REGULATORY COMPLIANCE REPORT

TITLE: FCC & IC Test Report for Test Report for Part 101 & RSS-119 Device
AUTHOR: Jeff Gilbert

REV	CCO	DESCRIPTION OF CHANGE	DATE	*APPROVALS*	
1		INITIAL RELEASE	01/17/07	Engineering	Jeff Gilbert
				Engineering	Drew Rosenberg

REVISION HISTORY

				Engineering	
				Engineering	
				Engineering	

Test Data Summary

FCC Part 101
RSS-119 Transmitter
952MHz – 960MHz
Device Model: DCU5000
Serial Number: 6320156
OATS Registration Number: FCC 90716, IC 5615

Rule	Description	Max. Reading	Pass/Fail
Part 101.113(a) / RSS-119	EIRP	12.13 dBW	Pass
Part 101.109 / RSS-119 Sec. 5.5, Table 3	Occupied Bandwidth	10.78 kHz	Pass
Part 101.111 / RSS-119 Sec. 5.83 Table 6 (Mask D)	Transmit Mask	N/A	Pass
Part 101.111 / RSS-119 Sec. 5.83 Table 6 (Mask D)	EIRP of Transmitter Spurious Emissions	-22.91 dBm	Pass
Part 101.107 / RSS-119 Sec. 5.3, Table 1	Frequency Stability	-733 Hz	Pass
RSS-Gen Sec. 7.2.3	Receiver spurious emissions	Noise Floor	Pass

Rule versions: FCC Part 1 (10-2006), FCC Part 2 (10-2006), FCC Part 101 (10-2006), RSS-102 (11-2005), RSS-119 Issue 8 (09-2006), RSS-Gen Issue 1 (09-2005).
Reference docs: ANSI C63.4-2003, TIA-603-C (08-2004).

Cognizant Personnel	
Name Mark Kvamme	Title Test Technician
Name Jeff Gilbert	Title Regulatory Engineer
Name Drew Rosenberg	Title Project Lead

FCC Part 101.113(a) / RSS-119

Output Power Limits

1. Output power must be +/-1dB of rated power.
2. EIRP limit is 14 dBW for mobile devices.
3. This device uses a third party OEM antenna with a gain of 5 dBi.

Equipment Used	Model Number	Serial Number	Cal Due Date
Spectrum Analyzer	E4408B	US40240538	March/07
Power Meter	437B	3125U11553	Nov/06
Power Sensor	8481D	3318A08626	Nov/06

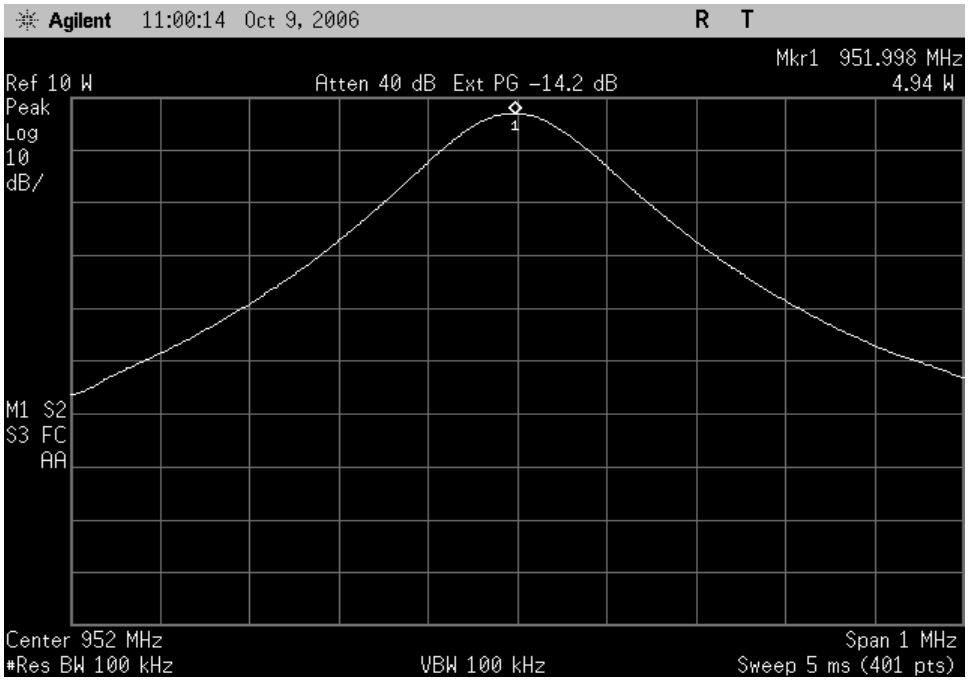
Date	Temp/Humidity ºF / %	Tested by
10/19/2006	54/60	Mark Kvamme

