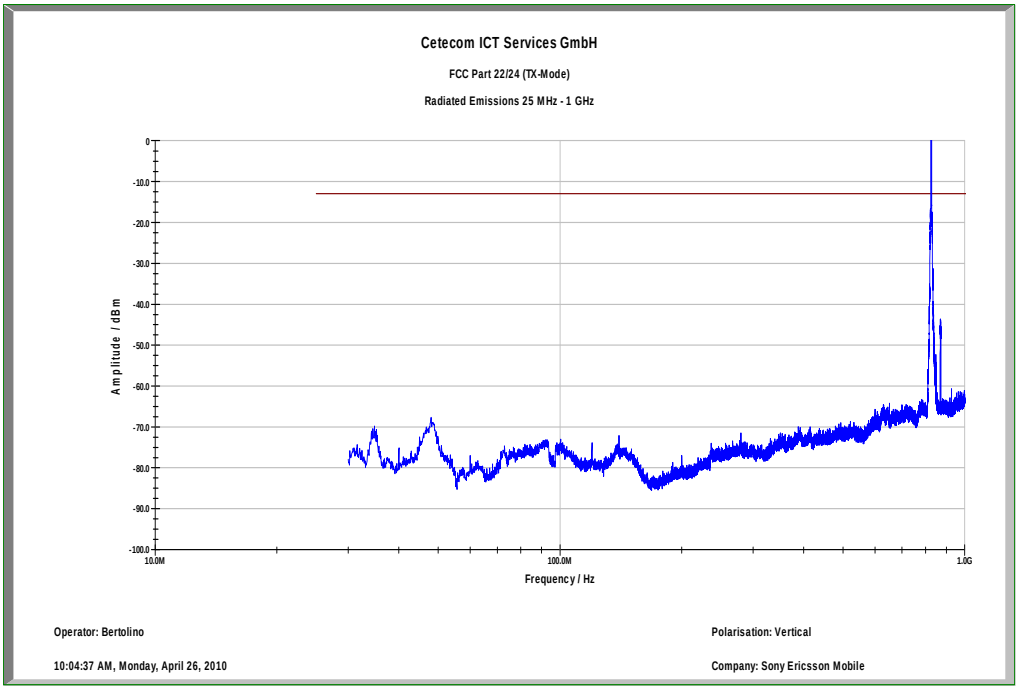
No peaks found < 20 dB below limit.

Sample calculation:

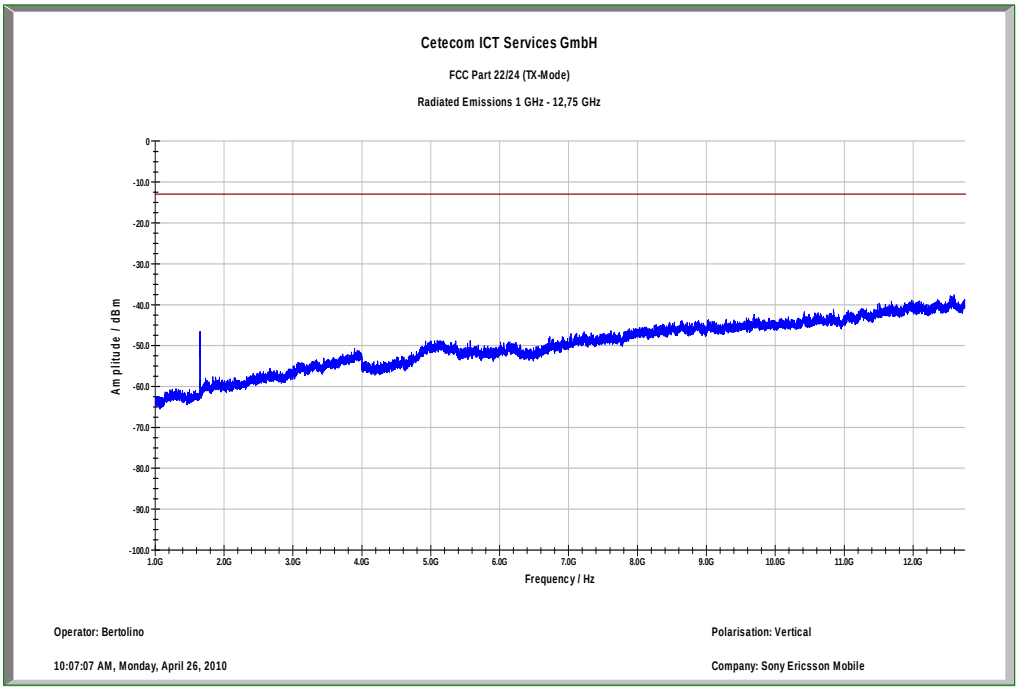
Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERP	Substitution Antenna
MHz	dBµV	dBm	dBi	dBd	dB	dBm	
846.6	124.9	21.5	8.4	0.0	3.3	26.3	UHAP Schwarzbeck S/N 460

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

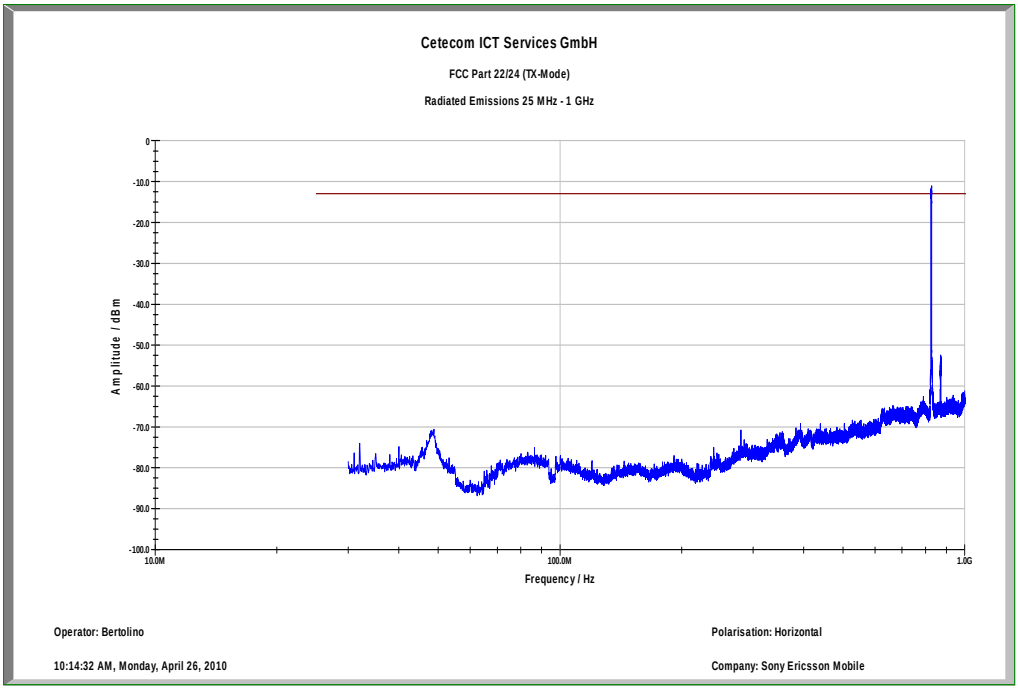
Plot 1: TX mode, channel 4132, UMTS / WCDMA, 30 MHz – 1 GHz, vertical polarization



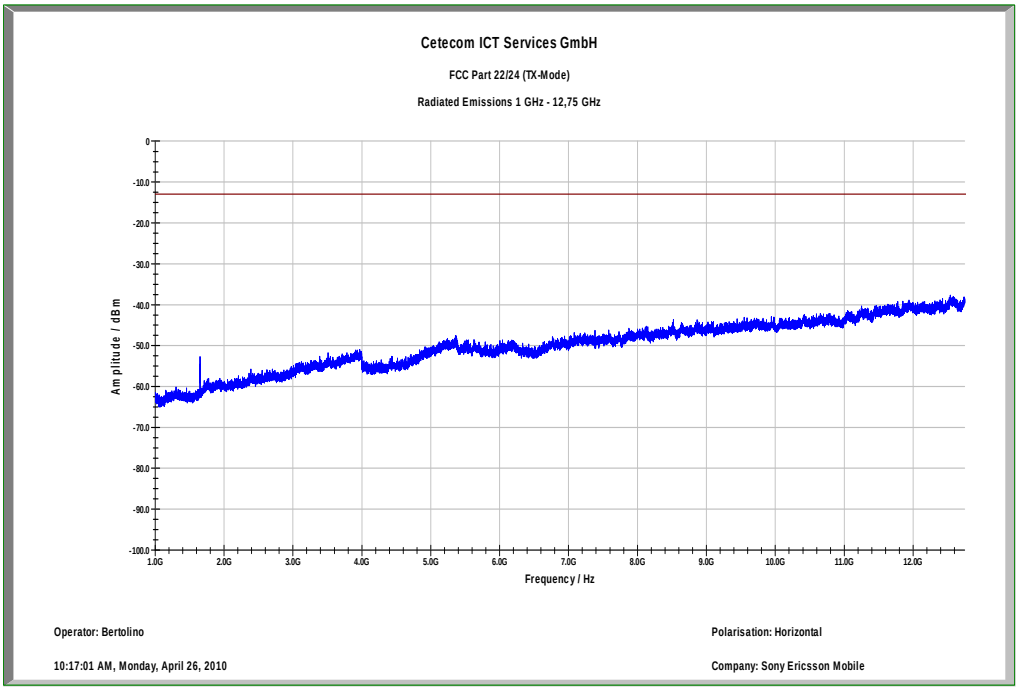
Plot 2: TX mode, channel 4132, UMTS / WCDMA, 1 GHz – 12.75 GHz, vertical polarization



