



Nemko

Test Report:

5W42297

Applicant:

VTech Engineering Canada
200-7671 Alderbridge Way
Richmond, BC
V6X 1Z9

Apparatus:

VTECH 2625

FCC ID:

EW780-5312-00

In Accordance With:

FCC Part 15 Subpart C, 15.247
FHSS System and Digitally Modulated Radiators
902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz
Class II Permissive Change

Tested By:

Nemko Canada Inc.
303 River Road
Ottawa, Ontario
K1V 1H2

Authorized By:

Sim Jagpal, Resource Manager

Date:

27 April 2005

Total Number of Pages:

36

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed:	VTECH 2625
Specification:	FCC Part 15 Subpart C, 15.247, Class II Permissive Change
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release

Author: Jason Nixon, Telecom Specialist

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows:

VTECH 2625

1.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
1	VTECH 2625 Base	GA: 12/04 0338
2	VTECH 2625 Handset	_____
5	VTECH 2625 Base, modified for conducted measurement	GA:12/04 0331
6	VTECH 2625 Handset, modified for conducted measurement	_____
19	Component Telephone Power supply CLASS 2 (M/N U093040D)	_____
33	Charger	_____
35	Headset	_____

The first samples were received on: April 5, 2005

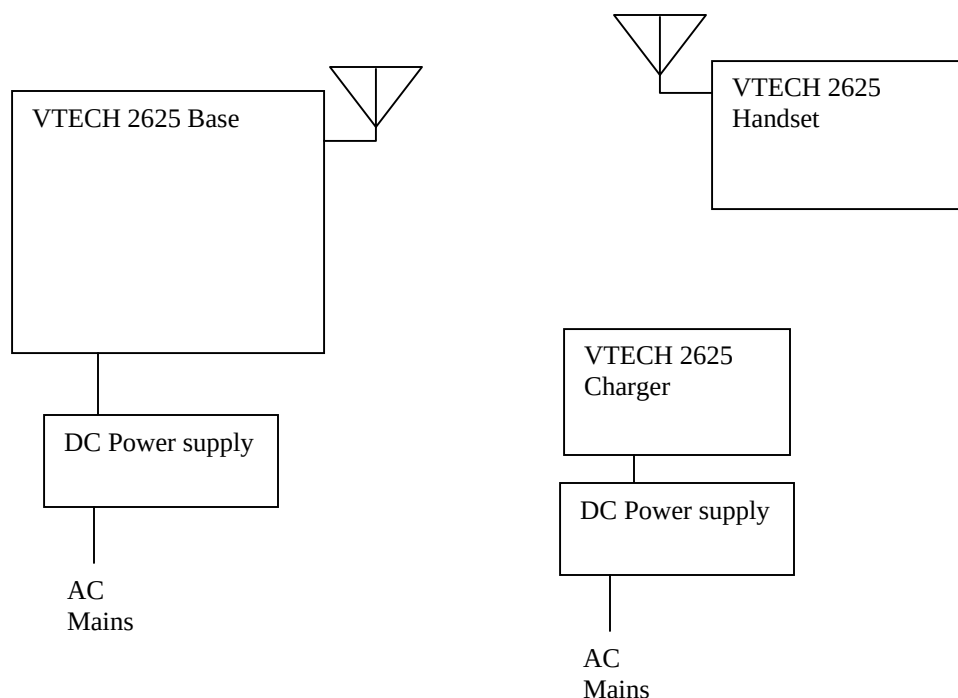
1.3 Theory of Operation

The EUT is a 2.4GHz cordless phone. The Handset and Base are used together with a charger
Base used only for charging the Handset.

1.4 Technical Specifications of the EUT

Manufacturer:	VTECH Engineering Canada
Operating Frequency:	2401.056 - 2482.272MHz
Peak Output Power (Measured):	BS: 0.112W HS: 0.108W
Emission Designator:	733K3F1D
Rated Power:	BS: 125mW (21dBm) HS: 125mW (21dBm)
Modulation:	GFSK
Antenna Data:	BS: 0dBi HS: 0dBi

1.5 Block Diagram of the EUT



Section 2 : Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247

FHSS System and Digitally Modulated Radiators

902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz

2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 °C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Last Cal.	Next Cal.
LISN	EMCO	4825/2	FA001545	Jan. 13/05	Jan. 13/06
Transient Limiter	Hewlett-Packard	1194 7A	FA000975	June 10/04	June 10/05
Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	May 28/04	May 28/05
Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	May 28/04	May 28/05
Receiver	Rohde & Schwarz	ESVS-30	FA001437	July 26/04	July 26/05
Biconical (2) Antenna	EMCO	3109	FA000904	Aug. 03/04	Aug. 03/05
Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Aug. 26/04	Aug. 26/05
Horn Antenna #1	EMCO	3115	FA000649	Dec. 22/04	Dec. 22/05
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	June 18/04	June 18/05
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	June 18/04	June 18/05
5.0 – 18.0 GHz Amplifier	NARDA	DWT-186N23U40	FA001409	COU	COU
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU	COU
Horn 18 – 40 GHz	EMCO	3116	FA001847	Apr 19/04	Apr 19/05

Section 3 : Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

3.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

3.4 Test Deleted

No Tests were deleted from this assessment.

3.5 Changes to EUT for Class II Permissive Change

The following changes have been performed to the EUT as declared by the manufacturer:

The manufacturer has removed 7 inductors from the transmitter circuit, changed to a one-piece shield can and reduced the design to have only 1 supply voltage. The result is a regulator deleted from the circuit in both the handset and base. The Tx frequency deviation has changed to 200kHz from 180kHz.

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart C : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

- N No : not applicable / not relevant.
- Y Yes : Mandatory i.e. the apparatus shall conform to these tests.
- N/T Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

4.1 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.207(a)	Powerline Conducted Emissions	Y	PASS
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS
15.247(a)(1)	Frequency hopping systems	Y	PASS
15.247(a)(1)(i)	Frequency hopping systems operating in the 902-928 MHz band	N	PASS
15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725-5850 MHz band	N	
15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400-2483.5 MHz band	N*	
15.247(a)(2)	Systems using digital modulation techniques	N	
15.247(b)(1)	Maximum peak output power of Frequency hopping systems operating in the 2400-2483.5 MHz band and 5725-5850 MHz band	Y	
15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902-928 MHz band	N	PASS
15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands	N	
15.247(b)(4)	Maximum peak output power	N	
15.247(c)(1)	Fixed point-to-point Operation with directional antenna gains greater than 6 dBi	N	
15.247(c)(2)	Transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams	N	
15.247(d)	Radiated Emissions Not in Restricted Bands	Y	PASS
15.247(e)	Power Spectral Density for Digitally Modulated Devices	N	
15.247(f)	Time of Occupancy for Hybrid Systems	N	

Notes:

* This requirement was not tested due to the changes to the circuitry would have no affect on the results obtained in the original assessment.

Appendix A : Test Results

Criteria: Clause 15.207(a) Powerline Conducted Emissions

Frequency of Conducted limit (dBmV)		
Emission (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

Test Conditions:

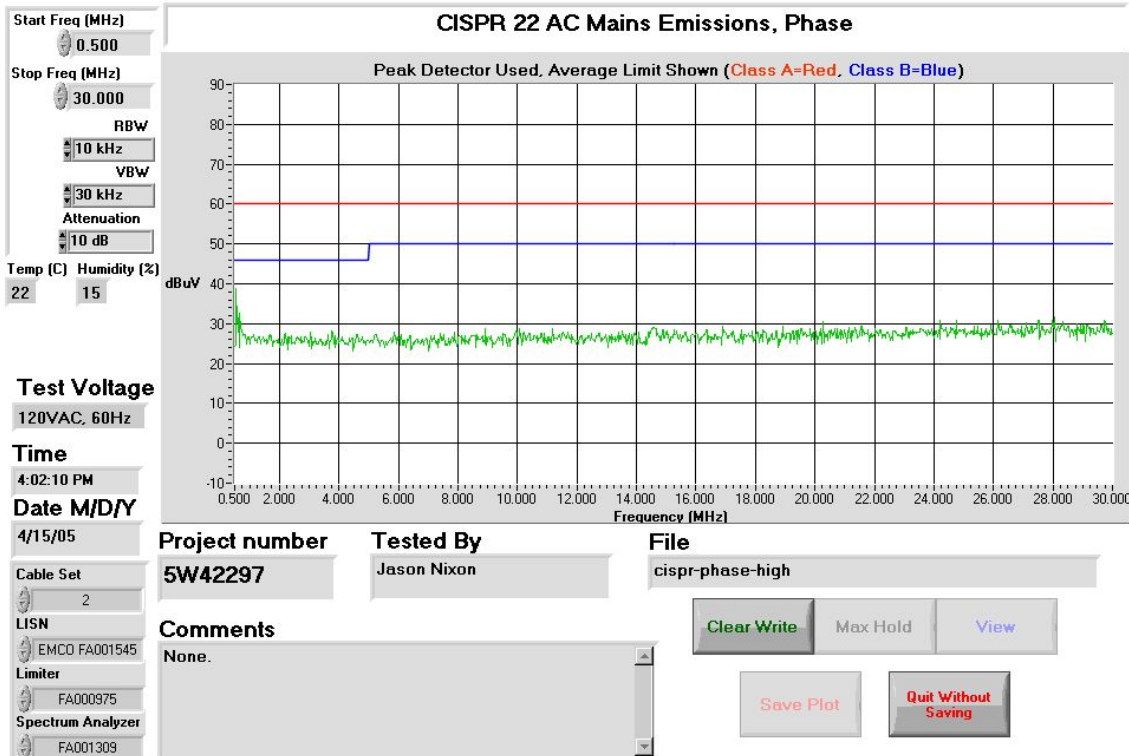
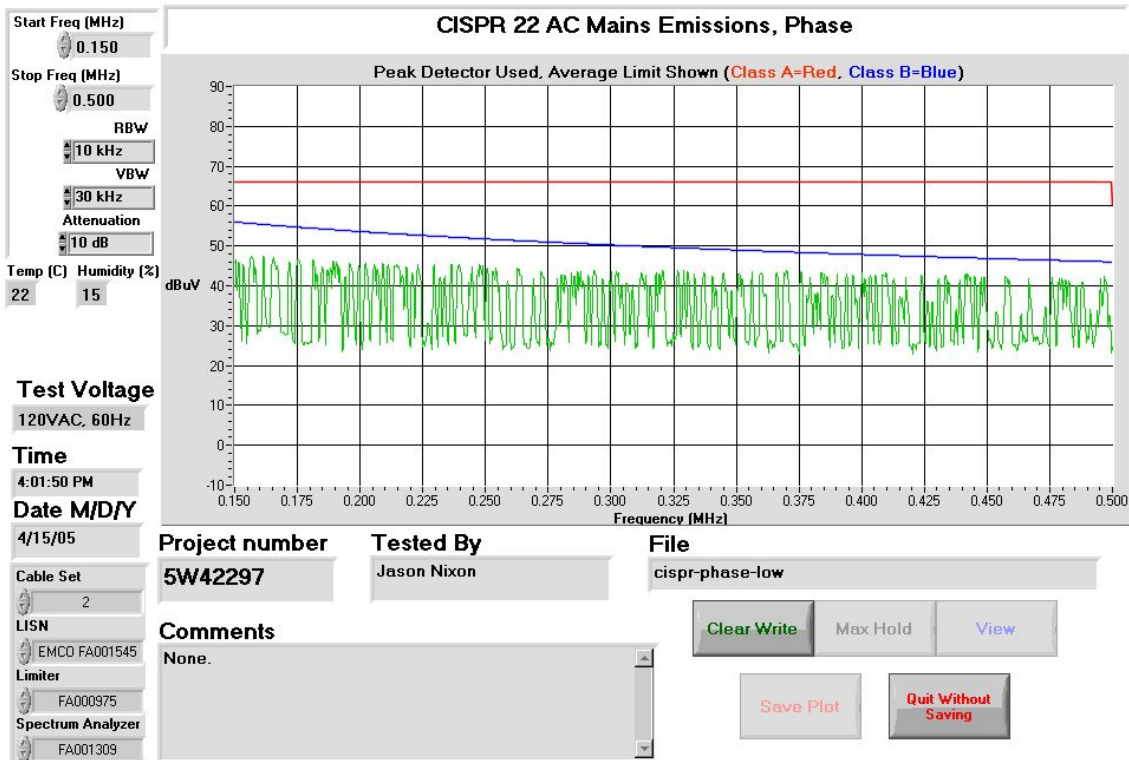
Sample Number:	1, 2, 19, 33	Temperature:	22
Date:	April 15, 2005	Humidity:	15
Modification State:	0	Tester:	Jason Nixon
		Laboratory:	Shielded Room

