Electromagnetic Compatibility Test Report

Tests Performed on a Landis + Gyr, Inc.

Electricity Meter with DSSS Transmitter,

Model RXRS4e with Cellnet Radio

Radiometrics Document RP-5752

ACCREDITED
Certification # 1495.01

Product Detail: FCC ID: ROV-CELNTMFMM Equipment type: 913 to 918 MHz Low Power Transmitter
Test Standards: US CFR Title 47, Chapter I, FCC Part 15 Subpart C FCC Part 15 CFR Title 47: 2006 Industry Canada RSS-210, Issue 5 as required for Category I Equipment This report concerns: Original Grant for Certification FCC Part 15.247

Tests Performed For:	*Test Facility:*
Landis + Gyr, Inc. 2800 Duncan Rd. Lafayette, IN 47904 Phone:	**Radiometrics Midwest Corporation** 12 East Devonwood Romeoville, IL 60446 Phone: (815) 293-0772 e-mail: info@radiomet.com

Test Date(s): (Month-Day-Year) January 16, March 7 and 9, 2006

Document RP-5752 Revisions:

Rev.	Issue Date	Affected Pages	Revised By
0	February 28, 2006		
1	March 9, 2006	3, 6, 11, 15-19	Joseph Strzelecki
2	March 9, 2006	16-19	Joseph Strzelecki
3	March 10, 2006	10	Joseph Strzelecki

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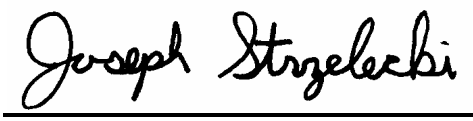
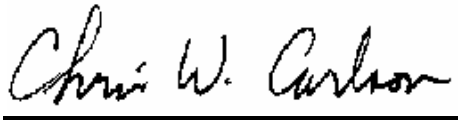
1 ADMINISTRATIVE DATA

Equipment Under Test: A Landis + Gyr, Inc., Electricity Meter with DSSS Transmitter Model: RXRS4e with Cellnet Radio Serial Number: 89 427 837 This will be referred to as the EUT in this Report	
Date EUT Received at Radiometrics: (Month-Day-Year) January 12, 2006	*Test Date(s): (Month-Day-Year)* January 16, 2006
Test Report Written By: Joseph Strzelecki Senior EMC Engineer	*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 an Electricity Meter with DSSS Transmitter, Model RXRS4e with Cellnet Radio, 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	RSS-210 & FCC Part 15	Pass
Conducted Emissions, AC Mains	0.15 - 30 MHz	RSS-210 & FCC Part 15	Pass

Spread Spectrum Transmitter Requirements

Environmental Phenomena	Frequency Range	FCC Section	RSS-210 Section	Test Result
6 dB Bandwidth Test;	902-928 MHz	15.247 a	6.2.2 (o) (a)	Pass
20 dB Bandwidth Test;	902-928 MHz	15.247 a	6.2.2 (o) (a)	Pass
Peak Output Power	902-928 MHz	15.247 b	6.2.2 (o) (a)	Pass
Band-edge Compliance of RF Conducted Emissions	902-928 MHz	15.247 d	6.2.2 (o) (e)	Pass
Spurious RF Conducted Emissions	30-9300 MHz	15.247 d	6.2.2 (o) (e1)	Pass
Spurious Radiated Emissions	30-9300 MHz	15.247 d	6.2.2 (o) (a)	Pass
Power Spectral Density	902-928 MHz	15.247 e	6.2.2 (o) (b)	Pass

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is an Electricity Meter with DSSS Transmitter, Model RXRS4e with Cellnet Radio, manufactured by Landis + Gyr, Inc. The EUT was in good working condition during the tests, with no known defects. The meter tested represents all meters that it will be used in.

This product transmits both mobile and fixed network transmissions. For mobile network transmissions, the RF frequency is 913.98 MHz; the radiated RF power level is approximately –3 dBm and modulation is CCSK. For fixed network transmissions, the RF frequency is 917.58 MHz, SS, the radiated RF power level is approximately +23 dBm and modulation is OOK.

The terms “mobile and fixed network transmissions” refer to the type of devices used to monitor the transmissions from the product. The terms describe the modes only and are not to be confused with the FCC definitions of mobile and fixed with regards to RF exposure.

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.

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. 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	Form 16S Electricity meter with DSSS Transmitter	E	Landis + Gyr, Inc.	RXRS4e with Cellnet Radio	89 427 837
2	Universal Shooter	S	Cellnet	25-3500	N/A
3	Laptop Computer	S	Dell	Latitude	N/A

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

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	2006	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
ANSI C63.4-2003	2003	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
IC RSS-210 Issue 6	2005	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-212 Issue 1	1999	Test Methods For Radio Equipment
IC RSS-Gen Issue 1	2005	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)
FCC 558074	2004	New Guidance on Measurements for Digital Transmission Systems in Section 15.247

The test procedures used are in accordance with the FCC DA 00-75, Industry Canada RSS-212 and ANSI document C63.4-2003, "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.org).

The following is a list of sites used during the tests:

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber.

Test Station F: Is an area that measures 10' D X 12' W X 10' H. The floor and back wall are metal shielded. This area is used for conducted emissions measurements.

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 US1065. The FCC test site Registration Number is 732175. 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.	12/22/05
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	12/21/05
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	10/13/04
ANT-44	Impossible Machine	Super Log Antenna	SL-20M2G	1002	20-2000MHz	24 Mo.	12/12/05
HPF-01	Solar	High Pass Filter	7930-100	HPF-1	0.15-30MHz	24 Mo.	04/20/05
HPF-04	Mini-Circuits	High Pass Filter	VHP-36	HPF-04	2.6-10 GHz	12 Mo.	02/08/06
LSN-03	Farnell	50 uH LISN	1EXLSN30B	000314	0.01-30MHz	24 Mo.	04/25/05
PRE-01	Hewlett Packard	Preselector	85685A	2510A00143	20 Hz-2GHz	12 Mo.	01/20/05
REC-03	Anritsu	Spectrum Analyzer	MS2601B	MT94589	0.01-2200MHz	12 Mo.	11/11/05
REC-08	Hewlett Packard	Spectrum Analyzer	8566B	2648A13481 2209A01436	30Hz-22GHz	12 Mo.	06/14/05
THM-01	Extech Inst.	Temp/Humid Meter	4465CF	001106557	N/A	24 Mo.	01/28/06

Note: All calibrated equipment is subject to periodic checks.

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 host computer (with the EUT connected) power cord, after testing all modes of operation.

Conducted Emissions Test Results

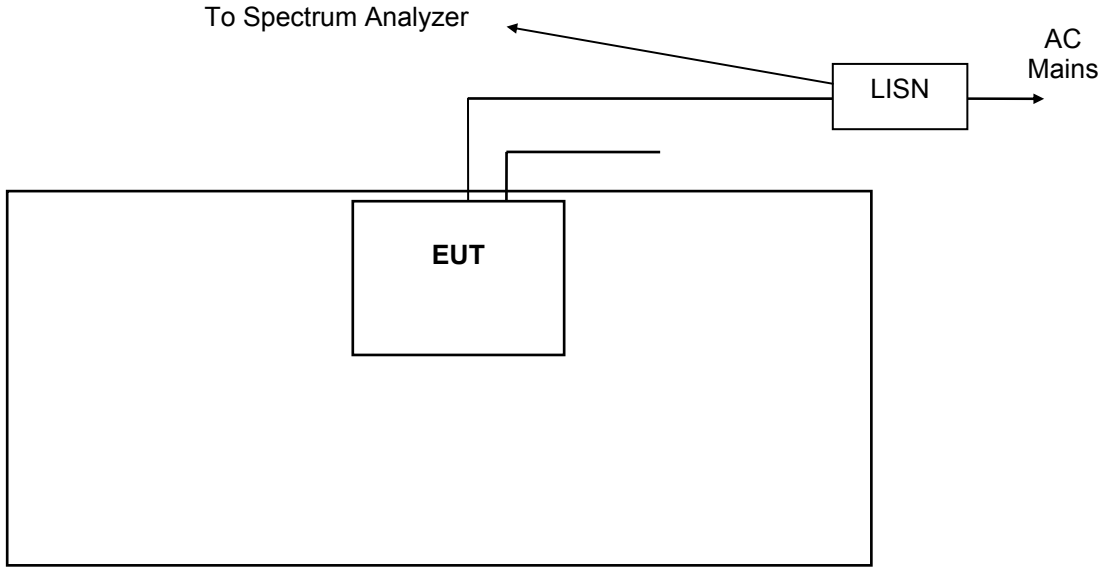
Test Date : January 16, 2006
The Amplitude is the final corrected value with cable and LISN Loss.

