

## TEST REPORT

**Report Number: 3047435-001**

**Project Number: 3047435**

**September 30, 2003**

**Evaluation of the  
MobileScape Wireless Terminal – Novatel CDMA Module  
Model Number: M105X  
FCC ID: QWL-M-105X**

**FCC Part 2  
FCC Part 15  
FCC Part 24 Subpart E**

**For**

**Commerciant, L.P.**

Test Performed by:

Intertek  
731 Enterprise Drive  
Lexington, KY 40510

Test Authorized by:

Commerciant, L.P.  
2901 Wilcrest Drive  
Houston, TX 77042

Prepared By: Bryan C. Taylor Date: 9/30/2003

**Bryan C. Taylor, Team Leader**

Approved By: David Schramm Date: 10/01/2003

**David Schramm, EMC Team Leader**



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**Intertek**

731 Enterprise Drive, Lexington, KY 40510

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## 1 EXECUTIVE SUMMARY

Testing performed for: Commerciant, L.P.

Equipment Under Test: M105X, MobileScape Wireless Terminal – Novatel CDMA Module

FCC RULE	DESCRIPTION OF TEST	RESULT	PAGE
§2.1046	RF Power Output	Passed	10
§24.232	EIRP	Passed	12
§2.1051 §24.238(a)	Out of Band Emissions at Antenna Terminals	Passed	13
§2.1053	Field Strength of Spurious Radiation	Passed	20
§15.107, §15.207	Power Line Conducted Emissions	Passed	27
§15.109	Receiver Spurious Emission	Passed	31
§2.1055, §24.235	Frequency Stability vs. Temperature	Passed	36
§2.1055, §24.235	Frequency Stability vs. Voltage	Passed	38
§2.1091, §2.1093	Specific Absorption Rate	Passed	See Note <sup>1</sup>

<sup>1</sup> The results for this testing are contained in a separate report.

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## 2 JOB DESCRIPTION

### 2.1 Client information

The MobileScape Wireless Terminal – Novatel CDMA Module has been tested at the request of

**Company:** Commerçant, L.P.  
2901 Wilcrest Drive  
Houston, TX 77042

**Name of contact:** Daniel Motsinger

**Telephone:** 713-735-5515

**Fax:** 713-735-5585

### 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

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

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## 2.3 Equipment Under Test (EUT)

The M105X was a Mobile Wireless Terminal used for scanning credit cards. The unit operated in the CDMA 1900 band using an internal wire antenna. The following is a detailed description of the EUT.

<b>Product</b>	MobileScape Wireless Terminal – Novatel CDMA Module
<b>EUT Model Number</b>	M105X
<b>EUT Serial Number</b>	Not Labeled
<b>Whether quantity (&gt;1) production is planned</b>	Quantity production is planned.
<b>Cellular Phone standards</b>	CDMA1900
<b>Type(s) of Emission</b>	1M25F9W
<b>RF Output Power</b>	1850-1910 MHz: 25.7 dBm – CDMA1900
<b>Frequency Range</b>	1850 – 1910 MHz CDMA1900
<b>Antenna &amp; Gain</b>	Integrated, non-retractable (internal)
<b>Detachable Antenna ?</b>	No
<b>External input</b>	<input type="checkbox"/> Audio <input checked="" type="checkbox"/> Digital Data
<b>Voltage and current into the final stage</b>	Vcc_main = 3.8V, I=603 mA

EUT receive date: 8/27/2003

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

Test start date: 8/27/2003

Test completion date: 9/6/2003

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

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### 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
9 – 18VDC Car Charger	Glob Tek, Inc.	HCD15-070200	1483	Not Listed
Switch-Mode Power Supply	Commerciant	EPA-101M-07A	DPS070130UM-9FT-RP5-SZ	Not Listed
3.7V Lithium Ion Battery	Ultralife	UBBP01	0212/BF01	Not Listed

### 2.3.2 Cables associated with EUT

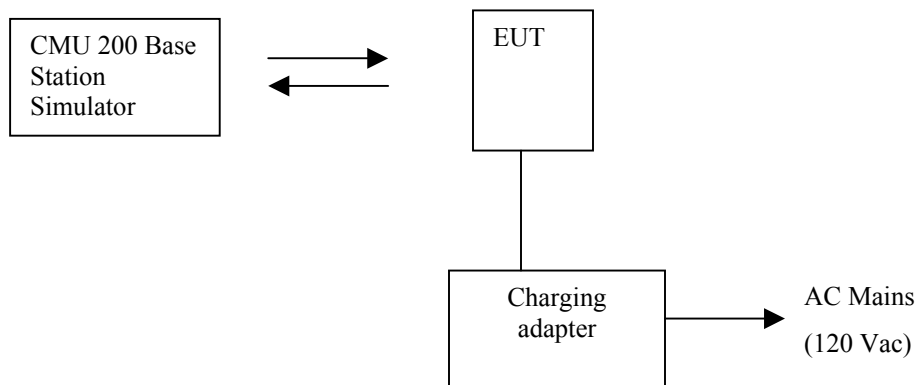
Table 2-2 contains the details of the cables associated with the EUT.

*Table 2-2: Interconnecting cables between modules of EUT*

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
Adapter cable	9ft	None	None	EUT	Charging adapter

### 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.



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#### **2.3.4 Justification**

The EUT was operated in the stand-alone configuration.

#### **2.3.5 Mode(s) of operation**

The EUT was powered from 3.7Vdc. For all testing, a fully charged battery was used with the battery charger attached.

### **2.4 Modifications required for compliance**

No modifications were implemented by Intertek.

### **2.5 Related Submittal(s) Grants**

None



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### 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*



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## 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, which 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 MobileScape Wireless Terminal – Novatel CDMA Module met the RF power output requirements of FCC Part FCC Part 24 Subpart E. The test results are located in Table 4-1 and Table 4-2.

Table 4-1 Conducted RF Power

EUT Mode	Frequency MHz	Channel	Measured Power dBm
CDMA1900	1851.25	25	23.90
	1880.00	600	23.65
	1908.75	1175	22.19

Table 4-2 RF Power Variation with temperature

EUT Mode	Frequency MHz	Channel	Measured Power dBm		
			+60°C	+20°C	-30°C
CDMA1900	1851.25	25	23.57	23.90	24.24
	1880.00	600	23.15	23.65	23.85
	1908.75	1175	21.16	22.19	25.70

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## 5 RADIATED RF POWER

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 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 1851.25-1908.75 MHz were measured using a substitution method. The EUT was replaced by a horn antenna connected to a signal generator, which was set to -10 dBm. The receiver reading was recorded and EIRP was calculated as follows:

$$\text{EIRP} = E_1 - E_2 + V_g + G$$

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

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### 5.3 Test Results

The MobileScape Wireless Terminal – Novatel CDMA Module 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 Flat on an 80cm High Wooden Table									
EUT Mode	Polarity (H/V)	Channel	Frequency (MHz)	Measurement Method (ERP/EIRP)	EUT Reading (dBuV)	Substitution Reading (dBuV)	Power Reading (dBm)	Tx Antenna Gain (dBi)	ERP / EIRP (dBm)
CDMA	V	25	1851.25	EIRP	76.96	61.93	-11.45	7.1	10.68
CDMA	V	600	1880	EIRP	75.63	60.81	-11.43	7.1	10.49
CDMA	V	1175	1908.75	EIRP	73.12	60.72	-11.46	7.1	8.04
CDMA	H	25	1851.25	EIRP	80.53	62.47	-11.45	7.1	13.71
CDMA	H	600	1880	EIRP	78.367	61.99	-11.43	7.1	12.047
CDMA	H	1175	1908.75	EIRP	75.32	62.18	-11.46	7.1	8.78

EUT Resting Vertical on an 80cm High Wooden Table									
EUT Mode	Polarity (H/V)	Channel	Frequency (MHz)	Measurement Method (ERP/EIRP)	EUT Reading (dBuV)	Substitution Reading (dBuV)	Power Reading (dBm)	Tx Antenna Gain (dBi)	ERP / EIRP (dBm)
CDMA	V	25	1851.25	EIRP	82.09	61.93	-11.45	7.1	15.81
CDMA	V	600	1880	EIRP	82.41	60.81	-11.43	7.1	17.27
CDMA	V	1175	1908.75	EIRP	77.41	60.72	-11.46	7.1	12.33
CDMA	H	25	1851.25	EIRP	80.2	62.47	-11.45	7.1	13.38
CDMA	H	600	1880	EIRP	76.57	61.99	-11.43	7.1	10.25
CDMA	H	1175	1908.75	EIRP	72.04	62.18	-11.46	7.1	5.5

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## 6 EMISSION LIMITATIONS, OCCUPIED BANDWIDTH

FCC §2.1047, FCC §24.238(a)

Out of Band Emissions: On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB.

