APREL Laboratories

Assessment of Compliance

with

Respect to FCC Rules &
Regulations Parts 2 and 22

NeoPoint Inc.

NeoPoint 1600 Dual Mode 800 MHz Phone

AMPS/CDMA

August 1999

51 Spectrum Way Nepean ON K2R 1E6
Tel: (613) 820-2730 Fax: (613) 820-4161
email: info@aprel.com

Engineering Report

Subject: **Assessment of Compliance with Respect to FCC Rules & Regulations Parts 2 and 22**

FCC ID: **N5WNP16PSBDMHJKH2**

Equipment: **Dual Mode 800 MHz Phone, AMPS/CDMA**

Model: **NeoPoint 1600**

Client: **NeoPoint, Inc.**
4225 Executive Square
Suite 600
La Jolla, CA, 92037
USA

Project #: NEOB-NEOPOINT-1600-3273

Prepared By: APREL Laboratories,
Regulatory Compliance Division

Approved by: _____ Date: Aug. 16, 1999

Jay Sarkar
Director, Standards & Certification

Released by: _____ Date: Aug 16, 99

Dr. Jack J. Wojcik, P.Eng.

REGISTERED PROFESSIONAL ENGINEER
J. J. Wojcik
PROVINCE OF ONTARIO

51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6

VISIT OUR WEB PAGES: WWW.APREL.COM

TEL (613) 820-2730
FAX (613) 820-4161
EMAIL: INFO@APREL.COM

FCC ID:	**N5WNP16PSBDMHJKH2**
Applicant:	NeoPoint, Inc.
Equipment:	Dual Mode 800 MHz Phone, AMPS/CDMA
Model:	NeoPoint 1600
Standard:	FCC Rules and Regulations Part 2 & 22

ENGINEERING SUMMARY

This report contains the results of the engineering evaluation performed on a Dual Mode 800 MHz Phone, AMPS/CDMA. The tests were carried out in accordance with FCC Rules and Regulations Part 2 and Part 22.

Based on the test results, it is certified that the product meets the requirements as set forth in the above specifications for certification.

Technical description of the Cellular Phone in accordance with the Commissions rules and regulations, FCC part 2 paragraph 2.983 are presented in page 7 of this report.

SAR Engineering Report in accordance with the commissions rule and regulations, FCC part 2.10191 and 2.1093 is presented seperately under EXHIBIT 10 of this FCC submmission.

Summary of the Results

Test Description	Exhibit No.	Page No.	Test Set-up Figure No.	Results Summary
RF Power Output as Radiated Ref. Paragraph 2.985(a) Part 22.913(a)	2	9	1	**Passed**
Modulation Characteristics Ref. Paragraph 2.987 & Part 22.915	2	14	2	**Passed**
Audio Frequency Response Ref. Paragraph 2.987 & Part 22.915(d)(1)	2	20	3	**Passed**
Occupied Bandwidth Ref. Paragraph 2.989 & Part 22.917(b)(d)	2	25	4	**Passed**
Spurious Emissions at Antenna Terminals Ref. Paragraph 2.991 & Part 22.917(e)(f)	2	43	5,6	**Passed**
Field Strength of Spurious Radiation Ref. Paragraph 2.993 & Part 22.917(e)	2	51	7	**Passed**
Frequency Stability Ref. Paragraph 2.995	2	57	8	**Passed**
SAR (RF exposure rules) Ref. Paragraph 2.1091, 2.1093	10	N/A	N.A	**Passed**

FCC SUBMISSION INFORMATION

FCC ID:	**N5WNP16PSBDMHJKH2**
Electronic Serial Number:	N/A
Equipment:	Dual Mode 800 MHz Phone, AMPS/CDMA
Model:	NeoPoint 1600
For:	Certification
Applicant:	NeoPoint, Inc. 4225 Executive Square Suite 600 La Jolla, CA, 92037 USA
Manufacturer:	NeoPoint, Inc. 4225 Executive Square Suite 600 La Jolla, CA, 92037 USA
Evaluated by:	APREL Laboratories 51 Spectrum Way Nepean, Ontario Canada K2R 1E6

FCC ID: N5WNP16PSBDMHJKH2

MANUFACTURER'S DATA

Equipment Type:	Dual Mode 800 MHz Phone, AMPS/CDMA
Model:	NeoPoint 1600
Electronic Serial Number:	N/A
Reference:	FCC Rules and Regulations Parts 2 and Part 22
Manufacturer:	NeoPoint, INC.
Power Source:	7.6 VDC Battery
Development Stage of Unit:	Production

GENERAL SPECIFICATIONS

1.	Frequency Range:	824.04 – 848.97 MHz (Transmitter) 869.04 – 893.97 MHz (Receiver)
2.	Rated Transmitted Output Power:	389 mW AMPS, 0.2 W CDMA
6.	Type of Modulation:	FM/CDMA
7.	Antenna Impedance	50 Ω

CHANNELS TESTED

	CDMA		AMPS
Channel	# 1013 (Lo)	824.700 MHz	#991(Lo) 824.04 MHz
Channel	#383 (M)	836.490 MHz	#383(M) 836.49 MHz
Channel	#777 (H)	848.310 MHz	#799(H) 848.97 MHz

INTRODUCTION

General

This report describes the results of the tests conducted on a Dual Mode 800 MHz Phone, AMPS/CDMA, model NeoPoint 1600 manufactured by NeoPoint, INC..

Test Facility

The tests were performed for NeoPoint, Inc. by APREL Laboratories at APREL's EMI facility located in Nepean, Ontario, Canada. The laboratory operates an (3m and 10m) Open Area Test Site (OATS). The measurement facility is calibrated in accordance with ANSI C63.4-1992.

A description of the measurement facility in accordance with the radiated and AC line conducted test site criteria per ANSI C63.4-1992 is on file with the Federal Communications Commission and is in compliance with the requirements of Section 2.948 of the Commissions rules and regulations.

APREL's registration number is 31040/SIT (1300F2)

APREL is accredited by Standard Council of Canada, under NAPTO program (ISO Guide 25). APREL is also accredited by Industry Canada (formerly DOC) and recognised by the Federal Communications Commissions (FCC).

Standard

The evaluation and analysis were conducted in accordance with FCC Rules and Regulations Parts 2 and 22.

Test Equipment

The test equipment used during the evaluation is listed in Appendix A. Calibration of all test equipment's are performed at 12 months intervals. All equipment used is calibrated or verified in accordance with the intent of AQAP-6/MIL-STD-45662.

Environmental Conditions

Measurements were conducted under normal laboratory conditions including open area test site.

- Temperature: 23 °C ± 2
- Relative Humidity: 30 - 50 %
- Air Pressure: 101 kPa ± 3

FCC ID: N5WNP16PSBDMHJKH2

TECHNICAL DESCRIPTION OF THE EQUIPMENT
Ref.: FCC Part2 paragraph 2.983

Complete Circuit Diagram

Ref: Paragraph 2.983 (d): See EXHIBIT 7

Instruction Book

Ref: Paragraph 2.983 (d): See EXHIBIT 9

Tune-up Procedure at Nominal Operating Power:

Ref: Paragraph 2.983 (d): See EXHIBIT 3

Circuitry and Devices for Determining and Stabilizing Frequency

Ref: Paragraph 2.983 (d): See EXHIBIT 3

Circuits for Suppression of Spurious Radiation, Limiting of Modulation, and Limiting of Power

Ref: Paragraph 2.983 (d): See EXHIBIT 3

Equipment Identification Plate/Label

Ref: Paragraph 2.983: See EXHIBIT 4

Photographs of the Equipment

Ref: Paragraph 2.983: See EXHIBIT 5

FCC ID: N5WNP16PSBDMHJKH2

TEST RESULTS

FOR

Dual Mode 800 MHz AMPS/CDMA

Model: NeopPoint 1600

NeoPoint, Inc.

Test: **RF Power Output as Radiated (ERP)**

Ref.: **FCC Part 2 paragraph 2.985(a) and Part 22 paragraph 22.913(a)**

Criteria: The effective radiated power of the mobile transmitter must not exceed 7 Watts. The equipment must employ means to limit the power to the minimum necessary to maintain successful communications. Power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.983(d)(5).

Set-up: See Figure No. 1.

Environmental Conditions: Temperature: 26 °C ± 2.
Air pressure:101 ± 3 kPa

Equipment: See Appendix A.

Procedure: RF Power Measurement by Radiated Method (ERP):

Test site: The radiated RF power measurement was taken at APREL Laboratory's open area test site (OATS). This open area test site is calibrated to ANSI C63.4 document and a description of the measurement facility is on file with the Federal Communications Commission and is in compliance with the requirement of Section 2.948 of the Commissions rules and regulations.(FCC File No.: 31040/SIT)

The test was set-up as illustrated in Fig.1. The mobile was configured to operate at maximum power (power level 0) with carrier unmodulated for AMPS. The equipment under test was placed on a turntable positioned 3 meters away from the calibrated receiving antenna, which in turn was connected to the spectrum analyzer.

For each transmitter frequency, the receiver signal was **maximised** by rotating the turntable and adjusting the height of the receiving antenna. To obtain the actual ERP, the mobile was replaced by a half-wave vertically polarised antenna, RF power amplifier and signal generator. The center of the dipole antenna was placed in the same location as the mobile. The signal generator level was adjusted until the

reading on the spectrum analyzer was identical to that obtained when the mobile was on the turntable. The output of power amplifier was disconnected from the dipole and connected to an RF power meter. **The effective radiated power was read directly form the power meter**.

The process was repeated for CDMA and the mobile was CDMA modulated.

Results: **PASSED.** See Table 1, Table 2.

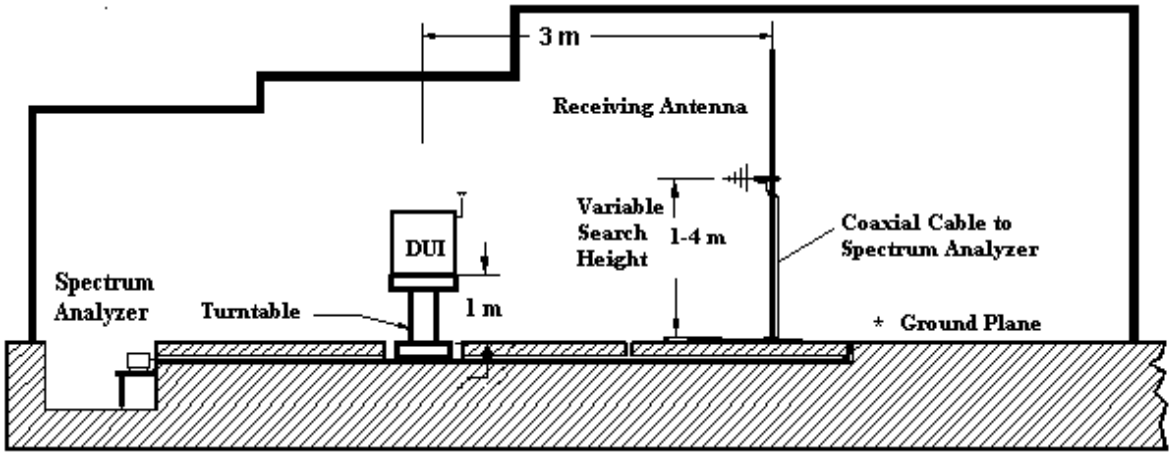


Figure 1.a Test Set Up for the Radiated Power (ERP) Measurement in OATS (not to scale)

Fig. 1.b APREL's OATS (Open Area Test Site)

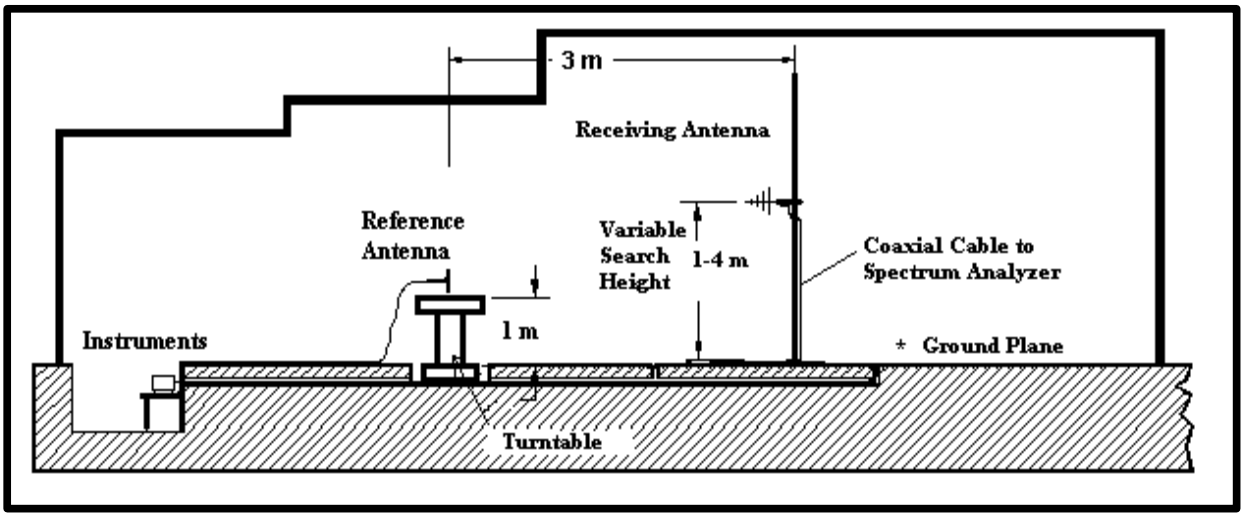


Figure 1.c Test Set Up for the Radiated Power (ERP) Measurement in OATS(not to scale)
The EUT is Replaced by Reference Dipole Antenna.