Test Results: See Attached Plots.

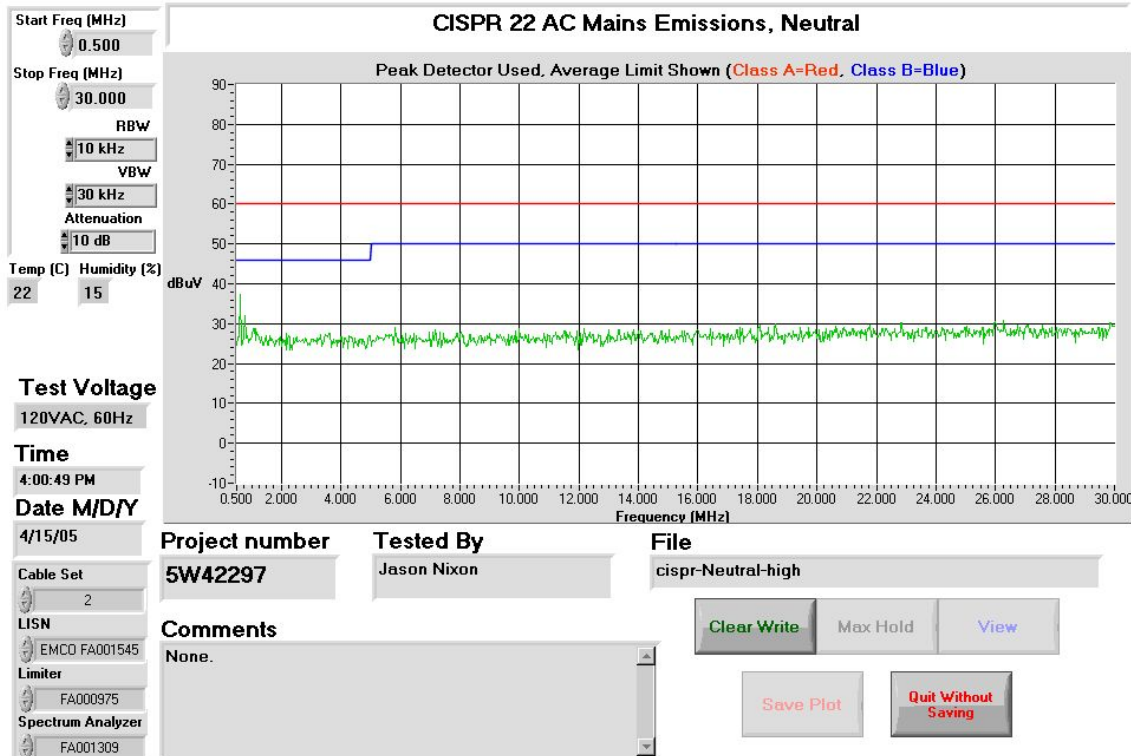
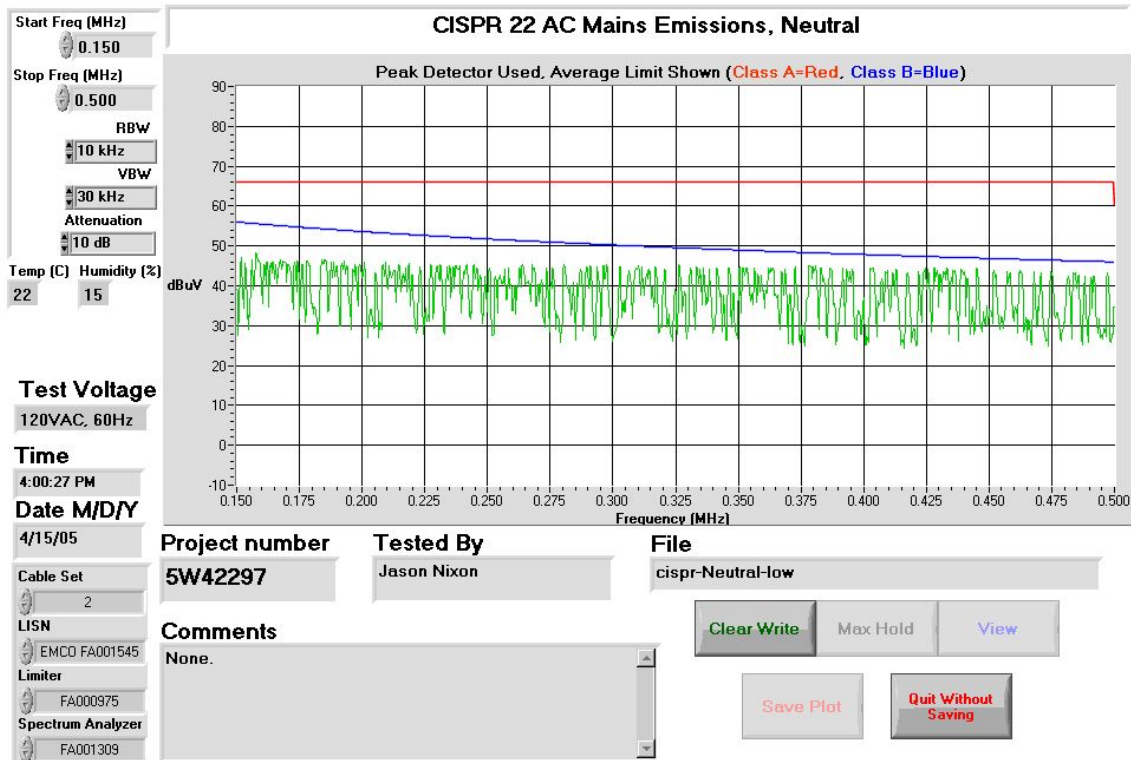
Additional Observations:

None

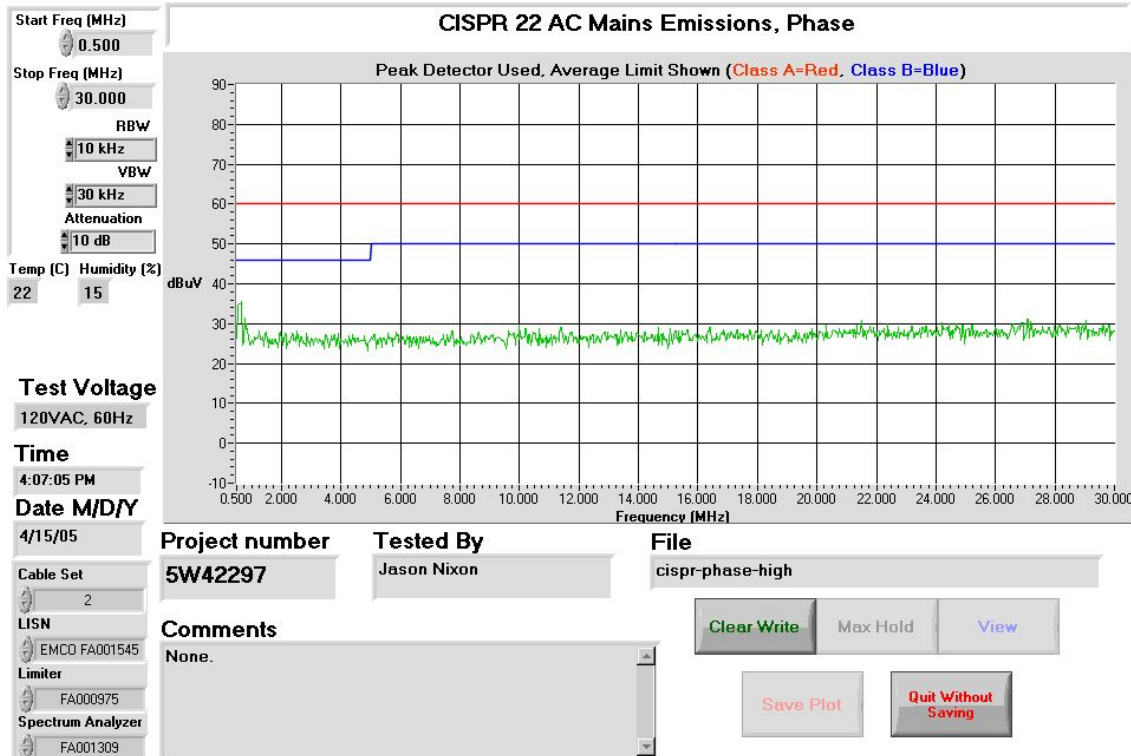
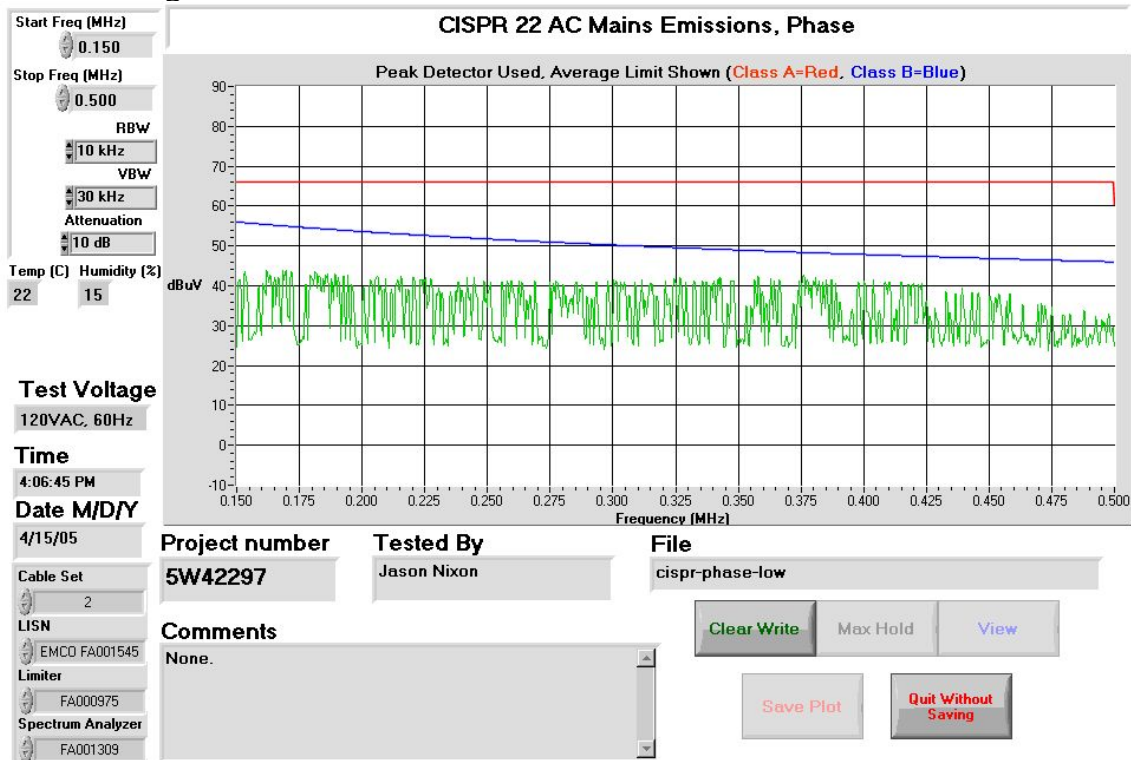
Phase – Base with Handset



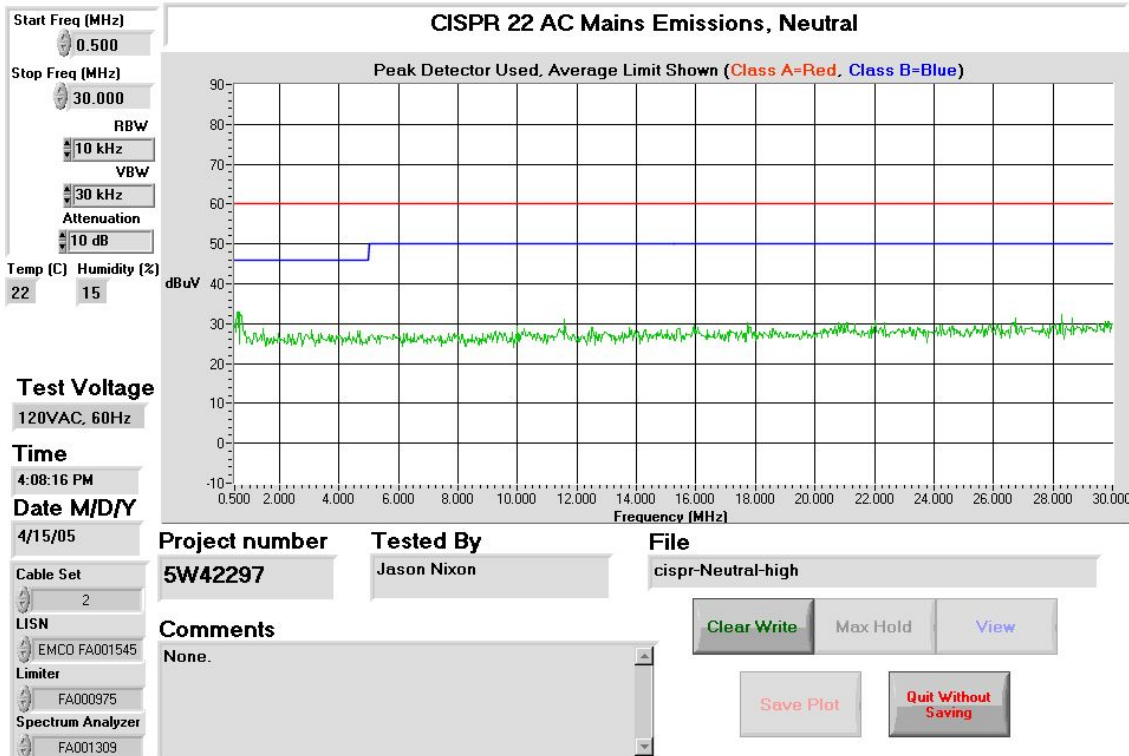
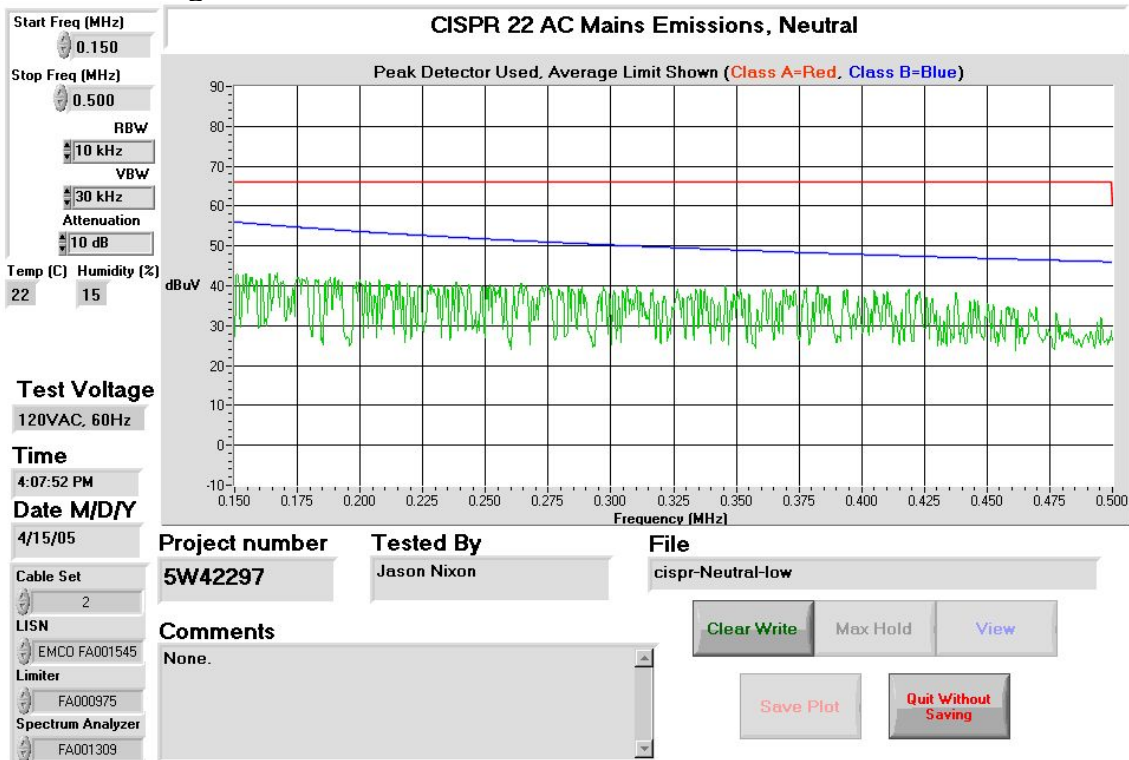
Neutral – Base with Handset



Phase – Charger with Handset



Neutral – Charger with Handset



Criteria: Clause 15.209(a) Radiated Emissions within Restricted Bands

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvoltsmeter)	Measurement Distance (meters)
0.009-0.490	2400F (kHz)	300
0.490-1.705	24000F (kHz)	30
1.705-30.0	30	30
30-88	1001	3
88-216	1502	3
216-960	2003	3
Above 960	500	3

Test Conditions:

Sample Number:	1, 2	Temperature:	12
Date:	April 15, 2005	Humidity:	17
Modification State:	0	Tester:	Jason Nixon
		Laboratory:	OATS

Test Results:

See Attached Table for Results

Additional Observations:

The Spectrum was searched from 30MHz to 25GHz.

These results apply to emissions found in the Restricted bands defined in FCC Part 15 Subpart C, 15.205.

The EUT was measured on three orthogonal axis.

All measurements were performed using a Peak Detector with 100kHz RBW below 1GHz and a 1MHz RBW above 1GHz at a distance of 3 meters.

Average measurements were calculated using the duty cycle correction factor and the Peak measurement.

Only emissions within 20dB below the limit have been included.

