REGULATORY COMPLIANCE REPORT

TITLE: FCC & IC Test Report for 15.249 & RSS-210 Low Power Transmitter, 100GDL
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REV	CCO	DESCRIPTION OF CHANGE	DATE	APPROVALS	
		INITIAL RELEASE		Engineering	
				Engineering	

REVISION HISTORY

19nov				Engineering	
26nov/ 01dec		updated appendix A for BWs to use		Engineering	
03dec		tested to 18.48GHz		Engineering	

Test Data Summary

FCC Part 15.249 / IC RSS-210 Sec. 6.2.2(m2)

Field strength of Low Power Transmitters, 908 MHz

FCC ID: EO9100GDLA
IC ID: 864D-100GDLA

Device Model:
Model 1 and Model 2

Model Numbers:
ERG-5002-001 to -004

Serial Number:
LM249 (all tests)

OATS Registration Number: FCC 90716, IC 5615

Rule	Description	Max. Reading	Pass/Fail
15.31(e)	Variation of Supply Voltage	N/A battery	N/A
15.207/RSS-210 Sec. 6.6(a)	Power line conducted emissions	N/A battery	N/A
15.249(d)/RSS-210 sec. 6.6.2(m2)(3)	Out of band non-harmonic radiated emissions	No Emissions	Pass
15.35(b)/RSS-210 sec. 6.5	duty cycle corrections	100%	N/A
15.249(a)/RSS-210 Sec. 6.2.2 (m2)(1)	Radiated emissions of transmitter fundamental and harmonics	93.31dbuV/m @908 MHz dbuV/m @ MHz	Pass
15.31(m)	Relative field intensities at high and low frequencies of transmitter	Single channel max reading of 93.31dbuV/m @908 MHz	Pass
15.249(d)	Band Edge	104 uV/m @902 MHz 53.52dbc @ 902 MHz and 70.04dbc @ 928 MHz	Pass
RSP-100 Appendix II	99% Bandwidth	120Khz @ 908 MHz	Pass

Rule versions: FCC Part 1 (01-2006), FCC Part 2 (01-2006), FCC Part 15 (02-01-2006), RSS-102 Issue 2 (11-2005), RSS-210 Issue 7 (June 2007), RSS-Gen Issue 1 (09-2005).
Reference docs: ANSI C63.4-2003, DA 00-705 (03-30-2000), OET65 (08-1997), OET65C (06-2001), IEEE C95.3-2002.

Cognizant Personnel

Name	Title
Mark Kvamme	Test Technician
Jon Mueller	R&D Manager
Jay Holcomb	R&D Regulatory Manager

Test 1: 15.31(e)

Variation of Supply Voltage

Vary the supply voltage from 85% to 115% of the nominal voltage. If the power level of the fundamental signal varies with supply voltage, record the voltage level at which the fundamental signal is at its highest and use that voltage level for all further testing.

DEVICE IS BATTERY OPERATED NOT CONNECTED TO THE POWER LINE. BATTER IS NOT RECHARGABLE. THERFORE THIS TEST IS N/A.

Test 2: 15.207 / RSS-210 Sec. 6.6(a)

Power line Conducted Emissions

Measure the AC power line conducted emissions from 150kHz to 30 MHz using a 50μH/50Ω line impedance stabilization network (LISN) according to the procedure specified in ANSI C63.4. Verify that no emissions exceed the following limits:

Frequency (MHz)	Quasi-Peak (dBμV)	Average (dBμV)
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of frequency

DEVICE IS BATTERY OPERATED NOT CONNECTED TO THE POWER LINE. BATTER IS NOT RECHARGABLE. THERFORE THIS TEST IS N/A.

Test 3: 15.209 / RSS-210 sec. 6.2(m2)(3)

Out of band non-harmonic emissions

Measure the field strength of all spurious emissions that are not harmonics according to the procedure in Appendix A. The maximum field strength shall not exceed:

Frequency (MHz)	Field Strength (μV/m)	in dBuV/m	Distance (meters)
1.705-30	30*	29.5	30*
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
>960	500	54	3

2– Adjust 40dB/decade when measuring at different distances than specified.

