



Accredited testing-laboratory

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

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

Recognized by the Federal Communications Commission

Anechoic chamber registration no.: 90462 (FCC)

Anechoic chamber registration no.: 3463A-1 (IC)

Certification ID: DE 0001

Accreditation ID: DE 0002

Accredited Bluetooth® Test Facility (BQTF)

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Test report no. : 1-0345-06-03/08

Type identification : GI0401

Applicant : Option N.V.

FCC ID : NCMOGI0401

IC Certification No : --

Test standards : 47 CFR Part 22

47 CFR Part 24

RSS - 132 Issue 2

RSS - 133 Issue 4

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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

Test laboratory manager:

2008-05-10	René Oelmann	
Date	Name	Signature

Technical responsibility for area of testing:

2008-05-10	Michael Berg	
Date	Name	Signature

1.2 Testing laboratory

CETECOM ICT Services GmbH

Untertürkheimer Straße 6 - 10

66117 Saarbrücken

Germany

Phone: + 49 681 5 98 - 0

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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: DAT-P-176/94-D1

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

Testing location, if different from CETECOM ICT Services GmbH:

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

1.3 Details of applicant

Name:	Option N.V.
Street:	Gaston Geenslaan 14
Town:	3001 Leuven
Country:	Belgium
Telephone:	+32-16-317-411
Fax:	+32-16-207-164
Contact:	Joeri Boeckx
E-mail:	J.Boeckx@option.com
Telephone:	-32-16-311-692

1.4 Application details

Date of receipt of order:	2008-04-30
Date of receipt of test item:	2008-05-05
Date of start test:	2008-05-05
Date of end test:	2008-05-10
Persons(s) who have been present during the test:	Joris Nys; Eric Ngouana

2 Test standard/s:

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

3 Technical tests

3.1 Details of manufacturer

Name:	Option N.V.
Street:	Gaston Geenslaan 14
Town:	3001 Leuven
Country:	Belgium

3.1.1 Test item

Kind of test item	:	USB stick
Type identification	:	GI0401
Serial Number	:	Cond.: RE2483W07V Rad.: RE2483W08A
Frequency	:	1850.2 – 1909.8 MHz and 824.2 – 848.8 MHz
Type of modulation	:	GMSK / 8PSK / QPSK
Number of channels	:	300 (PCS1900) / 125 (GSM850) / 278 (FDD II)
Antenna Type	:	internal antenna
Power supply (normal)	:	5V DC by USB
Output power GSM 850 / GMSK	:	cond.: 31.6 dBm Peak // 31.4 dBm AV ERP: 31.1dBm (Burst)
Output power GSM 1900 / GMSK	:	cond : 29.4 dBm Peak // 29.2 dBm AV EIRP: 25.5dBm (Burst)
Output power GSM 850 / 8-PSK	:	cond.: 29.1 dBm Peak // 25.9 dBm AV ERP: 28.8 dBm (Burst)
Output power GSM 1900 / 8-PSK	:	cond : 28.3 dBm Peak // 25.9 dBm AV EIRP: 25.1dBm (Burst)
Output power UMTS 1900 / WCDMA	:	cond : 25.97 dBm Peak // 22.80 dBm Max. RMS EIRP: 24.69 dBm (Burst)
Output power UMTS 1900 / HSDPA	:	cond : 25.98 dBm Peak // 22.78 dBm Max. RMS EIRP: 24.62 dBm (Burst)
Output power UMTS 1900 / HSUPA	:	cond : 26.33 dBm Peak // 22.86 dBm Max. RMS EIRP: 25.11 dBm (Burst)
Transmitter Spurious (worst case)	:	-38.8 dBm
Receiver Spurious (worst case)	:	35.1 dBμV
FCC ID	:	NCMOGI0401
Certification No. IC	:	--
Open Area Test Site IC No.	:	
IC Standards	:	RSS132, Issue 2, RSS133, Issue 4

ATTESTATION:

DECLARATION OF COMPLIANCE:

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

Laboratory Manager:

2008-05-10

René Oelmann



Date

Name

Signature

3.2 Test Setup

Hardware	:	2.0
Software	:	1.2.0.0
Unit; (cond. measurements)	:	SN: RE2483W07V; IMEI: 004401440911044
Unit; (rad. measurements)	:	SN: RE2483W08A; IMEI: 004401440850887

The radiated measurements were performed with three different host laptops.

- 1st Laptop – IBM Type 2373 (SPQ-Testunit-29)
- 2nd Laptop – DELL PP01X (SPQ-Testunit-47)
- 3rd Laptop – Fujitsu/Siemens AmiloPro (SPQ-Testunit-193)

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
3.1.1	RF Power Output	pass
3.1.2	Frequency Stability	pass
3.1.3	Radiated Emissions	pass
3.1.4	Receiver Radiated Emissions	pass
3.1.5	Conducted Spurious Emissions	pass
3.1.6	Block Edge Compliance	pass
3.1.7	Occupied Bandwidth	pass

4.1.2 GSM 850

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

4.1.3 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	Receiver Radiated Emissions	pass
5.3.5	Conducted Spurious Emissions	pass
5.3.6	Block Edge Compliance	pass
5.3.7	Occupied Bandwidth	pass

5 Measurements and results

For Part 24/22 we use the substitution method (TIA/EIA 603).

All measurements in this report are done in GSM mode. The device is able to transmit data in GPRS mode also.

But because the current measurements are performed in PEAK mode no other results from GPRS mode are possible.

The only different is the modulation average power, which is 3 dB higher (by using 2 timeslots in the Up-link).

All relevant tests have been repeated in 8-PSK Modulation if EDGE Mode is supported.

5.1 PART PCS 1900

5.1.1 RF Power Output

Reference

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

Summary:

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

Method of Measurements:

The mobile was set up for the max. output power with pseudo random data modulation.

The power was measured with R&S Signal Analyzer FSIQ 26 (peak and average)

These measurements were done at 3 frequencies, 1850.2 MHz, 1880.0 MHz and 1909.8 MHz (bottom, middle and top of operational frequency range).

Limits:

Nominal Peak Output Power (dBm)
+33

Test Results: Output Power (conducted) GMSK Mode

Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (dBm)
1850.2	29.1	28.9
1880.0	29.4	29.2
1909.8	29.0	28.8
Measurement uncertainty	±0.5 dB	

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

Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (dBm)
1850.2	28.2	25.9
1880.0	28.3	25.9
1909.8	27.8	25.7
Measurement uncertainty	±0.5 dB	

EIRP Measurements

Description:

This is the test for the maximum radiated power from the phone.

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

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

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

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

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

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

(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor

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

(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:

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

$$\text{EIRP} = P + G1 = P3 + L2 - L1 + A + G1$$

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

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

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

1st Laptop – IBM Type 2373 (SPQ-Testunit-29)

Test Results: Output Power (radiated) GMSK Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	24.5
1880.0	24.6
1909.8	25.4
Measurement uncertainty	±0.5 dB

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

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	23.9
1880.0	24.2
1909.8	25.0
Measurement uncertainty	±0.5 dB

2nd Laptop – DELL PP01X (SPQ-Testunit-47)

Test Results: Output Power (radiated) GMSK Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	24.3
1880.0	24.5
1909.8	25.1
Measurement uncertainty	±0.5 dB

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

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	23.9
1880.0	24.0
1909.8	24.8
Measurement uncertainty	±0.5 dB

3rd Laptop – Fujitsu/Siemens AmiloPro (SPQ-Testunit-193)

Test Results: Output Power (radiated) GMSK Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	24.6
1880.0	24.6
1909.8	25.5
Measurement uncertainty	±0.5 dB

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

Frequency (MHz)	Burst Peak EIRP (dBm)
1850.2	24.2
1880.0	24.4
1909.8	25.1
Measurement uncertainty	±0.5 dB

Sample Calculation:

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

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

5.1.2 Frequency Stability

Reference

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

Method of Measurement:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a “call mode”. This is accomplished with the use of a R&S CMU 200 DIGITAL RADIOCOMMUNICATION TESTER..

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

Measurement Limit:

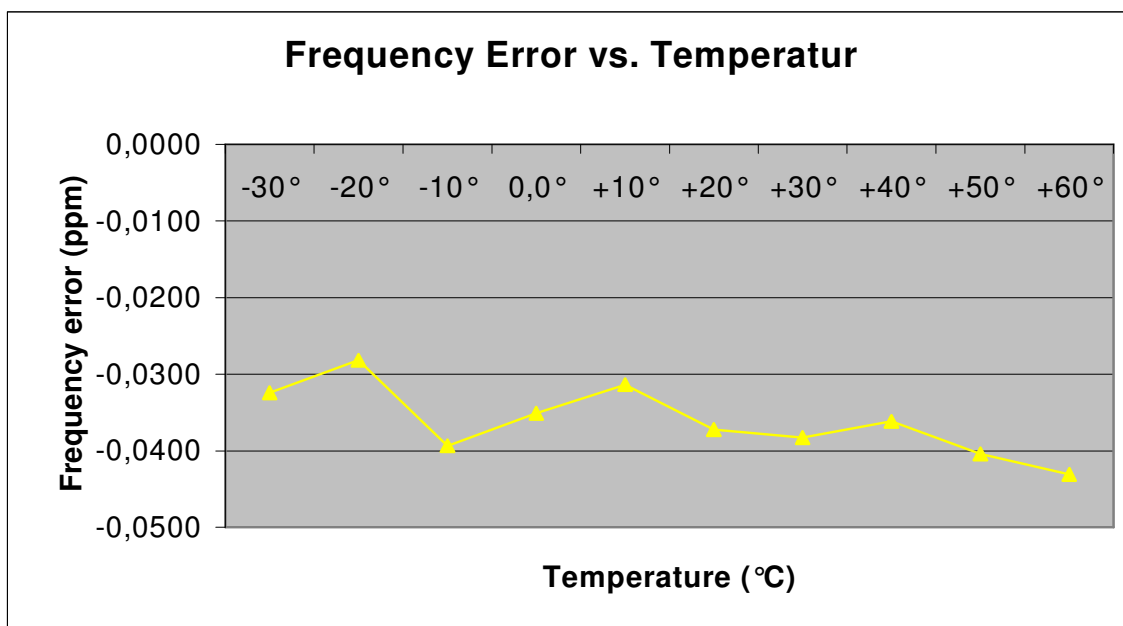
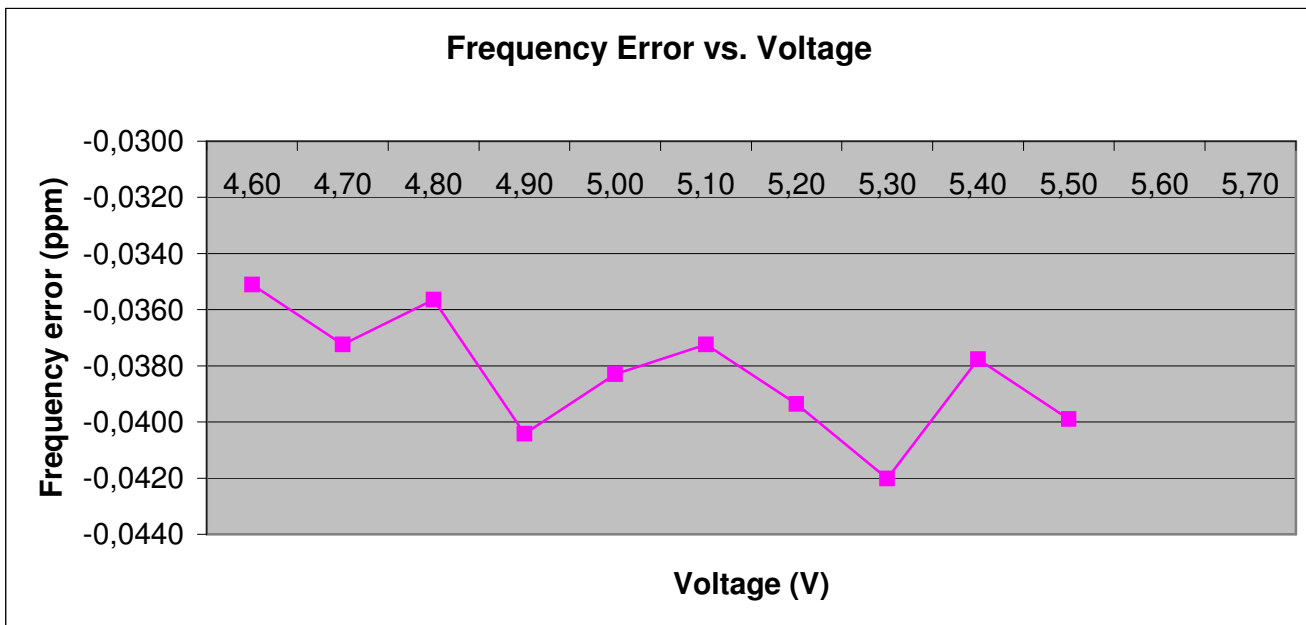
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission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

Test Results: AFC FREQ ERROR vs. VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
4.5	-69	-0.0000367	-0.0367
4.6	-66	-0.0000351	-0.0351
4.7	-70	-0.0000372	-0.0372
4.8	-67	-0.0000356	-0.0356
4.9	-76	-0.0000404	-0.0404
5.0	-72	-0.0000383	-0.0383
5.1	-70	-0.0000372	-0.0372
5.2	-74	-0.0000394	-0.0394
5.3	-79	-0.0000420	-0.0420
5.4	-71	-0.0000378	-0.0378
5.5	-75	-0.0000399	-0.0399

Test Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-61	-0.0000324	-0.0324
-20	-53	-0.0000282	-0.0282
-10	-74	-0.0000394	-0.0394
±0.0	-66	-0.0000351	-0.0351
+10	-59	-0.0000314	-0.0314
+20	-70	-0.0000372	-0.0372
+30	-72	-0.0000383	-0.0383
+40	-68	-0.0000362	-0.0362
+50	-76	-0.0000404	-0.0404
+60	-81	-0.0000431	-0.0431



5.1.3 Radiated Emissions

Reference

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

Measurement Procedure:

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

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

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load.
- c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 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 with 1st Laptop – IBM Type 2373 (SPQ-Testunit-29)

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

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

All measurements were done in horizontal and vertical polarization; the plots show the worst case. As can be seen from this data, the emissions from the test item were within the specification limit.

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

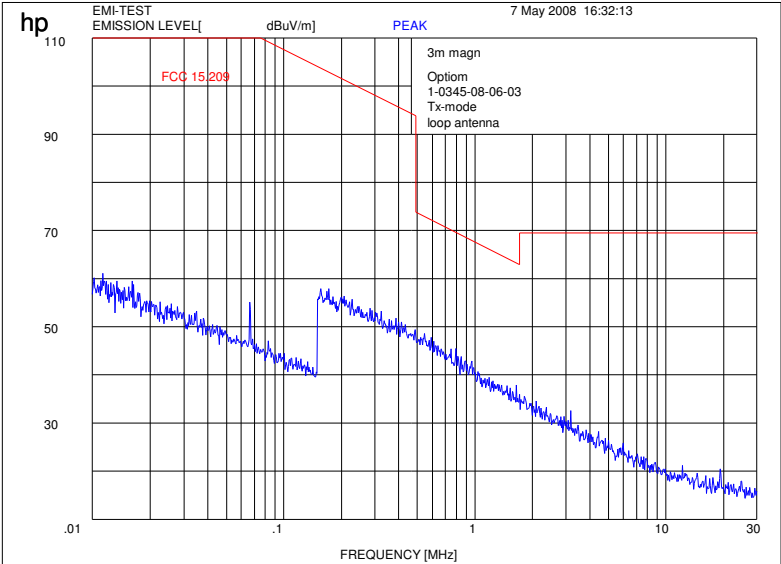
No peaks found < 20 dB below limit.

Sample calculation:

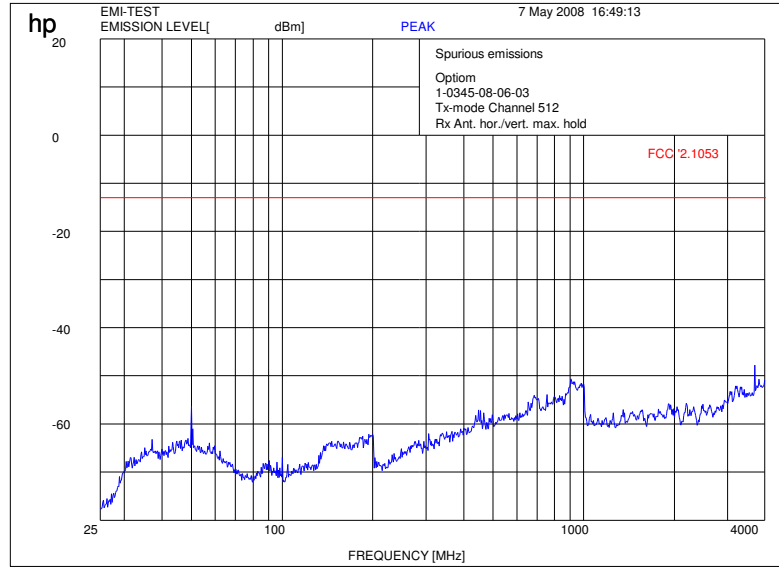
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBμV	dBm	dB <i>i</i>	dB <i>d</i>	dB	dBm			
1909.8	132.3	24.6	8.4	0.0	3.3	29.7			

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

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



Channel 512 (30 MHz - 4 GHz)

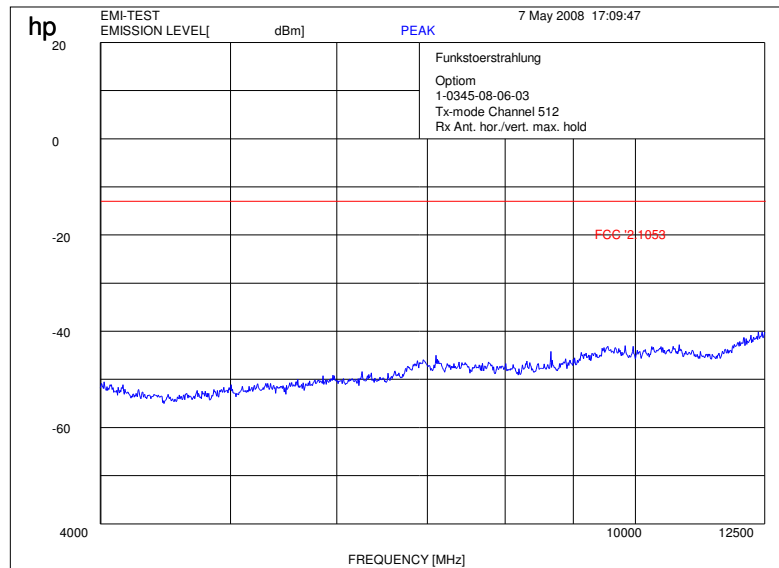


$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

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

Carrier suppressed with a rejection filter

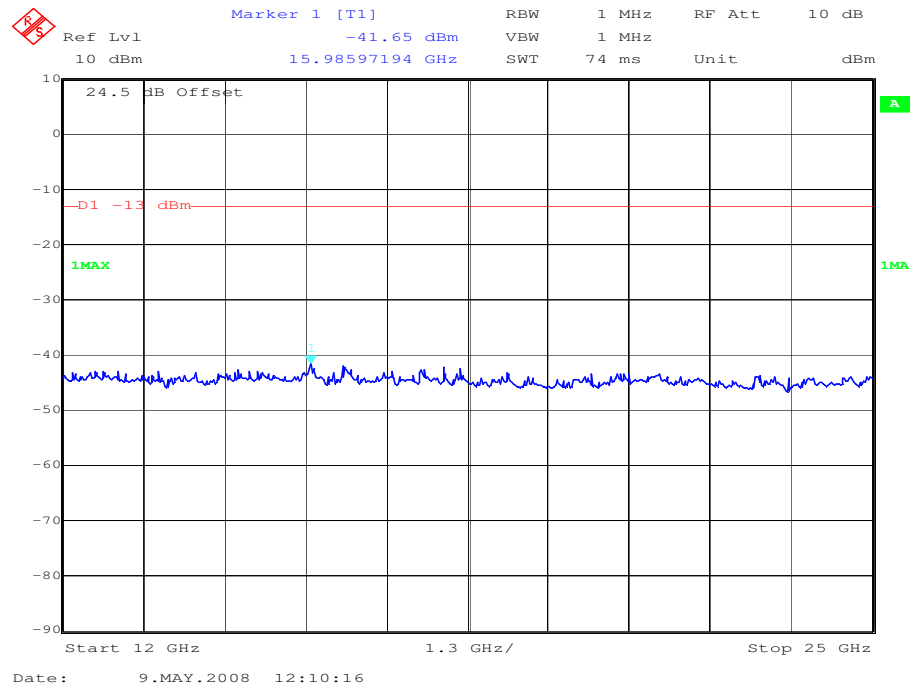
Channel 512 (4 GHz – 12.5 GHz)



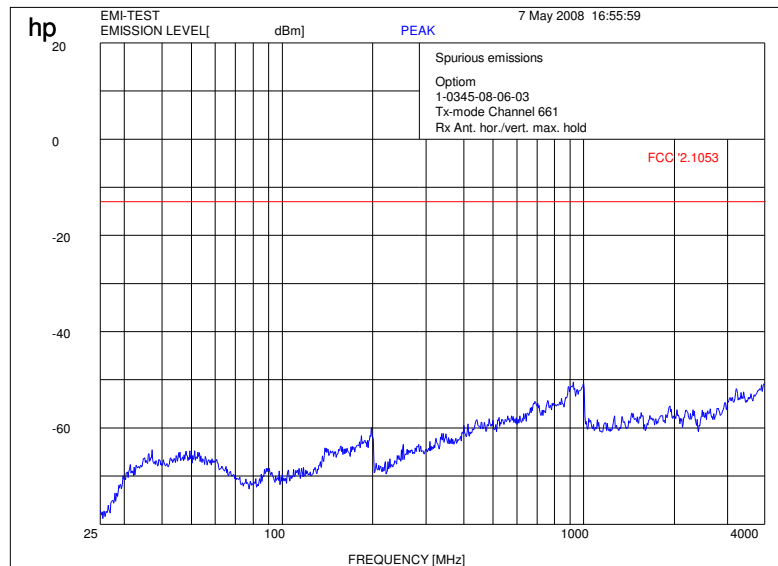
$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

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

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



Channel 661 (30 MHz - 4 GHz)

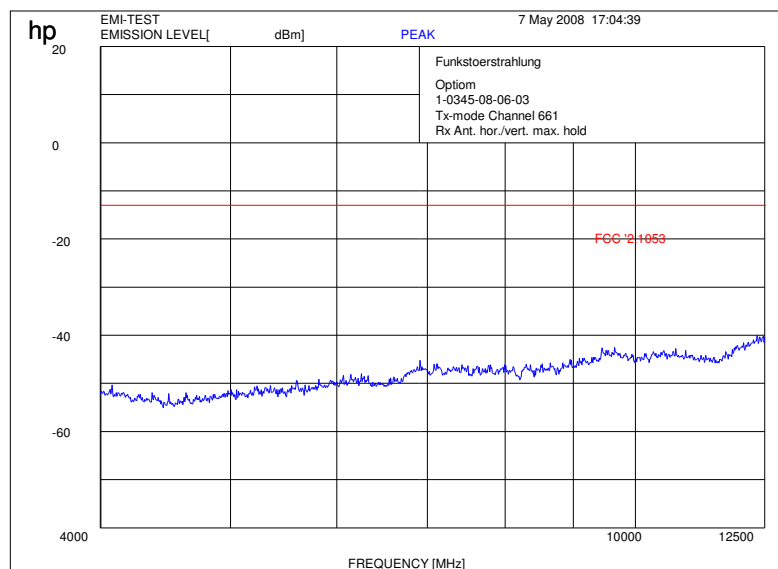


$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

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

Carrier suppressed with a rejection filter

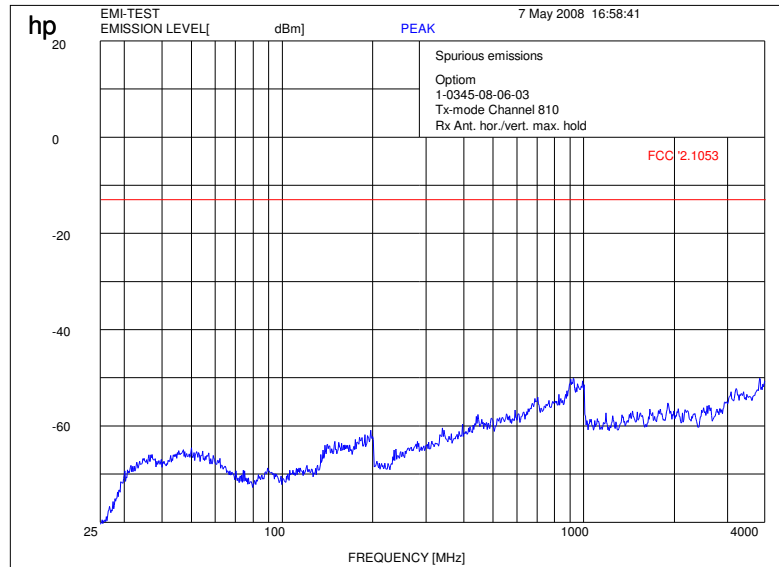
Channel 661 (4 GHz – 12.5 GHz)



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

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

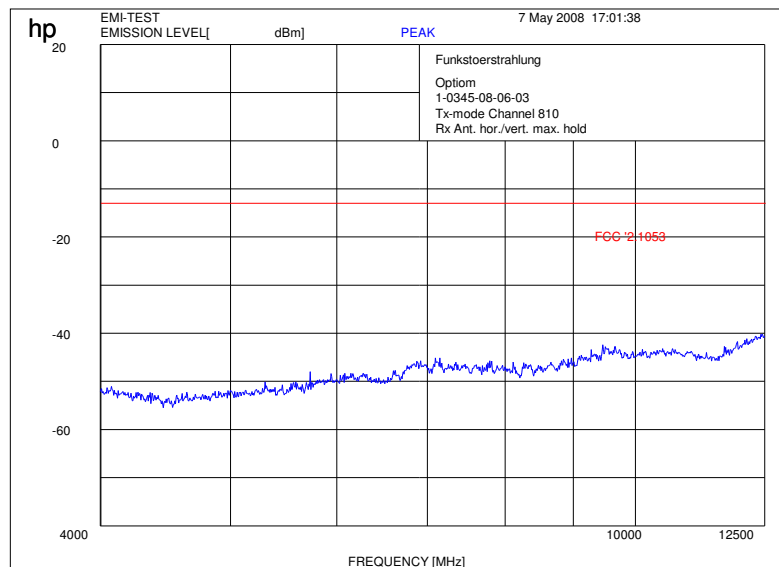
Channel 810 (30 MHz - 4 GHz)



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

f ≥ 1GHz : RBW / VBW 1 MHz

Channel 810 (4 GHz – 12.5 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

Measurement Results: Radiated Emissions with 2nd Laptop – DELL PP01X (SPQ-Testunit-47)

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

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

All measurements were done in horizontal and vertical polarization; the plots show the worst case. As can be seen from this data, the emissions from the test item were within the specification limit.

Harmonic	Tx ch.-512 Freq. (MHz)	Level (dBm)	Tx ch.-661 Freq. (MHz)	Level (dBm)	Tx ch.-810 Freq. (MHz)	Level (dBm)
2	3700.4	-	3760	-	3819.6	-38.8
3	5550.6	-	5640	-39.4	5729.4	-39.6
4	7400.8	-	7520	-	7639.2	-
5	9251.0	-	9400	-	9549.0	-
6	11101.2	-	11280	-	11458.8	-
7	12951.4	-	13160	-	13368.6	-
8	14801.6	-	15040	-	15278.4	-
9	16651.8	-	16920	-	17188.2	-
10	18502.0	-	18800	-	19098.0	-

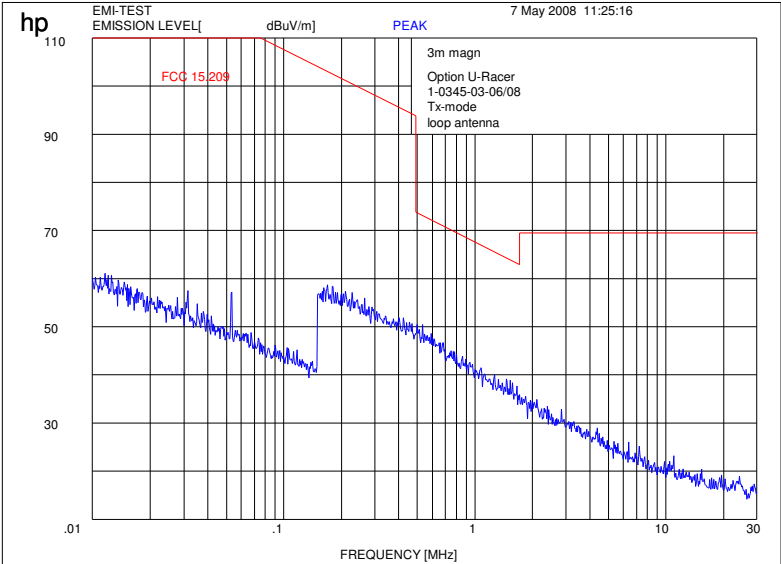
No peaks found < 20 dB below limit.

Sample calculation:

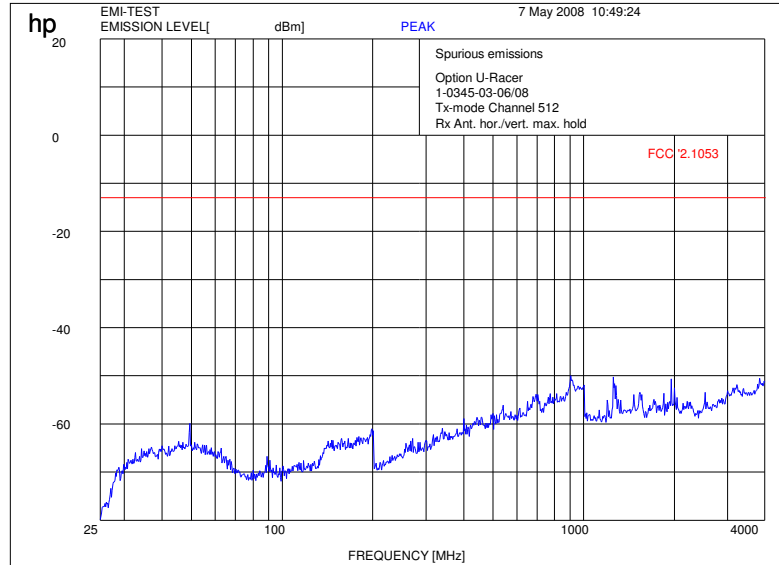
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBμV	dBm	dBi	dBd	dB	dBm			
1909.8	132.3	24.6	8.4	0.0	3.3	29.7			

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

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



Channel 512 (30 MHz - 4 GHz)

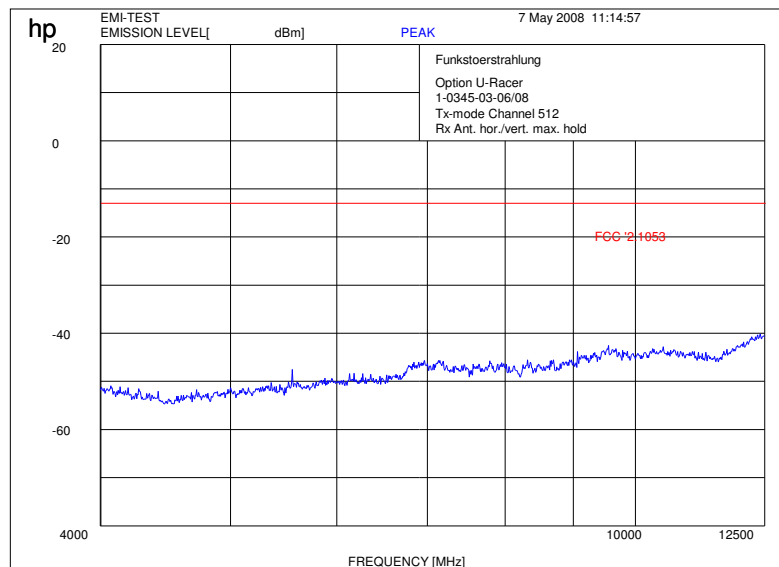


$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

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

Carrier suppressed with a rejection filter

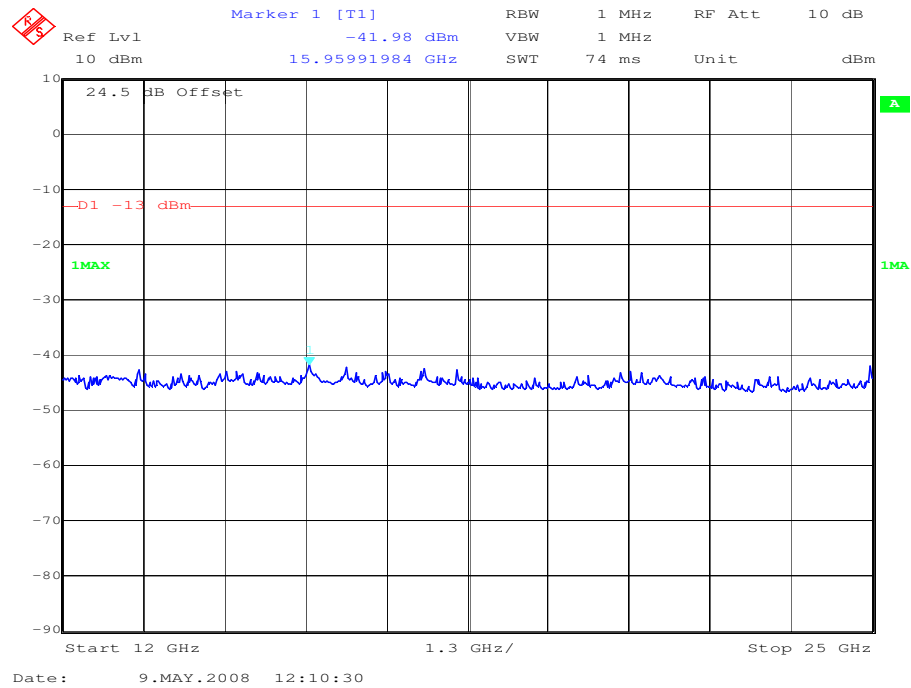
Channel 512 (4 GHz – 12.5 GHz)



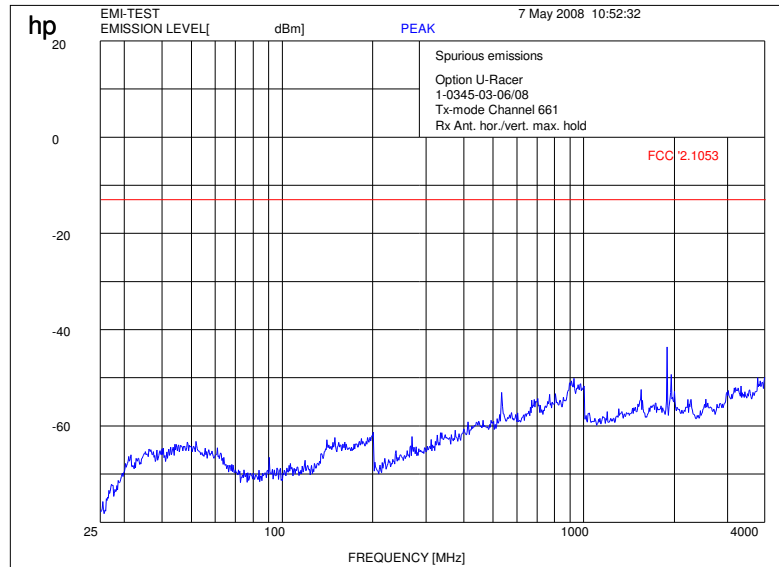
$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

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

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



Channel 661 (30 MHz - 4 GHz)

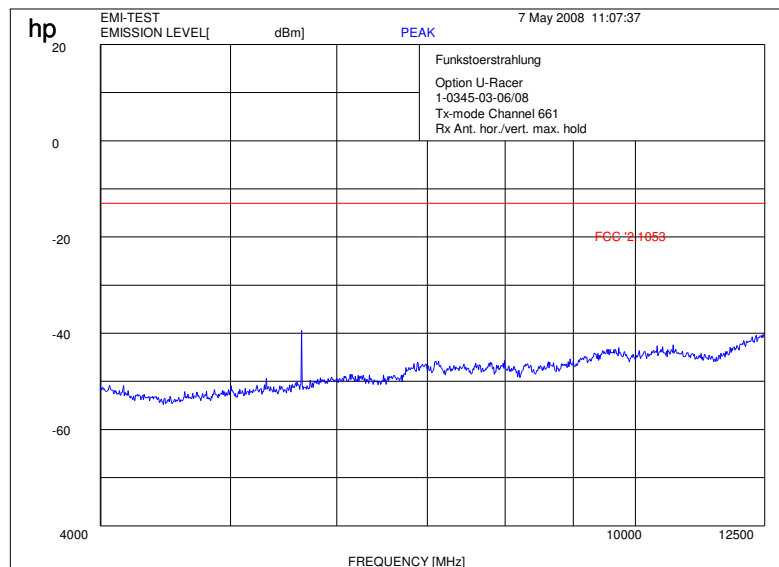


$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

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

Carrier suppressed with a rejection filter

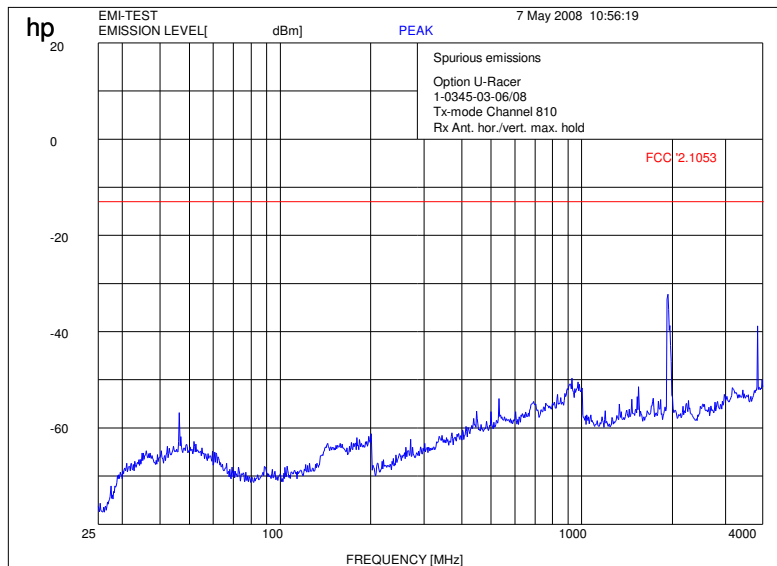
Channel 661 (4 GHz – 12.5 GHz)



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

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

Channel 810 (30 MHz - 4 GHz)

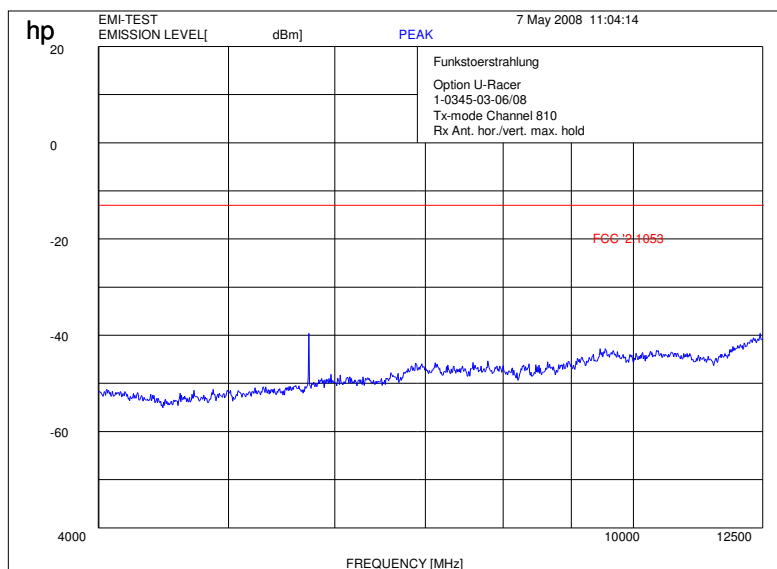


$f < 1 \text{ GHz}$: RBW/VBW: 100 kHz

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

Carrier suppressed with a rejection filter

Channel 810 (4 GHz – 12.5 GHz)



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

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

Measurement Results: Radiated Emissions with 3rd Laptop – Fujitsu/Siemens AmiloPro (SPQ-Testunit-193)

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

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

All measurements were done in horizontal and vertical polarization; the plots show the worst case. As can be seen from this data, the emissions from the test item were within the specification limit.

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

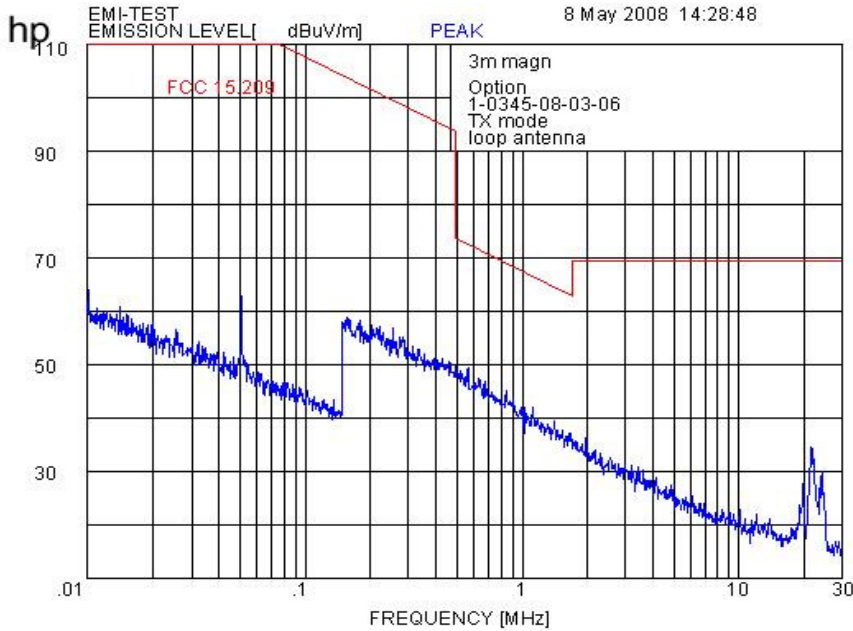
No peaks found < 20 dB below limit.

Sample calculation:

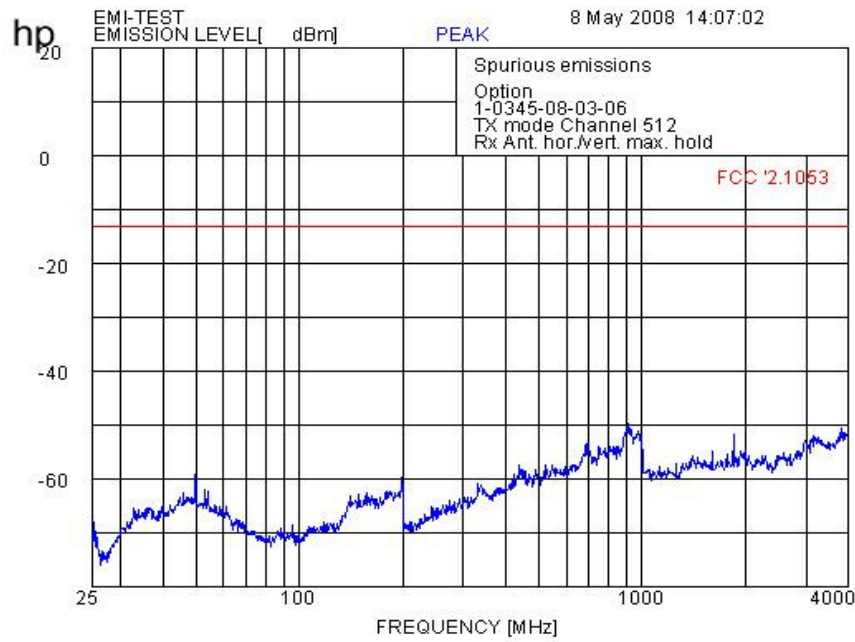
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBμV	dBm	dBi	dBd	dB	dBm			
1909.8	132.3	24.6	8.4	0.0	3.3	29.7			

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

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

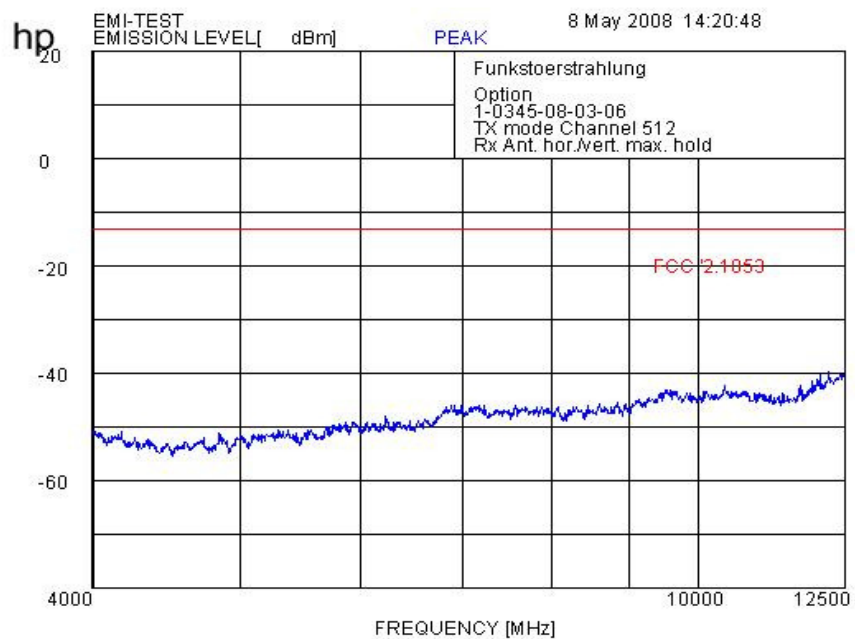


Channel 512 (30 MHz - 4 GHz)



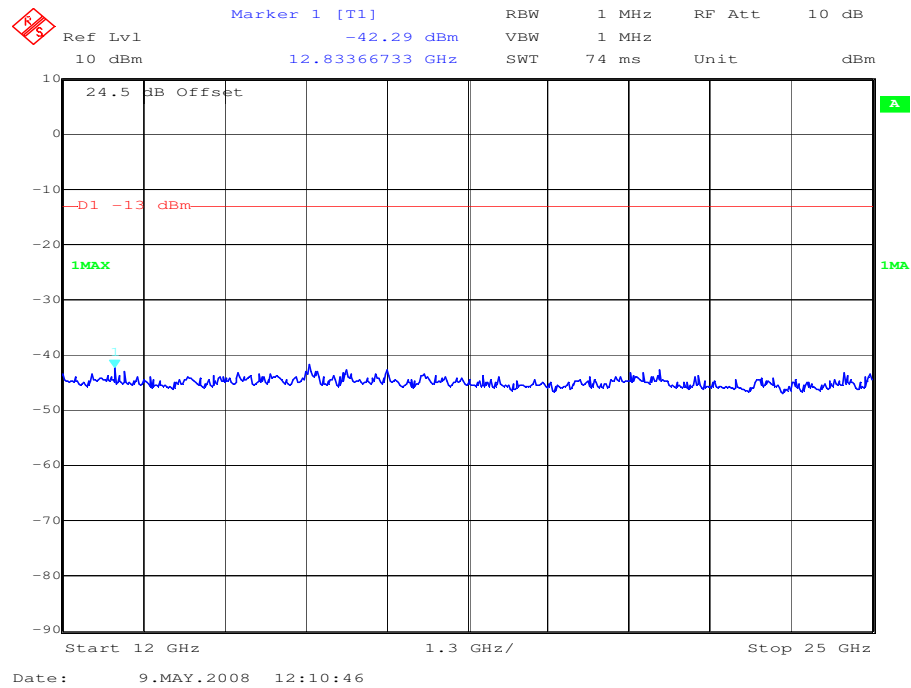
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
 Carrier suppressed with a rejection filter

Channel 512 (4 GHz – 12.5 GHz)

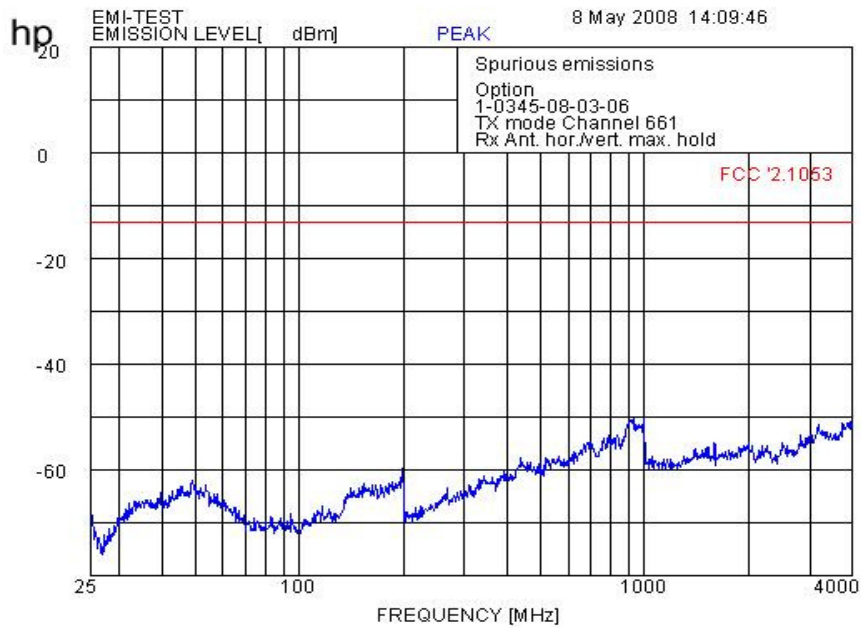


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

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

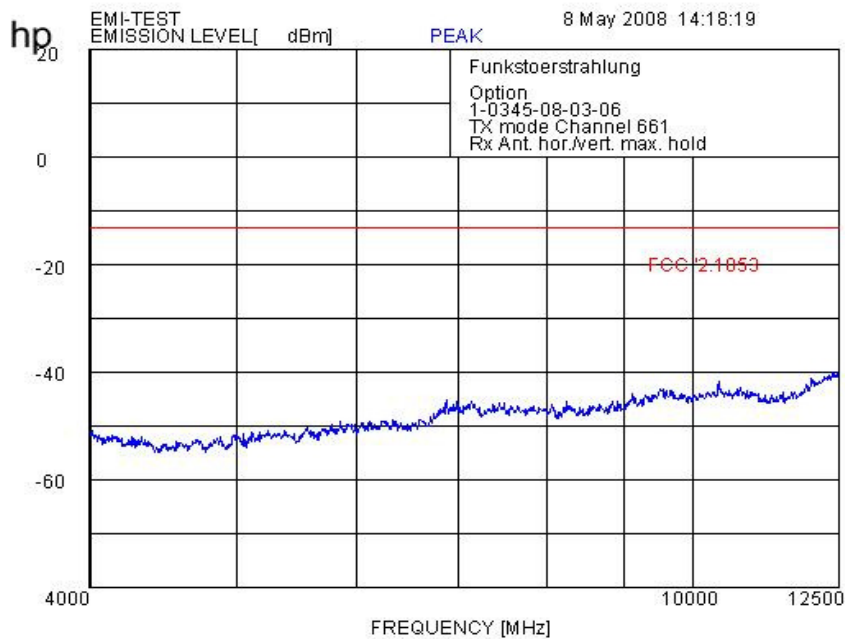


Channel 661 (30 MHz - 4 GHz)



