TEST REPORT

Report Number: 3095787LAX-001
Project Number: 3095787
April 20, 2006

Testing performed on the:
Wireless Detector and Remote for Pool Alarm System

Model:
AQUAGUARD

FCC ID: T5PAQUAGUARD

to
FCC Part 15 Subpart C (15.247)

For

RJE Technologies, Inc.

A2LA Certificate Number: 2085-01

Test Performed by:	**Test Authorized by:**
Intertek Testing Services	RJE Technologies, Inc.
27611 La Paz Rd., Suite C	15375 Barranca Pkwy., Suite B-107
Laguna Niguel, CA 92677	Irvine, CA 92618

Prepared by: _____ **Date:** 4/20/06
Sergey Marker, EMC Manager

Reviewed by: _____ **Date:** 4/21/06
Ollie Moyrong, EMC Manager

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1.0 Summary of Tests

FCC ID: T5PAQUAGUARD

TEST	REFERENCE	RESULTS
RF output power	15.247(b)	Complies
6 dB Bandwidth	15.247(a)(2)	Complies
Power Density	15.247(e)	Complies
Out of Band Antenna Conducted Emission	15.247(d)	Complies
Out of Band Radiated Emission (except emissions in restricted bands)	15.247(d)	Not performed. The EUT passed out-of-band antenna conducted emission
Radiated Emission in Restricted Bands	15.247(d), 15.209, 15.205	Complies
AC Conducted Emission	15.207	Complies
AC Conducted Emission from Digital Part and Receiver	15.107	Complies
Radiated Emission from Digital Part and Receiver	15.109	Complies
Antenna Requirement	15.203	Complies. Antenna integrated into PCB

2.0 General Description

2.1 Product Description

The model Aquaguard is a lower power high performance wireless Remote and Detector, designed for Pool Alarm System. The alarm mode can be set from Detector unit or from a Remote unit.

Overview of the Equipment under Test:

Applicant	RJE Technologies, Inc.
Model No.	AQUAGUARD
FCC Identifier	TP5QUAGUARD
Use of Product	The Aquaguard is a wireless detector and remote for pool alarm system.
Manufacturer & Model of Spread Spectrum Module	Chipcon AS SmartRF Model: CC2420, 2.4 GHz IEEE 802.15.4
Type of Transmission	Direct Sequence Spread Spectrum
Rated RF Output	1 mW (0 dBm)
Frequency Range	2405 – 2480 MHz
Type of modulation	O-QPSK with 250 kbps data rate
Number of Channel(s)	16, numbered 11 to 26
Antenna(s) & Gain,	Integrated into PCB. Antenna Gain 5 dBi
Antenna Requirement	Wire monopole inverted-F type, integrated into PCB
Manufacturer Name & Address	RJE Technologies, Inc., 15375 Barranca Pkwy., Suite B-107, Irvine, CA 92618

Note: Schematic diagram for transceiver identical for both Detector and Remote.

EUT receive date: April 10, 2006

EUT receive condition: The EUT was received in good condition with no apparent damage.

Test start date: April 11, 2006

Test completion date: April 20, 2006

The test results in this report pertain only to the item tested.

2.2 Related Submittal(s) Grants

Declaration of Conformity (DoC) for FCC Part 15 Subpart B

2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003). Radiated emission measurements were performed in 10 m Open Area Test Site. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

2.4 Test Facility

The test facility was a specially designed and constructed Open Area Test Site (OATS).
Test site included a metal ground plane constructed of 22-gauge sheet metal. It contained a 2.5 meter diameter turntable for floor standing equipment, and a fiber glass table measuring 1.5 x 1.5 x 0.8 meters for table top equipment. To facilitate testing, also it has heat and air conditioning systems to control environmental test conditions.
This test facility and site measurement data have been fully placed on file with the FCC, Industry of Canada and A2LA accredited.

Test Facility: Intertek ETL Semko
27611 La Paz Road, Suite C
Laguna Niguel, CA 92677

Accreditations:

FCC	Registration Number: 90711
A2LA	Certificate Number: 2085-01
IC	Reference Number: IC 3753

3.0 System Test Configuration

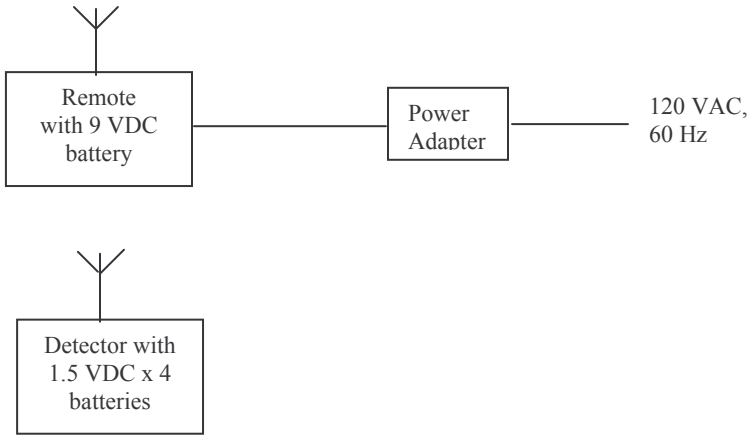
3.1 EUT

Item #	Description	Model No.	Serial No.
1	Wireless Keypad Detector	Aquaguard	054816709
2	Wireless Remote	Aquaguard	Not Labeled
3	12 VDC Power Adapter	35-12-200 made by CUI Inc	Not labeled

3.2 Support Equipment

Item #	Description	Model No.	Serial No.
None			

3.3 Block Diagram of Test Setup



S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

3.4 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

For radiated emission measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible).

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

3.5 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

3.6 Mode of Operation During Test

During testing, the transmitter was setup to transmit continuously at maximum RF power on low, middle and high channels with O-QPSK modulation and 250 kbps data rate.

Due to the fact that transceiver's circuits are identical for both units Detector and Remote, all conducted measurements were performed on the Detector unit.

3.7 Modifications Required for Compliance

Intertek installed no modifications during compliance testing in order to bring the product into compliance (Please note that this does not include changes made specifically by RJE Technologies, Inc. prior to compliance testing)

3.8 Additions, deviations and exclusions from standards

No additions, deviations or exclusions from the standard were made.

4.0 Measurement Results

4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rule 15.247(b)

Requirement

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm). For antennas with gains greater than 6 dBi, maximum allowed transmitter output level must be decreased by an amount equal to (GAIN - 6) dBm.

Procedure

The antenna of the EUT was disconnected and output of transceiver was connected to the input of Spectrum Analyzer. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals. RBW and VBW of spectrum analyzer were set to 10 MHz

Test Result

Frequency (MHz)	Output in dBm	Output in mWatt	Limit for 5.0 dBi Antenna Gain (mWatt)
2405 (channel 11)	-2.5	0.56	1000
2445 (channel 19)	-1.7	0.68	1000
2480 (channel 26)	-2.1	0.62	1000

4.2 6 dB RF Bandwidth,
FCC Rule 15.247(a)(2)

Requirement

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

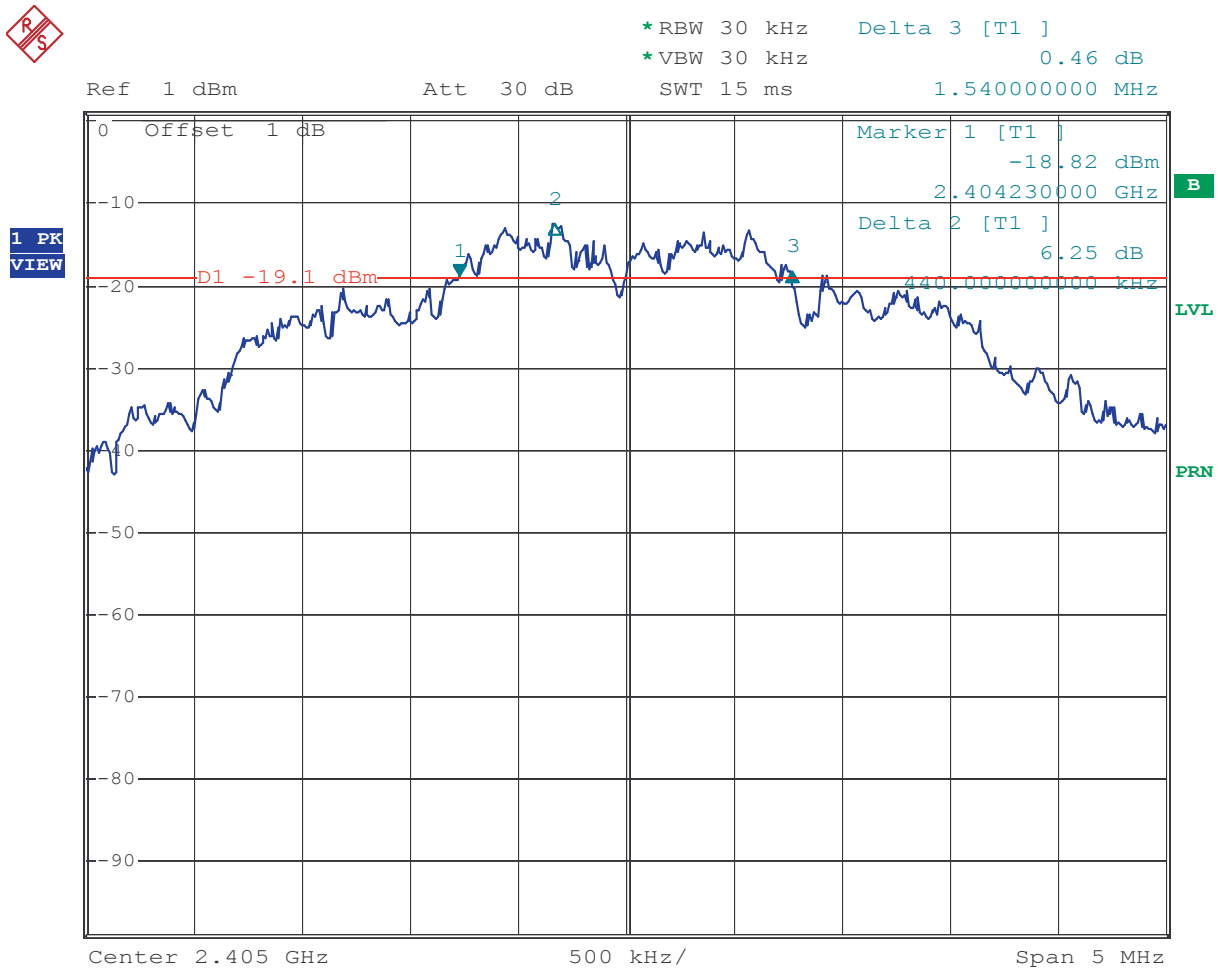
Procedure

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 30 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6-dB bandwidth was determined from where the channel output spectrum intersected the display line.

Test Result

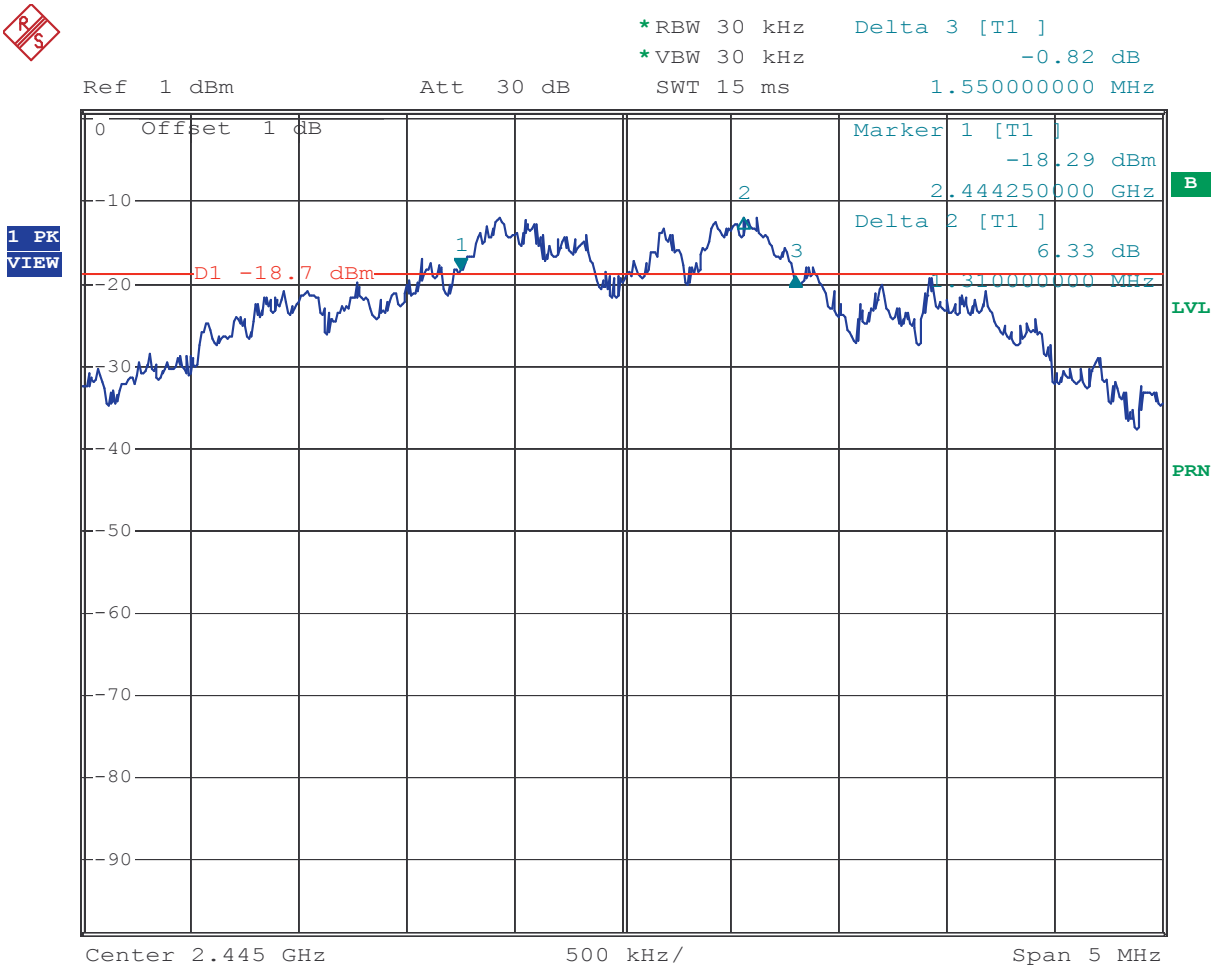
Frequency (MHz)	6 dB Bandwidth (MHz)	Plot
2405	1.54	2.1
2445	1.55	2.2
2480	1.46	2.3

