Engineering and Testing for EMC and Safety Compliance

CERTIFICATION REPORT

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MODEL: WCE-100

FCC ID: POQWCE-100

June 7, 2001

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 1999	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
PART 22: 1998	PUBLIC MOBILES SERVICES
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
RSS-118; Issue 2: August 1990	LAND AND SUBSCRIBER STATIONS: VOICE, DATA AND TONE MODULATED, ANGLE MODULATION RADIOTELEPHONE TRANSMITTERS AND RECEIVERS OPERATING IN THE CELLULAR MOBILE BANDS 824-849 MHZ AND 869-894 MHZ

FCC Rules Parts	Frequency Range	Output Power Radiated (W)	Freq. Tolerance	Emission Designator
22	824.70-848.31 MHz	.033	2.5 ppm	1M5F9W
Canadian	**Frequency Range**	**Output Power Radiated (W)**	**Freq. Tolerance**	**Emission Designator**
RSS-118	824.70-848.31 MHz	.033	2.5 ppm	1M5F9W

REPORT PREPARED BY:

Test Engineer: Daniel Baltzell
Administrative Writer: Melissa Fleming

Document Number: 2001119

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1 GENERAL INFORMATION

The following Report of a Type Certification is prepared on behalf of ***Withus Information & Telecommunication, CO. LTD.*** in accordance with the Federal Communications Commissions and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was the ***WCE-100; FCC ID: POQWCE-100***. 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: Part 22(H), Industry Canada RSS-133, 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.

1.1 TEST FACILITY

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

1.2 RELATED SUBMITTAL(S) / GRANT(S)

This is an original application report.

1.3 CONFORMANCE STATEMENT

STANDARDS REFERENCED FOR THIS REPORT	
PART 2: 1999	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS
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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, FCC Part 22(H) and Industry Canada RSS-133 Certification methodology.

Signature: ________________ Date: June 7, 2001

Typed/Printed Name: Bruno Clavier Position: Vice President of Operations (NVLAP Signatory)

Signature: ________________ Date: June 7, 2001

Typed/Printed Name: Daniel Baltzell Position: Test 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.

1.4 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.

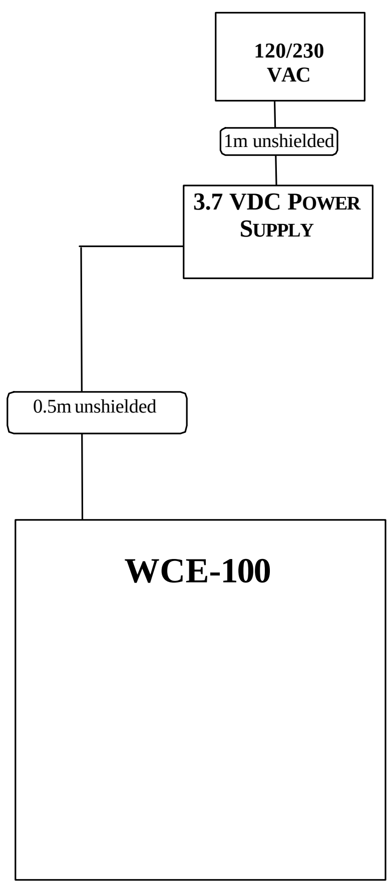
TABLE 1-1: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
PHONE	WITHUS INFORMATION & TELECOMMUNICATION, CO. LTD.	WCE-100	N/A	POQWCE-100	N/A	13280

TABLE 1-2: EXTERNAL COMPONENTS OF THE TEST CONFIGURATION

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
BATTERY	WITHUS INFORMATION & TELECOMMUNICATION, CO. LTD.	N/A	N/A	N/A	N/A	13285
BATTERY CHARGER	WITHUS INFORMATION & TELECOMMUNICATION, CO. LTD.	N/A	N/A	N/A	N/A	13298

FIGURE 1-1: CONFIGURATION OF TESTED SYSTEM



1.5 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

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

1.6 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.

