



Engineering and Testing for EMC and Safety Compliance

## TYPE CERTIFICATION REPORT

UTStarcom, Inc.  
33 Wood Avenue South  
3<sup>rd</sup> Floor  
Iselin, NJ 08830  
732-767-5263 (Scott Black)

**MODEL: UTS-EA7T56B**

**FCC ID: O6YUTS- EA7T56B**

*September 21, 2000*

| STANDARDS REFERENCED FOR THIS REPORT |                                                                                        |
|--------------------------------------|----------------------------------------------------------------------------------------|
| PART 2: 1999                         | FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS          |
| PART 15: 1999                        | §15.109: RADIATED EMISSIONS LIMITS                                                     |
| PART 24 (E): 1998                    | PERSONAL COMMUNICATIONS SERVICES – BROADBAND PCS                                       |
| ANSI C63.4-1992                      | STANDARD FORMAT MEASUREMENT/TECHNICAL REPORT PERSONAL COMPUTER AND PERIPHERALS         |
| ANSI/TIA/EIA603- 1992                | LAND MOBILE FM OR PM COMMUNICATIONS EQUIPMENT<br>MEASUREMENT AND PERFORMANCE STANDARDS |
| ANSI/TIA/EIA 603-1-1998              | ADDENDUM TO ANSI/TIA/EIA 603-1992                                                      |

| FCC Rules Parts | Frequency Range | Output Power<br>(W) | Freq. Tolerance | Emission Designator |
|-----------------|-----------------|---------------------|-----------------|---------------------|
| 24(E)           | 1895-1910 MHz   | 0.155               | 13 ppm          | 283KDXW             |

### REPORT PREPARED BY:

EMC Engineer: Rachid Sehb  
Administrative Assistant: Melissa Fleming

**Document Number: 2000461 / QRTL00-389**

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## 1 GENERAL INFORMATION

The following Report of a Type Certification, is prepared on behalf of **UTStarcom, Inc.** in accordance with the Federal Communications Commissions Rules and Regulations. The Equipment Under Test (EUT) was the **UTS-EA7T56B; FCC ID: O6YUTS-EA7T56B**. 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 FCC Rules and Regulations CFR 47 and ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 1992. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

### 3.1 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 Communication Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

### 1.1 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application report.



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## 2 CONFORMANCE STATEMENT

We, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this attached test record. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to or exclusions from the FCC Rules and Regulations CFR 47, Part 2 and Part 24 Certification methodology.

Signature: 

Date: September 21, 2000

Typed/Printed Name: Bruno Clavier

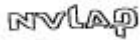
Position: Vice President of Operations  
(NVLAP Signatory)

Signature: 

Date: September 21, 2000

Typed/Printed Name: Rachid Sehb

Position: EMC Engineer



Accredited by the National Voluntary Accreditation Program for the specific scope of accreditation under Lab Code 200061-0.

**Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.**



### 3 EMISSIONS TEST EQUIPMENT LIST

| RTL equipment for emission testing |                                   |                    |                                                 |               |                      |
|------------------------------------|-----------------------------------|--------------------|-------------------------------------------------|---------------|----------------------|
| RTL Asset Number                   | Manufacturer                      | Model              | Part Type                                       | Serial Number | Calibration due date |
| 900969                             | Hewlett Packard                   | 85650A             | Quasi-Peak Adapter (30 Hz – 40 GHz)             | 2412A00414    | 03/23/01             |
| 900929                             | Hewlett Packard                   | 85650A             | Quasi-Peak Adapter (30 Hz – 40 GHz)             | 2811A01276    | 03/28/01             |
| 900901                             | Hewlett Packard                   | 85650A             | Quasi-Peak Adapter (30 Hz – 40 GHz)             | 3145A01599    | 11/09/00             |
| 900339                             | Hewlett Packard                   | 85650A             | Quasi-Peak Adapter (30 Hz – 40 GHz)             | 2521A00743    | 03/27/01             |
| 900042                             | Hewlett Packard                   | 85650A             | Quasi-Peak Adapter (30 Hz – 40 GHz)             | 2521A01032    | 11/09/00             |
| 900933                             | Hewlett Packard                   | 11975A             | Power Amplifier (2 - 8 GHz)                     | 2304A00348    | 11/10/00             |
| 901067                             | Hewlett Packard                   | 8903B              | Audio Analyzer                                  | 2303A00307    | 06/28/01             |
| 900968                             | Hewlett Packard                   | 8567A              | Spectrum Analyzer (10 kHz - 1.5 GHz)            | 2602A00160    | 03/23/01             |
| 900903                             | Hewlett Packard                   | 8567A              | Spectrum Analyzer (10 kHz - 1.5 GHz)            | 2841A00614    | 11/09/00             |
| 900897                             | Hewlett Packard                   | 8567A              | Spectrum Analyzer (10 kHz - 1.5 GHz)            | 2727A00535    | 11/09/00             |
| 901089                             | Hewlett Packard                   | HP875ET            | Transmission/Reflection Network Analyzer        | US39170052    | N/A                  |
| 901055                             | Hewlett Packard                   | 8901A Opt. 002-003 | Modulation Analyzer                             | 2545A04102    | 06/08/01             |
| 901020                             | Hewlett Packard                   | 8564E              | Portable Spectrum Analyzer (9 kHz - 40 GHz)     | 3943A01719    | 03/06/01             |
| 901016                             | Hewlett Packard                   | 8565E              | Portable Spectrum Analyzer (30 Hz-50 GHz)       | 3846A01069    | 02/28/01             |
| 900931                             | Hewlett Packard                   | 8566B              | Spectrum Analyzer (100 Hz - 22 GHz)             | 3138A07771    | 03/27/01             |
| 900926                             | Hewlett Packard                   | 8753D              | RF Vector Network Analyzer                      | 3410A09659    | 03/28/01             |
| 900912                             | Hewlett Packard                   | 8568A              | RF Spectrum Analyzer (100 Hz - 1.5 GHz)         | 2634A02704    | 08/02/01             |
| 900824                             | Hewlett Packard                   | 8591E              | RF Spectrum Analyzer (9 KHz - 1.8 GHz)          | 3710A06135    | 11/10/00             |
| 901088                             | Hewlett Packard                   | HP8954A            | Transceiver Interface                           | 2146A00139    | 07/28/01             |
| 901057                             | Hewlett Packard                   | 3336B              | Synthesizer/Level Generator                     | 2514A02585    | 06/21/01             |
| 900151                             | Rohde@Schwarz                     | HFH2-Z2            | Loop Antenna (9 kHz - 30 MHz)                   | 827525/019    | 05/26/01             |
| 900800                             | EMCO                              | 3301B              | Active Monopole                                 | 9809-4071     | 05/02/01             |
| 900154                             | Compliance Design Inc,            | Roberts Dipole     | Adjustable Elements Dipole Antenna (30-1000MHz) | -             | 07/266/01            |
| 900725                             | Antenna Research Associates, Inc. | LPB-2520           | LOG Periodic /Biconical Antenna (25-1000MHz)    | 1036          | 07/12/01             |
| 900724                             | Antenna Research Associates, Inc. | LPB-2520           | LOG Periodic /Biconical Antenna (25-1000MHz)    | 1037          | 02/01/01             |
| 901053                             | Schaffner                         | CBL6112B           | Bi-Log Chase Antenna (200 MHz – 2 GHz)          | 2648          | 07/24/01             |
| 900713                             | ATM                               | WR05               | Horn Antennas (140-220 GHz)                     | 05-443-6      | N/A                  |
| 900826                             | ATM                               | WR08,              | Horn Antennas (50-220 GHz)                      | 8041904-1     | N/A                  |
| 900711                             | ATM                               | WR10               | Horn Antennas (75-110 GHz)                      | 8051905-1     | N/A                  |
| 900712                             | ATM                               | WR15               | Horn Antennas (50-75 GHz)                       | 8051805-1     | N/A                  |
| 900814                             | Electro-Metrics                   | RGA-60             | Double Ridges Guide Antenna (1-18 GHz)          | 2310          | 02/26/01             |
| 900791                             | Schaffner - Chase                 | CBL6112            | Antenna (25 MHz - 2 GHz)                        | 2099          | 02/22/01             |
| 900321                             | EMCO                              | 3161-03            | Horn Antennas (4-8,2GHz)                        | 9508-1020     | N/A                  |
| 900323                             | EMCO                              | 3160-7             | Horn Antennas (8,2-12,4 GHz)                    | 9605-1054     | N/A                  |
| 900325                             | EMCO                              | 3160-9             | Horn Antennas (18 - 26.5 GHz)                   | 9605-1051     | N/A                  |
| 900338                             | EMCO                              | 3160-10            | Horn Antennas (26.5 - 40 GHz)                   | 9606-1033     | N/A                  |
| 900970                             | Hewlett Packard                   | 85662A             | Spectrum Analyzer Display                       | 254211239     | 03/23/01             |
| 900930                             | Hewlett Packard                   | 85662A             | Spectrum Analyzer Display                       | 3144A20839    | 03/28/01             |
| 900911                             | Hewlett Packard                   | 85662A             | Spectrum Analyzer Display                       | 2542A12739    | 08/02/01             |



