TEST REPORT

Report Number: 3049826-001
Project Number: 3049826
11/1/2003

Evaluation of the
ST810
Model Number: ST810
FCC ID:
EFCST0001

FCC Part 2
FCC Part 15
FCC Part 24 Subpart E

For

Orion Electronics Ltd.

Test Performed by:	Test Authorized by:
Intertek 731 Enterprise Drive Lexington, KY 40510	Orion Electronics Ltd. 90 Sanford Drive Box 2728 Windsor, Nova Scotia BON2TO

Prepared By:_____**Date:____2/13/2004_____**

Bryan C. Taylor, Team Leader

Approved By:_____**Date:____2/13/2004_____**

David Schramm, EMC Team Leader

The results contained in this report were derived from measurements performed on the identified test samples. Any implied performance of other samples based on this report is dependent on the representative adequacy of the samples tested.

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1 EXECUTIVE SUMMARY

Testing performed for: Orion Electronics Ltd.

Equipment Under Test: ST810

FCC RULE	IC RULE	DESCRIPTION OF TEST	RESULT	PAGE
§2.1046	RSS-129 §7.1, §9.1 RSS-133 §6.2	RF Power Output	Passed	10
§22.913, §24.232	RSS-129 §7.1, §9.1 RSS-133 §6.2	ERP, EIRP	Passed	12
§2.1049 §22.917(b)(d)	RSS-129 §6.3, RSS-129 §8.1	Emission Limitation, Occupied Bandwidth	Passed	13
§2.1051 §22.917(e) §22.917(f) §24.238(a)	RSS-129 §6.3, §7.2.2, §8.1.1, §10 RSS-133 §6.3	Out of Band Emissions at Antenna Terminals Mobile Emissions In Base Frequency Range	Passed	18
§2.1053	RSS-129 §8.1	Field Strength of Spurious Radiation	Passed	24
§2.1091, §2.1093	RSS-129 §11, RSS-133 §8	Specific Absorption Rate	N/S	See Note [1]
§15.107, §15.207	IC ES-003	Power Line Conducted Emissions	Passed	37
§15.109	IC ES-003 RSS-129 §10, RSS-133 §9	Receiver Spurious Emission	Passed	40
§2.1055, §22.355, §24.235	RSS-133 §7	Frequency Stability vs. Temperature	Passed	43
§2.1055, §22.355, §24.235	--	Frequency Stability vs. Voltage	Passed	44

N/S: Not under scope of this evaluation

[1] Specific Absorption Rate testing was not under the scope of this evaluation.

2 JOB DESCRIPTION

2.1 Client information

The ST810 has been tested at the request of

Company: Orion Electronics Ltd.
90 Sanford Drive Box 2728
Windsor, Nova Scotia BON2TO

Name of contact: David Roddis
Telephone: (800)-665-4648
Fax: (902)-798-8188

2.2 Test plan reference:

Tests were performed to the following standards:

- FCC Part 2
- FCC Part 15
- FCC Part 24 Subpart E rules for an intentional radiator
- FCC Part 22 Subpart H rules for an intentional radiator

The test procedures described in this test report and ANSI C63.4: 1992 were employed.

2.3 Equipment Under Test (EUT)

The Equipment Under Test (EUT) was an ST810 that operated in the CDMA800 and CDMA1900 modes.

Product	ST810
EUT Model Number	ST810
EUT Serial Number	RD009/03
Whether quantity (>1) production is planned	Quantity production is planned.
Cellular Phone standards	CDMA 800 and 1900
Type(s) of Emission	1M28F9W
RF Output Power	25.5 dBm – CDMA 800 24.7 dBm – CDMA1900
Frequency Range	824.7 – 848.31 MHz CDMA800 1850 – 1910 MHz CDMA1900
Antenna & Gain	1 Wi-Sys GPS antenna, part number ANT-SGM3 1 Klong EX202 dual-band antenna, part number ANT-DAG3-6FT
Detachable Antenna ?	Yes
External input	[] Audio [X] Digital Data

EUT receive date: 10/22/2003

EUT receive condition: The EUT was received in good condition with no apparent damage.

Test start date: 10/22/2003

Test completion date: 11/17/2003

The test results in this report pertain only to the item tested.

2.3.1 System Support Equipment

Table 2-1 contains the details of the support equipment associated with the Equipment Under Test during the FCC Part 15 testing.

Table 2-1: System Support Equipment

Description	Manufacturer	Model Number	Serial Number	FCC ID number
AC wall adapter	Mode Electronics	DV-1280	68-128-1	Not Labeled
GPS antenna	Wi-Sys	ANT-SGM3	HA5252	Not Labeled
Dual band antenna	Klong	EX-202	Not Labeled	Not Labeled

2.3.2 Cables associated with EUT

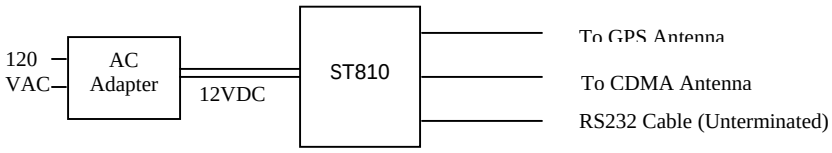
Table 2-2 contains the details of the cables associated with the EUT.

Table 2-2: Interconnecting cables between modules of EUT

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
Dual band antenna cable	6 ft	Coax	None	CDMA antenna port	Klong dual band antenna
GPS antenna cable	7 ft	Coax	None	GPS antenna port	GPS antenna
Power supply wire	5 ft	None	None	Wall mount power supply	Power input port
RS232 programming cable[2]	5 ft	Foil	None	RS232 port	Laptop

2.3.3 System Block Diagram

The diagram shown below details the interconnection of the EUT and its accessories during FCC Part 15 testing. For specific layout, refer to the test configuration photograph in the relevant section of this report.



[2] This cable is not normally used when the ST810 is in service. During the testing, the cable was attached but was un-terminated.

2.3.4 Justification

The EUT was operated in the stand-alone configuration.

2.3.5 Mode(s) of operation

The ST810 was powered by the plug in wall mount power supply during all testing.

2.4 Modifications required for compliance

No modifications were implemented by Intertek.

2.5 Related Submittal(s) Grants

None

3 TEST FACILITY

The INTERTEK-Lexington is located at 731 Enterprise Drive, Lexington Kentucky, 40510. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1: 1993 and ANSI C63.4: 1992. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

Figure 3-1: 10-Meter EMC Site

4 CONDUCTED RF POWER

FCC §2.1046

4.1 Test Procedure

The transmitter output was connected to a calibrated coaxial cable, the other end of which was connected to a CMU-200 Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The EUT was placed into a call and the transmitter output was read off the CMU-200 in dBm. The power output at the transmitter antenna port was determined by adding the value of the cable insertion loss to the CMU-200 power reading.

Tests were performed at three frequencies (low, middle, and high channels) and on the highest power levels, which can be setup on the transmitters.

4.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Base Station Simulator	Rohde & Schwarz	CMU-200	1100.0008.02	8/2004

4.3 Test Results

The ST810 met the RF power output requirements of FCC Part 22 Subpart H and FCC Part FCC Part 24 Subpart E. The test results are located in Table 4-1.

Table 4-1 RF Power Variation with temperature

EUT Mode	Frequency MHz	Channel	Measured Power dBm		
			+60°C	+20°C	-30°C
CDMA1900	1850.20	25	23.2	23.4	23.2
	1880.00	600	23.9	24.5	24.7
	1909.80	1175	23.08	24.3	24.7
CDMA800	836.52	384	24.2	24.0	24.3
	848.31	777	23.03	24.58	25.4
	824.70	1013	25.5	25.09	24.5

5 RADIATED RF POWER

FCC §22.913: The Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

FCC §24.232: The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

5.1 Test Procedure

The EUT was placed on a non-conductive turntable. The Base Station Simulator was set to force the EUT to its maximum power setting. The radiated emission at the fundamental frequency was measured at 3m with a test antenna and EMI receiver. This was performed with the antenna in both vertical and horizontal polarities.

During the measurement of the EUT, the receiver resolution bandwidth was set to 3 MHz and the video bandwidth was set to 10 kHz. These settings matched the power readings of a power meter with a thermocouple power sensor. The highest emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna. The receiver reading was recorded and the field strength (E in dBμV/m) was calculated.

EIRP in frequency band 1851.25-1910 MHz were measured using a substitution method. The EUT was replaced by a horn antenna (1851.25-1910 MHz) connected to a signal generator, which was set to -10 dBm. The receiver reading was recorded and EIRP was calculated as follows:

$$EIRP = E_1 - E_2 + V_g + G$$

where,

E_1 is the receiver reading in dBμV/m when measuring the field strength of the EUT

E_2 is the receiver reading in dBμV/m when measured field strength from the generator

V_g is the generator output in dBm

G is the gain of the transmitting antenna in dBi.

5.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Signal Generator	HP	83620B	3614A00199	8/2004
Horn Antenna	Antenna Research	DRG-118/A	1086	3/7/2007
Horn Antenna	EMCO	3115	6556	7/11/2004
EMI Receiver	Rohde & Schwarz	ESI 26	1088.7490	11/27/2003

5.3 Test Results

The ST810 met the radiated power requirements of FCC §24.232. The test results are located in Table 5-1.

Table 5-1 Radiated RF Power

EUT Resting Vertical on an 80cm High Wooden Table									
EUT Mode	**Channel**	**Frequency (MHz)**	**Rx Antenna Polarity**	**Measurement Method (ERP/EIRP)**	**EUT Reading (dBuV)**	**Substitution Reading (dBuV)**	**Cable Reading (dBm)**	**Tx Antenna Gain (dBi)**	**ERP / EIRP (dBm)**
CDMA PCS	25	1851.25	V	EIRP	79.16	62.31	-2.33	7.2	21.72
CDMA PCS	600	1880	V	EIRP	80.51	61.99	-2.32	7.2	23.4
CDMA PCS	1175	1908.75	V	EIRP	79.13	61.54	-2.44	7.2	22.35
CDMA PCS	25	1851.25	H	EIRP	78.2	62.24	-2.33	7.1	20.73
CDMA PCS	600	1880	H	EIRP	80.62	61.68	-2.32	7.1	23.72
CDMA PCS	1175	1908.75	H	EIRP	80.68	61.68	-2.44	7.1	23.66
CDMA Cell	384	836.52	V	ERP	92.8	70.98	2.36	0	24.18
CDMA Cell	777	848.31	V	ERP	93.61	71.41	2.34	0	24.54
CDMA Cell	1013	824.7	V	ERP	93.52	71.38	2.38	0	24.52
CDMA Cell	384	836.52	H	ERP	91.03	72.15	2.36	0	21.24
CDMA Cell	777	848.31	H	ERP	91.55	71.98	2.34	0	21.91
CDMA Cell	1013	824.7	H	ERP	93.81	72.97	2.38	0	23.22

EUT Resting Flat on an 80cm High Wooden Table									
EUT Mode	**Channel**	**Frequency (MHz)**	**Rx Antenna Polarity**	**Measurement Method (ERP/EIRP)**	**EUT Reading (dBuV)**	**Substitution Reading (dBuV)**	**Cable Reading (dBm)**	**Tx Antenna Gain (dBi)**	**ERP / EIRP (dBm)**
CDMA PCS	25	1851.25	V	EIRP	78.3	62.31	-2.33	7.2	20.86
CDMA PCS	600	1880	V	EIRP	79.24	61.99	-2.32	7.2	22.13
CDMA PCS	1175	1908.75	V	EIRP	78.46	61.54	-2.44	7.2	21.68
CDMA PCS	25	1851.25	H	EIRP	79.2	62.24	-2.33	7.1	21.73
CDMA PCS	600	1880	H	EIRP	78.35	61.68	-2.32	7.1	21.45
CDMA PCS	1175	1908.75	H	EIRP	80.21	61.68	-2.44	7.1	23.19
CDMA Cell	384	836.52	V	ERP	91.46	70.98	2.36	0	22.84
CDMA Cell	777	848.31	V	ERP	92.36	71.41	2.34	0	23.29
CDMA Cell	1013	824.7	V	ERP	93.27	71.38	2.38	0	24.27
CDMA Cell	384	836.52	H	ERP	91.05	72.15	2.36	0	21.26
CDMA Cell	777	848.31	H	ERP	91.84	71.98	2.34	0	22.2
CDMA Cell	1013	824.7	H	ERP	92.83	72.97	2.38	0	22.24

6 EMISSION LIMITATIONS, OCCUPIED BANDWIDTH

CFR 47 §2.1049

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

6.1 Test Procedure

In both CDMA 800 and 1900 modes the antenna port of the EUT was connected to a spectrum analyzer using a calibrated coaxial cable and directional coupler. The EUT was placed into a call using a CMU – 200 base station simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The occupied bandwidth function of the analyzer was used to automatically generate the occupied bandwidth plots below.

6.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Base Station Simulator	Rohde & Schwarz	CMU-200	1100.0008.02	8/2004
EMI Receiver	Rohde & Schwarz	ESI 26	1088.7490	11/27/2003
Directional Coupler	Amplifier Research	DC7144	22729	8/2004

6.3 Test Results

The following is the occupied bandwidth data for the ST810 .

