



**Nemko USA, Inc.**  
11696 Sorrento Valley Rd., Suite F  
San Diego, CA 92121-1024  
Phone (858) 755-5525 Fax (858) 452-1810

## CERTIFICATION TEST REPORT

**Report Number:** 2007 087190 EMC

**Project Number:** 7190-1

**Applicant:** AWAREPOINT  
10590 WEST OCEAN AIR DRIVE, SUITE 110  
SAN DIEGO, CA 92130

**Equipment Under Test (EUT):** TRACKING TAG  
**Model:** T2-S  
**FCC ID:** UAG-T2  
**IC:** 7348A-T2

**In Accordance With:** FCC Part 15 Subpart C, 15.247  
RSS-210, Issue 7, June 2007

**Tested By:** Nemko USA Inc.  
11696 Sorrento Valley Road, Suite F  
San Diego, CA 92121

**Authorized By:**   
Michael T. Krumweide, EMC Supervisor

**Date:** September 26, 2007

**Total Number of Pages:** 39

## 2.1. Section 1. Summary of Test Results

### General

#### All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15; Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

**Apparatus Assessed:** Tracking Tag  
Model T2-S

**Specification:** FCC Part 15 Subpart C, 15.247

**Date Received in Laboratory:** August 30, 2007

**Compliance Status:** Complies

**Exclusions:** None

**Non-compliances:** None

### Report Release History:

REVISION	DATE	COMMENTS	
-	September 26, 2007	Prepared By:	Ferdinand Custodio
-	September 26, 2007	Initial Release:	Mike T. Krumweide

**Nemko USA, Inc.**

UAG-T2  
7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247

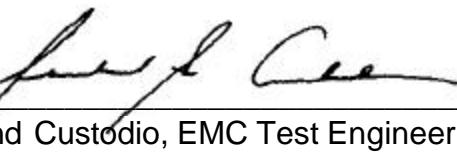
Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

Nemko USA Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko USA Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

TESTED BY:



*ferdinand custodio*

Ferdinand Custodio, EMC Test Engineer

Date: September 26, 2007

## TABLE OF CONTENTS

<b>2.1. Section 1. Summary of Test Results .....</b>	<b>2</b>
<b>Section 2: Equipment Under Test.....</b>	<b>5</b>
2.1 Product Identification .....	5
2.2 Samples Submitted for Assessment .....	9
2.3 Theory of Operation.....	10
2.4 Technical Specifications of the EUT.....	10
<b>Section 3: Test Conditions .....</b>	<b>11</b>
3.1 Specifications .....	11
3.2 Deviations From Laboratory Test Procedures .....	11
3.3 Test Environment .....	11
3.4 Test Equipment .....	12
<b>Section 4: Observations.....</b>	<b>13</b>
4.1 Modifications Performed During Assessment.....	13
4.2 Record Of Technical Judgements .....	13
4.3 EUT Parameters Affecting Compliance .....	13
4.4 Test Deleted.....	13
4.5 Additional Observations .....	13
<b>Section 5: Results Summary.....</b>	<b>14</b>
5.1 Test Results .....	14
<b>Appendix A: Test Results .....</b>	<b>15</b>
20dB Bandwidth .....	15
Out-of-band Emissions / Radiated Emissions within Restricted Bands .....	19
Bandedge Measurements .....	24
Minimum 6dB RF Bandwidth .....	28
Maximum peak output power.....	32
Maximum peak output power.....	32
Power Spectral Density .....	35
<b>Appendix B: Photos of Test Setups.....</b>	<b>40</b>
<b>Appendix C: Block Diagram of Test Setups .....</b>	<b>43</b>

## **Section 2: Equipment Under Test**

### **2.1 Product Identification**

Awarepoint Tag Model T2 has two variations: T2-S and T2-A. Both products use the same electronics but have minor differences in their plastic enclosure. The T2-S is a plain case and the T2-A has an additional piece of plastic on the top. The differences are trivial and do not affect RF performance.

**Nemko USA, Inc.**

UAG-T2

7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247

---

**Nemko USA, Inc.**

UAG-T2

7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247

N/A

**Nemko USA, Inc.**

UAG-T2

7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247

No connection

## **2.2 Samples Submitted for Assessment**

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



## 2.3 Theory of Operation

**The** T2-S is a Tracking Tag. The EUT is a wireless device that is attached to equipment so that the equipment may be located by a tracking system. The Tags transmit short messages periodically which are received by the tracking system receivers. The Receiver measures the signal strength of the pulse, and transmits this data (Tag ID and signal strength emitted from the Tag) to the Bridge via the mesh network created by the plurality of the Receivers. The Bridge communicates with the Tags on its wireless link via the Receivers. The Bridges communicate with the tracking system's Server over an Ethernet Interface. Tags, Receivers, and Bridges also periodically check the Server for updated configuration information or firmware updates.

The EUT was exercised by soldering a new fresh of battery for each test. The EUT will transmit every 5 seconds worst case but was modified to transmit continuously for the tests. Four (4) operating modes can be cycled using an external magnet to activate a Reed switch. These modes are Sleep (Stand-by), Low Channel transmit (2.405GHz), Mid Channel transmit (2.44GHz) and High Channel transmit (2.480GHz).

## 2.4 Technical Specifications of the EUT

<b>Manufacturer:</b>	Awarepoint
<b>Operating Frequency:</b>	2405 MHz to 2480 MHz in the 2400-2483.5 MHz Band
<b>Rated Power:</b>	110.54 uW
<b>Modulation:</b>	Offset Quadrature - PSK
<b>Antenna Connector:</b>	Integral
<b>Power Source:</b>	3V BR2477A Lithium Battery

## **Section 3: Test Conditions**

### **3.1 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

### **3.2 Deviations From Laboratory Test Procedures**

No deviations from Laboratory Test Procedure

### **3.3 Test Environment**

All tests were performed under the following environmental conditions:

Temperature range	:	22 – 27 °C
Humidity range	:	45 - 57 %
Pressure range	:	87 - 105 kPa
Power supply range	:	Fresh battery for each test

**Nemko USA, Inc.**

UAG-T2

7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247

**3.4 Test Equipment**

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
752	Antenna, DRWG	EMCO	3115	4943	10/17/2006	10/17/07
317	Preamplifier	HP	8449A	2749A00167	2/9/2007	02/09/08
835	Spectrum Analyzer	Rohde & Schwarz	RHDFSEK	829058/005	6/20/2007	06/20/08
110	Antenna, LPA	Electrometrics	LPA-25	1217	12/18/2006	12/18/07
877	Antenna, DRG Horn, .7-18GHz	AH Systems	SAS-571	688	7/10/2007	07/10/08
317	Preamplifier	HP	8449A	2749A00167	2/9/2007	02/09/08
897	Spectrum Analyzer	Rohde & Schwarz	FSP7	837620/009	9/14/2007	09/14/08
114	Antenna, Bicon	EMCO	3104	2997	12/20/2006	12/20/07
901	Preamplifier	Sonoma	310 N	130607	2/9/2007	02/09/08

2040B-1 OATS

## **Section 4: Observations**

### **4.1 Modifications Performed During Assessment**

No modifications were performed during assessment.

### **4.2 Record Of Technical Judgements**

No technical judgements were made during the assessment.

### **4.3 EUT Parameters Affecting Compliance**

The user of the apparatus could not alter parameters that would affect compliance.

### **4.4 Test Deleted**

No Tests were deleted from this assessment.

### **4.5 Additional Observations**

There were no additional observations made during this assessment.

## Section 5: Results Summary

This section contains the following:

### FCC Part 15 Subpart C: Test Results

§ 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

### 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

### RSS-Gen Issue 2 June 2007

General Requirements and Information for the Certification of Radiocommunication Equipment

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.

### 5.1 Test Results

Part 15C	RSS-210	Test Description	Required	Result
15.247(b)(3)	RSP100 A8.4 (4)	20 dB Bandwidth – required to determine emission designator per TRC-43 Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands	Y Y	Pass 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 4.6.1	Transmitter and Receiver AC Power Lines Conducted Emission Limit	N	Pass
Part 15B	RSS-GEN 4.10	Receiver Spurious Emissions	Y	Pass

#### Notes:

Spurious Emissions was measured when the unit is in "Stand By" mode to show compliance with IC RSS General Receiver requirements, however no emissions were detected.

## Appendix A: Test Results

### 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:**

<b>Sample Number:</b>	<b>T2-S</b>	<b>Temperature:</b>	26
<b>Date:</b>	August 30, 2007	<b>Humidity:</b>	55
<b>Modification State:</b>	Lo/Mid/High Channels	<b>Tester:</b>	FSCustodio
		<b>Laboratory:</b>	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.