Table 1.
RF Output Power Measurement
ERP
AMPS

Channel No.	Nominal Transmit Frequency	Manufacturer's Rated Output Power (Power Level: 0)	Measured Output Power ERP (Power Level: 0)	ERP (Power Level: 0)
	(MHz)	(W)	(dBm)	(W)
799	848.97	0.389	25.9	0.389
383	836.49	0.389	24.8	0.302
991	824.04	0.389	25.7	0.372

Table 2.
RF Output Power Measurement
ERP
CDMA

Channel No.	Nominal Transmit Frequency	Manufacturer's Rated Output Power (Power Level: 0)	Measured Output Power ERP (Power Level: 0)	ERP (Power Level: 0)
	(MHz)	(W)	(dBm)	(W)
777	848.31	0.2	24.0	0.251
383	836.49	0.2	24.5	0.281
1013	824.70	0.2	24.2	0.263

Test performed by: HY Date: August 6, 1999

Test: **Modulation Characteristics**

Ref.: **FCC Part 2 paragraph 2.987 and Part 22 paragraph 22.915**

Criteria: a) The levels of the modulating signals shall be set to the following values:

(1) The instantaneous frequency deviations shall not exceed the rated system frequency deviation of ± 12 kHz ± 10 %

(2) The instantaneous frequency deviation resulting from the supervisory audio tones (SAT) must be ±2 kHz ± 10 %.

(3) The instantaneous frequency deviation resulting from the Signalling Tone (ST) must be ±8 kHz ± 10 %.

(4) The instantaneous frequency deviation resulting from wideband data signals must be ±8 kHz ± 10%.

b) Deviation limitation circuitry. Cellular transmitters must be equipped with circuitry that automatically prevents modulation levels for voice transmission from exceeding the limits specified above.

Set-up: See Figure No. 2.

Environmental Conditions: Temperature: 23 °C ± 2.
Air pressure: 101 ± 3 kPa

Equipment: See Appendix A.

Procedure: In order to confirm the modulation characteristics of the sample unit, the audio signal was injected to the transmitter via a short cable from the RF communication test set HP8920A/D. The antenna was detached and a RF communication test set was connected to the RF connector of the device under test through a 50Ω cable. The modulation characteristics were checked with the carrier modulated by voice

(main modulation), supervisory audio tone (SAT), signalling tone, and wideband data (WBD). The worst case data was recorded with voice modulation.

The transmitter was set to a channel near the centre of the band and adjusted for full rated system deviation. The audio input frequency was set to 400 Hz; the signal level was then varied from 70 dBµV to 118 dBµV in steps of 3 dB. The frequency deviation was measured and recorded for each signal level. The test was repeated for a modulation signal of 1000 Hz and 3000 Hz. A family of curves for the frequency deviation versus the modulation input voltage is shown in plot 1.

Results: **PASSED.** See Tables 3 & 4 and Plot 1.

It can be seen from the modulation deviation plot (plot 1) that a deviation level of 12 kHz ± 10% (10.8 — 13.8 kHz) is achieved. Modulation deviation of 11.0 kHz was achieved at 400 Hz at an input level of 100.0 dBuV. The worst case data was observed with voice modulation.

Set up Figure No.2
Modulation Limiting

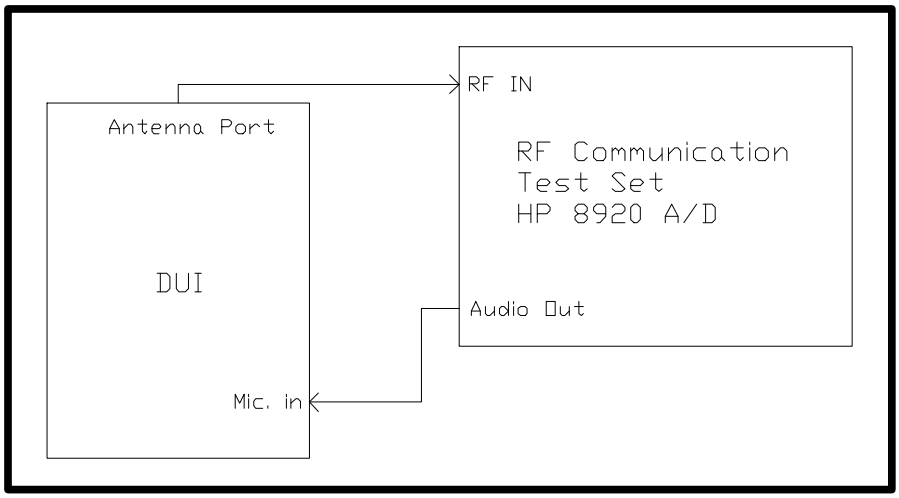


Table 3
Modulation Limiting
Frequency Deviation vs. Amplitude
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0

Injected Signal (dBµV)	Frequency Deviation (kHz)		
	at 400 Hz	at 1000 Hz	at 3000 Hz
70.0	1.1	1.1	1.9
73.0	1.1	1.4	2.2
76.0	1.1	1.6	2.5
79.0	1.3	2.3	3.0
82.0	2.8	4.0	3.8
85.0	4.3	5.5	4.7
88.0	5.7	6.2	5.4
91.0	7.2	6.8	5.3
94.0	8.7	7.4	5.7
97.0	9.8	7.5	5.6
100.0	11.0	7.8	5.7
103.0	11.1	8.0	6.0
106.0	11.0	8.2	6.6
109.0	11.0	8.0	5.8
112.0	11.3	8.2	6.1
115.0	11.4	8.2	6.6
118.0	11.4	7.8	6.6

Test performed by: HY Date: August 6, 1999

Plot #1
Modulation Characteristics

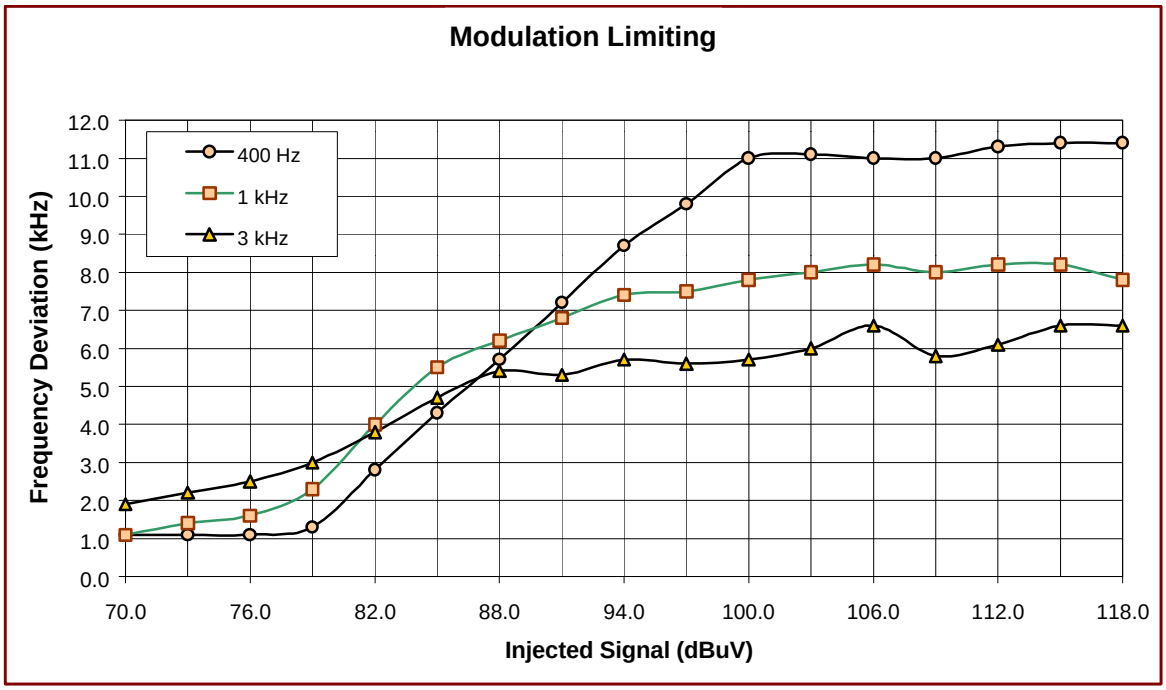


Table 4
Frequency Deviation
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0
SAT, ST, WBD

Signal	Measured Frequency Deviation (± kHz)	Limit Frequency Deviation (± kHz)
SAT (6000 Hz)	2.0	1.8 – 2.2
ST (10 kHz)	8.2	7.2 – 8.8
Wideband data	8.0	7.2 – 8.8

Test performed by: HY Date: August 6, 1999

Test: **Audio Frequency Response**

Ref.: **FCC Part 2 paragraph 2.987 (a) and Part 22 paragraph 22.915(d)(1)**

Criteria: Voice modulated communication equipment:

a) A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. The pre-emphasis characteristic will have a nominal +6 dB/octave response between 300 and 3000 Hz (22.906.a.4).

b) For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter shall be submitted to show that radio telephony signals applied to the modulator from the modulation limiter is attenuated as a function of frequency as specified below in Table 5. For mobile stations, these signals must be attenuated, relative to the level at 1 kHz as defined by Table below.

Table 5
Audio Filter Characteristics
Attenuation vs. Frequency of LPF

Frequency Band	Attenuation (Minimum)
3.0 kHz – 5.9 kHz	40 log (f/3) dB
5.9 kHz – 6.1 kHz	35 dB
6.1 kHz – 15.0 kHz	40 log (f/3) dB
> 15 kHz	28 dB

Note: f is the frequency of the signal in kHz.

Set-up: See Figure No. 3. In order to confirm the modulation characterisation of the device under test, the radio signal was injected to the transmitter via the standard telephone device connection RJ-11. This RJ-11 connection is provided for the telephone for voice communication and dialling. The antenna was detached and a RF communication test set was connected to the RF Communication Test Set was connected to the RF connector of the device under test through a 50 ohm cable.

Environmental Conditions: Temperature: 23 °C ± 2.
Air pressure: 101 ± 3 kPa.

Equipment: See Appendix A.

Procedure: a. The transmitter was operated with the compressor disabled. The standard test receiver of the RF Communication Test Set was set without standard 750 µs de-emphasis, with expandor disabled, and without C-message weighted filter. A sine wave signal was applied to the transmitter external audio port, the modulating frequency varied from 100 to 5000 Hz, and the demodulated audio level was recorded in Table 5.

To test the audio low-pass filter characteristics: the audio input frequency was adjusted to 1000 Hz, and the input level was set to 20 dB greater than that required to produce ± 8 kHz deviation. The output level on the test receiver was recorded. Using this output level as reference (0 dB), the modulating frequency was varied from 3000 Hz to 20,000 Hz, and the demodulated audio level was recorded in Table 6.

Results: **PASSED.** See Tables 6 & 7, and Plots 2 & 3.

Set up Figure No.3
Audio Frequency Response

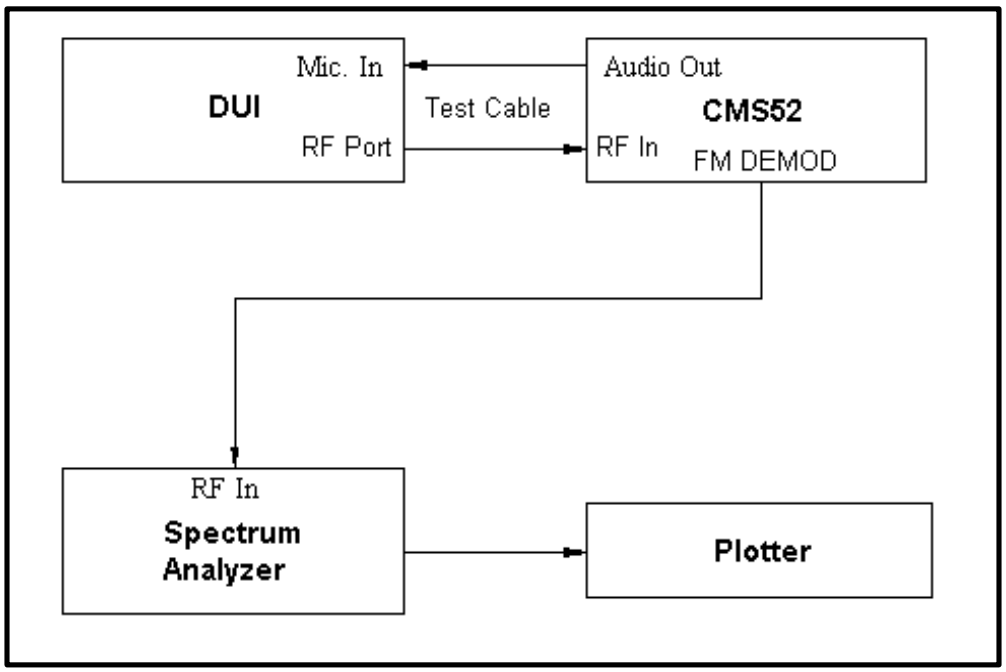


Table 6
Audio Frequency Response
Channel: 383
Power Level: 0

Frequency (kHz)	Demodulated Audio Level (dB)
0.1	-51.0
0.2	-27.0
0.3	-15.0
0.4	-8.0
0.5	-6.0
0.6	-4.0
0.7	-3.0
0.8	-2.0
1.0	0.0 (**Ref**.)
1.5	2.0
2.0	4.0
2.5	5.0
3.0	3.0
4.0	-50.0
5.0	-50.0