For emissions measurements below 30MHz, rotate the loop antenna about its horizontal and vertical positions to maximize emissions.

FS (dBuV/m) = 20 * log (FS(uV/m))

Equipment Used	Serial Number	Cal Date	Due
Agilent E7405A Spectrum Analyzer	MY45113415	7-Aug-07	7-Aug-09
Hewlett Packard HP8596E Spectrum Analyzer	3528U00340	04apr08	04apr10
Huber&Suhner 18 inch. Sma to Sma	220060 002	3-Dec-07	3-Dec-09
Huber&Suhner 40 foot cable	220297 001	3-Dec-07	3-Dec-09
AH systems preamplifer model number PAM 0126	135	12/8/2007	12/8/2008
Emco 6502 Loop (9kHz to 30MHz)	9509-2970	01oct08	01oct09
Emco 3110B Biconical (30MHz-to 300MHz)	9807-3129	04oct07	04oct09
Emco 3146 Log Periodic (200MHz to 1GHz)	9203-3358	03oct07	03oct09
Emco 3115 waveguide (1Ghz – 18GHz)	9205-3878	17mar08	17mar10
A.H.Systems SAS-572 18Ghz to 26.5Ghz	231	2/22/2007	2/22/2009
Huber&Suhner 18 inch. SMA to N	220057002	1 Dec 07	1 Dec 09
Date	Tested by	Temp/Humidity, ºF / %	
11/11,20/2008	Mark Kvamme	55F/35%	

Frequency range investigated was 9 kHz to 18.48GHz.

No emissions were found

Test 4: 15.35(b) / RSS-210 sec. 6.5

Pulsed Operation

Calculate the maximum duty cycle of the transmitter that will occur in any 100ms. Perform the following calculation:

$$\text{Duty Cycle}_{dB} = |20 * \log(\text{Duty Cycle \%})|$$

$$\text{Duty Cycle}_{dB} = 100\ \%|$$

Test 5: 15.249(a)/RSS-210 sec. 6.2(m2)(1)

Transmitter Fundamental and Harmonics

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following: (table below)
(c) Field strength limits are specified at a distance of 3 meters.
(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Measure the field strength of the transmitter fundamental and harmonic emissions at three meters according to the procedure in Appendix A. Record emissions levels with the transmitter near its lowest, middle, and highest frequencies. The maximum field strength of emissions may not exceed:

Fundamental (μV/m)	in (dBuV/m)	Harmonics (μV/m)	in (dBuV/m)
50,000	94	500	54

FS (dBuV/m) = 20 * log (FS(uV/m))

Equipment Used	Serial Number	Cal Date	Due
AH systems preamplifier model PAM 0126	135	12/8/07	12/8/08
H/S Sucoflex 40ft cable	220297001	12/3/07	12/3/09
Agilent E7405A Spectrum Analyzer	MY45113415	8/7/07	8/7/09
Emco 6502 Loop (9kHz to 30MHz)	9509-2970	01oct08	01oct09
Emco 3110B Biconical (30MHz-to 300MHz)	9807-3129	04oct07	04oct09
Emco 3146 Log Periodic (200MHz to 1GHz)	9203-3358	03oct07	03oct09
Emco 3115 wave guide (1GHz-18GHz)	9205-3878	3/17/08	3/17/10
Lindgren DB-4 Dipole (400MHz-1GHz)	78573	9/18/2008	9/18/2010
Hewlett Packard HP8596E Spectrum Analyzer	3528U00340	04apr08	04apr10
A.H.Systems SAS-572 18Ghz to 26.5Ghz	231	2/22/2007	2/22/2009
Huber&Suhner 18 inch. Sma to N	220057002	1 Dec 07	1 Dec 09
Date	Tested by	Temperature/humidity	
11/11/2008	Mark Kvamme	55F/34%	

