

TEST REPORT

Class II Permissive Change

for the

Apple Airport Extreme Wireless LAN

LAN card Model # M8440
New Antenna Model #A1066


Apple Computer, Inc.

June 17, 2003

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Test Report Summary

Specification	Test Description	Result	Comment
CFR 15.207(a)	Conducted Emission/Mains 150 kHz to 30 MHz	Pass	Section 2
CFR 15.209(a)	Radiated Emissions 30 MHz to 25 GHz	Pass	Section 3
CFR 15.247(b)(4)	RF Exposure	Pass	Section 4
CFR 15.247(c)	-20 dBc Spurious Emissions	Pass	Section 5

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1 General Information

1.1 Introduction and Purpose of testing for Class II Permissive Change

The trade name for the Apple Computer 802.11g wireless LAN card is Apple Airport Extreme. The card has already been approved by the FCC per CFR 47 Part 15, Subpart C as a Direct Sequence Spread Spectrum system. Apple Computer plans to use this card in a new Apple Desktop computer with a new external Apple antenna. The first 7 antennas listed below have already been approved by the FCC. The last antenna, shown in bold, is the new antenna and is the purpose of this application for a Class II permissive change.

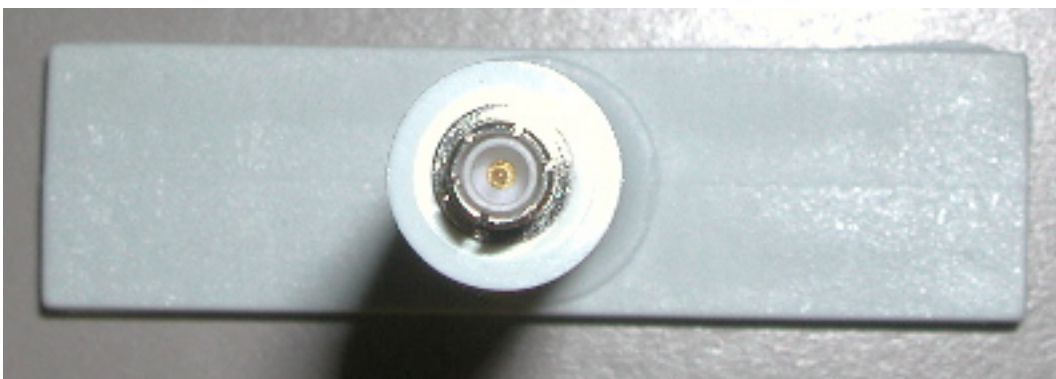
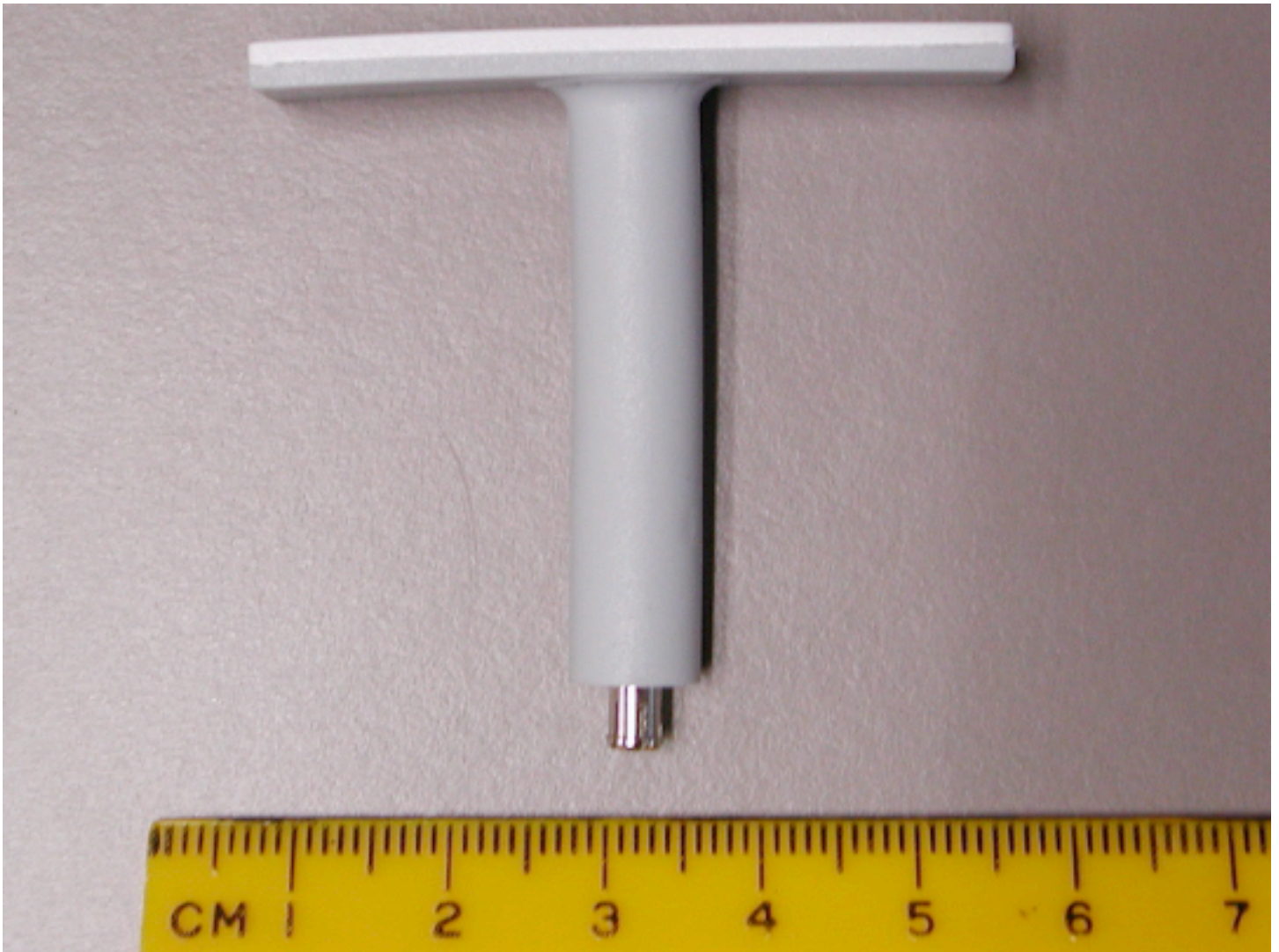
Type	Antenna Gain dBi	Antenna Model Number
Internal Inverted F	-1.5	603-1203
Internal Inverted F	0.35	603-0617
Internal Patch	3.45	603-2239
Internal Inverted F	0.76	620-2250
Internal Inverted F	3	613-4682
External Patch	6.24	613-4752+DBWADIRE
External Dipole	3.74	613-4752+DBWAOMNI
External Dipole - new	3.4	A1066

1.2 Product General and Technical Descriptions

Information on the Airport Extreme Wireless LAN card is provided in the table below.

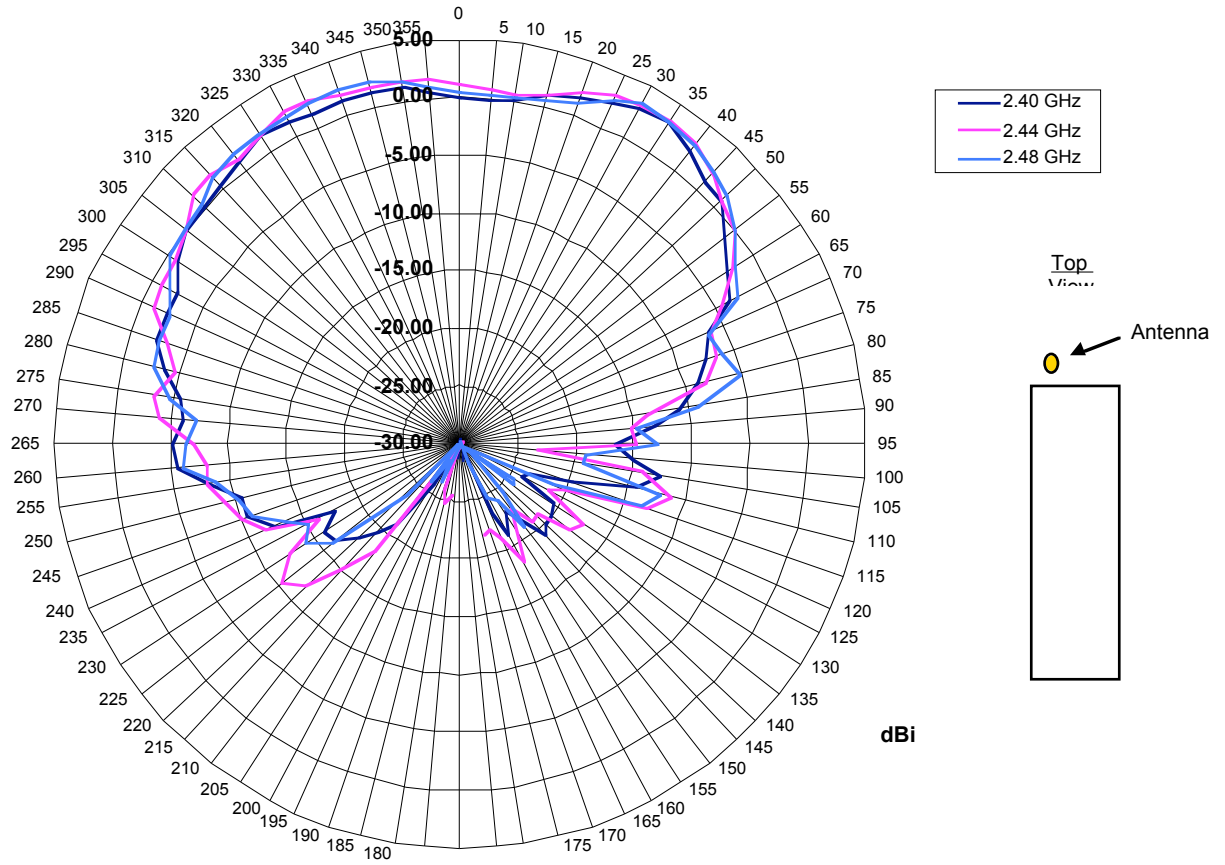
Existing Wireless Lan Card information	
Model Number	A1026
FCC ID	BCGA1026
Date of Original FCC Grant	January 7, 2003
Class	Spread Spectrum Transceiver
Method	OFDM, DSSS
Max RF Power Output	0.0691 W
Frequency Range	2412 MHz - 2462 MHz
Number of Channels	11
Data Rates	1, 2, 5.5., 11, 6, 9, 12, 18, 24, 36, 48, 54 MBPS

1.3 Antenna Photographs



1.4 Antenna Radiation Data

Model A1066 Antenna; All Cables Included; Azimuth Pattern



1.4 Antenna Radiation Data - continued

A1066 Antenna				A1066 Antenna			
Angle	2.40 GHz	2.44 GHz	2.48 GHz	Angle	2.40 GHz	2.44 GHz	2.48 GHz
0	0.08	1.18	0.47	185	-30.32	-24.66	-30.27
5	-0.04	0.76	0.26	190	-30.39	-25.77	-30.03
10	0.04	0.62	0.33	195	-29.05	-29.32	-26.82
15	1.05	1.23	0.52	200	-30.11	-28.24	-26.35
20	1.82	2.22	1.22	205	-25.74	-30.37	-28.24
25	2.30	2.98	2.59	210	-21.09	-18.17	-25.83
30	2.82	3.26	3.40	215	-19.56	-14.97	-29.83
35	3.15	3.21	3.20	220	-18.19	-11.86	-23.64
40	2.15	3.01	2.78	225	-16.23	-10.41	-16.11
45	0.97	1.92	2.22	230	-15.95	-12.52	-14.07
50	0.73	0.85	1.46	235	-17.77	-16.24	-15.06
55	-0.90	0.03	0.09	240	-12.59	-11.54	-13.70
60	-2.43	-1.91	-1.61	245	-10.54	-9.94	-10.98
65	-3.68	-4.50	-2.90	250	-10.46	-9.07	-10.18
70	-6.48	-6.35	-6.58	255	-8.06	-7.91	-8.60
75	-7.61	-6.62	-6.16	260	-5.42	-7.96	-5.97
80	-8.76	-8.20	-5.00	265	-5.13	-6.94	-6.16
85	-10.91	-13.67	-9.13	270	-6.04	-3.97	-7.10
90	-13.11	-15.17	-14.64	275	-5.50	-3.19	-4.52
95	-16.67	-14.69	-12.92	280	-3.75	-4.61	-2.86
100	-14.85	-23.23	-19.09	285	-2.24	-3.23	-2.58
105	-12.40	-14.22	-19.25	290	-2.29	-1.02	-2.65
110	-14.45	-11.20	-12.09	295	-2.25	-0.67	-1.49
115	-19.79	-13.05	-13.32	300	-0.83	-0.64	0.03
120	-23.42	-20.11	-21.26	305	0.01	-0.04	0.17
125	-23.86	-21.53	-30.12	310	0.20	1.59	0.49
130	-20.39	-17.27	-24.55	315	0.40	1.81	1.54
135	-19.99	-18.05	-24.18	320	1.06	1.21	1.83
140	-19.90	-21.00	-29.17	325	1.74	1.76	1.89
145	-19.07	-20.89	-24.43	330	1.56	2.55	2.06
150	-21.61	-22.85	-20.89	335	1.32	2.49	2.15
155	-22.97	-21.04	-24.24	340	1.39	2.03	2.37
160	-21.12	-18.41	-24.82	345	1.42	1.81	2.32
165	-23.38	-21.22	-28.11	350	1.23	1.83	1.77
170	-29.44	-22.16	-30.17	355	0.58	1.75	1.09
175	-28.53	-21.95	-30.05	MAX	3.15	3.26	3.40

