



Electromagnetic Compatibility Test Report

Tests Performed on a Landis + Gyr, Inc.

Meter with Utilinet, Model S4e Form 16S

Radiometrics Document RP-5294



Product Detail:

FCC ID: **ROV-UTTR900M**

Equipment type: 903 to 927 MHz Frequency Hopping Transmitter

Test Standards:

US CFR Title 47, Chapter I, FCC Part 15 Subpart C

FCC Part 15 CFR Title 47: 2002

This report concerns: Original Grant for Certification

FCC Part 15.247

Tests Performed For:

Landis + Gyr, Inc.

2800 Duncan Rd.

Lafayette, IN 47904-5012

Test Facility:

Radiometrics Midwest Corporation

12 East Devonwood

Romeoville, IL 60446

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Test Date(s): (Month-Day-Year)

June 22 thru 23, 2004

Document RP-5294 Revisions:

Rev.	Issue Date	Affected Pages	Revised By	Authorized Signature for Revision
0	July 12, 2004			

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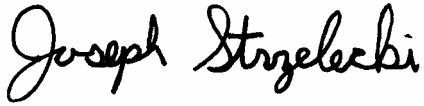
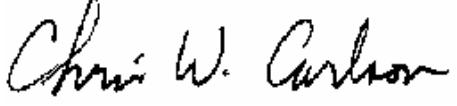
RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet

1 ADMINISTRATIVE DATA

Equipment Under Test:

A Landis + Gyr, Inc., Meter with Utilinet
Model: S4e Form 16S, Serial Number: 86 473 892
This will be referred to as the EUT in this Report

Date EUT Received at Radiometrics: (Month-Day-Year) June 22, 2004	Test Date(s): (Month-Day-Year) June 22 thru 23, 2004
Test Report Written By: Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	Test Witnessed By: Saieb Alrawi Landis + Gyr, Inc.
Radiometrics' Personnel Responsible for Test:  Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	Test Report Approved By  Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Meter with Utilinet, Model S4e Form 16S, manufactured by Landis + Gyr, Inc. The detailed test results are presented in a separate section. The following is a summary of the test results.

Emissions Tests Results

Environmental Phenomena	Frequency Range	Basic Standard	Test Result
RF Radiated Emissions	30-9300 MHz	FCC Part 15	Pass
Conducted Emissions, AC Mains	0.15 - 30 MHz	FCC Part 15	Pass
Occupied Bandwidth Test	Fundamental Freq.	FCC Part 15	Pass

Spread Spectrum Transmitter Requirements

Environmental Phenomena	Frequency Range	FCC Section	Test Result
Carrier Frequency Separation	902-928 MHz	15.247 a	Pass
Number of Hopping Frequencies	902-928 MHz	15.247 a	Pass
Time of Occupancy (Dwell Time)	902-928 MHz	15.247 a	Pass
20 dB Bandwidth Test	902-928 MHz	15.247 a	Pass
Peak Output Power	902-928 MHz	15.247 b	Pass
Band-edge Compliance of RF Conducted Emissions	902-928 MHz	15.247 c	Pass
Spurious RF Conducted Emissions	30-9300 MHz	15.247 c	Pass
Spurious Radiated Emissions	30-9300 MHz	15.247 c	Pass

2.1 RF Exposure Compliance Requirements

Since the power output is 170 mW, and an antenna gain of 2 dBi, the EUT meets the FCC requirement for RF exposure. There are no power level adjustments and the antenna is permanently attached.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a Meter with Utilinet, Model S4e Form 16S, manufactured by Landis + Gyr, Inc. The EUT was in good working condition during the tests, with no known defects. A complete description is in a separate exhibit.

3.1.1 FCC Section 15.203 & RSS-210 Section 5.5 Antenna Requirements

This device must be professionally installed. It is sold to utility companies for the purpose of automating the control of remote devices (relays, capacitor banks, etc.) and for collecting data from remote devices such as meters. Professionals adhering to the guidelines established in the device manual must do the installation.

3.2 Related Submittals

Landis + Gyr, Inc. is not submitting any other products simultaneously for equipment authorization related to the EUT.

4 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations.

In order to disable the Hopping functions and test individual functions, the EUT was operated in a diagnostic test mode during the tests. This was accomplished with a serial interface to a PC. Once the EUT was set to the desired operating mode, the serial interface was disconnected from the EUT.

Since the EUT is wall mounted, it was placed in an upright configuration during the tests. The EUT was tested as a stand-alone device. Power was supplied at 115 VAC, 60 Hz single-phase to its external power supply.

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

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Meter with Utilinet	E	Landis + Gyr, Inc.	S4e Form 16S	86 473 892

* Type: E = EUT, P = Peripheral, S = Support Equipment; H = Host Computer

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List of System Cables

QTY	Length (m)	Cable Description	Connected to (Item #)	Shielded?
1	3.5	AC input cable; Two wire	#1 Power input	No
1	3	AC Load Cable; Two wire	#1	No

4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2002	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
ANSI C63.4-1992	1992	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
FCC DA 00-705	2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
ANSI C12.1	2001	Electricity Meters Code For Electricity Metering

The test procedures used are in accordance with the FCC DA 00-75 and ANSI document C63.4-1992, (July 17, 1992) "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters. The antenna was raised and lowered from 1 to 4 meters.

6 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 1999 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.net).

The following is a list of shielded enclosures located in Romeoville, Illinois:

Chamber A: Is an anechoic chamber that measures 24' L X 12' W X 12' H. The walls and ceiling are fully lined with ferrite absorber tiles. The floor has a 10' x 10' section of ferrite absorber tiles in the located in the center. Panashield of Rowayton, Connecticut manufactured the chamber. The enclosure is NAMAS certified.

Chamber B: Is a shielded enclosure that measures 24' L X 12' W X 8' H. Erik A. Lindgren & Associates of Chicago, Illinois manufactured the enclosure.

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Chamber C: Is a shielded enclosure that measures 20' L X 10' W X 8' H. Lindgren RF Enclosures Inc. of Addison, Illinois manufactured the enclosure.

Chamber D: Is a fully anechoic chamber that measures 22' L X 10' W X 10' H. The walls, ceiling and floor are fully lined with ferrite absorber tiles. Braden Shielding Systems of Tulsa, Oklahoma manufactured the chamber.

A separate ten-foot long, brass plated, steel ground rod attached via a 6 inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

Open Area Test Site (OATS): Is located on 8625 Helmar Road in Newark, Illinois, USA and measures 56' L X 24' W X 17' H. The entire open field test site has a metal ground screen. The FCC has accepted these sites as test site number 31040/SIT 1300F2. The FCC test site Registration Number is 90897. Details of the site characteristics are on file with the Industry Canada as file number IC3124.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

7 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

8 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification. The results relate only to the EUT listed herein. Any modifications made to the EUT subsequent to the indicated test date will invalidate the data and void this certification.

9 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	11/27/03
AMP-12	MITEQ	Pre-amplifier	AM-1431	530935	0.01-1000MHz	12 Mo.	12/31/03
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	11/25/03
ANT-06	EMCO	Log-Periodic Ant.	3146	1248	200-1000MHz	24 mo	11/17/03
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	09/30/02
ANT-25	ARA	Super Log Antenna	LPB-2520/A	1116	20-2000MHz	24 Mo.	01/06/04
ANT-42	EMCO	Bicon Antenna	3104C	9512-4713	25-300MHz	12 Mo.	12/02/03
ATT-02	KDI	Attenuator	A710N	RCMC1	DC-10GHz	24 Mo.	01/12/03
HPF-01	Solar	High Pass Filter	7930-100	HPF-1	0.15-30MHz	24 Mo.	12/31/03
HPF-02	Microwave Cir.	High Pass Filter	H2G09G02	HPF-2	1.5-11 GHz	24 Mo.	05/01/03
LSN-03	Farnell	LISN	1EXLSN30B	000314	0.01-30MHz	24 Mo.	04/08/03
REC-08	Hewlett Packard	Spectrum Analyzer	8566B	2648A13481 2209A01436	30Hz-22GHz	12 Mo.	05/26/04
REC-03	Anritsu	Spectrum Analyzer	MS2601B	MT94589	0.01-2200MHz	12 Mo.	10/21/03
THM-01	Extech Inst.	Temp/Humid Meter	4465CF	001106557	N/A	12 Mo.	01/28/04

Note: All calibrated equipment is subject to periodic checks.

NCR – No Calibration Required. Device monitored by calibrated equipment. N/A: Not Applicable.

10 TEST SECTIONS

10.1 AC Conducted Emissions; Section 15.207

A computer-controlled analyzer was used to perform the conducted emissions measurements. The frequency range was divided into 500 subranges equally spaced on a logarithmic scale. The computer recorded the peak of each subrange. This data was then plotted on semi-log graph paper generated by the computer and plotter. Adjusting the positions of the cables and orientation of the test system then maximizes the highest emissions.

Mains Conducted emission measurements were performed using a 50 Ohm/50 uH Line Impedance Stabilization Network (LISN) as the pick-up device. Measurements were repeated on both leads within the power cord. If the EUT power cord exceeded 80 cm in length, the excess length of the power cord was made into a 30 to 40 cm bundle near the center of the cord. The LISN was placed on the floor at the base of the test platform and electrically bonded to the ground plane.

Broadband conducted emissions may exceed the following limits by no more than 13 dB. An emission is defined as broadband if the average detector amplitude is 6 dB or more under the quasi-peak detector amplitude.

FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBuV)	
	Quasi-Peak	Average
0.150 - 0.50*	66 - 56	56 - 46
0.5 - 5.0	56	46
5.0 - 30	60	50

* The limit decreases linearly with the logarithm of the frequency in this range.

The initial step in collecting conducted data is a peak detector scan and the plotting of the measurement range. Significant peaks are then marked as shown on the following table, and these signals are then measured with the quasi-peak detector. The following represents the worst case emissions from the power cord, after testing all modes of operation.

Test Date : June 22 thru 23, 2004

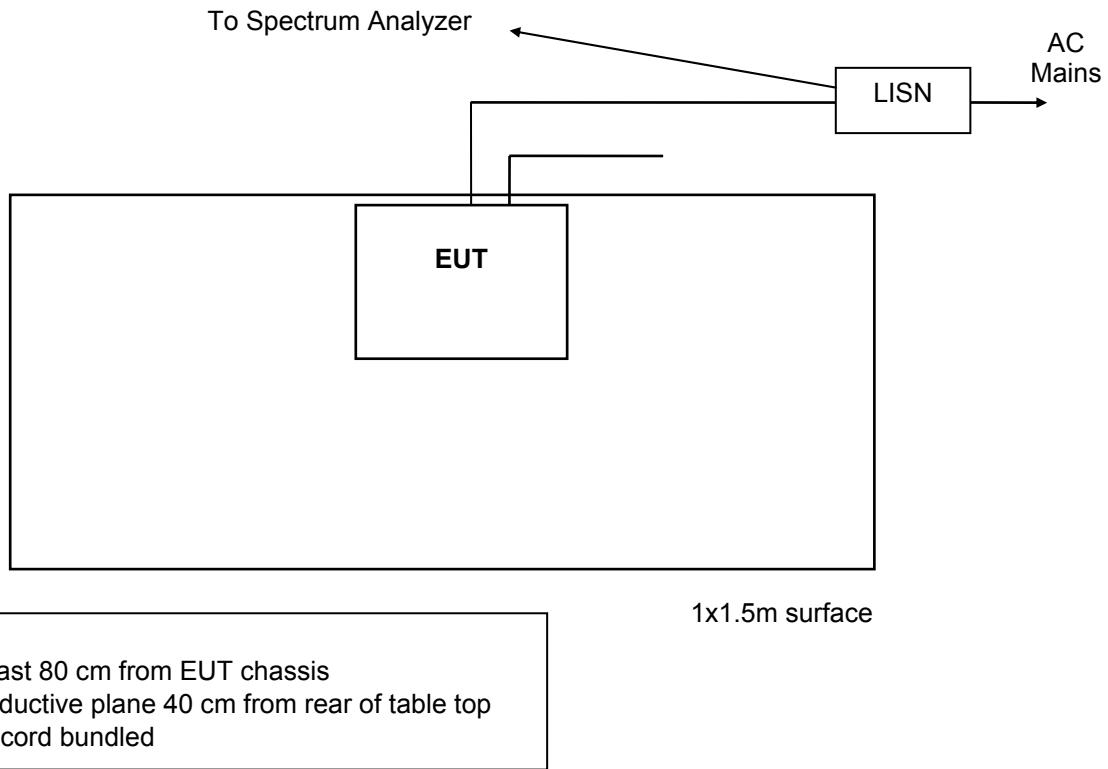
The Amplitude is the final corrected value with cable and LISN Loss.