Plot 2.1



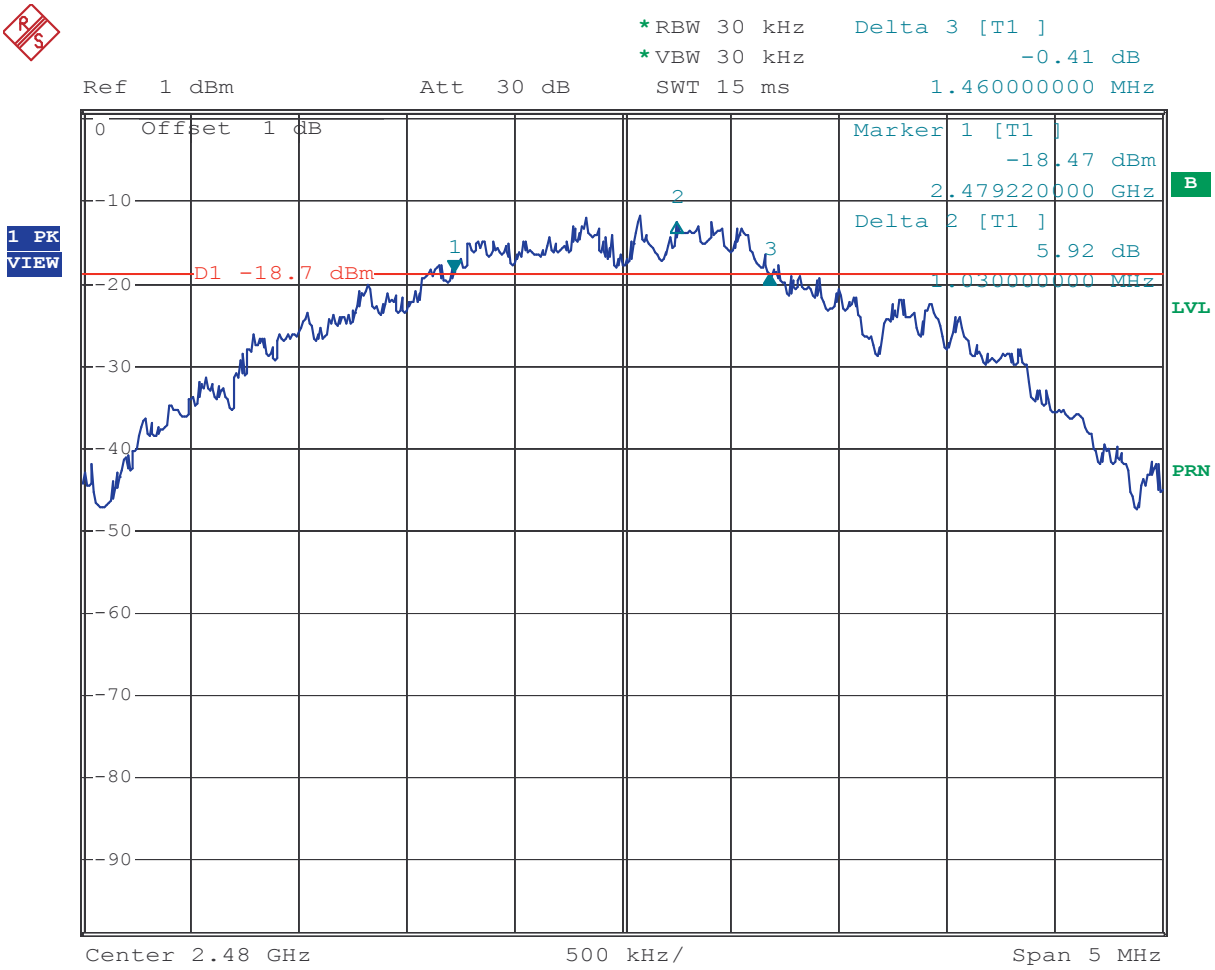
Comment: Channel 11, 6-dB Bandwidth
Date: 20.APR.2006 00:58:55

Plot 2.2



Comment: Channel 19, 6-dB Bandwidth
Date: 17.APR.2006 20:09:58

Plot 2.3



Comment: Channel 26, 6-dB Bandwidth
Date: 17.APR.2006 20:05:24

4.3 Power Density
FCC Rule 15.247(e)

Requirement

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. If there is no clear maximum amplitude in any given portion of the band, it may be necessary to make measurements at a number of bands defined by several START and STOP frequency pairs. Total SWEEP TIME is calculated as follows:

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

Frequency Span= 600 kHz

Sweep Time = Frequency Span/3 kHz = 200 seconds

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable is used, those losses are compensated for with the analyzer OFFSET function.

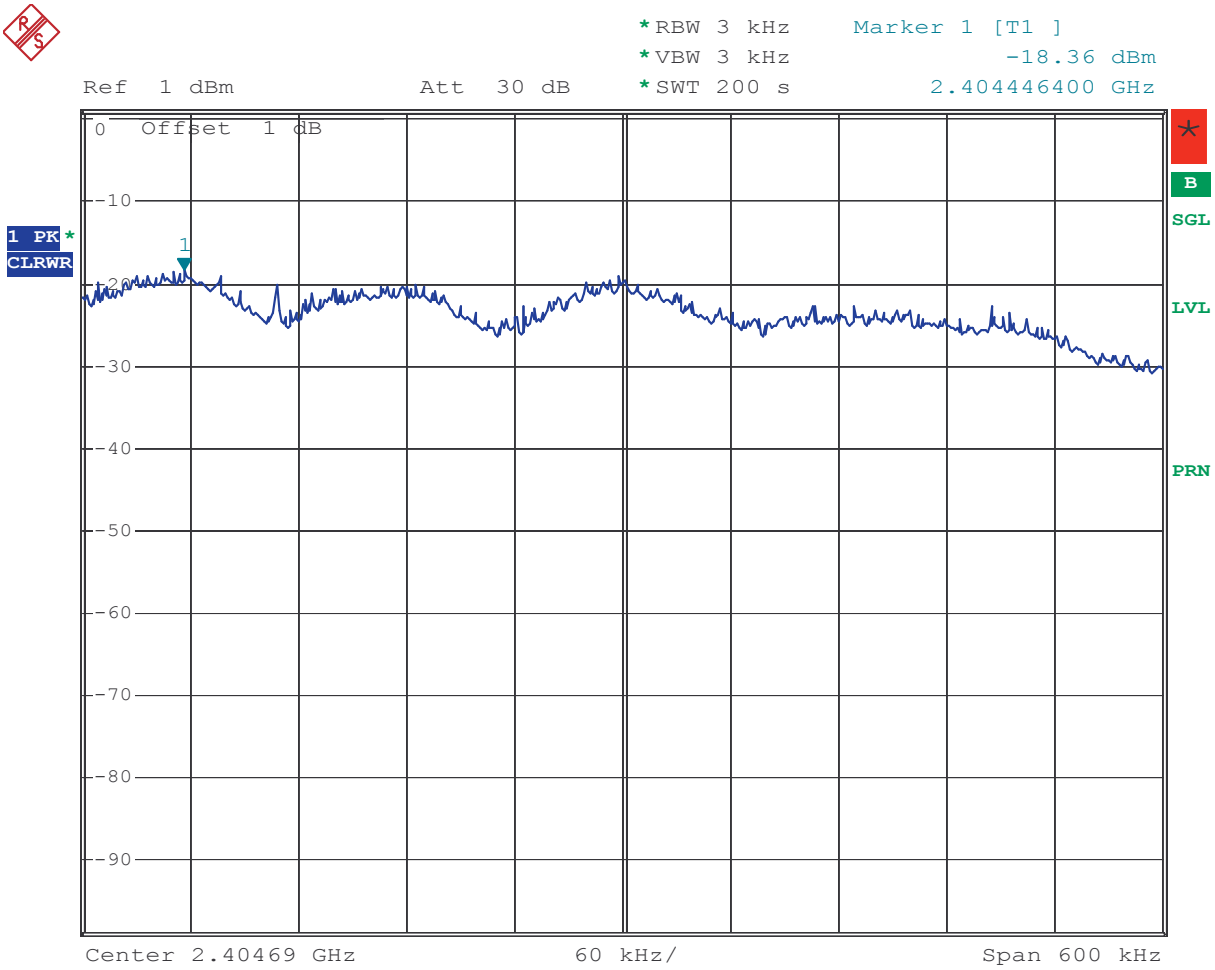
Test Result

Refer to the table below and plots.

Frequency (MHz)	Power Density (dBm)	Plot
2405	-18.4	3.1
2445	-17.7	3.2
2480	-17.1	3.3

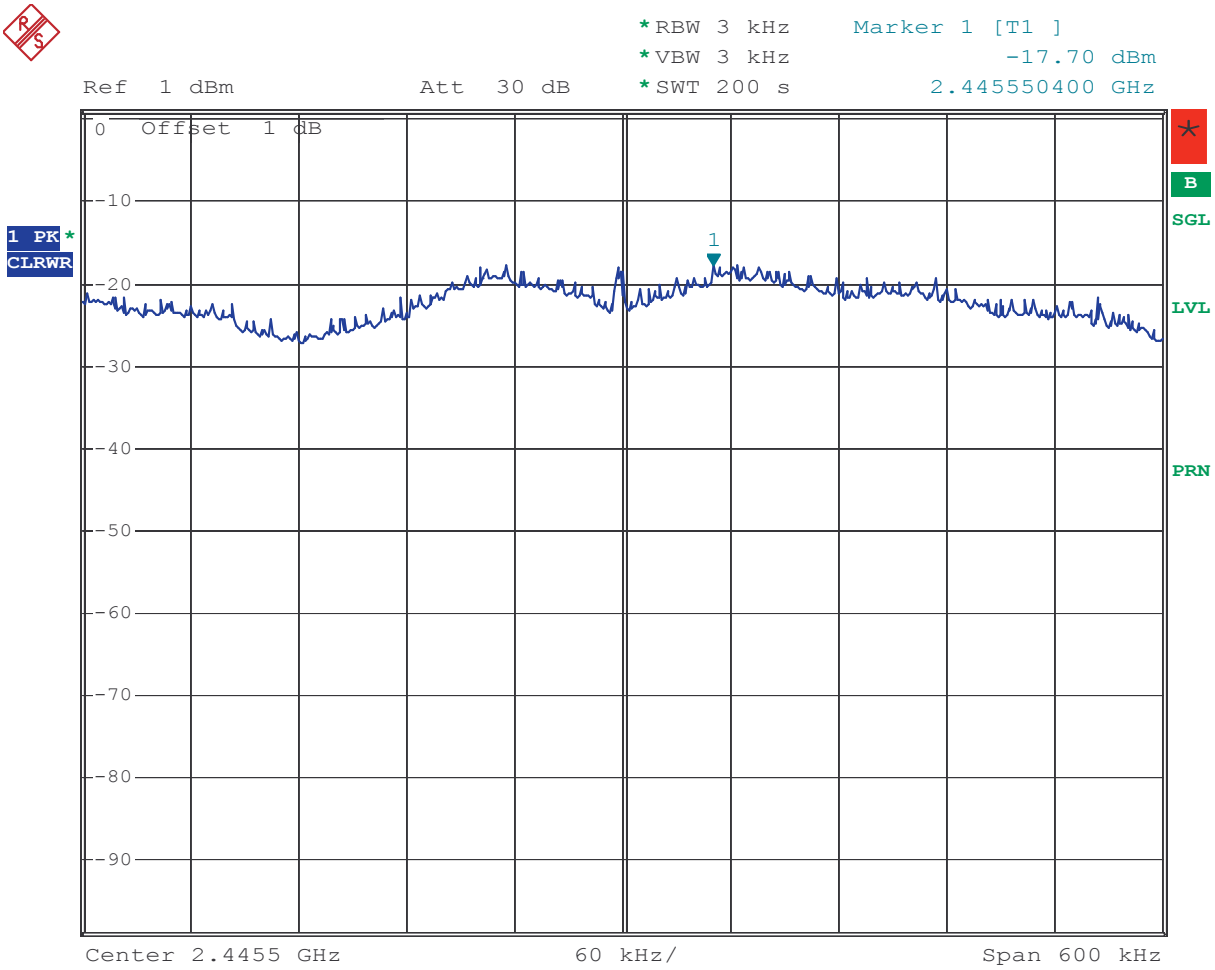
The EUT passed by 25.1 dB

Plot 3.1



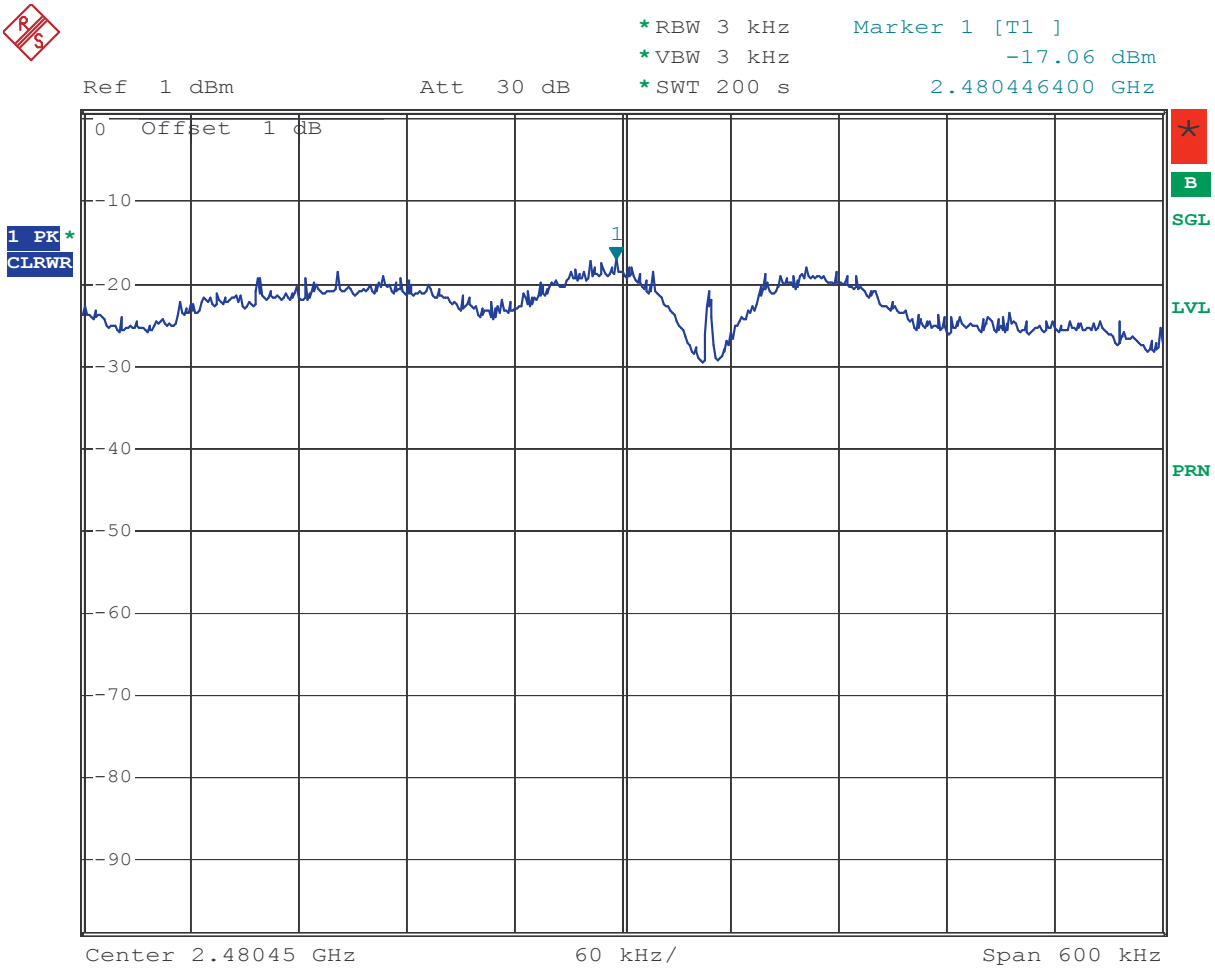
Comment: Channel 11, Power Density
Date: 17.APR.2006 20:24:16

