



PCTEST Engineering Laboratory, Inc.

6660-B Dobbin Road · Columbia, MD 21045 · U.S.A.
TEL (410) 290-6652 · FAX (410) 290-6654
<http://www.pctestlab.com>



CERTIFICATE OF COMPLIANCE FCC Part 24 & 22 Certification

NOKIA, INC.
12278 Scripps Summit Drive
San Diego, CA 92131

Dates of Tests: November 29-30, 2004
Test Report S/N: 22/24.241129645.QMN
Test Site: PCTEST Lab, Columbia MD

MODEL

2115i

APPLICANT

NOKIA, INC.

Classification: Licensed Portable Transmitter Held to Ear (PCE)
FCC Rule Part(s): §24(E), §22(H); §2
EUT Type: Tri-Mode Dual-Band Analog/PCS Phone (AMPS/CDMA)
Model: 2115i
Tx Frequency Range: 824.04MHz – 848.97MHz (AMPS) / 824.70 – 848.31MHz (CDMA)
1851.25MHz – 1908.75MHz (PCS CDMA)
Rx Frequency Range: 869.04MHz – 893.97MHz (AMPS) / 869.70 – 893.31MHz (CDMA)
1931.25MHz – 1988.75MHz (PCS CDMA)
Max. RF Output Power: 0.277 W ERP AMPS (24.429 dBm) / 0.300 W ERP CDMA (24.773 dBm)
0.323 W EIRP PCS CDMA (25.081 dBm)
Emission Designator(s): 40K0F8W / 40K0F1D (AMPS), 1M25F9W (CDMA)
Test Device Serial No.: Identical Prototype [S/N: EXA001741]

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

Alfred Cirwithian
Vice President Engineering



PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 1 of 32	

TABLE OF CONTENTS

ATTACHMENT A:	COVER LETTER(S)
ATTACHMENT B:	ATTESTATION STATEMENT(S)
ATTACHMENT C:	TEST REPORT
1.1 SCOPE	3
2.1 INTRODUCTION	4
3.1 INSERTS	5
4.1 DESCRIPTION OF TESTS	6-10
5.1 EFFECTIVE RADIATED POWER OUTPUT	11-12
6.1 EQUIVALENT ISOTROPIC RADIATED POWER	13
7.1 RADIATED MEASUREMENTS	14-22
8.1 FREQUENCY STABILITY	23-28
9.1 PLOTS OF EMISSIONS	29
10.1 LIST OF TEST EQUIPMENT	30
11.1 SAMPLE CALCULATIONS	31
12.1 CONCLUSION	32
ATTACHMENT D:	TEST PLOTS
ATTACHMENT E:	FCC ID LABEL / LOCATION
ATTACHMENT F:	TEST SETUP PHOTOGRAPHS
ATTACHMENT G:	EXTERNAL PHOTOGRAPHS
ATTACHMENT H:	INTERNAL PHOTOGRAPHS
ATTACHMENT I:	BLOCK DIAGRAM(S)
ATTACHMENT J:	SCHEMATIC DIAGRAM(S)
ATTACHMENT K:	OPERATIONAL / CIRCUIT DESCRIPTION
ATTACHMENT L:	PARTS LIST/TUNE UP PROCEDURE
ATTACHMENT M:	USER'S MANUAL
ATTACHMENT N:	SAR MEASUREMENT REPORT
ATTACHMENT O:	SAR TEST DATA
ATTACHMENT P:	SAR TEST SETUP PHOTOGRAPHS
ATTACHMENT Q:	DIPOLE VALIDATION
ATTACHMENT R:	PROBE CALIBRATION

PCTEST® PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN		Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 2 of 32

MEASUREMENT REPORT



1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

§2.1033 General Information

Applicant Name:	NOKIA, INC.
Address:	12278 Scripps Summit Drive
	San Diego, CA 92131

- Model: 2115i
- Quantity: Quantity production is planned
- Emission Designators: 40K0F8W / 40K0F1D (AMPS), 1M25F9W (CDMA)
- Tx Freq. Range: 824.04 – 848.97 MHz (AMPS)
824.70 – 848.31 MHz (CDMA)
1851.25 – 1908.75 MHz (PCS CDMA)
- Rx Freq. Range: 869.04 – 893.97 MHz (AMPS)
869.70 – 893.31 MHz (CDMA)
1931.25 – 1988.75 MHz (PCS CDMA)
- Max. Power Rating: 0.277 W ERP AMPS (24.429 dBm) / 0.300 W ERP CDMA (24.773 dBm)
0.323 W EIRP PCS CDMA (25.081 dBm)
- FCC Classification(s): Licensed Portable Tx Held to Ear (PCE)
- Equipment (EUT) Type: Tri-Mode Dual-Band Analog/PCS Phone
- Modulation(s): AMPS / CDMA
- Frequency Tolerance: $\pm 0.00025\%$ (2.5 ppm)
- FCC Rule Part(s): § 24(E), §22(H)
- Dates of Tests: November 29-30, 2004
- Place of Tests: PCTEST Lab, Columbia, MD U.S.A.
- Test Report S/N: 22/24.241129645.QMN
- Deviation from measurement procedure - None

PCTEST® PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN		Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 3 of 32

2.1 INTRODUCTION

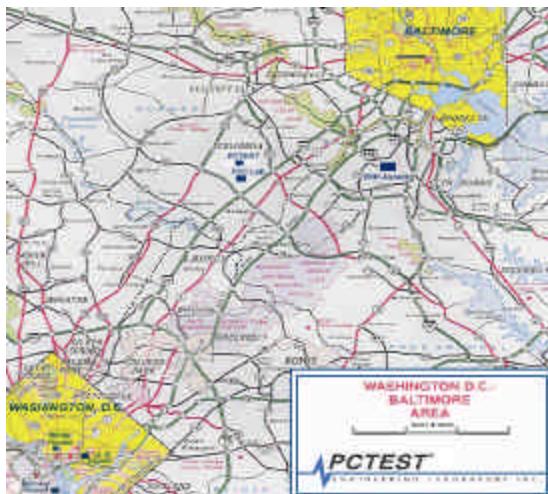


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

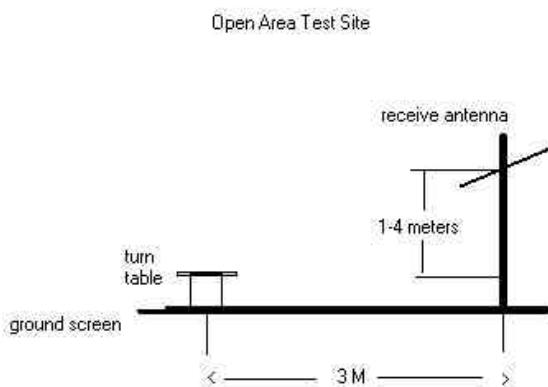


Figure 2. Diagram of 3-meter outdoor test range

These measurement tests were conducted at **PCTEST Engineering Laboratory, Inc.** facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are $39^{\circ} 11'15''$ N latitude and $76^{\circ} 49'38''$ W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.

Measurement Procedure

The radiated and spurious measurements were made outdoors at a 3-meter test range (see Figure 2). The equipment under test is placed on a wooden turntable 3-meters from the receive antenna.

The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

PCTEST® PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 4 of 32	
©2004 PCTEST ENGINEERING LABORATORY, INC.					

3.1 INSERTS

Function of Active Devices (Confidential)

The Function of active devices are shown in Attachment K.

Block & Schematic Diagrams (Confidential)

The block diagrams are shown in Attachment I, and the schematic diagrams are shown in Attachment J.

Operating Instructions

The instruction manual is shown in Attachment M.

Parts List & Tune-Up Procedure (Confidential)

The parts list & tune-up procedure is shown in Attachment L.

Description of Freq. Stabilization Circuit (Confidential)

The description of frequency stabilization circuit is shown in Attachment K.

Description for Suppression of Spurious Radiation, for Limiting Modulation, and Harmonic Supresion Circuits (Confidential)

The description of suppression stabilization circuits is shown in Attachment K.

PCTEST® PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 5 of 32	

4.1 DESCRIPTION OF TESTS

4.2 Transmitter Audio Frequency Response

The frequency response of the audio modulating circuit over the frequency range 100 – 5000 Hz is measured. The audio signal generator is connected to the audio input circuit/microphone of the EUT. The audio signal input is adjusted to obtain 50% modulation at 1kHz and this point is taken as the 0dB reference. With the input held constant and below the limit at all frequencies, the audio signal generator is varied from 100 to 50 kHz.

4.3 Audio Low Pass Filter Frequency Response

The response in dB relative to 1kHz is measured using the HP8901 a Modulation Analyzer. For the frequency response of the audio low-pass filter, the audio input is connected at the input to the modulation limiter and the modulated stage. The audio output is connected at the output of the modulated stage. The corresponding plots are shown herein.

4.4 Modulation Limiting

The audio signal generator is connected to the audio input circuit/microphone of the EUT. The modulation response is measured for each of the three modulating frequencies (300Hz, 1000 Hz, and 3000Hz), and the input voltage is varied from 30% modulation ($\pm 3.6\text{kHz}$ deviation) to at least 20dB higher than the saturation point. Measurements of modulation and the plots are attached herein. Measurements were performed for ST, SAT, and wide-band data modulations. The corresponding results are shown herein.

Note: ST, SAT, & Wide-Band data were internally generated by the EUT.

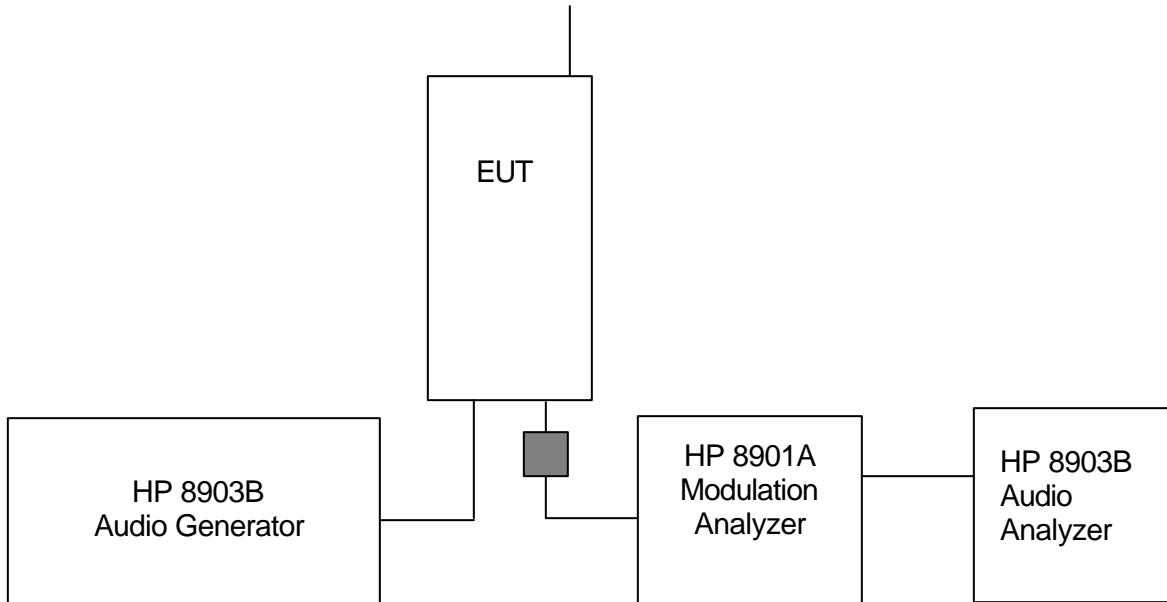


Fig. 3. Transmitter Audio Frequency & Tone Modulation Test Setup.

PCTEST® PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 6 of 32	
©2004 PCTEST ENGINEERING LABORATORY, INC.					

4.1 DESCRIPTION OF TESTS (CONTINUED)

4.5 Occupied Bandwidth Emission Limits

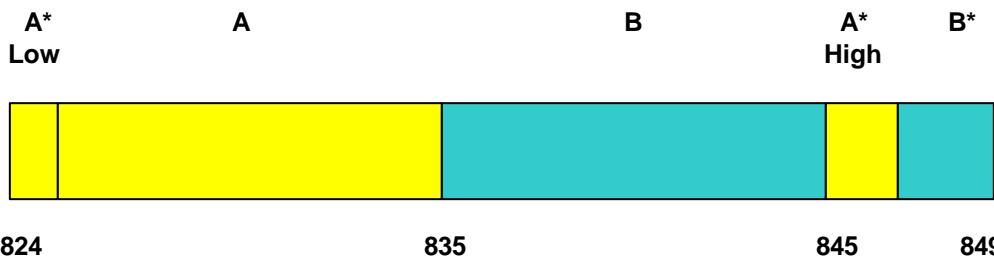
- (a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB.
- (b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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.
- (c) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
- (d) The measurement of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

4.6 Cellular - Base Frequency Blocks



BLOCK 1: 869 – 880 MHz (A* Low + A) **BLOCK 3: 890 – 891.5 MHz (A* High)**
BLOCK 2: 880 – 890 MHz (B) **BLOCK 4: 891.5 – 894 MHz (B*)**

4.7 Cellular - Mobile Frequency Blocks

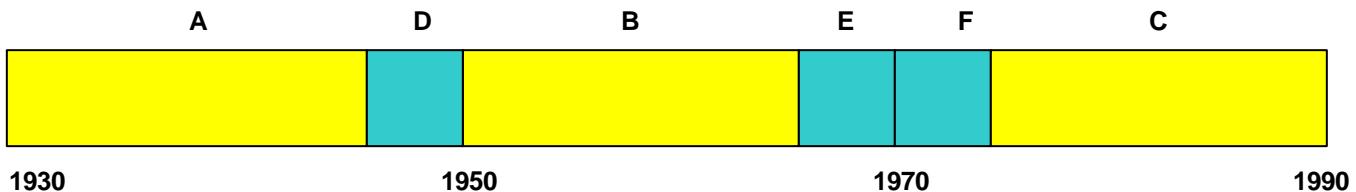


BLOCK 1: 824 – 835 MHz (A* Low + A) **BLOCK 3: 845 – 846.5 MHz (A* High)**
BLOCK 2: 835 – 845 MHz (B) **BLOCK 4: 846.5 – 849 MHz (B*)**

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 7 of 32	
©2004 PCTEST ENGINEERING LABORATORY, INC.					

4.1 DESCRIPTION OF TESTS (CONTINUED)

4.8 PCS - Base Frequency Blocks



BLOCK 1: 1930 – 1945 MHz (A)

BLOCK 4: 1965 – 1970 MHz (E)

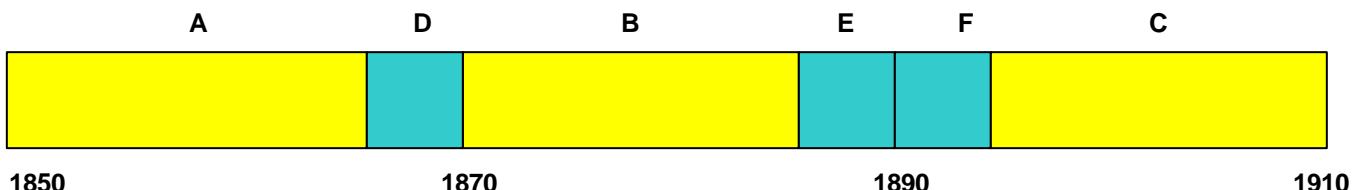
BLOCK 2: 1945 – 1950 MHz (D)

BLOCK 5: 1970 – 1975 MHz (F)

BLOCK 3: 1950 – 1965 MHz (B)

BLOCK 6: 1975 – 1990 MHz (C)

4.9 PCS - Mobile Frequency Blocks



BLOCK 1: 1850 – 1865 MHz (A)

BLOCK 4: 1885 – 1890 MHz (E)

BLOCK 2: 1865 – 1870 MHz (D)

BLOCK 5: 1890 – 1895 MHz (F)

BLOCK 3: 1870 – 1885 MHz (B)

BLOCK 6: 1895 – 1910 MHz (C)

FCC MEASUREMENT REPORT		Reviewed By: Quality Manager
PCTESTÔ PT. 22/24 REPORT	 NOKIA	

4.1 DESCRIPTION OF TESTS (CONTINUED)

4.10 Occupied Bandwidth

The audio signal generator is adjusted to 1kHz. The output level is set to ± 6 kHz deviation. With the level constant, the frequency is set to 2500Hz. Then the audio signal level is increased by 16dB. The occupied bandwidth data is obtained for the SAT (Supervisory Audio Tone), ST (Signaling Tone), WBD (Wideband data), and DTMF (Dual Tone Multi Frequencies). The results are shown on the attached graphs.

Specified Limits:

- On any frequency removed from the assigned carrier frequency by more than 20 kHz, up to and including 45kHz, the sideband is at least 26dB below the carrier.
- On any frequency removed from the assigned carrier frequency by more than 45 kHz, up to and including 90kHz, the sideband is at least 45dB below the carrier.
- On any frequency removed from the assigned carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency, the sideband is at least 60dB below the carrier or $40 + \log_{10}$ (mean power output in Watts) dB, whichever is the smaller attenuation.

4.11 Spurious and Harmonic Emissions at Antenna Terminal

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to at least the 10th harmonic. The transmitter is modulated with a 2500Hz tone at a level of 16dB greater than that required to provided 50% modulation.

At the input terminals of the spectrum analyzer, an isolator (RF circulator with one port terminated with 50 ohms) and an 870 MHz to 890 MHz bandpass filter is connected between the test transceiver (for conducted tests) or the receive antenna (for radiated tests) and the analyzer. The rejection of the bandpass filter to signals in the 825 – 845 MHz range is adequate to limit the transmit energy from the test transceiver which appears to a level which will allow the analyzer to measure signals less than -90dBm. Calibration of the test receiver is performed in the 870 – 890 MHz range to insure accuracy to allow variation in the bandpass filter insertion loss to be calibrated.

4.12 Frequencies

At the input terminals of the spectrum analyzer, an isolator (RF pad) and an high-pass filter are connected between the test transceiver (for conducted tests) or the receive antenna (for radiated tests) and the analyzer. The high-pass filter (signals below 1.6 GHz) is to limit the fundamental frequency from interfering with the measurement of low-level spurious and harmonic emissions and to ensure that the preamplifier is not saturated.

4.13 Radiation Spurious and Harmonic Emissions

Radiation and harmonic emissions are measured outdoors at our 3-meter test range. The equipment under test is placed on a wooden turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 9 of 32	
©2004 PCTEST ENGINEERING LABORATORY, INC.					

5.0 Frequency Stability/Temperature Variation.

The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +60°C using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025 (±2.5 ppm) of the center frequency.

Time Period and Procedure:

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (22°C to 25°C to provide a reference).
2. The equipment is subjected to an overnight "soak" at -30°C without any power applied.
3. After the overnight "soak" at -30°C (usually 14-16 hours), the equipment is turned on in a "standby" condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three minute interval after applying power to the transmitter.
4. Frequency measurements are made at 10°C interval up to room temperature. At least a period of one and one half-hour is provided to allow stabilization of the equipment at each temperature level.
5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
6. Frequency measurements are at 10 intervals starting at -30°C up to +50°C allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after re-applying power to the transmitter.
7. The artificial load is mounted external to the temperature chamber.

NOTE: The EUT is tested down to the battery endpoint.

PCTEST® PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 10 of 32	
<small>©2004 PCTEST ENGINEERING LABORATORY, INC.</small>					

5.1 Test Data

5.2 Effective Radiated Power Output

A. POWER: Low (Analog Mode)

Freq. Tuned (MHz)	REF. LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)
824.04	-36.900	H	0.003	4.373
836.52	-37.000	H	0.003	4.429
848.97	-37.900	H	0.002	3.685

B. POWER: High (Analog Mode)

Freq. Tuned (MHz)	REF. LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)	BATTERY
824.04	-16.900	H	0.274	24.373	Standard
836.52	-17.000	H	0.277	24.429	Standard
848.97	-17.900	H	0.234	23.685	Standard

Note: Standard batteries are the only options for this phone

NOTES:

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN		Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 11 of 32

5.1 Test Data

5.3 Effective Radiated Power Output

A. POWER: High (CDMA Mode)

Freq. Tuned (MHz)	REF. LEVEL (dBm)	POL (H/V)	ERP (W)	ERP (dBm)	BATTERY
824.70	-16.500	H	0.300	24.773	Standard
836.52	-17.000	H	0.278	24.433	Standard
848.31	-18.100	H	0.223	23.483	Standard

Note: Standard batteries are the only options for this phone

NOTES:

Effective Radiated Power Output Measurements by Substitution Method
according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN		Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 12 of 32

6.1 Test Data

6.2 Equivalent Isotropic Radiated Power (E.I.R.P.)

Radiated measurements at 3 meters

Supply Voltage: 3.7 VDC

Modulation: PCS CDMA

FREQ. (MHz)	REF. LEVEL (dBm)	POL (H/V)	Azimuth (o angle)	EIRP (dBm)	EIRP (W)	Battery
1851.25	-18.000	H	60	25.081	0.323	Standard
1880.00	-18.250	H	60	25.001	0.317	Standard
1908.75	-18.500	H	60	24.921	0.311	Standard

Note: Standard batteries are the only options for this phone

NOTES:

Equivalent Isotropic Radiated Power Measurements by Substitution Method
according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

PCTEST® PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i		Page 13 of 32

7.1 Test Data

7.2 AMPS Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 824.04 MHz
 CHANNEL: 0991 (Low)
 MEASURED OUTPUT POWER: 24.429 dBm = 0.277 W
 MODULATION SIGNAL: FM (Internal)
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 37.43 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1648.08	-60.28	6.10	-54.18	H	78.6
2472.12	-61.98	6.70	-55.28	H	79.7
3296.16	-65.18	6.80	-58.38	H	82.8
4120.20	-56.18	6.50	-49.68	H	74.1

NOTES:

Radiated Spurious Emission Measurements by Substitution Method
according to ANSI/TIA/FIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i		Page 14 of 32

7.1 Test Data (Continued)

7.3 AMPS Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 836.52 MHz
 CHANNEL: 384
 MEASURED OUTPUT POWER: 24.429 dBm = 0.277 W
 MODULATION SIGNAL: FM (Internal)
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 37.43 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1673.04	-58.48	6.10	-52.38	H	76.8
2509.56	-64.58	6.70	-57.88	H	82.3
3346.08	-63.18	6.80	-56.38	H	80.8
4182.60	-58.08	6.50	-51.58	H	76.0

NOTES:

Radiated Spurious Emission Measurements by Substitution Method

according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i		Page 15 of 32

7.1 Test Data (Continued)

7.4 AMPS Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 848.97 MHz
 CHANNEL: 0799 (High)
 MEASURED OUTPUT POWER: 24.429 dBm = 0.277 W
 MODULATION SIGNAL: FM (Internal)
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 37.43 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBD)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1697.94	-59.08	6.10	-52.98	H	77.4
2546.91	-60.38	6.70	-53.68	H	78.1
3395.88	-61.78	6.80	-54.98	H	79.4
4244.85	-56.88	6.50	-50.38	H	74.8

NOTES:

Radiated Spurious Emission Measurements by Substitution Method

according to ANSI/TIA/FIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i		Page 16 of 32

7.1 Test Data (Continued)

7.5 CELLULAR CDMA Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 824.70 MHz
 CHANNEL: 1013 (Low)
 MEASURED OUTPUT POWER: 24.773 dBm = 0.300 W
 MODULATION SIGNAL: CDMA (Internal)
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 37.77 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1649.40	-67.48	6.10	-61.38	H	86.2
2474.10	-64.28	6.70	-57.58	H	82.4
3298.80	-65.98	6.80	-59.18	H	84.0
4123.50	-60.98	6.50	-54.48	H	79.3

NOTES:

Radiated Spurious Emission Measurements by Substitution Method

according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i		Page 17 of 32

7.1 Test Data (Continued)

7.6 CELLULAR CDMA Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 836.52 MHz
 CHANNEL: 384
 MEASURED OUTPUT POWER: 24.773 dBm = 0.300 W
 MODULATION SIGNAL: CDMA (Internal)
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 37.77 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1673.04	-67.68	6.10	-61.58	H	86.4
2509.56	-68.28	6.70	-61.58	H	86.4
3346.08	-65.78	6.80	-58.98	H	83.8
4182.60	-59.78	6.50	-53.28	H	78.1

NOTES:

Radiated Spurious Emission Measurements by Substitution Method

according to ANSI/TIA/FIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i		Page 18 of 32

7.1 Test Data (Continued)

7.7 CELLULAR CDMA Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 848.31 MHz
 CHANNEL: 0777 (High)
 MEASURED OUTPUT POWER: 24.773 dBm = 0.300 W
 MODULATION SIGNAL: CDMA (Internal)
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 37.77 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
1696.62	-66.98	6.10	-60.88	H	85.7
2544.93	-68.78	6.70	-62.08	H	86.9
3393.24	-64.58	6.80	-57.78	H	82.6
4241.55	-60.88	6.50	-54.38	H	79.2

NOTES:

Radiated Spurious Emission Measurements by Substitution Method

according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i		Page 19 of 32

7.1 Test Data (Continued)

7.8 PCS CDMA Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 1851.25 MHz
 CHANNEL: 0025 (Low)
 MEASURED OUTPUT POWER: 25.081 dBm = 0.323 W
 MODULATION SIGNAL: CDMA (Internal)
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 38.09 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
3702.50	-43.63	8.70	-34.93	H	60.0
5553.75	-60.43	9.70	-50.73	H	75.8
7405.00	-47.53	9.90	-37.63	H	62.7

NOTES:

Radiated Spurious Emission Measurements by Substitution Method

according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i		Page 20 of 32

7.1 Test Data (Continued)

7.9 PCS CDMA Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 1880.00 MHz
 CHANNEL: 0600 (Mid)
 MEASURED OUTPUT POWER: 25.081 dBm = 0.323 W
 MODULATION SIGNAL: CDMA (Internal)
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 38.09 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
3760.00	-46.53	8.70	-37.83	H	62.9
5640.00	-59.73	9.70	-50.03	H	75.1
7520.00	-50.03	9.90	-40.13	H	65.2

NOTES:

Radiated Spurious Emission Measurements by Substitution Method
according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN		Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 21 of 32

7.1 Test Data (Continued)

7.10 PCS CDMA Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 1908.75 MHz
 CHANNEL: 1175 (High)
 MEASURED OUTPUT POWER: 25.081 dBm = 0.323 W
 MODULATION SIGNAL: CDMA (Internal)
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 38.09 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
3817.50	-43.23	8.70	-34.53	H	59.6
5726.25	-55.03	9.70	-45.33	H	70.4
7635.00	-48.33	9.90	-38.43	H	63.5

NOTES:

Radiated Spurious Emission Measurements by Substitution Method

according to ANSI/TIA/FIA-603-A-2001, Aug. 15, 2001:

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For CDMA signals, a peak detector is used, with RBW = VBW = 3 MHz. For AMPS, GSM, and NADC TDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN		Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 22 of 32