Base

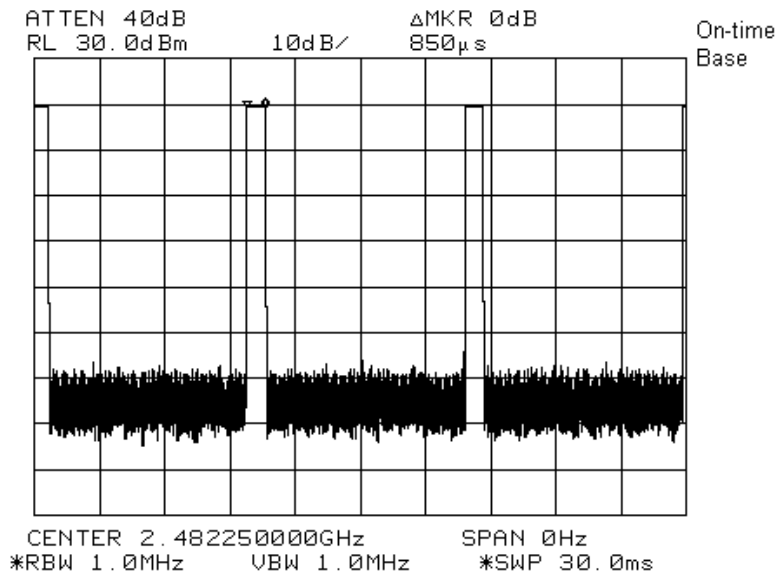
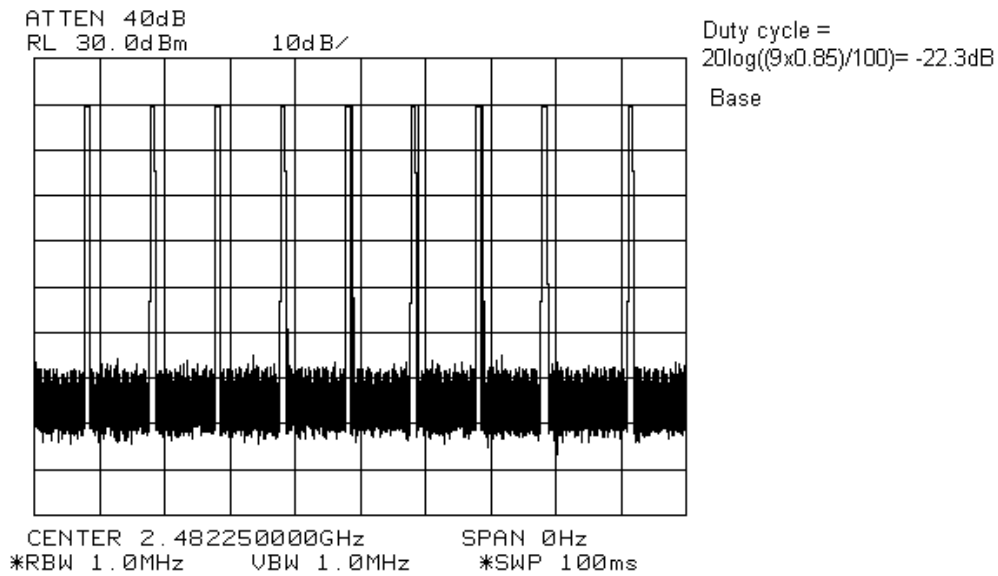
	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBuV)	Ant. Factor (dB/m)	Amp. Gain / Cable Loss (dB)	Duty Cycle Corr.	Distance Correction	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	CH00											
1	4802.4900	Horn1	V	69.8	33.4	45.8	22.3	0	57.4 35.1	74 54	16.6 18.8	Peak Average
2	4802.4900	Horn1	H	67.5	33.5	45.8	22.3	0	55.2 32.9	74 54	18.9 21.1	Peak Average
3	12006.225	Horn1	V	59.8	39.3	34.3	22.3	0	64.8 42.5	74 54	9.2 11.5	Peak Average
4	12006.225	Horn1	H	58.5	39.5	34.3	22.3	0	63.7 41.4	74 54	10.3 12.6	Peak Average
	CH47											
5	4883.8900	Horn1	V	71.3	33.4	44.6	22.3	0	60.2 37.9	74.0 54.0	13.8 16.1	Peak Average
6	4883.8900	Horn1	H	68.7	33.5	44.6	22.3	0	57.6 35.3	74.0 54.0	16.4 18.7	Peak Average
7	7325.8350	Horn1	V	62.2	36.5	43.6	22.3	0	55.0 32.7	74.0 54.0	19.0 21.3	Peak Average
8	7325.8350	Horn1	H	61.0	36.7	43.6	22.3	0	54.1 31.8	74.0 54.0	19.9 22.2	Peak Average
9	12209.725	Horn1	V	57.0	39.0	34.3	22.3	0	61.7 39.4	74 54	12.3 14.6	Peak Average
10	12209.725	Horn1	H	56.7	39.3	34.3	22.3	0	61.6 39.3	74 54	12.4 14.7	Peak Average
	CH94											
11	4964.0900	Horn1	V	69.0	33.4	43.9	22.3	0	58.6 36.3	74.0 54.0	15.4 17.7	Peak Average
12	4964.0900	Horn1	H	67.7	33.5	43.9	22.3	0	57.3 35.0	74.0 54.0	16.7 19.0	Peak Average
13	7446.1350	Horn1	V	64.3	36.5	44.3	22.3	0	56.6 34.3	74.0 54.0	17.4 19.7	Peak Average
14	7446.1350	Horn1	H	63.8	36.7	44.3	22.3	0	56.3 34.0	74.0 54.0	17.7 20.0	Peak Average
15	12410.225	Horn1	V	54.0	38.8	34.3	22.3	0	58.4 36.1	74 54	15.6 17.9	Peak Average
16	12410.225	Horn1	H	53.3	39.0	34.3	22.3	0	58.0 35.7	74 54	16.0 18.3	Peak Average

Handset

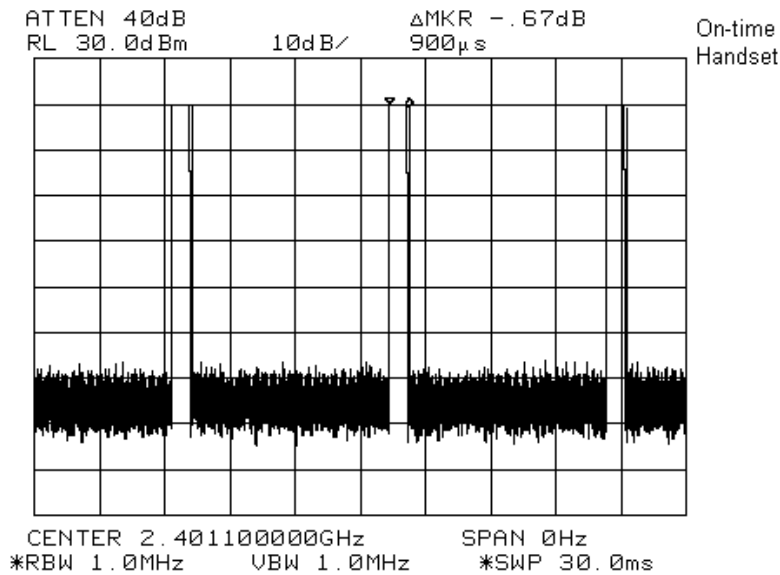
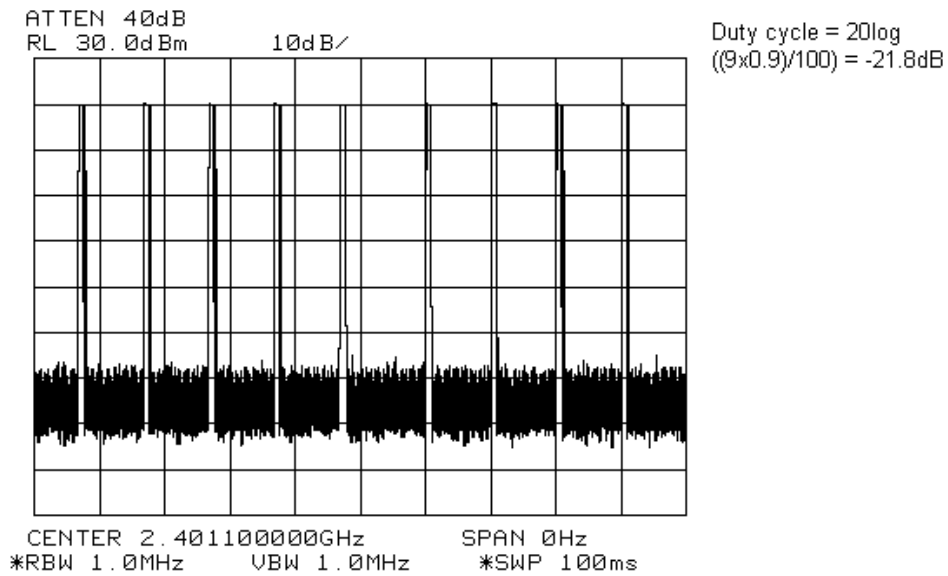
	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBuV)	Ant. Factor (dB/m)	Amp. Gain / Cable Loss (dB)	Duty Cycle Corr.	Distance Correction	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	CH00											
1	4802.4900	Horn1	V	68.2	33.4	45.8	21.8	0	55.8 34.0	74.0 54.0	18.2 20.0	Peak Average
2	4802.4900	Horn1	H	68.8	33.5	45.8	21.8	0	56.5 34.7	74.0 54.0	17.5 19.3	Peak Average
3	12006.225	Horn1	V	63.8	39.3	34.3	21.8	0	68.8 47.0	74 54	5.2 7.0	Peak Average
4	12006.225	Horn1	H	63.8	39.5	34.3	21.8	0	69.0 47.2	74 54	5.0 6.8	Peak Average
	CH47											
5	12209.725	Horn1	V	57.2	39.0	34.3	21.8	0	61.9 40.1	74 54	12.1 13.9	Peak Average
6	12209.725	Horn1	H	58.3	39.3	34.3	21.8	0	63.3 41.5	74 54	10.7 12.5	Peak Average
	CH94											
7	12410.225	Horn1	V	52.7	38.8	34.3	21.8	0	57.1 35.3	74 54	16.9 18.7	Peak Average
8	12410.225	Horn1	H	53.8	39.0	34.3	21.8	0	58.5 36.7	74 54	15.5 17.3	Peak Average

