



**FCC CFR47 CLASS II PERMISSIVE CHANGE  
CERTIFICATION**

**TEST REPORT**

**FOR**

**WIRELESS ETHERNET TRANSCEIVER**

**MODEL NUMBER: P5010M-INT AND P5010M-EXT**

**FCC ID: NCYP5010M**

**REPORT NUMBER: 05U3296-1**

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Revision History

| <u>Rev.</u> | <u>Revisions</u> | <u>Revised By</u> |
|-------------|------------------|-------------------|
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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** TRANGO SYSTEMS, INC.  
15070 AVENUE OF SCIENCE, SUITE 200  
SAN DIEGO, CA 92128

**EUT DESCRIPTION:** Wireless Ethernet Transceiver

**MODEL:** P5010M-INT AND P5010M- EXT

**DATE TESTED:** MARCH 21 – APRIL 25, 2005

| APPLICABLE STANDARDS  |                         |
|-----------------------|-------------------------|
| STANDARD              | TEST RESULTS            |
| FCC PART 15 SUBPART C | NO NON-COMPLIANCE NOTED |

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:



YAN ZHENG  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

Tested By:



CHIN PANG  
EMC ENGINEER  
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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER                           | UNCERTAINTY    |
|-------------------------------------|----------------|
| Radiated Emission, 30 to 200 MHz    | +/- 3.3 dB     |
| Radiated Emission, 200 to 1000 MHz  | +4.5 / -2.9 dB |
| Radiated Emission, 1000 to 2000 MHz | +4.5 / -2.9 dB |
| Power Line Conducted Emission       | +/- 2.9 dB     |

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an 802.11a Transceiver used for Ethernet Data point-to-point operation.

The EUT is manufactured by Trango Systems.

### 5.2. CLASS II PERMISSIVE CHANGE DESCRIPTION

This class II permissive change adds a 32.5 dBi external dish antenna. The radio circuitry is changed as follows: The fixed 5 dB attenuator in the RF output path is replaced with a switch-selectable attenuator or filter. Switching is performed automatically by the firmware, depending on the band of operation. The new 8 dB attenuator is switched in for operation in the 5.2 GHz band and the new filter is switched in for operation in the 5.8 GHz band.

### 5.3. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

5725 to 5850 MHz Authorized Band

| Frequency Range<br>(MHz) | Mode    | Output Power<br>(dBm) | Output Power<br>(mW) |
|--------------------------|---------|-----------------------|----------------------|
| 5735 - 5840              | 802.11a | 20.72                 | 118.03               |

#### **5.4. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes a Dish antenna with a maximum gain of 32.5dBi (including cable loss) or a Panel antenna with a maximum gain of 23 dBi.

#### **5.5. SOFTWARE AND FIRMWARE**

The firmware installed in the EUT during testing was 0.9a, rev. P5010M\_0p9a0.  
The test utility software used during testing was Atlas PtP-5010M, rev. 0p9a1D0501118022.

#### **5.6. WORST-CASE CONFIGURATION AND MODE**

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 5835 MHz.

The worst-case data rate for this channel is determined to be 6 Mb/s, based on measurements taken on the EUT to determine worst-case data.

Thus the worst-case emissions tests were made in the 802.11a mode was at 5835 MHz, 6 Mb/s.

## 5.7. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST |                |                |               |        |
|-----------------------------------|----------------|----------------|---------------|--------|
| Description                       | Manufacture    | Model          | Serial Number | FCC ID |
| Laptop PC                         | Sony           | Vaio; PCG-643L | 3525952       | DoC    |
| Docking Station                   | Sony           | PCGA-DSM51     | 1035361       | DoC    |
| AC Adapter                        | Sony           | PCGA-AC19W1    | 183529        | N/A    |
| POE Adapter                       | Trango Systems | N/A            | N/A           | N/A    |
| AC Adapter                        | CUI Inc.       | 3A181WP2L      | N/A           | N/A    |

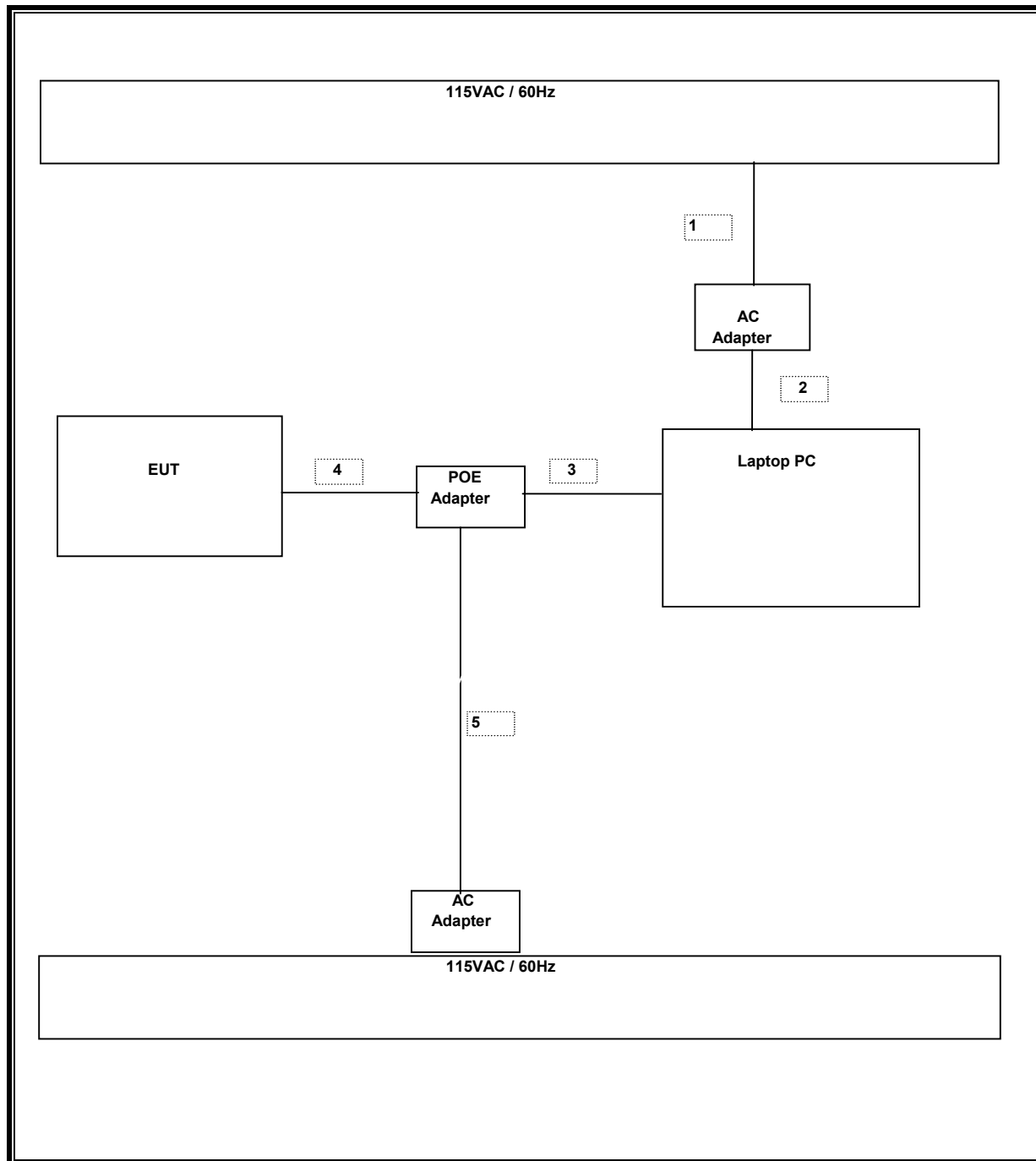
### I/O CABLES

| I/O CABLE LIST |      |                      |                |            |              |         |
|----------------|------|----------------------|----------------|------------|--------------|---------|
| Cable No.      | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks |
| 1              | AC   | 1                    | IEC            | Unshielded | 1.5m         |         |
| 2              | DC   | 1                    | DC             | Unshielded | 1.8m         |         |
| 3              | LAN  | 1                    | RJ-45          | Unshielded | 3m           |         |
| 4              | LAN  | 1                    | RJ-45          | Shielded   | 3+m          |         |
| 5              | DC   | 1                    | DC             | Unshielded | 1.8m         |         |

### TEST SETUP

The EUT is connected to a laptop computer via a shielded twisted pair cable and a power over Ethernet adapter. The test software exercised the radio.