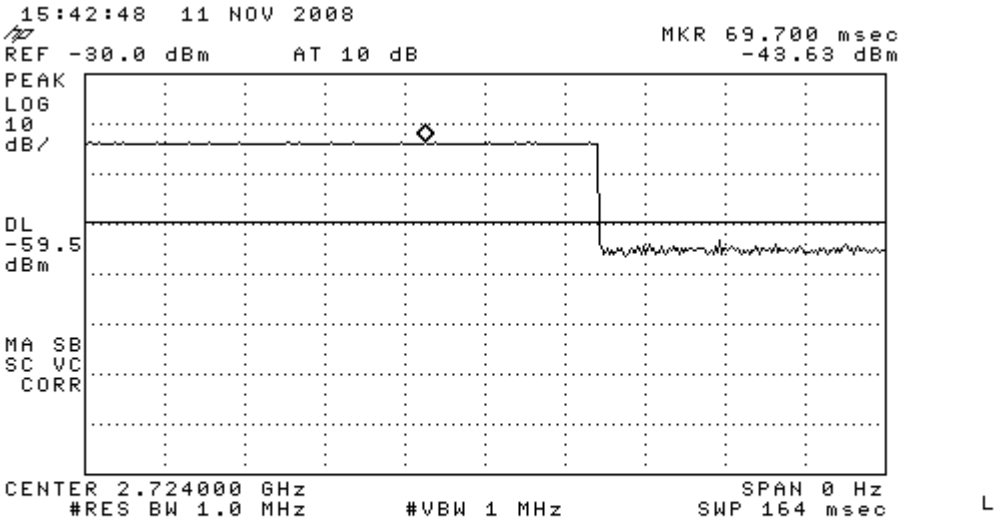
EUT Configuration: A new battery was used to power the device. The EUT is configured to transmit (special code set) on the low channel (908 MHz). The EUT is also configured to transmit every 4 seconds. This enables measurement of peak energy to be made at each location. .
For harmonics, adjust for the proper duty cycle correction of up to 20dB in accordance with the results from test 4.

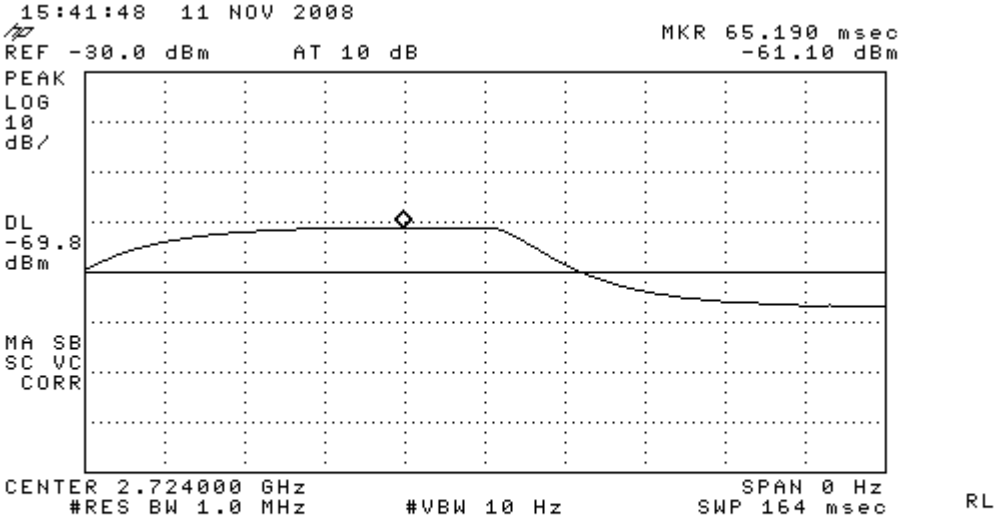
Frequency (MHz)	Polarity	Height	Angle	Reading dbuV/m	Ant #	ACF	Coax #	Coax corr.	Amp #	Amp corr.
908	Vertical	128	95	93.31	36982077	27.93	220297001	2.61	Not Selected	0