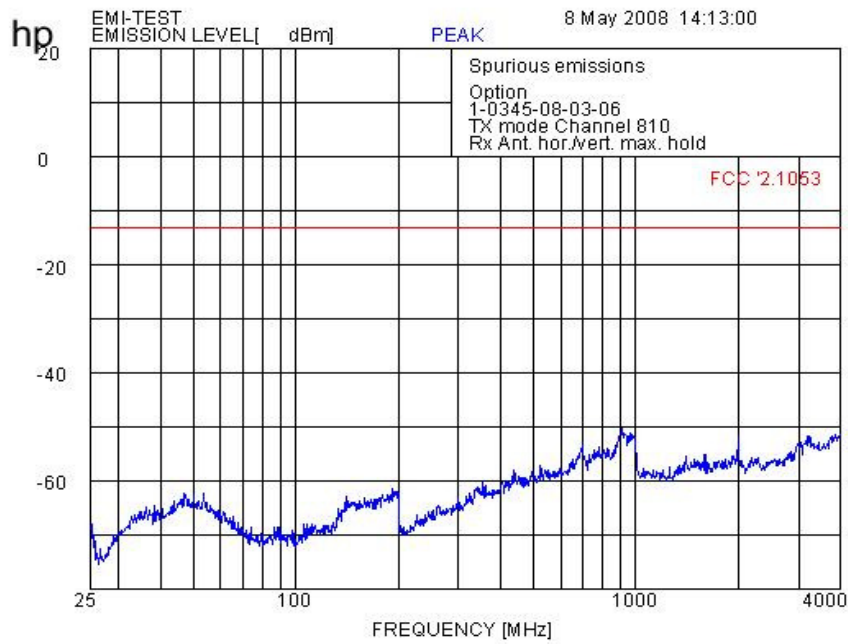
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
 Carrier suppressed with a rejection filter

Channel 661 (4 GHz – 12.5 GHz)



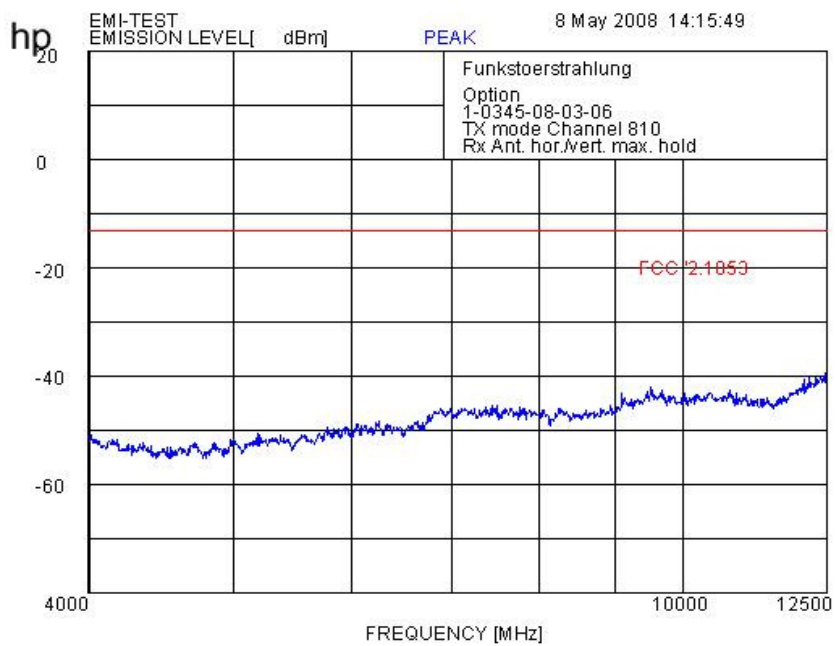
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 810 (30 MHz - 4 GHz)



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

Channel 810 (4 GHz – 12.5 GHz)



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

5.1.4 Receiver Radiated Emissions

Reference

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

Measurement Results: Radiated Emissions with 1st Laptop – IBM Type 2373 (SPQ-Testunit-29)

SPURIOUS EMISSIONS LEVEL (µV/m)								
Idle mode								
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
195.76	Quasipeak	28.3	-	-	-	-	-	-
200.46	Quasipeak	26.4	-	-	-	-	-	-
456.77	Quasipeak	32.1	-	-	-	-	-	-
497.00	Quasipeak	18.9	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

H = Horizontal ; V= Vertical

For measurement distance see table below

Limits: § 15.109

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

Idle Mode (30 MHz - 1 GHz)

Information

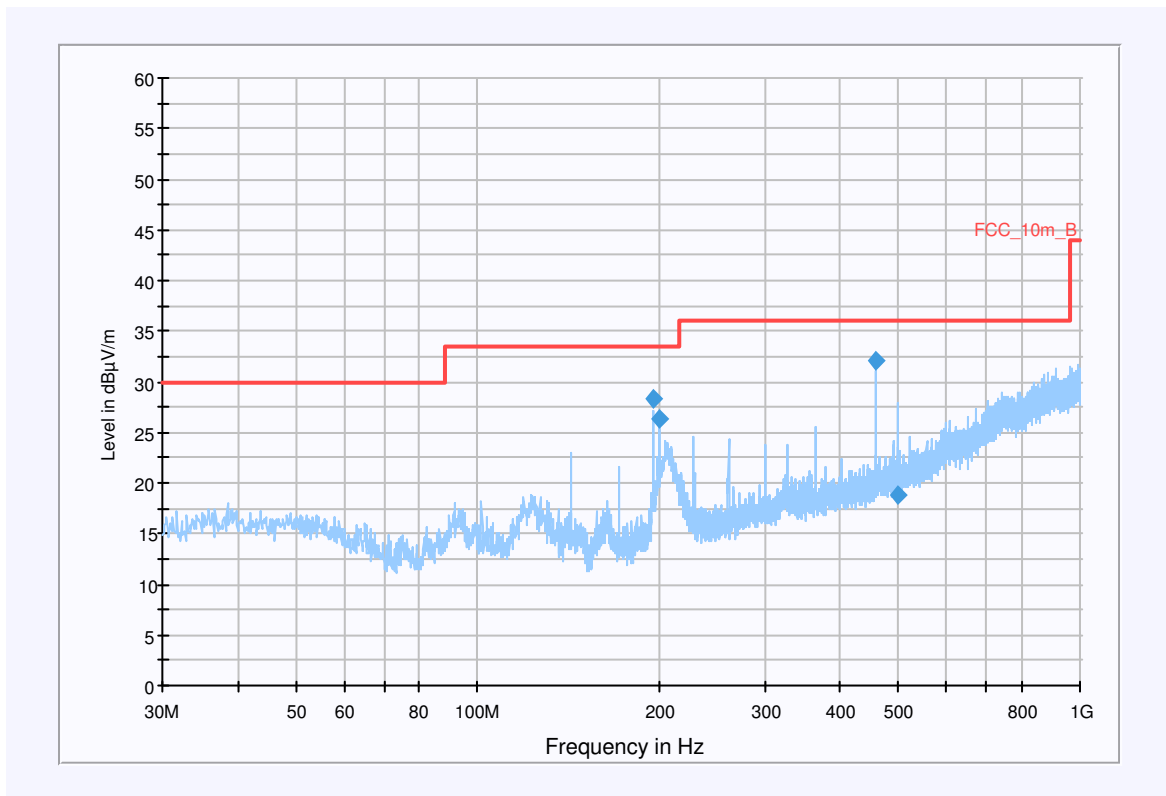
EUT: GI0401 + SPQ-TESTUNIT-29
 Serial Number: none
 Test Description: FCC class B @ 10 m
 Operating Conditions: IDLE 1900
 Operator Name: WAL
 Comment: EUT connect to notebook

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: EMI radiated\Electric Field (NOS)
 Level Unit: dB μ V/m

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

FCC_10m_FCCLIMIT(B)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
195.756700	28.3	15000.000	120.000	100.0	V	16.0	11.6	5.2	33.5	
200.459050	26.4	15000.000	120.000	100.0	V	0.0	11.9	7.1	33.5	
456.766850	32.1	15000.000	120.000	333.0	V	159.0	17.9	3.9	36.0	
496.997350	18.9	15000.000	120.000	163.0	H	15.0	18.7	17.2	36.0	

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

Subrange 1

Frequency Range: 30MHz - 2GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009

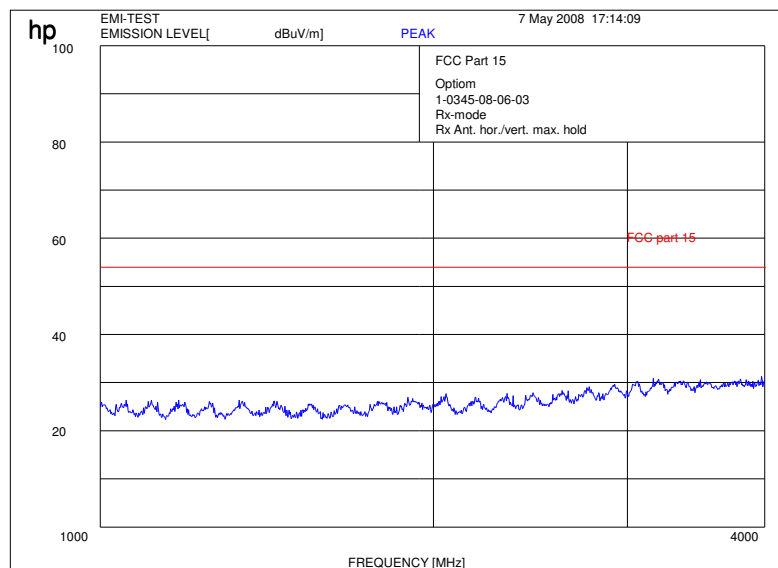
Signal Path: without Notch
FW 1.0

Antenna: VULB 9163
SN 9163-295, FW ---, CAL 08.04.2010
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table: Cabel with switch (0408)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9)

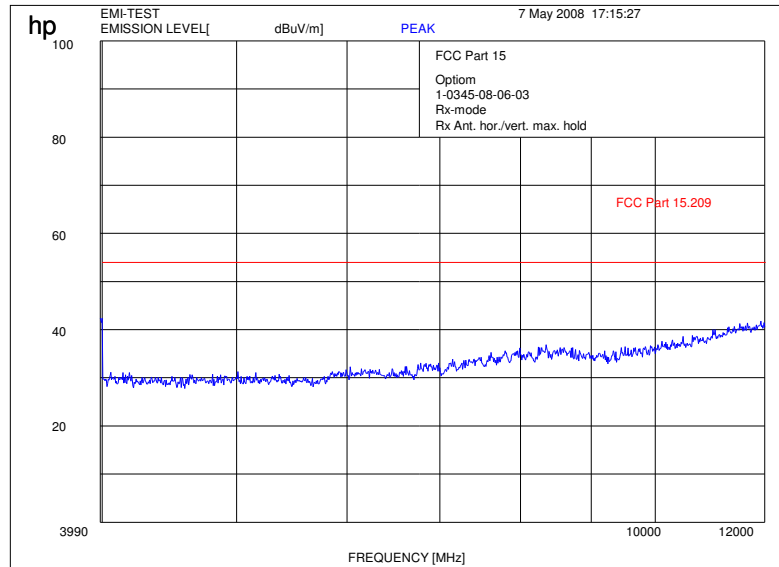
Idle Mode (1 MHz - 4 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

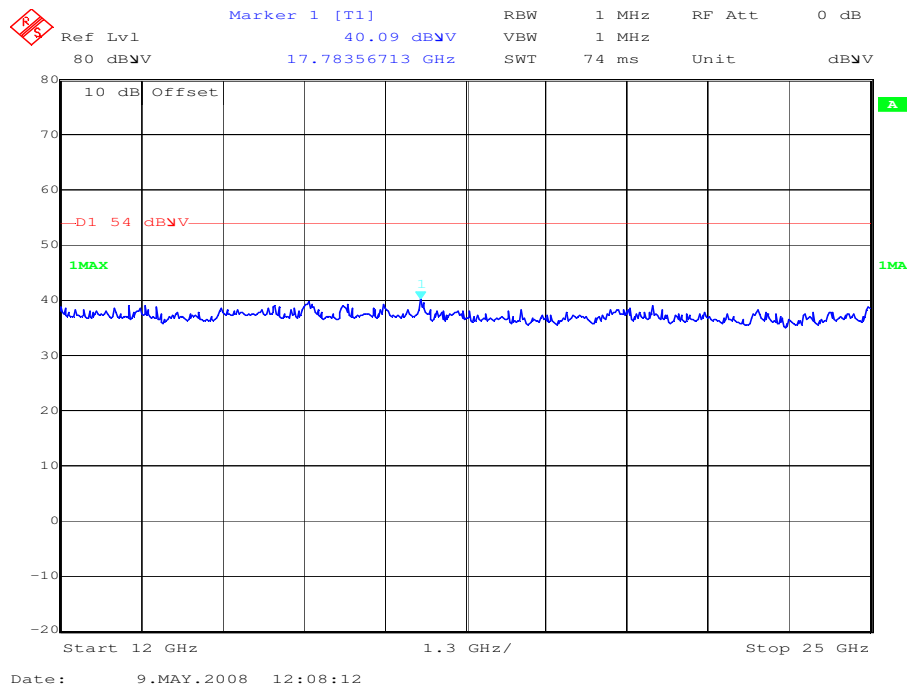
Idle Mode (4 GHz – 12.0 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

Idle Mode (12 GHz - 25 GHz)



Measurement Results: Radiated Emissions with 2nd Laptop – DELL PP01X (SPQ-Testunit-47)

SPURIOUS EMISSIONS LEVEL ($\mu\text{V/m}$)								
Idle mode								
f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)
208.07	Quasipeak	27.9	-	-	-	-	-	-
247.01	Quasipeak	17.8	-	-	-	-	-	-
268.95	Quasipeak	27.9	-	-	-	-	-	-
530.86	Quasipeak	28.9	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			± 3 dB					

f < 1 GHz : RBW/VBW: 100 kHz

f \geq 1GHz : RBW/VBW: 1 MHz

H = Horizontal ; V= Vertical

For measurement distance see table below

Limits: § 15.109

Frequency (MHz)	Field strength (dB $\mu\text{V/m}$)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

Idle Mode (30 MHz - 1 GHz)

Information

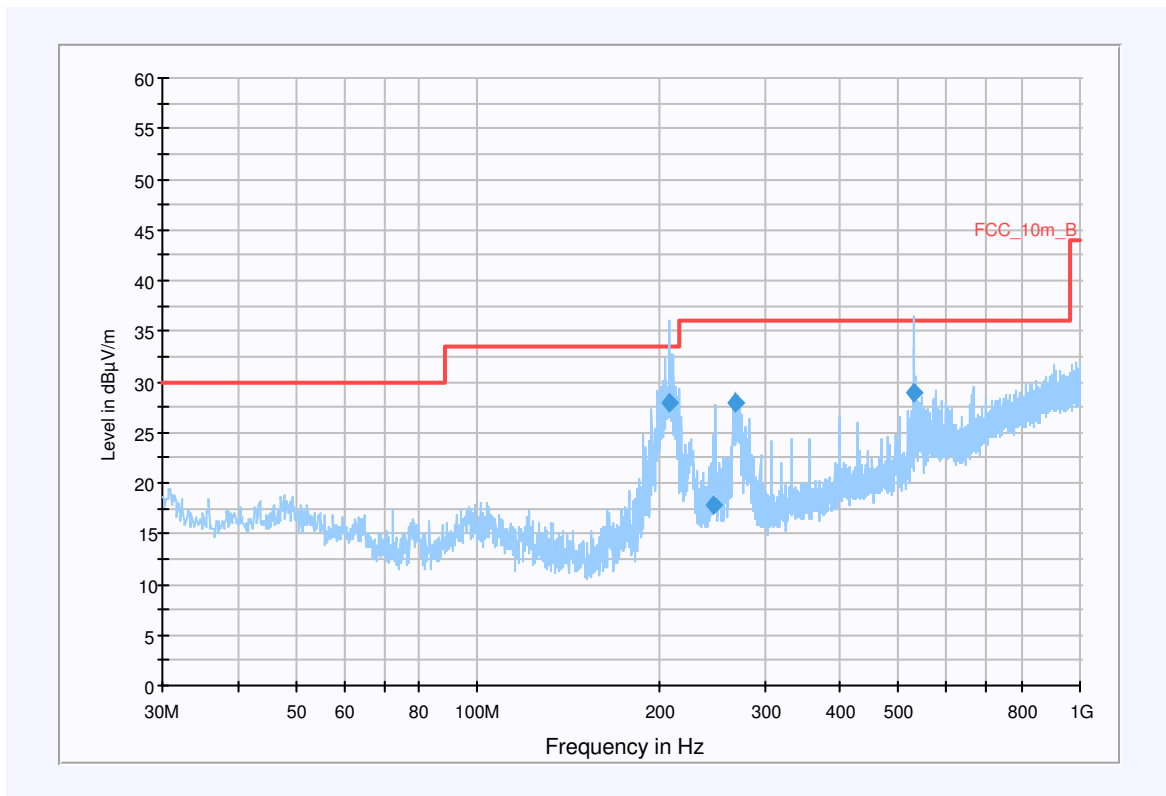
EUT: GI0401 + SPQ-TESTUNIT-47
 Serial Number: none
 Test Description: FCC class B @ 10 m
 Operating Conditions: IDLE 1900
 Operator Name: WAL
 Comment: EUT connect to notebook

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: EMI radiated\Electric Field (NOS)
 Level Unit: dB μ V/m

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

FCC_10m_FCCLIMIT(B)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
208.065750	27.9	15000.000	120.000	141.0	V	119.0	12.2	5.6	33.5	
247.005450	17.8	15000.000	120.000	100.0	V	343.0	13.4	18.2	36.0	
268.952950	27.9	15000.000	120.000	115.0	V	15.0	14.0	8.1	36.0	
530.861000	28.9	15000.000	120.000	180.0	H	107.0	19.3	7.1	36.0	

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

Subrange 1

Frequency Range: 30MHz - 2GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009

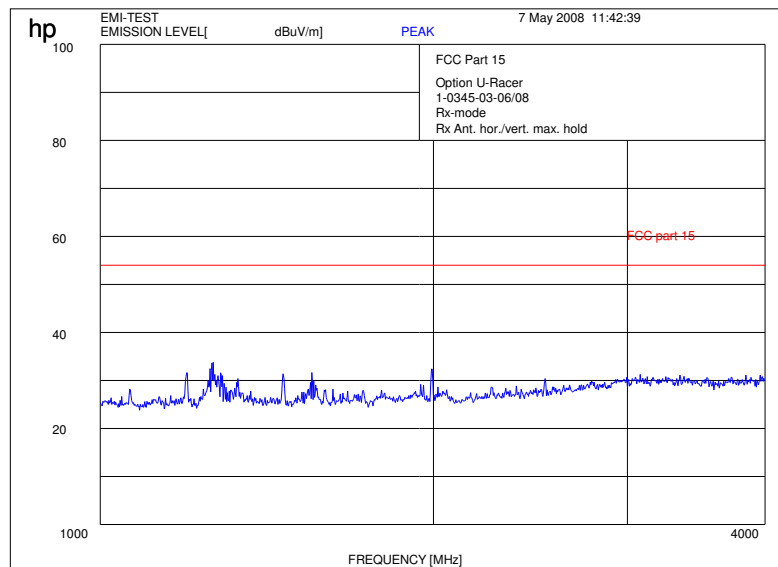
Signal Path: without Notch
FW 1.0

Antenna: VULB 9163
SN 9163-295, FW ---, CAL 08.04.2010
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table: Cabel with switch (0408)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9)

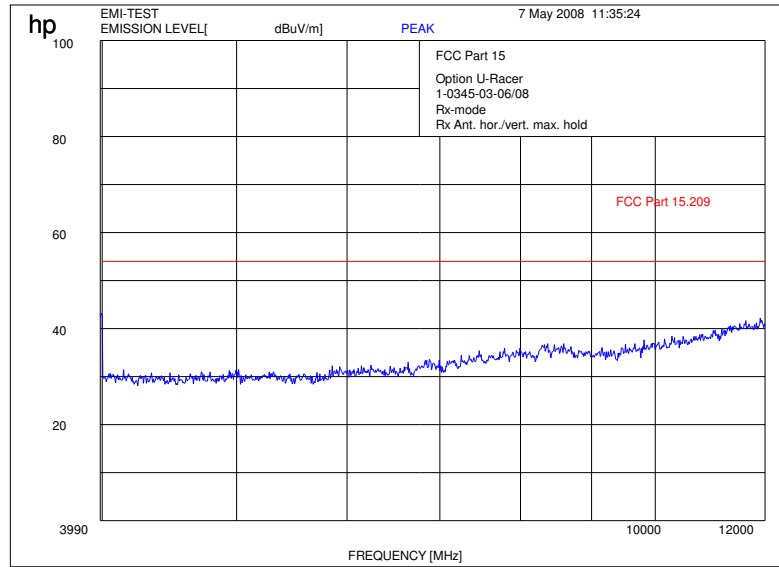
Idle Mode (1 MHz - 4 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

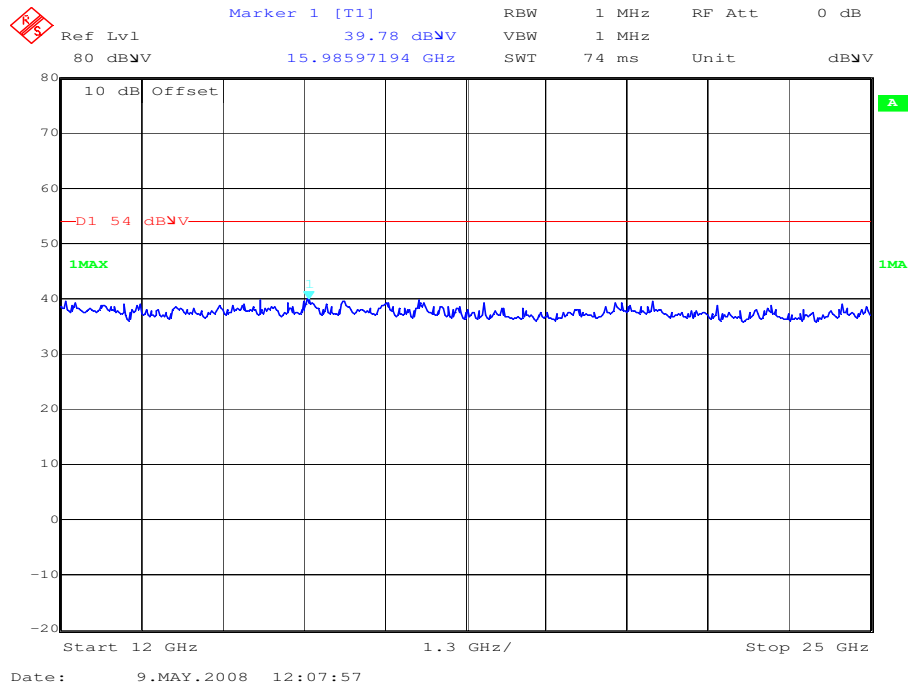
Idle Mode (4 GHz – 12.0 GHz)



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

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

Idle Mode (12 GHz - 25 GHz)



Measurement Results: Radiated Emissions with 3rd Laptop – Fujitsu/Siemens AmiloPro (SPQ-Testunit-193)

SPURIOUS EMISSIONS LEVEL ($\mu\text{V/m}$)								
Idle mode								
f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)
147.48	Quasipeak	17.3	-	-	-	-	-	-
297.37	Quasipeak	13.7	-	-	-	-	-	-
331.32	Quasipeak	12.5	-	-	-	-	-	-
461.76	Quasipeak	18.6	-	-	-	-	-	-
500.05	Quasipeak	25.3	-	-	-	-	-	-
954.04	Quasipeak	23.7	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			$\pm 3 \text{ dB}$					

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

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

H = Horizontal ; V= Vertical

For measurement distance see table below

Limits: § 15.109

Frequency (MHz)	Field strength (dB $\mu\text{V/m}$)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

Idle Mode (30 MHz - 1 GHz)

Information

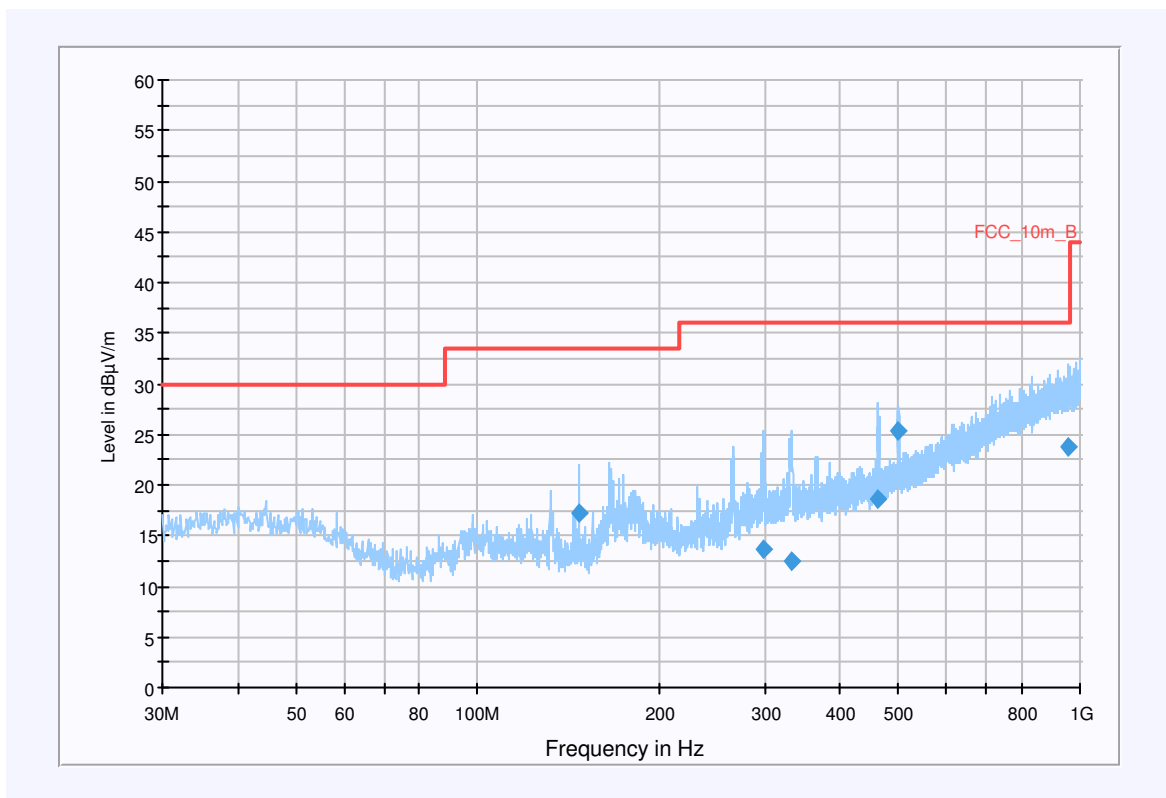
EUT: GI0401 + SPQ-TESTUNIT-193
 Serial Number: none
 Test Description: FCC class B @ 10 m
 Operating Conditions: IDLE 1900
 Operator Name: WAL
 Comment: EUT connect to notebook

Scan Setup: STAN_Fin [EMI radiated]

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

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

FCC_10m_FCCLIMIT(B)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
147.475500	17.3	15000.000	120.000	100.0	V	235.0	9.2	16.2	33.5	
297.373450	13.7	15000.000	120.000	100.0	V	-1.0	14.6	22.3	36.0	
331.319900	12.5	15000.000	120.000	127.0	V	99.0	15.7	23.5	36.0	
461.761800	18.6	15000.000	120.000	250.0	V	-1.0	18.0	17.4	36.0	
500.046200	25.3	15000.000	120.000	100.0	V	198.0	18.8	10.7	36.0	
954.043400	23.7	15000.000	120.000	100.0	H	19.0	26.5	12.3	36.0	

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

Subrange 1

Frequency Range: 30MHz - 2GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009

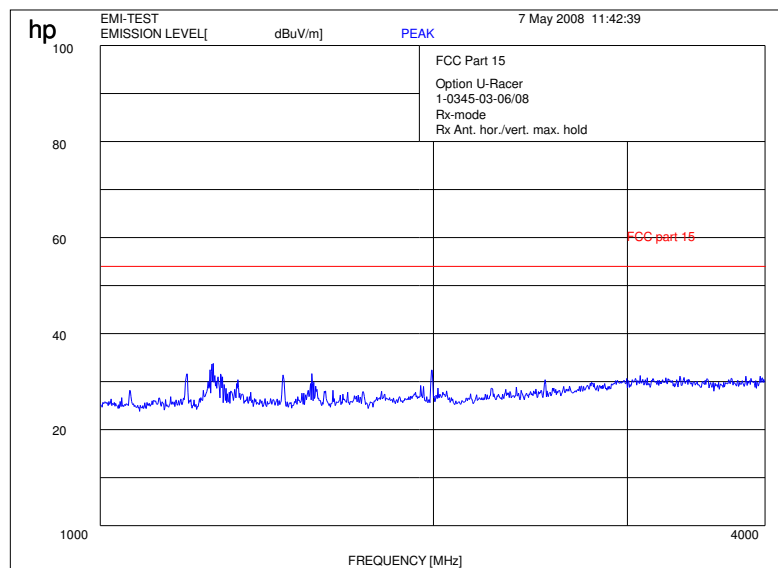
Signal Path: without Notch
FW 1.0

Antenna: VULB 9163
SN 9163-295, FW ---, CAL 08.04.2010
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table: Cabel with switch (0408)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9)

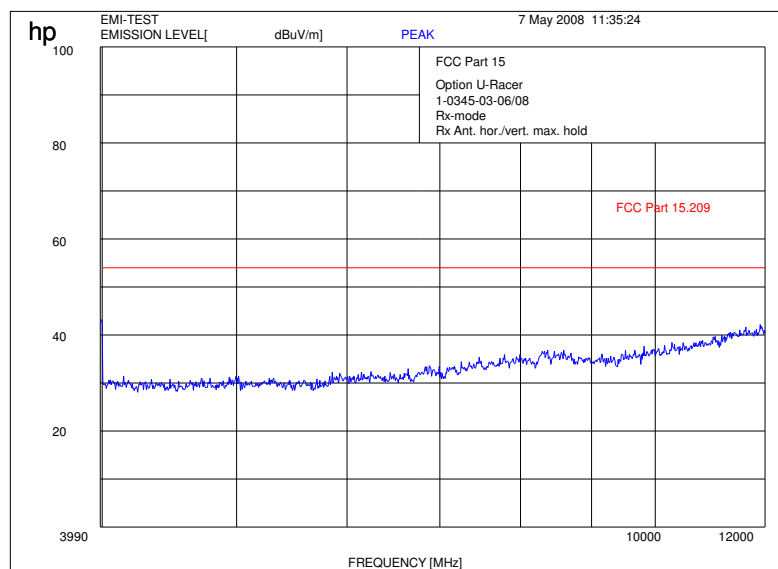
Idle Mode (1 MHz - 4 GHz)



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

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

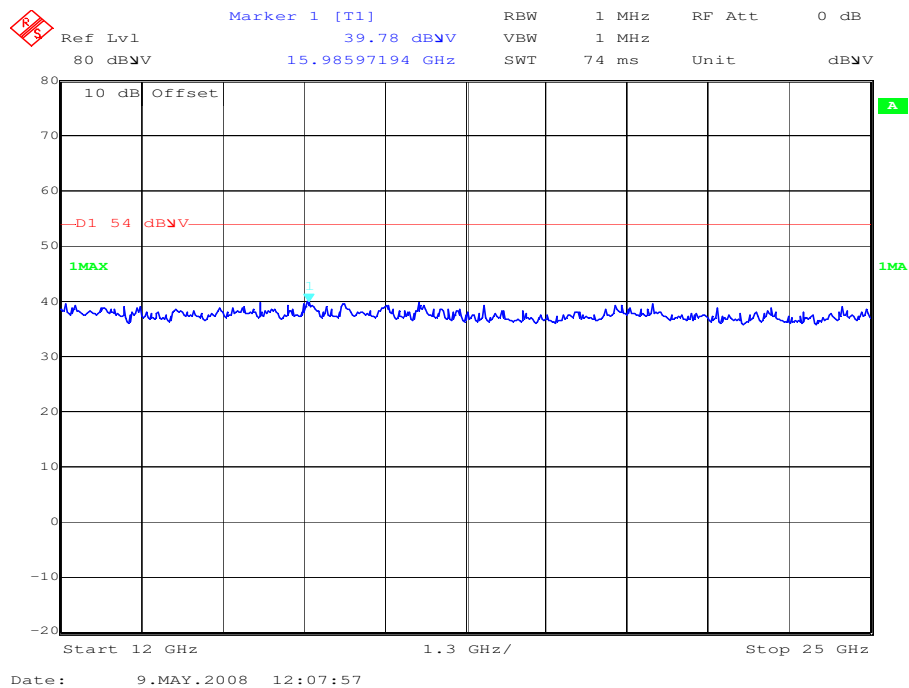
Idle Mode (4 GHz – 12.0 GHz)



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

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

Idle Mode (12 GHz - 25 GHz)



5.1.5 Conducted Spurious Emissions

Reference

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

Measurement Procedure:

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

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

USPCS Transmitter Channel Frequency:

- 512 1850.2 MHz
- 661 1880.0 MHz
- 810 1909.8 MHz

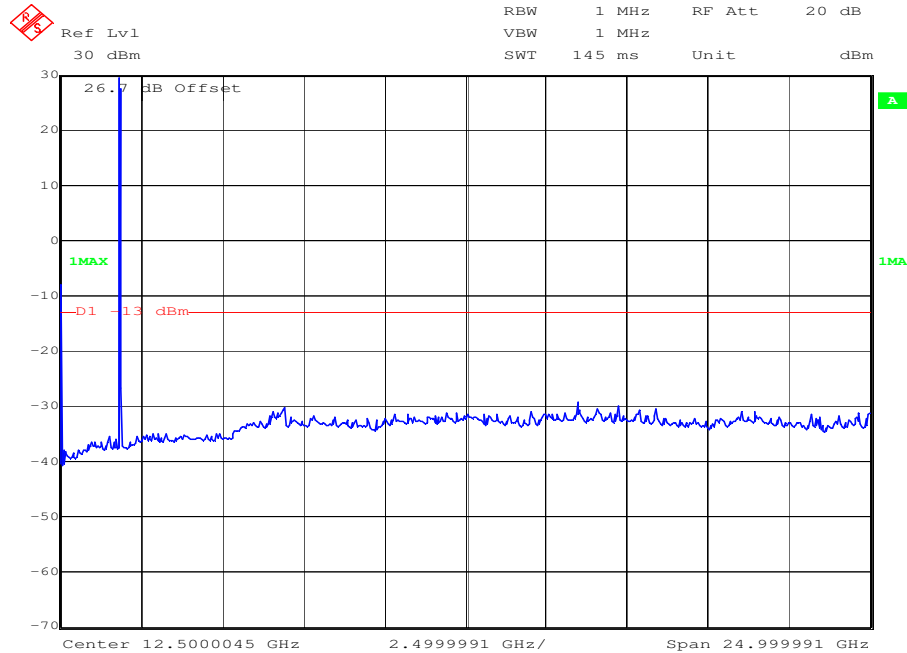
Measurement Limit:

(a) On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43+10\text{Log}(P)$ 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	-

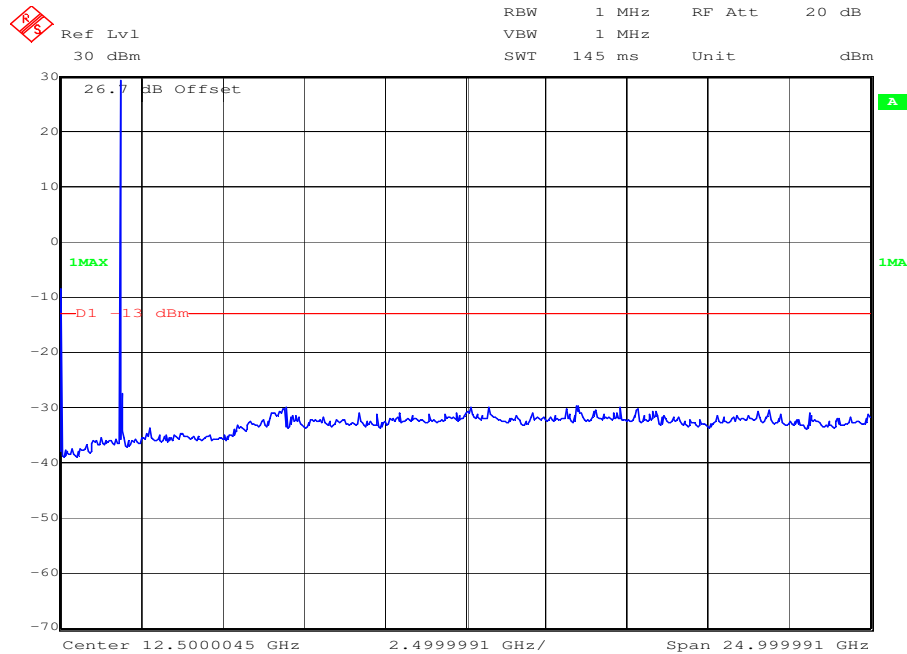
Channel: 512



Date: 5.MAY.2008 13:01:32

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

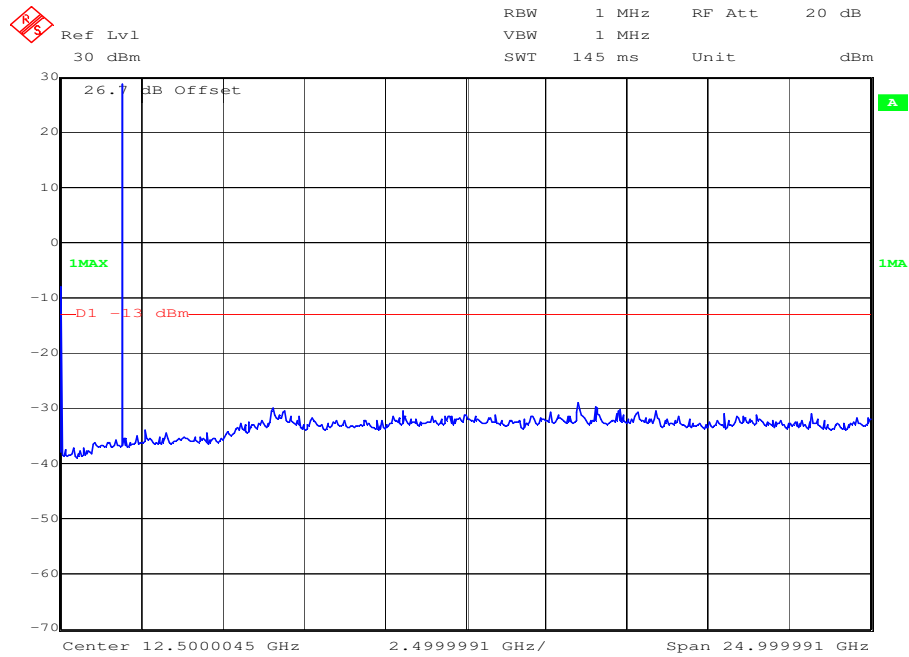
Channel 661



Date: 5.MAY.2008 13:00:55

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

Channel 810



Date: 5.MAY.2008 13:02:19

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

5.1.6 Block Edge Compliance

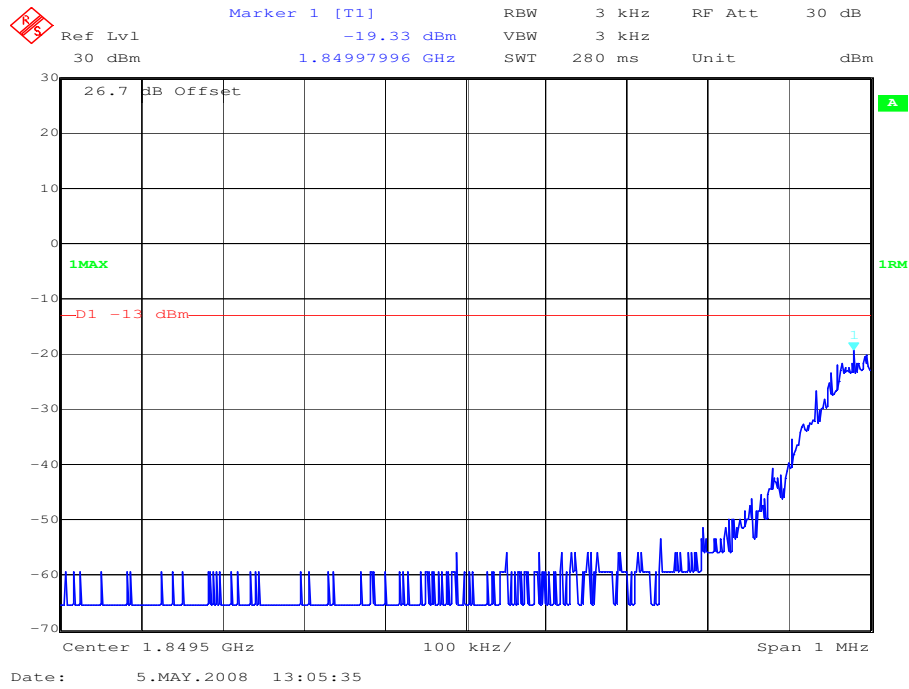
Reference

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

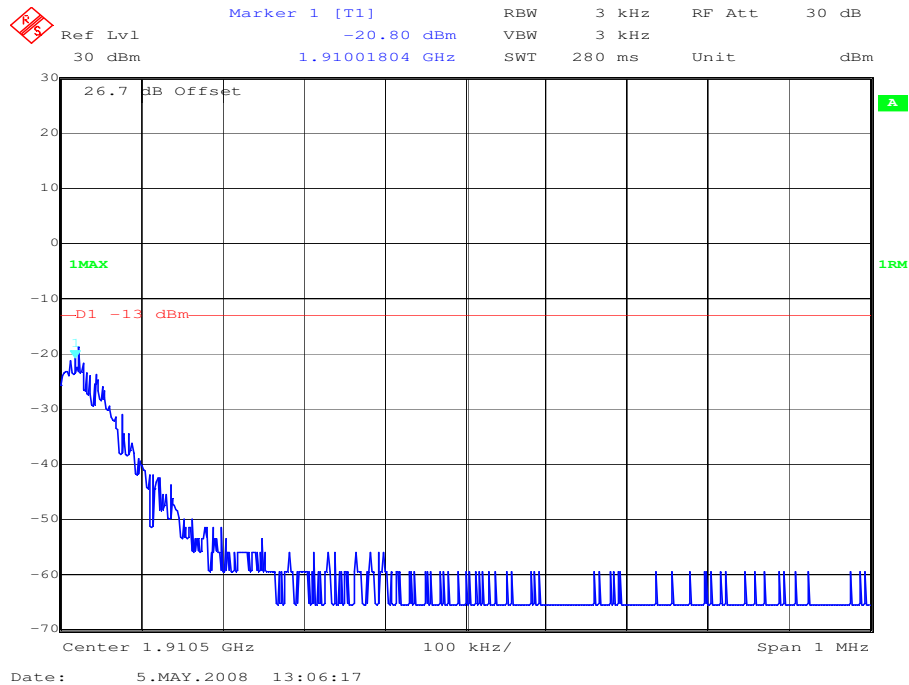
Measurement Limit:

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

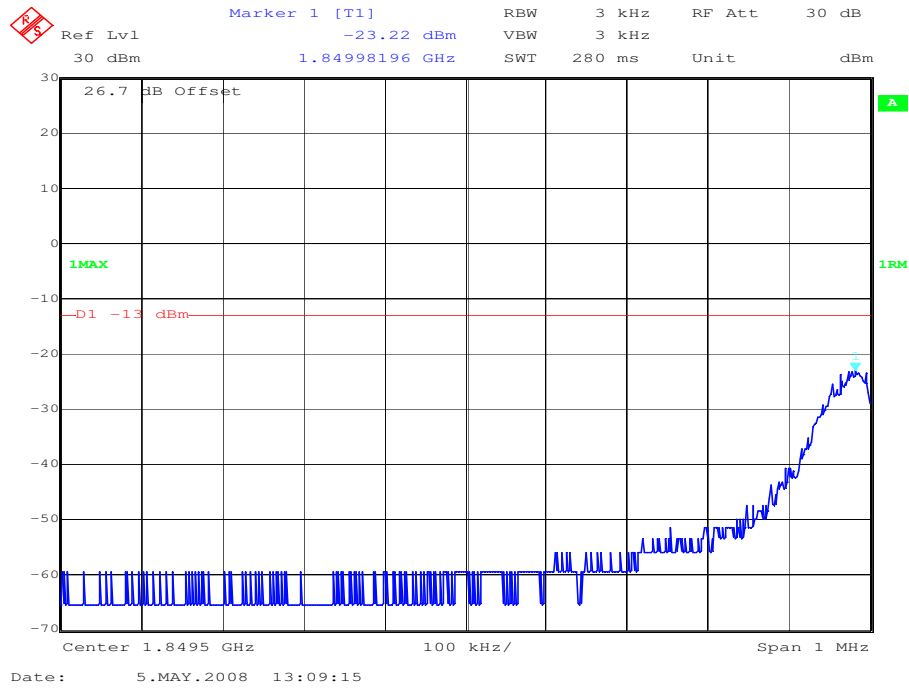
Block 1 Channel 512



Block 6 Channel 810



Block 1 Channel 512 (EDGE)



Block 6 Channel 810 (EDGE)



5.1.7 Occupied Bandwidth

Reference

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

Occupied Bandwidth Results

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

Normal mode

Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1850.2 MHz	262	310
1880.0 MHz	262	308
1909.8 MHz	264	312

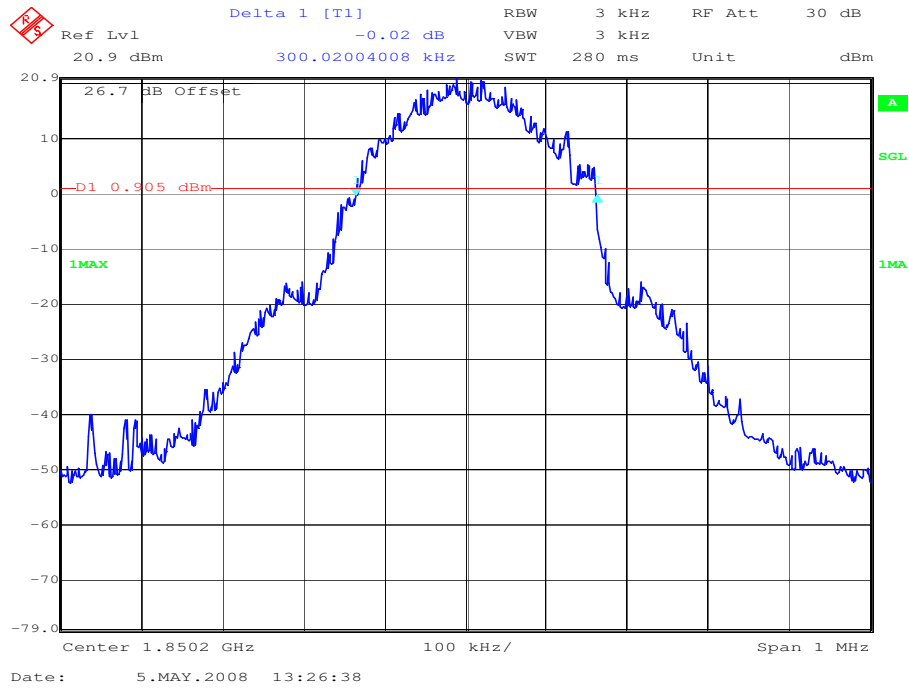
EDGE mode

Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1850.2 MHz	260	322
1880.0 MHz	262	334
1909.8 MHz	260	320

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.

