Nemko USA, Inc.
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San Diego, CA 92121-1024
Phone (858) 755-5525 Fax (858) 452-1810

CERTIFICATION TEST REPORT

PART 15.247C
IC RSS-210

For The Sensor Transceiver
Model: S2

FCC ID: UAG-S2
IC: 7348A-S2

PREPARED FOR:

Awarepoint
225 Broadway
San Diego, CA 92101

PREPARED ON JANUARY 8, 2008

REPORT NUMBER: 2008 017184-FCC

PROJECT NUMBER: 7184-2

Total Pages: 41

DOCUMENT HISTORY

REVISION	DATE	COMMENTS
-	JANUARY 8, 2008	Prepared By: F. Custodio
-	JANUARY 8, 2008	Initial Release: Alan Laudani

NOTE: Nemko USA, Inc. hereby makes the following statements so as to conform to Chapter 10 (Test Reports) Requirements of ANSI C63.4 (2003) "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

NOTE: Nemko USA, Inc. hereby makes the following statements so as to conform to Chapter 10 (Test Reports) Requirements of ANSI C63.4 (2003) "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- The unit described in this report was received at Nemko USA, Inc.'s facilities on March 11, 2004. Testing was performed on the unit described in this report on March 11, 2004 to March 16, 2004.
- The Test Results reported herein apply only to the Unit actually tested, and to substantially identical Units.
- This report does not imply the endorsement of the Federal Communications Commission (FCC), NVLAP or any other government agency.

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CERTIFICATION

Nemko USA, Inc., an independent Electromagnetic Compatibility (EMC) Test Laboratory, produced this Test Report and performed the Radio Frequency Interference (RFI) testing and data evaluation contained herein.

Nemko USA, Inc.'s measurement facility is currently registered with the United States Federal Communications Commission (FCC) in accordance with the provisions of 47 United States Code (CFR) Part 2, Subpart I, Section 2.948(a). A current description of Nemko USA, Inc.'s measurement facility is on file with the FCC. Nemko USA Inc. has additionally satisfied the FCC that it complies with the requirements set forth in 47 CFR Part 2, Subpart I, Section 2.948(d) regarding the accreditation of EMC laboratories.

The RFI testing, test data collection and test data evaluation were accomplished in accordance with the ANSI C63.4-1992 Standard, and in accordance with the applicable sections of the FCC rules (47 CFR Parts 2 and 15). The testing was also accomplished in accordance with Industry Canada's ICES-003 standard for unintentional radiating device per EMCAB-3, Issue 3 (May 1998). The administrative summary of this test report provides a description of the test sample.

I hereby certify that the test data, test data evaluation, and equipment configurations used to compile this test report are a true and accurate representation of the test sample's radio frequency interference characteristics as of the test date(s), and, for the design of the test sample.

Alan Laudani
RF/EMC Test Specialist

1. ADMINISTRATIVE DATA AND TEST SUMMARY

1.1. Administrative Data

CLIENT:	Awarepoint 225 Broadway San Diego, CA 92101
CONTACT:	Derek Smith dsmith@awarepoint.com
DATE (S) OF TEST:	January 3, 2008 to January 24, 200
EQUIPMENT UNDER TEST (EUT):	**Sensor Transceiver**
Model:	**S2**
Condition Upon Receipt	Suitable for Test

1.2. Technical Specifications of the EUT

Manufacturer:	Awarepoint
Operating Frequency:	2405 MHz to 2480 MHz in the 2400-2483.5 MHz Band
Rated Power:	5.5 mW
Modulation:	Offset Quadrature - PSK
Antenna Connector:	Integral
Power Source:	120V 60Hz

1.3. TEST SPECIFICATION:

FCC, Part 15.247, Subpart C, RSS 210 (Issue 7, June 2007)

Test Summary

Specification	*Frequency Range*	*Compliance Status*
FCC, CFR 47, Section 15.207	0.15 MHz - 30.00 MHz	PASS
FCC, CFR 47, Section 15.209	30 MHz – 10th Harmonic	PASS
FCC CFR 47, §15.247 Plus Bandedge	2405– 2480 MHz	PASS
RSS-210 - Low Power License Exempt Radio-communication Devices (All Frequency Bands)	2405– 2480 MHz	PASS

Testing was started at 30 MHz as there are no RF signals generated below this frequency.

Alan Laudani,
RF/EMC Test Specialist

Refer to the test results section for further details.

2. SYSTEM CONFIGURATION

2.1. Description and Method of Exercising the EUT

Awarepoint Sensor transceiver Model S2 is a "wall wart" type transceiver. Three (3) samples were provided by the manufacturer to represent Low, Mid and High channels. EUT transmits via RF and not through AC lines.

2.2. Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

2.3. System Components and Power Cables

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER CABLE
EUT - Sensor Transceiver	Awarepoint Model: S2 Engineering Sample	N/A

2.4. Device Interconnection and I/O Cables

Connection	I/O Cable
No connection	

2.5. Design Modifications for Compliance

The following design modifications were made to the EUT during testing.
No design modifications were made to the EUT during testing.

2.6. Theory of Operation

The S2 is a Sensor Transceiver. The EUT is part of Awarepoint Real-time Awareness Solution consisting of several components: Awarepoint Tags, Awarepoint Sensors (EUT), Awarepoint Bridges, and the Awarepoint Appliance. The Awarepoint Appliance contains all software necessary for system operation. The Tag is a wireless device that is attached to equipment so that the equipment may be located by the Awarepoint system. Although Tags a to the asset in a variety of ways, it is most commonly attached by zip-ties or high strength double-sided tape. The Tags broadcast short messages periodically. If the Tag is moving, the default update rate is 5 seconds. If it is stationary, the default update rate is 10 minutes. The EUT receive the messages broadcast by Tags. The Sensor measures the signal strength received from the pulse (message), and transmits this data (Tag ID and signal strength emitted from the Tag) to the Bridge. If the Bridge is not within direct range of the Sensor, the Sensor sends the data to another Sensor and so forth until it reaches the Bridge. In this manner, the Sensors form the Awarenet wireless mesh network. This network is "self-

healing" so if a Sensor is removed or otherwise compromised, other Sensors will route around it. Sensors also periodically broadcast messages to each other. These Sensor messages are used to calibrate the positioning engine. The Bridge connects the Awarenet wireless mesh network with the Awarepoint Appliance via the facility's Local Area Network (LAN). The Bridge contains a wireless network interface similar to what is inside the Sensor as well as a wired Ethernet interface. The Bridge is configured with a serial interface. Tags, Sensors, and Bridges also periodically check the Awarepoint Appliance for updated configuration information or firmware updates. All three products can remotely update their firmware. The System is configured using the System Manager, a Java application that runs on a PC connected to the facility LAN. The System Manager may be downloaded from the Awarepoint Appliance.

3. DESCRIPTION OF TEST SITE AND EQUIPMENT

3.1. Description of Test Site

The test site is located at 11696 Sorrento Valley Road, Suite F, San Diego, CA 92121. The site is physically located 18 miles Northwest of downtown San Diego. The general area is a valley 1.5 miles east of the Pacific Ocean. This particular part of the valley tends to minimize ambient levels, i.e. radio and TV broadcast stations and land mobile communications. The three and ten-meter Open Area Test Site (OATS) is located behind the office/lab building. It conforms to the normalized site attenuation limits and construction specifications as set in the EN 55022 (1987), CISPR 16 and 22 (1985) and ANSI C63.4-2001 documents. The OATS RN 90579 normalized site attenuation characteristics are verified for compliance every year.

4. DESCRIPTION OF TESTING METHODS

4.1. Introduction

As required in 47 CFR, Parts 2 and 15, the methods employed to test the radiated and conducted emissions (as applicable) of the EUT are those contained within the American National Standards Institute (ANSI) document C63.4-1992, titled "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz." All applicable FCC Rule Sections that provide further guidance for performance of such testing are also observed.

For General Test Configuration please refer to Figure 1 on the following page.

Digital devices sold in Canada are required to comply with the Interference Causing Equipment Standard for Digital Apparatus, ICES-003. These test methods and limits are specified in the Canadian Standards Association's (CSA) Standard C108.8-M1983 (1-1-94 version) and are "essentially equivalent" with FCC, Part 15 and CISPR 22 (EN55022) rules for unintentional radiators per EMCAB-3, Issue 3 (May 1998). No further testing is required for compliance to ICES-003.

4.2. Configuration and Methods of Measurements for Conducted Emissions

Section 7 of ANSI C63.4 determines the general configuration of the EUT and associated equipment, as well as the test platform for conducted emissions testing. Tabletop devices are placed on a non-conducting surface 80 centimeters above the ground plane floor and 40 centimeters from the ground plane wall. The EUT and associated system are configured to operate continuously, representing a "normally operating" mode. The EUT is powered via a Line Impedance Stabilization Network (LISN). The emissions are recorded using the required bandwidth of 9 kHz in the quasi-peak mode. The average amplitude is also observed employing a 10 kHz bandwidth to determine the presence of broadband RFI. When such interference is caused by broadband sources (as defined by the FCC and ANSI Rules), the deviation guidelines contained in Section 11.3.1 of ANSI C63.4 are employed, which allows a correction factor of 13 dB to be subtracted from the quasi-peak reading. The emission levels are then compared to the applicable FCC limits to determine compliance.

4.3. Configuration and Methods of Measurements for Frequency Identification

When performing all testing of equipment, the actual emissions of the EUT are segregated from ambient signals present within the laboratory or the open-field test range. Preliminary testing is performed to ensure that ambient signals are sufficiently low to allow for proper observation of the emissions from the EUT. Incoming power lines are filtered using a 120 dB, 30-ampere; 115/208-volt filter to assist in reducing ambient signals for tests of levels of conducted emissions. Ambients within the laboratory are compared to those noted at the nearby open-field site to discriminate between signals produced from the EUT and ambient signals. In the event that a significant emission is produced by the EUT at a frequency which is also demonstrating significant ambient signals, the spectrum analyzer is placed in the peak mode, the bandwidth is narrowed, the EUT's signal is centered on the analyzer, the scan width is expanded to 50 kHz while monitoring the audio to ensure that only the EUT signal is present, the analyzer is switched to quasi-peak mode, and the level of the EUT signal is recorded.

4.4. Configuration and Methods of Measurements for Radiated Emissions

Section 8 of ANSI C63.4 determines the general configuration and procedures for measuring the radiated emissions of equipment under test. Initially, the primary emission frequencies are identified inside the test lab by positioning a broadband receive antenna one meter from the EUT to locate frequencies of significant radiation. Next, the EUT and associated system are placed on a turntable on a ten meter open area test site (registered with the FCC in accord with its Rules and ANSI C63.4) and the receive antenna is located at a distance of ten meters from the EUT.

