Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 24

Test Lab:	Applicant:
Rhein Tech Laboratories, Inc. Phone: 703-689-0368 360 Herndon Parkway Fax: 703-689-2056 Suite 1400 Web Site: www.rheintech.com Herndon, VA 20170 Contact: ATCBINFO@rheintech.com	UTStarcom, Inc. Phone: 732-767-5263 33 Wood Avenue South Fax: 732-548-1099 3rd Floor Iselin, NJ 08830 USA Contact: Scott Black (sblack@utstar.com)

FCC ID:	O6YUTS-801FSU	**GRANTEE FRN NUMBER:**	0005823877
PLAT FORM:	Transmitter	**RTL WORK ORDER NUMBER:**	2003072
MODEL:	UTS801FSU	**RTL QUOTE NUMBER:**	QRTL03-821
DATE OF TEST REPORT:	July 16, 2003		

American National Standard Institute:	ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1
FCC Classification:	PCB – Licensed Base Station for Part 24
FCC Rule Part(s):	Part 24: Personal Communications Services Subpart E – Broadband PCS
Digital Interface Information	Digital Interface was found to be compliant
Receiver Information	Receiver was found to be compliant

Frequency Range (MHz)	Power (W)	Frequency Tolerance	Emission Designator
1893.65-1909.85	0.103	1.54 ppm	282KDXW

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. 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, FCC Part 15, FCC Part 24, ANSI C63.4, ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1.

Signature: _____ Date: July 16, 2003

Typed/Printed Name: Desmond Fraser Position: President

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

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1 GENERAL INFORMATION

1.1 SCOPE

FCC Rules Part 24 (E) PERSONAL COMMUNICATIONS SERVICES – BROADBAND PCS

All measurements contained in this application were conducted in accordance with the FCC Rules and Regulations CFR47 and ANSI/TIA/EIA603-1992/-1-1998 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards. 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.

1.2 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

1.3 RELATED SUBMITTAL(S)/GRANT(S)

This is a new application submittal. The Digital Interface and Receiver were investigated and found compliant. A DoC report can be provided upon request. The IF, LO and up to the 2nd LO were investigated.

2 EQUIPMENT INFORMATION

2.1 JUSTIFICATION

To complete the test configuration required by the FCC, the transmitter was software controlled by the manufacturer to operate in a continuous mode. The final data was taken as a substitution measurement. The device is provided with an external antenna connector. EIRP measurement is provided to support the RF exposure requirements for the antenna listed in this application filing.

2.2 EXERCISING THE EUT

The UTS801FSU is a desk phone transmitter designed to link to a PHS phone network which transmits at a frequency within the range 1893.65 MHz – 1909.95 MHz. Three channels were investigated, 1893.65 MHz, 1902.35 MHz, and 1909.95 MHz, in three orthogonal planes, with the receiving antenna in both horizontal and vertical polarities, from 1 meter to 4 meters in height.

2.3 TEST SYSTEM DETAILS

The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system, are:

TABLE 2-1: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
PHONE	UTSTARCOM	UTS801FSU	N/A	O6YUTS-801FSU	UNSHIELDED	15188
POWER SUPPLY	UTSTARCOM	UTS 700-U	N/A	N/A	UNSHIELDED POWER	15189

2.4 CONFIGURATION OF TESTED SYSTEM

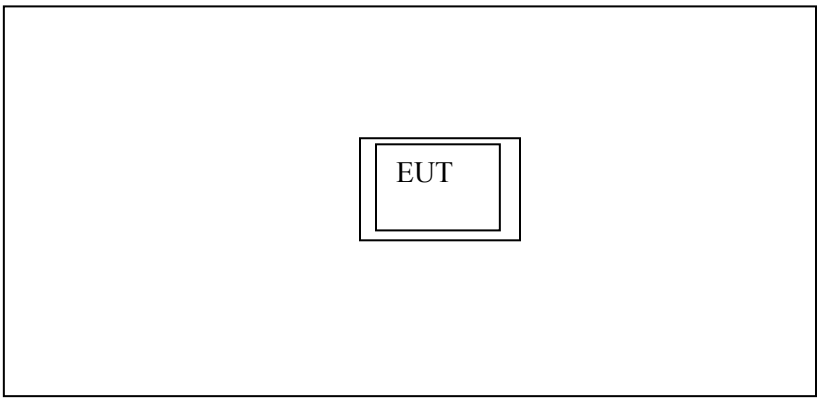


FIGURE 1: CONFIGURATION OF TESTED SYSTEM

3 DC VOLTAGES AND CURRENTS - PART §2.1033(C)(8)

The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range.

	Minimum	Typical	Maximum
Voltage (DC)	3.55	4.0	4.6
Current (Amps)	0.34	0.36	0.34

TEST PERSONNEL:

Signature:  Test Date: June 2, 2003

Typed/Printed Name: Rachid Sehb Position: EMC Engineer

4 RF POWER OUTPUT - §2.1046

TABLE 4-1: POWER OUTPUT AT THE ANTENNA PORT DATA - §2.1046

Channel	Frequency (MHz)	Peak Power Meter Level (dBm)
251	1893.65	19.75
25	1902.35	20.01
50	1909.85	20.16

TEST PERSONNEL:

Signature:  Test Date: June 3, 2003

Typed/Printed Name: Rachid Sehb Position: EMC Engineer

4.1 ANSI/TIA/EIA-603-1992, SECTION 2.2.1 TEST PROCEDURE

Substitution method.

4.2 EFFECTIVE ISOTROPIC RADIATED POWER LIMITS - §24.232 TEST PROCEDURE

(a) Base stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT.

4.3 RF POWER TEST EQUIPMENT

TABLE 4-2: RF POWER TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	6/17/03
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1-26.5 GHz)	3008A00505	7/15/03
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/2/03
900928	Hewlett Packard	83752A	Synthesized Sweeper (0.01 - 20 GHz)	3610A00866	6/19/03
900814	Electro-Metrics	EM-6961 (RGA-60)	Double Ridged Guide Antenna (1 - 18 GHz)	2310	2/17/04
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	7/19/03
901186	Agilent Technologies	E9323A (50MHz-6GHz)	Peak & Average Power Sensor	US40410380	7/19/03
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	6/17/03

4.4 EFFECTIVE RADIATED POWER TEST DATA- §2.1046

TABLE 4-3: RADIATED POWER DATA - §2.1046

Channel	Test Detector	Frequency (MHz)	Power meter Reading (dBm)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)
251	Pk	1893.65	-19.9	10.88	0.67	7	17.21
25	Pk	1902.35	-19.8	10.98	0.67	7	17.31
50	Pk	1909.85	-18.02	12.02	0.6	7	20.0

Notes: Pk = Peak Detector
EIRP Measurements by Substitution Method.