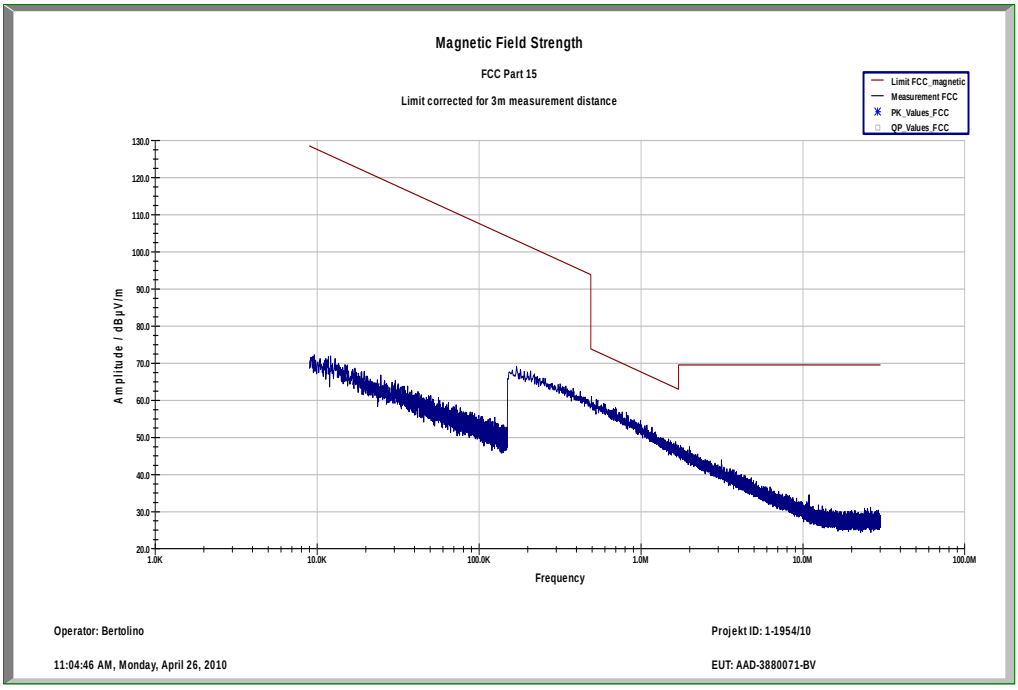
Plot 3: TX mode, channel 4132, UMTS / WCDMA, 30 MHz – 1 GHz, horizontal polarization



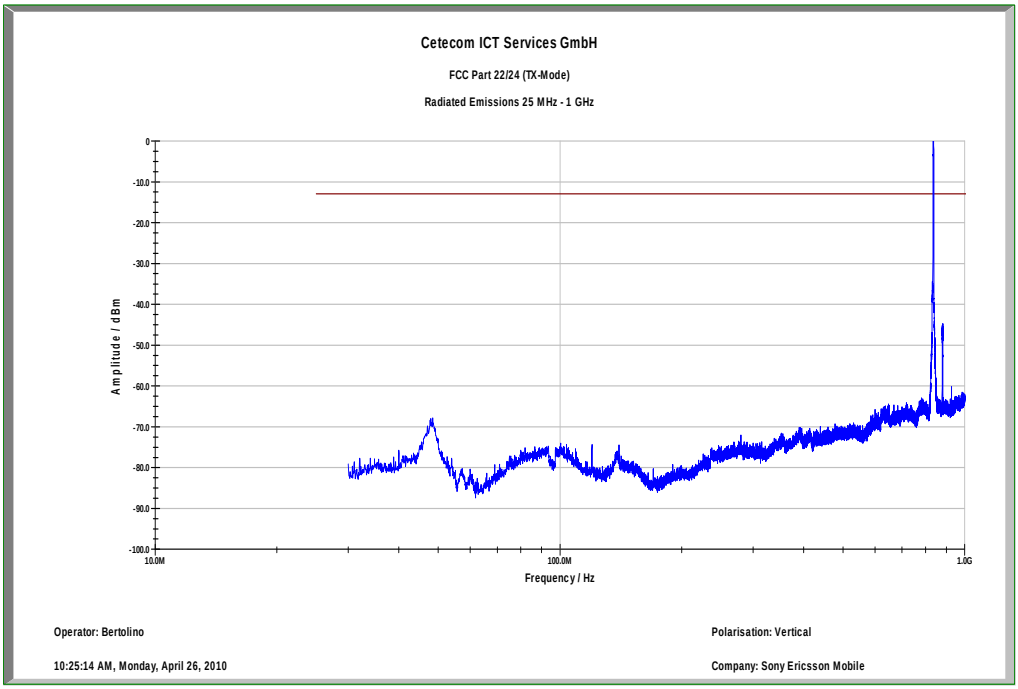
Plot 4: TX mode, channel 4132, UMTS / WCDMA, 1 GHz – 12.75 GHz, horizontal polarization



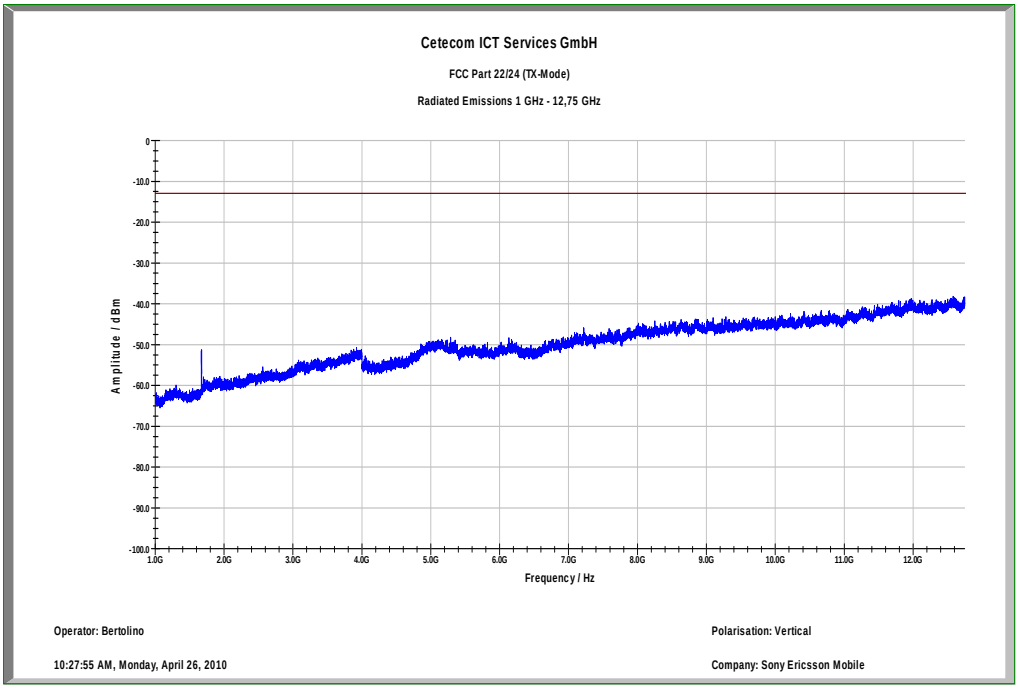
Plot 5: TX mode, channel 4180, UMTS / WCDMA, 10 kHz - 30 MHz (valid for all channels)



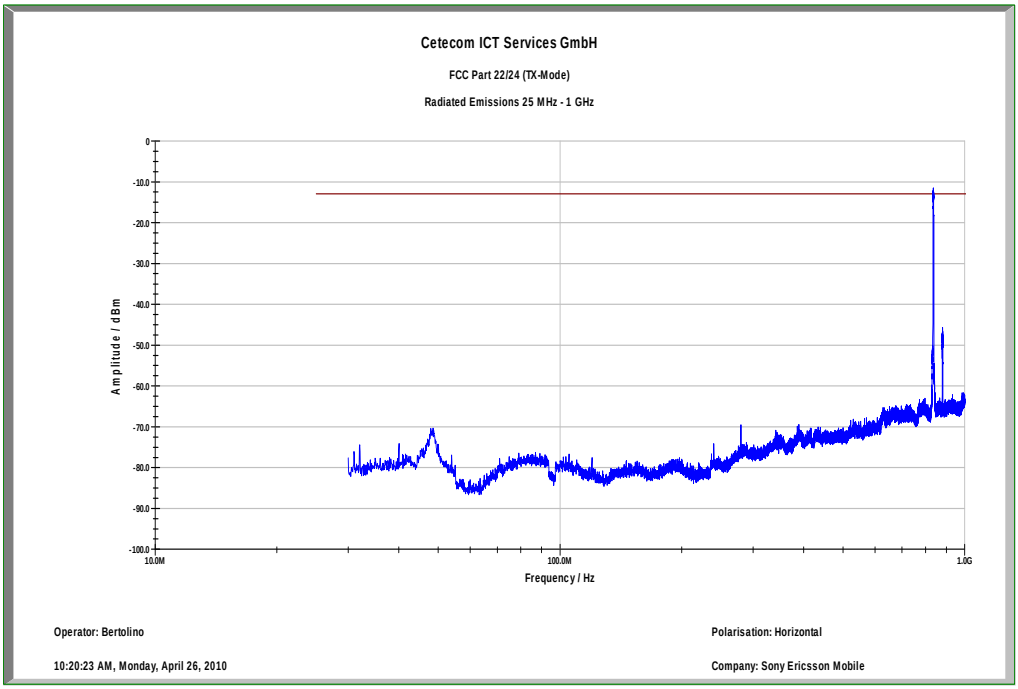
Plot 7: TX mode, channel 4180, UMTS / WCDMA, 30 MHz – 1 GHz, vertical polarization



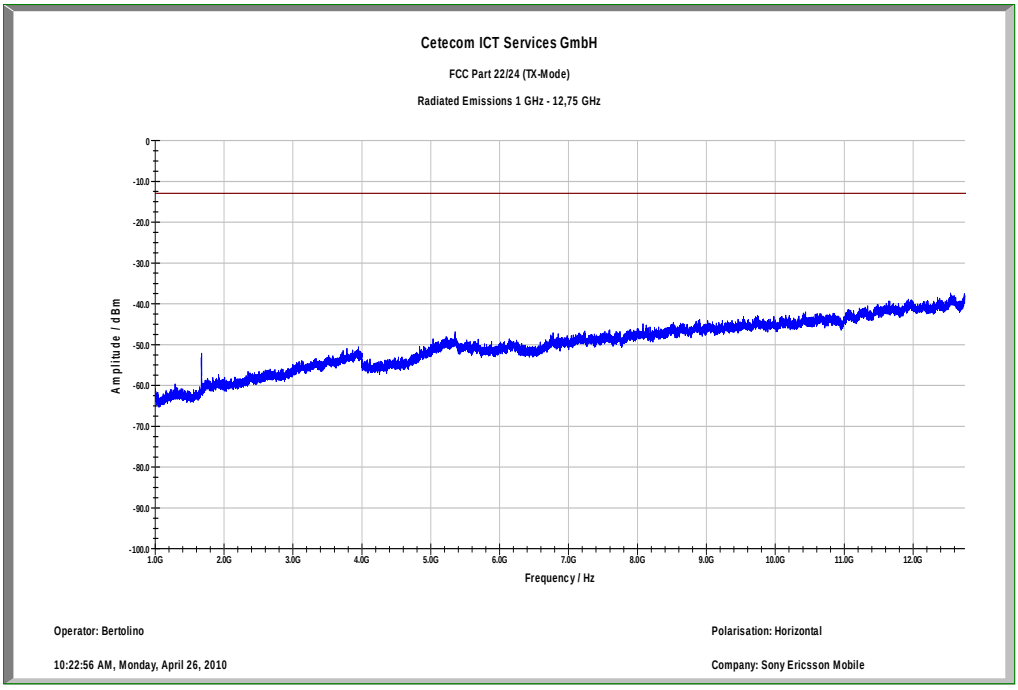
Plot 8: TX mode, channel 4180, UMTS / WCDMA, 1 GHz – 12.75 GHz, vertical polarization