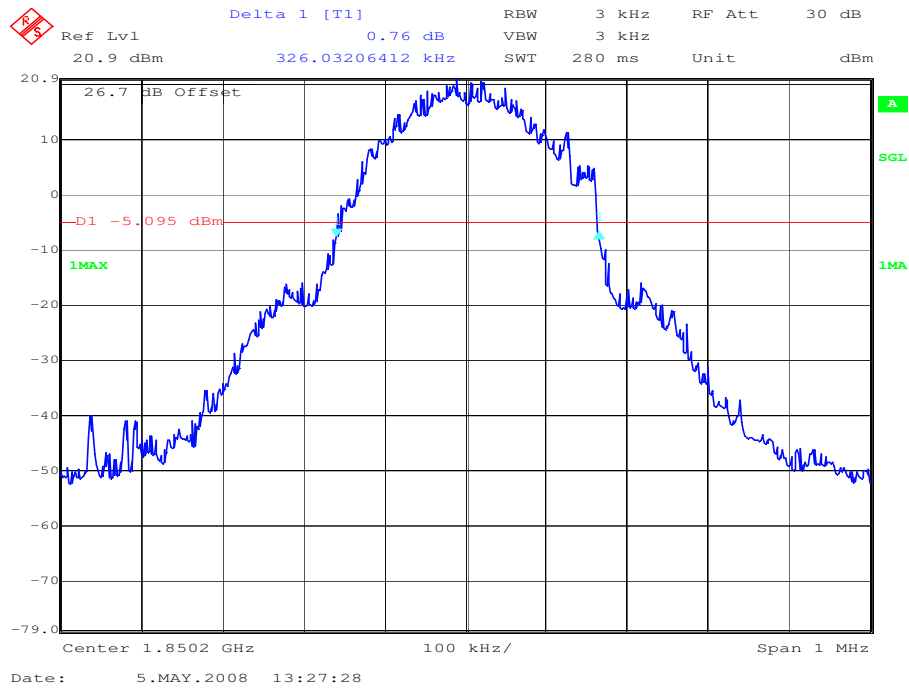
Channel 512

99% (-20 dB) Occupied Bandwidth

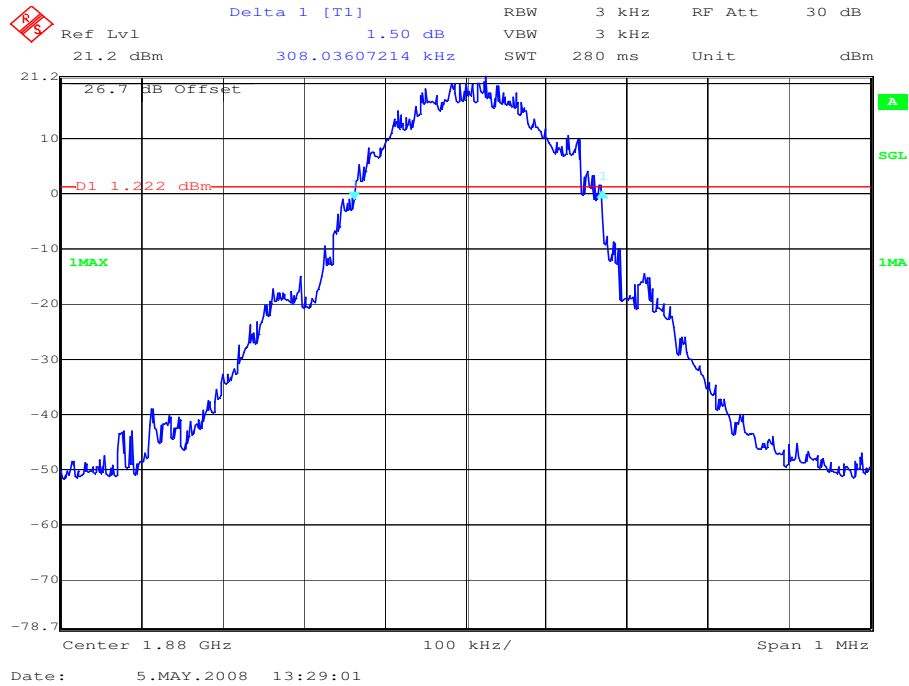


Channel 512

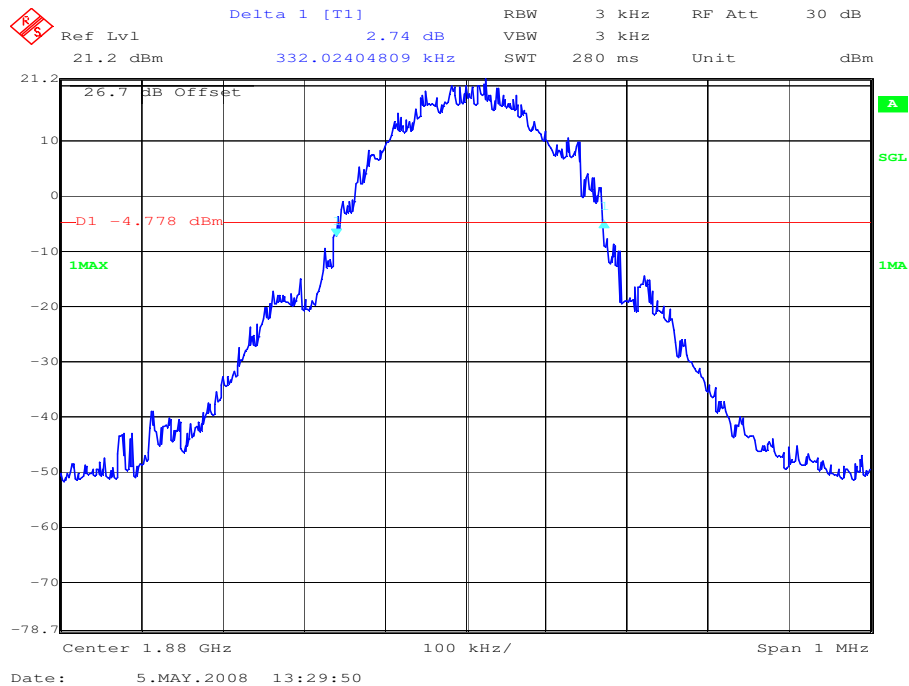
-26 dBc Bandwidth



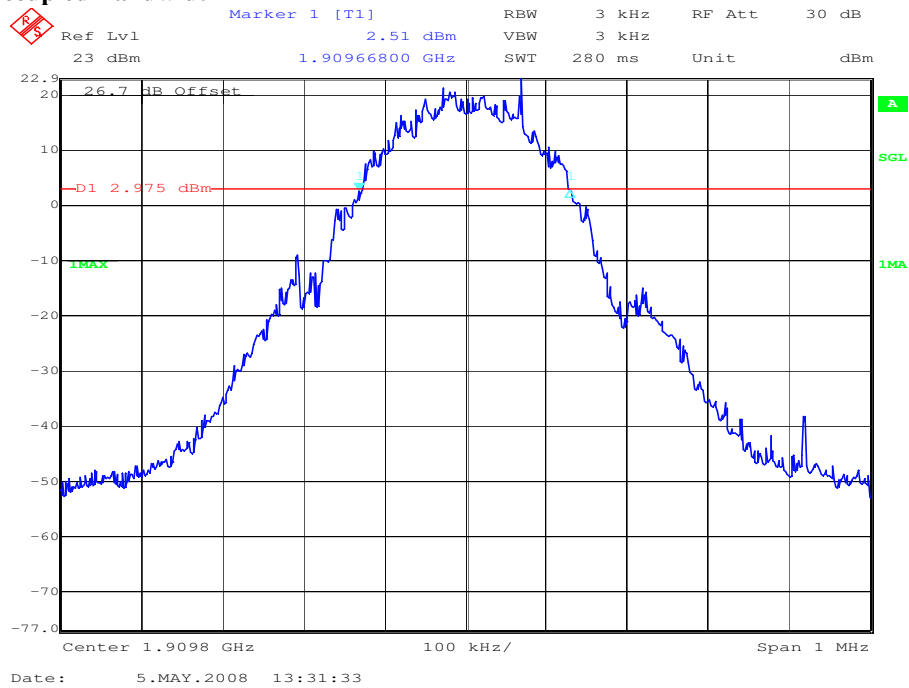
Channel 661
99% (-20 dB) Occupied Bandwidth



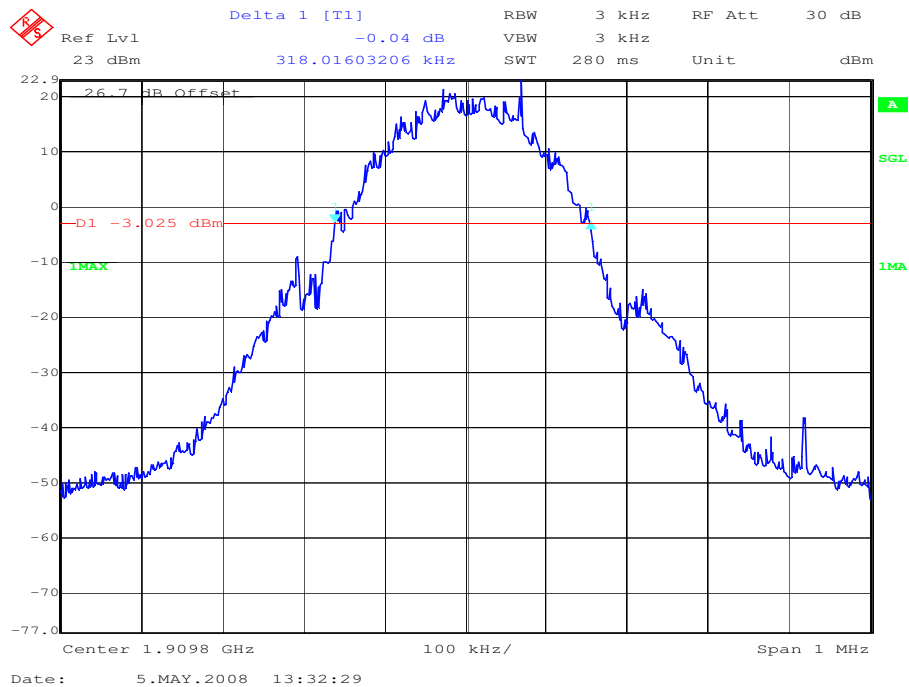
Channel 661
-26 dBc Bandwidth



Channel 810
99% (-20 dB) Occupied Bandwidth

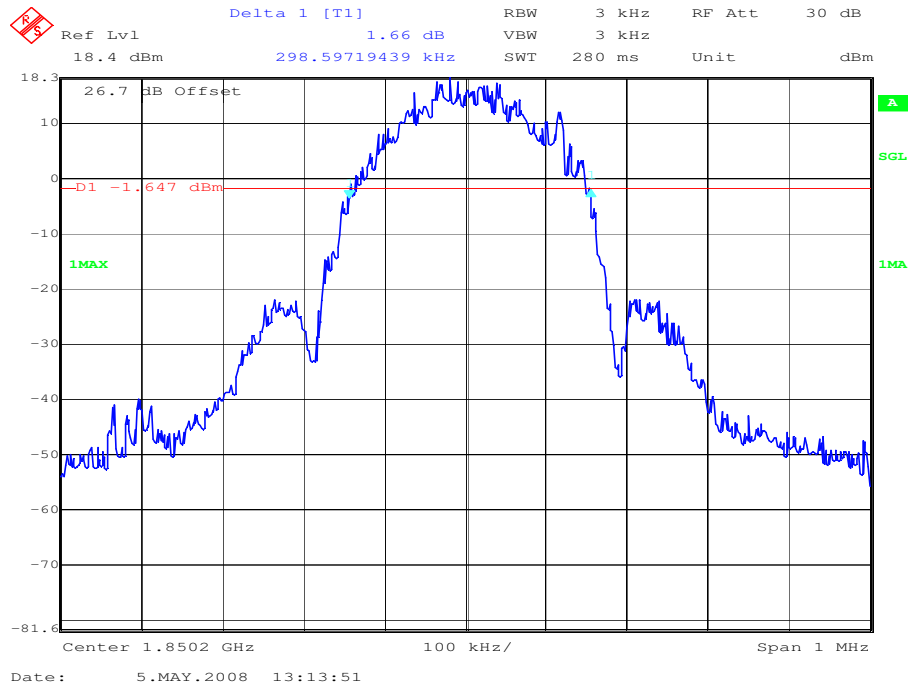


Channel 810
-26 dBc Bandwidth



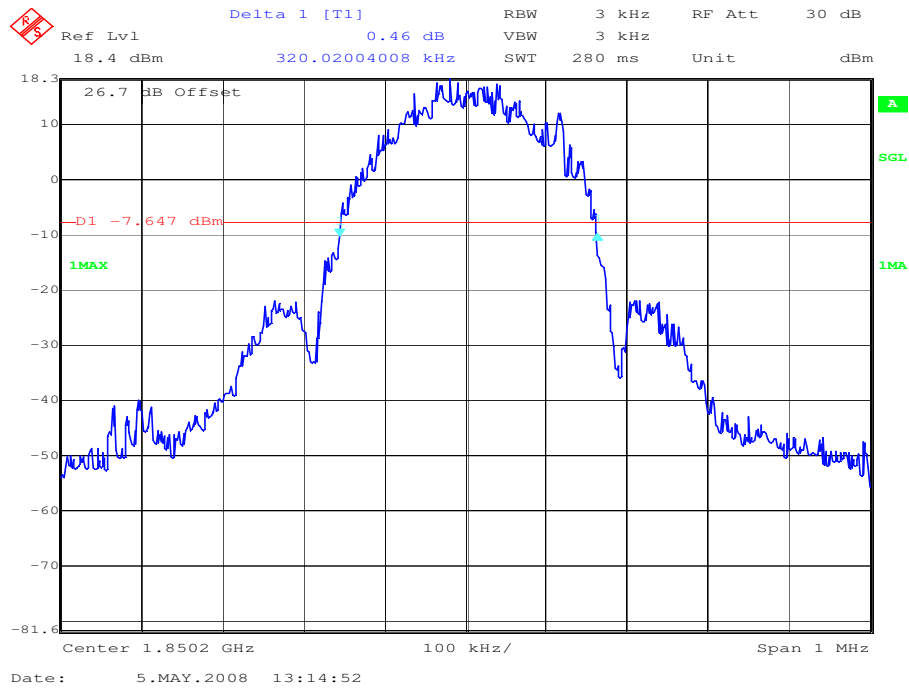
Channel 512 (EDGE)

99% (-20 dB) Occupied Bandwidth

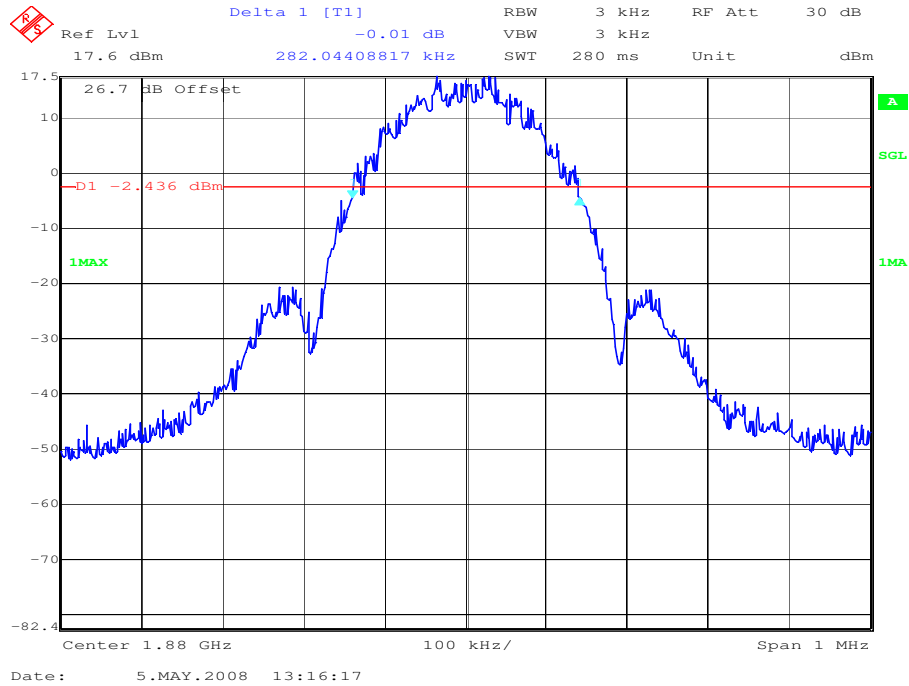


Channel 512 (EDGE)

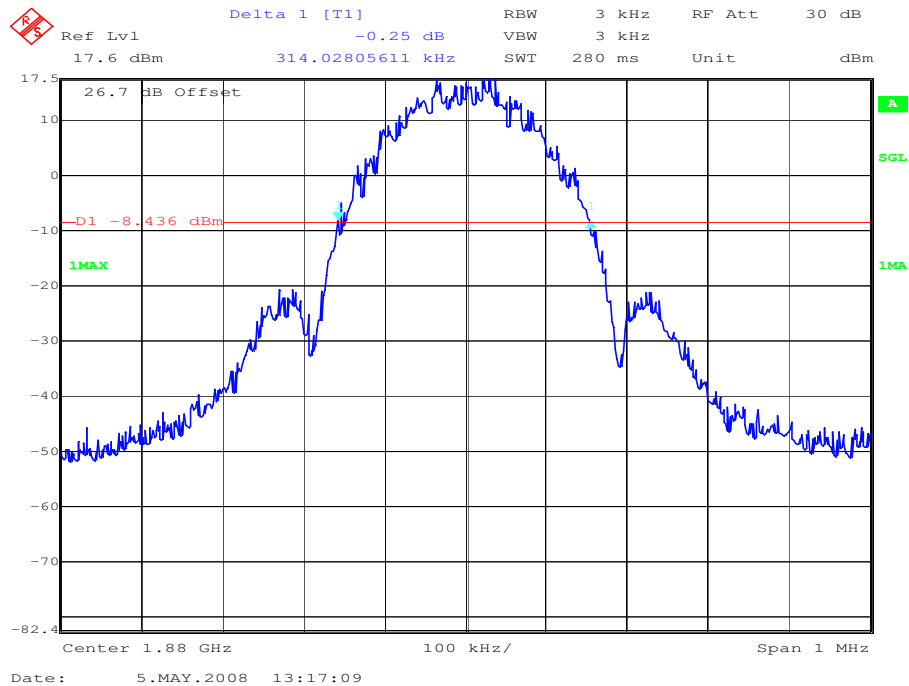
-26 dBc Bandwidth



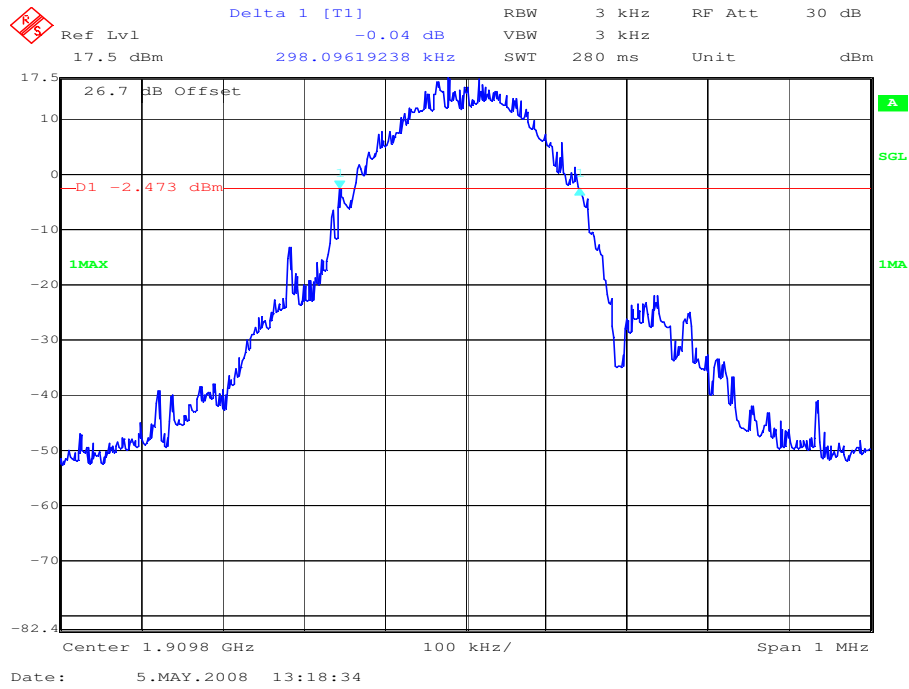
**Channel 661 (EDGE)
99% (-20 dB) Occupied Bandwidth**



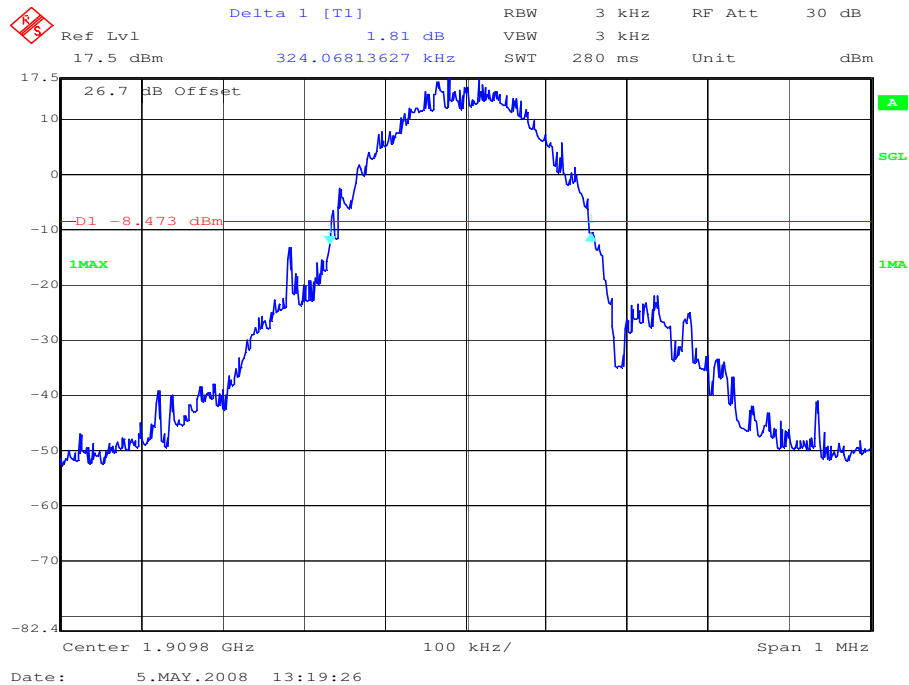
**Channel 661 (EDGE)
-26 dBc Bandwidth**



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

Measurements Results Output Power (conducted)

Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (dBm)
824.2	31.4	31.2
836.4	31.4	31.3
848.8	31.6	31.4
Measurement uncertainty	±0.5 dB	

Measurements Results Output Power (conducted) 8-PSK Mode

Frequency (MHz)	Peak Output Power (dBm)	Average Output Power (dBm)
824.2	28.9	25.7
836.4	28.9	25.8
848.8	29.1	25.9
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 o about a vertical axis until a higher maximum signal was received.
- (i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
- (j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
- (k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
- (l) Repeat for all different test signal frequencies

Measuring the ERP of Spurious/Harmonic Emissions using Substitution Method

- (a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring ERP) as follows:
 Center Frequency : equal to the signal source
 Resolution BW : 10 kHz
 Video BW : same
 Detector Mode : positive
 Average : off
 Span : 3 x the signal bandwidth
- (b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
 Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
 $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$
- (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:
 $P = P1 - L1 = (P2 + L2) - L1 = P3 + A + L2 - L1$
 $EIRP = P + G1 = P3 + L2 - L1 + A + G1$
 $ERP = EIRP - 2.15 \text{ dB}$

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

1st Laptop – IBM Type 2373 (SPQ-Testunit-29)

Test Results: Output Power (radiated) GMSK Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
824.2	28.8
836.4	29.9
848.8	31.1
Measurement uncertainty	±0.5 dB

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

Frequency (MHz)	Burst Peak EIRP (dBm)
824.2	26.7
836.4	27.6
848.8	28.8
Measurement uncertainty	±0.5 dB

2nd Laptop – DELL PP01X (SPQ-Testunit-47)

Test Results: Output Power (radiated) GMSK Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
824.2	28.0
836.4	29.1
848.8	29.7
Measurement uncertainty	±0.5 dB

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

Frequency (MHz)	Burst Peak EIRP (dBm)
824.2	25.7
836.4	26.9
848.8	27.6
Measurement uncertainty	±0.5 dB

3rd Laptop – Fujitsu/Siemens AmiloPro (SPQ-Testunit-193)

Test Results: Output Power (radiated) GMSK Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
824.2	27.9
836.4	28.8
848.8	29.4
Measurement uncertainty	±0.5 dB

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

Frequency (MHz)	Burst Peak EIRP (dBm)
824.2	25.8
836.4	26.7
848.8	27.1
Measurement uncertainty	±0.5 dB

Sample calculation:

Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERP	Substitution Antenna
MHz	dBμV	dBm	dBi	dBd	dB	dBm	
848.8	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.

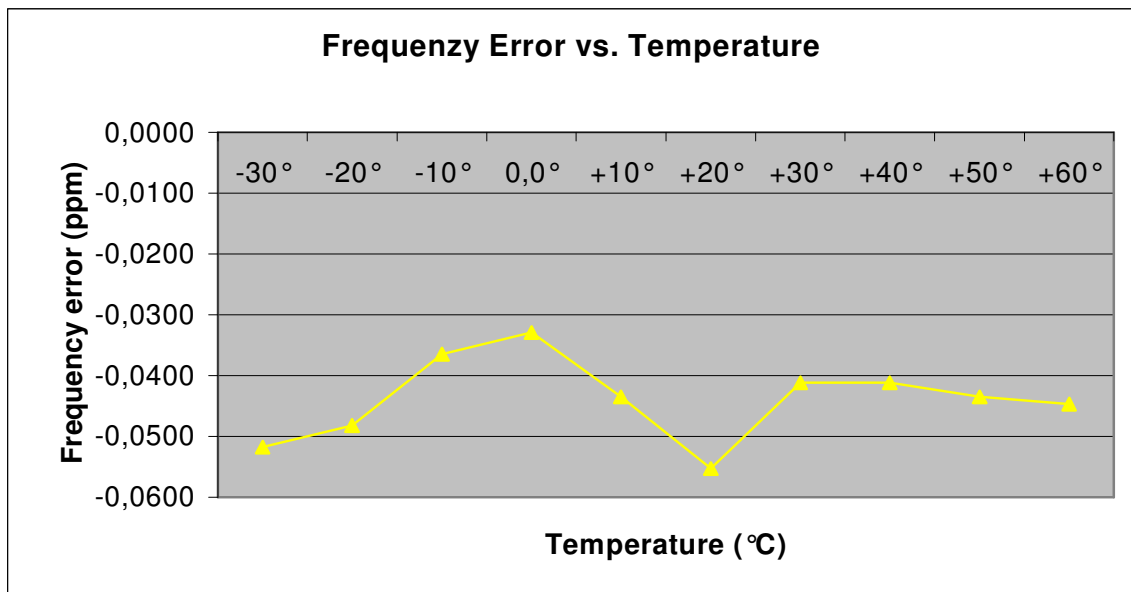
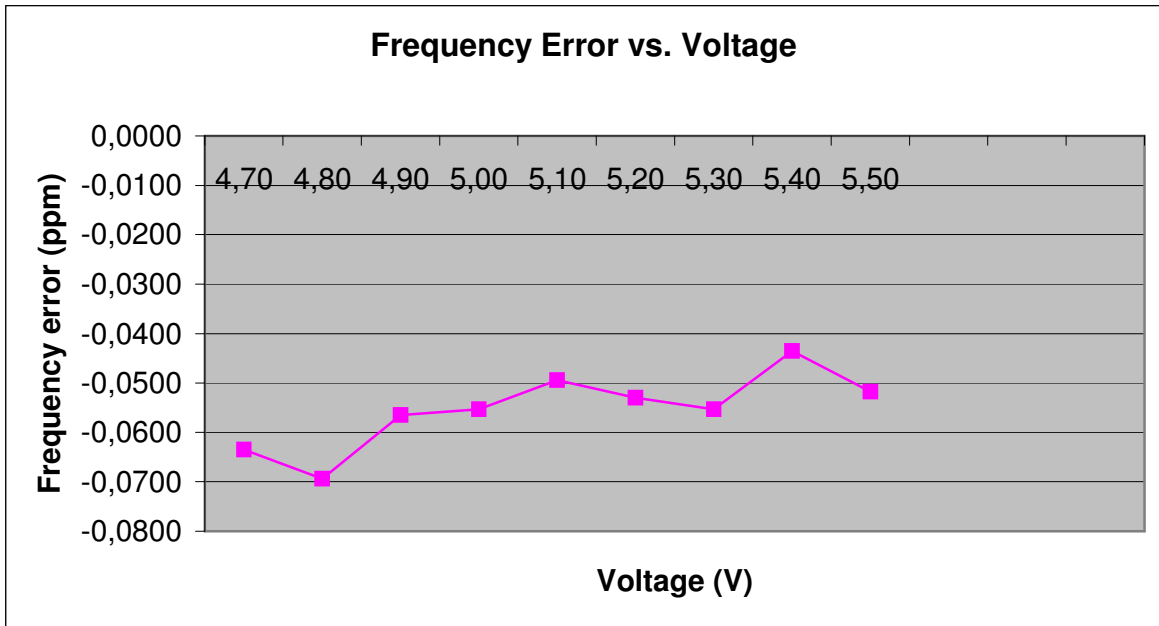
Measurement Results: AFC FREQ ERROR vs. VOLTAGE

Not Applicable

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
4.5	-56	-0.00000659	-0.0659
4.6	-50	-0.00000588	-0.0588
4.7	-54	-0.00000635	-0.0635
4.8	-59	-0.00000694	-0.0694
4.9	-48	-0.00000565	-0.0565
5.0	-47	-0.00000553	-0.0553
5.1	-42	-0.00000494	-0.0494
5.2	-45	-0.00000529	-0.0529
5.3	-47	-0.00000553	-0.0553
5.4	-37	-0.00000435	-0.0435
5.5	-44	-0.00000518	-0.0518

Measurement Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-44	-0.00000518	-0.0518
-20	-41	-0.00000482	-0.0482
-10	-31	-0.00000365	-0.0365
±0.0	-28	-0.00000329	-0.0329
+10	-37	-0.00000435	-0.0435
+20	-47	-0.00000553	-0.0553
+30	-35	-0.00000412	-0.0412
+40	-35	-0.00000412	-0.0412
+50	-37	-0.00000435	-0.0435
+60	-38	-0.00000447	-0.0447



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 with 1st Laptop – IBM Type 2373 (SPQ-Testunit-29)

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

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

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

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

Harmonic	Tx ch.-128 Freq. (MHz)	Level (dBm)	Tx ch.-189 Freq. (MHz)	Level (dBm)	Tx ch.-251 Freq. (MHz)	Level (dBm)
2	1648.4	-	1672.8	-	1697.6	- 46.3
3	2472.6	-	2509.2	-	2546.4	-
4	3296.8	-	3345.6	-	3395.2	-
5	4121.0	-	4182.0	-	4244.0	-
6	4945.2	-	5018.4	-	5092.8	-
7	5769.4	-	5854.8	-	5941.6	-
8	6593.6	-	6691.2	-	6790.4	-
9	7417.8	-	7527.6	-	7639.2	-
10	8242.0	-	8364.0	-	8488.0	-

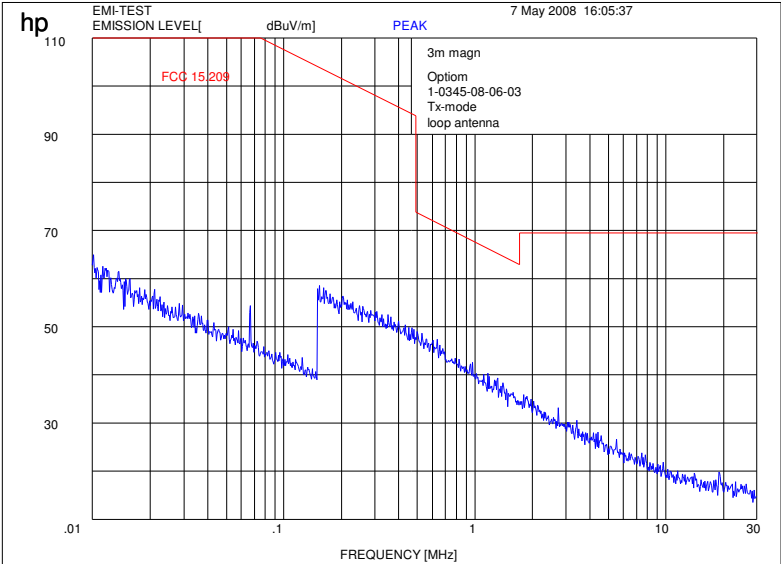
Sample calculation:

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

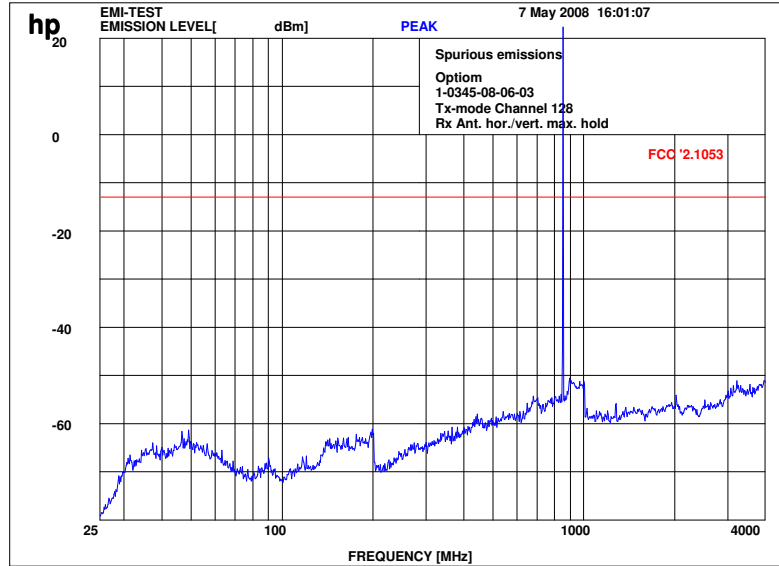
ERP = SG (dBm) - Cable Loss (dB) + Ant. gain (dB)

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

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



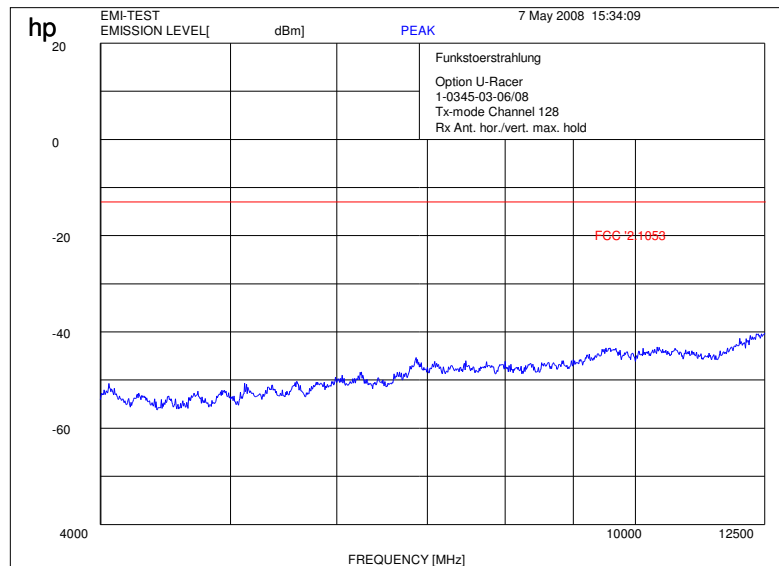
Channel 128 (30 MHz - 4 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

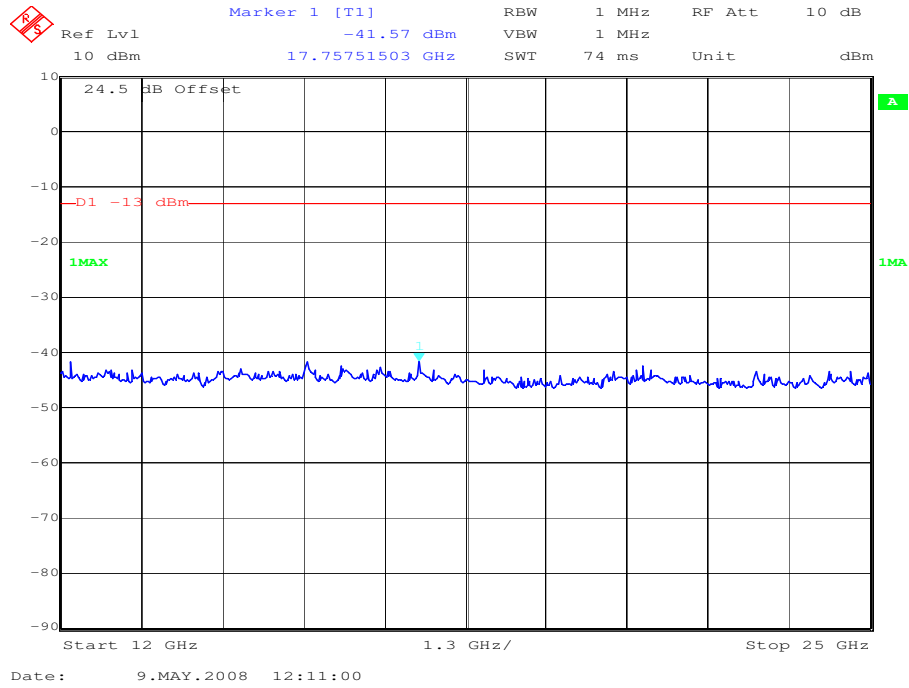
Channel 128 (4 GHz – 12.5 GHz)



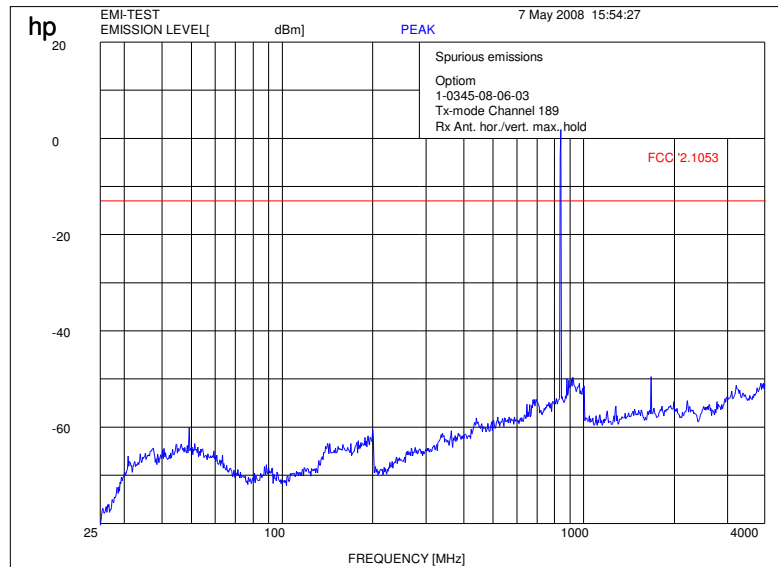
f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

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



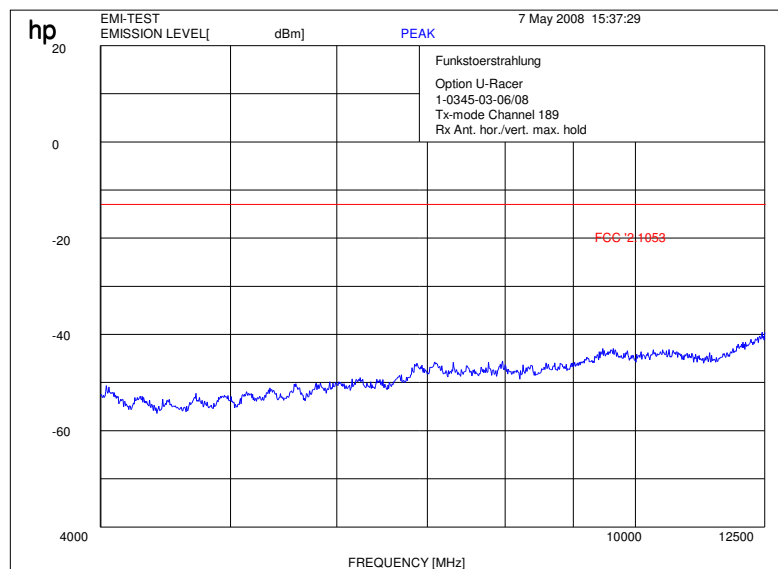
Channel 189 (30 MHz - 4 GHz)



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

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

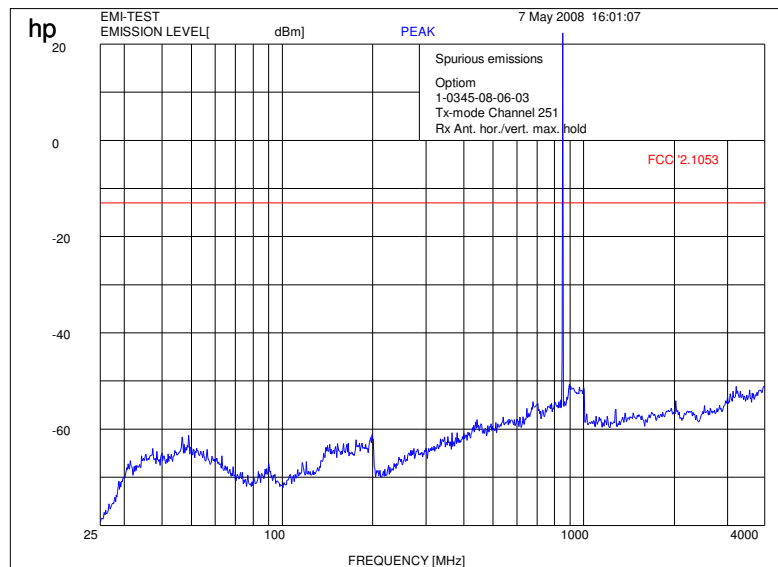
Channel 189 (4 GHz – 12.5 GHz)



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

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

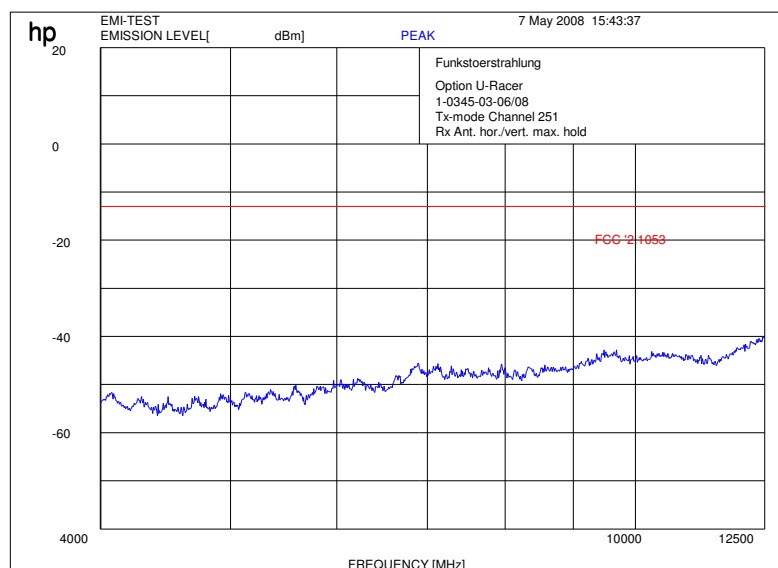
Channel 251 (30 MHz - 4 GHz)



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

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

Channel 251 (4 GHz – 12.5 GHz)



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

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

Measurement Results: Radiated Emissions with 2nd Laptop – DELL PP01X (SPQ-Testunit-47)

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

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

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

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

Harmonic	Tx ch.-128 Freq. (MHz)	Level (dBm)	Tx ch.-189 Freq. (MHz)	Level (dBm)	Tx ch.-251 Freq. (MHz)	Level (dBm)
2	1648.4	-	1672.8	-	1697.6	-
3	2472.6	-	2509.2	-	2546.4	- 43.0
4	3296.8	-	3345.6	-	3395.2	-
5	4121.0	-	4182.0	-	4244.0	-
6	4945.2	-	5018.4	-	5092.8	-
7	5769.4	-	5854.8	-	5941.6	-
8	6593.6	-	6691.2	-	6790.4	-
9	7417.8	-	7527.6	-	7639.2	-
10	8242.0	-	8364.0	-	8488.0	-

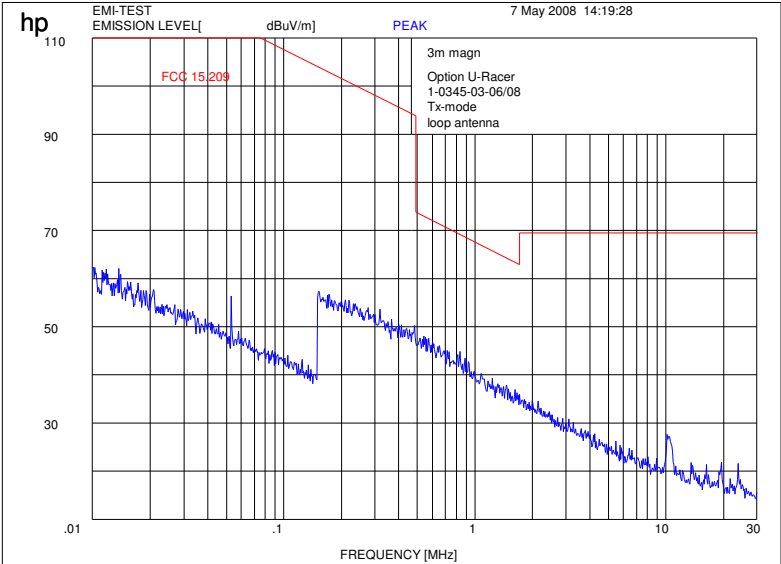
Sample calculation:

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

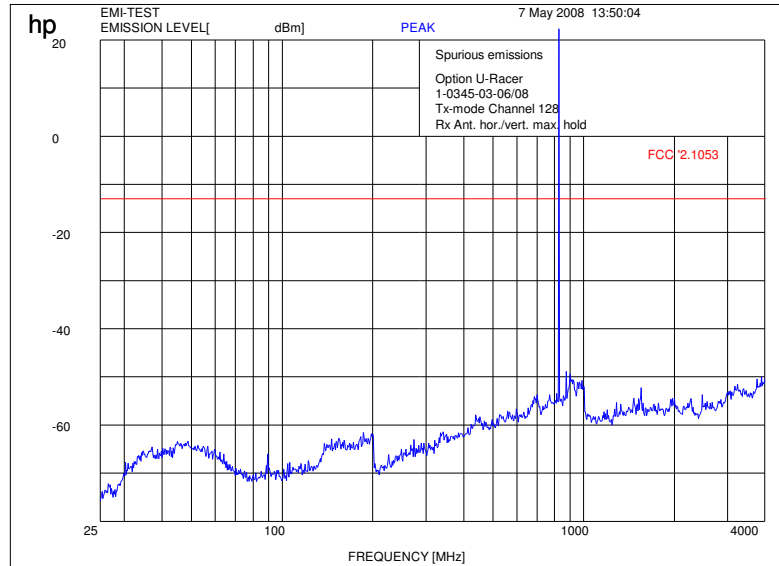
ERP = SG (dBm) - Cable Loss (dB) + Ant. gain (dB)

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

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



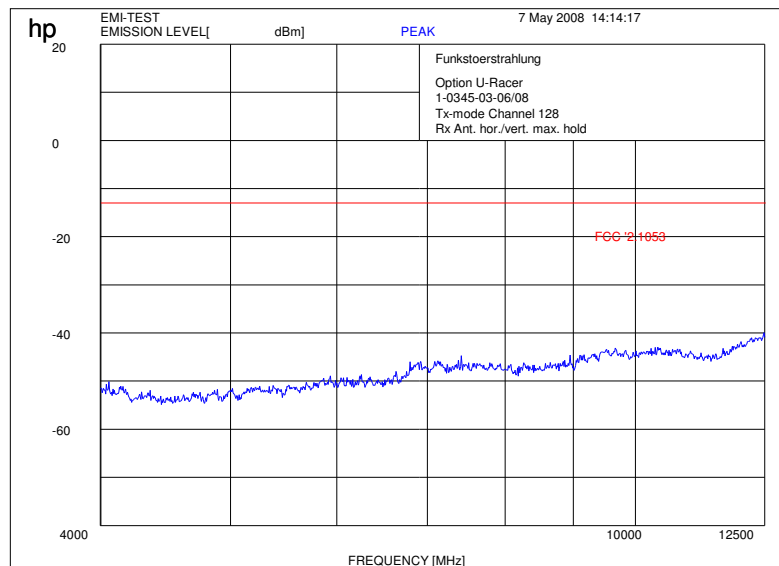
Channel 128 (30 MHz - 4 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

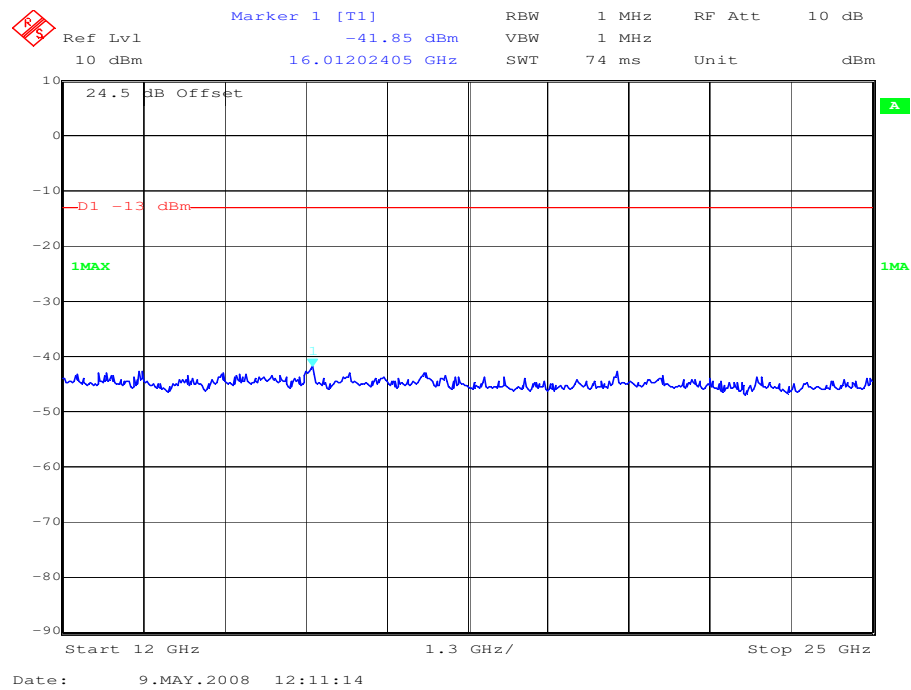
Channel 128 (4 GHz – 12.5 GHz)



