



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)

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Test report no. : 1-1954-15-02/10
Type identification : AAD-3880068-BV
Applicant : Sony Ericsson Mobile Communications AB
FCC ID : PY7A3880068
IC Certification No : 4170B-A3880068
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.

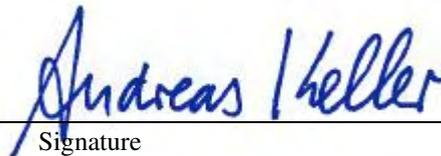
Test laboratory manager:

2010-03-16

Andreas Keller

Date

Name


Signature

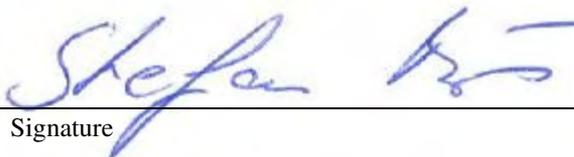
Technical responsibility for area of testing:

2010-03-16

Stefan Bös

Date

Name


Signature

1.2 Testing laboratory

CETECOM ICT Services GmbH

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Germany

Phone: + 49 681 5 98 - 0

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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
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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:	2010-03-06
Date of receipt of test item:	2010-03-10
Date of start test:	2010-03-10
Date of end test:	2010-03-16
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 Vattentorget
Town:	22188 Lund
Country:	Sweden

3.1.1 Test item

Kind of test item	:	Mobile Phone GSM 850/900/1800/1900, UMTS FDD1/FDD2
Type identification	:	AAD-3880068-BV
Serial Number	:	Rad.: CB511G3K1K, CB511G3K1L Cond.: CB511G3JD3, CB511G3JLW
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: 285KGXW 8-PSK: 269KG7W
Emission Designator for GSM 850	:	GMSK: 279KGXW 8-PSK: 281KG7W
Emission Designator for WCDMA 1900	:	QPSK: 4M58F9W
Emission Designator for WCDMA 850	:	QPSK: 4M58F9W
Number of channels	:	300 (PCS1900) and 125 (PCS850) 103 (FDD V) / 278 (FDD II)
Antenna Type	:	Inbuilt antenna
Power supply (normal)	:	Inbuilt Li-battery
Output power GSM 850 / GMSK	:	cond.: 32.83dBm ERP: 31.13dBm
Output power GSM 1900 / GMSK	:	cond : 31.07dBm EIRP: 31.09dBm
Output power GSM 850 / 8-PSK	:	cond.: 26.80dBm ERP: 28.16dBm
Output power GSM 1900 / 8-PSK	:	cond : 25.65dBm EIRP: 24.96dBm
Output power UMTS 850 / WCDMA	:	cond.: 23.42dBm ERP: 20.49dBm
Output power UMTS 1900 / WCDMA	:	cond : 22.39dBm EIRP: 24.53dBm
Transmitter Spurious (worst case)	:	-31.9dBm
Receiver Spurious (worst case)	:	32dBµV/m @ 3 m (noise floor)
FCC ID	:	PY7A3880068
Certification No. IC	:	4170B-A3880068
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.

Testing Manager:

2010-03-16 Andreas Keller
Date Name



Signature

3.2 Test Setup

Hardware	:	AP1.1
Software	:	1.0.A.1.3
Mobile; (cond. measurements)	:	CB511G3JD3
Mobile; (rad. measurements)	:	CB511G3K1K, CB511G3K1L

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	pass
5.1.2	Frequency Stability	pass
5.1.3	Radiated Emissions	pass
5.1.4	Conducted Spurious Emissions	pass
5.1.5	Block Edge Compliance	pass
5.1.6	Occupied Bandwidth	pass

4.1.2 GSM 850

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

4.1.3 UMTS Band II

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

4.1.4 UMTS Band V

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

4.1.5 Receiver

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

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.

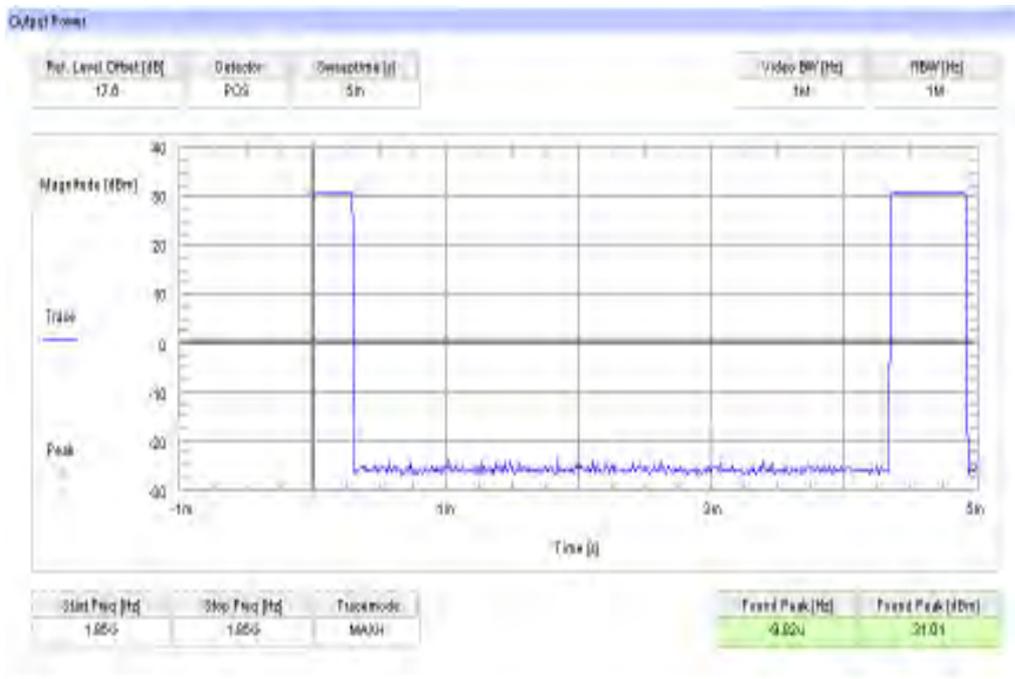
Test Results: Output Power (conducted) GMSK Mode

Frequency (MHz)	Average Output Power (dBm)	Peak-to-Average Ratio (dB)
1850.2	30.97	0.04
1880.0	30.79	0.04
1909.8	31.07	0.07
Measurement uncertainty	±0.5 dB	

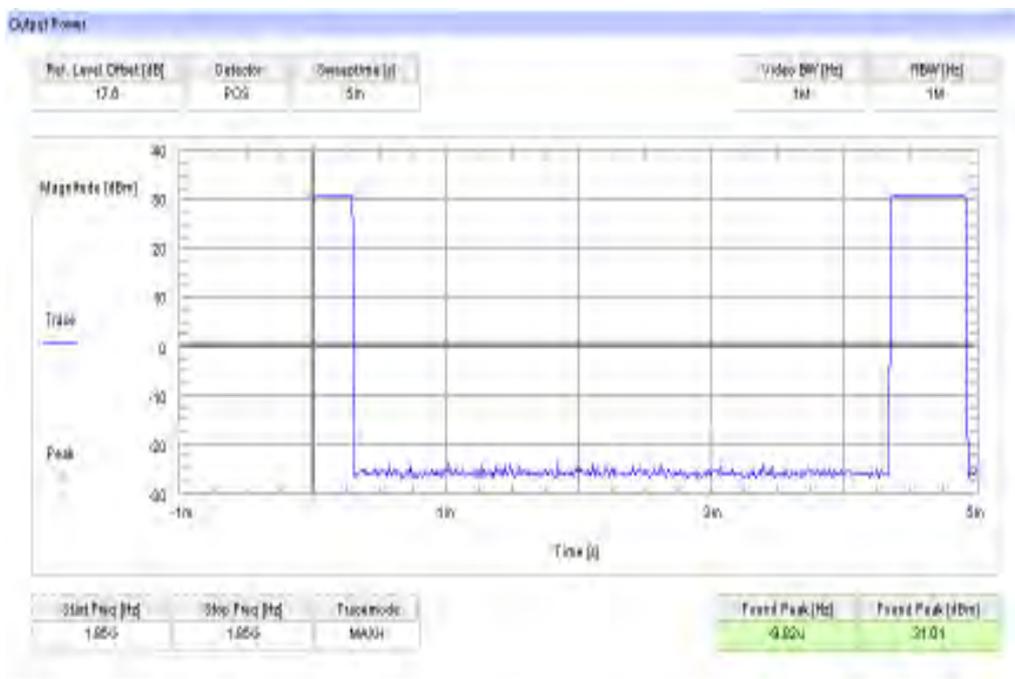
Test Results: Output Power (conducted) 8-PSK Mode

Frequency (MHz)	Average Output Power (dBm)	Peak-to-Average Ratio (dB)
1850.2	25.60	3.20
1880.0	25.55	3.31
1909.8	25.65	3.24
Measurement uncertainty	±0.5 dB	

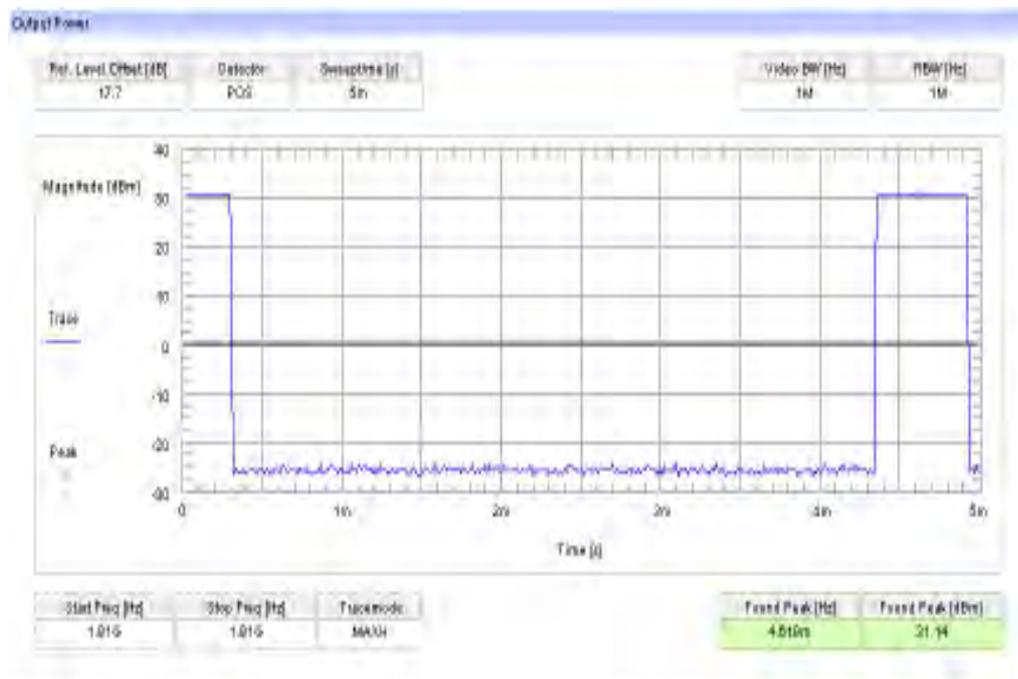
Plot 1: CH512 conducted output power GMSK (peak)



Plot 2: CH661 conducted output power GMSK (peak)



Plot 3: CH810 conducted output power GMSK (peak)



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

$E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$

(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° 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

$E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$

(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:

$$P = P1 - L1 = (P2 + L2) - L1 = P3 + A + L2 - L1$$

$$EIRP = P + G1 = P3 + L2 - L1 + A + G1$$

$$ERP = EIRP - 2.15 \text{ dB}$$

$$\text{Total Correction factor in EMI Receiver \# 2} = L2 - L1 + G1$$

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	29.71
1880.0	30.38
1909.8	31.09
Measurement uncertainty	±0.5 dB

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

Frequency (MHz)	Average EIRP (dBm)
1850.2	23.25
1880.0	24.96
1909.8	22.92
Measurement uncertainty	±0.5 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			

$EIRP = SG \text{ (dBm)} - \text{Cable Loss (dB)} + \text{Ant. gain (dBi)}$

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:

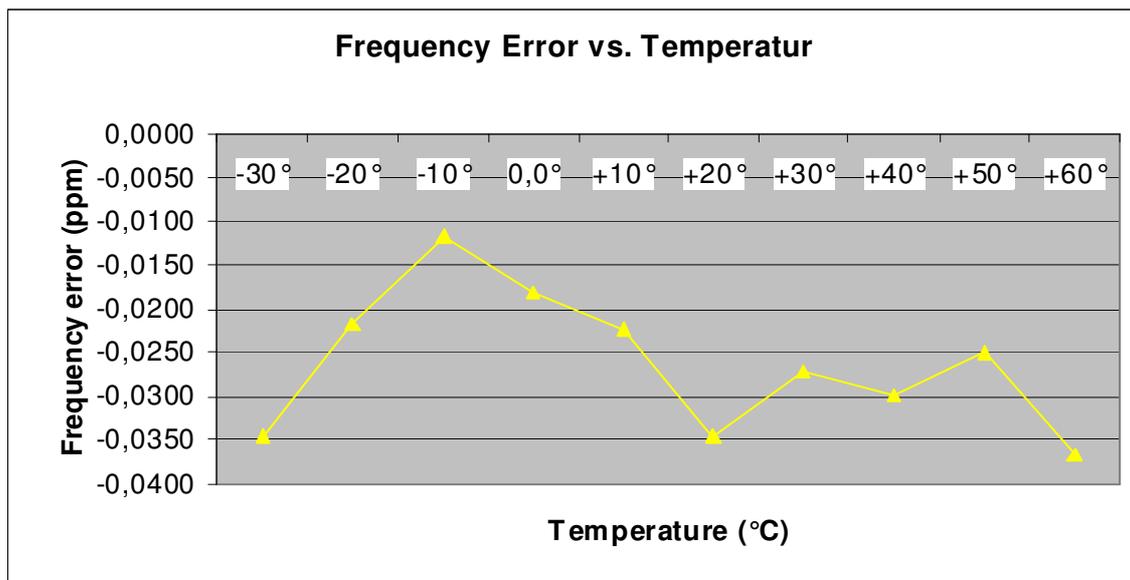
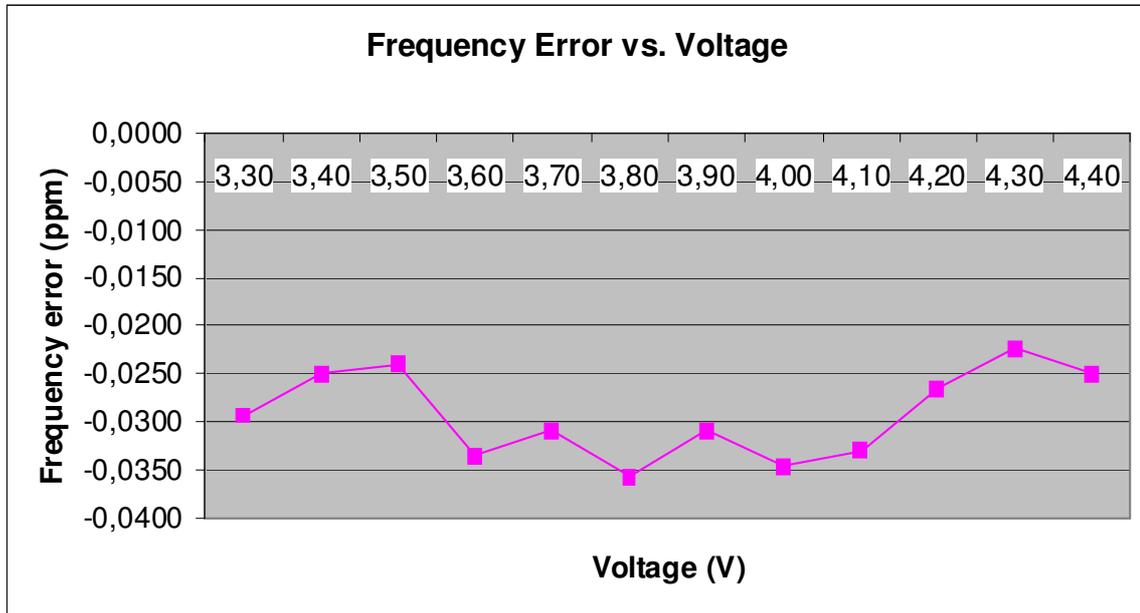
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission 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	-55	-0,0000293	-0,0293
3.4	-47	-0,0000250	-0,0250
3.5	-45	-0,0000239	-0,0239
3.6	-63	-0,0000335	-0,0335
3.7	-58	-0,0000309	-0,0309
3.8	-67	-0,0000356	-0,0356
3.9	-58	-0,0000309	-0,0309
4.0	-65	-0,0000346	-0,0346
4.1	-62	-0,0000330	-0,0330
4.2	-50	-0,0000266	-0,0266
4.3	-42	-0,0000223	-0,0223
4.4	-47	-0,0000250	-0,0250

Test Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-65	-0,0000346	-0,0346
-20	-41	-0,0000218	-0,0218
-10	-22	-0,0000117	-0,0117
±0.0	-34	-0,0000181	-0,0181
+10	-42	-0,0000223	-0,0223
+20	-65	-0,0000346	-0,0346
+30	-51	-0,0000271	-0,0271
+40	-56	-0,0000298	-0,0298
+50	-47	-0,0000250	-0,0250
+60	-69	-0,0000367	-0,0367



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 1 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 $43+10\text{Log}(P)$ dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Measurement Results: Radiated Emissions

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

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

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

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

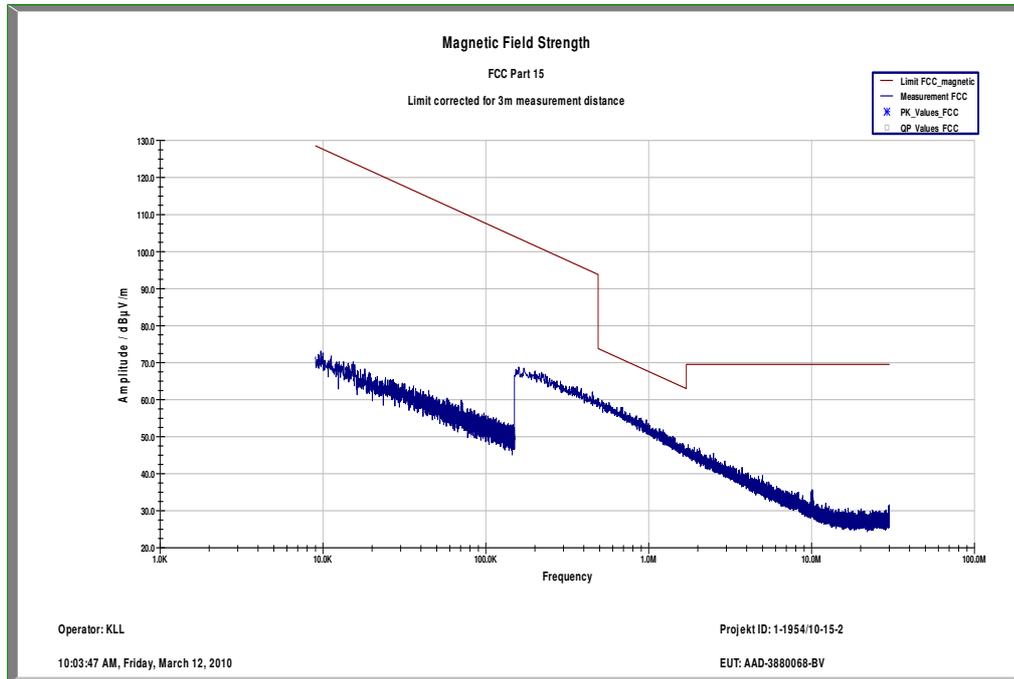
No peaks found > 20 dB below limit.

Sample calculation:

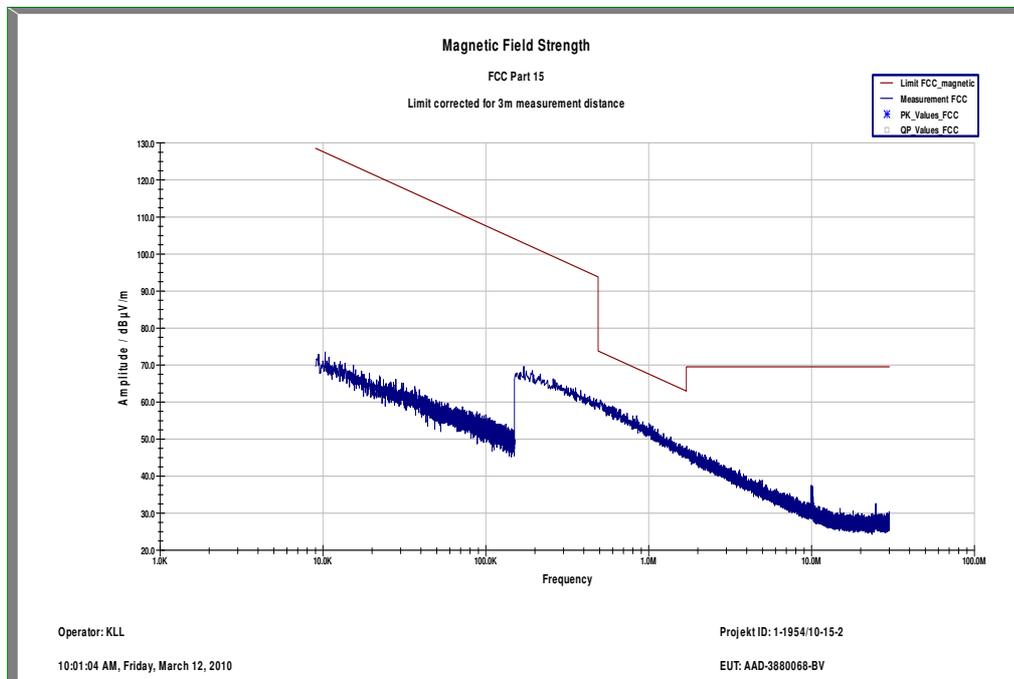
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBμV	dBm	dBi	dBd	dB	dBm			
1909.8	132.3	24.6	8.4	0.0	3.3	29.7			

$EIRP = SG \text{ (dBm)} - \text{Cable Loss (dB)} + \text{Ant. gain (dBi)}$

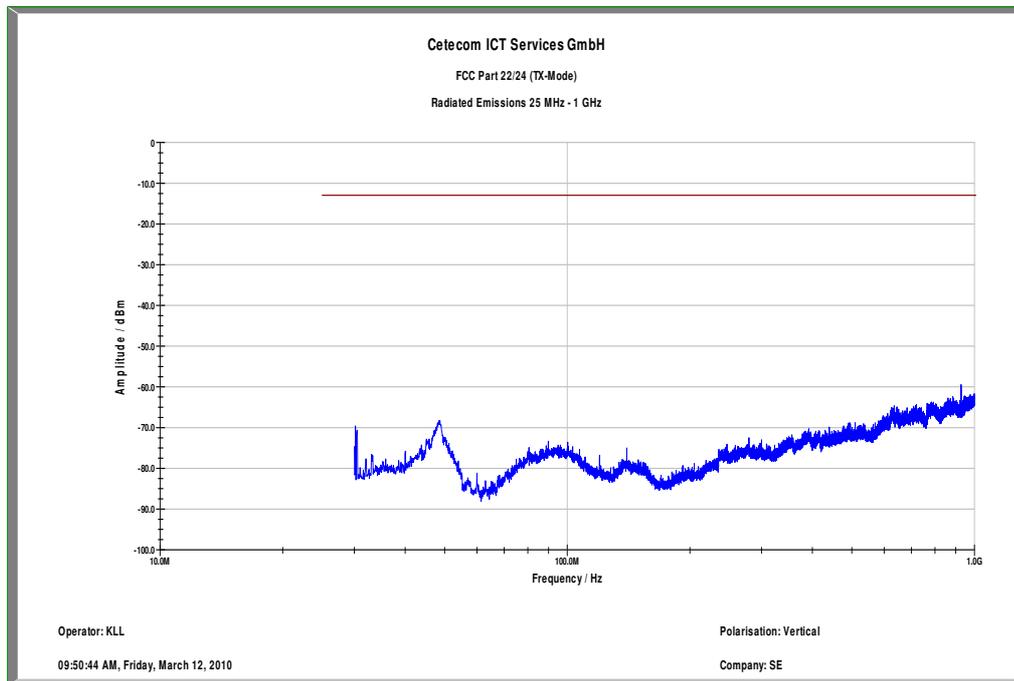
Plot 1: Channel 661 (Traffic mode up to 30 MHz), ant pos =0°



Plot 2: Channel 661 (Traffic mode up to 30 MHz), ant pos =90°



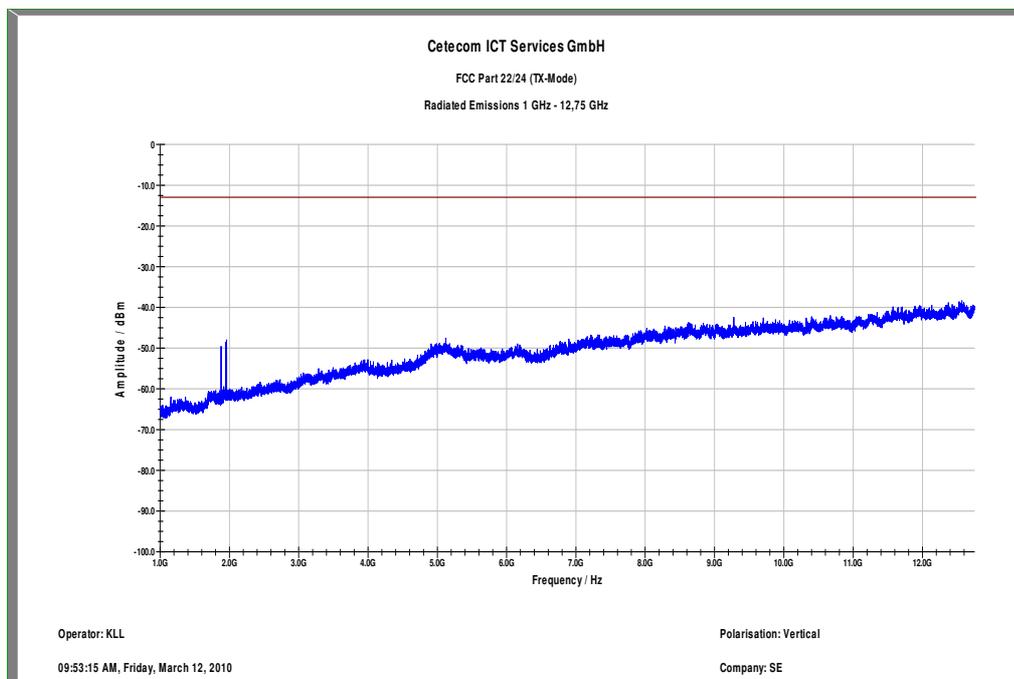
Plot 3: Channel 661 (30 MHz - 1 GHz), ant vertical



