



Nemko Test Report: 5L0221RUS1Rev1

Applicant: Sychip, Inc.

**Equipment Under Test:
(E.U.T.)** WLAN6100

In Accordance With: **FCC Part 15, Subpart C, 15.247**
Digital Transmission System Transmitter

Tested By: Nemko Dallas Inc.
802 N. Kealy
Lewisville, Texas 75057-3136

Authorized By: 
Tom Tidwell, Frontline Manager

Date: 8 March, 2006



NVLAP LAB CODE: 100426-0

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Section 1. Summary of Test Results

Manufacturer: Sychip, Inc.

Model No.: WLAN6100

Serial No.: 00.0B.6C.FF.81.1C

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, Paragraph 15.247 for Digital Transmission Systems. 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.

- | | | | |
|-------------------------------------|----------------------------|-------------------------------------|---------------------|
| <input checked="" type="checkbox"/> | New Submission | <input type="checkbox"/> | Production Unit |
| <input type="checkbox"/> | Class II Permissive Change | <input checked="" type="checkbox"/> | Pre-Production Unit |

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. NONE



NVLAP LAB CODE: 100426-0

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Summary Of Test Data

| NAME OF TEST | PARA. NO. | RESULT |
|---|------------------|---------------|
| Powerline Conducted Emissions | 15.207(a) | Complies |
| Minimum 6 dB Bandwidth | 15.247(a)(2) | Complies |
| Maximum Peak Power Output | 15.247(b)(1) | Complies |
| Spurious Emissions (Antenna Conducted) | 15.247(c) | Complies |
| Spurious Emissions (Restricted Bands) | 15.247(c) | Complies |
| Peak Power Spectral Density | 15.247(d) | Complies |

Footnotes:

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

| | |
|-----------------------------------|---------------------|
| Frequency Band: | 2412 to 2462 MHz |
| | Channel 1 - 11 |
| Channel Spacing: | 5 MHz |
| User Frequency Adjustment: | Software controlled |

Description of EUT

WLAN6100 EVK from SyChip Inc provides a platform for testing SyChip WLAN embedded modules

System Diagram

Refer to separate exhibit.

EQUIPMENT CONFIGURATION LIST (HARDWARE/PERIPHERALS):

Place an "*" next to EUT and any item that is part of the EUT.

| Item | * | Generic Description | Manufacturer | Model No. | Serial # | Rev. | FCC ID Status ¹ |
|------|---|---------------------|--------------|-----------|-------------------|------|----------------------------|
| (A) | | WLAN CARD | SYCHIP | WLAN6100 | 00.0B.6C.FF.81.1C | - | 3 |
| (B) | | LABTOP | DELL | unknown | unknown | - | - |
| (C) | | POWER SUPPLY | DELL | unknown | unknown | - | - |
| (D) | | | | | | | |
| (E) | | | | | | | |
| (F) | | | | | | | |
| (G) | | | | | | | |
| (H) | | | | | | | |
| (I) | | | | | | | |
| (J) | | | | | | | |
| (K) | | | | | | | |

1 FCC ID STATUS

- 1. FCC DOC
- 2. FCC A/B Verification
- 3. None - (If performing FCC testing, contact lab manager)
- 4. Certification (include FCC ID in parenthesis)

Section 3. Powerline Conducted Emissions

| | |
|---|----------------------|
| NAME OF TEST: Powerline Conducted Emissions | PARA. NO.: 15.207(a) |
| TESTED BY: Kevin Rose | DATE: 5/18/05 |

Test Results: Complies.

Measurement Data: See attached data.

Measurement Uncertainty: +/- 1.7 dB

Test Data – Powerline Conducted Emissions

| Conducted Emissions | | | | | | | | | | | | | |
|--|----------------------------|-------------------------|--------------------------|----------------------|----------------|------------------------|---------------------------|-------------------|--------|------------------|----------------|------------|---------------------|
| Powerline Voltage Measurement | | | | | | | | | | | | | |
| Complete | <u> X </u> | | Job # : <u> 5L0221R </u> | | | | Test # : <u> CEPV-01 </u> | | | | | | |
| Preliminary | <u> </u> | | Page <u> 1 </u> | | | | of <u> 1 </u> | | | | | | |
| Client Name : | <u> Sychip </u> | | | | | | | | | | | | |
| EUT Name : | <u> WLAN6100 </u> | | | | | | | | | | | | |
| EUT Model # : | <u> WLAN6100 </u> | | | | | | | | | | | | |
| EUT Part # : | <u> WLAN6100 </u> | | | | | | | | | | | | |
| EUT Serial # : | <u> 00.0B.6C.FF.81.1C </u> | | | | | | | | | | | | |
| EUT Config. : | <u> Tx </u> | | | | | | | | | | | | |
| Specification : | <u> 15.207 </u> | | | | | | Reference : | | | | | | |
| Transducer # : | <u> 545 </u> | Temp. (deg. C) : | <u> 22 </u> | | | | | | | | | Date : | <u> 05/18/05 </u> |
| HP Filter # : | <u> 1155 </u> | Humidity (%) : | <u> 45 </u> | | | | | | | | | Time : | <u> 9:00 </u> |
| Cable 1 # : | <u> 1998 </u> | EUT Voltage : | <u> 120 </u> | | | | | | | | | Staff : | <u> Kevin Rose </u> |
| Cable 2 # : | <u> 1019 </u> | EUT Frequency : | <u> 60 </u> | | | | | | | | | Location : | <u> SE01 </u> |
| Detector 1 # : | <u> 1659 </u> | Peak Bandwidth : | <u> 10kHz </u> | | | | | | | | | Photo ID : | <u> NA </u> |
| Detector 2 # : | <u> </u> | QP Bandwidth : | <u> 9kHz </u> | | | | | | | | | | |
| Limiter # : | <u> </u> | Avg. Bandwidth : | <u> 9kHz </u> | | | | | | | | | | |
| Meas. Freq. (MHz) | EUT Test Point | Detector Type (P,QP, A) | Limit Type (QP, A) | Meter Reading (dBuV) | Path Loss (dB) | Transducer Factor (dB) | Corrected Reading (dBuV) | Spec.limit (dBuV) | | CR/SL Diff. (dB) | Pass Fail Unc. | Comment | |
| | | | | | | | | Q.P. | Avg. | | | | |
| 0.15 | H | QP | QP | 51.2 | 0 | 0 | 51.2 | 66 | 56 | -14.8 | Pass | | |
| 0.15 | H | A | A | 24.9 | 0 | 0 | 24.9 | 66 | 56 | -31.1 | Pass | | |
| 0.222 | H | QP | QP | 48.0 | 0 | 0 | 48.0 | 62.74 | 52.744 | -14.7 | Pass | | |
| 0.222 | H | A | A | 32.0 | 0 | 0 | 32.0 | 62.74 | 52.744 | -20.7 | Pass | | |
| 24.3 | H | QP | QP | 26.0 | 0 | 0 | 26.0 | 60 | 50 | -34.0 | Pass | | |
| 24.3 | H | A | A | 23.0 | 0 | 0 | 23.0 | 60 | 50 | -27.0 | Pass | | |
| 0.15 | N | QP | QP | 51.0 | 0 | 0 | 51.0 | 66 | 56 | -15.0 | Pass | | |
| 0.15 | N | A | A | 27.0 | 0 | 0 | 27.0 | 66 | 56 | -29.0 | Pass | | |
| 0.222 | N | QP | QP | 44.0 | 0 | 0 | 44.0 | 62.74 | 52.744 | -18.7 | Pass | | |
| 0.222 | N | A | A | 29.0 | 0 | 0 | 29.0 | 62.74 | 52.744 | -23.7 | Pass | | |
| 24.3 | N | QP | QP | 26.0 | 0 | 0 | 26.0 | 60 | 50 | -34.0 | Pass | | |
| 24.3 | N | A | A | 19.8 | 0 | 0 | 19.8 | 60 | 50 | -30.2 | Pass | | |
| RESULTS FOR STANDBY ARE EQUAL TO OR LESS THEN TX | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
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..\EMCShare\AUTOMATE\DATASHTS\CEP_Voltage Rev C.xl: Document Control #EMC DS EM COND VOLT

Photos – Powerline Conducted Emissions

Front



Side



Section 4. Occupied Bandwidth

| | |
|----------------------------------|-------------------------|
| NAME OF TEST: Occupied Bandwidth | PARA. NO.: 15.247(a)(2) |
| TESTED BY: David Light | DATE: 5/17/05 |

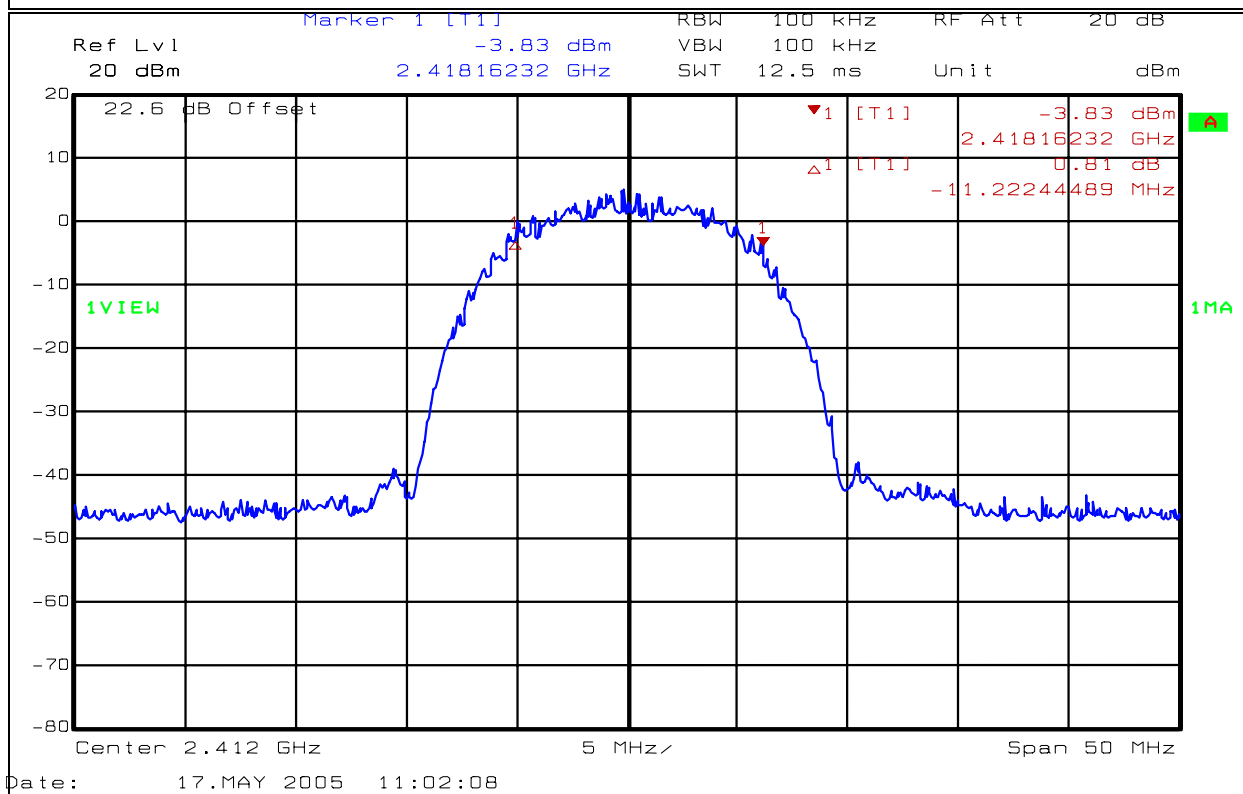
Test Results: Complies.

Measurement Data: See 6 dB BW plot

Measured 6 dB bandwidth: 10.2 MHz (802.11b)
16.6 MHz (802.11g)
Channel Separation: 5 MHz