The EUT was placed on a turntable 3 meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was maximized using a calibrated spectrum analyzer using a 1 MHz resolution bandwidth for each channel being tested, and adjusted to an peak and average level using a power meter attached at the end of the receive antenna. A double ridge horn antenna was substituted in place of the EUT. The horn antenna was fed by a signal generator and adjusted until the previous level was attained. This level was recorded and was further corrected by subtracting the cable loss from the signal generator to the transmit antenna and adding the horn gain.

i.e., Sg – CL + Gn = EIRP (dBm)

Sg = Signal Generator Level (dBm)
CL= Cable Loss (dB)
Gn= Transmitting horn antenna gain (dBi)

TEST PERSONNEL:

Signature:		Test Date:	June 3, 2003
Typed/Printed Name:	Rachid Sehb	Position:	EMC Engineer

5 OCCUPIED BANDWIDTH - §2.1049; NECESSARY BANDWIDTH §2.202 (OCCUPIED BANDWIDTH) – PART 24.238 (B) (EMISSION BANDWIDTH)

The channel 50 was found to be the worst case and is shown below.

Type of Emission: DXW

Necessary bandwidth designator derived from measurement of emission bandwidth (-26 dB) (282 kHz): 282KDXW

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

5.1 TEST PROCEDURE

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

Device with digital modulation: operation to its maximum extent

Note: Reference level is average conducted power measurement.

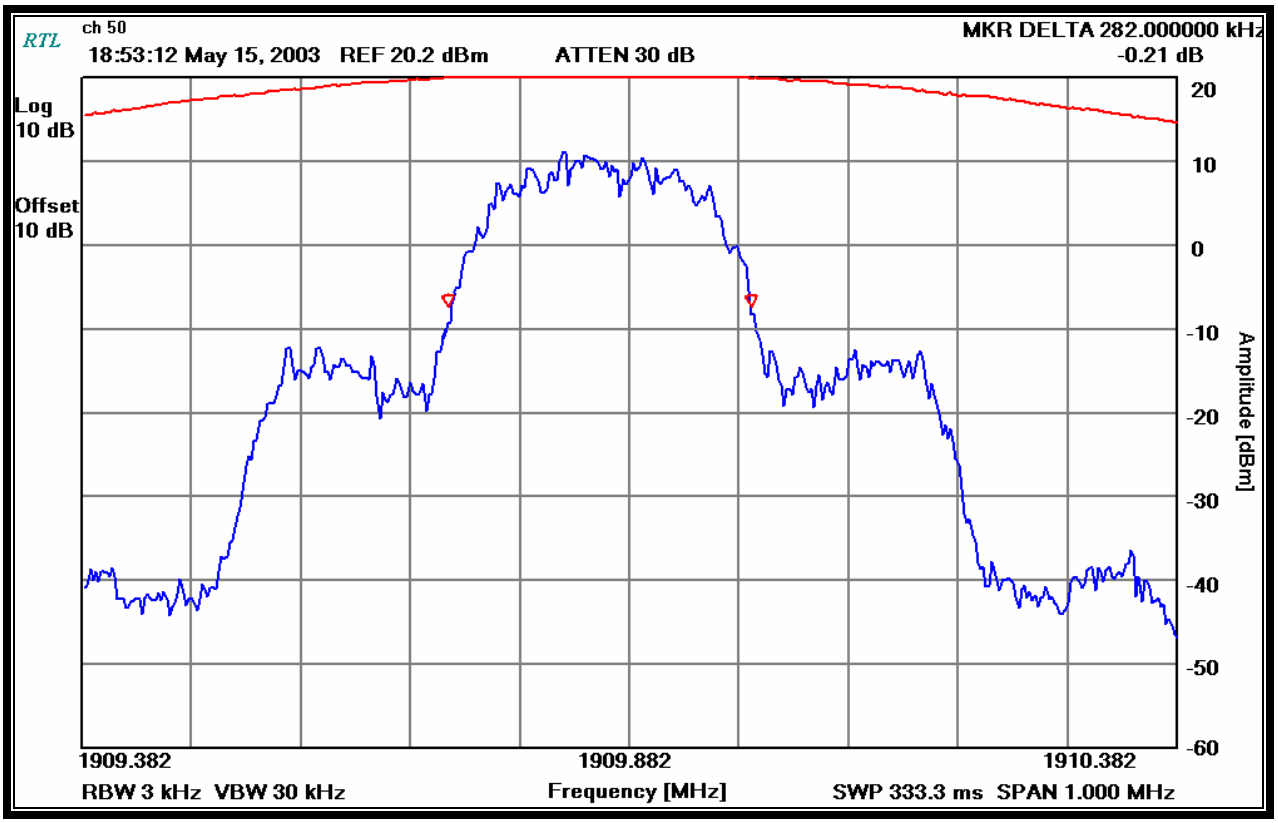
5.2 OCCUPIED BANDWIDTH TEST EQUIPMENT

TABLE 5-1: OCCUPIED BANDWIDTH TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/2/03

5.3 TEST DATA (CHANNEL 50: OCCUPIED BANDWIDTH = 282 KHZ)

PLOT 5-1: OCCUPIED BANDWIDTH (-26 DB)



TEST PERSONNEL:

Signature:		Test Date:	May 15, 2003
Typed/Printed Name:	Rachid Sehb	Position:	EMC Engineer

6 CONDUCTED SPURIOUS AND HARMONIC EMISSIONS - §2.1051

6.1 TEST PROCEDURE

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

The transmitter antenna terminal is connected with the 50 Ω impedance input to the spectrum analyzer. The worst case average channel test data is provided.

