Engineering and Testing for EMC and Safety Compliance

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# FCC Class 2 Permissive Change Report


**Airorlite Communications, Inc.**
**17-01 Pollitt Drive**
**Fair Lawn, NJ 07410**
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## Model: 50289-BAM-8-800-DL
## (851 – 869 MHz)

**FCC ID: UT650289BAM8800DL**

**May 30, 2008**

| Standards Referenced for this Report | |
|---|---|
| Part 2: 2007 | Frequency Allocations and Radio Treaty Matters; General Rules and Regulations |
| Part 90: 2007 | Private Land Mobile Radio Services |
| ANSI/TIA-603-C-2004 | Land Mobile FM or PM Communications Equipment Measurement and Performance Standards |

| Frequency Range(MHz) | Transmit Power (W) | Frequency Tolerance (ppm) | Emission Designator |
|---|---|---|---|
| 851 - 869 | 0.6* | Amp | F8E |

** Power listed is conducted per carrier*

**Report Prepared by Test Engineer: Daniel Baltzell**

Document Number: 2008097

## Table of Contents

## Table of Tables



## Table of Plots



## Table of Figures



## Table of Appendixes



## Table of Photographs

# 1 General Information

The following Class 2 Permissive Change Report is prepared on behalf of **Airorlite Communications, Inc.** in accordance with the Federal Communications Commission Part 90 Rules and Regulations. The Equipment Under Test (EUT) was the **Model 50289-BAM-8-800-DL, FCC ID: UT650289BAM8800DL**. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with the applicable FCC Rules and Regulations in CFR 47. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

## 1.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Virginia, 20170. This site has been fully described in a report submitted to and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

## 1.2 Related Submittal(s)/Grant(s)

This is a Class 2 Permissive Change report. The original grant was issued on 2/15/2008.

## 1.3 Description of Change

Bandpass filtering was added to the 52600-02-13 LAN Splitter component, and the first of the three bandpass filters was removed from the intermediate frequency stage of the 52600-02-11 Channel Card component.

These changes will result in slightly wider skirts on the output signal, but will have no impact on the overall output power. The changes do not involve the frequency determining elements.

## 2 Tested System Details

The test sample was received on May 28, 2008. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

**Table 2-1: Test System Details**

| | |
|---|---|
| **Model Tested** | 50289-BAM-8-800-DL (bi-directional booster (uplink)) |
| **Frequency Band** | 851 - 869 MHz |
| **Maximum Output Power** | 0.6 W conducted per carrier |
| **Number of Channels** | 8 |
| **Channel Bandwidth** | 25 kHz nominal |
| **Channel Spacing** | 25 kHz |
| **Primary Power** | 95-132 VAC, 45-64 Hz, 15 Amps, Maximum |
| **Duty Cycle** | Continuous |

**Table 2-2: Equipment Under Test (EUT)**

| Part | Manufacturer | Model | PN/SN | FCC ID | RTL Bar Code |
|---|---|---|---|---|---|
| Bi-Directional Booster | Airorlite Communications, Inc. | 50289-BAM-8-800-UL | N/A | UT650289BAM8800DL | 18250 |

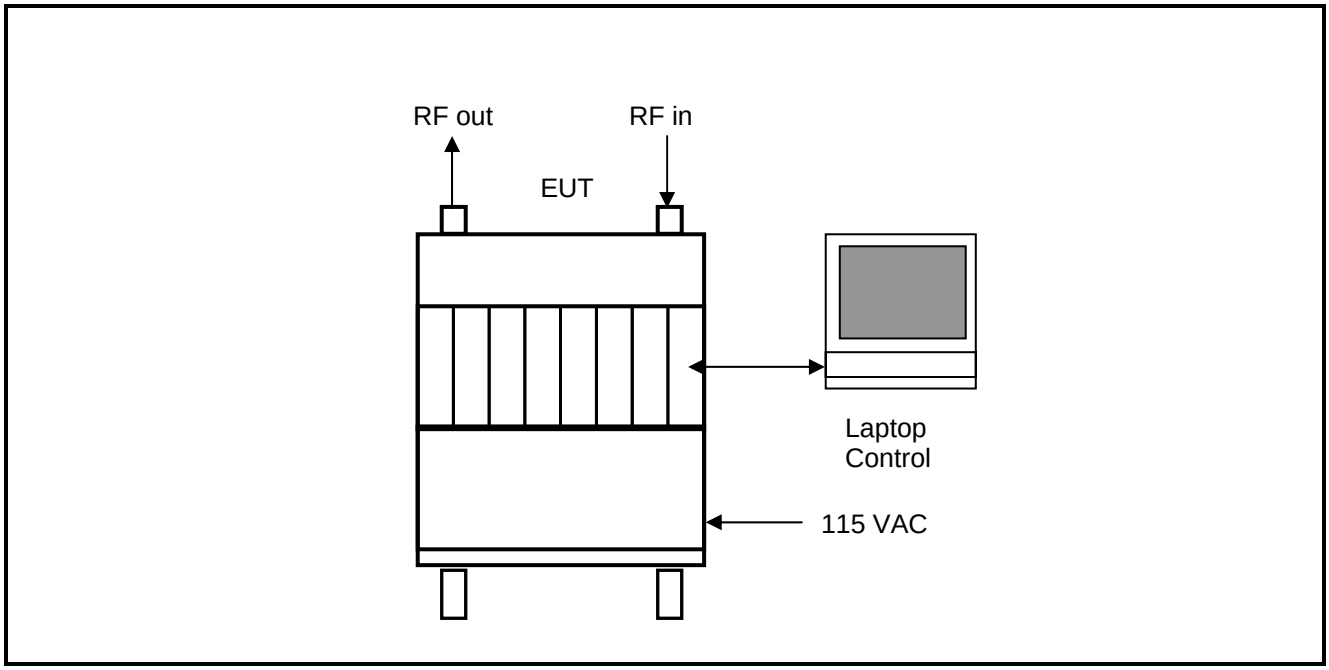
**Table 2-3: Ports and Cabling (EUT)**

| Port | Cable Type | Quantity | Length (feet) | Shield |
|---|---|---|---|---|
| RF In | N type | 1 | N/A | N/A |
| RF Out | N type | 1 | N/A | N/A |

