

RUBICOM SYSTEMS, INC.

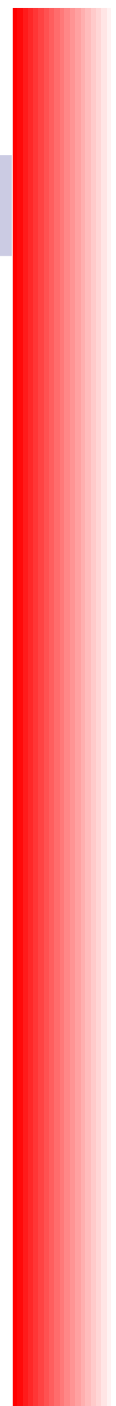


**FCC TEST REPORT
INTENTIONAL RADIATOR
FOR THE
INTERSIL CORP.
MODEL ISL 37300U
2.4GHZ USB WIRELESS TRANSMITTER**



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EXCEPT IN FULL WITHOUT THE WRITTEN
APPROVAL OF THE TESTING LABORATORY



FCC TEST REPORT
(INTENTIONAL RADIATOR)
FOR THE
INTERSIL CORP.
MODEL ISL 37300U
2.4GHz USB WIRELESS TRANSMITTER
S/N: 01120035

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CERTIFICATION

Rubicom Systems, Inc. certifies the information obtained in this report was performed consistent with the requirements of ANSI C63.4-1992. The Intersil Corp. Model ISL 37300U, 2.4GHz USB Wireless Transmitter complies with the requirements of CFR 47 Part 15 for Intentional Radiators as required in Paragraph 15.247(a)(2)(b)(1)(c) and (d).

This data was obtained while testing an ISL 37300U Wireless Transmitter, s/n: 01120035, furnished by Intersil Corp. Any modifications to the unit as tested may invalidate the data and void this certification.

ABSTRACT

This report presents test results of the emanations found emitting from the Intersil Corp. Model ISL 37300U, 2.4GHz USB Wireless Transmitter and the comparison of these emissions to the requirements of FCC Title 47, Part 15, Subpart C for Intentional Radiators as required for direct sequence type spread spectrum systems operating in the 2.4 to 2.4835GHz range.

The testing was performed on a 3-meter open field test site at Rubicom Systems, Inc. (RSI). The testing was performed for Intersil Corp. under purchase order 0261046. The results of this test effort demonstrate compliance of the Intersil Corp. Model ISL 37300U, 2.4GHz USB Wireless Transmitter to FCC Title 47, Part 15, Subpart C for Intentional Radiators (Paragraph 15.247(2)). The unit under test was serial number 01120035 for radiated and conducted measurements.

1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to show compliance of the Intersil Corp. ISL 37300U, 2.4GHz USB Wireless Transmitter to the requirements of Part 15 of the FCC Rules and Regulations (47CFR, Part 15, Subpart C) for Intentional Radiators. The applicable paragraphs covered by this report are 15.247(2)(b)(c) and (d).

1.2 Requirements

The test requirements for an intentional radiator are as follows:

RADIATED (15.205/15.209)

Frequency (MHz)	Field Strength ($\mu\text{V}/\text{m}$)	Measurement Distance (m)
0.009-0.490MHz	2400/F (KHz)	300
0.490-1.705MHz	240000/F (KHz)	30
1.705-30.0MHz	30	30
30-88MHz	100	3
88-216MHz	150	3
216-960MHz	200	3
Above 960MHz	500 Average	3

CONDUCTED (15.207)

Frequency (MHz)	μ Volts	dB μV
.450-30MHz	250	48

DIRECT SEQUENCE SPREAD SPECTRUM SYSTEM

15.247(2) Bandwidth

The minimum 6dB bandwidth shall be greater than 500KHz.

15.247(2)(b) Maximum Peak Power

The Maximum peak output power of the transmitter shall not exceed 1 watt.

15.247(2)(c) Out of Band Emissions, Radiated and Conducted

Power produced by Modulation Products of the Spreading Sequence, Information Sequence and the Carrier Frequency.

Levels in any 100KHz outside of the frequency band shall be 20dB below that of any 100KHz band within the band that contains the highest level of desired power or the requirements of 15.209, whichever results in lesser attenuation. All other emissions shall not exceed the limits of Section 15.209(a). Section 15.205 requirements are applicable.

