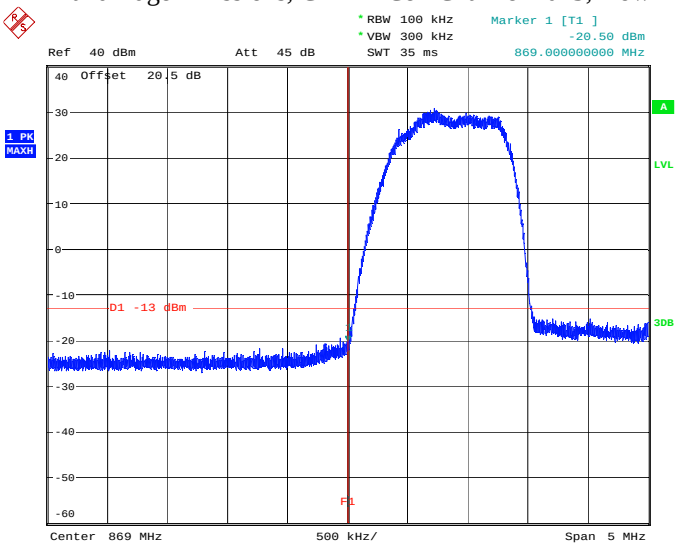
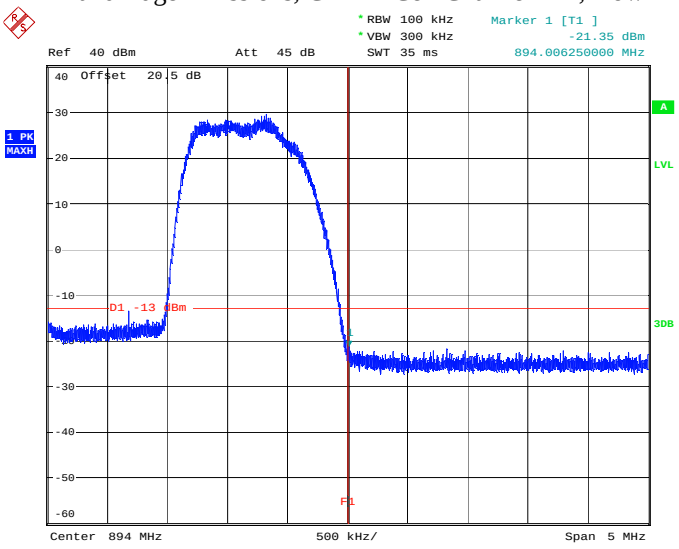
Graph 4.71
Band Edge Emissions, CDMA Cell Channel 1013, Down Link