2 PART 2.1046 (A) AND PART 22.913 RF POWER OUTPUT: RADIATED - ERP

2.1 TEST PROCEDURE

Substitution Method:

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

2.2 TEST DATA

Settings:

- High Power: 300 mW rated delivered to antenna
- Radiated power measurements (3 meter)

ERP Substitution Method Data (dBm)							
Frequency (MHz)	Antenna Orientation	Spectrum Analyzer (dBuV)	Signal Generator Level (dBm)	Correction Factor (dB)	Corrected Signal Generator Level (dBm)	ERP (W)	Amps Channel
824.64	H	90.7	28.70	-5.8	22.95	0.197	1011
835.89	H	90.4	28.82	-5.8	23.02	0.200	363
848.37	H	89.9	29.62	-7.0	22.62	0.183	779

*Measurement accuracy is +/- 1.5 dB

2.3 TEST EQUIPMENT

Spectrum Analyser HP8566B
Antenna Roberts ½ wave dipoles

360 Herndon Parkway
Suite 1400
Herndon, VA 20170
http://www.rheintech.com

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

3.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.12

The transmitter is terminated with a 50 Ω load and is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1000 Hz.

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

3.2 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.

Radiated Emissions (Channel 1011 at 824.64 MHz) Substitution Method (limit = -28.26 dBc)				
Frequency (MHz)	**S/G level (dBm)**	**Correction Factor (dB)***	**ERP (dBc)**	**Margin**
1649.28	-56.5	-1.7	-73.46	-45.2
2473.92	-93.6	-1.8	-110.66	-82.4
3298.56	-86.5	-2.7	-104.46	-76.2
4123.20	-41.8	-3.9	-60.96	-32.7
4947.84	-41.0	-3.8	-60.06	-31.8
5772.48	-46.0	-4.5	-65.76	-37.5
6597.12	-45.0	-7.0	-67.26	-39
7421.76	-46.3	-7.2	-68.76	-40.5
8246.40	-47.3	-7.4	-69.96	-41.7

*This insertion loss corresponds to the cable connecting the RF Signal Generator and the respective correction to a ½ wave dipole antenna.

Radiated Emissions (Channel 363 at 835.89 MHz) Substitution Method (limit = -27.44 dBc)				
Frequency (MHz)	**S/G level (dBm)**	**Correction Factor (dB)***	**ERP (dBm)**	**Margin (dB)**
1671.78	-55.0	-1.7	-71.14	-43.7
2507.67	-97.5	-3.0	-114.94	-87.5
3343.56	-89.3	-3.4	-107.14	-79.7
4179.45	-47.4	-4.7	-66.54	-39.1
5015.34	-40.4	-4.2	-59.04	-31.6
5851.23	-46.0	-6.5	-66.94	-39.5
6687.12	-45.3	-6.4	-66.14	-38.7
7523.01	-46.4	-7.5	-68.34	-40.9
8358.90	-47.3	-7.6	-69.34	-41.9

*This insertion loss corresponds to the cable connecting the RF Signal Generator and the respective correction to a ½ wave dipole antenna.

Radiated Emissions (Channel 779 at 848.37 MHz) Substitution Method (limit = 27.52 dBc)				
Frequency (MHz)	**S/G level (dBm)**	**Correction Factor (dB)***	**ERP (dBm)**	**Margin (dB)**
1696.74	-55.6	-1.8	-71.92	-44.4
2545.11	-98.6	-3.1	-116.22	-88.7
3393.48	-89.8	-3.7	-108.02	-80.5
4241.85	-43.0	-4.7	-62.22	-34.7
5090.22	-40.4	-5.2	-60.12	-32.6
5938.59	-46.5	-6.5	-67.52	-40.0
6786.96	-44.5	-6.5	-65.52	-38.0
7635.33	-46.4	-7.2	-68.12	-40.6
8483.70	-47.3	-7.7	-69.52	-42.0

*This insertion loss corresponds to the cable connecting the RF Signal Generator and the respective correction to a ½ wave dipole antenna.

