CETECOM ICT Services GmbH
Untertürkheimer Str. 6-10, 66117 Saarbruecken Phone: +49 (0) 681 598-0 Fax: -9075
RSC-Laboratory Phone: +49 (0) 681 598-0 Fax: -9075

Recognized by the
Federal Communications Commission
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: 3463 (IC)
TCB ID: DE 0001

Accredited by the
German Accreditation Council
DAR–Registration Number
DAT-P-176/94-D1

Independent ETSI
compliance test house

Accredited Bluetooth® Test Facility (BQTF)

Test report No.	**:**	**2-4239-24-02/06**
Applicant	**:**	**Sony Ericsson Mobile Communications AB**
Type	**:**	**AAF-1042011-BV**
Test Standard	**:**	**FCC Part 22, 24 RSS132, 133**
FCC ID	**:**	**PY7AF042011**
Certification No. IC	**:**	**4170B-AF042011**

Table of contents

1 General information

1.1. Administrative data of the test facility

1.1.1 Identification of the testing laboratory

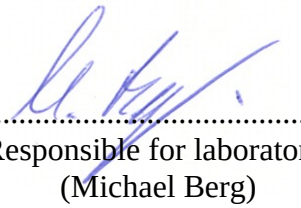
Company name:	Cetecom ICT Services GmbH
Address:	Untertürkheimerstr. 6-10 D-66117 Saarbruecken Germany
Laboratory accreditation:	DAR-Registration No. DAT-P-176/94-D1 Bluetooth Qualification Test Facility (BQTF) Federal Communications Commission (FCC) Identification/Registration No : 90462
Responsible for testing laboratory:	Michael Berg Phone: +49 681 598 0 Fax: +49 681 598 9075 email: info@ict.cetecom.de

1.2. 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 generalizations 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.

.....

Responsible for testing
(Jakob Reschke)



.....

Responsible for laboratory
(Michael Berg)

1.3 Details of Applicant

Name	:	Sony Ericsson Mobile Communications AB
Address	:	Nya Vattentornet
City	:	SE-22188 Lund
Country	:	Sweden
Phone	:	+ 46 (0) 70 320 7056
Fax	:	+ 46 (0) 8 404 3430
Contact	:	Peter Lindeborg
Phone	:	+ 46 (0) 70 57 57 380
Fax	:	+ 46 (0) 46 19 32 95
e-mail	:	Peter.lindeborg@sonyericsson.com

1.4 Application Details

Date of receipt of application	:	2006-05-26
Date of receipt of test item	:	2006-05-29
Date(s) of test	:	2006-05-26 to 2006-06-21
Date of report	:	2006-06-22

1.5 Test Item

Type of equipment	:	GSM Mobile Phone 850/900/1800/1900; EDGE; Bluetooth
Type name	:	AAF-1042011-BV
Manufacturer	:	Sony Ericsson Mobile Communications AB
Address	:	Nya Vattentornet
City	:	SE-22188 Lund
Country	:	Sweden
Frequency	:	1850.2 – 1909.8 MHz and 824.2 – 848.8 MHz
Type of modulation	:	300KGXW
Number of channels	:	300 (PCS1900) and 125 (PCS850)
Antenna Type	:	Integrated antenna
Power supply (normal)	:	4.0V DC
Output power GSM 850		cond.: 31.8 dBm Peak
(Normal – mode)	:	ERP: 31.7 dBm (Burst);
Output power GSM 850		cond.: 29.9 dBm Peak
(EDGE – mode)	:	ERP: 29.9 dBm (Burst);
Output power GSM 1900		cond : 29.9 dBm Peak
(Normal – mode)	:	EIRP: 29.7 dBm (Burst)
Output power GSM 1900		cond : 29,2 dBm Peak
(EDGE – mode)	:	EIRP: 29.5 dBm (Burst)
Transmitter Spurious (worst case)		0.43µW / -33.62 dBm
Receiver Spurious (worst case)		Nothing found
FCC ID	:	PY7AF042011
Certification No. IC	:	4170B-AF042011
Open Area Test Site IC No.	:	3463
IC Standards	:	RSS132, Issue 2, RSS133, Issue 3

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 :

2006-06-02 Jakob Reschke

Date Name Signature

1.6 Test Setup

Hardware	:	FP1
Software	:	R1DA002

Mobile; (cond. measurements)	:	SN: BDX0000NDD, BDX0000NFG
Mobile; (rad. measurements)	:	SN: BDX0000ND6, BDX0000NDU

Standard world wide charger
The radiated measurements were performed with this AC charging unit.

1.7 Test Standards

FCC:	**CFR Part 22 H**
	CFR Part 24 E
IC:	**RSS 132, Issue 2**
	RSS 133, Issue 3

2 Statement of Compliance

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

2.1 Summary of Measurement Results

2.1.1 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

2.1.2 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

3 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. 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).

3.1 PART PCS 1900

3.1.1 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 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)
This 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:

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

Test Results: Output Power (conducted)

Normal mode

Frequency (MHz)	Power Step	Peak Output Power (dBm)	Average Output Power (dBm)
1850.2	0	29.9	28.8
1880.0	0	29.9	28.8
1909.8	0	29.8	28.7
Measurement uncertainty		±0.5 dB	

EDGE- mode

Frequency (MHz)	Power Step	Peak Output Power (dBm)	Average Output Power (dBm)
1850.2	0	29.2	28.1
1880.0	0	29.1	28.0
1909.8	0	29.0	28.0
Measurement uncertainty		±0.5 dB	

EIRP Measurements

Description:

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

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method
(a) The measurements was performed with full rf output power and modulation.
(b) Test was performed at listed 3m test site (listed with FCC, IC).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(f) Set the EMI Receiver and #2 as follows:
Center Frequency: test frequency
Resolution BW: 100 kHz
Video BW: same
Detector Mode: positive
Average: off
Span: 3 x the signal bandwidth
(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
(l) Repeat for all different test signal frequencies

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:
Center Frequency : equal to the signal source
Resolution BW : 10 kHz
Video BW : same
Detector Mode : positive
Average : off
Span : 3 x the signal bandwidth
(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(c) Select the frequency and E-field levels for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (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 it's 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 thetransmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:
P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1
Where: P: Actual RF Power fed into the substitution antenna port after corrected.
P1: Power output from the signal generator
P2: Power measured at attenuator A input
P3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction
(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

Limits:

Power Step	Burst PEAK EIRP (dBm)
0	<33

Test Results: Output Power (radiated)

Normal – mode

Frequency (MHz)	Power Step	Peak Output Power (dBm)		Average Output Power (dBm)	
Antenna position		outside	inside	outside	inside
1850.2	0	28.4	29.5	27.6	27.9
1880.0	0	29.1	29.3	28.2	28.3
1909.8	0	29.7	29.7	28.5	28.5
Measurement uncertainty		±0.5 dB			

Test Results: Output Power (radiated)

EDGE – mode

Frequency (MHz)	Power Step	Peak Output Power (dBm)		Average Output Power (dBm)	
Antenna position		outside	inside	outside	inside
1850.2	0	28.1	29.4	26.4	27.4
1880.0	0	29.5	29.5	27.5	27.6
1909.8	0	29.5	29.6	27.4	27.4
Measurement uncertainty		±0.5 dB			

Sample Calculation:

Freg	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)

3.1.2 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:

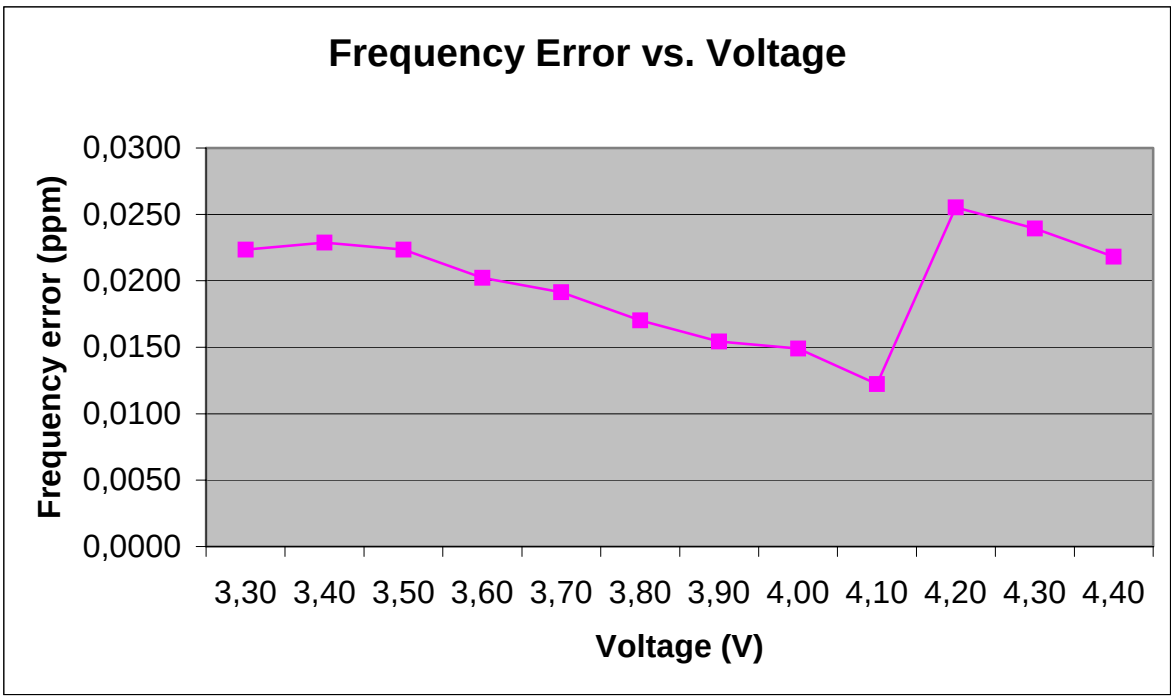
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission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

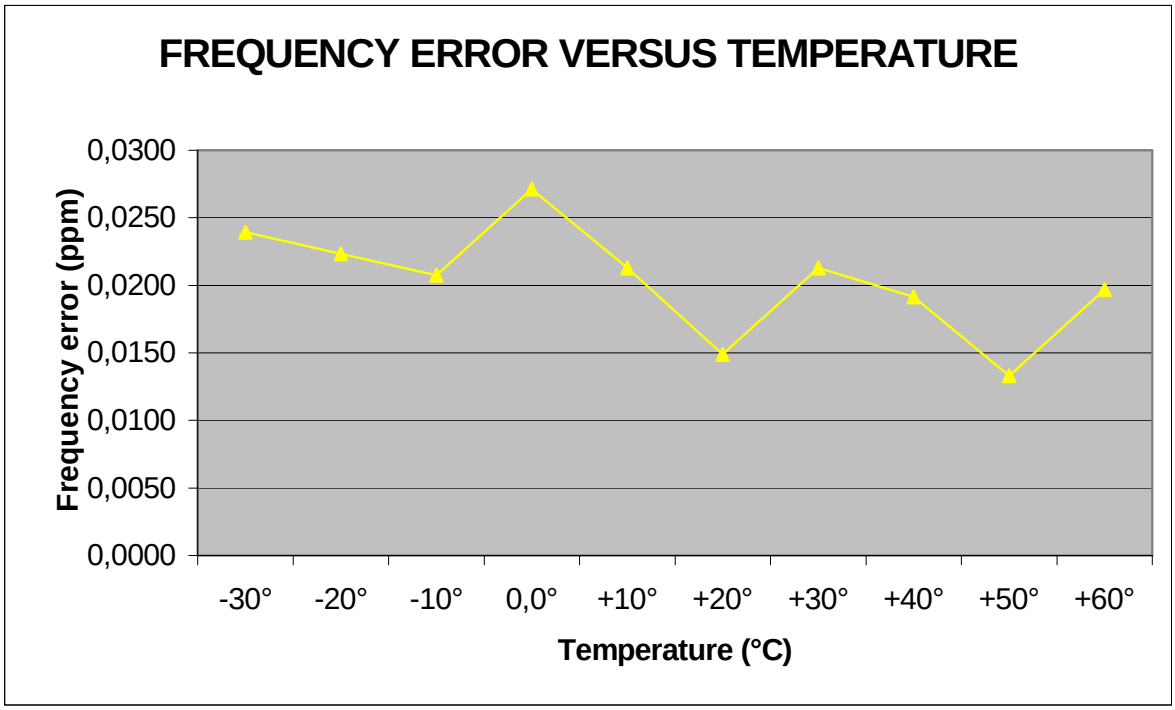
Test Results: AFC FREQ ERROR vs. VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	42	0,00000223	0,0223
3.4	43	0,00000229	0,0229
3.5	42	0,00000223	0,0223
3.6	38	0,00000202	0,0202
3.7	36	0,00000191	0,0191
3.8	32	0,00000170	0,0170
3.9	29	0,00000154	0,0154
4.0	28	0,00000149	0,0149
4.1	23	0,00000122	0,0122
4.2	48	0,00000255	0,0255
4.3	45	0,00000239	0,0239
4.4	41	0,00000218	0,0218

Test Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	45	0,00000239	0,0239
-20	42	0,00000223	0,0223
-10	39	0,00000207	0,0207
±0.0	51	0,00000271	0,0271
+10	40	0,00000213	0,0213
+20	28	0,00000149	0,0149
+30	40	0,00000213	0,0213
+40	36	0,00000191	0,0191
+50	25	0,00000133	0,0133
+60	37	0,00000197	0,0197


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


FREQUENCY ERROR VERSUS TEMPERATURE
Frequency error (ppm)
0,0300
0,0250
0,0200
0,0150
0,0100
0,0050
0,0000
-30° -20° -10° 0,0° +10° +20° +30° +40° +50° +60°
Temperature (°C)

3.1.3 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 ad
justable height antenna mast 3 meters from the test item for emission measurements.
d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and I MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded.
e) Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603.

Measurement Limit:

Sec. 24.238 Emission Limits.
(a) On any frequency outside a licensee' s frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB.
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Measurement Results: Radiated Emissions

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

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

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

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

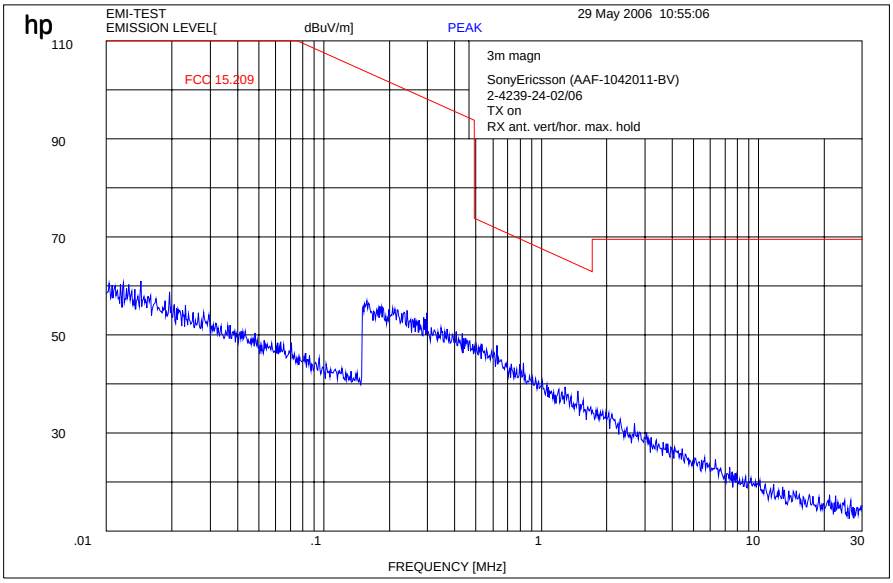
No peaks found < 20 dB below limit.

Sample calculation:

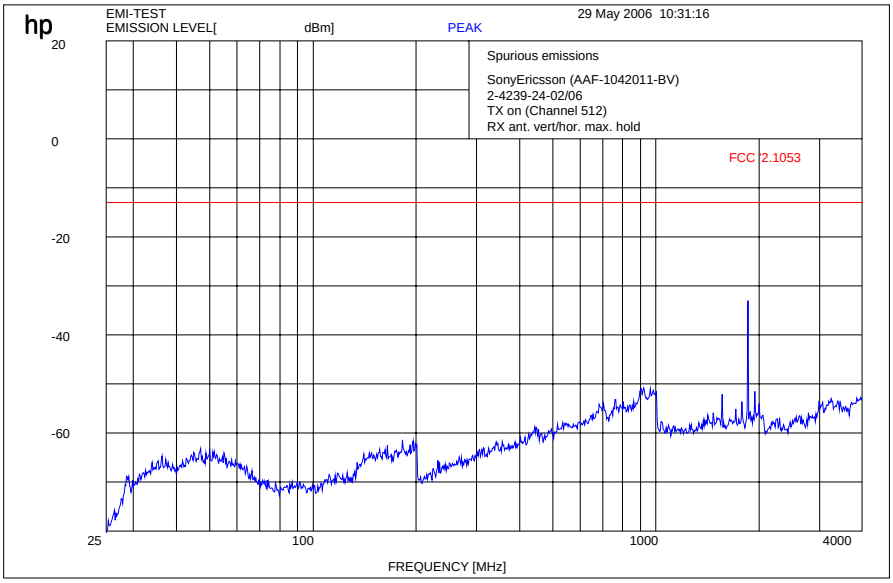
Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBµV	dBm	dBi	dBd	dB	dBm			
1909.8	132.3	24.6	8.4	0.0	3.3	29.7			

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

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

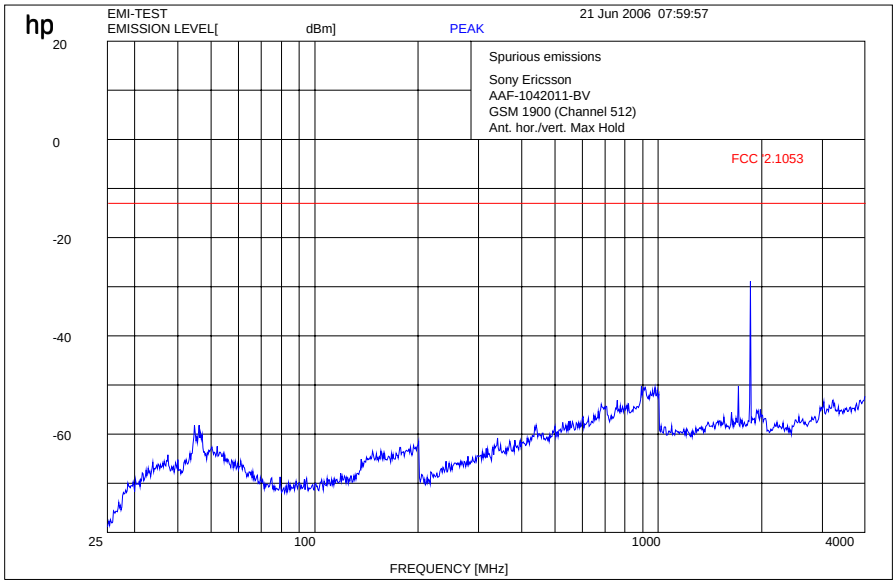


Channel 512 (30 MHz - 4 GHz) Antennaposition outside
Normal – mode



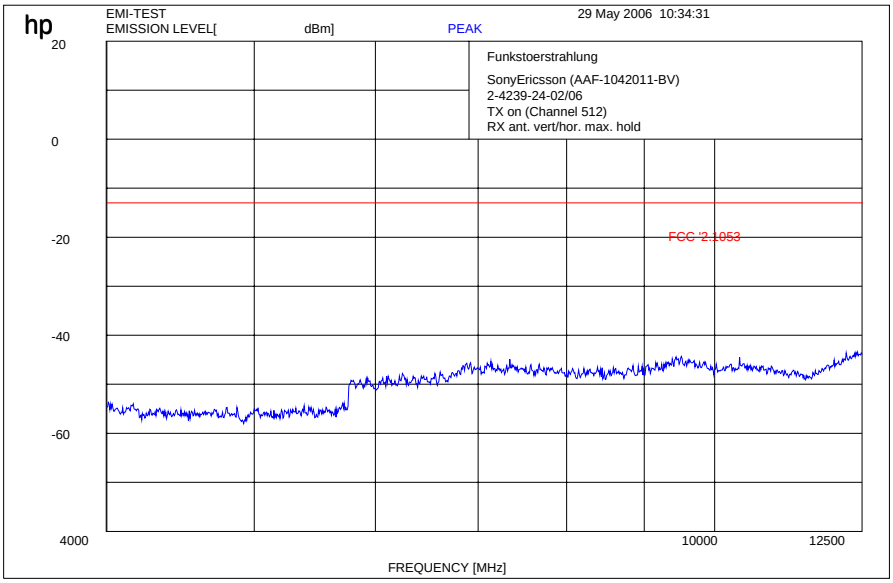
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 512 (30 MHz - 4 GHz) Antennaposition inside
Normal – mode



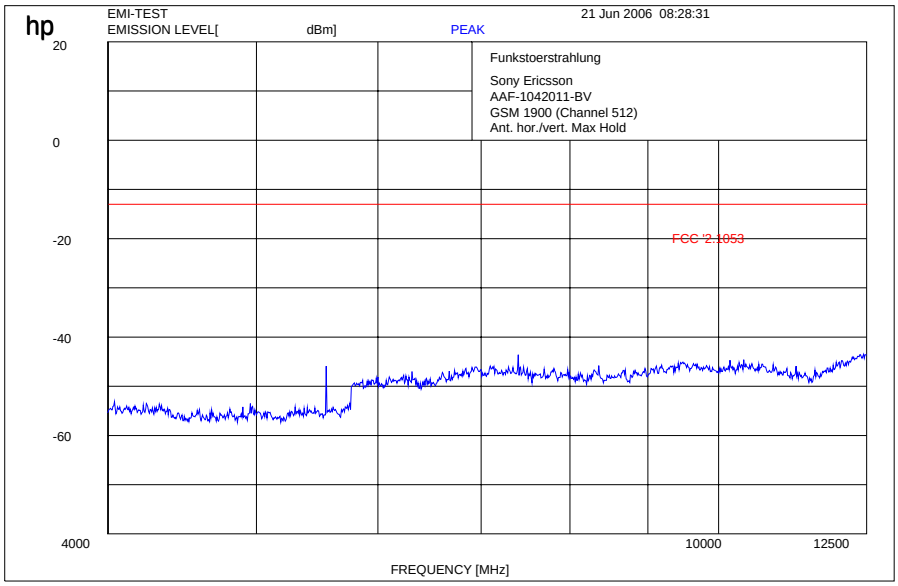
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 512 (4 GHz – 12.5 GHz) Antennaposition outside
Normal – mode



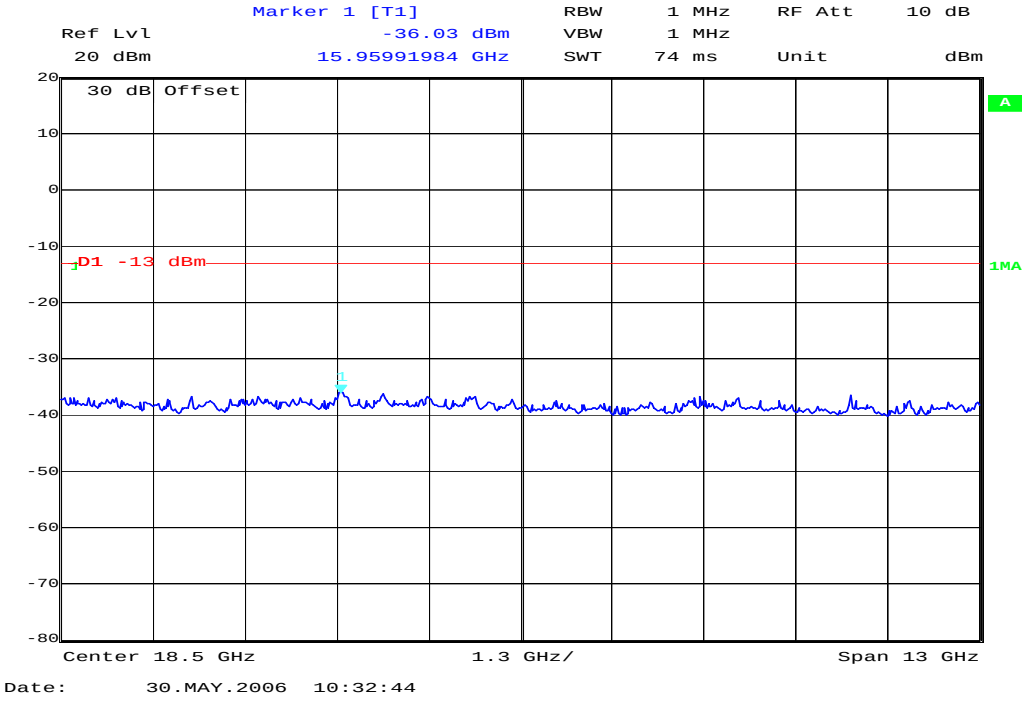
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 512 (4 GHz – 12.5 GHz) Antennaposition inside
Normal – mode

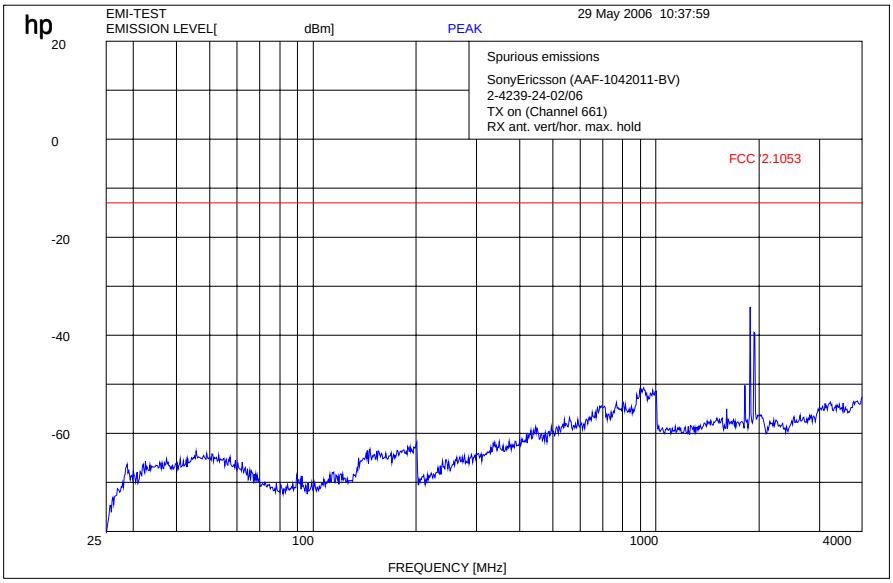


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 512 (12 GHz - 25 GHz) Antennaposition outside
Normal – mode

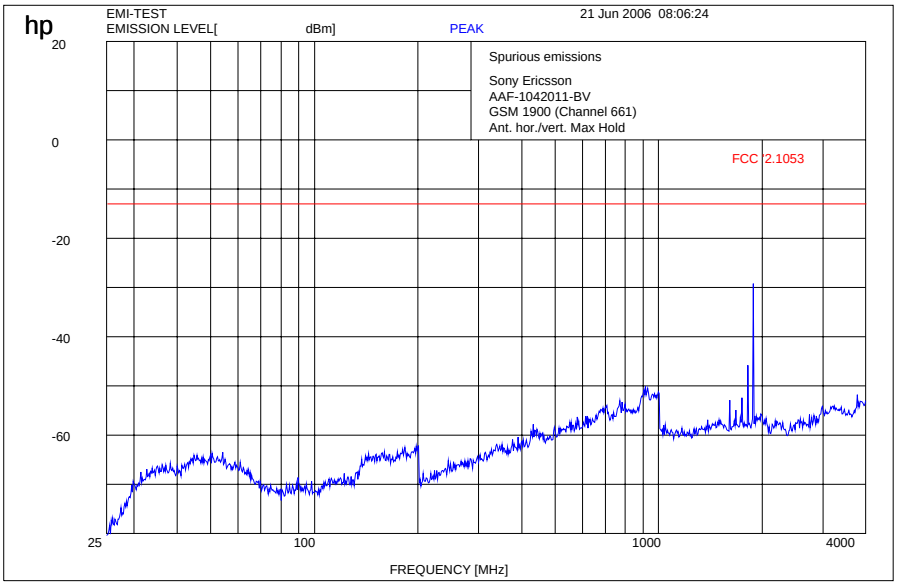


Channel 661 (30 MHz - 4 GHz) Antennaposition outside
Normal – mode



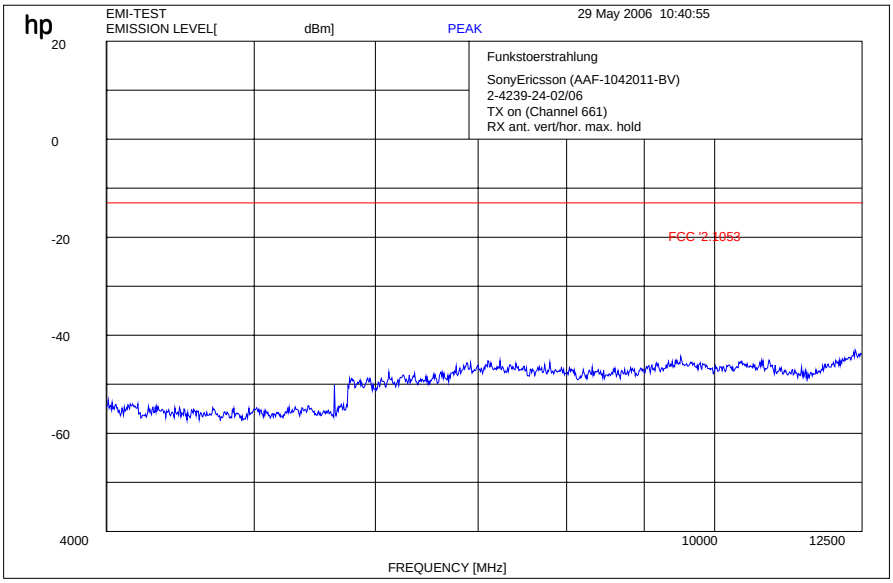
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 661 (30 MHz - 4 GHz) Antennaposition inside
Normal – mode



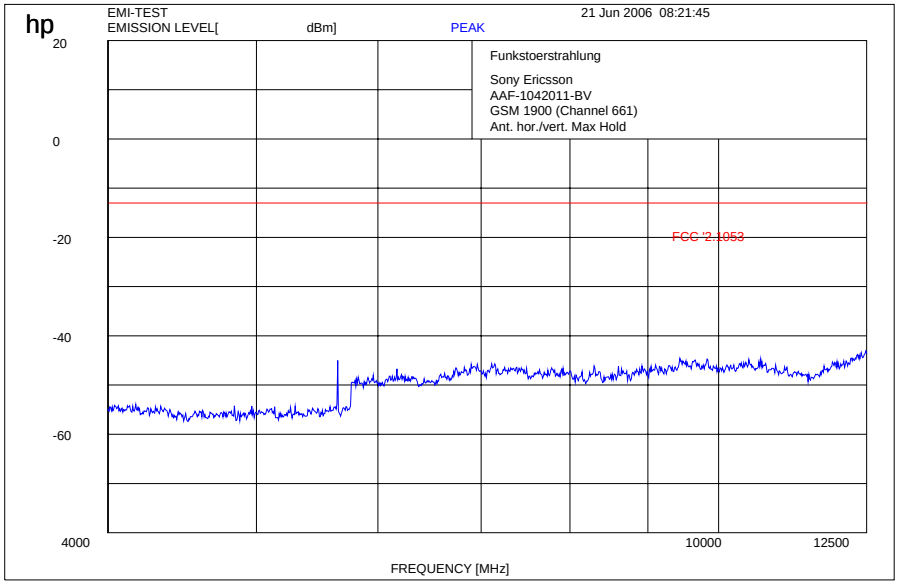
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 661 (4 GHz – 12.5 GHz) Antennaposition outside
Normal – mode