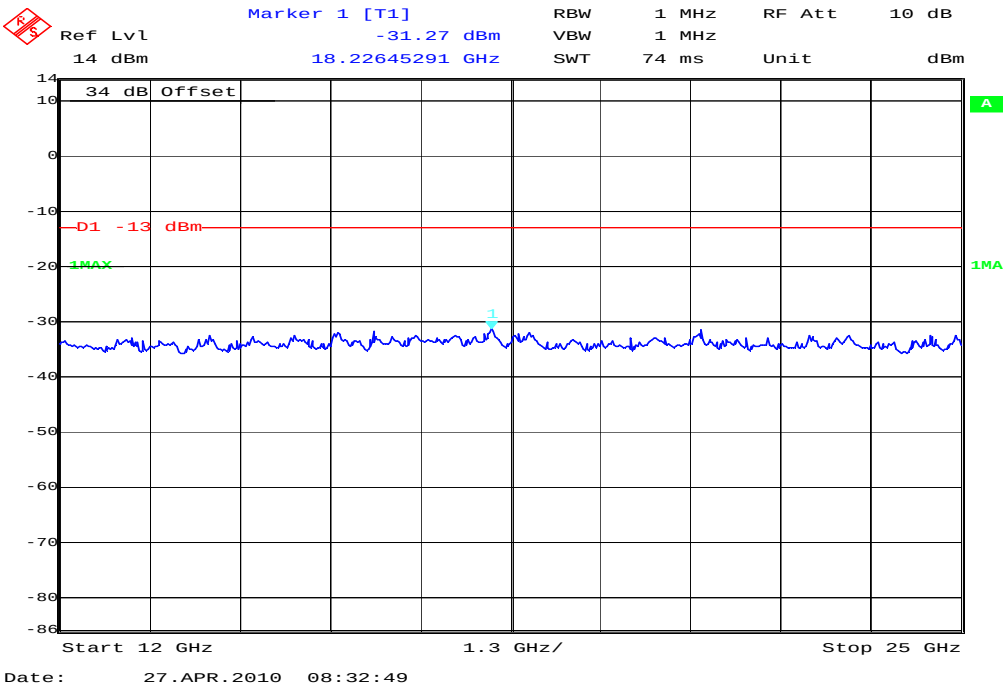
Plot 9: TX mode, channel 4180, UMTS / WCDMA, 30 MHz – 1 GHz, horizontal polarization



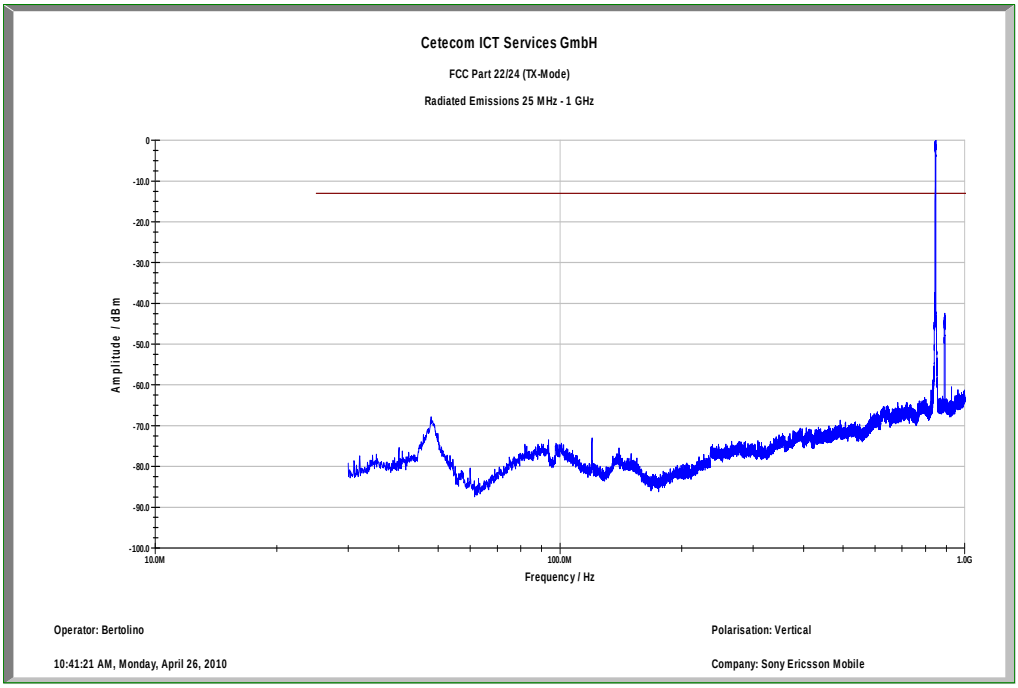
Plot 10: TX mode, channel 4180, UMTS / WCDMA, 1 GHz – 12.75 GHz, horizontal polarization



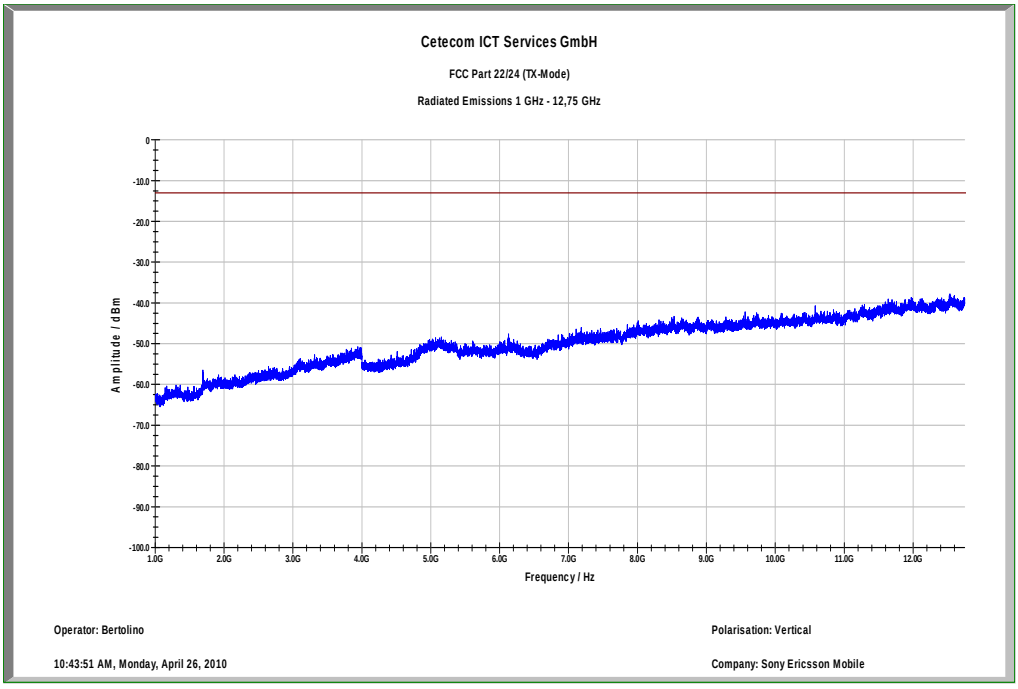
Plot 11: TX mode, channel 4180, UMTS / WCDMA, 12 GHz - 25 GHz (valid for all channels)



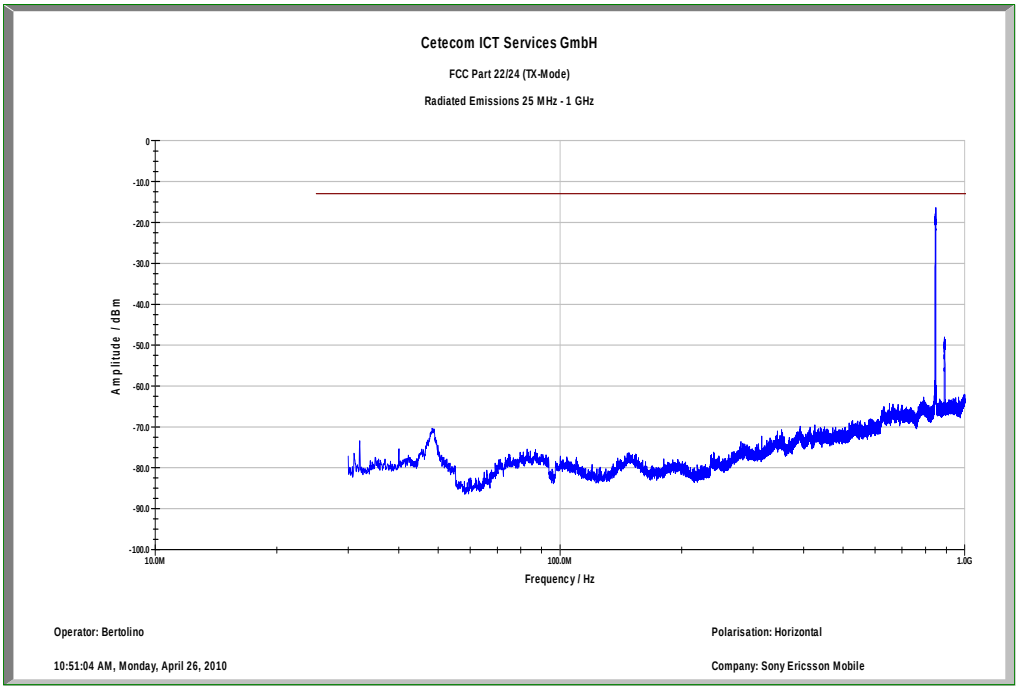
Plot 12: TX mode, channel 4233, UMTS / WCDMA, 30 MHz – 1 GHz, vertical polarization