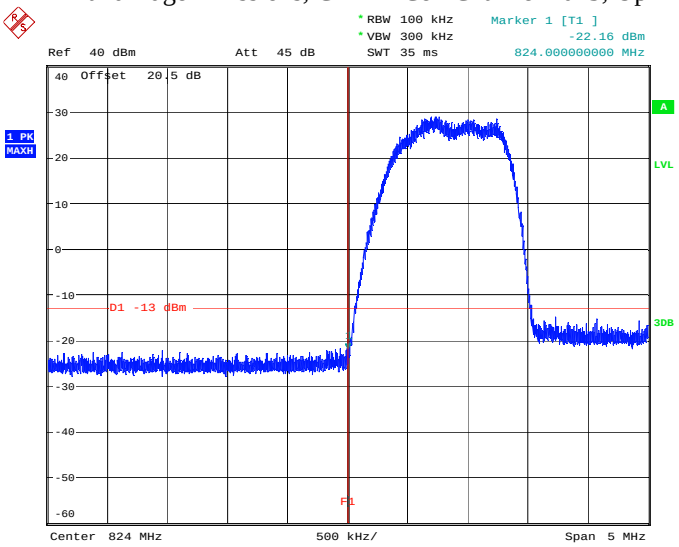
Date: 11.AUG.2009 19:12:08

Graph 4.72
Band Edge Emissions, CDMA Cell Channel 777, Down Link



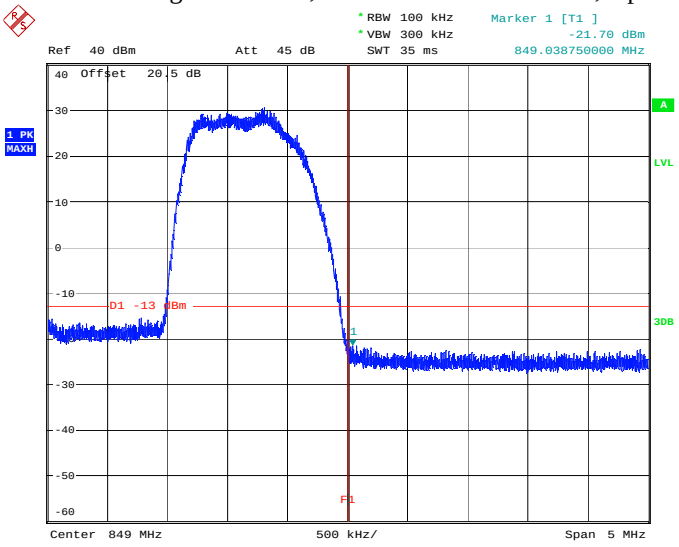
Date: 11.AUG.2009 19:14:58

Graph 4.73
Band Edge Emissions, CDMA Cell Channel 1013, Up Link



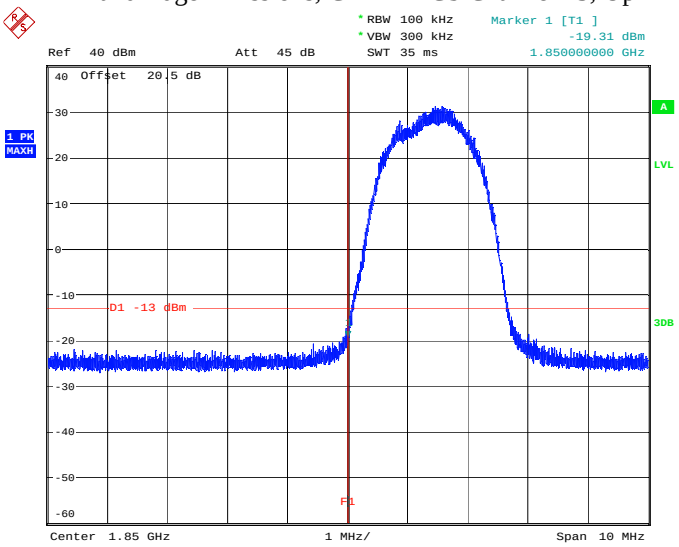
Date: 11.AUG.2009 19:18:08

Graph 4.74
Band Edge Emissions, CDMA Cell Channel 777, Up Link



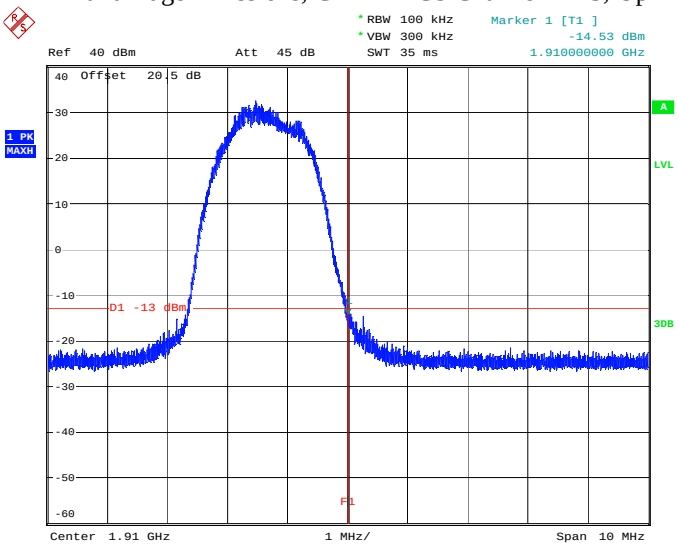
Date: 11.AUG.2009 19:20:43

Graph 4.75
Band Edge Emissions, CDMA PCS Channel 25, Up Link



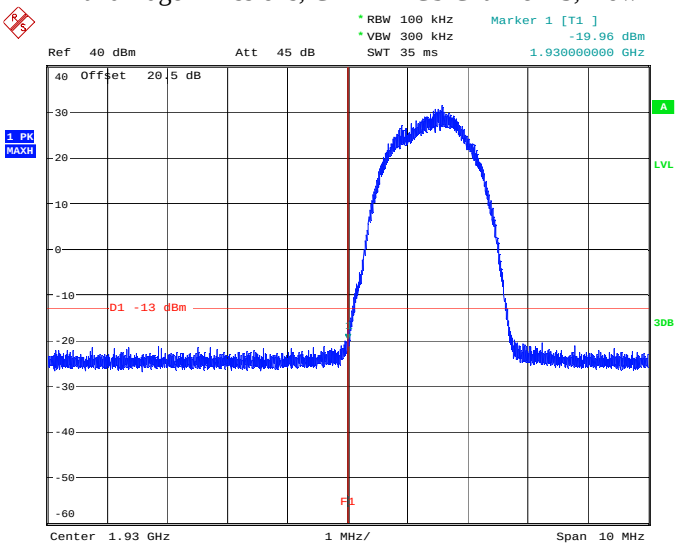
Date: 11.AUG.2009 19:28:25

Graph 4.76
Band Edge Emissions, CDMA PCS Channel 1175, Up Link



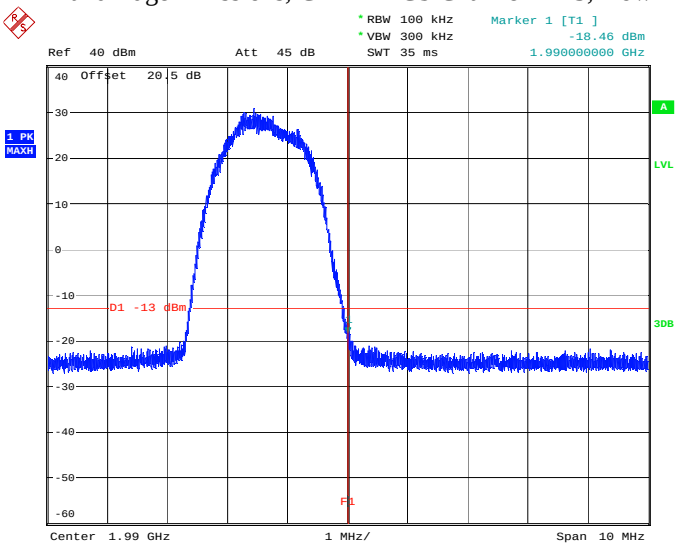
Date: 11.AUG.2009 19:30:45

Graph 4.77
Band Edge Emissions, CDMA PCS Channel 25, Down Link



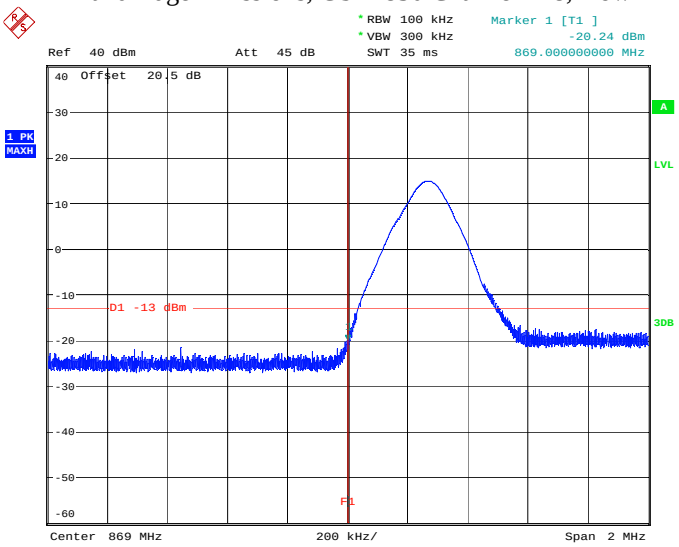
Date: 11.AUG.2009 19:35:09

Graph 4.78
Band Edge Emissions, CDMA PCS Channel 1175, Down Link



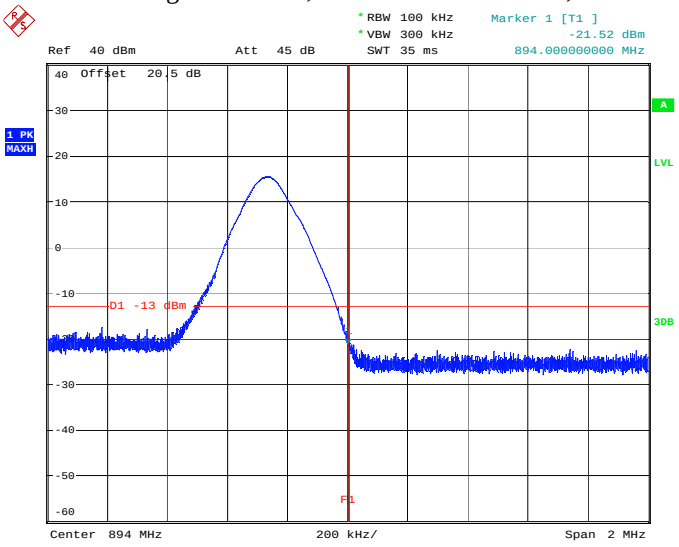
Date: 11.AUG.2009 19:37:11

Graph 4.79
Band Edge Emissions, GSM 850 Channel 128, Down Link



