Test Report

Report Number: 3186504MPK-004
Project Number: 3186504
Report Date: September 3, 2009

Testing performed on the
Cellular Repeater
Model Number: EPOCH-HC

FCC ID: S2O-EPOCHHC
IC ID: 6416A-EPOCHHC

to

FCC Part 22 Subpart H

for

Advanced RF Technologies

Test Performed by:	**Test Authorized by:**
Intertek	Advanced RF Technologies
1365 Adams Court	2607 Colorado Boulevard
Menlo Park, CA 94025 USA	Los Angeles, CA 90041 USA

Prepared by: _____ **Date:** September 3, 2009
Bruce Gordon, EMC Engineer

Reviewed by: _____ **Date:** September 3, 2009
Krishna Vemuri, Senior EMC Engineer

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1.0 Introduction

1.1 Product Description

The Equipment Under Test (EUT), model EPOCH-HC is a Cellular Repeater.

Rated RF Output Power	43 dBm, Down Link 27 dBm, Up Link
Frequency Ranges	Cellular Band 869 – 894 MHz, Down Link 824 – 849 MHz, Up Link
Type of modulation	CDMA (F9W) GSM (GXW) TDMA (DXW)
Antenna Gain	12 dBi max, Donor (Up Link) 3 dBi max, Server (Down Link)

EUT receive date: August 3, 2009
EUT receive condition: The production version of the EUT was received in good condition with no apparent damage.
Test start date: August 4, 2009
Test completion date: September 2, 2009

1.2 Summary of Test Results

FCC Rule	Description of Test	Result
2.1046	RF Power Output	Complies
2.1049	Occupied Bandwidth	Complies
22.913 24.232	ERP EIRP	N/A*
2.1051	Out of Band Emissions at Antenna Terminals	Complies
2.1053	Transmitter Spurious Radiation	Complies
2.1055	Frequency Stability vs. Temperature and Voltage	Complies
15.109	Radiated Emissions	Complies
15.107	AC Line Conducted	Complies

* This requirement is not applicable for amplifiers

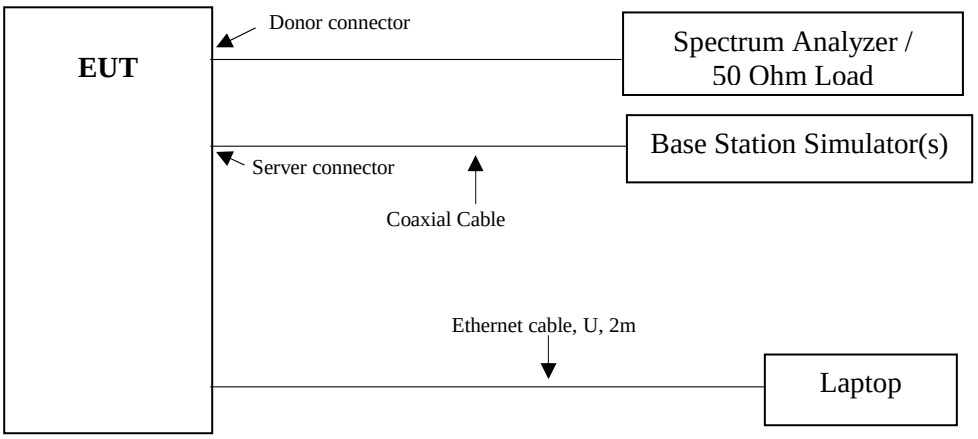
1.3 Test Configuration

1.3.1 Support Equipment

Description	Model	Serial Number
Compaq Laptop Computer	Compaq nc6220	None
JFW 50 Ohm Terminator	50T-034-1.0	ETL-342
JFW 50 Ohm Terminator	50T-034-1.0	ETL-343
Rohde & Schwarz Universal Radio Communication Set	CMU-200	101119
Rohde & Schwarz Universal Radio Communication Set	CMU-200	8374931/056

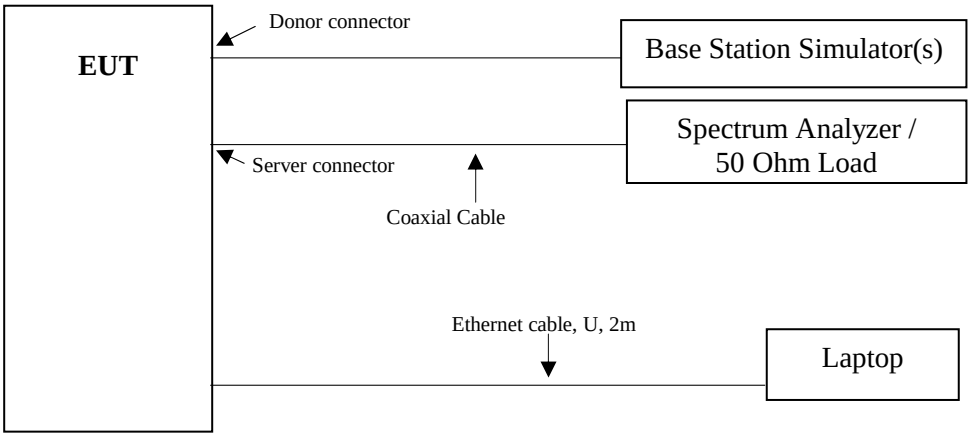
1.3.2 Block diagram of Test Setup

Up Link Configuration



S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

Down Link Configuration



S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

1.4 Mode of Operation

The EUT was powered by 120VAC. The EUT was configured for maximum gain, 95dB. Basestation simulators were used to provide the input signals to the EUT. Tests were performed with CDMA, GSM and TDMA modulations. The input power was the maximum declared by the manufacturer.

2.0 RF Power Output
FCC 2.1046

2.1 Test Procedure

The EUT RF output was connected as shown on the diagram in report section 1.3.2. The EUT was setup to transmit continuously with maximum power.

A spectrum analyzer was setup to measure peak power. Measurements were performed at three frequencies (low, middle, and high channels) with all modulations.

2.2 Test Equipment

Rohde & Schwarz FSU26 Spectrum Analyzer

2.3 Test Results

Up Link				
Modulation	**Channel**	**Frequency (MHz)**	**Input Power (dBm)**	**Output Power (dBm)**
CDMA Cell	1013	824.7	-75.2	27.0
CDMA Cell	384	836.52	-74.1	27.0
CDMA Cell	777	848.3	-73.5	27.0

Up Link				
Modulation	**Channel**	**Frequency (MHz)**	**Input Power (dBm)**	**Output Power (dBm)**
GSM 850	128	824.2	-67.2	27.0
GSM 850	190	836.6	-66.8	27.0
GSM 850	251	848.8	-66.0	27.0

Up Link				
Modulation	**Channel**	**Frequency (MHz)**	**Input Power (dBm)**	**Output Power (dBm)**
TDMA Cell	1013	824.7	-69.4	27.0
TDMA Cell	384	836.52	-69.1	27.0
TDMA Cell	777	848.3	-68.0	27.0

Down Link				
Modulation	**Channel**	**Frequency (MHz)**	**Input Power (dBm)**	**Output Power (dBm)**
CDMA Cell	1013	869.7	-53.0	43.0
CDMA Cell	384	881.52	-53.3	43.0
CDMA Cell	777	893.3	-53.8	43.0

Down Link				
Modulation	**Channel**	**Frequency (MHz)**	**Input Power (dBm)**	**Output Power (dBm)**
GSM 850	128	869.2	-51.1	43.0
GSM 850	190	881.6	-51.4	43.0
GSM 850	251	893.8	-52.1	43.0

Down Link				
Modulation	**Channel**	**Frequency (MHz)**	**Input Power (dBm)**	**Output Power (dBm)**
TDMA Cell	1013	869.7	-52.9	43.0
TDMA Cell	384	881.52	-53.4	43.0
TDMA Cell	777	893.3	-53.8	43.0

3.0 Occupied Bandwidth, Input/Output Comparison

FCC 2.1049

3.1 Test Procedure

The EUT RF ports were connected as shown on the diagram in report section 1.3.2. The EUT was setup to transmit maximum power.

The spectrum analyzer was setup to measure the Occupied Bandwidth (defined as the 99% Power Bandwidth). The Occupied Bandwidth was measured at the input and output ports of the EUT at the middle channels for each type of modulation in the Up Link and Down Link bands.

3.2 Test Equipment

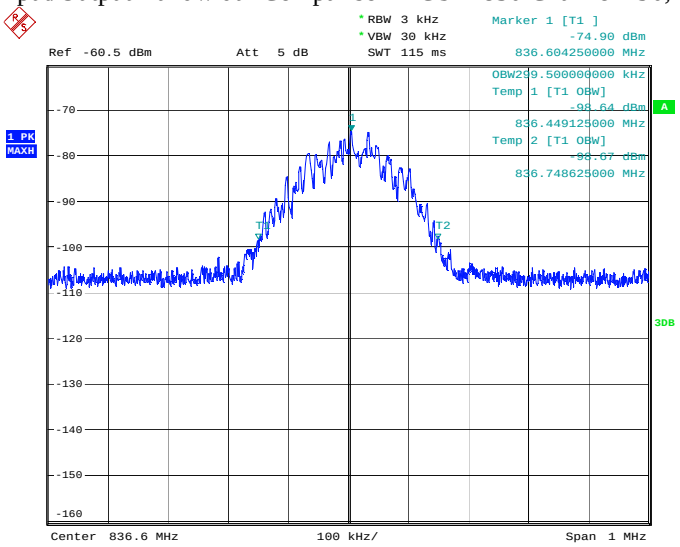
Rohde & Schwarz FSU26 Spectrum Analyzer

3.3 Test Results

Refer to the following Graphs.

Result	Complies

Graph 3.1
Input/Output Bandwidth Comparison – GSM 850 Channel 190, Up Link



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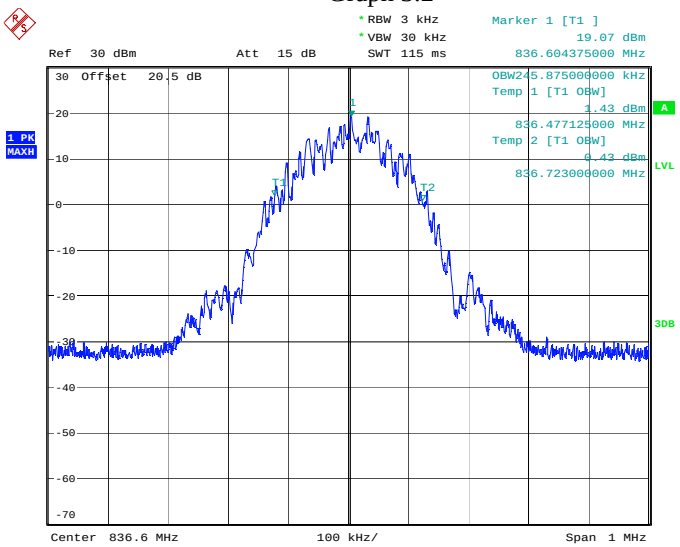
Graph 3.2



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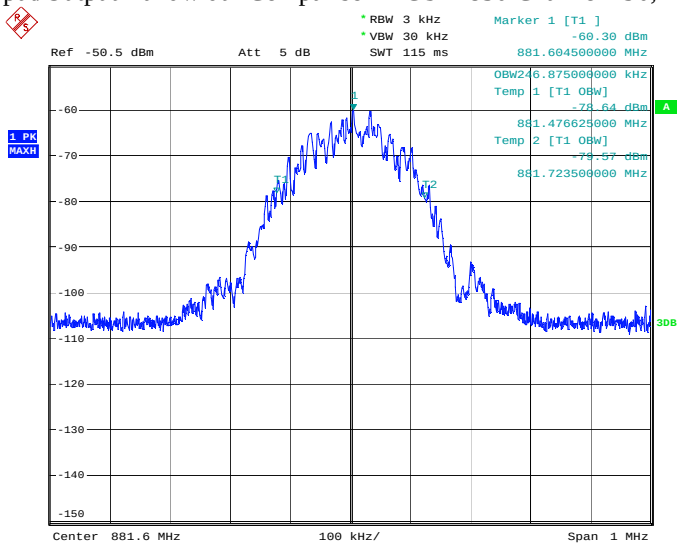
Graph 3.3
Input/Output Bandwidth Comparison – GSM 850 Channel 190, Down Link



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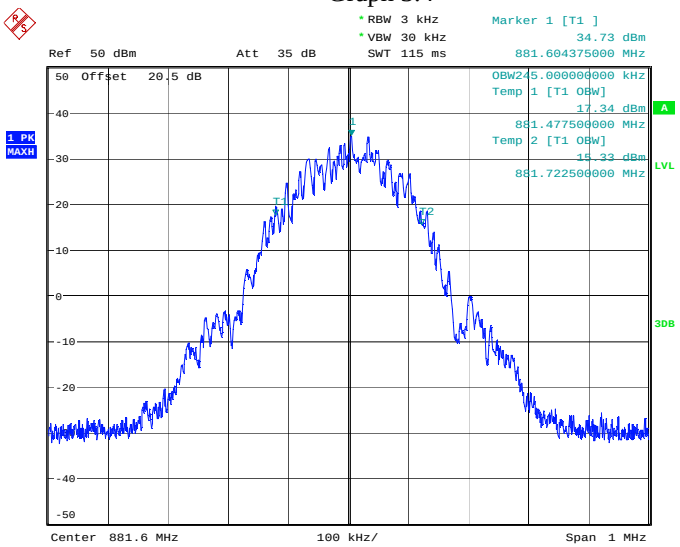
Graph 3.4



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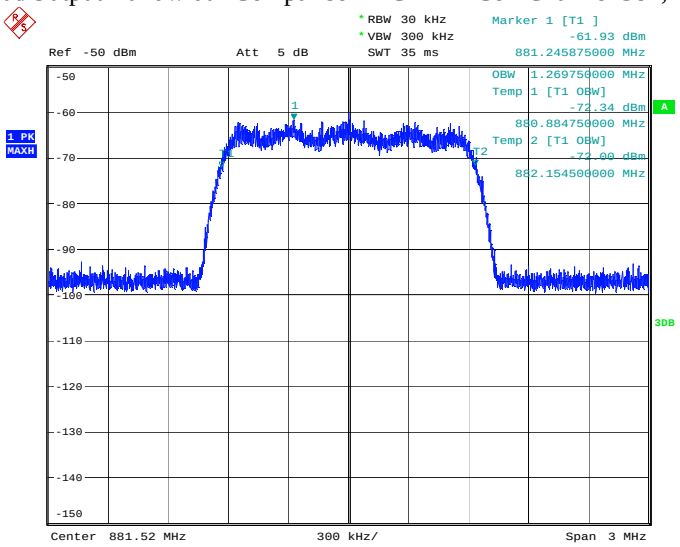
Graph 3.5
Input/Output Bandwidth Comparison – CDMA Cell Channel 384, Down Link



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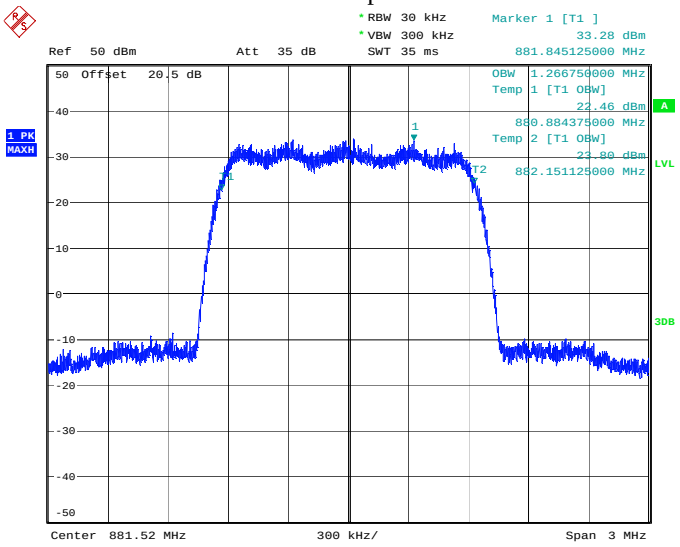
Graph 3.6



