

**ELECTRONICS
TEST CENTRE**
MPB TECHNOLOGIES INC.

Test Report Prepared By:
Electronics Test Centre
27 East Lake Hill
Airdrie, Alberta
Canada T2B 2B7
enquire@etc-mpbtech.com
phone: (403) 912-0037
fax: (403) 912-0083

MPBT Report No.: w02e2348 Rev: 1 Date: 27 July 2001

Report for Emissions Testing of: AWE 120-24 rev 2
Omni, TilTek Dish, and Sectoral Antennas

In accordance with: FCC Part 15, Subpart C (2000)

Test Personnel: Quang Tan Nguyen

Prepared for: Wi-LAN Inc.
2891 Sunridge Way N.E.
Calgary, Alberta
T1Y 7K7

Client Acceptance
Authorized Signatory

David Raynes
Laboratory Supervisor
Electronics Test Centre (Airdrie)
Authorized Signatory

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APPENDIX A: Test Sample Description: AWE 120-24 rev 2

1.0 INTRODUCTION

1.1 SCOPE

The purpose of this report is to present the findings and results of compliance testing performed in accordance with CFR Title 47 FCC Part 15, Subpart C, Intentional Radiators.

1.2 APPLICANT

This test report has been prepared for Wi-LAN Inc., located in Calgary, Alberta, Canada.

1.3 APPLICABILITY

All test procedures, limits, and results defined in this document apply to the Wi-LAN Inc. AWE 120-24 rev 2 unit, referred to herein as the Equipment Under Test (EUT).

The results contained in this report relate only to the item tested.

This report does not imply product endorsement by NVLAP or the Canadian or US governments.

1.4 TEST SAMPLE DESCRIPTION

The test sample provided for testing was an AWE 120-24 rev 2:

Product Type:	Information Technology
Model Number:	AWE 120-24 rev 2
Serial Number:	
Cables:	CAT 5, RS-232, antenna
Power Requirements:	120 to 230 VAC
Peripheral Equipment:	Omni, TilTek Dish, and Sectoral Antenna
Brief Functional Description:	Wireless Communication Base Station

More detailed information is provided by Wi-LAN Inc. in Appendix A.

1.5 GENERAL TEST CONDITIONS AND ASSUMPTIONS

The EUT was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report.

All testing, unless otherwise noted, was performed under the following environmental conditions:

Temperature:	17 to 23 °C
Humidity:	45 to 75 %

1.6 SCOPE OF TESTING

Testing was performed in accordance with FCC Part 15 Subpart C (2000), and ANSI C63.4 (1992).

1.6.1 VARIATIONS IN TEST METHODS

The following variations in test methodology were noted during testing:

- a) At the client's request, only radiated and conducted emissions tests were performed at the Electronics Test Centre.
- b) In all cases of radiated emissions testing, the transmitting antenna was placed above the unit instead of at 80 cm.
- c) The radiated emissions above 18 GHz were performed using a down-converter with a shift of 17 GHz. All measurements between 18 and 25 GHz were shifted down by 17 GHz to the range 1 to 8 GHz in order to detect them on the test equipment that was available.

1.6.2 MARGINAL EMISSIONS MEASUREMENTS

None of the emissions was measured to be within -6 dB of the specified limit.

1.6.3 TEST SAMPLE MODIFICATIONS

There were no equipment modifications during test performance.

2.0 ABBREVIATIONS

CE	-Conducted Emissions
E	-Field - Electric Field
H	-Field - Magnetic Field
N/T	-Not Tested
N/A	-Not Applicable
RBE	-Restricted Bands of Operation
RE	-Radiated Emissions

3.0 MEASUREMENT UNCERTAINTY

For Radiated E-Field Emissions and Conducted Emissions, the uncertainties in the measurements were calculated using the methods outlined in the NAMAS document, NIS81: May 1984.

Frequency	= \pm 1 kHz
Amplitude (RE)	= \pm 4.01 dB
Amplitude (CE)	= \pm 3.25 dB

4.0 TEST CONCLUSION

The EUT was subjected to the following tests. Compliance status is indicated as **PASS** or **FAIL**.

The following table summarizes the test case (the section in this report containing the results), the type of test performed, the applicable sections of FCC Part 15, the antenna and channel configurations, and the results, PASS or FAIL.

Test Case	Test Type	Specification	Antenna	Channel	Result
§4.1	Conducted Emissions	FCC Part 15.207	N/A	N/A	PASS
§4.2	Radiated Emissions including Restricted Bands of Operation	FCC Part 15.209 and 15.205	Omni	Low	PASS
				Mid	PASS
				High	PASS
			Tiltek Dish	Low	PASS
				Mid	PASS
				High	PASS
			Sectoral	Low	PASS
				Mid	PASS
				High	PASS

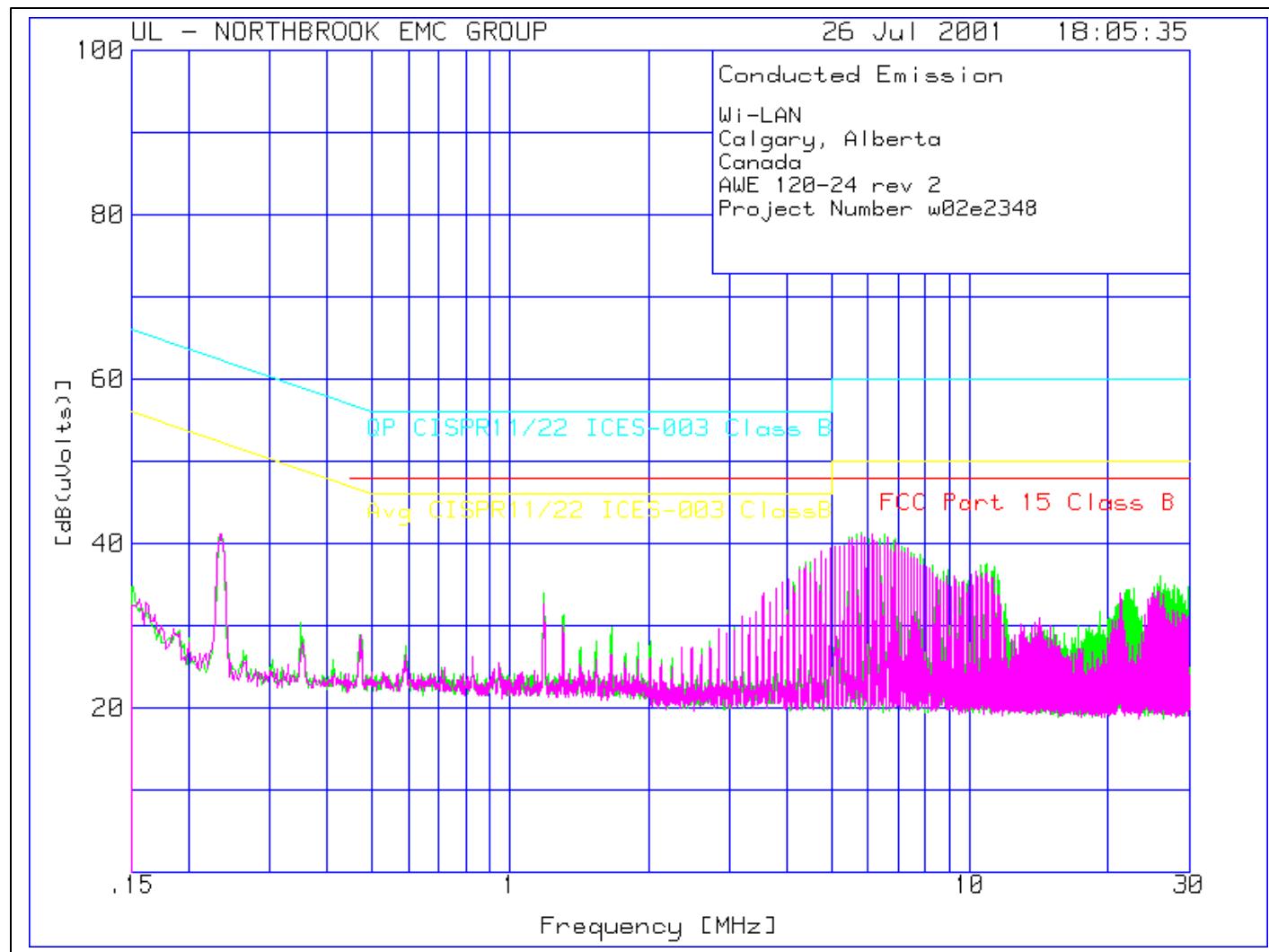
STATEMENT OF COMPLIANCE

The client equipment referred to in this report was found to comply with the requirements as stated above.

4.15 CONDUCTED EMISSIONS ON AC POWER LINES

Test Lab: Electronics Test Centre (Airdrie) Test Personnel: Q. Nguyen Test Date: 26 July 2001	Product: AWE 120-24 rev 2				
Test Result, AWE 120-24 rev 2: PASS					
Objectives/Criteria	Specifications				
The EUT was assessed against the requirements of FCC Part 15.207	FCC Part 15.207 Frequency [MHz] Limit (QP) [dB μ V] 0.45 – 30 47.96				
Line 1:	Line 2:				
Frequency [MHz]	RF Voltage [dB μ V]	Delta [dB from limit]	Frequency [MHz]	RF Voltage [dB μ V]	Delta [dB from limit]
There were no emissions within -6 dB of the limit. Please refer to Plot 1 for more detail.					

Plot 1
Conducted Emissions on AC Power Lines
0.45-30 MHz



4.2 RADIATED EMISSIONS INCLUDING RESTRICTED BANDS OF OPERATION

4.2.1 Omni Antenna

Test Lab: MPB Technologies Inc. Airdrie Test Personnel: Q. Nguyen, S. Tarkowski Test Date: 27 June & 3, 4, 9, 10, 11 July 2001	Product: AWE 120-24 rev 2												
<p>Test Result, AWE 120-24 rev 2</p> <p>LOW Channel: PASS</p> <p>MID Channel: PASS</p> <p>HIGH Channel: PASS</p>													
<p>Objectives/Criteria</p> <p>The Radiated E-Field emissions produced by a system or sub-system, measured at a distance of 3m from the EUT, shall not exceed these limits for the specifications <i>within the restricted bands of operation (RBOs)</i>. Any emissions lying outside the RBOs shall not exceed the level of the fundamental transmission.</p> <p>Emission levels should meet the requirements with a margin of 6dB.</p>													
	<p>Specifications</p> <table><tr><td>FCC Part 15.209 and 15.205</td><td></td></tr><tr><td>Frequency [MHz]</td><td>Limit (QP @ 3m) [dBμV/m]</td></tr><tr><td>30 – 88</td><td>40.00</td></tr><tr><td>88 – 216</td><td>43.52</td></tr><tr><td>216 – 960</td><td>46.02</td></tr><tr><td>Above 960</td><td>53.98</td></tr></table>	FCC Part 15.209 and 15.205		Frequency [MHz]	Limit (QP @ 3m) [dB μ V/m]	30 – 88	40.00	88 – 216	43.52	216 – 960	46.02	Above 960	53.98
FCC Part 15.209 and 15.205													
Frequency [MHz]	Limit (QP @ 3m) [dB μ V/m]												
30 – 88	40.00												
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216 – 960	46.02												
Above 960	53.98												
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<p>MID Channel:</p> <table><tbody><tr><td>1111.288</td><td>23.81</td><td>-30.19</td><td>949,9699</td><td>34.21</td><td>-11.79</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>		1111.288	23.81	-30.19	949,9699	34.21	-11.79						
1111.288	23.81	-30.19	949,9699	34.21	-11.79								
<p>HIGH Channel:</p> <table><tbody><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>													
<p>There were no emissions measured within -6 dB of the specified limit. Please refer to the test data and plots (Plots 2 through 28) for more detail.</p>													

Restricted Frequency Bands [MHz] FCC Part 15.205					
Start	End	Start	End	Start	End
4.17725	4.17775	123	138	3345.8	3358
4.20725	4.20775	149.9	150.05	3600	4400
6.215	6.218	156.52	156.53	4500	5150
6.26775	6.26825	156.7	156.9	5350	5460
6.31175	6.31225	162.01	167.17	7250	7750
8.291	8.294	167.72	173.2	8025	8500
8.362	8.366	240	285	9000	9200
8.37625	8.38675	322	335.4	9300	9500
8.41425	8.41475	399.9	410	10600	12700
12.29	12.293	608	614	13250	13400
12.51975	12.52025	960	1240	14470	14500
12.57675	12.57725	1300	1427	15350	16200
13.36	13.41	1435	1626.5	17700	21400
16.42	16.423	1645.5	1646.5	22010	23120
16.69475	16.69525	1660	1710	23600	24000
16.80425	16.80475	1718.8	1722.2	31200	31800
25.5	25.67	2200	2300	36430	36500
37.5	38.25	2310	2390		

Test Data

Radiated Emissions

Omni Antenna

Mid Channel

AWE 20-24 REV-2 in Base mode

30-1000 MHz

Wi-LAN
Mid channel
Wi-LAN AWE 120-24 rev 2
Project Number: w02e2348

Test	Meter	Gain/Loss	Transducer	Level	1	2	3	4
Frequency	Reading	Factor	Factor	[dB(uVolts)]				
[MHz]	[dB(uV)]	[dB]	[dB]					
949.9669	4.41	qp	6.4	23.4	34.21	56.9	46	N/A
59.2								
Azimuth: 120	Height:101	Horz		Margin [dB]	-22.69	-11.79	N/A	-24.99

LIMIT 1: FCC Part 15 Class A 3m
LIMIT 2: FCC Part 15 Class B 3m
LIMIT 3: NONE
LIMIT 4: AWE 120-24 REV 2I 300 328 TX

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

Test Data

Radiated Emissions

Omni Antenna

Mid Channel

AWE 20-24 REV-2 in Base mode

1-2 GHz

Wi-LAN
Omni
MID channel Base #58
AWE 120-24 rev 2
Project Number w02e2348

Test	Meter	Gain/Loss		Transducer	Level	Limit:1	2	3
4		Frequency	Reading	Factor	Factor	[dB(uVolts)]		
		[MHz]		[dB(uV)]	[dB]	[dB]		
		=====	=====	=====	=====	=====	=====	=====
1111.288	29.71	av	-31	25.1		23.81	57.7	54
54	N/A							
Azimuth: 117	Height:320	Vert		Margin [dB]		-33.89	-30.19	-30.19
N/A								

LIMIT 1: AWE 120-24 REV 2I 300 328 RX

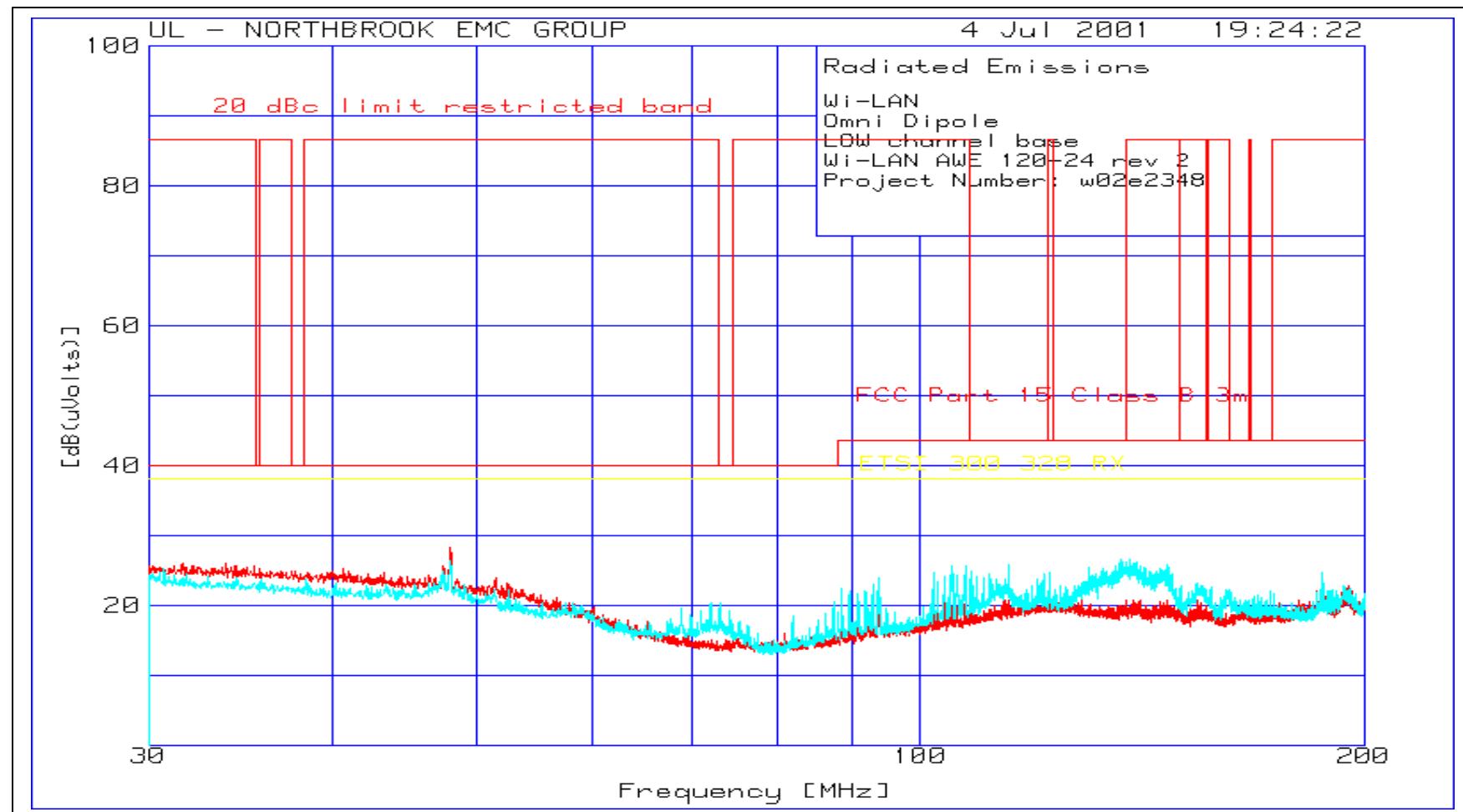
LIMIT 2: FCC Part 15 Subpart C 3m

LIMIT 3: 20 dBc limit restricted band

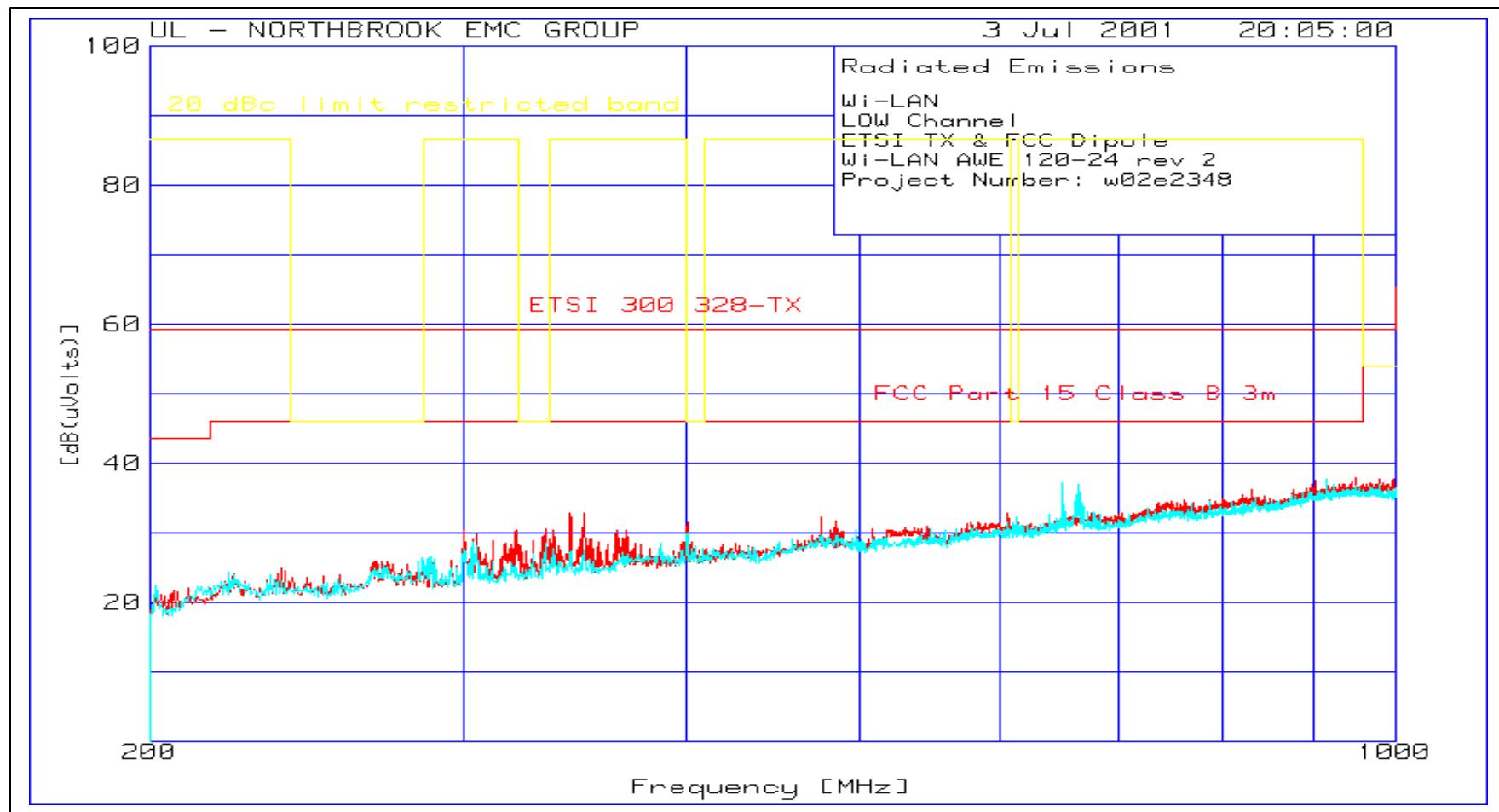
LIMIT 4: NONE

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

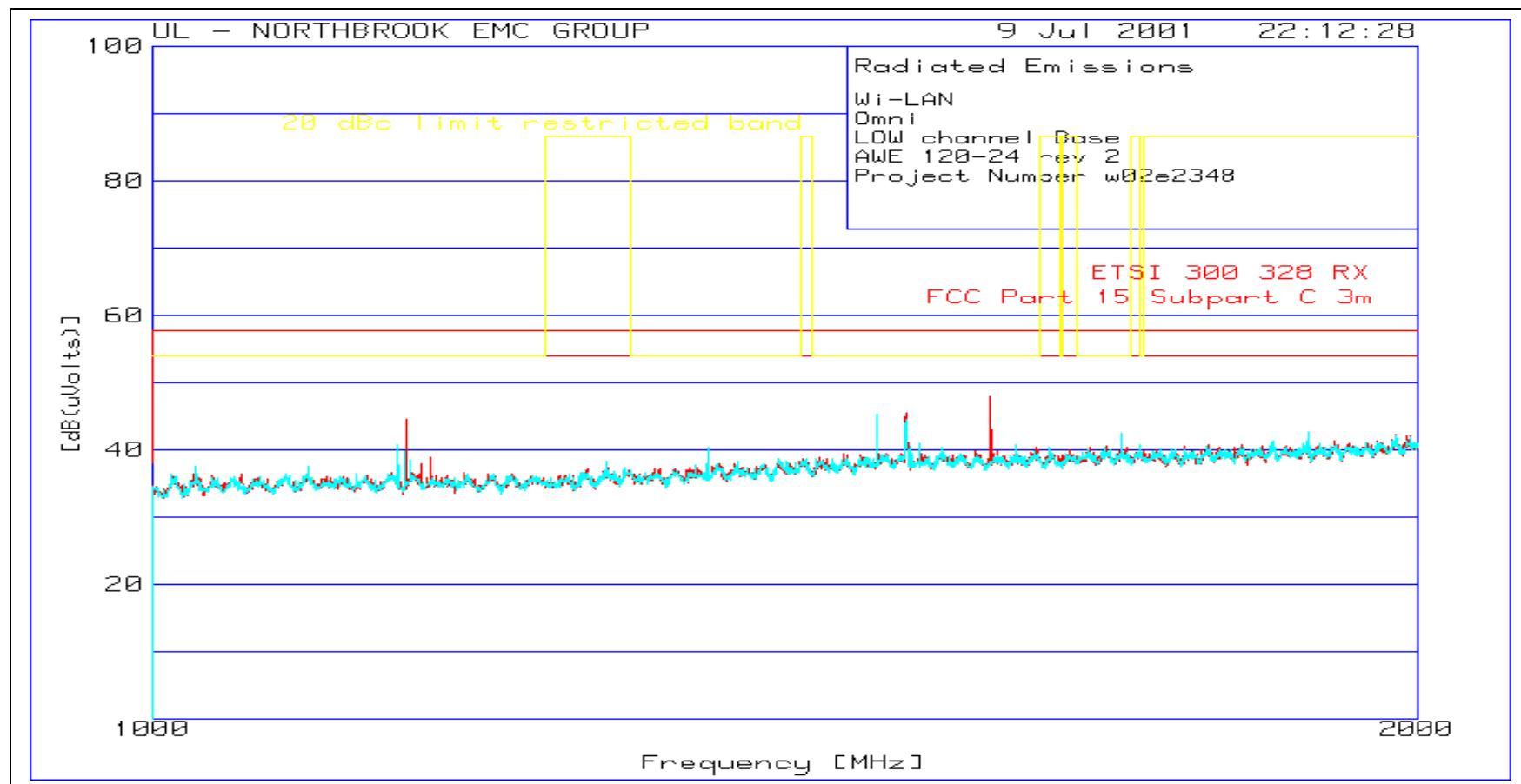
Plot 2
Radiated Emissions of Omni Antenna – Low Channel
AWE 120-24 REV 2 in Base mode
30-200 MHz



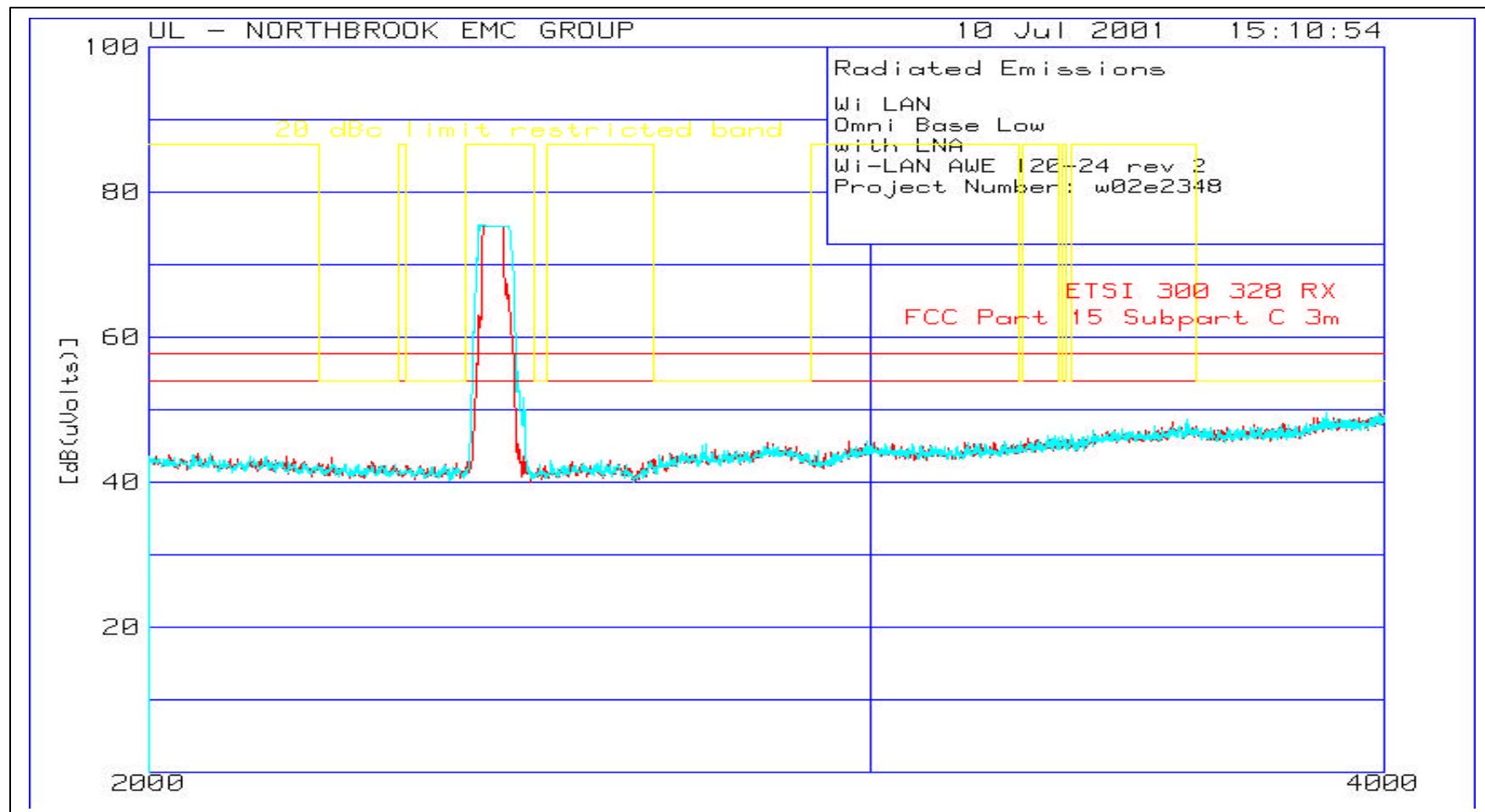
Plot 3
Radiated Emissions of Omni Antenna – Low Channel
AWE 120-24 REV 2 in Base mode
200-1000 MHz



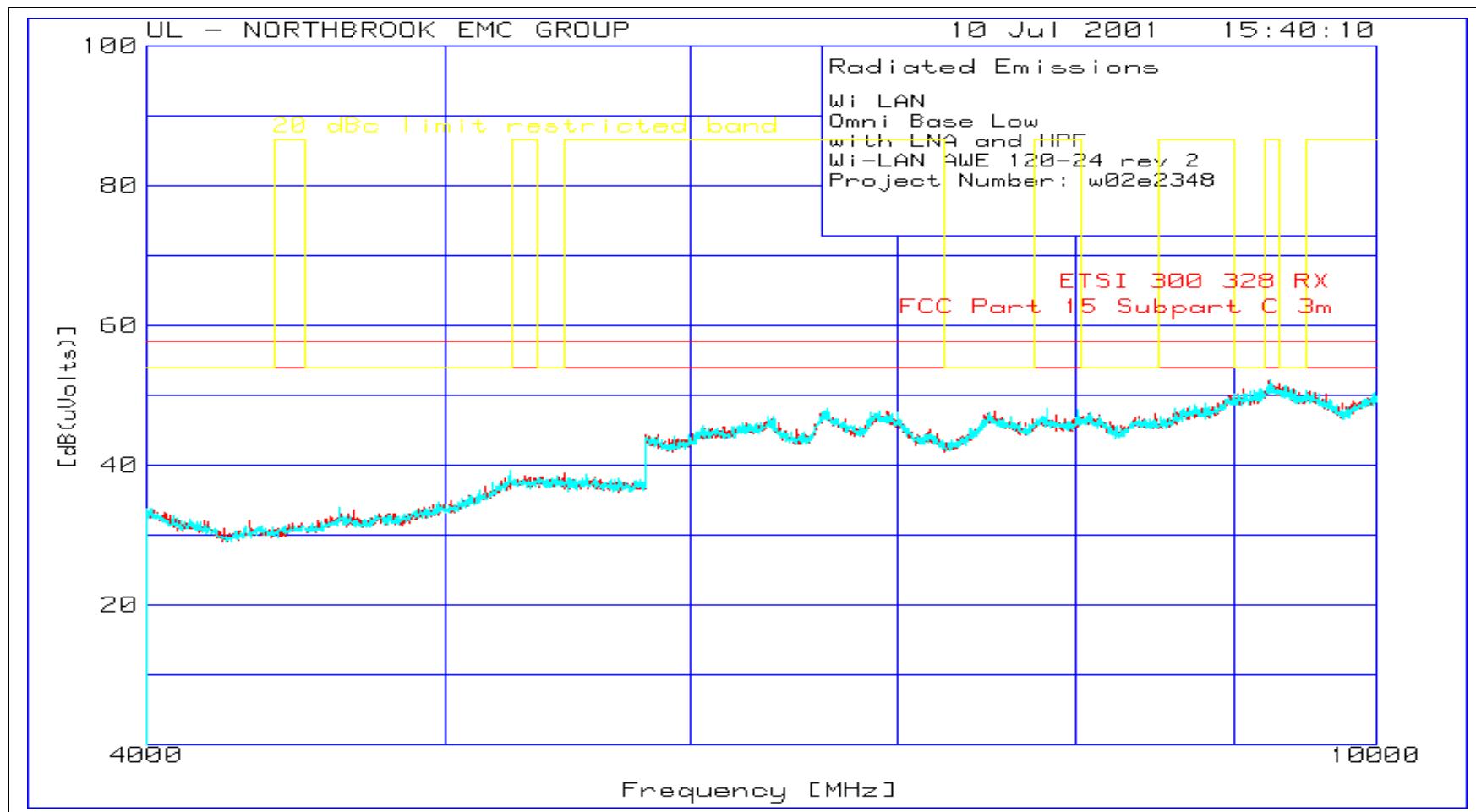
Plot 4 Radiated Emissions of Omni Antenna – Low Channel AWE 120-24 REV 2 in Base mode 1-2 GHz



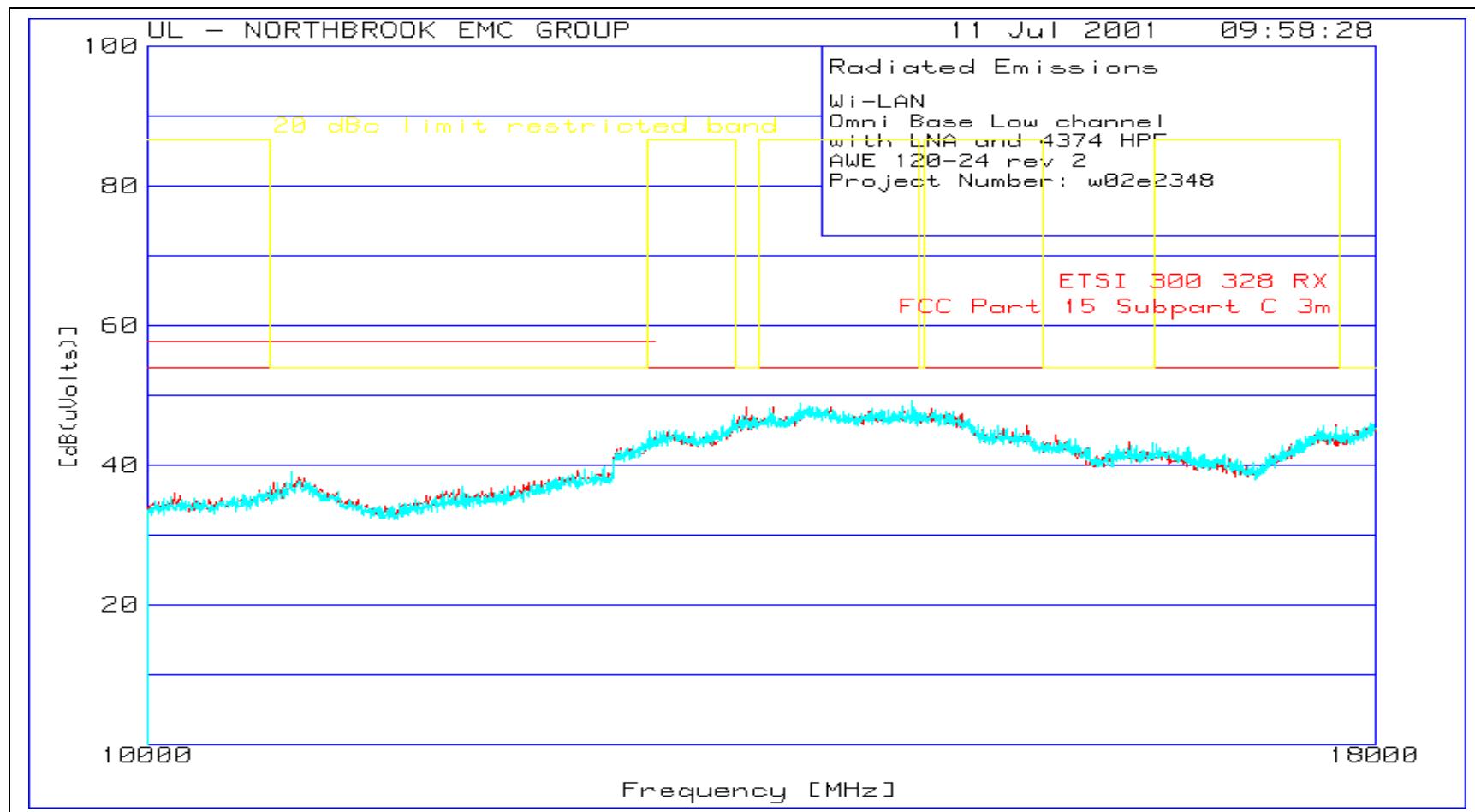
Plot 5
Radiated Emissions of Omni Antenna – Low Channel
AWE 120-24 REV 2 in Base mode
2-4 GHz



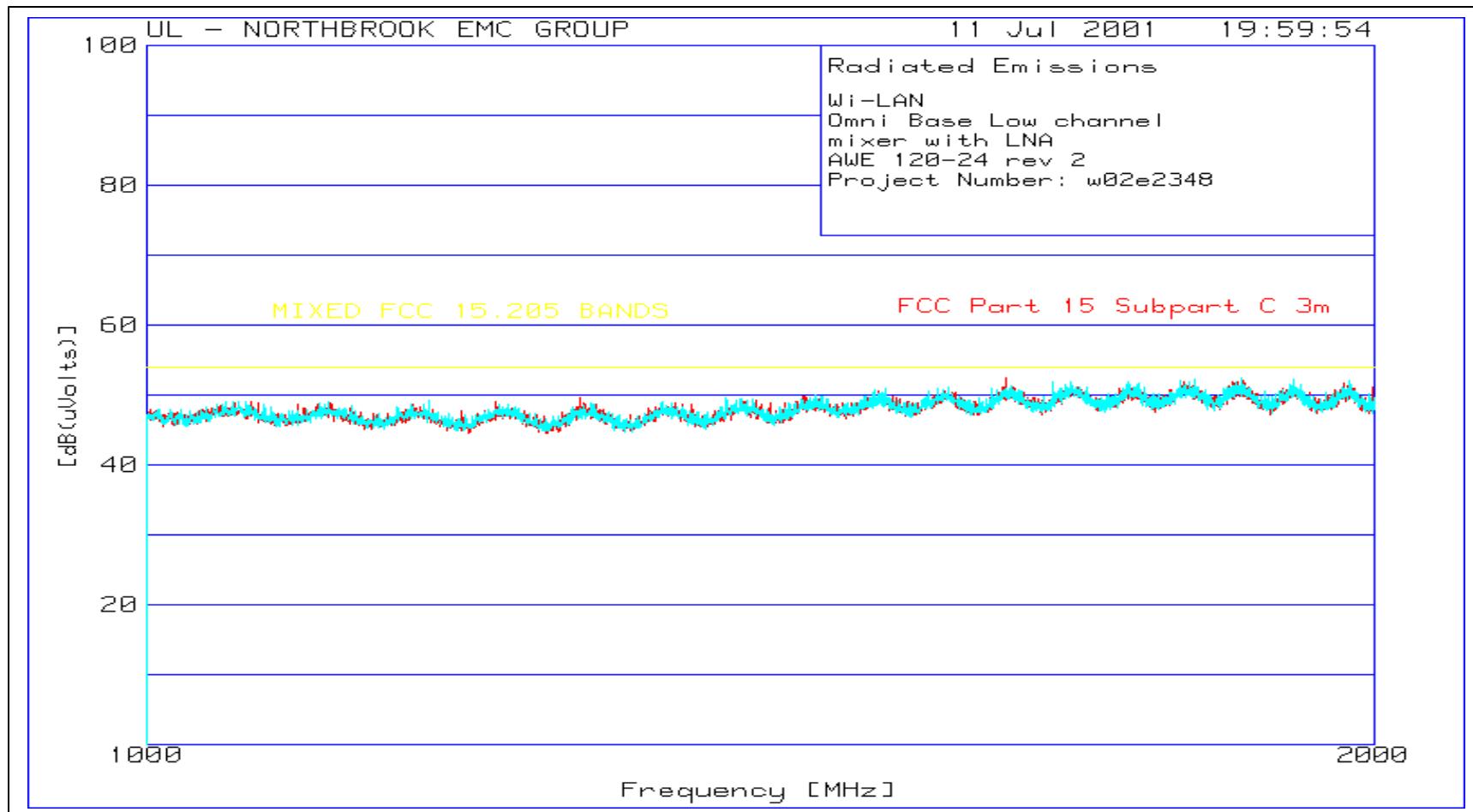
Plot 6
Radiated Emissions of Omni Antenna – Low Channel
AWE 120-24 REV 2 in Base mode
4-10GHz