3.3 TEST EQUIPMENT

Antenna: CHASE CBL6112 s/n 2099
Amplifier: HP8449Bs/n 3008A00505
Spectrum analyzer: HP8564Es/n 3943A01719

RF Signal Generator HP8648Cs/n 3537A01741
Synthesized Sweeper HP83752A s/n 3610A00846

4 FCC RULES AND REGULATIONS PART 2 §2.1049 (C) (1): OCCUPIED BANDWIDTH

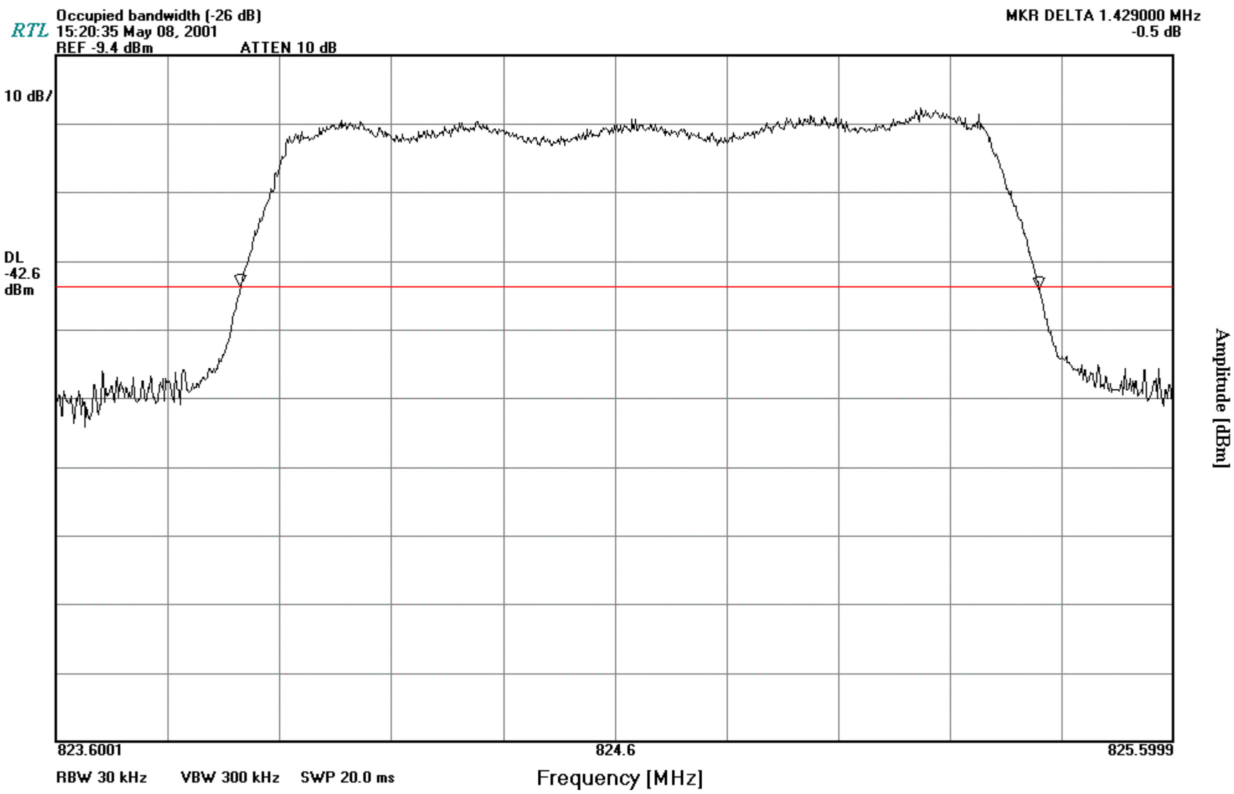
Occupied Bandwidth

4.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.11
Part 22.917

4.2 TEST DATA

Channel 1011; 824.64 MHz: 0.033W; –26 dB occupied bandwidth (1.429 MHz)



