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## **FCC PART 15.247 FHSS TEST REPORT**

|                         |                                                                        |
|-------------------------|------------------------------------------------------------------------|
| APPLICANT               | SYN-TECH SYSTEMS, INC.                                                 |
| ADDRESS                 | 100 FOUR POINTS WAY<br>TALLAHASSEE FLORIDA 32305                       |
| FCC ID                  | NR3-032B0100                                                           |
| PRODUCT DESCRIPTION     | PDA WITH BLUETOOTH                                                     |
| DATE SAMPLE<br>RECEIVED | June 21, 2006                                                          |
| DATE TESTED             | June 23, 2006                                                          |
| TESTED BY               | Nam Nguyen                                                             |
| APPROVED BY             | Mario de Aranzeta C.E.T.                                               |
| TIMCO REPORT NO.        | 209ZUT6TestReport                                                      |
| TEST RESULTS            | <input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL |

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT  
THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01



Certificate # 0955-01

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## **STATEMENT OF COMPLIANCE**

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 NW State Road 45, Newberry, Florida 32669 USA.

**Authorized by:** Mario de Aranzeta

**Function:** Engineer

**Date:** August 16 , 2006

APPLICANT: SYN-TECH SYSTEMS, INC.  
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## GENERAL INFORMATION AND EQUIPMENT UNDER TEST

|                                                              |                                                                            |                                |                               |
|--------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------|-------------------------------|
| Applicable Standards:                                        | FCC Part 15.247                                                            |                                |                               |
| Test Result:                                                 | The test results relate only to the items tested.                          |                                |                               |
| Manufacturer:                                                | SYN-TECH SYSTEMS, INC.<br>100 FOUR POINTS WAY<br>TALLAHASSEE FLORIDA 32305 |                                |                               |
| FCC ID:                                                      | NR3-032B0100                                                               |                                |                               |
| Product Description:                                         | PDA WITH BLUETOOTH DEVICE                                                  |                                |                               |
| Operating Frequency:                                         | 2402 - 2480 MHz                                                            |                                |                               |
| Max. Output Power (conducted):                               | <input type="checkbox"/> Conducted - dBm                                   | <input type="checkbox"/> ERP - | <input type="checkbox"/> EIRP |
| Type of Modulation:                                          | FHSS- Bluetooth                                                            |                                |                               |
| Power Supply:                                                | Primary Power                                                              | 3.6 Vdc                        |                               |
|                                                              | Secondary Power                                                            | 110VAC/50-60Hz                 |                               |
| Test Item:                                                   | Pre-Production                                                             |                                |                               |
| Antenna Type:                                                | Antenna spec attached                                                      |                                |                               |
| Antenna Connector:                                           | None-permanently attached                                                  |                                |                               |
| Modification to the EUT:                                     | None                                                                       |                                |                               |
| Test Facilities                                              | Timco Engineering Inc.<br>849 N.W. State Road 45, Newberry, FL 32669.      |                                |                               |
| Test Exercise (e.g. software description, test signal, etc.) | The test article was set in a continuous transmit mode of operation        |                                |                               |
| Test Conditions                                              | Temperature: 78°F<br>Humidity: 55%                                         |                                |                               |

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## TEST EQUIPMENT LIST

| Device                                | Manufacturer    | Model         | Serial Number            | Cal/Char Date     | Due Date |
|---------------------------------------|-----------------|---------------|--------------------------|-------------------|----------|
| 3/10-Meter OATS                       | TEI             | N/A           | N/A                      | Listed<br>3/27/04 | 3/26/07  |
| 3-Meter OATS                          | TEI             | N/A           | N/A                      | Listed<br>1/11/06 | 1/10/09  |
| Biconnical Antenna                    | Eaton           | 94455-1       | 1057                     | CAL<br>12/12/05   | 12/12/07 |
| Biconnical Antenna                    | Electro-Metrics | BIA-25        | 1171                     | CAL<br>4/29/05    | 4/29/07  |
| Analyzer Tan Tower Quasi-Peak Adapter | HP              | 85650A        | 3303a01690               | CAL<br>12/8/05    | 12/8/07  |
| Analyzer Tan Tower RF Preselector     | HP              | 85685A        | 3221A01400               | CAL<br>12/7/05    | 12/7/07  |
| Analyzer Tan Tower Spectrum Analyzer  | HP              | 8566B OPT 462 | 3188A07786<br>3144A20661 | CAL<br>12/7/05    | 12/7/07  |
| Analyzer Tan Tower Preamplifier       | HP              | 8449B-H02     | 3008A00372               | CAL<br>12/8/05    | 12/8/07  |
| LISN                                  | Electro-Metrics | EM-7820       | 2682                     | CAL<br>4/28/05    | 4/28/07  |
| Log-Periodic Antenna                  | Eaton           | 96005         | 1243                     | CAL<br>12/14/05   | 12/14/07 |

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## TEST PROCEDURE

**POWER LINE CONDUCTED INTERFERENCE:** The procedure used was ANSI STANDARD C63.4-2003 using a 50uH LISN. Both lines were observed with the UUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

**BANDWIDTH 20 dB:** The measurements were made with the spectrum analyzer's resolution bandwidth and the span set as shown on plot.

**POWER OUTPUT:** The RF power output was measured radiated EIRP.

**ANTENNA CONDUCTED EMISSIONS:** The RBW = 100 kHz, VBW = 300 kHz and the span set to 10 MHz and the spectrum was scanned from 30 MHz to the 10<sup>th</sup> Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

**RADIATION INTERFERENCE:** The test procedure used was ANSI STANDARD C63.4-2003 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.