**SETUP DIAGRAM FOR TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| TEST EQUIPMENT LIST                |                |                  |               |            |
|------------------------------------|----------------|------------------|---------------|------------|
| Description                        | Manufacturer   | Model            | Serial Number | Cal Due    |
| EMI Test Receiver                  | R & S          | ESHS 20          | 827129/006    | 10/22/2005 |
| LISN, 10 kHz ~ 30 MHz              | Solar          | 8012-50-R-24-BNC | 8379443       | 10/21/2005 |
| Site A Line Stabilizer/Conditioner | Tripplite      | LC-1800a         | A005181       | CNR        |
| LISN, 10 kHz ~ 30 MHz              | FCC            | LISN-50/250-25-2 | 2023          | 8/30/2005  |
| Antenna, Horn 1 ~ 18 GHz           | EMCO           | 3115             | 2238          | 9/12/2005  |
| Antenna, Horn, 18 ~ 26 GHz         | ARA            | MWH-1826/B       | 1013          | 9/12/2005  |
| 30MHz---- 2Ghz                     | Sunol Sciences | JB1 Antenna      | A121003       | 9/22/2005  |
| Spectrum Analyzer, 26.5 GHz        | HP             | 8593EM           | 3710A00205    | 1/6/2006   |
| Spectrum Analyzer 20 Hz ~ 44 GHz   | Agilent        | E4446A           | US42510266    | 8/25/2005  |
| Site A Preamplifier, 1300MHz       | HP             | 8447D            | 2944A06833    | 8/17/2005  |
| Power Meter                        | R & S          | NRVS             | DE 12101      | 10/21/2005 |
| Power Sensor,18GHz,300 mW          | R&S            | NVR-Z51          | DE 13014      | 10/20/2005 |
| Amplifier 1-26GHz                  | MITEQ          | NSP2600-SP       | 924341        | 12/23/05   |

## 7. LIMITS AND RESULTS

### 7.1. CHANNEL TESTS FOR THE 5725 TO 5850 MHz BAND

#### 7.1.1. PEAK OUTPUT POWER

##### PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt.

§15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.247 (b) (4) (ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

##### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

## **RESULTS**

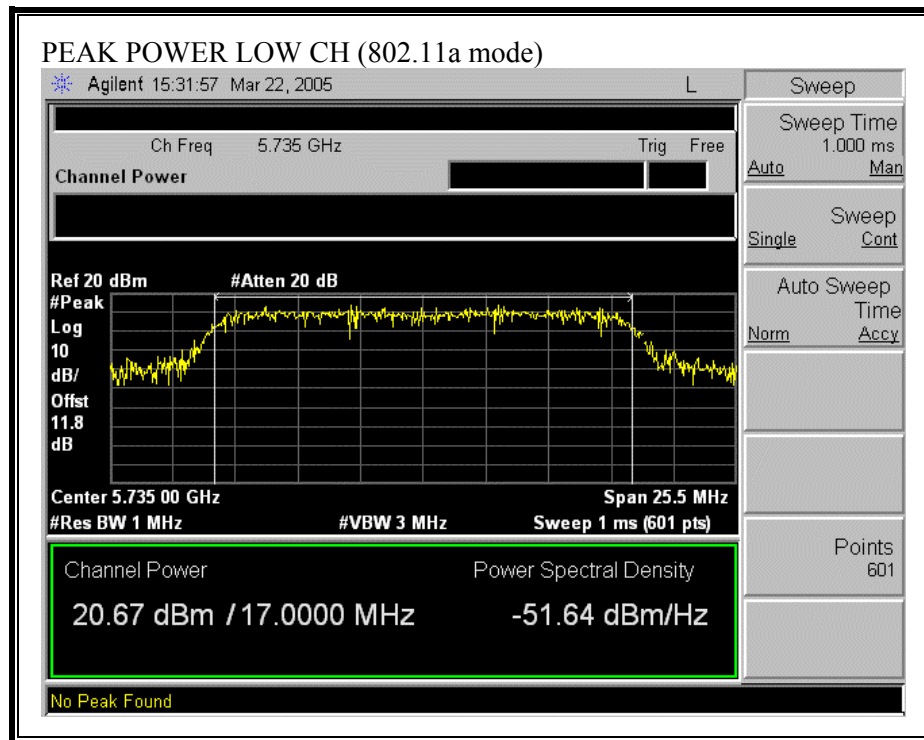
The maximum antenna gain is 32.5 dBi exclusively for fixed, point-to-point operation; therefore the limit is 30 dBm.

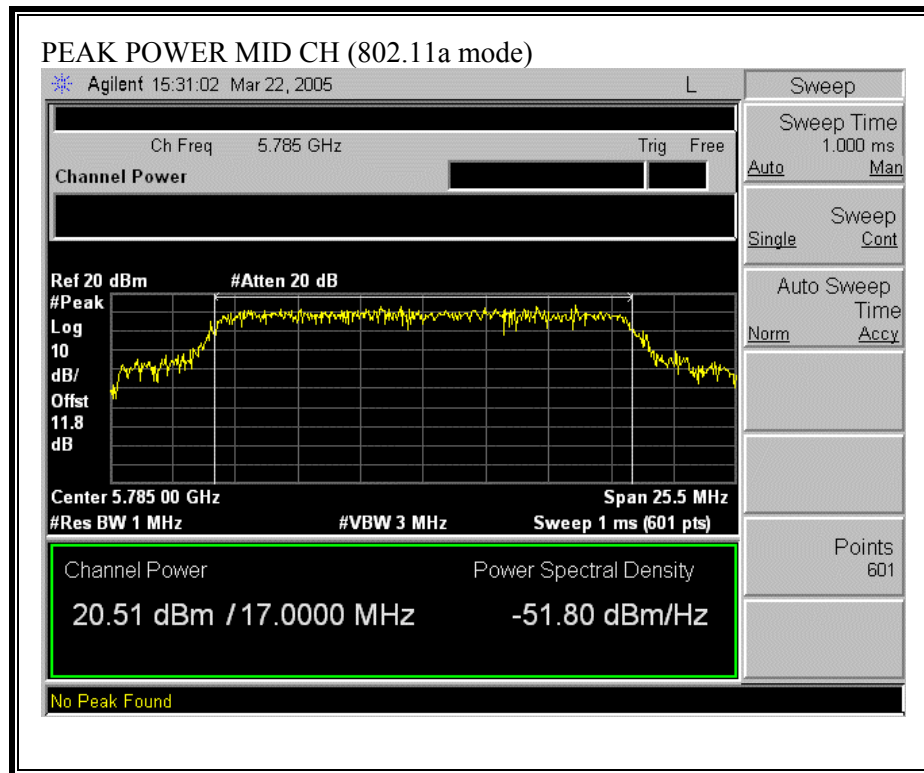
No non-compliance noted:

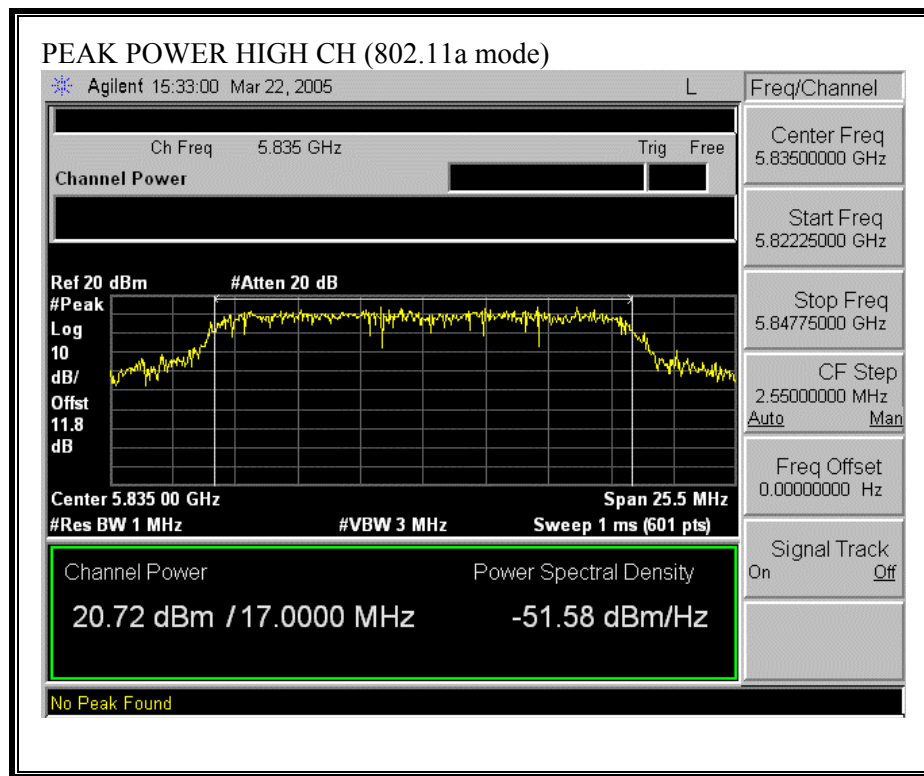
### 802.11a Mode

| <b>Channel</b> | <b>Frequency<br/>(MHz)</b> | <b>Peak Power<br/>(dBm)</b> | <b>Limit<br/>(dBm)</b> | <b>Margin<br/>(dB)</b> |
|----------------|----------------------------|-----------------------------|------------------------|------------------------|
| Low            | 5735                       | 20.67                       | 30                     | -9.33                  |
| Middle         | 5785                       | 20.51                       | 30                     | -9.49                  |
| High           | 5835                       | 20.72                       | 30                     | -9.28                  |

**OUTPUT POWER (802.11a MODE)**







## **7.1.2. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### **TEST PROCEDURE**

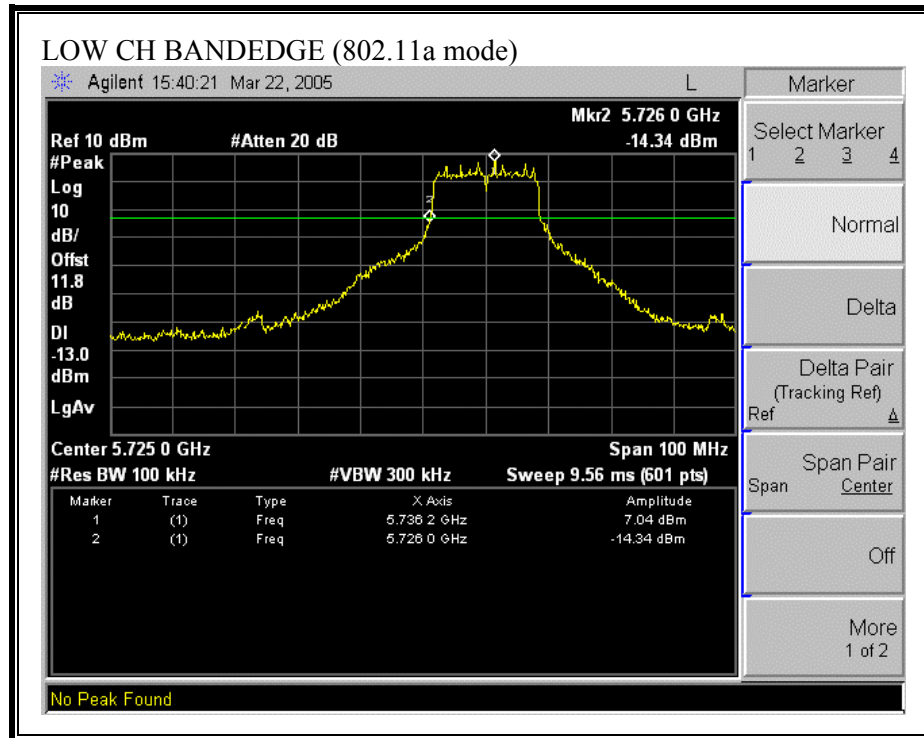
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

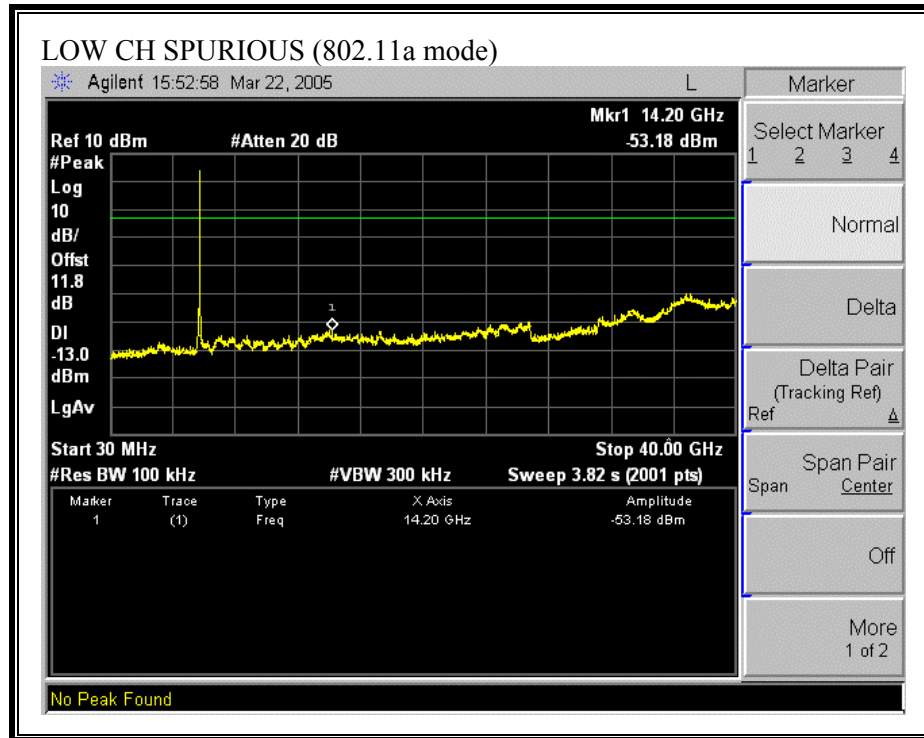
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

### **RESULTS**

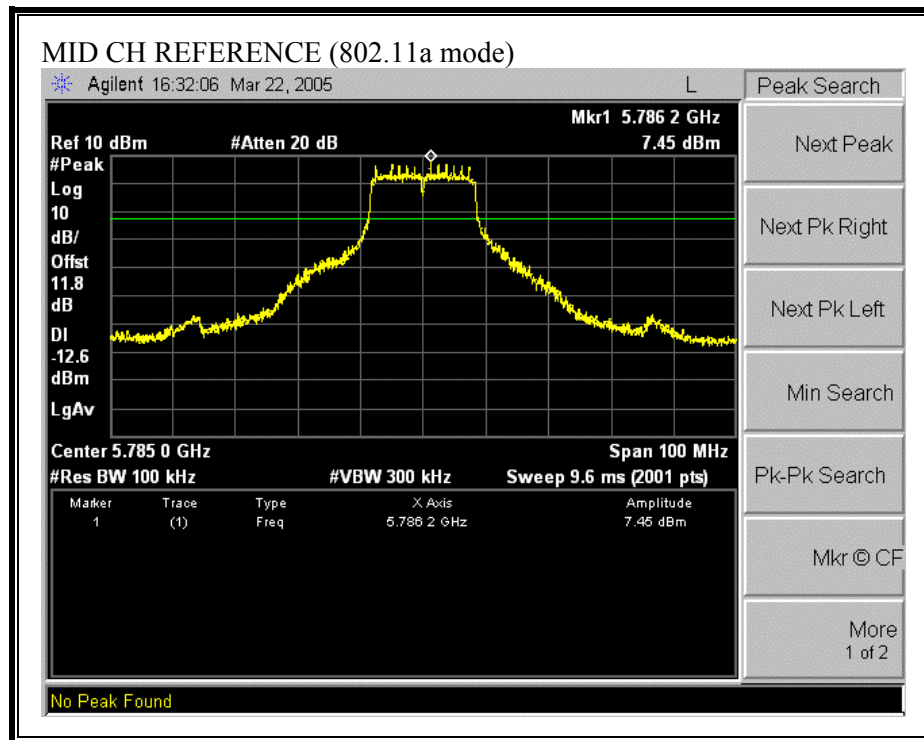
No non-compliance noted:

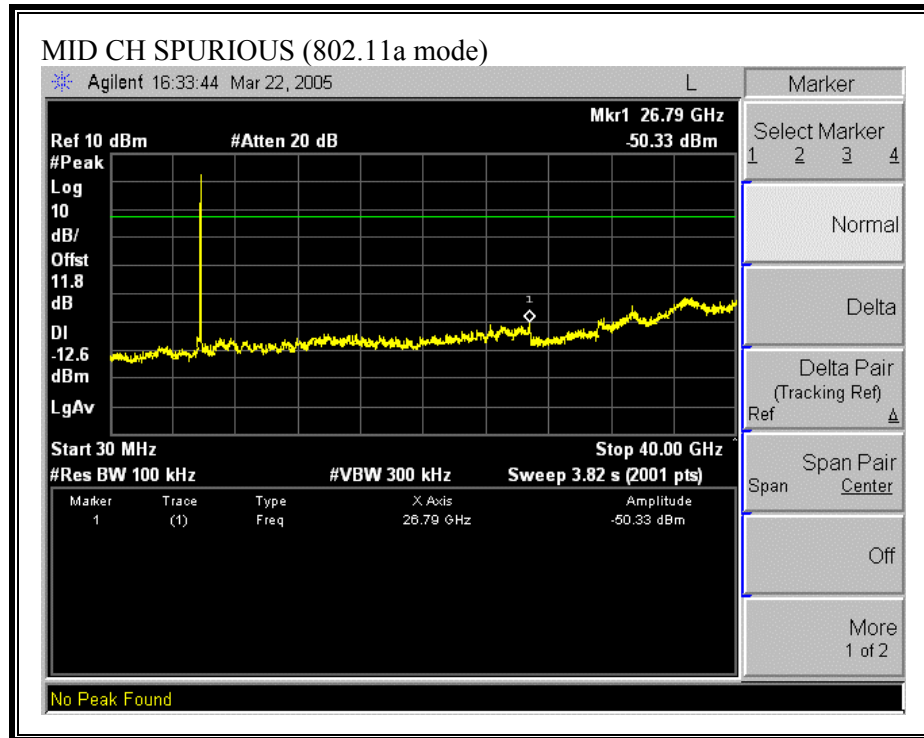
**SPURIOUS EMISSIONS, LOW CHANNEL (802.11a MODE)**



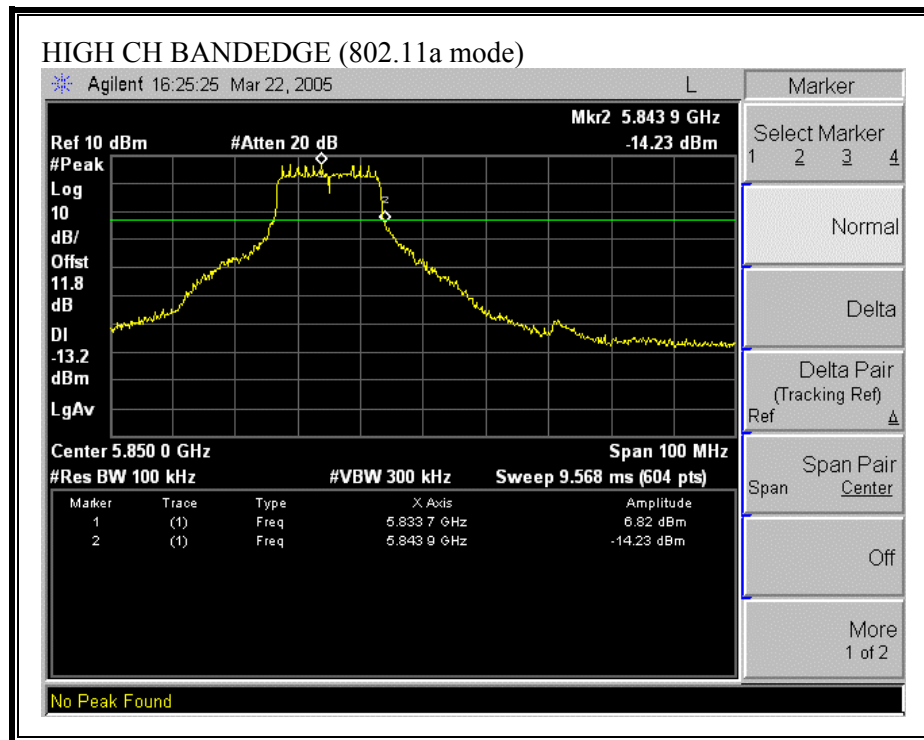


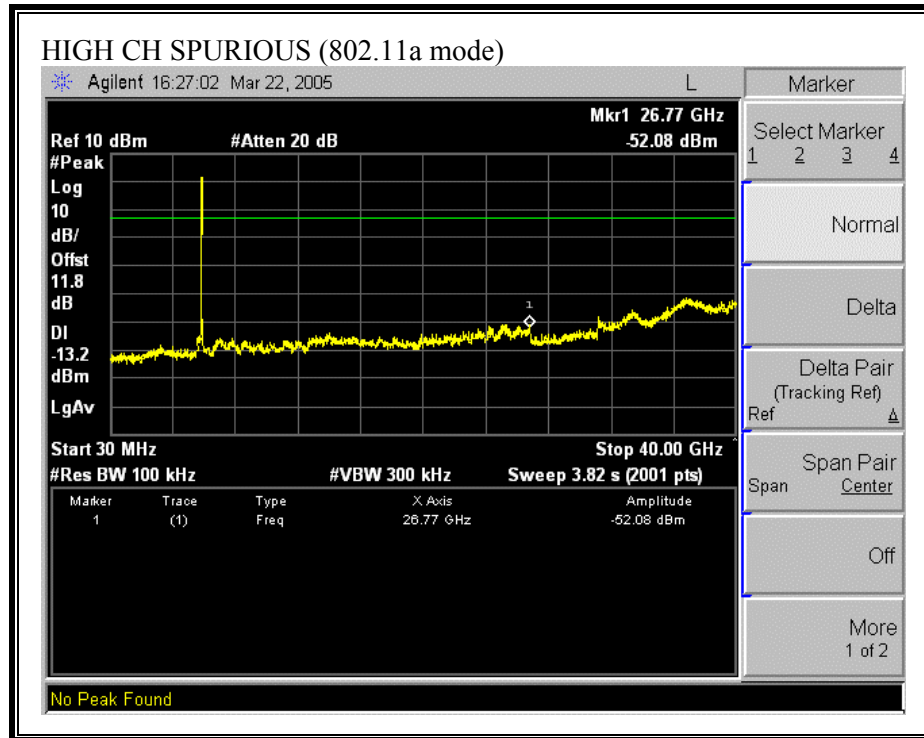
**SPURIOUS EMISSIONS, MID CHANNEL (802.11a MODE)**





**SPURIOUS EMISSIONS, HIGH CHANNEL (802.11a MODE)**





## 7.2. RADIATED EMISSIONS

### 7.2.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

#### LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                        | MHz                   | MHz             | GHz              |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 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        |
| 6.215 - 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     | ( <sup>2</sup> ) |
| 13.36 - 13.41              |                       |                 |                  |

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (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<br>(MHz) | Field Strength<br>(microvolts/meter) | Measurement Distance<br>(meters) |
|--------------------|--------------------------------------|----------------------------------|
| 30 - 88            | 100 **                               | 3                                |
| 88 - 216           | 150 **                               | 3                                |
| 216 - 960          | 200 **                               | 3                                |
| Above 960          | 500                                  | 3                                |

