TEST REPORT

Report Number: 3039424-43-1-1.doc
Project Number: 3039424
October 13, 2003

Evaluation of the
Phonecell SX4P
Model Number: 1D02A028
FCC ID: MTF030865

to

FCC Part 15
FCC Part 22 Subpart H

For

Telular, Inc.

Test Performed by:	Test Authorized by:
Intertek Testing Services 1950 Evergreen Blvd, Suite 100 Duluth, GA 30096	Telular, Inc. 580 Old Willets Path Hauppauge, NY 11788

Prepared by: _____ Date: OCTOBER 13, 2003
Jeffrey D. Hiday, Senior Project Engineer

Reviewed by: _____ Date: 10/13/03
David J. Schramm, EMC Team Leader

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Testing performed for: Telular, Inc.

Equipment Under Test: 1D02A028, Phonecell SX4P

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§2.1091, §2.1093	Specific Absorption Rate	N/S	See Note [1]
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N/S: Not under scope of this evaluation

[1] Specific Absorption Rate testing is evaluated in a separate report.

1 JOB DESCRIPTION

1.1 Client information

The Phonecell SX4P has been tested at the request of

Company: Telular, Inc.
580 Old Willets Path
Hauppauge, NY 11788

Name of contact: Matt McKiernan
Telephone: 631-232-6070 (Ext. 223)
Fax: 631-232-6082

1.2 Test plan reference:

Tests were performed to the following standards:

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

1.3 Equipment Under Test (EUT)

Product	Phonecell SX4P	
EUT Model Number	1D02A028	
EUT Serial Number	405	
Whether quantity (>1) production is planned	Quantity production is planned.	
Cellular Phone standards	AMPS and TDMA800	
Type(s) of Emission	40K0F8W and 40K0F1D	
RF Output Power	See Section 3.3 for RF Output Power	
Frequency Range	824 – 849	AMPS and TDMA800
Antenna & Gain	Monopole with right angle hinge, TNC connector and non-retractable (22.7cm)	
Detachable Antenna ?	Yes with TNC Connector	
External input	None	

EUT receive date: June 1, 2003

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

Test start date: June 6, 2003

Test completion date: June 11, 2003

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

1.4 Related Submittal(s) Grants

None

2 TEST FACILITY

The ITS-Duluth site is located at 1950 Evergreen Blvd., Suite 100, Duluth, Georgia. 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.

This site is on file with the FCC.

3 RF POWER OUTPUT

FCC §2.1046

3.1 Test Procedure

The transmitter output was connected to a calibrated coaxial attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm.

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

3.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
RF Communications Test Set	Hewlett Packard	8020B	US36412227	5/22/03
TDMA Cellular Adapter	Hewlett Packard	83206A	US37501280	5/22/03

3.3 Test Results

The Phonecell SX4P met the RF power output requirements of FCC Part 22 Subpart H.

Table 3.3-1 RF Power Output

EUT Mode	Frequency MHz	Channel	Measured Power dBm		
			+60°C	+20°C	-30°C
AMPS	824.04	991	26.3	25.9	26.6
	836.49	384	26.1	25.7	26.3
	848.97	799	25.9	25.4	26.1
TDMA800	824.04	991	34.5	34.0	35.3
	836.49	384	34.3	34.0	34.7
	848.97	799	34.2	33.7	35.3

4 RADIATED POWER

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

4.1 Test Procedure

The EUT was positioned on a non-conductive table, 1.5m above the ground plane inside a 10 meter semi-anechoic chamber. The radiated emission at the fundamental frequency was measured at 3m with a test antenna and EMI receiver.

During the measurement of the EUT, the receiver resolution bandwidth was set to 3 MHz and the average 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.

ERP in frequency band 824-849 MHz, were measured using a substitution method. The EUT was replaced by half-wave dipole (824-849 MHz) connected to a signal generator, which was set to approximately 0 dBm. The spectrum analyzer reading was recorded and ERP was calculated as follows:

$$ERP = E_1 - E_2 + V_g$$

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

4.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Power meter	Boonton	4232A-01	25901	9/10/03
Power sensor	Boonton	51013-4E	23599	8/19/03
Signal Generator	HP	83620B	3722A00537	3/4/04
Dipole Antenna	CDI	A100	R4	9/16/03
Receive Antenna	Schaffner-Chase	CBL6112B	2622	8/26/03
EMI Receiver	HP	8546A	3410A00173/ 3448A00203	4/2/04
Attenuator	Weinschel	2 (10dB)	BK2313	8/8/03

4.3 Test Results

The Phonecell SX4P met the radiated power requirements of FCC §22.913. The test results are located in Table 4.3-1.

Table 4.3-1 RF Power Output

EUT Mode	Measurement Method	Frequency MHz	Channel	Measured Power dBm
AMPS	ERP	824.04	991	22.7
	ERP	836.49	383	22.9
	ERP	848.97	799	24.9
TDMA800	ERP	824.04	991	32.8
	ERP	836.49	383	34.1
	ERP	848.97	799	33.1

5 MODULATION DEVIATION LIMITING

FCC §2.1047, FCC §22.915(b)(c)

5.1 Test Procedure

The RF output of the transceiver was connected to the input of a mobile station test set. The mobile station test set was configured as an audio signal generator and was coupled into the external microphone jack of the transceiver, or alternatively, the microphone element was removed and the generator output was connected to the microphone wires by clip leads. The compander was enabled during this test.

At three different modulating frequencies, the output level of the audio generator was varied from –20 to +20 dB in reference to the level required to generate 8kHz deviation at 1kHz. The mobile station test set was setup to generate the audio input and record the modulation output of the EUT.

5.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
RF Communications Test Set	HP	8920B	US36412227	5/22/2004

5.3 Test Results

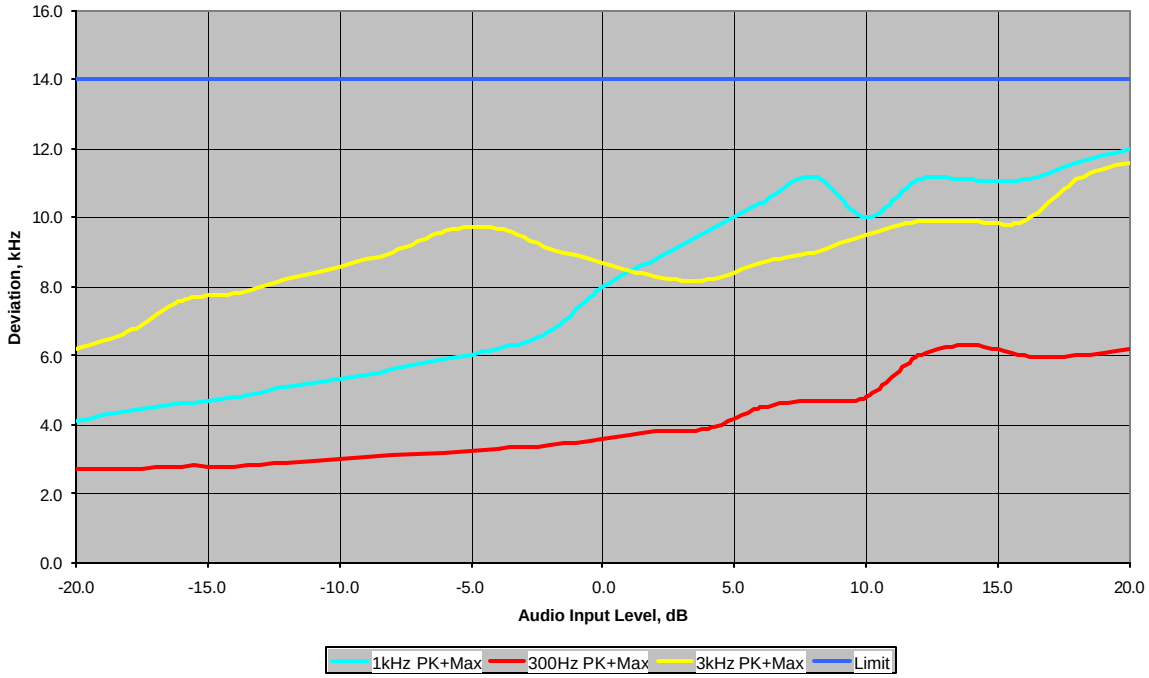
The deviation for voice and SAT is not to exceed 14 kHz. The test results are located in Figure 5-1. The audio input level was to 100 mV in order to obtain 8 kHz deviation. This value was set as the 0 dB reference.

Figure 5-1: Modulation Deviation Limiting

Manufacturer: Telular
EUT: 1D02A028
FCCID: MTF030865

Tested by: Bryan Taylor
Date: 6/18/2003

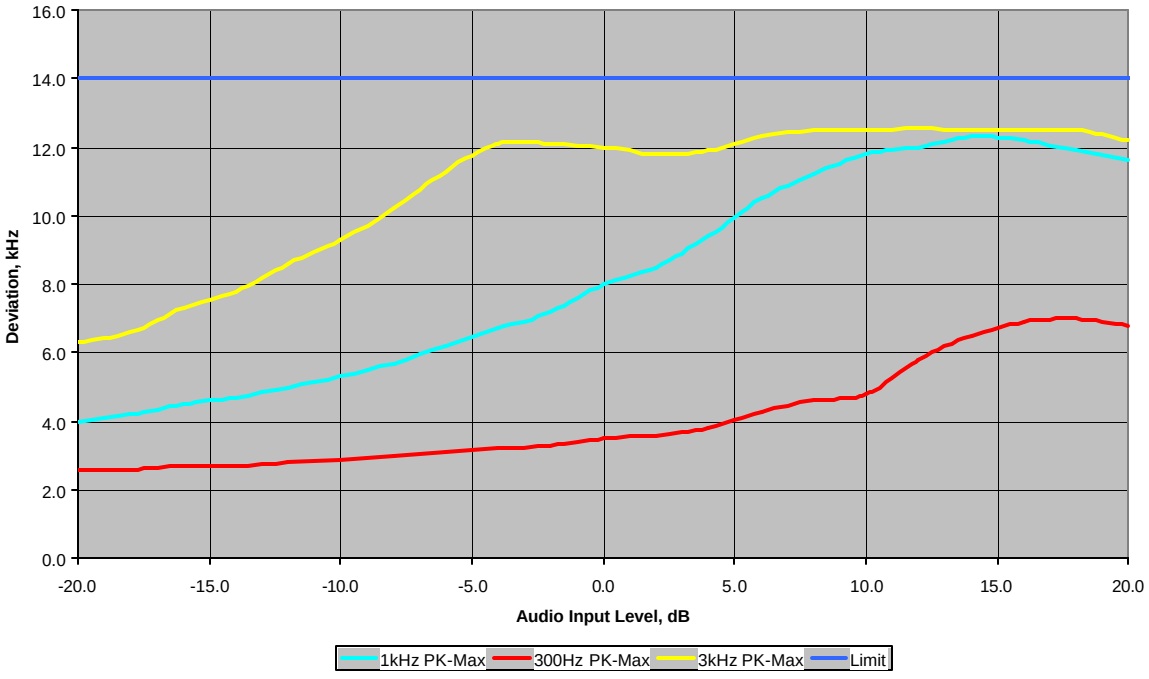
Modulation Limiting: Voice and SAT
Positive Peak



Manufacturer: Telular
EUT: 1D02A028
FCCID: MTF030865

Tested by: Bryan Taylor
Date: 6/18/2003

Modulation Limiting: Voice and SAT
Negative Peak



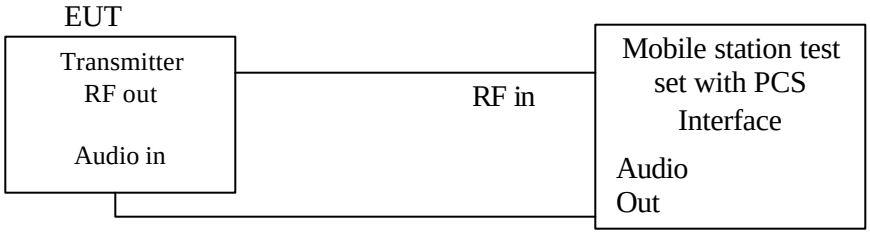
6 AUDIO FILTER CHARACTERISTICS

CFR 47 §22.915(D)

6.1 Test Procedure

The RF output of the transceiver was connected to the input of a Mobile station test set through sufficient attenuation so as not to overload the meter or distort the readings. An audio signal generator of the Mobile station test set was coupled into the external microphone jack of the transceiver, or alternatively, the microphone element was removed and the generator output was connected to the microphone wires by clip leads.