15.247(d) Power Density

Transmitted power density averaged over any one (1) second interval shall not be greater than 8dBm in any 3KHz bandwidth.

1.3 Unit Under Test Description

The ISL 37300U is a miniature Universal Serial Bus (USB) 802.11b Network Interface Card (NIC). The card operates as a wireless Ethernet card in the 2.4GHz ISM band. The card runs at data rates of 1, 2, 5.5 and 11 Mbits/sec. The NIC uses Direct Sequence Spread Spectrum technology. The card is an 8 layer printed circuit card that contains:

1. +18dBm power amplifier
2. RF/IF frequency synthesizer and image rejection mixer IC
3. I/Q modulator and demodulator IC
4. Integrated Baseband processor and Medium Access Controller with USB interface IC
5. The unit has two antenna jacks mounted on the PCB to support two external dipole antennas
6. The unit has a shield over the RF circuitry to minimize EMI
7. A minimum USB jack for connecting to a computer

1.4 Summary of Results

Paragraph 6.0 of this document presents the detailed results of each required test for the transmitter.

No modifications were required of the unit under test for this test effort.

The data shows compliance to the requirements stated in Paragraph 1.2 of this document.

2.0 APPLICABLE DOCUMENTS

The following documents form a part of this report to the extent expressed herein:

FCC Code of Federal Regulations Title 47, Part 15

FCC Procedure for Measuring RF Emissions from Computing Devices
FCC/OET MP-4, July 1987

ANSI C63.4-1992

FCC Characteristics of Open Field Test Sites Bulletin OET 55, October
1989

3.0 TEST SITE DESCRIPTION

This testing was performed at Rubicom Systems, Inc. 3-meter test site. The description of the measurement facility was found to be compliant with the requirements of Section 2.948 of the FCC Rules. A copy of the compliance letter is attached to this report as Appendix A.

3.1 Environmental Conditions

This test effort was performed from April 27, 2001 through May 5, 2001.

Typical conditions for the test site during this testing was:

Temperature: 78° - 85°F

Barometer: 29.50 - 29.65 inches

Humidity: 60 - 80%

4.0 TEST INSTRUMENTATION

The following test equipment was used to perform this testing.

Qty.	Description	Manufacturer	Model No.	Cal. Due Date	Cal. Cycle
1	Spectrum Analyzer	Advantest	R3271A	12/19/01	1 Yr.
2	Bi-Log Antenna	Chase	CLB6111B	07/17/01	1 Yr.
1	Plotter	Hewlett Packard	7440A	NCR	1 Yr.
1	Peak Power Meter	Wavetek	1018B	06/01/01	1 Yr.
1	Ridge Guide Horn Antenna	A.H. Systems	SAS-200/571	10/25/01	1 Yr.
1	Pre-Amplifier	Hewlett Packard	8449B	05/25/02	1 Yr.
1	Bandreject Filter	Lorch Microwave	6BR6-2440	03/21/03	2 Yr.

5.0 TEST SAMPLE SETUP AND CONFIGURATIONS

The ISL 37300U Transmitter was placed on a nonconductive table inside a shielded enclosure. The transmitter was connected via a USB cable to a Micronpc.com laptop computer. During conducted measurements the output was coupled directly to the spectrum analyzer.

During radiated emissions the transmitter was placed on the turntable. The transmitter was put into operation with a 1MBPS modulation during radiated measurements. Figure 5.0-1 presents the test configuration of the equipment.

Photo 1 presents the unit placed on the turntable during radiated testing.