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## POWER LINE CONDUCTED INTERFERENCE

**Rules Part No.:** 15.207(a)

### Requirements:

| Emission Frequency<br>(MHz)                      | FCC Conducted Limit (dB $\mu$ V) |              |
|--------------------------------------------------|----------------------------------|--------------|
|                                                  | Quasi-peak (QP)                  | Average (AV) |
| 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 Data:

APPLICANT: SYN-TECH SYSTEMS, INC.  
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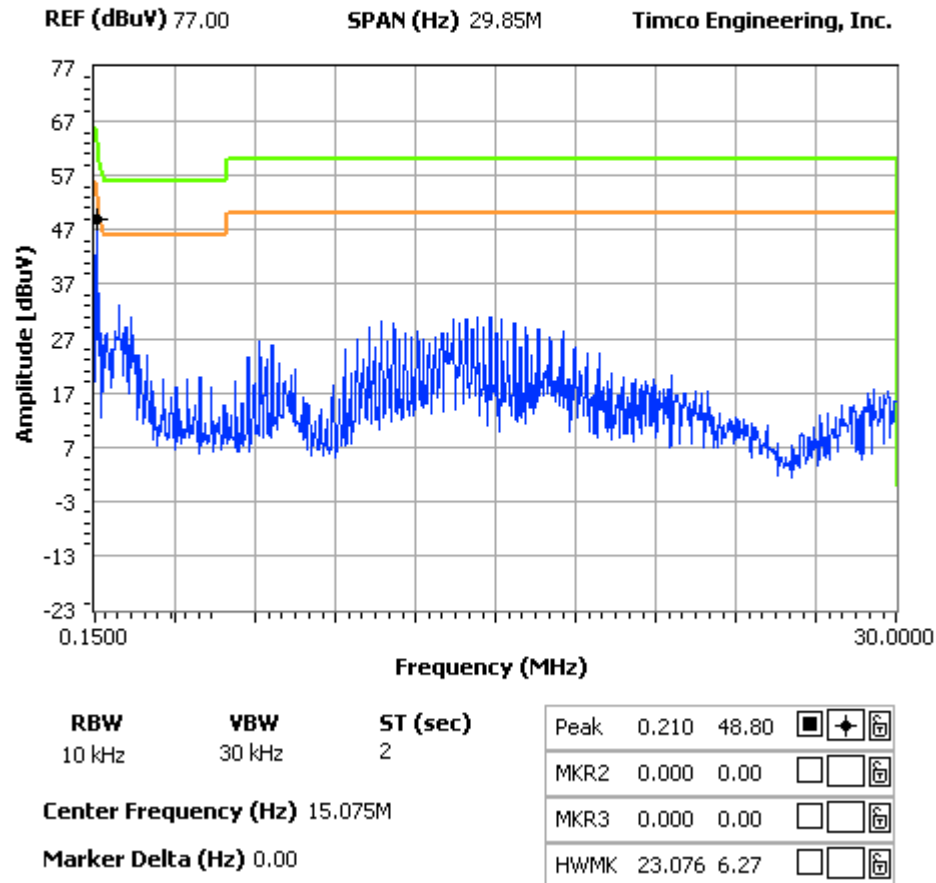


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**NOTES:**

SYN-TECH SYSTEMS, INC. -  
POWERLINE CONDUCTED PLOT - LINE 1

**FCC 15.107 Mask Class B**



APPLICANT: SYN-TECH SYSTEMS, INC.  
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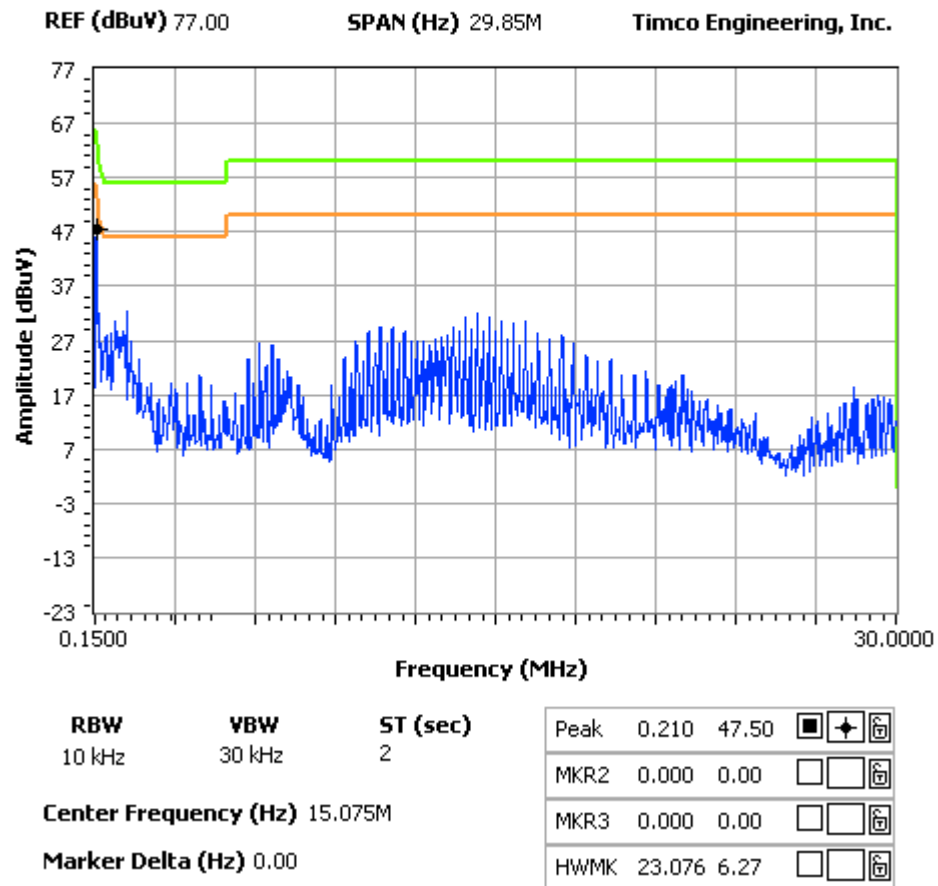


