Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 24

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

FCC ID:	O6YUTS-718	**GRANTEE FRN:**	0005823877
PLAT FORM:	N/A	**RTL WORK ORDER #:**	2003069
MODEL(S):	UTS718	**RTL QUOTE #:**	QRTL03-818
TEST REPORT DATE:	July 1, 2003		

American National Standard Institute:	ANSI/TIA/EIA603 and ANSI/TIA/EIA 603-1
FCC Classification:	PCE - Part 24 Licensed Portable Tx held to ear
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)	Peak EIRP (W)	Frequency Tolerance	Emission Designator
1893.65-1909.85	0.105	2.4 ppm	263KDXW

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.

Furthermore, there was no deviation from, additions to, or exclusions from the FCC Part 2, FCC Part 24, ANSI/TIA/EIA603, and ANSI/TIA/EIA 603-1.

Signature: _____ Date: July 1, 2003

Typed/Printed Name: Desmond A. Fraser Position: President

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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. The Digital Interface and Receiver were investigated and found compliant. The IF, LO and up to the 2nd LO were investigated.

2 EQUIPMENT INFORMATION

2.1 TEST 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 UTS718 is a portable phone transmitter designed to link to a PHS phone network which transmits at a frequency within the range 1890 MHz – 1910 MHz. Three channels were investigated, 1893.65 MHz, 1902.35 MHz, and 1909.85 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 RESULT SUMMARY

TABLE 2-1: TEST RESULT SUMMARY FOR FCC RULES AND REGULATIONS

STANDARD	TEST	PASS/FAIL OR N/A
FCC §2.1033(c)(8)	DC Voltages and Currents	Pass
FCC §2.1046	RF Power Output	Pass
FCC §24.238 (B)	Emission Bandwidth	Pass
FCC §1.1051	Conducted Spurious and Harmonic Emissions	Pass
FCC §2.1053	Radiated Spurious and Harmonic Emissions	Pass
FCC §24.238	Band Edge	Pass
FCC §2.1055	Frequency Stability / Temperature Variation	Pass

2.4 TEST SYSTEM DETAILS

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

TABLE 2-2: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
PORTABLE PHONE	UTSTARCOM, INC.	UTS718	C3440667D85B	O6YUTS-718	1 METER UNSHIELDED AUDIO TERMINATION	15159
BATTERY CHARGER	UTSTARCOM, INC.	PHSJ95	0102	N/A	N/A	15221
CHARGER AC ADAPTER	UTSTARCOM, INC.	PV-07540T	1001	N/A	1.9 METER UNSHIELDED POWER	15222
BATTERY CHARGER	UTSTARCOM, INC.	WSP0520321	CT200302	N/A	1.9 METER UNSHIELDED POWER	15161

2.5 CONFIGURATION OF TESTED SYSTEM

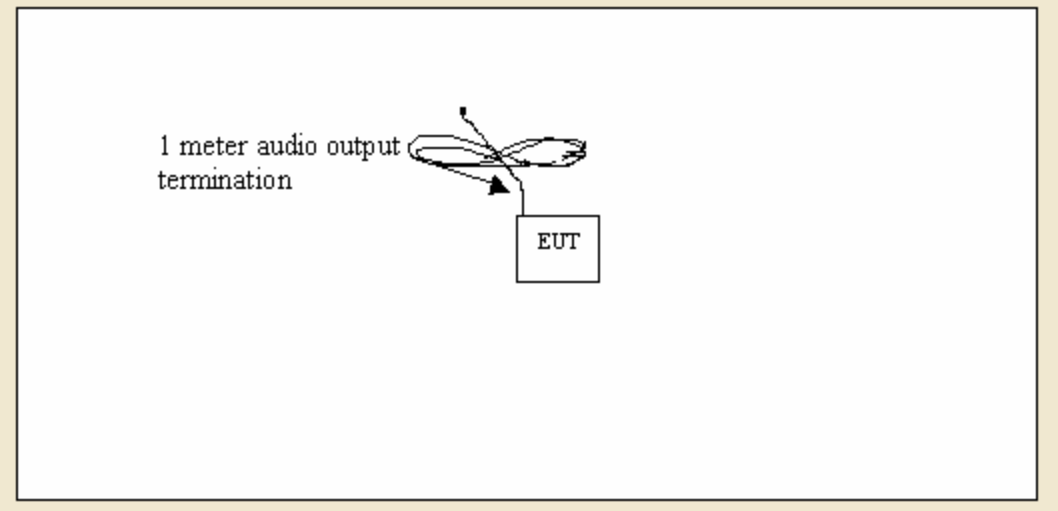


FIGURE 1: CONFIGURATION OF TESTED SYSTEM

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 was measured.