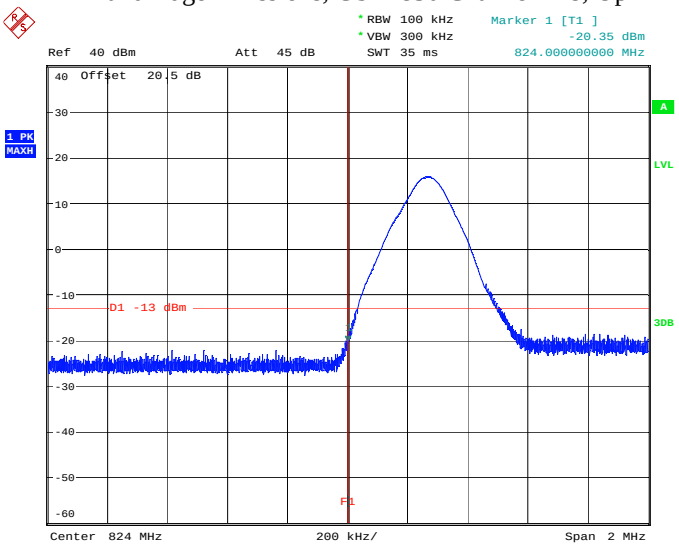
Date: 11.AUG.2009 19:47:21

Graph 4.80
Band Edge Emissions, GSM 850 Channel 251, Down Link



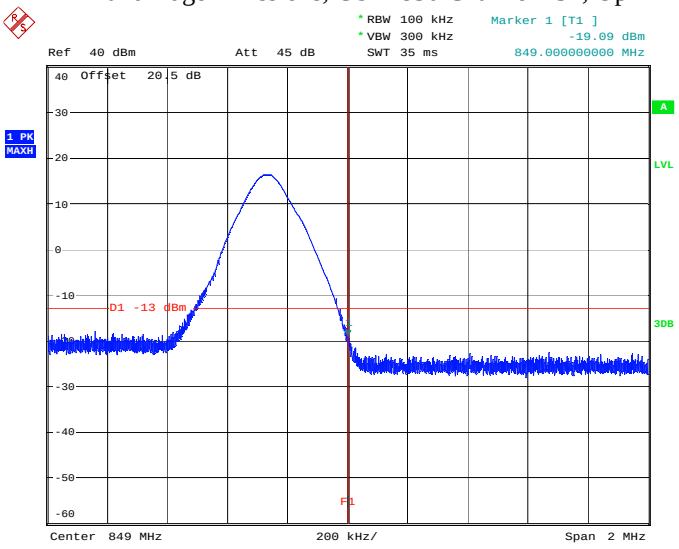
Date: 11.AUG.2009 19:49:20

Graph 4.81
Band Edge Emissions, GSM 850 Channel 128, Up Link



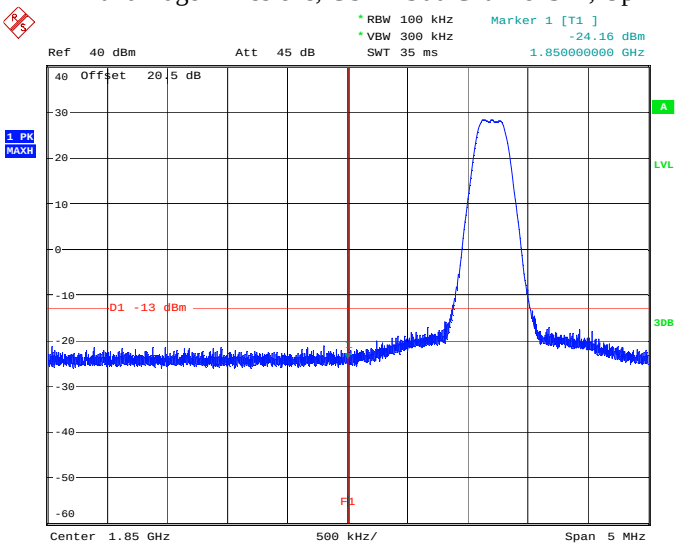
Date: 11.AUG.2009 19:51:36

Graph 4.82
Band Edge Emissions, GSM 850 Channel 251, Up Link



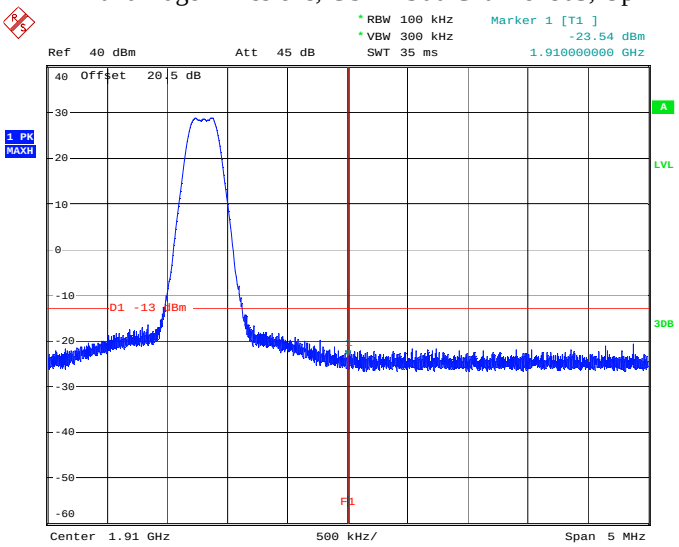
Date: 11.AUG.2009 19:53:07

Graph 4.83
Band Edge Emissions, GSM 1900 Channel 517, Up Link



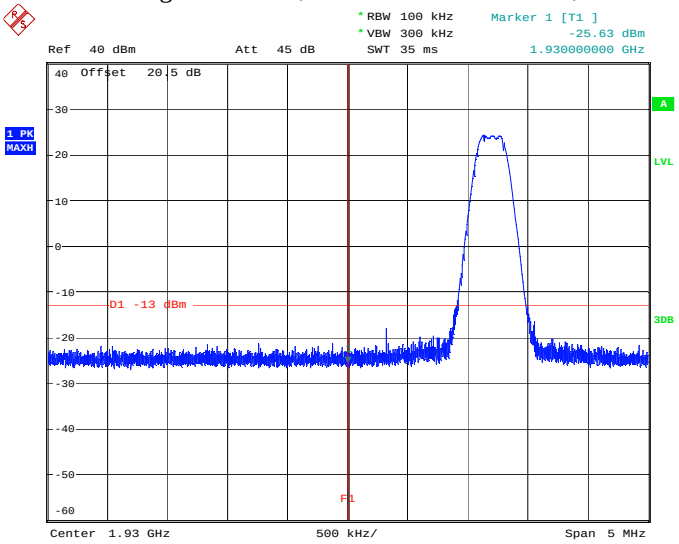
Date: 11.AUG.2009 20:10:14

Graph 4.84
Band Edge Emissions, GSM 1900 Channel 805, Up Link



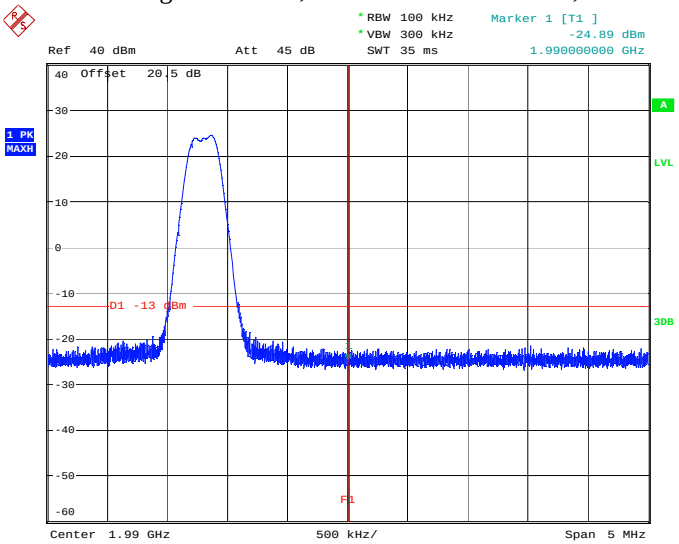
Date: 11.AUG.2009 20:12:42

Graph 4.85
Band Edge Emissions, GSM 1900 Channel 517, Down Link



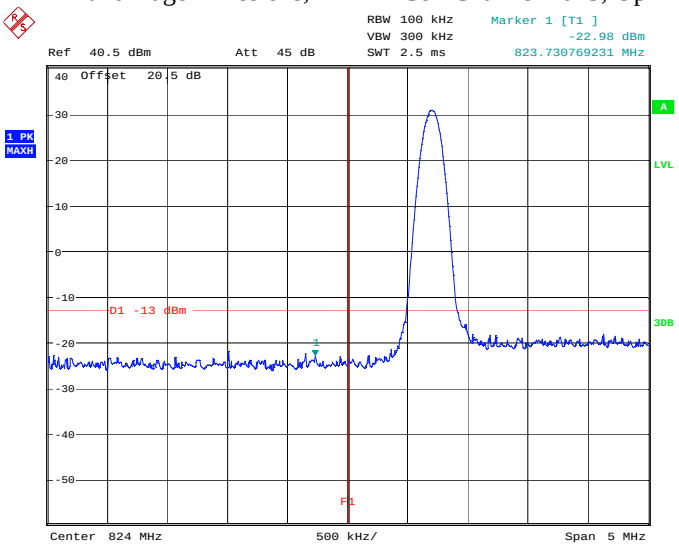
Date: 11.AUG.2009 20:21:14

Graph 4.86
Band Edge Emissions, GSM 1900 Channel 805, Down Link



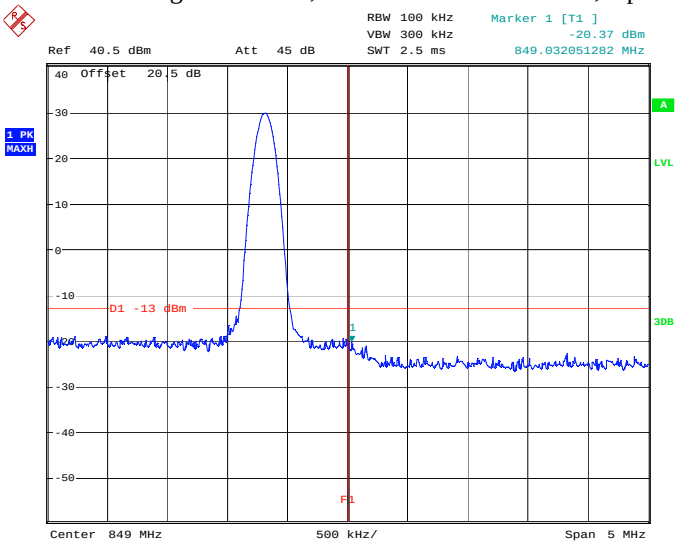
Date: 11.AUG.2009 20:18:27

Graph 4.87
Band Edge Emissions, TDMA Cell Channel 1013, Up Link