Plot 3.2



Comment: Channel 19, Power Density
Date: 17.APR.2006 20:31:14

Plot 3.3



Comment: Channel 26, Power Density
Date: 17.APR.2006 20:37:24

4.4 Out-of-Band Conducted Emissions, FCC Rule 15.247(d)

Requirement

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

Procedure

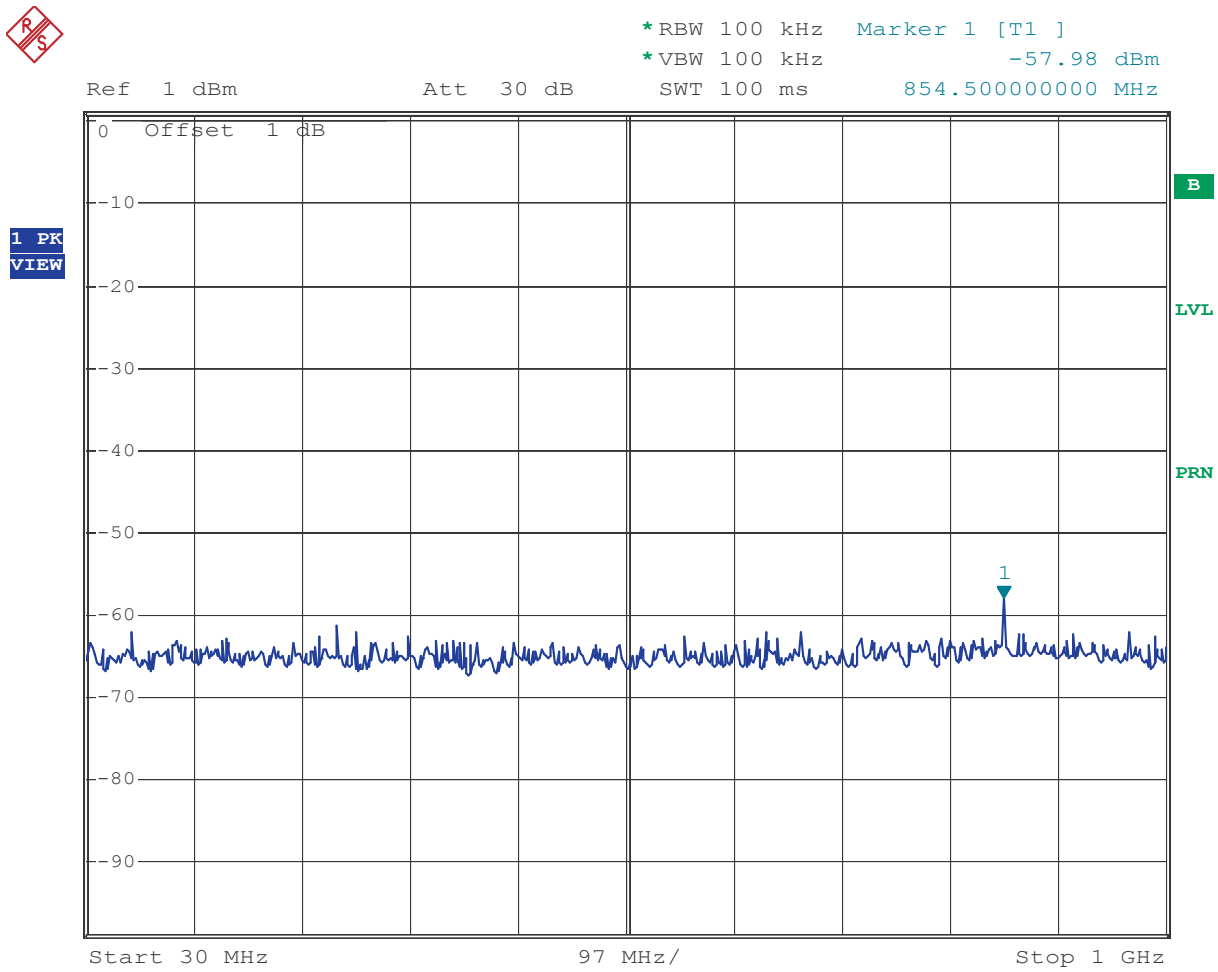
A spectrum analyzer was connected to the antenna port of the transmitter. Analyzer Resolution Bandwidth was set to 100 kHz. For each channel investigated, the in-band and out-of-band emission measurements were performed. The out-of-band emissions were measured from 30 MHz to 25 GHz.

Test Result

Refer to the table below and plots.

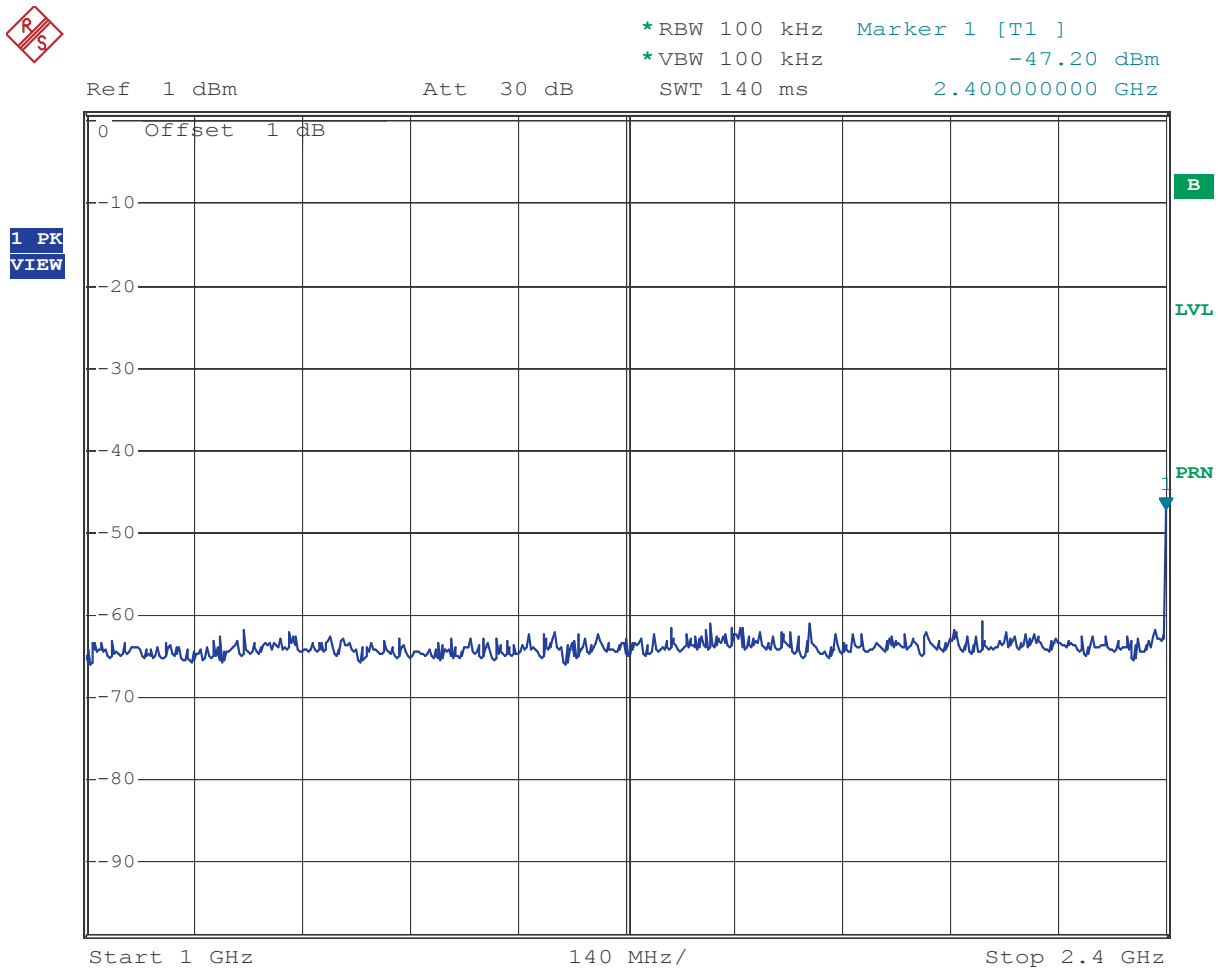
Frequency (MHz)	Description	Plot
2405	Scan 30 MHz – 1 GHz	4.1
	Scan 1 GHz – 2.4 GHz	4.2
	Scan 2.4 GHz – 2.4835 GHz	4.3
	Scan 2.4835 GHz – 25 GHz	4.4
2445	Scan 30 MHz – 1 GHz	4.5
	Scan 1 GHz – 2.4 GHz	4.6
	Scan 2.4 GHz – 2.4835 GHz	4.7
	Scan 2.4835 GHz – 25 GHz	4.8
2480	Scan 30 MHz – 1 GHz	4.9
	Scan 1 GHz – 2.4 GHz	4.10
	Scan 2.4 GHz – 2.4835 GHz	4.11
	Scan 2.4835 GHz – 3 GHz	4.12
	Scan 3 GHz – 25 GHz	4.13

Plot 4.1



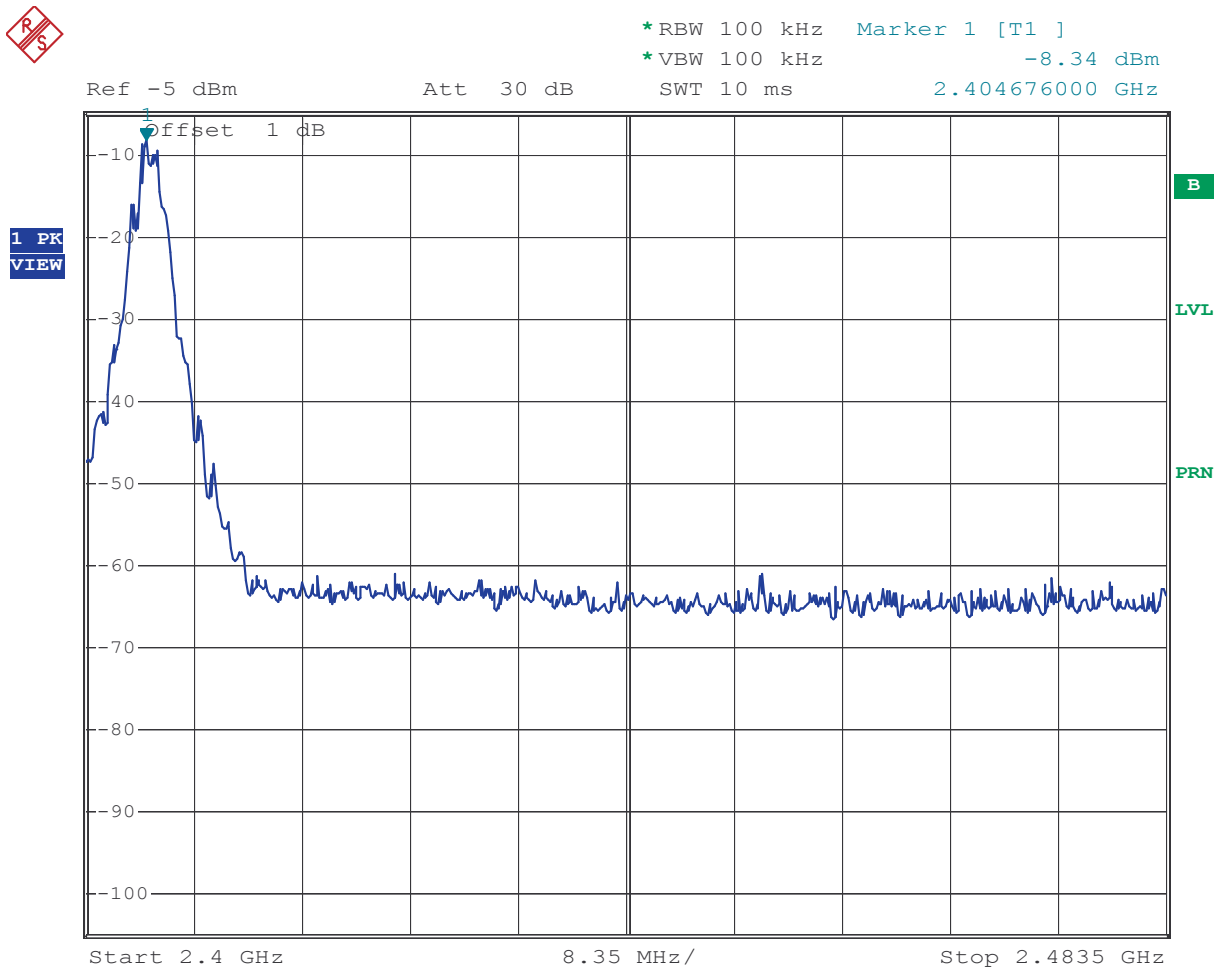
Comment: Channel 11, Out-of-Band Emissions
Date: 17.APR.2006 22:27:38