Lead Tested	Frequency MHz	QP Amplitude	QP Limit	Average Amplitude	Average Limit
AC Neutral	3.26	51.4	56.0	42.8	46.0
AC Neutral	2.998	50.6	56.0	42.4	46.0
AC Neutral	3.39	50.5	56.0	41.9	46.0
AC Neutral	2.736	47.9	56.0	40.8	46.0
AC Neutral	0.177	57.4	64.5	49.9	54.5
AC Neutral	0.259	52.6	61.4	45.9	51.4
AC Hot	0.155	58.3	65.7	50.6	55.7
AC Hot	3.14	48.9	56.0	39.2	46.0
AC Hot	3.24	49.5	56.0	39.6	46.0

The above are the worst case results with three frequencies test for each EUT

* QP readings are quasi-peak with a 9 kHz bandwidth and no video filter.

Judgment: Passed by 3.2 dB

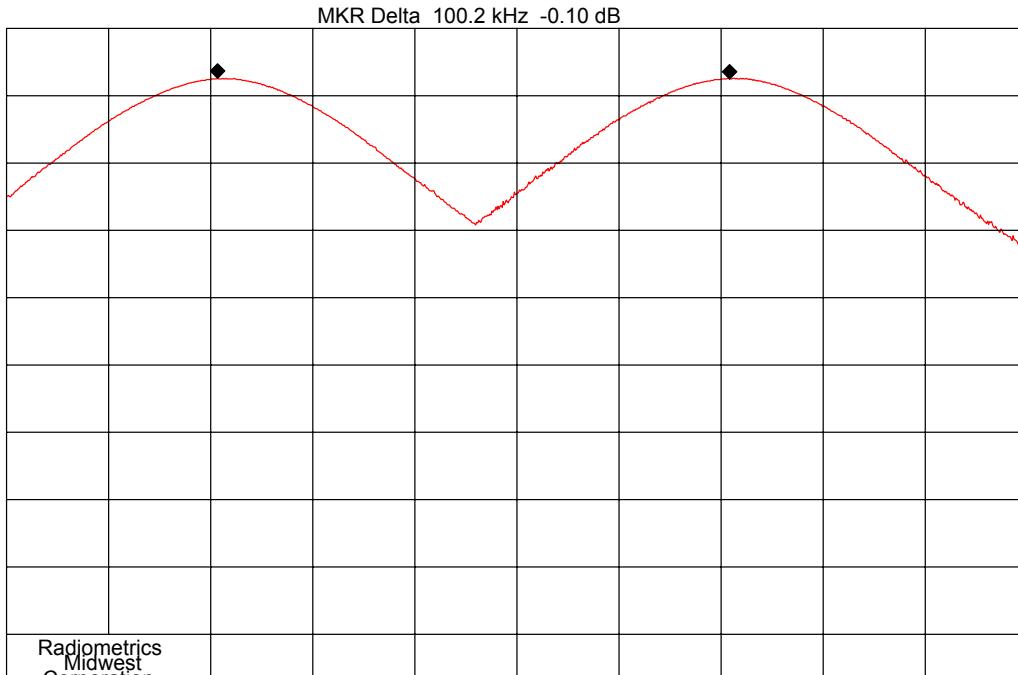
Figure 1. Conducted Emissions Test Setup

10.2 Carrier Frequency Separation

The EUT has its hopping function enabled. The spectrum analyzer was set to the MAX HOLD mode to read peak emissions. The sweep was set to AUTO. The trace was allowed to stabilize. The marker-delta function was used to determine the separation between the peaks of the adjacent channels.

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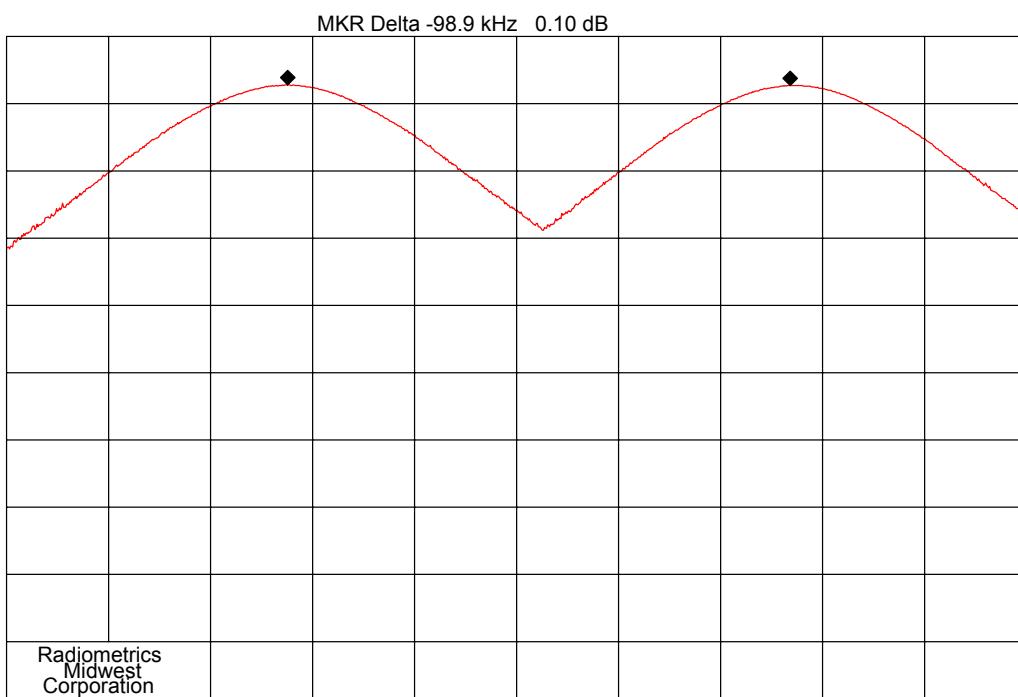
Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet



COMPANY : Landis + Gyr
CENTER 903.056 MHz
RES BW 30 kHz
10 dB/
NOTES : Carrier Freq. Separation, Low Freq.

ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 100 kHz
TIME : 11:54

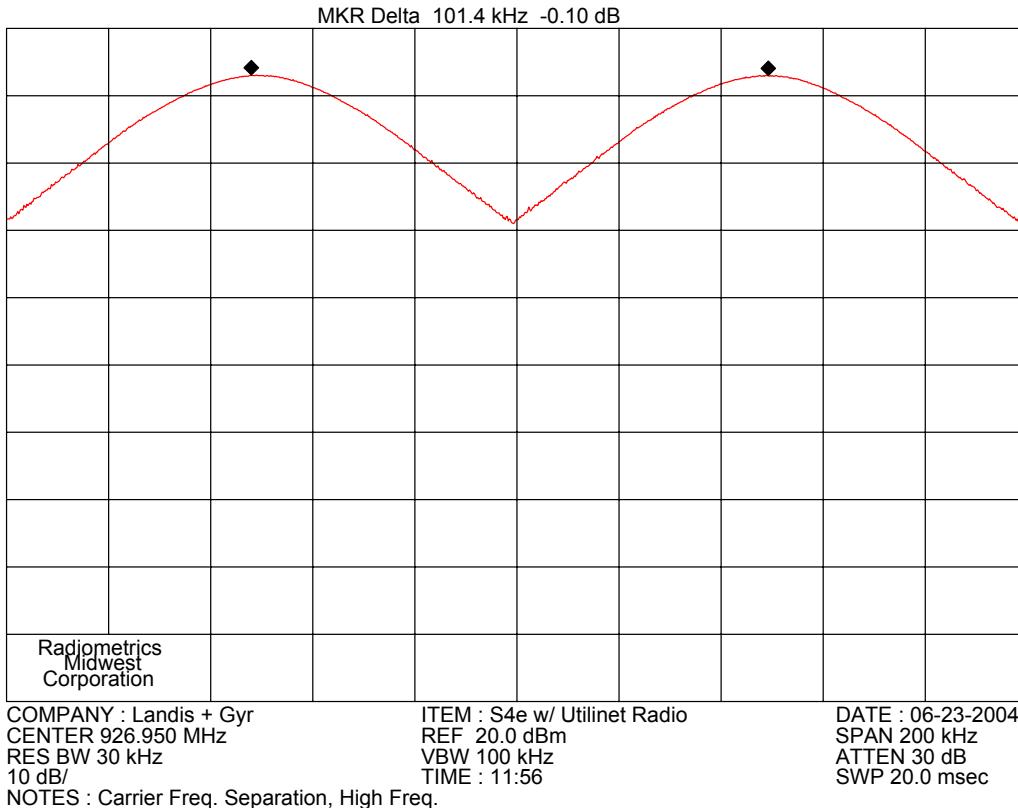
DATE : 06-23-2004
SPAN 200 kHz
ATTEN 30 dB
SWP 20.0 msec



COMPANY : Landis + Gyr
CENTER 915.044 MHz
RES BW 30 kHz
10 dB/
NOTES : Carrier Freq. Separation, Mid Freq

ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 100 kHz
TIME : 16:46

DATE : 06-22-2004
SPAN 201 kHz
ATTEN 30 dB
SWP 20.0 msec

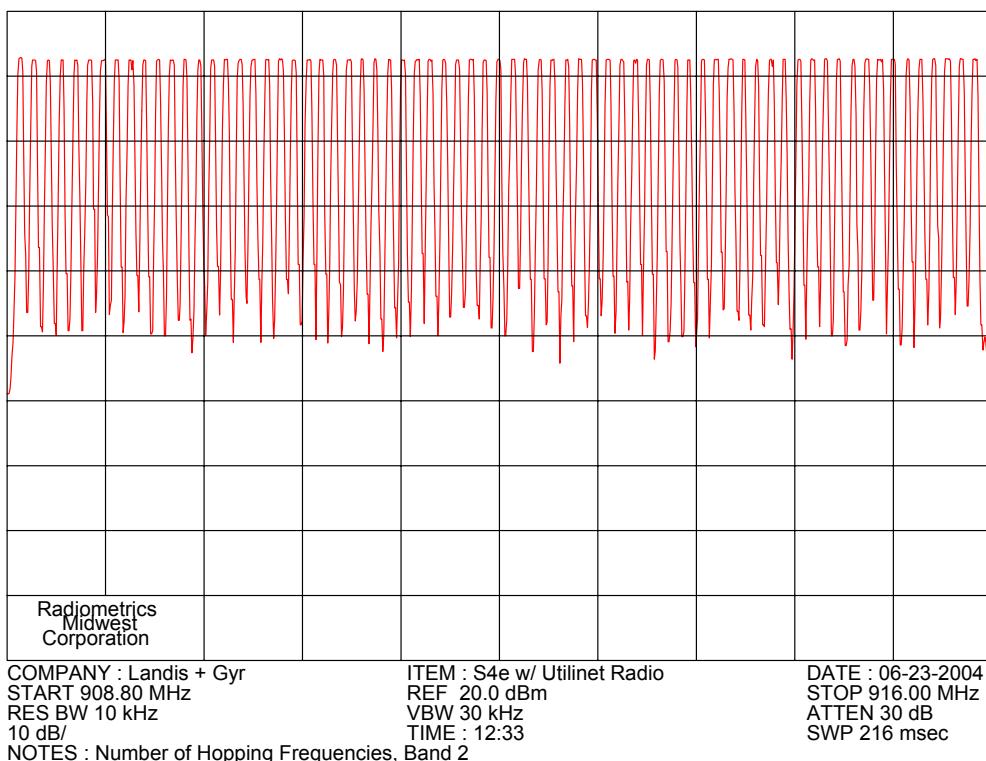
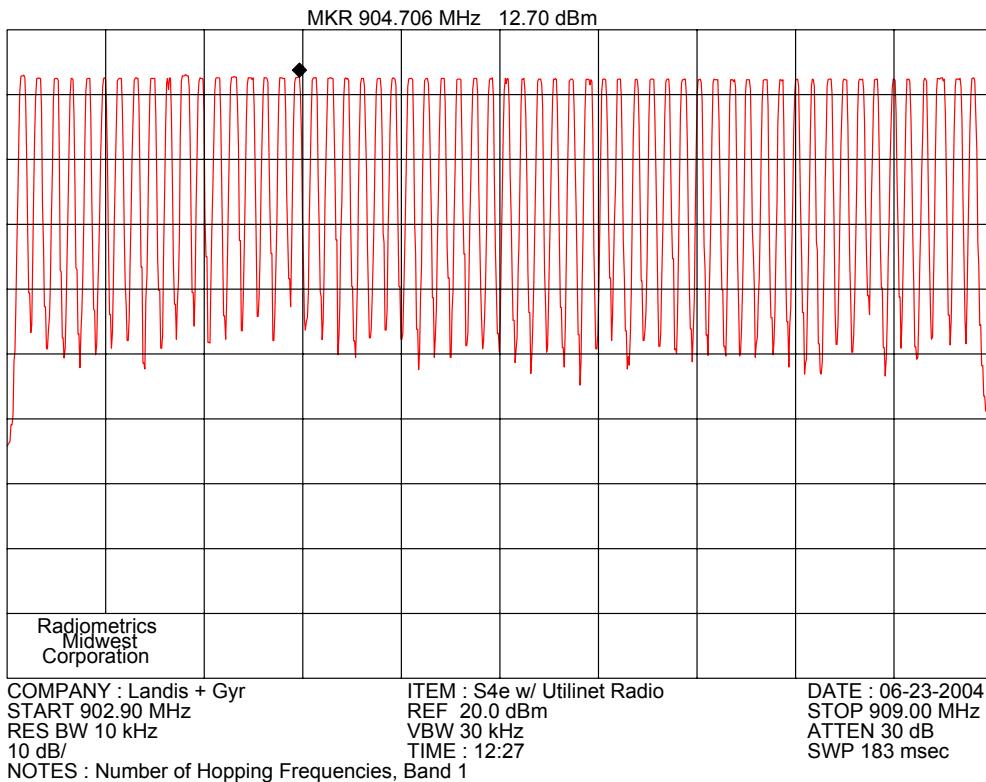


10.3 Number of Hopping Frequencies

The EUT has its hopping function enabled. The spectrum analyzer was set to the MAX HOLD mode to read peak emissions. The sweep was set to AUTO. The trace was allowed to stabilize. The plots show there are 240 channels. The minimum requirement is 50.