1.5 Airport Extreme Regulatory Certification Data Sheet



AirPort Extreme Regulatory Certification

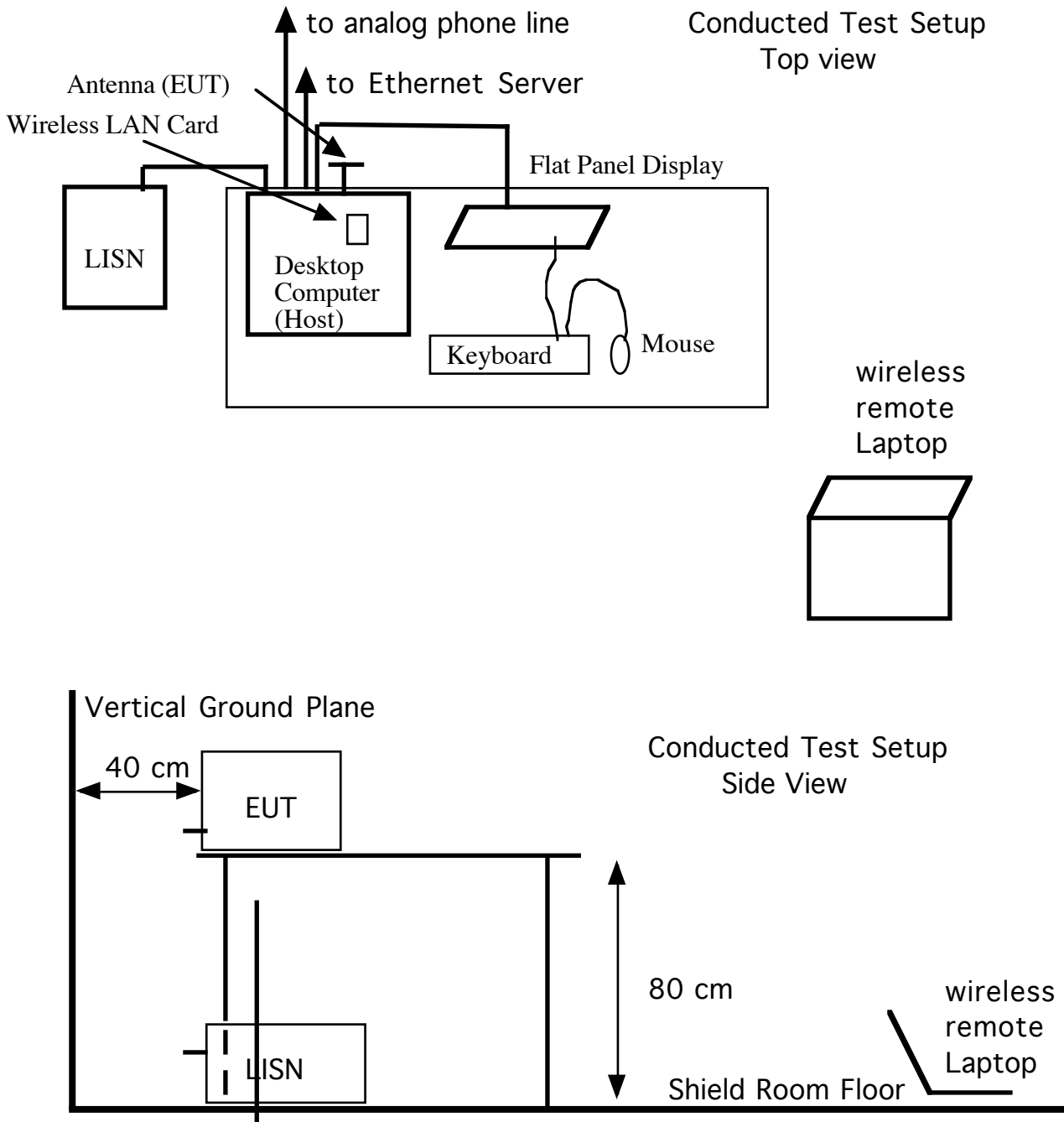
Country	Certification Model Number	Certification Number
Australia	A1027	DoC
Austria, Belgium, Denmark, Finland, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom	A1027	CE 0984 ⓘ
Canada	A1026	Industry Canada 579C-A1026. For indoor use only.
France	A1028	CE 0984 ⓘ For indoor use only.
France	A1027	CE 0984 ⓘ For indoor use only. Consult ART for restrictions on the use of Channels 1 through 9. www.art-telecom.fr
Italy	A1027	CE 0984 ⓘ If used outside of own premises, general authorization is required.
United States (including Puerto Rico)	A1026	FCC ID: BCGA1026

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033-2246-A

2 CFR 15.207(a) AC Power Line Conducted Emissions

2.1 CFR 15.207(a) AC Power Line Conducted Emissions Test Setup



2.2 CFR 15.207(a) AC Power Line Conducted Emissions Test Procedure

Conducted Emissions were performed at the Apple Computer EMC compliance lab located at 20650 Valley Green Drive, Cupertino, California. The EUT was placed on a nonmetallic table, 80 cm above the metallic ground-plane. The EUT and peripherals were powered from a filtered main supply. The frequency spectrum from 150 kHz to 30 MHz was scanned. This procedure was performed for both ac lines of the EUT.

2.3 CFR 15.207(a) Conducted Emissions Test Equipment

Description	Manufacturer	Model No.	Identification No.	Last Cal	Next Cal
Spectrum Analyzer	HP	8568B	1838A00423	23 January, 2003	23 January 2004
Receiver	R&S	ESCS30	100140	4 January, 2003	4 January 2004
LISN/AMN	R&S	ESH3-Z5	153874	28 May, 2003	28 May, 2004

Notes: H.P. is an abbreviation for Hewlett Packard.
 R&S is an abbreviation for Rhode & Schwarz.
 The above equipment is traceable to NVLAP calibration standards.

2.3.1 CFR 15.207(a) Conducted Emissions Instrument Settings:

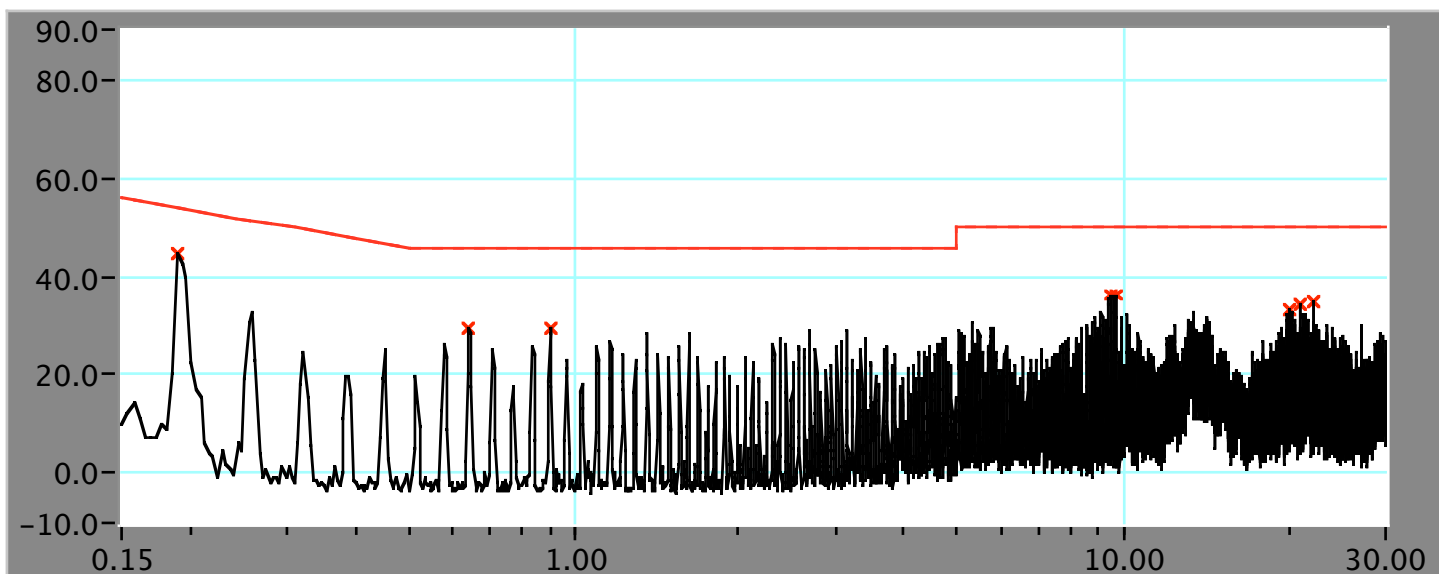
Instrument Settings				
Frequency Range	Reference Level	Attenuation	Resolution BW	Video BW
150 kHz - 30 MHz	90 dBuV	10	10 kHz	10 kHz

2.4 CFR 15.207(a) AC Power Line Conducted Emissions EUT Operating Conditions

Conducted Emissions scans were performed with the transmitter frequency set to the low, mid and high channels. In each case, the emissions were found to be similar. Thus conducted emissions data in this report is provided for channel 11 only.