Frequency (MHz)	Polarity	Peak Reading dbm	Peak dbuV/m	Average Reading dbm	Average dbuV/m	Ant #	ACF	Coax #	Coax corr.	Amp #	Amp corr.
1816	Vertical	-48.95	52.78			16256	26.52	220297001HPF1	4.44	135	-36.23
1816	Horizontal	-57.97	43.76			16256	26.52	220297001HPF1	4.44	135	-36.23
2724	Vertical	-52.87	52.68			16256	29.36	220297001HPF1	5.22	135	-36.03
2724	Horizontal	-43.63	61.92	-61.1	44.45	16256	29.36	220297001HPF1	5.22	135	-36.03

4540	Vertical	-57.03	53.05			16256	32.27	220297001HPF3	7.09	135	-36.28
4540	Horizontal	-59.32	50.76			16256	32.27	220297001HPF3	7.09	135	-36.28

dbuV/m = 107 + reading + ACF + coax + Amp. Corr.





All frequencies above the third harmonic are below the noise floor

Test 6: FCC Part 15.31(m)

Relative Field Intensities over frequency

Use the max hold feature of the analyzer to capture the full bandwidth of transmissions. Place markers near the highest and lowest transmission frequencies to demonstrate the relative field strengths of each.

Equipment Used	Serial Number	Cal Date	Cal Due
H/S Sucoflex 40ft cable	220297001	12/3/07	12/3/09
Agilent E7405A Spectrum Analyzer	MY45113415	8/7/07	8/7/09
Lindgren DB-4 Dipole (400MHz-1GHz)	78573	9/18/2008	9/18/2010

Date	Temp/Humidity ºF / %	Tested by
11/11/2008	55F/35%	Mark Kvamme

Frequency (MHz)	Polarity	Height	Angle	Reading dbuV/m	Ant #	ACF	Coax #	Coax corr.	Amp #	Amp corr.
908	Vertical	128	95	93.31	36982077	27.93	220297001	2.61	Not Selected	0

Test 7: FCC Part 15.249(d)

