



Electromagnetic Compatibility Test Report

Tests Performed on a Macmillan Publisher's

iClicker+, Model RLR15

Radiometrics Document RP-7224



Product Detail:

FCC ID: T24-RLR15

IC: 6495A-RLR15

Equipment type: 900 MHz Digital transmission system.

Test Standards:

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

FCC Part 15 CFR Title 47: 2012

Industry Canada RSS-210, Issue 8: 2010 as required for Category I Equipment

This report concerns: Original Grant for Certification

FCC Part 15.247

Tests Performed For:

Macmillan Publishers
Division of Holtzbrinck Publishers
 41 Madison Av., 38th Floor
 New York, NY 10010

Test Facility:

Radiometrics Midwest Corporation
 12 East Devonwood
 Romeoville, IL 60446

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

February 3 thru March 12, 2012

Document RP-7224 Revisions:

Rev.	Issue Date	Affected Pages	Revised By
0	July 30, 2012		
1	August 8, 2012	1, 22, 23	Joseph Strzelecki

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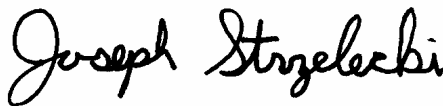
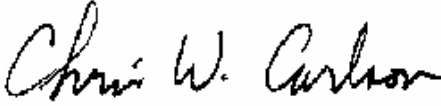
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RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

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1 ADMINISTRATIVE DATA

<i>Equipment Under Test:</i> A Macmillan Publishers, iClicker+ Transmitter Model: RLR15 Serial Number: none This will be referred to as the EUT in this Report	
<i>Date EUT Received at Radiometrics: (Month-Day-Year)</i> February 3, 2012	<i>Test Date(s): (Month-Day-Year)</i> February 3 thru March 12, 2012
<i>Test Report Written By:</i> Joseph Strzelecki Senior EMC Engineer	<i>Test Witnessed By:</i> The tests were not witnessed by Macmillan Publishers
<i>Radiometrics' Personnel Responsible for Test:</i>  Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	<i>Test Report Approved By</i>  Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is an iClicker+ Transmitter, Model RLR15, manufactured by Macmillan Publishers Division of Holtzbrinck Publishers. The detailed test results are presented in a separate section. The following is a summary of the test results.

900 MHz Test Results

Environmental Phenomena	Frequency Range	FCC Section	RSS-210 Section	Test Result
6 dB Bandwidth Test;	902-928 MHz	15.247 a	A8.1 (4)	Pass
20 dB Bandwidth Test;	902-928 MHz	15.247 a	A8.1 (4)	Pass
Peak Output Power	902-928 MHz	15.247 b	A8.1 (1)	Pass
Band-edge Compliance of RF Conducted Emissions	902-928 MHz	15.247 d	A8.4 (2)	Pass
Spurious RF Conducted Emissions	30 MHz to 25 GHz	15.247 d	A8.5	Pass
Spurious Radiated Emissions	30 MHz to 25 GHz	15.247 d	A8.5	Pass
Power Spectral Density	2400 to 2483 MHz	15.247 e	A8.2 (1)	Pass
Conducted Emissions, AC Mains	0.15 - 30 MHz	15.207	7.2.2 of RSS-Gen	Pass
Radiated Emissions (Unintentional Radiation Receive mode)	30 MHz to 5 GHz	15.109	Table 2	Pass

2.1 RF Exposure Compliance Requirements

Since the power output is 43 mW, the EUT meets the FCC requirement for RF exposure. There are no power level adjustments and the antenna is permanently attached. The detailed calculations for RF Exposure are presented in a separate document.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is an iClicker+ Transmitter wireless handheld classroom response device, Model RLR15, manufactured by Macmillan Publishers Division of Holtzbrinck. The EUT was in good working condition during the tests, with no known defects.

The EUT is a part of a 900 MHz audience response system. It is used to collect votes from an audience, such as in educational settings. It operates in accordance with a proprietary RF protocol. It operates on 16 channels in the 905.5 to 923 MHz range.

3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The 900 MHz antenna is permanently attached to the PCB via a trace on the circuit board. The antenna is internal to the EUT and it is not readily available to be modified by the end user. Therefore, it meets the 15.203 Requirement

3.2 Related Submittals

Macmillan Publishers 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.

The EUT was tested as a stand-alone device. Power was supplied with a new batteries.

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	iClicker+ Transmitter	E	Macmillan Publishers Division of Holtzbrinck Publishers	RLR15	none

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

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	2012	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 8	2010	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-Gen Issue 3	2010	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)
FCC 558074	2005	Measurement of Digital Transmission Systems Operating under Section 15.247

The test procedures used are in accordance with the FCC 558074, 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: 2005 "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 shielded enclosures located in Romeoville, Illinois used during the tests:

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 located in the center. Panashield of Rowayton, Connecticut manufactured the chamber. The enclosure is NAMAS certified.

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.

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 site number IC3124A-1.

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).

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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.	01/24/12
AMP-20	Avantek	Pre-amplifier	SF8-0652	15221	8-18GHz	12 Mo.	01/24/12
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	01/24/12
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	11/18/10
ANT-44	Impossible Machine	Super Log Antenna	SL-20M2G	1002	20-2000MHz	24 Mo.	12/14/11
ANT-53	EMCO	Loop Antenna	6507	1453	1 kHz-30 MHz	12 Mo.	10/26/11
HPF-01	Solar	High Pass Filter	7930-100	HPF-1	0.15-30MHz	24 Mo.	01/24/12
LSN-01	Electrometrics	50 uH LISN	FCC/VDE 50/2	1001	0.01-30MHz	24 Mo.	06/14/11
REC-01	HP / Agilent	Spectrum Analyzer	8566A	2106A02115, 2209A01349	30Hz-22GHz	24 Mo.	10/29/10
REC-07	Anritsu	Spectrum Analyzer	MS2601A	MT53067	0.01-2200MHz	12 Mo.	04/21/11
REC-08	Hewlett Packard	Spectrum Analyzer	8566B	2648A13481 2209A01436	30Hz-22GHz	12 Mo.	10/28/11
THM-02	Fluke	Temp/Humid Meter	971	93490471	N/A	24 Mo.	04/01/10

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 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 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.

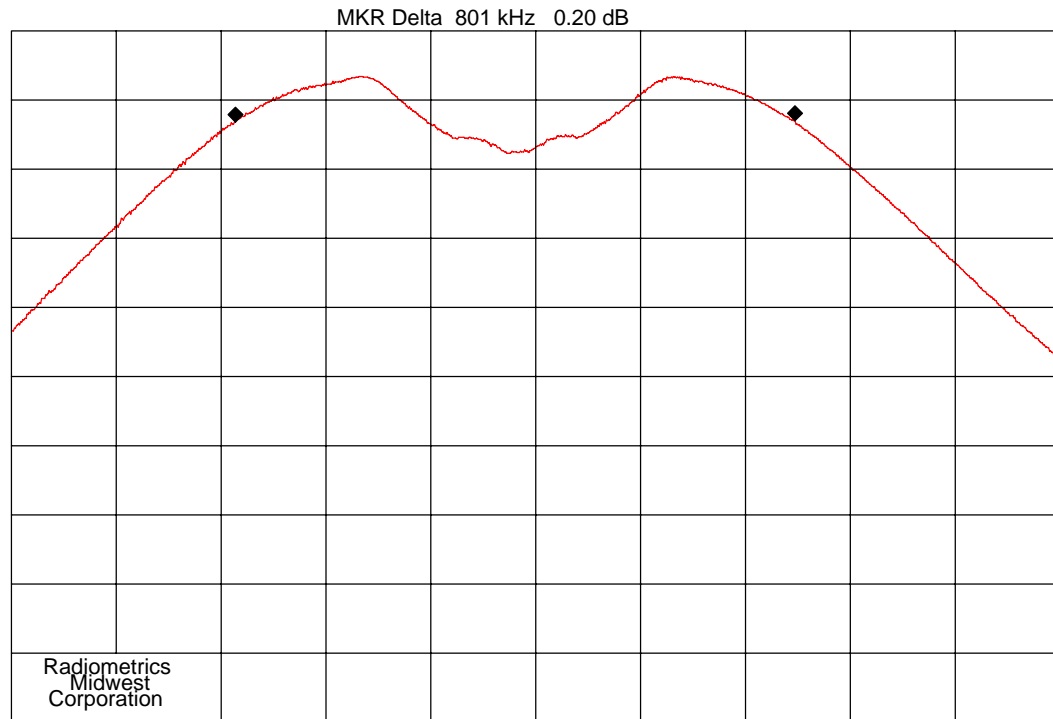
Channel MHz	6 dB EBW kHz	20 dB EBW kHz (Canada)
905.5	801	882
916.0	812	923
923.0	819	841