The test was performed according to the block diagram shown below.



Audio Filter Characteristics

Operate the transmitter with the compander disabled, and monitor the output with a deviation meter without standard 750 microsecond de-emphasis, and without C-message weighted filter. Apply a sine wave audio input to the transmitter external audio input port, vary the modulating frequency from 300 to 3000 Hz, and observe the input levels necessary to maintain a constant ±2.9 kHz system deviation.

From 300 to 3000 Hz the audio frequency response shall not vary more than +1 to –3 dB from a true 6 dB/octave pre-emphasis characteristic referred to the 1000 Hz level (with the exception of a permissible 6 dB/octave roll-off from 2500 to 3000 Hz).

Post Limiter Attenuation

Adjust the audio imput frequency to 1000 Hz, and adjust the input level to 20 dB greater than that required to produce ±8 kHz deviation. Note the output level on the frequency deviation meter. Using this output as reference (0 dB), vary the modulating frequency from 3000 Hz to 30,000 Hz, and observe the change in output while maintaining a constant audio input level.

For mobile stations, these signals must be attenuated, relative to the level at 1 kHz, as follows:

- In the frequency ranges of 3.0 to 5.9 kHz and 6.1 to 15.0 kHz, signals must be attenuated by at least 40 log (f/3) dB, where f is the frequency of the signal in kHz.
- In the frequency range of 5.9 to 6.1 kHz, signals must be attenuated at least 35 dB.
- In the frequency range above 15 kHz, signals must be attenuated at least 28 dB.

6.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
RF Communications Test Set	HP	8920B	US36412227	5/22/2004
Modulation Analyzer	HP	8901A	2026A00875	11/18/2003
Dynamic Signal Analyzer	HP	3562A	2738A02846	5/19/2004

6.3 Test Results

Figure 6-1: Audio Filter Characteristics

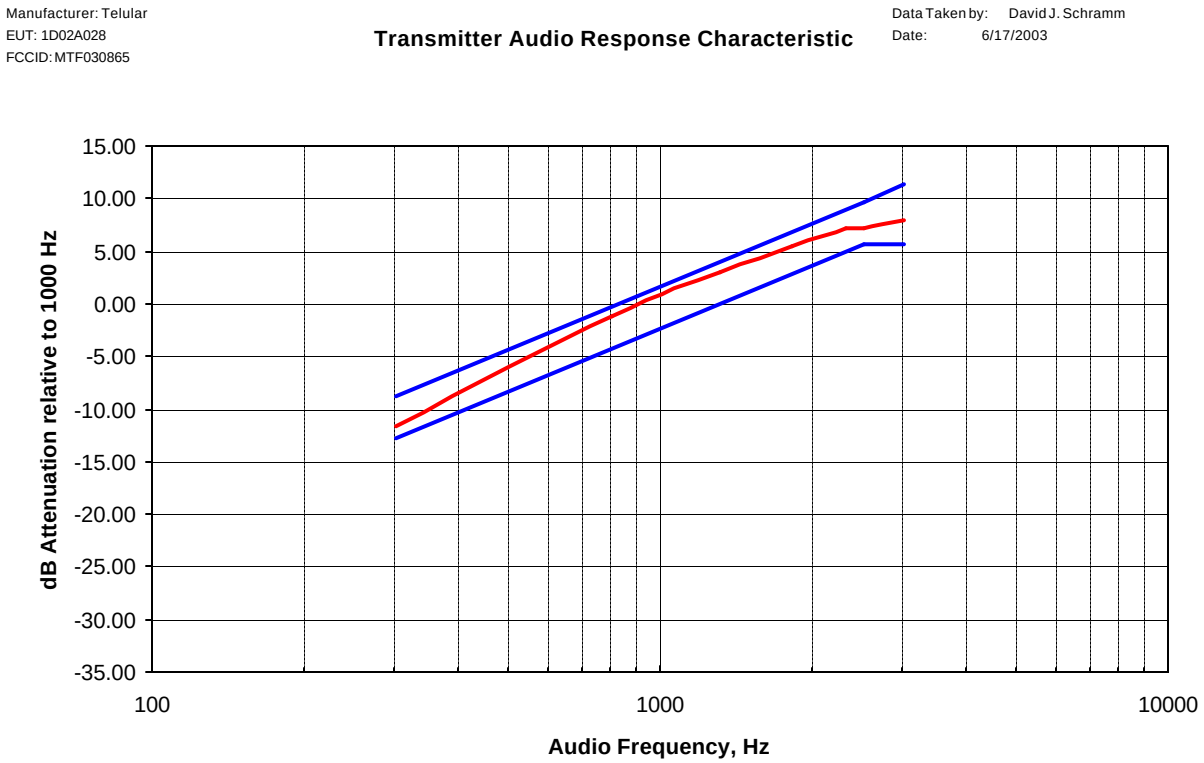
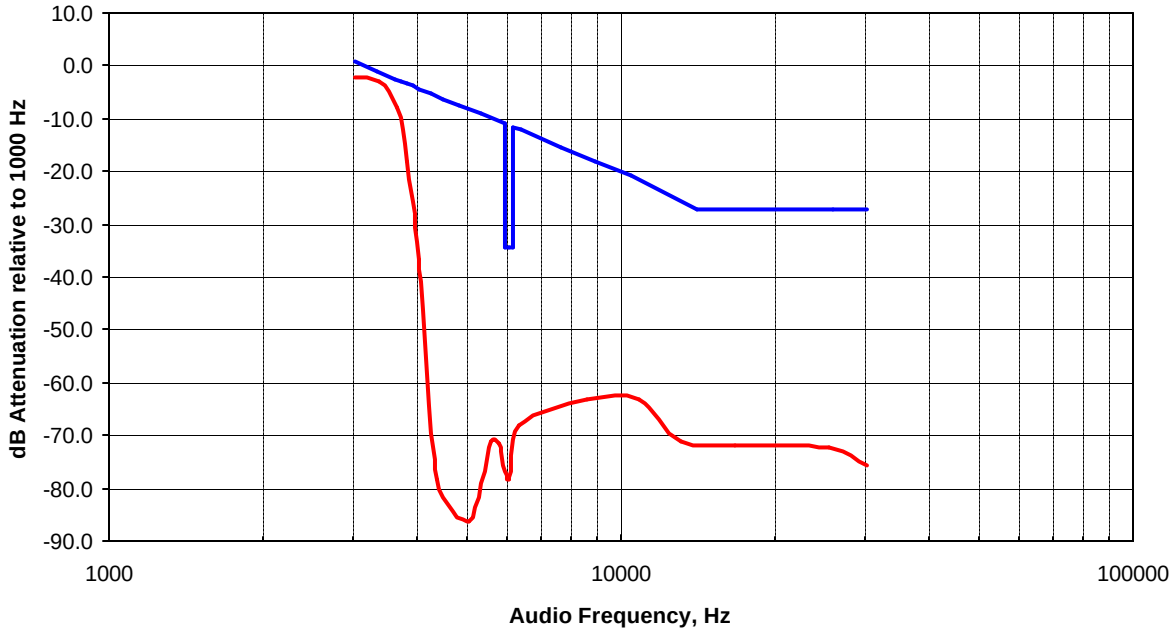


Figure 6-2: Post Limiter Filter Attenuation

Manufacturer: Telular
EUT: 1D02A028
FCCID: MTF030865

Transmitter Audio Response Characteristic
Modulation Level vs. Audio Frequency

Data Taken by: David J. Schramm
Date: 6/18/2003



7 EMISSION LIMITATIONS, OCCUPIED BANDWIDTH

CFR 47 §2.1049, §22.917(b)(d)

For F3E/F3D emission mask uses with audio filter, the mean power of emissions must be attenuated below the mean power of the unmodulated carrier wave (P) as follows:

- On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz: at least 26 dB;
- On any frequency removed from the carrier frequency by more than 45 kHz, up to the first multiple of the carrier frequency: at least 60 dB or 43 + 10 log P dB, whichever is the lesser attenuation.

For F1D emission mask, the mean power of emissions must be attenuated below the mean power of the unmodualted carrier (P) as follows:

- On any frequency removed from the carrier frequency by more than 20 kHz but no more than 45 kHz: at least 26 dB;
- On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz: at least 45 dB;
- On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple ofthe carrier frequency: at least 60 dB or 43 +10 log P db, whichever is the lesser attenuation.

7.1 Test Procedure

The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation. The audio generator was connected to the audio input of the transceiver.

The spectrum with no modulation was recorded. The audio input signal was adjusted to obtain the frequencies deviation equal 6 kHz at the audio frequency 2.5 kHz. The audio input level was increased by 16dB.

The resolution and video bandwidths of the spectrum analyzer were set to 300 Hz.

The spectrum was recorded in the frequency band 100 kHz above and 100 kHz below the carrier frequency. The same plots were generated for wideband emissions, SAT, ST, DTMF9, Voice, and some of the combinations of these modulating signals.

7.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Spectrum Analyzer	HP	8566B	2134A01032/ 2344A05843	12/12/03
Attenuator	Weinschel	2 (10dB)	BK2313	8/8/03

7.3 Test Results

The Phonecell SX4P met the occupied bandwidth requirements of FCC §22.917(b)(d) and IC RSS-128 §§7.4 and 7.5 and RSS-133 §6.3.