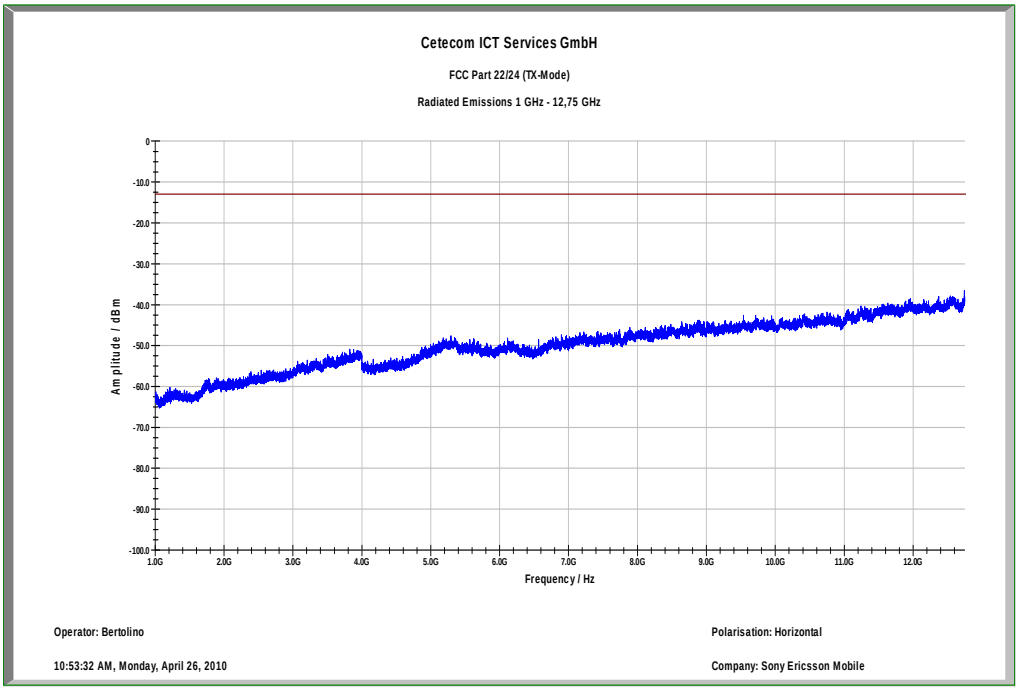
Plot 13: TX mode, channel 4233, UMTS / WCDMA, 1 GHz – 12.75 GHz, vertical polarization



Plot 14: TX mode, channel 4233, UMTS / WCDMA, 30 MHz – 1 GHz, horizontal polarization



Plot 15: TX mode, channel 4233, UMTS / WCDMA, 1 GHz – 12.75 GHz, horizontal polarization



5.4.4 Conducted Spurious Emissions

Reference

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

Measurement Procedure

The following steps outline the procedure used to measure the conducted emissions from the mobile station.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 19.1 GHz, data taken from 10 MHz to 20 GHz.

2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

UMTS Transmitter Channel Frequency

4132 826.4 MHz
4180 836.0 MHz
4233 846.6 MHz

Measurement Limit

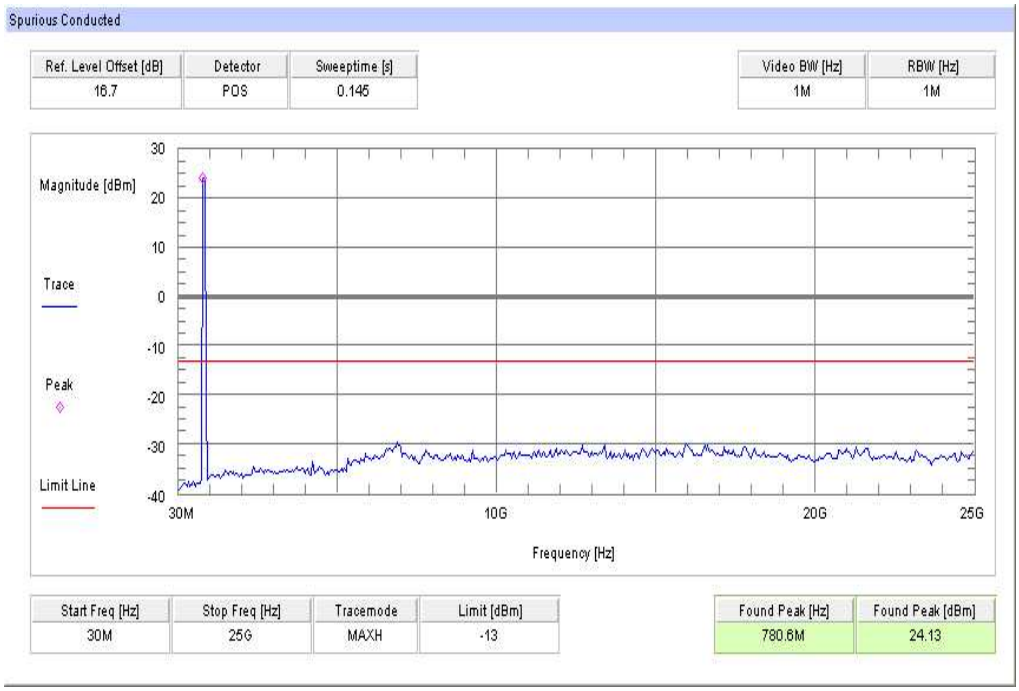
(a) On any frequency outside frequency band of the UMTS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log (P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

Measurement Results

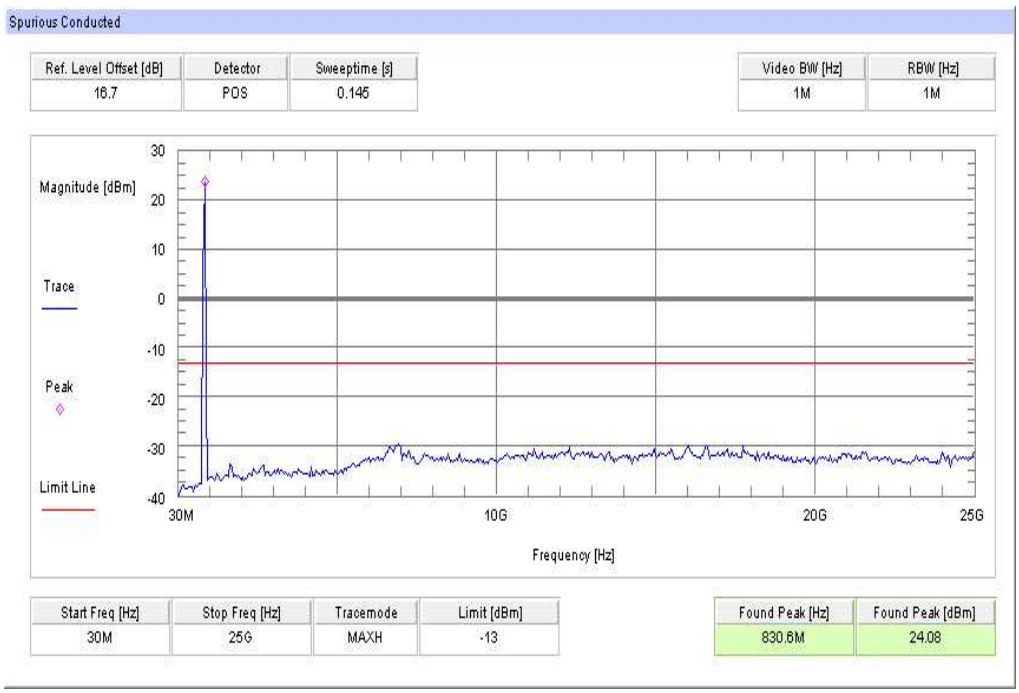
Harmonic	Tx ch.-4132 Freq. (MHz)	Level (dBm)	Tx ch.-4180 Freq. (MHz)	Level (dBm)	Tx ch.- 4233 Freq. (MHz)	Level (dBm)
2	1652.8	No harmonics detected!	1672.0	No harmonics detected!	1693.2	No harmonics detected!
3	2479.2		2508.0		2539.8	
4	3305.6		3344.0		3386.4	
5	4132.0		4180.0		4233.0	
6	4958.4		5016.0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

No peaks found < 20 dB below limit.