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**NOTES:**

SYN-TECH SYSTEMS, INC. -  
POWERLINE CONDUCTED PLOT - LINE 2

**FCC 15.107 Mask Class B**



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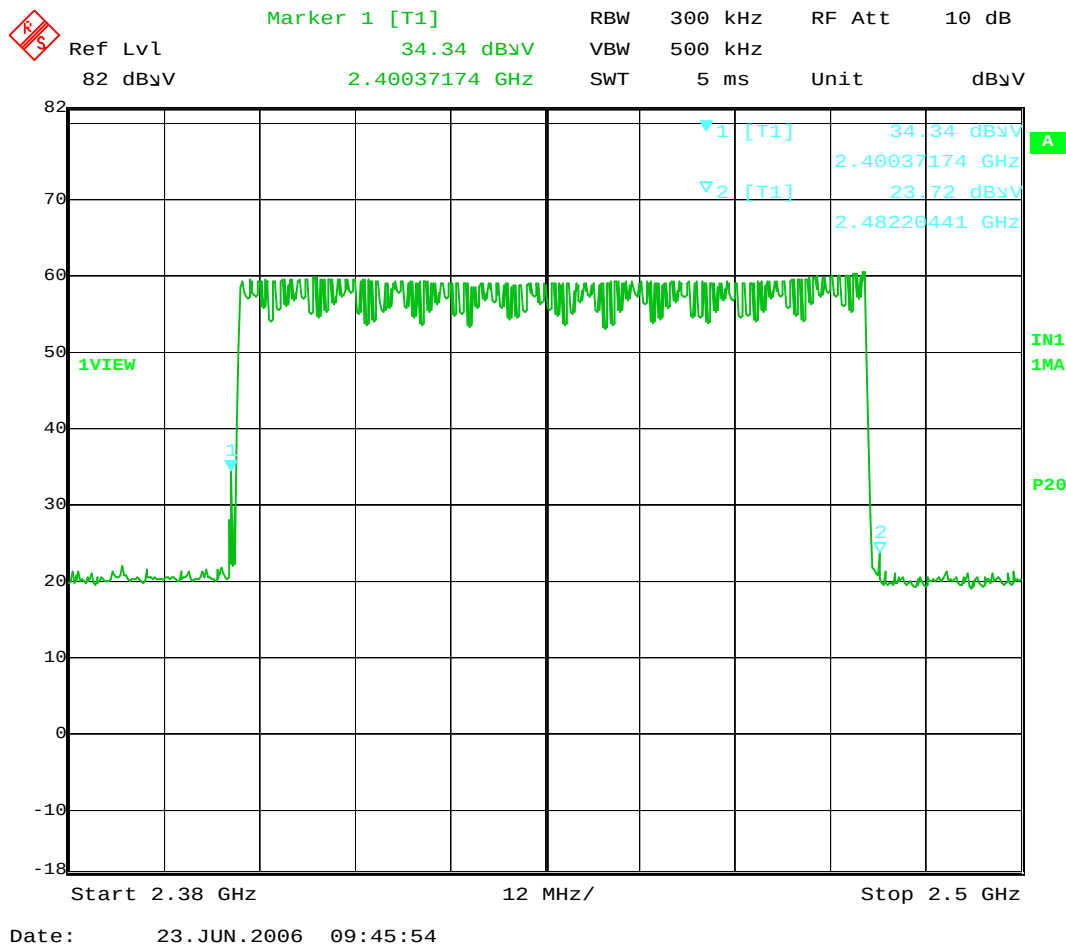
## NUMBER OF HOPPING CHANNELS

**Rules Part No.:** 15.247(a)(1)

### Requirements:

|                 |                                                                                                     |
|-----------------|-----------------------------------------------------------------------------------------------------|
| 902-928 MHz     | If the 20 dB bandwidth is less than 250 kHz, the system shall use at least 50 hopping frequencies.  |
|                 | If the 20 dB bandwidth is 250 kHz or greater, the system shall use at least 25 hopping frequencies. |
| 2400-2483.5 MHz | At least 15 channels                                                                                |
| 5725-5850 MHz   | At least 75 channels                                                                                |

**Test Data:** There are 79 hopping channels



APPLICANT: SYN-TECH SYSTEMS, INC.

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## DWELL TIME OF A HOPPING CHANNEL