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

Plot 4: Channel 661 (1 GHz – 12.5 GHz) , ant vertical

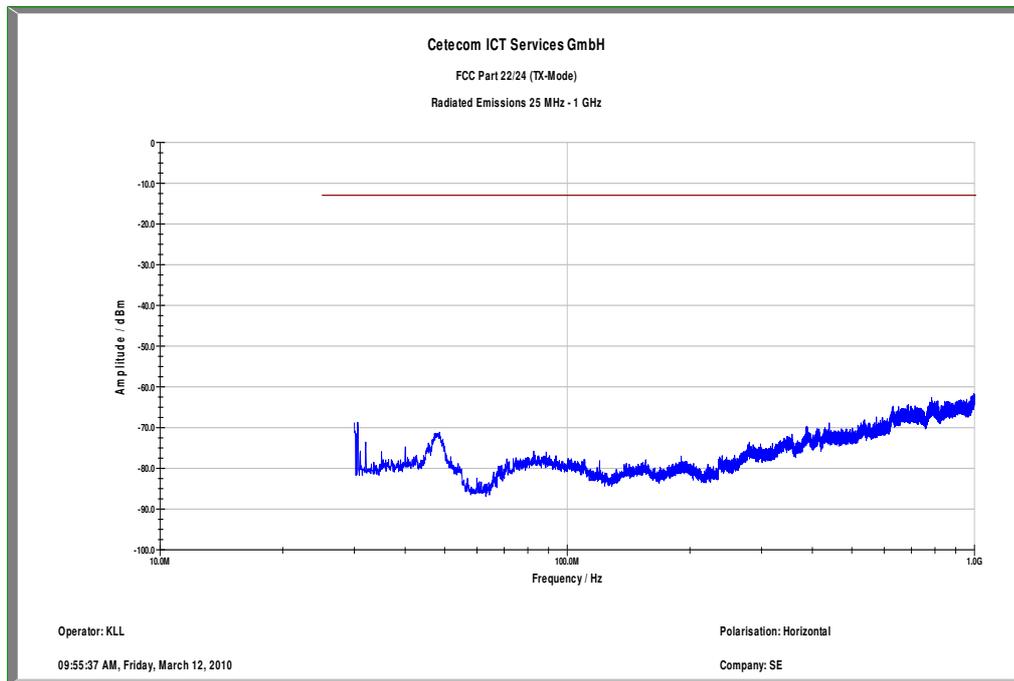


$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

Carrier notched with a rejection filter

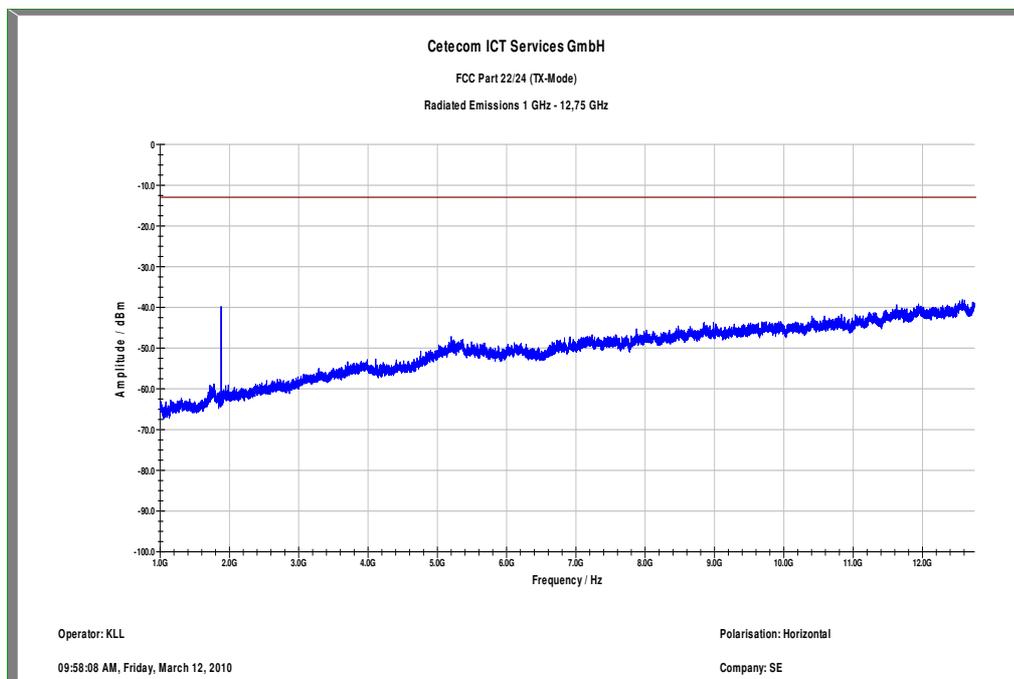
Plot 5: Channel 661 (30 MHz - 1 GHz), ant horizontal



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

Plot 6: Channel 661 (1 GHz – 12.5 GHz) , ant horizontal



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

Carrier notched with a 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

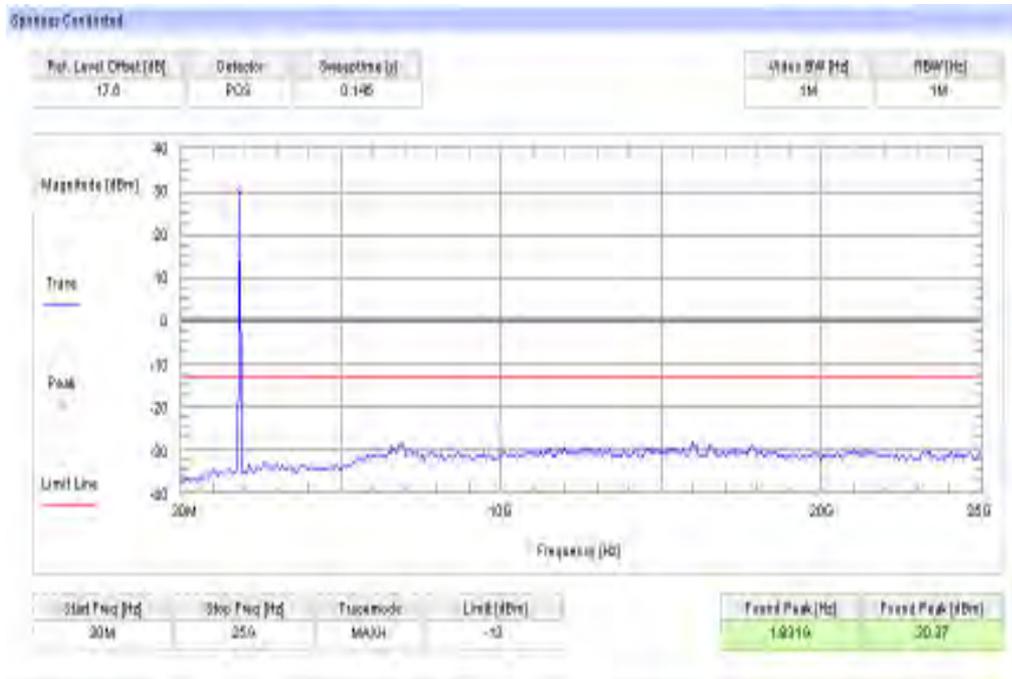
Measurement Limit:

(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 $43+10\text{Log}(P)$ dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

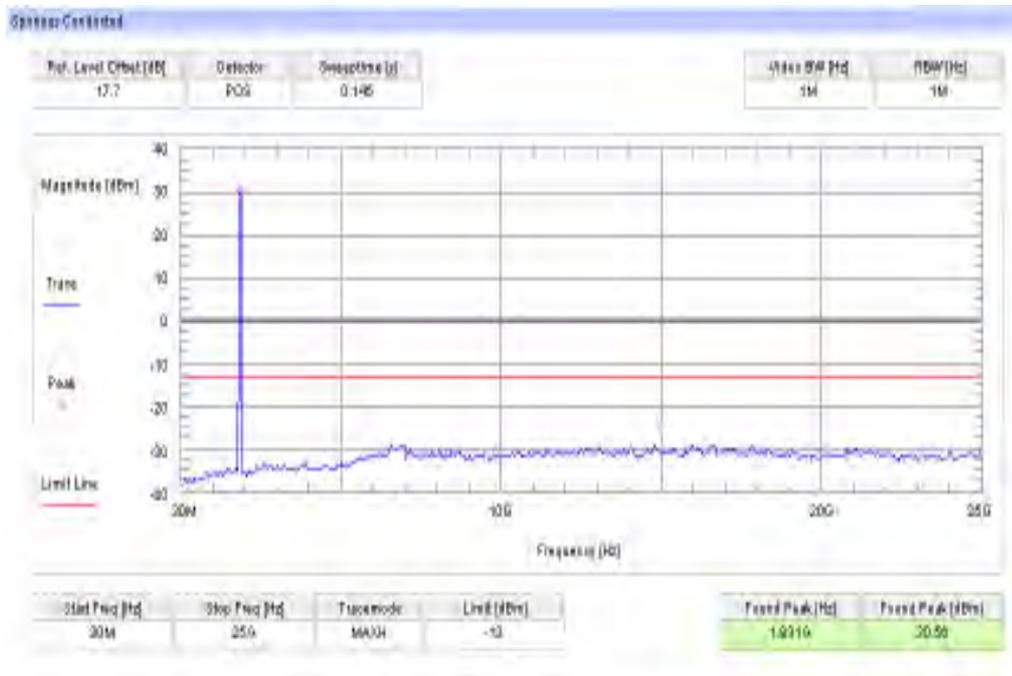
Measurement Results:

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

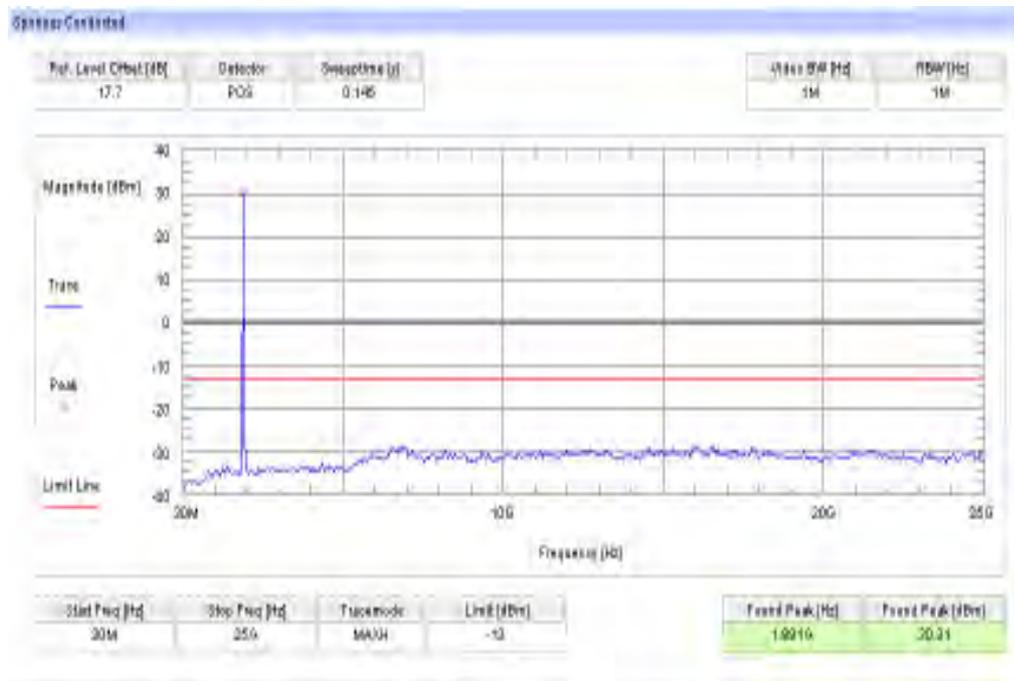
Channel 512



Channel 661



Channel 810



5.1.5 Block Edge Compliance

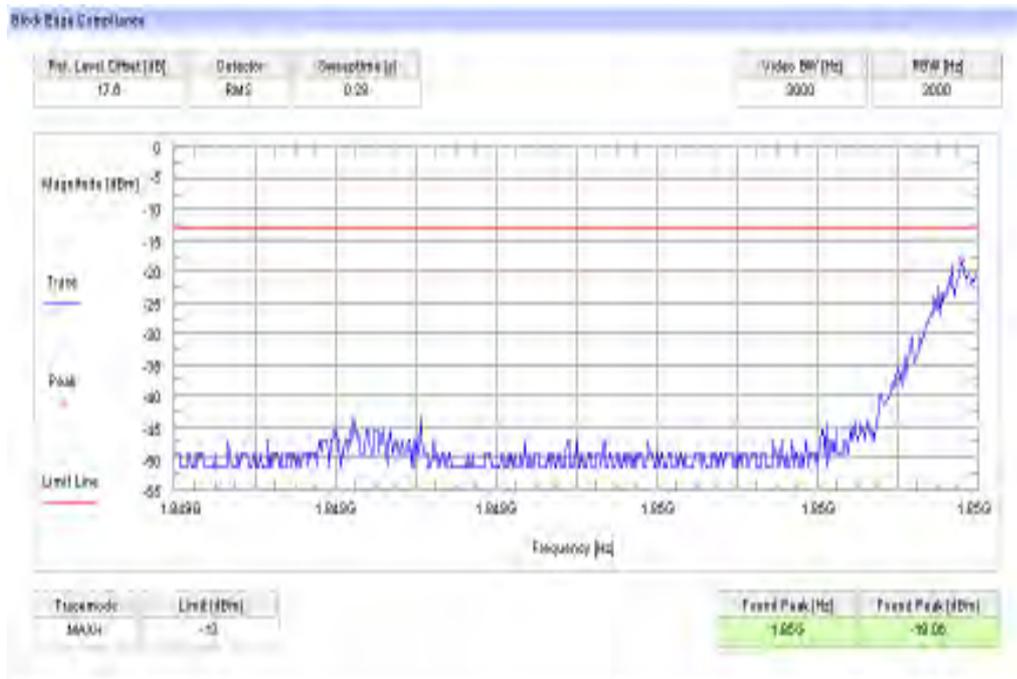
Reference

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

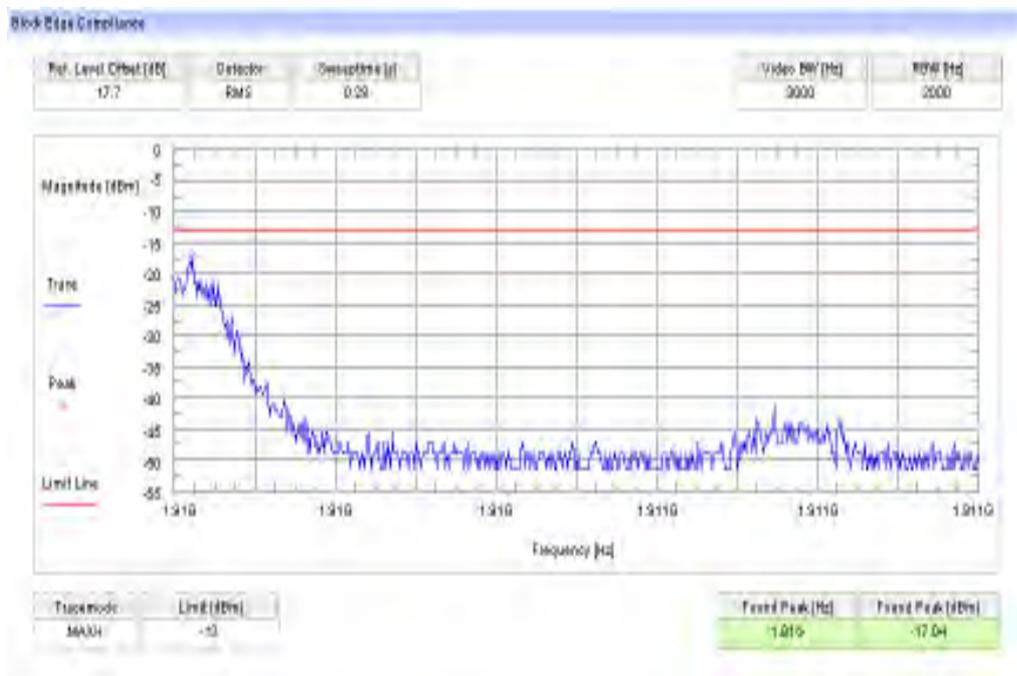
Measurement Limit:

(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 $43+10\text{Log}(P)$ dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

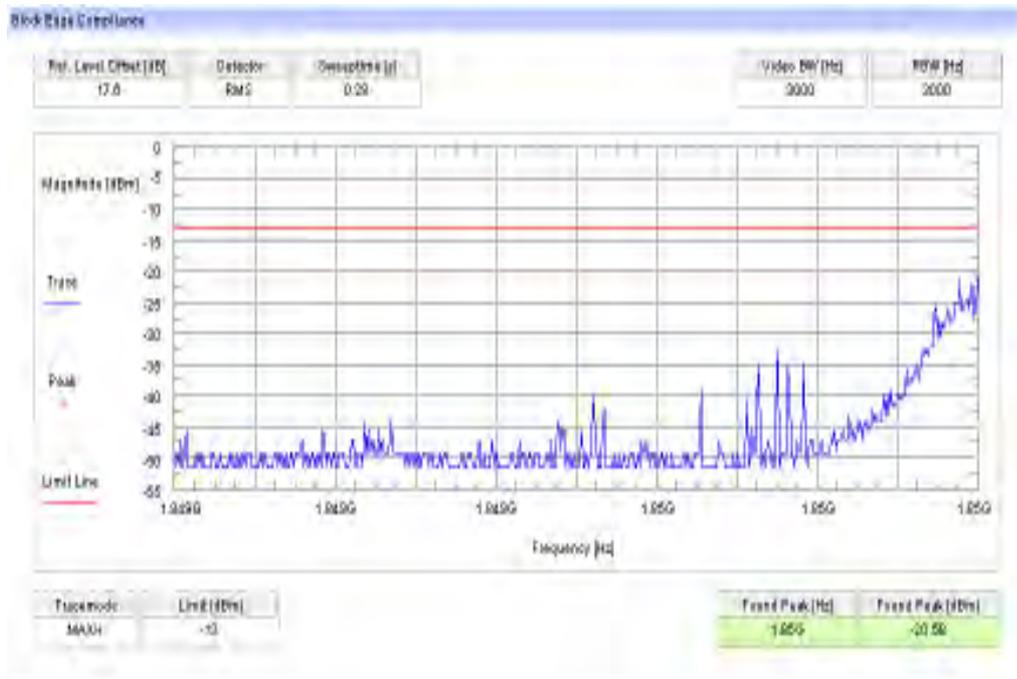
Block 1 Channel 512



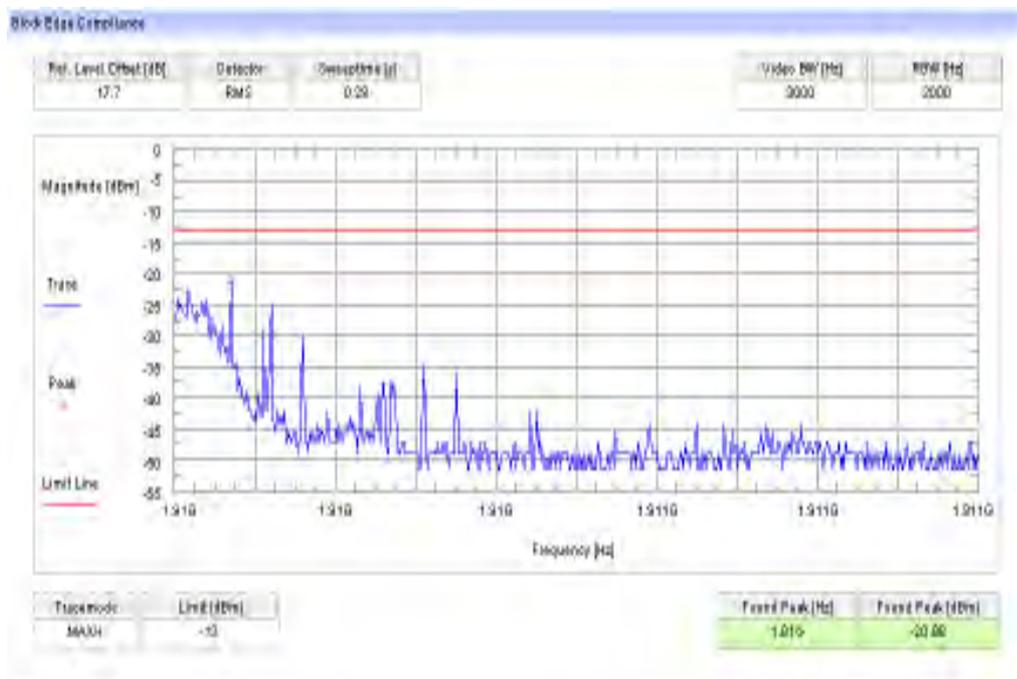
Block 6 Channel 810



Block 1 Channel 512 (EDGE)



Block 6 Channel 810 (EDGE)



5.1.6 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	271	317
1880.0 MHz	285	317
1909.8 MHz	285	317

EDGE mode

Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1850.2 MHz	269	291
1880.0 MHz	267	317
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.

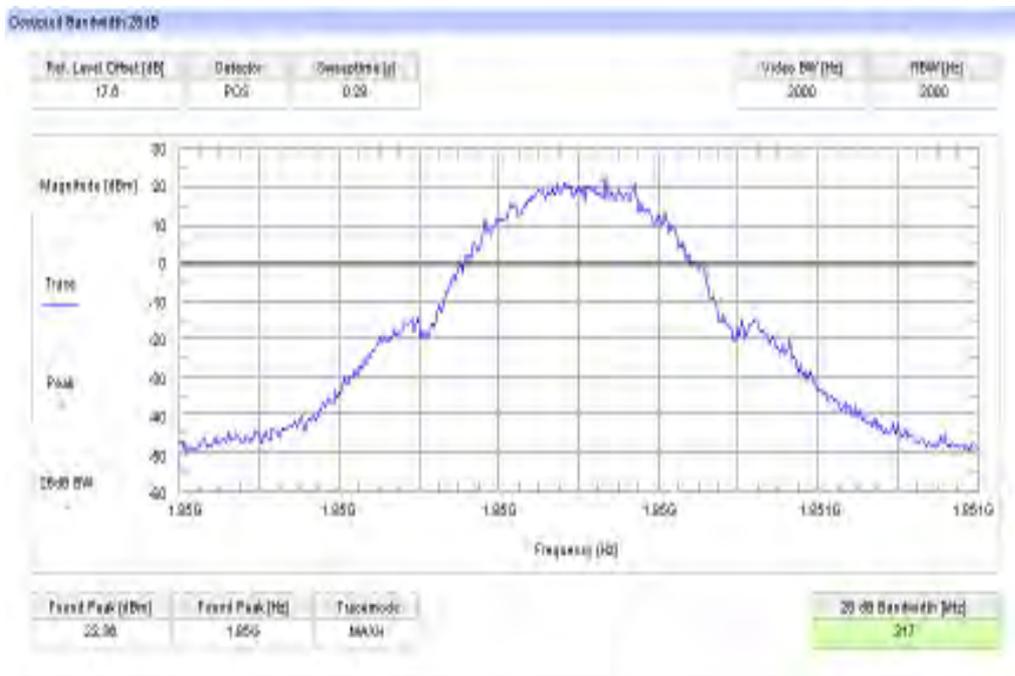
Channel 512

99% (-20 dB) Occupied Bandwidth



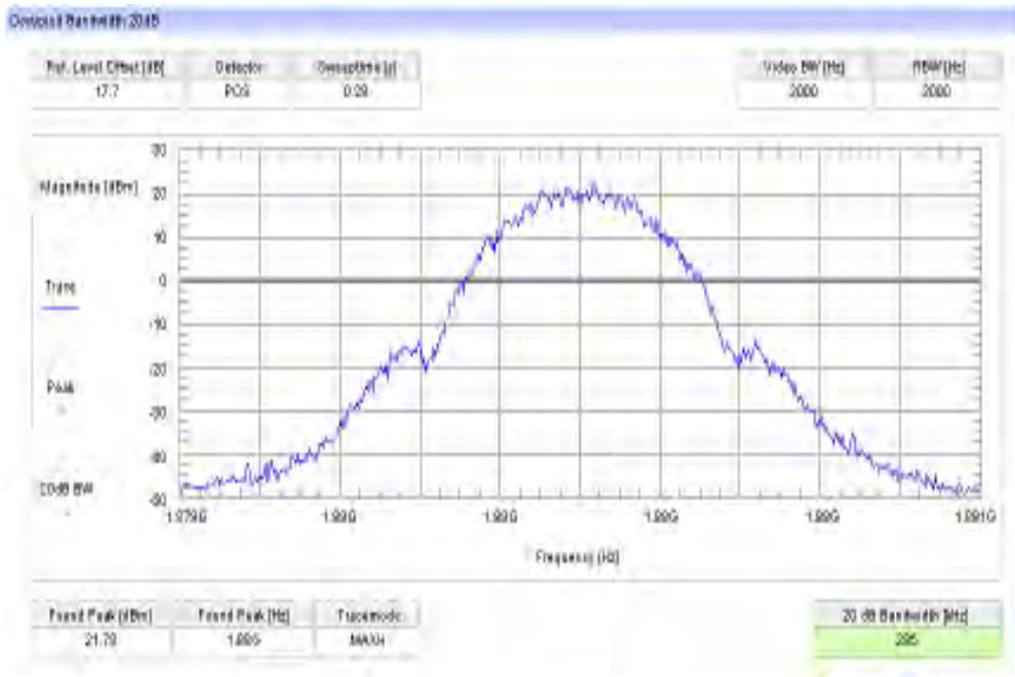
Channel 512

-26 dBc Bandwidth



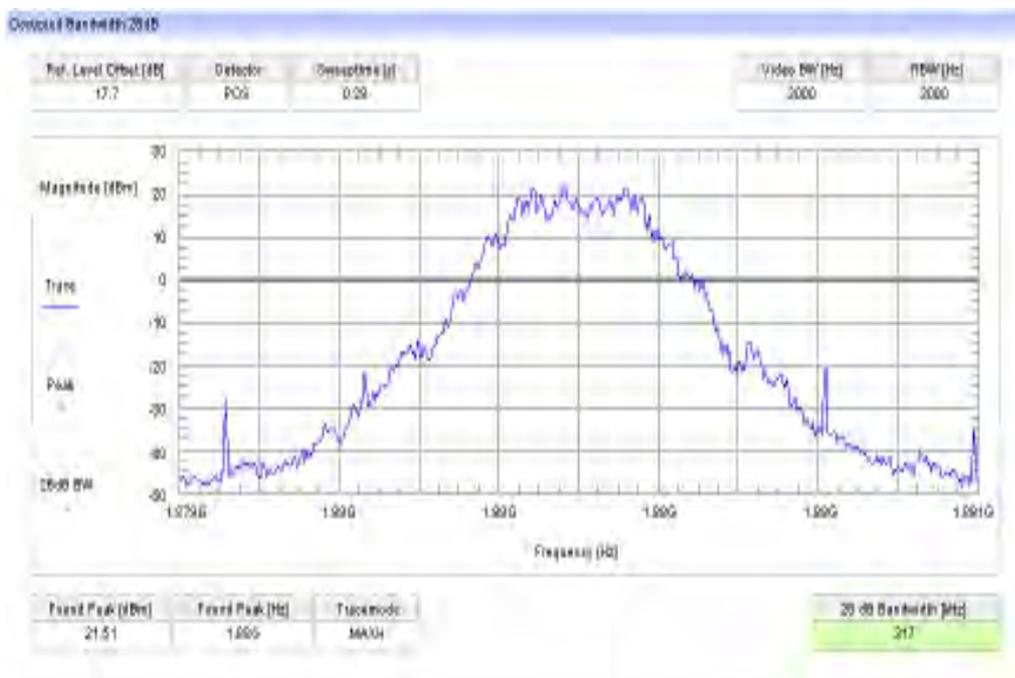
Channel 661

99% (-20 dB) Occupied Bandwidth



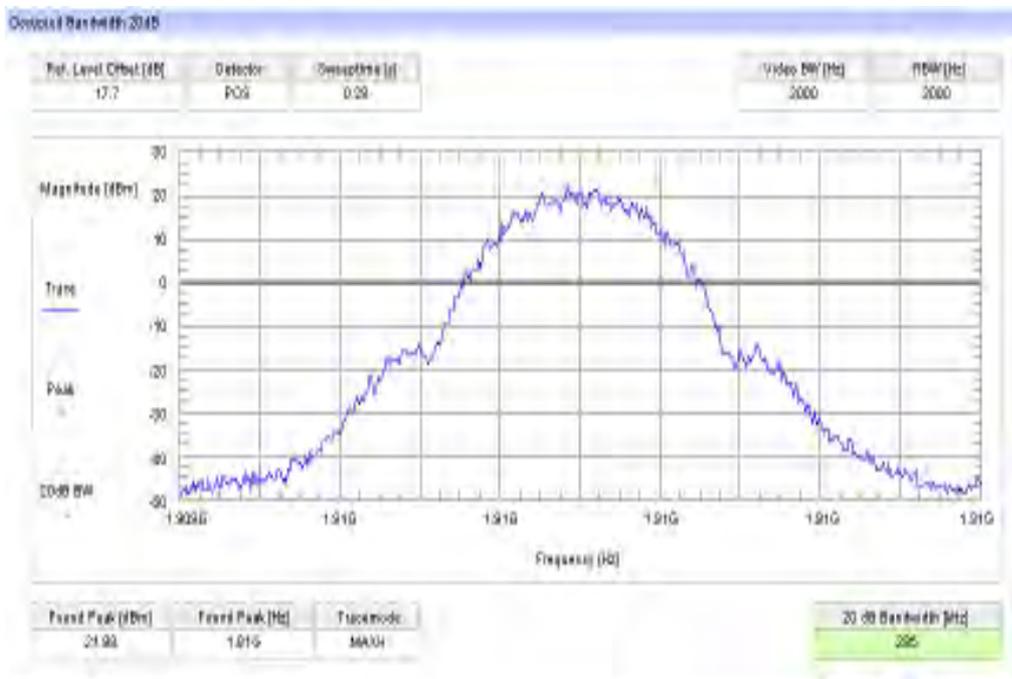
Channel 661

-26 dBc Bandwidth



Channel 810

99% (-20 dB) Occupied Bandwidth



Channel 810

-26 dBc Bandwidth



Channel 512 (EDGE)