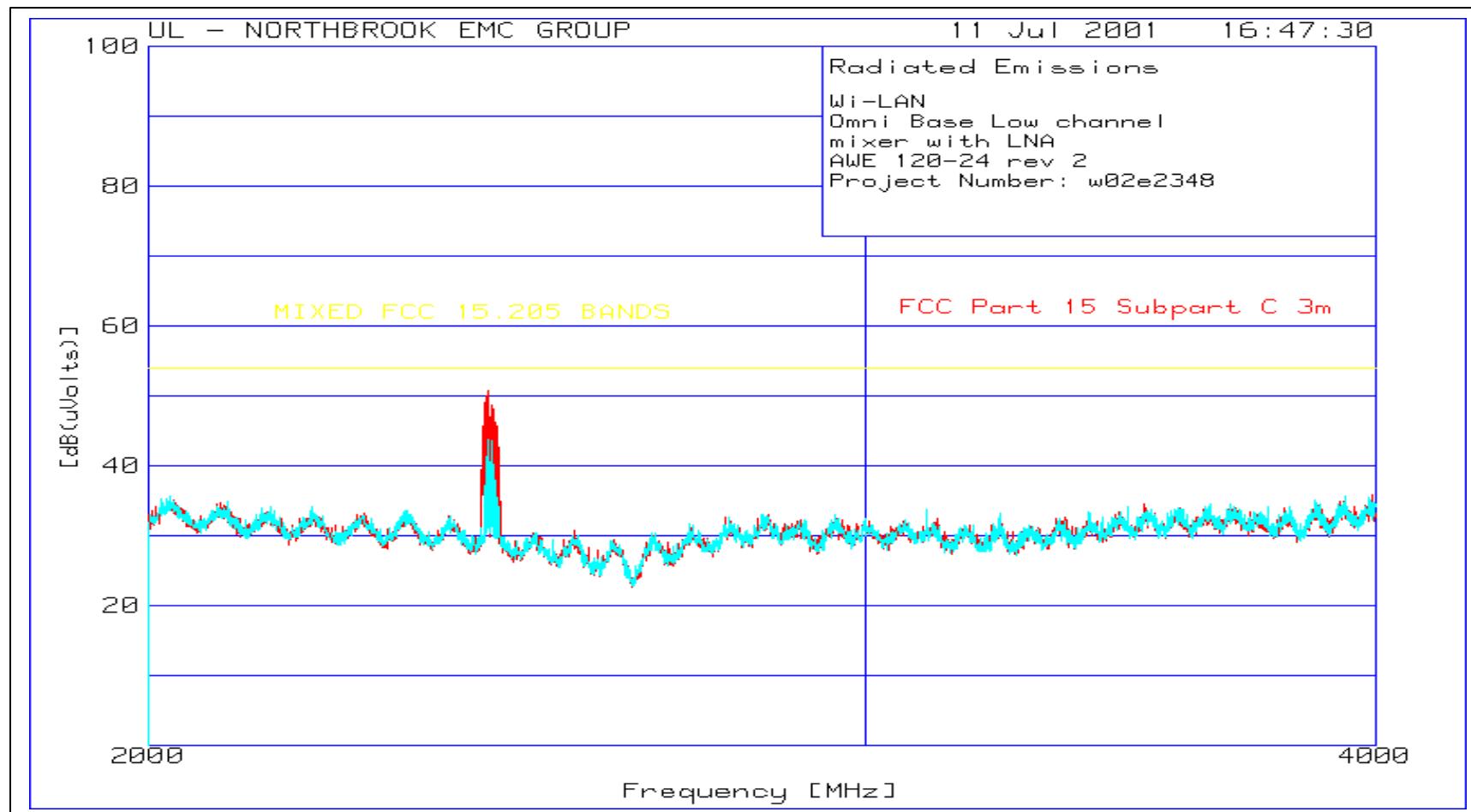
Plot 7
Radiated Emissions of Omni Antenna – Low Channel
AWE 120-24 REV 2 in Base mode
10-18 GHz



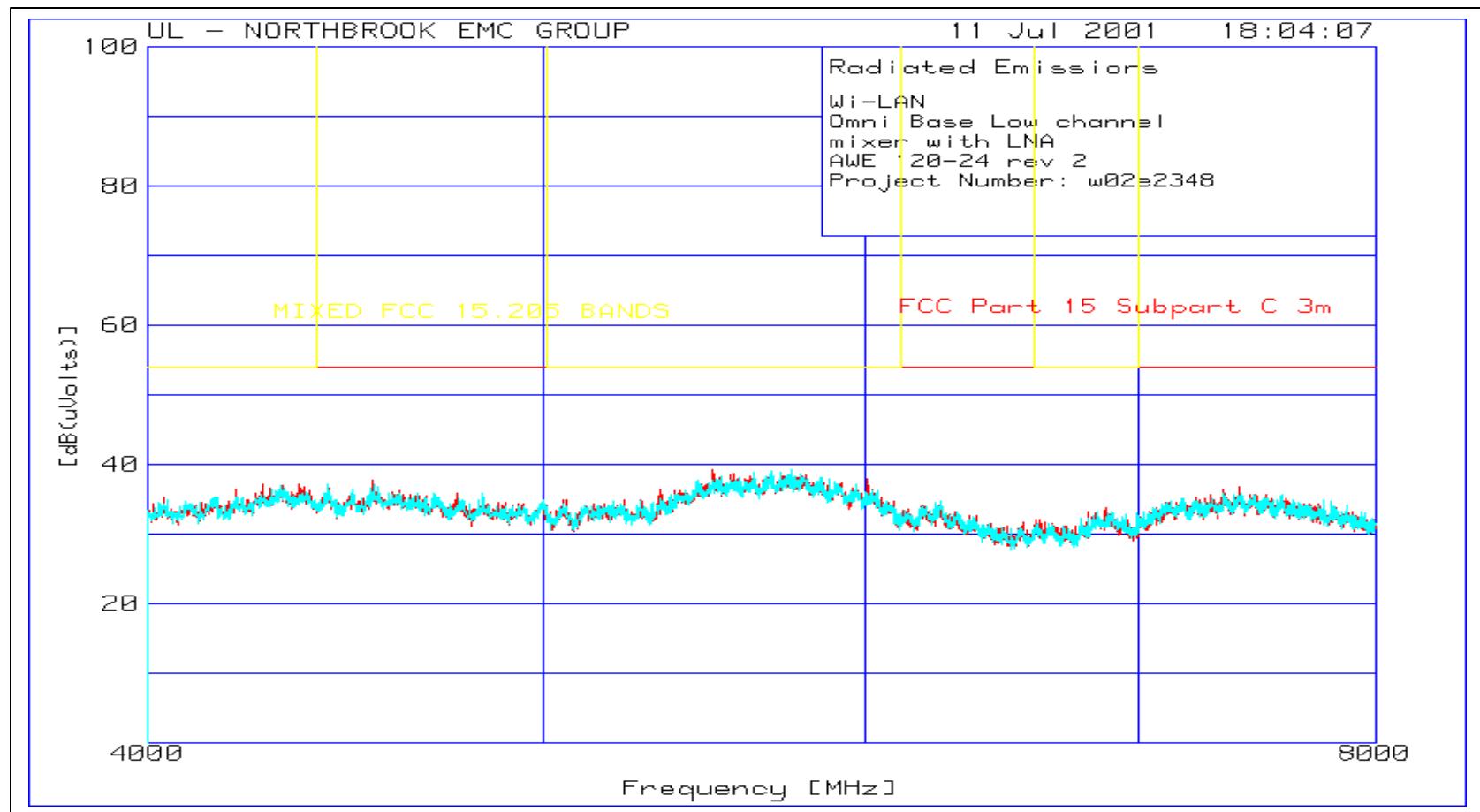
Plot 8
Radiated Emissions of Omni Antenna – Low Channel
AWE 120-24 REV 2 in Base mode
18-19 GHz



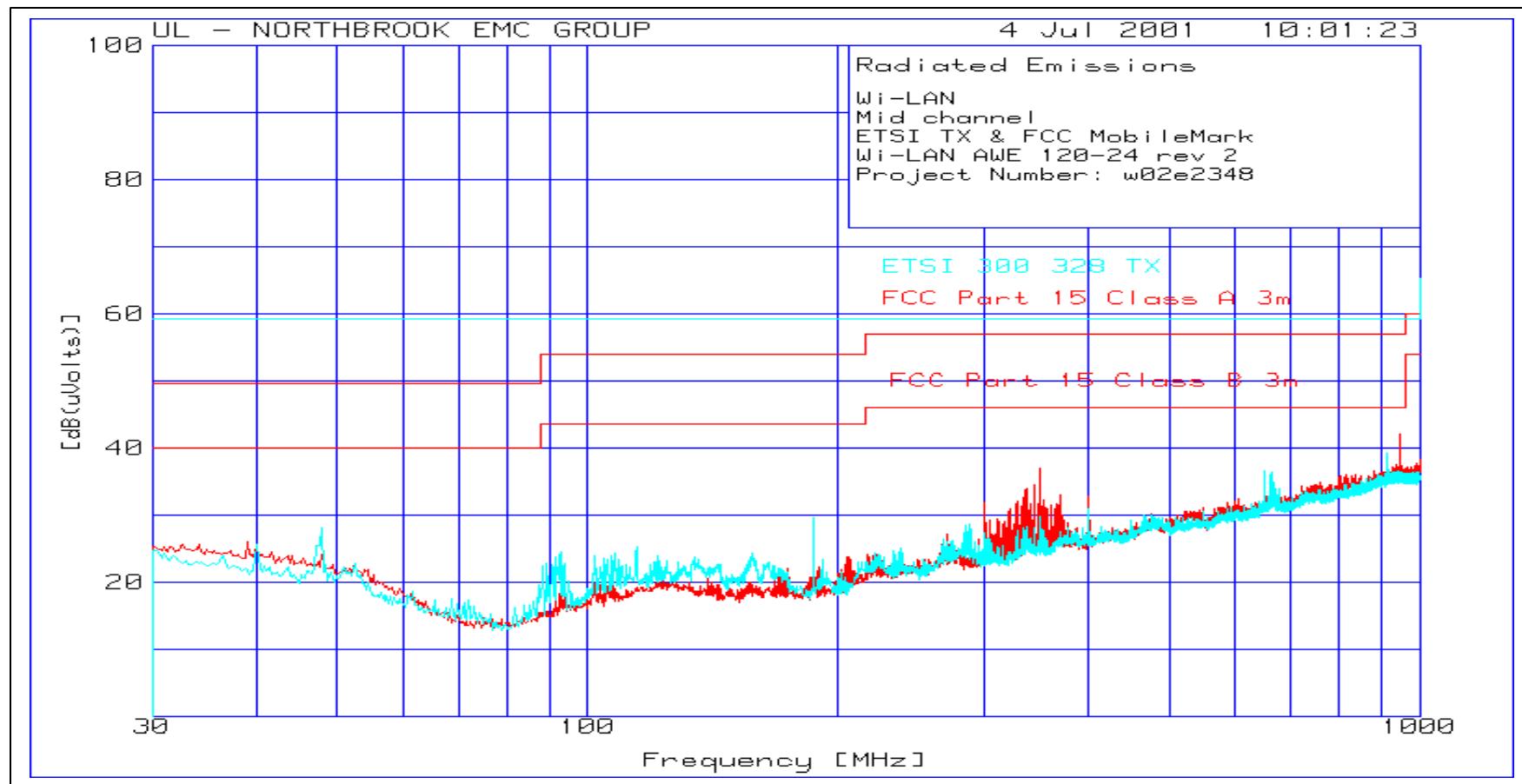
Plot 9
Radiated Emissions of Omni Antenna – Low Channel
AWE 120-24 REV 2 in Base mode
19-21 GHz



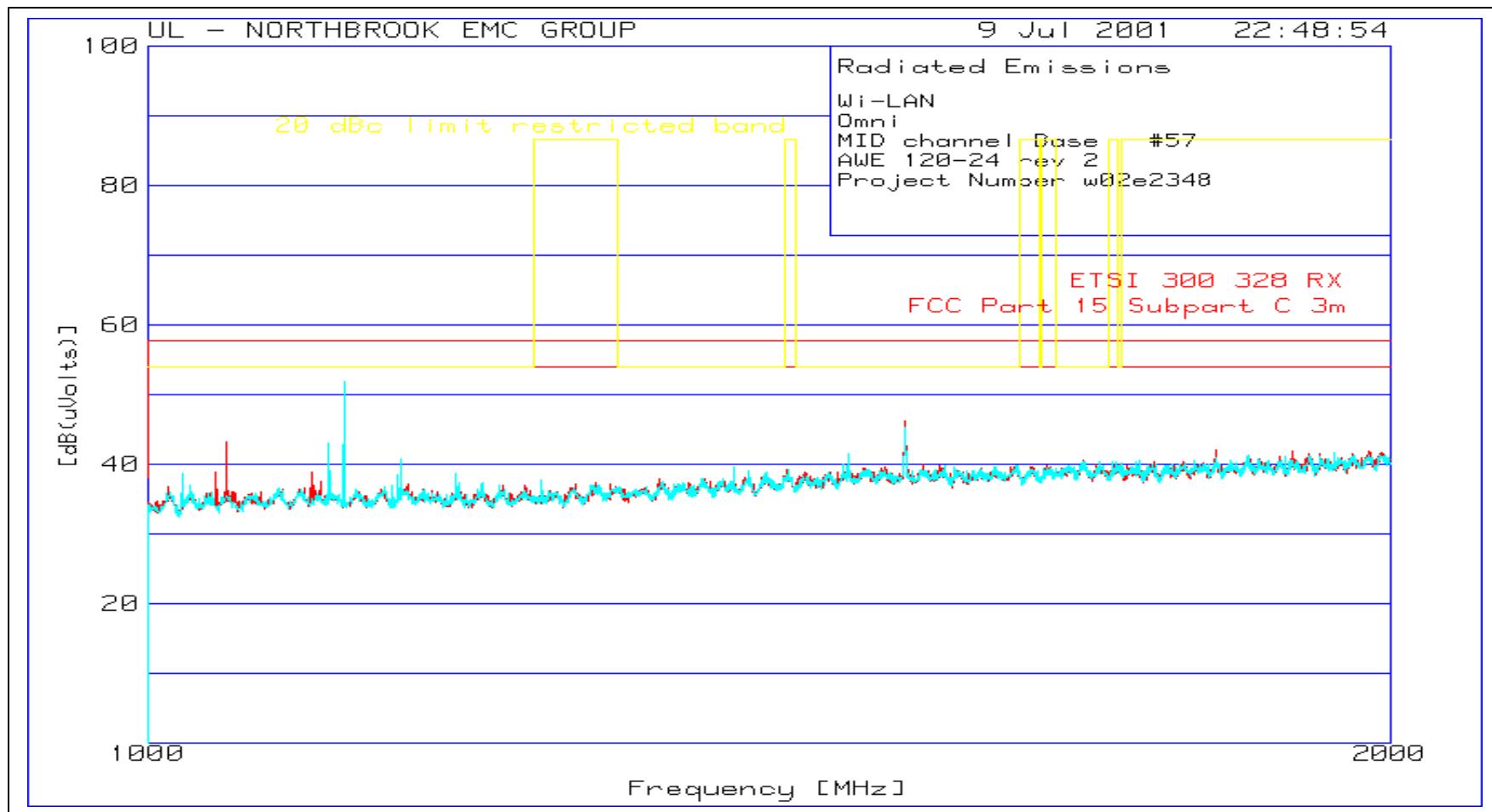
Plot 10
Radiated Emissions of Omni Antenna – Low Channel
AWE 120-24 REV 2 in Base mode
21-25GHz



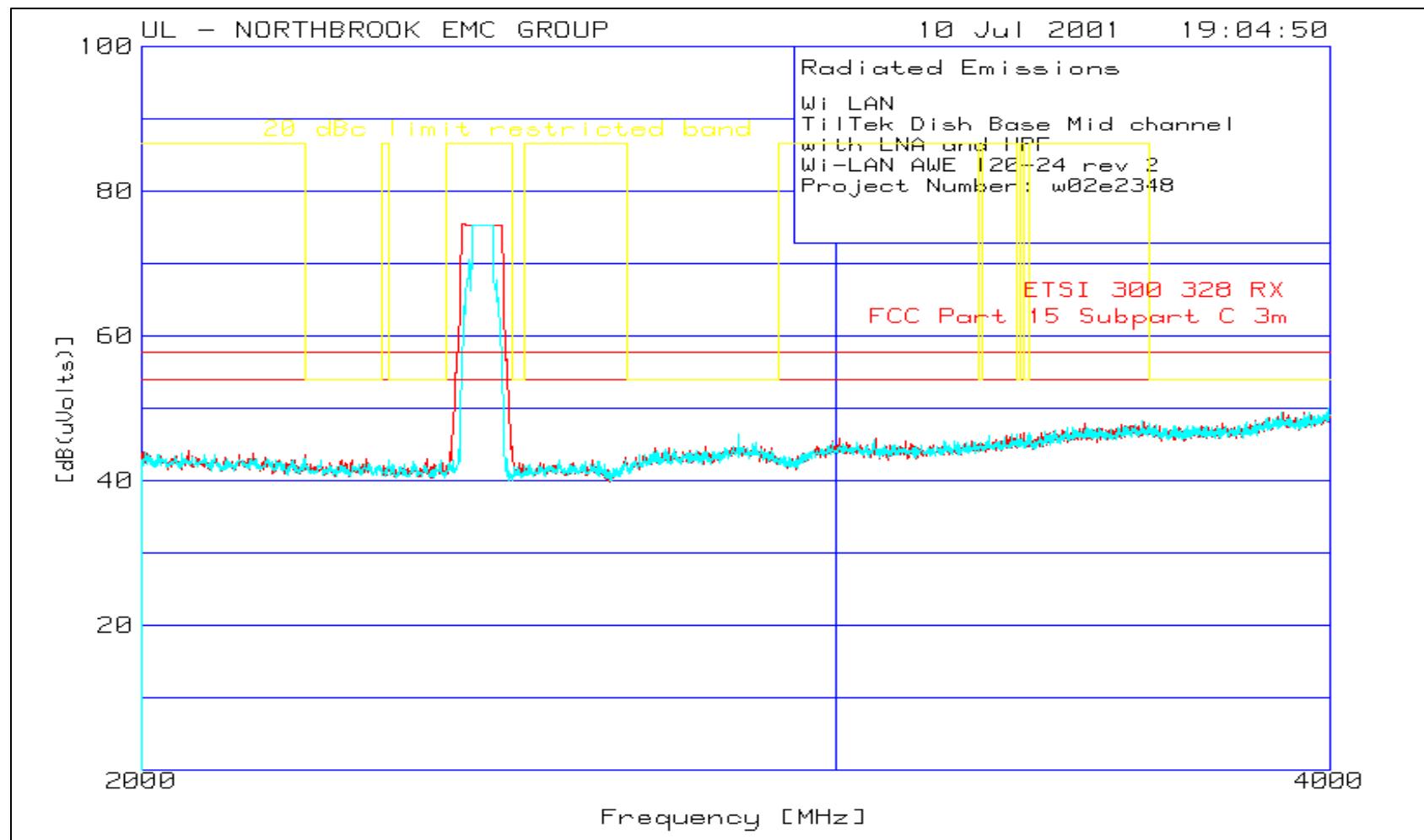
Plot 11
Radiated Emissions of Omni Antenna – Mid Channel
AWE 20-24 REV-2 in Remote mode
30-1000 MHz



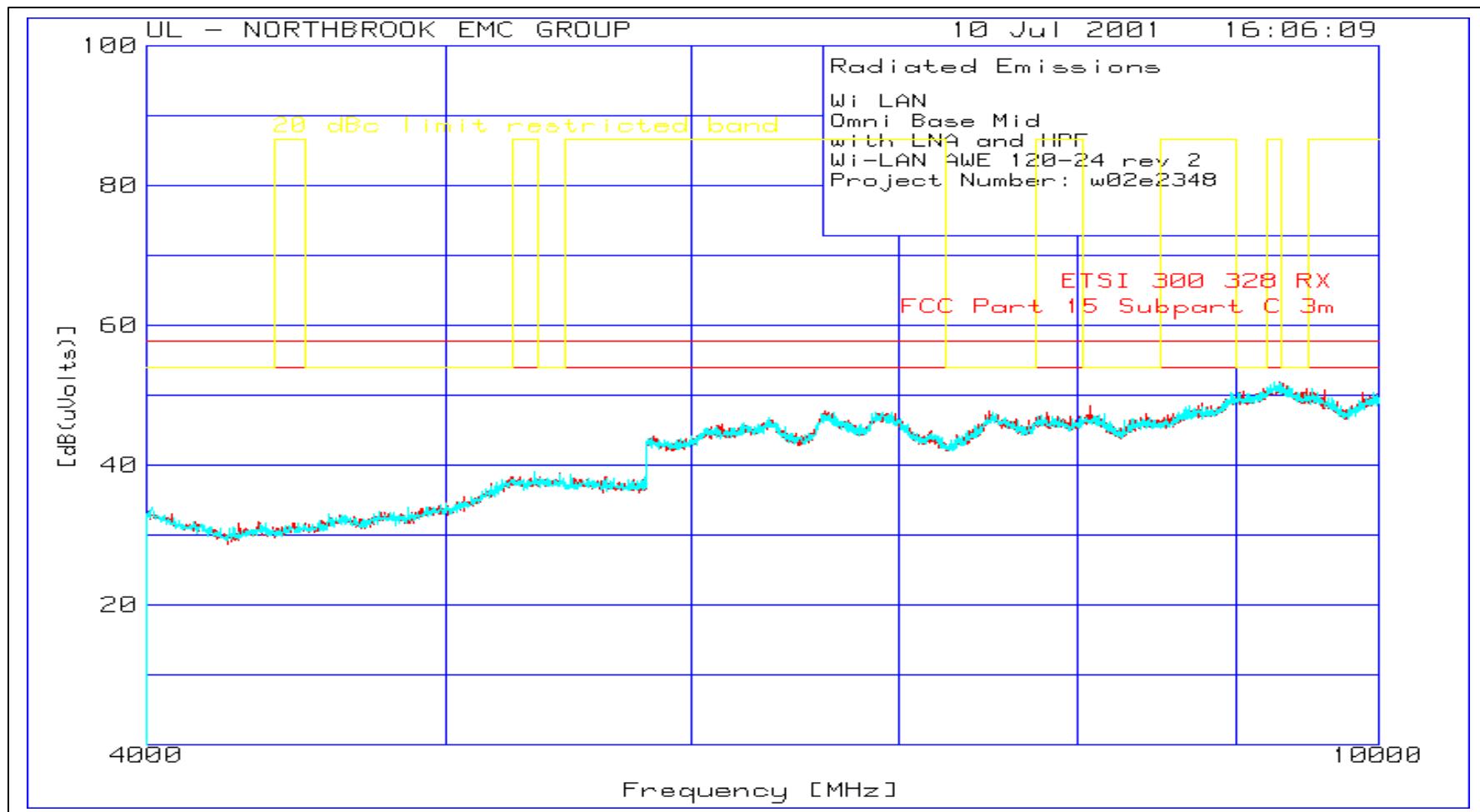
Plot 12
Radiated Emissions of Omni Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
1-2 GHz



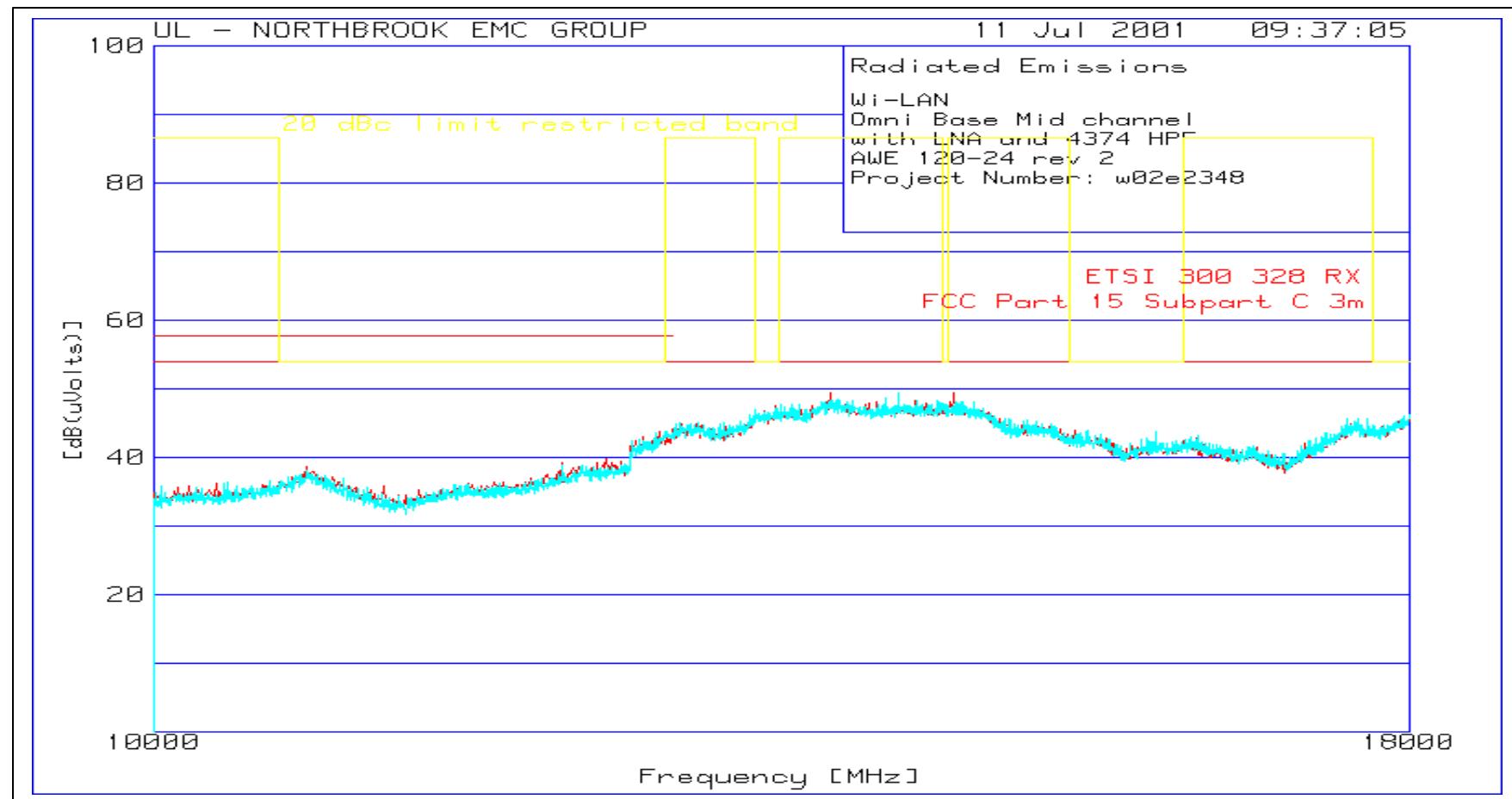
Plot 13
Radiated Emissions of Omni Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
2-4 GHz



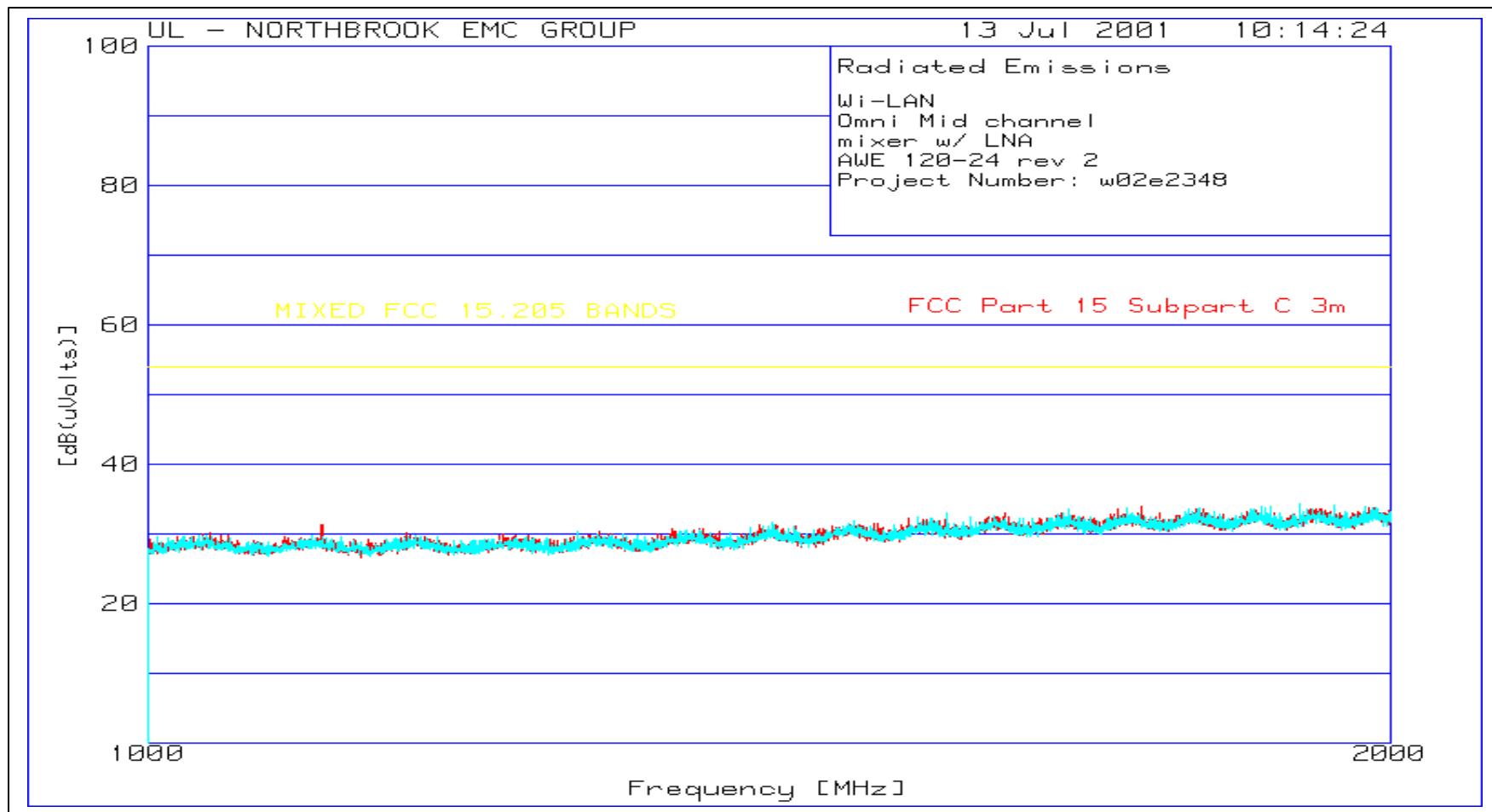
Plot 14
Radiated Emissions of Omni Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
4-10GHz



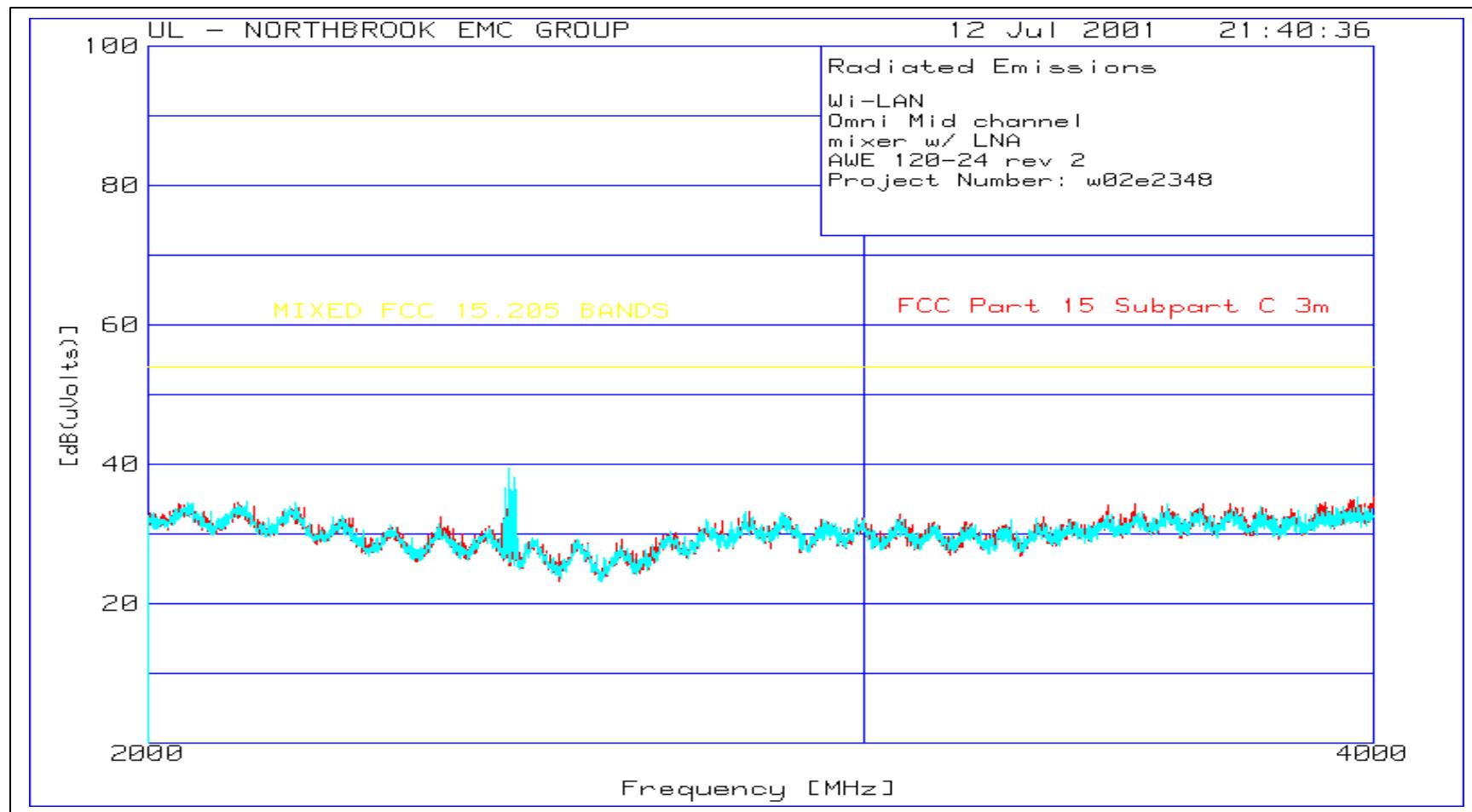
Plot 15 Radiated Emissions of Omni Antenna – Mid Channel AWE 20-24 REV-2 in Base mode 10-18 GHz



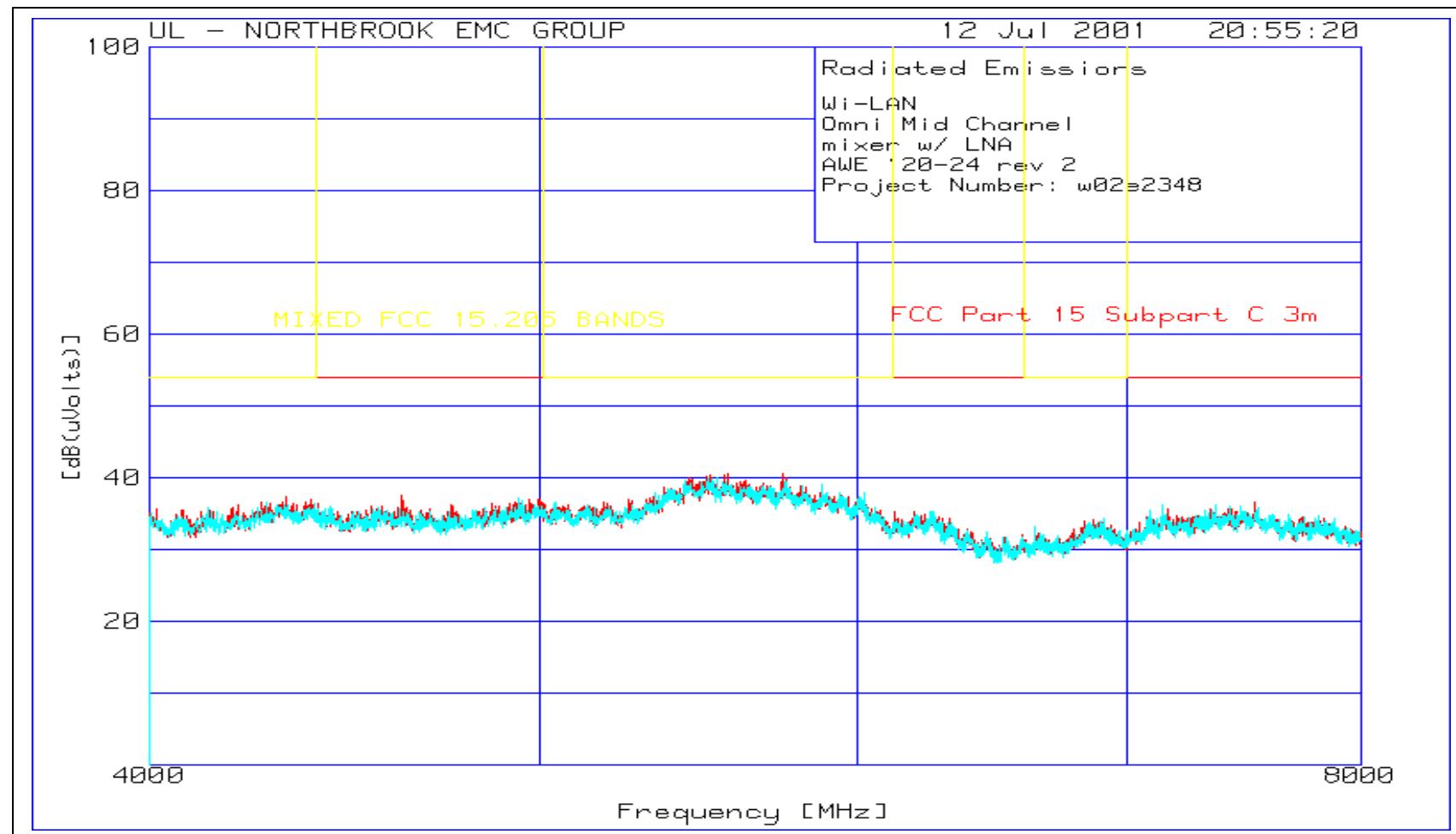
Plot 16
Radiated Emissions of Omni Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
18-19 GHz



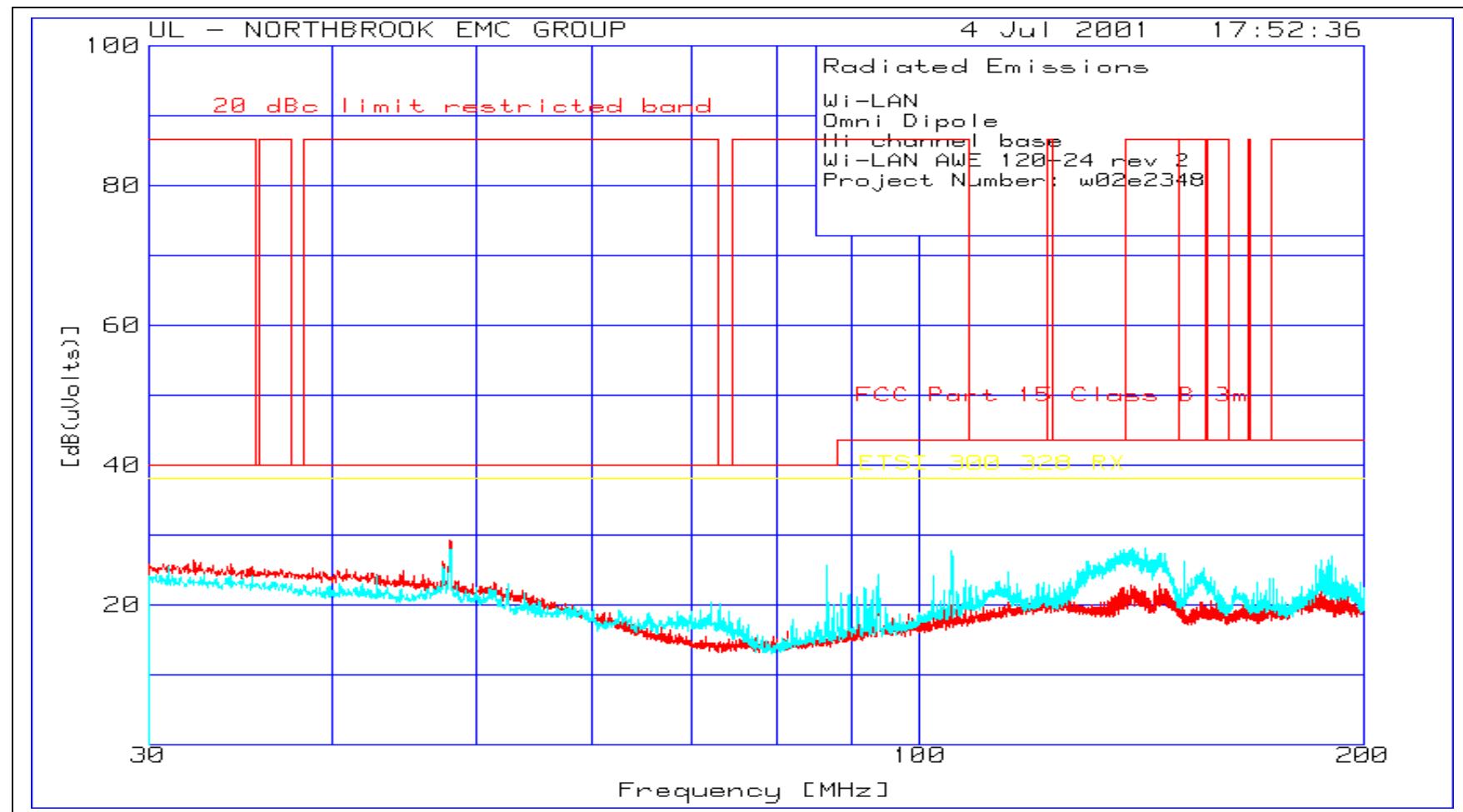
Plot 17
Radiated Emissions of Omni Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
19-21 GHz