8.1 Test Data

8.2 FREQUENCY STABILITY (AMPS)

OPERATING FREQUENCY: 836,520,003 Hz

CHANNEL: 384

REFERENCE VOLTAGE: 3.7 VDC

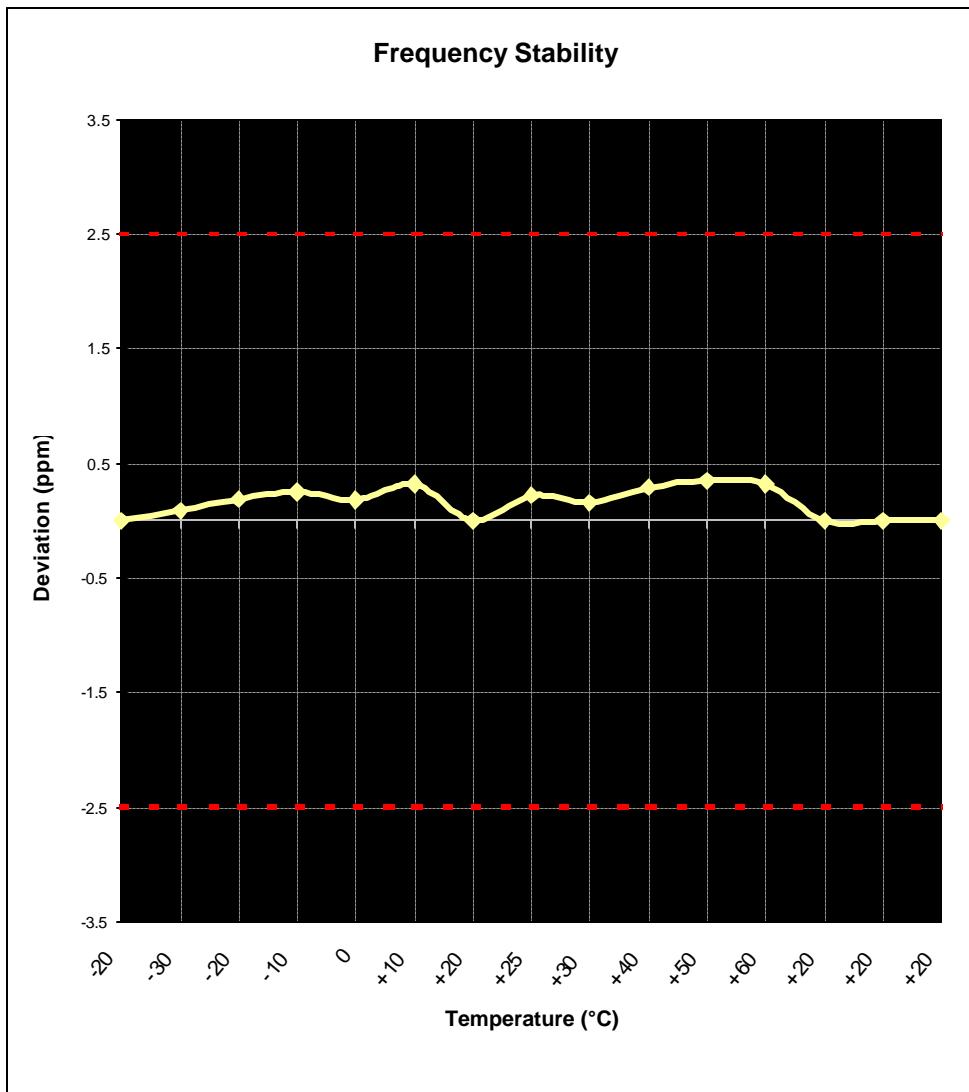
DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQ. (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.70	+ 20 (Ref)	836,520,003	0.00	0.000000
100 %		- 30	836,519,928	75.29	0.000009
100 %		- 20	836,519,844	158.94	0.000019
100 %		- 10	836,519,794	209.13	0.000025
100 %		0	836,519,852	150.57	0.000018
100 %		+ 10	836,519,735	267.69	0.000032
100 %		+ 20	836,520,003	0.00	0.000000
100 %		+ 25	836,519,819	184.03	0.000022
100 %		+ 30	836,519,869	133.84	0.000016
100 %		+ 40	836,519,760	242.59	0.000029
100 %		+ 50	836,519,710	292.78	0.000035
100 %		+ 60	836,519,735	267.69	0.000032
85 %	3.15	+ 20	836,520,003	0.00	0.000000
115 %	4.26	+ 20	836,520,003	0.00	0.000000
BATT. ENDPOINT	2.91	+ 20	836,520,003	0.00	0.000000

PCTEST PT. 22/24 REPORT	FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 23 of 32

8.1 Test Data (Continued)

8.3 FREQUENCY STABILITY (AMPS)



PCTEST PT. 22/24 REPORT	FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 24 of 32

8.1 Test Data

8.4 FREQUENCY STABILITY (CDMA)

OPERATING FREQUENCY: 836,520,005 Hz

CHANNEL: 384

REFERENCE VOLTAGE: 3.7 VDC

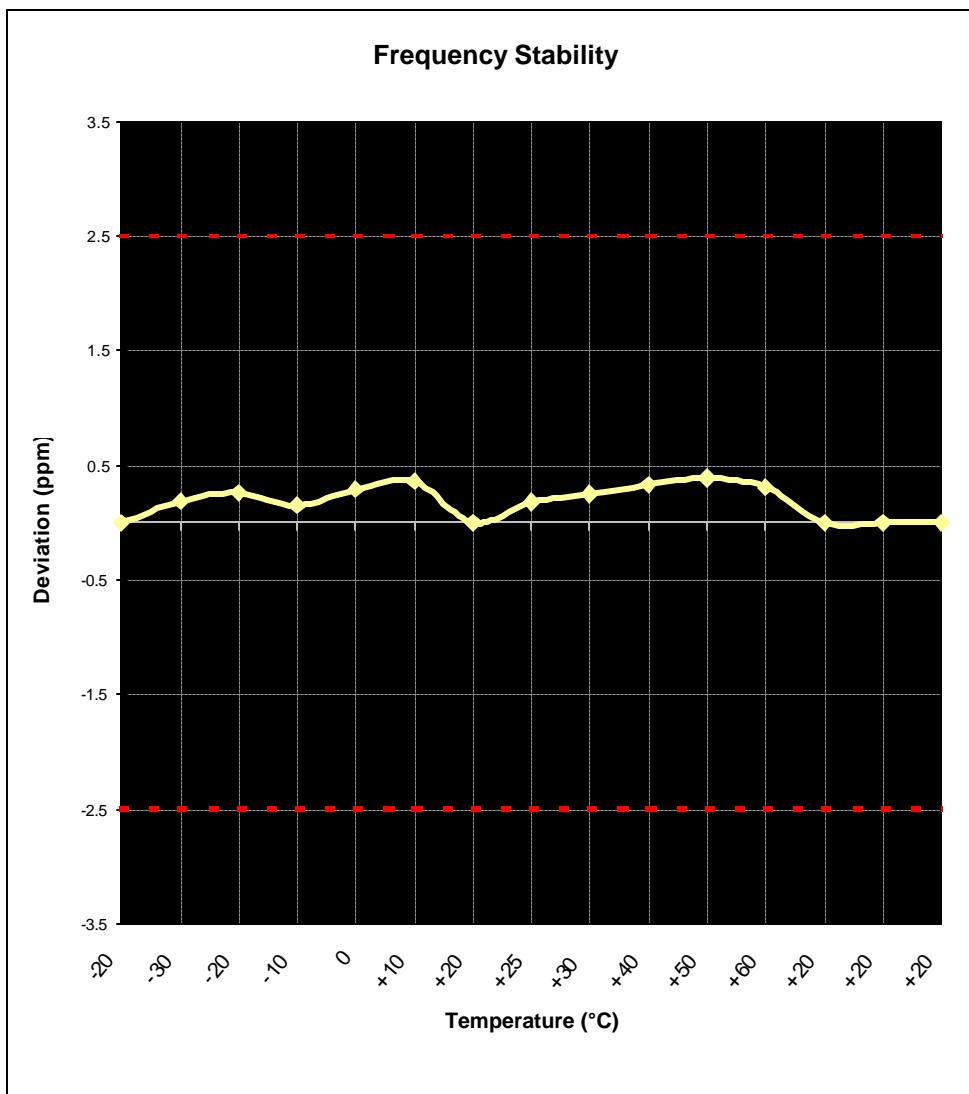
DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQ. (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.70	+ 20 (Ref)	836,520,005	0.00	0.000000
100 %		- 30	836,519,846	158.94	0.000019
100 %		- 20	836,519,788	217.50	0.000026
100 %		- 10	836,519,880	125.48	0.000015
100 %		0	836,519,762	242.59	0.000029
100 %		+ 10	836,519,704	301.15	0.000036
100 %		+ 20	836,520,005	0.00	0.000000
100 %		+ 25	836,519,854	150.57	0.000018
100 %		+ 30	836,519,796	209.13	0.000025
100 %		+ 40	836,519,729	276.05	0.000033
100 %		+ 50	836,519,679	326.24	0.000039
100 %		+ 60	836,519,746	259.32	0.000031
85 %	3.15	+ 20	836,520,005	0.00	0.000000
115 %	4.26	+ 20	836,520,005	0.00	0.000000
BATT. ENDPOINT	2.96	+ 20	836,520,005	0.00	0.000000

PCTEST PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i		Page 25 of 32

8.1 Test Data (Continued)

8.5 FREQUENCY STABILITY (CDMA)



PCTEST PT. 22/24 REPORT	FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 26 of 32

8.1 Test Data

8.6 FREQUENCY STABILITY (PCS CDMA)

OPERATING FREQUENCY: 1,880,000,003 Hz

CHANNEL: 600

REFERENCE VOLTAGE: 3.7 VDC

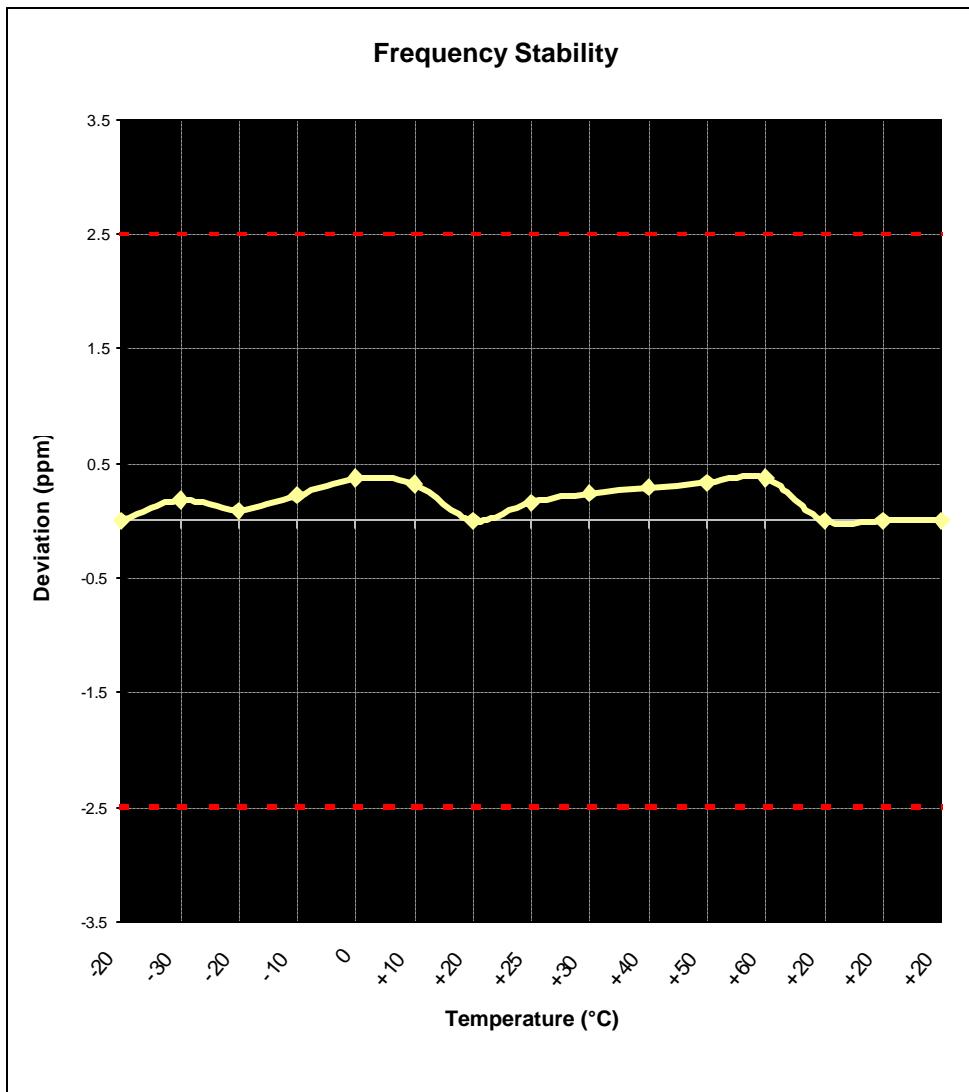
DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQ. (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.70	+ 20 (Ref)	1,880,000,003	0.00	0.000000
100 %		- 30	1,879,999,665	338.40	0.000018
100 %		- 20	1,879,999,834	169.20	0.000009
100 %		- 10	1,879,999,589	413.60	0.000022
100 %		0	1,879,999,307	695.60	0.000037
100 %		+ 10	1,879,999,401	601.60	0.000032
100 %		+ 20	1,880,000,003	0.00	0.000000
100 %		+ 25	1,879,999,702	300.80	0.000016
100 %		+ 30	1,879,999,552	451.20	0.000024
100 %		+ 40	1,879,999,458	545.20	0.000029
100 %		+ 50	1,879,999,383	620.40	0.000033
100 %		+ 60	1,879,999,307	695.60	0.000037
85 %	3.15	+ 20	1,880,000,003	0.00	0.000000
115 %	4.26	+ 20	1,880,000,003	0.00	0.000000
BATT. ENDPOINT	2.97	+ 20	1,880,000,003	0.00	0.000000

PCTEST PT. 22/24 REPORT	FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 27 of 32

8.1 Test Data (Continued)

8.7 FREQUENCY STABILITY (PCS CDMA)



PCTEST [®] PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN		Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 28 of 32

9.1 PLOT(S) OF EMISSIONS

(SEE ATTACHMENT D)

PCTEST [®] PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 29 of 32	

10.1 TEST EQUIPMENT

Type	Model	Cal. Due Date	S/N
Microwave Spectrum Analyzer	8566B (100Hz-22GHz) HP	08/15/05	3638A08713
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	04/17/05	2542A11898
Spectrum Analyzer/Tracking Gen.	HP 8591A (100Hz-1.8GHz)	08/10/05	3144A02458
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/05	2232A19558
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/05	1851A09816
Signal Generator*	Rohde & Schwarz (0.1-1000MHz)	09/11/05	894215/012
Alltech/Eaton Receiver	NM 37/57A-SL (30-1000MHz)	04/12/05	0792-032
Alltech/Eaton Receiver	NM 37/57A (30-1000MHz)	03/11/05	0805-03334
Alltech/Eaton Receiver	NM 17/27A (0.1-32MHz)	09/17/05	0608-03241
Quasi-Peak Adapter	HP 85650A	08/15/05	2043A00301
Alltech/Eaton Adapter	CCA-7 CISPR/ANSI/QP Adapter	03/11/05	0194-04082
Gigatronics Universal Power Meter	8657A		1835256
Gigatronics Power Sensor	80701A (0.05-18GHz)		1833460
Signal Generator	HP 8648D (9kHz-4GHz)		3613A00315
Amplifier Research	5S1G4 (5W, 800MHz-4.2GHz)		22322
Network Analyzer	HP 8753E (30kHz-3GHz)		JP38020182
Audio Analyzer	HP 8903B		3011A09025
Modulation Analyzer	HP 8901A		2432A03467
Power Meter	HP 437B		3125U24437
Power Sensor	HP 8482H (30μW-3W)		2237A02084
Harmonic/Flicker	Test System HP 6841A (IEC 555-2/3)		3531A00115
Broadband Amplifier (2)	HP 8447D		1145A00470, 1937A03348
Broadband Amplifier	HP 8447F		2443A03784
Horn Antenna	EMCO Model 3115 (1-18GHz)		9704-5182
Horn Antenna	EMCO Model 3115 (1-18GHz)		9205-3874
Horn Antenna	EMCO Model 3116 (18-40GHz)		9203-2178
Biconical Antenna (4)	Eaton 94455/Eaton 94455-1/Singer 94455-1/Compliance Design		1295, 1332, 0355
Log-Spiral Antenna (3)	Alltech/Eaton 93490-1		0608, 1103, 1104
Roberts Dipoles	Compliance Design (1 set)		
Alltech Dipoles	DM-105A (1 set)		33448-111
EMCO LISN (6)	3816/2		1079
Microwave Preamplifier 40dB	Gain HP 83017A (0.5-26.5GHz)		3123A00181
Microwave Cables	MicroCoax (1.0-26.5GHz)		
Alltech/Eaton Receiver	NM 37/57A-SL		0792-03271
Spectrum Analyzer	HP 8594A		3051A00187
Spectrum Analyzer (2)	HP 8591A		3034A01395, 3108A02053
Microwave Survey Meter	Holaday Model 1501 (2.450GHz)		80931
Digital Thermometer	Extech Instruments 421305		426966
Attenuator	HP 8495A (0-70dB) DC-4GHz		
Bi-Directional Coax Coupler	Narda 3020A (50-1000MHz)		
Shielded Screen Room	RF Lindgren Model 26-2/2-0		6710 (PCT270)
Shielded Semi-Anechoic Chamber	Ray Proof Model S81		R2437 (PCT278)
Environmental Chamber	Associated Systems Model 1025 (Temperature/Humidity)		PCT285

* Calibration traceable to the National Institute of Standards and Technology (NIST).

PCTEST PT. 22/24 REPORT	 FCC MEASUREMENT REPORT	NOKIA	Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i

11.1 SAMPLE CALCULATIONS

A. Emission Designator

Emission Designator = 1M25F9W

CDMA BW = 1.25 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

(Measured at the 99.75% power bandwidth)

Emission Designator = 40K0F8W

Calculation: Voice + SAT

Modulation: Voice is 2.5 kHz and SAT is 6 kHz – Maximum modulation is $M = 6$ kHz

Deviation: Voice is 12 kHz and SAT is 2 kHz – Maximum deviation is $D = 12 + 2 = 14$ kHz

$B_n = 2xM + 2xDK$ with $K = 1$

$B_n = 40$ kHz

Calculation: Signaling Tone (ST) + SAT

Modulation: ST is 10 kHz and SAT is 6 kHz – Maximum modulation is $M = 10$ kHz

Deviation: ST is 8 kHz and SAT is 2 kHz – Maximum deviation is $D = 8 + 2 = 10$ kHz

$B_n = 2xM + 2xDK$ with $K = 1$

$B_n = 40$ kHz

Emission Designator = 40K0F1D

Calculation: Voice + SAT

Modulation: Wideband Data is 10 kHz and SAT is 6 kHz – Maximum modulation is $M = 10$ kHz

Deviation: Wideband Data is 8 kHz and SAT is 2 kHz – Maximum deviation is $D = 8 + 2 = 10$ kHz

$B_n = 2xM + 2xDK$ with $K = 1$

$B_n = 40$ kHz

B. Spurious Radiated Emission - PCS Band

Example: Channel 25 PCS Mode 2nd Harmonic (3702.50 MHz)

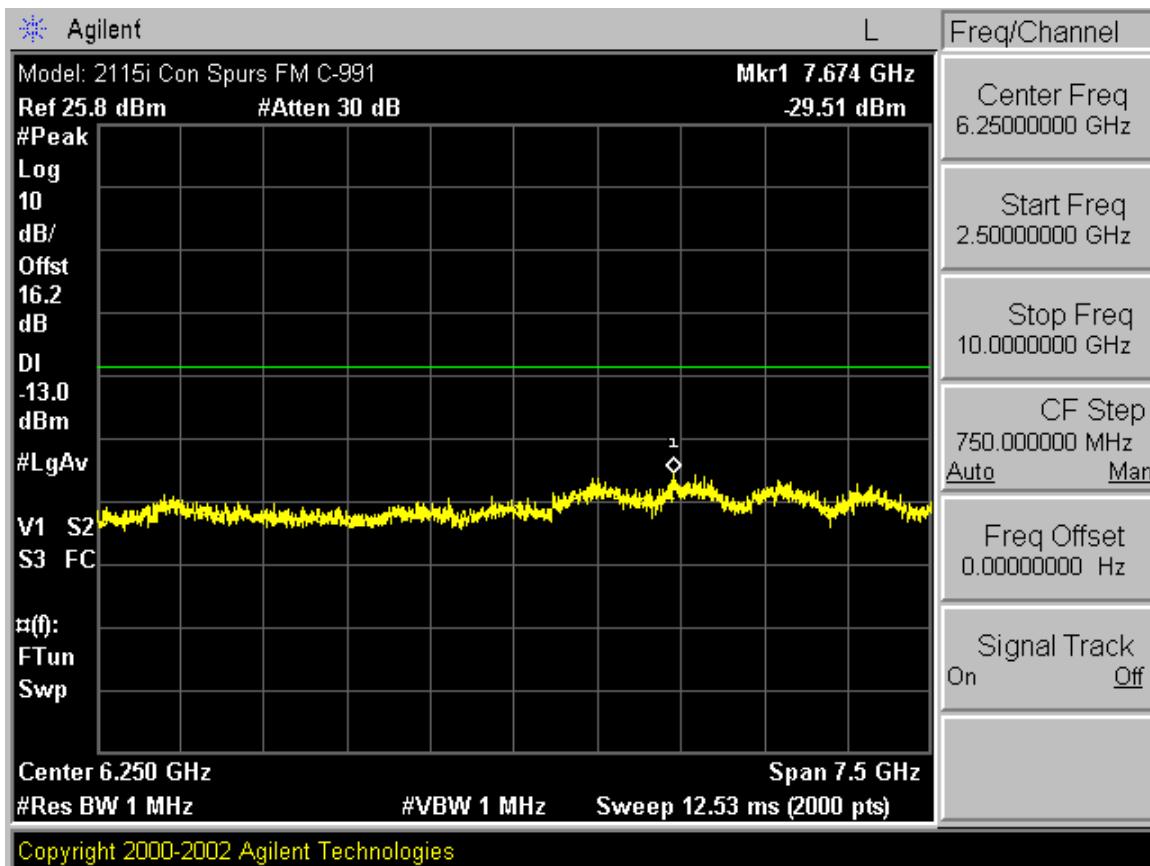
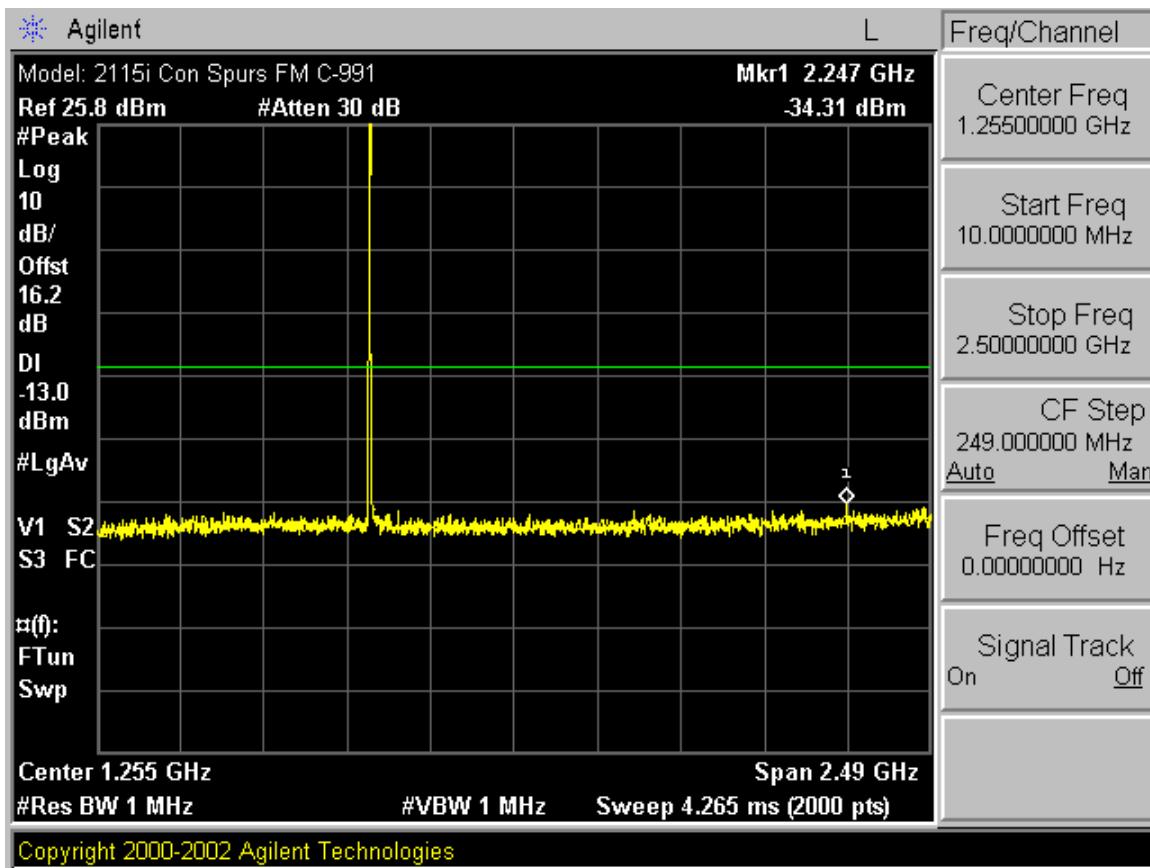
The receive analyzer reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the receive analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3702.50 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was $25.501 \text{ dBm} - (-24.80) = 50.3 \text{ dBc}$

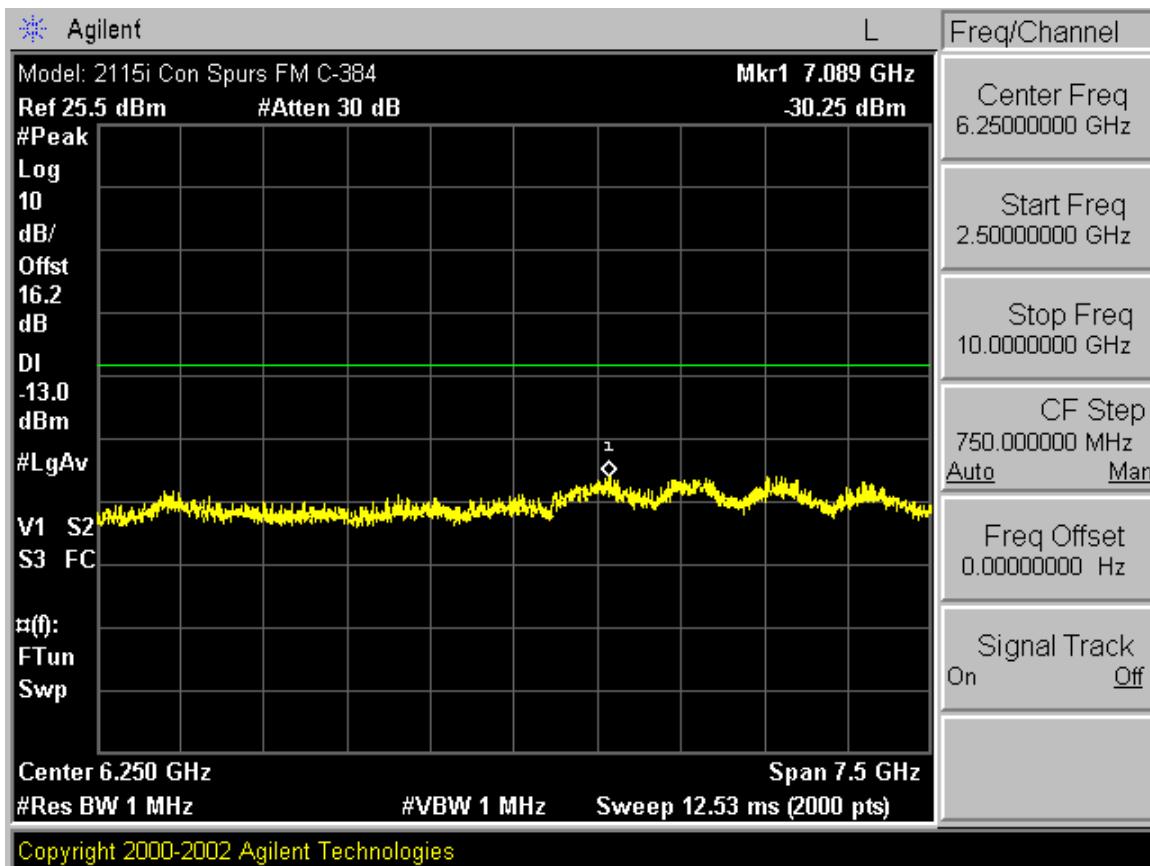
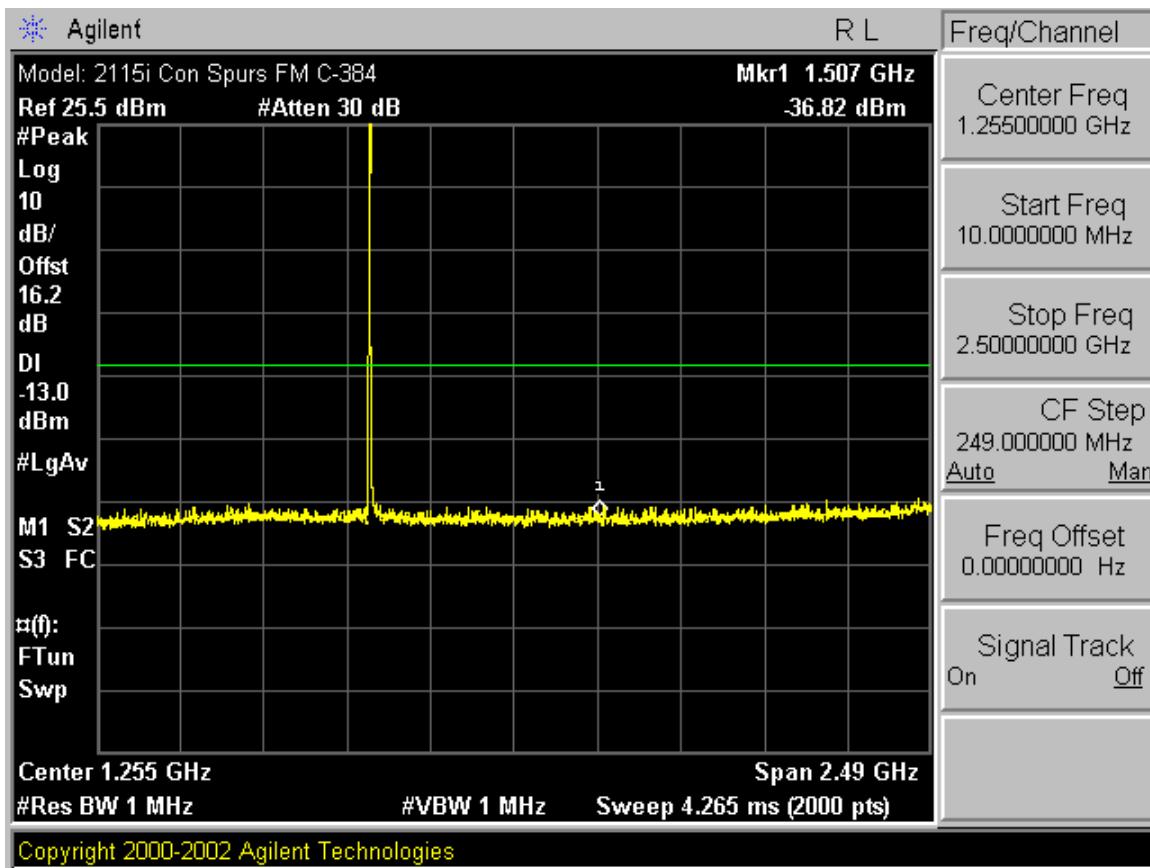
PCTEST PT. 22/24 REPORT	FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 31 of 32