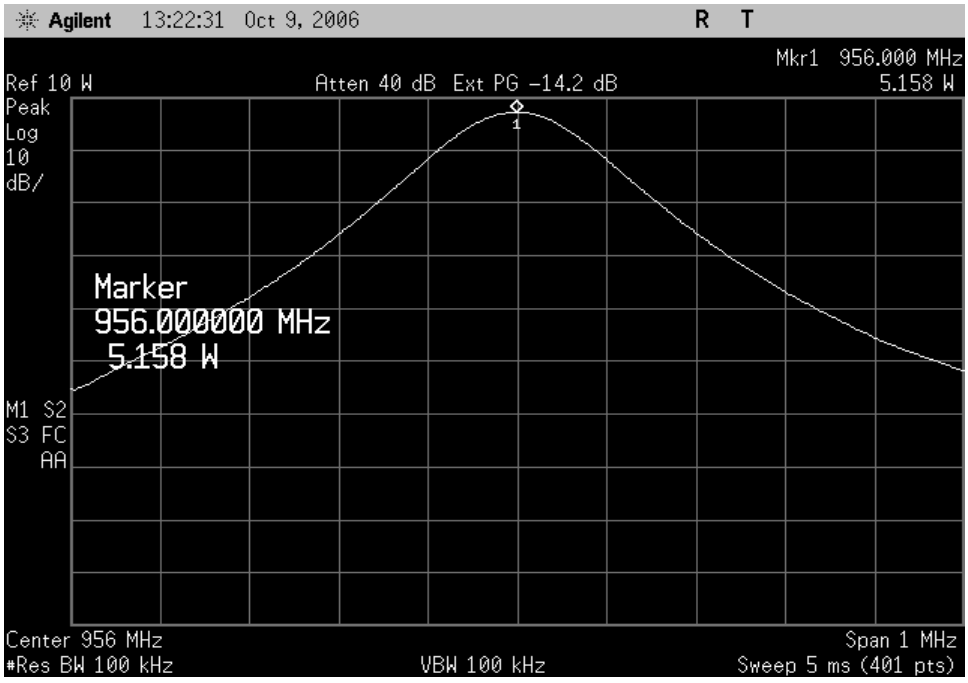
Frequency	Reading (Watts)	Rated Power (Watts)	Deviation (dB)
952	4.94	5	-0.05
956	5.16	5	0.14
960	4.83	5	-0.15