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## RTL equipment for emission testing

| RTL Asset Number | Manufacturer             | Model         | Part Type                                         | Serial Number | Calibration due date |
|------------------|--------------------------|---------------|---------------------------------------------------|---------------|----------------------|
| 900902           | Hewlett Packard          | 85662A        | Spectrum Analyzer Display                         | 2848A17585    | 11/09/00             |
| 900896           | Hewlett Packard          | 85662A        | Spectrum Analyzer Display                         | 2816A16471    | 11/09/00             |
| 900914           | Hewlett Packard          | 85460A        | RF Filter Section, (100 KHz to 6.5 GHz)           | 3330A00107    | 05/10/00             |
| 900059           | Hewlett Packard          | 8660C         | Synthesized Signal Generator (9KHz to 3200 MHz)   | 1947A02956    | 11/09/00             |
| 900960           | Hewlett Packard          | 8444A         | Tracking Generator (0.5 -1500MHz)                 | 2325A07827    | 03/08/01             |
| 900917           | Hewlett Packard          | 8648C         | Synthesized. Signal Generator (9 KHz to 3200 MHz) | 3537A01741    | 03/28/00             |
| 900660           | Philips                  | PM-5418TDS    | TV Generator                                      | LO 604891     | 11/10/00             |
| 901083           | AFJ International        | LS16/110VAC   | LISN, 16A                                         | 16010020080   | 06/16/01             |
| 901082           | AFJ International        | LS16/110VAC   | LISN, 16A                                         | 16010020081   | 06/16/01             |
| 901084           | AFJ International        | LS16/110VAC   | LISN, 16A                                         | 16010020082   | 06/16/01             |
| 900726           | Solar                    | 7225-1        | LISN                                              | -             | 03/29/01             |
| 900727           | Solar                    | 7225-1        | LISN                                              | -             | 03/29/01             |
| 901090           | Bajog electronic GmbH    | 4V-100/200    | LISN (150 kHz – 30 MHz)                           | 00-44-007     | 08/03/00             |
| 901054           | Hewlett Packard          | HP 3586B      | Selective Level Meter                             | 1928A01892    | 06/08/01             |
| 900126           | Hewlett Packard          | 11970A        | Harmonic Mixer (26-40 GHz)                        | 2332A01199    | 11/10/02             |
| 900396           | Hewlett Packard          | 11970K        | Harmonic Mixer (18-26 GHz)                        | 2332A00563    | 11/00/02             |
| 900717           | Hewlett Packard          | 11970U        | Harmonic Mixer (40-60 GHz)                        | 2332A01110    | 06/18/01             |
| 900715           | Hewlett Packard          | 11970V        | Harmonic Mixer (50-75 GHz)                        | 2521A00512    | 06/18/01             |
| 900716           | Hewlett Packard          | 11970W        | Harmonic Mixer (75-110 GHz)                       | 2521A00710    | 06/12/01             |
| 900752           | Oleson Microwave Lab.    | M05HW         | Mixer (140-700 GHz)                               | G80814-1      | 08/14/01             |
| 900751           | Oleson Microwave Lab.    | M08HW         | Mixer (90-140 GHz)                                | F80814-1      | 08/14/01             |
| 900770           | Hewlett Packard          | 437B          | Power Meter                                       | 2949A02966    | 11/09/00             |
| 900769           | Hewlett Packard          | 8481B         | Power Sensor                                      | 2702A05059    | 11/09/00             |
| 900061           | Hewlett Packard          | 86603A        | RF Plug-in (1 to 2600 MHz)                        | 2221A02967    | 11/09/00             |
| 900932           | Hewlett Packard          | 8449B OPT H02 | Preamplifier (1-26.5 GHz)                         | 3008A00505    | 11/10/00             |
| 900889           | Hewlett Packard          | 85685A        | RF Preselector for HP 8566B or 8568B (20Hz -2GHz) | 3146A01309    | 11/10/00             |
| 900913           | Hewlett Packard          | 85462A        | EMI Receiver RF Section (9 KHz – 6.5 GHz)         | 3325A00159    | 03/29/01             |
| 900937           | Hewlett Packard          | 8482H         | 3-watt Power Sensor (100 KHz to 4.2 GHz)          | 3318A08961    | 07/18/00             |
| 900928           | Hewlett Packard          | 83752A        | Synthesized Sweeper, 0.01 to 20 GHz               | 3610A00866    | 03/28/01             |
| 900946           | Tenney Engineering, Inc. | TH65          | Temperature Chamber with Humidity                 | 11380         | 09/22/00             |



### 3.1 TESTED SYSTEM DETAILS

Listed below is the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable.

