RF Emissions Test Report
To Determine Compliance With:
FCC, Part 15.247
Rules and Regulations

Model number: SD230
October 9, 2003

Manufacturer: coaXmedia
1220 Oak Industrial Lane
Suite B
Cumming, GA 30041

Contents Section

Section 1

General Information

Manufacturer:	coaXmedia 1220 Oak Industrial Lane Suite B Cumming, GA 30041
Manufacturer representative:	**Mr. Rob Terry**
Equipment covered by this report:	Model no. SD230
Options covered by this report:	None
Equipment serial no.	00032F0E0E27
Test specifications:	To determine compliance with: FCC, Part 15.247, Subpart C Rules and Regulations
Test report number:	03-152A
Test commenced:	May 14, 2003
Test completed:	October 2, 2003
Test engineer:	**Edward Barnes**

Test Facility: The test facility used to perform these tests is on file with the FCC under registration number 637500 and located at:

EMC Testing Laboratories, Inc.
2210 Justin Trail
Alpharetta, GA 30004

Section 2

Test report summary sheet 1 of 3

Summary:

Tests	Results
Conducted Output Power at Antenna Terminals	**Pass**
6 dB RF Bandwidth	**Pass**
Power Density	**Pass**
Out of Band Conducted Emissions	**Pass**
Out of Band Radiated Emissions	**Pass**
Transmitter Radiated Emissions in Restricted Bands	**Pass**
AC Line Conducted Emissions	**Pass**
Radiated Emissions from Digital Section	**Pass**
Radiated Emissions from Receiver (LO Radiation)	**Pass**

1- The product(s) covered by this report was found to comply with FCC, Part 15.247, Subpart C Rules and Regulations.

2- The test results apply only to the products identified on the test report.

3- Voltage variation measurements of 85% and 115% were not performed since the output of the switching power supply is regulated and does not vary with the 85% and 115% varied input.

Product description:
The product(s) covered by this report consisted of a model SD230, wireless access point allowing high-speed internet connectivity over existing building coaxial distribution systems. The EUT communicates to a personal computer via an internal 802.11b wireless access point.

The enclosure is constructed of plastic with overall dimensions measuring 18.2cm wide by 4cm high by 20.3cm deep and houses the following components judged as critical:

1. A printed wiring board, manufactured by coaXmedia, part no. 311004-001 Rev. B

Test report summary sheet 2 of 3

2. An 802.11B wireless access point, (with plastic enclosure removed and one antenna connector repositioned) manufactured by Trendnet, model TEW-310APBX, FCC ID: O7J-GL2422AP.
3. A reverse SMA external 2 dBi antenna
4. A reverse SMA internal 2 dBi antenna.

Test configuration:
The equipment under test (EUT) was set-up and configured as specified by the manufacturer as follows. The unit has an external and internal antenna. In normal operation the unit uses only the antenna with the highest signal strength. For the purposes of these tests the unit was made to use first the external antenna and then the internal antenna.

1- The EUT was connected to the following support peripherals:

NOTE: Except for item D below, the following peripheral equipment was positioned away from the EUT:

A) A Broadband Gateway, manufactured by coaXmedia, model no. BG-200, serial no. 10308000503101

B) A Dell Dimension XPS T6000R Desktop computer

C) A mouse, manufactured by Microsoft

D) A 120 VAC/5VDC Power Supply, manufactured by Fairway Electronic Co., Model WN10A-050, serial no. 3882B430.

2- The EUT utilized the following cables and were connected as indicated below:

A) A shielded cable, (integral to the mouse) was connected to the computer's mouse port.

B) A 75 ohm coaxial cable with a 40 dB attenuator was connected from the EUT's RF port to the IN port of a typical 2-way splitter, manufactured by Signal Vision Inc., part no. SV-2G. The OUT ports of the splitter were connected to the Broadway Gateway's RFI and RFO ports by two 75 ohm coaxial cables.

C) An unshielded category 5 cable was connected from the desktop computer's Ethernet port to the Broadband Gateway Ethernet port.