2.5 CFR 15.207(a) AC Power Line Conducted Emissions Line 1 Test results

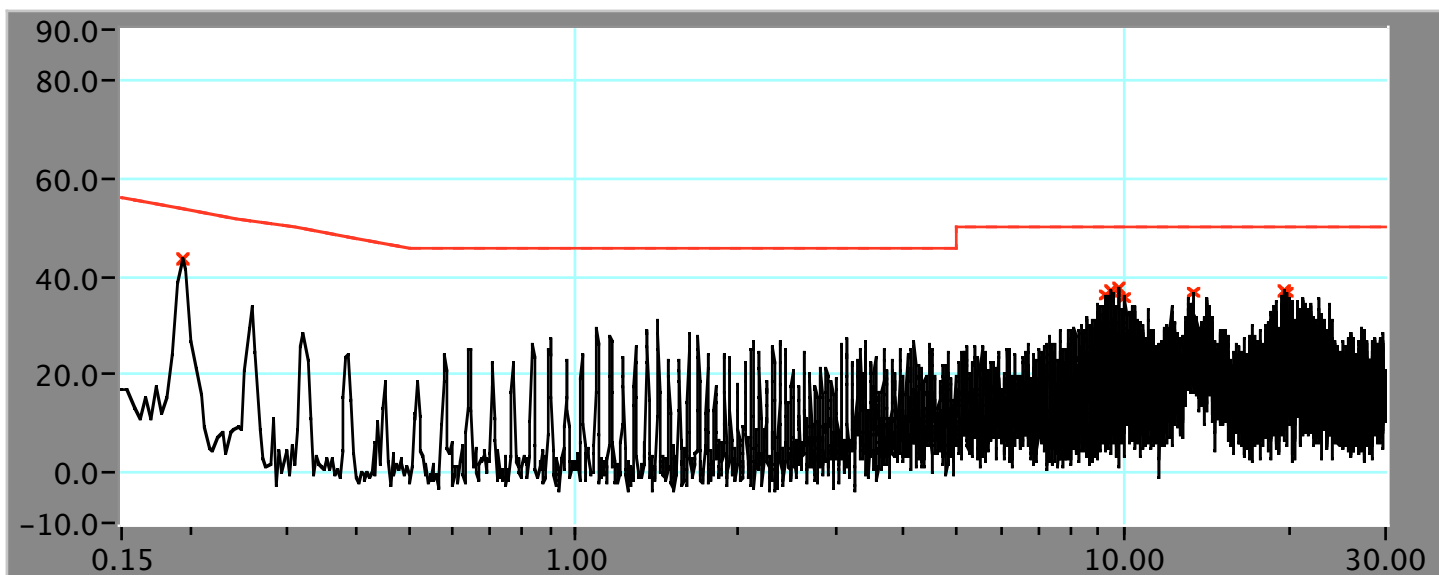
Date of test: May 30, 2003



Frequency MHz	Level dBuV	Limit dBuV	Delta dB	Raw Data dBuV	LISN dB	Cable dB	All Factors dB
0.189	44.7 Av	54.1	-9.4	42.62	2.04	0.06	-2.10
0.642	29.3 Av	46.0	-16.7	28.61	0.58	0.08	-0.67
0.904	29.1 Av	46.0	-16.9	28.58	0.44	0.09	-0.53
9.466	36.2 Av	50.0	-13.8	35.48	0.46	0.30	-0.76
9.724	36.1 Av	50.0	-13.9	35.31	0.46	0.30	-0.76
20.153	33.1 Av	50.0	-16.9	31.98	0.67	0.45	-1.12
20.930	34.1 Av	50.0	-15.9	32.98	0.68	0.46	-1.14
22.282	34.4 Av	50.0	-15.6	33.03	0.89	0.48	-1.38

All levels are with a peak detector.

2.6 CFR 15.207(a) AC Power Line Conducted Emissions Line 2 Test Results



Frequency MHz	Level dBuV	Limit dBuV	Delta dB	Raw Data dBuV	LISN dB	Cable dB	All Factors dB
0.193	43.9	53.9	-10.0	41.87	1.94	0.06	-2.00
9.337	36.3	50.0	-13.7	35.54	0.43	0.30	-0.73
9.532	37.5	50.0	-12.5	36.78	0.43	0.30	-0.73
9.794	38.1	50.0	-11.9	37.36	0.43	0.30	-0.73
10.048	35.6	50.0	-14.4	34.89	0.43	0.30	-0.73
13.372	36.6	50.0	-13.4	35.70	0.49	0.36	-0.85
19.579	37.2	50.0	-12.8	36.21	0.59	0.45	-1.03
19.770	36.7	50.0	-13.3	35.71	0.59	0.45	-1.04

All levels are with a peak detector.

3 CFR 15.209(a) Radiated Emissions**3.1 CFR 15.209(a) Radiated Emissions less than 1 GHz**

Pre-scans below 1 GHz were performed with the transmitter frequency set to the low, mid and high channels. In each case, the emissions below 1 GHz were found to be similar. Thus radiated emissions data in this report below 1 GHz is provided for channel 11 only.

3.1.1 CFR 15.209(a) Radiated Emissions less than 1 GHz Test Setup

Radiated Emission measurements at or below 1 GHz were performed at the Apple Computer Test Site ALTS #1, located at 123 East Evelyn Ave., Mountain View, California. The EUT was placed on a nonmetallic table, 80 cm above the metallic ground-plane. The EUT and peripherals were powered from a filtered main supply.

3.1.2 CFR 15.209(a) Radiated Emissions less than 1 GHz Test Procedure

The frequency spectrum from 30 MHz to ≤ 1 GHz was scanned and the emission levels maximized at each frequency recorded. The antenna was varied in height between 1.0 and 4.0 meters and the system was rotated 360 degrees while scanning for maximum emission amplitudes. This procedure was performed for both horizontal and vertical polarization of the receiving antenna. During maximization the position of the cables was varied and the scanning repeated until the worst case emission was found. The data recorded in this report are the maximum emission levels measured.

Radiated Emission measurements at or below 1 GHz were performed at an EUT to antenna distance of 3 meters.

3.1.3 CFR 15.209(a) Radiated Emissions less than 1 GHz Test Equipment

The following test equipment was used when performing radiated emissions tests below 1 GHz.

Description	Manufacturer	Model No.	Identification No.	Last Cal	Next Cal
Spectrum Analyzer	Rohde & Schwarz	ESIB 26	100025	30 Aug 2002	30 Aug 2003
EMI Receiver	Rohde & Schwarz	ESIB 26	100025	30 Aug 2002	30 Aug 2003
Antenna	Sunol	JB1	A122302-1	7 Jan 2003	7 Jan 2004
Amplifier	Evelyn 1 Amplifier	N/A	103	28 Jan 2003	28 Jan 2004

Notes: HP is an abbreviation for Hewlett Packard.
 R&S is an abbreviation for Rhode & Schwarz.
 N/A is an abbreviation for Not Applicable
 The above equipment is traceable to NVLAP calibration standards.

3.1.3.1 CFR 15.209(a) Radiated Emissions less than 1 GHz Instrument Settings:

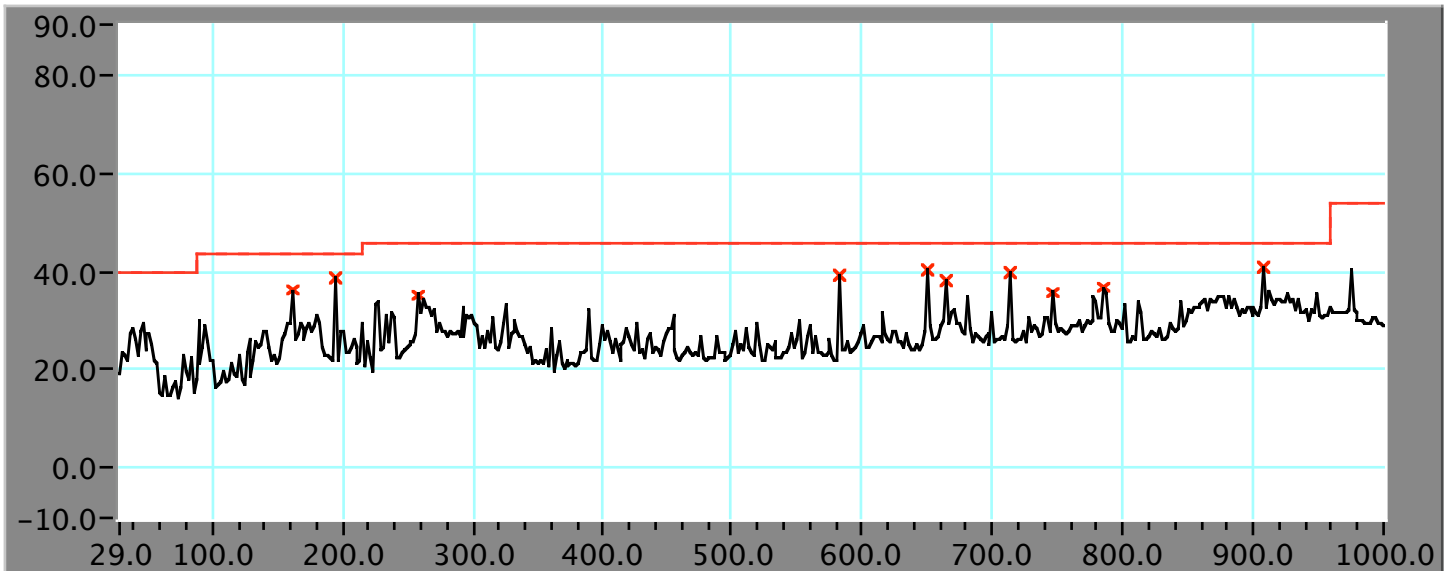
Instrument Settings				
Frequency Range	Reference Level	Attenuation	Resolution BW	Video BW
30 MHz - 1 GHz	90 dBuV	10	100 kHz	100 kHz

3.1.4 CFR 15.209(a) Radiated Emissions less than 1 GHz EUT Operation Conditions

The Antenna was installed on the desktop computer and a wireless computer-to-computer network was created and the appropriate channel was selected (1, 6 or 11). Pre-testing found that the highest data rate of 54 Mbps created the worst case conditions so this data rate was selected for final testing. A large file was transferred from the desktop computer to a remote client.

3.1.5 CFR 15.209(a) Radiated Emissions less than 1 GHz - Vertical Data

The data below was collected with a transmitter frequency of 2.462 GHz.

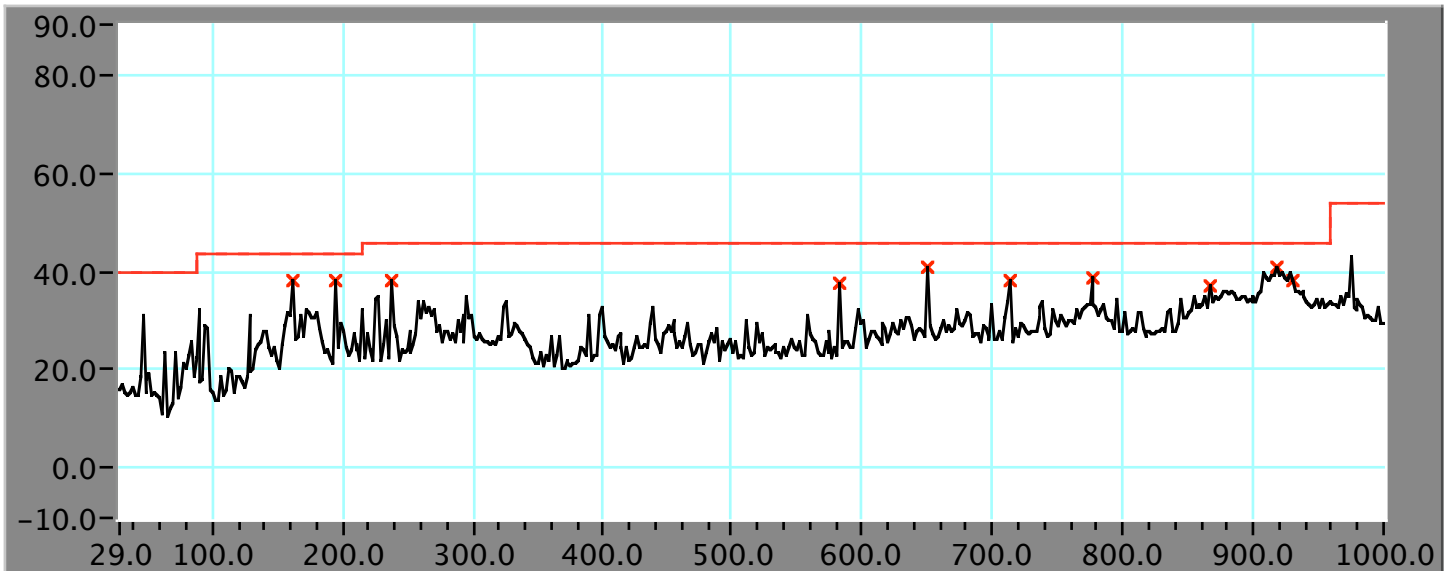


Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
161.32	36.3	43.5	-7.2	71.28	12.72	2.21	49.95	35.02
194.40	38.8	43.5	-4.7	74.38	11.79	2.42	49.77	35.55
258.62	35.3	46.0	-10.7	69.11	12.72	2.82	49.38	33.85
583.58	39.7	46.0	-6.3	65.07	18.90	4.53	48.79	25.36
649.74	40.4	46.0	-5.6	64.15	19.71	4.89	48.39	23.80
665.31	38.4	46.0	-7.6	61.96	19.91	4.96	48.42	23.56
713.95	39.7	46.0	-6.3	62.47	20.60	5.18	48.51	22.73
747.03	35.8	46.0	-10.2	57.83	21.04	5.43	48.50	22.03
785.95	37.0	46.0	-9.0	58.39	21.56	5.60	48.58	21.42
908.54	40.9	46.0	-5.1	60.83	22.50	6.19	48.62	19.93

All levels are with a peak detector.