#### 3.1.1 External Components

| PART                   | MANUFACTURER    | MODEL       | SERIAL NUMBER     | FCC ID | CABLE DESCRIPTION | RTL BAR CODE |
|------------------------|-----------------|-------------|-------------------|--------|-------------------|--------------|
| DC-AC INVERTER         | BCT             | HR-3301SC   | 1011999030-120226 | N/A    |                   |              |
| ADVANCED MICRO DESIGNS | UTSTARCOM, INC. | RPC-SIM     | 1011998101320222  | N/A    |                   |              |
| CHASSIS/PARTS          | UTSTARCOM, INC. | A-ABPM      | 10111999101020374 | N/A    |                   | 012709       |
| ROD ANTENNA            | UTSTARCOM, INC. | HTQ-1.9-7.2 | 00264             | N/A    |                   | 012727       |
| ROD ANTENNA            | UTSTARCOM, INC. | HTQ-1.9-7.2 | 00849             | N/A    |                   | 012724       |
| MAIN SHELF             | UTSTARCOM, INC. | EC-H11940-A | SB002372          | N/A    |                   | 012353       |
| OUTDOOR RADIO PORT     | UTSTARCOM, INC. | EA-7T56B    | SB0001402         | N/A    |                   | 012721       |

#### 3.1.2 Internal Components

| PART                       | MANUFACTURER    | MODEL               | SERIAL NUMBER            | FCC ID | CABLE DESCRIPTION | RTL BAR CODE |
|----------------------------|-----------------|---------------------|--------------------------|--------|-------------------|--------------|
| ENHANCED MAIN CONTROL CARD | UTSTARCOM, INC. | EC-C10967A          | 9B001884                 | N/A    | N/A               | 12718        |
| RP INTERFACE CARD          | UTSTARCOM, INC. | EC-L12999B          | 9B015071                 | N/A    | N/A               | 12719        |
| E1 INTERFACE CARD          | UTSTARCOM, INC. | EC-L12998B          | 02007282                 | N/A    | N/A               | 12716        |
| E1 INTERFACE CARD          | UTSTARCOM, INC. | A-E1M2              | NA                       | NA     | NA                | 12713        |
| SCM CARD                   | UTSTARCOM, INC. | A-SCM2              | NA                       | NA     | NA                | 12715        |
| PSM CARD                   | UTSTARCOM, INC. | A-PSM2              | NA                       | NA     | NA                | 12710        |
| DC-DC CONVERTER            | UTSTARCOM, INC. | AP10251B<br>AP10257 | 99K2380 8A<br>99K2408 AC | NA     | UNSHIELDED        | 12723        |

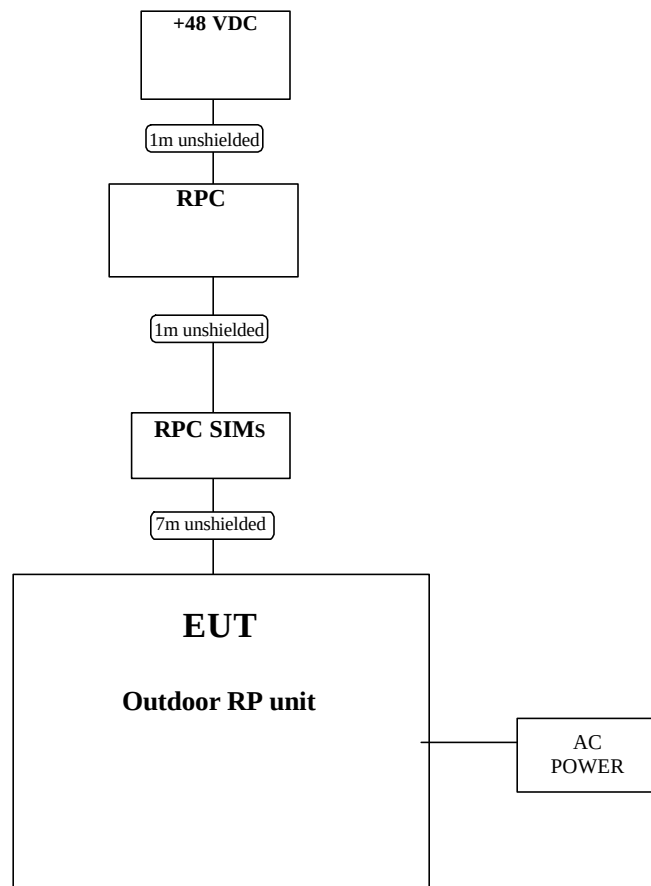


### 3.2 MODIFICATION

The following modifications were implemented on the Digital Interface controlling and powering the transmitter in order to be compliant with the FCC Rules and Regulations.

- Schaffner filter on the AC line input ( 2060-16)
- 100 pf and 1nf in parallel on the communication at the I/O of the RPC
- Ring ferrite on the communication line ( 6 turns) ( fair rite 2643803802)

### 3.3 CONFIGURATION OF TESTED SYSTEM





### 3.4 FIELD STRENGTH CALCULATION

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

$$FI(\text{dBuV/m}) = SAR(\text{dBuV}) + SCF(\text{dB/m})$$

FI = Field Intensity

SAR = Spectrum Analyzer Reading

SCF = Site Correction Factor

The Site Correction Factor (SCF) used in the above equation is determined empirically, and is expressed in the following equation:

$$SCF(\text{dB/m}) = -PG(\text{dB}) + AF(\text{dB/m}) + CL(\text{dB})$$

SCF = Site Correction Factor

PG = Pre-amplifier Gain

AF = Antenna Factor

CL = Cable Loss

The field intensity in microvolts per meter can then be determined according to the following equation:

$$FI(\text{uV/m}) = 10^{FI(\text{dBuV/m})/20}$$

For example, assume a signal at a frequency of 125 MHz has a received level measured as 49.3 dBuV. The total Site Correction Factor (antenna factor plus cable loss minus preamplifier gain) for 125 MHz is -11.5 dB/m. The actual radiated field strength is calculated as follows:

$$49.3 \text{ dBuV} - 11.5 \text{ dB/m} = 37.8 \text{ dBuV/m}$$

$$10^{37.8/20} = 10^{1.89} = 77.6 \text{ uV/m}$$



#### 4 CONDUCTED EMISSIONS – POWER LINES

The device is operated with +110 VAC.

NEUTRAL SIDE (Line 1)

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC B Limit (dBuV) | FCC B Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|--------------------|---------------------|
| 6.783                    | Pk            | 32.7                    | -2.2                        | 30.5                  | 48.0               | -17.5               |
| 10.880                   | Pk            | 44.2                    | -2.8                        | 41.4                  | 48.0               | -6.6                |
| 16.256                   | Qp            | 40.7                    | -3.5                        | 37.2                  | 48.0               | -10.8               |
| 17.791                   | Qp            | 48.7                    | -3.7                        | 45.0                  | 48.0               | -3.0                |
| 21.888                   | Qp            | 48.9                    | -4.0                        | 44.9                  | 48.0               | -3.1                |
| 25.983                   | Pk            | 46.3                    | -4.2                        | 42.1                  | 48.0               | -5.9                |

HOT SIDE (Line 2)

| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC B Limit (dBuV) | FCC B Margin (dBuV) |
|--------------------------|---------------|-------------------------|-----------------------------|-----------------------|--------------------|---------------------|
| 10.879                   | Pk            | 44.8                    | -2.8                        | 42.0                  | 48.0               | -6.0                |
| 15.369                   | Pk            | 48.6                    | -3.4                        | 45.2                  | 48.0               | -2.8                |
| 16.343                   | Qp            | 43.6                    | -3.5                        | 40.1                  | 48.0               | -7.9                |
| 17.023                   | Qp            | 42.2                    | -3.6                        | 38.6                  | 48.0               | -9.4                |
| 17.791                   | Qp            | 48.8                    | -3.7                        | 45.1                  | 48.0               | -2.9                |
| 21.887                   | Qp            | 48.9                    | -4.0                        | 44.9                  | 48.0               | -3.1                |



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## 5 RADIATED MEASUREMENT

Before final measurements of radiated emissions were made on the open-field three meter range, the EUT was scanned indoors at a three meter distance in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to insure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three-meter, open-field test site. The EUT was placed on a nonconductive turntable approximately 0.8 meters above the ground plane.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations.

*Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech quality manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.*



## 6 FCC RULES AND REGULATIONS PART 2 §2.1046 (A): RF POWER OUTPUT: CONDUCTED – PART 24.232(C)

### 6.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.1

The EUT was connected to a coaxial attenuator having a 50  $\Omega$  load impedance.

### 6.2 TEST DATA

The following channel were tested: **Channel 1=1895.15 MHz; Channel 25 = 1902.35 MHz; Channel 50 = 1909.95 MHz**

The worst-case Output Power (highest) levels are shown.

#### Conducted Power measurement:

| Frequency<br>(MHz) | Conducted Power<br>Output Level<br>(dBm) | Conducted Power<br>Output Level<br>(mW) | Method  |
|--------------------|------------------------------------------|-----------------------------------------|---------|
| 1895.15            | 31.0                                     | 1258.9                                  | Peak    |
| 1895.15            | 21.9                                     | 155.0                                   | Average |



## **7 PART 2.1046 (A) RF POWER OUTPUT: RADIATED – EIRP PART 24.232**

### **7.1 TEST PROCEDURE**

#### **7.1.1 Methodology of the EIRP**

The EUT was setup at an antenna to EUT distance of 3 meters on an open area test site. The EUT was placed on a nonconductive turntable approximately 0.8 meters above the ground plane.

The physical arrangement of the EUT and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations.

The worst-case, maximum radiated emission was recorded and used as reference for the EIRP measurement.

A power measurement has been performed for each channel, this value has been corrected by the site correction factor ( cable loss, gain of the preamplifier, antenna factor) and by the path loss

$$P_{Watt} = \frac{E_{v/m}^2 \times d_m^2}{30}$$

The value obtained represents the EIRP .



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## 7.2 TEST DATA

Information:

- Theoric antenna gain 5 (7dBi)
- Duty Cycle 12.5%

**Channel 1=1895.15 MHz; Channel 25 = 1902.35 MHz; Channel 50 = 1909.95 MHz**

| Frequency<br>(M Hz) | Emission*<br>Level<br>(dBuV) | Site<br>Factor (dB/m) | Emission<br>Level<br>(dBuV/m) | Calculated<br>EIRP<br>(mW) | Comments |
|---------------------|------------------------------|-----------------------|-------------------------------|----------------------------|----------|
| 1895.157            | 121.3                        | 9.4                   | 132.7                         | 5585                       | Pk       |
| 1895.157            | 102.4                        | 9.4                   | 123.9                         | 740                        | Av       |
| 1902.340            | 121.8                        | 9.6                   | 131.5                         | 4237.5                     | Pk       |
| 1902.340            | 101.5                        | 9.6                   | 122.4                         | 530.0                      | Av       |
| 1909.832            | 122.2                        | 9.6                   | 131.9                         | 4649                       | Pk       |
| 1909.879            | 101.4                        | 9.6                   | 122.8                         | 581.0                      | Av       |

\*Measurement accuracy is +/- 1.5 dB

- Spectrum analyzer was set to RBW/VBW 2Mhz/1Mhz for the peak measurement.
- Spectrum analyzer was set to RBW/VBW 1Mhz/10Hz for the average measurement



## **8 PART 2 §2.1051: SPURIOUS EMISSIONS AT ANTENNA TERMINALS – PART 24.238**

### **8.1 TEST PROCEDURE**

ANSI/TIA/EIA-603-1992, Section 2.2.13

The transmitter antenna terminal is connected with the 50  $\Omega$  impedance input to the spectrum analyzer.

### **8.2 TEST DATA**

Frequency range of measurement per Part 2.1057: 9kHz to 10 x Fc

Limits: (dBm):  $P(\text{dBm}) - (43 + 10 \times \text{LOG } P(\text{W}))$

The following channels were investigated: 1895.15 MHz, 1902.35 MHz, and 1909.95 MHz

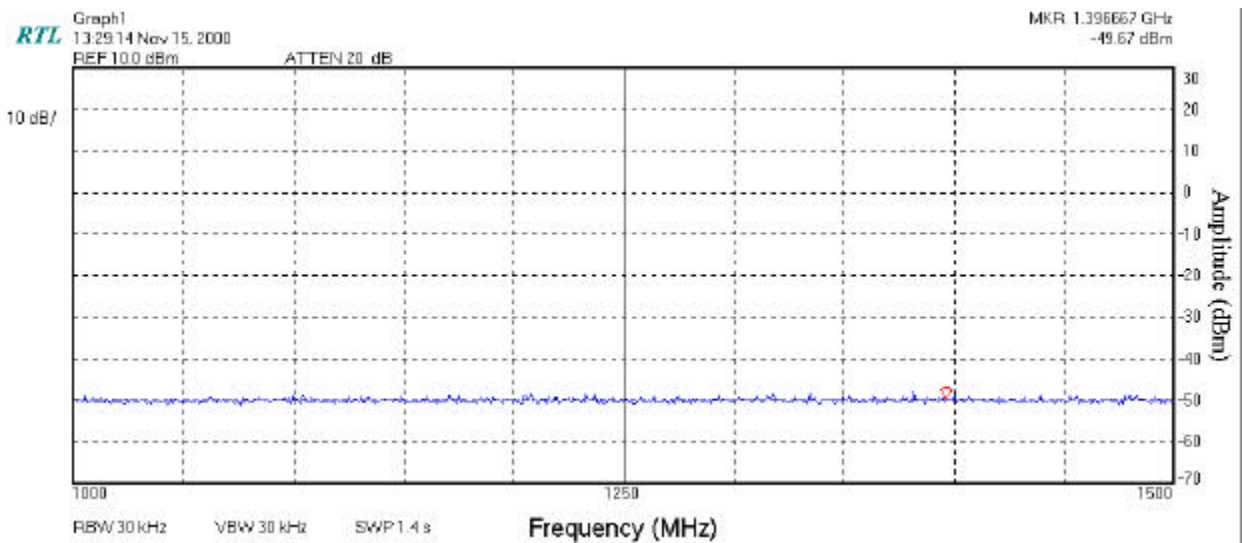
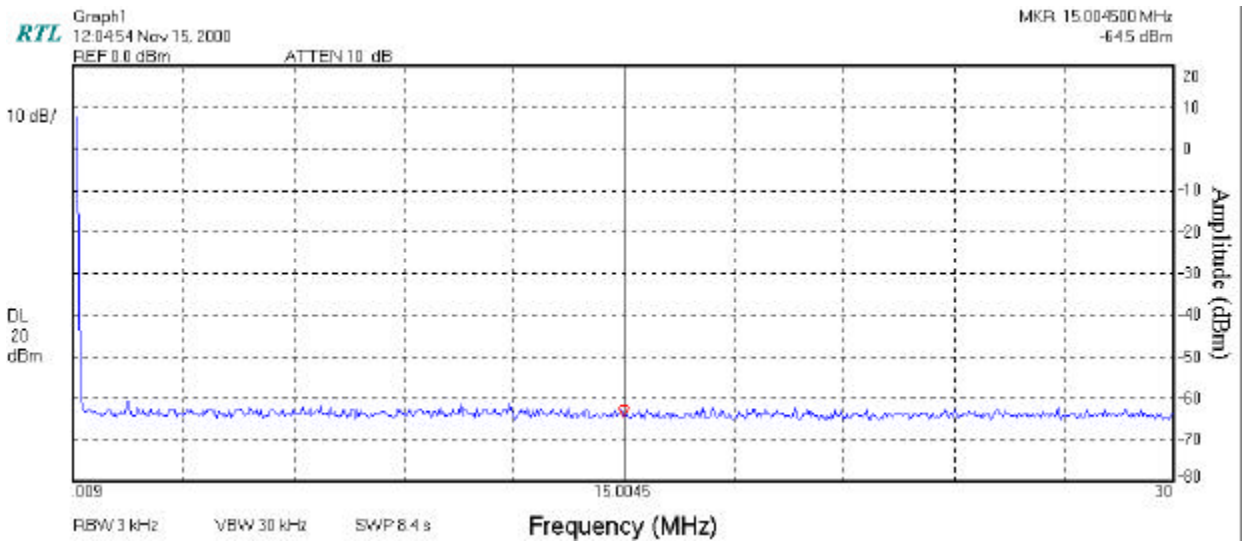
Channel 25 was found to be worst case at 1902.35 MHz, which is shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

