Engineering and Testing for EMC and Safety Compliance

TYPE CERTIFICATION REPORT

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

MODEL: UTS-EA7H74B

FCC ID: O6YUTS-EA7H74B

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 MEASUREMENT AND PERFORMANCE STANDARDS
ANSI/TIA/EIA 603-1-1998	ADDENDUM TO ANSI/TIA/EIA 603-1992

FCC Rules Parts	Frequency Range	Output Power (W)	Freq. Tolerance	Emission Designator
24(E)	1895-1910 MHz	0.140 EIRP	13 ppm	280KDXW

REPORT PREPARED BY:

EMI Technician: Daniel Baltzell
Administrative Writer: Melissa Fleming

Document Number: 2000322

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3 GENERAL INFORMATION

The following Report of a Type Certification, is prepared on behalf of ***UTStarcom, Inc.*** in accordance with the Federal Communications Commissions and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was the ***UTS-EA7H74B;FCC ID: O6YUTS-EA7H74B***. 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 dated March 3, 1994, submitted to and approved by the Federal Communication Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

3.1 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application report.

4 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 Part 2 and FCC Part 24 Certification methodology.

Signature:________________ Date: September 21, 2000

Typed/Printed Name: Bruno Clavier Position: Director Compliance Engineering (NVLAP Signatory)

Signature: ________________ Date: September 21, 2000

Typed/Printed Name: Daniel W. Baltzell Position: Test Engineer

NVLAP *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.

5 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

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	8546OA	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

5.1 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.

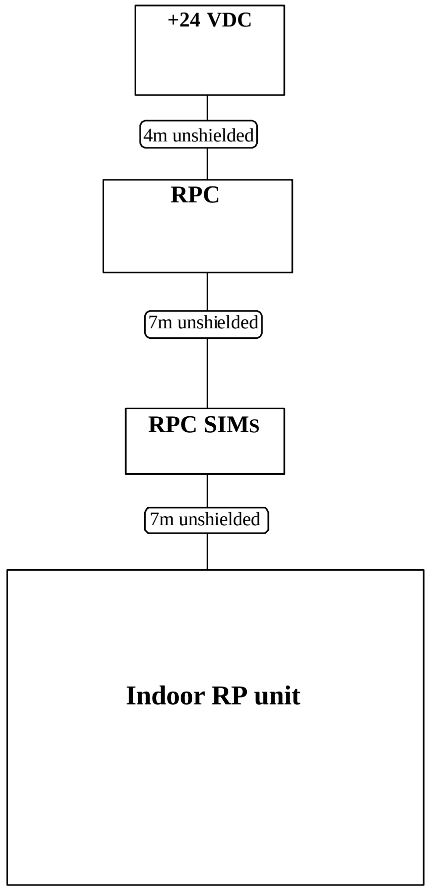
5.1.1 External Components

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
POWER SUPPLY	UTSTARCOM, INC.	EP-UTS 702/VE-S0571	CH0036910-99	N/A	UNSHIELDED POWER	012335
INDOOR RADIO PORT	UTSTARCOM, INC.	EA-7H74B	SB005235	N/A	UNSHIELDED POWER	012336
INDOOR RADIO PORT	UTSTARCOM, INC.	7H74B	SB006134	N/A	UNSHIELDED POWER	012337
DC-AC INVERTER	BCT	HR-3301SC	1011999030-120226	N/A		012341
DC-DC CONVERTER	UTSTARCOM, INC.	LW020A1	1011998092-121588	N/A	UNSHIELDED POWER	012342
ADVANCED MICRO DESIGNS	UTSTARCOM, INC.	RPC-SIM	1011998101320222	N/A	N/A	012345
CHASSIS/PARTS	UTSTARCOM, INC.	A-ABPM	10111991010020374	N/A	N/A	012348
MAIN SHELF	UTSTARCOM, INC.	EC-H11940-A	SB002372	N/A	N/A	012353

5.1.2 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	012339
RP INTERFACE CARD (WRP1F3)	UTSTARCOM, INC.	EC-L12999B	9C-15341	N/A	N/A	012340
E1 INTERFACE CARD (WE1IF)	UTSTARCOM, INC.	EC-L12998B	9B005180	N/A	N/A	012338

5.2 CONFIGURATION OF TESTED SYSTEM



5.3 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(dBuV/m) = SAR(dBuV) + SCF(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(dB/m) = - PG(dB) + AF(dB/m) + CL(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:

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

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 dBuV - 11.5 dB/m = 37.8 dBuV/m

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

6 CONDUCTED EMISSIONS – POWER LINES

N/A

The device is operated with +5.2 VDC from an auxiliary equipment in turn connected to – 48VDC.