Judgement: Pass

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The Bandwidth must be at least 500 kHz



Company: MacMillan
CENTER 905.50 MHz
RES BW 100 kHz
10 dB/

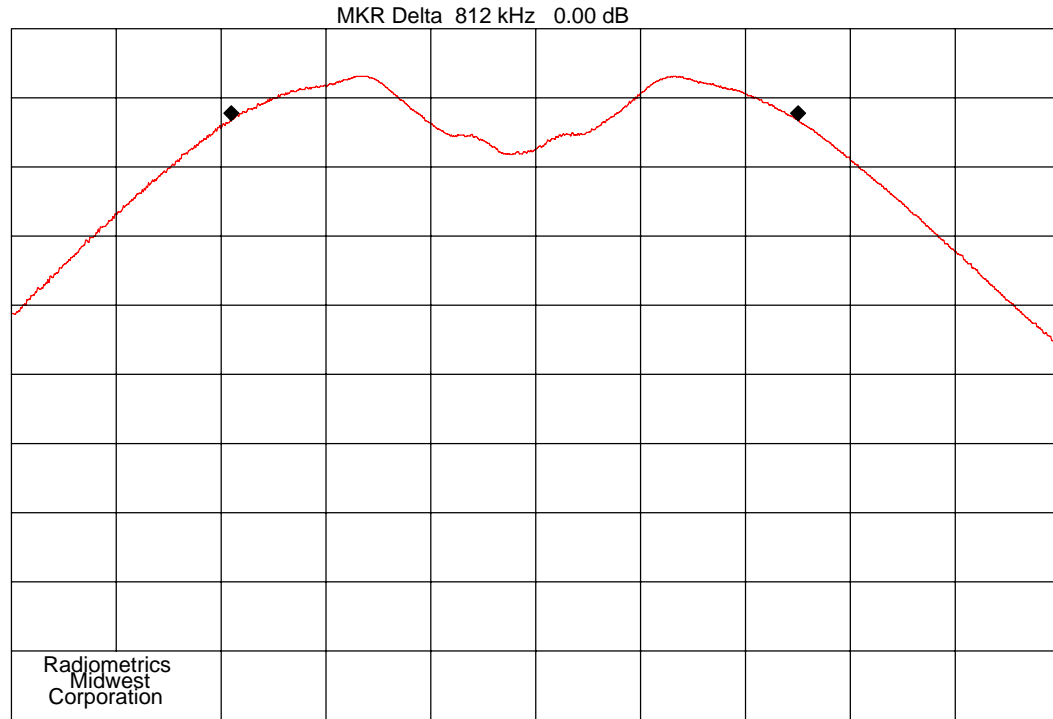
Notes: 6 dB Occupied Bandwidth, FCC method

ITEM : RLR15
REF 20.0 dBm
VBW 300 kHz
Time: 10:20

Date : 07-31-2012
SPAN 1.50 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BW1-6F

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Testing of the Macmillan Publishers, Model RLR15, iClicker+ Transmitter

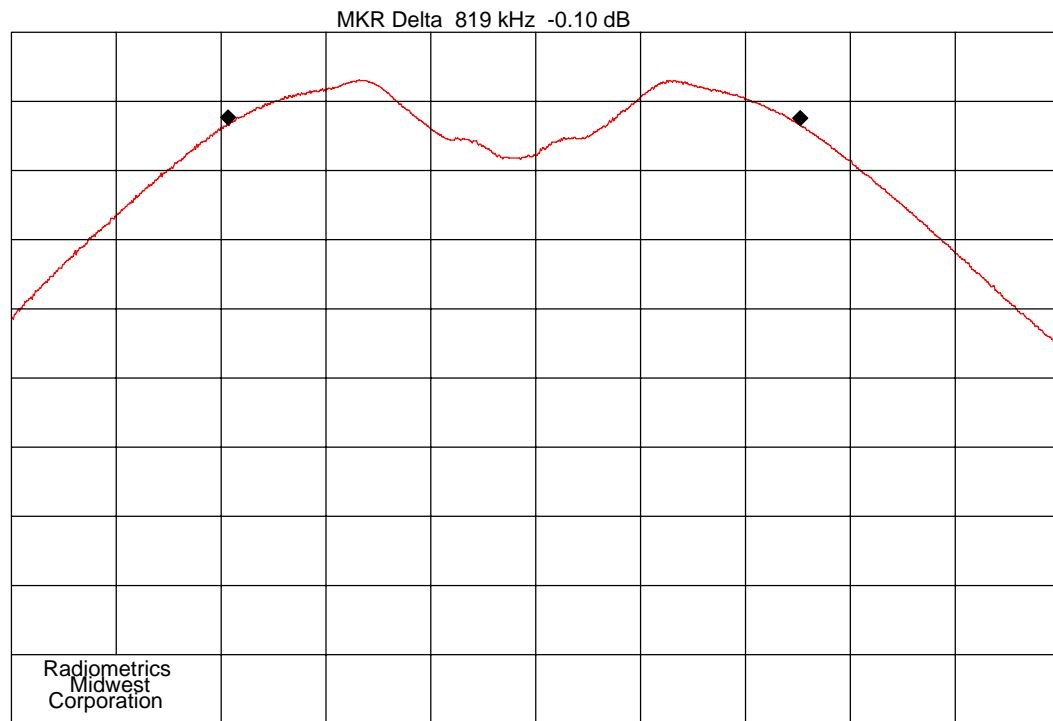


Company: MacMillan
CENTER 916.00 MHz
RES BW 100 kHz
10 dB/

Notes: 6 dB Occupied Bandwidth, FCC method

ITEM : RLR15
REF 20.0 dBm
VBW 300 kHz
Time: 10:23

Date : 07-31-2012
SPAN 1.50 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BW2-6F