**Table 2-4: Support Equipment**

| Part | Manufacturer | Model | PN/SN | FCC ID | RTL Bar Code |
|---|---|---|---|---|---|
| Notebook Computer | Dell | Inspiron 6400 | N/A | N/A | 901495 |
| Serial Interface Cable | N/A | DB-9 | N/A | N/A | N/A |
| 12VDC power Supply | Airorlite Communications, Inc. | 50483PS12 | N/A | N/A | 18252 |

**Figure 2-1: Configuration of Tested System**



# 3 FCC Rules and Regulations Part 90.219 and Part §2.1046(a): Peak Output Power

## 3.1 Test Procedure

ANSI TIA-603-2004, section 2.2.1.

The EUT was connected to a coaxial attenuator having a 50 Ω load impedance. Any cable losses were accounted for.

Though an antenna gain of 8.9 dBd (11 dBi) is used to show compliance with the 90.219 limit, RF exposure requirements dictate that the max antenna gain be -2 dBd (0.6 dBi). The downlink antenna is typically a leaky coax with 60 dB coupling. Per the manufacturer, -22.1 dBd (-20 dBi) is representative of the leaky coax gain.

## 3.2 Test Data

**Table 3-1: RF Power Output: Carrier Output Power**

| Frequency (MHz) | Power Level Measured (dBm/carrier) | Antenna Gain (dBd) | ERP (W) | Limit §90.219 (W) |
|---|---|---|---|---|
| 851.2125 | 26.4 | 8.9 | 3.4 | 5 |
| 853.9125 | 26.6 | 8.9 | 3.5 | 5 |
| 866.0750 | 25.4 | 8.9 | 2.7 | 5 |

*Measurement accuracy: +/-0.3 dB

**Table 3-2: Test Equipment for RF Power Output - Conducted**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due |
|---|---|---|---|---|---|
| 901184 | Agilent Technologies | E4416A | Power Meter | GB41050573 | 10/24/08 |
| 901356 | Agilent Technologies | E9323A | Power Sensor | 31764-264 | 10/24/08 |
| 901138 | Weinschel Corp. | 48-40-34 DC-18GHz | Attenuator, 100W 40dB | BK5883 | 1/13/09 |
| 901157 | Marconi Instruments | 2022D | Signal Generator (10 kHz-1 GHz) | 119161/056 | 12/12/08 |

**Test Personnel:**

| | | |
|---|---|---|
| Daniel Baltzell |  | May 28, 2008 |
| Test Engineer | Signature | Date of Tests |

# 4 FCC Rules and Regulations Part 90.210(b) and Part 2.1049(c): Occupied Bandwidth (Emissions Masks)

## 4.1 Test Procedure

ANSI TIA-603-C-2004, Section 2.2.11.

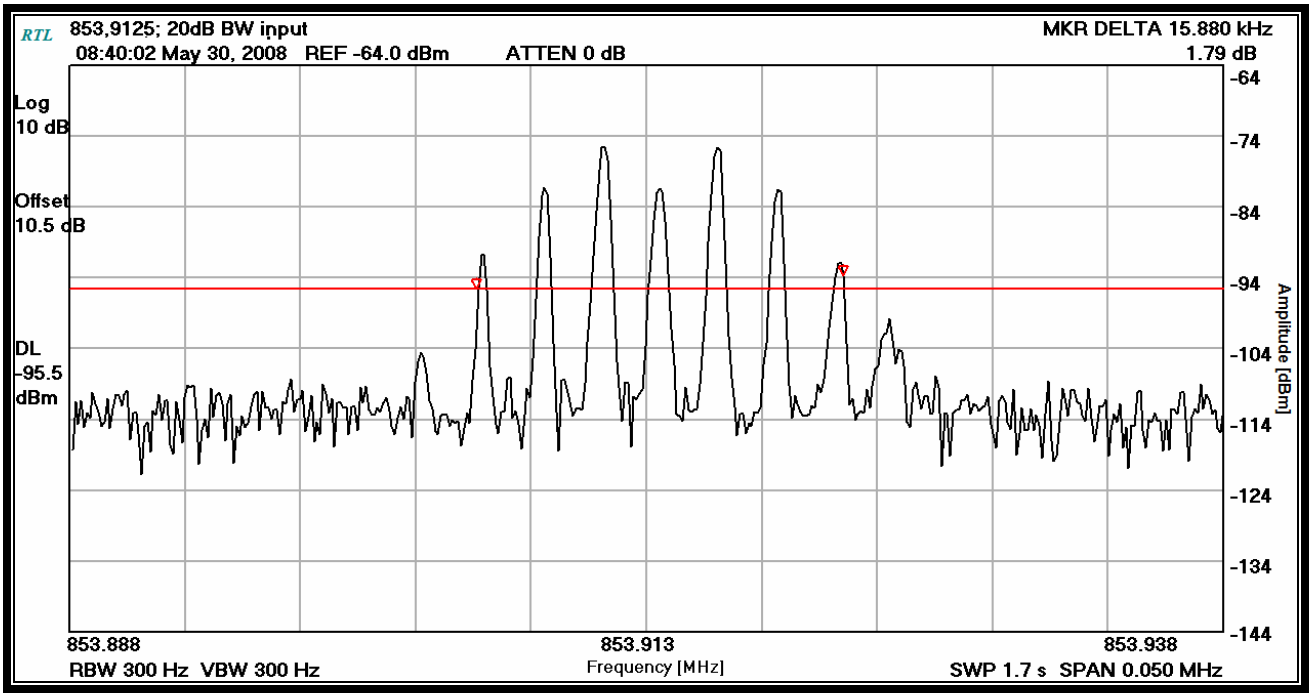
The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer. Cable losses were accounted for in measurement.