Band Edge Requirements: In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the Out of Band Emissions.

### 6.1 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1 MHz (except where indicated). Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

For the occupied bandwidth measurements, the OBW function of the Rohde & Schwarz ESI 26 was used to find the 99% bandwidth. The device was transmitting at maximum output power during this measurement.

### 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

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### 6.3 Test Results

The MobileScope Wireless Terminal – Novatel CDMA Module met the out of band emission at antenna terminal requirements of FCC §24.238(a).

*Table 6-1: Summary of test result locations*

Location	Mode (Band)	Channel	Description
Figure 6-1	CDMA1900	25	Occupied Bandwidth
Figure 6-2	CDMA1900	600	Occupied Bandwidth
Figure 6-3	CDMA1900	1175	Occupied Bandwidth
Figure 6-4	CDMA1900	25	Conducted spurious emissions, 30MHz to 20 GHz
Figure 6-5	CDMA1900	600	Conducted spurious emissions, 30MHz to 20 GHz
Figure 6-6	CDMA1900	1175	Conducted spurious emissions, 30MHz to 20 GHz
Figure 6-7	CDMA1900	25	Emissions within 1 MHz of band edge
Figure 6-8	CDMA1900	1175	Emissions within 1 MHz of band edge

*Table 6-2: Occupied Bandwidth Results*

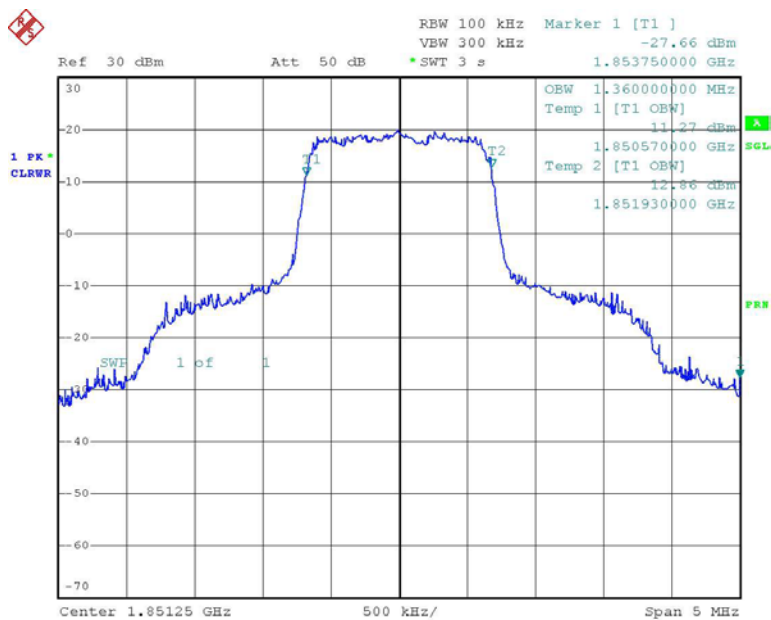
Mode	Channel	Resolution Bandwidth	Video Bandwidth	Sweep time	Measured Bandwidth MHz
CDMA1900	25	100 kHz	300 kHz	3 seconds	1.36
CDMA1900	600	100 kHz	300 kHz	3 seconds	1.36
CDMA1900	1175	100 kHz	300 kHz	3 seconds	1.36

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Figure 6-1: Occupied Bandwidth, CDMA 1900 Channel 25



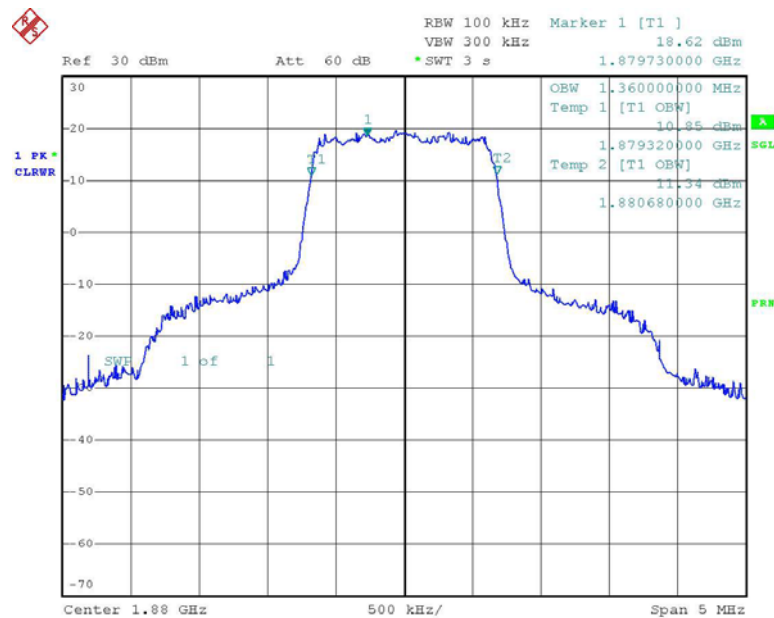
Date: 30.SEP.2003 13:29:26

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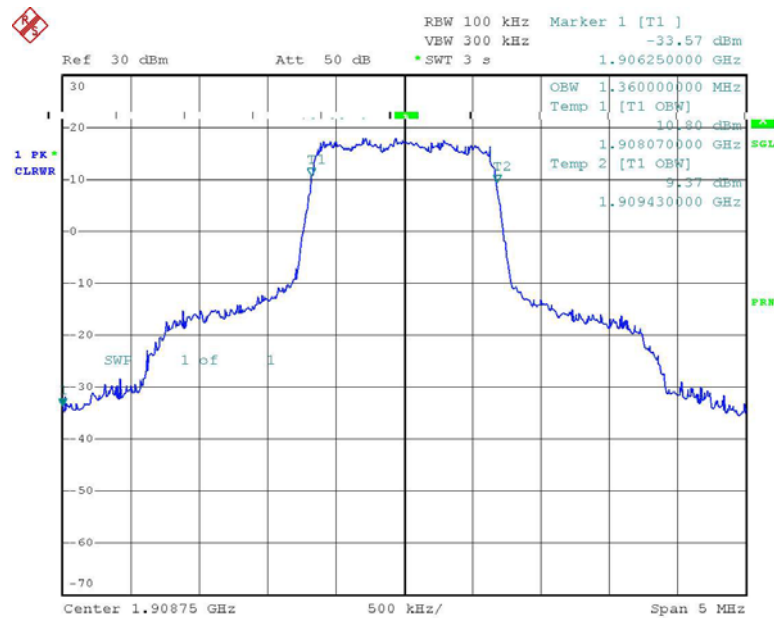
Model No: M105X

Figure 6-2: Occupied Bandwidth, CDMA 1900 Channel 600



Date: 30.SEP.2003 13:28:11

Figure 6-3: Occupied Bandwidth, CDMA 1900 Channel 1175



Date: 30.SEP.2003 13:31:42



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Figure 6-4: Out of band emissions at antenna terminals – CDMA1900 Channel 25