**Nemko USA, Inc.**

UAG-T2

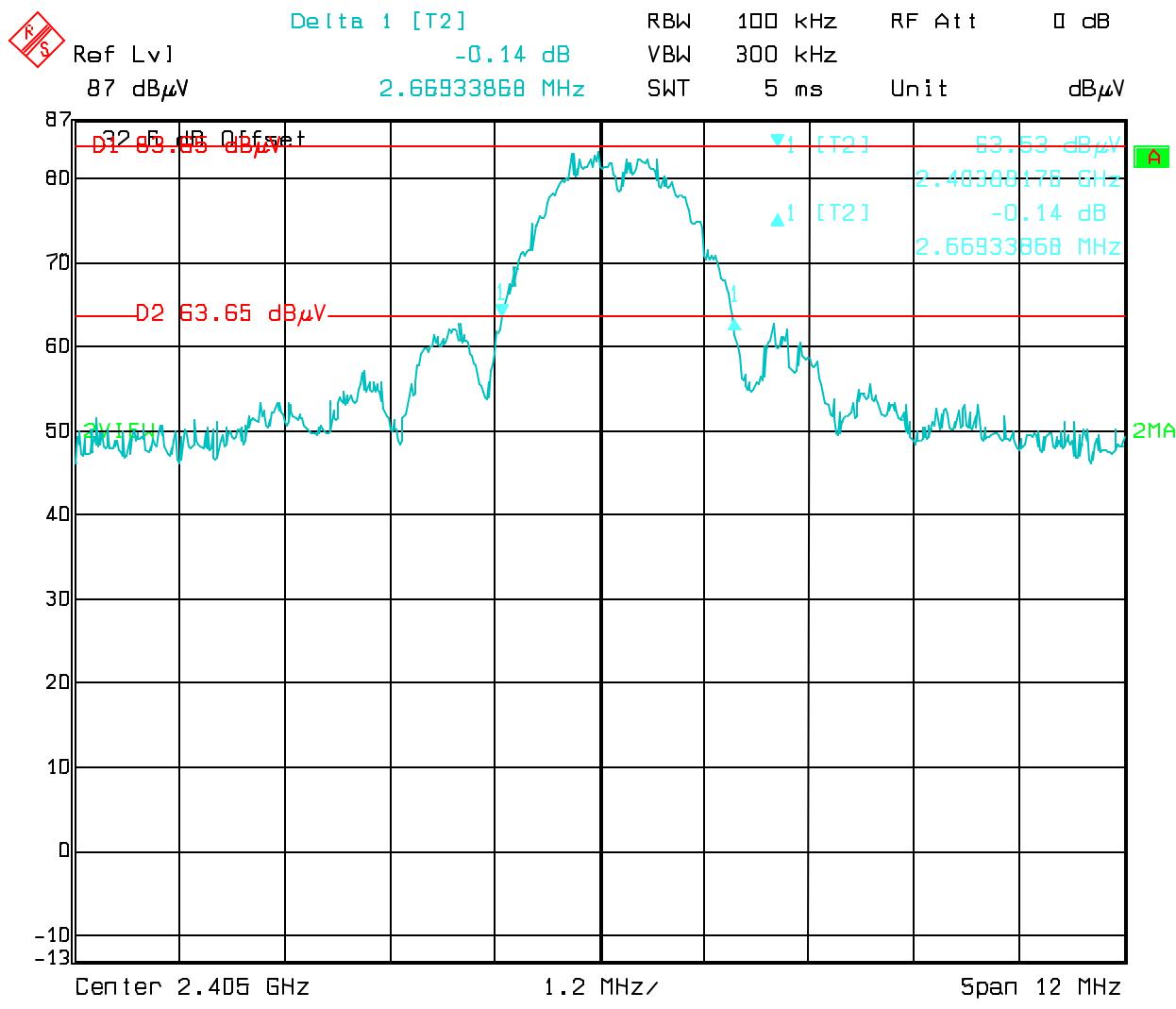
7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247



Date: 31.JUL.2007 17:52:09

LOW Channel 20dB bandwidth = 2.66 MHz

**Nemko USA, Inc.**

UAG-T2

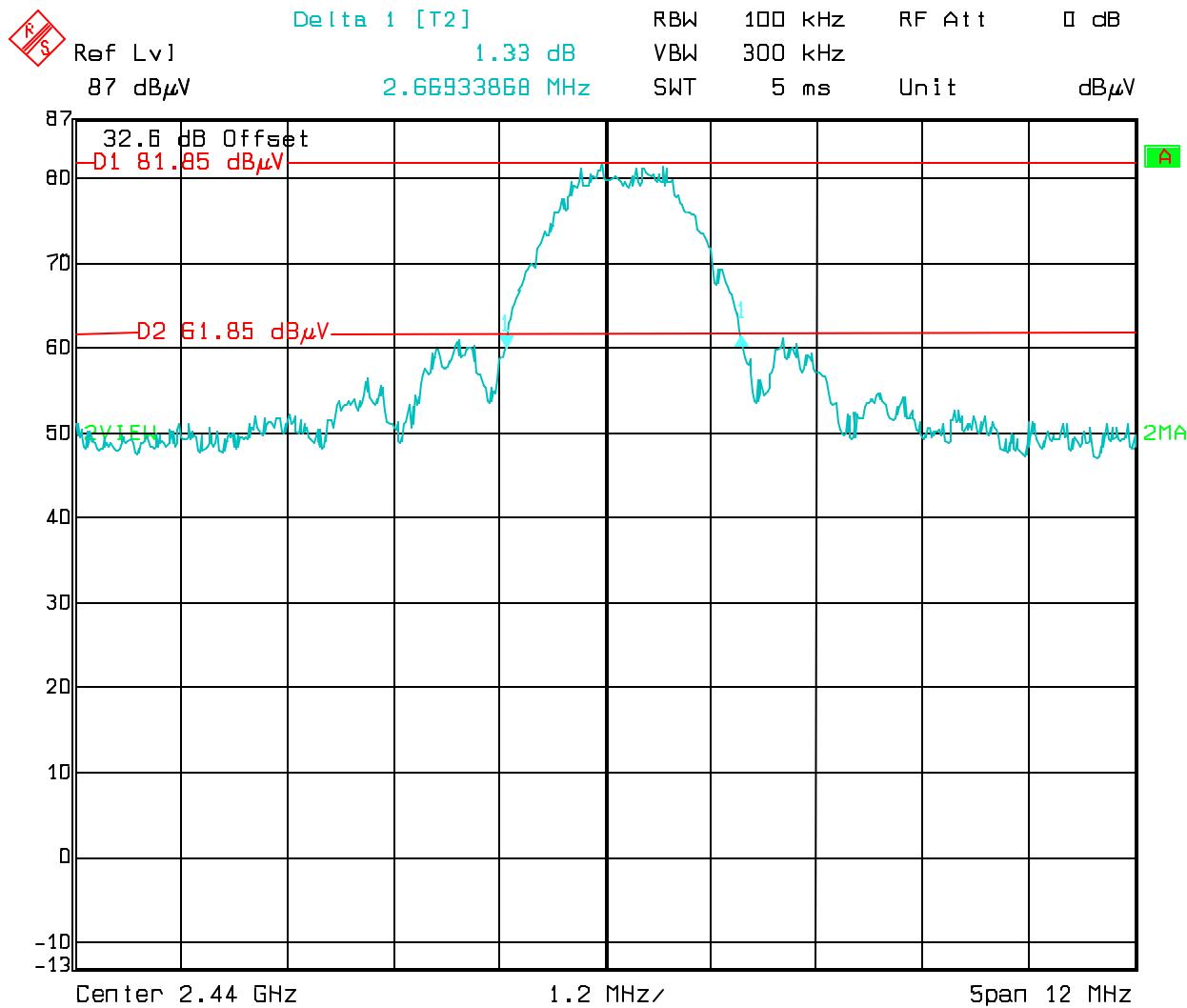
7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

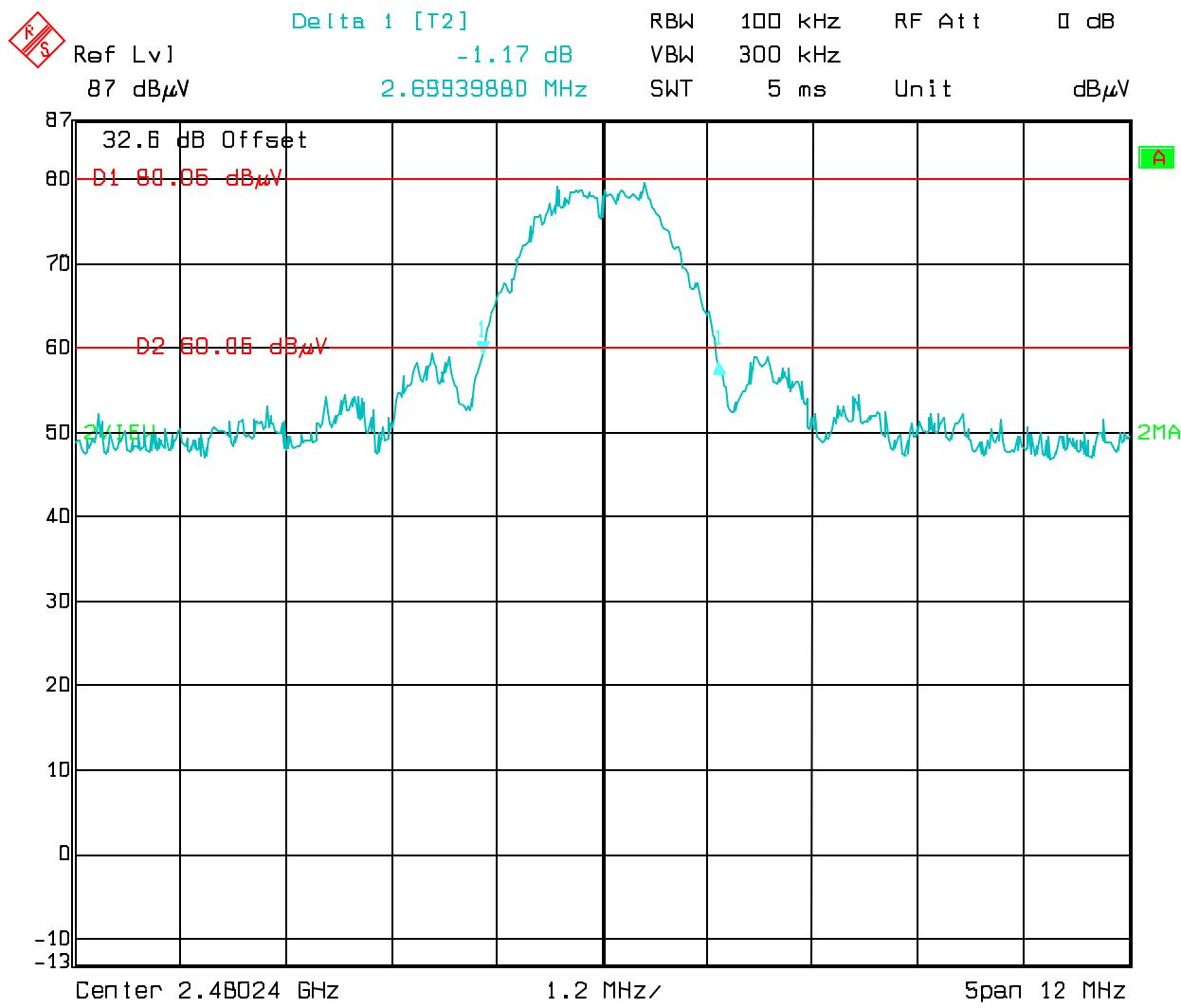
Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247



MID Channel 20dB bandwidth = 2.67MHz



HIGH Channel 20dB bandwidth = 2.70MHz

**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:**

<b>Sample Number:</b>	<b>T2-S</b>	<b>Temperature:</b>	26
<b>Date:</b>	September 26, 2007	<b>Humidity:</b>	55
<b>Modification State:</b>	Lo/Mid/High Channels	<b>Tester:</b>	FSCustodio
<b>Laboratory:</b>			SOATS

**Test Results:**

No emissions observed other than the fundamental.