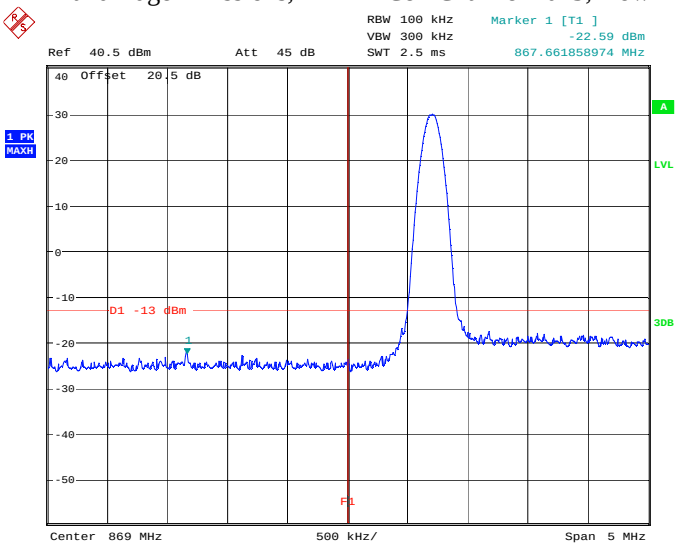
Date: 12.AUG.2009 16:47:16

Graph 4.88
Band Edge Emissions, TDMA Cell Channel 777, Up Link



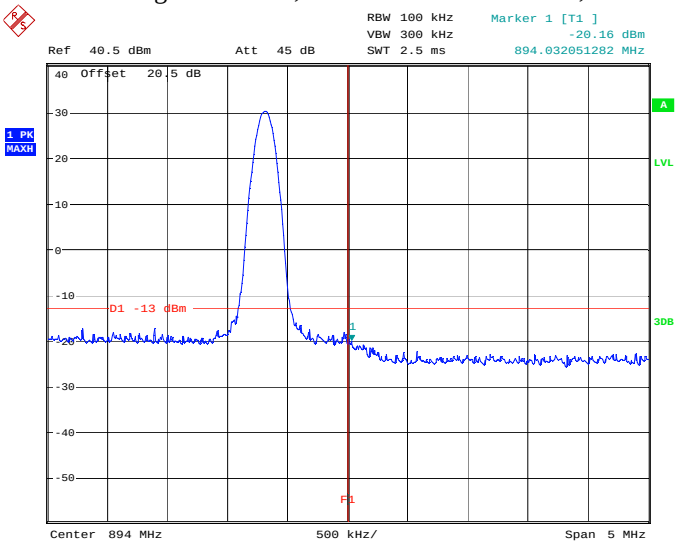
Date: 12.AUG.2009 16:49:54

Graph 4.89
Band Edge Emissions, TDMA Cell Channel 1013, Down Link



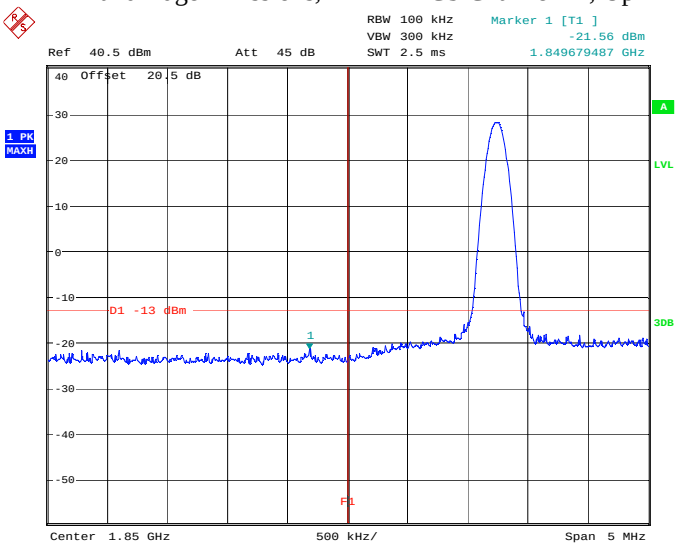
Date: 12.AUG.2009 16:38:12

Graph 4.90
Band Edge Emissions, TDMA Cell Channel 777, Down Link



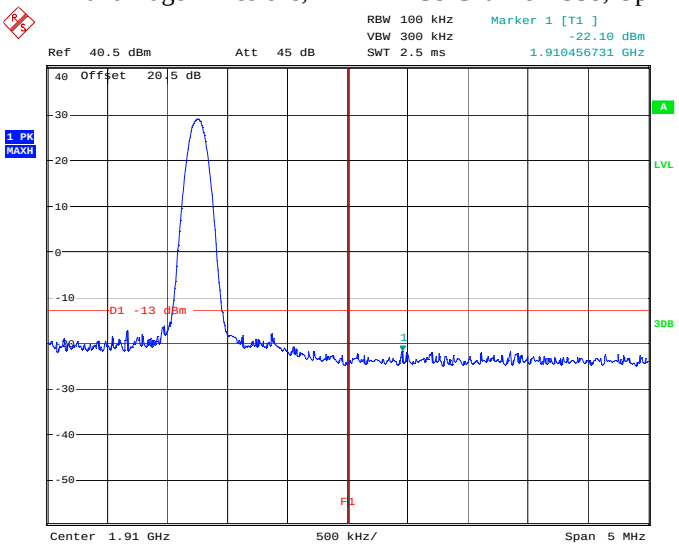
Date: 12.AUG.2009 16:41:47

Graph 4.91
Band Edge Emissions, TDMA PCS Channel 41, Up Link



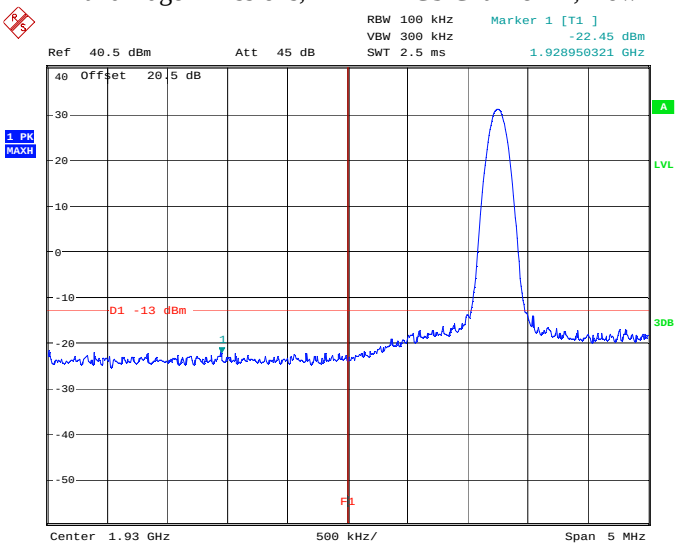
Date: 12.AUG.2009 15:43:17

Graph 4.92
Band Edge Emissions, TDMA PCS Channel 1958, Up Link



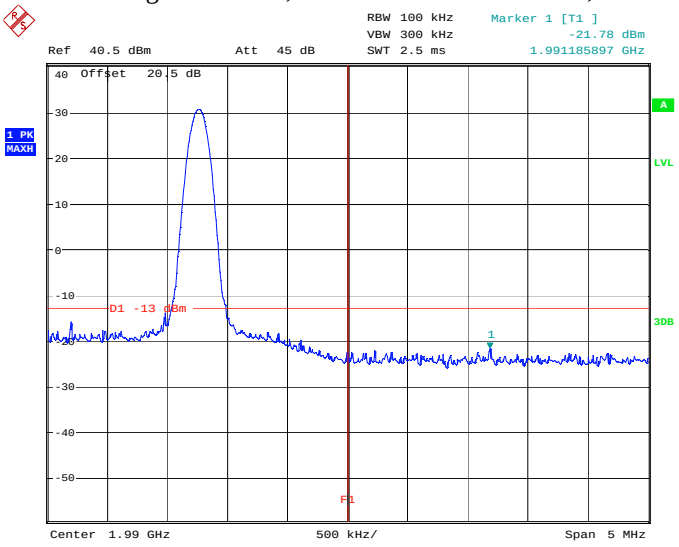
Date: 12.AUG.2009 15:46:10

Graph 4.93
Band Edge Emissions, TDMA PCS Channel 41, Down Link



Date: 12.AUG.2009 16:33:00

Graph 4.94
Band Edge Emissions, TDMA PCS Channel 1958, Down Link



Date: 12.AUG.2009 16:34:50

5.0 Transmitter Spurious Radiation

FCC 2.1053

5.1 Requirement

The power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least (43 + 10 log P) dB.