3.1.6 CFR 15.209(a) Radiated Emissions less than 1 GHz - Horizontal Data

The data below was collected with a transmitter frequency of 2.462 GHz.



Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
161.32	38.6	43.5	-4.9	73.96	12.40	2.21	49.95	35.34
194.40	38.5	43.5	-5.0	74.20	11.68	2.42	49.77	35.67
237.21	38.2	46.0	-7.8	72.89	12.13	2.75	49.55	34.67
583.58	37.8	46.0	-8.2	62.41	19.64	4.53	48.79	24.61
649.74	41.2	46.0	-4.8	64.20	20.49	4.89	48.39	23.01
713.95	38.2	46.0	-7.8	60.43	21.08	5.18	48.51	22.25
776.22	39.2	46.0	-6.8	59.97	22.10	5.65	48.55	20.80
867.68	37.3	46.0	-8.7	57.52	22.45	6.05	48.72	20.21
918.27	40.8	46.0	-5.2	59.68	23.47	6.24	48.55	18.84
929.95	38.2	46.0	-7.8	56.79	23.60	6.29	48.46	18.57

All levels are with a peak detector.

3.2 CFR 15.209(a) Radiated Emissions greater than 1 GHz**3.2.1 CFR 15.209(a) Radiated Emissions greater than 1 GHz Test Setup**

Radiated Emission measurements above 1 GHz were performed at the Apple Computer Test Site ALTS #1, located at 123 East Evelyn Ave., Mountain View, California. The EUT was placed on a nonmetallic table, 80 cm above the metallic ground-plane. The EUT and peripherals were powered from a filtered main supply.

Radiated Emission measurements above 1 GHz were performed at an EUT to antenna distance of 1 meter.

3.2.2 CFR 15.209(a) Radiated Emissions greater than 1 GHz Test Procedure

The restricted bands at the lower and upper edges of the ISM band were scanned for the maximum emissions with the transmitter set to transmit at corresponding low and highest channels. After completing the band edge tests, the frequency spectrum from 1 GHz to 25 GHz was scanned and the emission levels maximized at each frequency. The antenna was varied in height and the system was rotated 360 degrees while scanning for maximum emission amplitudes. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

Spurious radiated emissions scans above 1 GHz were performed with the transmitter frequency set to the low, mid and high channels and Radiated Emissions data is provided in this report for each case.

- low channel - 2.412 GHz
- mid channel - 2.437 GHz
- high channel - 2.462 GHz

3.2.3 CFR 15.209(a) Radiated Emissions greater than 1 GHz Test Equipment

The following test equipment was used when performing radiated emissions tests above 1 GHz.

Description	Manufacturer	Model No.	Identification No.	Last Cal	Next Cal
Spectrum Analyzer	Rohde & Schwarz	ESIB	100025	30 Aug 2002	30 Aug 3003
Amplifier (18-25 GHz)	HP	8449	3008A00713	4 March 2003	4 March 2004
Amplifier (1 - 18 GHz)	Advanced Microwave	WLA614	Amp 11	19 Feb 2003	19 Feb 2004
Horn Antenna	EMCO	3160-09	011269-0041264	09/01	09/05
Horn Antenna	EMCO	3115	9904-5788	09/01	09/05

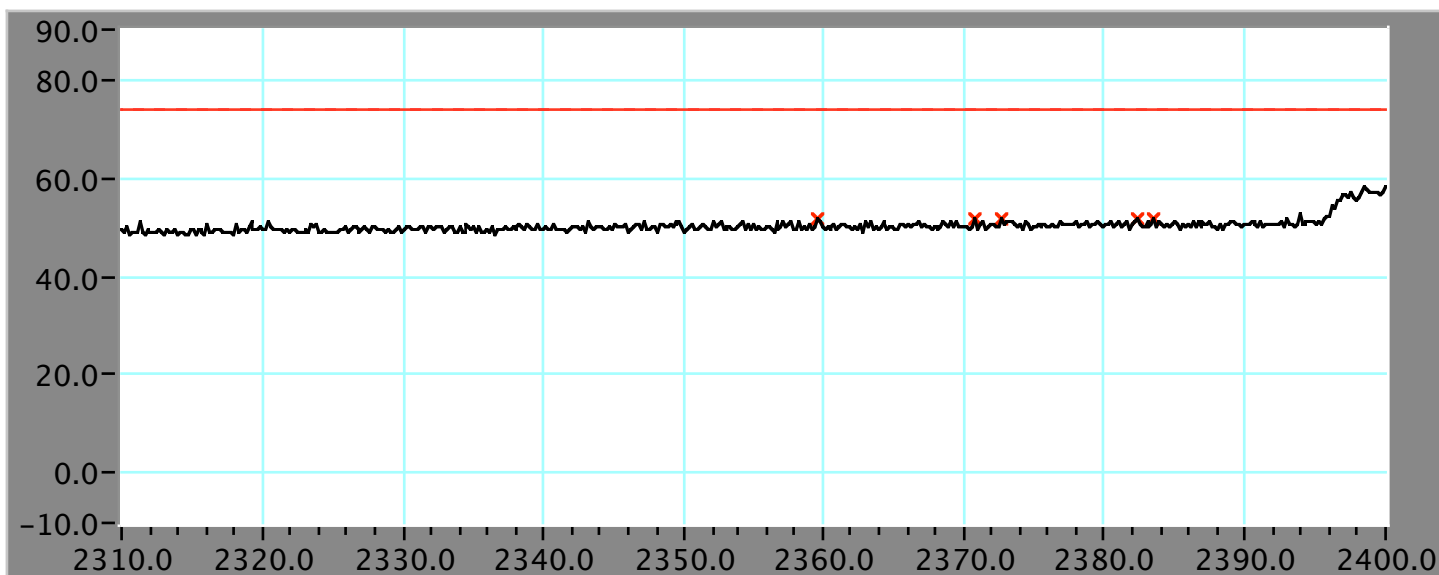
3.2.4 CFR 15.209(a) Radiated Emissions greater than 1 GHz EUT Operating Conditions

The Antenna was installed on the desktop computer and a wireless computer-to-computer network was created and the appropriate channel was selected (1, 6 or 11). Pre-testing found that the highest data rate of 1 Mbps created the worst case conditions so this data rate was selected for final testing. A large file was transferred from the desktop computer to a remote client.

Radiated emissions data is provided for the following:

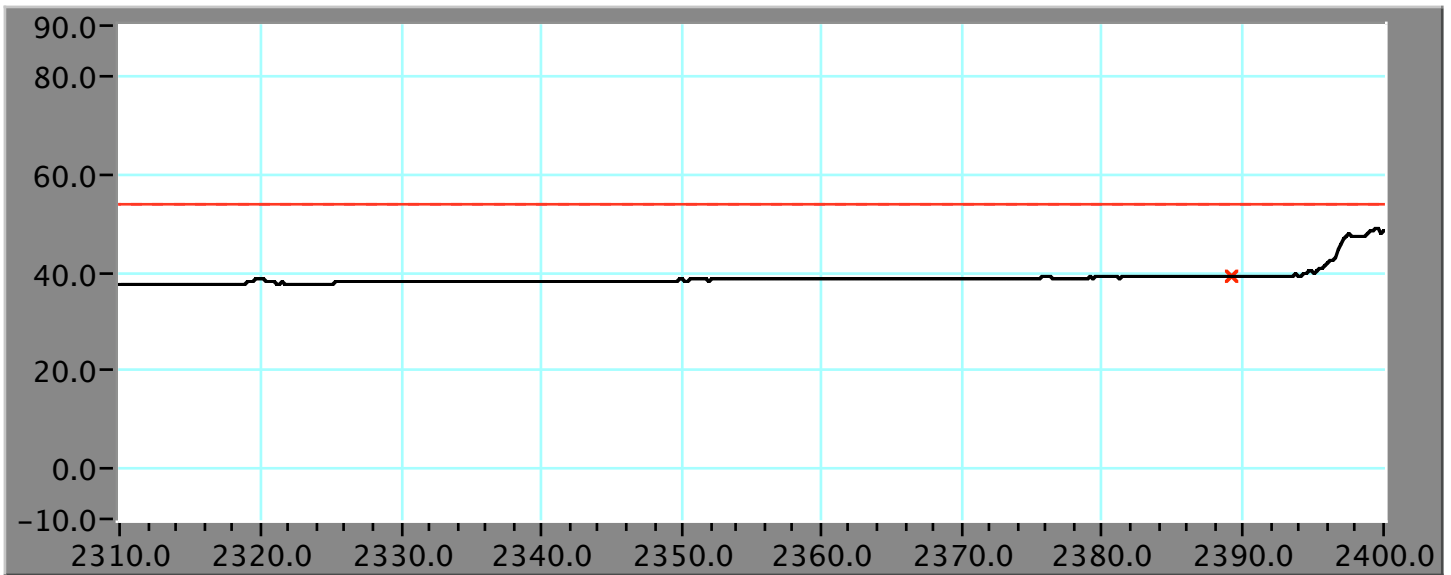
Description	Transmit Frequency	Detection	Polarity
2310 MHz - 2390 MHz Restricted Band	2412 MHz	Peak and Average	Vertical and Horizontal
2483.5 MHz - 2500 MHz Restricted Band	2462 MHz	Peak and Average	Vertical and Horizontal
1 - 25 GHz Spurious	2412 MHz 2437 MHz 2462 MHz	Peak data plotted against Average Limit	Vertical and Horizontal

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.412 GHz), Peak Detection



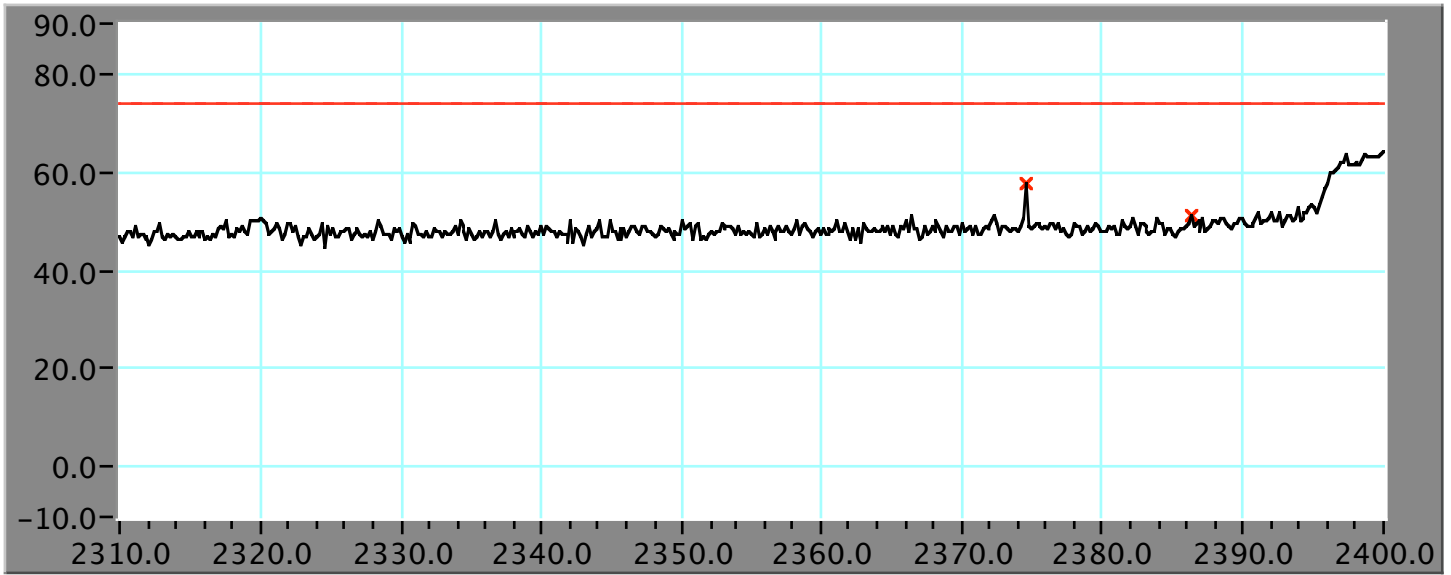
Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
2359.60	52.0	74.0	-22.0	26.46	30.18	4.86	9.50	-25.54
2370.78	51.7	74.0	-22.3	26.15	30.21	4.87	9.50	-25.58
2372.77	51.8	74.0	-22.2	26.20	30.22	4.87	9.50	-25.59
2382.32	51.7	74.0	-22.3	26.06	30.25	4.88	9.50	-25.63
2383.59	51.7	74.0	-22.3	26.02	30.25	4.88	9.50	-25.63

