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TCB ID: DE 0001



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



Accredited Bluetooth® Test Facility (BQTF)

Test report No.	: 1-1135-01-05-B/09
Applicant	: RADIO FREQUENCY SYSTEMS
Type	: OR2-SBLP1-1900-D OR2-SBLP1-1900-E OR2-SBLP1-1900-F
Test Standard	: FCC Part 24 RSS-131 Issue 2
FCC ID	: IWD-W3900009
Certification No. IC	: 1634B-W3900009

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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)
Responsible for testing laboratory:	Identification/Registration No : 90462 Stefan Bös 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
(Marco Bertolino)



Responsible for laboratory
(Stefan Bös)

1.3 Details of Applicant

Name	: RADIO FREQUENCY SYSTEMS
Address	: Kabelkamp 20
City	: D-30179 Hannover
Country	: Germany
Phone	: +49 511 676 3149
Fax	: +49 511 676 2188
Contact	: Mr. Ulrich Doberts
Phone	: +49 511 676 3149
Fax	: +49 511 676 2188
e-mail	: ulrich.dobrts@rfsworld.com

1.4 Application Details

Date of receipt of application	: 2009-03-30
Date of receipt of test item	: 2009-03-30
Date(s) of test	: 2009-03-30 to 2009-07-01
Date of report	: 2009-07-13

1.5 Additional EUT information for IC Canada (appendix 2)

Type of equipment	:	PCS 1900 Off-air-repeater
Type name	:	OR2-SBLP1-1900-D OR2-SBLP1-1900-E OR2-SBLP1-1900-F
Manufacturer	:	RADIO FREQUENCY SYSTEMS
Address	:	Kabelkamp 20
City	:	D-30179 Hannover
Country	:	Germany
Frequency	:	OR2-SBLP1-1900-D: Up link 1865-1870 MHz Down link 1945-1950 MHz OR2-SBLP1-1900-E: Up link 1885-1890 MHz Down link 1965-1970 MHz OR2-SBLP1-1900-F: Up link 1890-1895 MHz Down link 1970-1975 MHz
Type of modulation	:	F9W (CDMA)
Number of channels	:	-.-
Antenna Type	:	2 x N-connector
Power supply (normal)	:	115V AC
		Single Channel (Peak) Multi Channel (2)(Peak)
Output power UL / CDMA (D)	:	23.0 dBm 20.5 dBm
Output power DL / CDMA (D)	:	22.7 dBm 20.2 dBm
Output power UL / CDMA (E)	:	23.0 dBm 20.4 dBm
Output power DL / CDMA (E)	:	23.0 dBm 19.9 dBm
Output power UL / CDMA (F)	:	23.6 dBm 20.1 dBm
Output power DL / CDMA (F)	:	22.7 dBm 20.1 dBm
Transmitter Spurious (worst case)	:	0.19µW / -37.10 dBm
Receiver Spurious (worst case)	:	-.- µV/m @ 3 m
FCC ID	:	IWD-W3900009
Certification No. IC	:	1634B-W3900009
Open Area Test Site IC No.	:	IC 3462C-1
IC Standards	:	RSS131, Issue 2

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 :

2009-07-13

Stefan BöS

Date

Name

Signature



1.6 Test Setup

Hardware : -
Software : -

This Multi-channel RF Off-air-repeater amplifies signals bidirectional between base station and mobile handsets, it is suitable for CDMA communication standard in the cellular band. The band is subdivided in 6 subbands. For each subband a separate unit is built. This report includes all 6 units.

Model	Frequencies	Range	Mod.	FCC-ID	IC-Number
OR2-SBLP1-1900-D	UL 1865-1870MHz DL 1945-1950MHz	5MHz	CDMA		
OR2-SBLP1-1900-E	UL 1885-1890MHz DL 1965-1970MHz	5MHz	CDMA	IWD-W3900009	1634B-W3900009
OR2-SBLP1-1900-F	UL 1890-1895MHz DL 1970-1975MHz	5MHz	CDMA		

1.7 Test Standards

FCC:	PCC Part 24 Personal Communication Services FCC 2-11-04/EAB/RF Amplifier, Booster and Repeater Reminder Sheet
IC:	RSS 131, Issue 2

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

Section in this Report	Test Name	Verdict
3.1.1	RF Exposure FCC §1.1307, §2.1091/ RSS-131 §5.5	pass
3.1.2	RF Power Output FCC §2.1046, § 22.913, § 24.232 / IC RSS-131 §6.2	pass
3.1.3	Radiated Emissions FCC § 2.1053, § 22.917, § 24.238 / IC RSS-131 §6.4	pass
3.1.4	Conducted Spurious Emissions FCC § 2.1051, §22.917, § 24.238 / IC RSS-131 §6.3	pass
3.1.5	Block Edge Compliance FCC §2.1051, § 22.917, § 24.238 / IC RSS-131 §6.4	pass
3.1.6	Occupied Bandwidth FCC §2.1049, § 22.917, § 24.238 / IC RSS-131 §6.5	pass
3.1.7	Intermodulation Tests FCC § 2.1051, §22.917, § 24.238 / IC RSS-131 §6.3	pass
3.1.8	Out of Band Rejection	
3.1.9	Conducted Emissions <30 MHz FCC§15.107	pass

3 Measurements and results

For Part 24/22/90 we use the substitution method (TIA/EIA 603).
All measurements in this report are done in CDMA mode.

3.1 CDMA

3.1.1 RF Exposure

FCC:	FCC §1.1307, §2.1091
IC:	RSS-131 §5.5

MPE calculation

These equations are generally accurate in the far field of an antenna but will over predict power density in the near field, where they could be used for making a “worst case” prediction.

$$S = PG/4\pi R^2$$

where S = power density (in appropriate units, e.g. mW/cm²)
P = power input to the antenna (in appropriate units e.g. mW)
G = power gain of the antenna in the direction of interest relative to the isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units e.g. cm)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842f	4.89f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824f	2.19f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
1500–100,000			1.0	30

f = frequency in MHz
 * = Plane-wave equivalent power density
 NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
 NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

Antenna gain Worst case calculations: ($S4\pi R^2 / P$)

OR2-SBLP1-1900-D

Downlink:

Maximum peak output power at antenna input terminal (dBm): 22.7
 Maximum peak output power at antenna input terminal (mW): 186.2
 Prediction distance (cm): 20
 Prediction frequency (MHz): 1947.5
 MPE limit for uncontrolled exposure at predication frequency (mW/cm): 1.0
 Maximum Antenna Gain (numeric): 27.0
 Antenna Gain, typical (dBi): 14.3

Uplink:

Maximum peak output power at antenna input terminal (dBm): 23.0
 Maximum peak output power at antenna input terminal (mW): 199.5
 Prediction distance (cm): 20
 Prediction frequency (MHz): 1867.5
 MPE limit for uncontrolled exposure at predication frequency (mW/cm): 1.0
 Maximum Antenna Gain (numeric): 25.2
 Antenna Gain, typical (dBi): 14.0

Test result:

The device is compliant with the requirement MPE limit for uncontrolled exposure at predication frequency 1mW/cm. **The maximum allowed antenna gain for a distance of 20 cm is 14.3 dBi for Downlink and 14.0 dBi for Uplink.**

OR2-SBLP1-1900-E

Downlink:

Maximum peak output power at antenna input terminal (dBm): 23.0

Maximum peak output power at antenna input terminal (mW): 199.5

Prediction distance (cm): 20

Prediction frequency (MHz): 1967.5

MPE limit for uncontrolled exposure at predication frequency (mW/cm): 1.0

Maximum Antenna Gain (numeric): 25.2

Antenna Gain, typical (dBi): 14.0

Uplink:

Maximum peak output power at antenna input terminal (dBm): 23.0

Maximum peak output power at antenna input terminal (mW): 199.5

Prediction distance (cm): 20

Prediction frequency (MHz): 1887.5

MPE limit for uncontrolled exposure at predication frequency (mW/cm): 1.0

Maximum Antenna Gain (numeric): 25.2

Antenna Gain, typical (dBi): 14.0

Test result:

The device is compliant with the requirement MPE limit for uncontrolled exposure at predication frequency 1mW/cm. **The maximum allowed antenna gain for a distance of 20 cm is 14.0 dBi for Downlink and 14.0 dBi for Uplink.**

OR2-SBLP1-1900-F

Downlink:

Maximum peak output power at antenna input terminal (dBm): 22.7

Maximum peak output power at antenna input terminal (mW): 186.2

Prediction distance (cm): 20

Prediction frequency (MHz): 1972.5

MPE limit for uncontrolled exposure at predication frequency (mW/cm): 1.0

Maximum Antenna Gain (numeric): 27.0

Antenna Gain, typical (dBi): 14.3

Uplink:

Maximum peak output power at antenna input terminal (dBm): 23.6

Maximum peak output power at antenna input terminal (mW): 229.0

Prediction distance (cm): 20

Prediction frequency (MHz): 1892.5

MPE limit for uncontrolled exposure at predication frequency (mW/cm): 1.0

Maximum Antenna Gain (numeric): 21.9

Antenna Gain, typical (dBi): 13.4

Test result:

The device is compliant with the requirement MPE limit for uncontrolled exposure at predication frequency 1mW/cm. **The maximum allowed antenna gain for a distance of 20 cm is 14.3 dBi for Downlink and 13.4 dBi for Uplink.**

3.1.2 RF Power Output

Reference

FCC:	CFR Part 24.232, 2.1046
IC:	IC RSS-131 §4.3 and 6.2

Method of Measurements:

The input signal was set up for the max. output power and additionally increased by 10dB with pseudo random data modulation.

The power was measured with R&S Signal Analyzer FSIQ 26

This measurements were done at 3 frequencies (bottom, middle and top of operational frequency range) in downlink and uplink with one and two carriers.

Limits:

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

Test Results: Output Power (conducted)

The maximum gain is 60 dB (Limit : nominal + 1 dB)

Downlink

CDMA PCS Band (dBm)				
Unit	Frequency	Modulation	Output Power Single Channel	Output Power 2 Channels
1900-D	1947.5 MHz	CDMA	22.7	20.2
1900-E	1967.5 MHz		23.0	19.9
1900-F	1972.5 MHz		22.7	20.1

Uplink

CDMA PCS Band (dBm)				
Channel	Frequency	Modulation	Output Power Single Channel	Output Power 2 Channels
1900-D	1867.5 MHz	CDMA	23.0	20.5
1900-E	1887.5 MHz		23.0	20.4
1900-F	1892.5 MHz		22.6	20.1

3.1.3 Radiated Emissions

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° 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:

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

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

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

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.

Sample Calculation:

Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBμV	dBm	dB	dBd	dB	dBm			
1850.2	133.7	36.2	8.4	0.0	3.3	31.1			

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

Reference

FCC:	CFR Part 24.238, 2.1053
IC:	RSS 131, Issue 2, Section 4.4 and 6.4

Measurement Procedure:

All spurious emissions tests were measured with the two-tone method

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:

- The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
- The antenna output was terminated in a 50 ohm load.
- A double ridged waveguide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
- 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.
- Now each detected emissions were substituted by the Substitution method, in accordance with the TIA/EIA 603.

Measurement Limit:

Sec. 24.238 Emission Limits.

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least $43 + 10 \log(P)$ dB.

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

Measurement Results: Radiated Emissions

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the USPCS band (in uplink and downlink). 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.

Uplink

Harmonic	Unit D 1867.5 MHz	Level (dBm)	Unit E 1887.5 MHz	Level (dBm)	Unit F 1892.5 MHz	Level (dBm)
2	3735.0	-	3775.0	-	3785.0	-
3	5602.5	-	5662.5	-	5677.5	-
4	7470.0	-	7550.0	-	7570.0	-
5	9337.5	-	9437.5	-	9462.5	-
6	11205.0	-	11325.0	-	11355.0	-
7	13072.5	-	13212.5	-	13247.5	-
8	14940.0	-	15100.0	-	15140.0	-
9	16807.5	-	16987.5	-	17032.5	-
10	18675.0	-	18875.0	-	18925.0	-

Downlink

Harmonic	Unit D 1947.5 MHz	Level (dBm)	Unit E 1967.5 MHz	Level (dBm)	Unit F 1972.5 MHz	Level (dBm)
2	3895.0	-	3935.0	-	3945.0	-
3	5842.5	-	5902.5	-	5917.5	-
4	7790.0	-	7870.0	-	7890.0	-
5	9737.5	-	9837.5	-	9862.5	-
6	11685.0	-	11805.0	-	11835.0	-
7	13632.5	-	13772.5	-	13807.5	-
8	15580.0	-	15740.0	-	15780.0	-
9	17527.5	-	17707.5	-	17752.5	-
10	19475.0	-	19675.0	-	19725.0	-

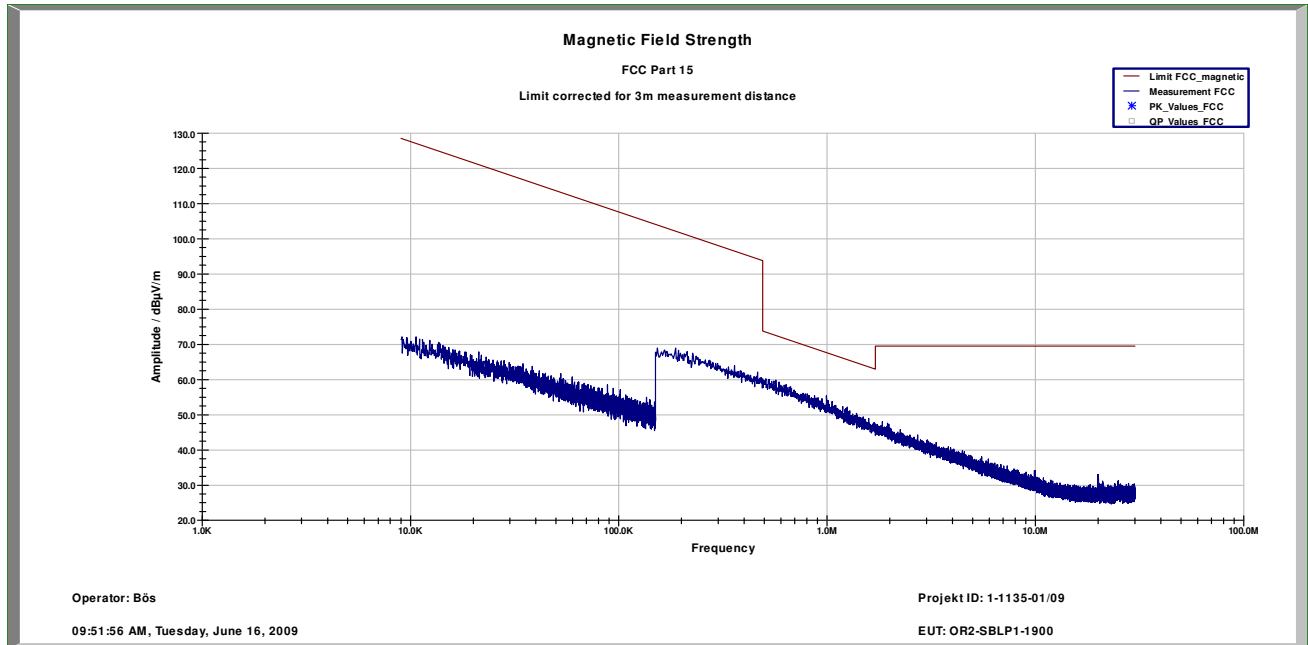
No peaks found < 20 dB below limit.

Sample calculation:

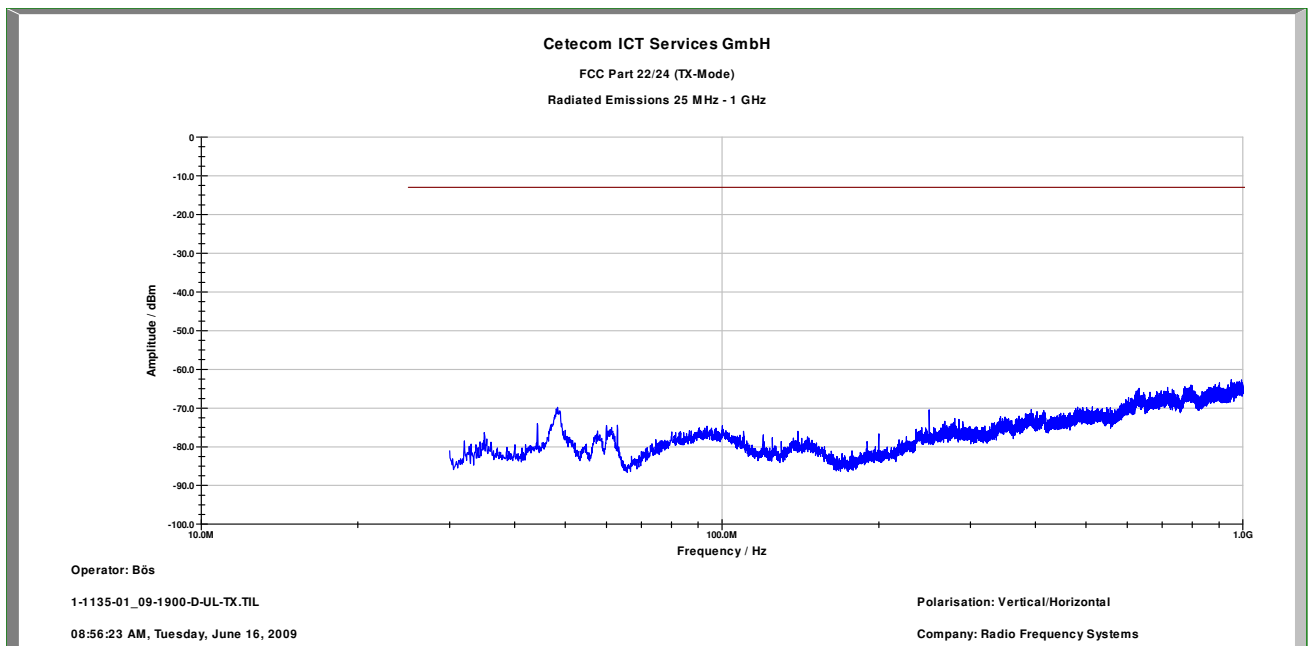
Freq	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	EIRP Result			
MHz	dBμV	dBm	dB	dBd	dB	dBm			
1880.0	122.5	24.9	8.4	0.0	3.33	30			

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

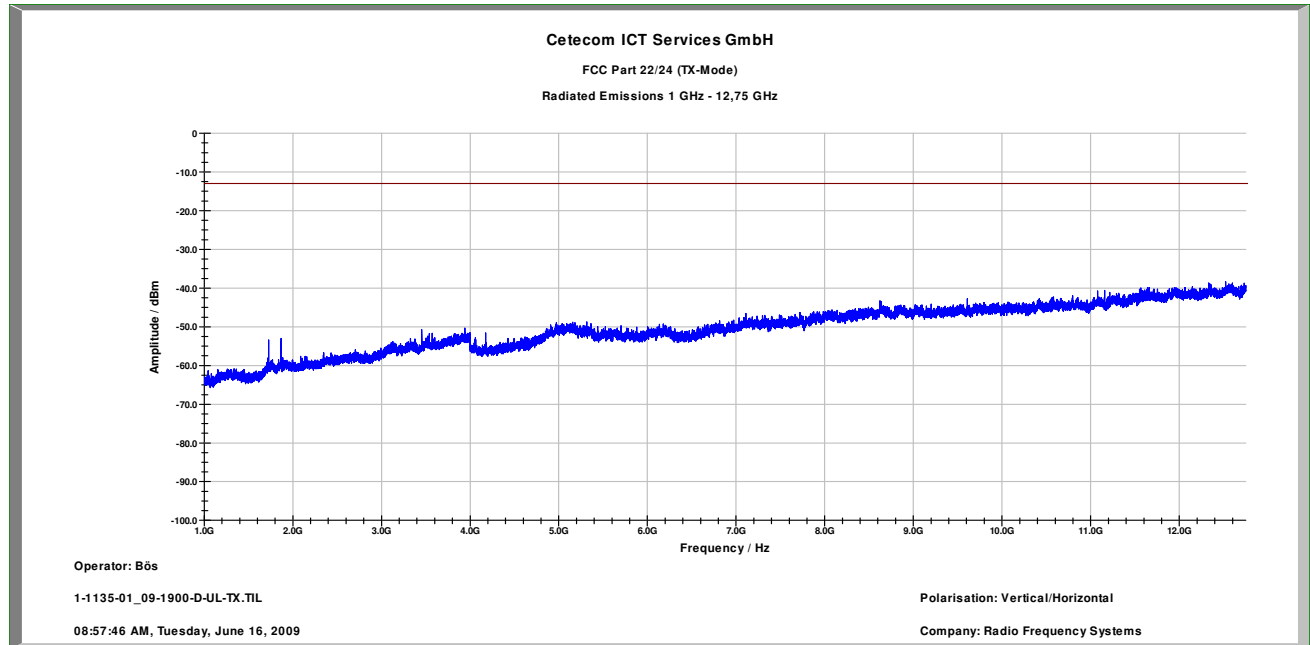
Up-/Downlink up to 30 MHz (Valid for all units)