Test report summary sheet 3 of 3

Test operation:
For all measurements, the equipment under test was caused to function in a continuous mode of operation for maximum electrical activity as specified by the manufacturer. Specifically, during test configuration 1, the EUT was made to continuously transmit and receive a ping signal between the access point and the Dell Dimension PC. The EUT was tested transmitting on Channel 1 (lowest frequency), Channel 6 (mid-range frequency), and Channel 11 (highest frequency) using first the external antenna and then the internal antenna.

Modifications:
The following modifications were required to comply with the indicated limits:

1- None

Engineering Statement:
All measurement data, of this test report, was taken in accordance with the FCC, Part 15.247, Subpart C Rules and Regulations and ANSI C63.4-1992 by EMC Testing Laboratories, Inc., located in Alpharetta, GA. Although this data is taken under stringent laboratory conditions and to the best of our knowledge, represents accurate data, it must be recognized that emissions from or immunity to this type equipment may be greatly affected by the final installation of the equipment. Therefore, EMC Testing Laboratories, Inc., while supporting the accuracy of the data in this report, takes no responsibility for use of equipment based on these tests. The manufacturer of this equipment must take full responsibility for any field problems which may arise, and agrees that EMC Testing Laboratories, Inc., in performing its functions in accordance with its objectives and purposes, does not assume or undertake to discharge any responsibility of the manufacturer to any other party or parties.

Conclusion:
With the above indicated modifications, the product(s) covered by this report has been tested and found to comply with FCC, Part 15.247, Subpart C Rules and Regulations.

Tested by:

Edward Barnes
Test Technician

Reviewed by:

Gene J. Bailey
Engineering Manager
EMC Testing Laboratories, Inc.

Section 2 cont…

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(Reserved for future use)

Section 3

STANDARD REFERENCE

The following primary standards were used for this test:

1) **ANSI C63.4-1992:** Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9 Khz to 40 Ghz.

2) **US Code of Federal Regulations (CFR) (1998):** Title 47, Part 15.247, Radio Frequency Devices, Subpart C, Intentional Radiators.

Section 4

TEST METHOD

INTRODUCTION:

The product(s) covered by this report were subjected to electromagnetic interference emissions measurements to determine compliance with the FCC, Part 15.247 requirements.

Radiated and conducted measurements were measured in accordance with Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 Khz to 40 Ghz, ANSI C63.4.

MEASUREMENT CALCULATIONS:

Radiated Emissions:

For radiated emissions measurements, the signal attenuation due to impedance losses in the antenna and signal cable was significant and was added to the spectrum analyzer reading to give corrected signal strength reading. If a preamplifier was used, the signal gain was subtracted from the signal strength reading. Radiated emissions data was specified as decibels above 1 microvolt per meter (dBμV/m) of radiated field strength.

Radiated emissions (dBμV) = Analyzer reading (dBμV) plus
antenna factor (dB) plus cable factor (dB) minus Amplifier gain (dB)

Conducted Emissions:

For conducted emissions, the signal attenuation due to impedance losses in the LISN and signal cables were negligible and assumed to be 0dB. The conducted emissions were directly equal to the spectrum analyzer reading. Conducted emissions data was specified as decibels above 1 microvolt (dBμV) of conducted line voltage.

Conducted emissions (dBμV) = Analyzer reading (dBμV)

RADIATED EMISSIONS MEASUREMENT:

Radiated emissions measurements were performed at an open field test site. The receiving antenna was positioned 1, 3 or 10 meters from the equipment under test as indicated below, along the center axis of the test site. Measurements were made with broadband antennas and if necessary, detected emissions were verified with dipole antennas. The dipole antenna was manually tuned to the signal frequency by adjusting the length of the antenna elements. The radiated emissions were measured for both the horizontal and vertical signal planes by rotating the antennas. Additionally, the EUT was rotated by the turntable and the antenna height was raised and lowered 1 to 4 meters to locate the maximum emission strength at each frequency.

Emission measurements made from 30 Mhz to 1000 Mhz were made at an antenna to EUT distance of 10 meters.

Emission measurements made from 1000 Mhz to 10 Ghz were made at an antenna to EUT distance of 3 meters.