6.2 RF POWER TEST EQUIPMENT

TABLE 6-1: RF POWER TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/2/03

6.3 CONDUCTED SPURIOUS AND HARMONIC TEST DATA - §2.1051

Operating Frequency (MHz):	1909.85
Channel:	50
Measured Power at the Antenna Port (dBm):	20.16
Modulation:	DXW
Limit (dBc):	33.16

TABLE 6-2: CONDUCTED SPURIOUS AND HARMONIC DATA §2.1051

Frequency (MHz)	Measured Level (dBm)	Corrected Measured Level (dBc)	Limit (dBc)	Margin (dB)
1866.13	-22.5	42.66	33.16	-9.5
1951.95	-20.7	40.86	33.16	-7.7
2140.75	-27.5	47.66	33.16	-14.5
2376.84	-51.4	71.56	33.16	-38.4
2817.25	-49.2	69.36	33.16	-36.2
3820.66	-46.4	66.56	33.16	-33.4
5729.13				<-50.0
7637.60				<-50.0
9546.07				<-50.0
11454.54				<-50.0

TEST PERSONNEL:

Signature:		Test Date:	May 14, 2003
Typed/Printed Name:	Rachid Sehb	Position:	EMC Engineer

Operating Frequency (MHz): 1893.65
Channel: 251
Measured Power at the Antenna Port (dBm): 19.75
Modulation: DXW
Limit (dBc): 32.75

TABLE 6-3: CONDUCTED SPURIOUS AND HARMONIC DATA §2.1051

Frequency (MHz)	Measured Level (dBm)	Corrected Measured Level (dBc)	Limit (dBc)	Margin (dB)
1054.92	-43.7	63.45	32.75	-30.7
1657.24	-44.9	64.65	32.75	-31.9
1921.95	-22.5	42.25	32.75	-9.5
1661.76	-45.6	65.35	32.75	-32.6
2122.17	-25.5	45.25	32.75	-12.5
3778.28	-48.0	67.75	32.75	-35.0
3401.58	-49.9	69.65	32.75	-36.9
5295.23	-50.1	69.85	32.75	-37.1
7574.60				<-50.0
9468.25				<-50.0
11361.90				<-50.0

TEST PERSONNEL:

Signature:  Test Date: May 14, 2003

Typed/Printed Name: Rachid Sehb Position: EMC Engineer

Operating Frequency (MHz):	1902.35
Channel:	25
Measured Power at the Antenna Port (dBm):	20.1
Modulation:	DXW
Limit (dBc):	33.1

TABLE 6-4: CONDUCTED SPURIOUS AND HARMONIC DATA §2.1051

Frequency (MHz)	Measured Level (dBm)	Corrected Measured Level (dBc)	Limit (dBc)	Margin (dB)
1869.57	-24.3	44.31	33.1	-11.21
1943.94	-25	45.01	33.1	-11.91
1672.77	-44.9	64.91	33.1	-31.81
2133.87	-31.0	51.01	33.1	-17.91
3804.70	-49.9	69.91	33.1	-36.81
5707.05				<-50.0
7609.40				<-50.0
9511.75				<-50.0
11414.10				<-50.0

TEST PERSONNEL:

Signature:  Test Date: May 14, 2003

Typed/Printed Name: Rachid Sehb Position: EMC Engineer

7 RADIATED SPURIOUS AND HARMONIC EMISSIONS - §2.1053

7.1 RADIATED SPURIOUS AND HARMONIC EMISSIONS - §2.1053

Substitution method. The EUT was terminated with a 50 ohm termination and placed on a turntable 3 meters from the receive antenna. The field of maximum intensity was found by rotating the EUT approximately 360 degrees and changing the height of the receive antenna from 1 to 4 meters. The field strength was recorded from a calibrated spectrum analyzer for each channel being tested. A double ridge horn antenna was substituted in place of the EUT. The horn antenna was fed by a signal generator and adjusted until the previous level was attained. The signal generator level was recorded. It was further corrected by subtracting the cable loss from the signal generator to the dipole and adding the horn gain. The worst case average channel test data is provided.

7.2 RADIATED SPURIOUS TEST EQUIPMENT

TABLE 7-1: RADIATED SPURIOUS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	6/17/03
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	7/15/03
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/2/03
900928	Hewlett Packard	83752A	Synthesized Sweeper (0.01 - 20 GHz)	3610A00866	6/19/03
900814	Electro-Metrics	EM-6961 (RGA-60)	Double Ridged Guide Antenna (1 - 18 GHz)	2310	2/17/04

7.3 FIELD STRENGTH OF SPURIOUS RADIATION TEST DATA - §2.1053

Operating Frequency (MHz):	1909.85
Channel:	50
Measured Power at the Antenna Port (dBm):	20.16
Modulation:	DXW
Distance (m):	3
Limit (dBc):	33.16

TABLE 7-2: FIELD STRENGTH OF SPURIOUS RADIATION TEST DATA §2.1053

Frequency (MHz)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)	Corrected Signal Generator Level (dBm)	Corrected Level (dBc)	Margin (dB)
1865.30	-34.8	0.5	7.0	-28.3	48.46	-15.3
2464.20	-35.8	0.5	7.0	-29.3	49.46	-16.3
2463.59	-33.9	0.7	7.5	-27.1	47.26	-14.1
2464.00	-32.7	0.7	7.5	-25.9	46.06	-12.9
2464.24	-34.9	0.7	7.5	-28.1	48.26	-15.1
3819.72	-38.1	0.8	8.0	-30.9	51.06	-17.9
5729.58	-49.6	1.2	8.7	-42.1	62.26	-29.1
7639.44	-27	6.5	9.9	-23.6	43.76	-10.6
9549.30	-38.7	7.3	10.6	-35.4	55.56	-22.4
11459.16	-39	8.2	10.7	-36.5	56.66	-23.5
13369.02	-32.8	8.8	12.7	-28.9	49.06	-15.9
15278.88	-32.0	9.2	11.0	-30.2	50.36	-17.2
17188.74	-31.0	9.7	12.5	-28.2	48.36	-15.2
19098.60	-28.7	10	16.8	-21.9	42.06	-8.9

TEST PERSONNEL:

Signature:  Test Date: May 18, 2003

Typed/Printed Name: Rachid Sehb Position: EMC Engineer

8 BAND-EDGE COMPLIANCE - PART 24.238

8.1 TEST PROCEDURE:

Delta Marker method : The resolution of the spectrum analyzer is adjusted to 1% of the emission bandwidth after the reference level is adjusted to the EIRP level using a resolution and video bandwidth of 1 MHz. The frequency is centered on the band edge of interest with a span capable of showing the peak; a delta-to-peak is performed with the display line set at –13 dBm (43+10LogP).