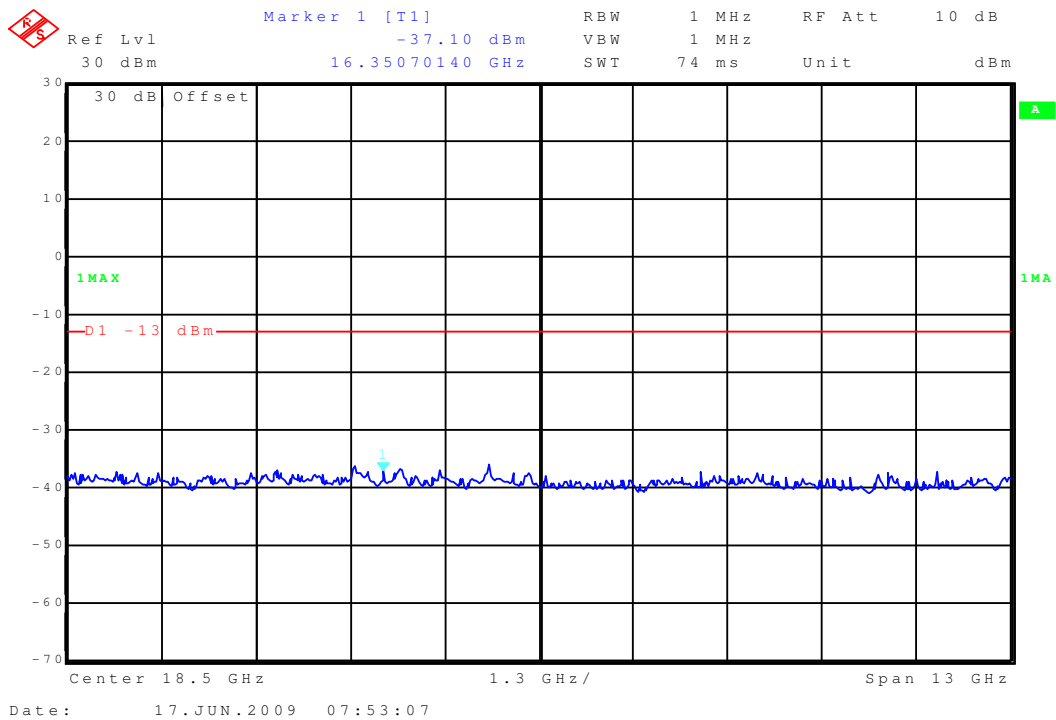
Uplink 1867.5 MHz (30 MHz - 1 GHz) – Unit 1900-D



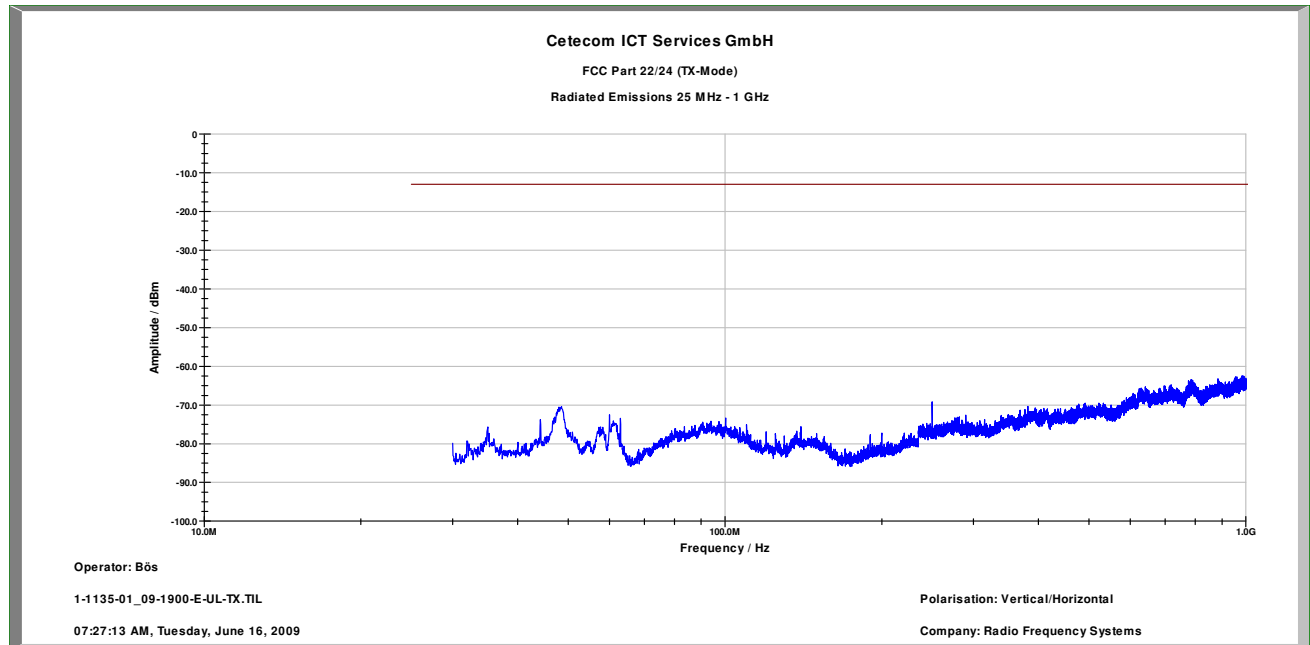
Uplink 1867.5 MHz (1 GHz - 12 GHz) – Unit 1900-D



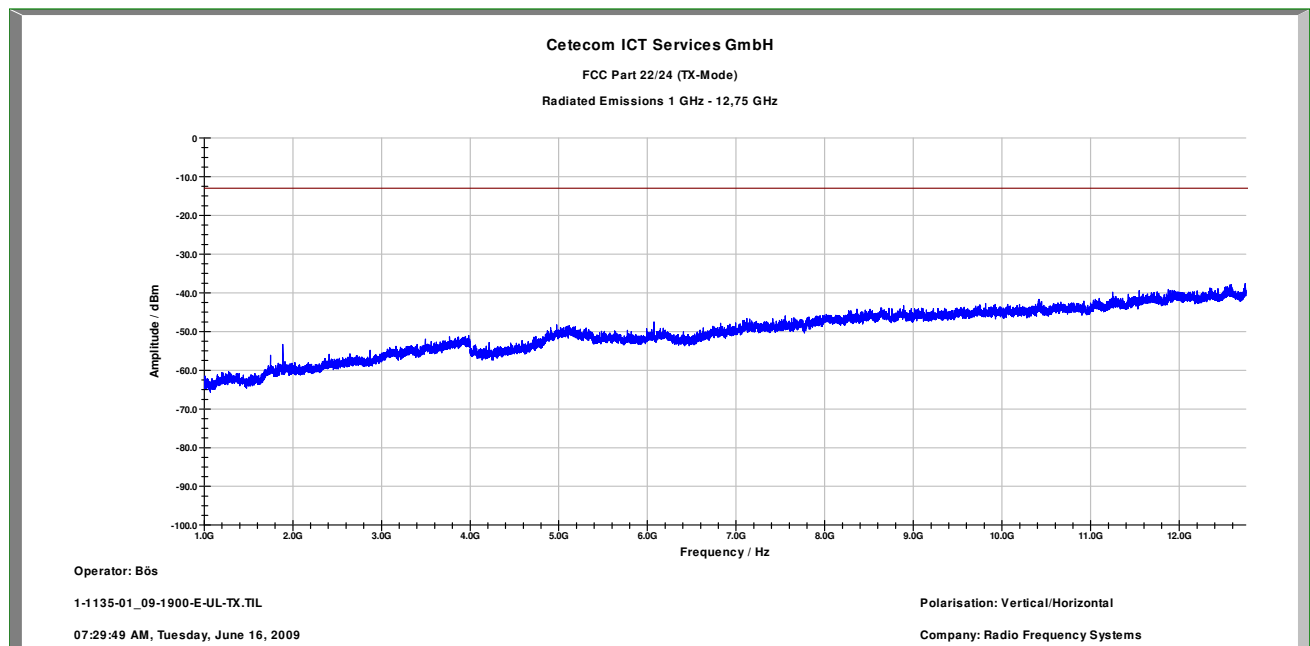
Uplink (12 GHz - 25 GHz) valid for all units



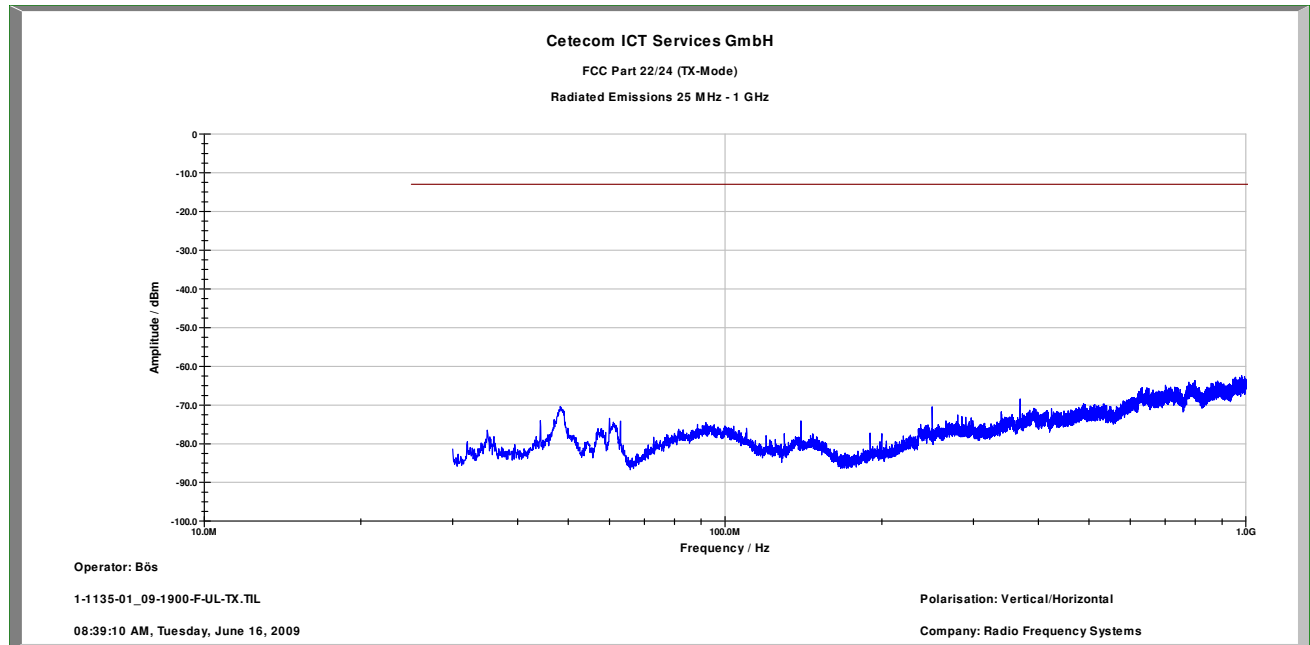
Uplink 1887.5 MHz (30 MHz - 1 GHz) – Unit 1900-E



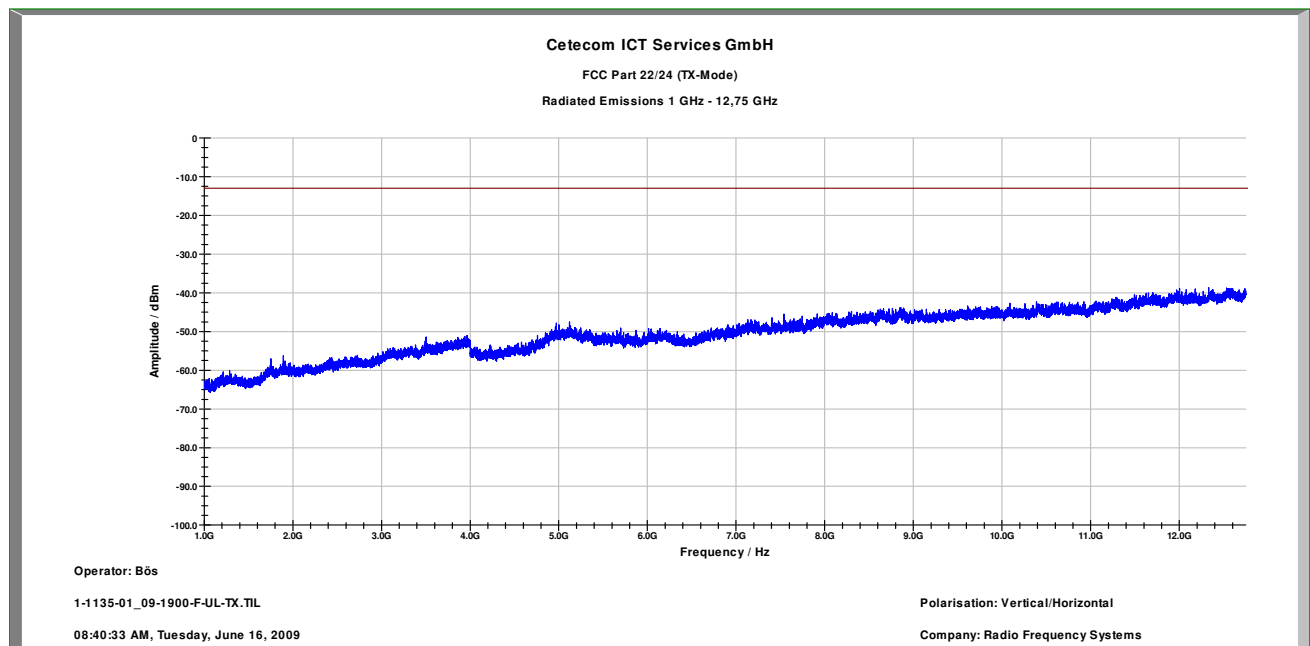
Uplink 1887.5 MHz (1 GHz - 12 GHz) – Unit 1900-E



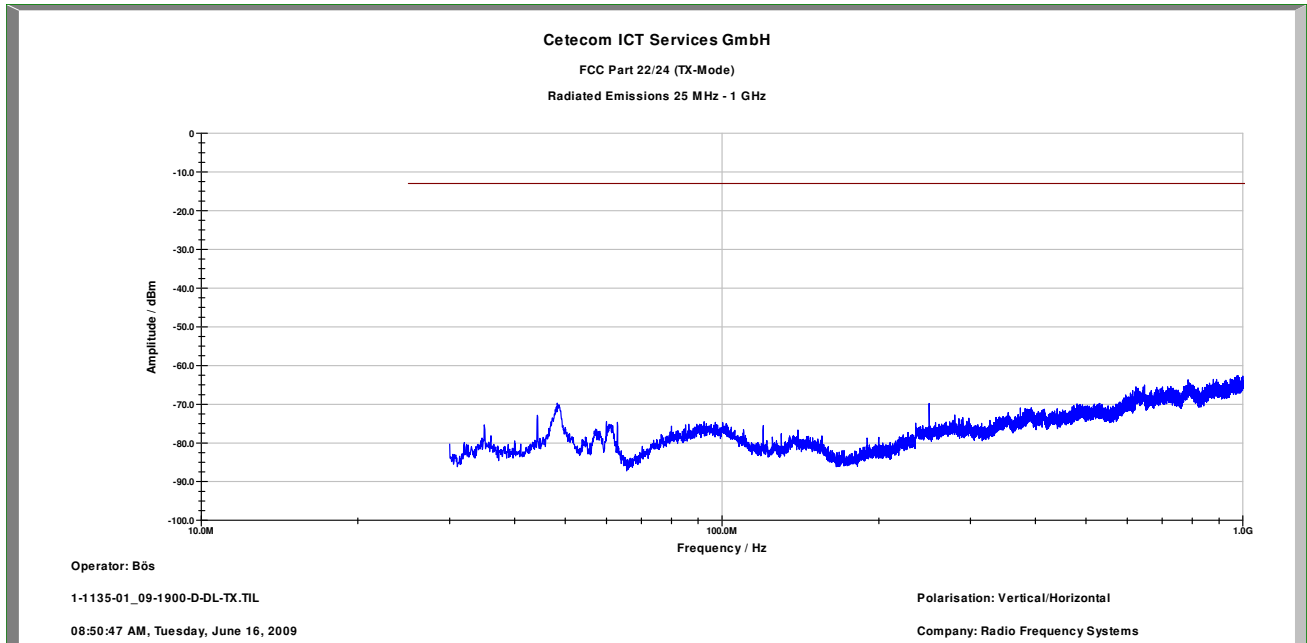
Uplink 1892.5 MHz (30 MHz - 1 GHz) – Unit 1900-F



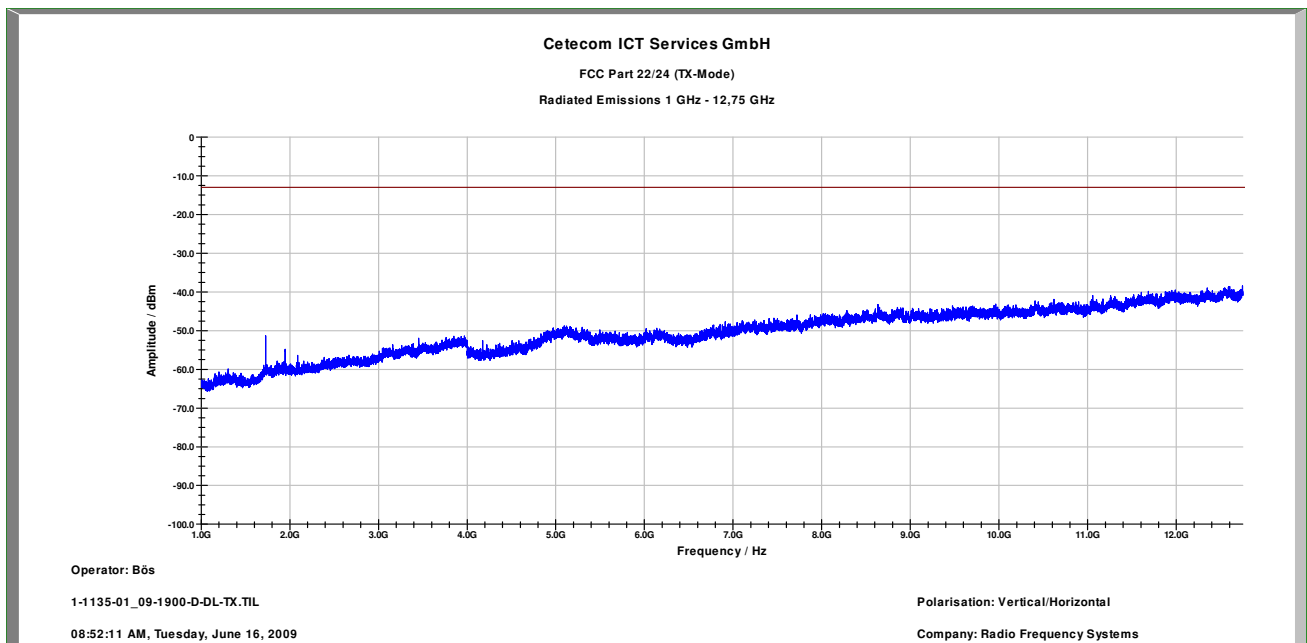
Uplink 1892.5 MHz (1 GHz - 12 GHz) – Unit 1900-F