Emission measurements made from 10 Ghz to 24 Ghz were made at an antenna to EUT distance of 1 meter.

The following antennas were used to measure the radiated emissions within the specified frequency spans.

Antenna	**Frequency Span**
Biconical	20 - 200 Mhz
Log Periodic	200 - 1000 Mhz
Dipoles	20 - 1000 Mhz
Horn	1-18 Ghz
Horn	18-40 Ghz

CONDUCTED EMISSIONS MEASUREMENT:

Conducted emissions measurements were performed on a ground plane that was electrically bonded to earth ground. The equipment under test was positioned 0.8 meter above the ground plane and 0.8 meter minimum from the LISN that was positioned on the ground plane. The LISN housings were electrically bonded to the ground plane. The conducted emissions for both the ungrounded supply conductor (L1) and the grounded conductor (L2) of the power supply cord were measured. The conducted emissions were measured over the frequency span of 0.15 to 30 Mhz. The measurements were

conducted in the quasi-peak and average detector modes.

INSTRUMENTATION:

Radiated and conducted signal strength measurements were taken with a spectrum analyzer. Radiated emissions were measured with broadband and tuned dipole antennas. Conducted emissions were measured with a 50 UH line impedance stabilization network (LISN). The test equipment consists of the following:

Test Equipment	Model No.	Serial No.	Cal. Due
Spectrum Analyzer	HP 8591A	3144A02506	01-06-04
Spectrum Analyzer w/Opt 26	8592L	3649A00744	01-10-04
LISN	94641-1	0145/0146	06-05-03
LISN	3825/2	9305-2088	08-21-03
LISN	LI-210	25145	07-10-03
Biconical Antenna	3110B	1708	10-01-03
Biconical Antenna	BIA-25	2451	09-18-03
Log Periodic	LPA25	1112	10-01-03
Dipole Antenna	DM-105A-T1	31402-110	06-05-03
Dipole Antenna	DM-105A-T2	31402-105	06-05-03
Dipole Antenna	DM-105A-T3	31402-109	06-05-03
Horn Antenna	3115	9405-4264	10-01-03
Horn Antenna	3116	8725-2203	12-17-03
R.F. Amplifier	QB-820	11602	01-11-04
Preamplifier	8449B	3008A00914	01-07-04

DETECTOR FUNCTION:

All measurements were taken using a peak hold signal detector function. In this mode, the spectrum analyzer makes continuous scans across the frequency band and stores the highest emission value detected at each frequency for all scans. The peak hold integration will detect transient or low duty cycle emissions peak which might be missed on single scan measurement. The emission value at each frequency was a true value.

SPECTRUM ANALYZER SETTING:

For all measurements, the spectrum analyzer was set for a 10 dB input attenuation. 10 dB/Division vertical scale and 90 or 100 dBμV reference level. The resolution bandwidth was set at 9 Khz for the 0.15 - 30 Mhz span, 120 Khz for 30 - 1000 Mhz span and 1 Mhz for measurement above 1000 Mhz. The video bandwidth and sweep rate were automatically coupled by the analyzer.

Section 5

CONDUCTED OUTPUT POWER AT ANTENNA TERMINALS

Requirements

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm).

Analyzer settings
The spectrum analyzer was set at 3MHz RBW, 3MHz VBW with a 20mS sweep utilizing a 100Mhz span.

Procedure

Both the external and internal antenna ports were alternately connected to the input of a spectrum analyzer. Power was read directly and cable loss correction was included in the offset function of the spectrum analyzer to obtain the power at the antenna terminals.

Due to the spectrum analyzers bandwidth limitations the following correction factor was entered into the analyzers reading:

10log(10MHz/3MHz)=5.22dB

Test Results

External Antenna

Frequency (MHz)	Output in dBm
2412	17.62 dBm
2437	17.32 dBm
2462	18.42 dBm

Internal Antenna

Frequency (MHz)	Output in dBm
2412	21.62 dBm
2437	21.52 dBm
2462	22.82 dBm

Section 6

6 dB RF Bandwidth

Requirements

The minimum 6dB bandwidth shall be at least 500 kHz.