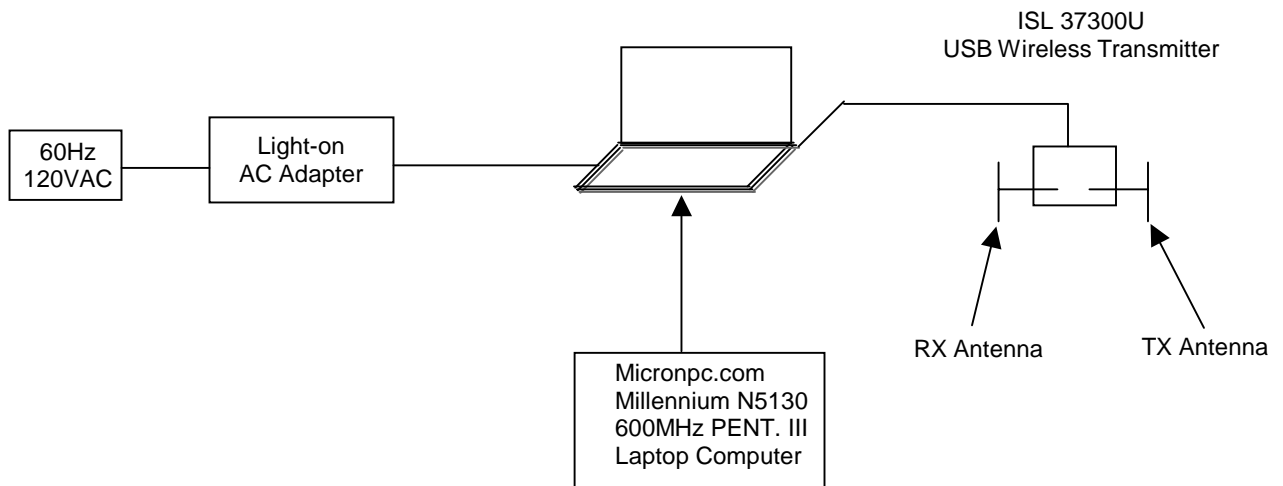


FIGURE 5.0-1

6.3.2 Radiated Emissions

Radiated emissions were performed on the ILS 37300U Transmitter over the frequency range of 30MHz-25GHz. The transmit frequency was 2.437GHz (or channel 6). Data plots are presented in three groups:

Data Sheets 6.3.2-1 - 6.3.2-6 30MHz-1GHz Quasi-Peak Detector
 Data Sheets 6.3.2-7 - 6.3.2-12 1GHz-25GHz Peak Plots (1MHz-RBW, 1MHz-VBW)
 Data Sheets 6.3.2-13 - 6.3.2-24 1GHz-25GHz Average Plots (1MHz-RBW, 10Hz-VBW)

A notch filter was added in front of the analyzer during these plots to prevent intermods and harmonics from being generated. The transmit signal is attenuated.

6.3.3 Peak Ambient (EUT Off/Support Equipment On)

Peak and average ambient data is used to compare the peak EUT data to the environmental ambient and determine true EUT signals. The tester uses a more detailed procedure to analyze signals by investigating frequency bands of 25MHz to 50MHz. The ambient is displayed and saved on the analyzer screen. The unit is then turned on and the true EUT signals are maximized. Ambient data plots are presented in three groups:

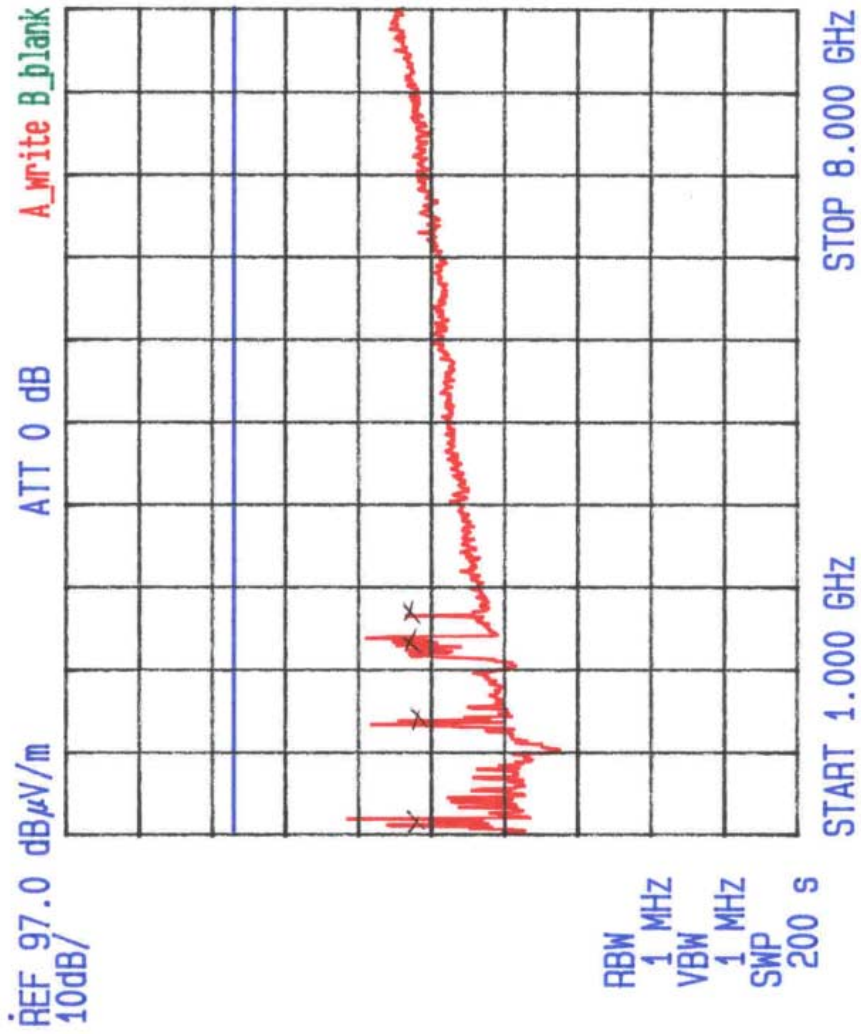
Data Sheets 6.3.3-1 - 6.3.3-6 30MHz-1GHz Quasi-Peak Ambient
 Data Sheets 6.3.3-7 - 6.3.3-12 1GHz-25GHz Peak Ambient Plots (1MHz-RBW, 1MHz-VBW)
 Data Sheets 6.3.3-13 - 6.3.3-24 1GHz-25GHz Average Ambient Plots (1MHz-RBW, 10Hz-VBW)