#### **Channel 25**

| Frequency (MHz) | Emission Level (dBm) | Limit (dBm) | Margin (dB) |
|-----------------|----------------------|-------------|-------------|
| 84.3            | -22.6                | -13         | -9.6        |
| 337.5           | -35.0                | -13         | -22.0       |
| 744.0           | -25.2                | -13         | -12.2       |
| 3790.0          | -53.5                | -13         | -40.5       |
| 5684.0          | -58.5                | -13         | -45.5       |
| 7579.0          | -52.1                | -13         | -39.1       |

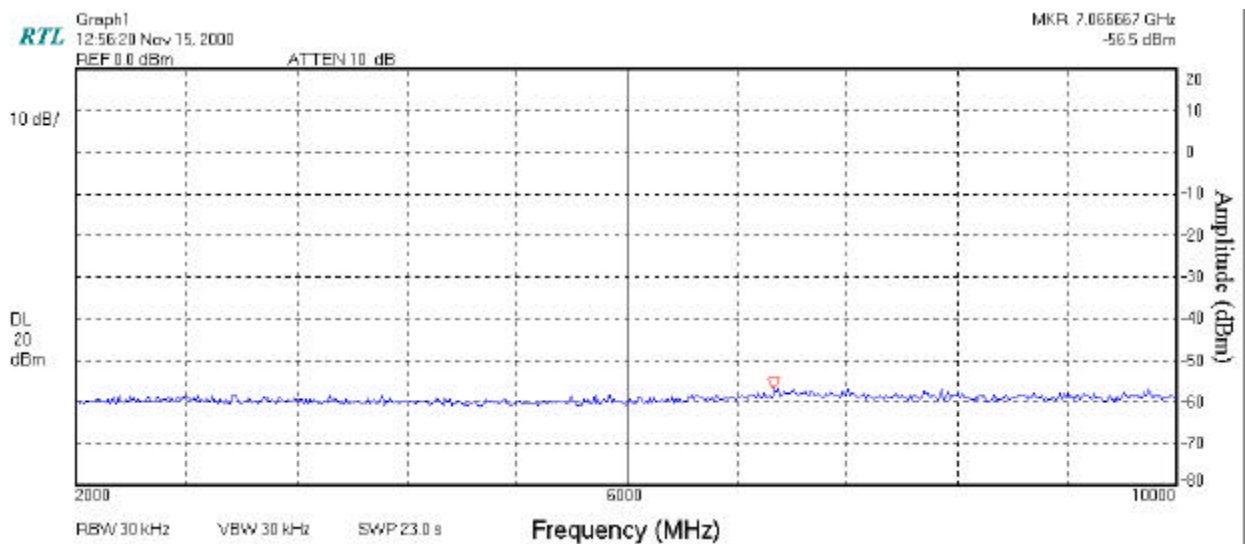
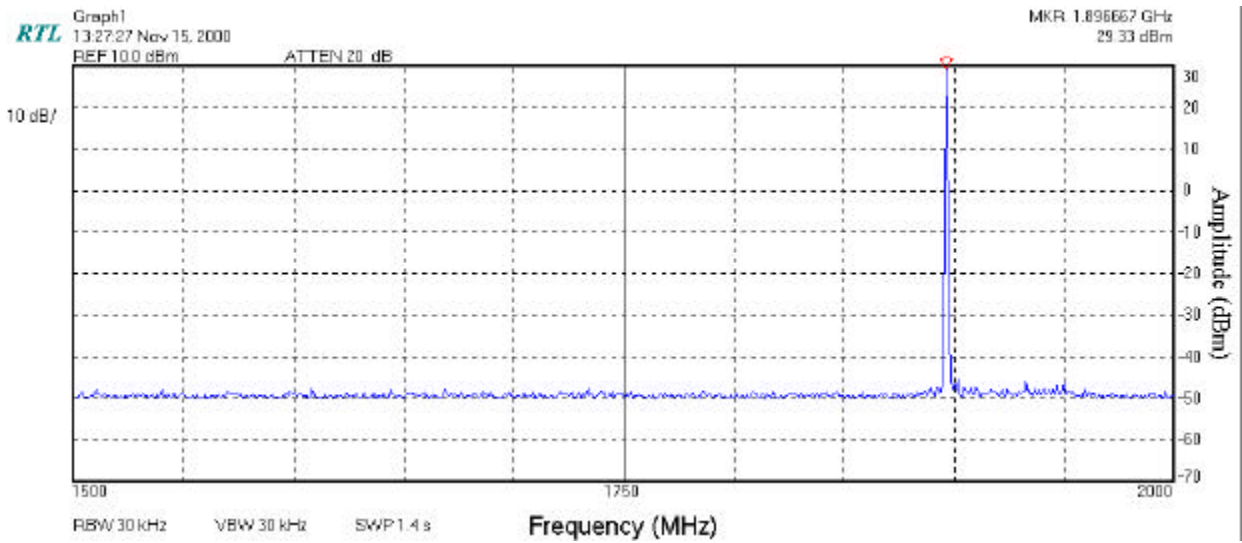