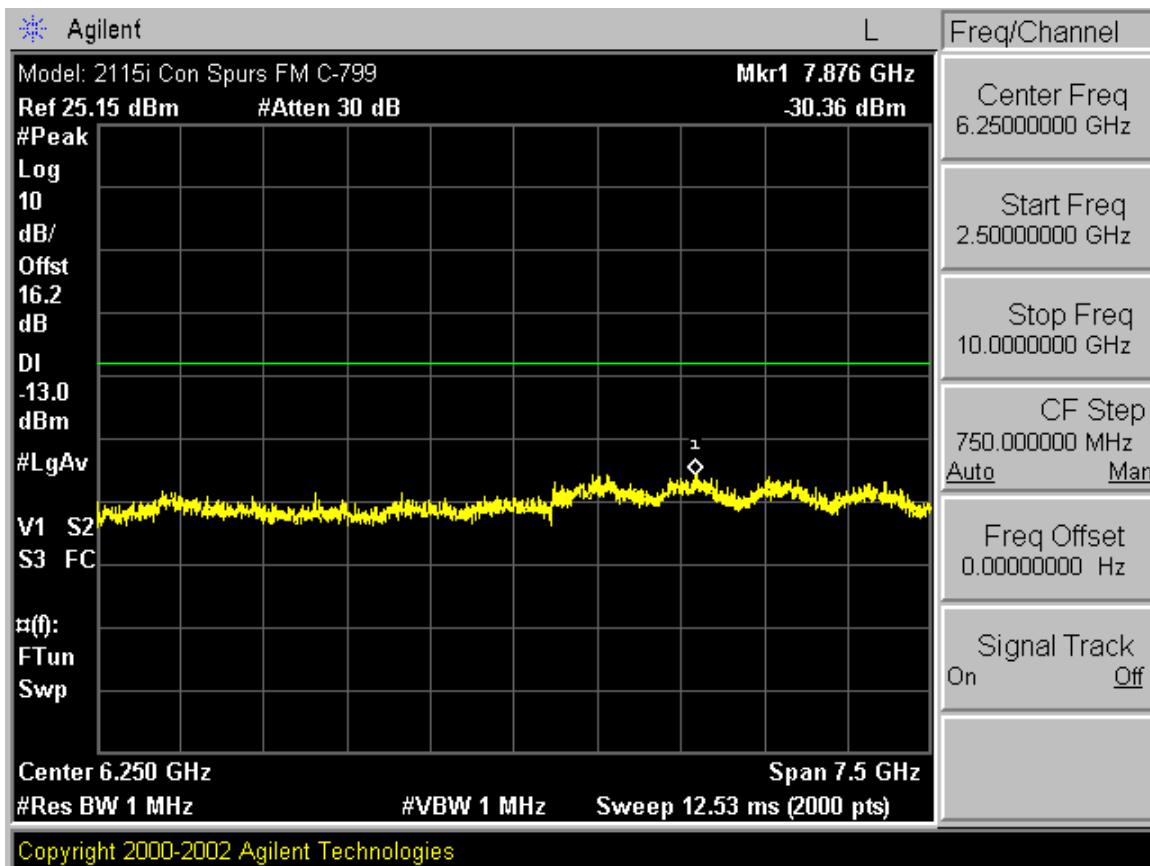
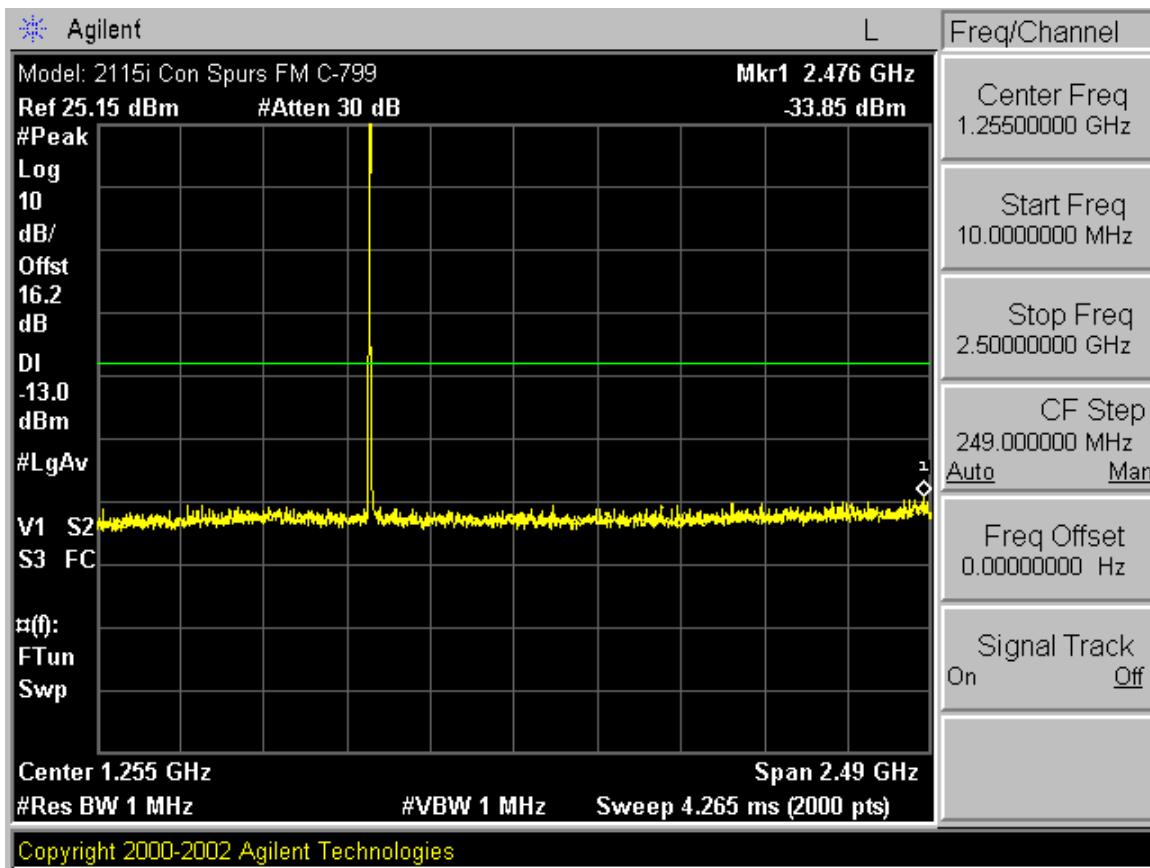
12.1 CONCLUSION

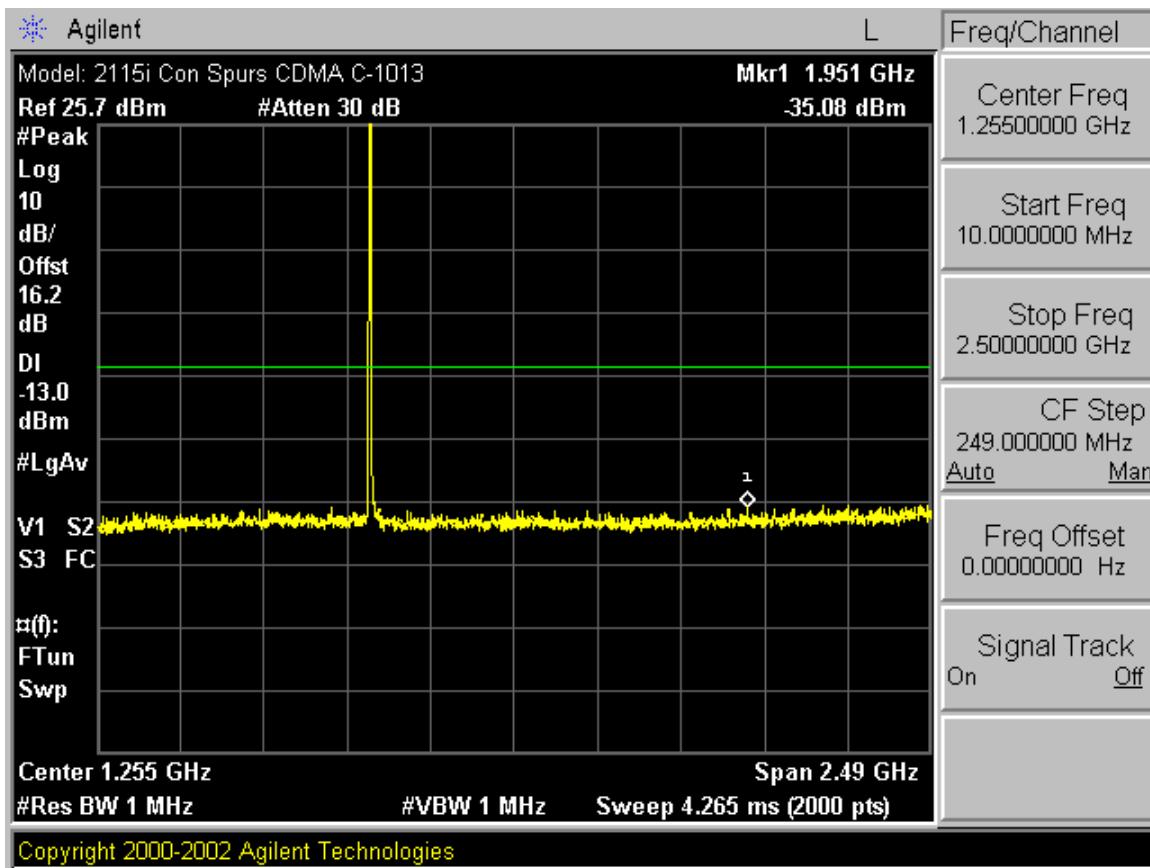
The data collected shows that the **NOKIA Tri-Mode Dual-Band Analog/PCS Phone (AMPS/CDMA)** **Model: 2115i** complies with all the requirements of Parts 2, 22, and 24 of the FCC rules.

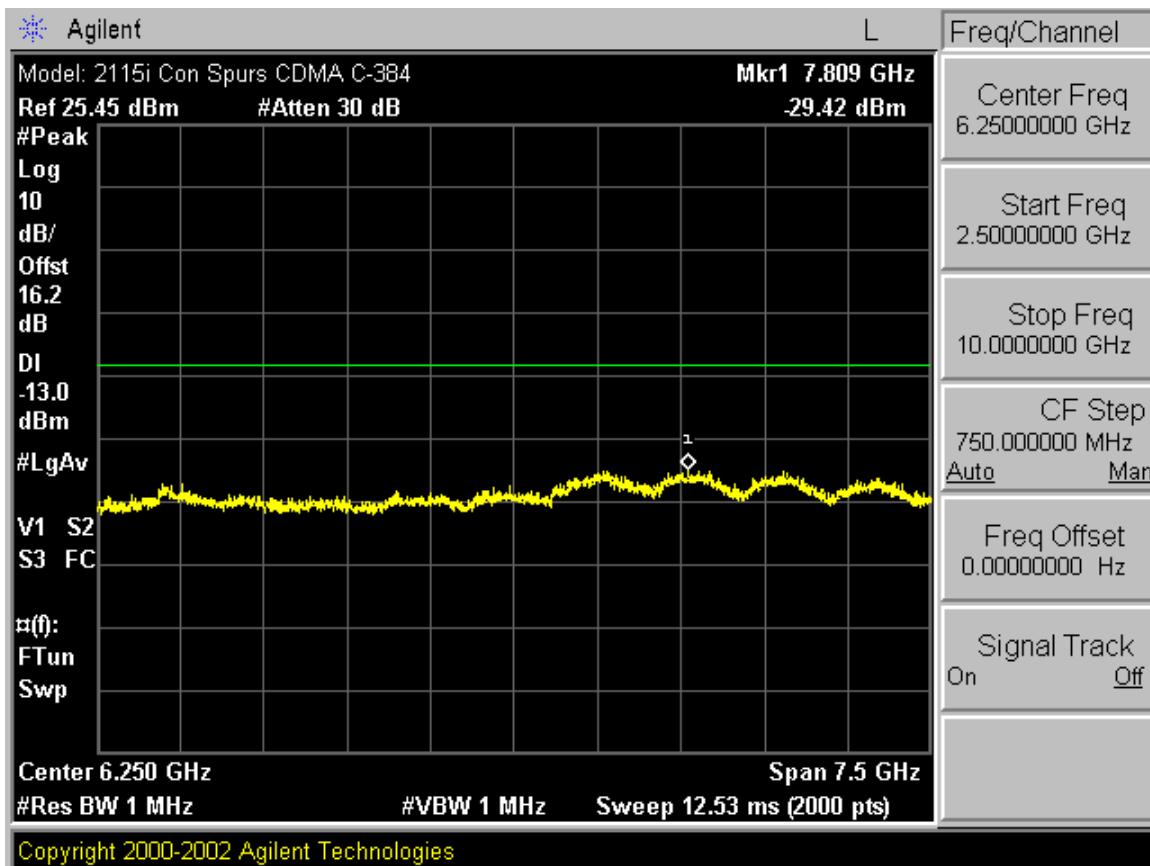
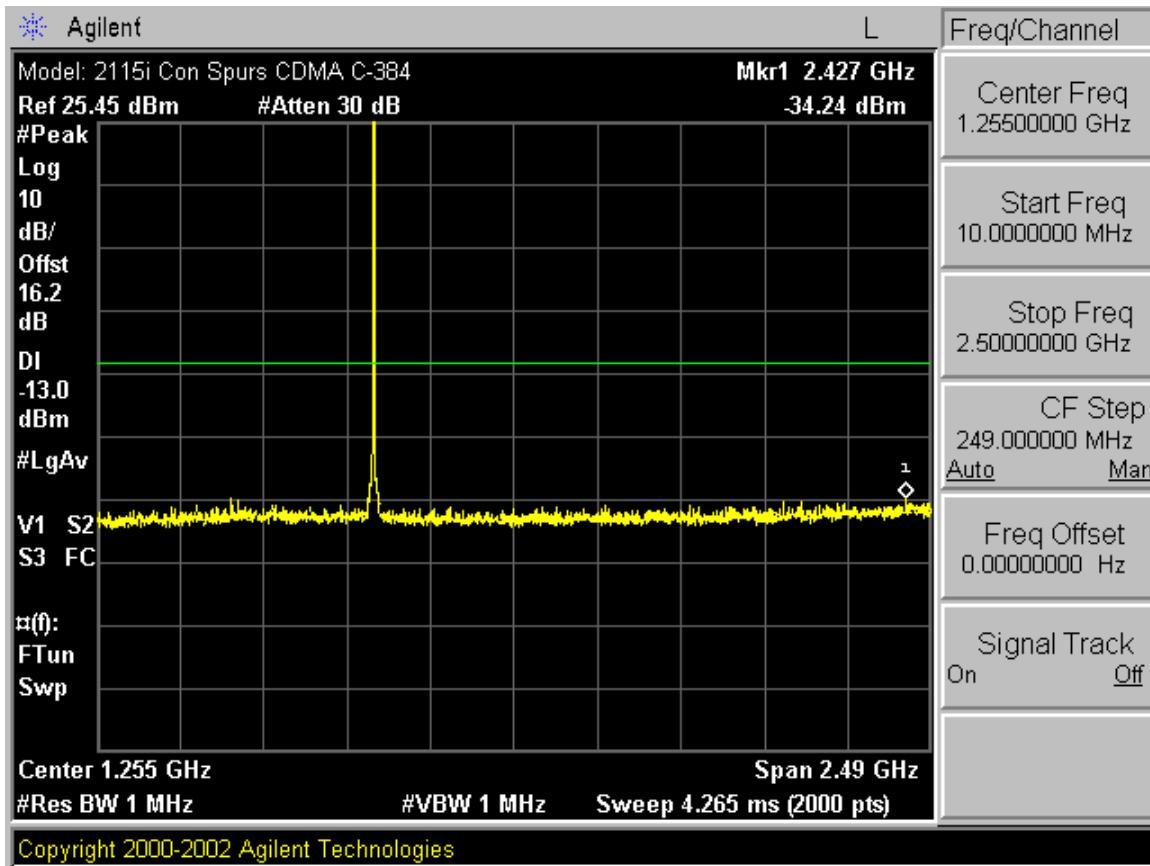
PCTEST® PT. 22/24 REPORT		FCC MEASUREMENT REPORT			Reviewed By: Quality Manager
Test Report S/N: 22/24.241129645.QMN	Test Dates: Nov.29-30, 2004	Phone Type: Tri-Mode Dual-Band	MODEL: 2115i	Page 32 of 32	

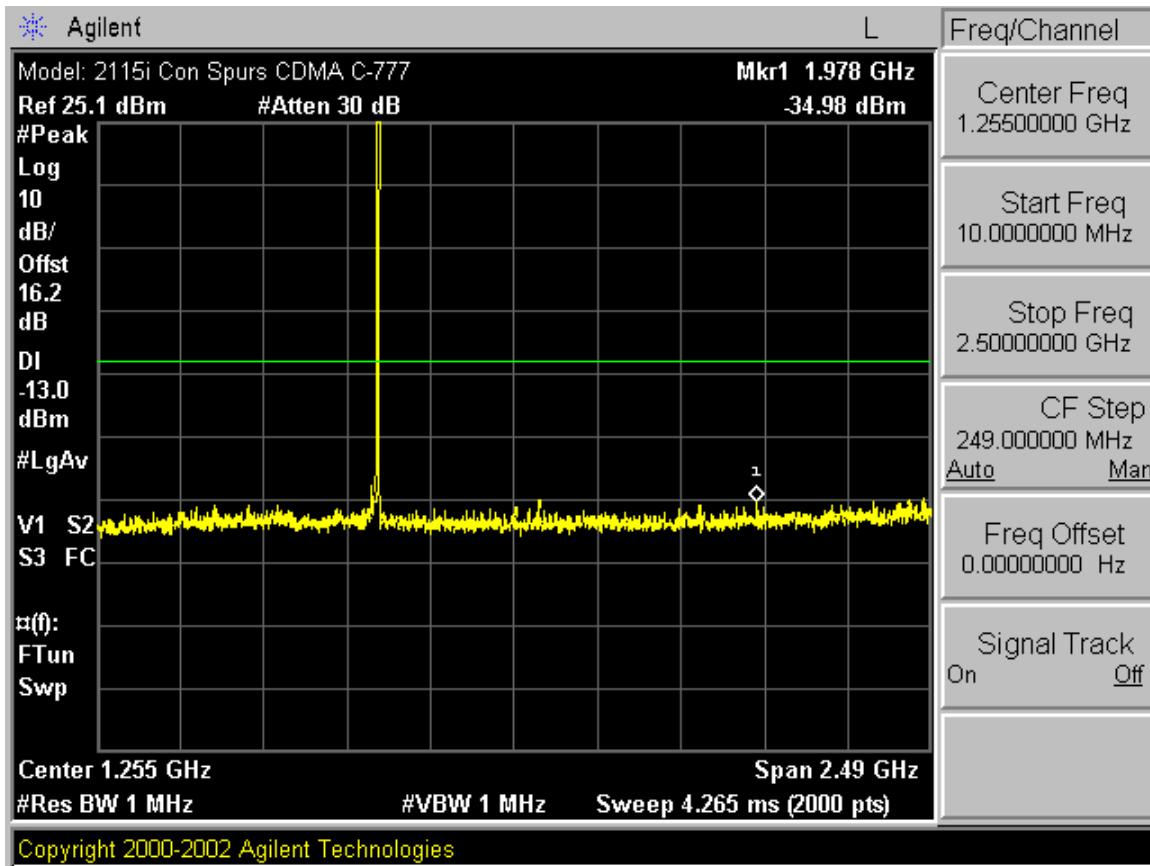


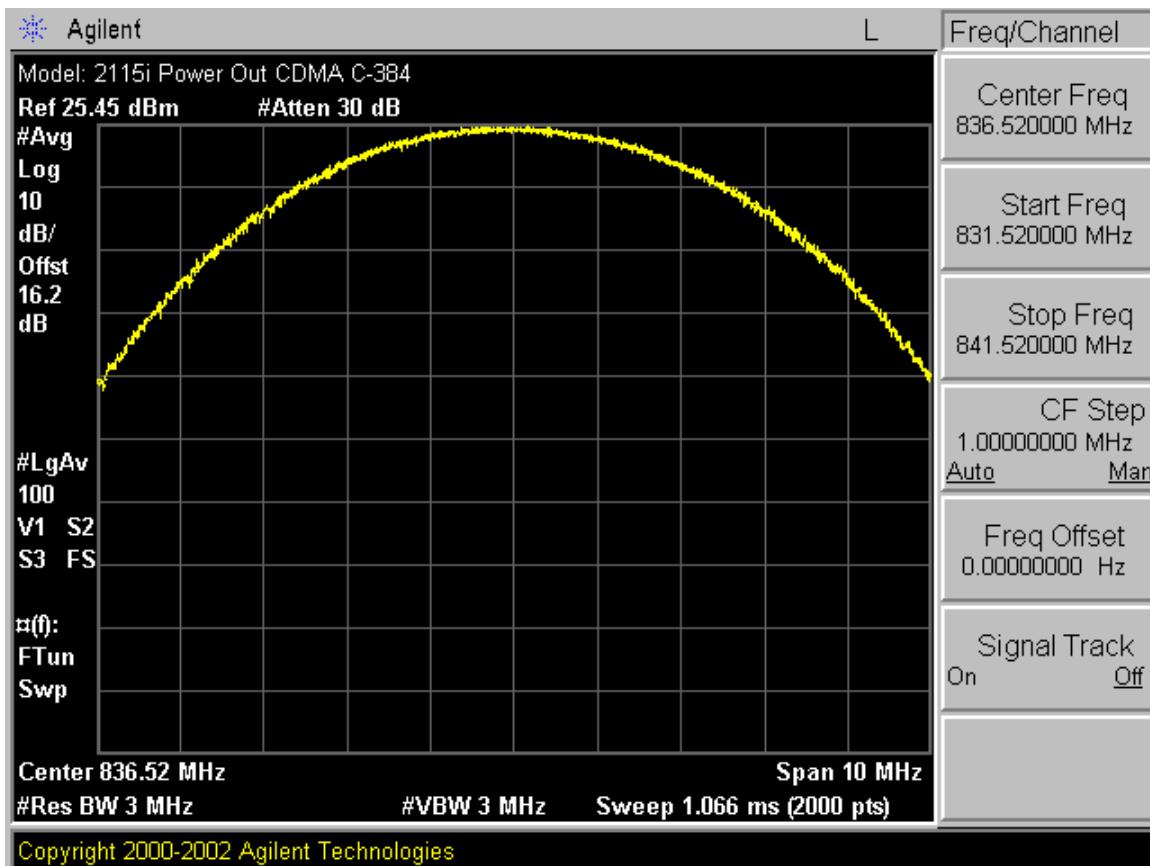
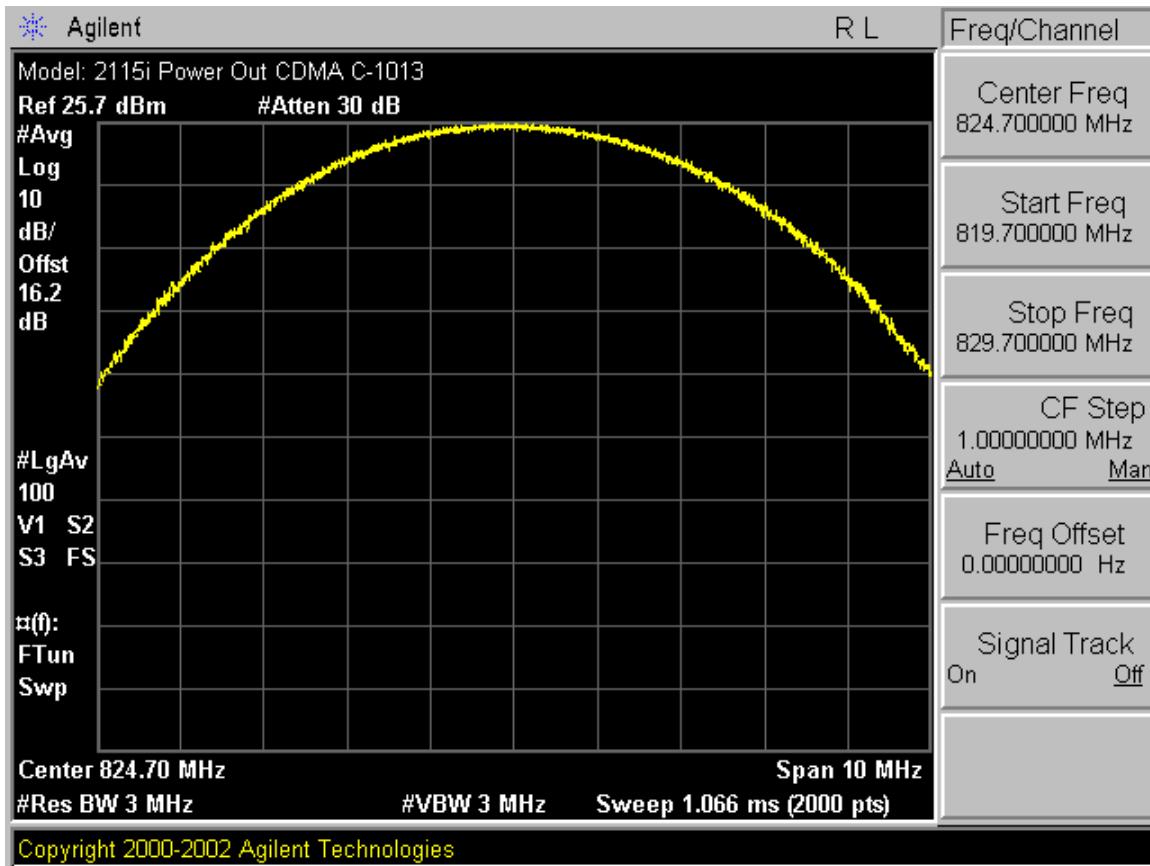


