REGULATORY COMPLIANCE REPORT

TITLE: FCC & IC Test Report for 15.249 & RSS-210 Low Power Transmitter, 100GDLV with remote disconnect.

AUTHOR: Mark Kvamme

REV	CCO	DESCRIPTION OF CHANGE	DATE	***APPROVALS***	
001		INITIAL RELEASE		Engineering	
				Regulatory	

REVISION HISTORY

A		ready for uploading		Engineering	
				Regulatory	
B		1st non-conforms: page3 plot info added, more clarity on fresh batteries and only 1 channel used. ; page 5; updated table and notes; page 6: more info on pulsed operation	06oct09	Engineering	
				Regulatory	
				Engineering	
				Regulatory	

Test Data Summary

FCC Part 15.249 / IC RSS-210 Sec. 6.2.2(m2);
Field strength of Low Power Transmitters,
100GDL with remote disconnect, 908 MHz
FCC ID: EO9100GDLV
IC ID: 864D-100GDLV
Device Model: 9
Model Numbers: ERG-5002-105
.Serial Number: see below
OATS Registration Number: FCC 90716, IC 5615

Rule	Description	Spec Limit	Max. Reading	Pass/Fail
15.31(e)	Variation of Supply Voltage	n/a	N/A battery	N/A
15.207 / RSS-Gen 7.2.2	Power line conducted emissions	n/a	N/A battery	N/A
15.249(d) / RSS-210 sec. 6.6.2(m2)(3)	Out of band non-harmonic radiated emissions	table	No Emissions	Pass
15.35(b) / RSS-210 sec. 6.5	duty cycle corrections	calculated	100%	N/A
15.249(a) / RSS-210 Sec. 6.2.2 (m2)(1)	Radiated emissions of transmitter fundamental and harmonics	50,000 / 500 uV/m	91.3dbuV/m @908 MHz and *Peak 56.09 dbuV/m @ 2724 MHz Average 42.39 dbuV/m @ 4540 Mhz*	Pass
15.249(d)	Band Edge – conducted	-50dBc or 200 uV/m (lesser)	83.21uV/m quasi peak @902 MHz 50.12 dbc @ 902 MHz and 60.65dbc @ 928 MHz	Pass
RSS-Gen 4.6.1	99% Bandwidth – conducted	<0.5% of the center frequency	140Khz @ 908 MHz	Pass

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

Cognizant Personnel

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

CONDITIONS DURING TESTING

No Modifications to the EUT were necessary during the testing.

FCC 15.31(m) – IC _n/a_; Number of Channel
This device operates and was tested on one channel.

ANSI C63.4 - Temperature and Humidity During Testing
The temperature during testing was within +10º C and +40º C.
The Relative humidity was between 10% and 90%.
RSS-Gen 4.3: Tests shall be performed at ambient temperature

EQUIPMENT UNDER TEST (EUT) DESCRIPTION
Itron declares that the EUT tested was representative of a production unit.

EQUIPMENT UNDER TEST

EUT Module

Manuf:	Itron, Inc.
Model:	Itron Metris Remote Disconnect
Serial Number(s)	Listed Below
Power source	Fresh Batteries were used

Plot Information
In the zero span measurements, the line in the display is the trigger level.

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. BATTERY IS NOT RECHARGABLE. THERFORE THIS TEST IS N/A.

15.207 / RSS-GEN 7.2.2

Power line Conducted Emissions

Measure the AC power line conducted emissions from 150kHz to 30 MHz using a 50□H/50□ 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 (dB□V)	Average (dB□V)
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. BATTERY IS NOT RECHARGABLE. THERFORE THIS TEST IS N/A.

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

Out of band non-harmonic emissions

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (microvolts/meter)	in dBuV/m	Measurement Distance (meters)*
0.009-0.490	2440F (kHz)		300
0.490-1.705	2400F (kHz)		30
1.705-30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

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

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

note: 15.249(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 all spurious emissions that are not harmonics according to the procedure in Appendix A.

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

Equipment Used	Serial Number	Cal Date	Due
Agilent E7405A Spectrum Analyzer	MY45113415	7/31/09	7/31/11
Huber&Suhner 18 inch. SMA to SMA	220057002	9/8/2009	9/8/2010
Microwave Circuits 1.3 Ghz High Pass Filter	405734	9/8/2009	9/8/2010
Huber&Suhner 40 foot cable	220297 001	1-Dec-07	1-Dec-09
AH systems preamplifer model number PAM 0126	146	3/13/2009	3/13/2010
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
Date	Tested by		
9/17/2009	Mark Kvamme		

Frequency range investigated was 9 kHz to 9.08GHz.