The following is a tabulated listing of the signals detected during the radiated testing. Calculation of field strength is described in Paragraph 6.1 of this document.

Frequency (MHz)	Antenna Pol.	Measured (dB μ V/m)	Limit (dB μ V/m @ 3 Meters)	Margin (dB)	Restricted Band
2437	H	97 Avg.	N/A	N/A	NO
2437	V	98 Avg.	N/A	N/A	NO
2437	H	101 Peak	N/A	N/A	NO
2437	V	104 Peak	N/A	N/A	NO



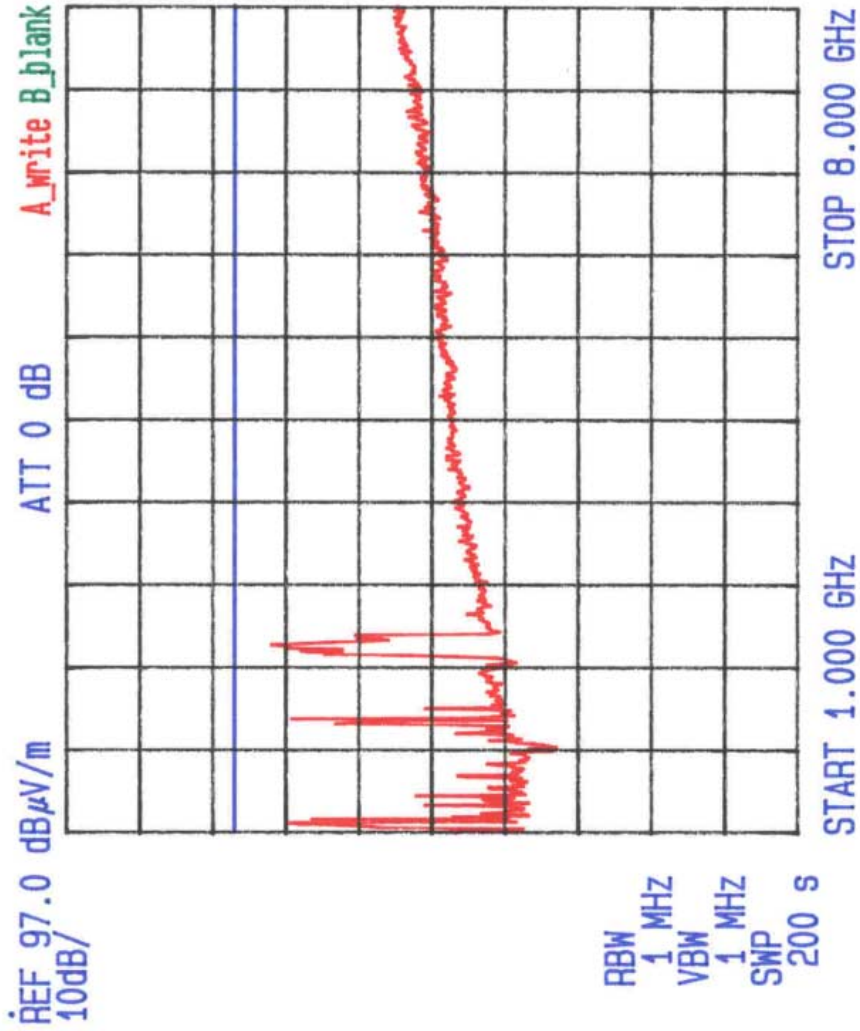
TEST: FCC RADIATED	EUT: ISL 37300U	S/N: 01120035
FREQ: 1G-8GHz	SPEC: 15.247	ANT. HT/POL: H / 1-4m
DETECTOR: PEAK	LINE UNDER TEST: N/A	EUT POSITION: 0-36e
DATE: 5-4-01	TEST SITE: 3 METER	TESTER: <i>AS</i>