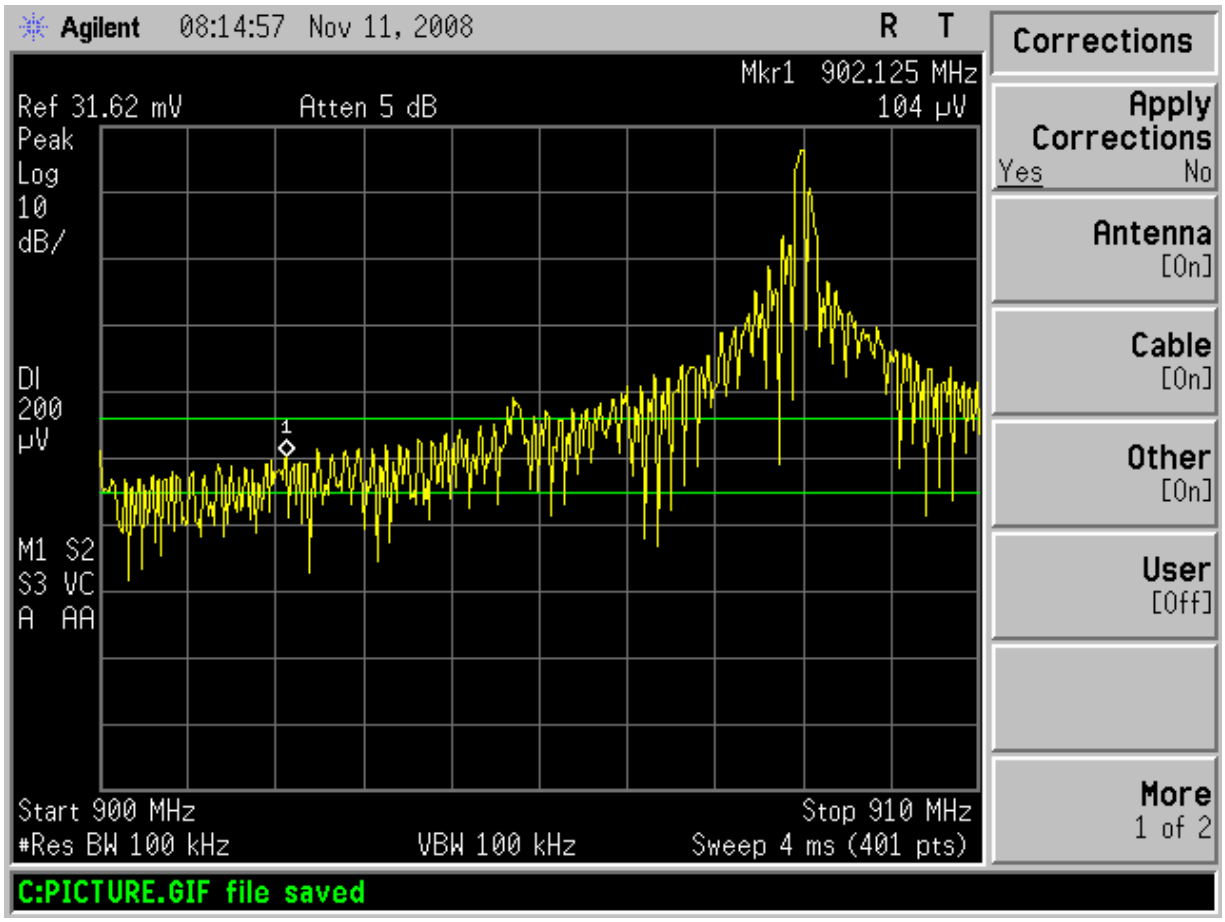
Band Edge

Demonstrate that the transmitter's emissions at the 902-928MHz band edge are at least 50dB below the carrier or less than 200uV/m at 3 meters, whichever is the lesser attenuation.

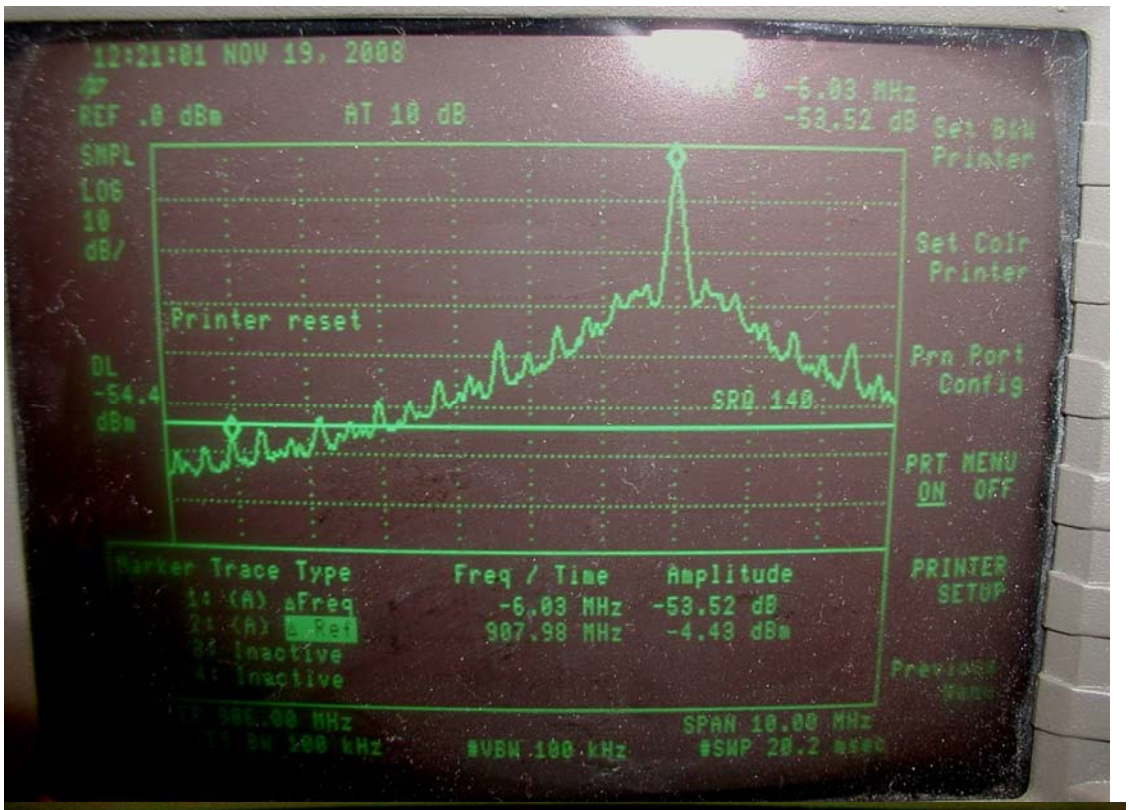
Equipment Used	Serial Number	Cal Date	Cal Due
H/S Sucoflex 40ft cable	220297001	12/3/07	12/3/09
Agilent E7405A Spectrum Analyzer	MY45113415	8/7/07	8/7/09
Emco 3146 Log Periodic (200MHz to 1GHz)	9203-3358	03oct07	03oct09
AH systems preamplifier model PAM 0126	135	12/8/07	12/8/08
HP 8593E	3523A01770	30 JAN 07	30 JAN 09