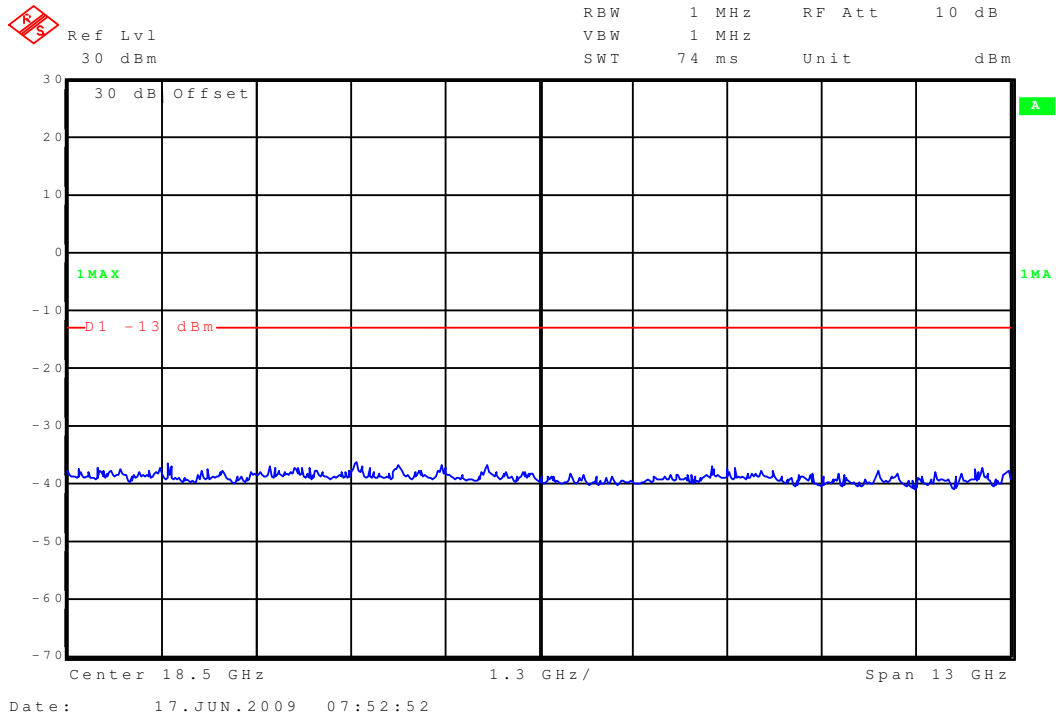
Downlink 1947.5 MHz (30 MHz - 1 GHz) – Unit 1900-D



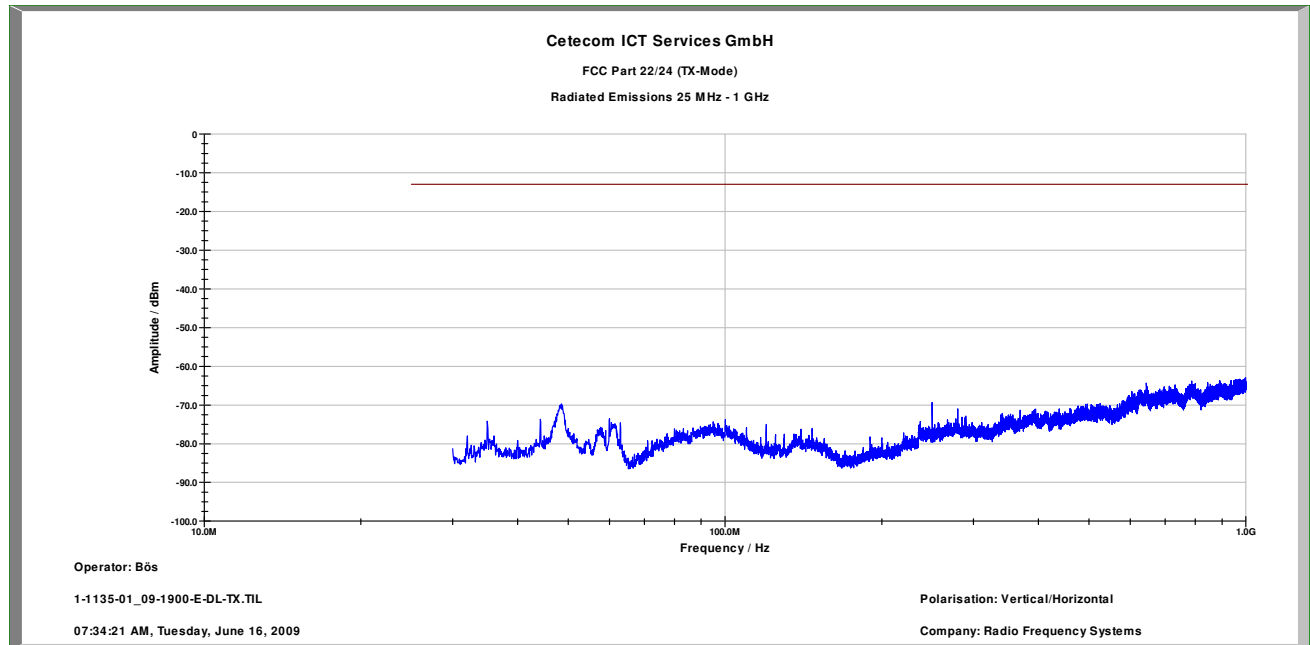
Downlink 1947.5 MHz (1 GHz - 12 GHz) – Unit 1900-D



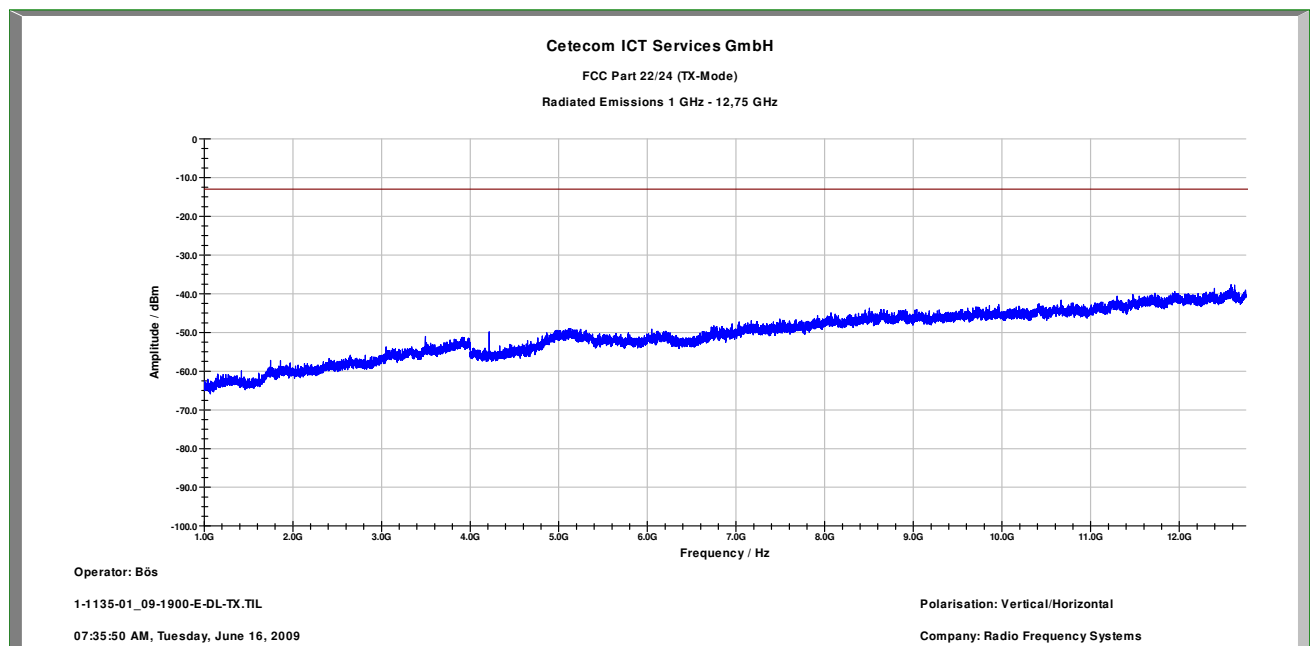
Downlink (12 GHz - 25 GHz) valid for all units



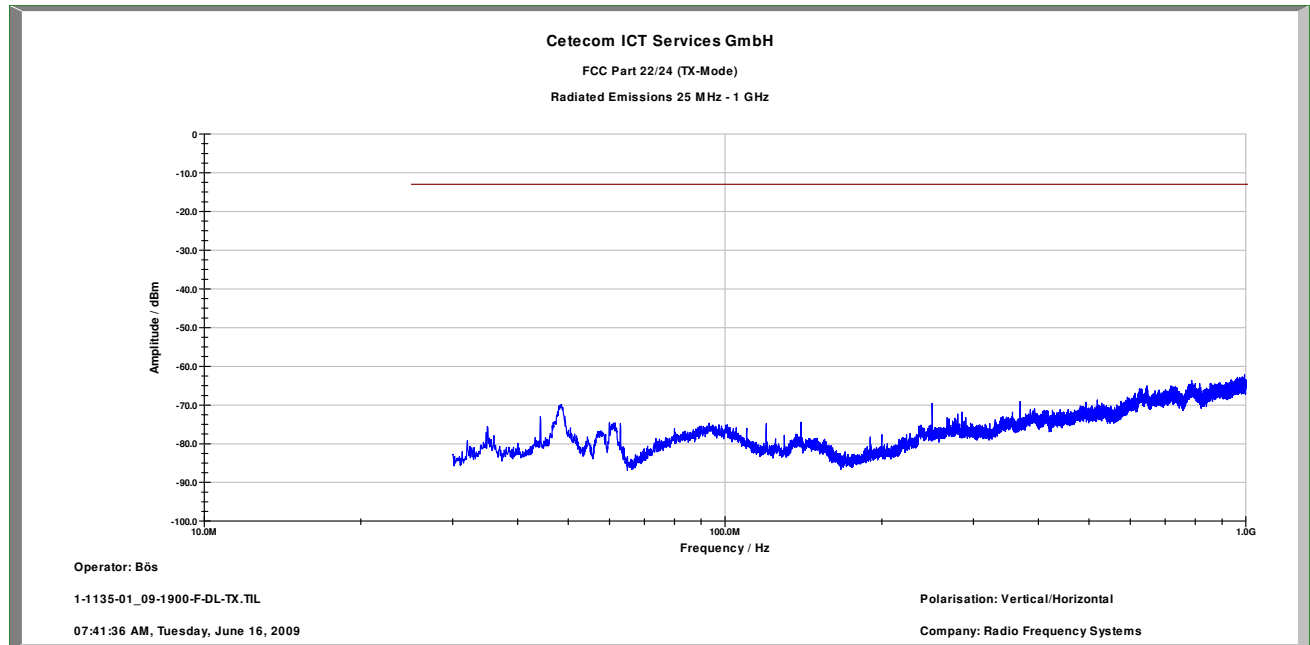
Downlink 1967.5 MHz (30 MHz - 1 GHz) – Unit 1900-E



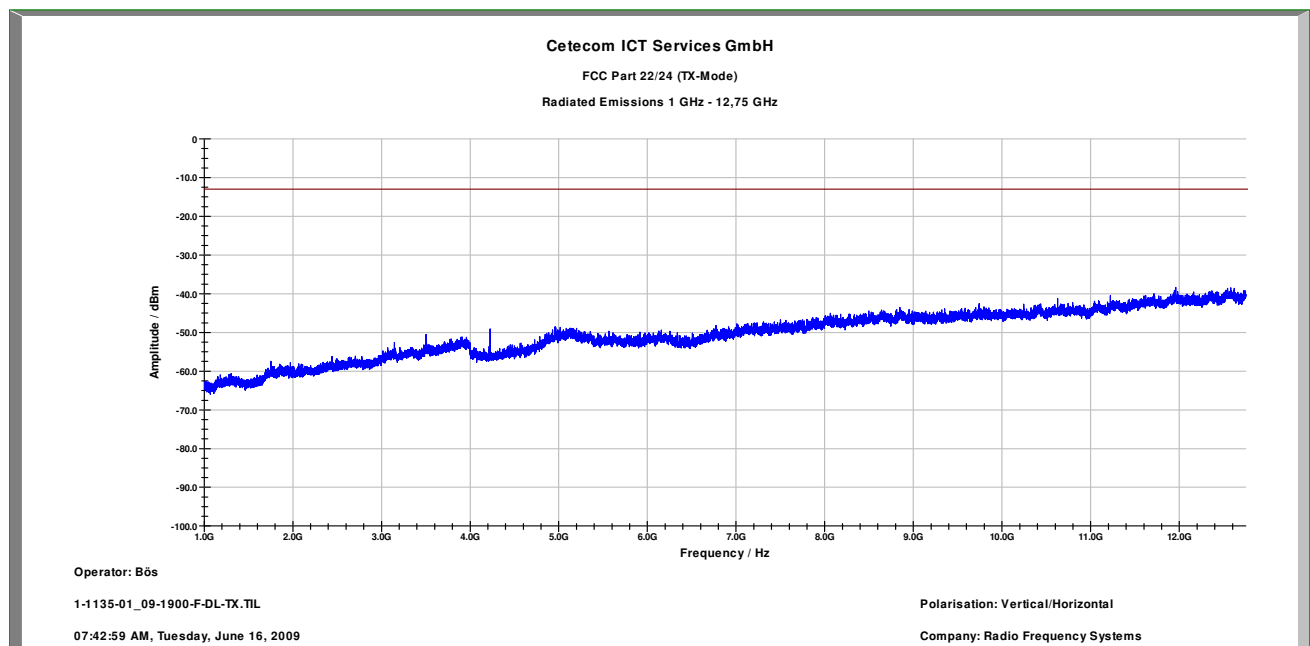
Downlink 1967.5 MHz (1 GHz - 12 GHz) – Unit 1900-E



Downlink 1972.5 MHz (30 MHz - 1 GHz) – Unit 1900-F



Downlink 1972.5 MHz (1 GHz - 12 GHz) – Unit 1900-F



3.1.4 Conducted Spurious Emissions

Reference

FCC:	CFR Part 24.238, 2.1051
IC:	RSS 131, Issue 2, Section 4.4 and 6.4

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 9 kHz to 25 GHz.
2. Determine mobile station transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

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.

Uplink

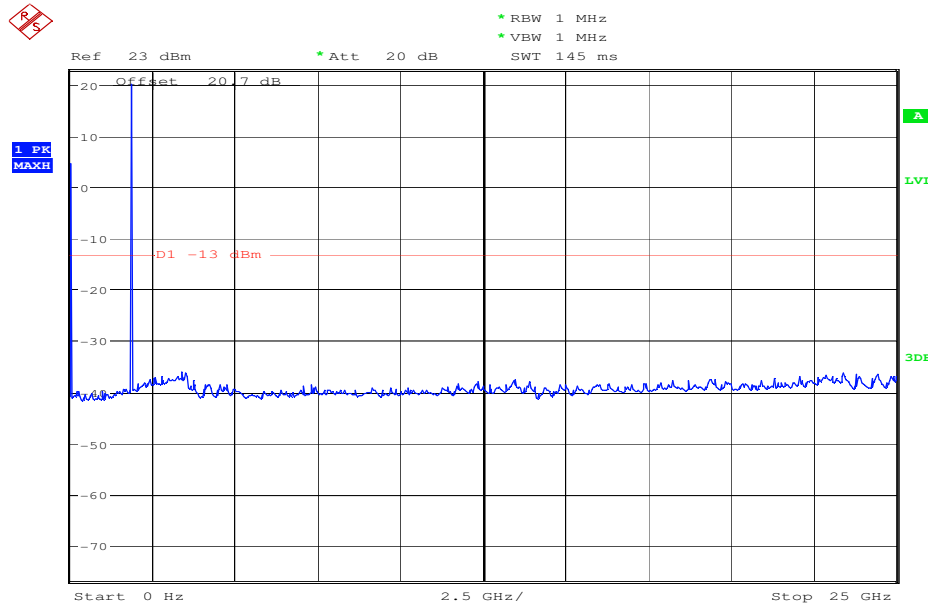
Harmonic	Unit D 1867.5 MHz	Level (dBm)	Unit E 1887.5 MHz	Level (dBm)	Unit F 1892.5 MHz	Level (dBm)
2	3735.0	-	3775.0	-	3785.0	-
3	5602.5	-	5662.5	-	5677.5	-
4	7470.0	-	7550.0	-	7570.0	-
5	9337.5	-	9437.5	-	9462.5	-
6	11205.0	-	11325.0	-	11355.0	-
7	13072.5	-	13212.5	-	13247.5	-
8	14940.0	-	15100.0	-	15140.0	-
9	16807.5	-	16987.5	-	17032.5	-
10	18675.0	-	18875.0	-	18925.0	-

Downlink

Harmonic	Unit D 1947.5 MHz	Level (dBm)	Unit E 1967.5 MHz	Level (dBm)	Unit F 1972.5 MHz	Level (dBm)
2	3895.0	-	3935.0	-	3945.0	-
3	5842.5	-	5902.5	-	5917.5	-
4	7790.0	-	7870.0	-	7890.0	-
5	9737.5	-	9837.5	-	9862.5	-
6	11685.0	-	11805.0	-	11835.0	-
7	13632.5	-	13772.5	-	13807.5	-
8	15580.0	-	15740.0	-	15780.0	-
9	17527.5	-	17707.5	-	17752.5	-
10	19475.0	-	19675.0	-	19725.0	-

No peaks found < 20 dB below limit.

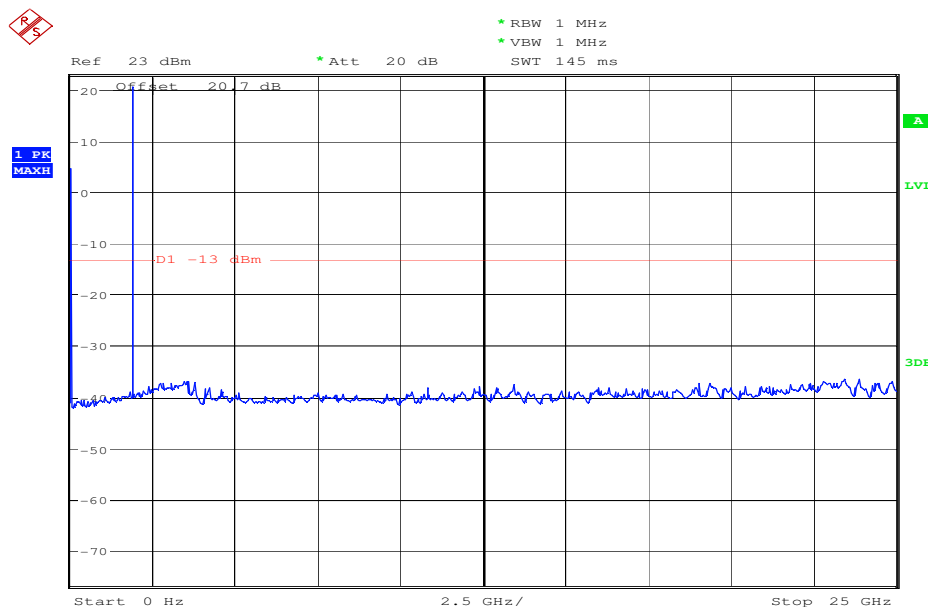
Uplink 1867.5 MHz (9 kHz - 25 GHz) – Unit 1900-D



Date: 10.JUN.2009 13:59:45

The peak at the beginning of the Plot is the LO from the Spectrum Analyzer.