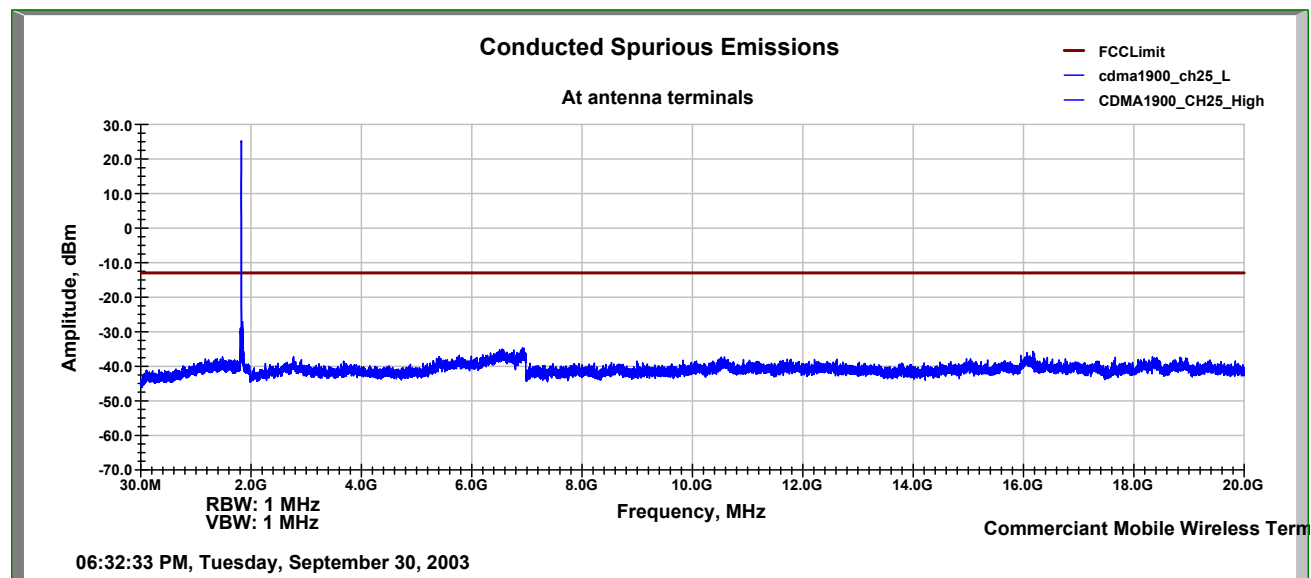
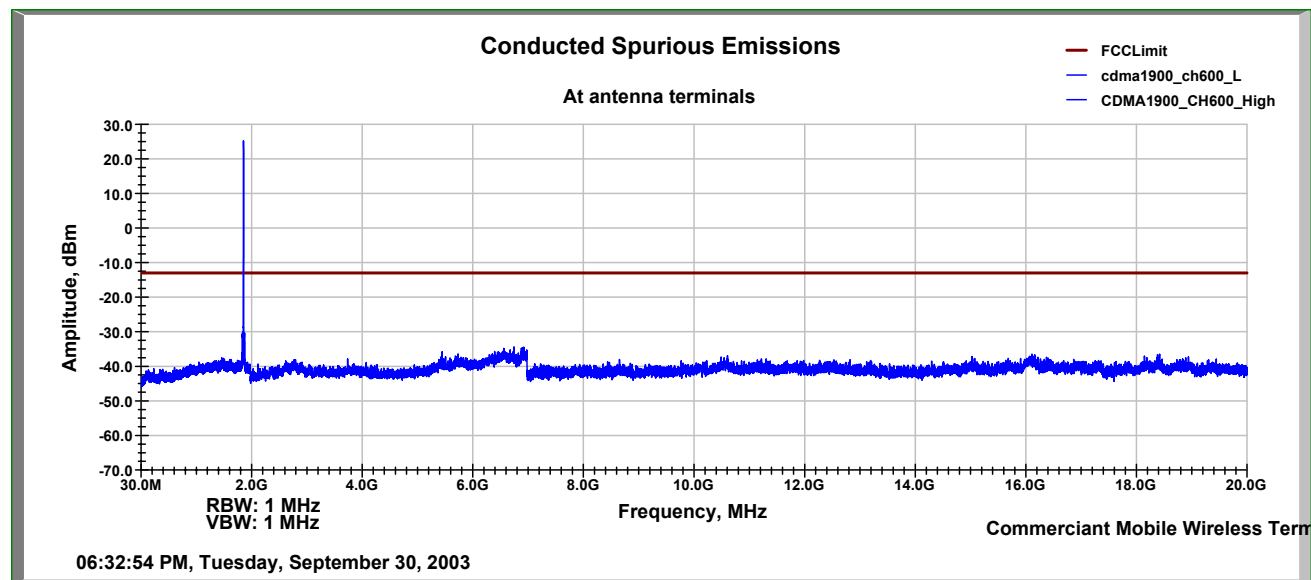


Figure 6-5: Out of band emissions at antenna terminals – CDMA1900 Channel 600



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Figure 6-6: Out of band emissions at antenna terminals – CDMA1900 Channel 1175

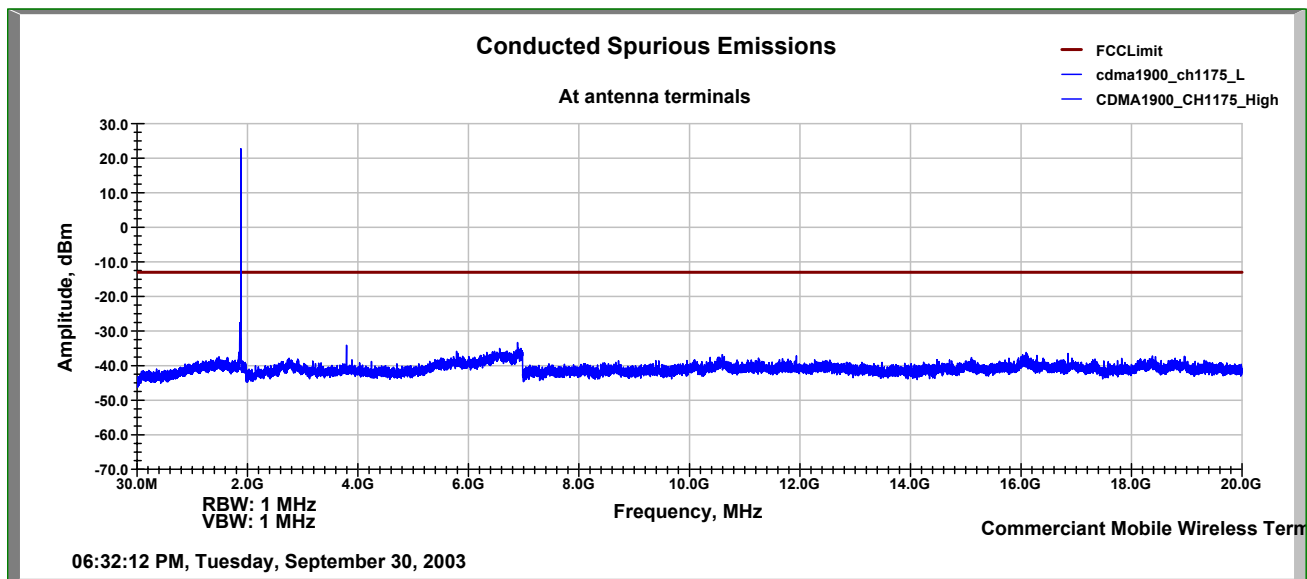
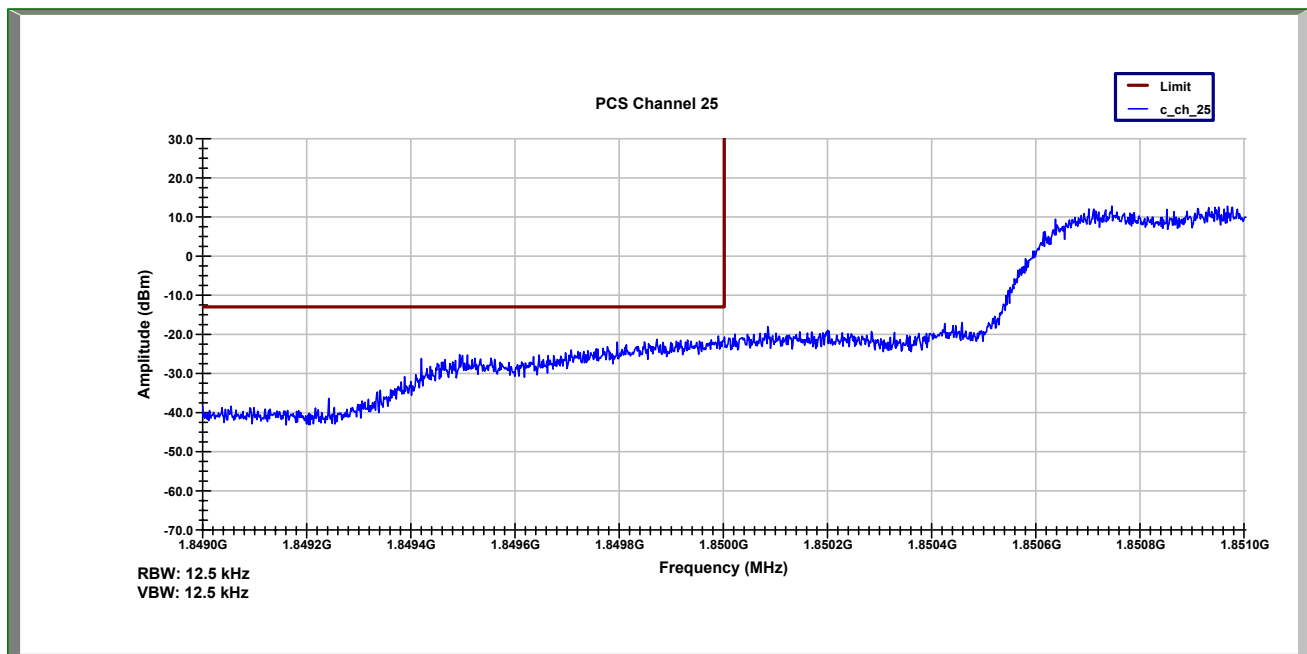