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.412 GHz), Average Detection



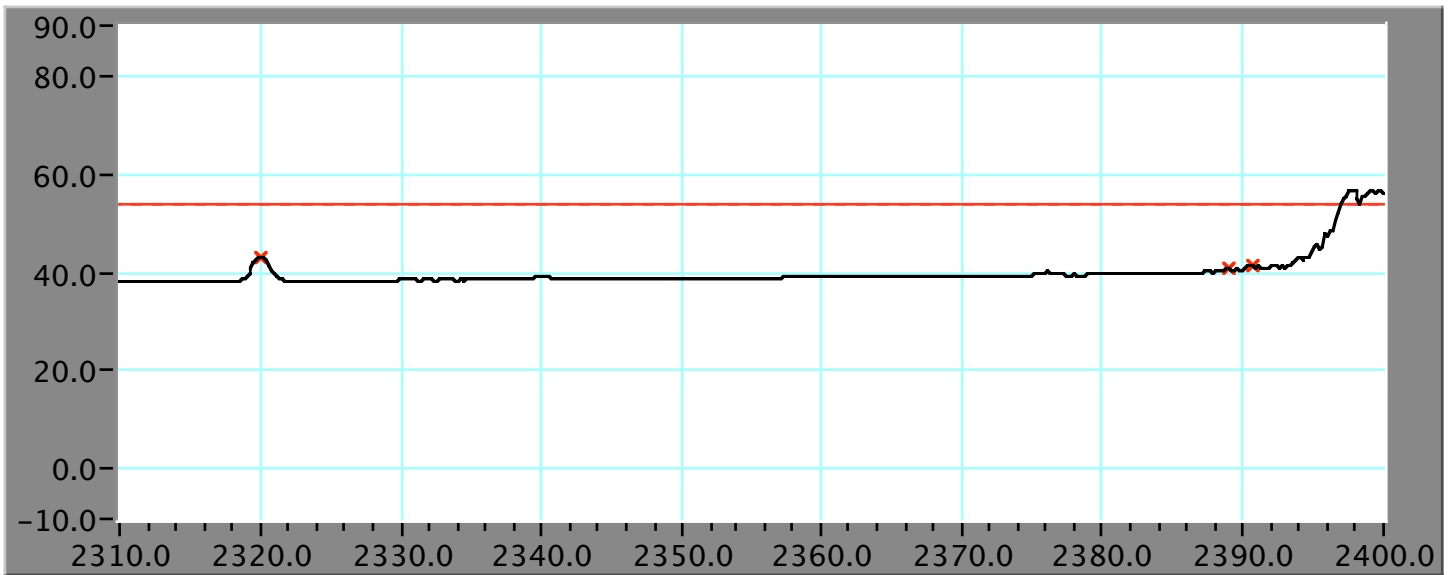
Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
2389.18	39.4	54.0	-14.6	13.79	30.27	4.89	9.50	-25.66

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.412 GHz), Peak Detection



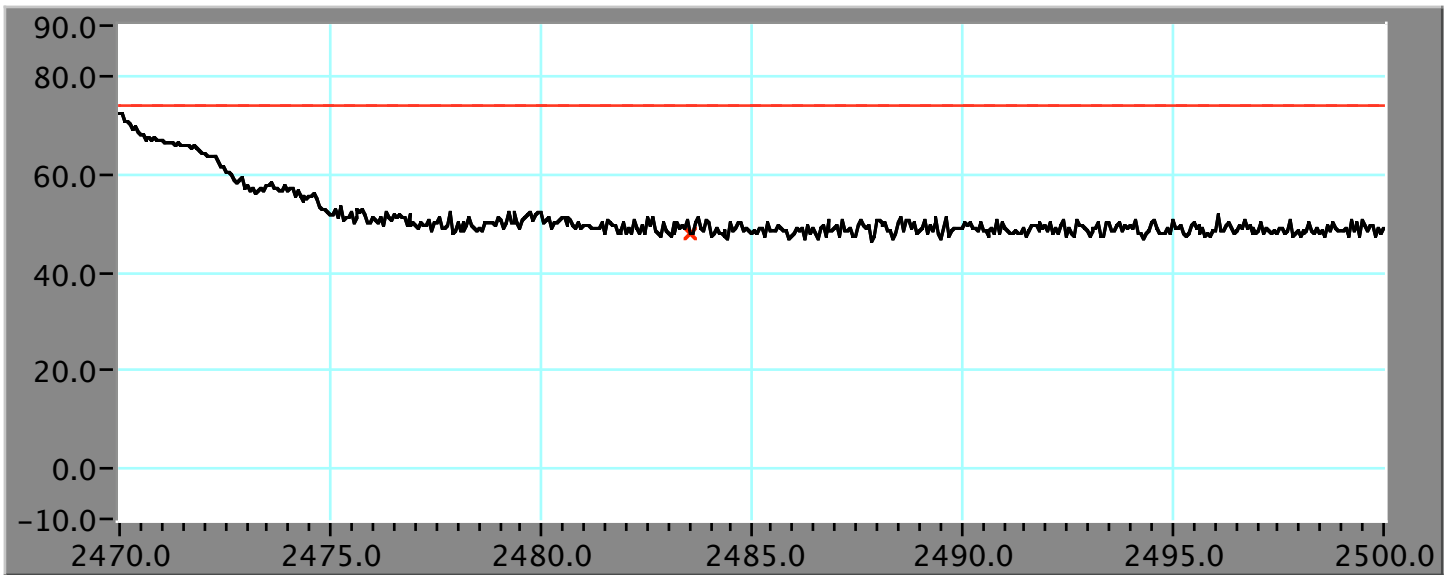
Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
2374.57	57.9	74.0	-16.1	32.36	30.17	4.87	9.50	-25.55
2386.29	51.5	74.0	-22.5	25.87	30.21	4.89	9.50	-25.60

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.412 GHz), Average Detection



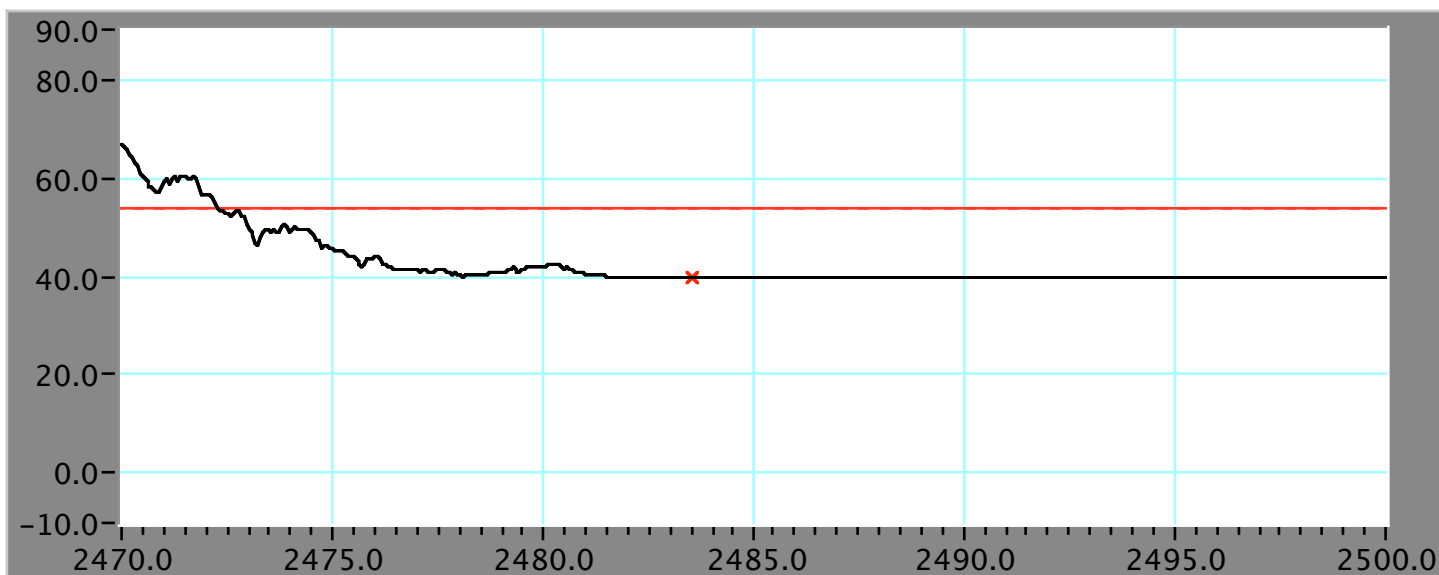
Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
2320.10	43.3	54.0	-10.7	17.99	29.99	4.82	9.50	-25.31
2389.00	41.0	54.0	-13.0	15.34	30.22	4.89	9.50	-25.61
2390.80	41.8	54.0	-12.2	16.22	30.23	4.89	9.50	-25.62

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 11 (2.462 GHz), Peak Detection



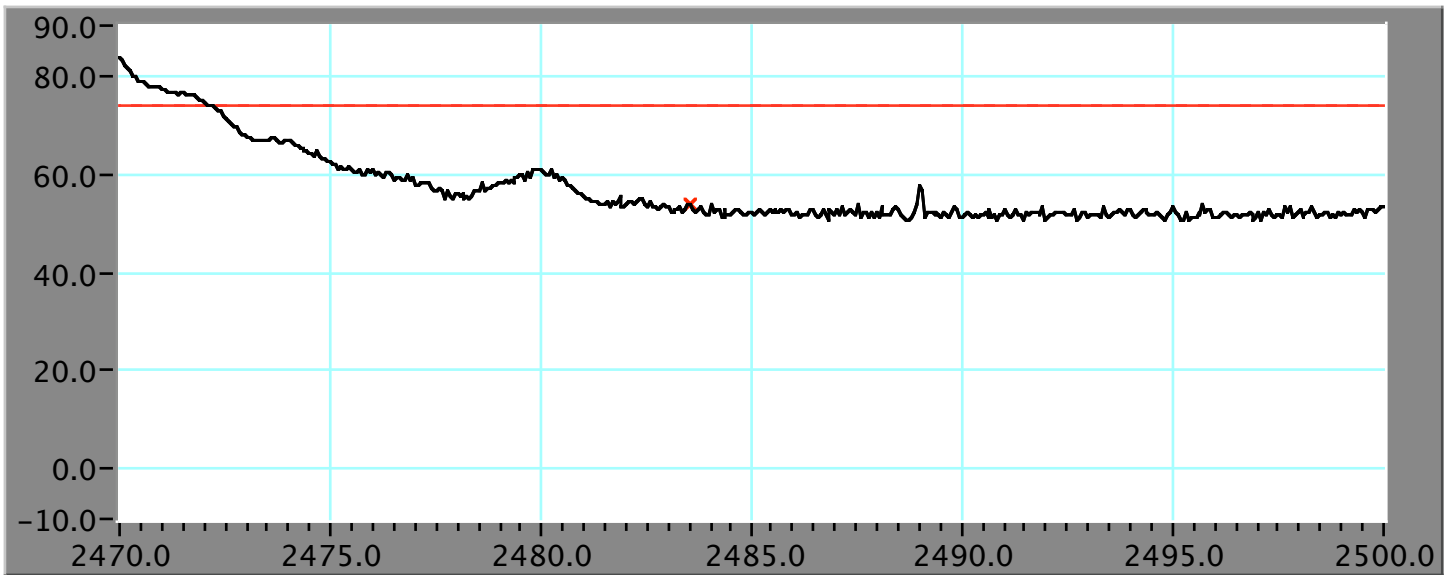
Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
2483.53	48.3	74.0	-25.7	22.24	30.55	4.98	9.50	-26.03