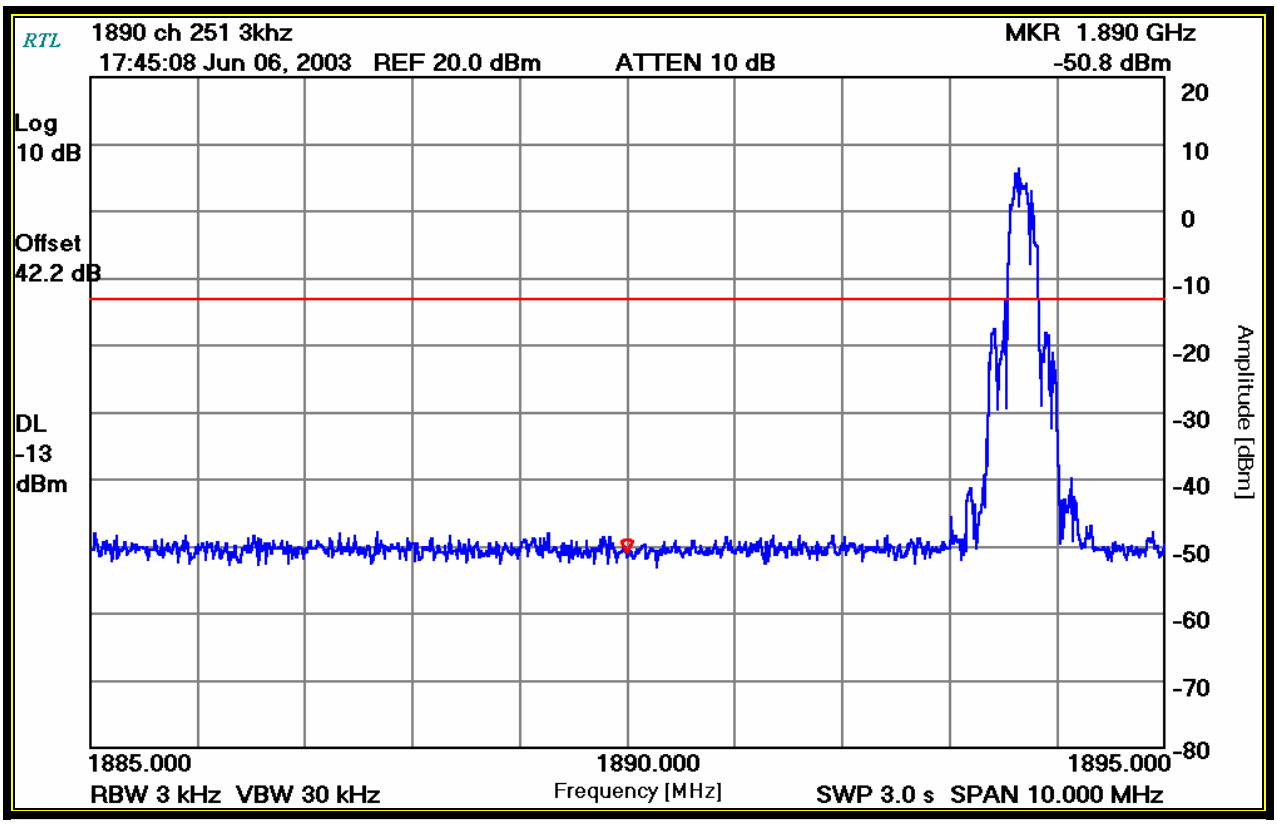
TABLE 8-1: BAND-EDGE TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	6/17/04
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/3/04

8.2 TEST DATA

Block applicable	Frequency (MHz)	Spurious at block edge (dBm)	Limit (dBm)	Margin (dB)
F	1890.00	-50.8	-13.0	-37.8
F	1895.00	-14.6	-13.0	-1.6
C	1894.87	-14.2	-13.0	-1.2
C	1910.00	-13.6	-13.0	-0.6