Test Data – Occupied Bandwidth

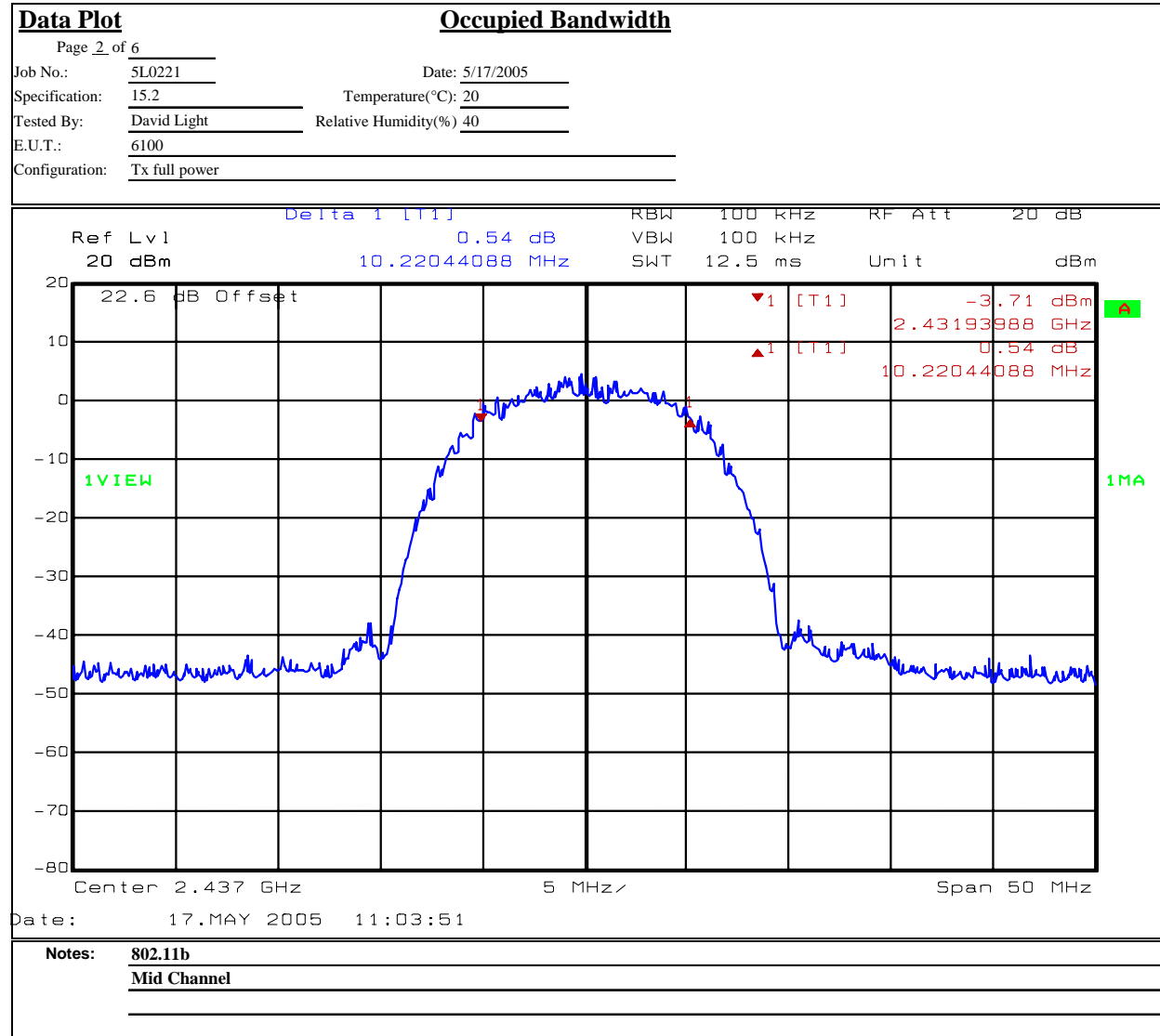
| <u>Data Plot</u> | | <u>Occupied Bandwidth</u> | | Complete |
|------------------------------------|--|----------------------------|--|--------------------|
| Page 1 of 6 | | | | X |
| Job No.: 5L0221 | | Date: 5/17/2005 | | Preliminary: _____ |
| Specification: 15.247 | | Temperature(°C): 20 | | |
| Tested By: David Light | | Relative Humidity(%): 40 | | |
| E.U.T.: 6100 | | | | |
| Configuration: Tx full power | | | | |
| Sample Number: 1 | | | | |
| Location: Lab 1 | | RBW: 100 kHz | | |
| Detector Type: Peak | | VBW: 100 kHz | | |
| <u>Test Equipment Used</u> | | | | |
| Antenna: _____ | | Directional Coupler: _____ | | |
| Pre-Amp: _____ | | Cable #1: 1973 | | |
| Filter: _____ | | Cable #2: _____ | | |
| Receiver: 1036 | | Cable #3: _____ | | |
| Attenuator #1: _____ | | Cable #4: _____ | | |
| Attenuator #2: 1472 | | Mixer: _____ | | |
| Additional equipment used: _____ | | | | |
| Measurement Uncertainty: +/-1.7 dB | | | | |