The EUT and associated system are configured to operate continuously, representing a "normally operating" mode. All significant radiated emissions are recorded when maximum radiation on each frequency is observed, in accordance with part 8 of ANSI C63.4-1992 and Section 15.33 of the FCC Rules. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to horizontal and vertical polarities, and the turntable is also rotated to determine the worst emitting configuration. The numerical results of the test are included herein to demonstrate compliance.

The numerical results that are applied to the emissions limits are arrived at by the following method:
Example: A=RR+CL+AF
A = Amplitude dBuV/m
RR = Receiver Reading dBuV
CL = cable loss dB
AF = antenna factor dB/m

Example Frequency = 110MHz
18.5 dBuV (spectrum analyzer reading)
+3.0 dB (cable loss @ frequency)
21.5 dBuV
+15.4 dB/m (antenna factor @ frequency)
36.9 dBuV/m Final adjusted value

The final adjusted value is then compared to the appropriate emission limit to determine compliance.

5. Test Methods

5.1. Test Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247
Operation within the bands 902-928 MHz, 2400-2483.5 MHz,
5725-5850 MHz and 24.0-24.25 GHz bands.

RSS-210, Issue 7, June 2007
Annex 8 - Frequency Hopping and Digital Modulation Systems Operating in the Bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

5.2. Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

5.3. Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	17 – 22 ^{o}C
Humidity range	:	29 - 30%
Pressure range	:	87 - 105 kPa
Power supply range	:	120VAC 60Hz (±15%)

5.4. Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
752	Antenna, DRWG	EMCO	3115	4943	10/31/2007	10/31/2008
837	Preamp	Spacek Labs	SLKa-35-3	3M12	Verified 01/03/2008	
835	Spectrum Analyzer	Rohde & Schwarz	RHDFSEK	829058/005	6/20/2007	6/20/2008
815	Multimeter	Fluke	111	78130066	7/9/2007	7/9/2008
115	Antenna, Bicon	EMCO	3104	3020	8/28/2007	8/28/2008
755	Antenna, LPA	EMCO	3147	1246	10/10/2007	10/10/2009
898	EMI Receiver & filter set	HP	8546A	3625A00348	1/18/2007	1/18/2008
317	Preamplifier	HP	8449A	2749A00167	2/9/2007	02/09/08
533	Quasi-Peak Adapter	HP	85650A	2043A00211	6/27/2007	6/27/2008
534	Spectrum Analyzer Display	HP	85662A	2534A10452	4/2/2007	4/2/2008
535	Spectrum Analyzer	HP	85680A	2517A01757	5/11/2007	5/11/2008
395	LISN	Solar	9348-50-R-24-BNC	941718	3/9/2007	3/9/2008
564	High Pass Filter	Solar	7801-5.0	853130	7/9/2007	7/9/2008
684	Transient Limiter	HP	11974A	3107A02636	9/5/2007	9/5/2008
625	Antenna, Dbl Ridge Horn	EMCO	3116	2325	2/3/2005	Verified 1/3/08

2040B-1 and RN 90579 OATS

5.5. Results Summary

The column headed "Required" indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: not applicable / not relevant
Y Yes: Mandatory i.e. the apparatus shall conform to these test.
N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

Part 15C	RSS-210	Test Description	Required	Result
	RSP100	20 dB Bandwidth – required to determine emission designator per TRC-43	Y	Pass
15.247(b)(3)	A8.4 (4)	Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands	Y	Pass
15.209 (a)	A8.5 Table 1	Radiated Emissions within Restricted Bands	Y	Pass
15.247(a)(2)	A8.2 (a)	Minimum 6dB RF Bandwidth	Y	Pass
15.247 (d)	A8.5	Out-of-band Emissions	Y	Pass
15.247(e)	A8.2 (b)	Power Spectral Density for Digitally Modulated Devices	Y	Pass
15.207	RSS-GEN 7.2.2	Transmitter and Receiver AC Power Lines Conducted Emission Limit	Y	Pass
Part 15B	RSS-GEN 4.10	Receiver Spurious Emissions	N	Pass[1]

Notes: [1]EUT does not have a separate Receive or Stand-By mode. EUT is configured to transmit and receive all the time.

6. Test Results

6.1. 20dB Bandwidth

RSS-Gen 4.6.1

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

Test Conditions:

Sample Number:	S2	**Temperature:**	17
Date:	January 3, 2008	**Humidity:**	29
Modification State:	Lo/Mid/High Channels	**Tester:**	FSCustodio
		Laboratory:	SOATS

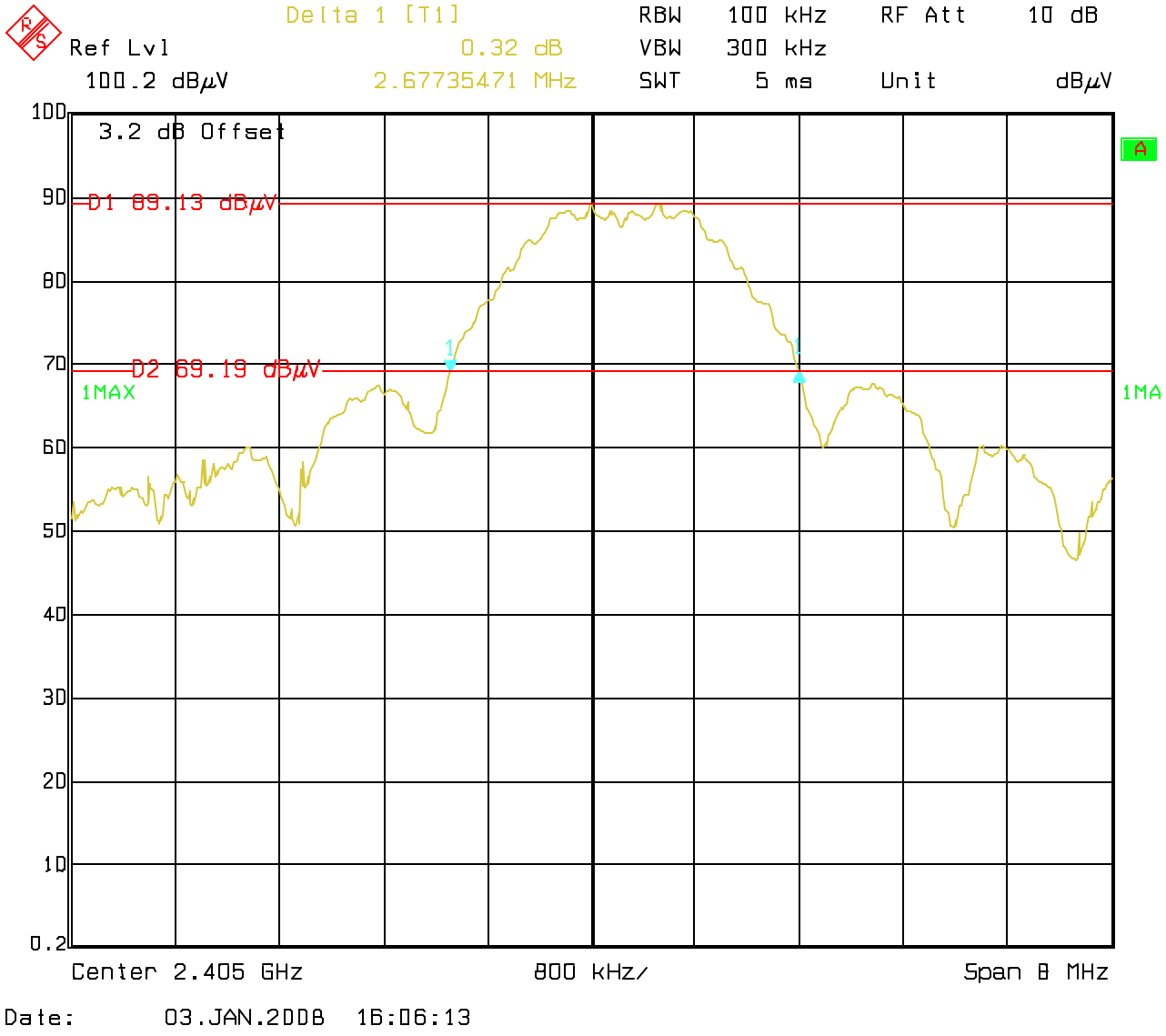
Test Results:

See Attached Plots.

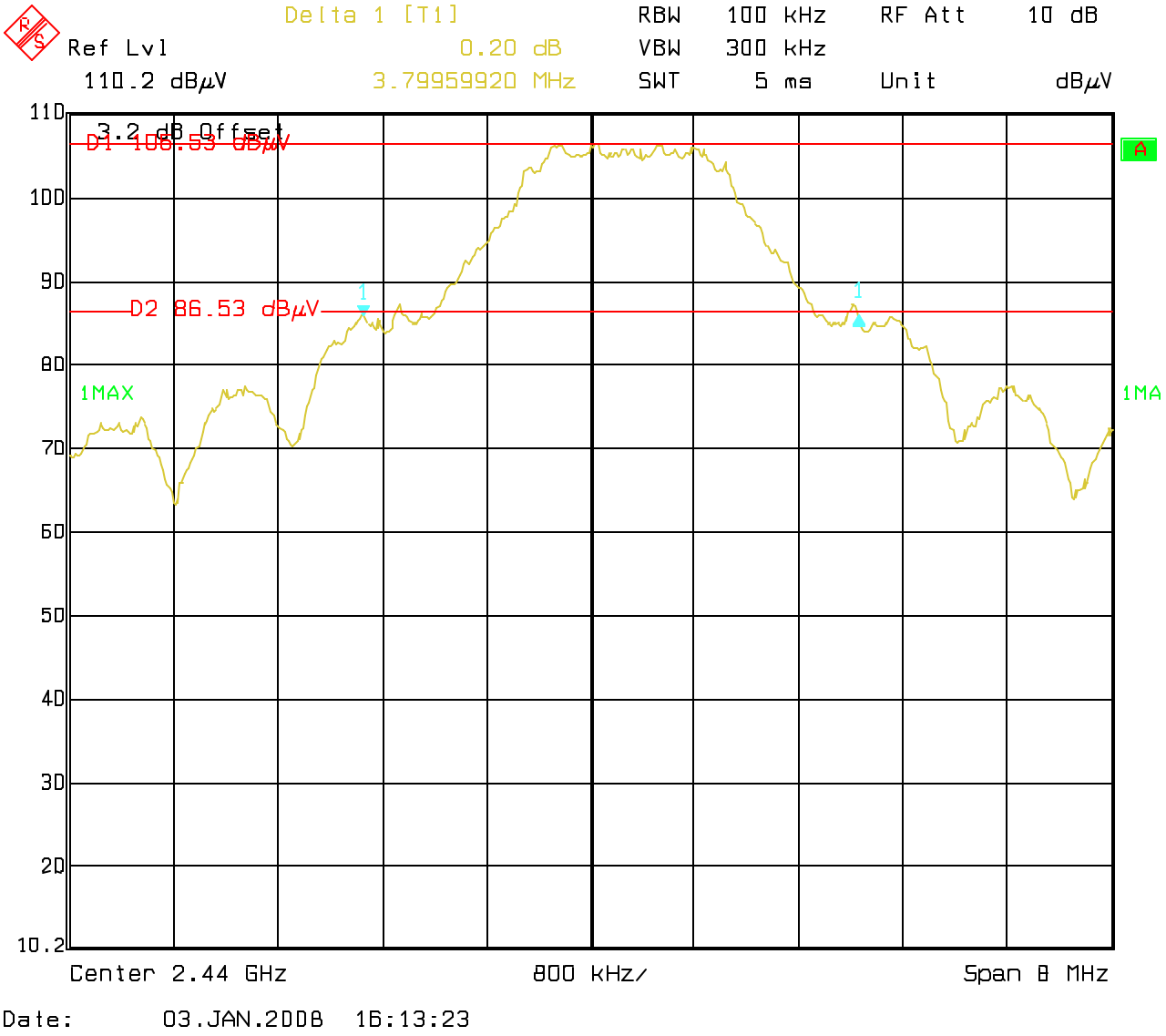
Additional Observations:

Measurements were made at 3 meters. Each channel investigated was maximized in the OATS before any reading was made. Analyzer RES BW was set to 100 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 20 dB lower than PEAK level. The bandwidth was determined from where the channel output spectrum intersected the display line.