**Additional Observations:**

- A new battery was installed for this test.
- The Spectrum was searched from 30MHz to the 10<sup>th</sup> 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.

**Nemko USA, Inc.**

UAG-T2

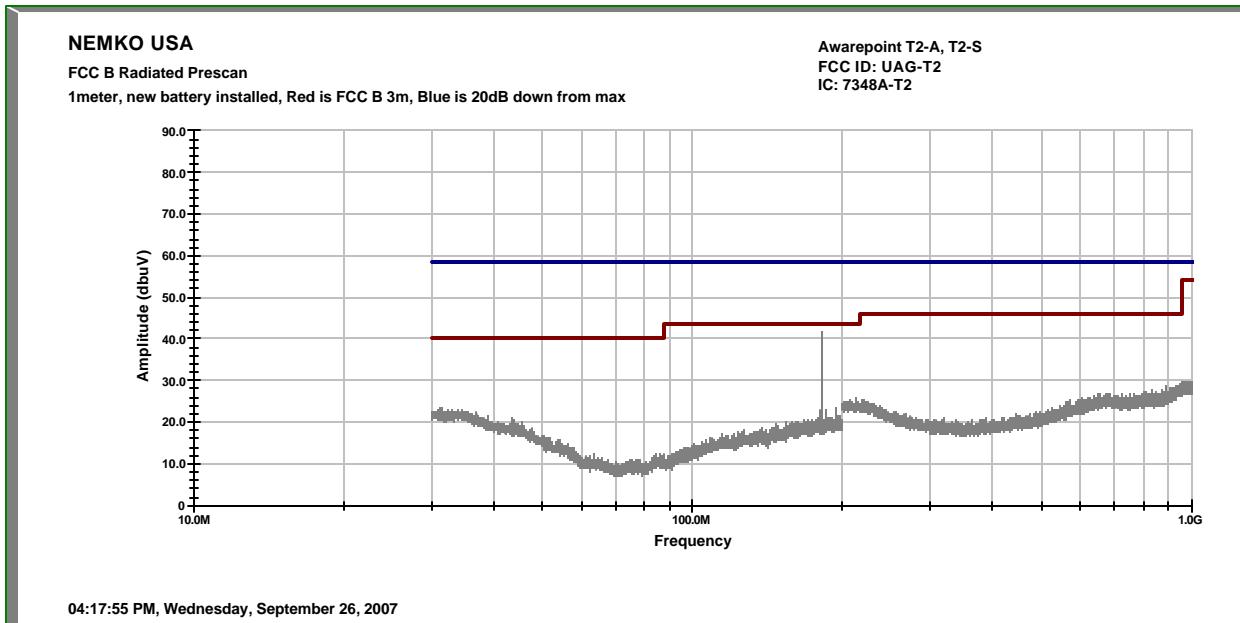
7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

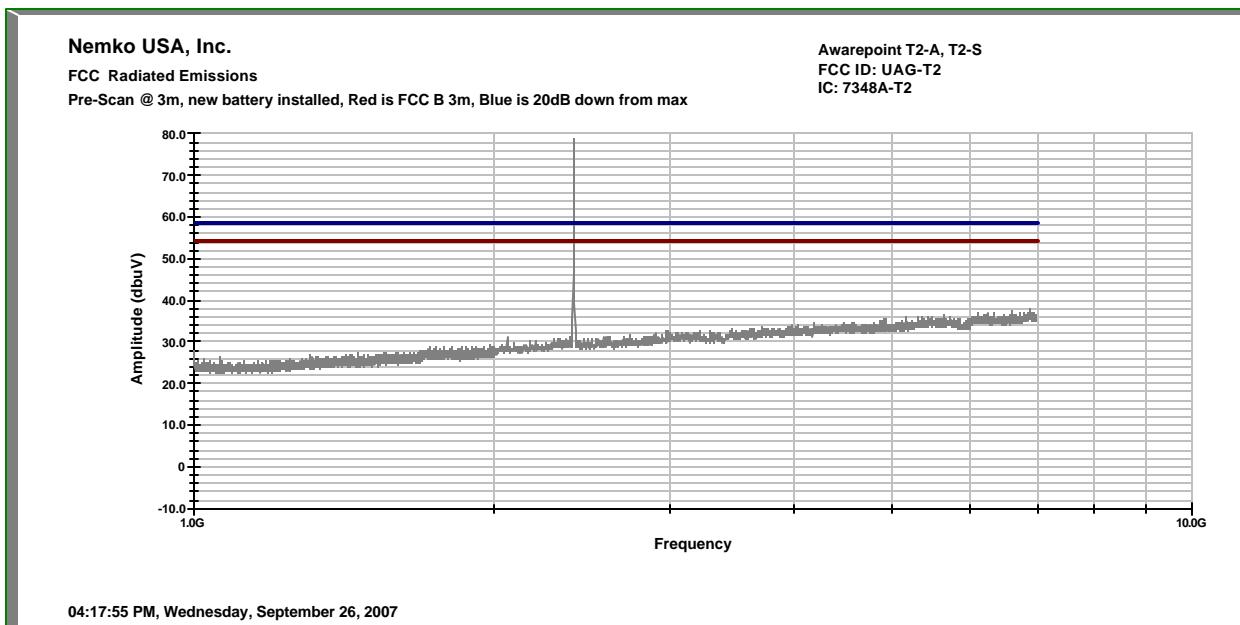
Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247



**Plots from 30 to 1000MHz (Peak)**, Red limit line is FCC Class B @ 3 meters while blue limit line is 20dB below the highest inband emission. The 181.181Mhz signal is verified ambient.



**Plots from 1 to 7GHz (Peak)**, Red limit line is FCC Class B @ 3 meters while blue limit line is 20dB below the highest inband emission.

**Nemko USA, Inc.**

UAG-T2

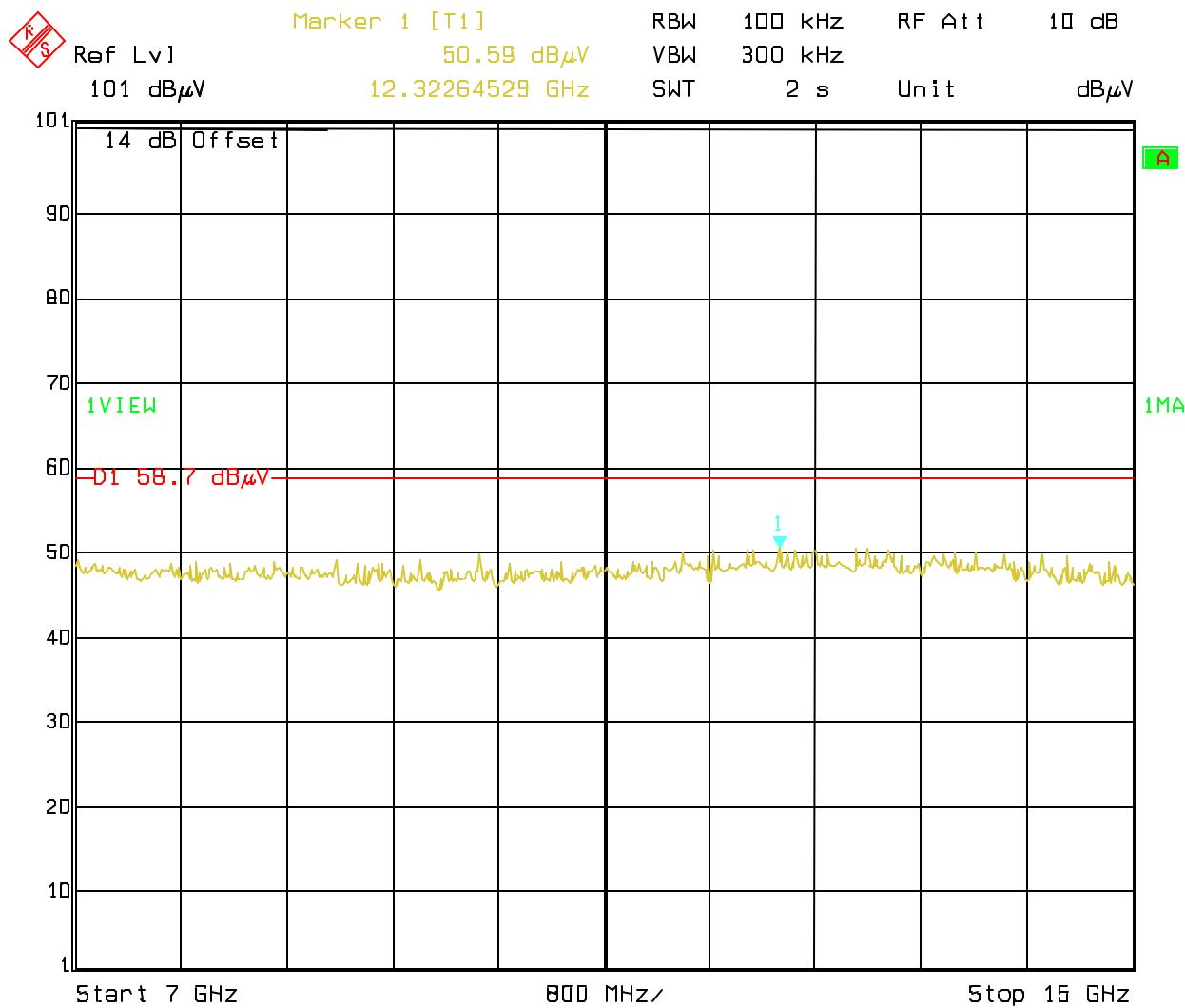
7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247