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

## **TEST PROCEDURE**

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

## 7.2.2. TRANSMITTER ABOVE 1 GHz FOR 5725 TO 5850 MHz BAND WITH 23dBi PANEL ANTENNA

### HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

|                                                                                                        |                       |                                                                            |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
|--------------------------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------------------------------|-------------------|------------------------|--------------------------------|---------------|--------------|-------------|------------------------------|---------------|------------------|---------------------------------------------|--------------|---------------|----------------|
| 3/25/2005 High Frequency Measurement<br>Compliance Certification Services, Morgan Hill Open Field Site |                       |                                                                            |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| Test Engr:                                                                                             |                       | HITESH H. SOLANKI                                                          |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| Project #:                                                                                             |                       | 05U3296                                                                    |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| Company:                                                                                               |                       | TRANGO SYSTEMS                                                             |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| EUT Descrip.:                                                                                          |                       | Ethernet Data Radio For Point to Point Operations with 23dBi PATCH ANTENNA |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| EUT M/N:                                                                                               |                       | Altas P5010M-INT                                                           |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| Test Target:                                                                                           |                       | FCC CLASS B                                                                |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| Mode Oper:                                                                                             |                       | TX, 5.2 GHz BAND                                                           |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| Test Equipment:                                                                                        |                       |                                                                            |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| EMCO Horn 1-18GHz                                                                                      |                       | Pre-amplifier 1-26GHz                                                      |                   | Pre-amplifier 26-40GHz |                                | Horn > 18GHz  |              |             |                              |               |                  |                                             |              |               |                |
| T60; S/N: 2238 @3m                                                                                     |                       | T86 Miteq 924341                                                           |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| Hi Frequency Cables                                                                                    |                       |                                                                            |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| 2 foot cable                                                                                           |                       | 3 foot cable                                                               |                   | 4 foot cable           |                                | 12 foot cable |              | HPF         |                              | Reject Filter |                  | Peak Measurements<br>RBW=VBW=1MHz           |              |               |                |
| 3_Vien                                                                                                 |                       |                                                                            |                   |                        |                                | 12_Hitesh     |              | HPF_4.0 GHz |                              | R_001         |                  | Average Measurements<br>RBW=1MHz ; VBW=10Hz |              |               |                |
| f<br>GHz                                                                                               | Dist<br>(m)           | Read Pk<br>dBuV                                                            | Read Avg.<br>dBuV | AF<br>dB/m             | CL<br>dB                       | Amp<br>dB     | D Corr<br>dB | Filtr<br>dB | Peak<br>dBuV/m               | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m                           | Pk Mar<br>dB | Avg Mar<br>dB | Notes<br>(V/H) |
| LOW CHANNEL                                                                                            |                       |                                                                            |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| 11.470                                                                                                 | 3.0                   | 53.8                                                                       | 40.2              | 38.1                   | 7.6                            | -42.6         | 0.0          | 0.9         | 57.7                         | 44.1          | 74               | 54                                          | -16.3        | -9.9          | V              |
| 17.205                                                                                                 | 3.0                   | 53.6                                                                       | 39.5              | 43.0                   | 10.8                           | -45.2         | 0.0          | 1.5         | 63.6                         | 49.5          | 74               | 54                                          | -10.4        | -4.5          | V              |
| MIDDLE CHANNEL                                                                                         |                       |                                                                            |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| 11.570                                                                                                 | 3.0                   | 52.9                                                                       | 39.0              | 38.2                   | 7.6                            | -42.7         | 0.0          | 0.9         | 56.9                         | 43.0          | 74               | 54                                          | -17.1        | -11.0         | V              |
| 17.355                                                                                                 | 3.0                   | 52.4                                                                       | 39.8              | 43.4                   | 10.9                           | -45.1         | 0.0          | 1.5         | 63.1                         | 50.5          | 74               | 54                                          | -10.9        | -3.5          | V              |
| HIGH CHANNEL                                                                                           |                       |                                                                            |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| 11.670                                                                                                 | 3.0                   | 52.7                                                                       | 40.1              | 38.2                   | 7.7                            | -42.8         | 0.0          | 0.9         | 56.7                         | 44.1          | 74               | 54                                          | -17.3        | -9.9          | V              |
| 17.505                                                                                                 | 3.0                   | 52.1                                                                       | 39.9              | 43.8                   | 11.0                           | -45.0         | 0.0          | 1.5         | 63.4                         | 51.2          | 74               | 54                                          | -10.6        | -2.8          | V              |
| LOW CHANNEL                                                                                            |                       |                                                                            |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| 11.470                                                                                                 | 3.0                   | 56.3                                                                       | 43.2              | 38.1                   | 7.6                            | -42.6         | 0.0          | 0.9         | 60.2                         | 47.1          | 74               | 54                                          | -13.8        | -6.9          | H              |
| 17.205                                                                                                 | 3.0                   | 53.1                                                                       | 39.4              | 43.0                   | 10.8                           | -45.2         | 0.0          | 1.5         | 63.1                         | 49.4          | 74               | 54                                          | -10.9        | -4.6          | H              |
| MIDDLE CHANNEL                                                                                         |                       |                                                                            |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| 11.570                                                                                                 | 3.0                   | 54.4                                                                       | 42.6              | 38.2                   | 7.6                            | -42.7         | 0.0          | 0.9         | 58.4                         | 46.6          | 74               | 54                                          | -15.6        | -7.4          | H              |
| 17.355                                                                                                 | 3.0                   | 53.1                                                                       | 39.8              | 43.4                   | 10.9                           | -45.1         | 0.0          | 1.5         | 63.8                         | 50.5          | 74               | 54                                          | -10.2        | -3.5          | H              |
| HIGH CHANNEL                                                                                           |                       |                                                                            |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| 11.670                                                                                                 | 3.0                   | 58.9                                                                       | 45.3              | 38.2                   | 7.7                            | -42.8         | 0.0          | 0.9         | 62.9                         | 49.3          | 74               | 54                                          | -11.1        | -4.7          | H              |
| 17.505                                                                                                 | 3.0                   | 53.0                                                                       | 39.9              | 43.8                   | 11.0                           | -45.0         | 0.0          | 1.5         | 64.3                         | 51.2          | 74               | 54                                          | -9.7         | -2.8          | H              |
|                                                                                                        |                       |                                                                            |                   |                        |                                |               |              |             |                              |               |                  |                                             |              |               |                |
| f                                                                                                      | Measurement Frequency |                                                                            |                   | Amp                    | Preamp Gain                    |               |              | Avg Lim     | Average Field Strength Limit |               |                  |                                             |              |               |                |
| Dist                                                                                                   | Distance to Antenna   |                                                                            |                   | D Corr                 | Distance Correct to 3 meters   |               |              | Pk Lim      | Peak Field Strength Limit    |               |                  |                                             |              |               |                |
| Read                                                                                                   | Analyzer Reading      |                                                                            |                   | Avg                    | Average Field Strength @ 3 m   |               |              | Avg Mar     | Margin vs. Average Limit     |               |                  |                                             |              |               |                |
| AF                                                                                                     | Antenna Factor        |                                                                            |                   | Peak                   | Calculated Peak Field Strength |               |              | Pk Mar      | Margin vs. Peak Limit        |               |                  |                                             |              |               |                |
| CL                                                                                                     | Cable Loss            |                                                                            |                   | HPF                    | High Pass Filter               |               |              |             |                              |               |                  |                                             |              |               |                |