Table 7.3-1: Summary of test result locations

Location	Mode	Channel	Description
Figure 7-1	AMPS	383	Occupied Bandwidth – SAT
Figure 7-2	AMPS	383	Occupied bandwidth – SAT and ST
Figure 7-3	AMPS	383	Occupied Bandwidth – Voice
Figure 7-4	AMPS	383	Occupied Bandwidth – 10kb Wideband Data

Table 7.3-2: Occupied bandwidth measurements for TDMA modes

Mode	Channel	Resolution Bandwidth	Video Bandwidth	Sweep time	Measured Bandwidth
TDMA800	383	300 Hz	300 Hz	10 s	28.5
TDMA800	799	300 Hz	300 Hz	10 s	28.3
TDMA800	991	300 Hz	300 Hz	10 s	28.5

Figure 7-1: Occupied Bandwidth – SAT

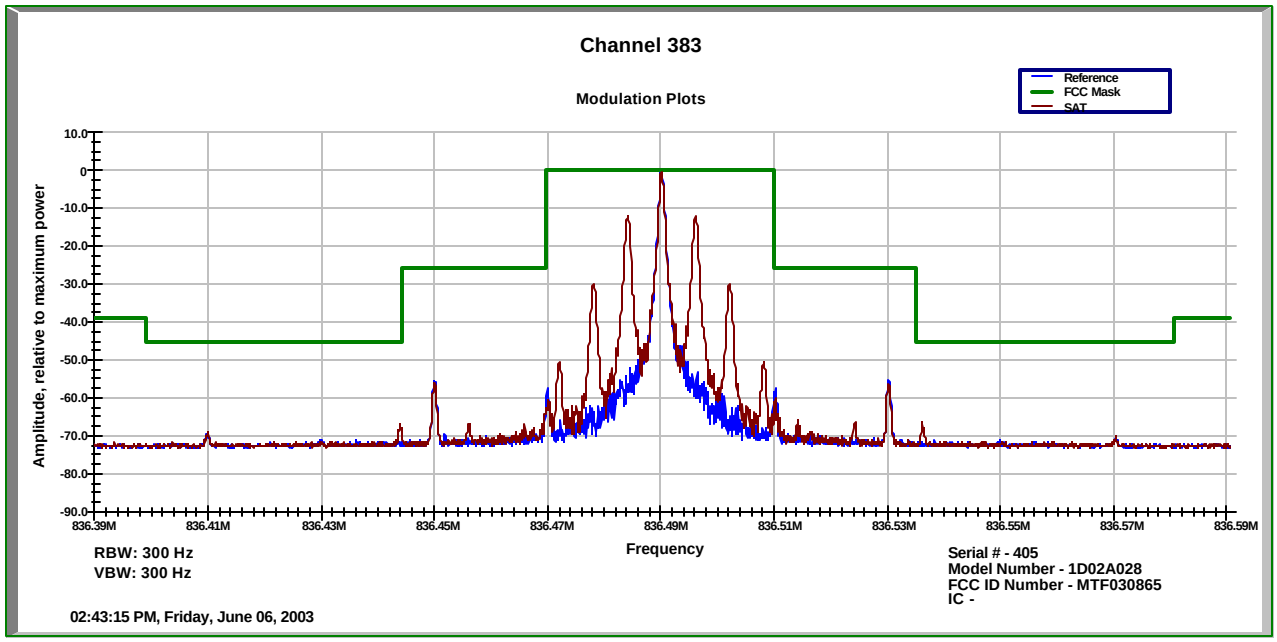


Figure 7-2: Occupied bandwidth – SAT and ST

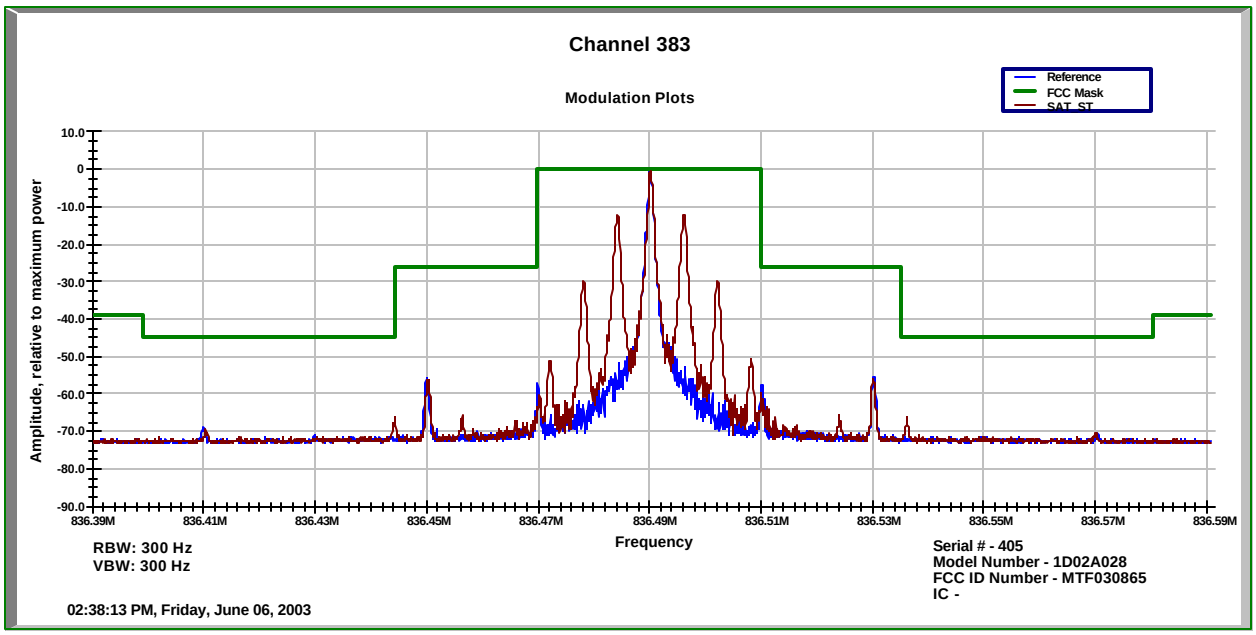


Figure 7-3: Occupied Bandwidth – Voice

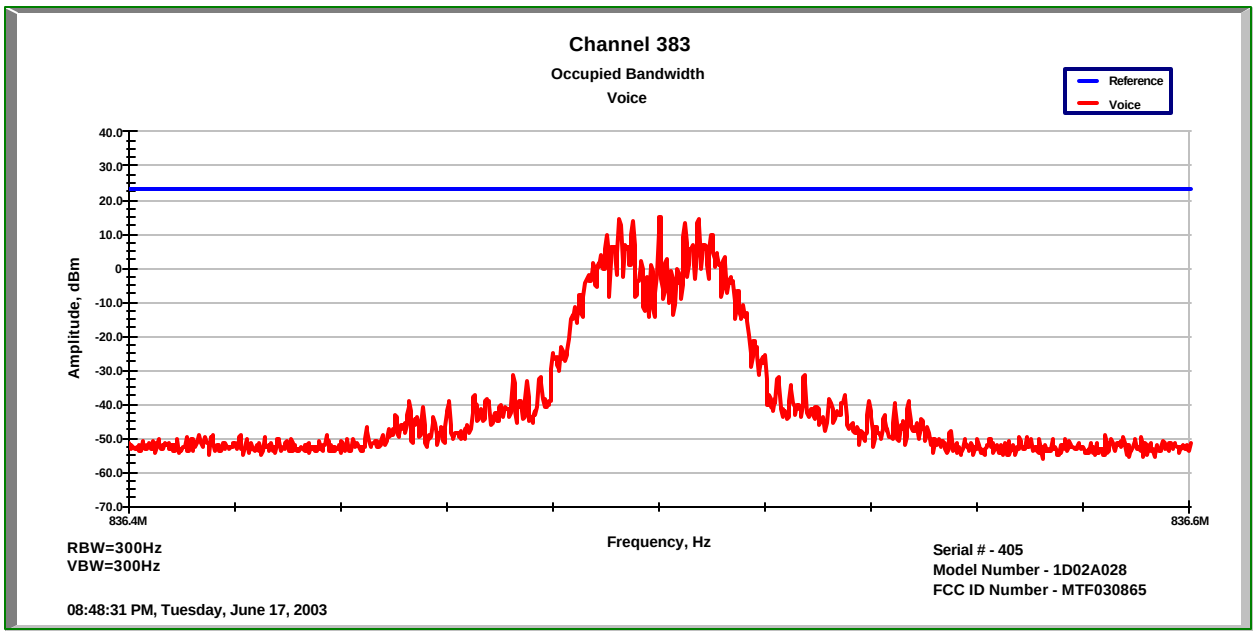
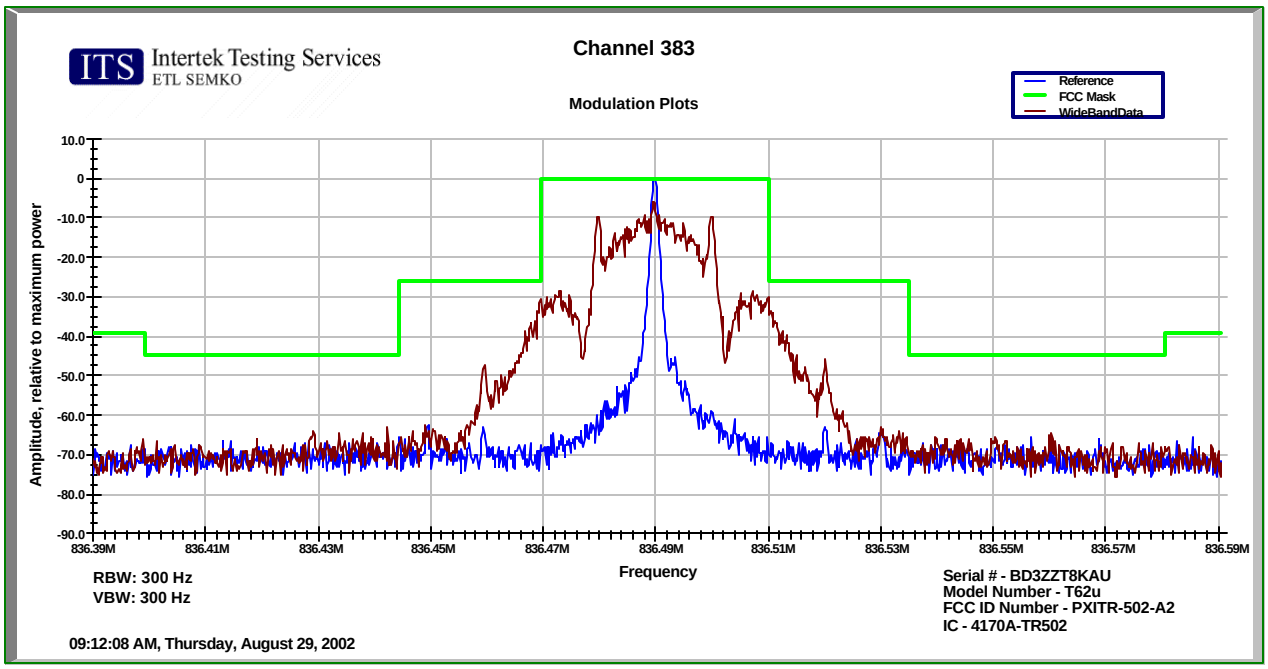


Figure 7-4: Occupied Bandwidth – 10kb Wideband Data



8 OUT OF BAND EMISSION AT ANTENNA TERMINALS

FCC §2.1047, FCC §22.901(d)(2), FCC §22.917(f)

Out of Band Emissions: The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at least 43 + 10 log P dB.