No emissions were found

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:

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

When operated under 15-249 rules, the 100G is typically transmits a low power message at 908 MHz in response to a received request transmitted at 908 MHz from an external device. There are a variety of responses that can be transmitted by the 100G, all with less than 53 mS duration. Testing to 15.249 limits was done with special code that transmits repeated low power 100 mS bursts at 908 MHz. Duty cycle averaging is not needed to demonstrate compliance with 15.249 rules, and is not employed.

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

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 (□V/m)	in (dBuV/m)	Harmonics (□V/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 preamplifer model number PAM 0126	146	3/13/2009	3/13/2010
Huber&Suhner 18 inch. SMA to SMA	220057002	9/8/2009	9/8/2010
Microwave Circuits 1.3 Ghz High Pass Filter	405734	9/8/2009	9/8/2010
Huber&Suhner 40 foot cable	220297 001	1-Dec-07	1-Dec-09
Agilent E7405A Spectrum Analyzer	MY45113415	7/31/09	7/31/11
Hewlett Packard HP8596E Spectrum Analyzer	3528U00340	04apr08	04apr10
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
Date	Tested by		
9/17/2009	Mark Kvamme		

EUT Configuration: 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 pulsed operation test above.

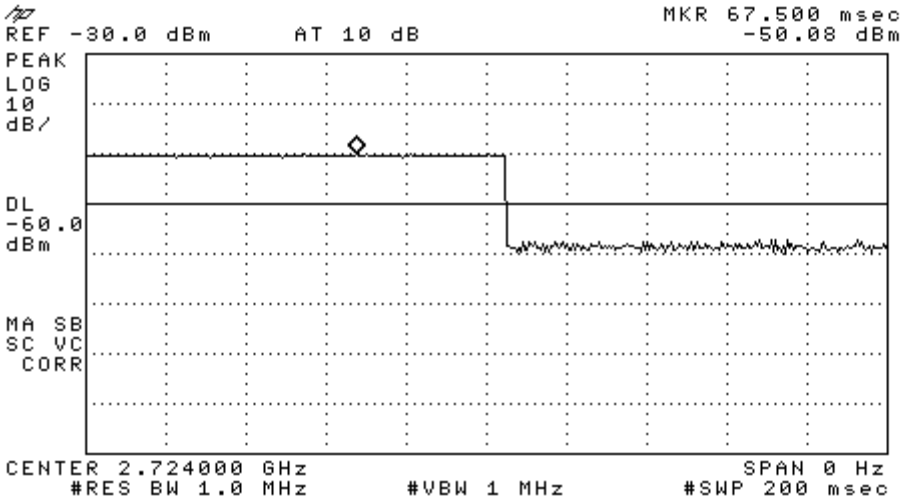
From the pulsed operation test above, there is no duty cycle correction for this case.

		1 Mhz RBW					1 Mhz RBW	
		1 Mhz VBW					1 Mhz VBW	
								Peak Power
		peak		Cable	Ant.	Amplifier	peak	Margin (db)
Freq.	Ant.	Level		Loss	Factor	Gain	Level	Limit
MHz	Pos.	dBm		dB	dB/m	dB	dBuV/m	(94 dbuV/m)
908	Vertical	-46.24		2.6	27.9	0	91.3	2.7