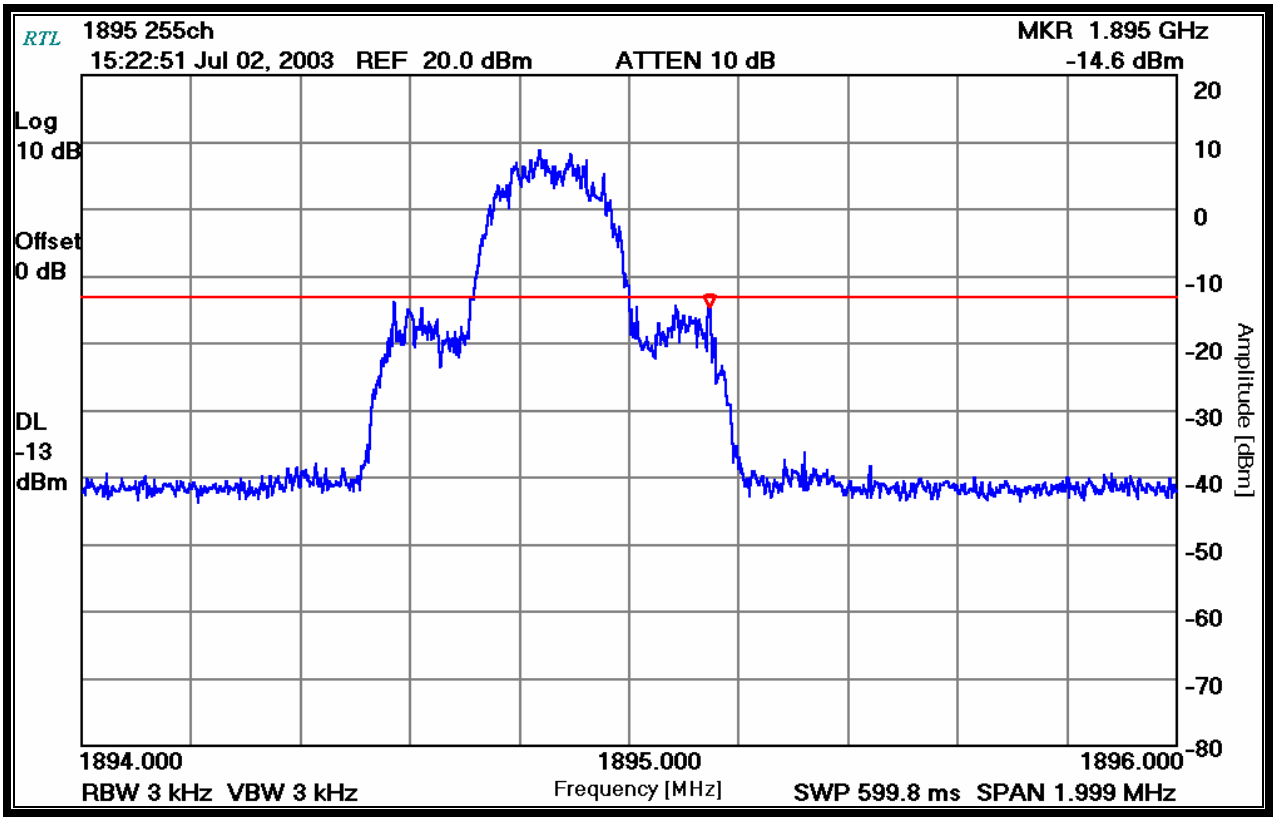
PLOT 8-1: LOWER BAND EDGE BLOCK F



TEST PERSONNEL:

Signature:		Test Date:	June 6, 2003
Typed/Printed Name:	Rachid Sehb	Position:	EMC Engineer

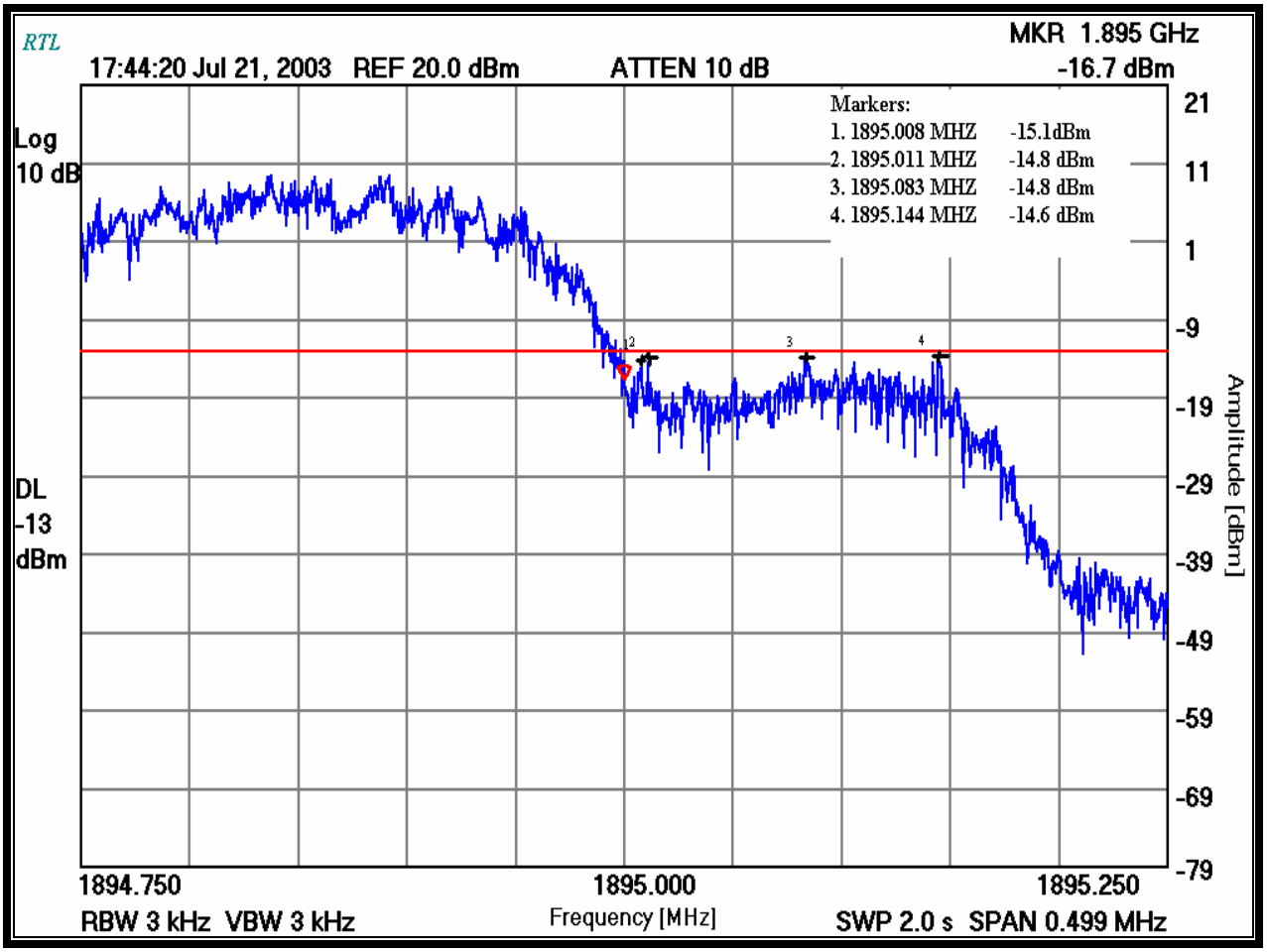
PLOT 8-2: UPPER BAND EDGE BLOCK F



TEST PERSONNEL:

Signature:		Test Date:	July 2, 2003
Typed/Printed Name:	Rachid Sehb	Position:	EMC Engineer