Mobile Emissions in Base Frequency Range: The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed -80 dBm at the transmit antenna connector.

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.

8.1 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 30 kHz. 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.

8.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Spectrum Analyzer	HP	8566B	2134A01032/ 2344A05843	12/12/03
Highpass Filter	FILTEK	HP12/1000-5AB	ITS213156	8/8/03
Highpass Filter	FILTEK	HP12/2000-5AB	ITS213156	8/8/03
Attenuator	Weinschel	2 (10dB)	BK2313	8/8/03

8.3 Test Results

The Phonecell SX4P met the out of band emission at antenna terminal requirements of FCC §2.1047, FCC §22.901(d)(2), FCC §22.917(f)

Table 8.3-1: Summary of test result locations

Location	Mode (Band)	Channel	Description
Figure 8-1	AMPS	383	Conducted spurious emissions, 30MHz to 10 GHz
Figure 8-2	AMPS	799	Conducted spurious emissions, 30MHz to 10 GHz
Figure 8-3	AMPS	991	Conducted spurious emissions, 30MHz to 10 GHz
Figure 8-4	TDMA	383	Conducted spurious emissions, 30MHz to 10 GHz
Figure 8-5	TDMA	799	Conducted spurious emissions, 30MHz to 10 GHz
Figure 8-6	TDMA	991	Conducted spurious emissions, 30MHz to 10 GHz
Figure 8-7	AMPS	383, 799, 991	Emissions in base frequency range, 869 to 894 MHz
Figure 8-8	TDMA800	383, 799, 991	Emissions in base frequency range, 869 to 894 MHz
Figure 8-9	TDMA800	991	1 MHz band edge conducted spurious emissions
Figure 8-10	TDMA800	799	1 MHz band edge conducted spurious emissions

Table 8.3-2: Out of band emissions at antenna terminals – Conducted readings

Company: **Telular**
Model: **1D02A028**
Project No.: **3039424**
Date: 06/05/03
Standard: FCC15
Class: B Group: None
Notes: Out of Band emissions at antenna terminals

Tested by: Jeffrey D. Hiday
Location: Duluth
Detector: HP8566
Antenna: N/A
PreAmp: N/A
Cable(s): N/A
Distance: conducted readings

Frequency MHz	Corrected Reading dBm	Limit dBm	Margin dB
TDMA 800 CH 383			
2509.000	-19.6	-13.0	-6.6
4153.000	-22.8	-13.0	-9.8
6589.000	-19.7	-13.0	-6.7
TDMA 800 CH 799			
2547.000	-20.6	-13.0	-7.6
6583.000	-23.7	-13.0	-10.7
TDMA 800 CH 799			
2546.000	-21.0	-13.0	-8.0
6586.000	-22.9	-13.0	-9.9