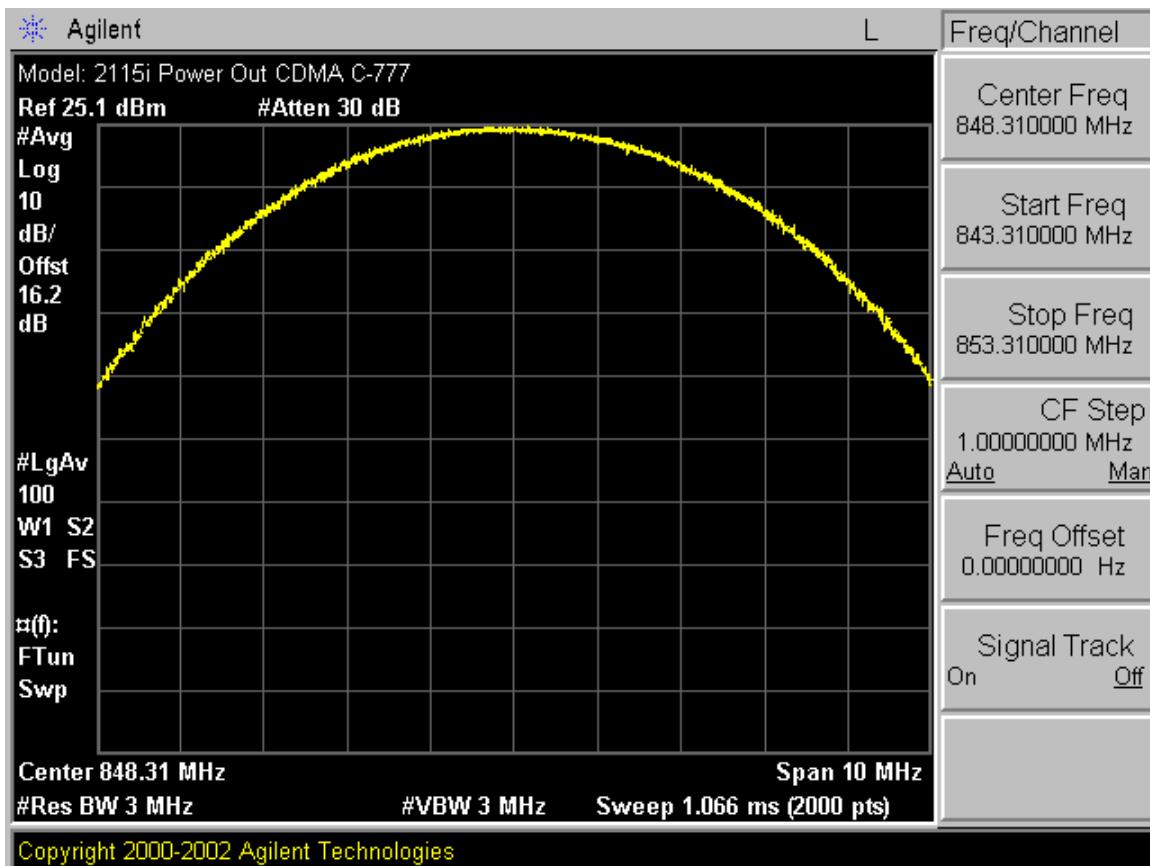
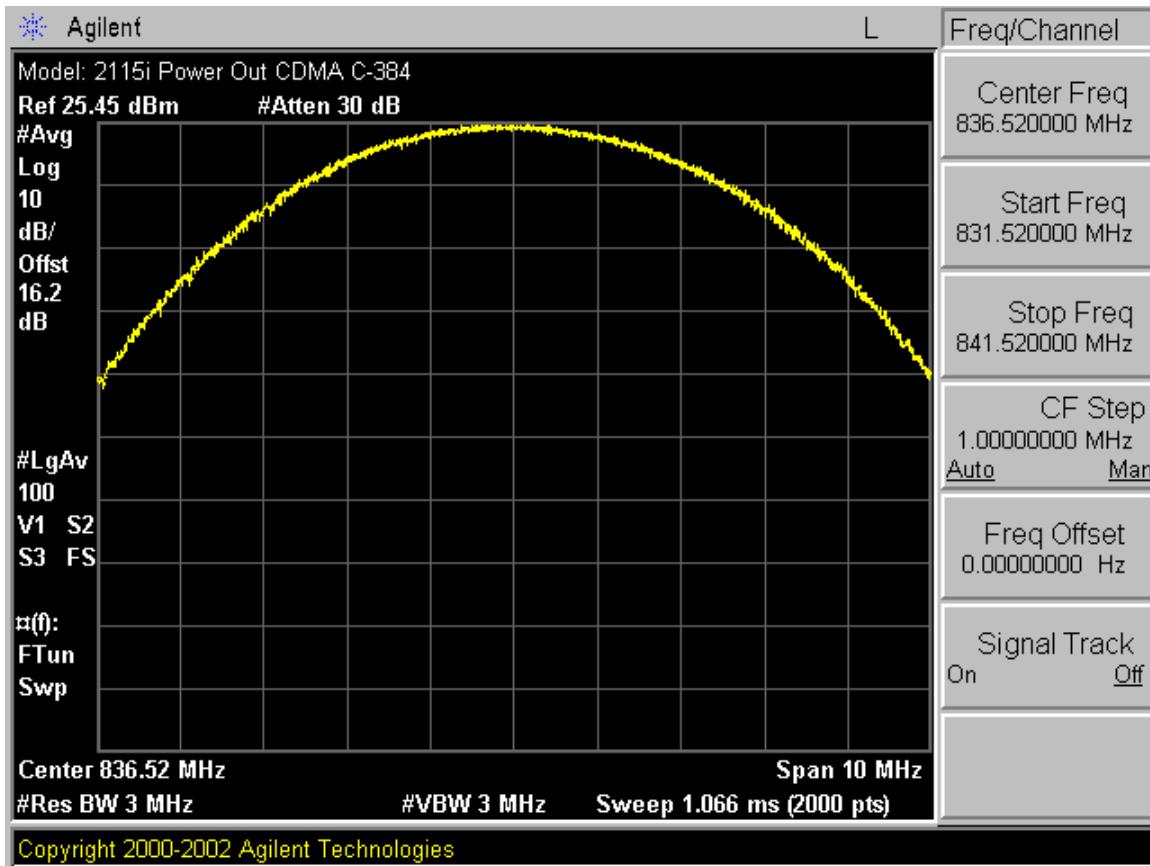


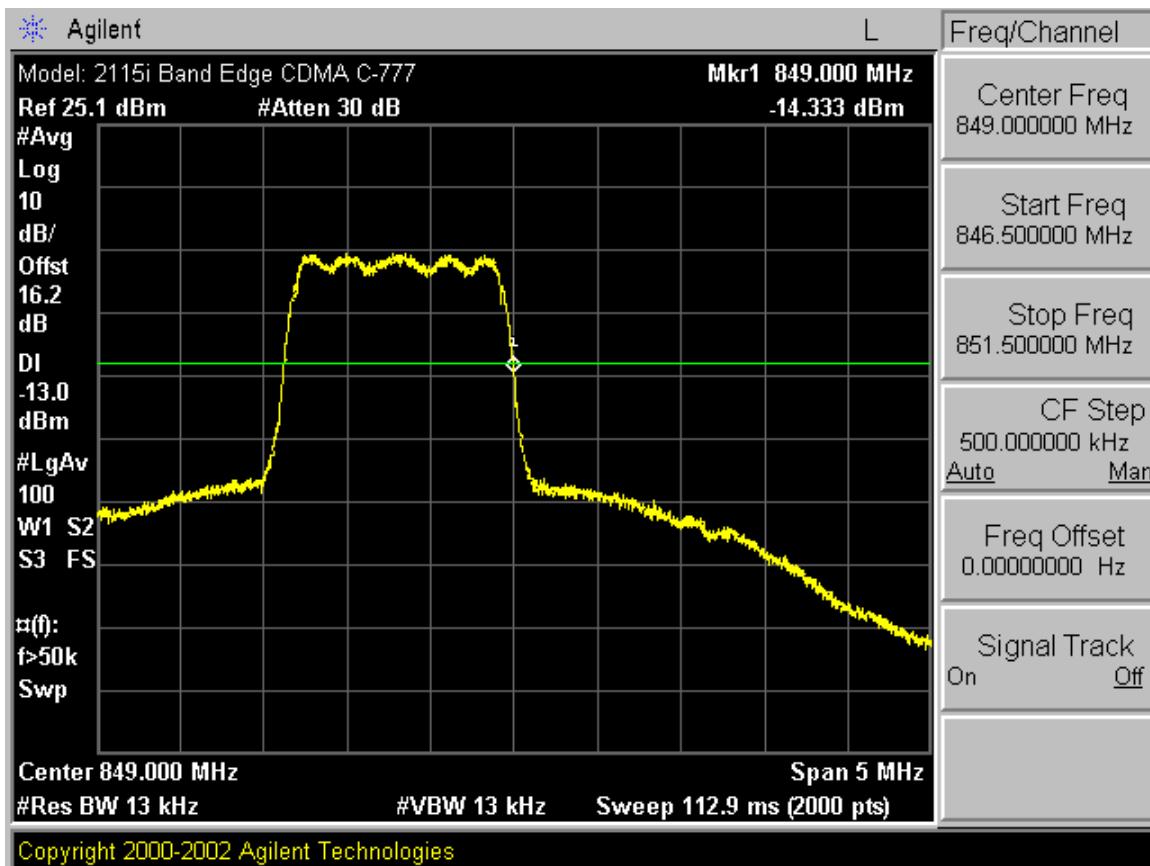
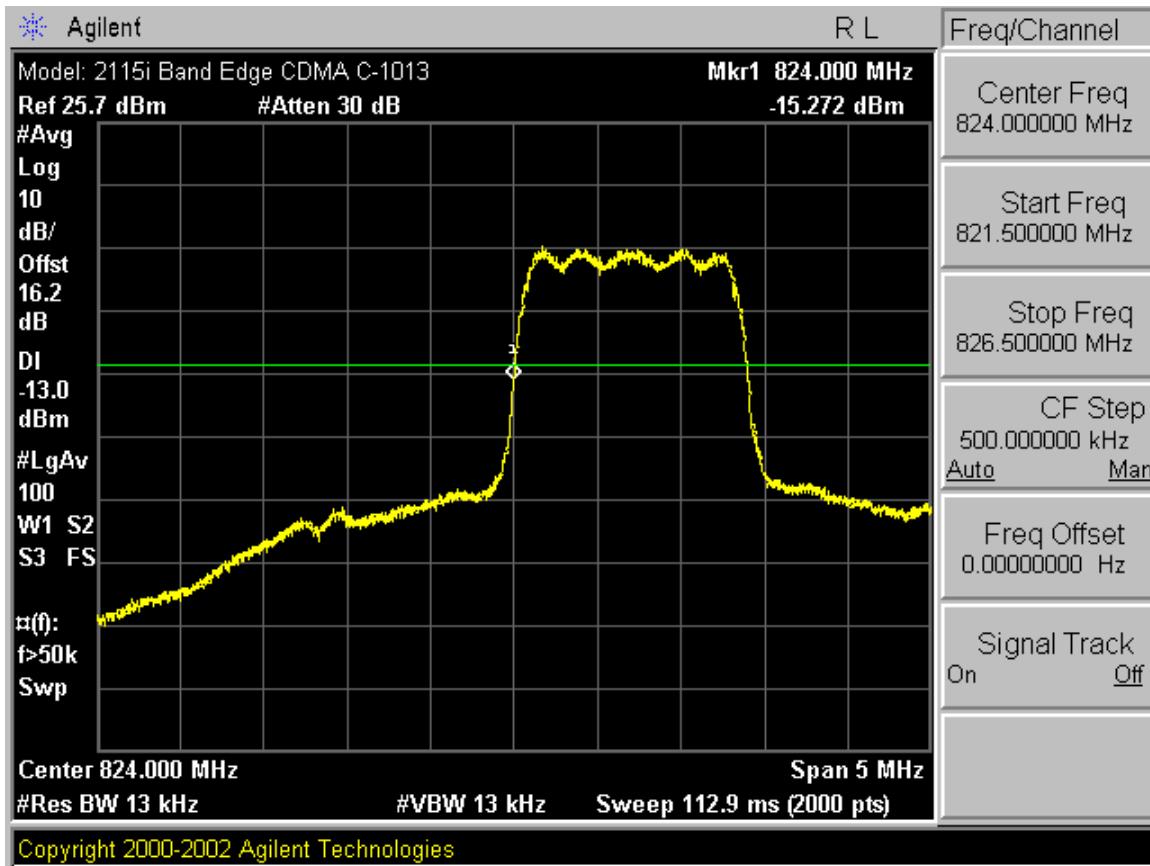


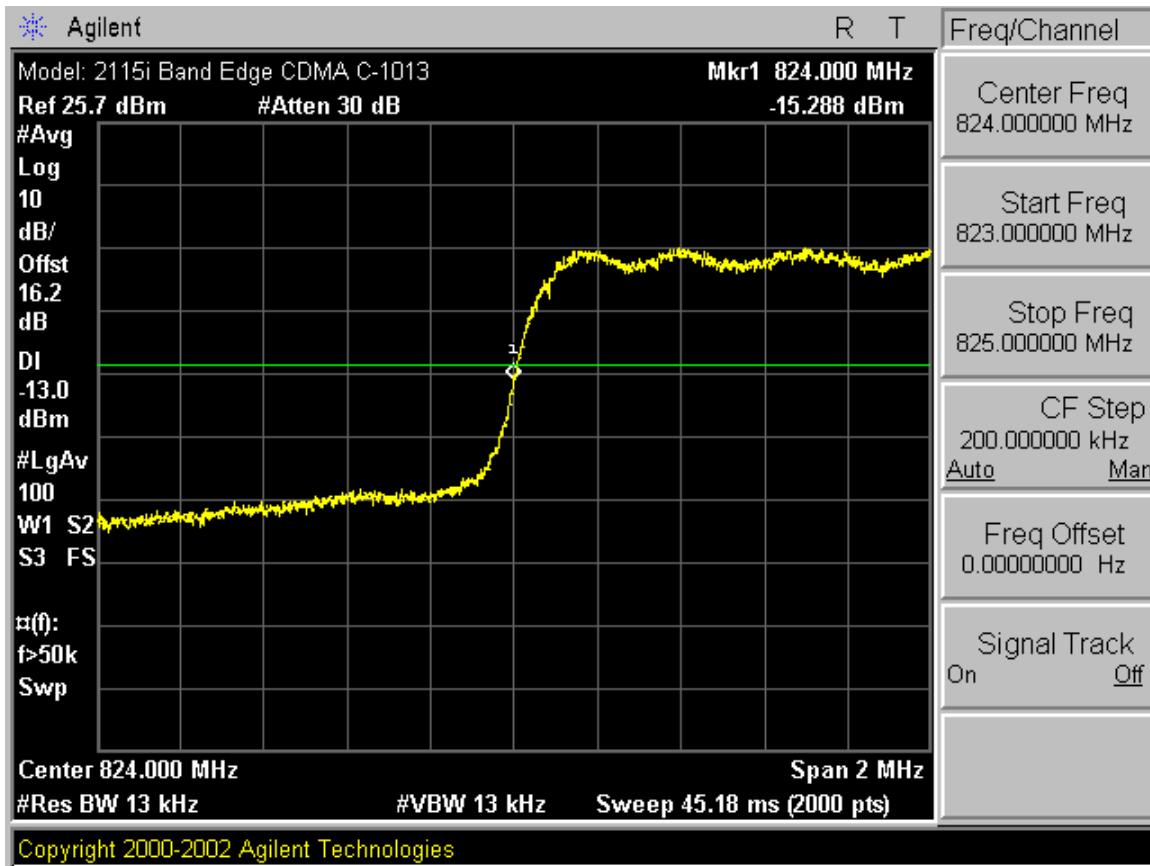


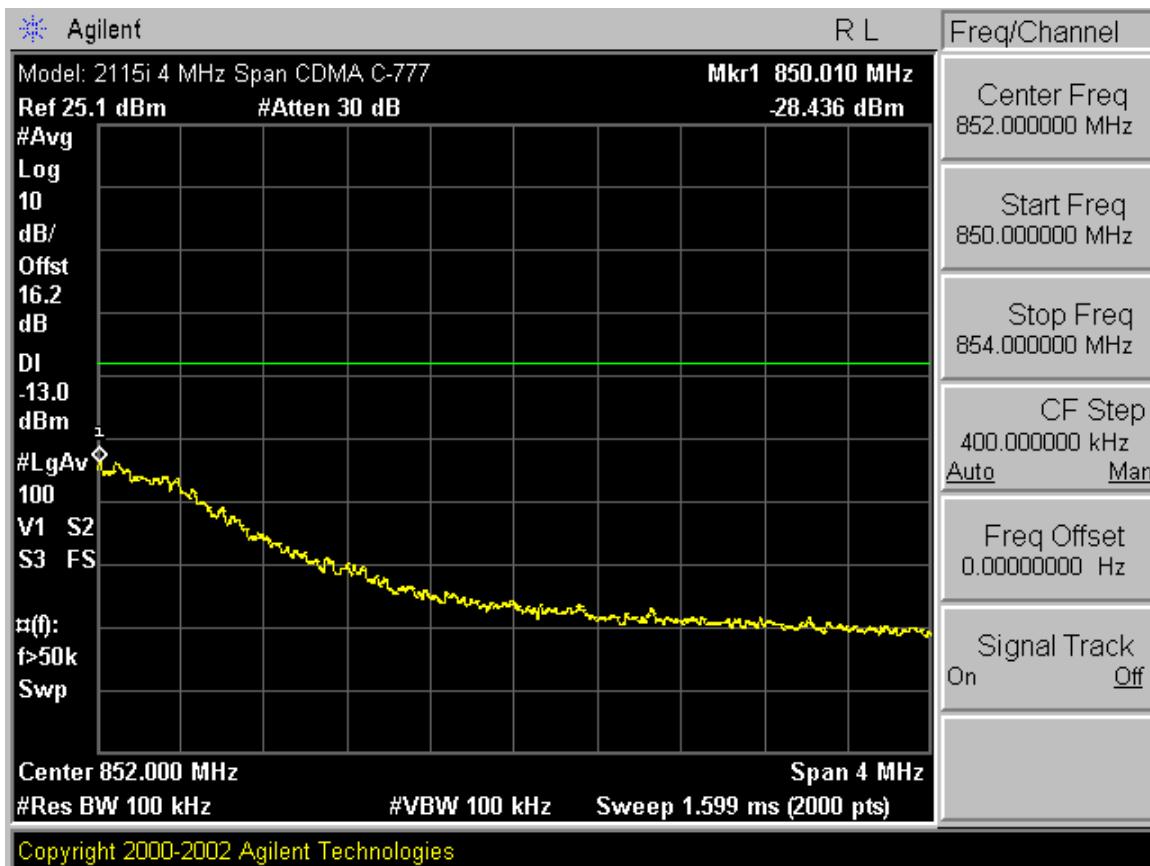
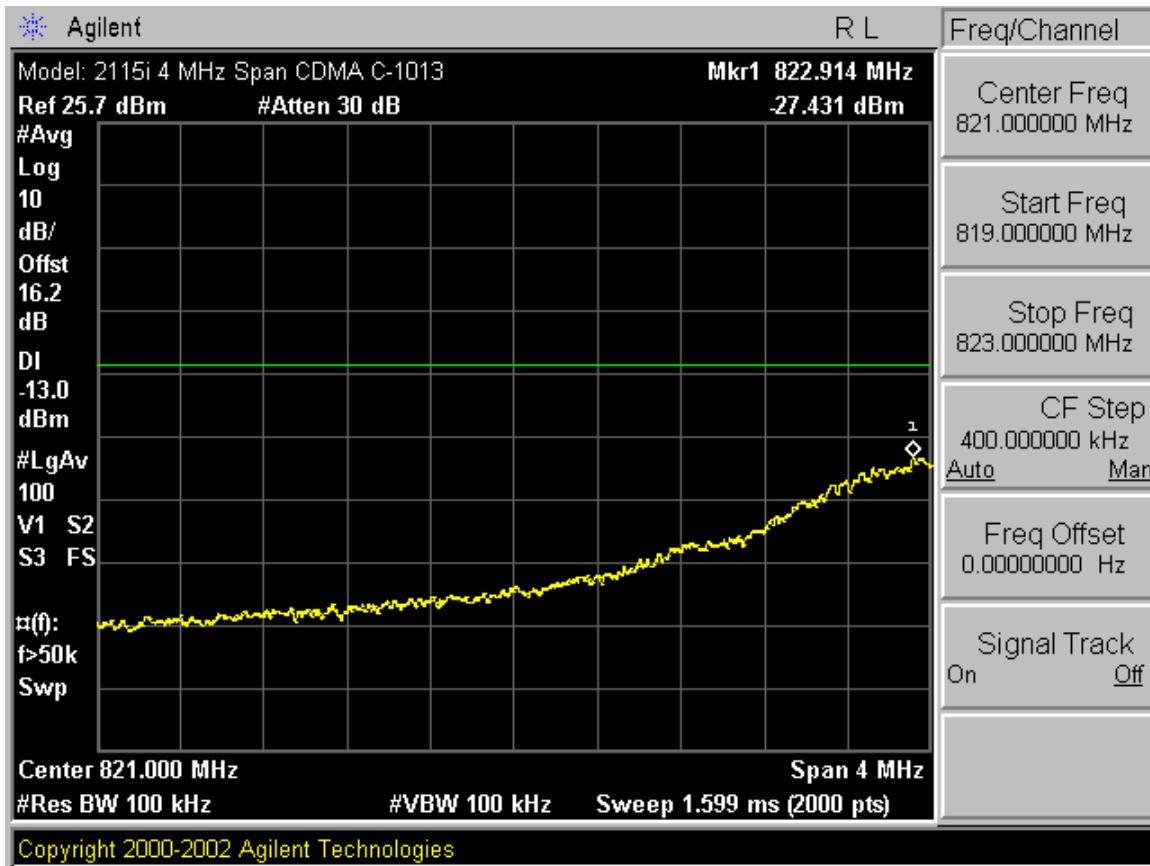


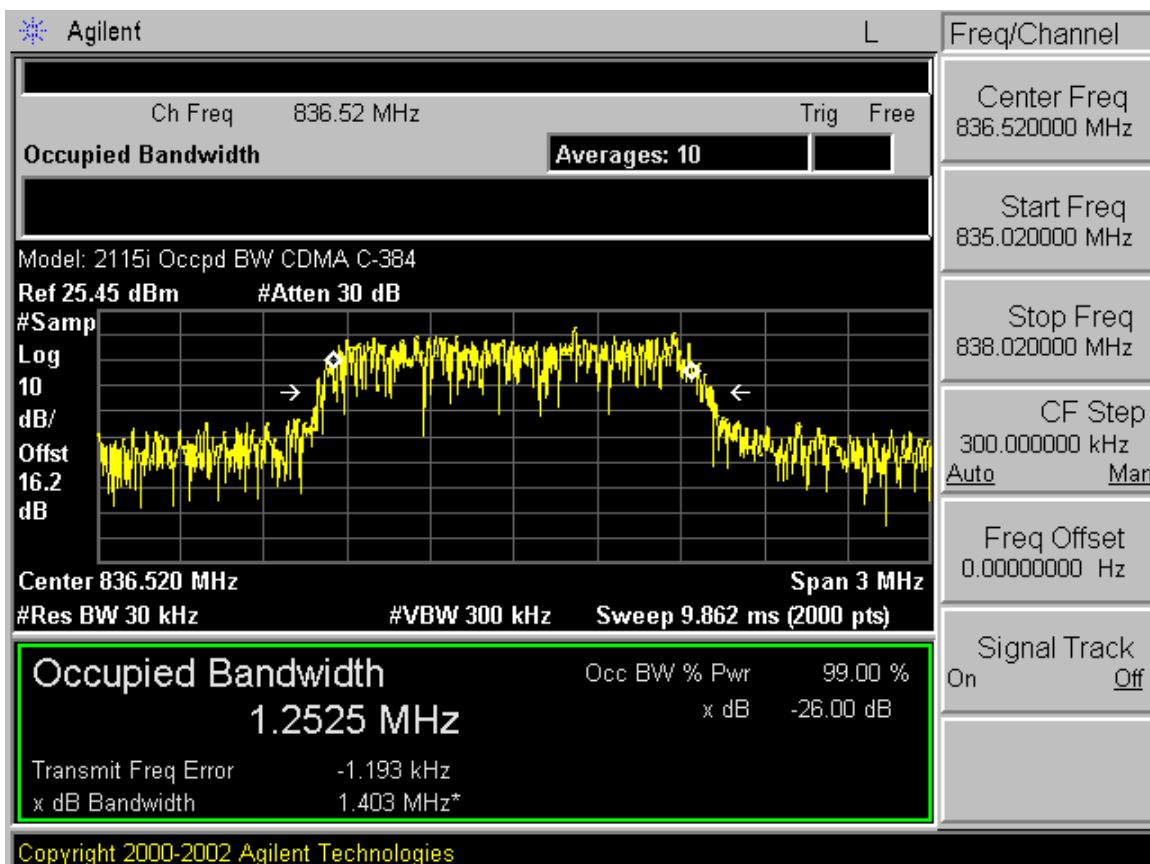
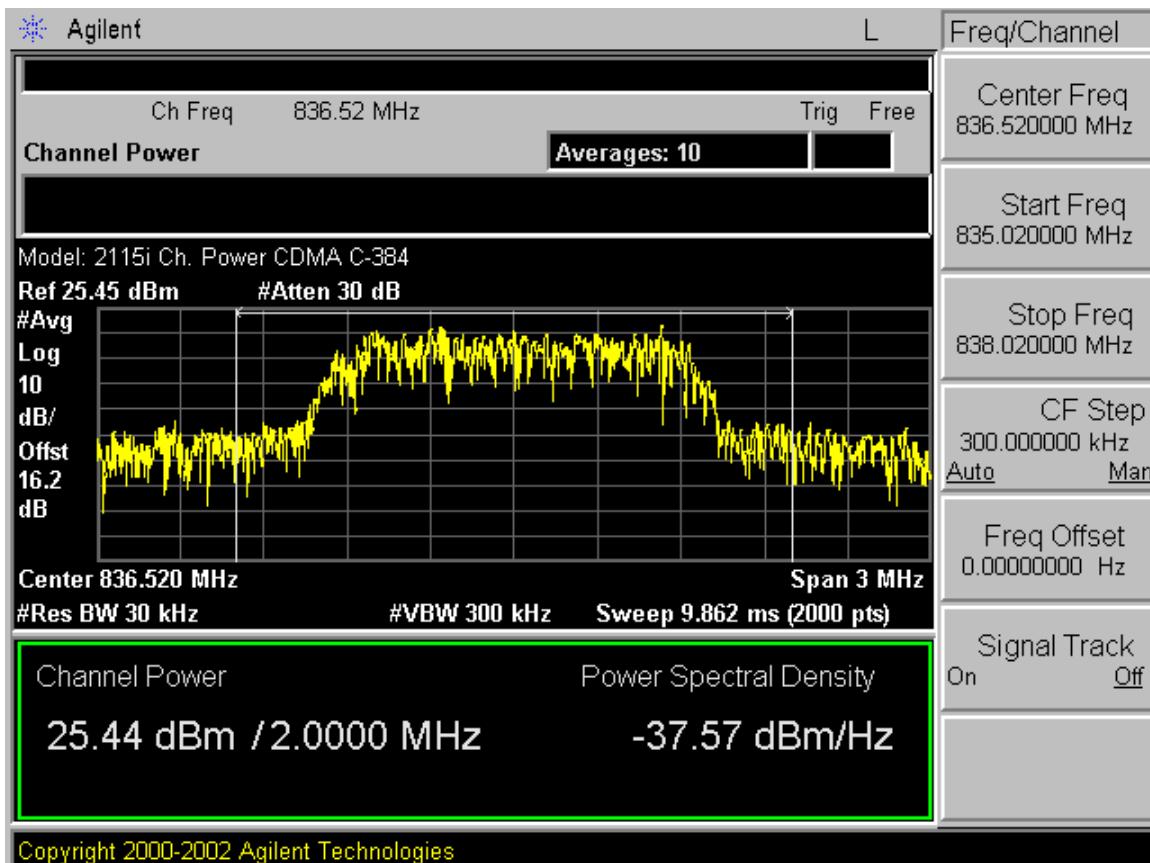