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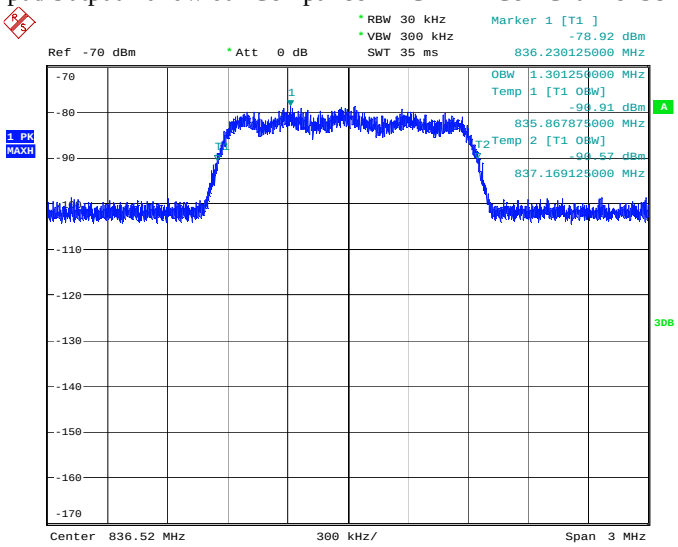
Graph 3.7
Input/Output Bandwidth Comparison – CDMA Cell Channel 384, Up Link



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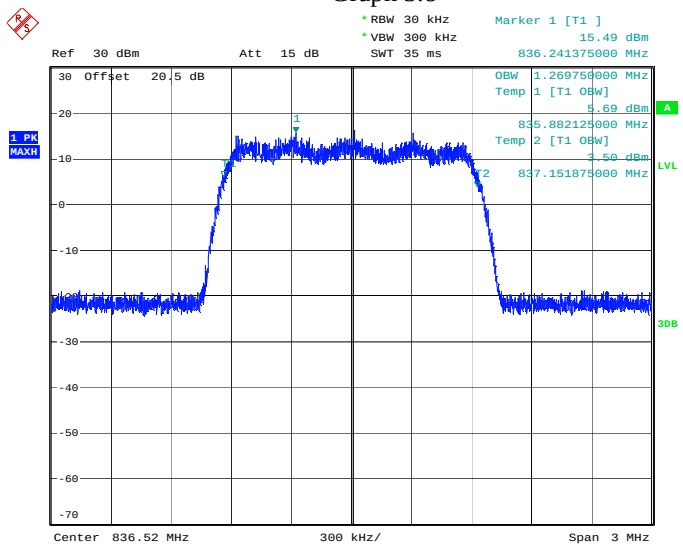
Graph 3.8



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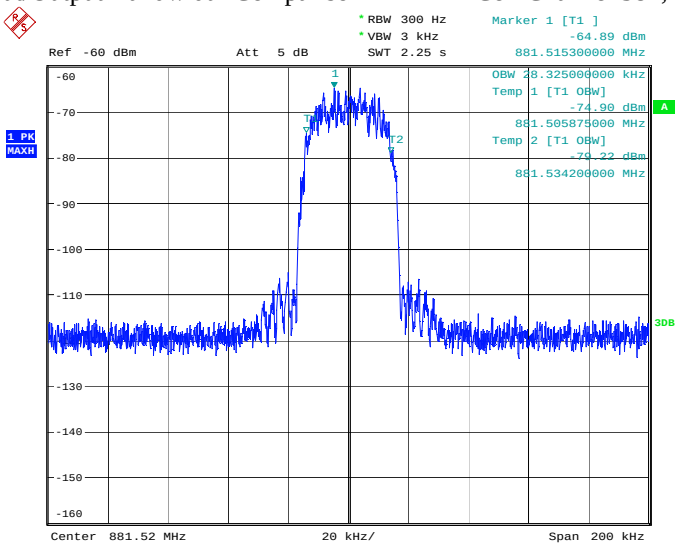
Graph 3.9
Input/Output Bandwidth Comparison – TDMA Cell Channel 384, Down Link



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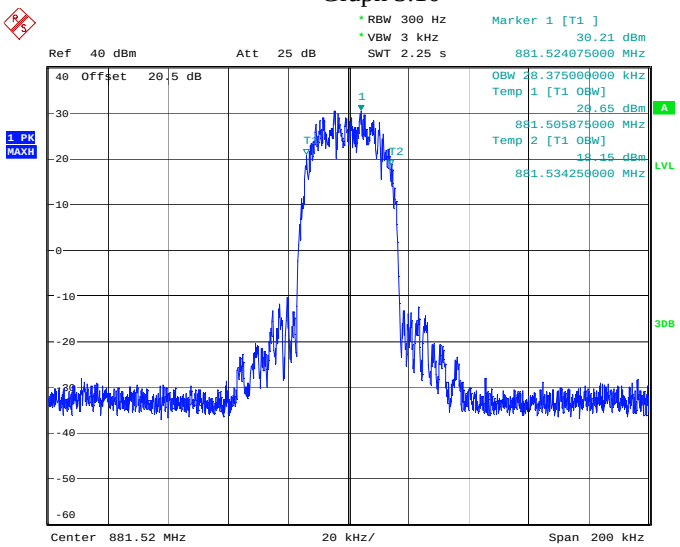
Graph 3.10



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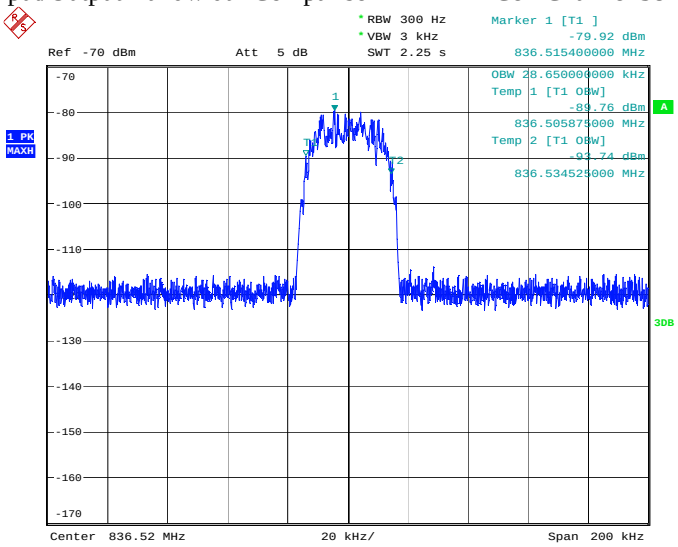
Graph 3.11
Input/Output Bandwidth Comparison – TDMA Cell Channel 384, Up Link



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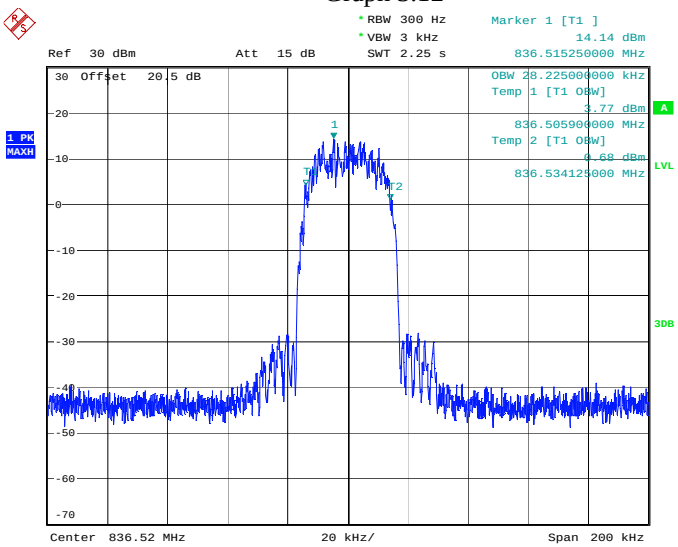
Graph 3.12



Date: 24.AUG.2009 19:08:41

4.0 Out-of-Band Emissions at Antenna Terminal

FCC 2.1051

4.1 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 out-of-band and spurious emissions.

4.2 Test Procedure

The EUT RF output was connected as shown on the diagram in report section 1.3.2. The EUT was setup to transmit the maximum power.

The spectrum analyzer resolution bandwidth (RBW) was set to 100 kHz in the Cell band. For measurements at the band edges, the resolution bandwidth (RBW) was set to 100 kHz. Measurements were performed at three frequencies at the low, middle, and high channels for all modulations types.

Intermodulation was performed by injecting two modulated signals into the EUT. One signal was set at the bandedge of either the Up Link or Down Link band and the other signal was set 6 MHz away.

4.3 Test Equipment

Rohde & Schwarz FSU26 Spectrum Analyzer

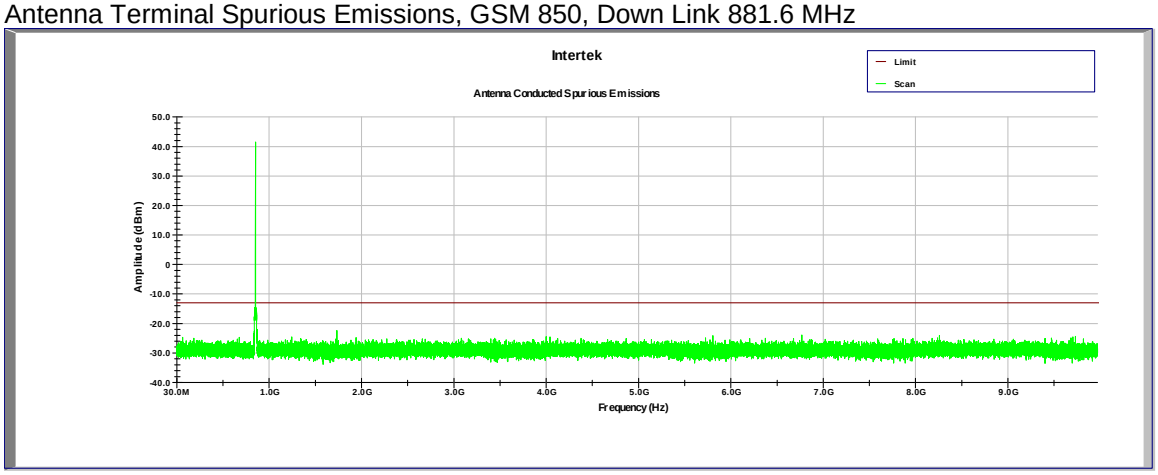
4.4 Test Results

Refer to the following Graphs.