3.1 DC VOLTAGES AND CURRENTS TEST EQUIPMENT

TABLE 3-1: DC VOLTAGES AND CURRENTS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901247	Wavetek	DM25XT	Multimeter	40804098	2/14/04

3.2 DC VOLTAGES AND CURRENTS TEST DATA

TABLE 3-2: DC VOLTAGES AND CURRENTS DATA

	Minimum	Typical	Maximum
Voltage (DC)	2.7	3.6	4.2
Current (Amps)	0.023	0.031	.036

TEST PERSONNEL:

Signature:  Test Date: May 27 , 2003

Typed/Printed Name: Daniel Baltzell Position: Test Engineer

4 RF POWER OUTPUT - §2.1046

The transmitter antenna terminal is connected with the 50 Ω impedance input to the spectrum analyzer.

4.1 RF POWER OUTPUT TEST EQUIPMENT

TABLE 4-1: RF POWER OUTPUT TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	7/19/03
901186	Agilent Technologies	E9323A (50 MHz-6 GHz)	Peak & Average Power Sensor	US40410380	7/19/03

4.2 RF POWER OUTPUT TEST DATA

TABLE 4-2: POWER OUTPUT AT THE ANTENNA PORT DATA - §2.1046

Channel	Frequency (MHz)	Peak Power Meter Level (dBm)	Peak Power Meter Level (mW)
251	1893.65	19.38	86.7
25	1902.35	19.98	99.5
50	1909.85	19.99	99.8

TEST PERSONNEL:

Signature:  Test Date: May 22, 2003

Typed/Printed Name: Daniel Baltzell Position: Test Engineer

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

Substitution method.

4.4 EFFECTIVE ISOTROPIC RADIATED POWER LIMITS - §24.232 (B) TEST PROCEDURE

Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

4.5 RF POWER TEST EQUIPMENT

TABLE 4-3: 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

4.6 EFFECTIVE ISOTROPIC RADIATED POWER TEST DATA- §2.1046

Channel	Test Detector	Frequency (MHz)	Spectrum Analyzer (dBuV)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)
251	Pk	1893.65	87.8	18.16	3.12	5.08	20.2	104.7
25	Pk	1902.35	88.2	18.06	3.14	5.08	20.0	100.0
50	Pk	1909.85	87.9	17.73	3.18	5.09	19.64	92.0

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 recorded from a calibrated spectrum analyzer using a 1 MHz resolution bandwidth for each channel being tested, and adjusted to an 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: May 21, 2003

Typed/Printed Name: Daniel Baltzell Position: Test Engineer

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

Type of Emission: DXW

Necessary bandwidth designator derived from measurement of emission bandwidth (-26 dB) (263 kHz): 263KDXW

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 peak conducted power measurement not corrected for duty cycle.