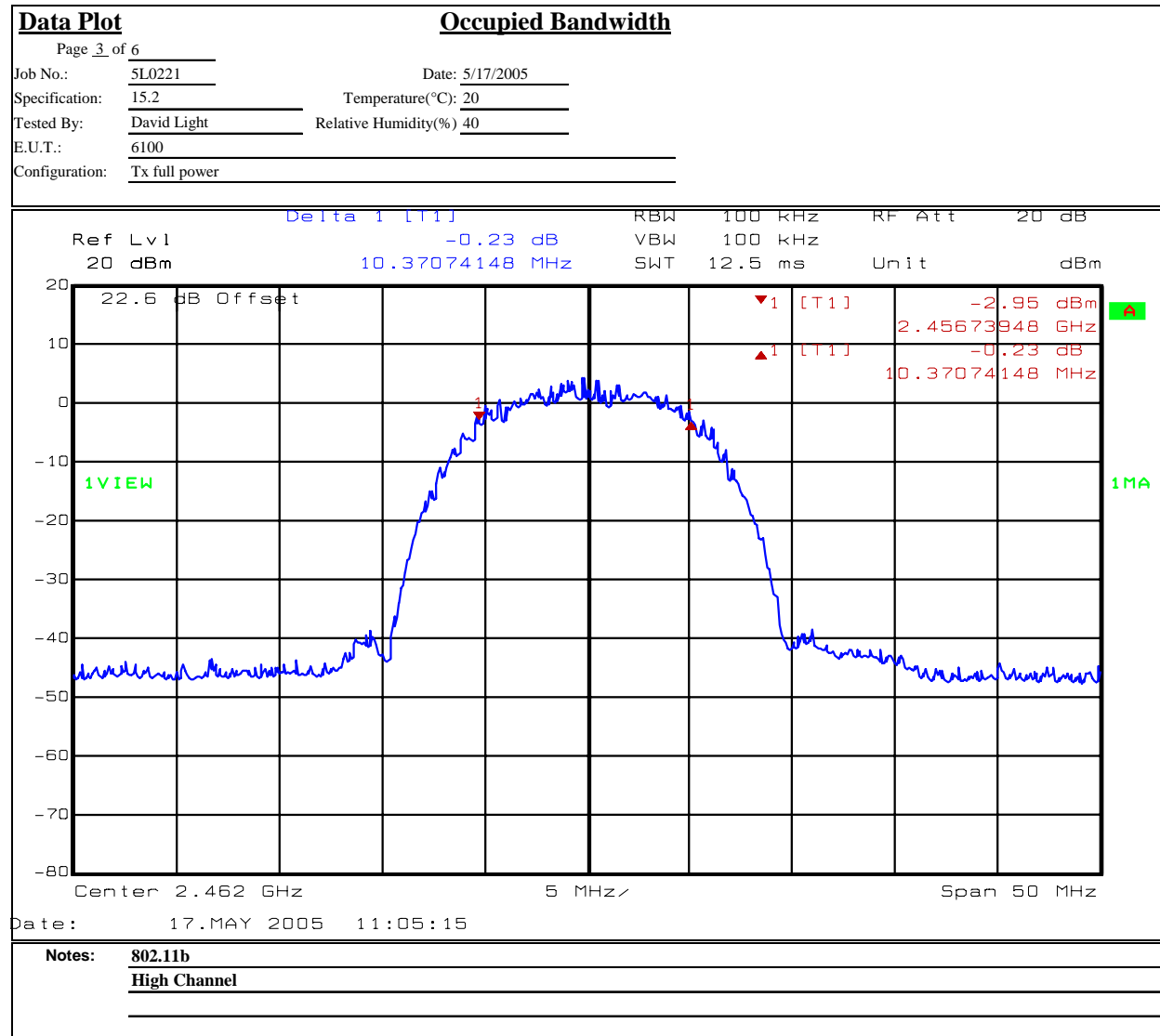
Date: 17.MAY 2005 11:02:08

Notes: 802.11b
 Low channel

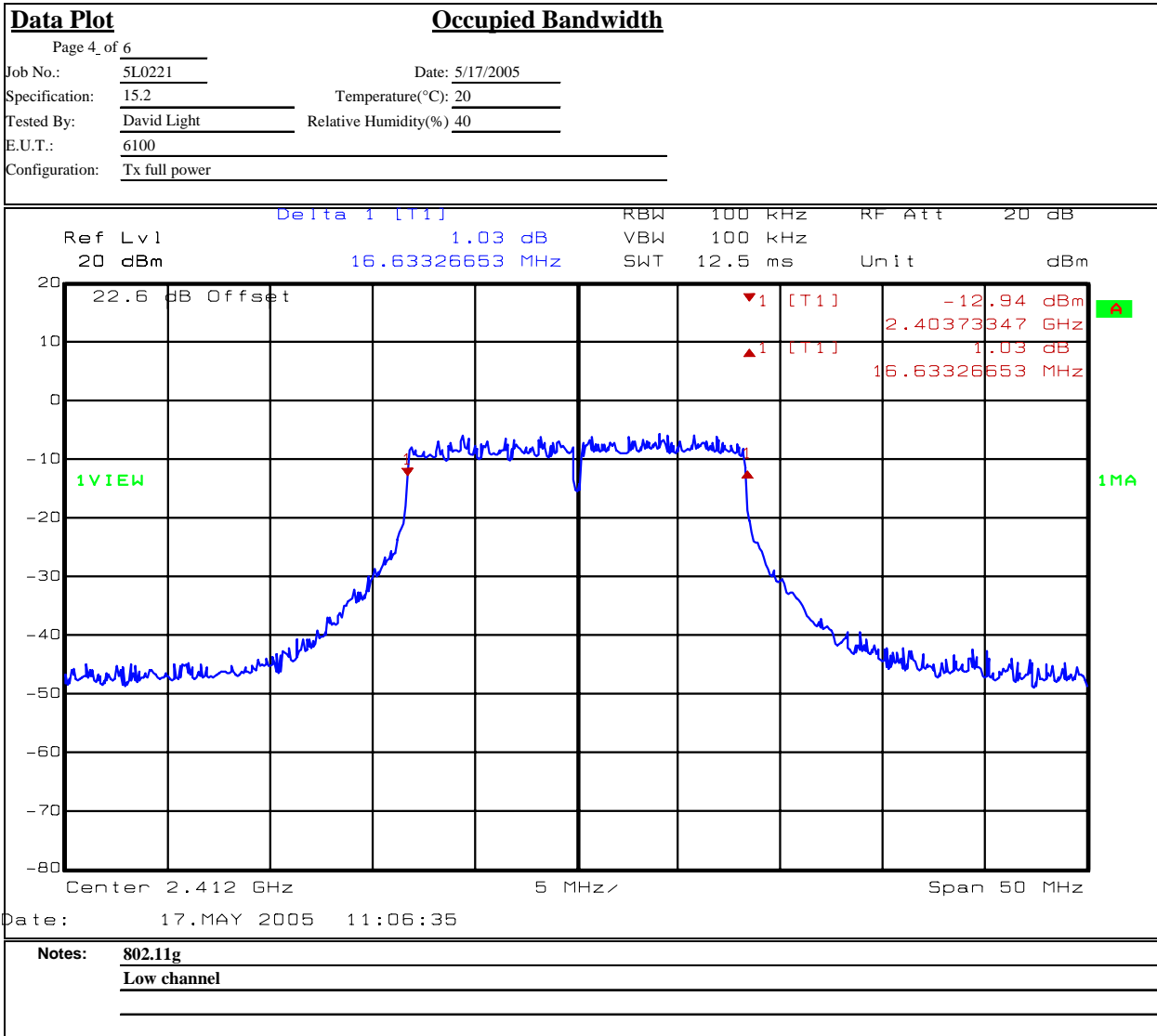
Test Data – Occupied Bandwidth



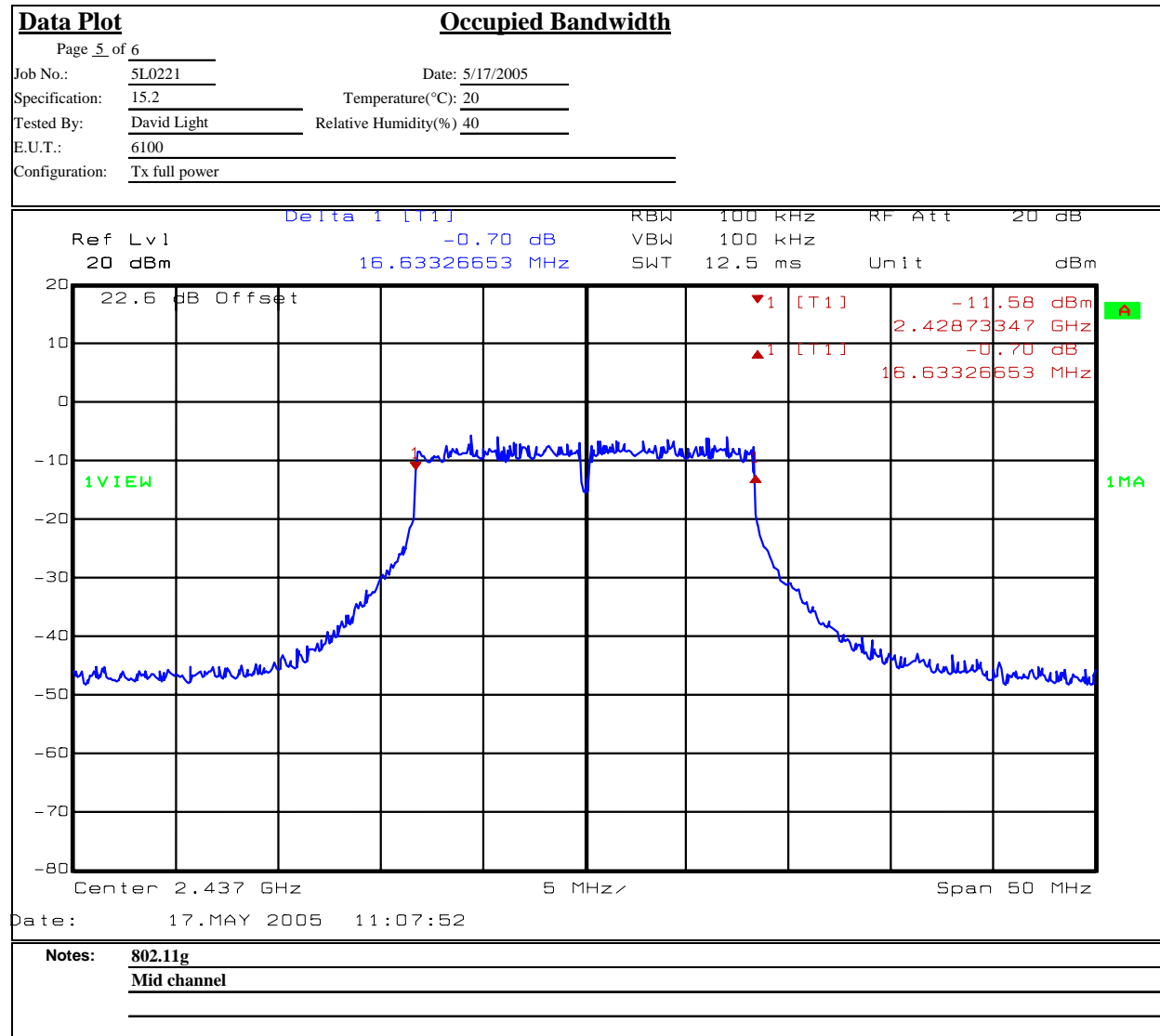
Test Data – Occupied Bandwidth



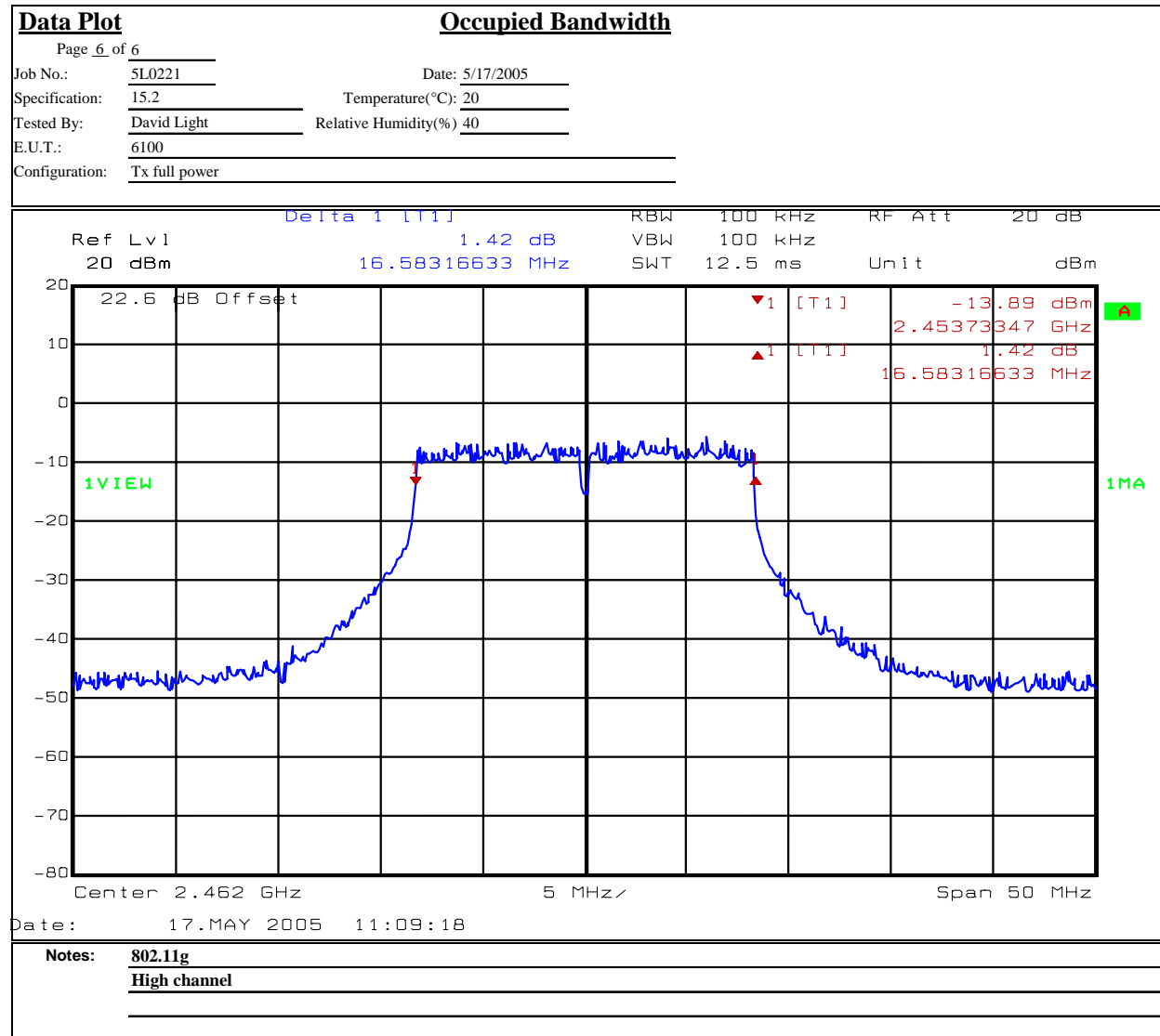
Test Data – Occupied Bandwidth



Test Data – Occupied Bandwidth



Test Data – Occupied Bandwidth



Section 5. Maximum Peak Output Power

| | |
|---|-------------------------|
| NAME OF TEST: Maximum Peak Output power | PARA. NO.: 15.247(b)(1) |
| TESTED BY: David Light | 5/17/05 |

Test Results: Complies.

Measurement Data: Refer to attached data

The measurement was repeated at +/- 15% of nominal supply voltage with no variation noted in rf power output.

802.11b
 2412 MHz – 16.67 dBm
 2437 MHz – 16.52 dBm
 2462 MHz – 16.52 dBm

802.11g
 2412 MHz – 14.91dBm
 2437 MHz – 14.69 dBm
 2462 MHz – 14.69 dBm

Test Equipment Used: 1973-1472-1029-1030

Test Conditions:

Temp.: 20°C
 RH: 40%

Section 6 Spurious Emissions at Antenna Terminals

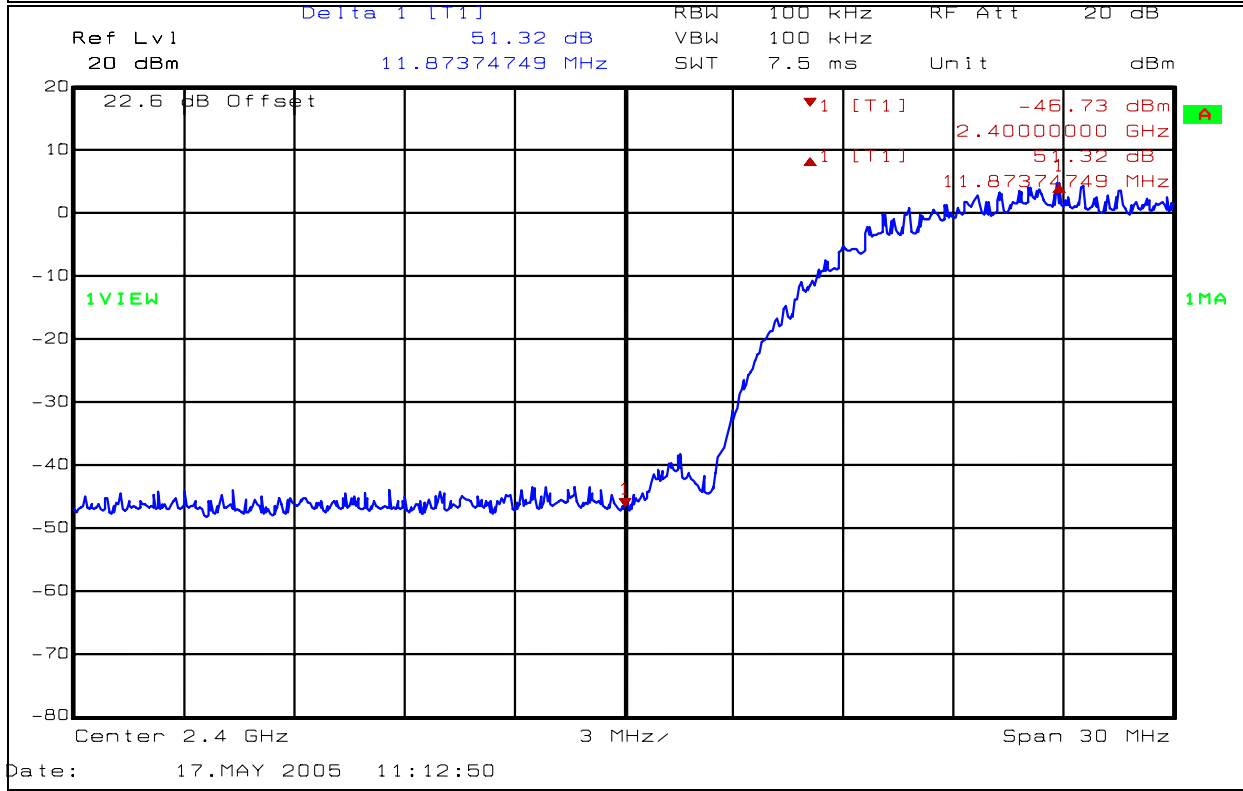
| | |
|---|-----------------------|
| NAME OF TEST: Spurious Emissions at Antenna Terminals | PARA. NO.: 15.247 (c) |
| TESTED BY: David Light | DATE: 5/17/05 |

Test Results: Complies.

Measurement Data: See attached plots.

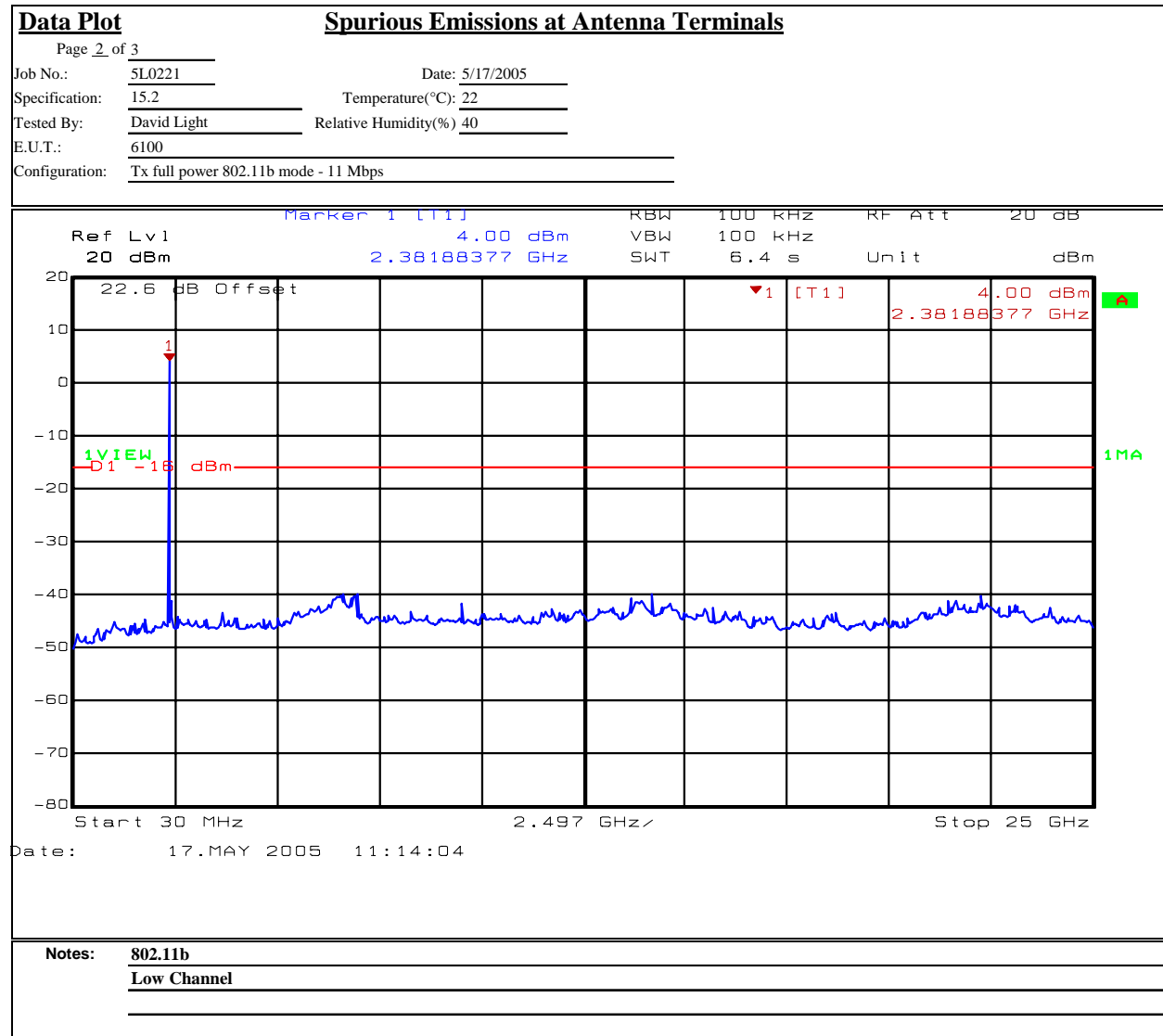
Test Data – Spurious Emissions at Antenna Terminals

| <u>Data Plot</u> | | <u>Spurious Emissions at Antenna Terminals</u> | |
|------------------------------------|---|--|--|
| Page 1 of 3 | | Complete <u>X</u> | |
| Job No.: 5L0221 | Date: 5/17/2005 | Preliminary: _____ | |
| Specification: 15.247 | Temperature(°C): 22 | | |
| Tested By: David Light | Relative Humidity(%): 40 | | |
| E.U.T.: 6100 | Configuration: Tx full power 802.11b mode - 11 Mbps | | |
| Sample Number: 1 | Location: Lab 1 | | |
| Detector Type: Peak | RBW: Refer to plots | VBW: Refer to plots | |
| <u>Test Equipment Used</u> | | | |
| Antenna: _____ | Directional Coupler: _____ | | |
| Pre-Amp: _____ | Cable #1: 1973 | | |
| Filter: _____ | Cable #2: _____ | | |
| Receiver: 1036 | Cable #3: _____ | | |
| Attenuator #1: 1472 | Cable #4: _____ | | |
| Attenuator #2: _____ | Mixer: _____ | | |
| Additional equipment used: _____ | | | |
| Measurement Uncertainty: +/-1.7 dB | | | |