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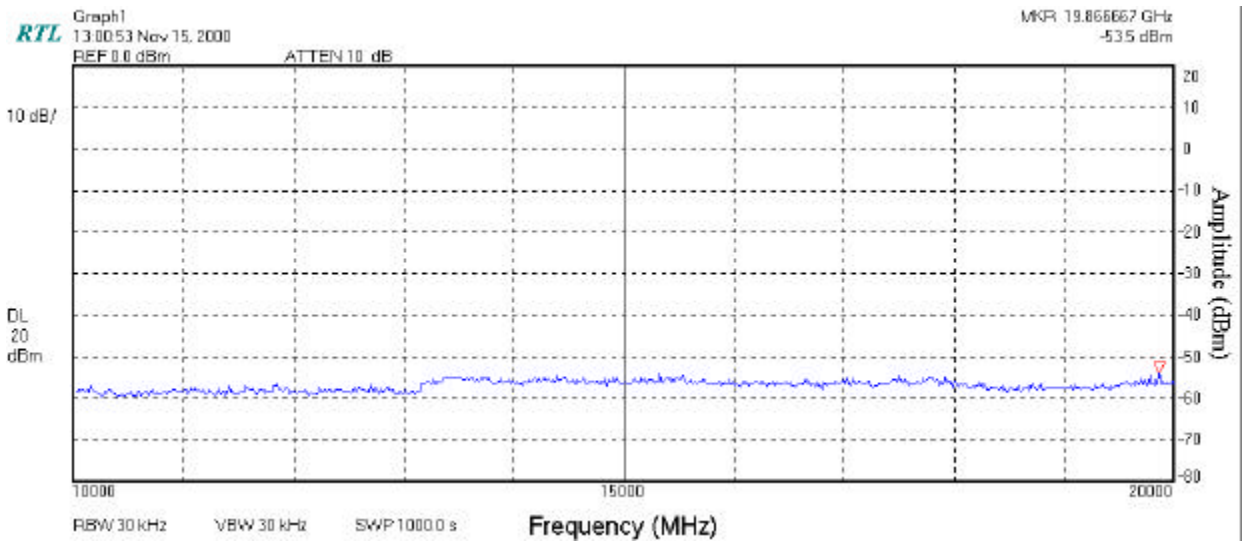


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## 9 BLOCK EDGE COMPLIANCE - PART 24.229 AND PART 24.238

### 9.1 TEST PROCEDURE:

#### Test procedure:

#### Radiated Block-Edge measurement

An in-band field strength measurement of the fundamental emission was performed. Next the amplitude between the peak of the fundamental and the peak of the band-edge emission was recorded. This relative “delta” measurement is subtracted from the field strength measured initially.

The following equation was used to calculate the radiated emission level limit (82.2 dBuV/m). This limit is based on a three-meter distance and an absolute –13 dBm conducted output power (0.05 mW).

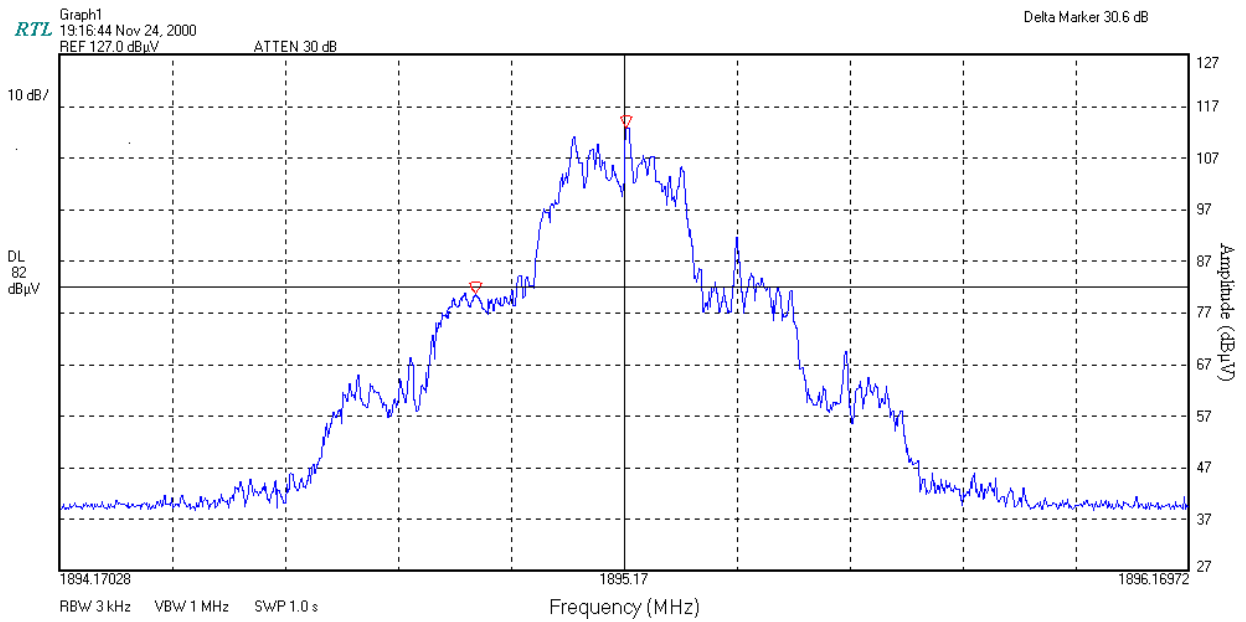
$$P_{Watt} = \frac{E_{v/m}^2 \times d_m^2}{30}$$

or,

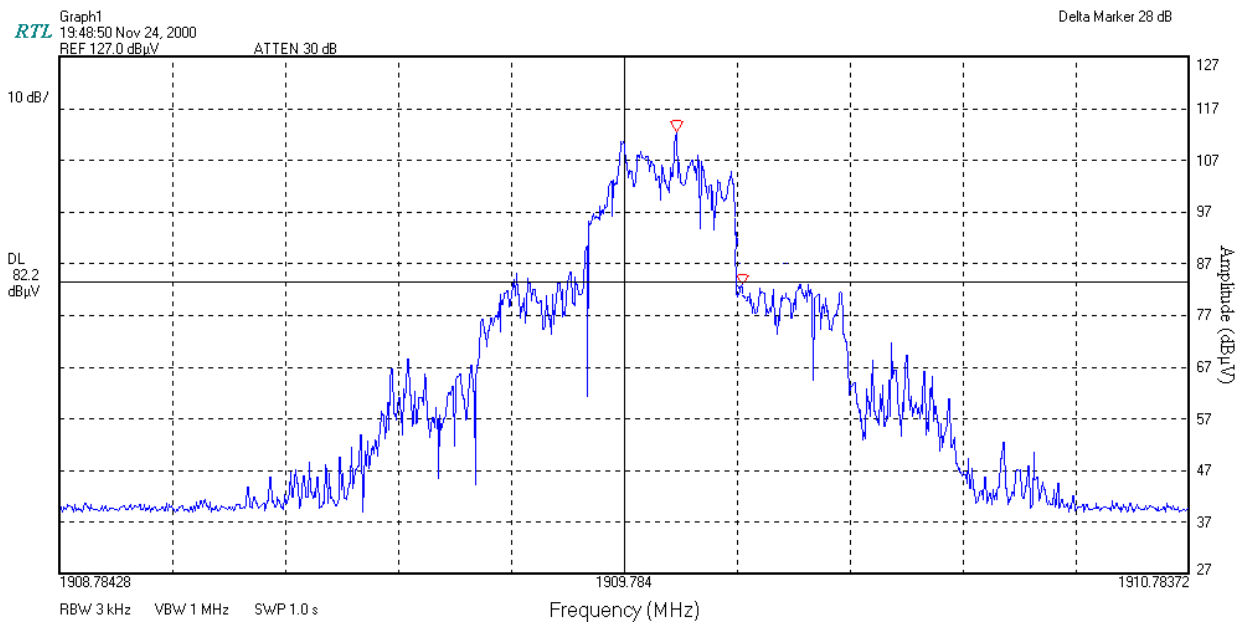
$$82.2 = 20 \log \left( 1E6 \cdot \frac{\sqrt{30 \cdot 0.00005}}{3} \right) = E_{dBuV/m}$$