Figure 8-1: Out of band emissions at antenna terminals – AMPS Channel 383

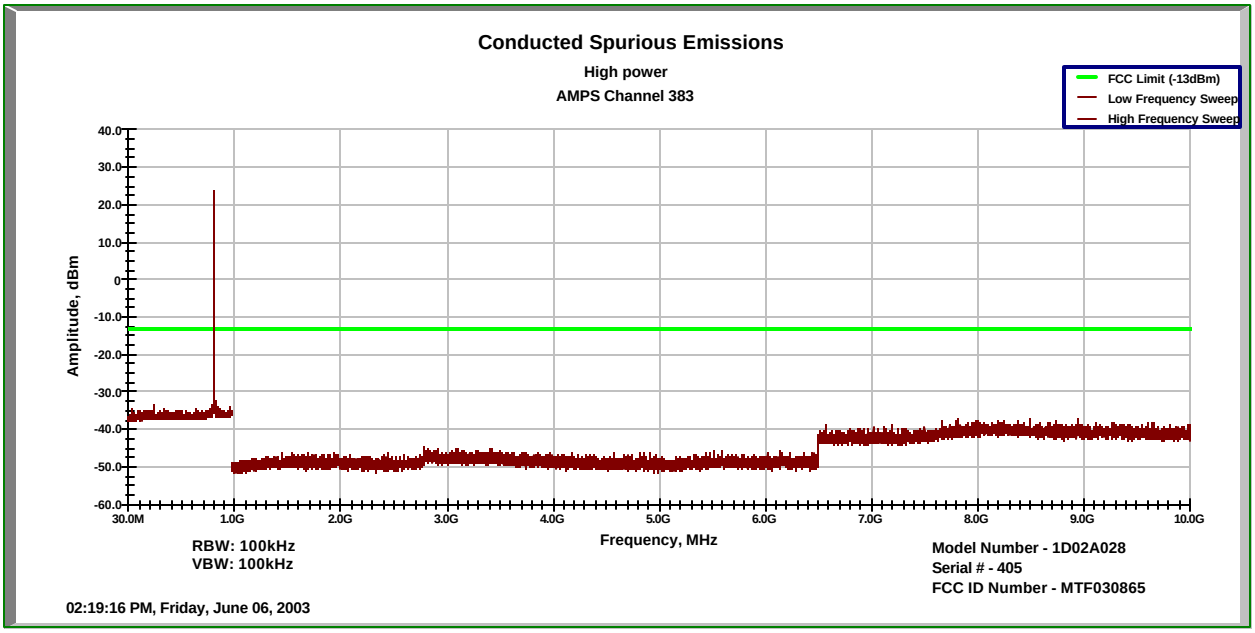


Figure 8-2: Out of band emissions at antenna terminals – AMPS Channel 799

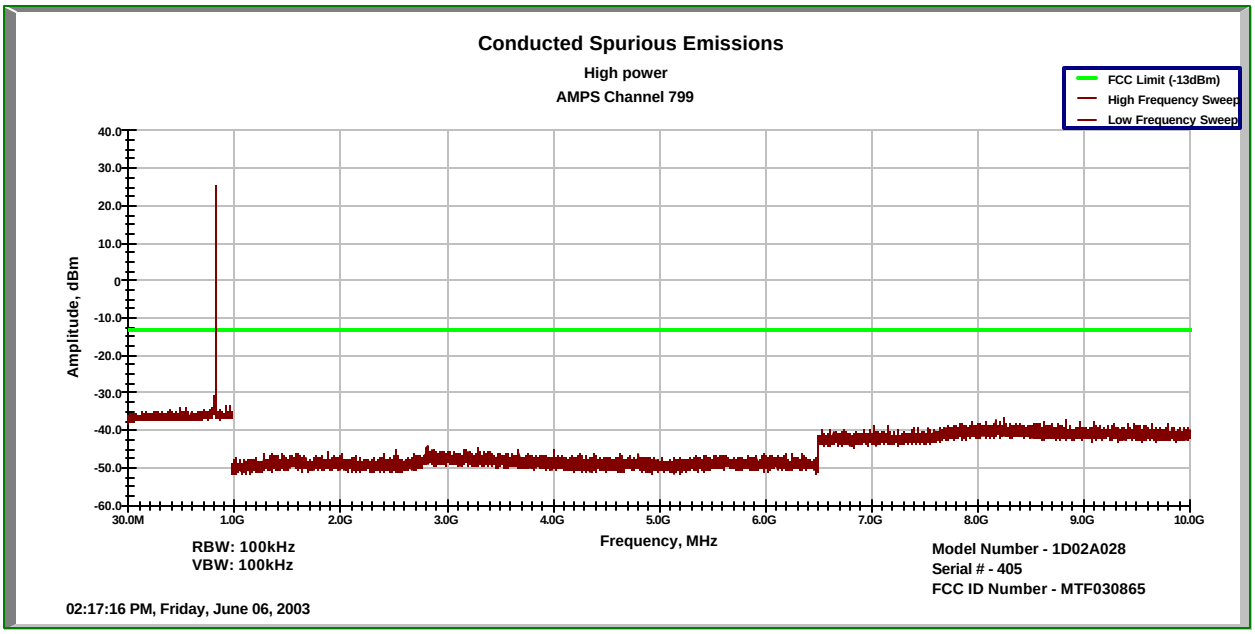


Figure 8-3: Out of band emissions at antenna terminals – AMPS Channel 991

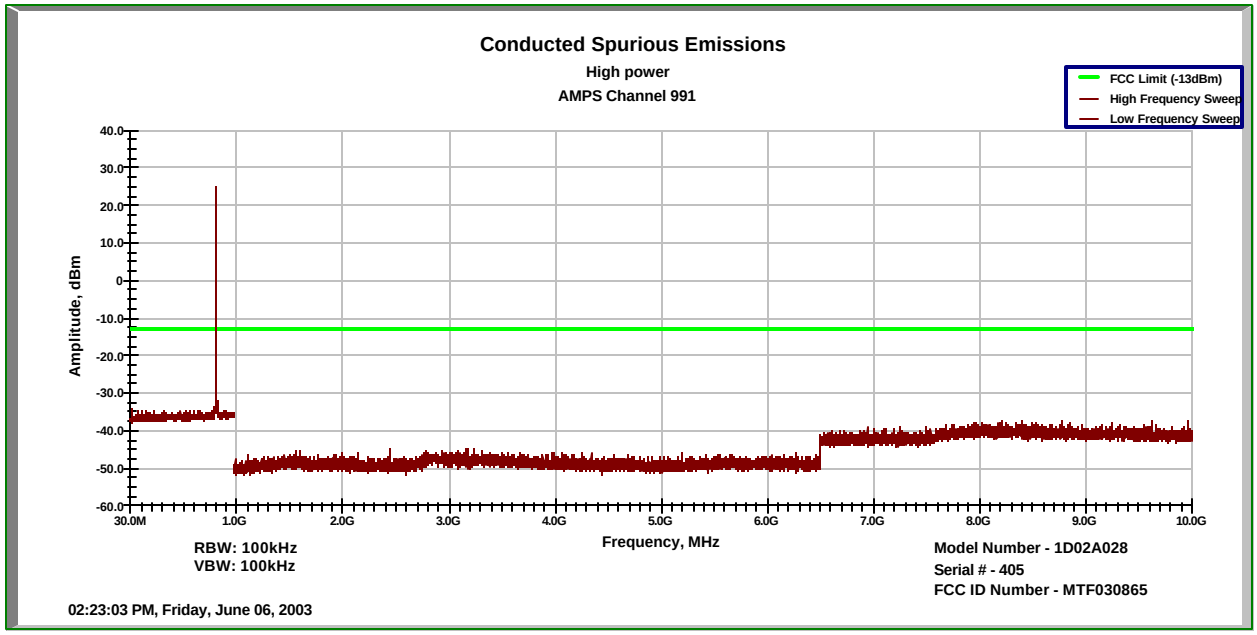


Figure 8-4: Out of band emissions at antenna terminals – TDMA800 Channel 383

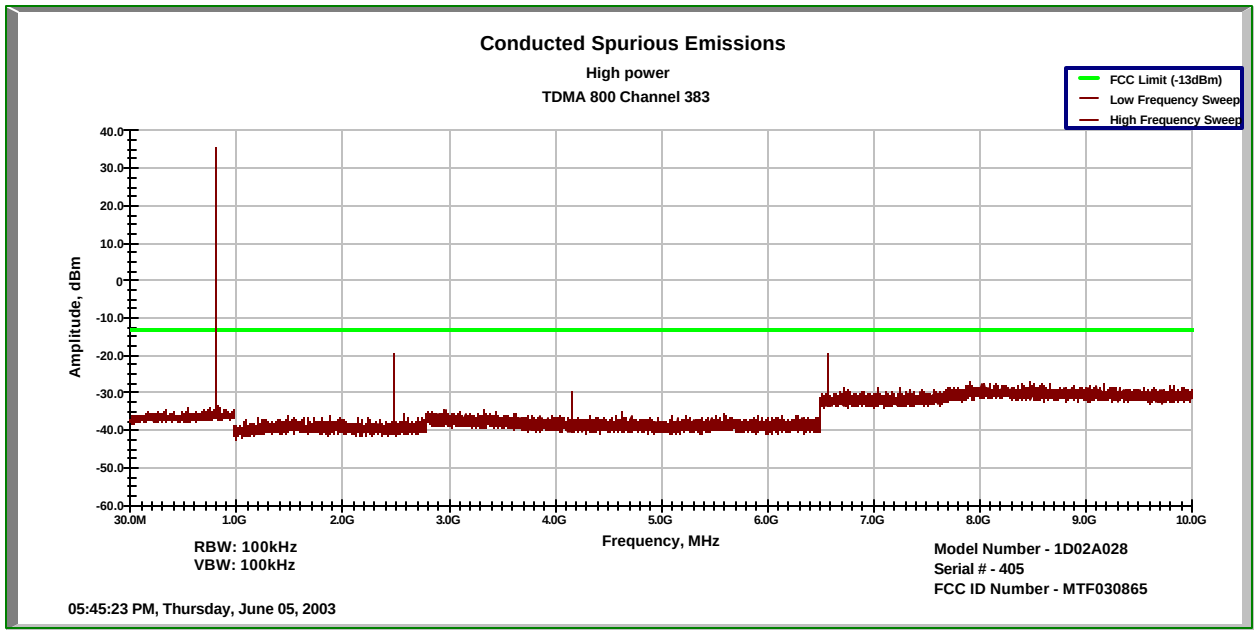


Figure 8-5: Out of band emissions at antenna terminals – TDMA800 Channel 799

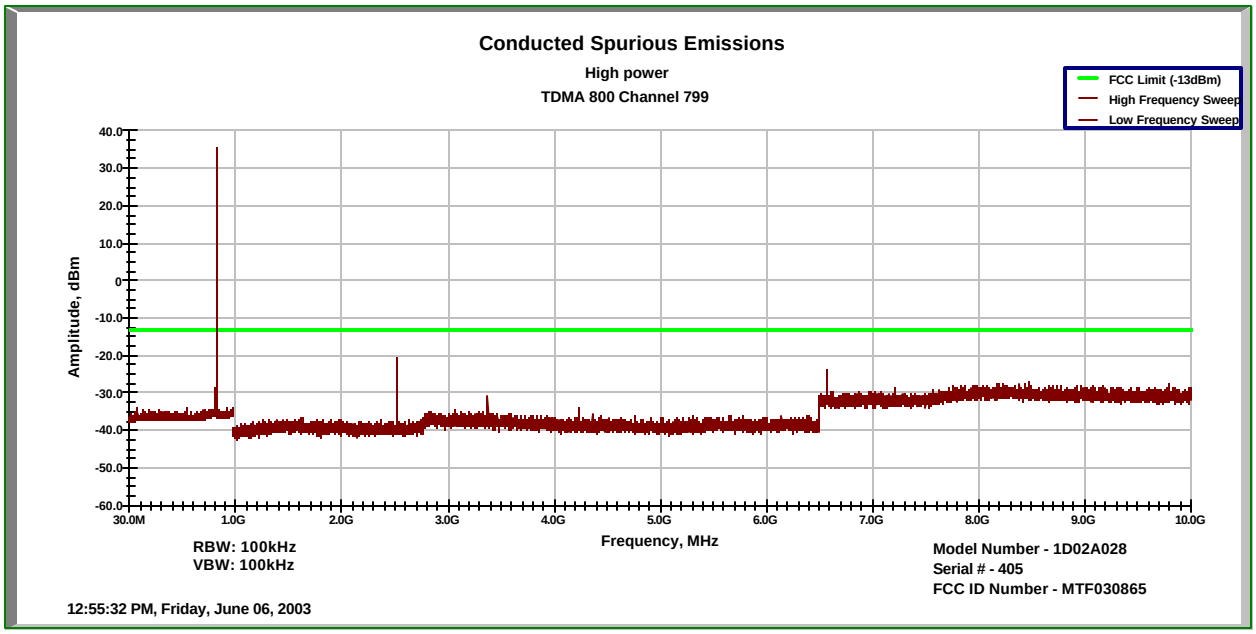


Figure 8-6: Out of band emissions at antenna terminals – TDMA800 Channel 991

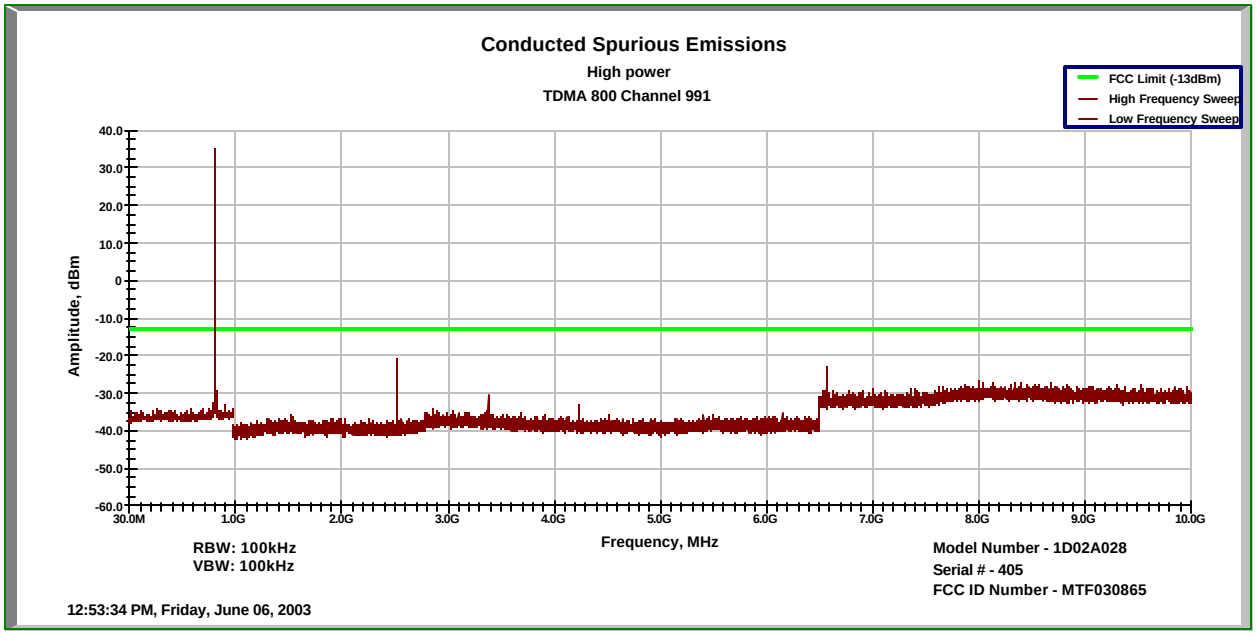


Figure 8-7: Emissions in base frequency range – AMPS Channels 383, 799, and 991

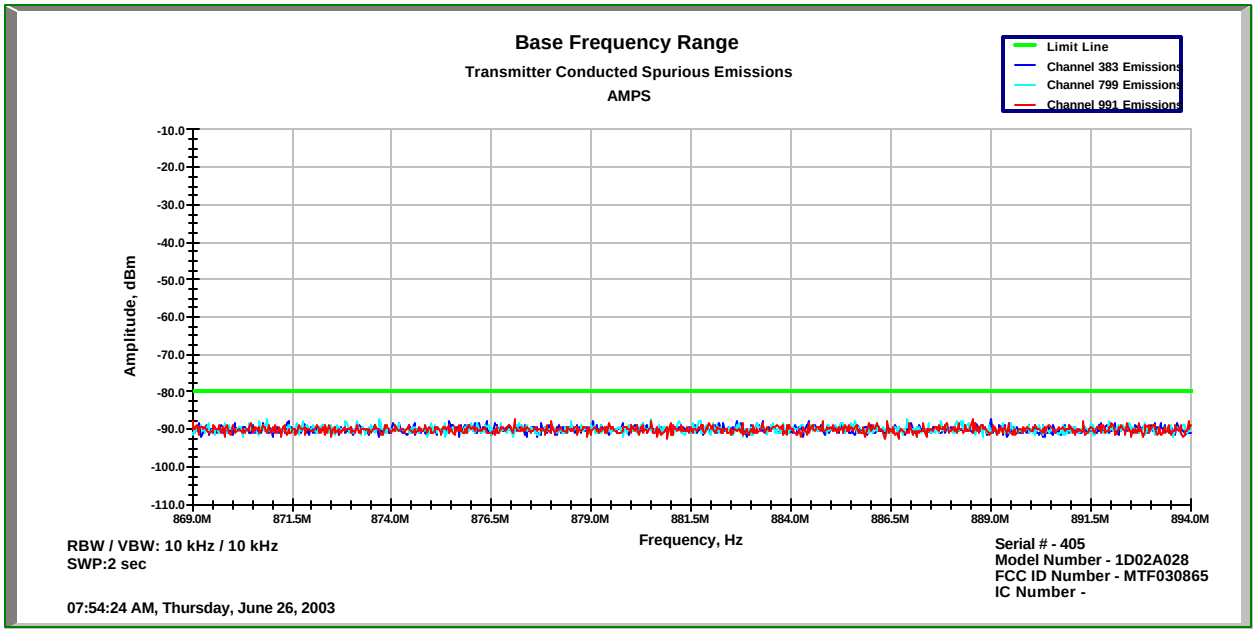


Figure 8-8: Emissions in base frequency range – TDMA800 Channels 383, 799 and 991