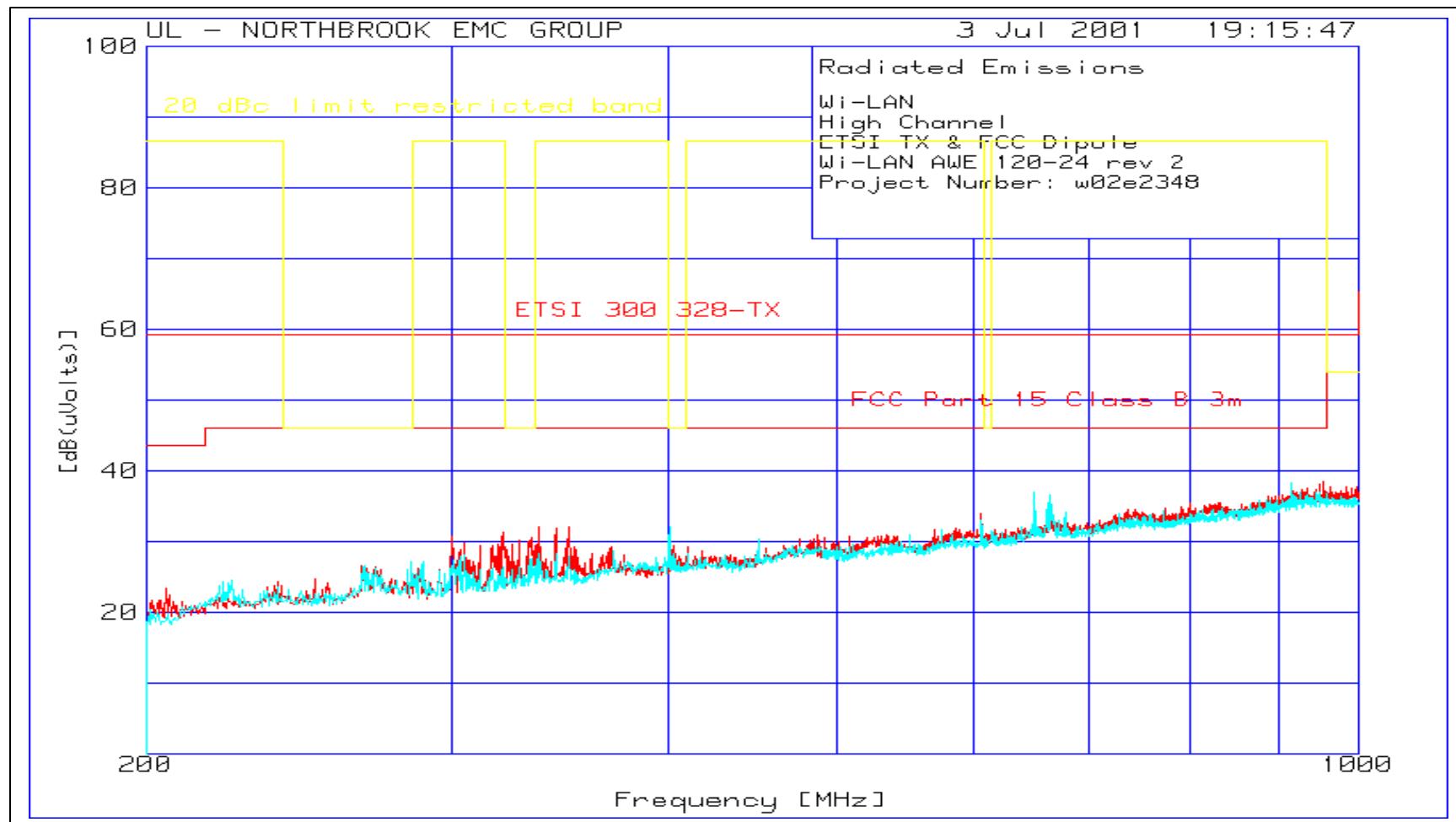
Plot 18
Radiated Emissions of Omni Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
21-25 GHz



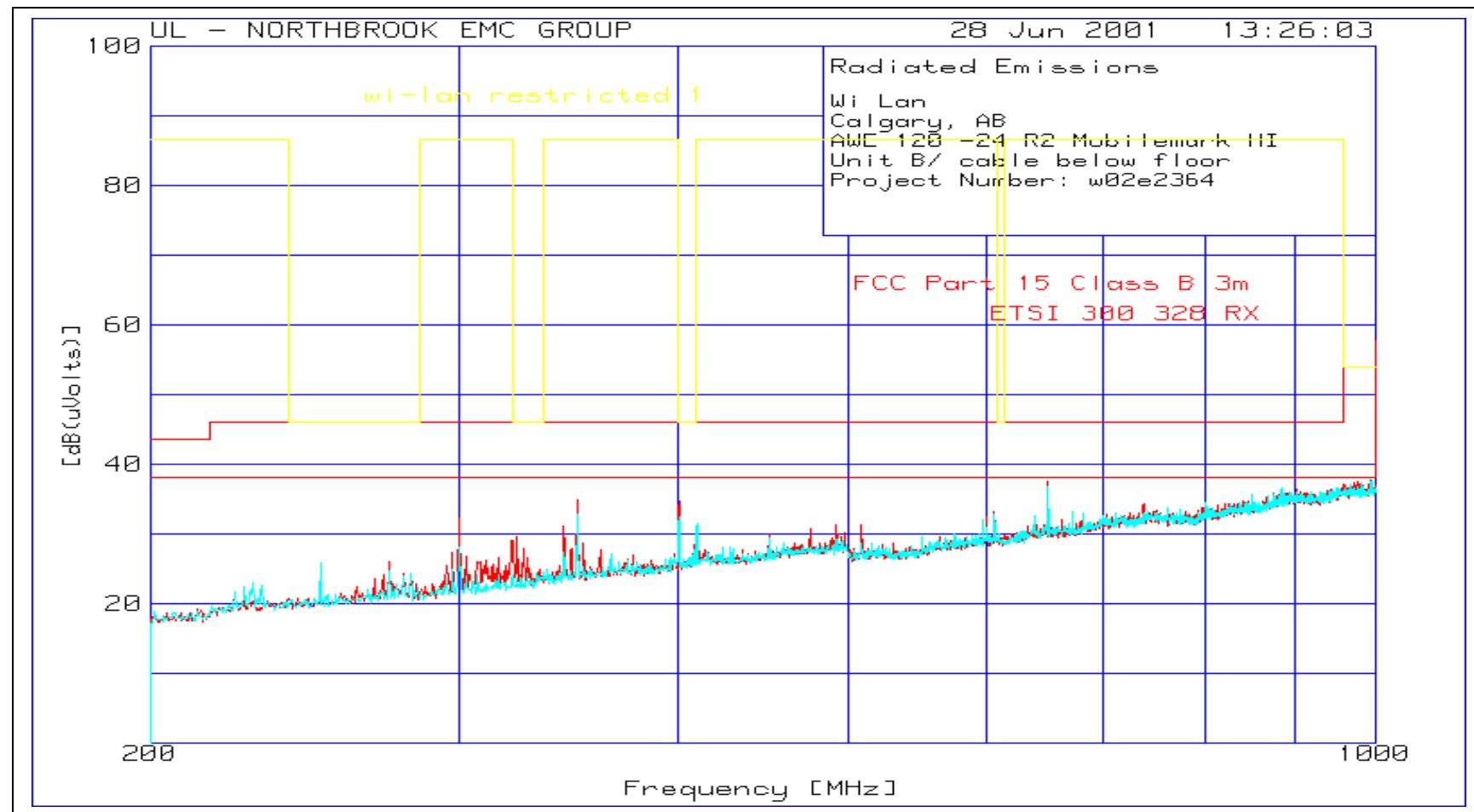
Plot 19
Radiated Emissions of Omni Antenna – High Channel
AWE 20-24 REV-2 in Base mode
30-200 MHz



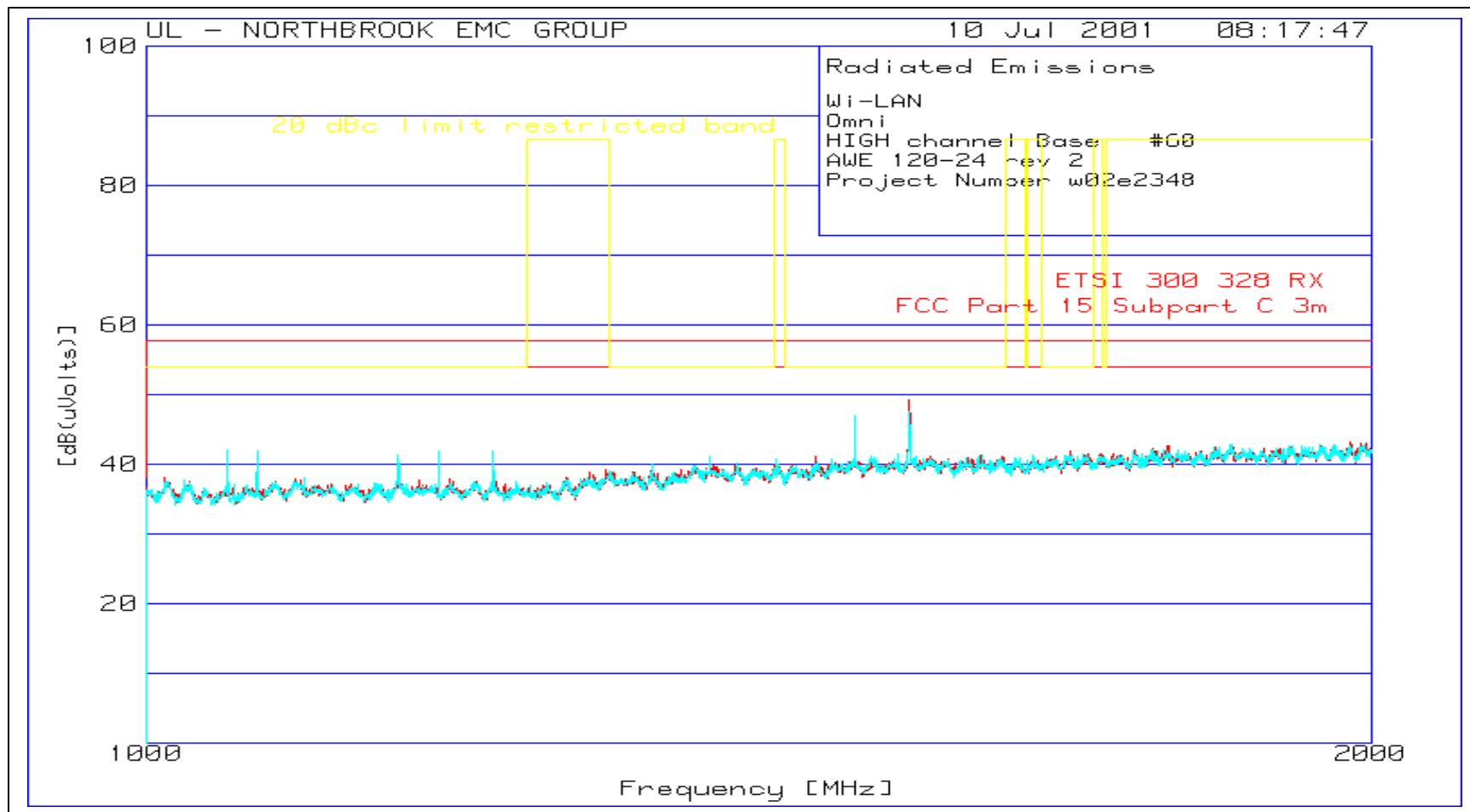
Plot 20
Radiated Emissions of Omni Antenna – High Channel
AWE 20-24 REV-2 in Base mode
200-1000 MHz



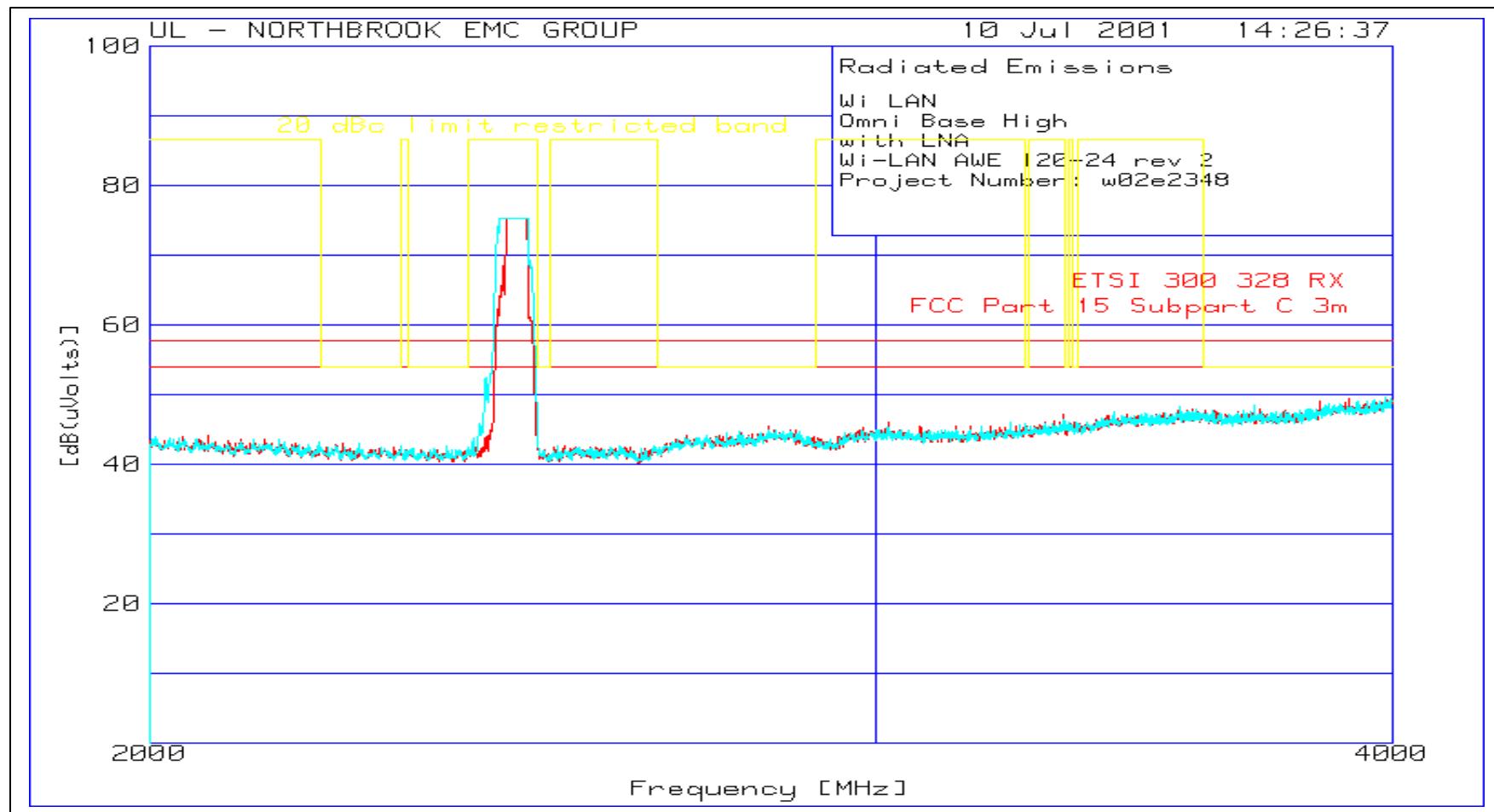
Plot 21
Radiated Emissions of Omni Antenna – High Channel
AWE 20-24 REV-2 in Remote mode
200-1000 MHz



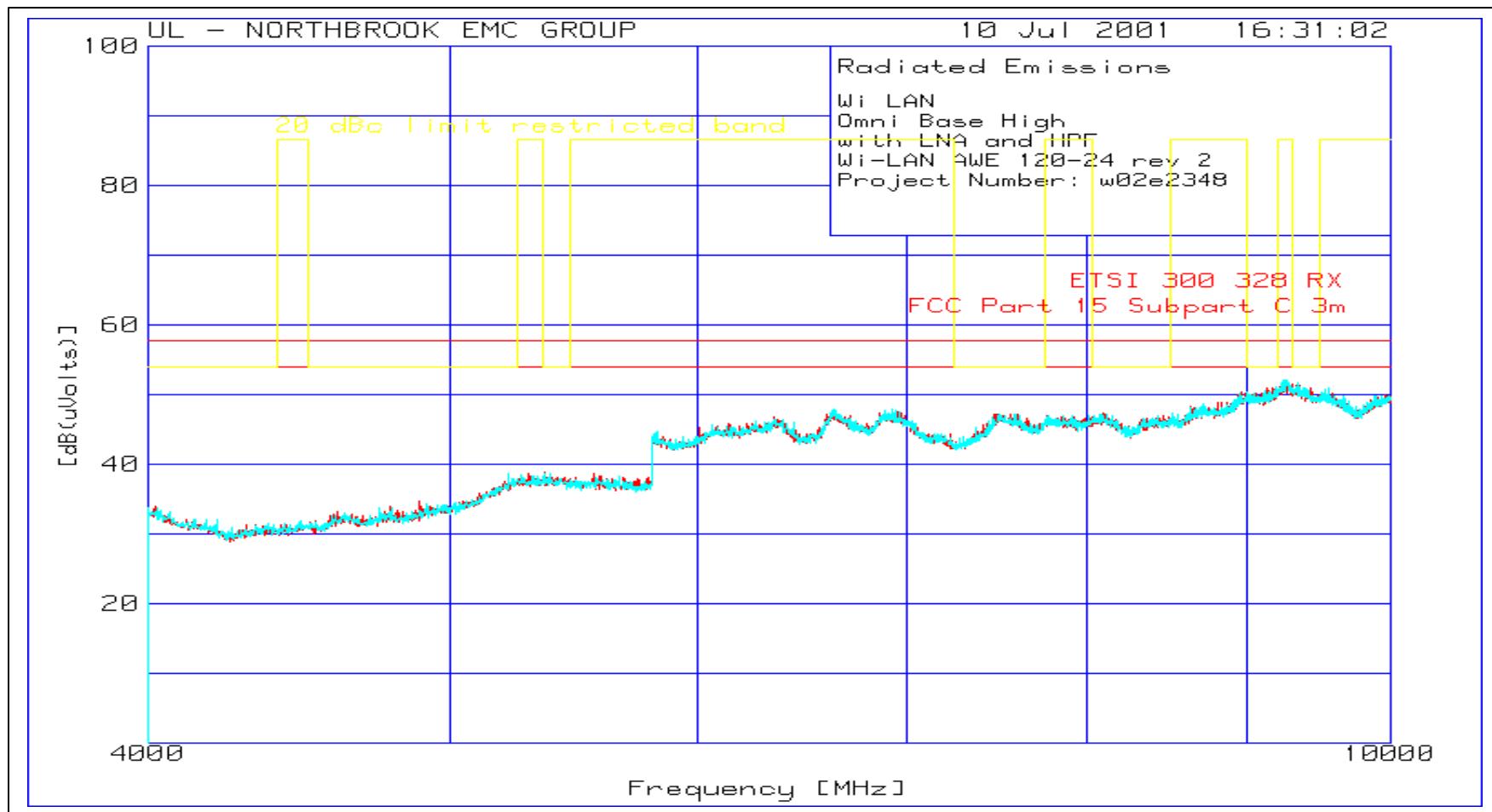
Plot 22
Radiated Emissions of Omni Antenna – High Channel
AWE 20-24 REV-2 in Base mode
1-2 GHz



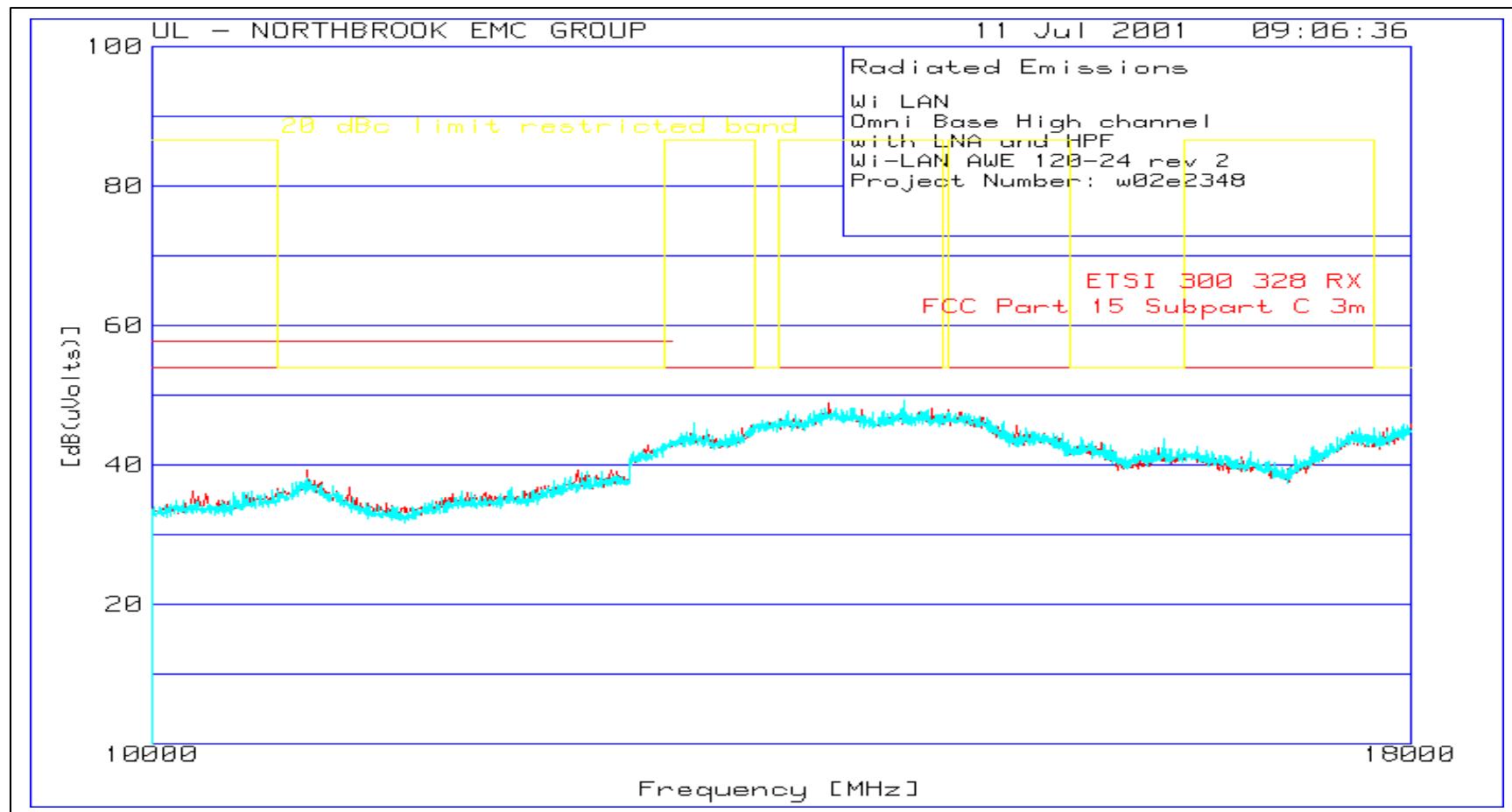
Plot 23
Radiated Emissions of Omni Antenna – High Channel
AWE 20-24 REV-2 in Base mode
2-4 GHz



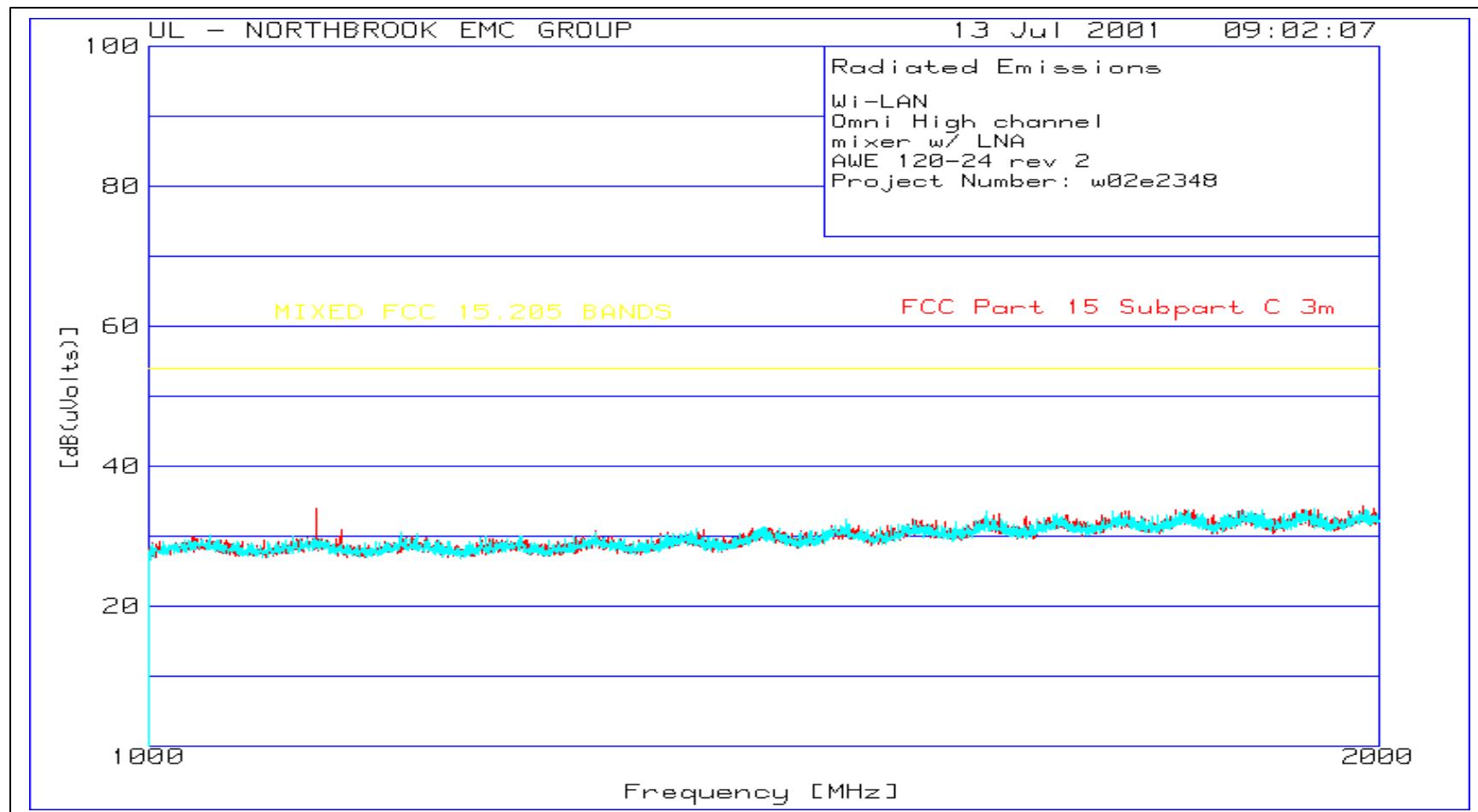
Plot 24
Radiated Emissions of Omni Antenna – High Channel
AWE 20-24 REV-2 in Base mode
4-10GHz



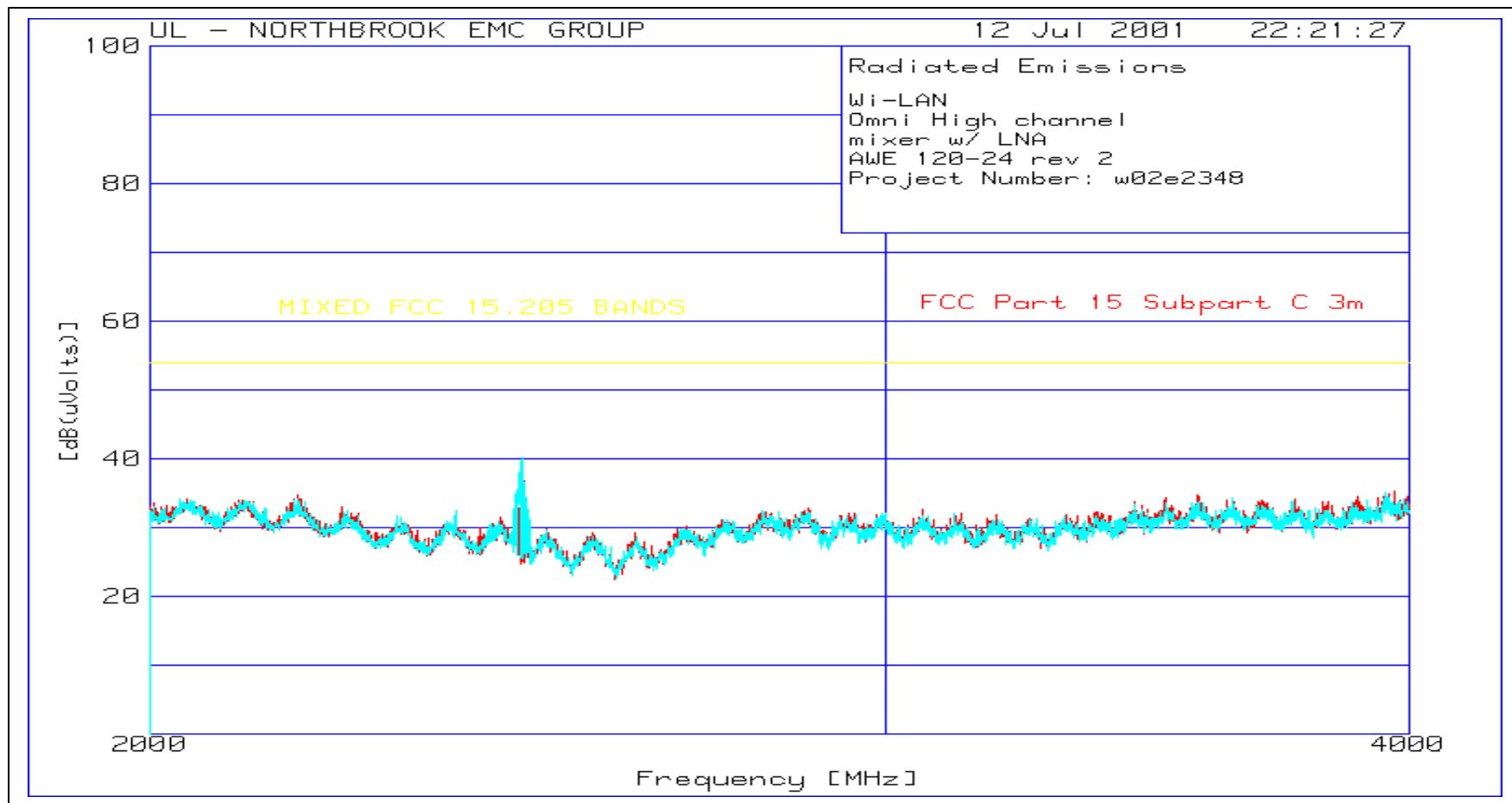
Plot 25
Radiated Emissions of Omni Antenna – High Channel
AWE 20-24 REV-2 in Base mode
10-18 GHz



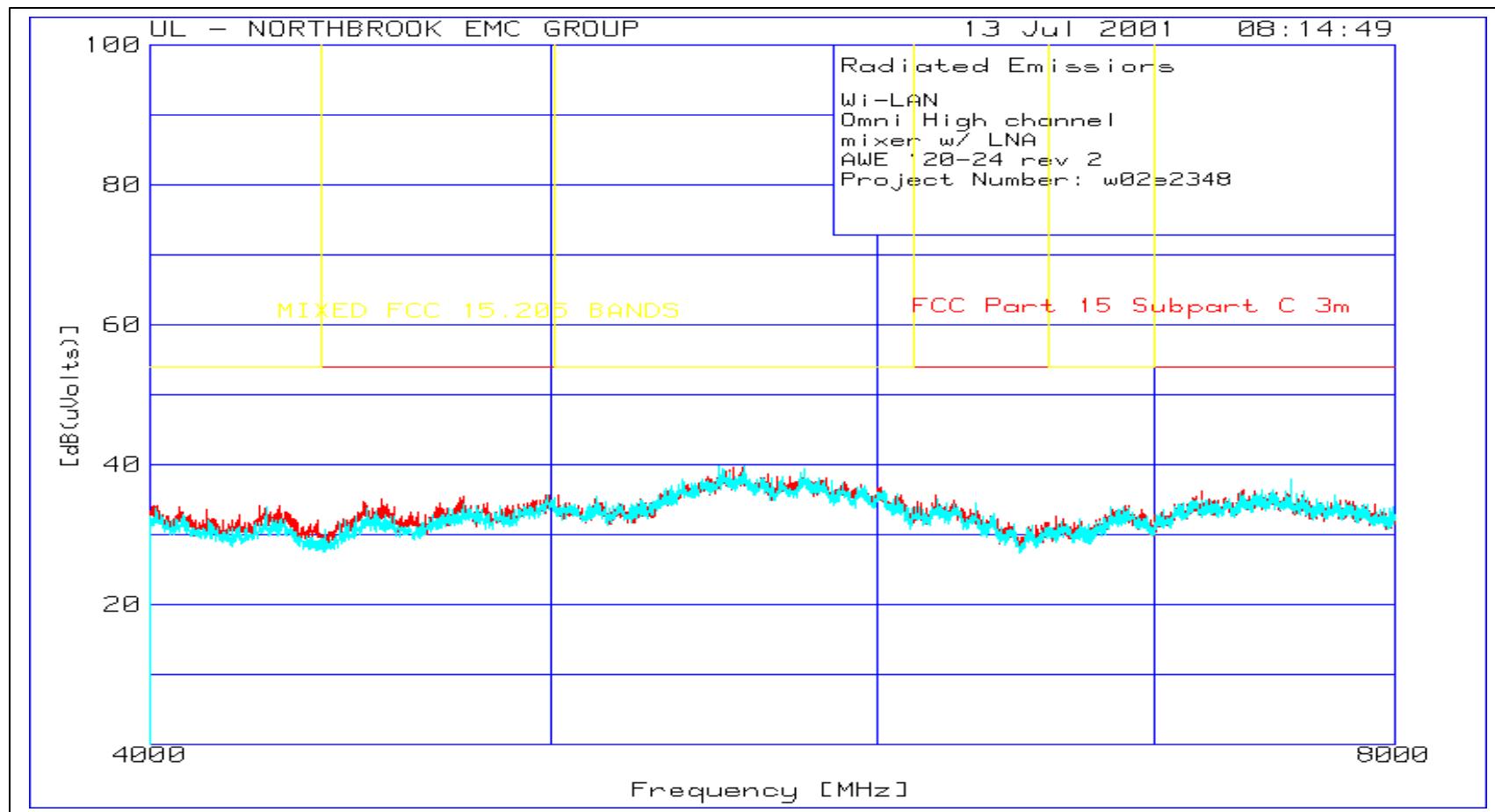
Plot 26
Radiated Emissions of Omni Antenna – High Channel
AWE 20-24 REV-2 in Base mode
18-19 GHz



Plot 27
Radiated Emissions of Omni Antenna – High Channel
AWE 20-24 REV-2 in Base mode
19-21 GHz



Plot 28
Radiated Emissions of Omni Antenna – High Channel
AWE 20-24 REV-2 in Base mode
21-25 GHz



4.2.2 TiTek Dish Antenna

Test Lab: MPB Technologies Inc. Airdrie Test Personnel: Q. Nguyen, S. Tarkowski Test Date: 27 June & 3, 4, 9, 10, 11 July 2001	Product: AWE 120-24 rev 2										
Test Result, AWE 120-24 rev 2 LOW Channel: PASS MID Channel: PASS HIGH Channel: PASS											
Objectives/Criteria											
<p>The Radiated E-Field emissions produced by a system or sub-system, measured at a distance of 3m from the EUT, shall not exceed these limits for the specifications <i>within the restricted bands of operation (RBOs)</i>. Any emissions lying outside the RBOs shall not exceed the level of the fundamental transmission.</p> <p>Emission levels should meet the requirements with a margin of 6dB.</p>	<p>Specifications</p> <p>FCC Part 15.209 and 15.205</p> <table> <thead> <tr> <th>Frequency [MHz]</th> <th>Limit (QP @ 3m) [dBμV/m]</th> </tr> </thead> <tbody> <tr> <td>30 – 88</td><td>40.00</td></tr> <tr> <td>88 – 216</td><td>43.52</td></tr> <tr> <td>216 – 960</td><td>46.02</td></tr> <tr> <td>Above 960</td><td>53.98</td></tr> </tbody> </table>	Frequency [MHz]	Limit (QP @ 3m) [dB μ V/m]	30 – 88	40.00	88 – 216	43.52	216 – 960	46.02	Above 960	53.98
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88 – 216	43.52										
216 – 960	46.02										
Above 960	53.98										
Vertical:											
<table> <thead> <tr> <th>f (MHz)</th> <th>Field Strength (dBμV/m)</th> <th>Delta (dB from limit)</th> <th>f (MHz)</th> <th>Field Strength (dBμV/m)</th> <th>Delta (dB from limit)</th> </tr> </thead> </table>	f (MHz)	Field Strength (dB μ V/m)	Delta (dB from limit)	f (MHz)	Field Strength (dB μ V/m)	Delta (dB from limit)					
f (MHz)	Field Strength (dB μ V/m)	Delta (dB from limit)	f (MHz)	Field Strength (dB μ V/m)	Delta (dB from limit)						
LOW Channel:											
			39.4	18.3	-21.7						
			40	17.4	-20.8						
MID Channel:											
194.3955	54	-28.16	56.7745	49.5	-27.1						
HIGH Channel:											
<p>There were no emissions measured within -6 dB of the specified limit. Please refer to the test data and plots (Plots 29 through 54) for more detail.</p>											

Test Data
Radiated Emissions
TilTek Dish Antenna
LOW Channel
AWE 20-24 REV-2 in Base mode
30-200 MHz

Wi-LAN
Til Tek Dish
Low channel base
Wi-LAN AWE 120-24 rev 2
Project Number: w02e2348

Test	Meter	Gain/Loss	Transducer	Level	Limit:1	2	3	4	
Frequency	Reading	Factor	Factor	[dB(uVolts)]					
[MHz]	[dB(uV)]	[dB]	[dB]						
39.4	-.4	qp	.9	17.8	18.3	86.6	40	38.2	N/A
Azimuth: 125	Height:316	Horz		Margin	[dB]	-68.3	-21.7	-19.9	N/A
40	-1.1	qp	.9	17.6	17.4	86.6	40	38.2	N/A
Azimuth: 124	Height:360	Horz		Margin	[dB]	-69.2	-22.6	-20.8	N/A

LIMIT 1: 20 dBc limit restricted band

LIMIT 2: FCC Part 15 Class B 3m

LIMIT 3: ETSI 300 328 RX

LIMIT 4: NONE

Test Data

Radiated Emissions

TilTek Dish Antenna

Mid Channel

AWE 20-24 REV-2 in Remote mode

30-1000 MHz

Wi-LAN

Mid channel base

FCC Tiltek Dish TX

Wi-LAN AWE 120-24 rev 2

Project Number: w02e2348

Test	Meter	Gain/Loss	Transducer	Level	Limit:1	2	3	4	
Frequency	Reading	Factor	Factor		[dB(uVolts)]				
[MHz]	[dB(uV)]	[dB]	[dB]						
56.7745	-1.2	qp	1.1	13	12.9	49.5	40	86.6	59.2
Azimuth: 359	Height:100	Horz		Margin [dB]	-36.6	-27.1	-73.7	-46.3	
194.3955	2.44	qp	2.4	10.5	15.34	54	43.5	86.6	59.2
Azimuth: 125	Height:103	Vert		Margin [dB]	-38.66	-28.16	-71.26	-43.86	