Plot 4.2



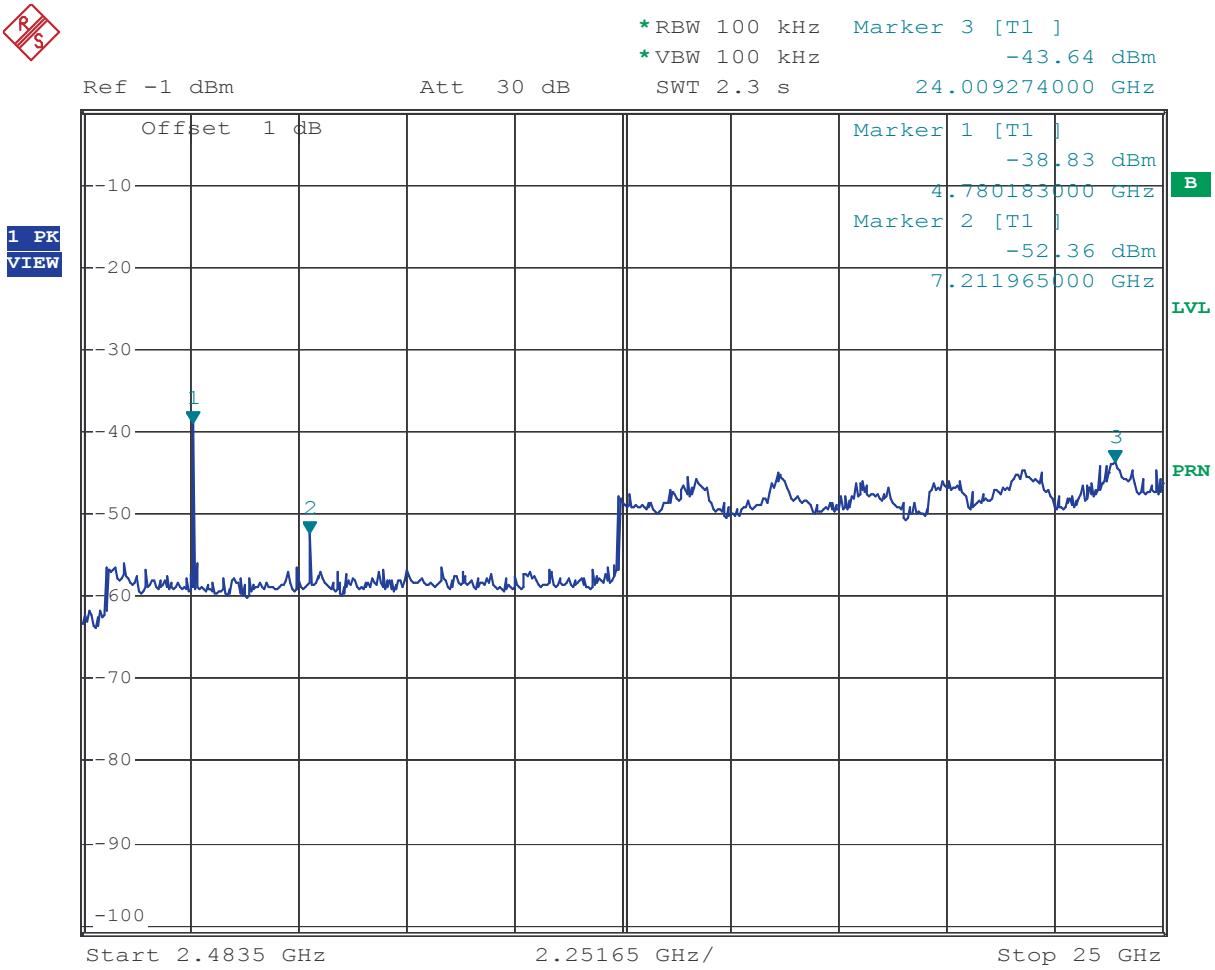
Comment: Channel 11, Out-of-Band Emissions
Date: 17.APR.2006 22:30:01

Plot 4.3



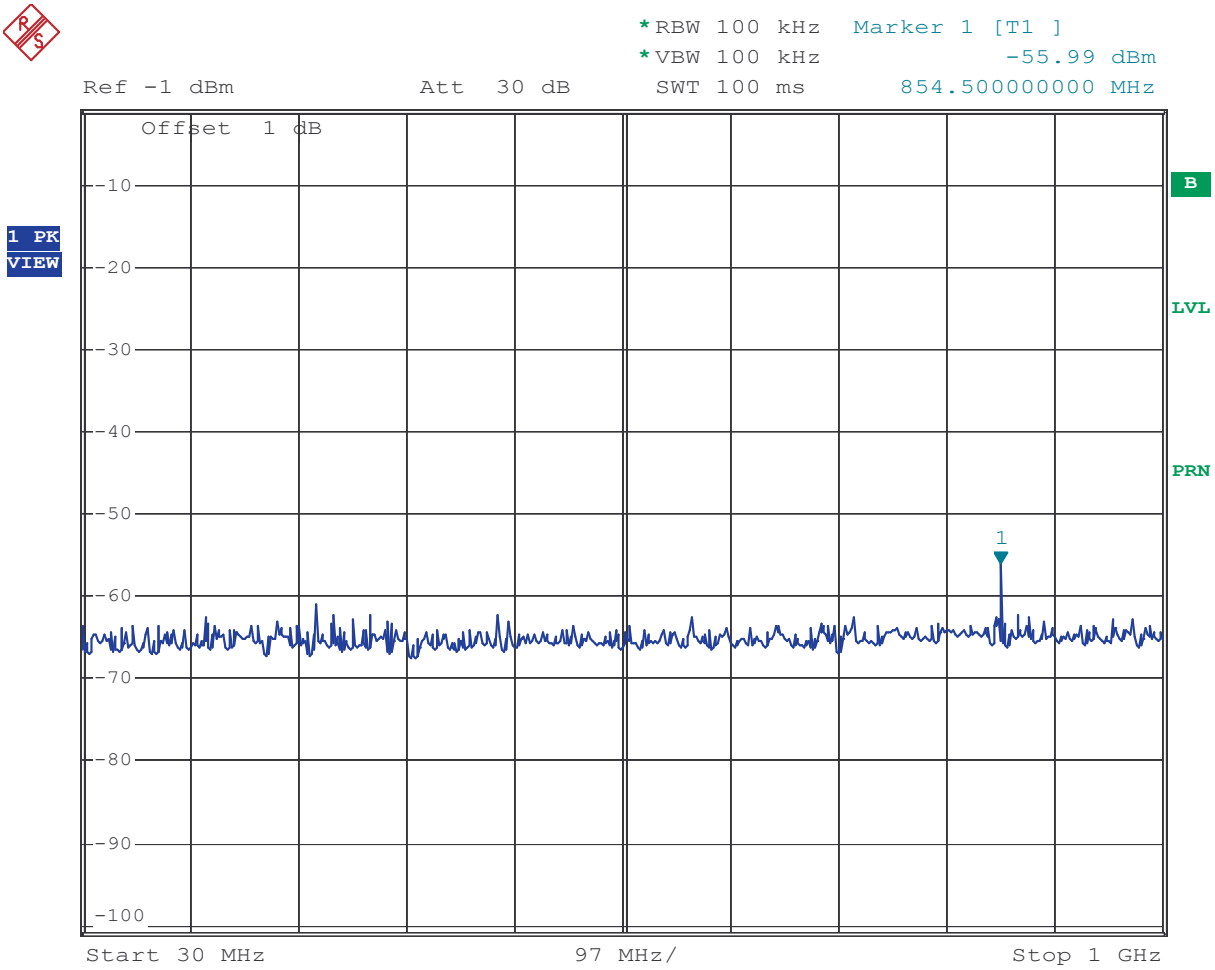
Comment: Channel 11, Out-of-Band Emissions
Date: 17.APR.2006 22:34:38

Plot 4.4



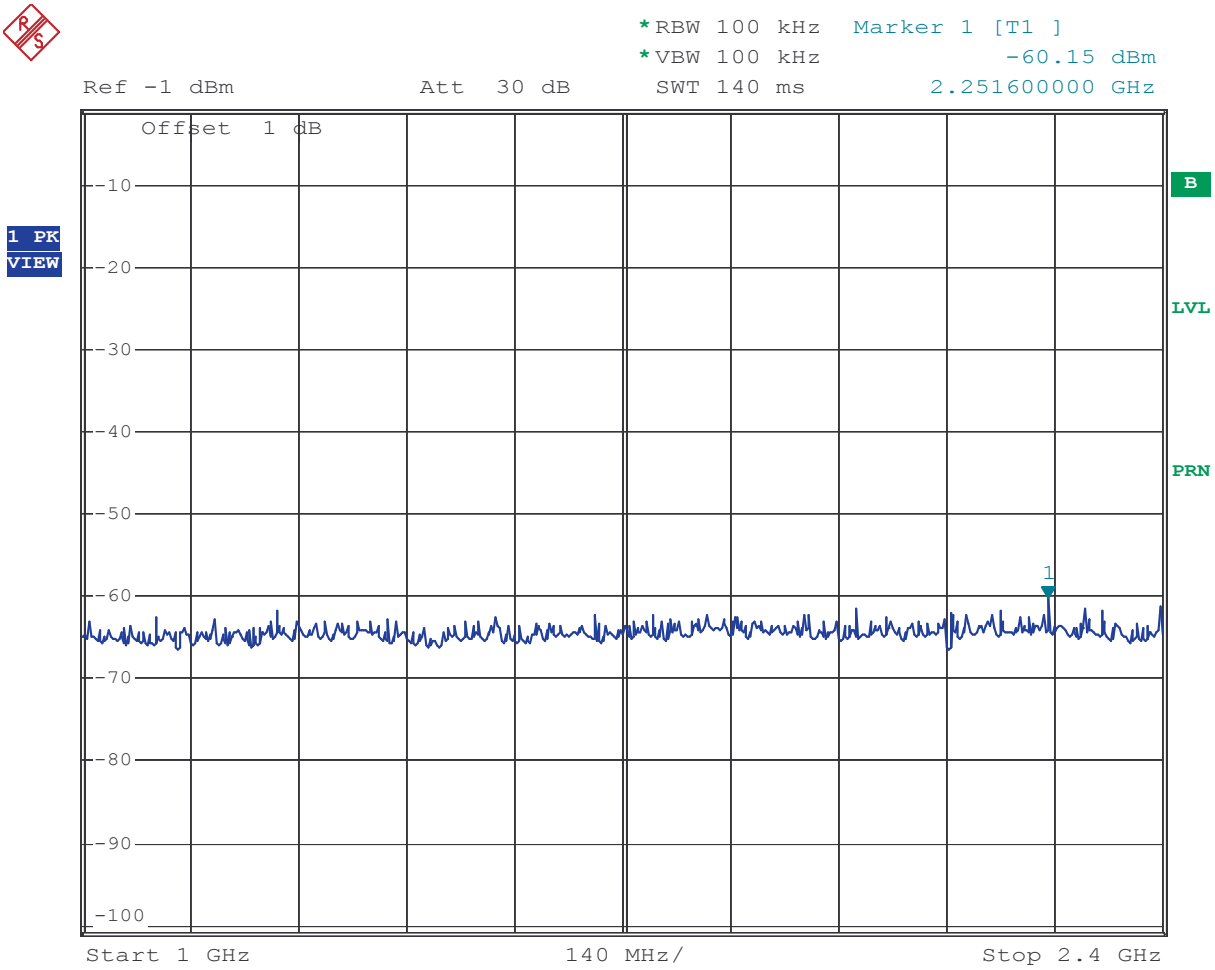
Comment: Channel 11, Out-of-Band Emissions
Date: 17.APR.2006 22:41:52

Plot 4.5



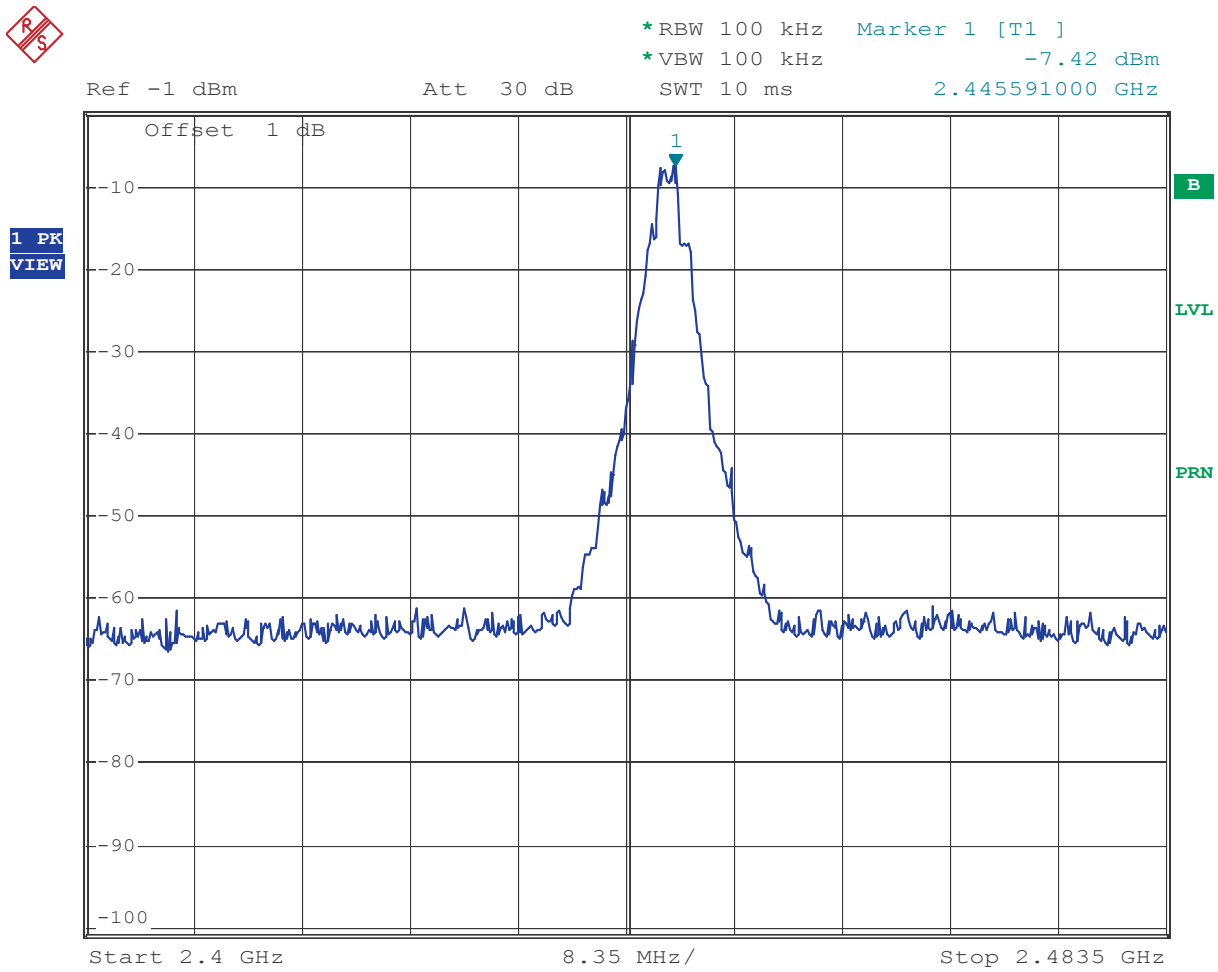
Comment: Channel 19, Out-of-Band Emissions
Date: 17.APR.2006 22:49:03