Note: That corresponds to the level of -13 dBm for any radiated out-of-band and spurious emissions.

5.2 Test Procedure

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to 10-th harmonic of each of the three fundamental frequencies (low, middle, and high channels) was investigated. The worst case of emissions are reported.

For spurious emissions attenuation, the substitution method was used. The EUT was substituted by a reference antenna (half-wave dipole - below 1 GHz, or Horn antenna - above 1GHz), connected to a signal generator. The signal generator output level ($\mathbf{V_g}$ in dBm) was adjusted to obtain the same reading as from EUT. The EIRP at the spurious emissions frequency was calculated as follows.

$$EIRP_{(dBm)} = \mathbf{V_g + G_{(dBi)}}$$

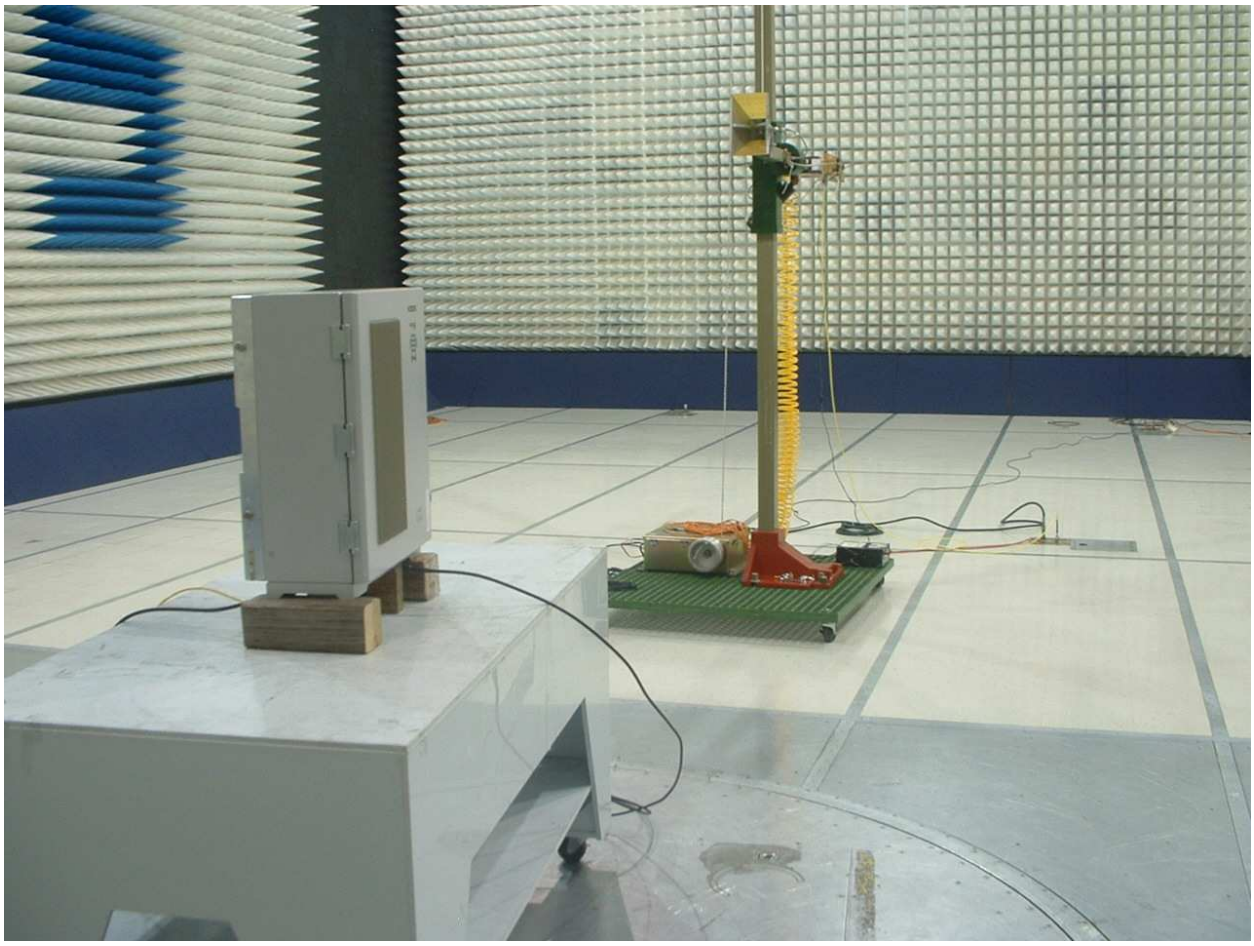
The EUT output port was connected to a 50 Ω termination load.

5.3 Test Equipment

EMCO 3115 Horn Antenna
Rohde & Schwarz FSU Spectrum Analyzer
Preamplifiers

5.4 Configuration Photographs

Radiated Emission Test Setup



5.5 Test Results

Transmitter Spurious Radiated Emissions - Cellular Band

Frequency	SA Reading (from EUT)	Signal Generator Output required to have the same SA Reading as from EUT	EIRP	EIRP Limit	EIRP Margin
MHz	dB(µV)	V_g dBm	dBm	dBm	dB
Up Link, 824.7 MHz					
1649.4	41.0	-70.7	-61.1	-13.0	-48.1
2474.1	41.5	-67.7	-57.5	-13.0	-44.5
Up Link, 836.5 MHz					
1673.0	41.2	-70.2	-60.7	-13.0	-47.7
2509.5	41.6	-67.2	-56.9	-13.0	-43.9
Up Link, 848.3 MHz					
1696.6	41.3	-69.9	-60.4	-13.0	-47.4
2544.9	41.8	-66.7	-56.4	-13.0	-43.4
Down Link, 869.7 MHz					
1739.4	41.1	-69.7	-60.3	-13.0	-47.3
2609.1	41.7	-66.1	-55.8	-13.0	-42.8
Down Link, 881.5 MHz					
1763.0	41.3	-69.3	-60.0	-13.0	-47.0
2644.5	41.7	-66.0	-55.7	-13.0	-42.7
Down Link, 893.3 MHz					
1786.6	41.4	-68.7	-59.7	-13.0	-46.7
2679.9	41.9	-65.7	-55.4	-13.0	-42.4

EIRP is calculated as: $EIRP_{(dBm)} = \mathbf{V_{g(dBm)} + G_{(dBi)}}$

All other emissions not reported are more than 20 dB below the limit.

Result	**Complies**

Transmitter Spurious Radiated Emissions - PCS Band

Frequency	SA Reading (from EUT)	Signal Generator Output required to have the same SA Reading as from EUT	EIRP	EIRP Limit	EIRP Margin
MHz	dB(µV)	V_g dBm	dBm	dBm	dB
Up Link, 1851.25 MHz					
3702.5	36.9	-65.6	-55.8	-13.0	-42.8
5553.8	43.3	-55.2	-44.5	-13.0	-31.5
Up Link, 1880 MHz					
3760.0	36.8	-65.5	-55.7	-13.0	-42.7
5640.0	43.4	-54.7	-43.8	-13.0	-30.8
Up Link, 1908.75 MHz					
3817.5	37.1	-64.9	-55.2	-13.0	-42.2
5726.25	43.6	-54.6	-43.5	-13.0	-30.5
Down Link, 1931.25 MHz					
3862.5	37.0	-64.9	-55.1	-13.0	-42.1
5793.75	43.4	-54.9	-43.6	-13.0	-30.6
Down Link, 1960 MHz					
3920.0	37.1	-64.8	-54.9	-13.0	-41.9
5880.0	43.5	-54.8	-43.4	-13.0	-30.4
Down Link, 1988.75 MHz					
3977.5	37.3	-64.8	-54.7	-13.0	-41.7
5966.25	43.4	-54.8	-43.4	-13.0	-30.4

EIRP is calculated as: $EIRP_{(dBm)} = V_{g(dBm)} + G_{(dBi)}$

All other emissions not reported are more than 20 dB below the limit.