Full modulation was applied with 5 kHz deviation and a 2500 Hz tone.

## 4.2 Test Data

Bandwidth Limit: 1 MHz

**Plot 4-1: Occupied Bandwidth: Input to Booster; 20 dB Bandwidth – 853.9125 MHz**



**Plot 4-2: Occupied Bandwidth: Booster Output; 20 dB Bandwidth – 853.9125 MHz**

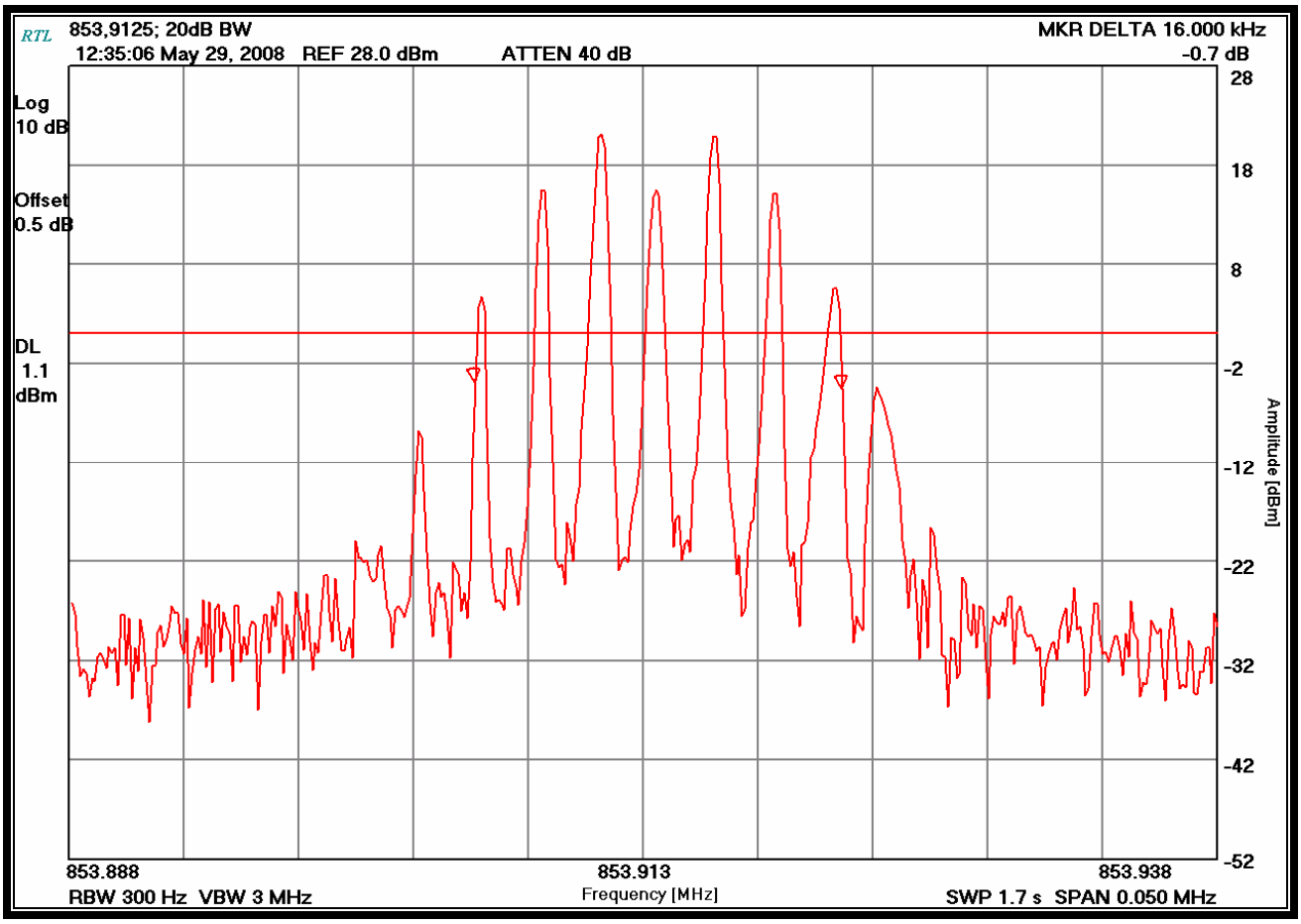


**Table 4-1: Test Equipment for Occupied Bandwidth**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due |
|---|---|---|---|---|---|
| 901215 | Hewlett Packard | 8596EM | EMC Analyzer (9 kHz–12.8 GHz) | 3826A00144 | 10/17/08 |
| 901057 | Hewlett Packard | 3336B | Synthesizer/Level Generator (100 Hz-20 MHz) | 2514A02585 | 12/13/08 |
| 901118 | Hewlett Packard | HP8901B | Modulation Analyzer (150 kHz-1300 MHz) | 2406A00178 | 8/20/08 |
| 901307 | Inmet | 6N-10dB | Attenuator 10 dB | 64671 | 1/11/09 |
| 901157 | Marconi Instruments | 2022D | Signal Generator (10 kHz-1 GHz) | 119161/056 | 12/12/08 |

**Test Personnel:**

| | | |
|---|---|---|
| Daniel Baltzell |  | May 29-30, 2008 |
| Test Technician/Engineer | Signature | Dates of Tests |