LIMIT 1: FCC Part 15 Class A 3m

LIMIT 2: FCC Part 15 Class B 3m

LIMIT 3: 20 dBc limit restricted band

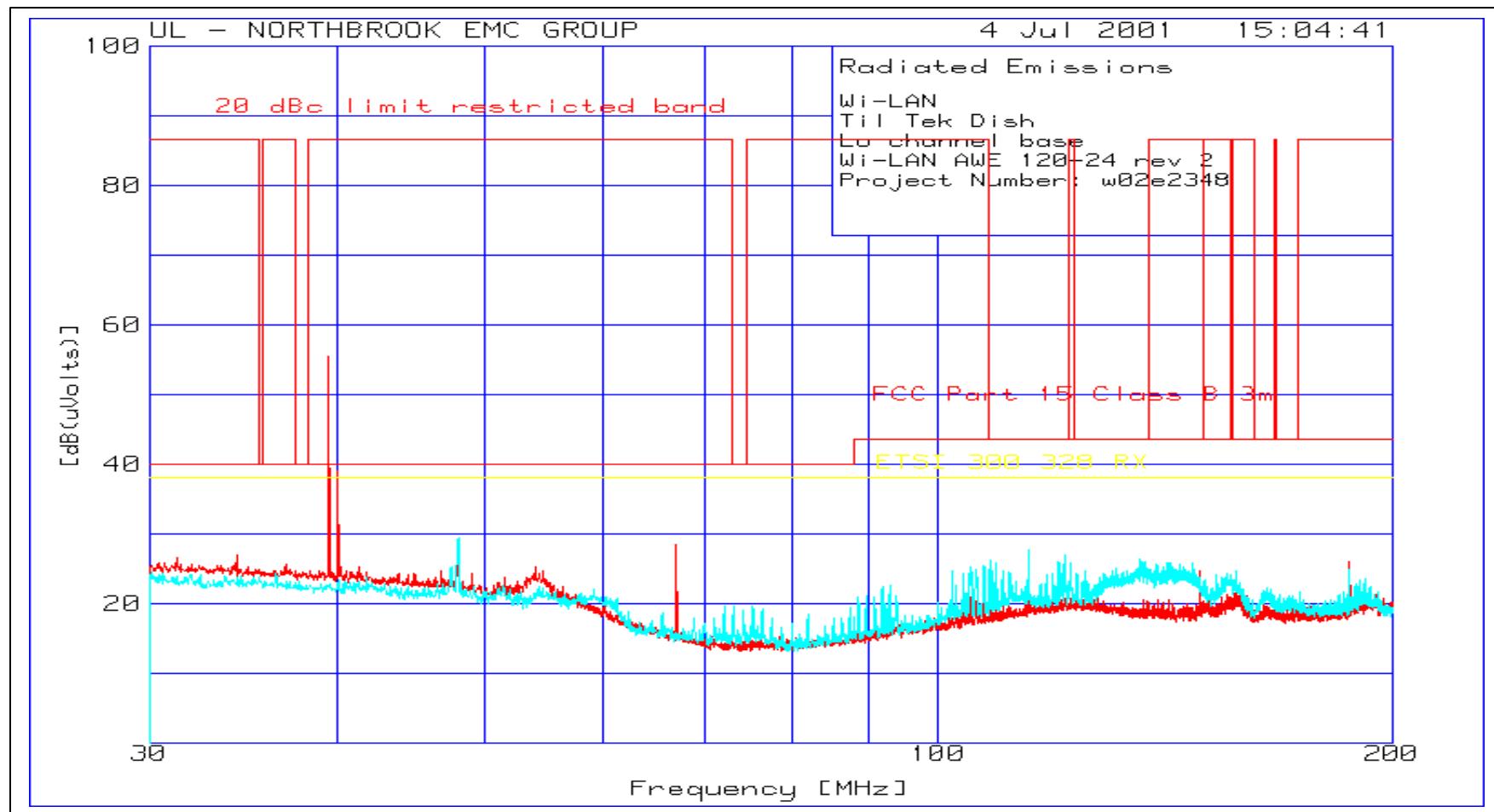
LIMIT 4: ETSI 300 328 TX

pk - Peak detector

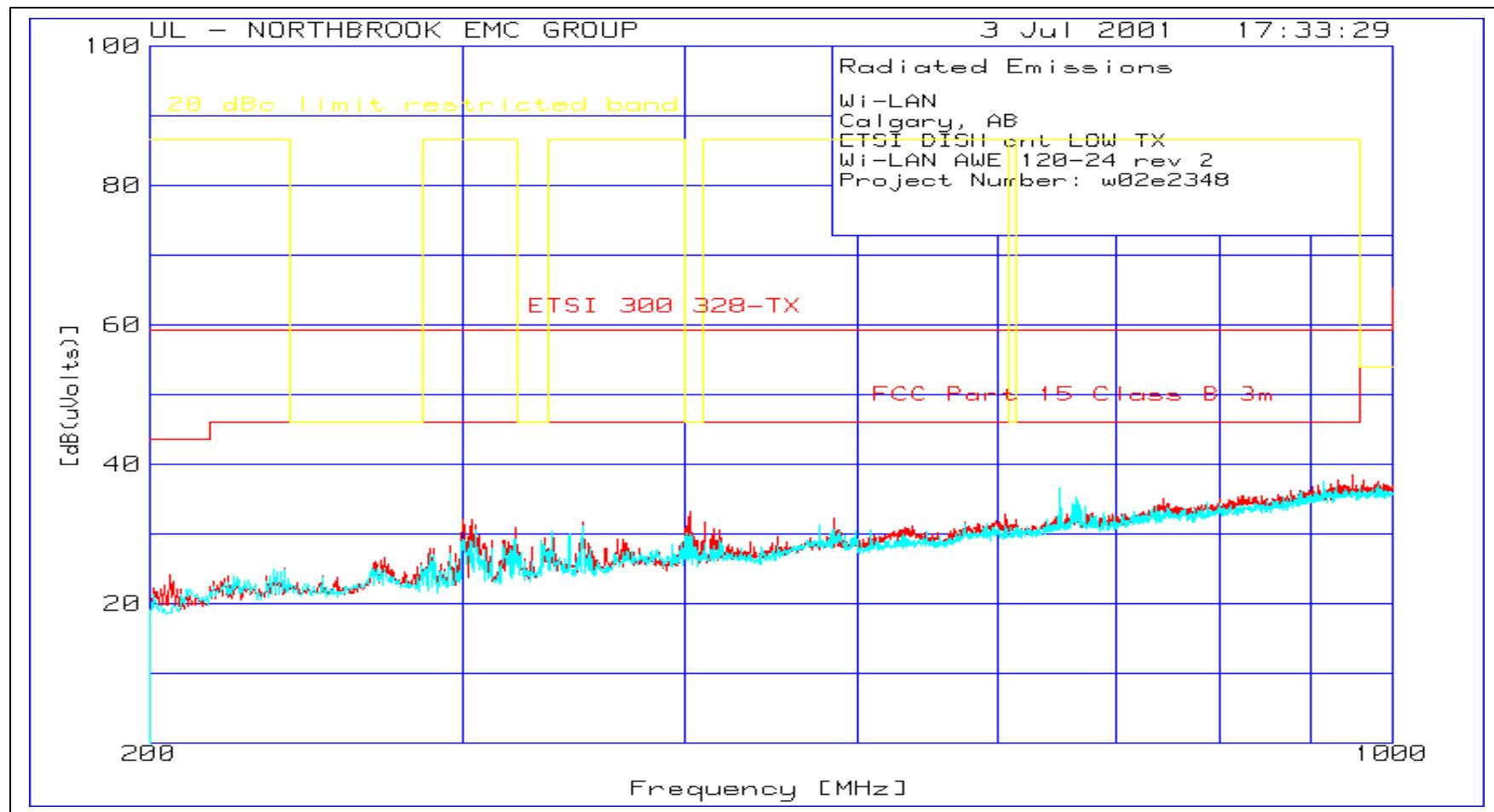
qp - Quasi-Peak detector

av - Average detector

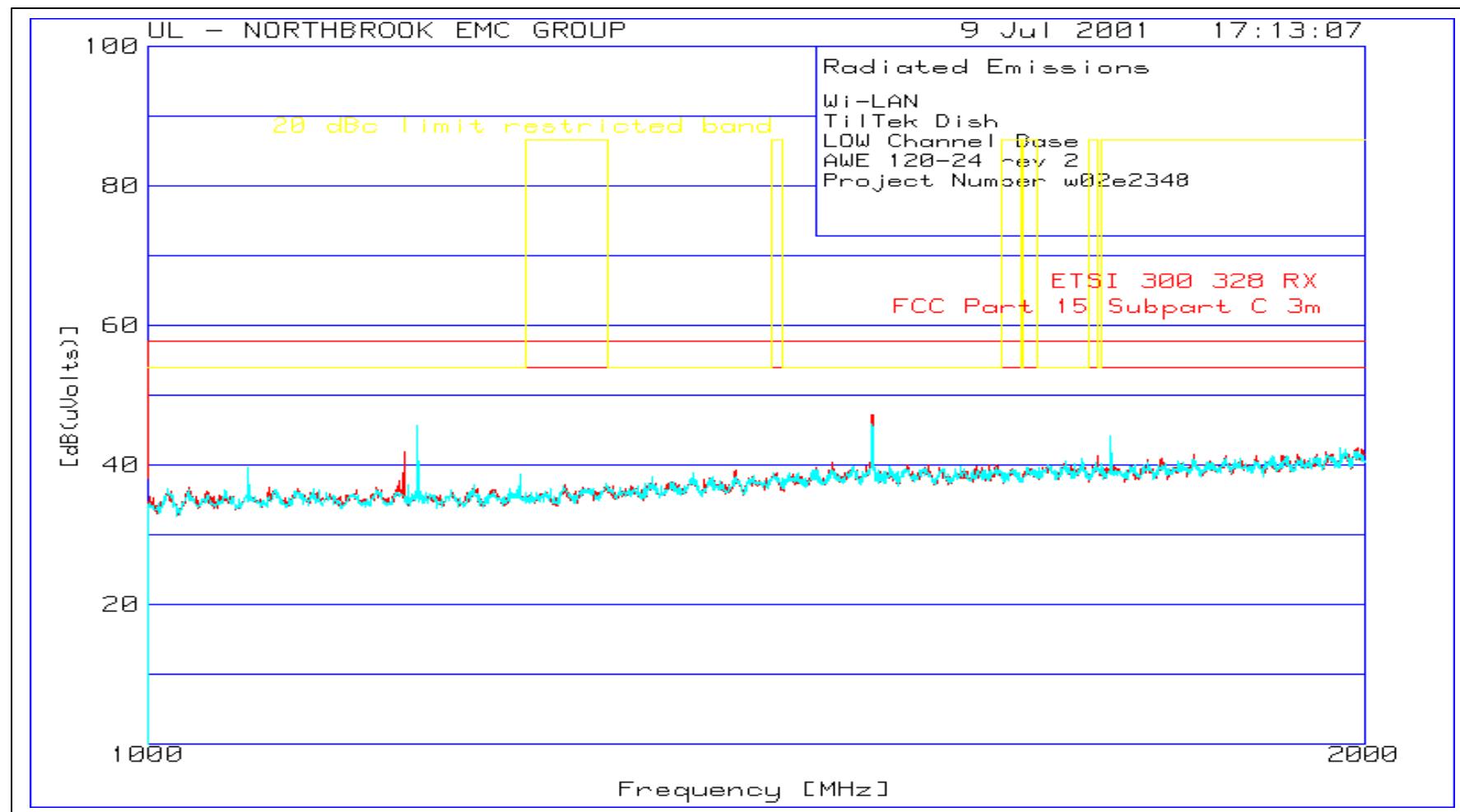
Plot 29
Radiated Emissions of TilTek Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
30-200 MHz



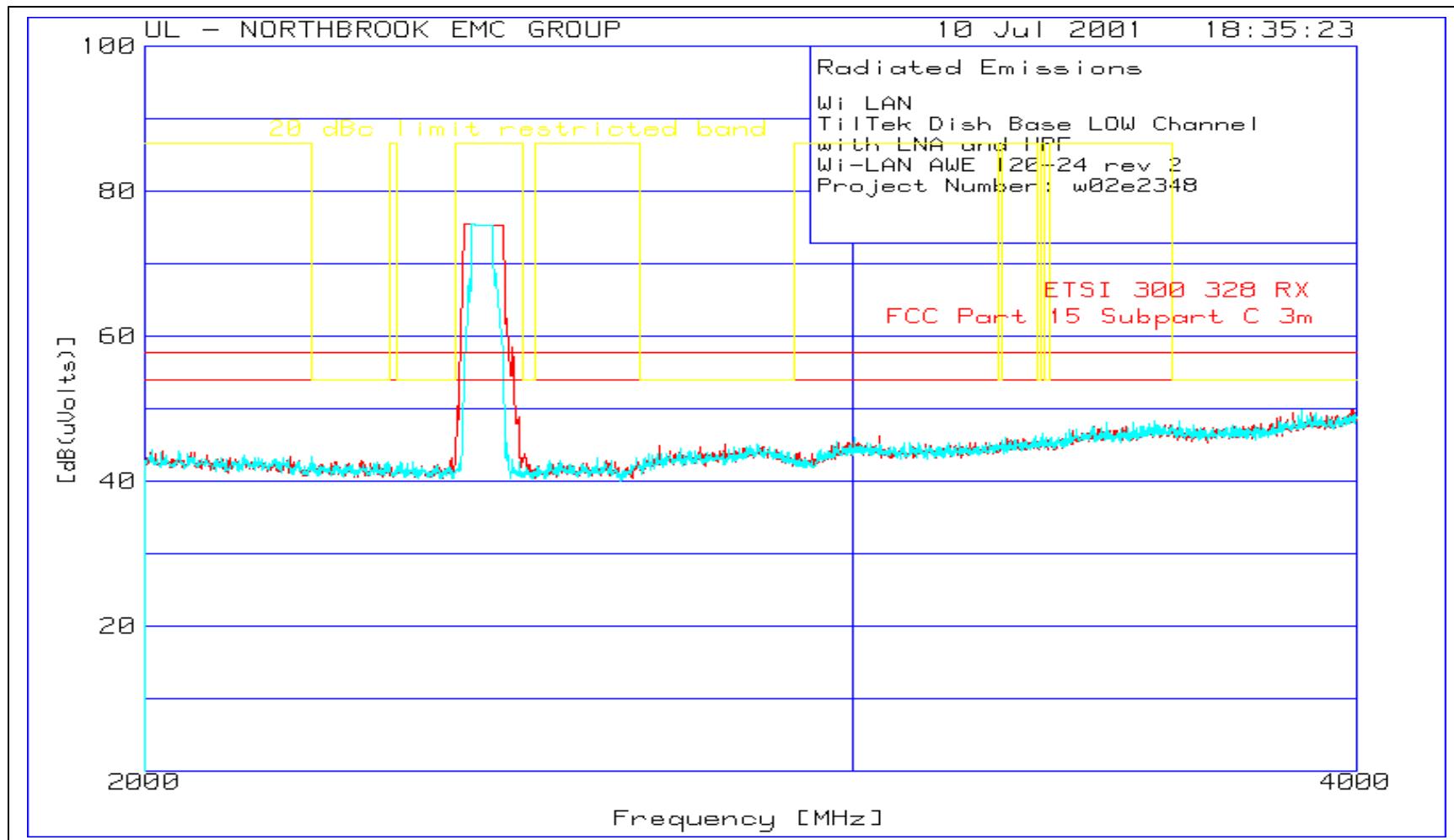
Plot 30
Radiated Emissions of TilTek Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
200-1000 MHz



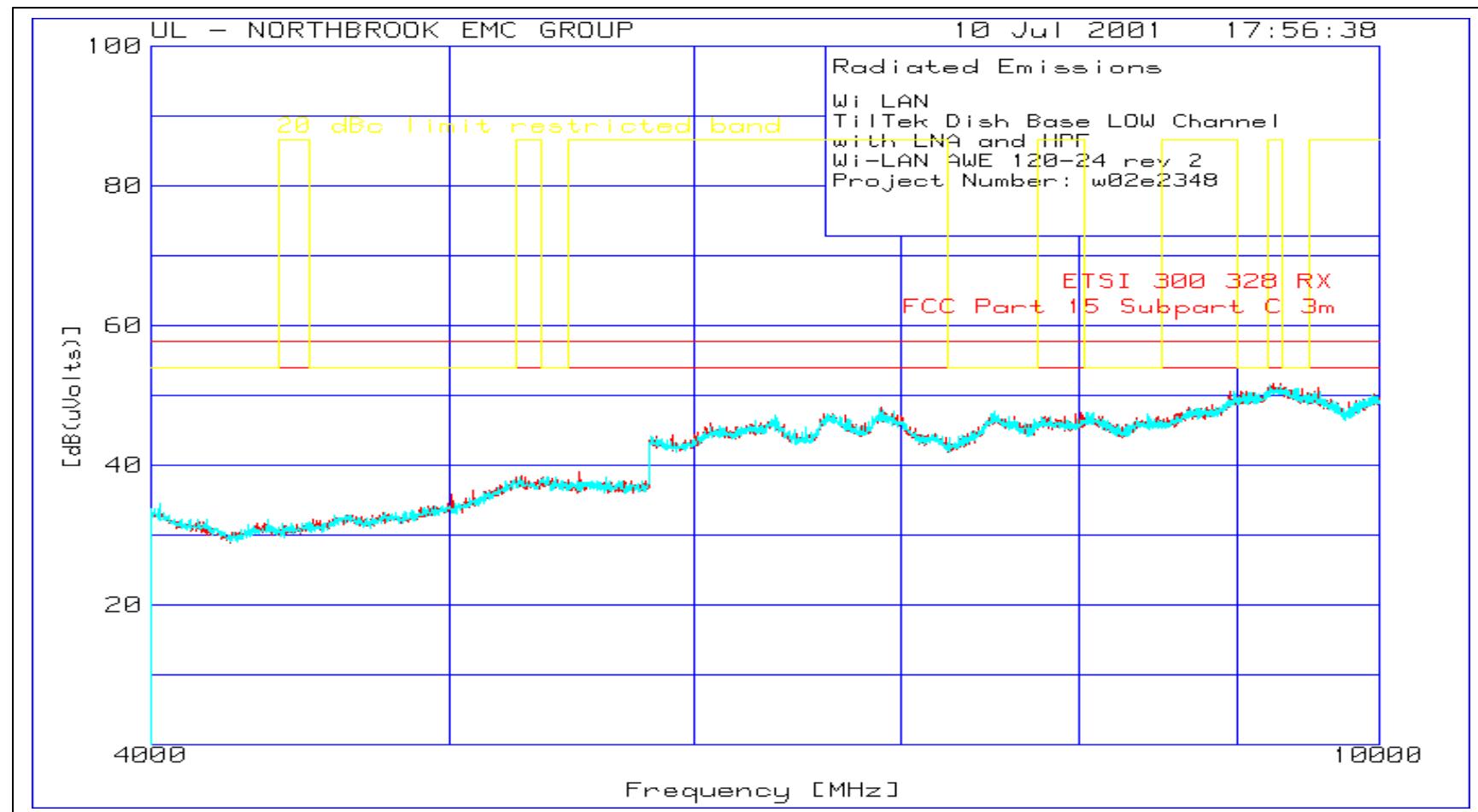
Plot 31
Radiated Emissions of TilTek Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
1-2 GHz



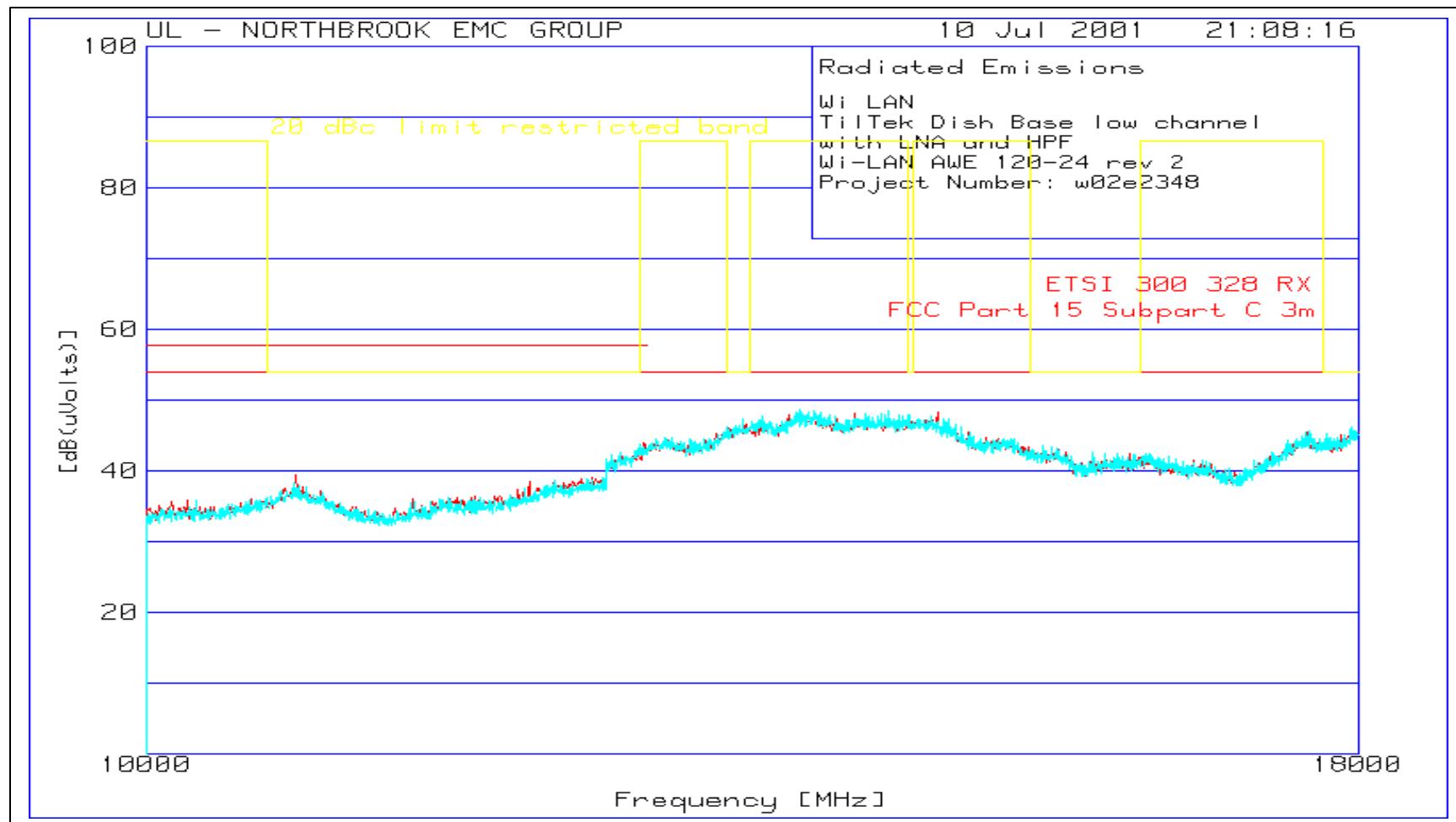
Plot 32
Radiated Emissions of TilTek Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
2-4 GHz



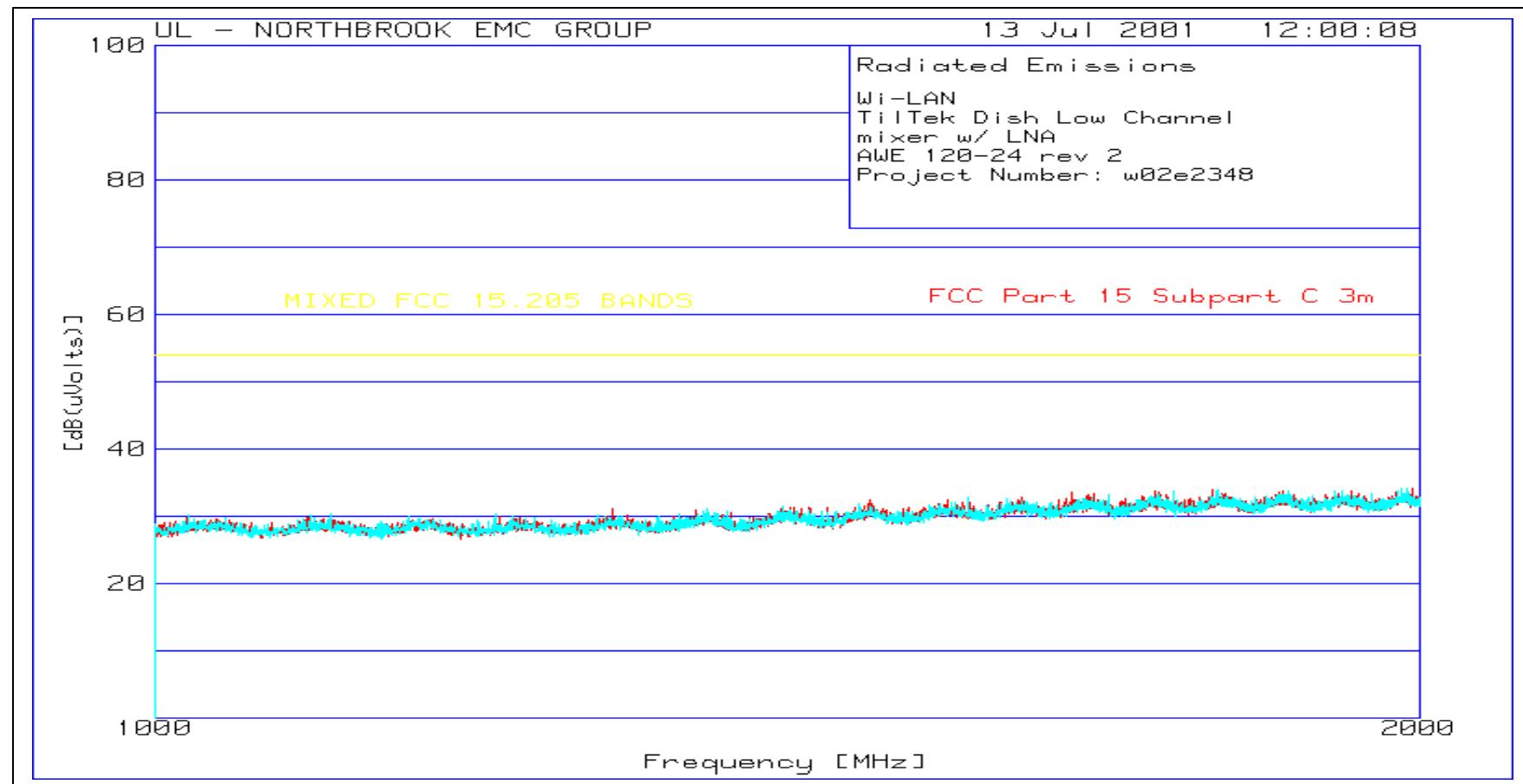
Plot 33
Radiated Emissions of TilTek Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
4-10GHz



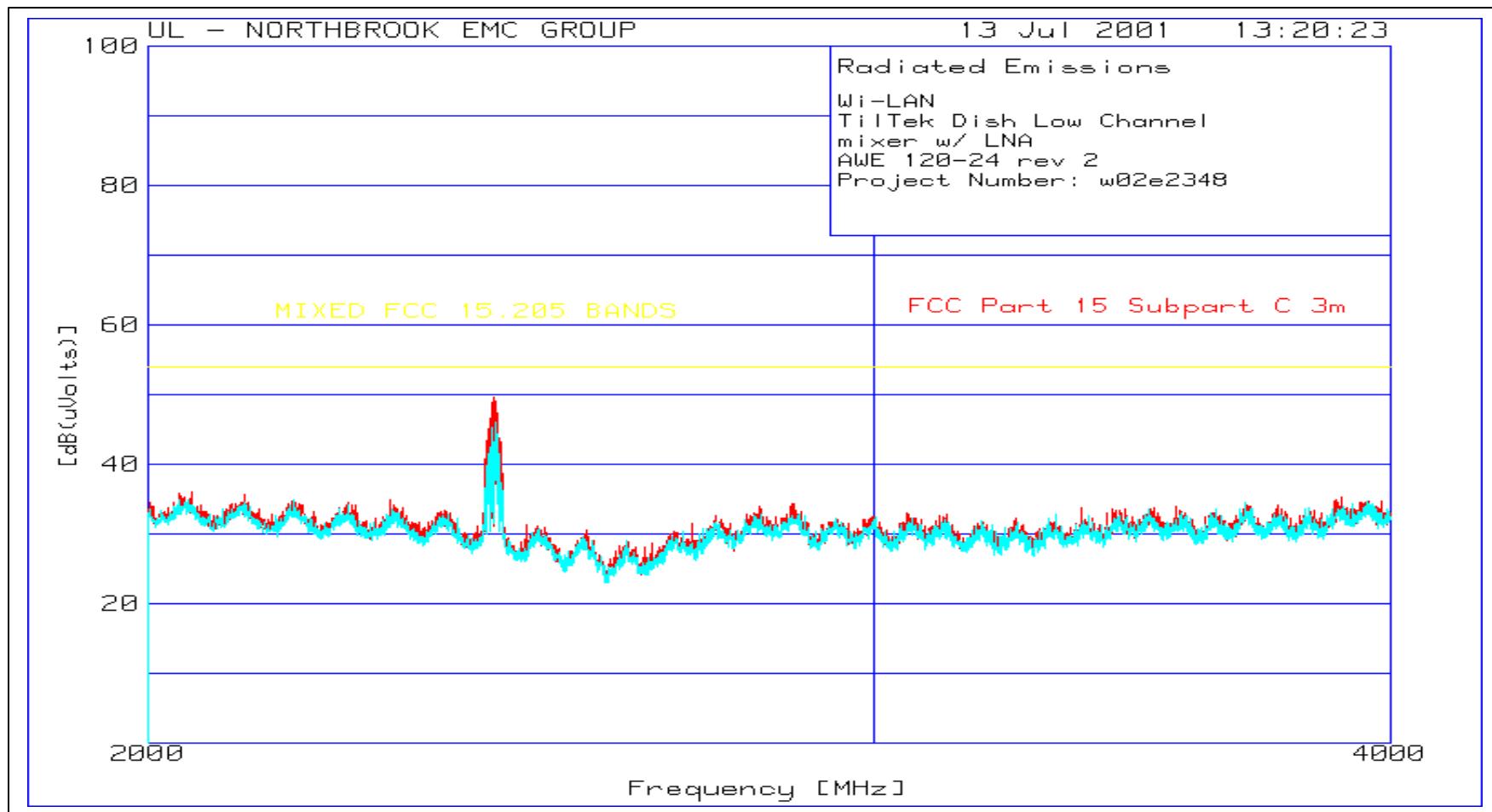
Plot 34
Radiated Emissions of TilTek Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
10-18 GHz



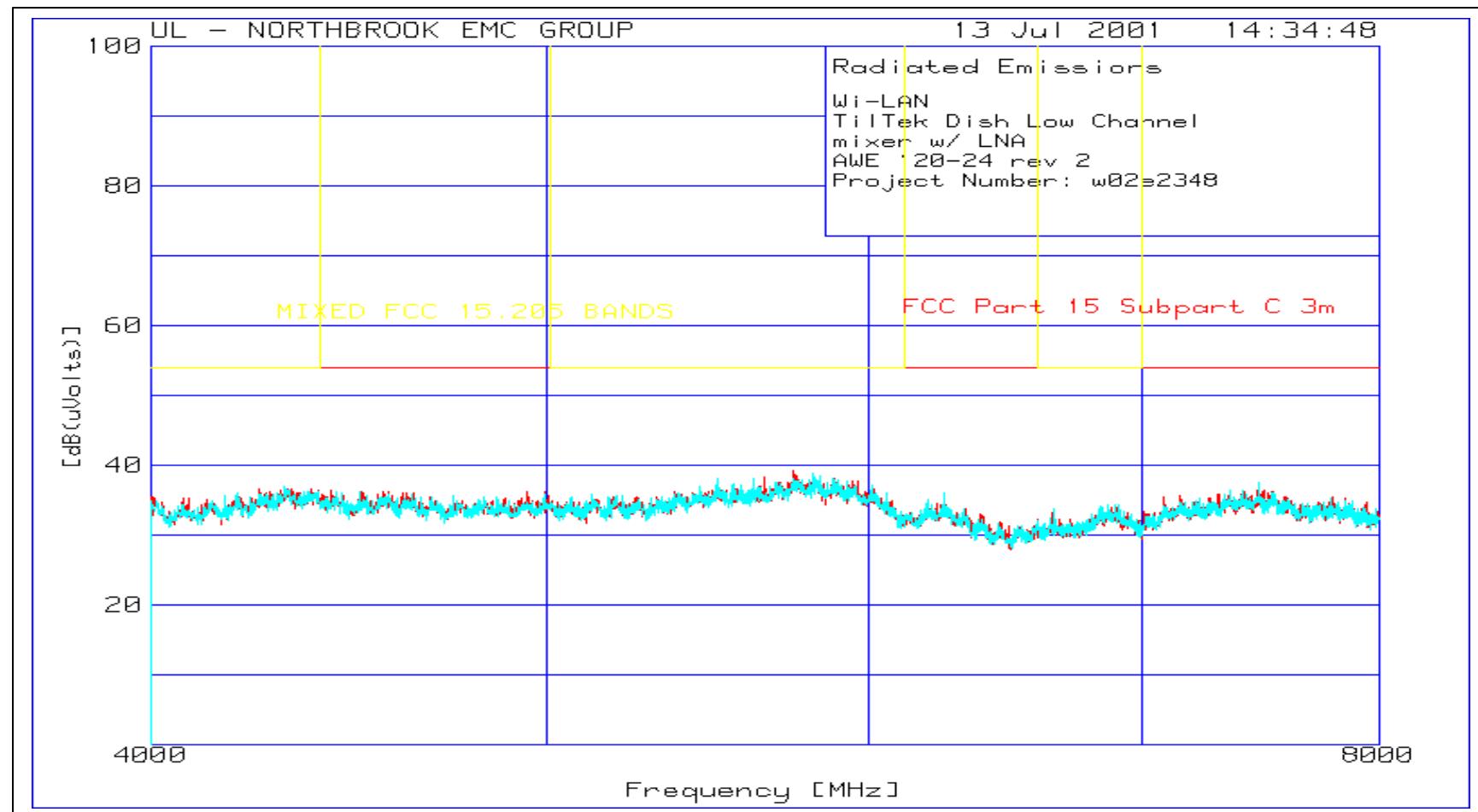
Plot 35
Radiated Emissions of TilTek Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
18-19 GHz



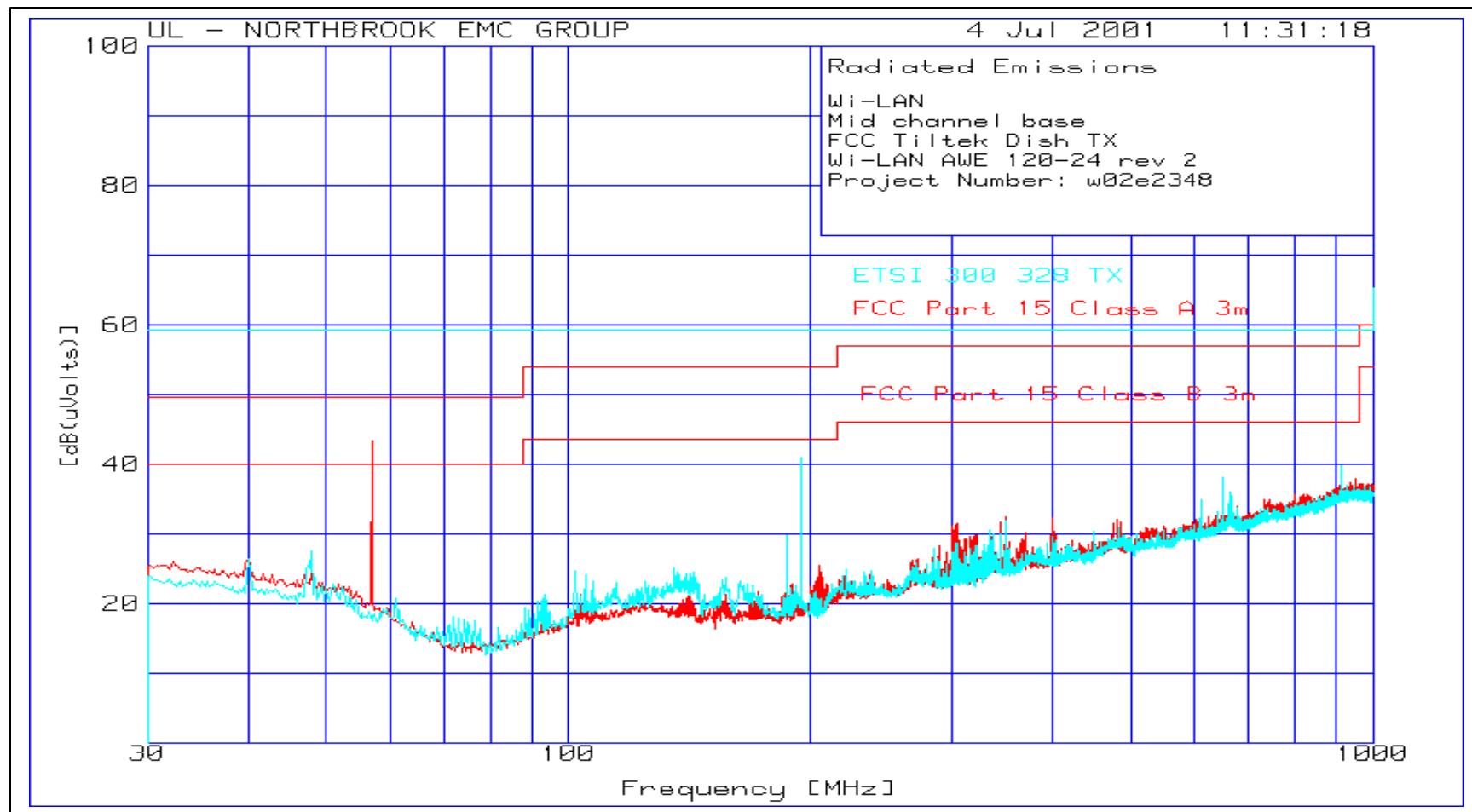
Plot 36
Radiated Emissions of TilTek Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
19-21 GHz



Plot 37
Radiated Emissions of TilTek Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
21-25 GHz

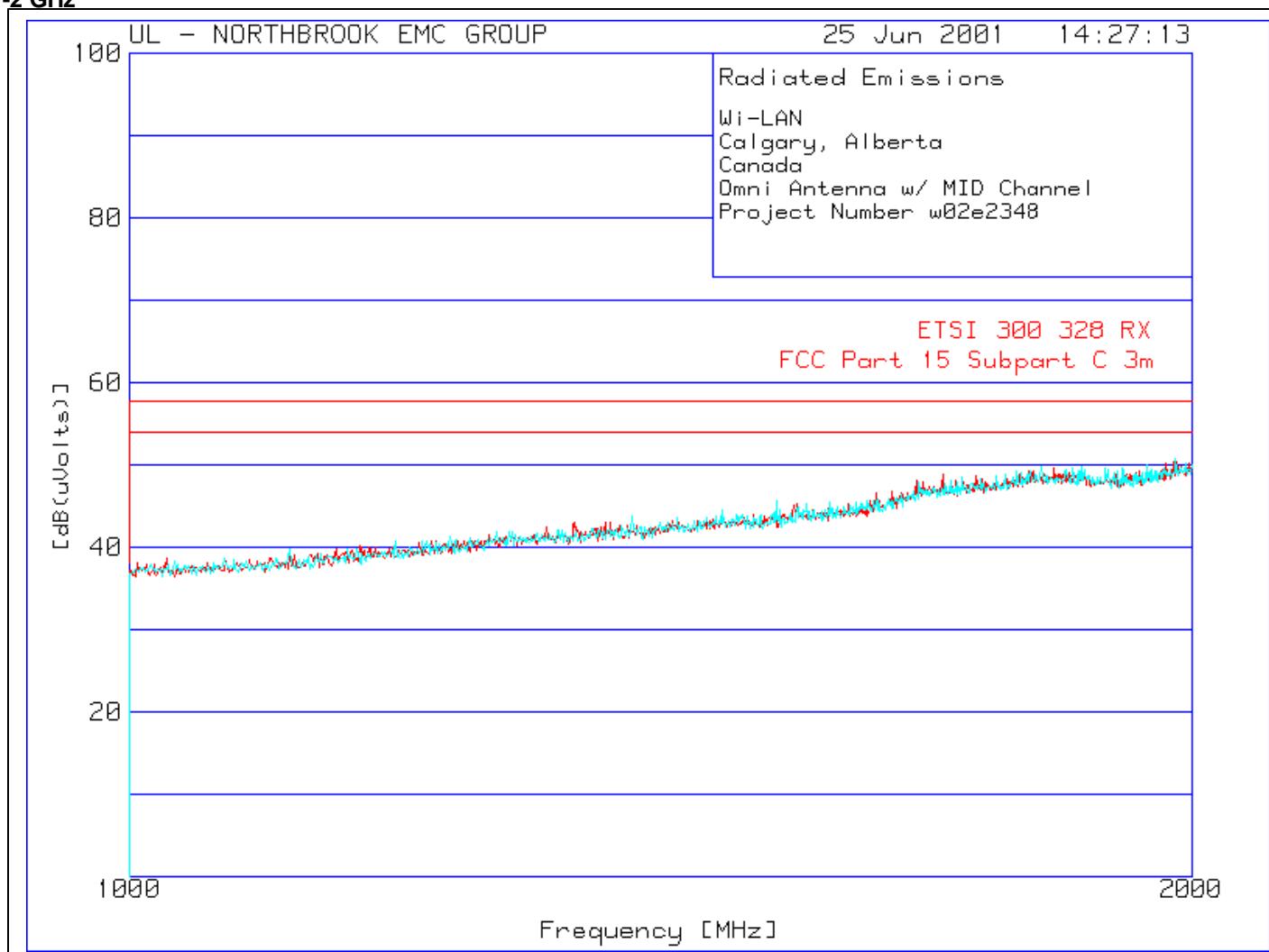


Ploy 38
Radiated Emissions of TilTek Dish Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
30-1000 MHz

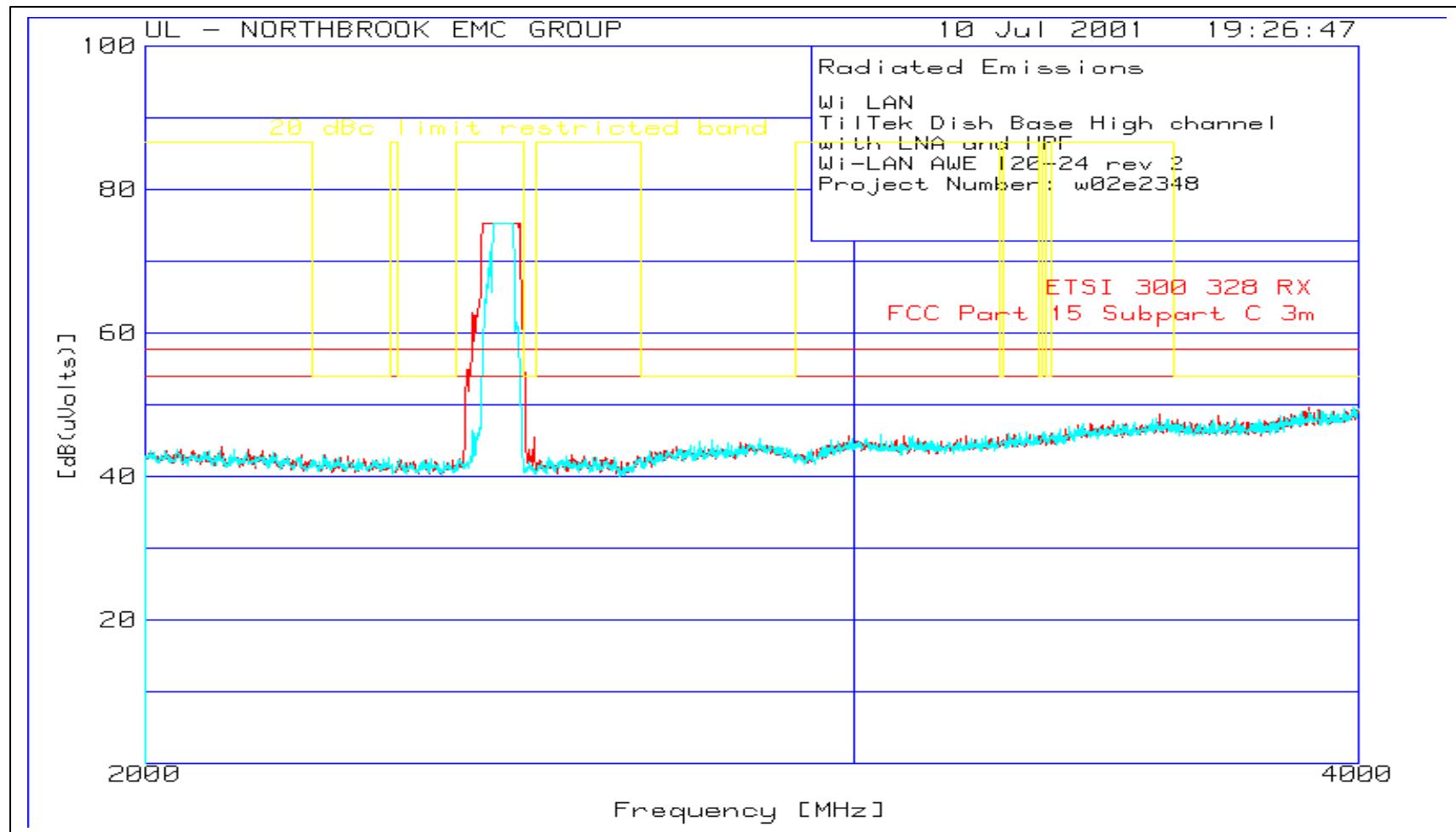


Plot 39 Radiated Emissions of TilTek Dish Antenna – Mid Channel AWE 20-24 REV-2 in Base mode