Result	**Complies**

6.0 Radiated Emissions

FCC 15.109

6.1 Radiated Emission Limits

The following radiated emission limits apply to Class A unintentional radiators:

Radiated Emissions Limits, Section 15.109(b)

Frequency **(MHz)**	**Class A at 10m (µV/m)**	**Class A at 10m (dBµV/m)**
30-88	90	39
88-216	150	43.5
216-960	210	46.4
Above 960	300	49.5

Note: Three sets of units are commonly used for EMI measurement, decibels below one milliwatt (-dBm), decibels above a microvolt (dBµV), and microvolts (µV). To convert between them, use the following formulas: 20 LOG$_{10}$ (µV) = dBµV, dBm = dBµV-107.

6.2 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

An example for the calculations in the following table is as follows:

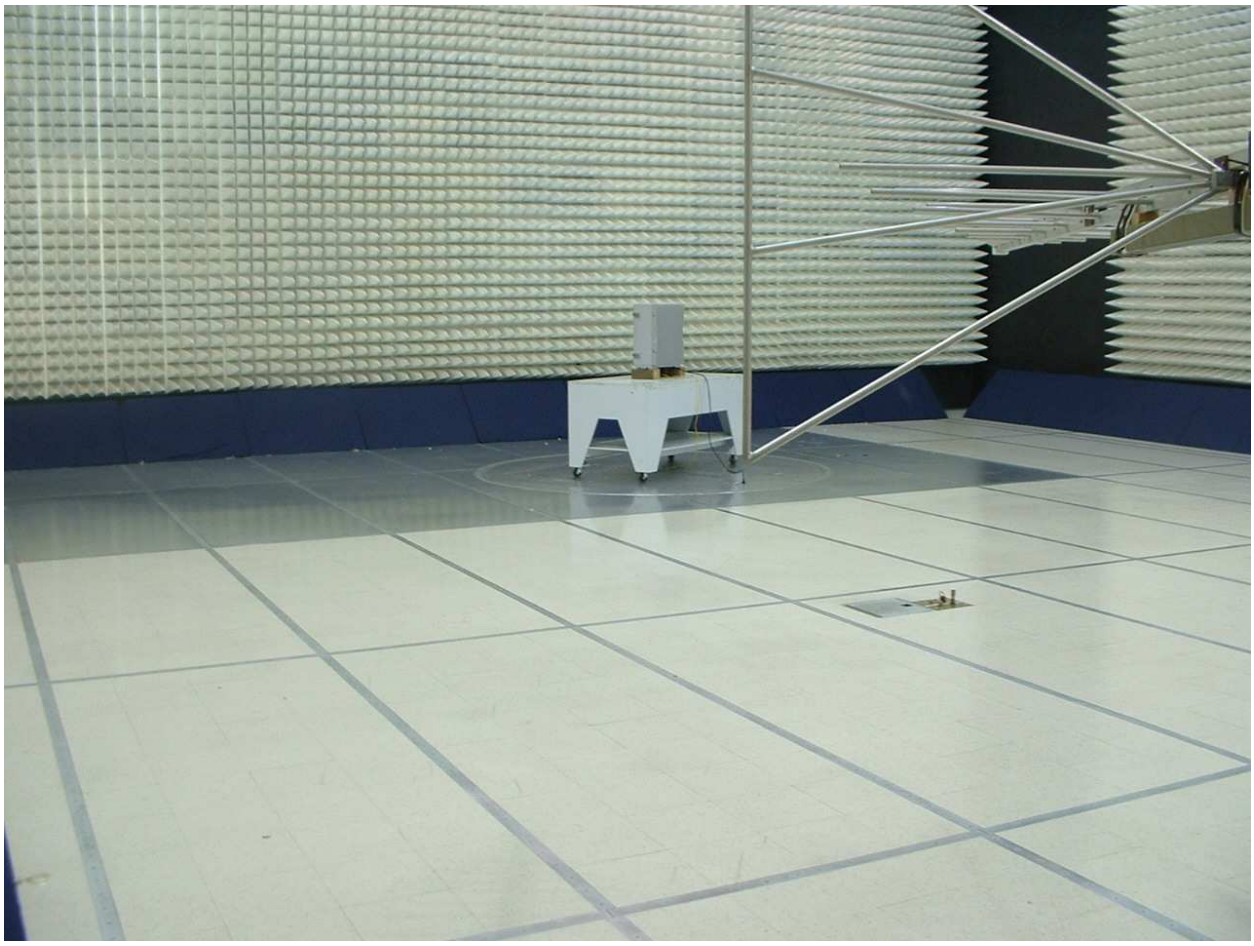
Assume a receiver reading of 52.0 dBµV is obtained. The antennas factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29.0 dB is subtracted, giving field strength of 32 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
FS = 52.0 + 7.4 + 1.6 – 29.0 = 32 dBµV/m

Level in µV/m = Common Antilogarithm [(32 dBµV/m)/20] = 39.8 µV/m

6.3 Configuration Photographs

Radiated Emission Test Setup



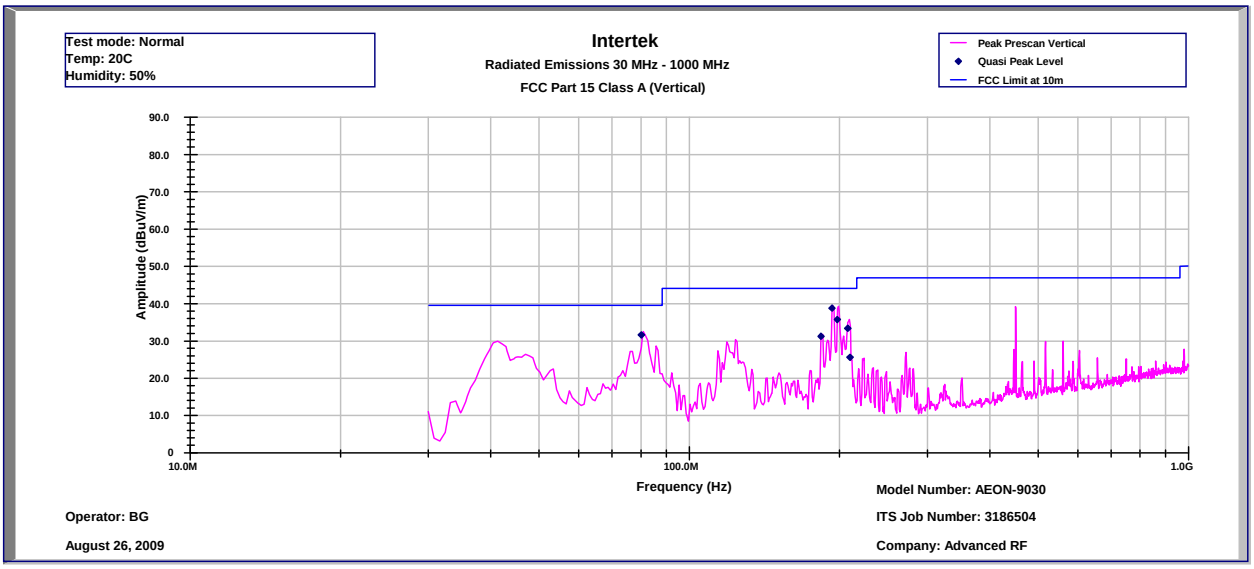
6.4 Test Results

Tested By:	Bruce Gordon
Test Date:	August 26, 2009

Note: A complete scan was made from 30 MHz – 1000 MHz.