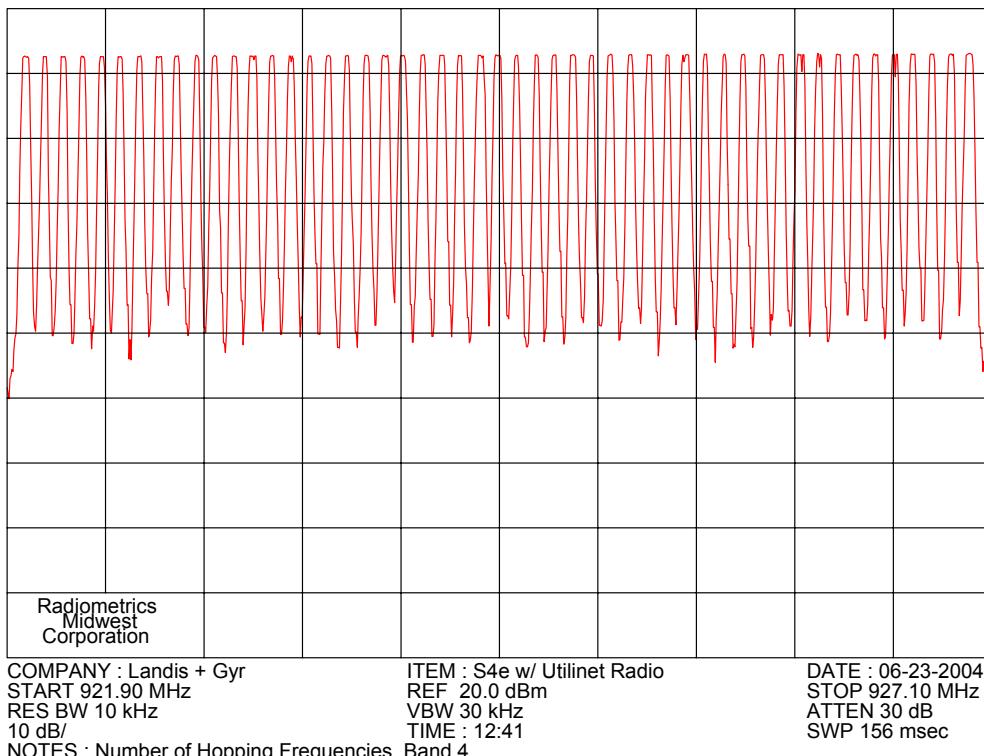
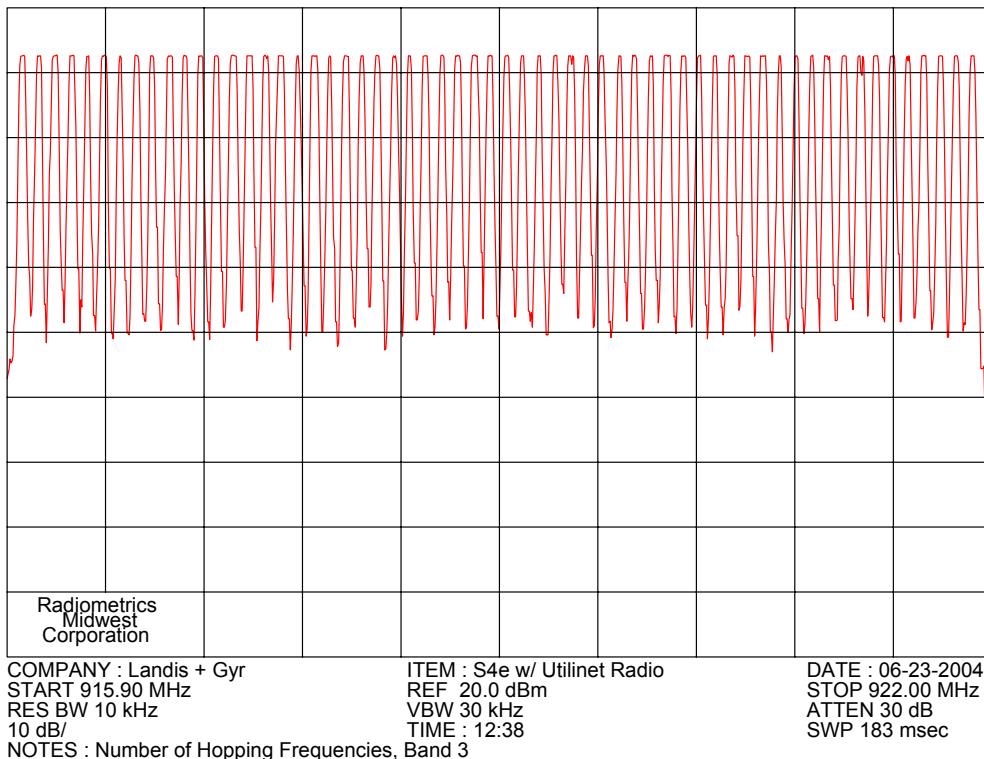
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Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet



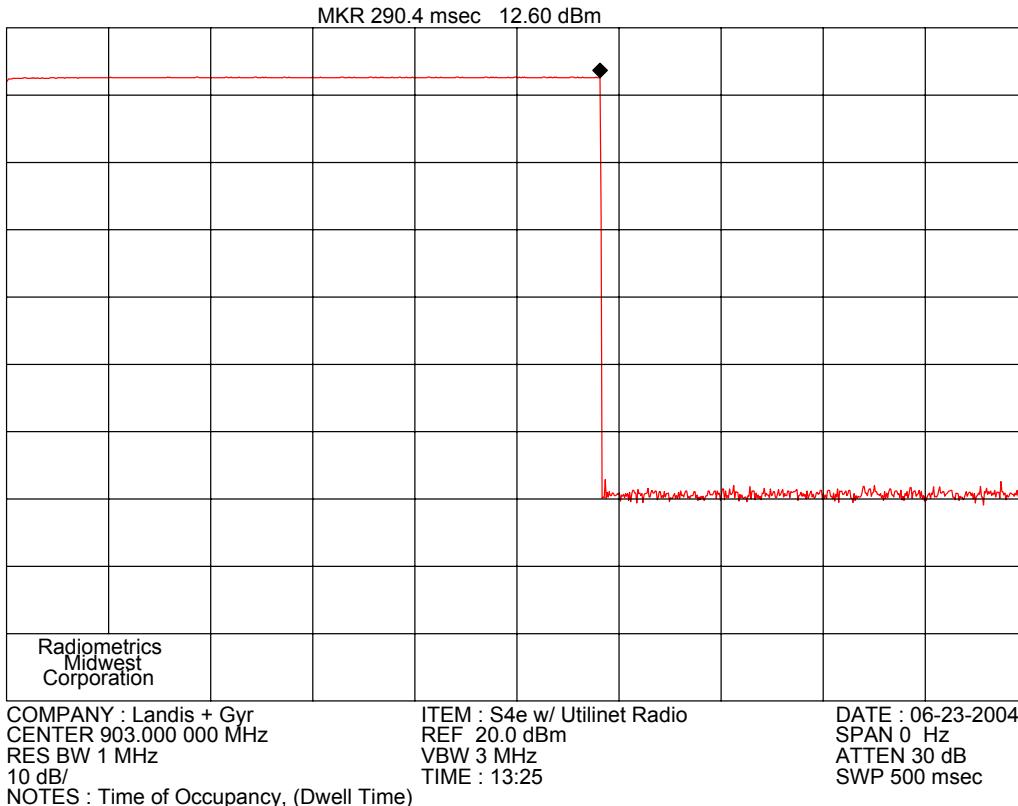
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Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet



10.4 Time of Occupancy (Dwell Time)

The EUT has its hopping function enabled. The spectrum analyzer was set to the MAX HOLD mode to read peak emissions. The span was set to zero. The marker-delta function to determine the dwell time.



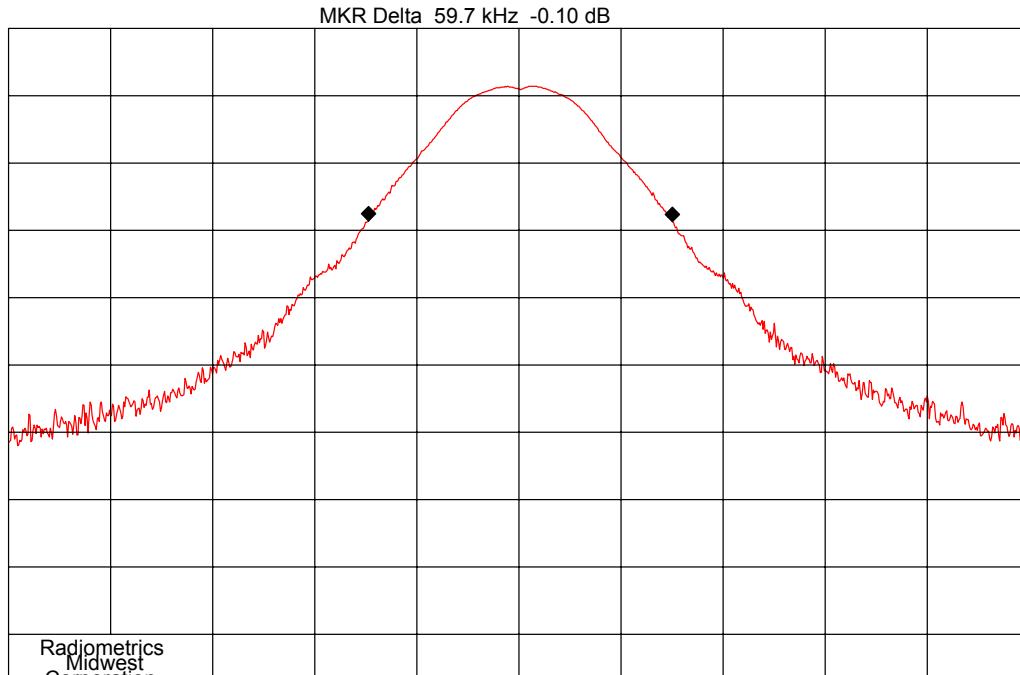
10.5 Occupied Bandwidth (20 dB)

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The EUT was transmitting at its maximum data rate. The trace was allowed to stabilize.

The marker-to-peak function was set to the peak of the emission. Then the marker-delta function was used to measure 20 dB down one side of the emission. The marker-delta function was reset and then moved to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

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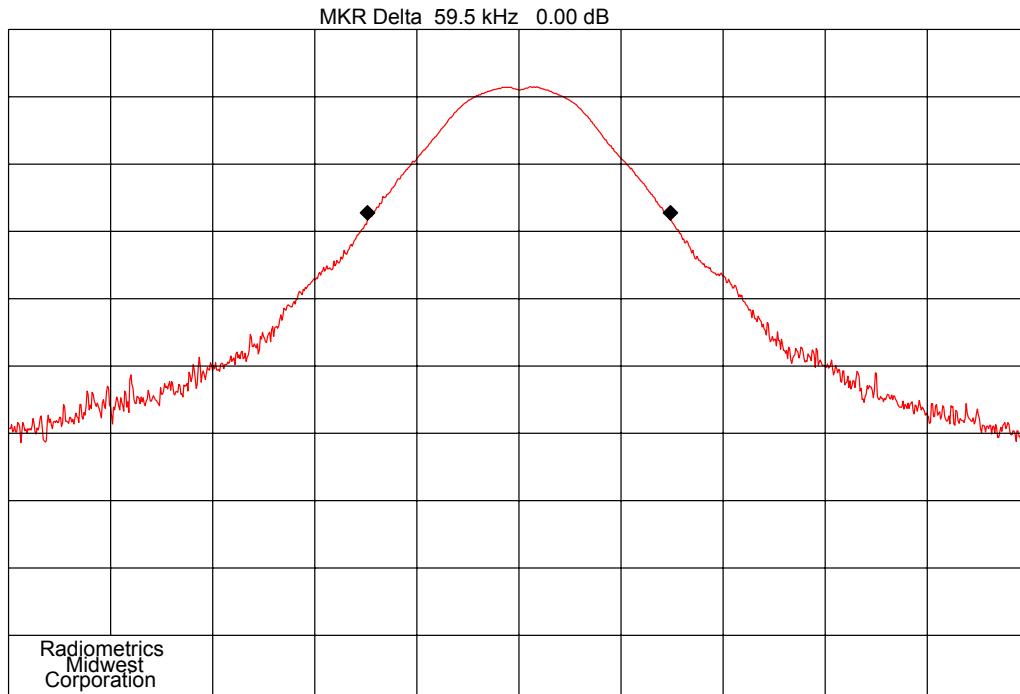
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COMPANY : Landis + Gyr
CENTER 903.000 MHz
RES BW 10 kHz
10 dB/
NOTES : 20 dB Bandwidth, Low Freq.

ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 30 kHz
TIME : 12:13

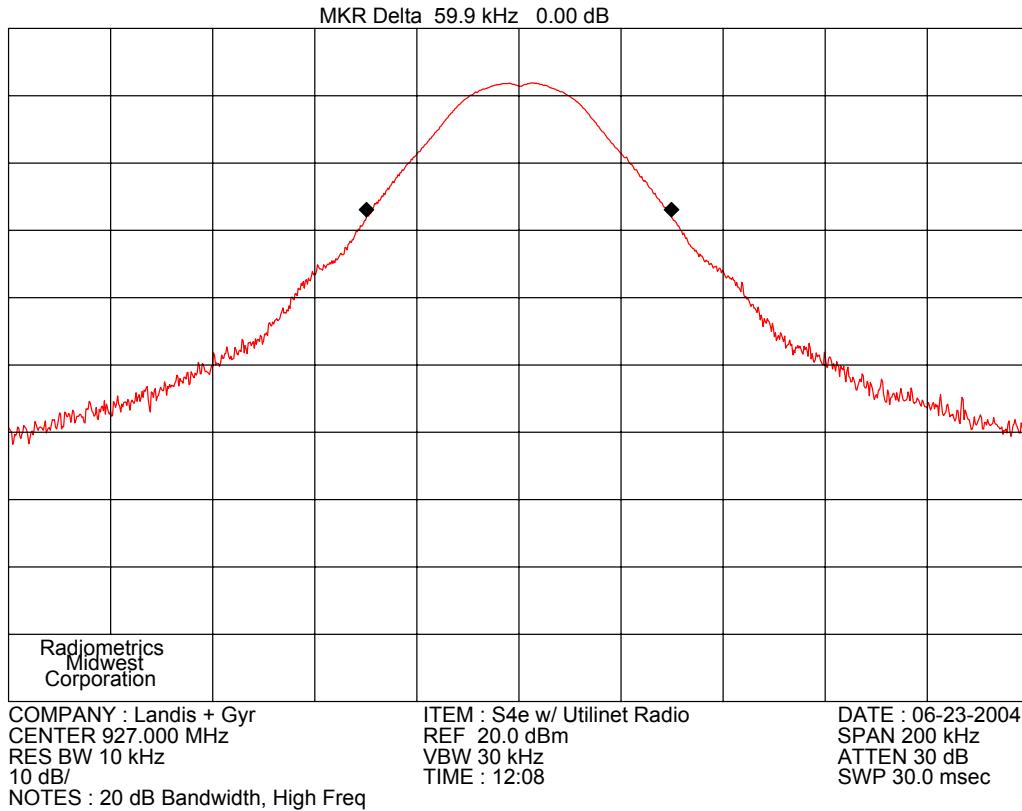
DATE : 06-23-2004
SPAN 200 kHz
ATTEN 30 dB
SWP 30.0 msec



COMPANY : Landis + Gyr
CENTER 915.000 MHz
RES BW 10 kHz
10 dB/
NOTES : 20 dB Bandwidth, Mid Freq.

ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 30 kHz
TIME : 12:11

DATE : 06-23-2004
SPAN 200 kHz
ATTEN 30 dB
SWP 30.0 msec



10.6 Peak Output Power

The spectrum analyzer was set to the following settings:

Span = 50 kHz (approximately 5 times the 20 dB bandwidth, centered on a hopping channel)

RBW = 100 kHz (> the 20 dB bandwidth of the emission being measured)

VBW = 300 kHz

Sweep = auto

Detector function = peak

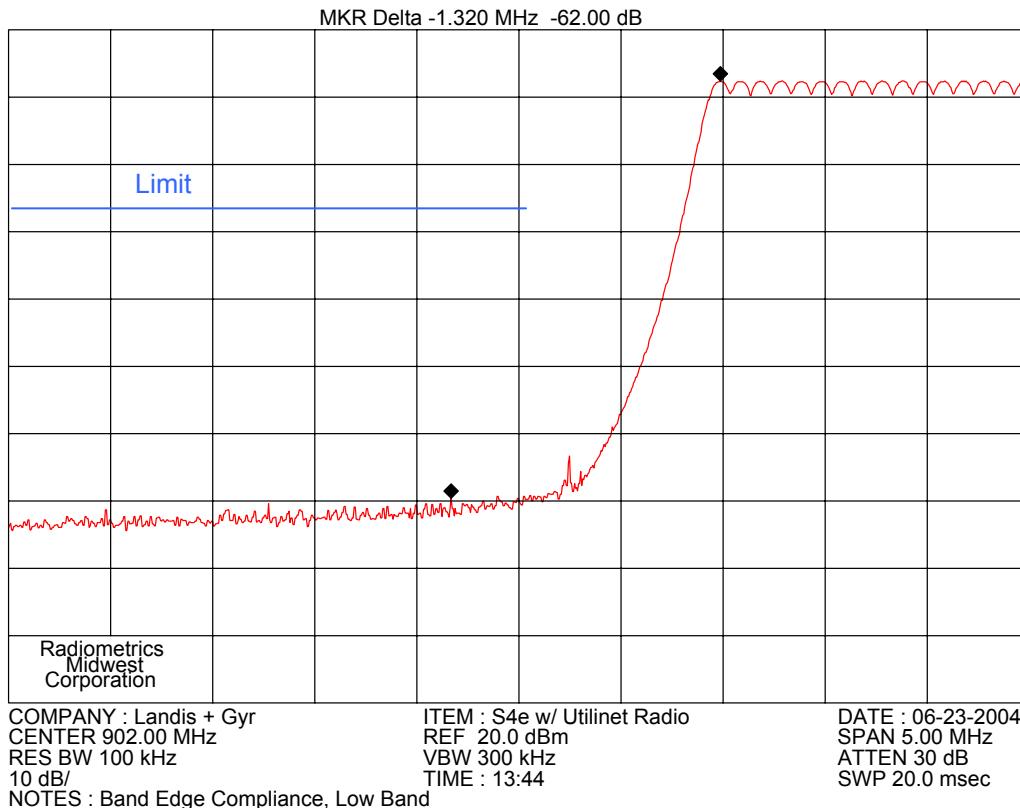
Trace = max hold

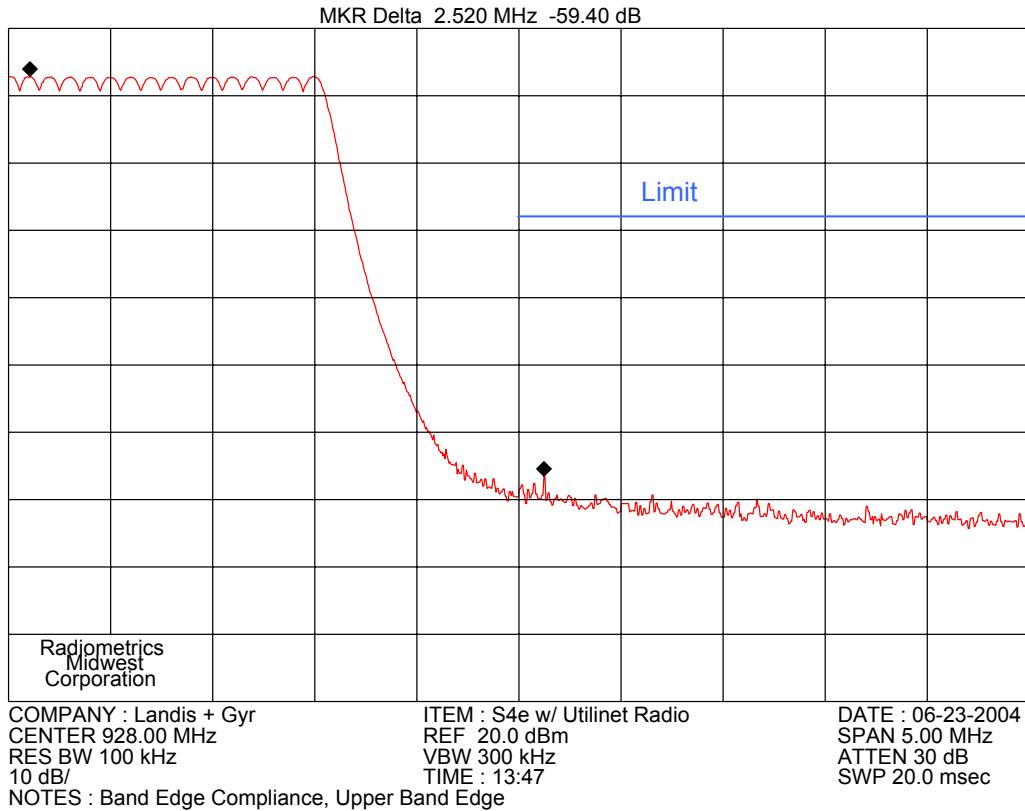
The trace was allowed to stabilize. The marker-to-peak function was used to measure the peak of the emission. The indicated level is the peak output power. Note 30 dBm = 1 watt. Since the gain of the antenna is always less than 6dB, the limit is not reduced.

Frequency (MHz)	Reading (dBm)	Attenuator (dB)	Cable Loss (dB)	Total Power (dBm)		Limit (dBm)
				dBm	Watts	
903	12.6	9.3	0.2	22.1	0.16	30
915	12.6	9.3	0.2	22.1	0.16	30
927	12.9	9.3	0.2	22.4	0.17	30

10.7 Band-edge Compliance of RF Conducted Emissions

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation at the band-edge, with the EUT set to the lowest frequency. The trace was allowed to stabilize.





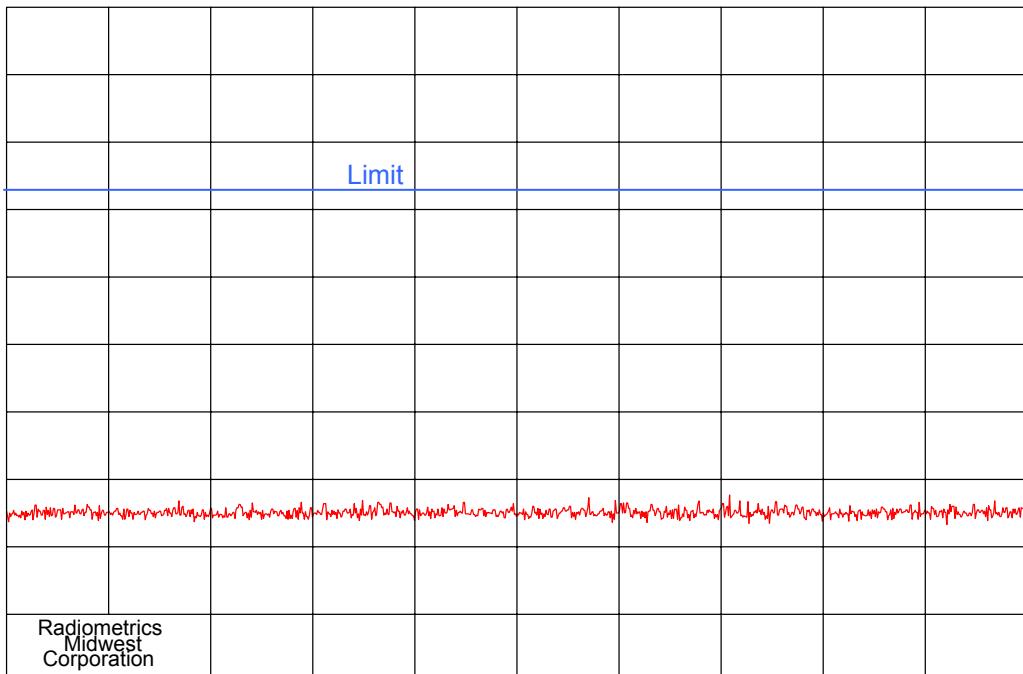
10.8 Spurious RF Conducted Emissions

The spectrum analyzer was set to the MAX HOLD mode to record all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic. The trace was allowed to stabilize. The first five plots were made with the EUT at 903 MHz. The middle five plots were with the EUT set to 915 MHz. The last five plots were with the EUT set to 927 MHz. Each frequency was on for 30 seconds.

