

EMISSIONS TEST REPORT

Report Number: 3097607BOX-009

Project Number: 3097607

Testing performed on the

nTAG Wave

Model: WV1000

To

FCC Part 15 Subpart C 15.247

Industry Canada's RSS-210 Issue 6 September 2005, Annex 8

FCC Part 15 Subpart B and ICES-003 Issue 4 February 2004

For

nTAG Interactive

Test Performed by:
Intertek – ETL SEMKO
70 Codman Hill Road
Boxborough, MA 01719

Test Authorized by:
nTAG Interactive
311 Summer Street, 5th Floor
Boston, MA 02210

Prepared by:


Nicholas Abbondante

Date:

6/27/06

Reviewed by:


Roland W. Gubisch

Date:

6-27-2006

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1.0 Job Description

1.1 Client Information

This EUT has been tested at the request of:

Company:	nTAG Interactive 311 Summer Street, 5 th Floor Boston, MA 02210
Contact:	Ernest Von Holten
Telephone:	617-451-7768
Fax:	617-451-7769
Email:	evonholten@ntag.com

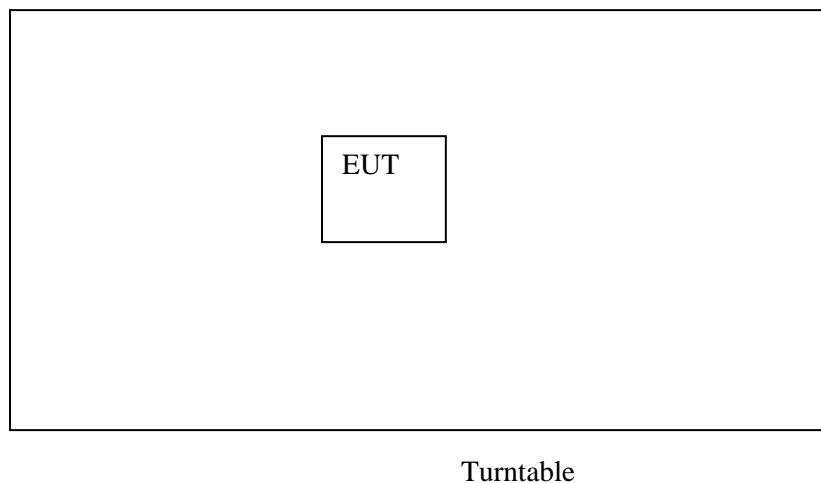
1.2 Equipment Under Test

Equipment Type:	nTAG Wave
Model Number(s):	WV1000
Serial number(s):	21151166
Manufacturer:	nTAG Interactive
EUT receive date:	05/01/2006
EUT received condition:	Prototypes in Good Condition
Test start date:	05/01/2006
Test end date:	05/31/2006

1.3 Test Plan Reference:	Tested according to the standards listed, ANSI C63.4:2003, and RSS-Gen Issue 1 September 2005.
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1.4 Test Configuration

1.4.1 Block Diagram



1.4.2. Cables:

Cable	Shielding	Connector	Length (m)	Qty.
None				

1.4.3. Support Equipment:

Name: None
Model No.:
Serial No.:

1.5 Mode(s) of Operation:

The nTAG Wave was activated from two fresh 3.0V lithium batteries. Only one battery is required for system operation. The EUT was transmitting nearly continuously on low, mid, and high channels and was manipulated in three orthogonal axes. The EUT does not have an antenna port.

1.6 Floor Standing Equipment: Applicable:____ Not Applicable: X

1.7 Modifications Required for Compliance:

No modifications were required for compliance.

2.0 Test Summary

TEST STANDARD		RESULTS	
FCC Part 15 Subpart C 15.247, Industry Canada's RSS-210 Issue 6 September 2005 Annex 8, FCC Part 15 Subpart B, and Industry Canada's ICES-003 Issue 4 February 2004			
SUB-TEST		TEST PARAMETER	COMMENT
RF Output Power and Human RF Exposure FCC 15.247(b)(3-5), RSS-210 A8.4, RSS-102 2.5, 4.3		The output power must not exceed 1 Watt (30 dBm) and 36 dBm EIRP. The human RF Exposure limit is 1 mW/cm ² .	Pass
Occupied Bandwidth FCC 15.247(a)(2), RSS-210 A8.2		The 6 dB bandwidth must be at least 500 kHz.	Pass
Radiated Spurious Emissions FCC 15.205, 15.209, 15.247(d), 15.109, RSS-210 2.2, 2.7, A8.5, ICES-003		The spurious emissions must be attenuated below the level of the fundamental by at least 20 dBc. Emissions which fall in the restricted bands must meet the general limits of 15.209 and RSS-210 2.7 Table 2. Emissions from the digital circuitry must not exceed the limits of FCC Part 15 Subpart B Class B and ICES-003 Class B.	Pass
Peak Power Spectral Density FCC 15.247(e), RSS-210 A8.2		The peak power spectral density of the Radio Module must not exceed 8 dBm / 3 kHz.	Pass
Band Edge Compliance FCC 15.215, RSS-210 2.1, A8.5		The fundamental frequency must stay within the assigned frequency band.	Pass

Notes: Channels selected for test were:

Channel 0 2405 MHz

Channel 7 2440 MHz

Channel 15 2480 MHz

REVISION SUMMARY – The following changes have been made to this Report:

<u>Date</u>	<u>Project</u>	<u>Project</u>	<u>Page(s)</u>	<u>Item</u>	<u>Description of Change</u>
	<u>No.</u>	<u>Handler</u>			

3.0 Sample Calculations

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = 52.0 dB μ V
 AF = 7.4 dB/m
 CF = 1.6 dB
 AG = 29.0 dB
 FS = 32 dB μ V/m

$$\text{Level in } \mu\text{V/m} = [10(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

The following is how net line-conducted readings were determined:

$$NF = RF + LF + CF + AF$$

Where

- NF = Net Reading in dB μ V
- RF = Reading from receiver in dB μ V
- LF = LISN Correction Factor in dB
- CF = Cable Correction Factor in dB
- AF = Attenuator Loss Factor in dB

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where UF = Net Reading in } \mu\text{V}$$

Example:

$$NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V}$$

$$UF = 10^{(49.1 \text{ dB}\mu\text{V} / 20)} = 254 \mu\text{V/m}$$

3.1 Measurement Uncertainty

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes.

The expanded uncertainty ($k = 2$) for radiated emissions from 30 to 1000 MHz has been determined to be:
 ± 3.5 dB at 10m, ± 3.8 dB at 3m

The expanded uncertainty ($k = 2$) for mains conducted emissions from 150 kHz to 30 MHz has been determined to be:

± 2.6 dB

The expanded uncertainty ($k = 2$) for telecom port conducted emissions from 150 kHz to 30 MHz has been determined to be:

± 3.2 for ISN and voltage probe measurements

± 3.1 for current probe measurements

3.2 Site Description

Test Site(s): 2

Our OATS are 3m and 10m sheltered emissions measurement ranges located in a light commercial environment in Boxborough, Massachusetts. They meet the technical requirements of ANSI C63.4-2003 and CISPR 22:1993/EN 55022:1994 for radiated and conducted emission measurements. The shelter structure is entirely fiberglass and plastic, with outside dimensions of 33 ft x 57 ft. The structure resembles a quonset hut with a center ceiling height of 16.5 ft.

The testing floor is covered by a galvanized sheet metal groundplane that is earth-grounded via copper rods around the perimeter of the site. The joints between individual metal sheets are bridged with a 2 inch wide metal strips to provide low RF impedance contact throughout. The sheets are screwed in place with stainless steel, round-head screws every three inches. Site illumination and HVAC are provided from beneath the ground reference plane through flush entry ports, the port covers are electrically bonded to the ground plane.

A flush metal turntable with 12 ft. diameter and 5000 lb. load capacity (12,000 lb. in Site 3) is provided for floor-standing equipment. A wooden table 80 cm high is used for table-top equipment. The turntable is electrically connected to the ground plane with three copper straps. The straps are connected to the turntable at the center of it with ground braid. The copper strap is directly connected to the groundplane at the edges of the turntable. The turntable is located on the south end of the structure and the antennas are mounted 3 and 10 meters away to the north. The antenna mast is a non-conductive with remote control of antenna height and polarization. The antenna height is adjustable from 1 to 4 meters.

All final radiated emission measurements are performed with the testing personnel and measurement equipment located below the ground reference plane. The site has a full basement underneath the turntable where support equipment may be remotely located. Operation of the antenna, turntable and equipment under test is controlled by remote controls that manipulate the antenna height and polarization and with a turntable control. Test personnel are located below the ellipse when measurements are performed, however the site maintains the ability of having personnel manipulate cables while monitoring test equipment. Ambient radiated emissions are 6 dB or more below the relevant FCC emission limits.

AC mains power is brought to the equipment under test through a power line filter, to remove ambient conducted noise. 50 Hz (240 VAC single phase), 60 Hz power (120 VAC single phase, 208 VAC three phase), and 60 Hz (480 VAC three phase) are available. Conducted emission measurements are performed with a Line Impedance Stabilization Network (LISN) or Artificial Mains Network (AMN) bonded to the ground reference plane. A removable vertical groundplane (2 meter X 2 meter area) is used for line-conducted measurements for table top equipment. The vertical groundplane is electrically connected to the reference groundplane.

The EMC Lab has two Semi-anechoic Chambers and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference groundplanes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Test Results: Pass

Test Standard: FCC 15.247(b)(3-5), RSS-210 A8.4, RSS-102 2.5, 4.3

Test: Transmitter Output Power and EIRP, and Human RF Exposure

Test Environment:

Environmental Conditions During Testing:	Humidity (%):	N/A	Pressure (hPa):	N/A	Ambient (°C):	N/A
Pretest Verification Performed	N/A		Equipment under Test:	nTAG Wave		

Maximum Test Parameters: The output power must not exceed 1 Watt (30 dBm) and 36 dBm EIRP. The human RF Exposure limit is 1 mW/cm².

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	07/26/2006
2	ANTENNA, RIDGED GUIDE, 1-18 GHZ	EMCO	3115	2784	08/11/2007
3	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/12/2006

Test Results:

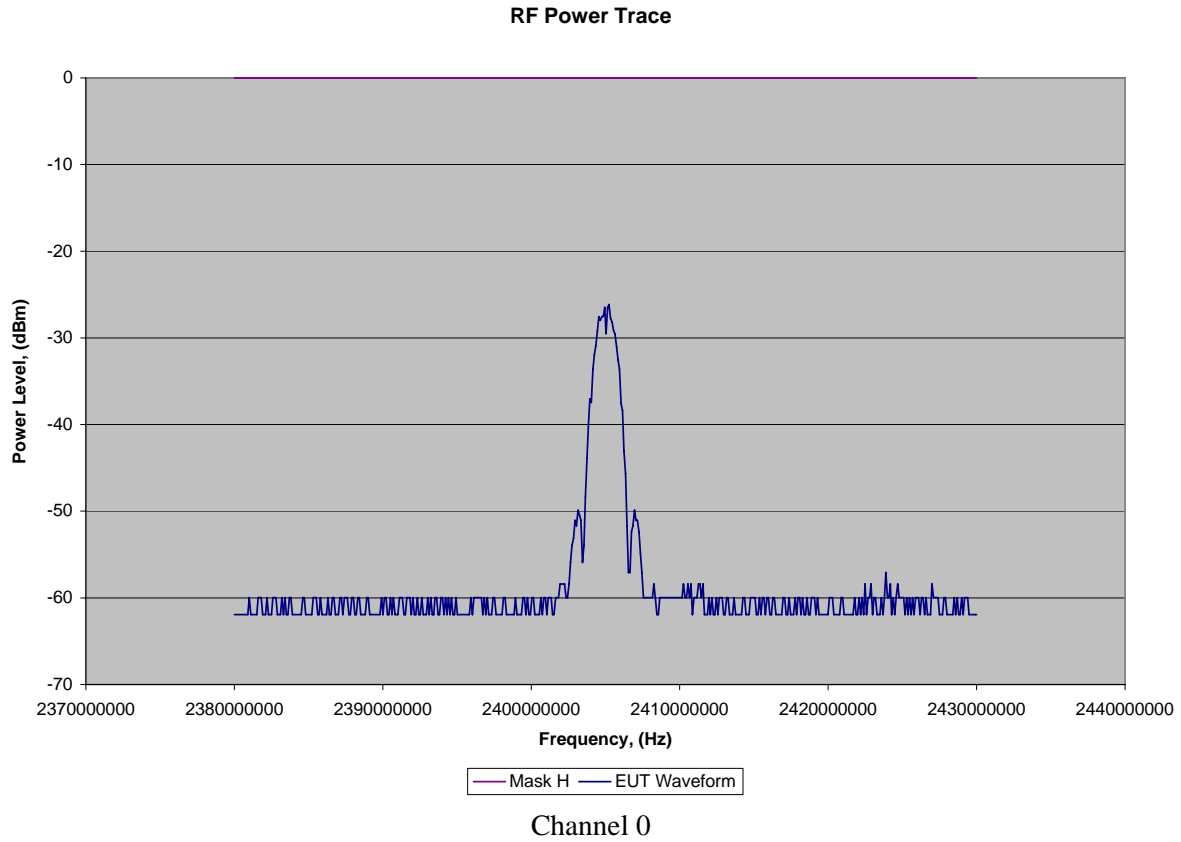
Notes: The cable loss and antenna factor were compensated for in the spectrum analyzer. The field strength obtained at 3 meters distance was converted to EIRP using the equations of DA-00-705A1. A 100 kHz bandwidth and RMS detector were used with a 50 MHz span in order to have 500 discrete non-overlapping values for integration. Since the antenna is integral, conducted output power compliance cannot be demonstrated.

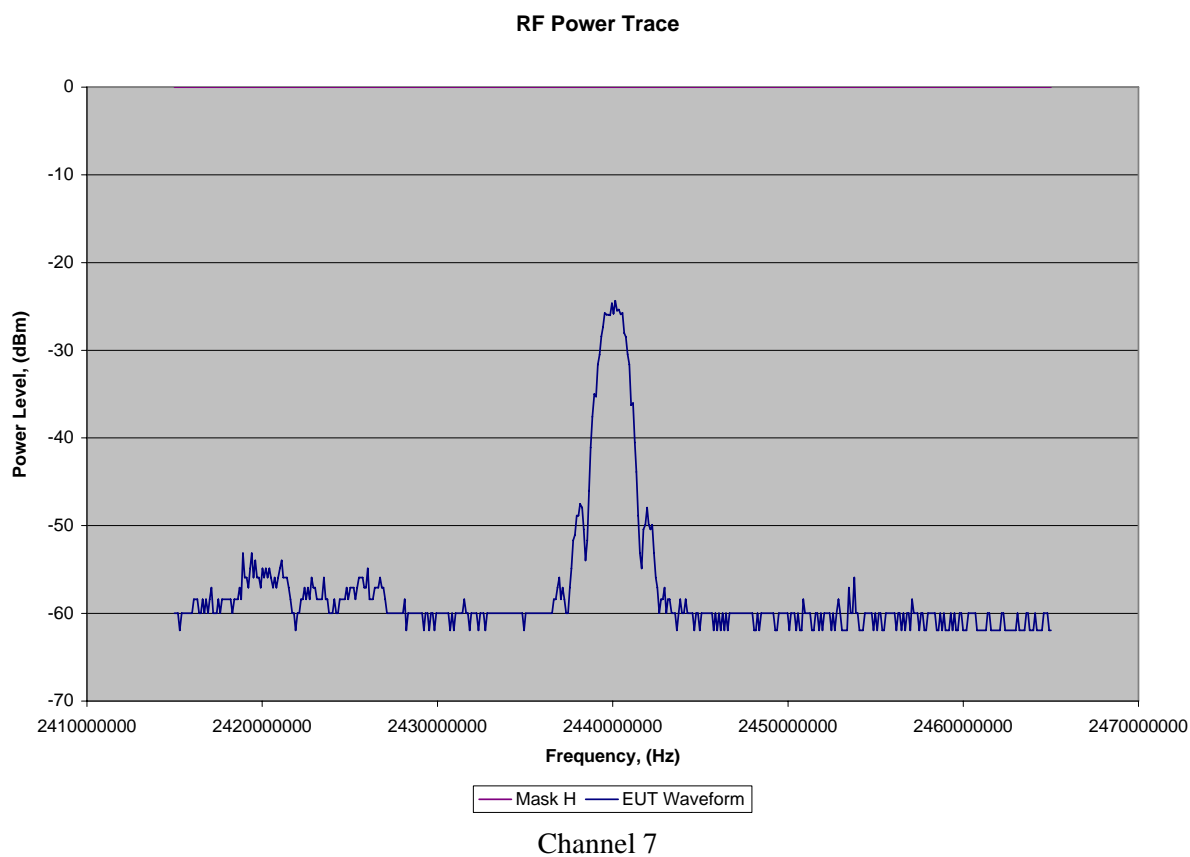
As referenced in RSS-102 2.5, the EUT is exempt from SAR evaluation because the output power is less than 20 mW and RF evaluation because the operating frequency is above 1.5 GHz and the EIRP does not exceed 5 watts. The FCC human RF exposure limit is 1 mW/cm². The power density S generated by some value of EIRP at a given distance d is related by the equation:

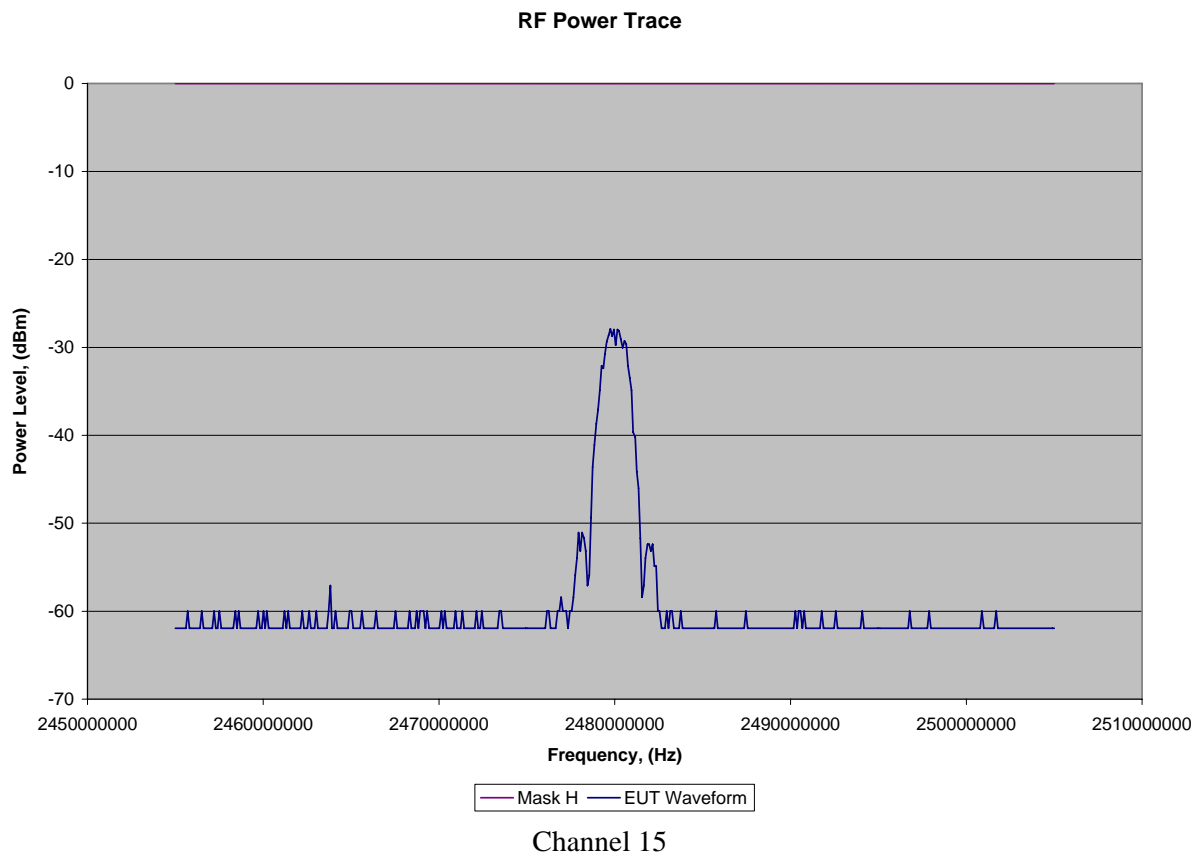
$$S = \text{EIRP} / (4\pi d^2)$$

The distance, given a maximum EIRP of -1.94 dBm (0.64 mW) at which the radiated power density of the EUT is equal to the human RF exposure limit is 0.22 cm from the antenna. Note that the EUT is exempt from FCC SAR evaluation because the output power is less than 25 mW.

Channel	Frequency	EIRP	EIRP Limit
0	2405 MHz	-3.96 dBm (0.40 mW)	36.0 dBm
7	2440 MHz	-1.94 dBm (0.64 mW)	36.0 dBm
15	2480 MHz	-5.07 dBm (0.31 mW)	36.0 dBm







Test Results: Pass

Test Standard: FCC 15.247(a)(2), RSS-210 A8.2

Test: Occupied Bandwidth

Test Environment:

Environmental Conditions During Testing:	Humidity (%):	N/A	Pressure (hPa):	N/A	Ambient (°C):	N/A
Pretest Verification Performed	N/A		Equipment under Test:	nTAG Wave		

Maximum Test Parameters: The 6 dB bandwidth must be at least 500 kHz.

Test Equipment Used:

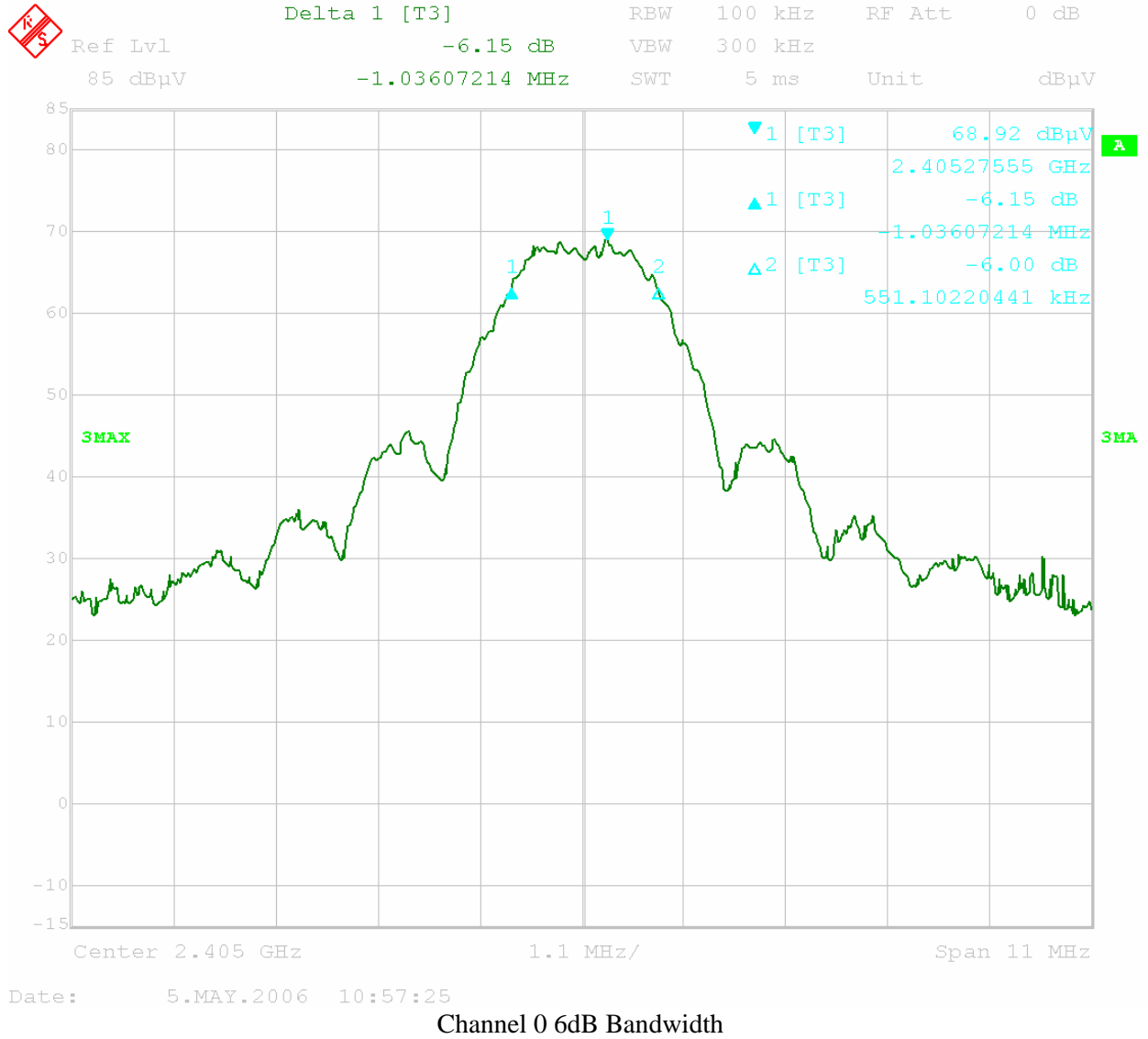
TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	Spectrum Analyzer 20hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	07/26/2006
2	HORN ANTENNA	EMCO	3115	9602-4675	09/13/2006
3	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/12/2006

Test Results:

Notes: There is no limit on the 20 dB bandwidth, it is simply included for informational purposes. The 20 dB bandwidth is referenced to the actual RF output power.

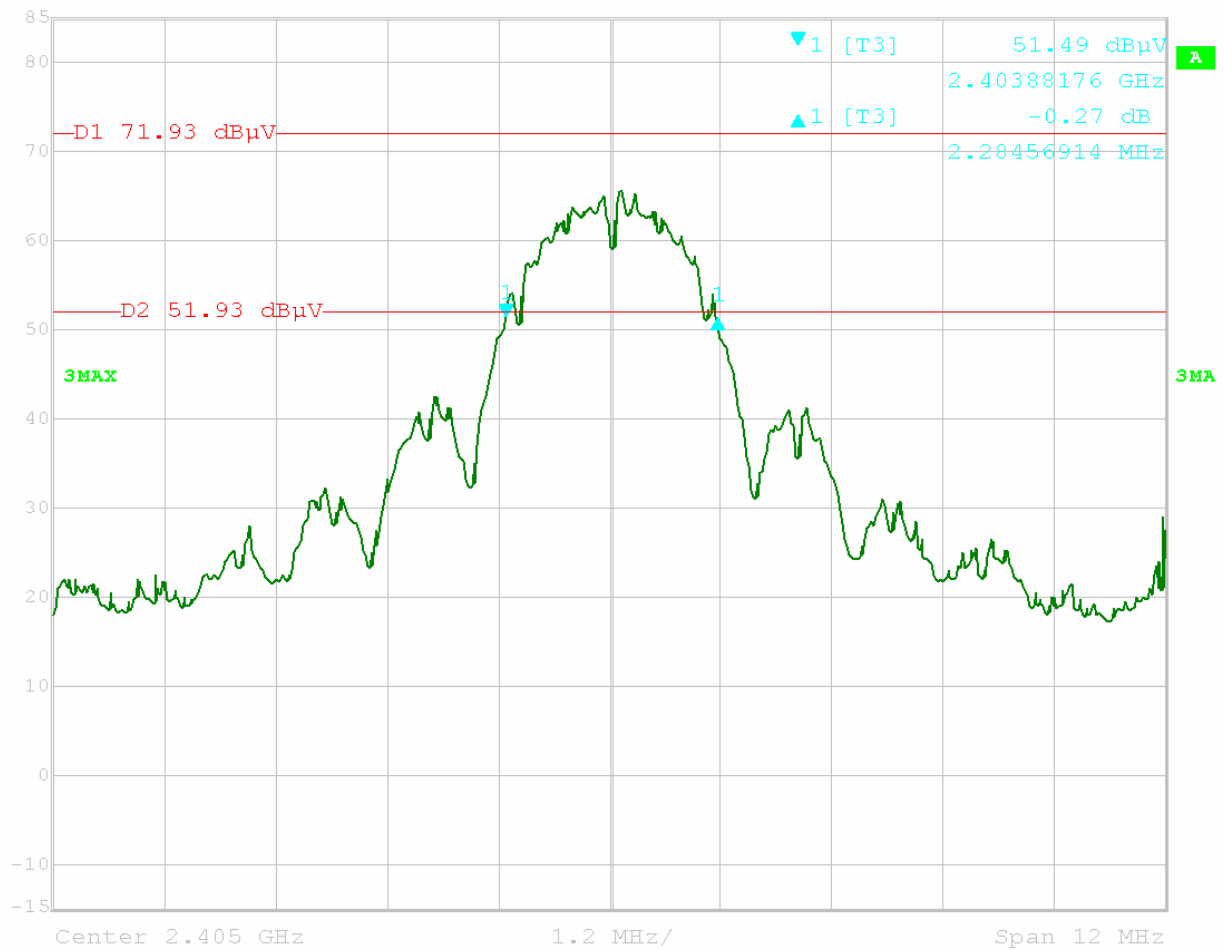
Channel	Frequency	6 dB Bandwidth
0	2405 MHz	1.55 MHz
7	2440 MHz	1.65 MHz
15	2480 MHz	1.65 MHz