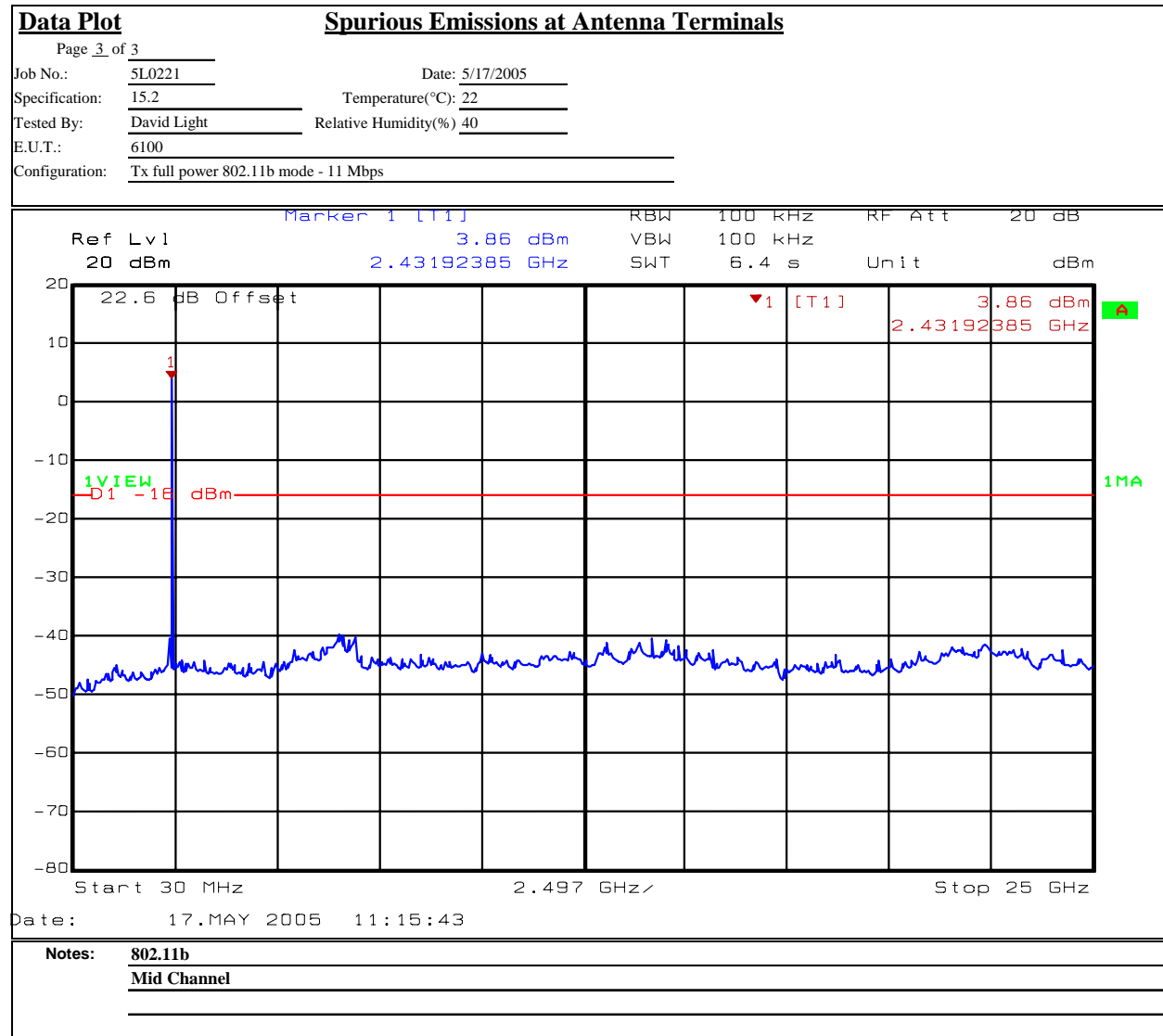


| |
|-----------------------|
| Notes: 802.11b |
| Low channel |
| |
| |

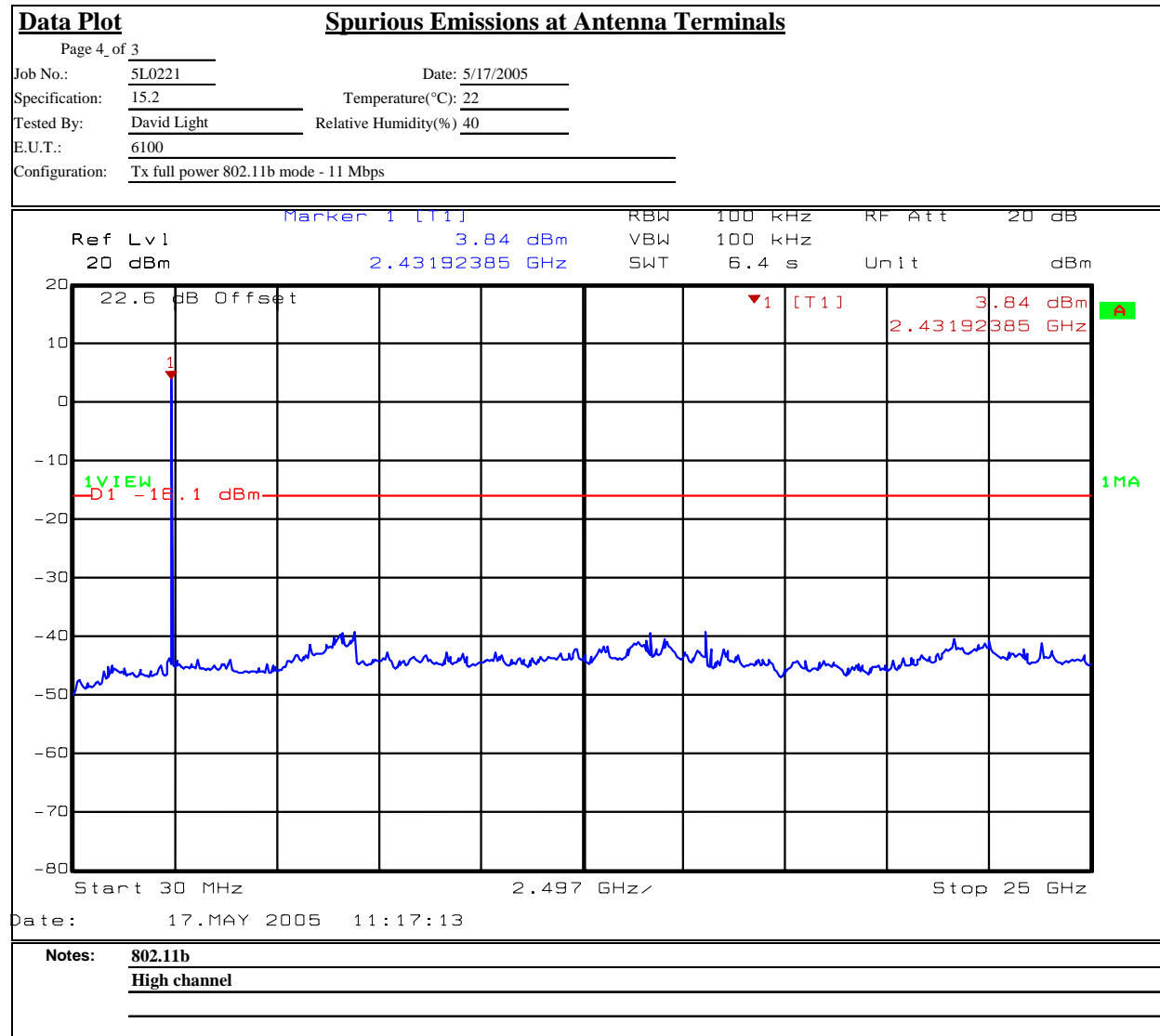
Test Data – Spurious Emissions at Antenna Terminals



Test Data – Spurious Emissions at Antenna Terminals

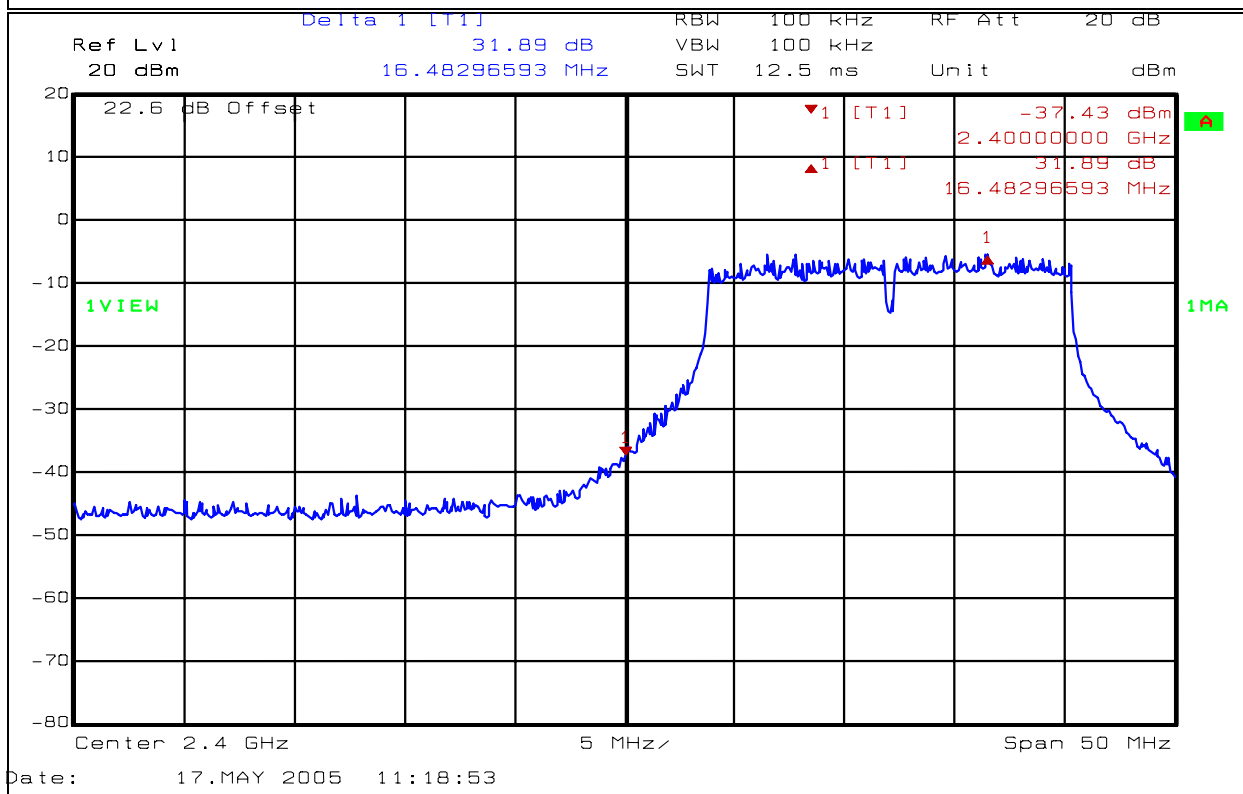


Test Data – Spurious Emissions at Antenna Terminals



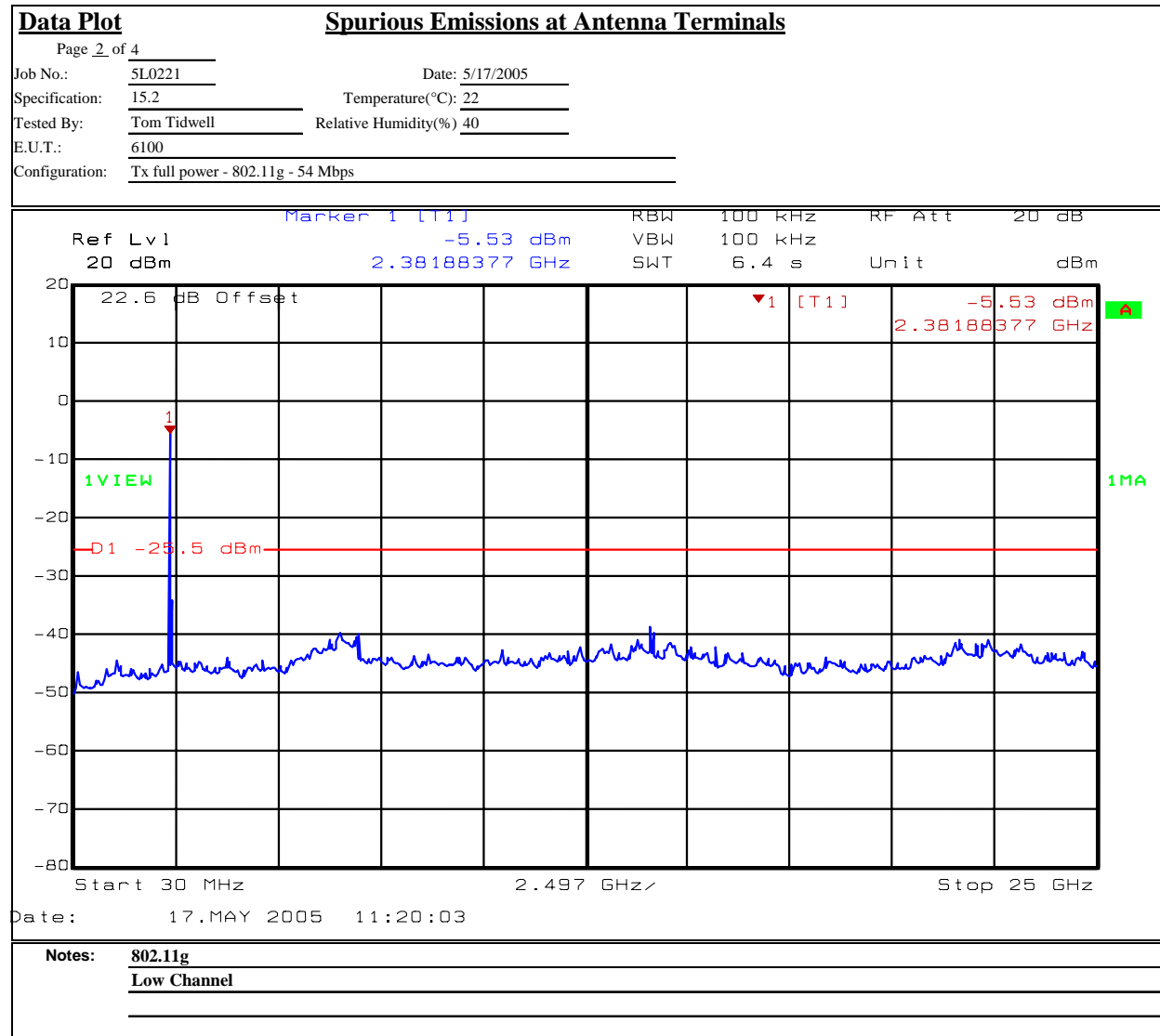
Test Data – Spurious Emissions at Antenna Terminals