6.1 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.

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

7.1 TEST PROCEDURE

7.1.1 Substitution Method: ERP

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 ERP measurement.

The EUT was then replaced by an ½ wave dipole antenna and polarized in accordance with the EUT's antenna polarization. The ½ wave dipole antenna was connected to a RF signal generator with a coaxial cable.

The search antenna height, and search antenna polarity was set to levels that produced the maximum reading obtained in step 3. The signal generator was adjusted to a level that produced the radiated emission level obtained in step 3.

The signal generator level was recorded and corrected by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal ½ wave dipole antenna. The signal generator corrected level is the ERP level

7.1.2 Calculation Method: EIRP

$$\mathrm{P}_{Watt} = \frac{\mathrm{E}_{v/m}{}^{2} \times d_{m}{}^{2}}{30}$$

7.2 TEST DATA

Settings:

- Peak 80mW delivered to antenna
- Radiated power measurements (3 meter)

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

Frequency (M Hz)	Emission Level (dBuV)	Site Factor (dB/m)	Emission Level (dBuV/m)	Calculated* EIRP (mW)	Comments
1895.15	104.6	12.0	116.6	137.0	Pk
1895.15	69.1	12.0	81.1		Av
1902.35	104.5	12.0	116.5	134.0	Pk
1902.35	69.2	12.0	81..2		Av
1909.95	104.7	12.0	116.7	140.3	Pk
1909.95	69.1	12.0	81.1		Av

*Calculation method
Measurement accuracy is +/- 1.5 dB

7.3 TEST EQUIPMENT

Spectrum Analyser HP8566B
Antenna BiLog Chase 6112L
Power Meter HP437B s/n 2949A02966

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

8.1 TEST PROCEDURE

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

The EUT was connected to a coaxial attenuator having a 50 Ω load impedance.

8.2 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 (MHz)	Emission Level (mW)	Method
1909.95	80.0	Peak
1909.95	10.0	Average

8.3 TEST EQUIPMENT

Spectrum Analyzer HP8566B
Power Meter HP437B s/n 2949A02966

9 BAND-EDGE COMPLIANCE - PART 24.229 AND PART 24.238

9.1 TEST PROCEDURE:

Test procedure:

Delta Marker Method: Radiated Band-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), since an integral antenna exists on the device under test.

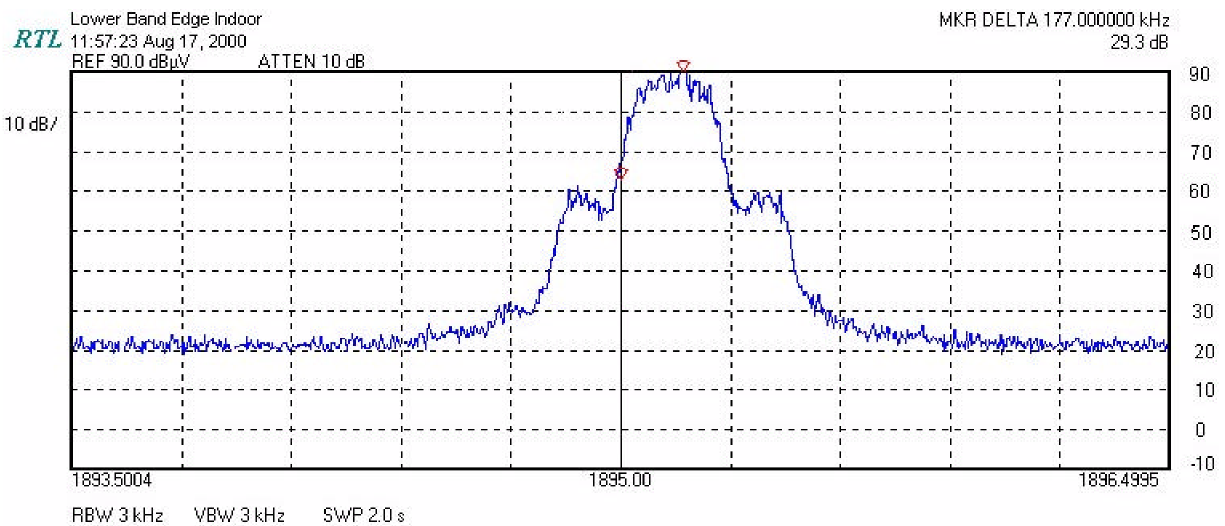
$$P_{Watt} = \frac{E_{v/m}{}^{2} \times d_{m}{}^{2}}{30}$$