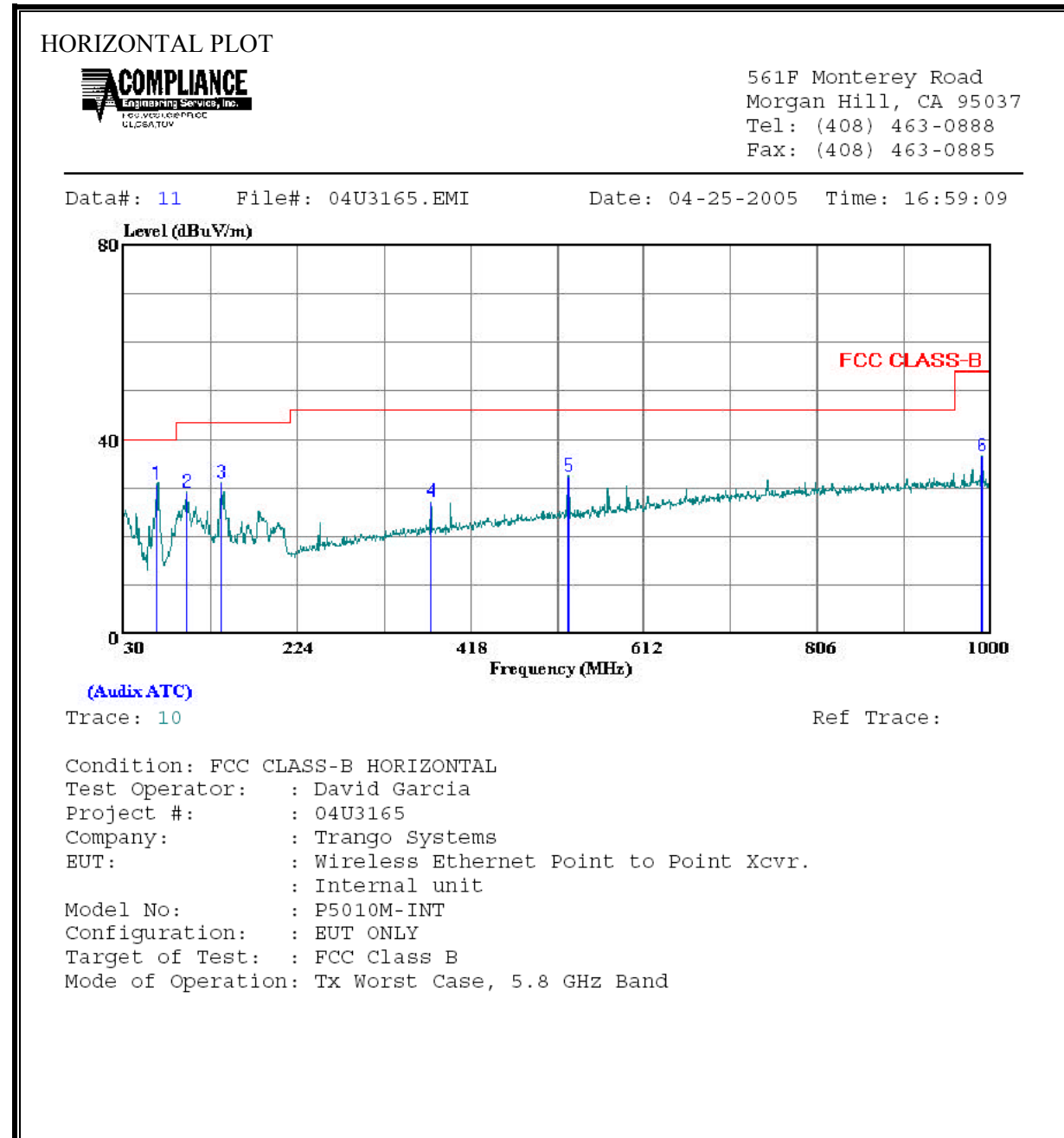
### 7.2.3. TRANSMITTER ABOVE 1 GHz FOR 5725 TO 5850 MHz BAND WITH 32.5dBi DISH ANTENNA

#### HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

| 3/23/2005 <b>High Frequency Measurement</b>                                                                                                                                                                                                           |                       |                       |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|----------------|------------------------|--------------------------------|---------------|-----------|-------------|------------------------------|---------------|---------------|-------------------|-----------|------------|-------------|--|
| Compliance Certification Services, Morgan Hill Open Field Site                                                                                                                                                                                        |                       |                       |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
| Test Engr:Chin Pang<br>05U3296-1<br>Company:Trango Systems, Inc.<br>EUT Descrp.:Ethernet Data Radio For Point to Point Operations with 4 feet antenna<br>EUT M/N:Altas P5010M-INT, -EXT, CSPC<br>Test Target:FCC Class B<br>Mode Oper:TX, 5.8GHz Band |                       |                       |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
| <b>Test Equipment:</b>                                                                                                                                                                                                                                |                       |                       |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
| EMCO Horn 1-18GHz                                                                                                                                                                                                                                     |                       | Pre-amplifier 1-26GHz |                | Pre-amplifier 26-40GHz |                                | Horn > 18GHz  |           |             |                              |               |               |                   |           |            |             |  |
| T59; S/N: 3245 @3m                                                                                                                                                                                                                                    |                       | T63 Miteq 646456      |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
| Hi Frequency Cables                                                                                                                                                                                                                                   |                       |                       |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
| 2 foot cable                                                                                                                                                                                                                                          |                       | 3 foot cable          |                | 4 foot cable           |                                | 12 foot cable |           | HPF         |                              | Reject Filter |               | Peak Measurements |           |            |             |  |
| 2_Chin                                                                                                                                                                                                                                                |                       |                       |                |                        |                                | 12_Vien       |           | HPF_ 7.6GHz |                              | R_001         |               | RBW=VBW=1MHz      |           |            |             |  |
| Average Measurements                                                                                                                                                                                                                                  |                       |                       |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
| RBW=1MHz ; VBW=10Hz                                                                                                                                                                                                                                   |                       |                       |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
| f GHz                                                                                                                                                                                                                                                 | Dist (m)              | Read Pk dBuV          | Read Avg. dBuV | AF dB/m                | CL dB                          | Amp dB        | D Corr dB | Fltr dB     | Peak dBuV/m                  | Avg dBuV/m    | Pk Lim dBuV/m | Avg Lim dBuV/m    | Pk Mar dB | Avg Mar dB | Notes (V/H) |  |
| <b>low ch, 5735MHz</b>                                                                                                                                                                                                                                |                       |                       |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
| 11.470                                                                                                                                                                                                                                                | 3.0                   | 53.0                  | 40.0           | 38.2                   | 5.3                            | -37.2         | 0.0       | 0.7         | 60.1                         | 47.1          | 74            | 54                | -13.9     | -6.9       | V           |  |
| 11.470                                                                                                                                                                                                                                                | 3.0                   | 55.0                  | 42.3           | 38.2                   | 5.3                            | -37.2         | 0.0       | 0.7         | 62.1                         | 49.4          | 74            | 54                | -11.9     | -4.6       | H           |  |
| <b>Mid , 5785MHz</b>                                                                                                                                                                                                                                  |                       |                       |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
| 11.570                                                                                                                                                                                                                                                | 3.0                   | 51.0                  | 38.0           | 38.3                   | 5.4                            | -37.2         | 0.0       | 0.7         | 58.1                         | 45.1          | 74            | 54                | -15.9     | -8.9       | V           |  |
| 11.570                                                                                                                                                                                                                                                | 3.0                   | 54.0                  | 39.2           | 38.3                   | 5.4                            | -37.2         | 0.0       | 0.7         | 61.1                         | 46.3          | 74            | 54                | -12.9     | -7.7       | H           |  |
| <b>High, 5835MHz</b>                                                                                                                                                                                                                                  |                       |                       |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
| 11.670                                                                                                                                                                                                                                                | 3.0                   | 52.0                  | 38.3           | 38.3                   | 5.4                            | -37.3         | 0.0       | 0.7         | 59.1                         | 45.4          | 74            | 54                | -14.9     | -8.6       | V           |  |
| 11.670                                                                                                                                                                                                                                                | 3.0                   | 56.3                  | 42.6           | 38.3                   | 5.4                            | -37.3         | 0.0       | 0.7         | 63.4                         | 49.7          | 74            | 54                | -10.6     | -4.3       | H           |  |
| Note: No other emissions were deteted above the system noise floor                                                                                                                                                                                    |                       |                       |                |                        |                                |               |           |             |                              |               |               |                   |           |            |             |  |
| f                                                                                                                                                                                                                                                     | Measurement Frequency |                       |                | Amp                    | Preamp Gain                    |               |           | Avg Lim     | Average Field Strength Limit |               |               |                   |           |            |             |  |
| Dist                                                                                                                                                                                                                                                  | Distance to Antenna   |                       |                | D Corr                 | Distance Correct to 3 meters   |               |           | Pk Lim      | Peak Field Strength Limit    |               |               |                   |           |            |             |  |
| Read                                                                                                                                                                                                                                                  | Analyzer Reading      |                       |                | Avg                    | Average Field Strength @ 3 m   |               |           | Avg Mar     | Margin vs. Average Limit     |               |               |                   |           |            |             |  |
| AF                                                                                                                                                                                                                                                    | Antenna Factor        |                       |                | Peak                   | Calculated Peak Field Strength |               |           | Pk Mar      | Margin vs. Peak Limit        |               |               |                   |           |            |             |  |
| CL                                                                                                                                                                                                                                                    | Cable Loss            |                       |                | HPF                    | High Pass Filter               |               |           |             |                              |               |               |                   |           |            |             |  |