Figure 6-7: Emissions within 1 MHz of band edge, CDMA 1900 Channel 25

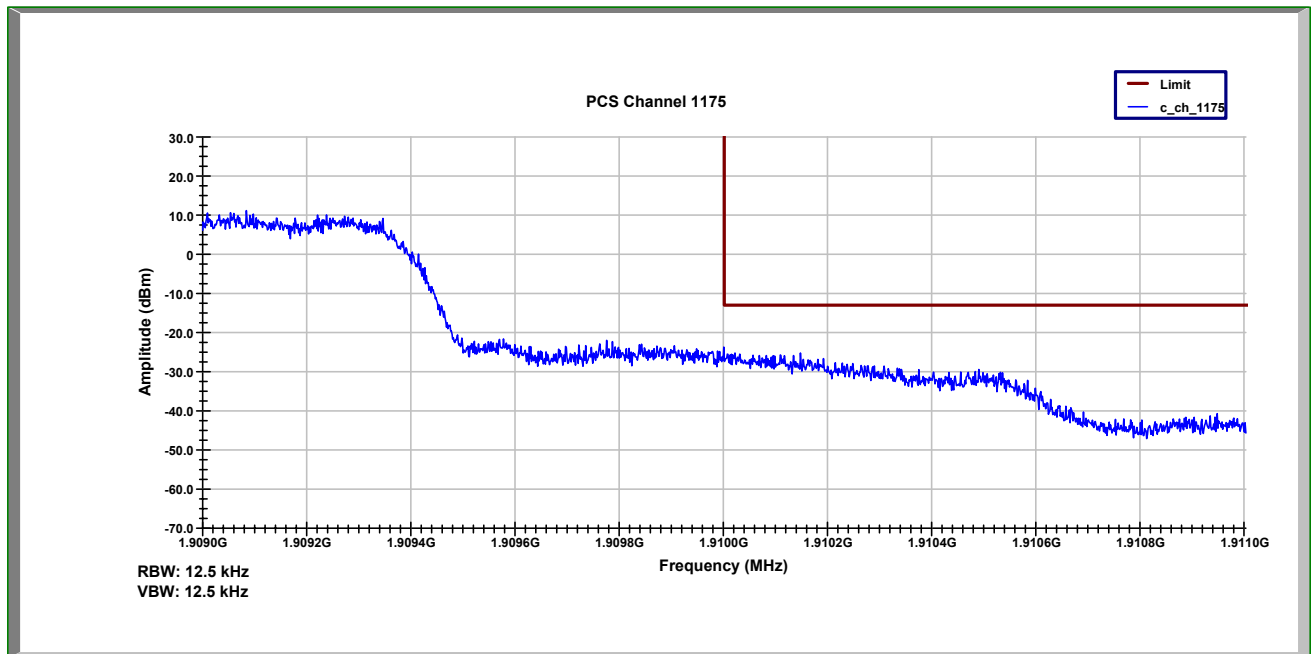


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Figure 6-8: Emissions within 1 MHz of band edge, CDMA 1900 Channel 1175



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## 7 FIELD STRENGTH OF SPURIOUS RADIATION

FCC §2.1053

### 7.1 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. 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 according to ANSI/TIA/EIA/-603 Standard.

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

### 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
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

Evaluation For: Commerciant, L.P.

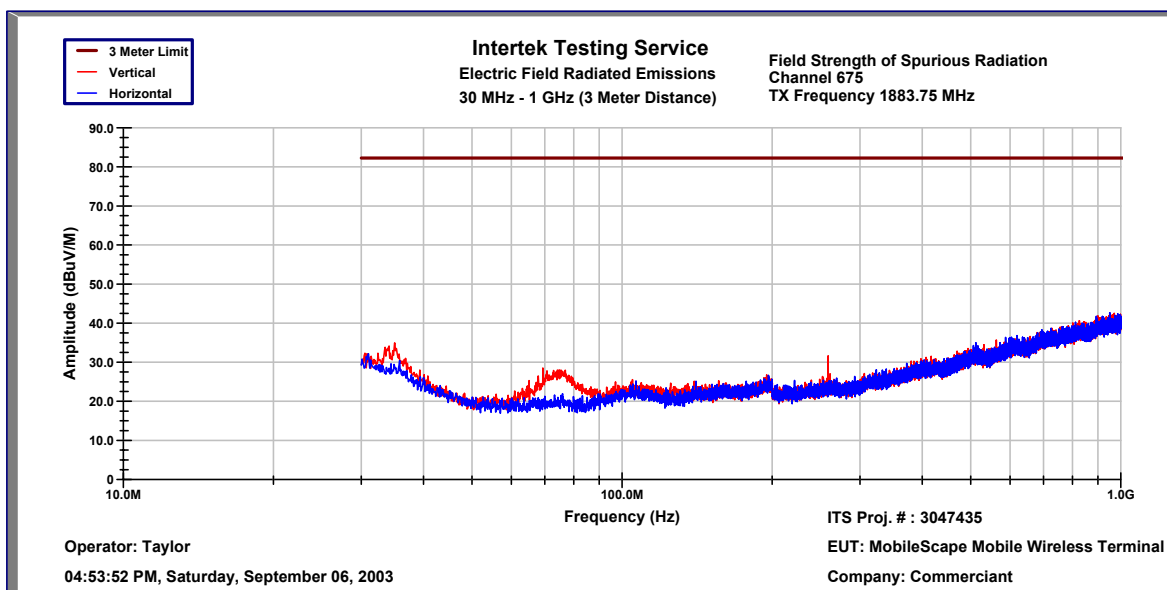
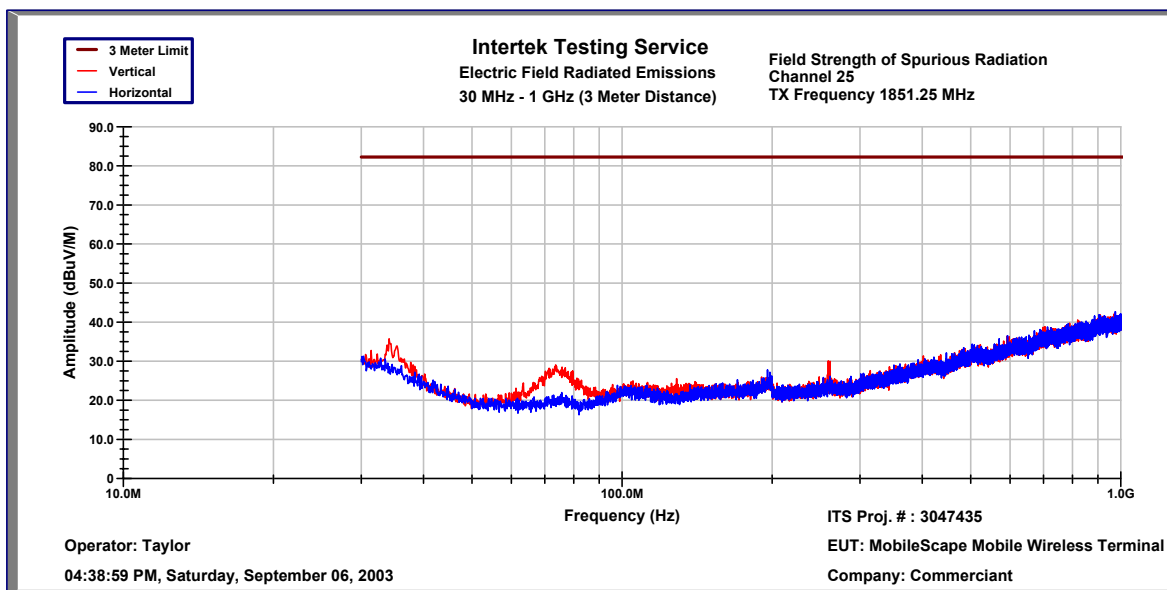
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### 7.3 Test Results

The MobileScope Wireless Terminal – Novatel CDMA Module met the field strength of spurious radiation requirements of FCC §2.1053. The scans below show no emissions found within 20dB of the limit.