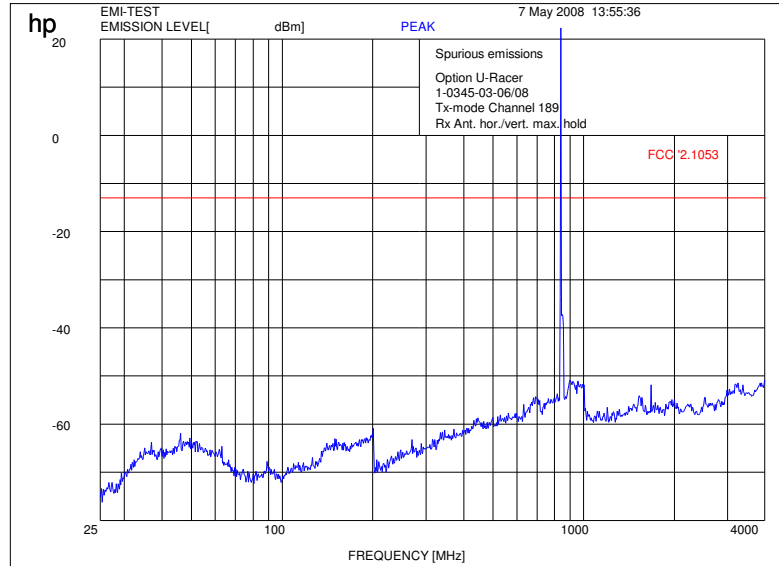
f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

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



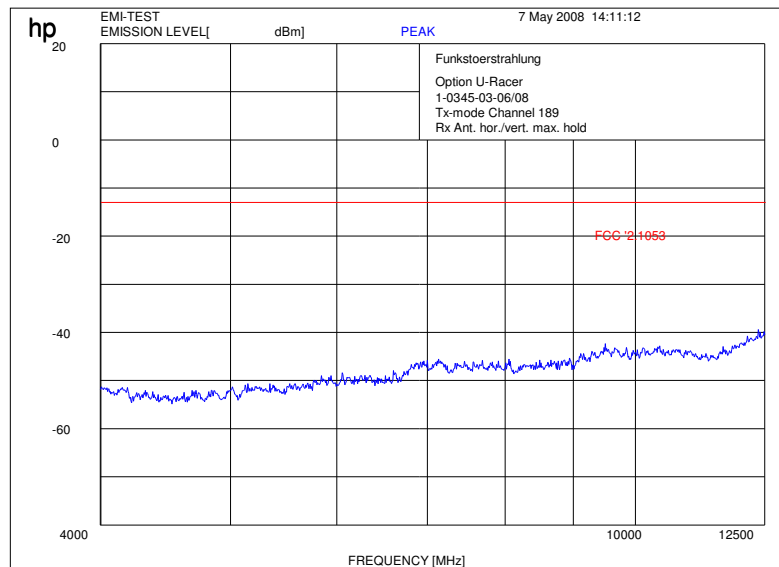
Channel 189 (30 MHz - 4 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

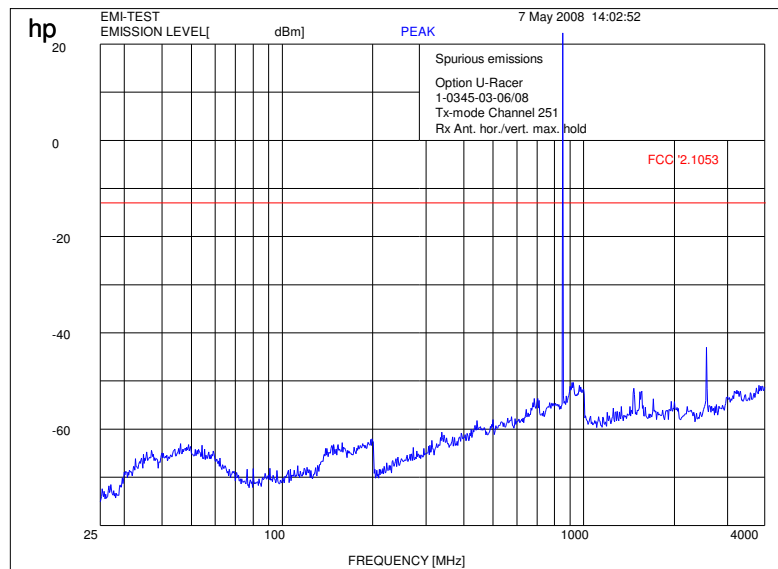
Channel 189 (4 GHz – 12.5 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

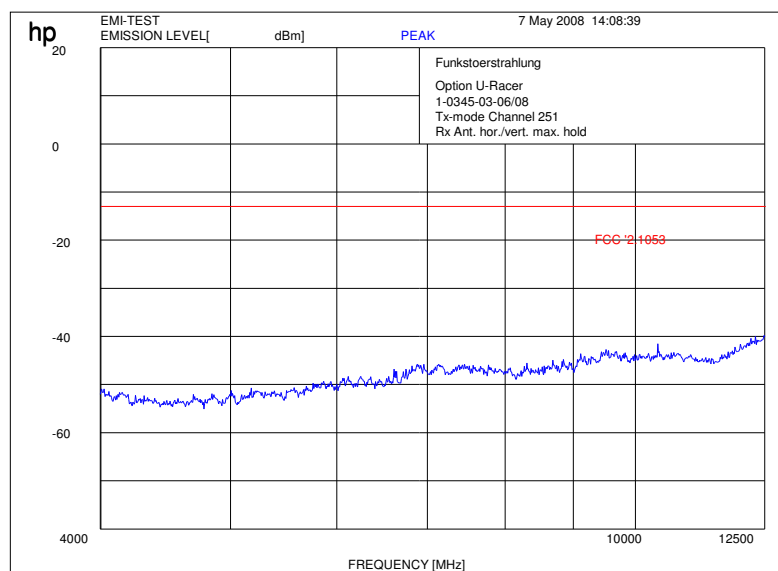
Channel 251 (30 MHz - 4 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

Channel 251 (4 GHz – 12.5 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

Measurement Results: Radiated Emissions with 3rd Laptop – Fujitsu/Siemens AmiloPro (SPQ-Testunit-193)

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

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

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

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

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

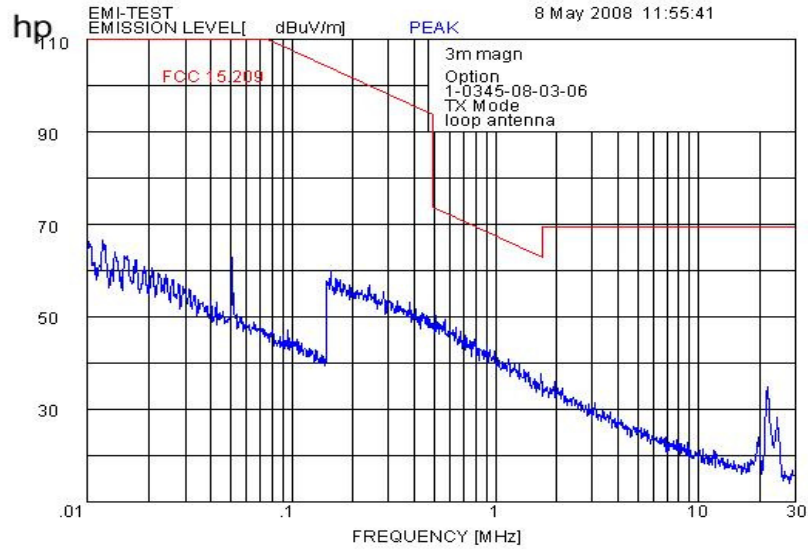
Sample calculation:

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

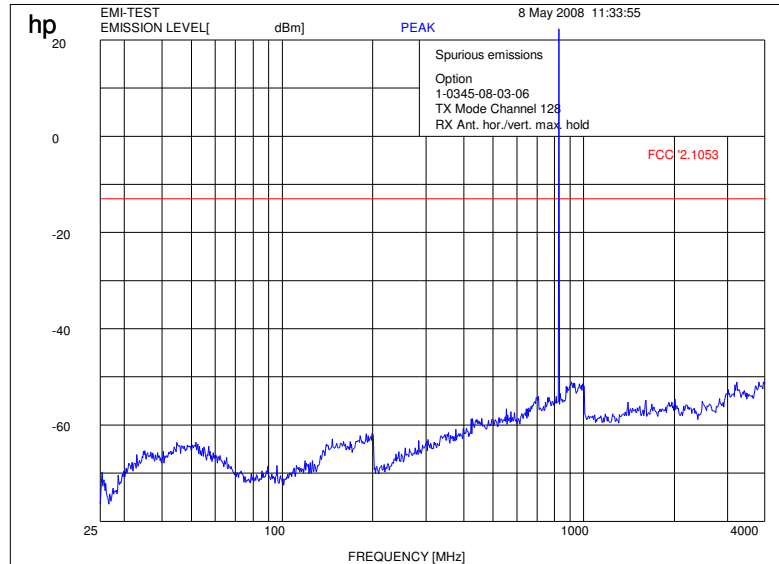
ERP = SG (dBm) - Cable Loss (dB) + Ant. gain (dB)

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

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



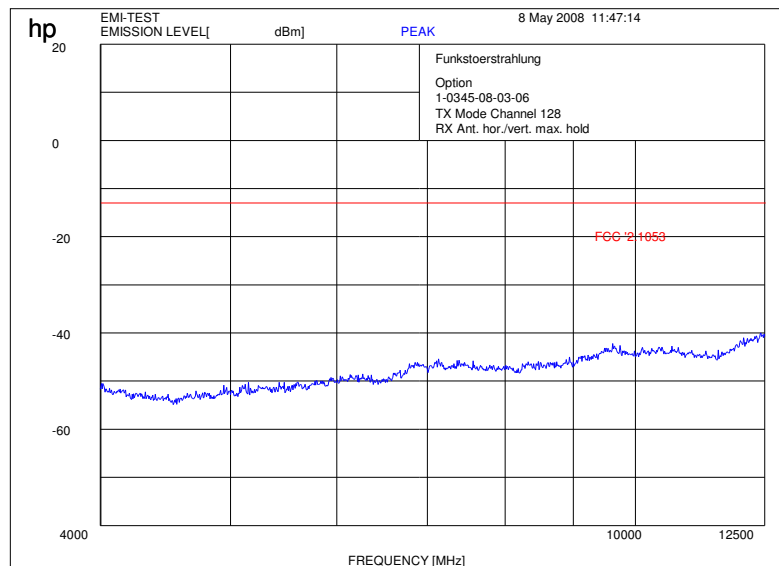
Channel 128 (30 MHz - 4 GHz)



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

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

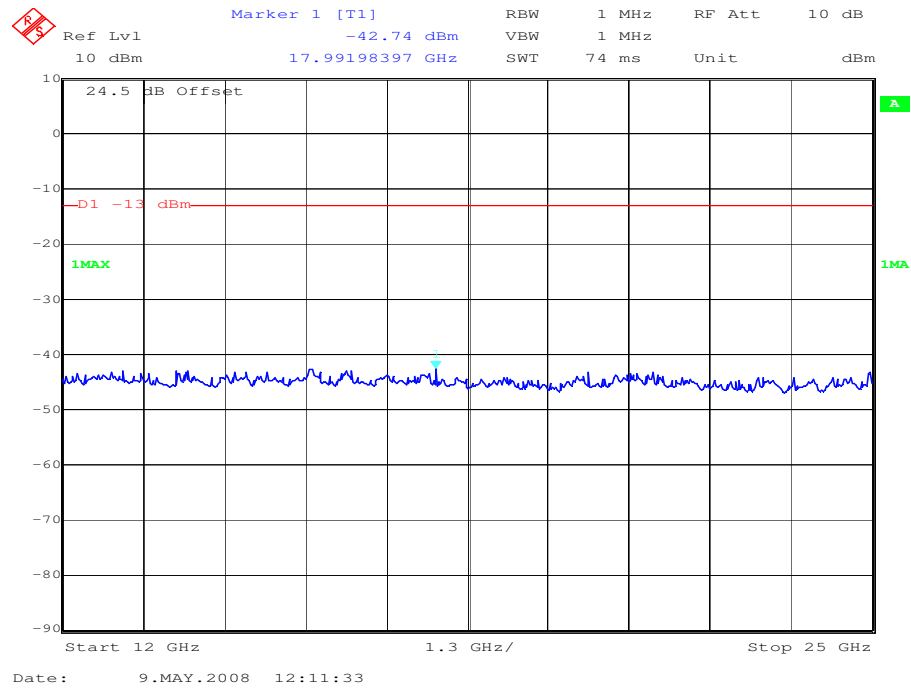
Channel 128 (4 GHz – 12.5 GHz)



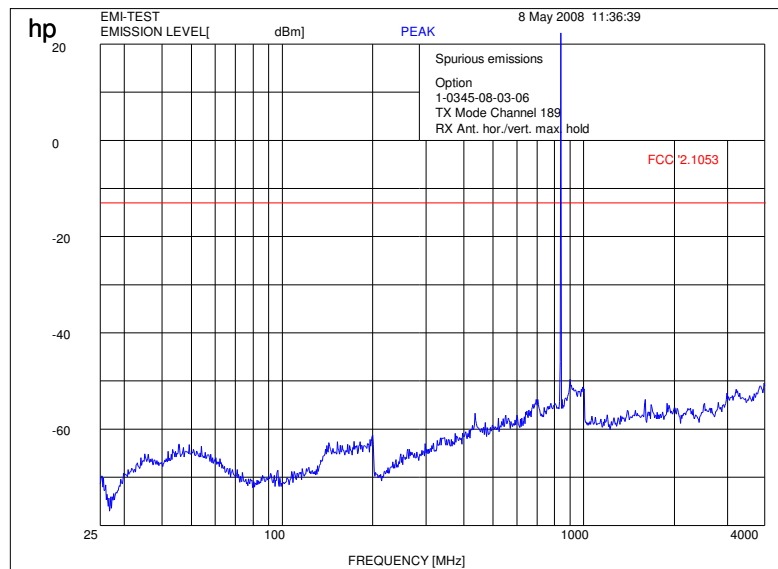
$f < 1 \text{ GHz} : \text{RBW/VBW: } 100 \text{ kHz}$

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

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



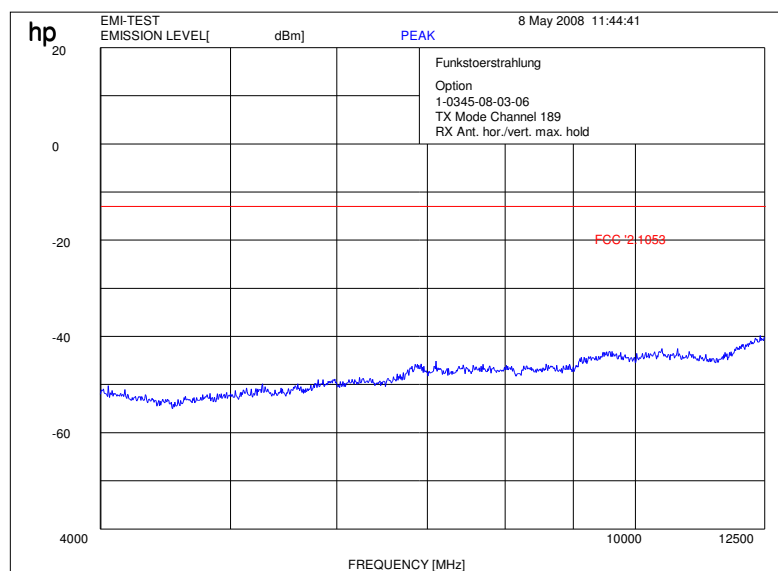
Channel 189 (30 MHz - 4 GHz)



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

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

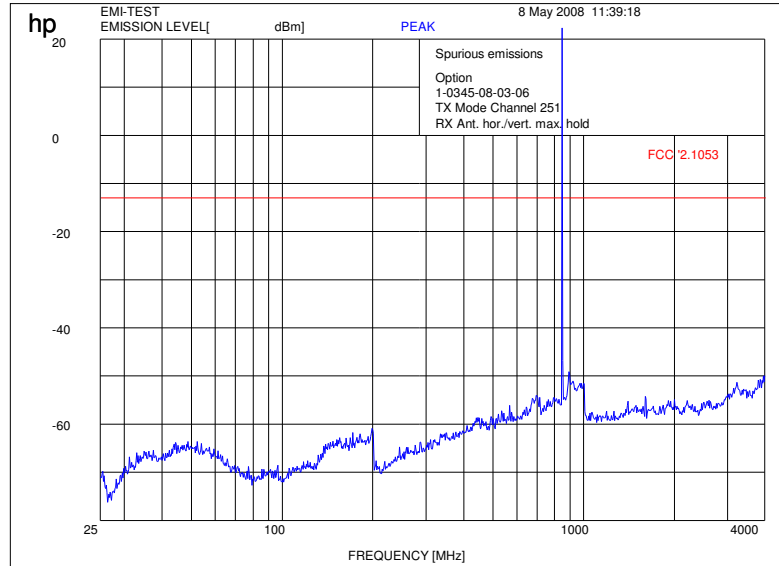
Channel 189 (4 GHz – 12.5 GHz)



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

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

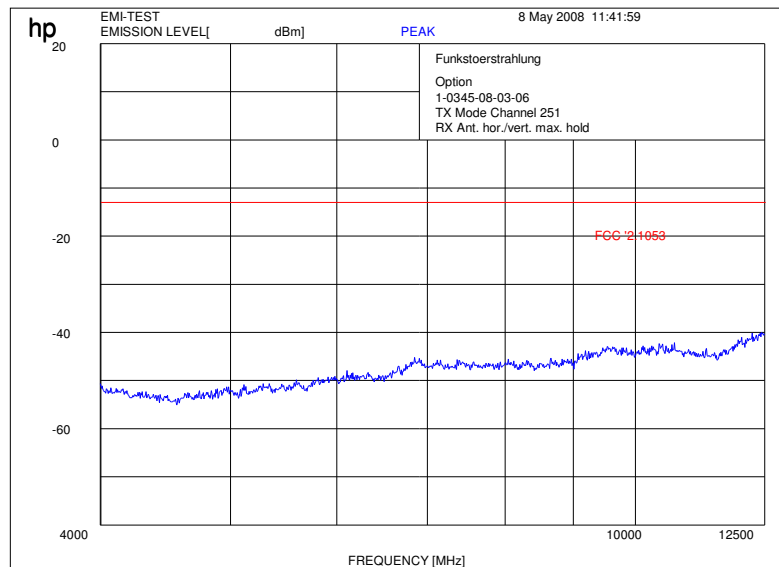
Channel 251 (30 MHz - 4 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

Channel 251 (4 GHz – 12.5 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

5.2.4 Receiver Radiated Emissions

Reference

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

Measurement Results: Radiated Emissions with 1st Laptop – IBM Type 2373 (SPQ-Testunit-29)

SPURIOUS EMISSIONS LEVEL ($\mu\text{V/m}$)								
Idle mode								
f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)
143.20	Quasipeak	22.0	-	-	-	-	-	-
195.75	Quasipeak	28.5	-	-	-	-	-	-
456.77	Quasipeak	31.8	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			± 3 dB					

$f < 1$ GHz : RBW/VBW: 100 kHz

$f \geq 1$ GHz : RBW/VBW: 1 MHz

H = Horizontal ; V= Vertical

For measurement distance see table below

Limits: § 15.109

Frequency (MHz)	Field strength (dB $\mu\text{V/m}$)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

Idle Mode (30 MHz - 1 GHz)

Information

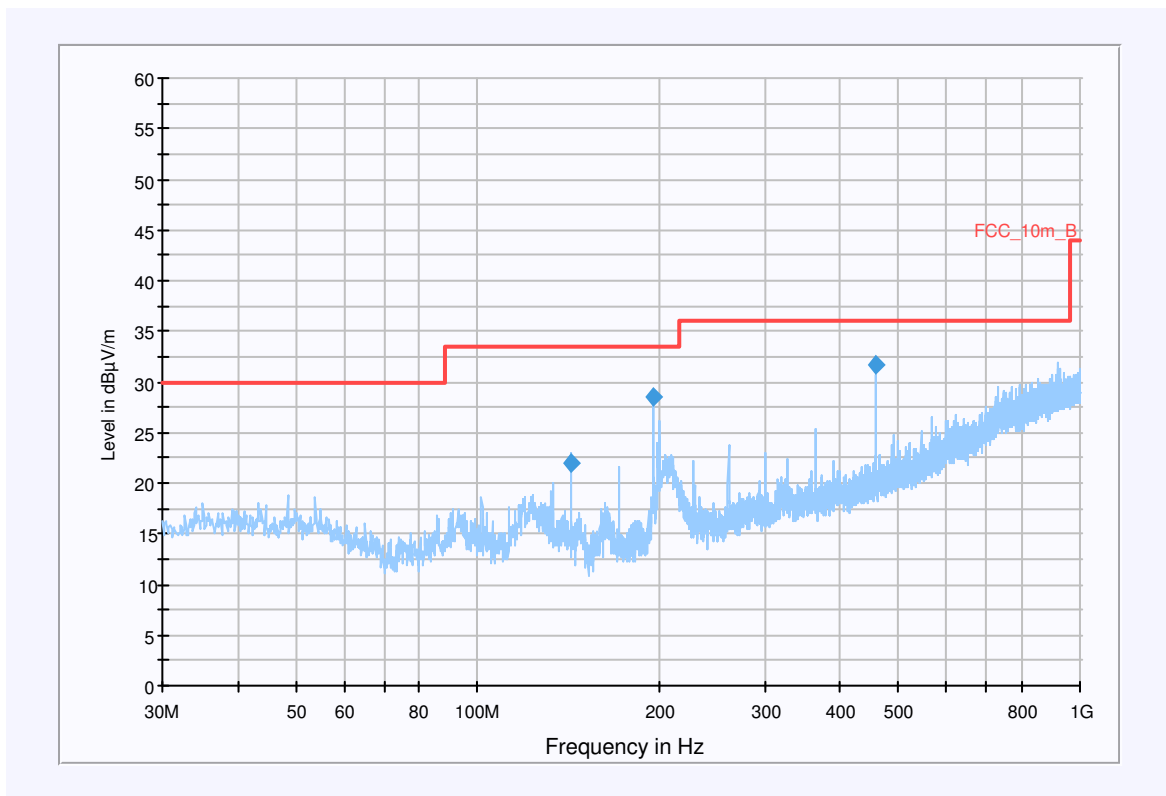
EUT: GI0401 + SPQ-TESTUNIT-29
 Serial Number: none
 Test Description: FCC class B @ 10 m
 Operating Conditions: IDLE 850
 Operator Name: WAL
 Comment: EUT connect to Notebook

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: EMI radiated\Electric Field (NOS)
 Level Unit: dB μ V/m

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

FCC_10m_FCCLIMIT(B)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
143.196300	22.0	15000.000	120.000	128.0	V	176.0	9.1	11.5	33.5	
195.746200	28.5	15000.000	120.000	100.0	V	0.0	11.6	5.0	33.5	
456.770600	31.8	15000.000	120.000	344.0	V	170.0	17.9	4.2	36.0	

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

Subrange 1

Frequency Range: 30MHz - 2GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009

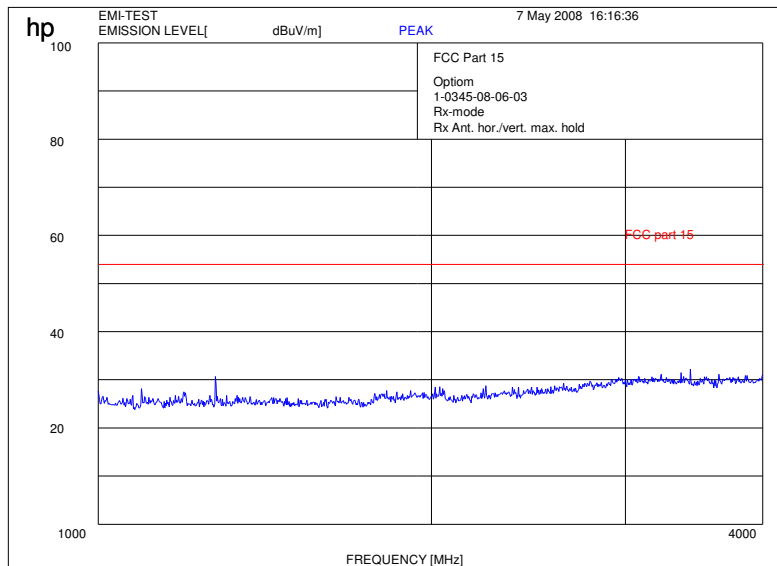
Signal Path: without Notch
FW 1.0

Antenna: VULB 9163
SN 9163-295, FW ---, CAL 08.04.2010
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table: Cabel with switch (0408)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9)

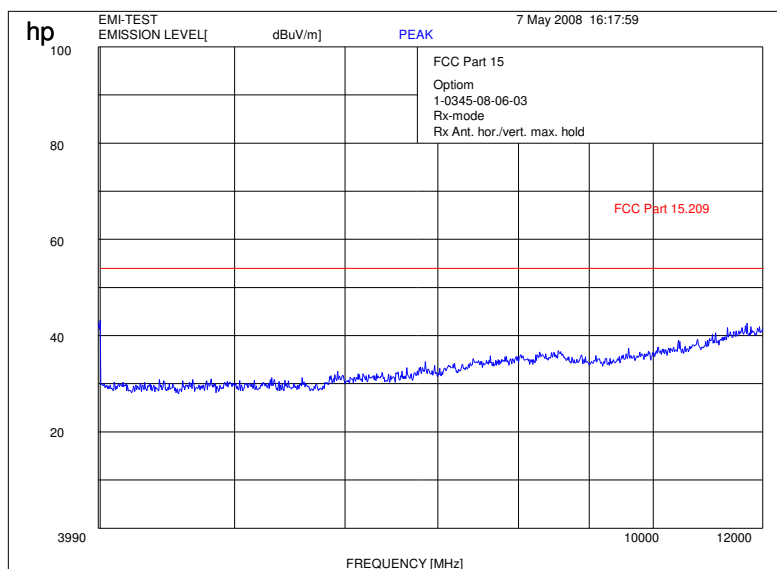
Idle Mode (1 MHz - 4 GHz)



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

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

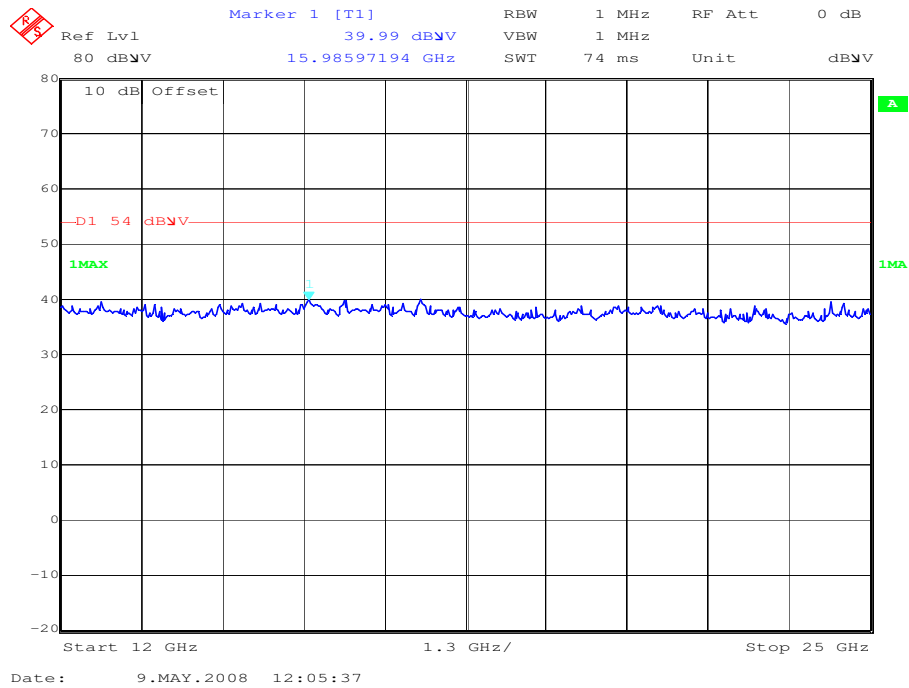
Idle Mode (4 GHz – 12.0 GHz)



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

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

Idle Mode (12 GHz - 25 GHz)



Measurement Results: Radiated Emissions with 2nd Laptop – DELL PP01X (SPQ-Testunit-47)

SPURIOUS EMISSIONS LEVEL (µV/m)								
Idle mode								
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
204.26	Quasipeak	22.9	-	-	-	-	-	-
531.60	Quasipeak	33.0	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

H = Horizontal ; V= Vertical

For measurement distance see table below

Limits: § 15.109

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

Idle Mode (30 MHz - 1 GHz)

Information

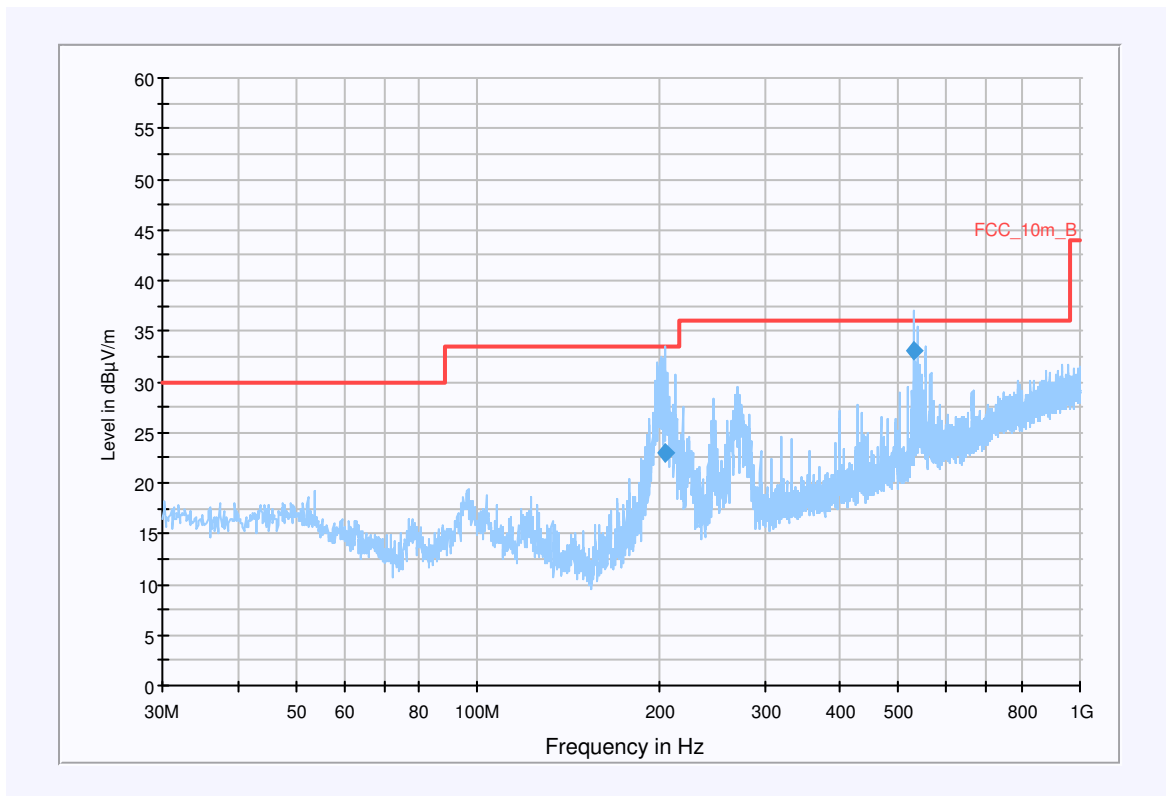
EUT: GI0401 + SPQ-TESTUNIT-47
Serial Number: none
Test Description: FCC class B @ 10 m
Operating Conditions: IDLE 850
Operator Name: WAL
Comment: EUT connect to notebook

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: EMI radiated\Electric Field (NOS)
Level Unit: dB μ V/m

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

FCC_10m_FCCLIMIT(B)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
204.262400	22.9	15000.000	120.000	150.0	V	60.0	12.1	10.6	33.5	
531.595400	33.0	15000.000	120.000	140.0	H	220.0	19.3	3.0	36.0	

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

Subrange 1

Frequency Range: 30MHz - 2GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009

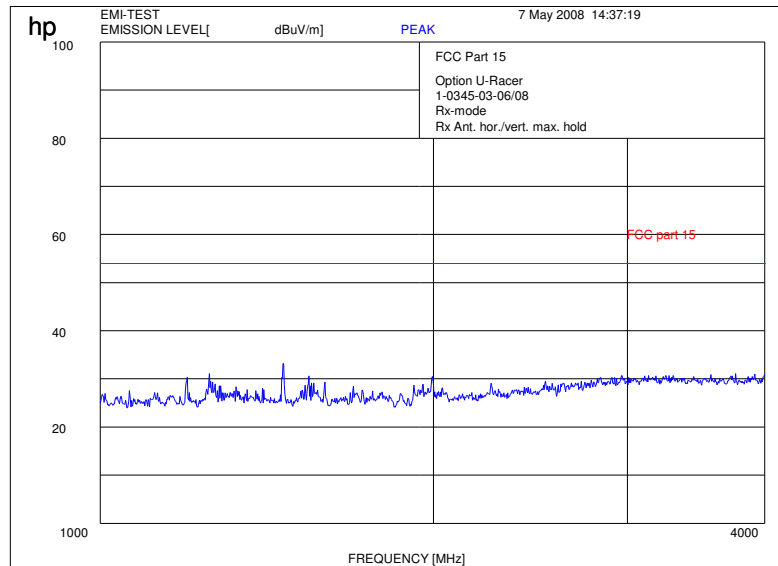
Signal Path: without Notch
FW 1.0

Antenna: VULB 9163
SN 9163-295, FW ---, CAL 08.04.2010
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table: Cabel with switch (0408)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9)

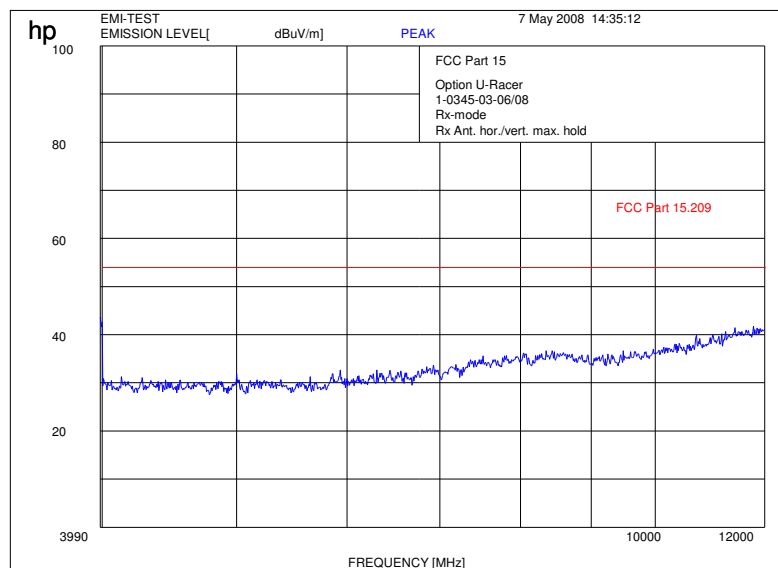
Idle Mode (1 MHz - 4 GHz)



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

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

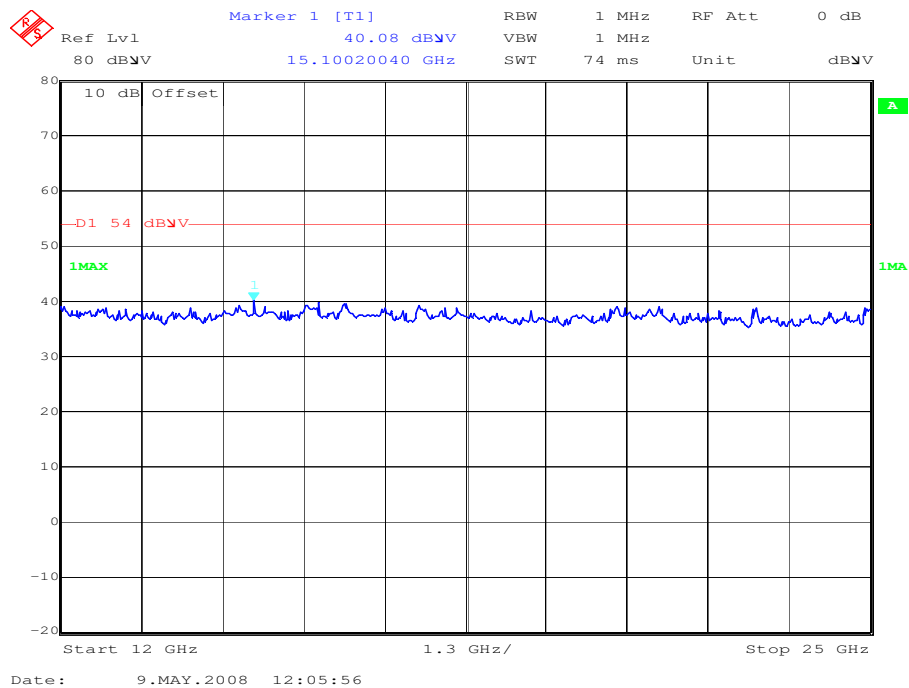
Idle Mode (4 GHz – 12.0 GHz)



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

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

Idle Mode (12 GHz - 25 GHz)



Measurement Results: Radiated Emissions with 3rd Laptop – Fujitsu/Siemens AmiloPro (SPQ-Testunit-193)

SPURIOUS EMISSIONS LEVEL ($\mu\text{V/m}$)								
Idle mode								
f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)
166.65	Quasipeak	21.7	-	-	-	-	-	-
497.74	Quasipeak	22.2	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			± 3 dB					

$f < 1$ GHz : RBW/VBW: 100 kHz

$f \geq 1$ GHz : RBW/VBW: 1 MHz

H = Horizontal ; V= Vertical

For measurement distance see table below

Limits: § 15.109

Frequency (MHz)	Field strength (dB $\mu\text{V/m}$)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

Idle Mode (30 MHz - 1 GHz)

Information

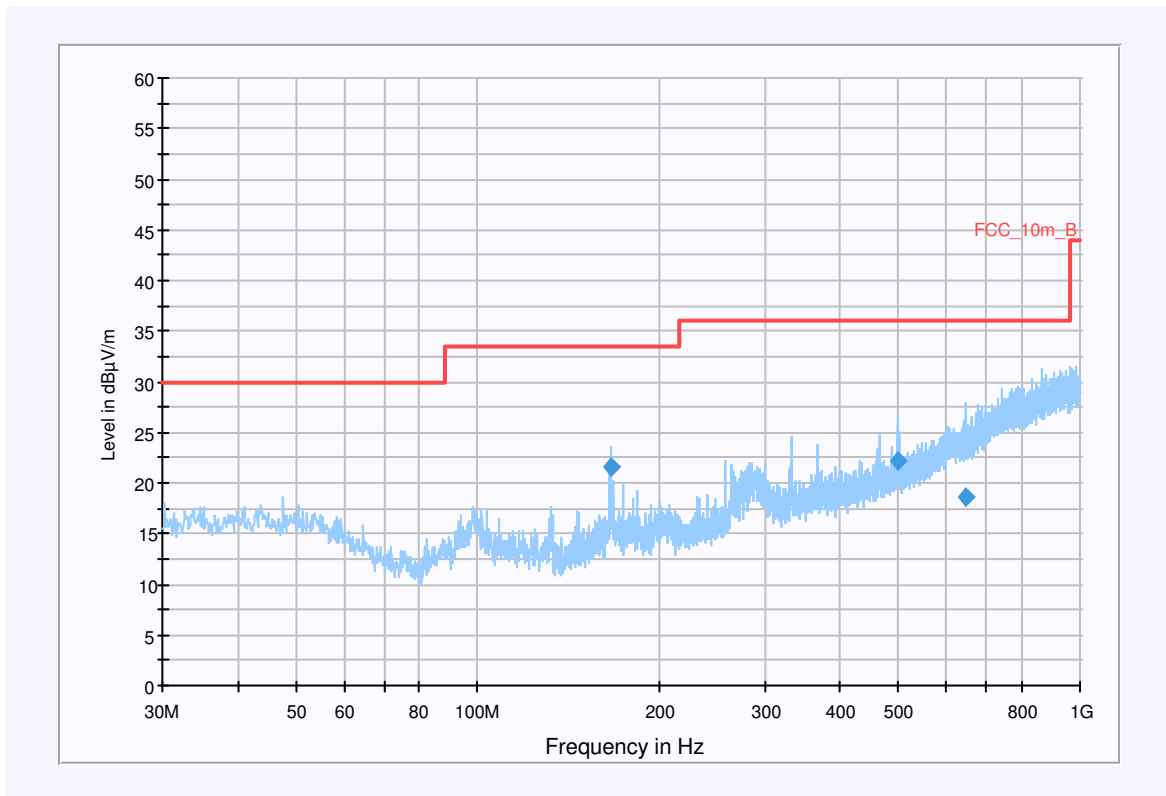
EUT: GI0401 + SPQ-TESTUNIT-193
 Serial Number: none
 Test Description: FCC class B @ 10 m
 Operating Conditions: IDLE 850
 Operator Name: WAL
 Comment: EUT connect to notebook

Scan Setup: STAN_Fin [EMI radiated]

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

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

FCC_10m_FCCLIMIT(B)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
166.654450	21.7	15000.000	120.000	115.0	V	229.0	9.9	11.8	33.5	
497.743200	22.2	15000.000	120.000	100.0	V	49.0	18.8	13.8	36.0	
645.577650	18.7	15000.000	120.000	150.0	V	218.0	21.4	17.3	36.0	

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

Subrange 1

Frequency Range: 30MHz - 2GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009

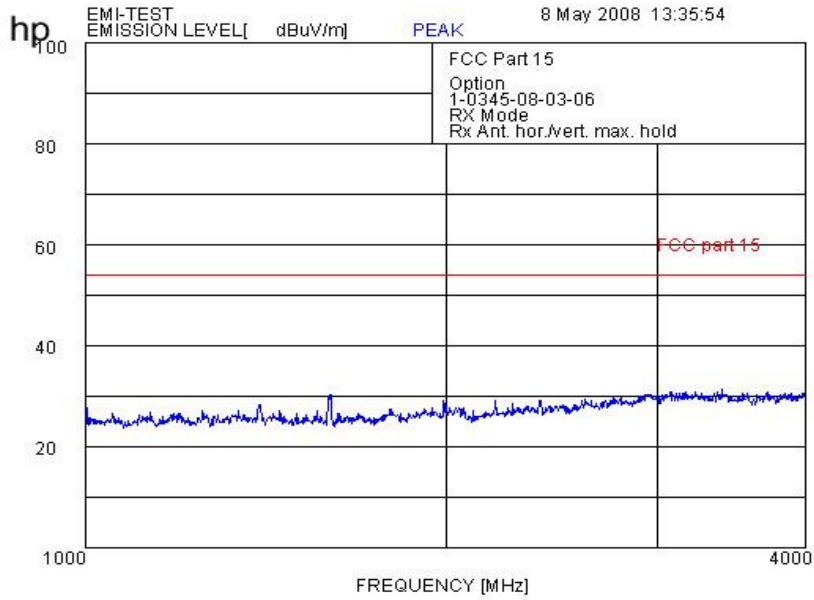
Signal Path: without Notch
FW 1.0

Antenna: VULB 9163
SN 9163-295, FW ---, CAL 08.04.2010
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table: Cabel with switch (0408)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9)

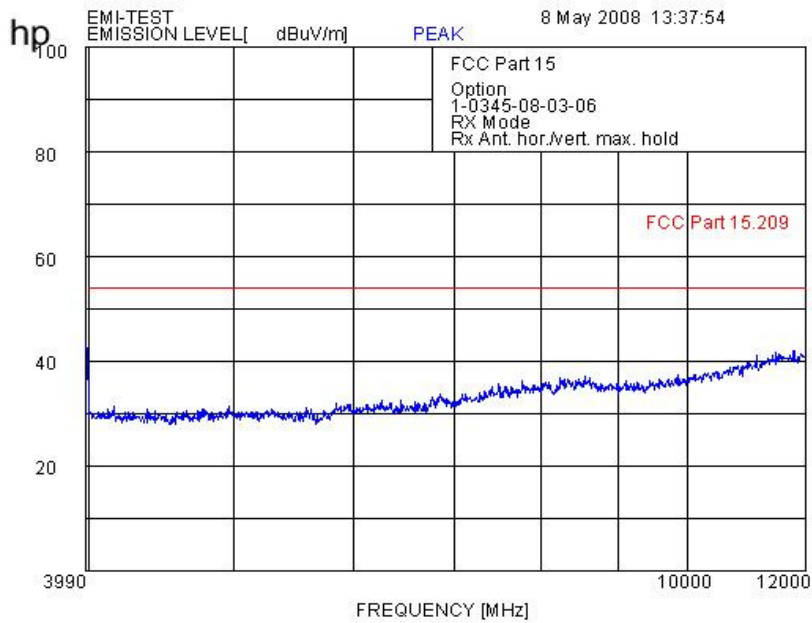
Idle Mode (1 MHz - 4 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

Idle Mode (4 GHz – 12.0 GHz)



f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW / VBW 1 MHz

5.2.5 Conducted Spurious Emissions

Reference

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

Measurement Procedure

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

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

USPCS Transmitter Channel Frequency

128 824.2 MHz

189 836.4 MHz

251 848.8 MHz

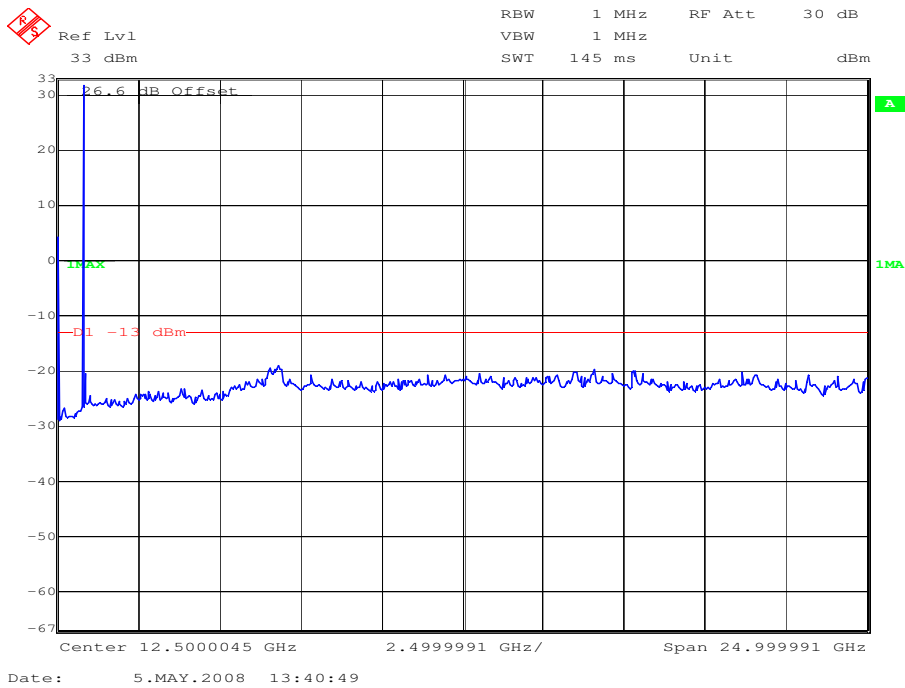
Measurement Limit

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

Measurement Results

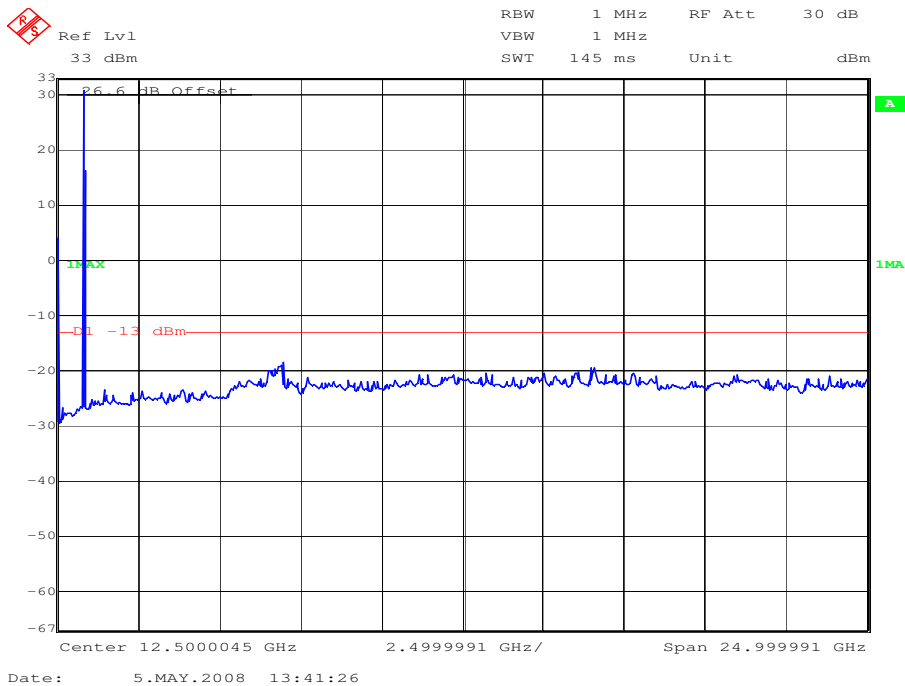
Harmonic	Tx ch.- 128	Level (dBm)	Tx ch.- 189	Level (dBm)	Tx ch.- 251	Level (dBm)
	Freq. (MHz)		Freq. (MHz)		Freq. (MHz)	
2	1648.4	-	1672.8	-	1697.6	-
3	2472.6	-	2509.2	-	2546.4	-
4	3296.8	-	3345.6	-	3395.2	-
5	4121.0	-	4182.0	-	4244.0	-
6	4945.2	-	5018.4	-	5092.8	-
7	5769.4	-	5854.8	-	5941.6	-
8	6593.6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

Channel: 128



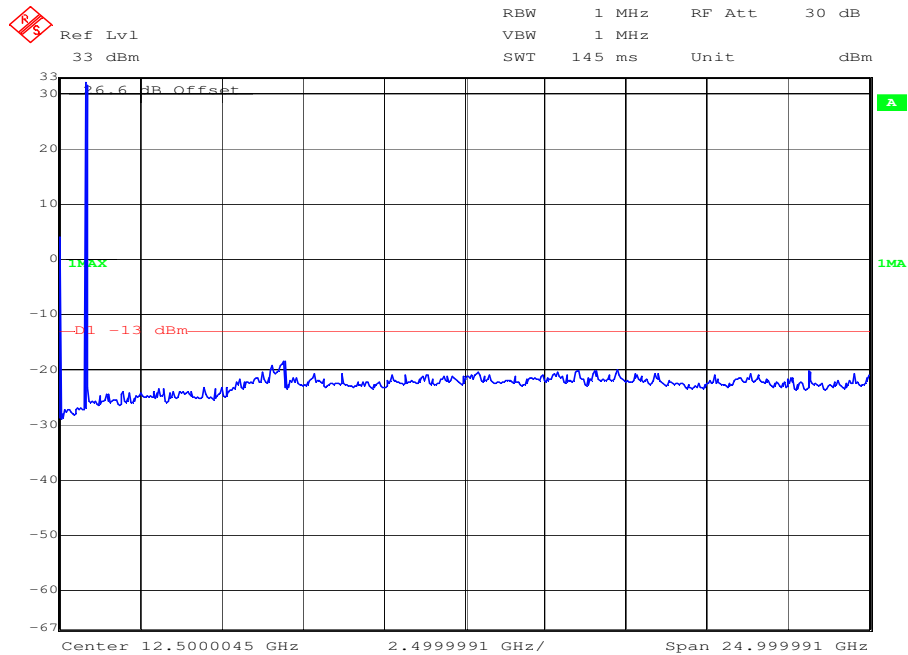
The peak at the beginning of the Plot is the LO from the measuring spectrum Analyzer and not from the EUT.