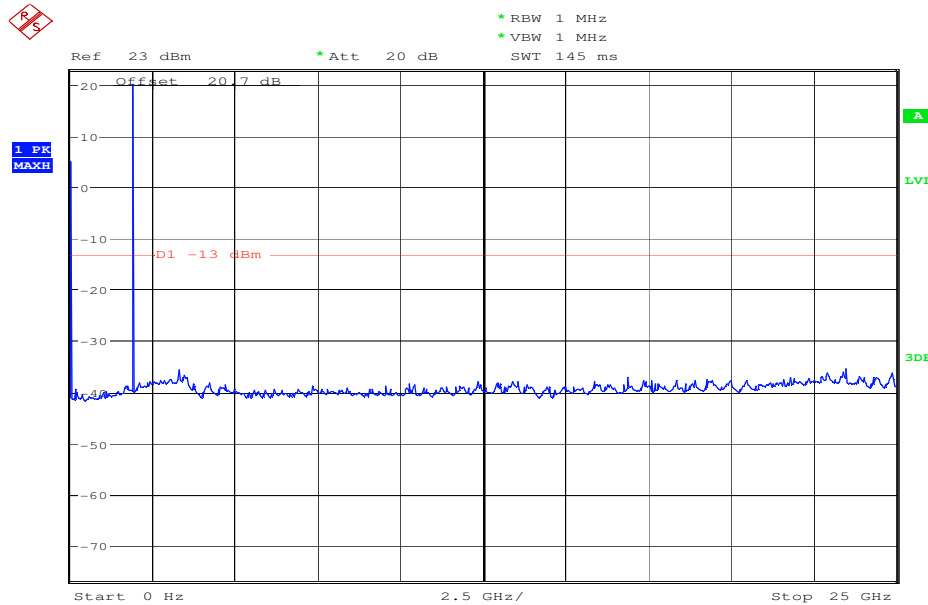
Uplink 1887.5 MHz (9 kHz - 25 GHz) – Unit 1900-E



Date: 10.JUN.2009 14:01:43

The peak at the beginning of the Plot is the LO from the Spectrum Analyzer.

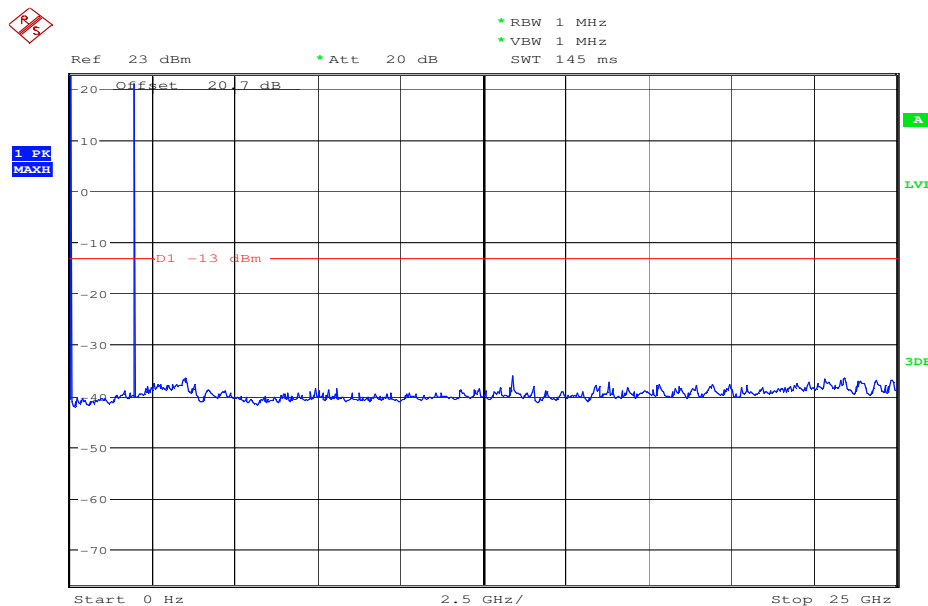
Uplink 1892.5 MHz (9 kHz - 25 GHz) – Unit 1900-F



Date: 10.JUN.2009 14:04:30

The peak at the beginning of the Plot is the LO from the Spectrum Analyzer.

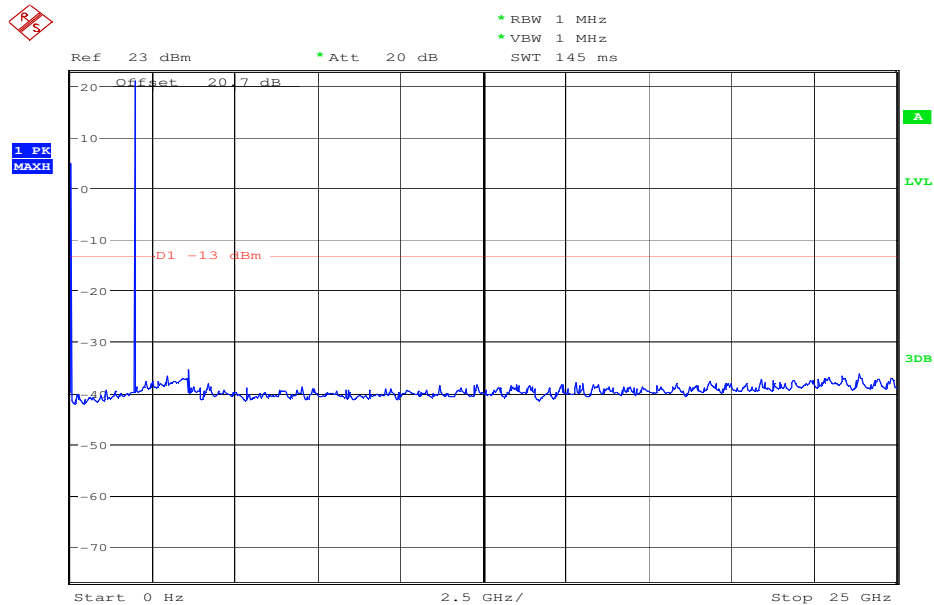
Downlink 1947.5 MHz (9 kHz - 25 GHz) – Unit 1900-D



Date: 10.JUN.2009 14:14:22

The peak at the beginning of the Plot is the LO from the Spectrum Analyzer.

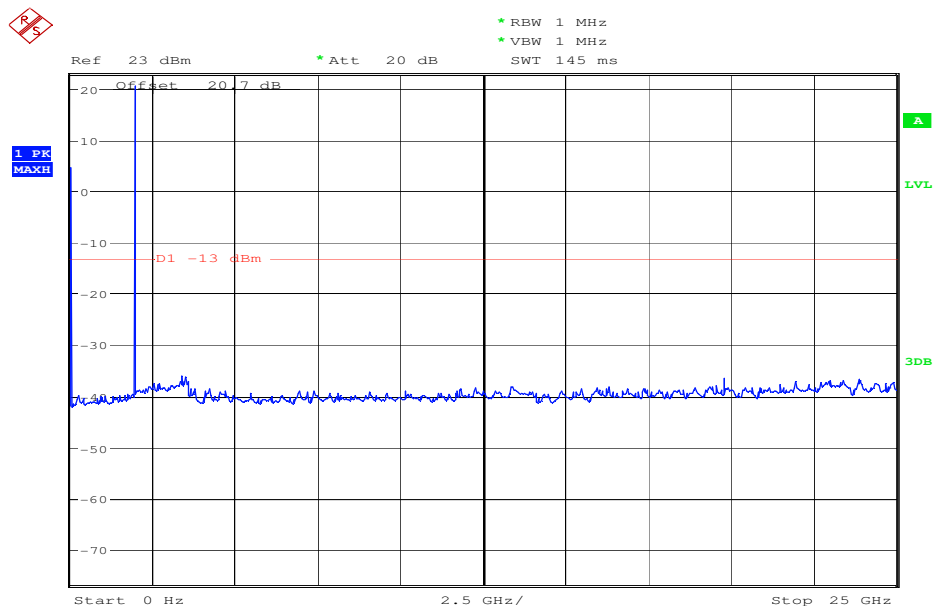
Downlink 1967.5 MHz (9 kHz - 25 GHz) – Unit 1900-E



Date: 10.JUN.2009 14:15:50

The peak at the beginning of the Plot is the LO from the Spectrum Analyzer.

Downlink 1972.5 MHz (9 kHz - 25 GHz) – Unit 1900-F



Date: 10.JUN.2009 14:17:14

The peak at the beginning of the Plot is the LO from the Spectrum Analyzer.

3.1.5 Block Edge Compliance

Reference

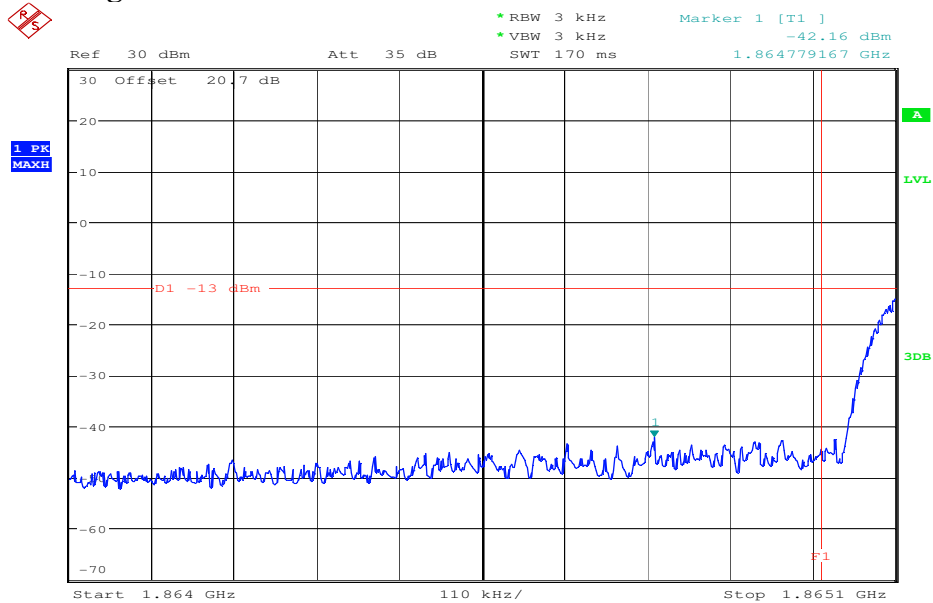
FCC:	CFR Part 24.238
IC:	RSS 131, Issue 2, Section 4.4 and 6.4

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.