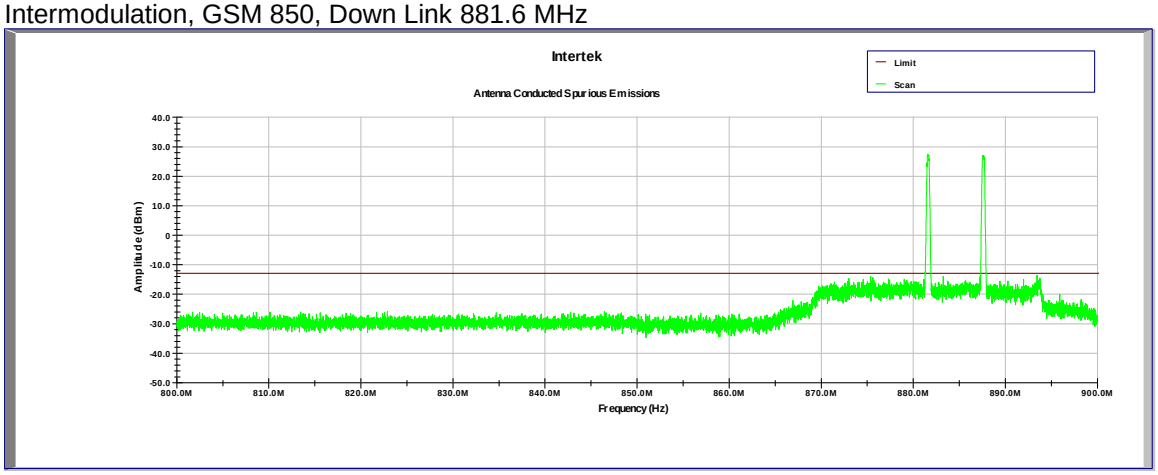
Result	Complies

Graph 4.1 & 4.2

Antenna Terminal Spurious Emissions, GSM 850, Down Link 881.6 MHz

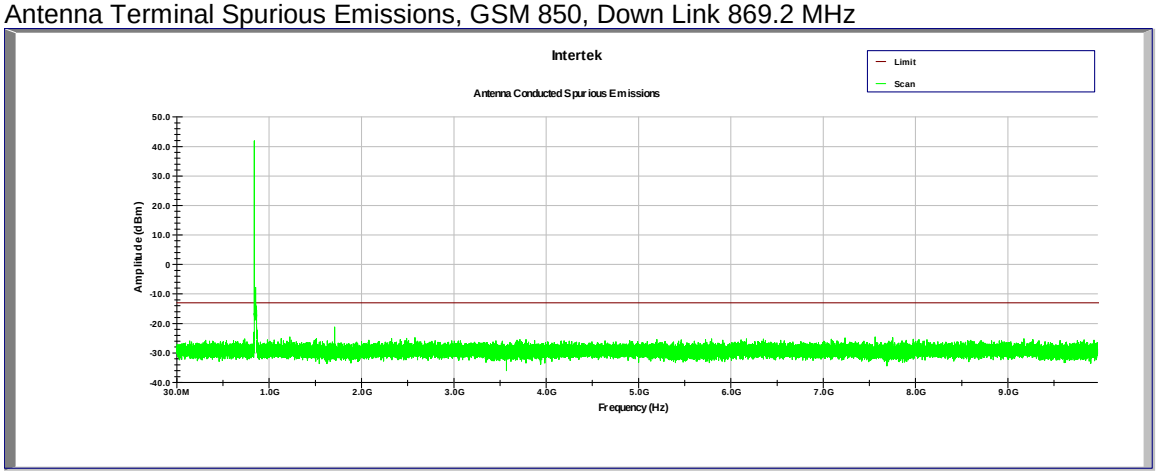


Intermodulation, GSM 850, Down Link 881.6 MHz

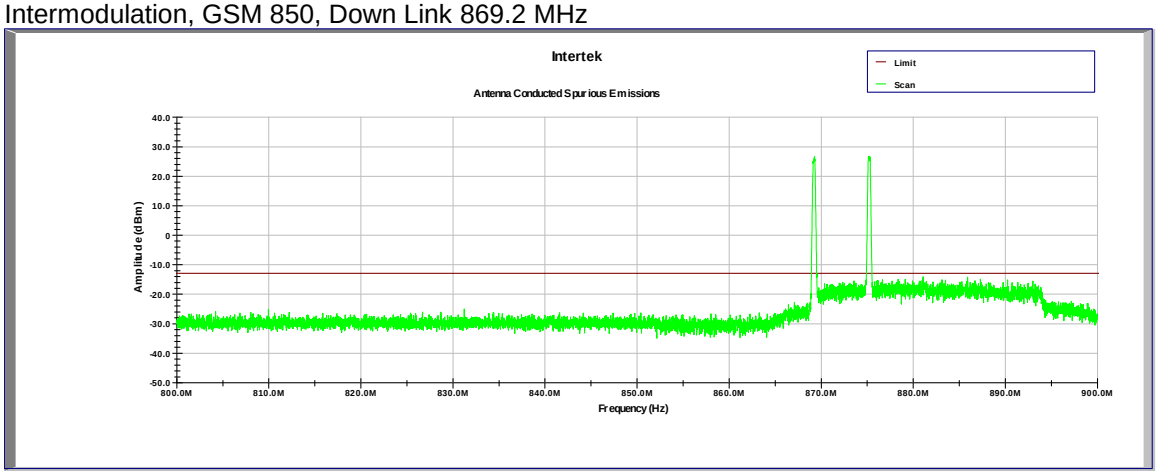


Graph 4.3 & 4.4

Antenna Terminal Spurious Emissions, GSM 850, Down Link 869.2 MHz

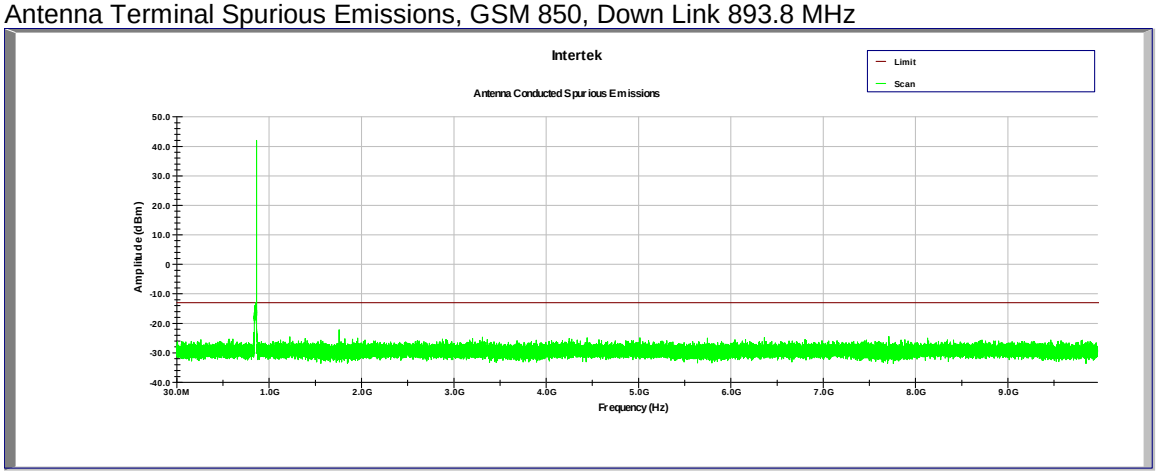


Intermodulation, GSM 850, Down Link 869.2 MHz

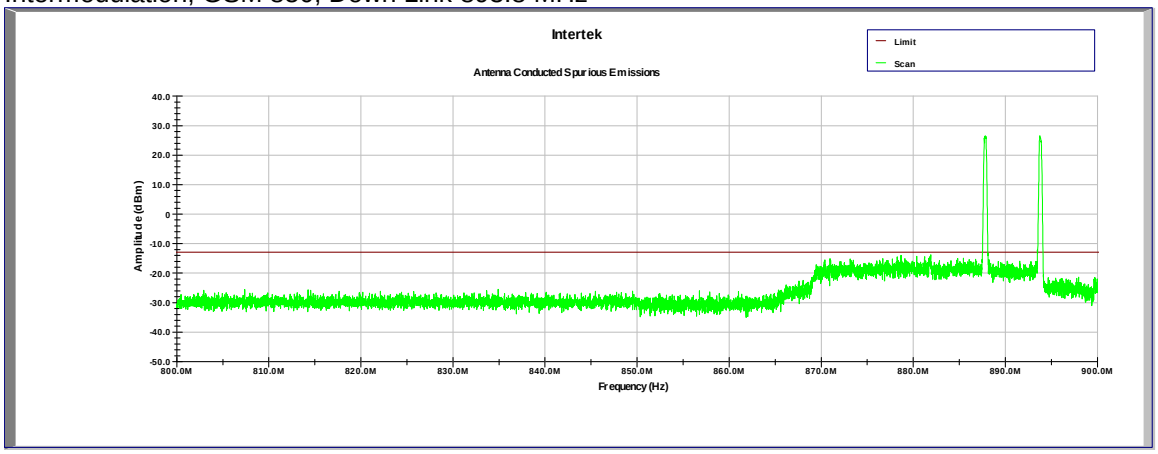


Graph 4.5 & 4.6

Antenna Terminal Spurious Emissions, GSM 850, Down Link 893.8 MHz

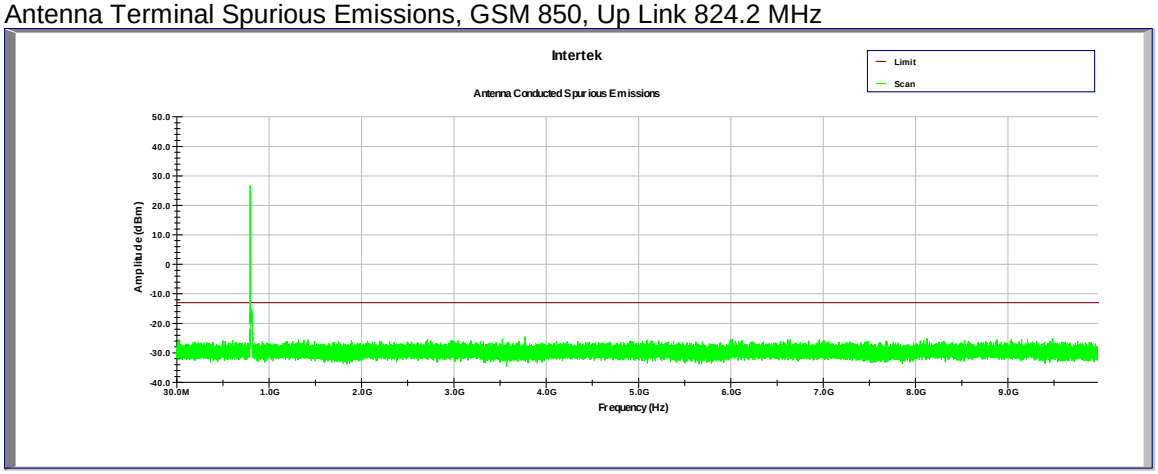


Intermodulation, GSM 850, Down Link 893.8 MHz

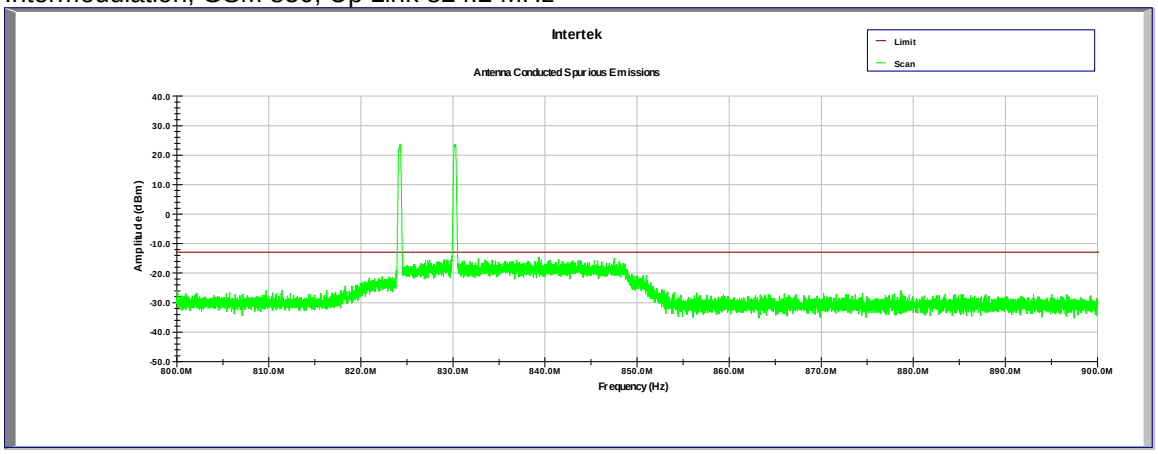


Graph 4.7 & 4.8

Antenna Terminal Spurious Emissions, GSM 850, Up Link 824.2 MHz

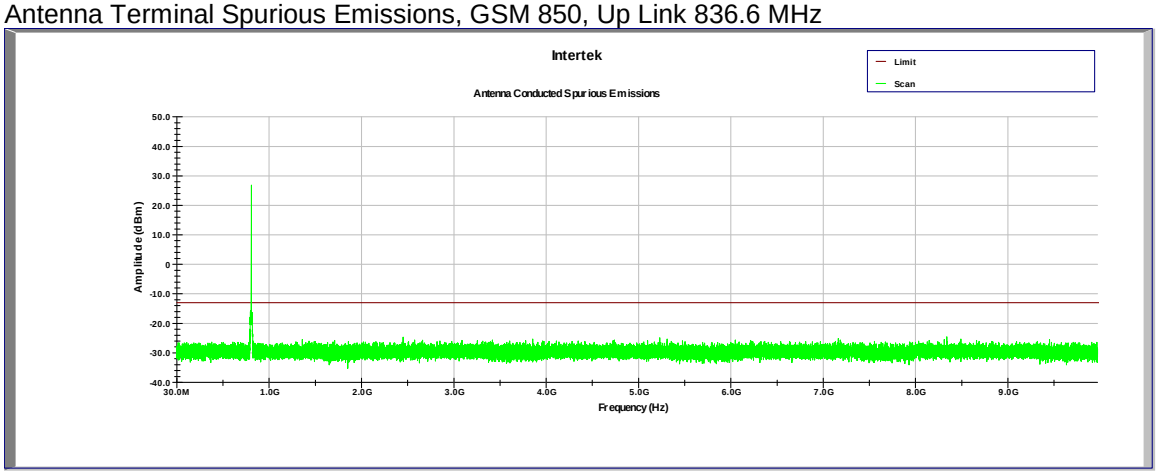


Intermodulation, GSM 850, Up Link 824.2 MHz

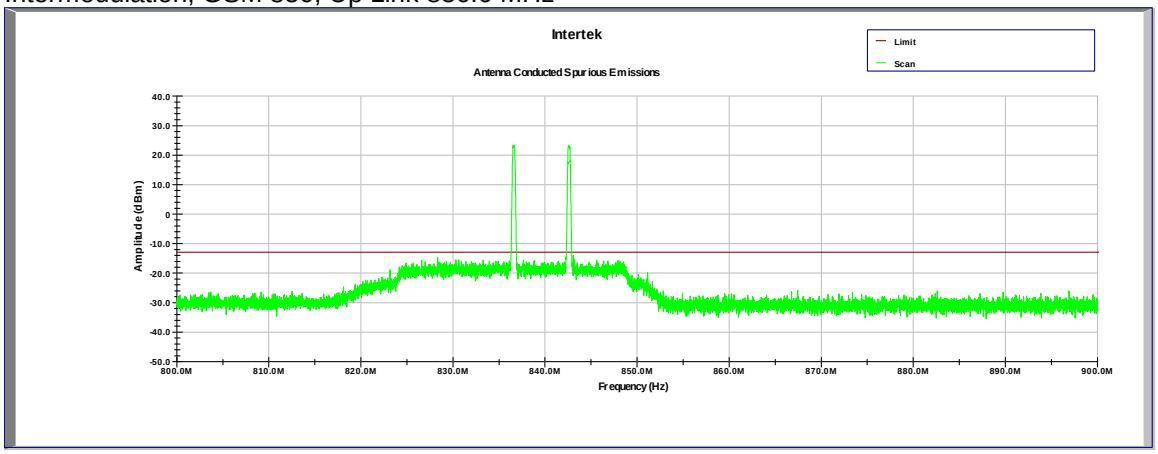


Graph 4.9 & 4.10

Antenna Terminal Spurious Emissions, GSM 850, Up Link 836.6 MHz