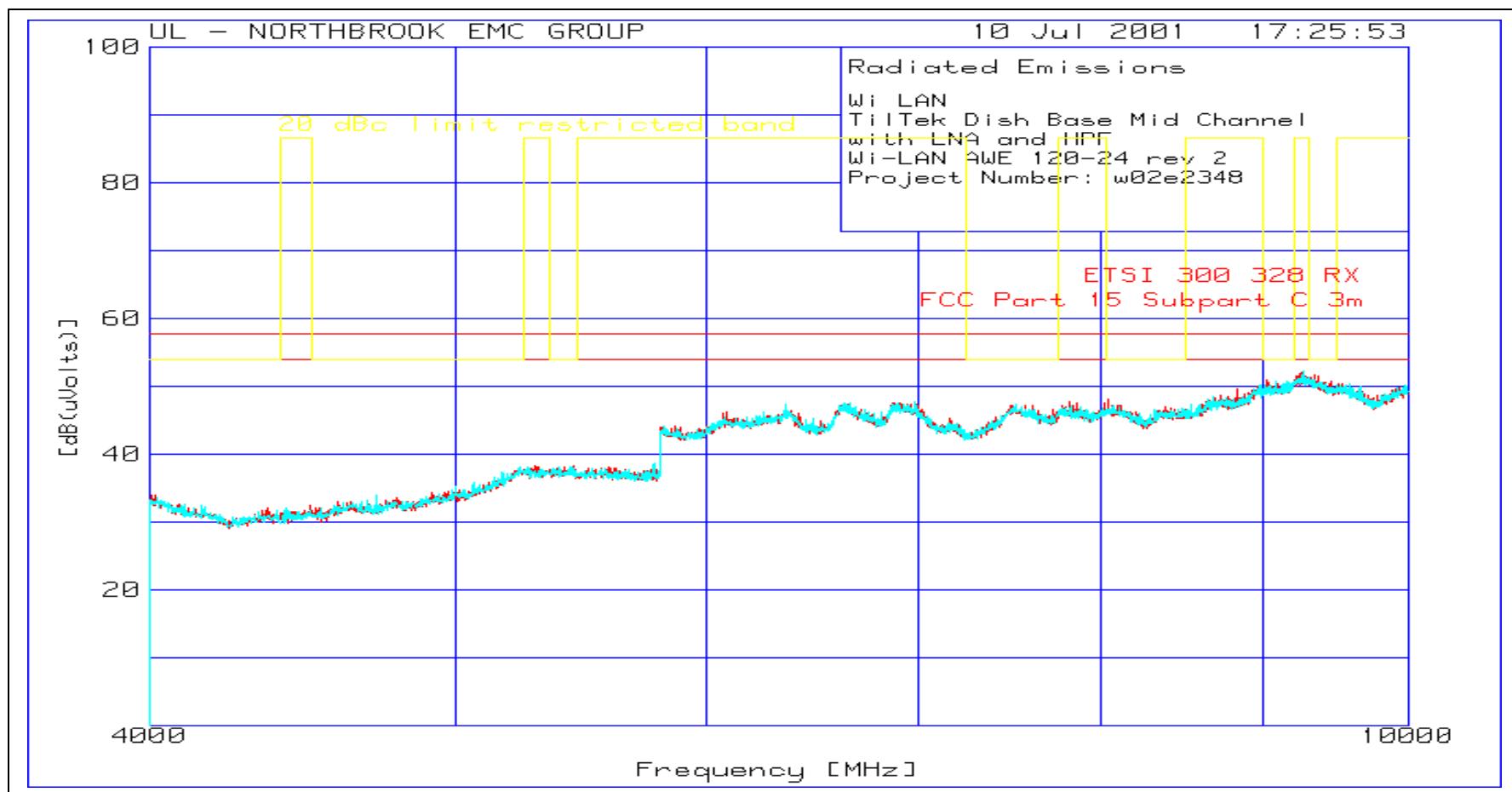
AWE 20
1-2 GHz



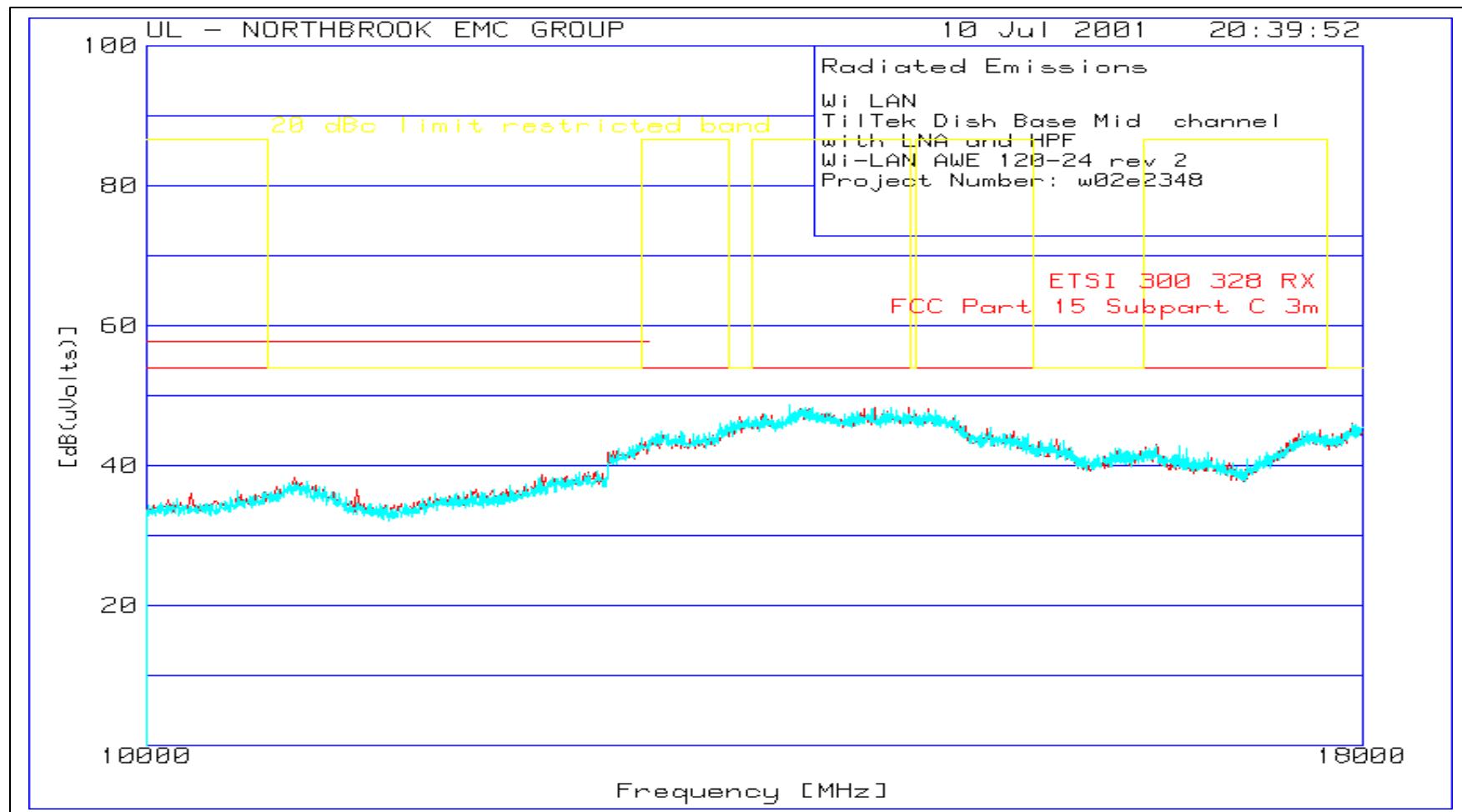
Plot 40
Radiated Emissions of TilTek Dish Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
2-4 GHz



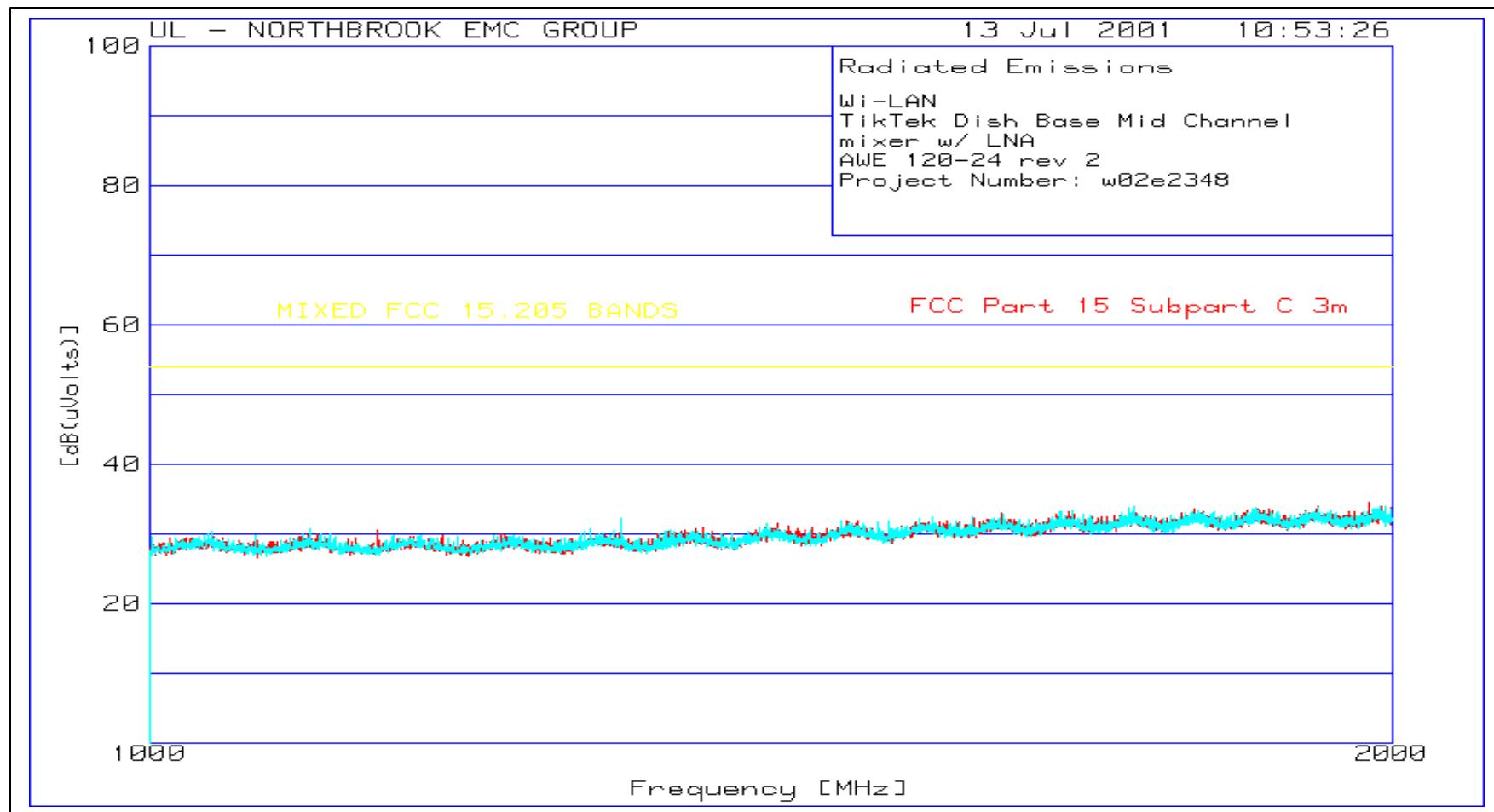
Plot 41
Radiated Emissions of TilTek Dish Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
4-10GHz



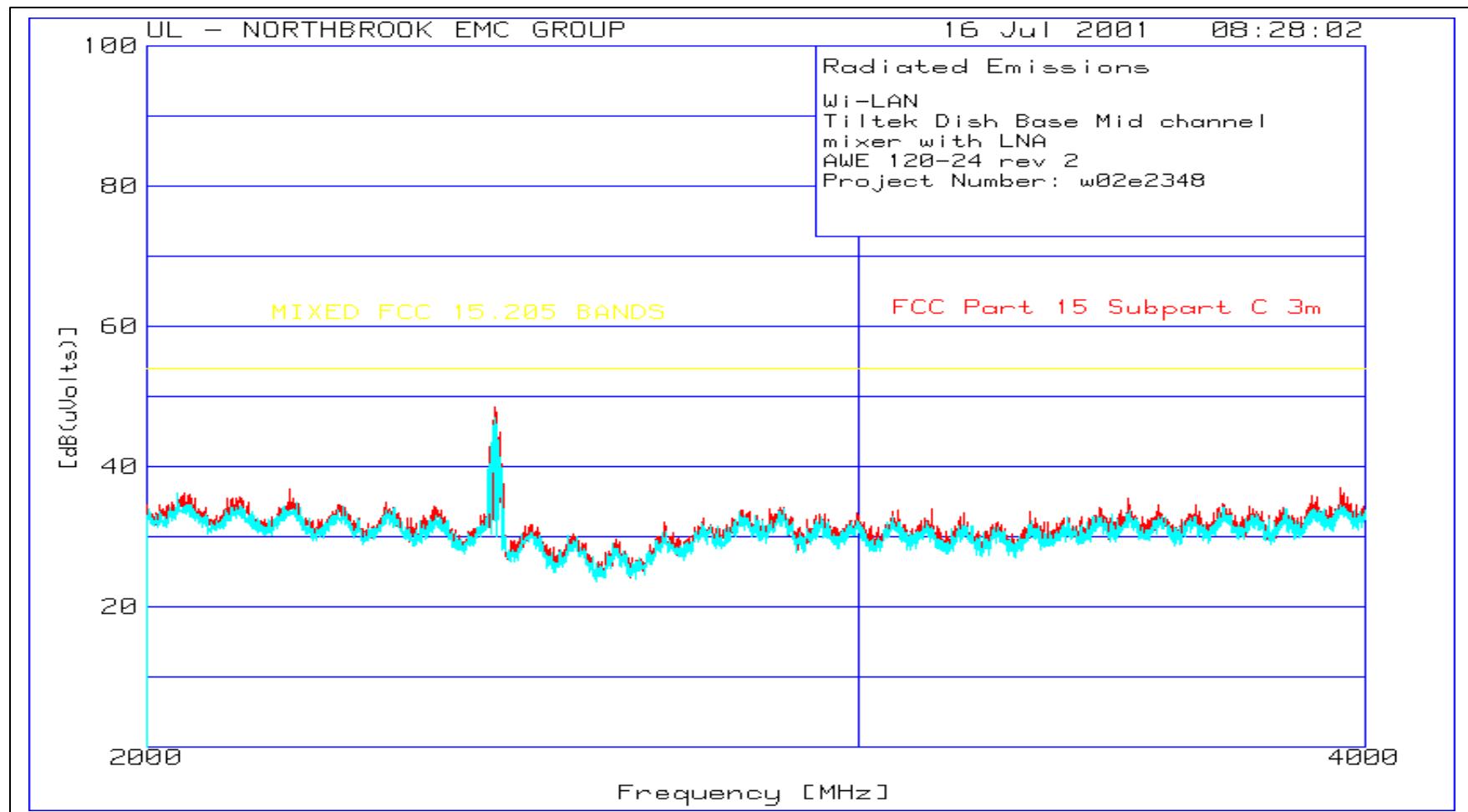
Plot 42
Radiated Emissions of TilTek Dish Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
10-18 GHz



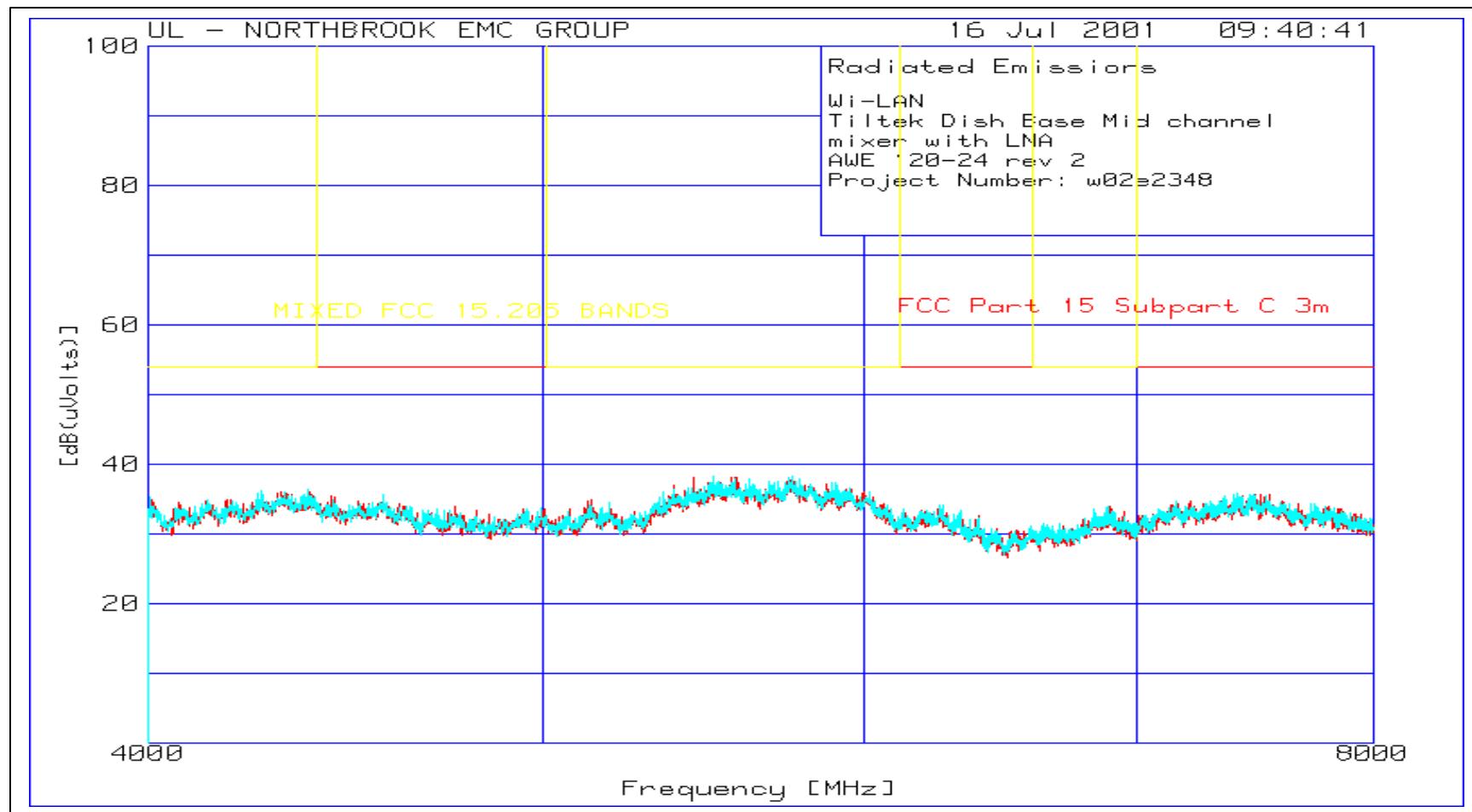
Plot 43
Radiated Emissions of TilTek Dish Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
18-19 GHz



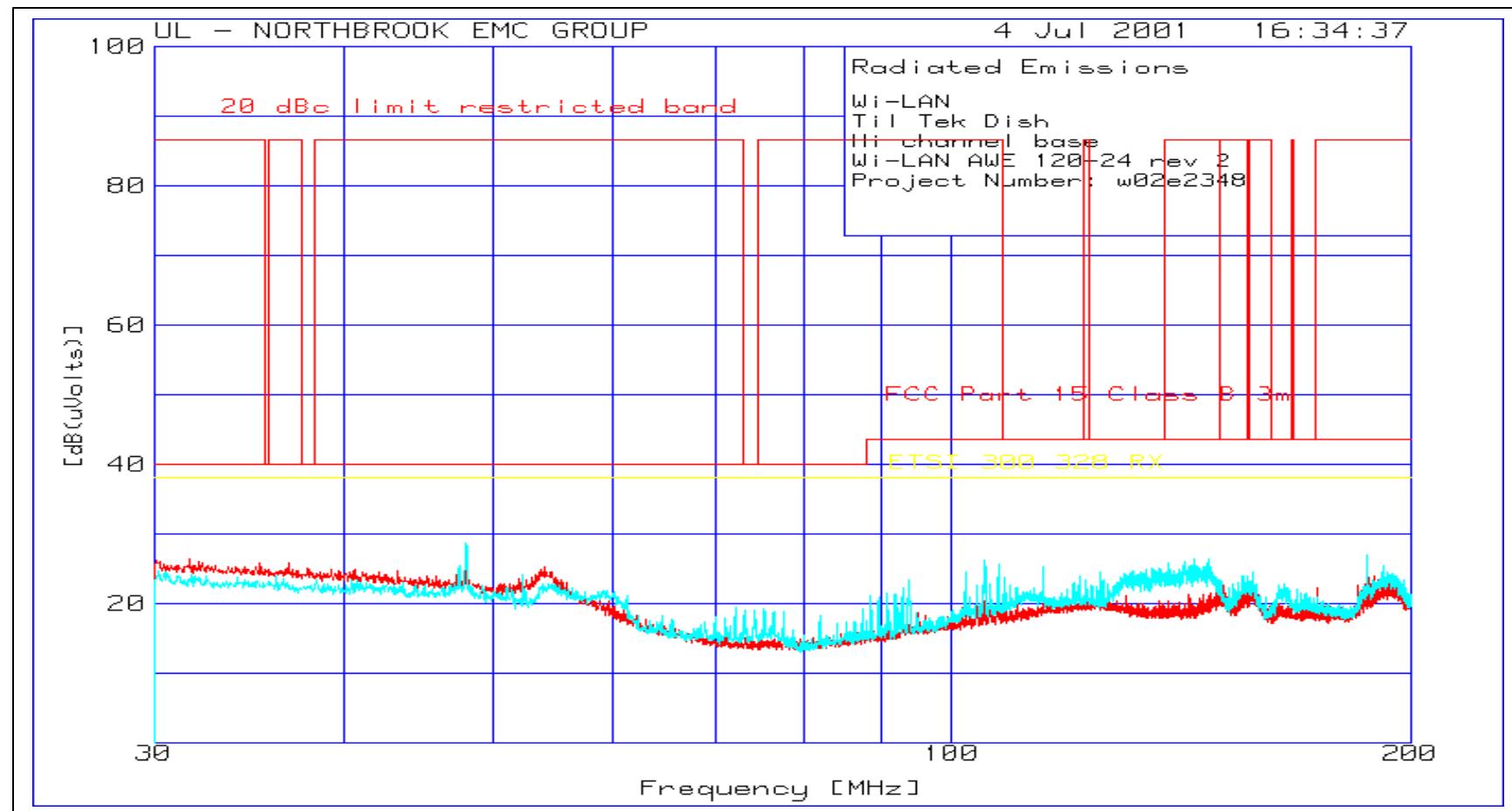
Plot 44
Radiated Emissions of TilTek Dish Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
19-21 GHz



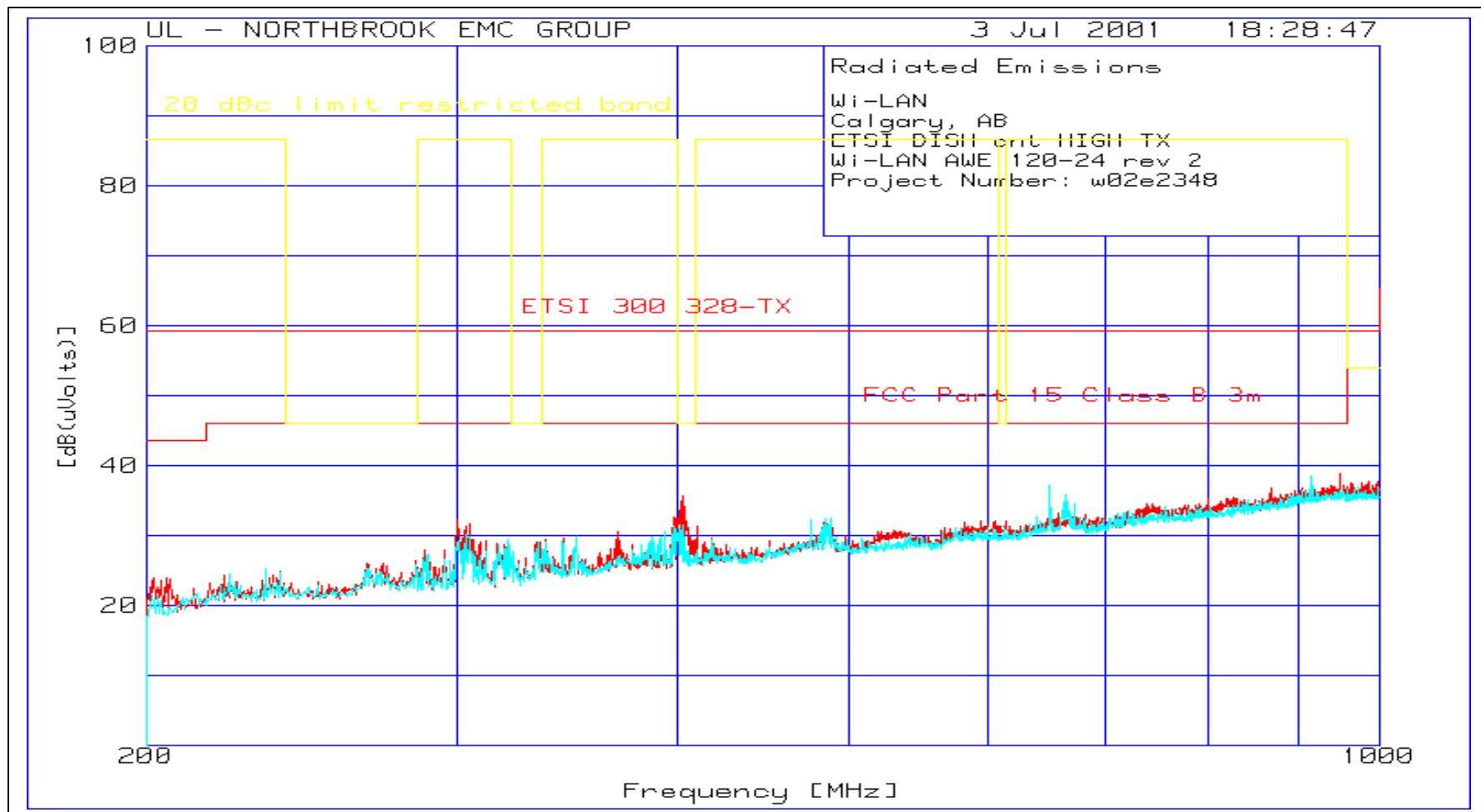
Plot 45
Radiated Emissions of TilTek Dish Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
21-25 GHz



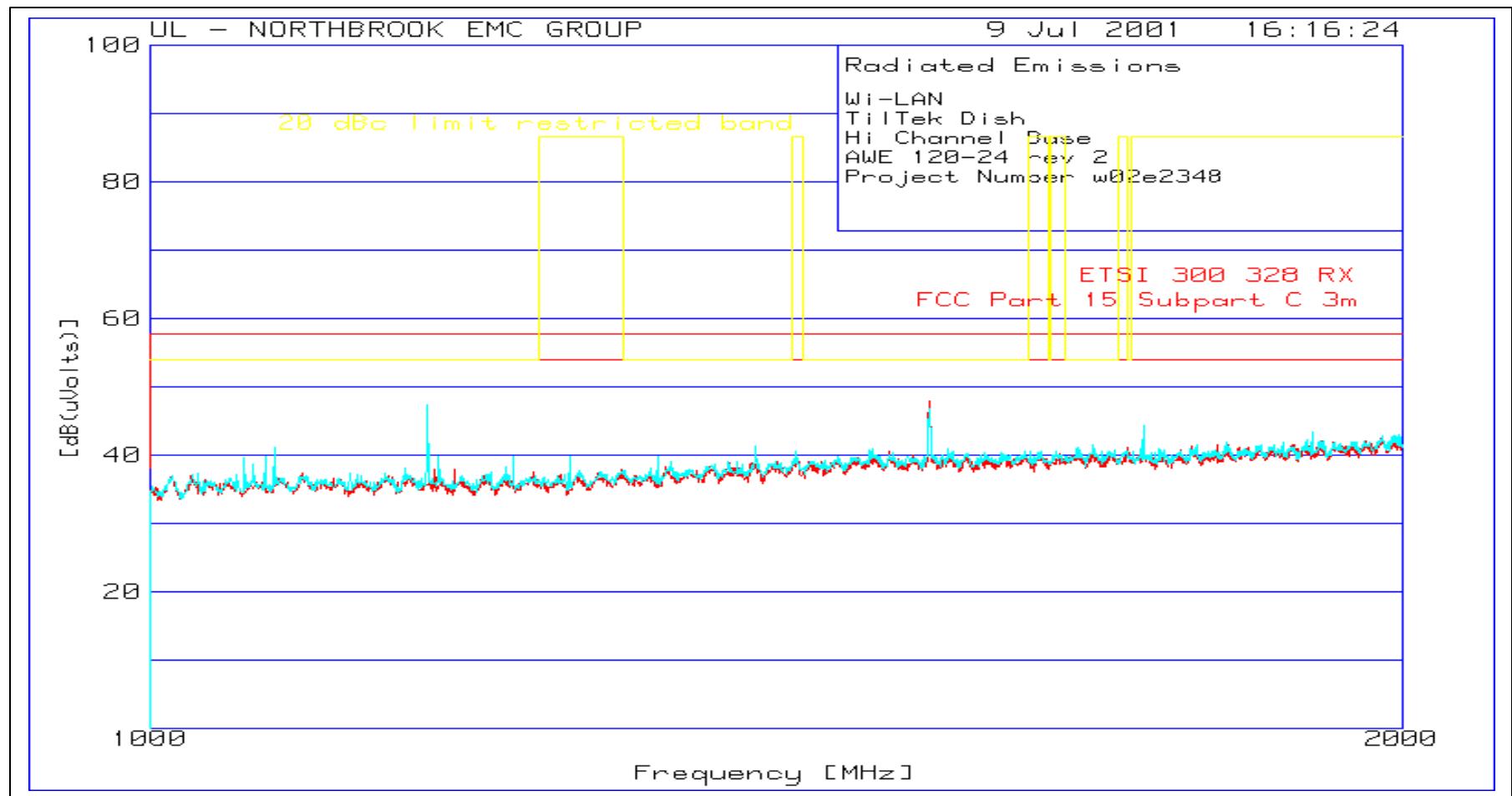
Plot 46
Radiated Emissions of TilTek Dish Antenna – High Channel
AWE 20-24 REV-2 in Base mode
30-200 MHz



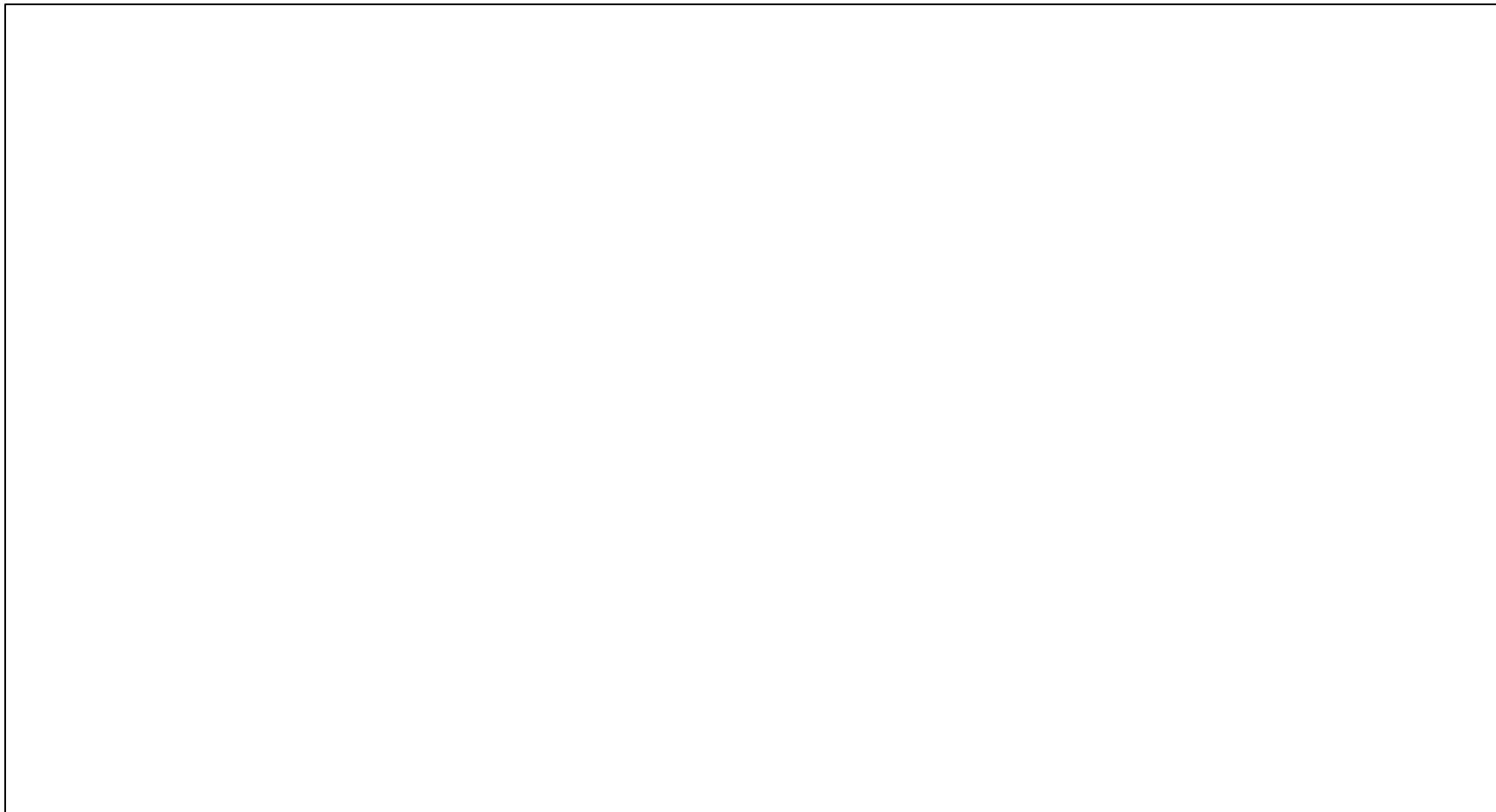
Plot 47
Radiated Emissions of TilTek Dish Antenna – High Channel
AWE 20-24 REV-2 in Base mode
200-1000 MHz



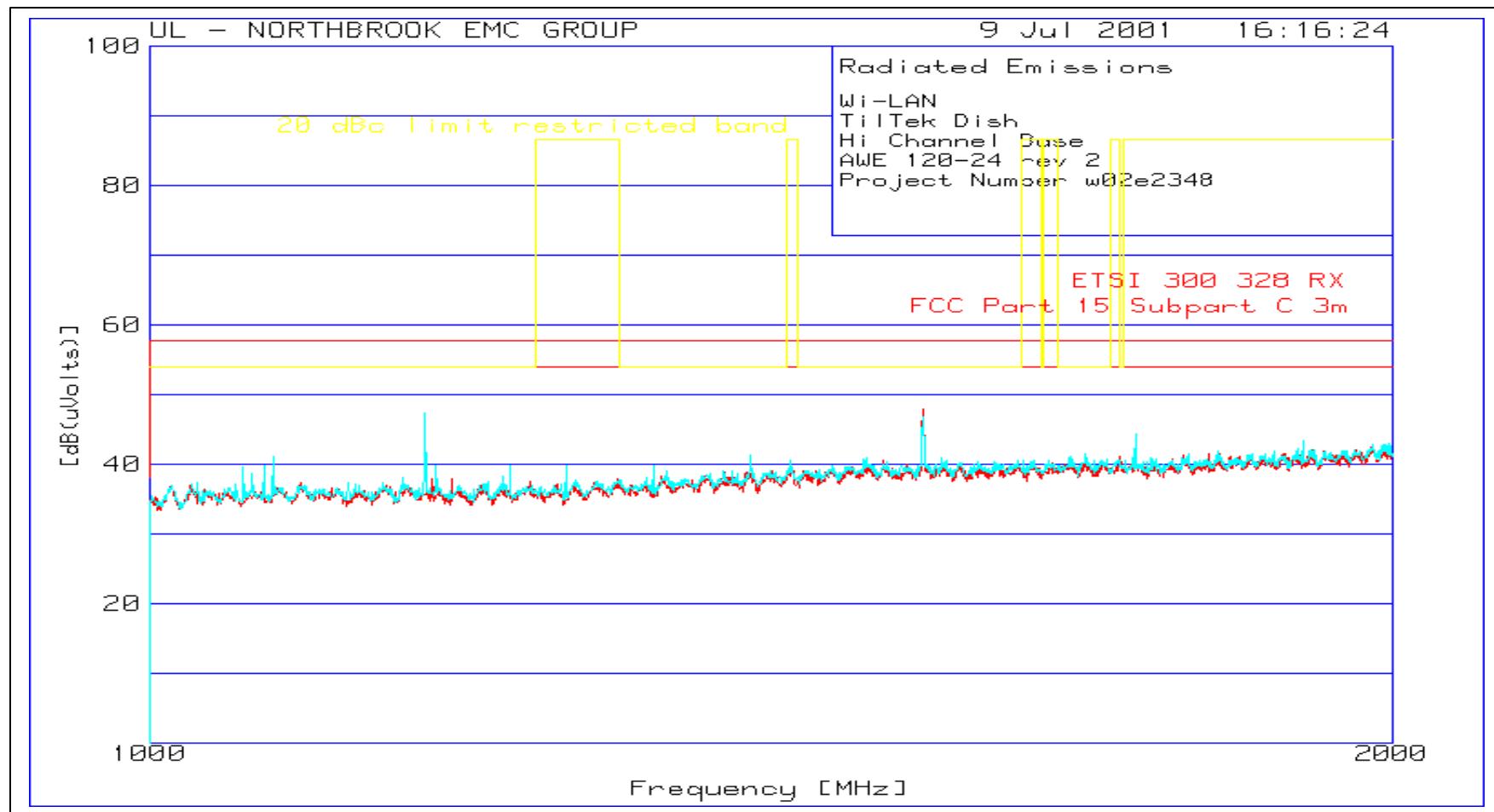
Plot 48
Radiated Emissions of TiTek Dish Antenna – High Channel
AWE 20-24 REV-2 in Base mode
1-2 GHz



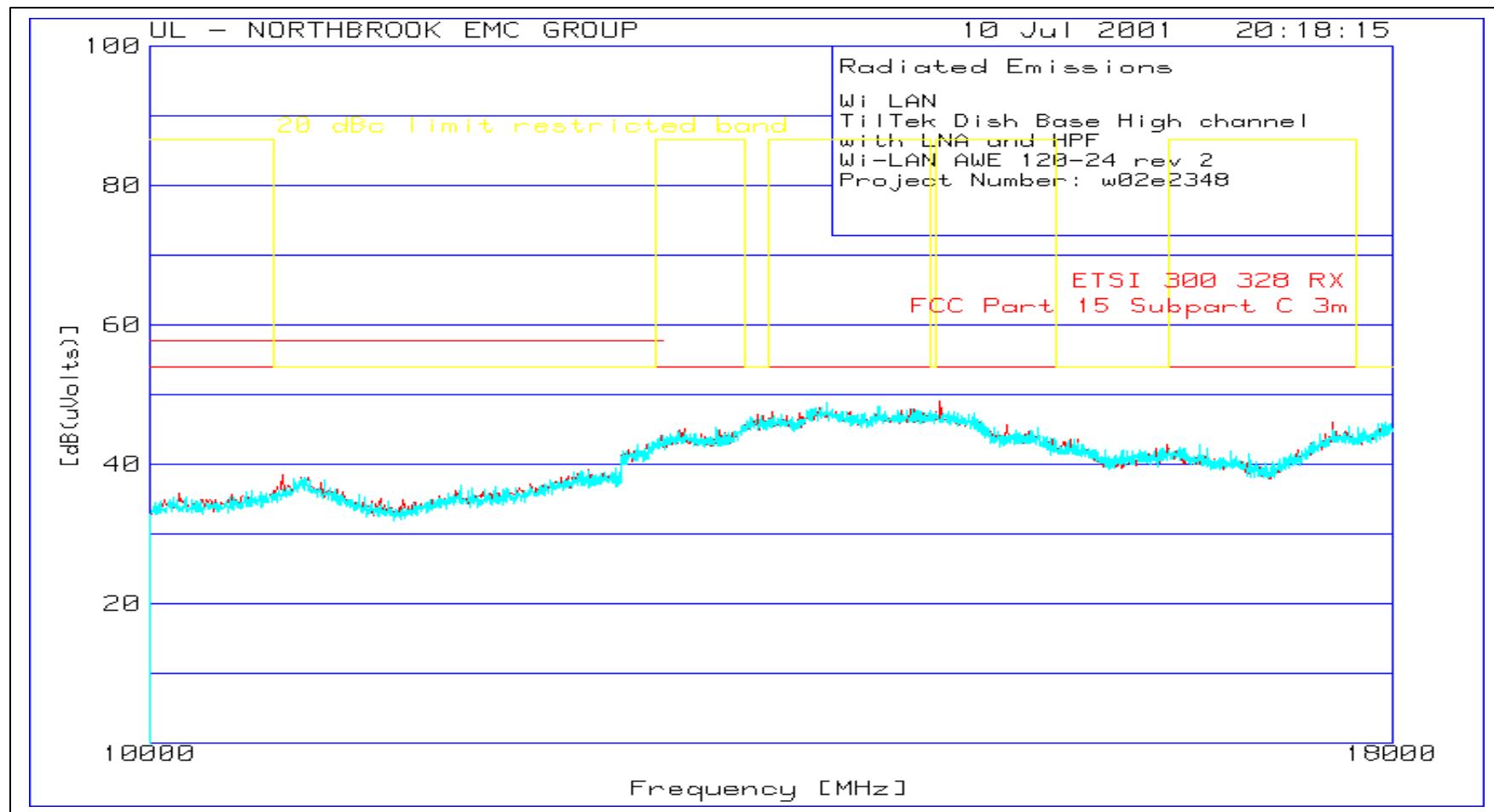
Plot 49
Radiated Emissions of TilTek Dish Antenna – High Channel
AWE 20-24 REV-2 in Base mode
2-4 GHz