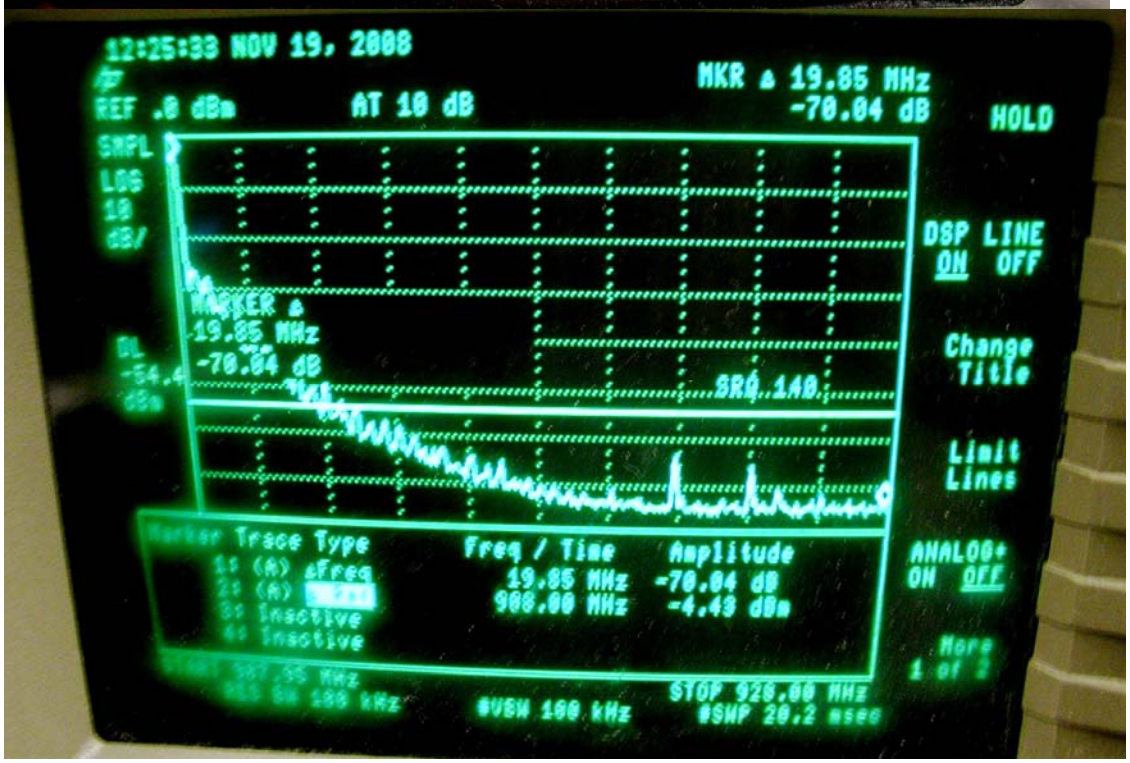
Date	Temp/Humidity ºF / %	Tested by
11/11 and 19/2008	55F/35%	Mark Kvamme