Channel 189



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

Channel 251



Date: 5.MAY.2008 13:42:06

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

5.2.6 Block Edge Compliance

Reference

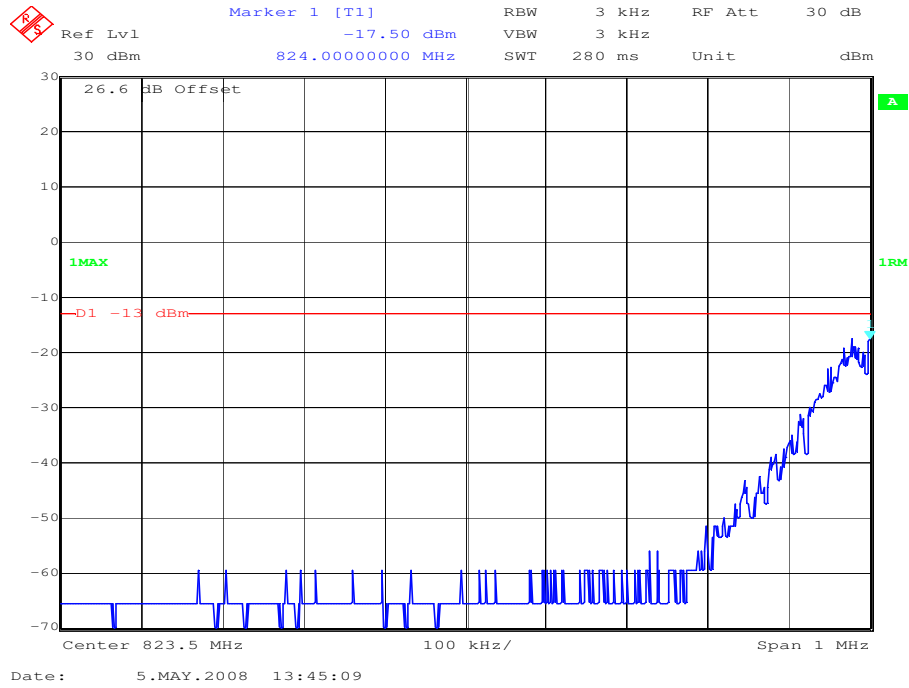
FCC:	CFR Part 22.917
IC:	RSS 132, Issue 2, Section 6.5

Measurement Limit:

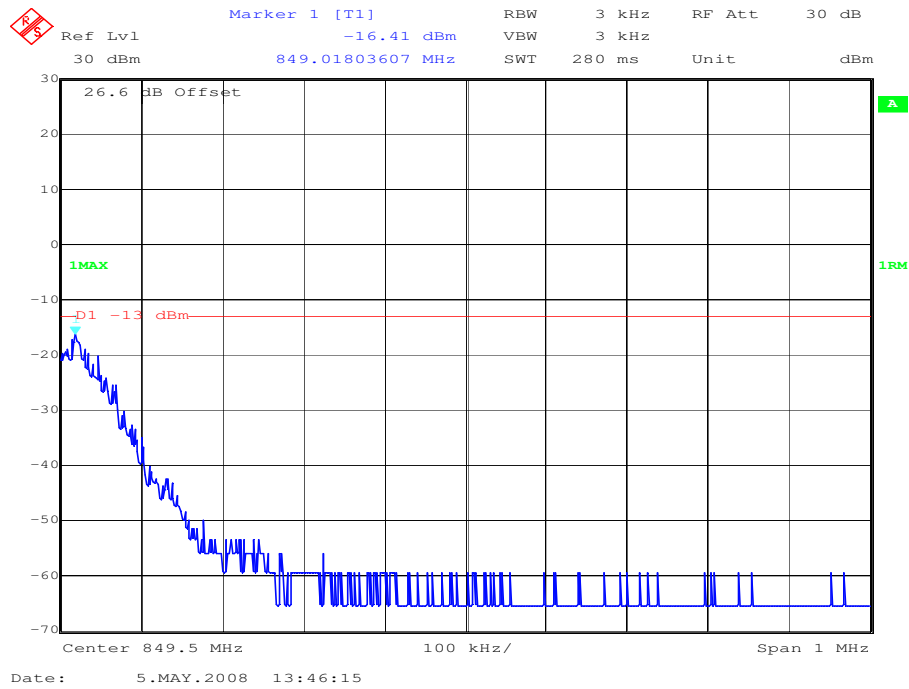
Sec. 22.917(b) Emission Limits.

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

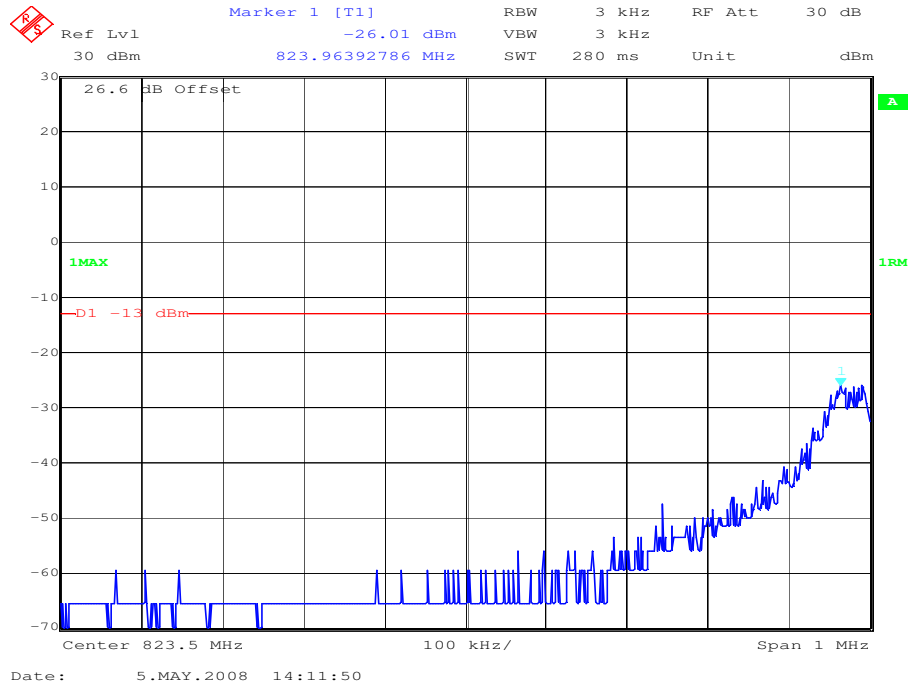
Block 1 Channel 128



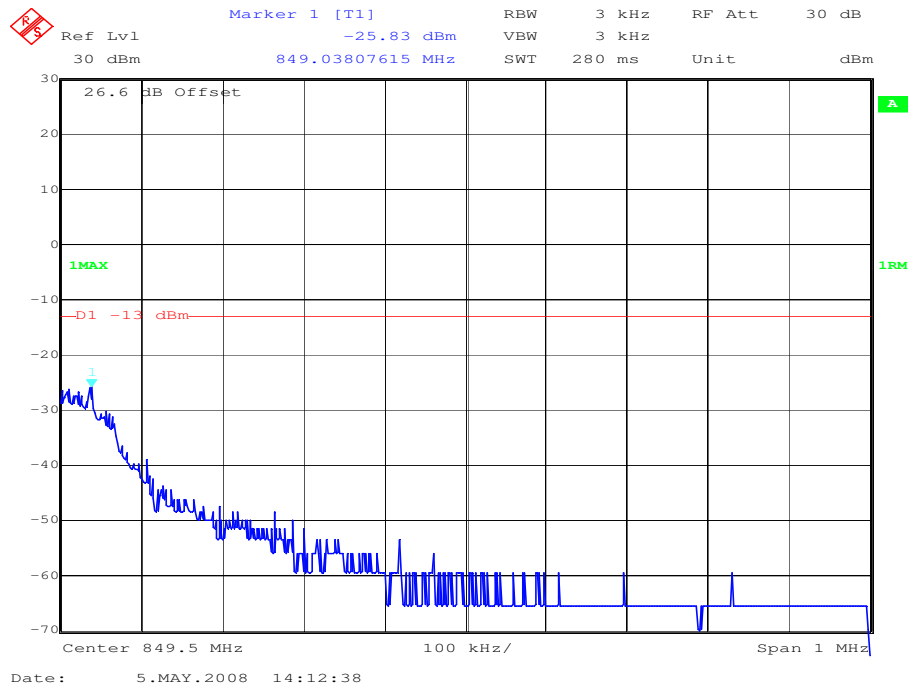
Block 4 Channel 251



Block 1 Channel 128 (EDGE)



Block 4 Channel 251 (EDGE)



5.2.7 Occupied Bandwidth

Reference

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

Occupied Bandwidth Results

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

Normal mode

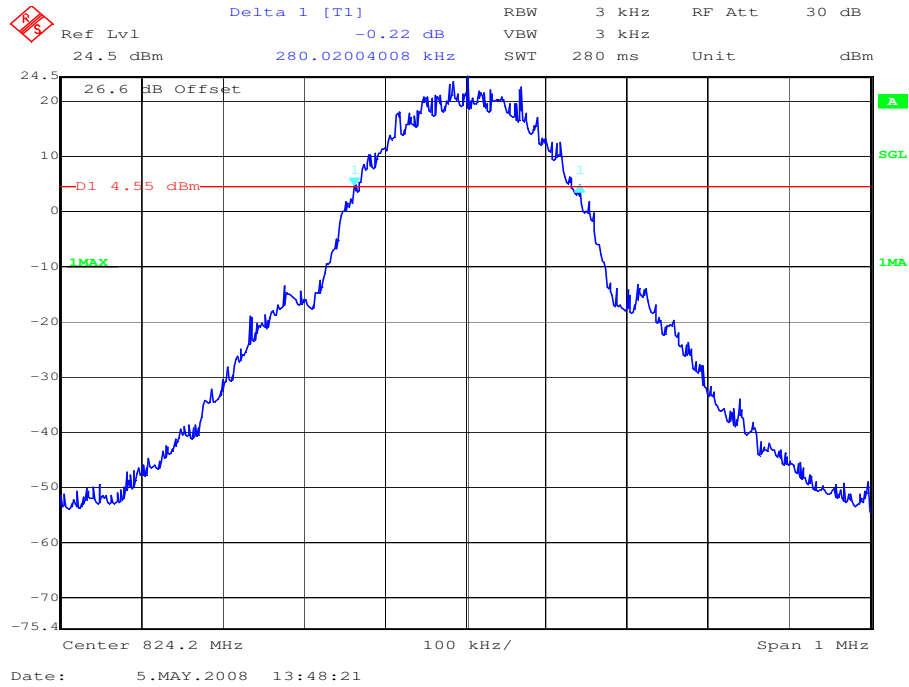
Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
824.2 MHz	280.02	318.02
836.4 MHz	282.04	318.04
848.8 MHz	280.04	320.00

EDGE mode

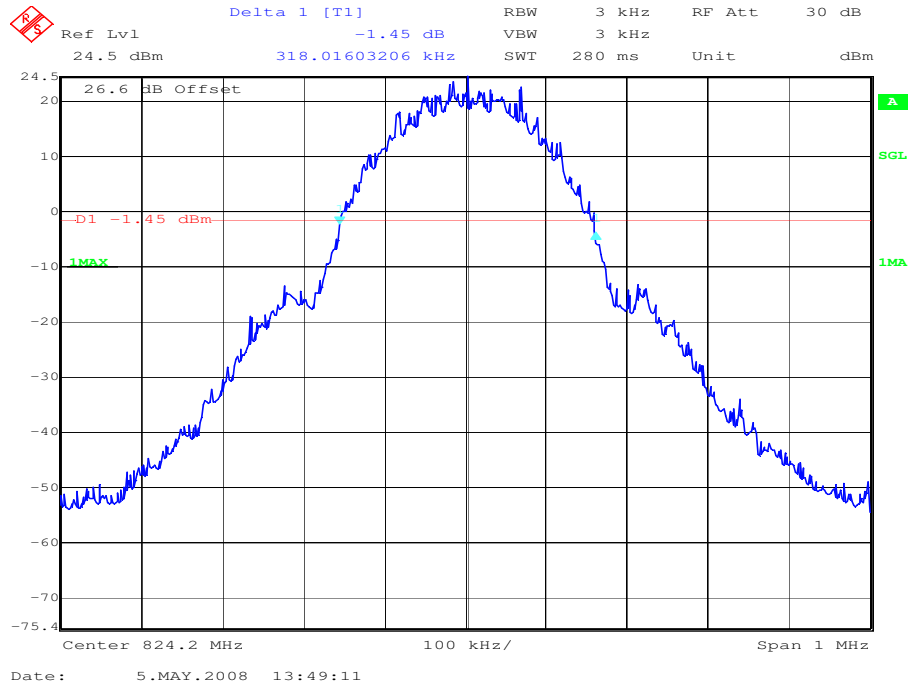
Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
824.2 MHz	306.01	322.00
836.4 MHz	298.02	318.00
848.8 MHz	298.00	334.01

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

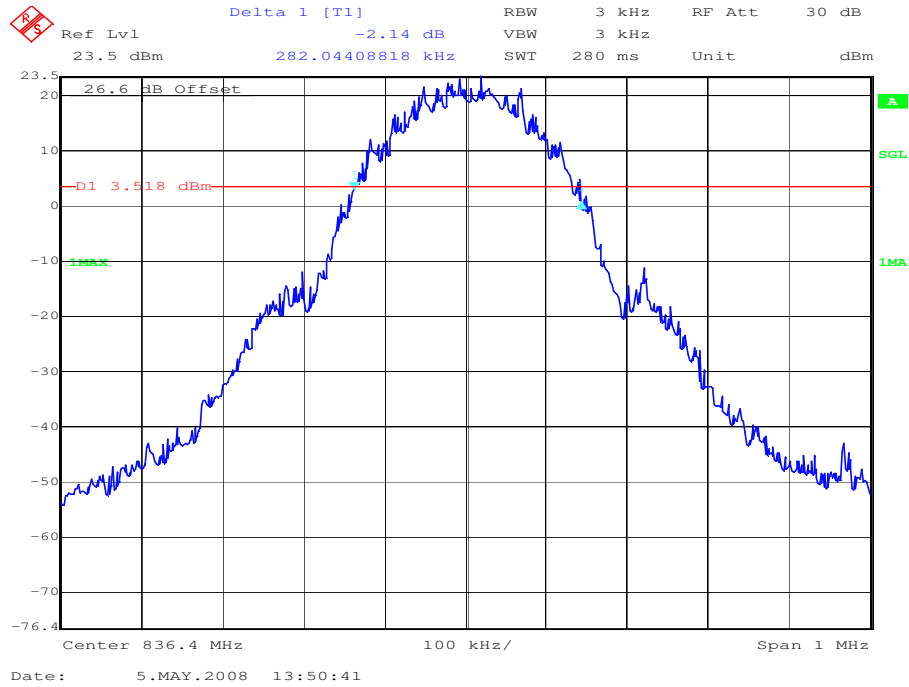


Channel 128
-26 dBc Bandwidth



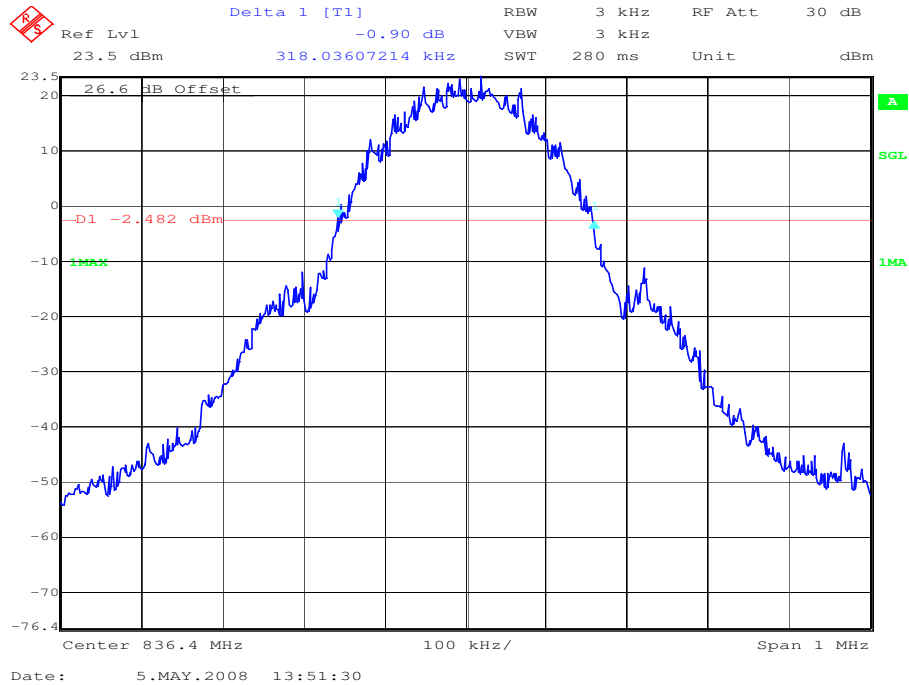
Channel 189

99% (-20 dB) Occupied Bandwidth

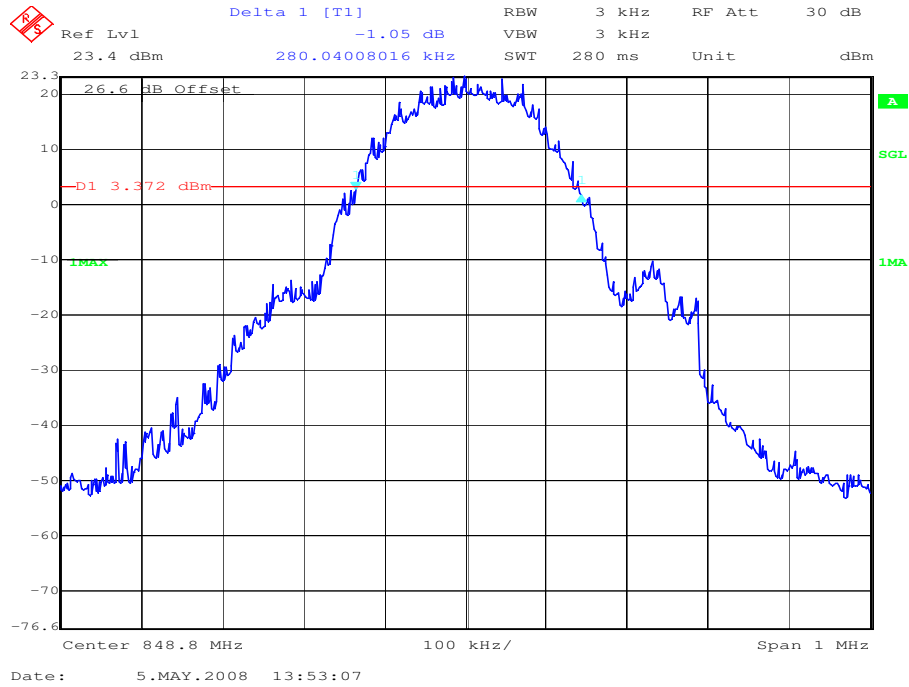


Channel 189

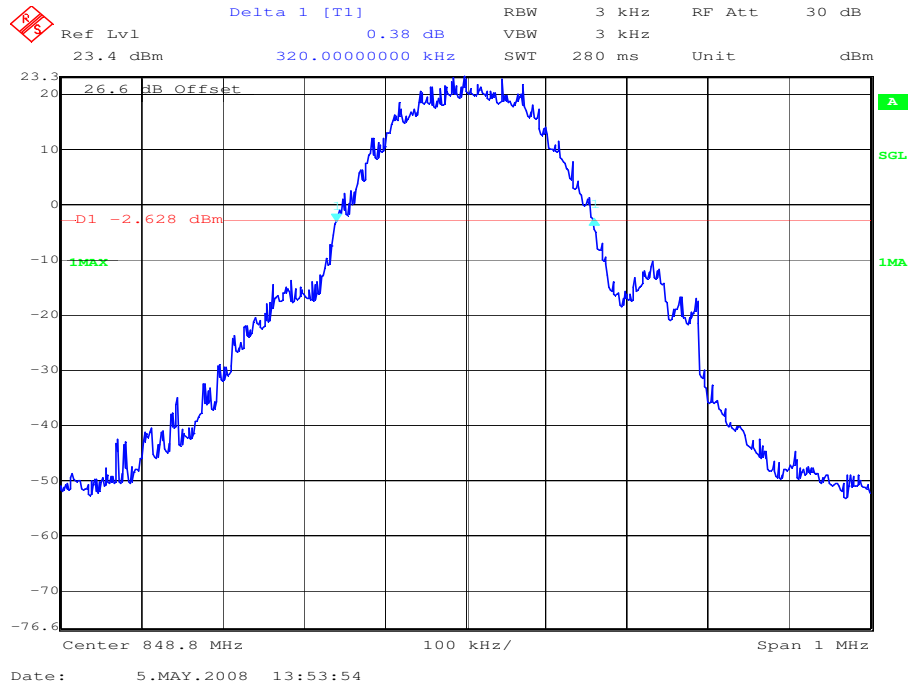
-26 dBc Bandwidth



Channel 251
99% (-20 dB) Occupied Bandwidth

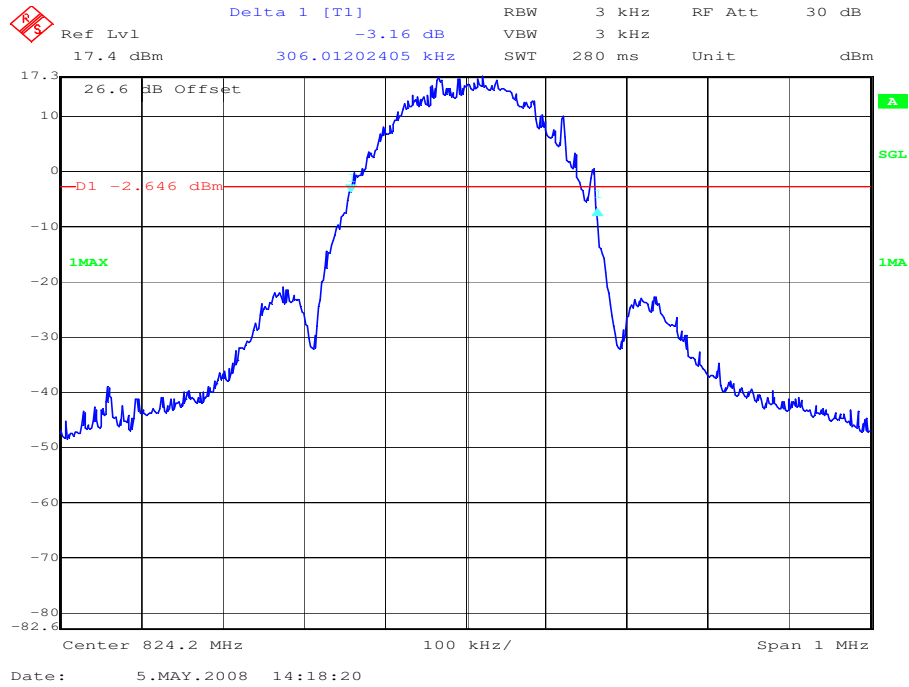


Channel 251
-26 dBc Bandwidth



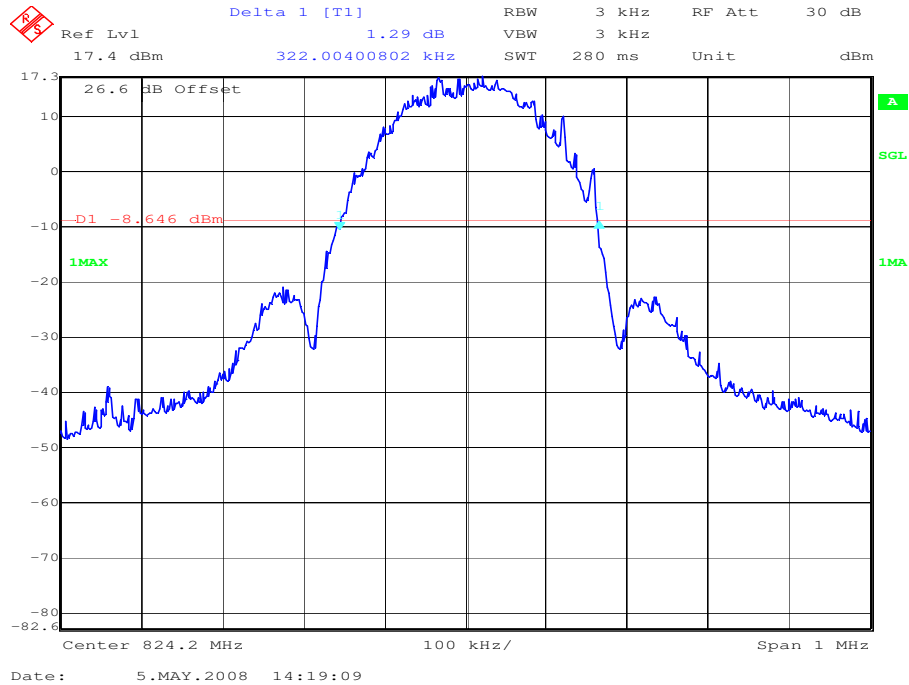
Channel 128 (EDGE)

99% (-20 dB) Occupied Bandwidth



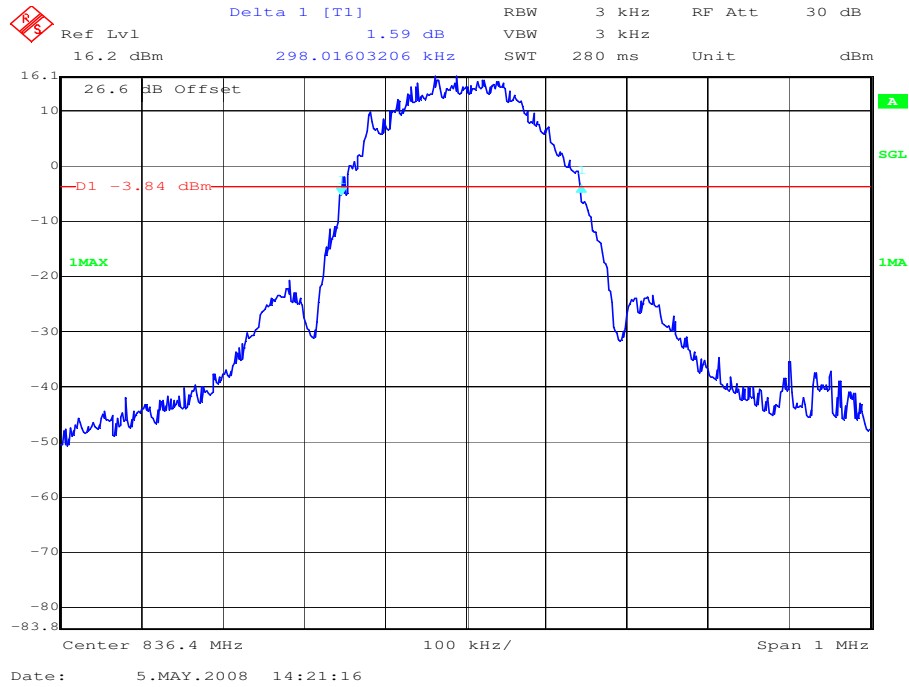
Channel 128 (EDGE)

-26 dBc Bandwidth



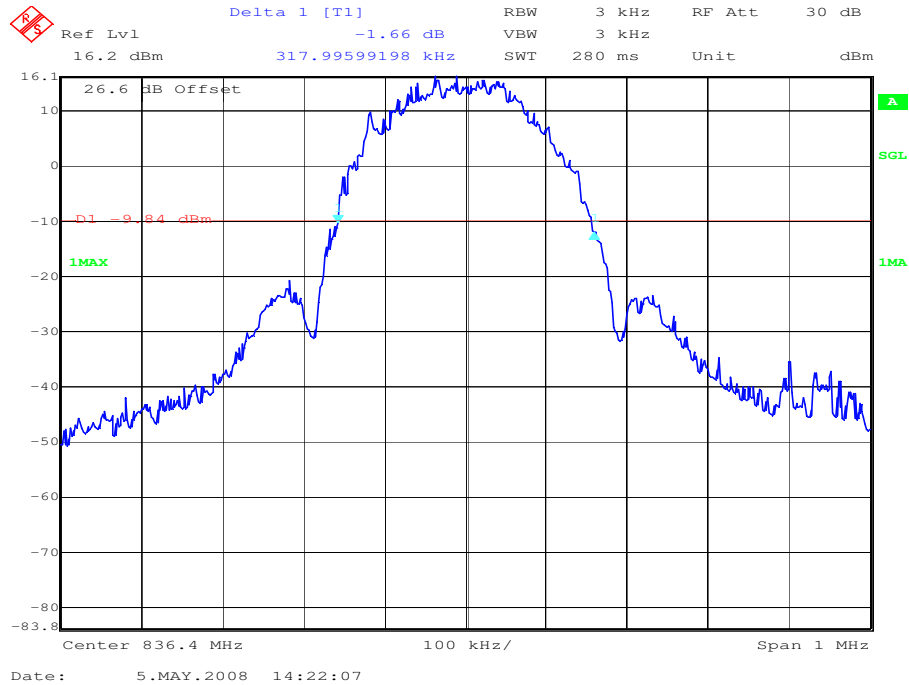
Channel 189 (EDGE)

99% (-20 dB) Occupied Bandwidth

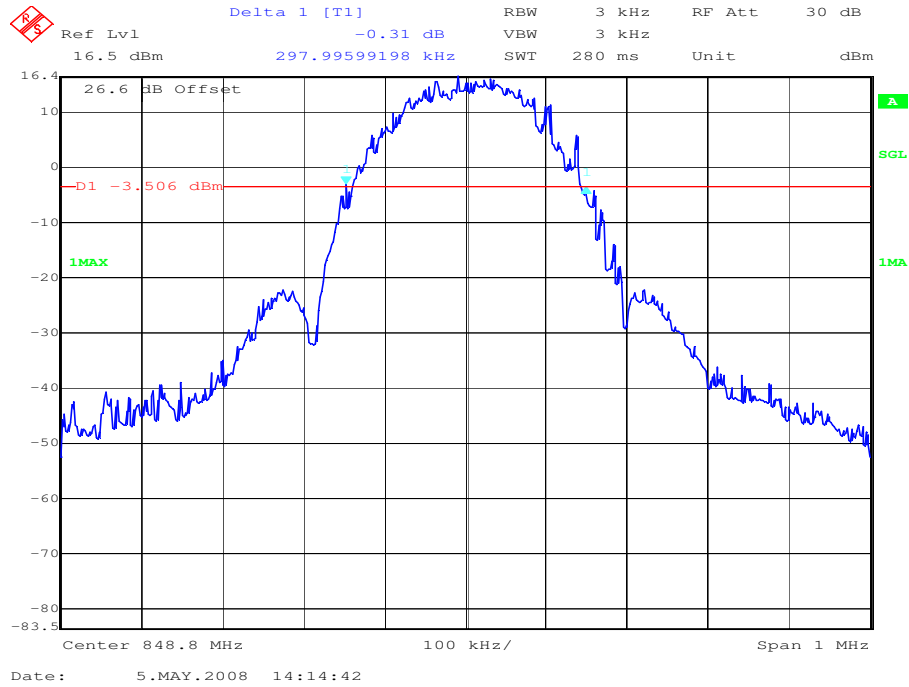


Channel 189 (EDGE)

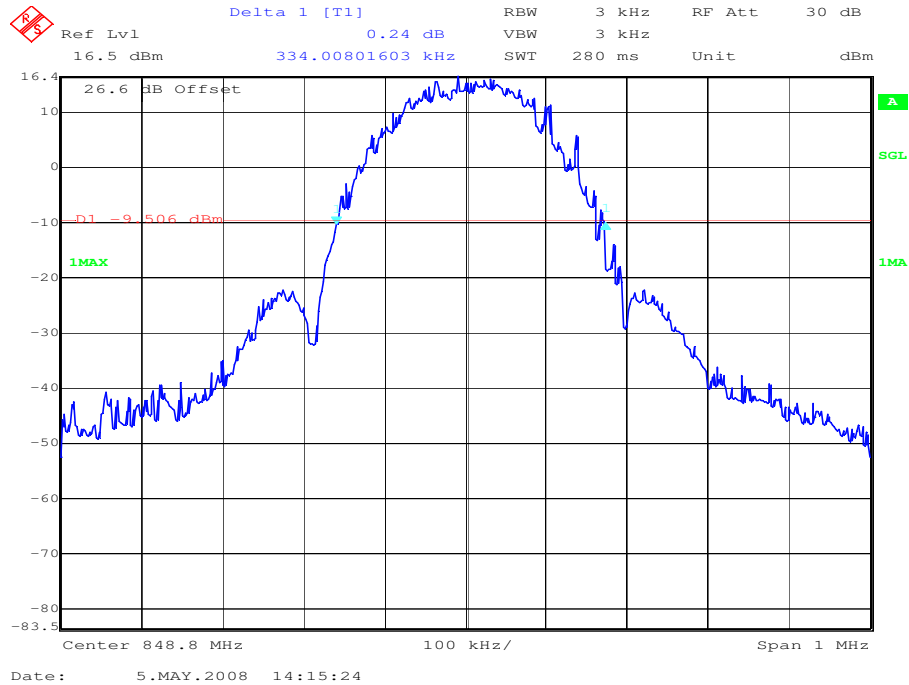
-26 dBc Bandwidth



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



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



5.1 PART UMTS Band II

5.1.1 RF Power Output

Reference

FCC:	CFR Part 24.232, 2.1046
IC:	RSS 133, Issue 3, Section 4.3

Summary:

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

Method of Measurements:

The mobile was set up for the max. output power with pseudo random data modulation.

The power was measured with R&S CMU 200 (peak and average)

These measurements were done at 3 frequencies, 1852.4 MHz, 1880.0 MHz and 1907.6 MHz (bottom, middle and top of operational frequency range).

WCDMA 1900 (RMC 12.2 kBit/s)		
Channel / frequency	Max. RMS	Peak
9262 / 1852.4 MHz	22.23 dBm	25.49 dBm
9400 / 1880.0 MHz	22.80 dBm	25.97 dBm
9538 / 1907.6 MHz	22.70 dBm	25.55 dBm

Table 1: Test results conducted peak power measurement WCDMA

WCDMA + HSDPA 1900			
Channel / frequency	sub-test	Max. RMS	Peak
9262 / 1852.4 MHz	1	22.36 dBm	25.75 dBm
9400 / 1880.0 MHz	1	22.78 dBm	25.98 dBm
9538 / 1907.6 MHz	1	22.69 dBm	25.52 dBm
9262 / 1852.4 MHz	2	22.01 dBm	25.41 dBm
9400 / 1880.0 MHz	2	22.41 dBm	25.57 dBm
9538 / 1907.6 MHz	2	22.33 dBm	25.09 dBm
9262 / 1852.4 MHz	3	21.47 dBm	24.73 dBm
9400 / 1880.0 MHz	3	21.55 dBm	24.88 dBm
9538 / 1907.6 MHz	3	21.56 dBm	24.40 dBm
9262 / 1852.4 MHz	4	21.68 dBm	24.92 dBm
9400 / 1880.0 MHz	4	21.69 dBm	25.01 dBm
9538 / 1907.6 MHz	4	21.73 dBm	25.08 dBm

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

WCDMA + HSDPA + HSUPA 1900			
Channel / frequency	Sub-test	Max. RMS	Peak
9262 / 1852.4 MHz	1	22.30 dBm	25.85 dBm
9400 / 1880.0 MHz	1	22.86 dBm	26.33 dBm
9538 / 1907.6 MHz	1	22.63 dBm	25.96 dBm
9262 / 1852.4 MHz	2	21.96 dBm	25.48 dBm
9400 / 1880.0 MHz	2	22.51 dBm	25.97 dBm
9538 / 1907.6 MHz	2	22.29 dBm	25.54 dBm
9262 / 1852.4 MHz	3	21.60 dBm	25.21 dBm
9400 / 1880.0 MHz	3	22.18 dBm	25.70 dBm
9538 / 1907.6 MHz	3	21.98 dBm	25.28 dBm
9262 / 1852.4 MHz	4	21.92 dBm	25.39 dBm
9400 / 1880.0 MHz	4	22.46 dBm	25.97 dBm
9538 / 1907.6 MHz	4	22.31 dBm	25.53 dBm
9262 / 1852.4 MHz	5	22.28 dBm	25.77 dBm
9400 / 1880.0 MHz	5	22.82 dBm	26.31 dBm
9538 / 1907.6 MHz	5	22.64 dBm	25.89 dBm

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

Remark : values in bold letters represent the subtest with maximum output power, which was compared to the standard WCDMA set-up to decide which modes need to be tested

5.1.1.1 Test set-up requirements according to 3GPP 34.121

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

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	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 3: Subtests for UMTS Release 5 HSDPA

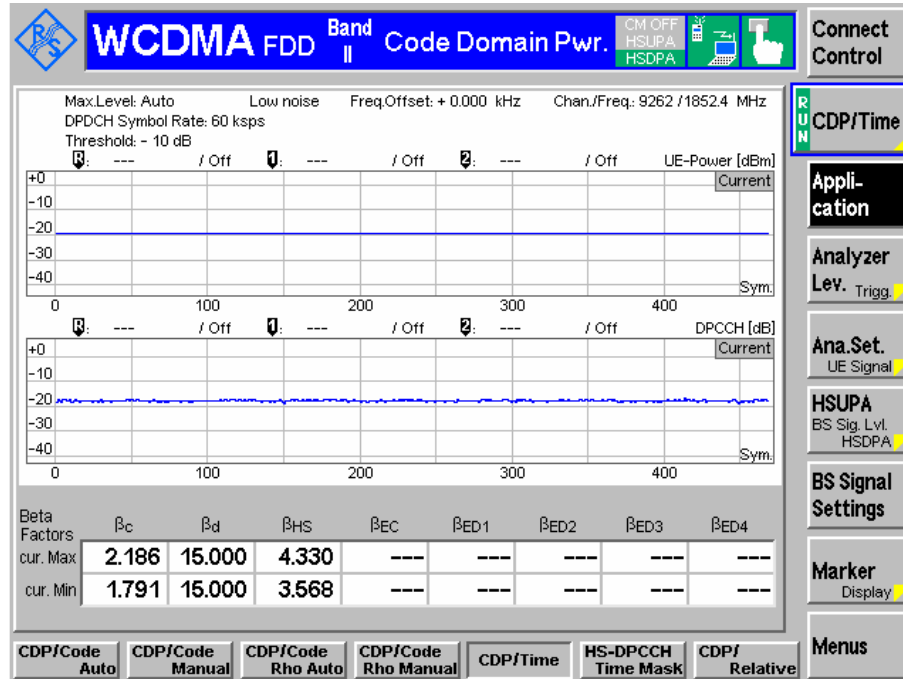
They were tested using the following settings for HSDPA FRC + H-Set 1 QPSK (see table C.8.1.1 of 3GPP 34.121)

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

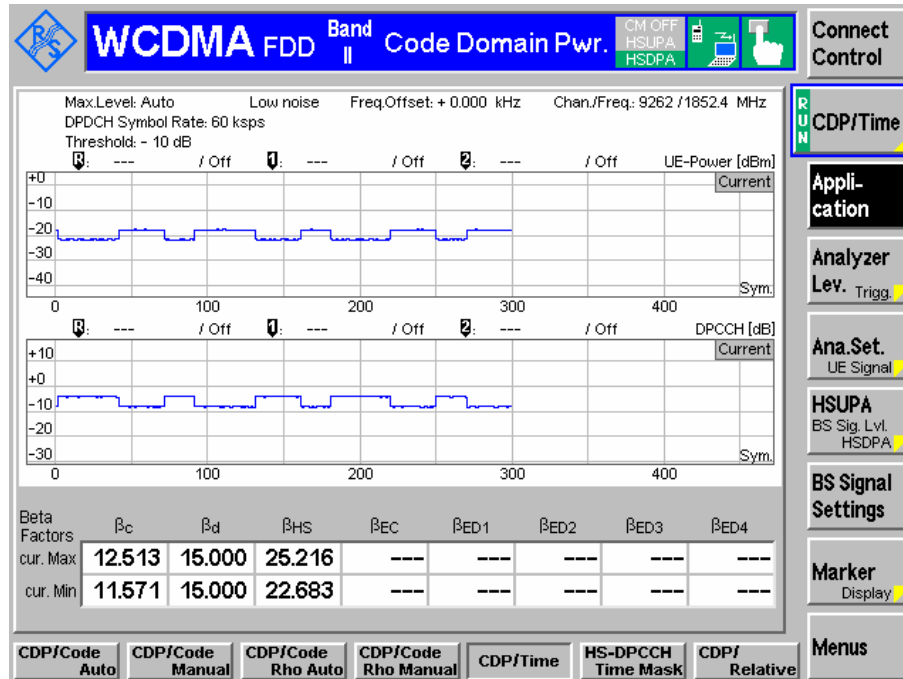
Table 4: settings of required H-Set 1 QPSK in HSDPA mode

Screenshots beta factors for HSDPA Subtests 1 to 4

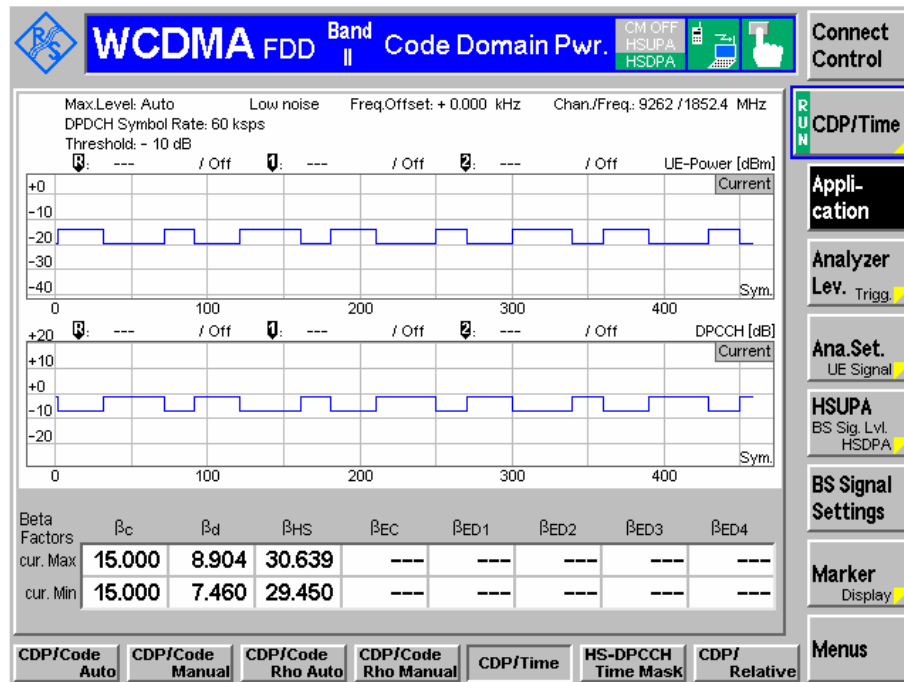
Subtest 1:



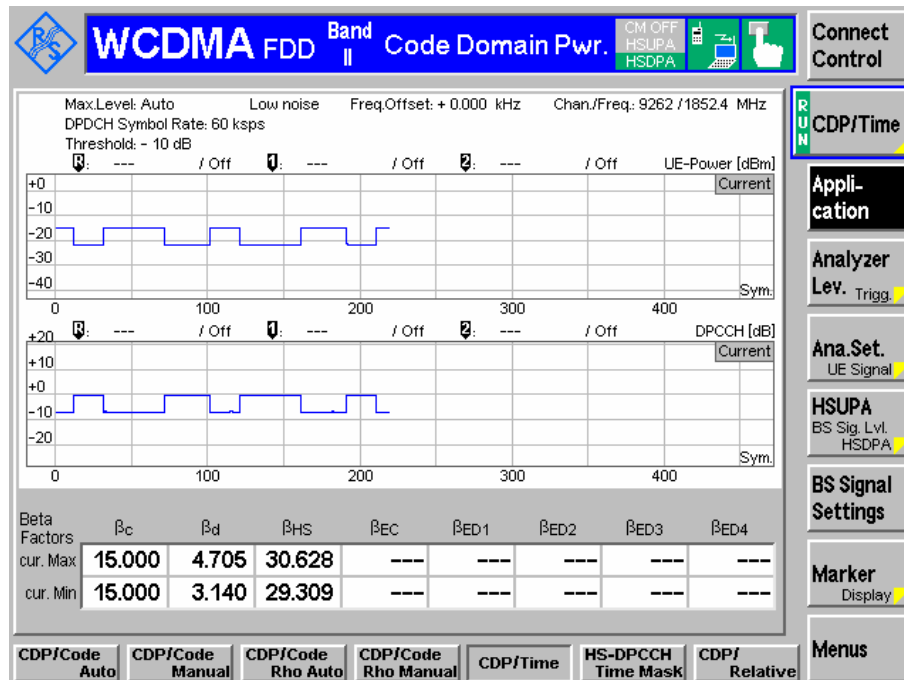
Subtest 2:



Subtest 3:



Subtest 4:



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
							$\beta_{ed1}:47/15$						
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed2}:47/15$	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 5: Subtests for UMTS Release 6 HSUPA

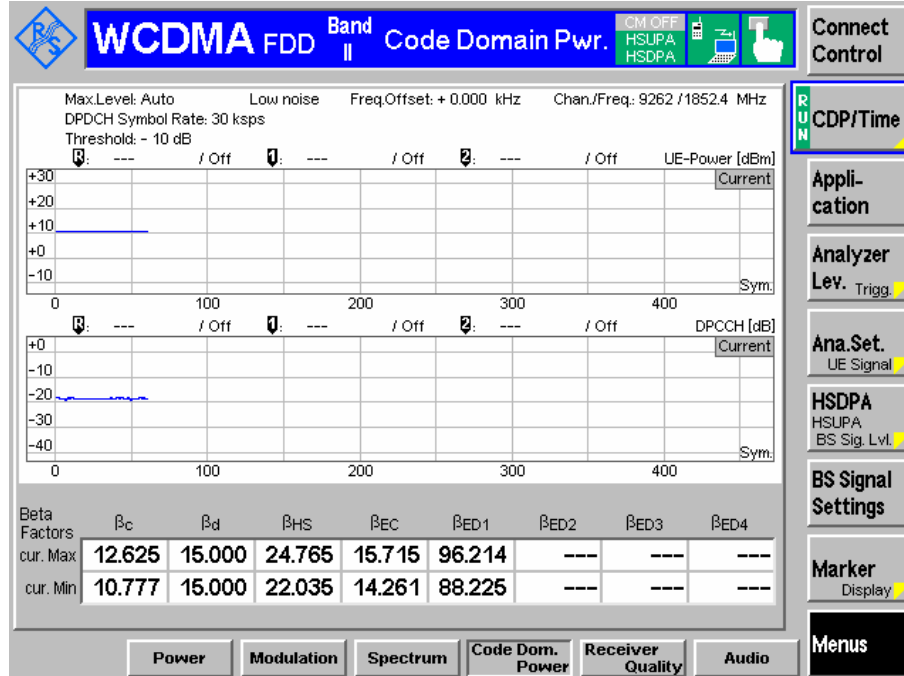
Some HSUPA sub test settings of parameters defined in the table above cannot be set directly. Instead $\Delta_{E-DPCCH}$, Reference E-TFCI and Reference E-TFCI Power Offset were set according to table 5.2B.2 of 3GPP 34.121, and CMU200 operating manual instructions of firmware V4x50.a11 were followed to reach a test condition with maximum output power and one E-TFCI.