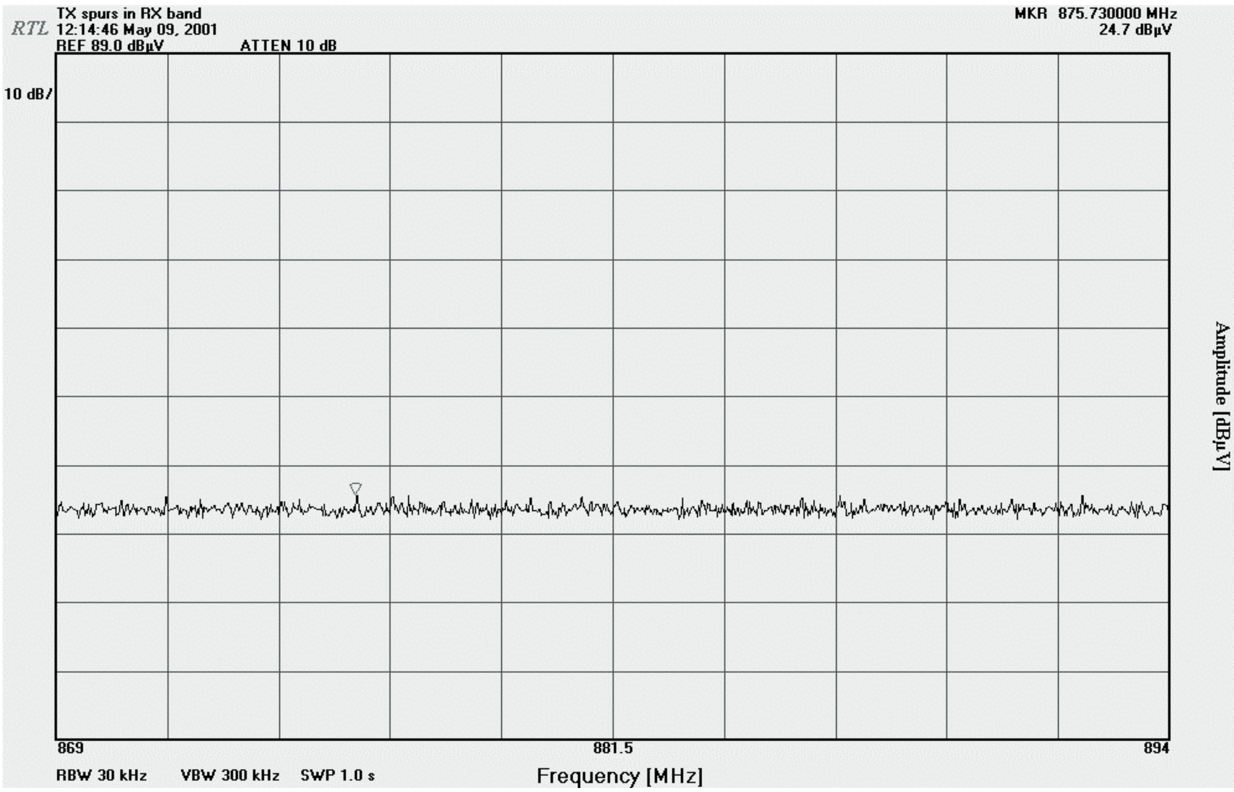
4.3 TEST EQUIPMENT

Spectrum Analyzer HP8564Es/n 3943A01719

5 FCC PART 22.917 (F) EMISSIONS IN BASE STATION FREQUENCY BAND FROM MOBILES

5.1 TEST DATA

TX spurs in RX critical



5.2 TEST EQUIPMENT

Spectrum Analyzer HP8564Es/n 3943A01719

360 Herndon Parkway
Suite 1400
Herndon, VA 20170
http://www.rheintech.com

6 FCC RULES AND REGULATION PART 2 §2.1055: FREQUENCY STABILITY

6.1 TEST PROCEDURE

ANSI/TIA/EIA-603-1992, section 2.2.2 and FCC part 22.355

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.

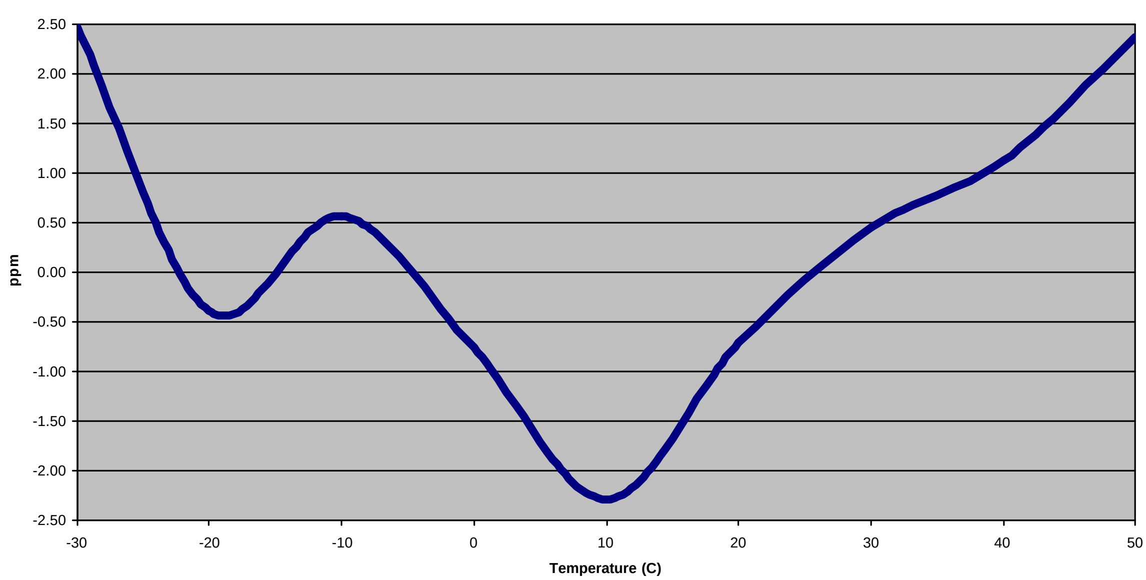
The temperature was initially set to -30°C and a 2-hour period was observed for stabilization of the EUT.
The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A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