Transmit Freq	Lead Tested	Frequency MHz	QP Amplitude	QP Limit	Average Amplitude	Average Limit
913.98 MHz	AC Neutral	0.15	59.77	65.93	50.13	55.93
913.98 MHz	AC Neutral	0.17	57.07	64.87	47.15	54.87
913.98 MHz	AC Neutral	0.19	53.80	63.90	44.72	53.90
913.98 MHz	AC Neutral	19.98	38.56	60.00	33.00	50.00
917.58 MHz	AC Neutral	0.15	59.95	66.00	49.51	56.00
917.58 MHz	AC Neutral	0.17	56.90	64.88	47.15	54.88
917.58 MHz	AC Neutral	0.19	53.52	63.91	44.16	53.91
917.58 MHz	AC Neutral	9.99	43.09	60.00	39.41	50.00
913.98 MHz	AC Hot	9.99	46.27	60.00	43.24	50.00
913.98 MHz	AC Hot	0.15	60.57	65.94	50.47	55.94
913.98 MHz	AC Hot	0.17	57.12	64.86	47.40	54.86
913.98 MHz	AC Hot	0.19	54.51	63.89	44.74	53.89
913.98 MHz	AC Hot	0.22	51.64	63.00	42.73	53.00
913.98 MHz	AC Hot	2.32	37.19	56.00	32.48	46.00
913.98 MHz	AC Hot	19.98	38.87	60.00	33.62	50.00
917.58 MHz	AC Hot	0.15	60.45	65.94	50.15	55.94
917.58 MHz	AC Hot	0.17	57.74	64.90	48.22	54.90
917.58 MHz	AC Hot	0.19	54.40	63.85	44.74	53.85
917.58 MHz	AC Hot	0.22	51.40	62.99	42.73	52.99
917.58 MHz	AC Hot	9.99	46.65	60.00	43.24	50.00

The above are the worst case results with three frequencies tested for each EUT
* QP readings are quasi-peak with a 9 kHz bandwidth and no video filter.

Judgment: Passed by 5.37 dB

Figure 1. Conducted Emissions Test Setup

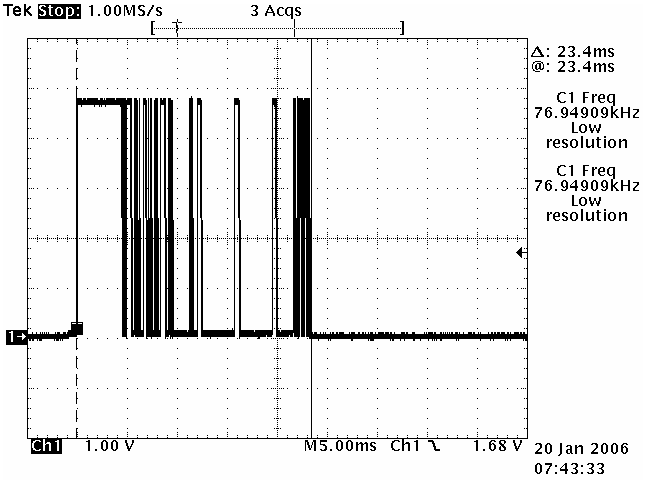


Notes:
- LISN's at least 80 cm from EUT chassis
- Vertical conductive plane 40 cm from rear of table top
- EUT power cord bundled

10.2 Duty Cycle Calculation for Peak to Average Correction Factor

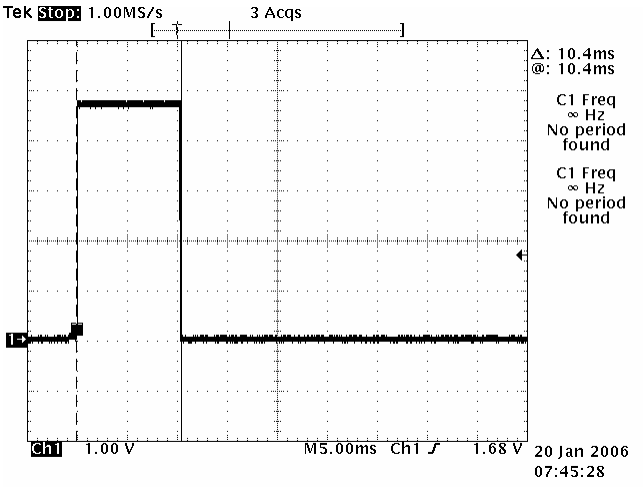
The Peak to average factor is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20 * Log(Duty cycle/100).

The following scope plot shows a typical OOK packet for the 917.58 MHz channel: (The transmitter is on for less than 50% for the 23mS packet)



Duty cycle correction factor is 20 * Log(11.5/100) = 18.8 dB

The following scope plot shows a typical CCSK packet for the 913.98 MHz channel: (The transmitter is on for the entire 10.4mS)



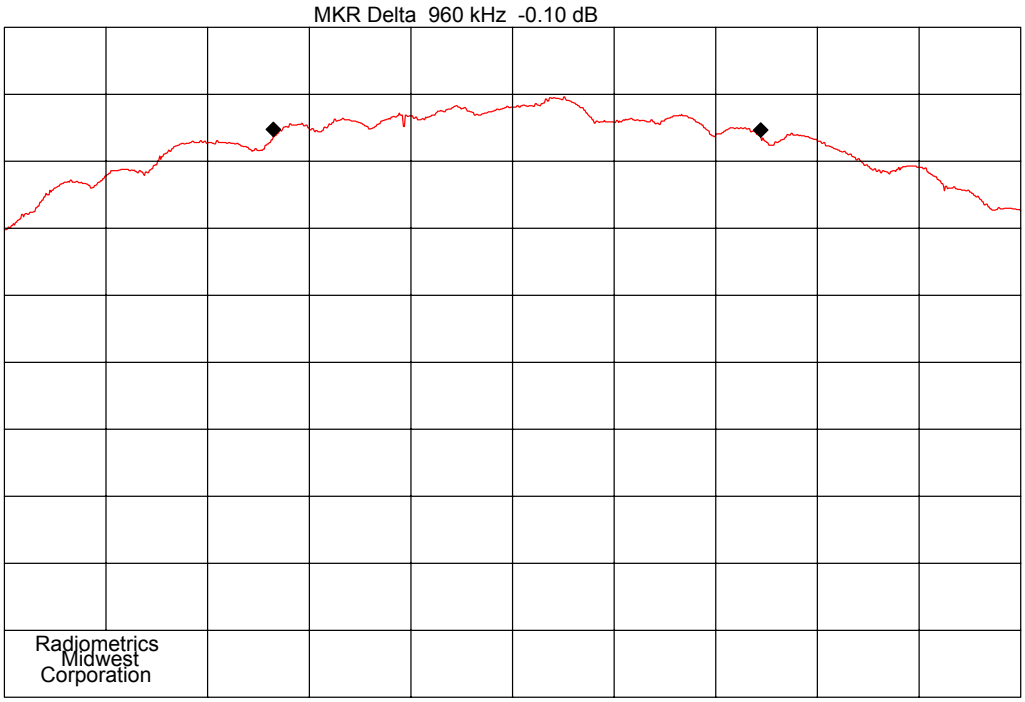
Duty cycle correction factor is 20 * Log(10.4/100) = 19.7 dB

10.3 Occupied Bandwidth

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 6 or 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 6 or 20 dB bandwidth of the emission.