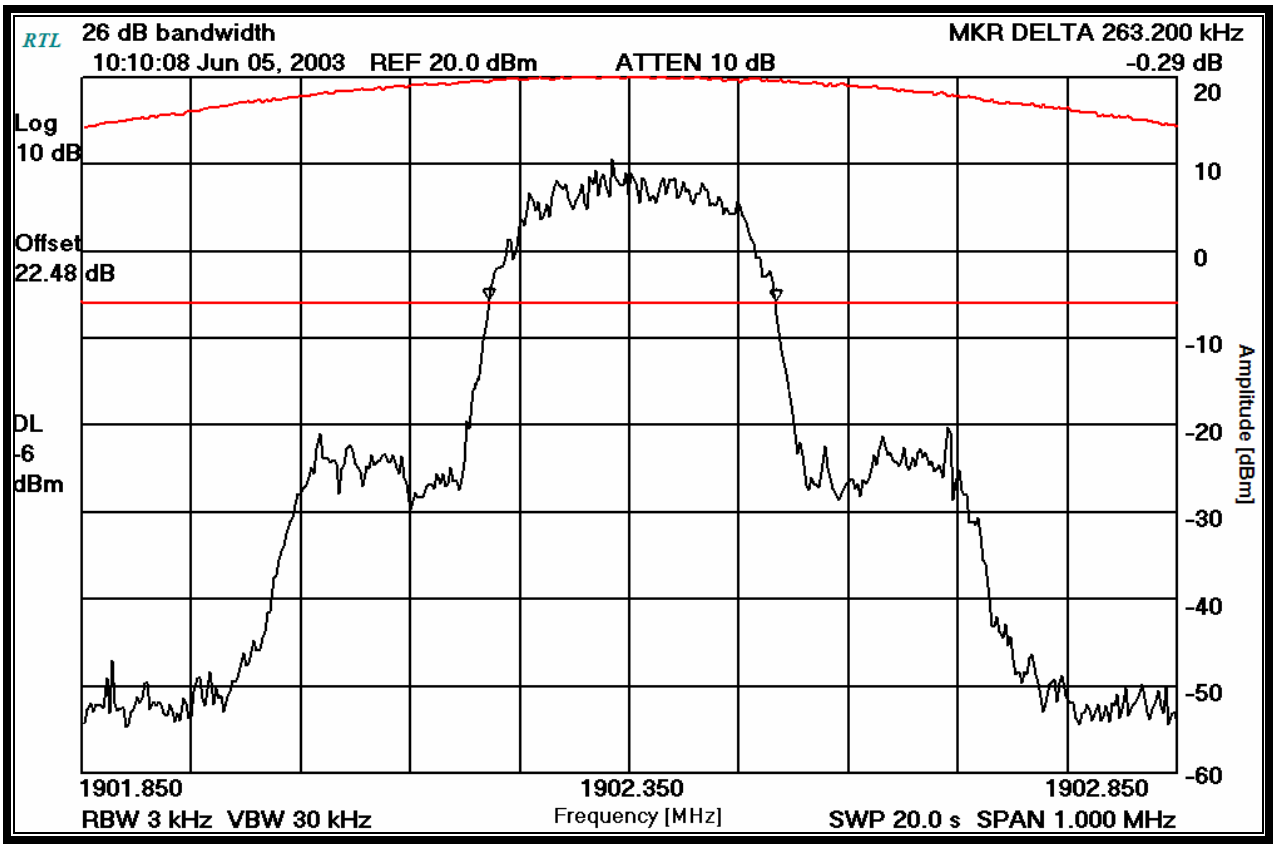
5.2 OCCUPIED BANDWIDTH TEST EQUIPMENT

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 25: EMISSION BANDWIDTH = 263 KHZ)

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



TEST PERSONNEL:

Signature: _____ Test Date: June 5, 2003

Typed/Printed Name: Daniel Baltzell Position: Test 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 peak channel test data is provided. Overloading of the input to the spectrum analyzer was checked and found it was not necessary to use a notch filter for this purpose during measurements.

6.2 CONDUCTED SPURIOUS AND HARMONIC TEST EQUIPMENT

TABLE 6-1: CONDUCTED SPURIOUS AND HARMONIC 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):	1893.65
Channel:	251
Measured Power at the Antenna Port (dBm):	19.38
Modulation:	DXW
Limit (dBc):	32.38

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

Frequency (MHz)	Measured Level (dBc)	Margin (dB)
3787.300	77.3	-44.9
5680.950	63.1	-30.7
7574.600	83.4	-51.0
9468.250	89.9	-57.5
11361.900	93.8	-61.4
13255.550	92.3	-59.9
15149.200	90.8	-58.4
17042.850	91.8	-59.4
18936.500	91.9	-59.5

Operating Frequency (MHz): 1902.35
Channel: 25
Measured Power at the Antenna Port (dBm): 19.98
Modulation: DXW
Limit (dBc): 32.98

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

Frequency (MHz)	Measured Level (dBc)	Margin (dB)
3804.700	60.0	-27.0
5707.050	61.4	-28.4
7609.400	82.5	-49.5
9511.750	92.2	-59.2
11414.100	91.7	-58.7
13316.450	93.9	-60.9
15218.800	94.0	-61.0
17121.150	93.9	-60.9
19023.500	95.0	-62.0

Operating Frequency (MHz): 1909.85
Channel: 50
Measured Power at the Antenna Port (dBm): 19.99
Modulation: DXW
Limit (dBc): 32.99

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

Frequency (MHz)	Measured Level (dBc)	Margin (dB)
3819.700	76.2	-43.2
5729.550	65.9	-32.9
7639.400	81.4	-48.4
9549.250	91.0	-58.0
11459.100	94.2	-61.2
13368.950	92.0	-59.0
15278.800	92.5	-59.5
17188.650	92.5	-59.5
19098.500	94.0	-61.0