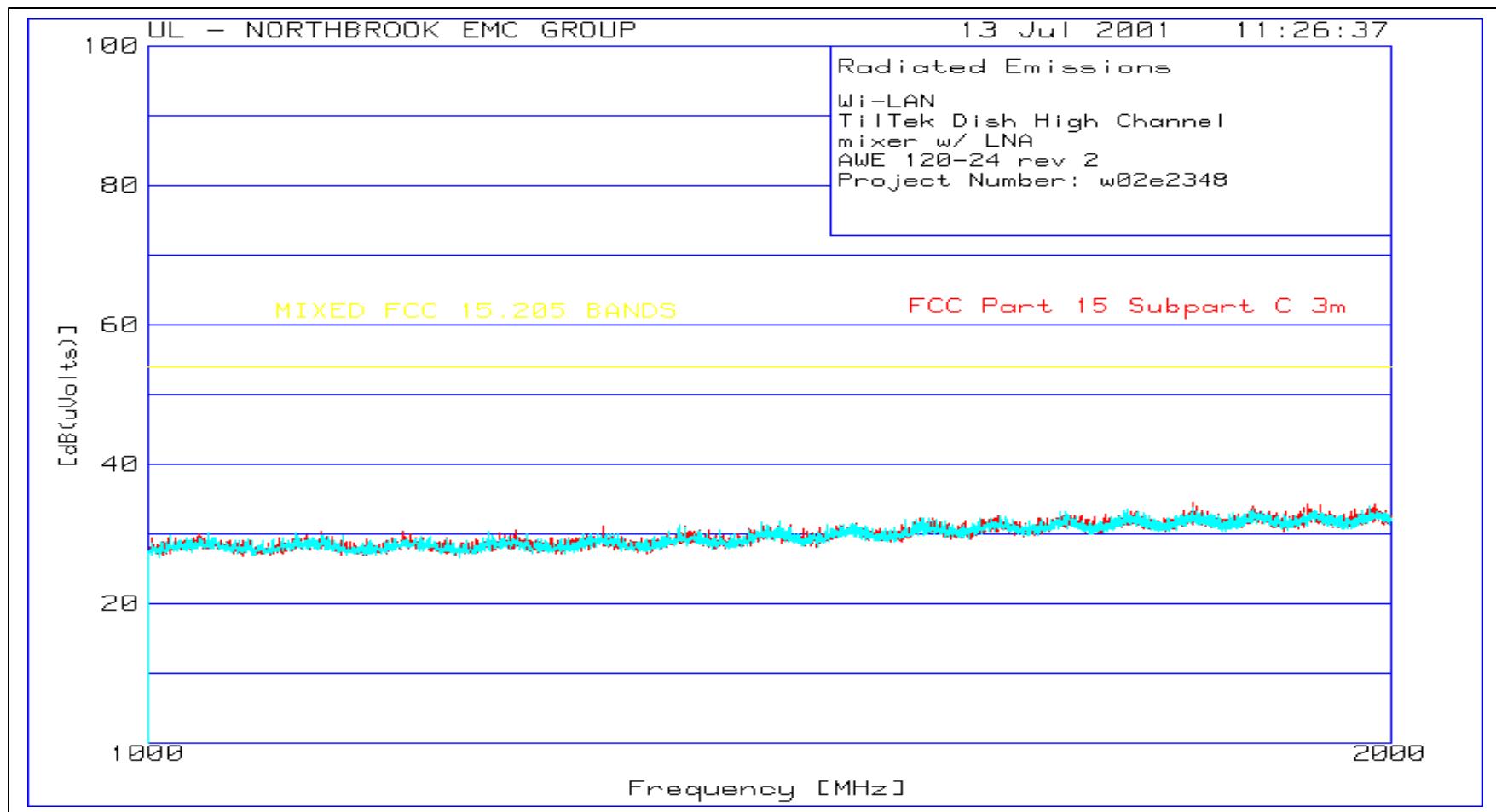
Plot 50
Radiated Emissions of TilTek Dish Antenna – High Channel
AWE 20-24 REV-2 in Base mode
4-10GHz



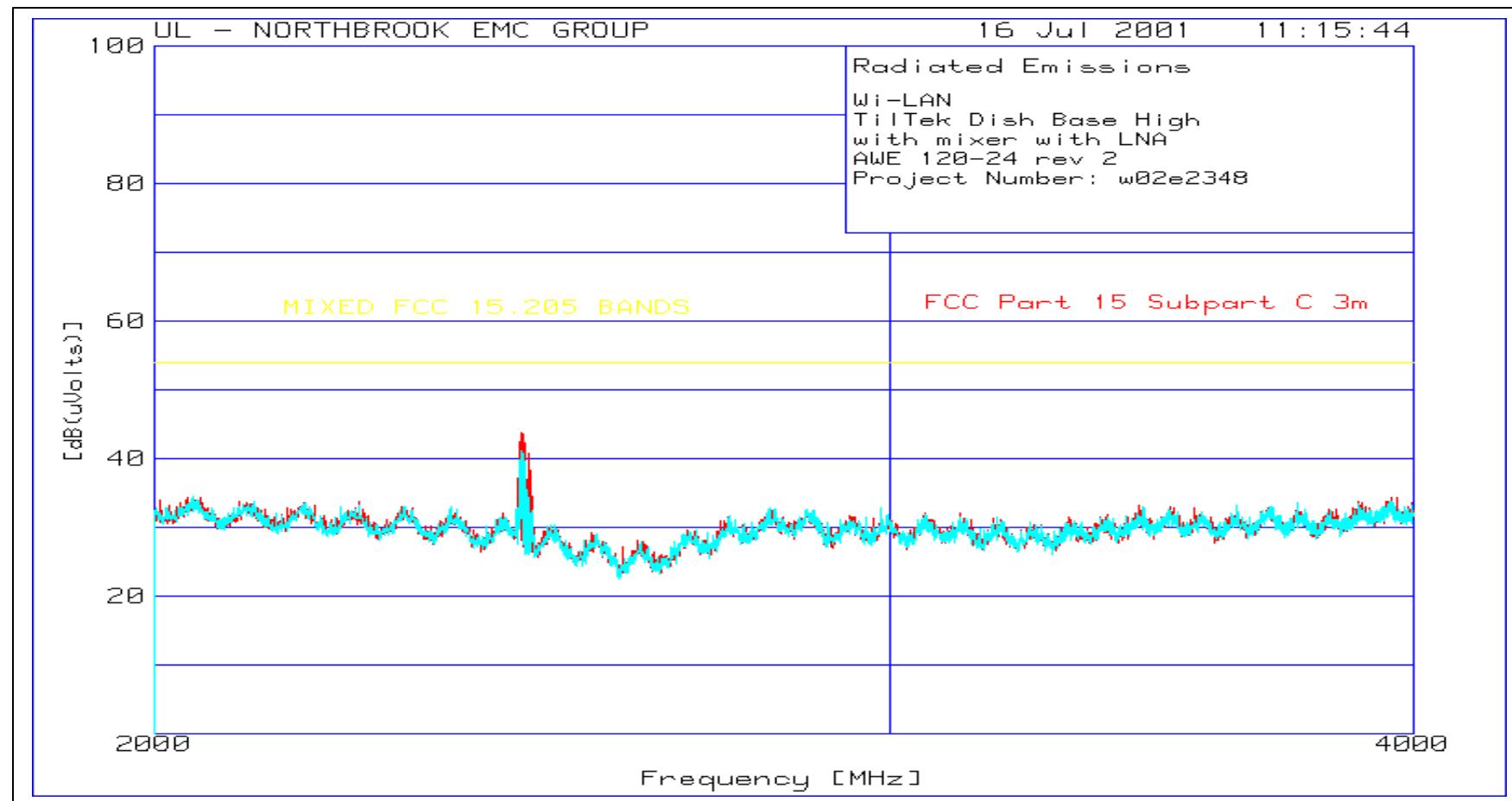
Plot 51
Radiated Emissions of TilTek Dish Antenna – High Channel
AWE 20-24 REV-2 in Base mode
10-18 GHz



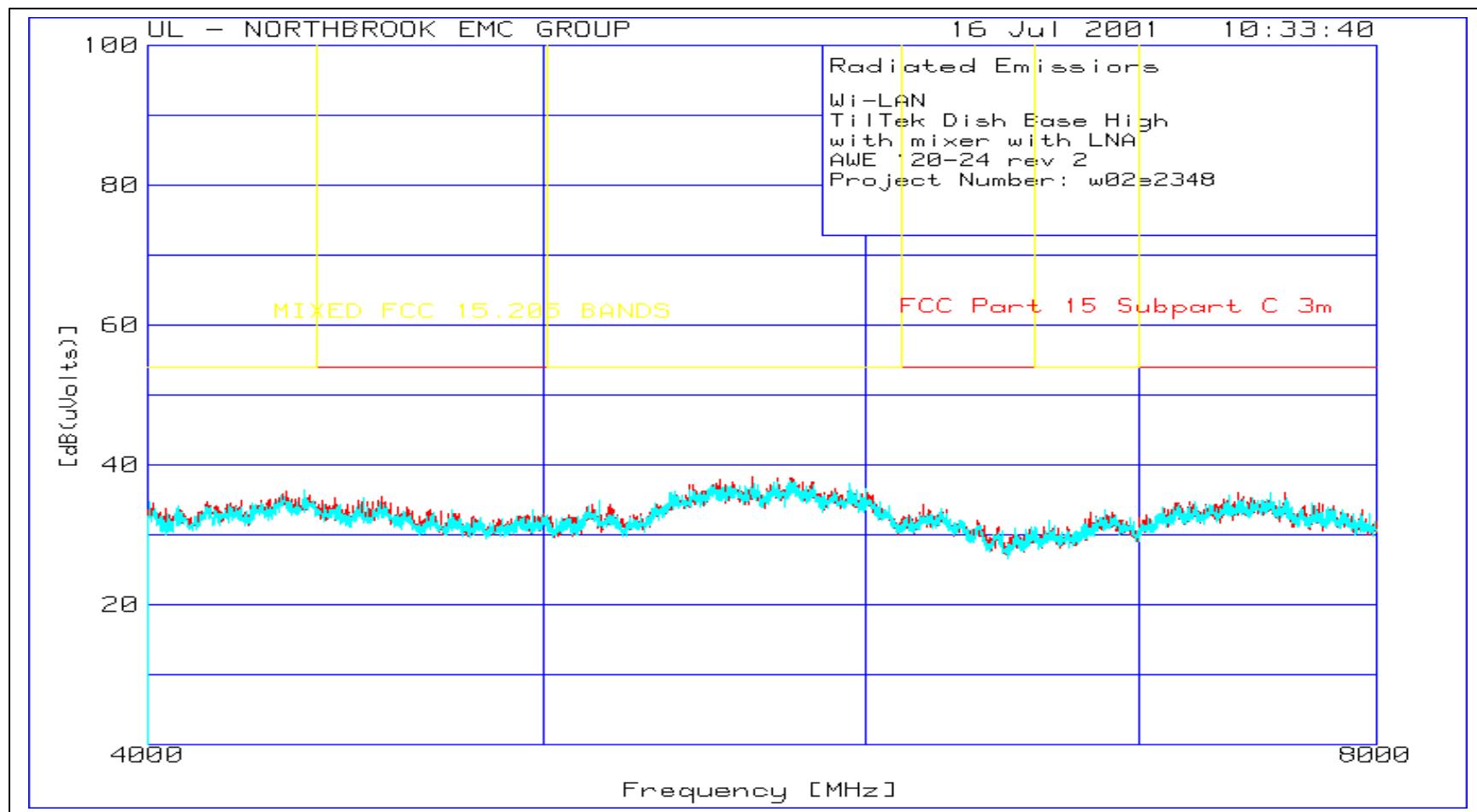
Plot 52
Radiated Emissions of TilTek Dish Antenna – High Channel
AWE 20-24 REV-2 in Base mode
18-19 GHz



Plot 53
Radiated Emissions of TilTek Dish Antenna – High Channel
AWE 20-24 REV-2 in Base mode
19-21 GHz



Plot 54
Radiated Emissions of TilTek Dish Antenna – High Channel
AWE 20-24 REV-2 in Base mode
21-25 GHz



4.2.3 Sectoral Antenna

Test Lab: MPB Technologies Inc. Airdrie Test Personnel: Q. Nguyen, S. Tarkowski Test Date: 27 June & 3, 4, 9, 10, 11 July 2001	Product: AWE 120-24 rev 2											
Test Result, AWE 120-24 rev 2 LOW Channel: PASS MID Channel: PASS HIGH Channel: PASS												
Objectives/Criteria												
<p>The Radiated E-Field emissions produced by a system or sub-system, measured at a distance of 3m from the EUT, shall not exceed these limits for the specifications <i>within the restricted bands of operation (RBOs)</i>. Any emissions lying outside the RBOs shall not exceed the level of the fundamental transmission.</p> <p>Emission levels should meet the requirements with a margin of 6dB.of 6dB.</p>	<p>Specifications</p> <p>FCC Part 15.209 and 15.205</p> <table> <thead> <tr> <th>Frequency [MHz]</th> <th>Limit (QP @ 3m) [dBμV/m]</th> </tr> </thead> <tbody> <tr> <td>30 – 88</td> <td>40.00</td> </tr> <tr> <td>88 – 216</td> <td>43.52</td> </tr> <tr> <td>216 – 960</td> <td>46.02</td> </tr> <tr> <td>Above 960</td> <td>53.98</td> </tr> </tbody> </table>	Frequency [MHz]	Limit (QP @ 3m) [dB μ V/m]	30 – 88	40.00	88 – 216	43.52	216 – 960	46.02	Above 960	53.98	
Frequency [MHz]	Limit (QP @ 3m) [dB μ V/m]											
30 – 88	40.00											
88 – 216	43.52											
216 – 960	46.02											
Above 960	53.98											
Vertical:												
<table> <thead> <tr> <th>f (MHz)</th> <th>Field Strength (dBμV/m)</th> <th>Delta (dB from limit)</th> <th>f (MHz)</th> <th>Field Strength (dBμV/m)</th> <th>Delta (dB from limit)</th> </tr> </thead> <tbody> <tr> <td>1141.4695</td> <td>24.46</td> <td>-29.54</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	f (MHz)	Field Strength (dB μ V/m)	Delta (dB from limit)	f (MHz)	Field Strength (dB μ V/m)	Delta (dB from limit)	1141.4695	24.46	-29.54			
f (MHz)	Field Strength (dB μ V/m)	Delta (dB from limit)	f (MHz)	Field Strength (dB μ V/m)	Delta (dB from limit)							
1141.4695	24.46	-29.54										
LOW Channel:												
1141.4695	24.46	-29.54										
MID Channel:												
HIGH Channel:												
1087.202	24.26	-29.74										
1203.292	24.21	-29.79										
<p>There were no measured within -20 dB of the specified limit. Please refer to the test data and plots (Plots 55 through 80) for more detail.</p>												

Test Data
Radiated Emissions
Sectoral Antenna
LOW Channel
AWE 20-24 REV-2 in Remote mode
30-1000 MHz

Wi-LAN
TilTek Sectoral
LOW Channel Base
AWE 120-24 rev 2
Project Number w02e2348

Test	Meter	Gain/Loss	Transducer	Level	Limit:	1	2	3	4
Frequency	Reading	Factor	Factor	[dB(uVolts)]					
[MHz]	[dB(uV)]	[dB]	[dB]						
1141.4695	30.56	av	-31.4	25.3	24.46	57.7	54	54	N/A
Azimuth: 55	Height:133	Vert		Margin	[dB]	-33.24	-29.54	-29.54	N/A

LIMIT 1: ETSI 300 328 RX
LIMIT 2: FCC Part 15 Subpart C 3m
LIMIT 3: 20 dBc limit restricted band
LIMIT 4: NONE

Test Data
Radiated Emissions
Sectoral Antenna
HIGH Channel
AWE 20-24 REV-2 in Remote mode
1-2 GHz

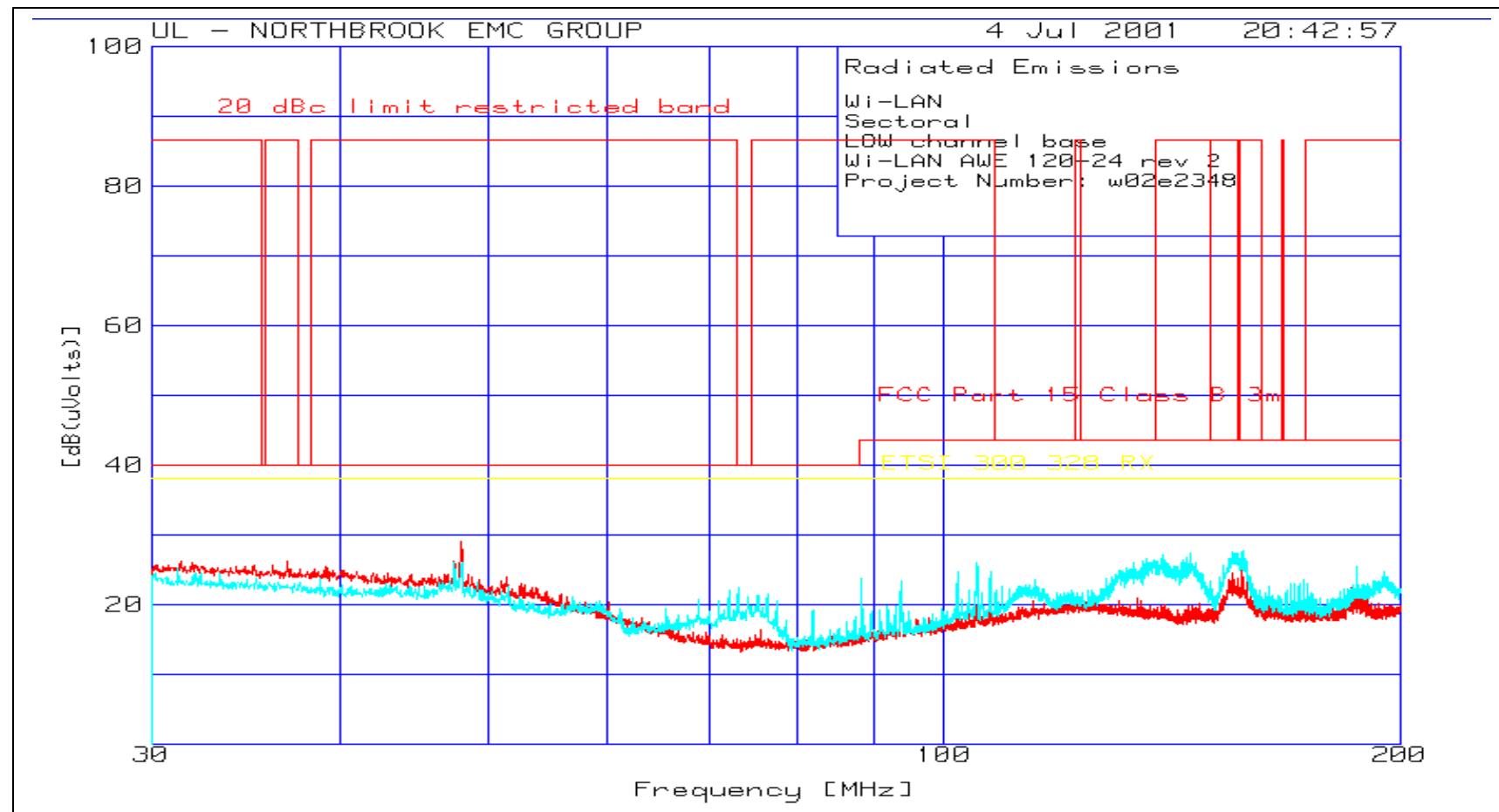
Wi-LAN
TilTek Sectoral
High channel Base
AWE 120-24 rev 2
Project Number w02e2348

Test	Meter	Gain/Loss	Transducer	Level	Limit:1	2	3	4
Frequency	Reading	Factor	Factor	[dB(uVolts)]				
[MHz]	[dB(uV)]	[dB]	[dB]					
<hr/>								
1087.202	29.96	av	-30.7	25	24.26	57.7	54	54
Azimuth: 26	Height:370	Vert		Margin	[dB]	-33.44	-29.74	-29.74
1203.292	31.01	av	-32.3	25.5	24.21	57.7	54	54
Azimuth: 101	Height:369	Vert		Margin	[dB]	-33.49	-29.79	-29.79

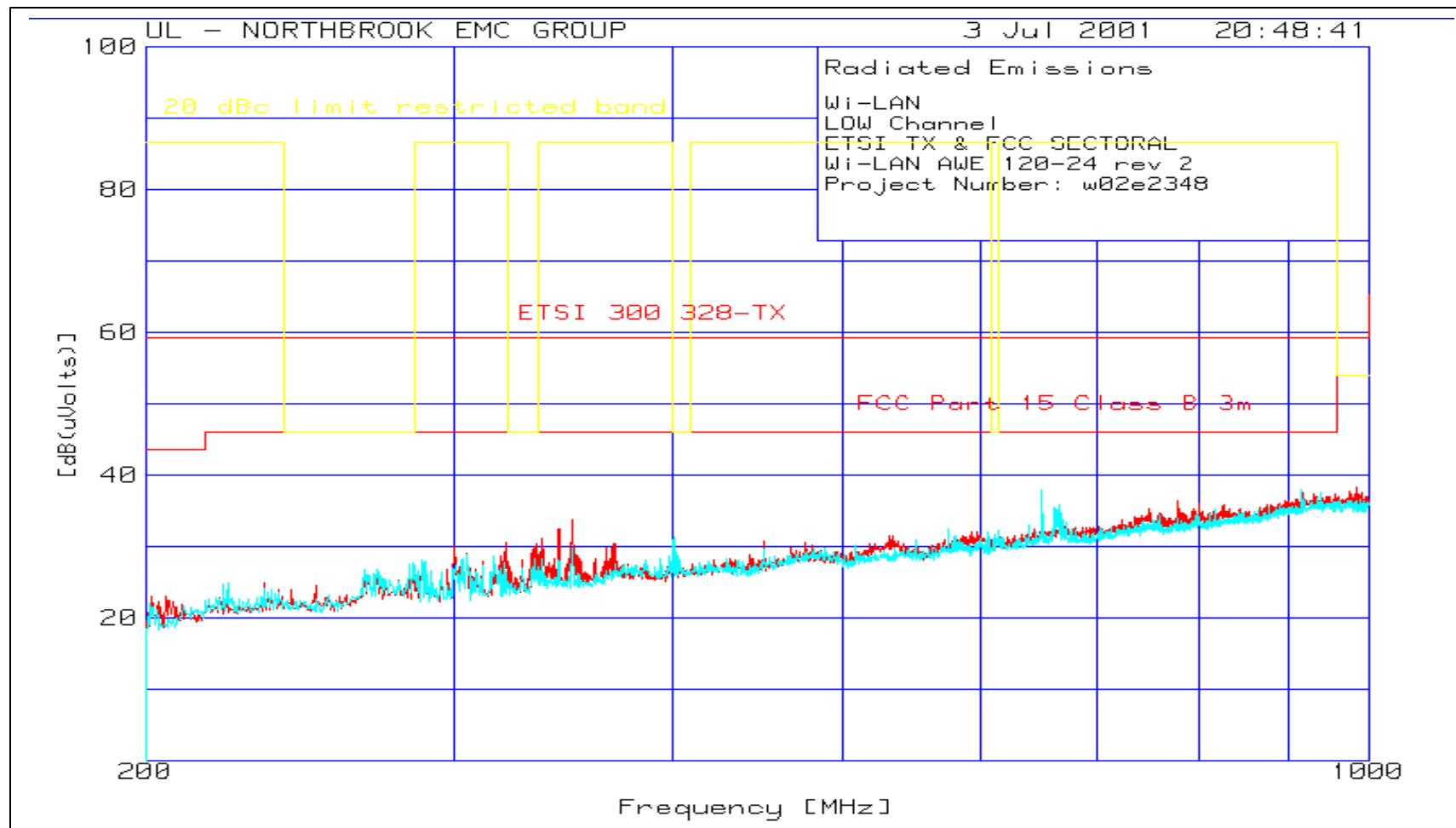
LIMIT 1: ETSI 300 328 RX
LIMIT 2: FCC Part 15 Subpart C 3m
LIMIT 3: 20 dBc limit restricted band
LIMIT 4: NONE

pk - Peak detector
qp - Quasi-Peak detector
av - Average detector

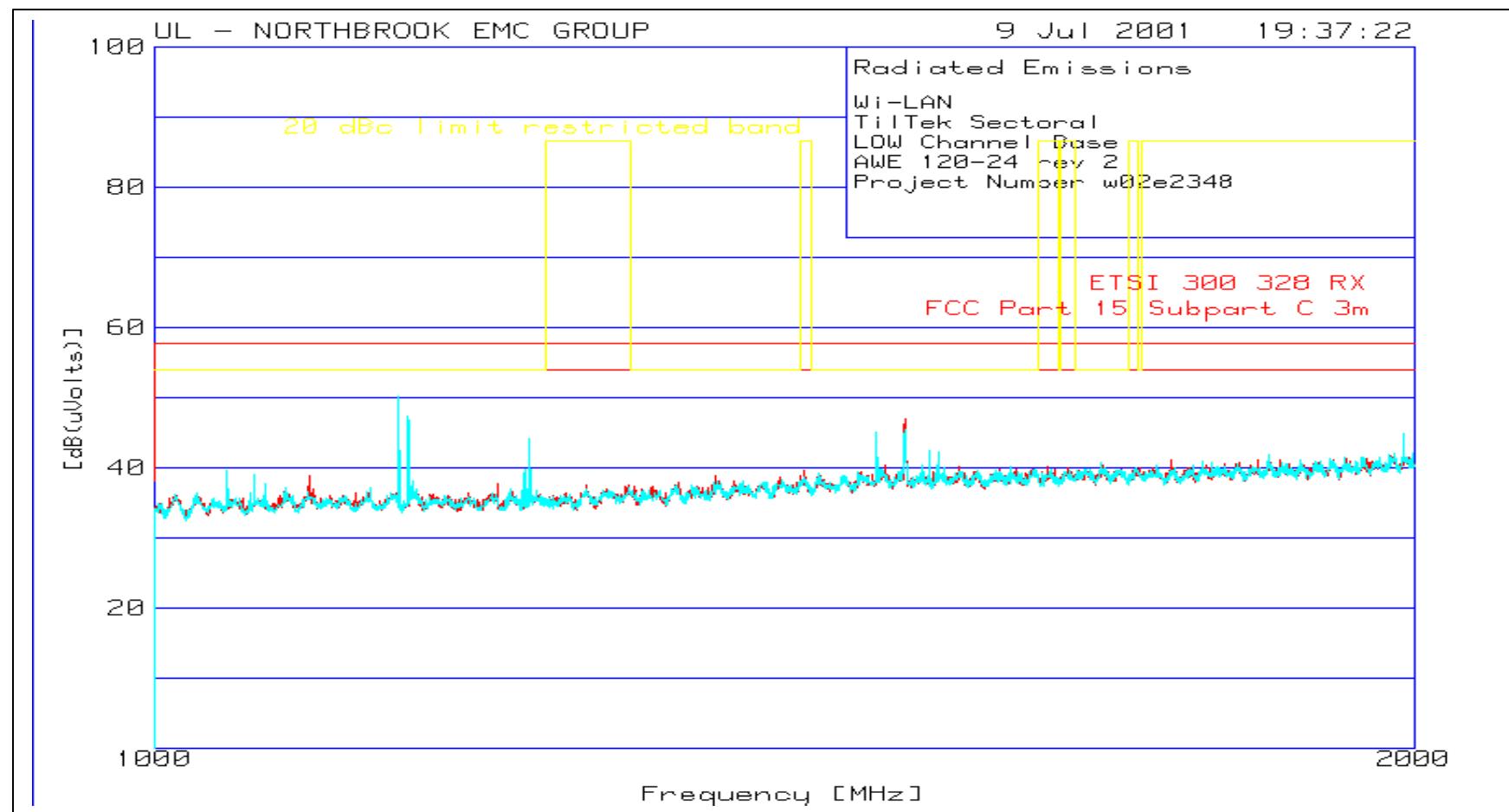
Plot 55
Radiated Emissions of Sectoral Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
30-200 MHz



Plot 56
Radiated Emissions of Sectoral Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
200-1000 MHz



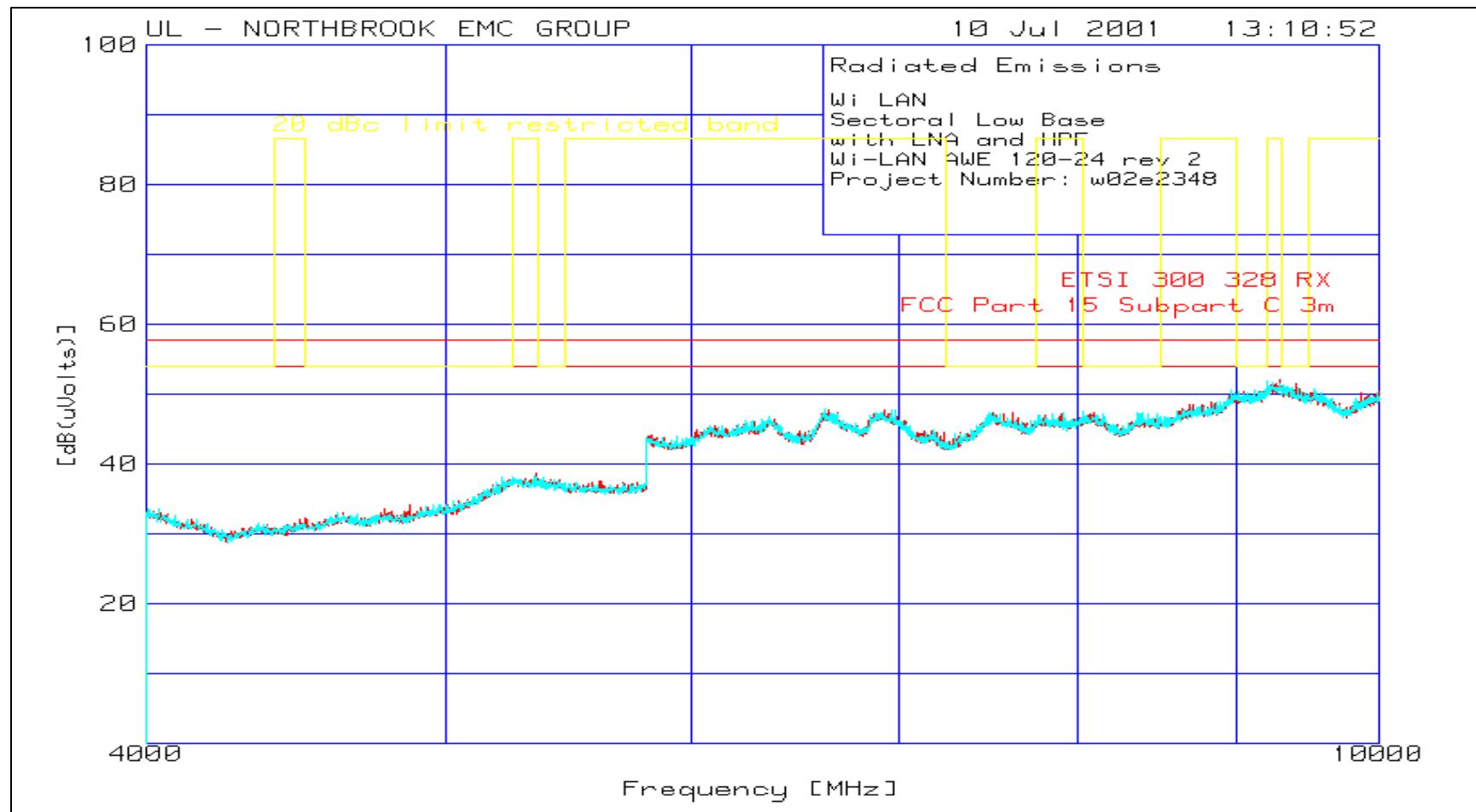
Plot 57
Radiated Emissions of Sectoral Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
1-2 GHz



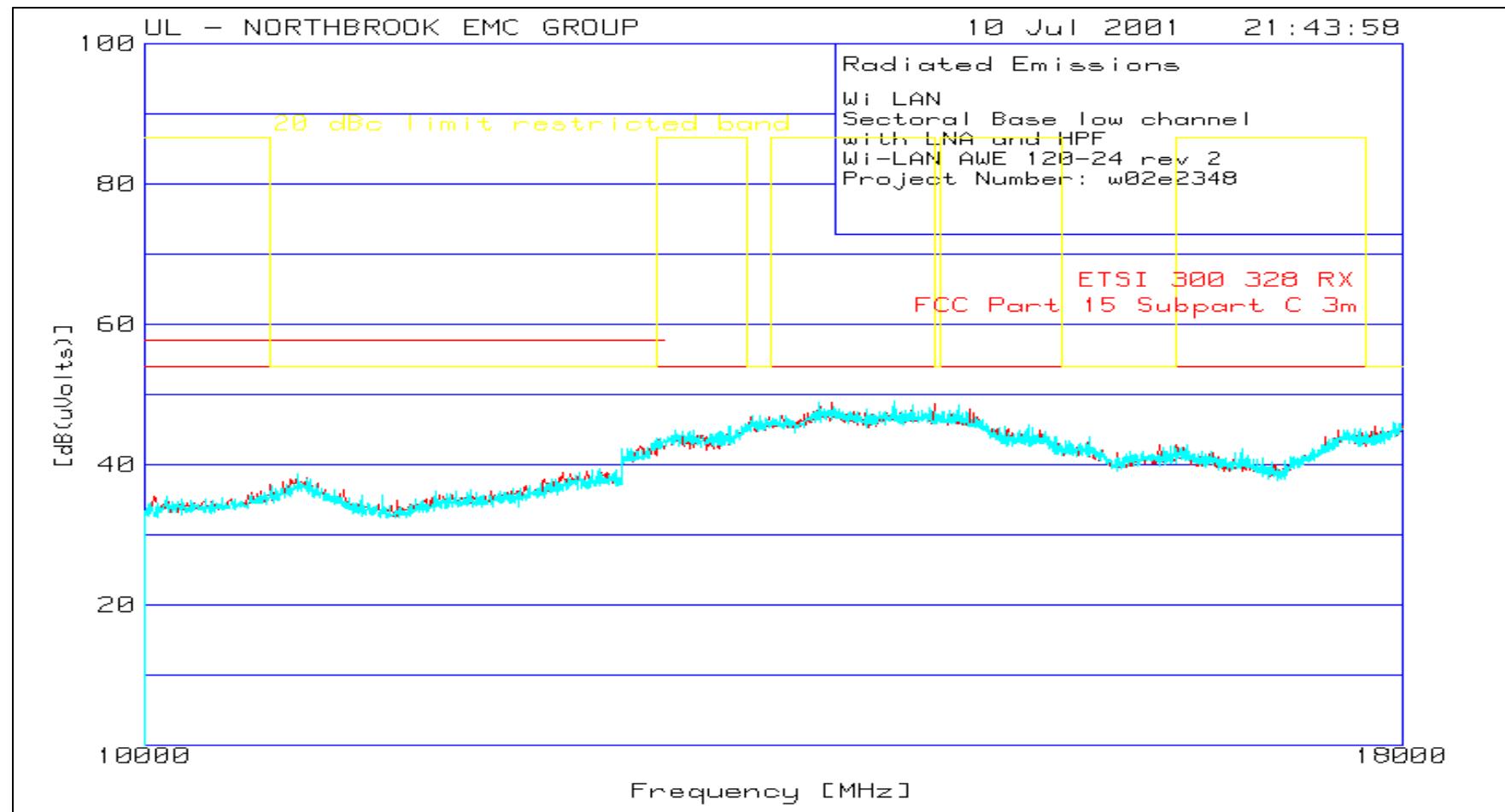
Ploy 58
Radiated Emissions of Sectoral Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
2-4 GHz



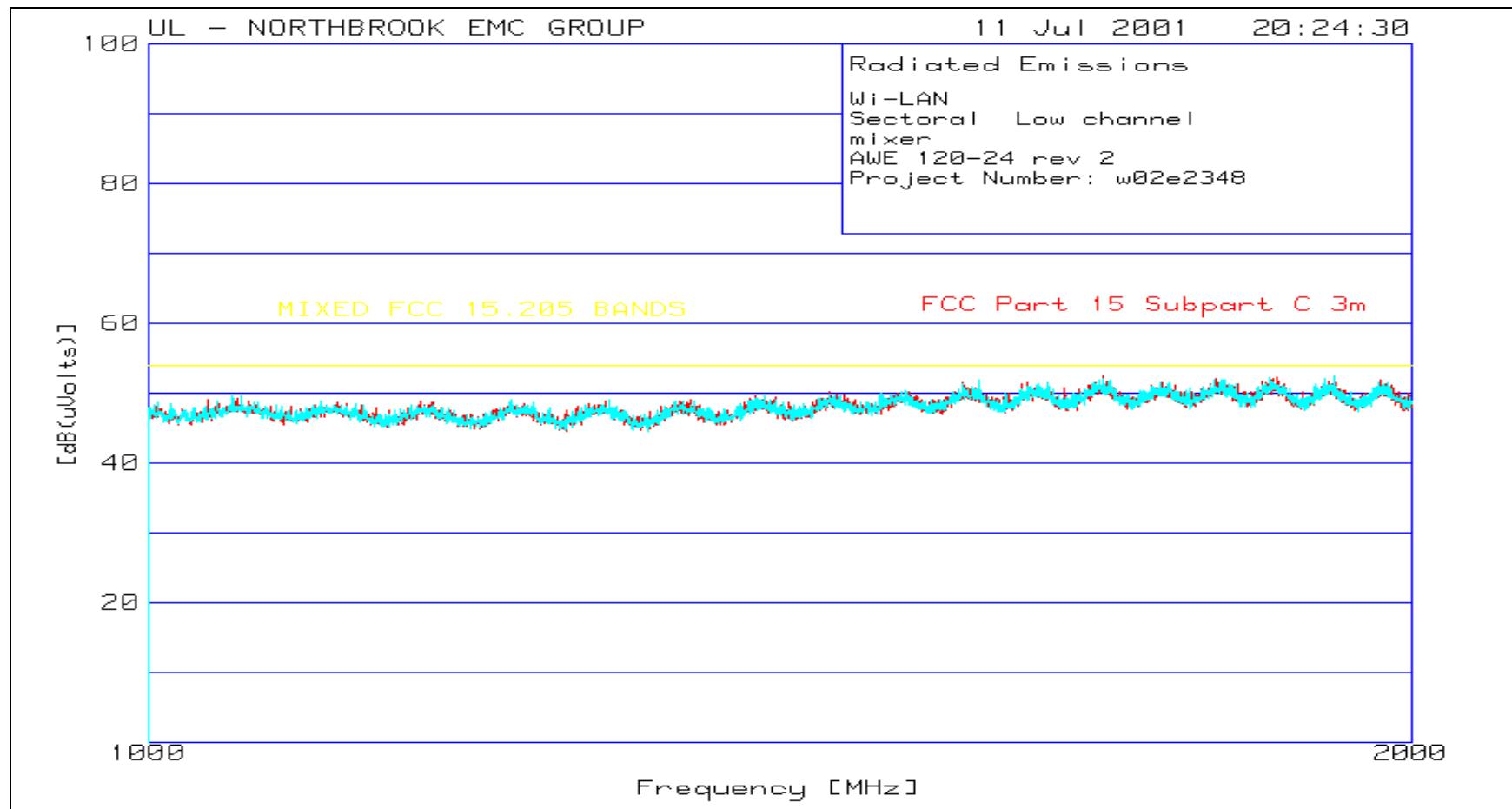
Plot 59
Radiated Emissions of Sectoral Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
4-10GHz



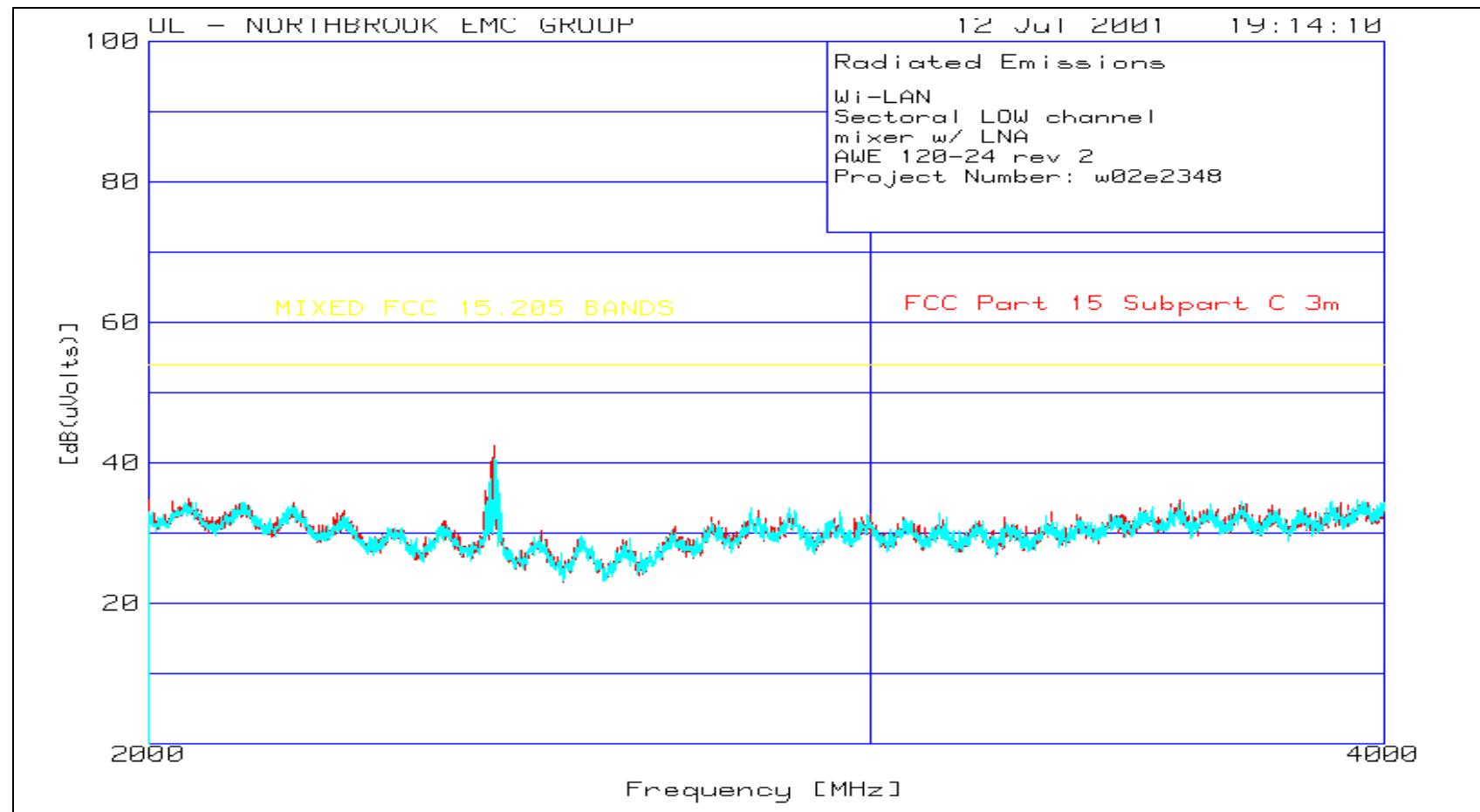
Plot 60
Radiated Emissions of Sectoral Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
10-18 GHz