# 5 Bandwidth Rejection

## 5.1 Test Procedure

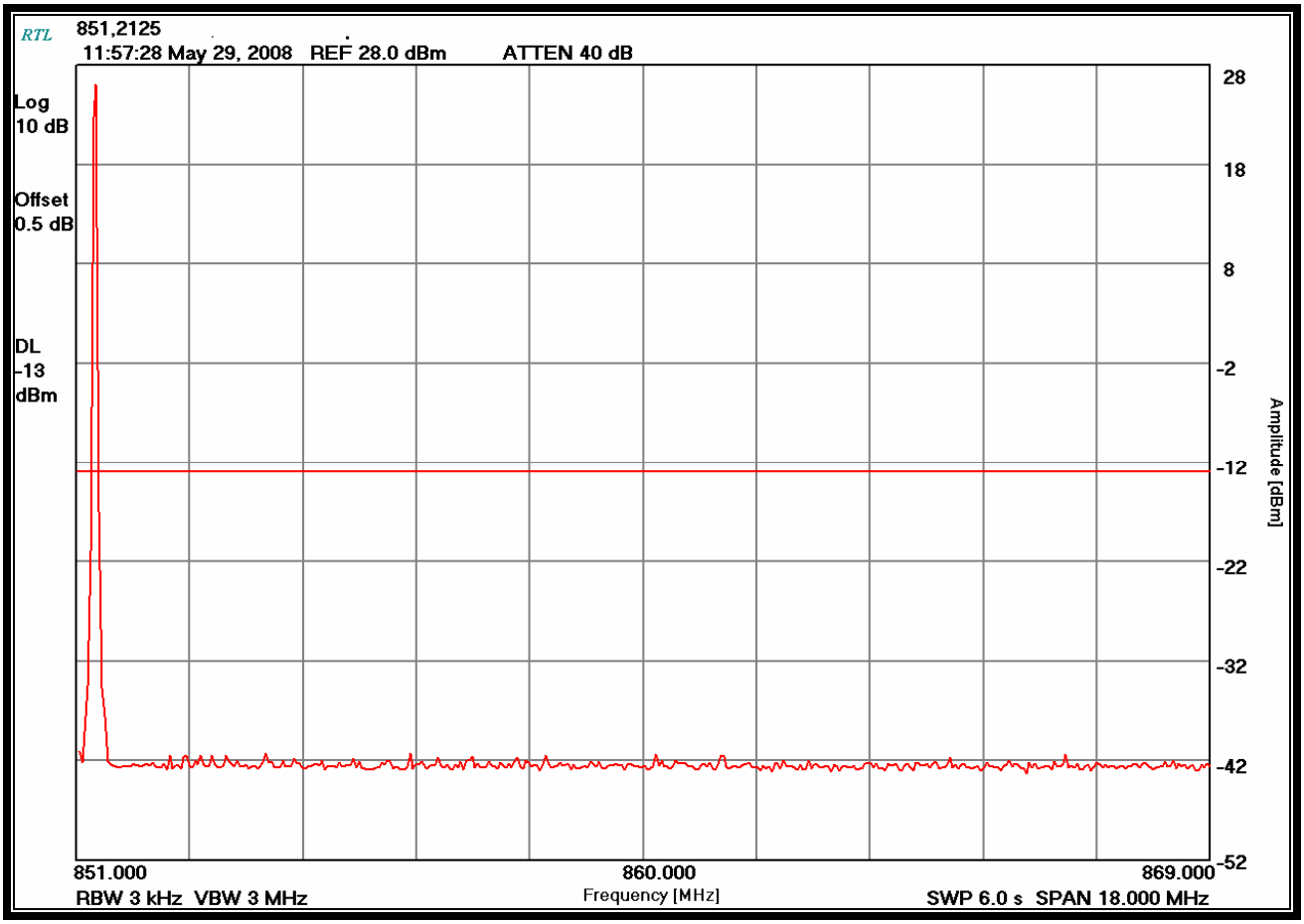
ANSI TIA-603-C-2004, Section 2.2.11.

Bandwidth rejection was performed by sweeping below and through the channel band with the spectrum analyzer on max hold. The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer. Cable losses were accounted for in measurement.