Date: 27.AUG.2007 18:53:02

**Plots from 7 to 15GHz (Peak)**, Display Line 1 (58.7 dB $\mu$ V) is the line 20dB below the highest inband emission.

**Nemko USA, Inc.**

UAG-T2

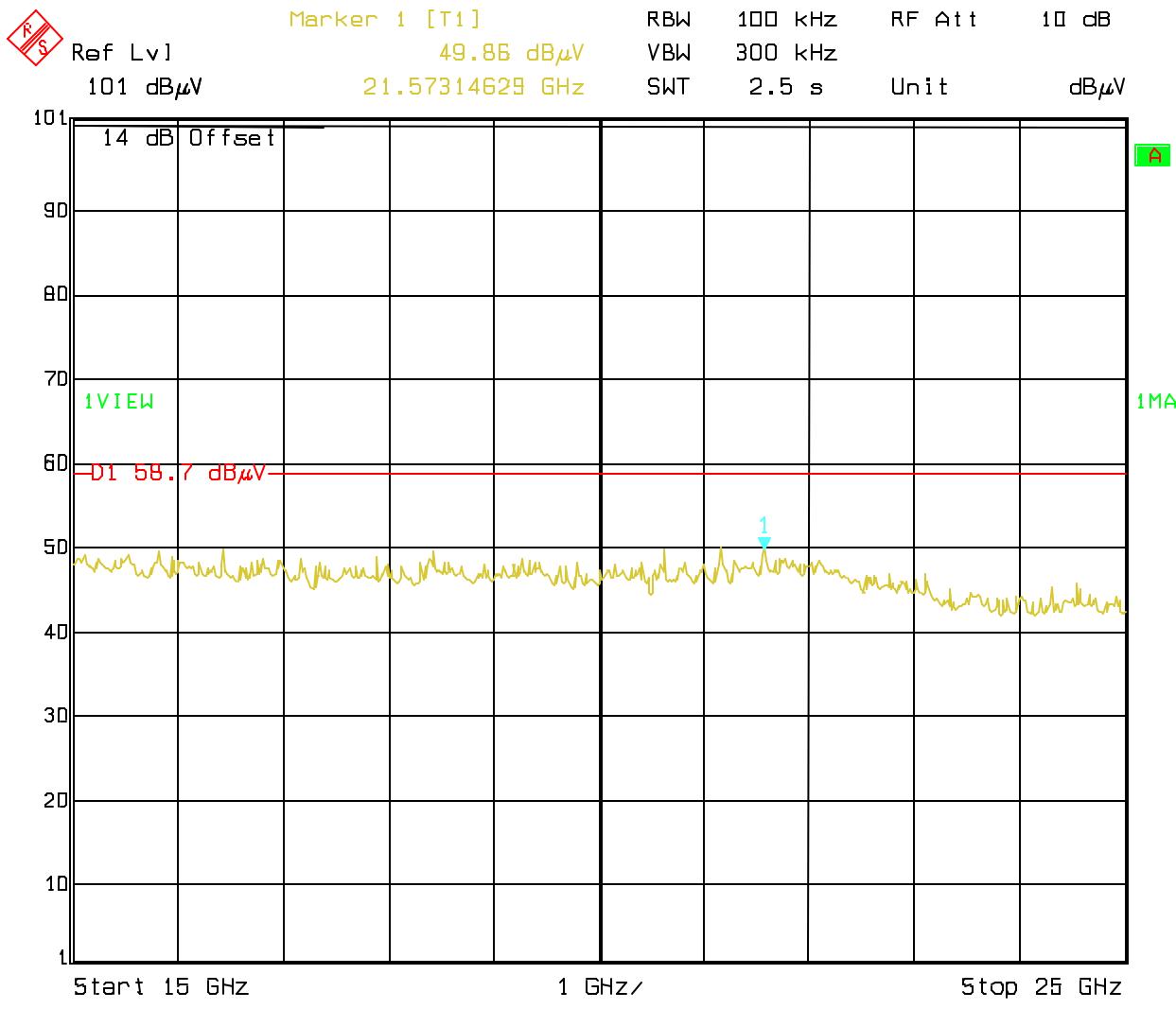
7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

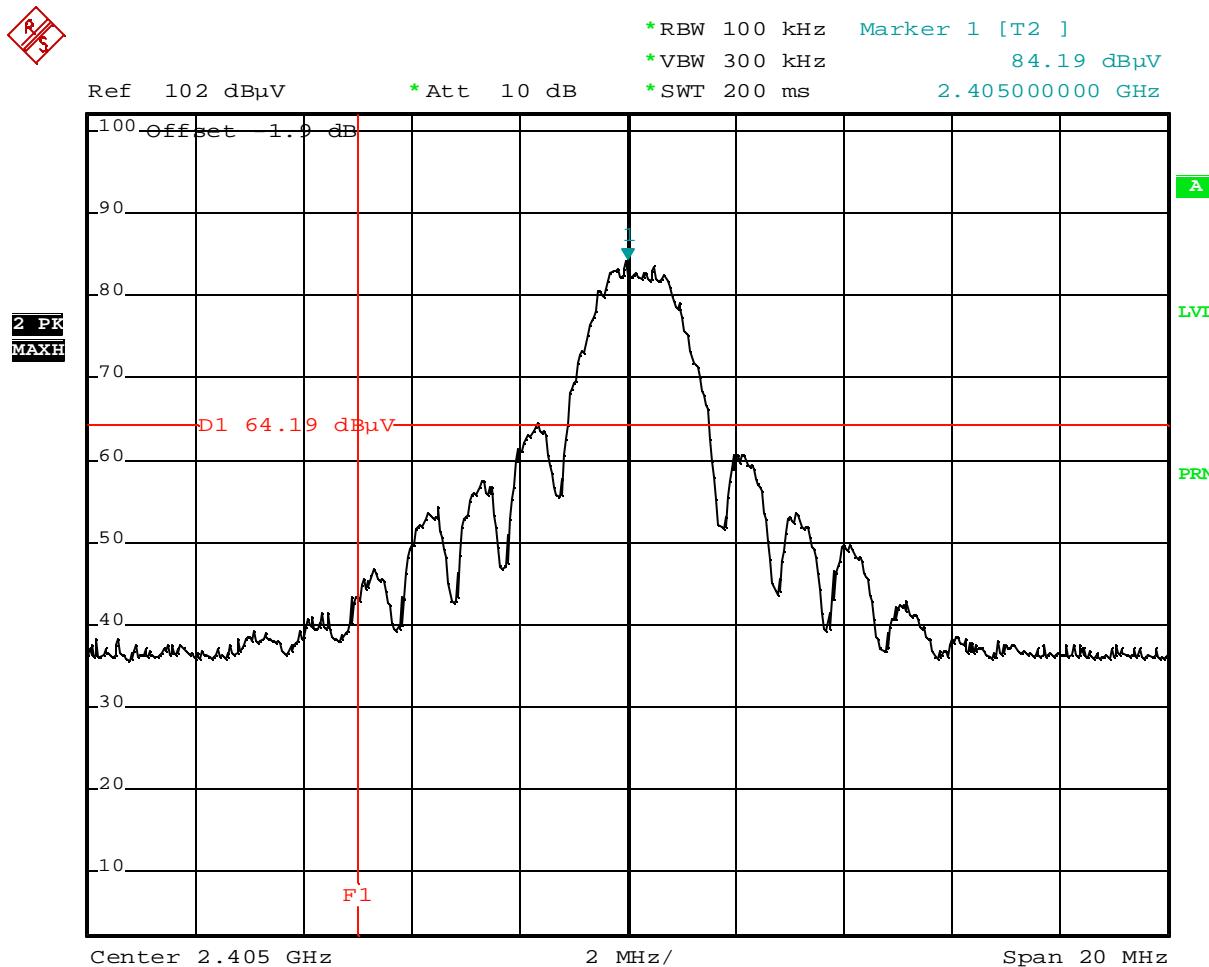
Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247



Date: 27.AUG.2007 18:55:46

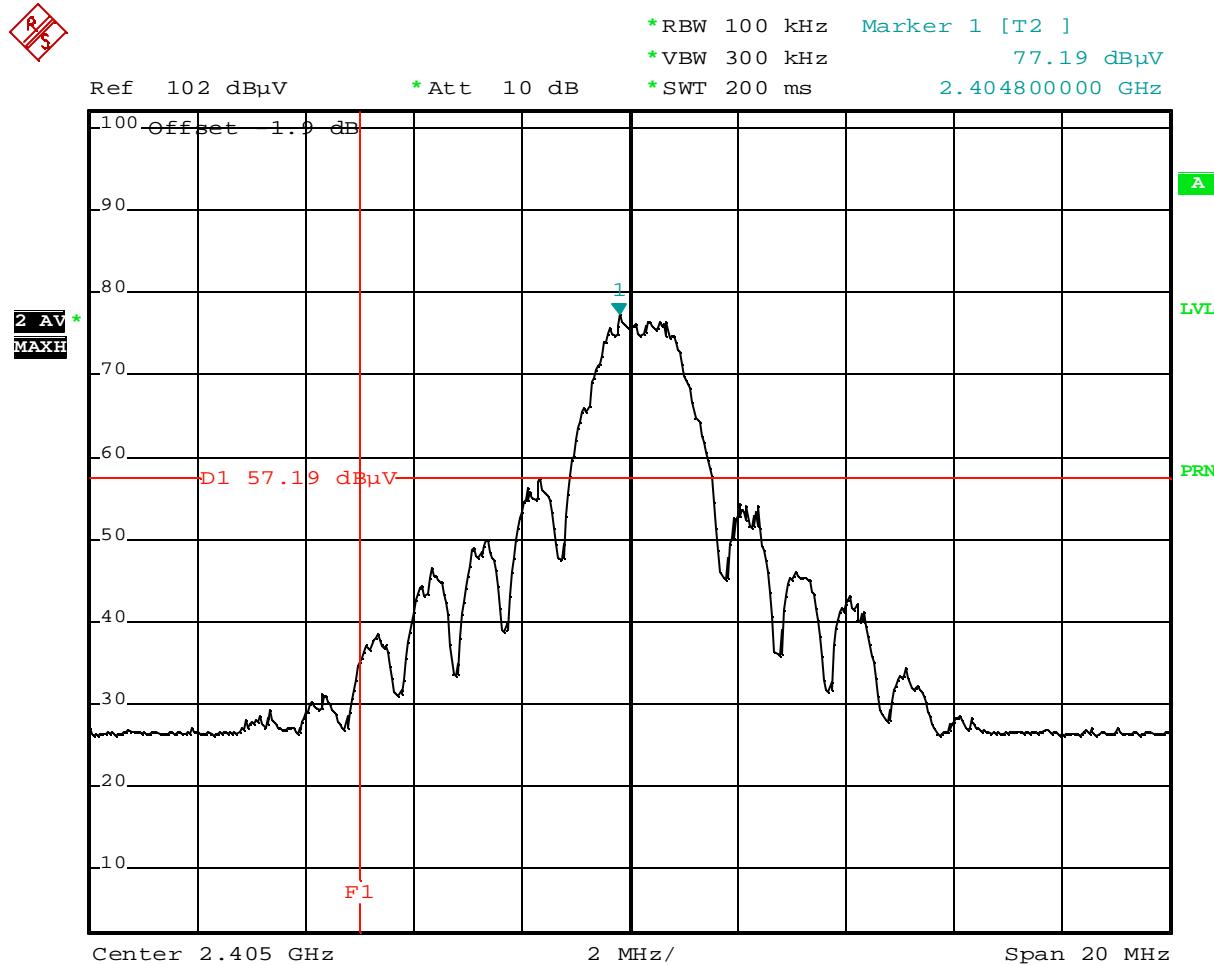
**Plots from 15 to 25GHz (Peak)**, Display Line 1 (58.7 dB $\mu$ V) is the line 20dB below the highest inband emission.