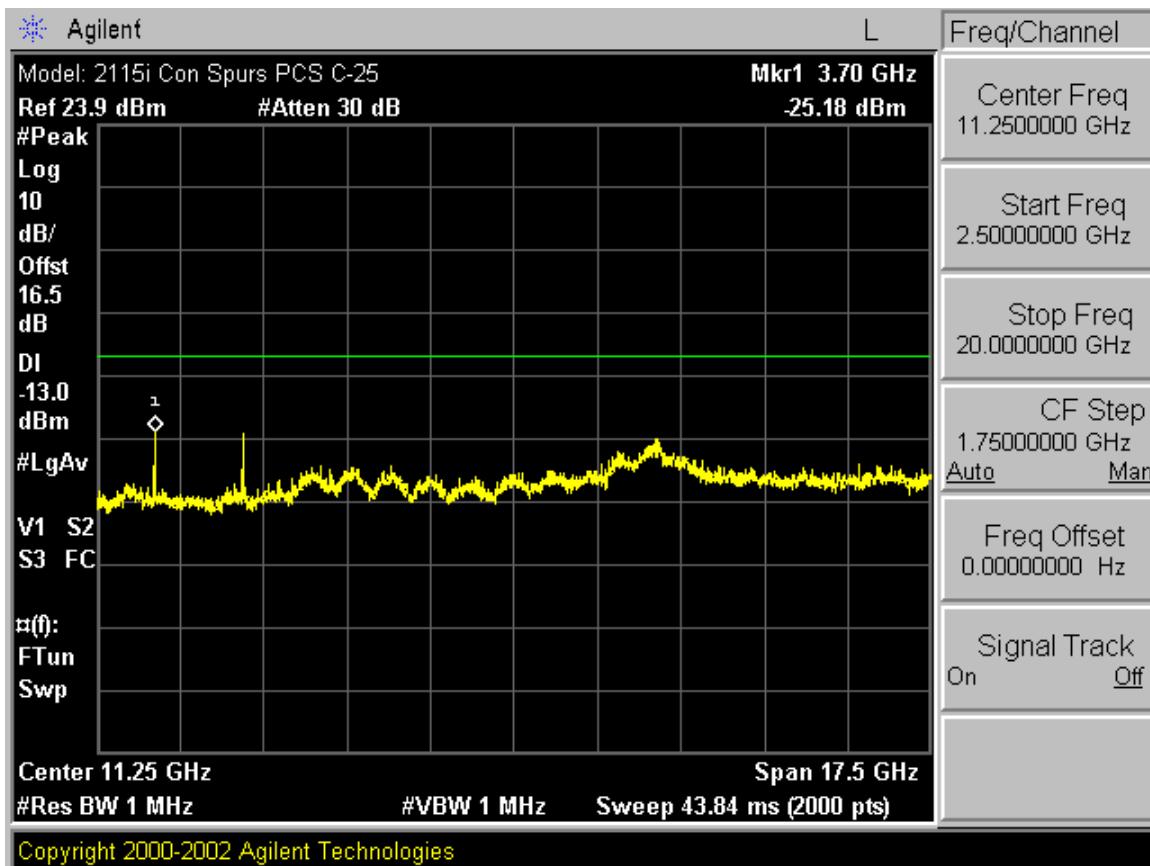
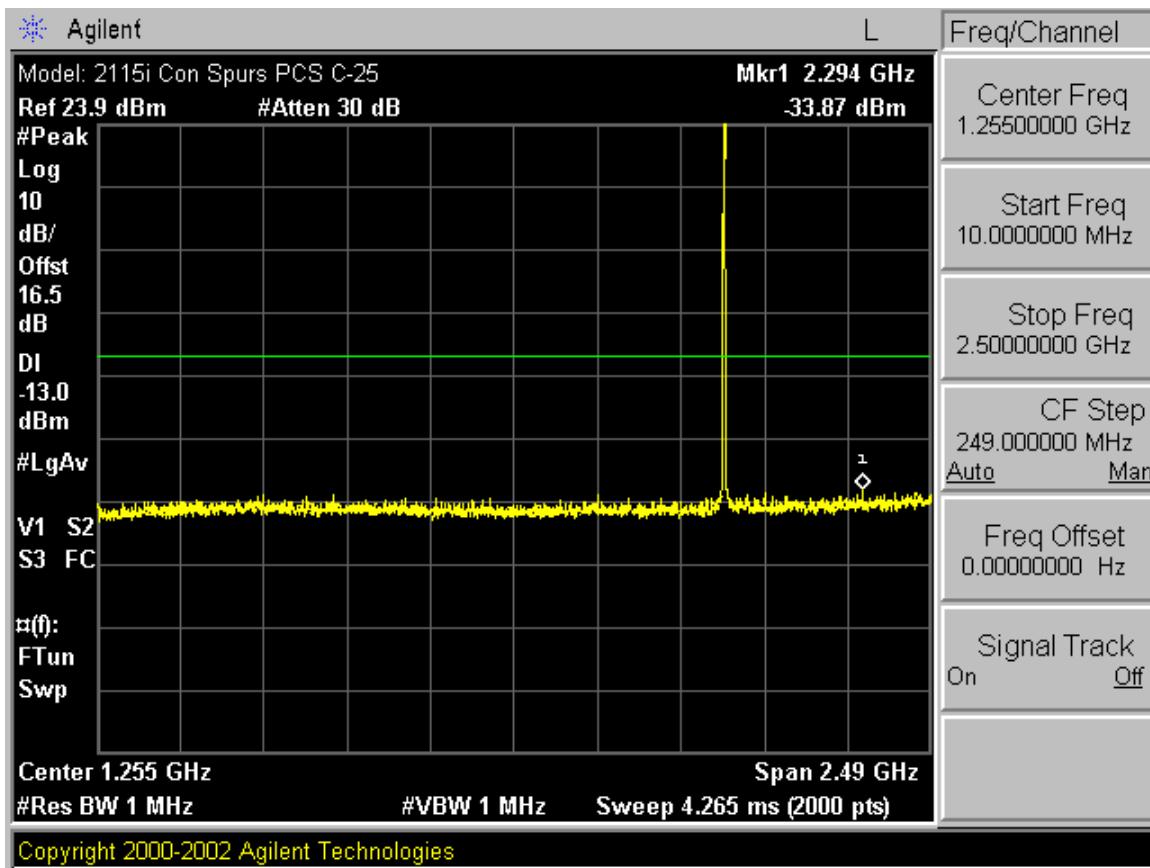


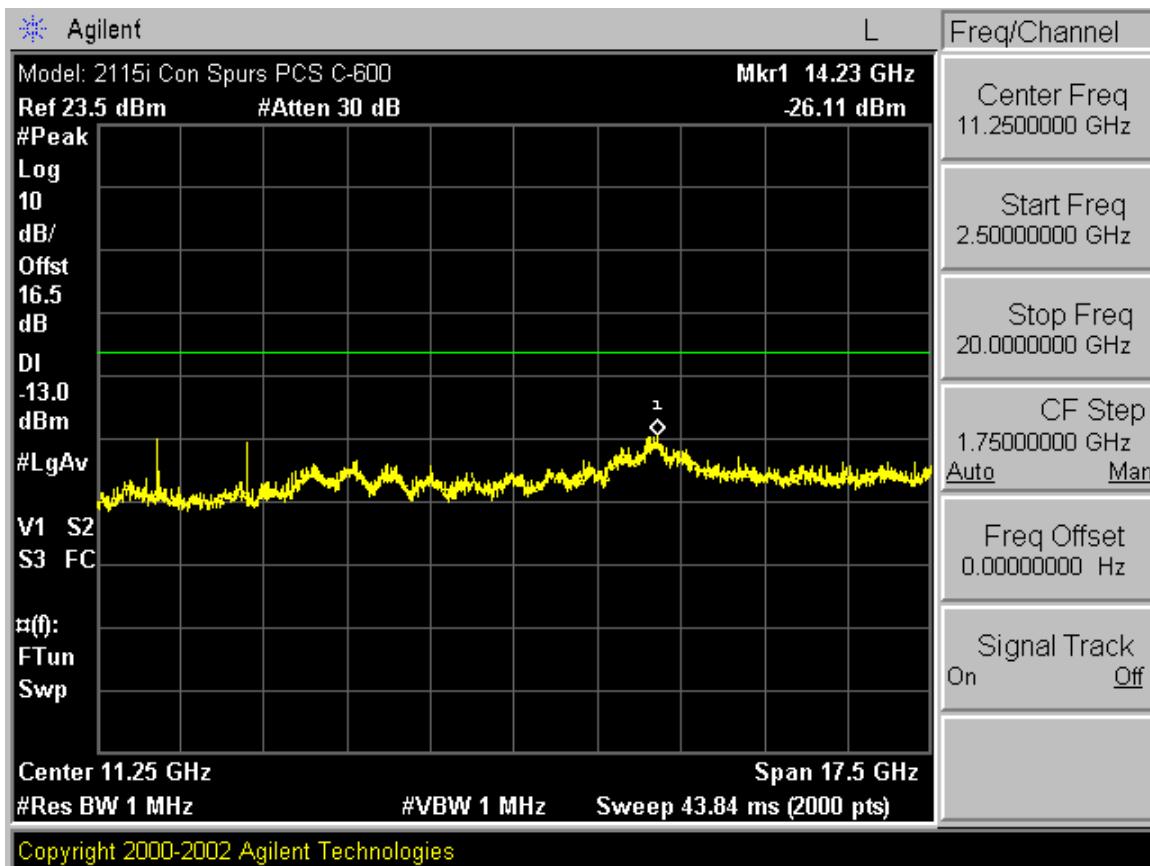
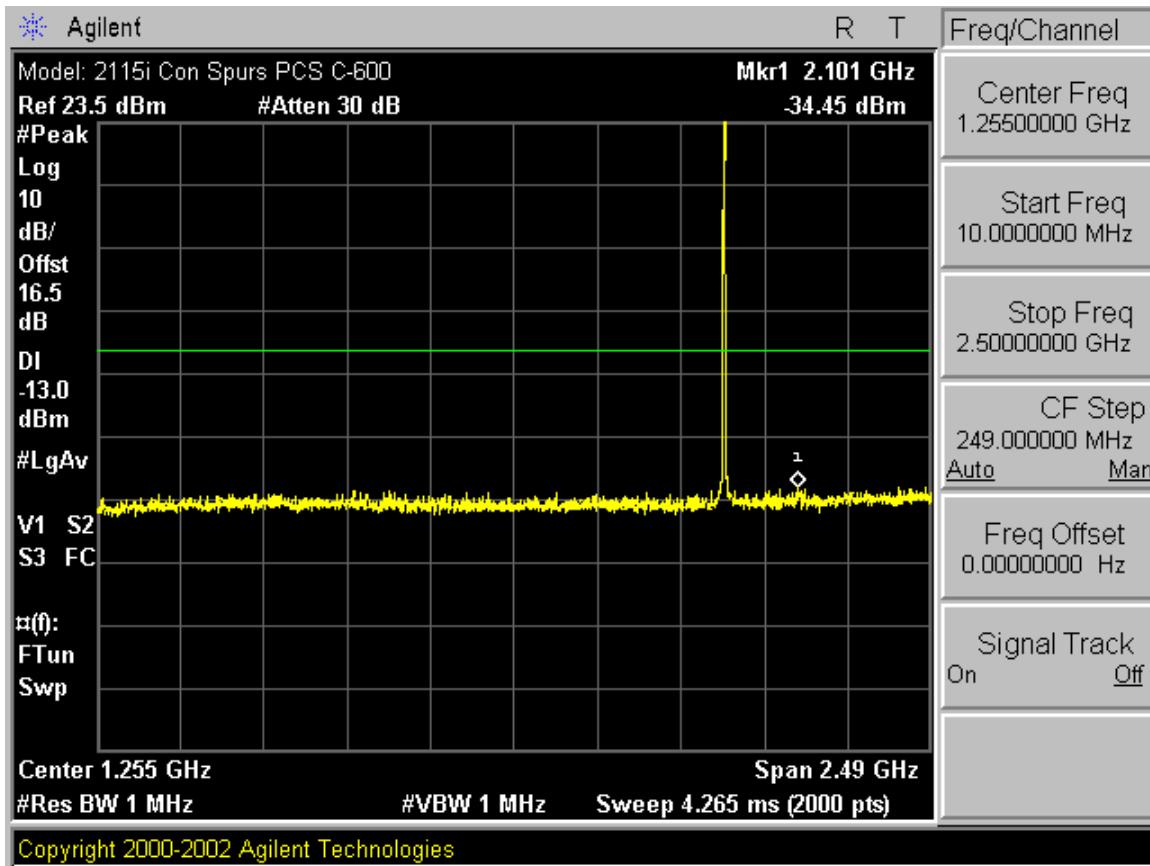


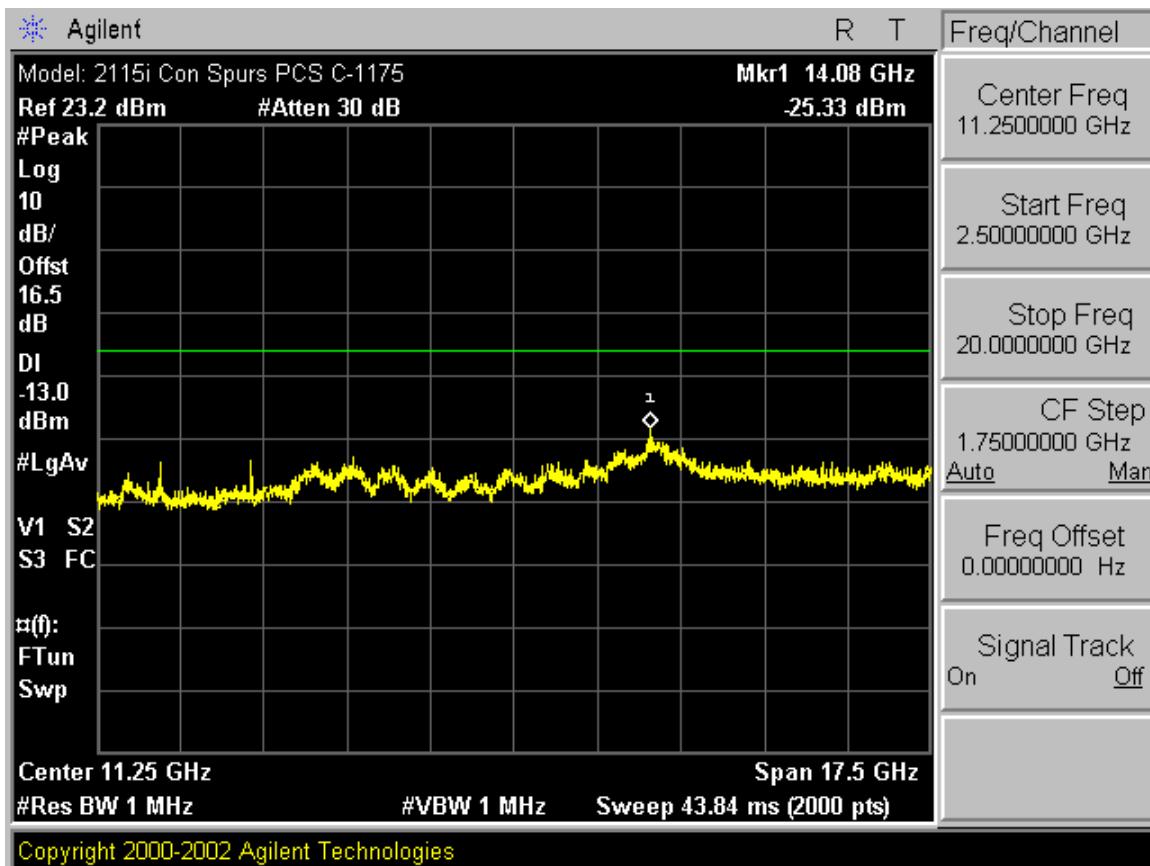
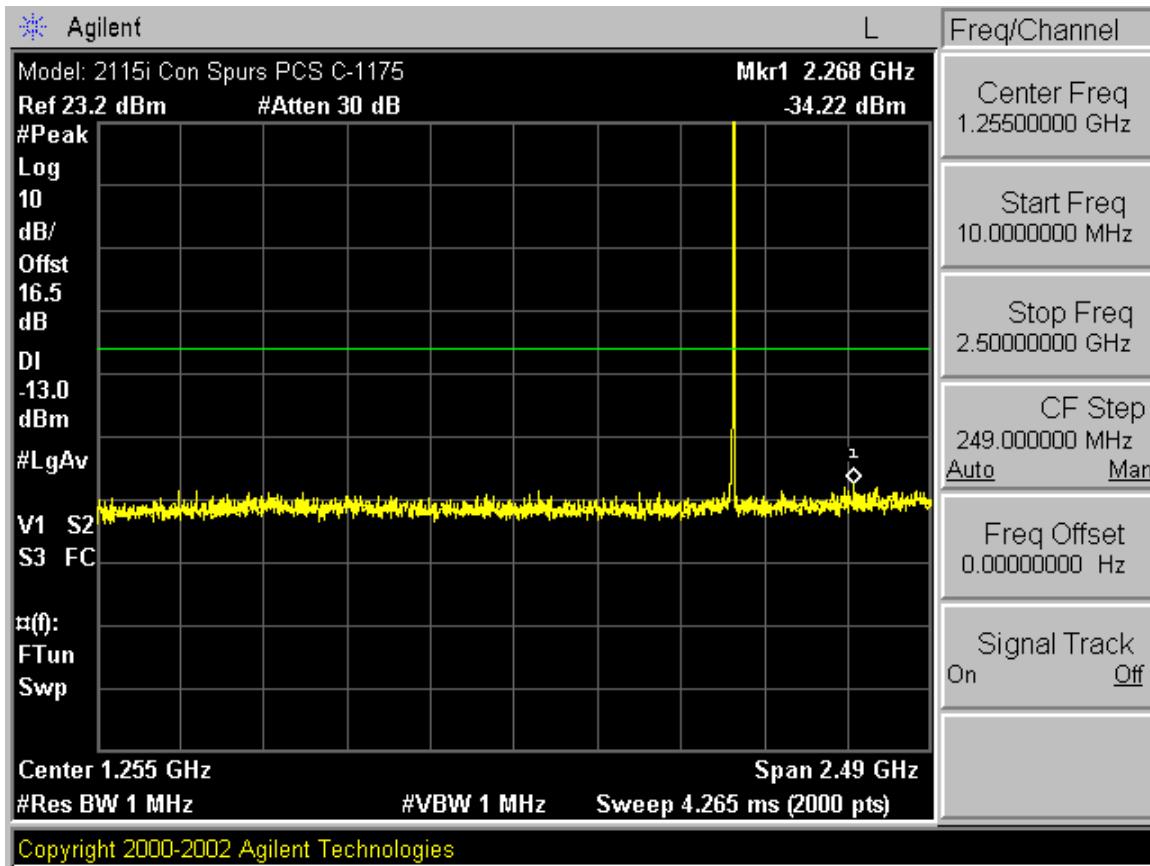


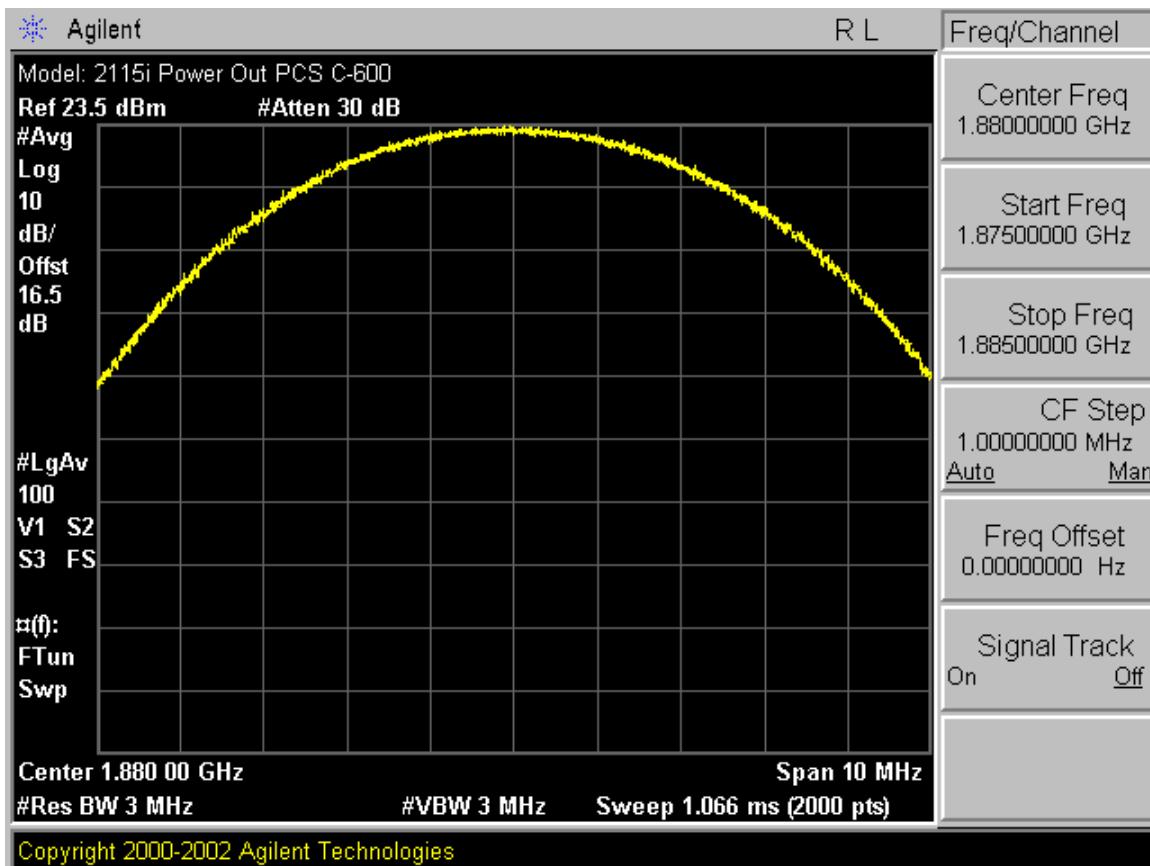
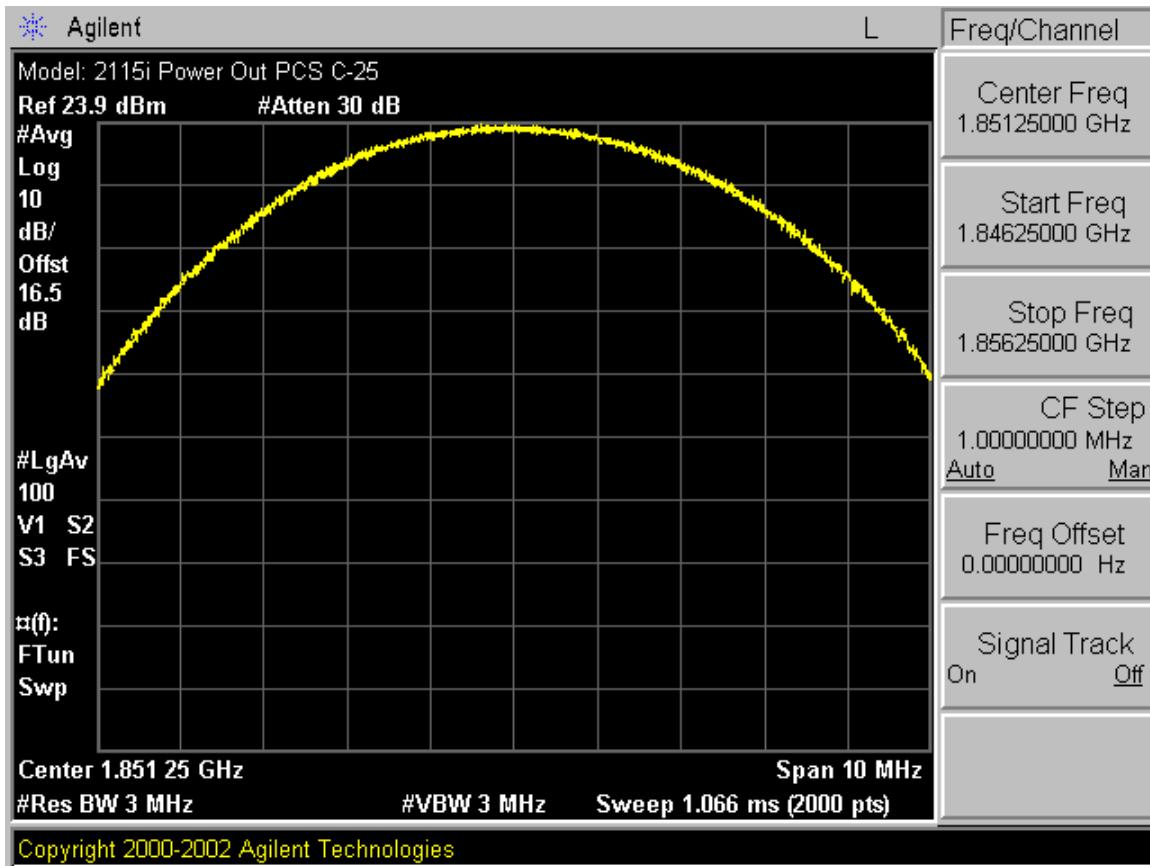


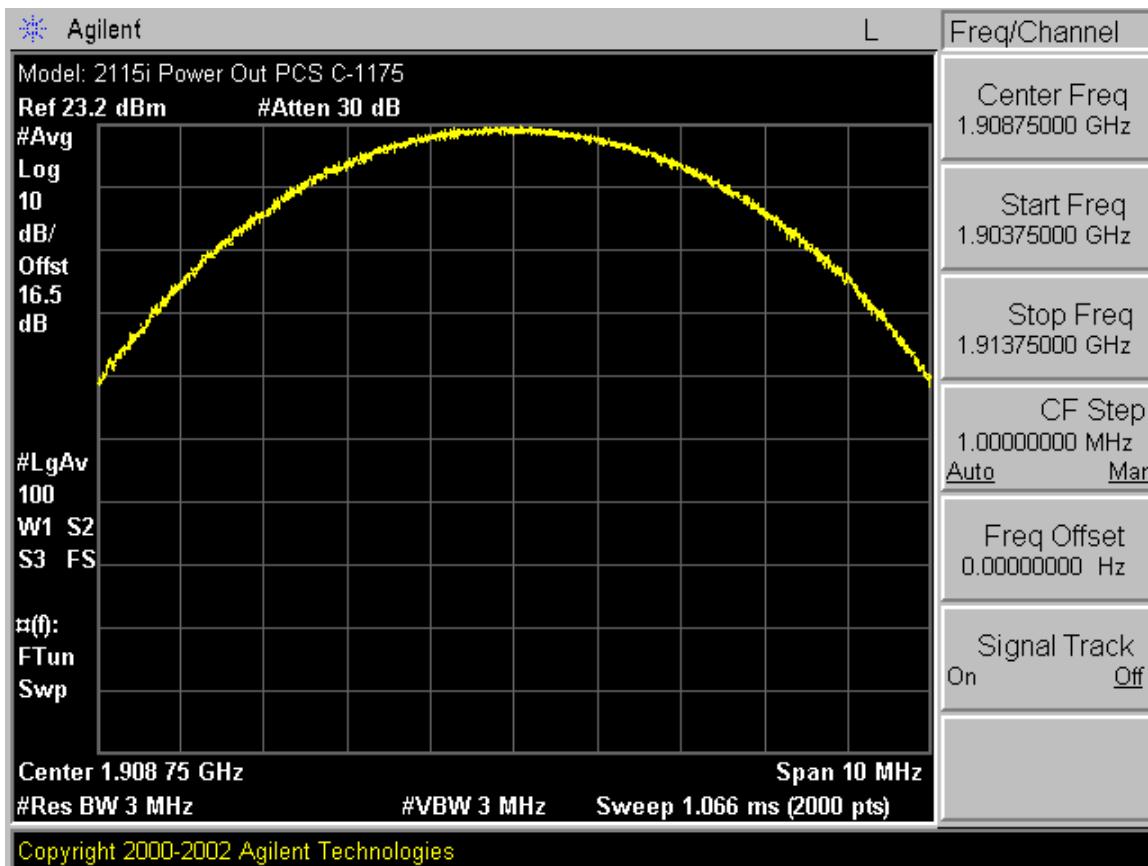
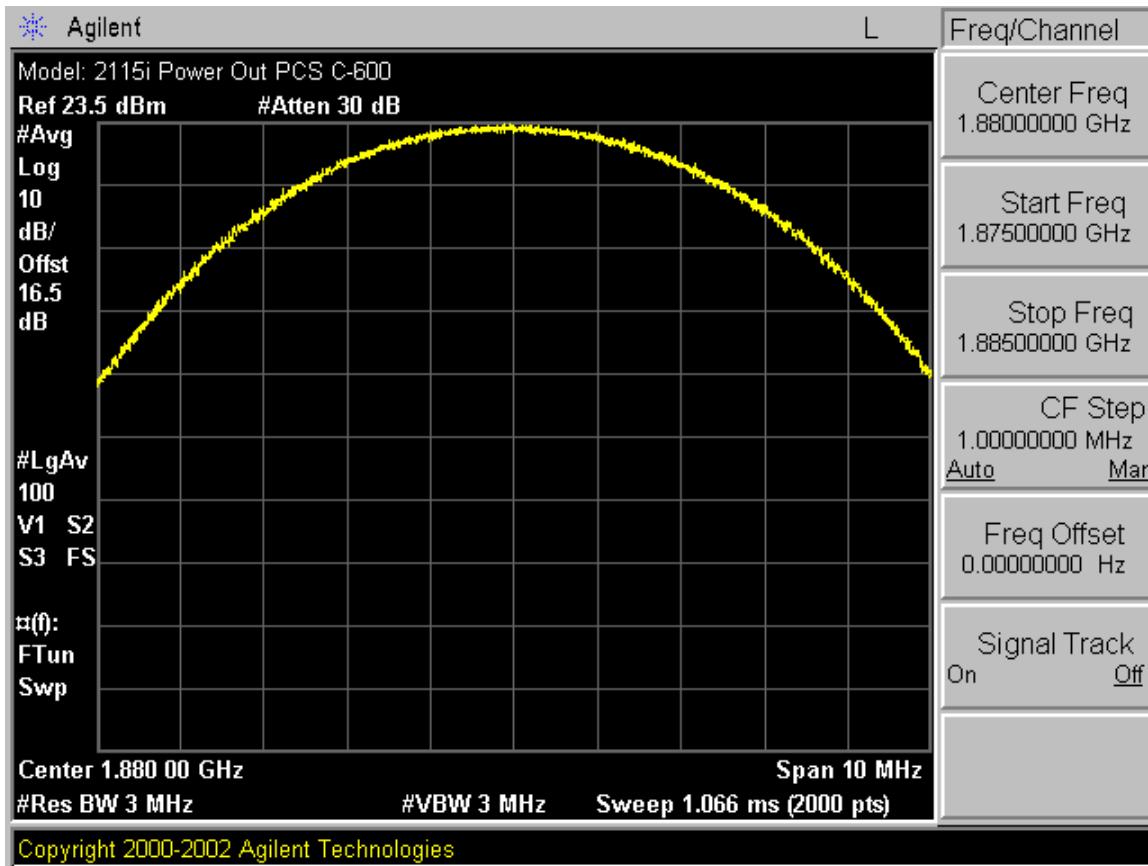