The worst-case test data are shown.

6.2 TEST DATA

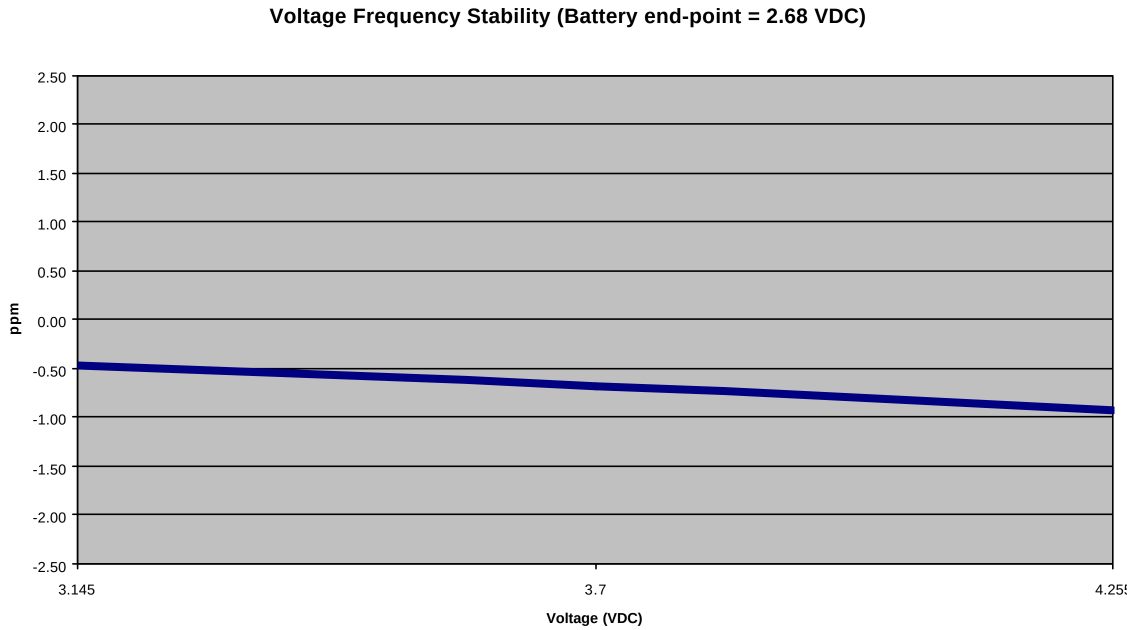
6.2.1 FREQUENCY STABILITY/FREQUENCY VARIATION

Temperature Frequency Stability



6.2.2 FREQUENCY STABILITY/VOLTAGE VARIATION

Battery end-point = 2.68 VDC



6.3 TEST EQUIPMENT

Temperature Chamber	Tenney TH65	s/n 11380
Frequency Counter	HP8901A (Frequency Mode)	s/n 2545A04102

7 FCC RULES AND REGULATIONS PART 2 §2.1047 (A): MODULATION CHARACTERISTICS

Due to the digital modulation, the modulation characteristic tests do not apply.

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

Type of Emission: F9W

Necessary Bandwidth is 1.5 MHz

Emission designator: 1M5F9W