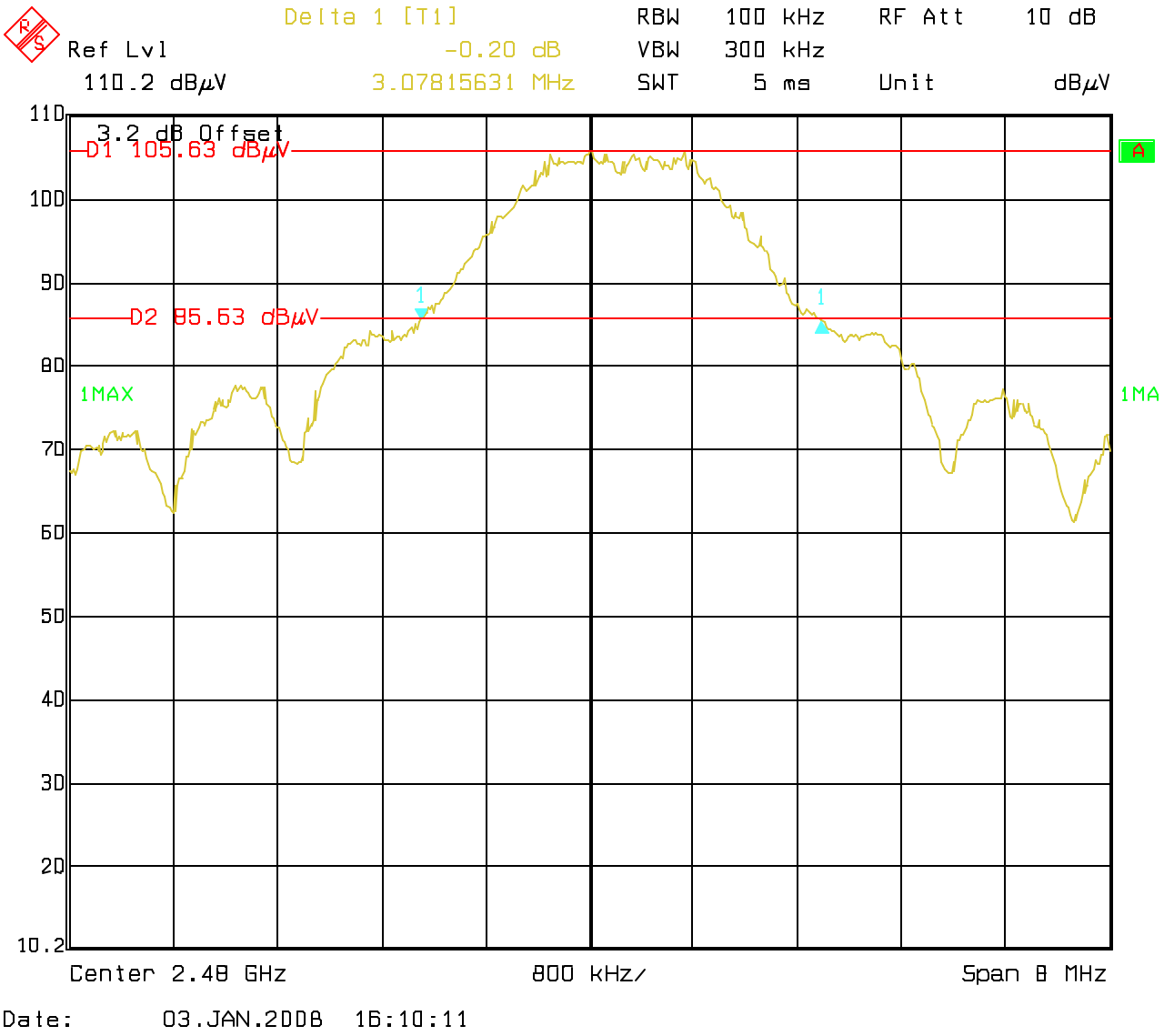
LOW Channel 20dB bandwidth = 2.68 MHz



MID Channel 20dB bandwidth = 3.8MHz



HIGH Channel 20dB bandwidth = 3.0MHz



6.2. Out-of-band Emissions / Radiated Emissions within Restricted Bands

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (uV/meter)	Measurement Distance (meter)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Sec. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a) (see Sec. 15.205(c)).

A8.5 Out-of-band Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

Test Conditions:

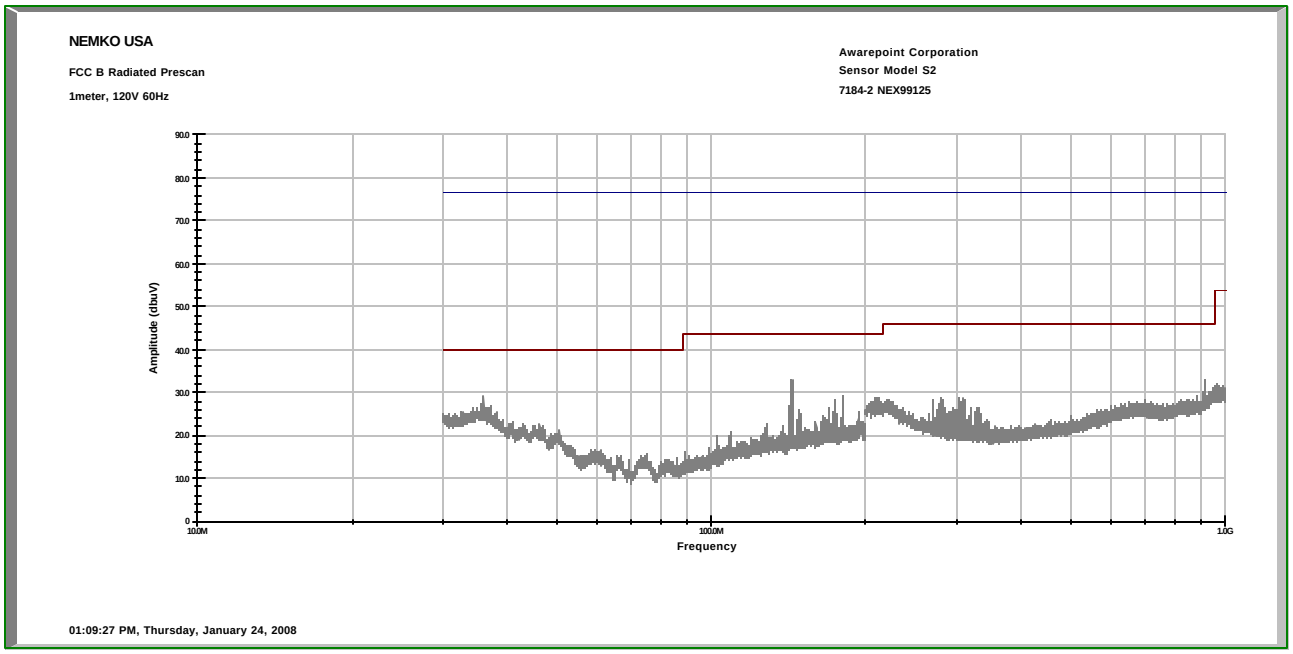
Sample Number:	S2	**Temperature:**	17
Date:	January 3, 2008	**Humidity:**	29
Modification State:	Lo/Mid/High Channels	**Tester:**	FSCustodio
		Laboratory:	SOATS

Test Results:

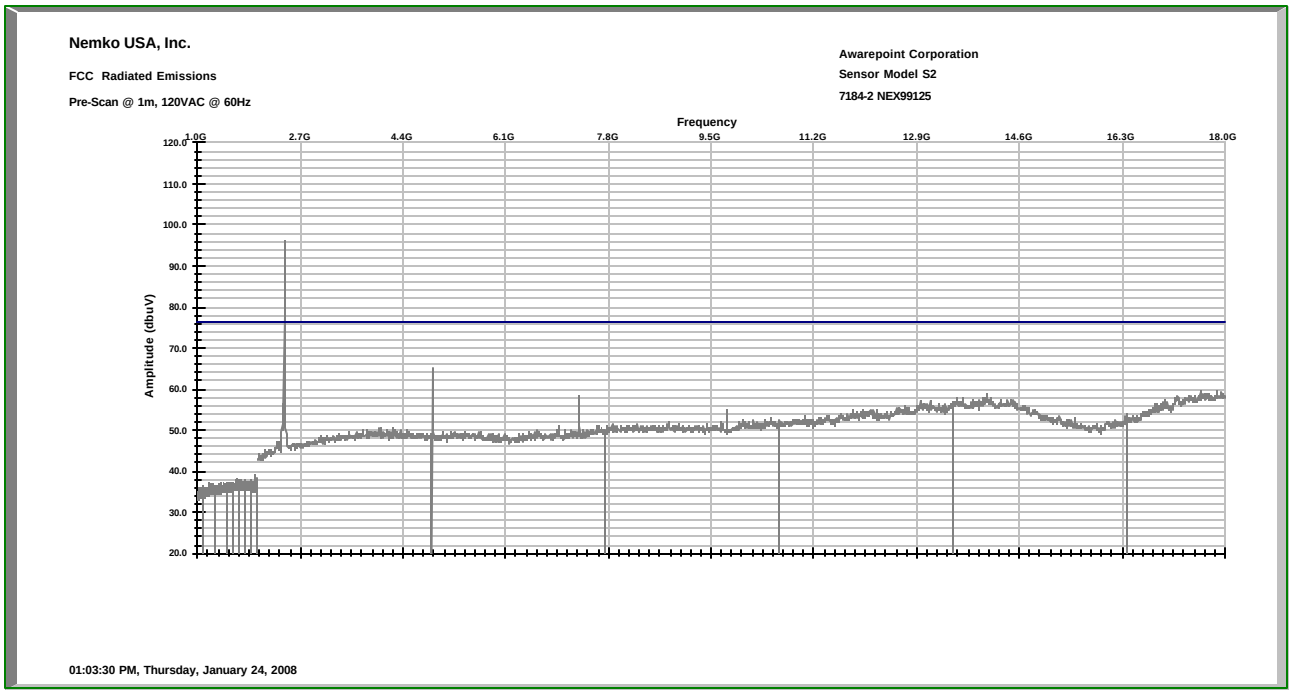
No emissions observed other than the fundamental.