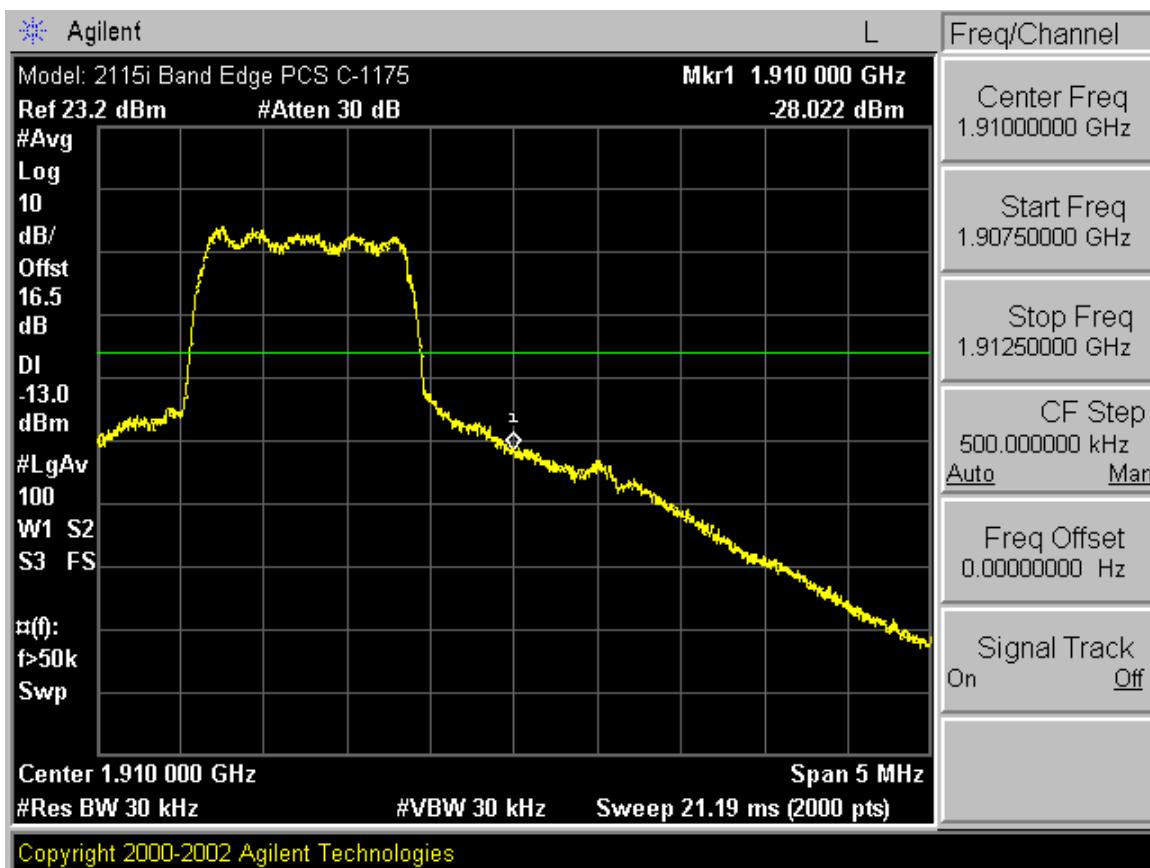
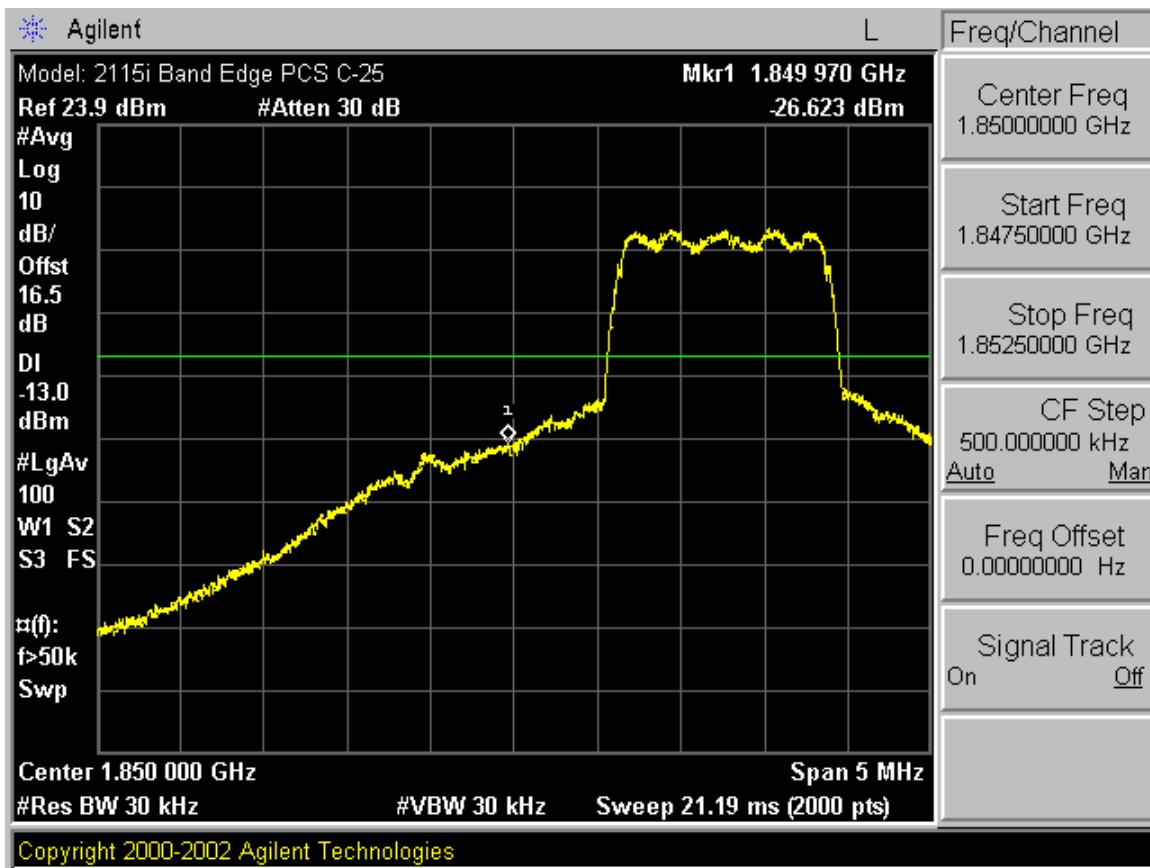


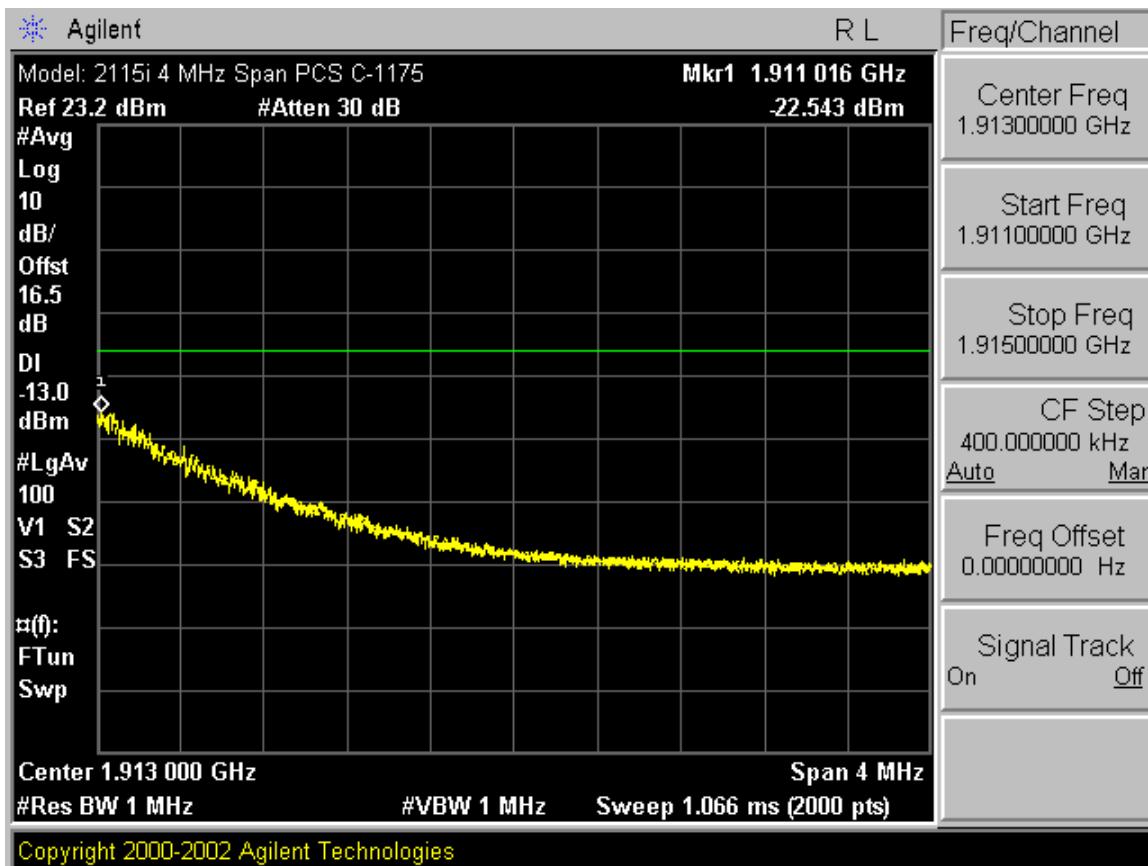
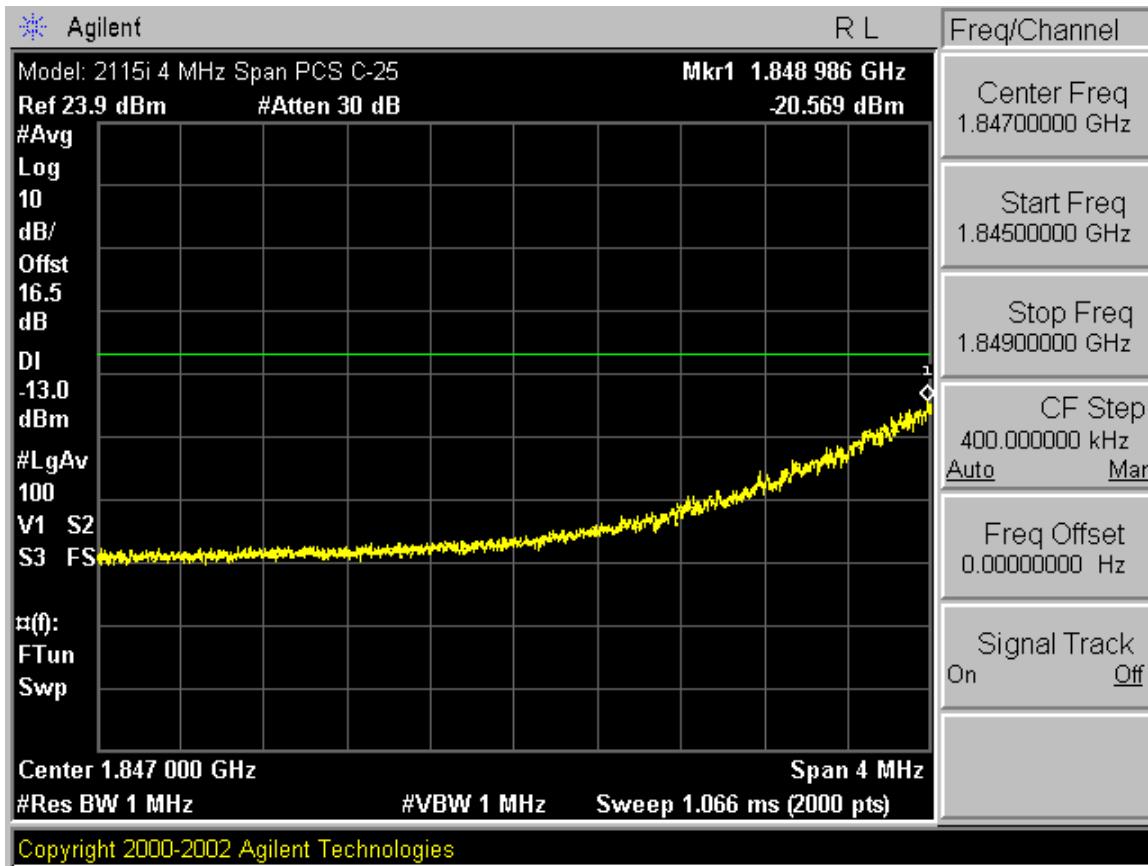


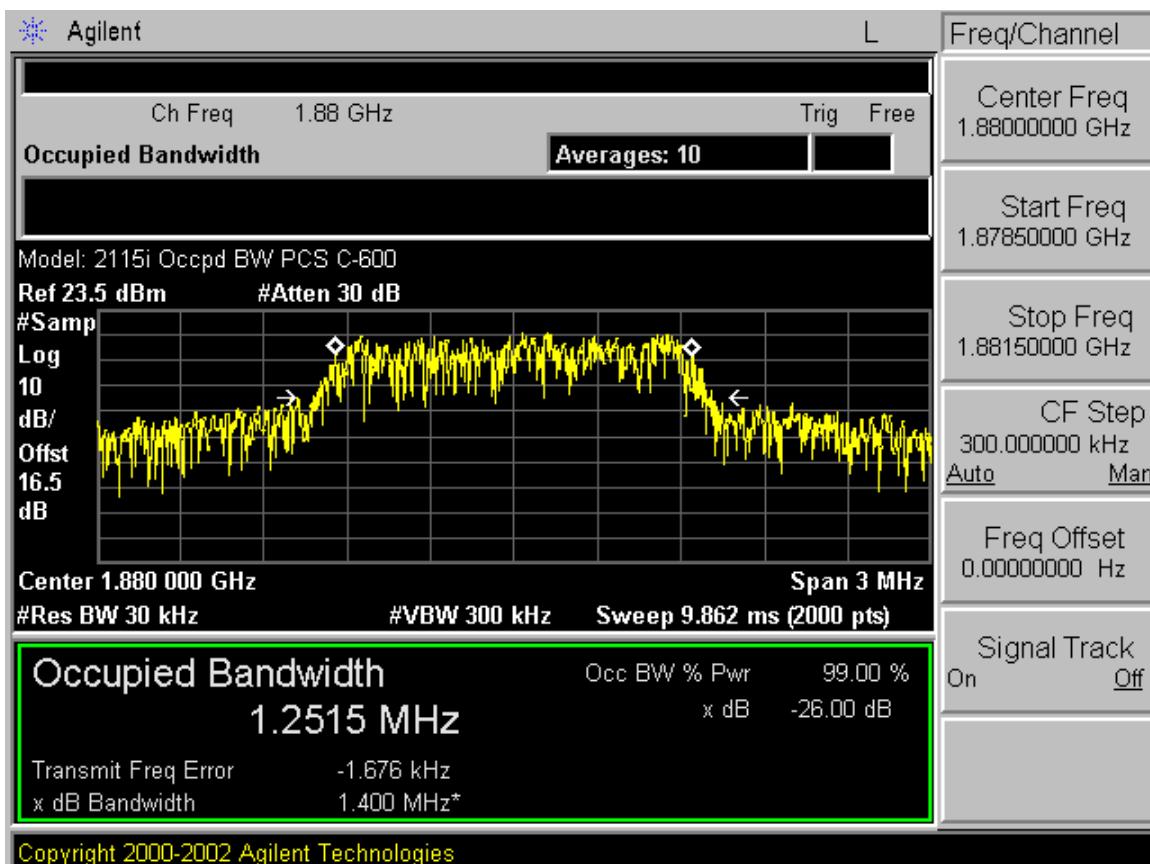
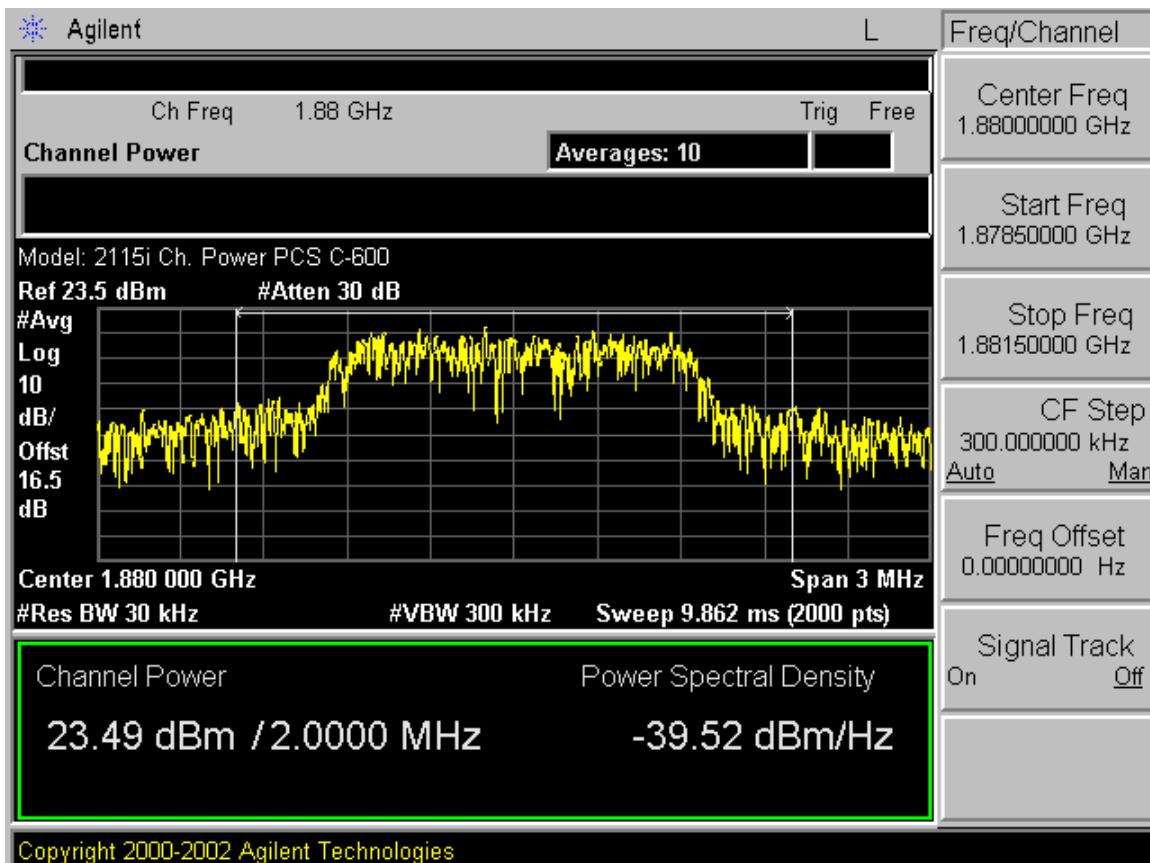












PCTEST Engineering Lab.

SPECTRUM ANALYZER PRESENTATION

FCC ID:Model: 2115i

NOKIA

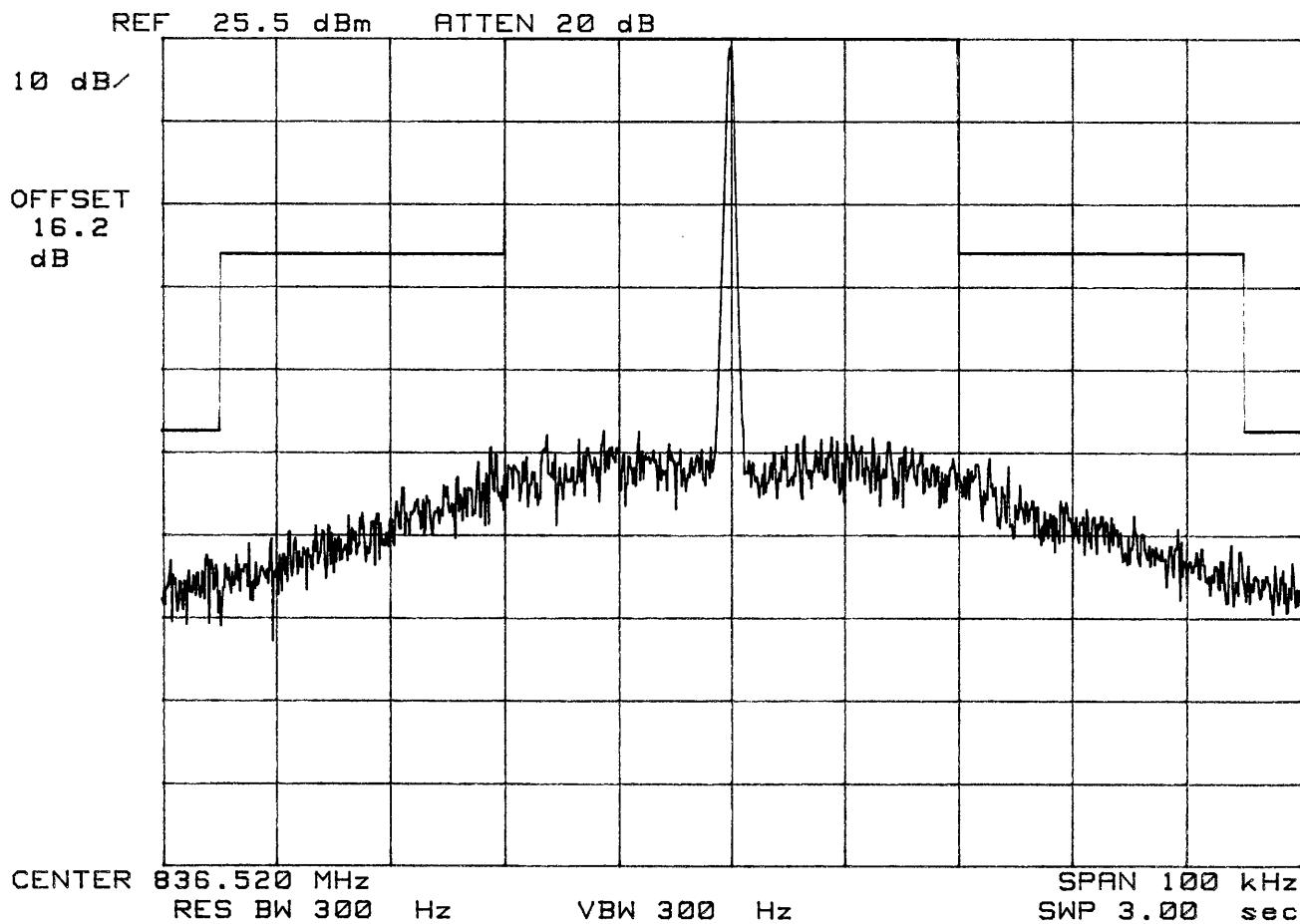
Tri-Mode Phone

FM Channel 384

Operating Frequency: 836.520 MHz

Output Power : 25.5 dBm

Test Mode:Unmodulated Signal



PCTEST Engineering Lab.

SPECTRUM ANALYZER PRESENTATION

FCC ID:Model: 2115i

NOKIA

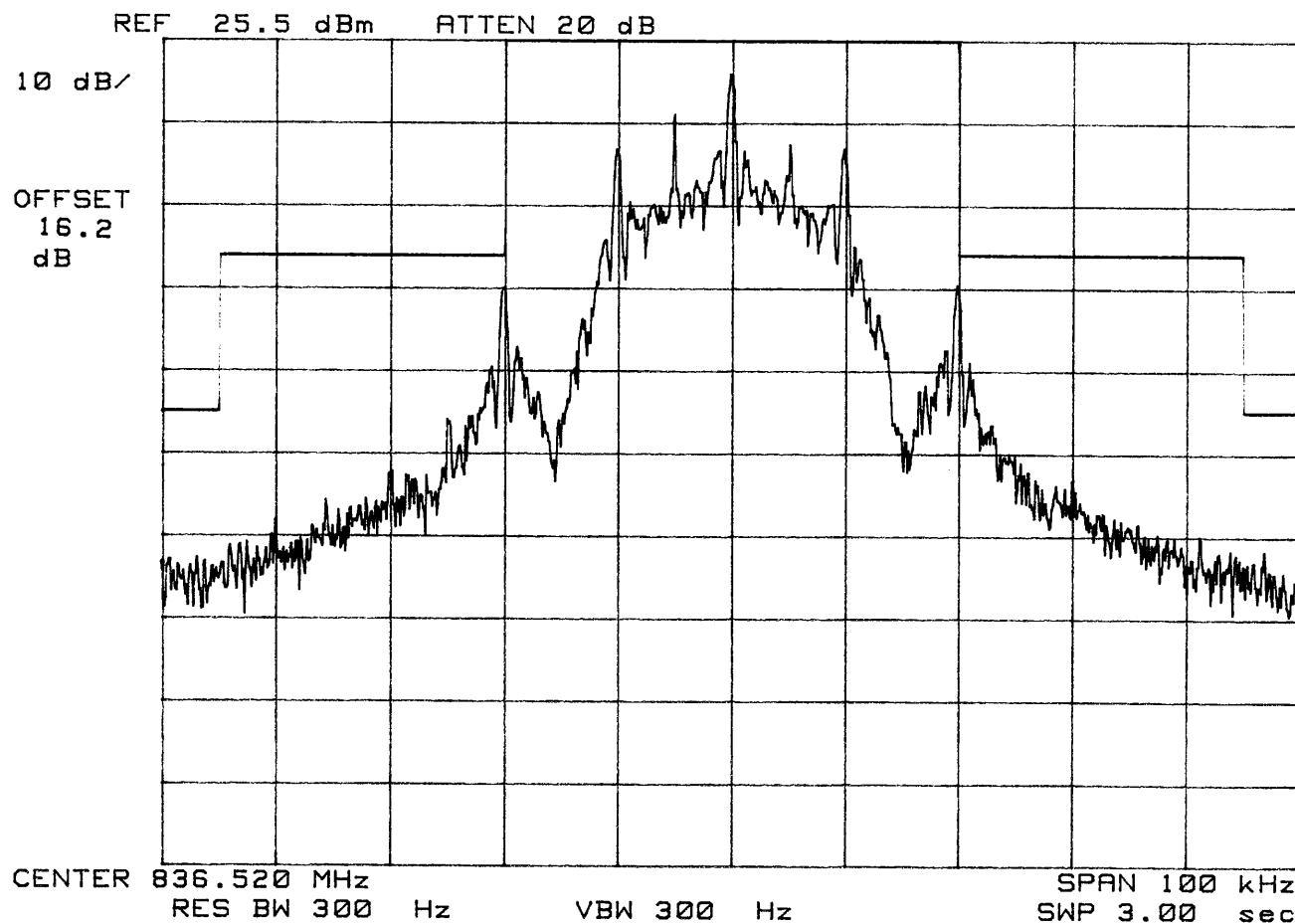
Tri-Mode Phone

FM Channel 384

Operating Frequency: 836.520 MHz

Output Power : 25.5 dBm

Test Mode:Wide Band Data



PCTEST Engineering Lab.