Plot #2
Audio Frequency Response

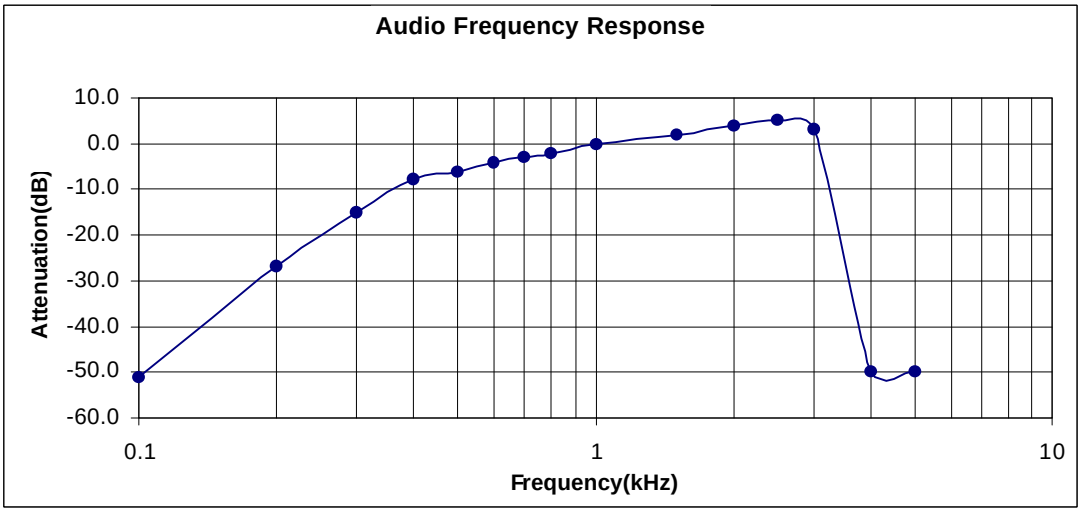
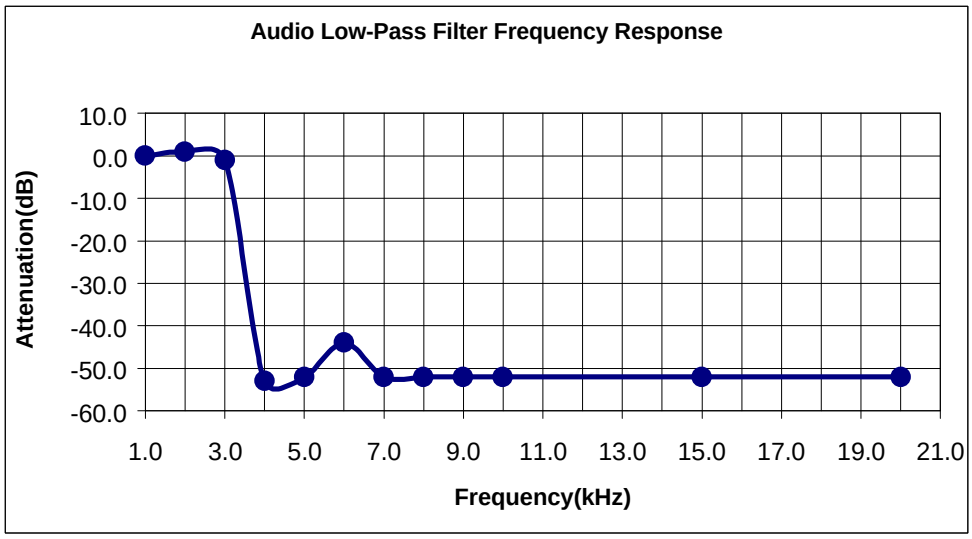


Table 7
Audio Low-Pass Filter Frequency Response
Channel: 383
Power Level: 0

Frequency (kHz)	Demodulated Audio Level (dB)
1.0 (**Ref.**)	0.0
2.0	1.0
3.0	-1.0
4.0	-53.0
5.0	-52.0
6.0	-44.0
7.0	-52.0
8.0	-52.0
9.0	-52.0
10.0	-52.0
15.0	-52.0
20.0	-52.0

Plot #3
Audio Low-Pass Filter Frequency Response



Test: **Occupied Bandwidth**

Ref.: **FCC Part 2 paragraph 2.989 and Part 22 paragraph 22.917(b)(d)**

Criteria: **F3E/F3D (Voice/ST, SAT) emission mask for use with audio filter:** The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz : at least 26 dB.

(2) On any frequency removed from the carrier frequency by more than 45 kHz, up to the first multiple of the carrier: at least 60 dB or 43 + 10 log (P) dB, whichever is the lesser attenuation.

F1D emission mask (Wide Band Data):
The mean power of emission must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz: at least 26 dB.
(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz: at least 45 dB.
(3) On any frequency removed from the carrier frequency by more than 90 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.

CDMA: Paragraph (e), page 26.

Set-up: See Figure No. 4.

Environmental Conditions: Temperature: 23 °C ± 2.
Air pressure: 101 ± 3 kPa

Equipment: See Appendix A.

Procedure: The first step in the procedure was to measure the unmodulated career with the setup of Figure 4. and record the peak level as a reference (0dB). Then the modulation measurements were performed with the same test setup.

When the carrier was modulated with voice, the modulating 2500 Hz sinusoidal signal was injected to the transmitter via the standard telephone device connection RJ-11. This RJ-11 connector is provided for the telephone for voice communication To produce the tones ST, SAT, ST+SAT, Voice + SAT etc and WBD, the carrier was modulated in sequence using the appropriate test command.

a) For voice and SAT measurements, the transmitter compressor was disabled and the DUI was modulated by a 2500 Hz sinusoidal signal with an input level 13.5 greater than that required to produce ± 8 peak frequency deviation at 1000 Hz. The 6000 Hz SAT signal was enabled.

b) For SAT and ST (Signalling Tone) measurements, voice was muted, the compressor, SAT (6000 Hz) and Signalling Tone (10 kHz) were enabled.

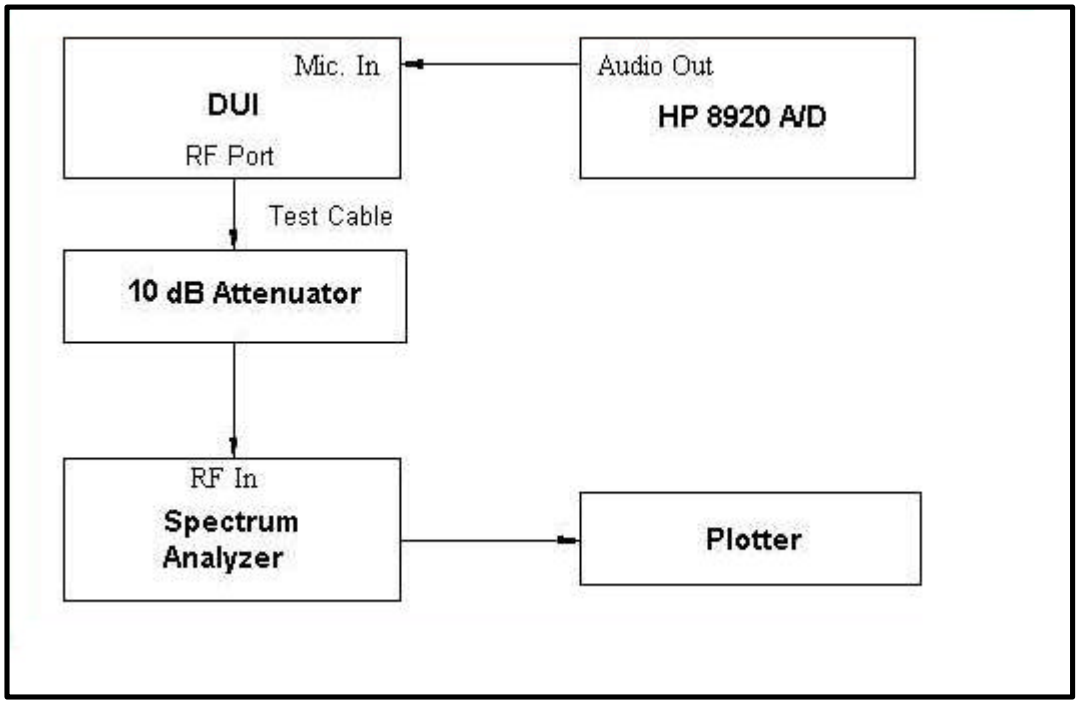
c) For wideband data measurements, the transmitter was modulated with a 10 kilobit/second data pattern at ± 8 kHz peak frequency deviation.

d) All BW measurements were performed at both highest power (level 0) output level and lowest (level 7) output level modes.

e). In CDMA mode, the mobile was modulated apropriately as required by CDMA. Compliance with this provision is based on the use of measuring instrumentation employing a resolution bandwidth of 1 MHz or greater. 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 emission are attenuated at least 26 dB below the transmitter power.

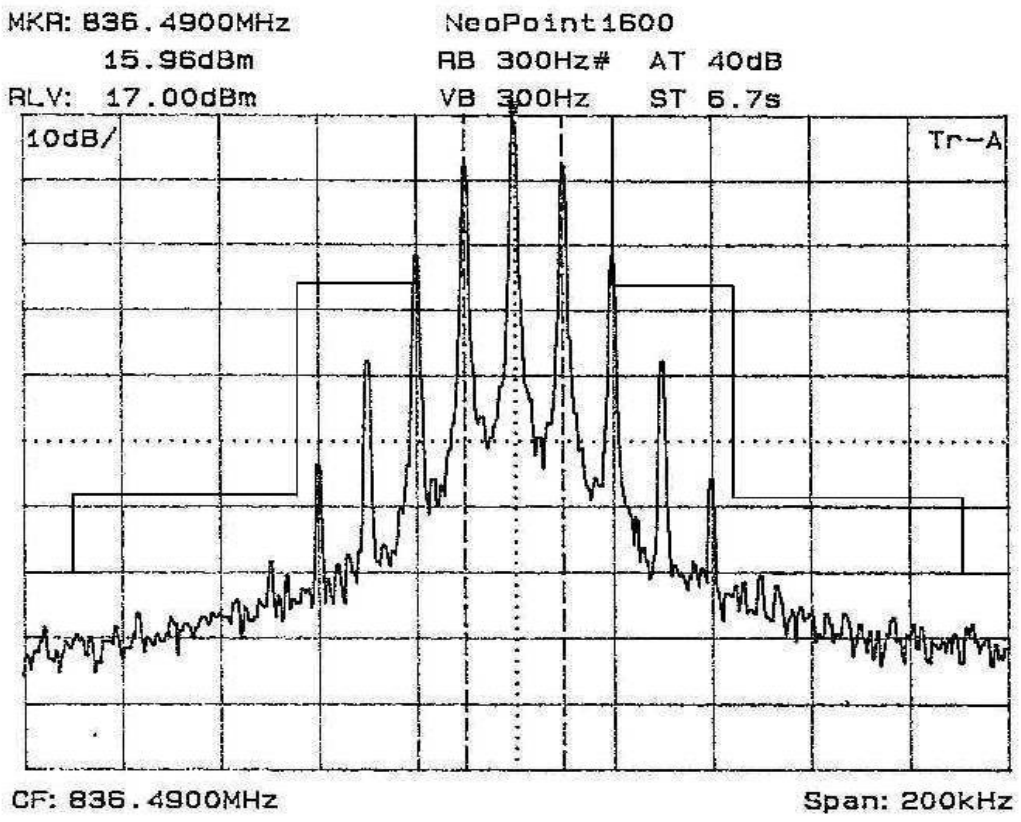
Results: **PASSED.**

Set Up Figure 4
Occupied Bandwidth Set Up



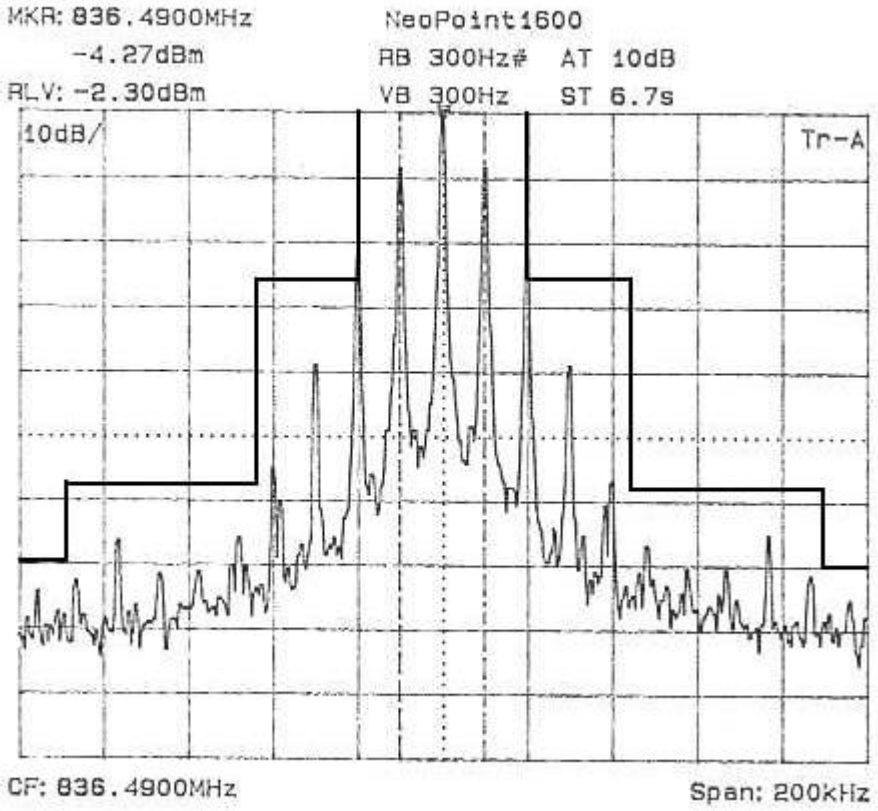
PLOT #4.a

Occupied Bandwidth
ST
Channel No.: 383
Transmit Frequency: 836.49 MHz
Power Level: 0



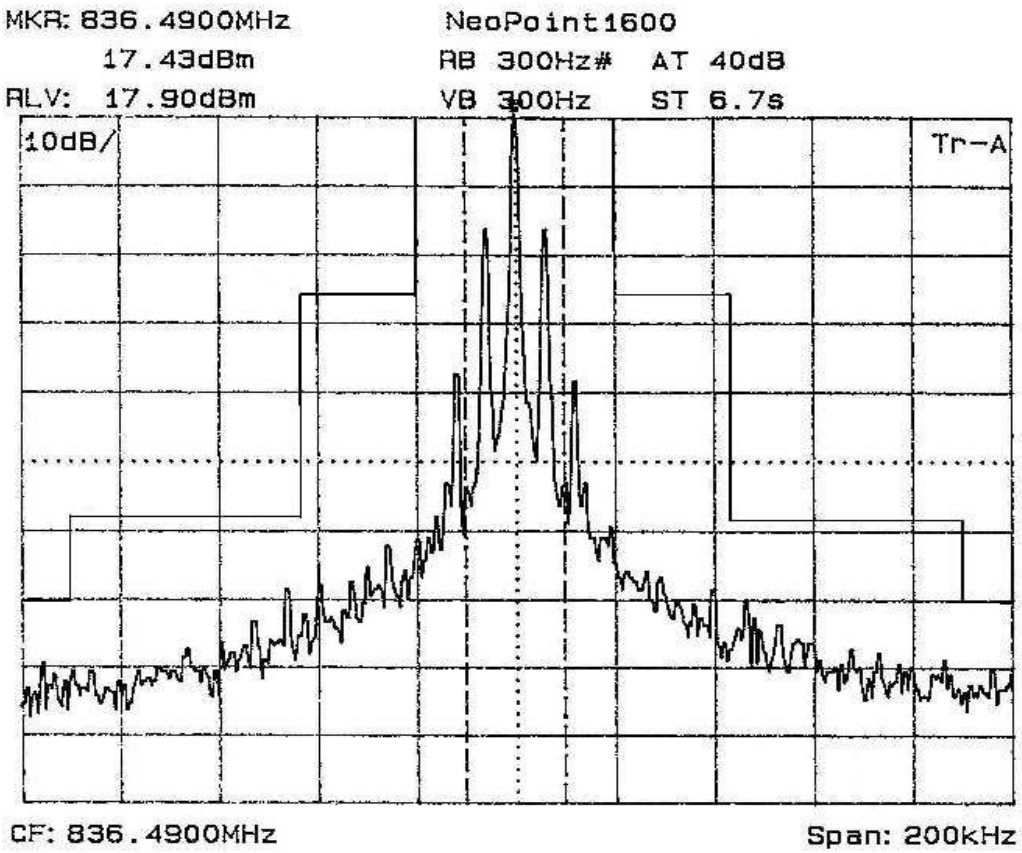
PLOT #4.b

Occupied Bandwidth
ST
Channel No.: 383
Transmit Frequency: 836.49 MHz
Power Level: 7