Additional Observations:

- The Spectrum was searched from 30MHz to the 10th Harmonic, 25000 MHz.
  There are no emissions found that do not comply to the restricted bands defined in **FCC Part 15 Subpart C, 15.205** or **Part 15.247(d)**.
- The EUT was measured on three orthogonal axes.
- Radiated Measurements below 1GHz were performed at 3m with a Quasi-Peak detector (RBW 120kHz/VBW 300kHz) while Radiated Peak (RBW 1MHz/VBW 3MHz) and Average (RBW 1MHz/VBW 10Hz) measurements conducted above 1GHz.
- The device has an integral antenna with no conducted measurement capability.



Plots from 30 to 1000MHz (Peak), Red limit line is FCC Class B @ 3 meters while blue limit line is 20dB below the highest in-band emission.



Plots from 1 to 18GHz (Peak), Blue limit line is 20dB below the highest in-band emission.

Corrected reading (@ 7320 MHz) = Meter Reading + Cable Loss + Antenna Factor – Preamp
= 35.8 + 11.1 + 35.0 – 32.6 = 49.3

Radiated Emissions Data

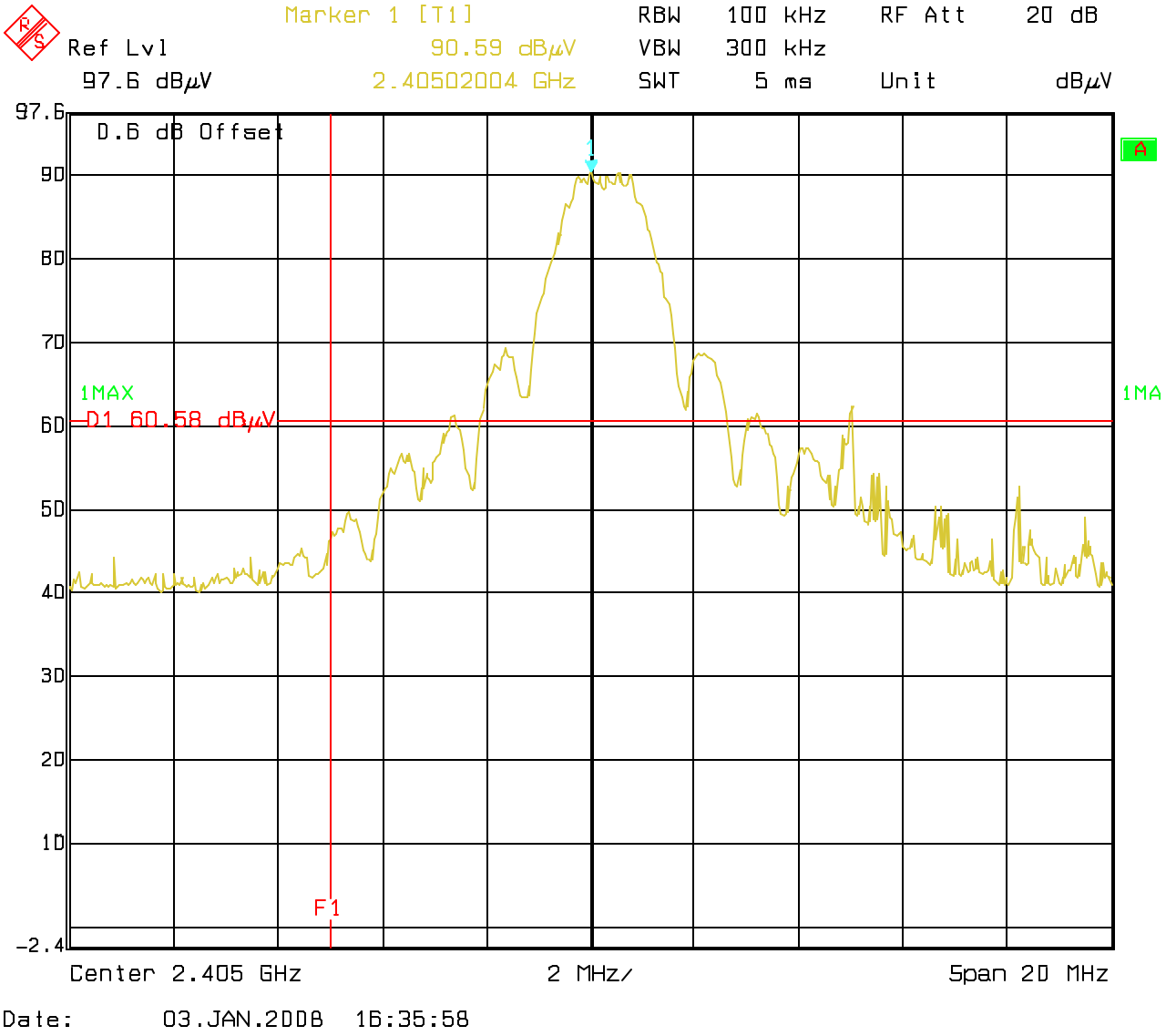
Job # :	7184-2	Date :	1/3/2008	Page 1 of 1	
NEX #:	99125	Time :	10:00AM		
		Staff :	FSCustodio		
Client Name :	Awarepoint			EUT Voltage :	120
EUT Name :	Sensor			EUT Frequency :	60
EUT Model # :	S2			Phase:	1
EUT Serial # :	Engineering sample			NOATS	X
EUT Config. :	Transmit (Low, Mid , High)			SOATS	
				Distance:	3m
	Part 15.247				
Specification :	CFR47 Part 15, Subpart B, Class B				
Loop Ant. #:	NA				
Bicon Ant.#:	NA	Temp. (°C) :	17		
Log Ant.#:	NA	Humidity (%) :	29		
DRG Ant. #	752	Spec An.#:	835		
Dipole Ant.#:	NA	Spec An. Display #:			
Cable LF#:	NA	QP #:			
Cable HF#:	40ft	PreSelect#:	NA		
Preamp LF#:	NA				
Preamp HF#	317				

Quasi-Peak	RBW: 120 kHz
	Video Bandwidth 300 kHz
Peak	RBW: 1 MHz
	Video Bandwidth 3 MHz
Average	RBW: 1 MHz
	Video Bandwidth 10 Hz

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading **Vertical**	Meter Reading **Horizontal**	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dBuV)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
2405.0											
4810.0	37.5	36.8	A		1.0	37.5	43.3	54.0	-10.7	Pass	
4810.0	47.8	46.6	P		1.0	47.8	53.6	74.0	-20.4	Pass	
2440.0											
4880.0	41.3	35.8	A		1.0	41.3	47.1	54.0	-6.9	Pass	
4880.0	52.0	45.7	P		1.0	52.01	57.8	74.0	-16.2	Pass	
7320.0	35.8	35.7	A		1.0	35.8	49.3	54.0	-4.7	Pass	
7320.0	45.6	46.1	P		1.0	46.13	59.6	74.0	-14.3	Pass	
2480.0											
4960.0	41.2	40.3	A		1.0	41.2	47.2	54.0	-6.8	Pass	
4960.0	51.8	50.5	P		1.0	51.75	57.7	74.0	-16.2	Pass	

6.3. Bandedge Measurements

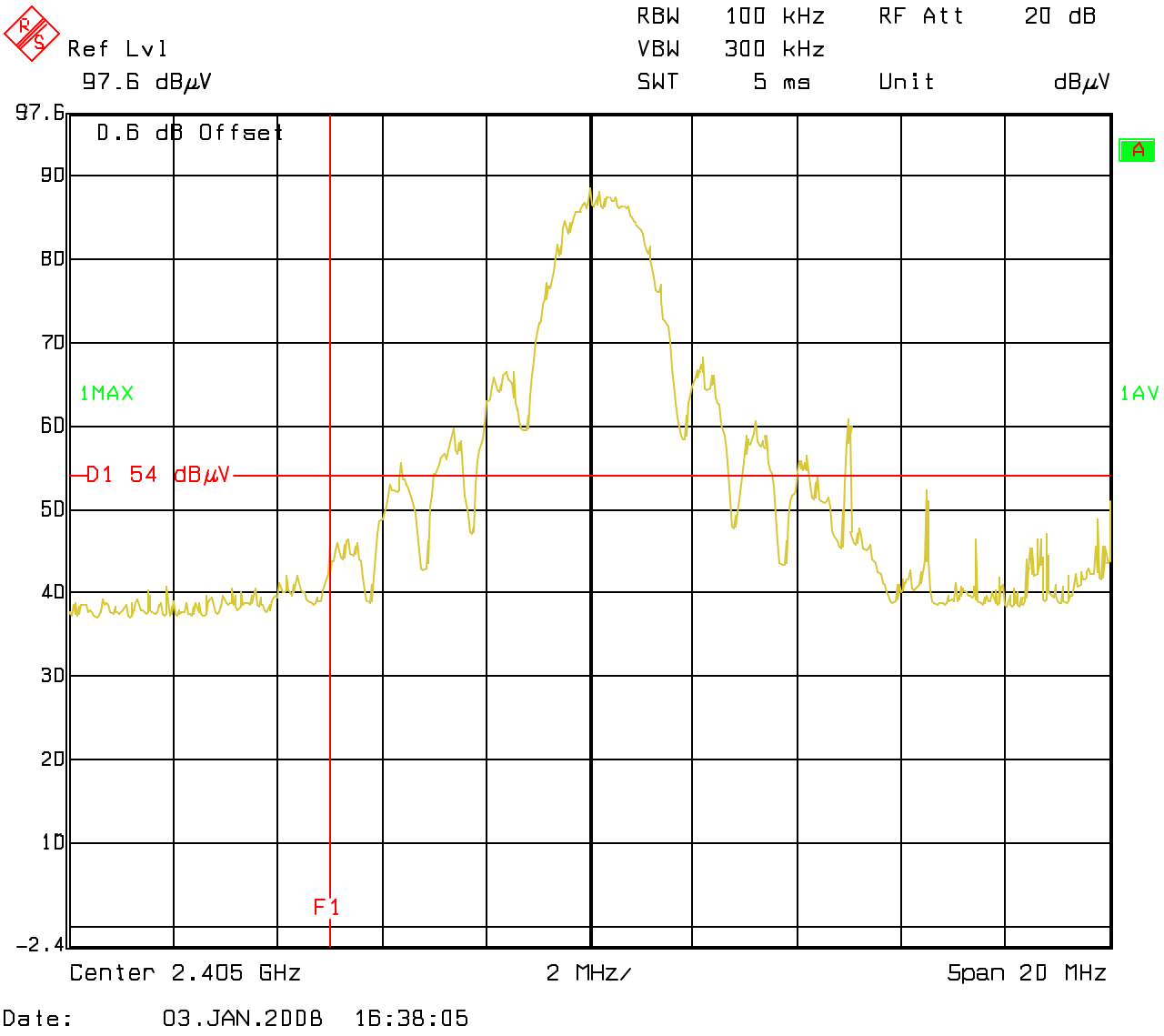


Low Channel 2405 MHz (Peak Measurement)