SPECTRUM ANALYZER PRESENTATION

FCC ID:Model: 2115i

NOKIA

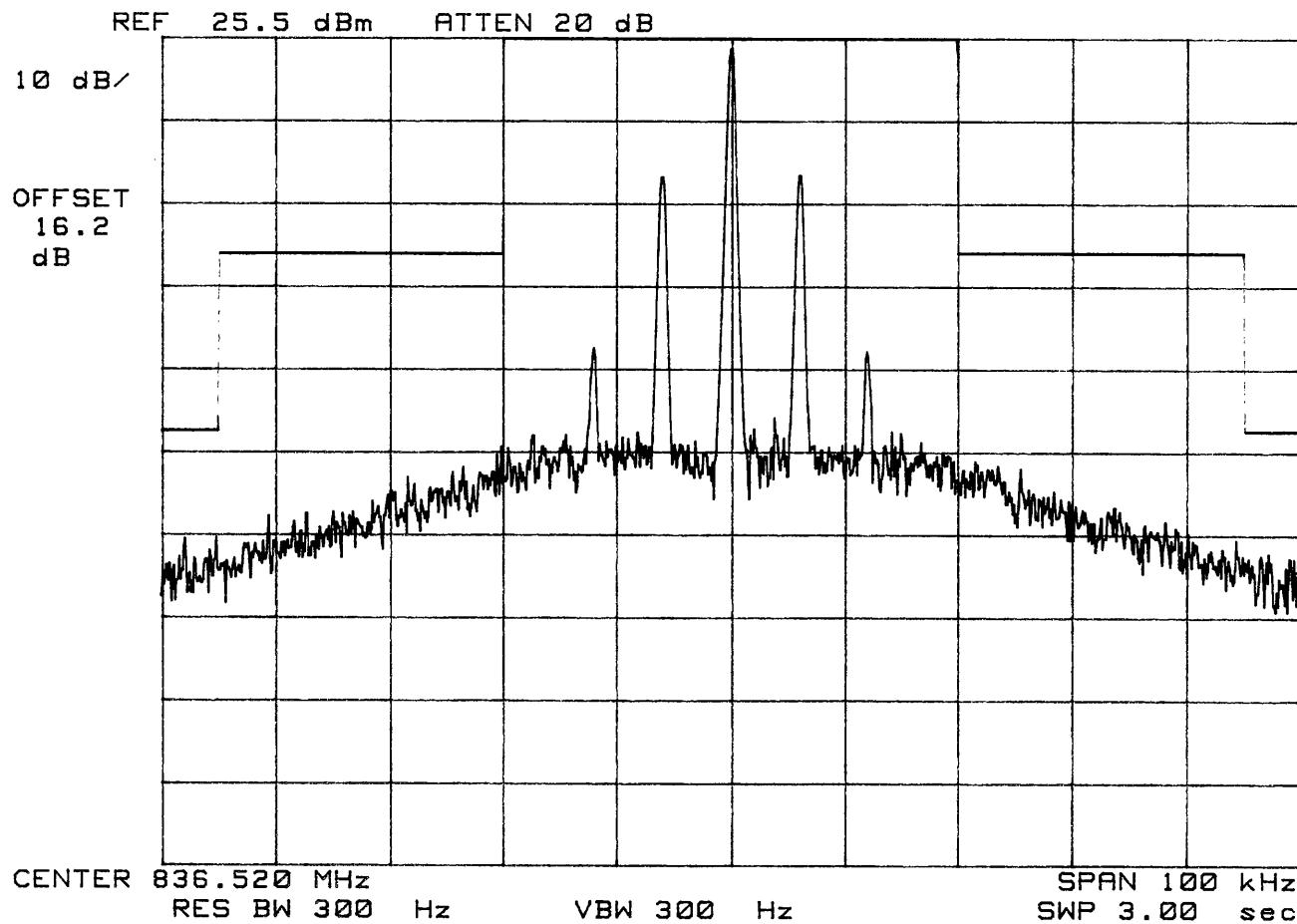
Tri-Mode Phone

FM Channel 384

Operating Frequency: 836.520 MHz

Output Power : 25.5 dBm

Test Mode: SAT



PCTEST Engineering Lab.

SPECTRUM ANALYZER PRESENTATION

FCC ID:Model: 2115i

NOKIA

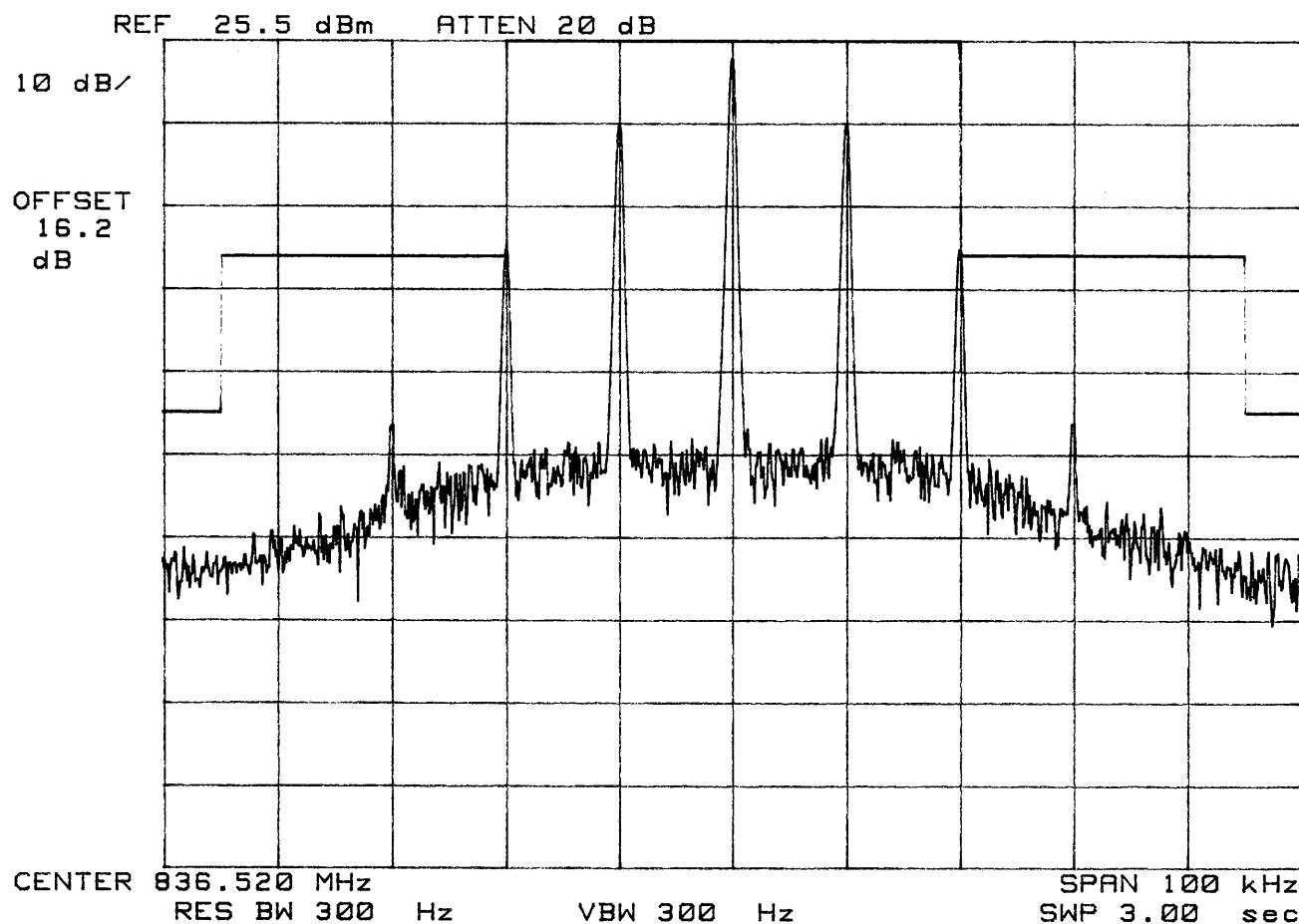
Tri-Mode Phone

FM Channel 384

Operating Frequency: 836.520 MHz

Output Power : 25.5 dBm

Test Mode:ST



PCTEST Engineering Lab.

SPECTRUM ANALYZER PRESENTATION

FCC ID:Model: 2115i

NOKIA

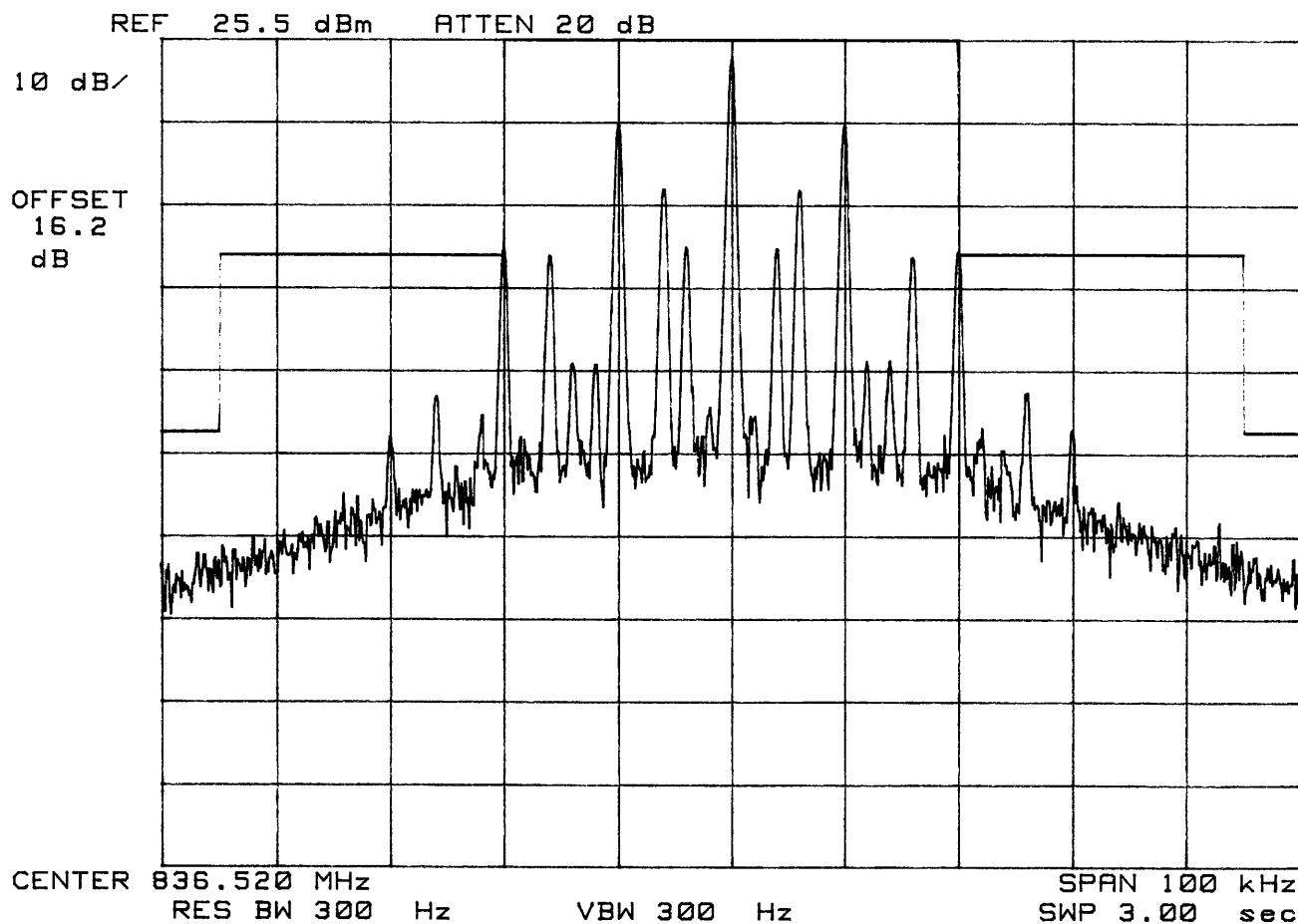
Tri-Mode Phone

FM Channel 384

Operating Frequency: 836.520 MHz

Output Power : 25.5 dBm

Test Mode: SAT + ST



PCTEST Engineering Lab.

SPECTRUM ANALYZER PRESENTATION

FCC ID: Model: 2115i

NOKIA

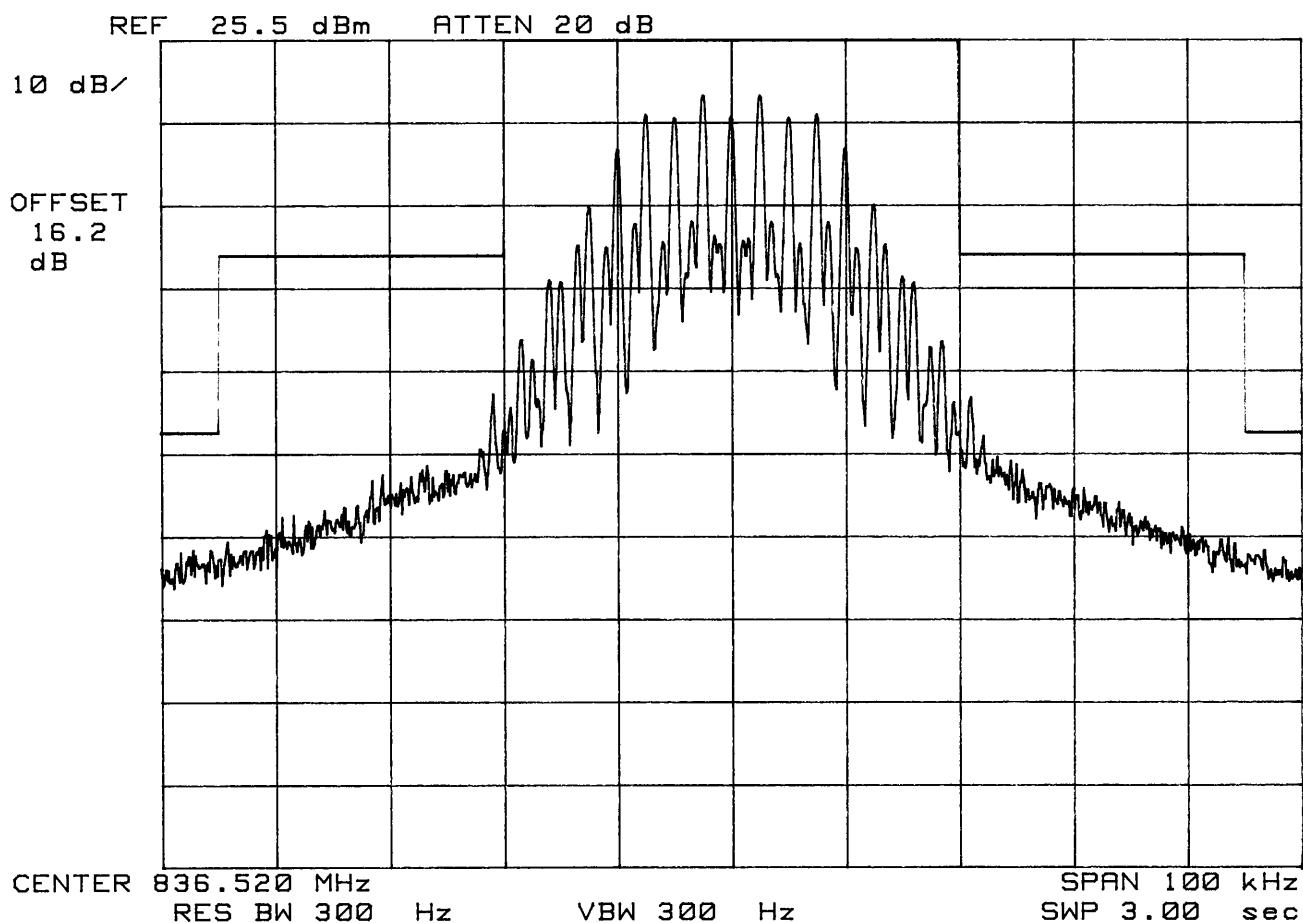
Tri-Mode Phone

FM Channel 384

Operating Frequency: 836.520 MHz

Output Power : 25.5 dBm

Test Mode: SAT + Voice



PCTEST Engineering Lab.

SPECTRUM ANALYZER PRESENTATION

FCC ID:Model: 2115i

NOKIA

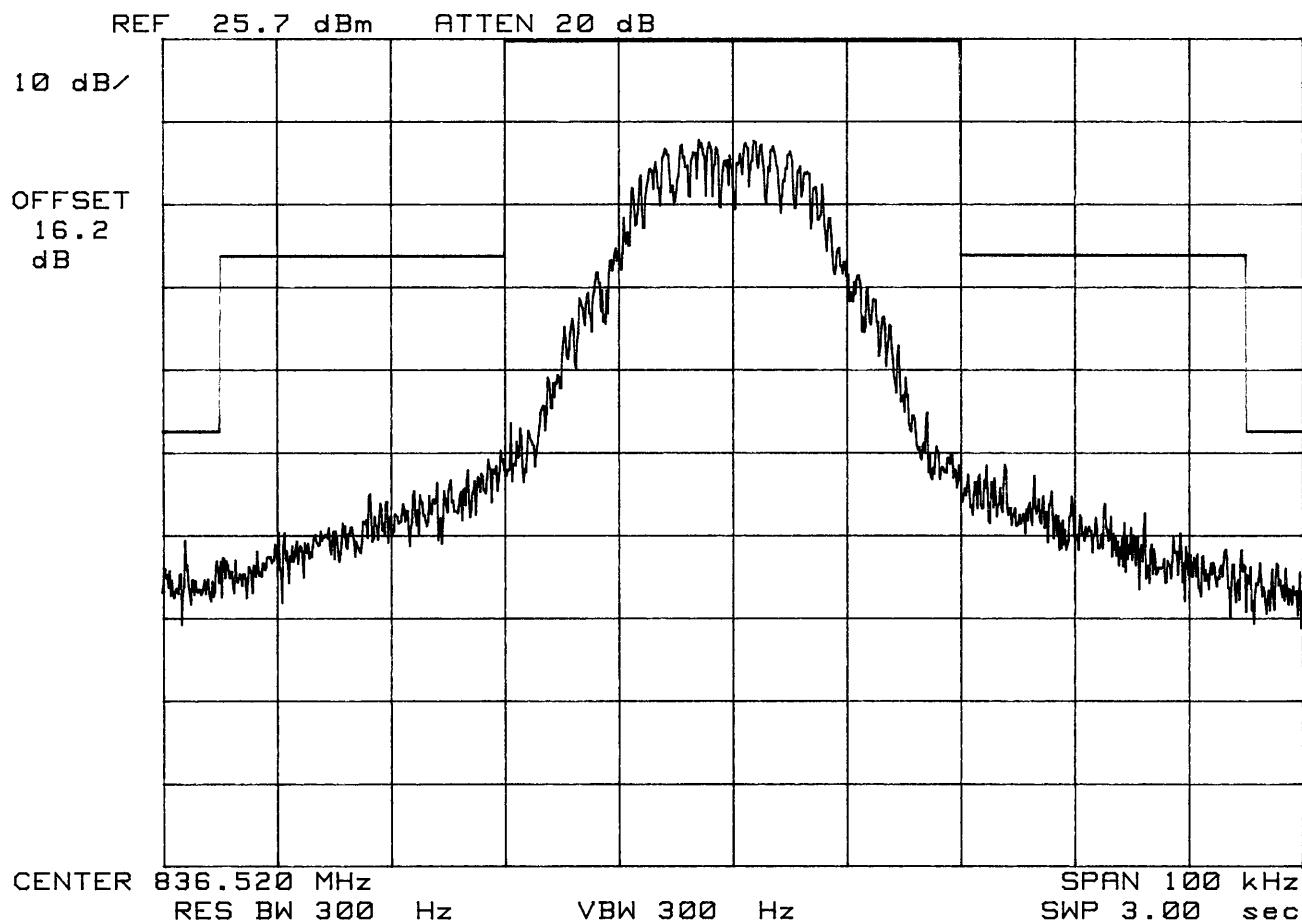
Tri-Mode Phone

FM Channel 384

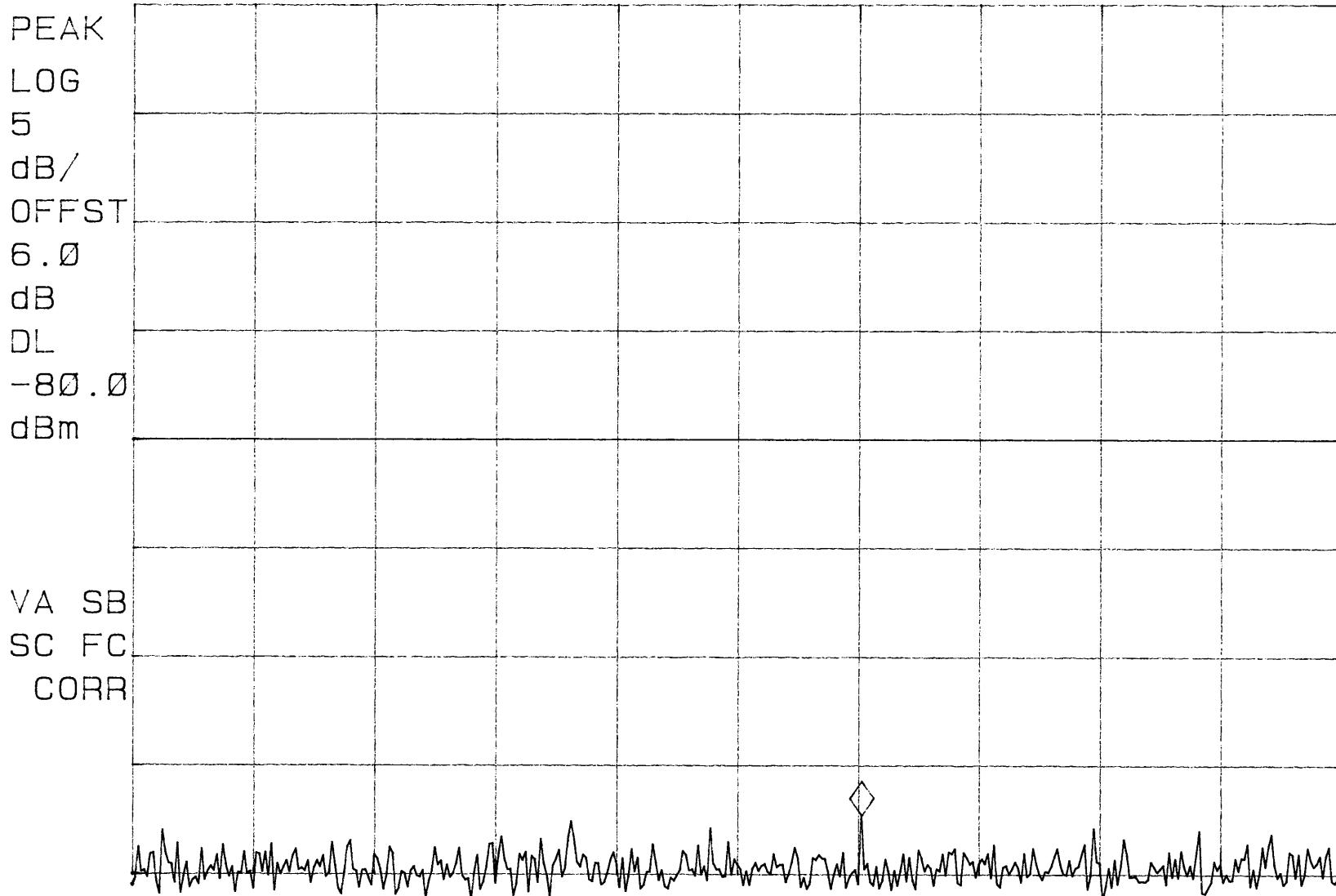
Operating Frequency: 836.520 MHz

Output Power : 25.5 dBm

Test Mode: SAT + DTMF



NOKIA Model: 2115i CDMA Mode MKR 884.06 MHz
REF -60.0 dBm ATTEN 10 dB PG 26.0 dB -97.28 dBm



START 869.00 MHz

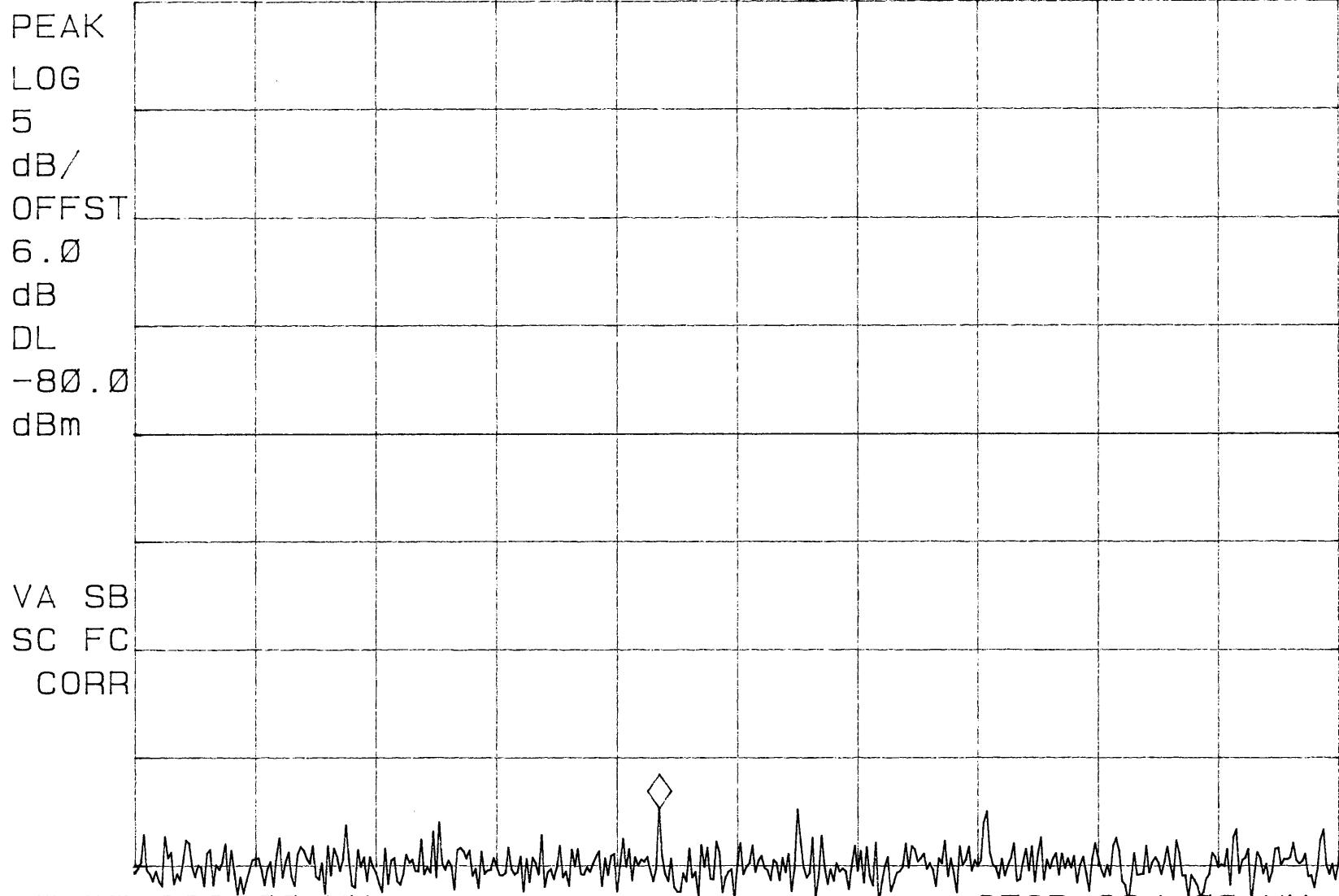
#RES BW 100 kHz

#VBW 300 kHz

STOP 894.00 MHz

SWP 20 msec

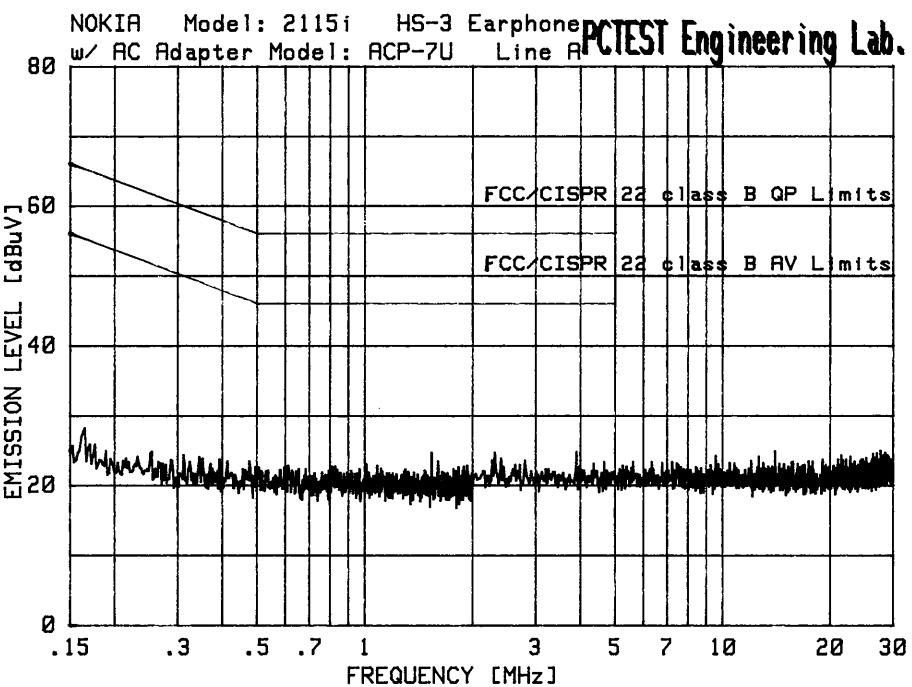
⚡ NOKIA Model: 2115i AMPS Mode MKR 879.87 MHz
REF -60.0 dBm ATTEN 10 dB PG 26.0 dB -97.34 dBm