EUT Configuration: A new battery was used to power the device. The EUT is configured to transmit (special code set) on the low channel (908 MHz. The EUT is also configured to transmit every 4 seconds. This enables measurement of peak energy to be made at each location. .



Band edge measured conducted is greater than 50dbc


12:21:01 NOV 19, 2008
REF .0 dBm
AT 10 dB
-6.03 MHz
-53.52 dB
SMPL
LOG
10
dB/
Printer reset
SRQ 140
DL
-54.4
dBm
Set Bitm Printer
Set Colr Printer
Prn Port Config
PRT MENU ON OFF
PRINTER SETUP
Marker Trace Type
1: (A) ΔFreq
2: (A) Δ Ref
3: Inactive
4: Inactive
Freq / Time
-6.03 MHz
907.98 MHz
Amplitude
-53.52 dB
-4.43 dBm
SPAN 10.00 MHz
#VBW 100 kHz
#SWP 20.2 msec


12:25:33 NOV 19, 2008
REF .0 dBm
AT 10 dB
MKR Δ 19.85 MHz
-70.04 dB
HOLD
SMPL
LOG
10
dB/
MARKER Δ
19.85 MHz
-70.04 dB
SRQ 140
DL
-54.4
dBm
DSP LINE ON OFF
Change Title
Limit Lines
ANALOG+ ON OFF
More 1 of 2
Marker Trace Type
1: (A) ΔFreq
2: (A) Δ Ref
3: Inactive
4: Inactive
Freq / Time
19.85 MHz
908.00 MHz
Amplitude
-70.04 dB
-4.43 dBm
STOP 928.00 MHz
#VBW 100 kHz
#SWP 20.2 msec