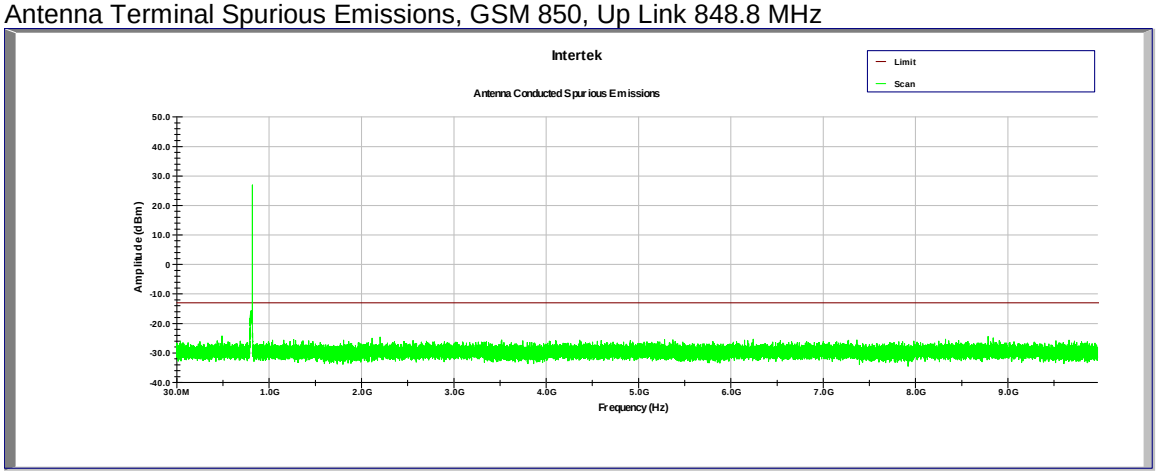


Intermodulation, GSM 850, Up Link 836.6 MHz

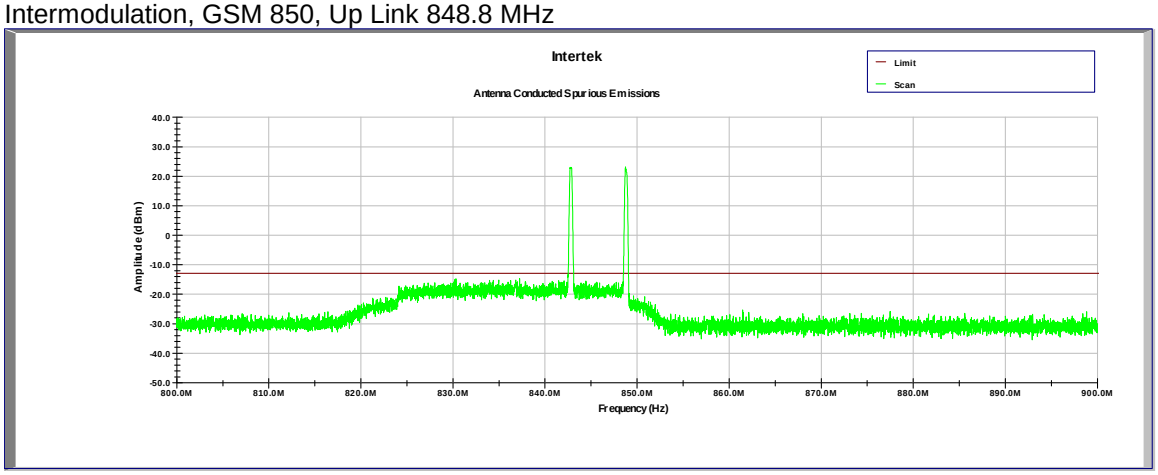


Graph 4.11 & 4.12

Antenna Terminal Spurious Emissions, GSM 850, Up Link 848.8 MHz

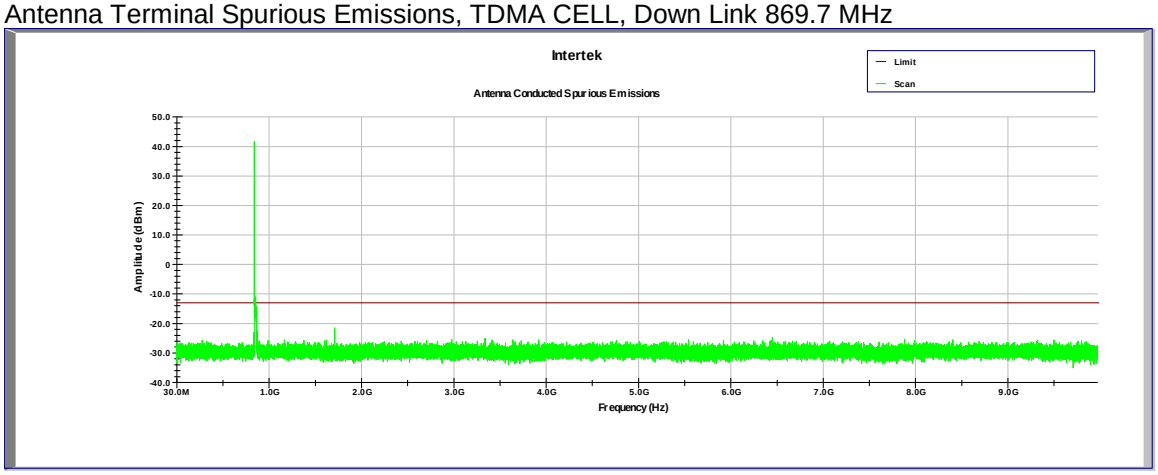


Intermodulation, GSM 850, Up Link 848.8 MHz

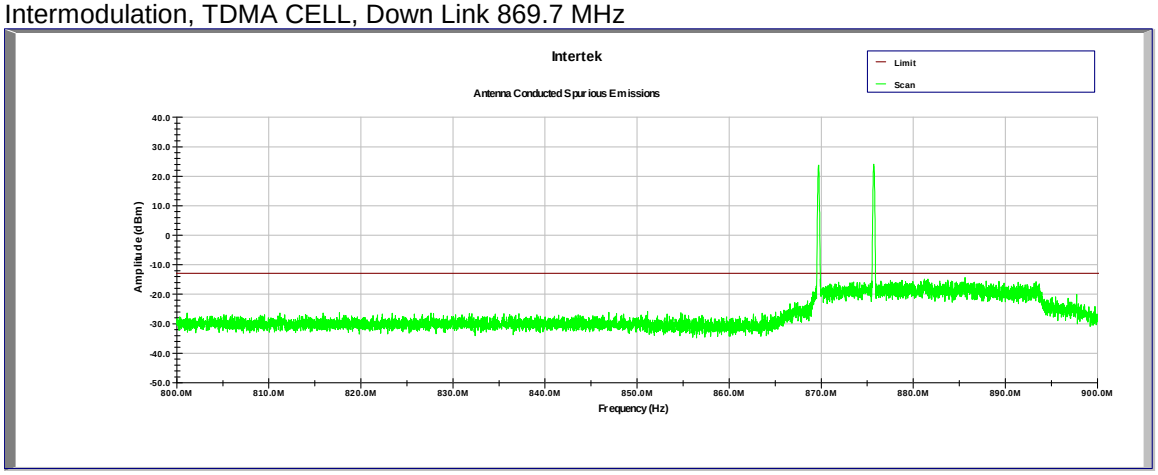


Graph 4.13 & 4.14

Antenna Terminal Spurious Emissions, TDMA CELL, Down Link 869.7 MHz

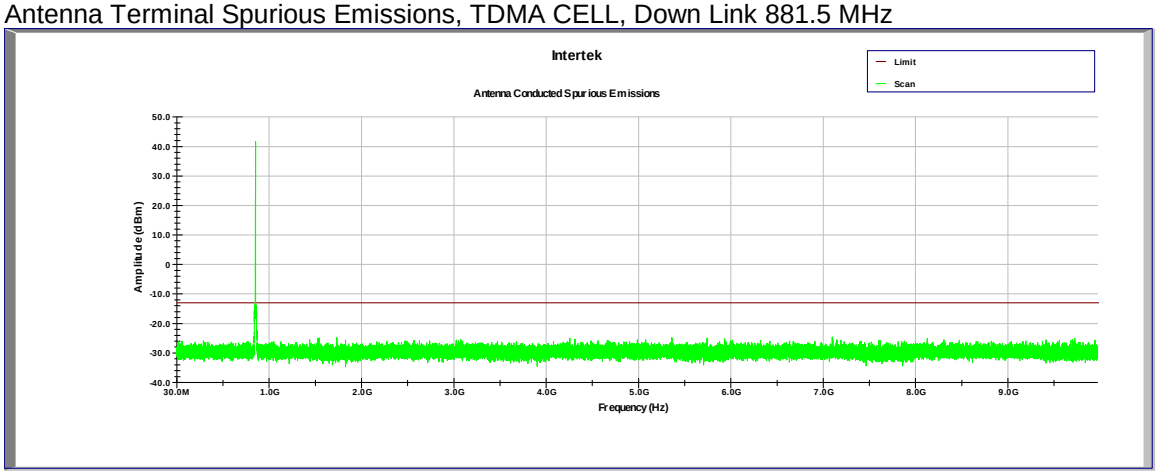


Intermodulation, TDMA CELL, Down Link 869.7 MHz

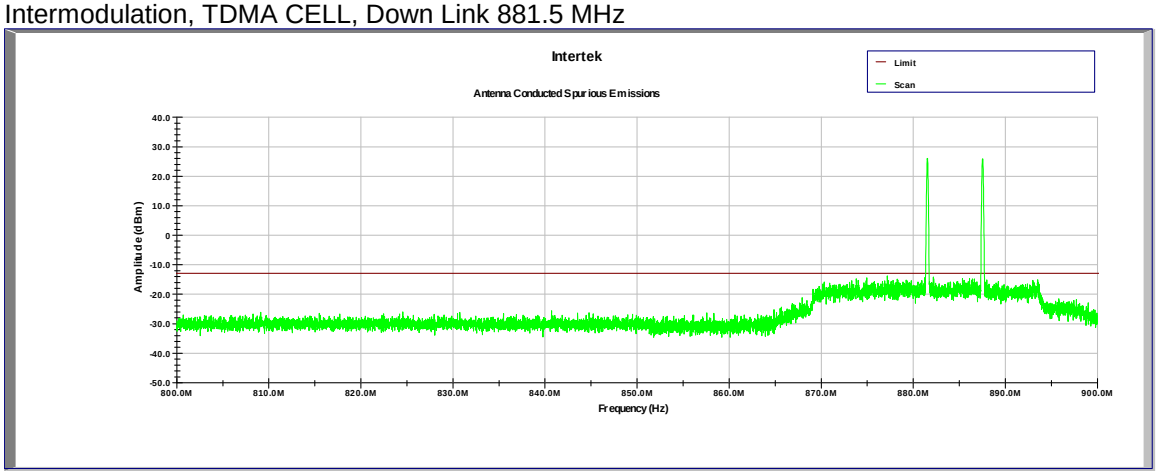


Graph 4.15 & 4.16

Antenna Terminal Spurious Emissions, TDMA CELL, Down Link 881.5 MHz

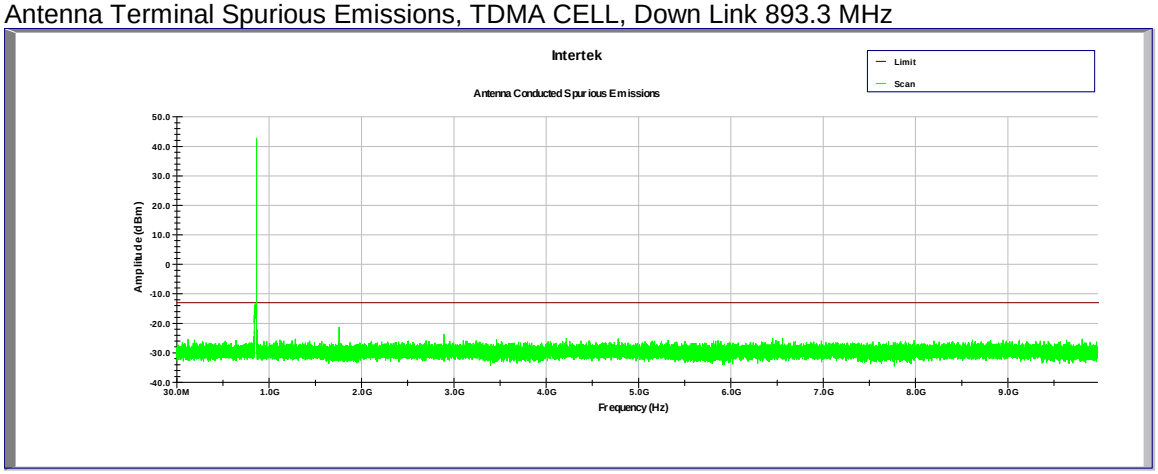


Intermodulation, TDMA CELL, Down Link 881.5 MHz

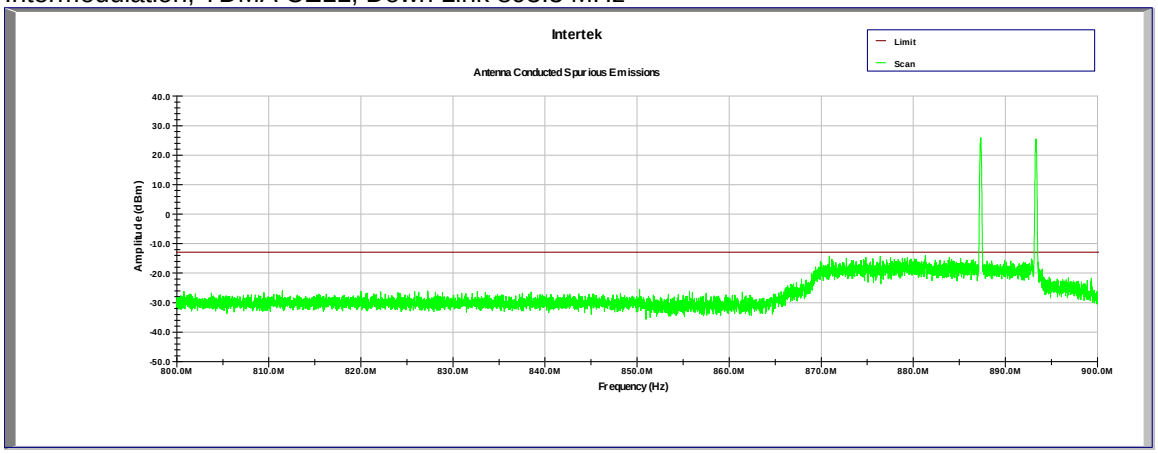


Graph 4.17 & 4.18

Antenna Terminal Spurious Emissions, TDMA CELL, Down Link 893.3 MHz

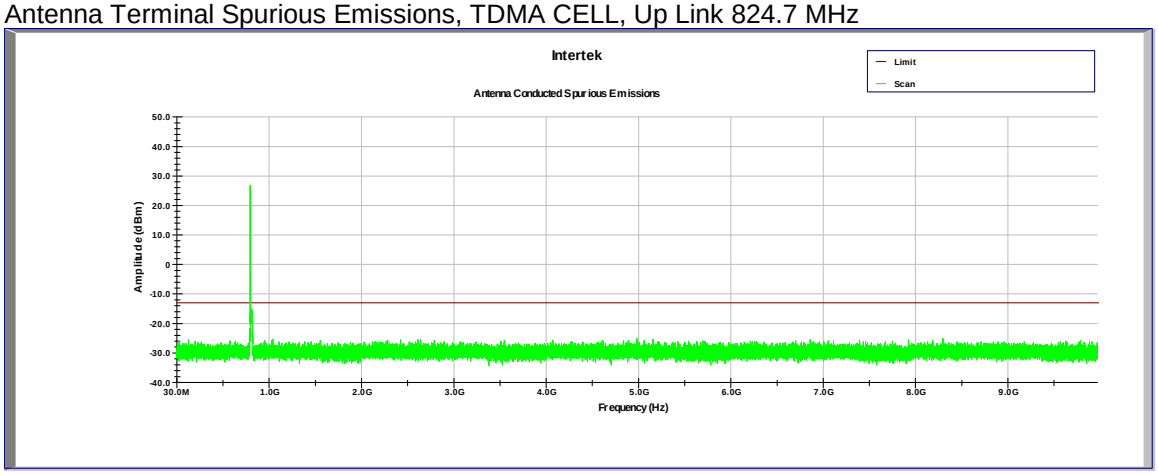


Intermodulation, TDMA CELL, Down Link 893.3 MHz