Company: MacMillan
CENTER 923.00 MHz
RES BW 100 kHz
10 dB/

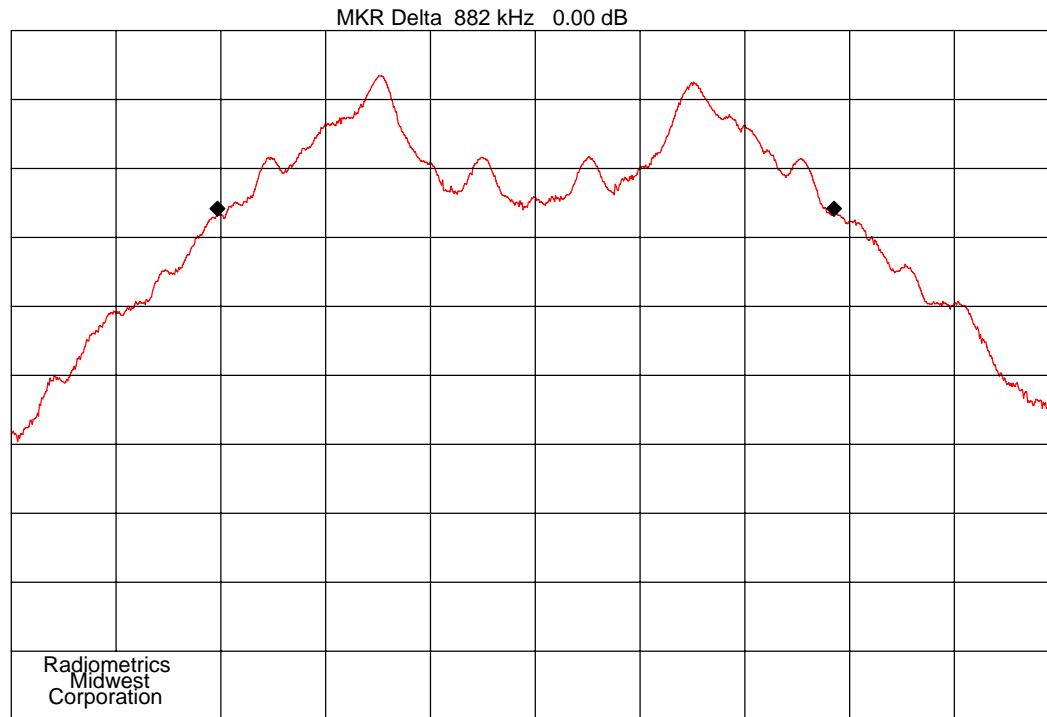
Notes: 6 dB Occupied Bandwidth, FCC method

ITEM : RLR15
REF 20.0 dBm
VBW 300 kHz
Time: 10:25

Date : 07-31-2012
SPAN 1.50 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BW3-6F

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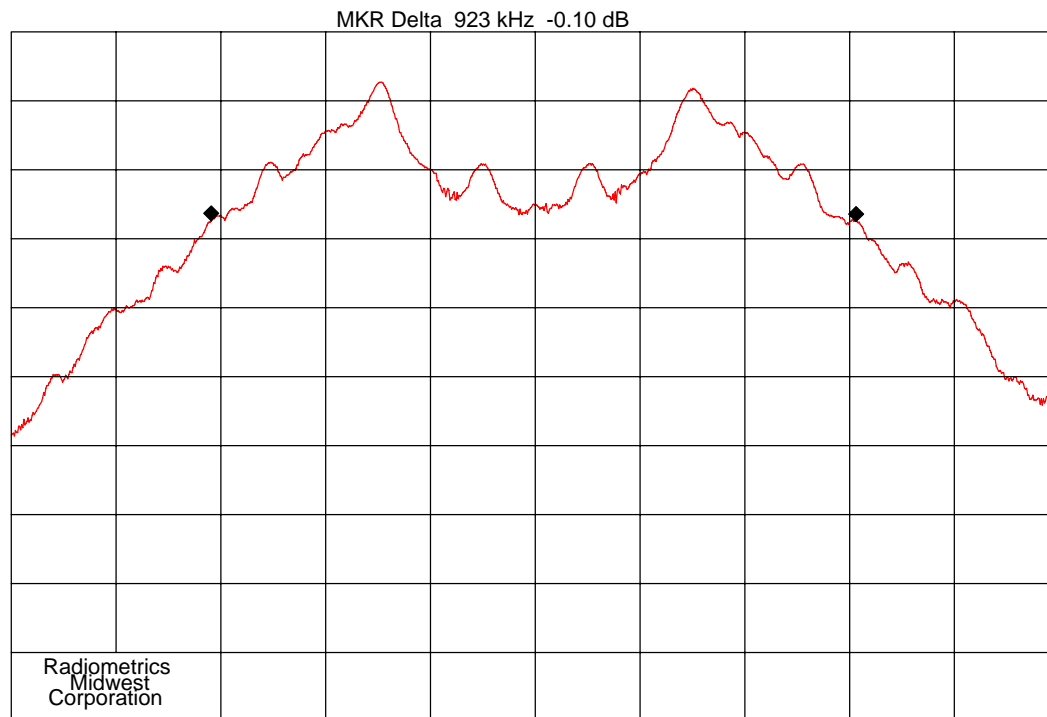


Company: MacMillan
CENTER 905.50 MHz
RES BW 30 kHz
10 dB/

Notes: Bandwidth (20dB), Low Channel

ITEM : RLR15
REF 10.0 dBm
VBW 100 kHz
Time: 15:31

Date : 03-12-2012
SPAN 1.50 MHz
ATTEN 20 dB
SWP 20.0 msec
File: BW1-20



Company: MacMillan
CENTER 916.00 MHz
RES BW 30 kHz
10 dB/

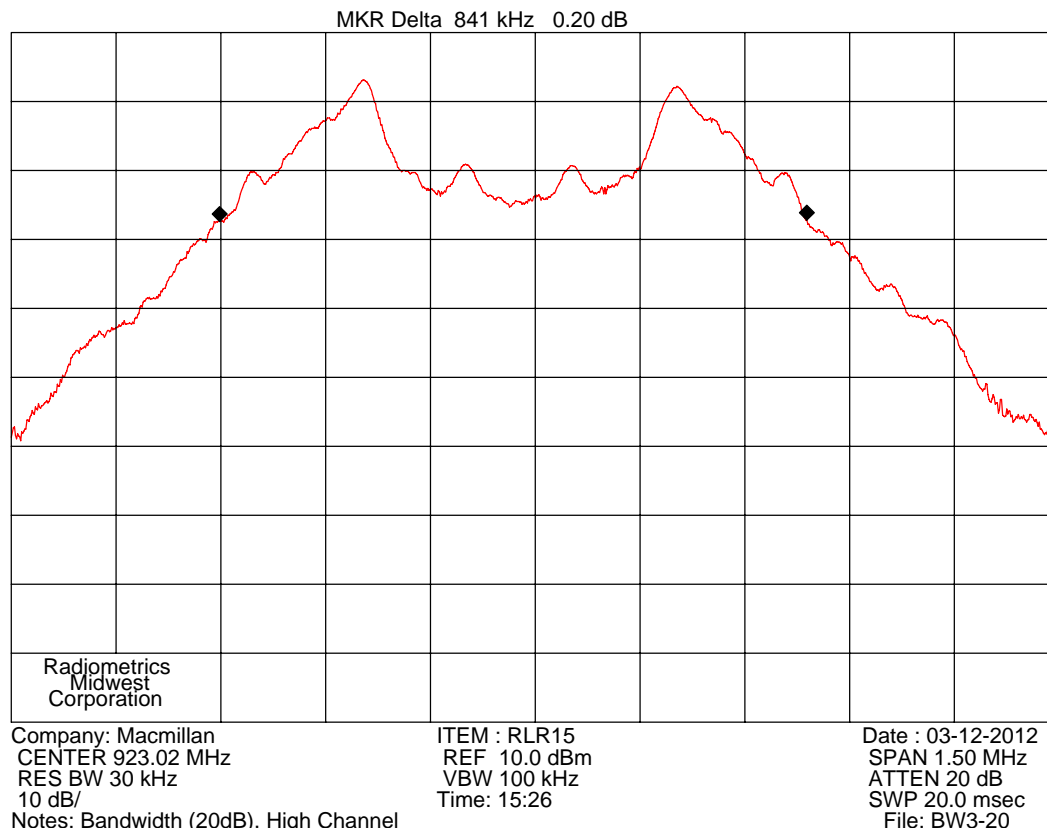
Notes: Bandwidth (20dB), Mid Channel

ITEM : RLR15
REF 10.0 dBm
VBW 100 kHz
Time: 15:28

Date : 03-12-2012
SPAN 1.50 MHz
ATTEN 20 dB
SWP 20.0 msec
File: BW2-20

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10.2 Peak Output Power

The EUT antenna port on the was connected to the spectrum analyzer via a low loss coaxial cable. The power output option 2; Method #3 from FCC rules 558074 was used for this test. The spectrum analyzer was set to the following settings:

Span = 2 MHz; RBW = 3 MHz; 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. The BW correction factor is $10 \cdot \log(BW)$. Note 30 dBm = 1 watt. Since the gain of the antenna is always less than 6 dB, the limit is not reduced.