## 7.2.4. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH 23dBi PANEL ANTENNA

### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



# HORIZONTAL DATA

|   | Freq    | Read<br>Level | Factor | Level  | Limit<br>Line | Over<br>Limit | Remark |
|---|---------|---------------|--------|--------|---------------|---------------|--------|
|   | MHz     | dBuV          | dB     | dBuV/m | dBuV/m        | dB            |        |
| 1 | 66.860  | 49.40         | -18.68 | 30.72  | 40.00         | -9.28         | Peak   |
| 2 | 100.810 | 45.20         | -16.21 | 28.99  | 43.50         | -14.51        | Peak   |
| 3 | 139.610 | 44.00         | -12.95 | 31.05  | 43.50         | -12.45        | Peak   |
| 4 | 373.380 | 37.30         | -10.09 | 27.21  | 46.00         | -18.79        | Peak   |
| 5 | 527.610 | 39.20         | -6.77  | 32.43  | 46.00         | -13.57        | Peak   |
| 6 | 990.300 | 36.90         | -0.42  | 36.49  | 54.00         | -17.52        | Peak   |

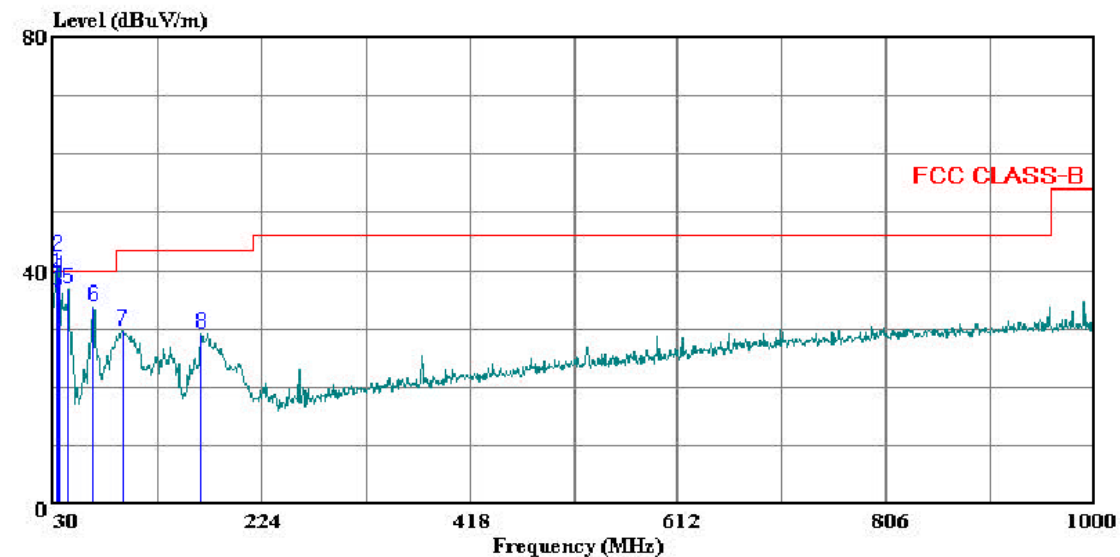
**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**

VERTICAL PLOT



561F Monterey Road  
Morgan Hill, CA 95037  
Tel: (408) 463-0888  
Fax: (408) 463-0885

Data#: 9 File#: 04U3165.EMI Date: 04-25-2005 Time: 16:53:33



(Audix ATC)

Trace: 6

Ref Trace:

Condition: FCC CLASS-B VERTICAL  
Test Operator: : David Garcia  
Project #: : 04U3165  
Company: : Trango Systems  
EUT: : Wireless Ethernet Point to Point Xcvr.  
: Internal unit  
Model No: : P5010M-INT  
Configuration: : EUT ONLY  
Target of Test: : FCC Class B  
Mode of Operation: Tx Worst Case, 5.8 GHz Band

VERTICAL DATA

|     | Freq    | Read<br>Level | Factor | Level  | Limit<br>Line | Over<br>Limit | Remark |
|-----|---------|---------------|--------|--------|---------------|---------------|--------|
|     | MHz     | dBuV          | dB     | dBuV/m | dBuV/m        | dB            |        |
| 1   | 33.880  | 48.23         | -8.87  | 39.36  | 40.00         | -0.64         | QP     |
| 2 * | 33.880  | 51.10         | -8.87  | 42.23  | 40.00         | 2.23          | Peak   |
| 3   | 34.850  | 45.76         | -9.35  | 36.41  | 40.00         | -3.59         | QP     |
| 4   | 34.850  | 47.51         | -8.87  | 38.65  | 40.00         | -1.35         | Peak   |
| 5   | 43.580  | 51.80         | -14.89 | 36.91  | 40.00         | -3.09         | Peak   |
| 6   | 66.860  | 52.40         | -18.68 | 33.72  | 40.00         | -6.28         | Peak   |
| 7   | 94.990  | 47.30         | -17.67 | 29.63  | 43.50         | -13.87        | Peak   |
| 8   | 167.740 | 43.40         | -14.20 | 29.20  | 43.50         | -14.30        | Peak   |

## 7.2.5. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH 32.5dBi DISH ANTENNA

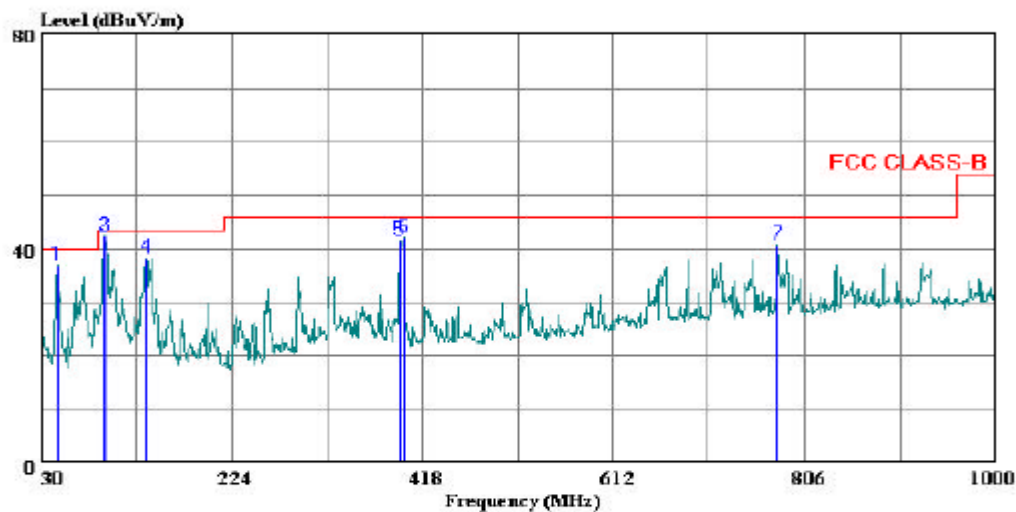
### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

#### HORIZONTAL PLOT



561F Monterey Road  
Morgan Hill, CA 95037  
Tel: (408) 463-0888  
Fax: (408) 463-0885

Data#: 4 File#: 5,2 GHz 1.EMI Date: 03-24-2005 Time: 15:40:41



(Auxiliary ATC)