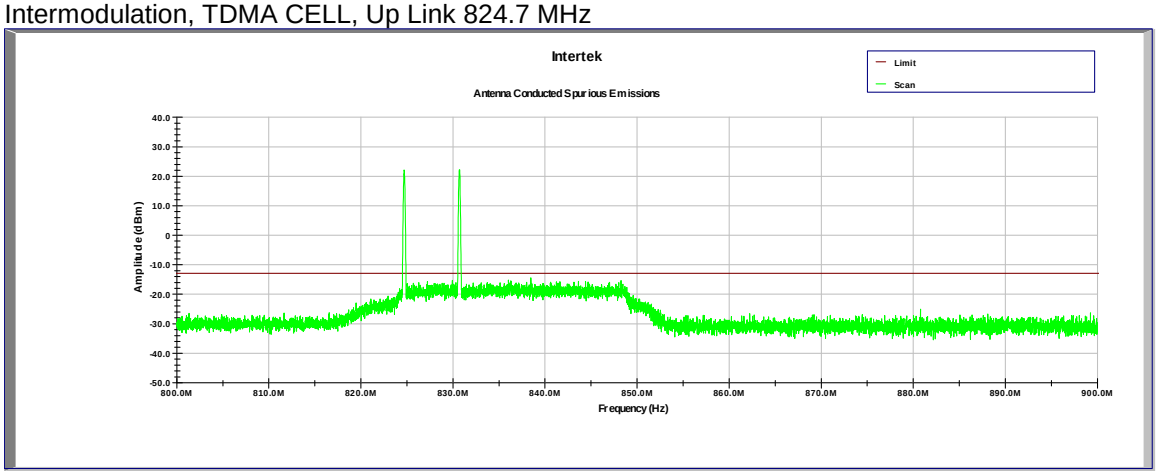


Graph 4.19 & 4.20

Antenna Terminal Spurious Emissions, TDMA CELL, Up Link 824.7 MHz

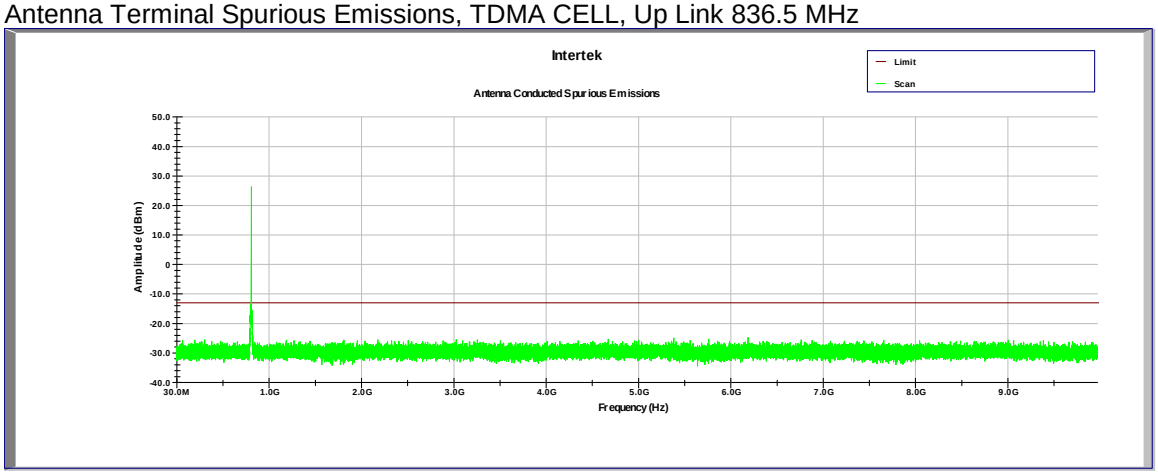


Intermodulation, TDMA CELL, Up Link 824.7 MHz

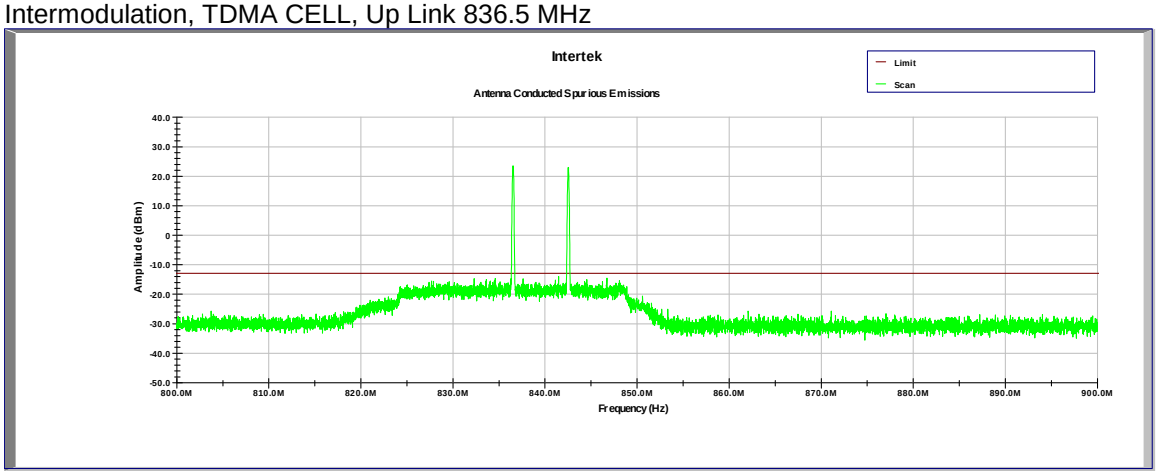


Graph 4.21 & 4.22

Antenna Terminal Spurious Emissions, TDMA CELL, Up Link 836.5 MHz

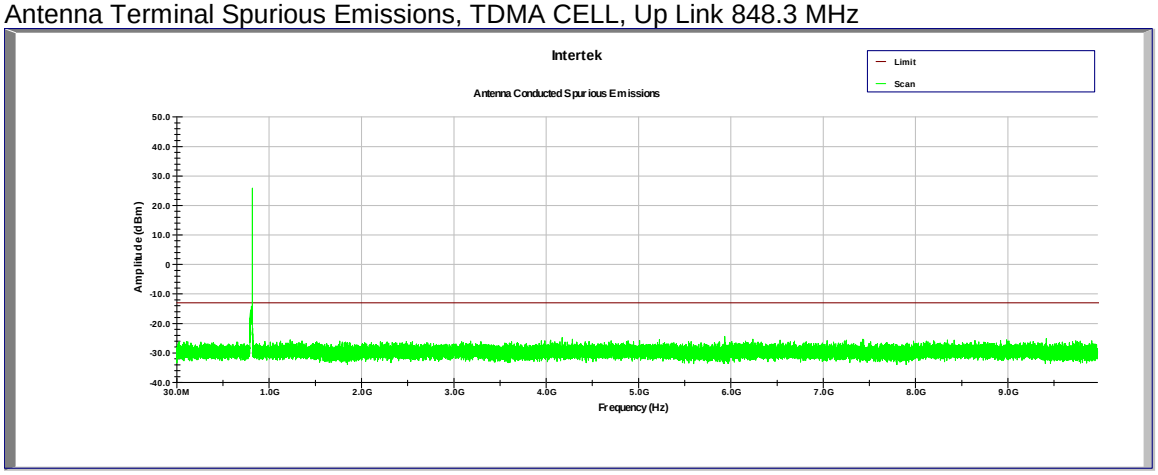


Intermodulation, TDMA CELL, Up Link 836.5 MHz

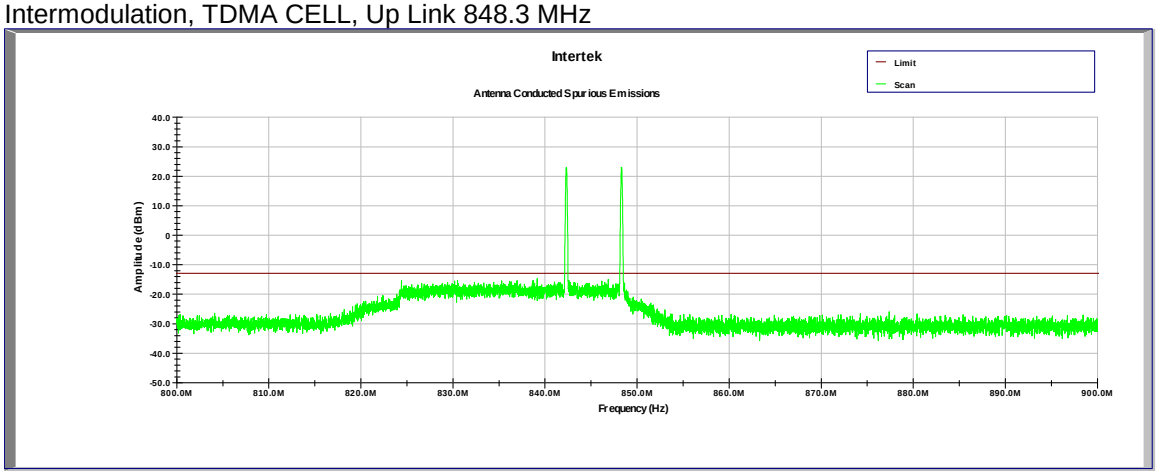


Graph 4.23 & 4.24

Antenna Terminal Spurious Emissions, TDMA CELL, Up Link 848.3 MHz

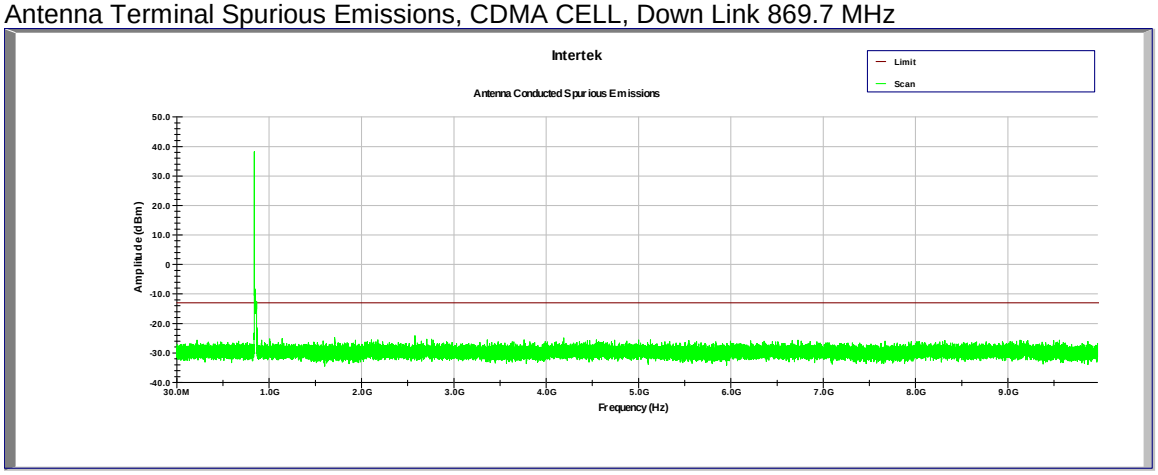


Intermodulation, TDMA CELL, Up Link 848.3 MHz

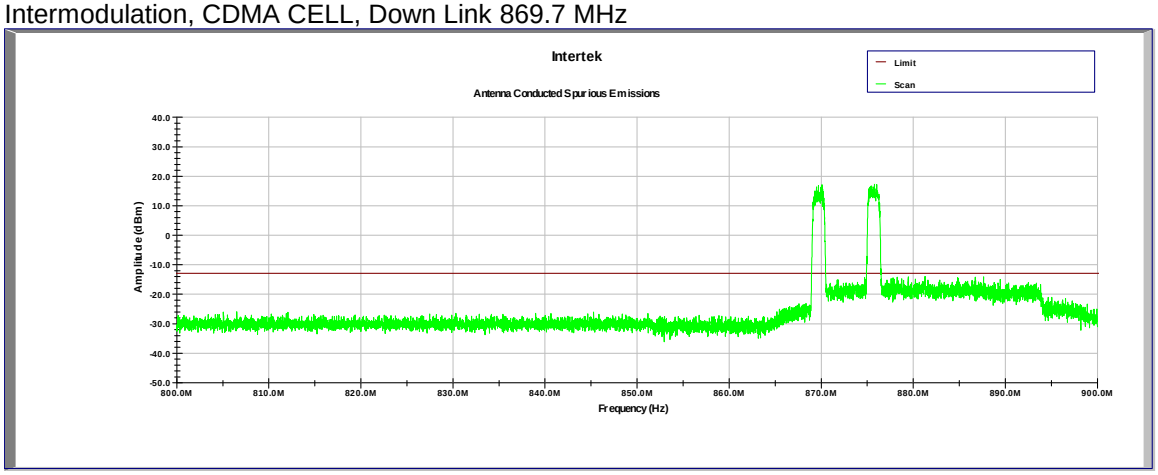


Graph 4.25 & 4.26

Antenna Terminal Spurious Emissions, CDMA CELL, Down Link 869.7 MHz

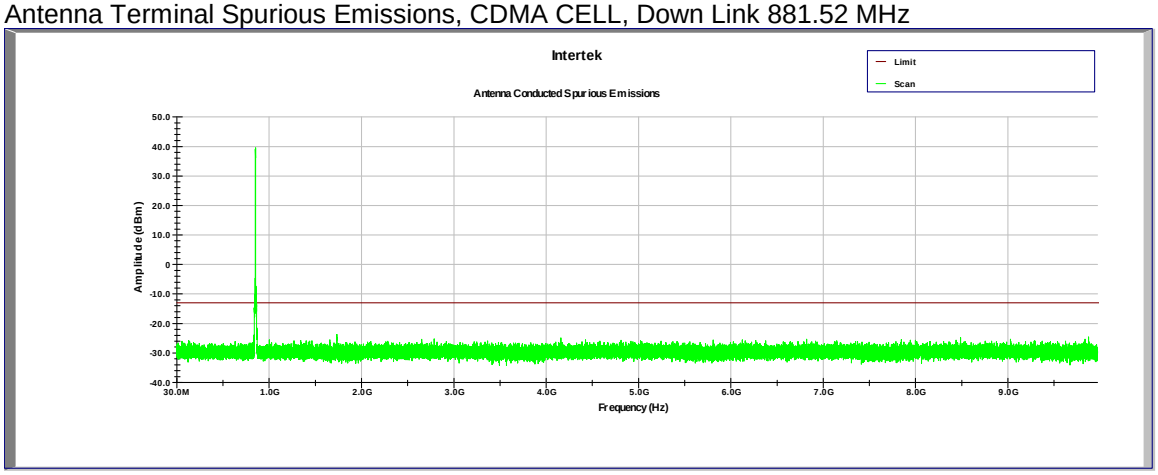


Intermodulation, CDMA CELL, Down Link 869.7 MHz

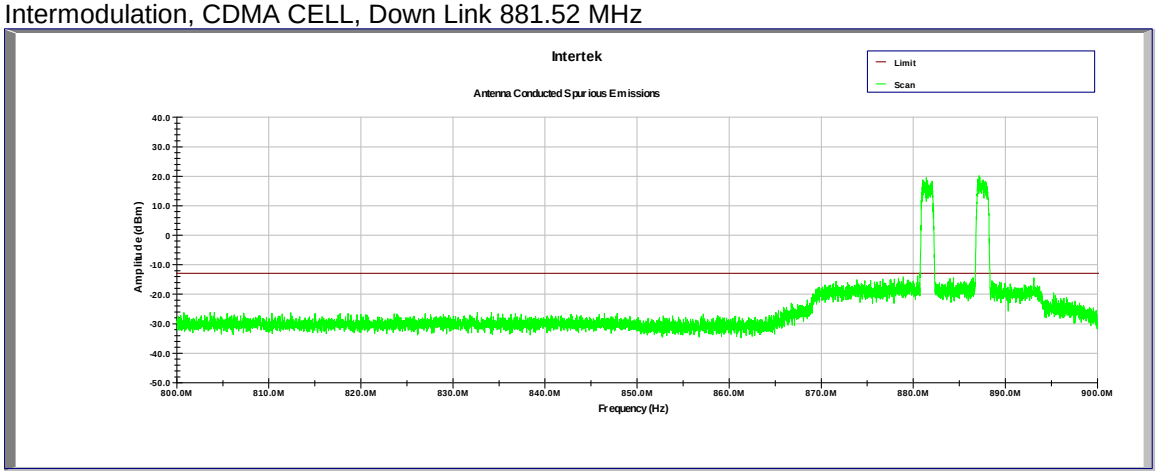


Graph 4.27 & 4.28