Plot 4.6



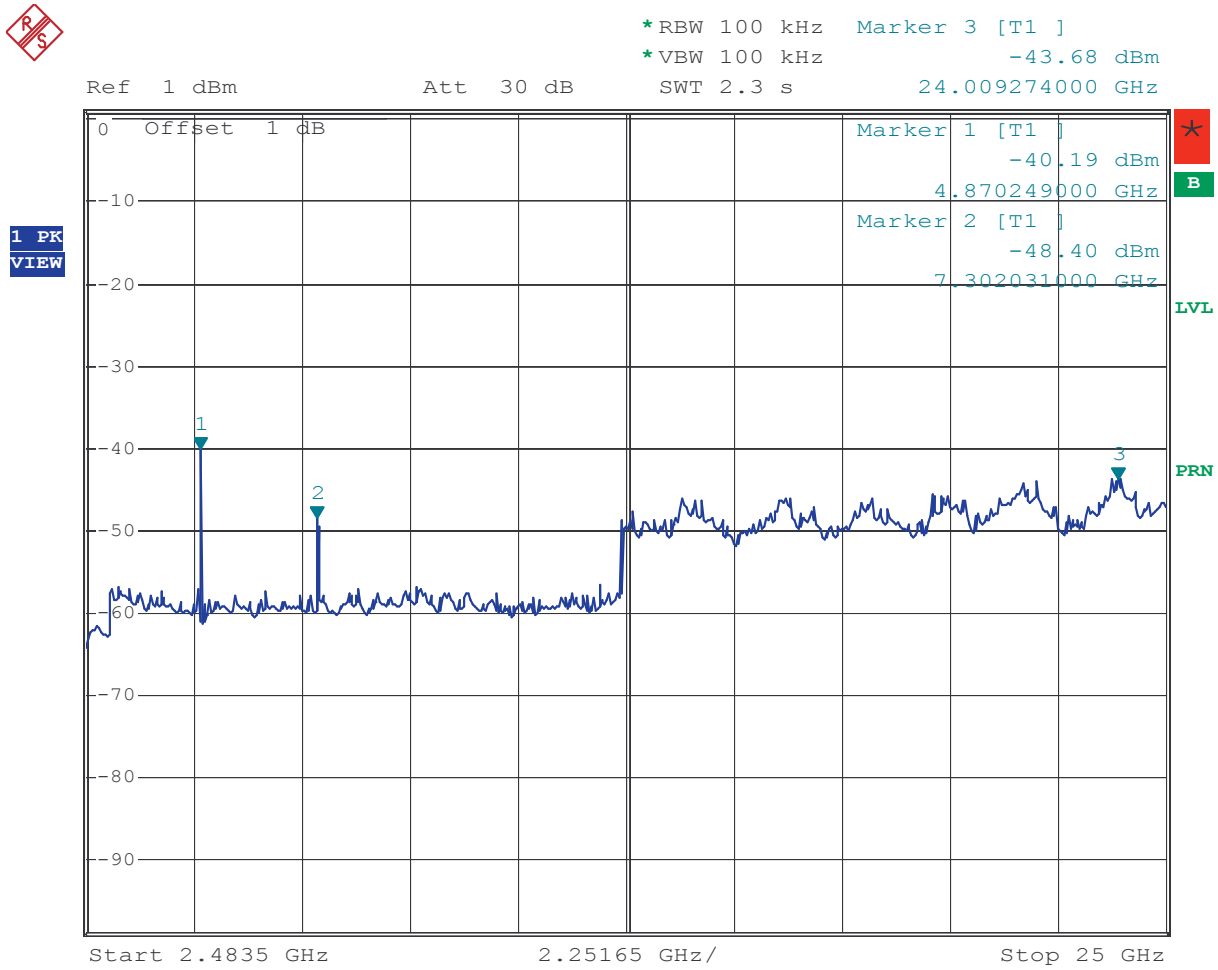
Comment: Channel 19, Out-of-Band Emissions
Date: 17.APR.2006 22:50:27

Plot 4.7



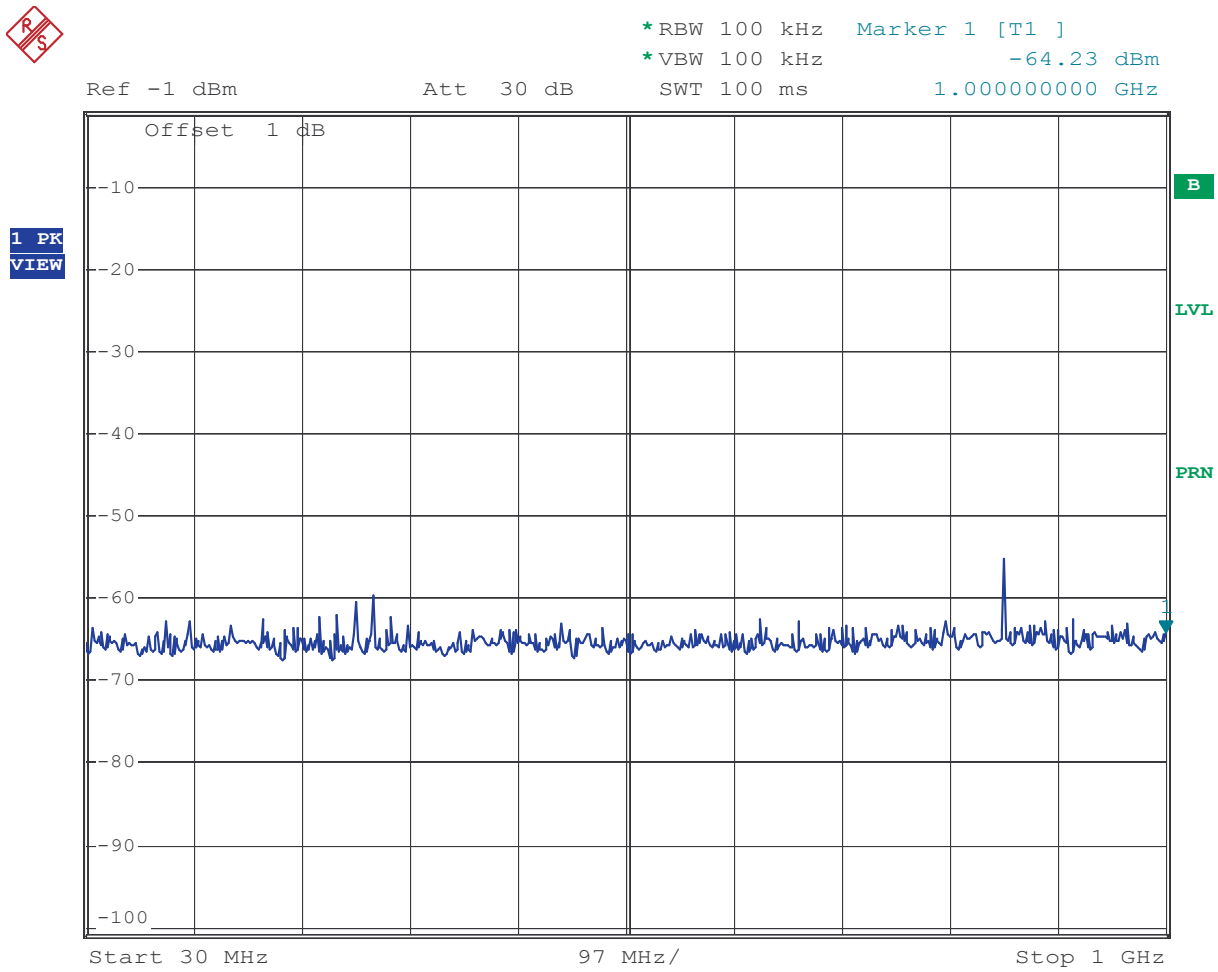
Comment: Channel 19, Out-of-Band Emissions
Date: 17.APR.2006 22:51:54

Plot 4.8



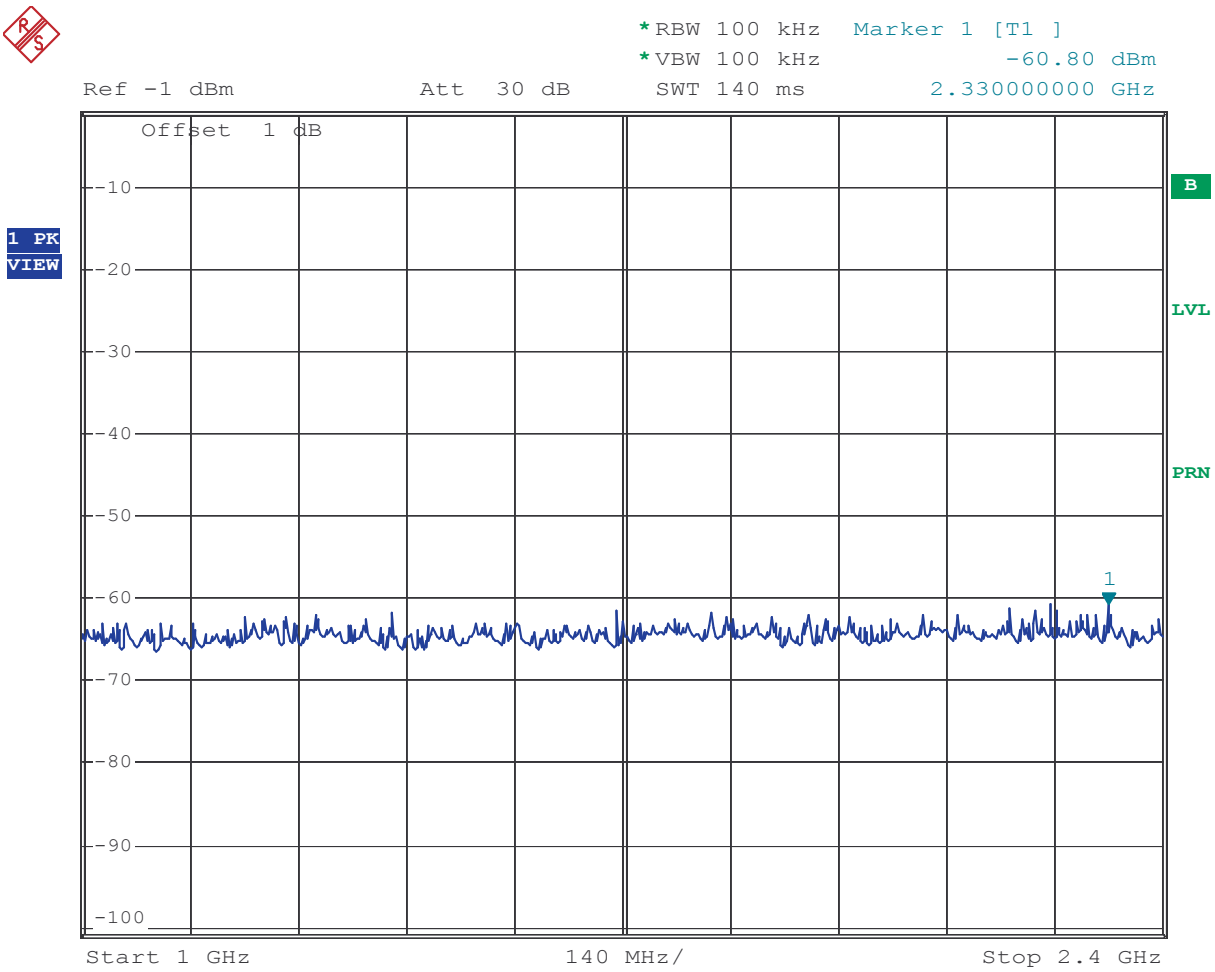
Comment: Channel 19, Out of band emission
Date: 20.APR.2006 00:52:51

Plot 4.9



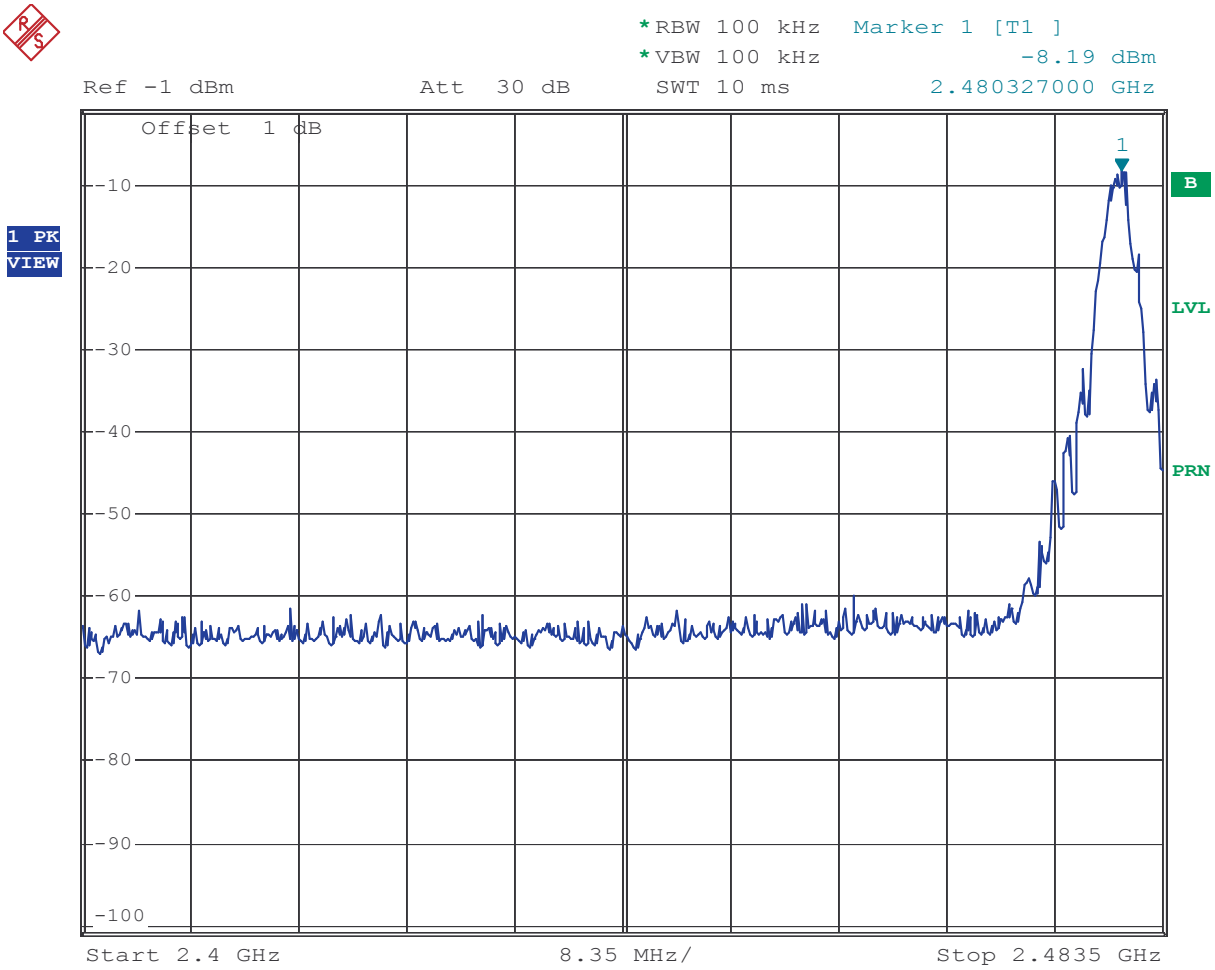
Comment: Channel 26, Out-of-Band Emissions
Date: 17.APR.2006 22:59:53