Channel	Frequency	20 dB Bandwidth
0	2405 MHz	2.28 MHz
7	2440 MHz	2.28 MHz
15	2480 MHz	2.31 MHz





Delta 1 [T3] RBW 30 kHz RF Att 0 dB
 Ref Lvl -0.27 dB VBW 100 kHz
 85 dBμV 2.28456914 MHz SWT 34 ms Unit dBμV

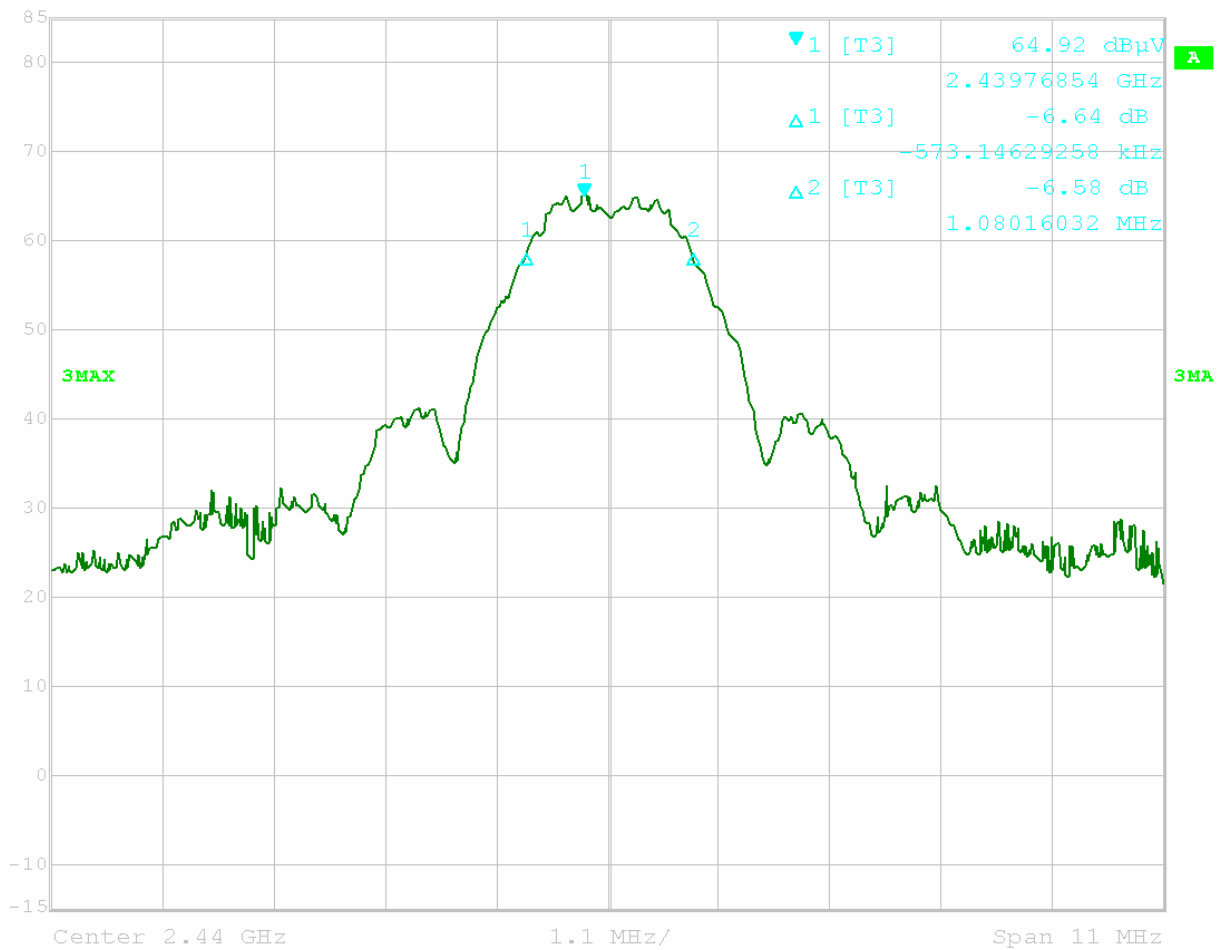


Date: 5.MAY.2006 11:45:58

Channel 0 20 dB Bandwidth

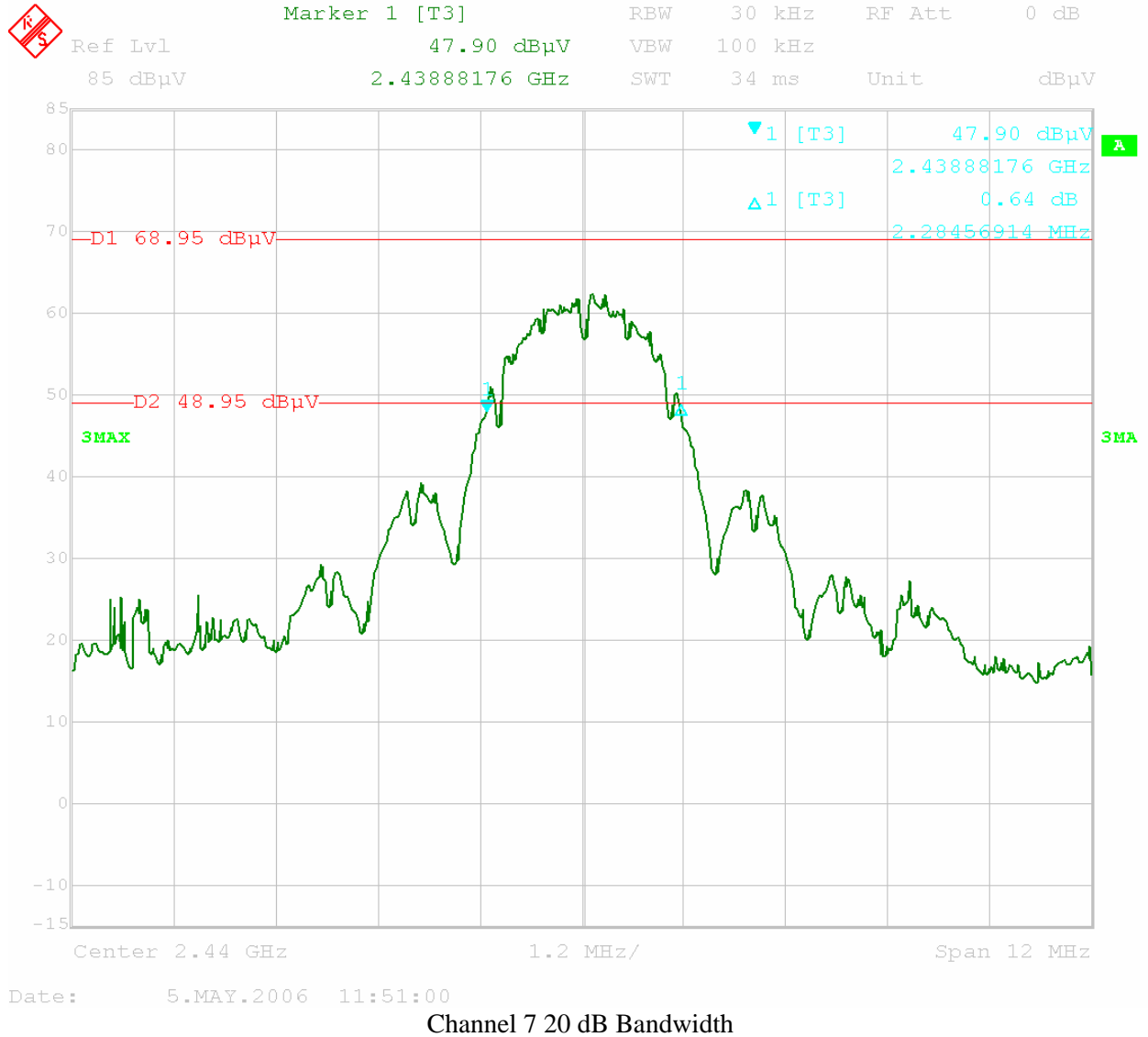


Marker 1 [T3] RBW 100 kHz RF Att 0 dB
 Ref Lvl 64.92 dBμV VBW 300 kHz
 85 dBμV 2.43976854 GHz SWT 5 ms Unit dBμV