Antenna Terminal Spurious Emissions, CDMA CELL, Down Link 881.52 MHz

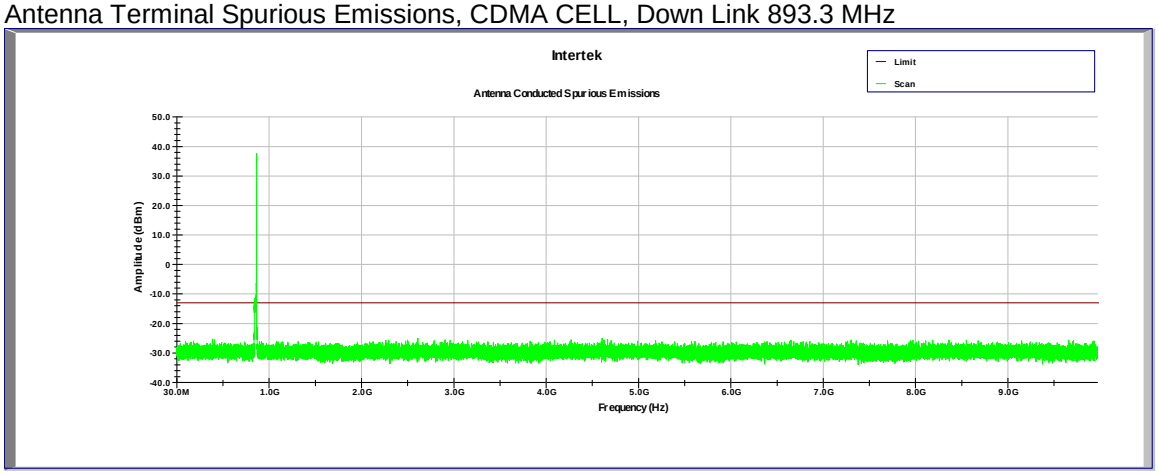


Intermodulation, CDMA CELL, Down Link 881.52 MHz

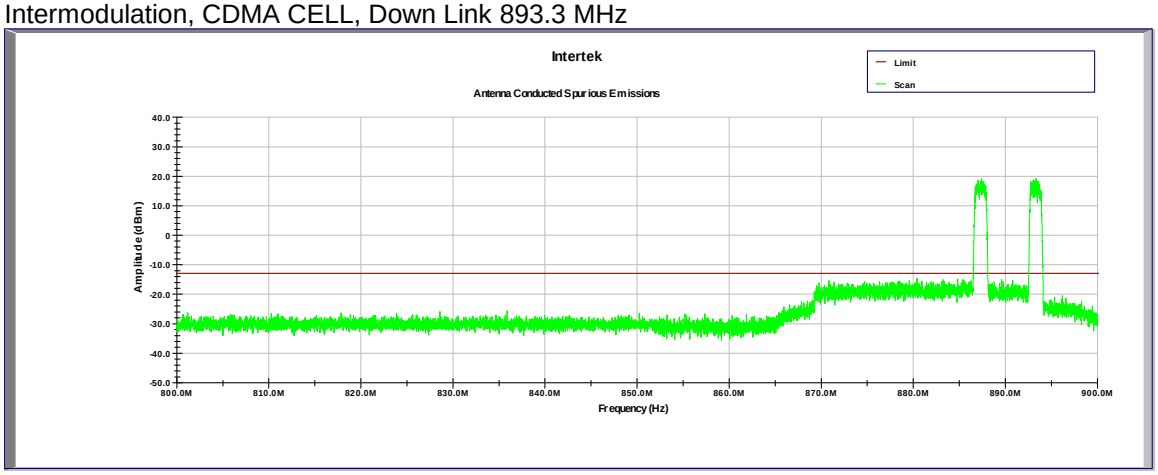


Graph 4.29 & 4.30

Antenna Terminal Spurious Emissions, CDMA CELL, Down Link 893.3 MHz

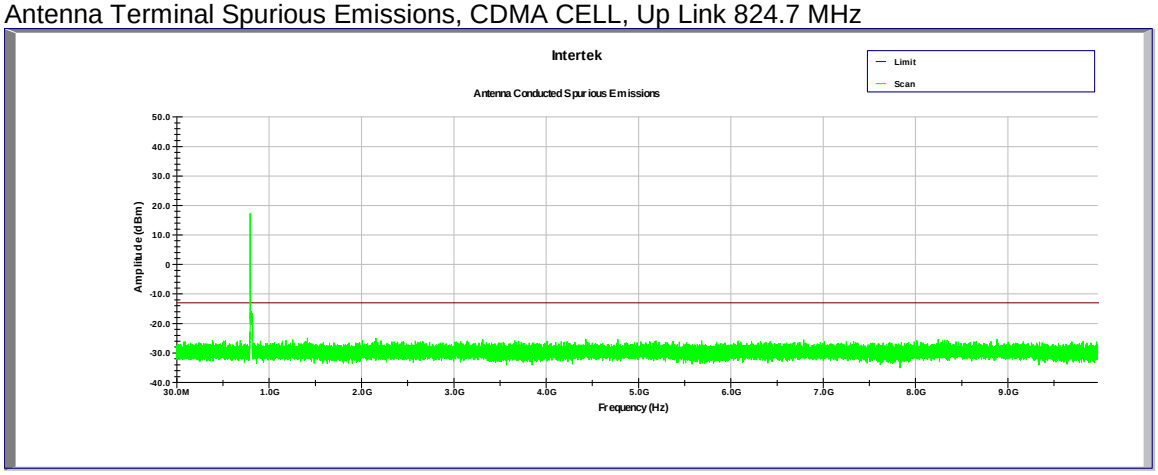


Intermodulation, CDMA CELL, Down Link 893.3 MHz

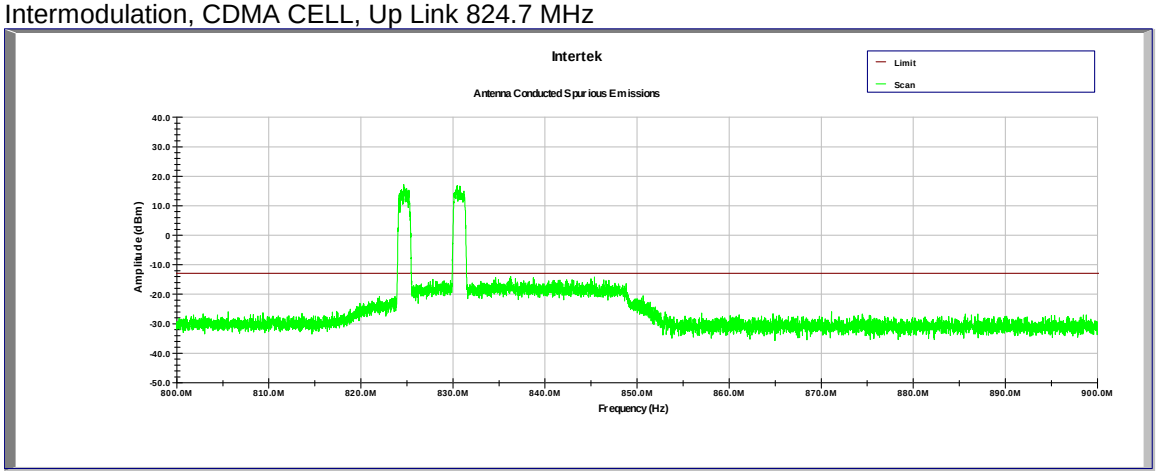


Graph 4.31 & 4.32

Antenna Terminal Spurious Emissions, CDMA CELL, Up Link 824.7 MHz

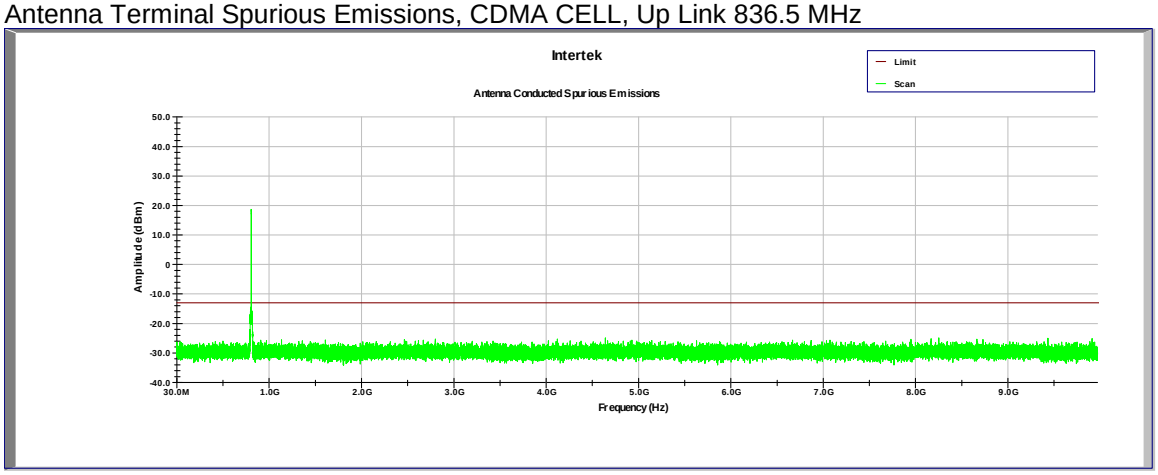


Intermodulation, CDMA CELL, Up Link 824.7 MHz

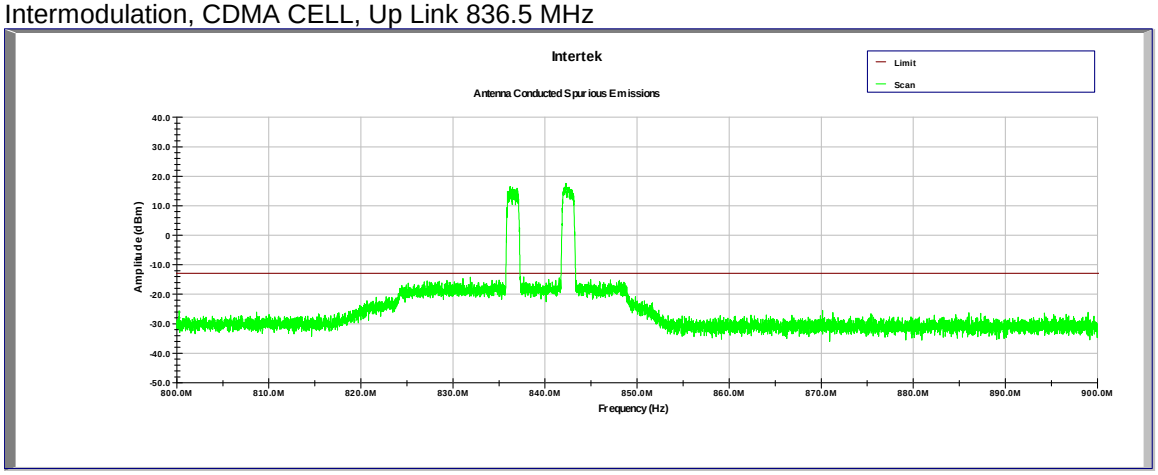


Graph 4.33 & 4.34

Antenna Terminal Spurious Emissions, CDMA CELL, Up Link 836.5 MHz

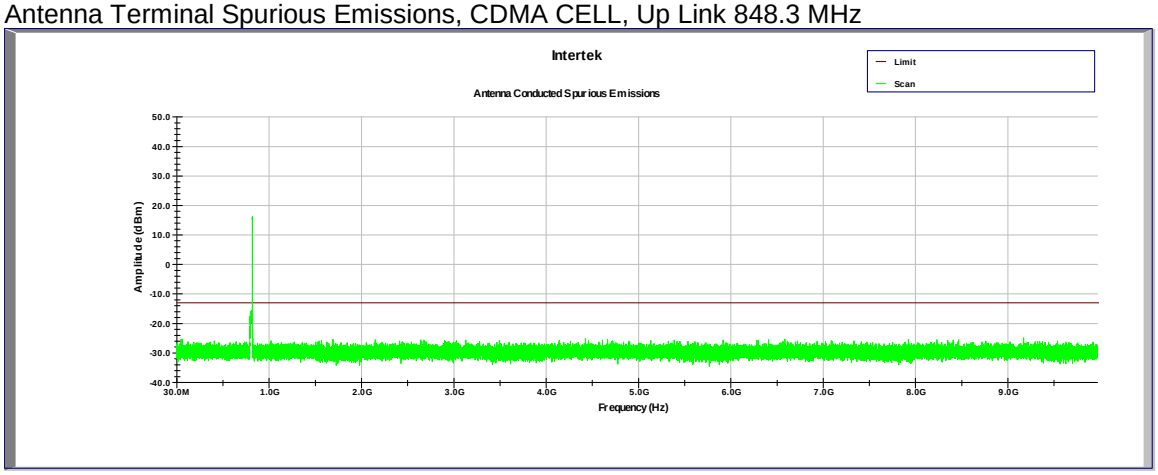


Intermodulation, CDMA CELL, Up Link 836.5 MHz

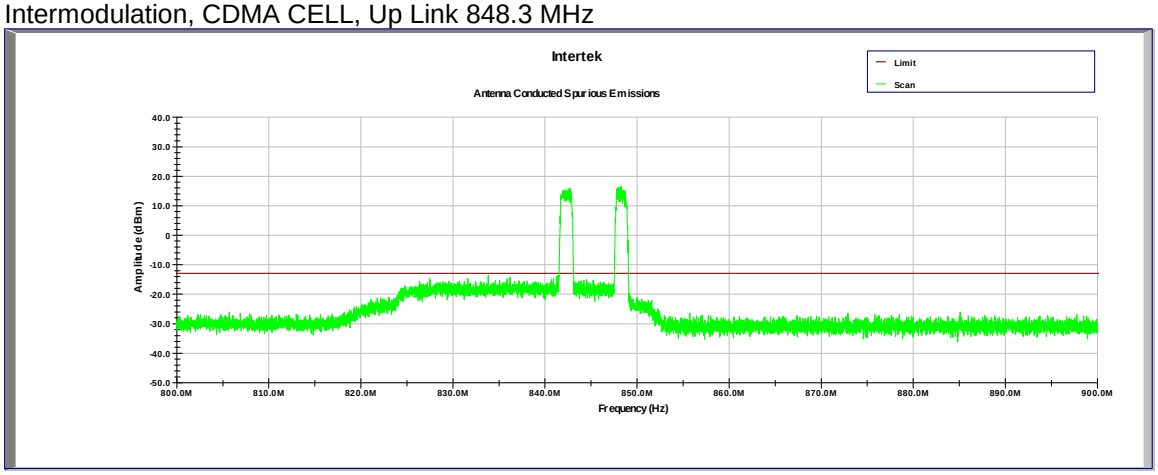


Graph 4.35 & 4.36

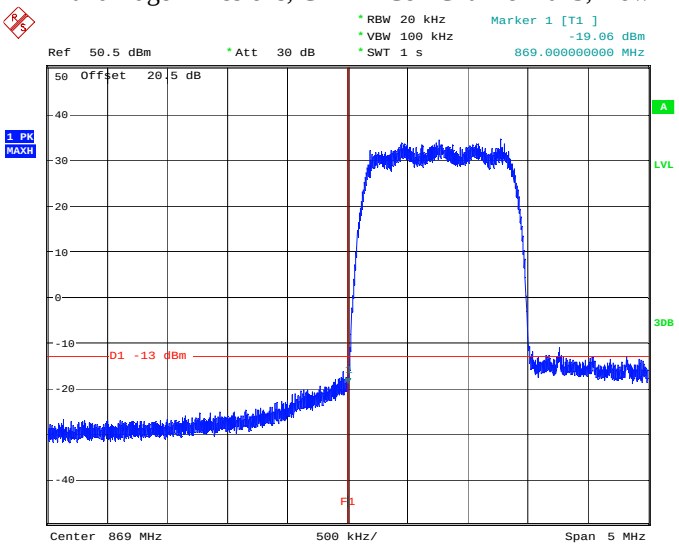
Antenna Terminal Spurious Emissions, CDMA CELL, Up Link 848.3 MHz