Frequency (MHz)	Reading (dBm)	Cable Loss (dB)	Total Power (dBm)		Limit (dBm)
			dBm	Watts	
905.5	15.8	0.4	16.2	0.042	30
916.0	15.9	0.4	16.3	0.043	30
923.0	15.6	0.4	16.0	0.040	30

Judgment: Pass by 13.7 dB

10.3 Power Spectral Density

PSD option 1 was used for this test. No external attenuator was used. A direct connection from the EUT to the analyzer was used.

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Since the spectrum line spacing could not be resolved on the spectrum analyzer, the noise density function the spectrum analyzer directly measured the noise power density normalized to a 1 Hz noise power bandwidth. A 34.8 dB for correction factor was used for 3 kHz.

Frequency (MHz)	Spectral Density (dBm per Hz)	Cable Loss (dB)	Correction to 3 kHz (dB)	3 kHz Spectral Density dBm	Limit (dBm)
905.5	-29.2	0.4	34.8	6.0	8.0
916	-30.6	0.4	34.8	4.6	8.0
923	-30.2	0.4	34.8	5.0	8.0

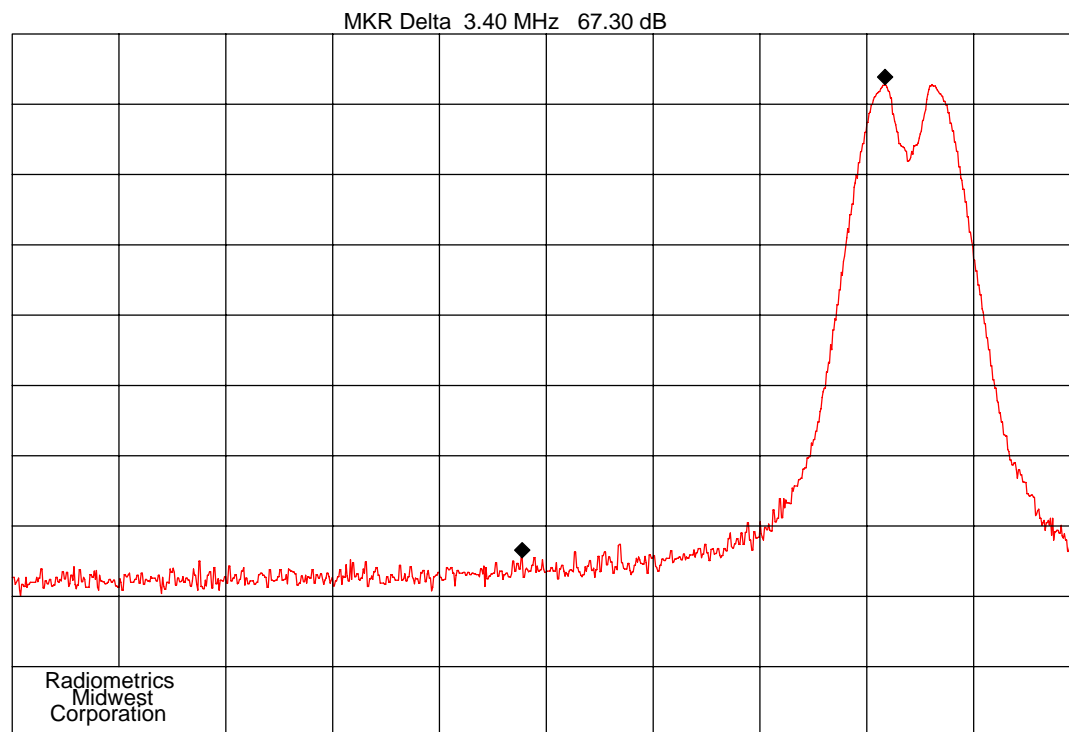
Judgment: Pass by 2 dB

10.4 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.

Channel	Band Edge in dB	Minimum Allowed dB
Lower Band edge	67.3	20
Upper Band edge	67.9	20

Judgment: Pass by 47.3 dB

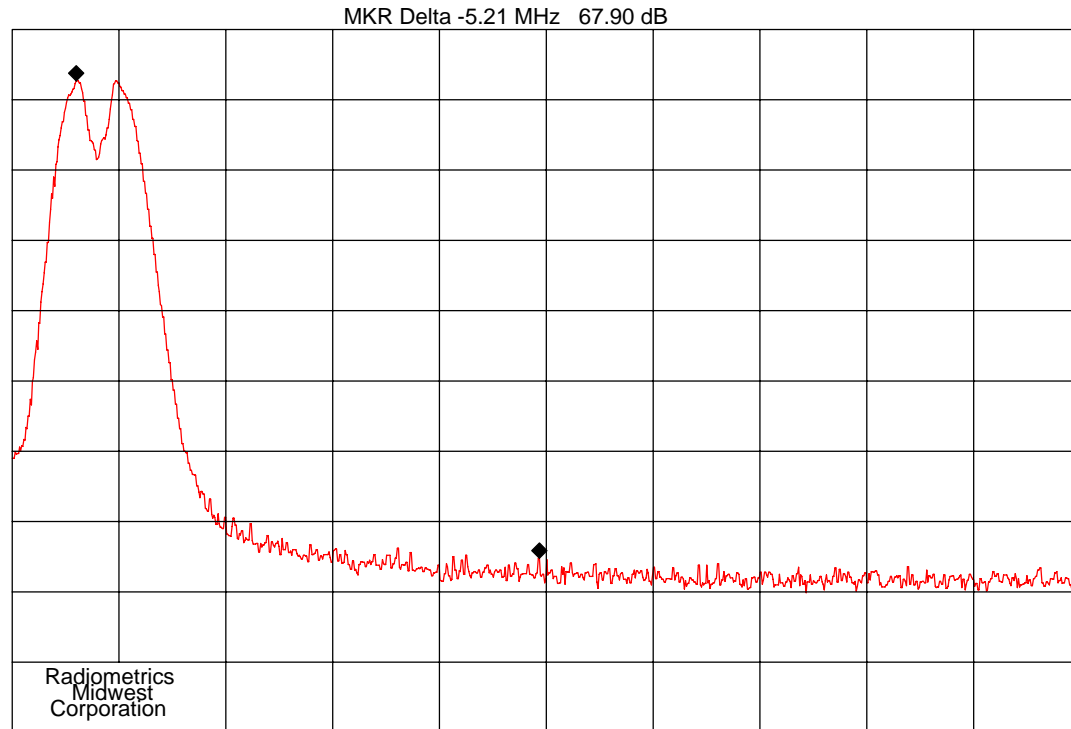


Company: MacMillan
CENTER 902.0 MHz
RES BW 100 kHz
10 dB/

Notes: Band edge, Lower Channel

ITEM : RLR15
REF 20.0 dBm
VBW 300 kHz
Time: 10:47

Date : 03-12-2012
SPAN 10.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BE-1