99% (-20 dB) Occupied Bandwidth



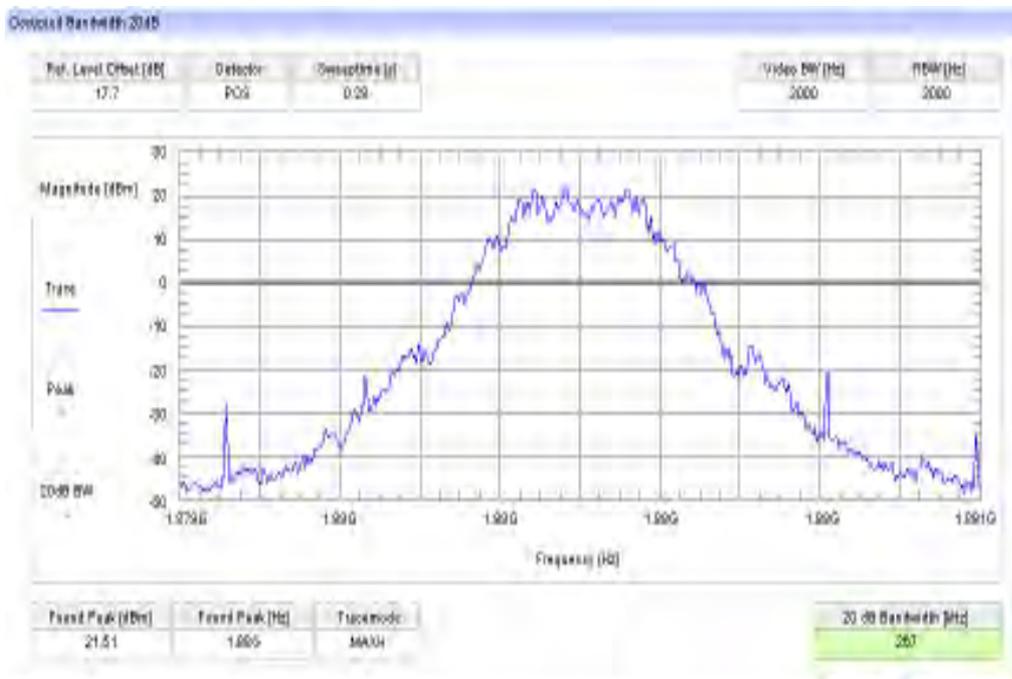
Channel 512 (EDGE)

-26 dBc Bandwidth



Channel 661 (EDGE)

99% (-20 dB) Occupied Bandwidth



Channel 661 (EDGE)

-26 dBc Bandwidth



Channel 810 (EDGE)

99% (-20 dB) Occupied Bandwidth



Channel 810 (EDGE)

-26 dBc Bandwidth



5.2 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

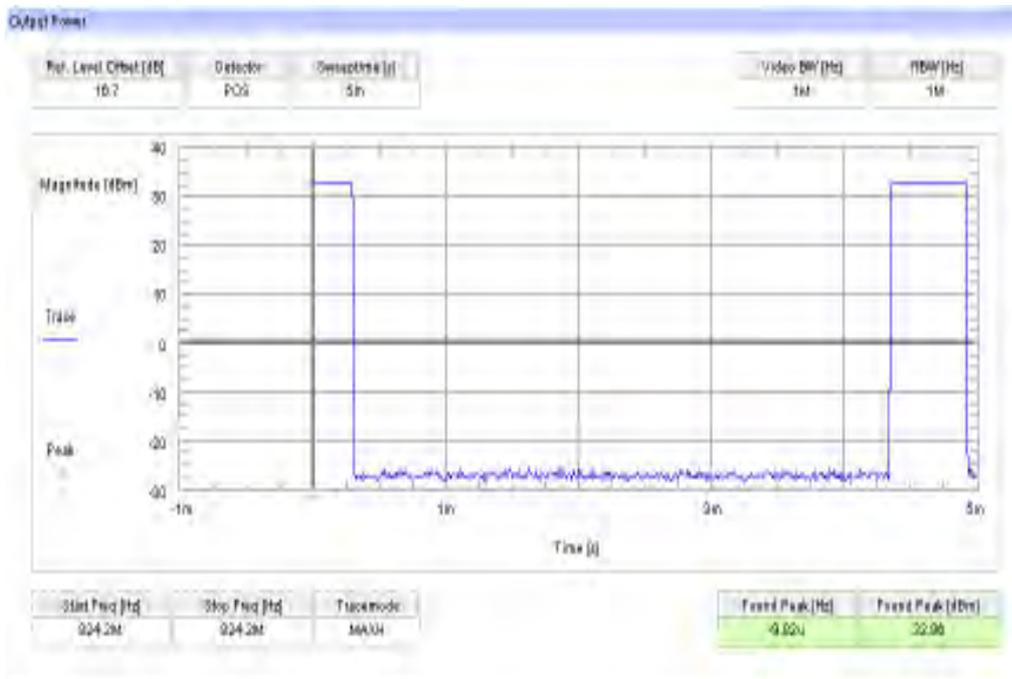
Test Results: Output Power (conducted) GMSK Mode

Frequency (MHz)	Average Output Power (dBm)	Peak-to-Average Ratio (dB)
824.2	32.83	0.06
836.4	32.60	0.03
848.8	32.57	0.03
Measurement uncertainty	±0.5 dB	

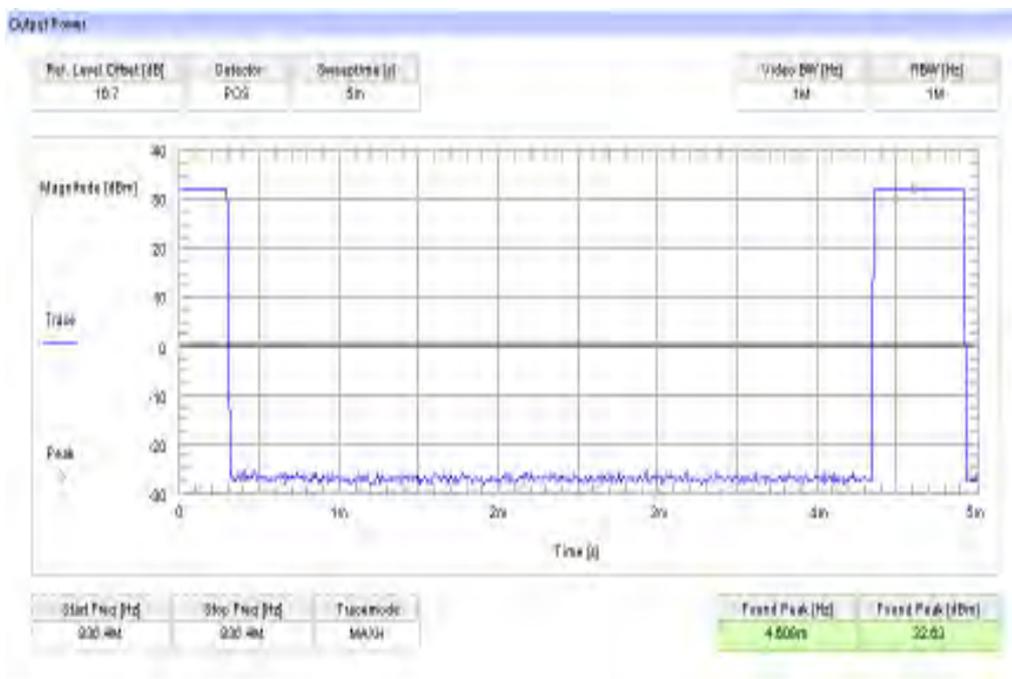
Test Results: Output Power (conducted) 8-PSK Mode

Frequency (MHz)	Average Output Power (dBm)	Peak-to-Average Ratio (dB)
824.2	26.80	3.10
836.4	26.65	3.19
848.8	26.61	3.26
Measurement uncertainty	±0.5 dB	

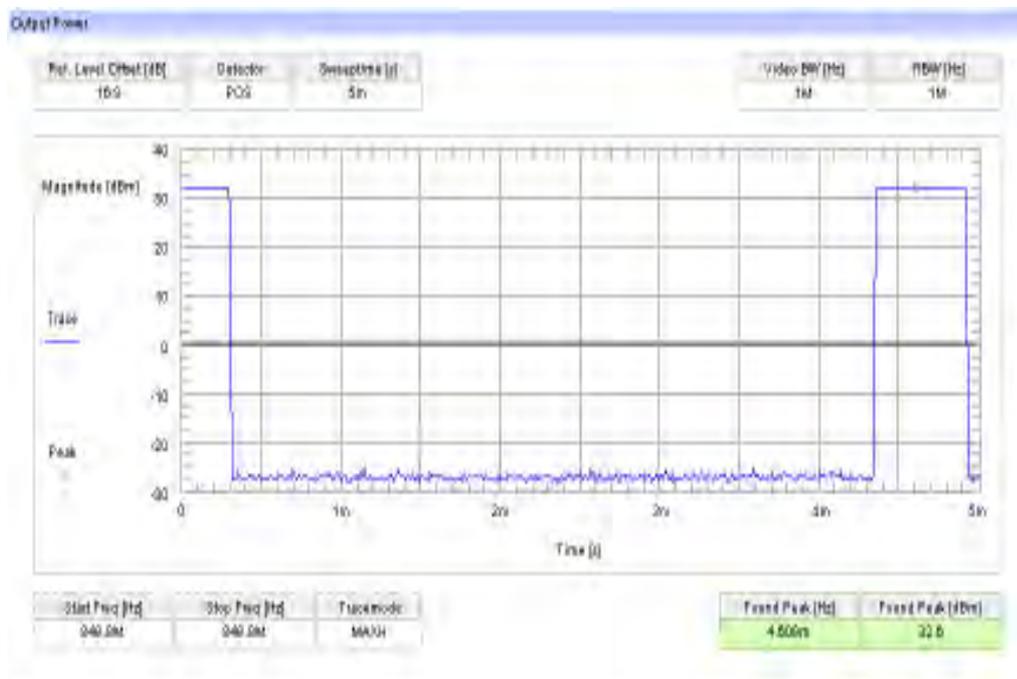
Plot 1: CH128 conducted output power GMSK (peak)



Plot 2: CH189 conducted output power GMSK (peak)



Plot 3: CH251 conducted output power GMSK (peak)



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

$E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$

(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° 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

$E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$

(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:

$$P = P1 - L1 = (P2 + L2) - L1 = P3 + A + L2 - L1$$

$$EIRP = P + G1 = P3 + L2 - L1 + A + G1$$

$$ERP = EIRP - 2.15 \text{ dB}$$

$$\text{Total Correction factor in EMI Receiver \# 2} = L2 - L1 + G1$$

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	29.39
836.4	31.13
848.8	30.34
Measurement uncertainty	±0.5 dB

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

Frequency (MHz)	Average (dBm)
824.2	26.42
836.4	28.16
848.8	28.02
Measurement uncertainty	±0.5 dB

Sample calculation:

Freq	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:

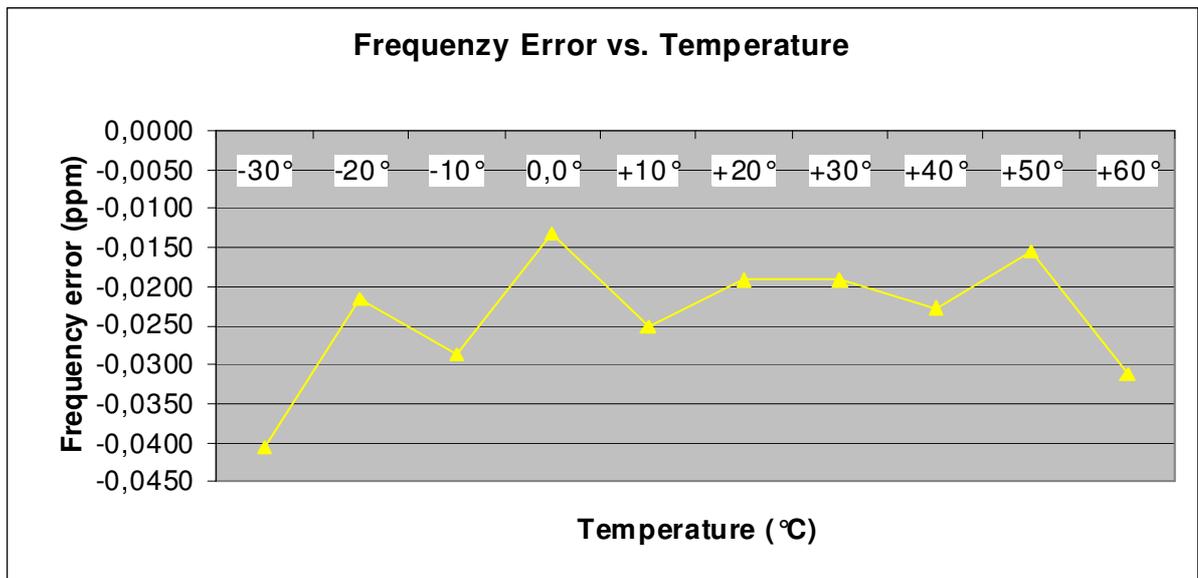
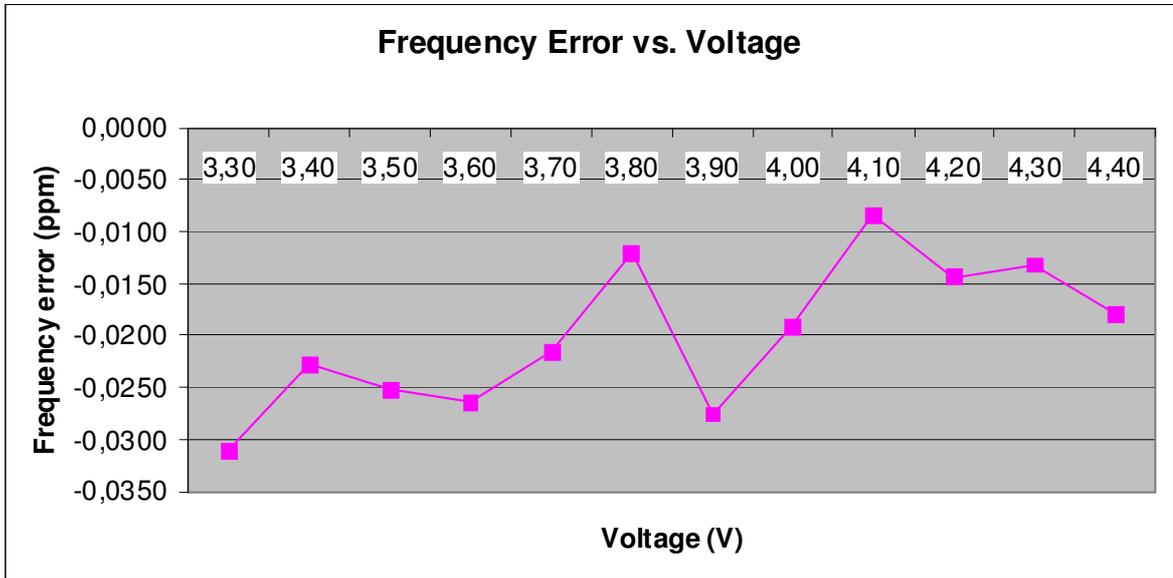
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 22.355, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission 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	-26	-0,00000311	-0,0311
3.4	-19	-0,00000227	-0,0227
3.5	-21	-0,00000251	-0,0251
3.6	-22	-0,00000263	-0,0263
3.7	-18	-0,00000215	-0,0215
3.8	-10	-0,00000120	-0,0120
3.9	-23	-0,00000275	-0,0275
4.0	-16	-0,00000191	-0,0191
4.1	-7	-0,00000084	-0,0084
4.2	-12	-0,00000143	-0,0143
4.3	-11	-0,00000132	-0,0132
4.4	-15	-0,00000179	-0,0179

Measurement Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-34	-0,00000407	-0,0407
-20	-18	-0,00000215	-0,0215
-10	-24	-0,00000287	-0,0287
±0.0	-11	-0,00000132	-0,0132
+10	-21	-0,00000251	-0,0251
+20	-16	-0,00000191	-0,0191
+30	-16	-0,00000191	-0,0191
+40	-19	-0,00000227	-0,0227
+50	-13	-0,00000155	-0,0155
+60	-26	-0,00000311	-0,0311



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 1 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 $43+10\text{Log}(P)$ dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Measurement Results:

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

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

All measurements were done in horizontal and vertical polarization; the plots shows the worst case.

The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked, too.

The found values are stated in the table below.

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

Harmonic	Tx ch.-128 Freq. (MHz)	Level (dBm)	Tx ch.-189 Freq. (MHz)	Level (dBm)	Tx ch.-251 Freq. (MHz)	Level (dBm)
2	1648.4	-47.44 (h)	1672.8	-46.74 (h)	1697.6	-44.97 (h)
3	2472.6	-32.47 (v)	2509.2	-31.88 (v)	2546.4	-32.58 (v)
4	3296.8	-44.22 (v)	3345.6	-44.24 (h)	3395.2	-43.09 (h)
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	-

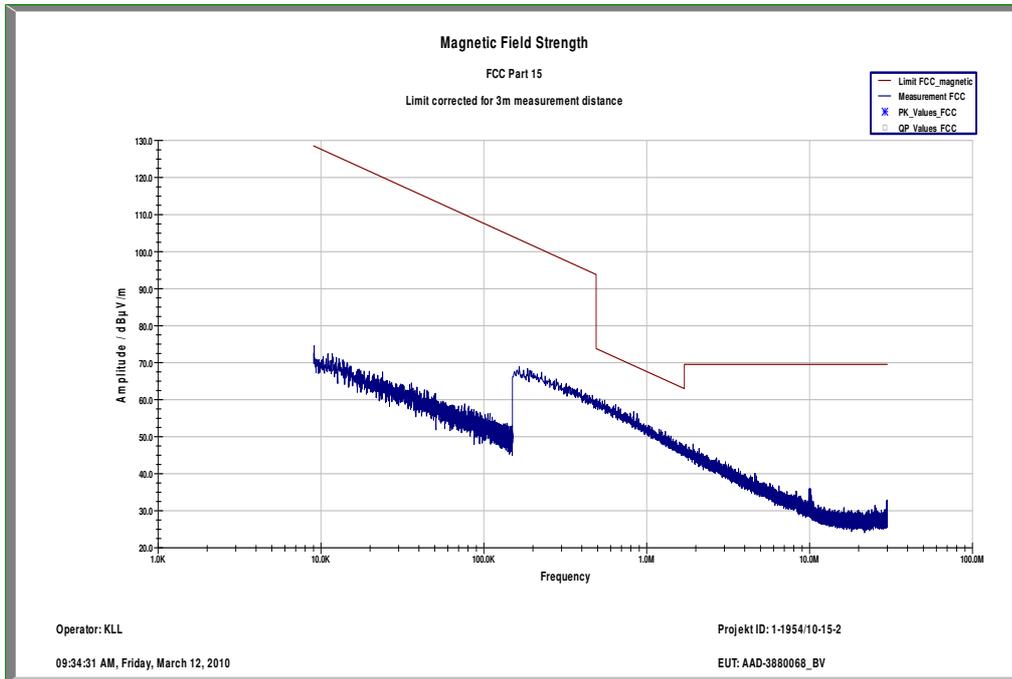
Sample calculation:

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

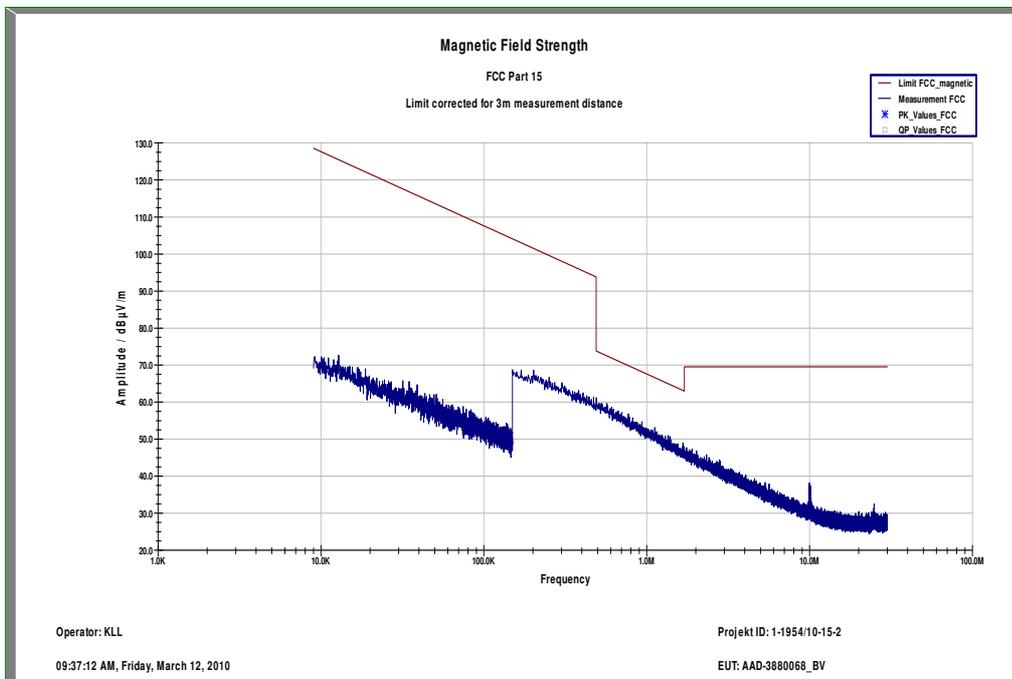
ERP = SG (dBm) - Cable Loss (dB) + Ant. gain (dB)

*ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.1dBi

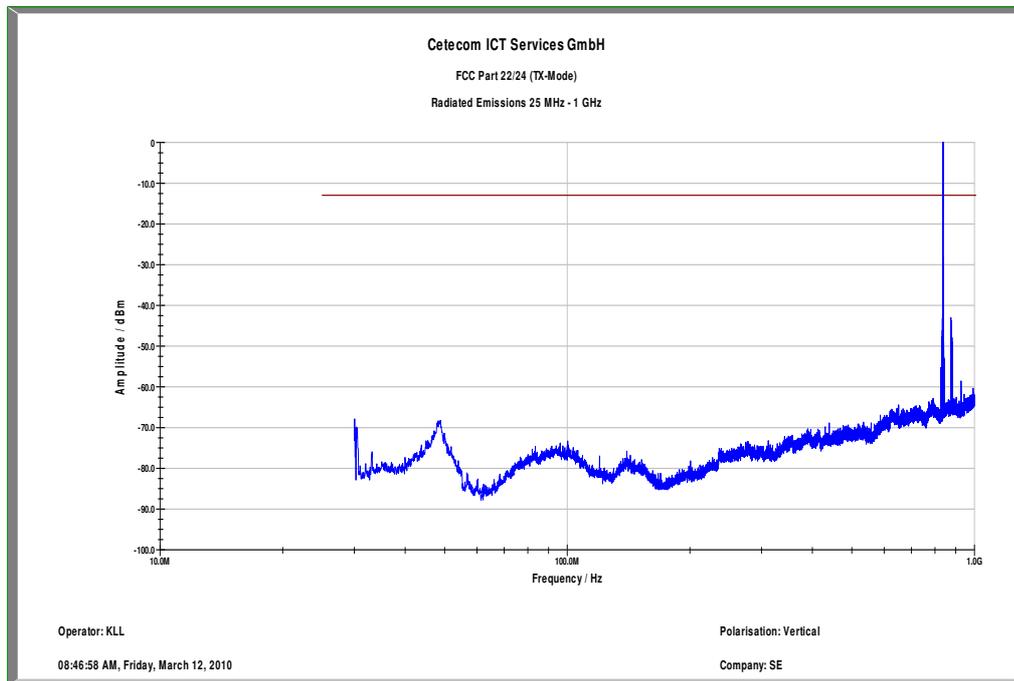
Plot 1: Channel 189 (Traffic mode up to 30 MHz), ant pos 0°