| Data Plot | | Spurious Emissions at Antenna Terminals | |
|--|--------------------------|---|----------|
| Page 1 of 4 | | Complete | <u>X</u> |
| Job No.: 5L0221 | Date: 5/17/2005 | Preliminary: | |
| Specification: 15.247 | Temperature(°C): 22 | | |
| Tested By: Tom Tidwell | Relative Humidity(%): 40 | | |
| E.U.T.: 6100 | | | |
| Configuration: Tx full power - 802.11g - 54 Mbps | | | |
| Sample Number: 1 | | | |
| Location: Lab 1 | RBW: 100 kHz | | |
| Detector Type: Peak | VBW: 100 kHz | | |
| Test Equipment Used | | | |
| Antenna: | Directional Coupler: | | |
| Pre-Amp: | Cable #1: | 1973 | |
| Filter: | Cable #2: | | |
| Receiver: 1036 | Cable #3: | | |
| Attenuator #1: 1472 | Cable #4: | | |
| Attenuator #2: | Mixer: | | |
| Additional equipment used: | | | |
| Measurement Uncertainty: +/-1.7 dB | | | |



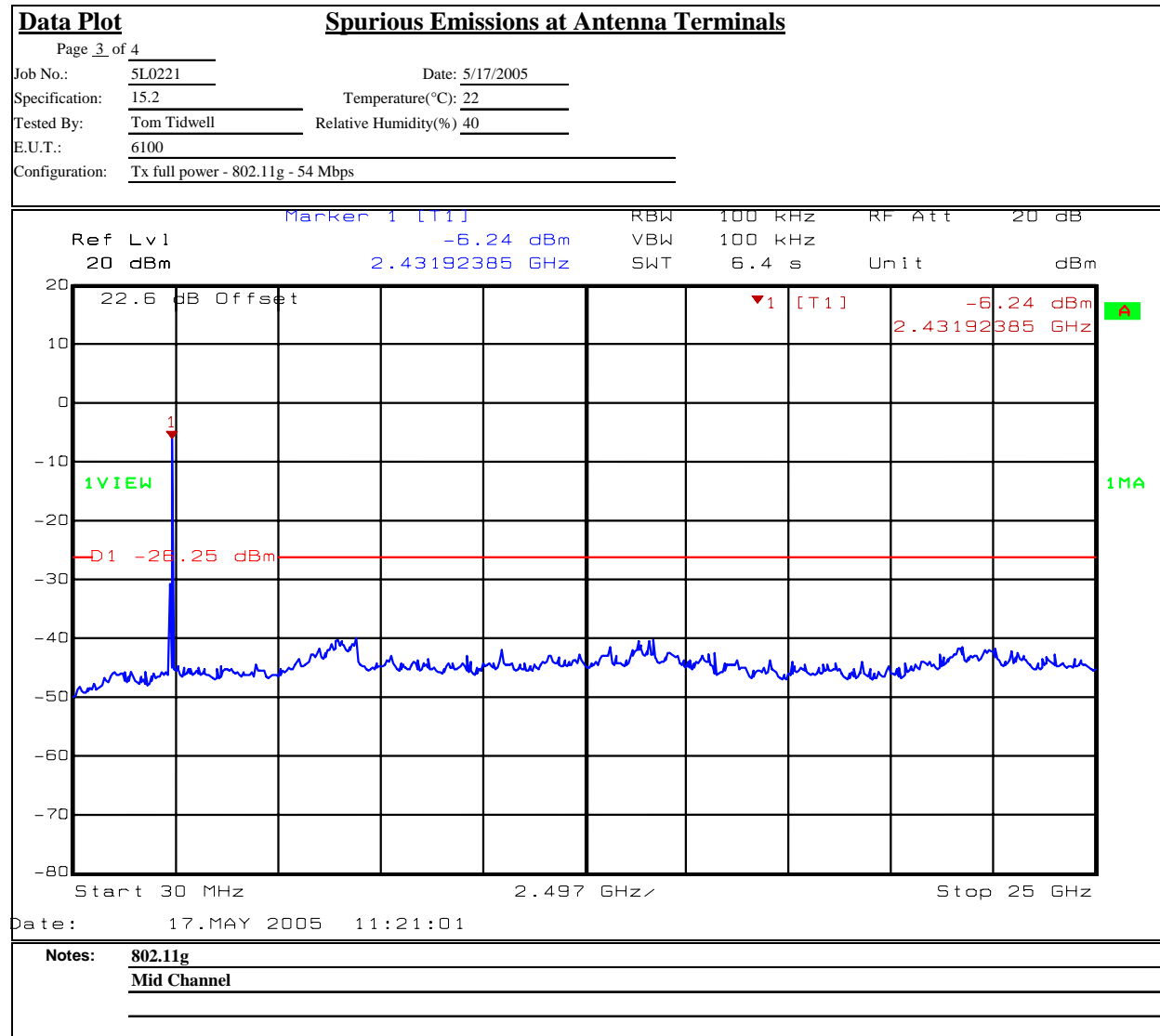
| | |
|--------|-------------|
| Notes: | 802.11g |
| | Low channel |
| | |
| | |

Test Data – Spurious Emissions at Antenna Terminals



Notes: 802.11g
Low Channel

Test Data – Spurious Emissions at Antenna Terminals

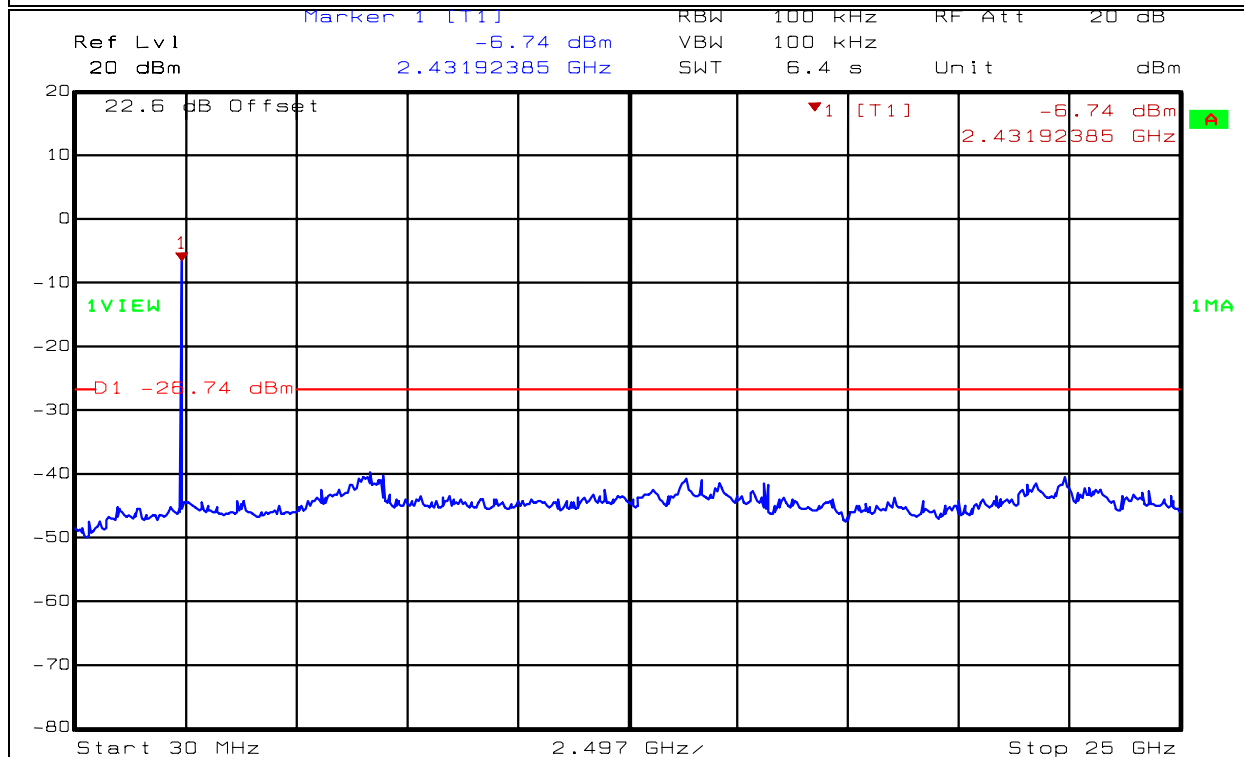


Test Data – Spurious Emissions at Antenna Terminals

Data Plots at Antenna Terminals

Page 4 of 4

Job No.: 5L0221 Date: 5/17/2005
 Specification: 15.2 Temperature(°C): 22
 Tested By: Tom Tidwell Relative Humidity(%) 40
 E.U.T.: 6100
 Configuration: Tx full power - 802.11g - 54 Mbps



Date: 17.MAY 2005 11:22:02

Notes: 802.11g
 right
 channel

Section 7. Radiated Emissions

| | |
|----------------------------------|-----------------------|
| NAME OF TEST: Radiated Emissions | PARA. NO.: 15.247 (c) |
| TESTED BY: Kevin Rose | DATE: 5/18/05 |

Test Results: Complies.

Measurement Data: See attached table.

Measurement was made from 30 MHz to 25 GHz.

Radiated Emissions



Nemko Dallas, Inc.

Dallas Headquarters:

802 N. Kealy
 Lewisville, TX 75057
 Tel: (972) 436-9600
 Fax: (972) 436-2667

| <u>Radiated Emissions</u> | |
|--------------------------------------|----------------------------------|
| Page <u>1</u> of <u>1</u> | |
| Job No.: 5L0221R | Date: 5/18/2005 |
| Specification: 15.247/15.205 | Temperature(°C): <u>21</u> |
| Tested By: <u>Kevin Rose</u> | Relative Humidity(%) <u>46</u> |
| E.U.T.: <u>802.11b/g Transmitter</u> | |
| Configuration: <u>Tx in host PC</u> | |
| Sample Number: <u>1</u> | |
| Location: <u>AC 3</u> | RBW: <u>1 MHz</u> |
| Detector Type: <u>Peak</u> | VBW: <u>1 MHz</u> |
| <u>Test Equipment Used</u> | |
| Antenna: <u>1304</u> | Directional Coupler: <u>#N/A</u> |
| Pre-Amp: <u>1016</u> | Cable #1: <u>1484</u> |
| Filter: <u>#N/A</u> | Cable #2: <u>1485</u> |
| Receiver: <u>1464</u> | Cable #3: <u>#N/A</u> |
| Attenuator #1: <u>#N/A</u> | Cable #4: <u>#N/A</u> |
| Attenuator #2: <u>#N/A</u> | Mixer: <u>#N/A</u> |
| Measurement Uncertainty: +/- 3.6 dB | |

| Frequency (GHz) | Meter Reading (dBuV) | Antenna Factor (dB) | Cable Loss (dB) | Pre-Amp Gain (dB) | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | Average Limit (dBuV/m) | Detector / Polarity |
|-----------------|----------------------|---------------------|-----------------|-------------------|----------------------------|---------------------|------------------------|---------------------|
| | | | | | | | | 802.11b/Channel 11 |
| 2.484 | 49.3 | 28.0 | 3.1 | 32.8 | 47.6 | 74 | 54 | Peak/Horizontal |
| 2.484 | 48.3 | 28.0 | 3.1 | 32.8 | 46.6 | 74 | 54 | Peak/Vertical |
| | | | | | | | | 802.11g/Channel 11 |
| 2.484 | 53.2 | 28.0 | 3.1 | 32.8 | 51.5 | 74 | 54 | Peak/Horizontal |
| 2.484 | 53.5 | 28.0 | 3.1 | 32.8 | 51.8 | 74 | 54 | Peak/Vertical |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Radiated Photographs