Trace: 3

Ref Trace:

Condition: FCC CLASS-B HORIZONTAL  
Test Operator: : VIENTRAN  
Project #: : 05U3296-1  
Company: : TRANGO SYSTEM  
EUT: : ETHERNET DATA RADIOS FOR POINT  
: TO POINT OPERATION  
Model No : ATLAS P5010M-INT, -EXT, C2PC  
Configuration: : EUT only  
Target of Test: : FCC CLASS B  
Mode of Operation: TX WORST CASE - 5.8GHz BAND

HORIZONTAL DATA

|   | Freq    | Read<br>Level | Factor | Level  | Limit<br>Line | Over<br>Limit | Remark |
|---|---------|---------------|--------|--------|---------------|---------------|--------|
|   | MHz     | dBuV          | dB     | dBuV/m | dBuV/m        | dB            |        |
| 1 | 46.490  | 52.89         | -16.12 | 36.77  | 40.00         | -3.23         | Peak   |
| 2 | 94.020  | 60.20         | -17.95 | 42.25  | 43.50         | -1.25         | Peak   |
| 3 | 96.930  | 59.50         | -17.24 | 42.26  | 43.50         | -1.24         | Peak   |
| 4 | 136.700 | 51.20         | -12.86 | 38.34  | 43.50         | -5.16         | Peak   |
| 5 | 394.720 | 51.30         | -9.64  | 41.66  | 46.00         | -4.34         | Peak   |
| 6 | 399.570 | 51.60         | -9.55  | 42.05  | 46.00         | -3.95         | Peak   |
| 7 | 777.870 | 42.99         | -2.17  | 40.83  | 46.00         | -5.17         | Peak   |

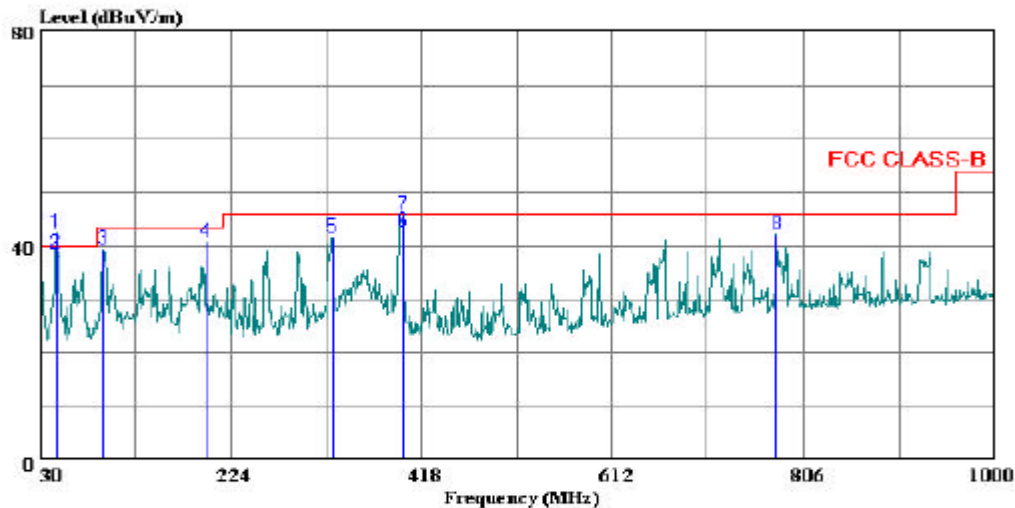
**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**

VERTICAL PLOT



561F Monterey Road  
Morgan Hill, CA 95037  
Tel: (408) 463-0888  
Fax: (408) 463-0885

Data#: 8 File#: 5,2 GHZ 1.EMI Date: 03-24-2005 Time: 16:04:00



(Auxiliary ATC)

Trace: 5

Ref Trace:

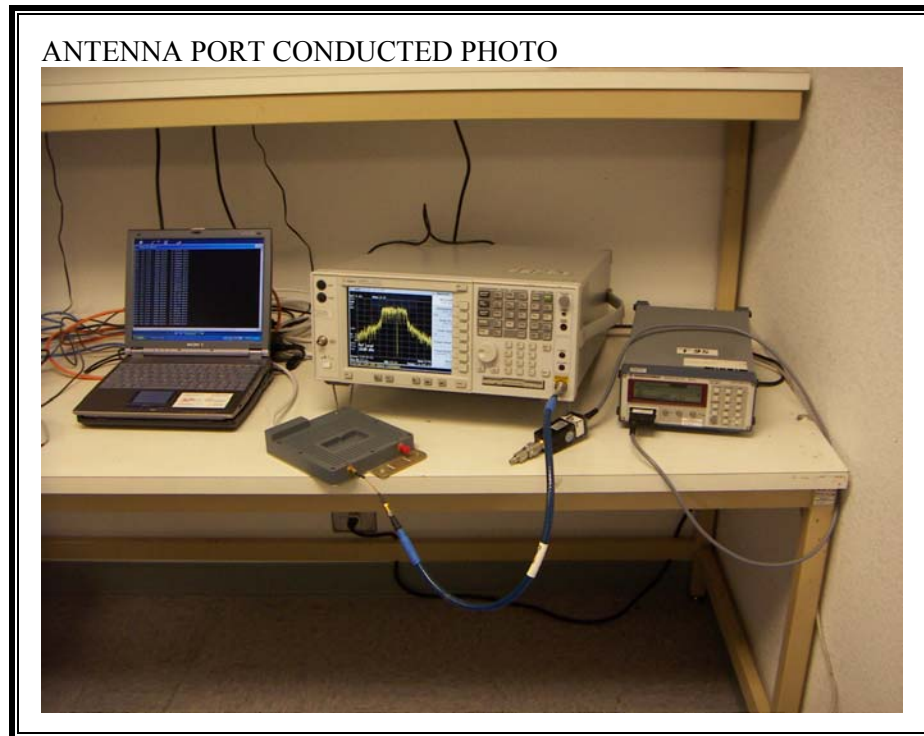
Condition: FCC CLASS-B VERTICAL  
Test Operator: : VIENTRAN  
Project #: : 05U3296-1  
Company: : TRANGO SYSTEM  
EUT: : ETHERNET DATA RADIOS FOR POINT  
: TO POINT OPERATION  
Model No : ATLAS P5010M-INT, -EXT, C2PC  
Configuration: : EUT only  
Target of Test: : FCC CLASS B  
Mode of Operation: TX WORST CASE - 5.8GHZ BAND

VERTICAL DATA

|     | Freq    | Read<br>Level | Factor | Level  | Limit<br>Line | Over<br>Limit | Remark |
|-----|---------|---------------|--------|--------|---------------|---------------|--------|
|     | MHz     | dBuV          | dB     | dBuV/m | dBuV/m        | dB            |        |
| 1 * | 46.490  | 58.39         | -16.12 | 42.27  | 40.00         | 2.27          | Peak   |
| 2   | 46.490  | 55.15         | -16.63 | 38.52  | 40.00         | -1.48         | QP     |
| 3   | 94.020  | 57.20         | -17.95 | 39.25  | 43.50         | -4.25         | Peak   |
| 4   | 198.780 | 54.10         | -13.27 | 40.83  | 43.50         | -2.67         | Peak   |
| 5   | 327.790 | 52.70         | -11.13 | 41.57  | 46.00         | -4.43         | Peak   |
| 6   | 399.570 | 52.20         | -9.55  | 42.65  | 46.00         | -3.35         | QP     |
| 7   | 399.570 | 55.10         | -9.55  | 45.55  | 46.00         | -0.45         | Peak   |
| 8   | 777.870 | 44.29         | -2.17  | 42.13  | 46.00         | -3.87         | Peak   |

## 8. SETUP PHOTOS

### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



**RADIATED RF MEASUREMENT SETUP WITH 23dBi PANEL ANTENNA**



RADIATED BACK PHOTO



**RADIATED RF MEASUREMENT SETUP WITH 32.5dBi DISH ANTENNA**

RADIATED FRONT PHOTO



RADIATED BACK PHOTO



**END OF REPORT**