Plot 2: Channel 189 (Traffic mode up to 30 MHz), ant pos 90°



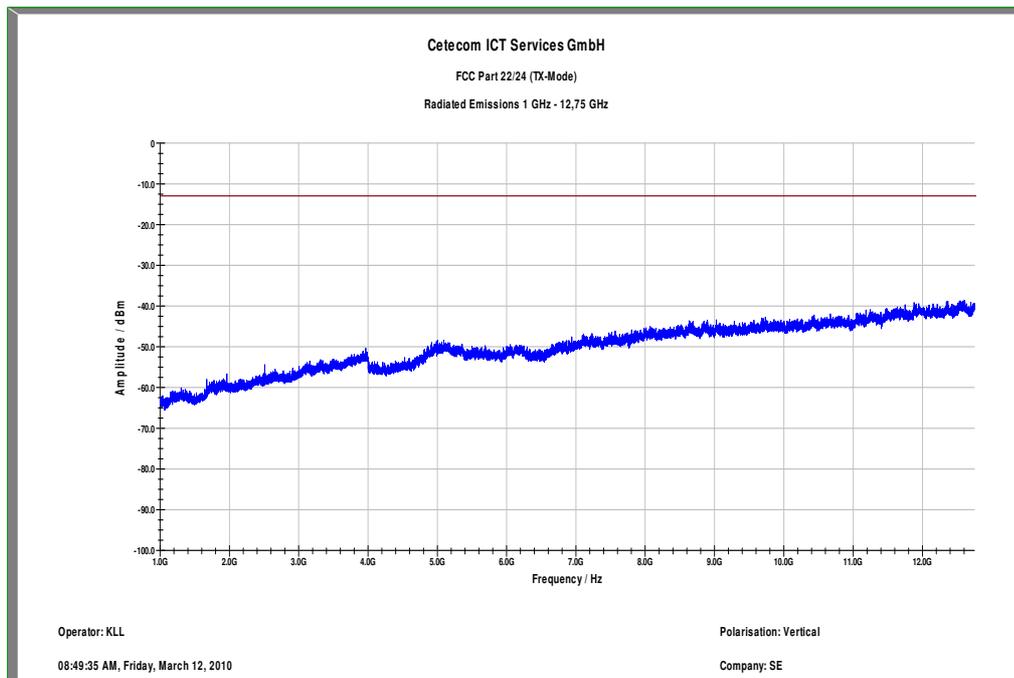
Plot 3: Channel 189 (30 MHz - 1 GHz), antenna vertical



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

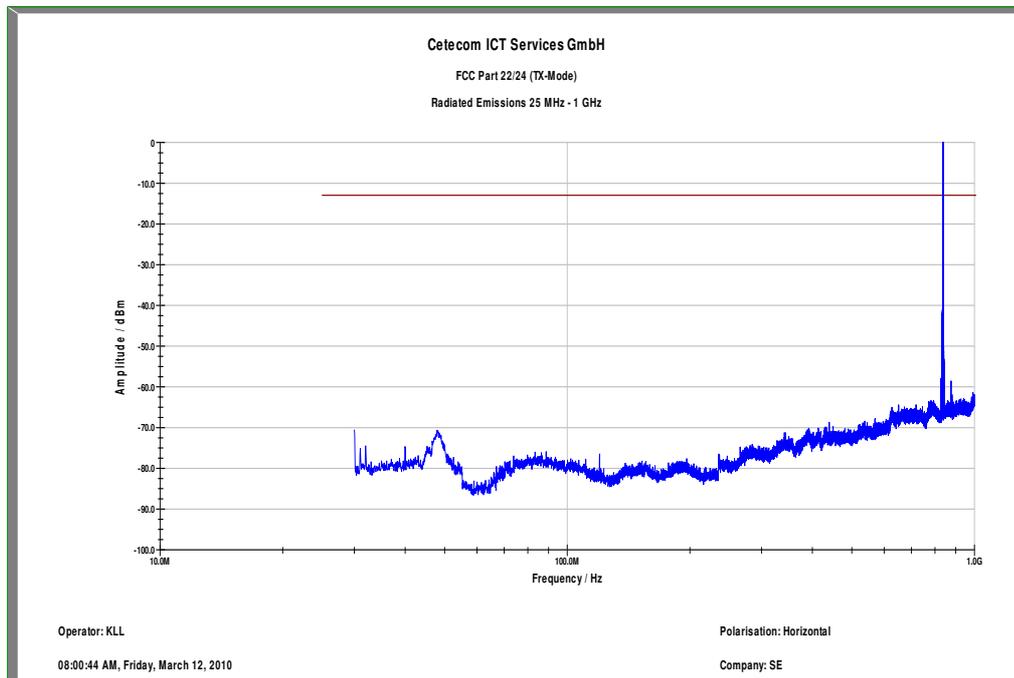
Plot 4: Channel 189 (1 GHz – 12.5 GHz) , antenna vertical



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

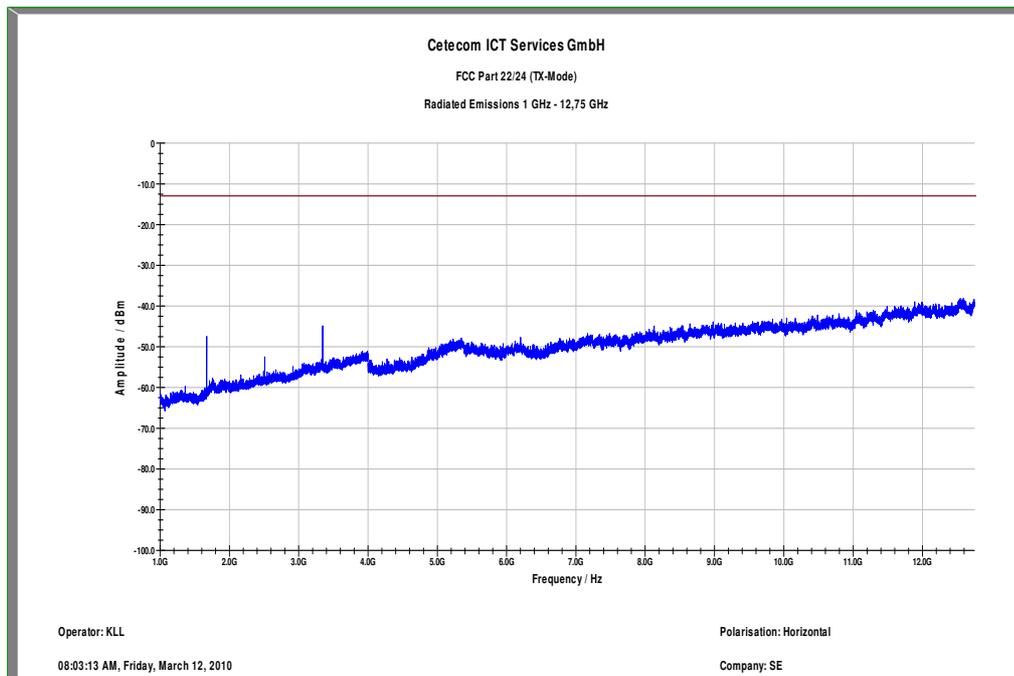
Plot 5: Channel 189 (30 MHz - 1 GHz), antenna horizontal



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

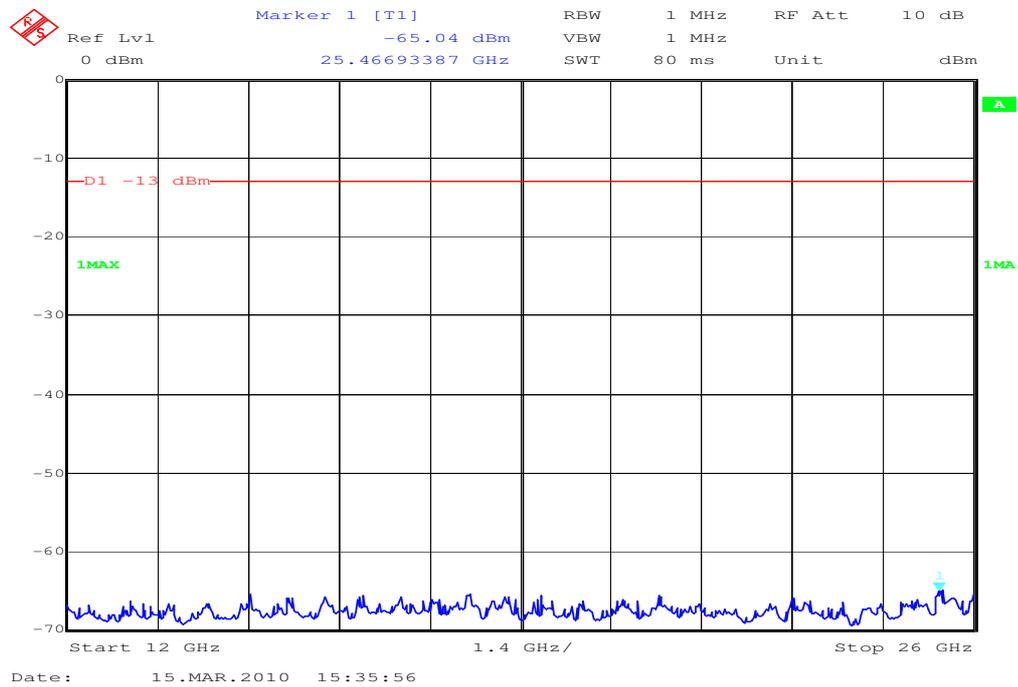
Plot 6: Channel 189 (1 GHz – 12.5 GHz), antenna horizontal



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

Plot 7: Channel 189 (12 GHz - 25 GHz), H/V max. hold



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

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

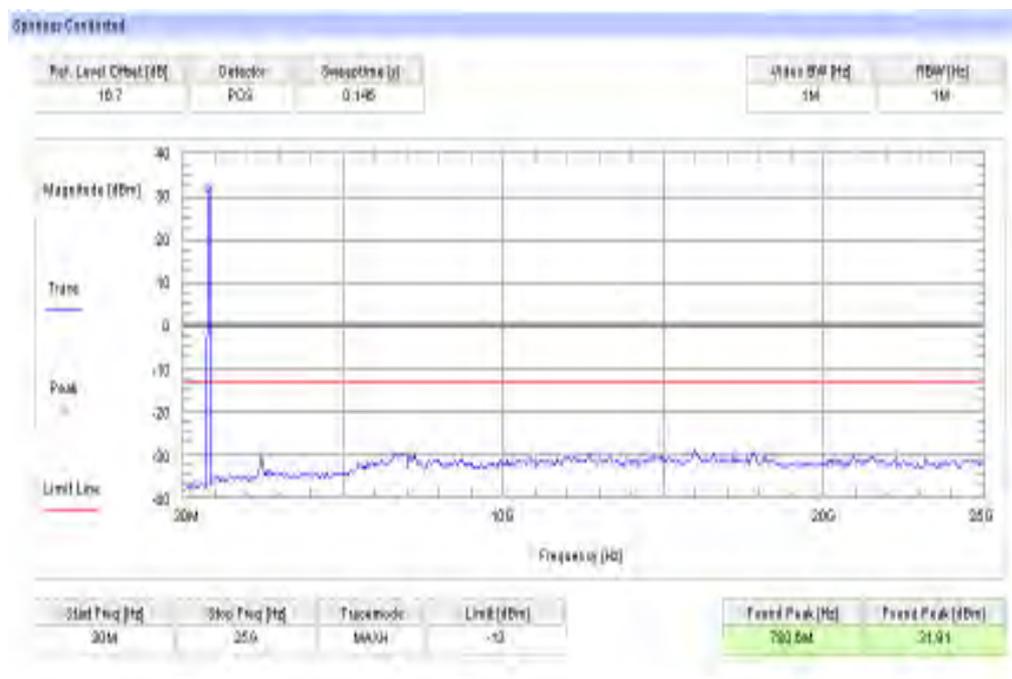
Measurement Limit

(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 $43+10\text{Log}(P)$ dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

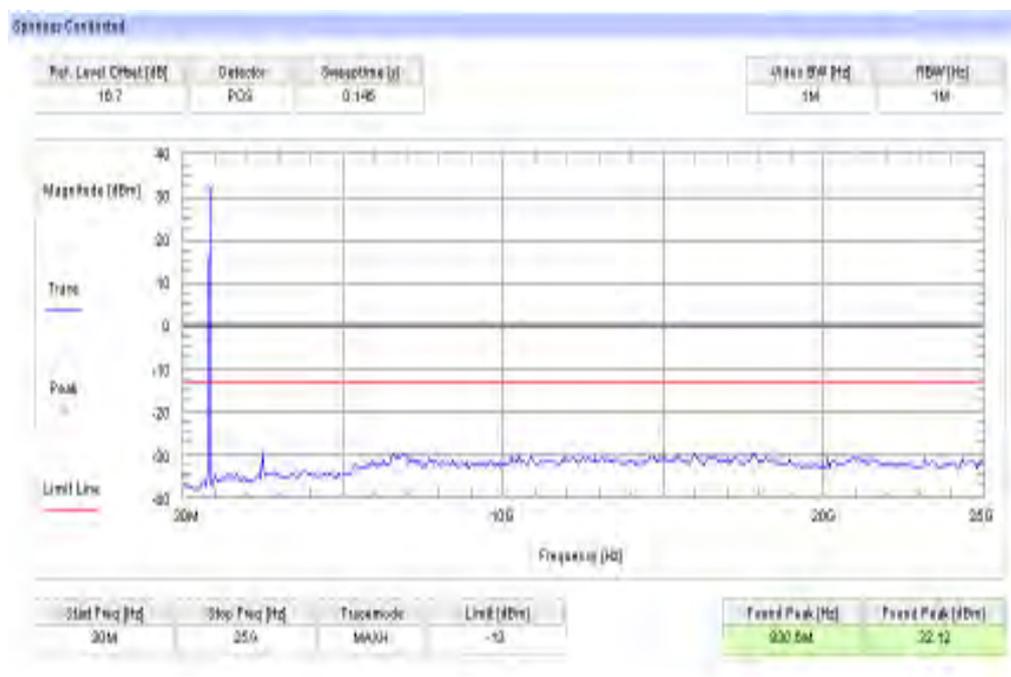
Measurement Results

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

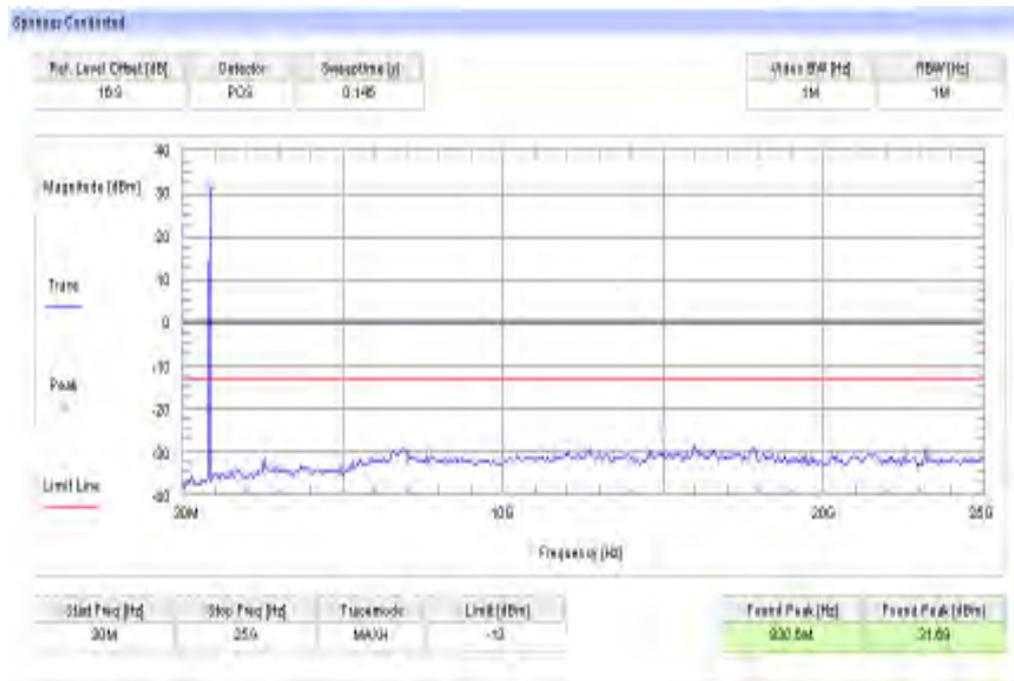
Channel: 128



Channel 189



Channel 251



5.2.5 Block Edge Compliance

Reference

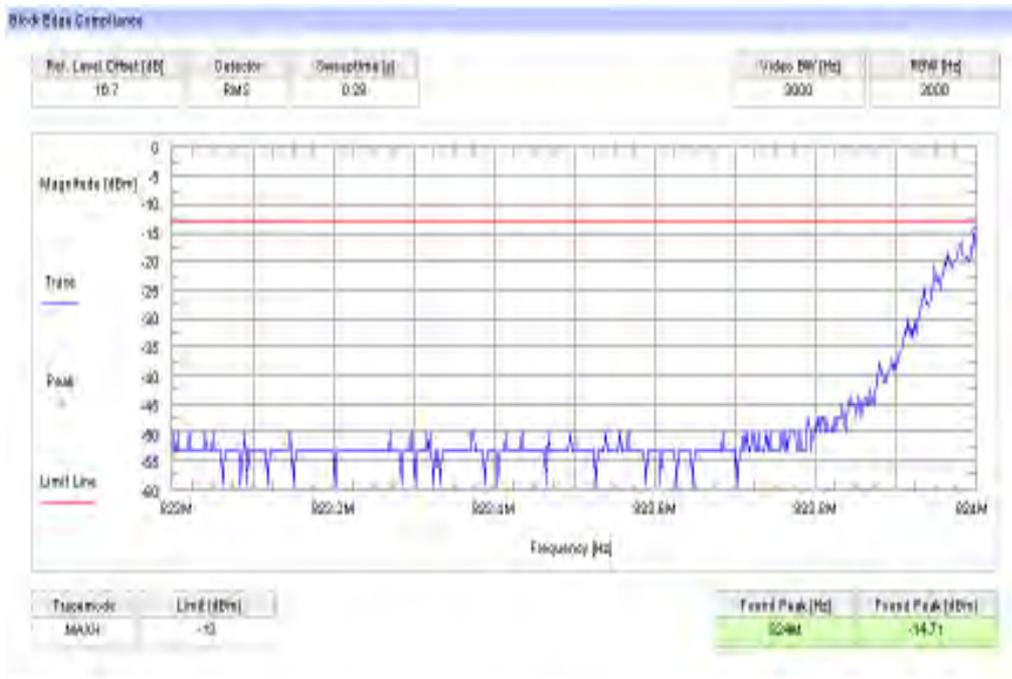
FCC:	CFR Part 22.917
IC:	RSS 132, Issue 2, Section 6.5

Measurement Limit:

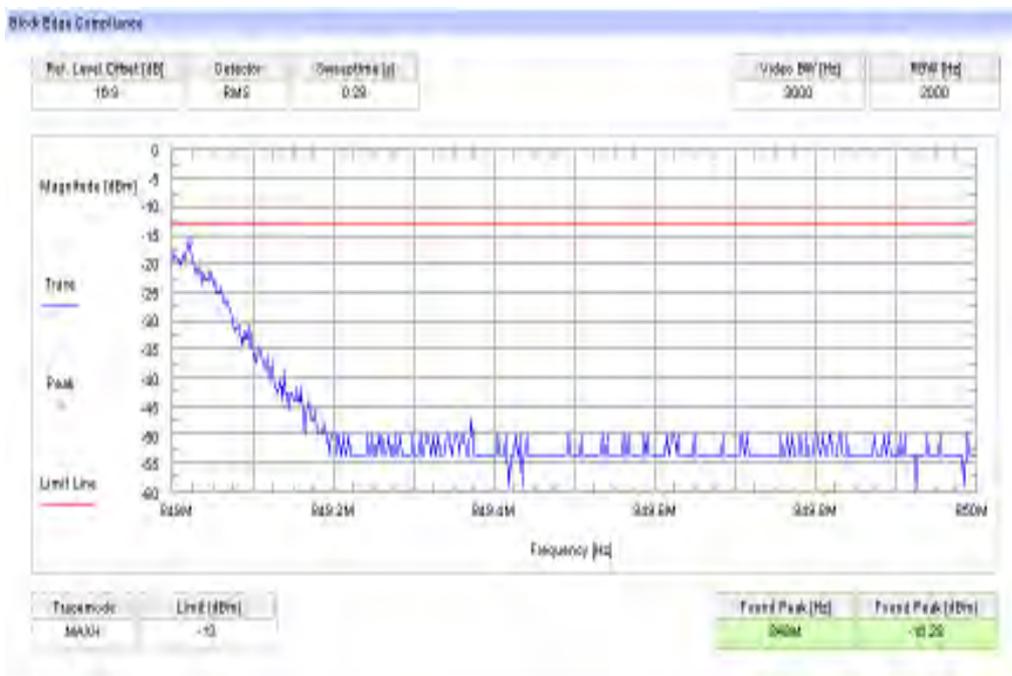
Sec. 22.917(b) Emission Limits.

(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 $43+10\text{Log}(P)$ dB. For all power levels +33 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

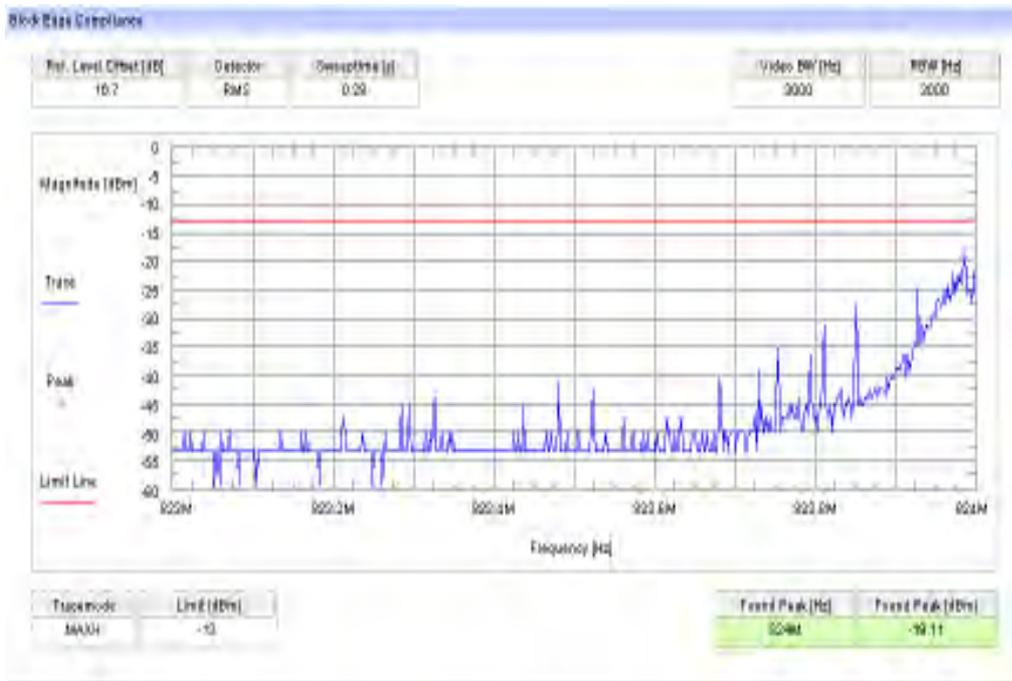
Block 1 Channel 128



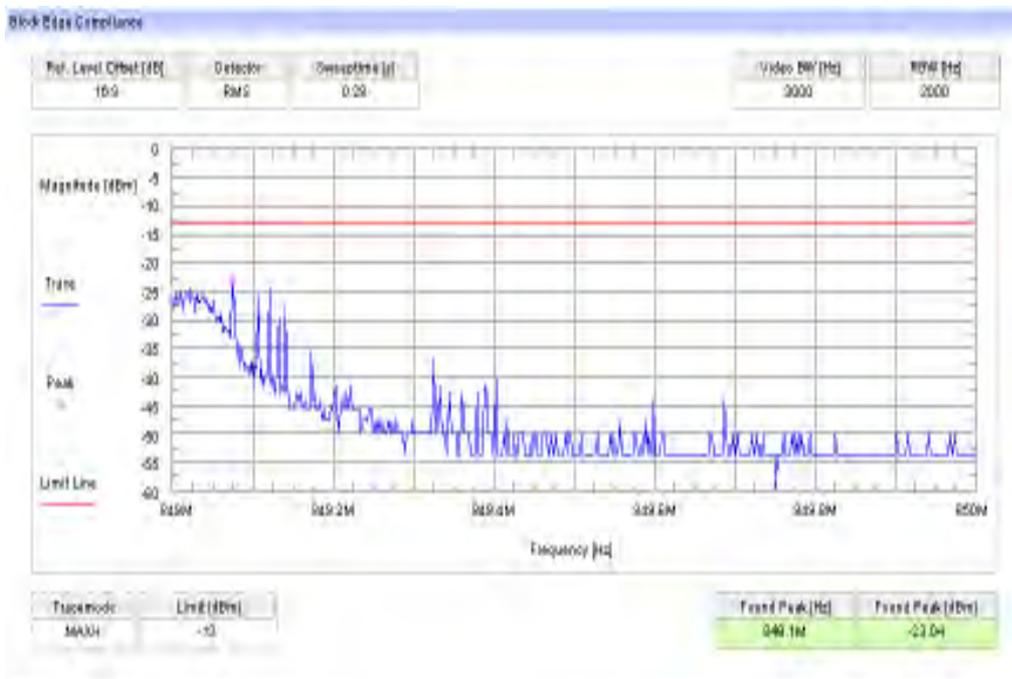
Block 4 Channel 251



Block 1 Channel 128 (EDGE)



Block 4 Channel 251 (EDGE)



5.2.6 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	269	307
836.4 MHz	279	313
848.8 MHz	267	309

EDGE mode

Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
824.2 MHz	281	311
836.4 MHz	257	315
848.8 MHz	257	315

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

Channel 128

99% (-20 dB) Occupied Bandwidth



Channel 128

-26 dBc Bandwidth



Channel 189

99% (-20 dB) Occupied Bandwidth



Channel 189

-26 dBc Bandwidth



Channel 251

99% (-20 dB) Occupied Bandwidth



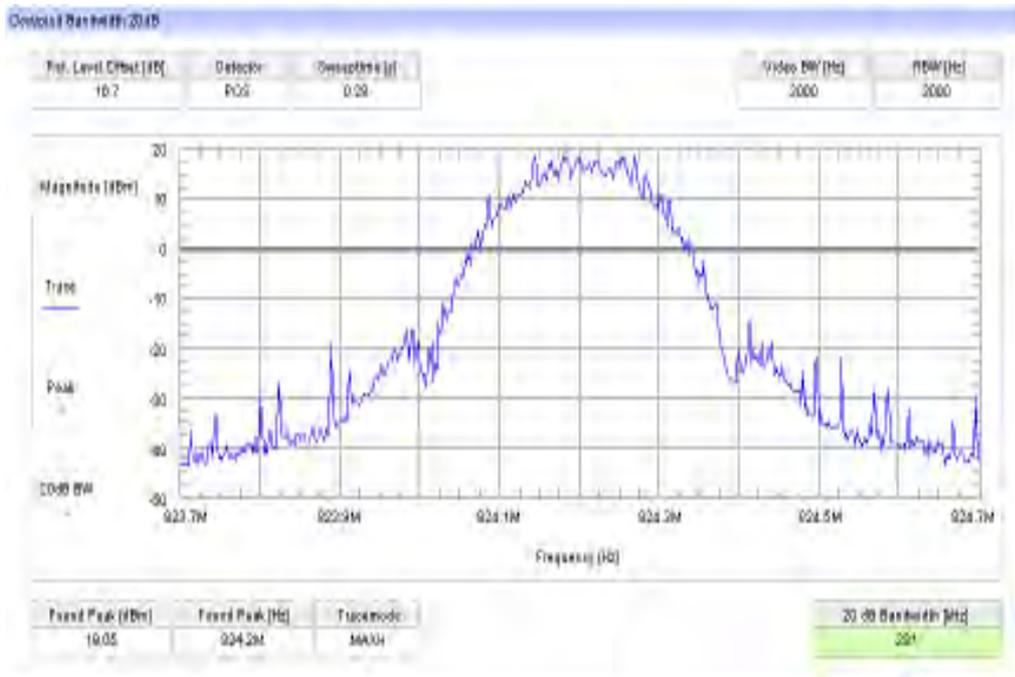
Channel 251

-26 dBc Bandwidth



Channel 128 (EDGE)

99% (-20 dB) Occupied Bandwidth



Channel 128 (EDGE)

-26 dBc Bandwidth



Channel 189 (EDGE)

99% (-20 dB) Occupied Bandwidth



Channel 189 (EDGE)

-26 dBc Bandwidth



Channel 251 (EDGE)

99% (-20 dB) Occupied Bandwidth



Channel 251 (EDGE)

-26 dBc Bandwidth



5.3 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	22.25	3.52
1880.0	22.39	3.56
1907.6	22.27	3.51
Measurement uncertainty	±0.5 dB	

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

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	CM(dB) ⁽²⁾
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 ⁽³⁾	15/15 ⁽³⁾	64	12/15 ⁽³⁾	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: $\Delta_{ACK}, \Delta_{NACK}, \Delta_{CQI} = 8 \iff A_{hs} = \beta_{hs}/\beta_c = 30/15 \iff \beta_{hs} = 30/15 * \beta_c$

Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$

Note 3 : For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$

Table 1: Subtests for UMTS Release 5 HSDPA

It was checked that the EUT supports the HSDPA-Mode and fulfils the requirements of the table above. The exact power-values are part of the SAR-report.