Intermodulation, CDMA CELL, Up Link 848.3 MHz

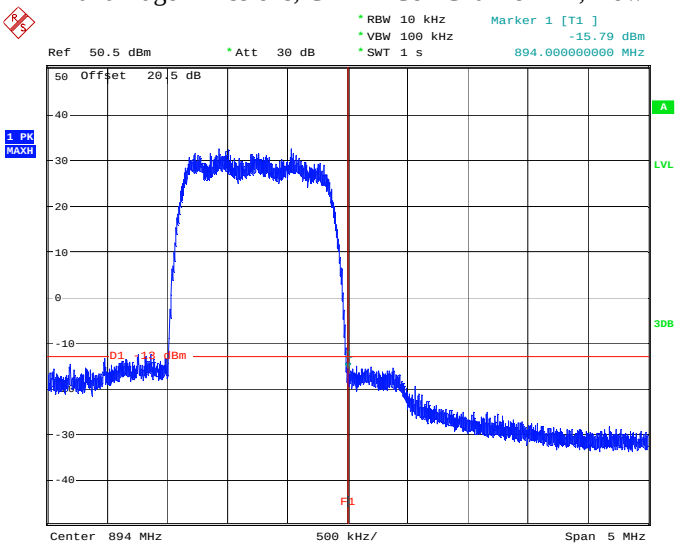


Graph 4.37
Band Edge Emissions, CDMA Cell Channel 1013, Down Link



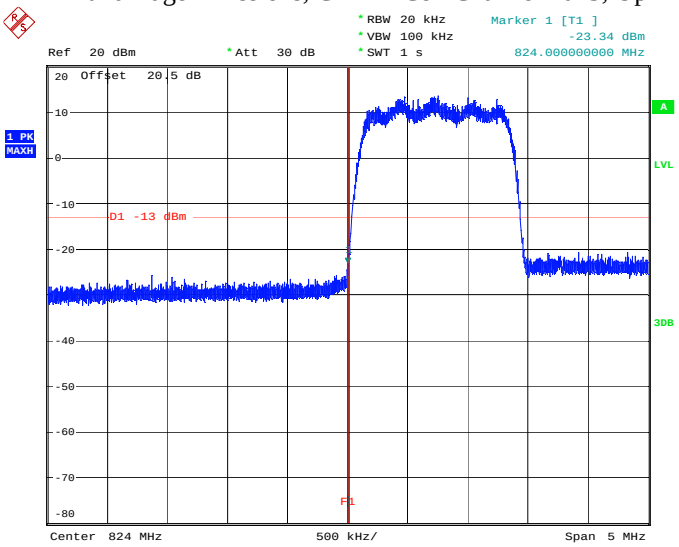
Date: 25.AUG.2009 01:57:23

Graph 4.38
Band Edge Emissions, CDMA Cell Channel 777, Down Link



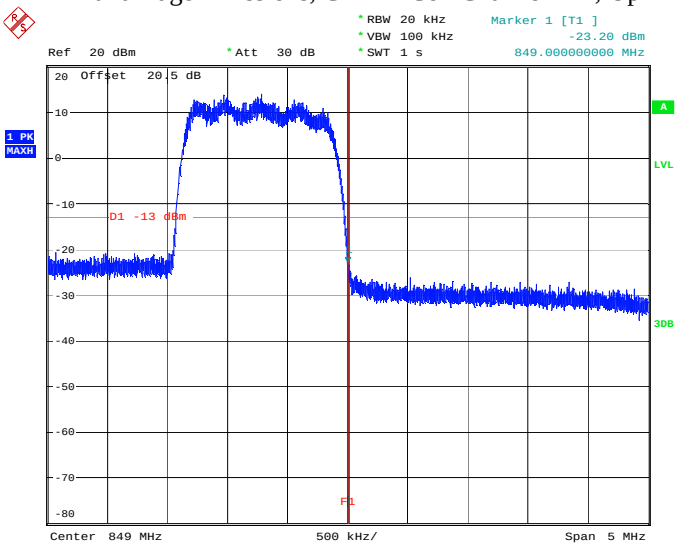
Date: 25.AUG.2009 02:05:08

Graph 4.39
Band Edge Emissions, CDMA Cell Channel 1013, Up Link



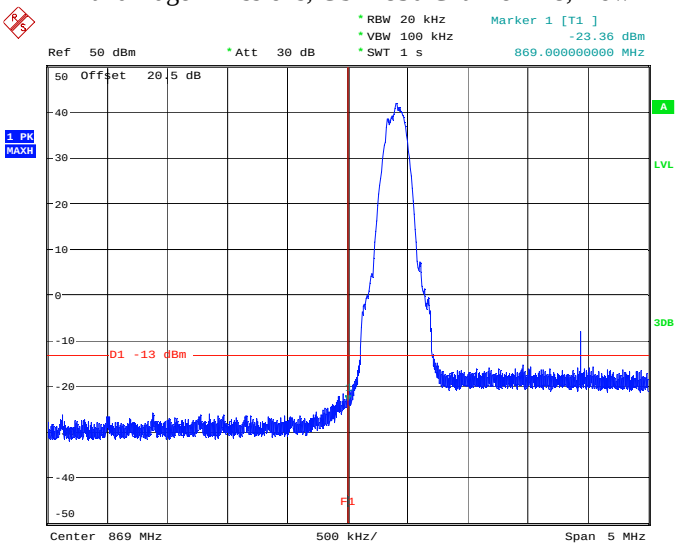
Date: 25.AUG.2009 02:10:10

Graph 4.40
Band Edge Emissions, CDMA Cell Channel 777, Up Link

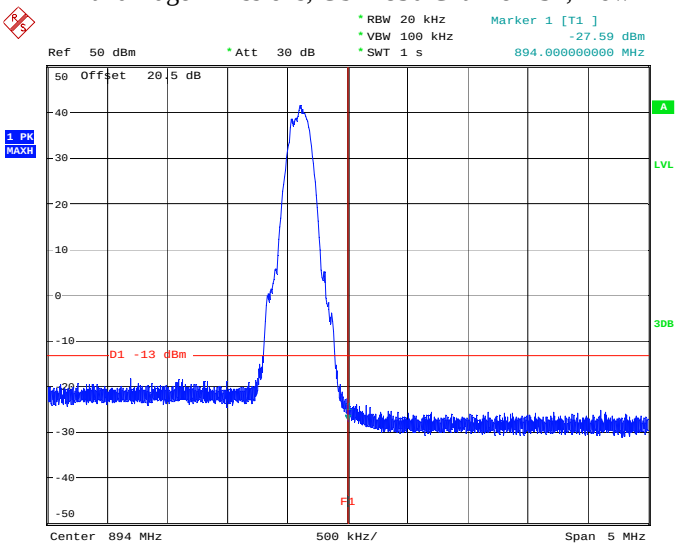


Date: 25.AUG.2009 02:11:51

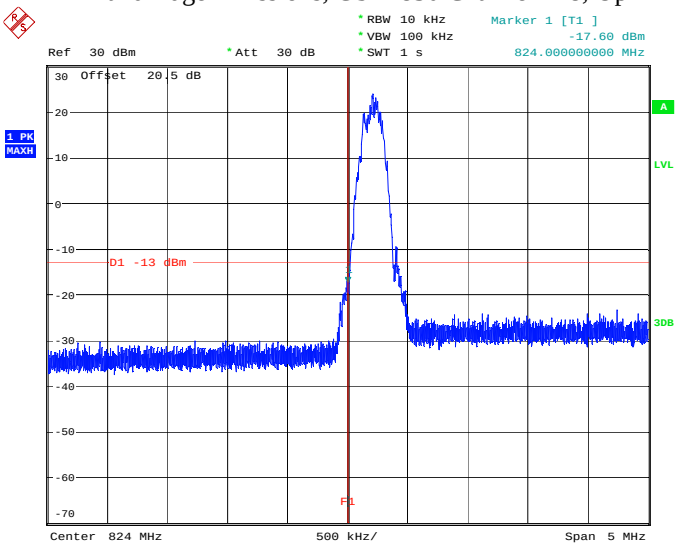
Graph 4.41
Band Edge Emissions, GSM 850 Channel 128, Down Link



Graph 4.42
Band Edge Emissions, GSM 850 Channel 251, Down Link

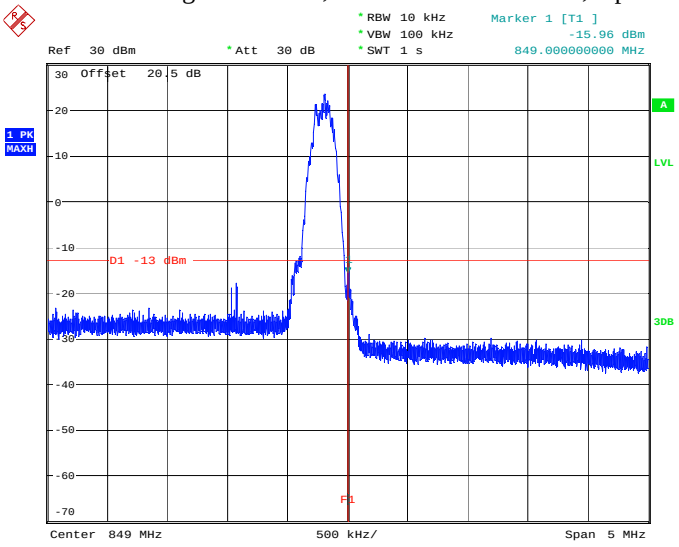


Graph 4.43
Band Edge Emissions, GSM 850 Channel 128, Up Link



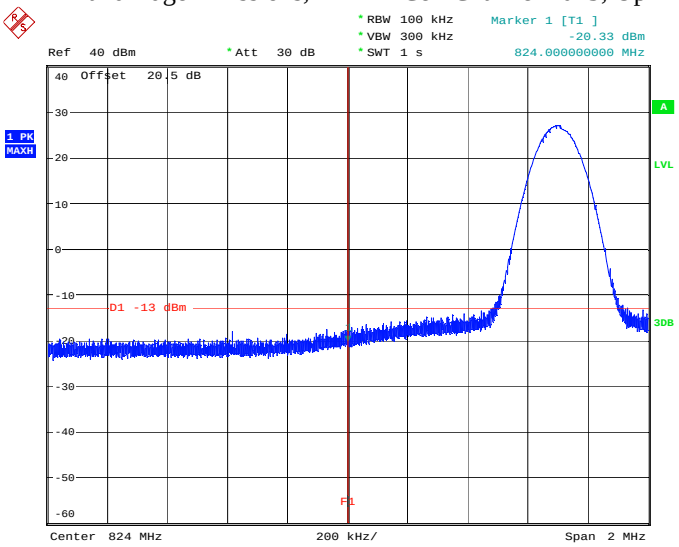
Date: 25.AUG.2009 02:39:24

Graph 4.44
Band Edge Emissions, GSM 850 Channel 251, Up Link

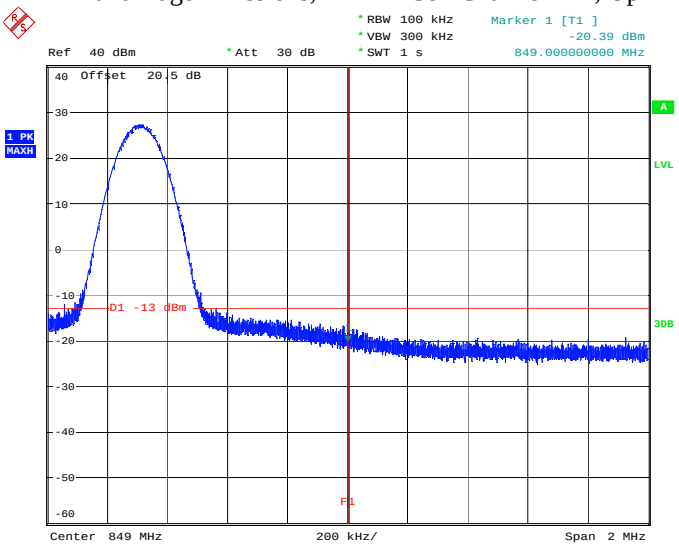


Date: 25.AUG.2009 02:40:16

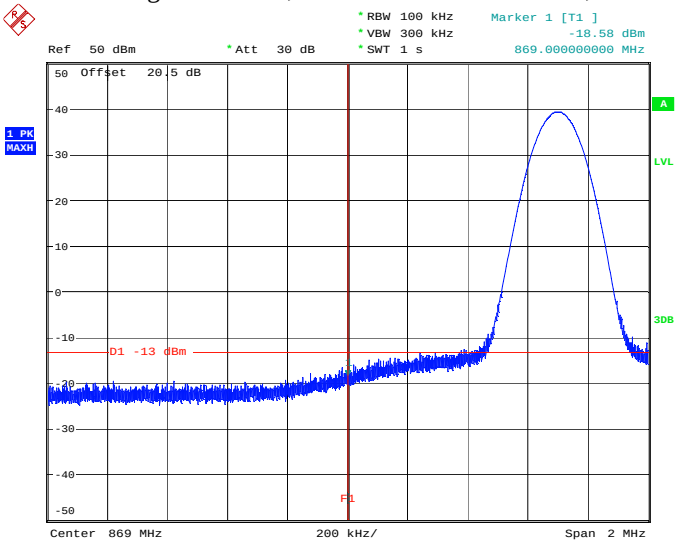
Graph 4.45
Band Edge Emissions, TDMA Cell Channel 1013, Up Link



Graph 4.46
Band Edge Emissions, TDMA Cell Channel 777, Up Link

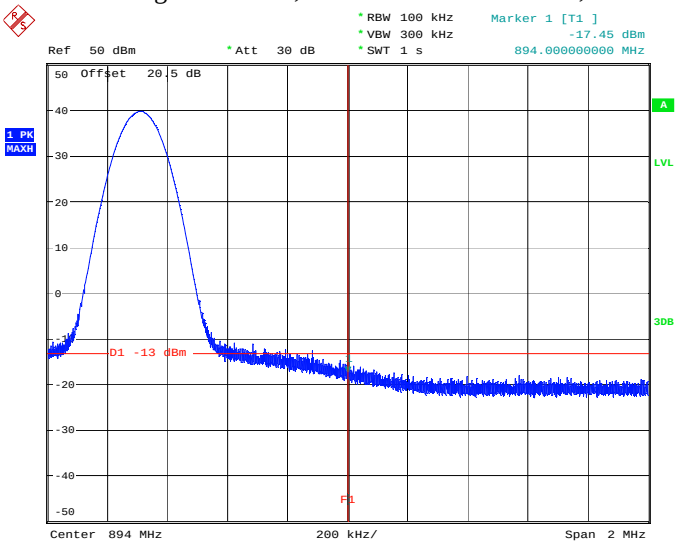


Graph 4.47
Band Edge Emissions, TDMA Cell Channel 1013, Down Link



Date: 25.AUG.2009 02:45:39

Graph 4.48
Band Edge Emissions, TDMA Cell Channel 777, Down Link



Date: 25.AUG.2009 02:47:10

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.

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

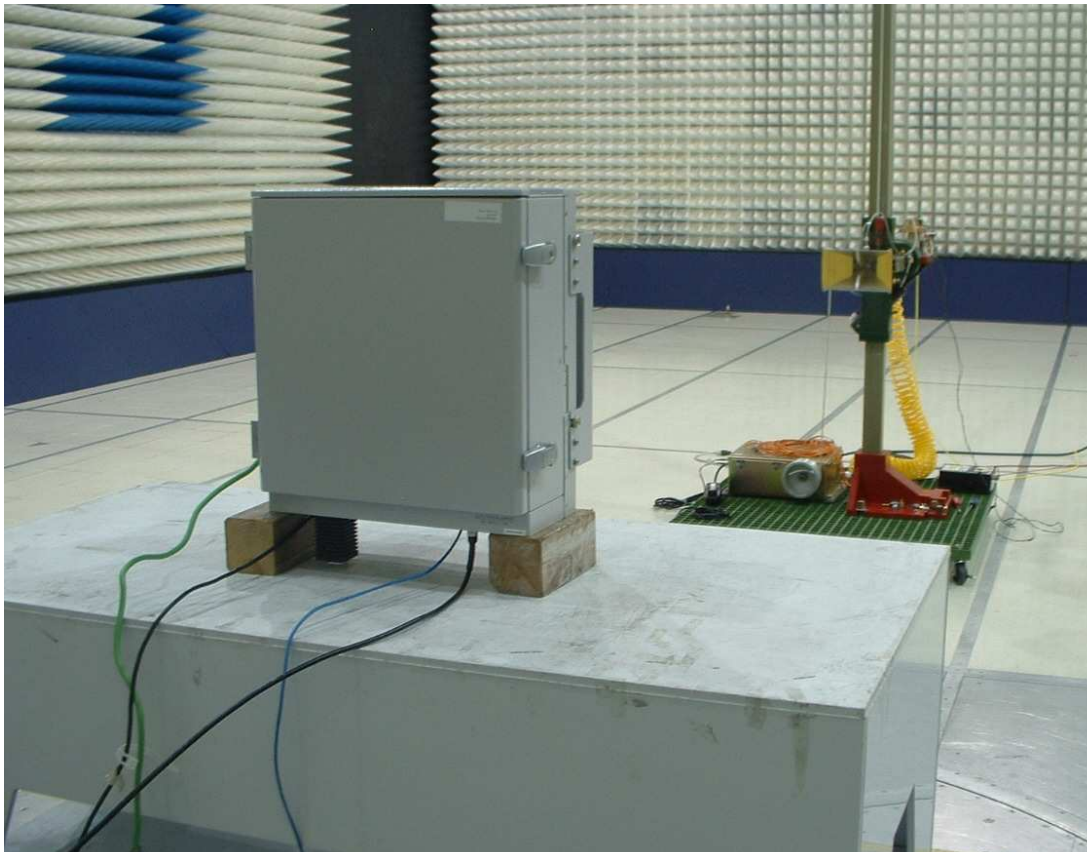
The EUT output port was connected to a 50 Ω termination load.