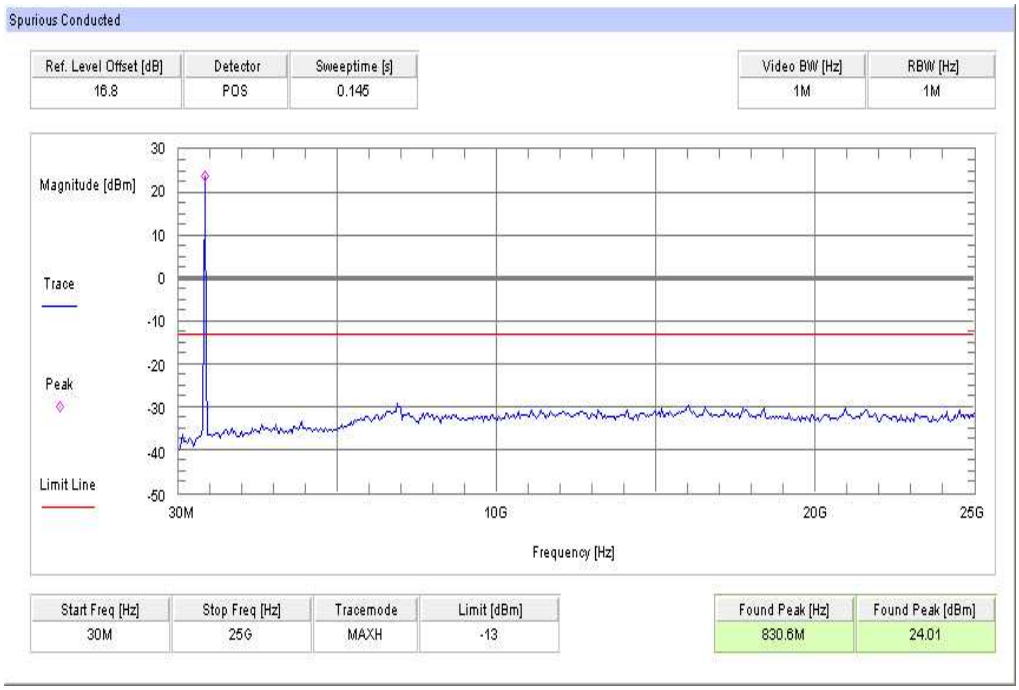
Plot 1: TX mode, channel 4132, UMTS / WCDMA, 30 MHz – 25 GHz



Plot 2: TX mode, channel 4180, UMTS / WCDMA, 30 MHz – 25 GHz



Plot 3: TX mode, channel 4233, UMTS / WCDMA, 30 MHz – 25 GHz



5.4.5 Block Edge Compliance

Reference

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

Measurement Limit:

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

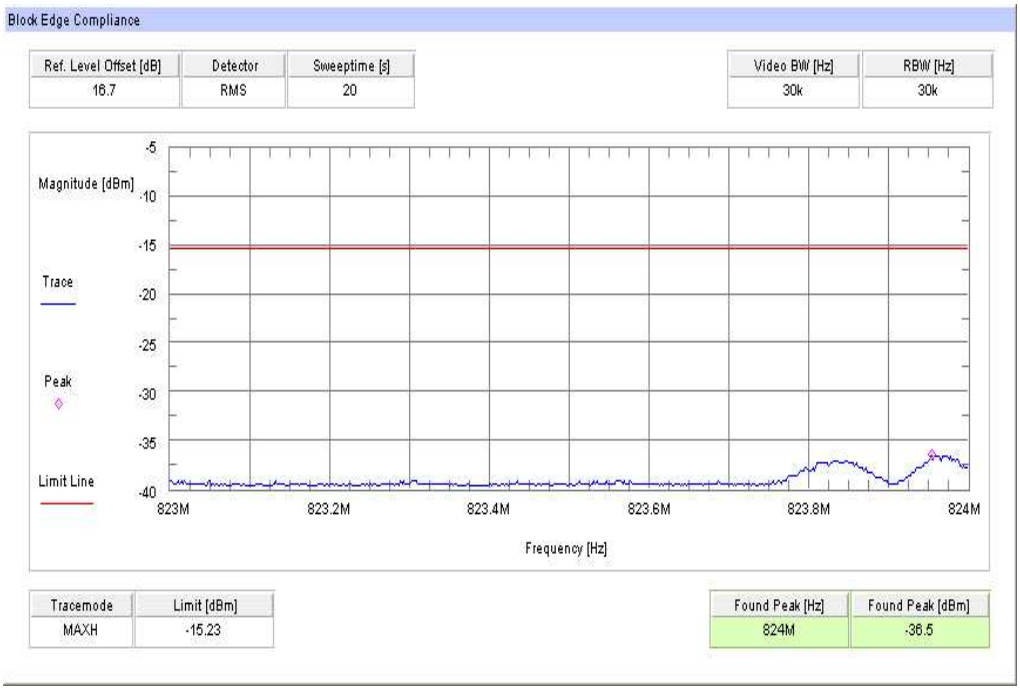
Part 22.917 specifies that "the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB."

However, in publication number 890810, The FCC Office of Engineering and Technology specified the following correction to the limits when a resolution bandwidth smaller than 1% of the emission bandwidth is used:

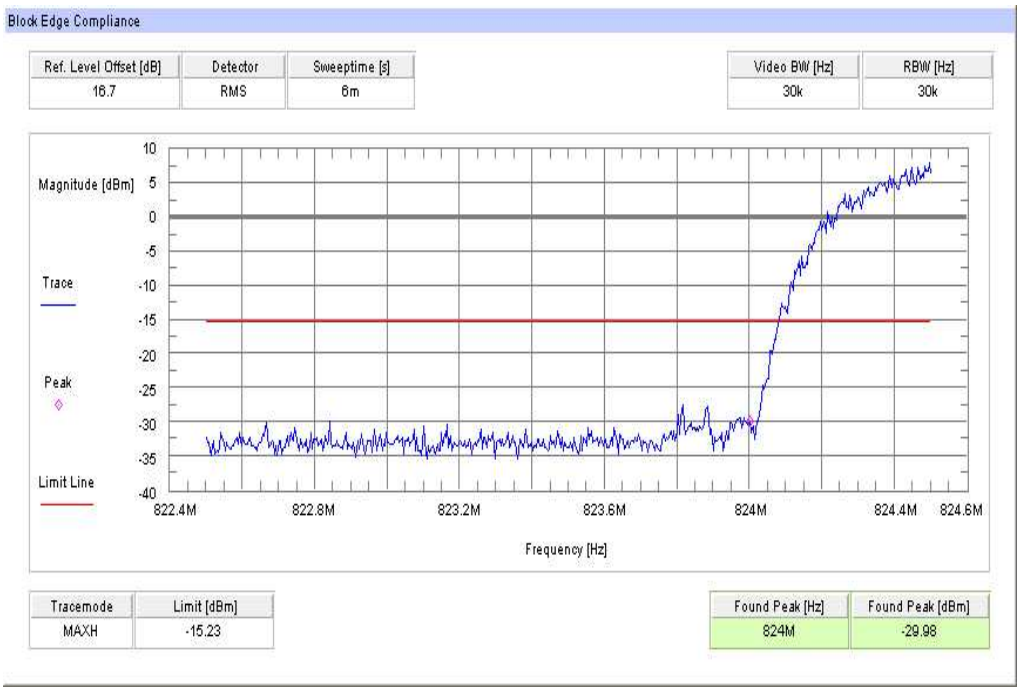
"An alternative is to add an additional correction factor of 10 Log (RBW1/ RBW2) to the 43 +10 Log (P) limit. RBW1 is the narrower measurement resolution bandwidth and RBW2 is either the 1% emissions bandwidth or 1 MHz."

When using a 30 kHz bandwidth, this yields a -2.2185 adjustment to the limit [10log(30kHz/50kHz) = -2.2185]. When this adjustment is applied to the limit, the limit becomes -15.2288.

Plot 1: TX mode, channel 4132, UMTS / WCDMA

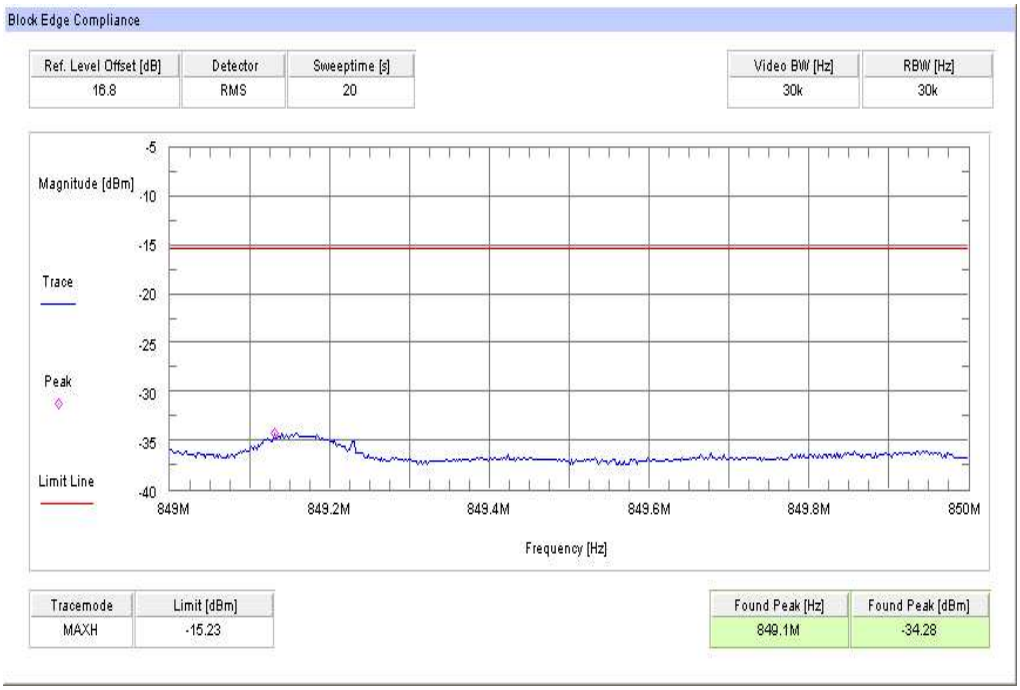


Plot 2: TX mode, channel 4132, UMTS / WCDMA



Plot not mandatory – for information only!