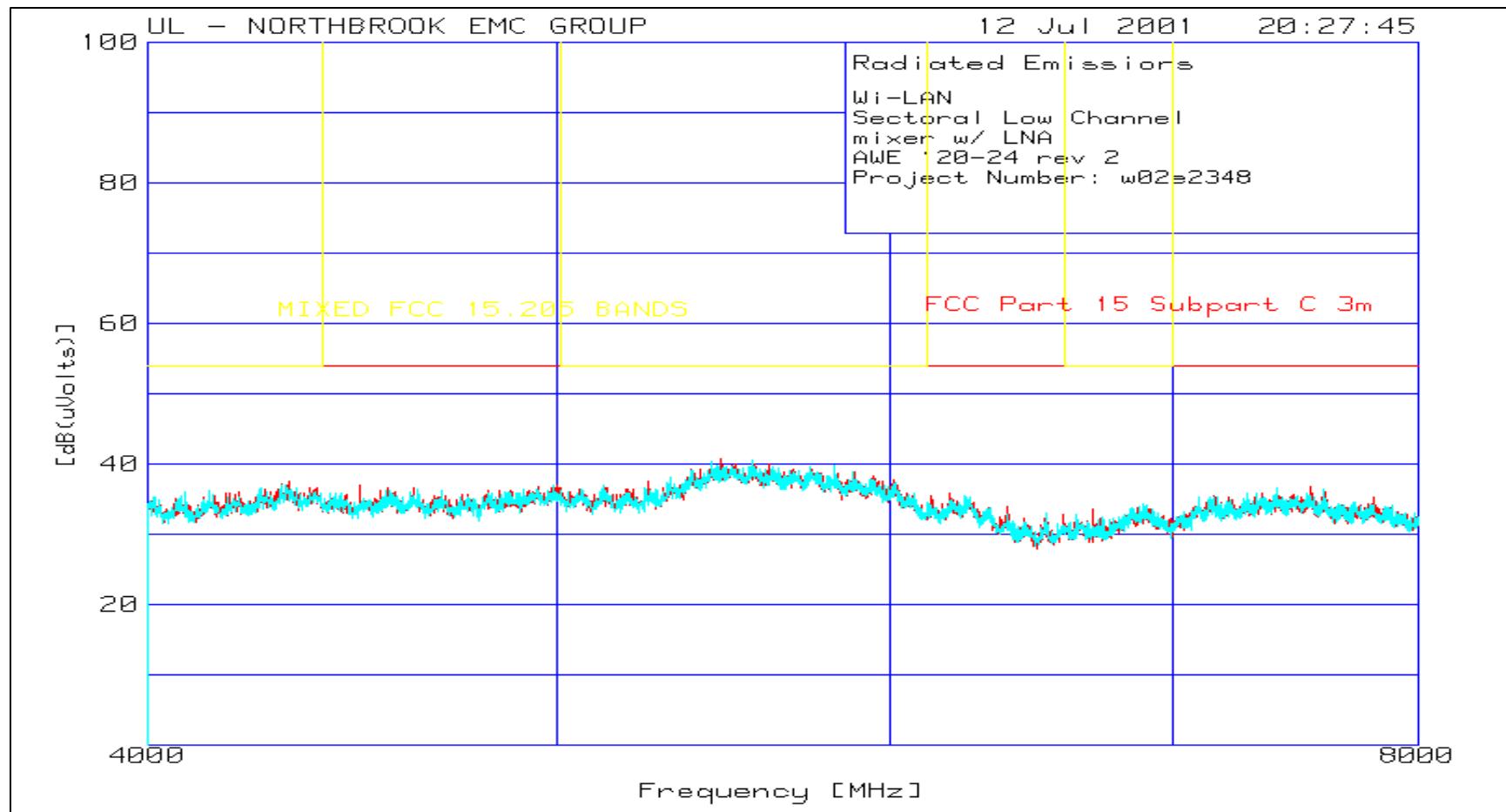
Plot 61
Radiated Emissions of Sectoral Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
18-19 GHz



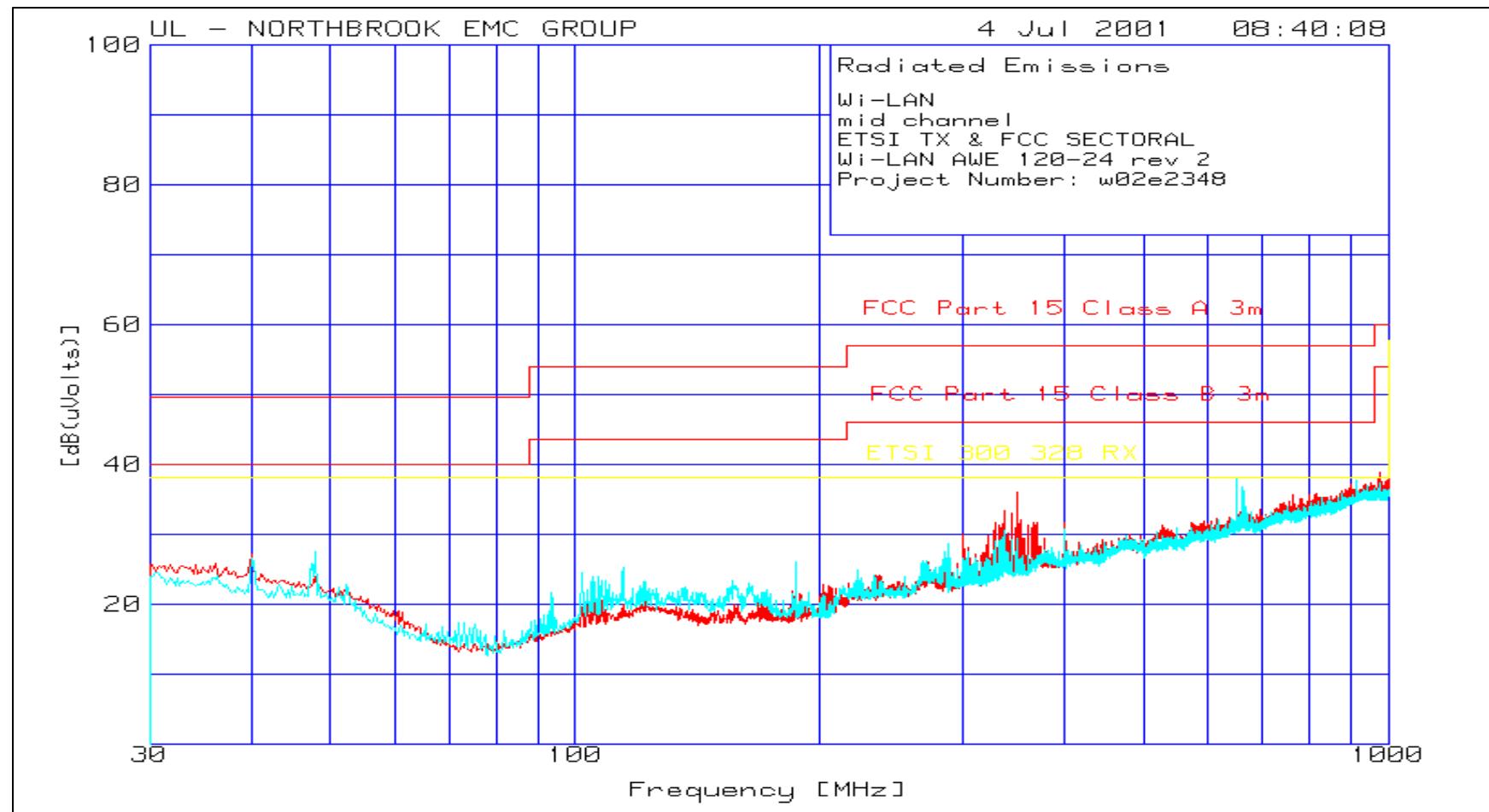
Plot 62
Radiated Emissions of Sectoral Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
19-21 GHz



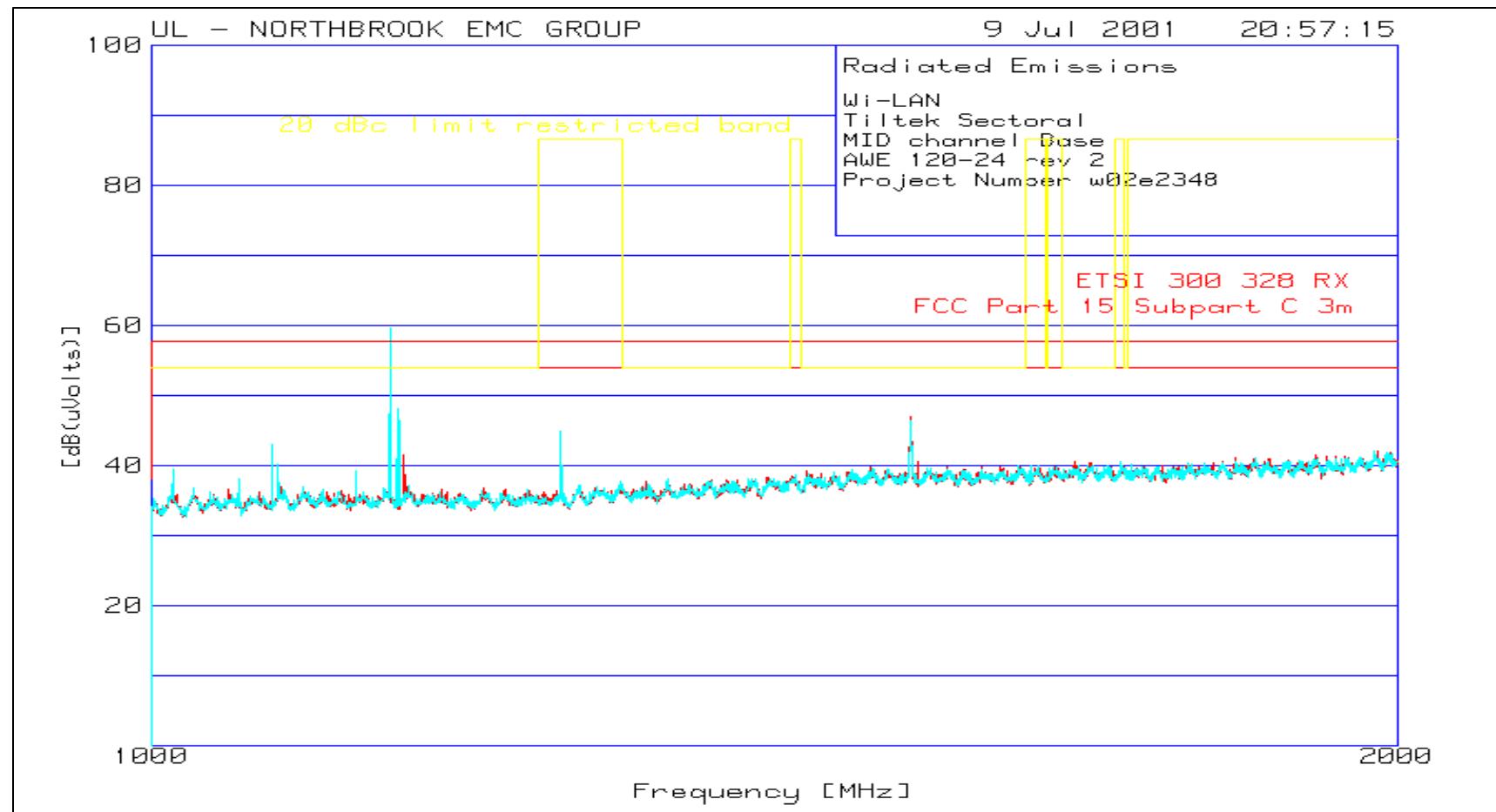
Plot 63
Radiated Emissions of TilTek Dish Antenna – Low Channel
AWE 20-24 REV-2 in Base mode
21-25 GHz



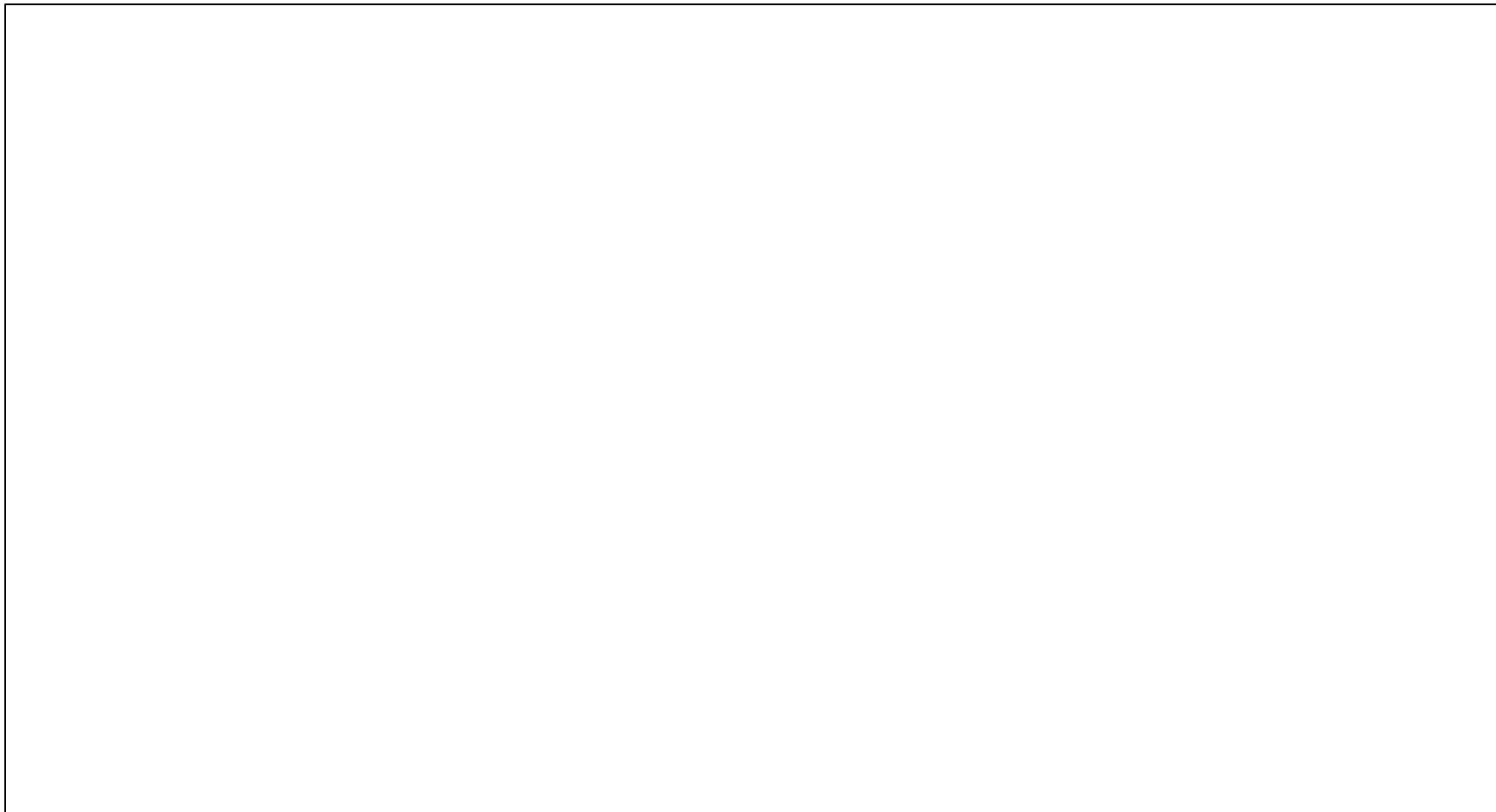
Plot 64
Radiated Emissions of Sectoral Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
30-1000 MHz



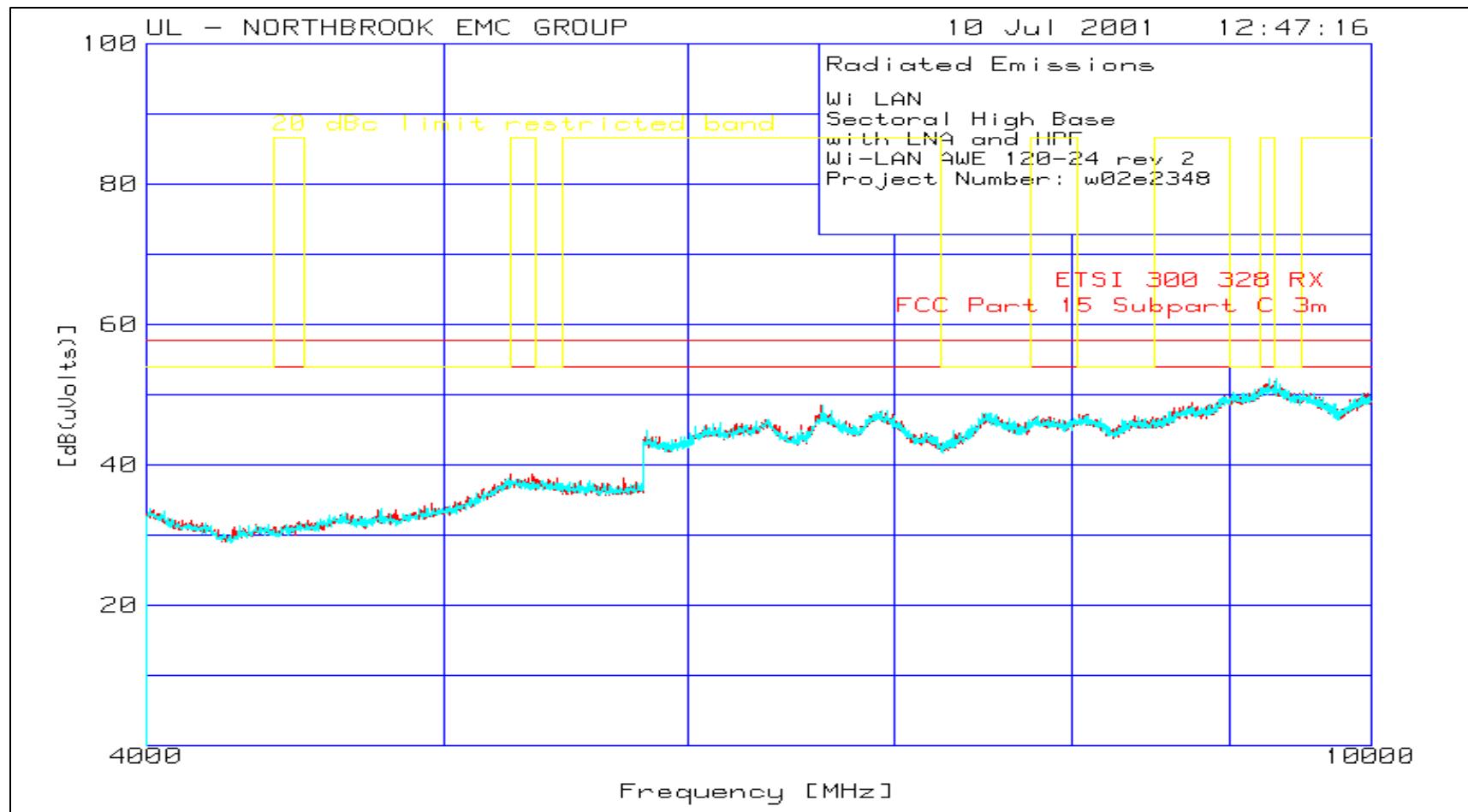
Plot 65
Radiated Emissions of Sectoral Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
1-2 GHz



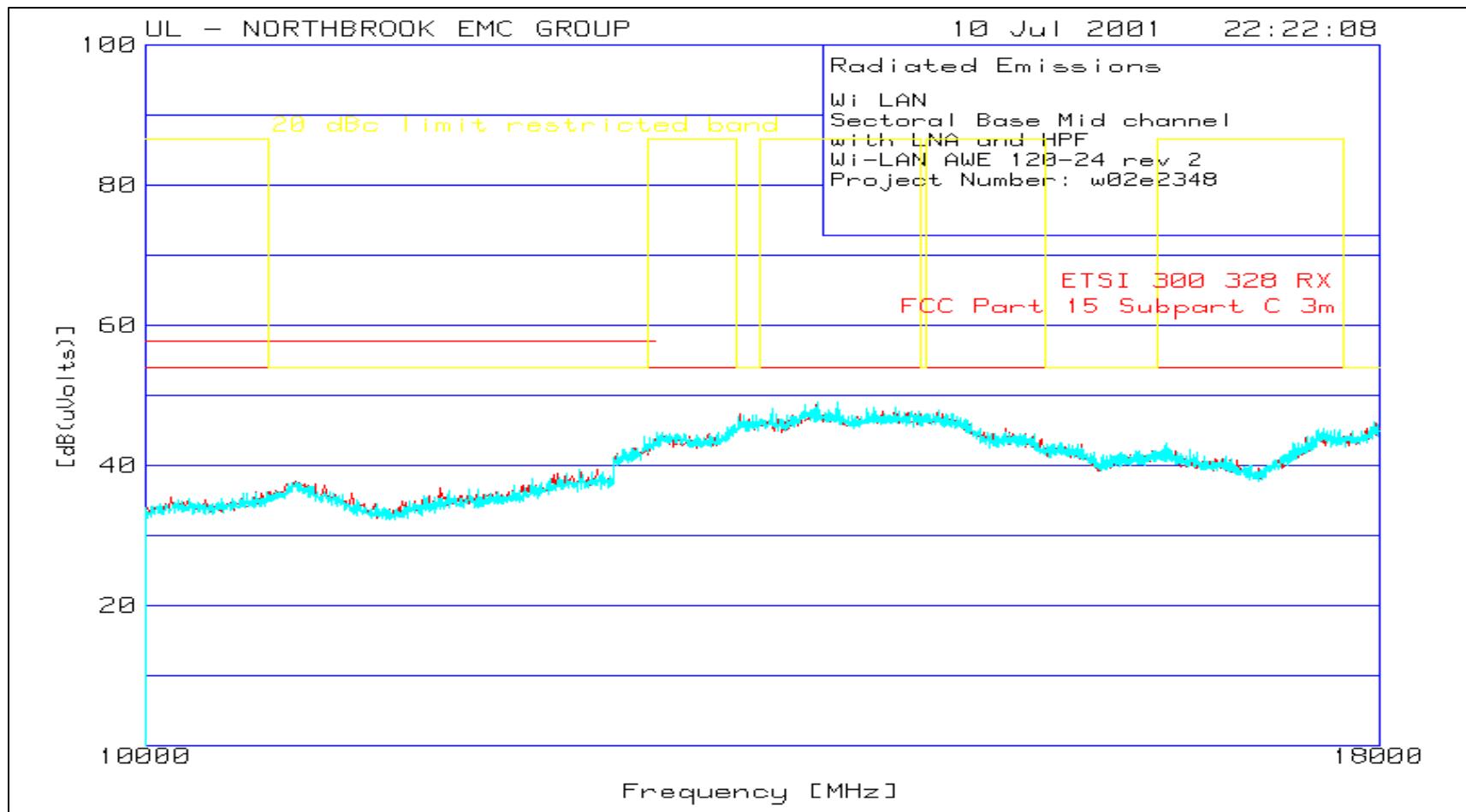
Plot 66
Radiated Emissions of Sectoral Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
2-4 GHz



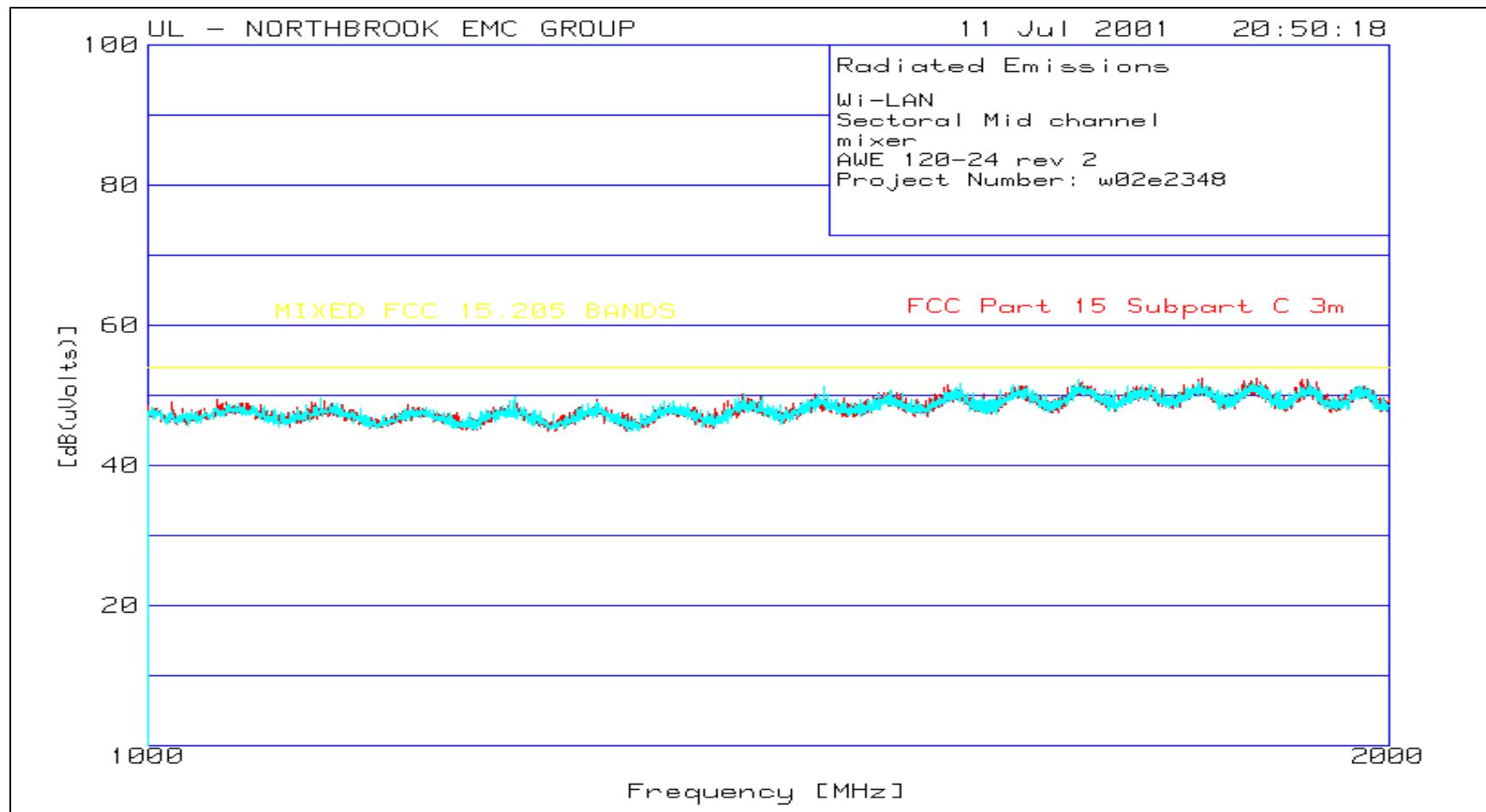
Plot 67
Radiated Emissions of Sectoral Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
4-10GHz



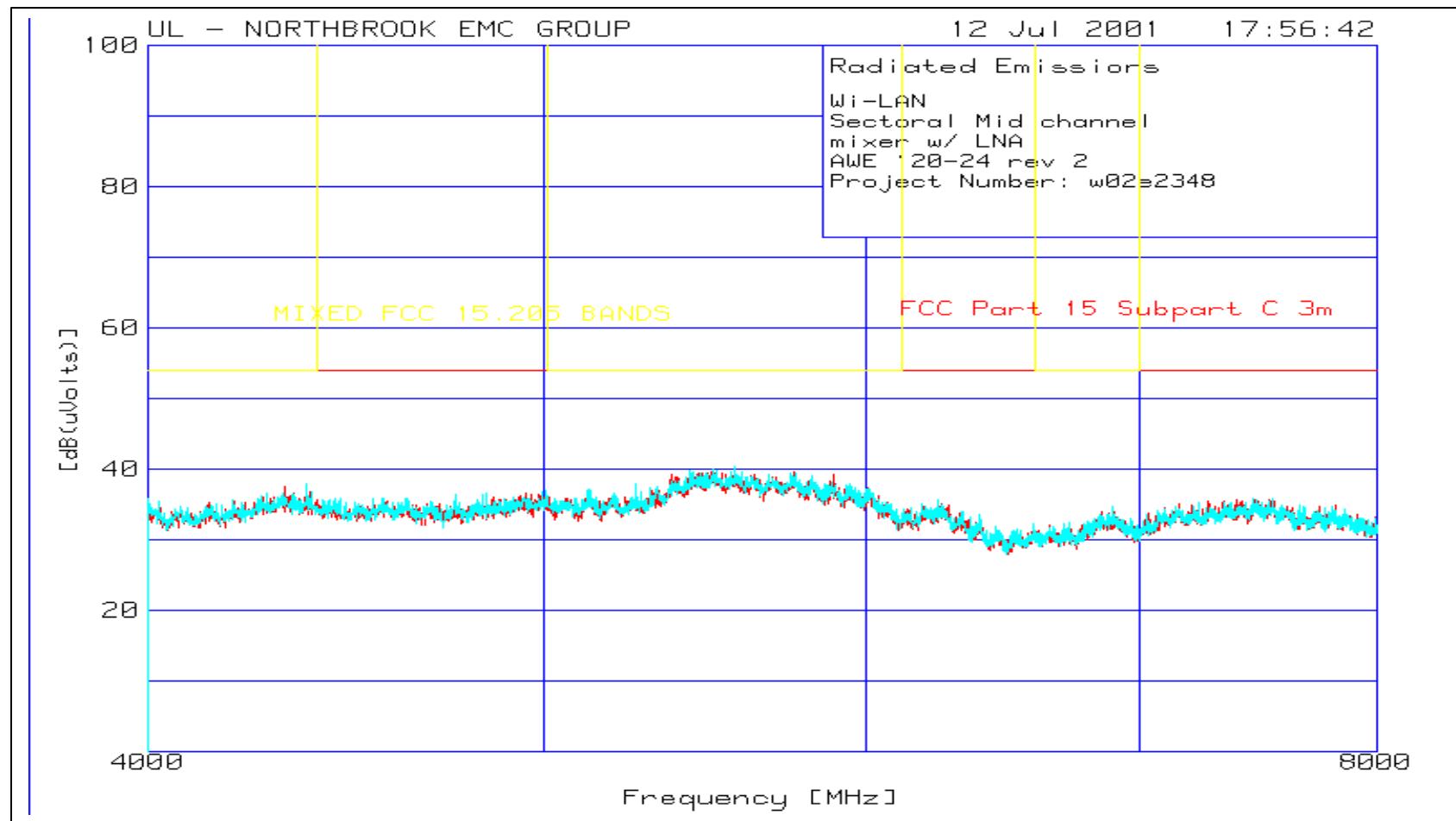
Plot 68
Radiated Emissions of Sectoral Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
10-18 GHz



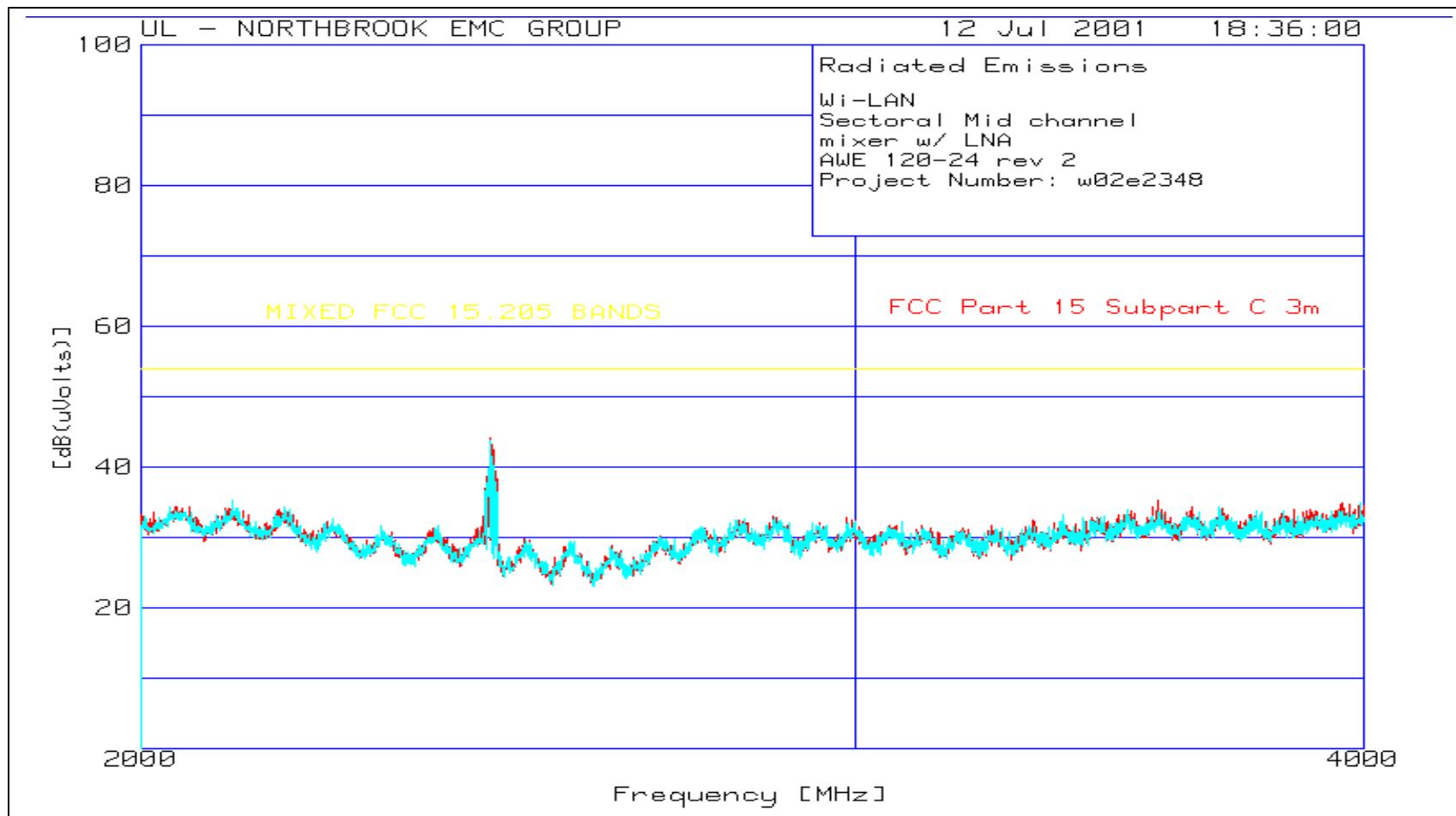
Plot 69
Radiated Emissions of Sectoral Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
18-19 GHz



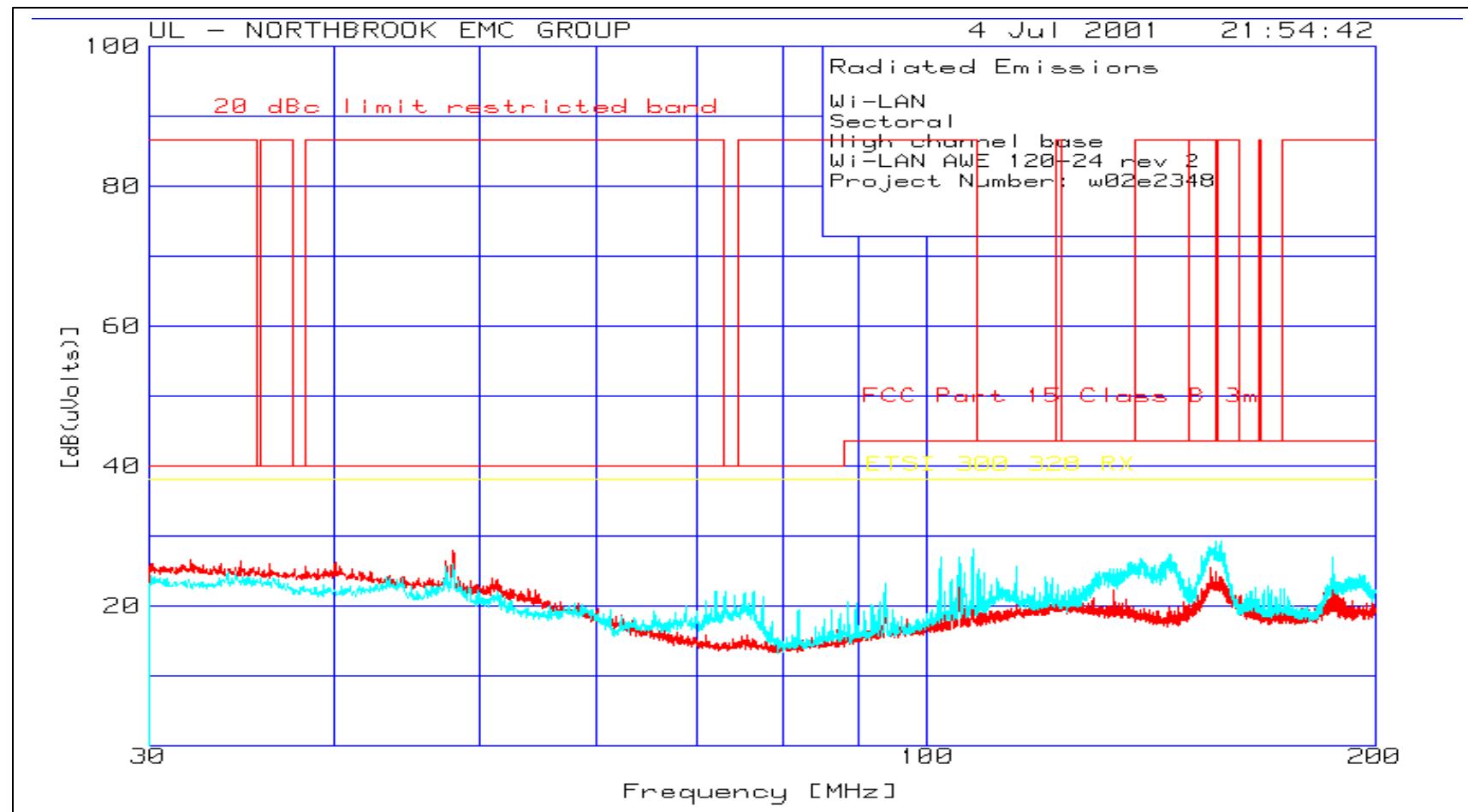
Plot 70
Radiated Emissions of Sectoral Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
19-21 GHz



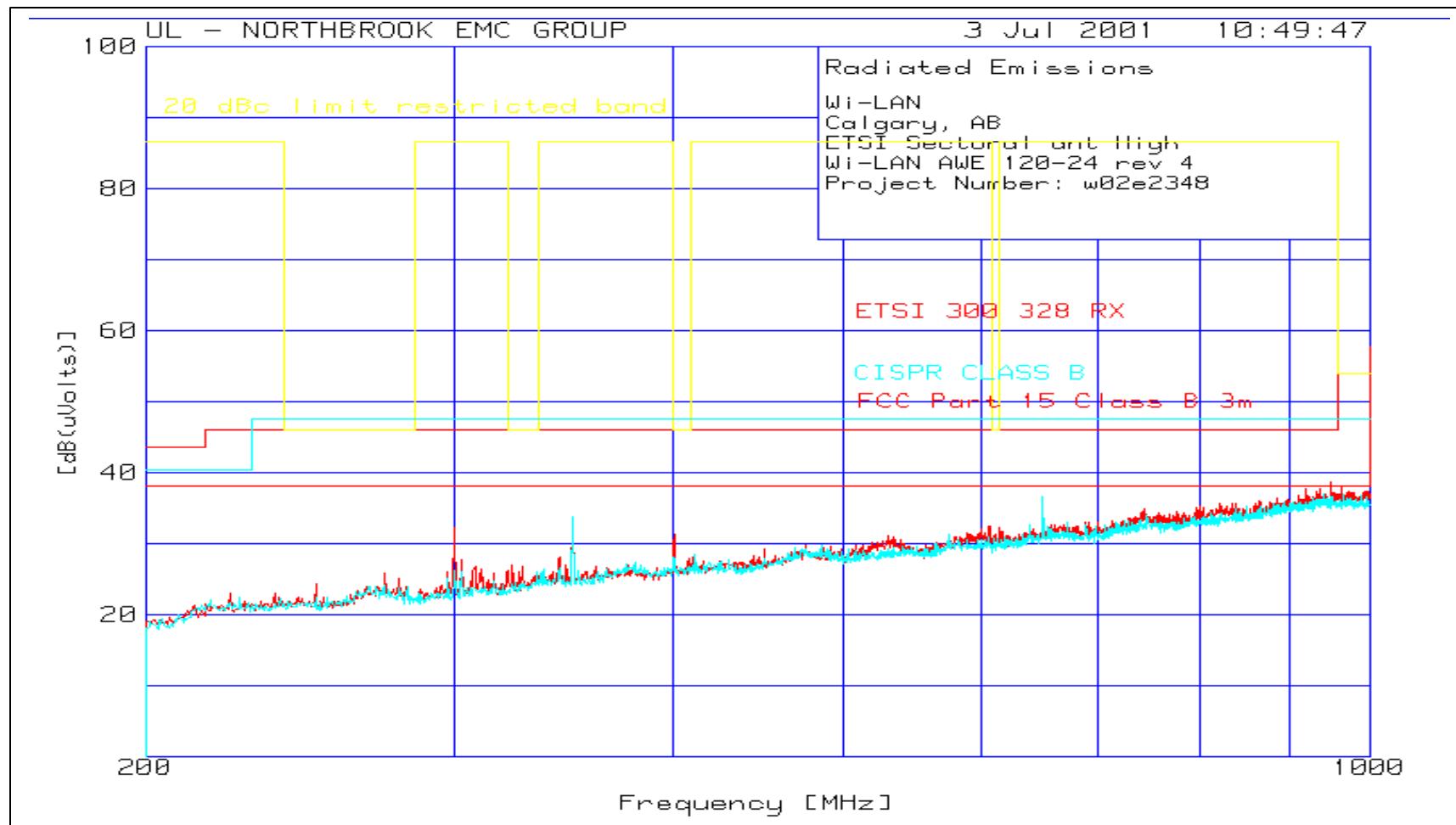
Plot 71
Radiated Emissions of Sectoral Antenna – Mid Channel
AWE 20-24 REV-2 in Base mode
21-25 GHz