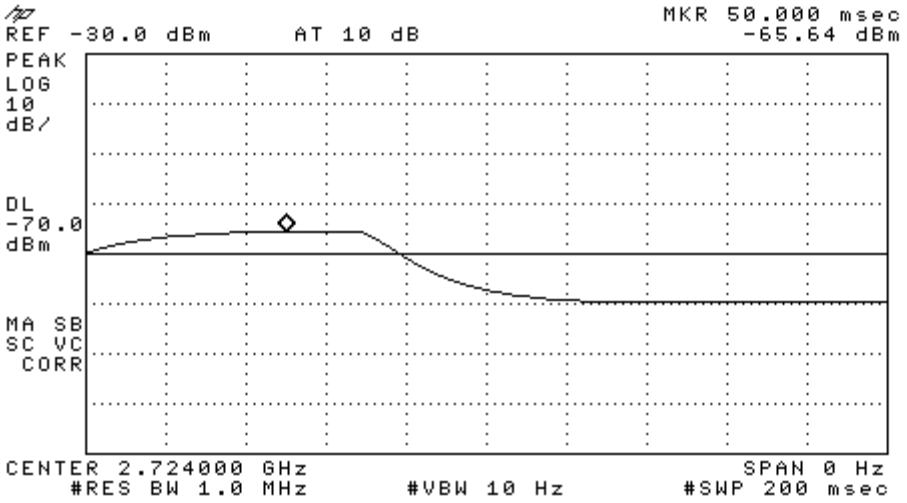
`		1 Mhz RBW	1 Mhz RBW				1 Mhz RBW		1 Mhz RBW	
		1 Mhz VBW	10hz VBW				1 Mhz VBW		10hz VBW	
								Peak Power		Avg Power
		peak	Average	Cable	Ant.	Amplifier	peak	Margin (db)	Average	Margin (db)
Freq.	Ant.	Level	Level	Loss	Factor	Gain	Level	Limit	Level	Limit
MHz	Pos.	dBm	dBm	dB	dB/m	dB	dBuV/m	(74 dbuV/m)	dBuV/m	(54 dbuV/m)
2724	Horizontal	-50.88	-65.64	5.27	29.36	34.66	56.09	17.91	41.33	12.67
4540	Horizontal	-55.52	-69.11	6.84	32.27	34.61	55.98	18.02	42.39	11.61
3632	Horizontal	-57.37	**	5.98	31.54	33.98	53.17	20.83		
6356	Horizontal	-61.57	**	8.27	34.47	35.08	53.09	20.91		
2724	Vertical	-54.78	**	5.27	29.36	34.66	52.19	21.81		
6356	Horizontal	-62.41	**	8.27	34.47	35.08	52.25	21.75		

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

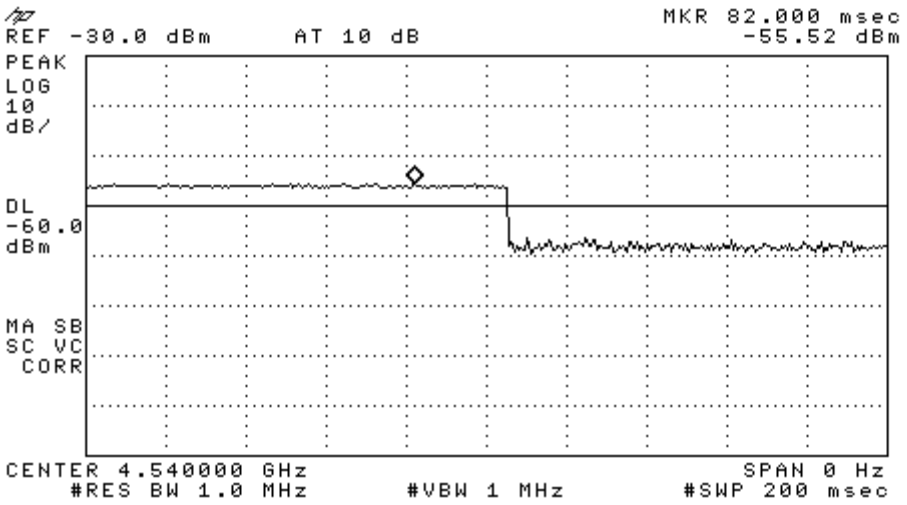
****Peak measurement were below the average spec limits, therefore average not reported.**