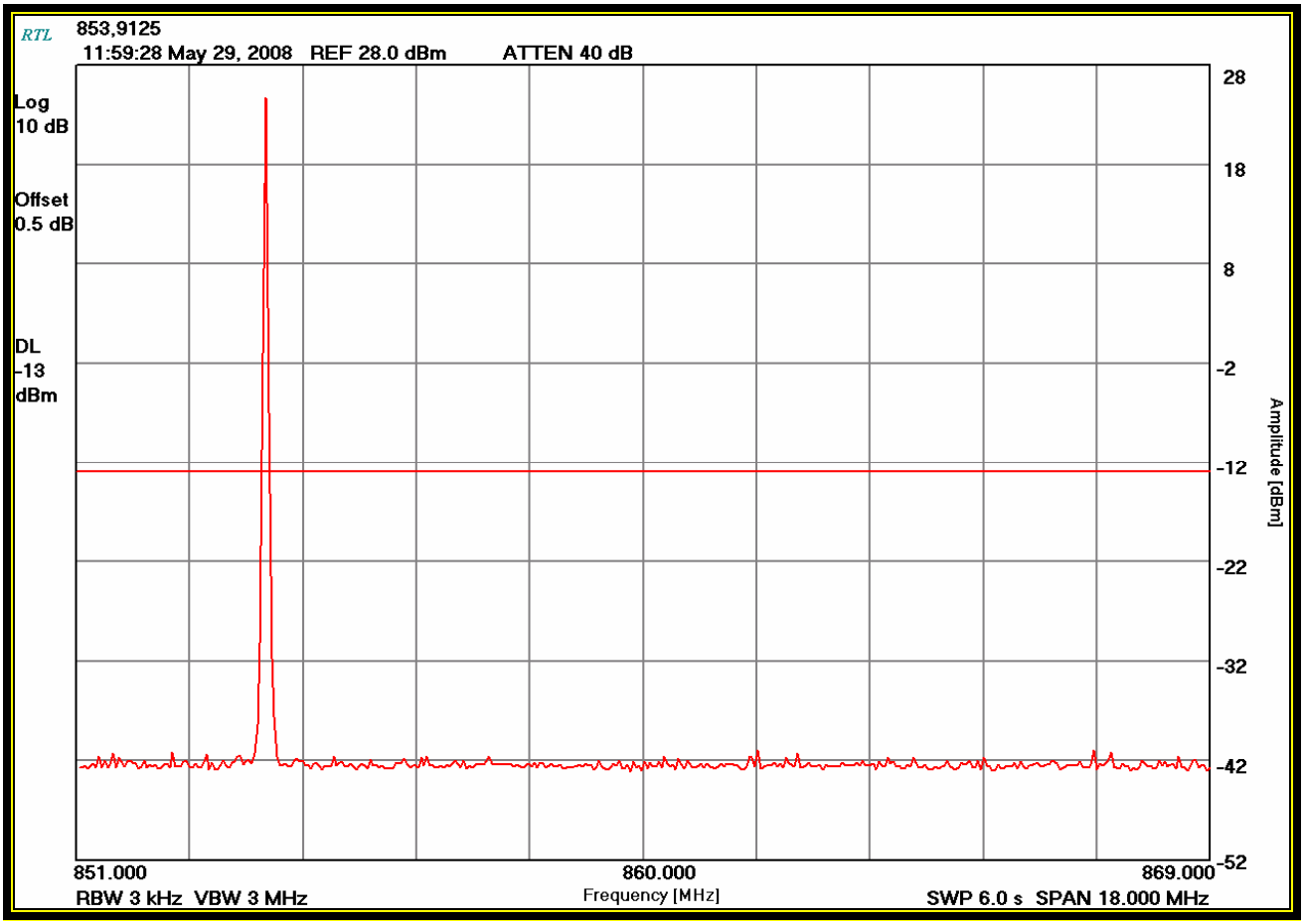
Full modulation was applied with 5 kHz deviation and a 2,500 Hz tone.

## 5.2 Test Data

**Plot 5-1: Bandwidth Rejection – 851.2125 MHz**



**Plot 5-2: Bandwidth Rejection – 853.9125 MHz**



**Plot 5-3: Bandwidth Rejection – 866.075 MHz**

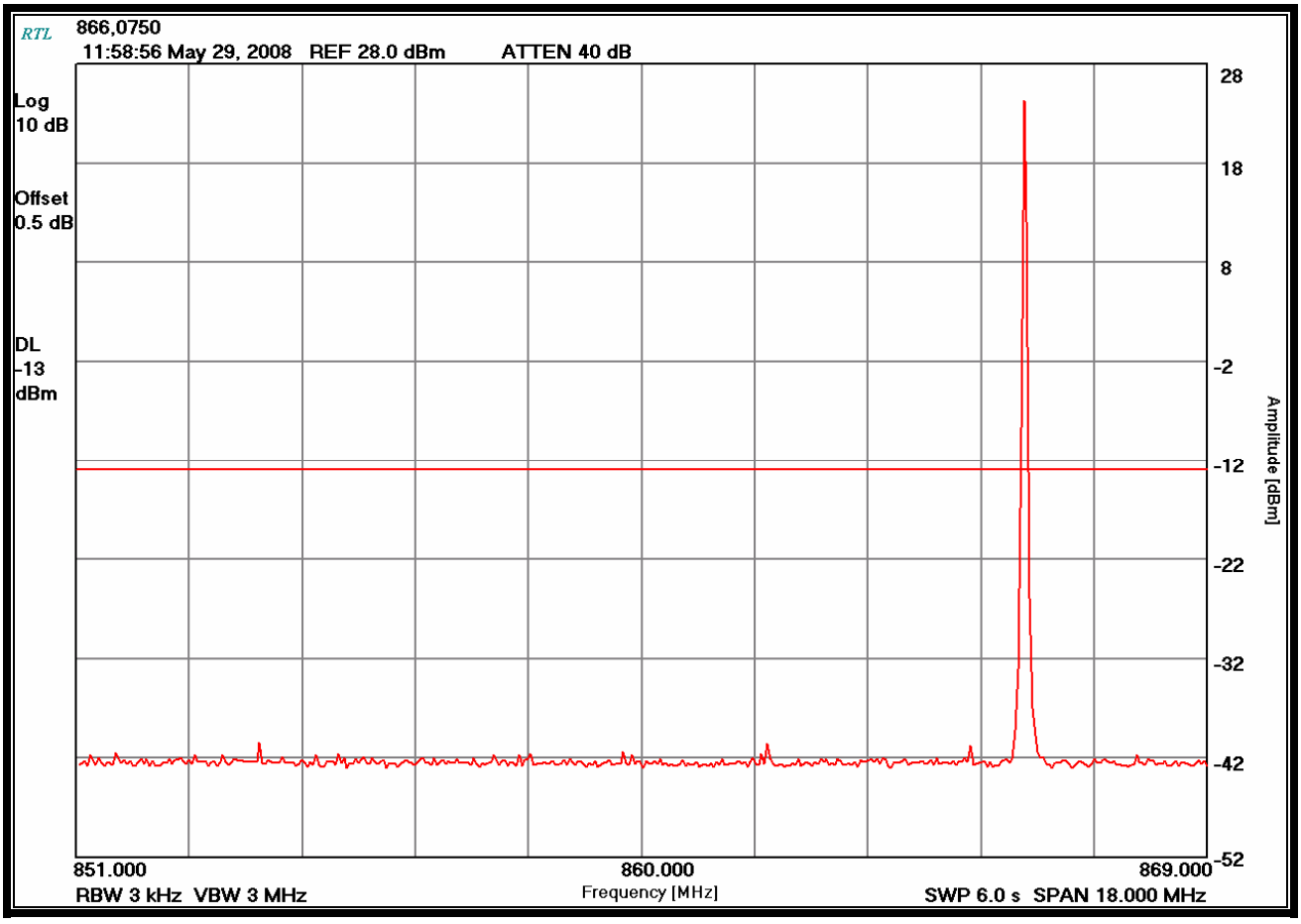
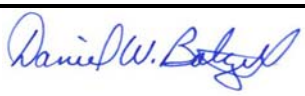