DATA SHEET 6.3.2-7



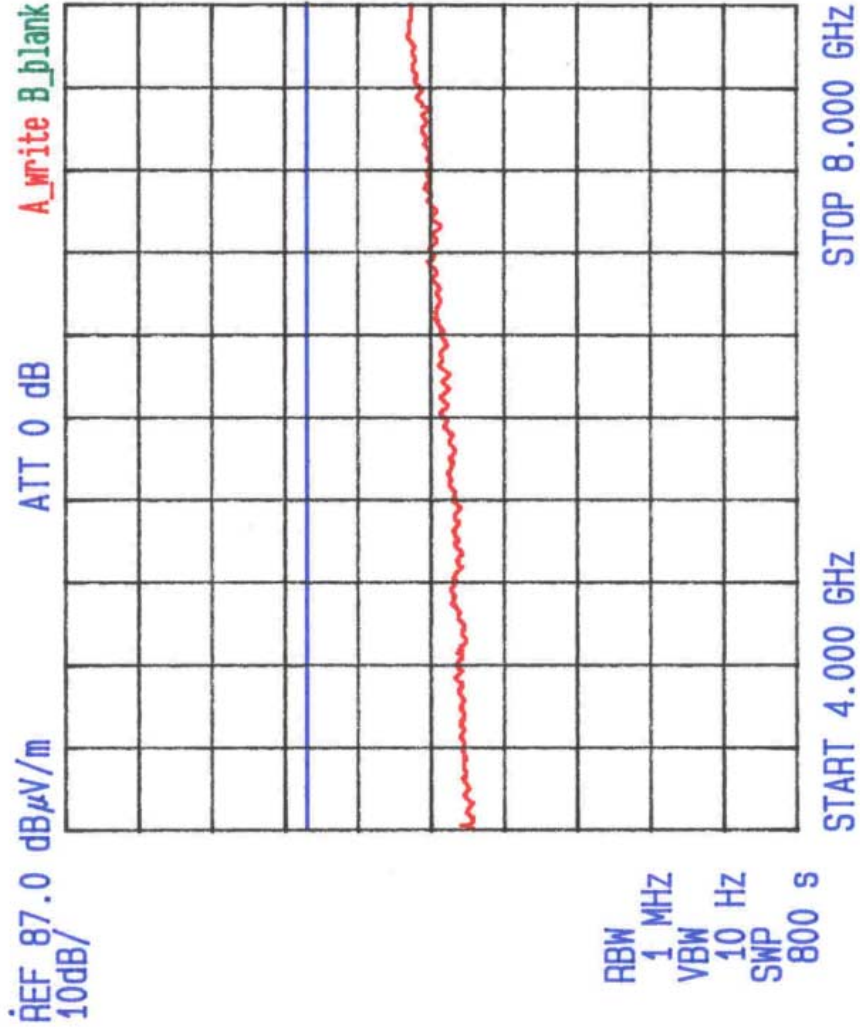
TEST: FCC RADIATED	EUT: ISL 37300U	S/N: 01120035
FREQ: 1G-8GHZ	SPEC: 15.247	ANT. HT/POL: V / 1-4M
DETECTOR: PEAK	LINE UNDER TEST: N/A	EUT POSITION: 0-360
DATE: 5-4-01	TEST SITE: 3 METER	TESTER: AD