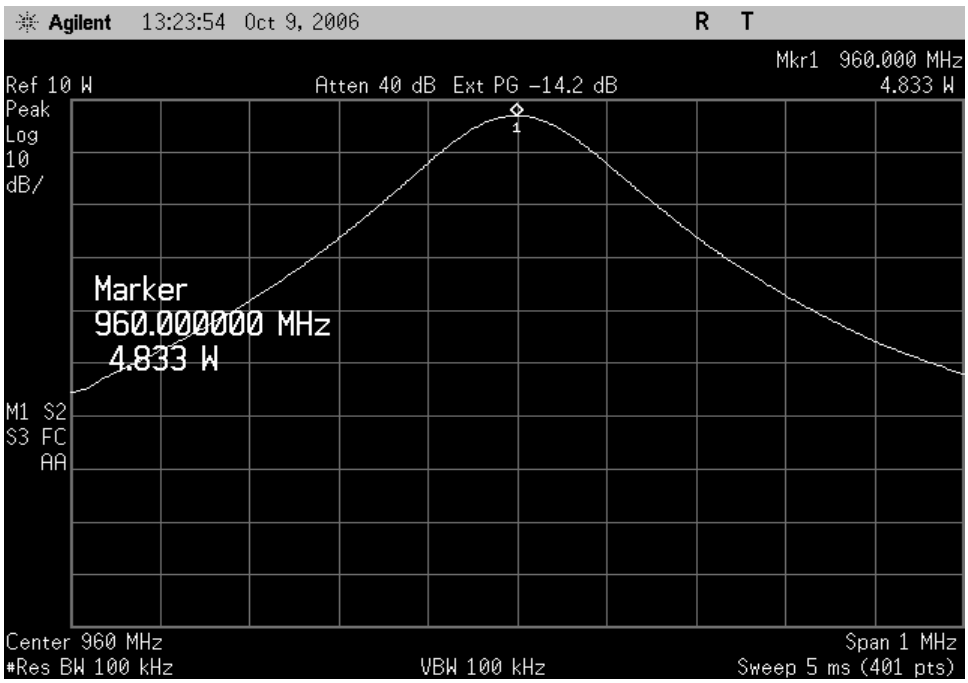
Loss in the 10 dB attenuator and cable is 14.2 dB. The loss was entered as an external power gain of -14.2 dB.

EIRP for this device is:

Antenna Conducted Power = 5.16 W (37.13 dBm)
Antenna Gain = 5 dBi
EIRP = 42.13 dBm (16.33 W or 12.13 dBW)




Agilent 13:22:31 Oct 9, 2006
R T
Mkr1 956.000 MHz
5.158 W
Ref 10 W
Atten 40 dB Ext PG -14.2 dB
Peak
Log
10
dB/
Marker
956.000000 MHz
5.158 W
M1 S2
S3 FC
AA
Center 956 MHz
#Res BW 100 kHz
VBW 100 kHz
Span 1 MHz
Sweep 5 ms (401 pts)


Agilent 13:23:54 Oct 9, 2006
R T
Mkr1 960.000 MHz
4.833 W
Ref 10 W
Atten 40 dB Ext PG -14.2 dB
Peak
Log
10
dB/
Marker
960.000000 MHz
4.833 W
M1 S2
S3 FC
AA
Center 960 MHz
#Res BW 100 kHz
VBW 100 kHz
Span 1 MHz
Sweep 5 ms (401 pts)