TEST PERSONNEL:

Signature:  Test Date: May 22, 2003

Typed/Printed Name: Daniel Baltzell Position: Test 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 moving the EUT through three orthogonal planes while 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 (dBi). 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): 1902.35
Channel: 25
Measured EIRP (dBm): 20.0
Modulation: DXW
Distance (m): 3
Limit (dBc): 33.0

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 Level (dBc)	Margin (dB)
3804.700	-43.20	0.80	8.04	55.96	-22.96
5707.050	-34.70	1.20	8.68	47.22	-14.22
7609.400	-27.00	6.53	9.90	43.63	-10.63
9511.750	-38.66	7.30	10.60	55.36	-22.36
11414.100	-39.00	8.20	10.72	56.48	-23.48
13316.450	-32.83	8.84	12.74	48.93	-15.93
15218.800	-31.97	9.20	10.96	50.21	-17.21
17121.150	-31.03	9.66	12.54	48.15	-15.15
19023.500	-28.73	9.97	16.80	41.90	-8.90

TEST PERSONNEL:

Signature:  Test Date: May 17, 2003

Typed/Printed Name: Daniel Baltzell Position: Test Engineer

8 BLOCK/BAND-EDGE COMPLIANCE - PART 24.238

8.1 TEST PROCEDURE:

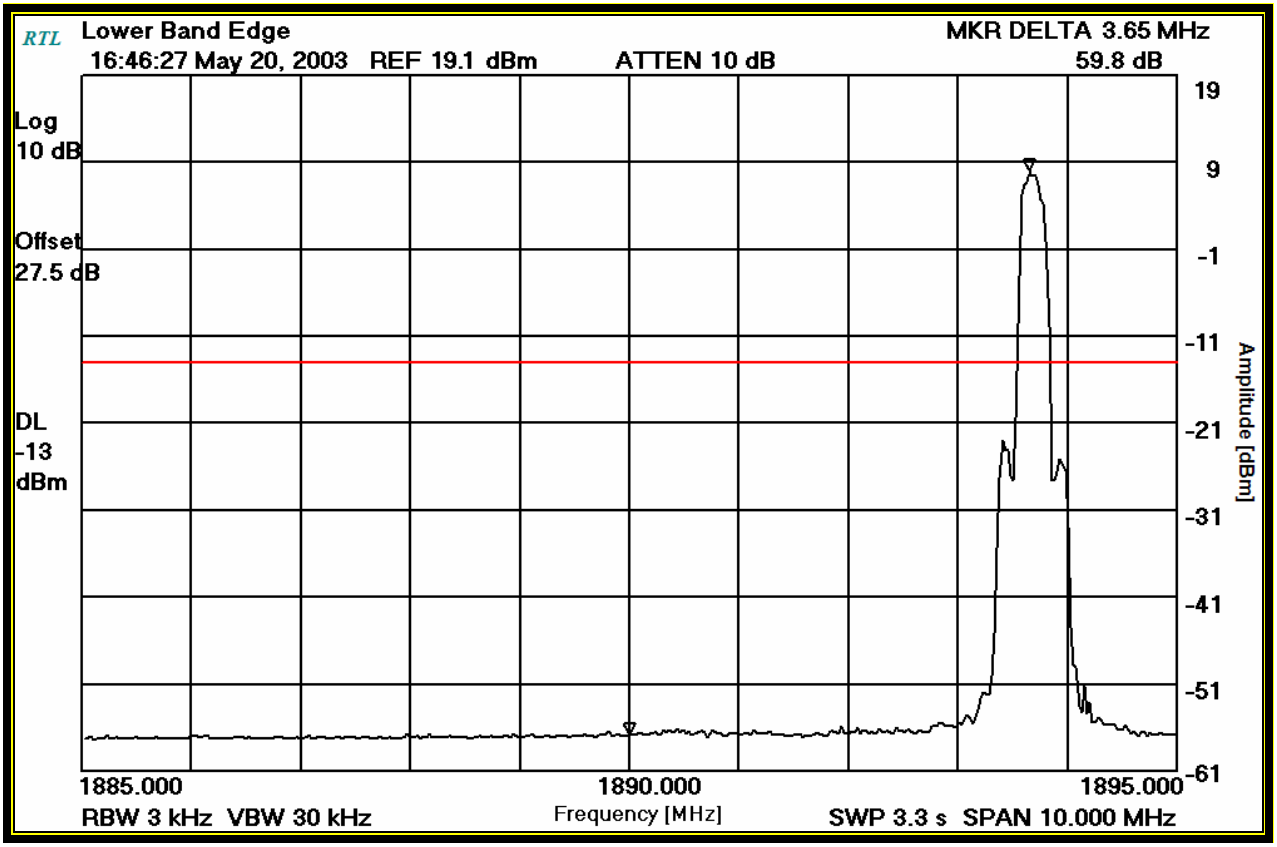
The resolution of the spectrum analyzer is adjusted to 1% of the emission bandwidth after the reference level is adjusted to the maximized EIRP level using a resolution and video bandwidth of 1 MHz. The frequency is centered on the band edge of interest with a span capable of showing the peak, the display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