Company: MacMillan
CENTER 928.0 MHz
RES BW 100 kHz
10 dB/

Notes: Band edge, Upper Channel

ITEM : RLR15
REF 20.0 dBm
VBW 300 kHz
Time: 10:43

Date : 03-12-2012
SPAN 12.0 MHz
ATTEN 30 dB
SWP 20.0 msec
File: BE-2

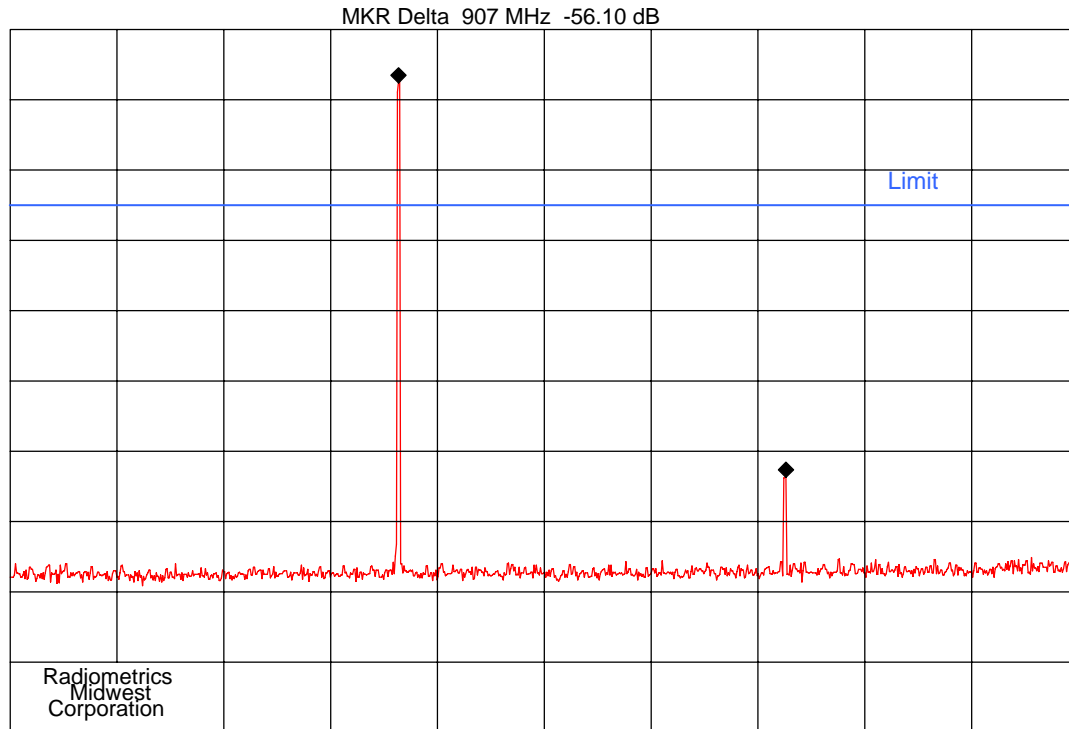
10.5 Spurious RF Conducted Emissions

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.

Judgement: Pass by at least 30 dB

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Company: MacMillan
START 1 MHz
RES BW 100 kHz
10 dB/

Notes: Conducted Emissions, Low Channel

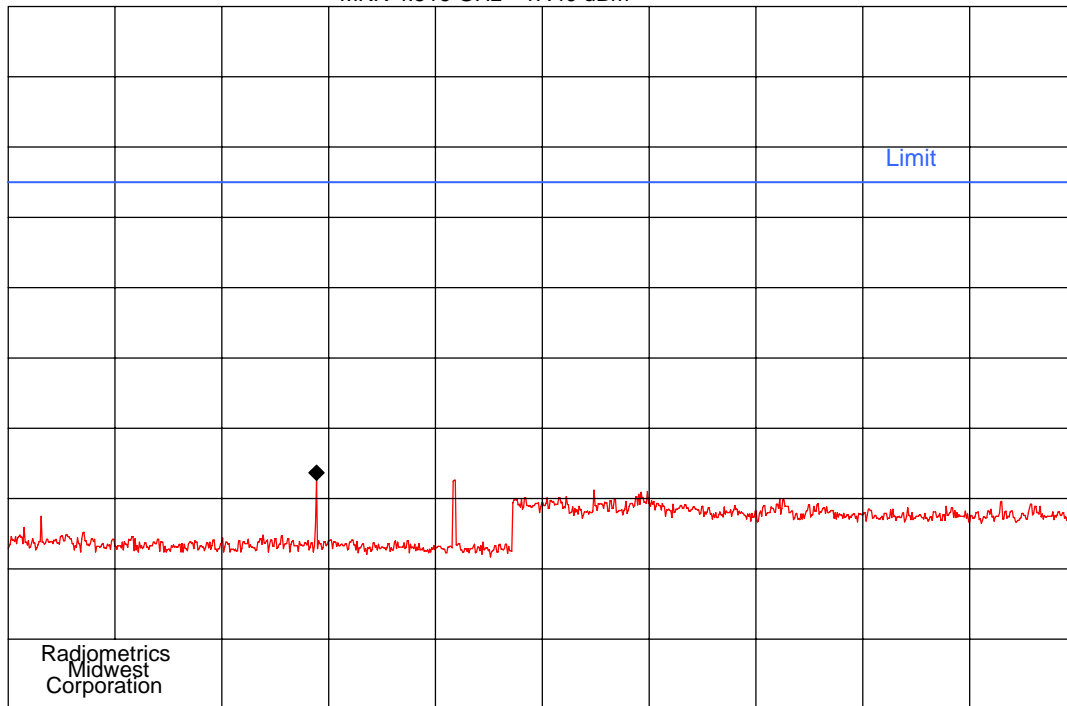
ITEM : RLR15
REF 20.0 dBm
VBW 300 kHz
Time: 10:52