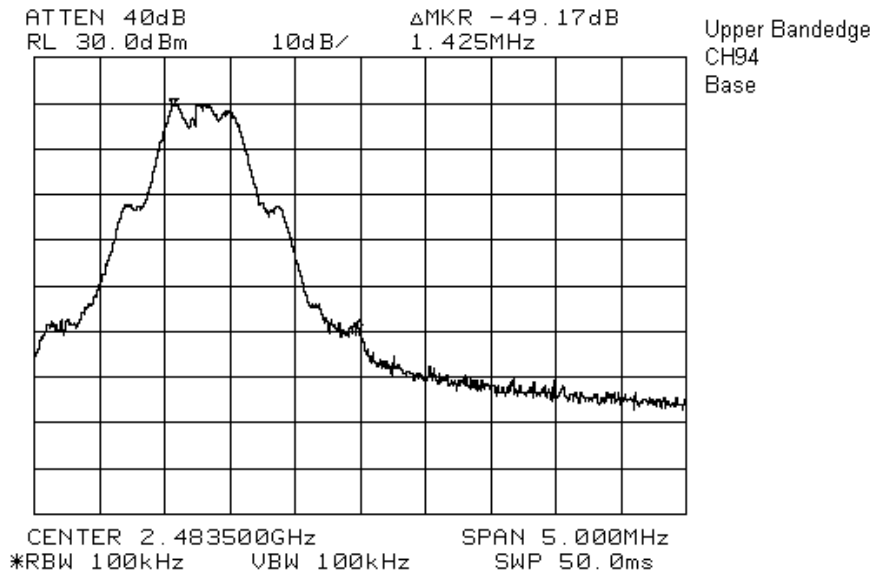
Duty Cycle:

Base



Duty Cycle: Handset



Delta Marker Measurement for 2.4835GHz Band Edge**Base**

Measured Field Strength for High Channel in 1MHz RBW = 114.5dBuV/m

Delta Marker = -49.17dB

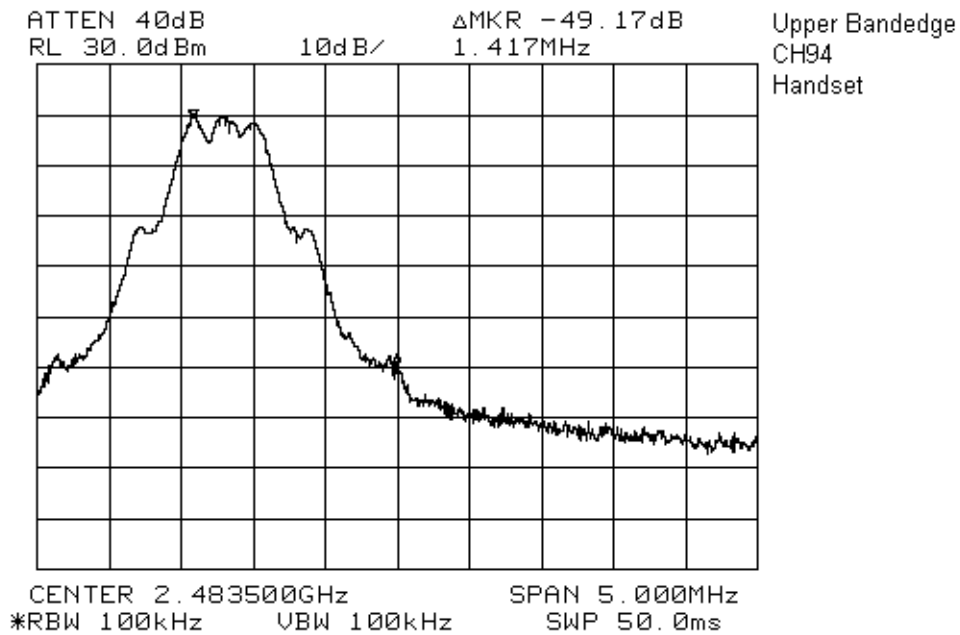
Therefore, Peak Field Strength = 114.5dBuV/m - 49.17dB = 65.33dBuV/m

Limit = 74dBuV/m

Average Field Strength = 65.33dBuV/m - 22.3dB(Duty Cycle) = 43.03dBuV/m

Limit = 54dBuV/m

Handset



Measured Field Strength for High Channel in 1MHz RBW = 116.2dBuV/m

Delta Marker = -49.17dB

Therefore, Peak Field Strength = 116.2dBuV/m – 49.17dB = 67.03dBuV/m

Limit = 74dBuV/m

Average Field Strength = 67.03dBuV/m – 21.8dB(Duty Cycle) = 45.23dBuV/m

Limit = 54dBuV/m

Criteria: Clause 15.247(a)(1) Frequency hopping systems

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

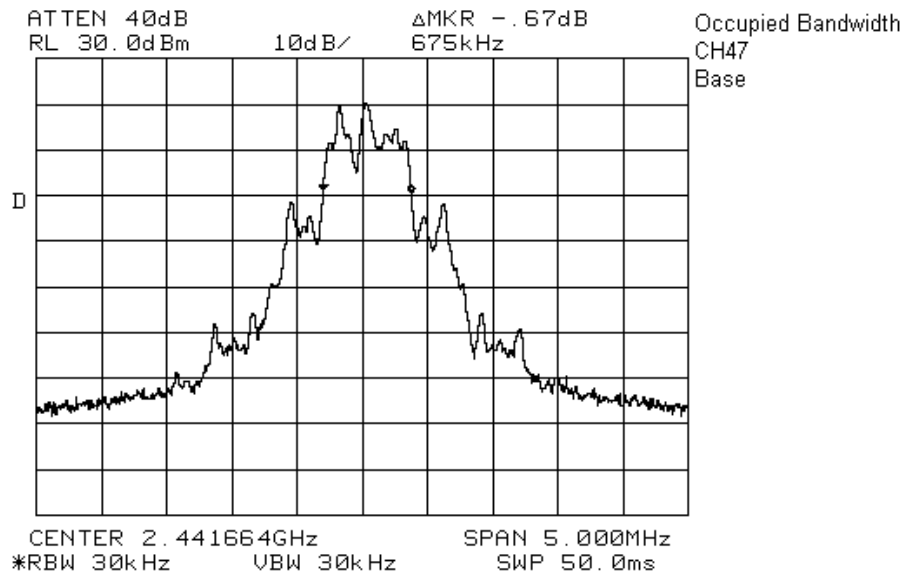
Test Conditions:

Sample Number:	5, 6	Temperature:	22
Date:	April 15, 2005	Humidity:	15
Modification State:	0	Tester:	Jason Nixon
		Laboratory:	Wireless Lab

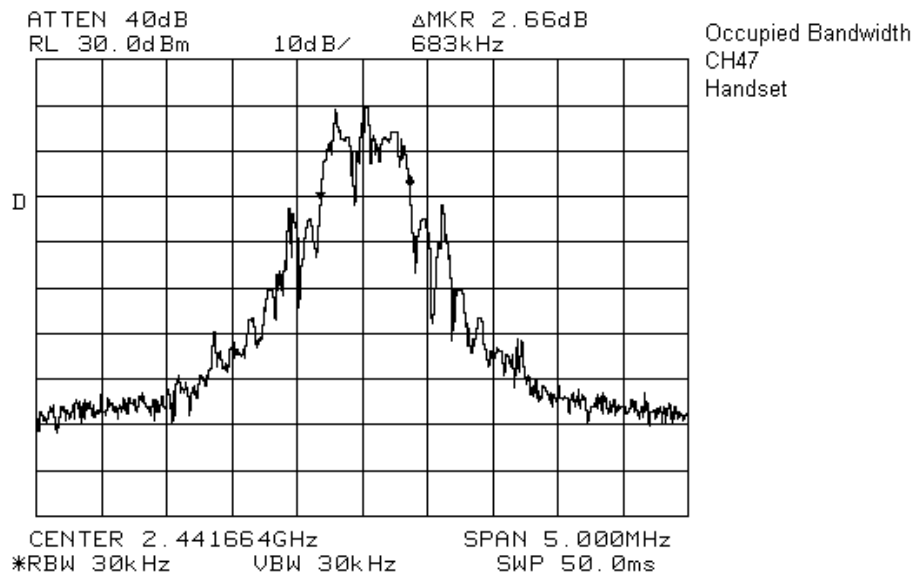
Test Results:

20dB Bandwidth:

Base



Handset



Criteria: Clause 15.247(b)(1) Maximum peak output power of Frequency hopping systems operating in the 2400-2483.5 MHz band and 5725-5850 MHz band

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

Test Conditions:

Sample Number:	1, 2, 5, 6	Temperature:	12
Date:	April 15, 2005	Humidity:	17
Modification State:	0	Tester:	Jason Nixon
		Laboratory:	OATS, Wireless Lab

Test Results:

Conducted Output Power:

Base

Measured output power = 20.5dBm

Maximum output power = 20.5dBm + 0dBi = 20.5dBm EIRP

Limit = 36dBm EIRP

Handset

Measured output power = 20.33dBm

Maximum output power = 20.33dBm + 0dBi = 20.33dBm EIRP

Limit = 36dBm EIRP

The output power was measured at +/-15% of the supply voltage and found that there was no change.

Note: The EUT was modified by the manufacturer to perform conducted measurements.