Part 101.109 / RSS-119 Sec. 5.5, Table 3

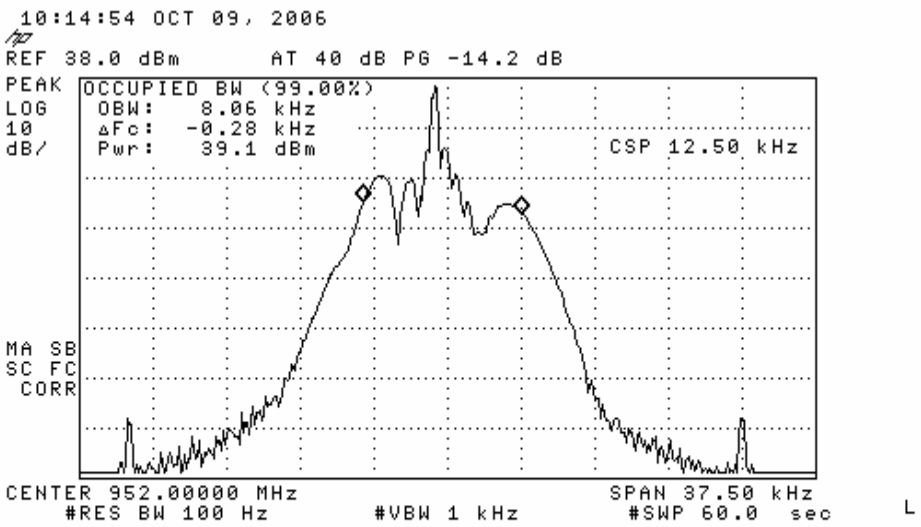
Occupied Bandwidth

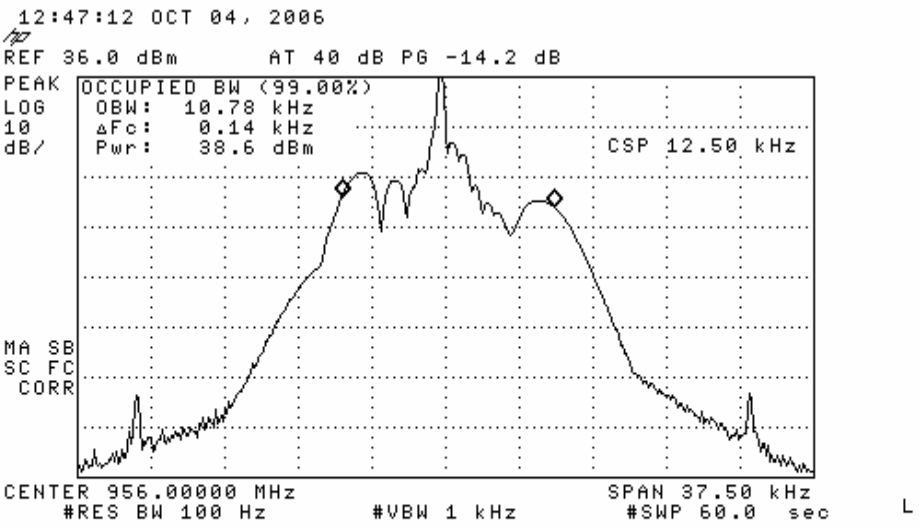
Measure the occupied bandwidth (99% bandwidth). The Occupied bandwidth may not exceed 11.25 kHz.

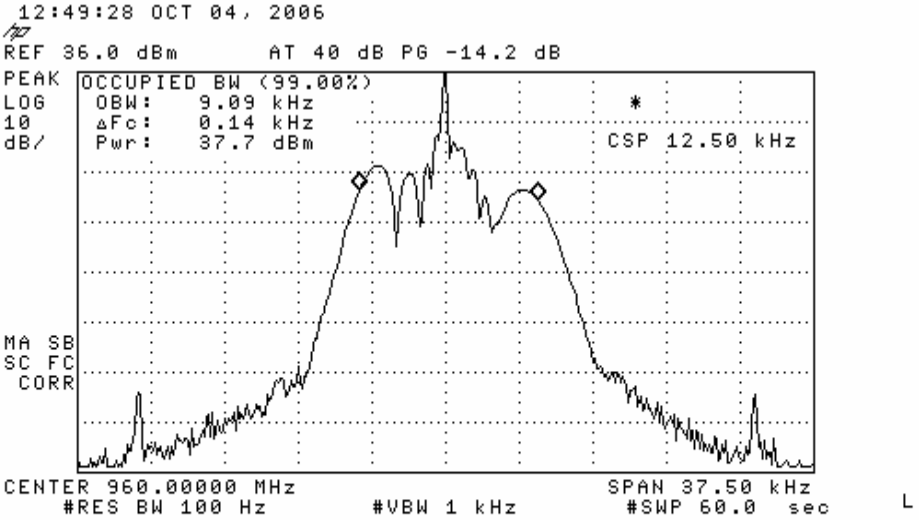
Equipment Used	Model Number	Serial Number	Cal Due Date
Spectrum Analyzer	8594E	3710A04999	Feb/07