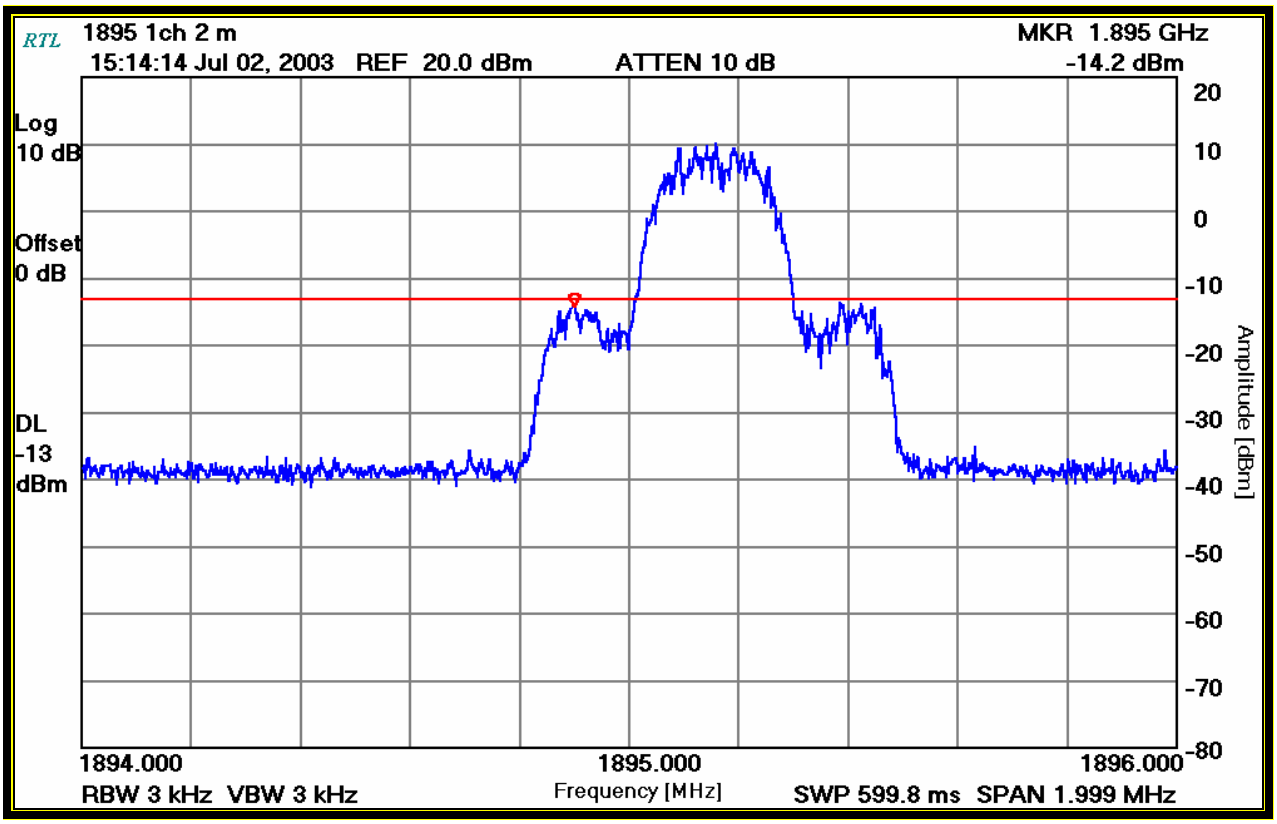
PLOT 8-3: ZOOM OF UPPER BAND EDGE BLOCK F



TEST PERSONNEL:

Signature:		Test Date:	July 21, 2003
Typed/Printed Name:	Rachid Sehb	Position:	EMC Engineer

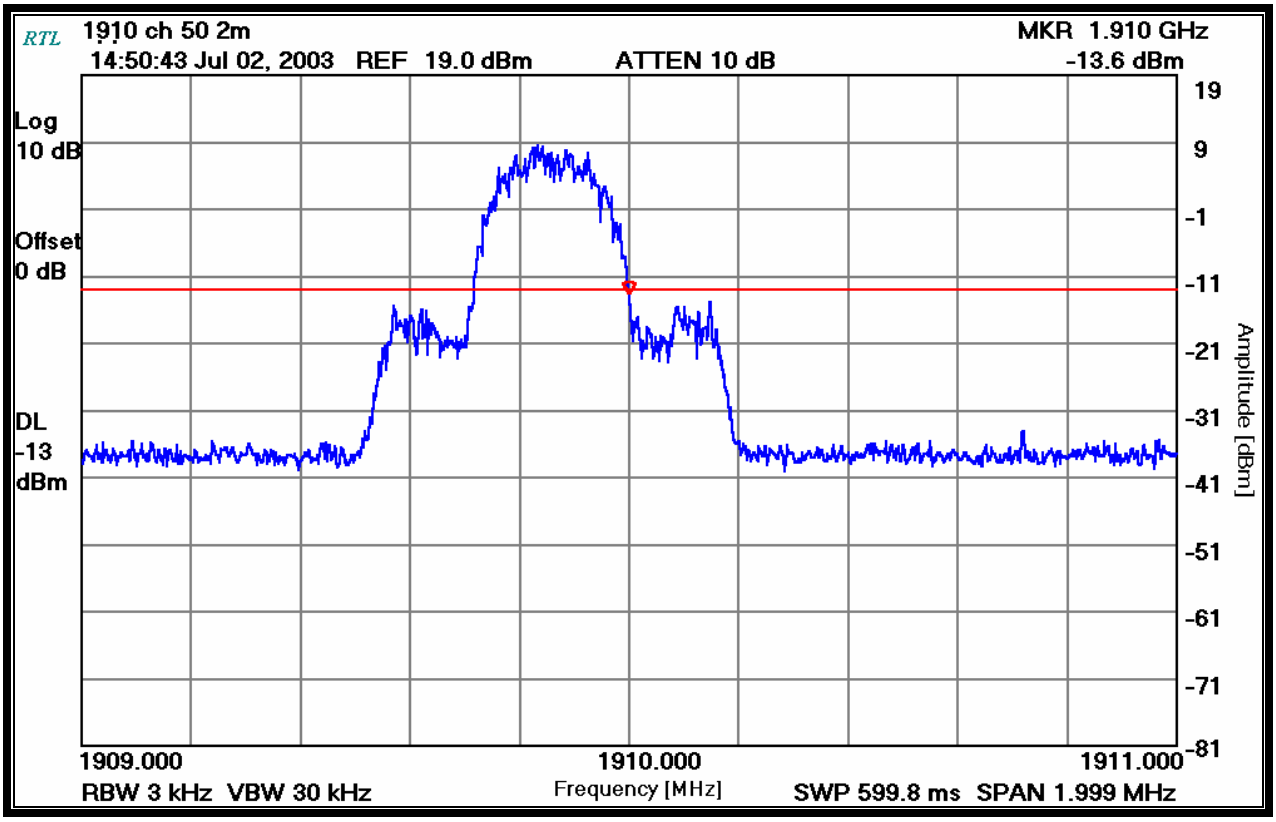
PLOT 8-4: LOWER BAND EDGE BLOCK C



TEST PERSONNEL:

Signature:		Test Date:	July 2, 2003
Typed/Printed Name:	Rachid Sehb	Position:	EMC Engineer

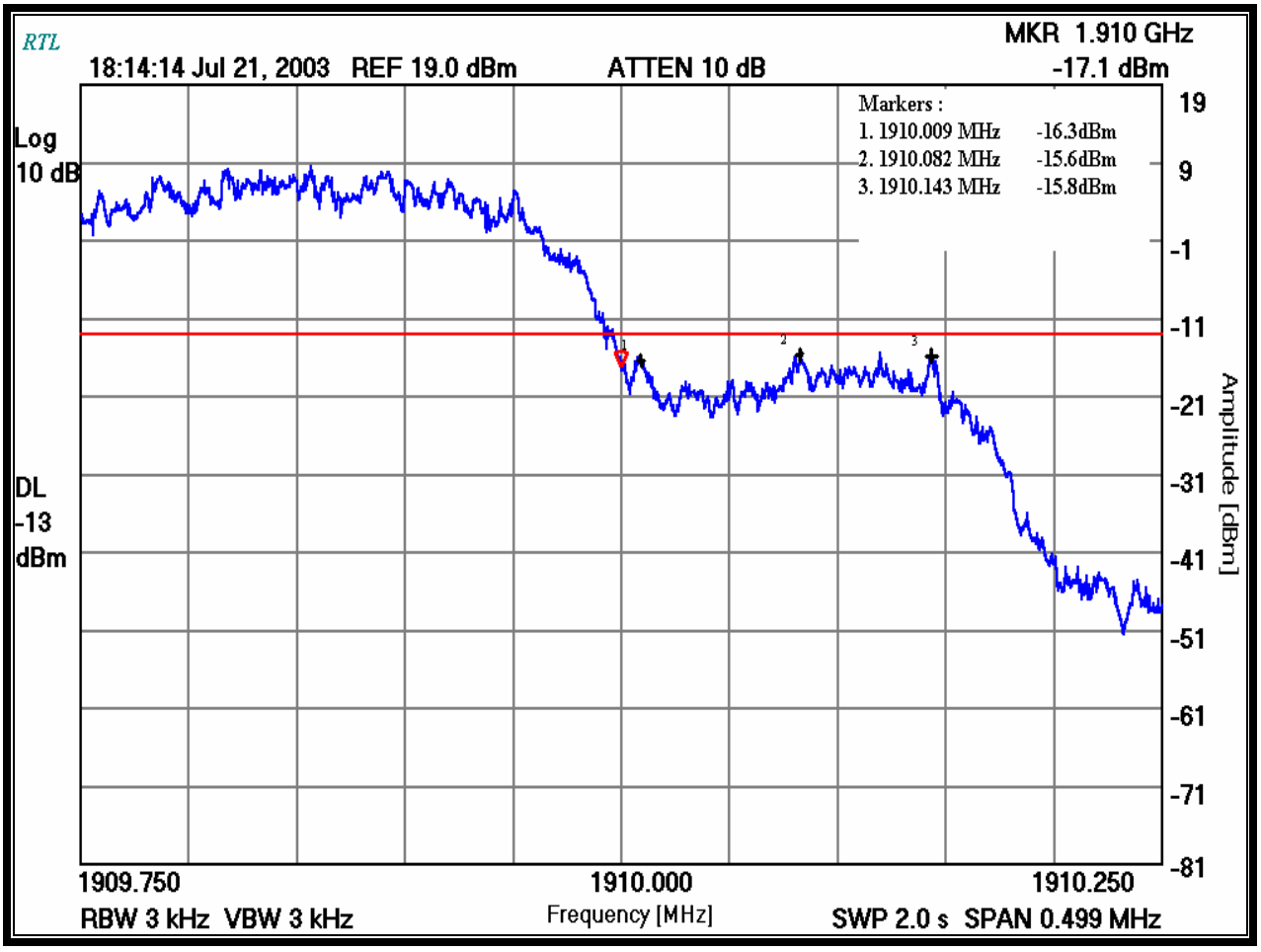
PLOT 8-5: UPPER BAND EDGE BLOCK C



TEST PERSONNEL:

Signature:		Test Date:	July 2, 2003
Typed/Printed Name:	Rachid Sehb	Position:	EMC Engineer

PLOT 8-6: ZOOM OF UPPER BAND EDGE BLOCK C



TEST PERSONNEL:

Signature:		Test Date:	July 21, 2003
Typed/Printed Name:	Rachid Sehb	Position:	EMC Engineer

9 FREQUENCY STABILITY / TEMPERATURE VARIATION - §2.1055

The frequency stability and RF power, measured at the antenna connector using a communications test set as the specified load, are plotted against supply voltage variations and temperature variations at the highest power levels for each modulation type. All measurements are made at the center of the frequency band.

9.1 MEASUREMENT METHOD:

The frequency stability of the transmitter was measured by:

1. Temperature: The temperature was varied from -30°C to +50°C at intervals no more than 10°C throughout the temperature range using an environmental chamber. A period of time sufficient to stabilize all of the components in the equipment shall be allowed prior to each frequency measurement.
2. Primary Supply Voltage: The primary supply voltage was varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied. The EUT was tested down to the battery endpoint.

9.2 FREQUENCY STABILITY TEST EQUIPMENT

TABLE 9-1: FREQUENCY STABILITY TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900946	Tenney Engineering, Inc	TH65	Temperature Chamber	11380	2/4/04
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	7/2/03

9.3 TIME PERIOD AND PROCEDURE:

1. The carrier frequency of the transmitter was measured at room temperature (25°C to provide a reference).
2. The equipment was subjected to a “soak” at -30°C without any power applied.
3. After the “soak” at -30°C, the measurement of the carrier frequency of the transmitter was made within a three-minute interval after applying power to the transmitter.
4. Frequency measurements were made at 10°C intervals up to +50°C, then back to room temperature. A minimum period of one hour was provided to allow stabilization of the equipment at each temperature level.