Date : 03-12-2012
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: CE1-L

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MKR 4.516 GHz -47.40 dBm



Radiometrics
Midwest
Corporation

Company: MacMillan
START 2.50 GHz
RES BW 100 kHz
10 dB/

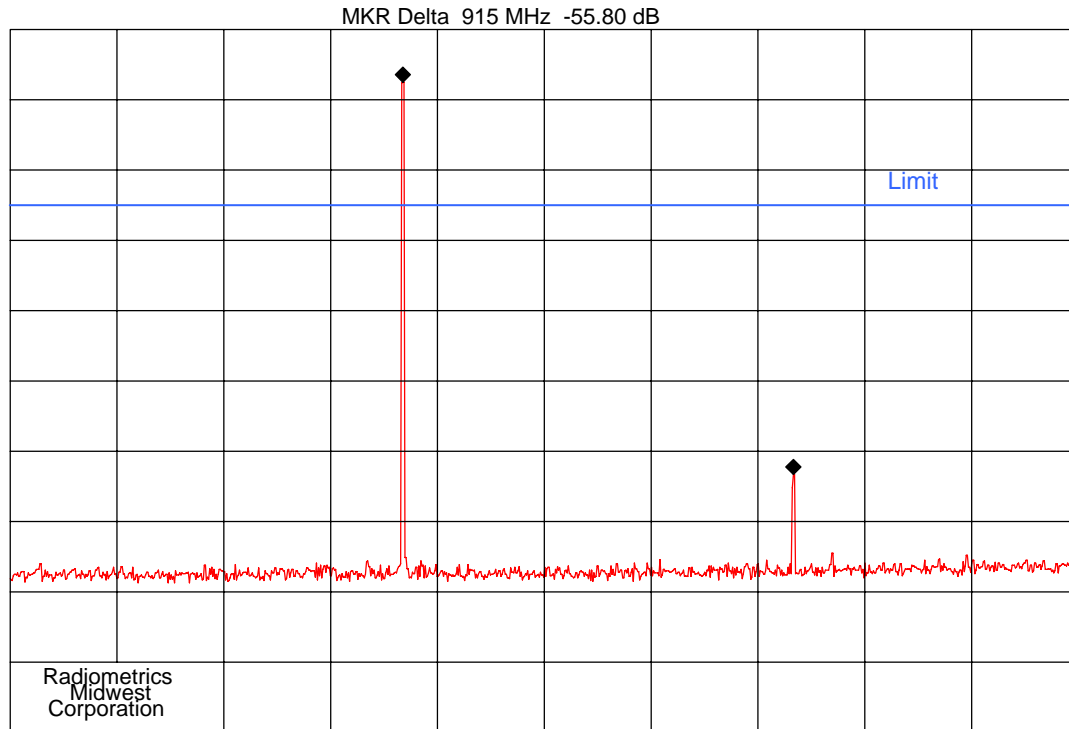
Notes: Conducted Emissions, Low Channel

ITEM : RLR15
REF 20.0 dBm
VBW 300 kHz
Time: 10:53

Date : 03-12-2012
STOP 9.50 GHz
ATTEN 30 dB
SWP 2.10 sec
File: CE1-U

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Company: MacMillan

START 1 MHz

RES BW 100 kHz

10 dB/

Notes: Conducted Emissions, Middle Channel

ITEM : RLR15

REF 20.0 dBm

VBW 300 kHz

Time: 11:09

Date : 03-12-2012

STOP 2.50 GHz

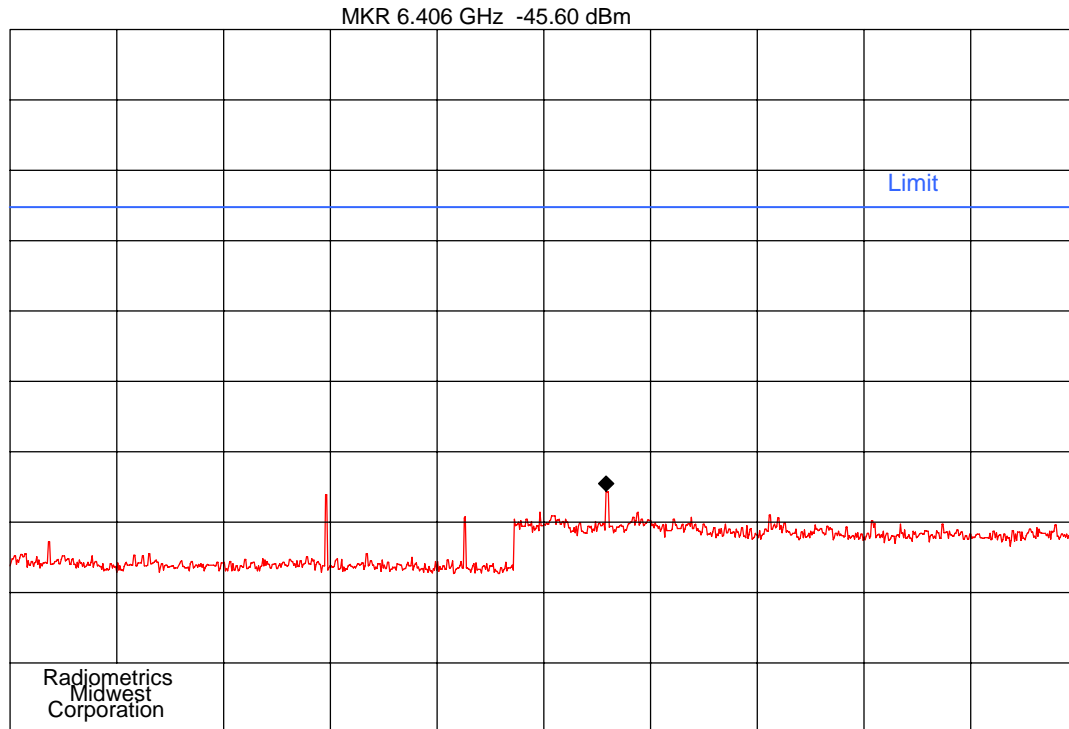
ATTEN 30 dB

SWP 750 msec

File: CE2-L

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Company: MacMillan
START 2.50 GHz
RES BW 100 kHz
10 dB/

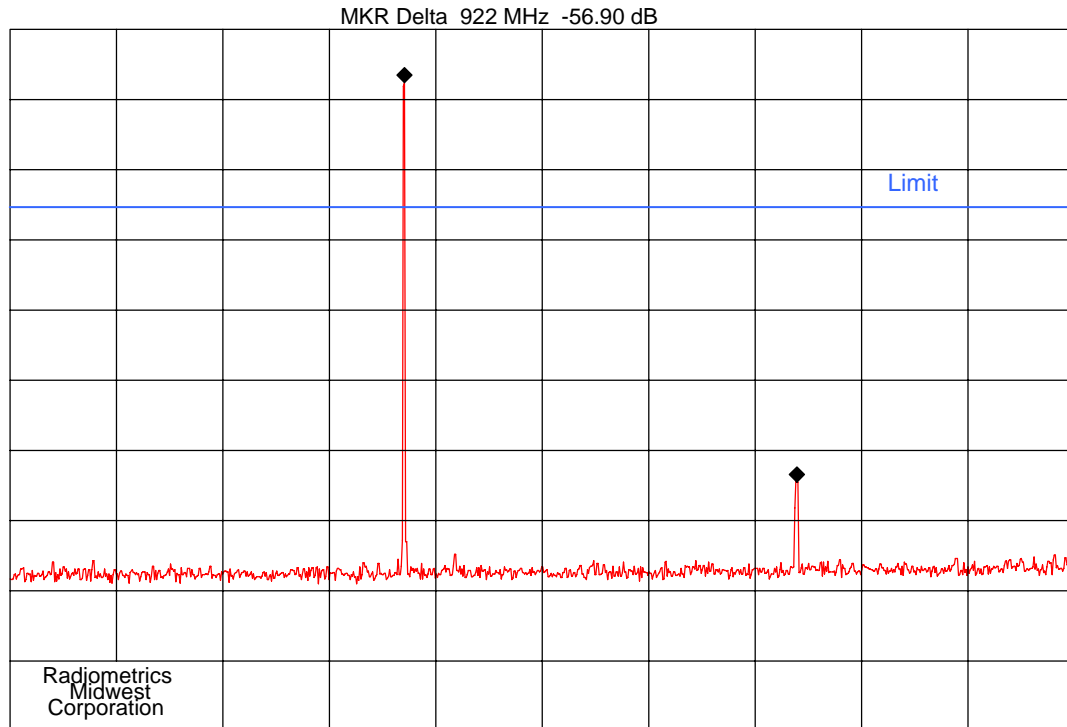
Notes: Conducted Emissions, Middle Channel