Date	Temp/Humidity ºF / %	Tested by
10/4/2006	77/43	Mark Kvamme
10/9/2006	55/60	Mark Kvamme

Frequency	Occupied Bandwidth (Khz)	Limit (Khz)	pass fail
952	8.06	11.25	Pass
956	10.78	11.25	Pass
960	9.09	11.25	Pass




12:47:12 OCT 04, 2006
REF 36.0 dBm
AT 40 dB PG -14.2 dB
PEAK
LOG
10
dB/
OCCUPIED BW (99.00%)
OBW: 10.78 kHz
ΔFc: 0.14 kHz
Pwr: 38.6 dBm
CSP 12.50 kHz
MA SB
SC FC
CORR
CENTER 956.00000 MHz
SPAN 37.50 kHz
#RES BW 100 Hz
#VBW 1 kHz
#SWP 60.0 sec
L


12:49:28 OCT 04, 2006
REF 36.0 dBm
AT 40 dB PG -14.2 dB
PEAK
LOG
10
dB/
OCCUPIED BW (99.00%)
OBW: 9.09 kHz
ΔFc: 0.14 kHz
Pwr: 37.7 dBm
CSP 12.50 kHz
MA SB
SC FC
CORR
CENTER 960.00000 MHz
SPAN 37.50 kHz
#RES BW 100 Hz
#VBW 1 kHz
#SWP 60.0 sec
L

Part 101.111 / RSS-119 Sec. 5.83 Table 6 (Mask D)

Transmitter Mask

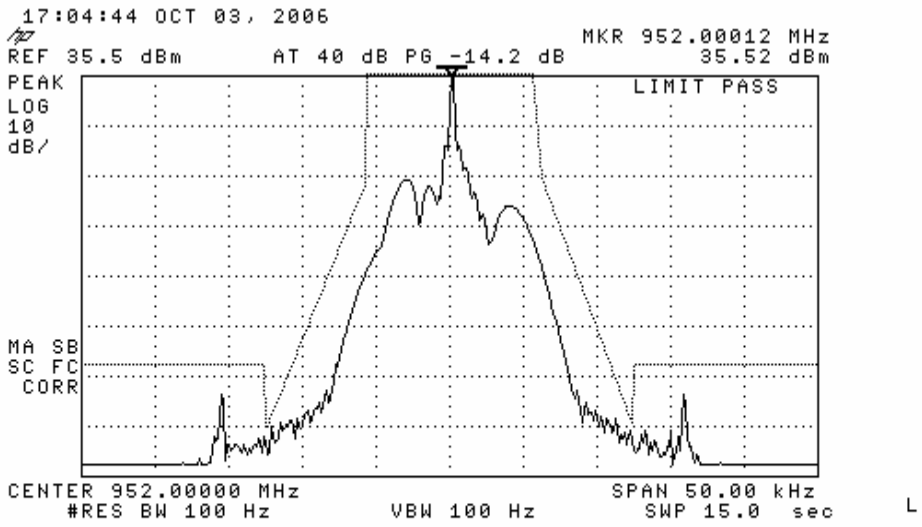
Measure the transmitter mask, referenced to an unmodulated carrier, according to the following schedule:

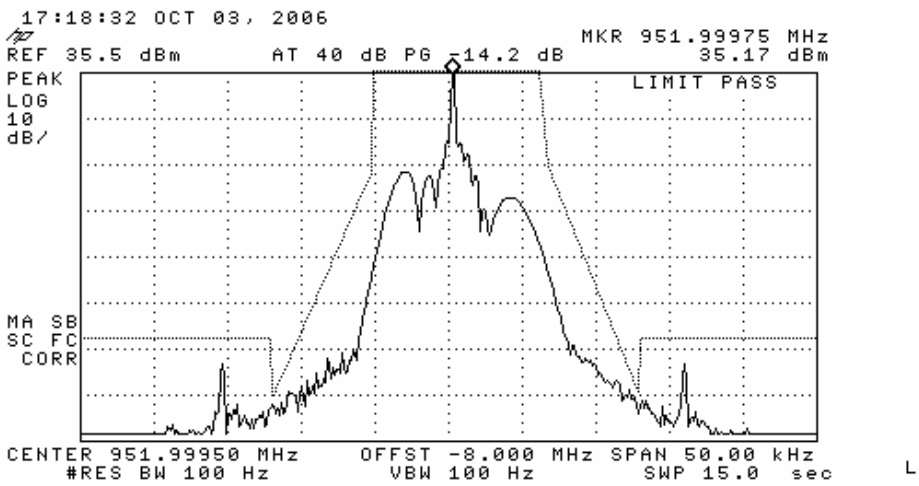
Minimum Displacement Frequency (kHz)	Maximum Displacement Frequency (kHz)	Attenuation below unmodulated carrier (dB)
0	5.625	0
5.625	12.5	7.27*(fd-2.88)
12.5	> 12.5	50+10log(P) or 70

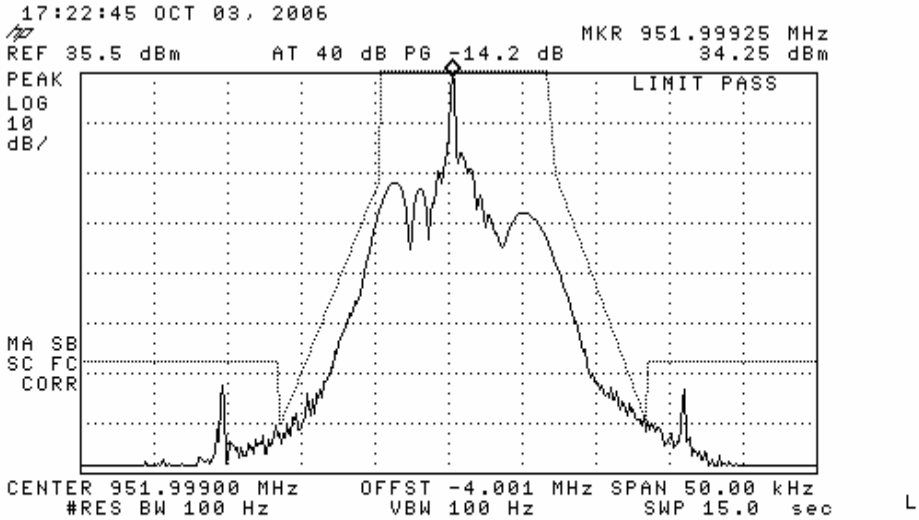
Equipment Used	Model Number	Serial Number	Cal Due Date
Spectrum Analyzer	8594E	3710A04999	Feb/07

Date	Temp/Humidity ºF / %	Tested by
10/3/2006	73/50	Mark Kvamme

50+10log (P) = 50+10log (16.33 W) = 62.13 > 70dB




17:18:32 OCT 03, 2006
MKR 951.99975 MHz
REF 35.5 dBm
AT 40 dB PG -14.2 dB
35.17 dBm
PEAK
LOG
10
dB/
LIMIT PASS
MA SB
SC FC
CORR
CENTER 951.99950 MHz
OFFST -8.000 MHz
SPAN 50.00 kHz
#RES BW 100 Hz
VBW 100 Hz
SWP 15.0 sec


17:22:45 OCT 03, 2006
MKR 951.99925 MHz
REF 35.5 dBm
AT 40 dB PG -14.2 dB
34.25 dBm
PEAK
LOG
10
dB/
LIMIT PASS
MA SB
SC FC
CORR
CENTER 951.99900 MHz
OFFST -4.001 MHz
SPAN 50.00 kHz
#RES BW 100 Hz
VBW 100 Hz
SWP 15.0 sec

Part 101.111 / RSS-119 Sec. 5.83 Table 6 (Mask D)

Spurious Emissions

Measure the EIRP of all transmitter spurious emissions that are >15 kHz away from the center of the fundamental peak. The EIRP of these emissions may not exceed 50+10log (P) or 70dB below the EIRP of the fundamental (measured in test 1). Use the antenna substitution procedure to perform these measurements (appendix A).