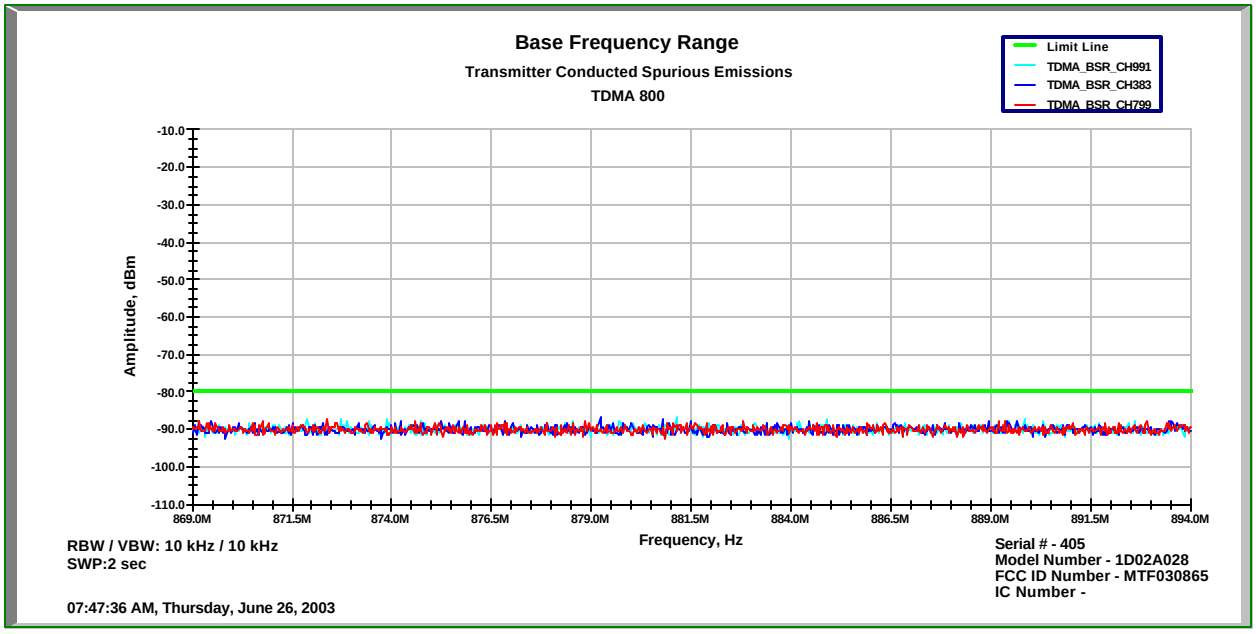


Figure 8-9: Band edge – TDMA800 Low Channel

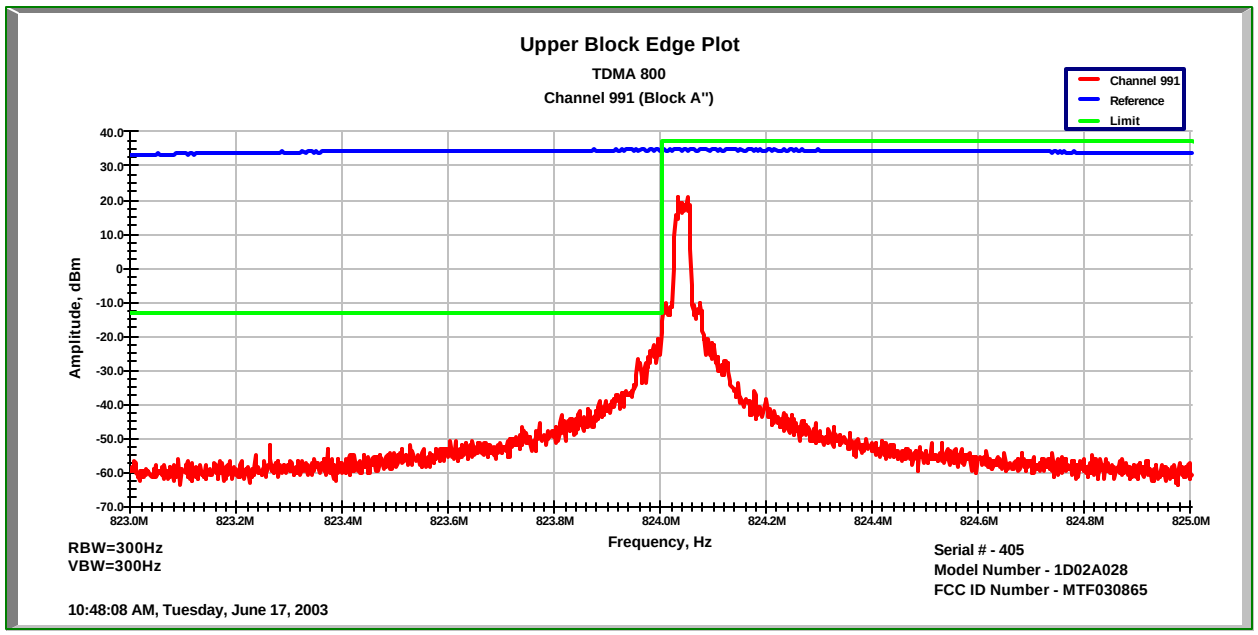
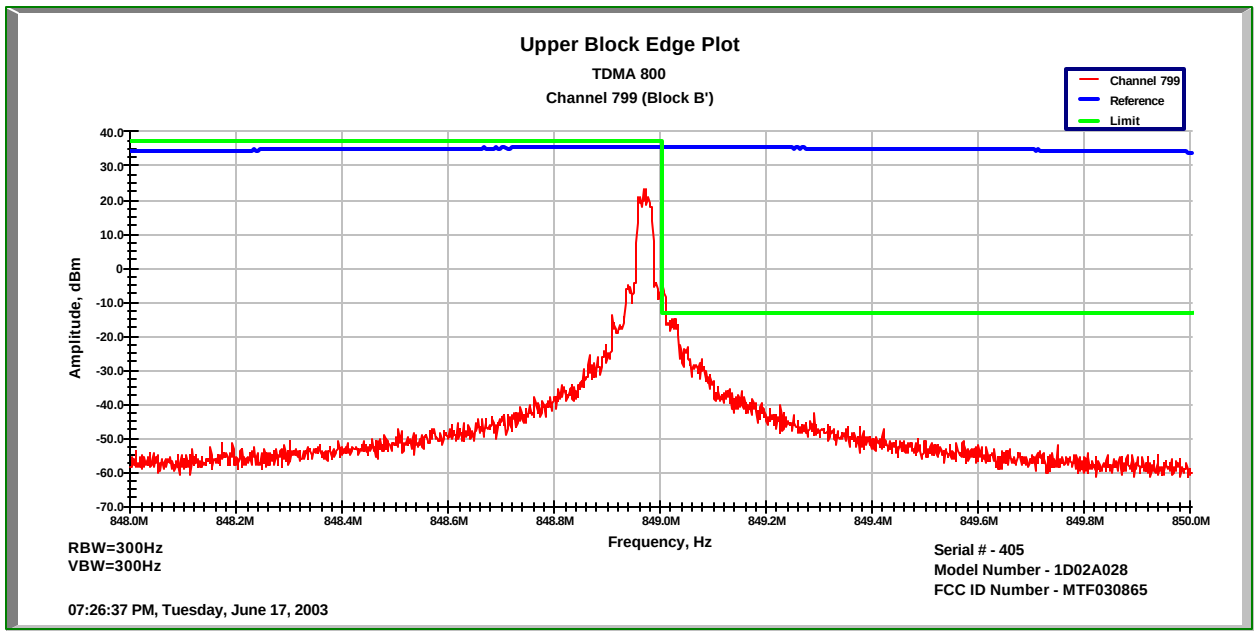


Figure 8-10: Band edge – TDMA800 High Channel



9 FIELD STRENGTH OF SPURIOUS RADIATION

FCC §2.1053

9.1 Test Procedure

The measurement antenna was placed at a distance of 3 meters from the EUT. The EUT was configured to operate at maximum power and was connected to the earpiece. 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 measurement antenna in both vertical and horizontal polarizations.

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.

9.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Spectrum Analyzer	HP	8593E	3407A01055	8/23/03
Spectrum Analyzer	HP	8546A	3410A00173/ 3448A00203	4/2/04
Preamplifier	HP	8447D	2648A04926	4/2/04
Preamplifier	HP	8449B	3008A00989	10/29/03
Antenna	Schaffner-Chase	CBL6112B	2622	8/26/03
High pass Filter	FILTEK	HP12/1000-5AB	ITS213156	8/8/03
High pass Filter	FILTEK	HP12/2000-5AB	ITS213155	8/8/03
Receiving Biconilog Antenna	Chase	CBL6112	2622	8/26/03
Receiving Horn Antenna	AH-Systems	SAS-200/571	246	1/31/04
Transmitting Dipole Antenna	CDI	A100	423-B4	9/16/03
Transmitting Horn Antenna	EMCO	3115	9208-3919	3/4/04

9.3 Test Results

The Phonecell SX4P (S/N: 405) met of spurious radiation requirements of FCC §2.1053 and IC RSS-128 §7.4 and §7.5. The test results are located in Table 9.3-1.

Table 9.3-1: Radiated spurious emissions

Company: **Teluar**
Model: **Phonecell (SN 405)**
Project No.: **3039424**
Date: 06/13/03
Standard: FCC15
Class: B Group: None
Notes:

Tested by: Jeffrey D. Hiday
Location: Duluth
Detector: HP8566
Antenna: AH571
PreAmp: HP8449B
Cable(s): HS7000 N-SM Cable TW3
Distance: **3**

Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB
TDMA 800 CH 383									
V	2500.000	59.1	29.1	9.4	35.8	0.0	61.8	82.2	-20.4
H	4185.000	43.5	32.4	11.9	35.1	0.0	52.8	82.2	-29.4
V	6583.000	65.3	36.2	15.0	35.4	0.0	81.1	82.2	-1.1
V	8302.340	54.9	37.7	16.8	35.8	0.0	73.6	82.2	-8.6
TDMA 800 CH 799									
V	2545.000	51.0	29.2	9.5	35.8	0.0	53.8	82.2	-28.4
V	4247.000	50.5	32.5	11.9	35.1	0.0	59.9	82.2	-22.3
V	6587.000	65.0	36.2	15.0	35.4	0.0	80.8	82.2	-1.4
V	8305.000	52.6	37.7	16.8	35.8	0.0	71.3	82.2	-10.9
TDMA 800 CH 991									
V	2472.500	54.7	29.1	9.3	35.8	0.0	57.3	82.2	-24.9
V	4132.000	43.0	32.3	11.7	35.1	0.0	52.0	82.2	-30.2
V	6583.870	62.0	36.2	15.0	35.4	0.0	77.8	82.2	-4.4
V	8305.000	56.0	37.7	16.8	35.8	0.0	74.7	82.2	-7.5
AMPS 800 CH 383									
V	8283.280	52.7	37.7	16.8	35.8	0.0	71.4	82.2	-10.8