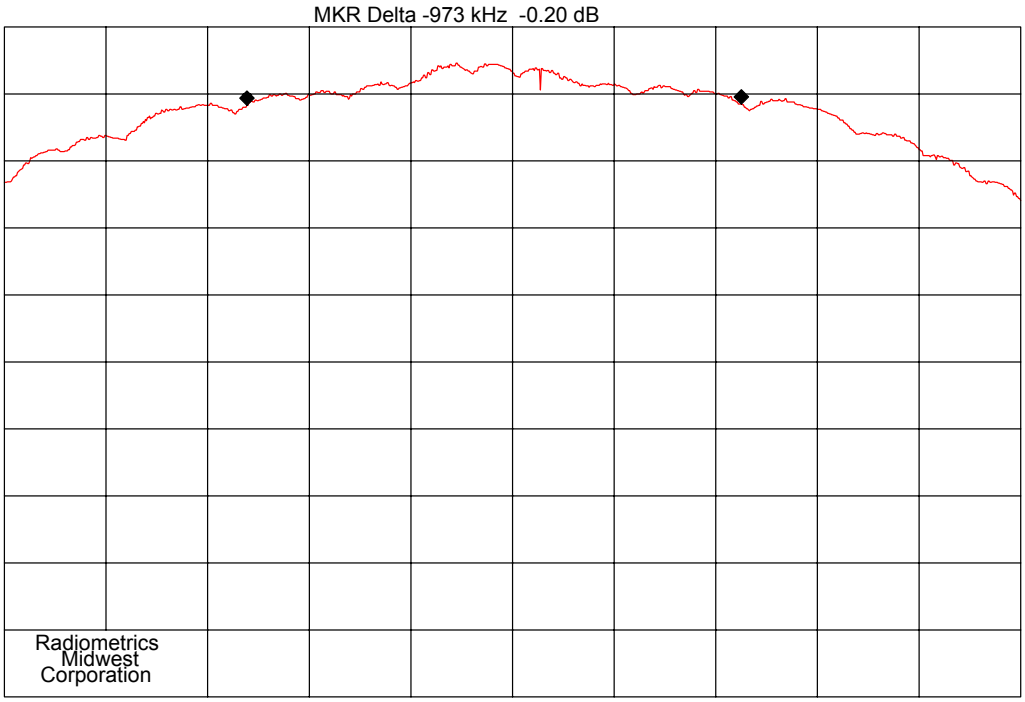
Channel	6 dB EBW MHz	20 dB EBW MHz	Minimum BW	Test Result
913.98	0.973	3.875	0.5 MHz	Pass
917.58	0.960	3.725	0.5 MHz	Pass



COMPANY : Landis + Gyr
CENTER 917.58 MHz
RES BW 100 kHz
10 dB/
NOTES : 6 dB Bandwidth; Fixed (917.58 MHz),

ITEM : S4e w/MFMM Cellnet
REF 30.0 dBm
VBW 300 kHz
TIME : 11:55

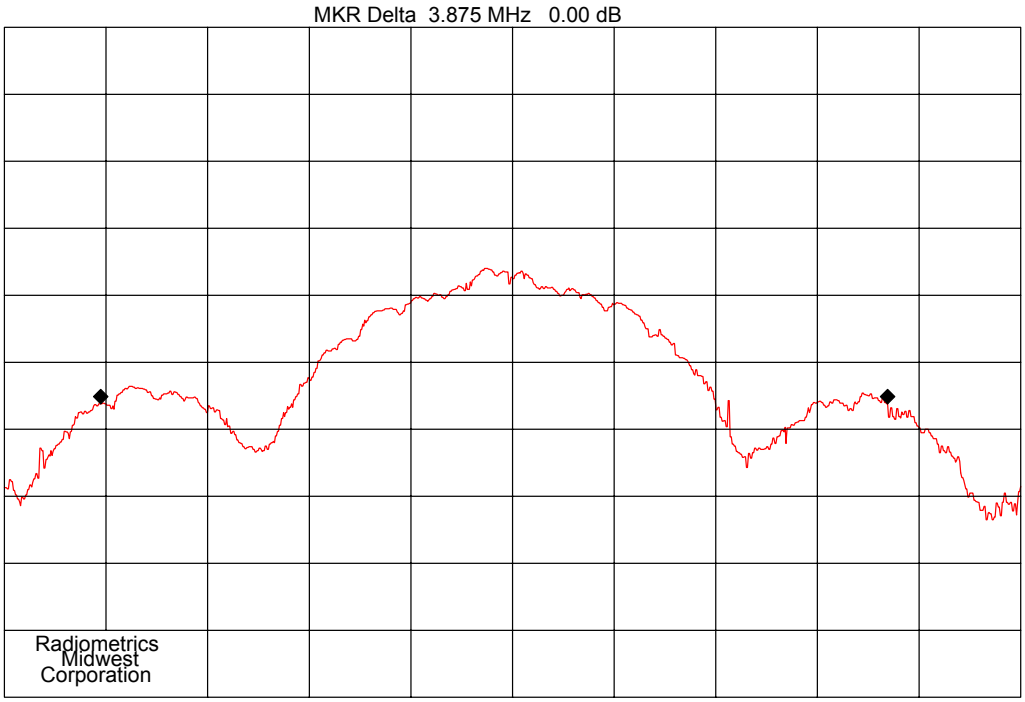
DATE : 03-07-2006
SPAN 2.00 MHz
ATTEN 40 dB
SWP 20.0 msec



COMPANY : Landis + Gyr
CENTER 913.98 MHz
RES BW 100 kHz
10 dB/
NOTES : 6 dB Bandwidth, Mobile (913.98 MHz)

ITEM : S4e w/MFMM Cellnet
REF 0.0 dBm
VBW 300 kHz
TIME : 12:07

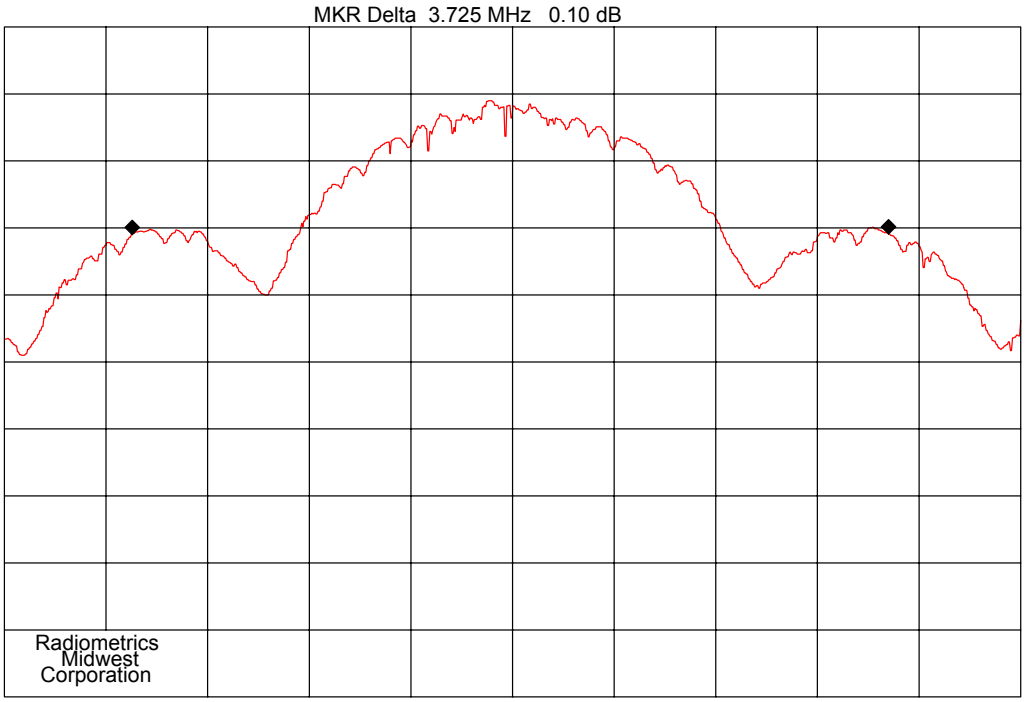
DATE : 03-09-2006
SPAN 2.00 MHz
ATTEN 10 dB
SWP 20.0 msec