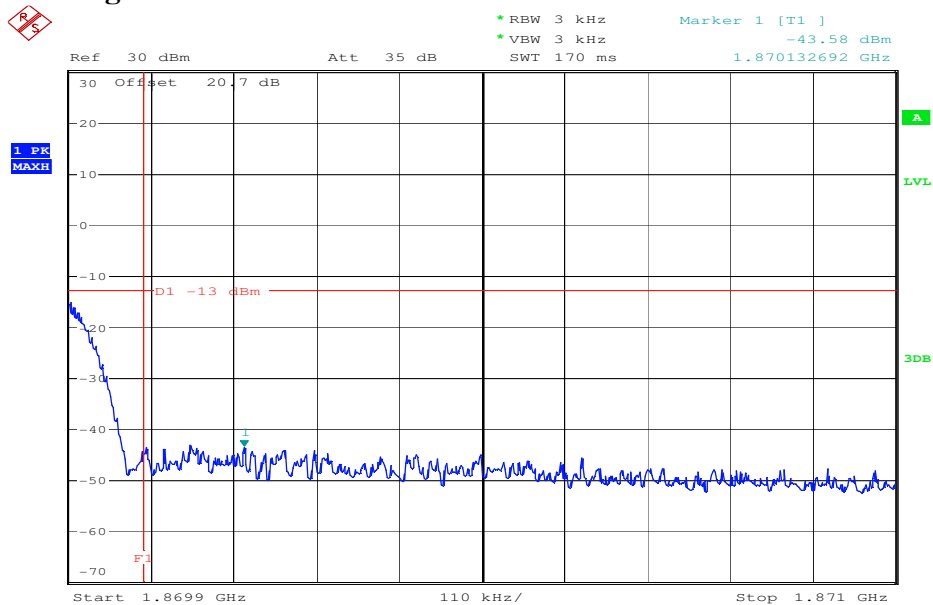
CDMA Uplink Unit D

Lower Block Edge



Date: 13.JUL.2009 11:02:00

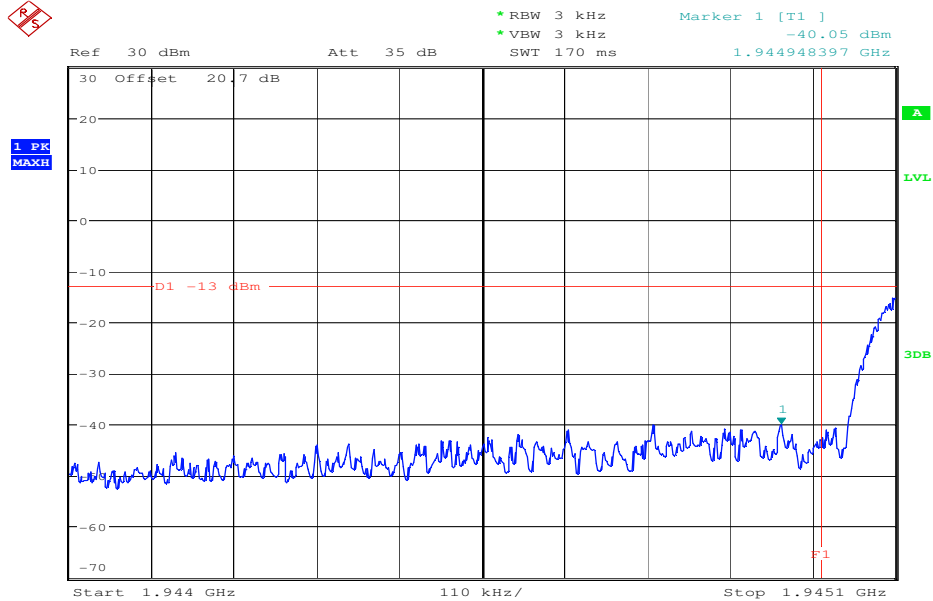
Upper Block Edge



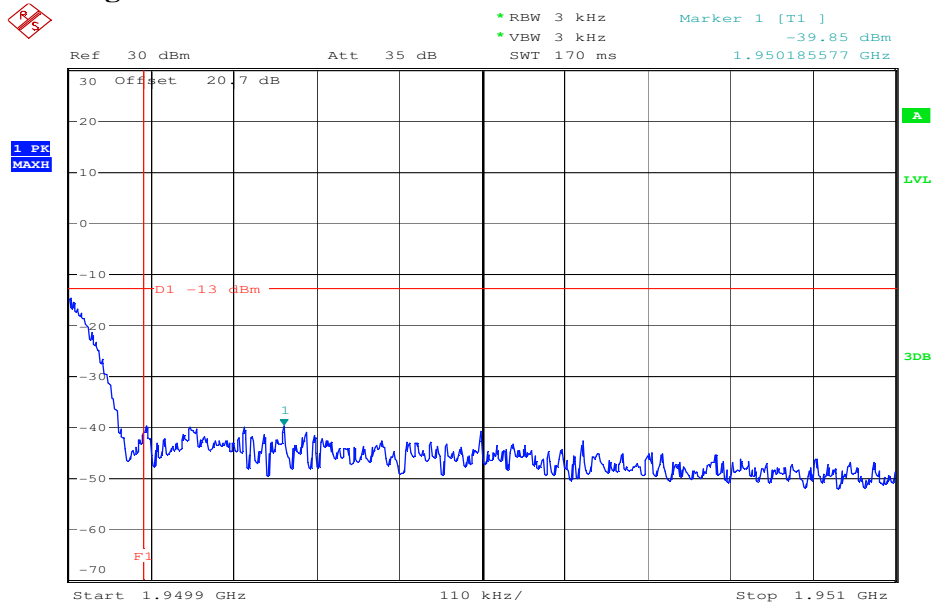
Date: 13.JUL.2009 11:04:17

CDMA Downlink Unit D

Lower Block Edge

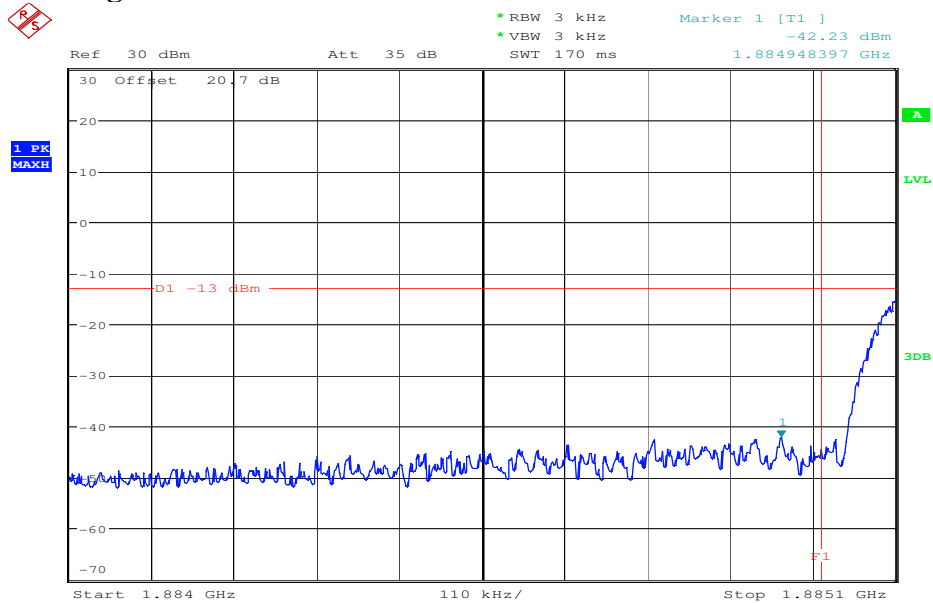


Upper Block Edge

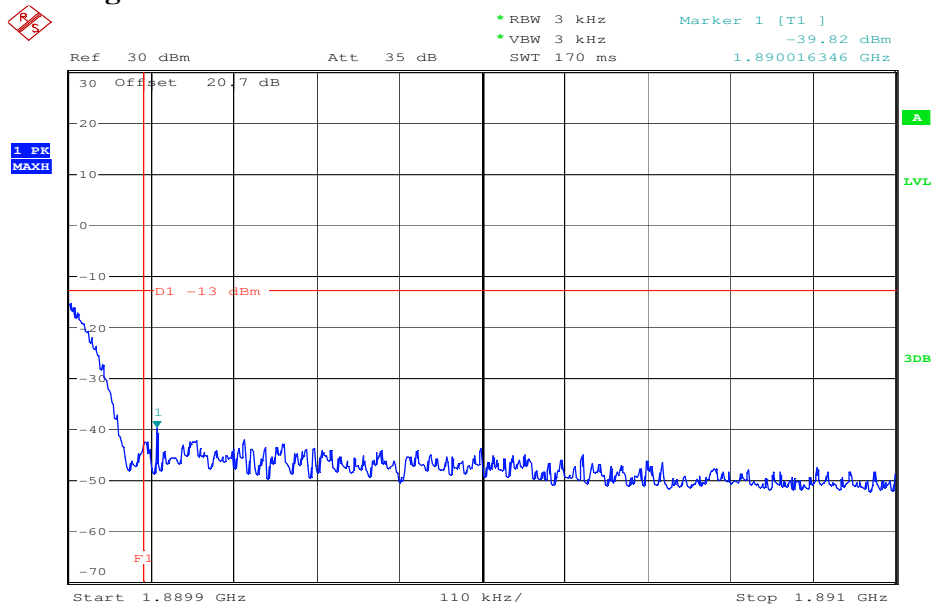


CDMA Uplink Unit E

Lower Block Edge

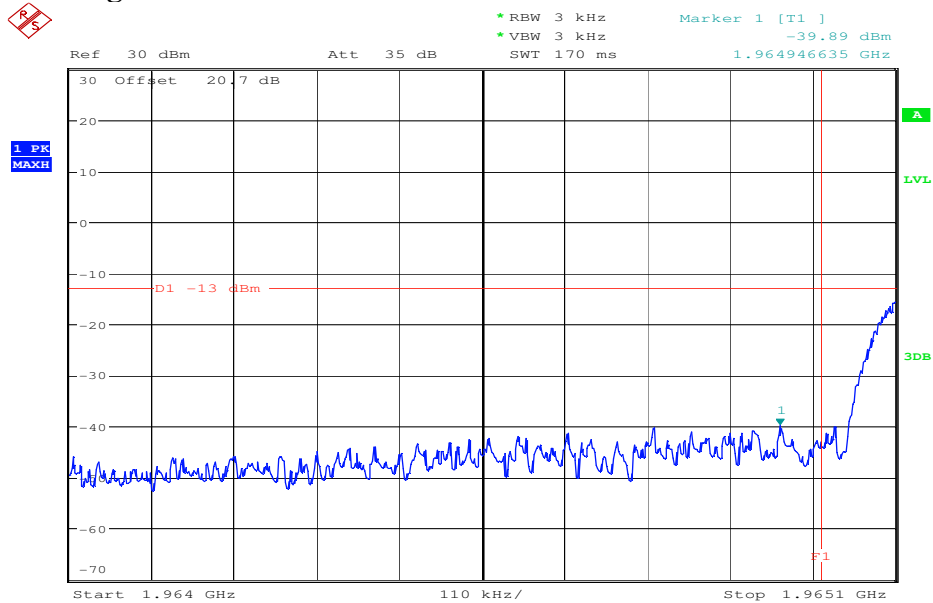


Upper Block Edge



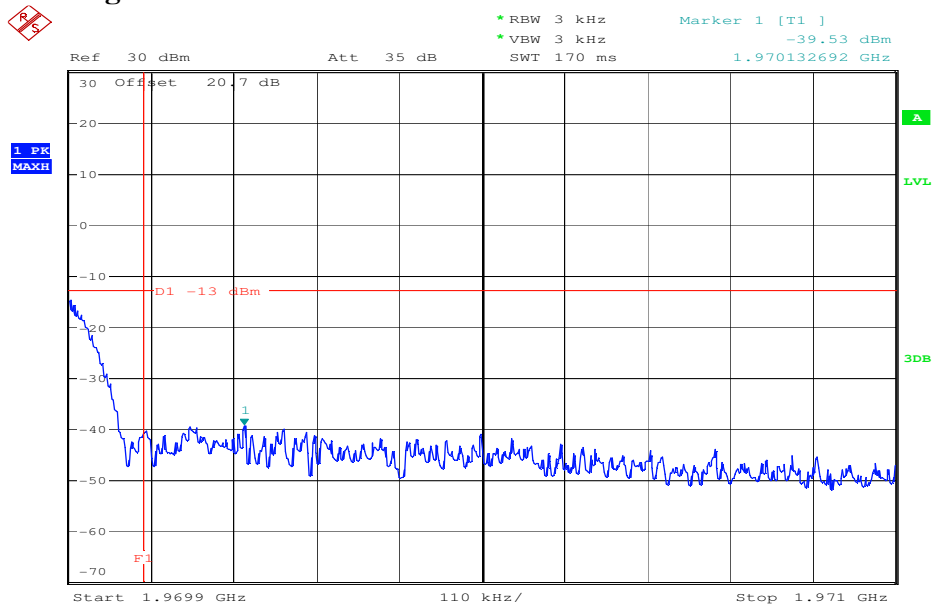
CDMA Downlink Unit E

Lower Block Edge



Date: 13.JUL.2009 11:24:08

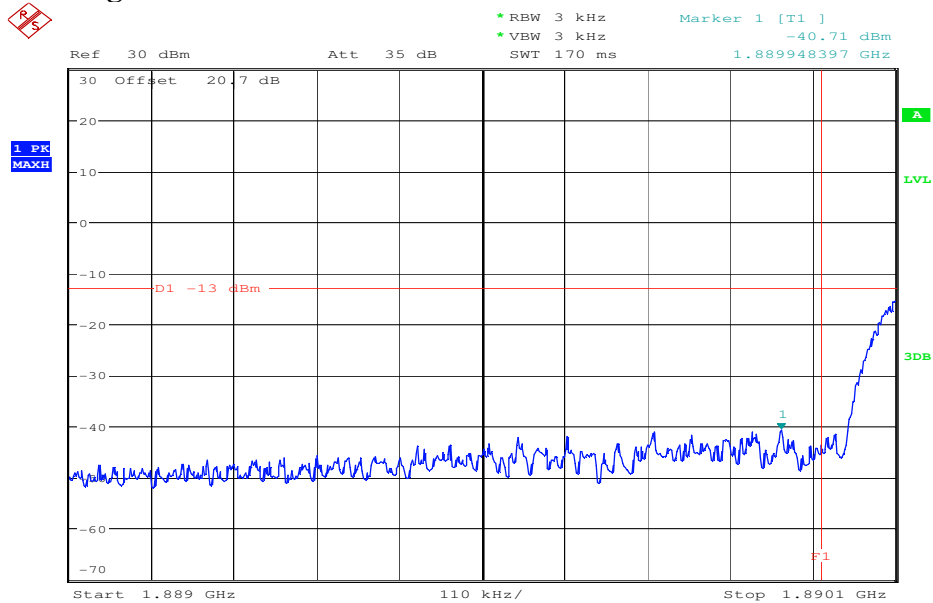
Upper Block Edge



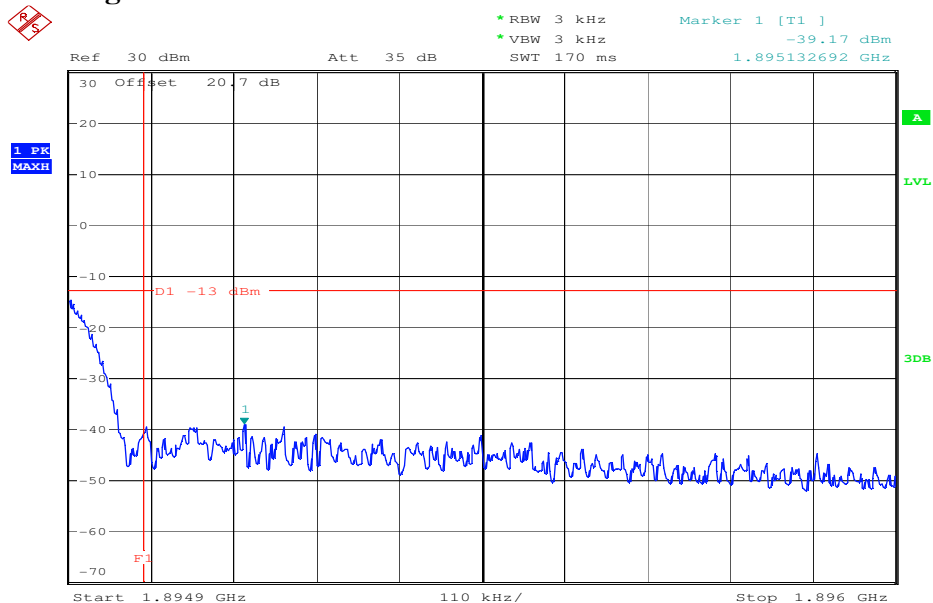
Date: 13.JUL.2009 11:24:54

CDMA Uplink Unit F

Lower Block Edge

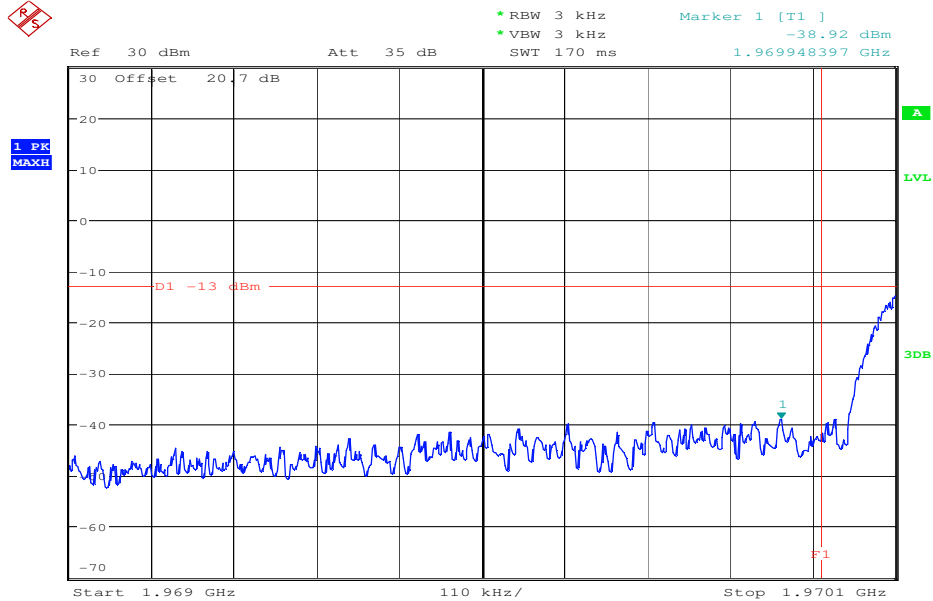


Upper Block Edge



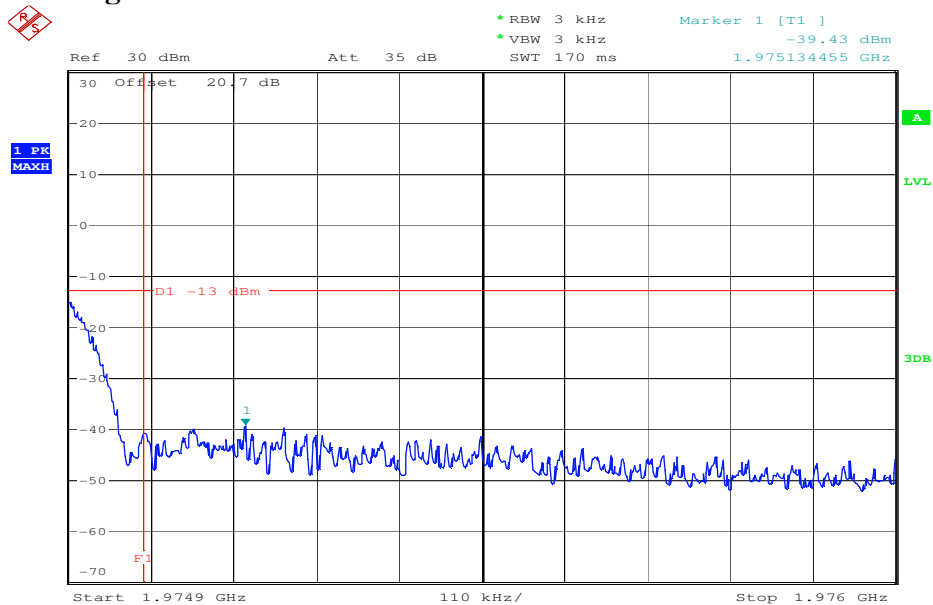
CDMA Downlink Unit F

Lower Block Edge



Date: 13.JUL.2009 12:00:31

Upper Block Edge



Date: 13.JUL.2009 12:02:23

3.1.6 Occupied Bandwidth

Reference

FCC:	CFR Part 24.238, 2.1049
IC:	RSS 131, 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 8.2 below lists the measured 99% occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Test results OBW Input / Output

Downlink

CDMA PCS Band (kHz)				
Unit	Frequency	Modulation	Input	Output
1900-D	1947.5 MHz	CDMA	1.30288	1.29327
1900-E	1967.5 MHz		1.30288	1.29327
1900-F	1972.5 MHz		1.30288	1.29327

Uplink

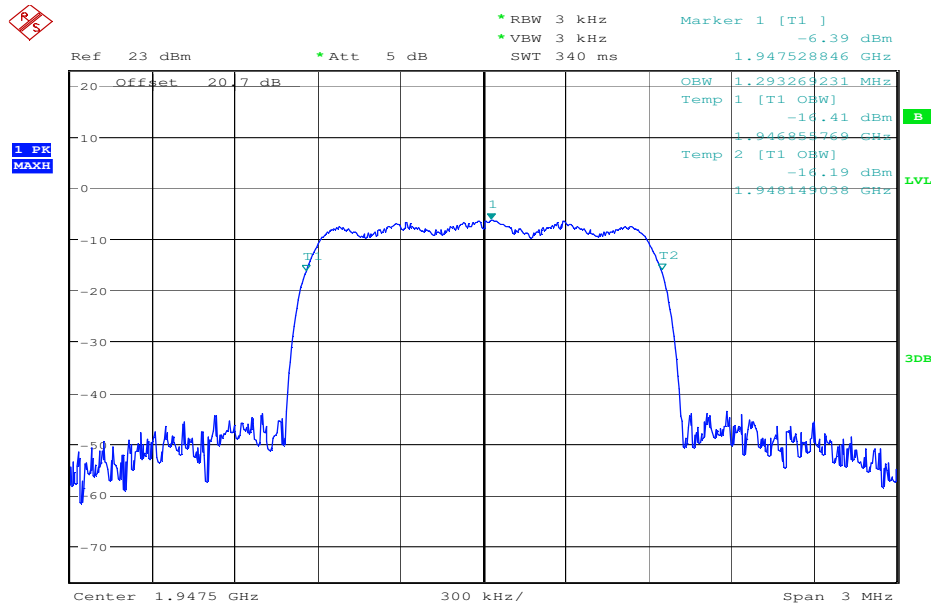
CDMA PCS Band (kHz)				
Channel	Frequency	Modulation	Input	Output
1900-D	1867.5 MHz	CDMA	1.29808	1.29327
1900-E	1887.5 MHz		1.29808	1.29327
1900-F	1892.5 MHz		1.29808	1.29327

Plots of measurement

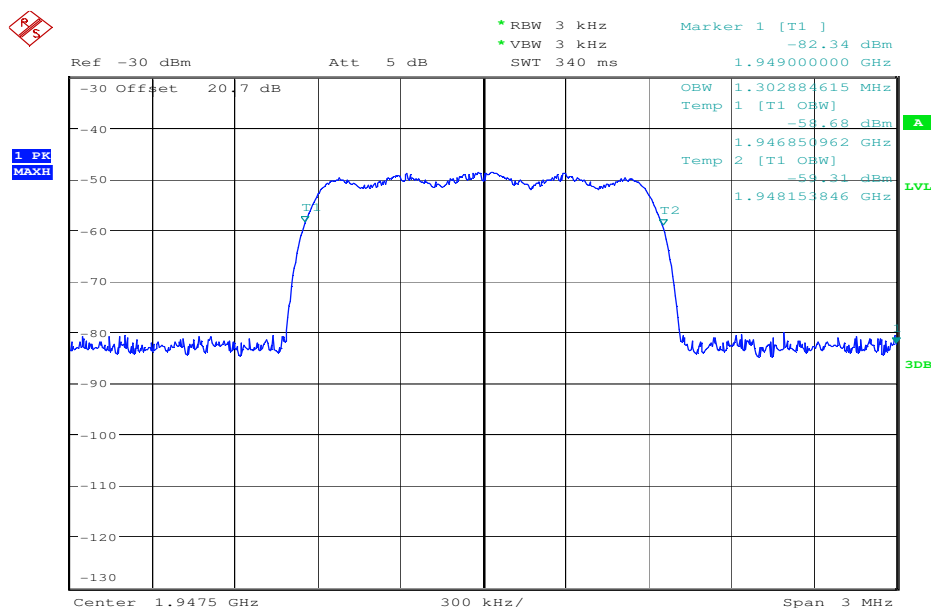
The plots show in the upper part the output signal and in the lower part the input signal