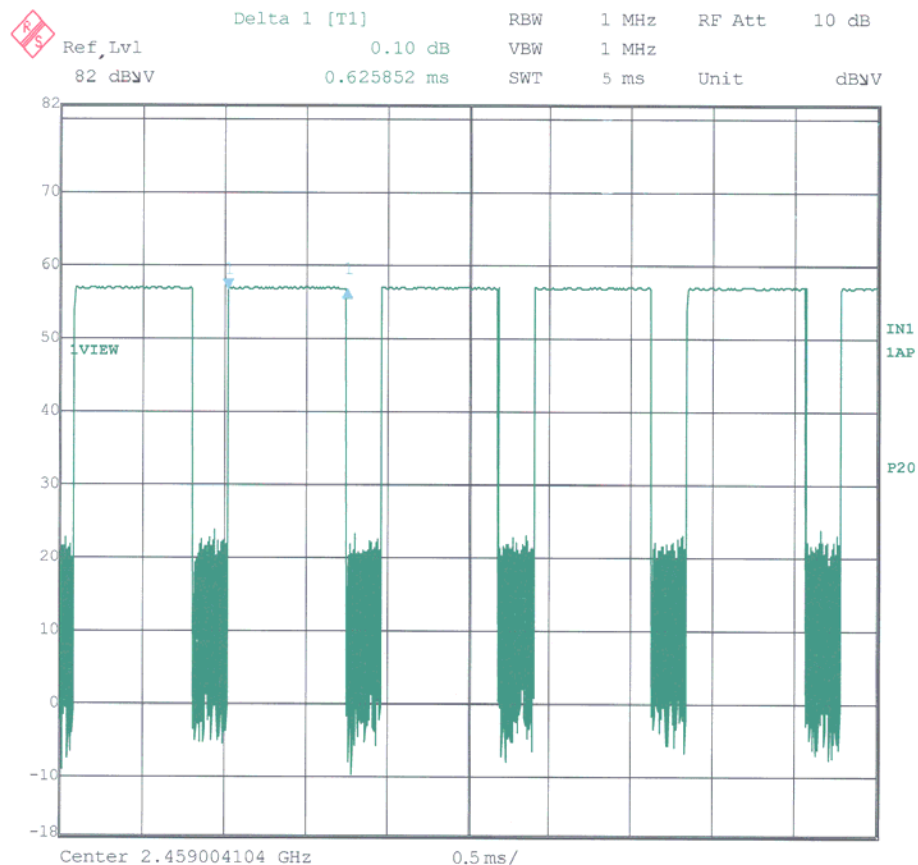
**Rules Part No.:** 15.247(a)(1)(i)

### Requirements:

|                 |                                                                                                |
|-----------------|------------------------------------------------------------------------------------------------|
| 902-928 MHz     | If 20 dB bandwidth is less than 250 kHz, Dwell time $\leq 0.4$ seconds in a 20 second period.  |
|                 | If 20 dB bandwidth is 250 kHz or greater, Dwell time $\leq 0.4$ seconds in a 10 second period. |
| 2400-2483.5 MHz | $\leq 0.4$ seconds in a 0.4 seconds multiplied the number of hopping channels employed.        |
| 5725-5850 MHz   | $\leq 0.4$ seconds in a 30 second period.                                                      |

### Test Data:

The dwell time is 0.625 msec/hop or 400msec for 640 hops/.4 seconds.  
 $30(1600 \times 79) \times 625 \text{ msec} = 380 \text{ msec}$ .



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## 20 dB BANDWIDTH

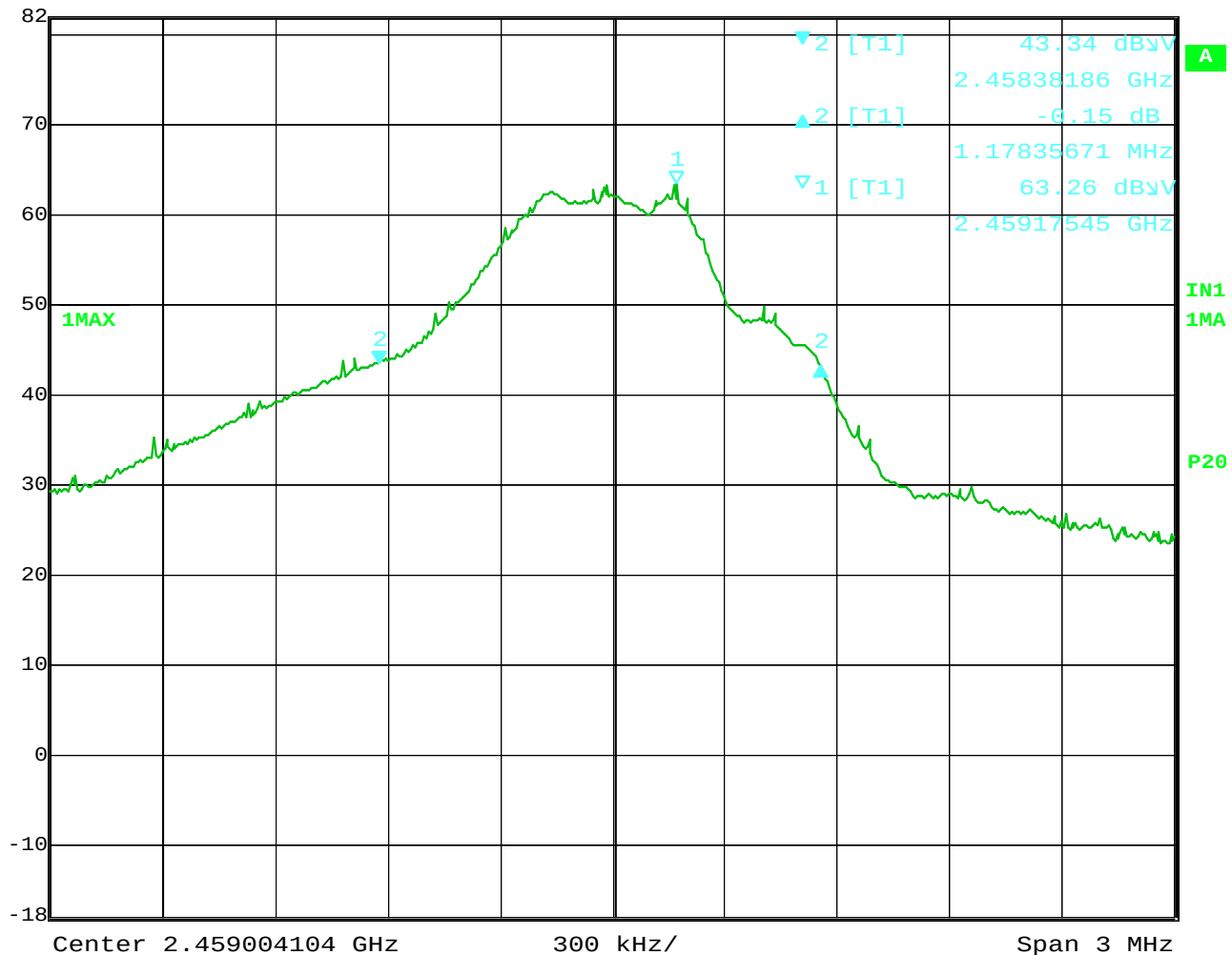
**Rules Part No.:** 15.247(a)(2)

**Requirements:** 20 dB bandwidth

**Test Data:** See the following plot



|         |                |     |         |        |       |
|---------|----------------|-----|---------|--------|-------|
| Ref Lvl | Delta 2 [T1]   | RBW | 100 kHz | RF Att | 10 dB |
| 82 dBμV | -0.15 dB       | VBW | 500 kHz |        |       |
|         | 1.17835671 MHz | SWT | 5 ms    | Unit   | dBμV  |



Date: 23.JUN.2006 10:36:15

This device was tested at the low , middle, and high channels. The worst case is reported.

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## CARRIER FREQUENCY SEPARATION

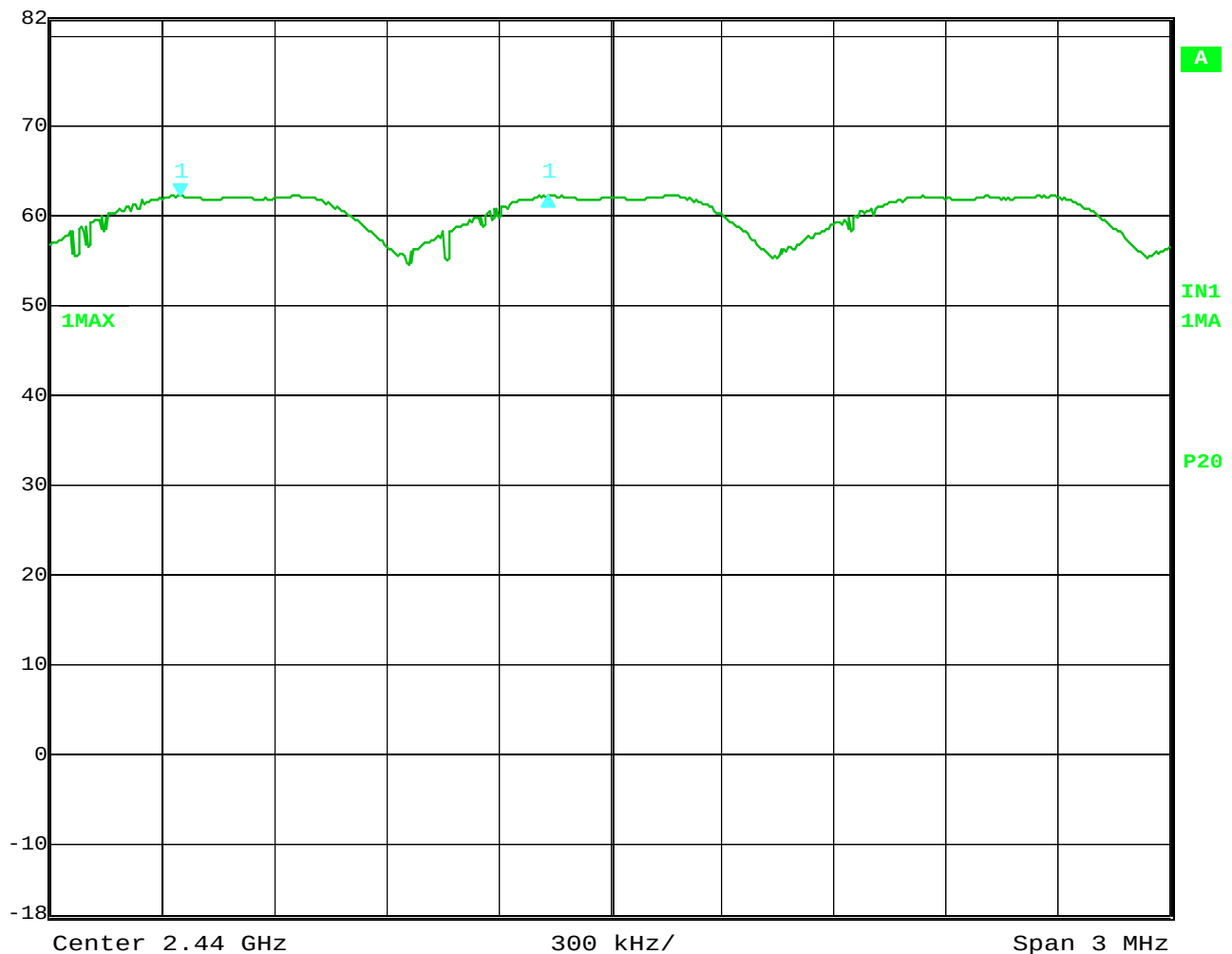
**Rules Part No.:** 15.247(a)(2)

**Requirements:** The hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

**Test Data:** See the following plot



|         |                  |     |         |        |       |
|---------|------------------|-----|---------|--------|-------|
| Ref Lvl | Delta 1 [T1]     | RBW | 300 kHz | RF Att | 10 dB |
| 82 dBμV | -0.03 dB         | VBW | 500 kHz |        |       |
|         | 985.97194389 kHz | SWT | 5 ms    | Unit   | dBμV  |



Date: 23.JUN.2006 09:29:45

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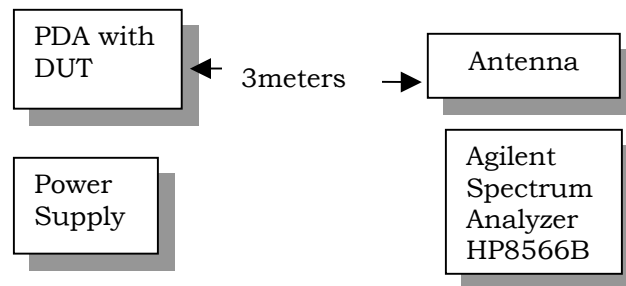
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## POWER OUTPUT

**Rules Part No.:** 15.247(b)

**Requirements:** The maximum peak output power shall not exceed 1 watt (30 dBm). If directional transmitting antennas with a gain of more than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**Test Method:** The antenna was permanently attached and the power output was measured radiated.



**Test Data:** 2 mWatts EIRP

Three places in the band were measured and the highest power presented above.



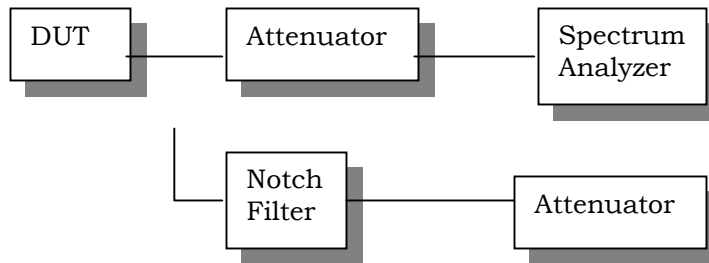
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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS

**Rules Part No.:** 15.247(c)

**Requirements:** Emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

### Method of Measuring:



Note: The spectrum was scanned to the tenth harmonic.

### Test Data:

**Not Applicable**



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## FIELD STRENGTH OF SPURIOUS EMISSIONS

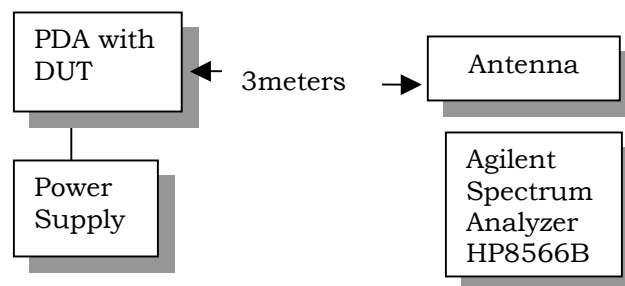
**Rules Part No.:** 15.247(c), 15.205 & 15.209(b)

### Requirements:

| (Fundamental) Frequency | (Field Strength) Limits |
|-------------------------|-------------------------|
| 902 – 928MHz            | 127.37dBuV/m            |
| 2.4 – 2.4835GHz         | 54 dBuV/m @3m           |
| 30 - 88 MHz             | 40 dBuV/m @3M           |
| 88 -216 MHz             | 43.5 dBuV/m @3M         |
| 216 -960 MHz            | 46 dBuV/m @3M           |
| ABOVE 960 MHz           | 54dBuV/m                |

Emissions that fall in the restricted bands (15.205) must be less than or equal to 500 uV/m (54 dBuV/m). Spurious not in a restricted band must be 20 dBc.

### Test Setup



Equipment placed 80cm above ground on a rotatable platform.

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**Test Data:**

| Tuned Frequency MHz | Emission Frequency MHz | Meter Reading dBuV | Ant. Polarity | Coax Loss dB | Correction Factor dB | Field Strength dBuV/m | Margin dB |
|---------------------|------------------------|--------------------|---------------|--------------|----------------------|-----------------------|-----------|
| 2,402.00            | 2,402.00               | 55.1               | V             | 3.18         | 32.33                | 90.61                 | 36.77     |
| 2,402.00            | 2,402.00               | 62                 | H             | 3.18         | 32.33                | 97.51                 | 29.87     |
| 2,402.00            | 4,804.00r              | 11.4               | V             | 4.9          | 34.34                | 50.64                 | 3.36      |
| 2,402.00            | 4,804.00r              | 10.1               | H             | 4.9          | 34.34                | 49.34                 | 4.66      |
| 2,402.00            | 7,206.00               | 9.6                | H             | 5.72         | 36.15                | 51.47                 | 28.24     |
| 2,402.00            | 7,206.00               | 12.7               | V             | 5.72         | 36.15                | 54.57                 | 25.14     |
| 2,459.00            | 2,459.00               | 54.3               | V             | 3.22         | 32.49                | 90.01                 | 37.37     |
| 2,459.00            | 2,459.00               | 61.9               | H             | 3.22         | 32.49                | 97.61                 | 29.77     |
| 2,459.00            | 4,918.00r              | 13.9               | V             | 4.96         | 34.43                | 53.29                 | 0.71      |
| 2,459.00            | 4,918.00r              | 12.4               | H             | 4.96         | 34.43                | 51.79                 | 2.21      |
| 2,459.00            | 7,377.00r              | 9.5                | H             | 5.83         | 36.35                | 51.68                 | 2.32      |
| 2,459.00            | 7,377.00r              | 10.5               | V             | 5.83         | 36.35                | 52.68                 | 1.32      |
| 2,480.00            | 2,480.00               | 54.1               | V             | 3.24         | 32.54                | 89.88                 | 37.5      |
| 2,480.00            | 2,480.00               | 58.8               | H             | 3.24         | 32.54                | 94.58                 | 32.8      |
| 2,480.00            | 4,960.00r              | 12.4               | V             | 4.98         | 34.47                | 51.85                 | 2.15      |
| 2,480.00            | 4,960.00r              | 13.8               | H             | 4.98         | 34.47                | 53.25                 | 0.75      |
| 2,480.00            | 7,440.00r              | 10.8               | H             | 5.86         | 36.43                | 53.09                 | 0.91      |
| 2,480.00            | 7,440.00r              | 11.6               | V             | 5.86         | 36.43                | 53.89                 | 0.11      |