Section 8. Peak Power Spectral Density

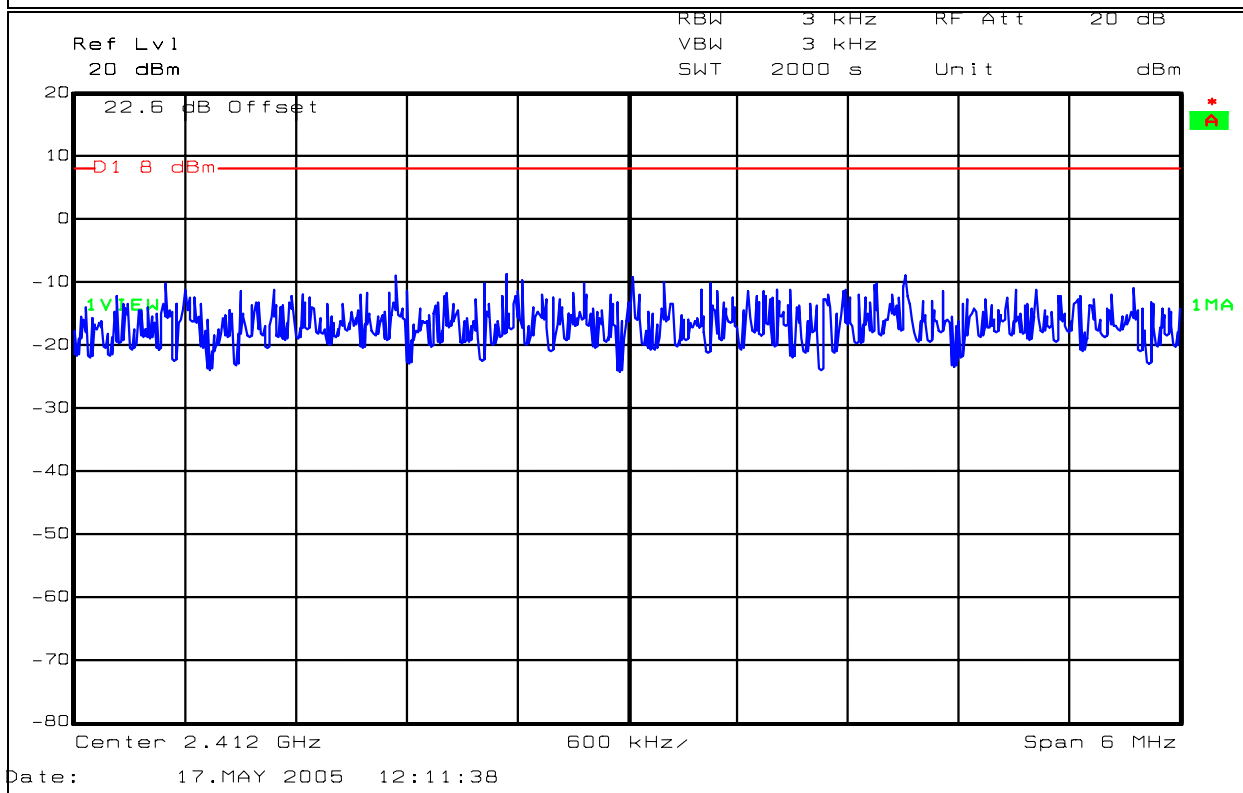
| | |
|---|----------------------|
| NAME OF TEST: Peak Power Spectral Density | PARA. NO.: 15.247(d) |
| TESTED BY: David Light | DATE: 5/17/05 |

Test Results: Complies.

Measurement Data: See attached data.

Peak Power Spectral Density

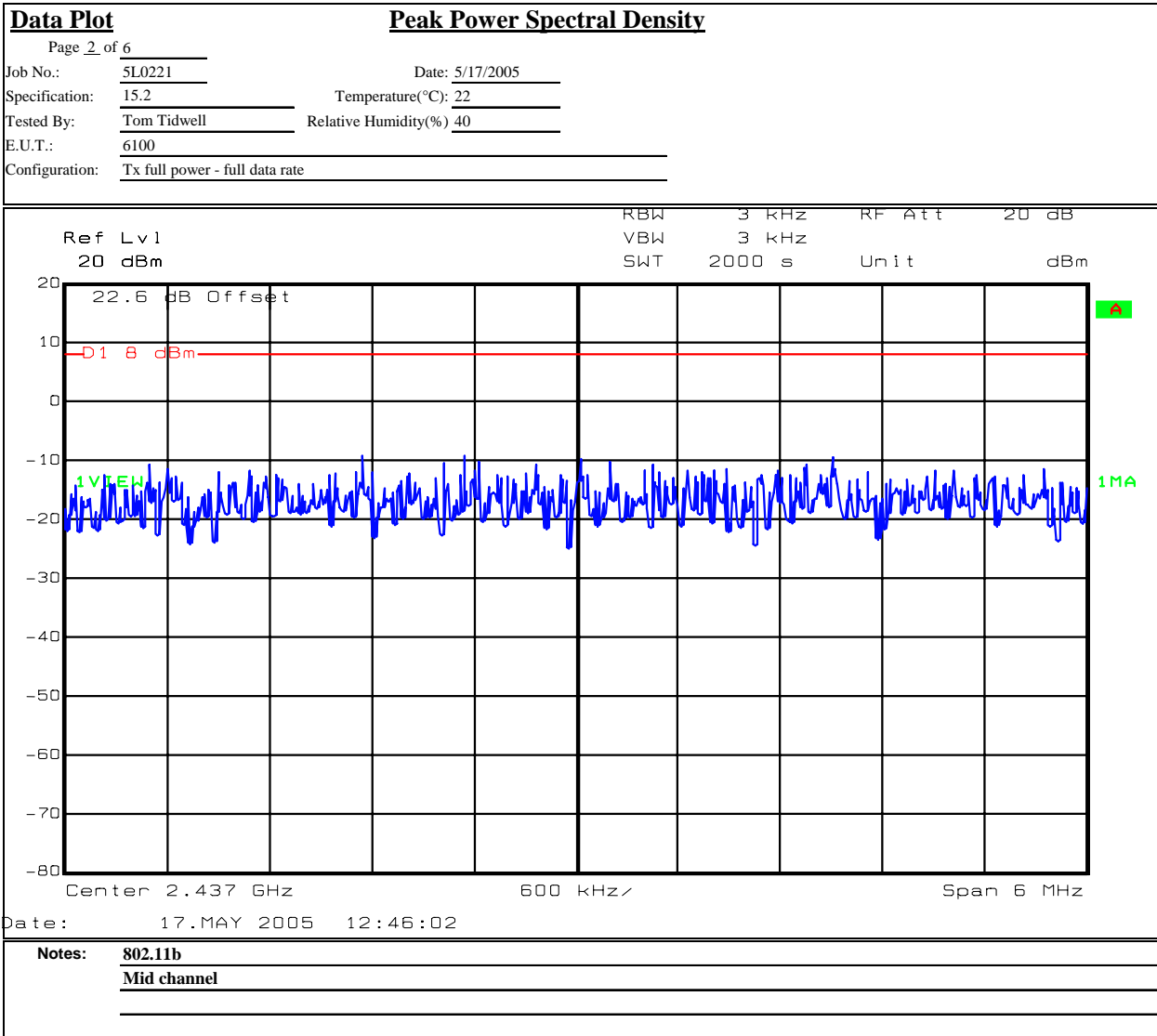
| <u>Data Plot</u> | | <u>Peak Power Spectral Density</u> | | Complete |
|---|--|------------------------------------|--|--------------------|
| Page 1 of 6 | | | | X |
| Job No.: 5L0221 | | Date: 5/17/2005 | | Preliminary: _____ |
| Specification: 15.247 | | Temperature(°C): 22 | | |
| Tested By: Tom Tidwell | | Relative Humidity(%): 40 | | |
| E.U.T.: 6100 | | | | |
| Configuration: Tx full power - full data rate | | | | |
| Sample Number: 1 | | | | |
| Location: Lab 1 | | RBW: 3 kHz | | |
| Detector Type: Peak | | VBW: 3 kHz | | |
| <u>Test Equipment Used</u> | | | | |
| Antenna: _____ | | Directional Coupler: _____ | | |
| Pre-Amp: _____ | | Cable #1: 1973 | | |
| Filter: _____ | | Cable #2: _____ | | |
| Receiver: 1036 | | Cable #3: _____ | | |
| Attenuator #1: 1472 | | Cable #4: _____ | | |
| Attenuator #2: _____ | | Mixer: _____ | | |
| Additional equipment used: _____ | | | | |
| Measurement Uncertainty: +/-1.7 dB | | | | |