COMPANY : Landis + Gyr
CENTER 913.98 MHz
RES BW 100 kHz
10 dB/
NOTES : 20 dB Occupied Bandwidth,

ITEM : S4e w/ MFMM Cellnet
REF 30.0 dBm
VBW 300 kHz
TIME : 13:32

DATE : 01-16-2006
SPAN 5.00 MHz
ATTEN 40 dB
SWP 20.0 msec



COMPANY : Landis + Gyr
CENTER 917.58 MHz
RES BW 100 kHz
10 dB/
NOTES : 20 dB Bandwidth, Fixed (917.58 MHz)

ITEM : S4e w/ MFMM Cellnet
REF 30.0 dBm
VBW 300 kHz
TIME : 14:26

DATE : 01-16-2006
SPAN 5.00 MHz
ATTEN 40 dB
SWP 20.0 msec

Test Result: Pass

10.4 Peak Output Power

Power output Option #1 measurement method was used. The spectrum analyzer was set to the following settings:
Span = 2 MHz
RBW = 3 MHz (> the 6 dB bandwidth of the emission being measured)
VBW = 3 MHz
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)	Cable Loss (dB)	Total Power (dBm)		Limit (dBm)
			dBm	Watts	
913.98	-0.9	0.6	-0.3	0.00093	30
917.58	24.2	0.6	24.8	0.302	30

Test Date: March 7 and 9, 2006
Test Result: Pass

10.5 Power Spectral Density

PSD Measurement method #1 was used. The spectrum analyzer was set to the following settings:

Span = 1.5 MHz
RBW = 3 kHz
VBW = 10 kHz
Sweep = 500 seconds.

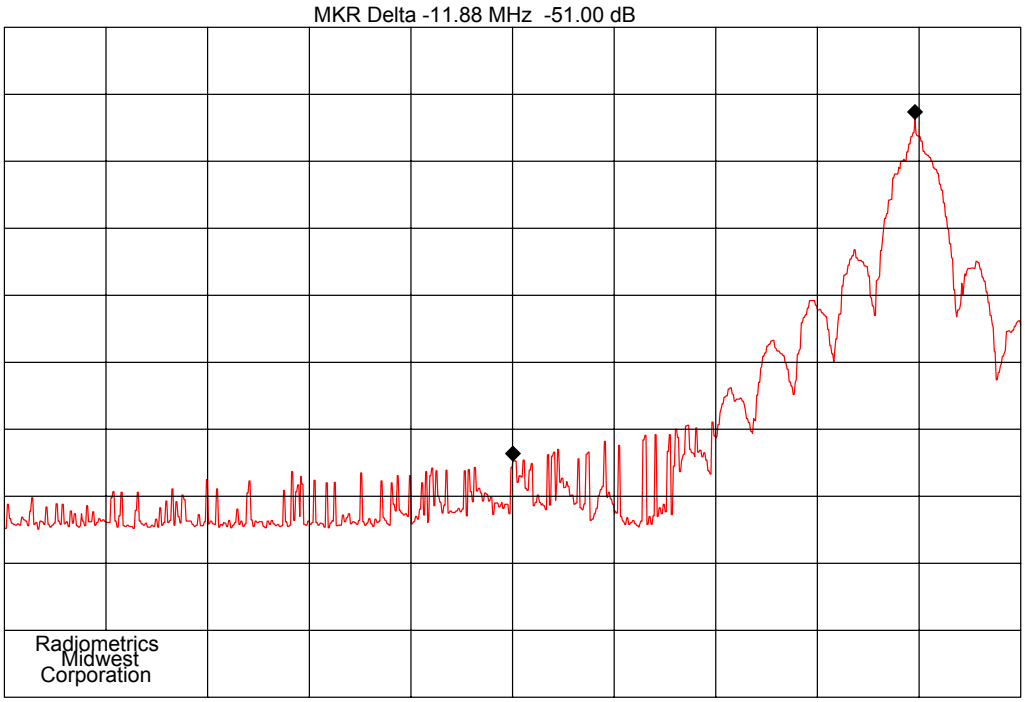
The Spectrum line spacing is greater than 3 kHz.

Frequency (MHz)	Reading dBm	Cable Loss (dB)	3 kHz Spectral Density (dBm)	Limit (dBm)
913.98	-18.9	0.2	-18.7	8.0
917.58	6.7	0.2	6.9	8.0

Test Date: March 7 and 9, 2006
Test Result: Pass

10.6 Band-edge Compliance of RF Conducted Emissions

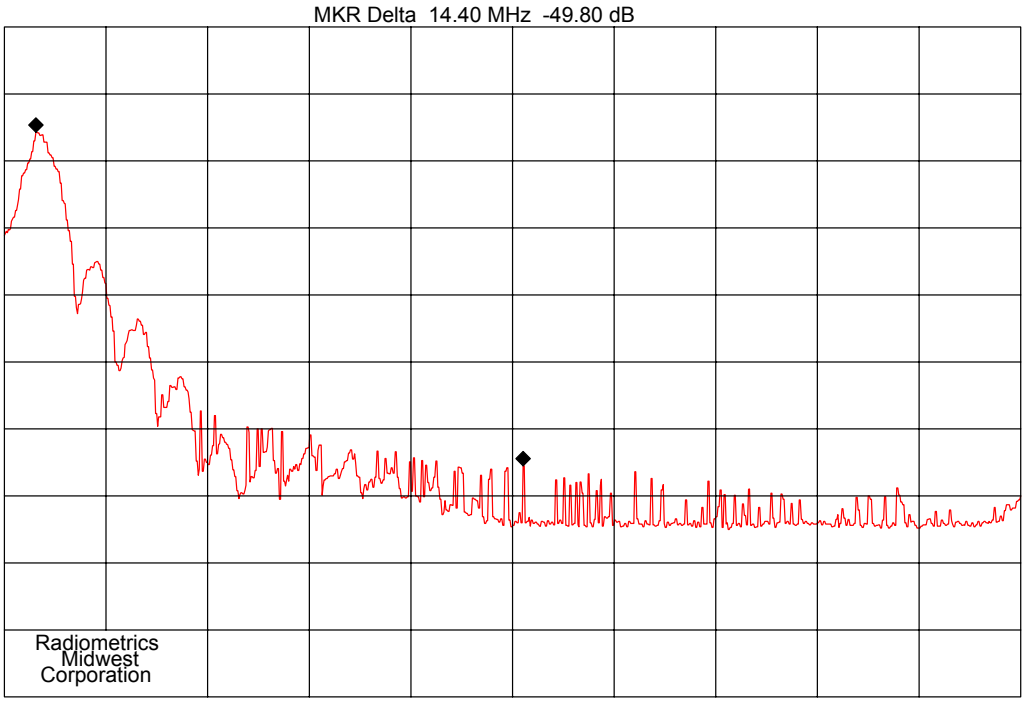
The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation at the band-edge, with the EUT set to the lowest frequency. The trace was allowed to stabilize.