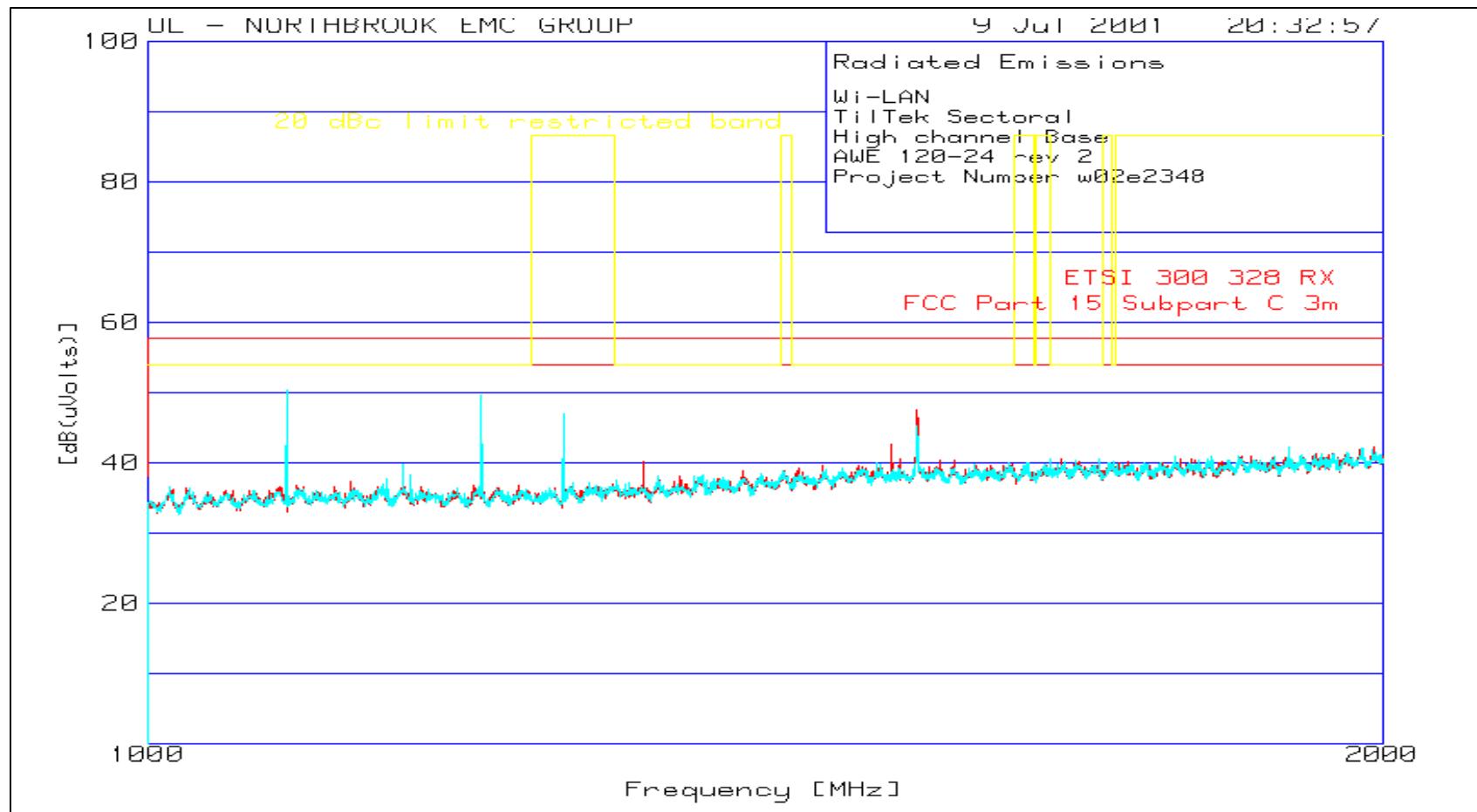
Plot 72
Radiated Emissions of Sectoral Antenna – High Channel
AWE 20-24 REV-2 in Base mode
30-200 MHz



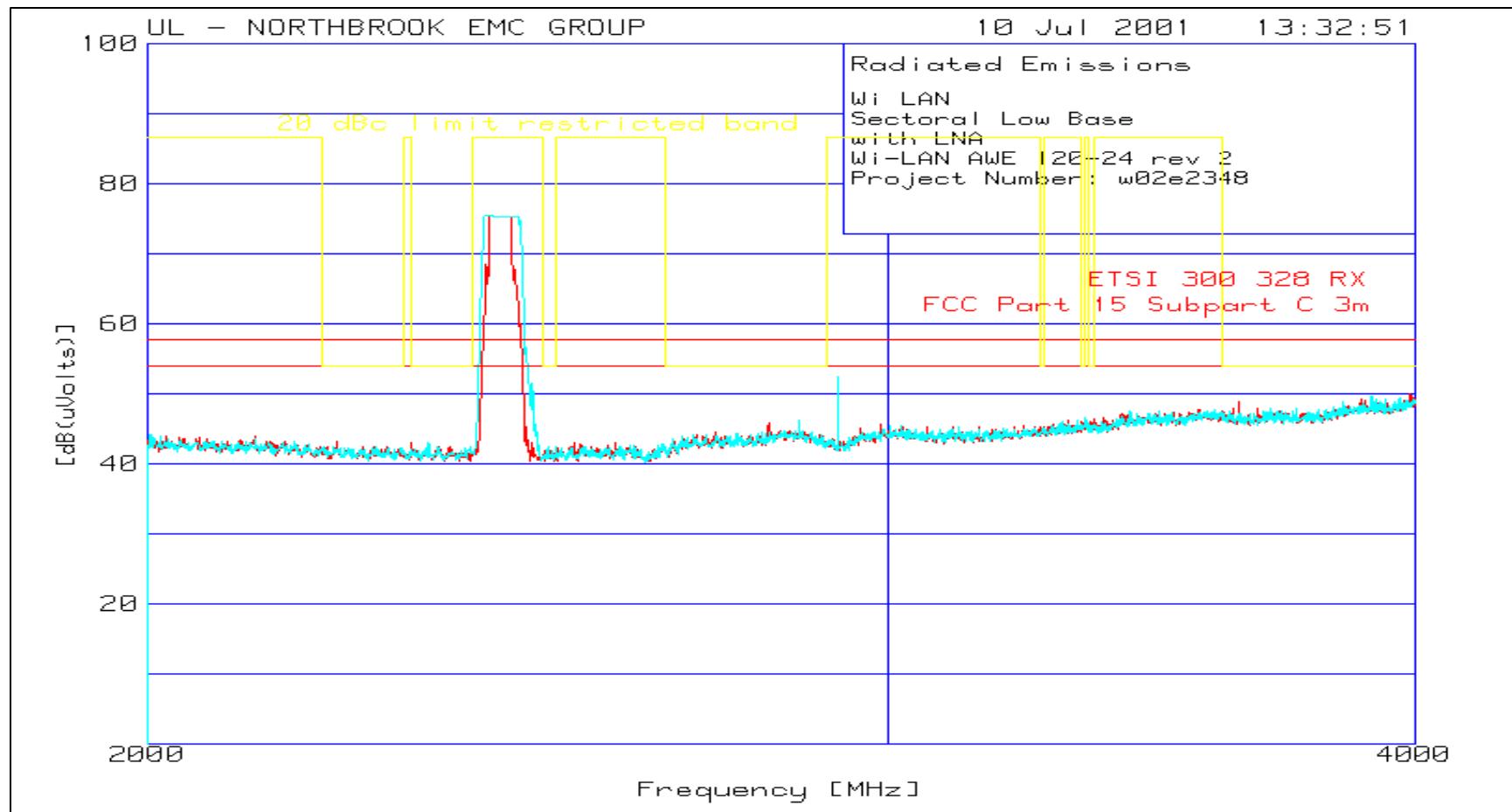
Plot 73
Radiated Emissions of Sectoral Antenna – High Channel
AWE 20-24 REV-2 in Base mode
200-1000 MHz



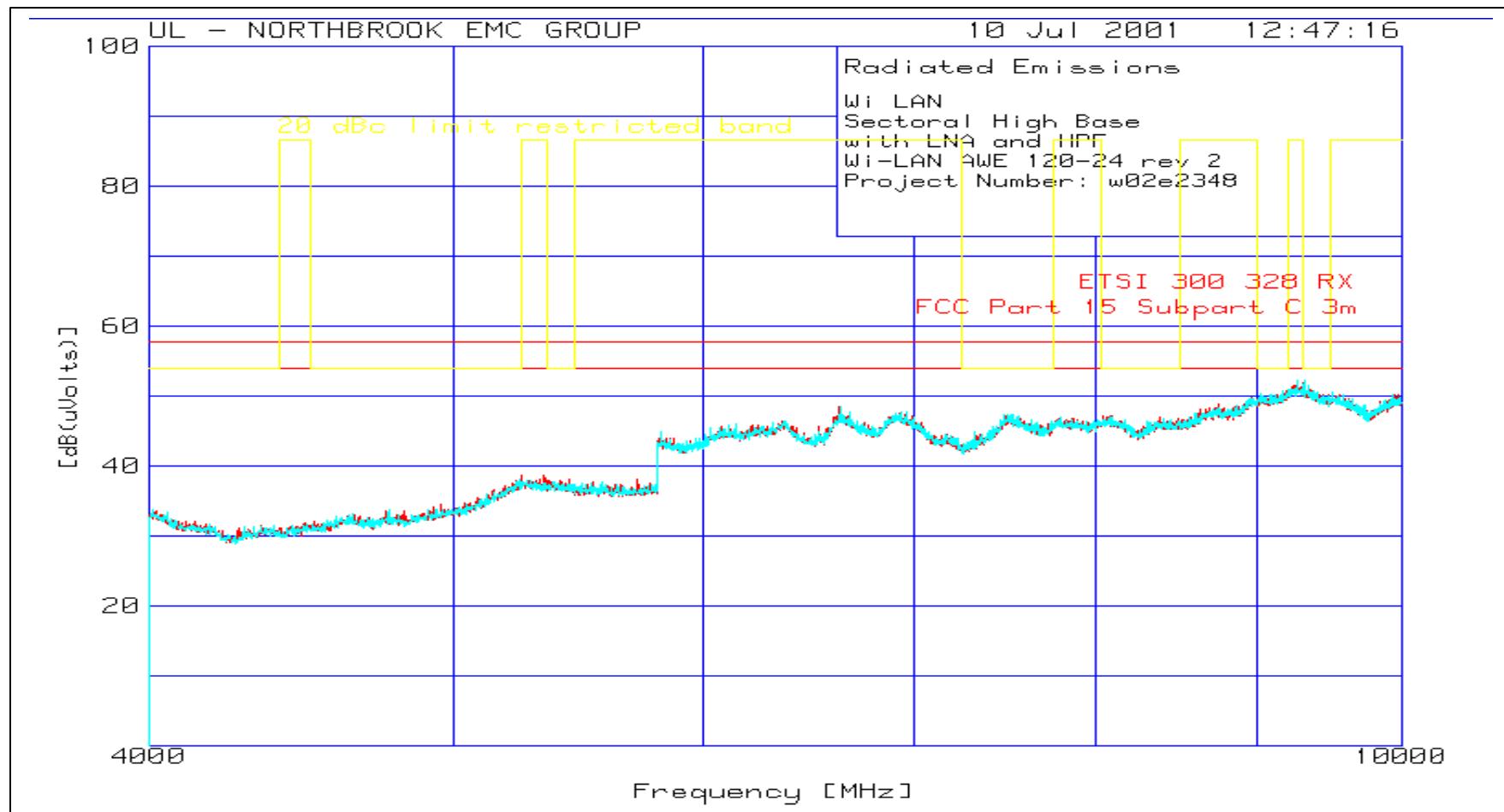
Plot 74
Radiated Emissions of Sectoral Antenna – High Channel
AWE 20-24 REV-2 in Base mode
1-2 GHz



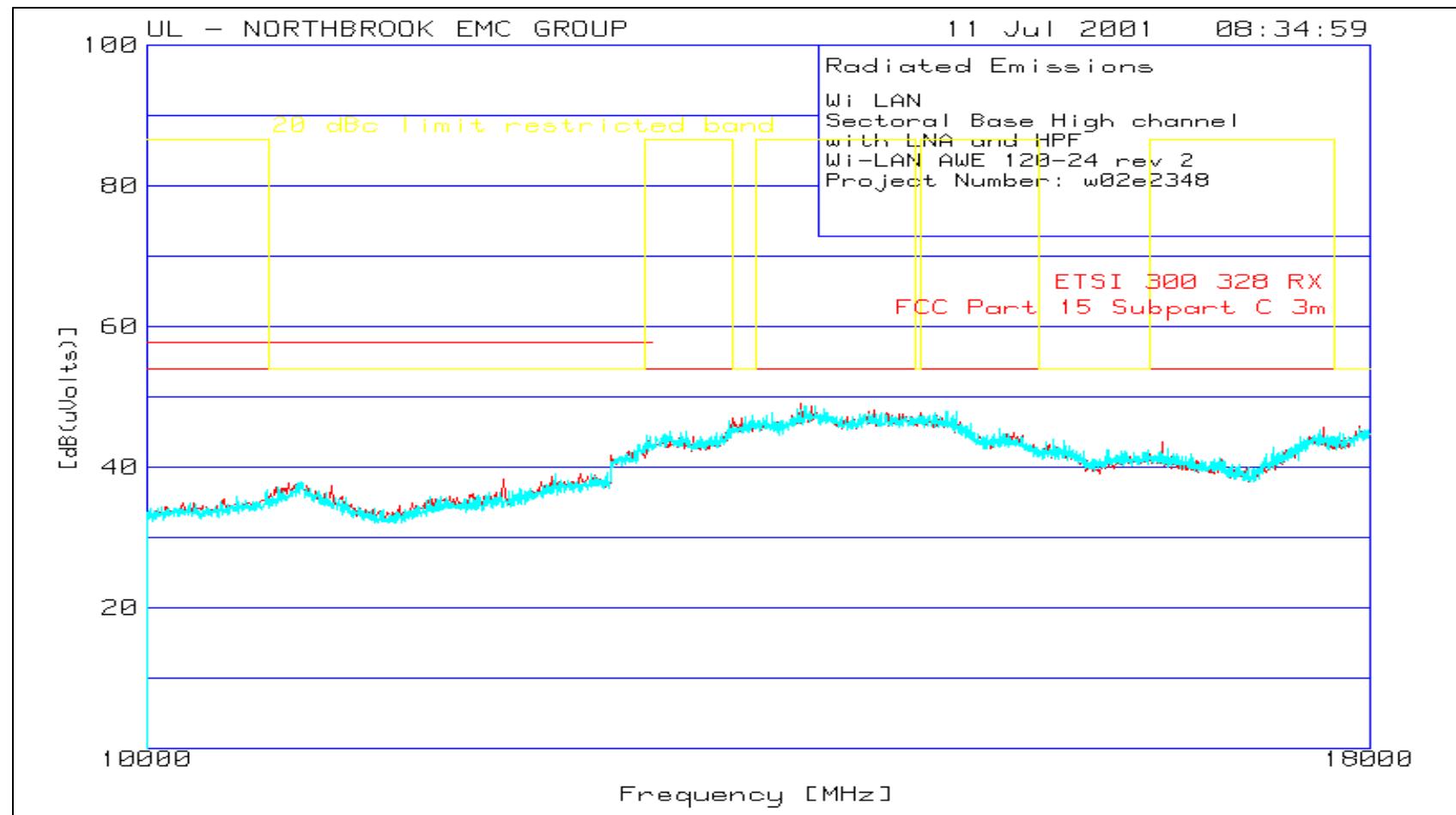
Plot 75
Radiated Emissions of Sectoral Antenna – High Channel
AWE 20-24 REV-2 in Base mode
2-4 GHz



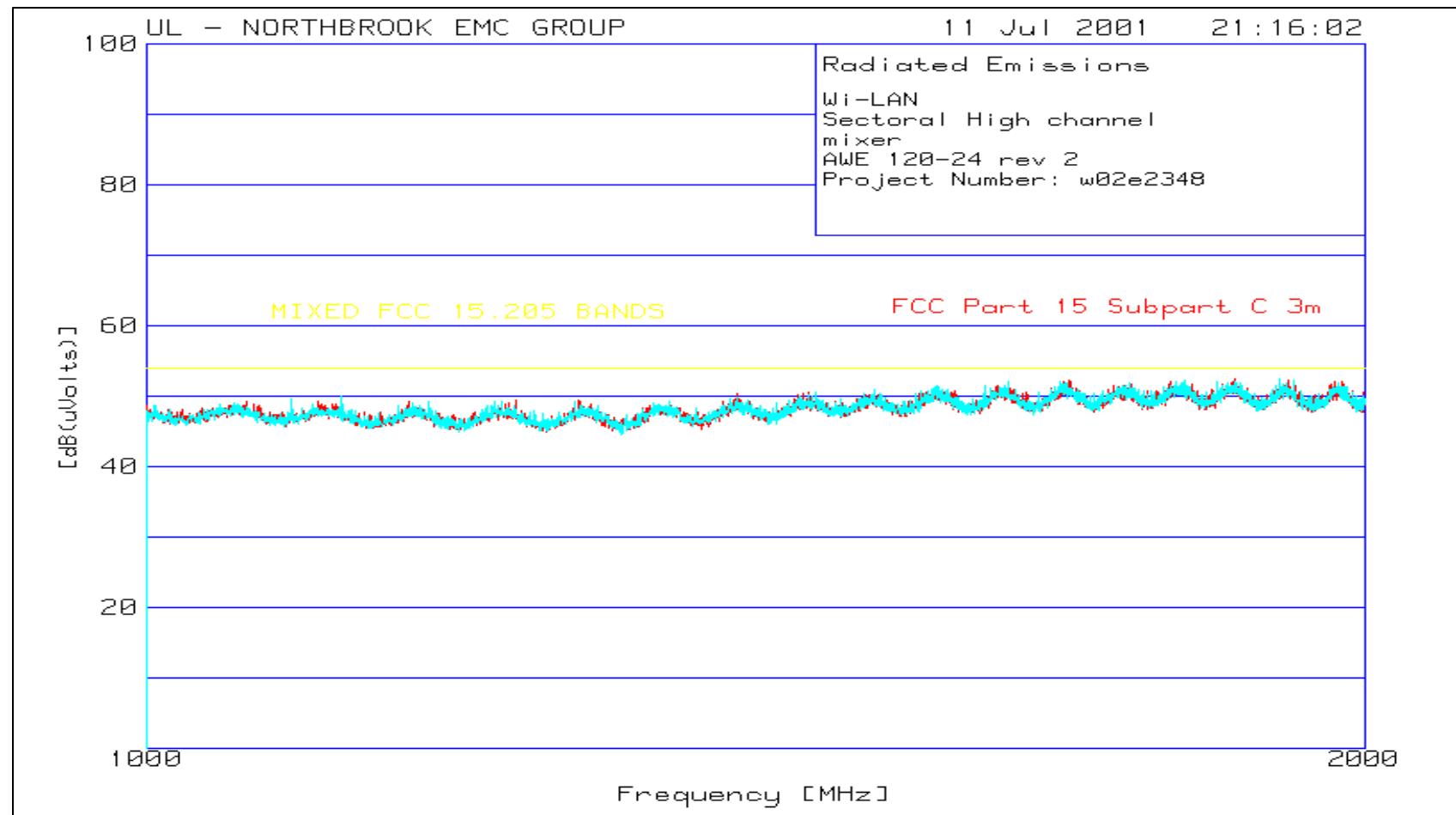
Plot 76
Radiated Emissions of Sectoral Antenna – High Channel
AWE 20-24 REV-2 in Base mode
4-10GHz



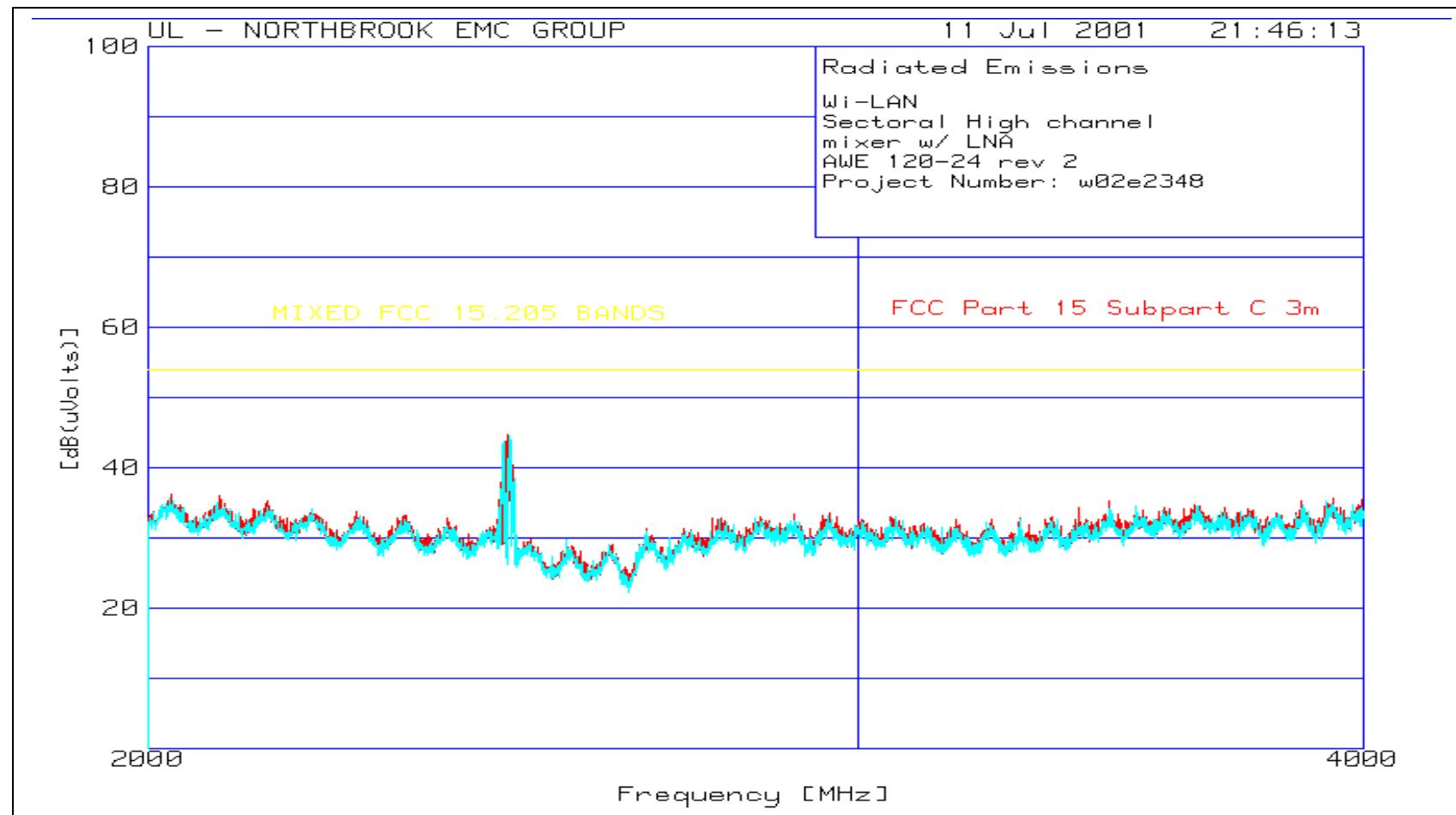
Plot 77
Radiated Emissions of Sectoral Antenna – High Channel
AWE 20-24 REV-2 in Base mode
10-18 GHz



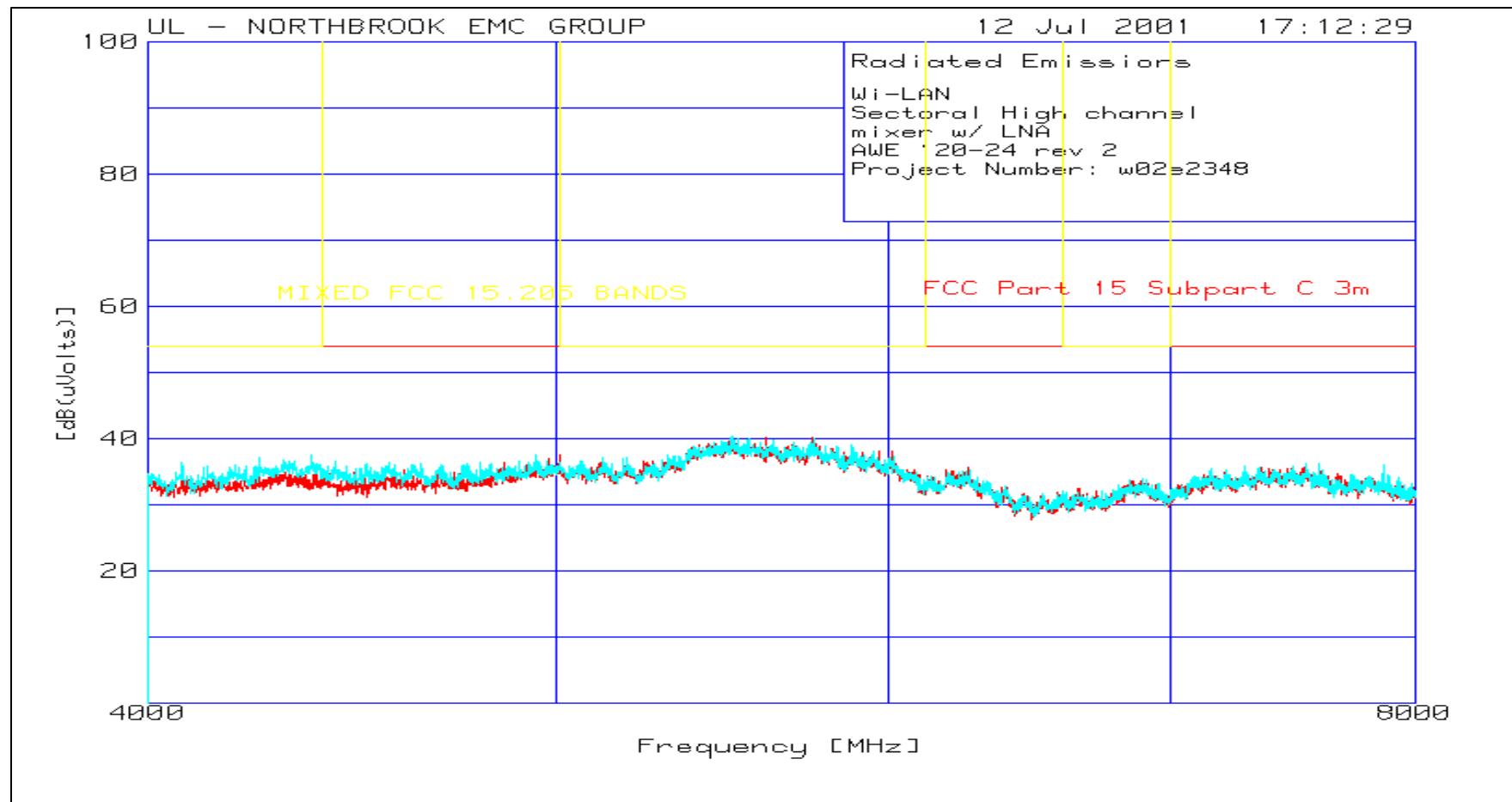
Plot 78
Radiated Emissions of Sectoral Antenna – High Channel
AWE 20-24 REV-2 in Base mode
18-19 GHz



Plot 79
Radiated Emissions of Sectoral Antenna – High Channel
AWE 20-24 REV-2 in Base mode
19-21 GHz



Plot 80
Radiated Emissions of Sectoral Antenna – High Channel
AWE 20-24 REV-2 in Base mode
21-25 GHz



5.0 TEST FACILITY

5.1 LOCATION

The EUT was tested for Electromagnetic Compatibility at the Electronics Test Centre, located in Airdrie, Alberta, Canada.

The RF Anechoic Chamber (RFAC) is identified as Chamber 1, located in the main building complex at the Electronics Test Centre. Its usable working space measures 10.6 m long x 7.3 m wide x 6.5 m high.

This test site is listed with the FCC under Registration Number 99541. Measurements taken at this site are accepted by Industry Canada per file number IC 2046-1.

The floor, walls and ceiling consist of annealed steel panels. The walls and ceiling are covered with ferrite tile, augmented by RF absorbant foam material on the end wall nearest the turntable, and on the adjacent walls and the ceiling. The chamber floor supports a 15 cm high internal floor, constructed of annealed steel panels, that forms the ground plane, and is bonded to the chamber walls.

The 3-m diameter turntable is flush-mounted with the floor. A sub-floor cable-way is provided to route cables between the turntable pit and EUT support equipment. Cables reach the EUT through an opening in the centre of the turntable.

Test instrumentation and EUT support equipment is located in two shielded vestibules located at the side of the main room. Cables are routed through bulkhead panels between the rooms as required. Power feeds are routed into the main room and vestibules through line filters providing at least 100 dB of attenuation between 10 kHz and 10 GHz.

5.2 GROUNDING PLAN

The EUT was located on a wooden table 80 cm above the ground planes. The EUT was not grounded according to the client's specifications.

5.3 POWER

AC power was supplied via an Underwriter's Laboratories ULW100-69, 100 dB, 100 Ampere wall mounted filter. Bonding to ground is implemented at the chamber wall.

5.4 EMISSIONS PROFILE

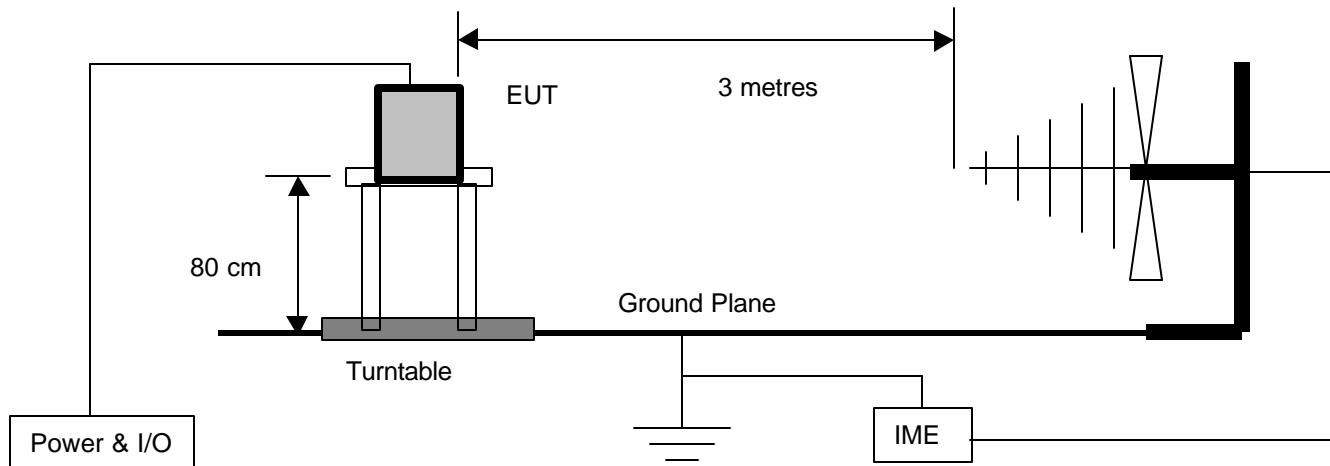
Ambient conducted and radiated electromagnetic emission profiles were generated throughout the tests and are included in the test data.

5.5 TEST CONFIGURATION

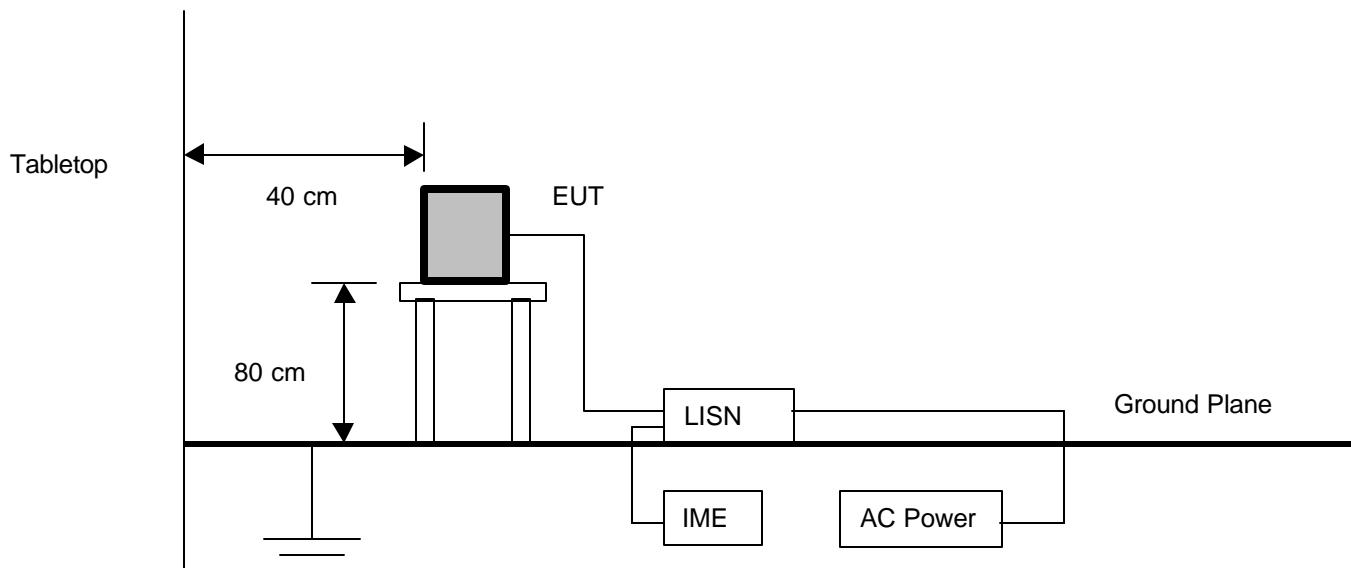
5.5.1 Tabletop Equipment

The following diagrams illustrate the configuration of the EUT test and **Radiated Emissions** measurement equipment for Radiated and Conducted Emissions Testing of tabletop equipment.

Tabletop



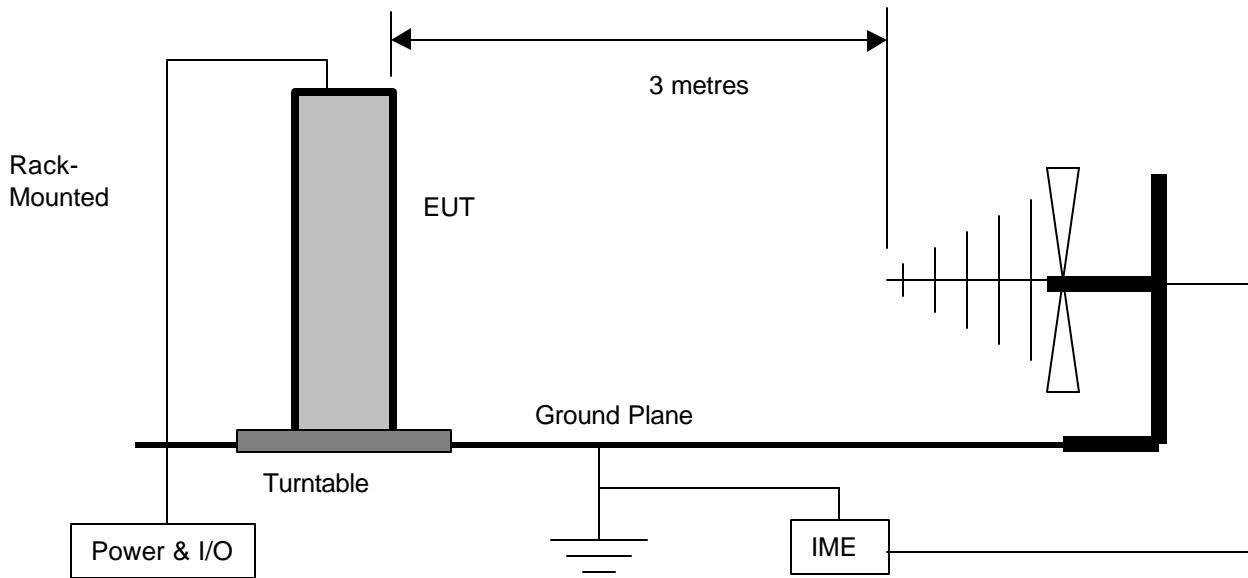
Conducted Emissions



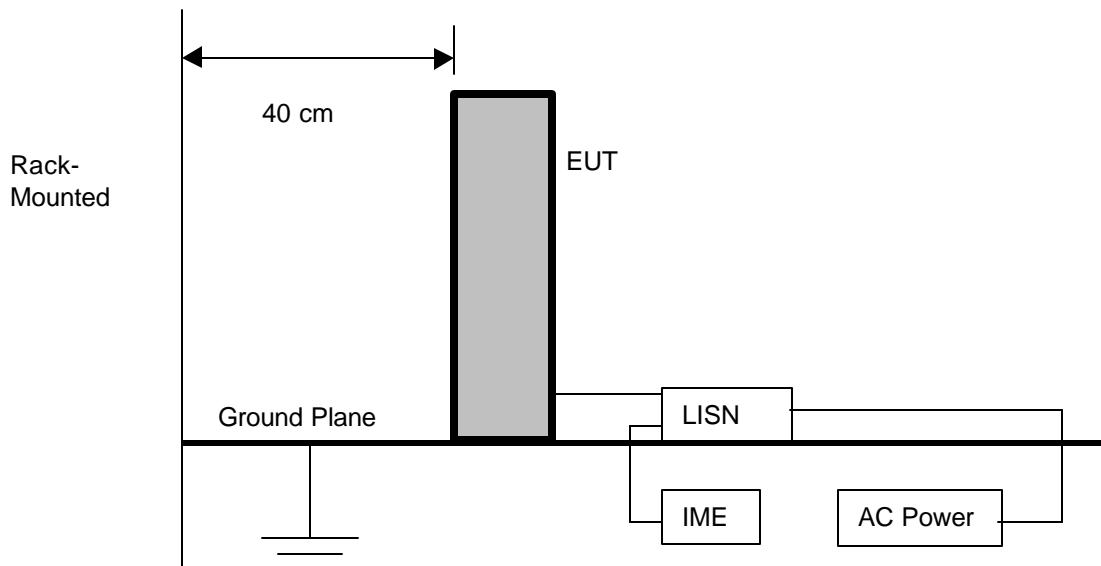
5.5.2 Rack Mount

The following diagrams illustrate the configuration of the EUT test and measurement equipment for Radiated and Conducted Emissions Testing of rack mounted equipment.

Radiated Emissions



Conducted Emissions



6.0 TEST EQUIPMENT

The following equipment was used for this procedure. All measurement devices are calibrated annually, traceable to NIST.

6.1 RADIATED EMISSIONS

- a) Spectrum Analyzer with RF Preselector
- b) CISPR Quasi-peak Adapter
- c) Power Isolation Transformers
- d) Biconilog antenna (20 MHz to 2 GHz)
- e) Antenna mast positioner, and controller
- f) Flush-mounted turntable, and controller
- g) Personal Computer and EMC software

6.2 CONDUCTED EMISSIONS

- a) Spectrum Analyzer with RF Preselector
- b) Line Impedance Stabilization Network, 50 μ H
- c) CISPR Quasi-peak Adapter
- d) Isolation Transformer
- e) Personal Computer and EMC software

6.3 CALIBRATION

All measurement instrumentation conforms to ANSI C63.2. Calibration is maintained in accordance with manufacturer recommendations. Each measurement device is labeled with its ETC asset number and calibration due date.

6.3.1 CALIBRATION ACCURACY

Test equipment used to provide quantitative measurements are calibrated with standards traceable to the National Research Council, National Institute of Standards and Technology or other national standards. Instrumentation systems for emissions measurements have the following accuracies:

Frequency = \pm 1 kHz
Amplitude (RE) = \pm 4.01 dB
Amplitude (CE) = \pm 3.25 dB

6.3.2 TEST EQUIPMENT DESCRIPTION

The equipment used in the tests was selected from the following list.

Instrument	Manufacturer	Model No.	Asset No.	Calibration Due
Spectrum Analyzer	Hewlett Packard	8566B	9565	11 April 2002
Spectrum Analyzer	Hewlett Packard	8566B	9168	30 January 2002
RF Preselector	Hewlett Packard	85685A	9563	21 September 2001
RF Preselector	Hewlett Packard	85685A	9728	30 March 2002
Quasi-Peak Adapter	Hewlett Packard	85650A	9243	16 August 2001
Line Impedance Stabilization Network	EMCO	3825/2r	9331	2 November 2001
Line Impedance Stabilization Network	EMCO	3825/2r	9259	2 November 2001
Biconilog Antenna	ARA	Lpb-2520/A	4318	13 June 2002
Dual Ridged Guide Antenna	EMCO	3115	9588	6 August 2001
Low Noise Amplifier	MITEQ	JS43-01001800-21-5P	4354	14 February 2002
Power Meter	Hewlett Packard	436A	9061	3 August 2001
Power Sensor	Hewlett Packard	8482A	9758	3 August 2001
Down Converter (Mixer)	Quinstar		4381	11 July 2002

Appendix A

AWE 120-24 rev 2

Test Sample Description (from data provided by Wi-LAN)

Product Application	Product Category
Commercial <input checked="" type="checkbox"/> Military <input type="checkbox"/>	Telecommunications <input type="checkbox"/> Information Technology <input checked="" type="checkbox"/> Surface Transportation <input type="checkbox"/> Other <input type="checkbox"/> _____
Product Name	AWE 120-24 rev 2
Part/Model No.	AWE 120-24 rev 2
Serial Number	N/A
Power Requirements: (Voltage, AC/DC, Hz, Current)	120 to 230 VAC 50/60 Hz
Typical Installation Instructions or Configuration	N/A
Ground Connection (in addition to power cord)	N/A
Internally Generated Frequencies	2.400 to 2.485 GHz
Peripheral Support Equipment	Omni, TilTek Dish, and Sectoral Antennas
Description and number of interconnecting Leads & Cables	CAT 5, RS-232, antenna cable
Brief Functional Description	Wireless communication base station