Table 6-1: Occupied bandwidth measurements for CDMA modes

Mode	Channel	Resolution Bandwidth	Video Bandwidth	Sweep time	Measured Bandwidth MHz
CDMA800	384	30 kHz	300 kHz	2s	1.28
CDMA800	1013	30 kHz	300 kHz	2s	1.27
CDMA800	777	30 kHz	300 kHz	2s	1.28
CDMA1900	25	30 kHz	300 kHz	2s	1.28
CDMA1900	600	30 kHz	300 kHz	2s	1.28
CDMA1900	1175	30 kHz	300 kHz	2s	1.28

Figure 6-1: Occupied Bandwidth – Cell Channel 384

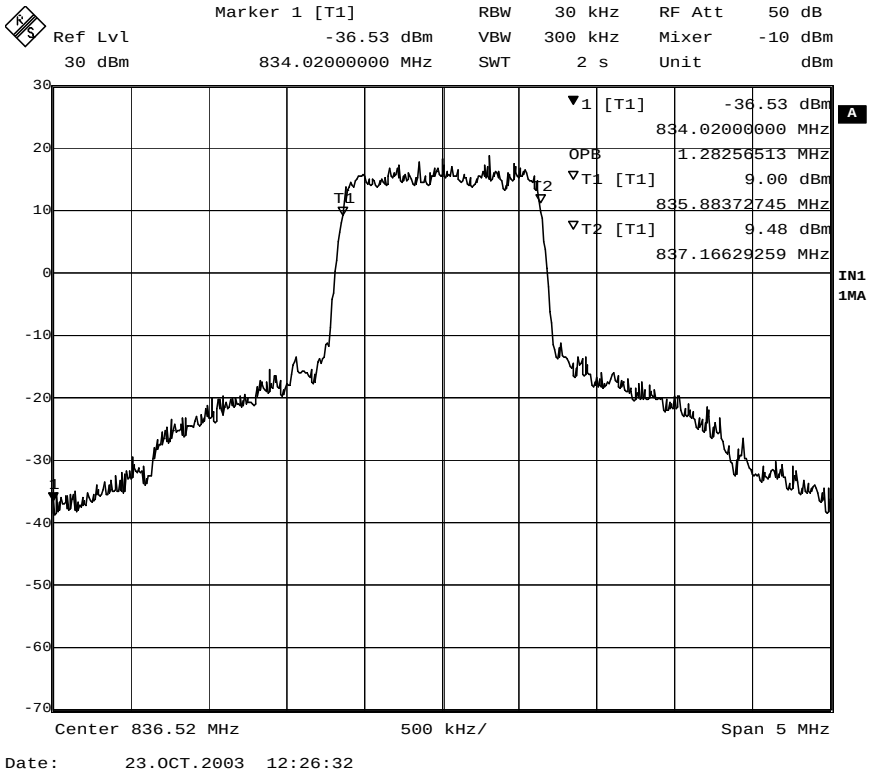


Figure 6-3: Occupied Bandwidth – Cell Channel 777

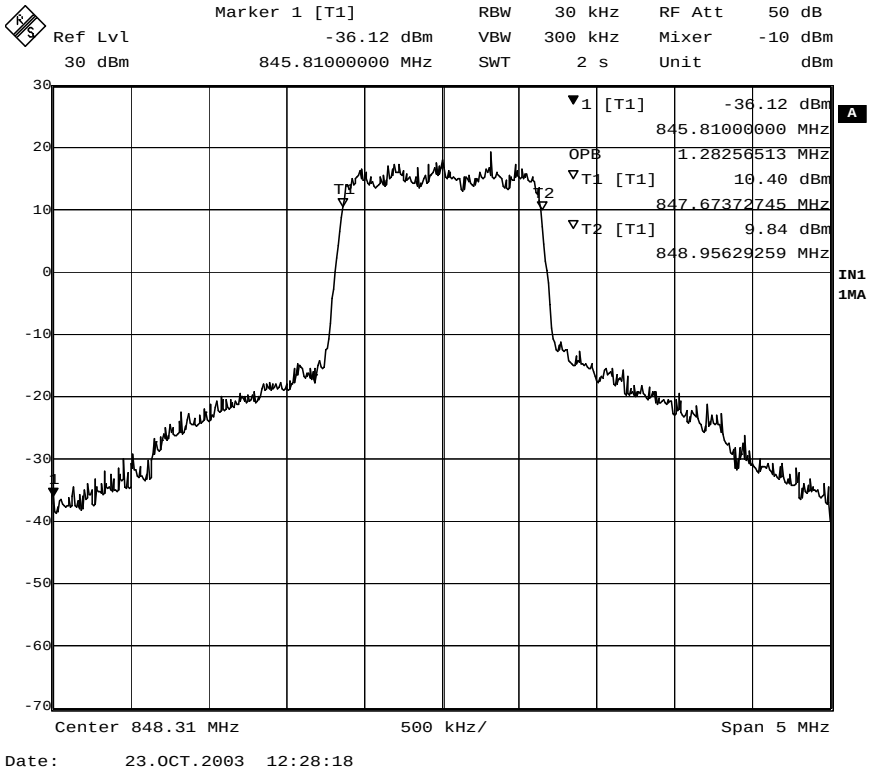


Figure 6-5: Occupied Bandwidth – Cell Channel 1013

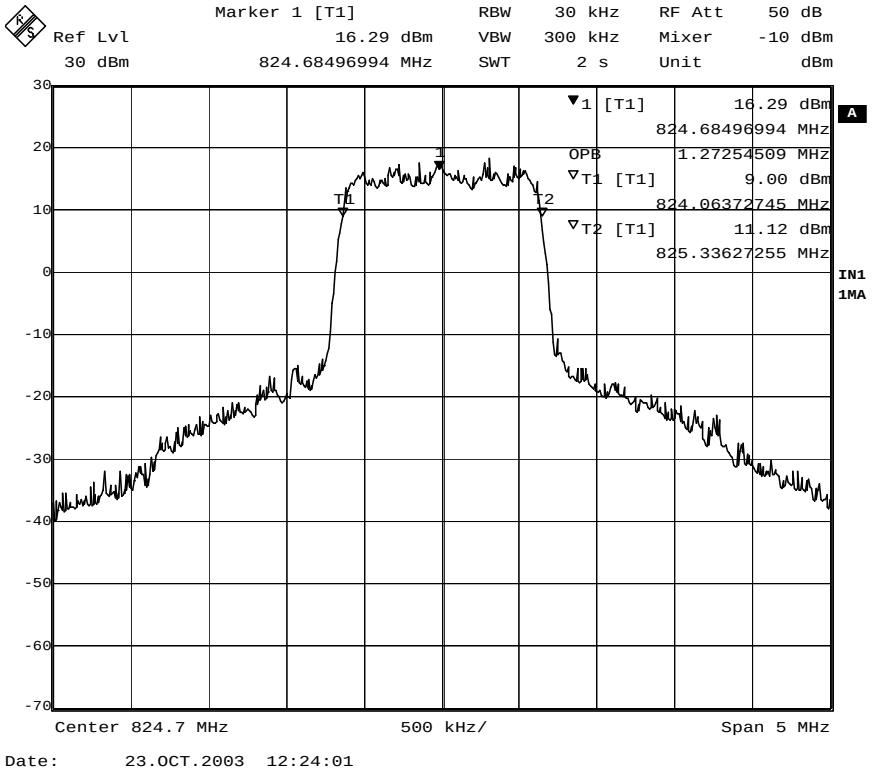


Figure 6-7: Occupied Bandwidth – PCS Channel 25

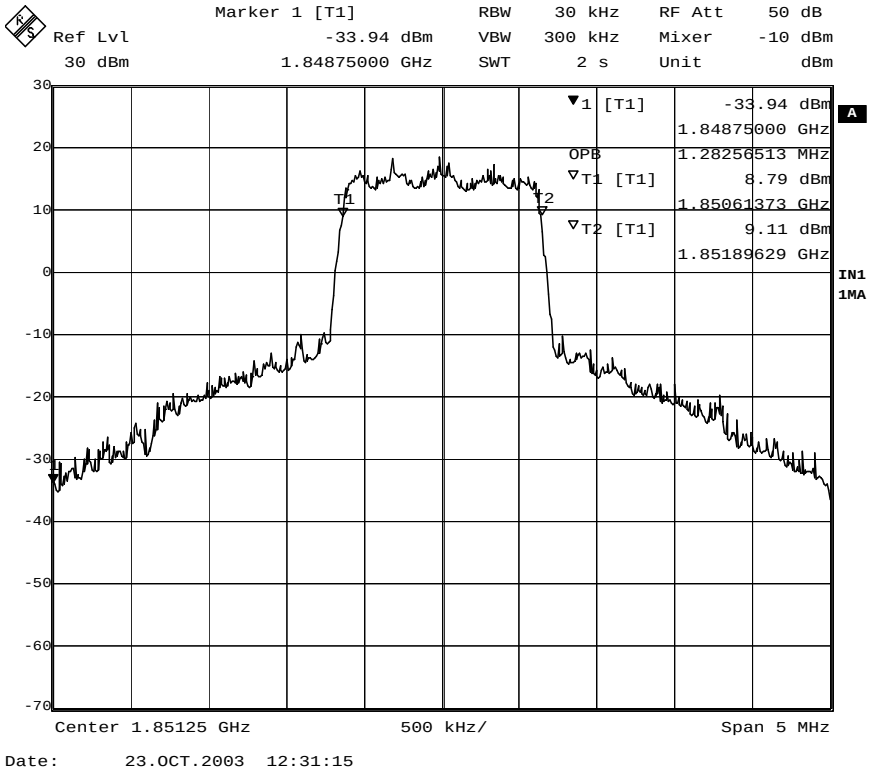


Figure 6-9: Occupied Bandwidth – PCS Channel 600

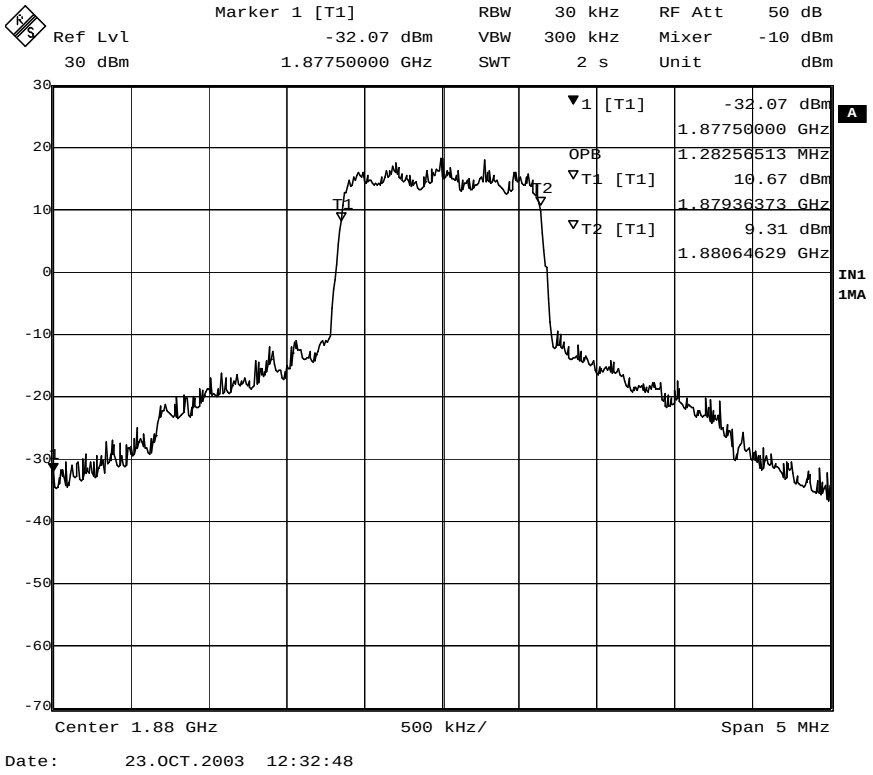
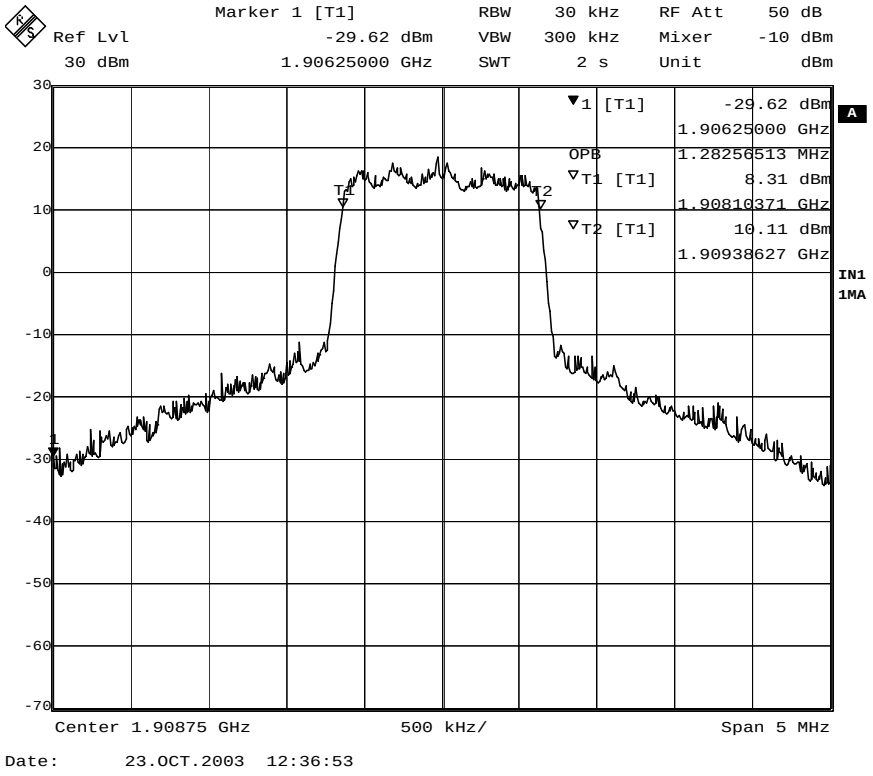


Figure 6-11: Occupied Bandwidth – PCS Channel 1175



7 OUT OF BAND EMISSION AT ANTENNA TERMINALS

FCC §2.1049, FCC §2.1051, §22.917(a), FCC §24.238(a)

Out of Band Emissions: The power of any emission 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.

7.1 Test Procedure

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for the Cellular band and 1 MHz or greater in the PCS band. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The Base Station Simulator was set to force the EUT to its maximum power setting. The resolution bandwidth of the spectrum analyzer was set at 1 MHz. The audio modulating signal was adjusted like it is described in Section 6.1 of this report. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

7.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Base Station Simulator	Rohde & Schwarz	CMU-200	1100.0008.02	8/2004
EMI Receiver	Rohde & Schwarz	ESI 26	1088.7490	11/27/2003
Directional Coupler	Amplifier Research	DC7144	22729	8/2004

7.3 Test Results

The ST810 met the out of band emission at antenna terminal requirements.