Plot 3: TX mode, channel 4233, UMTS / WCDMA



5.4.6 Occupied Bandwidth

Reference

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

Occupied Bandwidth Results

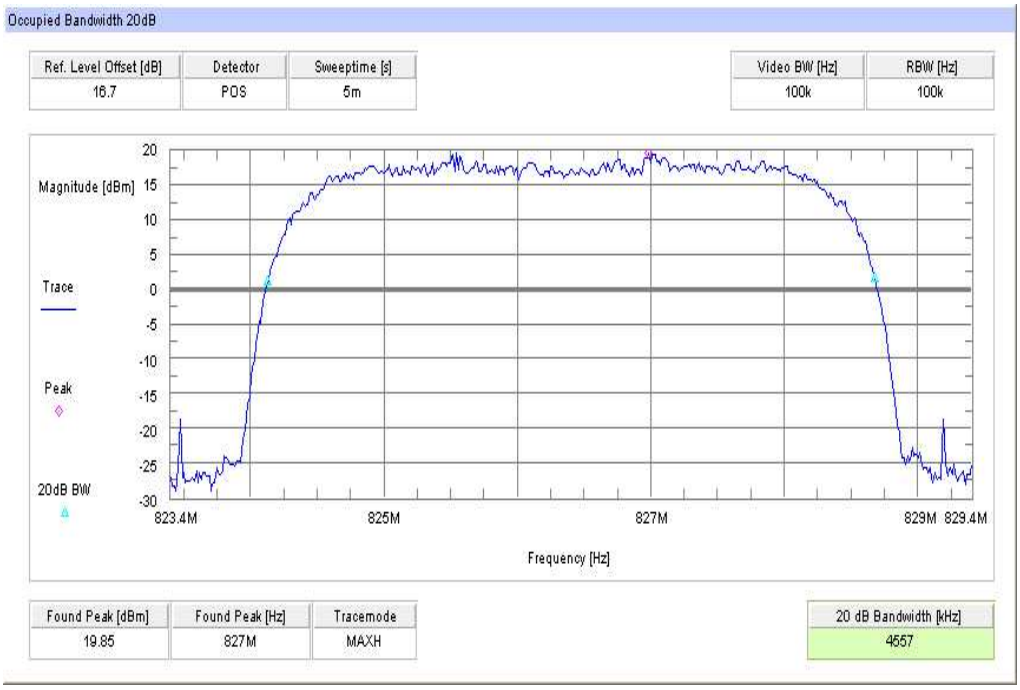
Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the UMTS frequency band. Table below lists the measured 99% power and -26dBC occupied bandwidths.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

Normal mode

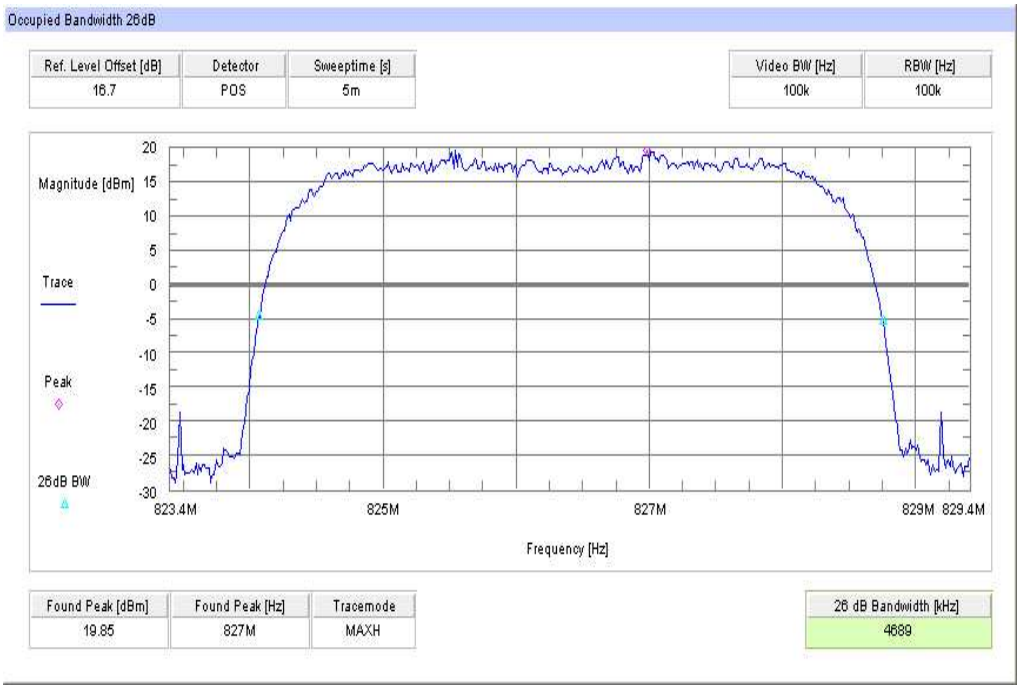
Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
826.4 MHz	4557	4689
836.0 MHz	4569	4701
846.6 MHz	4569	4701

Part 22 requires a measurement bandwidth of at least 1% of the occupied bandwidth. For ca. 4700 kHz, this equates to a resolution bandwidth of at least 50 kHz. For this testing, a resolution bandwidth 100 kHz was used.

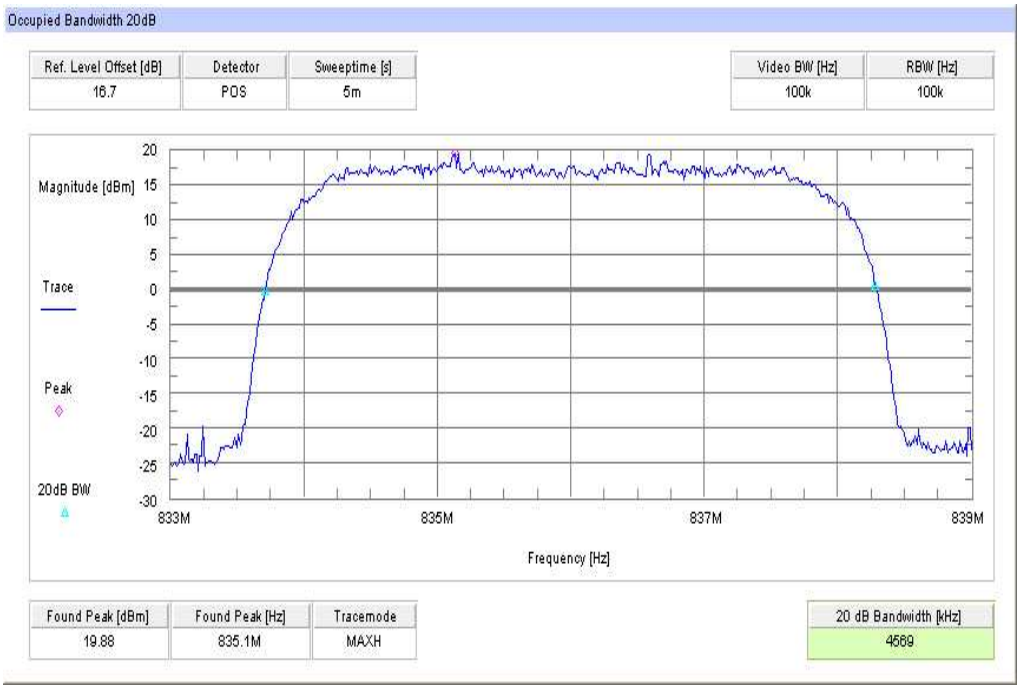
Plot 1: TX mode, channel 4132, UMTS / WCDMA, 99% (-20 dB) Occupied Bandwidth



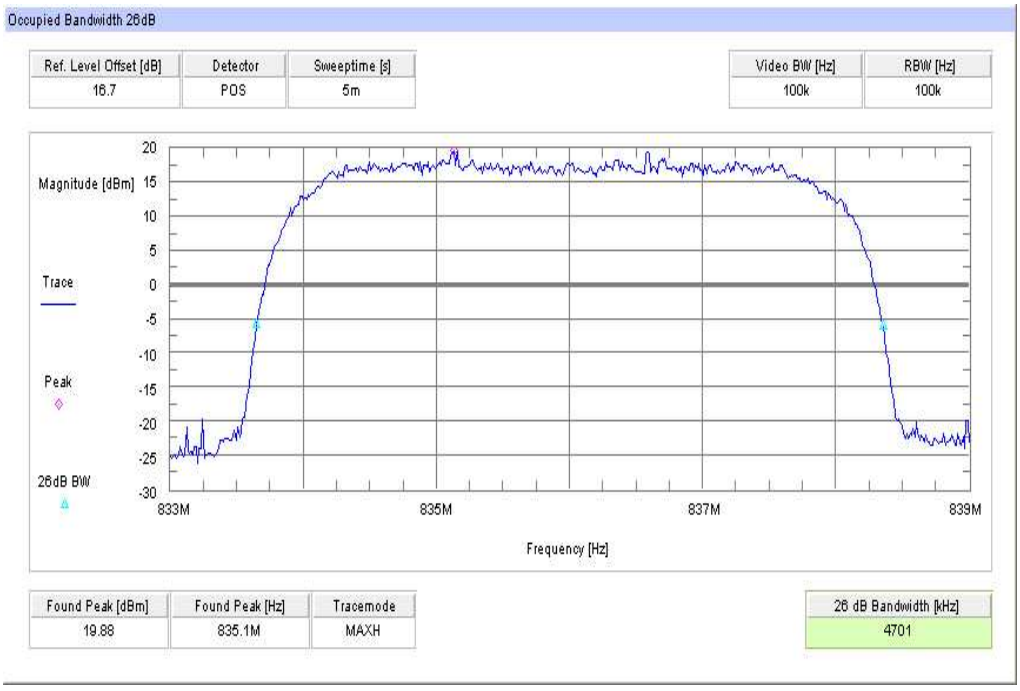
Plot 2: TX mode, channel 4132, UMTS / WCDMA, -26 dBc Bandwidth



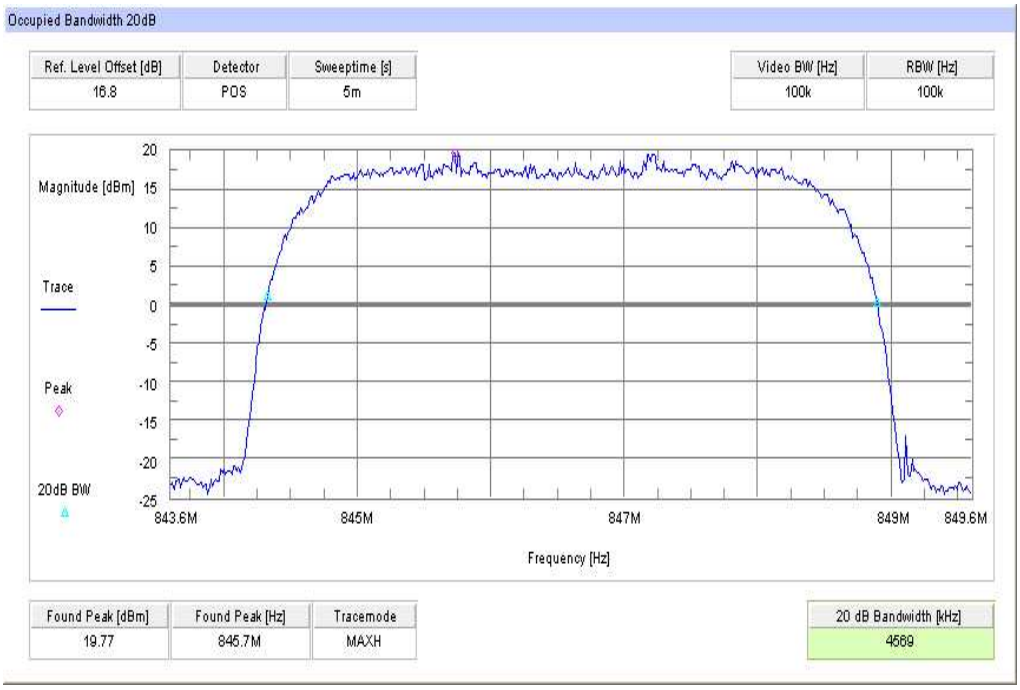
Plot 3: TX mode, channel 4180, UMTS / WCDMA, 99% (-20 dB) Occupied Bandwidth