Result	**Complies by 4.7 dB**

Radiated Emissions below 1 GHz

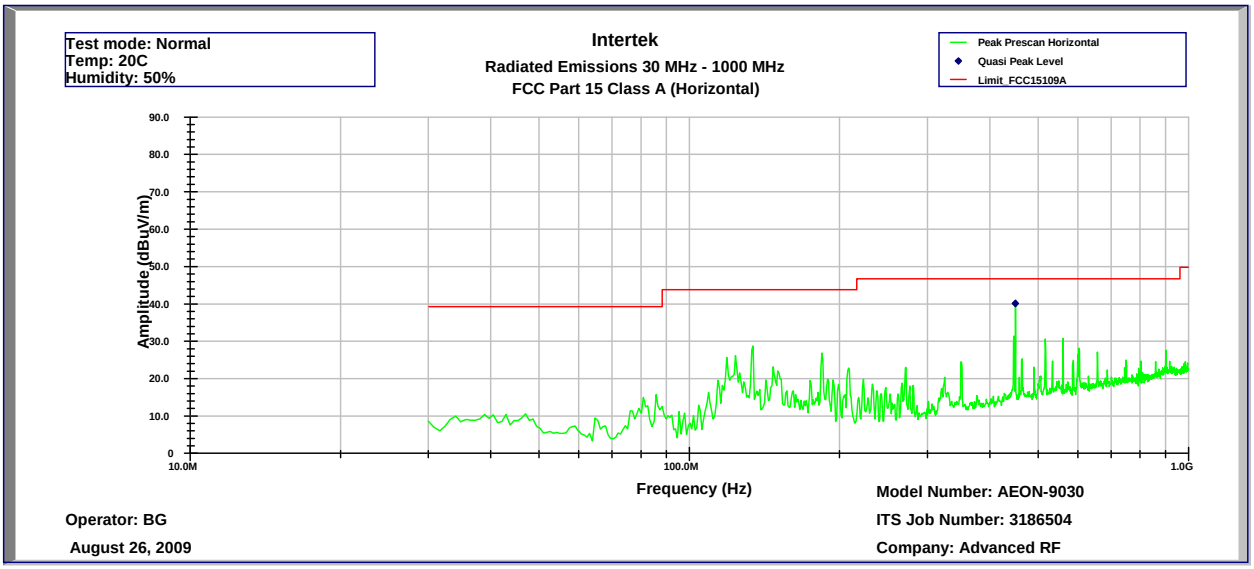


Intertek
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class A (QP-Vertical)
Operator: BG
Model Number: AEON
ITS Job Number: 3186504
26-Aug-09
Company: Advanced RF

Frequency	Quasi Pk FS	Limit at 10m	Margin	RA	AF	CF	AG
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB(1/m)	dB	dB
8.02E+07	31.6	39.0	-7.4	55.3	7.3	0.9	32.0
1.84E+08	31.2	43.5	-12.3	51.4	10.3	1.4	31.9
1.93E+08	38.8	43.5	-4.7	58.3	11.0	1.4	31.9
1.98E+08	35.7	43.5	-7.8	55.0	11.2	1.5	31.9
2.08E+08	33.4	43.5	-10.1	52.3	11.5	1.5	31.9
2.10E+08	25.6	43.5	-17.9	44.3	11.7	1.5	31.9

Test mode: Normal
Temp: 20C
Humidity: 50%

Radiated Emissions below 1 GHz



Intertek
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class A (QP-Horizontal)
Operator: BG

26-Aug-09

Model Number: AEON
ITS Job Number: 3186504
Company: Advanced RF

Frequency	Quasi Pk FS	Limit at 10m	Margin	RA	CF	AG	AF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB(1/m)
4.50E+08	40.1	46.4	-6.3	52.3	2.2	32.0	17.6

Test mode: Normal
Temp: 20C
Humidity: 50%

7.0 AC Line Conducted Emissions

FCC 15.107

7.1 Conducted Emission Limits

The following conducted emission limits apply to Class A and Class B unintentional radiators:

Conducted Emissions Limits, Section 15.107(b)

Frequency Band MHz	Class A Limit dB (µV)		Class B Limit dB (µV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15-0.50	79	66	66 to 56 Decreases linearly with the logarithm of the frequency	56 to 46 Decreases linearly with the logarithm of the frequency
0.50-5.00	73	60	56	46
5.00-30.00	73	60	60	50

Note: At the transition frequency the lower limit applies.

7.2 Test Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

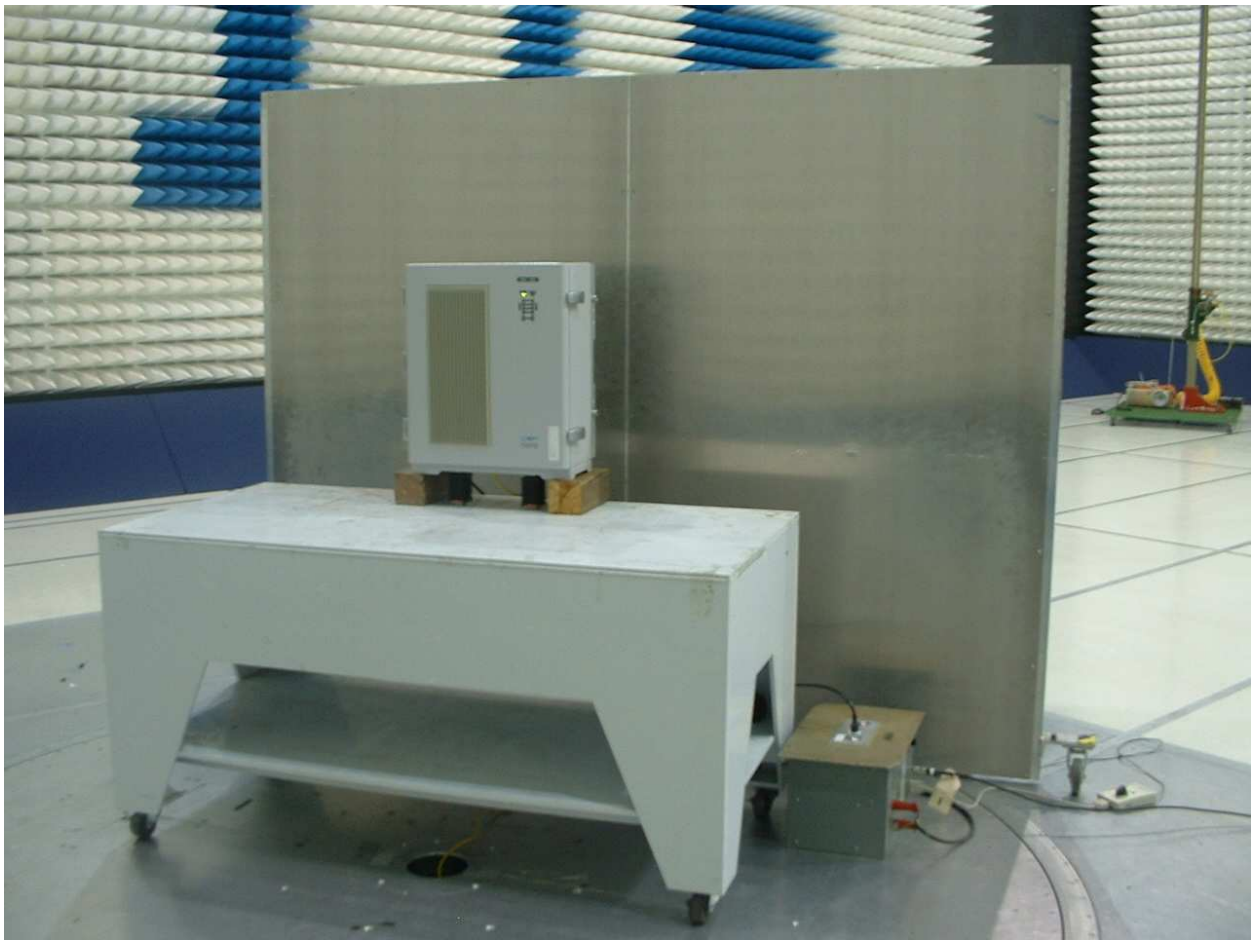
Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4.