Analyzer settings
The spectrum analyzer was set at 100kHz RBW, 100kHz VBW with a 100mS sweep utilizing a 20Mhz span.

Test Result

External Antenna

Frequency (MHz)	6 dB Bandwidth
2412	10.35 MHz
2437	10.98 MHz
2462	10.27 MHz

Internal Antenna

Frequency (MHz)	6 dB Bandwidth
2412	10.25 MHz
2437	10.28 MHz
2462	10.20 MHz

Section 7

POWER DENSITY

Requirements

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Procedure

The spectrum analyzer RES BW was set to 3 kHz. The START and STOP frequencies were set to the band edges of the maximum output passband.

Total SWEEP TIME is calculated as follows:

SWEEP TIME (SEC) = (Fstop, kHz-Fstart, kHz)/3 kHz

Antenna port output of the EUT was connected directly to the to the spectrum analyzer. Cable loss was compensated for with the analyzer OFFSET function.

External Antenna

Frequency (MHz)	Power Density (dBm)
2412	-16.69 dBm
2437	-14.94 dBm
2462	-17.2 dBm

Internal Antenna

Frequency (MHz)	Power Density (dBm)
2412	-13.28 dBm
2437	-13.42 dBm
2462	-16.62 dBm

Section 8

OUT OF BAND CONDUCTED EMISSIONS

Requirement

In any 100 kHz bandwidth outside the EUT passband, the RF power shall be at least 20 dB below that of the maximum in-band 100 kHz emission.

External Antenna

Frequency (MHz)	Level below Carrier (dBc)
2397.4	-31.99 dBc

Internal Antenna

Frequency (MHz)	Level below Carrier (dBc)
2397.6	-30.6 dBc

NOTE: No other out of band conducted emissions within 50 dBc of the fundamental transmit frequency.

Section 9

OUT OF BAND RADIATED EMISSIONS

Requirement

In any 100 kHz bandwidth outside the EUT passband, the RF power shall be at least 20 dB below that of the maximum in-band 100 kHz emission.

External Antenna

Frequency (MHz)	Polarity	Level below carrier (dBc)
2397.5	Vertical	33.5
2397.3	Horizontal	34.5
2483.5	Vertical	46.9
2483.5	Horizontal	47.8

Internal Antenna

Frequency (MHz)	Polarity	Level below carrier (dBc)
2397.1	Vertical	34.7
2397.3	Horizontal	33.7
2483.5	Vertical	52.3
2483.5	Horizontal	47.0

Section 10

Transmitter Radiated Emissions

Radiated emissions were performed from 30 MHz to 24000 MHz.

For radiated emissions tests, the analyzer setting was as follows:

	RES BW	VID BW	
Frequency<1GHz	100 kHz	100 kHz	
Frequency>1GHz	1 MHz	1 MHz	(Peak Measurements)
	1 MHz	100 Hz	(Average Measurements)

Transmitter was tested and scanned for emissions using the lowest frequency 2412 MHz, the middle frequency 2437 MHz, and the highest frequency 2462 MHz.

External Jack

Frequency Mhz	**Measurement Reading dBμV/m**	**Corrected Reading dBμV/m**	**FCC Limit dBμV/m**	**Minimum Margin dBμV/m**
Vertical				
2412	103.8	99.3	117.3	-18.0
2437	104.4	100.0	117.2	-17.2
2462	109.3	105.1	117.1	-12.0
Horizontal				
2412	107.5	103.5	117.3	-13.8
2437	107.0	103.1	117.2	-14.1
2462	109.5	106.7	117.1	-10.4

Section 10 continued…

Internal Jack

Frequency Mhz	Measurement Reading dBμV/m	Corrected Reading dBμV/m	FCC Limit dBμV/m	Minimum Margin dBμV/m
Vertical				
2412	84.6	80.1	117.3	-37.2
2437	89.5	85.1	117.2	-32.1
2462	96.1	91.9	117.1	-25.2
Horizontal				
2412	99.0	95.0	117.3	-22.3
2437	101.7	97.8	117.2	-19.4
2462	104.7	101.3	117.1	-15.8

* - All measurements of the fundamental frequency were taken using Peak Detector.