**Bandedge Measurements**

Date: 26. SEP. 2007 15:17:14

**Low Channel 2405 MHz (Peak Measurement)**

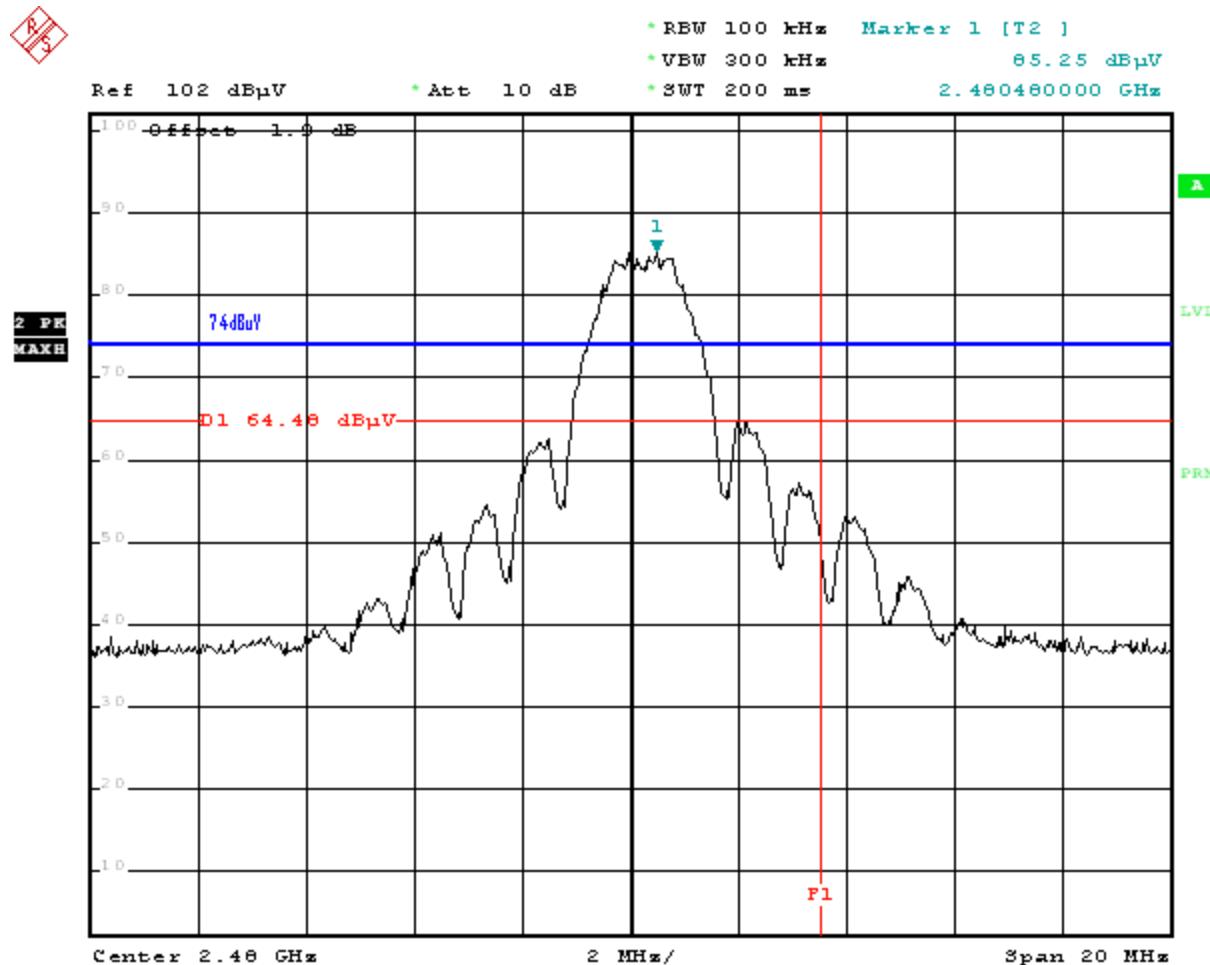
Frequency line is 2400MHz  
-1.9 dB offset for antenna (29.5), cable loss (2.4) and Preamp (-33.8)



Date: 26.SEP.2007 15:19:02

**Low Channel 2405 MHz (Average Measurement)**

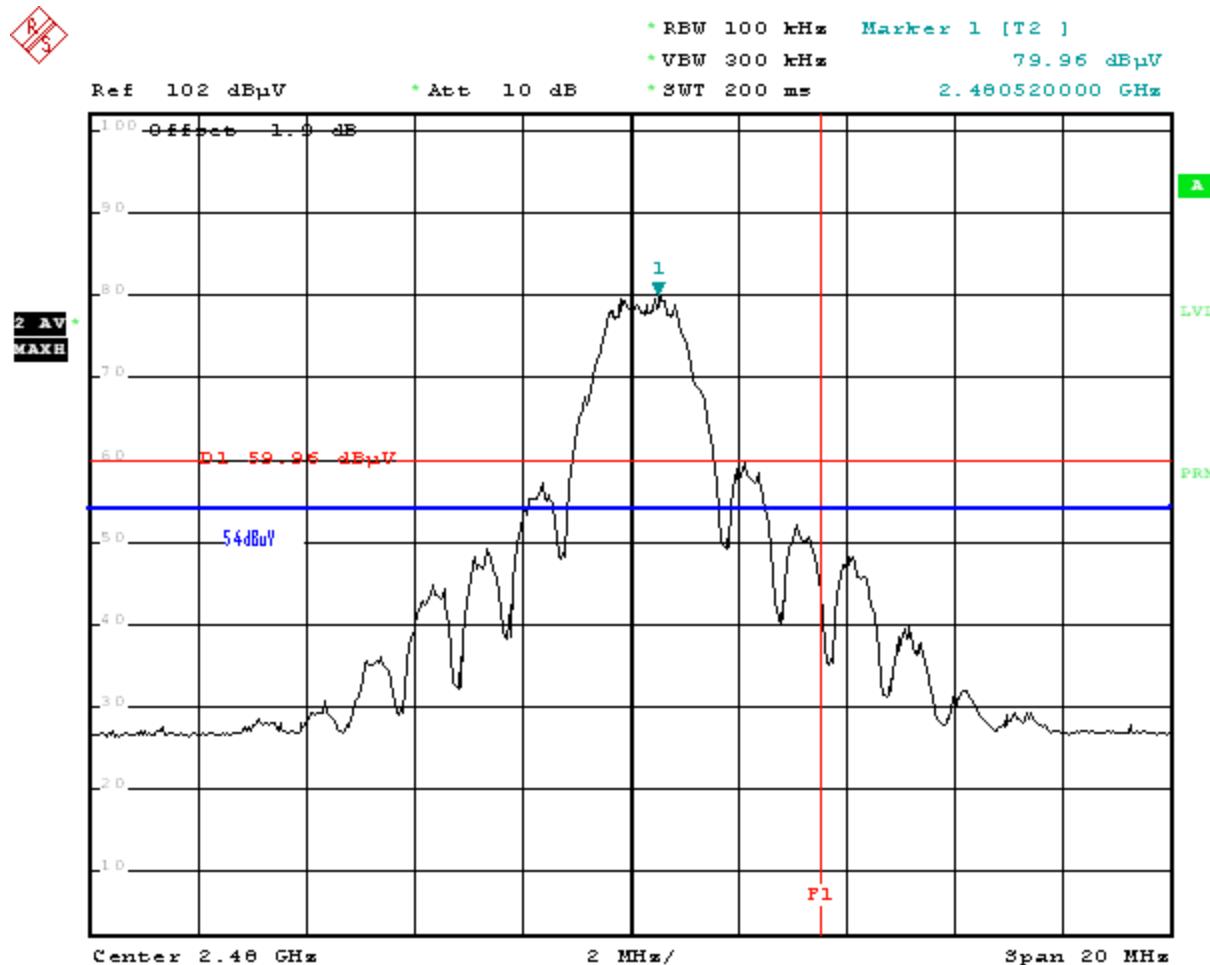
Frequency line is 2400MHz  
-1.9 dB offset for antenna (29.5), cable loss (2.4) and Preamp (-33.8)



Date: 26. SEP. 2007 15:13:31

**High Channel 2480 MHz (Peak Measurement)**

Frequency line is 2483.5 MHz  
-1.9 dB offset for antenna (29.5), cable loss (2.4) and Preamp (-33.8)



Date: 26. SEP. 2007 15:15:03

**High Channel 2480 MHz (Average Measurement)**

Frequency line is 2483.5 MHz  
-1.9 dB offset for antenna (29.5), cable loss (2.4) and Preamp (-33.8)