Table 7-1: Summary of test result locations

Location	Mode (Band)	Channel	Description
Figure 7-1	CDMA Cell	384, 777, 1013	Conducted spurious emissions, 30MHz to 20 GHz
Figure 7-2	CDMA Cell	384, 777, 1013	Zoom Graph of the Carrier Frequencies
Figure 7-3	CDMA PCS	25, 600, 1175	Conducted spurious emissions, 30MHz to 20 GHz
Figure 7-4	CDMA PCS	25, 600, 1175	Zoom Graph of the Carrier Frequencies
Figure 7-5	CDMA Cell	1013	Emissions within 1 MHz of band edge
Figure 7-6	CDMA Cell	777	Emissions within 1 MHz of band edge
Figure 7-7	CDMA PCS	25	Emissions within 1 MHz of band edge
Figure 7-8	CDMA PCS	1175	Emissions within 1 MHz of band edge

Figure 7-1: Out of band emissions at antenna terminals – CDMA 800 Channel 384, 777, and 1013

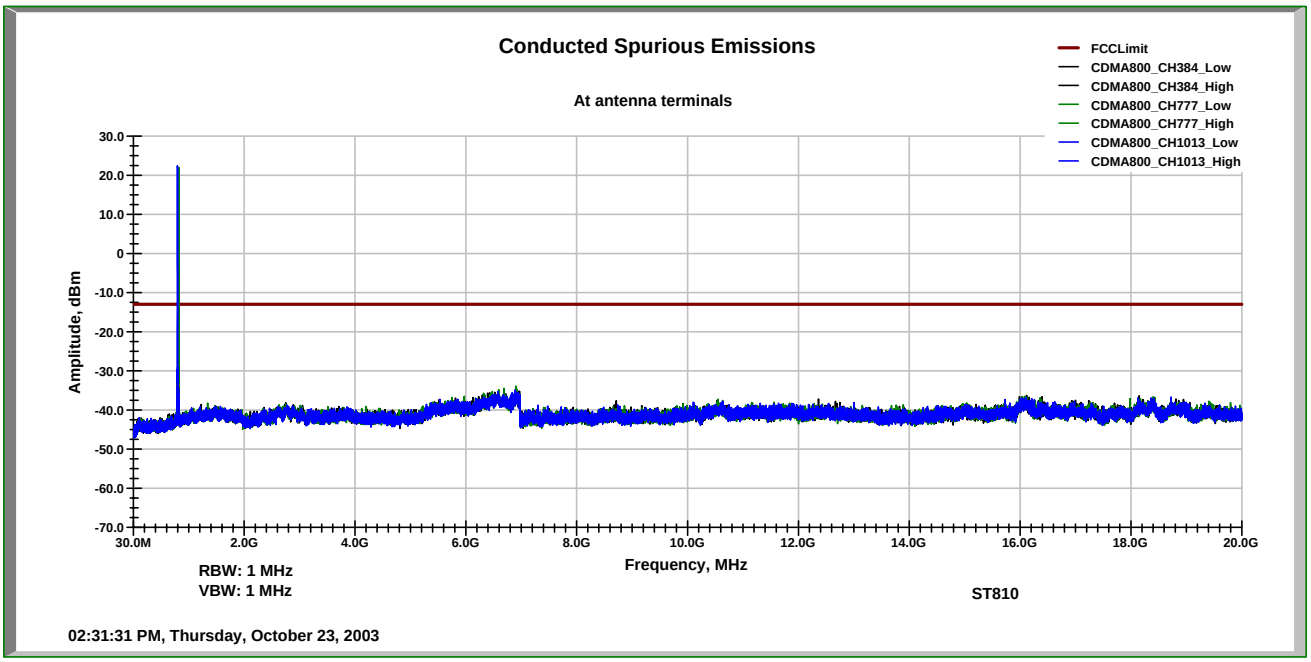


Figure 7-2: Out of band emissions at antenna terminals – CDMA 800 Channel 384, 777, and 1013 (Zoomed Around Carrier Frequencies)

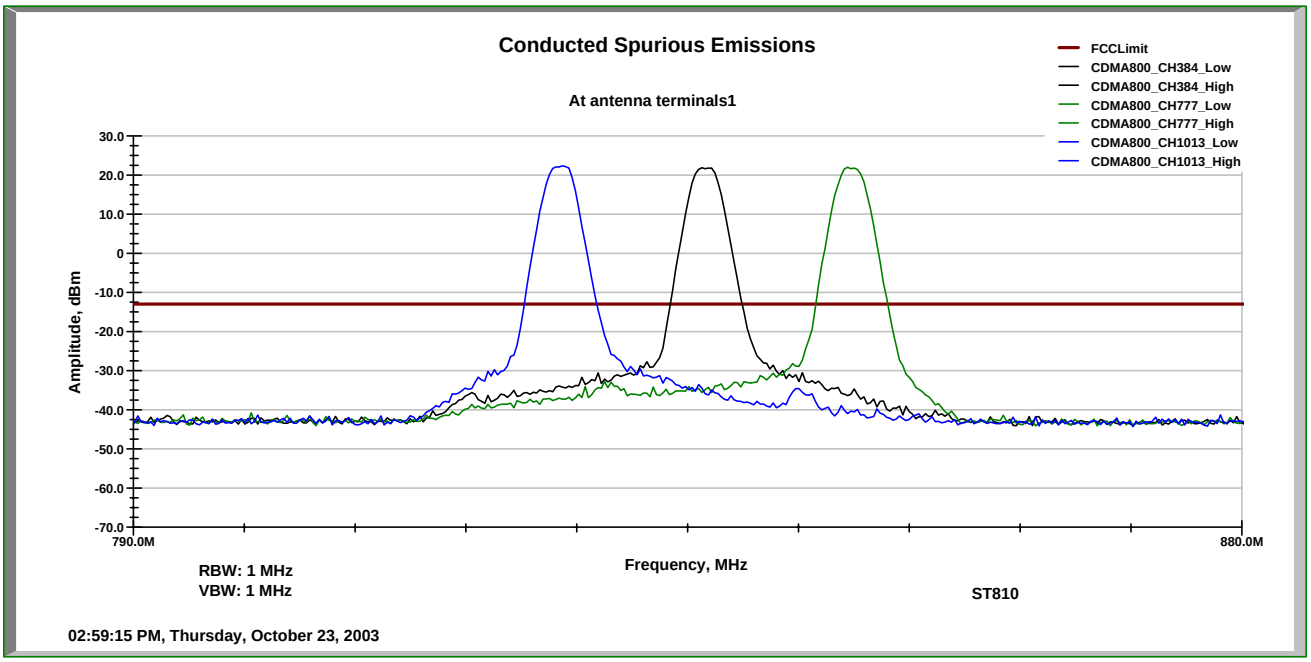


Figure 7-3: Out of band emissions at antenna terminals – CDMA1900 Channel 25, 600, 1175

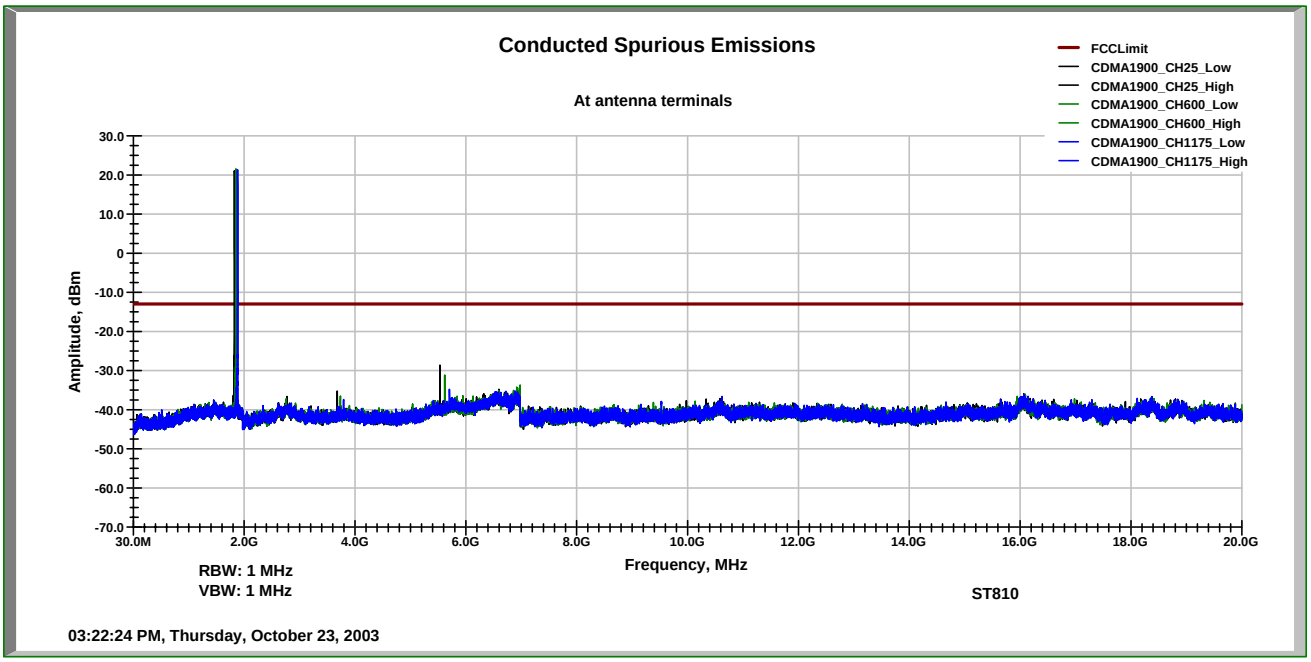


Figure 7-4: Out of band emissions at antenna terminals – CDMA1900 Channel 25, 600, 1175 (Zoomed In on Carrier Frequencies)