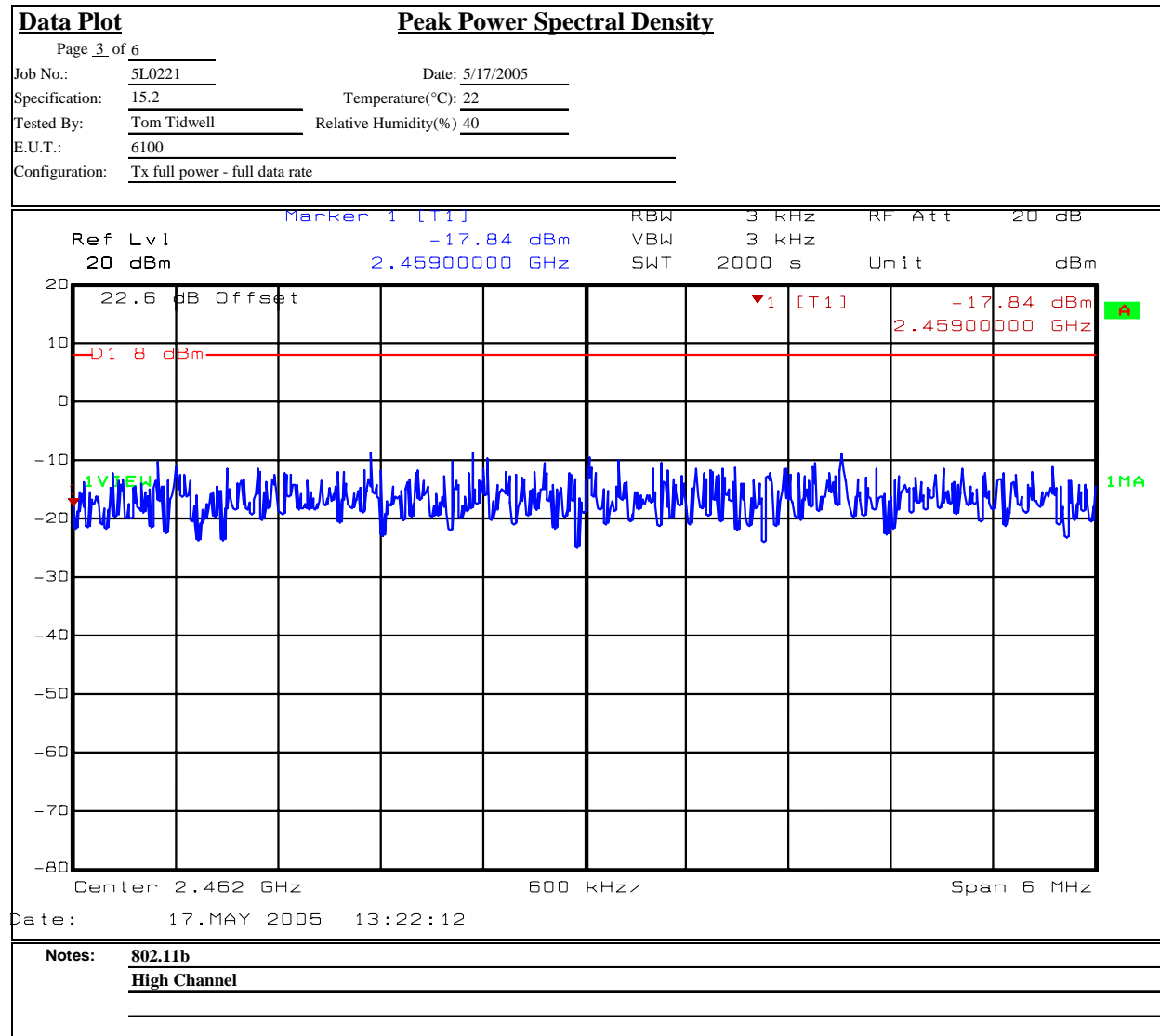
Date: 17.MAY 2005 12:11:38

Notes: 802.11a
 Low channel

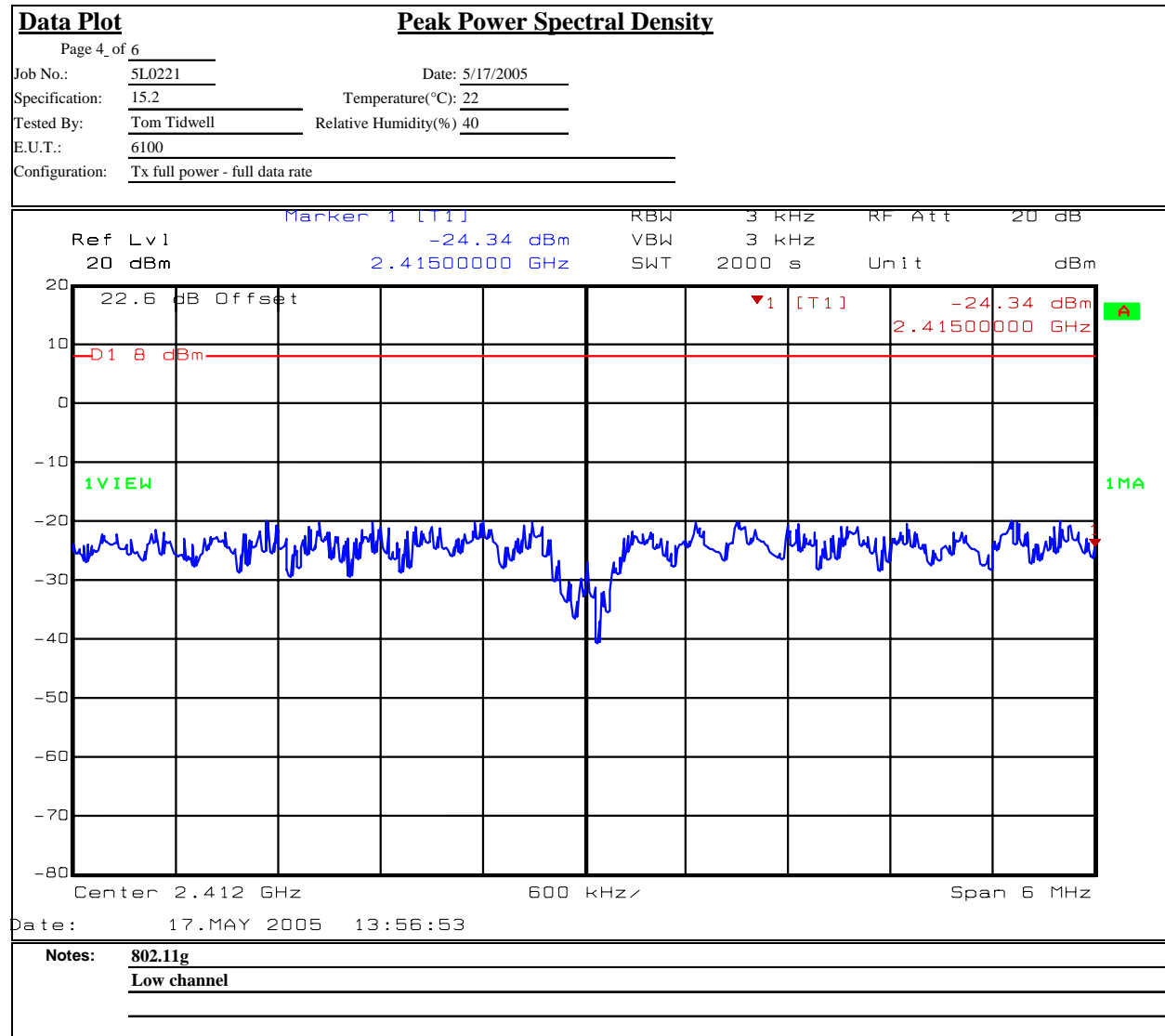
Peak Power Spectral Density



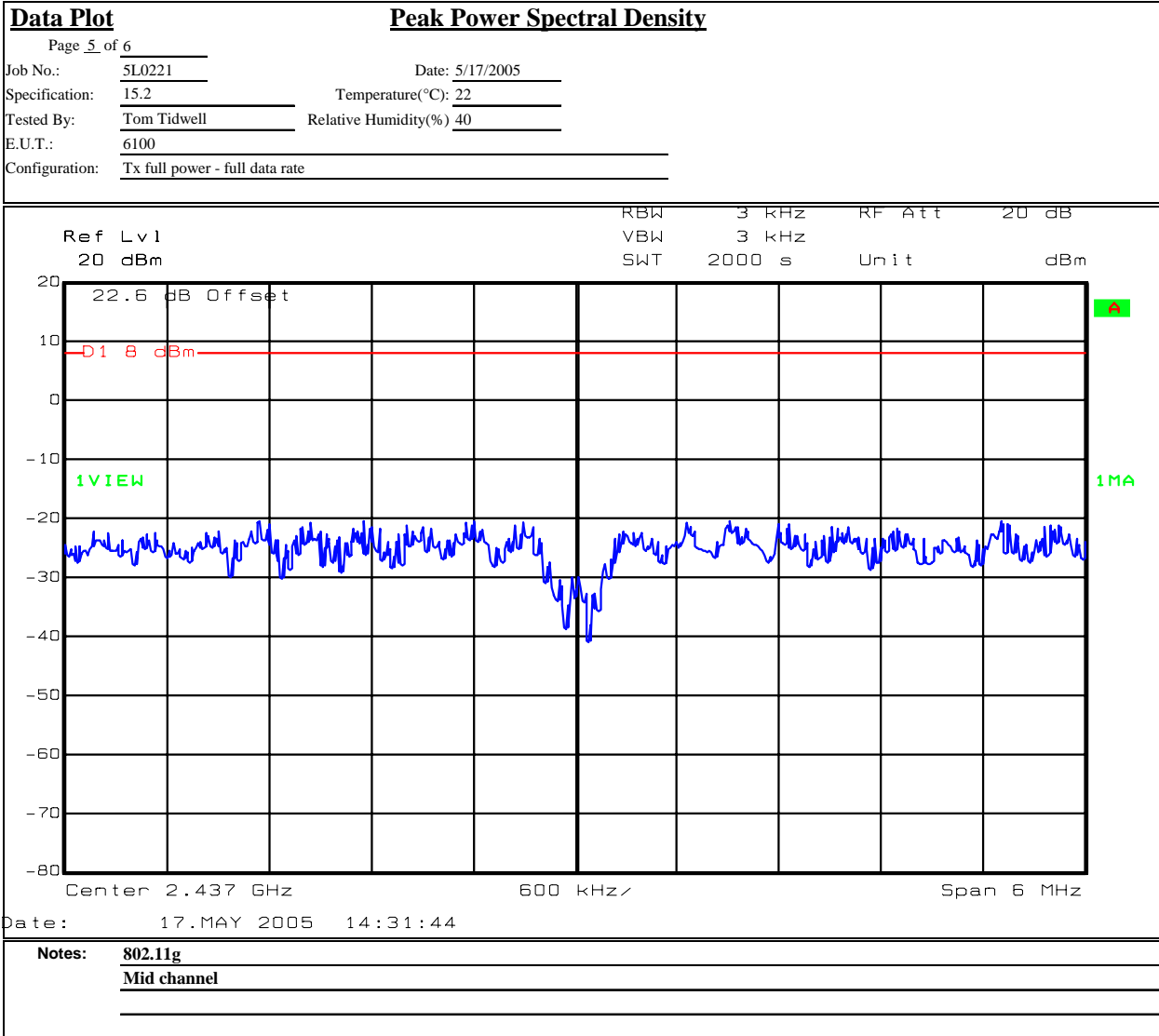
Peak Power Spectral Density



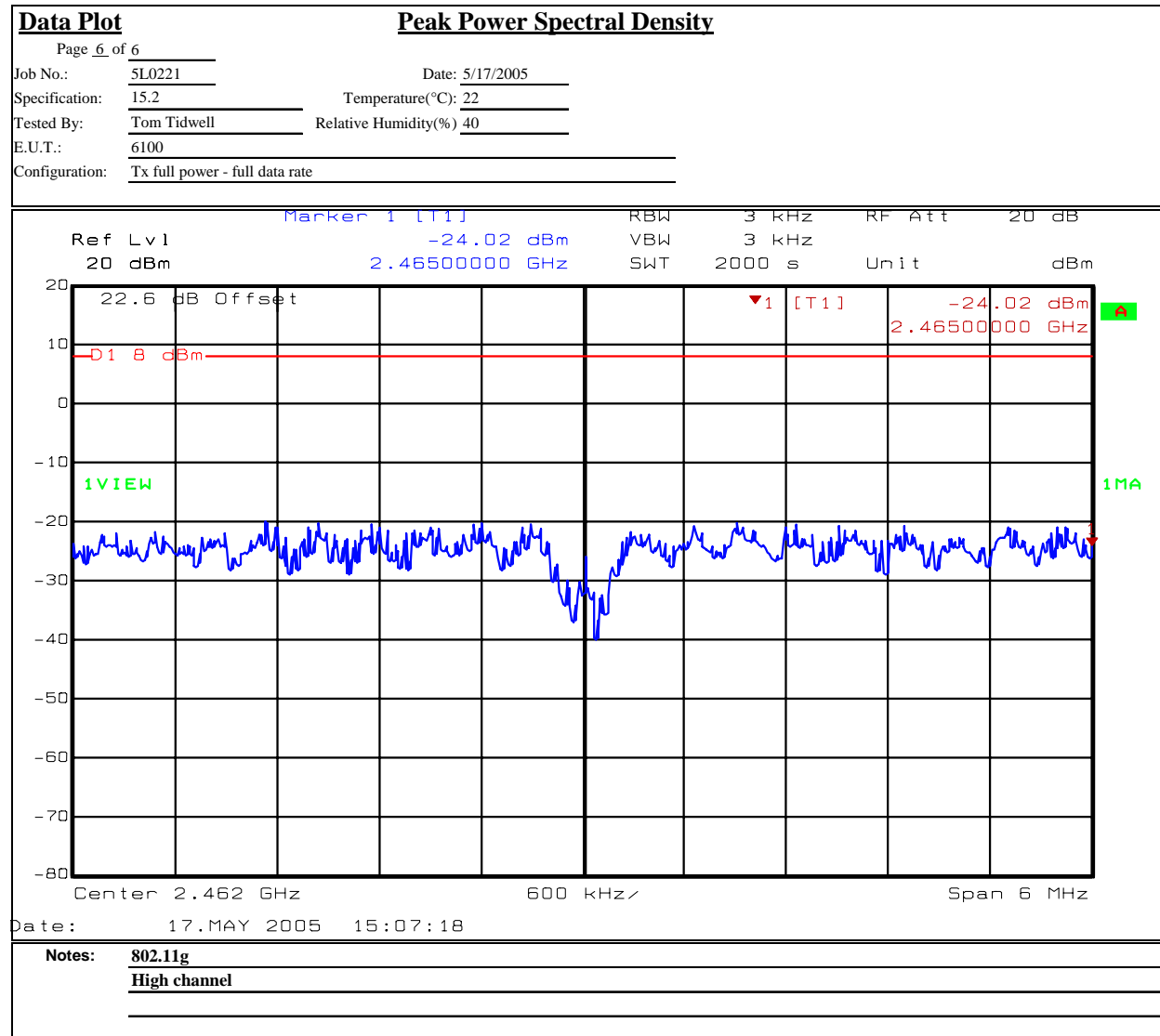
Peak Power Spectral Density



Peak Power Spectral Density



Peak Power Spectral Density



Section 9. Test Equipment List

| Nemko ID | Description | Manufacturer Model Number | Serial Number | Calibration Date | Calibration Due |
|----------|---------------------------|----------------------------|---------------|------------------|-----------------|
| 545 | LISN | Schwarz Beck 8120 | 8120350 | 09/17/04 | 09/17/05 |
| 1555 | Filter high pass 5KHz | Solar Electronics 7930-5.0 | 933125 | 04/20/05 | 04/20/06 |
| 1998 | CABLE, 1m | KTL RG223 | N/A | 06/09/04 | 06/09/05 |
| 1019 | CABLE, 9.5m | KTL RG223 | N/A | 07/27/04 | 07/27/05 |
| 1659 | Spectrum Analyzer | Rhode & Schwarz FSP | 973353 | 10/02/03 | 10/02/05 |
| 1036 | SPECTRUM ANALYZER | ROHDE & SCHWARZ FSEK30 | 830844/006 | 03/22/04 | 03/23/06 |
| 1472 | 20db Attenuator DC 18 Ghz | Omni Spectra 20600-20db | NONE | CBU | N/A |
| 1973 | CABLE, 1m | KTL 0 | N/A | 08/02/04 | 08/02/05 |
| 1304 | HORN ANTENNA | ELECTRO METRICS RGA-60 | 6151 | 09/22/03 | 09/22/05 |
| 1016 | Pre-Amp | HEWLETT PACKARD 8449A | 2749A00159 | 11/12/04 | 11/12/05 |
| 1464 | Spectrum analyzer | Hewlett Packard 8563E | 3551A04428 | 01/14/05 | 01/15/07 |
| 1484 | Cable 2.0-18.0 Ghz | Storm PR90-010-072 | N/A | 08/26/04 | 08/26/05 |
| 1485 | Cable 2.0-18.0 Ghz | Storm PR90-010-216 | N/A | 08/02/04 | 08/02/05 |
| 1029 | PEAK POWER METER | HP 8900D | 3303U0012 | 09/14/05 | 09/14/06 |
| 1030 | PEAK POWER SENSOR | HP 84811A | 2539A03573 | 09/15/05 | 09/15/06 |

ANNEX A - TEST DETAILS

| | |
|---|----------------------|
| NAME OF TEST: Powerline Conducted Emissions | PARA. NO.: 15.207(a) |
|---|----------------------|

Minimum Standard: §15.207 Conducted limits.

(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 mH/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.

| Frequency of Conducted Emission (MHz) | Limit (dBmV) | |
|---------------------------------------|--------------|-----------|
| | 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.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 mV within the frequency band 535-1705 kHz, as measured using a 50 mH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as provided in §15.205 and §§15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

| | |
|----------------------------------|-------------------------|
| NAME OF TEST: Occupied Bandwidth | PARA. NO.: 15.247(a)(2) |
|----------------------------------|-------------------------|

Minimum Standard: The minimum 6 dB bandwidth shall be at least 500 kHz

| | |
|---|-------------------------|
| NAME OF TEST: Maximum Peak Output Power | PARA. NO.: 15.247(b)(1) |
|---|-------------------------|

Minimum Standard: The maximum peak output power shall not exceed 1 watt.

If transmitting antennas of directional gain greater 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.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Direct Measurement Method For Detachable Antennas:

If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load. The dBi gain of the antenna(s) employed shall be reported.

Substitution Antenna Method for Integral Antennas:

The peak field strength of the carrier is measured in a worst-case configuration with a RBW > 5 times the occupied bandwidth of the transmitted waveform. For cases where the RBW of the test instrument is not sufficient, the power is measured using a peak power meter instead of the spectrum analyzer.