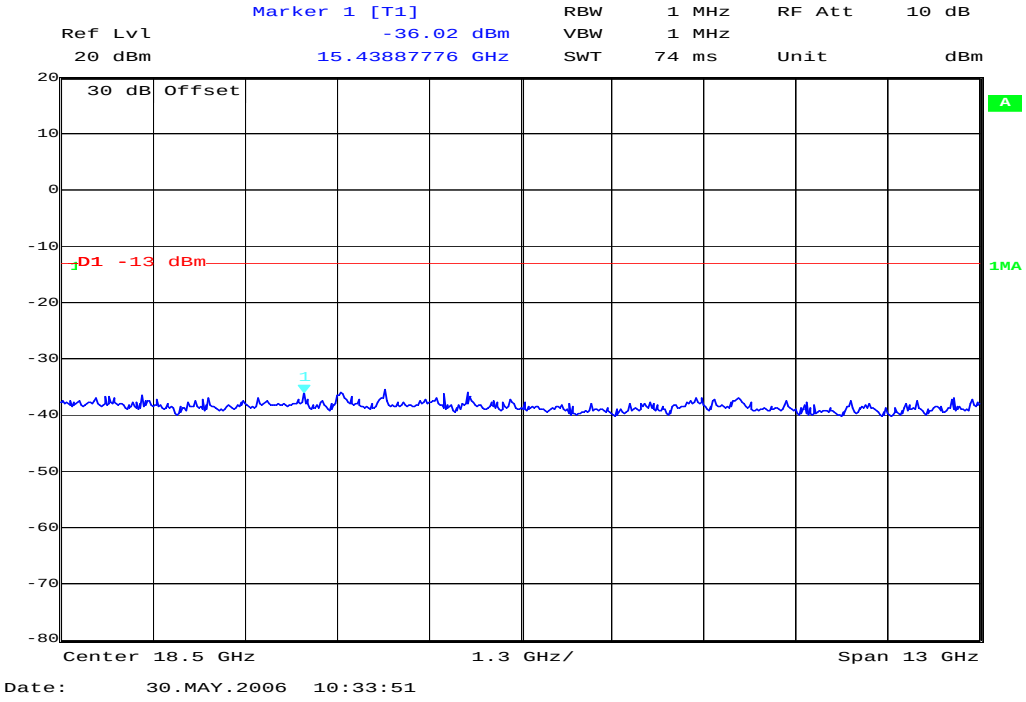
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 661 (4 GHz – 12.5 GHz) Antennaposition outside
Normal – mode

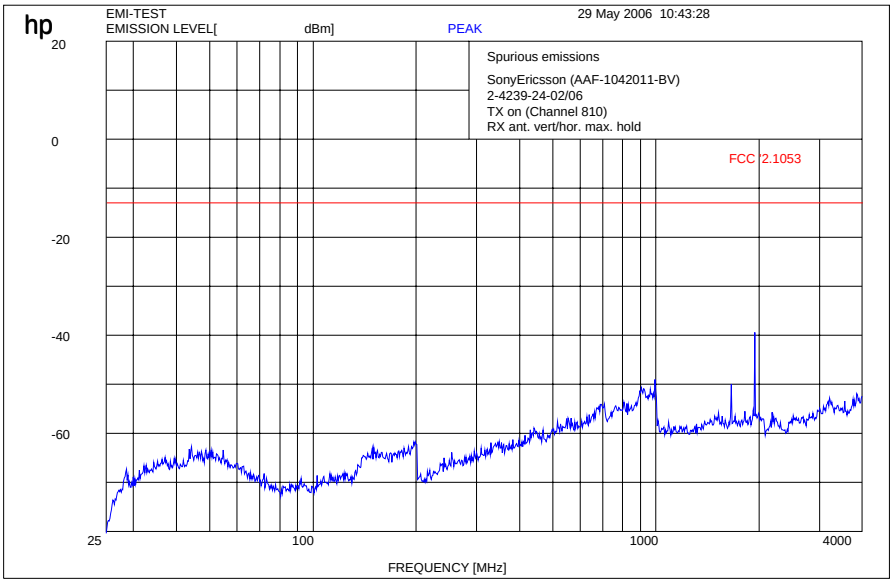


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 661 (12 GHz - 25 GHz) Antennaposition outside Normal – mode

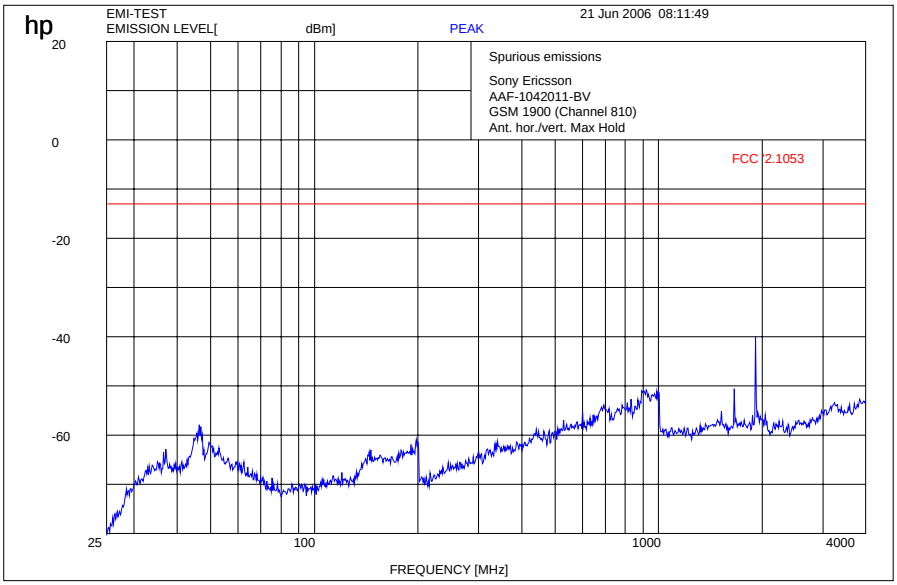


Channel 810 (30 MHz - 4 GHz) Antennaposition outside
Normal – mode



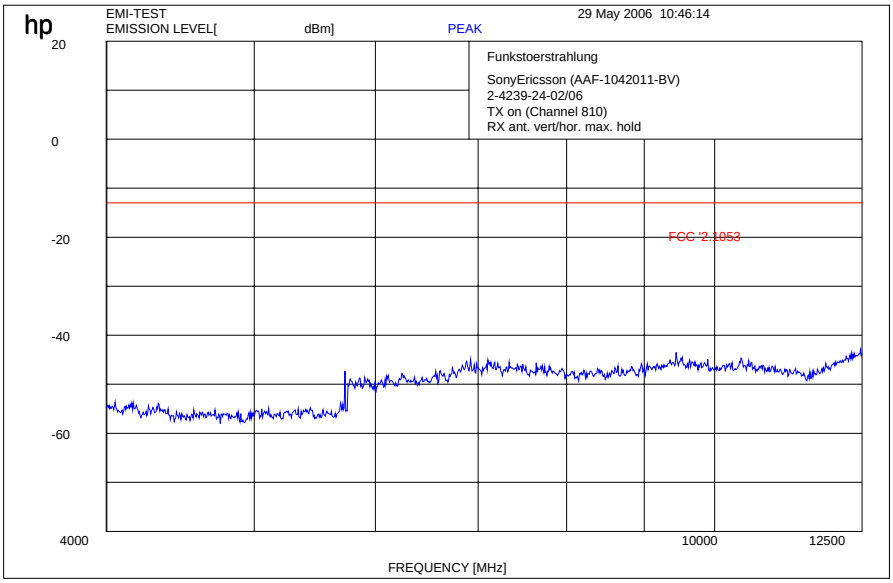
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 810 (30 MHz - 4 GHz) Antennaposition inside
Normal – mode



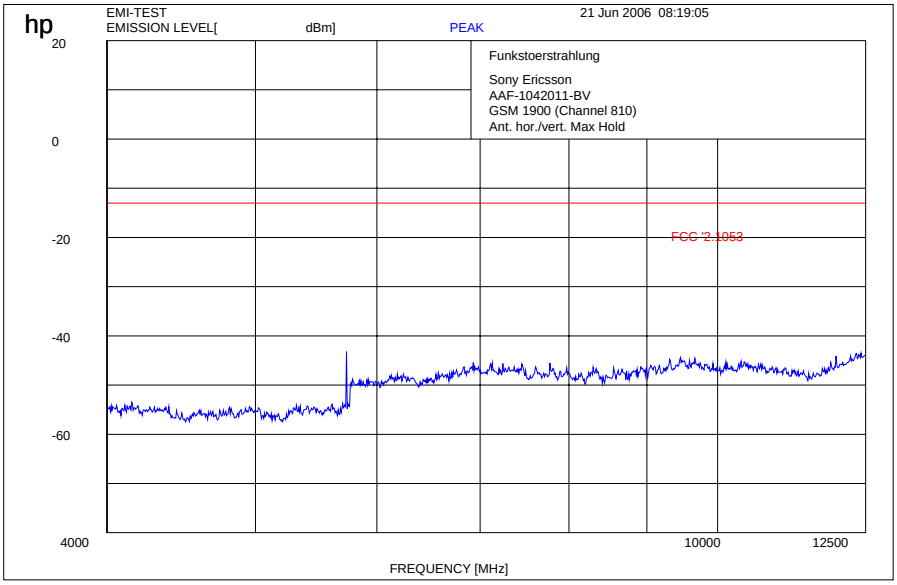
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 810 (4 GHz – 12.5 GHz) Antennaposition outside
Normal – mode



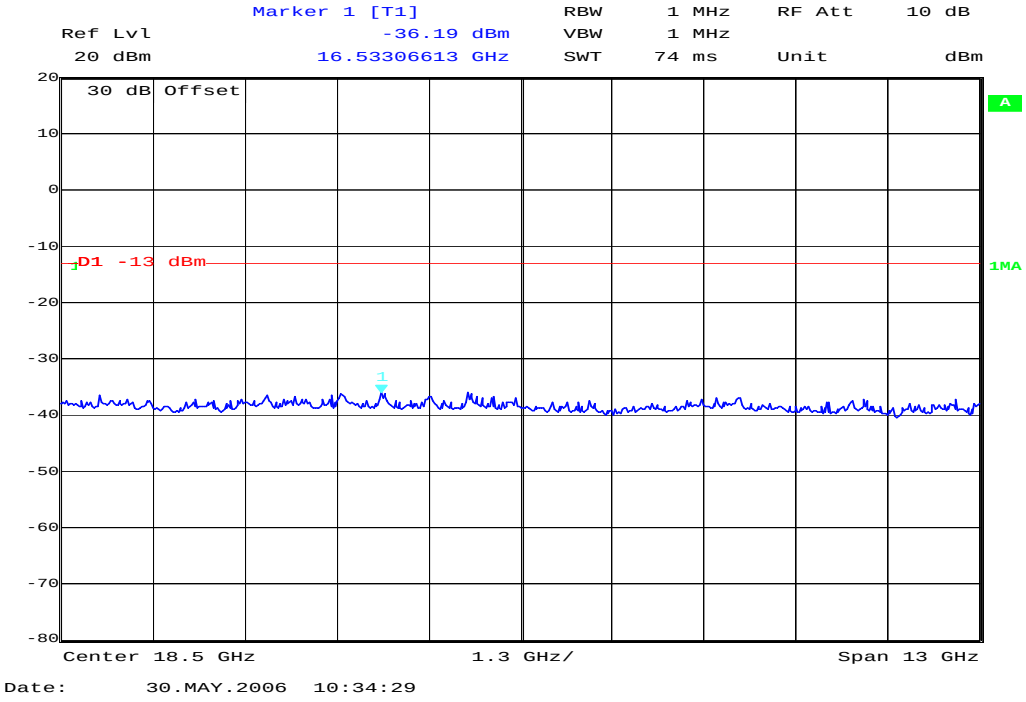
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 810 (4 GHz – 12.5 GHz) Antennaposition outside
Normal – mode

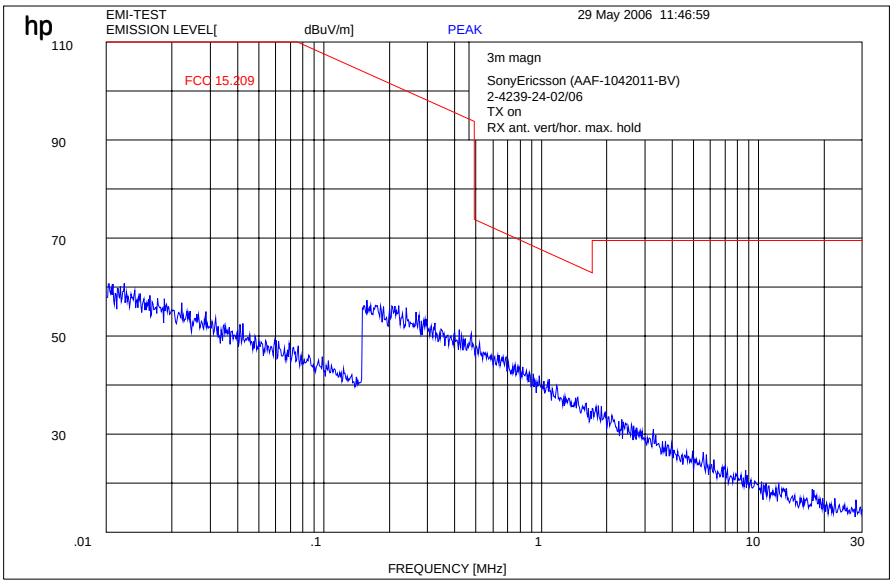


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

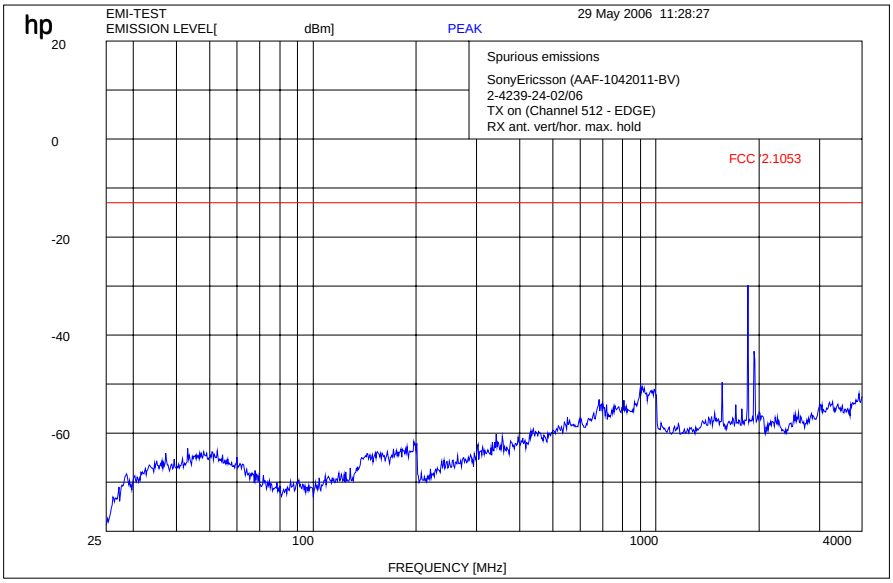
Channel 810 (12 GHz - 25 GHz) Antennaposition outside Normal – mode



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

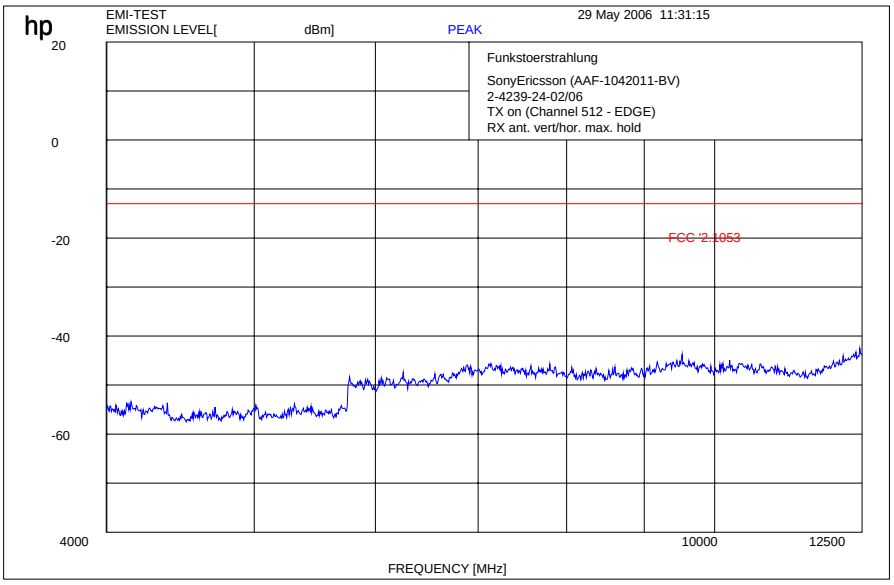


Channel 512 (30 MHz - 4 GHz)
EDGE – mode



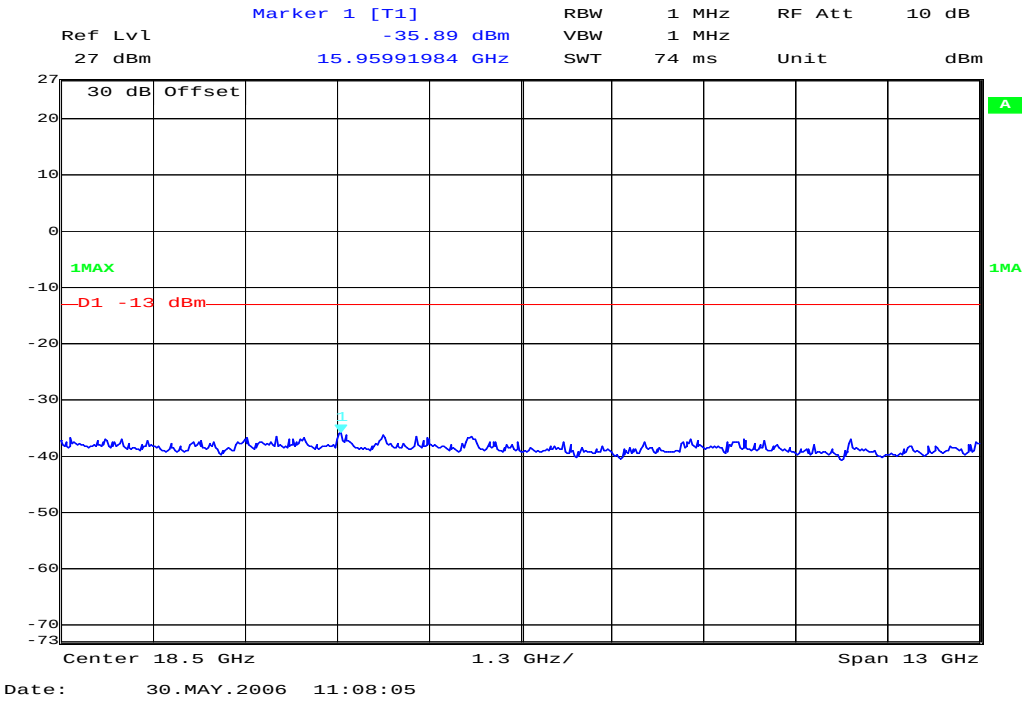
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 512 (4 GHz – 12.5 GHz)
EDGE – mode

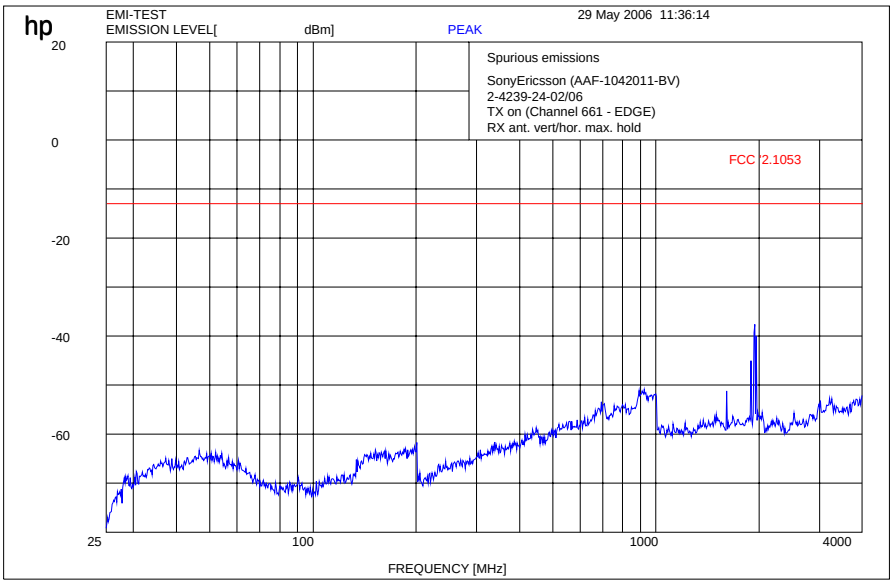


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 512 (12 GHz - 25 GHz)
EDGE – mode

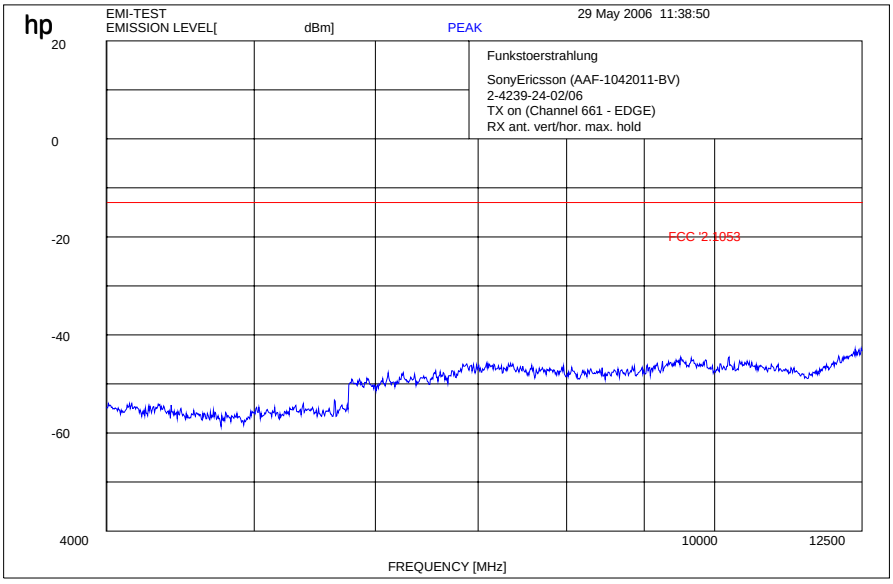


Channel 661 (30 MHz - 4 GHz)
EDGE – mode



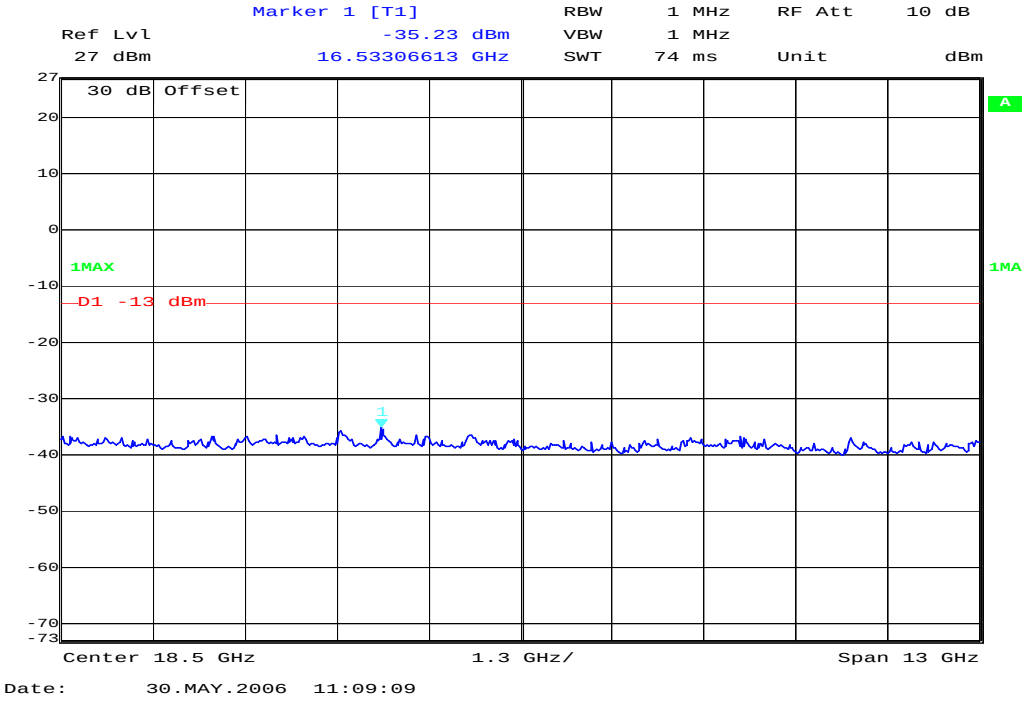
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 661 (4 GHz – 12.5 GHz)
EDGE – mode

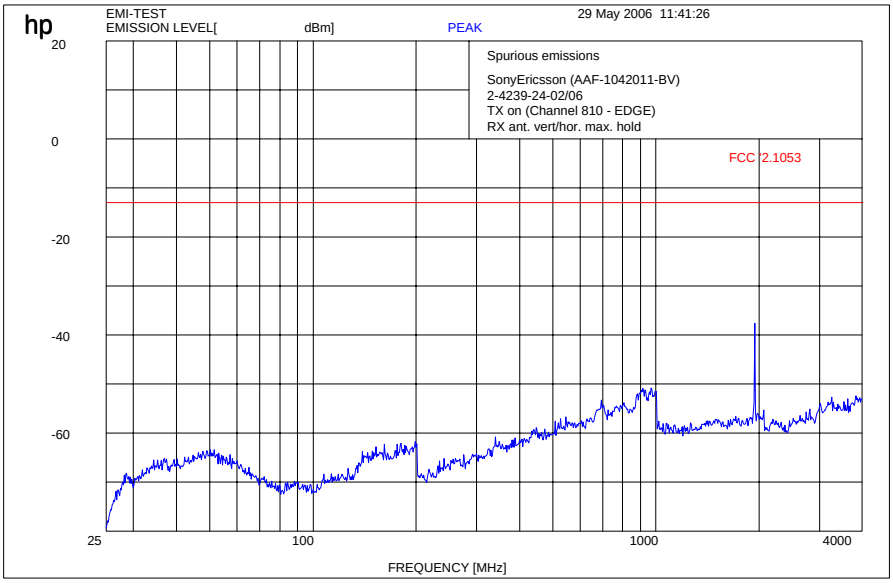


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 661 (12 GHz - 25 GHz)
EDGE – mode

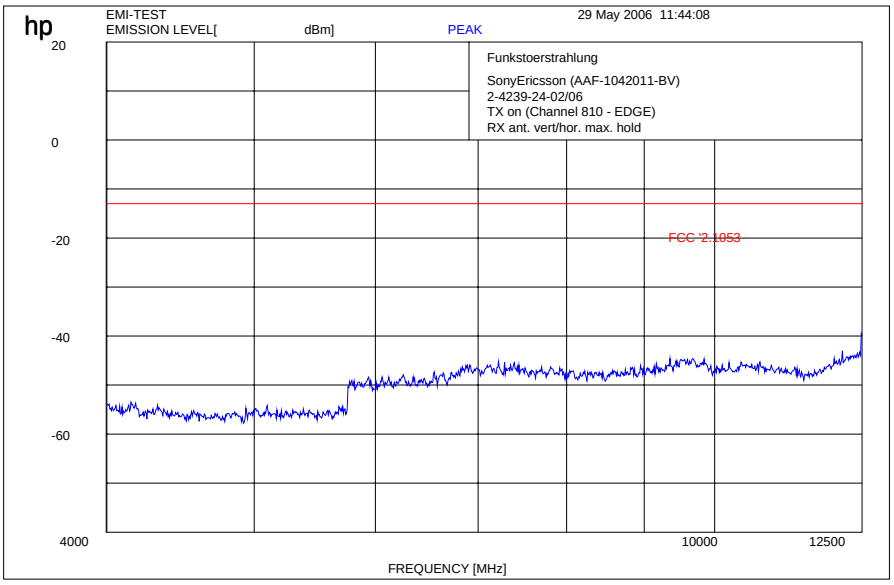


Channel 810 (30 MHz - 4 GHz)
EDGE – mode



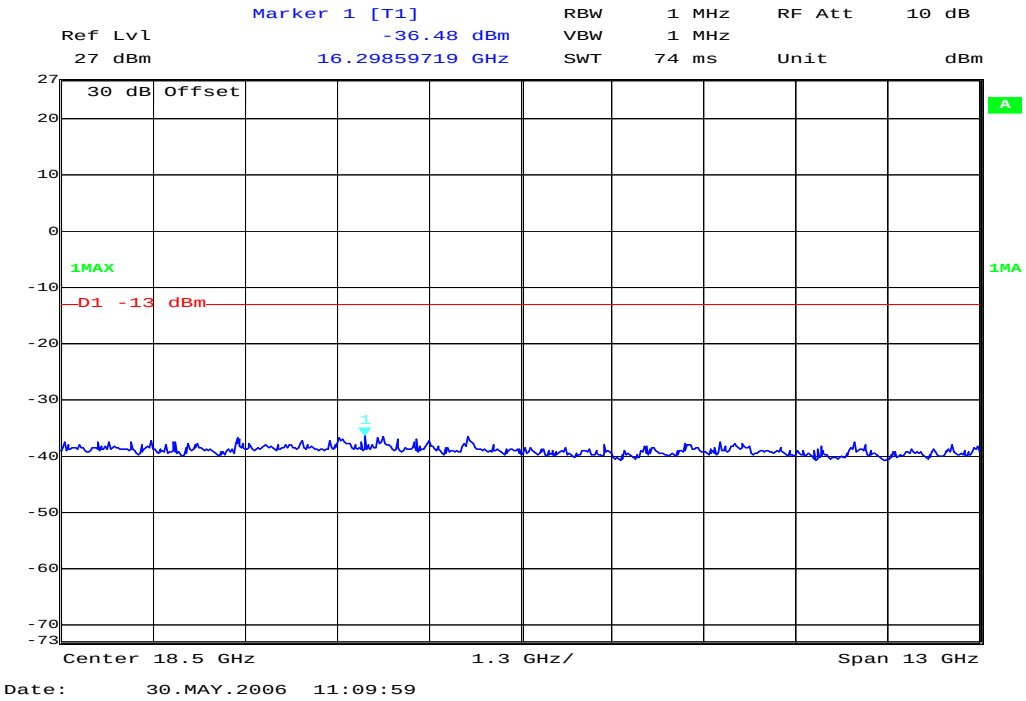
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 810 (4 GHz – 12.5 GHz)
EDGE – mode