8.2 BAND-EDGE TEST EQUIPMENT

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	7/2/03
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	5/12/04

8.3 TEST DATA

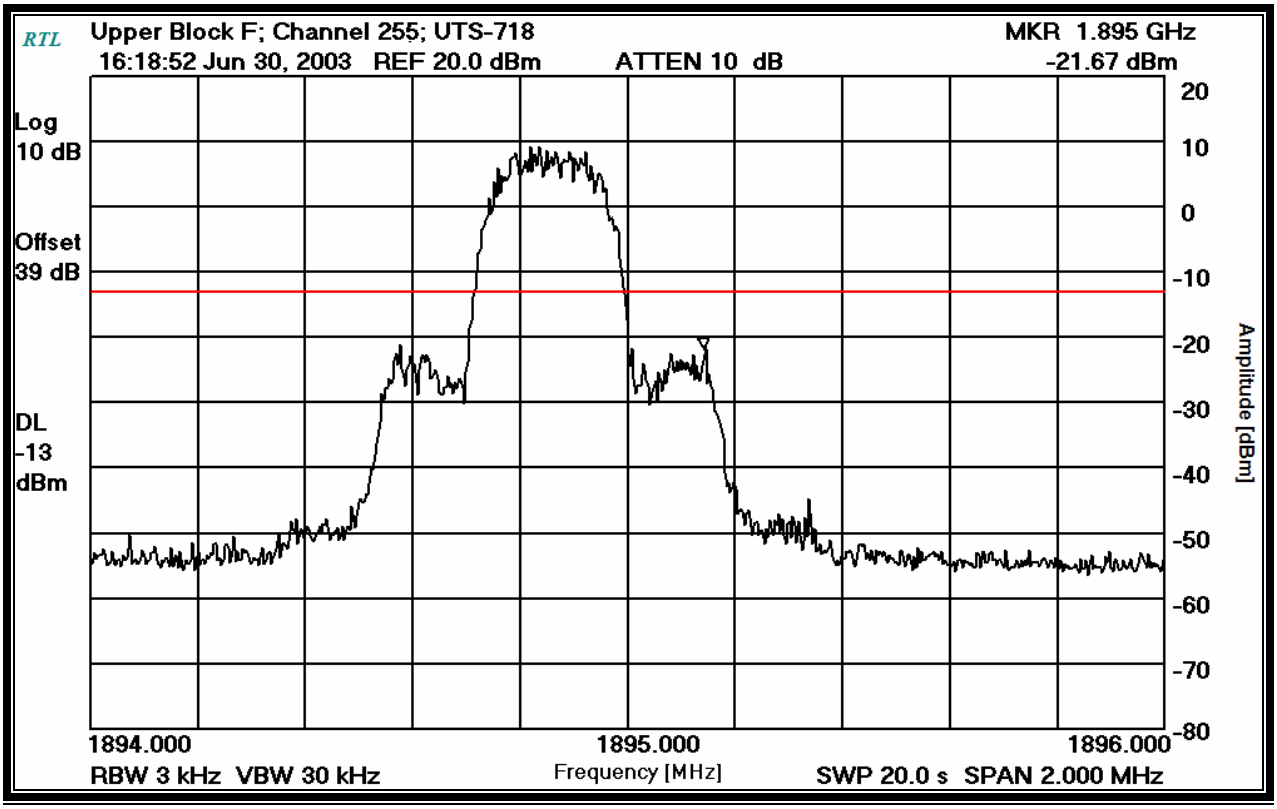


PLOT 8-1: LOWER BAND EDGE (LOWER BLOCK F)