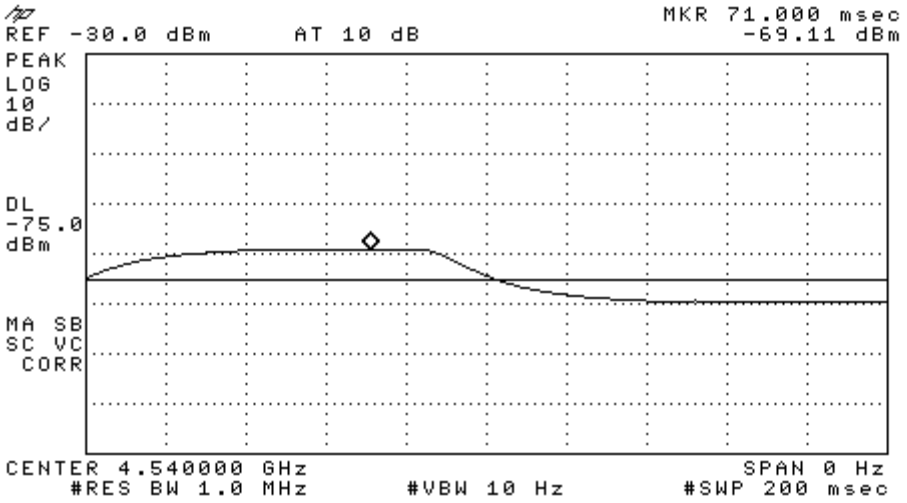

REF -30.0 dBm
AT 10 dB
MKR 67.500 msec
-50.08 dBm
PEAK
LOG
10
dB/
DL
-60.0
dBm
MA SB
SC VC
CORR
CENTER 2.724000 GHz
#RES BW 1.0 MHz
#VBW 1 MHz
SPAN 0 Hz
#SWP 200 msec

L


REF -30.0 dBm
AT 10 dB
MKR 50.000 msec
-65.64 dBm
PEAK
LOG
10
dB/
DL
-70.0
dBm
MA SB
SC VC
CORR
CENTER 2.724000 GHz
#RES BW 1.0 MHz
#VBW 10 Hz
SPAN 0 Hz
#SWP 200 msec

L





All frequencies above the Seventh harmonic are below the noise floor

FCC Part 15.249(d)

Band Edge, conducted

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209 (200uV/m at 3 meters), whichever is the lesser attenuation.

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation
RBW ≥ 1% of the span
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

Allow the trace to stabilize. Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section. Submit this plot.

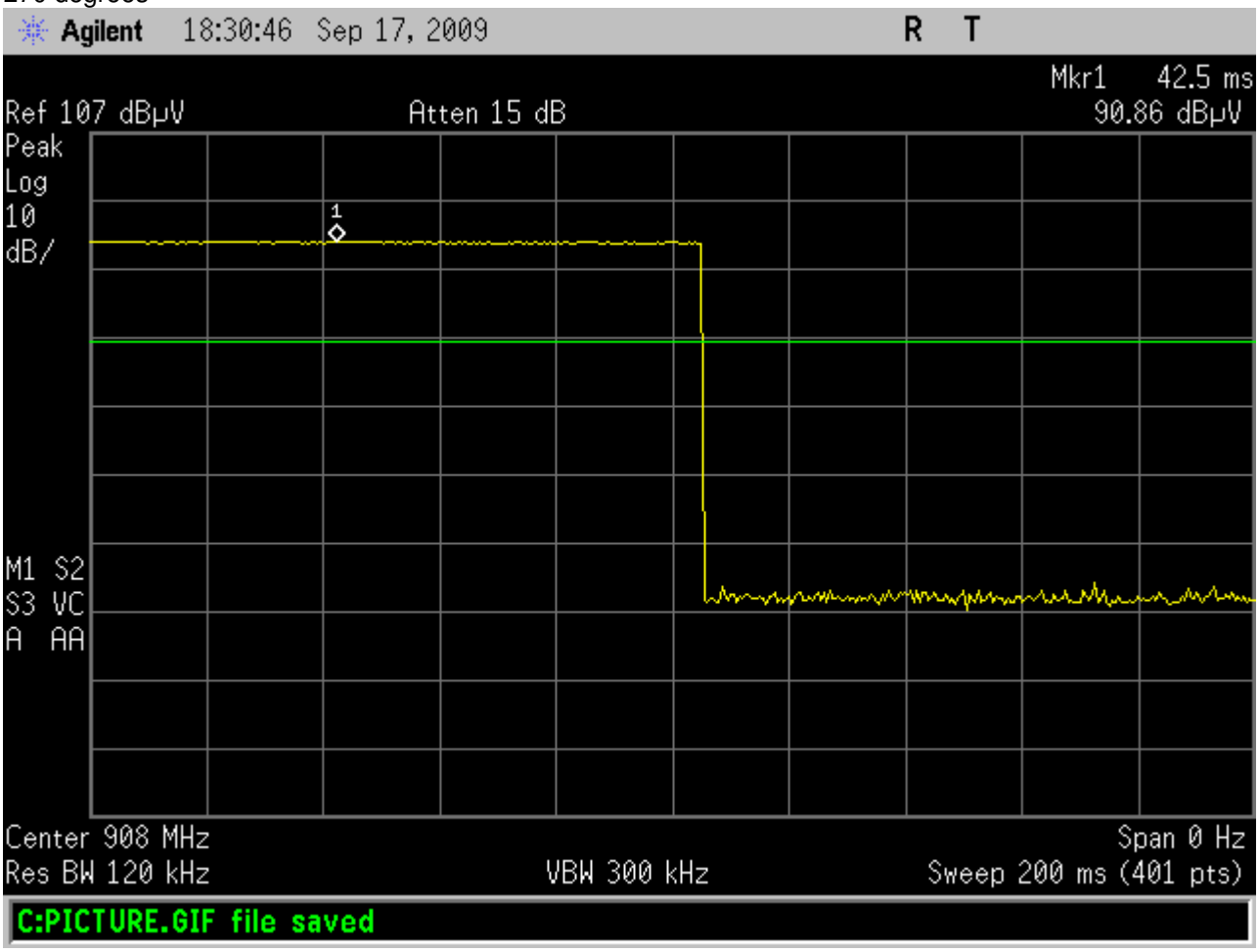
Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit. Submit this plot.