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

Channel 810 (12 GHz - 25 GHz)
EDGE – mode



3.1.4 Receiver Radiated Emissions

Reference

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

Measurement Results

SPURIOUS EMISSIONS LEVEL (µV/m)								
Idle Mode Normal GSM			Idle Mode EDGE					
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
No peaks found			No peaks found			-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

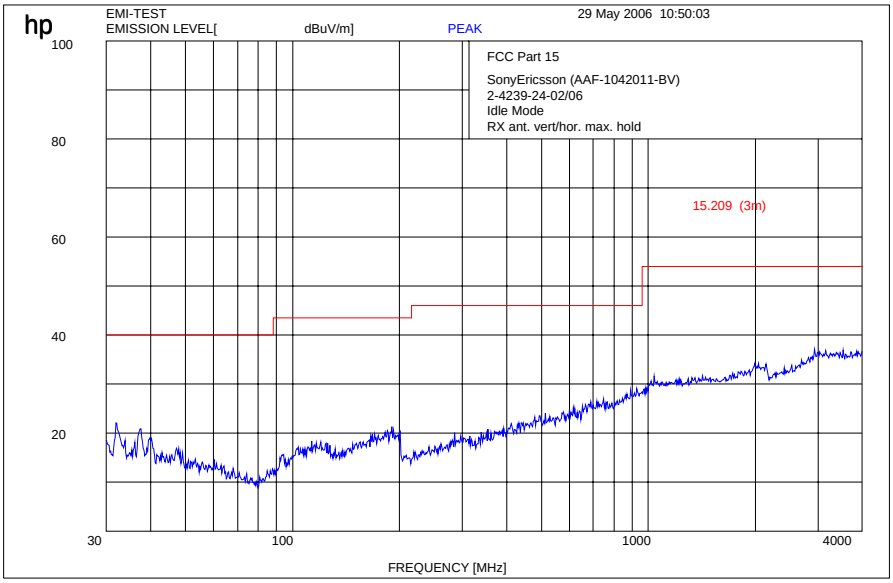
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz
H = Horizontal ; V= Vertical

For measurement distance see table below

Limits: § 15.109

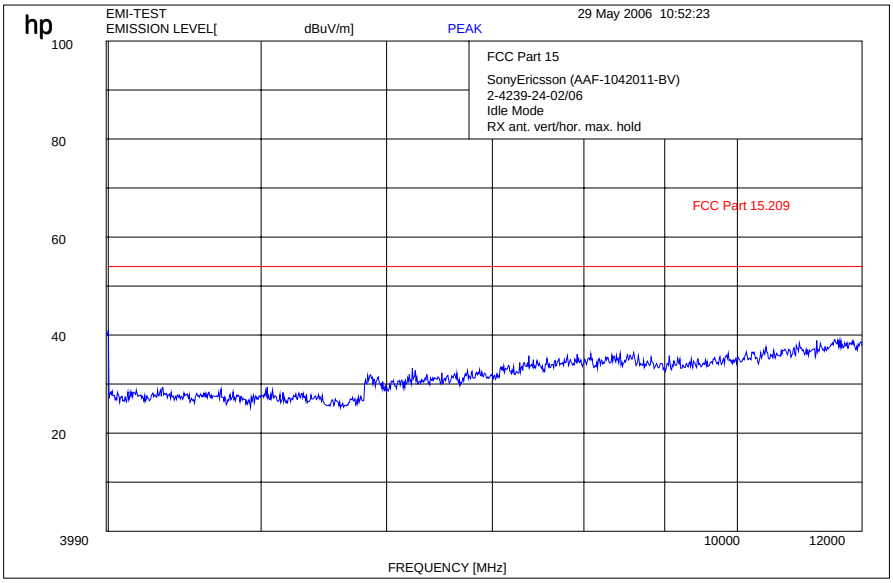
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

Idle Mode (30 MHz - 4 GHz)
Normal – mode



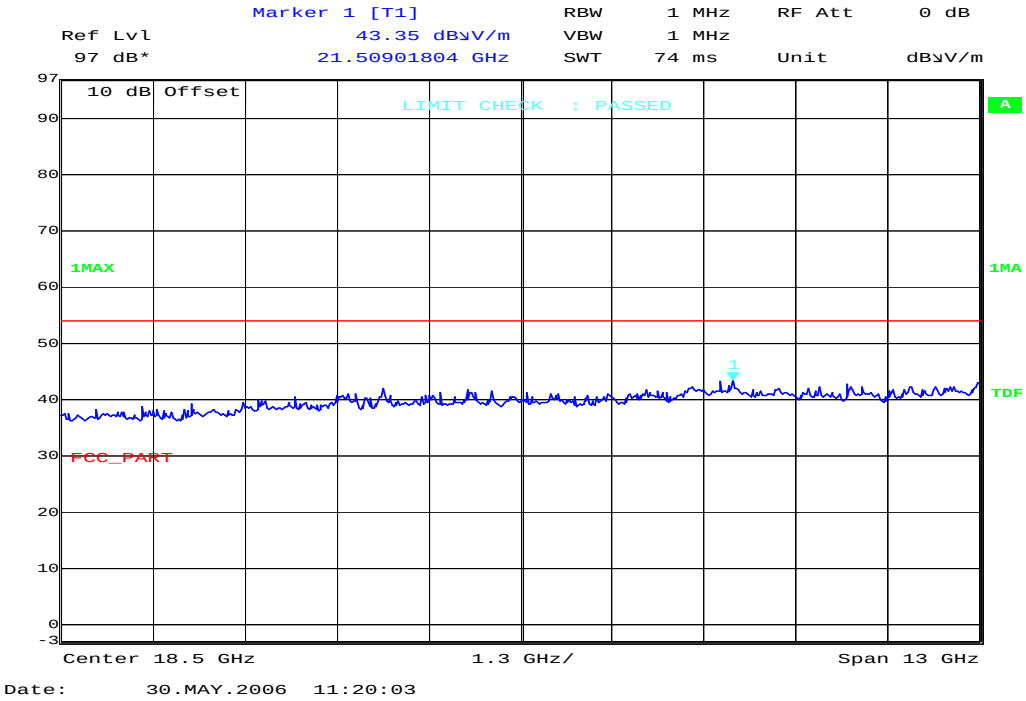
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Idle Mode (4 GHz – 12.0 GHz)
Normal – mode

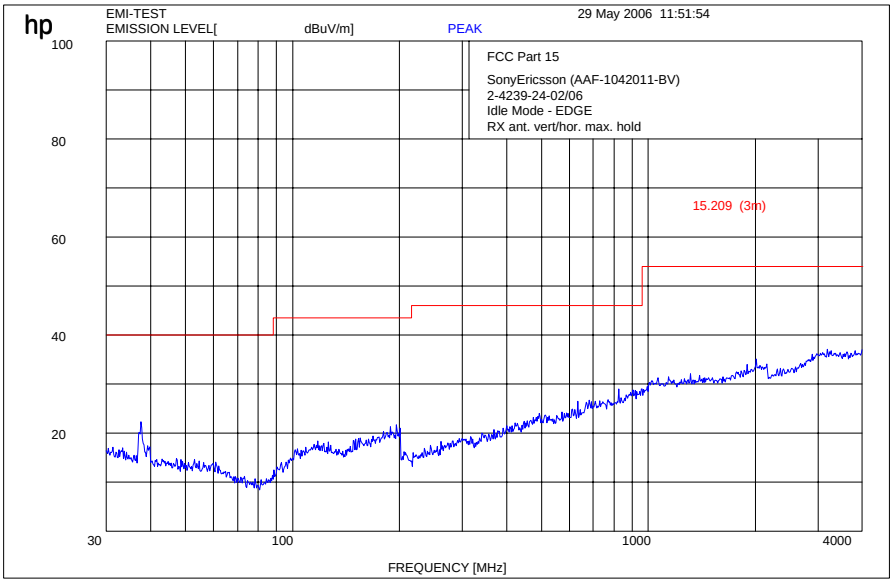


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Idle Mode (12 GHz - 25 GHz)
Normal – mode

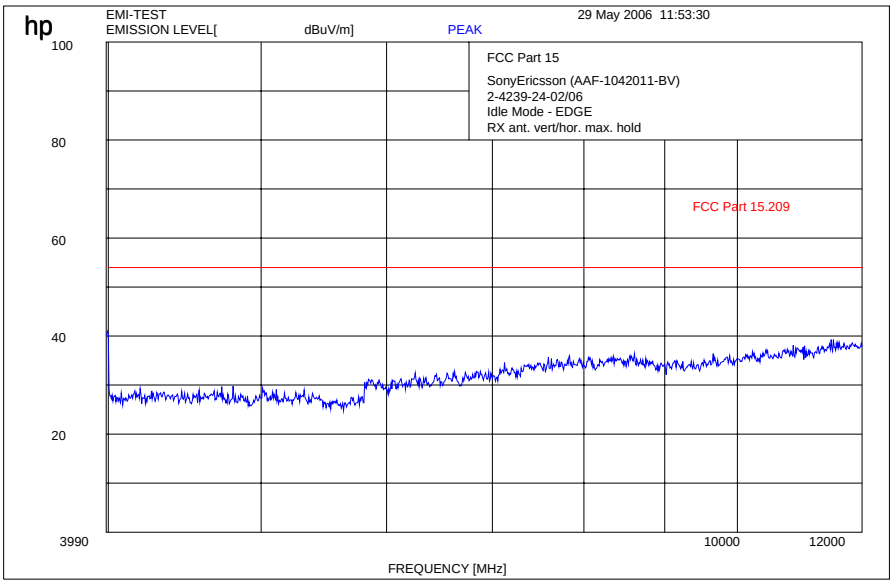


Idle Mode (30 MHz - 4 GHz)
EDGE – mode



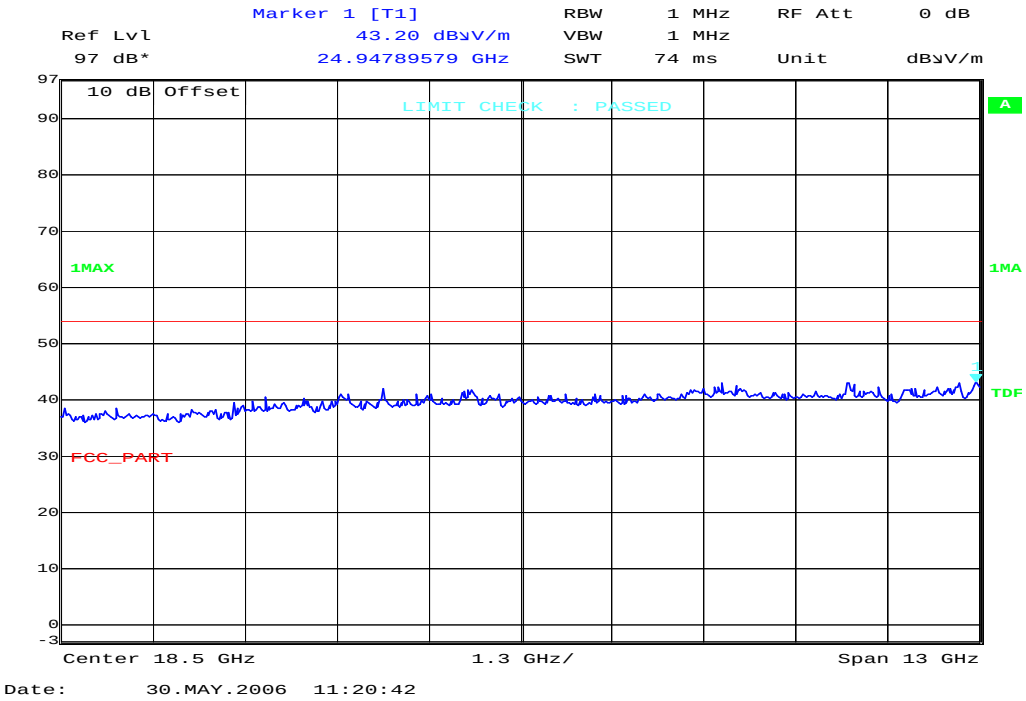
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Idle Mode (4 GHz – 12.0 GHz)
EDGE – mode



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

Idle Mode (12 GHz - 25 GHz)
EDGE – mode



3.1.5 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.

USPCS Transmitter Channel Frequency:
512 1850.2 MHz
661 1880.0 MHz
810 1909.8 MHz

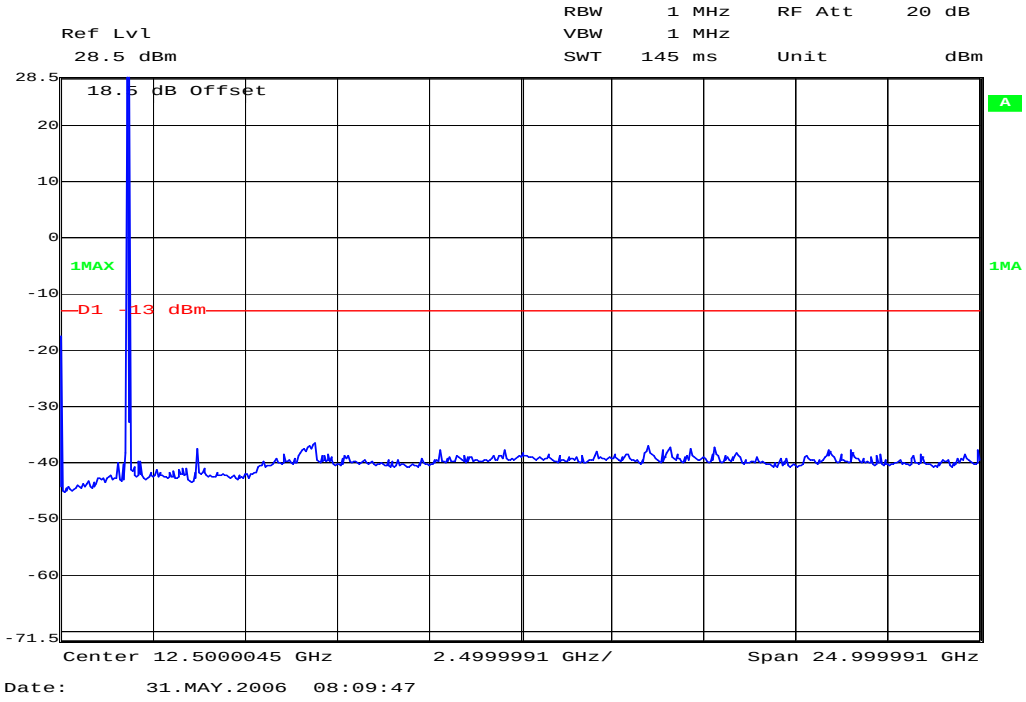
Measurement Limit:

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

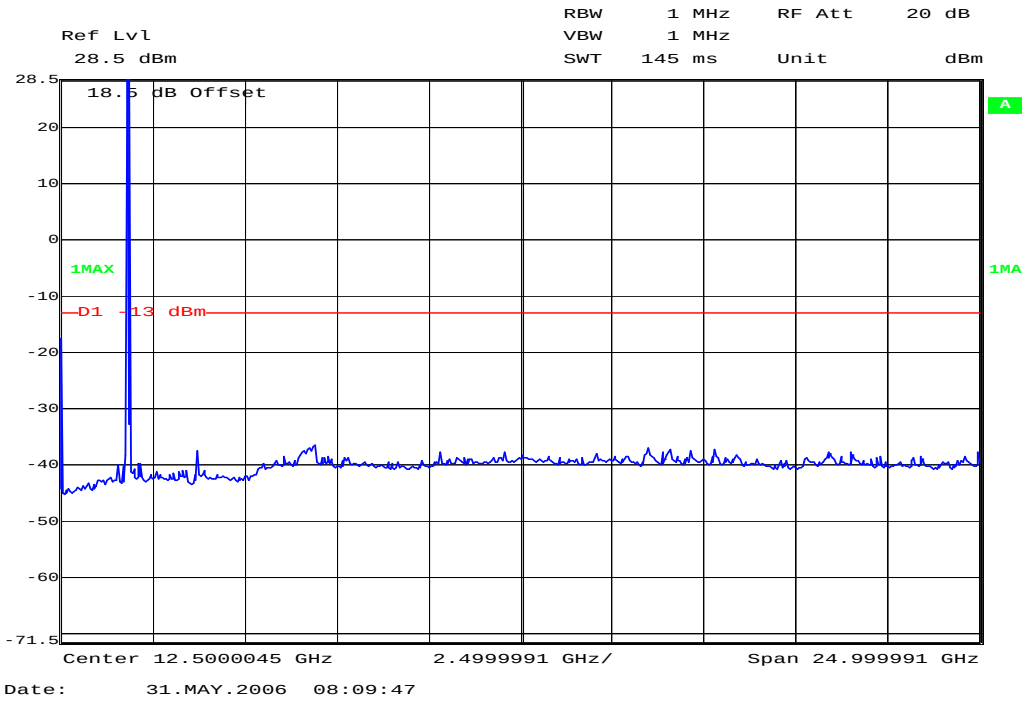
Measurement Results:

Harmonic	Tx ch.-512 Freq. (MHz)	Level (dBm)	Tx ch.-661 Freq. (MHz)	Level (dBm)	Tx ch.-810 Freq. (MHz)	Level (dBm)
	848.2	-	848.2	-	848.2	-
2	3700.4	-	3760	-33.62	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	-

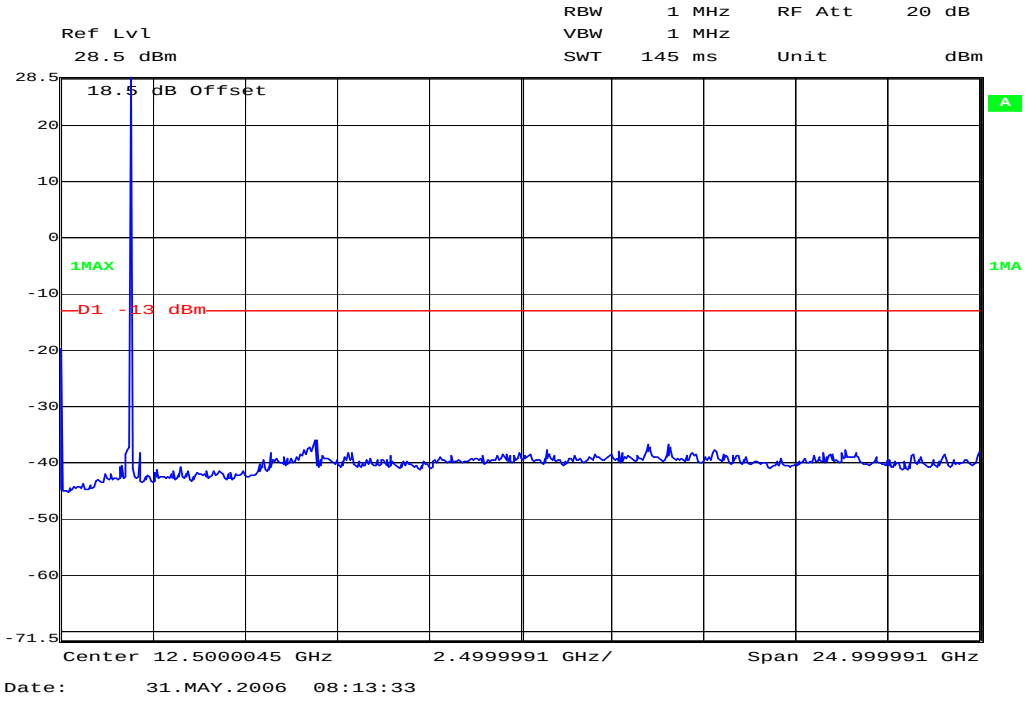
Channel: 512
Normal mode



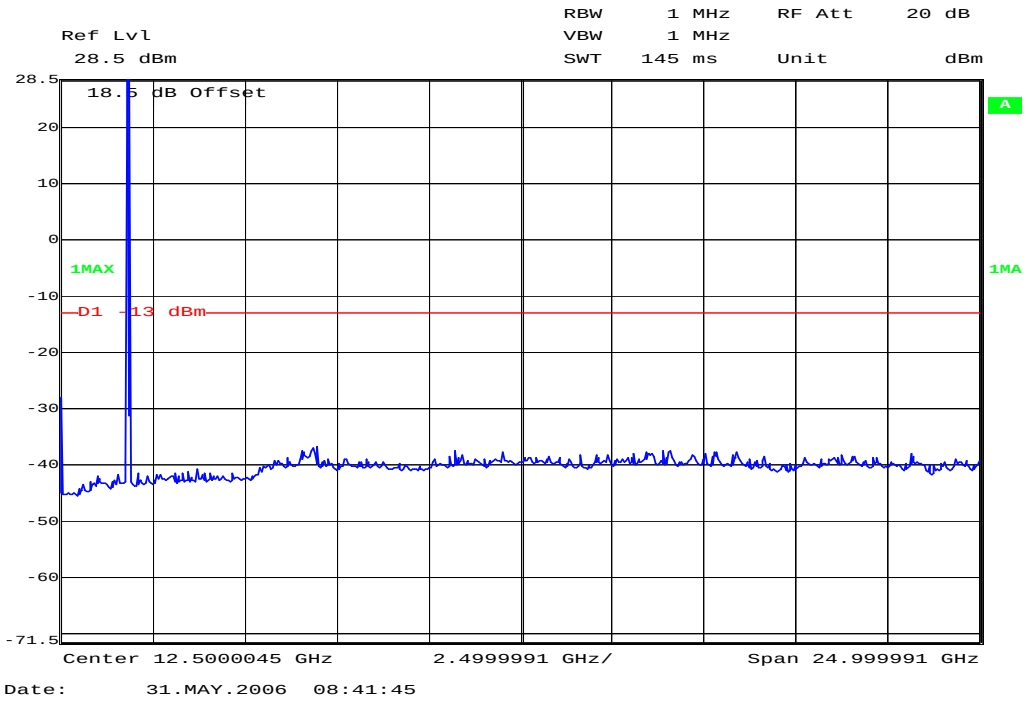
Channel 661
Normal mode



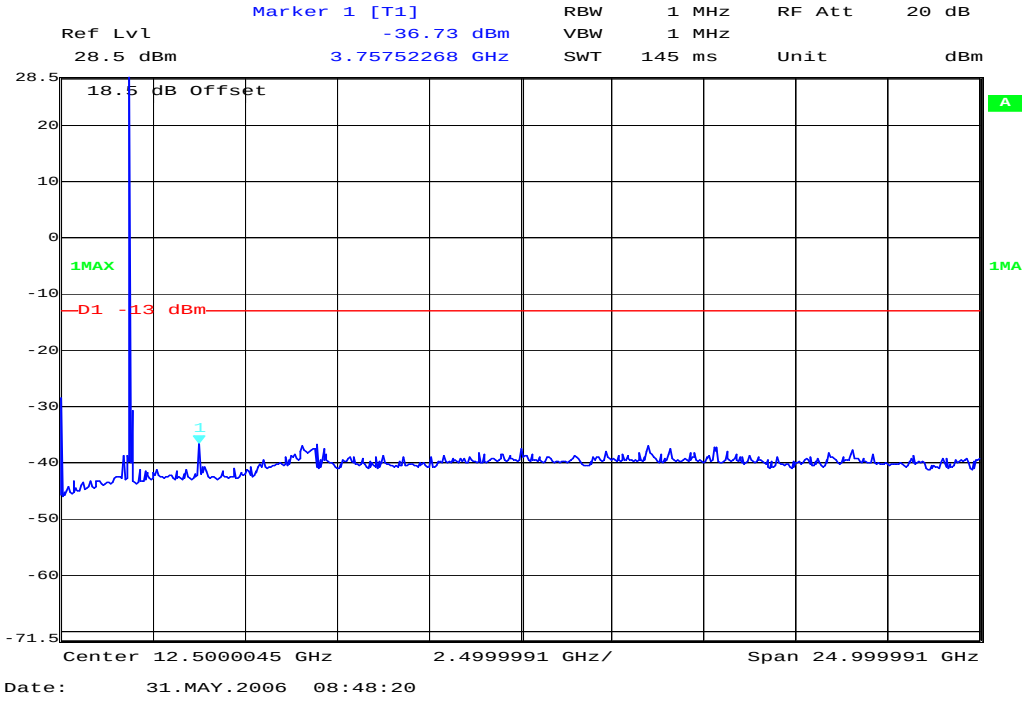
Channel 810
Normal mode



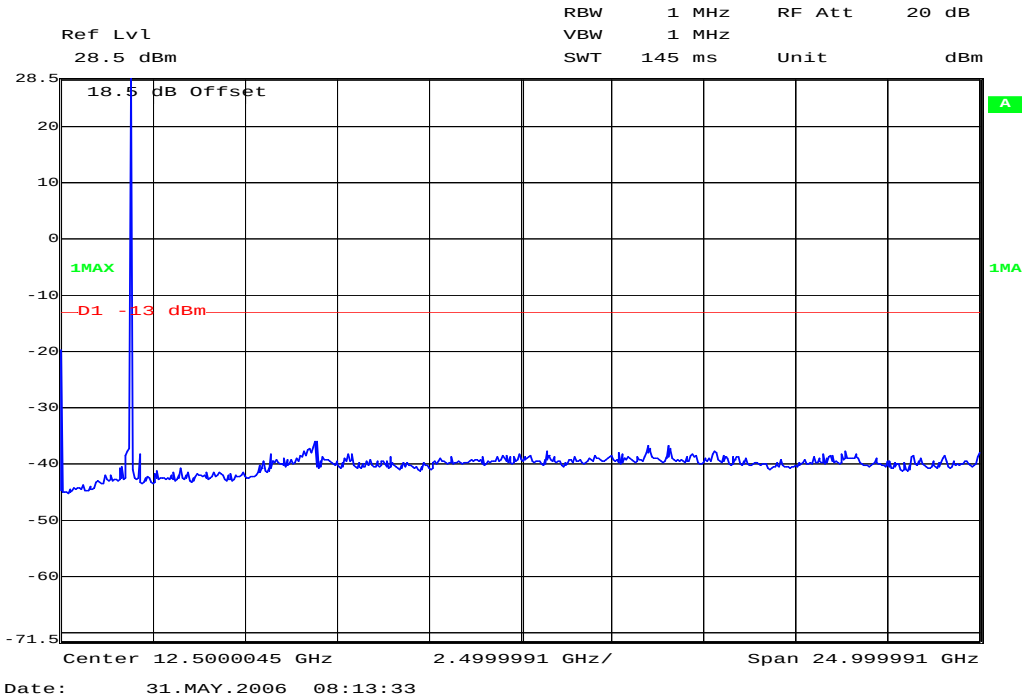
Channel: 512
EDGE mode



Channel 661
EDGE mode



Channel 810
EDGE mode



3.1.6 Block Edge Compliance

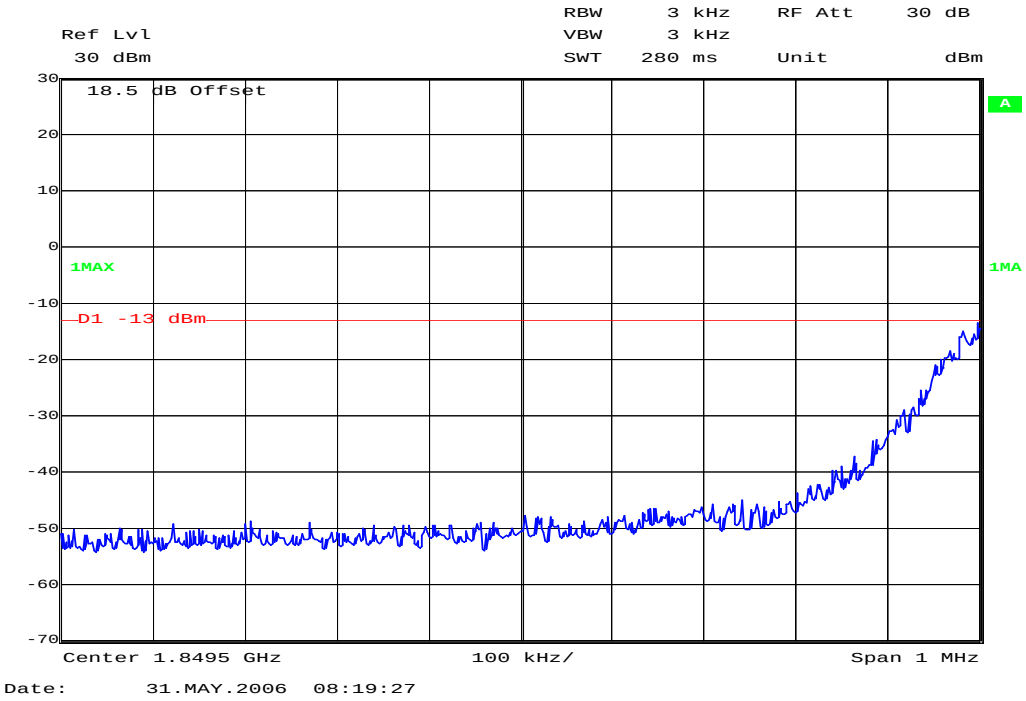
Reference

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

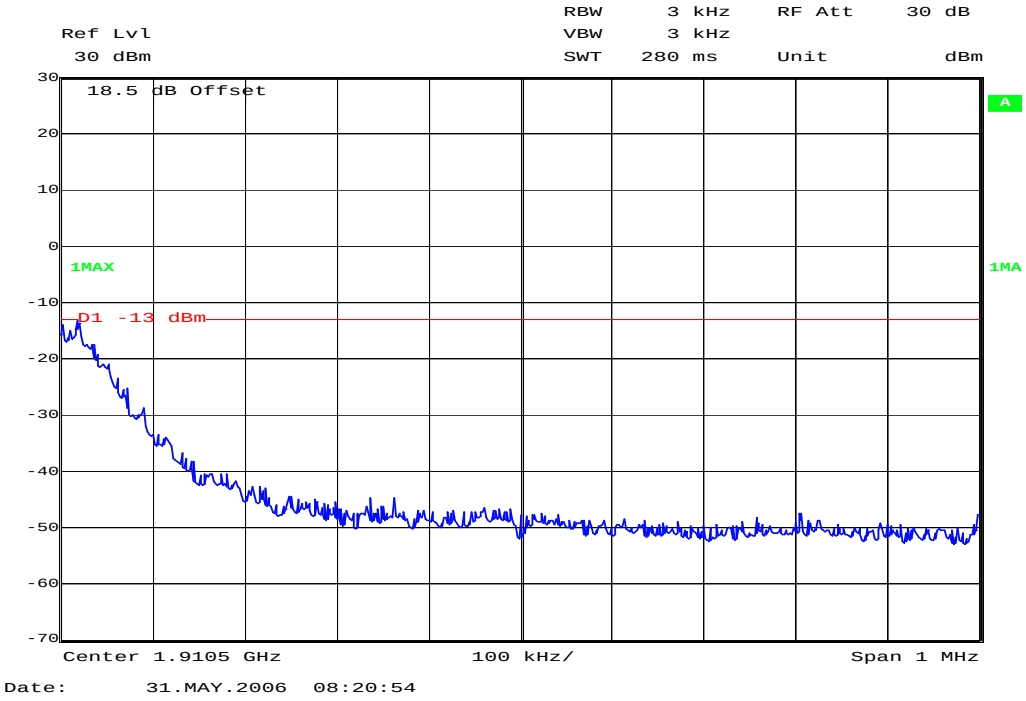
Measurement Limit:

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

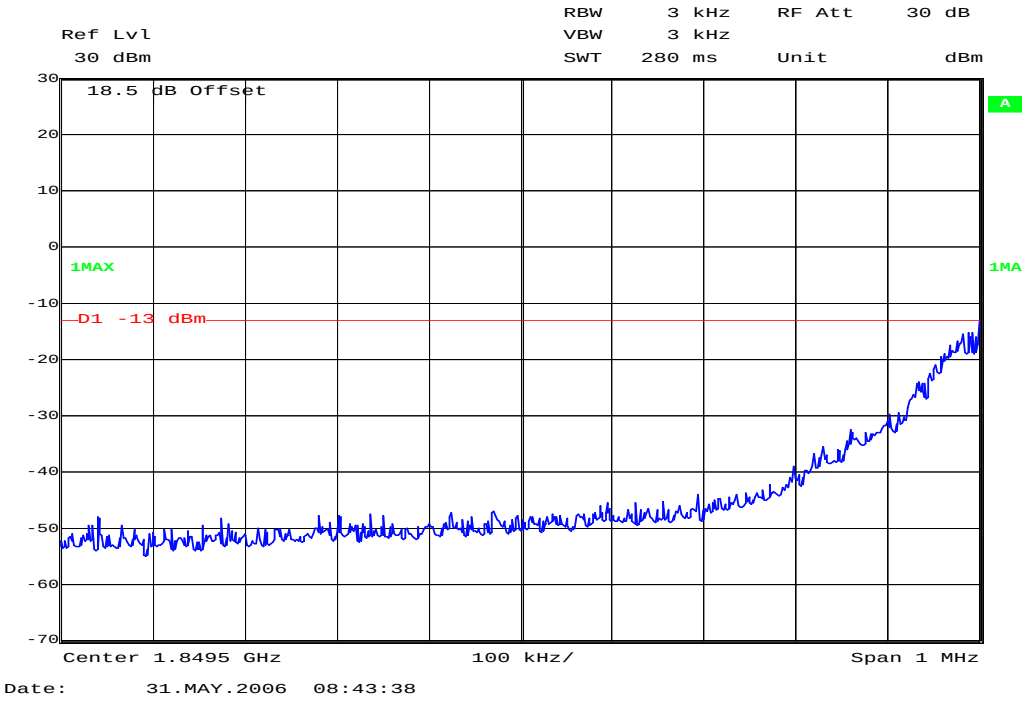
Block 1 Channel 512
Normal - mode



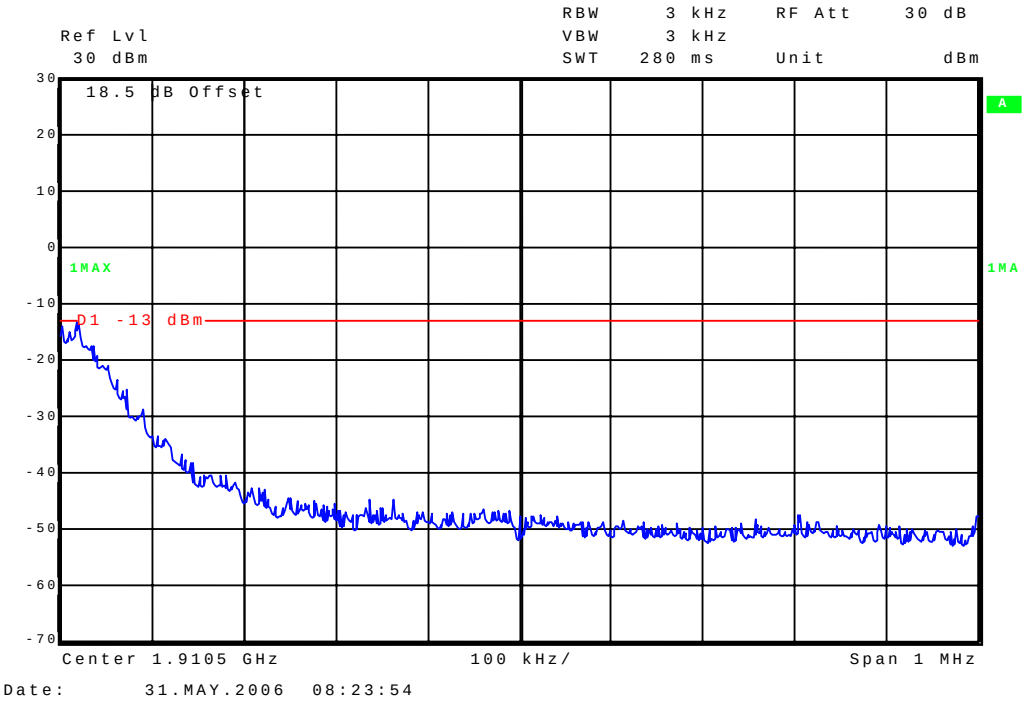
Block 6 Channel 810
Normal – mode



Block 1 Channel 512
EDGE - mode



Block 6 Channel 810
EDGE – mode



3.1.7 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

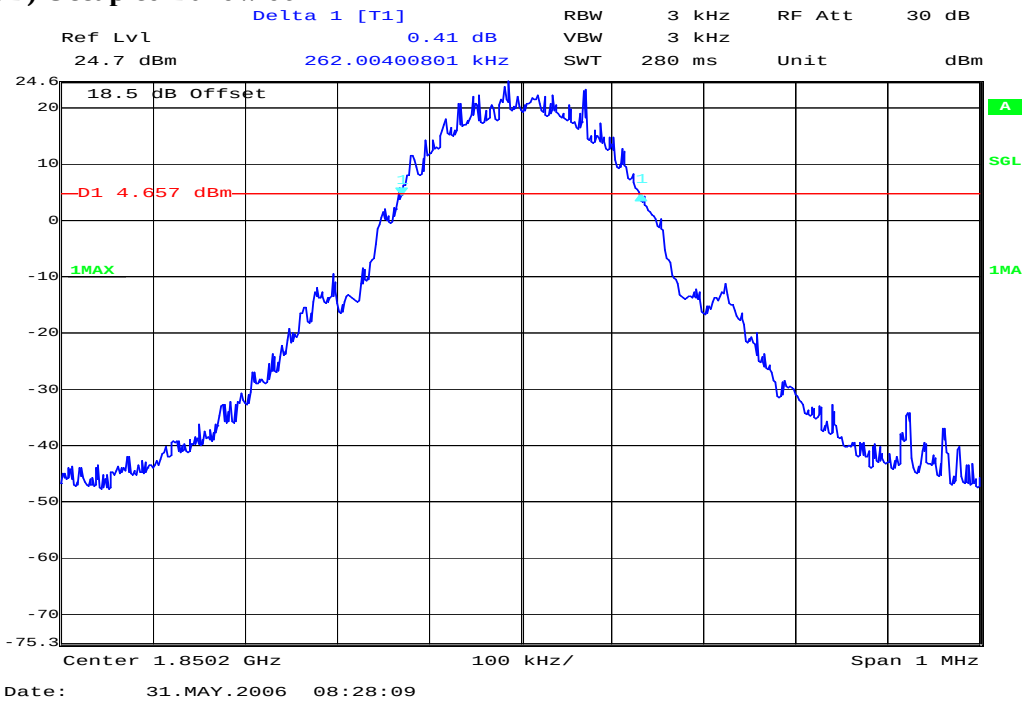
Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1850.2 MHz	262.00	310.04
1880.0 MHz	276.01	314.02
1909.8 MHz	262.00	302.00

EDGE mode

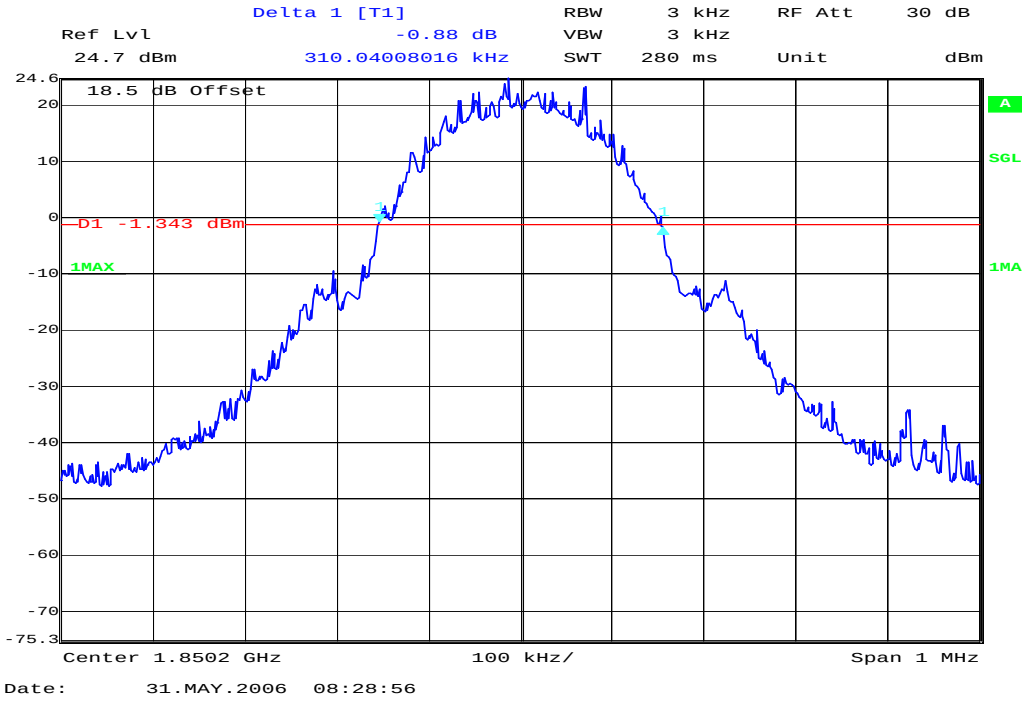
Frequency	99% Occupied Bandwidth kHz	-26 dBc Bandwidth kHz
1850.2 MHz	278.03	306.01
1880.0 MHz	272.02	312.04
1909.8 MHz	270.00	302.04

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.

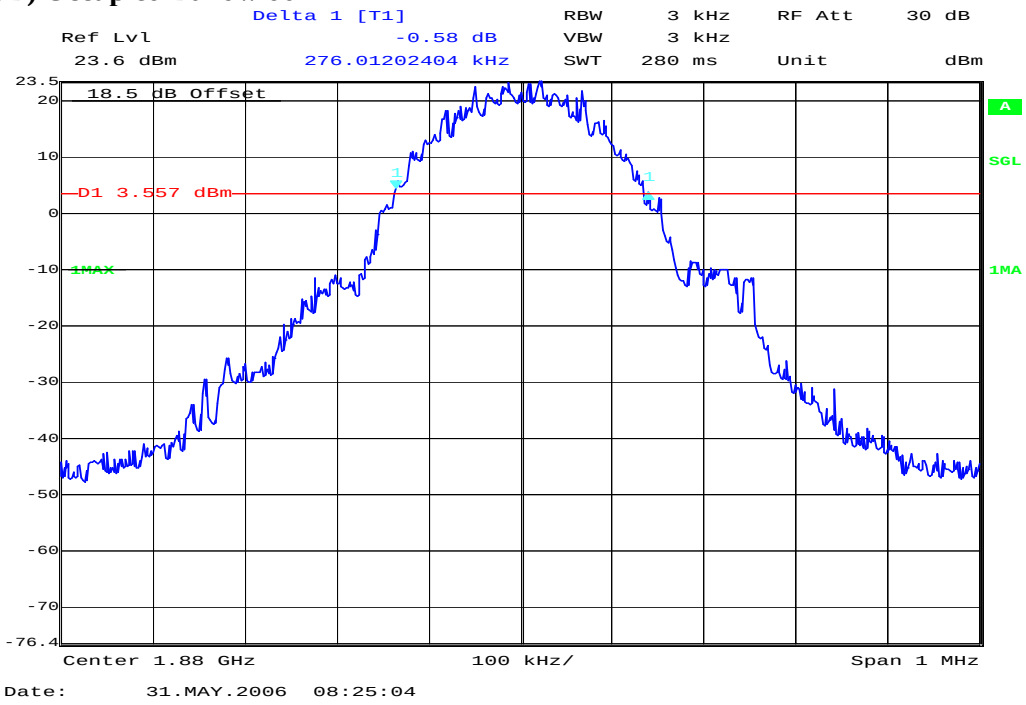
Channel 512 Normal - mode
99% (-20 dB) Occupied Bandwidth



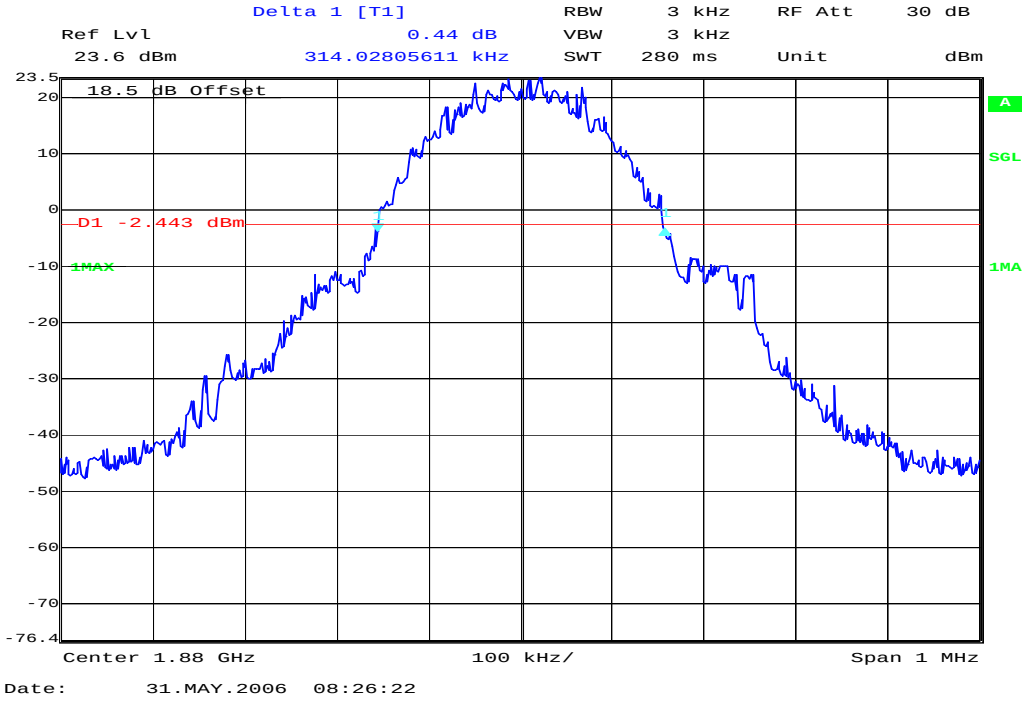
Channel 512 Normal - mode
-26 dBc Bandwidth



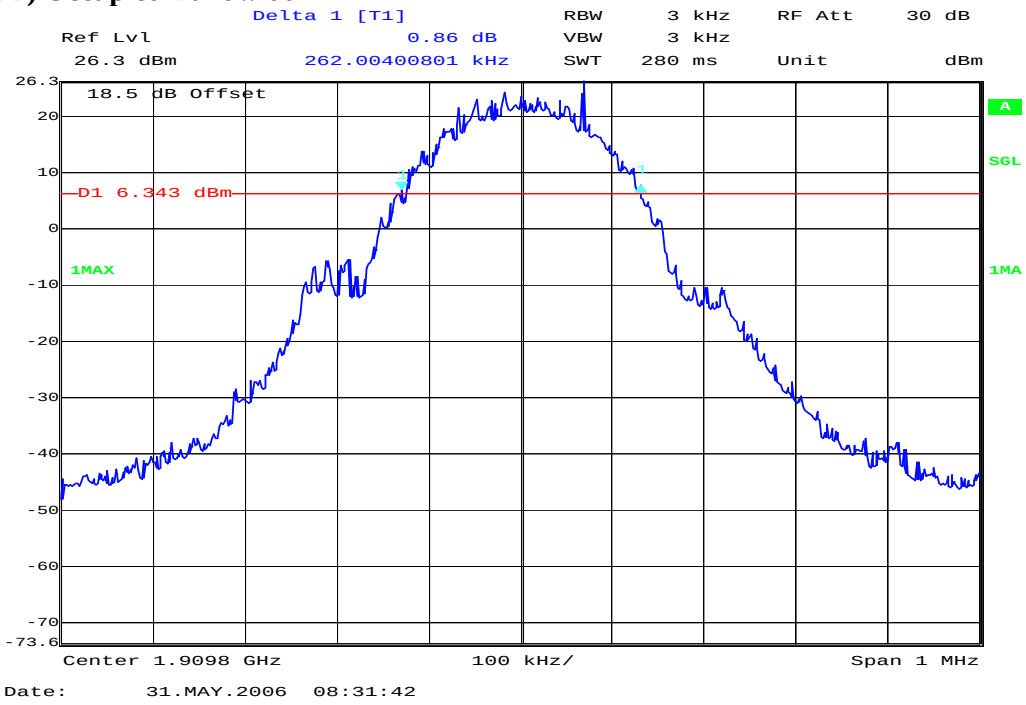
Channel 661 Normal - mode
99% (-20 dB) Occupied Bandwidth



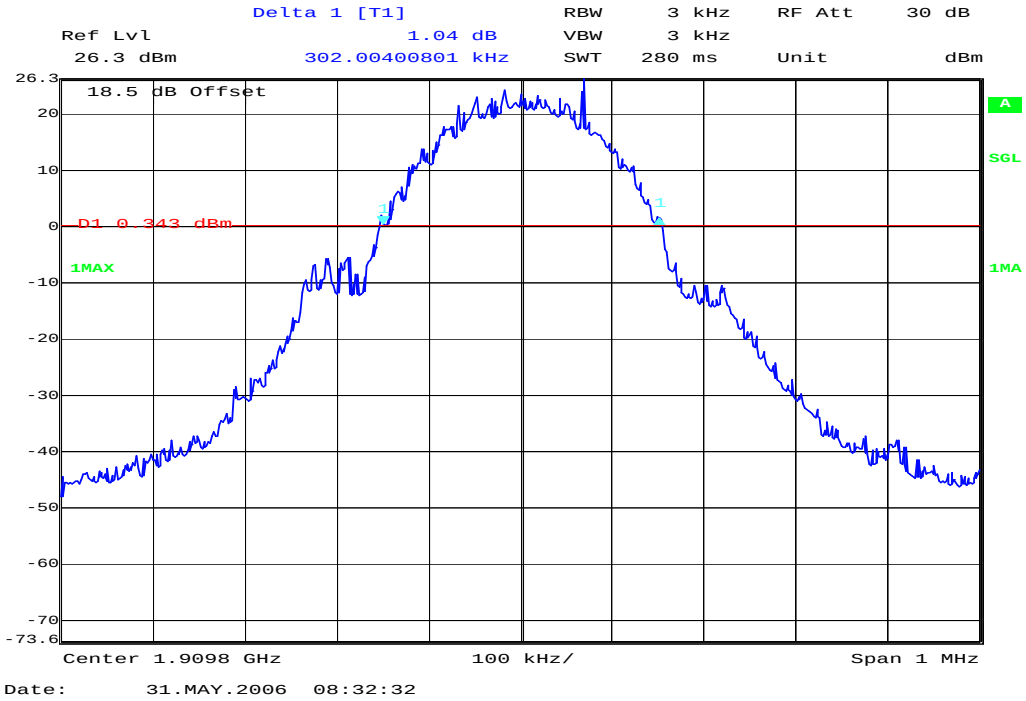
Channel 661 Normal - mode
-26 dBc Bandwidth



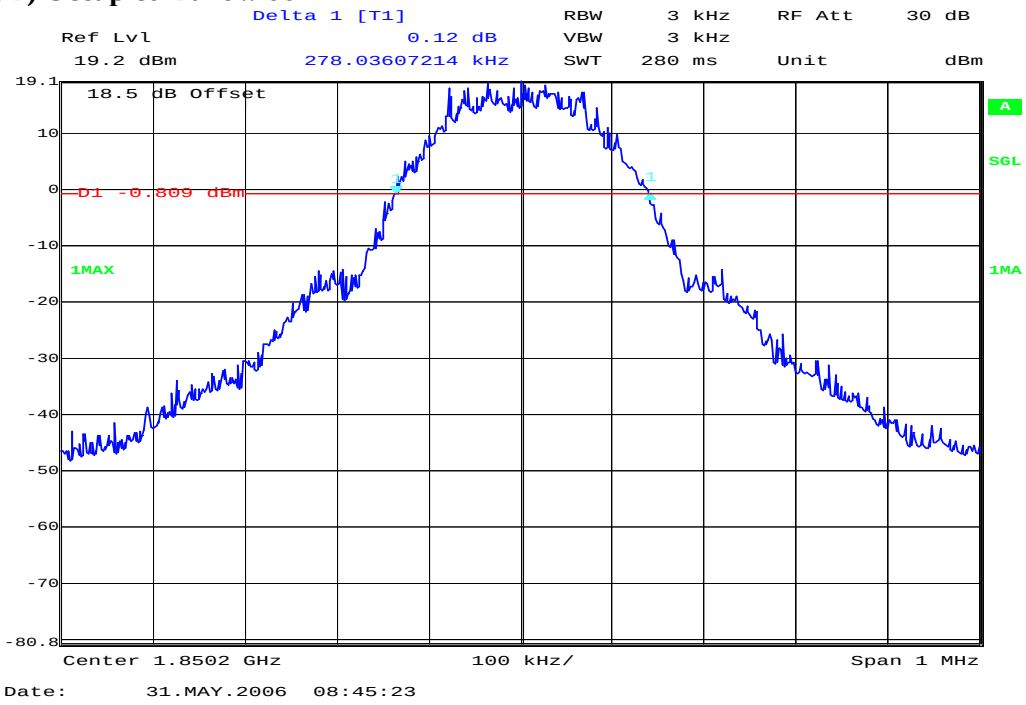
Channel 810 Normal - mode
99% (-20 dB) Occupied Bandwidth



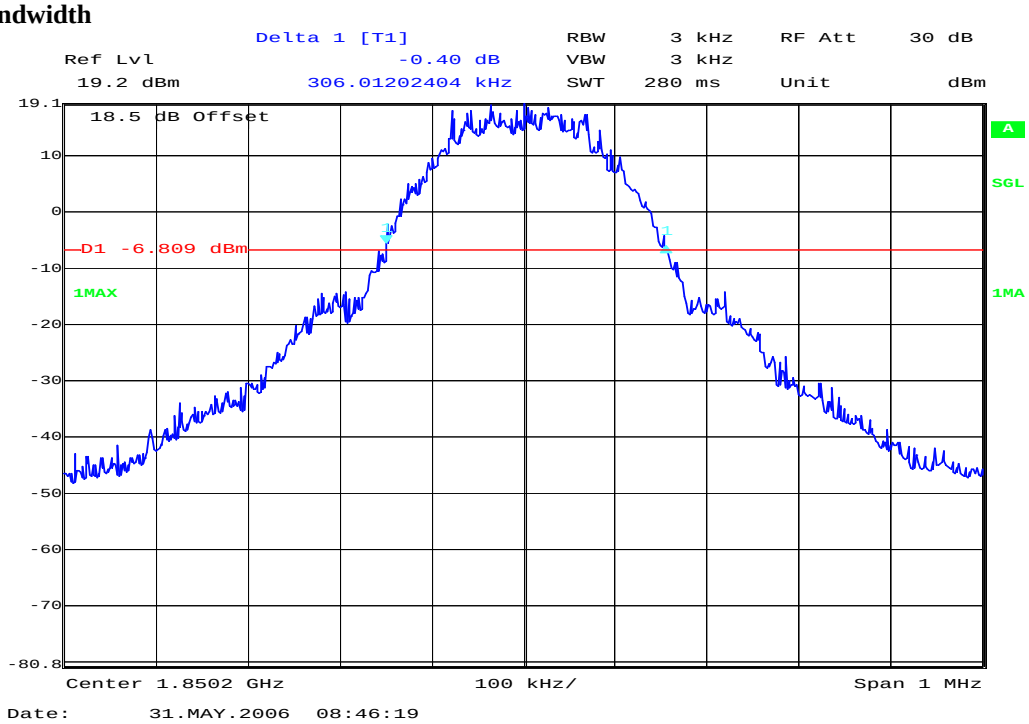
Channel 810 Normal - mode
-26 dBc Bandwidth



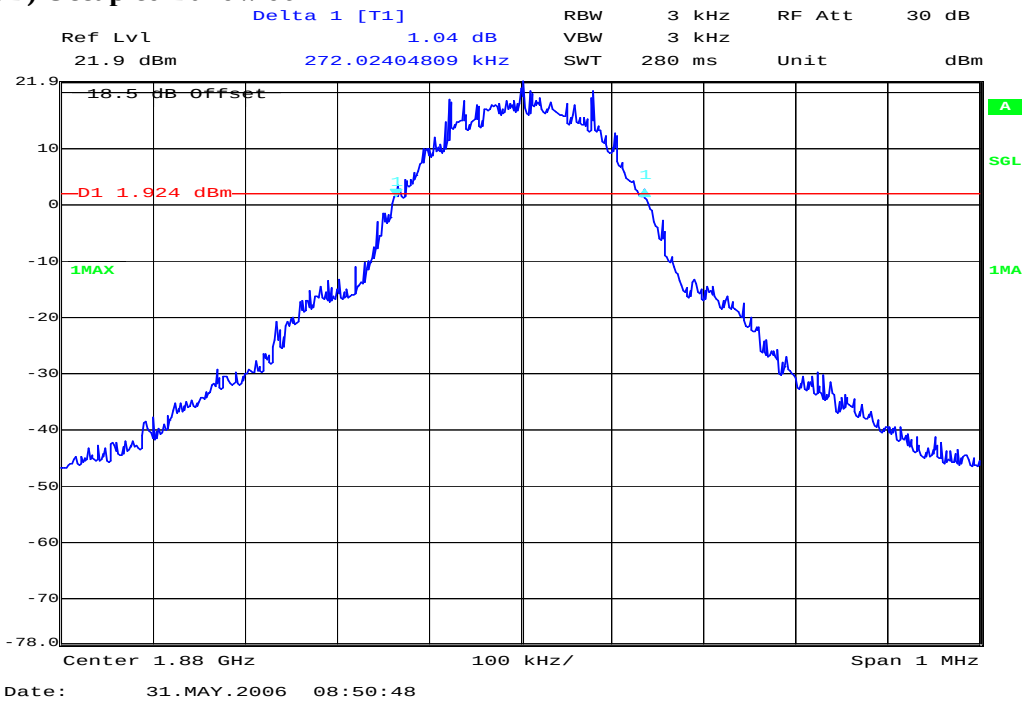
Channel 512 EDGE - mode
99% (-20 dB) Occupied Bandwidth



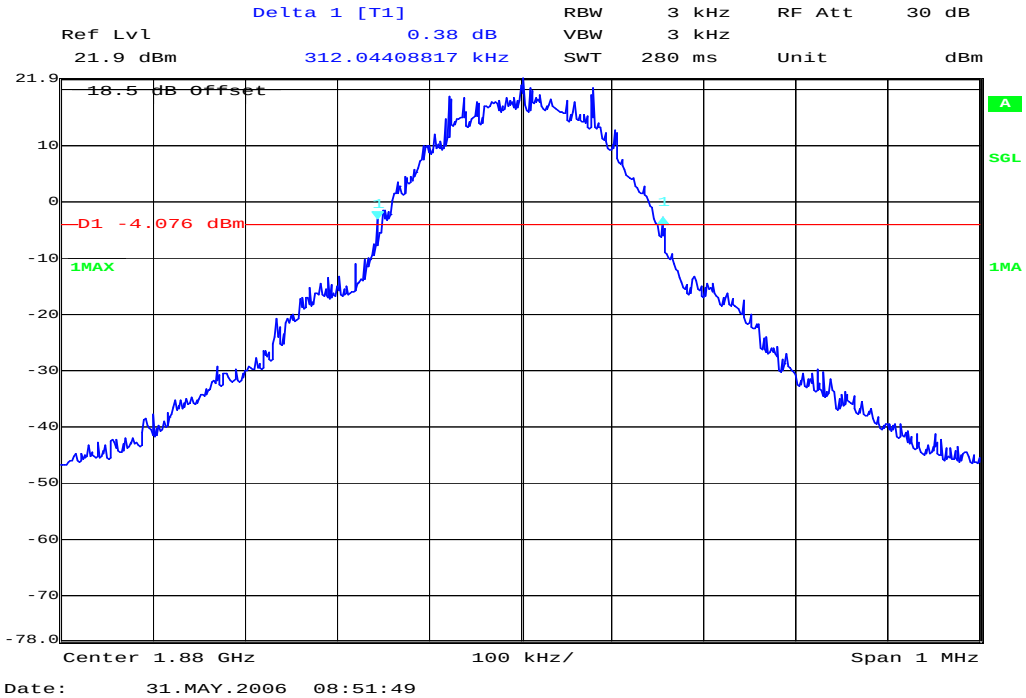
Channel 512 EDGE - mode
-26 dBc Bandwidth



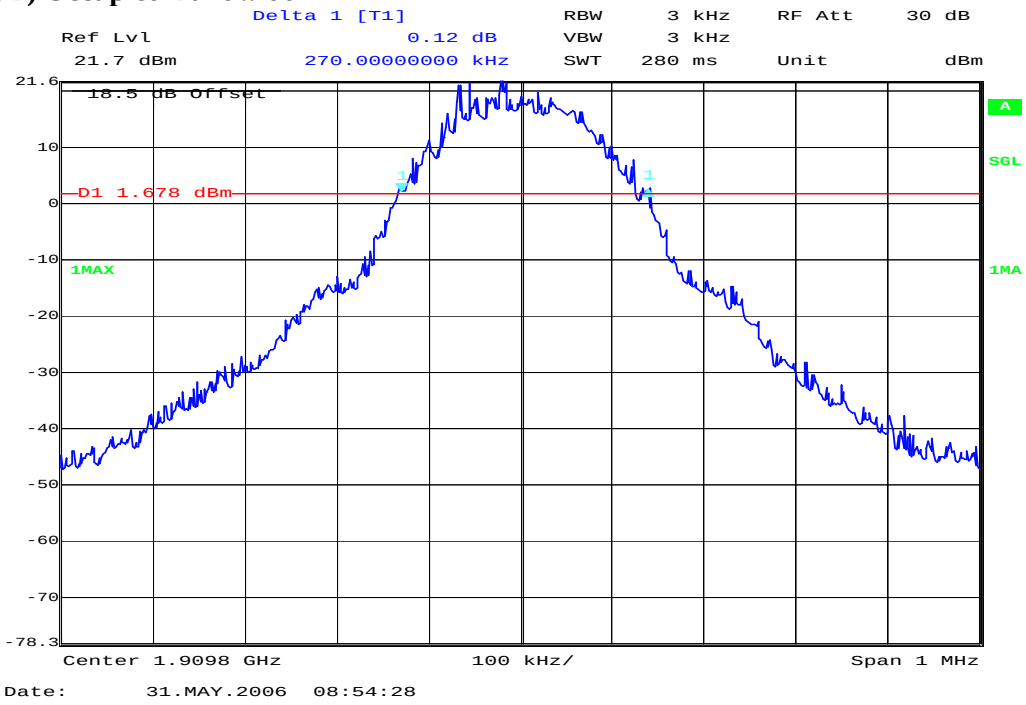
Channel 661 EDGE - mode
99% (-20 dB) Occupied Bandwidth



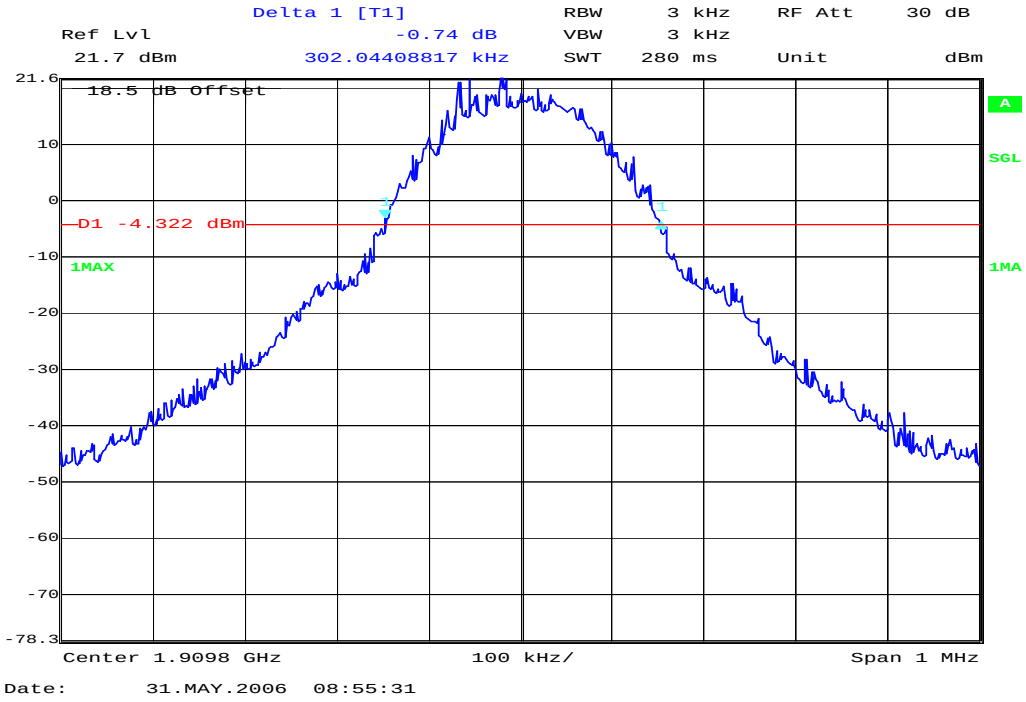
Channel 661 EDGE - mode
-26 dBc Bandwidth



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



Channel 810 EDGE - mode
-26 dBc Bandwidth



3.2 PART GSM 850

3.2.1 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)
This measurements were done at 3 frequencies, 824.2 MHz, 836.2 MHz and 848.8 MHz (bottom, middle and top of operational frequency range).