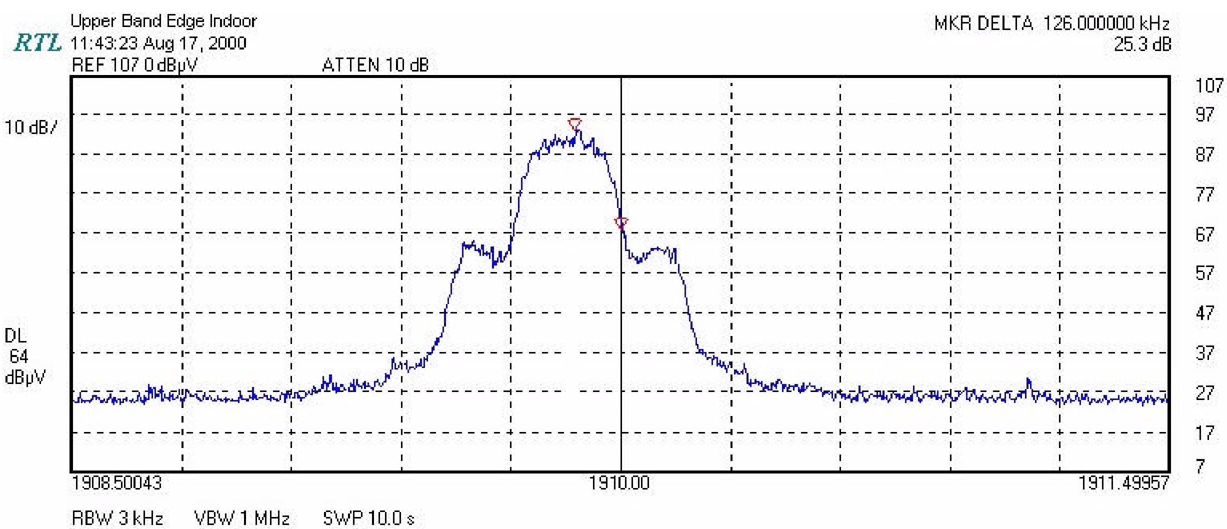
or,

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

9.2 TEST DATA

Frequency (MHz)	Avg. Radiated Emission Level (dBuV/m)	Delta Measured (dB)	Band Edge Calculated Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1895.15	81.1	29.3	51.8	82.2	-30.4
1909.95	81.1	25.3	55.8	82.2	-26.4





9.3 TEST EQUIPMENT

Spectrum Analyzer	HP8566B
Antenna	BiLog Chase 6112L

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

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 amplitude of spurious emissions attenuated more than 20 dB below the FCC limit need not be reported.