2483.50 MHz - 2500 MHz Restricted Band - Vertical, channel 11 (2.462 GHz), Average Detection



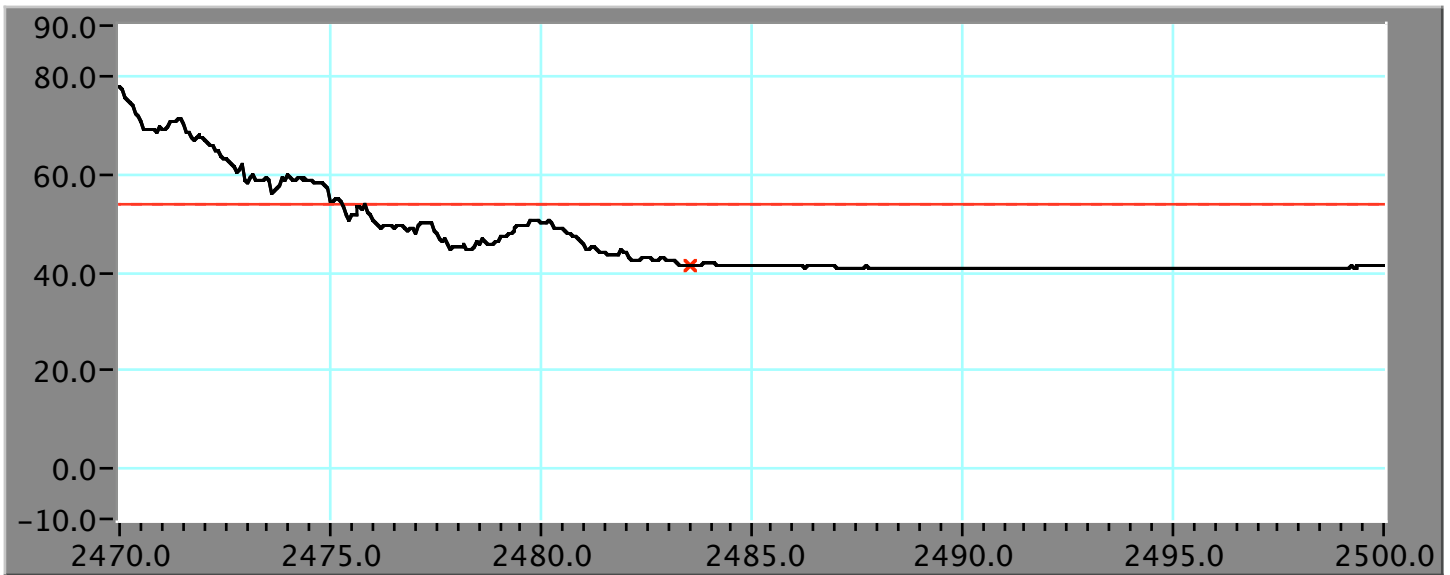
Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
2483.53	39.9	54.0	-14.1	13.88	30.55	4.98	9.50	-26.03

2483.5 MHz - 2500 MHz Restricted Band - Horizontal, channel 11 (2.462 GHz), Peak Detection



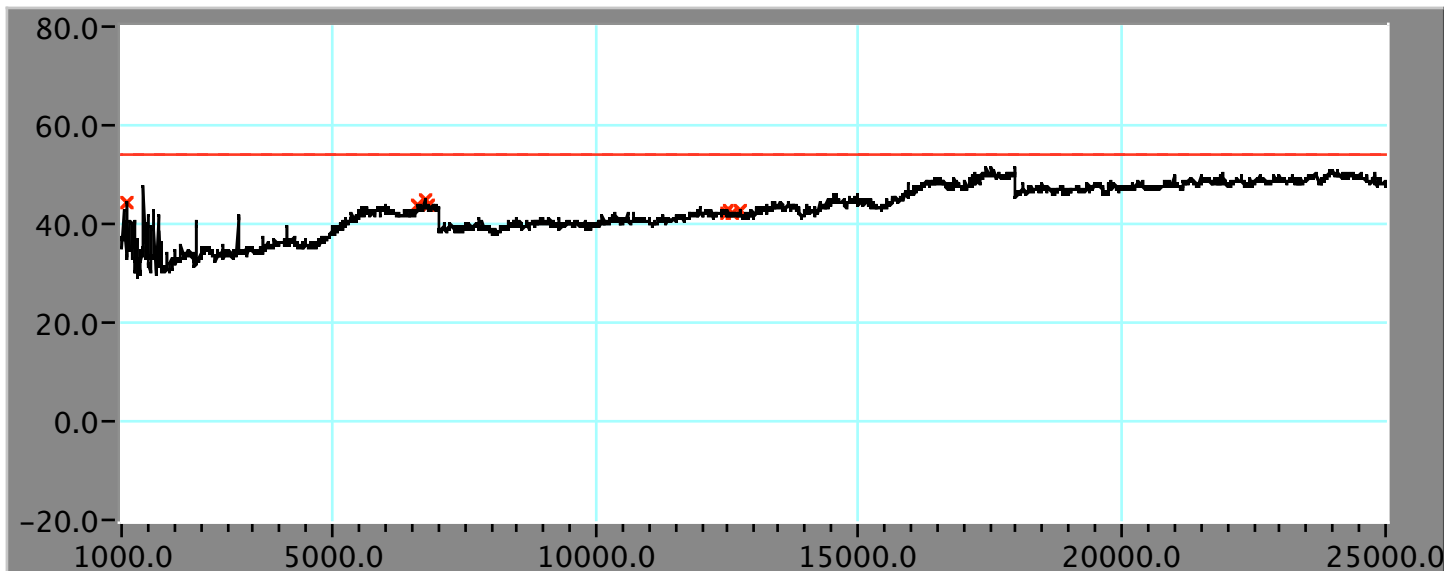
Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
2483.53	54.2	74.0	-19.8	28.13	30.54	4.98	9.50	-26.03

2483.5 MHz - 2500 MHz Restricted Band - Horizontal, channel 11 (2.462 GHz), Average Detection



Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
2483.53	41.8	54.0	-12.2	15.73	30.54	4.98	9.50	-26.03

Spurious Radiated Emissions - Vertical, channel 1 (2.412 GHz)

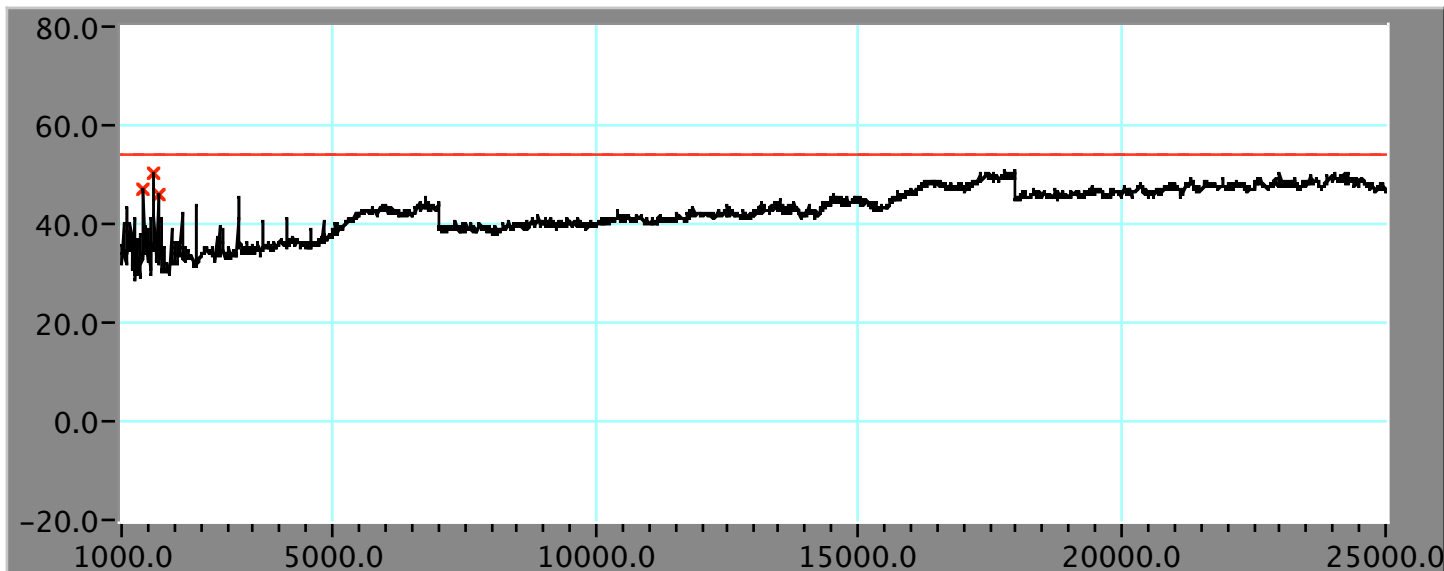


Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
1096.19	44.3	54.0	-9.7	68.27	25.25	4.27	53.45	23.93
6627.25	43.9	54.0	-10.1	52.51	36.48	7.87	52.97	8.62
6735.47	45.2	54.0	-8.8	53.63	36.63	7.91	52.95	8.41
6831.66	43.8	54.0	-10.2	52.00	36.76	7.94	52.93	8.23
12458.92	42.5	54.0	-11.5	44.24	40.79	10.51	53.00	1.69
12531.06	42.9	54.0	-11.1	44.53	40.68	10.56	52.91	1.68
12627.25	42.5	54.0	-11.5	44.11	40.60	10.75	52.95	1.60
12783.57	43.2	54.0	-10.8	44.63	40.47	11.07	53.01	1.47

All levels are with a peak detector unless otherwise indicated.

Date of Test: June 3, 2003

3.2.6 CFR 15.209(a) Radiated Emissions - Horizontal, channel 1 (2.412 GHz)

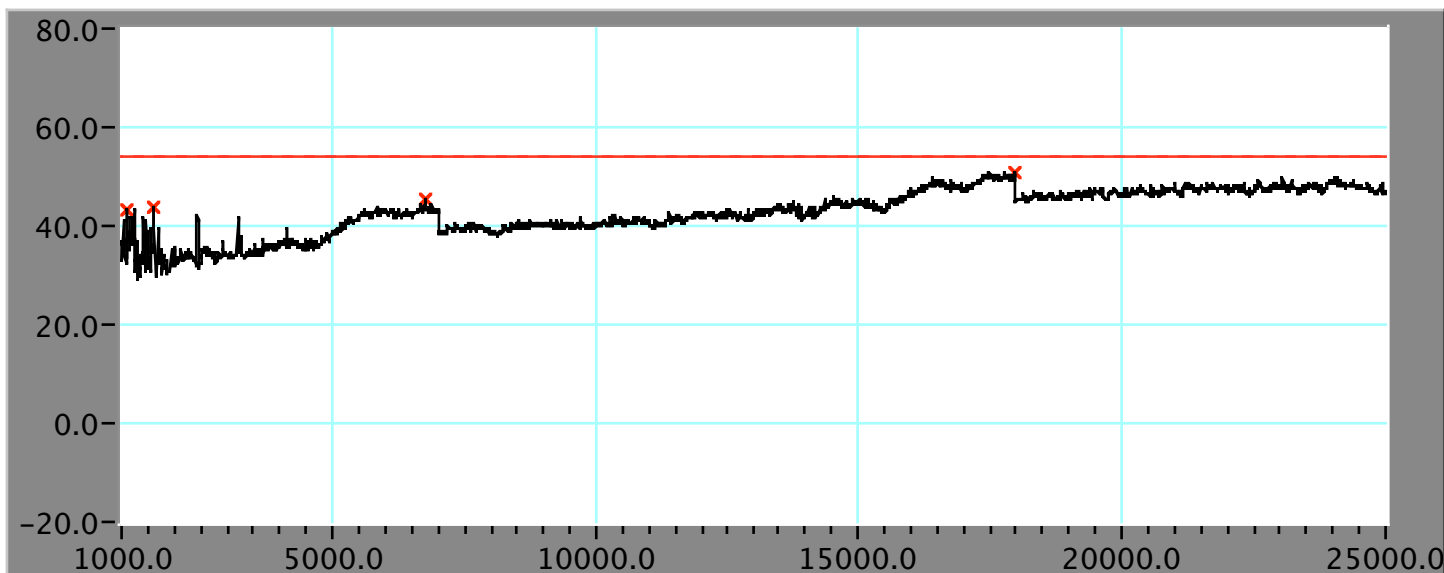


Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
1420.84	47.4	54.0	-6.6	70.88	26.42	4.05	53.97	23.50
1613.23	50.5	54.0	-3.5	73.17	27.20	4.11	54.01	22.70
1685.37	46.3	54.0	-7.7	68.51	27.52	4.19	53.95	22.25

All levels are with a peak detector unless otherwise indicated.