COMPANY : Landis + Gyr
CENTER 902.0 MHz
RES BW 100 kHz
10 dB/
NOTES : Band Edge Test, Mobile (913.98 MHz)

ITEM : S4e w/ MFMM Cellnet
REF 10.0 dBm
VBW 300 kHz
TIME : 14:01

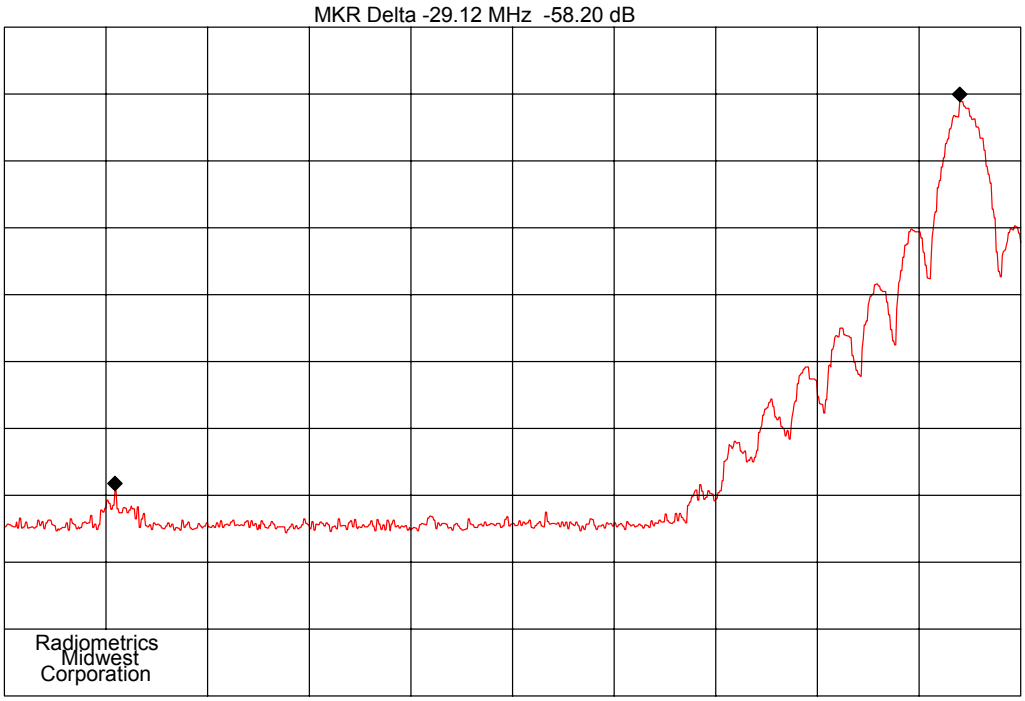
DATE : 01-16-2006
SPAN 30.0 MHz
ATTEN 20 dB
SWP 20.0 msec



COMPANY : Landis + Gyr
CENTER 928.0 MHz
RES BW 100 kHz
10 dB/
NOTES : Band Edge Test, Mobile (913.98 MHz)

ITEM : S4e w/ MFMM Cellnet
REF 10.0 dBm
VBW 300 kHz
TIME : 14:07

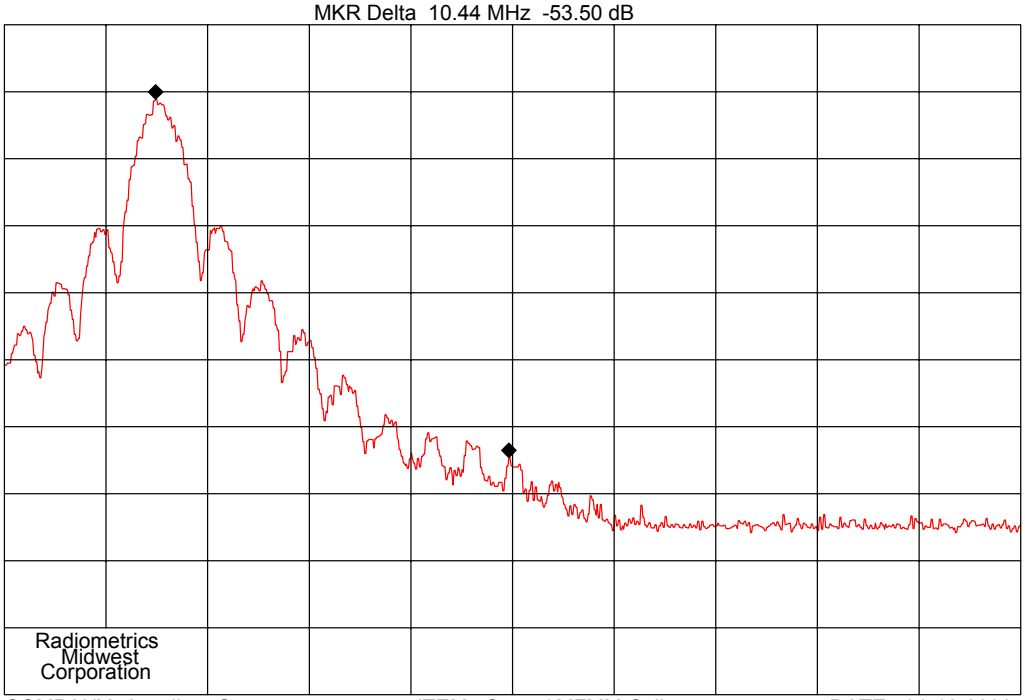
DATE : 01-16-2006
SPAN 30.0 MHz
ATTEN 20 dB
SWP 20.0 msec



COMPANY : Landis + Gyr
CENTER 902.0 MHz
RES BW 100 kHz
10 dB/
NOTES : Band Edge, Fixed (917.58 MHz)

ITEM : S4e w/ MFMM Cellnet
REF 30.0 dBm
VBW 300 kHz
TIME : 14:50

DATE : 01-16-2006
SPAN 35.0 MHz
ATTEN 40 dB
SWP 20.0 msec



COMPANY : Landis + Gyr
CENTER 928.0 MHz
RES BW 100 kHz
10 dB/
NOTES : Band Edge, Fixed (917.58 MHz)

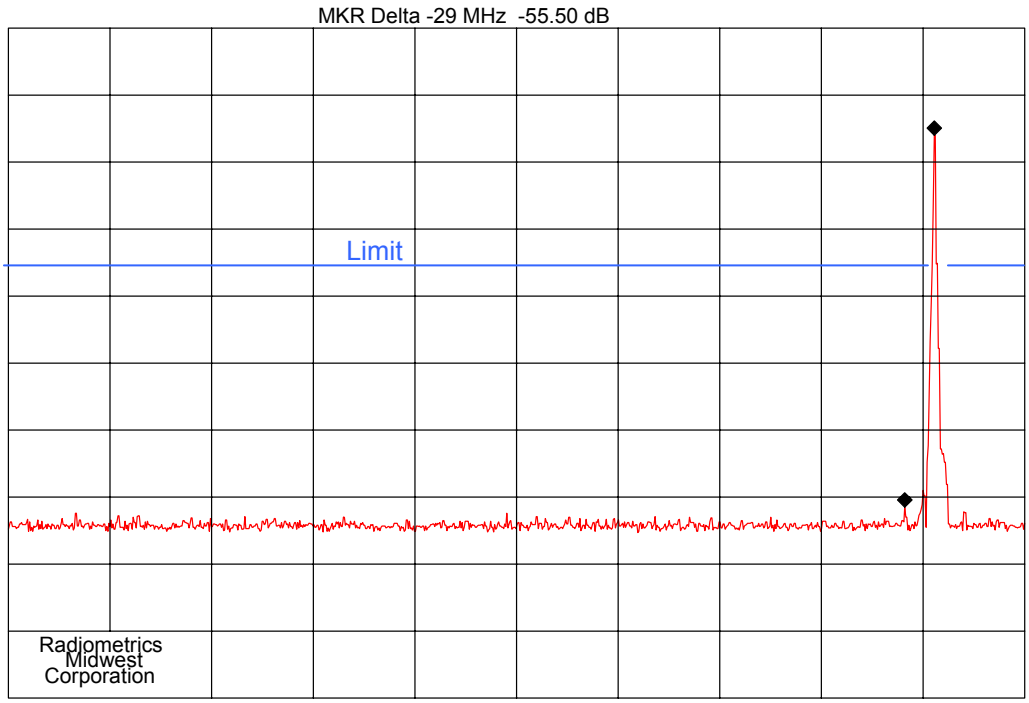
ITEM : S4e w/ MFMM Cellnet
REF 30.0 dBm
VBW 300 kHz
TIME : 14:52