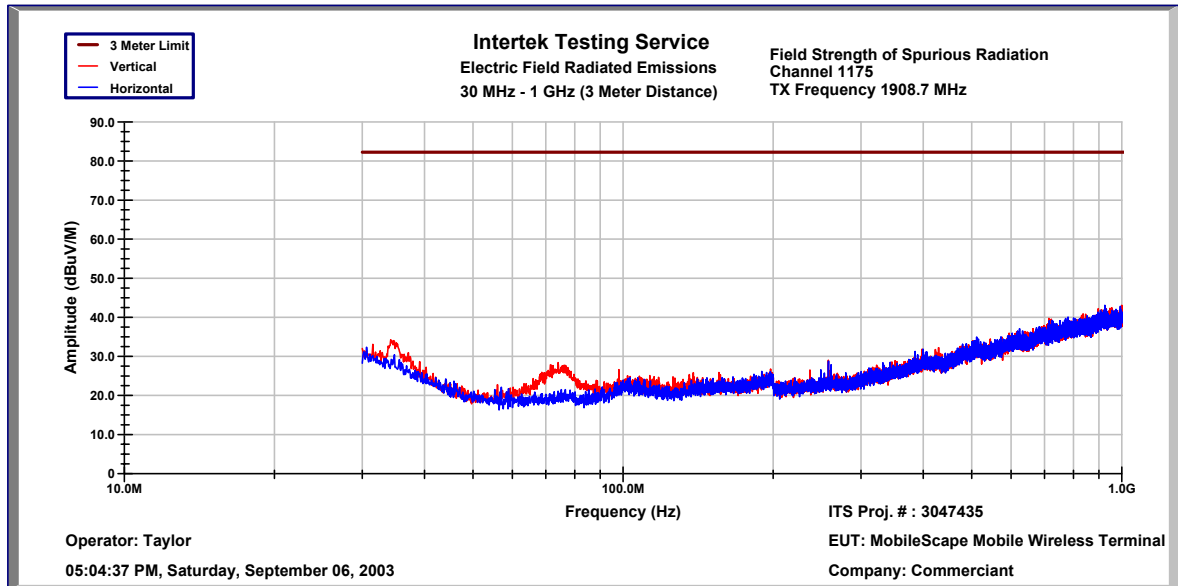
*Figure 7-1: Field Strength of Spurious Radiation (30 MHz – 1 GHz), CDMA 1900 Channel 25, 675, and 1175*



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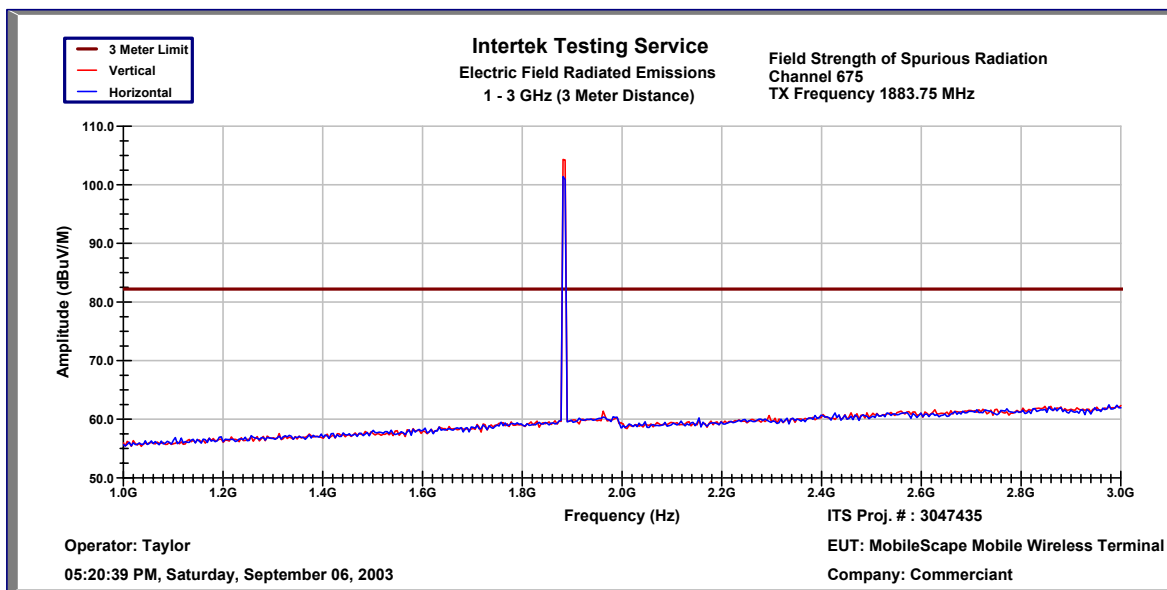
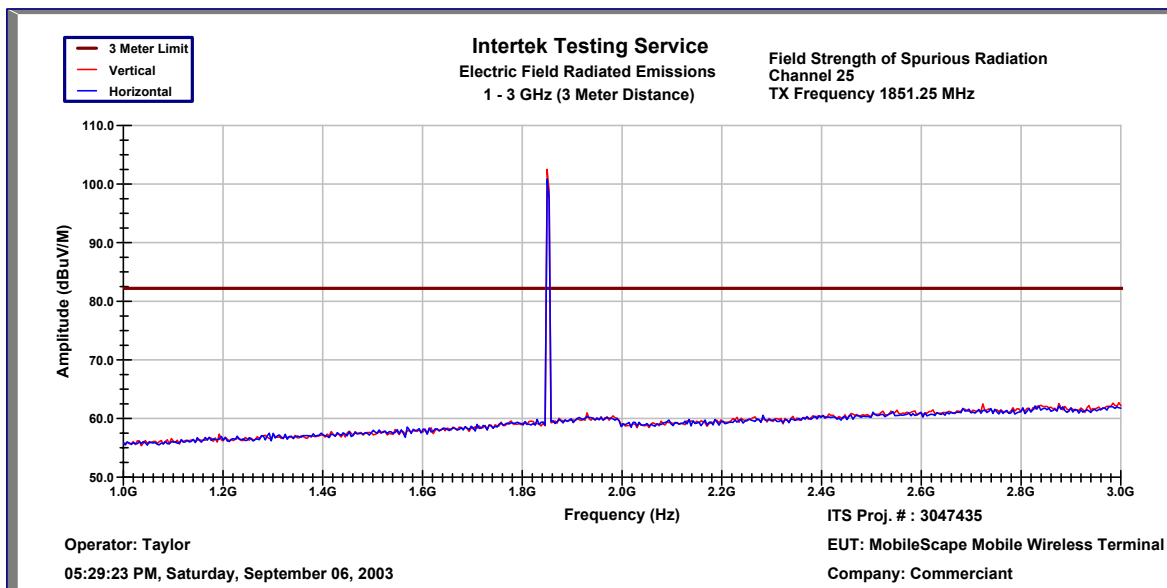


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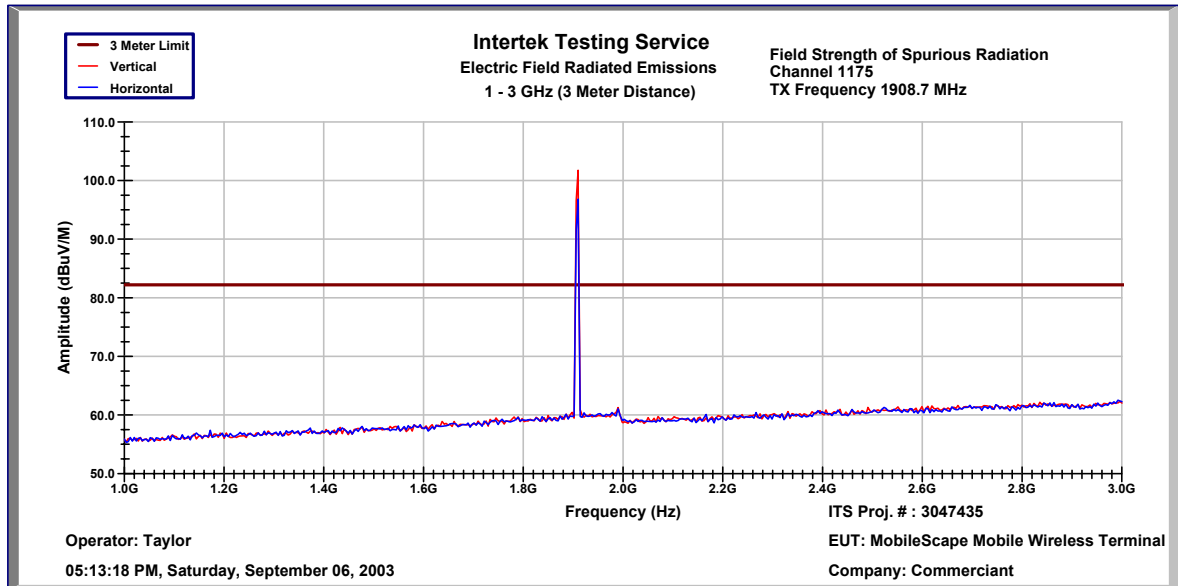
*Figure 7-2: Field Strength of Spurious Radiation (1 GHz – 3 GHz), CDMA 1900 Channel 25, 675, and 1175*