**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:**

<b>Sample Number:</b>	<b>T2-S</b>	<b>Temperature:</b>	26
<b>Date:</b>	August 30, 2007	<b>Humidity:</b>	55
<b>Modification State:</b>	Lo/Mid/High Channels	<b>Tester:</b>	FSCustodio
		<b>Laboratory:</b>	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

**Nemko USA, Inc.**

UAG-T2

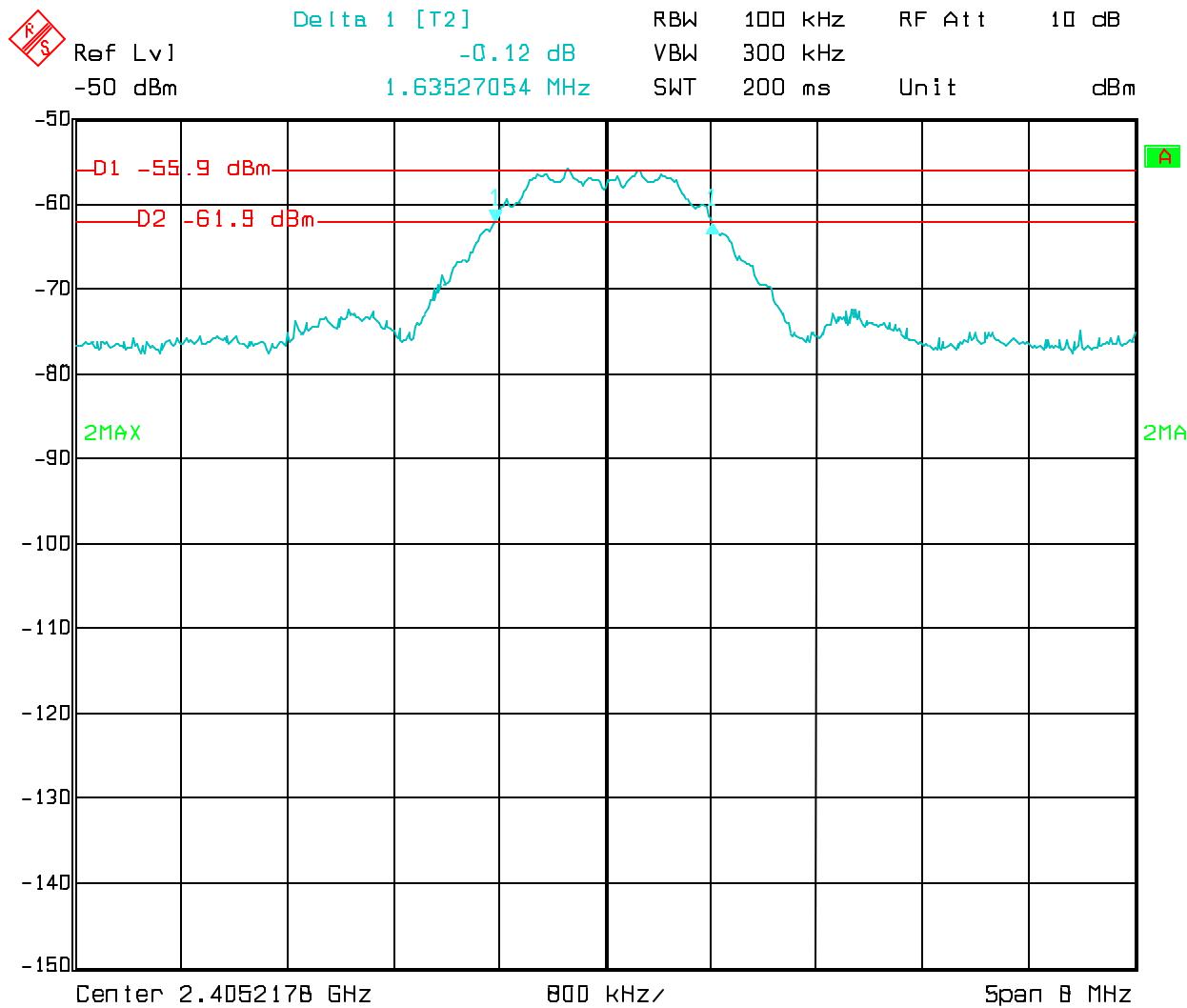
7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

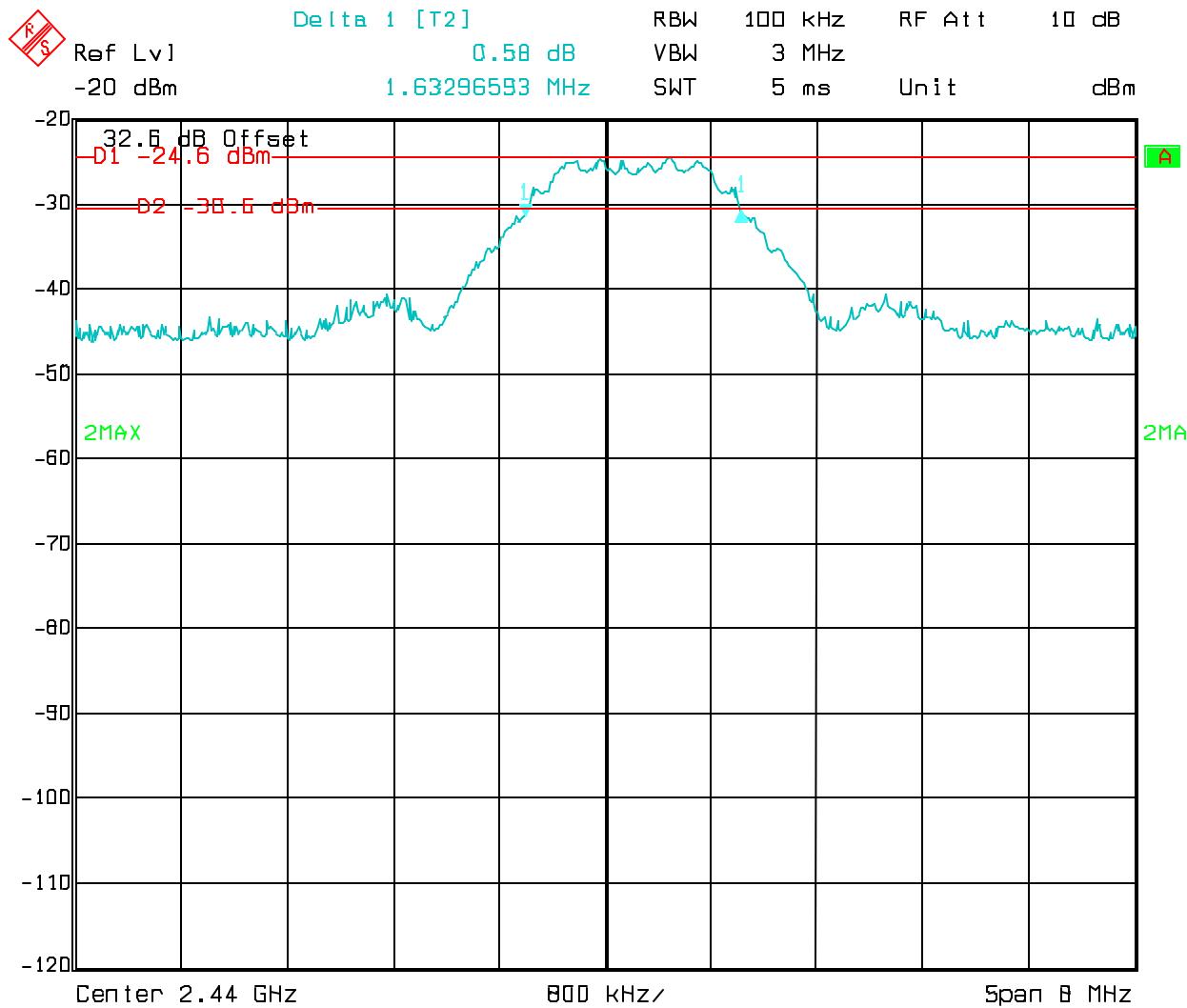
Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

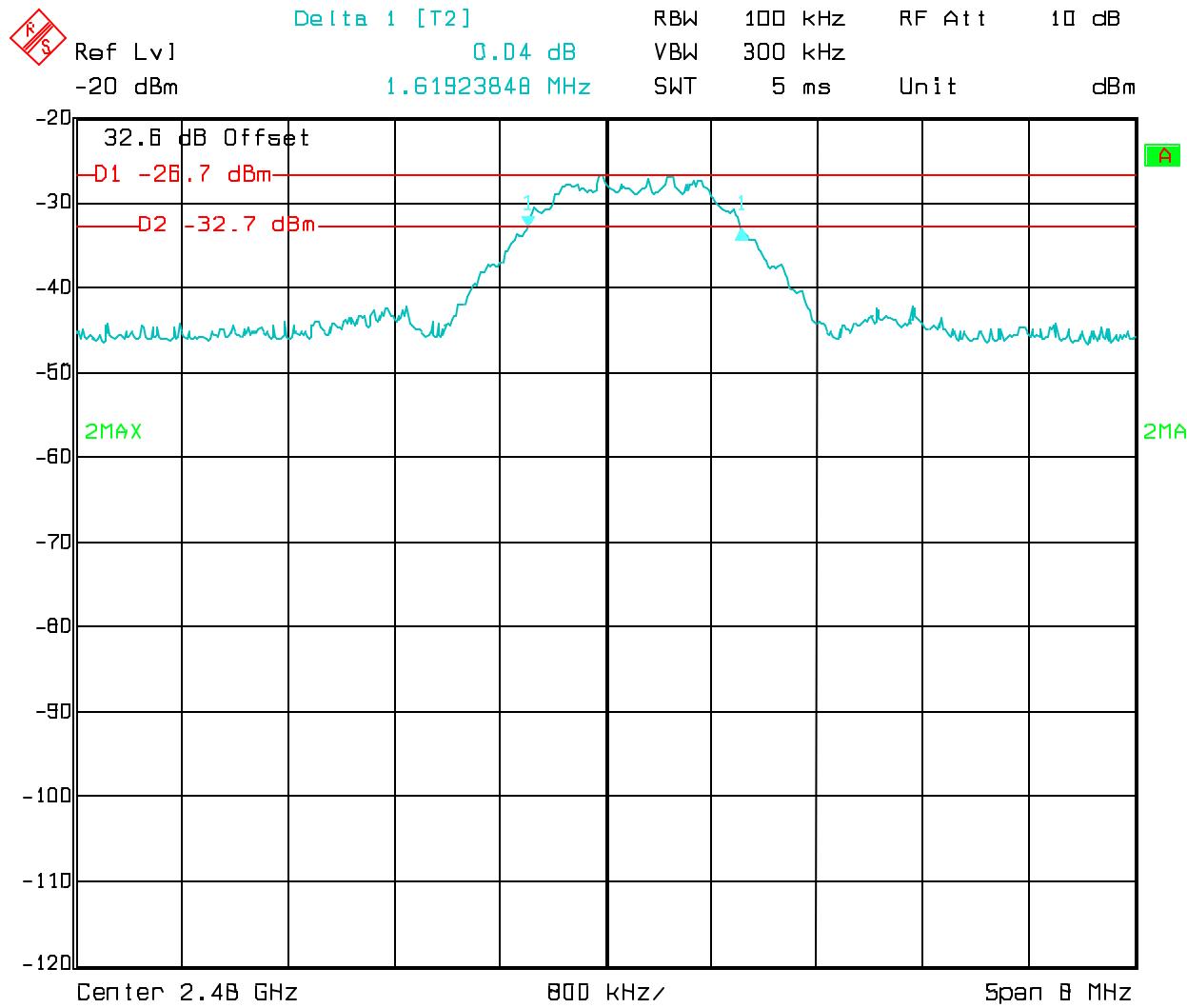
Specification: FCC Part 15 Subpart C, 15.247



LOW Channel (2405 MHz)



MID Channel (2440 MHz)

**HIGH Channel (2480 MHz)**

**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:**

<b>Sample Number:</b>	<b>T2-S</b>	<b>Temperature:</b>	26
<b>Date:</b>	August 30, 2007	<b>Humidity:</b>	55
<b>Modification State:</b>	Lo/Mid/High Channels	<b>Tester:</b>	FSCustodio
<b>Laboratory:</b>			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 32.6 was added to compensate for antenna factor and cable loss.
- 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 (assume 1 as antenna is trace in circuitry and cannot be determined.)

**Nemko USA, Inc.**

UAG-T2

7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247

**Test Results:**

Channel	Frequency (MHz)	Measured Output Power (W)
Low	2405	110.54 uW
Mid	2440	73.03 uW
High	2480	88.80 uW

$$1.93E-02 = 10^{(85.7-120/20)}$$

$$0.00011054 \text{ W} = (1.93E-02 \times 3)^2 / (30 \times 1)$$

**Nemko USA, Inc.**

UAG-T2  
7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247

T2 is also known as T2-S



NEMKO USA, Inc.

**San Diego Headquarters:**

11696 Sorrento Valley Rd.

San Diego, CA 92121

Tel: (858) 755-5525

Fax: (858) 452-1810

**Radiated Emissions Data**

Job # :	<u>7190-1</u>	Date :	<u>8/30/07</u>	Page	<u>1</u>	of	<u>1</u>			
NEX #:	<u>92187</u>	Time :	<u>10:00AM</u>							
Staff :	<u>FSCustodio</u>									
Client Name :	<u>Awarepoint</u>						EUT Voltage :	<u>_____</u>		
EUT Name :	<u>Tracking Tag</u>						EUT Frequency :	<u>_____</u>		
EUT Model # :	<u>T2</u>						Phase:	<u>1</u>		
EUT Serial # :	<u>Engineering sample</u>						NOATS	<u>_____</u>		
EUT Config. :	<u>Transmit (Low, Mid, High)</u>						SOATS	<u>X</u>		
								Distance:	<u>3m</u>	
Specification :	<u>Part 15.247</u>									
<u>CFR47 Part 15, Subpart B, Class B</u>										
Loop Ant. #:	<u>NA</u>		Temp. (°C) :	<u>27</u>		Quasi-Peak	<u>RBW: 120 kHz</u>			
Bicon Ant. #:	<u>NA</u>		Humidity (%) :	<u>57</u>		Peak	<u>Video Bandwidth 300 kHz</u>			
Log Ant. #:	<u>NA</u>		Spec An. #:	<u>835</u>		Average	<u>RBW: 1 MHz</u>			
DRG Ant. #	<u>752</u>		Spec An. Display #:	<u>_____</u>			<u>Video Bandwidth 3 MHz</u>			
Dipole Ant. #:	<u>NA</u>		QP #:	<u>_____</u>			<u>RBW: 1 MHz</u>			
Cable LF#:	<u>NA</u>		PreSelect#:	<u>NA</u>			<u>Video Bandwidth 10 Hz</u>			
Cable HF#:	<u>40ft</u>					Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.				
Preamp LF#:	<u>NA</u>					Measurements above 1 GHz are Average values, unless otherwise stated.				
Preamp HF#:	<u>NA</u>									

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
2404.7	52.4	50.6	P		1.0	52.37	85.0	125.3	-40.3	Pass	Side
2404.7	51.3	51.4	P		1.0	51.42	84.0	125.3	-41.3	Pass	Flat
2404.7	53.1	49.1	P		1.0	53.09	85.7	125.3	-39.6	Pass	Vertical
2439.7	49.6	50.0	P		1.0	50.03	82.6	125.3	-42.7	Pass	Side
2439.7	49.5	47.3	P		1.0	49.46	82.1	125.3	-43.2	Pass	Flat
2439.7	51.3	45.9	P		1.0	51.34	83.9	125.3	-41.4	Pass	Vertical
2479.8	49.9	49.8	P		1.0	49.85	82.5	125.3	-42.8	Pass	Side
2479.8	48.3	48.5	P		1.0	48.53	81.1	125.3	-44.2	Pass	Flat
2479.8	51.9	46.6	P		1.0	51.85	84.5	125.3	-40.8	Pass	Vertical

**Correction Factor for all measurements** = 32.6 (28.6 Antenna factor + 4.0 Cable loss)

**Corrected Reading** = Max Reading + Correction Factor  
 =  $52.37 + 32.6$   
 = 85.0 dBuV/m

**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:**

<b>Sample Number:</b>	<b>T2-S</b>	<b>Temperature:</b>	26
<b>Date:</b>	August 30, 2007	<b>Humidity:</b>	55
<b>Modification State:</b>	Lo/Mid/High Channels	<b>Tester:</b>	FSCustodio
		<b>Laboratory:</b>	SOATS

**Test Results:**

Channel	Channel Frequency (MHz)	RF Power Level in 3KHz BW (dBm)	Maximum Limit (dBm)	PASS/FAIL
LO	2405	-23.64	8	Pass
MID	2440	-25.26	8	Pass
HIGH	2480	-27.53	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 32.6 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 finally compared to the +8 dBm limit.

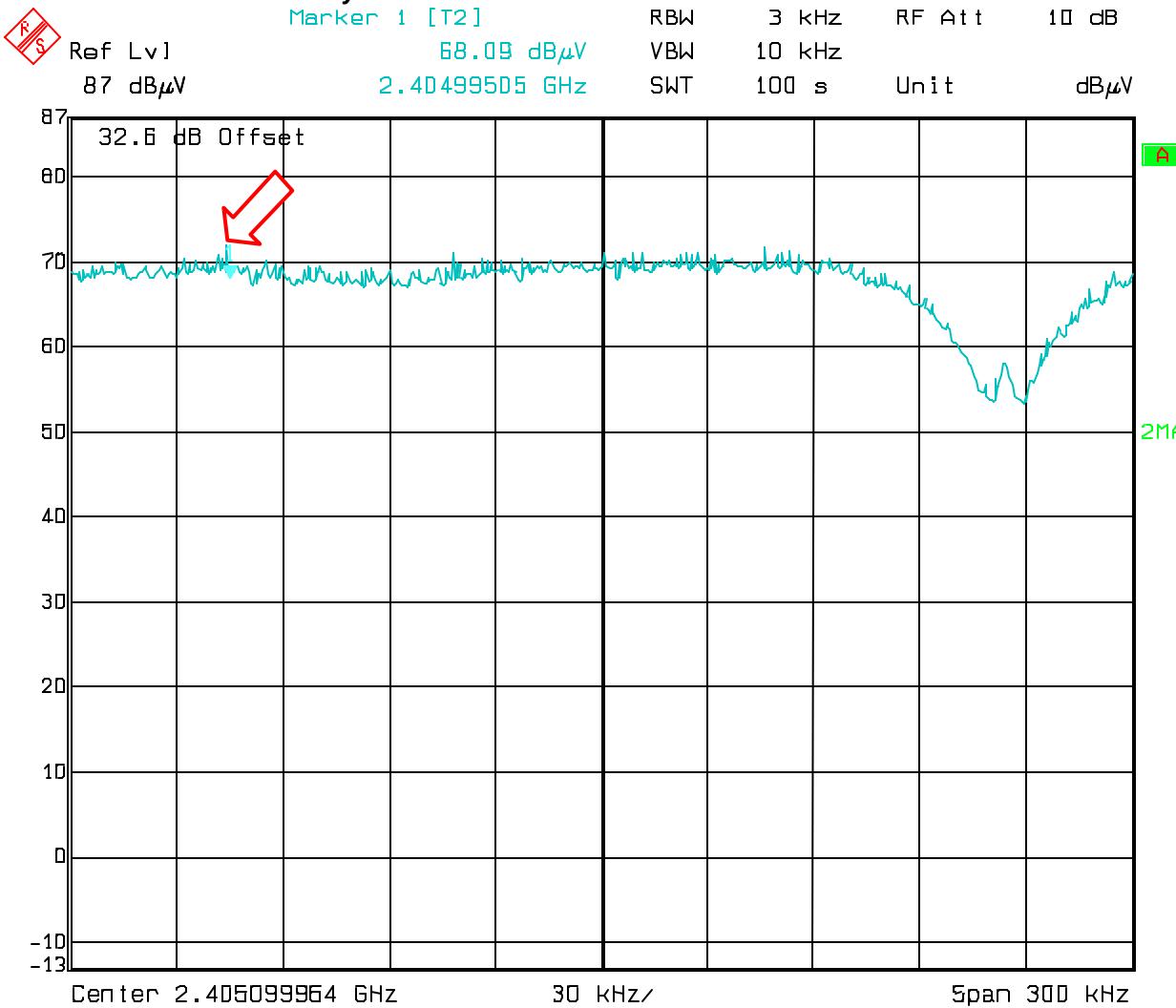
**Nemko USA, Inc.**UAG-T2  
7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

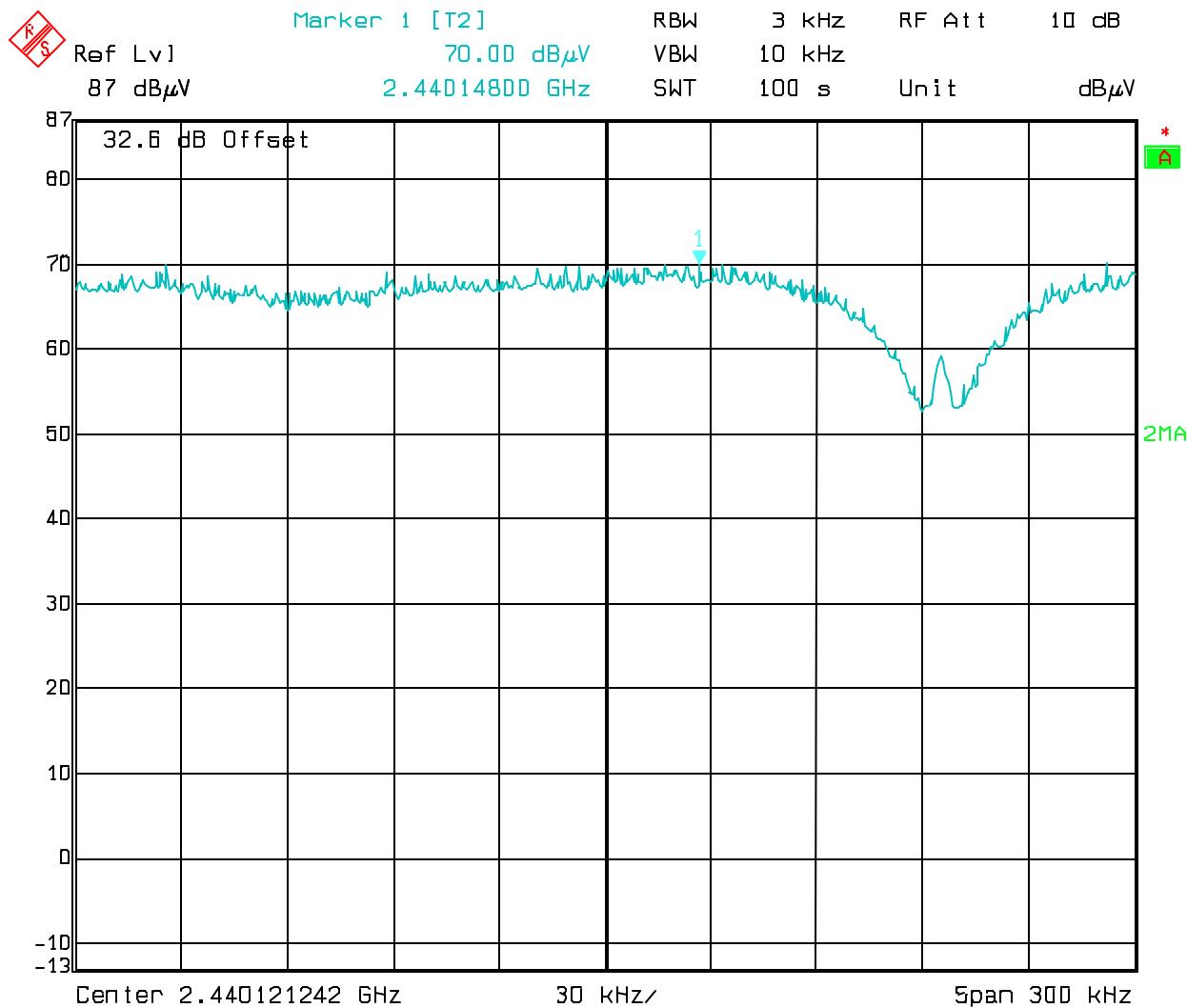
Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247

**Test Note: Marker in 68.09 dB<sub>u</sub>V/m during screen capture however peak is at 71.62 dB<sub>u</sub>V/m during measurements as indicated by the arrow.****Low Channel 2405 MHz****Max Peak = 71.62 dB<sub>u</sub>V/m or 0.00381 V/m**

Using formula:  $P = (E \times d)^2 / (30 \times G)$   
 $= (0.00381 \times 3)^2 / (30 \times 1)$   
 $= 4.32\mu\text{W}$  or  $-23.64 \text{ dBm}$

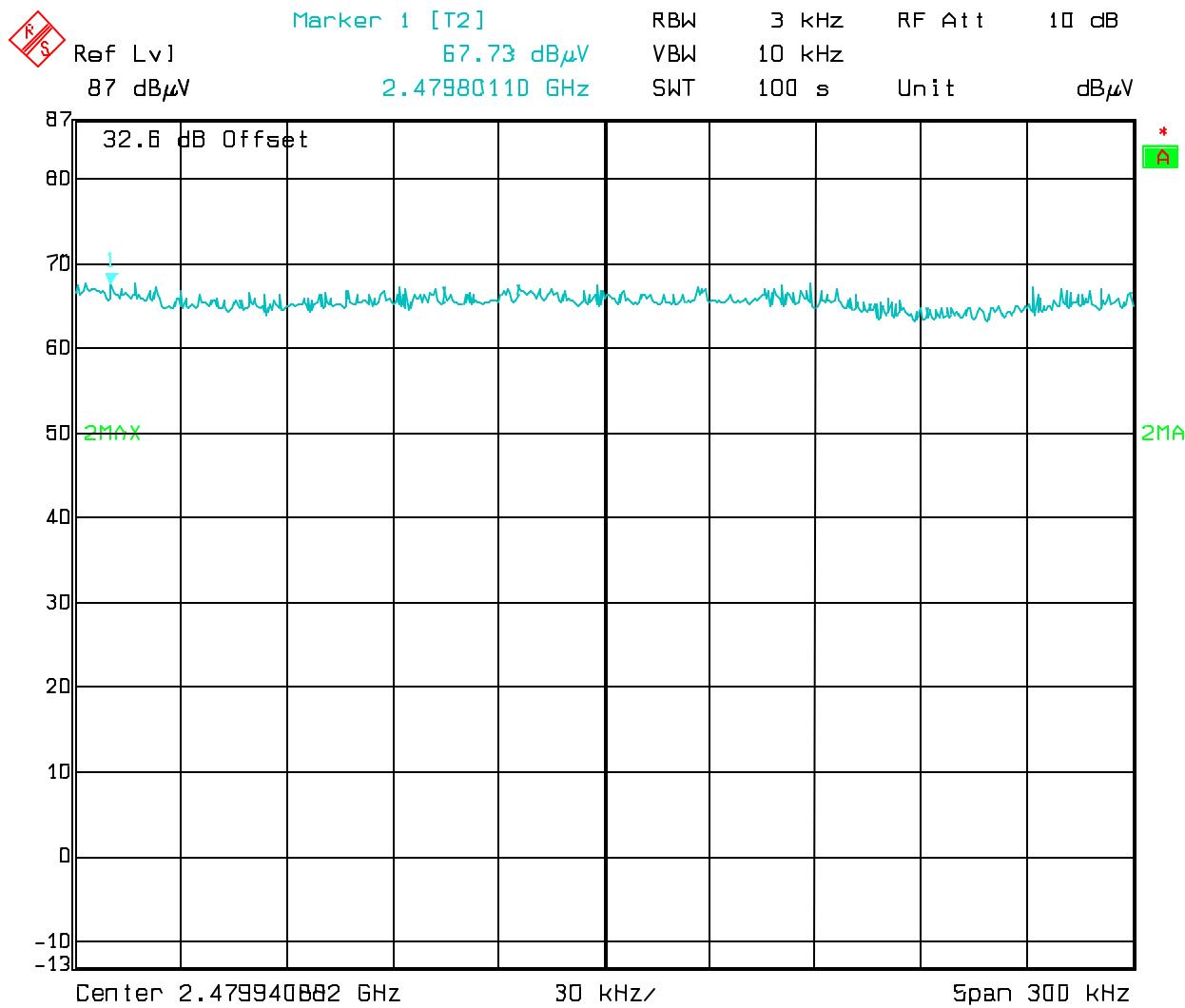
**Test Note: Marker in 68.09 dB<sub>u</sub>V/m during screen capture however peak is at 71.62 dB<sub>u</sub>V/m during measurements as indicated by the arrow.**



Date: 31.JUL.2007 17:35:08

**Mid Channel 2440 MHz****Max Peak = 70.0 dB $\mu$ V/m or 0.00316V/m**

Using formula:  $P = (E \times d)^2 / (30 \times G)$   
 $= (0.00316 \times 3)^2 / (30 \times 1)$   
 $= 2.98\mu W$  or  $-25.26$  dBm

**High Channel 2440 MHz****Max Peak = 67.73 dB $\mu$ V/m or 0.00243V/m**

Using formula:  $P = (E \times d)^2 / (30 \times G)$   
 $= (0.00243 \times 3)^2 / (30 \times 1)$   
 $= 1.76\mu\text{W}$  or  $-27.73 \text{ dBm}$

## Appendix B: Photos of Test Setups



**Power Output, Bandwidth and Power Spectral Density**

**Nemko USA, Inc.**

UAG-T2  
7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247



**Spurious Emissions**

**Nemko USA, Inc.**

UAG-T2  
7348A-T2

11696 Sorrento Valley Road, Suite F, San Diego, CA 92121

Phone (858) 755-5525 Fax (858) 452-1810

Report Number: 2007 087190 EMC

Specification: FCC Part 15 Subpart C, 15.247



**Spurious Emissions "Z" Axis**

## Appendix C: Block Diagram of Test Setups

### Test Site For Radiated Emissions