TEST PERSONNEL:

Signature: _____ Test Date: May 20, 2003

Typed/Printed Name: Daniel Baltzell Position: Test Engineer

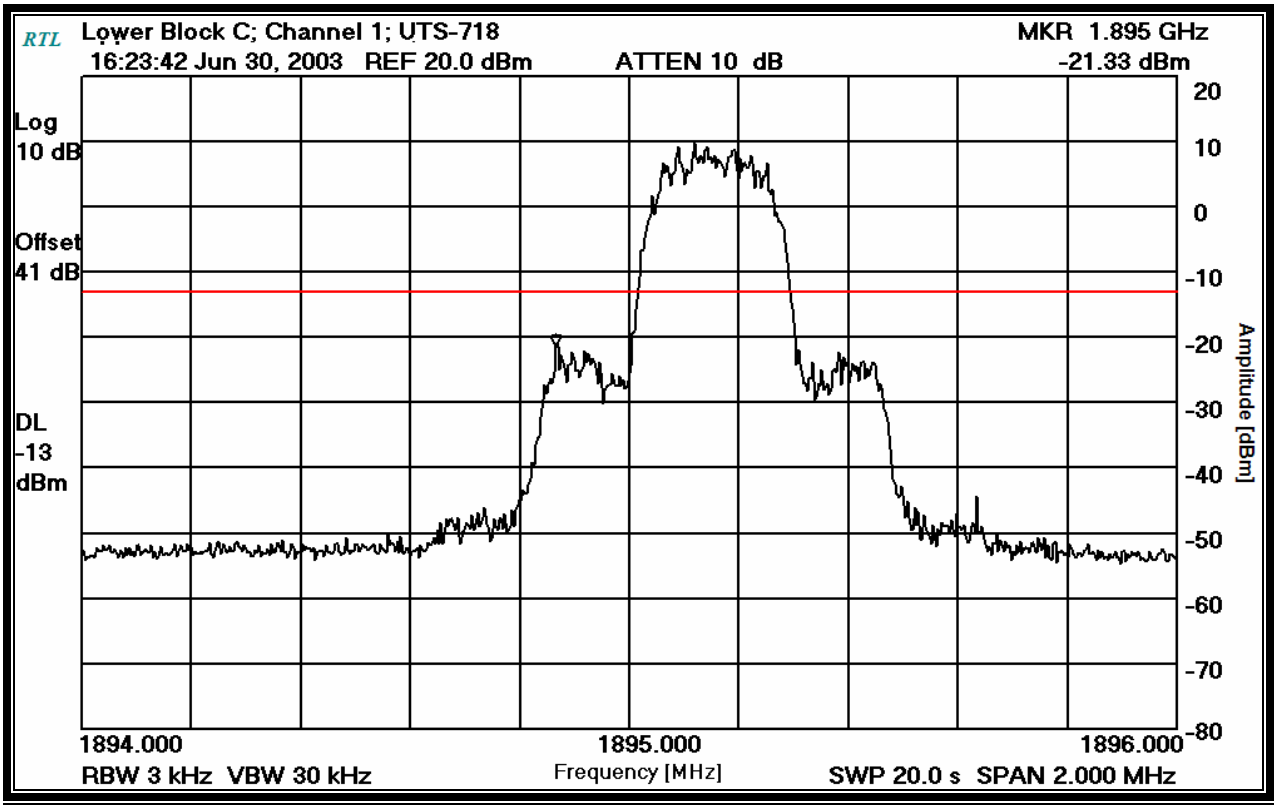


PLOT 8-2: UPPER BLOCK EDGE F

TEST PERSONNEL:

Signature: _____ Test Date: June 30, 2003

Typed/Printed Name: Daniel Baltzell Position: Test Engineer

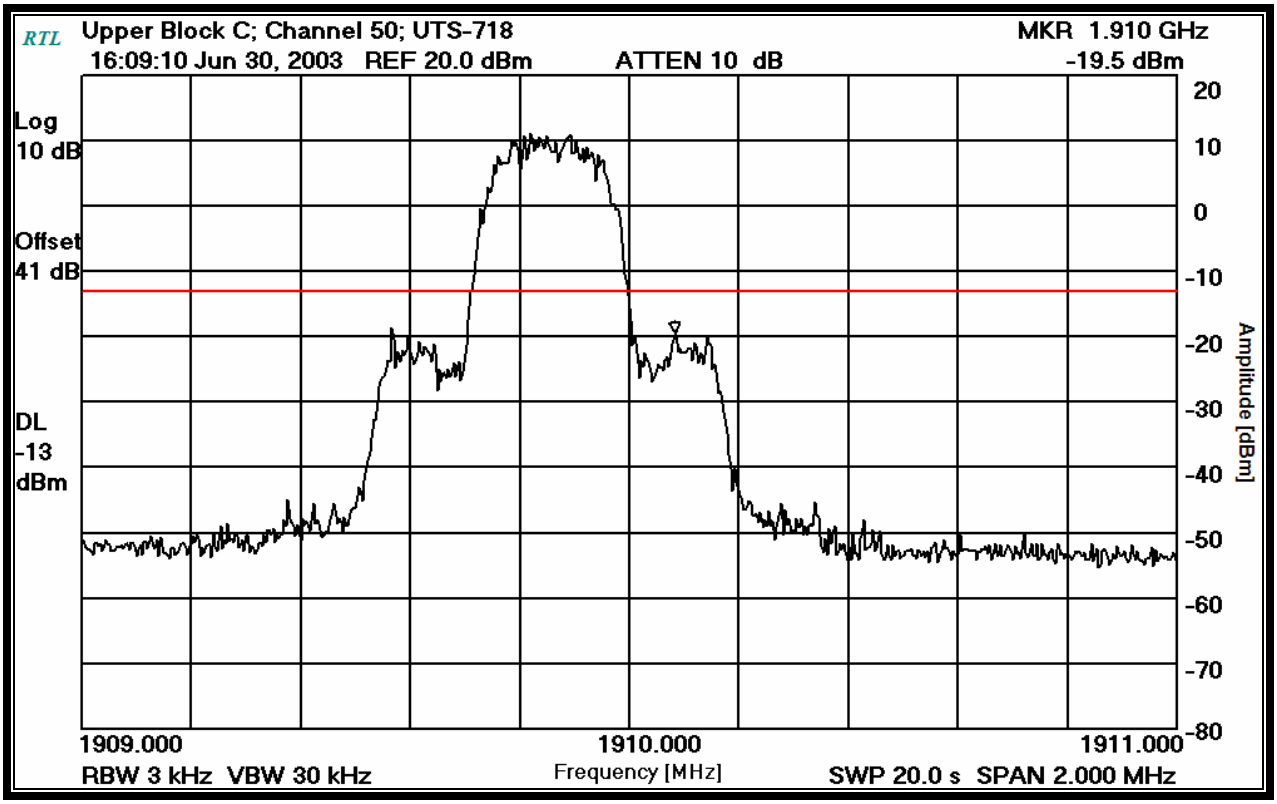


PLOT 8-3: LOWER BLOCK EDGE C

TEST PERSONNEL:

Signature: _____ Test Date: June 30, 2003

Typed/Printed Name: Daniel Baltzell Position: Test Engineer



PLOT 8-4: UPPER BAND EDGE (UPPER BLOCK C)

TEST PERSONNEL:

Signature: _____ Test Date: June 30, 2003

Typed/Printed Name: Daniel Baltzell Position: Test 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

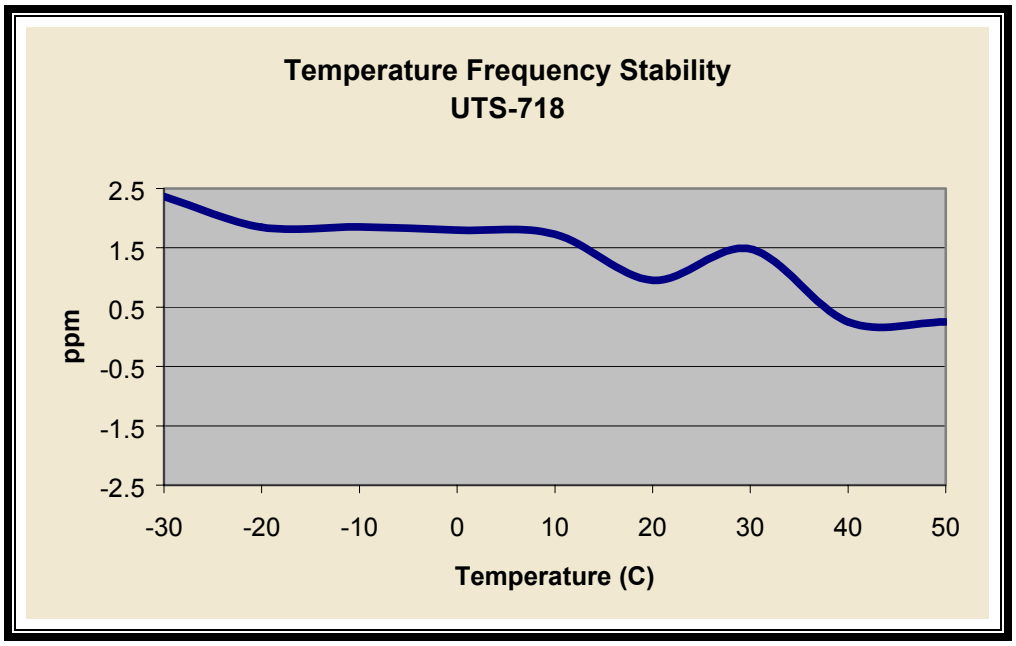
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