Limits:

Power Step	Nominal Peak Output Power (dBm)	Tolerance (dB)
5	+33	± 2

Measurements Results Output Power (conducted)

Normal – mode

Frequency (MHz)	Power Step	Peak Output Power (dBm)	Average Output Power (dBm)
824.2	0	31.8	31.7
836.4	0	31.7	31.6
848.8	0	31.6	31.5
Measurement uncertainty		±0.5 dB	

EDGE – mode

Frequency (MHz)	Power Step	Peak Output Power (dBm)	Average Output Power (dBm)
824.2	0	29.9	28.6
836.4	0	29.8	28.6
848.8	0	29.6	28.4
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 was performed with full rf output power and modulation.
(b) Test was performed at listed 3m test site (listed with FCC, IC).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(f) Set the EMI Receiver and #2 as follows:
Center Frequency: test frequency
Resolution BW: 100 kHz
Video BW: same
Detector Mode: positive
Average: off
Span: 3 x the signal bandwidth
(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
(l) Repeat for all different test signal frequencies

Measuring the ERP of Spurious/Harmonic Emissions using Substitution Method

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring ERP) as follows:
Center Frequency : equal to the signal source
Resolution BW : 10 kHz
Video BW : same
Detector Mode : positive
Average : off
Span : 3 x the signal bandwidth
(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)
(c) Select the frequency and E-field levels for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (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 it's elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.

(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:
P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1
Where: P: Actual RF Power fed into the substitution antenna port after corrected.
P1: Power output from the signal generator
P2: Power measured at attenuator A input
P3: Power reading on the Average Power Meter
EIRP: EIRP after correction
ERP: ERP after correction
(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.
Limits:

Power Step	Burst Peak (dBm)
0	<33

Measurement Results Output Power (Radiated)

Normal - mode

Frequency (MHz)	Power Step	BURST Peak (dBm)	BURST Peak (dBm)
Antenna position		outside	inside
		ERP	ERP
824.2	0	31.5	30.2
836.4	0	31.4	30.1
848.8	0	31.7	29.7
Measurement uncertainty: 1.5%			

EDGE - mode

Frequency (MHz)	Power Step	BURST Peak (dBm)	BURST Peak (dBm)
Antenna position		outside	inside
		ERP	ERP
824.2	0	29.6	28.3
836.4	0	29.5	28.2
848.8	0	29.9	28.0
Measurement uncertainty: 1.5%			

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

3.2.2 Frequency Stability

Reference

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

Method of Measurement:

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

Measurement Limit:

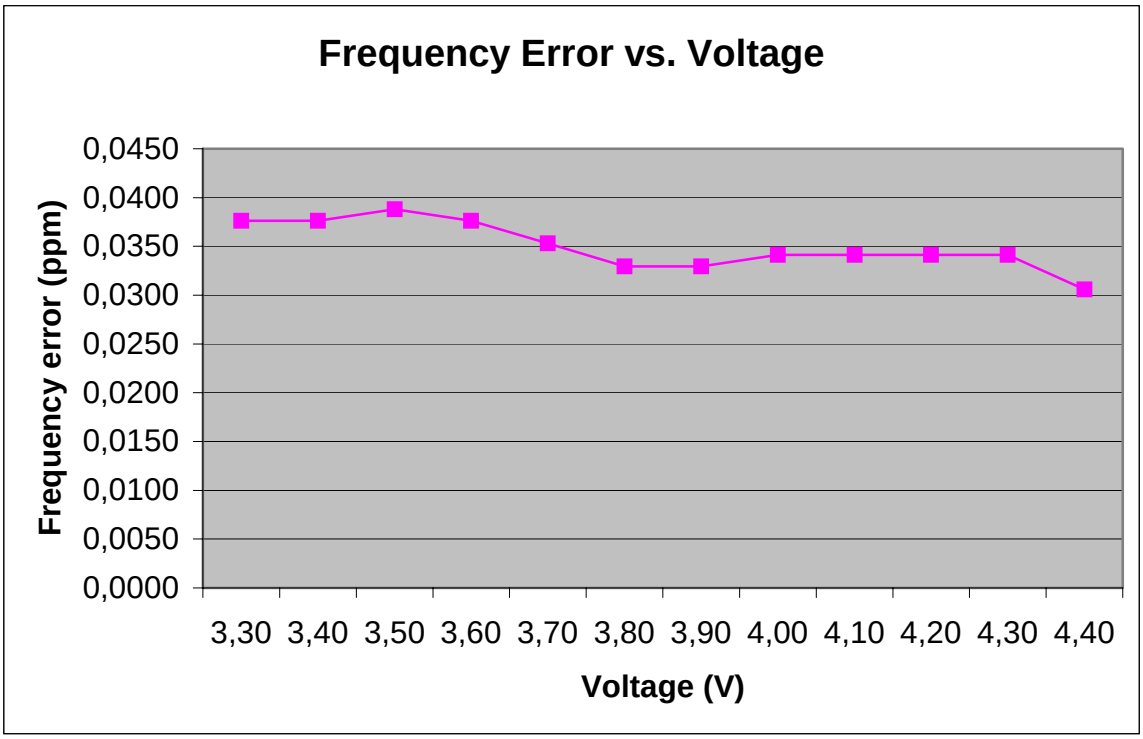
According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 22.355, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission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

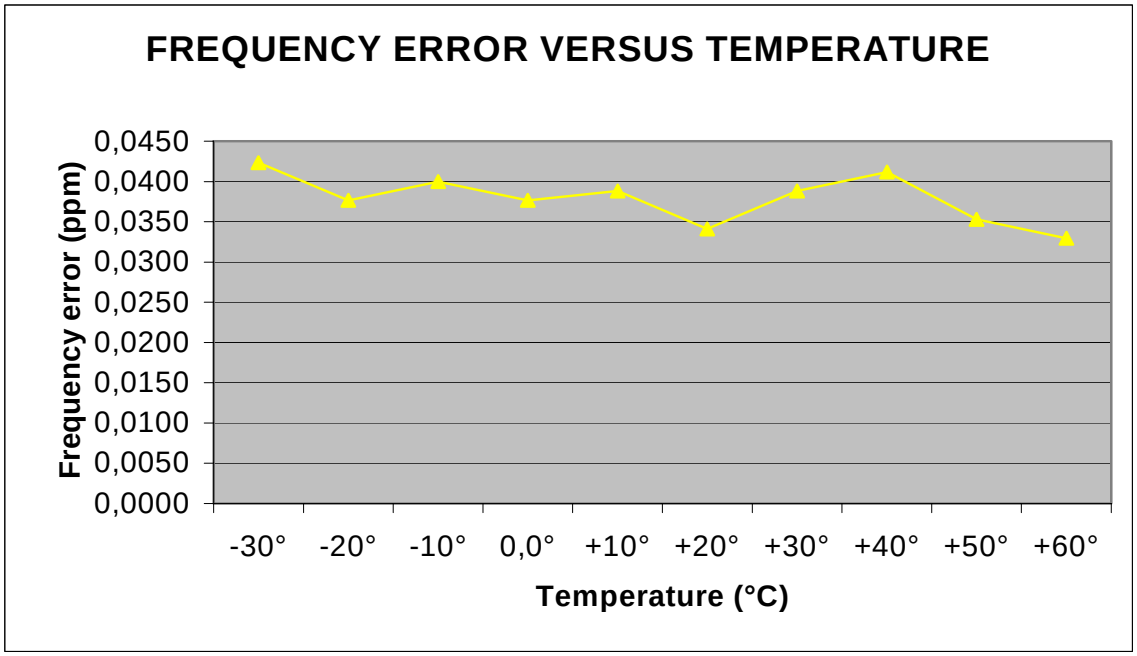
Measurement Results: AFC FREQ ERROR vs. VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	32	0,00000376	0,0376
3.4	32	0,00000376	0,0376
3.5	33	0,00000388	0,0388
3.6	32	0,00000376	0,0376
3.7	30	0,00000353	0,0353
3.8	28	0,00000329	0,0329
3.9	28	0,00000329	0,0329
4.0	29	0,00000341	0,0341
4.1	29	0,00000341	0,0341
4.2	29	0,00000341	0,0341
4.3	29	0,00000341	0,0341
4.4	26	0,00000306	0,0306

Measurement Results: AFC FREQ ERROR vs. TEMPERATURE

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	36	0,00000424	0,0424
-20	32	0,00000376	0,0376
-10	34	0,00000400	0,0400
±0.0	32	0,00000376	0,0376
+10	33	0,00000388	0,0388
+20	29	0,00000341	0,0341
+30	33	0,00000388	0,0388
+40	35	0,00000412	0,0412
+50	30	0,00000353	0,0353
+60	28	0,00000329	0,0329


Frequency Error vs. Voltage
Frequency error (ppm)
0,0450
0,0400
0,0350
0,0300
0,0250
0,0200
0,0150
0,0100
0,0050
0,0000
3,30 3,40 3,50 3,60 3,70 3,80 3,90 4,00 4,10 4,20 4,30 4,40
Voltage (V)


FREQUENCY ERROR VERSUS TEMPERATURE
Frequency error (ppm)
0,0450
0,0400
0,0350
0,0300
0,0250
0,0200
0,0150
0,0100
0,0050
0,0000
-30° -20° -10° 0,0° +10° +20° +30° +40° +50° +60°
Temperature (°C)

3.2.3 Radiated Emissions

Reference

FCC:	CFR Part 22.917, 2.1053
IC:	RSS 132, Issue 2, Section 4.5 and 6.5

Measurement Procedure:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2003 requirements and is recognized by the FCC to be in compliance for a 3 and a10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 848.8 MHz. This was rounded up to 12 GHz. The resolution bandwidth is set as outlined in Part 22.917. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the USPCS band.

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

a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
b) The antenna output was terminated in a 50 ohm load.
c) A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and I MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters using the equation shown below:
e)Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603 .

Measurement Limit:

Sec. 22.917 Emission Limits.
(a) On any frequency outside a licensee' s frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB.
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Measurement Results:

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

The final open field radiated levels are presented on the next pages.
All measurements were done in horizontal and vertical polarization, the plots shows the worst case.
As can be seen from this data, the emissions from the test item were within the specification limit.

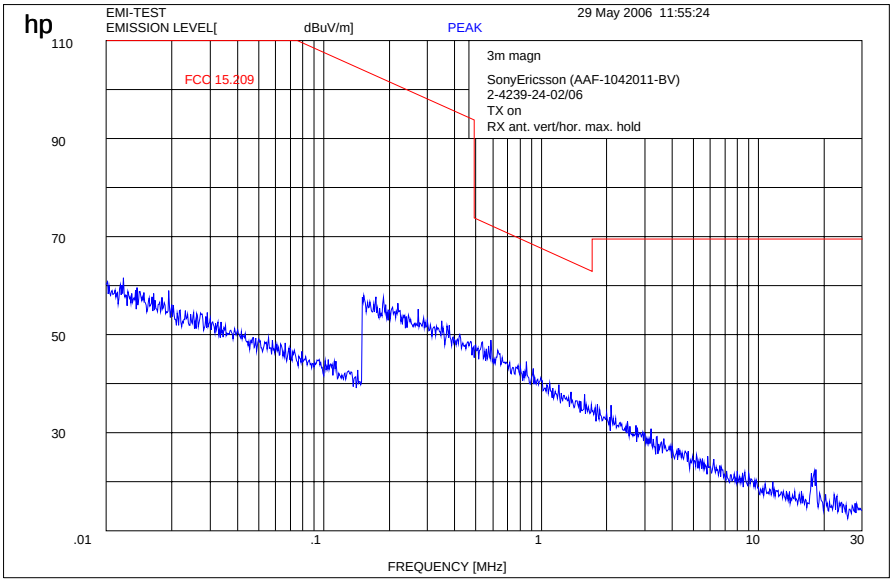
Harmonic	Tx ch.-128 Freq. (MHz)	Level (dBm)	Tx ch.-189 Freq. (MHz)	Level (dBm)	Tx ch.-251 Freq. (MHz)	Level (dBm)
2	1648.4	-	**1672.8**	-	1697.6	-
3	2472.6	-	**2509.2**	-	2546.4	-
4	3296.8	-	**3345.6**	-	3395.2	-
5	4121.0	-	**4182.0**	-	4244.0	-
6	4945.2	-64.10	**5018.4**	-50.60	5092.8	-48.10
7	5769.4	-	**5854.8**	-	5941.6	-
8	6593.6	-	**6691.2**	-	6790.4	-
9	7417.8	-	**7527.6**	-	7639.2	-
10	8242.0	-64.70	**8364.0**	-41.10	8488.0	-40.7

Sample calculation:

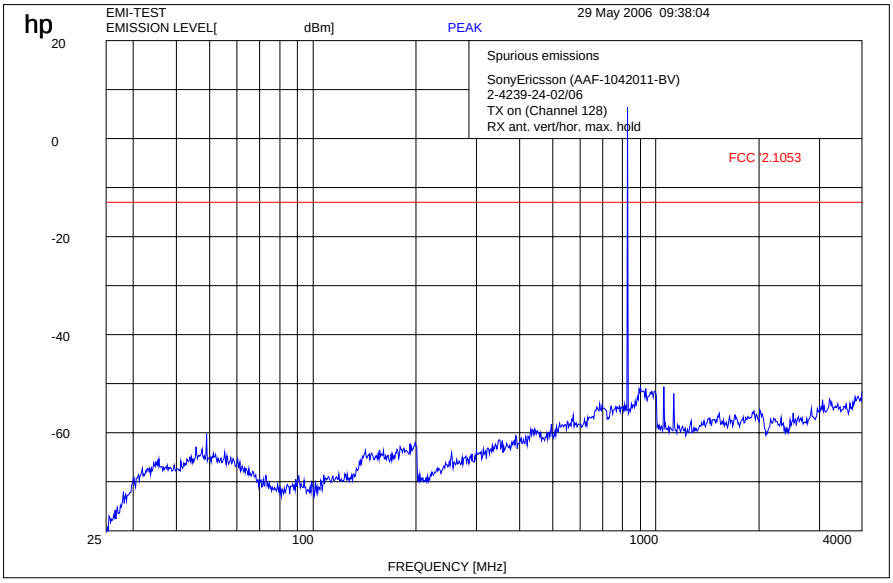
Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERP	Substitution Antenna
MHz	dBµV	dBm	dBi	dBd	dB	dBm	
848.8	137.8	26.6	8.4	0.0	3.3	31.7	UHAP Schwarzbeck S/N 460

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

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

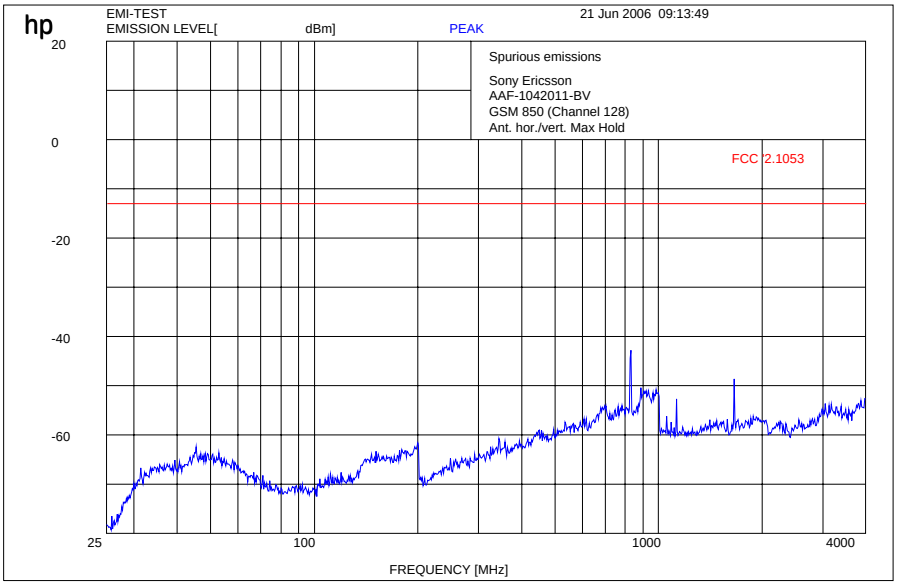


Channel 128 (30 MHz - 4 GHz) Antenna outside
Normal – mode



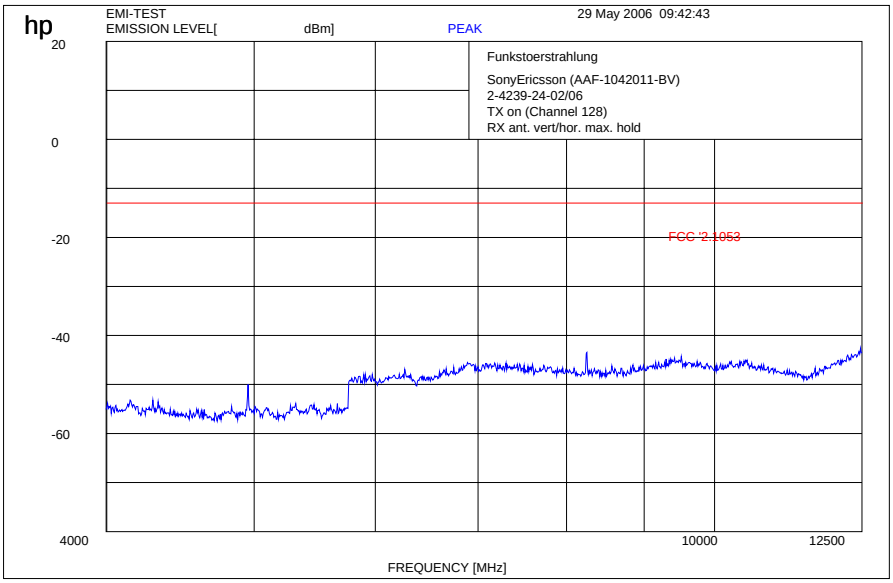
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 128 (30 MHz - 4 GHz) Antenna inside
Normal – mode



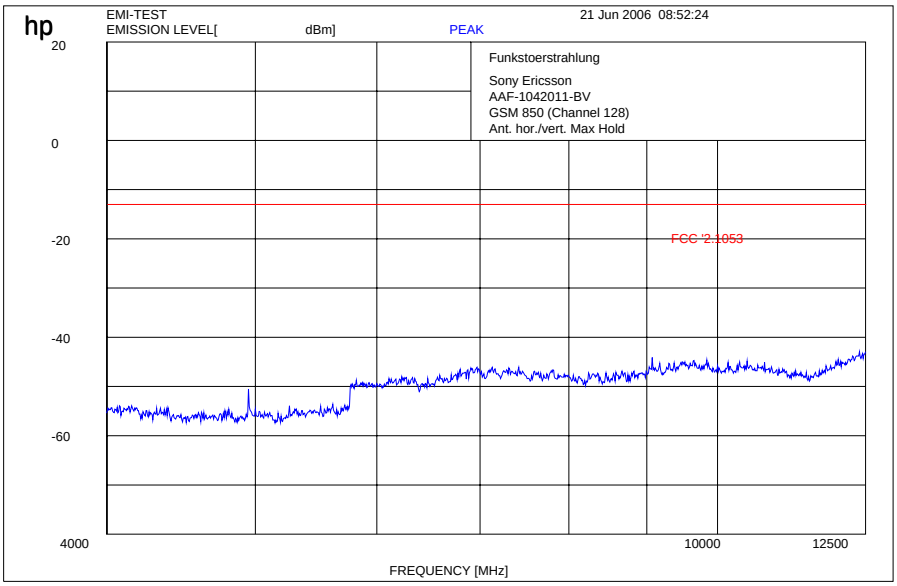
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 128 (4 GHz – 12.5 GHz) Antenna outside
Normal – mode



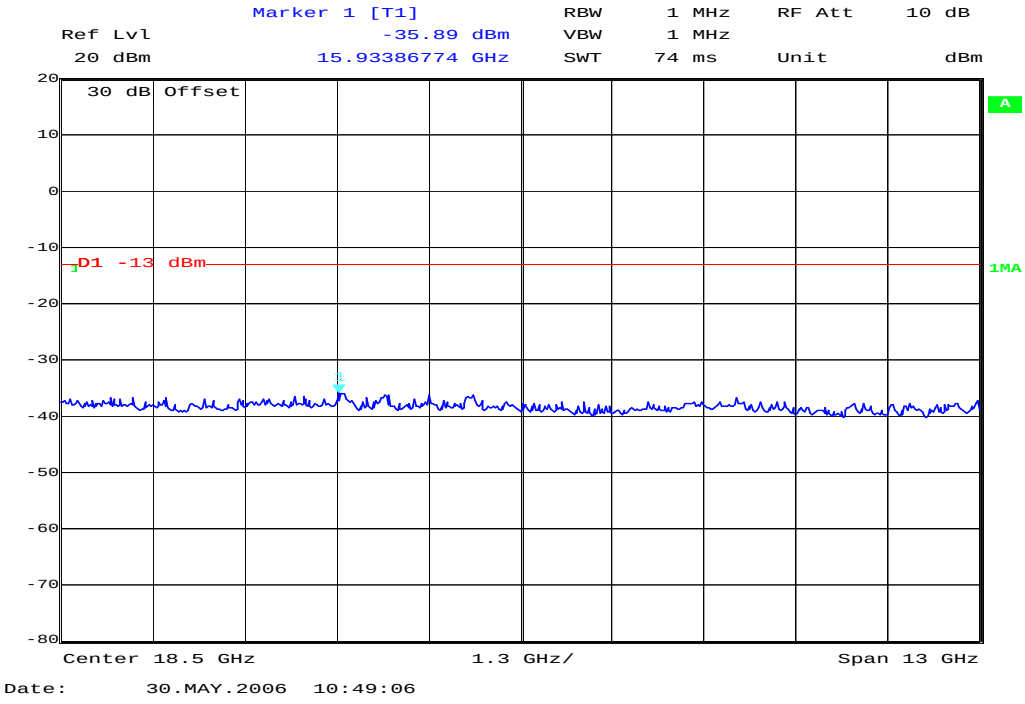
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 128 (4 GHz – 12.5 GHz) Antenna inside
Normal – mode

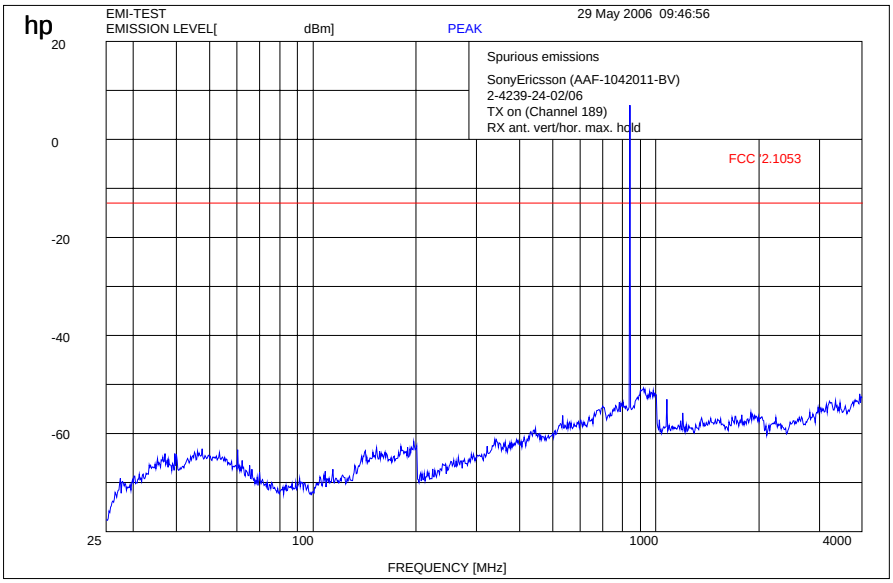


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 128 (12 GHz - 25 GHz) Antenna outside
Normal – mode

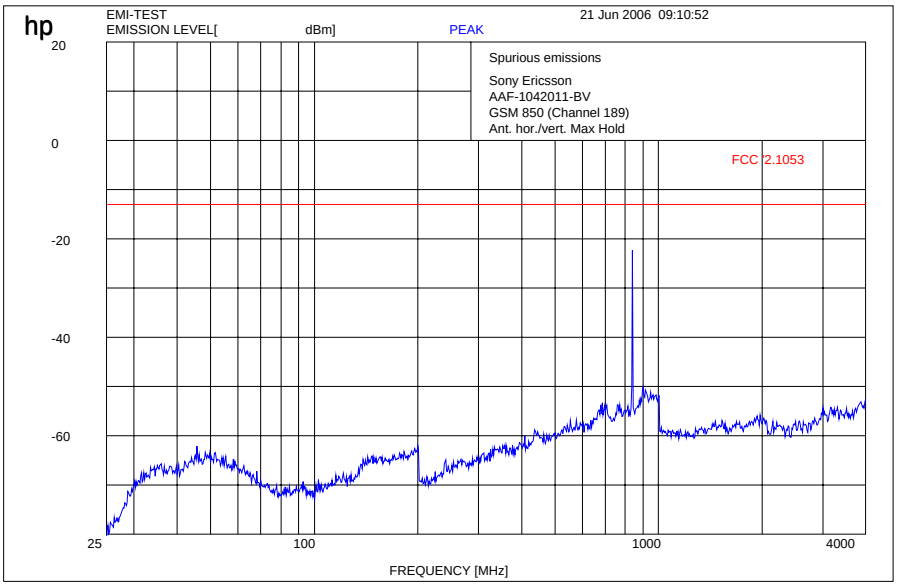


Channel 189 (30 MHz - 4 GHz) Antenna outside
Normal – mode



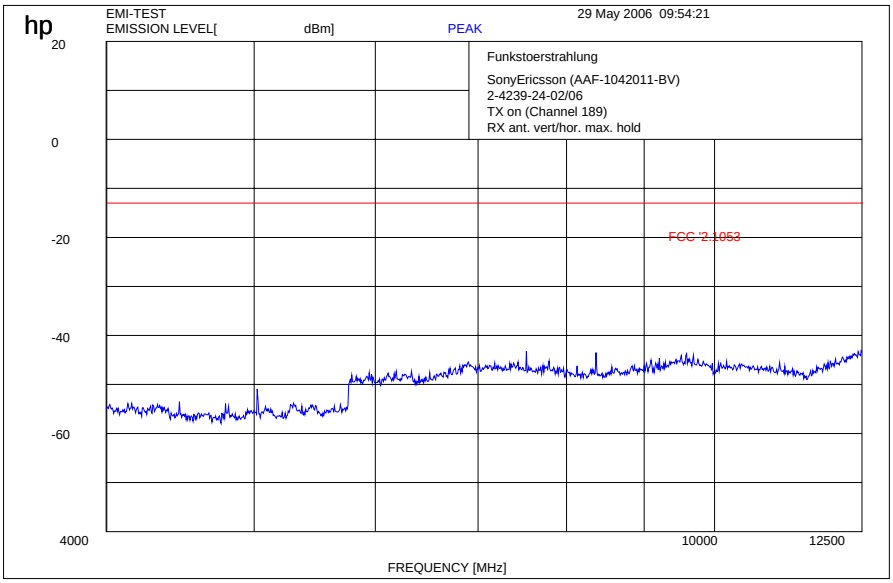
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 189 (30 MHz - 4 GHz) Antenna inside
Normal – mode



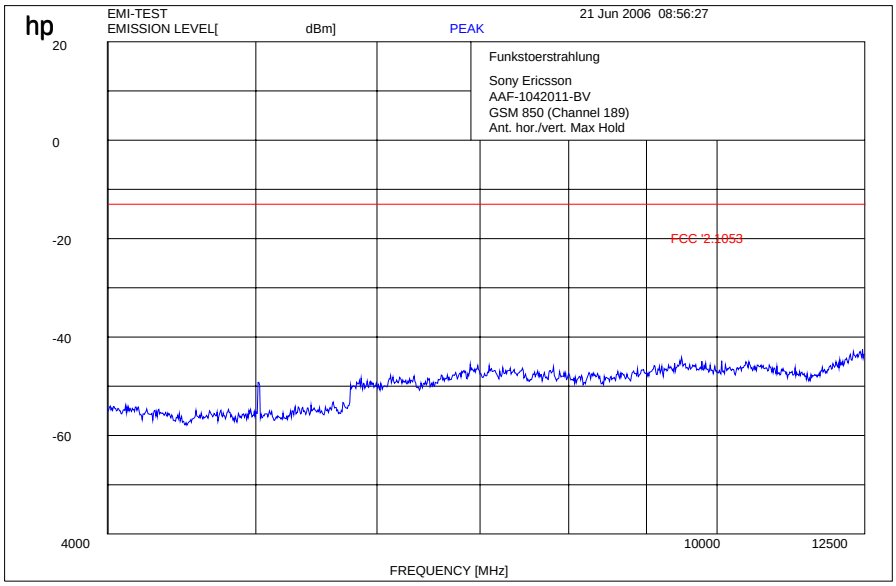
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 189 (4 GHz – 12.5 GHz) Antenna outside
Normal – mode