Equipment Used	Model Number	Serial Number	Cal Due Date
Spectrum Analyzer	E4408B	US40240538	March/07
Substitution Antenna	6412	9508-4550	Mar/08
Receive Antenna	16256	9205-3878	N/A

Date	Temp/Humidity ºF / %	Tested by
10/9/2006	56/50	Mark Kvamme

50+10log (P) = 50+10log (16.33 W) = 62.13dB > 70dB

From Test 1: Fundamental EIRP = 42.13 dBm

Limit = 42.13 dBm – 62.13dB = -20 dBm

Frequency (Mhz)	Polarity	Analyzer Reading of Device Emissions (dBm)	Analyzer Reading of Generator Emissions (dBm)	Difference (add to ERP reading)	Substitution Antenna Gain (dBi)	Generator Output (dBm)	EIRP (dBm)
1912.00	**V**	-62.04	-62.10	0.06	8.7	-59.83	-51.07
1912.00	**H**	-57.43	-57.50	0.07	7.6	-56.70	-49.03
2868.00	**V**	-42.24	-42.10	-0.14	9.6	-53.40	-43.94
2868.00	**H**	-40.36	-40.30	-0.06	9.6	-51.93	-42.39
3824.00	**V**	-25.11	-25.10	-0.01	9.6	-32.50	-22.91
3824.00	**H**	-25.64	-25.60	-0.04	9.3	-33.20	-23.94
4780.00	**V**	-32.48	-32.60	0.12	10.5	-41.10	-30.48
4780.00	**H**	-35.97	-36.15	0.18	9.9	-43.46	-33.38

Part 101.107 / RSS-119 Sec. 5.3, Table 1

Section 2.1055 Measurements required: Frequency stability.

(a) The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From -30 degrees to +50 degrees centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

Section 101.107 Frequency tolerance.

(a) The carrier frequency of each transmitter authorized in these services must be maintained within the percentage of the reference frequency except as otherwise provided in paragraph (b) of this section or in the applicable subpart of this part (unless otherwise specified in the instrument of station authorization the reference frequency will be deemed to be the assigned frequency):
…
952 to 960 (7) ……. ……. …….
…
(7) For private operational fixed point-to-point microwave systems, with a channel greater than or equal to 50 KHz bandwidth, ±0.0005%; for multiple address master stations, regardless of bandwidth, ±0.00015%; for multiple address remote stations with 12.5 KHz bandwidths or less, ±0.00015%; for multiple address remote stations with channels greater than 12.5 KHz bandwidth, ±0.0005%.

Limit = ±0.00015% * 951,000,000 Hz = ±1426Hz.

Test Results

Temperature soak time: 1 hour

Temperature (degrees Celsius)	Frequency (MHz)	Delta to reference (Hz)	Drift from reference (PPM)	Frequency (MHz)	Delta to reference (Hz)	Drift from reference (PPM)	Frequency (MHz)	Delta to reference (Hz)	Drift from reference (PPM)
-30	951.000098	66	0.07	954.500092	61	0.06	962.000086	52	0.05
-20	950.999935	-97	-0.10	954.499935	-96	-0.10	961.999937	-97	-0.10
-10	951.000153	121	0.13	954.500152	121	0.13	962.000154	120	0.12
0	950.999910	-122	-0.13	954.499913	-118	-0.12	961.999909	-125	-0.13
10	950.999953	-79	-0.08	954.499953	-78	-0.08	961.999951	-83	-0.09
20	951.000032	Reference	0.00	954.500031	Reference	0.00	962.000034	Reference	0.00
30	950.999689	-343	-0.36	954.499686	-345	-0.36	961.999685	-349	-0.36
40	950.999467	-565	-0.59	954.499465	-566	-0.59	961.999461	-573	-0.60
50	950.999308	-724	-0.76	954.499306	-725	-0.76	961.999301	-733	-0.76