Note that the limit does not apply to the fundamental Frequency.

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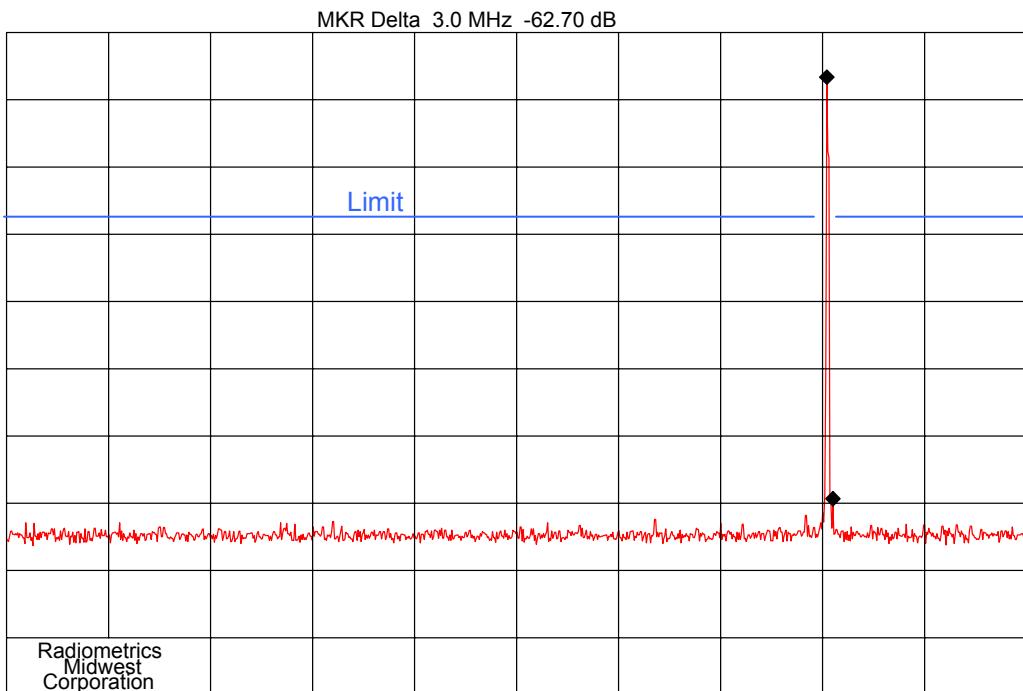


COMPANY : Landis + Gyr
START 1 MHz
RES BW 100 kHz
10 dB/

ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 300 kHz
TIME : 16:03

DATE : 06-22-2004
STOP 500 MHz
ATTEN 30 dB
SWP 150 msec

NOTES : Spurious RF Conducted Emissions, Low Channel



COMPANY : Landis + Gyr
START 500 MHz
RES BW 100 kHz
10 dB/

ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 300 kHz
TIME : 16:09

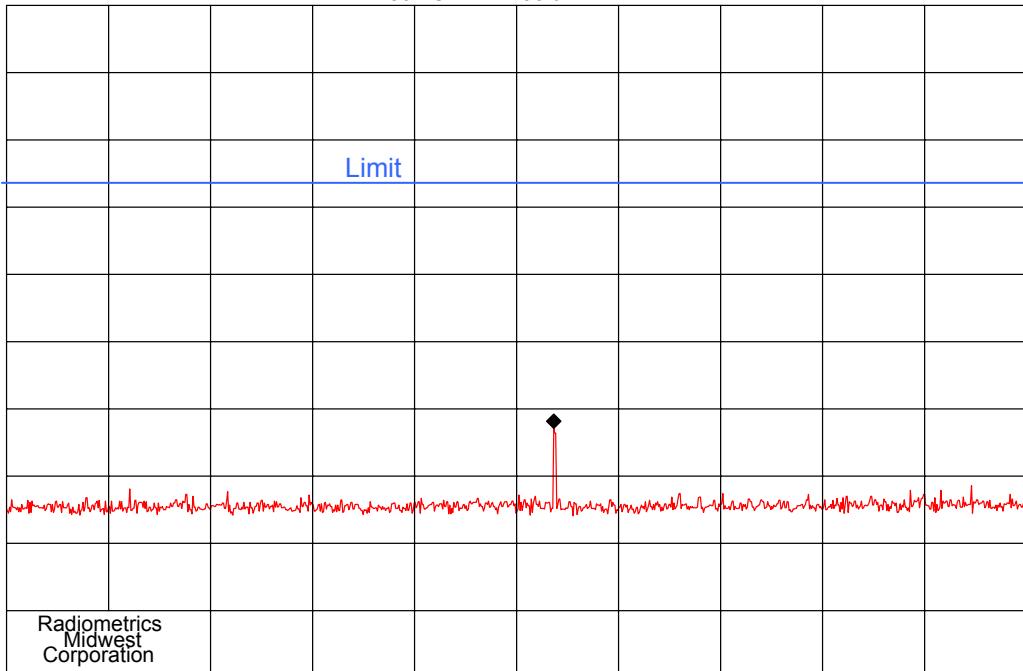
DATE : 06-22-2004
STOP 1.000 GHz
ATTEN 30 dB
SWP 150 msec

NOTES : Spurious RF Conducted Emission, Low Channel

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Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet

MKR 1.804 GHz -42.90 dBm

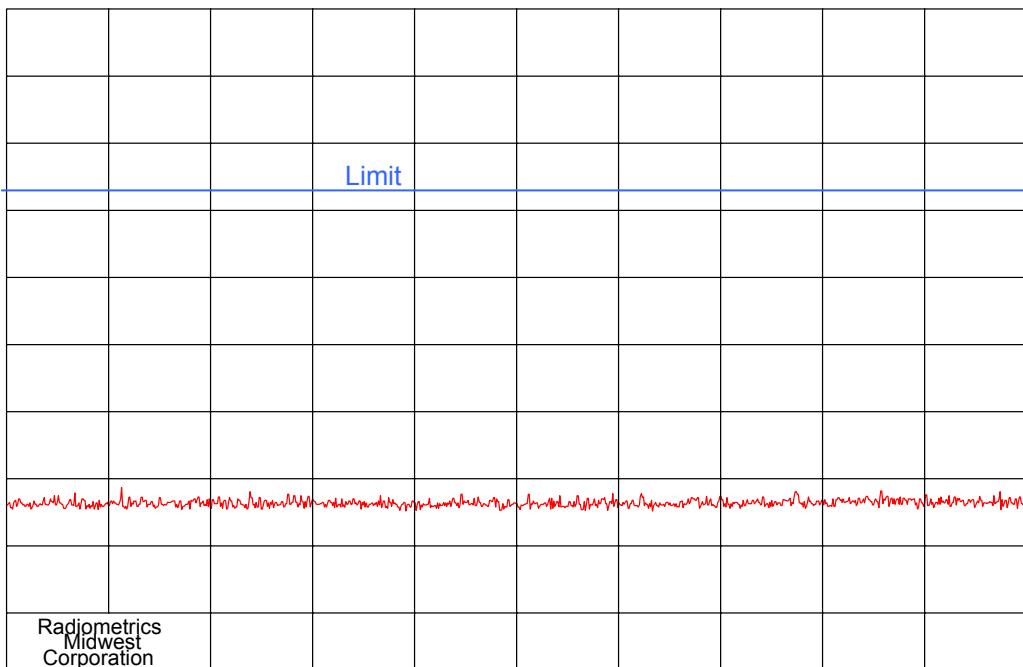


COMPANY : Landis + Gyr
START 1.00 GHz
RES BW 100 kHz
10 dB/

ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 300 kHz
TIME : 16:12

DATE : 06-22-2004
STOP 2.50 GHz
ATTEN 30 dB
SWP 450 msec

NOTES : Spurious RF Conducted Emissions, Low Channel



COMPANY : Landis + Gyr
START 2.00 GHz
RES BW 100 kHz
10 dB/

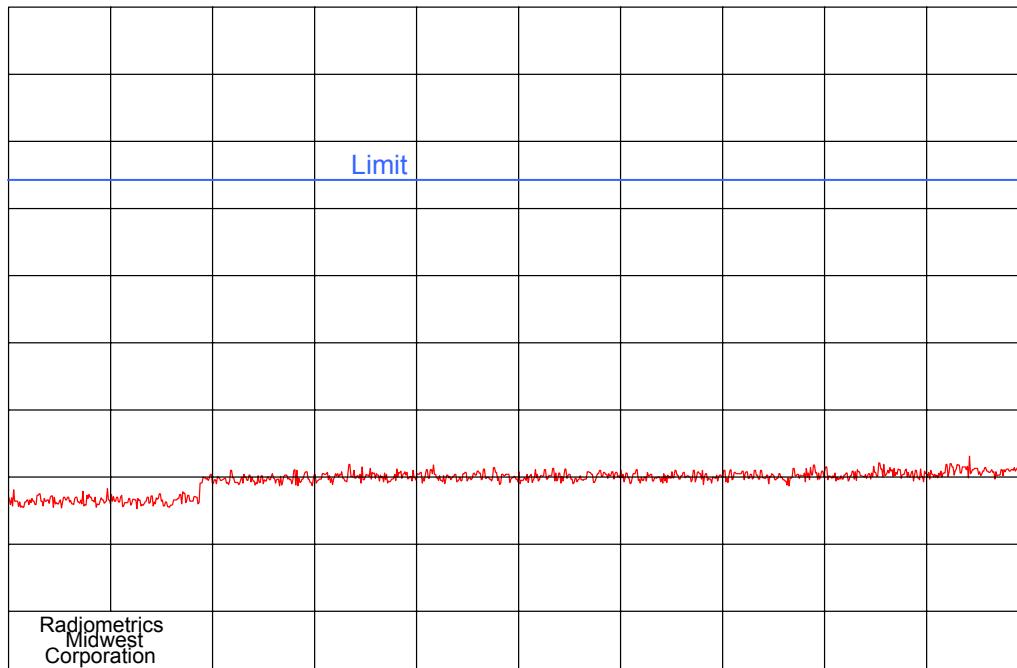
ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 300 kHz
TIME : 16:14