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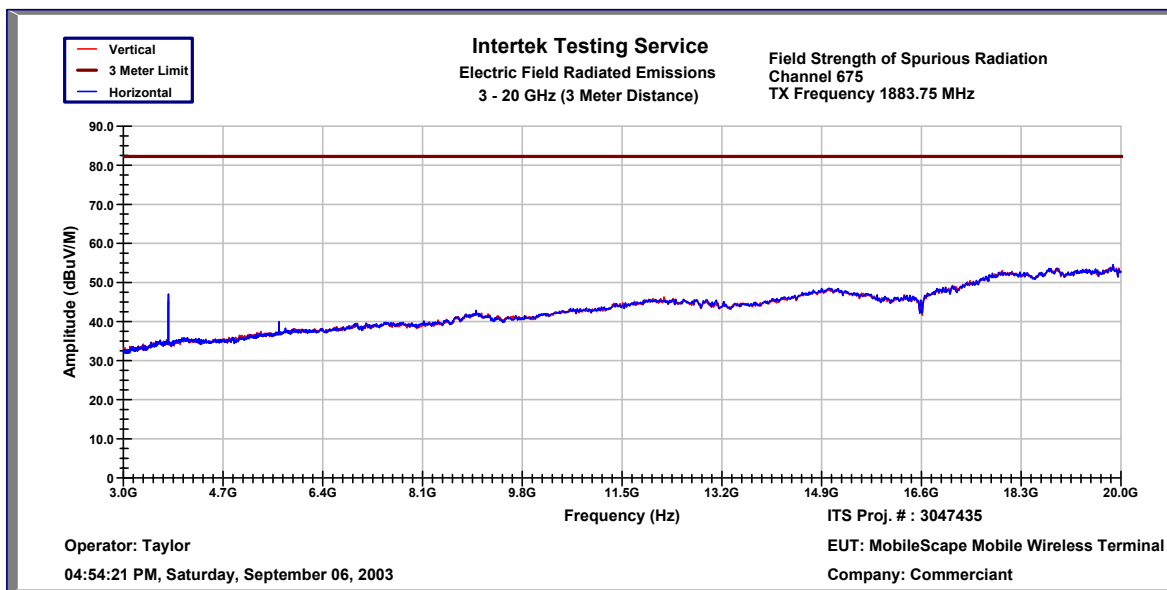
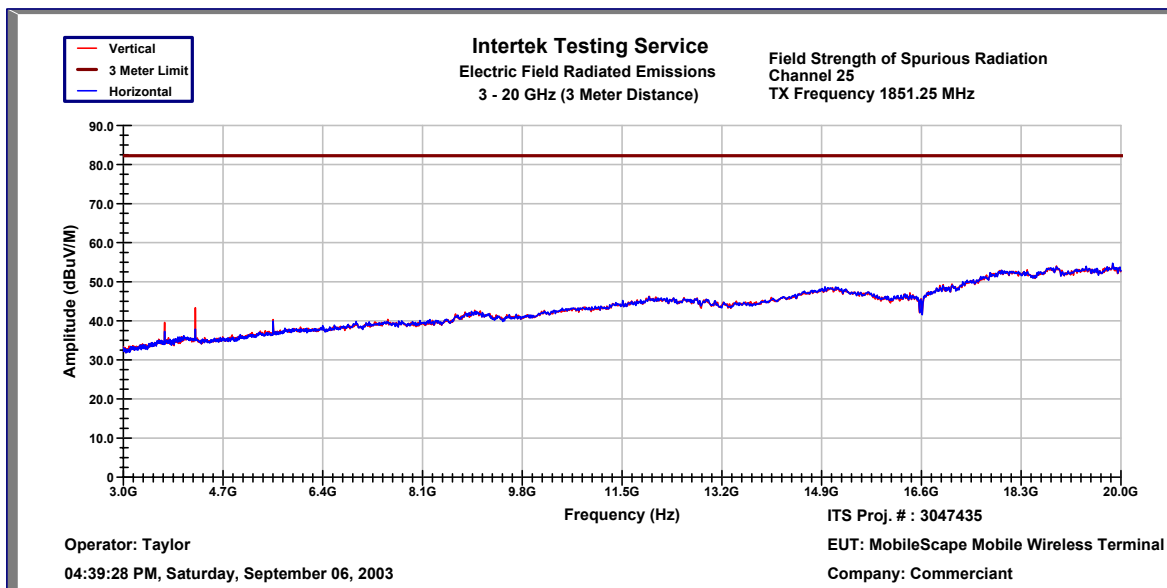


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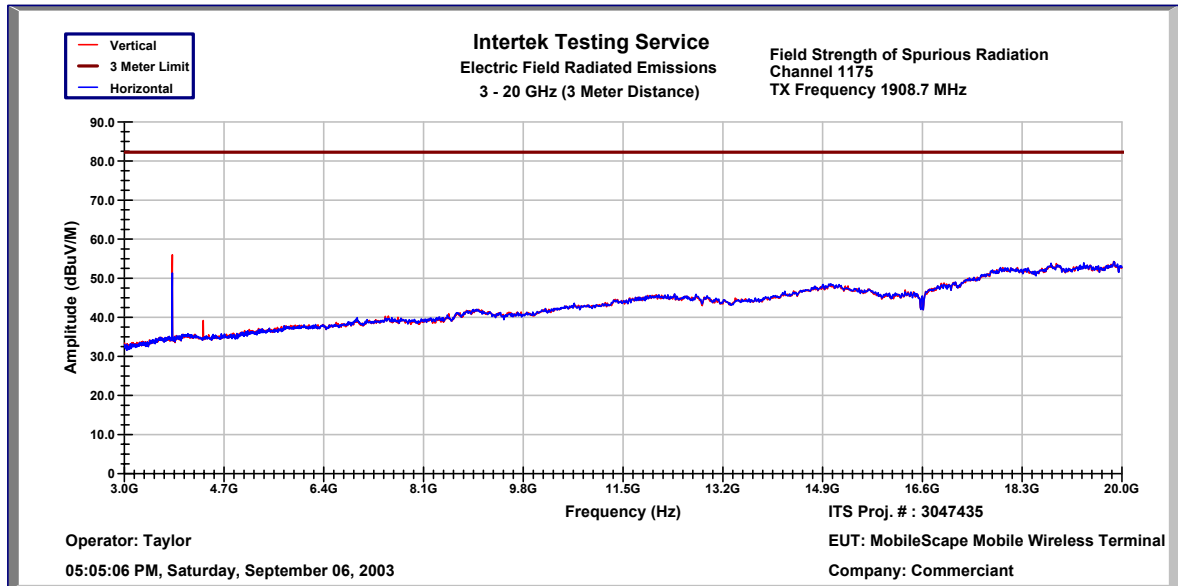
*Figure 7-3: Field Strength of Spurious Radiation (3GHz – 20GHz), CDMA 1900 Channel 25, 675, and 1175*



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Model No: M105X

## 8 POWER LINE CONDUCTED EMISSIONS

FCC §15.107, FCC §15.207

### 8.1 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.

### 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
EMI Receiver	Rohde & Schwarz	ESI 26	1088.7490	11/27/2003
LISN	FCC	FCC-LISN-50-50-2M	1026	12/2003

### 8.3 Test Results

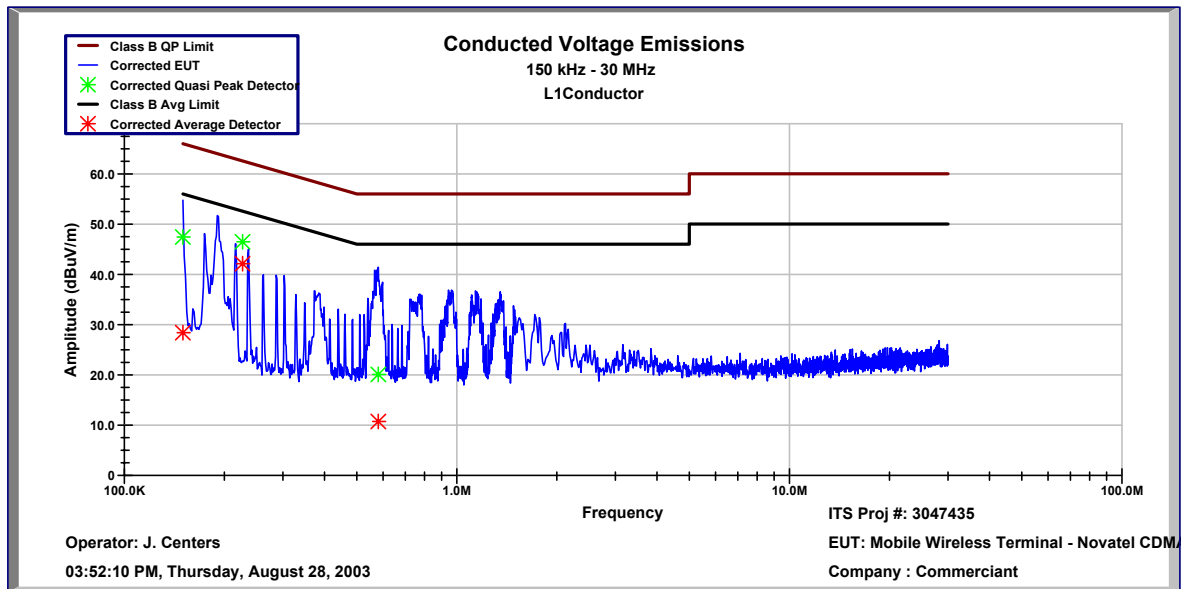
The MobileScape Wireless Terminal – Novatel CDMA Module met the power line conducted emission requirements of FCC §15.107 and §15.207. The test results are located in Figure 8-1 and Figure 10-2.