7.3 Configuration Photographs



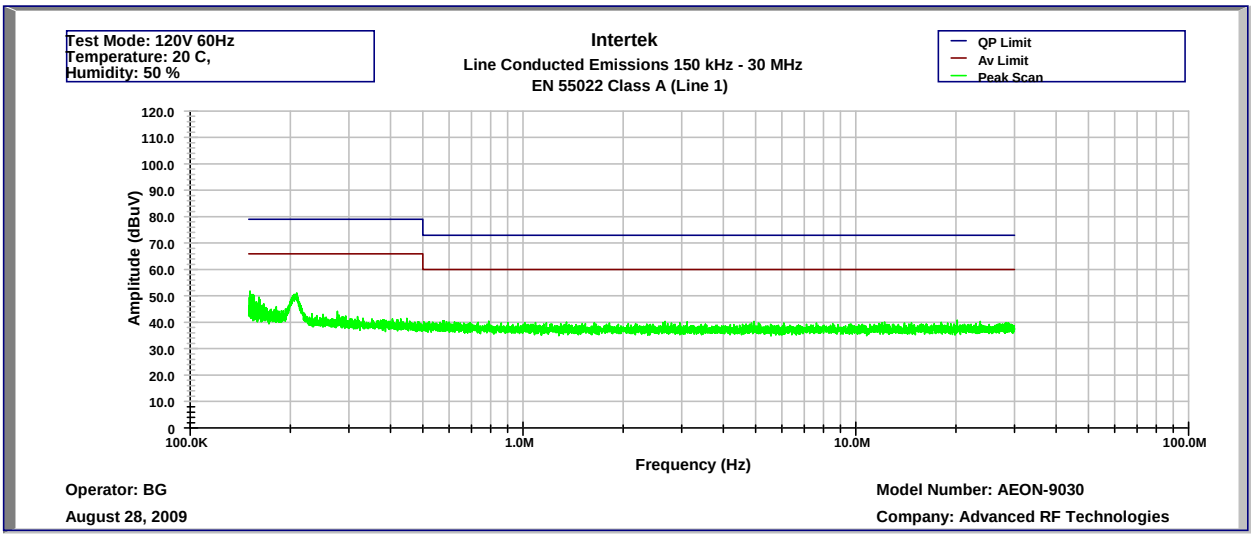
7.4 Test Results

Tested By:	Bruce Gordon
Test Date:	August 28, 2009

Note: A complete scan was made from 0.15 MHz – 30 MHz.

Result	**Complies by 12.0 dB**

Conducted Emissions

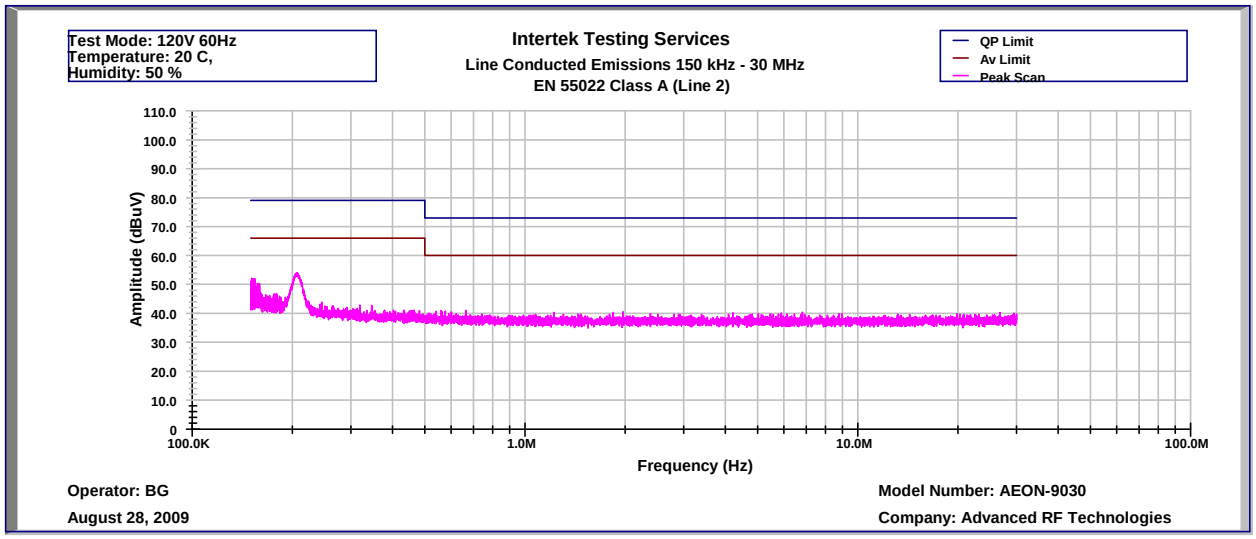


Intertek
Line Conducted Emissions 150 kHz - 30 MHz
EN55022 Class A (Line 1)
Operator: BG — Model Number: AEON
ITS Job Number: 3186504
28-Aug-09 — Company: Advanced RF

Frequency	Pk Level	QP Limit	Av Limit	Pk Margin
Hz	dB(uV)	dB(uV)	dB(uV)	dB
151385	51.8	79.0	66.0	-14.2
152078	50.6	79.0	66.0	-15.4
152424	50.2	79.0	66.0	-15.8
152944	50.2	79.0	66.0	-15.8
154329	50.5	79.0	66.0	-15.5
155888	50.1	79.0	66.0	-15.9
209049	51.2	79.0	66.0	-14.8

Test Mode: 120VAC 60Hz
Temperature: 20 C
Humidity: 50 %

Conducted Emissions



Intertek
Line Conducted Emissions 150 kHz - 30 MHz
EN55022 Class A (Line 2)
Operator: BG — Model Number: AEON
ITS Job Number: 3186504
28-Aug-09 — Company: Advanced RF

Frequency	Pk Level	QP Limit	Av Limit	Pk Margin
Hz	dB(uV)	dB(uV)	dB(uV)	dB
150173	51.2	79.0	66.0	-14.8
151039	52.2	79.0	66.0	-13.8
152771	52.0	79.0	66.0	-14.0
153290	51.0	79.0	66.0	-15.0
154329	51.9	79.0	66.0	-14.1
206106	54.0	79.0	66.0	-12.0

Test Mode: 120VAC 60Hz
Temperature: 20 C
Humidity: 50 %

8.0 Frequency Stability versus Temperature and Voltage
FCC 2.1055

8.1 Requirement

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

8.2 Test Procedure

The EUT was placed inside the temperature chamber. The RF output port was connected to a spectrum analyzer. The EUT was setup to transmit the maximum power.

After the temperature stabilized for approximately 20 minutes, the transmitting frequency was measured by the spectrum analyzer and recorded.

At room temperature, the frequency was measured when the EUT was powered with the nominal voltage and with 85% and 115% of the nominal voltage.

8.3 Test Results

Frequency Stability Test Data

Nominal frequency: 1880.000179 MHz

Temperature (Celsius)	Measured Frequency (MHz)	Deviation (Hz)
50	1880.000236	57
40	1880.000210	31
30	1880.000247	68
20	1880.000179	0
10	1880.000185	6
-10	1880.000153	26
-20	1880.000164	15
-30	1880.000228	49

Voltage AC 60Hz	Measured Frequency (MHz)	Deviation (Hz)
102	1880.000158	21
120	1880.000179	0
138	1880.000216	37

Result	Complies

9.0 List of Test Equipment

Measurement equipment used for compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
RF Filter Section	Hewlett Packard	85460A	3448A00267	12	7/01/10
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	7/01/10
Spectrum Analyzer	Rohde&Schwarz	FSU26	200482	12	4/27/10
BI-Log Antenna	EMCO	3143	9509	12	11/07/09
Pre-Amplifier	Sonoma	310N	185634	12	11/10/09
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	7/29/10
LISN	FCC	FCC-LISN-50-50-M-H	2011	12	9/19/09
Horn Antenna	EMCO	3115	9509-3712	12	10/22/09

10.0 RF Exposure evaluation

The EUT is a Cellular Repeater used in a fixed application, at least 50 cm from any body part of the user or near by persons.

PCS Band

The maximum conducted power for PCS Band is 1000 mW; antenna is fix-mounted with a maximum gain of 12 dBi gain. Therefore, to comply with RF Exposure Requirement, the MPE is calculated.

The maximum Peak EIRP calculated is 42 dBm or 15,849mW.

The Power Density can be calculated using the formula

$$S = EIRP/ 4\pi D^2$$

Where: S is Power Density in W/m^2
D is the distance from the antenna.

It is considered that 50cm is the minimum distance that a user can go closer to the EUT.

At 0.5 m, S = 5.05 W/m^2, which is below the MPE Limit of 10 W/m^2

Cell Band

The maximum conducted power for PCS Band is 1000 mW; antenna is fix-mounted with a maximum gain of 12 dBi gain. Therefore, to comply with RF Exposure Requirement, the MPE is calculated.

The maximum Peak EIRP calculated is 42 dBm or 15,849mW.

The Power Density can be calculated using the formula

$$S = EIRP/ 4\pi D^2$$

Where: S is Power Density in W/m^2
D is the distance from the antenna.

It is considered that 50cm is the minimum distance that a user can go closer to the EUT.

At 0.5 m, S = 5.05 W/m^2, which is below the MPE Limit of 5.67 W/m^2

11.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / 3186405	BG	August 31, 2009	Original document