**- No Harmonics of the Fundamental found above the noise floor.

There were no measurable harmonics. The following measurements were taken of the noise floor at the frequencies of the transmitter harmonics.

Transmitter set to 2412Mhz		
Frequency Mhz	**Measurement Reading dBµV/m**	**Corrected Reading dBµV/m**
Vertical		
4824	30.6	36.1
7236	34.4	45.1
9648	35.1	48.9
12060	35.9	42.5
14472	38.9	48.7
16884	40.5	51.3
19296	40.0	55.1
21708	45.1	60.7
24120	45.7	61.9
Transmitter set to 2437Mhz		
Vertical		
4874	30.7	36.3
7311	34.9	45.7
9748	35.4	49.3
12185	35.5	42.1
14622	39.1	48.9
17059	41.5	52.4
19496	43.8	59.0
21933	46.0	61.6
24730	46.4	62.6
Transmitter set to 2462 MHz		
Vertical		
4924	30.3	36.0
7386	35.2	45.0
9448	35.4	49.3
12310	35.1	41.9
14772	39.2	49.1
17234	41.3	52.3
19696	43.9	59.1
22158	45.1	60.9
24620	46.2	62.7

Transmitter set to 2412Mhz		
Frequency Mhz	**Measurement Reading dBµV/m**	**Corrected Reading dBµV/m**
Horizontal		
4824	30.6	34.7
7236	34.4	44.5
9648	35.1	48.0
12060	35.9	41.3
14472	38.9	47.7
16884	40.5	50.1
19296	40.0	53.4
21708	45.1	60.1
24120	45.7	60.7
Transmitter set to 2437Mhz		
Horizontal		
4874	30.7	35.9
7311	34.9	44.6
9748	35.4	48.2
12185	35.5	41.1
14622	39.1	47.6
17059	41.5	51.4
19496	43.8	57.4
21933	46.0	60.4
24730	46.4	61.2
Transmitter set to 2462 MHz		
Horizontal		
4924	30.3	35.7
7386	35.2	44.5
9448	35.4	48.4
12310	35.1	40.0
14772	39.2	48.2
17234	41.3	51.4
19696	43.9	58.2
22158	45.1	59.9
24620	46.2	61.3

Section 11

AC LINE CONDUCTED EMISSIONS

Model number: SD230
Test voltage: 120V, 60Hz **Test date:** 5/14/03

Frequency Mhz	Reading dBuV, L1	Frequency Mhz	Reading dBuV, L2	FCC Limit, dBuV	Margin dBuV
0.787	40.3	0.651	37.5	46.0	-5.7
0.865	40.4	0.689	36.1	46.0	-5.6
1.00	44.5	0.766	39.2	46.0	**-1.5**
1.101	42.3	0.868	36.0	46.0	-3.7
1.136	41.8	.921	37.5	46.0	-4.2
1.14	41.4	.991	38.7	46.0	-4.6

Section 12

RADIATED EMISSION DIGITAL SECTION

Requirements

Radiated emissions from the digital section must meet the requirements of FCC Part 15.209.

Procedure

Radiated emissions were performed from 30 MHz to 24000 MHz.

For radiated emissions tests, the analyzer setting was as follows:

	RES BW	VID BW	
Frequency<1GHz	100 kHz	100 kHz	
Frequency>1GHz	1 MHz	1 MHz	(Peak Measurements)

Transmitter was tested and scanned for emissions using the lowest frequency 2412 MHz, the middle frequency 2437 MHz, and the highest frequency 2462 MHz.

Emissions from 30 MHz to 1000 MHz were tested at 10 meters. Emissions from 1000 MHz to 10,000MHz were tested at 3 meters. Emissions from 10,000 MHz to 24,000MHz were tested at 1 meter.

Radiated Emissions Measurements cont...