Date of Test: June 3, 2003

3.2.7 CFR 15.209(a) Radiated Emissions - Vertical Channel 6 (2.437 GHz)

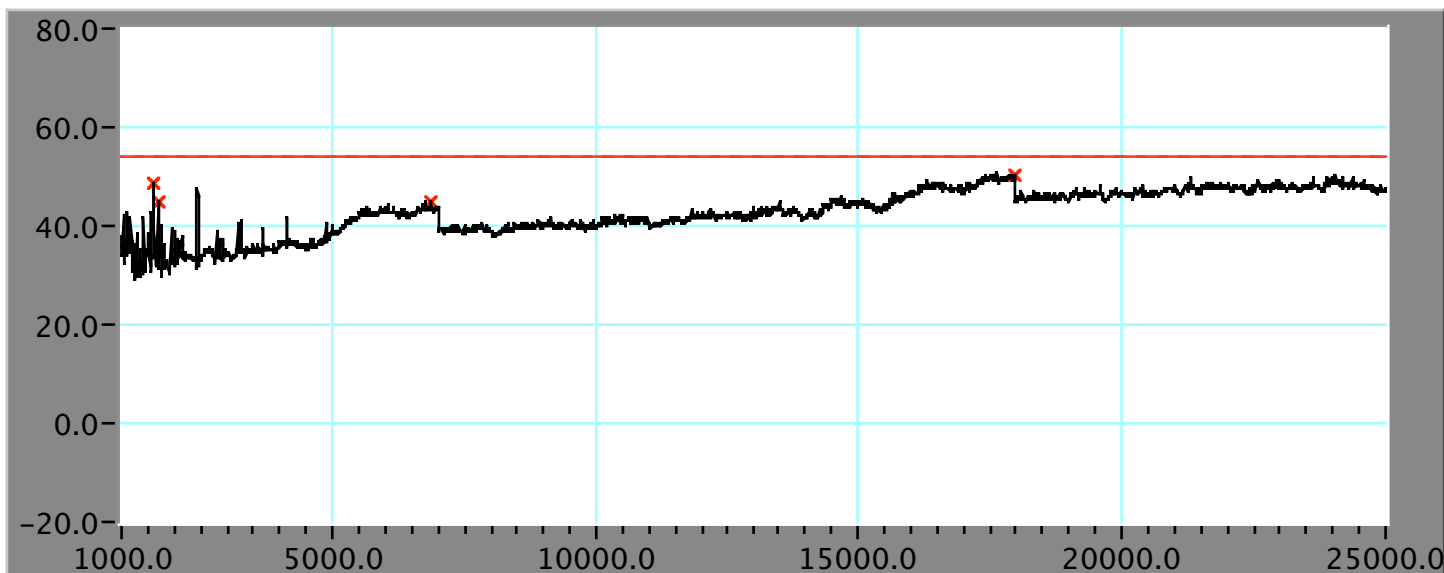


Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
1096.19	43.5	54.0	-10.5	67.40	25.25	4.27	53.45	23.93
1613.23	43.9	54.0	-10.1	66.60	27.24	4.11	54.01	22.65
6759.52	45.4	54.0	-8.6	53.80	36.66	7.92	52.95	8.37
17979.96	50.8	54.0	-3.2	42.99	45.23	13.16	50.61	-7.78

All levels are with a peak detector unless otherwise indicated.

Date of Test: June 5, 2003

3.2.8 CFR 15.209(a) Radiated Emissions - Horizontal Channel 6 (2.437 GHz)

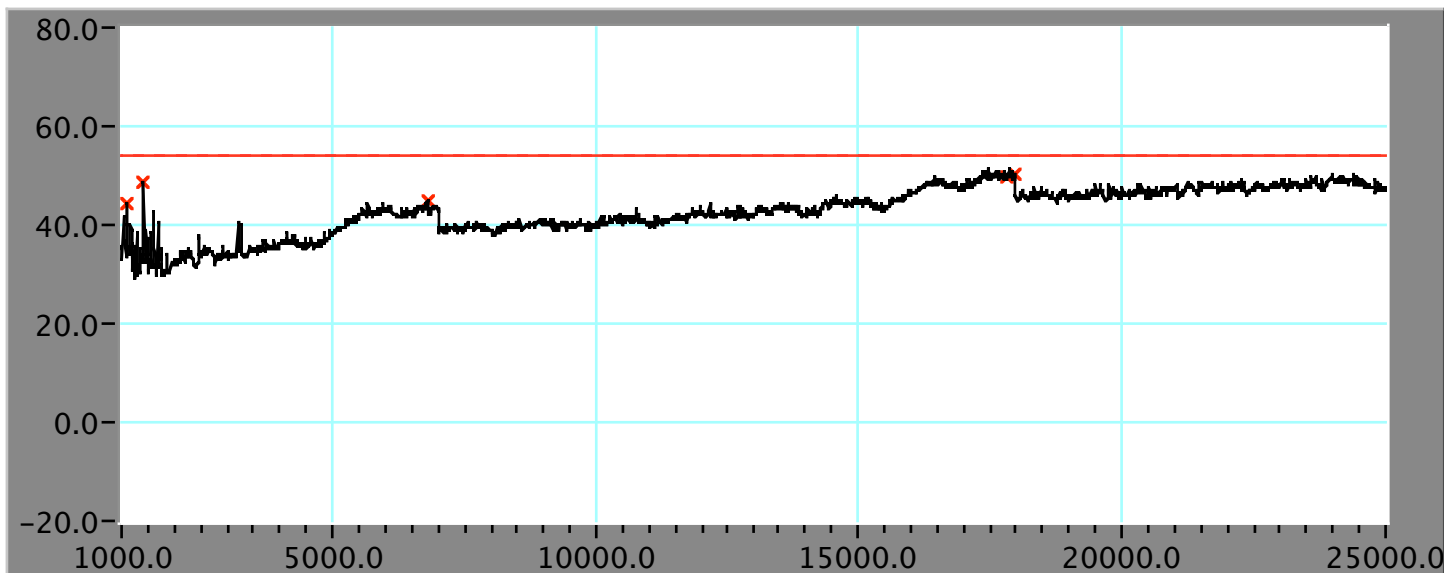


Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
1613.23	48.9	54.0	-5.1	71.56	27.20	4.11	54.01	22.70
1685.37	45.1	54.0	-8.9	67.30	27.52	4.19	53.95	22.25
6867.74	45.1	54.0	-8.9	53.00	37.06	7.96	52.93	7.91
18000.00	50.4	54.0	-3.6	42.60	45.30	13.17	50.70	-7.77

All levels are with a peak detector unless otherwise indicated.

Date of Test: June 5, 2003

3.2.9 CFR 15.209(a) Radiated Emissions - Vertical Channel 11 (2.462 GHz)

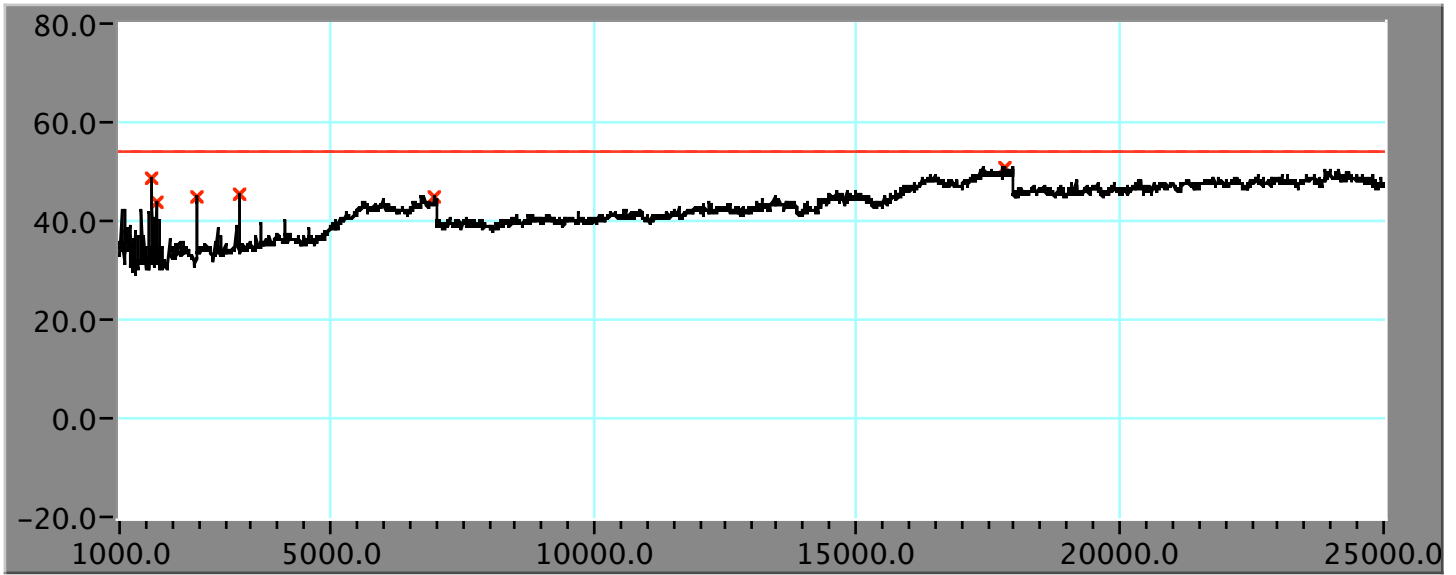


Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
1096.19	44.6	54.0	-9.4	68.49	25.25	4.27	53.45	23.93
1420.84	48.8	54.0	-5.2	72.29	26.42	4.05	53.97	23.50
6795.59	44.8	54.0	-9.2	53.12	36.71	7.93	52.94	8.30
17829.66	49.7	54.0	-4.3	41.90	44.69	13.08	49.95	-7.82
17979.96	50.4	54.0	-3.6	42.67	45.23	13.16	50.61	-7.78

All levels are with a peak detector unless otherwise indicated.

Date of Test: June 3, 2003

3.2.10 CFR 15.209(a) Radiated Emissions - Horizontal Channel 11 (2.462 GHz)



Frequency MHz	Level dBuV/m	Limit dBuV/m	Delta dB	Raw Data dBuV	Antenna dB	Cable dB	Amp dB	All Factor dB
1613.23	48.8	54.0	-5.2	71.50	27.20	4.11	54.01	22.70
1685.37	44.2	54.0	-9.8	66.40	27.52	4.19	53.95	22.25
2454.91	45.0	54.0	-9.0	66.62	30.45	4.95	56.98	21.57
3284.57	45.6	54.0	-8.4	65.09	32.44	5.61	57.53	19.48
6963.93	44.9	54.0	-9.1	52.61	37.24	7.99	52.91	7.68
17829.66	51.0	54.0	-3.0	43.36	44.55	13.08	49.95	-7.68

All levels are with a peak detector unless otherwise indicated.

Date of Test: June 3, 2003

4 CFR 15.247(b)(4) RF Exposure

SAR testing was performed against the limits defined in OET65c. The tests were performed on the Airport Extreme antenna individually and again while co-located with an Apple Bluetooth antenna transmitting simultaneously. The report number is 03U2023-3. The results of this report conclude that compliance with the limits of OET65c can be achieved as long as a separation distance of at least 10 millimeters from the Airport Extreme Antenna is maintained. The following warning statement will be included in the user's manual.

The FCC Rules require that the operator or a nearby person be more than 1 centimeter (0.4 inches) away from the Airport Extreme antenna during transmission. In addition, the Airport Extreme antenna must not be located with any other transmitter or antenna except for the Apple Bluetooth antenna model A1067.

5 CFR 15.247(c) -20 dBc Spurious Conducted Emissions

5.1 CFR 15.247(c) -20 dBc Spurious Conducted Emissions Test Setup

Spurious conducted emissions measurements were performed at the Apple Computer 3 meter semi-anechoic chamber located at 20650 Valley Green Drive. The EUT was placed on a nonmetallic table, 80 cm above the metallic ground-plane. The EUT and peripherals were powered from a filtered main supply.