\*Harmonics were measured to the 10<sup>th</sup> harmonic\*



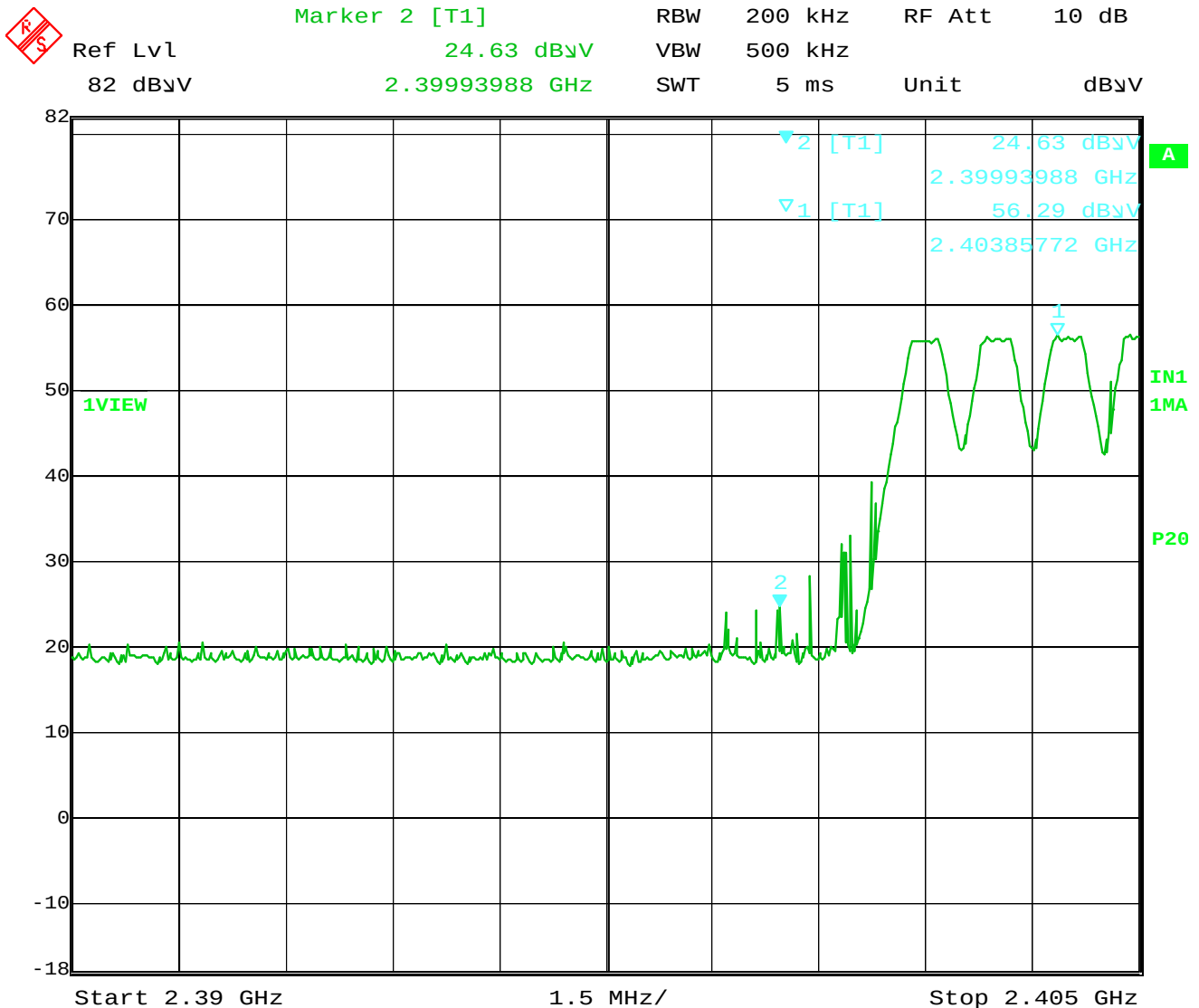
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## RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND

**Rule Parts No.:** Part 15.205

**Requirements:** Emissions that fall in the restricted bands (15.205). These emissions must be less than or equal to 500 uV/m (54dBuV/m). Emissions not in the restricted band must be 20 dBc.