Limits:

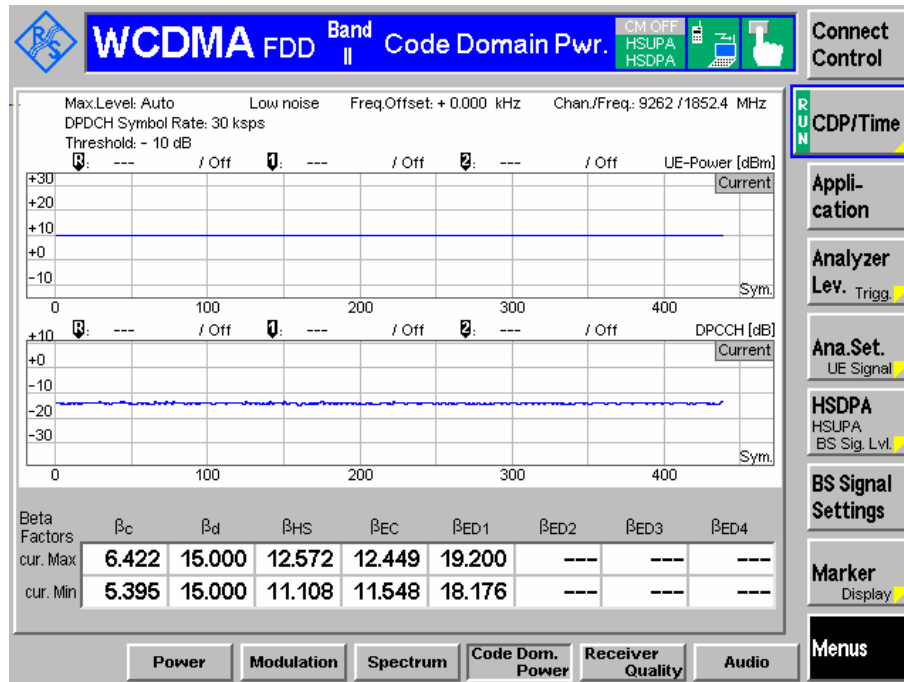
Power Step	Nominal Peak Output Power (dBm)	Tolerance (dB)
0	+30	± 2

Screenshots beta factors for HSDPA Subtests 1 to 5

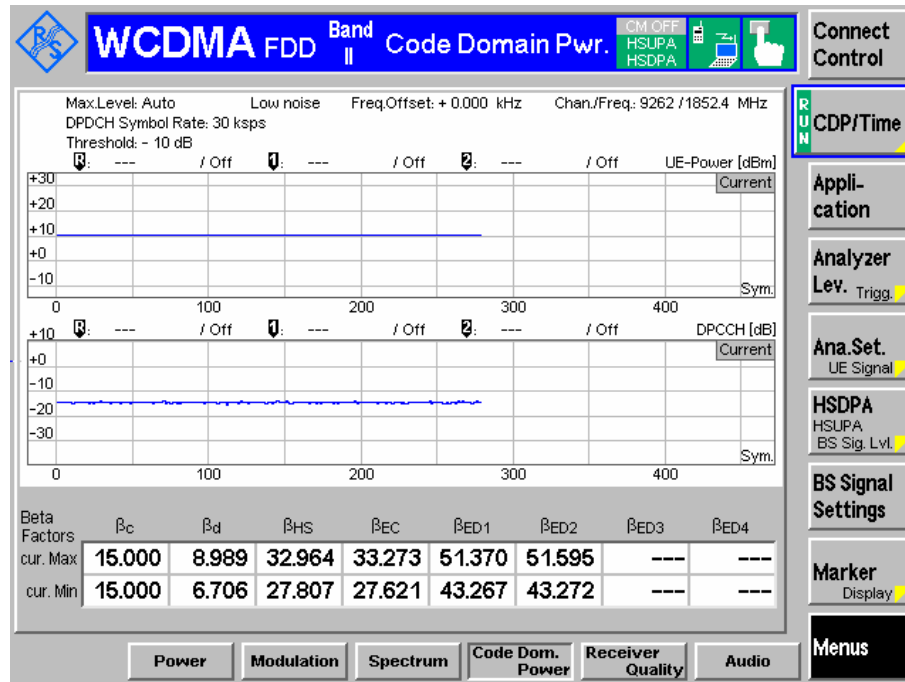
Subtest 1:



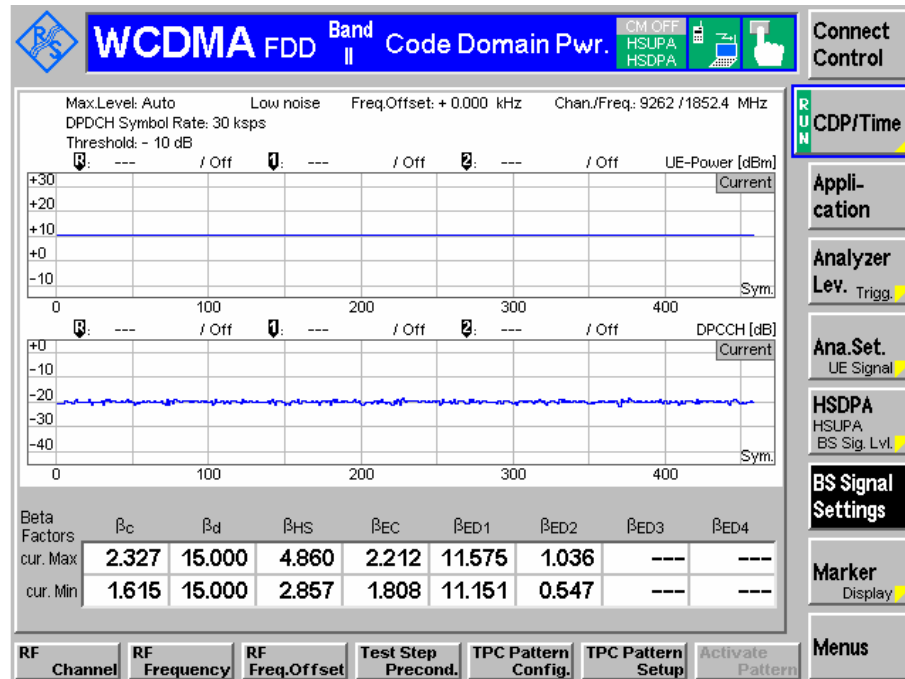
Subtest 2:



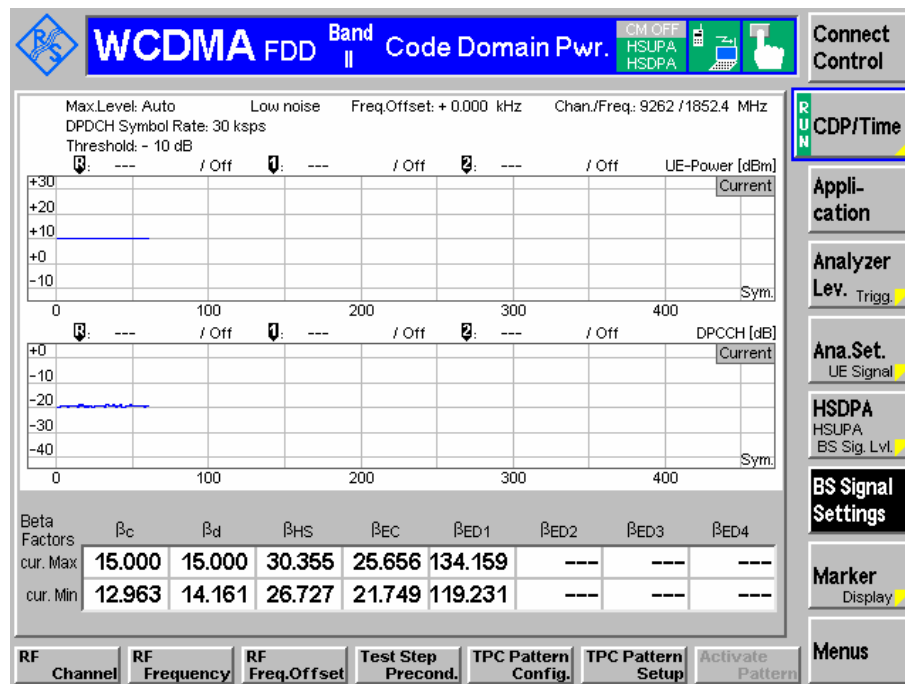
Subtest 3:



Subtest 4:



Subtest 5:



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:

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

$$\text{EIRP} = P + G1 = P3 + L2 - L1 + A + G1$$

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

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

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

1st Laptop – IBM Type 2373 (SPQ-Testunit-29)

Test Results: Output Power (radiated) UMTS Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	24.23
1880.0	24.51
1907.6	24.66
Measurement uncertainty	±0.5 dB

Test Results: Output Power (radiated) HSDPA Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	24.27
1880.0	24.49
1907.6	24.53
Measurement uncertainty	±0.5 dB

Test Results: Output Power (radiated) HSUPA Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	24.54
1880.0	24.88
1907.6	25.02
Measurement uncertainty	±0.5 dB

2nd Laptop – DELL PP01X (SPQ-Testunit-47)

Test Results: Output Power (radiated) UMTS Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	24.17
1880.0	24.46
1907.6	24.59
Measurement uncertainty	±0.5 dB

Test Results: Output Power (radiated) HSDPA Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	24.23
1880.0	24.47
1907.6	24.49
Measurement uncertainty	±0.5 dB

Test Results: Output Power (radiated) HSUPA Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	24.51
1880.0	24.77
1907.6	24.95
Measurement uncertainty	±0.5 dB

3rd Laptop – Fujitsu/Siemens AmiloPro (SPQ-Testunit-193)

Test Results: Output Power (radiated) UMTS Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	24.29
1880.0	24.61
1907.6	24.69
Measurement uncertainty	±0.5 dB

Test Results: Output Power (radiated) HSDPA Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	24.30
1880.0	24.48
1907.6	24.62
Measurement uncertainty	±0.5 dB

Test Results: Output Power (radiated) HSUPA Mode

Frequency (MHz)	Burst Peak EIRP (dBm)
1852.4	24.59
1880.0	24.90
1907.6	25.11
Measurement uncertainty	±0.5 dB

Sample Calculation:

Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBμV	dBm	dB <i>i</i>	dB <i>d</i>	dB	dBm			
1852.4	125.8	22.6	8.4	0.0	3.3	27.7			

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

5.1.2 Frequency Stability

Reference

FCC:	CFR Part 24.235, 2.1055
IC:	RSS 133, Issue 3, Section 4.2

Method of Measurement:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a “call mode”. This is accomplished with the use of a R&S CMU 200 DIGITAL RADIOCOMMUNICATION TESTER..

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

Measurement Limit:

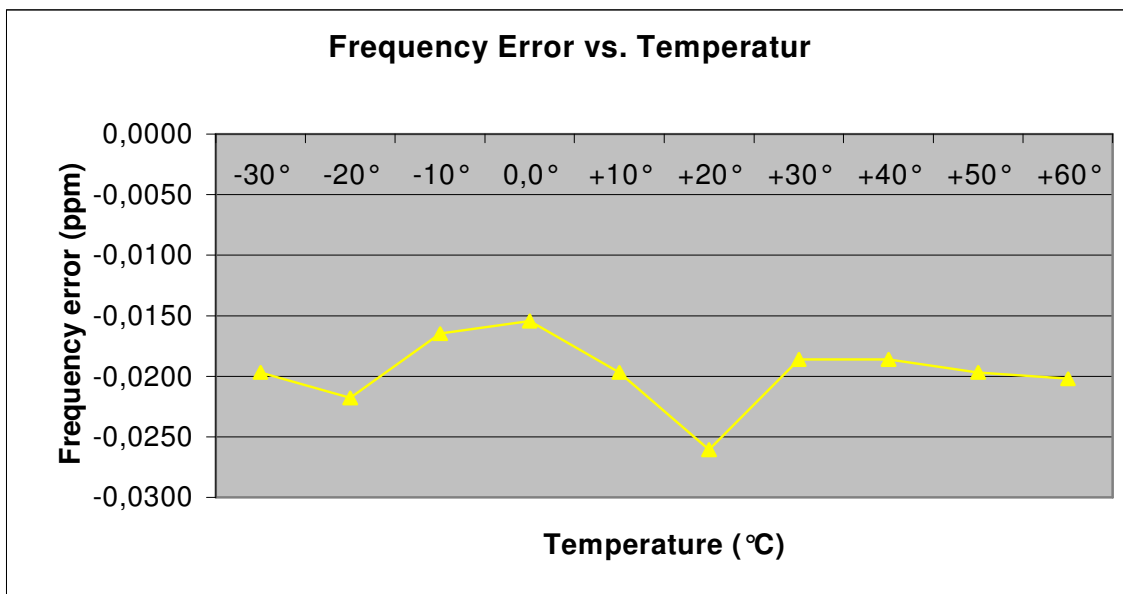
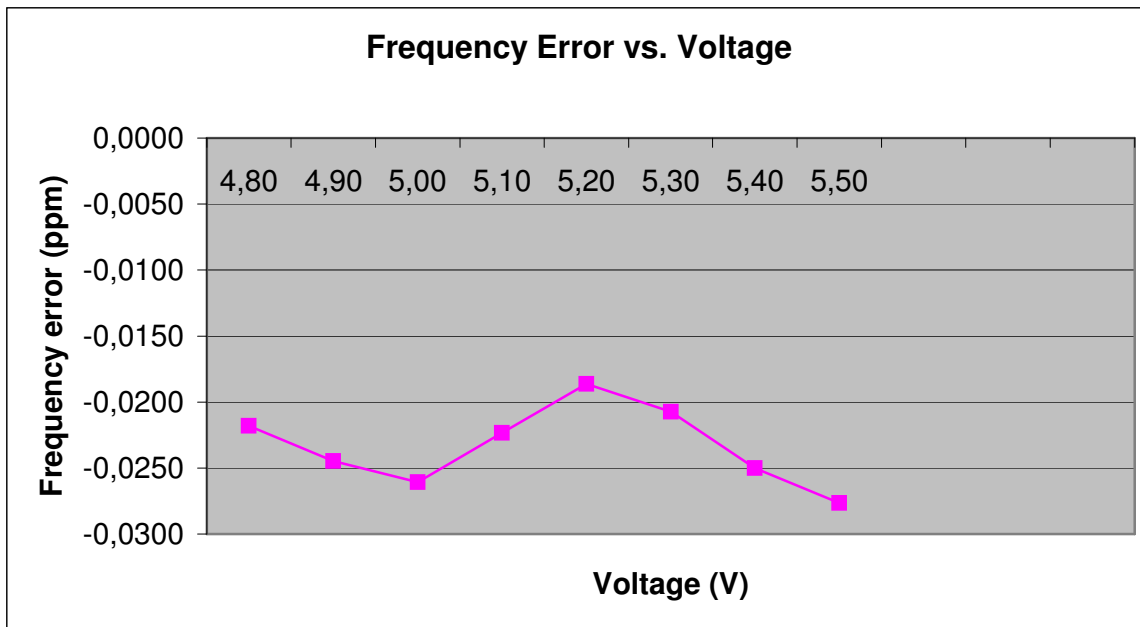
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission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

Test Results: AFC FREQ ERROR vs. VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
4.5	-42	-0.00000223	-0.0223
4.6	-44	-0.00000234	-0.0234
4.7	-38	-0.00000202	-0.0202
4.8	-41	-0.00000218	-0.0218
4.9	-46	-0.00000245	-0.0245
5.0	-49	-0.00000261	-0.0261
5.1	-42	-0.00000223	-0.0223
5.2	-35	-0.00000186	-0.0186
5.3	-39	-0.00000207	-0.0207
5.4	-47	-0.00000250	-0.0250
5.5	-52	-0.00000277	-0.0277

Test Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-37	-0.00000197	-0.0197
-20	-41	-0.00000218	-0.0218
-10	-31	-0.00000165	-0.0165
±0.0	-29	-0.00000154	-0.0154
+10	-37	-0.00000197	-0.0197
+20	-49	-0.00000261	-0.0261
+30	-35	-0.00000186	-0.0186
+40	-35	-0.00000186	-0.0186
+50	-37	-0.00000197	-0.0197
+60	-38	-0.00000202	-0.0202



5.1.3 Radiated Emissions

Reference

FCC:	CFR Part 24.238, 2.1053
IC:	RSS 133, Issue 3, Section 4.4

Measurement Procedure:

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

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

- a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- b) The antenna output was terminated in a 50 ohm load.
- c) A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 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 with 1st Laptop – IBM Type 2373 (SPQ-Testunit-29)

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

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

All measurements were done in horizontal and vertical polarization; the plots show the worst case. As can be seen from this data, the emissions from the test item were within the specification limit.

Harmonic	Tx ch.-9262 Freq. (MHz)	Level (dBm)	Tx ch.-9400 Freq. (MHz)	Level (dBm)	Tx ch.-9538 Freq. (MHz)	Level (dBm)
2	3704.8	-	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	-

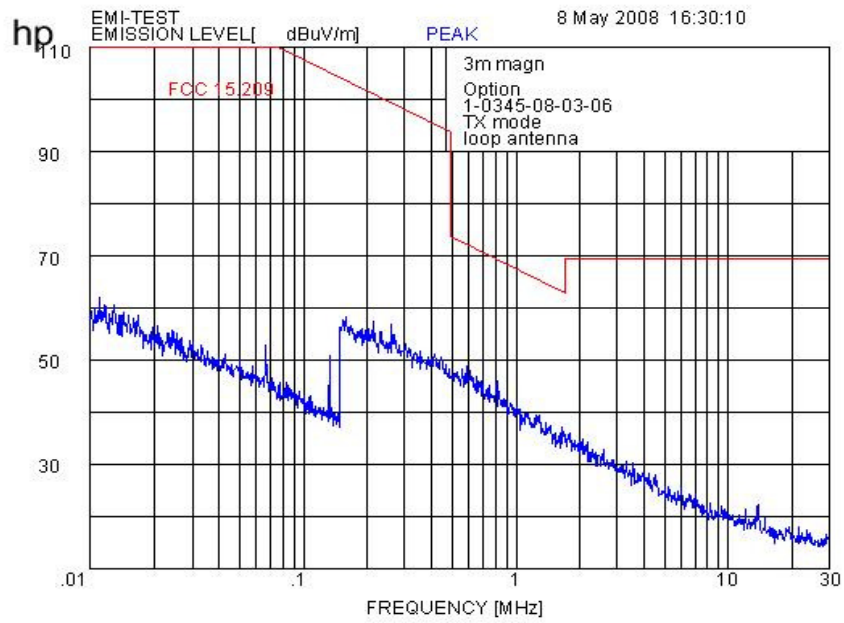
No peaks found < 20 dB below limit.

Sample calculation:

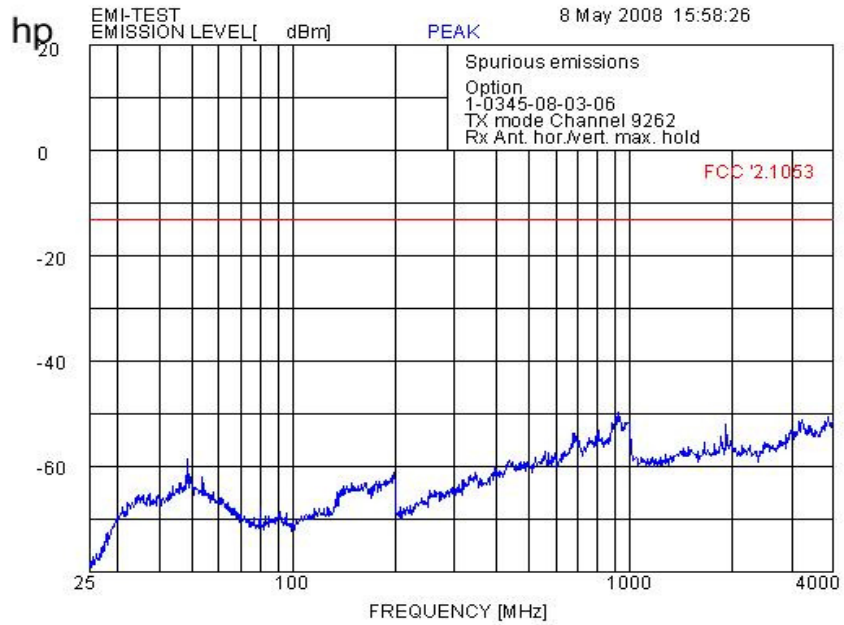
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBμV	dBm	dBi	dBd	dB	dBm			
1852.4	125.8	22.6	8.4	0.0	3.3	27.7			

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

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



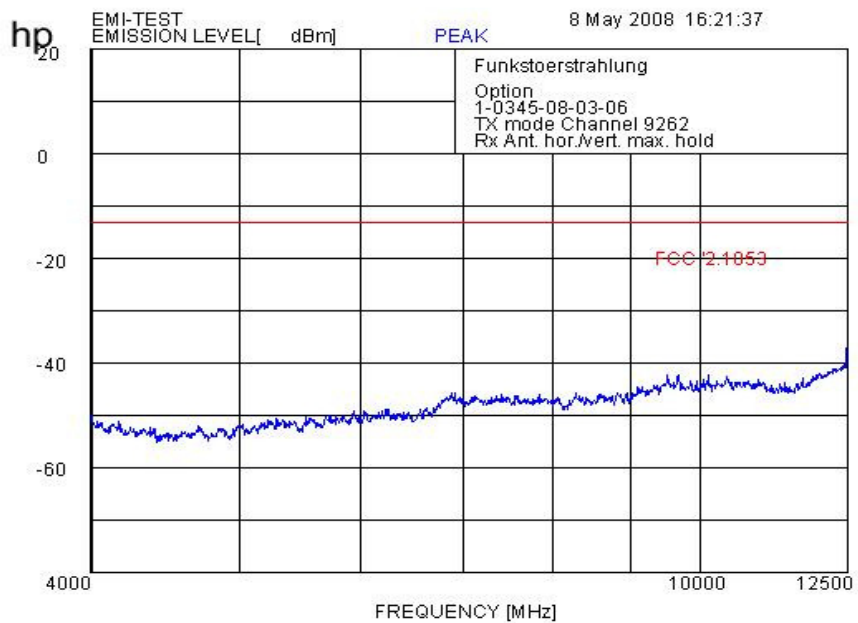
Channel 9262 (30 MHz - 4 GHz)



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

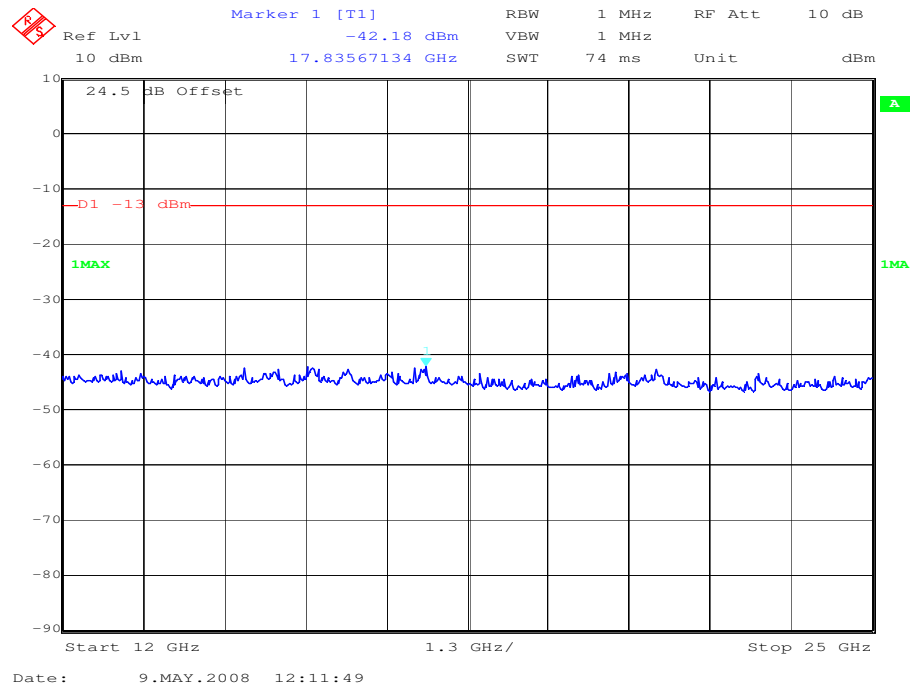
f > 1 GHz : RBW / VBW 1 MHz

Channel 9262 (4 GHz – 12.5 GHz)

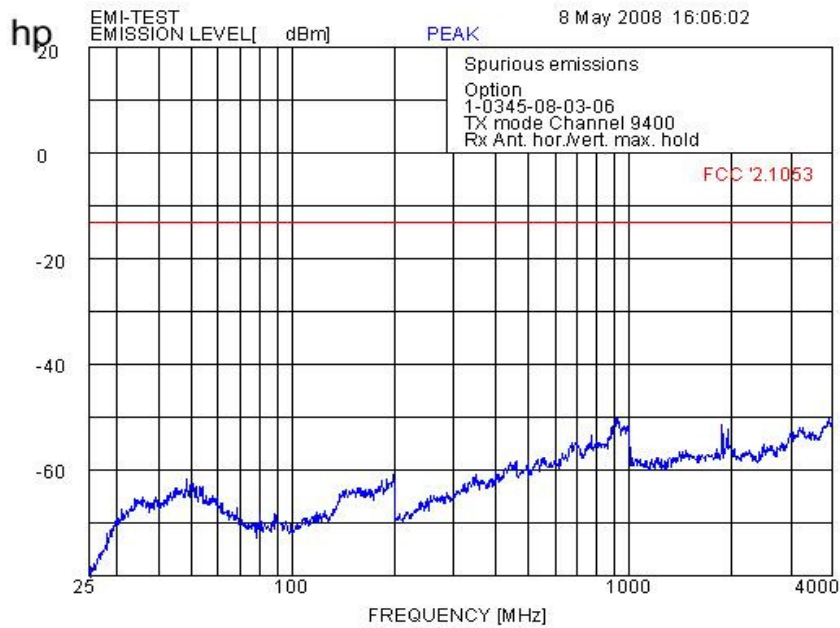


RBW / VBW 1 MHz

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



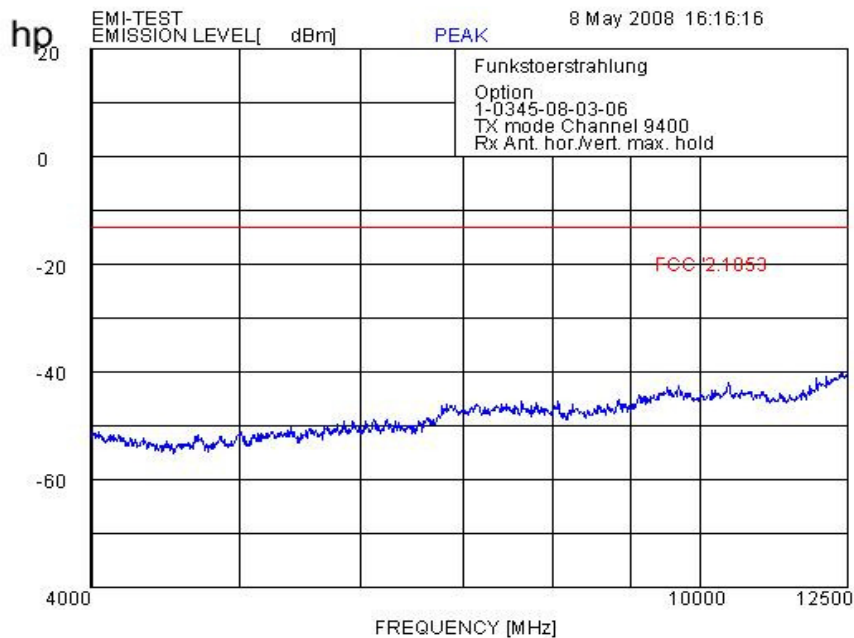
Channel 9400 (30 MHz - 4 GHz)



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

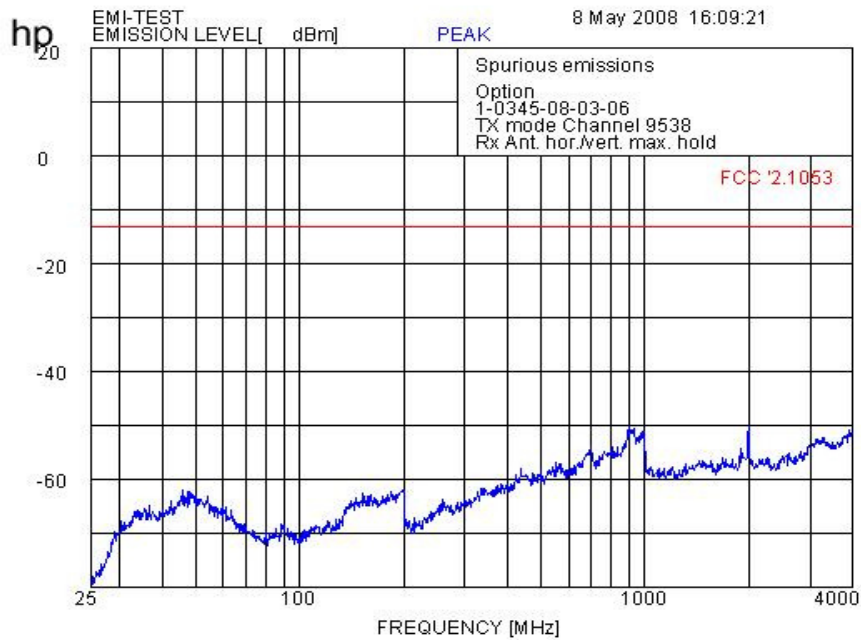
f > 1 GHz : RBW / VBW 1 MHz

Channel 9400 (4 GHz – 12.5 GHz)



RBW / VBW 1 MHz

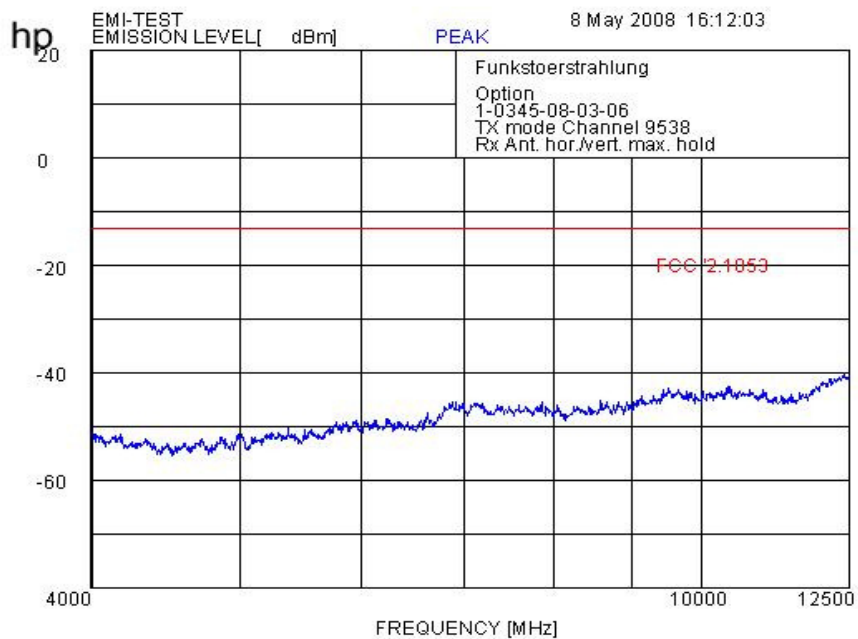
Channel 9538 (30 MHz - 4 GHz)



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

f > 1 GHz : RBW / VBW 1 MHz

Channel 9538 (4 GHz – 12.5 GHz)



RBW / VBW 1 MHz

Measurement Results: Radiated Emissions with 2nd Laptop – DELL PP01X (SPQ-Testunit-47)

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

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

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

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

Harmonic	Tx ch.-9262 Freq. (MHz)	Level (dBm)	Tx ch.-9400 Freq. (MHz)	Level (dBm)	Tx ch.-9538 Freq. (MHz)	Level (dBm)
2	3704.8	-	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	-

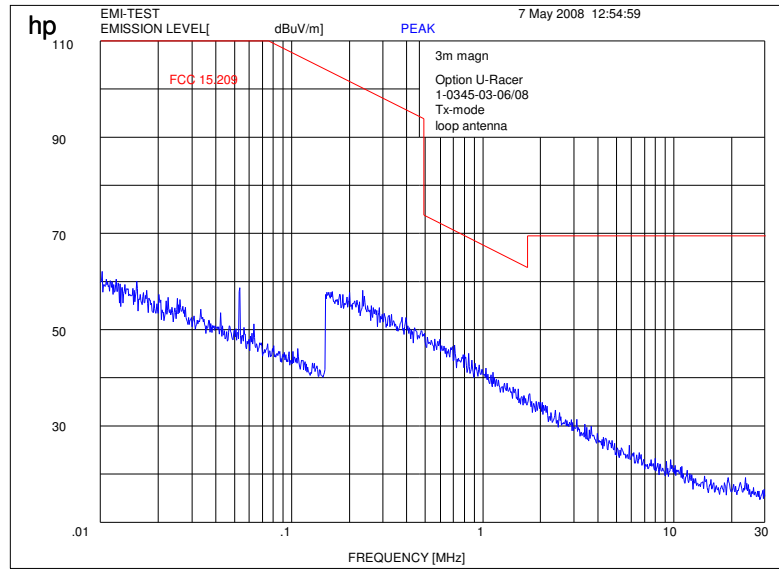
No peaks found < 20 dB below limit.

Sample calculation:

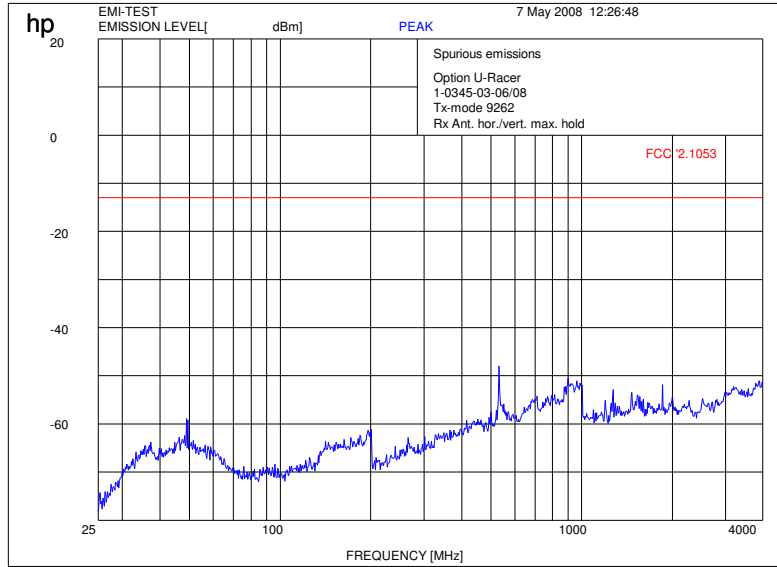
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBμV	dBm	dBi	dBd	dB	dBm			
1852.4	125.8	22.6	8.4	0.0	3.3	27.7			

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

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



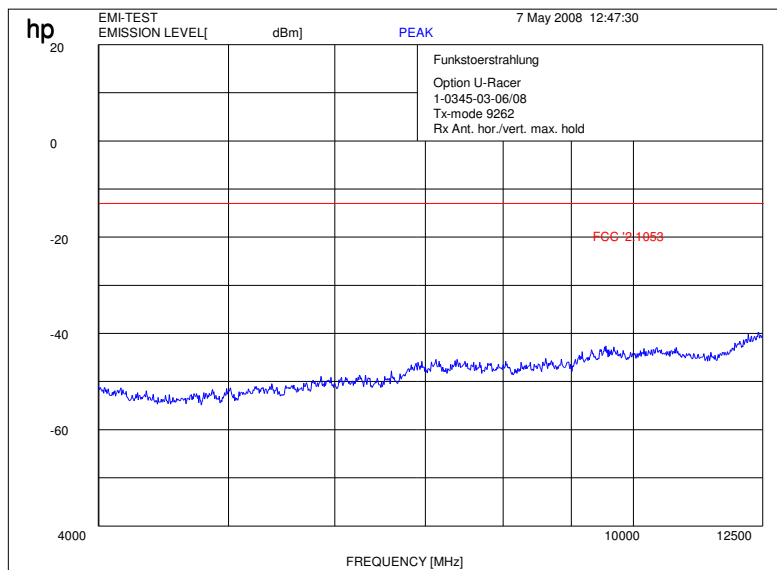
Channel 9262 (30 MHz - 4 GHz)



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

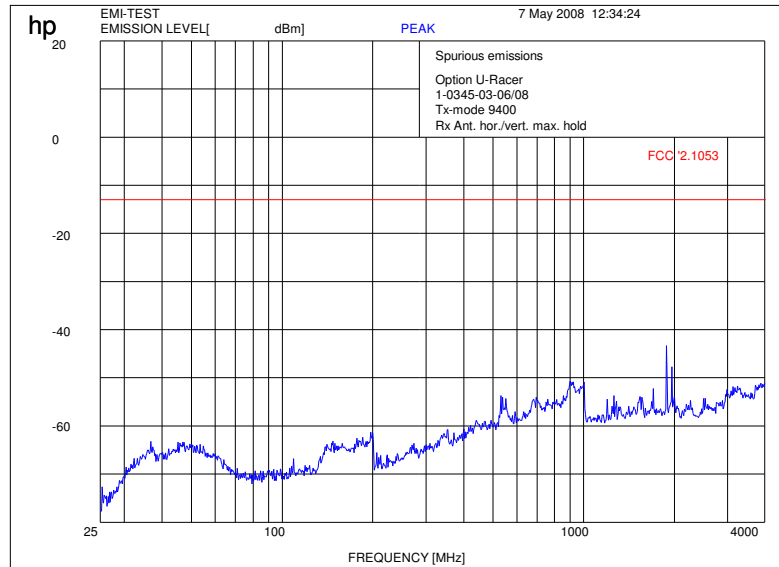
f > 1 GHz : RBW / VBW 1 MHz

Channel 9262 (4 GHz – 12.5 GHz)



RBW / VBW 1 MHz

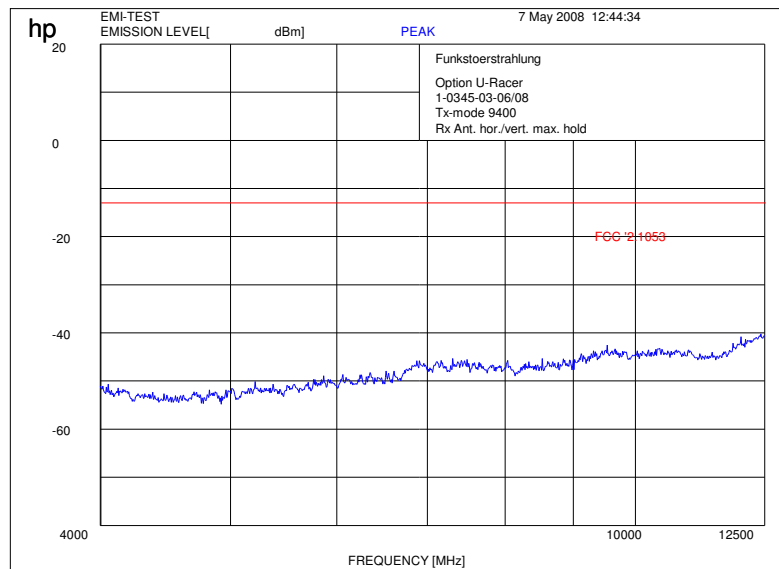
Channel 9400 (30 MHz - 4 GHz)



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

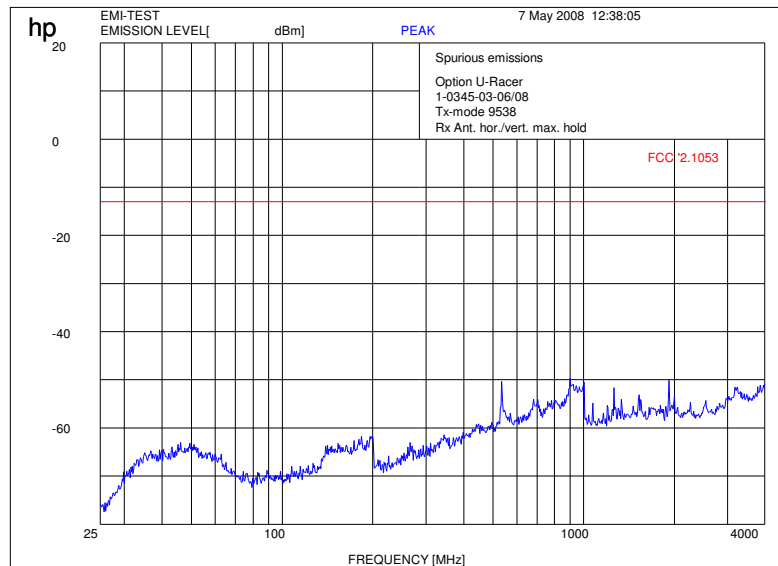
f > 1 GHz : RBW / VBW 1 MHz

Channel 9400 (4 GHz – 12.5 GHz)



RBW / VBW 1 MHz

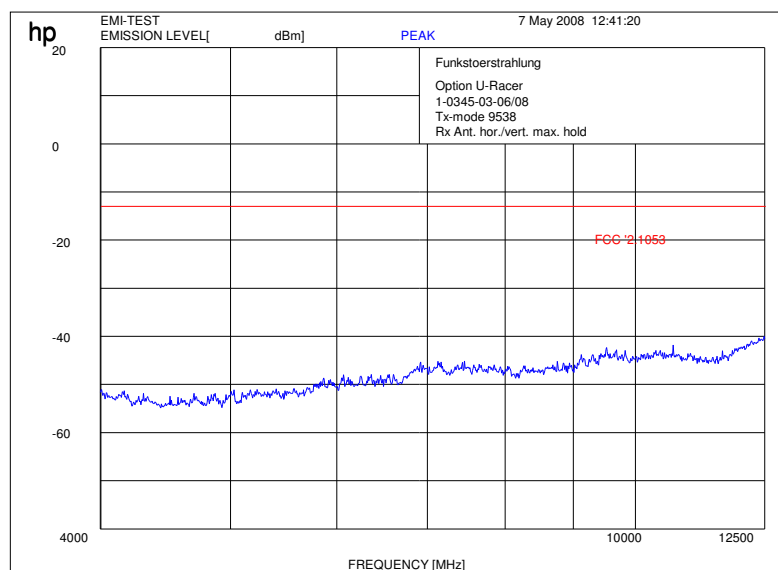
Channel 9538 (30 MHz - 4 GHz)



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

f > 1 GHz : RBW / VBW 1 MHz

Channel 9538 (4 GHz – 12.5 GHz)



RBW / VBW 1 MHz

Measurement Results: Radiated Emissions with 3rd Laptop – Fujitsu/Siemens AmiloPro (SPQ-Testunit-193)

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

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

All measurements were done in horizontal and vertical polarization; the plots show the worst case. As can be seen from this data, the emissions from the test item were within the specification limit.

Harmonic	Tx ch.-9262 Freq. (MHz)	Level (dBm)	Tx ch.-9400 Freq. (MHz)	Level (dBm)	Tx ch.-9538 Freq. (MHz)	Level (dBm)
2	3704.8	- 34.2	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	-

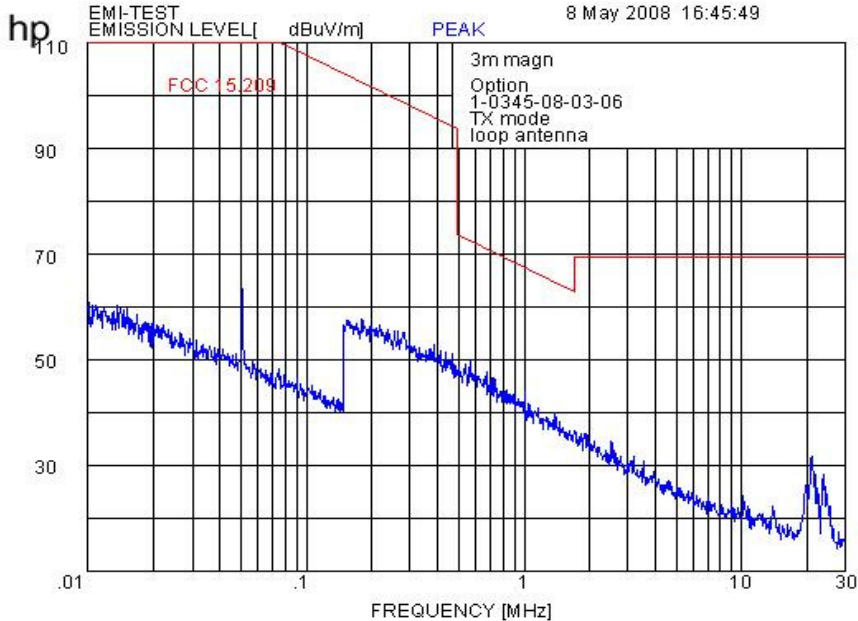
No peaks found < 20 dB below limit.