DATA SHEET 6.3.2-8



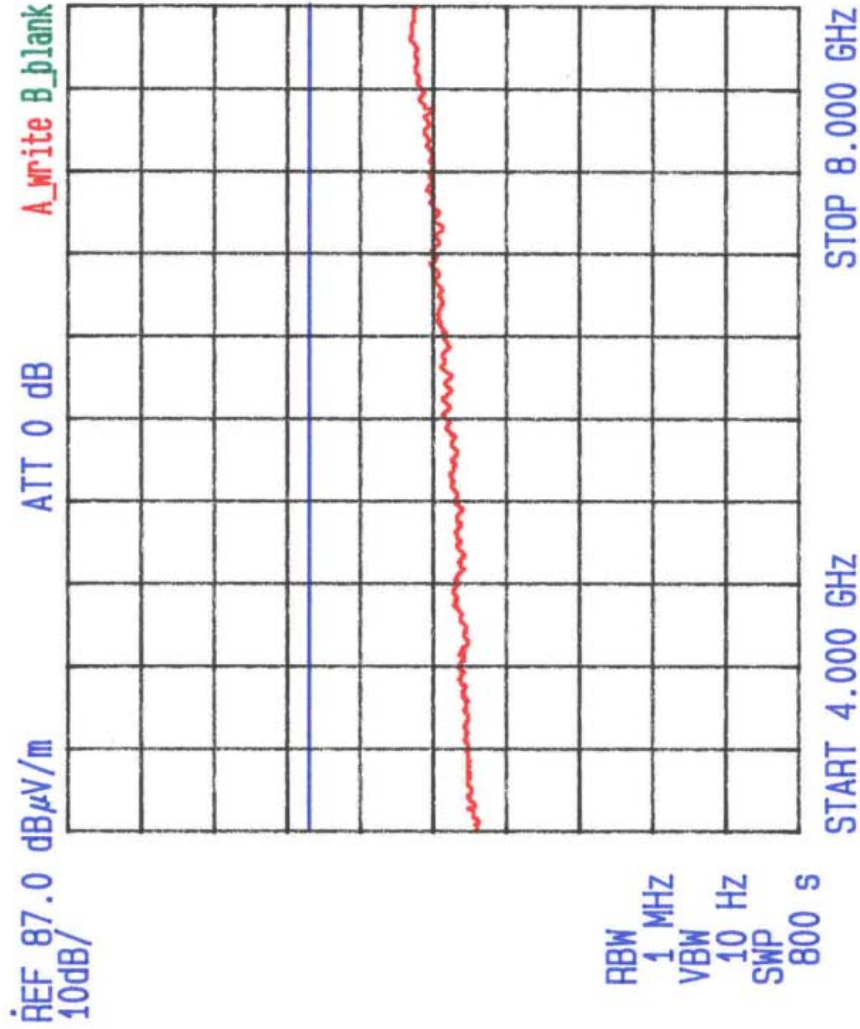
TEST: FCC RADIATED	EUT: ISL 373000	S/N: 01120035
FREQ: 4G-8GHz	SPEC: 15247	ANT. HT/POL: H
DETECTOR: AVERAGE	LINE UNDER TEST: N/A	EUT POSITION: 0-500°
DATE: 5-4-01	TEST SITE: 3 METER	TESTER: <i>[Signature]</i>



DATA SHEET 6.3.2-15



TEST: FCC RADIATED	EUT: ISL 37300U	S/N: 01120035
FREQ: 4G-8GHZ	SPEC: 15.247	ANT. HT/POL: V 1-4m
DETECTOR: AVERAGE	LINE UNDER TEST: N/A	EUT POSITION: 0-360°
DATE: 5-4-01	TEST SITE: 3 METER	TESTER: AB



DATA SHEET 6.3.2-16

6.4 Operation Within The Bands (2.4GHz-2.4835GHz) 15.204(2)(b)(c)(d)

6.4.1 6dB Bandwidth 15.247(2)

The minimum 6dB bandwidth must be greater than 500KHz. Data Sheets 6.4.1-1 through 6.4.1-6 show the measured 6dB points to give bandwidths between 10.8 and 11.5MHz at the MIN, MID and MAX frequency tested. Data plots were made for the MIN and MAX data rates. The system exceeds the 500KHz minimum bandwidth.

Photo 3 is representative of the 6dB bandwidth setup.