9.4 FREQUENCY STABILITY § 24.235

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

9.5 FREQUENCY STABILITY TEST DATA - §2.1055

Operating Frequency (MHz): 1909.85
Channel: 50
Reference Voltage (VDC): 4
Deviation Limit (ppm): 2.5

TABLE 9-2: TEMPERATURE FREQUENCY STABILITY DATA - §2.1055

Temperature	Frequency Measured (MHz)	ppm
-30	1909.894250	0.86
-20	1909.894213	0.84
-10	1909.893751	0.60
0	1909.893313	0.37
10	1909.893576	0.50
20	1909.892614	0.00
30	1909.892626	0.01
40	1909.892964	0.18
50	1909.891914	-0.37
-30	1909.894250	0.86
-20	1909.894213	0.84

TEST PERSONNEL:

Signature:  Test Date: May 18, 2003

Typed/Printed Name: Rachid Sehb Position: EMC Engineer

PLOT 9-1: TEMPERATURE FREQUENCY STABILITY DATA - §2.1055

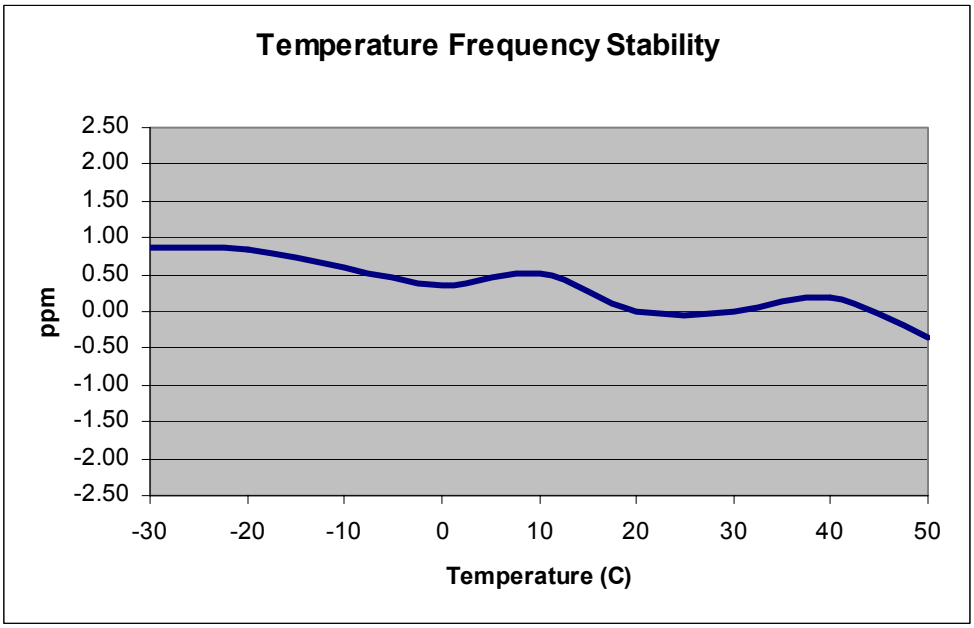


TABLE 9-3: VOLTAGE FREQUENCY STABILITY DATA - §2.1055

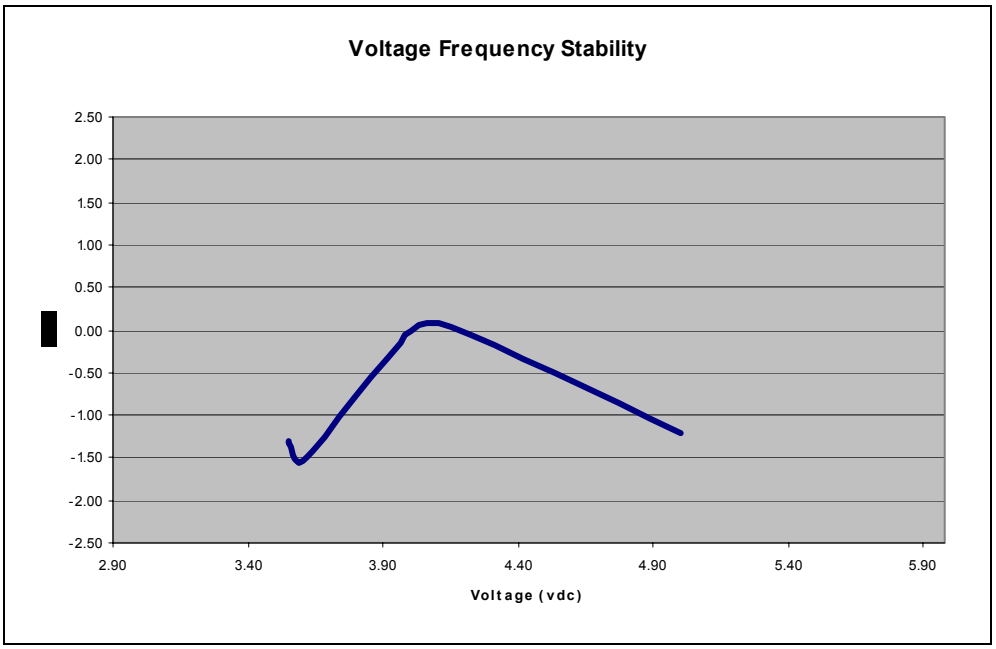
Battery endpoint = 3.55 VDC

Voltage	Frequency Measured (MHz)	ppm
3.55	1909.8240140	-1.31
3.60	1909.8235840	-1.54
4.00	1909.8265240	0.00
4.15	1909.8265740	0.03
5.00	1909.8242190	-1.21
3.55	1909.8240140	-1.31

TEST PERSONNEL:

Signature:		Test Date:	May 18, 2003
Typed/Printed Name:	Rachid Sehb	Position:	EMC Engineer

PLOT 9-2: VOLTAGE FREQUENCY STABILITY



TEST PERSONNEL:

Signature:		Test Date:	May 18, 2003
Typed/Printed Name:	Rachid Sehb	Position:	EMC Engineer

10 CONCLUSION

The data in this measurement report shows that the UTStarcom, Inc. Model # UTS801FSU, FCC ID: O6YUTS-801FSU complies with all the requirements of Parts 2 and 24 of the FCC Rules.