Plot 4.10



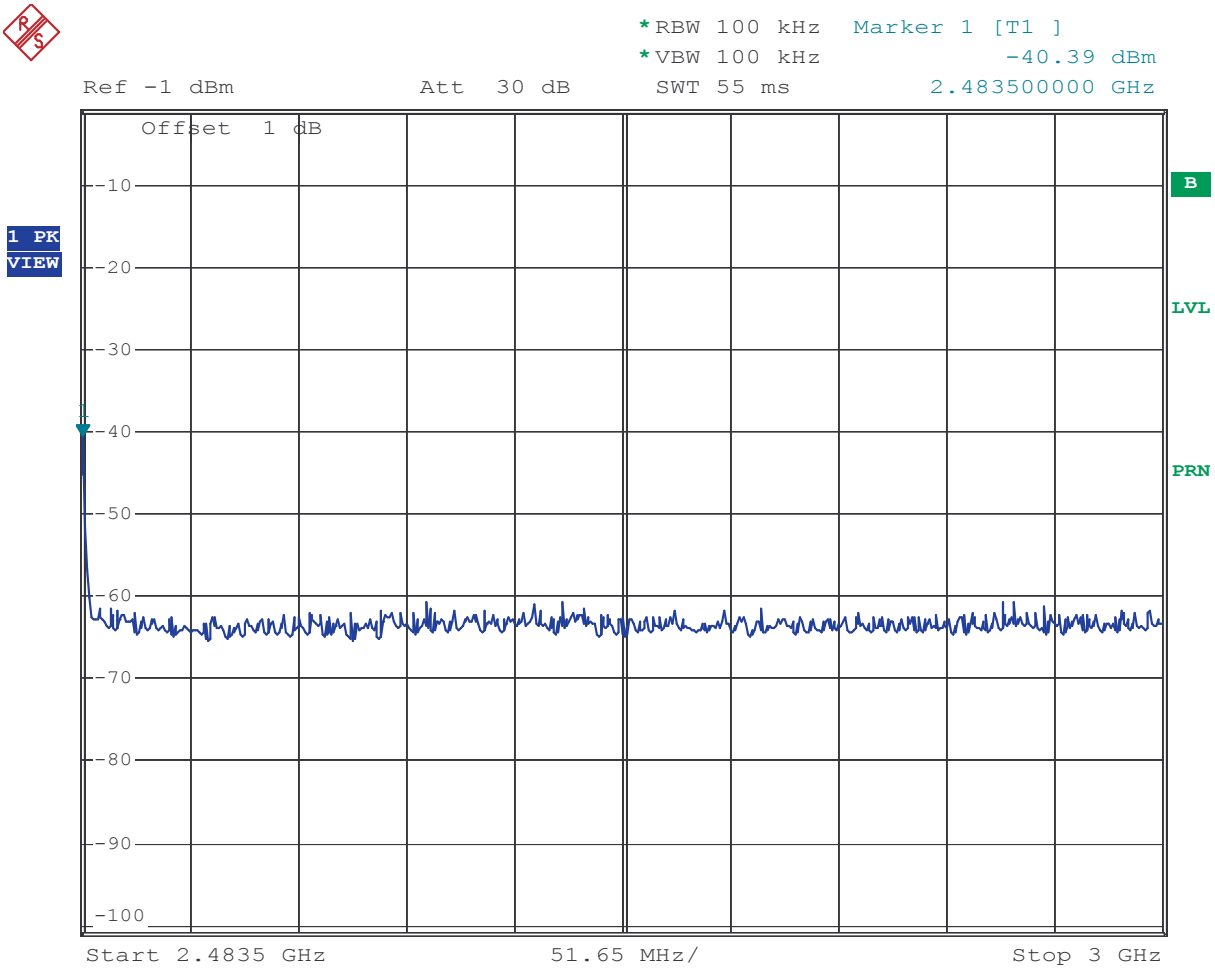
Comment: Channel 26, Out-of-Band Emissions
Date: 17.APR.2006 23:02:23

Plot 4.11



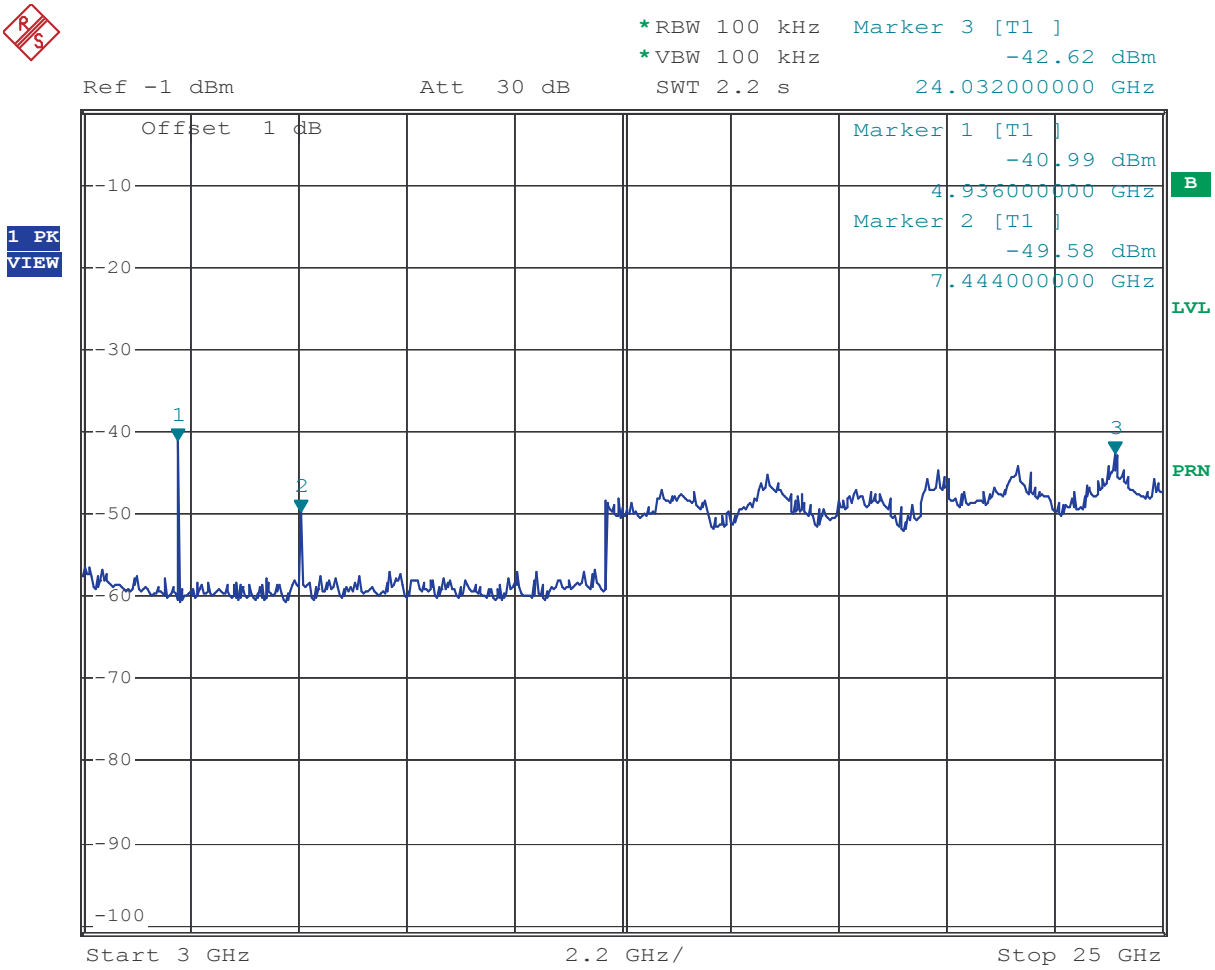
Comment: Channel 26, Out-of-Band Emissions
Date: 17.APR.2006 23:09:58

Plot 4.12



Comment: Channel 26, Out-of-Band Emissions
Date: 17.APR.2006 23:12:38

Plot 4.13



Comment: Channel 26, Out-of-Band Emissions
Date: 17.APR.2006 23:14:26

4.5 Out of Band Radiated Emissions (except emissions in restricted bands)
FCC Rule 15.247(d)

Procedure

For out of band radiated emissions (except for frequencies in restricted bands) that are close to or that exceed the 20 dB attenuation requirement described in the specification, radiated measurements were performed at a 3 m separation distance to determine whether these emissions complied with the general radiated emission requirement.

Test Result

Test was not performed, the EUT passed out-of-band antenna conducted emission test.

4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.247(d), 15.209, 15.205

Procedure

Radiated emission measurements were performed from 30 MHz to 25,000 MHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz - for frequencies above 1000 MHz.

The EUT is placed on a plastic turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three-meter reading using inverse scaling with distance.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels).

Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with antennas, cables, preamplifiers (if any) and average factors (when specified limits is in average and measurements are made with peak detectors) The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG + AV

where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude in dB(μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB/m
AG = Amplifier Gain in dB
AV = Average Factor in (-dB)

Assume a receiver reading of 52.0 dB(μV) is obtained. The antenna factor of 7.4 dB/m ,cable factor of 4.6 dB and average factor of -5.1dB are added. The amplifier gain of 27 dB is subtracted, giving a field strength of 32 dB(μV/m).

RA = 52 dB(μV) CF = 1.6 dB AV = -5.1 dB
AF = 7.4 dB/m AG = 29 dB FS = 52 + 7.4 + 4.7 – 27 – 5.1 = 32 dB(μV/m)

This value in dB(μV/m) was converted to its corresponding level in μV/m.
Level in μV/m = Common Antilogarithm {[32 dB(μV/m)]/20} = 39.8 μV/m
Note: In the following table(s), the level shown on the data table includes the antenna factor, cable factor and preamplifier gain.

Calculation of Average Factor.

Average Factor (AV) in dB = 20 log (duty cycle)

The specification for output field strength for frequencies above 1000 MHz according to FCC rules specify measurements with average detectors. During the tests EUT was wired to operate at continuous transmitting mode (CW). For field strength measurements of emission from transmitter, average factor was calculated and added to the peak emission obtained in CW mode and compared to the limit specified for average detector.

The time period over the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for calculation.
The duty cycle is simply the 0n-time divided by the period:

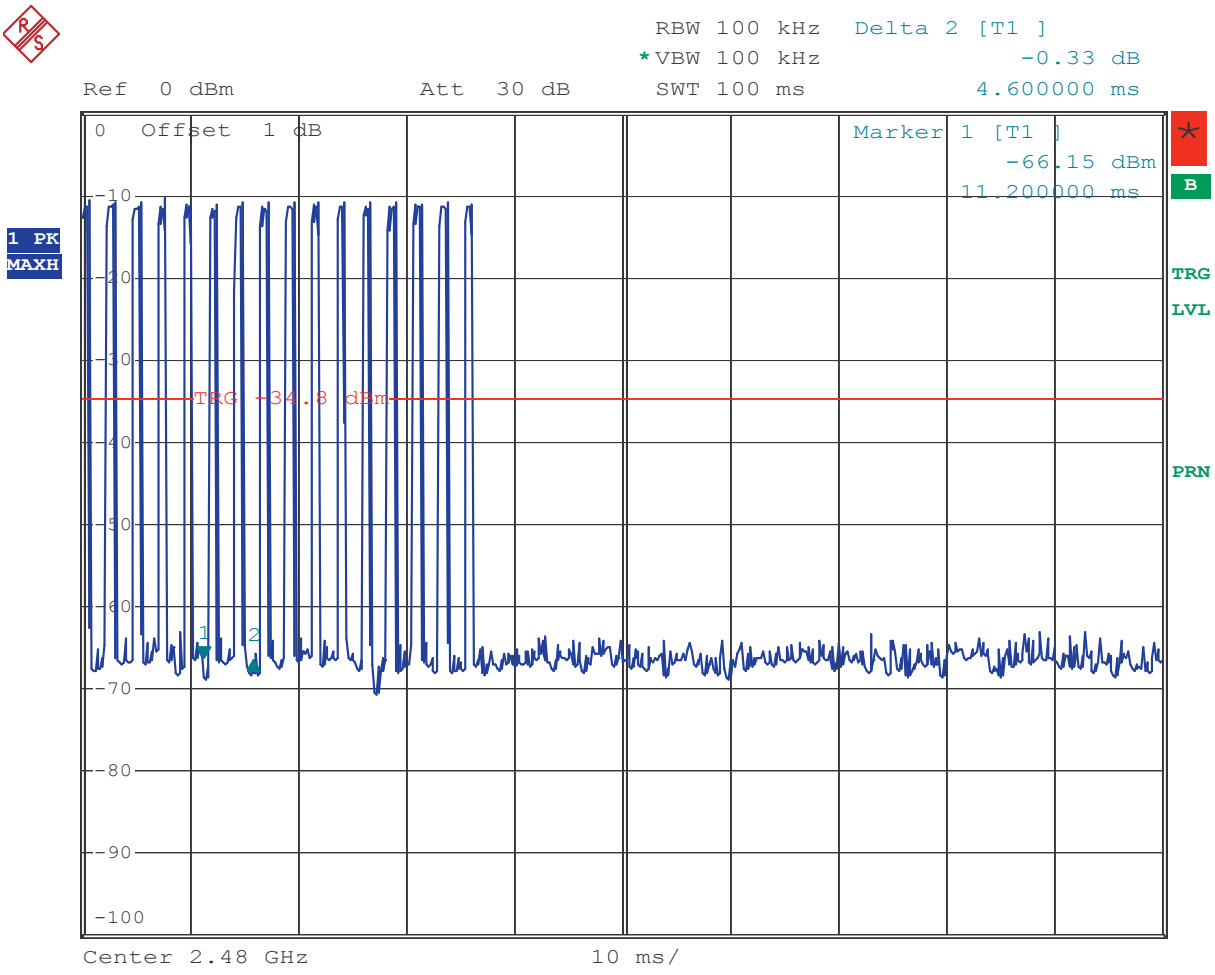
Time period = 100 ms
Number of frames = 16
A frame is 23 bytes long and 1 byte takes 32 microseconds to be sent.

Effective period of the cycle = 0.032 ms x 23 x 16 = 11.8 ms

DC = 11.8 ms/100 ms = 0.118

AV = 20 log 0.118 = -18.6 dB

Plot on the next page shows the transmission timing over 100 ms time frame.



Comment: Channel 26, Duty Cycle
Date: 18.APR.2006 01:33:36

Test Result

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance for the worst-case configuration.

The EUT passed the test by 5.5 dB.