Equipment Used	Serial Number	Cal Date	Cal Due
H/S Sucoflex 40ft cable	220297001	12/3/07	12/3/09
Huber&Suhner 18 inch. Sma to Sma	220060 002	3-Dec-07	3-Dec-09
HP 8593E	3523A01770	30 JAN 09	30 JAN 11
Agilent E7405A Spectrum Analyzer	MY45113415	7/31/09	7/31/11
Lindgren DB-4 Dipole (400Mhz-1GHz)	78573	9/18/2008	9/18/2010
AH systems preamplifer model number PAM 0126	146	3/13/2009	3/13/2010

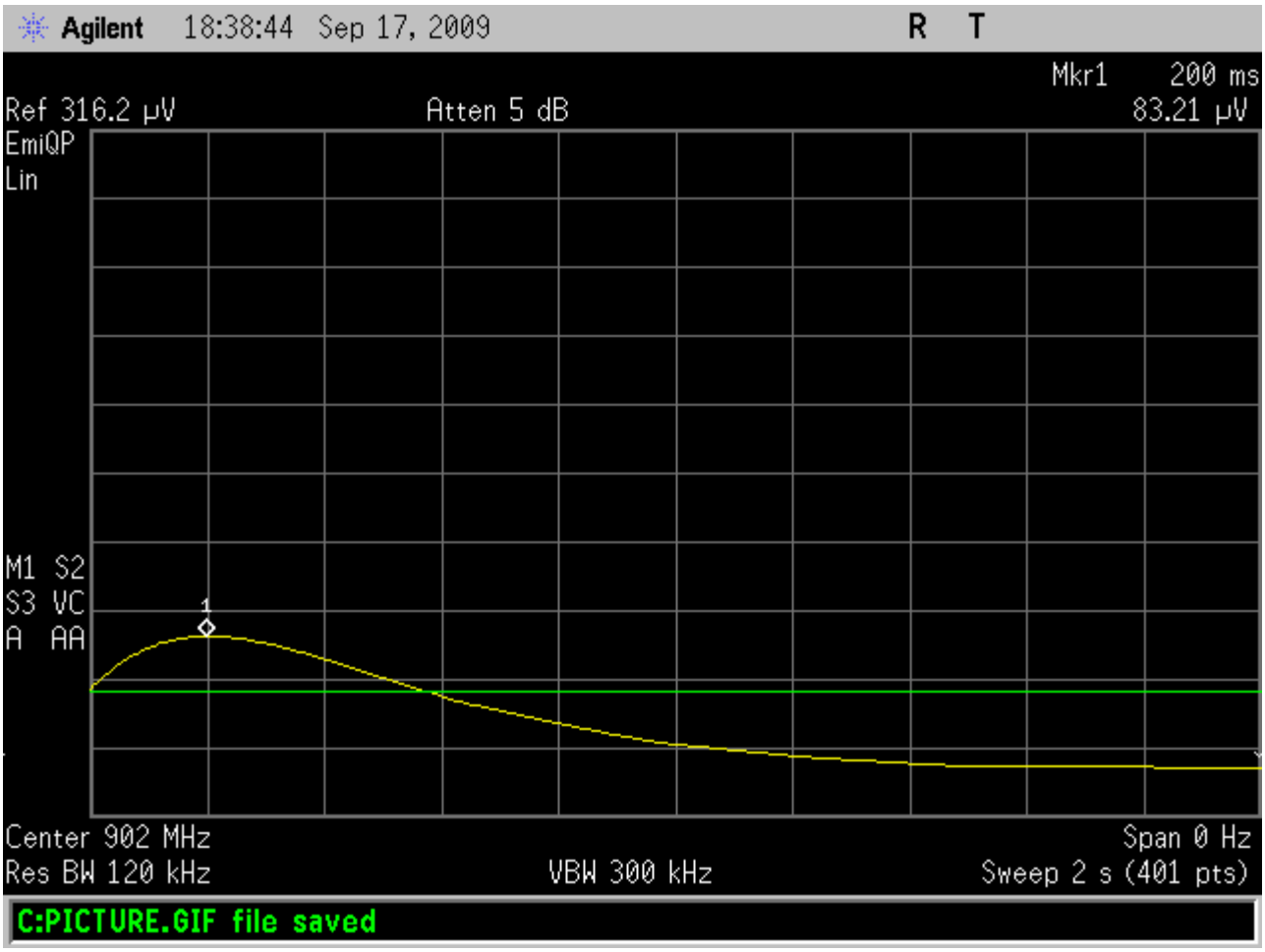
Date	Tested by	
9/17/2009	Mark Kvamme	

EUT Configuration: 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.

Fundamental peak reading with measuring dipole Vertical @ 124cm above ground plane azimuth 270 degrees

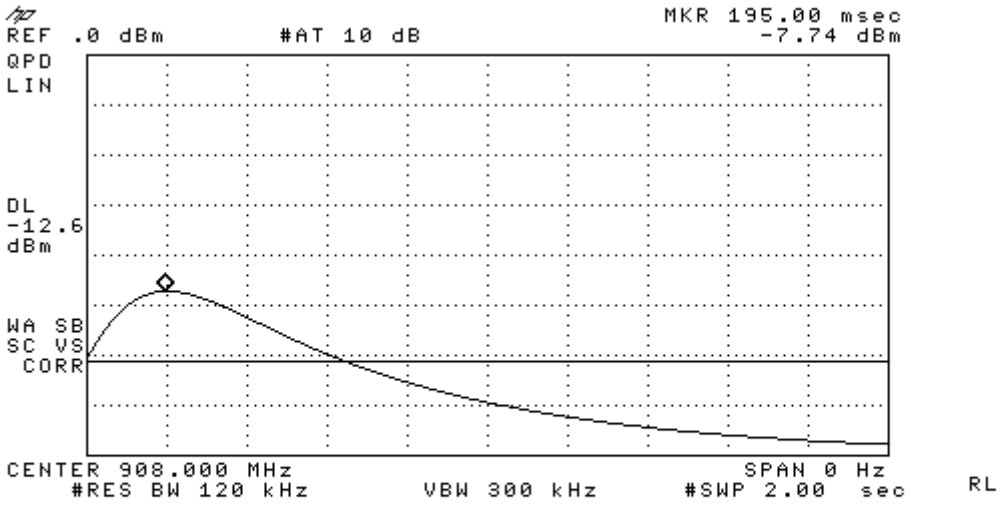


Band edge Quasi peak reading with measuring dipole Vertical @ 124cm above ground plane azimuth 270 degrees