Table 9.3-2: Power measurements of radiated spurious emissions

Company: **Telular**
Model: **1D02A028**
Project No.: **3039424**
Date: 06/13/03
Standard: FCC15
Class: B Group: None
Notes:

Tested by: Jeffrev D. Hidav
Location: Duluth
Detector: HP8546
Antenna: AH571
PreAmp: HP8449B
Cable(s): Cable TW3 HS7000 N-SMA
Distance: **3**

1 Antenna Pol. (V or H)	2 Frequency MHz	3 Receiver Reading dBm	4 Path Loss dB	5 Antenna Gain dBi	6 EIRP dBm	7 EIRP Limit dBm	8 Margin dB
TDMA 800 Channel 383							
V	6583.000	-41.7	15.0	10.5	-16.2	-13.0	-3.2
V	8302.340	-52.1	17.3	9.3	-25.5	-13.0	-12.5
TDMA 800 Channel 799							
V	6587.000	-42.0	14.9	10.5	-16.6	-13.0	-3.6
V	8305.000	-54.4	17.3	10.5	-26.6	-13.0	-13.6
TDMA 800 Channel 991							
V	6583.870	-45.0	14.9	10.5	-19.6	-13.0	-6.6
V	8305.000	-51.0	17.3	9.3	-24.4	-13.0	-11.4
AMPS 800 Channel 383							
V	8232.280	-54.3	17.6	10.5	-26.2	-13.0	-13.2

1 - Antenna Polarization
2 - Frequency of measurement
3 - Highest emission from EUT recorded on measurement receiver
4 - Path loss from EUT to measurement receiver
5 - Substitution antenna gain, dBi
6 - Effective Isotropic Radiated Power, dBm (3+4+5)
7 - Spurious emission limit, dBm (=10Log(P*1000)-(43+10Log(P))
8 - Margin, dB (6-7)

10 POWER LINE CONDUCTED EMISSIONS

FCC §15.107

10.1 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.

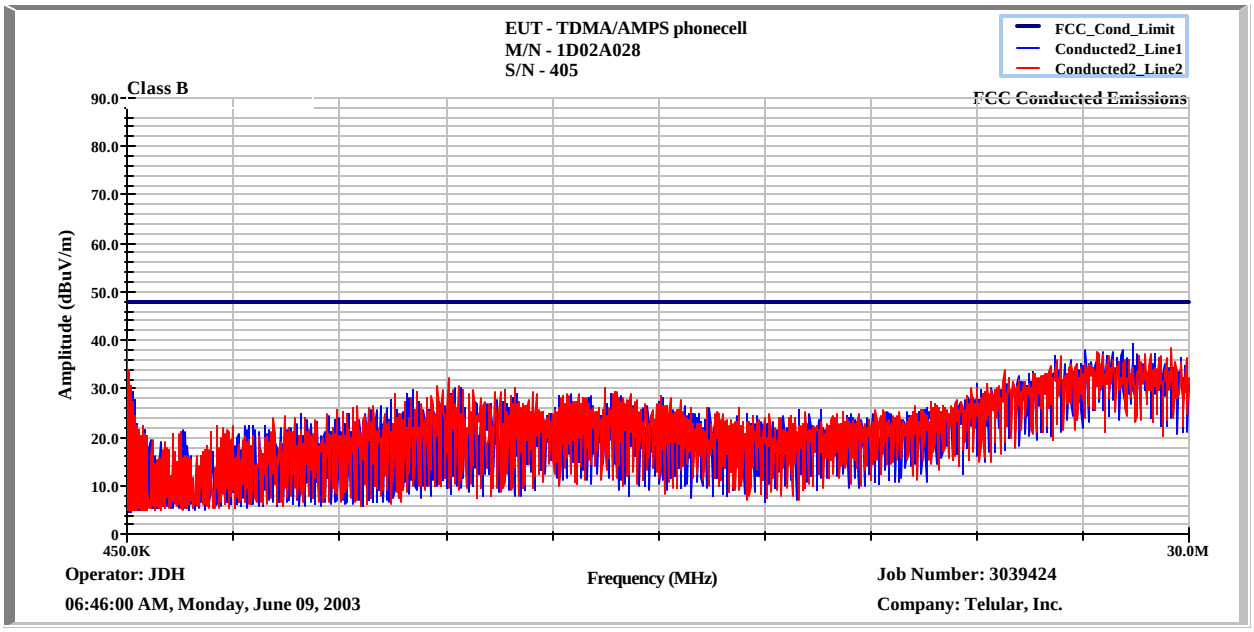
10.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Cable	Belden	Cable TT4	ITS# 211404	12/4/03
EMI Receiver	HP	8546A	3410A00173/ 3448A00203	4/2/04
LISN	FCC	FCC-LISN-50-50-M	2020	5/12/03

10.3 Test Results

The Phonecell SX4P met the power line conducted emission requirements of FCC §15.107 and §15.207 and ICES-003. The test results are located in Figure 10-1.

Figure 10-1: FCC §15.107 Power line Conducted Emissions



10.4 Test Configuration Photograph

Figure 10-2 and Figure 10-3 show the testing configurations used.