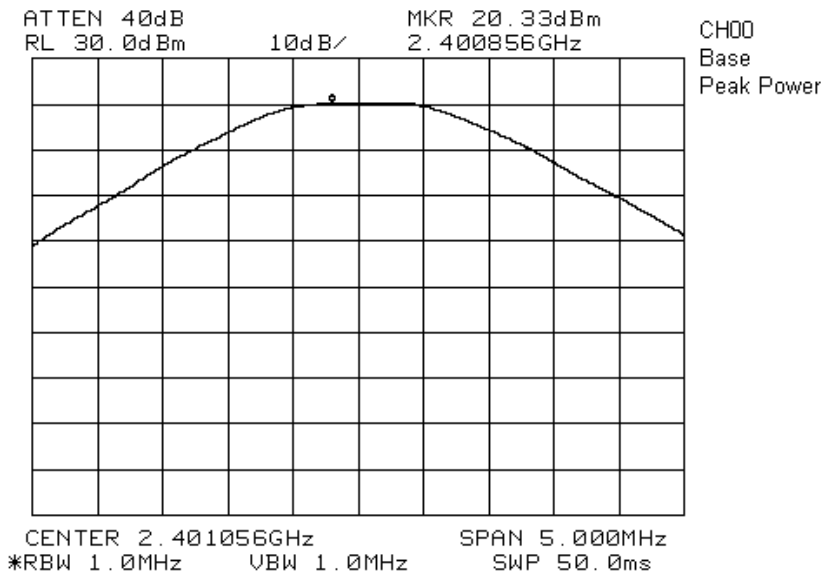
Base

Channel Range	Measured Output Power (W) Conducted
Low	0.108W (20.33dBm)
Mid	0.112W (20.50dBm)
High	0.093W (19.67dBm)

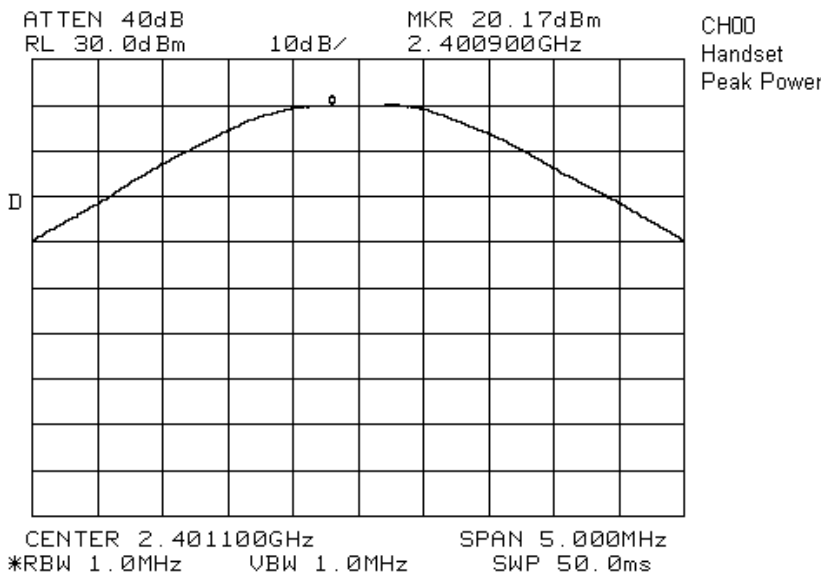
Handset

Channel Range	Measured Output Power (W) Conducted
Low	0.104W (20.17dBm)
Mid	0.108W (20.33dBm)
High	0.093W (19.67dBm)

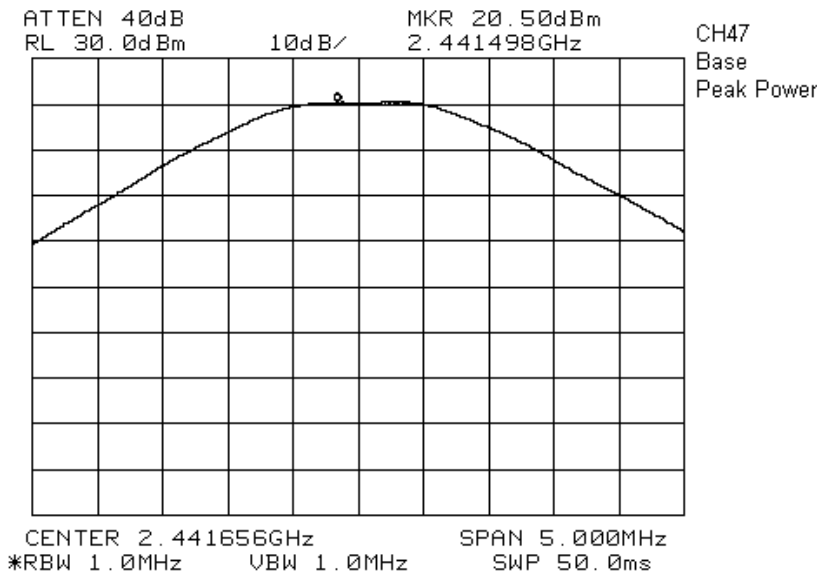
Low Channel:
Base



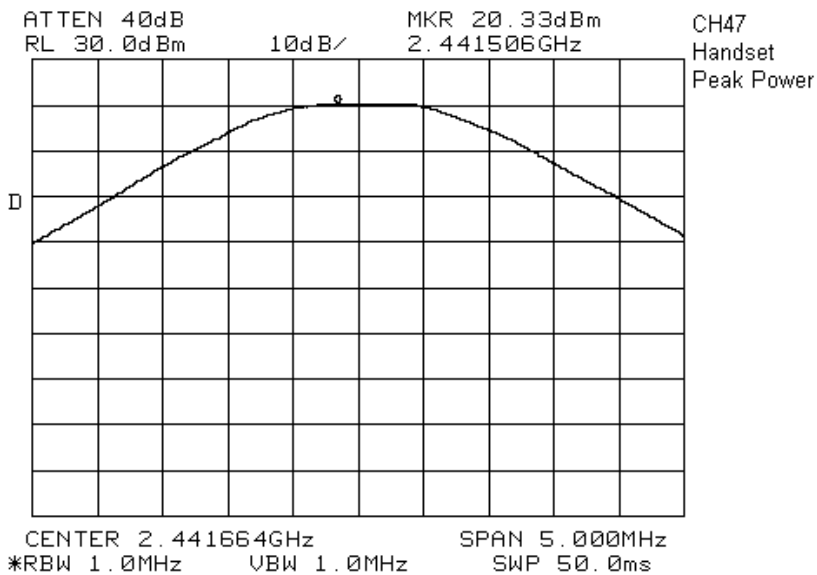
Handset



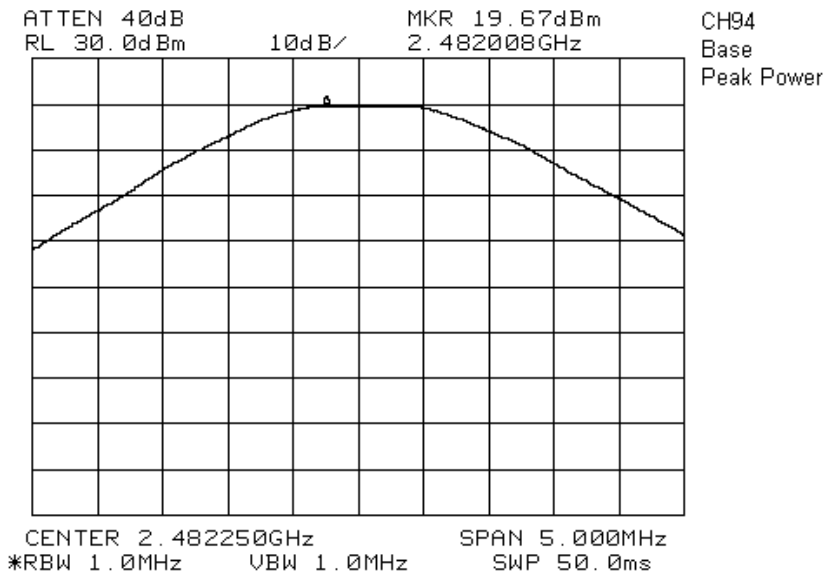
Mid Channel:
Base



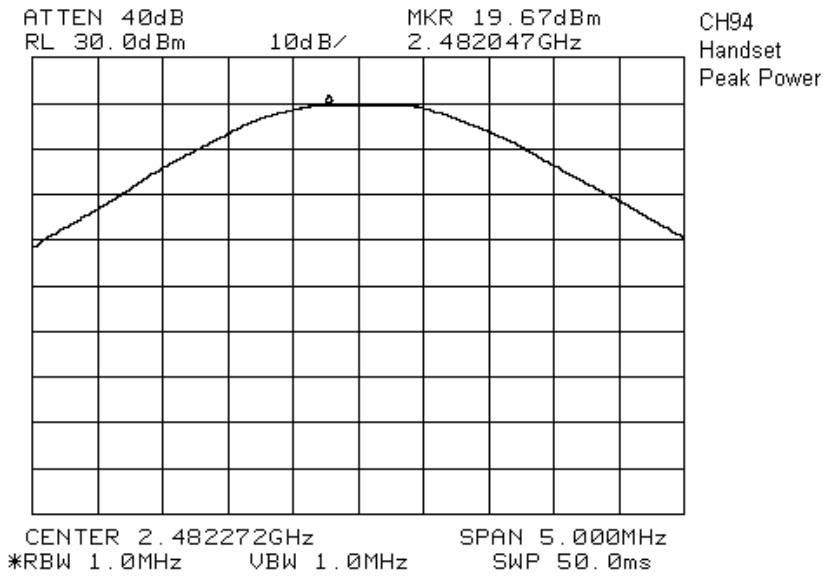
Handset



High Channel:
Base



Handset



Criteria: Clause 15.247(d) Radiated Emissions Not in Restricted Bands

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

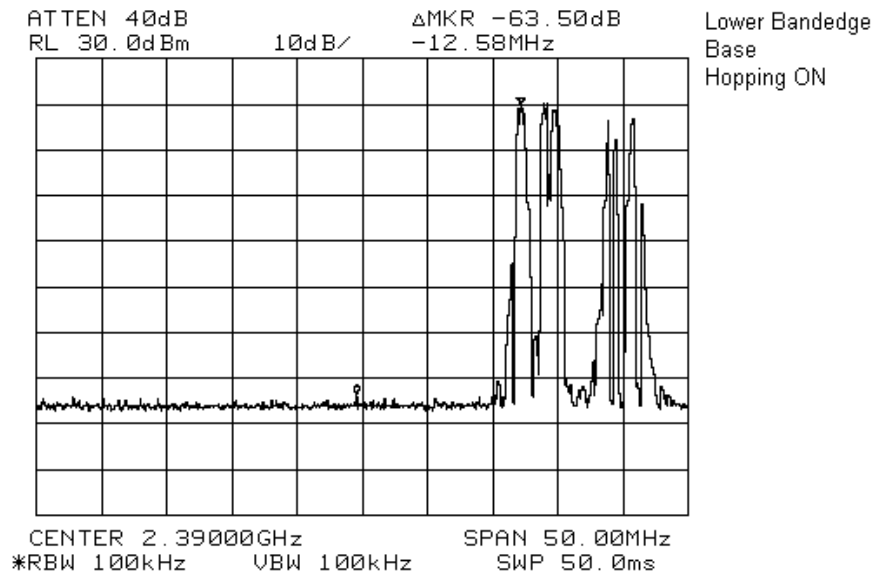
Test Conditions:

Sample Number:	1, 2	Temperature:	12
Date:	April 15, 2005	Humidity:	17
Modification State:	0	Tester:	Jason Nixon
		Laboratory:	OATS, Wireless Lab