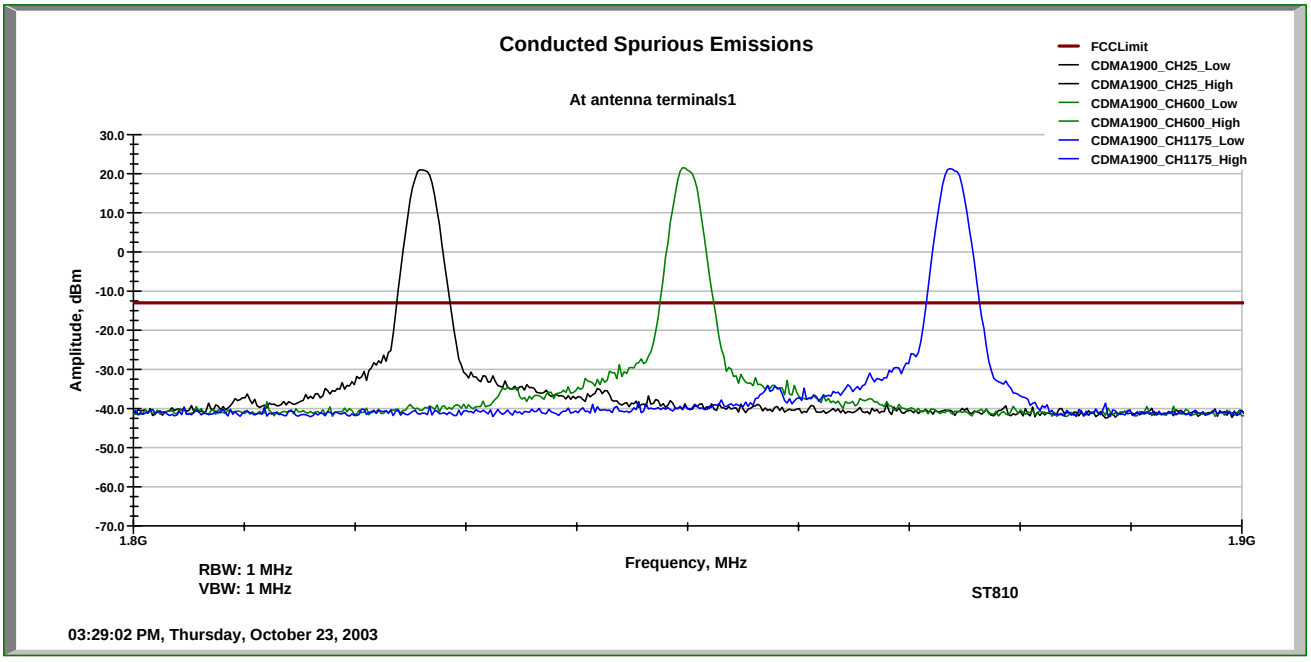


Figure 7-5: Emissions within 1 MHz of band edge, CDMA 800 Channel 1013

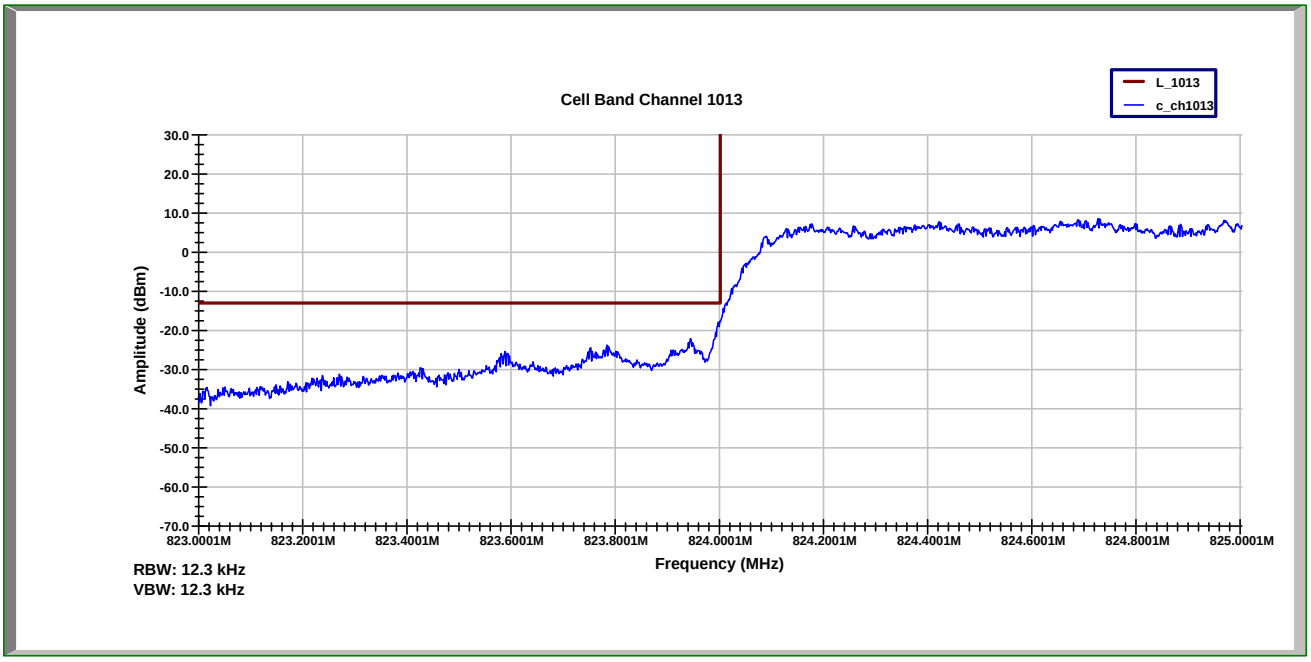


Figure 7-6: Emissions within 1 MHz of band edge, CDMA 800 Channel 777

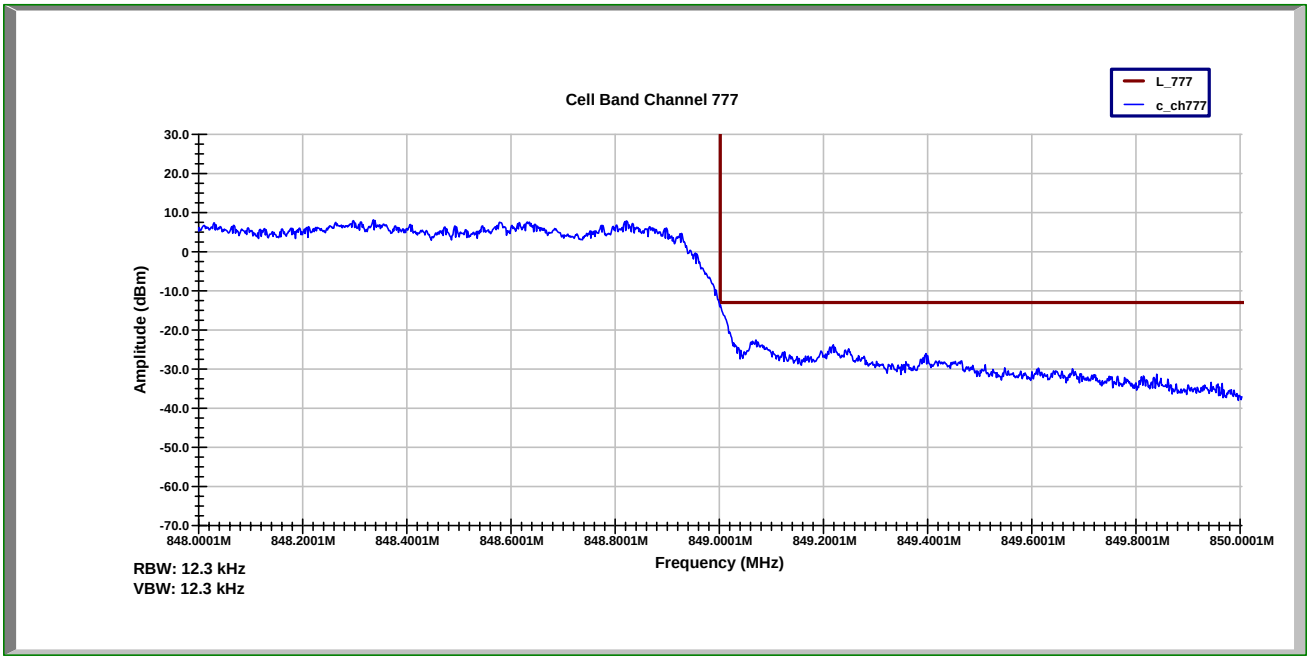


Figure 7-7: Emissions within 1 MHz of band edge, CDMA 1900 Channel 25

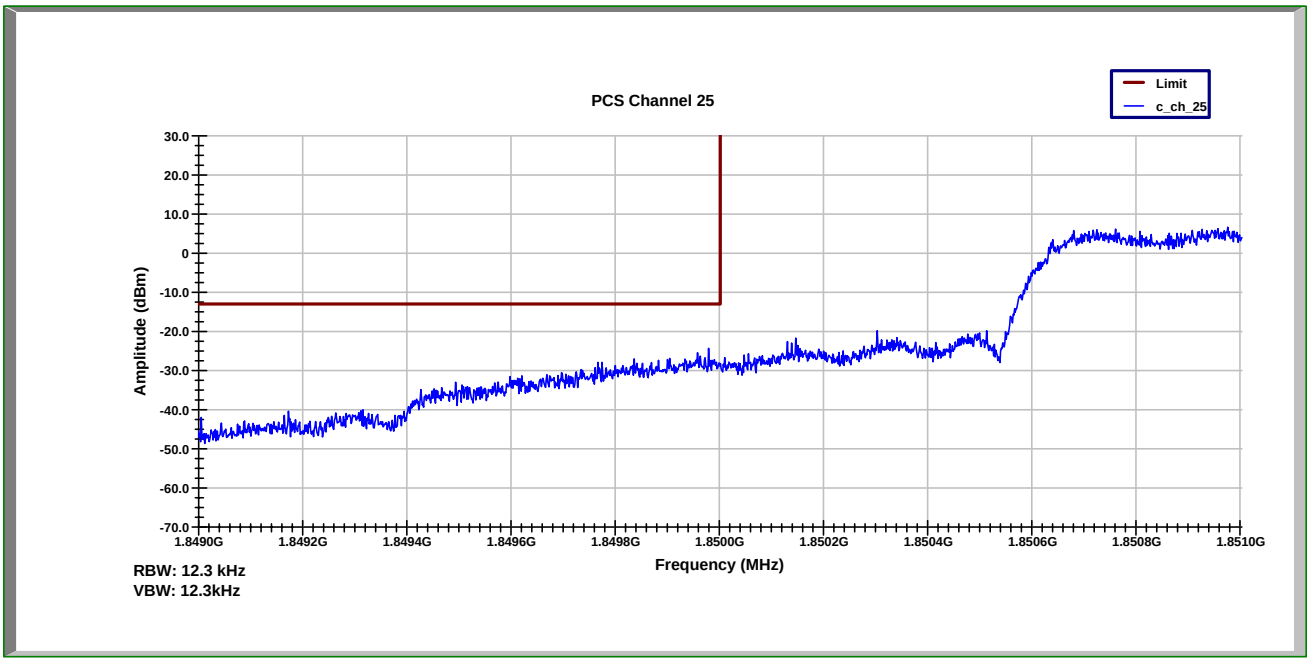
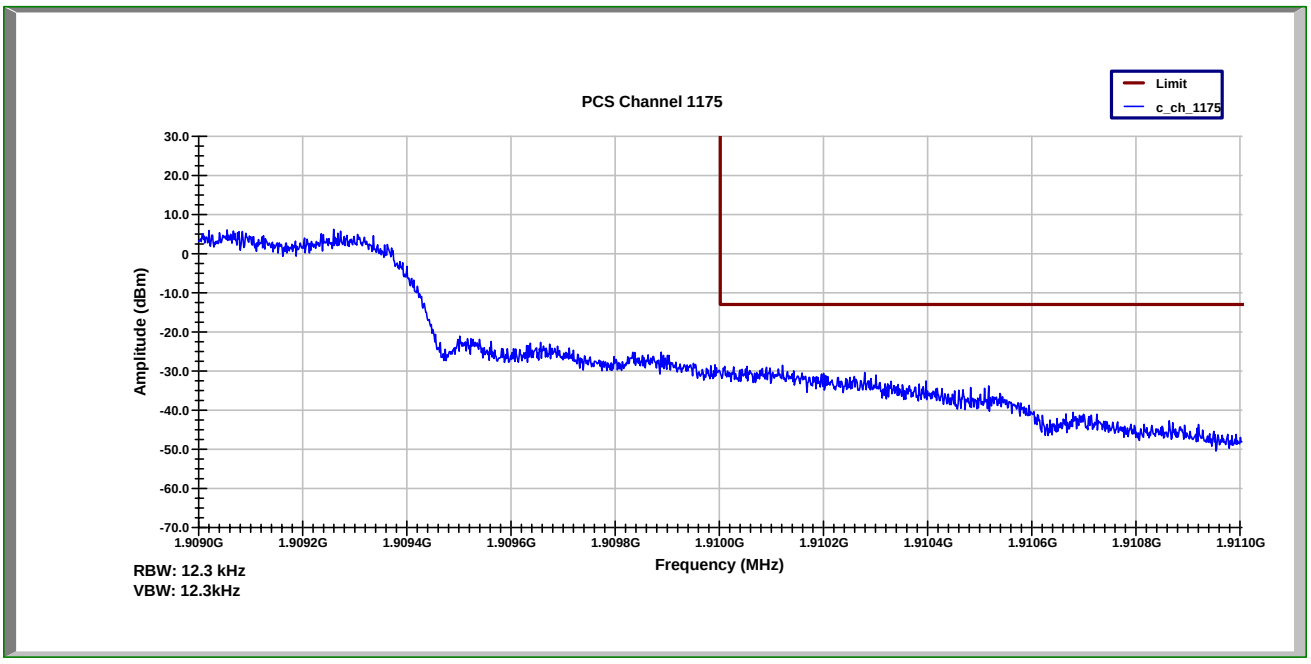


Figure 7-8: Emissions within 1 MHz of band edge, CDMA 1900 Channel 1175



8 FIELD STRENGTH OF SPURIOUS RADIATION

FCC §2.1053

8.1 Test Procedure

The EUT was placed on a non-conductive turntable. The measurement antenna was placed at a distance of 3 meters from the EUT. The Base Station Simulator was set to force the EUT to its maximum power setting. During the tests, the antenna height and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle, and high channels). Once spurious emissions were identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and at the spurious emissions frequency.

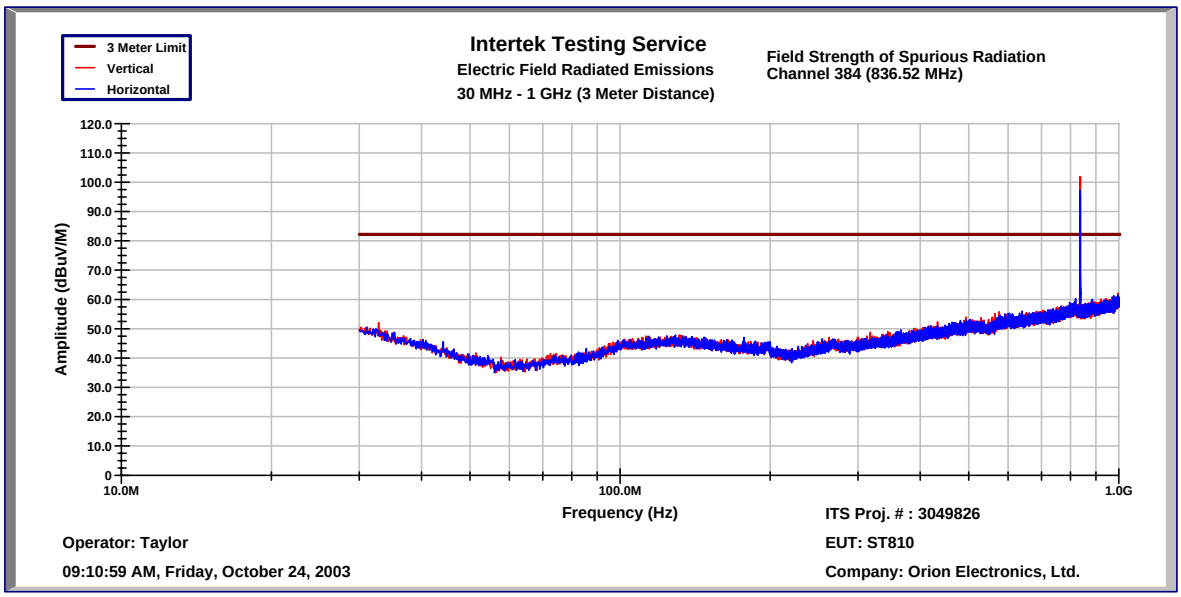
8.2 Test Equipment

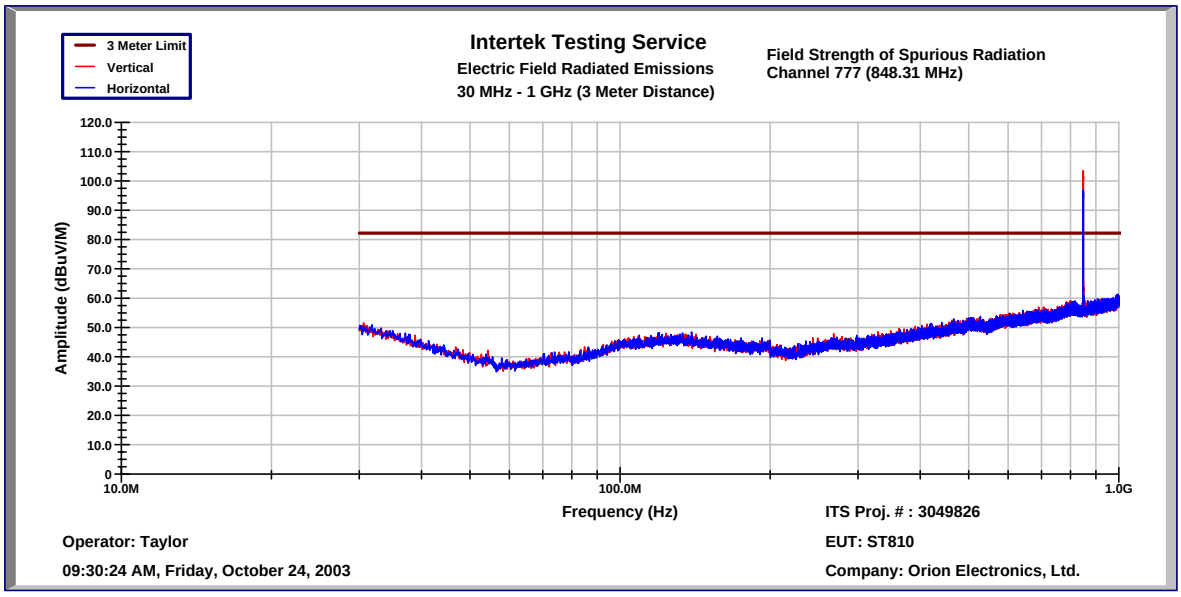
Description	Manufacturer	Model Number	Serial Number	Calibration due date
Base Station Simulator	Rohde & Schwarz	CMU-200	1100.0008.02	8/2004
Signal Generator	HP	83620B	3614A00199	8/2004
Horn Antenna	Antenna Research	DRG-118/A	1086	3/7/2007
Horn Antenna	EMCO	3115	6556	7/11/2004
EMI Receiver	Rohde & Schwarz	ESI 26	1088.7490	11/27/2003
LISN	FCC	FCC-LISN-50-50-2M	1026	12/2003
Bilog Antenna	EMCO	3142B	1674	8/2004
Preamplifier	HP	8449B	3008A00775	12/2003
High Pass Filter	Filtek	HP12/2000-5AB	15B61	8/2004

8.3 Test Results

The ST810 met the field strength of spurious radiation requirements of FCC §2.1053. There were no spurious emissions within 20 dB of the limit. See Figure 8-1 through Figure 8-6 for the graphical test data.

Figure 8-1: Field Strength of Spurious Radiation (30 MHz – 1 GHz), CDMA 800 Channel 384, 777, and 1013





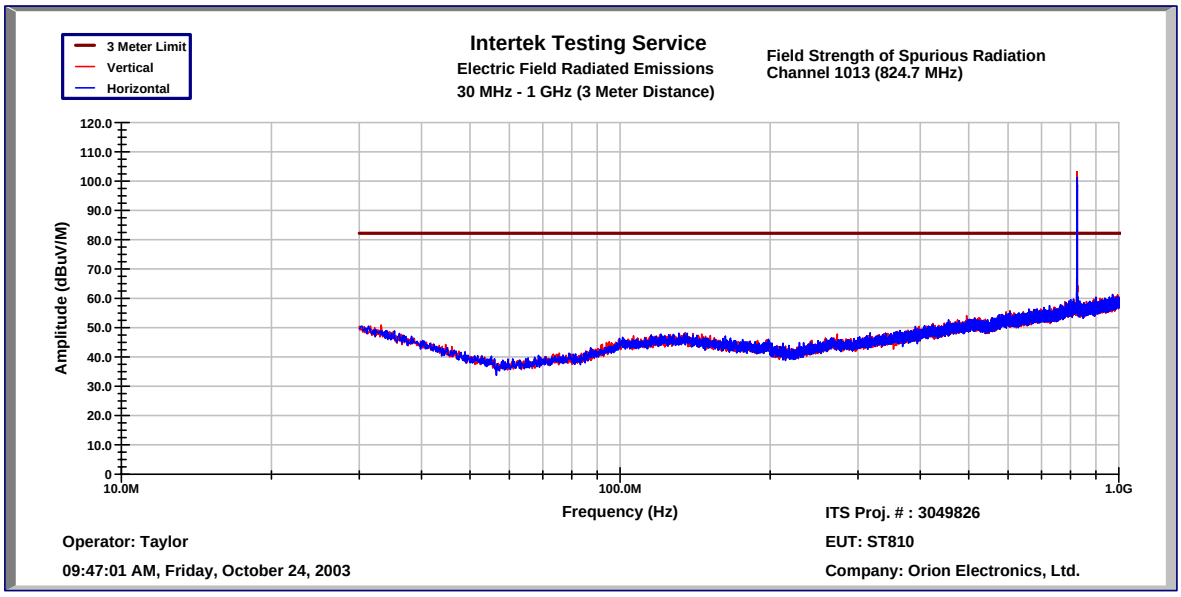
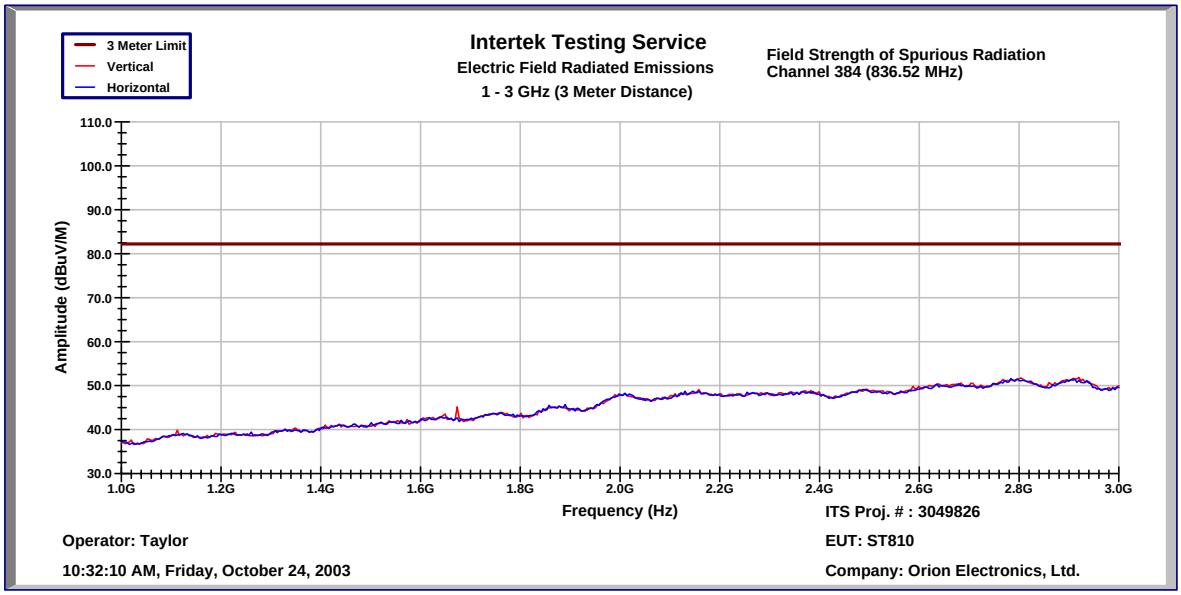
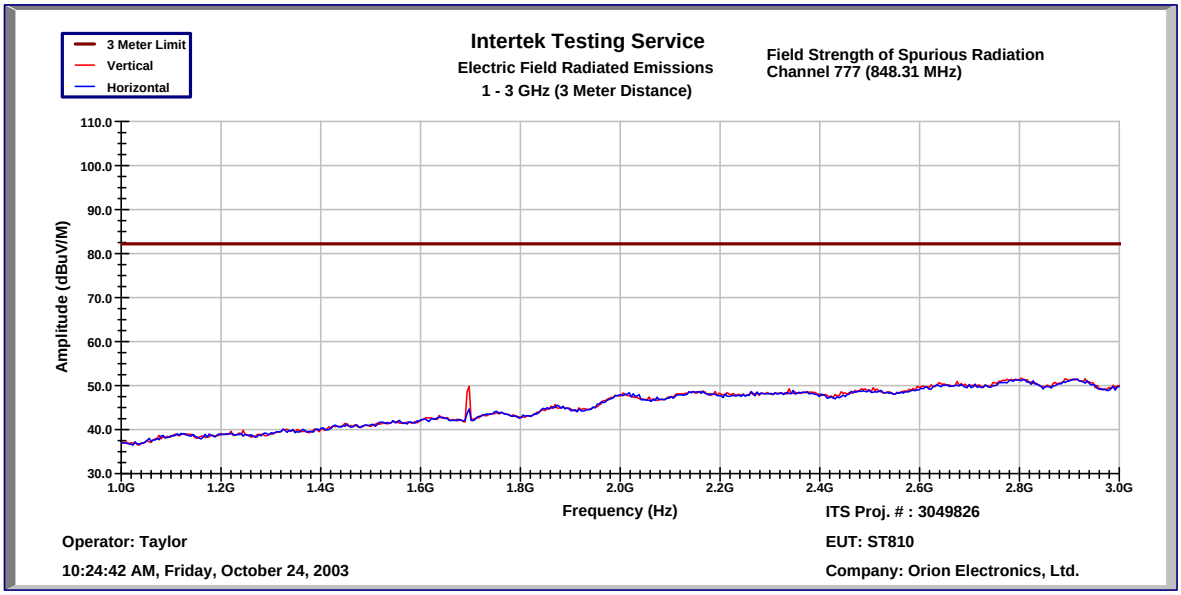

3 Meter Limit
Vertical
Horizontal
Intertek Testing Service
Electric Field Radiated Emissions
30 MHz - 1 GHz (3 Meter Distance)
Field Strength of Spurious Radiation
Channel 1013 (824.7 MHz)
Amplitude (dBuV/M)
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
10.0M
100.0M
1.0G
Frequency (Hz)
Operator: Taylor
09:47:01 AM, Friday, October 24, 2003
ITS Proj. # : 3049826
EUT: ST810
Company: Orion Electronics, Ltd.

Figure 8-2: Field Strength of Spurious Radiation (1 GHz – 3 GHz), CDMA 800 Channel 384,777, 1013





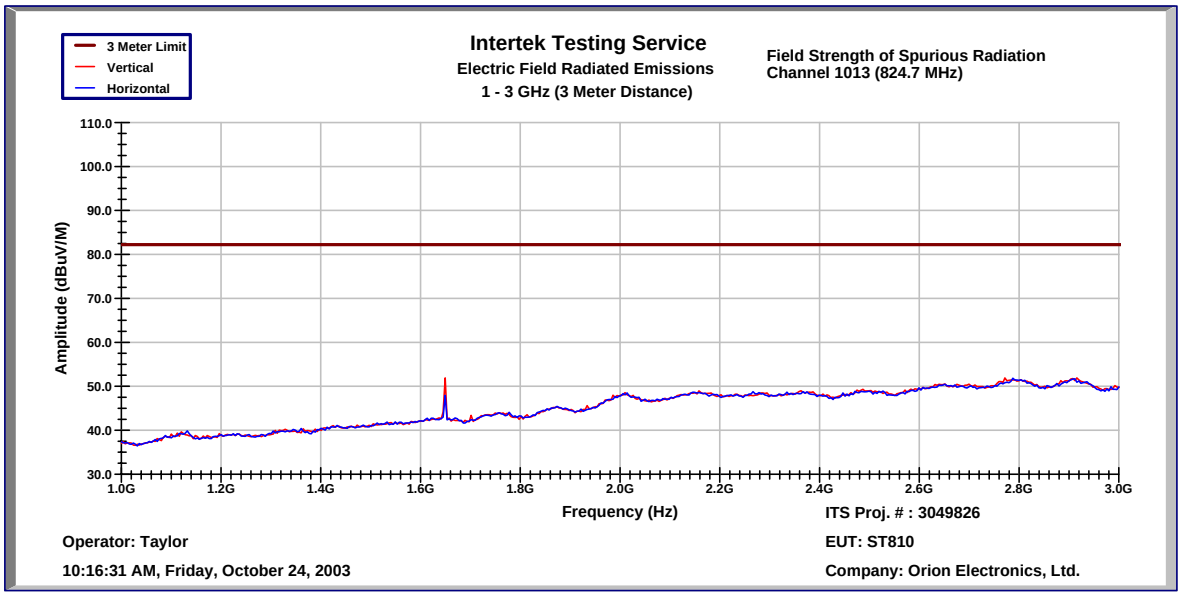
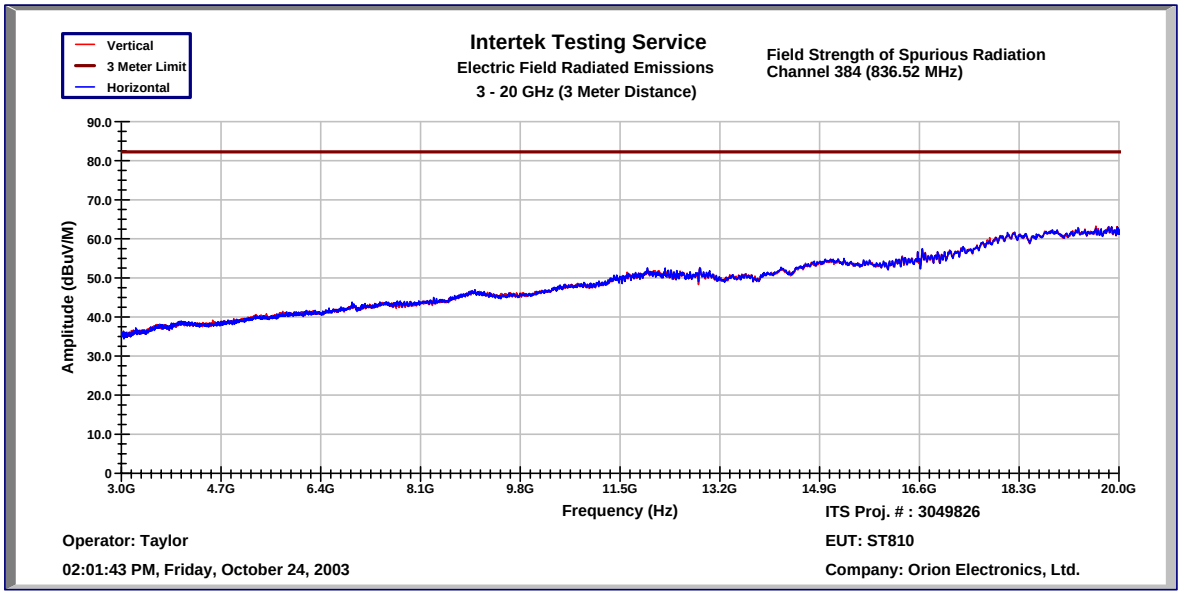
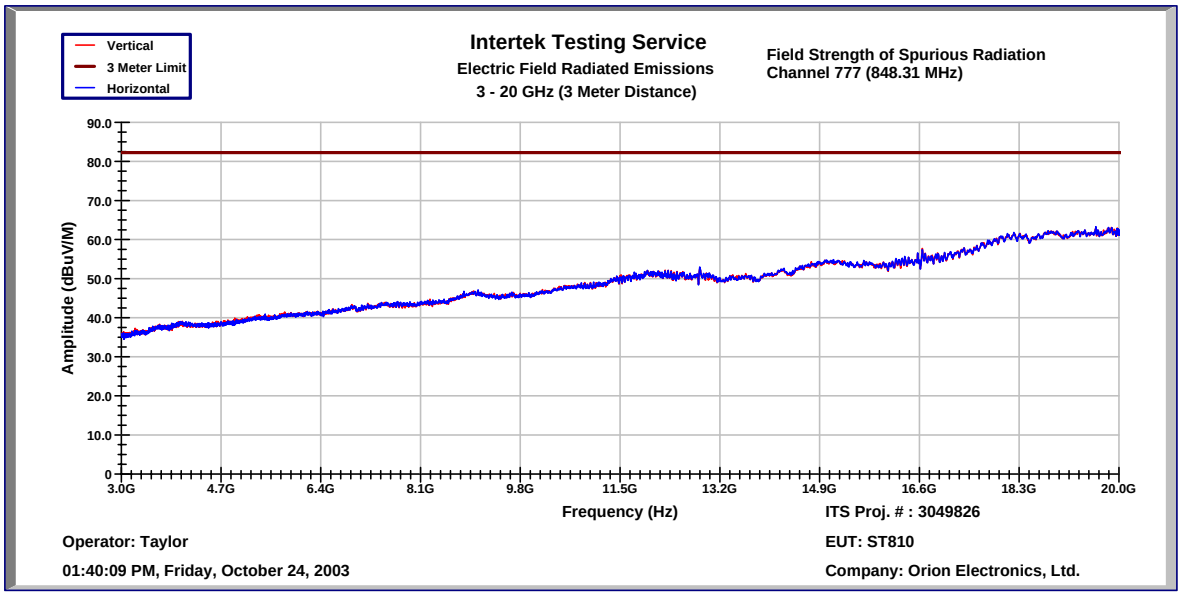

3 Meter Limit
Vertical
Horizontal
Intertek Testing Service
Electric Field Radiated Emissions
1 - 3 GHz (3 Meter Distance)
Field Strength of Spurious Radiation
Channel 1013 (824.7 MHz)
Amplitude (dBuV/M)
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
1.0G
1.2G
1.4G
1.6G
1.8G
2.0G
2.2G
2.4G
2.6G
2.8G
3.0G
Frequency (Hz)
Operator: Taylor
10:16:31 AM, Friday, October 24, 2003
ITS Proj. # : 3049826
EUT: ST810
Company: Orion Electronics, Ltd.