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

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

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

It was checked that the EUT supports the HSUPA-Mode and fulfils the requirements of the table above. The exact power-values are part of the SAR-report.

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

$E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$

(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° 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

$E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$

(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:

$$P = P1 - L1 = (P2 + L2) - L1 = P3 + A + L2 - L1$$

$$EIRP = P + G1 = P3 + L2 - L1 + A + G1$$

$$ERP = EIRP - 2.15 \text{ dB}$$

$$\text{Total Correction factor in EMI Receiver \# 2} = L2 - L1 + G1$$

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	24.50
1880.0	24.29
1907.6	24.53
Measurement uncertainty	±0.5 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			

$EIRP = SG \text{ (dBm)} - \text{Cable Loss (dB)} + \text{Ant. gain (dB)}$

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:

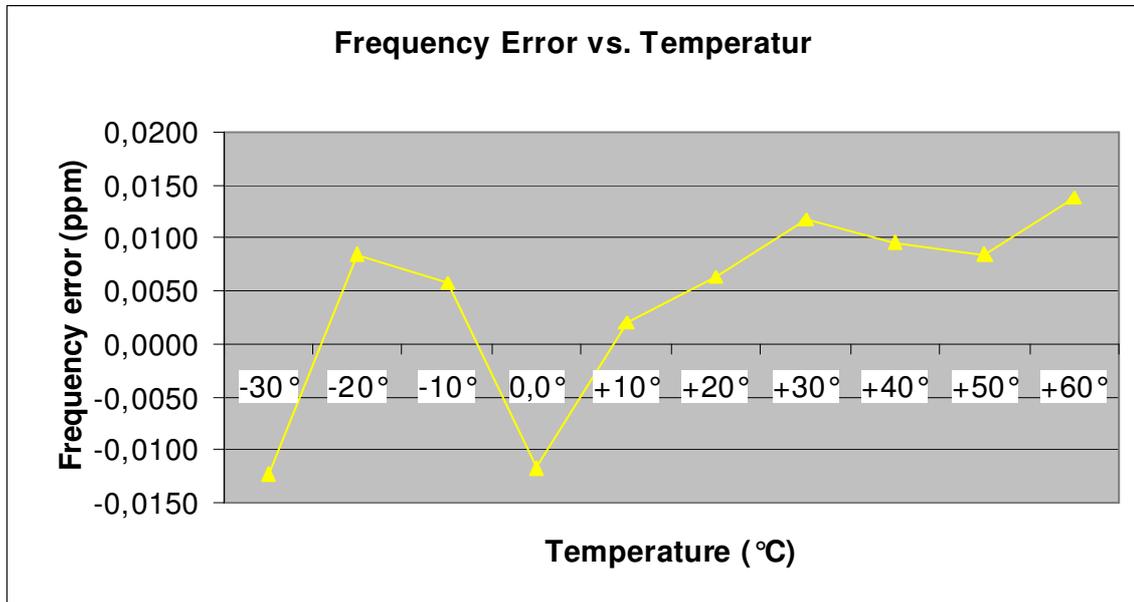
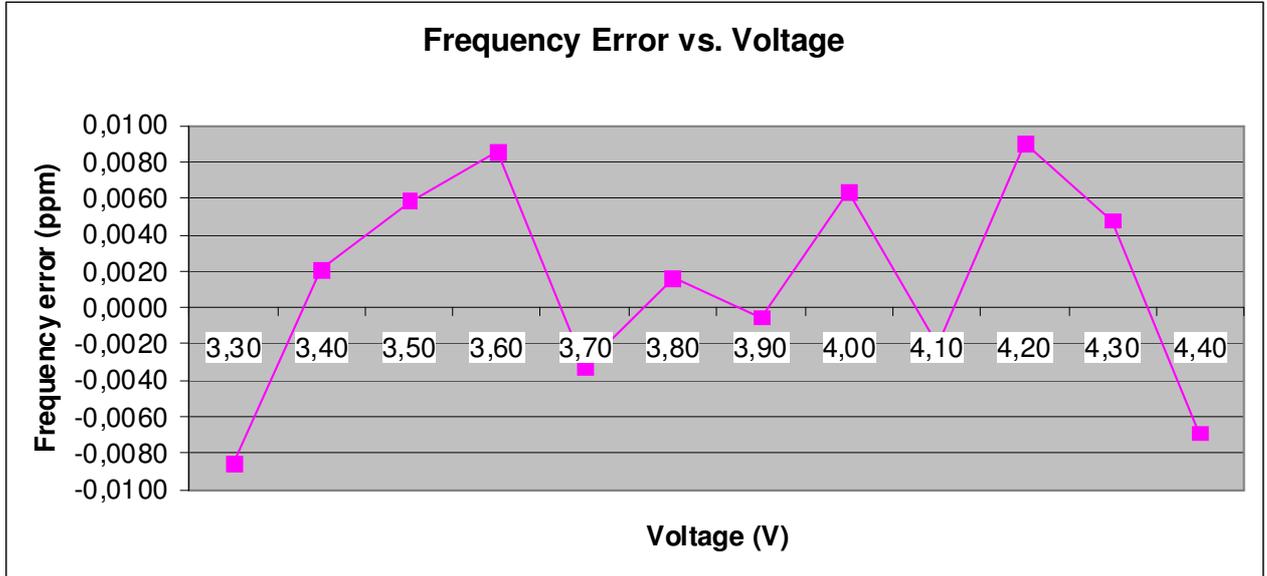
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission 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	-16	-0,00000085	-0,0085
3.4	4	0,00000021	0,0021
3.5	11	0,00000059	0,0059
3.6	16	0,00000085	0,0085
3.7	-6	-0,00000032	-0,0032
3.8	3	0,00000016	0,0016
3.9	-1	-0,00000005	-0,0005
4.0	12	0,00000064	0,0064
4.1	-4	-0,00000021	-0,0021
4.2	17	0,00000090	0,0090
4.3	9	0,00000048	0,0048
4.4	-13	-0,00000069	-0,0069

Test Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-23	-0,00000122	-0,0122
-20	16	0,00000085	0,0085
-10	11	0,00000059	0,0059
±0.0	-22	-0,00000117	-0,0117
+10	4	0,00000021	0,0021
+20	12	0,00000064	0,0064
+30	22	0,00000117	0,0117
+40	18	0,00000096	0,0096
+50	16	0,00000085	0,0085
+60	26	0,00000138	0,0138



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 1 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 $43 + 10 \log(P)$ dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Measurement Results: Radiated Emissions

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the UMTS band (1852.4 MHz, 1880.0 MHz and 1907.6 MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the UMTS band into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

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

All measurements were done in horizontal and vertical polarization; the plots show the worst case. 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	-	3760	-	3815.2	-
3	5557.2	-	5640	-	5722.8	-
4	7409.6	-	7520	-	7630.4	-
5	9262.0	-	9400	-	9538.0	-
6	11114.4	-	11280	-	11445.6	-
7	12966.8	-	13160	-	13353.2	-
8	14819.2	-	15040	-	15260.8	-
9	16671.6	-	16920	-	17168.4	-
10	18524.0	-	18800	-	19076.0	-

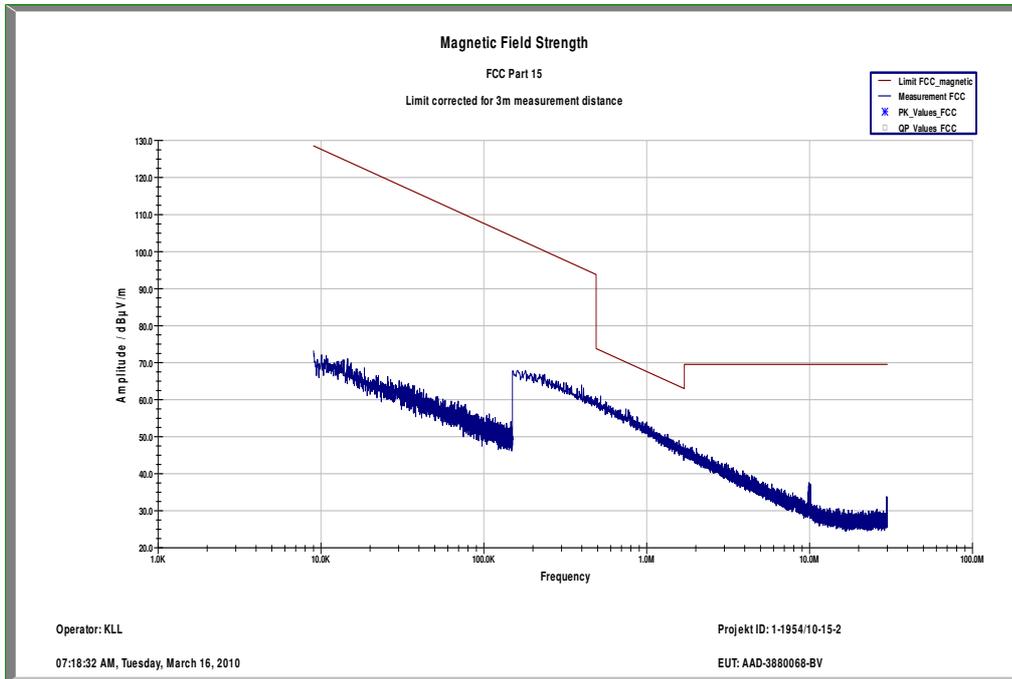
No peaks found < 20 dB below limit.

Sample calculation:

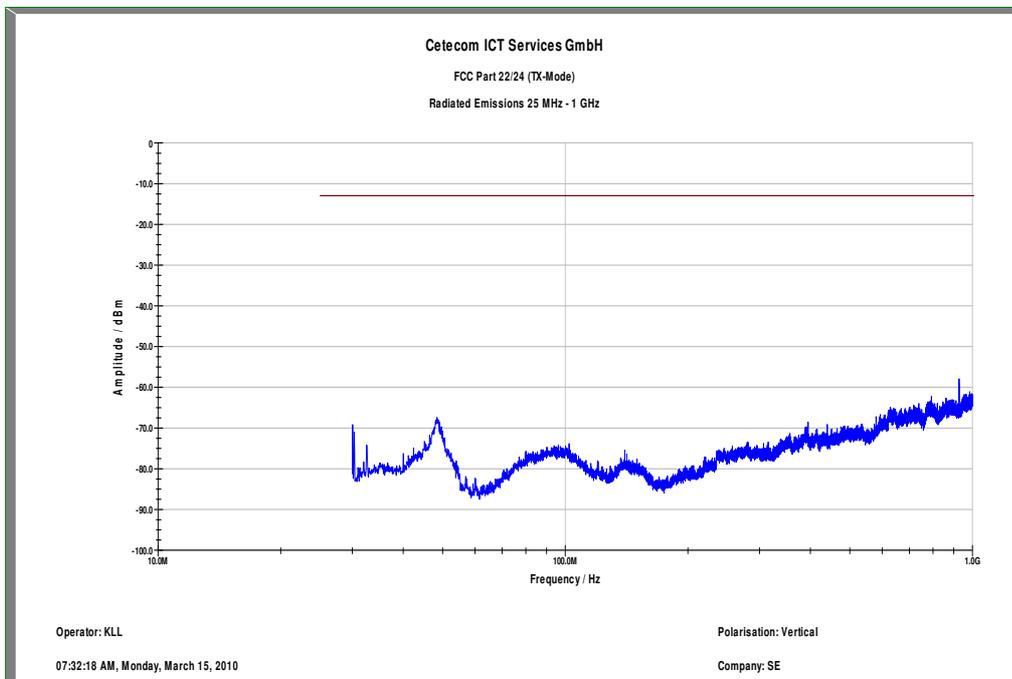
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBμV	dBm	dBi	dBd	dB	dBm			
1852.4	125.8	22.6	8.4	0.0	3.3	27.7			

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

Plot 1: Channel 9400 (Traffic mode up to 30 MHz), antenna position 0°



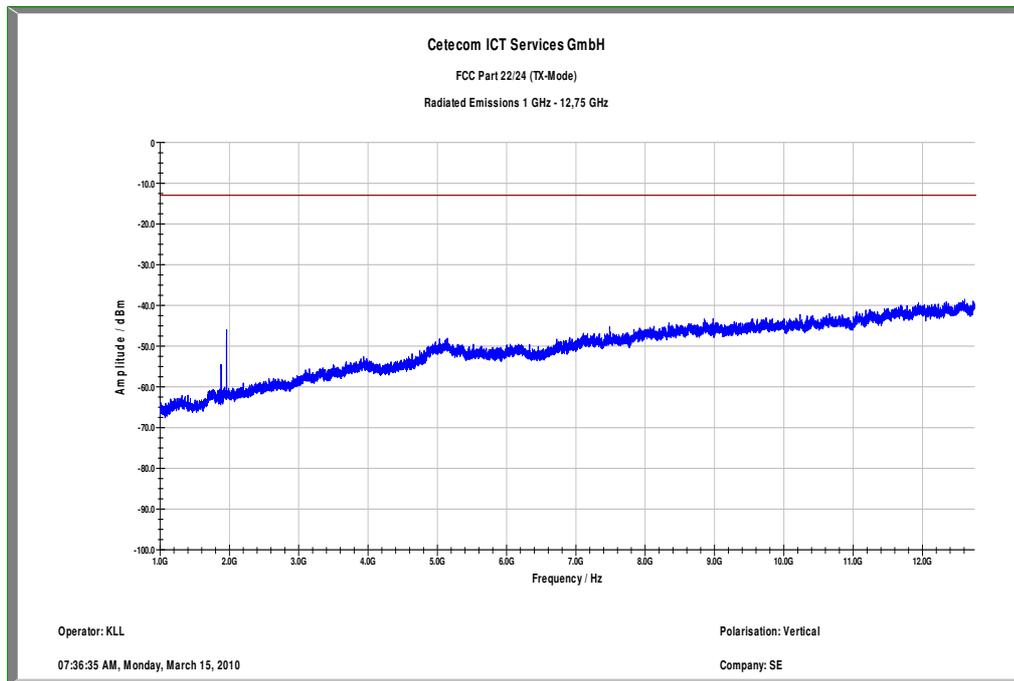
Plot 2: Channel 9400 (30 MHz - 1 GHz), antenna vertical



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

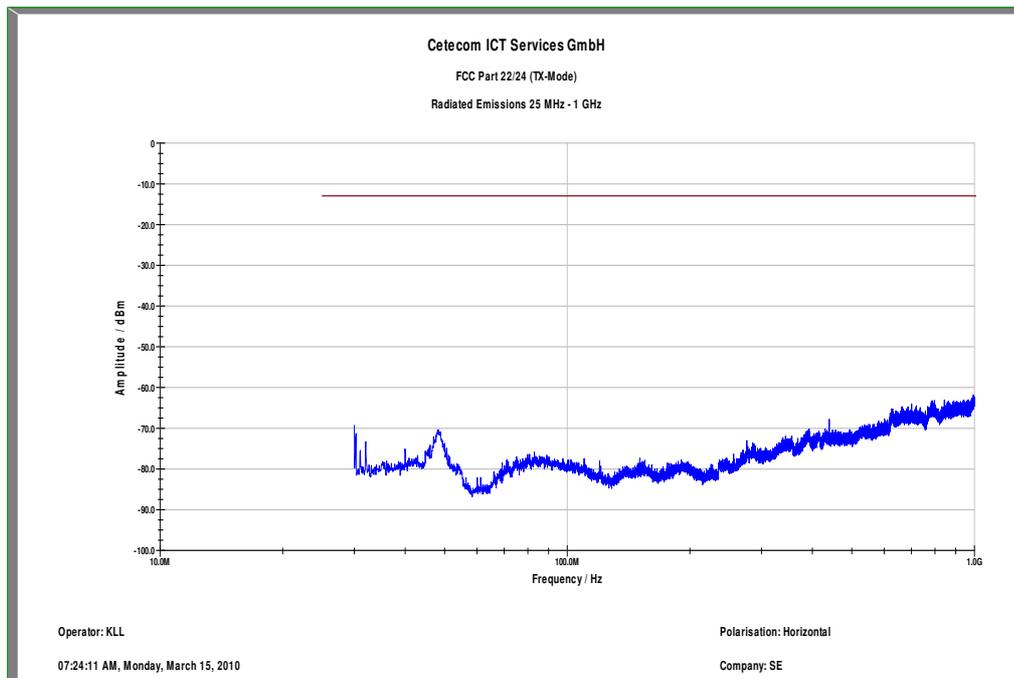
Plot 3: Channel 9400 (1 GHz – 12.5 GHz), antenna vertical



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz
Carrier notched with a rejection filter

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

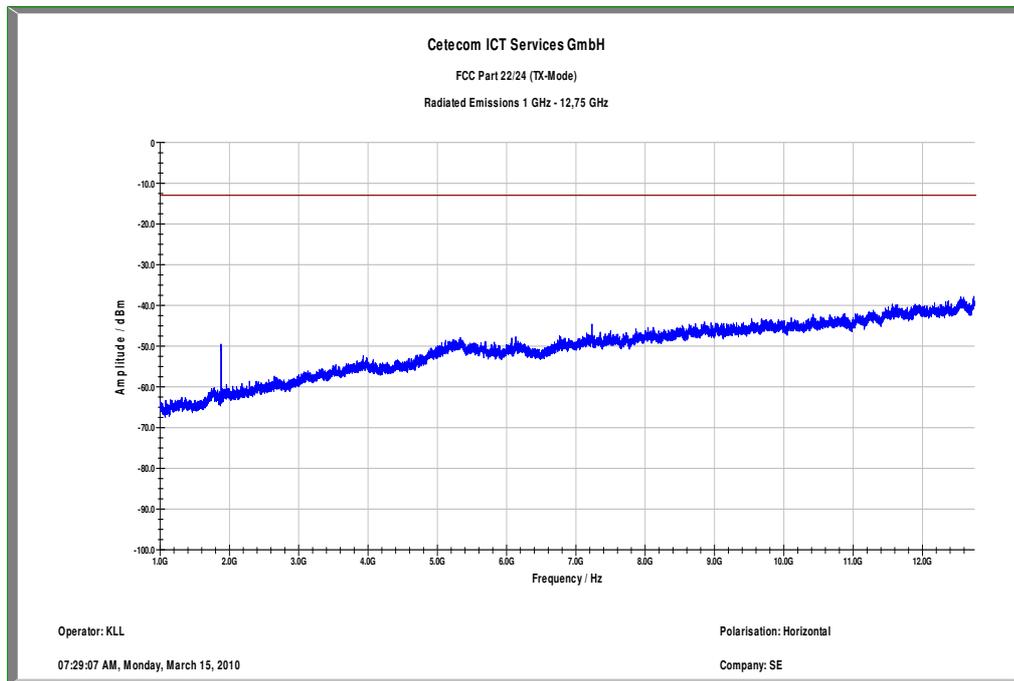
Plot 4: Channel 9400 (30 MHz - 1 GHz), antenna horizontal



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

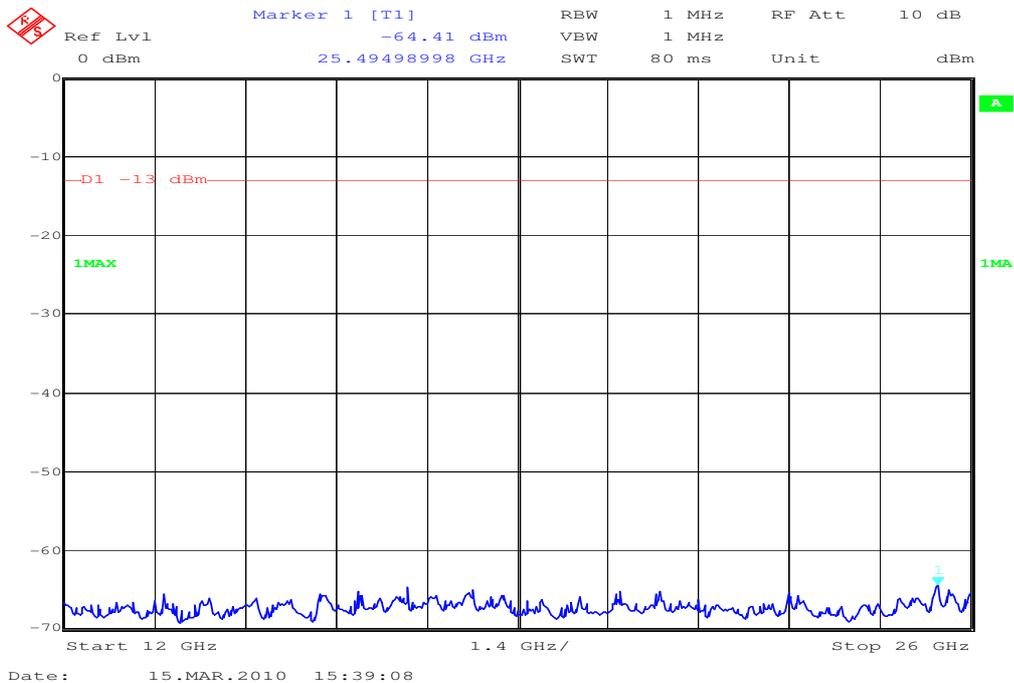
Plot 5: Channel 9400 (1 GHz – 12.5 GHz), antenna horizontal



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz
Carrier notched with a rejection filter

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

Plot 6: Channel 9400 (12 GHz - 25 GHz) valid for all 3 channels



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

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

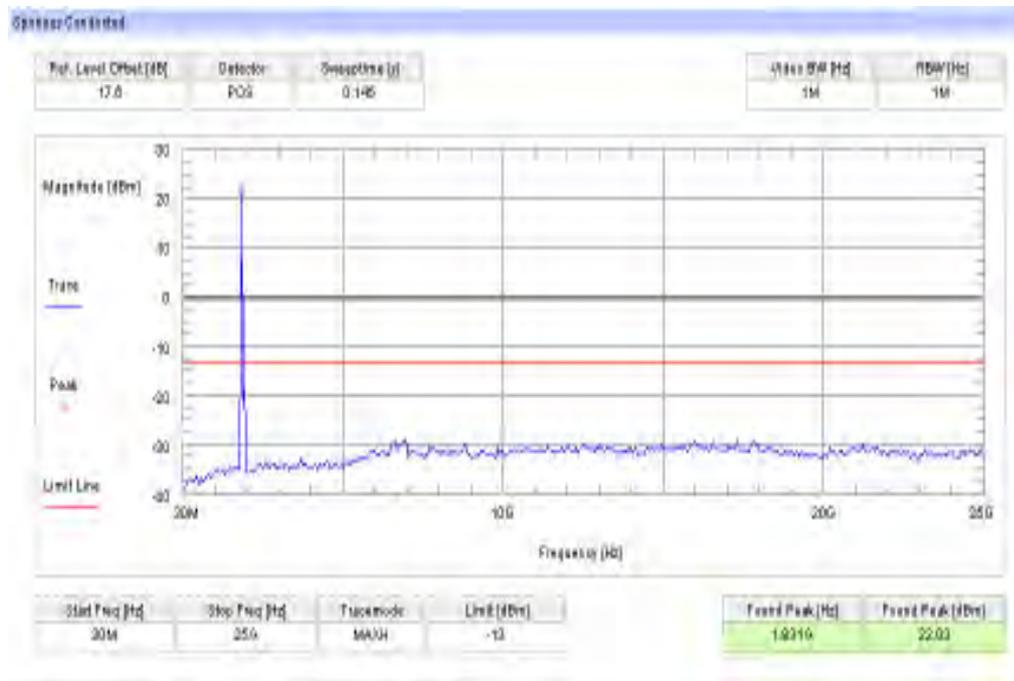
Measurement Limit:

(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 $43+10\text{Log}(P)$ dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

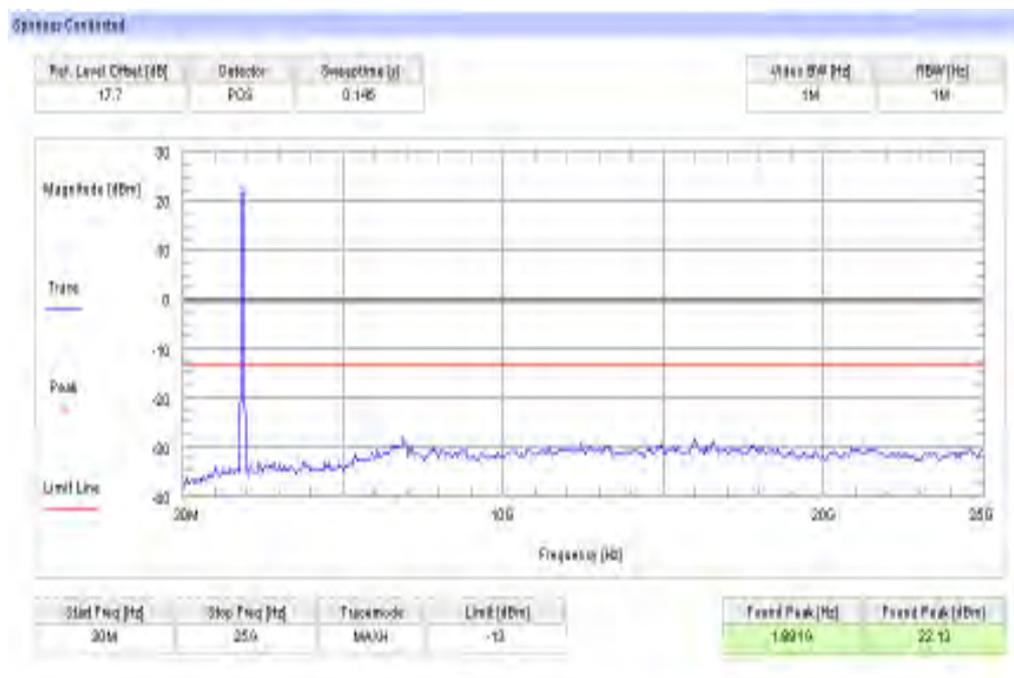
Measurement Results:

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

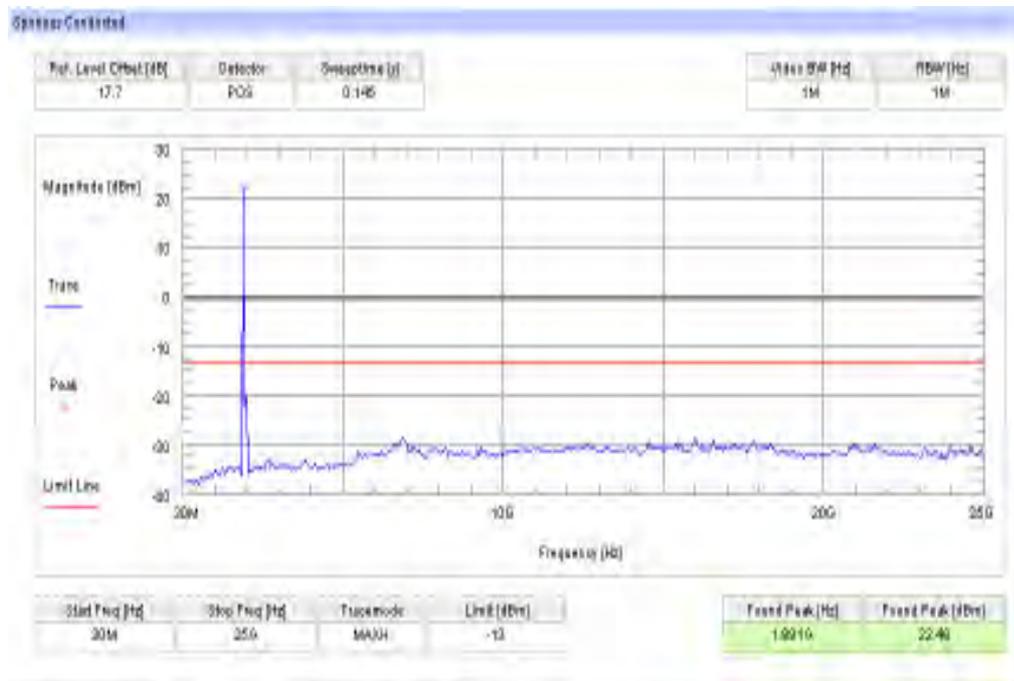
Channel 9262 (30 MHz – 25 GHz)



Channel 9400 (30 MHz – 25 GHz)



Channel 9538 (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 $43+10\text{Log}(P)$ dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

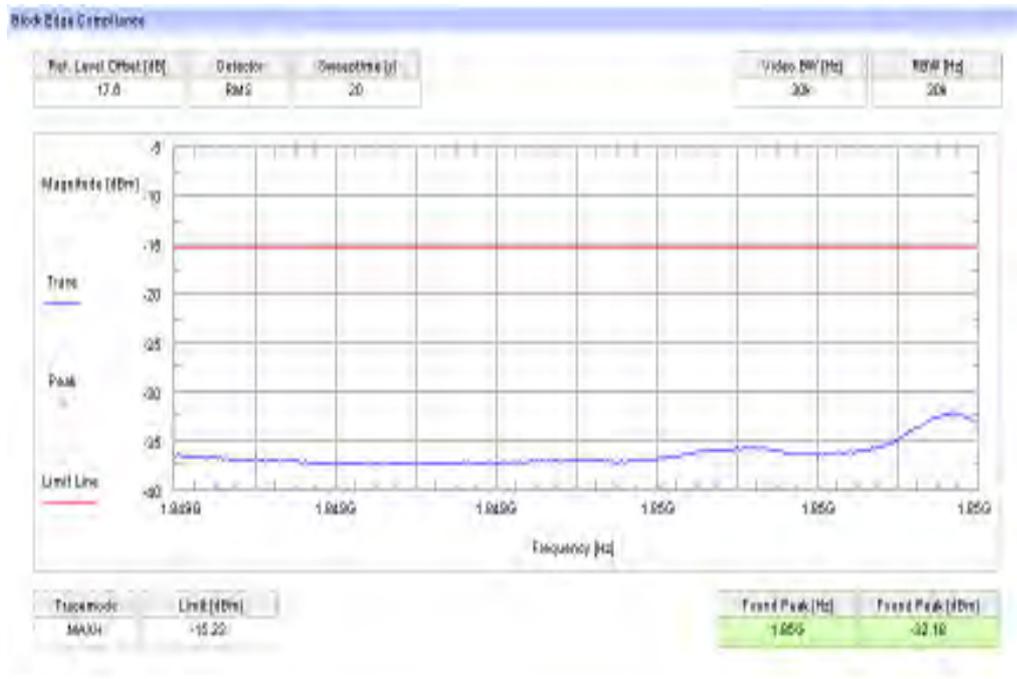
Part 22.917 specifies that “the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.”

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:

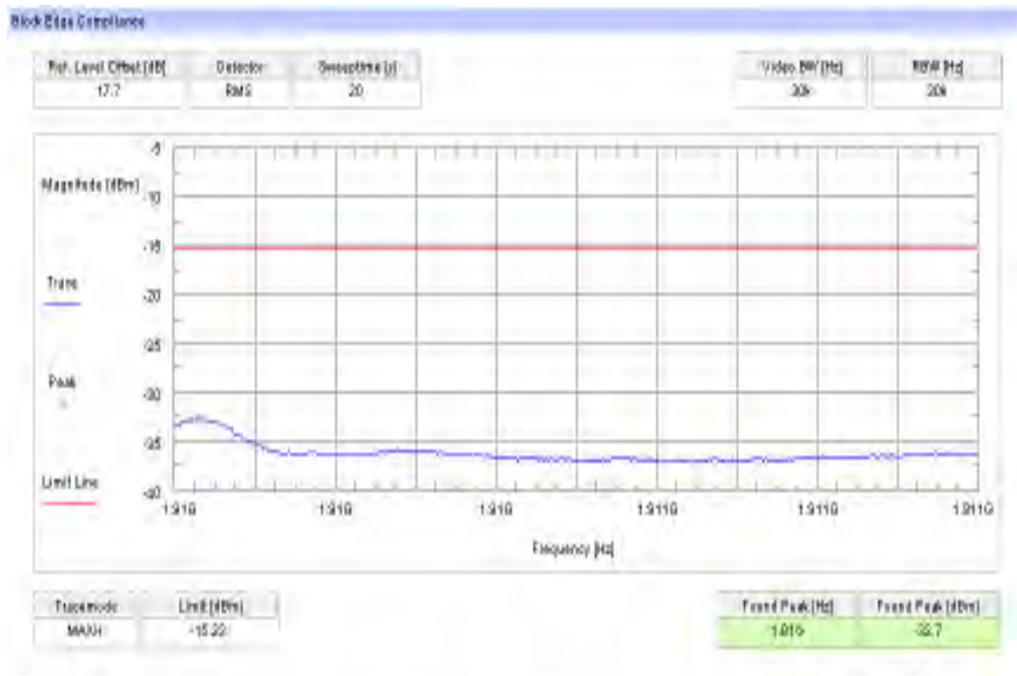
“An alternative is to add an additional correction factor of $10 \text{Log} (\text{RBW1}/ \text{RBW2})$ to the $43 + 10 \text{Log} (P)$ limit. RBW1 is the narrower measurement resolution bandwidth and RBW2 is either the 1% emissions bandwidth or 1 MHz.”

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

Channel 9262



Channel 9538



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.

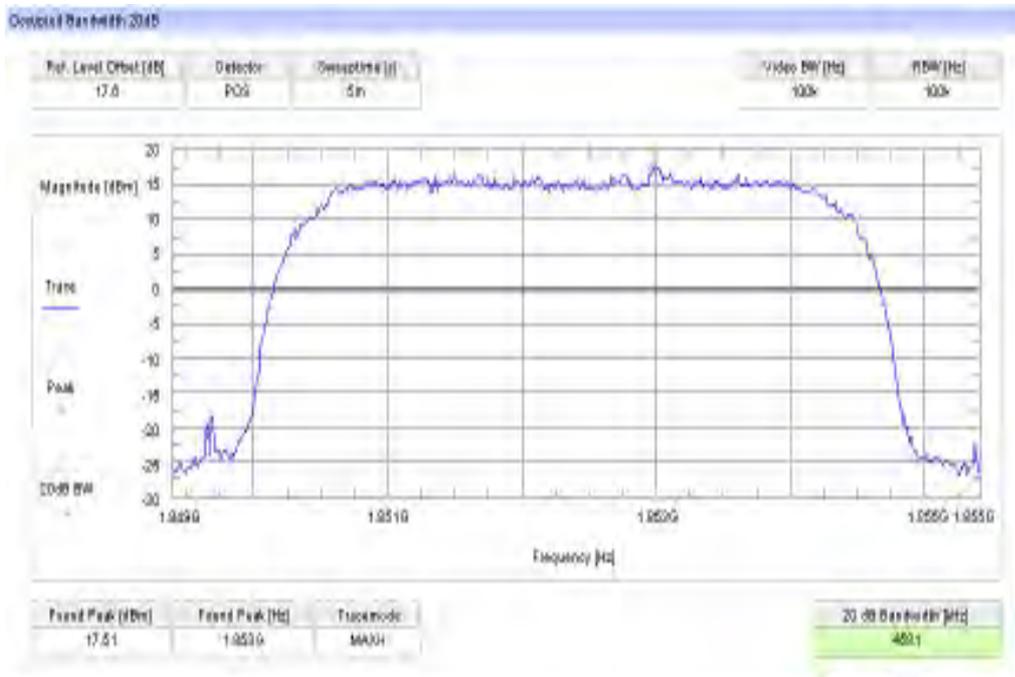
Normal mode

Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1852.4 MHz	4581	4701
1880.0 MHz	4581	4689
1907.6 MHz	4557	4677

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.

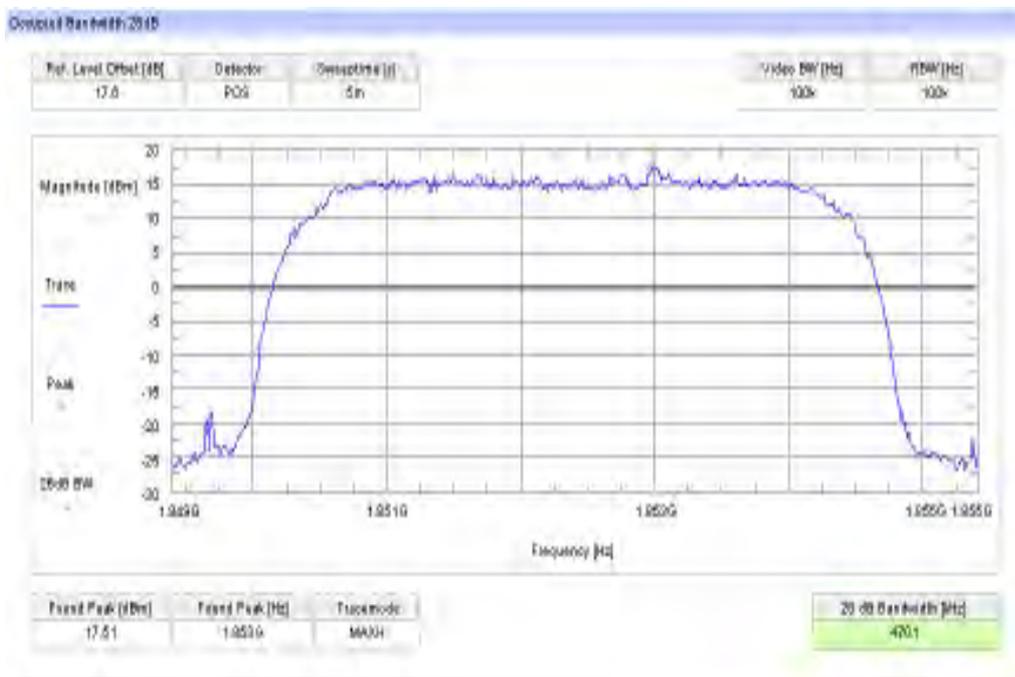
Channel 9262

99% (-20 dB) Occupied Bandwidth

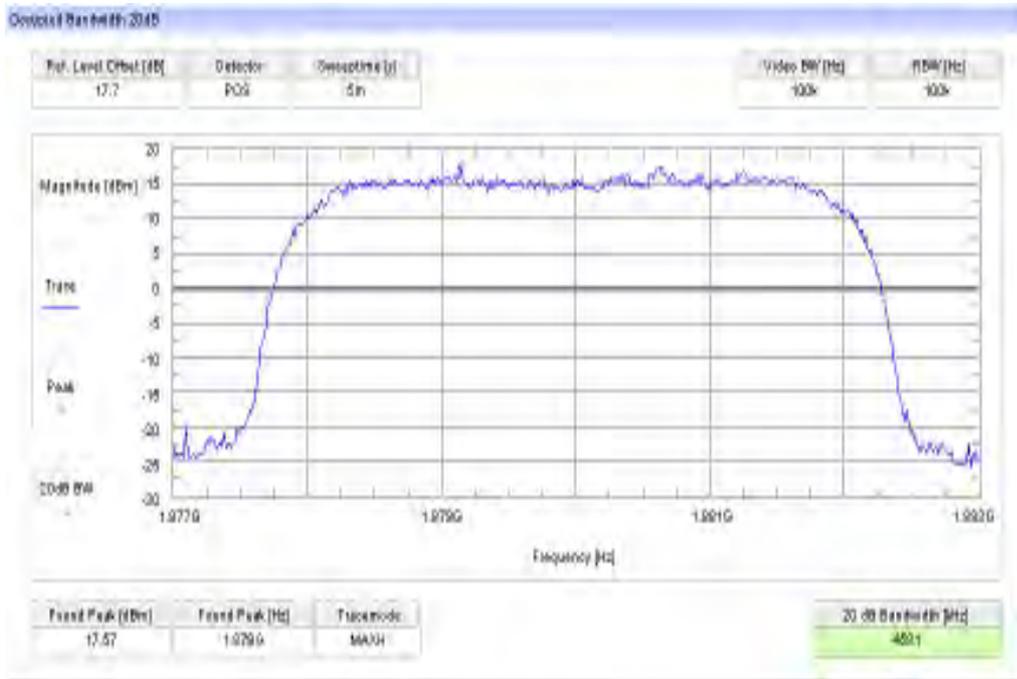


Channel 9262

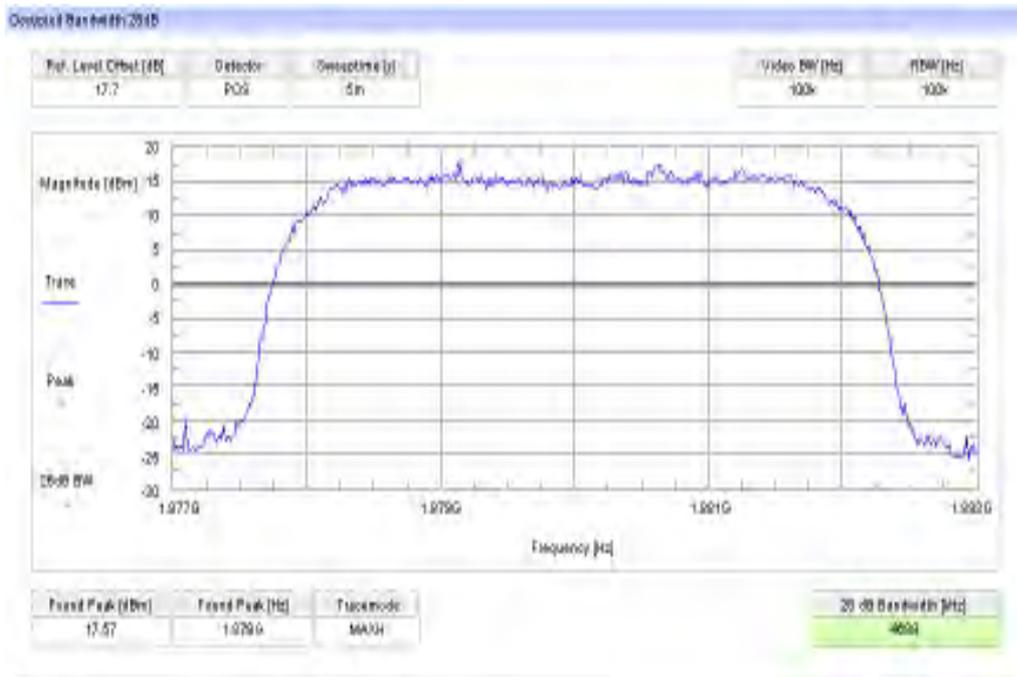
-26 dBc Bandwidth



Channel 9400
99% (-20 dB) Occupied Bandwidth



Channel 9400
-26 dBc Bandwidth



Channel 9538

99% (-20 dB) Occupied Bandwidth



Channel 9538

-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	23.20	3.37
836.0	23.42	3.59
846.6	23.21	3.41
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

$E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$

(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° 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

$E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$

(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° 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:

$$P = P_1 - L_1 = (P_2 + L_2) - L_1 = P_3 + A + L_2 - L_1$$

$$\text{EIRP} = P + G_1 = P_3 + L_2 - L_1 + A + G_1$$

$$\text{ERP} = \text{EIRP} - 2.15 \text{ dB}$$

$$\text{Total Correction factor in EMI Receiver \# 2} = L_2 - L_1 + G_1$$

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	20.49
836.0	18.12
846.6	20.27
Measurement uncertainty	±0.5 dB

Sample calculation:

Freq	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)

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

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	CM(dB) ⁽²⁾
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15 ⁽³⁾	15/15 ⁽³⁾	64	12/15 ⁽³⁾	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: $\Delta_{ACK}, \Delta_{NACK}, \Delta_{CQI} = 8 \iff A_{hs} = \beta_{hs}/\beta_c = 30/15 \iff \beta_{hs} = 30/15 * \beta_c$

Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$

Note 3 : For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$

Table 1: Subtests for UMTS Release 5 HSDPA

It was checked that the EUT supports the HSDPA-Mode and fulfils the requirements of the table above. The exact power-values are part of the SAR-report.

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

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

Note 1: $\Delta_{ACK}, \Delta_{NACK}, \Delta_{CQI} = 8 \iff A_{hs} = \beta_{hs}/\beta_c = 30/15 \iff \beta_{hs} = 30/15 * \beta_c$

Note 2 : CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference

Note 3 : For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$

Note 4 : For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1,TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$

Note 5 : Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g

Note 6 : β_{ed} can not be set directly; it is set by Absolute Grant Value

Table 2: Subtests for UMTS Release 6 HSUPA

It was checked that the EUT supports the HSUPA-Mode and fulfils the requirements of the table above. The exact power-values are part of the SAR-report.

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:

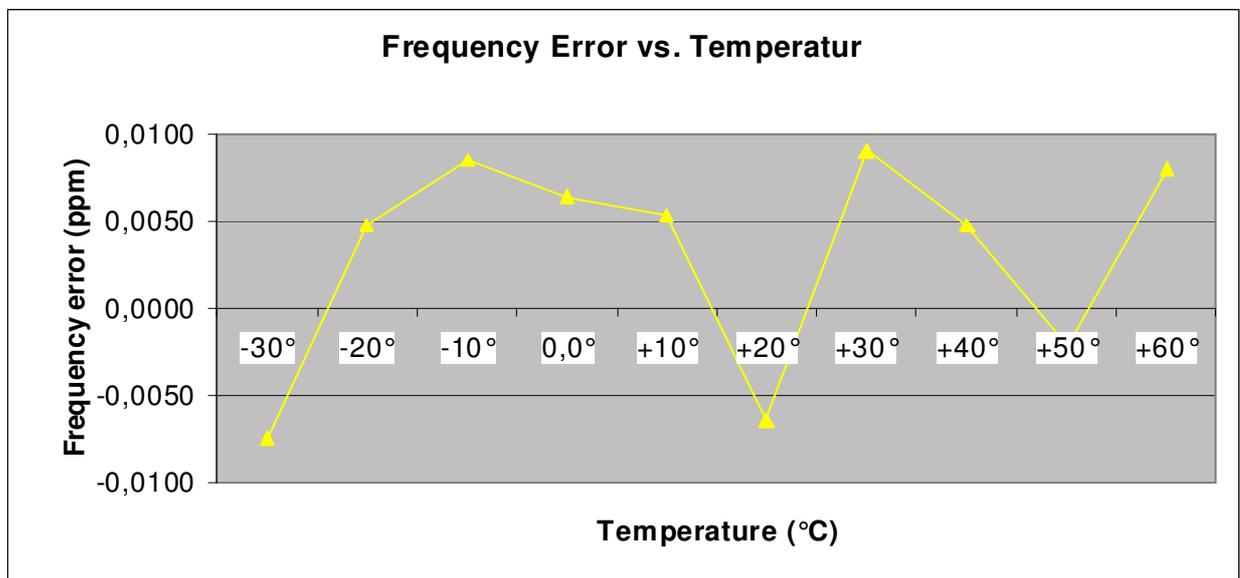
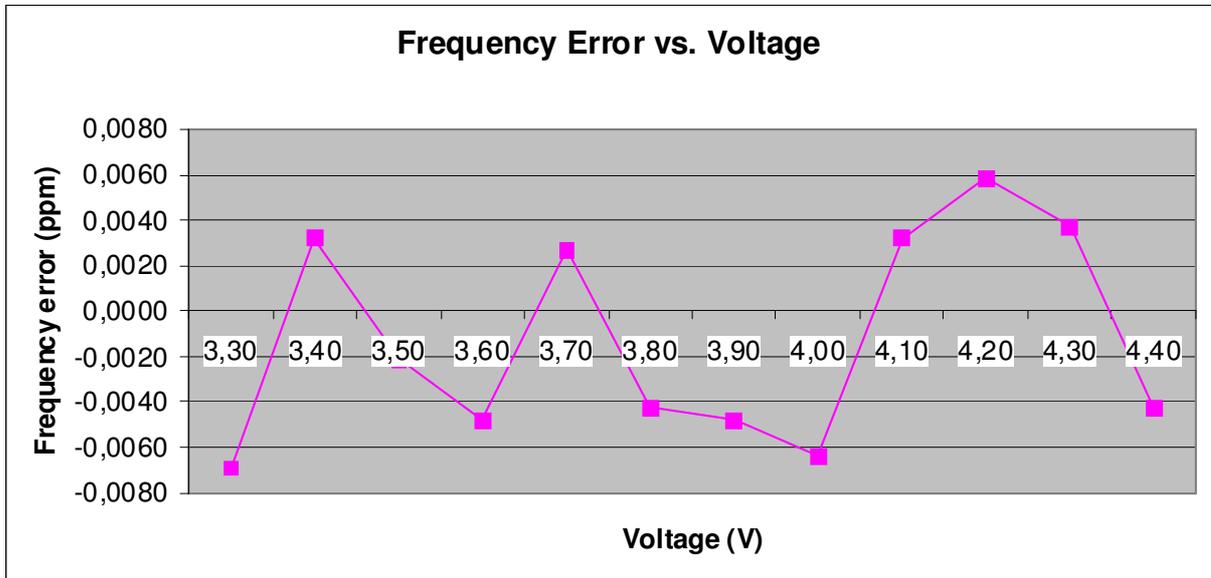
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 22.355, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission 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	-13	-0,00000069	-0,0069
3.4	6	0,00000032	0,0032
3.5	-4	-0,00000021	-0,0021
3.6	-9	-0,00000048	-0,0048
3.7	5	0,00000027	0,0027
3.8	-8	-0,00000043	-0,0043
3.9	-9	-0,00000048	-0,0048
4.0	-12	-0,00000064	-0,0064
4.1	6	0,00000032	0,0032
4.2	11	0,00000059	0,0059
4.3	7	0,00000037	0,0037
4.4	-8	-0,00000043	-0,0043

Test Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-14	-0,00000074	-0,0074
-20	9	0,00000048	0,0048
-10	16	0,00000085	0,0085
±0.0	12	0,00000064	0,0064
+10	10	0,00000053	0,0053
+20	-12	-0,00000064	-0,0064
+30	17	0,00000090	0,0090
+40	9	0,00000048	0,0048
+50	-4	-0,00000021	-0,0021
+60	15	0,00000080	0,0080



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 1 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 $43+10\log(P)$ 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 shows 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	-	1672.0	-	1693.2	-
3	2479.2	-	2508.0	-	2539.8	-
4	3305.6	-	3344.0	-	3386.4	-
5	4132.0	-	4180.0	-	4233.0	-
6	4958.4	-	5016.0	-	5079.6	-
7	5784.8	-	5852.0	-	5926.2	-
8	6611.2	-	6688.0	-	6772.8	-
9	7437.6	-	7524.0	-	7619.4	-
10	8264.0	-	8360.0	-	8466.0	-

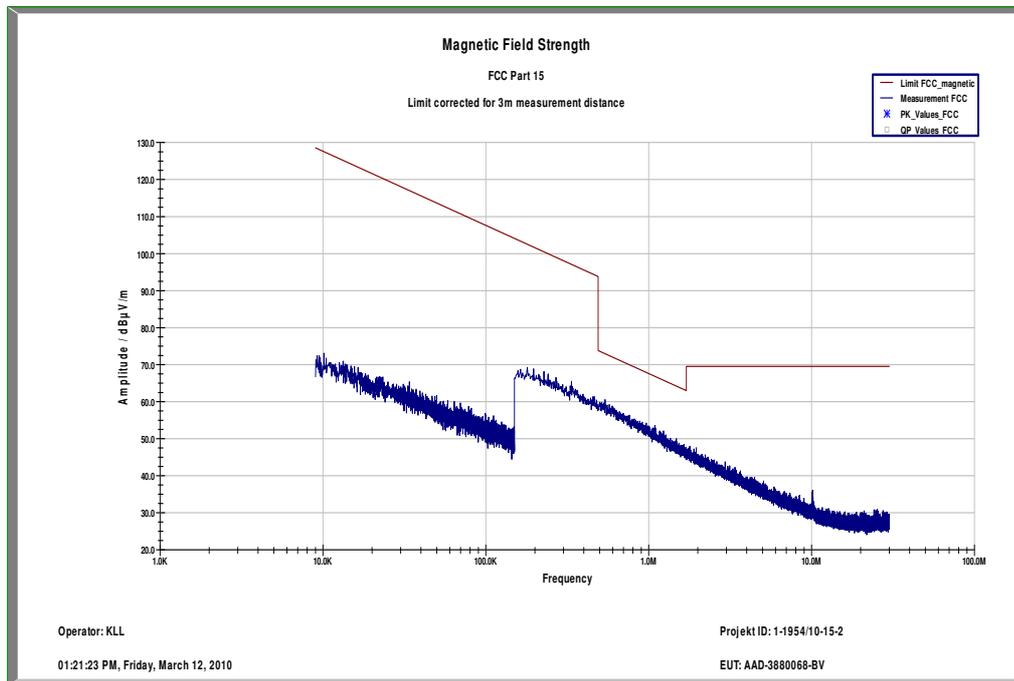
Sample calculation:

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

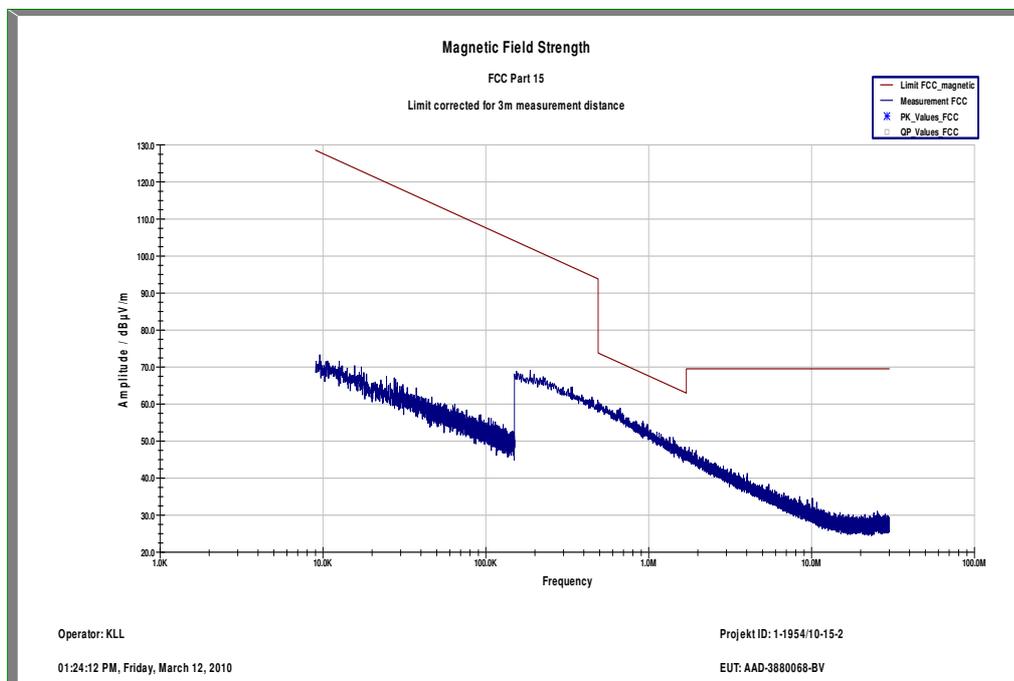
ERP = SG (dBm) - Cable Loss (dB) + Ant. gain (dB)

*ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.1dBi

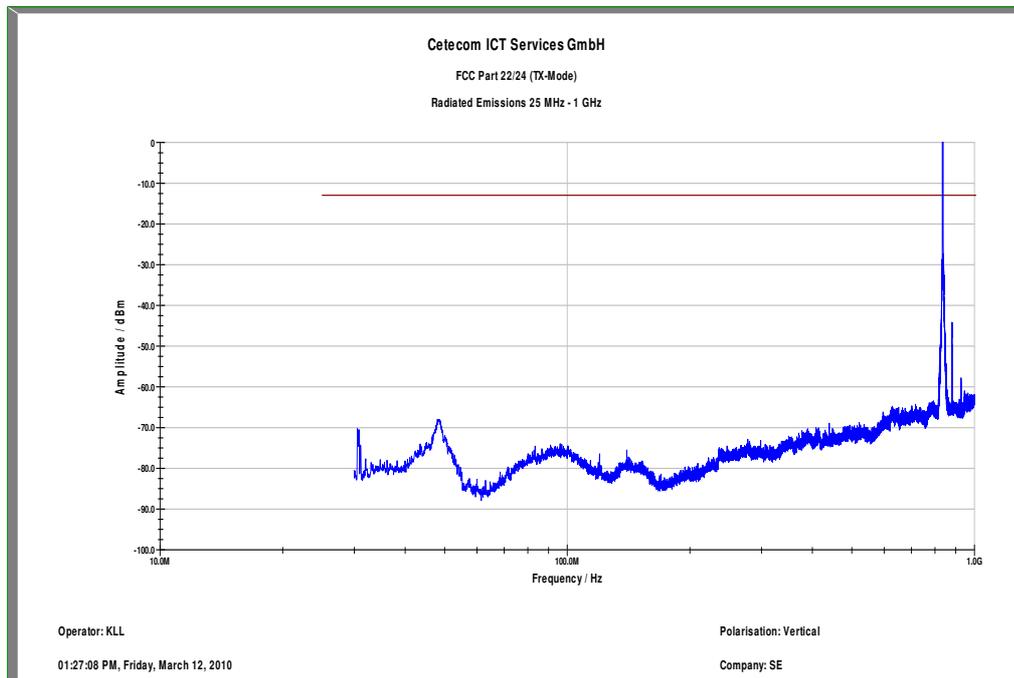
Plot 1: Channel 4180 (Traffic mode up to 30 MHz), antenna position 0°



Plot 2: Channel 4180 (Traffic mode up to 30 MHz), antenna position 90°



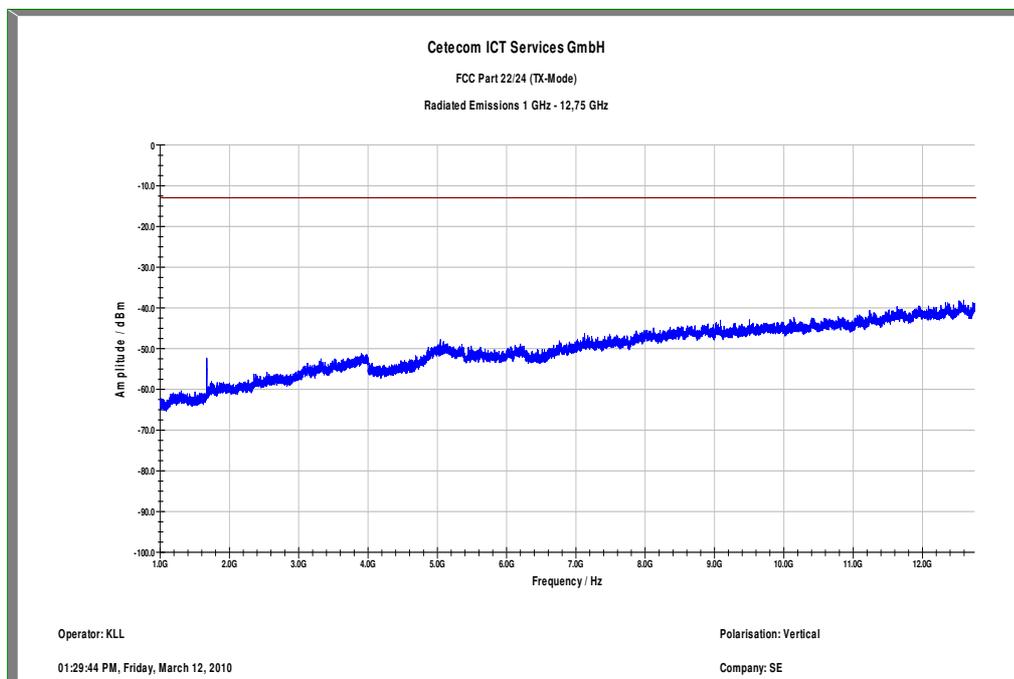
Plot 3: Channel 4180 (30 MHz - 1 GHz), antenna vertical



$f < 1 \text{ GHz} : \text{RBW/VBW} : 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW} / \text{VBW} : 1 \text{ MHz}$

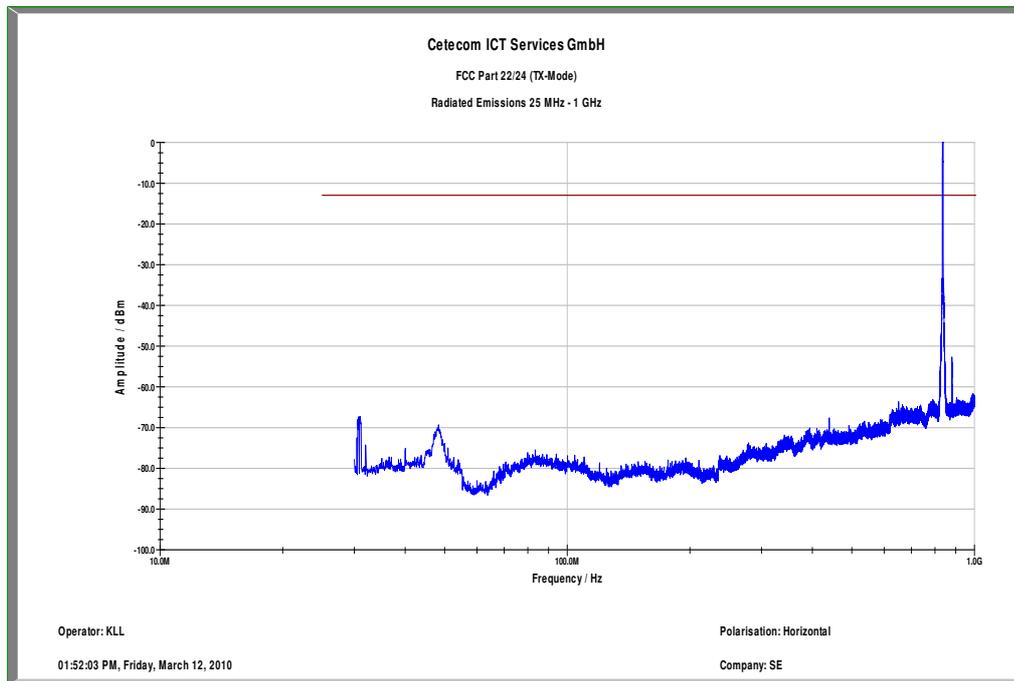
Plot 4: Channel 4180 (1 GHz – 12.5 GHz), antenna vertical



$f < 1 \text{ GHz} : \text{RBW/VBW} : 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW} / \text{VBW} : 1 \text{ MHz}$

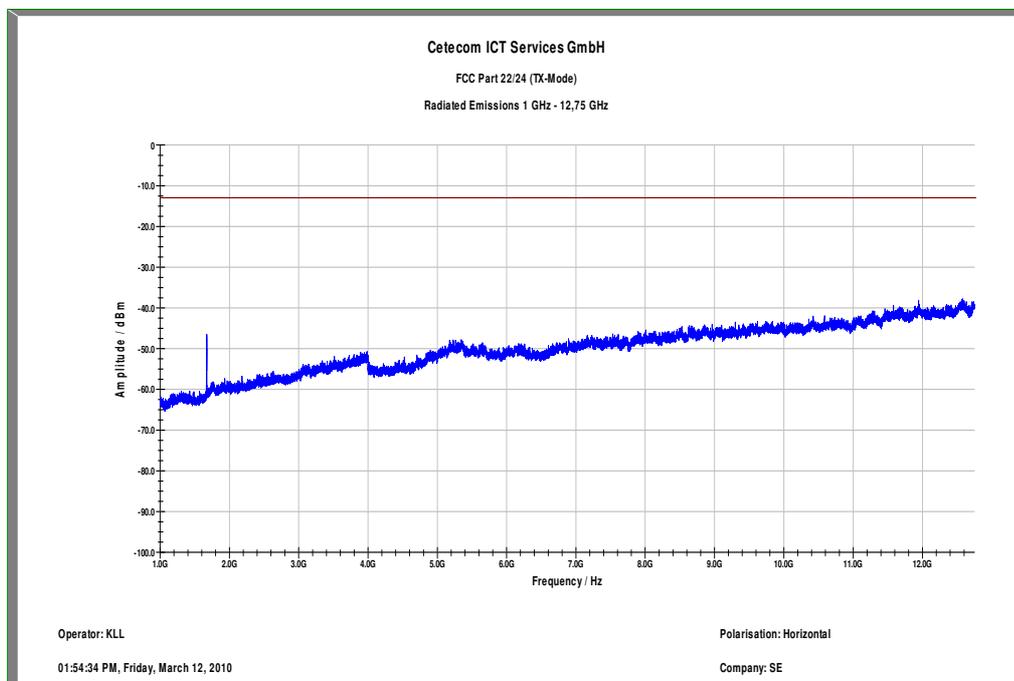
Plot 5: Channel 4180 (30 MHz - 1 GHz), antenna horizontal



$f < 1 \text{ GHz} : \text{RBW/VBW} : 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW / VBW} : 1 \text{ MHz}$

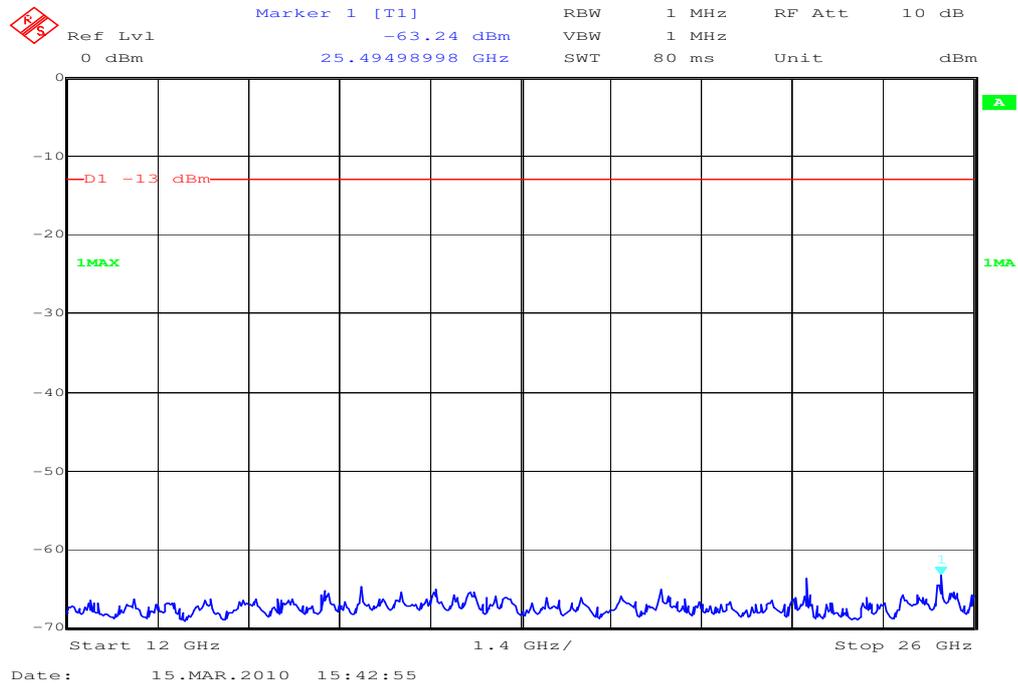
Plot 6: Channel 4180 (1 GHz – 12.5 GHz), antenna horizontal



$f < 1 \text{ GHz} : \text{RBW/VBW} : 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW / VBW} : 1 \text{ MHz}$

Plot 6: Channel 4180 (12 GHz - 25 GHz) valid for all 3 channels



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

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

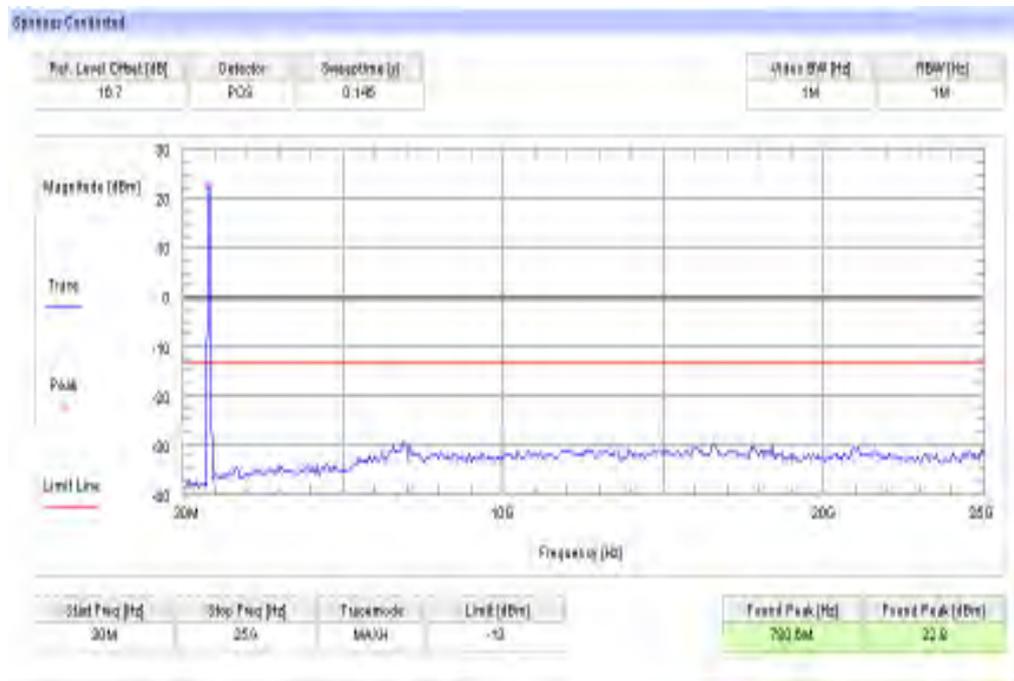
Measurement Limit

(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 $43+10\text{Log}(P)$ dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

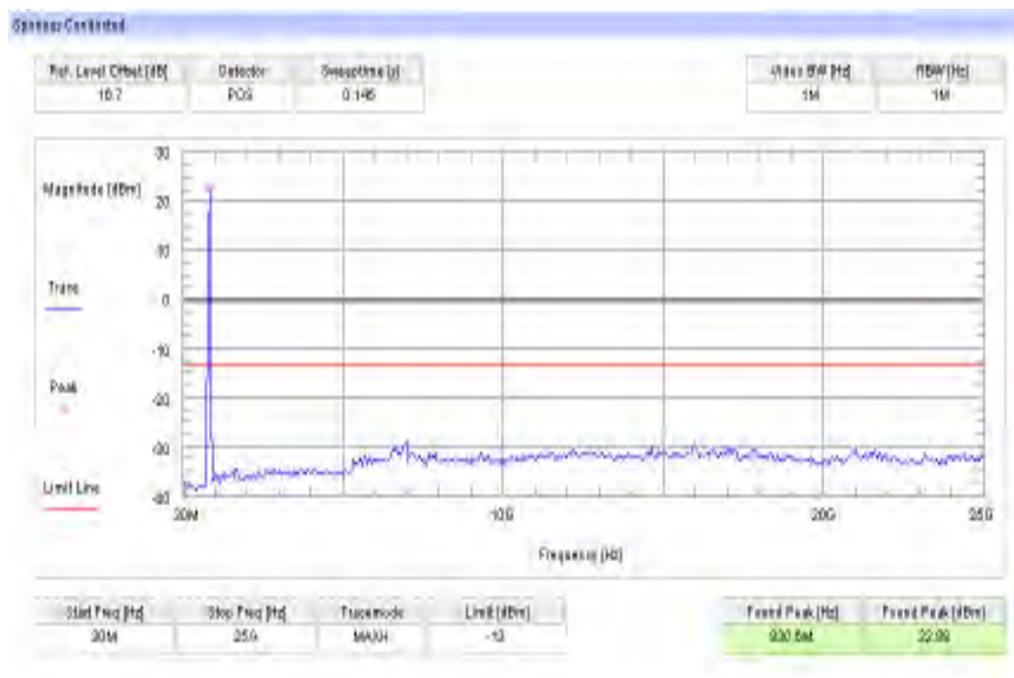
Measurement Results

Harmonic	Tx ch.-4132 Freq. (MHz)	Level (dBm)	Tx ch.-4180 Freq. (MHz)	Level (dBm)	Tx ch.- 4233 Freq. (MHz)	Level (dBm)
2	1652.8	-	1672.0	-	1693.2	-
3	2479.2	-	2508.0	-	2539.8	-
4	3305.6	-	3344.0	-	3386.4	-
5	4132.0	-	4180.0	-	4233.0	-
6	4958.4	-	5016.0	-	5079.6	-
7	5784.8	-	5852.0	-	5926.2	-
8	6611.2	-	6688.0	-	6772.8	-
9	7437.6	-	7524.0	-	7619.4	-
10	8264.0	-	8360.0	-	8466.0	-

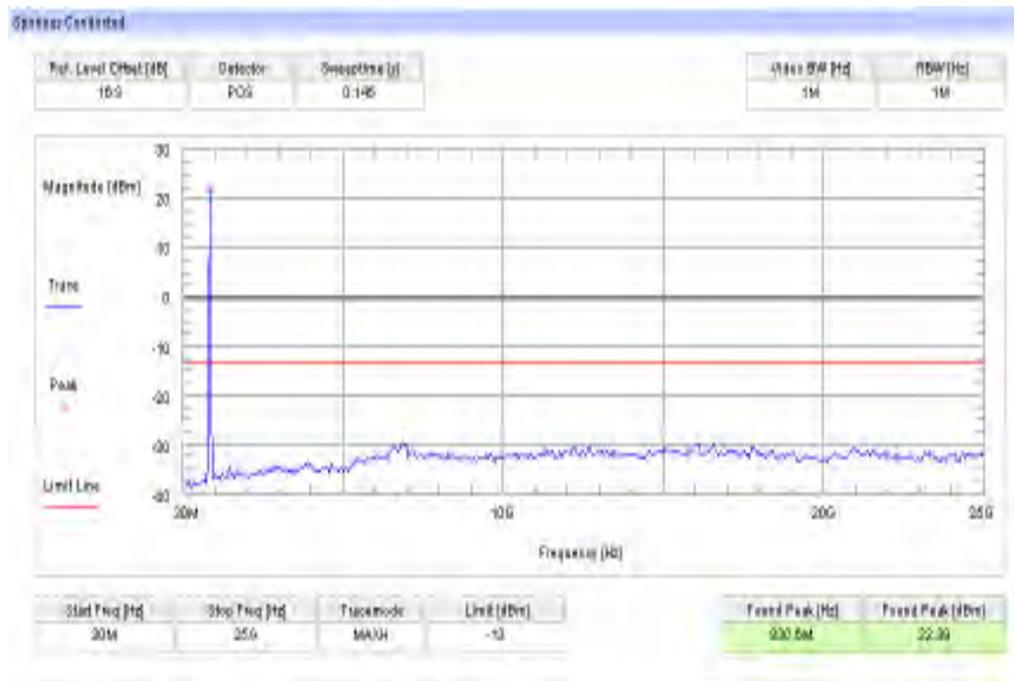
Channel 4132 (30 MHz – 25 GHz)



Channel 4180 (30 MHz – 25 GHz)



Channel 4233 (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 $43+10\text{Log}(P)$ 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.”

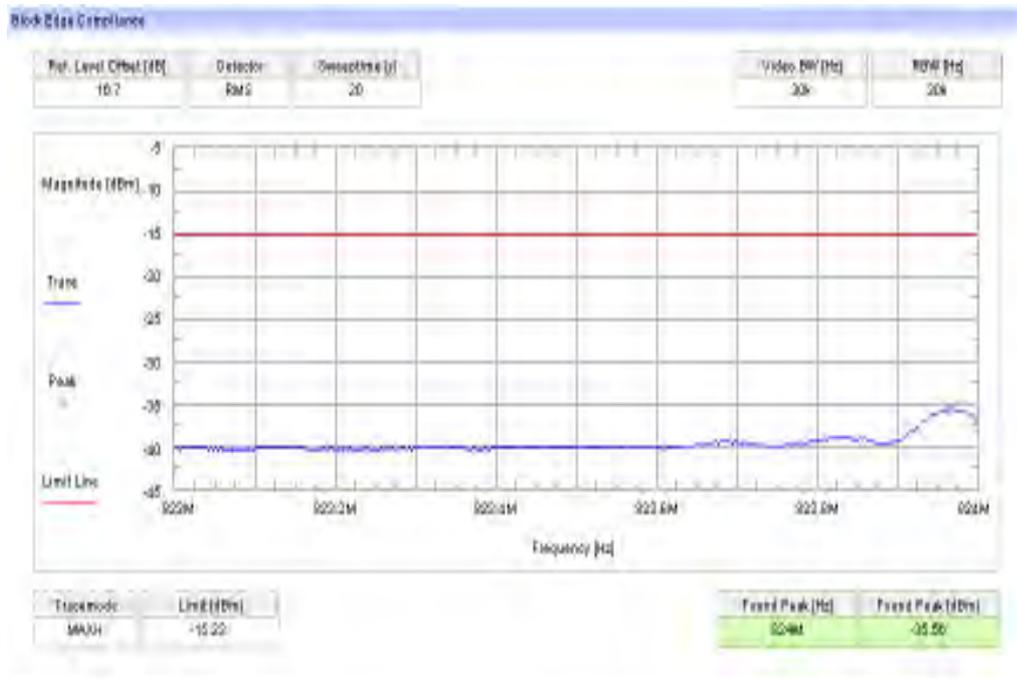
However, in publication number 890810, The FCC Office of Engineering and Technology specified the following correction to the limits when a resolution bandwidth smaller than 1% of the emission bandwidth is used:

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

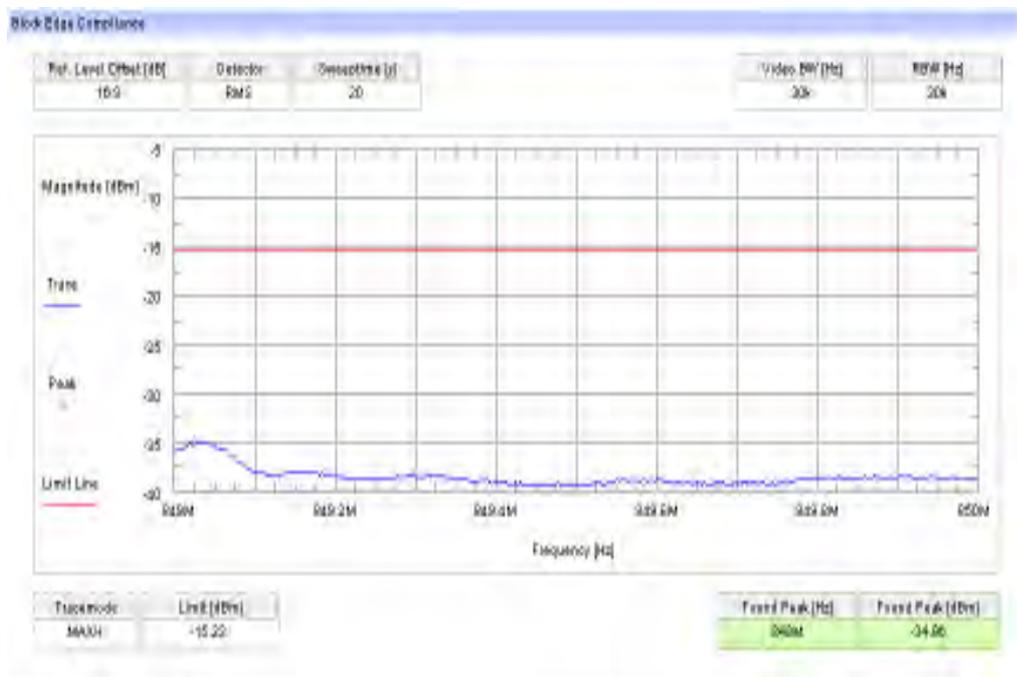
When using a 30 kHz bandwidth, this yields a -2.2185 adjustment to the limit

$[10\log(30\text{kHz}/50\text{kHz}) = -2.2185]$. When this adjustment is applied to the limit, the limit becomes -15.2288.

Channel 4132



Channel 4233



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.