DATE : 06-22-2004
STOP 5.00 GHz
ATTEN 30 dB
SWP 900 msec

NOTES : Spurious RF Conducted Emissions, Low Channel

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet

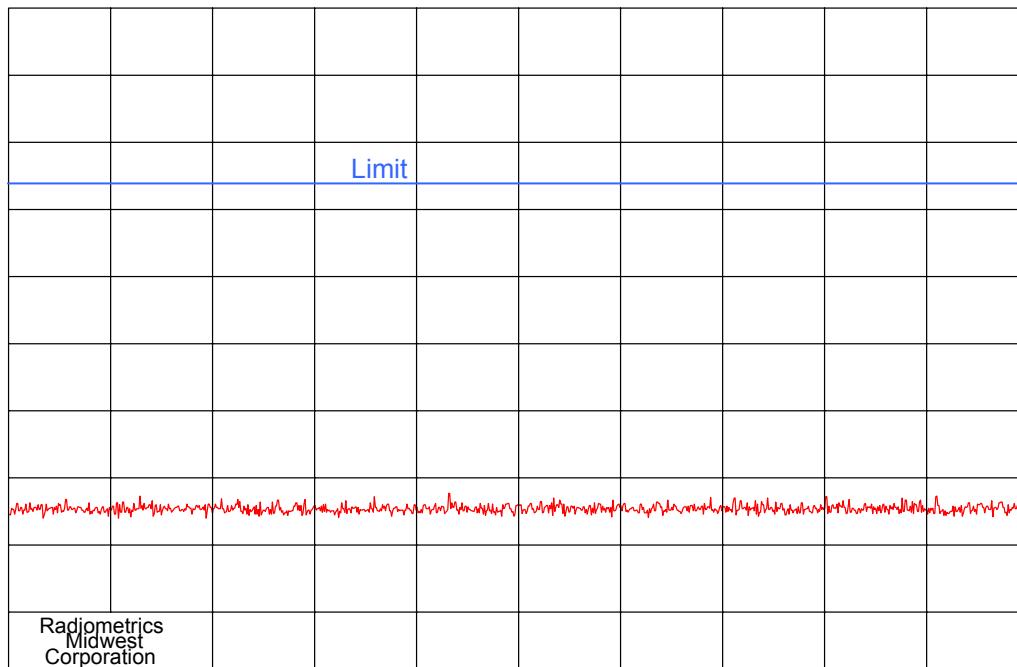


COMPANY : Landis + Gyr
START 5.00 GHz
RES BW 100 kHz
10 dB/

ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 300 kHz
TIME : 16:15

DATE : 06-22-2004
STOP 9.30 GHz
ATTEN 30 dB
SWP 1.29 sec

NOTES : Spurious RF Conducted Emissions, Low Channel



COMPANY : Landis + Gyr
START 1 MHz
RES BW 100 kHz
10 dB/

ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 300 kHz
TIME : 16:18

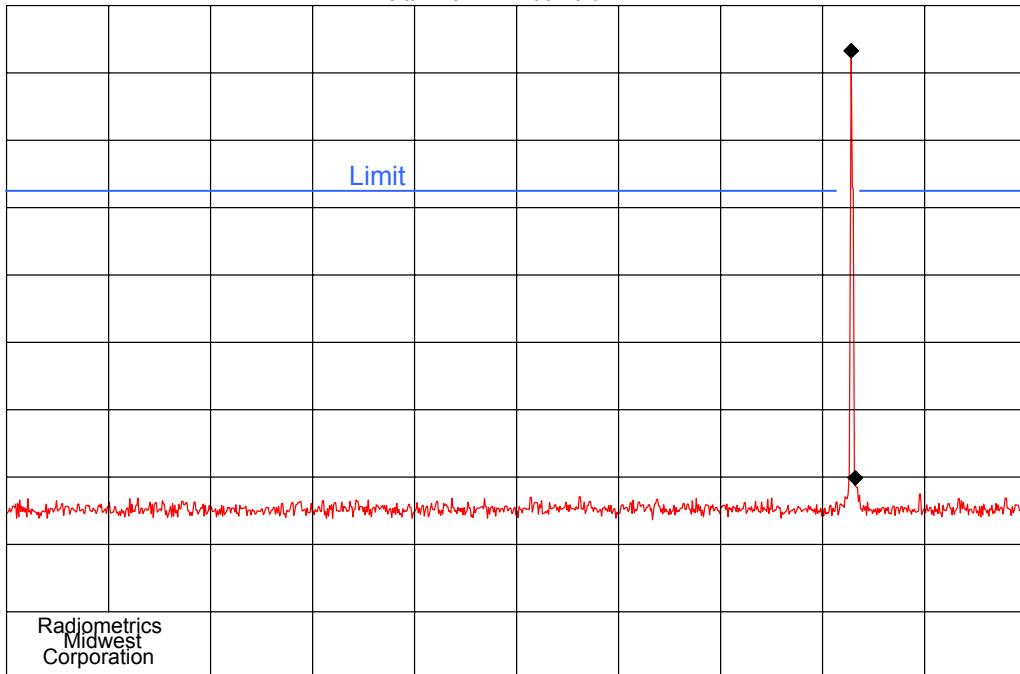
DATE : 06-22-2004
STOP 500 MHz
ATTEN 30 dB
SWP 150 msec

NOTES : Spurious RF Conducted Emissions, Middle Freq

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet

MKR Delta 2.0 MHz -63.40 dB



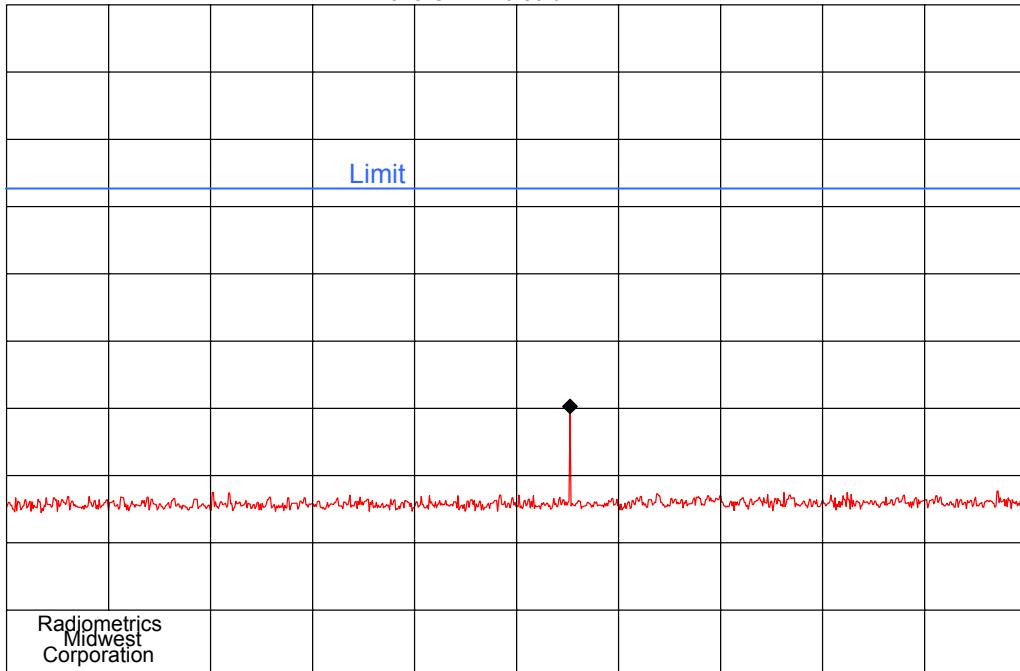
COMPANY : Landis + Gyr
START 500 MHz
RES BW 100 kHz
10 dB/

ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 300 kHz
TIME : 16:20

DATE : 06-22-2004
STOP 1.000 GHz
ATTEN 30 dB
SWP 150 msec

NOTES : Spurious RF Conducted Emissions, Middle Freq

MKR 1.828 GHz -40.80 dBm



COMPANY : Landis + Gyr
START 1.00 GHz
RES BW 100 kHz
10 dB/

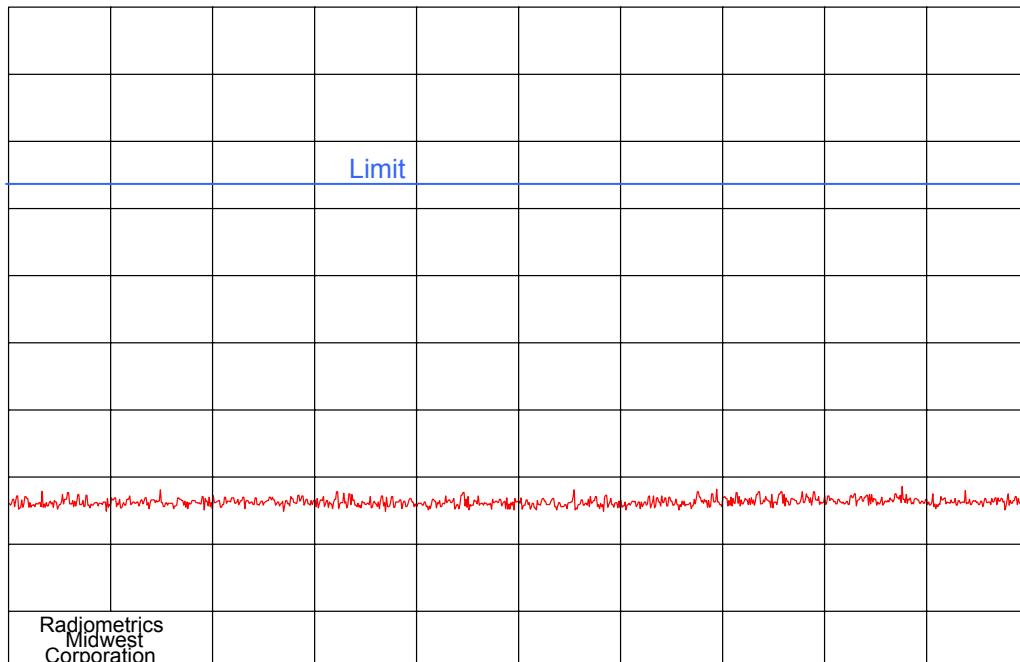
ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 300 kHz
TIME : 16:21

DATE : 06-22-2004
STOP 2.50 GHz
ATTEN 30 dB
SWP 450 msec

NOTES : Spurious RF Conducted Emissions, Middle Freq

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet



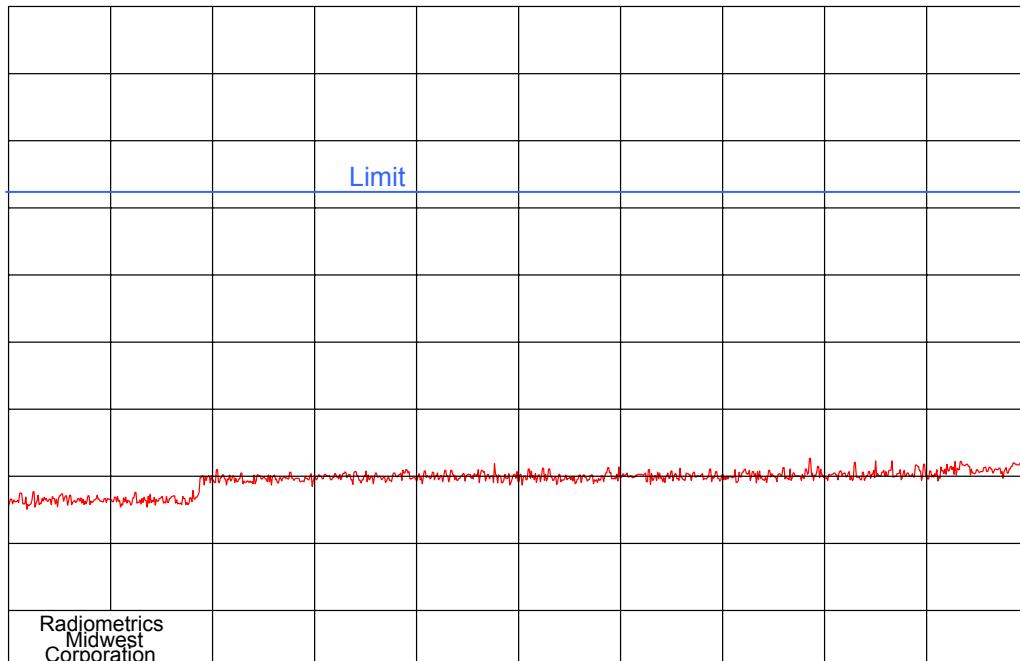
Radiometrics
Midwest
Corporation

COMPANY : Landis + Gyr
START 2.00 GHz
RES BW 100 kHz
10 dB/

ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 300 kHz
TIME : 16:22

DATE : 06-22-2004
STOP 5.00 GHz
ATTEN 30 dB
SWP 900 msec

NOTES : Spurious RF Conducted Emissions, Middle Freq



Radiometrics
Midwest
Corporation

COMPANY : Landis + Gyr
START 5.00 GHz
RES BW 100 kHz
10 dB/

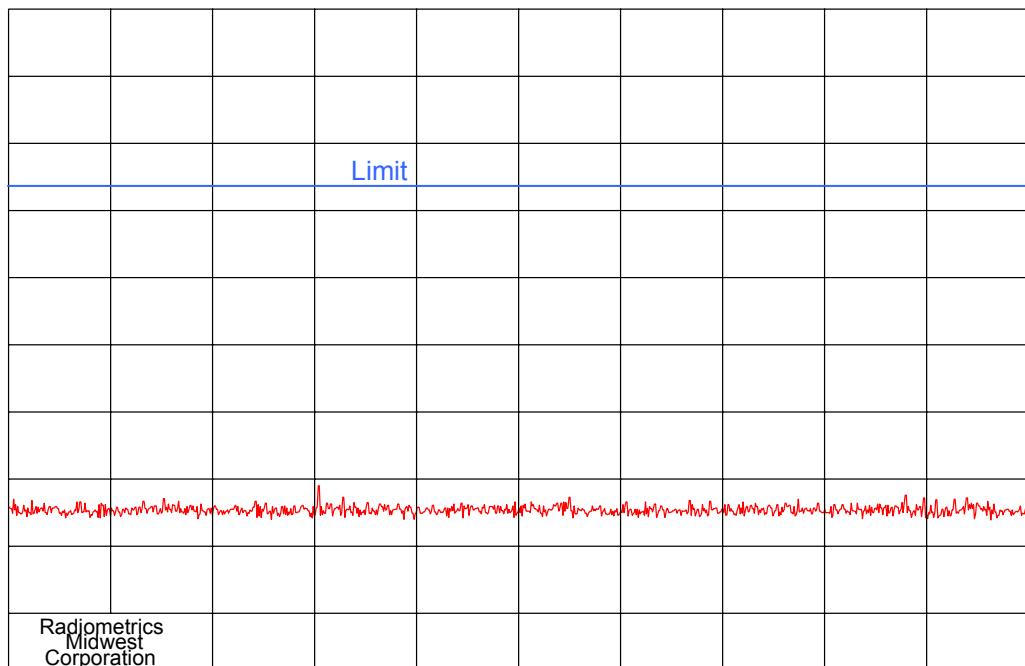
ITEM : S4e w/ Utilinet Radio
REF 20.0 dBm
VBW 300 kHz
TIME : 16:23