Temperature: 21.0 C								RJE Technologies, Inc.		
Humidity: 48.8 %								Model: Aquaguard Detector		
Measured at 1 & 3 m										
Frequency MHz	Polarity	Detector	SA reading dB(uV)	Cable loss dB	Pre- amp gain dB	Ant. factor dB(1/m)	D.C.F dB	Field Strength dB(uV/m)	Limit dB(uV/m)	Margin dB
Tx, @ 2405 MHz										
2390	H	Peak	45.3	6.2	-37.0	28.2	0	42.7	74	-31.3
2390	H	Aver	26.7	6.2	-37.0	28.2	0	24.1	54	-29.9
4810	V	Peak	60.2	8.2	-37.0	33.1	0	64.5	74	-9.5
4810	V	Aver	41.6	8.2	-37.0	33.1	0	45.9	54	-8.1
*12025	V/H	Peak	47.6	12.5	-38.8	39.3	-9.5	51.1	74	-22.9
*12025	V/H	Aver	29.0	12.5	-38.8	39.3	-9.5	32.5	54	-21.5
*19240	V/H	Peak	56.7	6.7	-52.6	45.6	-9.5	41.8	74	-32.2
*19240	V/H	Aver	38.1	6.7	-52.6	45.6	-9.5	23.2	54	-30.8
Tx, @ 2445 MHz										
4890	H	Peak	59.2	7.7	-37.0	33.4	0	63.3	74	-10.7
4890	H	Aver.	40.6	7.7	-37.0	33.4	0	44.7	54	-9.3
*7335	V/H	Peak	28.2	9.5	-36.9	36.0	0	36.8	74	-17.2
*7335	V/H	Aver	46.8	9.5	-36.9	36.0	0	55.4	54	-18.6
*12225	V/H	Peak	47.3	12.2	-37.8	39.0	-9.5	51.2	74	-22.8
*12225	V/H	Aver	28.7	12.2	-37.8	39.0	-9.5	32.6	54	-21.4
*19560	V/H	Peak	56.4	5.4	-54.0	45.4	-9.5	43.7	74	-30.3
*19560	V/H	Aver	37.8	5.4	-54.0	45.4	-9.5	25.1	54	-28.9
Tx, @ 2462 MHz										
4960	H	Peak	58.8	8.4	-37.2	32.5	0	62.5	74	-11.5
4960	H	Aver	40.2	8.4	-37.2	32.5	0	43.9	54	-10.1
*7440	V/H	Peak	47.1	9.9	-36.9	36.6	0	56.7	74	-17.3
*7440	V/V	Aver	28.5	9.9	-36.9	36.6	0	38.1	54	-15.9
*12400	V/H	Peak	46.7	12.5	-35.3	38.9	-9.5	53.3	74.0	-20.7
*12400	V/H	Aver	28.1	12.5	-35.3	38.9	-9.5	34.7	54.0	-19.3
*14880	V/H	Peak	52.7	13.1	-35.4	41.0	-9.5	61.9	74.0	-12.1
*14880	V/H	Aver	34.1	13.1	-35.4	41.0	-9.5	43.3	54.0	-10.7
*19840	V/H	Peak	56	5.4	-53.4	45.6	-9.5	44.1	74.0	-29.9
*19840	V/H	Aver	37.4	5.4	-53.4	45.6	-9.5	25.5	54.0	-28.5
*22320	V/H	Peak	56.4	6.8	-52.6	45.7	-9.5	46.8	74.0	-27.2
*22320	V/H	Aver	37.8	6.8	-52.6	45.7	-9.5	28.2	54.0	-25.8

* Noise floor

Radiated Emission in Restricted Bands at the band-edge frequencies
(measured using the "delta" method)

Frequency GHz	Polarity	Detector	SA reading dB(uV)	Cable loss dB	Ant. factor dB(1/m)	Field Strength at 3 m dB(uV/m)	Limit at 3 m dB(uV/m)	Margin dB
2.480	H	Peak	65.0	6.2	28.4	99.6	-	-
2.480	H	Aver.	46.4	6.2	28.4	81.0	-	-
2.4835 –2.5	V	Peak	-	-	-	99.6 – 32.5=67.1*	74.0	-6.9
2.4835 –2.5	V	Aver.	-	-	-	81.0-32.5=48.5*	54.0	-5.5

* delta = 32.5 dB obtained from plot 5.1

Refer to the following plots

Band-edge frequency	Delta, dB	Plot
2483.5	-41.8	5.1
2640 MHz	-32.5	5.1

Temperature: 21.0 C								RJE Technologies, Inc.		
Humidity: 48.8 %								Model: Aquaguard Remote		
Measured at 1 & 3 m										
Frequency MHz	Polarity	Detector	SA reading dB(uV)	Cable loss dB	Pre- amp gain dB	Ant. factor dB(1/m)	D.C.F dB	Field Strength dB(uV/m)	Limit dB(uV/m)	Margin dB
Tx, @ 2405 MHz										
2390	H	Peak	45.7	6.2	-37.0	28.2	0	43.1	74	-30.9
2390	H	Aver	27.1	6.2	-37.0	28.2	0	24.5	54	-29.5
4810	V	Peak	53.3	8.2	-37.0	33.1	0	57.6	74	-16.4
4810	V	Aver	34.7	8.2	-37.0	33.1	0	39.0	54	-15.0
*12025	V/H	Peak	46.8	12.5	-38.8	39.3	-9.5	50.3	74	-23.7
*12025	V/H	Aver	28.2	12.5	-38.8	39.3	-9.5	31.7	54	-22.3
*19240	V/H	Peak	56.7	6.7	-52.6	45.6	-9.5	41.8	74	-32.2
*19240	V/H	Aver	38.1	6.7	-52.6	45.6	-9.5	23.2	54	-30.8
Tx, @ 2445 MHz										
4890	H	Peak	55.4	7.7	-37.0	33.4	0	59.5	74	-14.5
4890	H	Aver.	36.8	7.7	-37.0	33.4	0	40.9	54	-13.1
*7335	V/H	Peak	45.5	9.5	-36.9	36.0	0	54.1	74	-19.9
*7335	V/H	Aver	26.9	9.5	-36.9	36.0	0	35.5	54	-18.5
*12225	V/H	Peak	46.8	12.2	-37.8	39.0	-9.5	50.7	74	-23.3
*12225	V/H	Aver	28.2	12.2	-37.8	39.0	-9.5	32.1	54	-21.9
*19560	V/H	Peak	56.4	5.4	-54.0	45.4	-9.5	43.7	74	-30.3
*19560	V/H	Aver	37.8	5.4	-54.0	45.4	-9.5	25.1	54	-28.9
Tx, @ 2462 MHz										
4960	H	Peak	56.0	8.4	-37.2	32.5	0	59.7	74	-14.3
4960	H	Aver	37.4	8.4	-37.2	32.5	0	41.1	54	-12.9
*7440	V/H	Peak	45.8	9.9	-36.9	36.6	0	55.4	74	-18.6
*7440	V/V	Aver	27.2	9.9	-36.9	36.6	0	36.8	54	-17.2
*12400	V/H	Peak	46.7	12.5	-35.3	38.9	-9.5	53.3	74.0	-20.7
*12400	V/H	Aver	28.1	12.5	-35.3	38.9	-9.5	34.7	54.0	-19.3
*14880	V/H	Peak	52.3	13.1	-35.4	41.0	-9.5	61.5	74.0	-12.5
*14880	V/H	Aver	33.7	13.1	-35.4	41.0	-9.5	42.9	54.0	-11.1
*19840	V/H	Peak	56.0	5.4	-53.4	45.6	-9.5	44.1	74.0	-29.9
*19840	V/H	Aver	37.4	5.4	-53.4	45.6	-9.5	25.5	54.0	-28.5
*22320	V/H	Peak	56.4	6.8	-52.6	45.7	-9.5	46.8	74.0	-27.2
*22320	V/H	Aver	37.8	6.8	-52.6	45.7	-9.5	28.2	54.0	-25.8

* Noise floor

Remote unit, Radiated Emission in Restricted Bands at the band-edge frequencies
(measured using the "delta" method)

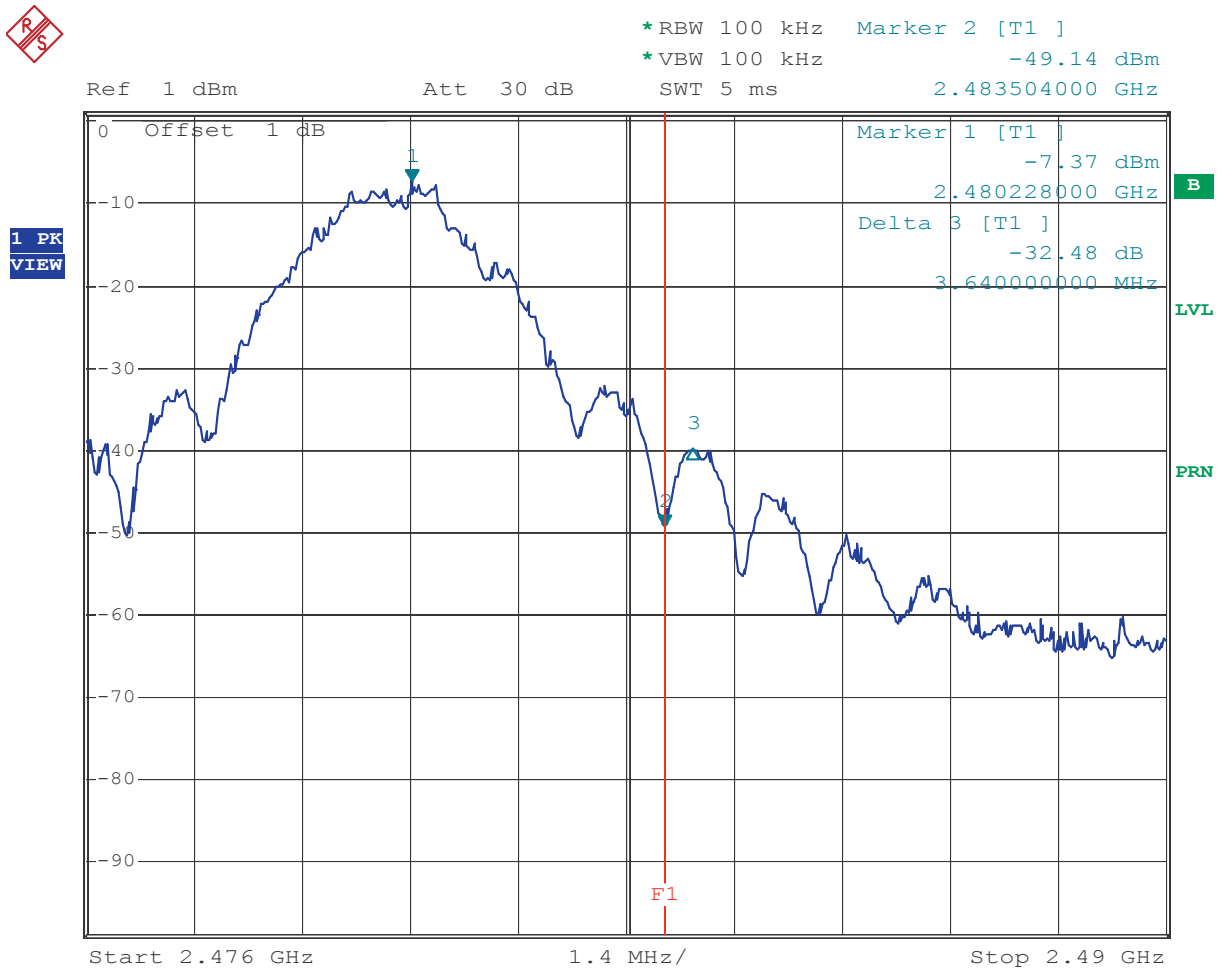
Frequency GHz	Polarity	Detector	SA reading dB(uV)	Cable loss dB	Ant. factor dB(1/m)	Field Strength at 3 m dB(uV/m)	Limit at 3 m dB(uV/m)	Margin dB
2.480	H	Peak	64.1	6.2	28.4	98.7	-	-
2.480	H	Aver.	45.5	6.2	28.4	80.1	-	-
2.4835 –2.5	V	Peak	-	-	-	98.7–32.5=66.2*	74.0	-7.8
2.4835 –2.5	V	Aver.	-	-	-	80.1-32.5=47.6*	54.0	-6.4

* delta = 32.5 dB obtained from plot 5.1

Refer to the following plots

Band-edge frequency	Delta, dB	Plot
2483.5	-41.8	5.1
2640 MHz	-32.5	5.1

Plot 5.1



Comment: Channel 26, band-edge delta
Date: 18.APR.2006 17:18:38

4.7 Radiated Emission from Digital Part and Receiver

Requirements:

Parameter:	FCC 15.109, class A
Requirement:	FCC 15.109, class A
30-88 MHz 88-216 MHz 216-960 MHz Above 960 MHz	39.1 dBµV @ 10 m 43.5 dBµV @ 10 m 46.4 dBµV @ 10 m 49.5 dBµV @ 10 m

Procedure:

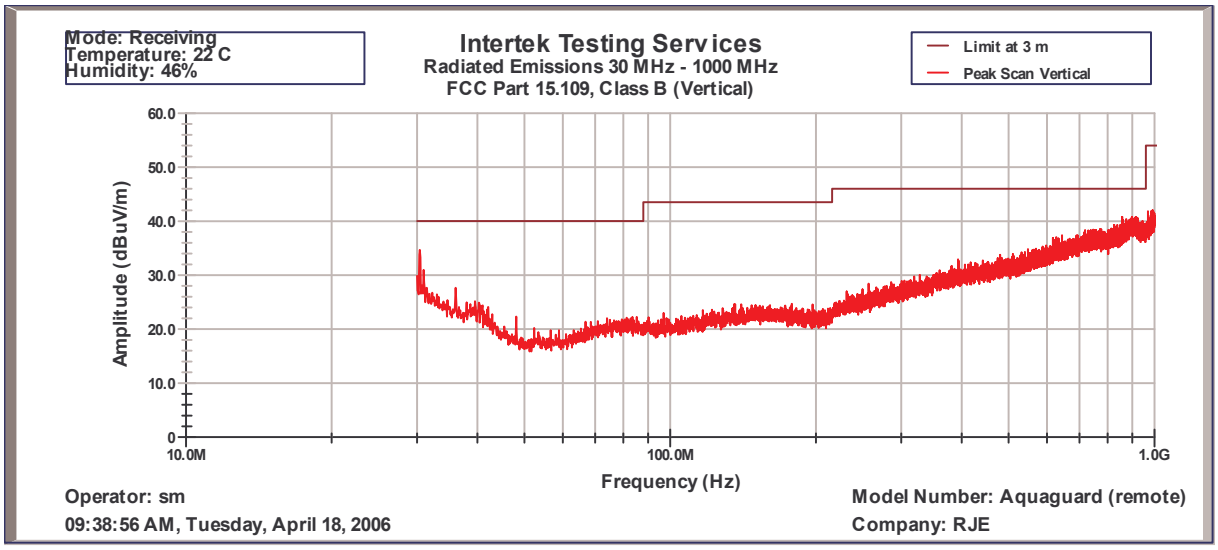
See section 4.6 for details of test procedure.