9.5 FREQUENCY STABILITY TEST DATA - §2.1055

Operating Frequency MHz): 1902.35
Channel: 25
Reference Voltage (VDC): 3.6
Deviation Limit (ppm): 2.5

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

Temperature	Frequency Measured (MHz)	ppm
-30	1902.354500	2.4
-20	1902.353513	1.8
-10	1902.353525	1.9
0	1902.353425	1.8
10	1902.353288	1.7
20	1902.351813	1.0
30	1902.352813	1.5
40	1902.350476	0.3
50	1902.350476	0.3

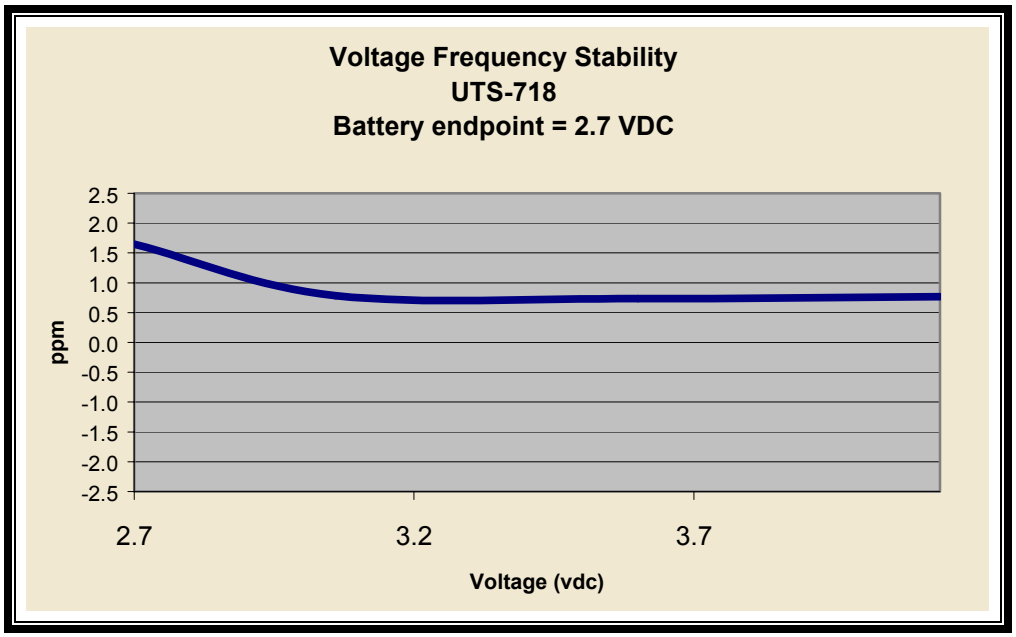


PLOT 9-1: TEMPERATURE FREQUENCY STABILITY - §2.1055

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

Battery endpoint = 2.7 VDC

Voltage	Frequency Measured (MHz)	ppm
2.7	1902.390130	1.6
3.06	1902.388491	0.8
3.6	1902.388399	0.7
4.14	1902.388458	0.8



PLOT 9-2: VOLTAGE FREQUENCY STABLITY

TEST PERSONNEL:

Signature: _____ Test Date: May 19, 2003

Typed/Printed Name: Daniel Baltzell Position: Test Engineer

10 CONCLUSION

The data in this measurement report shows that the UTStarcom Model # UTS718, FCC ID: O6YUTS-718, complies with all the requirements of Parts 2 and 24 of the FCC Rules.