6.4.2 Peak Output Power 15.247(2)(b)

The peak output power to the antenna shall not exceed 1 watt.

The equipment under test (EUT) was configured to continuously transmit. The highest emission level within the authorized band was measured. The peak power level is recorded below. The carrier frequency of the EUT was 2412MHz, 2437MHz and 2462MHz. The MID, MIN and MAX data rates were used.

Photo 4 is representative of this setup.

The data is presented below for each frequency. All levels were below the 1 watt peak power limit.

MIN TX FREQ. 2412GHz	DATA RATE MIN: -10.0dBw MID: -9.7dBw MAX: -10.0dBw
MID TX FREQ. 2437GHz	DATA RATE MIN: -9.4dBw MID: -9.4dBw MAX: -9.3dBw
MAX TX FREQ. 2462GHz	DATA RATE MIN: -9.8dBw MID: -9.7dBw MAX: -9.3dBw

6.4.3 Out of Band Emission 15.247(2)(c)

Out of band measurements were made on the antenna port of the RF unit. The measurement was made over the 1-25GHz range using the 100KHz RBW. Data Sheets 6.4.3-1 through 6.4.3-12 present the transmit and receive scans across the entire range at the MIN, MID and MAX channels at MIN and MAX modulation rates. The plots demonstrate that there is greater than 20dB separation between the intended signal and any other signals in the range.

Data Sheet 6.4.3-13 is included to show the spectrum analyzer setup for restricted band testing where the start frequency and marker number "1" represented one restricted band (2.310-2.390GHz). Marker number "2" is the beginning of the 2.4835-2.5GHz restricted band. All signals falling into the restricted band were below

the display line, which represents the peak or average limit. These measurements were radiated measurements.

Data Sheets 6.4.3-14 through 6.4.3-37 present the peak and average measurements for the MIN, MID and MAX channels at the MIN and MAX data rates.

All signals that fall into the restricted bands are below the requirement of 15.209(a) and are listed in tabular form below.

Frequency (GHz)	Antenna Pol.	Measured (dB μ V/m)	Limit (dB μ V/m@ 3 Meters)	Margin (dB)	Data Rate
2.3855	H	46	54	-8	1Mbps
2.3855	V	49	54	-5	1Mbps
2.3820	V	46	54	-8	1Mbps
2.3820	H	46.5	54	-7.5	11Mbps
2.3820	H	44	54	-10	11Mbps
2.3855	V	48.5	54	-5.5	11Mbps
2.3820	V	45	54	-9	11Mbps
2.488	V	47	54	-7	1Mbps
2.488	V	48	54	-6	11Mbps

6.4.2 Peak Output Power 15.247(2)(b)

The peak output power to the antenna shall not exceed 1 watt.

The equipment under test (EUT) was configured to continuously transmit. The highest emission level within the authorized band was measured. The peak power level is recorded below. The carrier frequency of the EUT was 2412MHz, 2437MHz and 2462MHz. The MID, MIN and MAX data rates were used.

Photo 4 is representative of this setup.

The data is presented below for each frequency. All levels were below the 1 watt peak power limit.

MIN TX FREQ. 2412GHz	DATA RATE MIN: -10.0dBw MID: -9.7dBw MAX: -10.0dBw
MID TX FREQ. 2437GHz	DATA RATE MIN: -9.4dBw MID: -9.4dBw MAX: -9.3dBw
MAX TX FREQ. 2462GHz	DATA RATE MIN: -9.8dBw MID: -9.7dBw MAX: -9.3dBw

6.4.3 Out of Band Emission 15.247(2)(c)

Out of band measurements were made on the antenna port of the RF unit. The measurement was made over the 1-25GHz range using the 100KHz RBW. Data Sheets 6.4.3-1 through 6.4.3-12 present the transmit and receive scans across the entire range at the MIN, MID and MAX channels at MIN and MAX modulation rates. The plots demonstrate that there is greater than 20dB separation between the intended signal and any other signals in the range.

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the display line, which represents the peak or average limit. These measurements were radiated measurements.