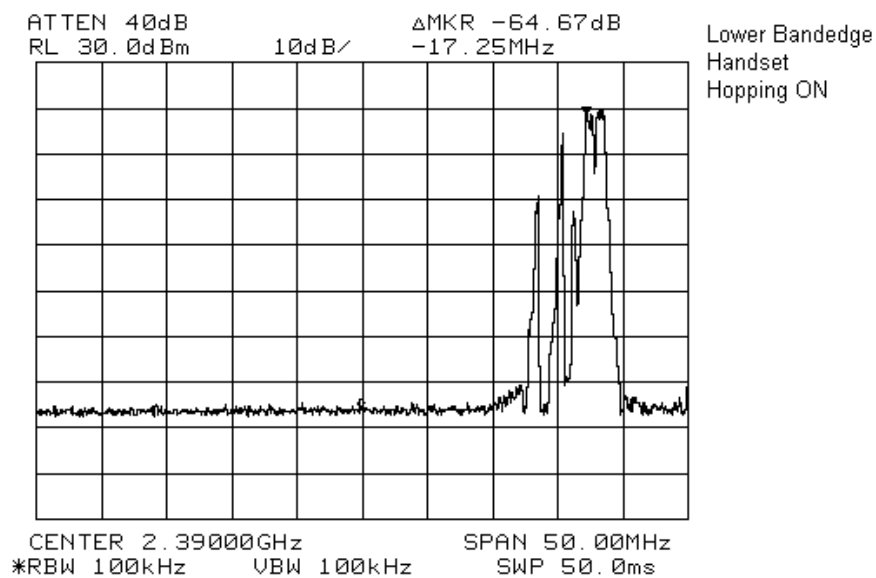
Test Results:

See Attached Table and Plots.