Model number: SD230 **Test date:** 05/16/03

Frequency Mhz	Measurement Reading dBμV/m	Corrected Reading dBμV/m	FCC Limit dBμV/m	Minimum Margin dBμV/m
Horizontal				
144.0	28.9	21.1	33.0	-11.9
1150	37.6	21.1	54.0	-10.1
Vertical				
42.9	31.8	21.5	29.5	-8.0
*144.0	36.4	29.4	33.0	**-3.5**
1150	39.1	27.7	54.0	-26.3
1200	40.7	29.5	54.0	-24.5
1250	40.4	29.4	54.0	-24.6
1375	39.5	29.0	54.0	-25.0
1550	39.4	29.7	54.0	-24.3
1625	41.0	31.9	54.0	-22.1
1700	39.2	30.7	54.0	-23.3
1830	43.9	36.3	54.0	-17.7

* - Indicates Quasi-Peak Measurement

Section 13

RADIATED EMISSIONS FROM THE RECEIVER SECTION (LO RADIATION)

Procedure

Radiated emissions were performed from 30 MHz to 24000 MHz.

For radiated emissions tests, the analyzer setting was as follows:

	RES BW	VID BW
Frequency<1GHz	100 kHz	100 kHz
Frequency>1GHz	1 MHz	1 MHz (Peak Measurements)

Transmitter was tested and scanned for emissions using the lowest frequency 2412 MHz, the middle frequency 2437 MHz, and the highest frequency 2462 MHz.

Emissions from 30 MHz to 1000 MHz were tested at 10 meters. Emissions from 1000 MHz to 24000MHz were tested at 3 meters.

Model number: SD230 **Test date:** 05/16/03
External Jack

Frequency Mhz	Measurement Reading dBμV/m	Corrected Reading dBμV/m	FCC Limit dBμV/m	Minimum Margin dBμV/m
Horizontal				
2038	36.1	30.8	54.0	-22.2
2063	37.5	32.3	54.0	-21.7
2088	35.5	30.4	54.0	-22.6

Frequency Mhz	Measurement Reading dBμV/m	Corrected Reading dBμV/m	FCC Limit dBμV/m	Minimum Margin dBμV/m
Vertical				
2038	42.1	36.0	54.0	-18.0
2063	44.1	38.2	54.0	-15.8
2088	43.3	37.5	54.0	-16.5

Internal Jack

Frequency Mhz	Measurement Reading dBμV/m	Corrected Reading dBμV/m	FCC Limit dBμV/m	Minimum Margin dBμV/m
Horizontal				
2038	37.5	32.2	54.0	-21.8
2063	38.8	33.6	54.0	-20.4
2088	35.7	30.6	54.0	-22.4

Frequency Mhz	Measurement Reading dBμV/m	Corrected Reading dBμV/m	FCC Limit dBμV/m	Minimum Margin dBμV/m
Vertical				
2038	40.9	34.9	54.0	-19.1
2063	41.4	35.5	54.0	-18.5
2088	40.9	35.1	54.0	-18.9

* All measurements taken using Peak detector.

Section 14

MPE Calculations

MPE Introduction

This engineering analysis was done according to the FCC part 15.247 (b) (4) as part of the FCC certification requirements for spread spectrum devices.

The measured EIRP values on both the internal and external antennas, for the lowest, middle and highest TX channels were used for the calculations based on the FCC OET Bulletin 65 and supplements A, B and C. These calculations were done in worst case mode, assuming 100% reflection of incoming radiation, resulting in a potential doubling of predicted field strength and a four-fold increase in (far field equivalent) power density (S).

$$S = \frac{EIRP}{4\pi R^2}$$ (power density without reflection)

$$S = \frac{(2)^2 EIRP}{4\pi R^2}$$ (worst case power density with 100% reflection)

with R = 20cm

Calculation results

Table 1 below shows the power density (S) results for the lowest, middle and highest TX channels:

Measured EIRP (mW)			**Calculated worst case Power Density S (mW/cm²)**		
External Antenna					
CH 1	**CH 6**	**CH 11**	**CH 1**	**CH 6**	**CH 11**
57.8	54.0	69.5	0.0489	0.046	0.059
Internal Antenna					
145.2	141.9	191.4	0.123	0.120	0.162