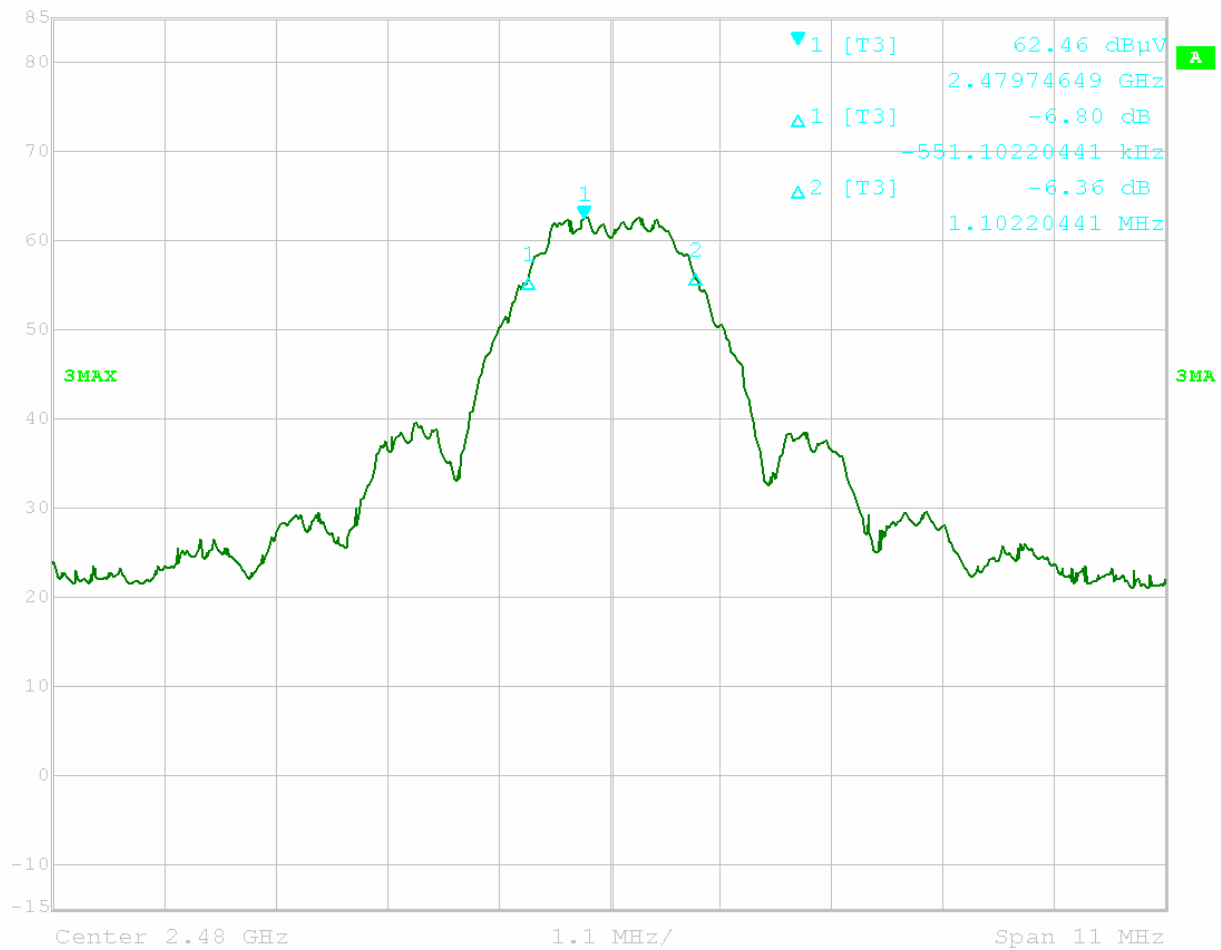
Date: 5.MAY.2006 11:16:46

Channel 7 6 dB Bandwidth



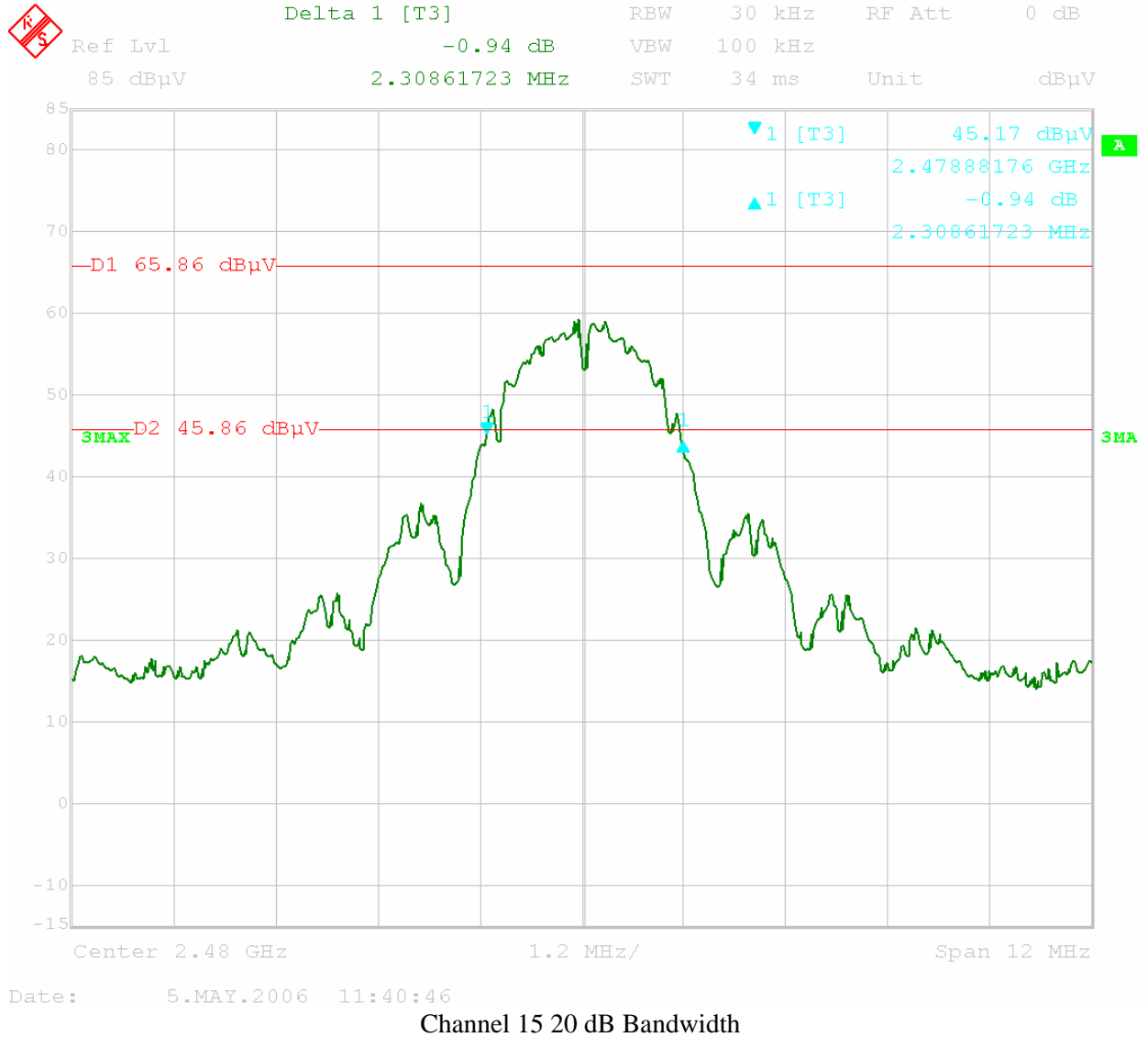


Marker 1 [T3] RBW 100 kHz RF Att 0 dB
 Ref Lvl 62.46 dBμV VBW 300 kHz
 85 dBμV 2.47974649 GHz SWT 5 ms Unit dBμV



Date: 5.MAY.2006 11:21:01

Channel 15 6 dB Bandwidth



Test Results: Pass

Test Standard: FCC 15.205, 15.209, 15.247(d), 15.109, RSS-210 2.2, 2.7, A8.5, ICES-003

Test: Radiated Spurious Emissions

Test Environment:

Environmental Conditions During Testing:	Humidity (%):	See Tables	Pressure (hPa):	See Tables	Ambient (°C):	See Tables
Pretest Verification Performed	N/A		Equipment under Test:	nTAG Wave		

Maximum Test Parameters: The spurious emissions must be attenuated below the level of the fundamental by at least 20 dBc. Emissions which fall in the restricted bands must meet the general limits of 15.209 and RSS-210 2.7 Table 2. Emissions from the digital circuitry must not exceed the limits of FCC Part 15 Subpart B Class B and ICES-003 Class B.

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	Digital 4 Line Barometer	Mannix	0ABA116	BAR2	08/02/2007
2	ANTENNA	EMCO	3142	9701-1116	11/10/2006
3	ANTENNA, RIDGED GUIDE, 1-18 GHZ	EMCO	3115	2784	08/11/2007
4	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	12/13/2007
5	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/12/2006
6	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL029	12/20/2006
7	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	12/12/2006
8	3 Meter In floor cable for site 2	ITS	RG214B/U	S2 3M FLR	09/02/2006
9	PREAMPLIFIER 1- 40 GHz	MITEQ	NSP4000-NF	507145	11/21/2006
10	Spectrum Analyzer	Agilent	E7405A	US40240205	08/09/2006

Software Utilized:

Name	Manufacturer	Version
EXCEL 2000	Microsoft Corporation	9.0.6926 SP-3
EMI BOXBOROUGH	Intertek	1/17/06 Revision

Test Results:

Notes: Above 1 GHz, the emissions shown compare the peak values with the average limits in order to demonstrate overall compliance. The range up to 26 GHz was investigated using the SHF equipment listed in the tables, but only the emissions shown were observed. In cases where no emissions were observed, the noise floor was verified to be under the limit. Since the EUT contains digital circuitry, non-transmitter emissions were compared to both the FCC Part 15 Subpart B Class B and ICES-003 Class B limits and the transmitter limit.

Special Radiated Emissions

Company: nTAG Interactive
Model #: WV1000
Serial #: 21151166
Engineers: Nicholas Abbondante
Project #: 3097602
Standard: FCC Part 15 Subpart B Class B
Receiver: R&S FSEK-30 (ROS001)
PreAmp: PRE8 11-21-06.amp
Barometer: BAR2
Temp/Humidity/Pressure: 23c 45% 986mB
PreAmp Used? (Y or N): N
Voltage/Frequency: Fresh Battery
Antenna & Cables: N Bands: N, LF, HF, SHF
LF Antenna: EMC02 8-11-06 V3m.ant EMC02 8-11-06 H3m.ant
N Antenna: LOG1 11-10-06 V3.ant LOG1 11-10-06 H3.ant
HF Antenna: EMC02 8-11-06 V3m.ant EMC02 8-11-06 H3m.ant
SHF Antenna: EMC04 V 1m 12-13-2006.txt EMC04 H 1m 12-13-2006.txt
LF Cable(s): CBL028 12-12-2006.txt NONE.
N Cable(s): S2 3M FLR 9-2-2006.cbl NONE.
HF Cable(s): CBL029 12-20-2006.txt CBL030 12-12-2006.txt
SHF Cable(s): CBL029 12-20-2006.txt CBL030 12-12-2006.txt
Frequency Range: 30 - 1000 MHz
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
PK	V	309.500	12.4	13.7	2.1	0.0	-10.5	38.7	46.0	-7.3	120/300 kHz		
PK	V	337.500	11.8	14.6	2.3	0.0	-10.5	39.2	46.0	-6.8	120/300 kHz		
PK	V	352.000	13.0	15.2	2.4	0.0	-10.5	41.0	46.0	-5.0	120/300 kHz		
PK	V	365.000	13.5	15.6	2.4	0.0	-10.5	42.0	46.0	-4.0	120/300 kHz		
PK	V	377.500	14.1	15.5	2.5	0.0	-10.5	42.6	46.0	-3.4	120/300 kHz		
PK	V	390.500	14.2	15.3	2.6	0.0	-10.5	42.6	46.0	-3.4	120/300 kHz		
PK	V	403.500	14.7	15.0	2.7	0.0	-10.5	42.8	46.0	-3.2	120/300 kHz	RB	RB
PK	V	416.000	15.0	15.5	2.7	0.0	-10.5	43.7	46.0	-2.3	120/300 kHz		
PK	V	429.000	16.5	15.7	2.7	0.0	-10.5	45.3	46.0	-0.7	120/300 kHz		
PK	V	441.500	15.2	16.2	2.7	0.0	-10.5	44.6	46.0	-1.4	120/300 kHz		

Special Radiated Emissions

Company: nTAG Interactive
Model #: WV1000
Serial #: 21151166
Engineers: Nicholas Abbondante
Project #: 3097602
Standard: FCC Part 15 Subpart C 15.247
Receiver: R&S FSEK-30 (ROS001)
PreAmp: PRE8 11-21-06.amp
Barometer: BAR2
Temp/Humidity/Pressure: 23c 45% 986mB
PreAmp Used? (Y or N): N
Voltage/Frequency: Fresh Battery
Antenna & Cables: N Bands: N, LF, HF, SHF
LF Antenna: EMC02 8-11-06 V3m.ant EMC02 8-11-06 H3m.ant
N Antenna: LOG1 11-10-06 V3.ant LOG1 11-10-06 H3.ant
HF Antenna: EMC02 8-11-06 V3m.ant EMC02 8-11-06 H3m.ant
SHF Antenna: EMC04 V 1m 12-13-2006.txt EMC04 H 1m 12-13-2006.txt
LF Cable(s): CBL028 12-12-2006.txt NONE.
N Cable(s): S2 3M FLR 9-2-2006.cbl NONE.
HF Cable(s): CBL029 12-20-2006.txt CBL030 12-12-2006.txt
SHF Cable(s): CBL029 12-20-2006.txt CBL030 12-12-2006.txt
Frequency Range: 30 - 1000 MHz
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
PK	V	309.500	12.4	13.7	2.1	0.0	-10.5	38.7	65.8	-27.1	120/300 kHz		
PK	V	337.500	11.8	14.6	2.3	0.0	-10.5	39.2	65.8	-26.6	120/300 kHz		
PK	V	352.000	13.0	15.2	2.4	0.0	-10.5	41.0	65.8	-24.8	120/300 kHz		
PK	V	365.000	13.5	15.6	2.4	0.0	-10.5	42.0	65.8	-23.8	120/300 kHz		
PK	V	377.500	14.1	15.5	2.5	0.0	-10.5	42.6	65.8	-23.2	120/300 kHz		
PK	V	390.500	14.2	15.3	2.6	0.0	-10.5	42.6	65.8	-23.2	120/300 kHz		
PK	V	403.500	14.7	15.0	2.7	0.0	-10.5	42.8	46.0	-3.2	120/300 kHz	RB	RB
PK	V	416.000	15.0	15.5	2.7	0.0	-10.5	43.7	65.8	-22.1	120/300 kHz		
PK	V	429.000	16.5	15.7	2.7	0.0	-10.5	45.3	65.8	-20.5	120/300 kHz		
PK	V	441.500	15.2	16.2	2.7	0.0	-10.5	44.6	65.8	-21.2	120/300 kHz		

Radiated Emissions

Company: nTAG Interactive
 Model #: WV1000
 Serial #: 21151166
 Engineers: Nicholas Abbondante
 Project #: 3097602 Date(s): 05/08/06
 Standard: FCC Part 15 Subpart C 15.247
 Receiver: R&S FSEK-30 (ROS001)
 PreAmp: PRE8 11-21-06.amp
 Barometer: BAR2 Temp/Humidity/Pressure: 22c 48% 988mB
 PreAmp Used? (Y or N): N
 Peak: PK Quasi-Peak: QP Average: AVG
 Antenna & Cables: LF Bands: N, LF, HF, SHF
 LF Antenna: EMC02 8-11-06 V3m.ant EMC02 8-11-06 H3m.ant
 N Antenna: LOG1 11-10-06 V3.ant LOG1 11-10-06 H3.ant
 HF Antenna: EMC02 8-11-06 V3m.ant EMC02 8-11-06 H3m.ant
 SHF Antenna: EMC04 V 1m 12-13-2006.txt EMC04 H 1m 12-13-2006.txt
 LF Cable(s): CBL028 12-12-2006.txt NONE.
 N Cable(s): S2 3M FLR 9-2-2006.cbl NONE.
 HF Cable(s): CBL029 12-20-2006.txt CBL030 12-12-2006.txt
 SHF Cable(s): CBL029 12-20-2006.txt CBL030 12-12-2006.txt
 Limit Distance (m): 3
 Test Distance (m): 3
 Voltage/Frequency: 120V/60Hz
 Frequency Range: 1 - 4 GHz
 RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth
PK	H	2405.000	52.6	28.4	3.1	0.0	0.0	84.2	-	-	100/300 kHz
PK	H	2440.000	54.3	28.5	3.2	0.0	0.0	85.9	-	-	100/300 kHz
PK	H	2480.000	51.2	28.5	3.2	0.0	0.0	83.0	-	-	100/300 kHz
PK	V	2405.000	52.6	28.3	3.1	0.0	0.0	84.1	-	-	100/300 kHz
PK	V	2440.000	54.3	28.4	3.2	0.0	0.0	85.8	-	-	100/300 kHz
PK	V	2480.000	51.2	28.5	3.2	0.0	0.0	82.9	-	-	100/300 kHz

FCC IC

Special Radiated Emissions

Company: nTAG Interactive
 Model #: WV1000
 Serial #: 21151166
 Engineers: Nicholas Abbondante
 Project #: 3097602 Date(s): 05/31/06
 Standard: FCC Part 15 Subpart C 15.247
 Receiver: R&S FSEK-30 (ROS001)
 PreAmp: PRE8 11-21-06.amp
 Barometer: BAR2 Temp/Humidity/Pressure: 23c 49% 1012mB
 PreAmp Used? (Y or N): Y
 Peak: PK Quasi-Peak: QP Average: AVG
 Antenna & Cables: HF Bands: N, LF, HF, SHF
 LF Antenna: EMC02 8-11-06 V3m.ant EMC02 8-11-06 H3m.ant
 N Antenna: LOG1 11-10-06 V3.ant LOG1 11-10-06 H3.ant
 HF Antenna: EMC02 8-11-06 V3m.ant EMC02 8-11-06 H3m.ant
 SHF Antenna: EMC04 V 1m 12-13-2006.txt EMC04 H 1m 12-13-2006.txt
 LF Cable(s): CBL028 12-12-2006.txt NONE.
 N Cable(s): S2 3M FLR 9-2-2006.cbl NONE.
 HF Cable(s): CBL029 12-20-2006.txt CBL030 12-12-2006.txt
 SHF Cable(s): CBL029 12-20-2006.txt CBL030 12-12-2006.txt
 Limit Distance (m): 3
 Test Distance (m): 3
 Voltage/Frequency: Fresh Battery
 Frequency Range: 4-26 GHz
 RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth
PK	H	4810.000	36.0	33.0	3.8	22.5	0.0	50.3	54.0	-3.7	1/3 MHz
PK	H	4880.000	36.8	33.2	3.8	22.5	0.0	51.3	54.0	-2.7	1/3 MHz
PK	H	4960.000	39.0	33.3	3.9	22.6	0.0	53.6	54.0	-0.4	1/3 MHz

FCC IC
 RB RB
 RB RB

Setup Photos





Test Results: Pass

Test Standard: FCC 15.247(e), RSS-210 A8.2

Test: Peak Power Spectral Density

Test Environment:

Environmental Conditions During Testing:	Humidity (%):	N/A	Pressure (hPa):	N/A	Ambient (°C):	N/A
Pretest Verification Performed	N/A		Equipment under Test:	nTAG Wave		

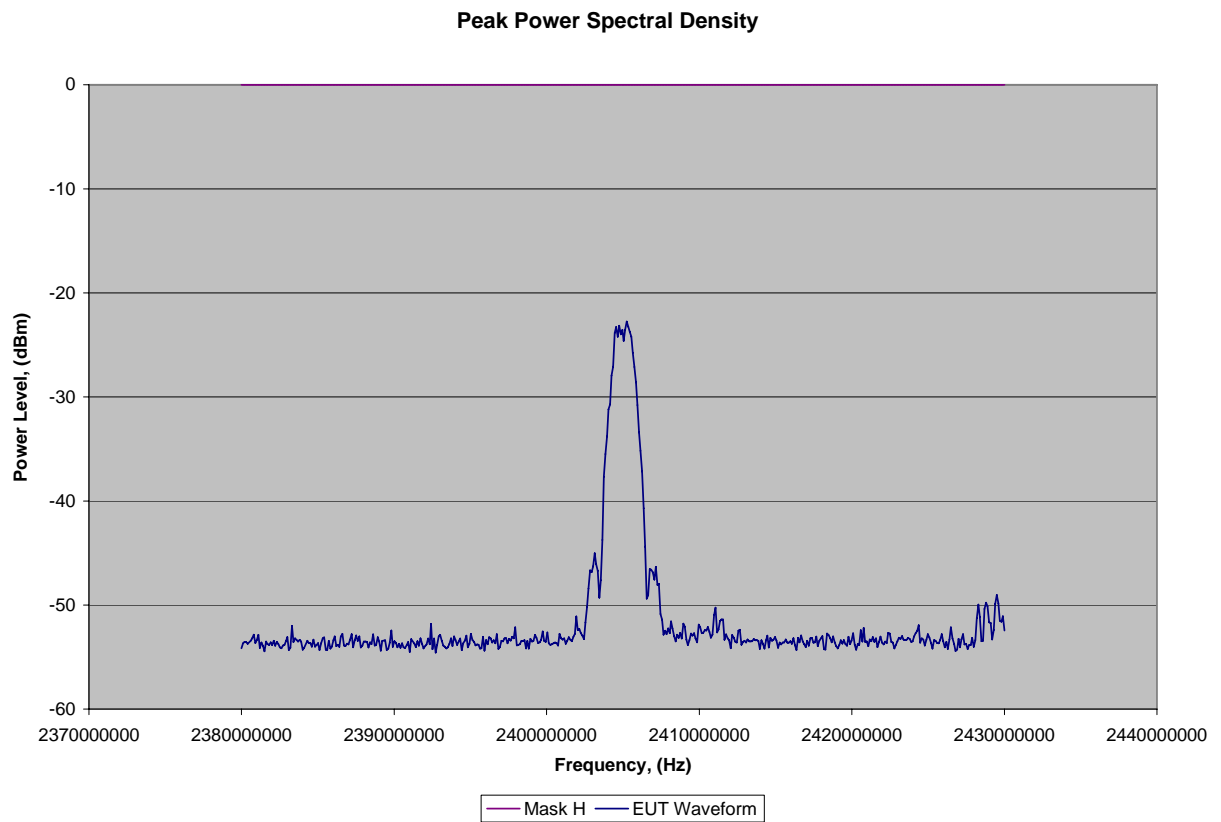
Maximum Test Parameters: The peak power spectral density must not exceed 8 dBm / 3 kHz.

Test Equipment Used:

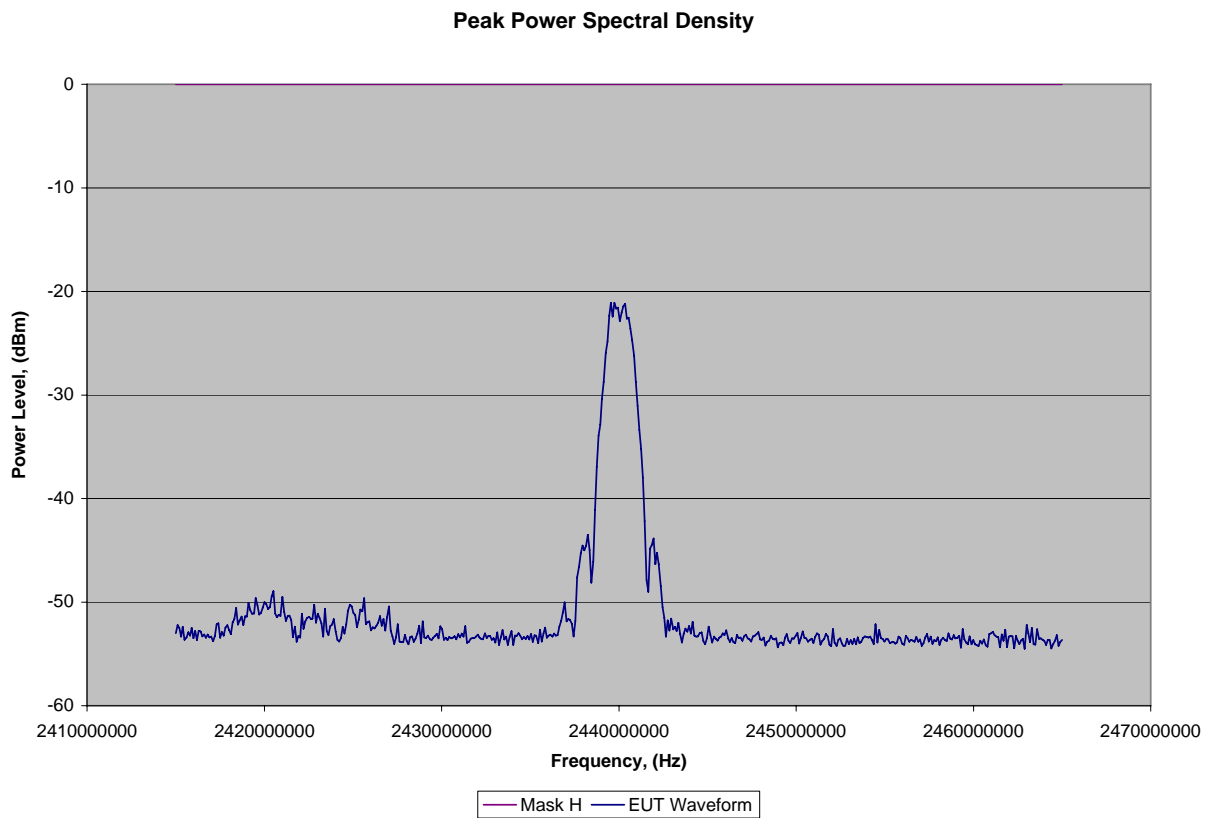
TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	07/26/2006
2	ANTENNA, RIDGED GUIDE, 1-18 GHZ	EMCO	3115	2784	08/11/2007
3	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/12/2006

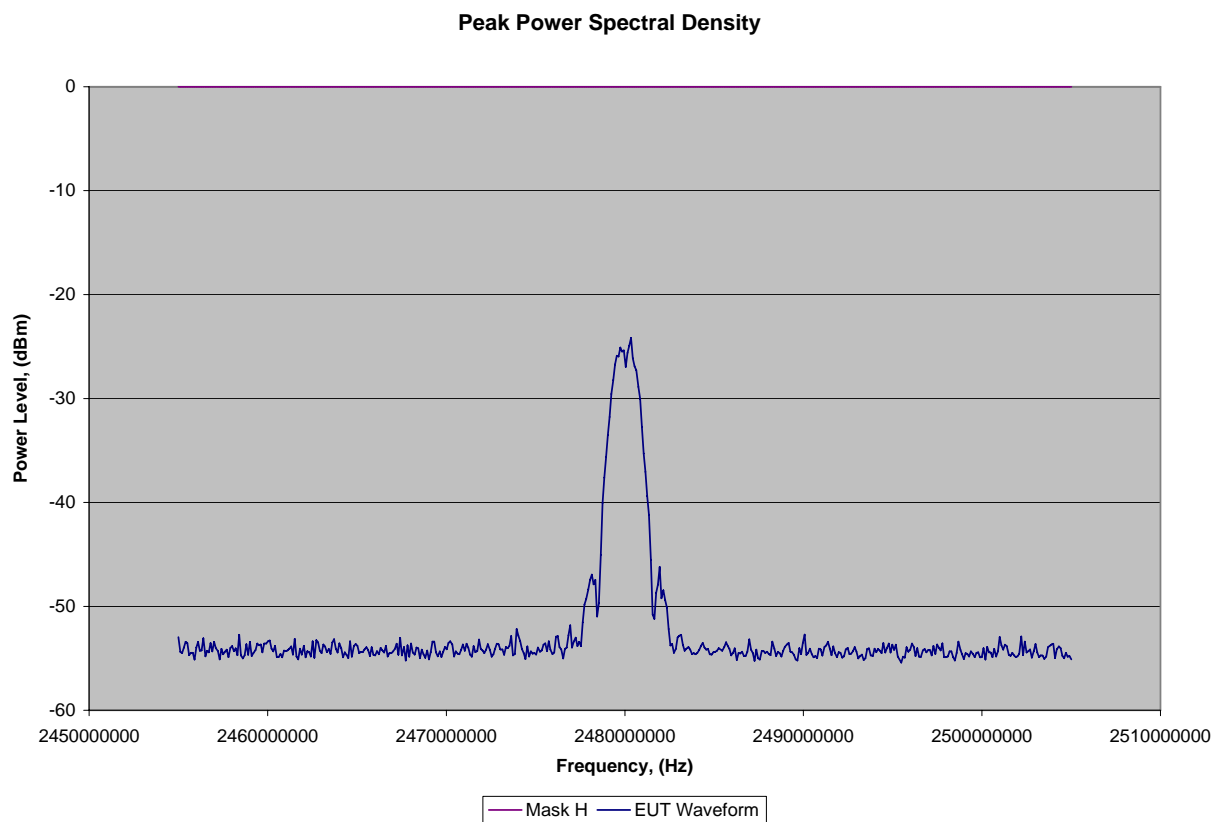
Test Results:

Notes: The cable loss and antenna factor were compensated for in the spectrum analyzer. The field strength obtained at 3 meters distance was converted to EIRP using the equations of DA-00-705A1. A 100 kHz bandwidth was used with a max peak detector, which overestimates compliance compared to the rules, which only require compliance using a 3 kHz bandwidth.



Channel 0 Peak Power Spectral Density





Channel 15 Peak Power Spectral Density

Test Results: Pass

Test Standard: FCC 15.215, RSS-210 2.1, A8.5

Test: Band Edge Compliance

Test Environment:

Environmental Conditions During Testing:	Humidity (%):	N/A	Pressure (hPa):	N/A	Ambient (°C):	N/A
Pretest Verification Performed	N/A		Equipment under Test:	nTAG Wave		

Maximum Test Parameters: The fundamental frequency must stay within the assigned frequency band.

Test Equipment Used:

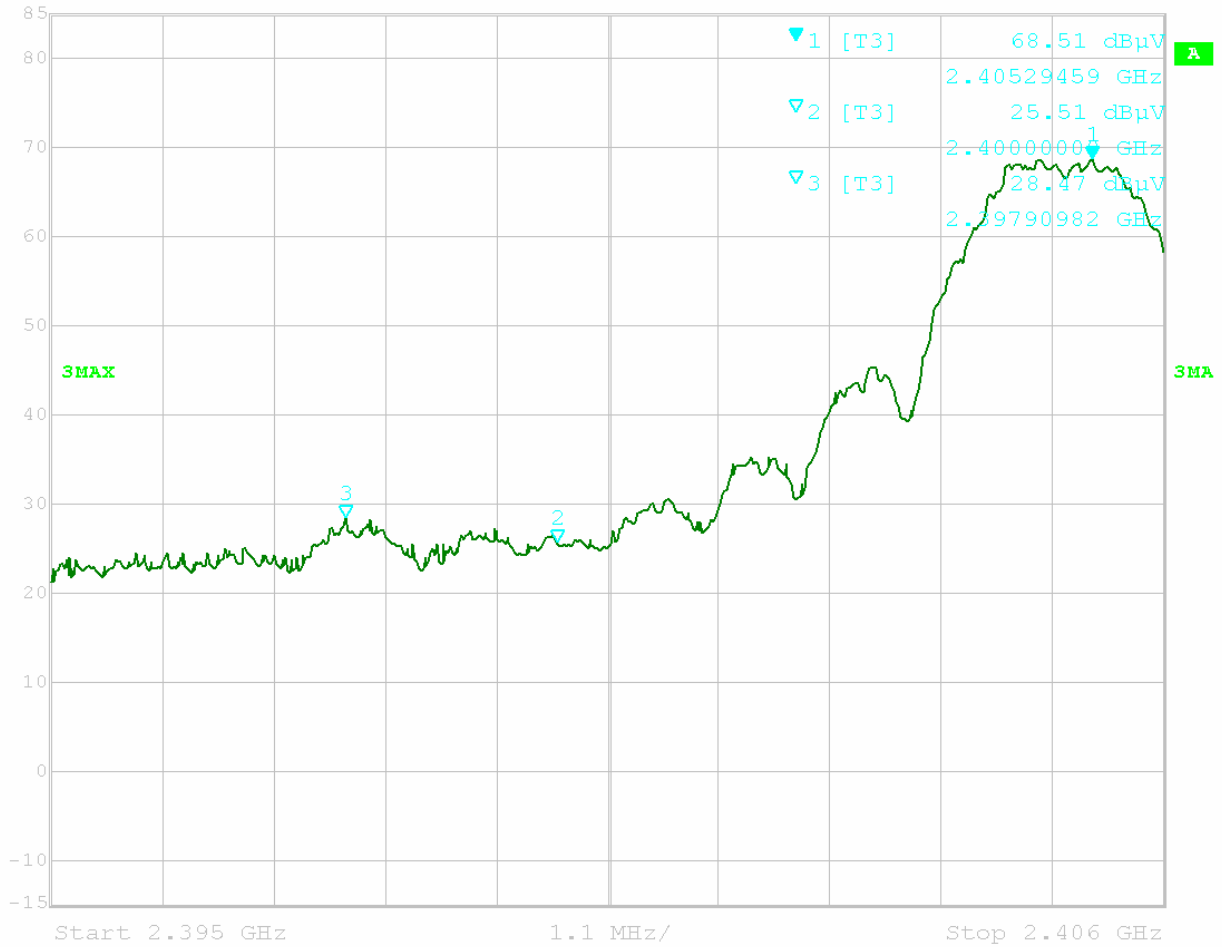
TEST EQUIPMENT LIST					
Item	Equipment Type	Make	Model No.	Serial No.	Next Cal. Due
1	Spectrum Analyzer 20hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	07/26/2006
2	HORN ANTENNA	EMCO	3115	9602-4675	09/13/2006
3	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 197	CBL028	12/12/2006

Test Results:

Notes: A 100 kHz bandwidth and peak detector were used, and a marker was placed at the peak fundamental level. A marker was placed at the band edge at the highest signal outside the band edge.



Marker 1 [T3] RBW 100 kHz RF Att 0 dB
 Ref Lvl 68.51 dBμV VBW 300 kHz
 85 dBμV 2.40529459 GHz SWT 5 ms Unit dBμV

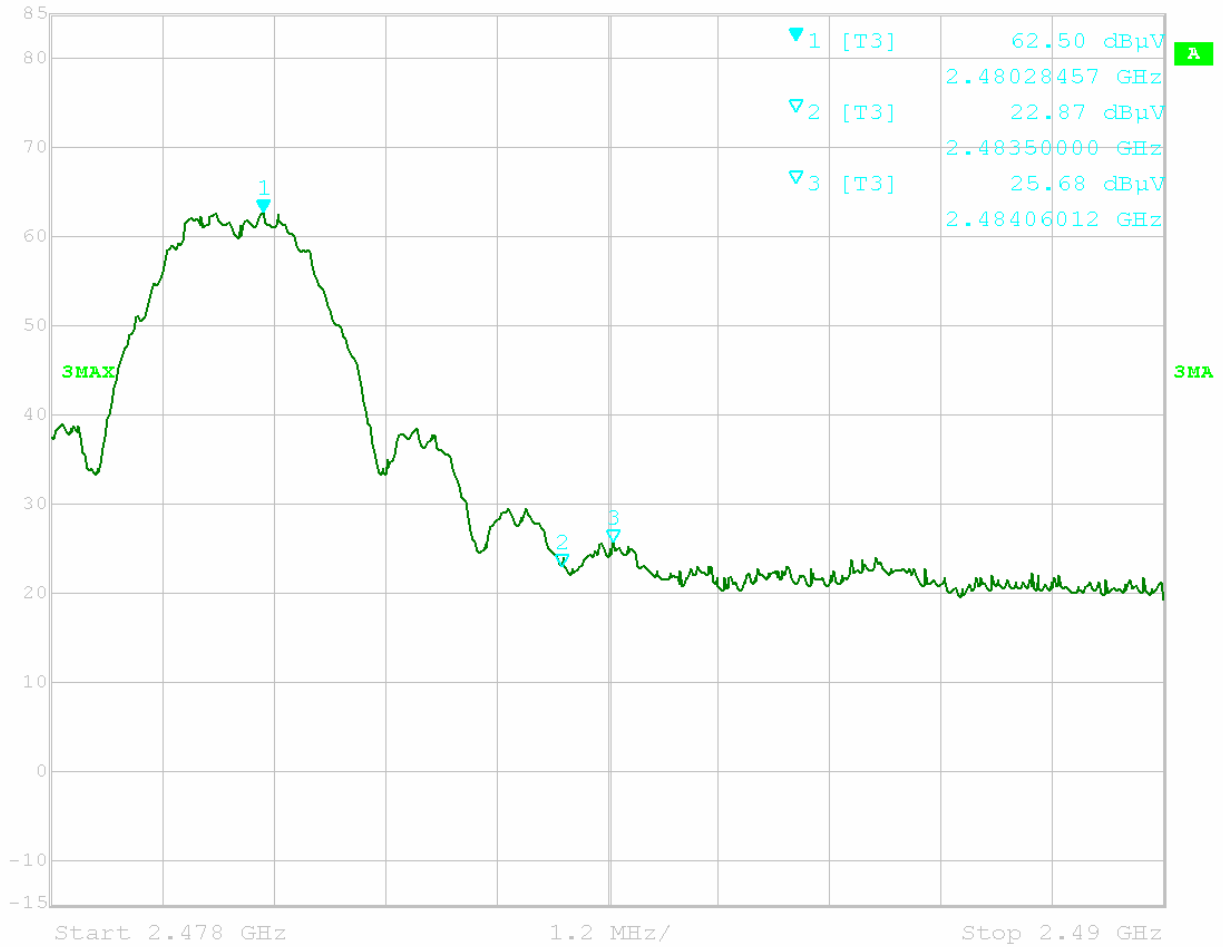


Date: 5.MAY.2006 10:54:35

Channel 0 Band Edge Compliance



Marker 1 [T3] RBW 100 kHz RF Att 0 dB
 Ref Lvl 62.50 dBμV VBW 300 kHz
 85 dBμV 2.48028457 GHz SWT 5 ms Unit dBμV



Date: 5.MAY.2006 11:32:36

Channel 15 Band Edge Compliance