Evaluation For:Commerciant, L.P.

FCC ID: QWL-M-105X

Model No: M105X

Figure 8-1: FCC §15.107 and §15.207 power line conducted emissions (Line 1)



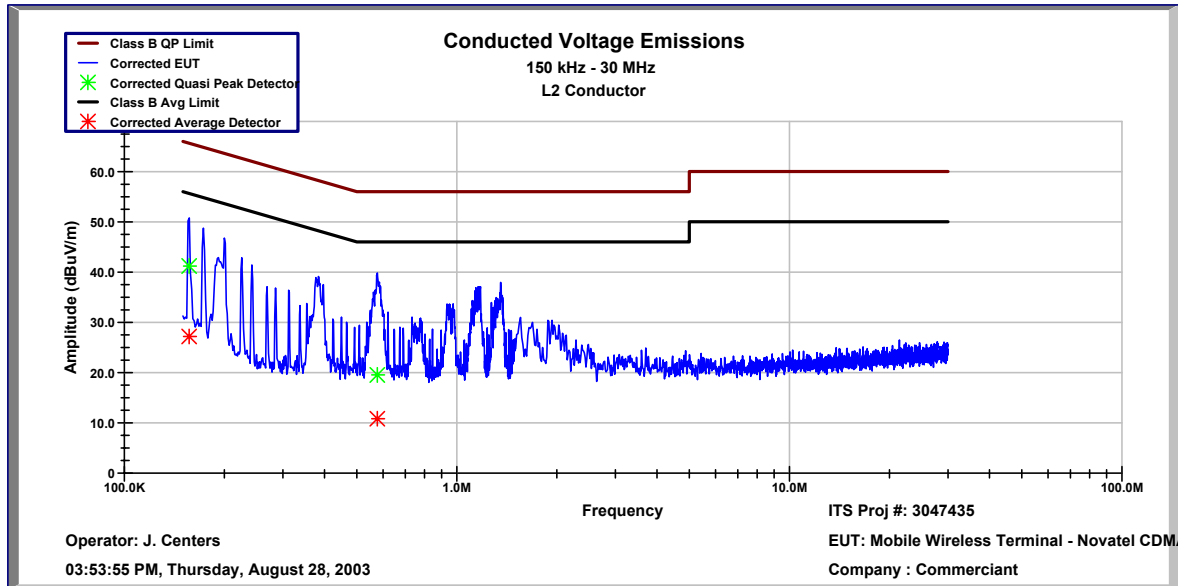
Frequency (MHz)	Quasi-Peak-L1 (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average - L1 (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
150.0 KHz	47.43	66	-18.57	28.38	56	-27.62	Compliant
226.7 KHz	46.47	63.81	-17.34	42.13	53.81	-11.68	Compliant
580.6 KHz	20.08	56	-35.92	10.71	46	-35.29	Compliant

Evaluation For:Commerciant, L.P.

FCC ID: QWL-M-105X

Model No: M105X

Figure 8-2: FCC §15.107 and §15.207 power line conducted emissions (Line 2)



Frequency (MHz)	Quasi-Peak-L2 (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average - L2 (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
156.7 KHz	41.19	65.81	-24.62	27.16	55.809	-28.648	Compliant
576.6 KHz	19.52	56	-36.48	10.81	46	-35.195	Compliant

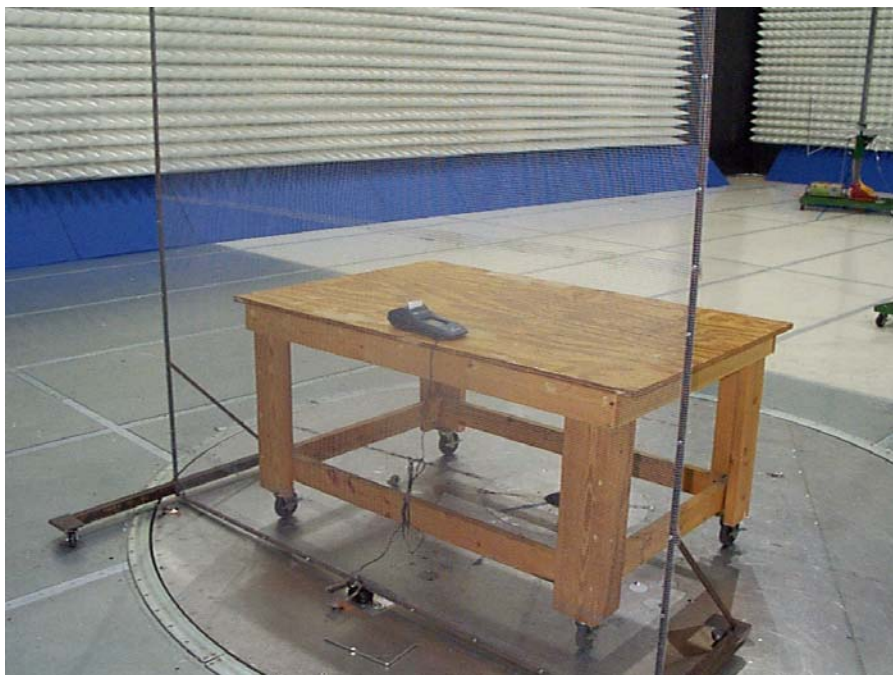
Evaluation For: Commerçant, L.P.

FCC ID: QWL-M-105X

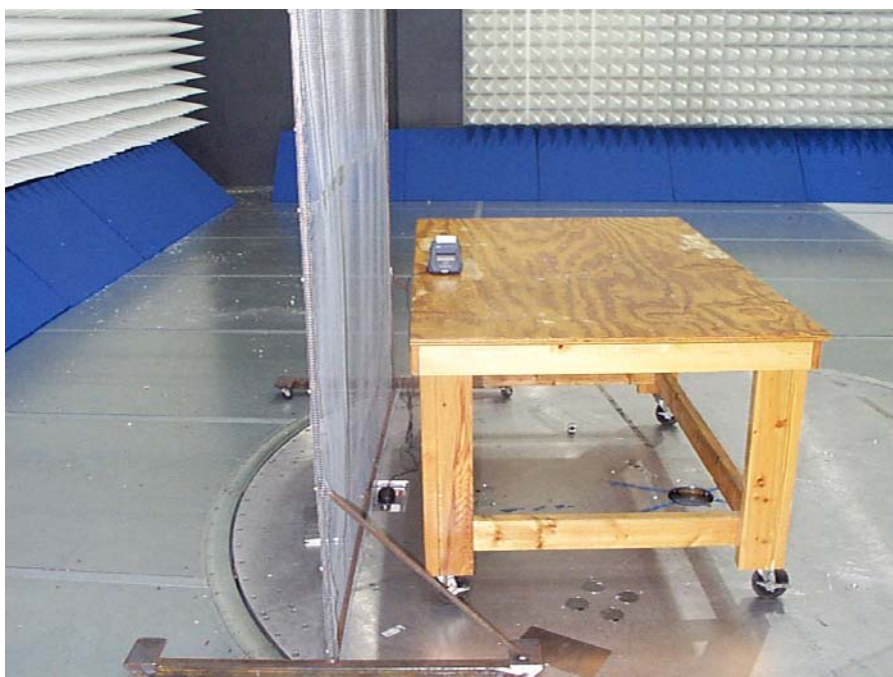
Model No: M105X

#### 8.4 Test Configuration Photograph

*Figure 8-3: Configuration photograph, AC mains conducted emission*



*Figure 8-4: Configuration photograph, AC mains conducted emission, side view*



Evaluation For: Commerciant, L.P.