Sample calculation:

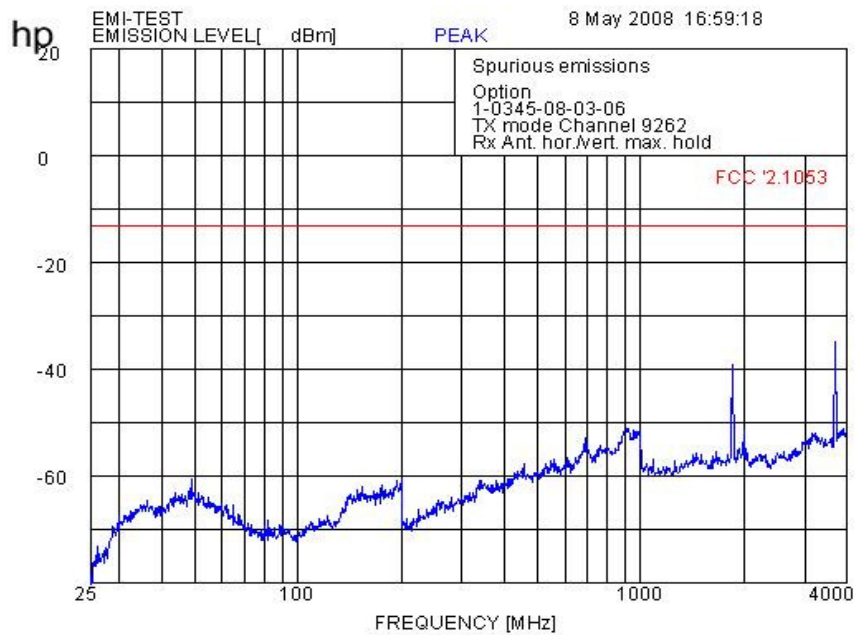
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBμV	dBm	dBi	dBd	dB	dBm			
1852.4	125.8	22.6	8.4	0.0	3.3	27.7			

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

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



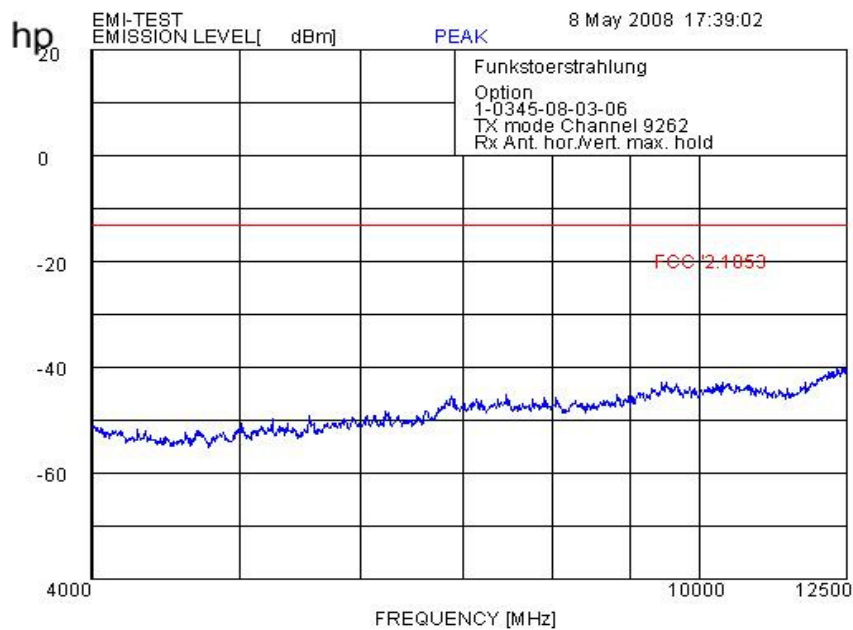
Channel 9262 (30 MHz - 4 GHz)



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

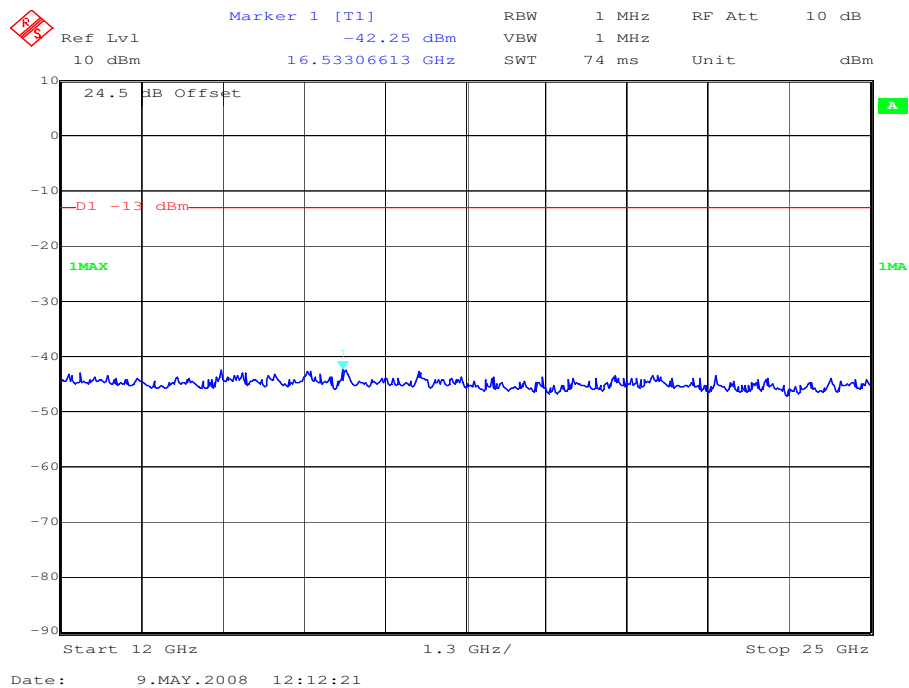
f > 1 GHz : RBW / VBW 1 MHz

Channel 9262 (4 GHz – 12.5 GHz)

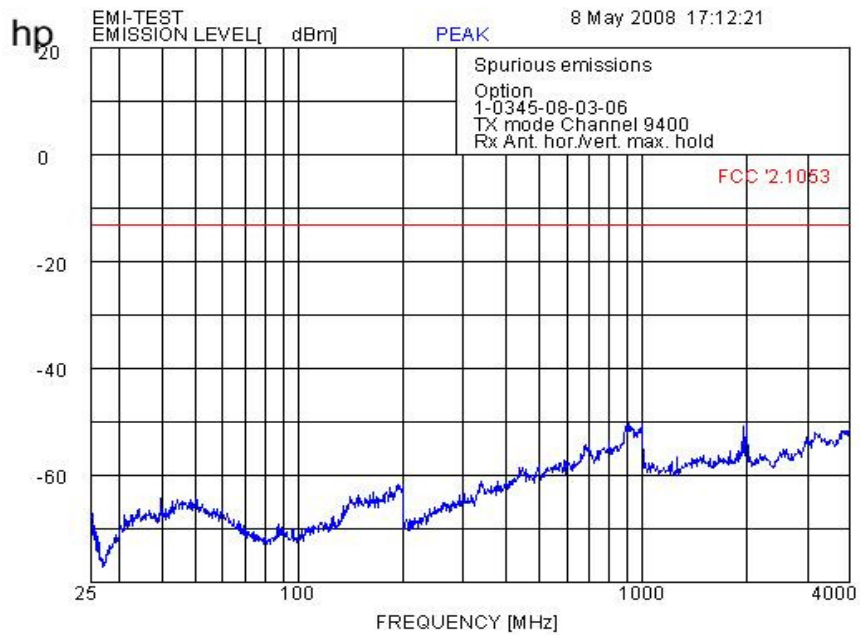


RBW / VBW 1 MHz

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



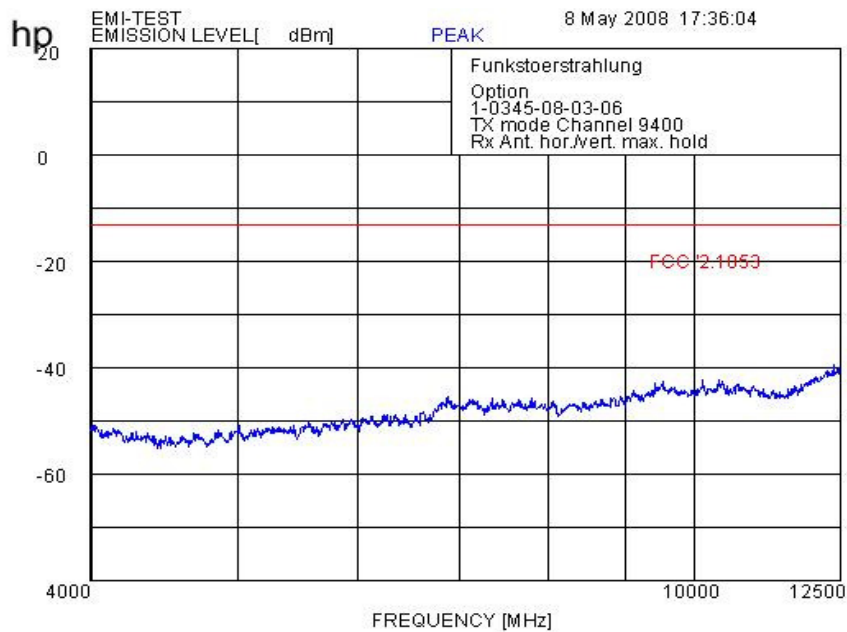
Channel 9400 (30 MHz - 4 GHz)



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

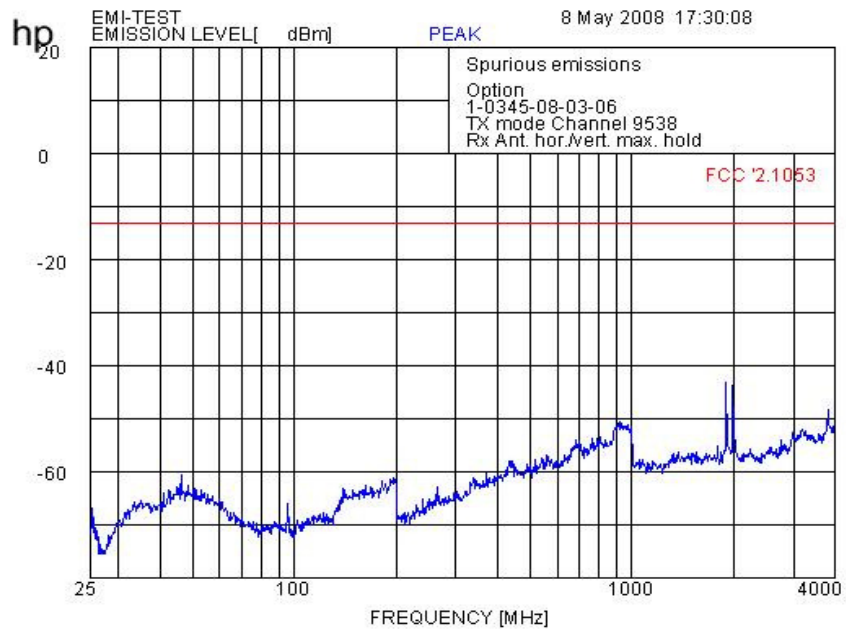
f > 1 GHz : RBW / VBW 1 MHz

Channel 9400 (4 GHz – 12.5 GHz)



RBW / VBW 1 MHz

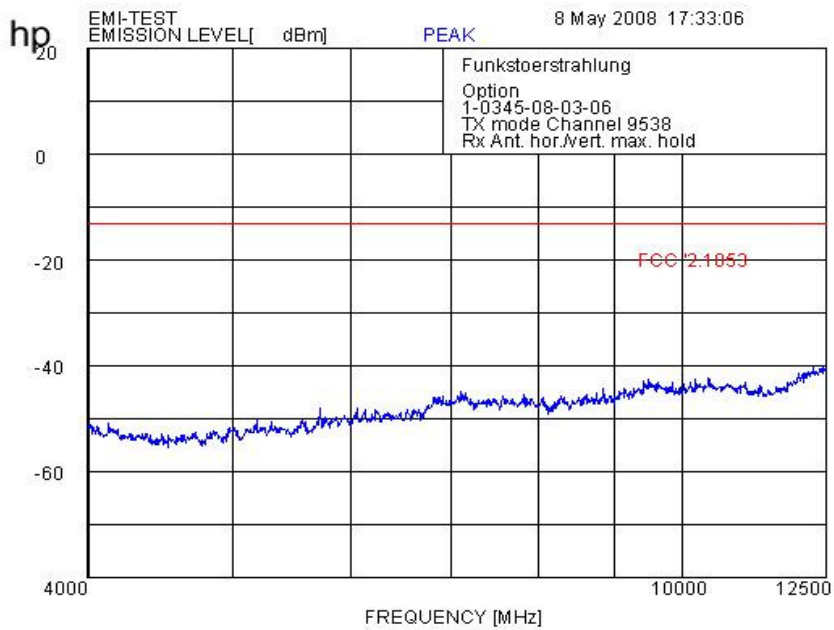
Channel 9538 (30 MHz - 4 GHz)



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

f > 1 GHz : RBW / VBW 1 MHz

Channel 9538 (4 GHz – 12.5 GHz)



RBW / VBW 1 MHz

5.1.4 Receiver Radiated Emissions

Reference

FCC:	CFR Part 15.109, 2.1053
IC:	RSS 133, Issue 3, Section 4.5

Measurement Results: Radiated Emissions with 1st Laptop – IBM Type 2373 (SPQ-Testunit-29)

SPURIOUS EMISSIONS LEVEL (µV/m)								
Idle mode								
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
200.46	Quasipeak	25.5	-	-	-	-	-	-
456.76	Quasipeak	32.1	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

H = Horizontal ; V= Vertical

For measurement distance see table below

Limits: § 15.109

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

Idle Mode (30 MHz - 1 GHz)

Information

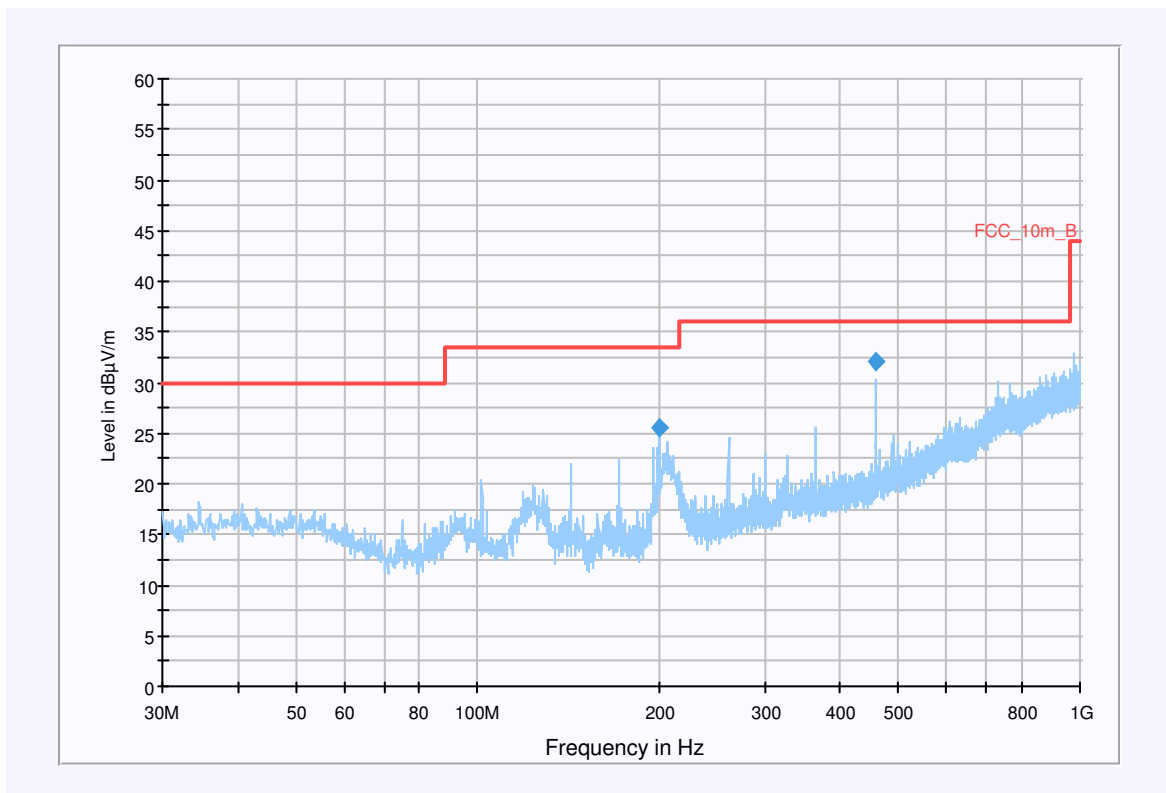
EUT: GI0401 + SPQ-TESTUNIT-29
 Serial Number: none
 Test Description: FCC class B @ 10 m
 Operating Conditions: IDLE WCDMA II
 Operator Name: WAL
 Comment: EUT connect to notebook

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: EMI radiated\Electric Field (NOS)
 Level Unit: dB μ V/m

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

FCC_10m_FCCLIMIT(B)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
200.463100	25.5	15000.000	120.000	127.0	V	342.0	11.9	8.0	33.5	
456.757250	32.1	15000.000	120.000	349.0	V	158.0	17.9	3.9	36.0	

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

Subrange 1

Frequency Range: 30MHz - 2GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009

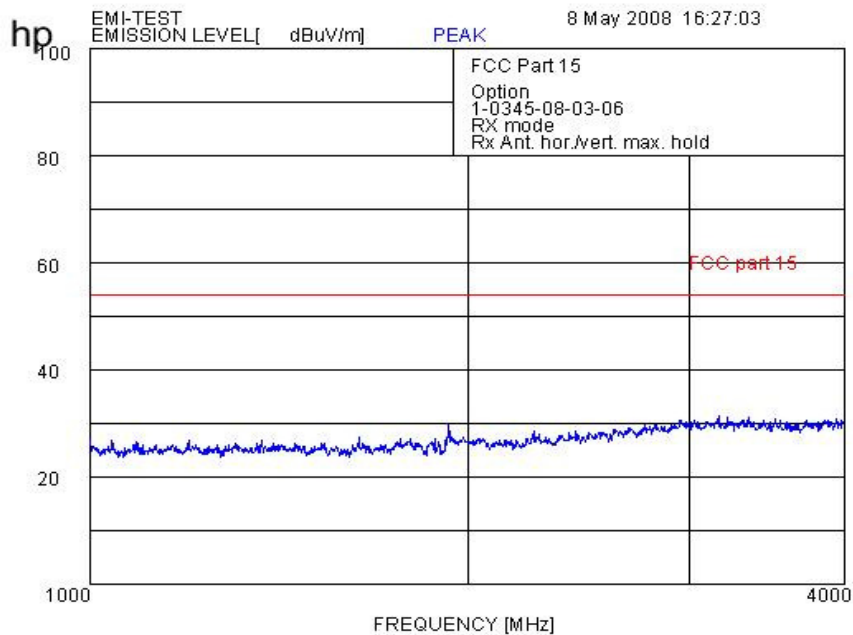
Signal Path: without Notch
FW 1.0

Antenna: VULB 9163
SN 9163-295, FW ---, CAL 08.04.2010
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table: Cabel with switch (0408)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

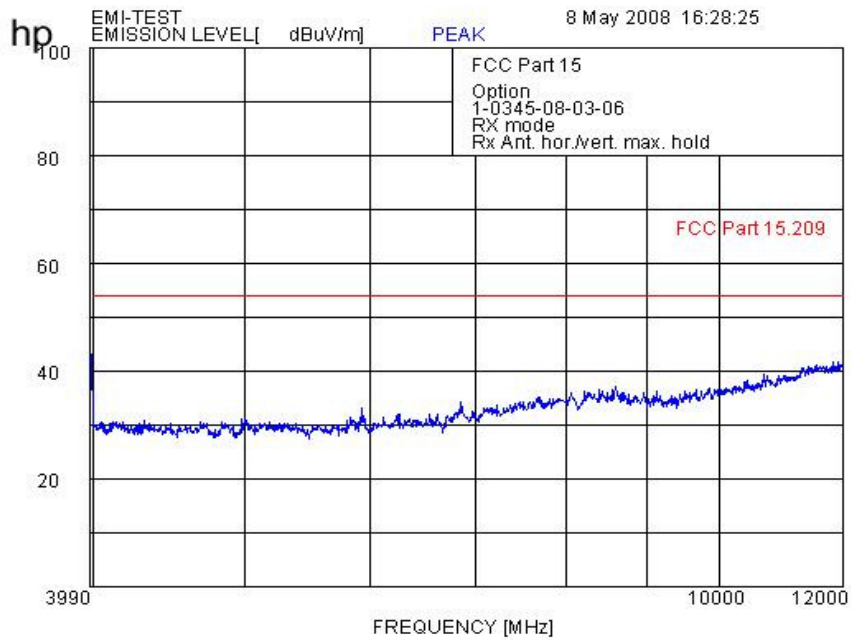
Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9)

Idle Mode (1 GHz - 4 GHz)



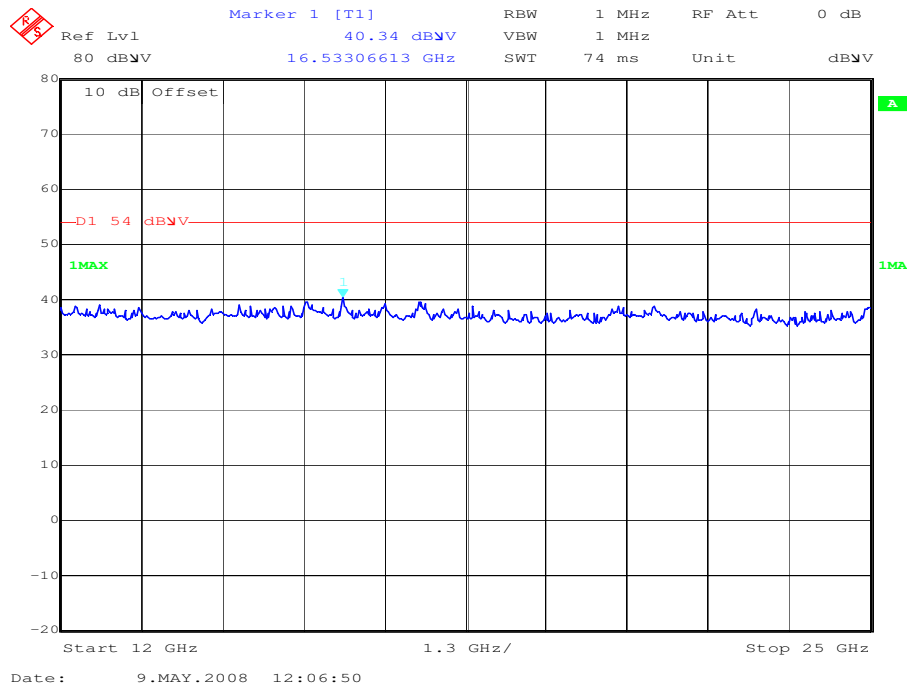
RBW / VBW 1 MHz

Idle Mode (4 GHz – 12.0 GHz)



RBW / VBW 1 MHz

Idle Mode (12 GHz - 25 GHz)



Measurement Results: Radiated Emissions with 2nd Laptop – DELL PP01X (SPQ-Testunit-47)

SPURIOUS EMISSIONS LEVEL (µV/m)								
Idle mode								
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
209.62	Quasipeak	28.4	-	-	-	-	-	-
270.15	Quasipeak	28.2	-	-	-	-	-	-
528.38	Quasipeak	32.1	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

H = Horizontal ; V= Vertical

For measurement distance see table below

Limits: § 15.109

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

Idle Mode (30 MHz - 1 GHz)

Information

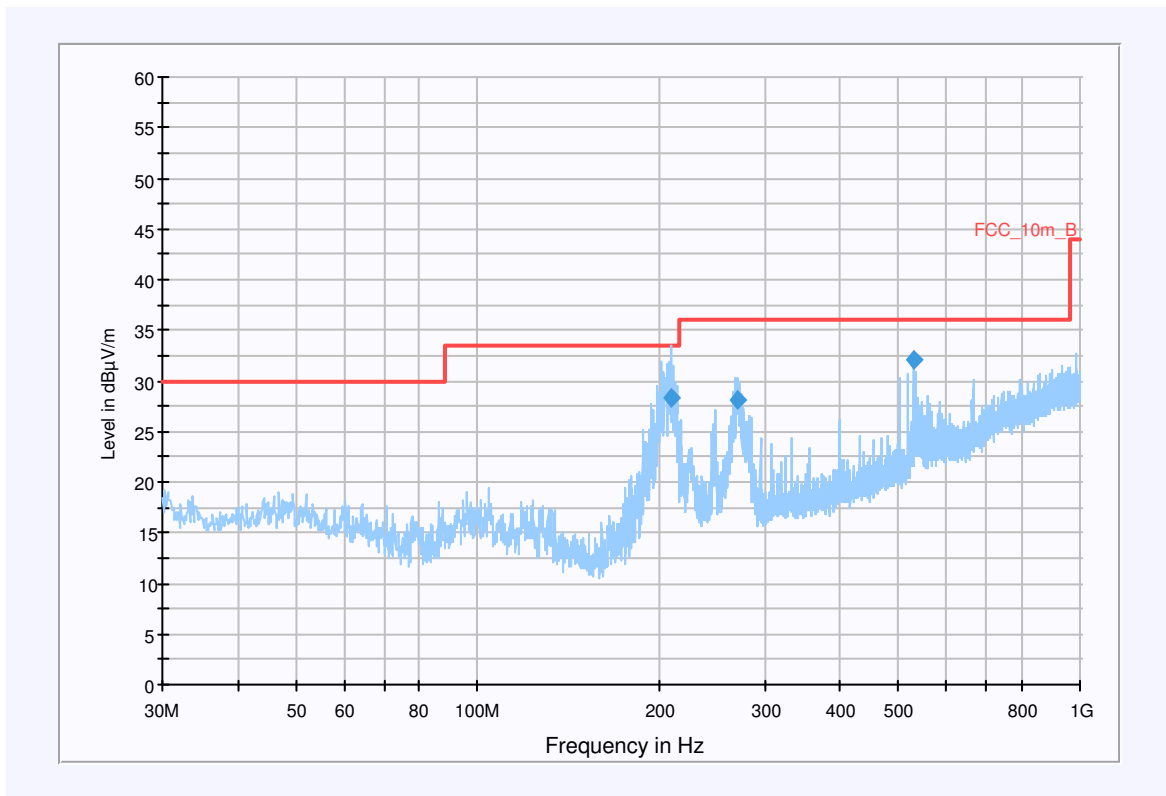
EUT: GI0401 + SPQ-TESTUNIT-47
 Serial Number: none
 Test Description: FCC class B @ 10 m
 Operating Conditions: IDLE WCDMA II
 Operator Name: WAL
 Comment: EUT connect to notebook

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: EMI radiated\Electric Field (NOS)
 Level Unit: dB μ V/m

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

FCC_10m_FCCLIMIT(B)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
209.621150	28.4	15000.000	120.000	166.0	V	246.0	12.2	5.1	33.5	
270.149700	28.2	15000.000	120.000	100.0	V	5.0	14.0	7.8	36.0	
528.376650	32.1	15000.000	120.000	100.0	V	219.0	19.2	3.9	36.0	

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

Subrange 1

Frequency Range: 30MHz - 2GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009

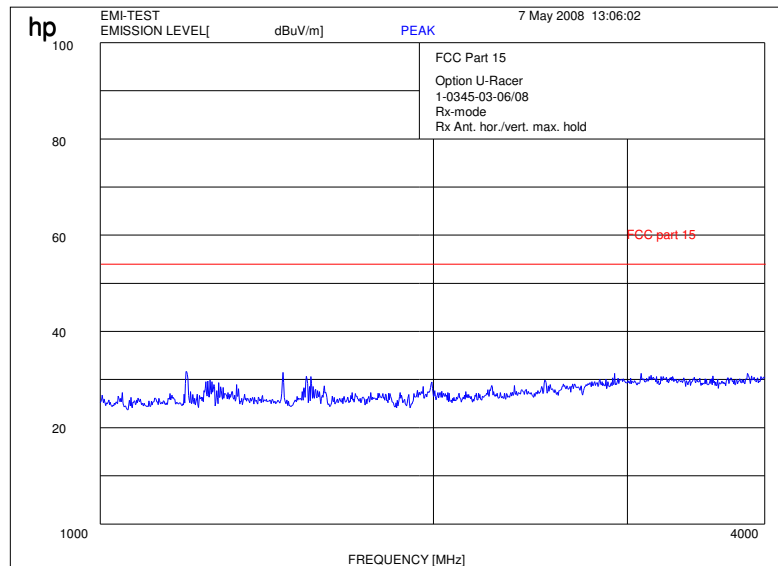
Signal Path: without Notch
FW 1.0

Antenna: VULB 9163
SN 9163-295, FW ---, CAL 08.04.2010
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table: Cabel with switch (0408)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

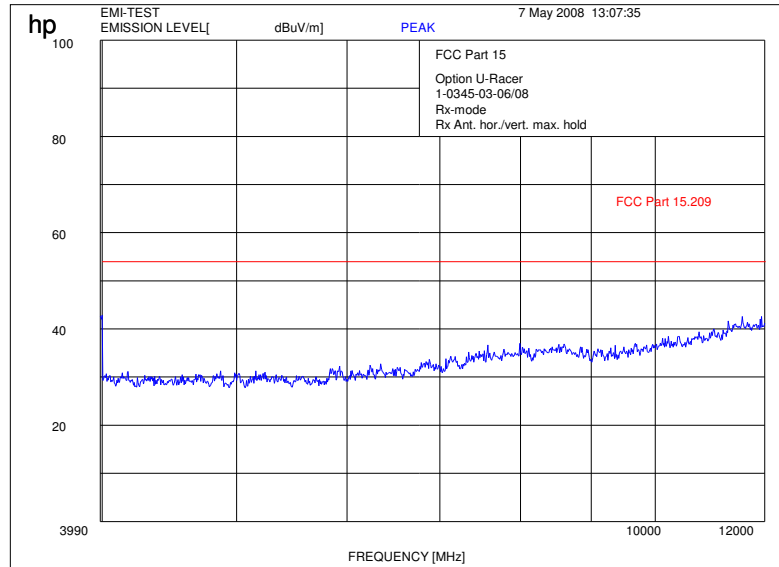
Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9)

Idle Mode (1 GHz - 4 GHz)



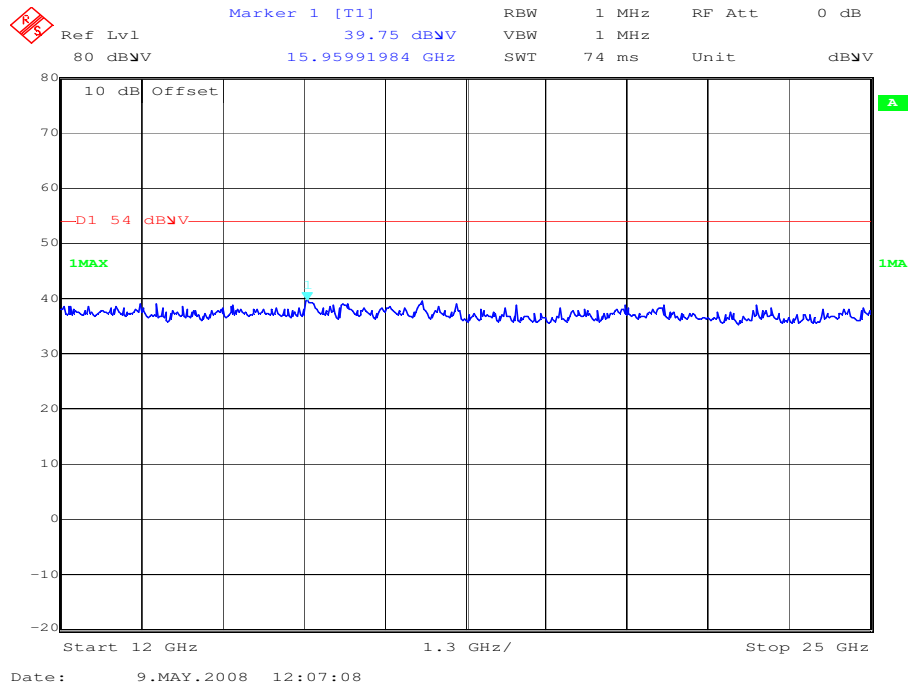
RBW / VBW 1 MHz

Idle Mode (4 GHz – 12.0 GHz)



RBW / VBW 1 MHz

Idle Mode (12 GHz - 25 GHz)



Measurement Results: Radiated Emissions with 3rd Laptop – Fujitsu/Siemens AmiloPro (SPQ-Testunit-193)

SPURIOUS EMISSIONS LEVEL ($\mu\text{V/m}$)								
Idle mode								
f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)	f (MHz)	Detector	Level ($\mu\text{V/m}$)
332.92	Quasipeak	13.2	-	-	-	-	-	-
466.17	Quasipeak	17.7	-	-	-	-	-	-
497.80	Quasipeak	24.9	-	-	-	-	-	-
726.42	Quasipeak	21.1	-	-	-	-	-	-
1315.50	Quasipeak	32.2	-	-	-	-	-	-
2001.40	Quasipeak	35.1	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			± 3 dB					

$f < 1$ GHz : RBW/VBW: 100 kHz

$f \geq 1$ GHz : RBW/VBW: 1 MHz

H = Horizontal ; V= Vertical

For measurement distance see table below

Limits: § 15.109

Frequency (MHz)	Field strength (dB $\mu\text{V/m}$)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

Idle Mode (30 MHz - 1 GHz)

Information

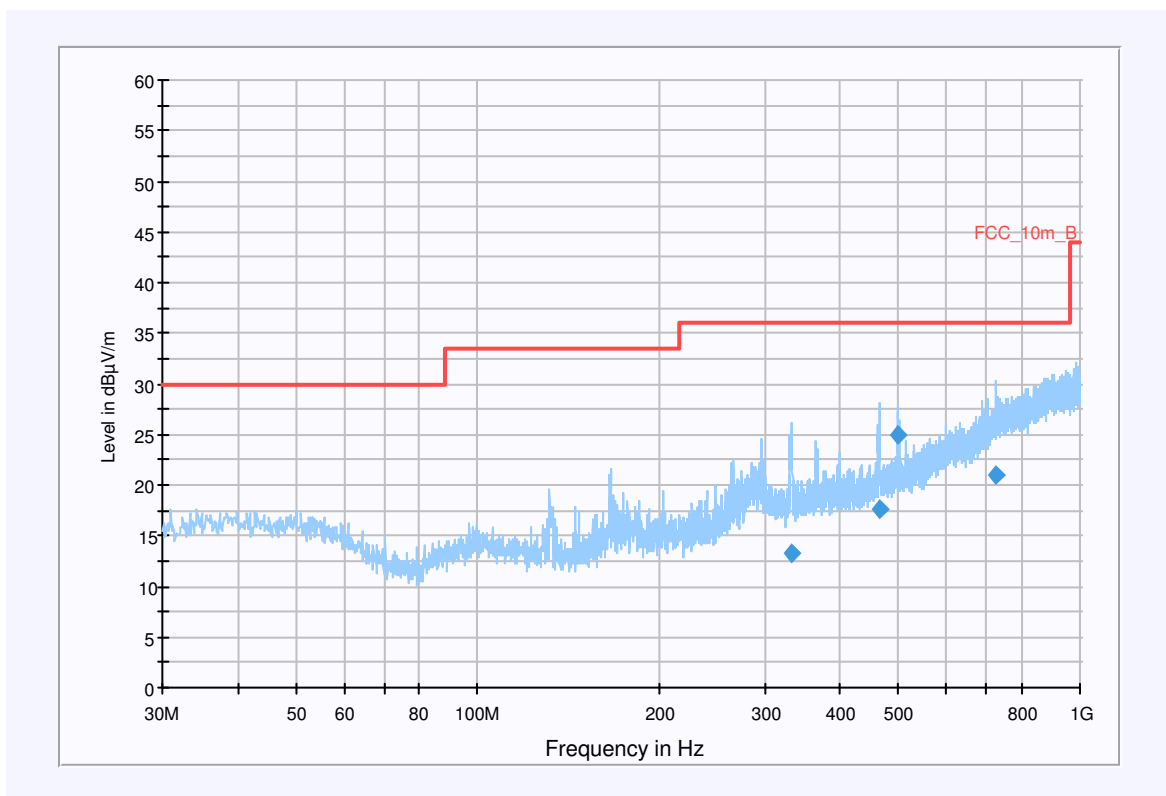
EUT: GI0401 + SPQ-TESTUNIT-193
 Serial Number: none
 Test Description: FCC class B @ 10 m
 Operating Conditions: IDLE WCDMA II
 Operator Name: WAL
 Comment: EUT connect to notebook

Scan Setup: STAN_Fin [EMI radiated]

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

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

FCC_10m_FCCLIMIT(B)



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
332.924400	13.2	15000.000	120.000	178.0	H	69.0	15.7	22.8	36.0	
466.168950	17.7	15000.000	120.000	379.0	V	219.0	18.1	18.3	36.0	
497.796900	24.9	15000.000	120.000	100.0	V	188.0	18.8	11.1	36.0	
726.420950	21.1	15000.000	120.000	140.0	H	205.0	23.6	14.9	36.0	

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

Subrange 1

Frequency Range: 30MHz - 2GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009

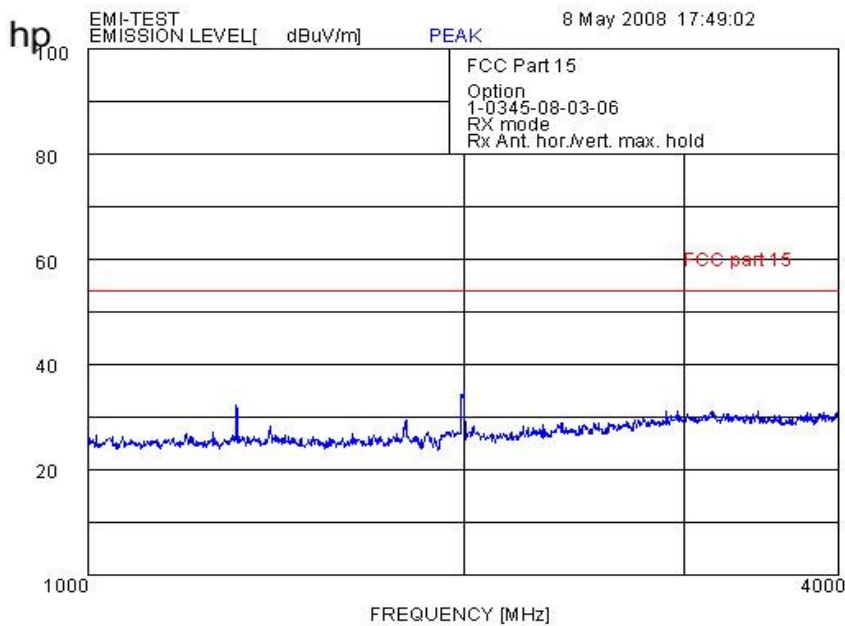
Signal Path: without Notch
FW 1.0

Antenna: VULB 9163
SN 9163-295, FW ---, CAL 08.04.2010
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table: Cabel with switch (0408)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

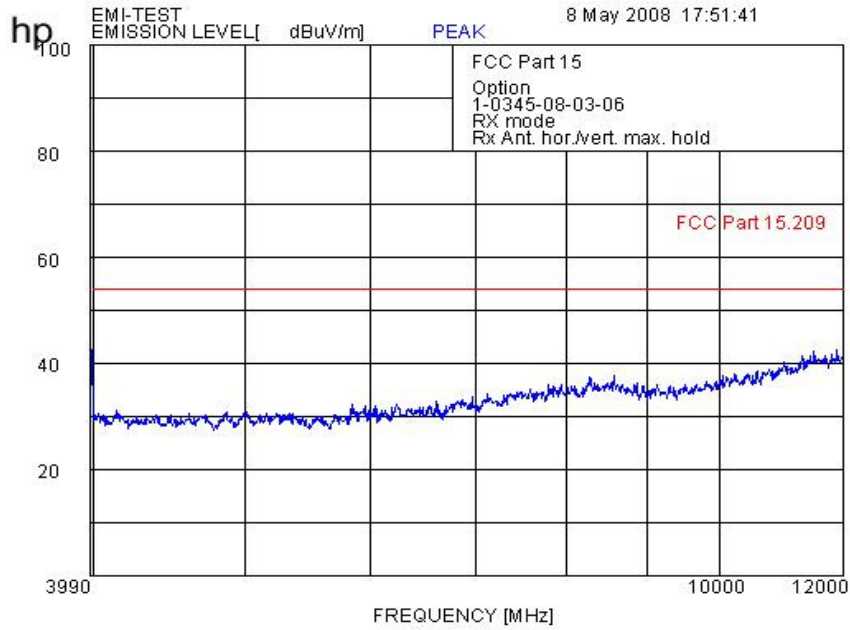
Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9)

Idle Mode (1 GHz - 4 GHz)



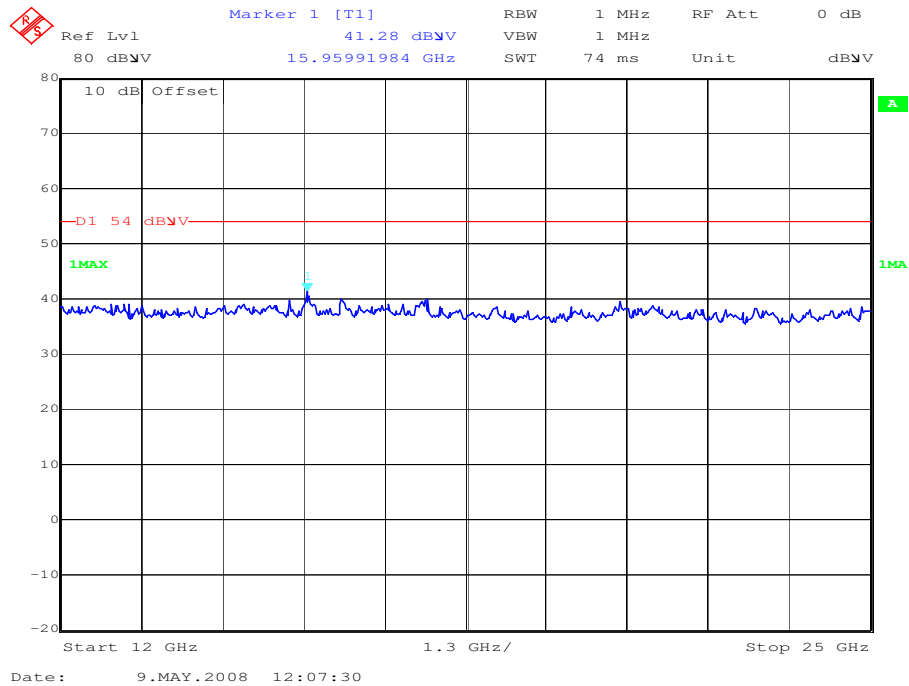
RBW / VBW 1 MHz

Idle Mode (4 GHz – 12.0 GHz)



RBW / VBW 1 MHz

Idle Mode (12 GHz - 25 GHz)



5.1.5 Conducted Spurious Emissions

Reference

FCC:	CFR Part 24.238, 2.10.51
IC:	RSS 133, Issue 3, Section 4.4

Measurement Procedure:

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

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

UMTS Transmitter Channel Frequency:

9262 1852.4 MHz

9400 1880.0 MHz

9538 1907.6 MHz

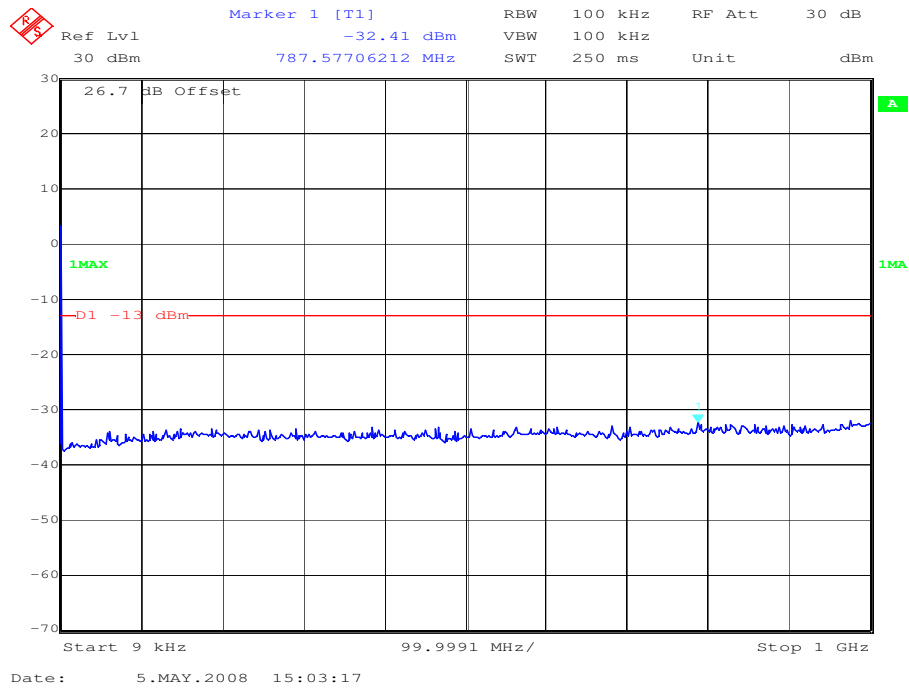
Measurement Limit:

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

Measurement Results:

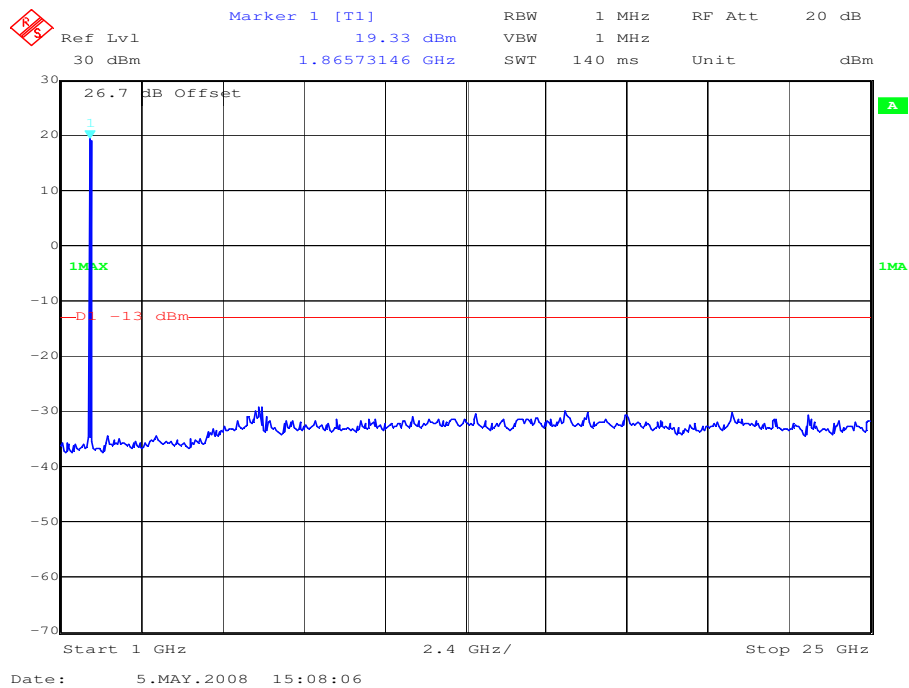
Harmonic	Tx ch.- 9262 Freq. (MHz)	Level (dBm)	Tx ch.-9400 Freq. (MHz)	Level (dBm)	Tx ch.-9538 Freq. (MHz)	Level (dBm)
2	3704.8	-	3760	-	3815.2	-
3	5557.2	-	5640	-	5722.8	-
4	7409.6	-	7520	-	7630.4	-
5	9262.0	-	9400	-	9538.0	-
6	11114.4	-	11280	-	11445.6	-
7	12966.8	-	13160	-	13353.2	-
8	14819.2	-	15040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

Channel 9538 (30 MHz – 1 GHz)



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

Channel 9538 (1 GHz – 25 GHz)



5.1.6 Block Edge Compliance

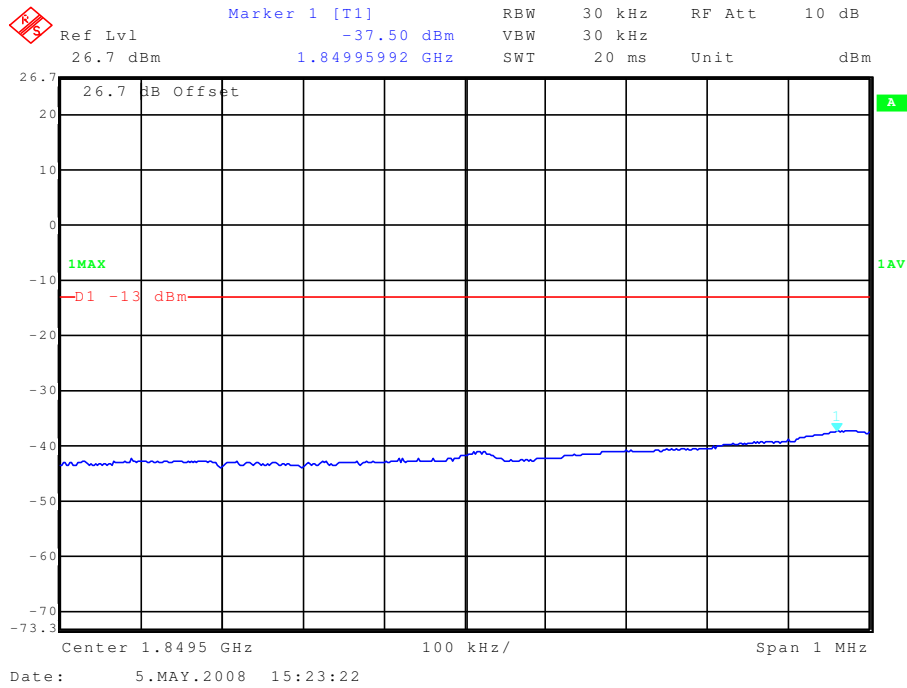
Reference

FCC:	CFR Part 24.238
IC:	RSS 133, Issue 3, Section 6.5

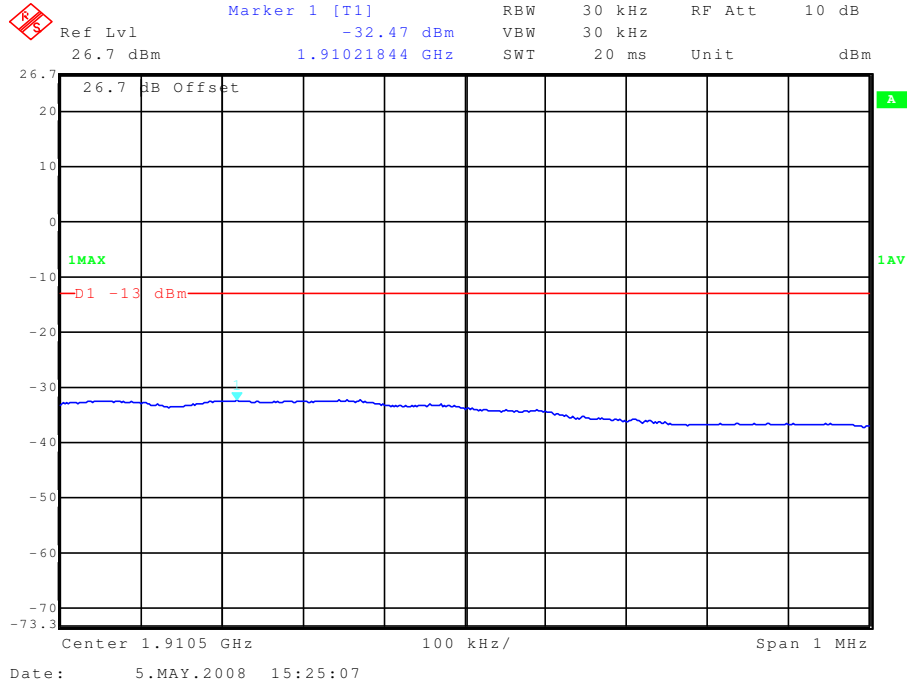
Measurement Limit:

(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.