ITEM : RLR15
REF 20.0 dBm
VBW 300 kHz
Time: 11:11

Date : 03-12-2012
STOP 9.50 GHz
ATTEN 30 dB
SWP 2.10 sec
File: CE2-U

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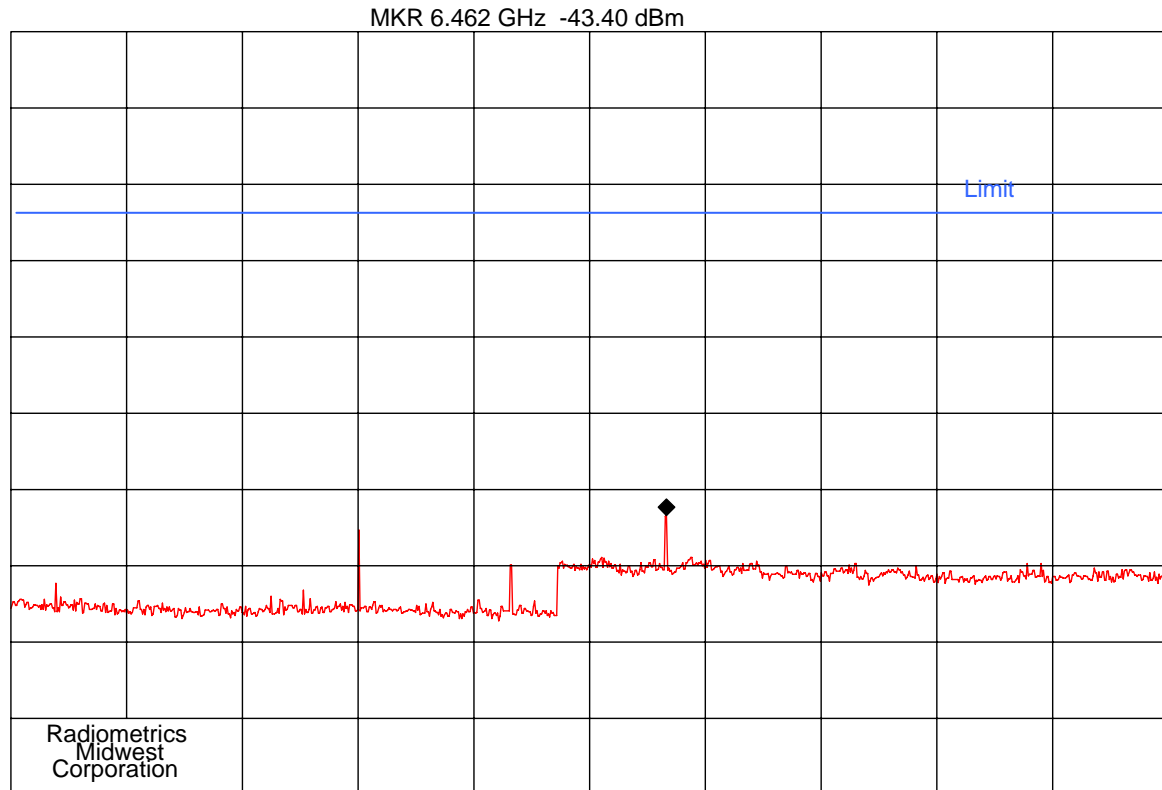
Radiometrics
Midwest
Corporation

Company: MacMillan
START 1 MHz
RES BW 100 kHz
10 dB/

Notes: Conducted Emissions, Upper Channel

ITEM : RLR15
REF 20.0 dBm
VBW 300 kHz
Time: 11:02

Date : 03-12-2012
STOP 2.50 GHz
ATTEN 30 dB
SWP 750 msec
File: CE3-L



Company: Indesign
START 2.50 GHz
RES BW 100 kHz
10 dB/

ITEM : 1550
REF 20.0 dBm
VBW 300 kHz
Time: 11:07

Date : 03-12-2012
STOP 9.50 GHz
ATTEN 30 dB
SWP 2.10 sec
File: CE3-U

Notes: Conducted Emissions, Upper Channel

10.6 Spurious Radiated Emissions

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. The radiated emission measurements were performed with a spectrum analyzer. The bandwidth used from 150 kHz to 30 MHz is 9 or 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz, a 1 MHz bandwidth is used. 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 was used. For tests from 1 to 25 GHz, an HP 8566 spectrum analyzer was used. For tests from 1 to 10 GHz, a high pass filter was used to reduce the fundamental emission. A harmonic mixer was used from 18 to 25 GHz. Figure 4 herein lists the details of the test equipment used during radiated emissions tests. In addition, a high pass filter was used to reduce the fundamental emission. The was device was rotated through three orthogonal axis as per 13.1.4.1 of ANSI C63.4 during the prescans and during final radiated tests.

Final radiated emissions measurements were performed inside of an anechoic chamber at a test distance of 3 meters. The anechoic chamber is designated as Chamber E. This Chamber meets the Site Attenuation requirements of ANSI C63.4 and CISPR 16-1. Chamber E is located at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

The entire frequency range from 30 to 25000 MHz was slowly scanned with particular attention paid to those frequency ranges which appeared high. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. All measurements may be performed using either the peak, average or quasi-peak detector functions. If the peak detector data exceeds or is marginally close to the limits, the measurements are repeated using a quasi-peak detector or average function as required by the specification for final determination of compliance.

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.

10.6.1 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:

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

Where: FS = Field Strength

RA = Receiver Amplitude

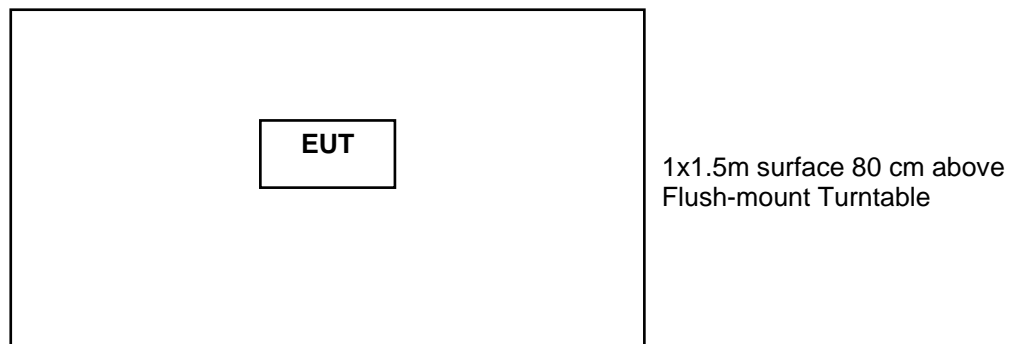
AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

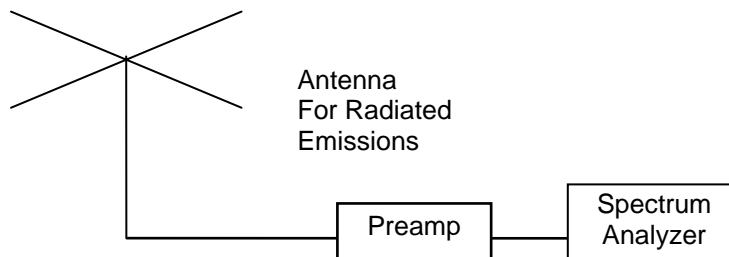
HPF = High pass Filter Loss

Figure 1. 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 tested system is 3 meters
- Not to Scale



10.6.2 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 $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

A Video Bandwidth of 10 Hz was used for Average measurements above 1 GHz.