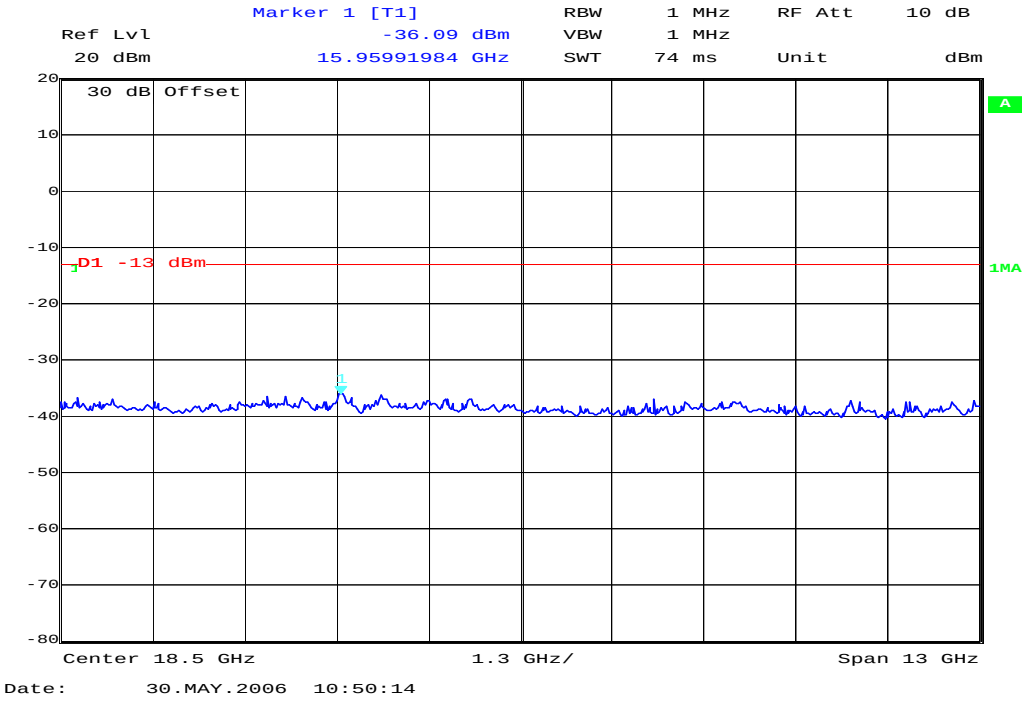
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 189 (4 GHz – 12.5 GHz) Antenna inside
Normal – mode

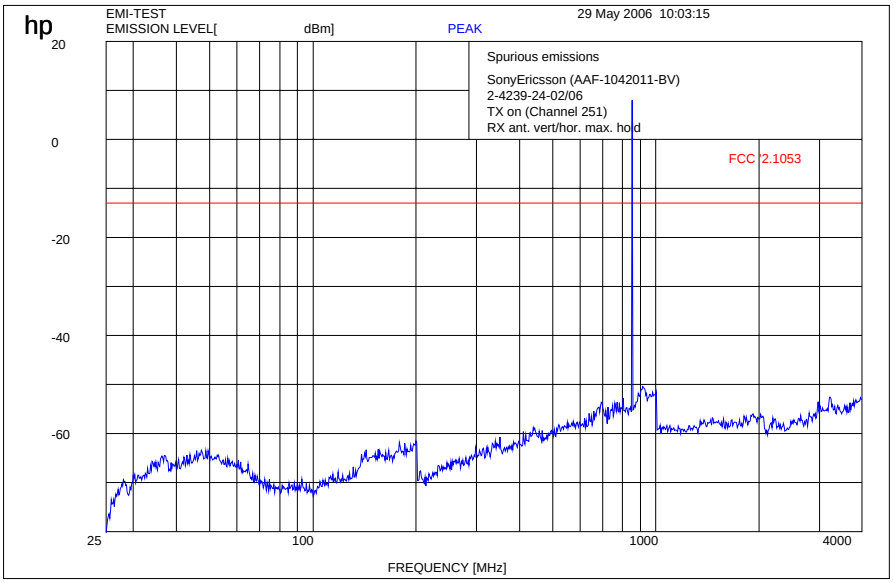


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 189 (12 GHz - 25 GHz) Antenna outside
Normal - mode

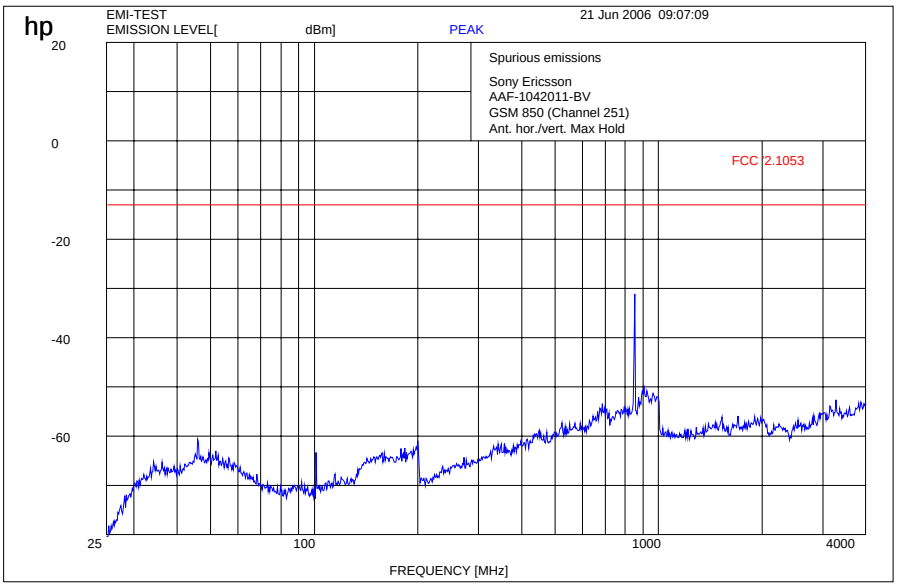


Channel 251 (30 MHz - 4 GHz) Antenna outside
Normal – mode



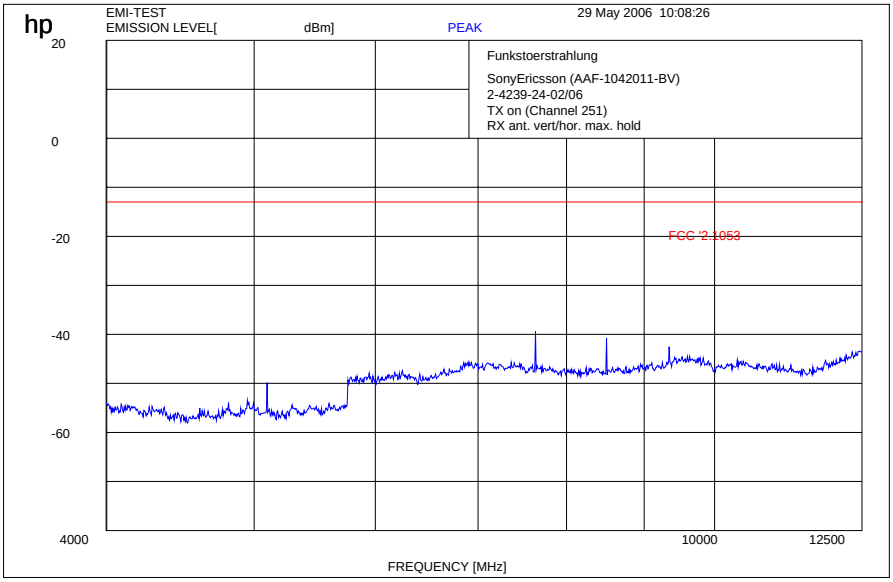
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 251 (30 MHz - 4 GHz) Antenna inside
Normal – mode



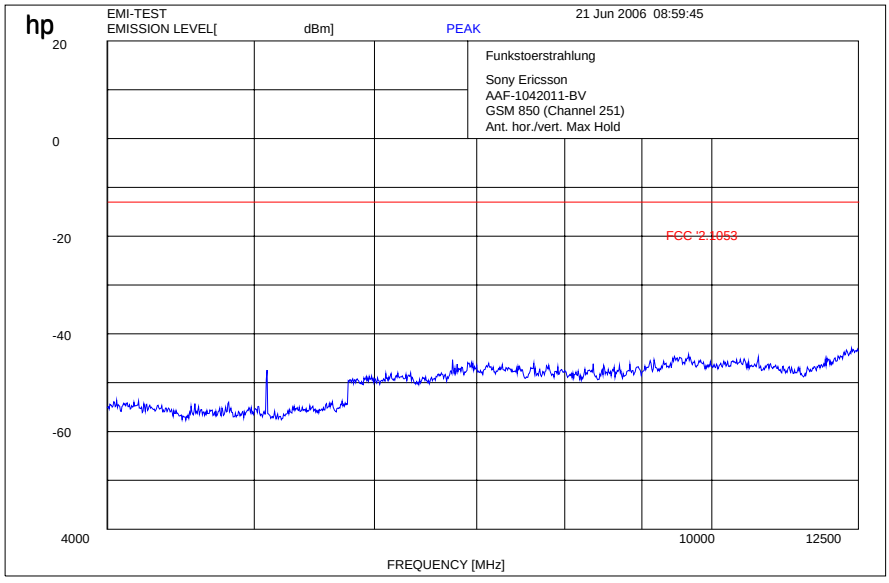
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz
Carrier suppressed with a rejection filter

Channel 251 (4 GHz – 12.5 GHz) Antenna outside
Normal – mode



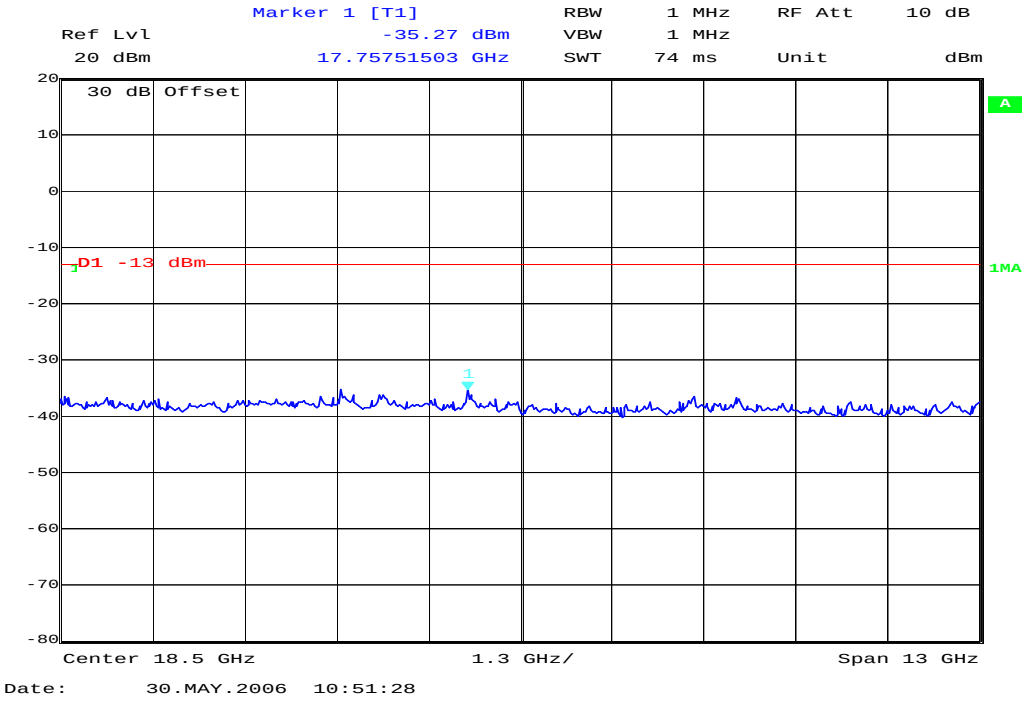
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 251 (4 GHz – 12.5 GHz) Antenna inside
Normal – mode

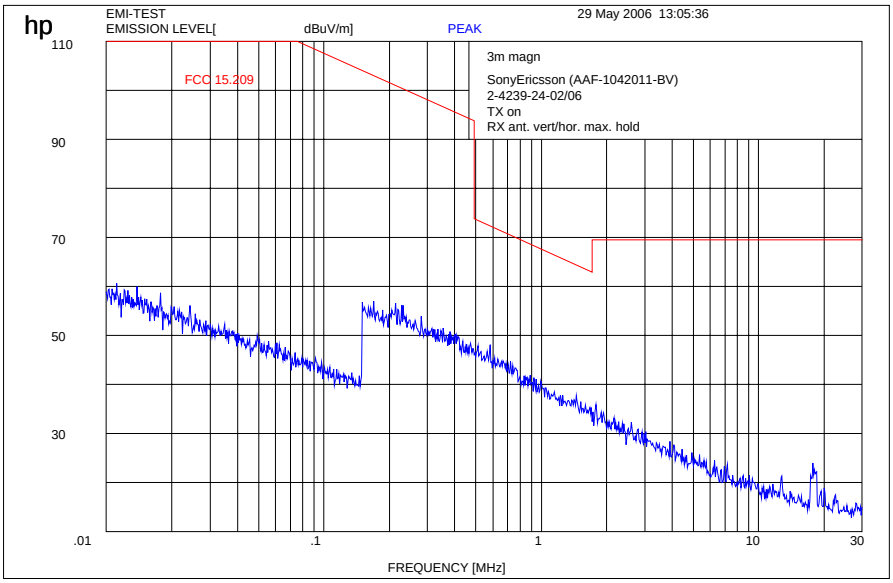


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

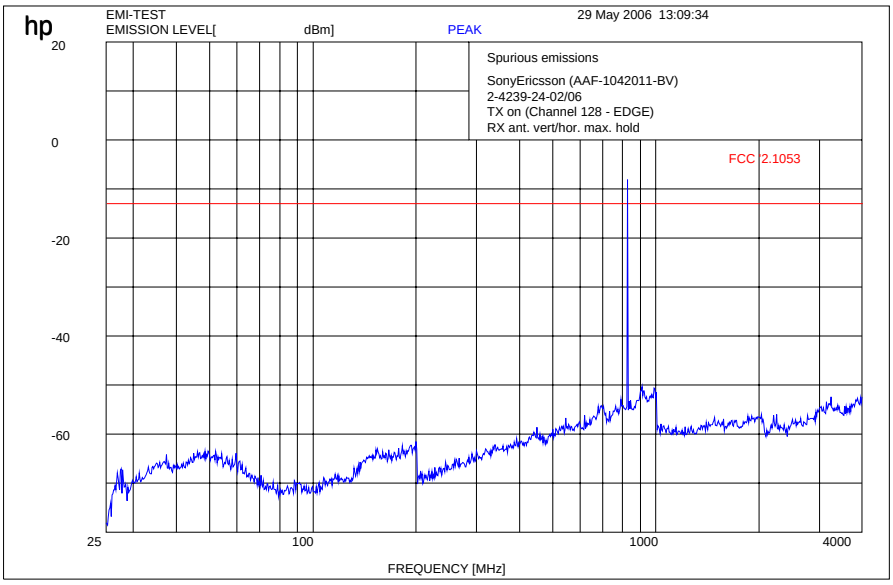
Channel 251 (12 GHz - 25 GHz) Antenna outside
Normal - mode



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

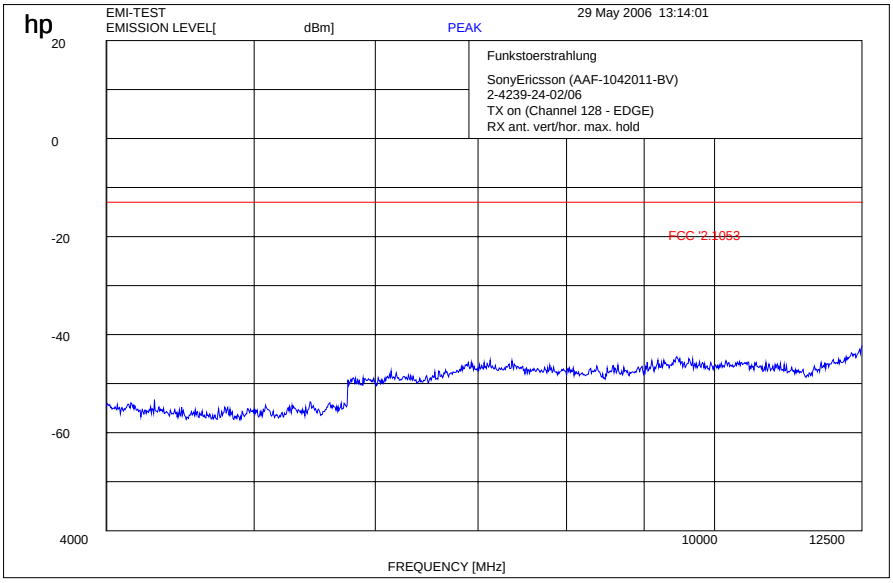


Channel 128 (30 MHz - 4 GHz)
EDGE – mode



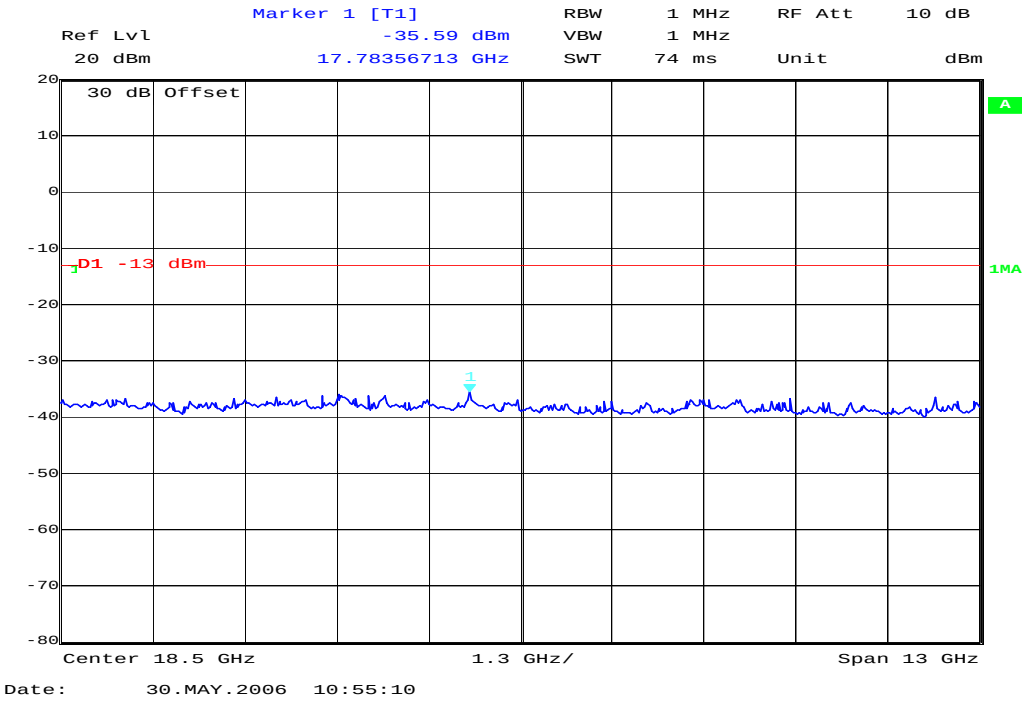
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 128 (4 GHz – 12.5 GHz)
EDGE – mode

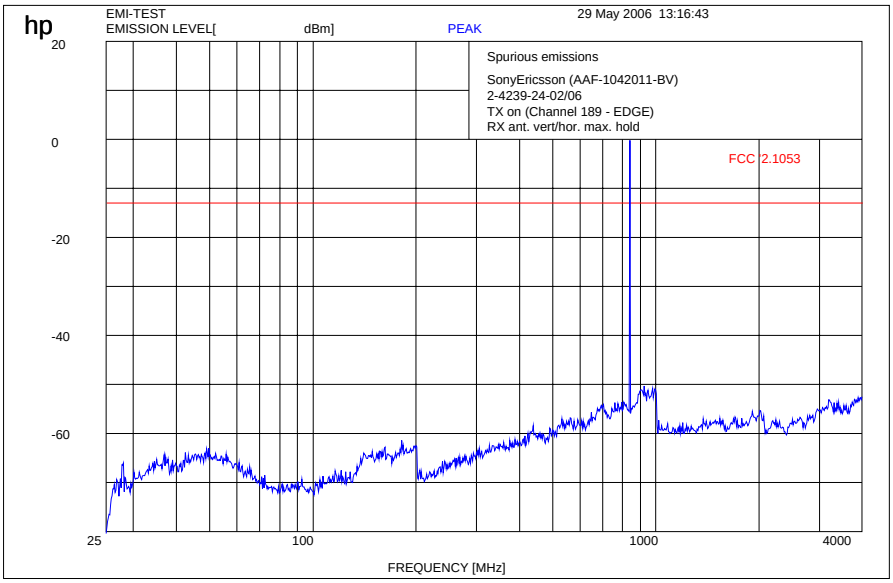


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 128 (12 GHz - 25 GHz)
EDGE – mode

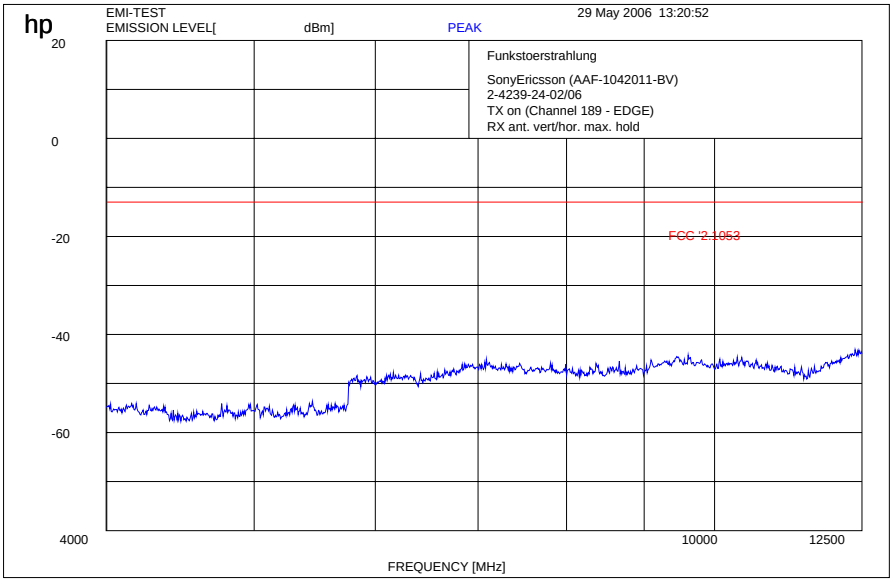


Channel 189 (30 MHz - 4 GHz)
EDGE – mode



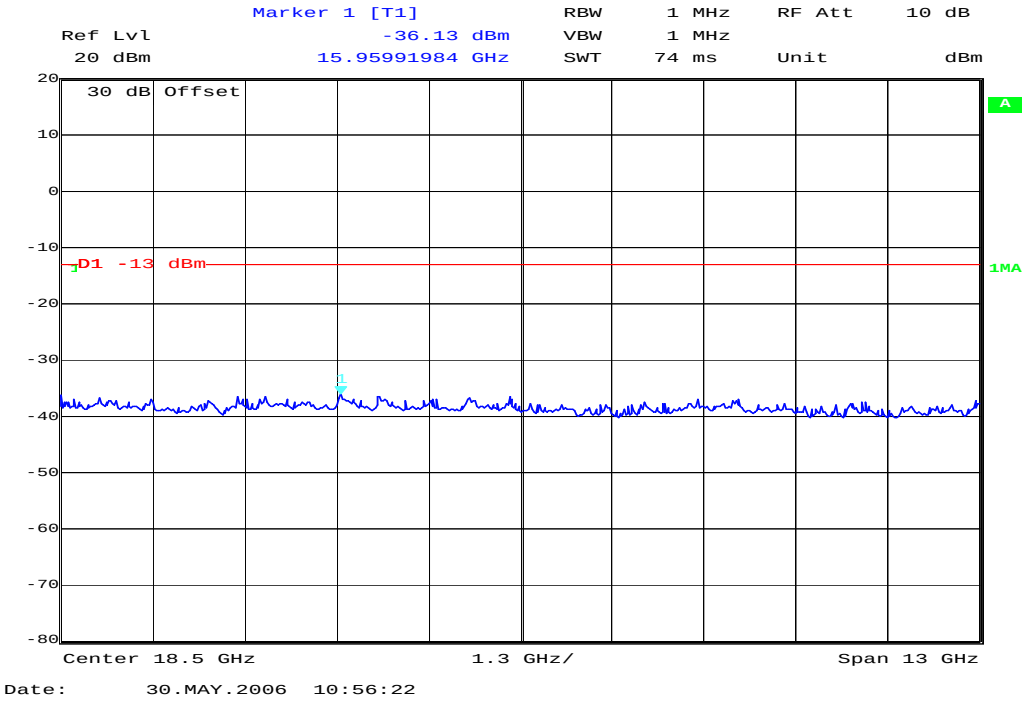
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 189 (4 GHz – 12.5 GHz)
EDGE – mode

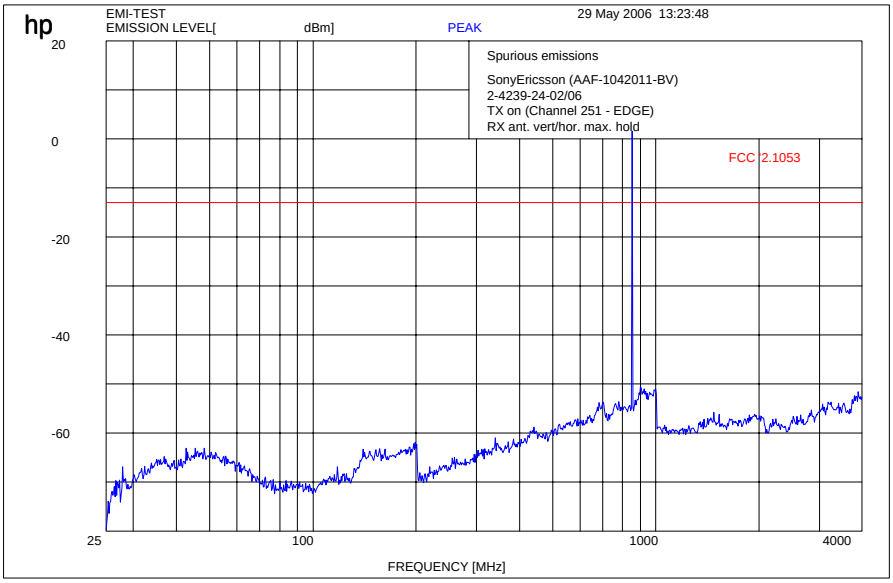


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 189 (12 GHz - 25 GHz)
EDGE – mode

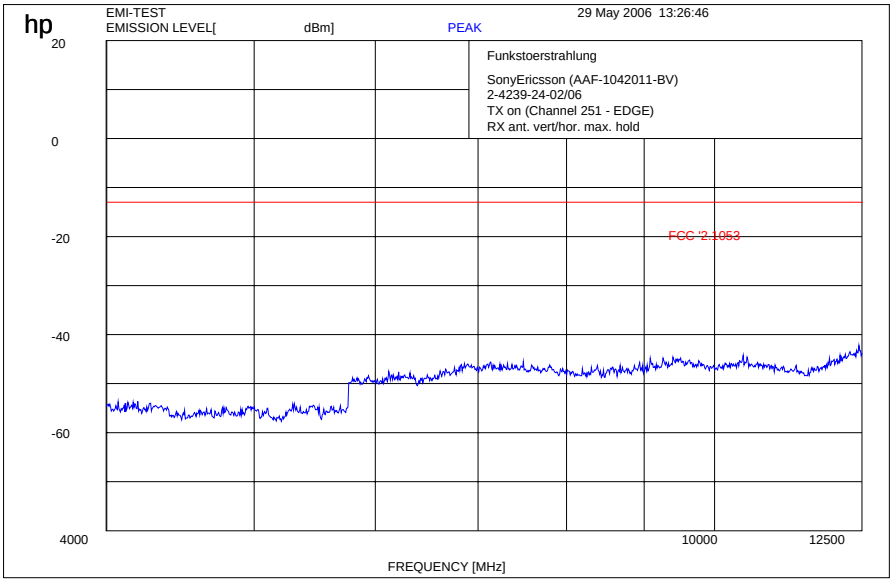


Channel 251 (30 MHz - 4 GHz)
EDGE – mode

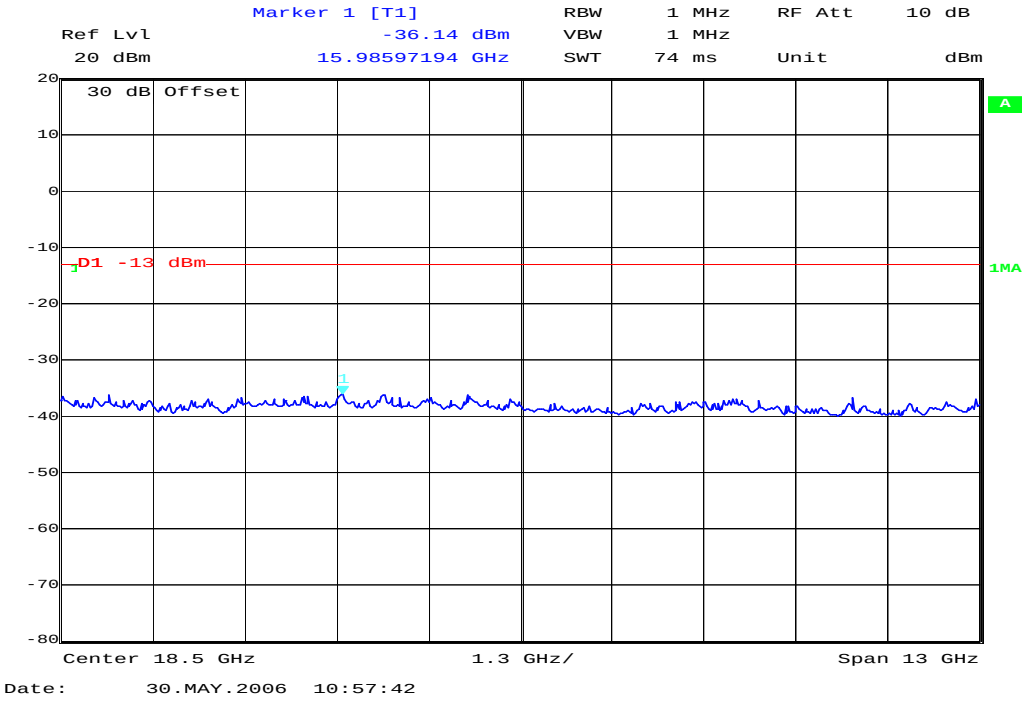


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Channel 251 (4 GHz – 12.5 GHz)
EDGE – mode



Channel 251 (12 GHz - 25 GHz)
EDGE – mode



3.2.4 Receiver Radiated Emissions

Reference

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

SPURIOUS EMISSIONS LEVEL (µV/m)								
Idle Mode Normal GSM			Idle Mode EDGE					
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
No peaks found			No peaks found			-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
Measurement uncertainty			±3 dB					