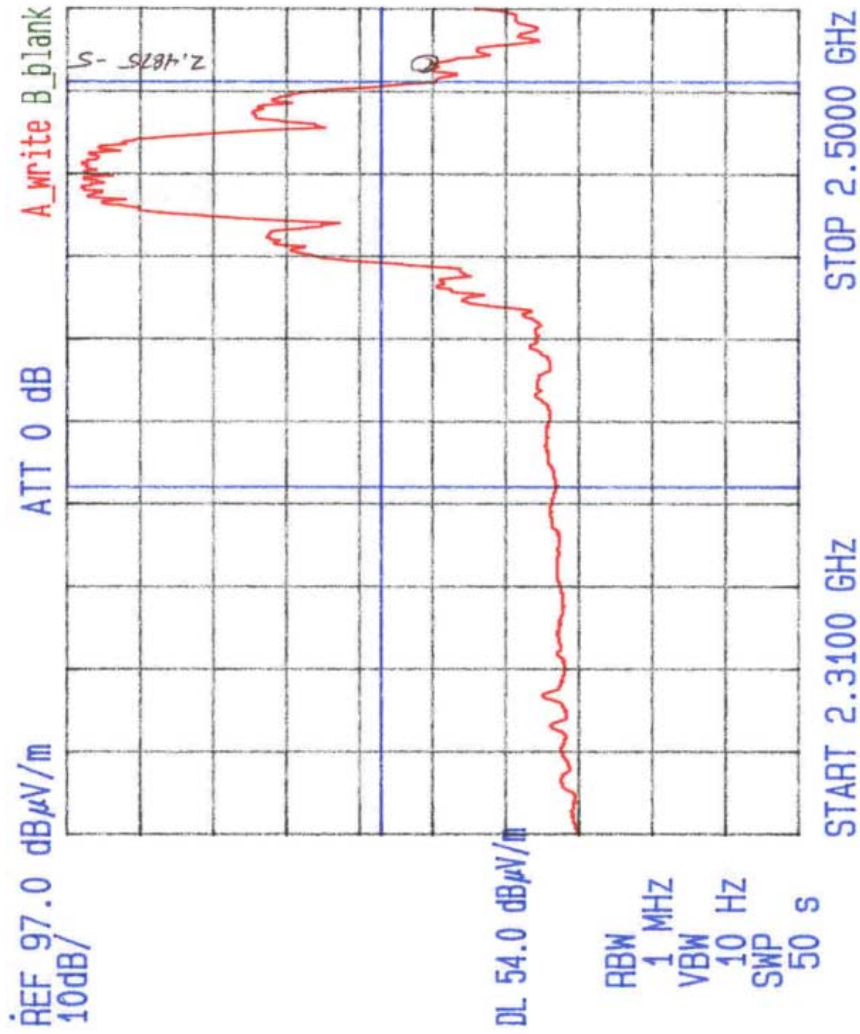
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Frequency (GHz)	Antenna Pol.	Measured (dB μ V/m)	Limit (dB μ V/m@ 3 Meters)	Margin (dB)	Data Rate
2.3855	H	46	54	-8	1Mbps
2.3855	V	49	54	-5	1Mbps
2.3820	V	46	54	-8	1Mbps
2.3820	H	46.5	54	-7.5	11Mbps
2.3820	H	44	54	-10	11Mbps
2.3855	V	48.5	54	-5.5	11Mbps
2.3820	V	45	54	-9	11Mbps
2.488	V	47	54	-7	1Mbps
2.488	V	48	54	-6	11Mbps



TEST: RESTRICTED BANDS	EUT: INTERSIL ISL 37300U REV.B2-1	S/N: 01220059
FREQ: 2.13GHz-2.50GHz	SPEC: 15.247	ANT. HT/POL: H
DETECTOR: AVERAGE	LINE UNDER TEST: 2.462GHz (1Mbps)	EUT POSITION:
DATE: 7-17-01	TEST SITE: 3 METER	TESTER: <i>AB</i>



DATA SHEET 6.4.3-32

6.4.4 Power Spectral Density 15.247(2)(d)

The transmit power density averaged over a 1 second interval shall not be greater than +8dBm in any 3KHz bandwidth within the band.

The peak point was selected after a Max hold was performed and the spectrum analyzer peak marker was positioned. The peak frequency was used as the center frequency. The RBW was set to 3KHz and the span width of 1.5MHz and sweep time of 500 seconds selected. Data Sheets 6.4.4-1 through 6.4.4-12 present the data plots for the three channels at the MIN and MAX data rates.

The results show the spectral density to be greater than 16dB below the +8dBm requirement.

Photo 5 is representative of this setup.