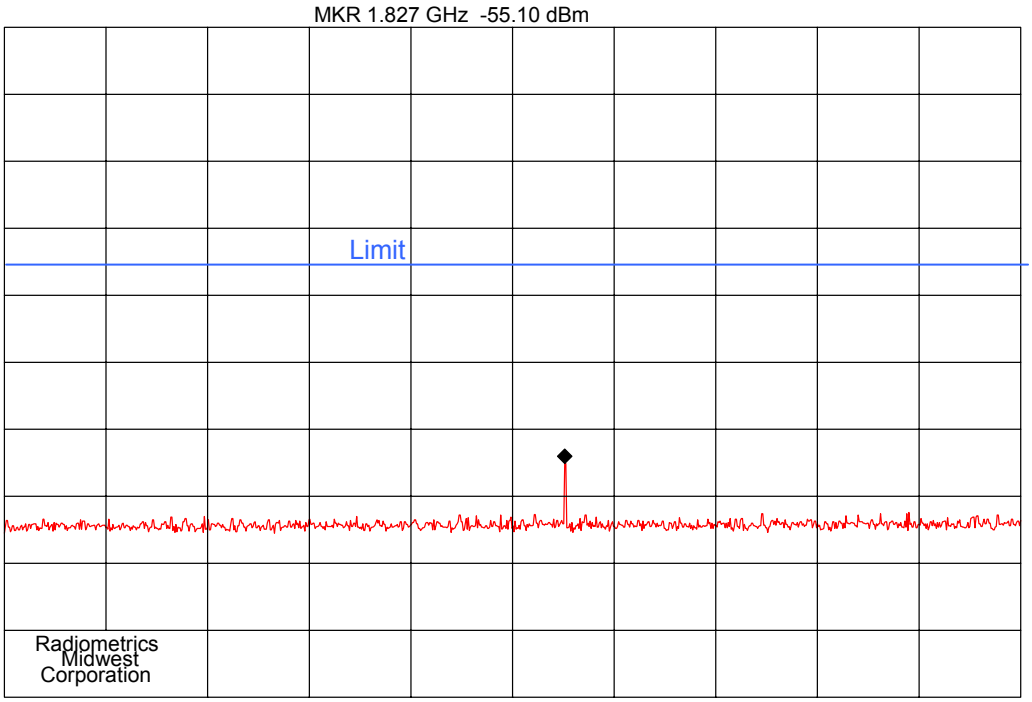
DATE : 01-16-2006
SPAN 30.0 MHz
ATTEN 40 dB
SWP 20.0 msec

Test Result: Pass

10.7 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 two plots were made while stepping through three frequencies (Low middle and high). Each frequency was on for 30 seconds.

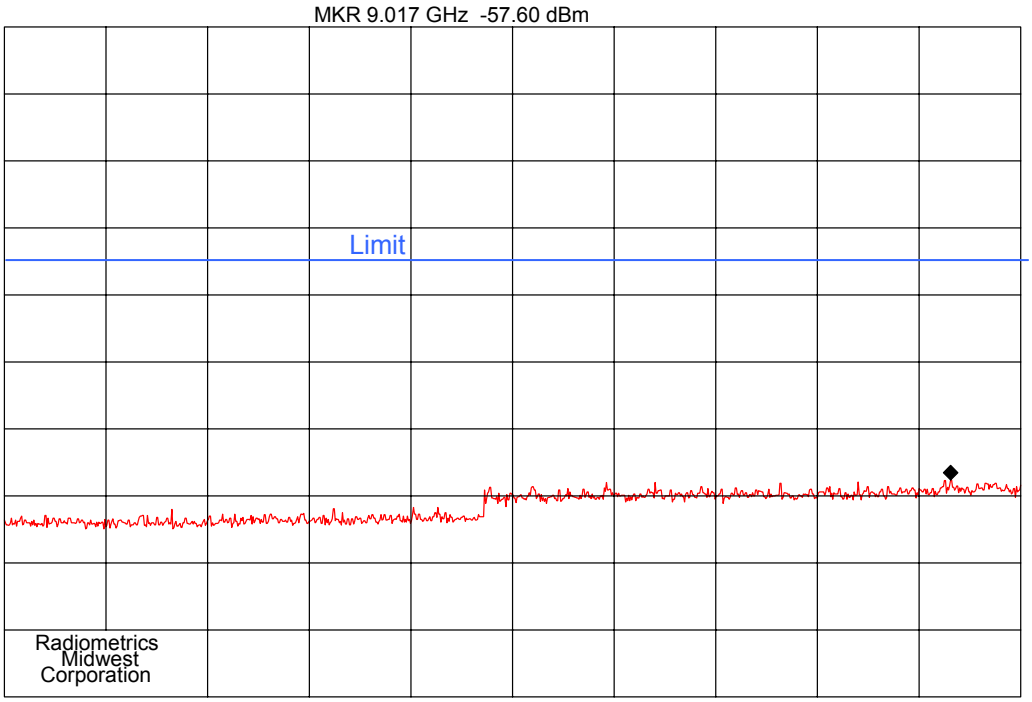




COMPANY : Landis + Gyr
START 1.00 GHz
RES BW 100 kHz
10 dB/
NOTES : Spurious Conducted Emissions, Mobile (913.98 MHz)

ITEM : S4e w/MFMM Cellnet
REF 10.0 dBm
VBW 300 kHz
TIME : 12:00

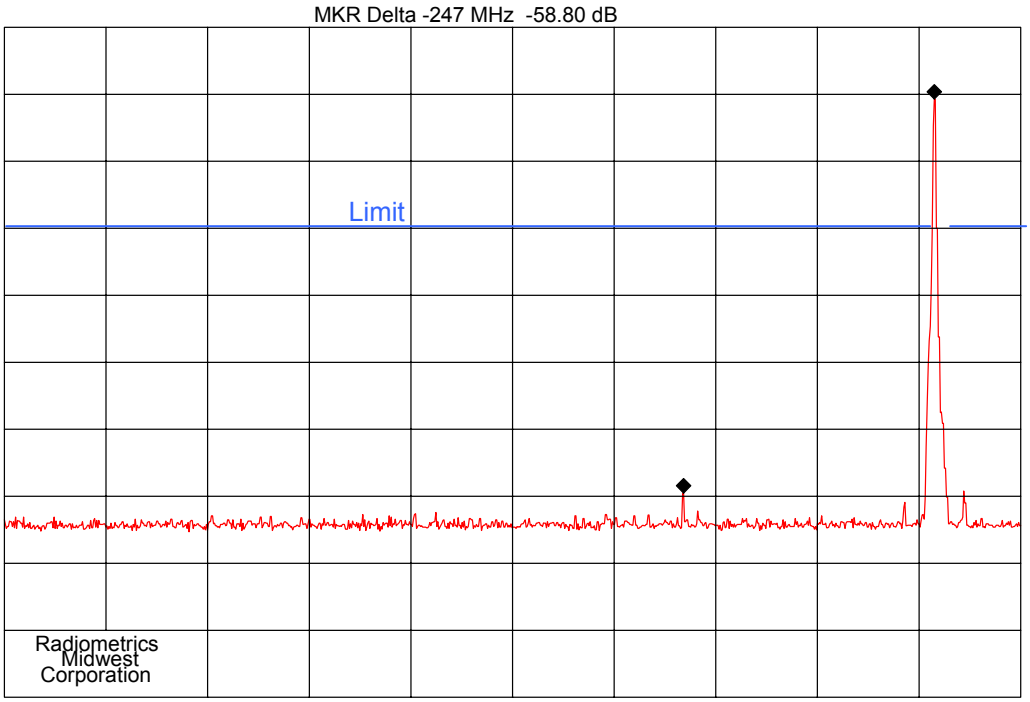
DATE : 03-09-2006
STOP 2.50 GHz
ATTEN 20 dB
SWP 450 msec