Frequency line is 2400MHz

Limit used is 30dB from peak

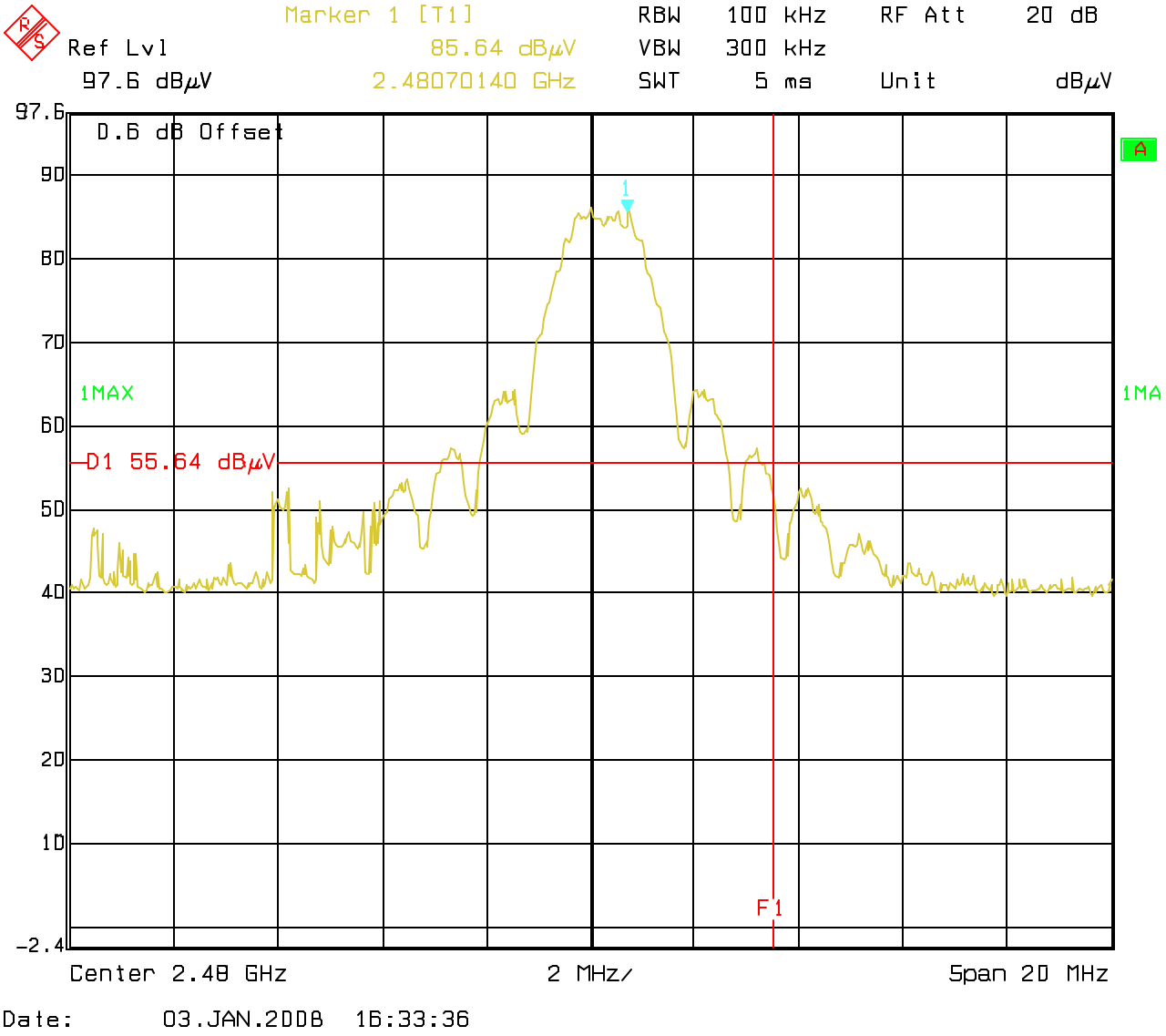
-0.6 dB offset for antenna (27.3),cable loss (5.9) and Preamp (-33.8)



Low Channel 2405 MHz (Average Measurement)

Frequency line is 2400MHz

-0.6 dB offset for antenna (27.3),cable loss (5.9) and Preamp (-33.8)

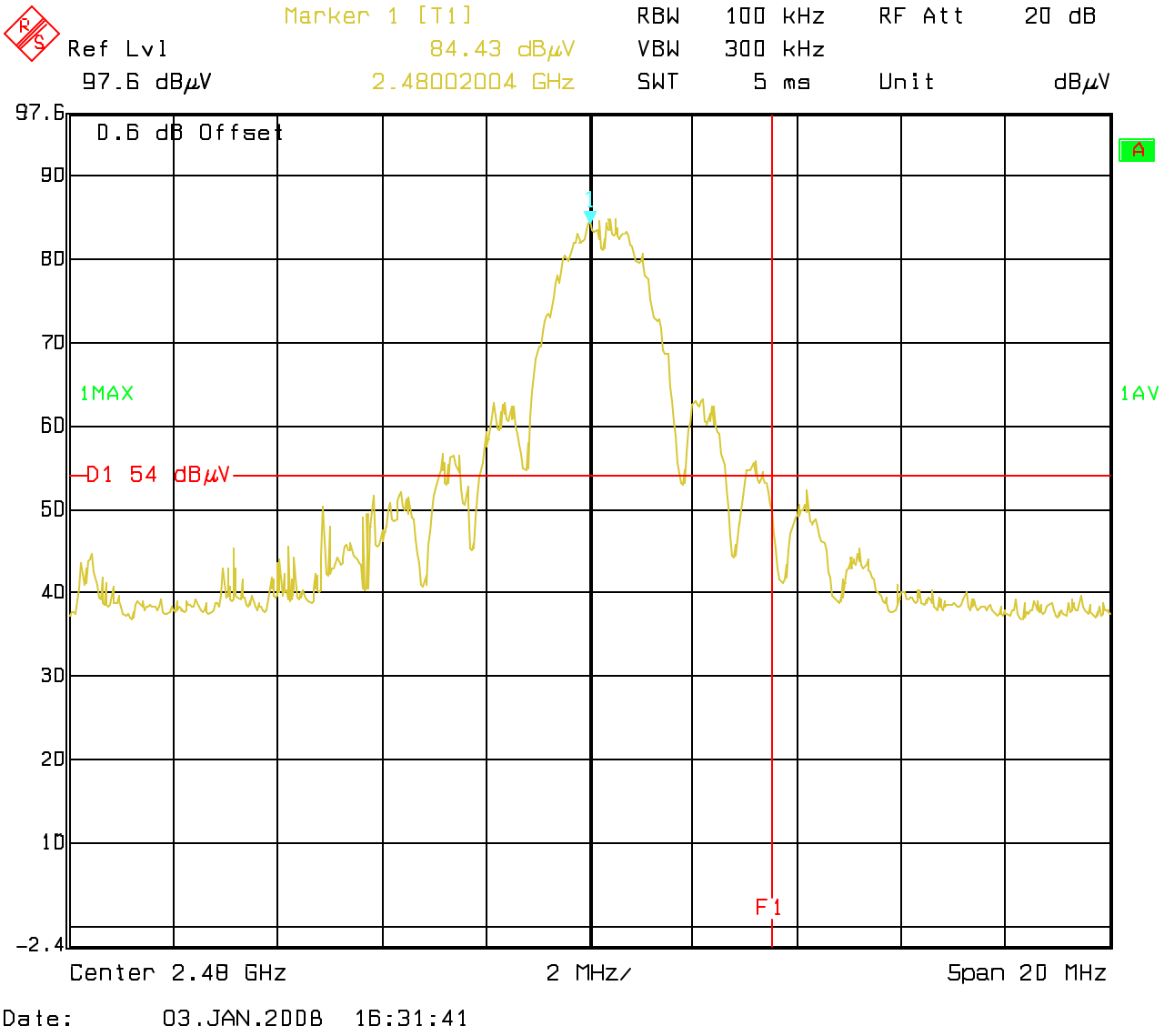


High Channel 2480 MHz (Peak Measurement)

Frequency line is 2483.5 MHz

Limit used is 30dB from peak

-0.6 dB offset for antenna (27.3),cable loss (5.9) and Preamp (-33.8)



High Channel 2480 MHz (Average Measurement)

Frequency line is 2483.5 MHz

-0.6 dB offset for antenna (27.3),cable loss (5.9) and Preamp (-33.8)

6.4. Minimum 6dB RF Bandwidth

(a)(2) Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

A8.2 (a) The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Conditions:

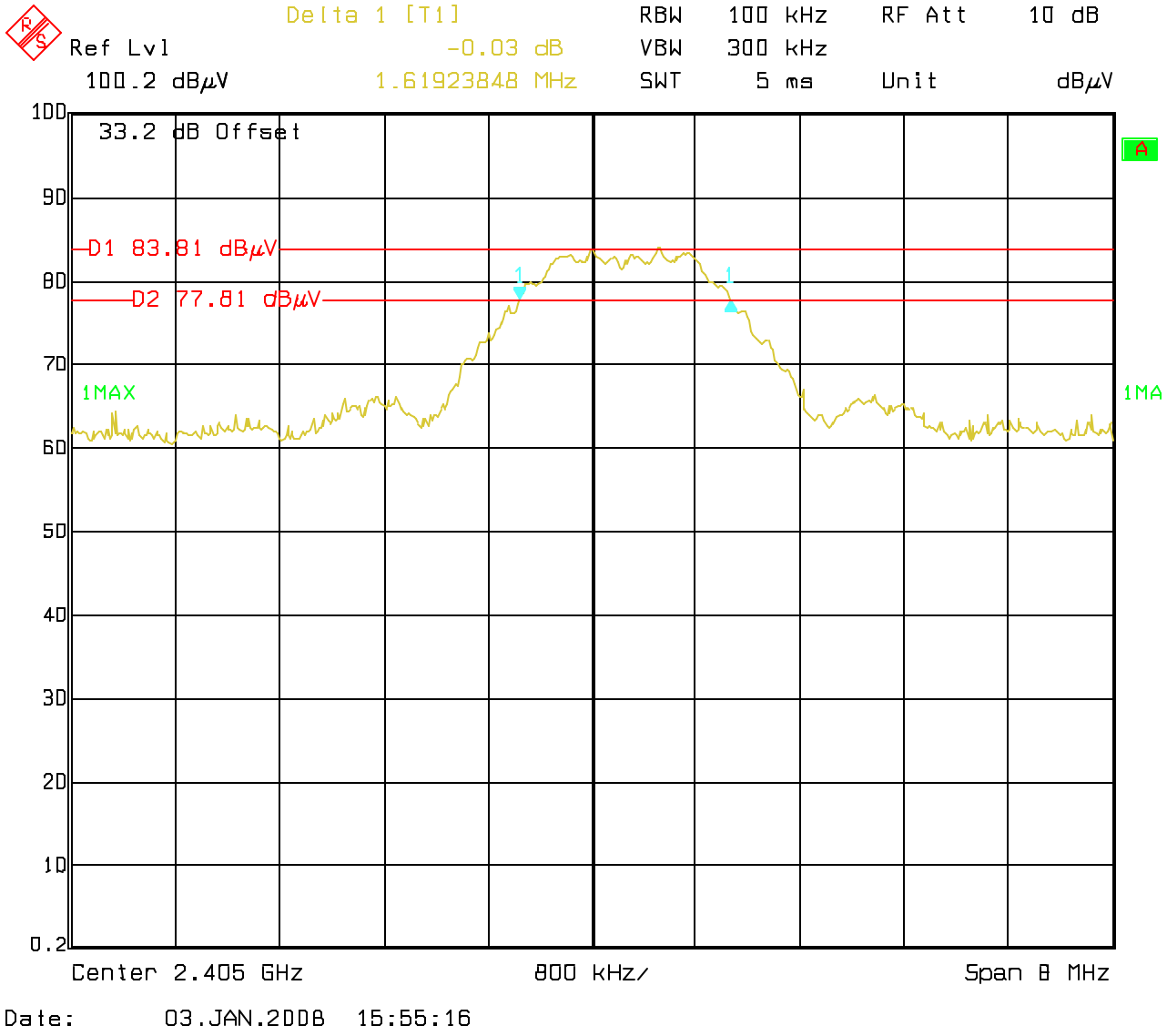
Sample Number:	S2	**Temperature:**	17
Date:	January 3, 2008	**Humidity:**	29
Modification State:	Lo/Mid/High Channels	**Tester:**	FSCustodio
		Laboratory:	SOATS

Test Results:

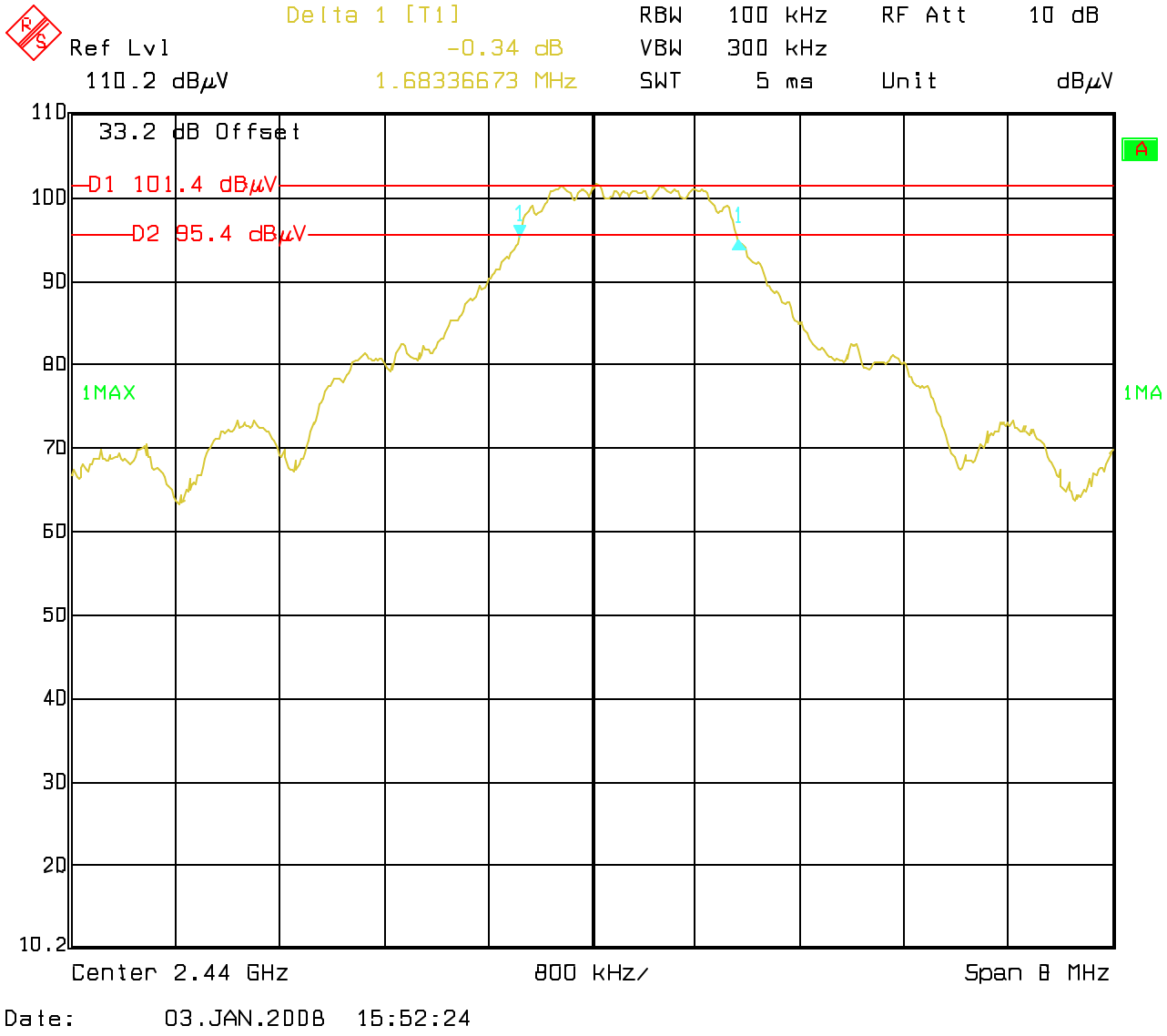
6dB Bandwidth:

Measurements were made at 3 meters. Each channel investigated was maximized in the OATS before any reading was made. Analyzer RES BW was set to 100 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.

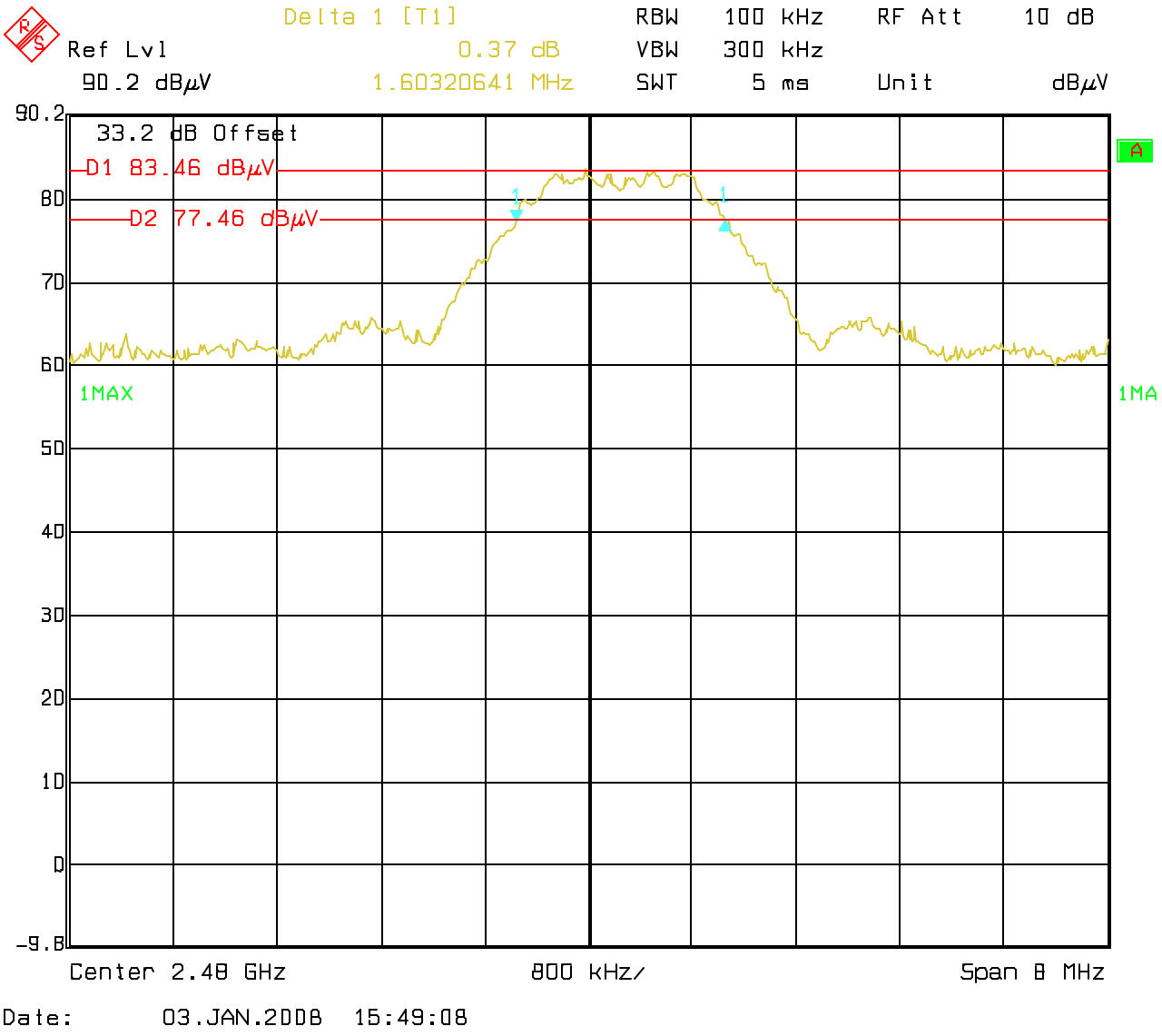
Channel Range	6 dB Bandwidth
Low (2405 MHz)	1.63 MHz
Mid (2440 MHz)	1.63 MHz
High (2480 MHz)	1.62 MHz



LOW Channel (2405 MHz)



MID Channel (2440 MHz)



HIGH Channel (2480 MHz)

6.5. Maximum peak output power

(b) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

A8.5
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

Test Conditions:

Sample Number:	S2	**Temperature:**	17
Date:	January 3, 2008	**Humidity:**	29
Modification State:	Lo/Mid/High Channels	**Tester:**	FSCustodio
		Laboratory:	SOATS

Additional Observations:

- **Investigations were made at 3 meters. Each channel investigated was maximized in the OATS. Analyzer RES BW was set to 1 MHz and VBW to 3 MHz.**
- **A correction factor of 33.2 was added to compensate for antenna factor and cable loss.**
- **Measurements were made at 102VAC, 120VAC and 138VAC 60Hz, however no noticeable differences were observed.**
- **The peak level measured was converted to V/m and Peak power computed using the formula:**

$$P = (E \times d)^2 / (30 \times G)$$

Where:
P = Power in watts
E = measured maximum field strength in V/m
d = distance in meters during measurement
G = numeric gain of the transmitting antenna over an isotropic radiator (1.)

$$0.170 = 10^{((104.6-120)/20)}$$

$$0.00867\ W = (0.170 \times 3)^2 / (30 \times 1)$$

Test Results:

Channel	Frequency (MHz)	Measured Output Power (V/m)	Measured Output Power (mW)	Calcalated Conducted Output Power
Low	2405	0.0452	0.613 mW	0.00004 mW
Mid	2440	0.170	8.58 mW	**5.5 mW**
High	2480	0.168	8.46 mW	5.5 mW

Antenna antenova© Mica 2.4 GHz SMD Anttena: Gain =1.9 dBi

Radiated Power Measured calculates to Conducted Output Power before antenna:

8.58 mW => 9.3 dBm

9.3d dB – 1.9dBi = 7.4 dBm

7.4 dBm => 5.5 mW

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Fax: (858) 452-1810

Radiated Emissions Data

Job # :	7184-2	Date :	1/3/2008	Page	1 of 1
NEX #:	99125	Time :	10:00AM		
		Staff :	FSCustodio		
Client Name :	Awarepoint			EUT Voltage :	120
EUT Name :	Sensor			EUT Frequency :	60
EUT Model # :	S2			Phase:	1
EUT Serial # :	Engineering sample			NOATS	
EUT Config. :	Transmit (Low, Mid , High)			SOATS	X
				Distance:	3m
	Part 15.247				
Specification :	CFR47 Part 15, Subpart B, Class B				
Loop Ant. #:	NA				
Bicon Ant.#:	NA	Temp. (°C) :	17		
Log Ant.#:	NA	Humidity (%) :	29		
DRG Ant. #	752	Spec An.#:	835		
Dipole Ant.#:	NA	Spec An. Display #:			
Cable LF#:	NA	QP #:			
Cable HF#:	40ft	PreSelect#:	NA		
Preamp LF#:	NA				
Preamp HF#	NA				

Quasi-Peak	RBW: 120 kHz
	Video Bandwidth 300 kHz
Peak	RBW: 1 MHz
	Video Bandwidth 3 MHz
Average	RBW: 1 MHz
	Video Bandwidth 10 Hz

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.

Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Meter Reading **Vertical**	Meter Reading **Horizontal**	Det.	EUT Side F/L/R/B	Ant. Height m	Max. Reading (dBuV)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail	Comment
2405.0	58.6	59.9	P		1.0	59.92	93.1	125.3	-32.2	Pass	Up
2405.0	53.7	48.7	P		1.0	53.66	86.8	125.3	-38.4	Pass	Side
2405.0	56.1	60.0	P		1.0	59.99	93.1	125.3	-32.1	Pass	Top
2440.0	71.5	69.8	P		1.0	71.49	104.6	125.3	-20.6	Pass	Up
2440.0	70.5	67.5	P		1.0	70.47	103.6	125.3	-21.6	Pass	Side
2440.0	67.4	70.5	P		1.0	70.47	103.6	125.3	-21.6	Pass	Top
2480.0	71.3	68.2	P		1.0	71.31	104.5	125.3	-20.8	Pass	Up
2480.0	54.1	63.6	P		1.0	63.61	96.8	125.3	-28.5	Pass	Side
2480.0	67.5	70.0	P		1.0	70.03	103.2	125.3	-22.1	Pass	Top

Correction Factor for all measurements = 33.2 (27.3 Antenna factor + 5.9 Cable loss)

Corrected Reading = Max Reading + Correction Factor

= 59.92 + 33.2

= 93.12 dBuV/m

6.6. Power Spectral Density

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

A8.2(b) The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0-second duration. This power spectral density shall be determined in accordance with the provisions of Section A8.4(4); (i.e. the power spectral density shall be determined using the same method for determining the conducted output power).

Test Conditions:

Sample Number:	S2	**Temperature:**	17
Date:	January 3 and 24, 2008	**Humidity:**	29
Modification State:	Lo/Mid/High Channels	**Tester:**	FSCustodio
		Laboratory:	SOATS

Test Results:

Channel	Channel Frequency (MHz)	RF Power Level in 3KHz BW (dBm)	Maximum Limit (dBm)	PASS/FAIL
LO	2405	-18.08	8	Pass
MID	2440	-5.23	8	Pass
HIGH	2480	-6.47	8	Pass

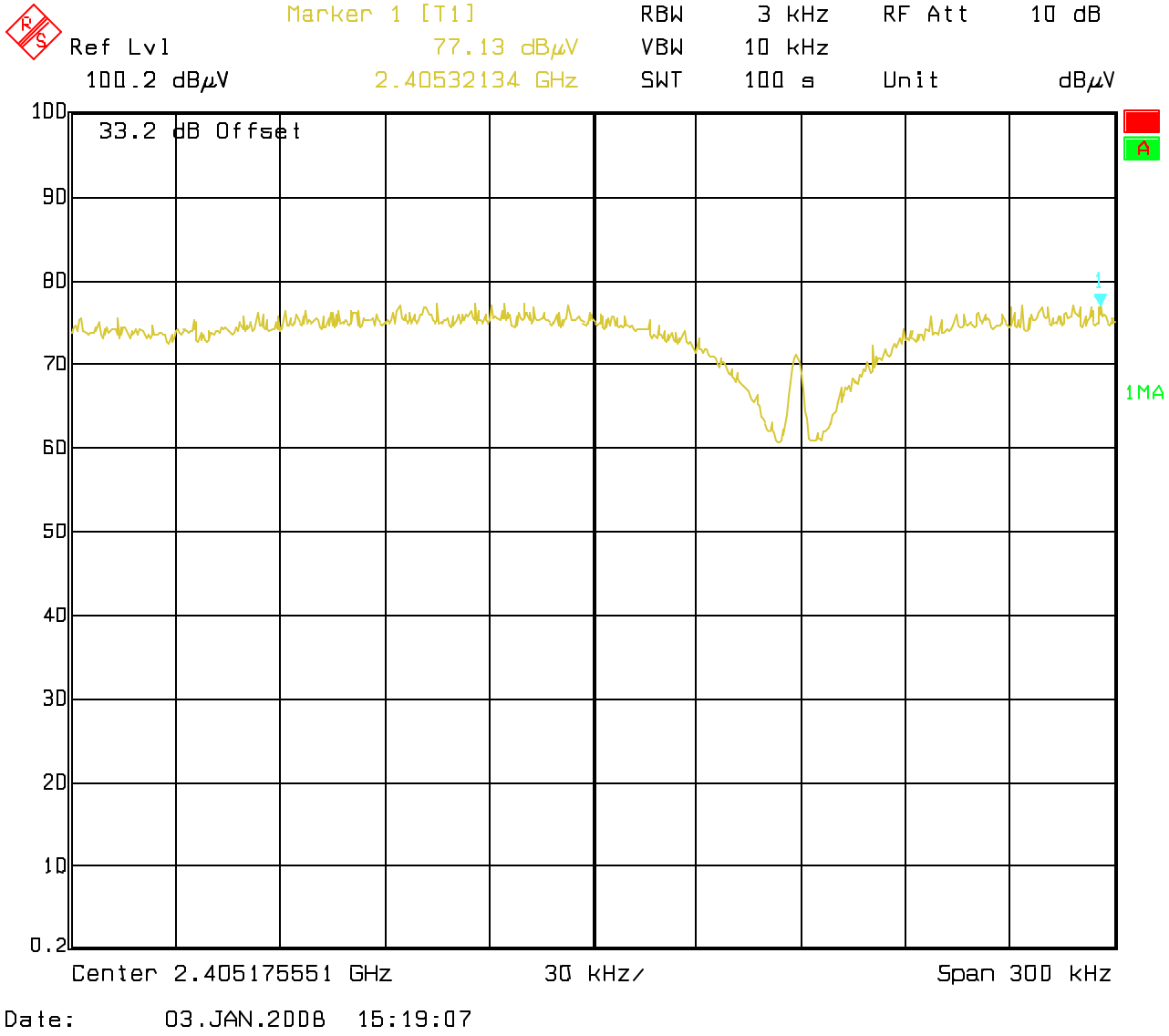
Additional Observations:

- **Investigations were made at 3 meters. Each channel investigated was maximized in the OATS and the highest point centered during measurements. Analyzer RES BW was set to 3 kHz, VBW to 10 kHz, Span to 300 kHz with sweep time of 100 seconds.**
- **A correction factor of 33.2 was added to compensate for antenna factor and cable loss.**
- **The peak level measured was converted to V/m and used in the formula:**

$$P = (E \times d)^2 / (30 \times G)$$

Where: P= Power in watts
E = measured maximum field strength in V/m
d = distance in meters during measurement
G = numeric gain of the transmitting antenna over an isotropic radiator