### 9.2 TEST DATA

| Frequency (MHz) | Delta Measured (dBc) | Level corrected dBì V/m | Limits dBì V/m | Margin (dB) |
|-----------------|----------------------|-------------------------|----------------|-------------|
| 1895.15         | 35.6                 | 81.0                    | 82.2           | -1.2        |
| 1909.95         | 29.5                 | 81.5                    | 82.2           | -0.7        |



Lower Channel



Upper Channel



## 10 FCC RULES AND REGULATIONS PART 2 §2.1053 (A): FIELD STRENGTH OF SPURIOUS RADIATION - PART 24.238

### 10.1 TEST PROCEDURE

ANSI C63.4-1992

The transmitter is set in continuous transmitting mode and modulated with pseudo random data using the internal software.

Refer to section “Radiated Measurement” in this report for further information.

### 10.2 TEST DATA

The worst-case emissions test data are shown. The magnitude of emissions attenuated more than 20 dB below the FCC limit need not be recorded.

The following equation was used to calculate the radiated emission level limit (82.2 dBuV/m). This limit is based on a three-meter distance and an absolute –13 dBm conducted output power (0.05 mW), since an integral antenna exists on the device under test.

$$P_{Watt} = \frac{E_{v/m}^2 \times d_m^2}{30}$$

or,

$$82.2 = 20 \log \left( 1E6 \cdot \frac{\sqrt{30 \cdot 0.00005}}{3} \right) = E_{dBuV/m}$$

Channel 50 ; 1909.85 MHz

Outdoor RP

| Emission Frequency (MHz) | Analyzer Reading (dBuV) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin | Comments |
|--------------------------|-------------------------|-------------------------------|-------------------------|----------------|--------|----------|
| 3819.6                   | 54.3                    | 4.5                           | 58.8                    | 82.2           | 23.4   | Peak     |
| 5729.5                   | NF 25.4                 |                               |                         |                |        | Peak     |
| 7639.4                   | NF 32.4                 |                               |                         |                |        | Peak     |
| 9549.2                   | NF 32.7                 |                               |                         |                |        | Peak     |
| 11459.1                  | NF 32.8                 |                               |                         |                |        | Peak     |
| 13368.9                  | NF 35.8                 |                               |                         |                |        | Peak     |
| 15278.8                  | NF 36.8                 |                               |                         |                |        | Peak     |
| 17188.6                  | NF 35.9                 |                               |                         |                |        | Peak     |
| 19098.5                  | NF 40.9                 |                               |                         |                |        | Peak     |

\* PK= PEAK MEASUREMENT; AV = AVERAGE MEASUREMENT; NF=NOISE FLOOR



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## 11 FCC RULES AND REGULATIONS PART 2 §2.1049 (C) (1): OCCUPIED BANDWIDTH – PART 24.238

CONDUCTED OCCUPIED BANDWIDTH (99% POWER BANDWIDTH) - COMPLIANCE WITH THE EMISSION MASKS

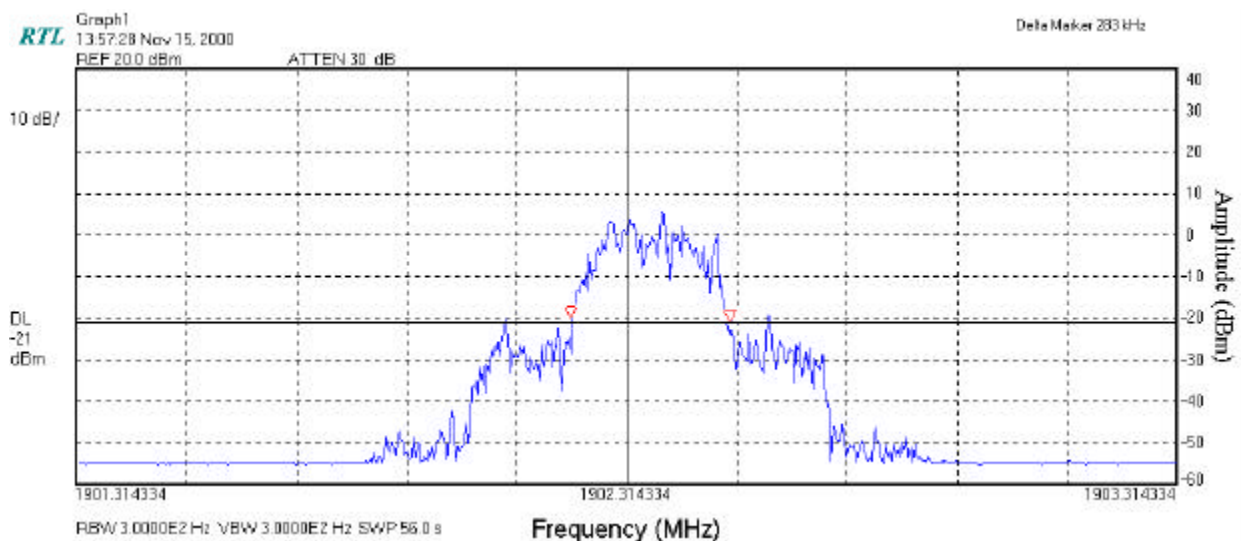
### 11.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.11

Device with digital modulation: operation to its maximum extent

### 11.2 TEST DATA

Channel 25 : Occupied Bandwidth (Outdoor RP) = 283 kHz



## 12 FCC RULES AND REGULATIONS PART 2.202: NECESSARY BANDWIDTH AND EMISSION BANDWIDTH

Modulation : TDMA

Type of Emission: DXW

Necessary Bandwidth: (measured at 99% power bandwidth)

B<sub>n</sub> = 283 kHz



## 13 PART 2 §2.1055: FREQUENCY STABILITY – PART 24.235

### 13.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.2

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

The EUT was evaluated over the temperature range -30°C to +50°C.