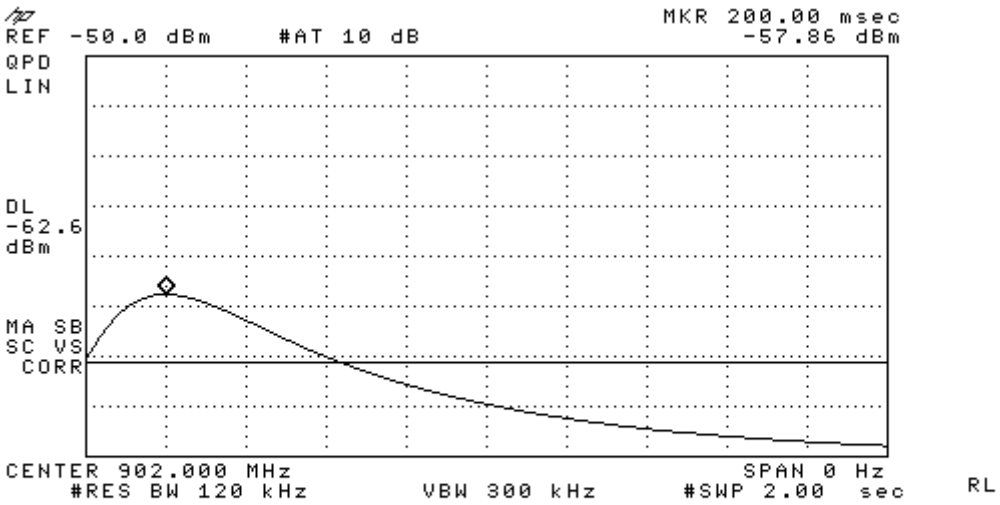


Band edge measured conducted is greater than 50dbc

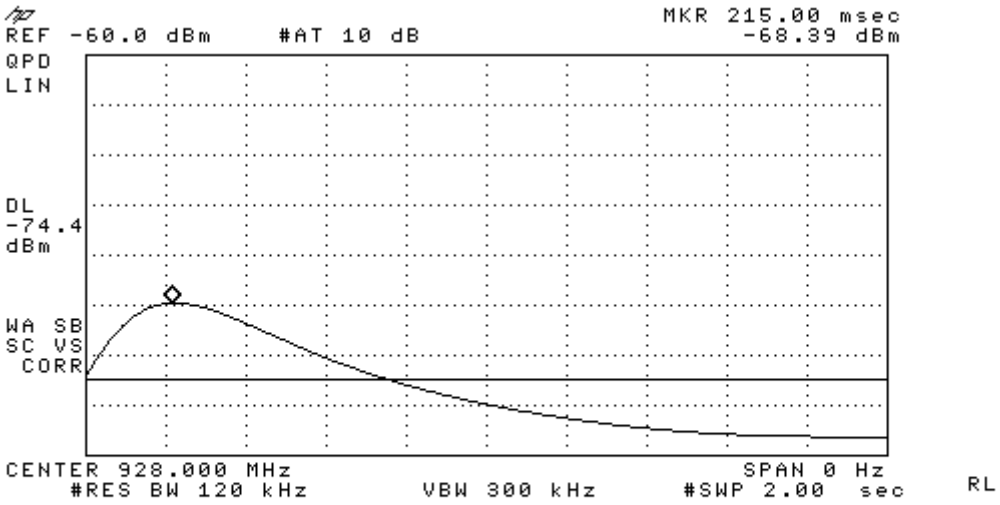
The fundamental signal conducted (measured quasi peak)



Band edge @ 902Mhz conducted (measured quasi peak) -7.74dbm- (-57.86dbm)=50.12 dbc



Band edge @ 928Mhz conducted (measured quasi peak) -7.74dbm- (-68.39dbm)=60.65dbc



RSS-GEN 4.6.1

99% Bandwidth, conducted

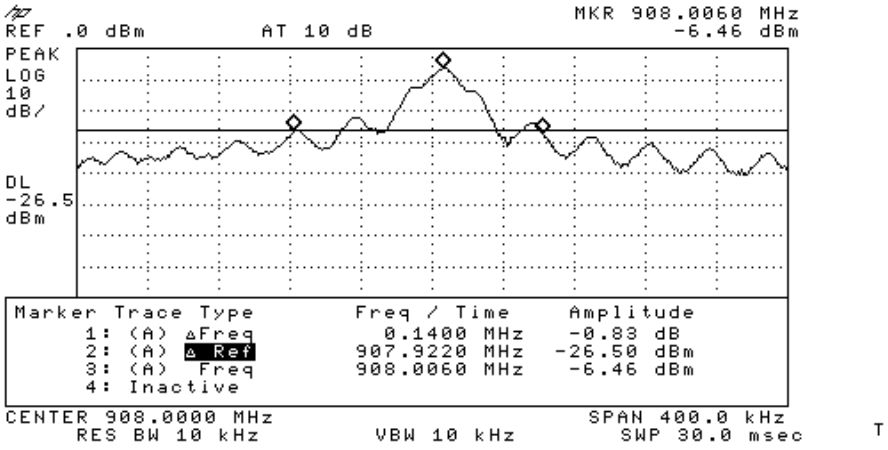
The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.
The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.
The span between the two recorded frequencies is the occupied bandwidth.

Capture a plot of the 99% bandwidth of a single transmission.

Equipment Used	Serial Number	Cal Date	Cal Due
HP 8593E	3523A01770	30 JAN 09	30 JAN 11

Date	Tested by	Temp/Humidity
9/15/2009	Mark Kvamme	

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.



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 or quasi peak .

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.