**Table 5-1: Test Equipment for Bandwidth Rejection**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due |
|---|---|---|---|---|---|
| 901215 | Hewlett Packard | 8596EM | EMC Analyzer (9 kHz–12.8 GHz) | 3826A00144 | 10/17/08 |
| 901057 | Hewlett Packard | 3336B | Synthesizer/Level Generator (100 Hz-20 MHz) | 2514A02585 | 12/13/08 |
| 901118 | Hewlett Packard | HP8901B | Modulation Analyzer (150 kHz-1300 MHz) | 2406A00178 | 8/20/08 |
| 901424 | Insulated Wire Inc. | KPS-1503-360-KPS | RF cable 36" | NA | 10/5/08 |
| 901425 | Insulated Wire, Inc. | KPS-1503-2400-KPS | RF cable, 20' | NA | 10/5/08 |
| 901157 | Marconi Instruments | 2022D | Signal Generator | 119161/056 | 12/12/08 |

**Test Personnel:**

| | | |
|---|---|---|
| Daniel Baltzell |  | May 29, 2008 |
| Test Engineer | Signature | Date of Tests |

# 6 FCC Rules and Regulations Part 2.1051: Spurious Emissions at Antenna Terminals; Part 90.210: Emissions Masks

## 6.1 Test Procedure

ANSI TIA-603-C-2004, Section 2.2.13.

The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer. Cable losses were accounted for in measurement.

## 6.2 Test Data

Frequency range of measurement per Part 2.1057: 9 kHz to 10xFc.

The worst case (unwanted emissions) channels are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

**Plot 6-1: Conducted Spurious Emissions – 853.9125 MHz**

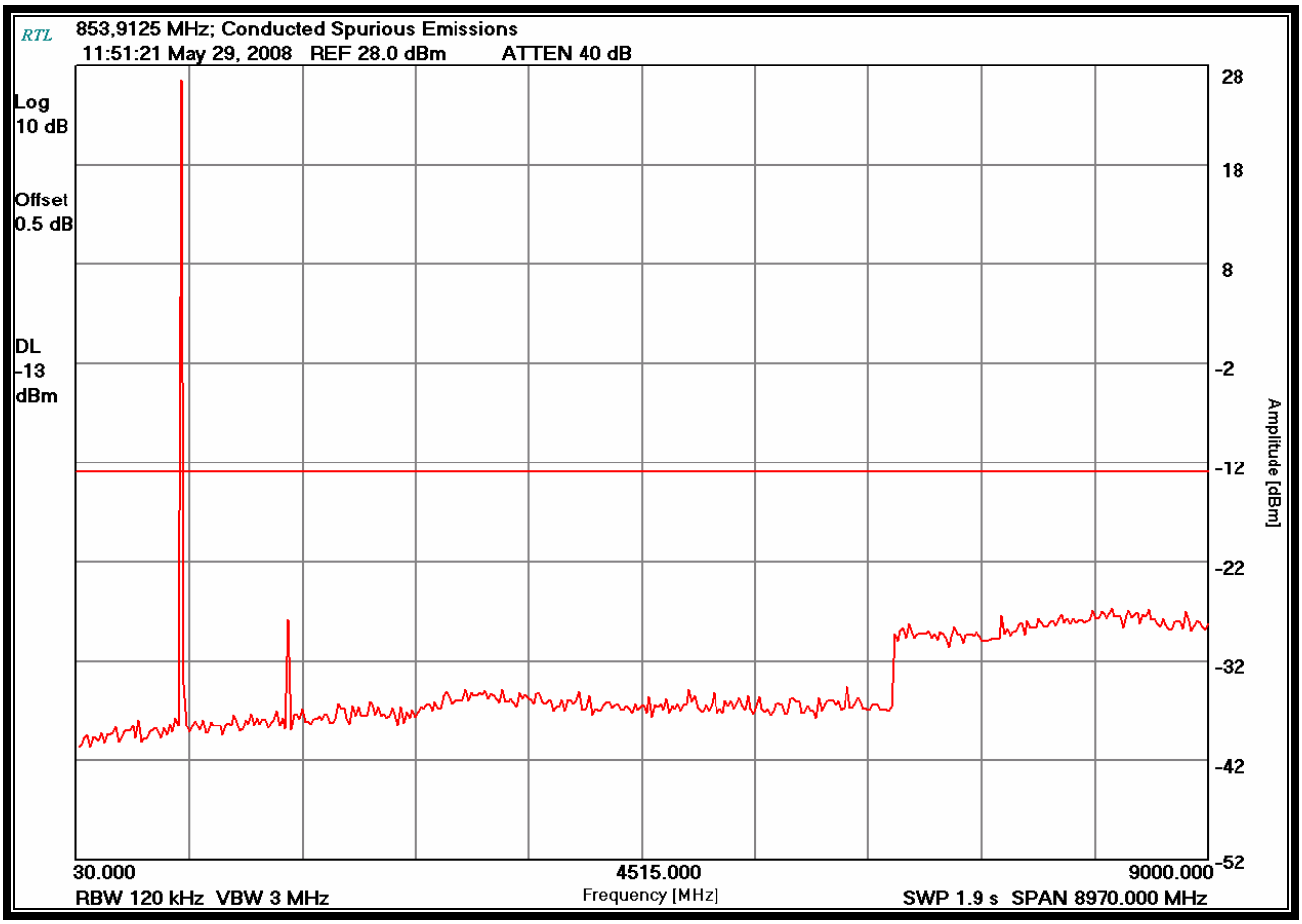
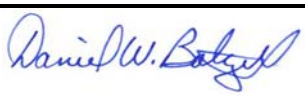