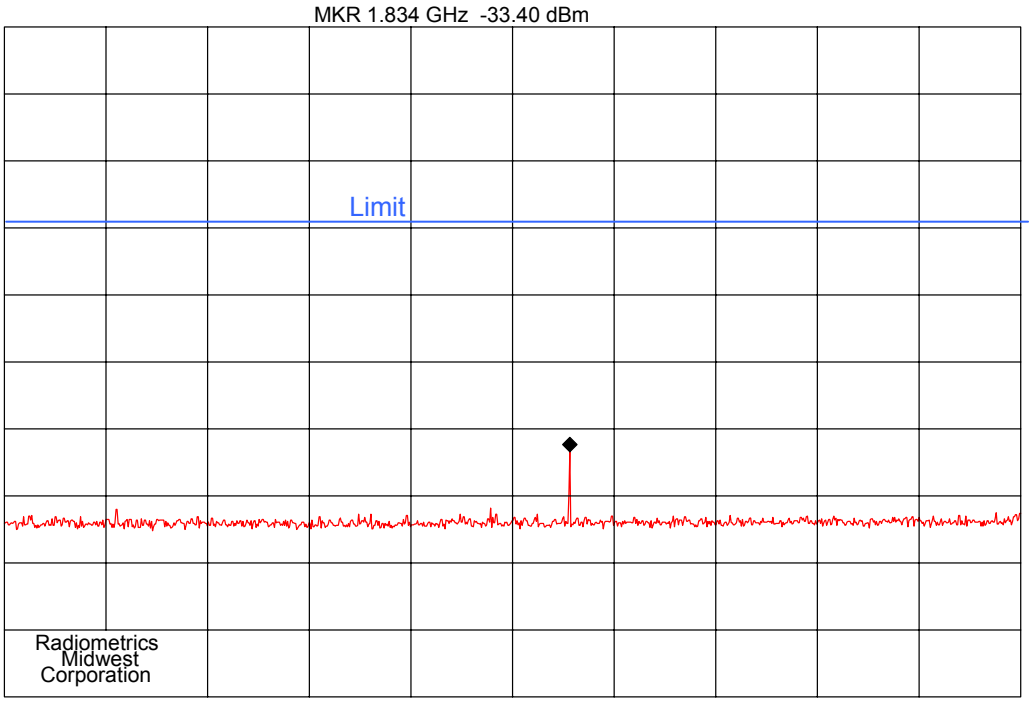
COMPANY : Landis + Gyr
START 2.50 GHz
RES BW 100 kHz
10 dB/
NOTES : Spurious Conducted Emissions, Mobile (913.98 MHz)

ITEM : S4e w/MFMM Cellnet
REF 10.0 dBm
VBW 300 kHz
TIME : 12:03

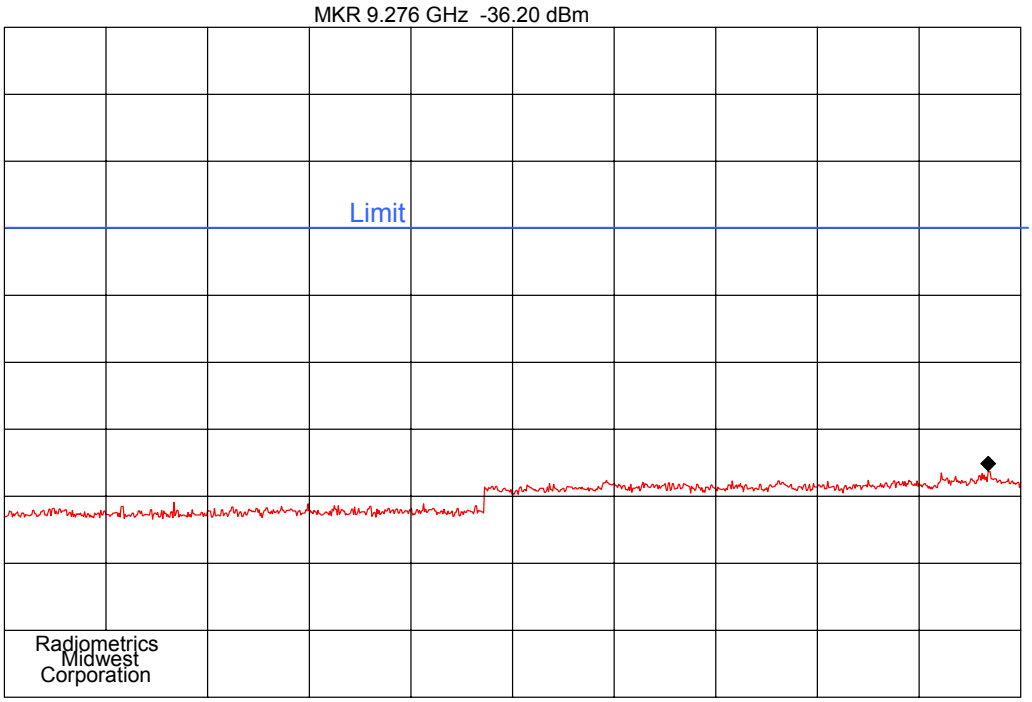
DATE : 03-09-2006
STOP 9.50 GHz
ATTEN 20 dB
SWP 2.10 sec



COMPANY : Landis + Gyr
START 1 MHz
RES BW 100 kHz
10 dB/
ITEM : S4e w/MFMM Cellnet
REF 30.0 dBm
VBW 300 kHz
TIME : 12:07
DATE : 03-07-2006
STOP 1.00 GHz
ATTEN 40 dB
SWP 300 msec
NOTES : Spurious Conducted Emissions, Fixed (917.58 MHz)



COMPANY : Landis + Gyr
START 1.00 GHz
RES BW 100 kHz
10 dB/
ITEM : S4e w/MFMM Cellnet
REF 30.0 dBm
VBW 300 kHz
TIME : 12:12
DATE : 03-07-2006
STOP 2.50 GHz
ATTEN 40 dB
SWP 450 msec
NOTES : Spurious Conducted Emissions, Fixed (917.58 MHz)



10.8 Spurious Radiated Emissions (Restricted Band)

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. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded.

From 30 to 1000 MHz, an Anritsu Spectrum analyzer and a pre-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 9300 MHz, an HP8566 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.

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.

10.8.1 Radiated Emissions Field Strength Sample Calculation

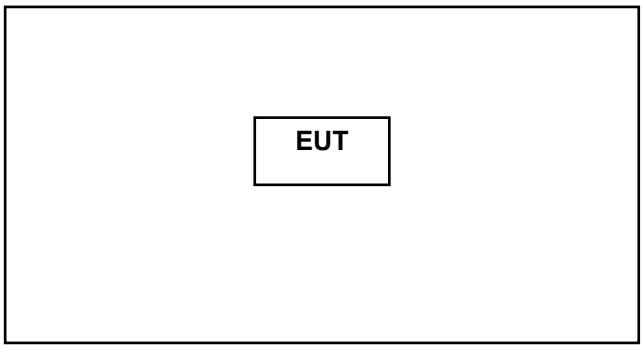
The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

FS = RA + AF + CF - AG

Where: FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain
HPF = High pass Filter Loss
PKA = Peak to Average Factor (This is zero for non-average measurements)

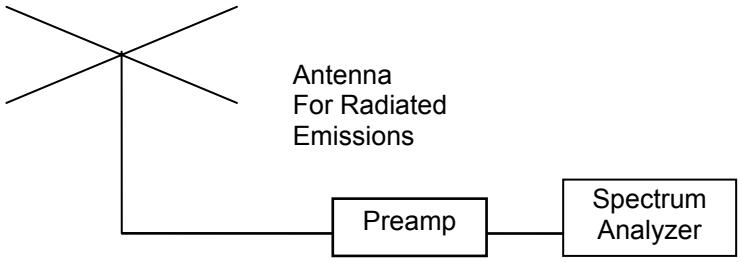
The Peak to average factor is used when average measurements are required. It is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20 * Log(Duty cycle/100).

Figure 2. Drawing of Radiated Emissions Setup



1x1.5m surface 80 cm above
Flush-mount Turntable

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 tested system is 3 meters
- Not to Scale



10.8.2 Spurious Radiated Emissions Test Results

The following spectrum analyzer settings were used.