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	41.3	-70.4	-60.8	-13.0	-47.8
2474.1	41.5	-67.8	-57.6	-13.0	-44.6
Up Link, 836.5 MHz					
1673.0	41.4	-69.9	-60.4	-13.0	-47.4
2509.5	41.7	-67.2	-56.9	-13.0	-43.9
Up Link, 848.3 MHz					
1696.6	41.4	-69.7	-60.2	-13.0	-47.2
2544.9	41.8	-66.6	-56.3	-13.0	-43.3
Down Link, 869.7 MHz					
1739.4	41.5	-69.3	-59.9	-13.0	-46.9
2609.1	41.7	-66.0	-55.7	-13.0	-42.7
Down Link, 881.5 MHz					
1763.0	41.4	-69.2	-59.9	-13.0	-46.9
2644.5	41.9	-65.7	-55.4	-13.0	-42.4
Down Link, 893.3 MHz					
1786.6	41.3	-68.8	-59.8	-13.0	-46.8
2679.9	41.8	-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**

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

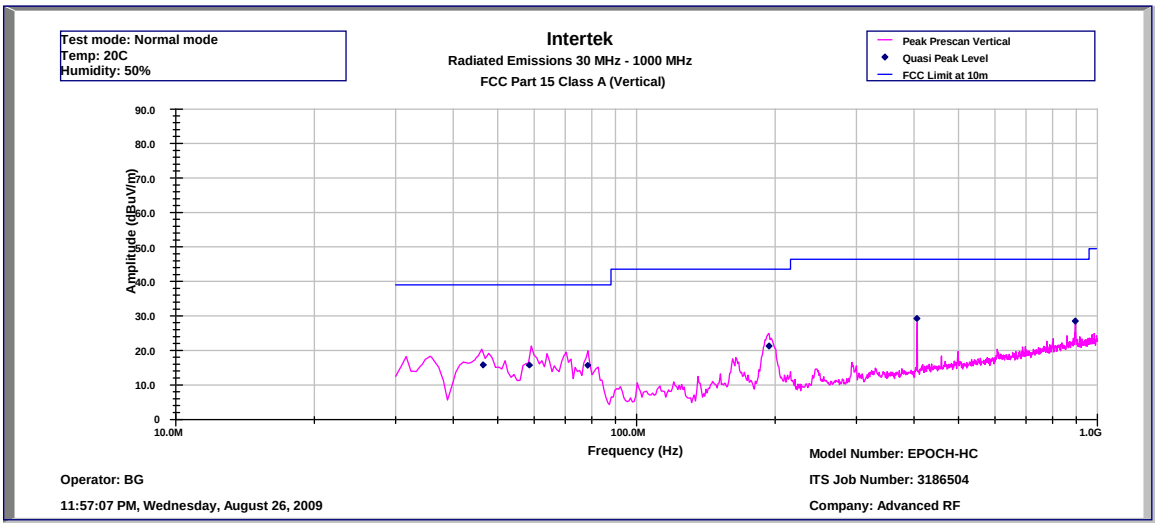
6.4 Test Results

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

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

Result	**Complies by 17.2 dB**

Radiated Emissions below 1 GHz



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

Model Number: EPOCH-HC
ITS Job Number: 3186504

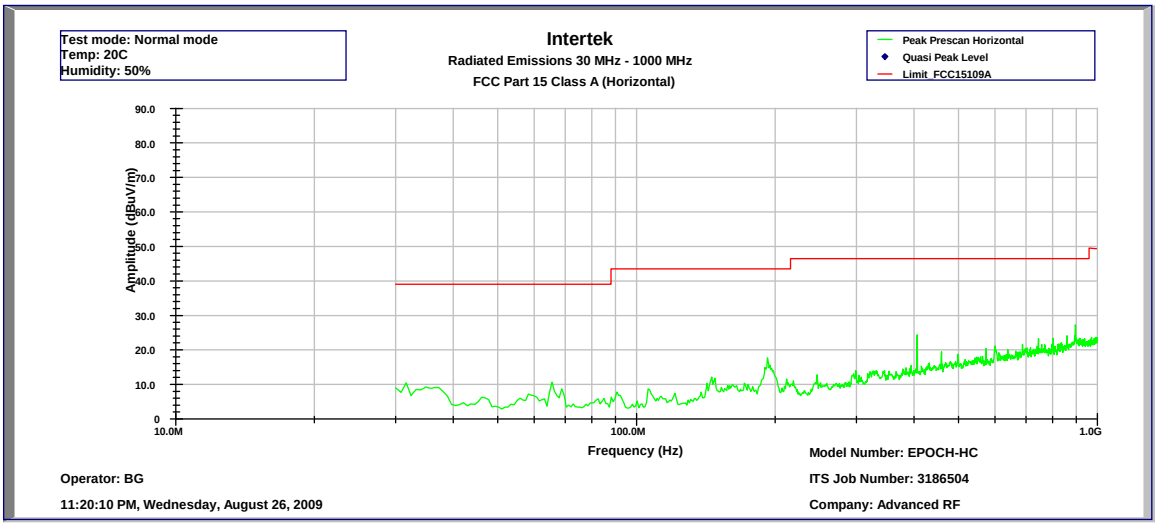
26-Aug-09

Company: Advanced RF

Frequency Hz	Quasi Pk FS dB(uV/m)	Limit at 10m dB(uV/m)	Margin dB	RA dB(uV)	AF dB(1/m)	CF dB	AG dB
4.65E+07	15.7	39.0	-23.3	41.1	15.7	0.7	32.0
5.85E+07	15.7	39.0	-23.3	43.6	15.7	0.8	32.0
7.84E+07	15.6	39.0	-23.4	40.2	15.6	0.9	32.0
1.94E+08	21.2	43.5	-22.3	40.7	21.2	1.4	31.9
4.06E+08	29.2	46.4	-17.2	42.3	29.2	2.1	32.0
8.96E+08	28.5	46.4	-17.9	33.0	28.5	3.2	31.5

Test mode: Stby mode
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

Model Number: EPOCH-HC
ITS Job Number: 3186504

26-Aug-09

Company: Advanced RF

Frequency Hz	Quasi Pk FS dB(uV/m)	Limit at 10m dB(uV/m)	Margin dB	RA dB(uV)	CF dB	AG dB	AF dB(1/m)
The highest amplitude signals were measured with the search antenna vertically polarized.							

Test mode: Normal mode
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.

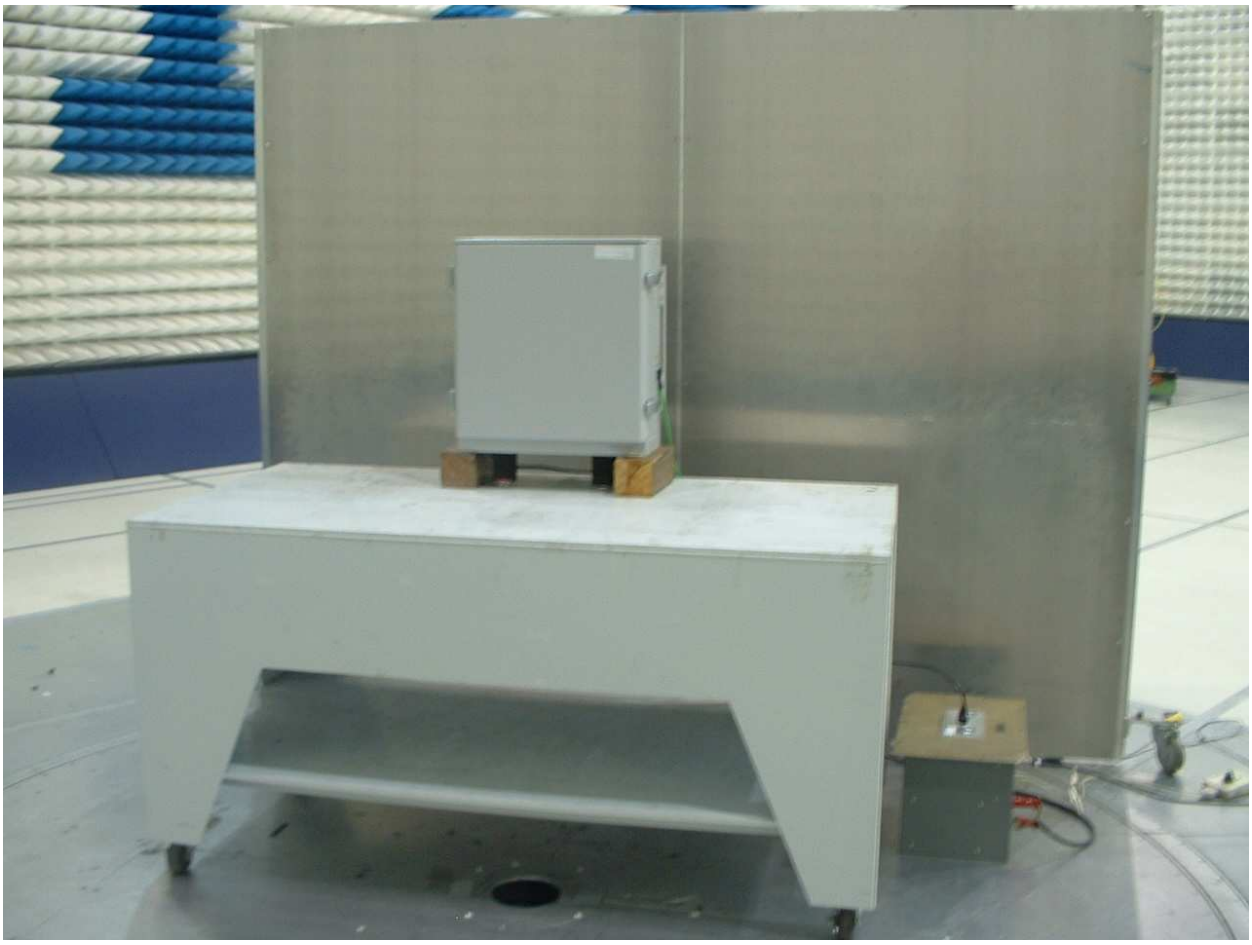
Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

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



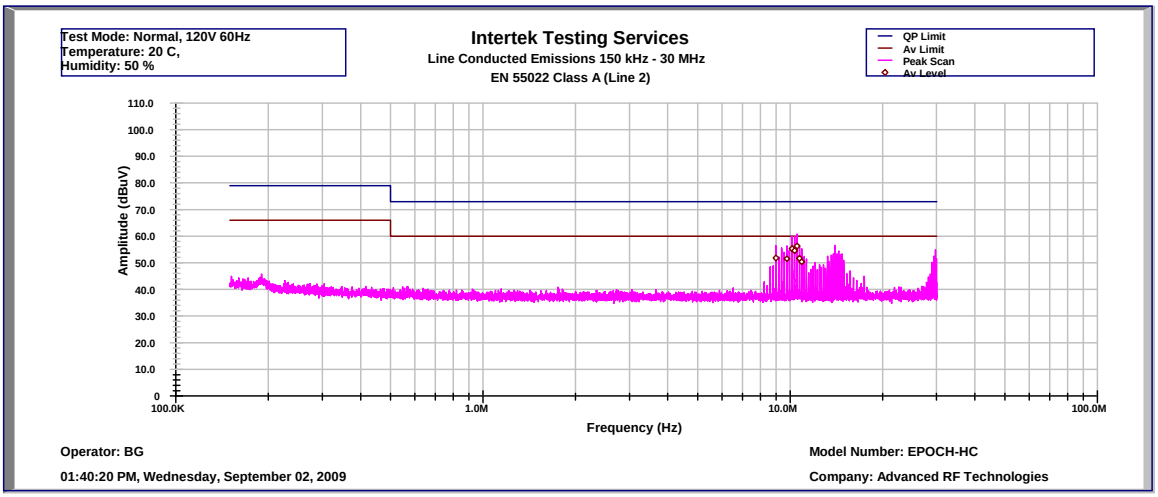
7.4 Test Results

Tested By:	Bruce Gordon
Test Date:	September 2, 2009

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

Result	**Complies by 3.7 dB**

Conducted Emissions

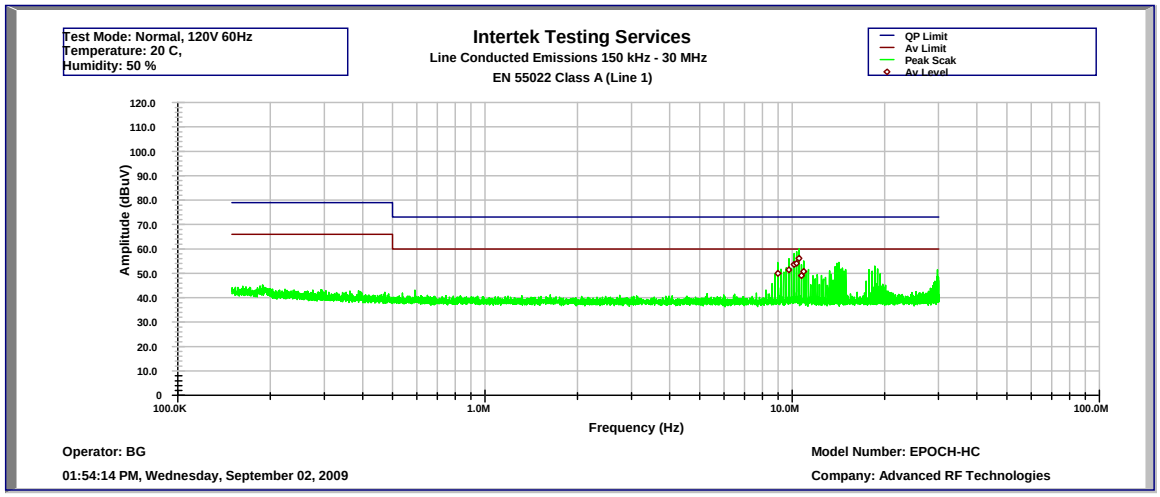


Intertek
Line Conducted Emissions 150 kHz - 30 MHz
EN55022 Class A (Line 2)
Operator: BG — Model Number: EPOCH-HC
ITS Job Number: 3186504
2-Sep-09 — Company: Advanced RF

Frequency Hz	QP Level dB(uV)	AV Level dB(uV)	QP Limit dB(uV)	AV Limit dB(uV)	QP Margin dB	AV Margin dB
8.99E+06	56.5	51.8	73.0	60.0	-16.5	-8.2
9.75E+06	56.4	51.5	73.0	60.0	-16.6	-8.5
1.01E+07	60.1	55.3	73.0	60.0	-12.9	-4.7
1.03E+07	59.7	54.6	73.0	60.0	-13.3	-5.4
1.05E+07	60.9	56.3	73.0	60.0	-12.1	-3.7
1.07E+07	56.4	51.7	73.0	60.0	-16.6	-8.3
1.09E+07	55.3	50.4	73.0	60.0	-17.7	-9.6

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

Conducted Emissions



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

Frequency Hz	QP Level dB(uV)	AV Level dB(uV)	QP Limit dB(uV)	AV Limit dB(uV)	QP Margin dB	AV Margin dB
8.99E+06	54.5	50.0	73.0	60.0	-18.5	-10.0
9.75E+06	56.1	51.4	73.0	60.0	-16.9	-8.6
1.01E+07	58.1	53.7	73.0	60.0	-14.9	-6.3
1.03E+07	58.9	54.1	73.0	60.0	-14.1	-5.9
1.05E+07	60.1	56.2	73.0	60.0	-12.9	-3.8
1.07E+07	53.5	49.1	73.0	60.0	-19.5	-10.9
1.09E+07	55.1	50.8	73.0	60.0	-17.9	-9.2

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: 836.520220 MHz

Temperature (Celsius)	Measured Frequency (MHz)	Deviation (Hz)
50	836.520211	-9
40	836.520201	-19
30	836.520243	23
20	836.520220	0
10	836.520205	-15
-10	836.520216	-4
-20	836.520238	18
-30	836.520249	29

Voltage AC 60Hz	Measured Frequency (MHz)	Deviation (Hz)
102	836.520244	24
120	836.520220	0
138	836.520231	11

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 80 cm from any body part of the user or near by persons.

Cell Band

The maximum conducted power for Cell Band is 43 dBm; 20W; antenna is fix-mounted with a maximum gain of 3 dBi. Therefore, to comply with RF Exposure Requirement, the MPE is calculated.

The maximum Peak EIRP calculated is 46 dBm; 40W.

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 80cm is the minimum distance that a user can go closer to the EUT.

At 0.8m, S = 4.98 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 / 3186504	BG	September 3, 2009	Original document