The RBW of the spectrum analyzer shall be set to a value greater than the measured 6 dB occupied bandwidth of the E.U.T.

Number of channels tested:

| Tuning range | Number of channels tested | Channel location in band |
|------------------|---------------------------|--------------------------|
| 1 MHz or less | 1 | middle |
| 1 to 10 MHz | 2 | top and bottom |
| more than 10 MHz | 3 | top, middle, bottom |

| | |
|----------------------------------|-------------------------|
| NAME OF TEST: Channel Separation | PARA. NO.: 15.247(a)(1) |
|----------------------------------|-------------------------|

Minimum Standard:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

| | |
|--|-------------------------|
| NAME OF TEST: Pseudorandom Hopping Algorithm | PARA. NO.: 15.247(a)(1) |
|--|-------------------------|

Minimum Standard:

The system shall hop to channel frequencies that are selected from a pseudo-randomly ordered list of hopping frequencies. Each frequency must be used equally on average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their transmitters and shall shift frequencies in synchronization with the transmitted signals.

| | |
|---------------------------------|-----------------------------|
| NAME OF TEST: Time of Occupancy | PARA. NO.: 15.247(a)(1)(ii) |
|---------------------------------|-----------------------------|

Minimum Standard:

| Frequency Band (MHz) | 20 dB Bandwidth | No. of Hopping Channels | Average Time of Occupancy |
|----------------------|-----------------|-------------------------|---------------------------|
| 902 - 928 | <250 kHz | 50 | =<0.4 sec. in 20 sec. |
| 902 – 928 | =>250 kHz | 25 | =<0.4 sec. in 10 sec. |
| 2400 – 2483.5 | ----- | 75 | =<0.4 sec. in 30 sec. |
| 5725 – 5850 | ----- | 75 | =<0.4 sec. in 30 sec. |

Method Of Measurement:

The spectrum analyzer is set as follows:

- RBW: 1 MHz
- VBW: = RBW
- Span: 0 Hz
- LOG dB/div.: 10 dB
- Sweep: Sufficient to see one hop time sequence.
- Trigger: Video

The occupancy time of one hop is measured as above. The average time of occupancy is calculated over the appropriate period of time from above table (10, 20, or 30 seconds).

Avg. time of occupancy = (period from table/duration of one hop)/no. of channels multiplied by the duration of one hop.

For instance:

If a 2.4 GHz system has a measured hop duration time of 1 msec. and uses 75 channels, then the average time of occupancy would be:

$$(30 \text{ sec.}/.001 \text{ sec.})/75 \text{ chan.} = 400 \times 1 \text{ msec.} = 400 \text{ msec. or } 0.4 \text{ sec. in } 30 \text{ sec.}$$

| | |
|----------------------------------|-------------------------|
| NAME OF TEST: Occupied Bandwidth | PARA. NO.: 15.247(a)(2) |
|----------------------------------|-------------------------|

Minimum Standard:

| Frequency Band (MHz) | Maximum 20 dB Bandwidth |
|----------------------|-------------------------|
| 902 - 928 | 500 kHz |
| 2400 – 2483.5 | 1 MHz |
| 5725 – 5850 | 1 MHz |

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW: At least 1% of span/div.

VBW: >RBW

Span: Sufficient to display 20 dB bandwidth

LOG dB/div.: 10 dB

Sweep: Auto

Number of channels tested:

| Tuning range | Number of channels tested | Channel location in band |
|------------------|---------------------------|--------------------------|
| 1 MHz or less | 1 | middle |
| 1 to 10 MHz | 2 | top and bottom |
| more than 10 MHz | 3 | top, middle, bottom |

| | |
|---------------------------|-------------------------|
| NAME OF TEST: RF Exposure | PARA. NO.: 15.247(b)(4) |
|---------------------------|-------------------------|

Minimum Standard:

Systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines stipulated in 1.1307(b)(1) of CFR 47.

| | |
|---|----------------------|
| NAME OF TEST: Spurious Emissions(conducted) | PARA. NO.: 15.247(c) |
|---|----------------------|

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

| Frequency (MHz) | Field Strength ($\mu\text{V/m}$ @ 3m) | Field Strength (dB @ 3m) |
|-----------------|--|--------------------------|
| 30 - 88 | 100 | 40.0 |
| 88 - 216 | 150 | 43.5 |
| 216 - 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

THE SPECTRUM IS SEARCHED TO THE 10th HARMONIC OF THE HIGHEST FREQUENCY GENERATED IN THE EUT.

Method Of Measurement:

30 MHz - 10th harmonic plot

RBW: 100 kHz

VBW: 300 kHz

Sweep: Auto

Display line: -20 dBc

Lower Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 902 MHz, 2400 MHz, or 5725 MHz

Marker: Peak of fundamental emission

Marker Δ : Peak of highest spurious level below center frequency.

Upper Band Edge

RBW: At least 1% of span/div.

VBW: >RBW

Span: As necessary to display any spurious at band edge.

Sweep: Auto

Center Frequency: 928 MHz, 2483.5 MHz, or 5850 MHz

Marker: Peak of fundamental emission

Marker Δ : Peak of highest spurious level above center frequency.

Number of channels tested:

| Tuning range | Number of channels tested | Channel location in band |
|------------------|---------------------------|--------------------------|
| 1 MHz or less | 1 | middle |
| 1 to 10 MHz | 2 | top and bottom |
| more than 10 MHz | 3 | top, middle, bottom |

| | |
|---|----------------------|
| NAME OF TEST: Radiated Spurious Emissions | PARA. NO.: 15.247(c) |
|---|----------------------|

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

| Frequency (MHz) | Field Strength ($\mu\text{V/m @ 3m}$) | Field Strength (dB @ 3m) |
|-----------------|---|--------------------------|
| 30 - 88 | 100 | 40.0 |
| 88 - 216 | 150 | 43.5 |
| 216 - 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

15.205 Restricted Bands

| MHz | MHz | MHz | GHz |
|-------------------|---------------------|---------------|-------------|
| 0.09-0.11 | 16.42-16.423 | 399.9-410 | 4.5-5.25 |
| 0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.125-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2655-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | Above 38.6 |
| 13.36-13.41 | 1718 | | |

Number of channels tested:

| Tuning range | Number of channels tested | Channel location in band |
|------------------|---------------------------|--------------------------|
| 1 MHz or less | 1 | middle |
| 1 to 10 MHz | 2 | top and bottom |
| more than 10 MHz | 3 | top, middle, bottom |

| | |
|---|----------------------|
| NAME OF TEST: Transmitter Power Density | PARA. NO.: 15.247(d) |
|---|----------------------|

Minimum Standard: The transmitted power density averaged over any 1 second interval shall not be greater than +8 dBm in any 3 kHz bandwidth.

Method Of Measurement: The spectrum analyzer is set as follows:

- RBW: 3 kHz
- VBW: >3 kHz
- Span: => measured 6 dB bandwidth
- Sweep: Span(kHz)/3 (i.e. for a span of 1.5 MHz the sweep rate is 1500/3 = 500 sec.
- LOG dB/div.: 2 dB

Note: For devices with spectrum line spacing \leq 3 kHz, the RBW of the analyzer is reduced until the spectral lines are resolved. The measurement data is normalized to 3 kHz by summing the power of all the individual spectral lines within a 3 kHz band in linear power units.

For Devices With Integral Antenna:

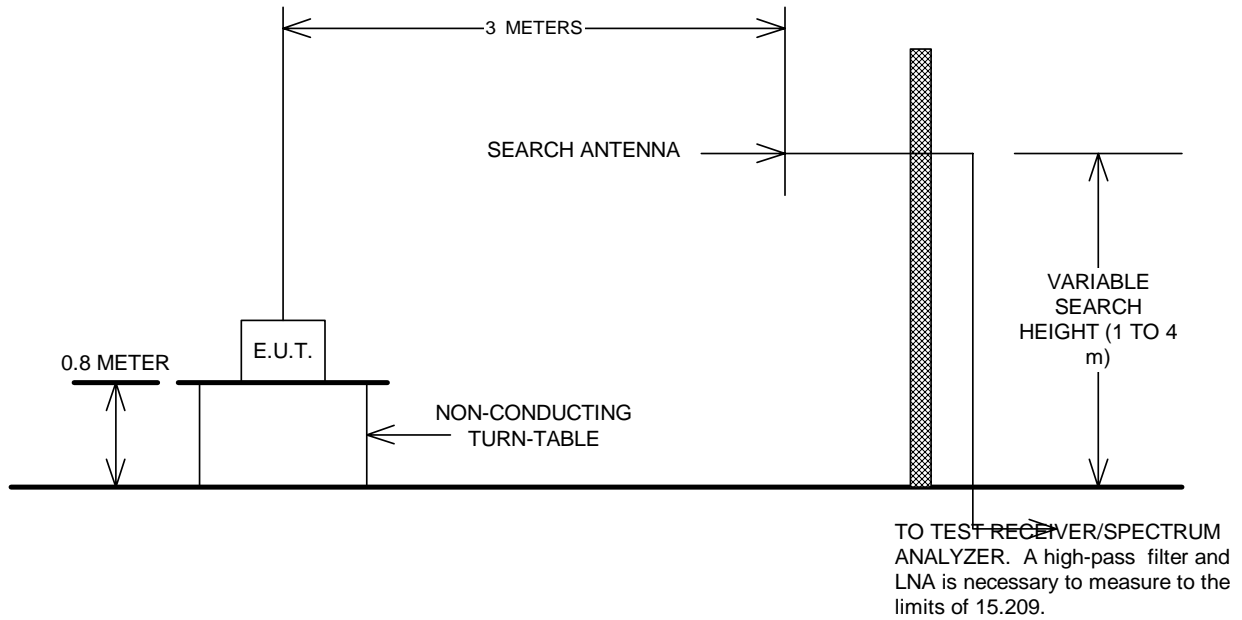
For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent isotropic radiated power using the same method as described for Peak Power output.

Number of channels tested:

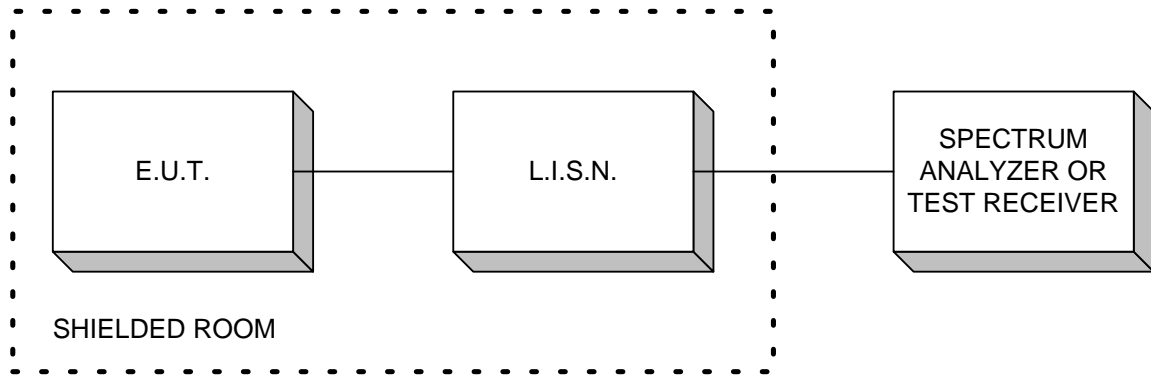
| Tuning Range | Number Of Channels Tested | Channel Location In Band |
|------------------|---------------------------|--------------------------|
| 1 MHz or Less | 1 | Middle |
| 1 to 10 MHz | 2 | Top And Bottom |
| More Than 10 MHz | 3 | Top, Middle, Bottom |

ANNEX B - TEST DIAGRAMS

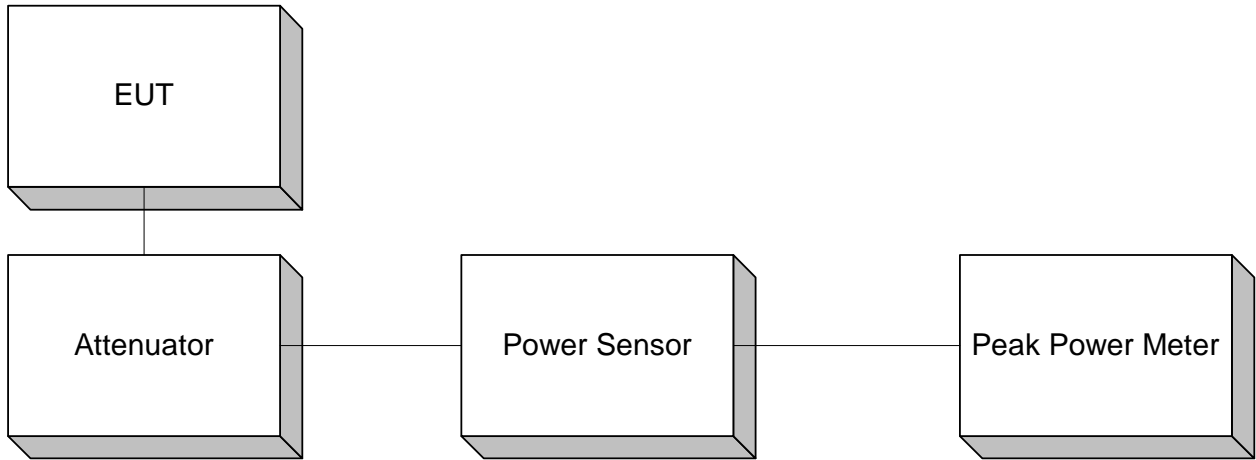
Test Site For Radiated Emissions



Conducted Emissions



Peak Power At Antenna Terminals



**Minimum 6 dB Bandwidth
Peak Power Spectral Density
Spurious Emissions (conducted)**