FCC ID: QWL-M-105X

Model No: M105X

## 9 RECEIVER SPURIOUS EMISSIONS

### 9.1 Test Limits

*Table 9-1 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

### 9.2 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

### 9.3 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.

Evaluation For: Commerciant, L.P.

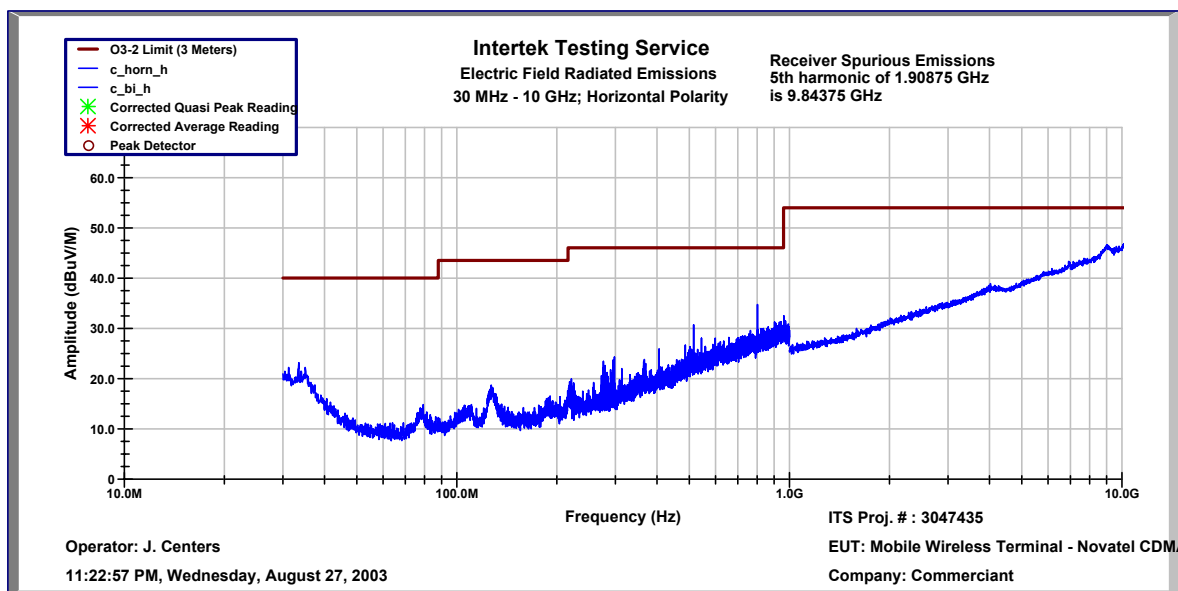
FCC ID: QWL-M-105X

Model No: M105X

## 9.4 Test Results

The MobileScape Wireless Terminal – Novatel CDMA Module met the radiated disturbance requirements of FCC §15.109. The maximized quasi peak data can be found in Figure 9-3. There were no other emissions detected within 10 dB of the limit.

*Figure 9-1 FCC §15.109 Worse Case Receiver Spurious Emission (Horizontal)*





Evaluation For:Commerciant, L.P.

FCC ID: QWL-M-105X

Model No: M105X

Figure 9-2 FCC §15.109Worse Case Receiver Spurious Emission (Vertical)

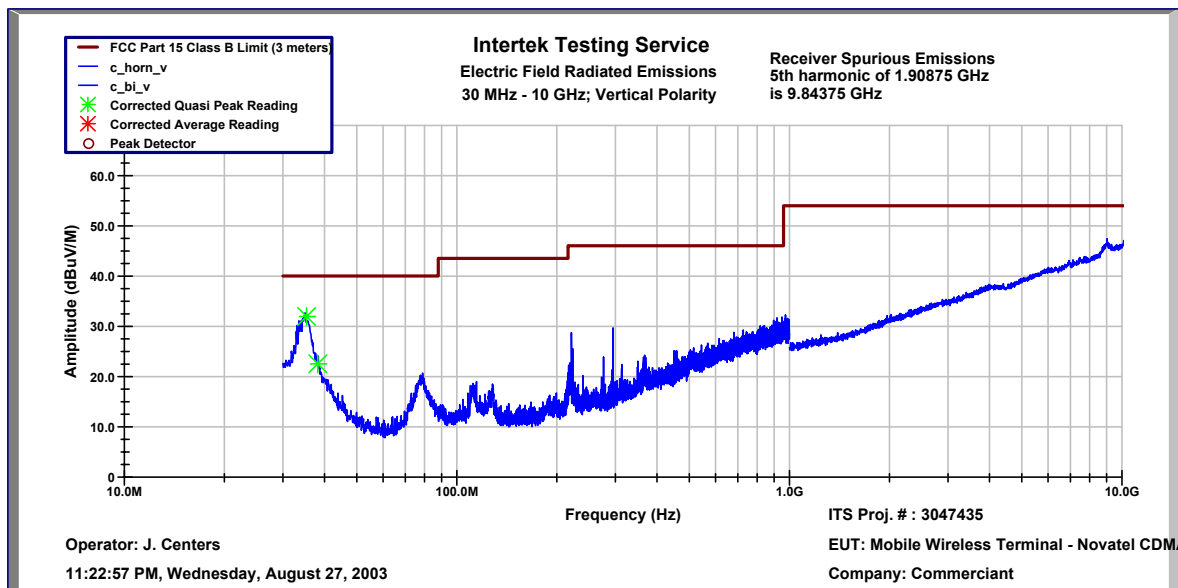


Figure 9-3 FCC §15.109 Maximized Quasi Peak Emissions

Frequency (MHz)	Polarity (H/V)	Cab. (dB)	Ant. (dB)	Corr. Reading. (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Azimuth (deg)	Tower (cm)	Results
35.33 MHz	V	0.46	17.25	31.96	40	-8.04	45	100	Compliant
38.2 MHz	V	0.47	15.36	22.52	40	-17.48	46	103	Compliant

Evaluation For: Commerciant, L.P.

FCC ID: QWL-M-105X

Model No: M105X

## 9.5 Test Configuration Photograph

The following photos show the testing configurations used for the radiated receiver spurious emissions testing.

*Figure 9-4 FCC §15.109 Test Configuration Photograph*



Evaluation For: Commerçant, L.P.

FCC ID: QWL-M-105X

Model No: M105X

*Figure 9-5 FCC §15.109 Test Configuration Photograph*



Evaluation For:Commerciant, L.P.

FCC ID: QWL-M-105X

Model No: M105X

## 10 FREQUENCY STABILITY VS TEMPERATURE

FCC §2.1055, FCC §24.235

### 10.1 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 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.

### 10.2 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

### 10.3 Test Results

The MobileScape Wireless Terminal – Novatel CDMA Module met the frequency stability requirements of FCC §2.1055 and FCC §24.235. The test results are located in Table 10-1.

Evaluation For:Commerciant, L.P.

FCC ID: QWL-M-105X

Model No: M105X

*Table 10-1: CDMA1900 Channel 600, Frequency stability vs. Temperature*

Tx Frequency: 1880 MHz

Temperature (°C)	Difference (Hz)
60	49
50	-53
40	-41
30	92
20	-86
10	-89
0	-83
-10	94
-20	-57
-30	97

Evaluation For:Commerciant, L.P.

FCC ID: QWL-M-105X

Model No: M105X

## 11 FREQUENCY STABILITY VS VOLTAGE

FCC §2.1055, FCC §22.355

### 11.1 Test Procedure

An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased to the battery end point, which was determined by Commerciant, L.P. to be 85% of the nominal value. The output frequency was recorded for each battery voltage.

### 11.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
DC Power Supply	Good Will Instrument Company	GPS-1830D	9631894	5/2004
Temperature Chamber	Thermotron	SM-8C	32692	12/2003
Base Station Simulator	Rohde & Schwarz	CMU-200	1100.0008.02	8/2004

### 11.3 Test Results

The MobileScape Wireless Terminal – Novatel CDMA Module met the frequency stability requirements of FCC §2.1055. The test results are located in Table 11-1.

Evaluation For:Commerciant, L.P.

FCC ID: QWL-M-105X

Model No: M105X

*Table 11-1: CDMA 1900 Channel 600, Frequency stability vs. input voltage*

Tx Frequency: 1880 MHz

<b>Supply (Battery) (Volt)</b>	<b>Difference (Hz)</b>
3.4	184
3.5	69
3.6	47
3.7	38
3.8	26
9	41
4.0	41
4.1	27
4.2	-71