Figure 8-3: Field Strength of Spurious Radiation (3GHz – 20GHz), CDMA 800 Channel 384, 777, and 1013





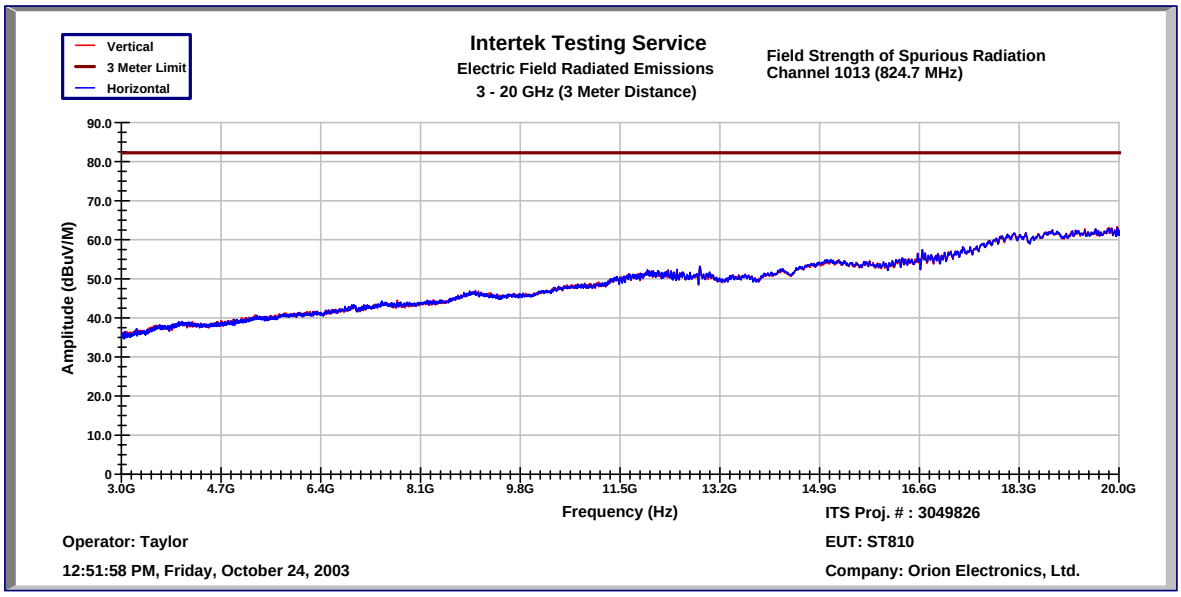
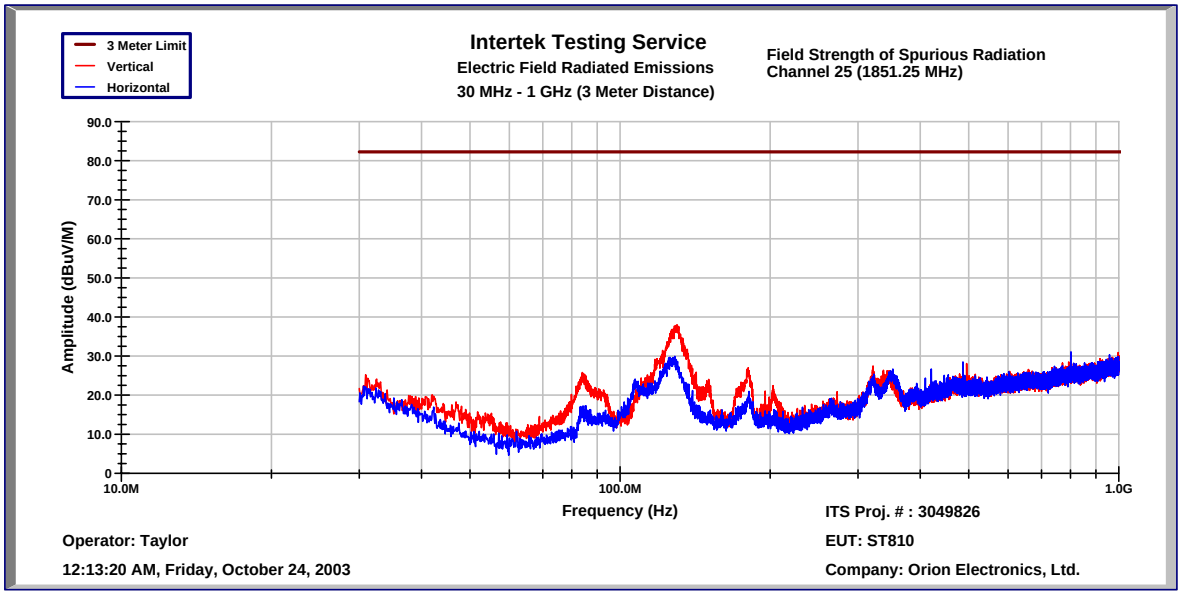
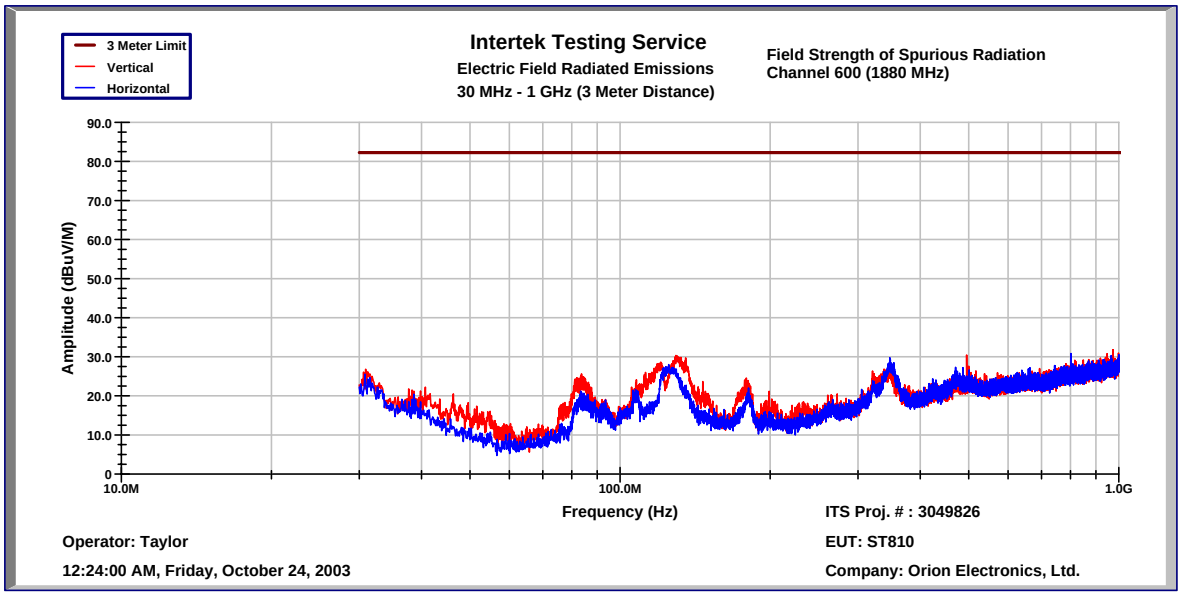

Vertical
3 Meter Limit
Horizontal
Intertek Testing Service
Electric Field Radiated Emissions
3 - 20 GHz (3 Meter Distance)
Field Strength of Spurious Radiation
Channel 1013 (824.7 MHz)
Amplitude (dBuV/M)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
3.0G
4.7G
6.4G
8.1G
9.8G
11.5G
13.2G
14.9G
16.6G
18.3G
20.0G
Frequency (Hz)
Operator: Taylor
12:51:58 PM, Friday, October 24, 2003
ITS Proj. # : 3049826
EUT: ST810
Company: Orion Electronics, Ltd.

Figure 8-4: Field Strength of Spurious Radiation (30 MHz – 1 GHz), CDMA 1900 Channel 25, 600, and 1175





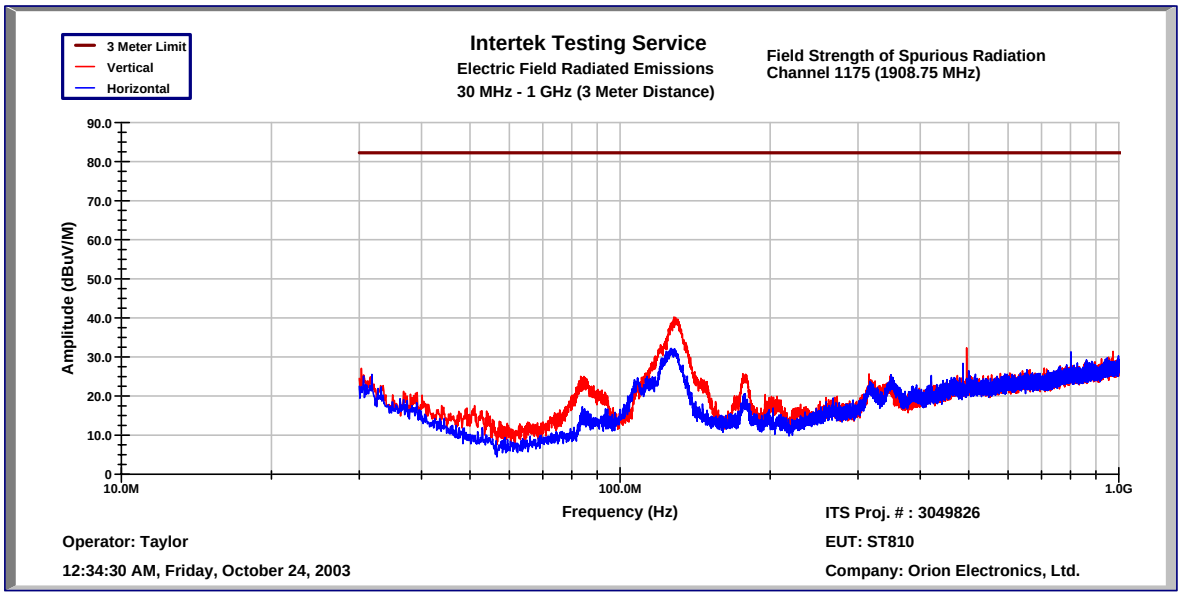
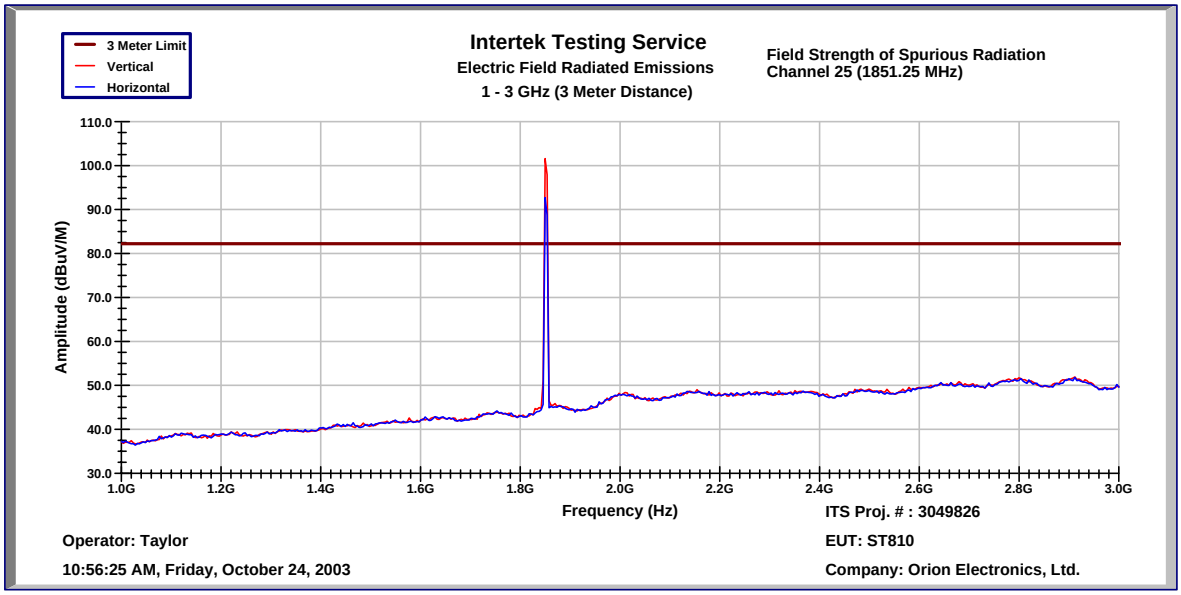
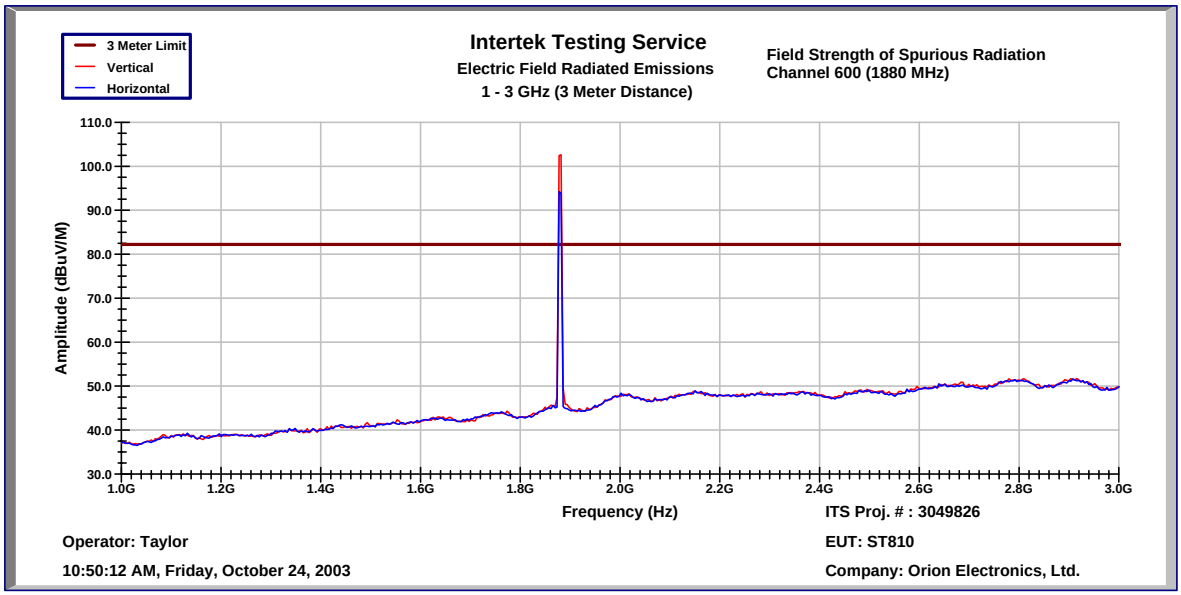

3 Meter Limit
Vertical
Horizontal
Intertek Testing Service
Electric Field Radiated Emissions
30 MHz - 1 GHz (3 Meter Distance)
Field Strength of Spurious Radiation
Channel 1175 (1908.75 MHz)
Amplitude (dBuV/M)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
10.0M
100.0M
1.0G
Frequency (Hz)
Operator: Taylor
12:34:30 AM, Friday, October 24, 2003
ITS Proj. # : 3049826
EUT: ST810
Company: Orion Electronics, Ltd.

Figure 8-5: Field Strength of Spurious Radiation (1 GHz – 3 GHz), CDMA 1900 Channel 25, 600, and 1175





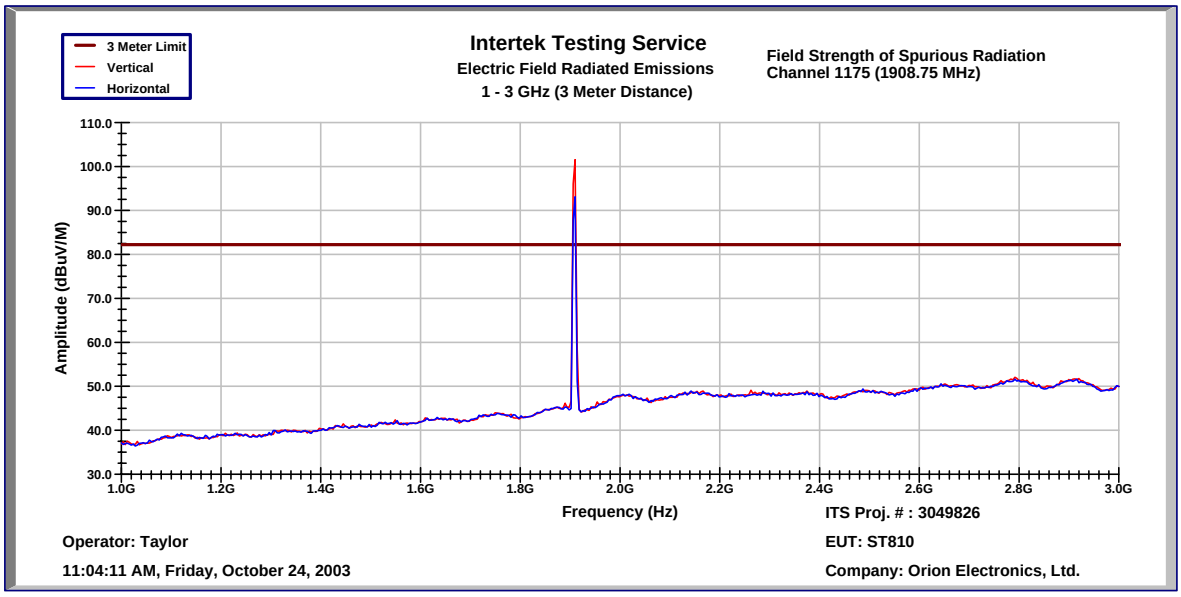
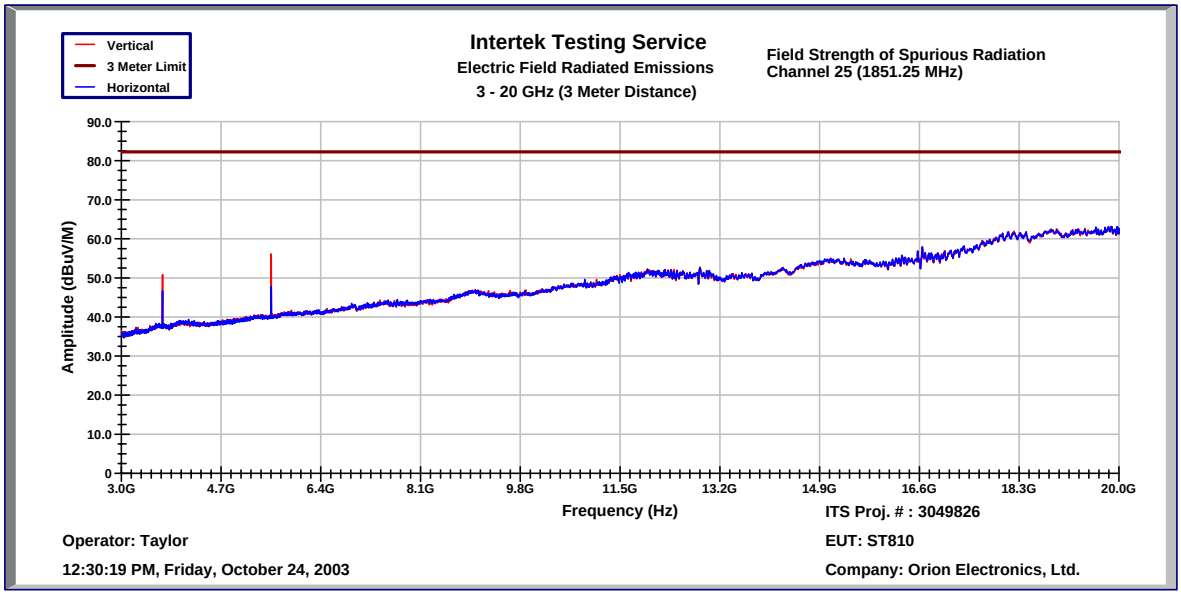
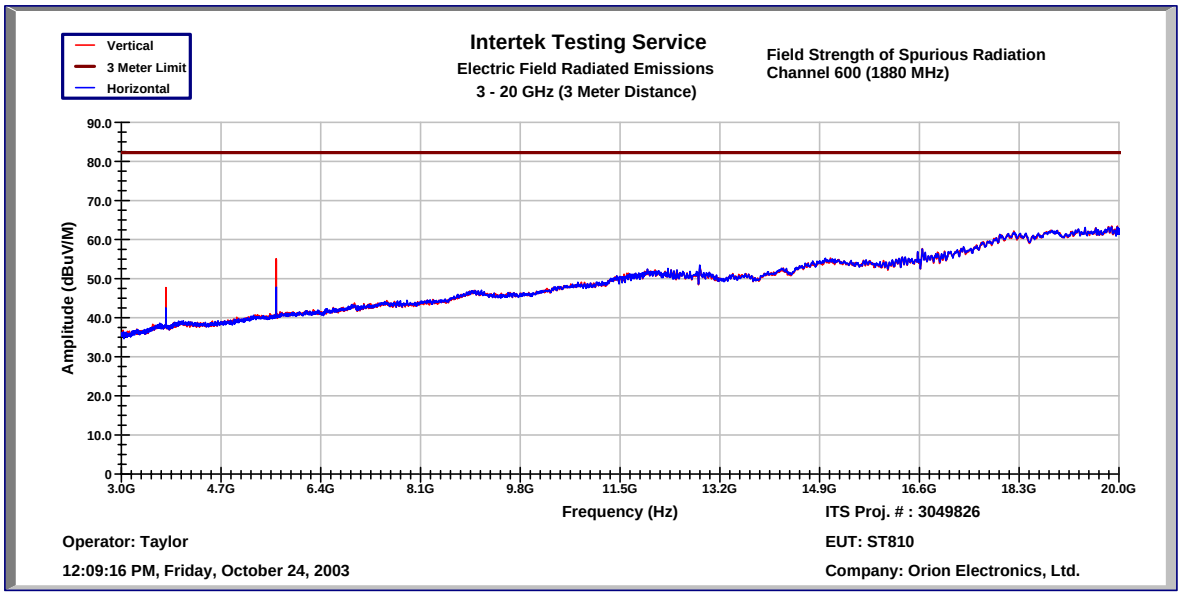
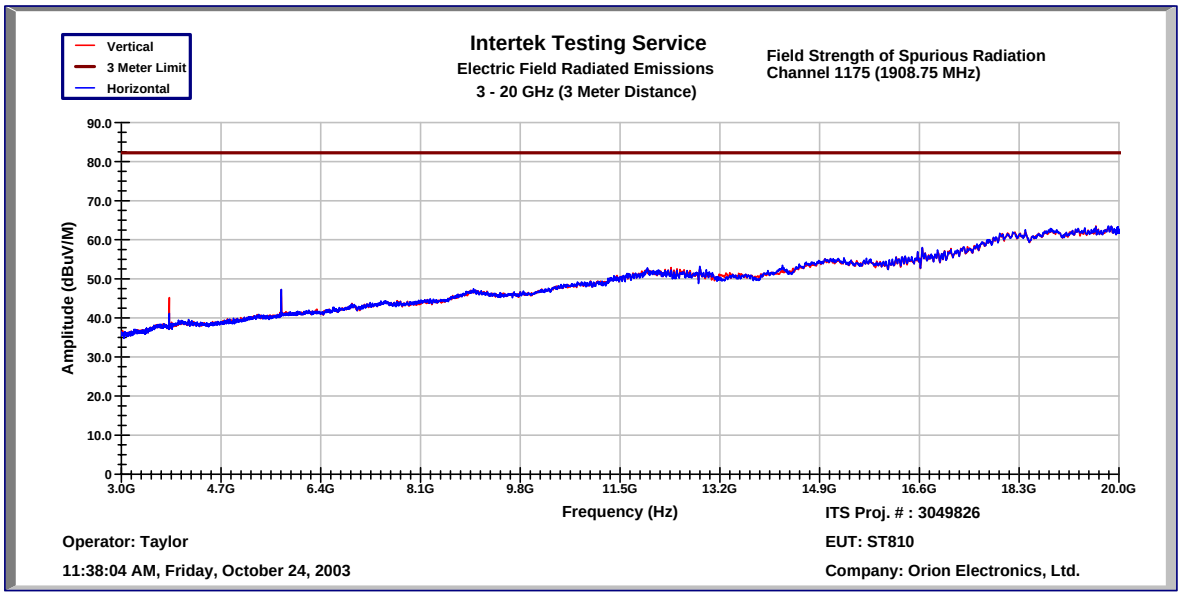

3 Meter Limit
Vertical
Horizontal
Intertek Testing Service
Electric Field Radiated Emissions
1 - 3 GHz (3 Meter Distance)
Field Strength of Spurious Radiation
Channel 1175 (1908.75 MHz)
Amplitude (dBuV/M)
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
1.0G
1.2G
1.4G
1.6G
1.8G
2.0G
2.2G
2.4G
2.6G
2.8G
3.0G
Frequency (Hz)
Operator: Taylor
11:04:11 AM, Friday, October 24, 2003
ITS Proj. # : 3049826
EUT: ST810
Company: Orion Electronics, Ltd.

Figure 8-6: Field Strength of Spurious Radiation (3GHz – 20GHz), CDMA 1900 Channel 25, 600, and 1175






Vertical
3 Meter Limit
Horizontal
Intertek Testing Service
Electric Field Radiated Emissions
3 - 20 GHz (3 Meter Distance)
Field Strength of Spurious Radiation
Channel 1175 (1908.75 MHz)
Amplitude (dBuV/M)
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
3.0G
4.7G
6.4G
8.1G
9.8G
11.5G
13.2G
14.9G
16.6G
18.3G
20.0G
Frequency (Hz)
Operator: Taylor
11:38:04 AM, Friday, October 24, 2003
ITS Proj. # : 3049826
EUT: ST810
Company: Orion Electronics, Ltd.

9 POWER LINE CONDUCTED EMISSIONS

FCC §15.107, FCC §15.207

9.1 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: 1992.

9.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Base Station Simulator	Rohde & Schwarz	CMU-200	1100.0008.02	8/2004
EMI Receiver	Rohde & Schwarz	ESI 26	1088.7490	11/27/2003
LISN	FCC	FCC-LISN-50-50-2M	1026	12/2003

9.3 Test Results

The ST810 met the power line conducted emission requirements of FCC §15.107 and §15.207. The test results are located in Figure 9-1 through . The graphical data, measured with peak detection, was all below the class B quasi-peak and average limits.