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,

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

Channel 25; 1902.35 MHz

Indoor RP

Frequency (MHz)	Emission Level (dBuV)	Correction Factor (dB/m)	Corrected emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Comment
3804.7	53.2	-6.8	46.4	82.2	-35.8	Peak

10.3 TEST EQUIPMENT

Antenna: CHASE CBL6112 s/n 2099
Amplifier: HP8449B s/n 3008A00505
Spectrum analyzer: HP8564E s/n 3943A01719

RF Signal Generator HP8648C s/n 3537A01741
Synthesized Sweeper HP83752A s/n 3610A00846

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

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

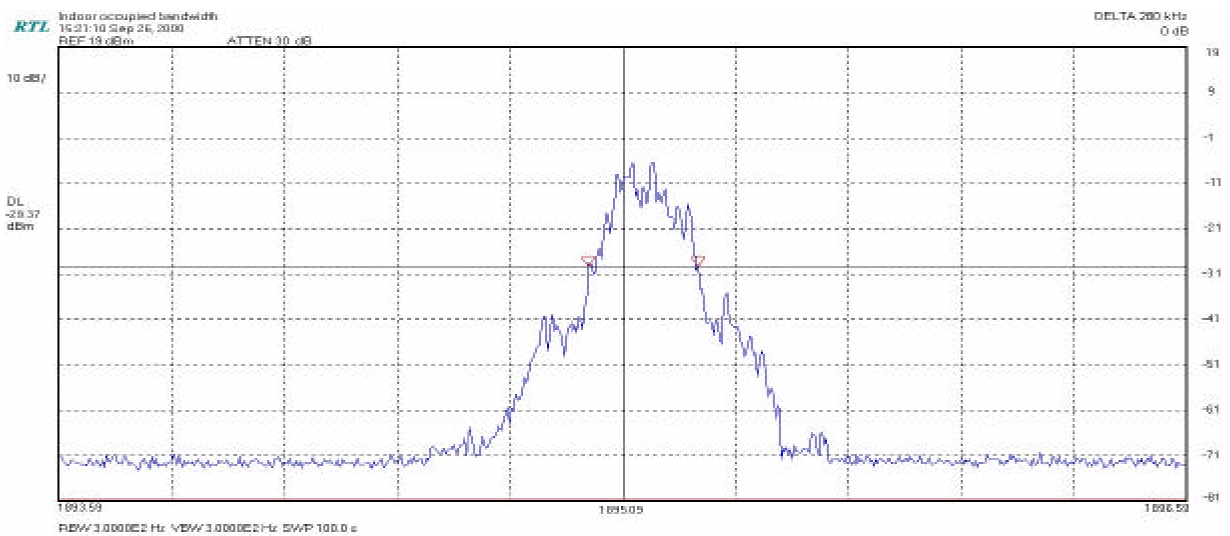
11.1 TEST PROCEDURE

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

Device with digital modulation: operation to its maximum extent

11.2 TEST DATA

Occupied Bandwidth 280 kHz



11.3 TEST EQUIPMENT

Spectrum Analyzer HP8564E s/n 3943A01719

12 FCC RULES AND REGULATION PART 2 §2.1055: FREQUENCY STABILITY – PART 24.235

12.1 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.

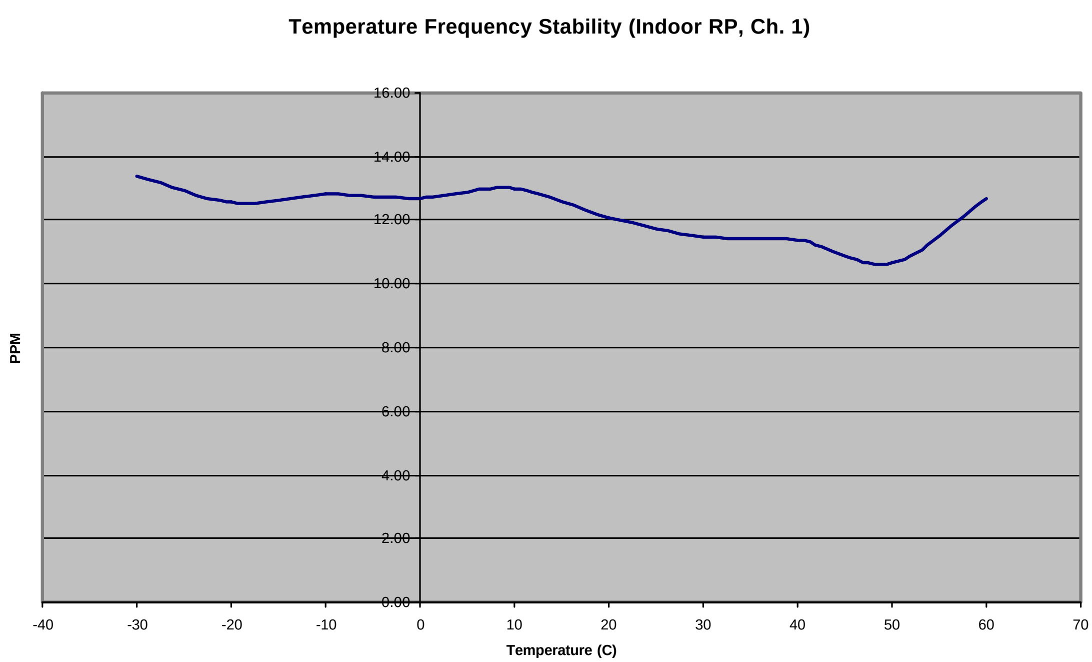
The EUT was evaluated over the temperature range -30°C to +50°C.