5.2 CFR 15.247(c) -20 dBc Spurious Conducted Emissions Test Procedure

The frequency spectrum from 1 GHz to 25 GHz was scanned

Scans were performed with the transmitter frequency set to the low, mid and high channels and -20 dBc Spurious Emissions data is provided in this report for each case.

- low channel - 2.412 GHz
- mid channel - 2.437 GHz
- high channel - 2.462 GHz

5.3 CFR 15.247(c) -20 dBc Spurious Conducted Emissions Test Equipment

The following test equipment was used when performing spurious emissions tests above 1 GHz.

Description	Manufacturer	Model No.	Identification No.	Last Cal	Next Cal
Spectrum Analyzer	Rohde & Schwarz	ESIB 40	1088.7490	14 May 2003	14 May 2004

5.3.1 CFR 15.247(c) -20 dBc Spurious Conducted Emissions Instrument Settings

Instrument Settings			
Frequency Range	Resolution BW	Video BW	Reference Level
1 GHz - 25 GHz	100 kHz	100 kHz	20 dBm

5.4 CFR 15.247(c) -20 dBc Spurious Conducted Emissions EUT Operating Conditions

The -20 dBc spurious conducted emissions tests were performed at the RF antenna connector port on the back of the tower. The Airport Extreme card was activated by creating a wireless computer-to-computer network and selecting the appropriate channel. Then a large file was transferred from the tower to the client computer. The data rate was set to 1 Mbps. The following channels were tested.

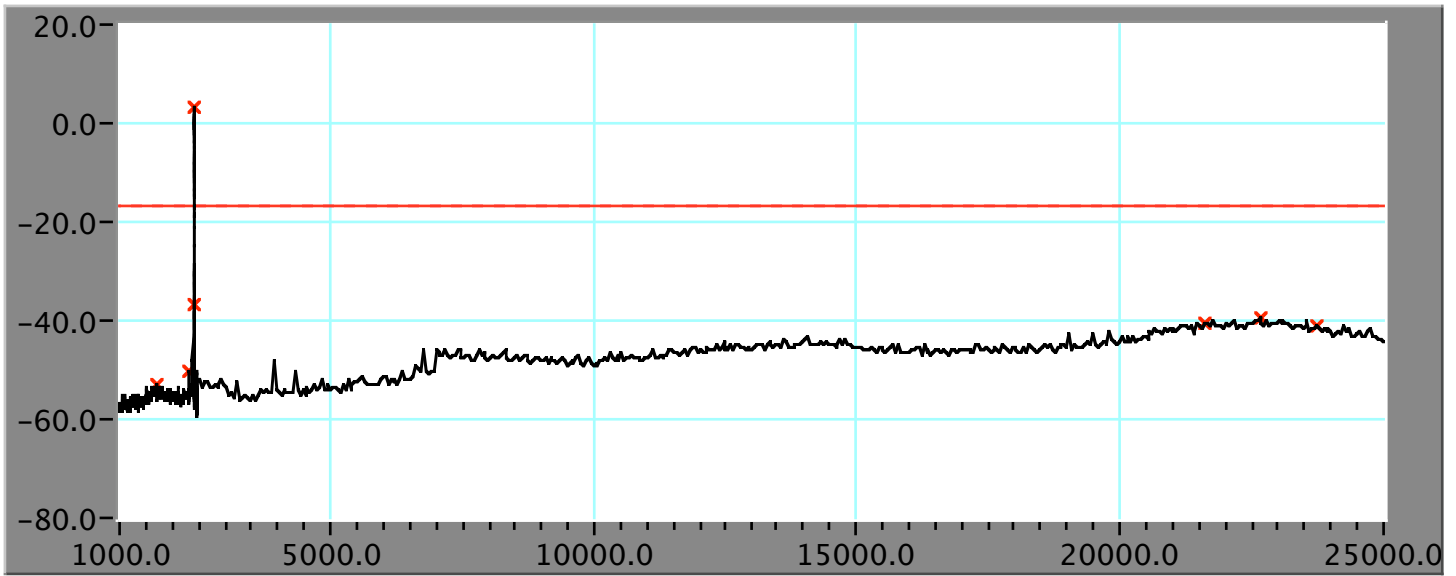
Low - 2412 MHz
Mid - 2437 MHz
High - 2462 MHz

The data from each of these scans is presented in the following pages.

Results

All of the conducted spurious emissions are under the -20dBc requirement.
Conclusion: Pass

CFR 15.247(c) -20 dBc Spurious Conducted Emissions -Channel 1 (2.412 GHz)

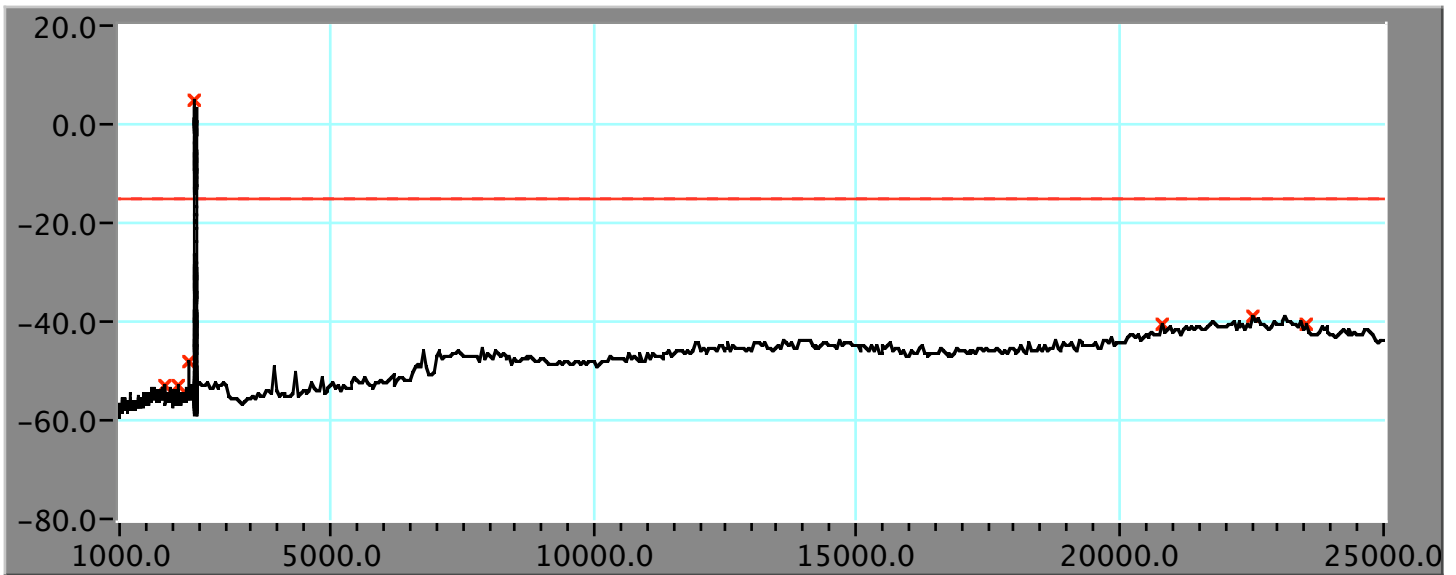


Frequency MHz	Level dBm	Limit dBm	Delta dB	Raw Data dBm	Cable dB	All Factors dB
1690.18	-53.1	-16.5	-36.6	-54.96	1.83	-1.83
2321.44	-50.5	-16.5	-34.0	-52.76	2.31	-2.31
2400.00	-37.2	-16.5	-20.7	-39.57	2.34	-2.34
2414.89	3.5	-16.5	20.0	1.19	2.34	-2.34
21615.76	-40.5	-16.5	-24.0	-49.18	8.69	-8.69
22653.59	-39.7	-16.5	-23.2	-48.41	8.70	-8.70
23736.55	-41.1	-16.5	-24.6	-50.59	9.53	-9.53

All levels are with a peak detector.

Date of Test: June 10, 2003

CFR 15.247(c) -20 dBc Spurious Conducted Emissions - Channel 6 (2.437 GHz)

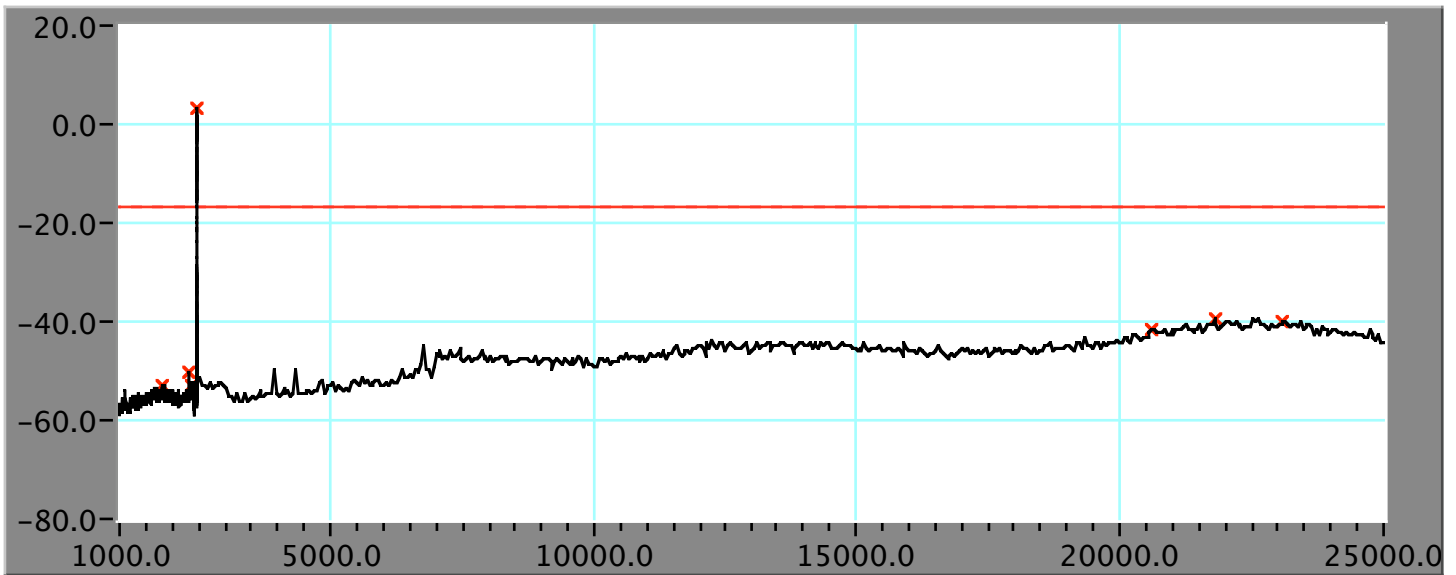


Frequency MHz	Level dBm	Limit dBm	Delta dB	Raw Data dBm	Cable dB	All Factors dB
1858.52	-53.3	-15.2	-38.1	-55.30	2.02	-2.02
2096.99	-53.3	-15.2	-38.1	-55.52	2.21	-2.21
2321.44	-48.2	-15.2	-33.0	-50.46	2.31	-2.31
2434.47	4.8	-15.2	20.0	2.41	2.35	-2.35
20803.54	-40.8	-15.2	-25.6	-50.35	9.58	-9.58
22518.22	-39.1	-15.2	-23.9	-47.65	8.55	-8.55
23556.06	-40.9	-15.2	-25.7	-50.31	9.42	-9.42

All levels are with a peak detector.

Date of Test: June 10, 2003

CFR 15.247(c) -20 dBc Spurious Conducted Emissions Channel 11 (2.462 GHz)



Frequency MHz	Level dBm	Limit dBm	Delta dB	Raw Data dBm	Cable dB	All Factors dB
1793.99	-53.0	-16.8	-36.2	-54.99	1.95	-1.95
2321.44	-50.6	-16.8	-33.8	-52.90	2.31	-2.31
2385.97	-53.3	-16.8	-36.5	-55.65	2.33	-2.33
2459.57	3.2	-16.8	20.0	0.85	2.36	-2.36
20623.04	-41.8	-16.8	-25.0	-51.14	9.36	-9.36
21796.25	-39.7	-16.8	-22.9	-48.05	8.36	-8.36
23104.82	-40.0	-16.8	-23.2	-49.15	9.14	-9.14

All levels are with a peak detector.

Date of Test: June 10, 2003