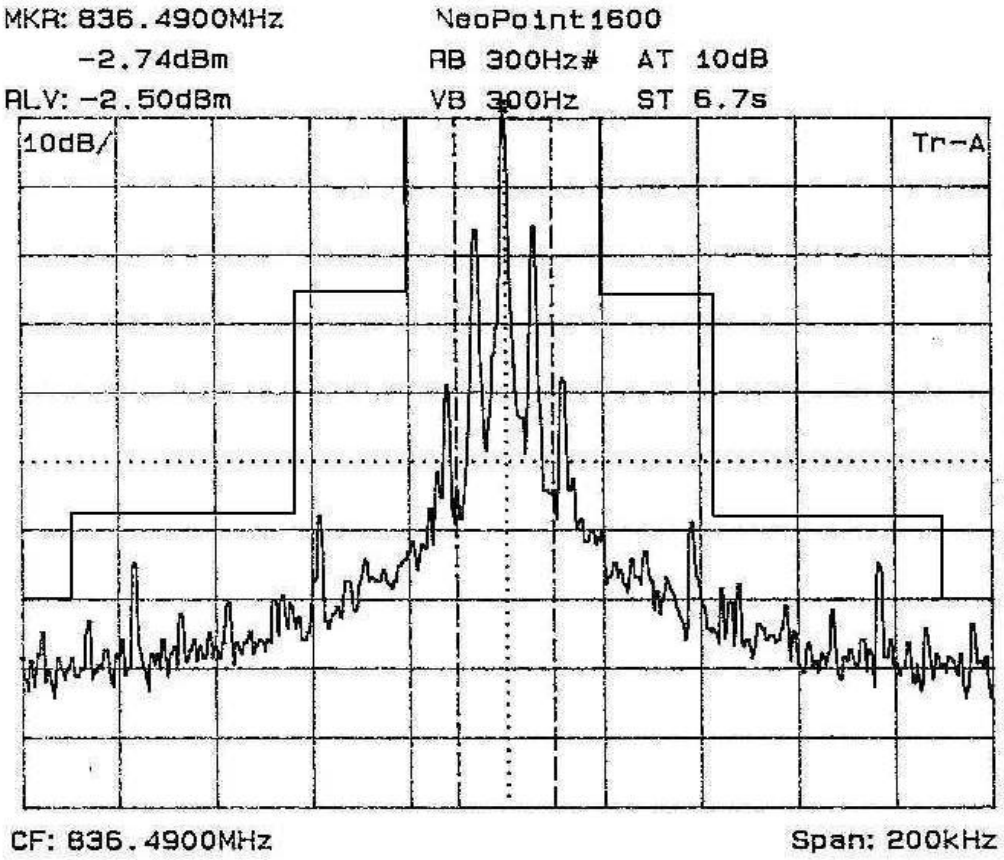
PLOT #5.a

Occupied Bandwidth
SAT (6000 Hz)
Channel No.: 383
Transmit Frequency: 836.49 MHz
Power Level: 0



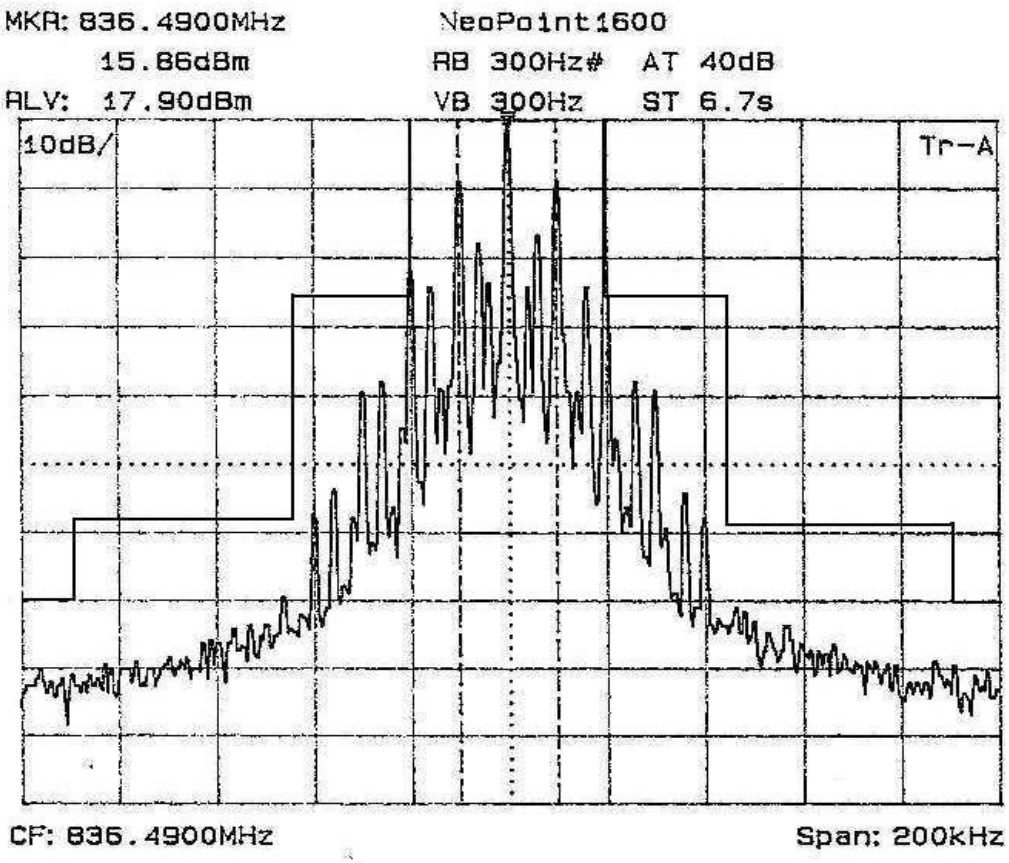
PLOT #5.b

Occupied Bandwidth
SAT (6000 Hz)
Channel No.: 383
Transmit Frequency: 836.49 MHz
Power Level: 7



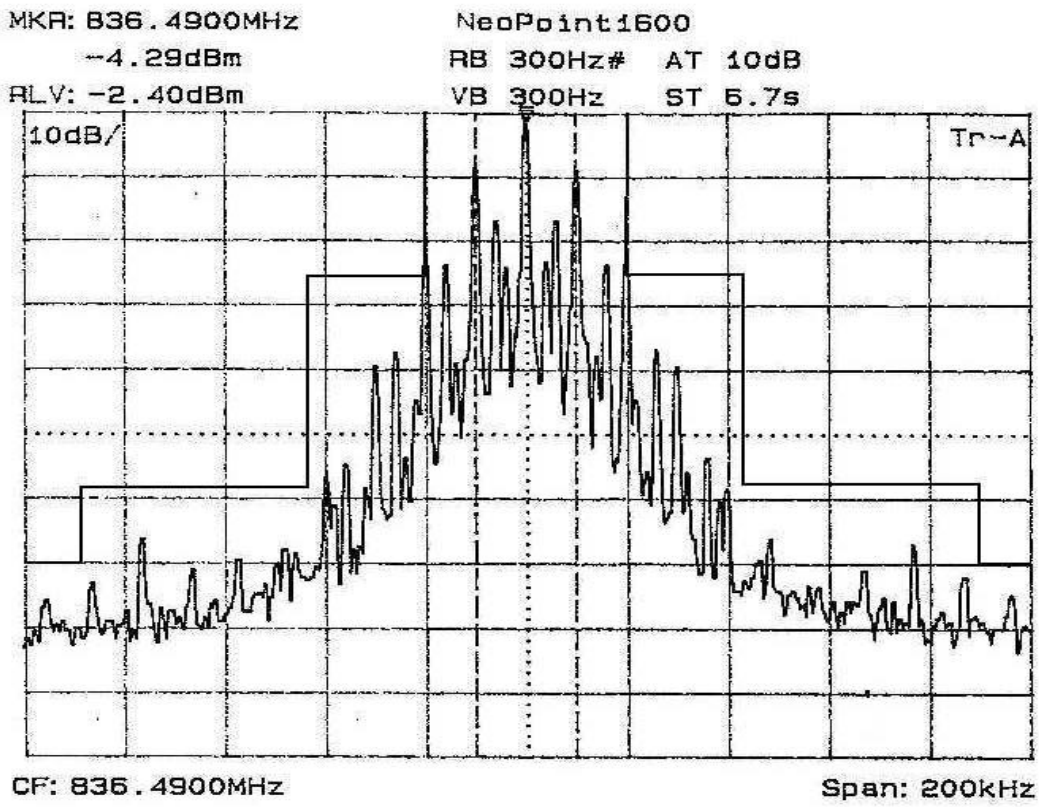
PLOT #6.a

Occupied Bandwidth
ST and SAT (6000 Hz)
Channel No.: 383
Transmit Frequency: 836.49 MHz
Power Level: 0



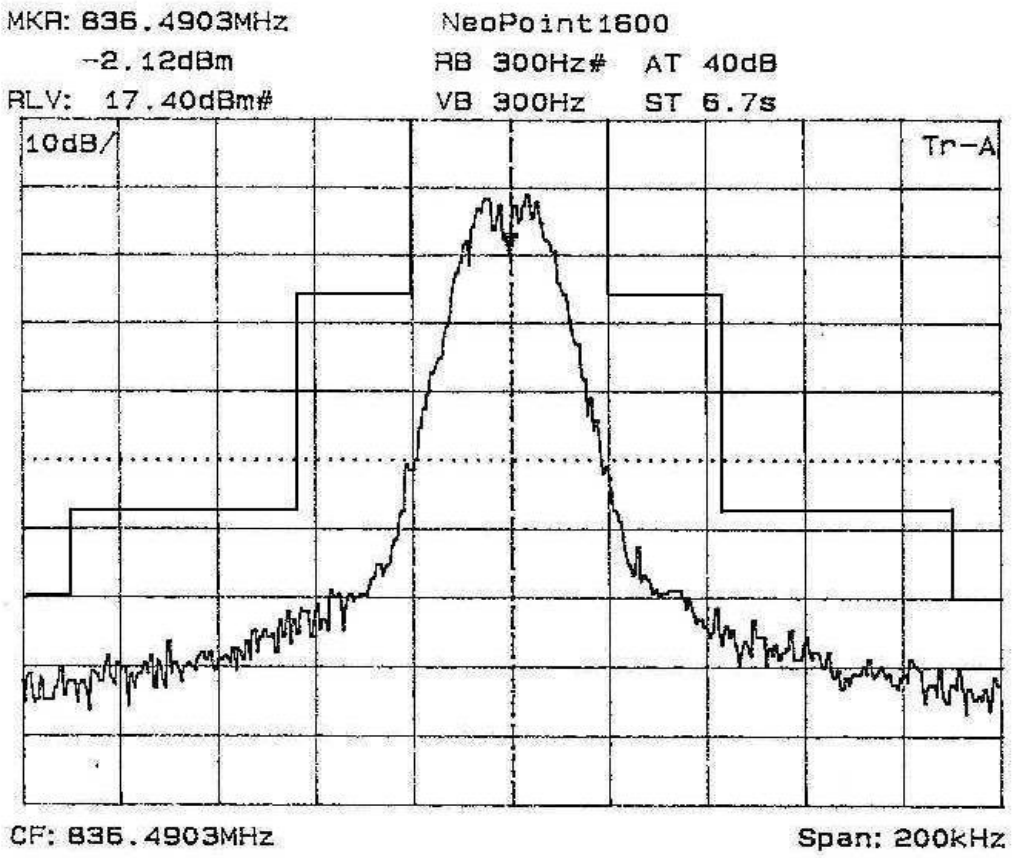
PLOT #6.b

Occupied Bandwidth
ST and SAT (6000 Hz)
Channel No.: 383
Transmit Frequency: 836.49 MHz
Power Level: 7