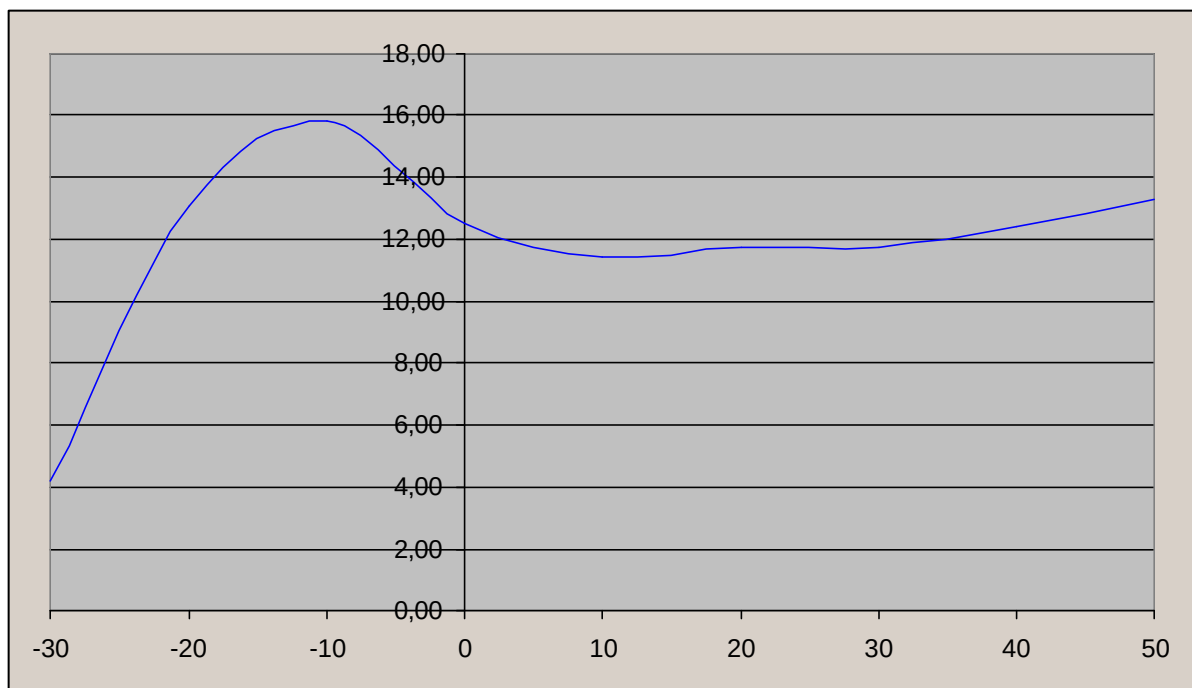
The temperature was initially set to -30°C and a 2-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A ½ an hour period was observed to stabilize the EUT at each measurement step and the frequency stability was measured within one minute after application of primary power to the transmitter.

Additionally, the power supply voltage of the EUT was varied from 85% to 115% of the nominal AC voltage.

The worst-case test data are shown.

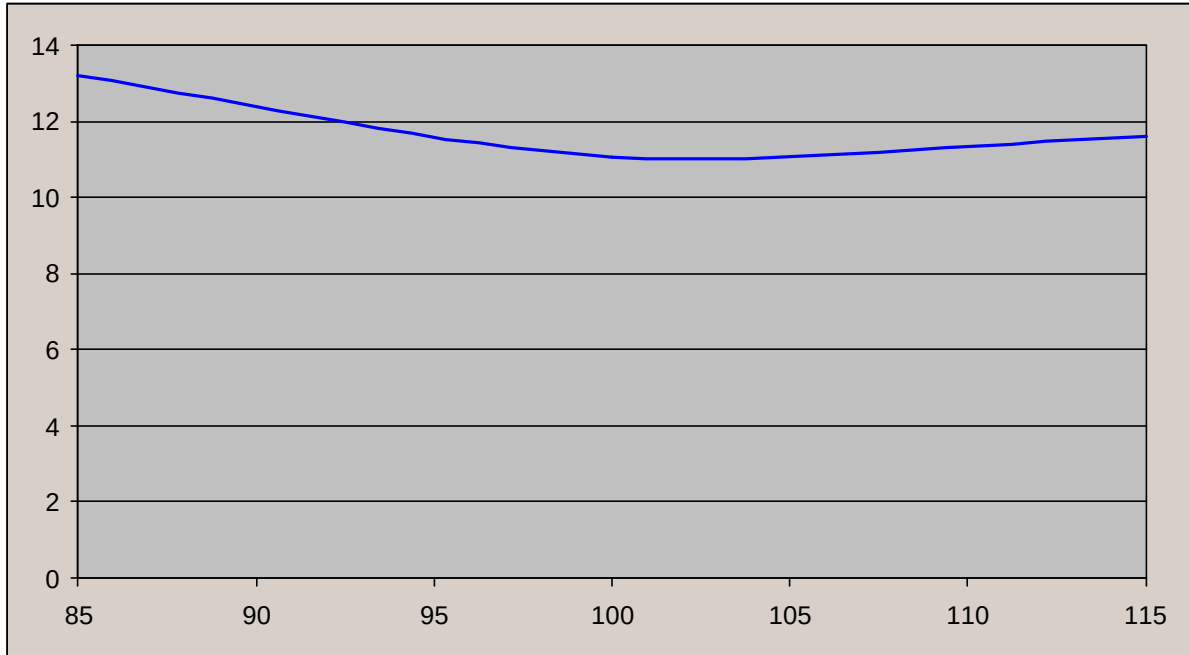
### 13.2 TEST DATA

#### 13.2.1 Frequency Stability as a function of Temperature variation





### 13.2.2 Frequency Stability as a function of Voltage variation





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## 14 RECEIVER/DIGITAL INTERFACE DATA

The unintentional radiator portion of device has been tested. It was found compliant with the Part 15.109 Class A limits. A separate Class A verification report is available upon request

Radiated Data at a 3 meter distance:

| Emission Frequency (MHz) | Test Detector | Antenna Polarity (H/V) | Turntable Azimuth (deg) | Antenna Height (m) | Analyzer Reading (dBuV) | Site Correction Factor (dB/m) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|--------------------------|---------------|------------------------|-------------------------|--------------------|-------------------------|-------------------------------|-------------------------|----------------|-------------|
| 160.600                  | Qp            | H                      | 0                       | 1.0                | 11.5                    | -17.5                         | -6.1                    | 43.5           | -49.6       |
| 233.600                  | Qp            | H                      | 0                       | 1.0                | 14.5                    | -16.2                         | -1.8                    | 46.0           | -47.8       |
| 306.600                  | Qp            | H                      | 0                       | 1.0                | 13.7                    | -13.1                         | 0.6                     | 46.0           | -45.5       |
| 379.600                  | Qp            | H                      | 0                       | 1.0                | 9.6                     | -10.6                         | -1.1                    | 46.0           | -47.1       |
| 423.275                  | Qp            | H                      | 30                      | 1.0                | 42.2                    | -8.6                          | 33.6                    | 46.0           | -12.5       |
| 846.550                  | Qp            | H                      | 30                      | 1.8                | 42.9                    | -3.0                          | 40.0                    | 46.0           | -6.1        |