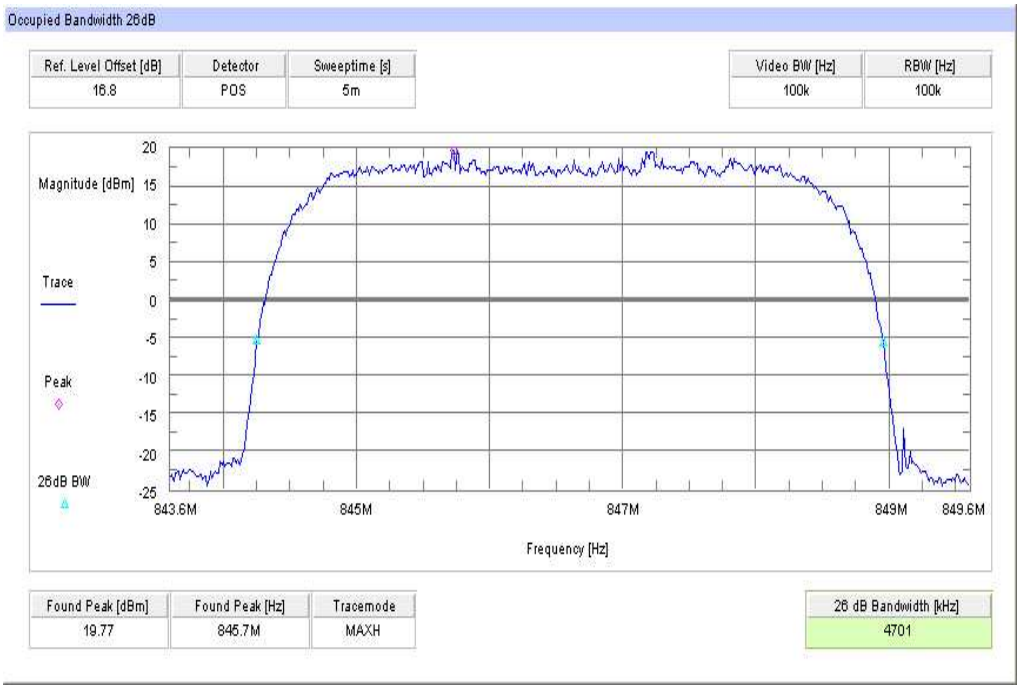
Plot 4: TX mode, channel 4180, UMTS / WCDMA, -26 dBc Bandwidth



Plot 5: TX mode, channel 4233, UMTS / WCDMA, 99% (-20 dB) Occupied Bandwidth



Plot 6: TX mode, channel 4233, UMTS / WCDMA, -26 dBc Bandwidth



5.5 Receiver

5.5.1 Receiver Radiated Emissions

Reference

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

Method of measurement

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

Measurement Results

SPURIOUS EMISSIONS LEVEL (dBµV/m)								
Idle mode			-/-			-/-		
f (MHz)	Detector	Level (dBµV/m)	f (MHz)	Detector	Level (dBµV/m)	f (MHz)	Detector	Level (dBµV/m)
No critical peaks detected. All detected emissions are below the limit.								
Measurement uncertainty			±3 dB					

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

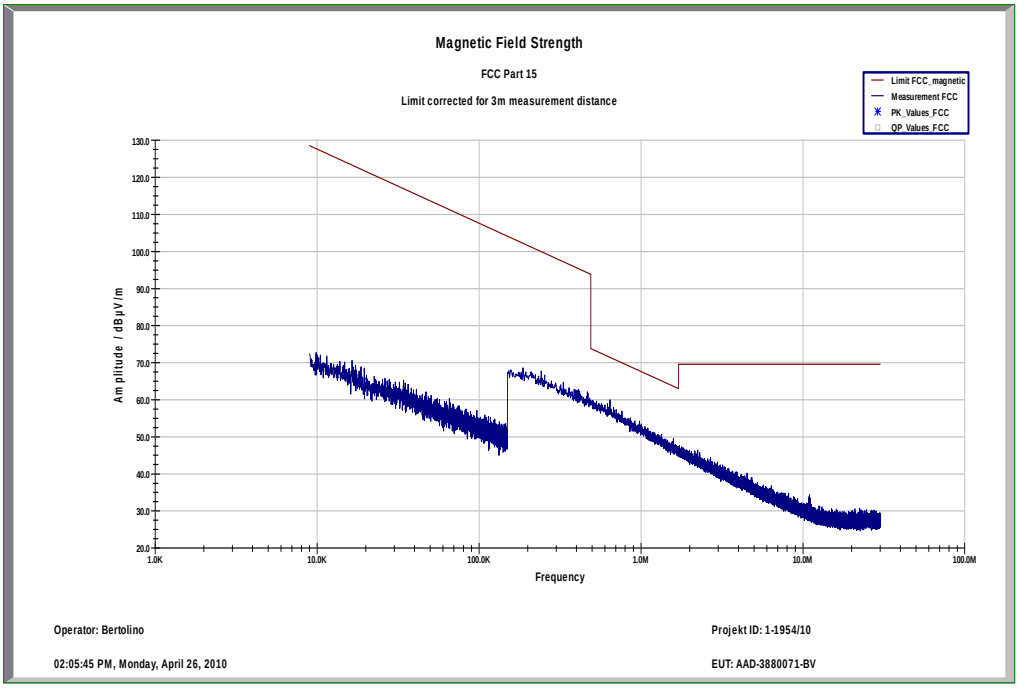
H = Horizontal; V= Vertical

Measurement distance see table

Limits: § 15.109

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

Plot 1: RX mode, 10 kHz – 30 MHz (valid for all channels)



Plot 2: RX mode, 30 MHz – 1 GHz, vertical & horizontal polarization

CETECOM ICT Services GmbH

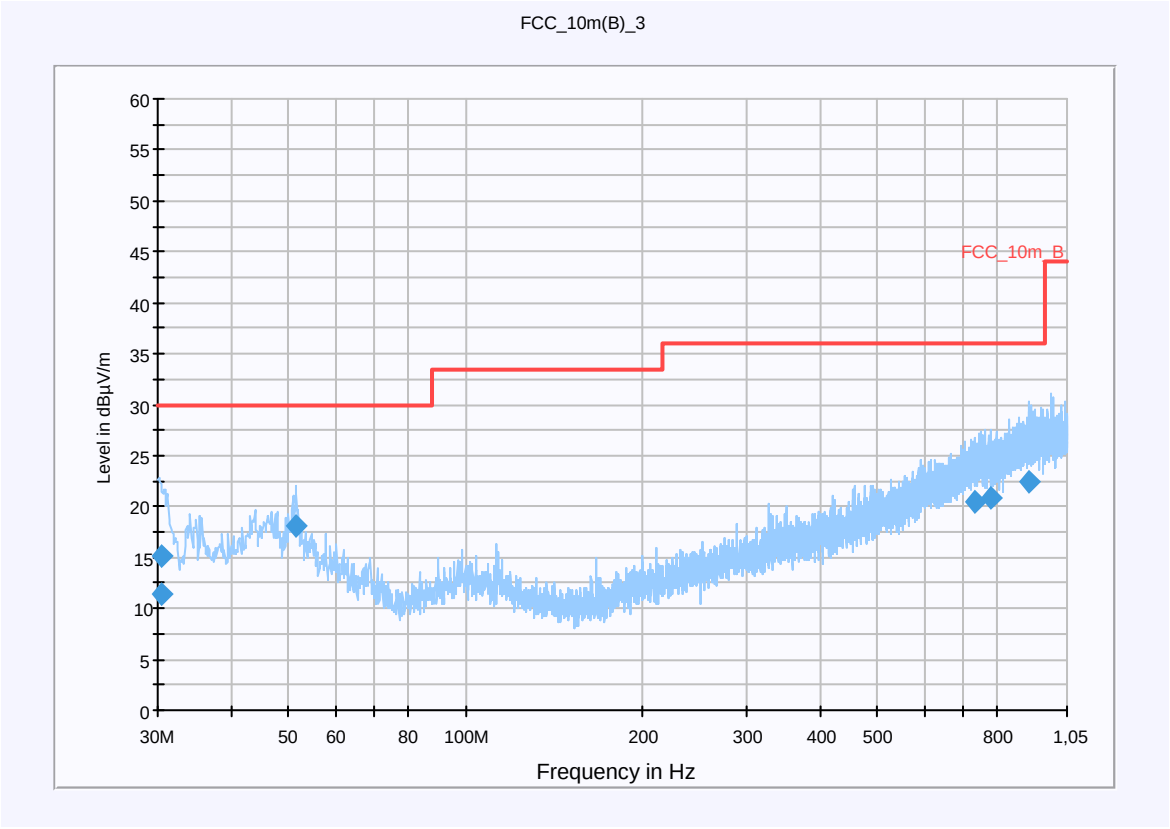
Common Information

EUT:	AAD-3880071-BV + Standard USB Charger EP800
Serial Number:	IMEI:00440214-045595-1
Test Description:	FCC part 15 B Class B @ 10m
Operating Conditions:	GSM / UMTS idle / A-GPS active
Operator Name:	Lang
Comment:	AC: 115 V / 60 Hz

Scan Setup: STAN_Fin [EMI radiated]

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

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1,05 GHz	QuasiPeak	120 kHz	15 s	Receiver