**Table 6-1: Test Equipment for Conducted Spurious Emissions**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due |
|---|---|---|---|---|---|
| 901057 | Hewlett Packard | 3336B | Synthesizer/Level Generator (100 Hz-20 MHz) | 2514A02585 | 12/13/08 |
| 901424 | Insulated Wire Inc. | KPS-1503-360-KPS | RF cable 36" | NA | 10/5/08 |
| 901425 | Insulated Wire, Inc. | KPS-1503-2400-KPS | RF cable, 20' | NA | 10/5/08 |
| 901215 | Hewlett Packard | 8596EM | EMC Analyzer (9 kHz–12.8 GHz) | 3826A00144 | 10/17/08 |
| 901157 | Marconi Instruments | 2022D | Signal Generator | 119161/056 | 12/12/08 |

**Test Personnel:**

| | | |
|---|---|---|
| Daniel Baltzell |  | May 29, 2008 |
| Test Engineer | Signature | Date of Tests |

# 7 Intermodulated Spurious Emissions

## 7.1 Test Procedure

The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer. Cable losses were accounted for in measurement. Two signal generators were used to produce interference signals. Two signals were injected on the low end of band and two signals were injected on the high end of band.

Low end: Plot 7-1
851.2125 MHz – 5 kHz deviation, 2.5 kHz tone at -50 dBm
852.2125 MHz - 5 kHz deviation, 2.5 kHz tone at -50 dBm

## 7.2 Test Data

**Plot 7-1: Intermodulated Spurious Emissions - Low Channels In-Band Intermodulation**

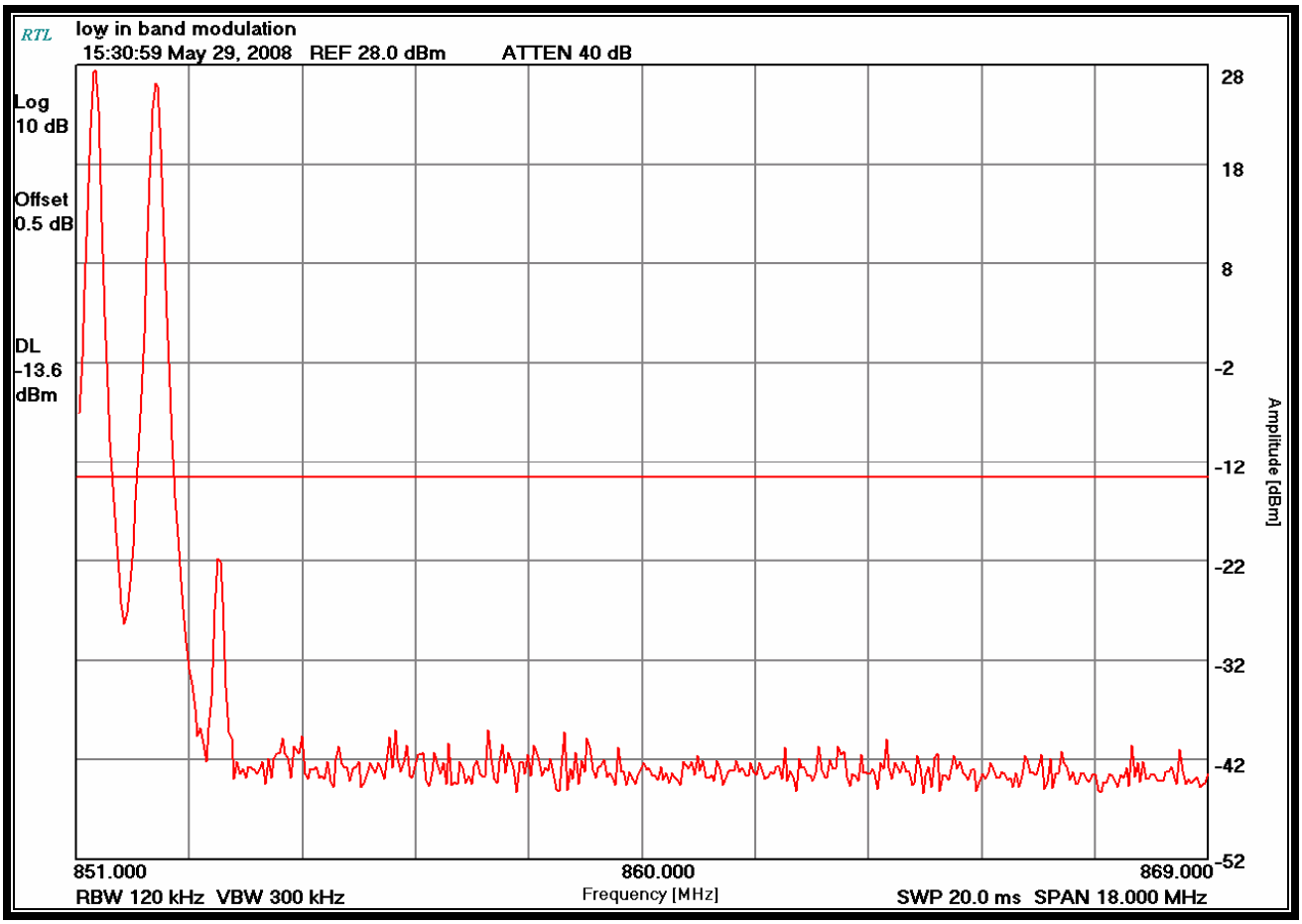
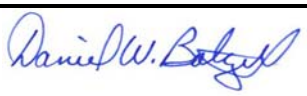