Figure 9-1: FCC §15.107 and §15.207 power line conducted emissions (Line 1)

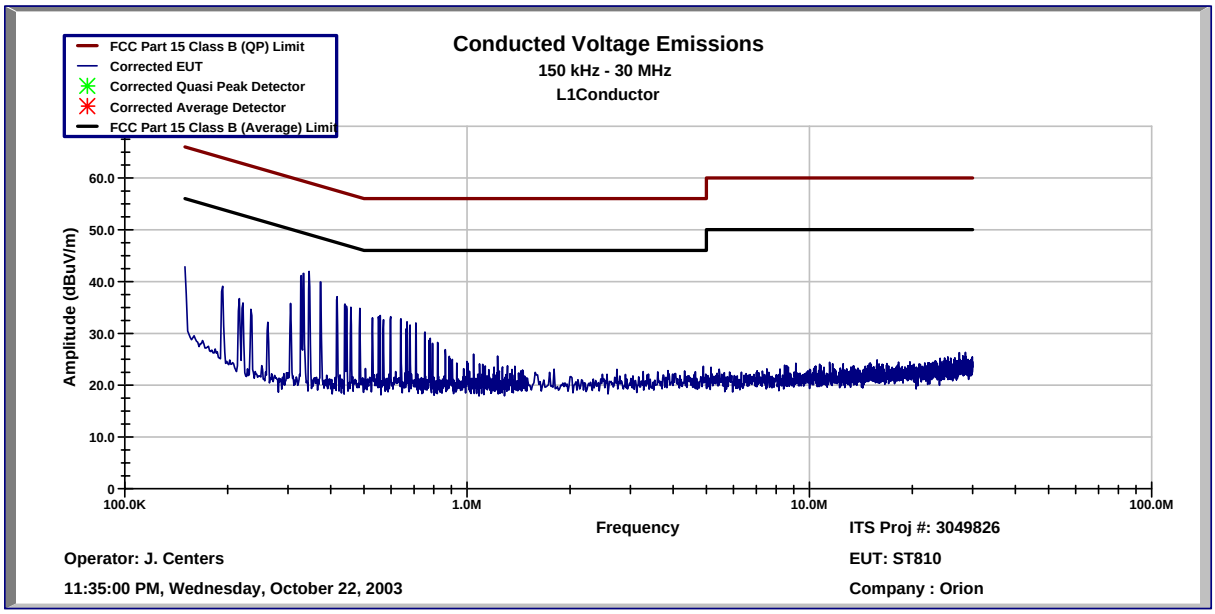
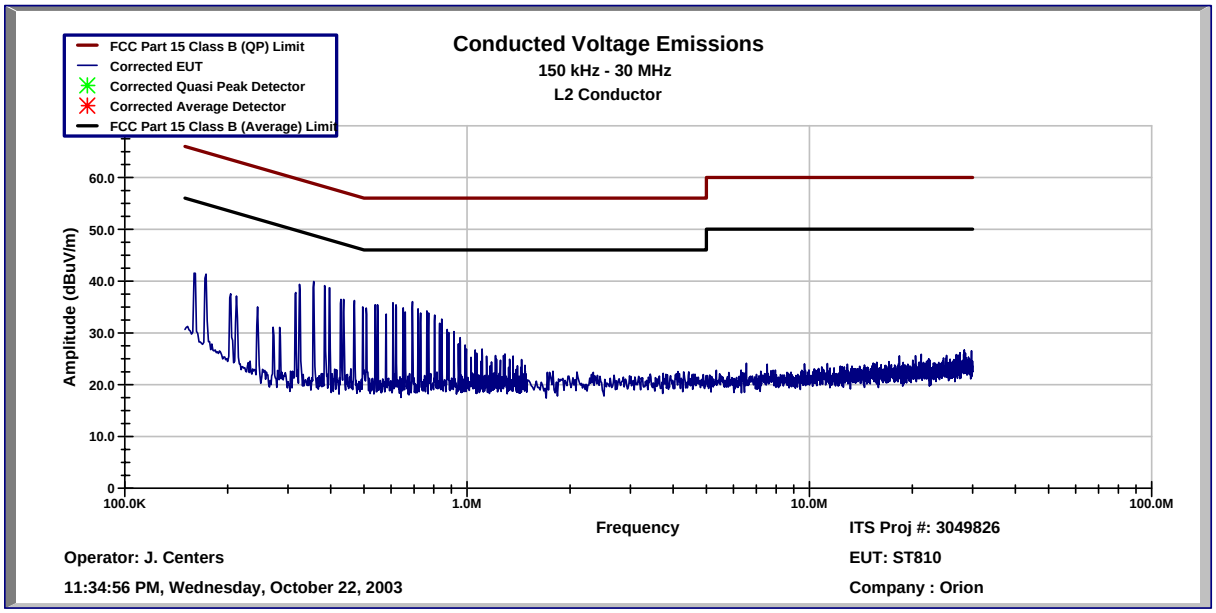


Figure 9-2: FCC §15.107 and §15.207 power line conducted emissions (Line 2)



RECEIVER SPURIOUS EMISSIONS

10.1 Test Limits

Table 10-1 Radiated Emission Limit for FCC §15.109

Radiated Emission Limits at 3 meters	
Frequency (MHz)	**Quasi-Peak limits, dB (μV/m)**
30 to 88	40.0
88 to 216	43.5
216 to 960	46.0
960 and up	54.0

10.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Horn Antenna	Antenna Research	DRG-118/A	1086	3/7/2007
Horn Antenna	EMCO	3115	6556	7/11/2004
EMI Receiver	Rohde & Schwarz	ESI 26	1088.7490	11/27/2003
Bilog Antenna	EMCO	3142B	1674	8/2004
Preamplifier	HP	8449B	3008A00775	12/2003

10.3 Test Procedure

Measurements are made over the frequency range of 30 MHz to five times the highest frequency operating within the device. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole. From 30 to 1000 MHz, a quasi-peak detector was used for measurement. Above 1000 MHz, average measurements were performed.

Measurements of the radiated field are made with the antenna located at a distance of 3 meters from the EUT. If the field-strength measurements at 3m cannot be made because of high ambient noise level or for other reasons, measurements may be made at a closer distance, for example 1m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4: 1992.

10.4 Test Results

The ST810 met the radiated disturbance requirements of FCC §15.109. The maximized quasi peak data can be found in Figure 10-3. There were no other emissions detected within 10 dB of the limit.

Figure 10-1 FCC §15.109Worse Case Receiver Spurious Emission (Horizontal)

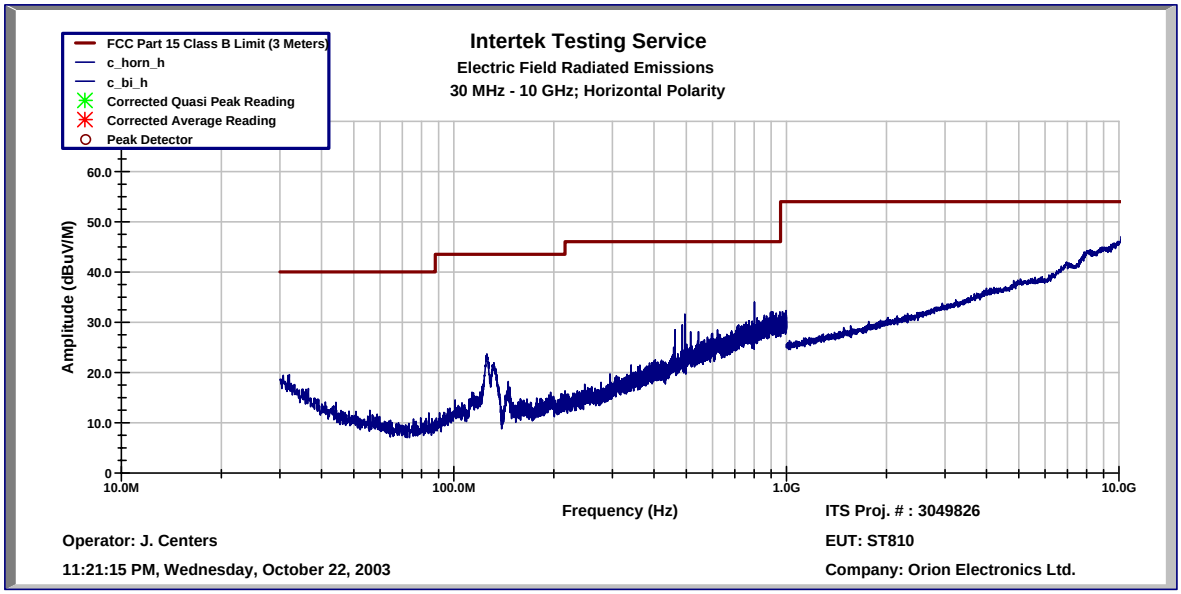


Figure 10-2 FCC §15.109Worse Case Receiver Spurious Emission (Vertical)

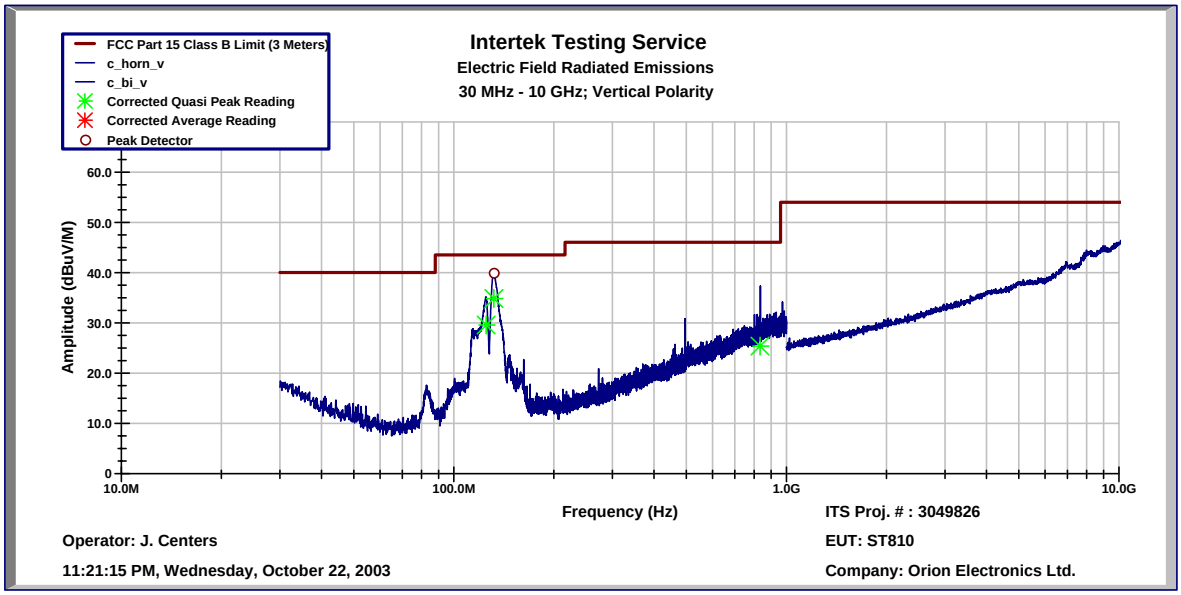


Figure 10-3 FCC §15.109 Maximized Quasi Peak and Average Emissions (Sorted by Delta)

Frequency (MHz)	Polarity (H/V)	Cab. (dB)	Ant. (dB)	Corr. Reading. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Azimuth (deg)	Tower (cm)	Results
132.02 MHz	V	0.91	7.7	34.83	43.52	-8.69	28	99	**Compliant**
125.09 MHz	V	0.88	7.93	29.56	43.52	-13.96	319	100	**Compliant**
833.57 MHz	V	2.35	23.7	25.35	46.02	-20.67	45	352	**Compliant**

11 FREQUENCY STABILITY VS TEMPERATURE

FCC §2.1055, FCC §22.355, FCC §24.235

Frequency tolerance: 2.5ppm

11.1 Test Procedure

The equipment under test was connected to an external DC power supply and the RF output was connected to a CMU-200 Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for that purpose. After the temperature stabilized for approximately 30 minutes, the frequency error was read from the CMU-200.

11.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Base Station Simulator	Rohde & Schwarz	CMU-200	1100.0008.02	8/2004
Environmental Chamber	Thermotron	SM-8C	32692	12/2003

11.3 Test Results

The ST810 met the frequency stability requirements of FCC §2.1055, FCC §22.355and FCC §24.235. The test results are located in Table 11-1.

Table 11-1: Frequency stability vs. Temperature

Frequency Stability (Hz) vs. Temp.						
	PCS Phone			Cell Phone		
Temp (C)	25	600	1175	384	777	1013
60	-4	-9	-6	-3	-8	-1
50	-1	-5	-4	-3	-8	2
40	-2	-1	4	-2	-6	2
30	-4	-8	-10	-7	-11	-5
20	-6	-5	-4	-1	-4	-2
10	2	-1	-1	-4	-4	-1
0	1	-3	-1	-1	0	1
-10	-6	1	-7	1	-2	2
-20	-1	2	3	-1	-1	1
-30	-1	-3	3	2	0	2

12 FREQUENCY STABILITY VS VOLTAGE

FCC §2.1055, FCC §22.355

Frequency tolerance: 2.5ppm

12.1 Test Procedure

An external DC power supply was connected to the battery terminals of the equipment under test. The Base Station Simulator was set to force the EUT to its maximum power setting. The voltage was set to 115% of the nominal value and was then decreased to 85% of the nominal value. The output frequency was recorded for each battery voltage.

12.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
DC Power Supply	HP	6226	6M1203	5/20/2004
Temperature Chamber	Thermotron	SM-8C	32692	12/2003
Base Station Simulator	Rohde & Schwarz	CMU-200	1100.0008.02	8/2004

12.3 Test Results

The ST810 met the frequency stability requirements of FCC §2.1055 and FCC §22.355. The test results are located in Table 12-1.

Table 12-1: CDMA Frequency stability vs. input voltage

Frequency Stability (Hz) vs. Voltage						
	PCS Phone			Cell Phone		
Vdc	25	600	1175	384	777	1013
13.8	1	-1	1	3	3	4
12	1	-2	-1	5	5	4
10.2	1	-1	3	3	4	4