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 Portable PS EUT was varied from 85% to 115% of the nominal battery voltage.

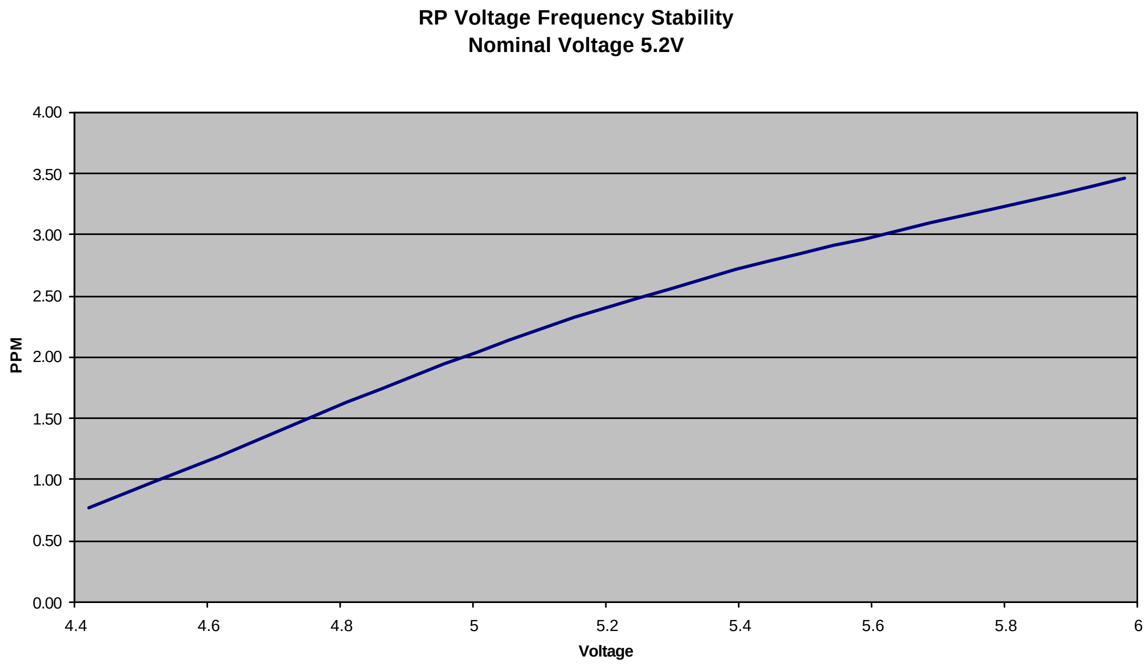
The worst-case test data are shown.

12.2 TEST DATA

12.2.1 Frequency Stability as a function of Temperature variation



12.2.2 Frequency Stability as a function of Temperature variation



12.3 TEST EQUIPMENT

Temperature Chamber Tenney TH65 s/n 11380

Frequency Counter HP8901A (Frequency Mode) s/n 2545A04102

13 FCC RULES AND REGULATIONS PART 2.202: NECESSARY BANDWIDTH AND EMISSION BANDWIDTH

Type of Emission: DXW

Necessary Bandwidth:
Bn = 280 kHz