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak or Quasi-peak
Trace = max hold

Emissions above 1 GHz

Tx Freq MHz	Ant Pol.	Detector Function	Emission Freq. MHz	Peak EUT FS dBuV/m	Peak Limit dBuV/m	Pk to Ave Corr. dB	Ave. EUT FS dBuV/m	Ave. Limit dBuV/m	Margin under limit
913.98	H	Peak	2741.9	51.7	74	19.7	32.0	54	22.0
913.98	H	Peak	3655.9	47.3	74	19.7	27.6	54	26.4
913.98	H	Peak	4569.9	46.5	74	19.7	26.8	54	27.2
914.98	H	Peak	7319.8	53.8	74	19.7	34.1	54	19.9
913.98	H	Peak	8225.8	57.6	74	19.7	37.9	54	16.1
913.98	H	Peak	9139.8	64.1	74	19.7	44.4	54	9.6
913.98	V	Peak	2741.9	55.5	74	19.7	35.8	54	18.2
913.98	V	Peak	3655.9	51.0	74	19.7	31.3	54	22.7
913.98	V	Peak	4569.9	48.1	74	19.7	28.4	54	25.6
913.98	V	Peak	7311.8	54.8	74	19.7	35.1	54	18.9
913.98	V	Peak	8225.8	58.7	74	19.7	39.0	54	15.0
913.98	V	Peak	9139.8	64.3	74	18.8	45.5	54	8.5
917.58	H	Peak	2752.7	68.7	74	18.8	49.9	54	4.1
917.58	H	Peak	3670.3	59.6	74	18.8	40.8	54	13.2
917.58	H	Peak	4587.9	53.8	74	18.8	35.0	54	19.0
917.58	H	Peak	7340.6	54.5	74	18.8	35.7	54	18.3
917.58	H	Peak	8258.2	55.8	74	18.8	37.0	54	17.0
917.58	H	Peak	9175.8	58.7	74	18.8	39.9	54	14.1
917.58	V	Peak	2752.7	71.5	74	18.8	52.7	54	1.3
917.58	V	Peak	3670.3	64.8	74	18.8	46.0	54	8.0
917.58	V	Peak	4587.9	58.5	74	18.8	39.7	54	14.3
917.58	V	Peak	7340.6	54.4	74	18.8	35.6	54	18.4
917.58	V	Peak	8258.2	56.4	74	18.8	37.6	54	16.4
917.58	V	Peak	9175.8	59.1	74	18.8	40.3	54	13.7

Judgment: Passed by 1.3 dB
No other emissions were detected in the restricted bands. Above 1 GHz

Emissions Below 1 GHz;

The worst case emissions for the two channels is displayed in the following table. Non-restricted band emissions are also included.

Manufacturer	Landis + Gyr, Inc.	Specification	FCC Part 15; Subpart B; Class B
Model	RXRS4e with Cellnet Radio	Test Date	1/16/2006
Serial Number	89 427 837	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 – Duty Cycle Factor + HP Filter Loss		

Emissions Below 1 GHz; The worst case for the two channels is display in the following table.

Freq. MHz	Meter Reading dBuV	Antenna Factor dB	Antenna Pol/ Type	Corr. Factors dB	Field Strength dBuV/m EUT	Field Strength dBuV/m Limit	Margin Under Limit dB
45.0	32.1 P	16.5	H/44	-17.5	31.1	40.0	8.9
60.1	36.0 P	11.4	H/44	-17.2	30.2	40.0	9.8
70.3	34.3 P	7.2	H/44	-17.0	24.4	40.0	15.6
108.8	32.3 P	12.3	H/44	-16.5	28.1	43.5	15.4
129.7	36.8 P	14.1	H/44	-16.3	34.5	43.5	9.0
134.7	35.0 P	12.8	H/44	-16.3	31.5	43.5	12.0
160.7	36.7 Q	10.0	H/44	-16.1	30.6	43.5	12.9
163.9	35.3 Q	9.9	H/44	-16.1	29.1	43.5	14.4
168.6	39.1 Q	9.3	H/44	-16.0	32.4	43.5	11.1
179.8	42.9 Q	9.3	H/44	-15.9	36.3	43.5	7.2
181.4	46.7 P	9.4	H/44	-15.9	40.2	43.5	3.3
185.7	37.4 Q	9.5	H/44	-15.9	31.0	43.5	12.5
186.0	38.2 Q	9.5	H/44	-15.8	31.9	43.5	11.6
224.3	33.5 Q	11.4	H/44	-15.5	29.4	46.0	16.6
235.9	34.7 Q	11.9	H/44	-15.4	31.2	46.0	14.8
258.9	40.1 P	12.8	H/44	-15.2	37.7	46.0	8.3
286.2	37.9 Q	12.9	H/44	-15.1	35.7	46.0	10.3
295.8	39.3 P	13.4	H/44	-15.1	37.7	46.0	8.3
313.8	30.5 P	14.0	H/44	-14.9	29.6	46.0	16.4
317.6	30.3 P	14.0	H/44	-14.9	29.4	46.0	16.6
479.9	25.8 Q	18.0	H/44	-14.0	29.8	46.0	16.2
59.9	38.8 Q	12.3	V/44	-17.2	33.9	40.0	6.1
64.4	37.4 Q	10.5	V/44	-17.1	30.8	40.0	9.2
69.9	43.3 Q	7.9	V/44	-17.0	34.2	40.0	5.8
70.3	43.1 P	7.8	V/44	-17.0	33.9	40.0	6.1
84.3	35.9 P	7.1	V/44	-16.8	26.2	40.0	13.8
95.3	36.0 P	10.6	V/44	-16.7	29.9	43.5	13.6
109.9	35.3 P	13.1	V/44	-16.5	31.9	43.5	11.6
130.5	36.3 P	14.6	V/44	-16.3	34.6	43.5	8.9
143.4	40.2 P	11.7	V/44	-16.2	35.7	43.5	7.8
152.8	41.6 P	10.6	V/44	-16.1	36.0	43.5	7.5
181.2	38.4 P	9.8	V/44	-15.9	32.3	43.5	11.2
189.5	42.0 Q	10.2	V/44	-15.8	36.4	43.5	7.1
190.7	42.2 Q	10.3	V/44	-15.8	36.6	43.5	6.9
206.2	38.7 Q	10.8	V/44	-15.7	33.8	43.5	9.7
208.7	41.3 Q	11.2	V/44	-15.7	36.8	43.5	6.7
215.3	40.7 Q	11.8	V/44	-15.6	36.9	43.5	6.6
221.2	39.1 Q	12.0	V/44	-15.5	35.6	46.0	10.4

Freq. MHz	Meter Reading dBuV	Antenna Factor dB	Antenna Pol/ Type	Corr. Factors dB	Field Strength dBuV/m EUT	Field Strength dBuV/m Limit	Margin Under Limit dB
240.1	36.8 Q	12.8	V/44	-15.4	34.2	46.0	11.8
245.5	39.9 P	12.9	V/44	-15.4	37.5	46.0	8.5
264.6	36.2 P	13.2	V/44	-15.2	34.2	46.0	11.8
270.1	36.3 P	13.4	V/44	-15.2	34.5	46.0	11.5
280.7	36.4 P	13.2	V/44	-15.1	34.4	46.0	11.6
305.3	34.0 P	14.0	V/44	-15.0	33.0	46.0	13.0
422.0	27.9 P	16.5	V/44	-14.4	30.0	46.0	16.0
428.2	30.9 P	16.5	V/44	-14.4	33.0	46.0	13.0
487.5	26.7 Q	18.1	V/44	-13.9	30.9	46.0	15.1
487.6	34.0 P	18.1	V/44	-13.9	38.2	46.0	7.8
541.7	31.5 Q	18.2	V/44	-13.4	36.3	46.0	9.7
543.7	34.3 P	18.3	V/44	-13.4	39.2	46.0	6.8