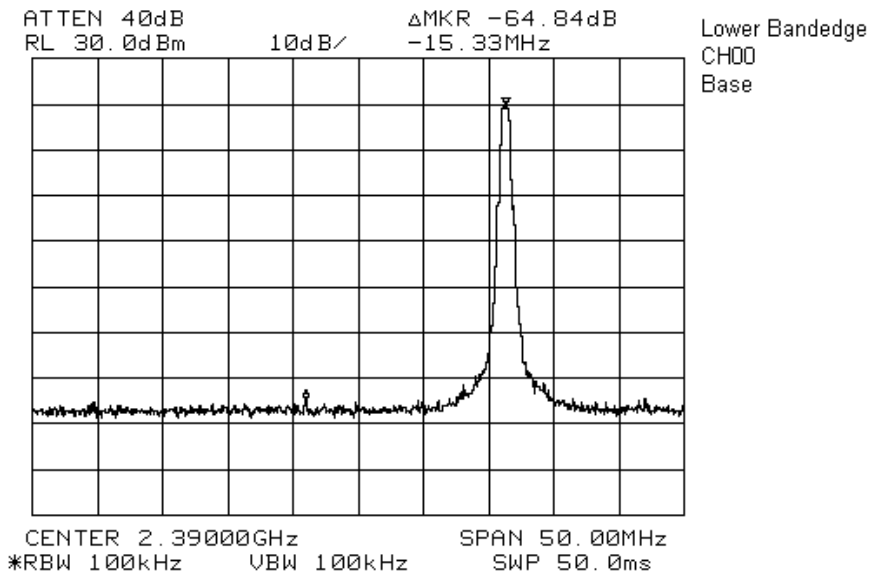
Lower Band Edge Hopping On: Base



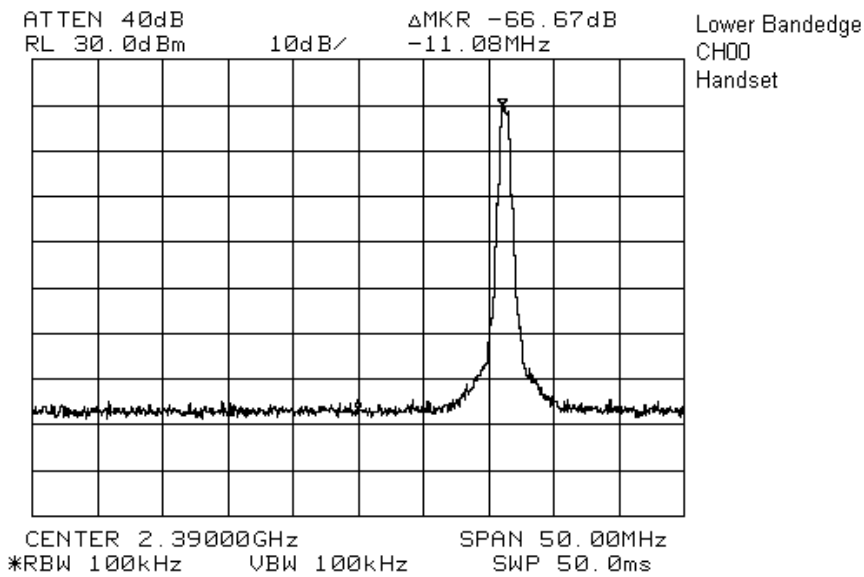
Handset



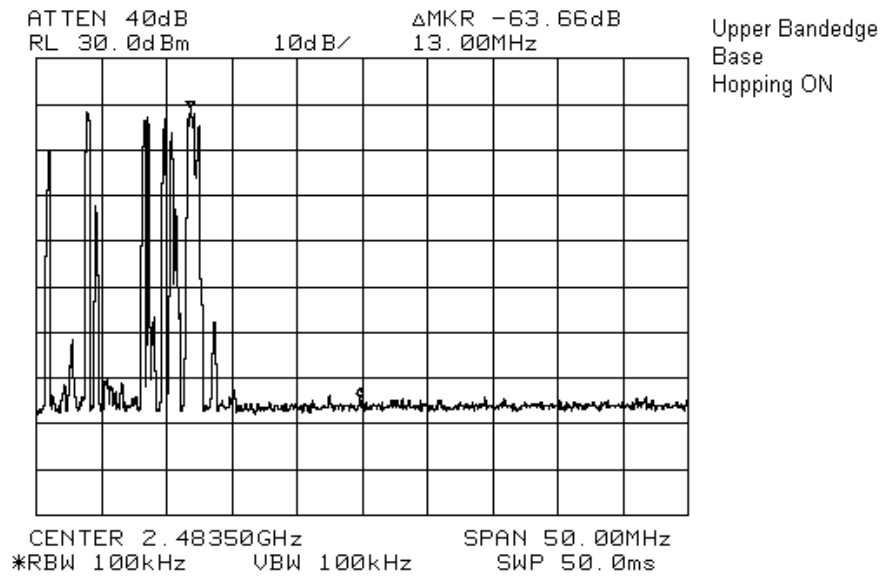
Lower Band Edge Hopping Off:
Base



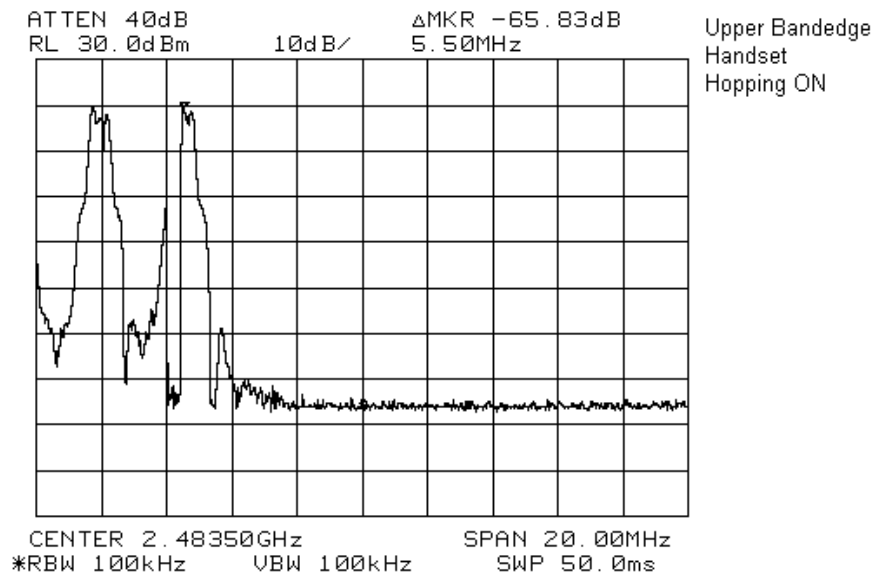
Handset



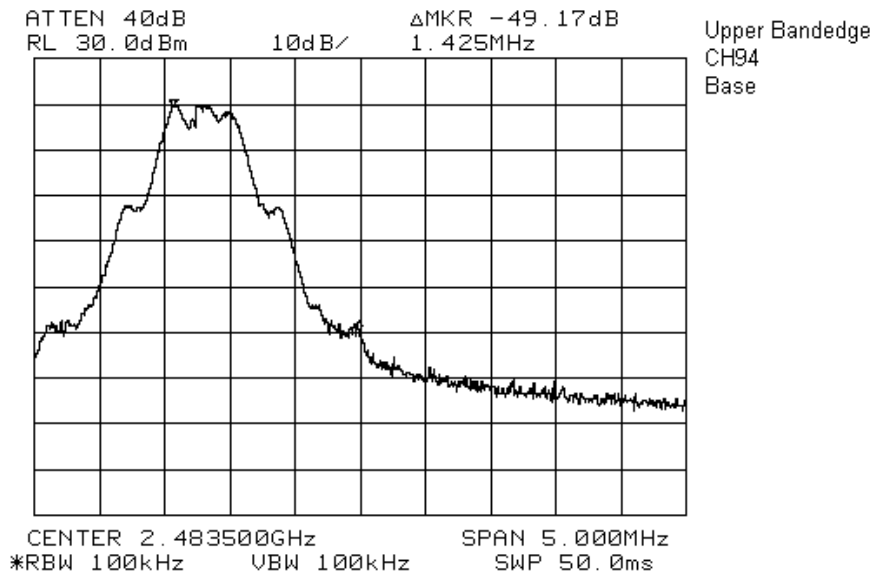
Upper Band Edge Hopping On: Base



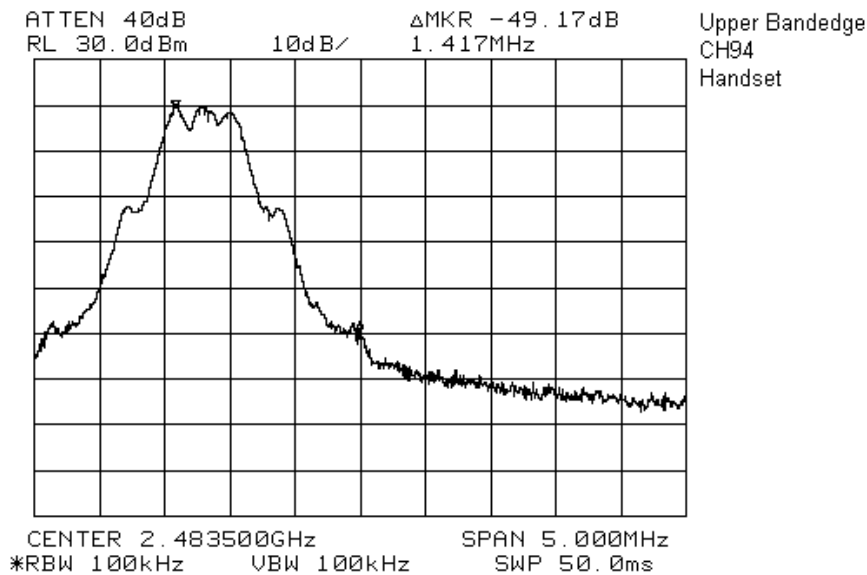
Handset



Upper Band Edge Hopping Off: Base



Handset



Base

Freq. (MHz)	Ant	Pol. V/H	RCVD Signal (dBμV)	Ant. Factor (dB/m)	Amp. Gain (dB)	Cable Loss (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)
41.3580	BC2	V	20.5	10.4	—	0.8	31.7	40.0	8.3
41.3580	BC2	H	7.0	11.8	—	0.8	19.6	40.0	20.4
Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole									

Handset

Freq. (MHz)	Ant	Pol. V/H	RCVD Signal (dBμV)	Ant. Factor (dB/m)	Amp. Gain (dB)	Cable Loss (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)
345.6005	LP1	V	10.9	14.8	—	2.4	28.1	46.4	18.3
345.6005	LP1	H	21.3	15.3	—	2.4	39.0	46.4	7.4
290.3050	BC2	V	9.8	18.4	—	2.2	30.4	46.4	16.0
290.3050	BC2	H	12.1	20.0	—	2.2	34.3	46.4	12.2
208.2491	BC2	V	11.9	15.6	—	1.8	29.3	43.5	14.2
208.2491	BC2	H	8.8	15.0	—	1.8	25.6	43.5	17.9
207.3607	BC2	V	13.4	15.6	—	1.8	30.8	43.5	12.8
207.3607	BC2	H	23.2	15.0	—	1.8	40.0	43.5	3.6
Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole									

Additional Observations:

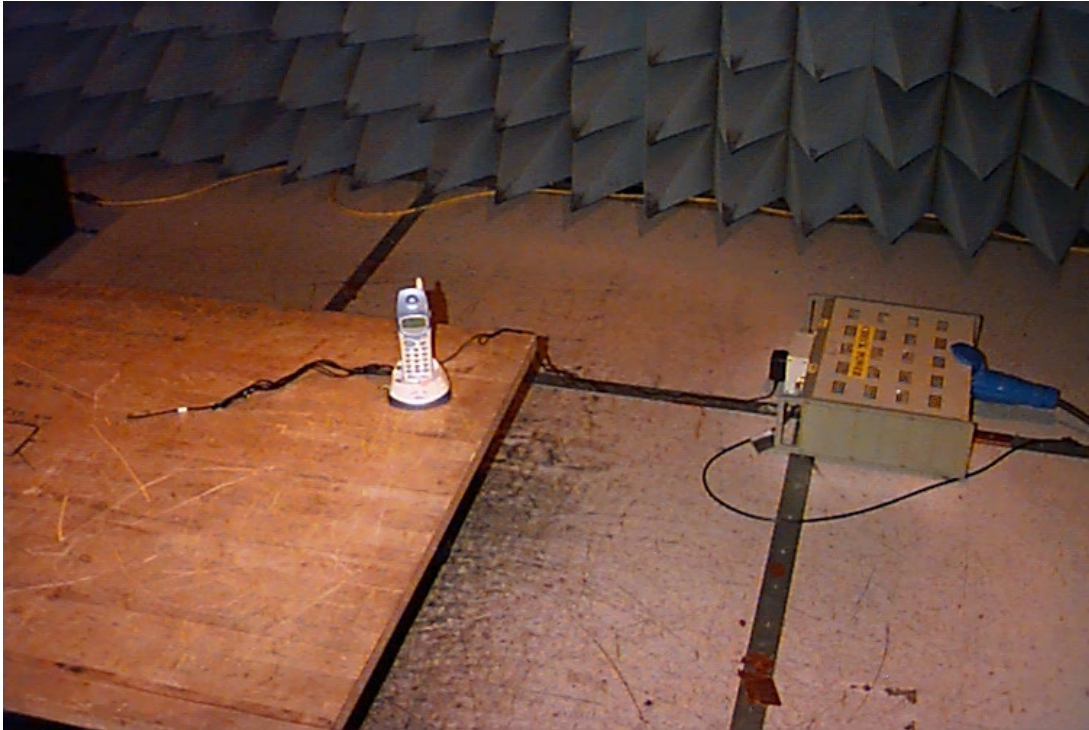
All measurements were performed using a Quasi-Peak detector below 1GHz at 3m.

Only measurements greater than 20dB below the limit have been included.

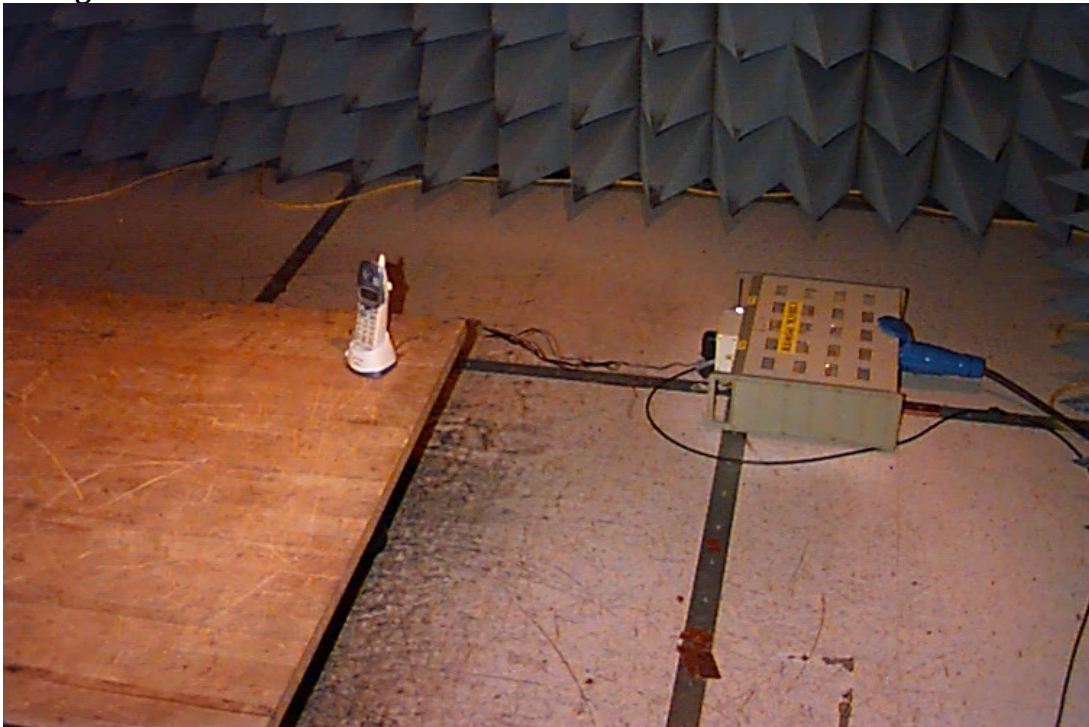
Appendix B : Setup Photographs

Conducted Emissions Setup:

Base with handset



Charger with handset



**Spurious Emissions Setup:
Base**

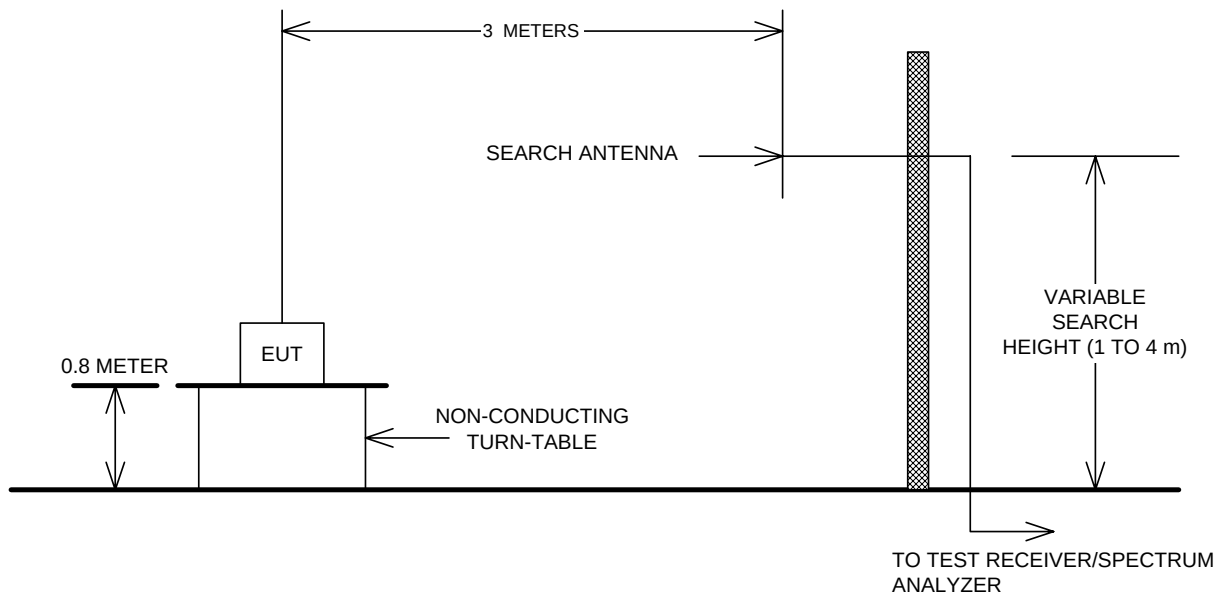


Handset



Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions