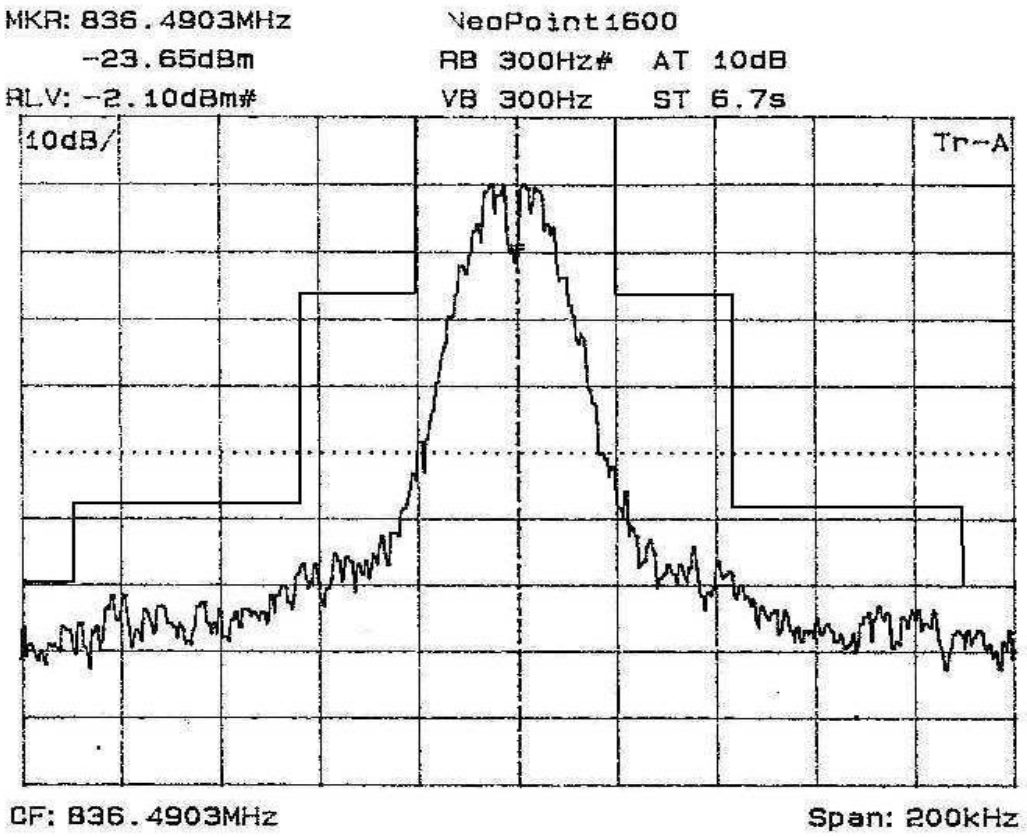
PLOT #7.a

Occupied Bandwidth
Voice and SAT (6000 Hz)
Channel No.: 383
Transmit Frequency: 836.49 MHz
2.5 kHz Tone @ 126.4 dBµV
Power Level: 0



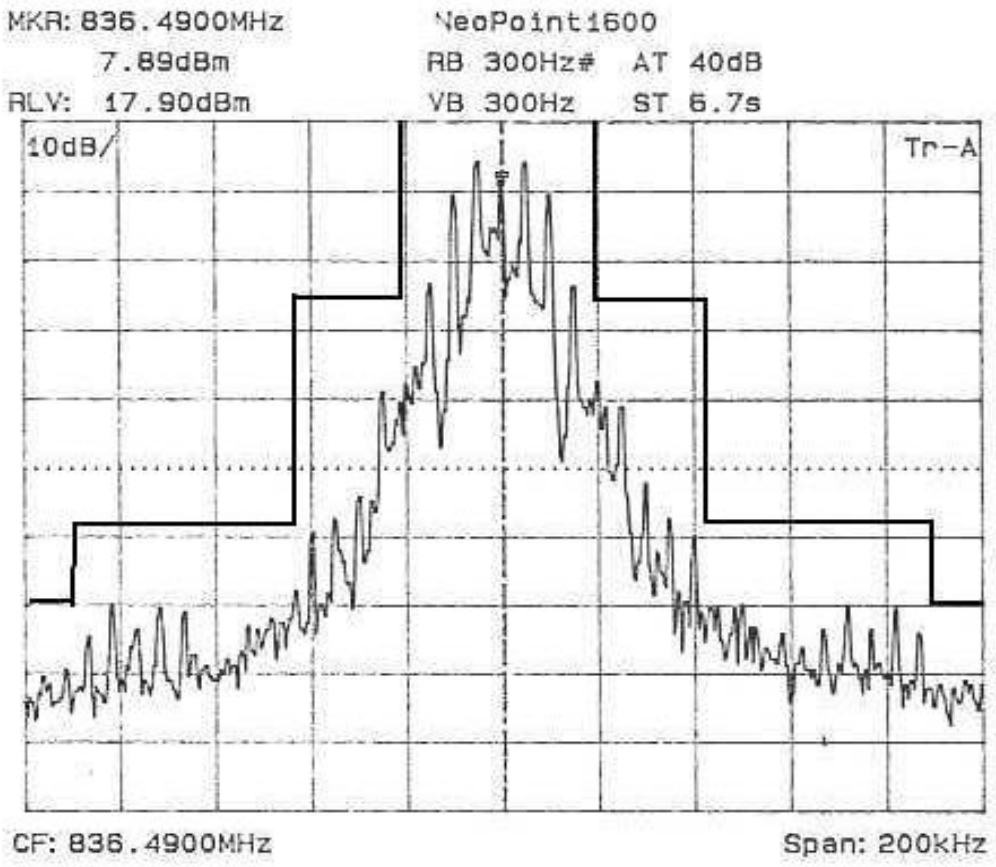
PLOT #7.b

Occupied Bandwidth
Voice and SAT (6000 Hz)
Channel No.: 383
Transmit Frequency: 836.49 MHz
2.5 kHz Tone @ 126.4 dBµV
Power Level: 7



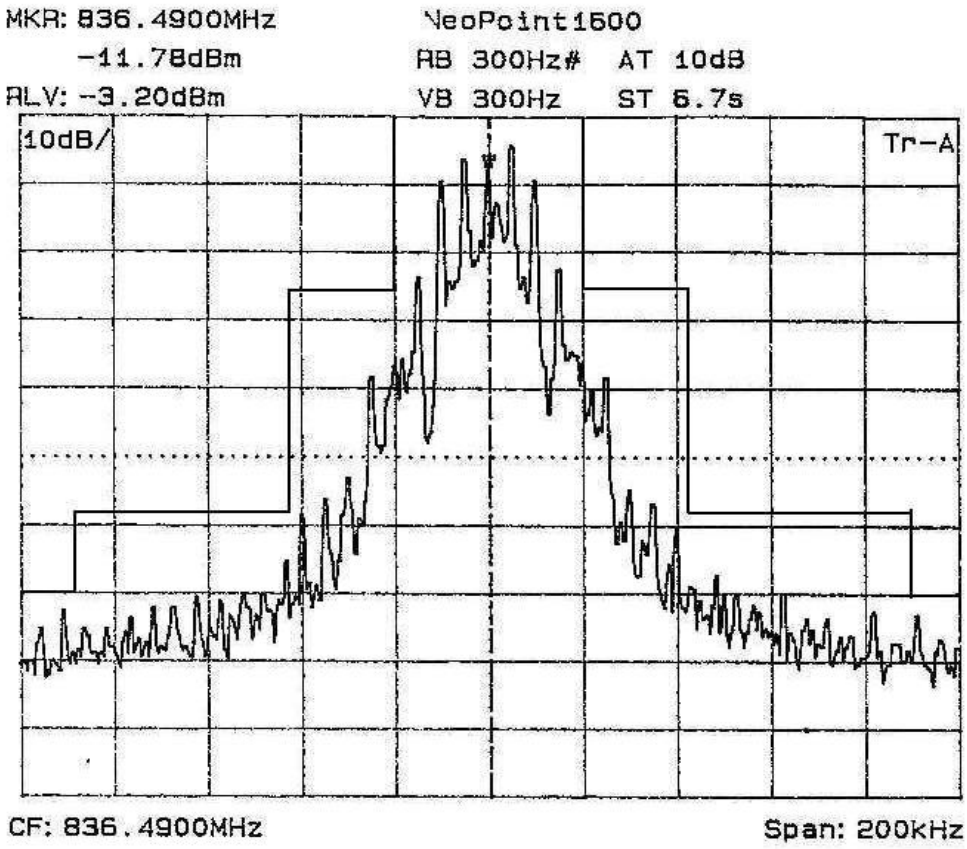
PLOT #8.a

Occupied Bandwidth
Wideband Data
Channel No.: 383
Transmit Frequency: 836.49 MHz
Power Level: 0



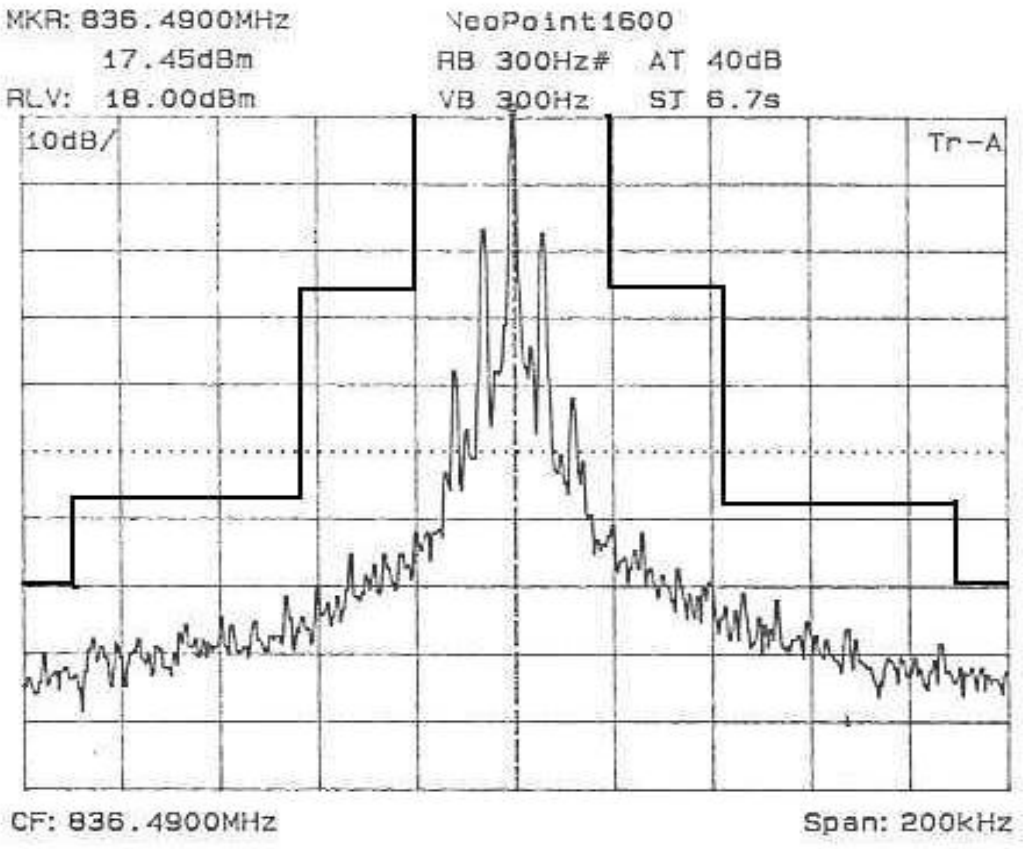
PLOT #8.b

Occupied Bandwidth
Wideband Data
Channel No.: 383
Transmit Frequency: 836.49 MHz
Power Level: 7



PLOT #9.a

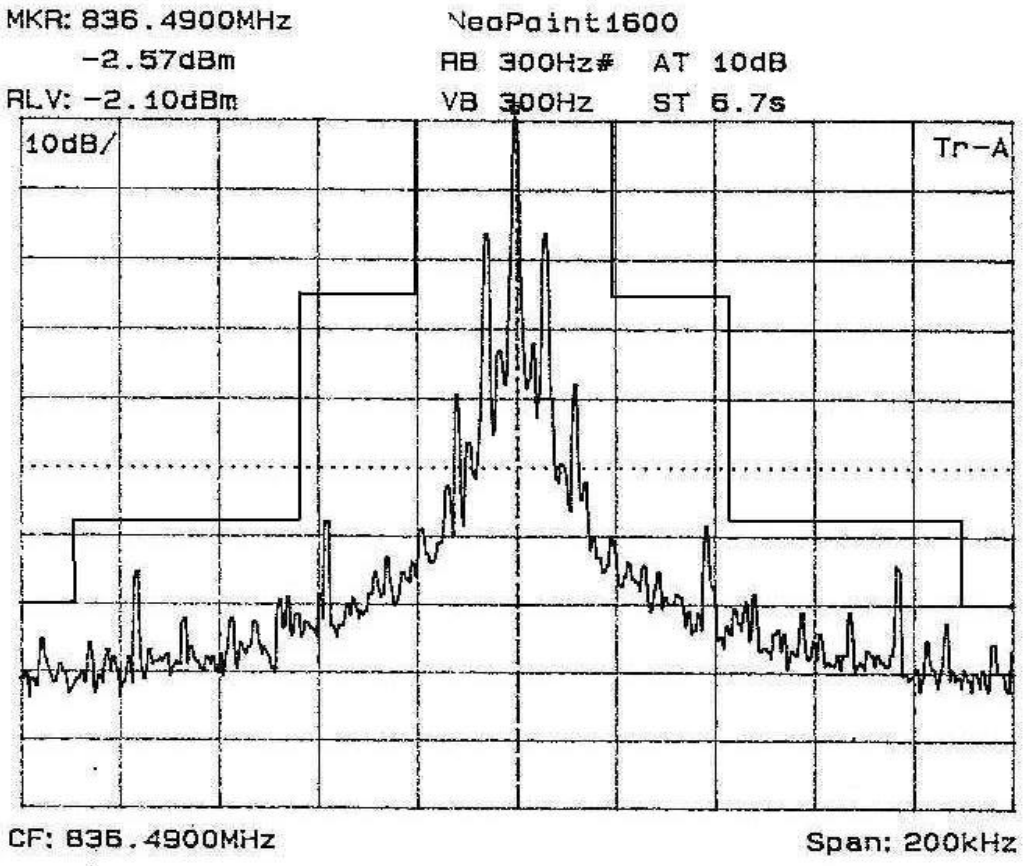
Occupied Bandwidth
DTMF and SAT (6000 Hz)
Channel No.: 383
Transmit Frequency: 836.49 MHz
Power Level: 0



FCC ID: N5WNP16PSBDMHJKH2

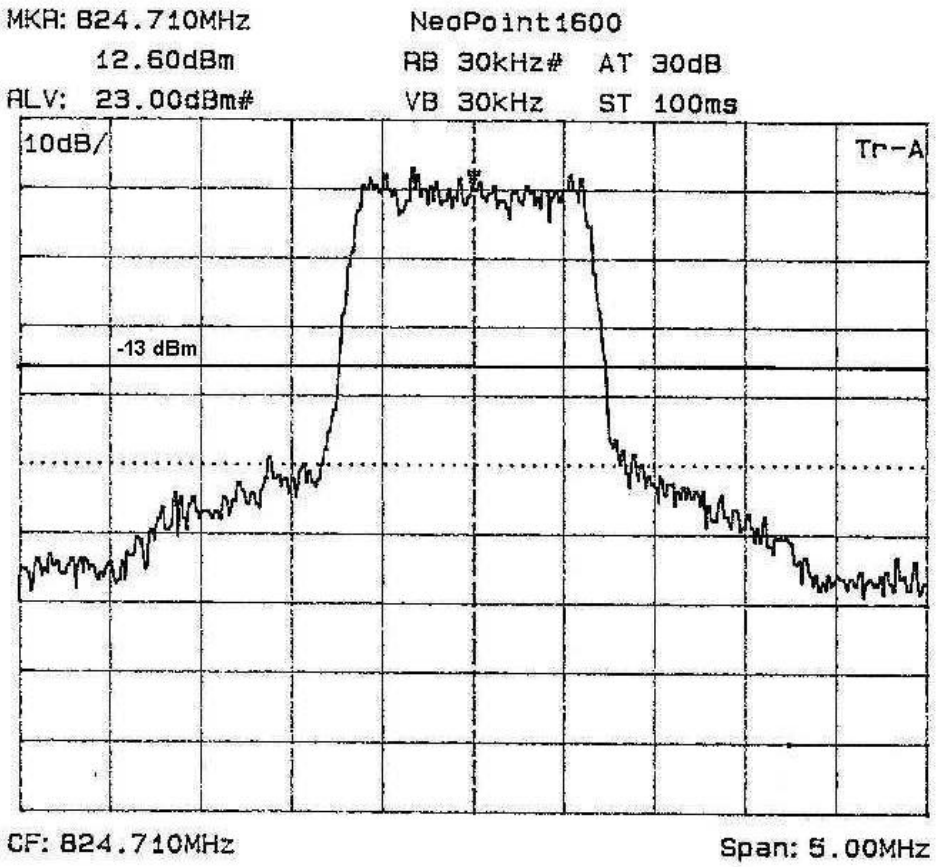
PLOT #9.b

Occupied Bandwidth
DTMF and SAT (6000 Hz)
Channel No.: 383
Transmit Frequency: 836.49 MHz
Power Level: 7



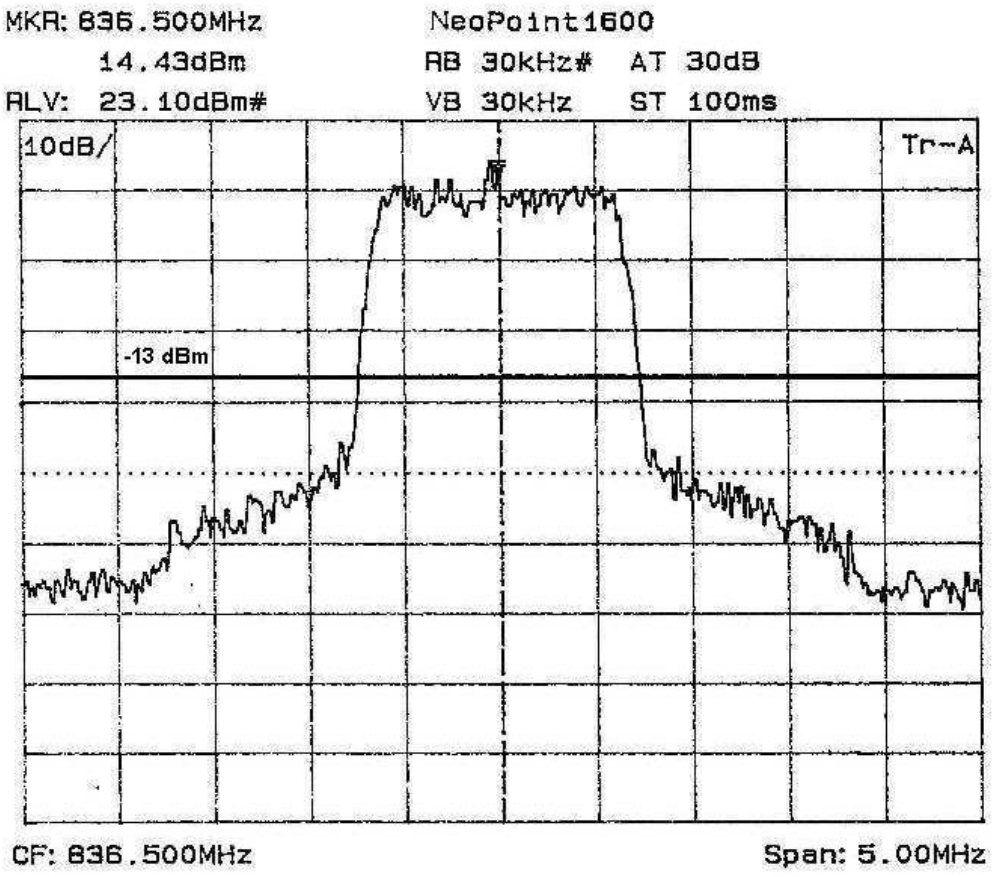
PLOT #10

Occupied Bandwidth
CDMA
99% Power BW
Channel No.: 1013
Transmit Frequency: 824.70 MHz
Power Level: 0



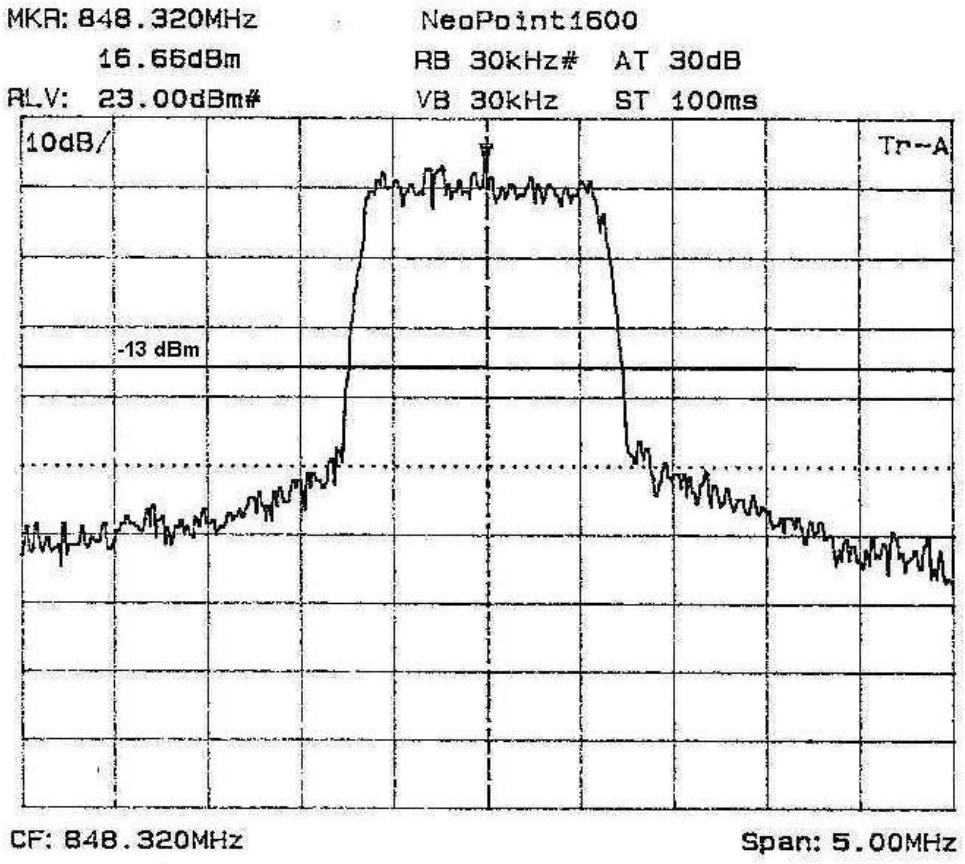
PLOT #11

Occupied Bandwidth
CDMA
99% Power BW
Channel No.: 1383
Transmit Frequency: 836.49 MHz
Power Level: 0



PLOT #12

Occupied Bandwidth
CDMA
99% Power BW
Channel No.: 777
Transmit Frequency: 848.31 MHz
Power Level: 0



Test: **Spurious Emissions at Antenna Terminal**

Ref.: **FCC Part 2 paragraph 2.991 and Part 22 paragraph 22.917(e)(f)**

Criteria: Part 22.917(e): 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 of the mobile by: at least 43 + 10 log (P) dB. This is calculated to be -13 dBm.

Part 22.917(f): Mobile emissions in base frequency range (869 – 894 MHz). 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.

Set-up: See Figure No. 5 & 6.

Environmental Conditions: Temperature: 23 °C ± 2.
Air pressure: 101 ± 3 kPa.

Equipment: See Appendix A.

Procedure: The mobile was configured to operate at maximum power and applicable modulation applied to the transmitter. The mobile was coupled to the spectrum analyzer through a 25 dB attenuator and directly to the HP8920 A/D. The spectrum was searched from 9 kHz to the 10^{th} harmonic of the operating frequency. In the band 869 – 894 MHz the spurious emissions was measured using a resolution bandwidth of 30 kHz.

Compliance with these requirements is based on the use of the spectrum analyzer employing the resolution band widths of: 1) when operating in the SAT mode, 300 Hz for any emission not more than 45kHz removed from the carrier frequency and 30 kHz for any emission more than 45kHz removed from the carrier frequency; 2) when operating in the wideband data made or ST mode, 300Hz for any emission not more than 60 kHz removed from the carrier frequency and 30 kHz for any emission more than 60 kHz removed from the carrier frequency.

Part 2.991: Measurements required — Spurious emissions at antenna terminals — The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in paragraph 2.989 as appropriate. The magnitude of spurious emissions that are attenuated more than 20 dB below the permissible value need not be specified.

Part 2.997: Frequency Spectrum to be investigated — In all of the spurious emissions measurements of spurious emissions at antenna terminals (2.991) and Field Strength of Spurious Emissions, the Spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least to the 10^{th} harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower if the equipment operates below 10 GHz (the mobile under test operates below 10 GHz).

The amplitude of spurious emissions, which are attenuated more than 20 dB below the permissible value, need not be reported.

Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.

Measurements given in the spurious emissions test result tables contain: spectrum analyzer reading, correction factor, and final reading. The final spurious emission levels are derived from the analyzer measurement and the correction factor (20 dB attenuator and cable loss) as shown in the following example:

Sample Calculation:

A. Spectrum analyzer reading (Direct measurement)

At 968.3 MHz a spurious level of –36.65 dBm is measured.

B. Correction factor (10.7 dB attenuator and cable loss also included in Reading)

Total Correction Factor: 0 dB

C. Spurious Emission Level (Spurious Emissions at Antenna Terminal)

C=A+B
C= - 36.65 dBm

D. The criteria level.

Pt is manufacturer's rated transmitter power, 0.389 Watts (25.9 dBm)

D = Pt - (43 + (10 log P)
D = 25.9 dBm - (43 + (10 log 0.389 W))
D = 25.9 dBm – 38.9 dB
D = -13 dBm

Criteria (reference) level is -13 dBm

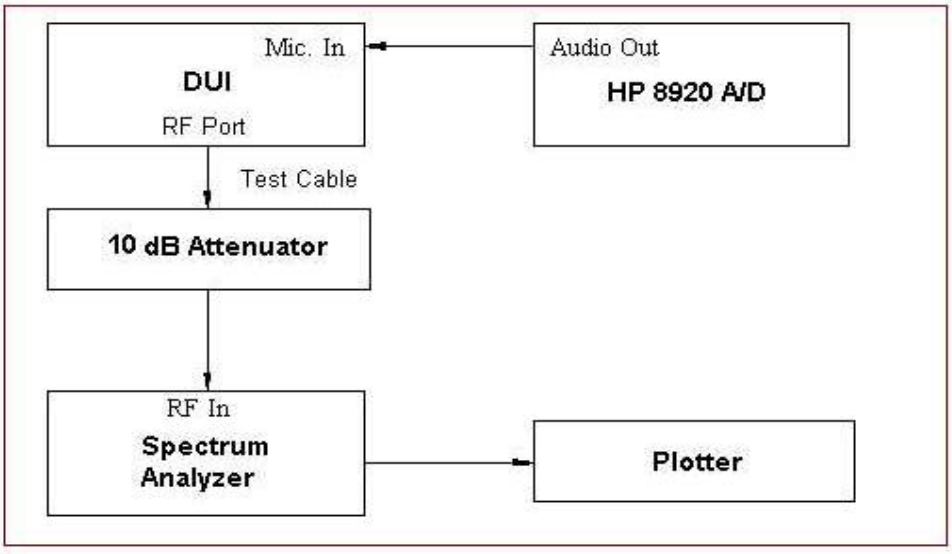
E = Margin (spurious emission below the reference level)

E = D - C
E = (-13 dBm) – (-36.65 dBm)
E = 23.65 dB

The above calculation is shown for AMPS. A similar calculation can be shown for CDMA.

Results: **PASSED.** See Table 7,8,9 and 10.

Set Up Figure 5
Spurious Emissions at Antenna Terminal



Set Up Figure 6
Spurious Emissions at Antenna Terminal
Spurious Emissions measurement between 869 – 894 MHz.

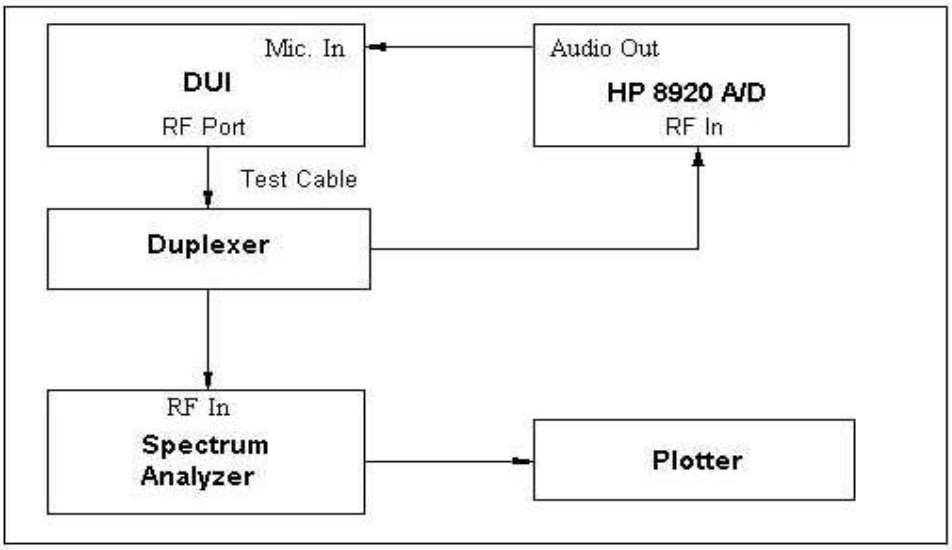


Table 7
AMPS
Spurious Emissions at Antenna Terminal
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0
R.B.: 30 KHz

Frequency (MHz)	Measured Level (dBm) "A"	Correction Factor (dB) "B"	Spurious Emission Level (dBm) "C"	Criteria Level (dBm) "D"	Margin (dB) "E
966.87	-36.65	N/A *	-36.65	-13	23.65

*. Attenuator and Cable Loss (10.7 dB) has already been included in Spectrum Analyzer Setting.
No other signal were detected.

Table 8
Mobile Emissions in Base Frequency Band
AMPS
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0
Resolution Bandwidth: 30 kHz

Frequency (MHz)	Measured Level (dBm) "A"	Correction Factor (Db) "B"	Spurious Emission Level (dBm) "C"	Criteria Level (dBm) "D"	Margin (Db) "E
No signal were detected above spectrum analyzer noise level.(-90 dBm)					

No signal were detected in the base station frequency range (869 – 894 MHz).
See Plot No.: 13.

Table 9
Spurious Emissions at Antenna Terminal
CDMA
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0
R.B.: 1 MHz

Frequency (MHz)	Measured Level (dBm) "A"	Correction Factor (dB) "B"	Spurious Emission Level (dBm) "C"	Criteria Level (dBm) "D"	Margin (dB) "E
966.87	-31.5	N/A *	-31.5	-13	18.5

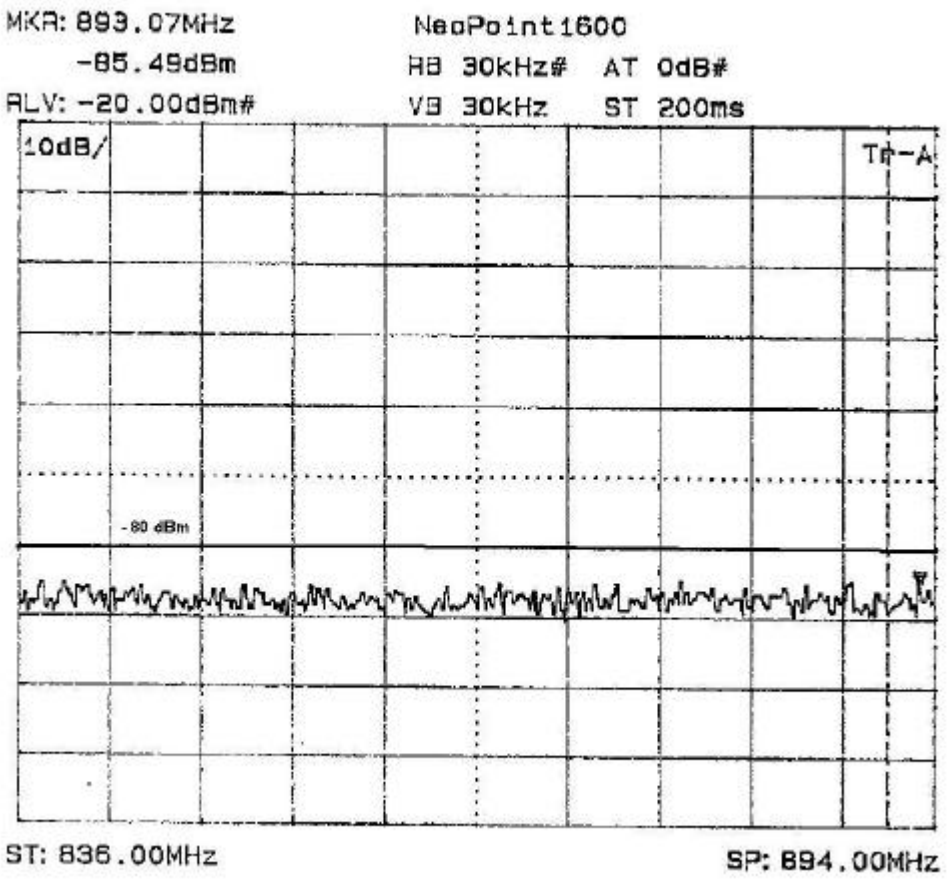
*. Attenuator and Cable Loss (10.7 dB) has already been included in Spectrum Analyzer setting.
No other signal were detected.

Table 10
Mobile Emissions in Base Frequency Band
CDMA
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0
Resolution Bandwidth: 30 kHz

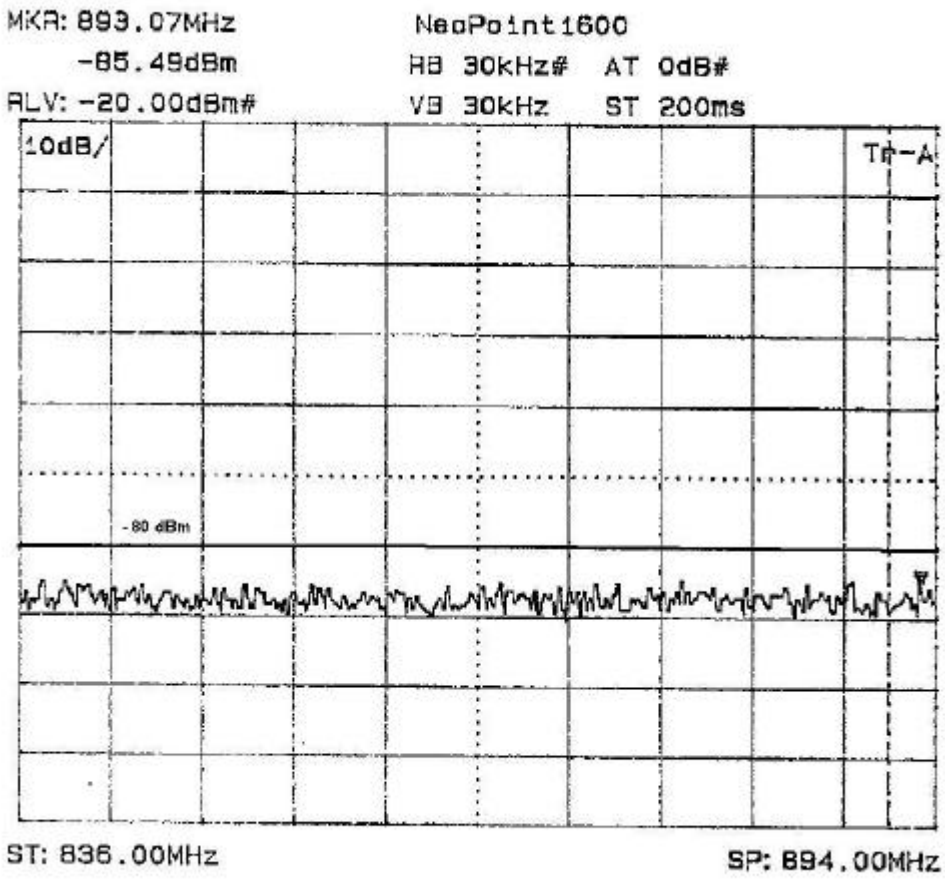
Frequency (MHz)	Measured Level (dBm) "A"	Correction Factor (Db) "B"	Spurious Emission Level (dBm) "C"	Criteria Level (dBm) "D"	Margin (Db) "E
No signal were detected above spectrum analyzer noise level.(-90 dBm)					

No signal were detected in the base station frequency range (869 – 894 MHz).
See Plot No.: 14.

Plot #13
Emissions in Base Frequency Band
AMPS
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0



Plot #14
Mobile Emissions in Base Frequency Band
CDMS
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0



Test: **Field Strength of Spurious Radiation**

Ref.: **FCC Part 22 subpart H, Paragraph 22.917(e) and Part 2.993**

Criteria: On any frequency twice or more than twice the fundamental frequency of the mobile, the mean power of spurious emissions shall be attenuated below the power of the unmodulated carrier by at least 43 + 10 log (P) dB.

This was calculated to be 84.6 dBμV/m at 3 meters.

Set-up: See Figure No. 7.

Environmental Conditions: Temperature: 27 °C ± 2.
Air pressure: 101 ± 3 kPa

Procedure: The final measurements were taken at APREL Laboratory's open area test site (OATS) measurement facility. This open area test site is calibrated to ANSI C63.4 document and a description of the measurement facility is on file with the Federal Communications Commission and is in compliance with the requirements of Section 2.948 of the Commissions rules and regulations. (FCC File No.: 31040/SIT).

The mobile was configured to operate at maximum power with appropriate modulation. The mobile was keyed on channel 383 (836.49 MHz).

Prior to final measurements in the OATS, preliminary radiated spurious emissions were scanned in a shielded enclosure at a distance of 1 m using a broadband Discone antenna and horn antenna in order to determine the characteristic frequencies of the field strength of spurious emissions. Based on this information, measurements were performed in the OATS at these characteristic frequencies using calibrated antennas.

The transmitter output was fed to a Spectrum Analyzer and the output power was noted for reference. A 50 Ω dummy load was attached to the antenna connector. All field strength measurements were made with spectrum analyzer and the appropriate calibrated antenna for the frequency range of 9 kHz up to 10^{th} harmonics of the transmit frequency (See equipment list for the calibrated antenna used).

The equipment under test was placed on a turntable positioned 3 meters away from the calibrated receiving antenna, which in turn was connected to the spectrum analyzer. For each identified frequency, the received signal was maximised by the positioning of the turntable and the height of the antenna. The process was repeated for both horizontal and vertical polarization.

Information submitted includes the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antenna.

Measurements given in the spurious emissions test result tables contain: analyzer reading, correction factor, and final reading. The final field strength level are derived from the analyzer measurement and the correction factor (antenna factor and cable loss) as shown in the following example:

Sample Calculation (not actual measurement):

A. Spectrum analyzer reading (Direct measurement)

At 966.87 MHz a spurious level of 35.0 dBµV @ 3 meters is measured.

B. Correction factor (antenna factor and cable loss)

Cable loss: 2.4 dB
Antenna factor: 23 dB
Total Correction Factor: 2.4 + 23 = 25.4 dB/m

C. Final Reading (Field Strength of spurious emission)

C=A+B
C= 35.0 dBµV + 25.4 dB
C= 60.4 dBµV/m @ 3 meters

D. The criteria level.

The field intensity which would be produced by the transmitter carrier operating into a half-wave dipole antenna (gain of 1.64), at a distance of 3 m was calculated using the following formula:

$$\text{Field Strength of carrier (dB}\mu\text{V/m)} = 10\log_{10}\left(\frac{PtG}{4\pi r^2}\right) + 146 \text{ dB}$$

Pt is transmitter power, 0.389 Watts
G is gain, 1.64
r is distance, 3 meters

Field Strength of carrier (dBµV/m) = $10\log_{10}\left(\frac{(0.389\,\mathrm{W})(1.64)}{4\pi(3\,\mathrm{m})^2}\right)+146\,\mathrm{dB}$

Field Strength of carrier = 123.5 dBµV/m

D = Field Strength of carrier - (43 + (10 log P))
D = 123.5 dBµV/m - (43 + (10 log 0.389))
D = 84.6 dBµV/m @ 3 meters

Criteria (reference) level at 3 meters from 0.389 Watts into half-wave dipole antenna is 84.6 dBµV/m

E = Margin (spurious emission below the reference level)

E = D - C
E = 84.6 dBµV/m –60.4 dBµV/m
E = 24.2 dB (This is not actual reading, but an sample to show the calculation)

The above calculation is shown for AMPS. Similarly it can be shown for CDMA, the criteria is 84.6 dBµV/m at 3 meters.

Results: **PASSED.** See Tables 11,12,13 and 14.

Table 11
Spurious Emission Levels
AMPS
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0
Antenna Polarization: Horizontal
R.B.: 30 kHz

Frequency (MHz)	Measured Level (dBµV) "A"	Correction Factor (dB/m) "B"	Field Strength (dBµV/m) "C"	Criteria Level (dBµV/m) "D"	Margin (dB) "E"
966.87	25.0	25.4	50.4	84.6	34.2

No other spurious were detected.

Table 12
Spurious Emission Levels
AMPS
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0
Antenna Polarization: Vertical
R.B.: 30 kHz

Frequency (MHz)	Measured Level (dBµV) "A"	Correction Factor (dB/m) "B"	Field Strength (dBµV/m) "C"	Criteria Level (dBµV/m) "D"	Margin (dB) "E"
966.87	35.0	25.4	60.4	84.6	24.2
1672.98	12.0	30.3	42.3	84.6	42.3

No other spurious were detected.

Table 13
Spurious Emission Levels
CDMA
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0
Antenna Polarization: Horizontal
R.B.: 1 MHz

Frequency (MHz)	Measured Level (dBµV) "A"	Correction Factor (dB/m) "B"	Field Strength (dBµV/m) "C"	Criteria Level (dBµV/m) "D"	Margin (dB) "E"
966.87	28.0	25.4	53.4	84.6	31.2

No other spurious were detected.

Table 14
Spurious Emission Levels
CDMA
Channel No.: 383
Transmitter Frequency: 836.49 MHz
Power Level: 0
Antenna Polarization: Vertical
R.B.: 1 MHz

Frequency (MHz)	Measured Level (dBµV) "A"	Correction Factor (dB/m) "B"	Field Strength (dBµV/m) "C"	Criteria Level (dBµV/m) "D"	Margin (dB) "E"
966.87	36.5	25.4	61.9	84.6	22.7

No other spurious were detected.