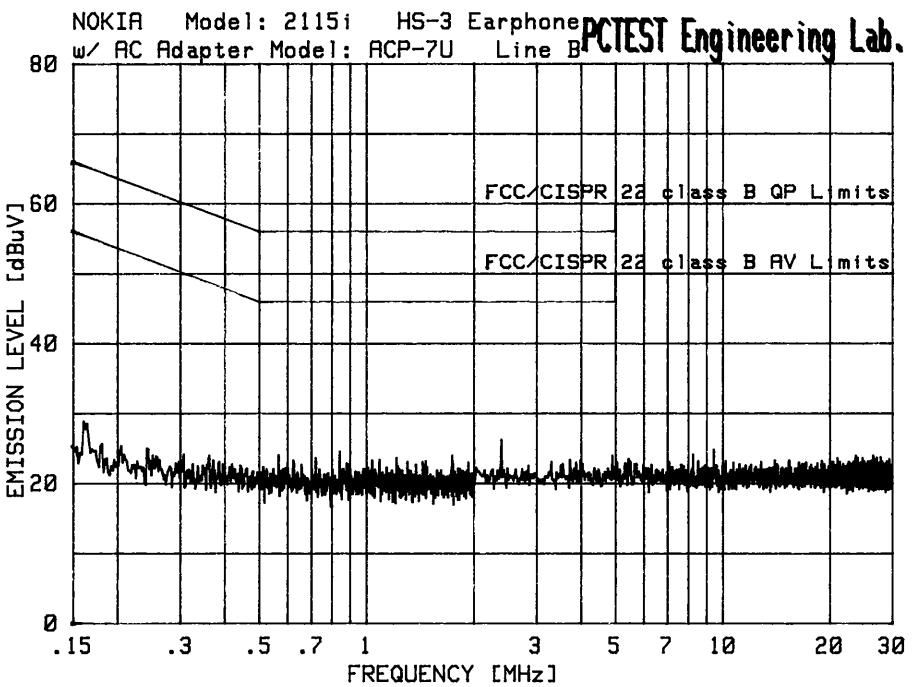
#RES BW 100 kHz

#VBW 300 kHz

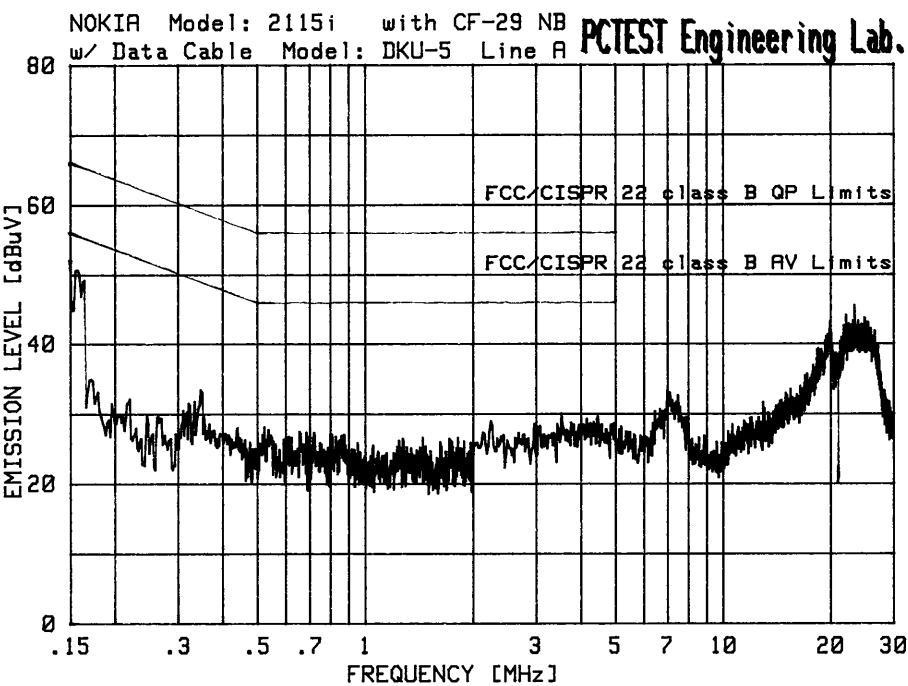
SWP 20 msec



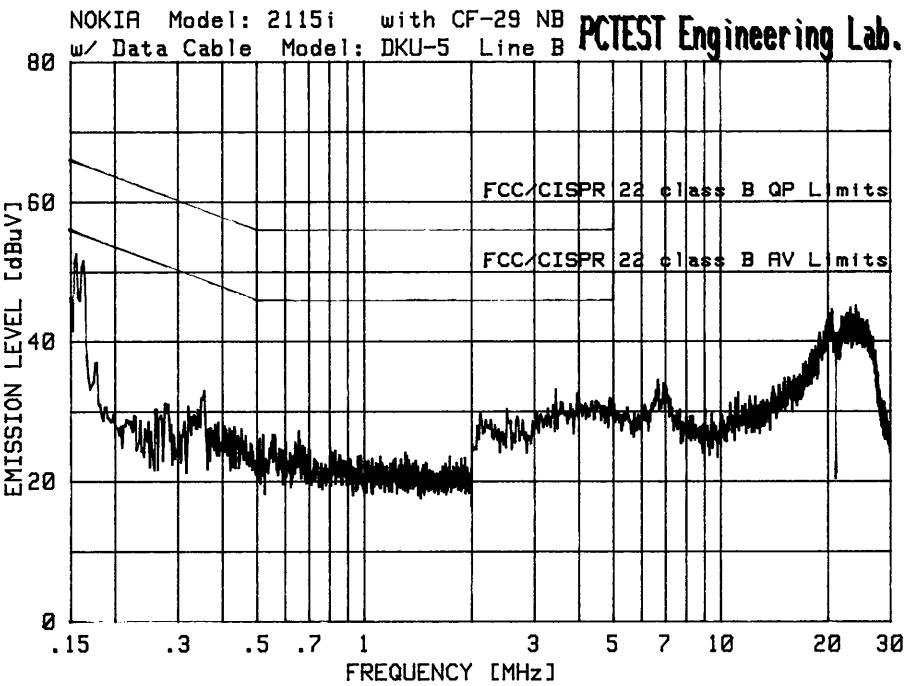
No.	Freq. [MHz]	Quasi-Pk [dBuV]	Limit [dBuV]	Margin [dB]	Average [dBuV]	Limit [dBuV]	Margin [dB]
1	3.831	20.57	56.00	-35.43	17.28	46.00	-28.72
2	1.536	21.80	56.00	-34.20	17.30	46.00	-28.70
3	2.305	20.65	56.00	-35.35	17.27	46.00	-28.73
4	2.361	20.77	56.00	-35.23	17.28	46.00	-28.72
5	2.699	20.68	56.00	-35.32	17.27	46.00	-28.73
6	1.581	21.43	56.00	-34.57	17.21	46.00	-28.79
7	4.561	20.42	56.00	-35.58	17.24	46.00	-28.76
8	.992	22.34	56.00	-33.66	17.28	46.00	-28.72
9	.476	24.27	56.41	-32.14	17.35	46.59	-29.24
10	.591	23.92	56.00	-32.08	17.35	46.00	-28.65



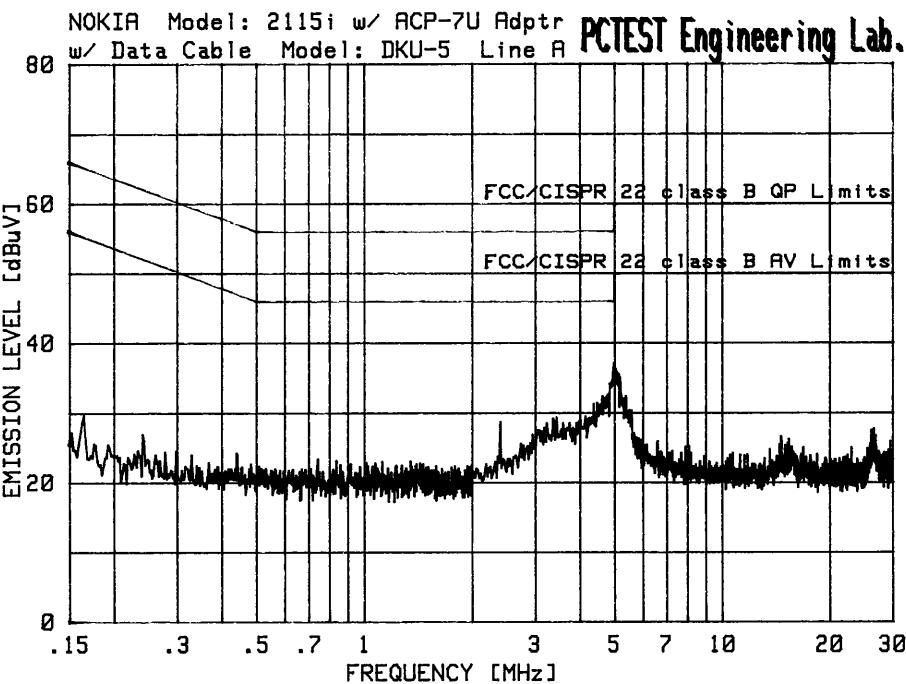
No.	Freq. [MHz]	Quasi-Pk [dBuV]	Limit [dBuV]	Margin [dB]	Average [dBuV]	Limit [dBuV]	Margin [dB]
1	2.357	20.93	56.00	-35.07	17.30	46.00	-28.70
2	.826	22.83	56.00	-33.17	17.33	46.00	-28.67
3	.548	23.65	56.00	-32.35	17.35	46.00	-28.65
4	1.743	21.27	56.00	-34.73	17.32	46.00	-28.68
5	4.820	20.39	56.00	-35.61	17.26	46.00	-28.74
6	.713	23.23	56.00	-32.77	17.36	46.00	-28.64
7	1.215	21.67	56.00	-34.33	17.29	46.00	-28.71
8	1.072	21.82	56.00	-34.18	17.26	46.00	-28.74
9	3.630	20.42	56.00	-35.58	17.28	46.00	-28.72
10	.613	23.89	56.00	-32.11	17.27	46.00	-28.73



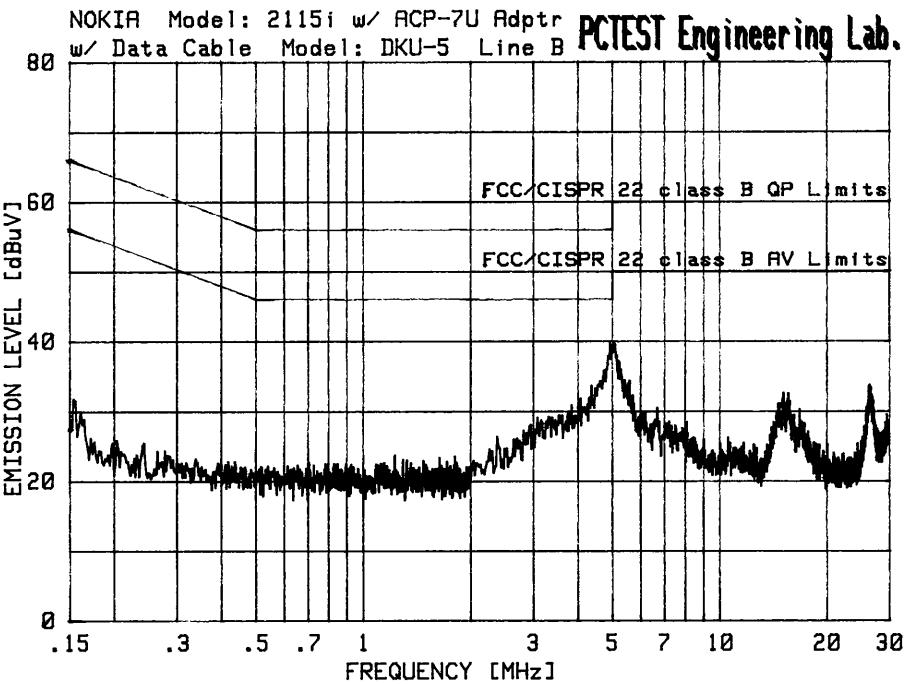
No.	Freq. [MHz]	Quasi-Pk [dBuV]	Limit [dBuV]	Margin [dB]	Average [dBuV]	Limit [dBuV]	Margin [dB]
1	.150	41.68	65.98	-24.30	23.04	56.00	-32.96
2	23.328	34.38	60.00	-25.62	27.19	50.00	-22.81
3	.150	40.46	65.98	-25.52	22.77	56.00	-33.23
4	22.092	33.33	60.00	-26.67	26.10	50.00	-23.90
5	23.393	34.87	60.00	-25.13	27.79	50.00	-22.21
6	24.961	34.07	60.00	-25.93	27.13	50.00	-22.87
7	24.999	36.43	60.00	-23.57	26.86	50.00	-23.14
8	23.930	34.62	60.00	-25.38	27.34	50.00	-22.66
9	19.963	34.76	60.00	-25.24	27.07	50.00	-22.93
10	25.436	33.83	60.00	-26.17	27.07	50.00	-22.93



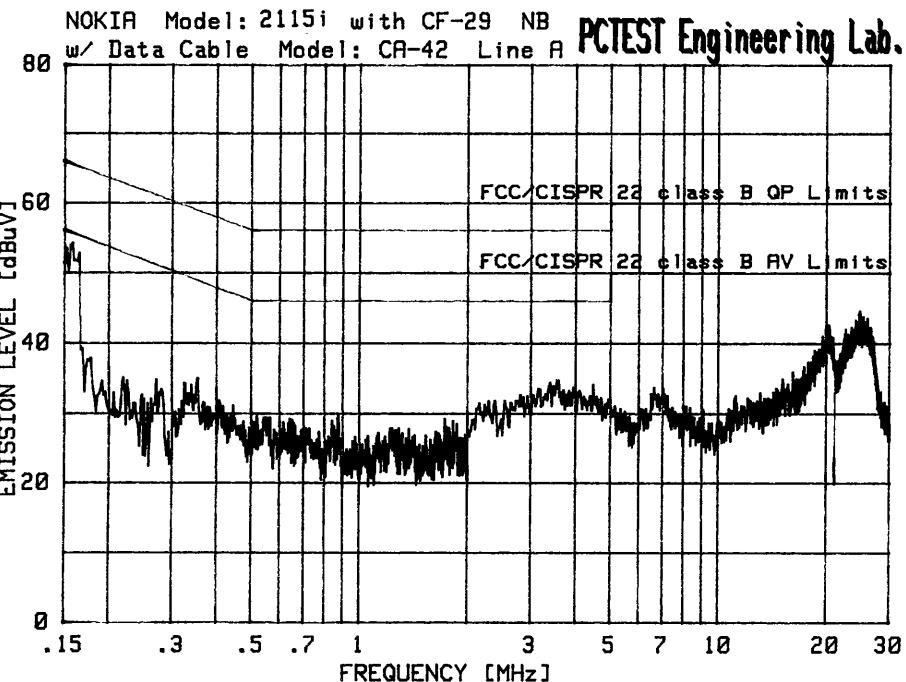
No.	Freq. [MHz]	Quasi-Pk [dBuV]	Limit [dBuV]	Margin [dB]	Average [dBuV]	Limit [dBuV]	Margin [dB]
1	.150	47.98	65.98	-18.00	24.52	56.00	-31.48
2	.163	48.16	65.29	-17.13	24.30	55.83	-31.53
3	23.981	35.98	60.00	-24.02	28.96	50.00	-21.04
4	23.062	35.74	60.00	-24.26	28.75	50.00	-21.25
5	20.433	36.61	60.00	-23.39	29.50	50.00	-20.50
6	23.949	36.05	60.00	-23.95	28.84	50.00	-21.16
7	24.335	35.61	60.00	-24.39	28.30	50.00	-21.70
8	20.062	36.08	60.00	-23.92	28.51	50.00	-21.49
9	22.607	35.77	60.00	-24.23	28.08	50.00	-21.92
10	24.109	35.90	60.00	-24.10	28.51	50.00	-21.49



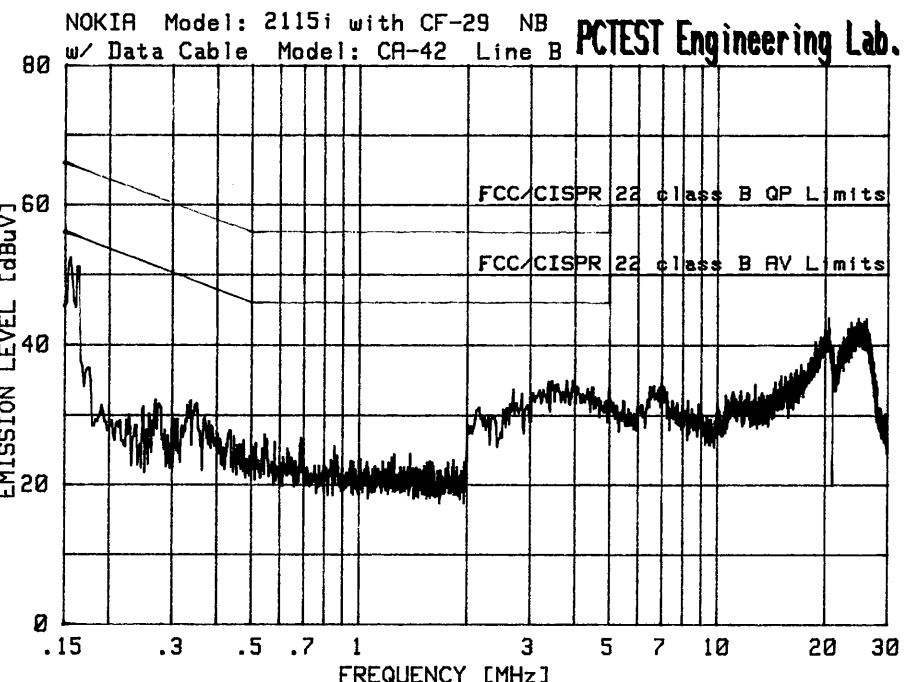
No.	Freq. [MHz]	Quasi-Pk [dBuV]	Limit [dBuV]	Margin [dB]	Average [dBuV]	Limit [dBuV]	Margin [dB]
1	4.968	31.02	56.00	-24.98	21.89	46.00	-24.11
2	4.382	24.72	56.00	-31.28	18.73	46.00	-27.27
3	3.356	23.00	56.00	-33.00	18.34	46.00	-27.66
4	2.402	22.05	56.00	-33.95	17.81	46.00	-28.19
5	3.246	22.23	56.00	-33.77	17.95	46.00	-28.05
6	5.475	24.87	60.00	-35.13	19.98	50.00	-30.02
7	26.501	22.38	60.00	-37.62	19.29	50.00	-30.71
8	26.089	21.74	60.00	-38.26	18.74	50.00	-31.26
9	.722	23.17	56.00	-32.83	17.31	46.00	-28.69
10	.421	24.20	57.43	-33.23	17.56	47.24	-29.68



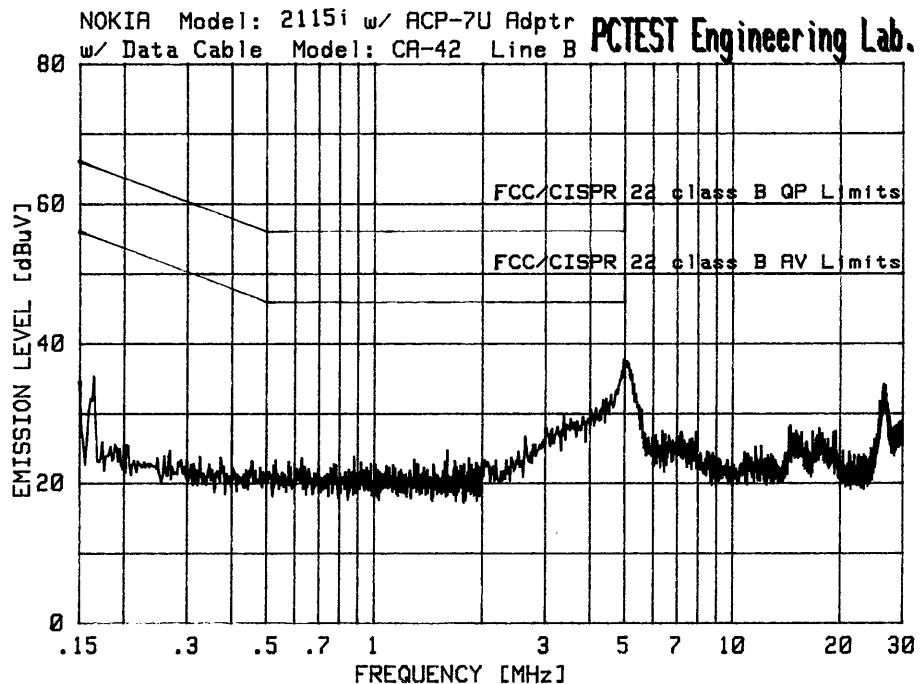
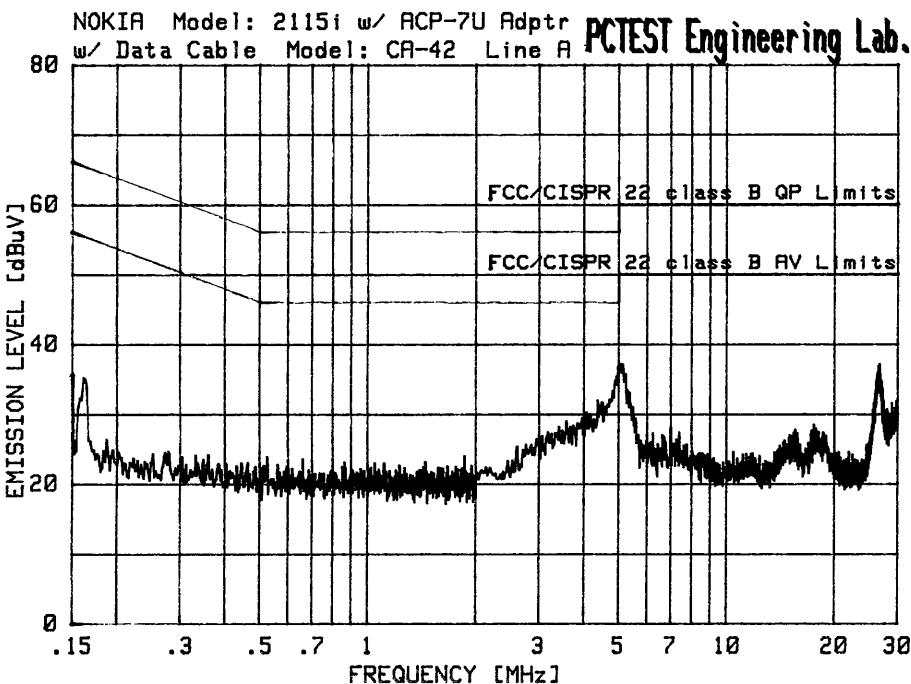
No.	Freq. [MHz]	Quasi-Pk [dBuV]	Limit [dBuV]	Margin [dB]	Average [dBuV]	Limit [dBuV]	Margin [dB]
1	4.929	34.46	56.00	-21.54	24.47	46.00	-21.53
2	4.564	28.37	56.00	-27.63	19.84	46.00	-26.16
3	4.058	25.71	56.00	-30.29	19.78	46.00	-26.22
4	26.328	26.47	60.00	-33.53	20.82	50.00	-29.18
5	26.195	26.01	60.00	-33.99	20.33	50.00	-29.67
6	26.546	27.08	60.00	-32.92	20.88	50.00	-29.12
7	26.247	26.25	60.00	-33.75	20.65	50.00	-29.35
8	15.124	26.01	60.00	-33.99	19.67	50.00	-30.33
9	15.559	26.46	60.00	-33.54	19.85	50.00	-30.15
10	26.926	25.06	60.00	-34.94	19.83	50.00	-30.17



No.	Freq. [MHz]	Quasi-Pk [dBuV]	Limit [dBuV]	Margin [dB]	Average [dBuV]	Limit [dBuV]	Margin [dB]
1	.150	43.52	65.98	-22.46	23.44	56.00	-32.56
2	24.716	35.92	60.00	-24.08	28.73	50.00	-21.27
3	24.601	36.05	60.00	-23.95	29.01	50.00	-20.99
4	25.253	35.95	60.00	-24.05	28.56	50.00	-21.44
5	25.049	36.18	60.00	-23.82	29.11	50.00	-20.89
6	26.023	35.31	60.00	-24.69	27.89	50.00	-22.11
7	24.112	35.79	60.00	-24.21	28.53	50.00	-21.47
8	24.578	35.76	60.00	-24.24	29.20	50.00	-20.80
9	24.471	37.60	60.00	-22.40	28.55	50.00	-21.45
10	25.701	35.61	60.00	-24.39	28.56	50.00	-21.44



No.	Freq. [MHz]	Quasi-Pk [dBuV]	Limit [dBuV]	Margin [dB]	Average [dBuV]	Limit [dBuV]	Margin [dB]
1	.150	48.21	65.98	-17.77	24.43	56.00	-31.57
2	20.481	35.53	60.00	-24.47	28.57	50.00	-21.43
3	24.805	35.32	60.00	-24.68	28.60	50.00	-21.40
4	26.140	35.15	60.00	-24.85	27.91	50.00	-22.09
5	25.826	35.41	60.00	-24.59	28.13	50.00	-21.87
6	23.663	34.78	60.00	-25.22	27.49	50.00	-22.51
7	24.552	35.65	60.00	-24.35	28.76	50.00	-21.24
8	25.122	35.81	60.00	-24.19	28.51	50.00	-21.49
9	24.943	35.68	60.00	-24.32	28.60	50.00	-21.40
10	25.594	35.63	60.00	-24.37	28.26	50.00	-21.74



No.	Freq. [MHz]	Quasi-Pk [dBuV]	Limit [dBuV]	Margin [dB]	Average [dBuV]	Limit [dBuV]	Margin [dB]
1	4.964	31.67	56.00	-24.33	21.71	46.00	-24.29
2	26.678	29.78	60.00	-30.22	22.53	50.00	-27.47
3	26.531	28.18	60.00	-31.82	22.16	50.00	-27.84
4	26.266	27.63	60.00	-32.37	21.56	50.00	-28.44
5	26.919	31.84	60.00	-28.16	21.83	50.00	-28.17
6	26.099	26.46	60.00	-33.54	21.34	50.00	-28.66
7	27.195	27.15	60.00	-32.85	21.03	50.00	-28.97
8	3.554	22.71	56.00	-33.29	18.38	46.00	-27.62
9	3.680	22.89	56.00	-33.11	18.40	46.00	-27.60
10	27.354	26.25	60.00	-33.75	20.37	50.00	-29.63

No.	Freq. [MHz]	Quasi-Pk [dBuV]	Limit [dBuV]	Margin [dB]	Average [dBuV]	Limit [dBuV]	Margin [dB]
1	4.970	31.73	56.00	-24.27	20.25	46.00	-25.75
2	4.555	27.24	56.00	-28.76	19.41	46.00	-26.59
3	4.160	24.96	56.00	-31.04	19.57	46.00	-26.43
4	26.473	26.52	60.00	-33.48	21.01	50.00	-28.99
5	26.976	26.18	60.00	-33.82	20.47	50.00	-29.53
6	3.247	22.26	56.00	-33.74	18.27	46.00	-27.73
7	25.881	23.83	60.00	-36.17	19.05	50.00	-30.95
8	2.547	20.97	56.00	-35.03	17.35	46.00	-28.65
9	5.577	24.57	60.00	-35.43	18.68	50.00	-31.32
10	.150	29.27	65.99	-36.72	21.40	55.71	-34.31