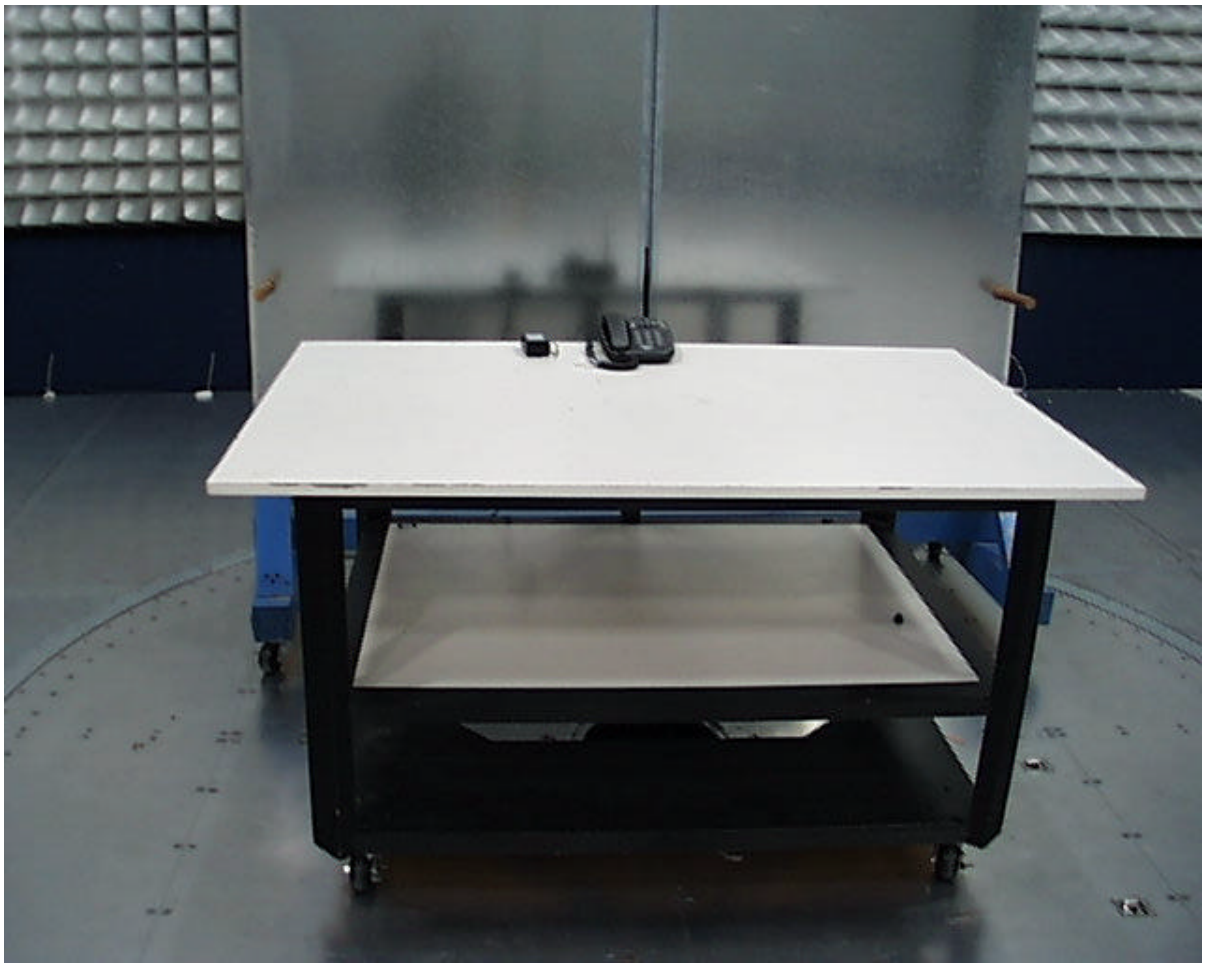


Figure 10-2: Configuration photograph, AC mains conducted emission, front view

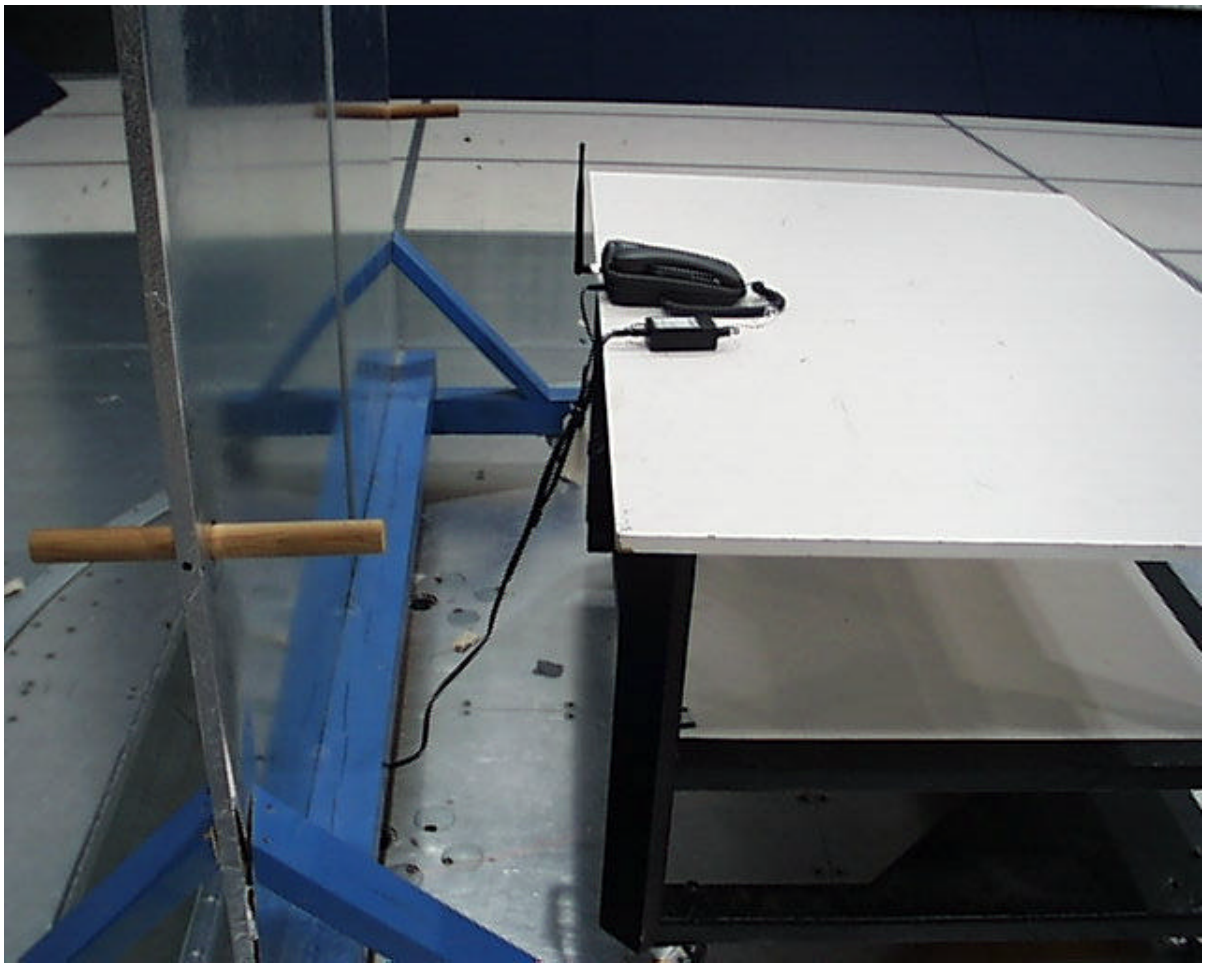


Figure 10-3: Configuration photograph, AC mains conducted emission, rear view

11 FREQUENCY STABILITY VS TEMPERATURE

FCC §2.1055, FCC §22.355

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 frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber. The DC leads, RF output cable, and external PTT cable exited the chamber through an opening made for that purpose.

After the temperature stabilized for approximately 30 minutes, the external PTT switch was activated, and the frequency output was recorded from the counter.

11.2 Test Equipment

/

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Communications Test Set	Hewlett Packard	HP8920B	US36412227	5/22/2003
TDMA Cellular Adapter	Hewlett Packard	HP83206A	US37501280	5/22/2003
Temperature Chamber	Thermotron	SM32C	25673	4/15/2003

11.3 Test Results

The Phonecell SX4P met the frequency stability requirements of FCC §2.1055, FCC §22.355.

Table 11.3-1: TDMA800 Channel 383, Frequency stability vs. Temperature

Tx Frequency: 836.49 MHz
Tolerance: +/- 2091 Hz

	TDMA Channel 383	AMPS Channel 383
Temperature (°C)	Difference (Hz)	Difference (Hz)
60	1	-100
50	-6	-95
40	4	-118
30	-9	-102
20	14	-135
10	4	29
0	-3	-100
-10	-11	-110
-20	-2	-111
-30	-9.2	-101

12 FREQUENCY STABILITY VS VOLTAGE

FCC §2.1055, FCC §22.355

Frequency tolerance: 2.5ppm

12.1 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 until the transmitter light no longer illuminates; i.e., the battery end point. The output frequency was recorded for each battery voltage.

12.2 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Communications Test Set	Hewlett Packard	HP8920B	US36412227	5/22/2003
TDMA Cellular Adapter	Hewlett Packard	HP83206A	US37501260	5/22/2003
Power Supply	Combinova	6408-1	6408-1000172	10/4/2003

12.3 Test Results

The Phonecell SX4P met the frequency stability requirements of FCC §2.1055, FCC §22.355.

Table 12.3-1: Frequency stability vs. input voltage

Tx Frequency: 836.49 MHz
Tolerance: +/- 2091 Hz

	TDMA Channel 383	AMPS Channel 383
Supply Voltage AC Volts	Difference (Hz)	Difference (Hz)
102	-8	-129
120	14	-135
138	-6	-130

13 RECEIVER SPURIOUS EMISSION

FCC §15.109

13.1 Test Limits

Table 13.1-1 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

13.2 Test Equipment

Description	Make	Model	Serial #	Cal Due Date
EMI Receiver	HP	8546A	3410A00173/ 3448A00203	4/2/04
Spectrum Analyzer	HP	8593E	3407A01055	8/23/03
PreAmp	HP	8449B	3008A0089	10/30/03
BiLog Antenna	Chase	CBL6112B	2622	8/26/03
Horn Antenna	AH Systems	SAS200/571	246	1/31/04
Cable	N/A	Cable N2	ITS# 211999a2	6/12/03
Cable	N/A	CableTW2	ITS# 211411	6/12/03
Cable	N/A	CableTW3	ITS# 211412	6/12/03
EMI Receiver	HP	8546A	3410A00173/ 3448A00203	4/2/04

13.2.1 Cables associated with EUT

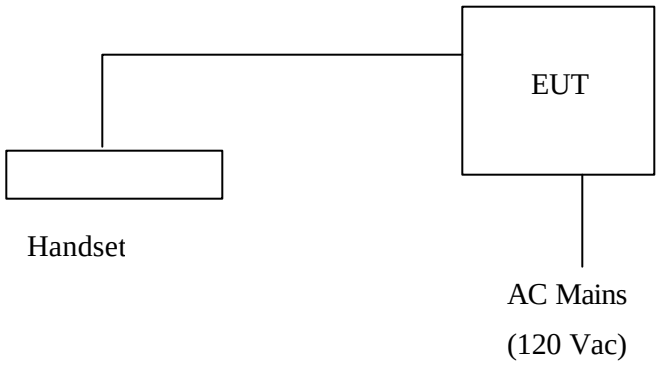
Table 13.2-1 contains the details of the cables associated with the EUT.

Table 13.2-1: Interconnecting cables between modules of EUT

Cables					
Description	**Length**	**Shielding**	**Ferrites**	**Connection**	
				From	**To**
AC power cable	1.5m	None	None	EUT	AC Mains
Phone Handset coiled cable	1.0m	None	None	EUT	Handset

13.2.2 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.



13.2.3 Justification

The EUT was operated in the stand-alone configuration.

13.2.4 Mode(s) of operation

The EUT was powered from 120V AC, 60Hz.

The EUT was set to the AMPS and TDMA800 modes during testing.

13.3 Modifications required for compliance

No modifications were implemented by Intertek.

13.4 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 was 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.

13.5 Test Results

The Phonecell SX4P met the radiated disturbance requirements of FCC §15.109. There were no emissions detected within 10 dB of the limit. The highest frequency scanned was 5 GHz for AMPS and TDMA800 modes.

13.6 Test Configuration Photograph

Figure 13-1 and Figure 13-2 show the testing configurations used.

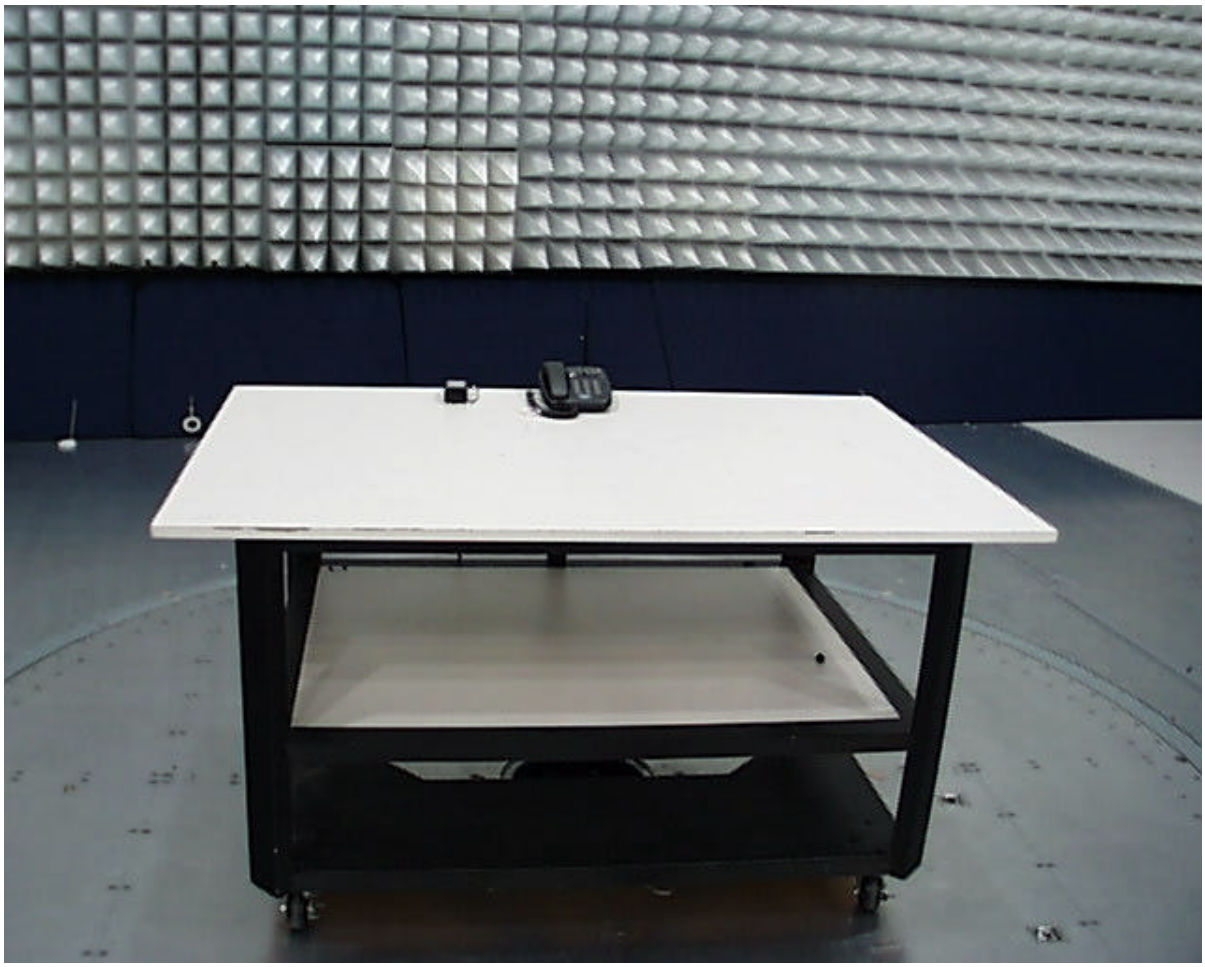


Figure 13-1: Configuration photograph, radiated emission, front view

Figure 13-2: Configuration photograph, radiated emission, rear view

14 REVISION HISTORY

Revision Level	Date	Report Number	Notes
Original issue	June 25, 2003	3039424-43-1-0	--
1	October 13, 2003	3039424-43-1-1	Model number changed from SX4D to SX4P