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

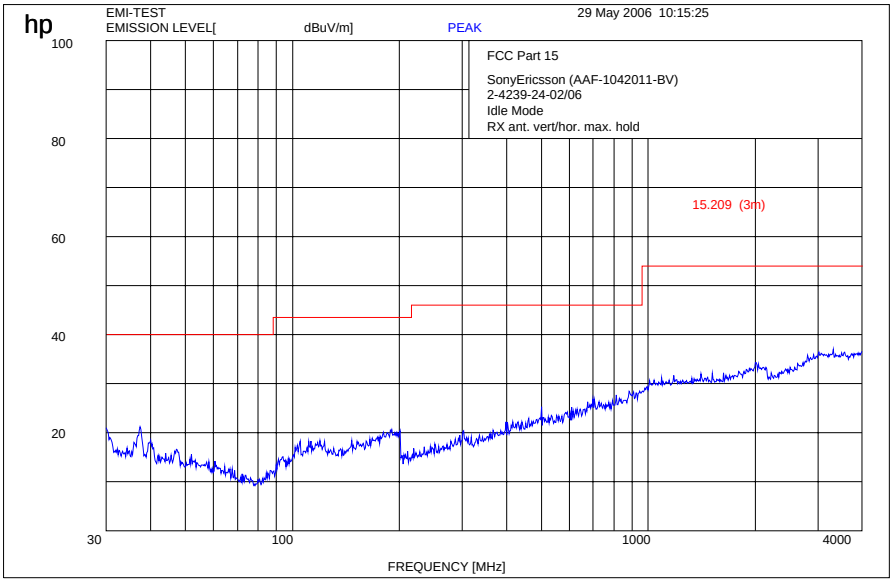
H = Horizontal ; V= Vertical

Measurement distance see table

Limits: § 15.109

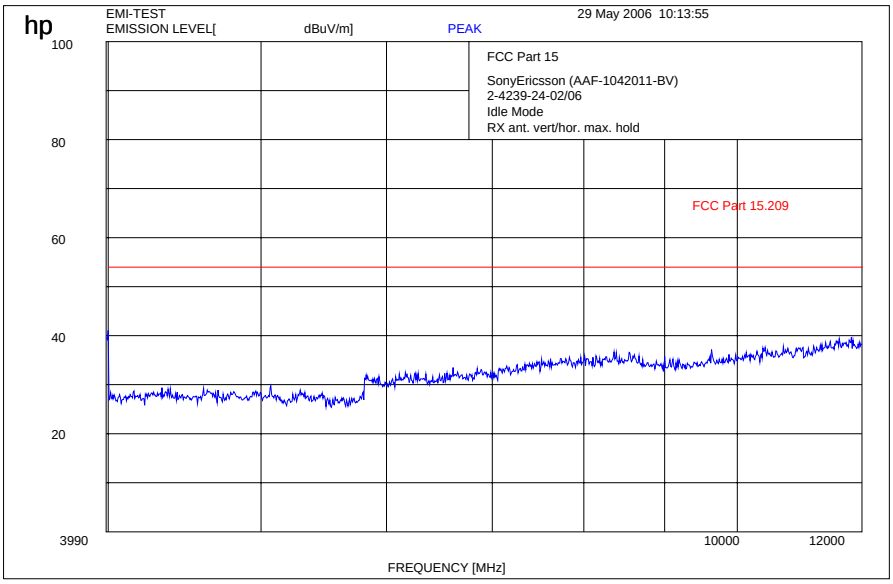
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

Idle-Mode (30 MHZ - 4 GHZ)
Normal – mode



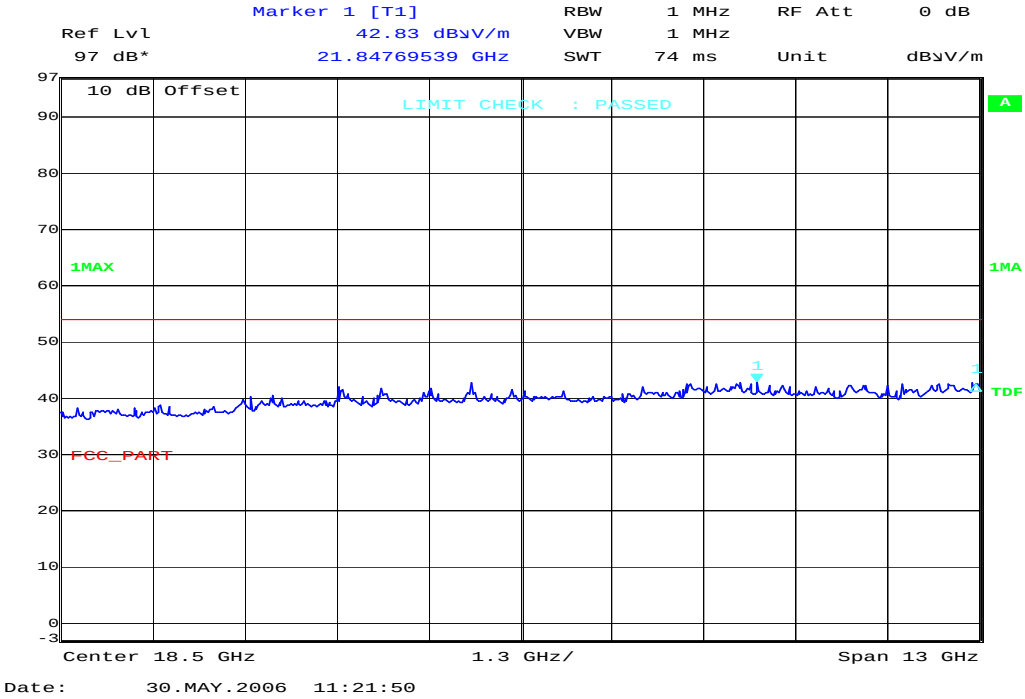
f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

IDLE-MODE (4 GHz – 12.0 GHz)
Normal – mode

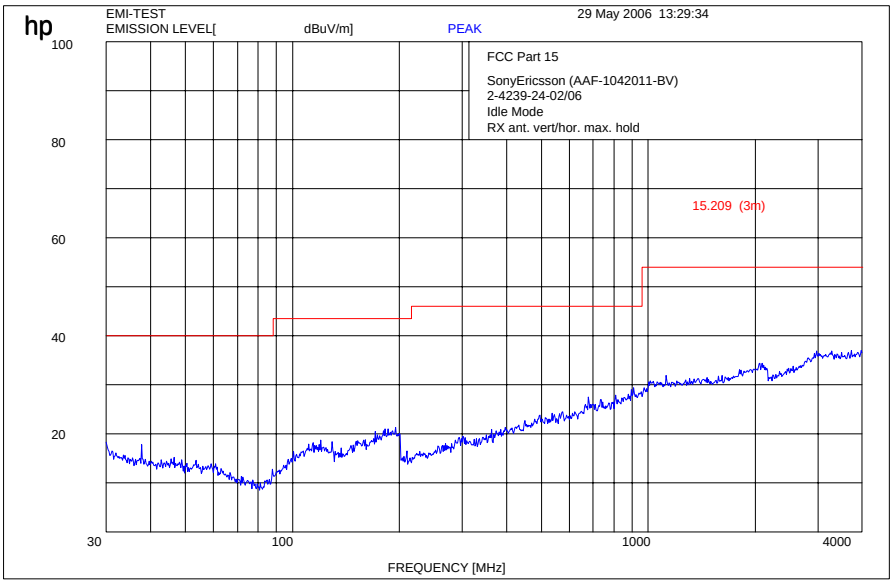


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

Idle-Mode (12 GHz - 25 GHz)
Normal – mode

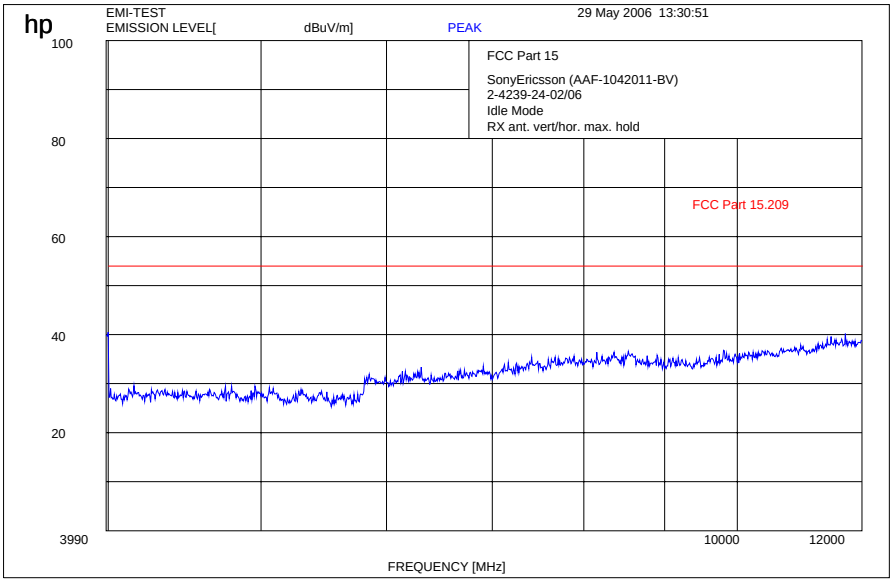


Idle-Mode (30 MHZ - 4 GHZ)
Edge – mode

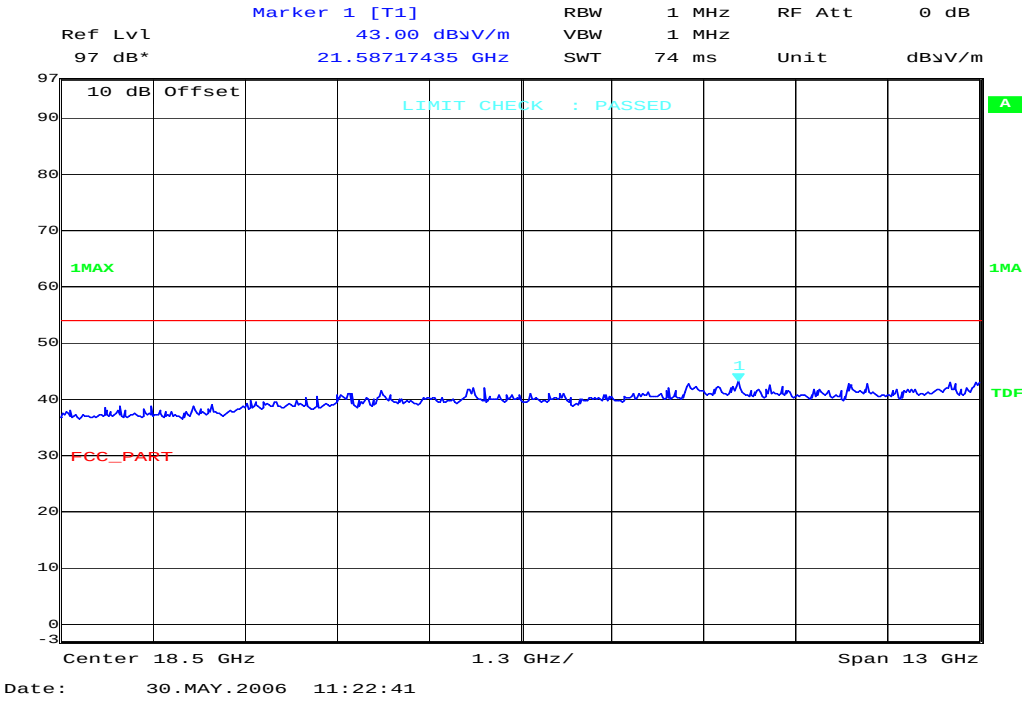


f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW / VBW 1 MHz

IDLE-MODE (4 GHz – 12.0 GHz)
Edge – mode



Idle-Mode (12 GHz - 25 GHz)
Edge– mode



3.2.5 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 transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

USPCS Transmitter Channel Frequency
128 824.2 MHz
189 836.2 MHz
251 848.8 MHz

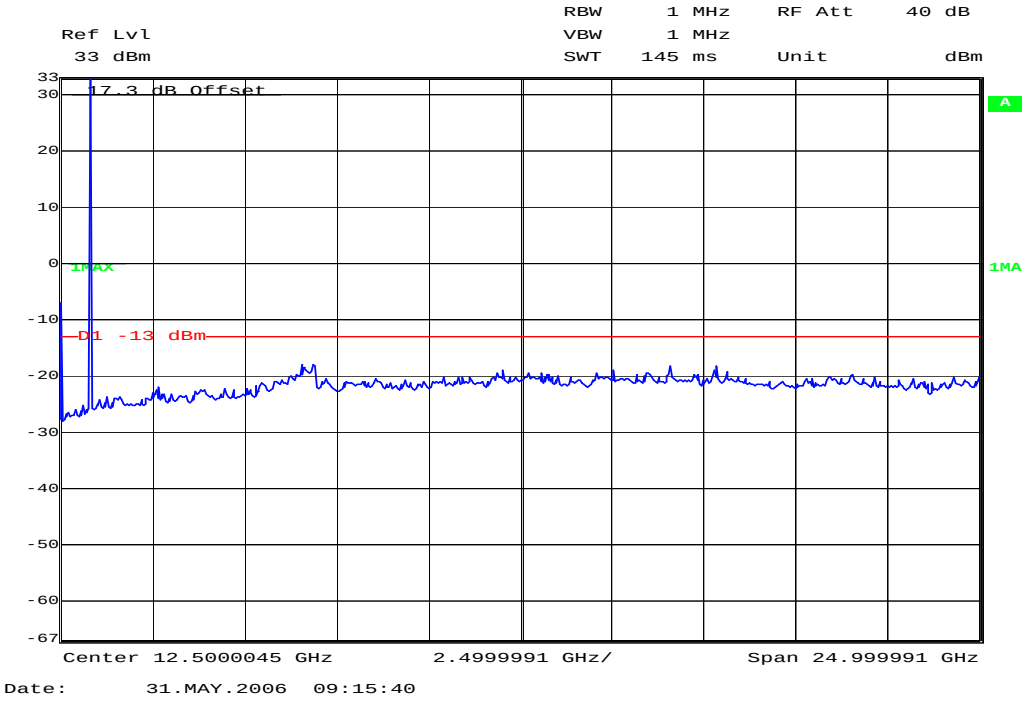
Measurement Limit

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

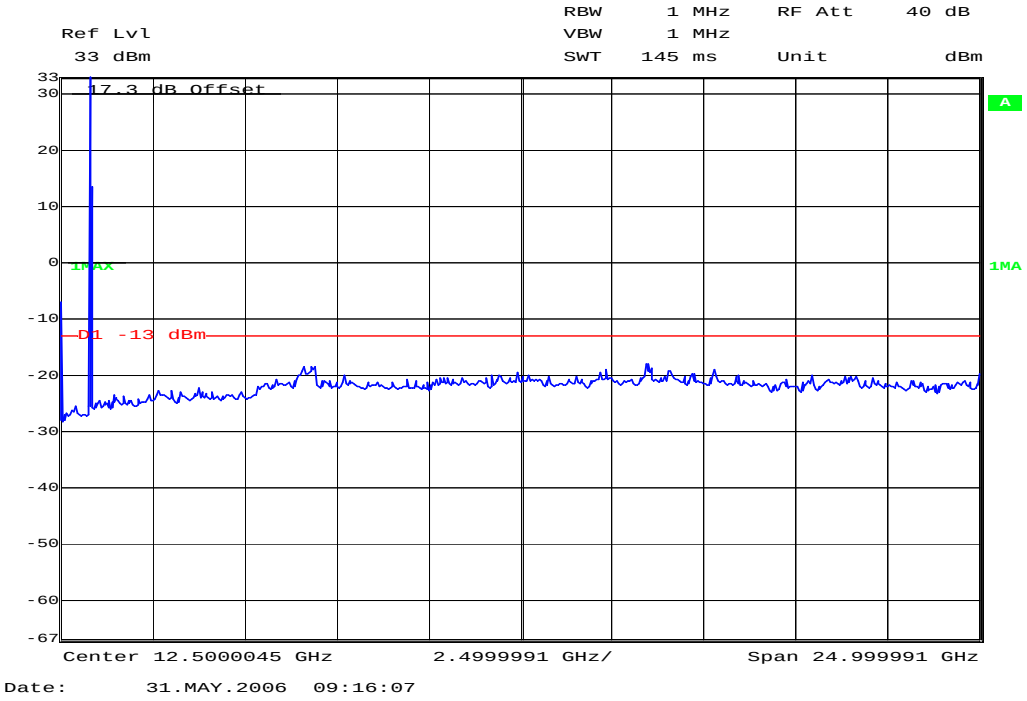
Measurement Results

Harmonic	TX CH.-128 Freq. (MHz)	Level (dBm)	TX CH.-189 Freq. (MHz)	Level (dBm)	TX CH.-251 Freq. (MHz)	Level (dBm)
2	1648.4	-	1672.4	-	1697.6	-
3	2472.6	-	2508.6	-	2546.4	-
4	3296.8	-	3344.8	-	3395.2	-
5	4121.0	-	4181.0	-	4244.0	-
6	4945.2	-	5017.2	-	5092.8	-
7	5769.4	-	5853.4	-	5941.6	-
8	6593.6	-	6689.6	-	6790.4	-
9	7417.8	-	7525.8	-	7639.2	-
10	8242.0	-	8362.0	-	8488.0	-

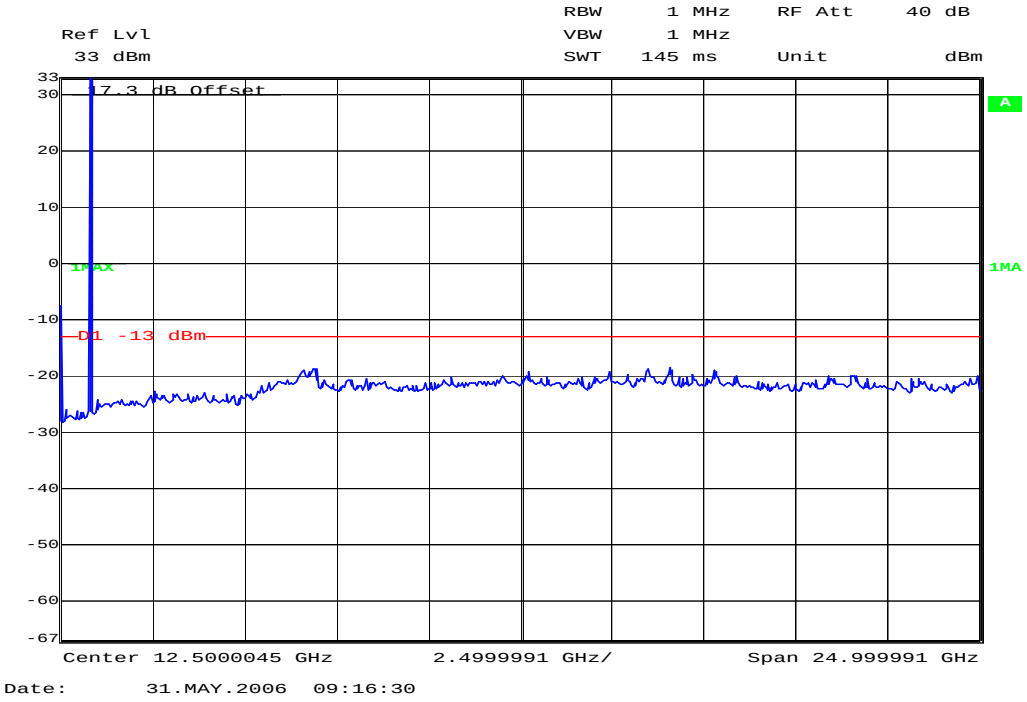
Channel: 128
Normal mode



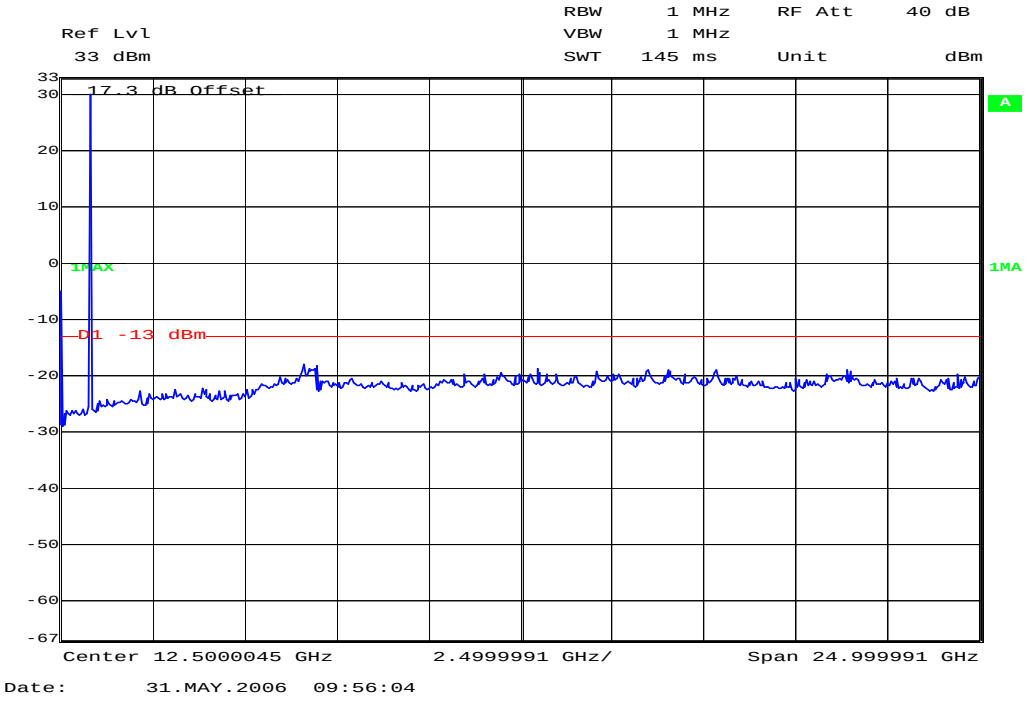
Channel 189
Normal mode



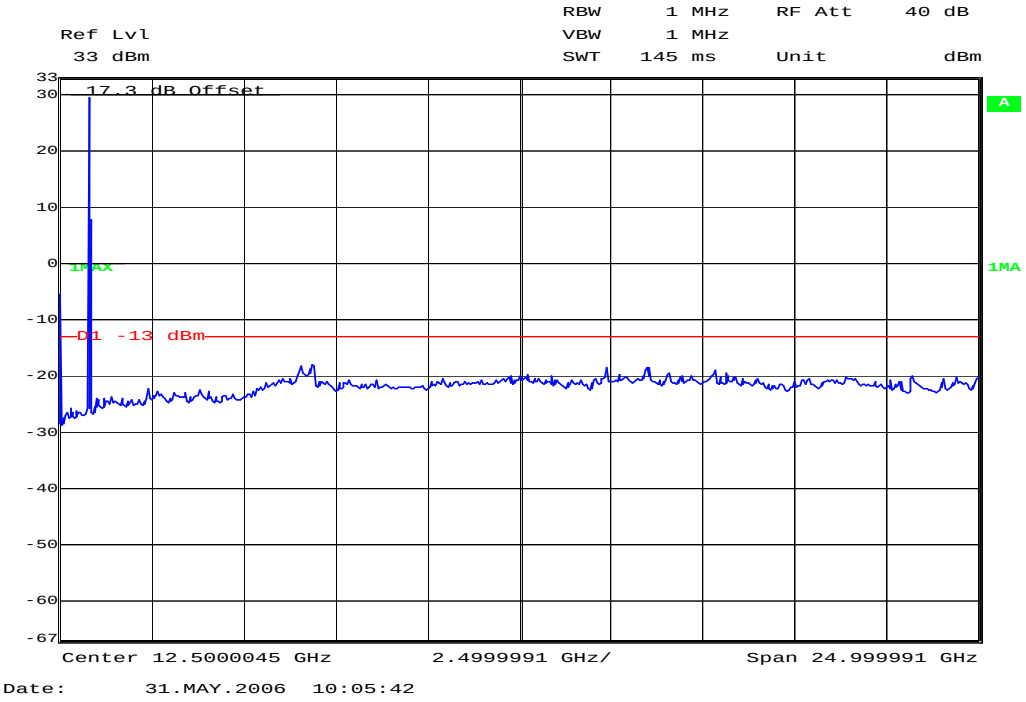
Channel 251
Normal mode



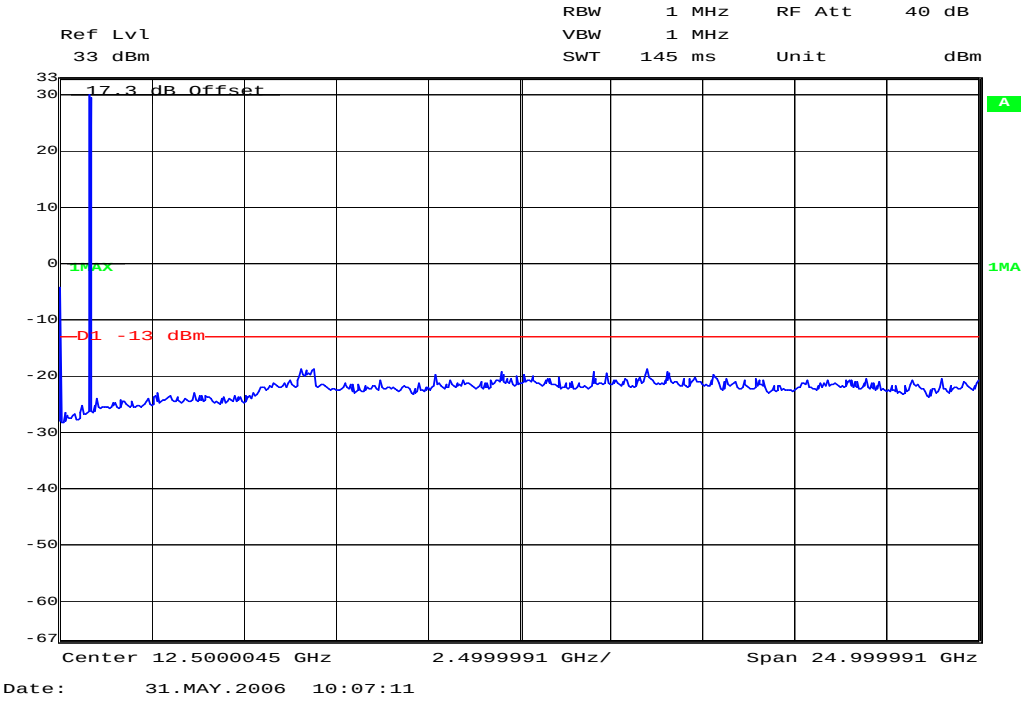
Channel: 128
EDGE mode



Channel 189
EDGE mode



Channel 251
EDGE mode



3.2.6 Block Edge Compliance

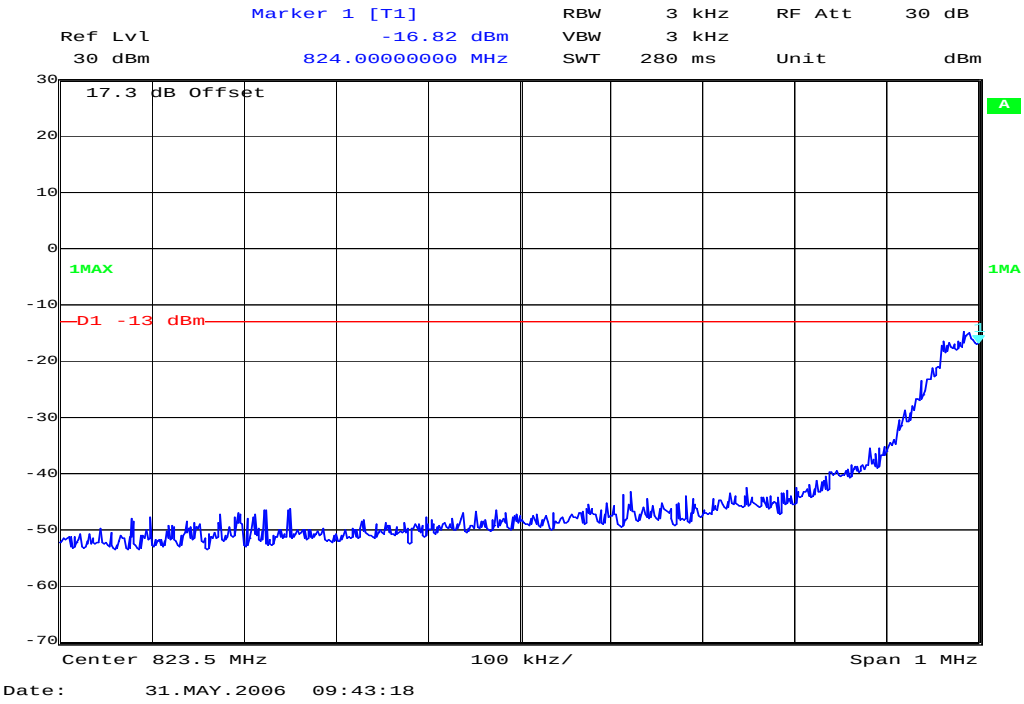
Reference

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

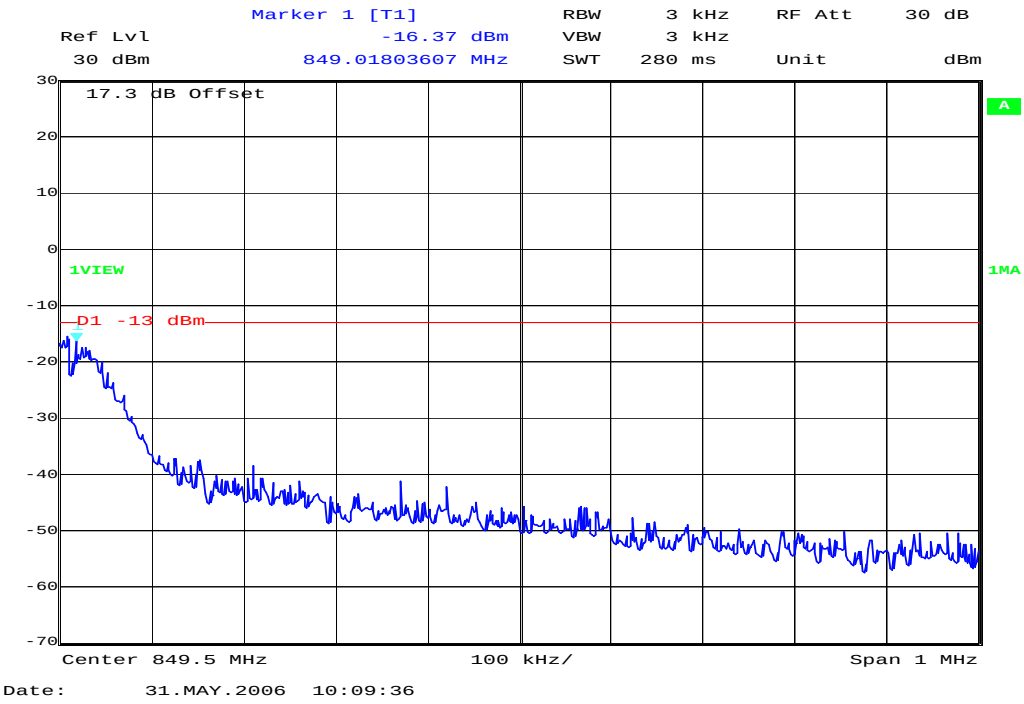
Measurement Limit:

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

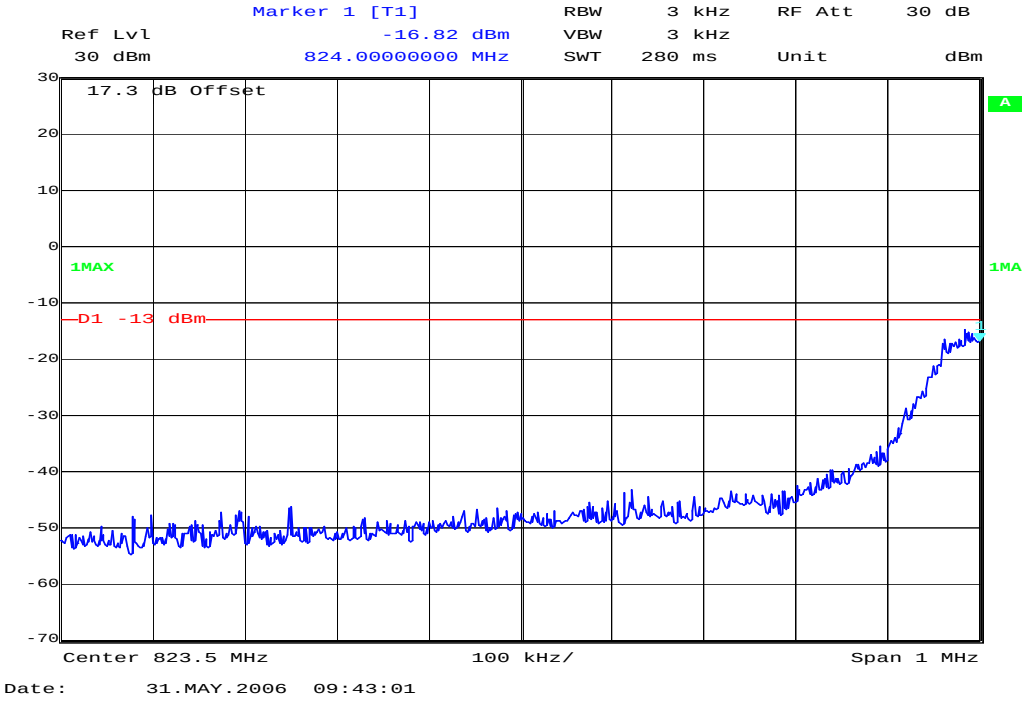
Block 1 Channel 128
Normal – mode



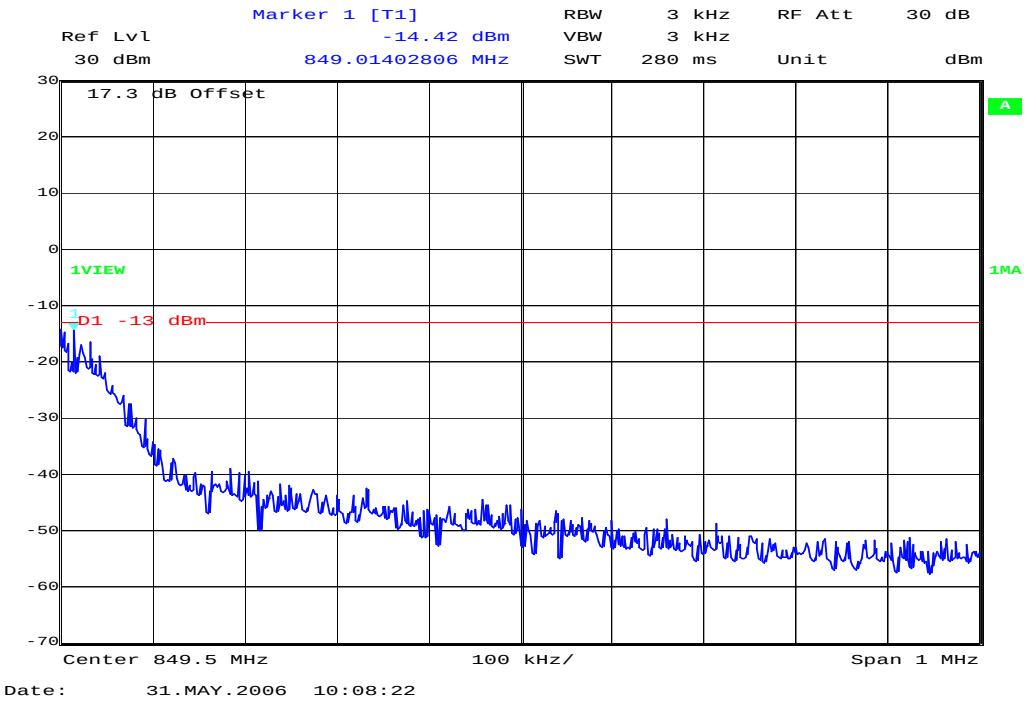
Block 4 Channel 251
Normal – mode



Block 1 Channel 128
EDGE – mode



Block 4 Channel 251
EDGE – mode



3.2.7 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

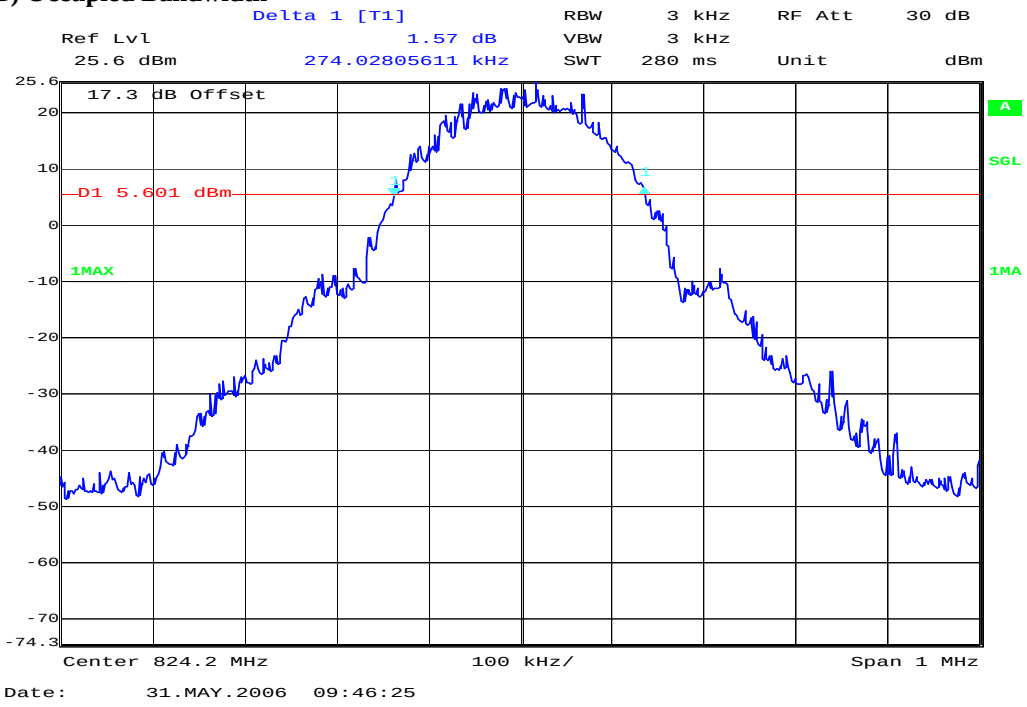
Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
824.2 MHz	274.02	310.02
836.4 MHz	266.01	308.01
848.8 MHz	280.00	314.02

EDGE - mode

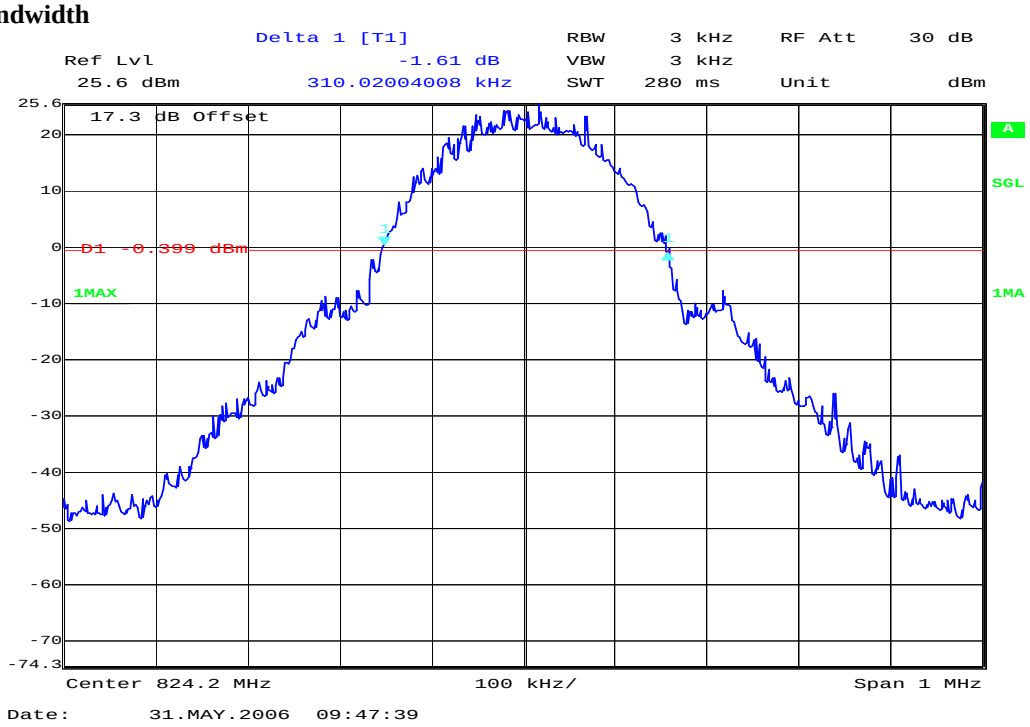
Frequency	99% Occupied Bandwidth (kHz)	-26 dBc Bandwidth (kHz)
824.2 MHz	272.00	302.00
836.4 MHz	272.02	320.02
848.8 MHz	260.02	304.02

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.

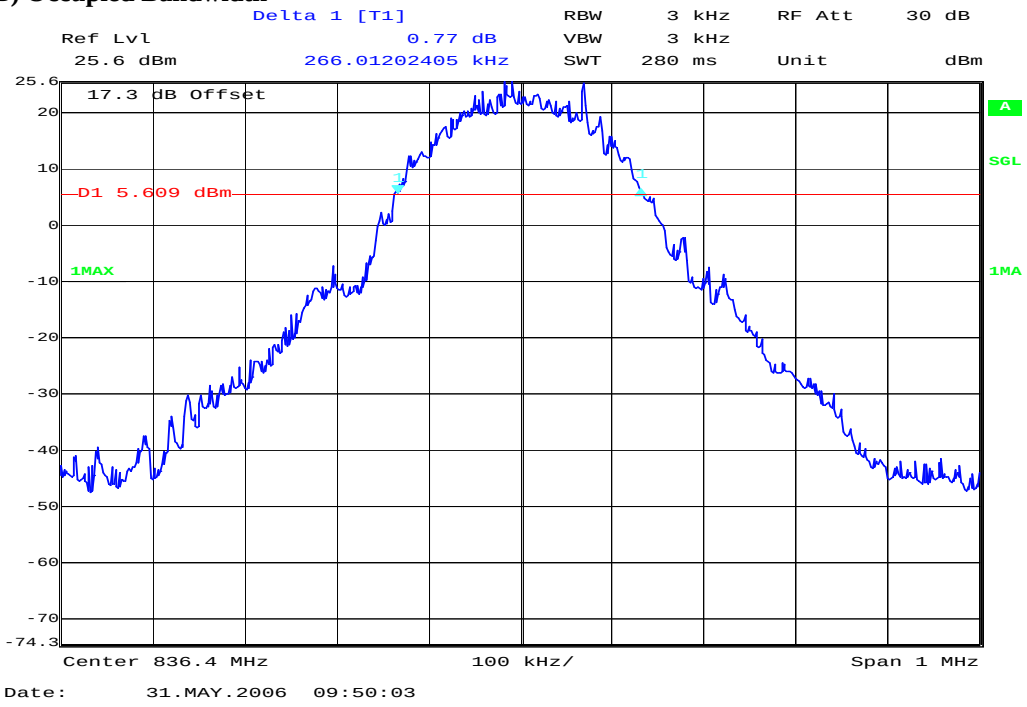
Channel 128 Normal - mode
99% (-20 dB) Occupied Bandwidth



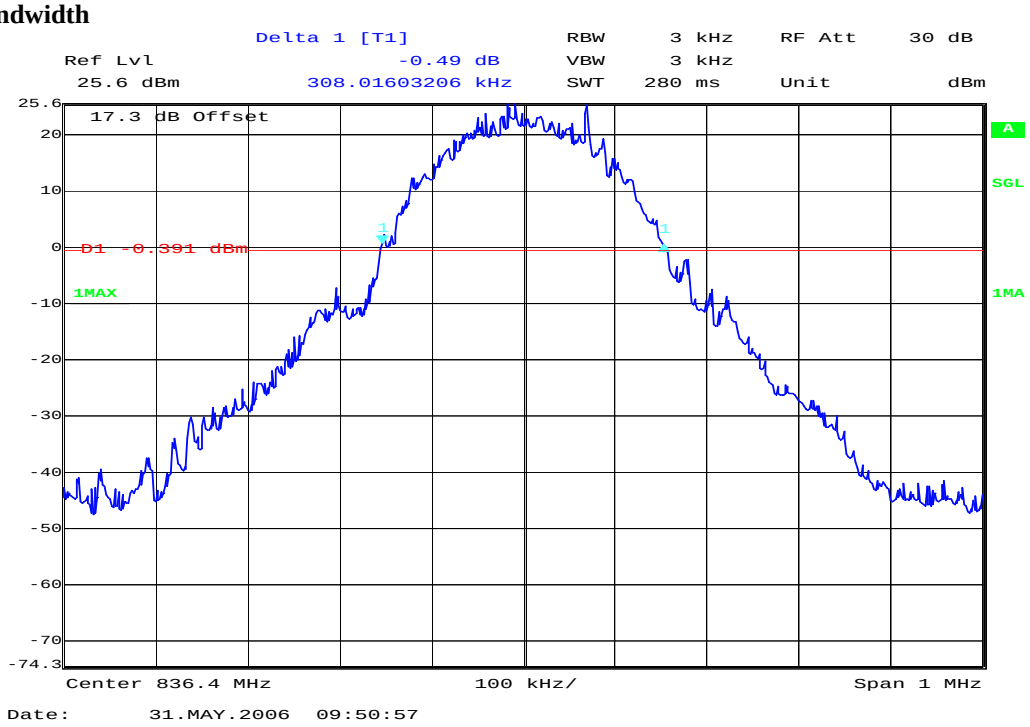
Channel 128 Normal - mode
-26 dBc Bandwidth



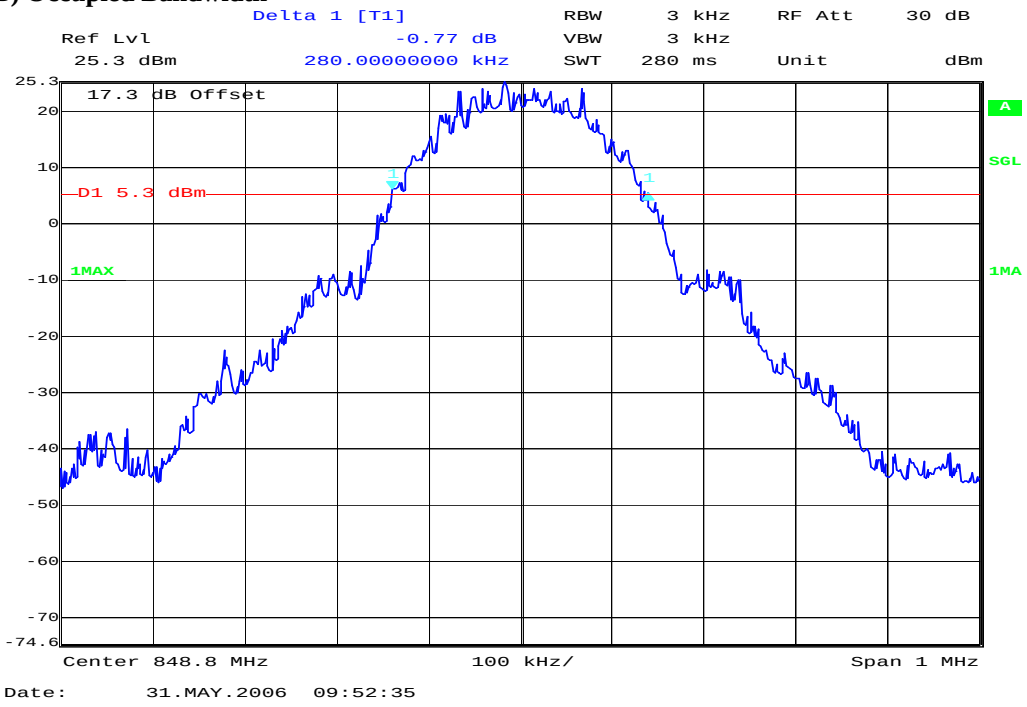
Channel 189 Normal - mode
99% (-20 dB) Occupied Bandwidth



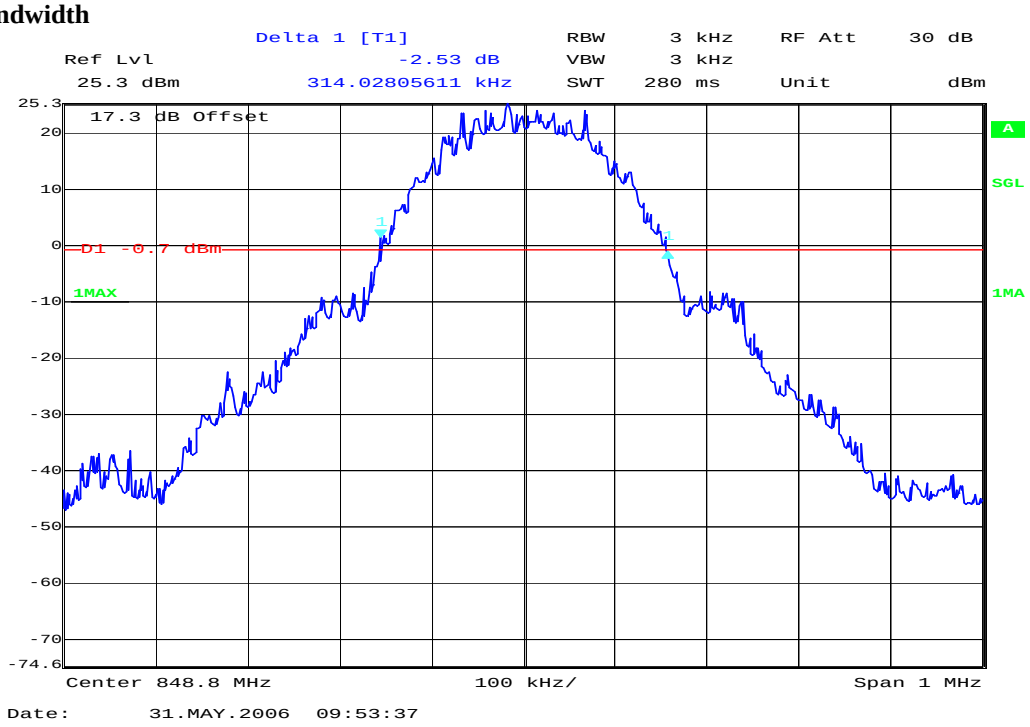
Channel 189 Normal - mode
-26 dBc Bandwidth



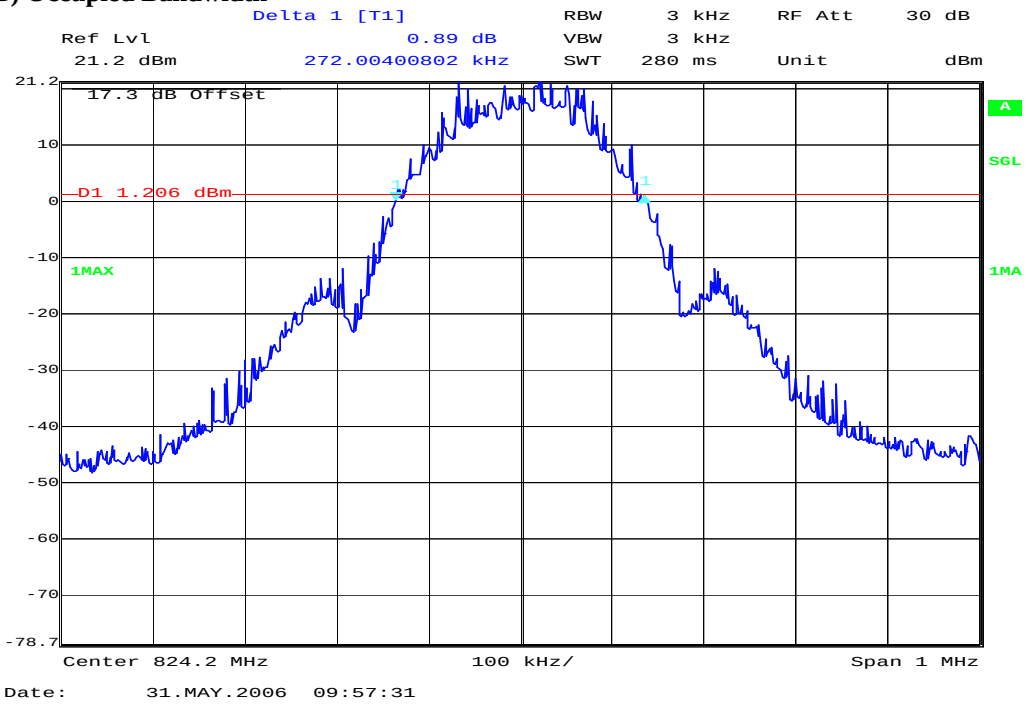
Channel 251 Normal - mode
99% (-20 dB) Occupied Bandwidth



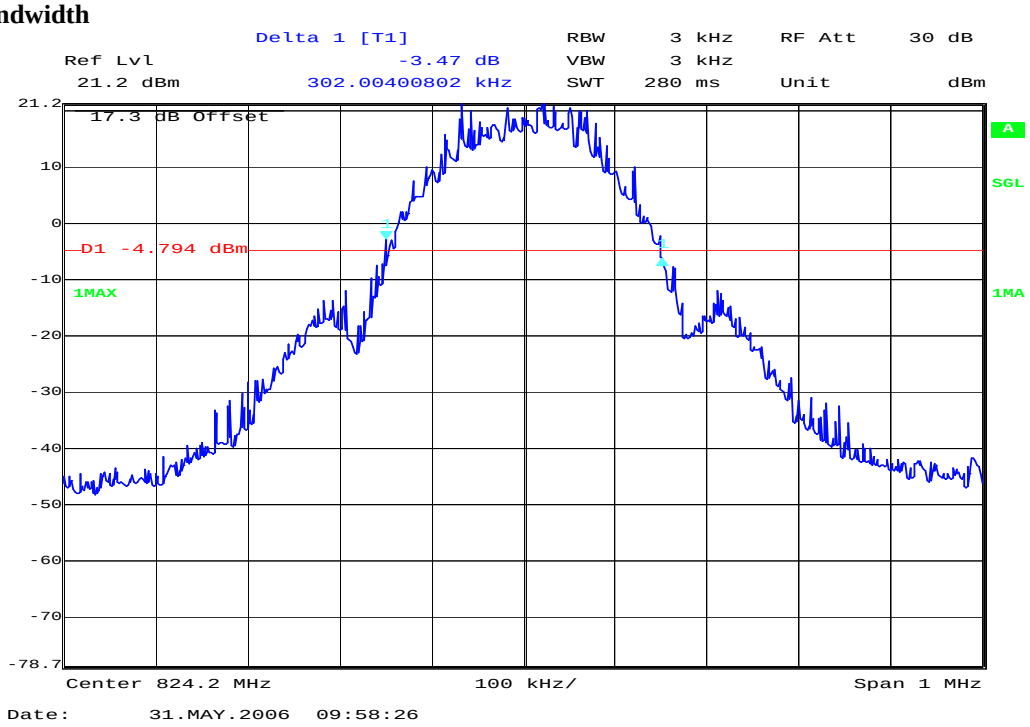
Channel 251 Normal - mode
-26 dBc Bandwidth



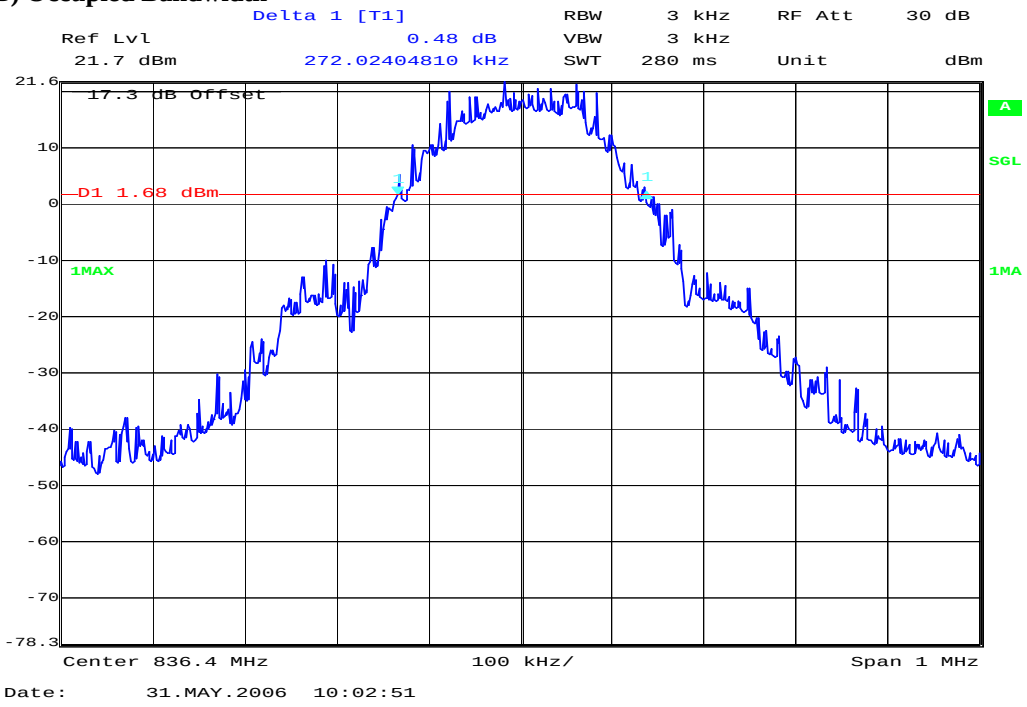
Channel 128 EDGE - mode
99% (-20 dB) Occupied Bandwidth



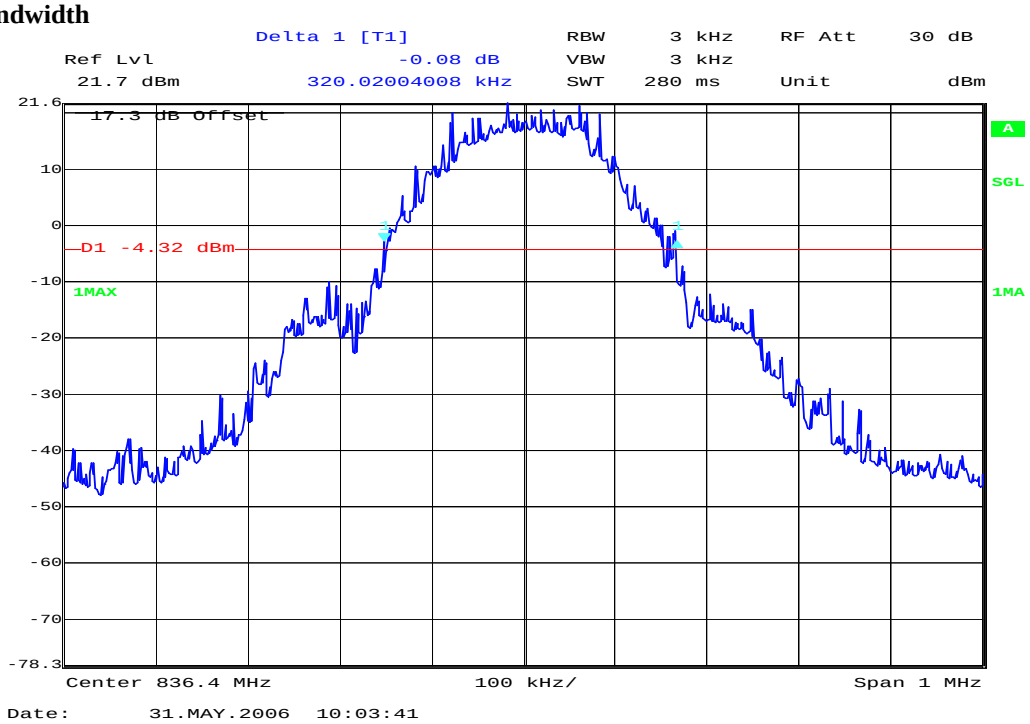
Channel 128 EDGE - mode
-26 dBc Bandwidth



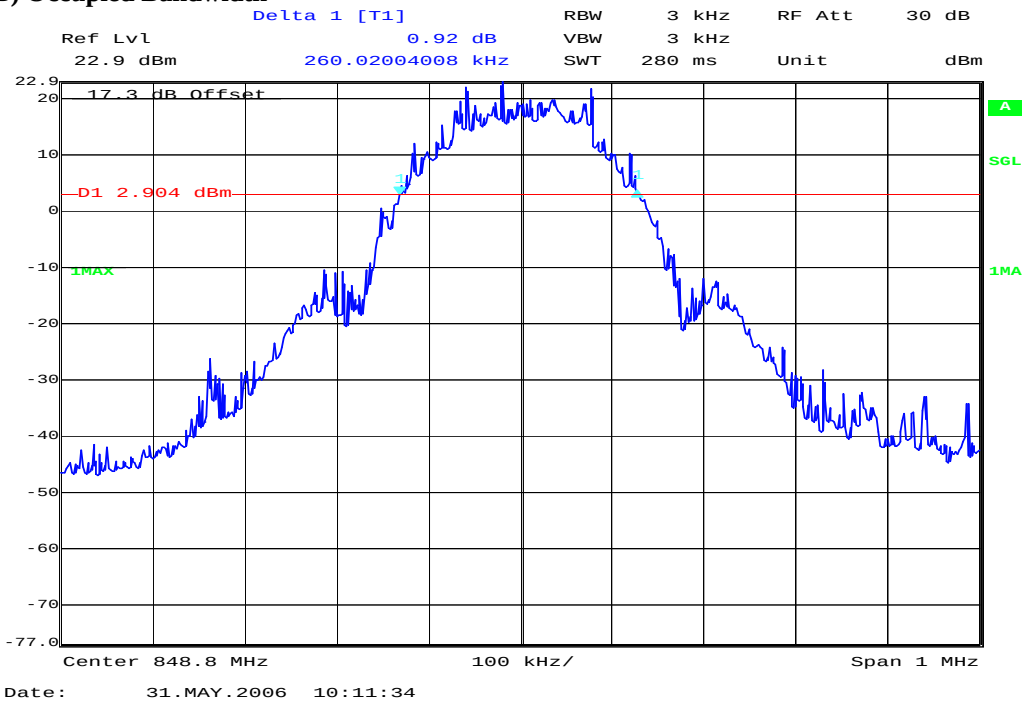
Channel 189 EDGE - mode
99% (-20 dB) Occupied Bandwidth



Channel 189 EDGE - mode
-26 dBc Bandwidth



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



Channel 251 EDGE - mode
-26 dBc Bandwidth