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10.6.3 Radiated Emissions Results; Above 1 GHz

		Spectrum Analyzer Readings									EUT	Peak	Ave	Pea k	Ave	Margi n
hrm	Tx	Peak			Ave	Peak			Ave	Corr .	Emissio n	Tot. FS		Limit		Under
#	Freq	Vertical Polarization				Horizontal Polarization				Fact.	Freq MHz	dBuV/m		dBuV/m		Limit
		X	Y	Z	Max	X	Y	Z	Max							
BE	905.5	25.9	10.0	16.3	7.5	14.5	27.5	23.9	9.1	24.6	902	52.1	33.7	74	54	20.3
2	905.5	59.5	56.8	59.6	41.2	57.3	56.4	56.8	38.9	2.0	1811	61.6	43.2	90	70	26.8
3	905.5	50.7	49.4	50.4	32.3	45.9	61.0	53.5	42.6	6.6	2717	67.6	49.2	74	54	4.8
4	905.5	41.0	41.6	37.4	23.2	37.8	44.2	45.9	27.5	8.7	3622	54.6	36.2	74	54	17.8
5	905.5	48.1	46.3	46.2	29.7	43.1	40.2	45.3	26.9	12.4	4528	60.5	42.1	74	54	11.9
6	905.5	43.3	46.3	43.0	27.9	42.8	41.6	48.1	29.7	14.9	5433	63.0	44.6	74	54	9.4
7	905.5	46.1	42.5	51.2	32.8	50.1	47.9	46.3	31.7	15.1	6339	66.3	47.9	90	70	22.1
8	905.5	40.1	37.9	39.6	21.7	39.5	39.5	40.4	22.0	18.8	7244	59.2	40.8	90	70	29.2
2	916.0	58.9	53.0	57.9	40.5	55.5	56.9	55.7	38.5	1.8	1832	60.7	42.3	90	70	27.7
3	916.0	50.0	47.5	44.8	31.6	43.9	45.2	54.7	36.3	6.1	2748	60.8	42.4	74	54	11.6
4	916.0	40.6	39.6	39.0	22.2	37.3	43.2	46.4	28.0	8.6	3664	55.0	36.6	74	54	17.4
5	916.0	45.3	46.1	46.7	28.3	45.2	47.1	45.6	28.7	12.3	4580	59.4	41.0	74	54	13.0
6	916.0	45.6	43.7	41.8	27.2	39.3	40.8	45.7	27.3	14.6	5496	60.3	41.9	90	70	28.1
7	916.0	49.0	48.2	54.6	36.2	53.4	50.1	49.6	35.0	15.0	6412	69.6	51.2	90	70	18.8
8	916.0	37.7	37.0	38.6	20.2	38.6	37.9	36.0	20.2	18.5	7328	57.1	38.7	74	54	15.3
BE	923.0	29.6	15.1	30.3	11.9	19.6	32.7	30.4	14.3	24.3	928	57.0	38.6	74	54	15.4
2	923.0	57.2	53.2	56.6	38.8	54.5	56.1	53.1	37.7	2.1	1846	59.3	40.9	90	70	29.1
3	923.0	51.3	49.8	48.8	32.9	43.9	56.0	51.8	37.6	6.5	2769	62.5	44.1	74	54	9.9
4	923.0	40.3	39.3	37.1	21.9	45.4	41.8	46.0	27.6	8.8	3692	54.8	36.4	74	54	17.6
5	923.0	48.4	47.9	48.2	30.0	40.7	48.1	47.9	29.7	12.4	4615	60.8	42.4	74	54	11.6
6	923.0	44.2	43.8	41.5	25.8	39.8	38.9	45.0	26.6	15.0	5538	60.0	41.6	90	70	28.4
7	923.0	47.7	53.3	55.2	36.8	56.6	51.4	52.2	38.2	15.2	6461	71.8	53.4	90	70	16.6
8	923.0	38.2	37.0	35.0	19.8	37.9	37.4	37.2	19.5	19.6	7384	57.8	39.4	74	54	14.6
Column numbers (see below for explanations)																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

- Column #1. hrm = Harmonic; BE = Band Edge emissions
- Column #2. Frequency of Transmitter.
- Column #3. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
- Column #4. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
- Column #5. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
- Column #6. Average Reading based on peak reading reduced by the Duty cycle correction
- Column #7. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
- Column #8. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
- Column #9. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
- Column #10. Average Reading based on peak reading reduced by the Duty cycle correction
- Column #11. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
- Column #12. Frequency of Tested Emission
- Column #13. Highest peak field strength at listed frequency.
- Column #14. Highest Average field strength at listed frequency.
- Column #15. Peak Limit. In the non restricted band the limit was set to 20 dB below the level of the Fundamental.
- Column #16. Average Limit. In the non restricted band the limit was set to 20 dB below the level of the Fundamental.
- Column #17. The margin (last column) is the worst case margin under the peak or average limits for that row.

Judgment: Pass by 4.8 dB; There were no other emissions detected from 1 to 9.5 GHz

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Transmitter Spurious Emissions (non-Harmonics)

Manufacturer	Macmillan Publishers	Specification	FCC Part 15.247 & RSS-210
Model	RLR15	Test Date	03-08-2012
Serial Number	none	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 AMP-2220		

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Factor dB	Pol/ ID#		EUT	Limit	
75.6	25.1	P	6.9	H/44	-8.1	23.8	40.0	16.2
133.2	25.0	P	13.0	H/44	-7.7	30.2	43.5	13.3
197.2	24.8	P	10.3	H/44	-7.7	27.4	43.5	16.1
296.7	24.2	P	12.7	H/44	-7.5	29.4	46.0	16.6
381.8	24.8	P	15.5	H/44	-7.6	32.6	46.0	13.4
483.2	24.9	P	17.6	H/44	-7.6	34.9	46.0	11.1
570.0	24.5	P	19.6	H/44	-7.4	36.7	46.0	9.3
757.0	24.4	P	20.8	H/44	-6.4	38.8	46.0	7.2
58.8	24.0	P	11.1	V/44	-8.3	26.8	40.0	13.2
136.8	25.0	P	12.1	V/44	-7.7	29.3	43.5	14.2
212.8	24.6	P	10.8	V/44	-7.6	27.8	43.5	15.7
274.8	24.6	P	13.1	V/44	-7.5	30.3	46.0	15.7
365.0	26.0	P	14.4	V/44	-7.6	32.8	46.0	13.2
468.0	25.4	P	17.2	V/44	-7.6	35.1	46.0	10.9
564.0	25.7	P	18.9	V/44	-7.4	37.1	46.0	8.9
755.0	23.3	P	20.6	V/44	-6.4	37.5	46.0	8.5

Judgment: Pass by 7.2 dB

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

Testing of the Macmillan Publishers, Model RLR15, iClicker+ Transmitter

Receiver Spurious Emissions

Manufacturer	Macmillan Publishers	Specification	FCC Part 15.247 & RSS-210
Model	RLR15	Test Date	03-08-2012
Serial Number	none	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 AMP-2210		

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Factor dB	Pol/ ID#		EUT	Limit	
47.2	25.8	P	14.4	H/44	-17.7	22.5	40.0	17.5
60.4	28.4	P	10.5	H/44	-17.5	21.4	40.0	18.6
115.2	28.5	P	13.3	H/44	-16.7	25.1	43.5	18.4
180.4	27.8	P	9.2	H/44	-16.1	20.9	43.5	22.6
207.6	28.4	P	10.1	H/44	-15.9	22.6	43.5	20.9
368.9	28.9	P	14.6	H/44	-15.2	28.2	46.0	17.8
59.2	28.9	P	10.9	V/44	-17.5	22.3	40.0	17.7
78.0	32.4	P	6.9	V/44	-17.2	22.1	40.0	17.9
95.6	31.2	P	8.6	V/44	-17.0	22.8	43.5	20.7
133.2	31.7	P	12.8	V/44	-16.8	27.8	43.5	15.7
155.2	29.7	P	9.9	V/44	-16.2	23.3	43.5	20.2
226.8	30.2	P	11.7	V/44	-15.8	26.1	46.0	19.9
488.8	28.5	P	17.3	V/44	-14.4	31.4	46.0	14.6

Judgment: Pass by 14.6 dB