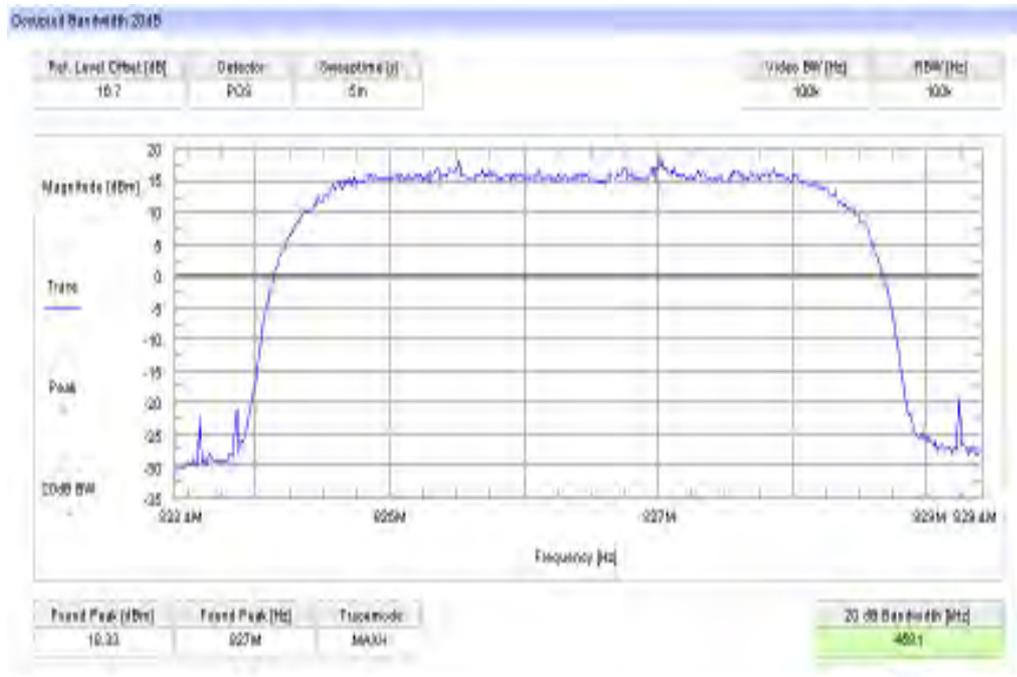
Normal mode

Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
826.4 MHz	4581	4689
836.0 MHz	4569	4665
846.6 MHz	4581	4677

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.

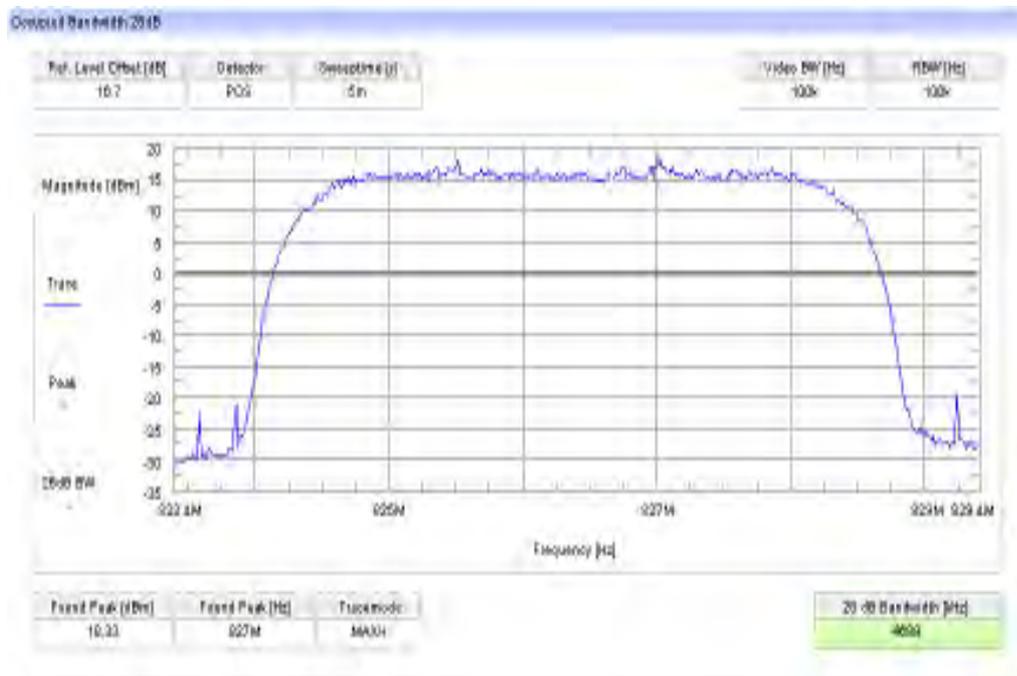
Channel 4132

99% (-20 dB) Occupied Bandwidth



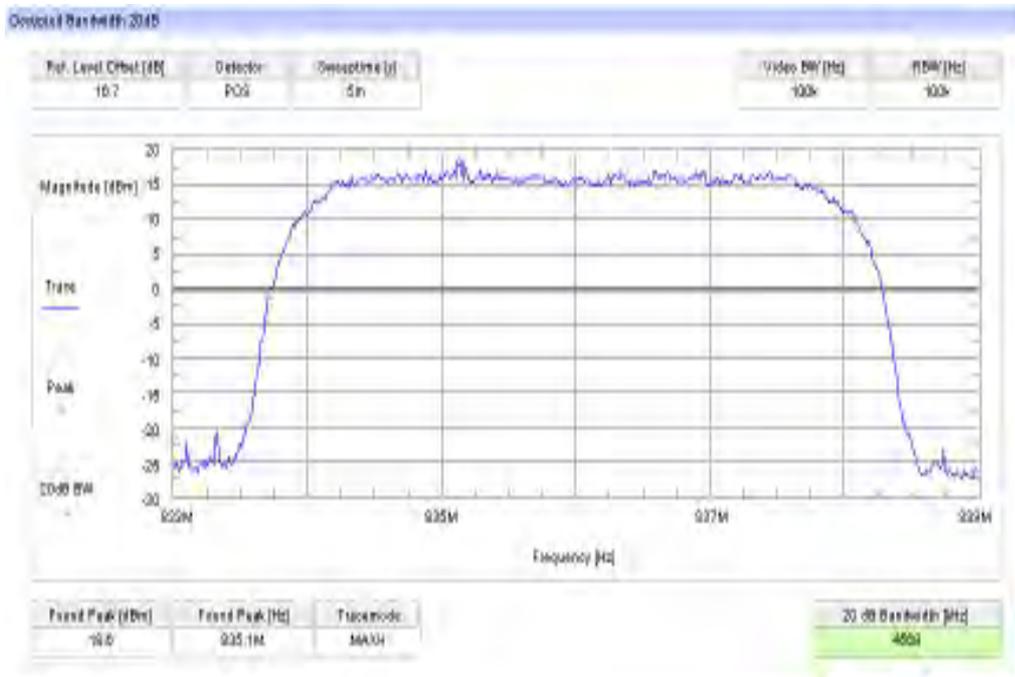
Channel 4132

-26 dBc Bandwidth



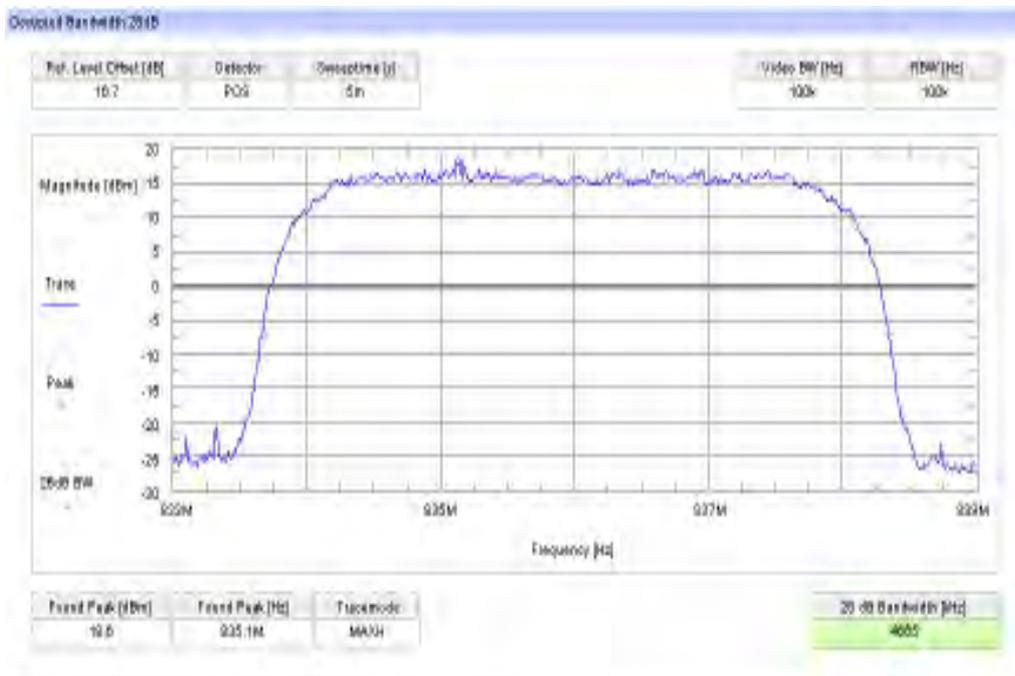
Channel 4180

99% (-20 dB) Occupied Bandwidth



Channel 4180

-26 dBc Bandwidth



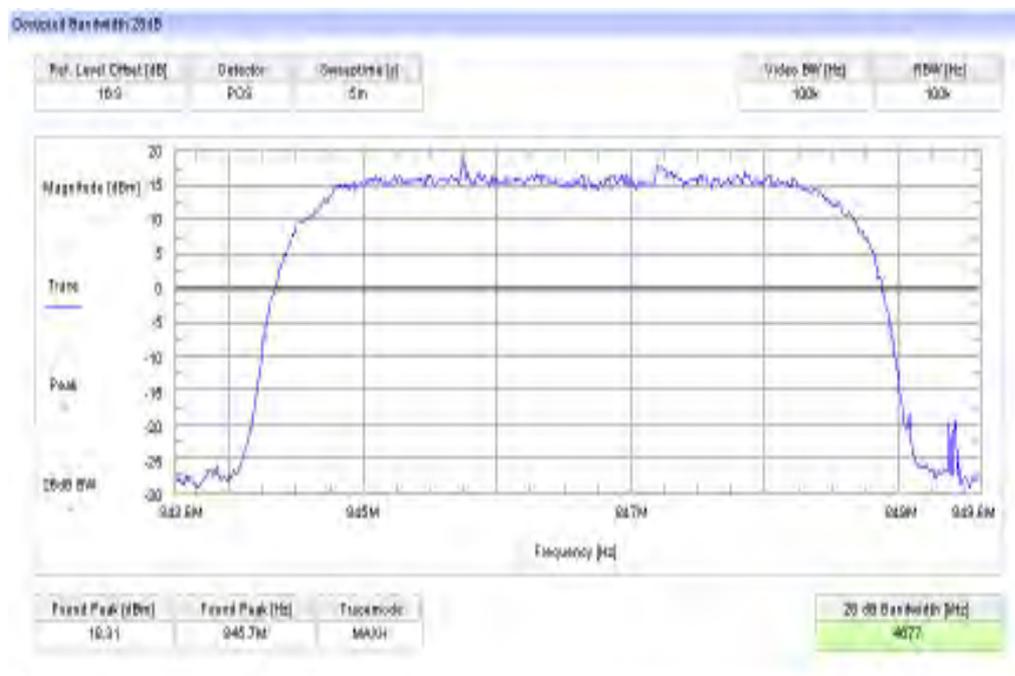
Channel 4233

99% (-20 dB) Occupied Bandwidth



Channel 4233

-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 (dB μ V/m)								
Idle mode			-/-			-/-		
f (MHz)	Detector	Level (dB μ V/m)	f (MHz)	Detector	Level (dB μ V/m)	f (MHz)	Detector	Level (dB μ V/m)
No critical peaks detected								
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 (dB μ V/m)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

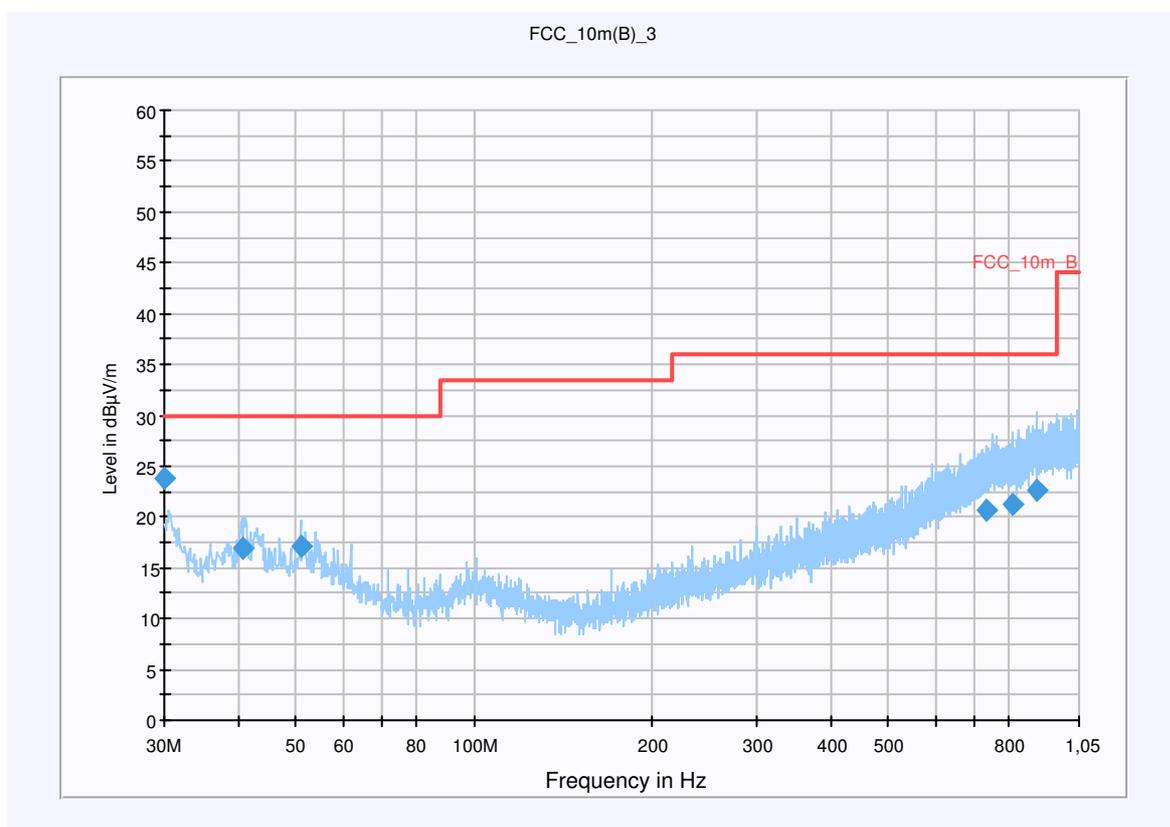
Plot 1: Idle-Mode (30 MHz - 1 GHz)

EUT: AAD-3880068-BV
 Serial Number: CB511G3K1K (IMEI:00440107-999180-4)
 Test Description: FCC part 15 B class B @ 10 m
 Operating Conditions: idle + charging
 Operator Name: Hennemann
 Comment: AC: 115 V / 60 Hz

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Level Unit: dB μ V/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 (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
30.025808	23.8	15000.000	120.000	128.0	V	109.0	12.5	6.2	30.0	
40.650750	16.9	15000.000	120.000	105.0	V	34.0	13.4	13.1	30.0	
50.995050	17.2	15000.000	120.000	220.0	V	27.0	13.3	12.8	30.0	
733.238100	20.7	15000.000	120.000	149.0	H	4.0	23.2	15.3	36.0	
809.211900	21.2	15000.000	120.000	98.0	V	101.0	23.9	14.8	36.0	
892.900800	22.6	15000.000	120.000	213.0	V	242.0	25.1	13.4	36.0	

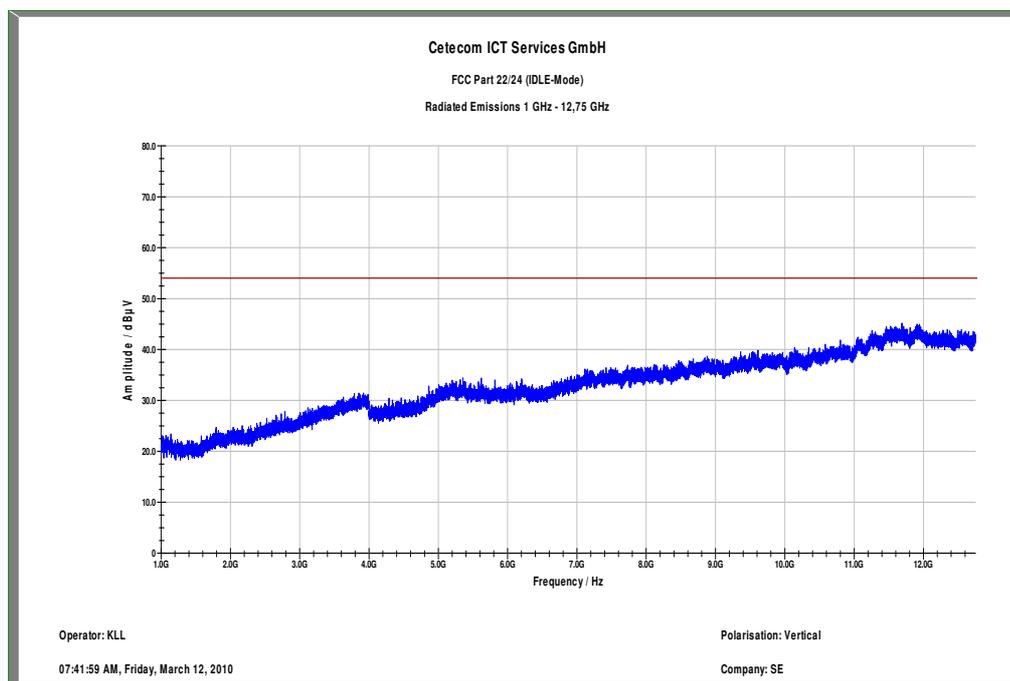
Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

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

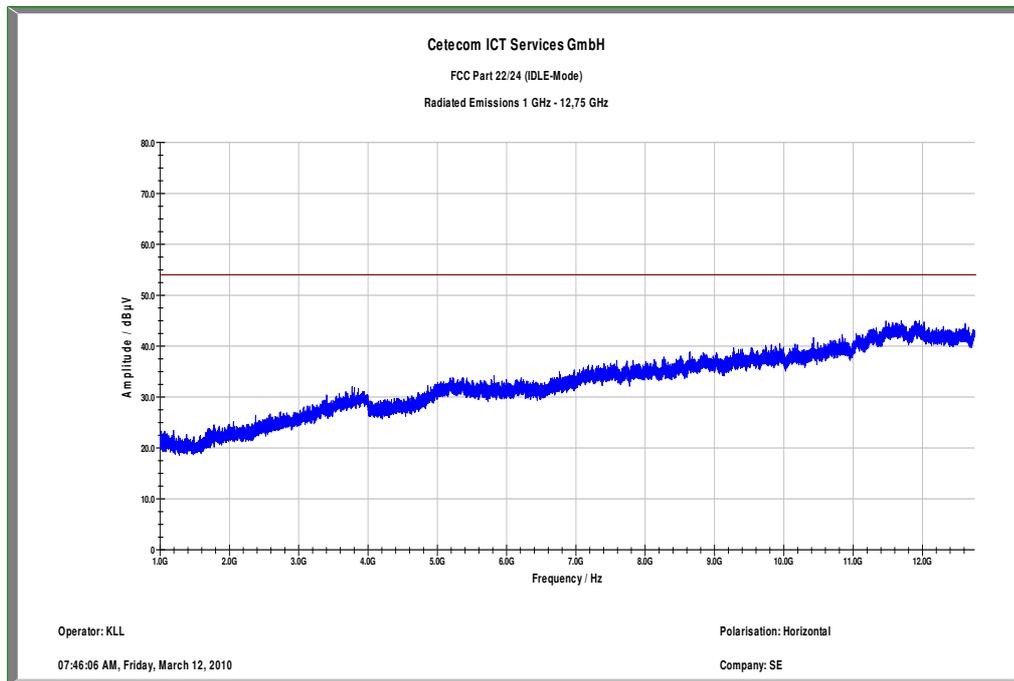
Plot 2: Idle-Mode (1 GHz - 13 GHz), antenna vertical



$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

$f \geq 1 \text{ GHz}$: RBW / VBW 1 MHz

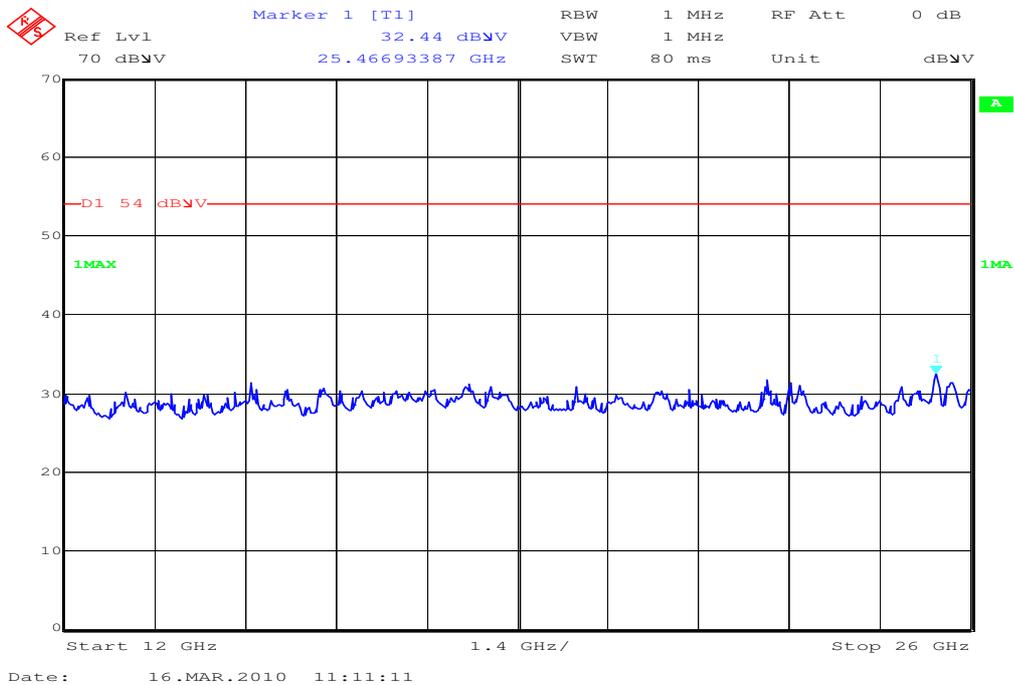
Plot 3: Idle-Mode (1 GHz – 13 GHz), antenna horizontal



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW / VBW } 1 \text{ MHz}$

Plot 4: Idle-Mode (12 GHz - 25 GHz), H/V max. hold



$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

$f \geq 1 \text{ GHz} : \text{RBW / VBW } 1 \text{ MHz}$

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.	Netzgerät	6032A	HP Meßtechnik	2818A 03450	300001040	Ve	08.01.2009	08.01.2012
2	n. a.	Horn Antenne 1-26.5GHz	3115	EMCO	8812-3088	300001032	vIKI!	05.03.2009	05.03.2011
3	n. a.	Active Loop Antenne	6502	EMCO	2210	300001015	ne		
4	n. a.	Absorberhalle		MWB	87400/02	300000996			
5	Spec.A. 2_2e	System-Rack	85900	HP I.V.	*	300000222	ne		
6	9	Netznachbildung Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/0 20	300001210	Ve	06.01.2010	06.01.2012
7	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15 013	300001156	ne		
8	n. a.	Relais Matrix	PSU	R&S	890167/0 24	300001168	ne		
9	n. a.	Trenntrafo	RT5A	Grundig	9242	300001263	ne		
10	n. a.	Leitungsteiler	11850C	HP Meßtechnik		300000997	ne		
11	n. a.	Switch / Control Unit	3488A	HP	2605e087 70	300001443	ne		
12	n. a.	Band Reject filter	WRCG1855/ 1910- 1835/1925- 40/8SS	Wainwright	7	300003350	ev		
13	n. a.	Band Reject filter	WRCG2400/ 2483- 2375/2505- 50/10SS	Wainwright	11	300003351	ev		
14	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
15	n. a.	Hochpassfilter	WHKX2.9/18 G-12SS	Wainwright	1	300003492	ev		
16	n. a.	Hochpassfilter	WHK1.1/15G -10SS	Wainwright	3	300003255	ev		
17	n. a.	Hochpassfilter	WHKX7.0/18 G-8SS	Wainwright	18	300003789	ne		
18	n. a.	PSA-Spektrumanalysator 3 Hz - 26,5 GHz	E4440A	Agilent Vertr. Bad Hom	MY4825 0080	300003812	k	05.08.2008	05.08.2010
19	n. a.	Microwave Analog Signal Generator	N5183A	Agilent Vertr. Bad Hom	MY4742 0220	300003813	k	06.08.2008	06.08.2010
20	n. a.	EMI Preselector 9kHz - 1 GHz	N9039A	Agilent Vertr. Bad Hom	MY4826 0003	300003825	vIKI!	19.08.2008	19.08.2010
21	n. a.	TRIOLOG Super Breitband Antenne	VULB9163	Schwarzbeck	371	300003854	vIKI!	17.12.2008	17.12.2010

22	n. a.	Signal Analyzer 20Hz-26.5GHz- 150 to + 30 DBM	FSIQ26	R&S	835540/0 18	300002681- 0005	k	07.01.2010	07.01.2012
23	n. a.	Universal Communication Tester	CMU 200	R&S	832221/0 55	300002862	k	20.03.2008	20.03.2011
24	n. a.	Universal Communication Tester	CMU 200	R&S	103992	300003231	vIKI!	04.06.2008	04.06.2010
25	19	Horn Antenne 1-26.5GHz	3115	EMCO	9107- 3697	300001605	Ve	30.06.2008	30.06.2010
26	n. a.	Klimaschrank	VT 4002	Heraeus Voetsch	521/8419 3	300003889	vIKI!	28.05.2009	28.05.2011
27	45	Switch-Unit	3488A	HP Meßtechnik	2719A14 505	300000368	g		
28	50	Netzgerät	6032A	HP Meßtechnik	2920A04 466	300000580	k	06.01.2009	06.01.2011
29	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081; B5979	300000210	k	03.09.2001	03.09.2003
30	n. a.	EMI- Messempfänger	ESCI 1166.5950.03	R&S	100083	300003312	k	08.01.2010	08.01.2012
31	n. a.	Analysator- Referenz- System (Harmonics u. Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	06.06.2007	06.06.2009
32	n. a.	Amplifier	JS42- 00502650-28- 5A	MITEQ	1084532	300003379	ev		
33	n. a.	Antennenmast	Model 2175	ETS- LINDGREN	64762	300003745	izw		
34	n. a.	Steuergerät	Model 2090	ETS- LINDGREN	64672	300003746	izw		
35	n. a.	Interface-Box für Drehtisch	Model 105637	ETS- LINDGREN	44583	300003747	izw		
36	n. a.	Breitbandanten- ne	VULB9163	Schwarzbeck	295	300003787	k	01.04.2008	01.04.2010
37	n. a.	Spectrum- Analyzer	FSU26	R&S	200809	300003874	k	08.01.2010	08.01.2012