BAND EDGE - HIGH



Date: 23.JUN.2006 11:41:48

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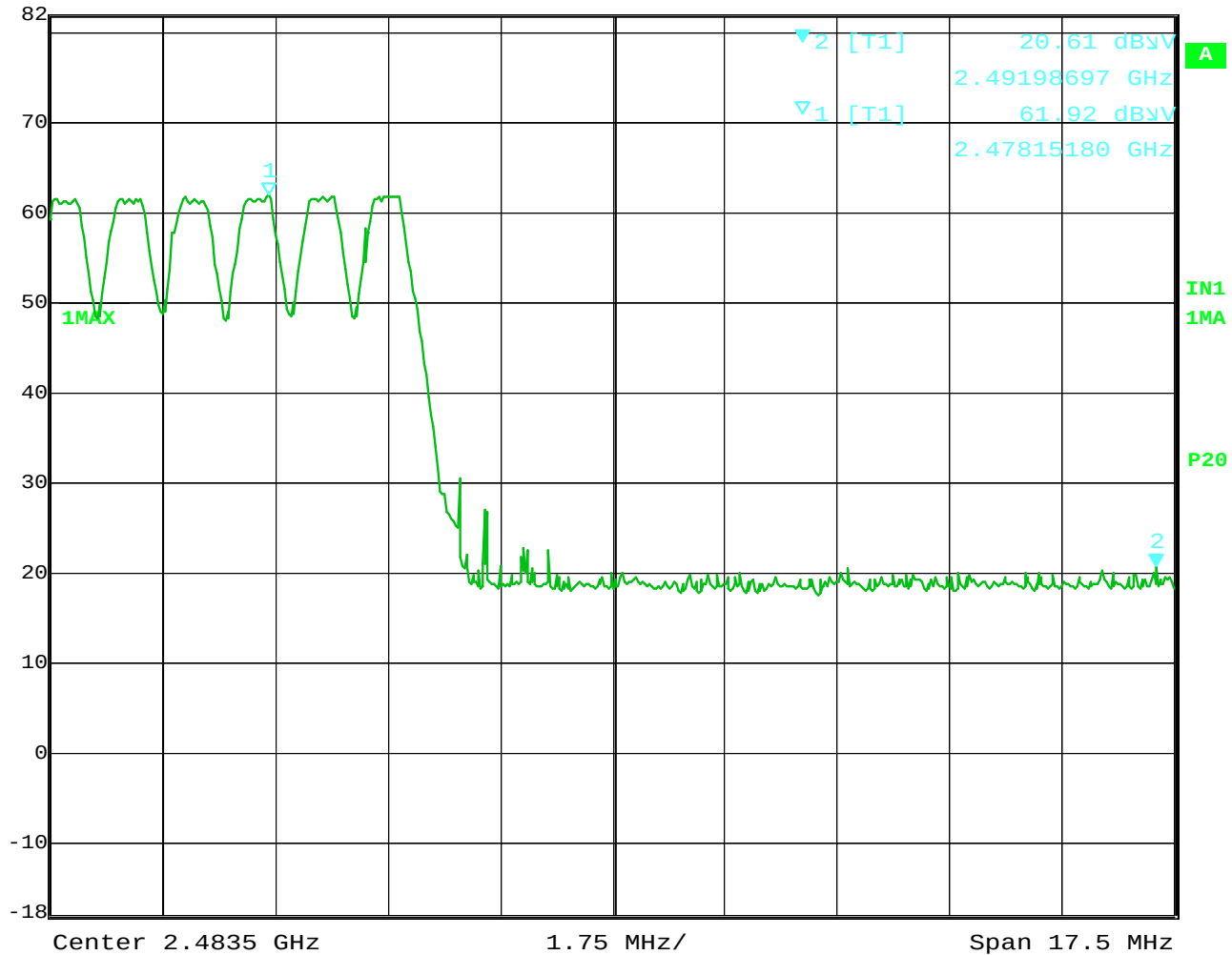


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### BAND EDGE - HIGH



Ref Lvl 82 dB $\mu$ V  
Marker 2 [T1] 20.61 dB $\mu$ V  
2.49198697 GHz  
RBW 200 kHz  
VBW 500 kHz  
SWT 5 ms  
RF Att 10 dB  
Unit dB $\mu$ V



Date: 23.JUN.2006 14:32:57

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## RF EXPOSURE REQUIREMENT

| §15.247 (e), §1.1307 (b)(2), §1.1310, & §2.1093     |                                        |
|-----------------------------------------------------|----------------------------------------|
| Frequency Range<br>(MHz)                            | Power Density<br>(mW/cm <sup>2</sup> ) |
| Limits for Occupational/Controlled Exposures        |                                        |
| 0.3 – 3.0                                           | *(100)                                 |
| 3.0 – 30                                            | *(900/f <sup>2</sup> )                 |
| 30 - 300                                            | 1.0                                    |
| 300 - 1500                                          | f/300                                  |
| 1500 – 100,000                                      | 5.0                                    |
| Limits for General Population/Uncontrolled Exposure |                                        |
| 0.3 – 3.0                                           | *(100)                                 |
| 3.0 – 30                                            | *(180/f <sup>2</sup> )                 |
| 30 - 300                                            | 0.2                                    |
| 300 - 1500                                          | f/1500                                 |
| 1500 – 100,000                                      | 1.0                                    |
| f = frequency in MHz                                |                                        |
| * = Place-wave equivalent power density             |                                        |

### MPE Calculation

The calculations on the next page are based on the following:

An output power of 2 mW

A gain of 0 dBi

A value for the general population expose limit of 1 mW/cm<sup>2</sup> which in the formula is designated as S=1 or as calculated from 1500/1500=1

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Po := 2      mWatts      dBd := 0      antenna gain      f := 1500      Frequency in MHz

G := dBd + 2.15      gain in dBi      G = 2.15

Gn :=  $10^{\frac{G}{10}}$       gain numeric      S :=  $\frac{f}{1500}$       300 for controlled  
1500 for uncontrolled

Gn = 1.641      S = 1

$$R := \sqrt{\frac{(Po \cdot Gn)}{(4 \cdot \pi \cdot S)}}$$

$$\text{Rinches} := \frac{R}{2.54}$$

R = 0.511      distance in centimeters  
required for compliance

Rinches = 0.201