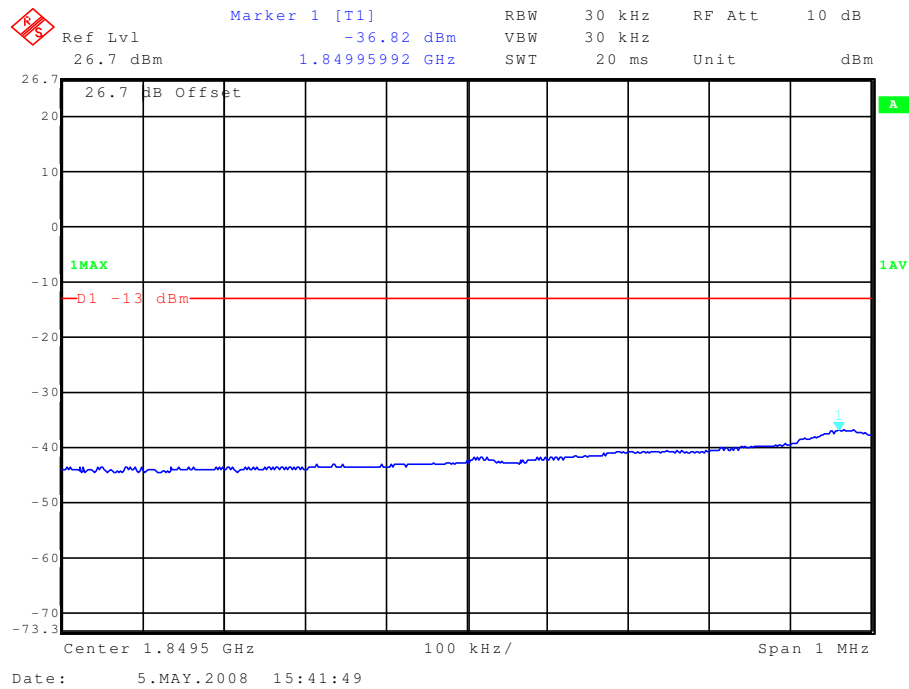
Channel 9262



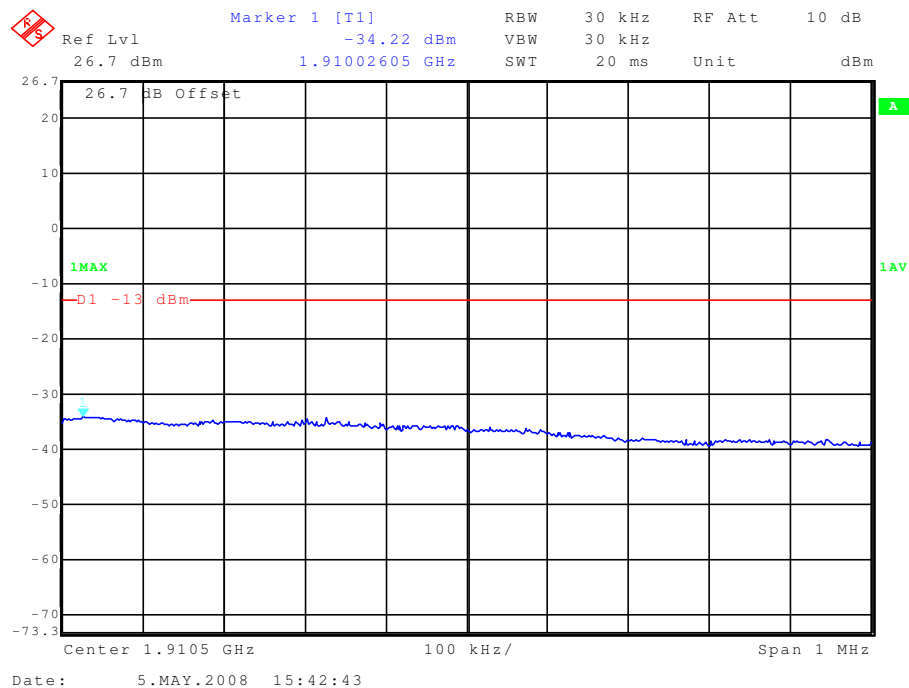
Channel 9538



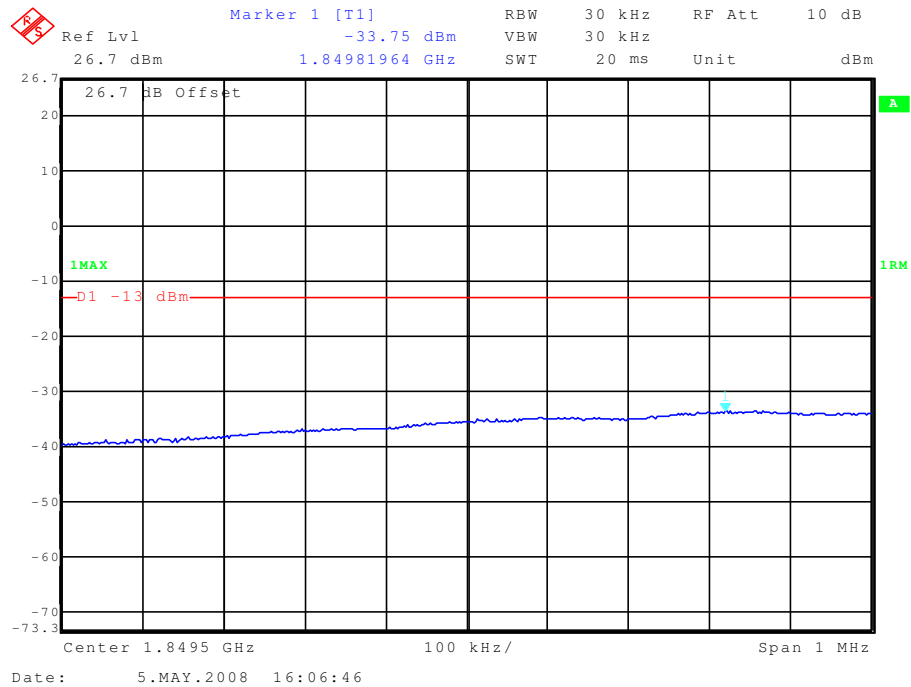
Channel 9262 (HSDPA)



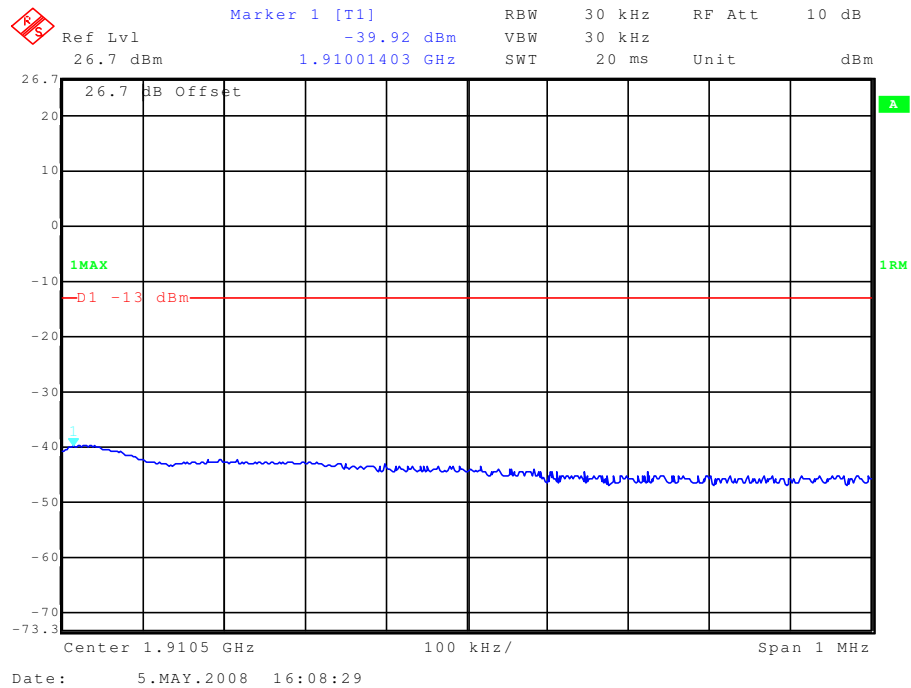
Channel 9538 (HSDPA)



Channel 9262 (HSUPA)



Channel 9538 (HSUPA)



5.1.7 Occupied Bandwidth

Reference

FCC:	CFR Part 24.238, 2.1049
IC:	RSS 133, Issue 3, 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	4557	4689
1907.6 MHz	4545	4665

HSDPA mode

Frequency	99% Occupied Bandwidth KHz	-26 dBc Bandwidth KHz
1852.4 MHz	4509	4629
1880.0 MHz	4533	4629
1907.6 MHz	4545	4629

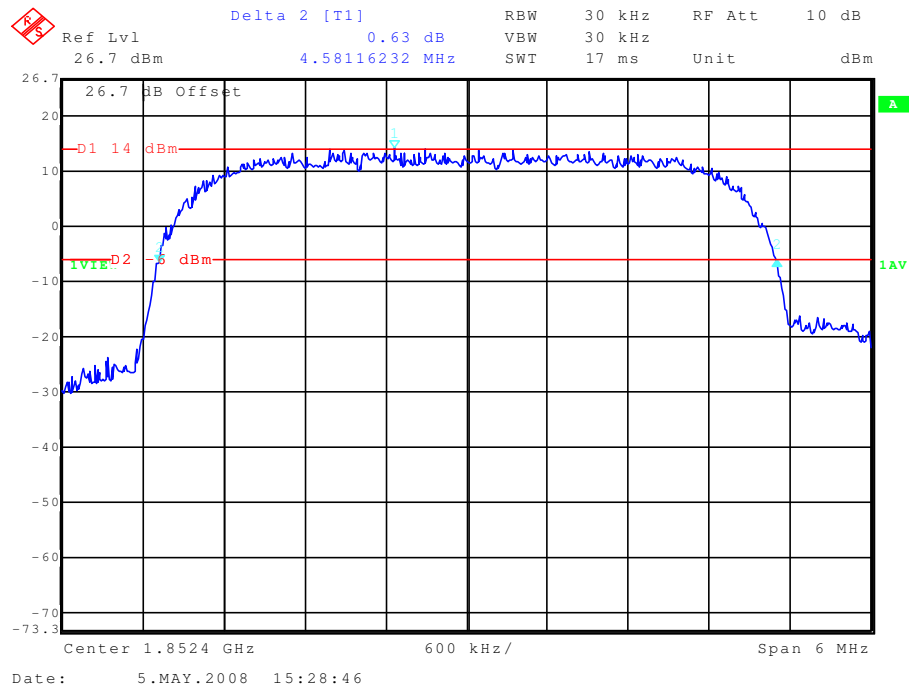
HSUPA mode

Frequency	99% Occupied Bandwidth KHz	-26 dBc Bandwidth KHz
1852.4 MHz	4533	4629
1880.0 MHz	4533	4629
1907.6 MHz	4533	4629

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 30.0 kHz was used.

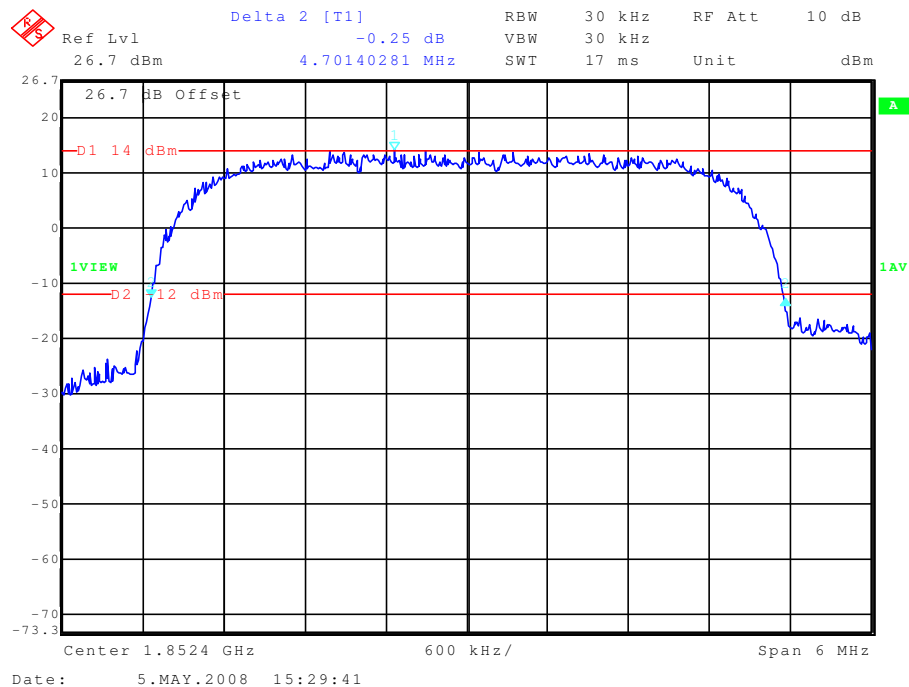
Channel 9262

99% (-20 dB) Occupied Bandwidth



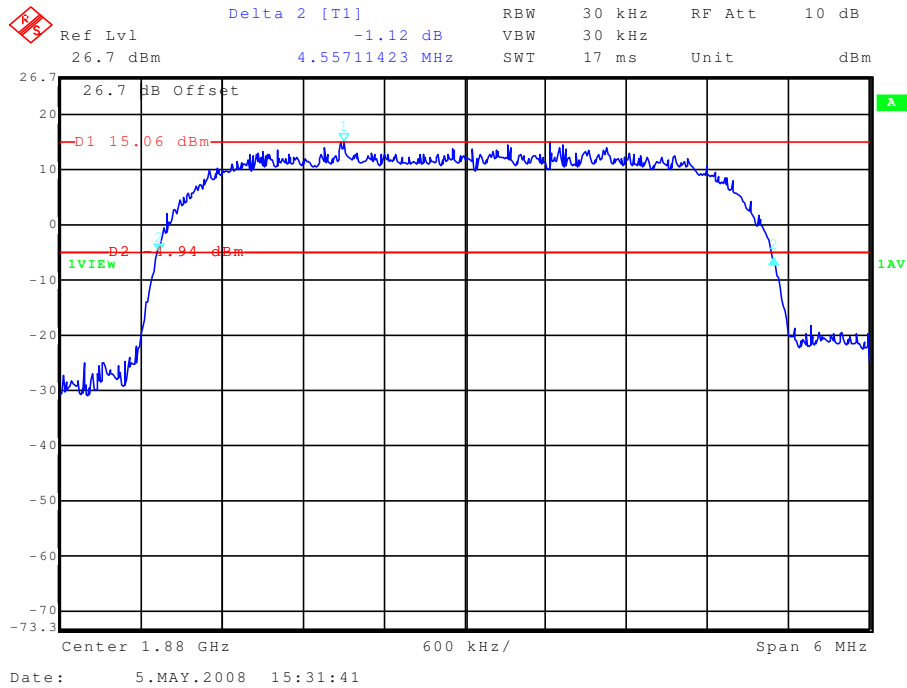
Channel 9262

-26 dBc Bandwidth



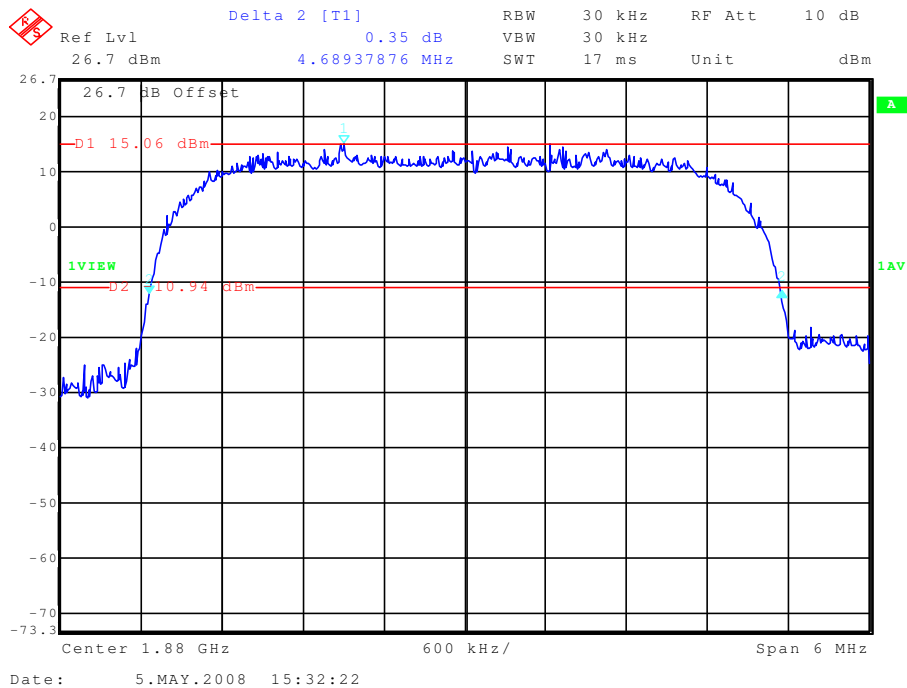
Channel 9400

99% (-20 dB) Occupied Bandwidth

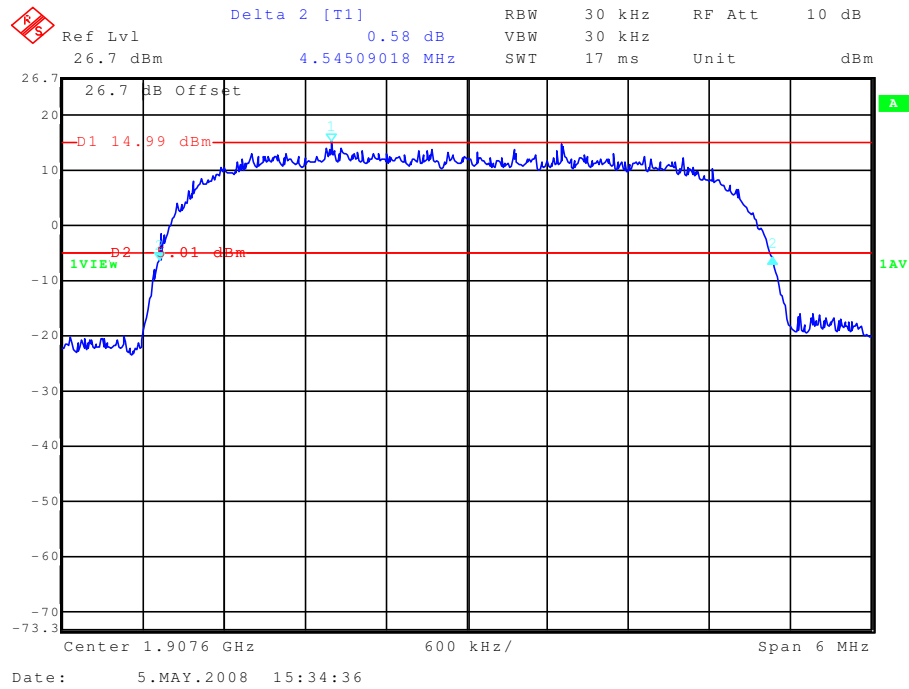


Channel 9400

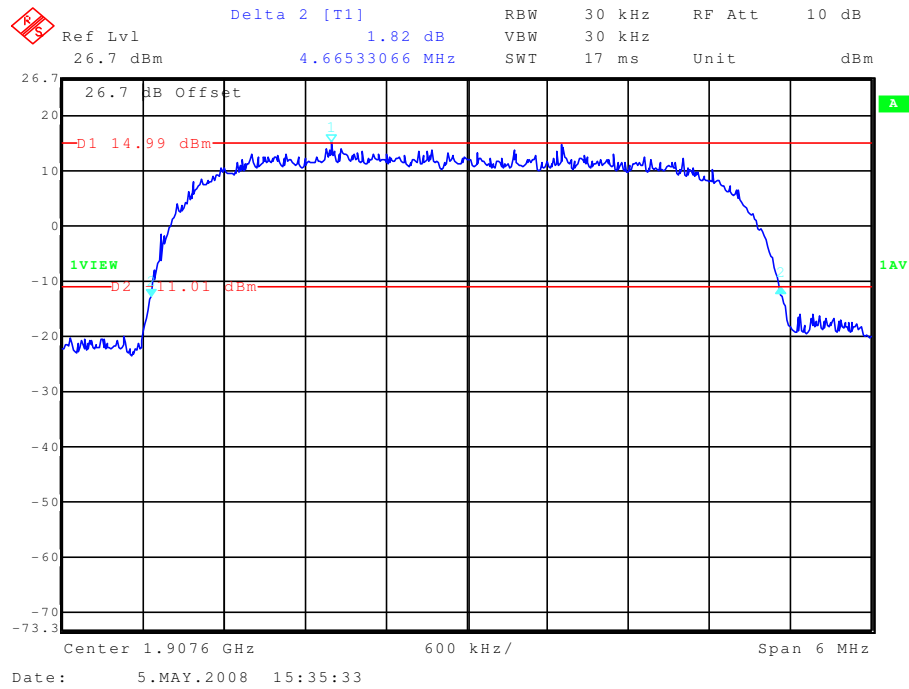
-26 dBc Bandwidth



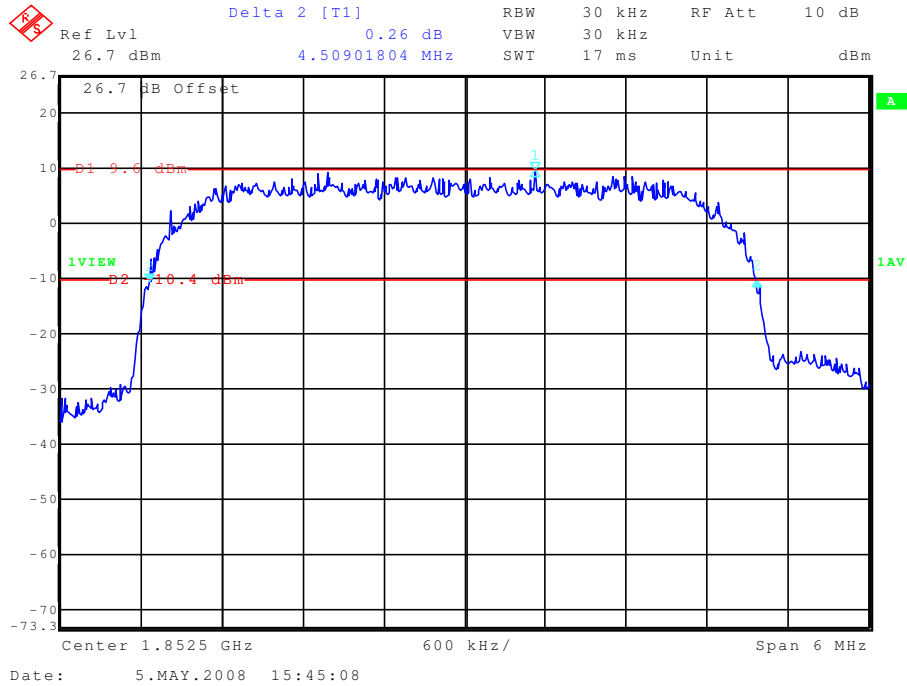
Channel 9538
99% (-20 dB) Occupied Bandwidth



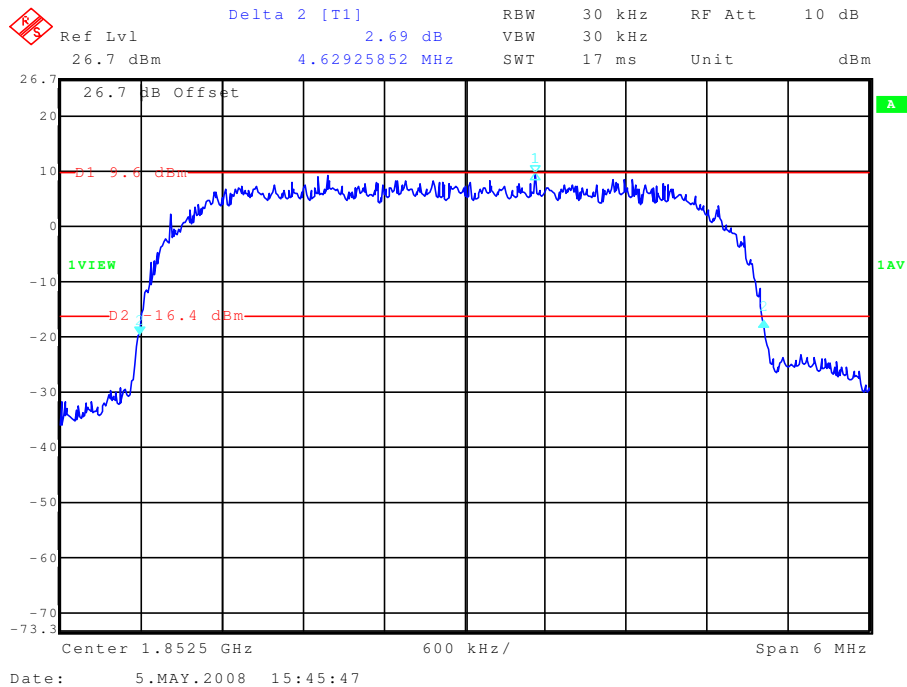
Channel 9538
-26 dBc Bandwidth



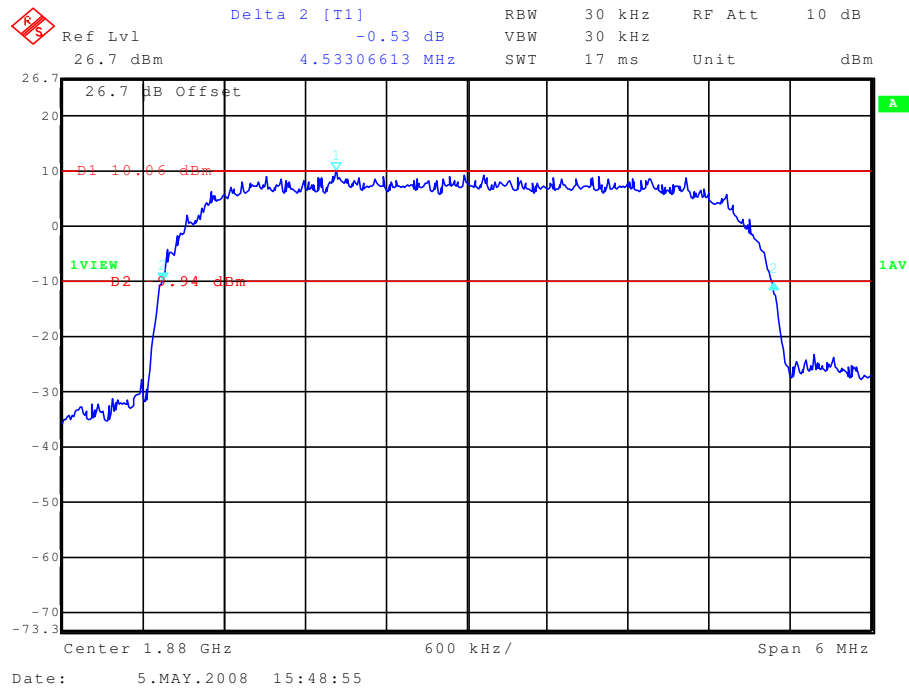
Channel 9262 (HSDPA)
99% (-20 dB) Occupied Bandwidth



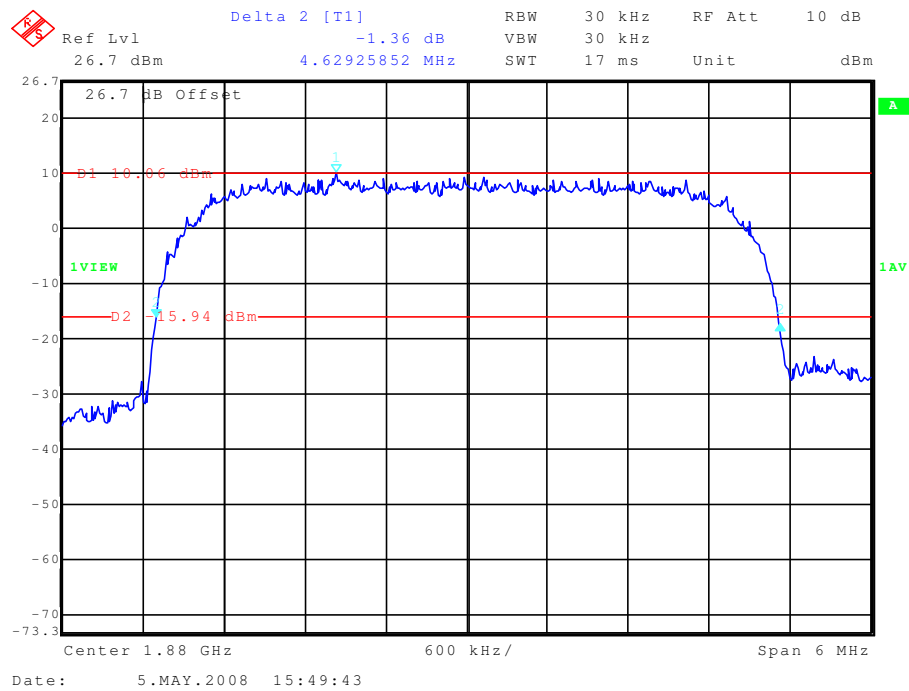
Channel 9262 (HSDPA)
-26 dBc Bandwidth



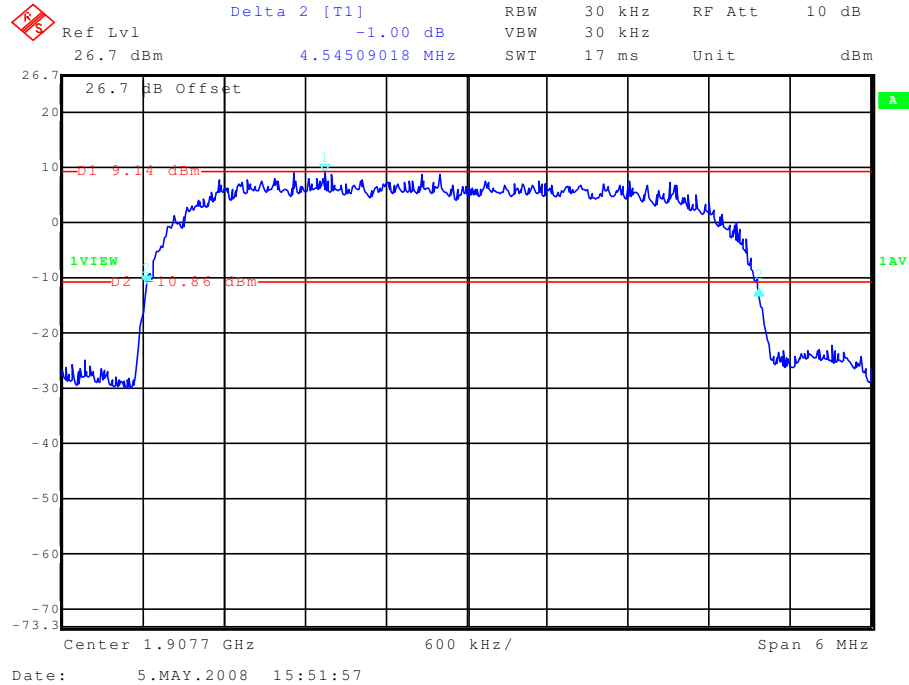
Channel 9400 (HSDPA)
99% (-20 dB) Occupied Bandwidth



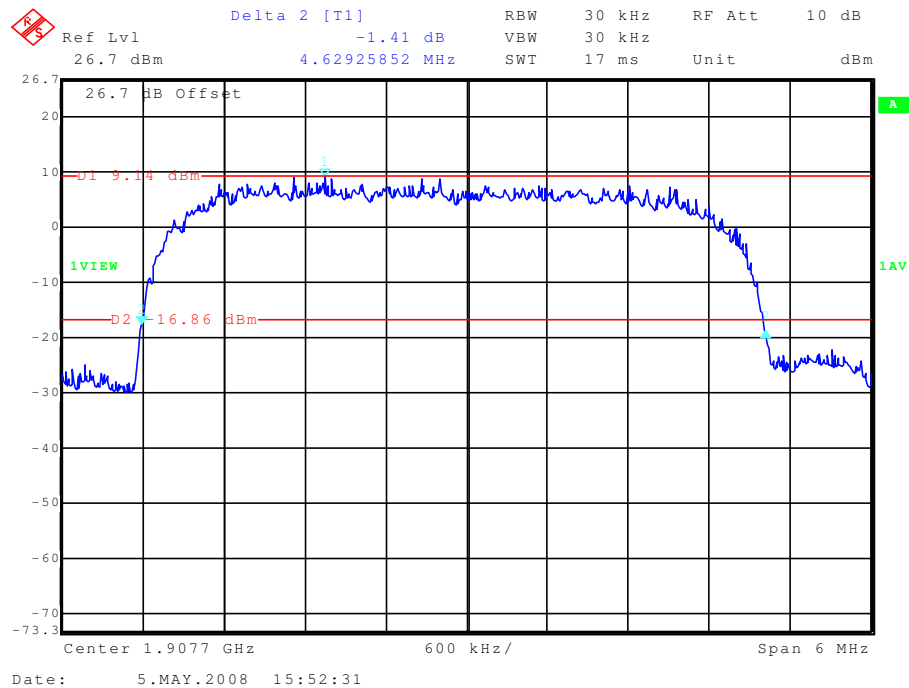
Channel 9400 (HSDPA)
-26 dBc Bandwidth



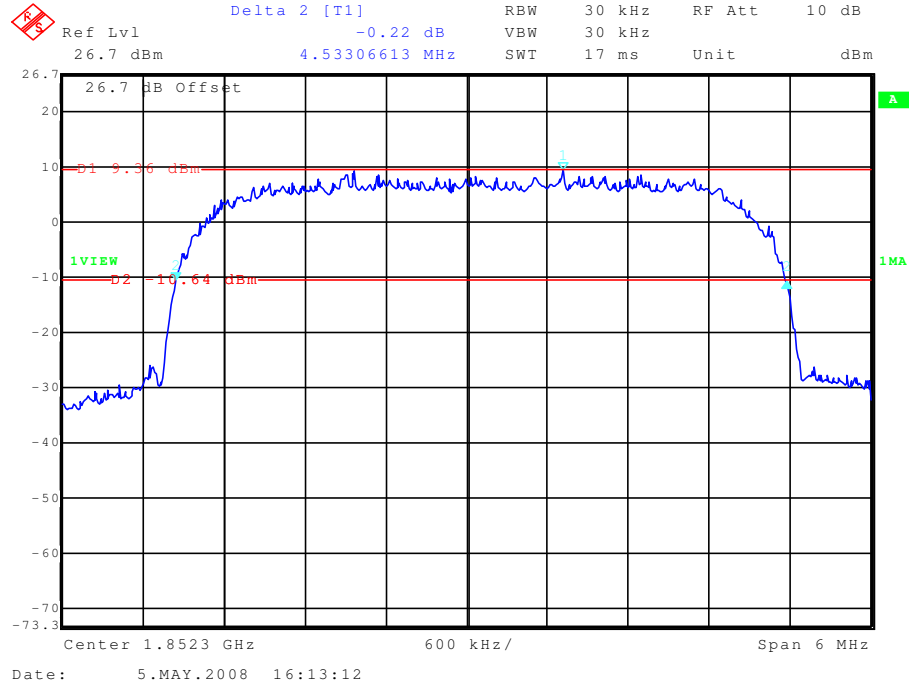
Channel 9538 (HSDPA)
99% (-20 dB) Occupied Bandwidth



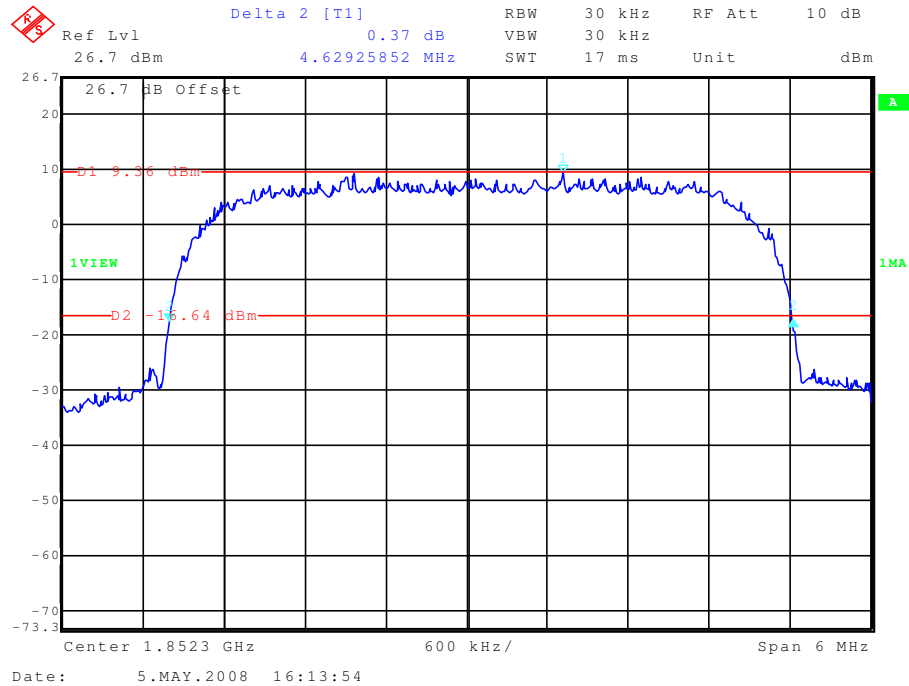
Channel 9538 (HSDPA)
-26 dBc Bandwidth



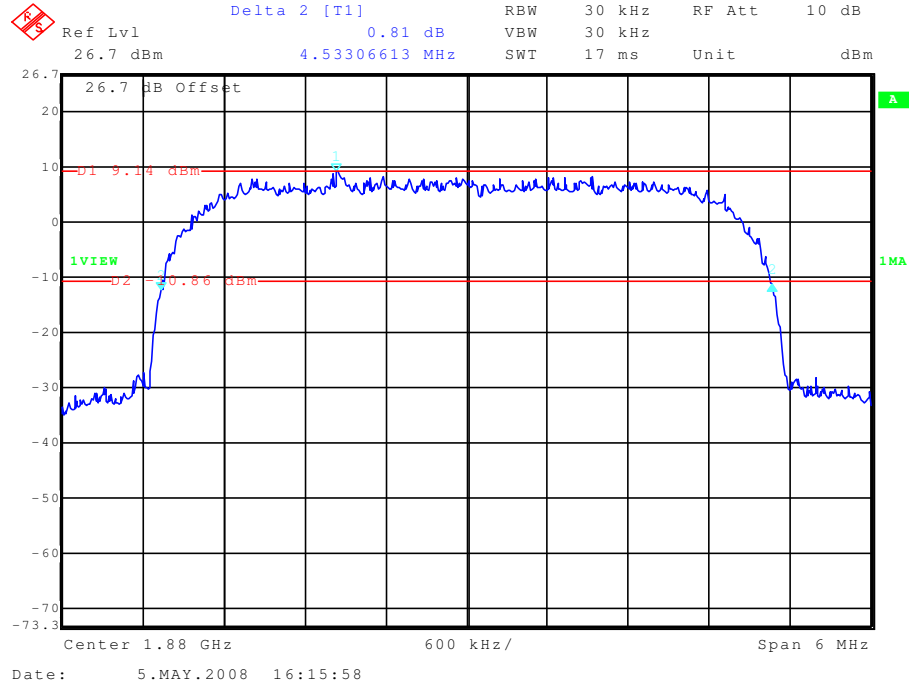
Channel 9262 (HSUPA)
99% (-20 dB) Occupied Bandwidth



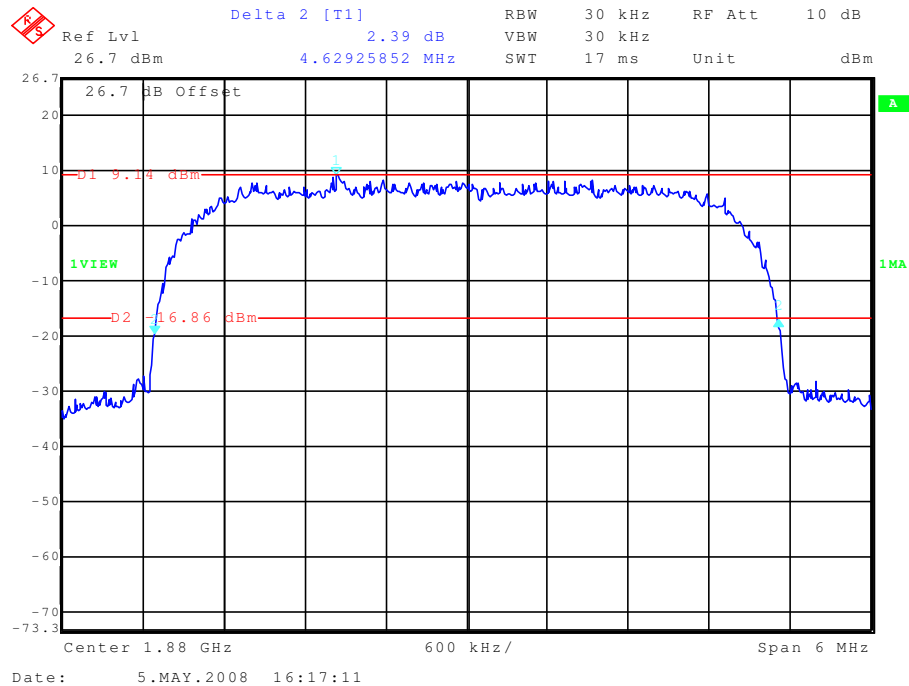
Channel 9262 (HSUPA)
-26 dBc Bandwidth



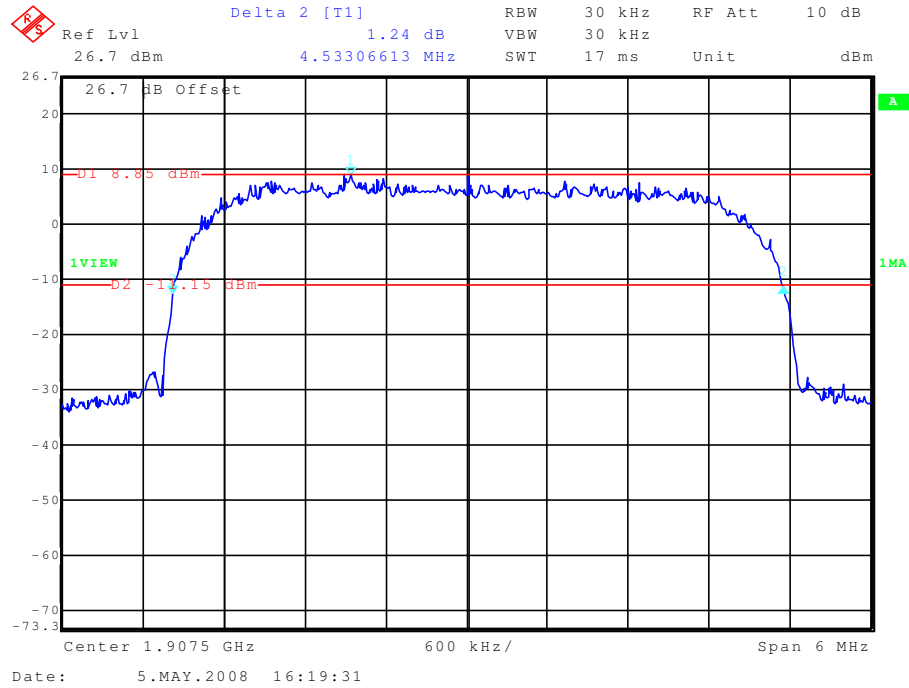
Channel 9400 (HSUPA)
99% (-20 dB) Occupied Bandwidth



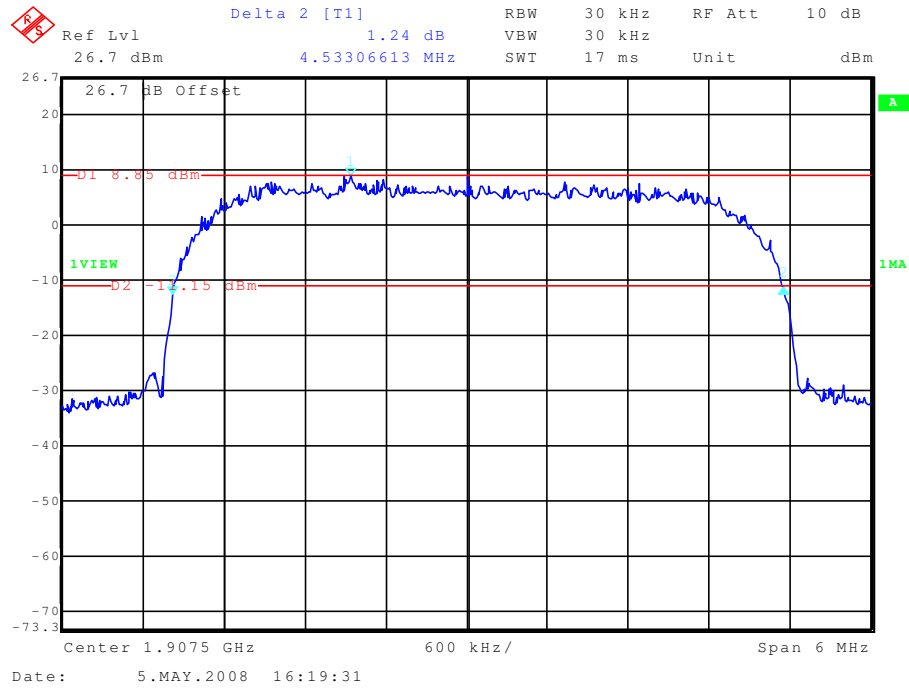
Channel 9400 (HSUPA)
-26 dBc Bandwidth



Channel 9538 (HSUPA)
99% (-20 dB) Occupied Bandwidth



Channel 9538 (HSUPA)
-26 dBc Bandwidth



Test equipment and ancillaries used for tests

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

Anechoic chamber C:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Anechoic chamber	MWB	87400/02	300000996	Monthly verification		
2	System-Rack 85900	HP I.V.	*	300000222	n.a.		
3	Measurement System 1						
4	Spektrum Analyzer 8566B	HP	2747A05306	300001000	05.10.2006	24	05.10.2008
5	Spektrum Analyzer Display 85662A	HP	2816A16541	300002297	05.10.2006	24	05.10.2008
6	Quasi-Peak-Adapter 85650A	HP	2811A01131	300000999	05.10.2006	24	05.10.2008
7	RF-Preselector 85685A	HP	2837A00779	300000218	08.11.2006	24	08.11.2008
8	PC Vectra VL	HP		300001688	n.a.		
9	Software EMI	HP		300000983	n.a.		
10	Measurement System 2						
11	FSP 30	R&S	100623	ICT 300003464	05.10.2007	24	15.10.2009
12	PC	F+W			n.a.		
13	TILE	TILE			n.a.		
14	Biconical antenna	EMCO	S/N: 860 942/003		Monthly verification (System cal.)		
15	Log. Period. Antenna 3146	EMCO	2130	300001603	Monthly verification (System cal.)		
16	Double Ridged Antenna HP 3115P	EMCO	3088	300001032	Monthly verification (System cal.)		
17	Active Loop Antenna 6502	EMCO	2210	300001015	Monthly verification (System cal.)		
18	Power Supply 6032A	HP	2818A03450	300001040	12.05.2007	36	12.05.2010
19	Busisolator	Kontron		300001056	n.a.		
20	Leitungsteiler 11850C	HP		300000997	Monthly verification (System cal.)		
21	Power attenuator 8325	Byrd	1530	300001595	Monthly verification (System cal.)		
22	Band reject filter WRCG1855/1910	Wainwright	7	300003350	Monthly verification (System cal.)		
23	Band reject filter WRCG2400/2483	Wainwright	11	300003351	Monthly verification (System cal.)		

Signalling Units:

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

SRD Laboratory Room 002:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	System Controller PSM 12	R&S	835259/007	3000002681-00xx	n.a.		
2	Memory Extension PSM-K10	R&S	To 1	3000002681	n.a.		
3	Operating Software PSM-B2	R&S	To 1	3000002681	n.a.		
4	19" Monitor		22759020-ED	3000002681	n.a.		
5	Mouse		LZE 0095/6639	3000002681	n.a.		
6	Keyboard		G00013834L 461	3000002681	n.a.		
7	Spectrum Analyser FSIQ 26	R&S	835540/018	3000002681-0005	01.08.2006	24	01.08.2008
8	Tracking Generator FSIQ-B10	R&S	835107/015	3000002681	s.No.7		
10	RF-Generator SMIQ03 (B1 Signal)	R&S	835541/056	3000002681-0002	01.08.2006	36	01.08.2009
11	Modulation Coder SMIQ-B20	R&S	To 10	3000002681	s.No.10		
12	Data Generator SMIQ-B11	R&S	To 10	3000002681	s.No.10		
13	RF Rear Connection SMIQ-B19	R&S	To 10	3000002681	s.No.10		
14	Fast CPU SM-B50	R&S	To 10	3000002681	s.No.10		
15	FM Modulator SM-B5	R&S	835676/033	3000002681	s.No.10		
16	RF-Generator SMIQ03 (B2 Signal)	R&S	835541/055	3000002681-0001	01.08.2006	36	01.08.2009
17	Modulation Coder SMIQ-B20	R&S	To 16	3000002681	s.No.16		
18	Data Generator SMIQ-B11	R&S	To 16	3000002681	s.No.16		
19	RF Rear Connection SMIQ-B19	R&S	To 16	3000002681	s.No.16		
20	Fast CPU SM-B50	R&S	To 16	3000002681	s.No.16		
21	FM Modulator SM-B5	R&S	836061/022	3000002681	s.No.16		
22	RF-Generator SMP03 (B3 Signal)	R&S	835133/011	3000002681-0003	01.08.2006	36	01.08.2009
23	Attenuator SMP-B15	R&S	835136/014	3000002681	S.No.22		
24	RF Rear Connection SMP-B19	R&S	834745/007	3000002681	S.No.22		
25	Power Meter NRVD	R&S	835430/044	3000002681-0004	01.08.2006	24	01.08.2008
26	Power Sensor NRVD-Z1	R&S	833894/012	3000002681-0013	01.08.2006	24	01.08.2008
27	Power Sensor NRVD-Z1	R&S	833894/011	3000002681-0010	01.08.2006	24	01.08.2008
28	Rubidium Standard RUB	R&S		3000002681-0009	01.08.2006	24	01.08.2008

29	Switching and Signal Conditioning Unit SSCU	R&S	338864/003	3000002681-0006	01.08.2006	24	01.08.2008
30	Laser Printer HP Deskjet 2100	HP	N/A	3000002681-0011	n.a.		
31	19'' Rack	R&S	1113836300004	3000002681	n.a.		
32	RF-cable set	R&S	N/A	3000002681	n.a.		
33	IEEE-cables	R&S	N/A	3000002681	n.a.		
34	Sampling System FSQ-B70	R&S	835355/009	3000002681	s.No.7		
35	RSP programmable attenuator	R&S	834500/010	3000002681-0007	01.08.2006	24	01.08.2008
36	Signalling Unit	R&S	838312/011	3000002681	n.a.		
37	NGPE programmable Power Supply for EUT	R&S	192.033.41	3000002681			
38	Climatic box VT 4002	Heraeus Vötsch	58566046820010	300003019	11.05.2007	24	11.05.2009
39	Signaling Unit CMU200	R&S	832221/0055	300002862	12.01.2006	24	12.01.2008
40	Power Splitter 6005-3	Inmet Corp.	none	300002841	23.12.2006	24	23.12.2008
41	SMA Cables SPS-1151-985-SPS	Insulated Wire	different	different	n.a.		
42	CBT32 with EDR Signaling Unit	R&S					
43	Coupling unit	Narda	N/A	--	n.a.		
44	2xSwitch Matrix PSU	R&S	872584/021	300001329	n.a.		
45	RF-cable set	R&S	N/A	different	n.a.		
46	IEEE-cables	R&S	N/A	--	n.a.		

Anmerkung: 3000002681-00xx als Systeme inventarisiert

System Rack Room 005 :

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

Anechoic chamber F:

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