DATE : 06-22-2004
STOP 9.30 GHz
ATTEN 30 dB
SWP 1.29 sec

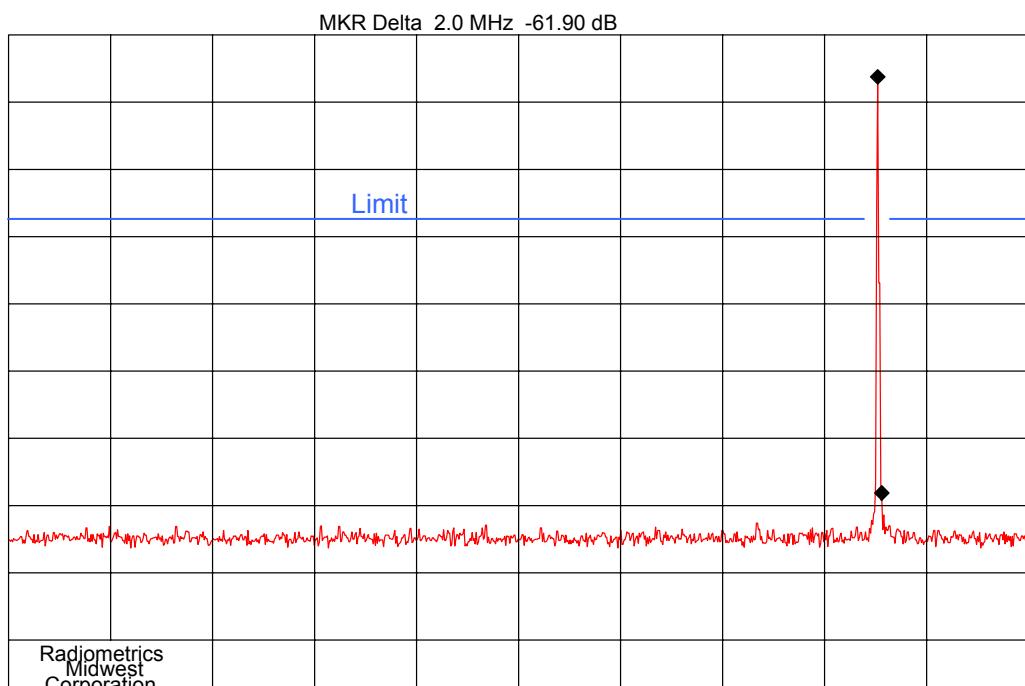
NOTES : Spurious RF Conducted Emissions, Middle Freq

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet



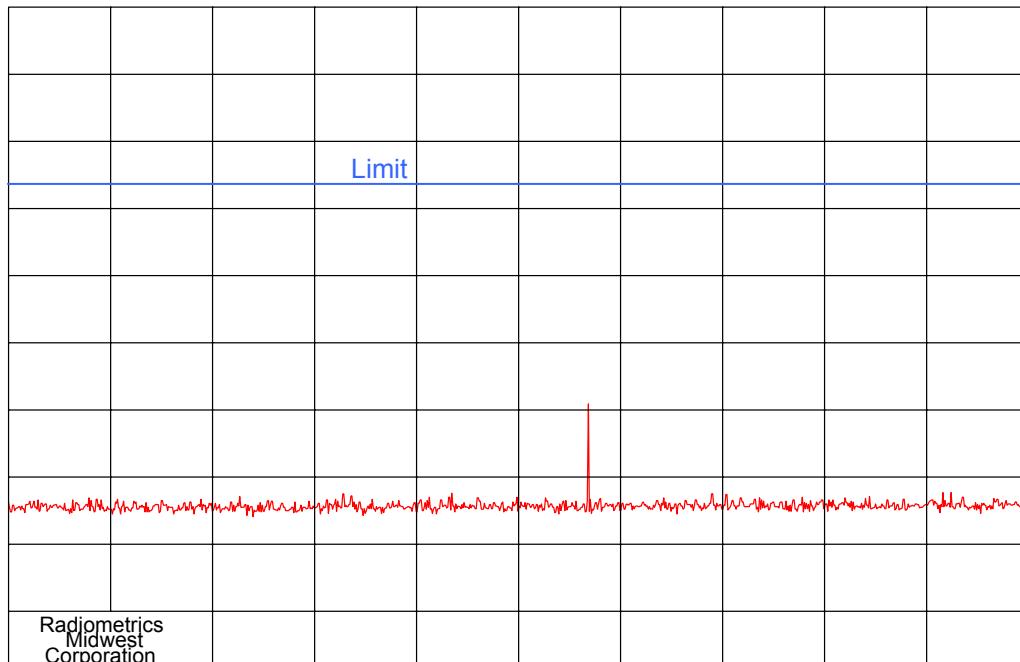
COMPANY : Landis + Gyr ITEM : S4e w/ Utilinet Radio DATE : 06-22-2004
 START 1 MHz REF 20.0 dBm STOP 500 MHz
 RES BW 100 kHz VBW 300 kHz ATTEM 30 dB
 10 dB/ TIME : 16:33 SWP 150 msec
 NOTES : Spurious RF Conducted Emissions, High Freq



COMPANY : Landis + Gyr ITEM : S4e w/ Utilinet Radio DATE : 06-22-2004
 START 500 MHz REF 20.0 dBm STOP 1.000 GHz
 RES BW 100 kHz VBW 300 kHz ATTEM 30 dB
 10 dB/ TIME : 16:25 SWP 150 msec
 NOTES : Spurious RF Conducted Emissions, High Freq

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet

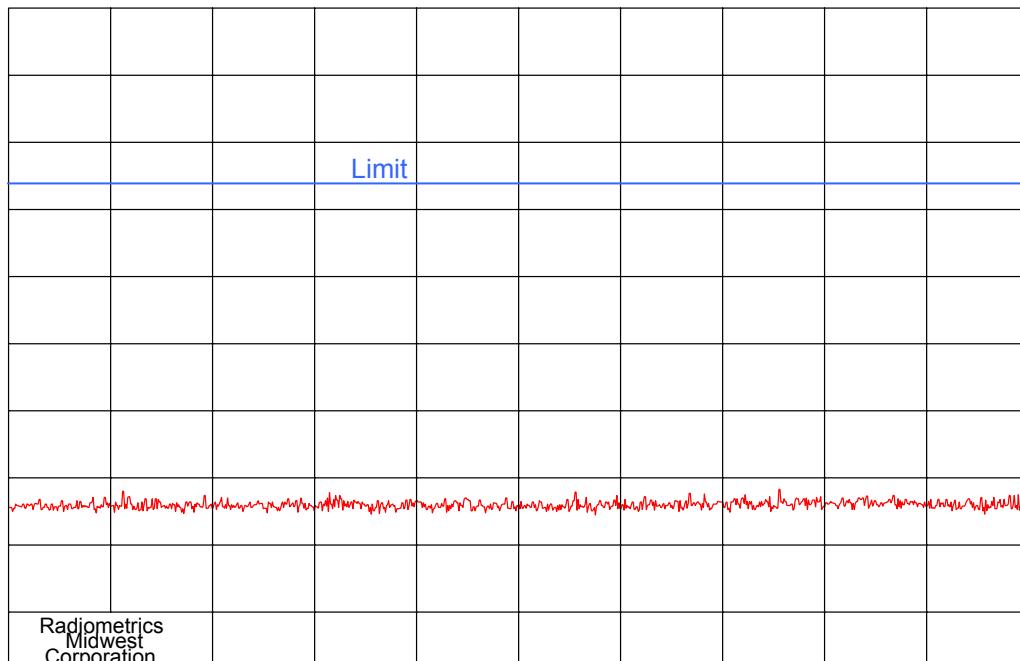


COMPANY : Landis + Gyr
 START 1.00 GHz
 RES BW 100 kHz
 10 dB/

ITEM : S4e w/ Utilinet Radio
 REF 20.0 dBm
 VBW 300 kHz
 TIME : 16:34

DATE : 06-22-2004
 STOP 2.50 GHz
 ATTEN 30 dB
 SWP 450 msec

NOTES : Spurious RF Conducted Emissions, High Freq

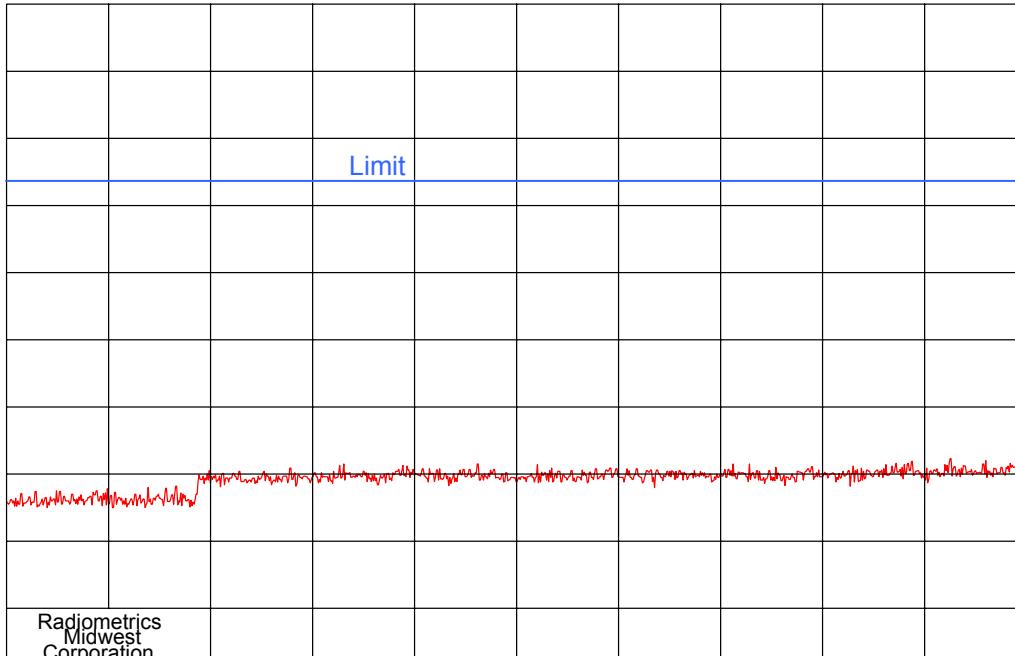


COMPANY : Landis + Gyr
 START 2.00 GHz
 RES BW 100 kHz
 10 dB/

ITEM : S4e w/ Utilinet Radio
 REF 20.0 dBm
 VBW 300 kHz
 TIME : 16:27

DATE : 06-22-2004
 STOP 5.00 GHz
 ATTEN 30 dB
 SWP 900 msec

NOTES : Spurious RF Conducted Emissions, High Freq



COMPANY : Landis + Gyr
 START 5.00 GHz
 RES BW 100 kHz
 10 dB/
 NOTES : Spurious RF Conducted Emissions, High Freq

ITEM : S4e w/ Utilinet Radio
 REF 20.0 dBm
 VBW 300 kHz
 TIME : 16:28

DATE : 06-22-2004
 STOP 9.30 GHz
 ATTEN 30 dB
 SWP 1.29 sec

10.9 Spurious Radiated Emissions

Radiated emission measurements in the Restricted bands were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. Below 1 GHz, when a radiated emission is detected approaching the specification limit, the measurement of the emission is repeated using a tuned dipole antenna with a Roberts Balun. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists.

From 30 to 1000 MHz, an Anritsu Spectrum analyzer and a MITEQ AM-1431 amplifier with a 10 dB attenuator connected to the input were used. The out of band emissions and the ambient emissions were below the level of input overload (80 dBuV).

For tests from 1 to 9.3 GHz, an HP8566A spectrum analyzer was used with a Celeritek uWave amplifier. The out of band emissions and the ambient emissions were below the level of input overload (72 dBuV). In addition, a high pass filter was used to reduce the fundamental emission.

Radiated emission measurements are performed with linearly polarized broadband antennas. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded.