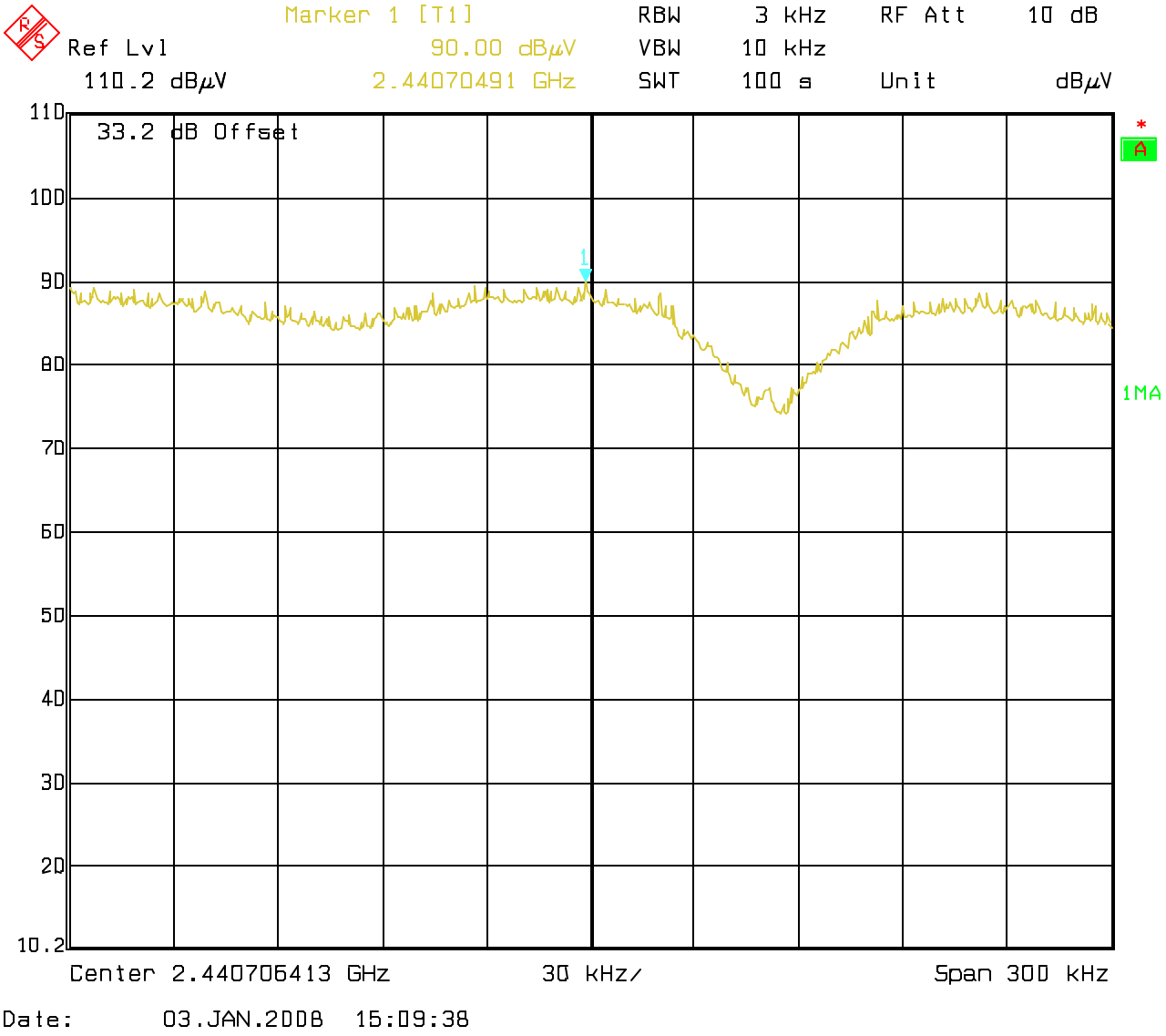
- **Power level computed from the formula in watts was converted to dBm and compared to the +8 dBm limit.**



Low Channel 2405 MHz

Max Peak = 77.13 dBuV/m or 0.0072 V/m

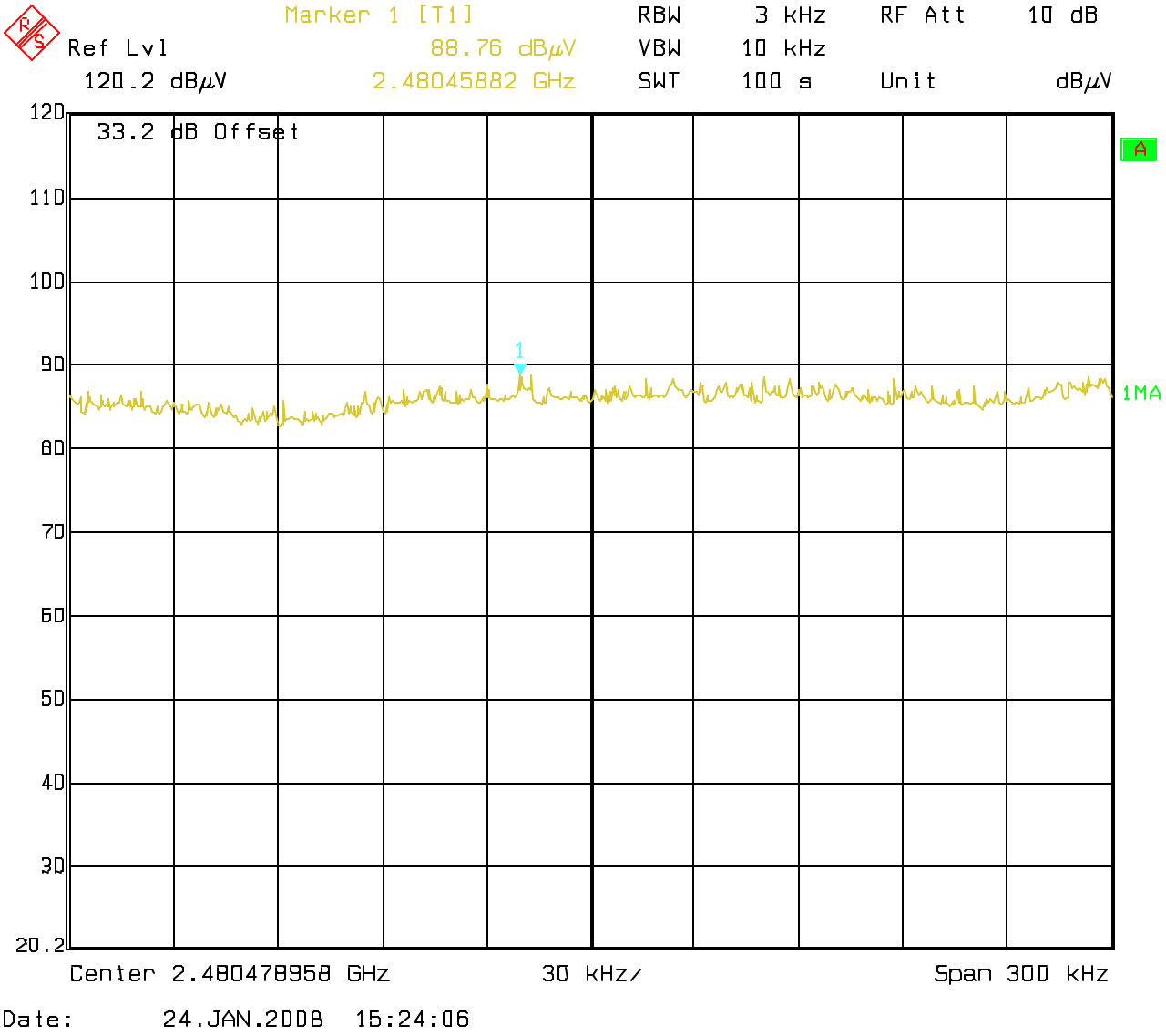
Using formula: P = (E x d)^2 / (30 x G)
= (0.00381 x 3) ^{2} / (30 x 1)
= 15.6uW or -18.082 dBm



Mid Channel 2440 MHz

Max Peak = 90 dBuV/m or 0.03162V/m

Using formula: P = (E x d)^2 / (30 x G)
= (0.03162 x 3)^2 / (30 x 1)
= 300uW or -5.2296 dBm



High Channel 2440 MHz

Max Peak = 88.76 dBuV/m or 0.0274V/m

Using formula: $P = (E \times d)^2 / (30 \times G)$
$= (0.0274 \times 3)^2 / (30 \times 1)$
= 225.22uW or -6.4738 dBm

6.7. Transmitter and Receiver AC Power Lines Conducted Emission Limit

Part 15.207(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

7.2.2 The purpose of this test is to measure unwanted radio frequency currents induced in any AC conductor external to the equipment which could conduct interference to other equipment via the AC electrical network. Except when the requirements applicable to a given device state otherwise, for any licence-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown below. The tighter limit applies at the frequency range boundaries. The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Test Conditions:

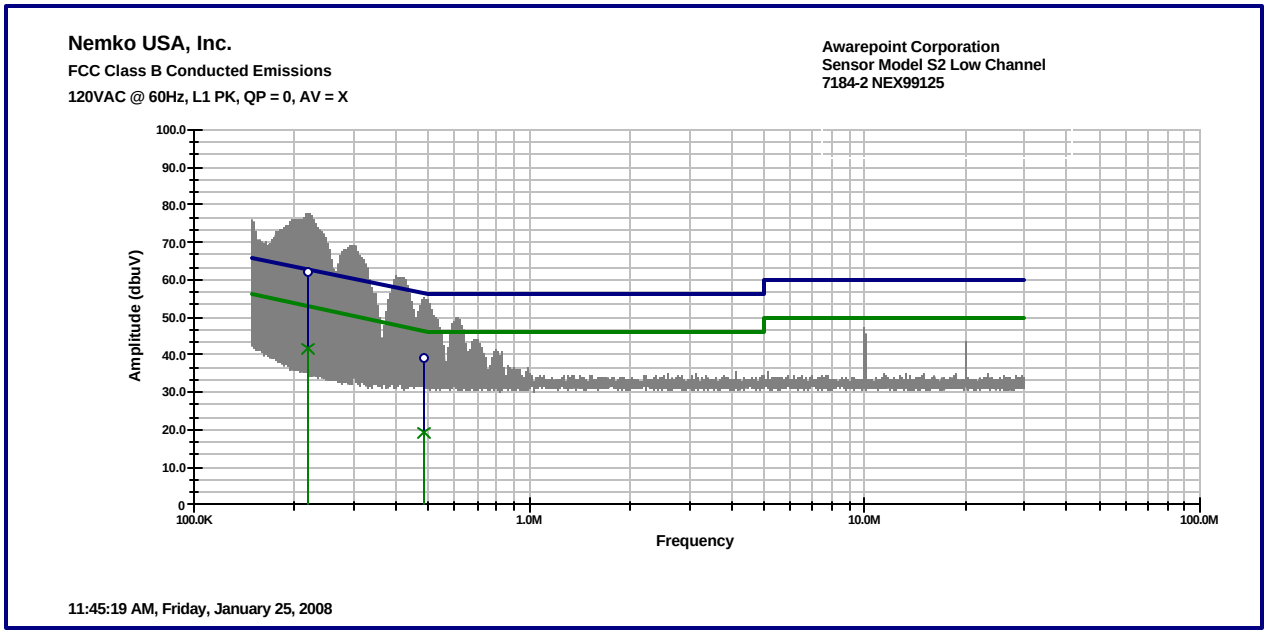
Sample Number:	S2	**Temperature:**	22.2
Date:	January 25, 2008	**Humidity:**	30
Modification State:	Lo/Mid/High Channels	**Tester:**	FSCustodio
		Laboratory:	Shield Room #1

Test Results: See Attached Plots.

Additional Observations:

- Green limit line is Average limit and blue limit line is Quasi-peak limit.
- Instrumentation settings are 9kHz RBW/30kHz VBW for Average measurements and 100kHz RBW/100kHz VBW for Peak measurements.

Line 1 (EUT SN 50046)



Line 2 (EUT SN 50046)