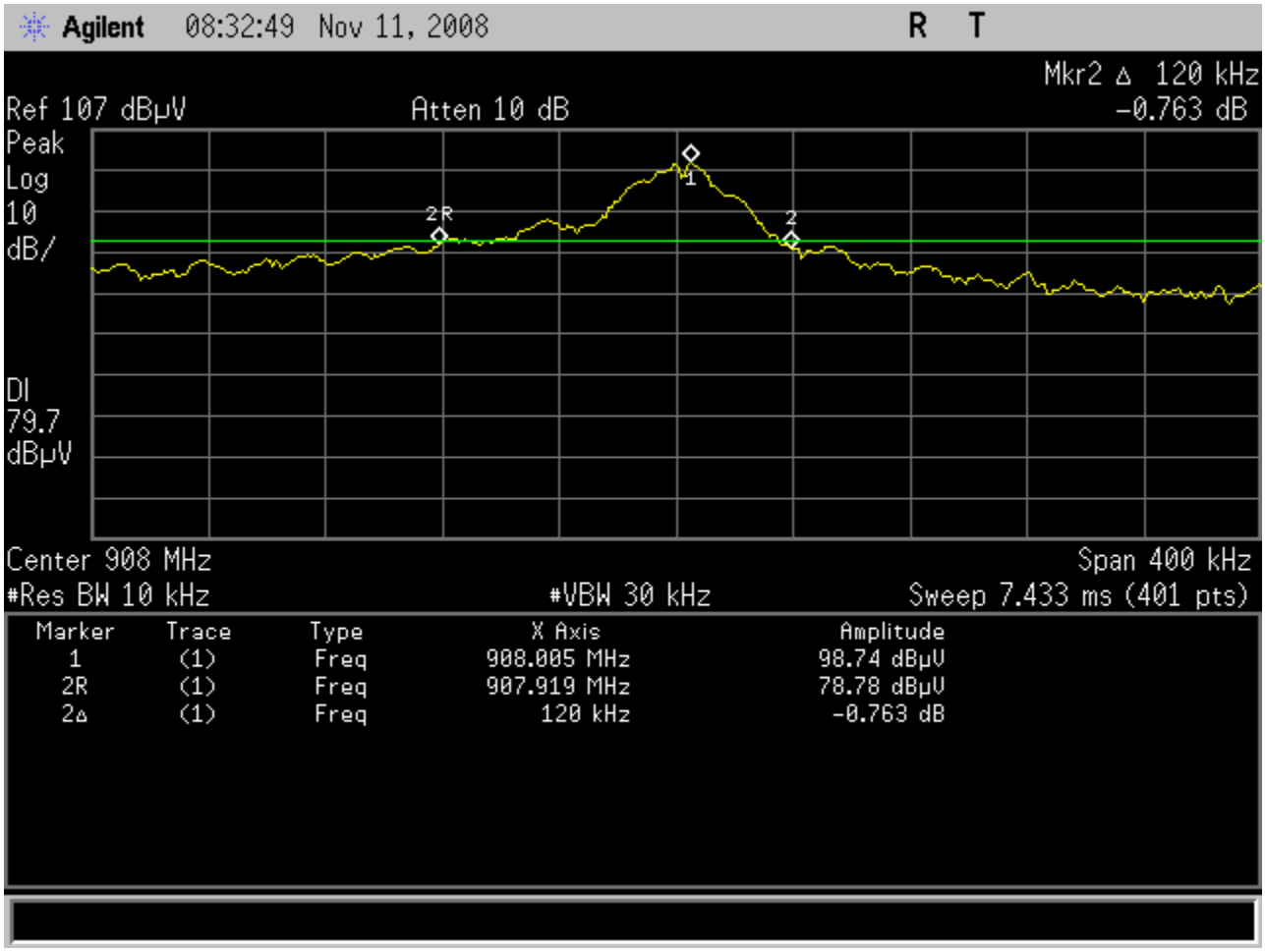
Test 8: RSP-100 Appendix II

99% Bandwidth

Equipment Used	Serial Number	Cal Date	Cal Due
H/S Sucoflex 40ft cable	220297001	12/3/07	12/3/09
Agilent E7405A Spectrum Analyzer	MY45113415	8/7/07	8/7/09
Emco 3146 Log Periodic (200MHz to 1GHz)	9203-3358	03oct07	03oct09
AH systems preamplifier model PAM 0126	135	12/8/07	12/8/08

Date	Temp/Humidity ºF / %	Tested by
11/11/2008	55F/35%	Mark Kvamme

EUT Configuration: A new battery was used to power the device. The EUT is configured to transmit (special code set) on the low channel (908 MHz) every 4 seconds. This enables measurement of peak energy to be made at each location. .



Appendix A

Field Strength Measurement Procedure

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. The bandwidths used shall be per ANSI C63.4-2003; 200 Hz from 9 kHz to 150 kHz, 9 kHz from 150 kHz to 30 MHz, 100 kHz from 30 MHz to 1000 MHz, and 1 MHz from 1 GHz to 40 GHz, with the detector set to peak hold.

1) The antenna correction factor, preamplifier gain (if the preamplifier is installed), and cable loss are stored in tables in the EMC analyzer and the level at the analyzer is the corrected level in dbuV/m.
2) Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.
3) 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.
4) 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 3). Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.
5) 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 3) with the antenna fixed at this height. Otherwise, move the antenna to the height that repeats the highest amplitude observation and proceed.
6) Change the polarity of the antenna and repeat step 3), step 4), and step 5). Compare the resulting suspected highest amplitude signal with that found for the other polarity. Select and note the higher of the two signals.
7) The final maximized level displayed on the EMC analyzer is the field strength.