**Table 7-1: Test Equipment for Intermodulated Spurious Emissions**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due |
|---|---|---|---|---|---|
| 901215 | Hewlett Packard | 8596EM | EMC Analyzer (9 kHz–12.8 GHz) | 3826A00144 | 10/17/08 |
| 900352 | Werlatone | C1795 | Directional Coupler | 4989 | 06/06/08 |
| 901157 | Marconi Instruments | 2022D | Signal Generator | 119161/056 | N/A |
| 900917 | Hewlett Packard | 8648C | Signal Generator | 3537A01741 | 9/5/08 |
| 901057 | Hewlett Packard | 3336B | Synthesizer/Level Generator (100 Hz-20 MHz) | 2514A02585 | 12/13/08 |
| 901118 | Hewlett Packard | HP8901B | Modulation Analyzer (150 kHz–1300 MHz) | 2406A00178 | 8/20/08 |
| 901425 | Insulated Wire, Inc. | KPS-1503-2400-KPS | RF cable, 20' | NA | 10/5/08 |
| 901424 | Insulated Wire Inc. | KPS-1503-360-KPS | RF cable 36" | NA | 10/5/08 |

**Test Personnel:**

| | | |
|---|---|---|
| Daniel Baltzell |  | May 30, 2008 |
| Test Engineer | Signature | Date of Tests |

# 8 FCC Rules and Regulations Part 90.210 and Part 2.1053(a): Field Strength of Spurious Radiation

## 8.1 Test Procedure

ANSI TIA-603-C-2004, section 2.2.12.

The EUT was placed on a floor-mounted turntable at a distance of 3 meters from the receiving antenna. The receiving antenna was varied between 1–4 meters to maximize emissions. The spurious emissions levels were measured and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half wave dipole.

The output was terminated with 50 Ω load.

## 8.2 Test Data

### 8.2.1 CFR 47 Part 90.210 Requirements

Limit: P(dBm) – (43 + 10xLOG P(W)) = 39.6 dBc

The following investigation revealed these frequencies to be the only amplitudes which were within 20 dB of the limit.

**Table 8-1: Field Strength of Spurious Radiation; 853.9125 MHz (Vertical Polarity)**

| Frequency (MHz) | Spectrum Analyzer Level (dBuV) | Signal Generator Level (dBm) | Cable Loss (dB) | Antenna Gain (dBd) | Corrected Signal Generator Level (dBc) | Margin (dB) |
|---|---|---|---|---|---|---|
| 2561.7375 | 76.4 | -18.5 | 11.7 | 7.2 | 49.6 | -10.0 |
| 3415.6500 | 54.9 | -29.1 | 11.1 | 7.5 | 59.3 | -19.7 |

**Table 8-2: Field Strength of Spurious Radiation; 853.9125 MHz (Horizontal Polarity)**

| Frequency (MHz) | Spectrum Analyzer Level (dBuV) | Signal Generator Level (dBm) | Cable Loss (dB) | Antenna Gain (dBd) | Corrected Signal Generator Level (dBc) | Margin (dB) |
|---|---|---|---|---|---|---|
| 2561.7375 | 77.2 | -18.1 | 11.7 | 7.2 | 49.2 | -9.6 |
| 3415.6500 | 55.3 | -29.3 | 11.1 | 7.5 | 59.5 | -19.9 |

**Table 8-3: Test Equipment for Field Strength of Spurious Radiation**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due |
|---|---|---|---|---|---|
| 901053 | Schaffner-Chase | CBL6112 | Antenna (25 MHz–2 GHz) | 2648 | 12/20/08 |
| 901365 | MITEQ | JS4-00102600-41-5P | Amplifier, 0.1-26 GHz, 30dB gain | N/A | 10/8/08 |
| 901215 | Hewlett Packard | 8596EM | Portable Spectrum Analyzer (9 kHz–12.8 GHz) | 3826A00144 | 10/17/08 |
| 900928 | Hewlett Packard | HP 83752A | Synthesized Sweeper (.01–20 GHz) | 3610A00866 | 12/7/08 |
| 900772 | EMCO | 3161-02 | Horn Antenna (2–4 GHz) | 9504-1044 | 6/14/10 |
| 900321 | EMCO | 3161-03 | Horn Antenna (4–8 GHz) | 9508-1020 | 6/14/10 |
| 900323 | EMCO | 3160-07 | Horn Antenna (8.2-12.4 GHz) | 9605-1054 | 6/14/10 |
| 900814 | Electrometrics | RGA-60 | Double Ridge Horn Antenna (1–18 GHz) | 2310 | 3/30/09 |
| 901424 | Insulated Wire Inc. | KPS-1503-360-KPS | RF cable 36" | NA | 10/5/08 |
| 901425 | Insulated Wire, Inc. | KPS-1503-2400-KPS | RF cable, 20' | NA | 10/5/08 |
| 901426 | Insulated Wire Inc. | KPS-1503-3600-KPS | RF cable, 30' | NA | 10/5/08 |

**Test Personnel:**

| | | |
|---|---|---|
| Daniel Baltzell |  | May 28, 2008 |
| Test Engineer | Signature | Date of Tests |

## 9 Conclusion

The data in this measurement report shows that the **Airorlite Communications, Inc**. **Model 50289-BAM-8-800-DL, FCC ID: UT650289BAM8800DL,** complies with all the applicable requirements of FCC Parts 90 and 2.