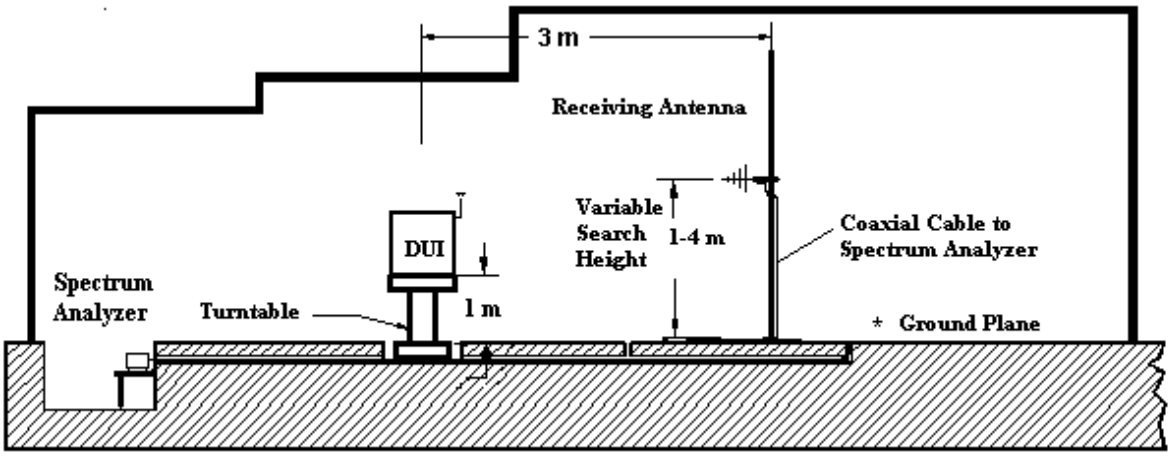


Fig. 7.a: Test set up for the radiated emission measurement in OATS (not to scale)

Fig. 7.b APREL's OATS(Open Area Test Site)

Test: **Frequency Stability**

Ref.: **FCC Part 2 paragraph 2.995**

Criteria: ± 2.5 ppm

Set-up: See Figure No. 8.

Environmental Conditions: Temperature: Paragraph 2.995(a)(1) and (b)
Air pressure: 101 ± 3 kPa

Equipment: See Appendix A.

Procedure: Temperature

The frequency of the transmitter, operating at room ambient temperature (+25°C), was adjusted to the nominal assigned frequency, as per the manufacturer's instructions.

The transceiver was placed in an environmental chamber, with the primary power turned off. The temperature of the chamber was varied over the range of -30°C to +50°C stabilising the temperature every 10°C. At each 10°C step the transmitter was keyed on, at full power. The transmitter frequency was measured every minute for a period of 10 minutes or until sufficient measurements were obtained to indicate clearly that the frequency had stabilised. The test set-up for frequency stability measurements is shown in Figure 8.

Vary the promary supply volatage from 85 to 115 percent of the norminal value for other than hand carried battery equipment.

For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacture.

Since it is a hand carried and battery powered equipment, only voltage variation test was performed with the battery operating end point (6 VDC).

Results: **PASSED.** See Table 15.

FCC ID: N5WNP16PSBDMHJKH2

Set Up Figure 8
Transmitter Test Under Environmental Conditions

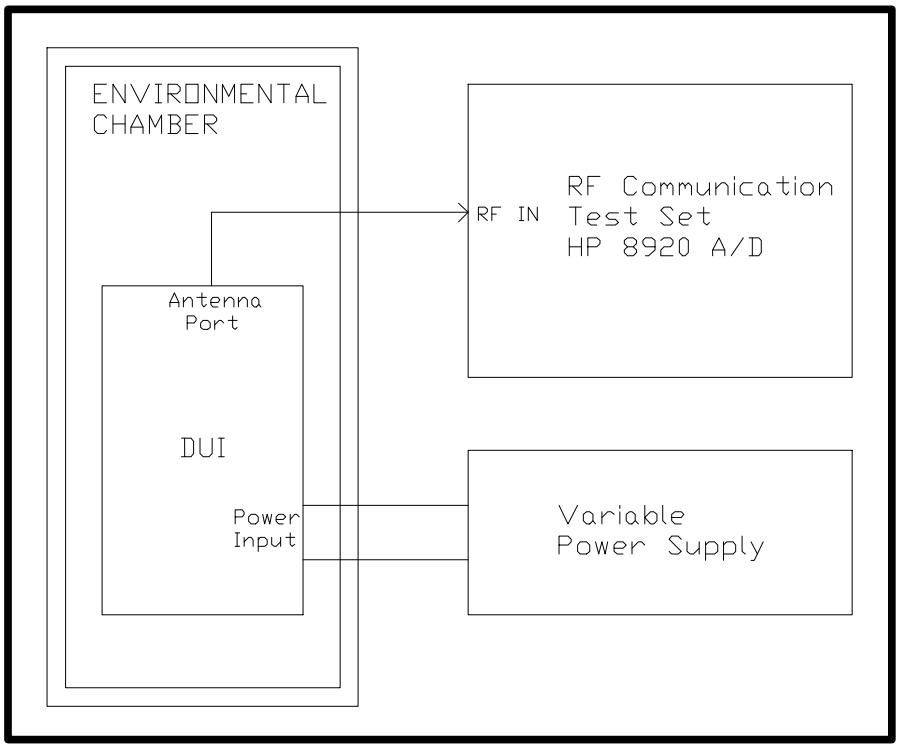


Table 15
Frequency Stability over Temperature and Voltage
Channel No.: 300
Transmitter Frequency: 834.00 MHz
Power Level: 0
Reference Voltage: 7.6 V

VDC	temp	normalized freq offset(KHz)	deviation(ppm)	measured offset (KHz)
7.6V (reference)	20	0	0	0.712
7.6V	-30	1.596	1.913669065	-0.884
7.6V	-20	1.306	1.565947242	-0.594
7.6V	-10	0.848	1.016786571	-0.136
7.6V	0	0.499	0.598321343	0.213
7.6V	10	0.254	0.304556355	0.458
7.6V	20	0.023	0.027577938	0.689
7.6V	30	-0.102	-0.122302158	0.814
7.6V	40	0.031	0.037170264	0.681
7.6V	50	0.253	0.303357314	0.459
7.6V	60	0.483	0.579136691	0.229
7.6V	20	0.018	0.021582734	0.694
7.6V	20	-0.122	-0.146282974	0.834
6V (end of battery)	20	0.088	0.105515588	0.624

APPENDIX A

List of Test Equipment

FCC ID: N5WNP16PSBDMHJKH2

List of Equipment

Description	Manufacturer	Model #	Asset #	Cal . Due Data
Spectrum Analyzer	Tektronix	492	100949	Jan 11, 2000
Spectrum Analyzer	Anritsu	MS2661C	N/A	Aug 20, 2000
RadioCommunication Service Monitor	Rohde&Schwarz	CMS52	100759	May 5, 2000
RF Communication Test Set	Hewlett-Packard	HP 8920 A/D	301289	Sep 13, 1999
20 dB Attenuator	Narda	4779-20	301370	May 18, 2000
Duplexer	APREL Inc.	1020P	301371	Sep 13, 1999
Signal Generator	Hewlett-Packard	HP 8662A	100456	Jun 28, 2000
Signal Generator	Hewlett-Packard	HP 8340B	100955	Sep 4, 1999
RF Power Amplifier	Amplifier Research	25W100M	100735	Oct 2, 1999
10 dB Attenuator	Narda	4779-10	301370	May 4, 2000
800MHz Dipole	APREL Inc.	D-8355	N/A	Jun 16, 2000
Bi-conical Antenna	Eaton	94455-1	100156	July 21, 2000
Log-Periodic Antenna	APREL Inc.	ALP1	100761	July 21, 2000
Double Ridged Guided Horn Antenna	APREL Inc.	A1	100400	July 21, 2000
Turntable with Controller	EMCO	1060-1.241	100506	CNR
Computer Controlled Antenna Position Mast	EMCO	1051-12	100507	CNR
OATS	APREL Inc.	3m & 10m	N/A	N/A
Shielded Room	Universal Shielding	6/15/87	101329	May 1, 2000
Environmental Chamber with Micro Tenn Programmable Computer	Tenney	TR14-3	100636	Sep 19, 1999
Digital Multimeter	Fluke	8010A	---	Sep 11,1999

APPENDIX B

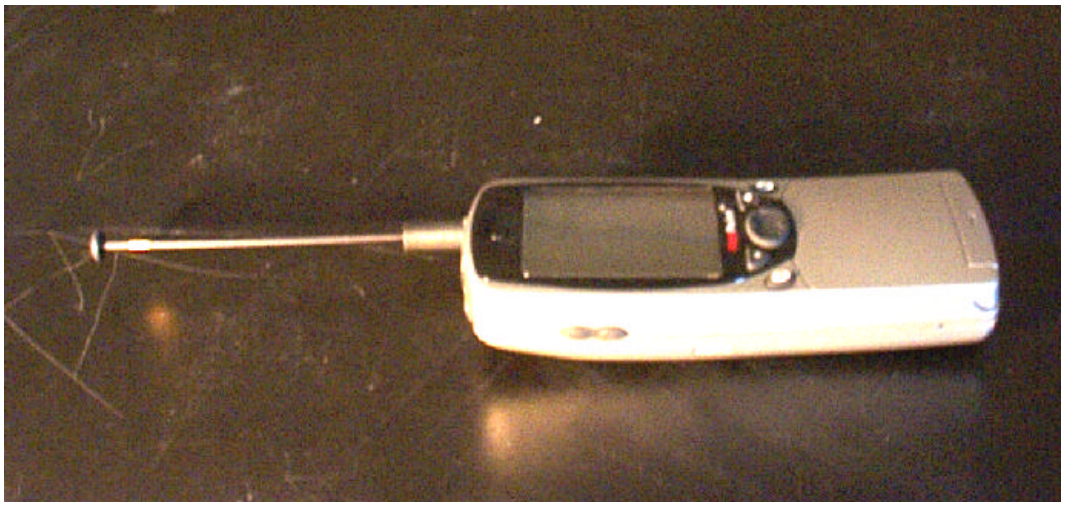
Photographs

FCC ID: N5WNP16PSBDMHJKH2

NeoPoint 1600

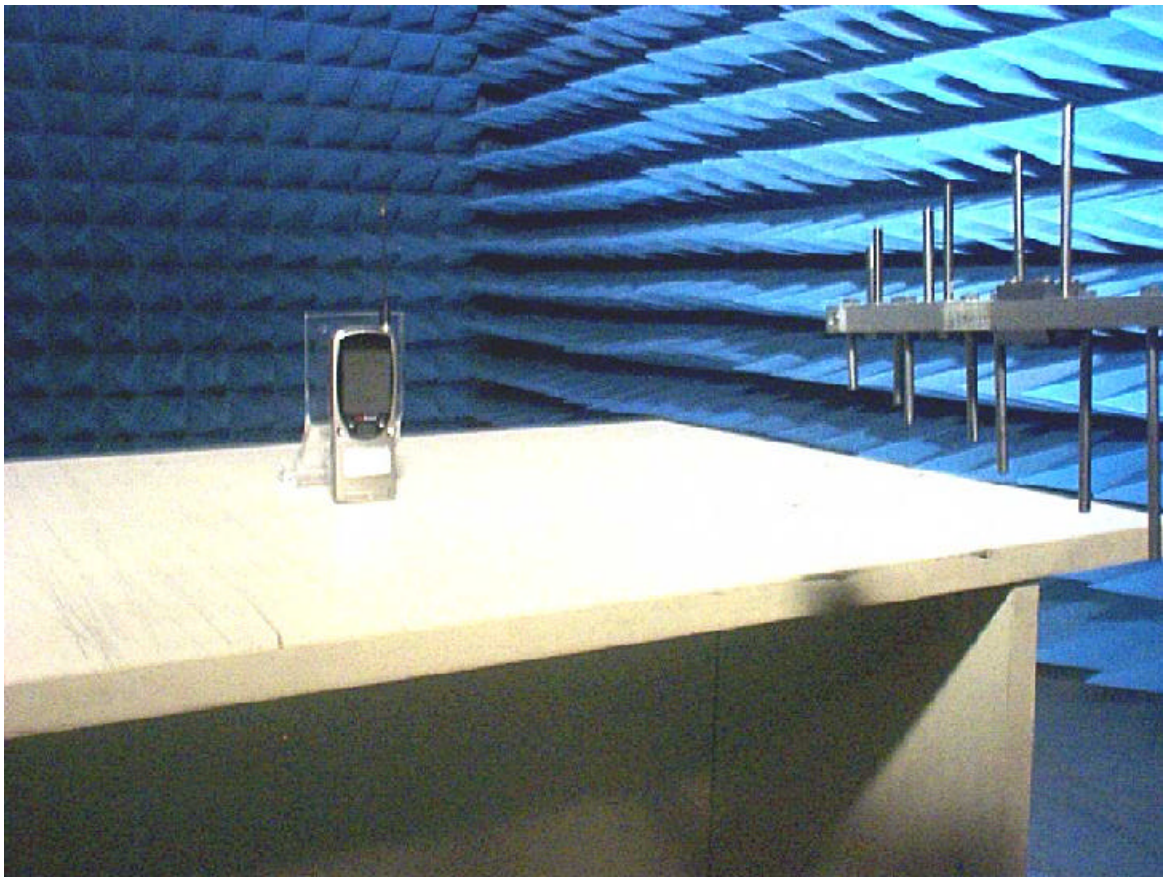
NeoPoint 1600

NeoPoint 1600



NeoPoint 1600

NeoPoint 1600



Signature of Spurious Radiation in Shielded Room

Reference Dipole Antenna Used for ERP Measurement

APREL's 10 metre Open Area Test Site is fully protected against climatic changes. The site is used for studies on electromagnetic radiation and for antenna calibration, and was developed as the most advanced structure of this type in North America. All laboratory instruments, a turntable and cables are located below a perforated metal ground plane, while the building itself is constructed with specially formed fibreglass modules.

Shown is one of two complete SAR (Specific Absorbtion Rate) labs at APREL. These are used for dosimetry measurements, as well as for near-field antenna design studies. APREL was the first fully independent (and ISO Guide 25 accredited) organization to offer SAR expertise .

Spectrum Sciences™ Institute is an almost 30,000 sq. ft facility nestled in 18 acres of treed land known as Spectrum Sciences™ Park, and located in Ottawa- Canada's high-tech hot-spot.

The current building consists of:

- **the Technology Gallery and Conference facility**
- **APREL Laboratories and NCL Calibration Labs**
- **Spectrum Sciences™ Institute offices**
- **"Incubation" offices**

APREL Laboratories
51 Spectrum Way Nepean ON K2R 1E6
Tel: (613) 820-2730 Fax: (613) 820-4161
email: info@aprel.com