RSS-Gen Sec. 7.2.3

Receiver Spurious Emissions

Receiver spurious emissions may not exceed the following limits:

Frequency (MHz)	Field Strength (uV/m)
30-88	100
88-216	150
216-960	200
960-1610	500
> 1610	1000

Equipment Used	Model Number	Serial Number	Cal Due Date
Spectrum Analyzer	E4408B	US40240538	March/07
Antenna	3110B	9807-3129	Sept/07
Power Meter	437B	3125U11553	Nov/06
Power Sensor	8481D	3318A08626	Nov/06

Date	Temp/Humidity ºF / %	Tested by
10/9/2006	56/50	Mark Kvamme

Freq. MHz	Ant. Pos.	Antenna Height / Table Azimuth	Level dBm		Level dBuV	Amplifier Gain dB	Ant. Factor dB	Cable Loss dB	**Corrected Level dBuV/m**	Limit dBuV/m	Margin dB
40.70	V	100/0	**-72.0**	P	**35.0**	**31.1**	11.0	0.5	**15.4**	40	24.6
73.20	V	100/300	**-63.0**	P	**44.0**	**30.1**	8.8	0.5	**23.2**	40	16.8
119.20	V	100/0	**-68.5**	P	**38.5**	**29.3**	11.8	0.5	**21.5**	43.5	22.0

The local oscillator of the receiver is 916MHz. When measured off of the antenna port, the receiver could not be found. An attempt was made to perform this measurement at the three meter site. Again, the receiver could not be found.

Below are the details in tabular format:

Freq. (MHz)	Measurement Type	Pol.	Reading (dBm)	Reading (dBuV)	ACF	Cable Loss	Amp. Gain	Final Reading
851	Conducted (NF)	N/A	-87.4	-	-	0	29.3	-116.7dBm
851	Radiated (NF)	N/A	-87.4	19.69	29.8	1.55	29.3	21.74 dBuV/m

**NF = Noise floor*

Appendix A – Antenna Substitution Method of EIRP Measurement

This test measures the field strength of radiated emissions using a spectrum analyzer and a receiving antenna in accordance with ANSI C63.4-2003. During the test, the EUT is to be placed on a non-conducting support at 80 cm above the horizontal ground plane of the OATS. The horizontal distance between the antenna and the EUT is to be exactly 3 meters. Levels below 1 GHz are to be measured with the spectrum analyzer resolution bandwidth at 120 kHz and levels at or above 1 GHz are to be measured with the spectrum analyzer resolution bandwidth at 1 MHz.

1) Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.
2) If appropriate, manipulate the system cables to produce the highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.
3) Rotate the EUT 360° to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat step 2). Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.
4) Move the antenna over its fully allowed range of travel to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to step 2) with the antenna fixed at this height. Otherwise, move the antenna to the height that repeats the highest amplitude observation and proceed.
5) Change the polarity of the antenna and repeat step 2), step 3), and step 4). Compare the resulting suspected highest amplitude signal with that found for the other polarity. Select and note the higher of the two signals.
6) The transmitter shall be replaced by a substitution antenna.
The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter. The substitution antenna shall be connected to a calibrated signal generator. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
7) The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
8) The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
9) The input level to the substitution antenna shall be recorded as power level, corrected for any change of input attenuator setting of the measuring receiver.
10) The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
11) The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary. This signal is termed the highest observed signal with respect to the limit for this EUT operational mode.