Field Strength Calculation:

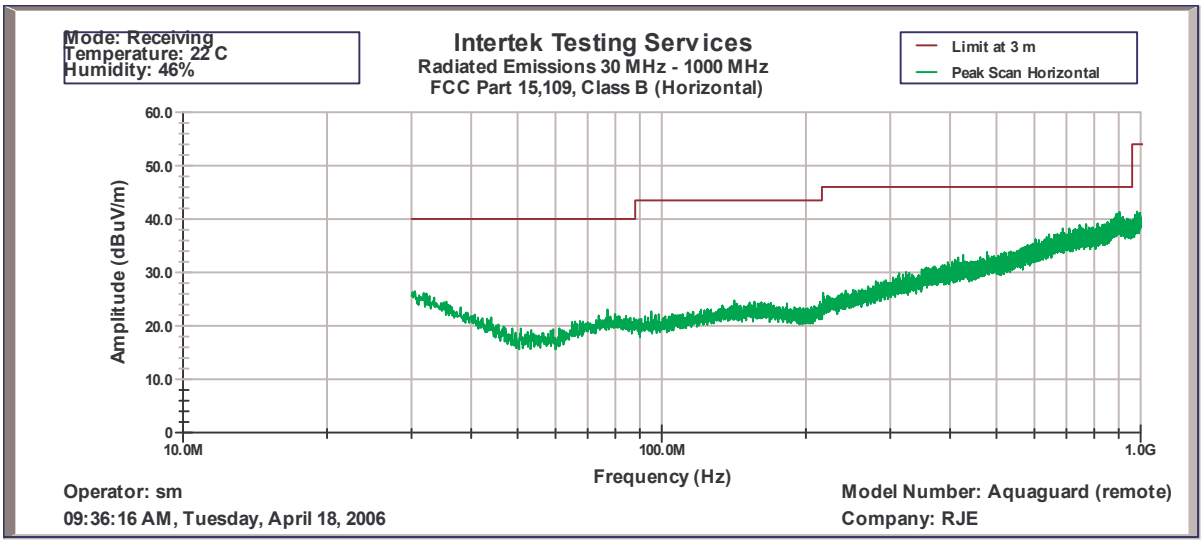
See section 4.6 for details of test procedure.

Test Result:

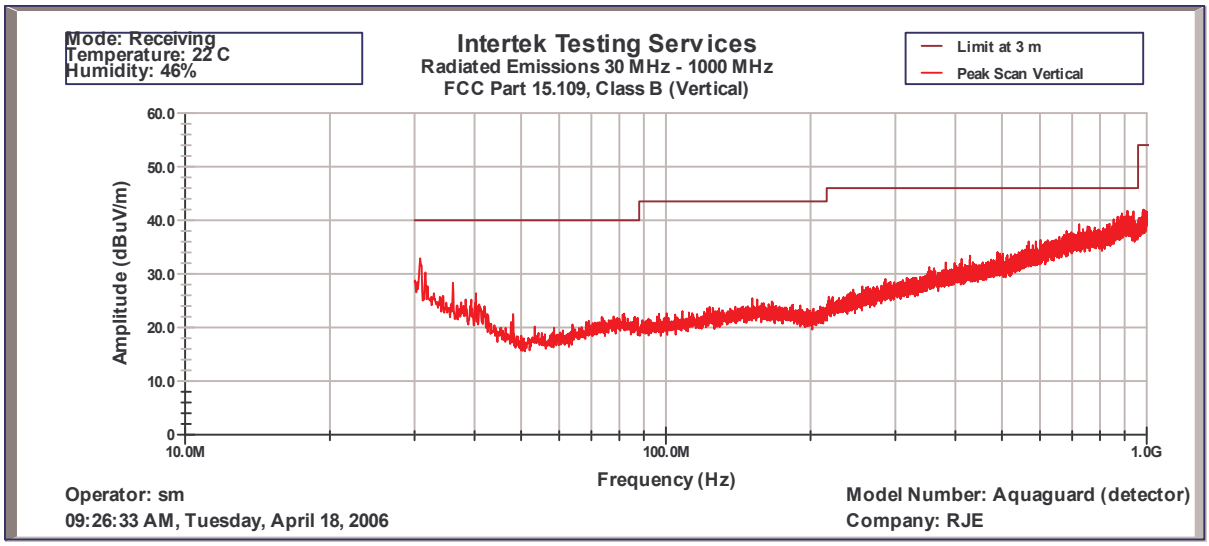
The peak scans on the following pages show that there are no emission found below the noise level of EMI receiver.



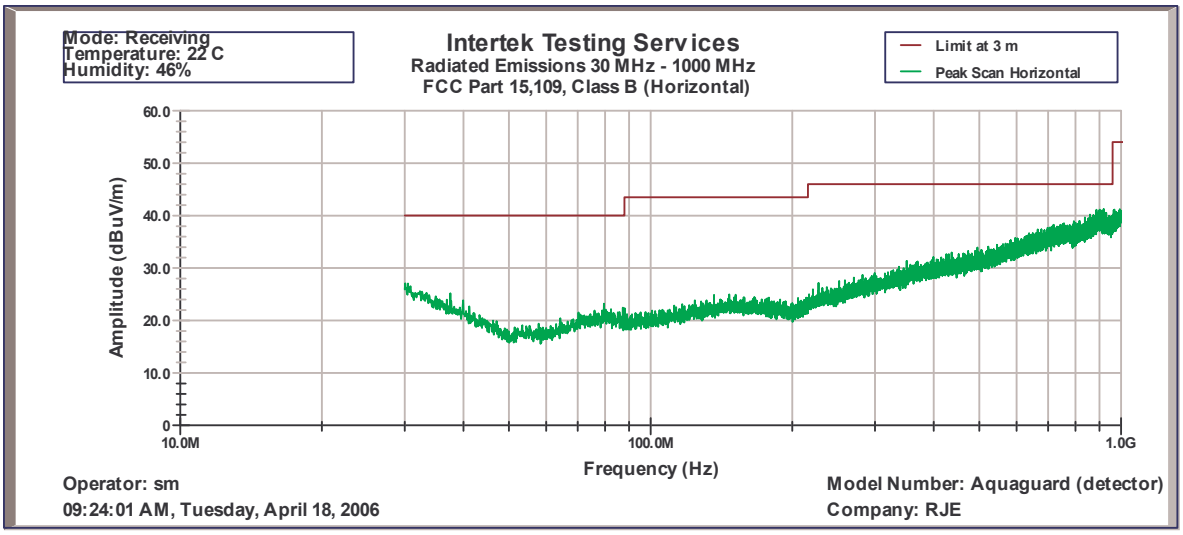
Remote: Radiated emission peak scan, Vertical Polarization



Remote: Radiated emission peak scan, Horizontal Polarization



Detector: Radiated emission peak scan, Vertical Polarization



Detector: Radiated emission peak scan, Horizontal Polarization

4.8 AC Line Conducted Emission,
FCC Rule 15.207:

Requirements

Parameter:	FCC 15.207	
Requirement:	FCC 15.207	
Frequency (MHz)	QP Limits (dBµV)	AVG Limits (dBµV)
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Procedure

All conducted voltage measurements were made on each current-carrying conductor at the plug end of the EUT power cord or calibrated extension by the use of mating plugs and receptacles on the EUT and LISN/AMN if used. Equipment was tested with power cords that were normally used or that have electrical and shielding characteristics that were the same as those cords normally used. For those measurements using a LISN/AMN, the 50 Ω measuring port was terminated by a 50 Ω receiver or a 50 Ω resistive load. Hence all 50 Ω measuring ports of the LISN/AMN were terminated by 50 Ω.

If a screened room or chamber was used, the EUT was placed 40 cm from a conductive wall, with the wall at the lead of the EUT. IF the test was being performed on an OATS or sheltered site, the vertical ground plane was placed 40 cm away from the rear of the EUT.

The excess length of the lead between the EUT and the LISN/AMN receptacle (or mains outlet where a LISN/AMN cannot be used) was folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. If the EUT does not have a flexible power lead, then it was placed at a distance of 80 cm from the LISN/AMN (or mains outlet where a LISN/AMN cannot be used) and connected to it by a lead or appropriate connection no longer than 1 m. Measurements were made at the LISN/AMN end of this lead or connection

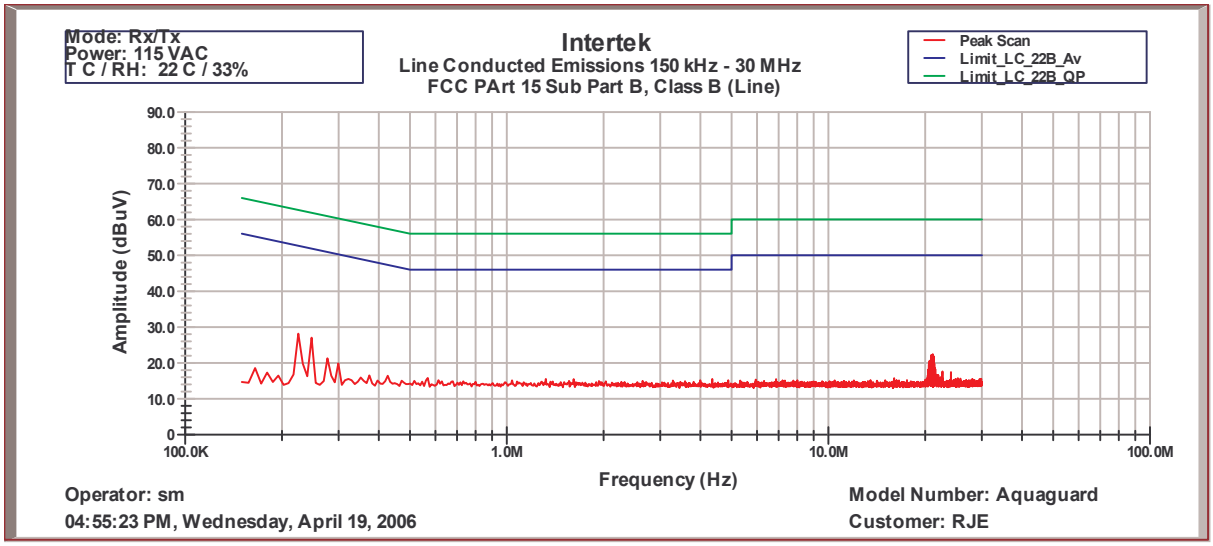
Conducted emission measurements were performed according to the procedures in ANSI C63.4 (2003)

Test Result

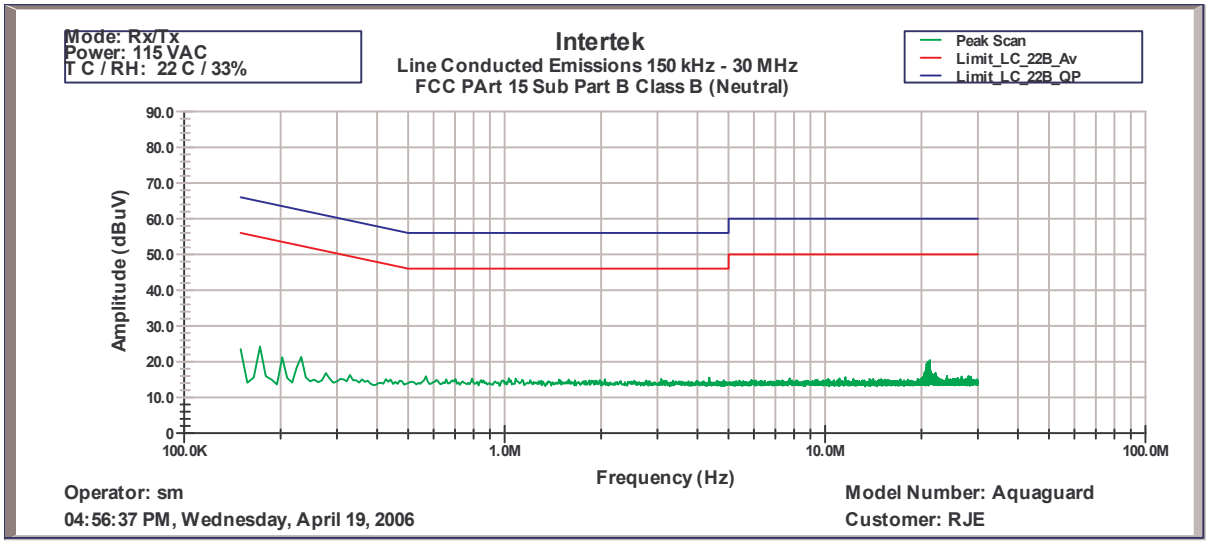
Note :

a) A complete scan from 0.15 - 30 MHz was made.
b) Analyzer setting: RBW = 9 kHz, VBW = 30 kHz
c) Detector mode: Quasi-peak and Average.
d) All measurements were more than 30 dB below the limit lines.

The next two pages are the peak scan made on line and neutral conductors



Remote: Conducted emission on Line.



Remote: Conducted emission on Neutral.

4.9 Radiation exposure evaluation.
FCC rules 1.1310 & 2.1091, 2.1093

The Aquaguard is a wireless transceivers . The Detector mounted near the swimming pool and battery operated device. Remote unit mounted away of the pool and used with AC power adapter or internal battery.
a) Detector device located at least 20 cm from the any body part of the user and can be considered as mobile device. It is required the MPE evaluation per 2.1093
The maximum Peak EIRP calculated is 0.002 W.
The Power Density can be calculated using the formula:

$S = EIRP/ 4\pi D^2$

Where: S is Power Density in mW/cm^2 = 1 mW/cm^2
D is the distance from the antenna in cm.

The minimum separation distance between the antenna and bodies of users are calculated using the following formula:

$D = (EIRP/4\pi S)^{1/2} = [0.002/4(3.14)(1)]^{1/2} = 0.00056$ cm

Per FCC Rules for mobile devices, the minimum separation distance shall be 20 cm, which will be specified in the user's manual to inform end users of RF Exposure requirements.

b) Remote device can be considered as a portable device located between 2.5 cm and 20 cm from the any body part of the user. It is required routine RF evaluation to demonstrate RF Exposure compliance per 2.1093

Limit for general population:
User distance < 2.5 cm: $P < 60/f$ (mW) – no SAR evaluation required to certify.
Device RF output power is 2 mW. $2 < 60/2.4 = 25$ mW

RF output power is less then specified limit. Therefore no SAR evaluation is required, and device considered in compliance with RF Exposure requirements.

5.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Receivers / Spectrum Analyzers / Pre amp

DESCRIPTION	SERIAL NO.	LAST CAL DATE	CAL DUE	TICK IF USED
HP 8546A Receiver RF Section	3549A00261	11/22/05	11/22/06	X
HP 85460A RF Filter Section	3448A00265	11/22/05	11/22/06	X
Tile Software	Rev. 3.0 G	N/A	N/A	X
R & S FSP40 Spectrum Analyzer	100027	2/21/06	2/21/07	X
Agilent 8447D RF Pre Amplifier	2944A10141	1/09/06	1/09/07	X
HP 8449B RF Pre Amplifier	300801168	1/17/06	1/17/07	X

Antennas

DESCRIPTION	SERIAL NO.	LAST CAL DATE	CAL DUE	TICK IF USED
A.H Systems SAS-510-4 Logoperiodic Antenna	156	1/17/06	1/17/07	X
ETS Lindgren 3116 Horn Antenna	00028304	03/22/06	03/22/07	X
Com-Power AL-100 Logperiodic Antenna	16055	05/02/05	05/02/06	
ETS Lindgren 3115 Horn Antenna	00031626	03/13/06	03/13/07	X
ETS Lindgren 3110BBiconical Antenna	00059996	5/13/05	5/13/06	X

Artificial Mains Networks/Absorbing Clamps

DESCRIPTION	SERIAL NO.	LAST CAL DATE	CAL DUE	TICK IF USED
EMCO 3825/2 25A LISN	2527	7/20/05	7/20/06	X
FCC LISN 50 Amp 5 μH	9827	02/07/05	02/07/06	

6.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / 3095787	SM	April 20, 2006	Original document