Final radiated emissions measurements were performed in the open area test site at a test distance of 3 meters. The entire frequency range from 30 to 9300 MHz was slowly scanned and the emissions in the restricted frequency bands were recorded. Measurements were performed using the peak detector function. The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground. The open area test site used to collect the radiated data is located on 8625 Helmar Road in Newark, Illinois. The open field test site has a metal ground screen. All other tests are performed at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

10.9.1 Radiated Emissions Field Strength Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

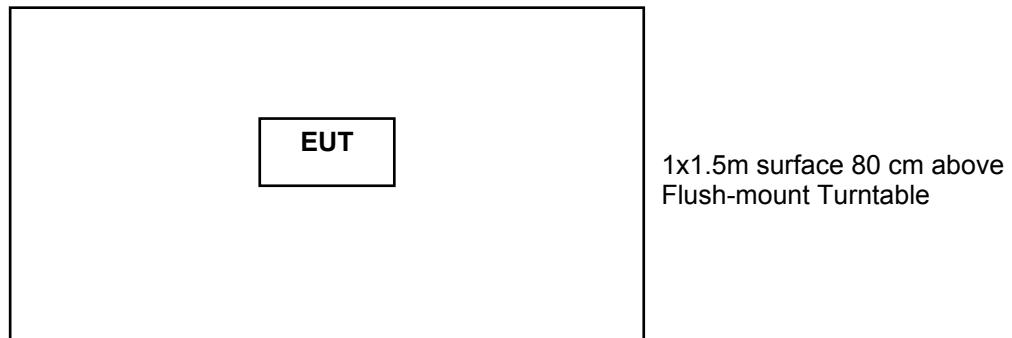
CF = Cable Attenuation Factor

AG = Amplifier Gain

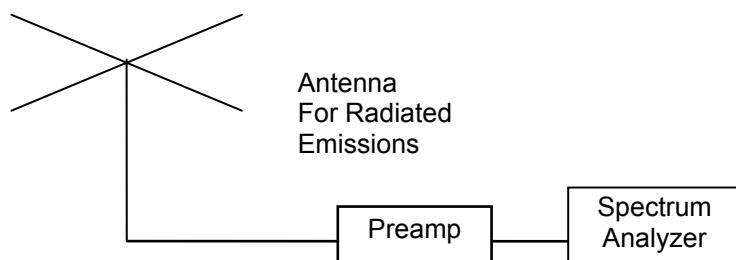
Assume a receiver reading of 49.5 dBuV is obtained. The Antenna Factor of 8.1 and a Cable Factor of 1.7 is added. The Amplifier Gain of 23.3 dB is subtracted, giving a field strength of 36 dBuV/m. The 36 dBuV/m can be mathematically converted to its corresponding level in uV/m.

$$FS = 49.5 + 8.1 + 1.7 - 23.3 = 36.0 \text{ dBuV/m}$$

$$\text{Level in uV/m} = \text{Common Antilogarithm} [(36 \text{ dBuV/m})/20] = 63.1 \text{ uV/m}$$

Figure 2. Drawing of Radiated Emissions Setup**Notes:**

- AC outlet with low-pass filter at the base of the turntable
- Antenna height varied from 1 to 4 meters
- Distance from antenna to EUT is 3 meters
- AC cables are not shown
- Not to Scale

**10.9.2 Spurious Radiated Emissions Test Results (Restricted Band)**

The following spectrum analyzer settings were used.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

$VBW \geq RBW$

Sweep = auto

Detector function = peak

Trace = max hold

The duty cycle factor is $20 * \text{Log}(18.7/100) = -14.5$ dB; The plot for this is in section 10.3. The peak emissions did not exceed the average by more than 20 dB.

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet

Manufacturer	Landis + Gyr, Inc.	Specification	FCC Part 15 Subpart C & RSS-210
Model	S4e Form 16S	Test Date	6/23/2004
Serial Number	86 473 892	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; BC = Biconical (ANT-3); LP = Log-Periodic (ANT-6); HN = Horn (ANT-13) P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain + HP Filter Loss		
Configuration			

Emissions above 1 GHz

Tx Freq	Ant Pol.	Detector Function	Emission Freq. MHz	dBuV/m	Limit	Margin under limit
903	H	Ave	2708.9	47.8	54.0	6.2
903	H	Ave	3612.1	39.2	54.0	14.8
903	H	Ave	4515.0	39.6	54.0	14.4
903	H	Ave	5417.8	37.6	54.0	16.4
903	H	Ave	8127.1	40.3	54.0	13.7
903	H	Ave	9029.6	46.1	54.0	7.9
903	V	Ave	2709.0	45.3	54.0	8.7
903	V	Ave	3612.0	42.2	54.0	11.8
903	V	Ave	4515.0	42.1	54.0	11.9
903	V	Ave	5417.9	43.0	54.0	11.0
903	V	Ave	8126.9	48.5	54.0	5.5
903	V	Ave	9029.9	45.4	54.0	8.6
915	H	Ave	2744.9	50.0	54.0	4.0
915	H	Ave	3659.9	39.9	54.0	14.1
915	H	Ave	4575.0	39.5	54.0	14.5
915	H	Ave	8234.8	40.7	54.0	13.3
915	H	Ave	9150.2	45.2	54.0	8.8
915	V	Ave	2745.0	46.9	54.0	7.1
915	V	Ave	3659.9	40.0	54.0	14.0
915	V	Ave	4575.0	38.4	54.0	15.6
915	V	Ave	8234.9	40.7	54.0	13.3
915	V	Ave	9151.1	45.4	54.0	8.6
927	H	Ave	2780.9	43.0	54.0	11.0
927	H	Ave	3707.9	37.3	54.0	16.7
927	H	Ave	4635.0	39.1	54.0	14.9
927	H	Ave	8342.2	40.6	54.0	13.4
927	V	Ave	2780.9	48.8	54.0	5.2
927	V	Ave	3707.9	36.1	54.0	17.9
927	V	Ave	4634.9	39.7	54.0	14.3
927	V	Ave	8342.1	40.7	54.0	13.3
903	H	Peak	2708.9	51.2	74.0	22.8
903	H	Peak	3612.1	42.3	74.0	31.7
903	H	Peak	4515.0	43.5	74.0	30.5
903	H	Peak	5417.8	41.0	74.0	33.0
903	V	Peak	2709.0	48.9	74.0	25.1
903	V	Peak	3612.0	45.2	74.0	28.8
903	V	Peak	4515.0	45.2	74.0	28.8
903	V	Peak	5417.9	46.1	74.0	27.9
915	H	Peak	2744.9	53.5	74.0	20.5

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report
Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet

Tx Freq	Ant Pol.	Detector Function	Emission Freq. MHz	dBuV/m	Limit	Margin under limit
915	H	Peak	3659.9	43.1	74.0	30.9
915	H	Peak	4575.0	42.6	74.0	31.4
915	H	Peak	8234.8	44.7	74.0	29.3
915	H	Peak	9150.2	49.0	74.0	25.0
915	V	Peak	2745.0	50.2	74.0	23.8
915	V	Peak	3659.9	43.6	74.0	30.4
915	V	Peak	4575.0	41.5	74.0	32.5
927	H	Peak	2780.9	46.9	74.0	27.1
927	H	Peak	3707.9	40.5	74.0	33.5
927	H	Peak	4635.0	42.7	74.0	31.3
927	V	Peak	2780.9	52.3	74.0	21.7
927	V	Peak	3707.9	39.1	74.0	34.9
927	V	Peak	4634.9	43.4	74.0	30.6

Emissions Below 1 GHz

Tx Freq	Ant Pol.	Detector Function	Emission Freq. MHz	dBuV/m	Limit	Margin under limit
903	H	Peak	37.3	23.0	40.0	17.0
903	H	Peak	72.9	25.5	40.0	14.5
903	H	Peak	109.8	28.1	43.5	15.4
903	H	Peak	117.5	29.4	43.5	14.1
903	H	Peak	126.0	26.3	43.5	17.2
903	H	Peak	134.9	24.4	43.5	19.1
903	H	Peak	171.9	24.7	43.5	18.8
903	H	Peak	173.2	29.8	43.5	13.7
903	H	Peak	247.8	30.3	46.0	15.7
903	H	Peak	264.3	30.6	46.0	15.4
903	H	Peak	274.9	29.0	46.0	17.0
903	H	Peak	283.4	30.2	46.0	15.8
903	H	Peak	327.7	27.8	46.0	18.2
903	H	Peak	399.9	30.1	46.0	15.9
903	V	Peak	37.9	25.9	40.0	14.1
903	V	Peak	73.3	22.6	40.0	17.4
903	V	Peak	75.0	21.5	40.0	18.5
903	V	Peak	75.6	26.3	40.0	13.7
903	V	Peak	110.1	30.5	43.5	13.0
903	V	Peak	120.3	29.1	43.5	14.4
903	V	Peak	123.2	26.3	43.5	17.2
903	V	Peak	130.4	29.2	43.5	14.3
903	V	Peak	149.6	26.5	43.5	17.0
903	V	Peak	156.9	29.4	43.5	14.1
903	V	Peak	240.0	30.1	46.0	15.9
903	V	Peak	249.8	29.0	46.0	17.0
903	V	QP	253.1	29.7	46.0	16.3
903	V	Peak	330.0	29.7	46.0	16.3
915	V	Peak	30.4	33.9	40.0	6.1
915	V	Peak	33.8	29.3	40.0	10.7

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet

Tx Freq	Ant Pol.	Detector Function	Emission Freq. MHz	dBuV/m	Limit	Margin under limit
915	V	Peak	34.7	32.4	40.0	7.6
915	V	Peak	37.7	21.1	40.0	18.9
915	V	Peak	45.8	29.1	40.0	10.9
915	V	QP	61.9	34.5	40.0	5.5
915	V	QP	62.8	31.7	40.0	8.3
915	V	QP	63.9	29.7	40.0	10.3
915	V	QP	74.3	25.0	40.0	15.0
915	V	QP	74.9	33.9	40.0	6.1
915	V	QP	85.6	34.3	40.0	5.7
915	V	Peak	96.0	29.2	43.5	14.3
915	V	QP	109.2	31.5	43.5	12.0
915	V	Peak	119.9	30.9	43.5	12.6
915	V	Peak	171.2	30.3	43.5	13.2
915	V	Peak	177.7	33.5	43.5	10.0
915	V	QP	230.9	30.8	46.0	15.2
915	V	Peak	260.9	28.9	46.0	17.1
915	H	QP	73.0	24.3	40.0	15.7
915	H	Peak	75.7	23.4	40.0	16.6
915	H	Peak	109.2	27.8	43.5	15.7
915	H	Peak	111.4	26.3	43.5	17.2
915	H	Peak	116.4	24.8	43.5	18.7
915	H	Peak	122.5	25.8	43.5	17.7
915	H	Peak	149.8	29.1	43.5	14.4
915	H	Peak	166.2	26.1	43.5	17.4
915	H	Peak	167.8	24.1	43.5	19.4
915	H	Peak	267.4	31.7	46.0	14.3
915	H	Peak	273.2	28.7	46.0	17.3
915	V	Peak	252.6	32.6	46.0	13.4
915	V	Peak	254.2	35.6	46.0	10.4
915	V	Peak	319.4	27.6	46.0	18.4
915	V	Peak	609.7	28.7	46.0	17.3
927	H	Peak	73.3	23.9	40.0	16.1
927	H	Peak	74.9	20.6	40.0	19.4
927	H	Peak	109.6	27.9	43.5	15.6
927	H	Peak	123.2	24.2	43.5	19.3
927	H	Peak	149.8	33.7	43.5	9.8
927	H	Peak	157.1	28.8	43.5	14.7
927	H	Peak	249.8	32.6	46.0	13.4
927	H	Peak	257.1	28.7	46.0	17.3
927	H	Peak	258.8	28.5	46.0	17.5
927	H	Peak	269.9	30.5	46.0	15.5
927	H	Peak	270.8	27.8	46.0	18.2
927	H	Peak	280.2	28.3	46.0	17.7
927	H	Peak	282.8	29.5	46.0	16.5
927	H	Peak	290.3	34.7	46.0	11.3
927	H	Peak	390.0	30.5	46.0	15.5
927	H	Peak	399.0	28.0	46.0	18.0
927	V	Peak	72.7	26.3	40.0	13.7
927	V	Peak	74.9	24.7	40.0	15.3

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Landis + Gyr, Inc., Model S4e Form 16S, Meter with Utilinet

Tx Freq	Ant Pol.	Detector Function	Emission Freq. MHz	dBuV/m	Limit	Margin under limit
927	V	Peak	121.5	26.1	43.5	17.4
927	V	Peak	123.0	29.8	43.5	13.7
927	V	Peak	130.5	26.9	43.5	16.6
927	V	Peak	132.5	27.0	43.5	16.5
927	V	Peak	149.9	35.6	43.5	7.9
927	V	Peak	249.8	36.7	46.0	9.3
927	V	Peak	256.2	30.1	46.0	15.9
927	V	Peak	264.7	32.5	46.0	13.5
927	V	Peak	265.8	29.5	46.0	16.5
927	V	Peak	269.9	33.0	46.0	13.0
927	V	Peak	287.1	33.3	46.0	12.7
927	V	Peak	324.0	27.9	46.0	18.1
927	V	Peak	330.3	30.3	46.0	15.7
927	V	Peak	363.0	33.6	46.0	12.4
927	V	Peak	367.7	36.9	46.0	9.1
927	V	Peak	411.6	34.4	46.0	11.6

Judgment: Passed by 4.0 dB

No other emissions were detected in the restricted bands.