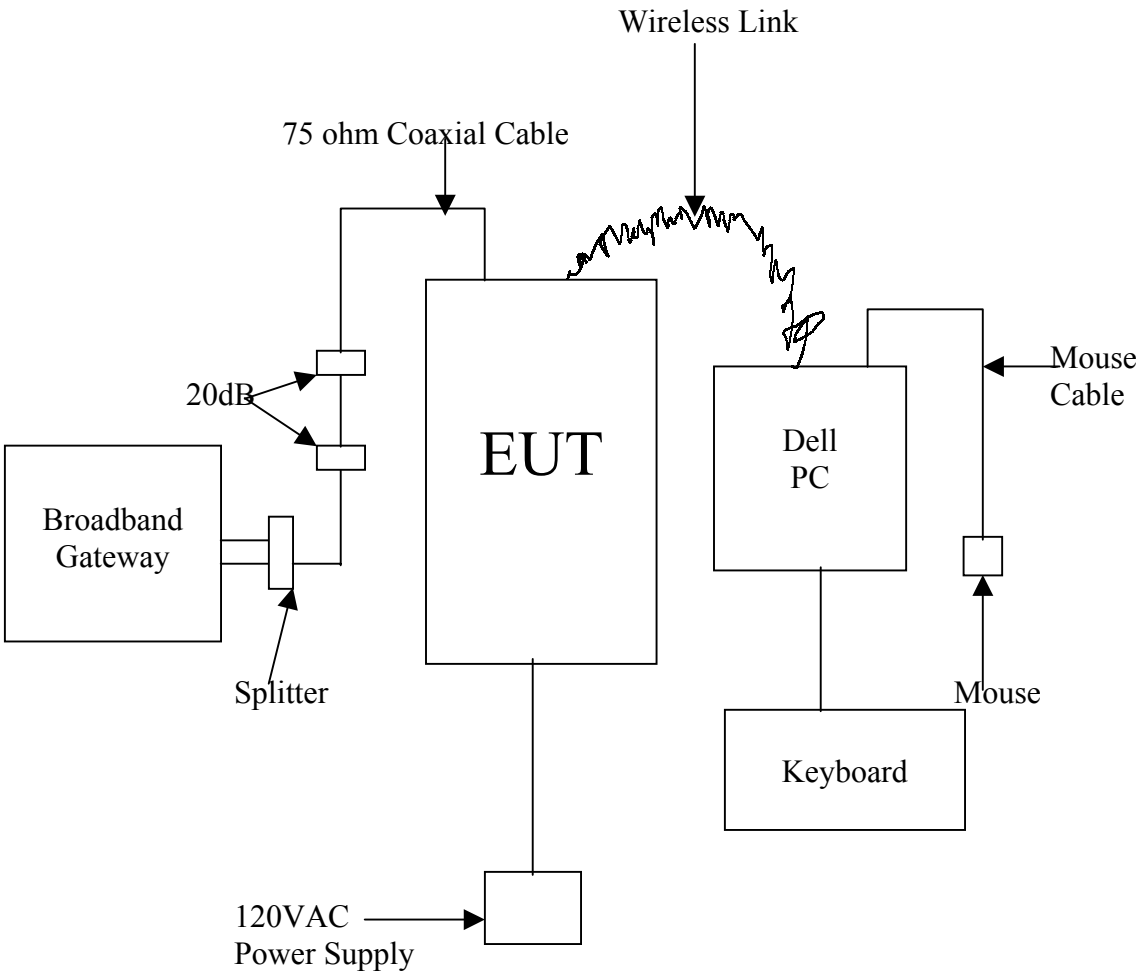
MPE Conclusion

Based on these calculations and using the limits of the general population / uncontrolled environment (which is 1.0mW/cm² at 2.4 GHz), the EUT described in this report does not exceed the MPE requirements set forth in documents above, with a minimum safe distance between antenna and operator of 20 centimeters.

The equipment therefore fulfills the requirements on power density for general population/uncontrolled exposure and therefore complies with the requirements of FCC Part 15.247(b)(4) and FCC OET Bulletin 65 including supplements A, B, and C.

Section 15

Configuration



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