Final Result 1

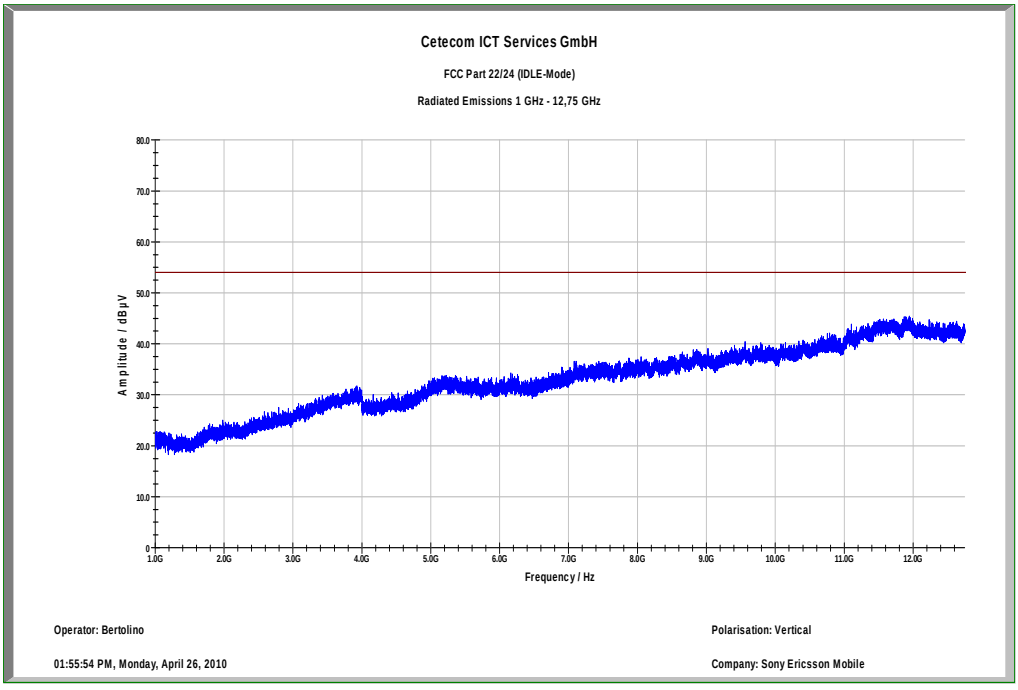
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
30.454415	15.1	15000.000	120.000	98.0	V	44.0	12.6	14.9	30.0	
30.526500	11.3	15000.000	120.000	98.0	V	211.0	12.6	18.7	30.0	
51.612000	18.2	15000.000	120.000	98.0	V	314.0	13.2	11.8	30.0	
732.225300	20.4	15000.000	120.000	220.0	H	152.0	23.2	15.6	36.0	
779.261850	20.8	15000.000	120.000	220.0	H	325.0	23.7	15.2	36.0	
907.747200	22.4	15000.000	120.000	190.0	H	152.0	25.2	13.6	36.0	

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

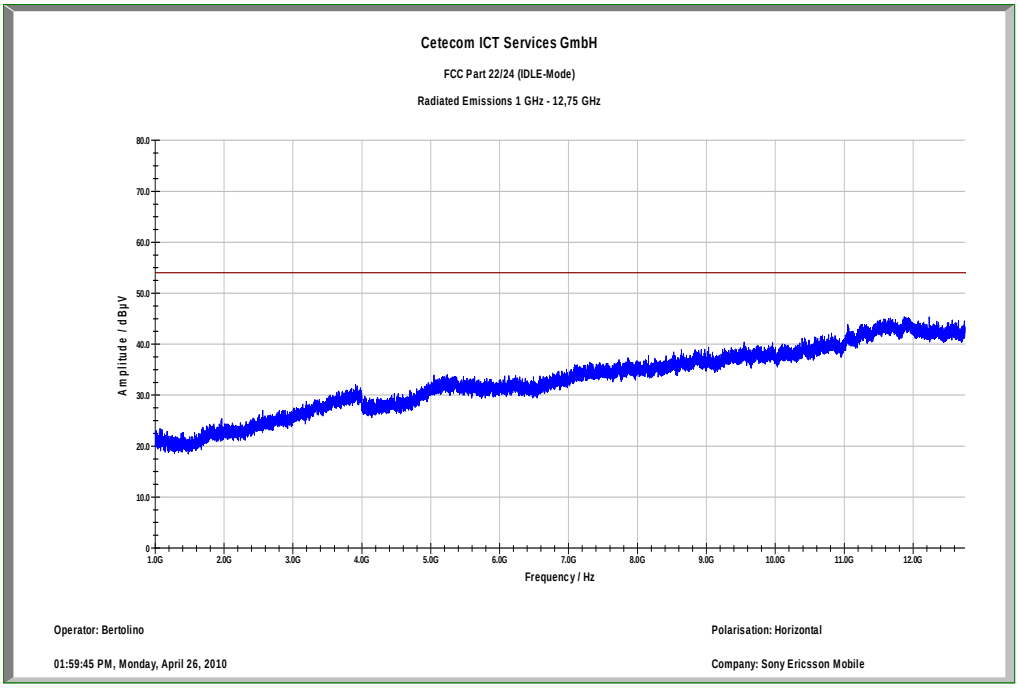
Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.32
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table: Cable_EN_1GHz (0909)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

EMC 32 Version 8.10.00

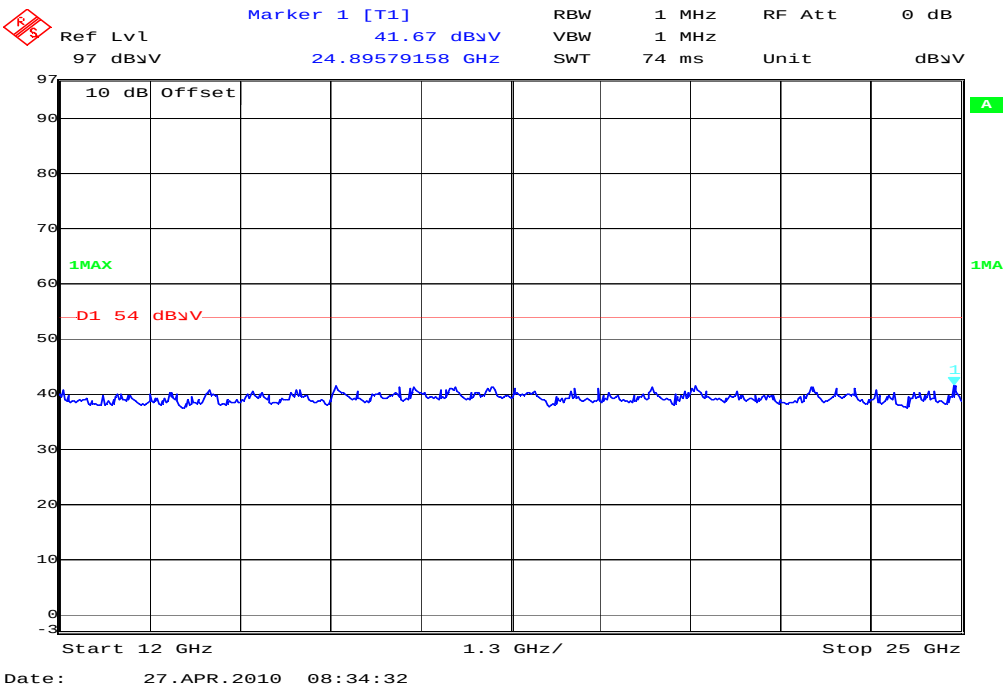
Plot 3: RX mode, 1 GHz – 12.75 GHz, vertical polarization



Plot 4: RX mode, 1 GHz – 12.75 GHz, horizontal polarization



Plot 5: RX mode, 12 GHz – 25 GHz (valid for all channels)



6 Test equipment and ancillaries used for tests

In order to simplify the identification of the equipment used at each specific test, each item of test equipment and ancillaries are provided with an identifier or number in the equipment list below.

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

No.	Labor / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kal. Art	Last Calibration	Next Calibration
1	n. a.	System Autoranging DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	08.01.2009	08.01.2012
2	n. a.	PowerAttenuator	8325	Byrd	1530	300001595			
3	n. a.	Double-Ridged Waveguide Horn Antenna 1-26.5GHz	3115	EMCO	8812-3088	300001032	vlKI!	05.03.2009	05.03.2011
4	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
5	n. a.	Anechoic chamber		MWB	87400/02	300000996			
6	Spec.A. 2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
7	9	Artificial Mains 9 kHz to 30 MHz, 4 x 25 Ampere	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
8	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
9	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
10	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
11	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
12	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
13	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
14	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
15	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		

16	n. a.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
17	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
18	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
19	n. a.	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Vertr. Bad Hom	MY48250080	300003812	k	05.08.2008	05.08.2010
20	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Vertr. Bad Hom	MY47420220	300003813	k	06.08.2008	06.08.2010
21	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Vertr. Bad Hom	MY48260003	300003825	vlKI!	19.08.2008	19.08.2010
22	n. a.	TRILOG Super Breitband Antenne	VULB9163	Schwarzbeck	371	300003854	vlKI!	17.12.2008	17.12.2010
23	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
24	50	Netzgerät	6032A	HP Meßtechnik	2920A04466	300000580	k	06.01.2009	06.01.2011
25	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B5979	300000210	k	03.09.2001	03.09.2003
26	n. a.	EMI-Messempfänger	ESCI 1166.5950.03	R&S	100083	300003312	k	08.01.2010	08.01.2012
27	n. a.	Analysator-Referenz-System (Harmonics u. Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	06.06.2007	06.06.2009
28	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
29	n. a.	Antennenmast	Model 2175	ETS-LINDGREN	64762	300003745	izw		
30	n. a.	Steuergerät	Model 2090	ETS-LINDGREN	64672	300003746	izw		
31	n. a.	Interface-Box für Drehtisch	Model 105637	ETS-LINDGREN	44583	300003747	izw		
32	n. a.	Breitbandantenne	VULB9163	Schwarzbeck	295	300003787	k	01.04.2008	01.04.2010
33	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	08.01.2010	08.01.2012
34	n. a.	DC Power Supply 0 – 32V	1108-32	Heiden	1802	300001383	Ve	13.05.2007	13.05.2010
35	n. a.	System Autoranging DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04590	300001041	Ve	08.01.2009	08.01.2012
36	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/83761	300002326	Ve	28.05.2009	28.05.2011
37	n. a.	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSiQ26	R&S	835111/0004	300002678	Ve	06.01.2009	06.01.2011