CDMA

Downlink Unit D

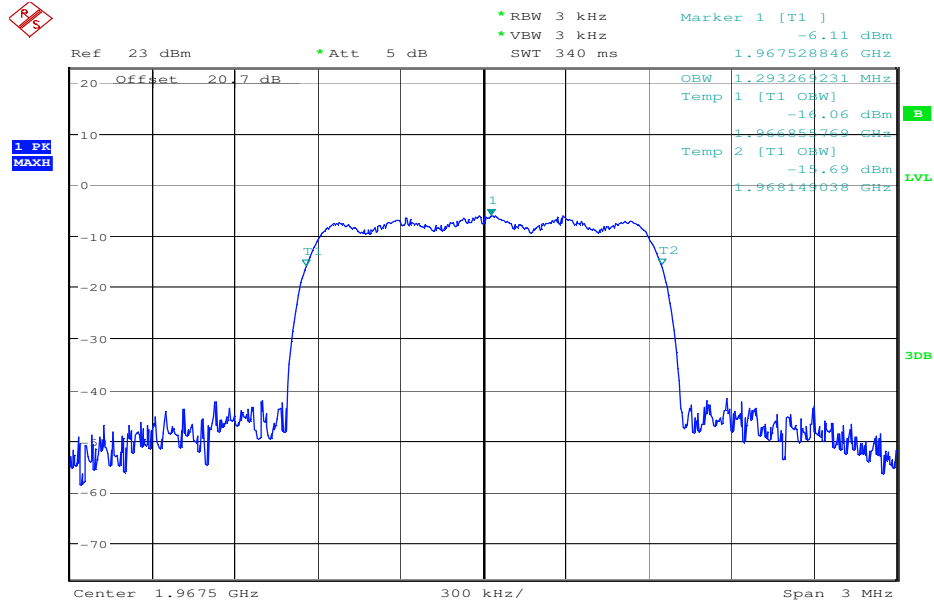


Date: 15.JUN.2009 15:26:31

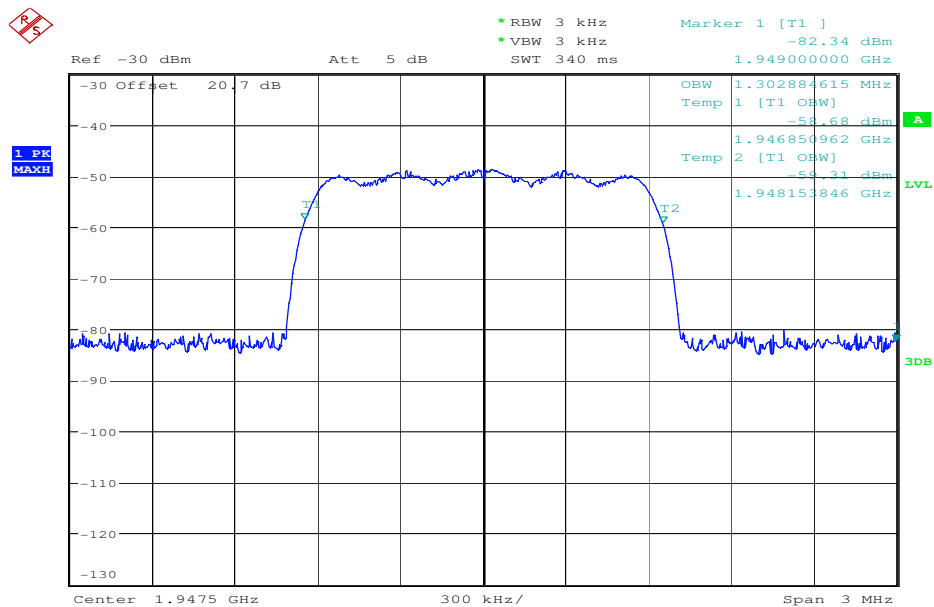


Date: 15.JUN.2009 15:16:05

Downlink Unit E

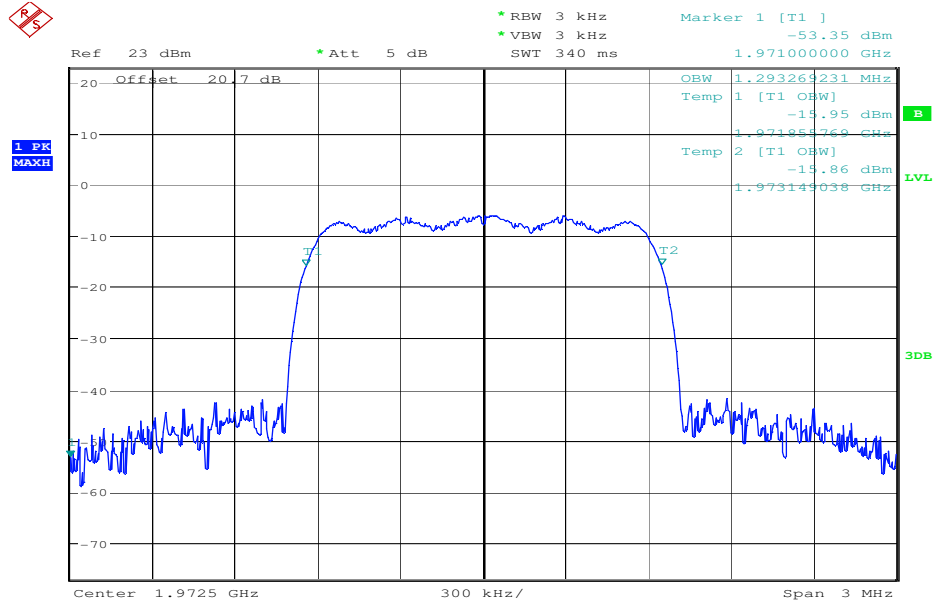


Date: 15.JUN.2009 15:29:06

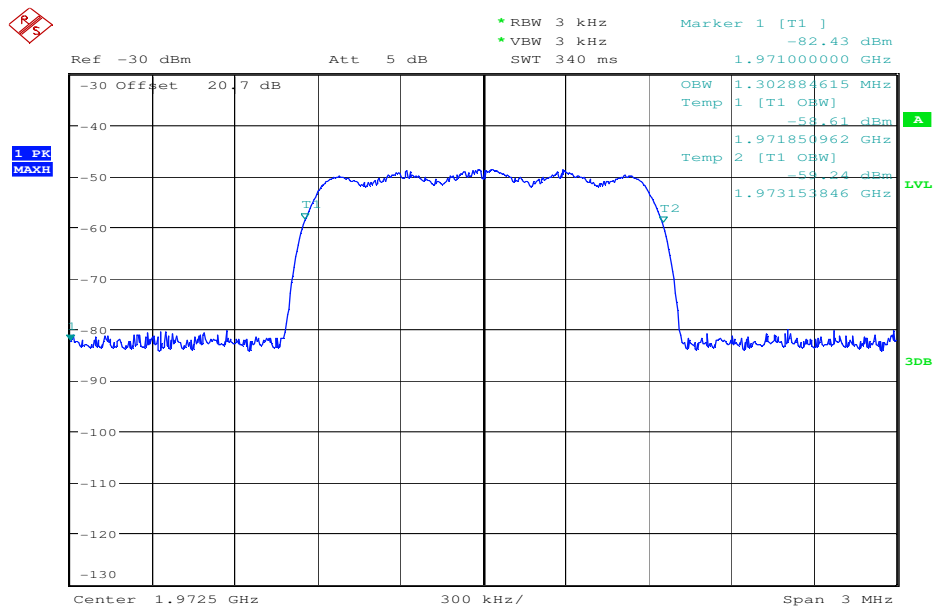


Date: 15.JUN.2009 15:16:05

Downlink Unit F

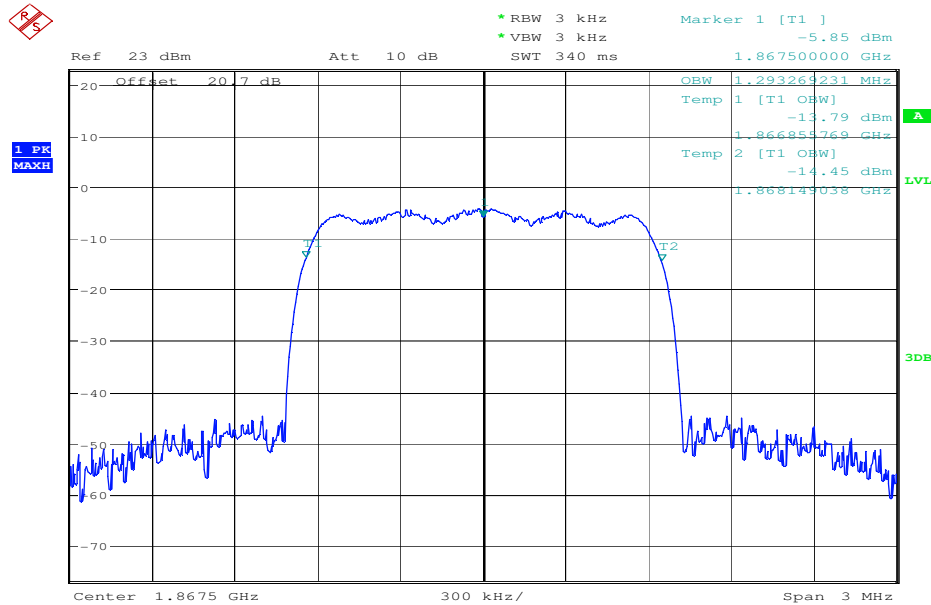


Date: 15.JUN.2009 15:30:50

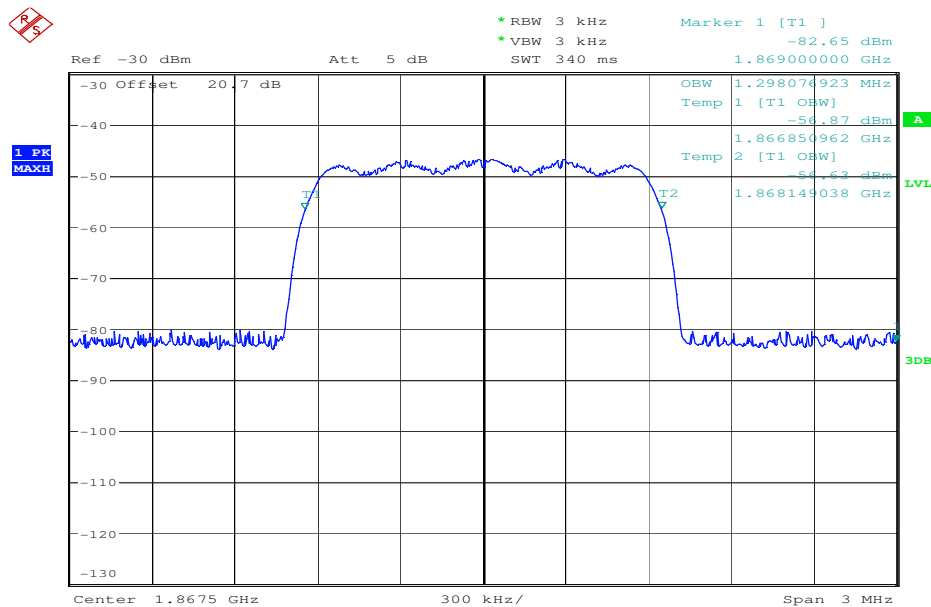


Date: 15.JUN.2009 15:17:46

Uplink Unit D

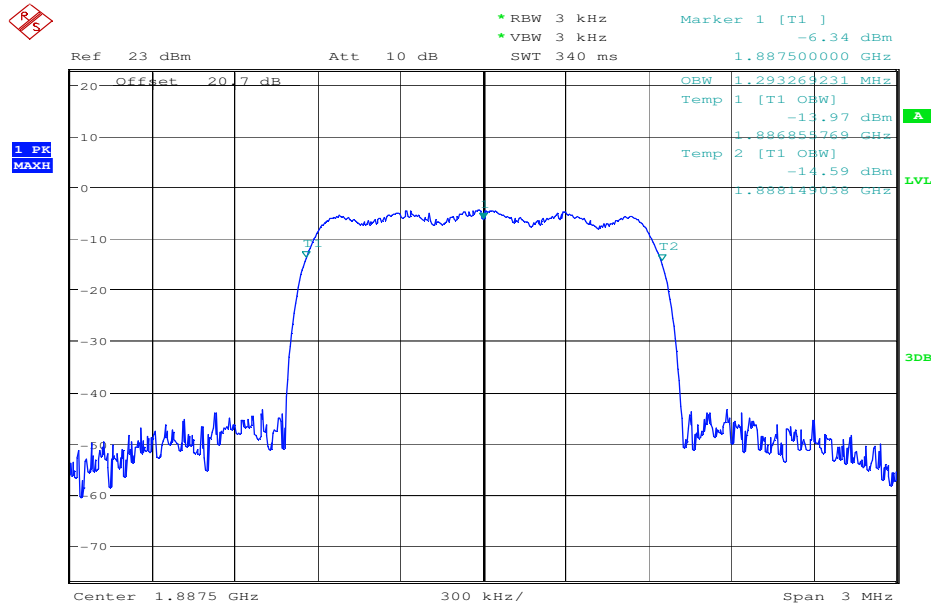


Date: 10.JUN.2009 15:38:04

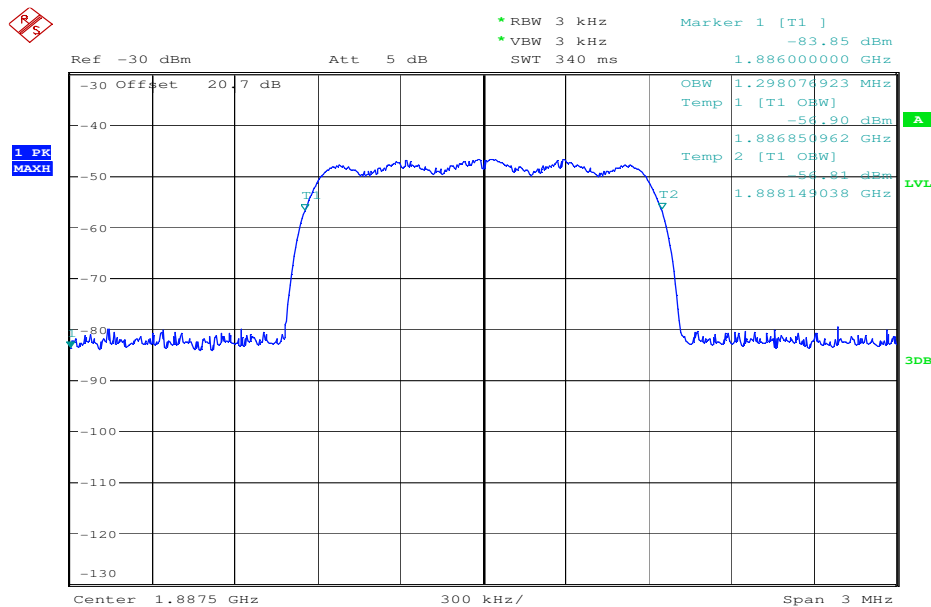


Date: 10.JUN.2009 15:36:58

Uplink Unit E

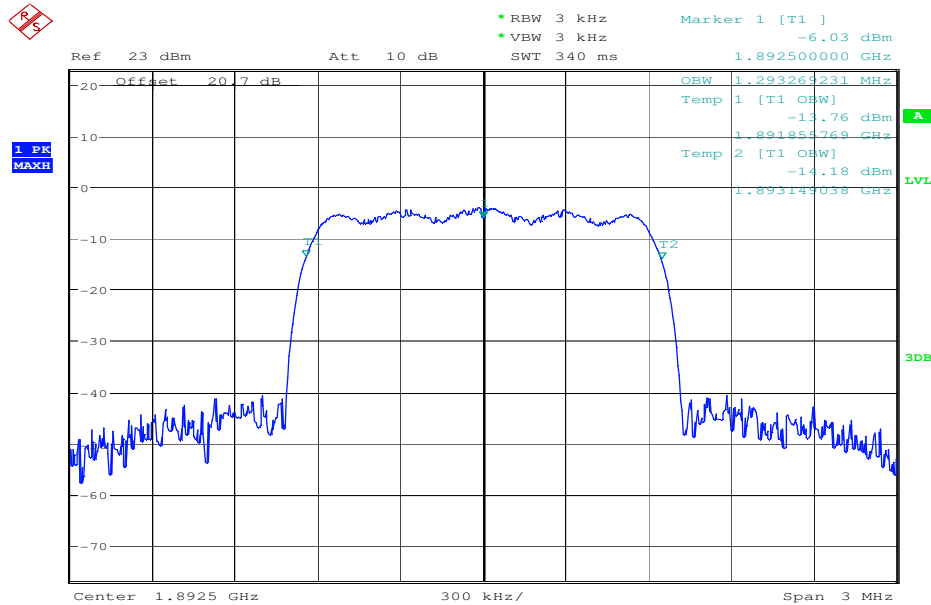


Date: 10.JUN.2009 15:41:14

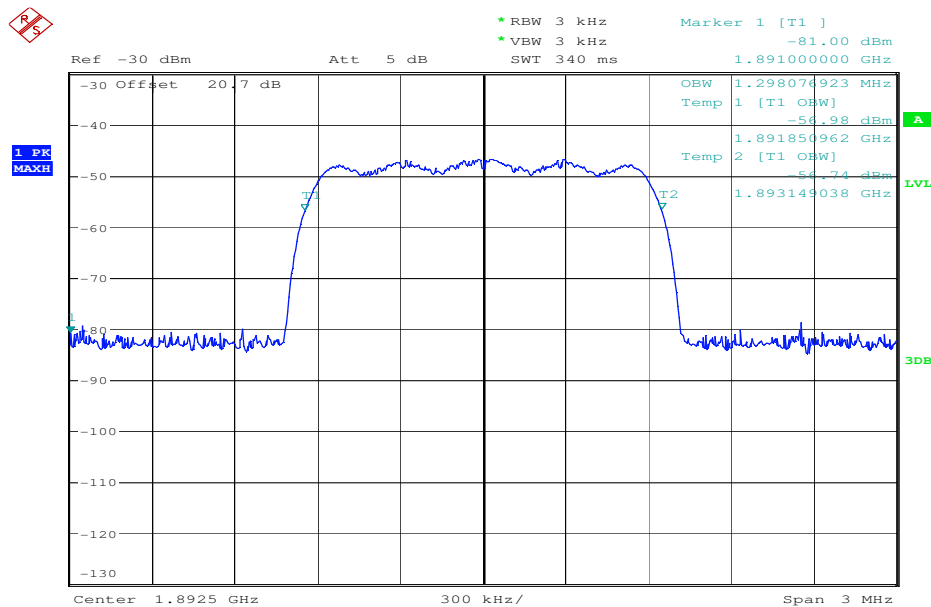


Date: 10.JUN.2009 15:39:52

Uplink Unit F



Date: 10.JUN.2009 15:44:21



Date: 10.JUN.2009 15:42:55

3.1.7 Intermodulation Tests

Reference

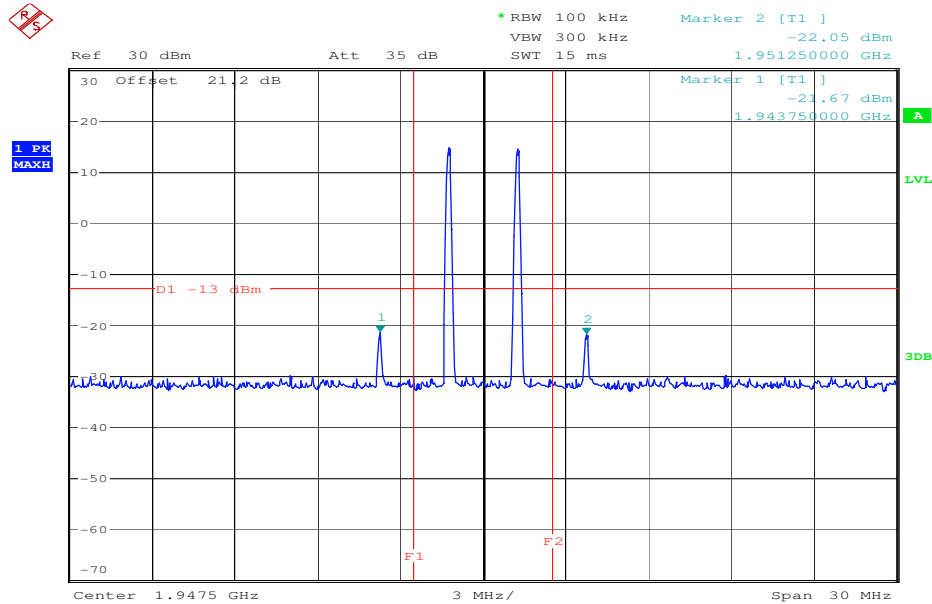
FCC:	FCC § 2.1051, CFR Part §24.238
IC:	IC RSS-131 §6.3

Method of Measurement:

Two RF signals set as inputs. The frequencies of both RF signals shall be within the repeater's operating band. The spacing between both RF signals shall be the minimum possible spacing applied in a network. The level of both RF input signals shall be increased, until the maximum rated output power per channel, as declared by the manufacturer, is reached.

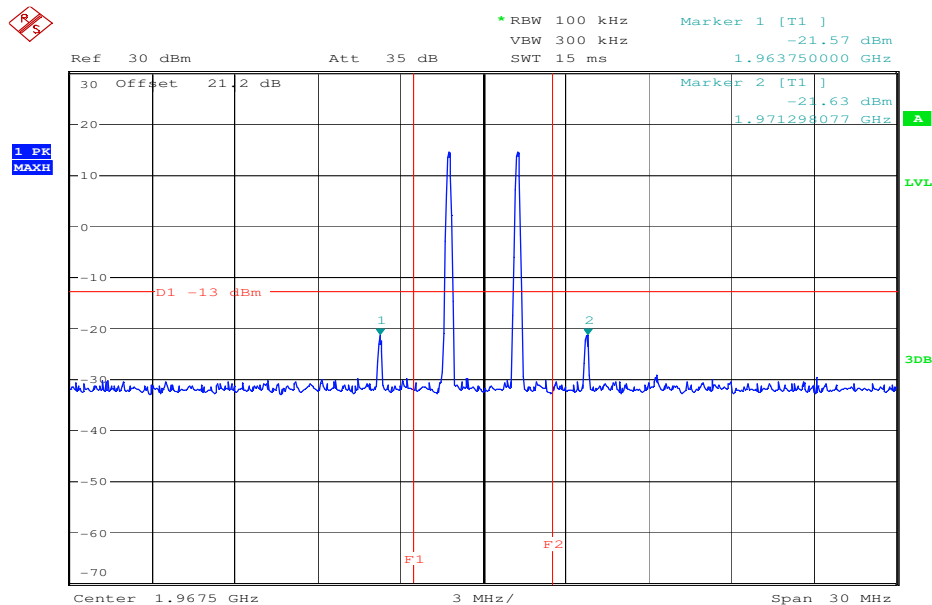
CDMA Downlink

Unit D:



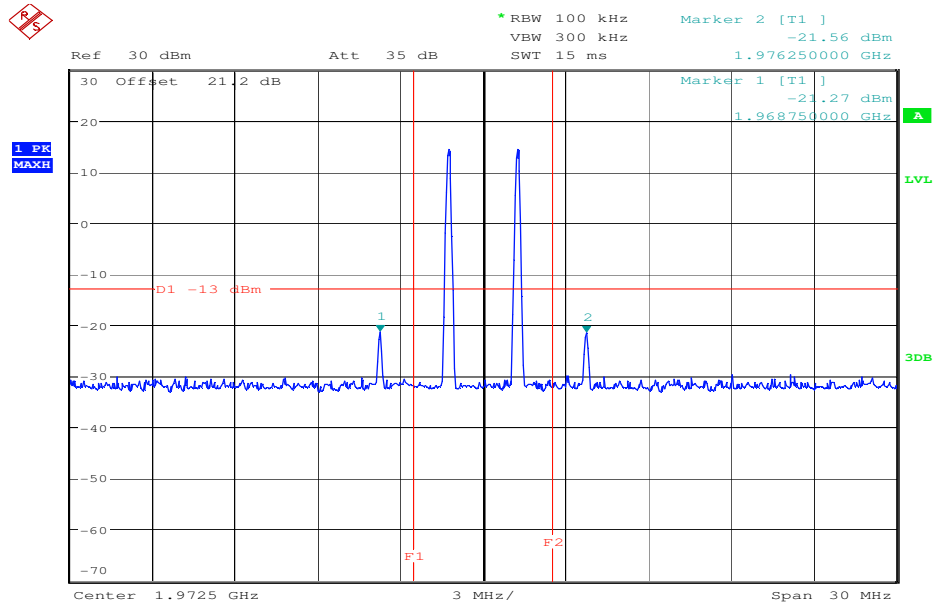
Date: 18.JUN.2009 14:59:39

Unit E:



Date: 18.JUN.2009 15:02:24

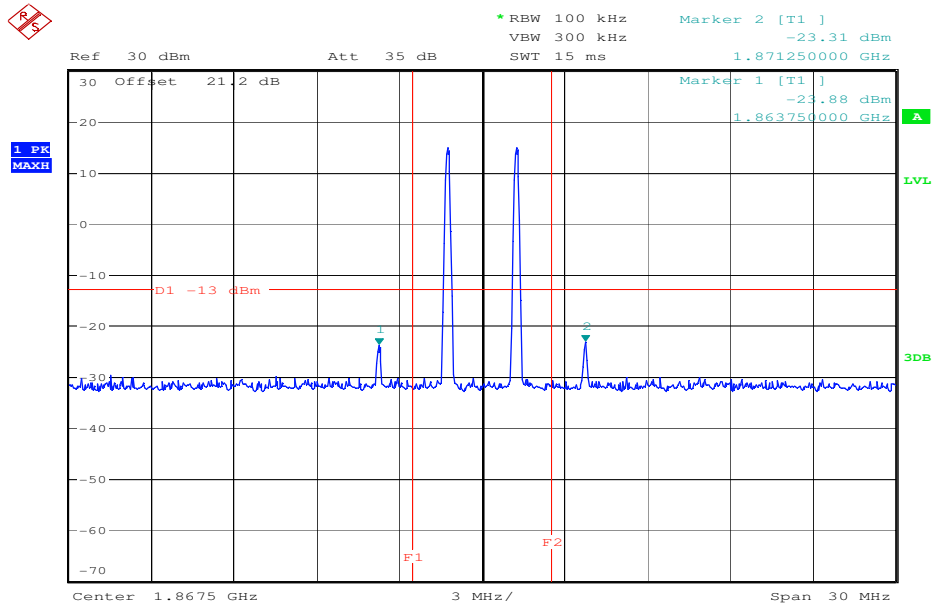
Unit F:



Date: 18.JUN.2009 15:04:54

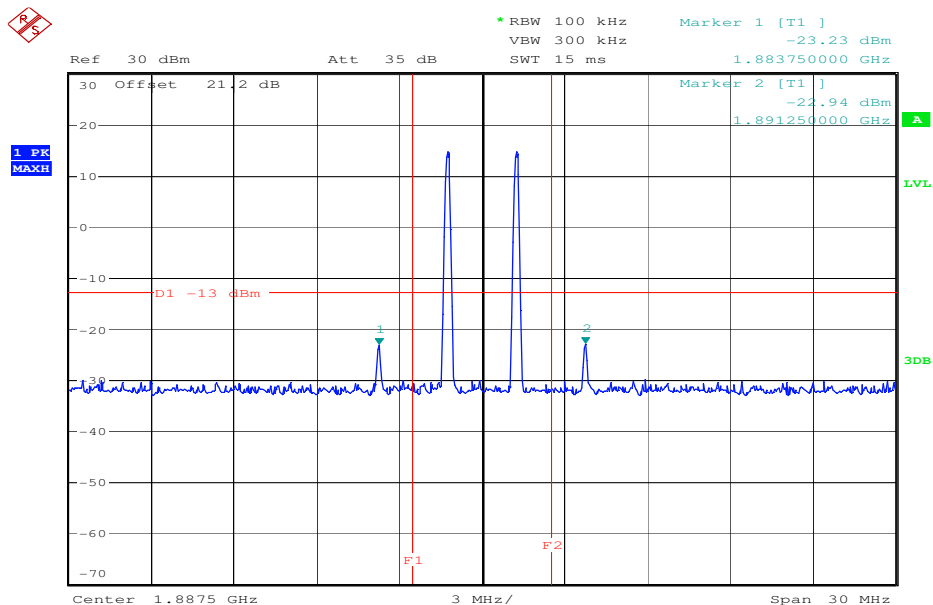
CDMA Uplink

Unit D:



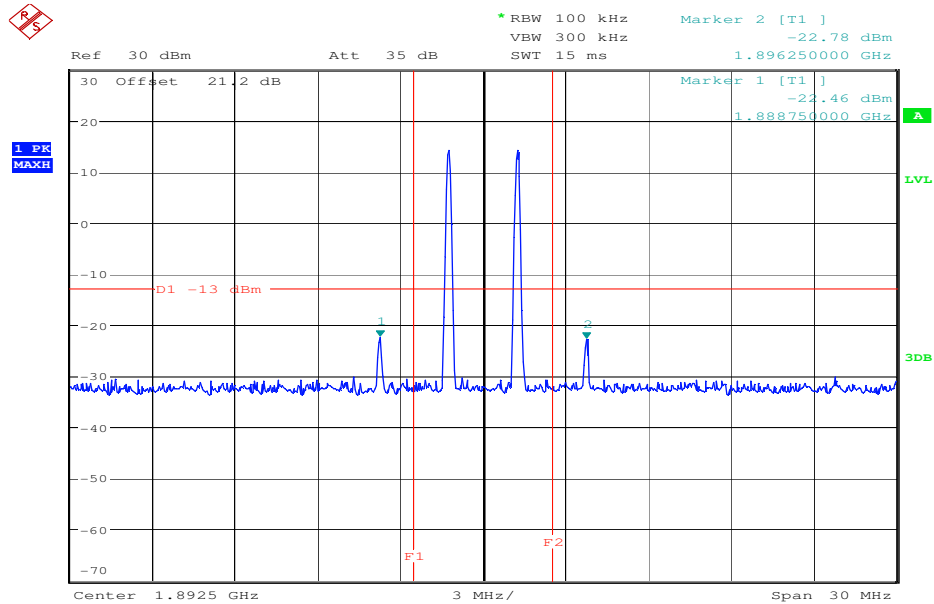
Date: 18.JUN.2009 14:30:14

Unit E:



Date: 18.JUN.2009 14:34:35

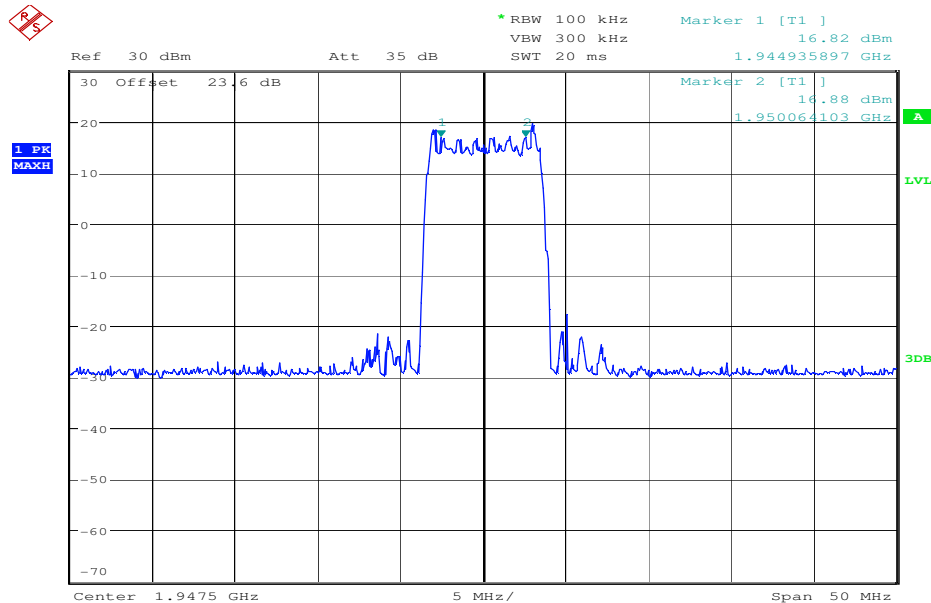
Unit F:



Date: 18.JUN.2009 14:38:04

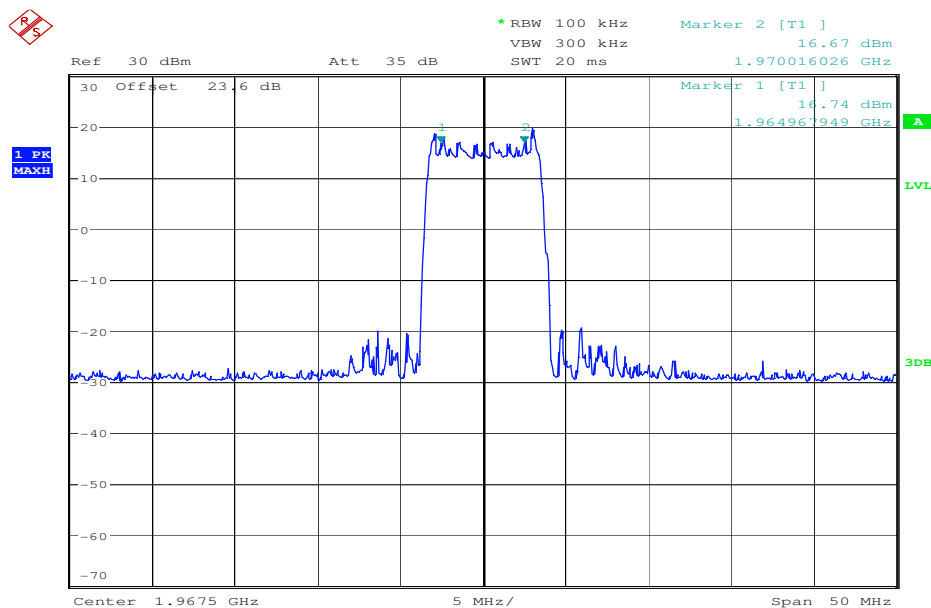
3.1.8 Out of Band Rejection

Downlink Band Pass Unit D



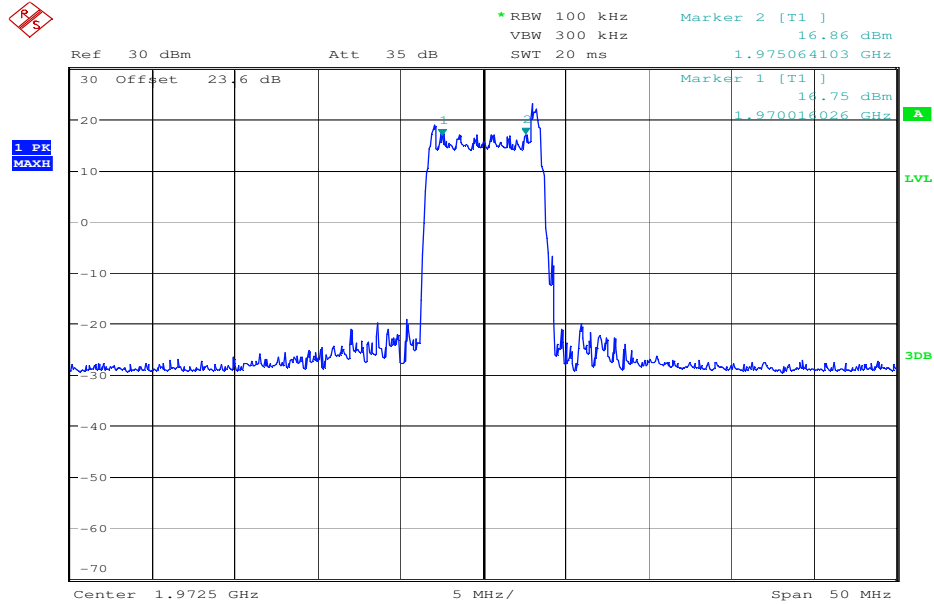
Date: 18.JUN.2009 11:26:53

Downlink Band Pass Unit E



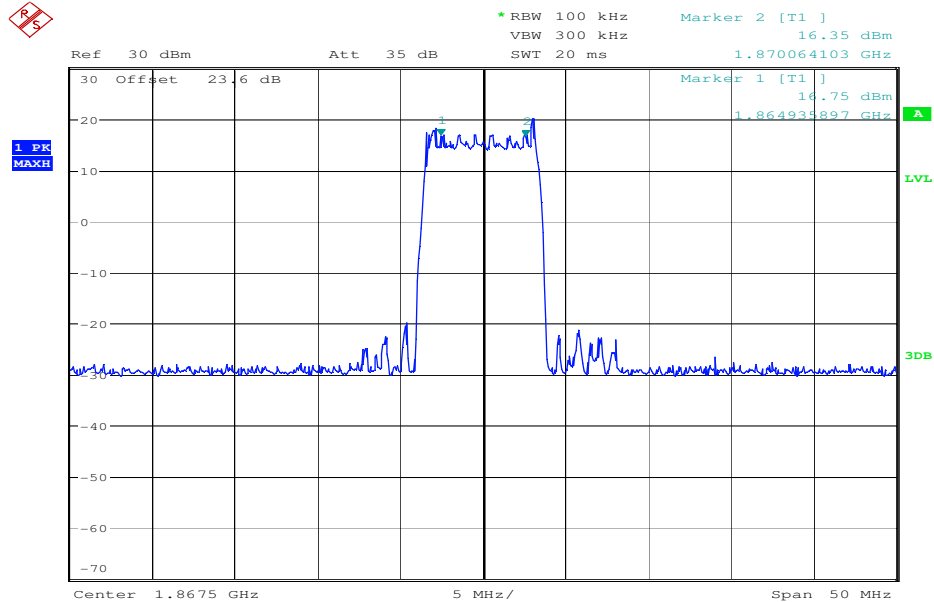
Date: 18.JUN.2009 11:30:35

Downlink Band Pass Unit F



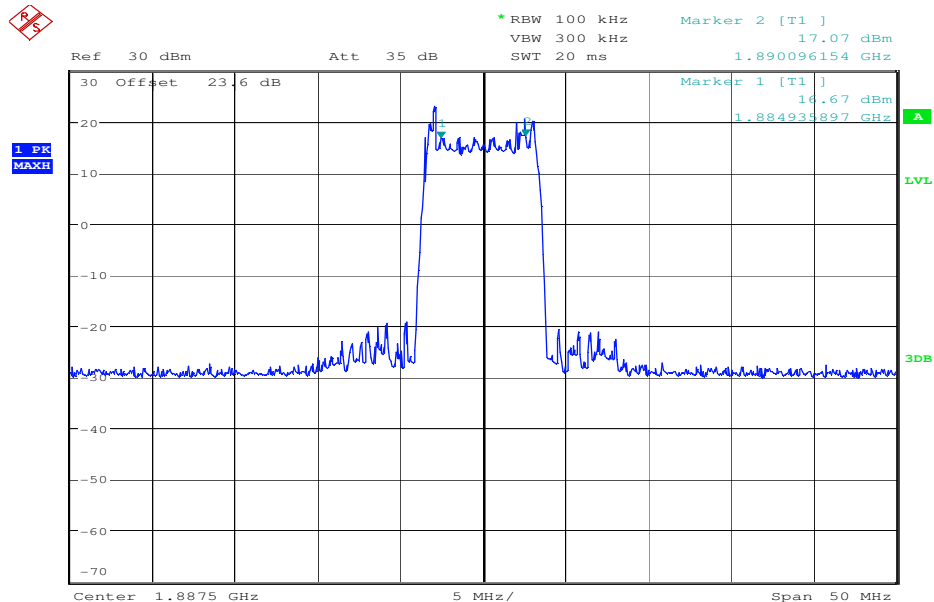
Date: 18.JUN.2009 11:35:11

Uplink Band Pass Unit D



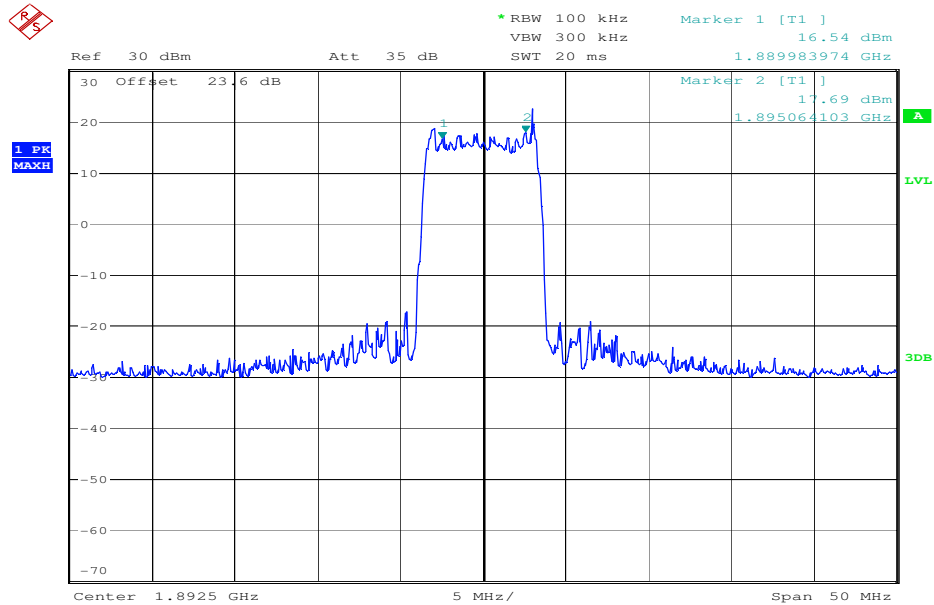
Date: 18.JUN.2009 11:00:47

Uplink Band Pass Unit E



Date: 18.JUN.2009 11:04:57

Uplink Band Pass Unit F



Date: 18.JUN.2009 11:11:06

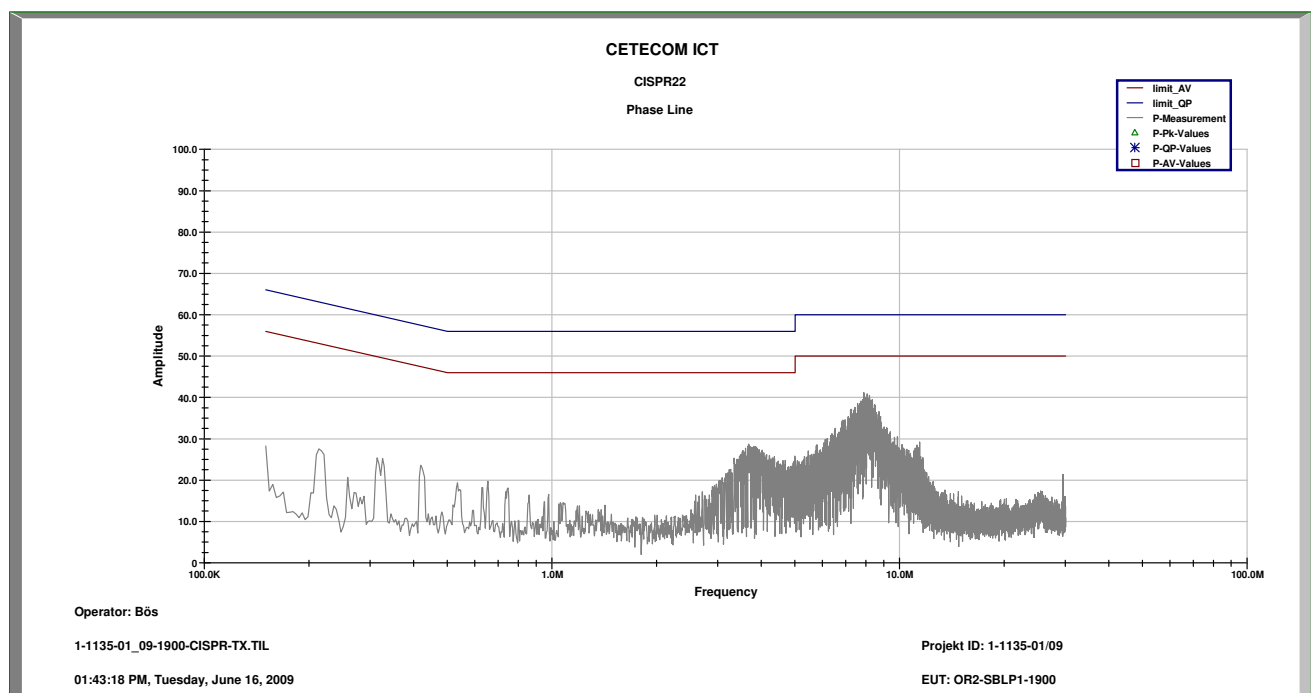
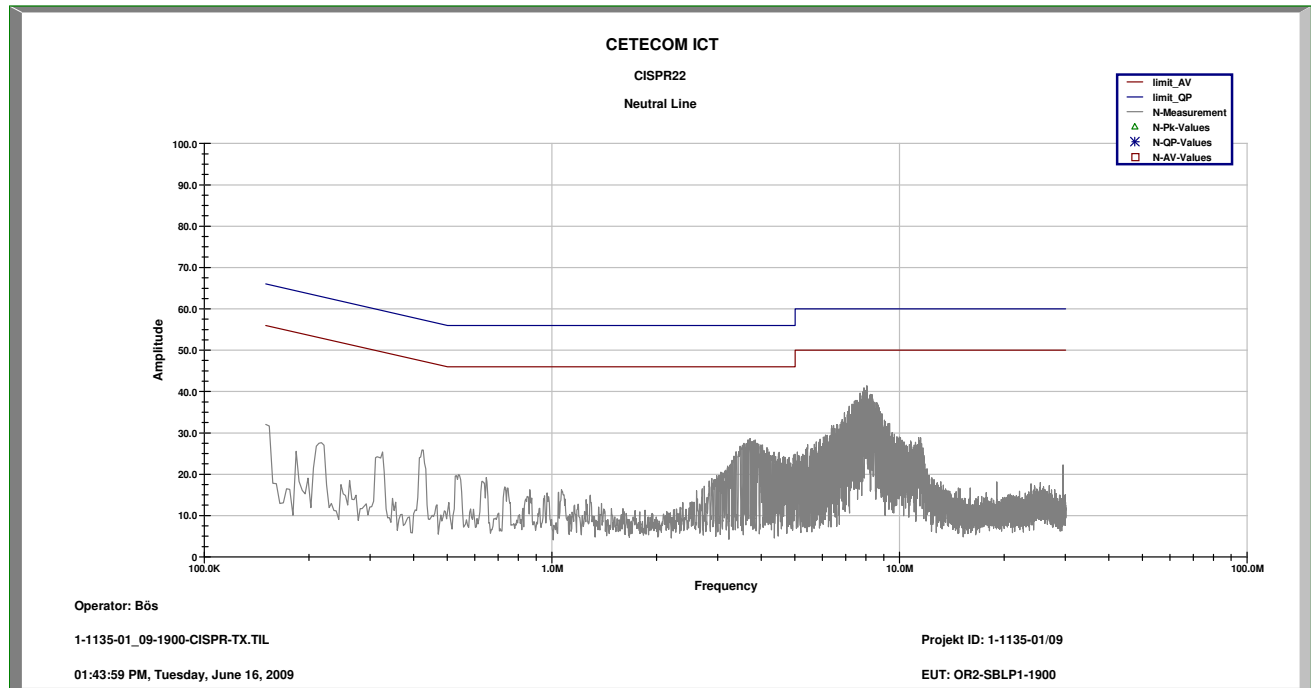
3.1.9 Conducted Emissions <30 MHz

§15.107/207

(measured with the 115V AC power)

Normal operating mode (up- and downlink)

Plot 1: CISPR 22



We measured L1 and N floating and grounded, max value was hold.

Limits :

Under normal test conditions only	0.15 to 0.5 MHz, 66-56 dB μ V QP, 56-46 dB μ V AV 0.5 to 5.0 MHz, 56 dB μ V QP, 46 dB μ V AV 5.0 to 30 MHz, 60 dB μ V QP, 50 dB μ V AV
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4 Used Test Equipment

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.

All reported calibration intervals are calibrations according to the EN/ISO/IEC 17025 standard. These calibrations were performed from an accredited external calibration laboratory.

Additional to these calibrations the laboratory performed comparison measurements with other calibrated systems and performed a weekly chamber inspection.

All used devices are connected with a 10 MHz external reference.

According to the manufacturers' instruction it is possible to establish a calibration interval for the FSP unit of 24 month, if the device has an external 10 MHz reference.

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	PSA-Spektrumanalysator 3 Hz - 26,5 GHz (E4440A)	Agilent	MY48250080	300003812	05.08.2008	24	05.08.2010
5	EMI Preselector 9kHz - 1 GHz (N9039A)	Agilent	MY48260003	300003825	19.08.2008	24	19.08.2010
6	Microwave Analog Signal Generator (N5183A)	Agilent	MY47420220	300003813	06.08.2008	24	06.08.2010
7	PC	F+W			n.a.		
8	TILE	TILE			n.a.		
9	TRILOG Super Breitband Antenne (VULB9163)	Schwarzbeck	371	300003854	Monthly verification (System cal.)		
10	Double Ridged Antenna 3115	EMCO	3088	300001032	Monthly verification (System cal.)		
11	Active Loop Antenna 6502	EMCO	2210	300001015	Monthly verification (System cal.)		
12	Switch / Control Unit 3488A	HP	2719A15013	300001156	n.a.		
13	Power Supply 6032A	HP	2818A03450	300001040	08.01.2009	36	08.01.2012
14	Busisolator	Kontron		300001056	n.a.		
15	Leitungsteiler 11850C	HP		300000997	Monthly verification (System cal.)		
16	Power attenuator 8325	Byrd	1530	300001595	Monthly verification (System cal.)		
17	Band reject filter WRCG1855/1910	Wainwright	7	300003350	Monthly verification (System cal.)		
18	Band reject filter WRCG2400/2483	Wainwright	11	300003351	Monthly verification (System cal.)		
19	Hochpassfilter WHK1.1/15G-10SS	Wainwright	3	300003255	Monthly verification (System cal.)		
20	Hochpassfilter WHKX2.9/18G-12SS	Wainwright	1	300003492	Monthly verification (System cal.)		
21	Hochpassfilter WHKX7.0/18G-8SS	Wainwright	18	300003789	Monthly verification (System cal.)		
22	Switch / Control Unit 3488A	HP	2605e08770	300001443	n.a.		
23	Trenntrafo RT5A	Grundig	9242	300001263	n.a.		
24	Relais Matrix PSU	R&S	890167/024	300001168	n.a.		
25	Netznachbildung ESH3-Z5	R&S	828576/020	300001210	n.a.		

System Rack Room 005 :

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	FSP 30	R&S	100886	300003575	25.08.2008	24	25.08.2010
2	CBT	R&S	100313	300003516	03.09.2008	24	03.09.2010
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

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	300002681-00xx	n.a.		
2	Memory Extension PSM-K10	R&S	To 1	300002681	n.a.		
3	Operating Software PSM-B2	R&S	To 1	300002681	n.a.		
4	19" Monitor		22759020-ED	300002681	n.a.		
5	Mouse		LZE 0095/6639	300002681	n.a.		
6	Keyboard		G00013834L461	300002681	n.a.		
7	Spectrum Analyser FSIQ 26	R&S	835540/018	300002681-0005	10.01.2008	24	10.01.2010
8	Tracking Generator FSIQ-B10	R&S	835107/015	300002681	s.No.7		
10	RF-Generator SMIQ03 (B1 Signal)	R&S	835541/056	300002681-0002	26.08.2008	36	26.08.2011
11	Modulation Coder SMIQ-B20	R&S	To 10	300002681	s.No.10		
12	Data Generator SMIQ-B11	R&S	To 10	300002681	s.No.10		
13	RF Rear Connection SMIQ-B19	R&S	To 10	300002681	s.No.10		
14	Broadband horn antenna (1-18 GHz)	EMCO	9107-3696	300001604	16.04.2008	24	16.04.2010
15	Broadband horn antenna (1-18 GHz)	EMCO	9107-3697	300001605	21.08.2008	24	21.08.2010
16	Std gain horn antenna (18-26.5 GHz)	Narda	Model no. 638	300000486	n.a.		
17	Std gain horn antenna (18-26.5 GHz)	Narda	Model no. 638	300000487	n.a.		
18	Sleeve dipole antenna Model 3126-880	ETS-Lindgren	00040887	3000000	n.a.		
19	Fast CPU SM-B50	R&S	To 10	300002681	s.No.10		
20	FM Modulator SM-B5	R&S	835676/033	300002681	s.No.10		
21	RF-Generator SMIQ03 (B2 Signal)	R&S	835541/055	300002681-0001	25.08.2008	36	25.08.2011
22	Modulation Coder SMIQ-B20	R&S	To 21	300002681	s.No.21		
23	Data Generator SMIQ-B11	R&S	To 21	300002681	s.No.21		
24	RF Rear Connection SMIQ-B19	R&S	To 21	300002681	s.No.21		
25	Fast CPU SM-B50	R&S	To 21	300002681	s.No.21		
26	FM Modulator SM-B5	R&S	836061/022	300002681	s.No.21		
27	RF-Generator SMP03 (B3 Signal)	R&S	835133/011	300002681-0003	26.08.2008	36	26.08.2011
28	Attenuator SMP-B15	R&S	835136/014	300002681	S.No.27		
29	RF Rear Connection SMP-B19	R&S	834745/007	300002681	S.No.27		
30	Power Meter NRVD	R&S	835430/044	300002681-0004	26.08.2008	24	26.08.2010
31	Power Sensor NRVD-Z1	R&S	833894/012	300002681-0013	26.08.2008	24	26.08.2010
32	Power Sensor NRVD-Z1	R&S	833894/011	300002681-0010	26.08.2008	24	26.08.2010
33	Rubidium Standard RUB	R&S		300002681-0009	27.08.2008	24	27.08.2010

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34	Switching and Signal Conditioning Unit SSCU	R&S	338864/003	300002681-0006	Verified with path compensation		
35	Laser Printer HP Deskjet 2100	HP	N/A	300002681-0011	n.a.		
36	19" Rack	R&S	11138363000004	300002681	n.a.		
37	RF-cable set	R&S	N/A	300002681	n.a.		
39	IEEE-cables	R&S	N/A	300002681	n.a.		
40	Sampling System FSIQ-B70	R&S	835355/009	300002681	s.No.7		
41	RSP programmable attenuator	R&S	834500/010	300002681-0007	26.08.2008	24	26.08.2010
42	Signalling Unit	R&S	838312/011	300002681	n.a.		
43	NGPE programmable Power Supply for EUT	R&S	192.033.41	300002681			
44	Power Splitter 6005-3	Inmet Corp.	none	300002841	n.a.		
45	SMA Cables SPS-1151-985-SPS	Insulated Wire	different	different	n.a.		
46	CBT32 with EDR Signaling Unit	R&S					
47	Coupling unit	Narda	N/A	--	n.a.		
48	2xSwitch Matrix PSU	R&S	872584/021	300001329	n.a.		
49	RF-cable set	R&S	N/A	different	n.a.		
50	IEEE-cables	R&S	N/A	--	n.a.		

Note: 3000002681-00xx inventoried as a system

SRD Laboratory Room 005:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Spektrum Analyzer 8566B	HP	2747A05275	300000219	18.01.2008	24	18.01.2010
2	Spektrum Analyzer Display 85662A	HP	2816A16497	300001690	23.01.2008	24	23.01.2010
3	Quasi-Peak-Adapter 85650A	HP	2811A01135	300000216	23.01.2008	24	23.01.2010
4	Power Supply	Heiden	003202	300001187	12.05.2007	36	12.05.2010
5	Power Supply	Heiden	1701	300001392	12.05.2007	36	12.05.2010

SRD Laboratory Room 011:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	NRP Power Meter	R&S	100212	300003780	27.02.2008	24	27.02.2010

5 Photographs of Test Set-up

Photo 1: Radiated Emissions



Photo 2: Radiated Emissions



Photo 3: Radiated Emissions

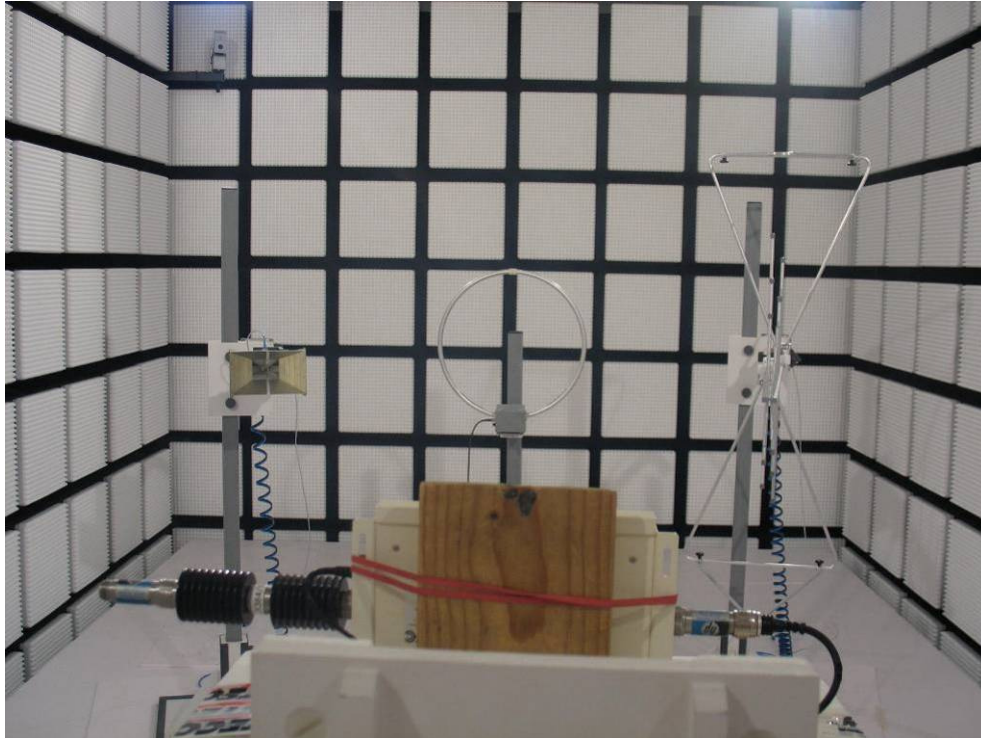


Photo 4: Conducted Emissions



6 Photographs of EUT

6.1 External Photos

Photo 1:



Photo 2:



Photo 3:



Photo 4:



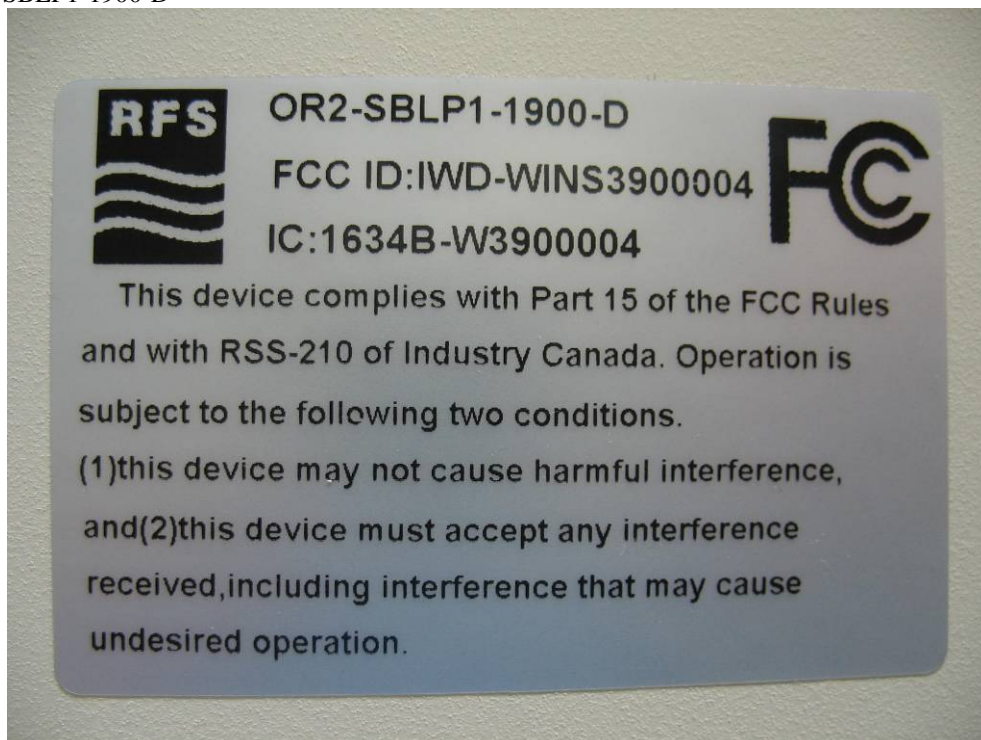
(ID's not actual)

Photo 5: OR2-SBLP1-1900-D



(ID's not actual)

Photo 6: OR2-SBLP1-1900-D



(ID's not actual)

Photo 7: OR2-SBLP1-1900-E



(ID's not actual)

Photo 8: OR2-SBLP1-1900-E



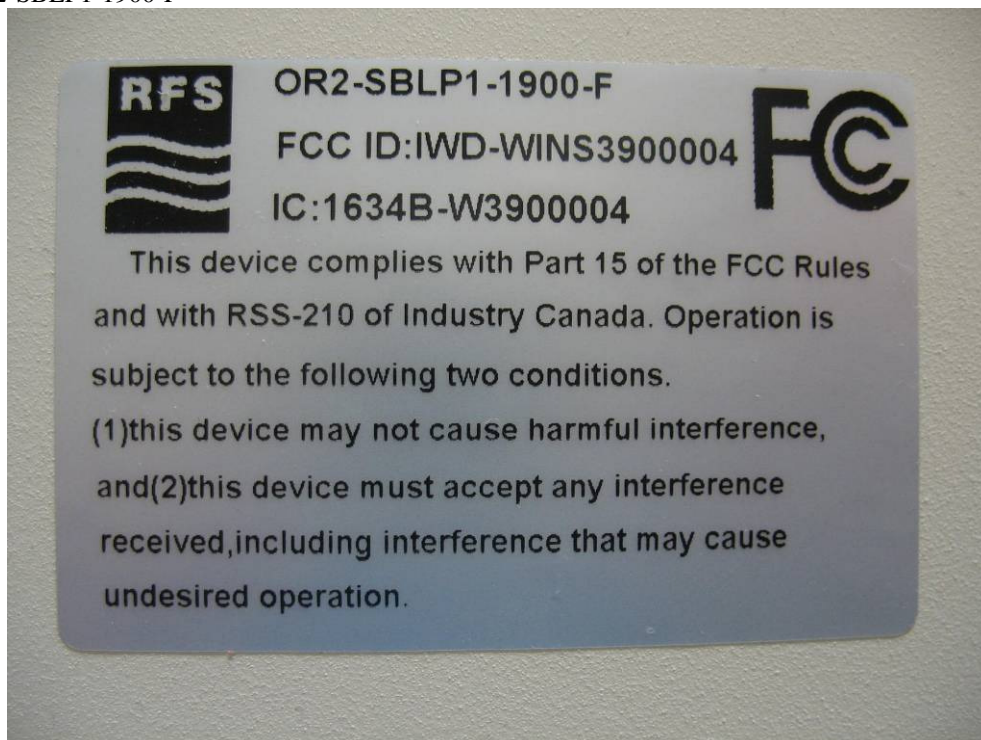
(ID's not actual)

Photo 9: OR2-SBLP1-1900-F



(ID's not actual)

Photo 10: OR2-SBLP1-1900-F



(ID's not actual)

Photo 11:



Photo 12:



Photo 13:



Photo 14:

