

T.E.S.T.

TECHNOLOGIES, INC.

4675 Burr Drive • Liverpool, NY 13088 • 1-800-724-6452 • FAX: 315-457-0428 • 315-457-0245

November 27, 2012

Mr. Brad Lightner
GOJO Industries
1 GOJO Plaza-Suite 500
Akron, OH 44311

Dear Mr. Lightner:

Enclosed is the test report for the GOJO Industries Gateway 2840-711/ Repeater 2840-611 System which was tested at our facility located at 4675 Burr Drive in Liverpool, NY. This facility is on file with the Federal Communications Commission (FCC) per 47 CFR 2.948. (Site File Registration Number: 306552)

As narrated in the report, the product configuration meets the requirements of the FCC per CFR 47 Part 15.247 Class C for Intentional Radiators. Additionally, all spurious emissions signals are greater than 20 dB below the limit of FCC Part 15.209 and are not reported. Therefore, the unit under test meets the FCC Part 15.209 requirements. The plots indicated ambient scans.

Thank you for selecting Diversified T.E.S.T. Technologies, Inc. for your testing needs. We look forward to working with you on future projects. Should you have any questions or concerns regarding this report, contact me at 315-457-0245. Please feel free to visit our website at www.dtlab.com.

Sincerely,



Michael McElroy
Technical Associate

DIVERSIFIED T.E.S.T. TECHNOLOGIES, INC. TEST REPORT	
GOJO Industries Gateway 2840-711/ Repeater 2840-611 System	Project Number: 6388

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Emissions Testing

Documentation

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DIVERSIFIED T.E.S.T. TECHNOLOGIES, INC. TEST REPORT	
GOJO Industries Gateway 2840-711/ Repeater 2840-611 System	Project Number: 6388

Test Report

Laboratory

Diversified TEST Technologies, Inc.
4675 Burr Drive
Liverpool, NY 13088
315-457-0245

Manufacturer

GOJO Industries
1 GOJO Plaza-Suite 500
Akron, OH 44311

Report Issue Date: **November 27, 2012**

Project Number: **6388**

Report Number: **6388-112712 FCCC Gateway/ Repeater System (Edition 3)**

Date Received: **November 12, 2012**

Date Tested: **November 12, 2012 – November 14, 2012**

Product: **Gateway**

Model Numbers: **2840-711**

FCC ID: **O76-X1DL0915A**

Traceability: *Reference standards of measurement have been calibrated by a competent body using standards traceable to NIST.*

The testing performed by Diversified TEST Technologies, Inc. has shown that the product referenced above complies with the electromagnetic compatibility requirements according to the standard(s) specified on page 3 of the test report. The results in this test report apply only to the product denoted above. The manufacturer is responsible for ensuring that additional units are manufactured with identical mechanical and electrical characteristics.

The equipment listed above conforms to the specified requirements of the test standards listed on page 3 of this report.

Complied by:



Signature:

Michael McElroy
Technical Associate

Date: November 27, 2012

Reviewed by:



Signature:

Annelle Frierson
Vice- President

Date: November 27, 2012

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GOJO Industries Gateway 2840-711/ Repeater 2840-611 System	Project Number: 6388

Emissions Test Regulations

The emissions tests were performed according to the following regulations:

EN 50081-1:1992

EN 50081-2:1995

EN 55011:1998 / A1:1999 / A2:2001 Group 1 Group 2

Class A Class B

EN 55013:1990 / A12:1994 / A13:1996 / A14:1999

EN 55014:1993 / A1: 1997

Household appliances and similar

Portable tools

Semiconductor devices

EN 55022:1998

Class A Class B

FCC Part 15.247

Class A Class B Class C

Certification

Verification

Declaration of Conformity

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Emissions Test Conditions: FCC PART 15.247

The Harmonics and Bandwidth measurements were tested in a horizontal and vertical polarization at the following test location:

- Diversified TEST Technologies, Inc. Open Area Test Site
- Diversified TEST Technologies, Inc. Lab

at a test distance of:

- 1 meter
- 3 meters
- 30 meters

Test equipment used:

Manufacturer	Model	Description	Serial #	Cal.	Cal. Due
Hewlett Packard	8593EM	Spectrum Analyzer	3536A00139	6/19/12	6/19/13
Electro-Metrics	RGA60	Ridge Horn Antenna	2981	8/25/12	8/25/13
Hewlett Packard	7550A	Plotter	2407A00476	CNR	CNR
Electro-Metrics	LPA-25	Log Periodic Antenna 200-1000 MHz	1242	9/11/12	9/11/13
	MFR-57500	Blue low-loss transmit cable	337	CNR	CNR
		Non-conductive wooden turntable		CNR	CNR
		10-meter open field test range, grounded with 1/4" x 1/4" hardware cloth		CNR	CNR
EMCO	6520	Active Loop Antenna	9110-2685	7/19/12	7/19/13
Hewlett Packard	8595E	Spectrum Analyzer	3746A03177	7/23/12	7/23/13
Agilent	E7402A	Spectrum Analyzer	MY45103221	3/25/12	3/25/13
Electro-Metrics	BIA-30W	Biconical Antenna	103	9/1/12	9/1/13

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Equipment under Test (EUT) Test Operation Mode – Emissions Tests:

The device under test was operated under the following conditions during emissions testing:

- Standby
- Normal Operating Mode
- Practice Operation

Description / Configuration of the device under test:

The unit was powered by a 120 VAC 60 Hz supply during the collection of data.

Rationale for EUT setup / configuration:

ANSI C63.4:2003

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Emissions Test Results:

FCC Part 15.247 Part C for 915 MHz

The requirements are **MET** **NOT MET**

General Remarks:

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Spurious Emissions Measurements were taken from 16 MHz up to the tenth harmonic and any emission found were more than 20 dB below the limit were not reported.

Peak power measurements did not exceed 1W. (30 dBm)

The EUT was evaluated in 1 orthogonal orientation and the worst case data is reflected in the test report. Testing was performed at 1 Meter above 1 GHz to make it easier to see harmonics caused from EUT.

Summary:

FCC ID:

The requirements according to the technical regulations are

- Met.
- Not met.

The device under test does

- fulfill the general approval requirements mentioned on page 3.
- not fulfill the general approval requirements mentioned on page 3.

Testing Start Date: November 12, 2012

Testing End Date: November 14, 2012

DIVERSIFIED T.E.S.T. TECHNOLOGIES, INC. TEST REPORT

GOJO Industries

Gateway 2840-711/ Repeater 2840-611 System

Project Number:
6388

Test Setup Photographs:

FCC PART 15.247 CLASS C –915 MHz

Photograph 1: FCC Part 15.247 Class C



Photograph 2: Radiated Measurements



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Harmonics Test Datasheets – 915 MHz

21 pages to follow.

Tested: November 12, 2012
 November 12, 2012

FCC Harmonics Field Strength Test of Gateway-Repeater at 915 MHz										
Measured Field Strength (dB μ V) Peak*	Res. Bandwidth (KHz)	DUT Frequency (MHz)	Measured Frequency (MHz)	Cable Factor	Amplifier Gain (dB μ V)	Measurement Distance (Meters)	FCC Limit (dB μ V)	Corrected Field Strength (dB μ V/M) Peak	Margin	Polarity
							at 3M	Corrected to 3Meters		
N/A	N/A	915	915	0.0	0	N/A	N/A	N/A	N/A	N/A
32.80	1000	915	1830	2.1	0	1	54	34.90	-19.10	Horizontal
32.94	1000	915	2745	2.2	0	1	54	35.14	-18.86	Horizontal
38.73	1000	915	3660	2.2	0	1	54	40.93	-13.07	Horizontal
37.88	1000	915	4575	2.4	0	1	54	40.28	-13.72	Horizontal
39.78	1000	915	5490	2.6	0	1	54	42.38	-11.62	Horizontal
38.58	1000	915	6405	2.7	0	1	54	41.28	-12.72	Horizontal
37.66	1000	915	7320	2.7	0	1	54	40.36	-13.64	Horizontal
38.38	1000	915	8235	2.9	0	1	54	41.28	-12.72	Horizontal
39.08	1000	915	9150	3.0	0	1	54	42.08	-11.92	Horizontal
N/A	N/A	915	915	0.0	0	N/A	N/A	N/A	N/A	N/A
38.80	1000	915	1830	2.1	0	1	54	40.90	-13.10	Vertical
32.49	1000	915	2745	2.2	0	1	54	34.69	-19.31	Vertical
38.64	1000	915	3660	2.2	0	1	54	40.84	-13.16	Vertical
37.81	1000	915	4575	2.4	0	1	54	40.21	-13.79	Vertical
37.64	1000	915	5490	2.6	0	1	54	40.24	-13.76	Vertical
37.82	1000	915	6405	2.7	0	1	54	40.52	-13.48	Vertical
39.80	1000	915	7320	2.7	0	1	54	42.50	-11.50	Vertical
39.15	1000	915	8235	2.9	0	1	54	42.05	-11.95	Vertical
39.10	1000	915	9150	3.0	0	1	54	42.10	-11.90	Vertical
*Antenna factors are pre-calculated into Measured Field Strength (dB μ V)										
Unit Under Test:	Gateway-Repeater	PN: 2840-711			11/12/2012					

Agilent

13:24:11 Nov 12, 2012

G0J0#6388

GATEWAY 915 HARMONICS 3M 1 H

Ref 76.99 dB μ V

*Atten 0 dB

Mkr1 914.80 MHz

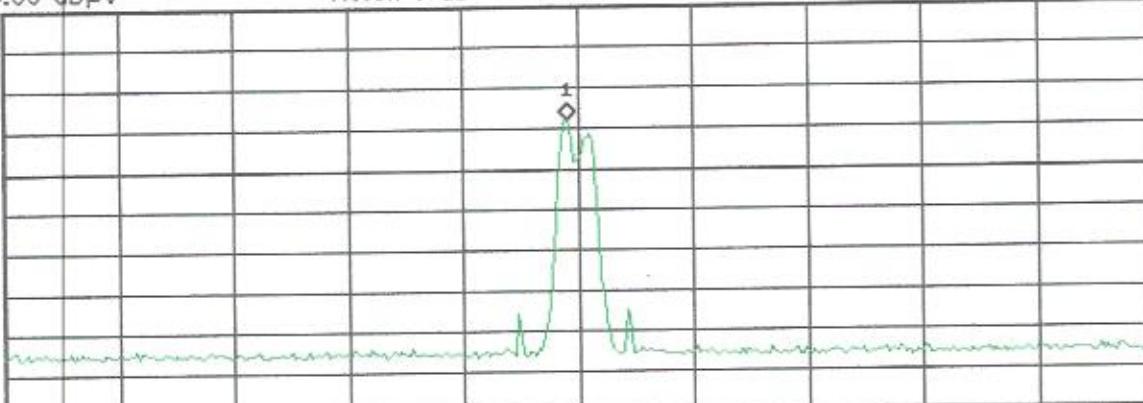
54.38 dB μ V

Peak

Log

8

dB/



Start 905 MHz

#Res BW 120 kHz

*VBW 300 kHz

Stop 925 MHz

Sweep 4 ms (401 pts)

Signal (0)	Freq	Peak Ampl dB μ V	QP Ampl dB μ V	Avg Ampl dB μ V	QP △ LL1 dB	QP △ LL2 dB
Deleted signal.						

Deleted signal.

Agilent 14:31:05 Nov 12, 2012

GOJ0#6388 GATEWAY 915 HARMONICS 1M 2 H
Ref 80 dB μ V Atten 5 dB

Mkr1 1.83129 GHz
32.8 dB μ V

Peak
Log
8
dB/

M1 S2
S3 FC
AA

Center 1.83 GHz
Res BW 1 MHz

VBW 3 MHz

Span 20 MHz
Sweep 5.03 ms (504 pts)

1



* Agilent 14:39:30 Nov 12, 2012

G0J0*6388 GATEWAY 915 HARMONICS 1M 2 H
Ref 80 dB μ V Atten 5 dB

Mkr1 2.744697 GHz
32.94 dB μ V

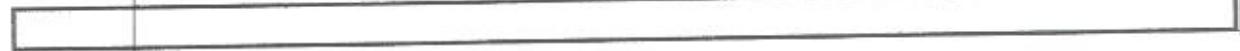
Peak
Log
8
dB/

V1 S2
S3 FC
AA

Center 2.745 GHz
Res BW 1 MHz

VBW 3 MHz

Span 5 MHz
Sweep 5.03 ms (504 pts)



15:47:37 12 NOV 2012
/P GOJO#6388 GATEWAY 915 HARM 1M 4 H MKR 3.659675 GHz
REF 8d 4B:V AT 10 dB 38.73 dBmV

VA SB
SC FC
CORR

CENTER 3.660000 GHz
#RES BW 1.0 MHz

VBW 300 kHz

SPAN 5.000 MHz
SWP 20.0 msec

16: Ø6: Ø6 12 NOV 2012
Ø GOJO#6388 GATEWAY 911

REF 8Ø.Ø dBµV AT 1Ø dB MKR 4.574625 GHz
REF 8Ø.Ø dBµV AT 1Ø dB MKR 37.88 dBµV

MA
SB
SC
FC
CORR

CENTER 4.575 GHz

#RES BW 1.0 MHz

VBW 300 kHz SPAN 3.000 MHz SWP 20.0 msec

16: 10: 34 12 NOV 2012
GOJO#6388 GATEWAY 915 HARM 1M 6 H MKR 5.489788 GHz
--> 28.45 V AT 48 dB 39.78 dBmV

HEF 80 .0 08840 A1 100 USE

PEAK
LOG
10
dB/

W. H. H. 1888

MA SB
SC FC
CORR

CENTRAL ASIAN STUDIES

#RES BW 1.Ø MHz

VBW 300 kHz SWP 20.0 msec

16: 19: 36 12 NOV 2012
GOJO#6388 GATEWAY 915 HARM 1M 7 H MKR 6.404925 GHz
REF ID: 4B.V AT 10 dB 38.58 dBW

REF ID: A11900

MKR 6.404925 GHz
38.58 dB μ V

MA SB
SC FC
CORR

CENTER 6 405000 GHz

VBW 300 kHz SWP 20.0 msec

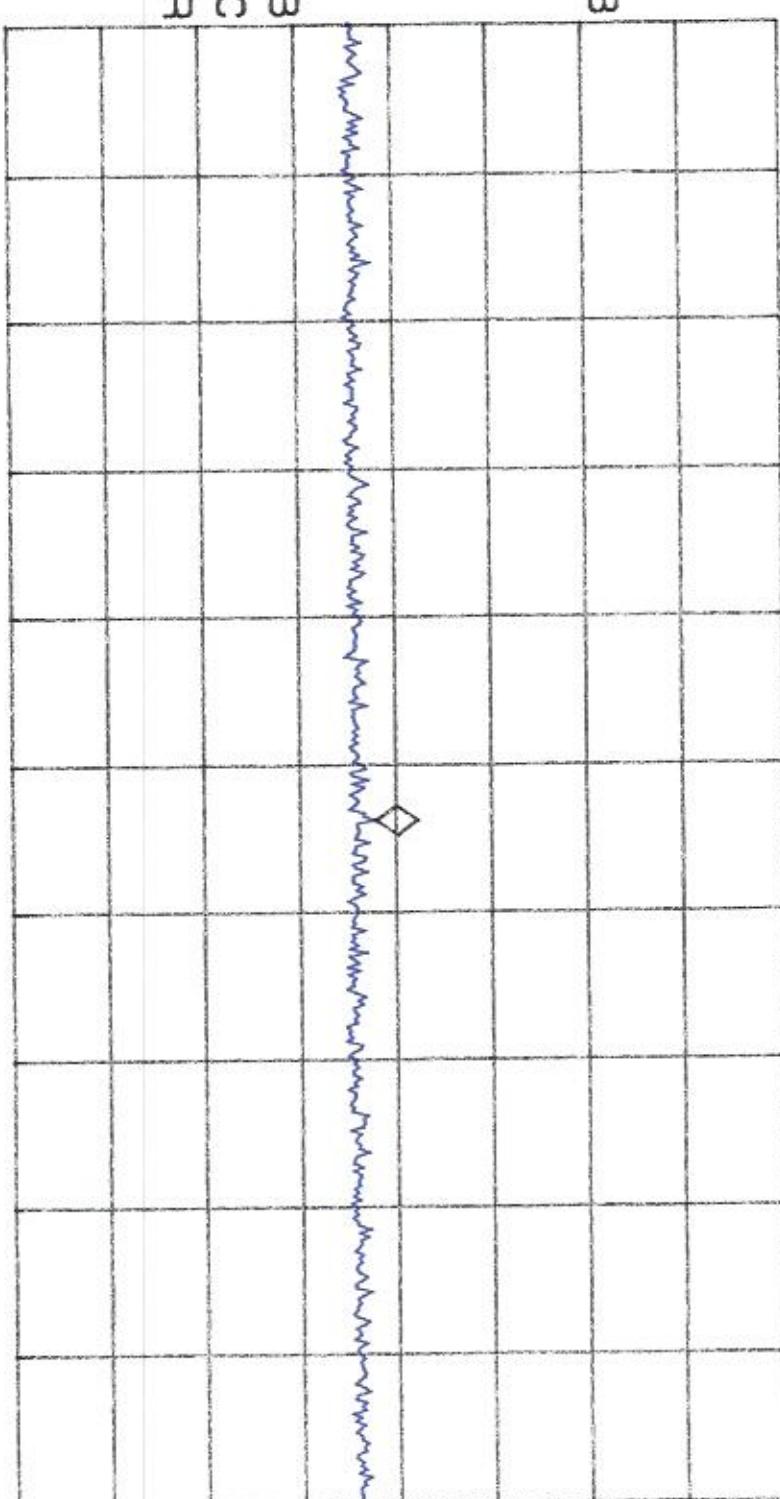
16: 16: 02 NOV 12, 2012
GOJO#6388 GATEWAY 915 HARM 1M 8 H

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 7.320188 GHz
37.66 dB μ V

PREAMP ON

LOG REF 80.0 dB μ V

10
dB/
ATN
10 dB



CENTER 7.3200000 GHz

#IF BW 1.0 MHz

Avg BW 300 kHz

SPAN 5.000 MHz
Swp 20.0 msec

16: 24: 14 NOV 12, 2012
GOJO#6388 GATEWAY 915 HARM 1M 9 H

4

GOJO#6388 GATEWAY 915 HARM 1M 9 H ACT

ACTV DET: PEAK

ACTV DET: PEAK MEAS DET: PEAK QP AVG

MKR 8.235ø13 GHz

PREAMP ON

卷之三

111

ATN

MA SB
SC FG
CORR

CENTER 8.2335000 GHz

SPAN 5.000 MHz

#IF BW 1.0 MHz AVG BW 300 kHz

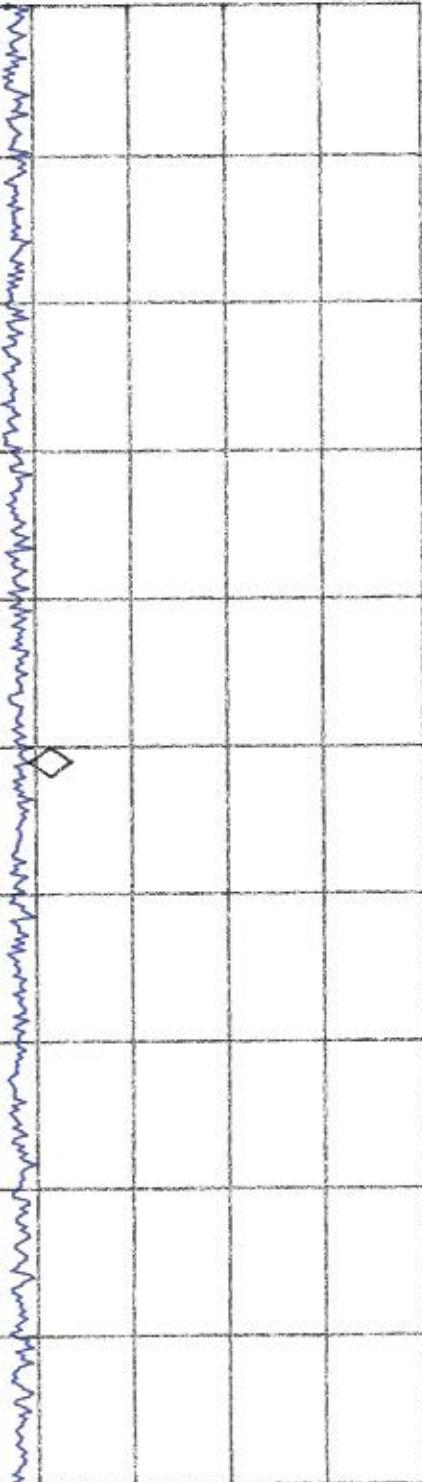
SPAN 5.000 MHz
SWP 20.0 msec

16: 27: 06 NOV 12, 2012
GOJO#6388 GATEWAY 915 HARM 1M 10 H

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 9.150050 GHz
39.08 dB μ V
PREAMP ON

LOG REF 80.0 dB μ V

10
dB/
ATN
10 dB



MA SB
SC FC
CORR

CENTER 9.1500000 GHz
#IF BW 1.0 MHz

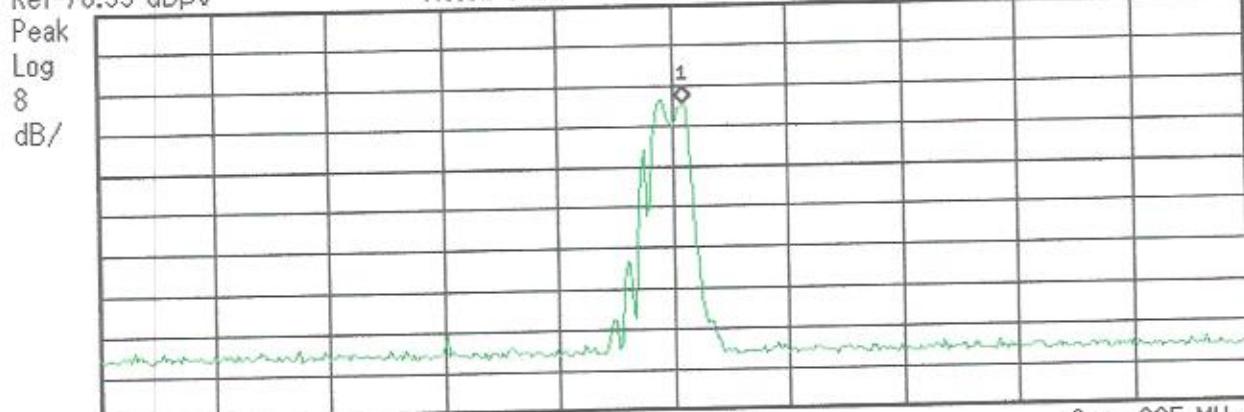
Avg BW 300 kHz

SPAN 5.000 MHz
SWP 20.0 msec

Agilent 13:20:13 Nov 12, 2012

G0J0#6388 GATEWAY 915 HARMONICS 3M 1 V
Ref 76.99 dB μ V #Atten 0 dB

Mkr1 915.20 MHz
57.47 dB μ V



Signal (0)	Freq	Peak Ampl dB μ V	QP Ampl dB μ V	Avg Ampl dB μ V	QP △ LL1 dB	QP △ LL2 dB

Deleted signal.

Agilent 14:32:38 Nov 12, 2012

GOJ0#6388 GATEWAY 915 HARMONICS 1M 2 V
Ref 80 dB μ V Atten 5 dB

Mkr1 1.82954 GHz
38.8 dB μ V

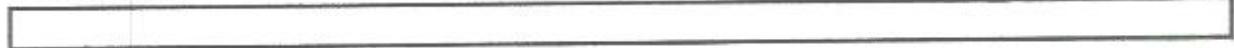
Peak
Log
8
dB/

M1 S2
S3 FC
AA

Center 1.83 GHz
Res BW 1 MHz

VBW 3 MHz

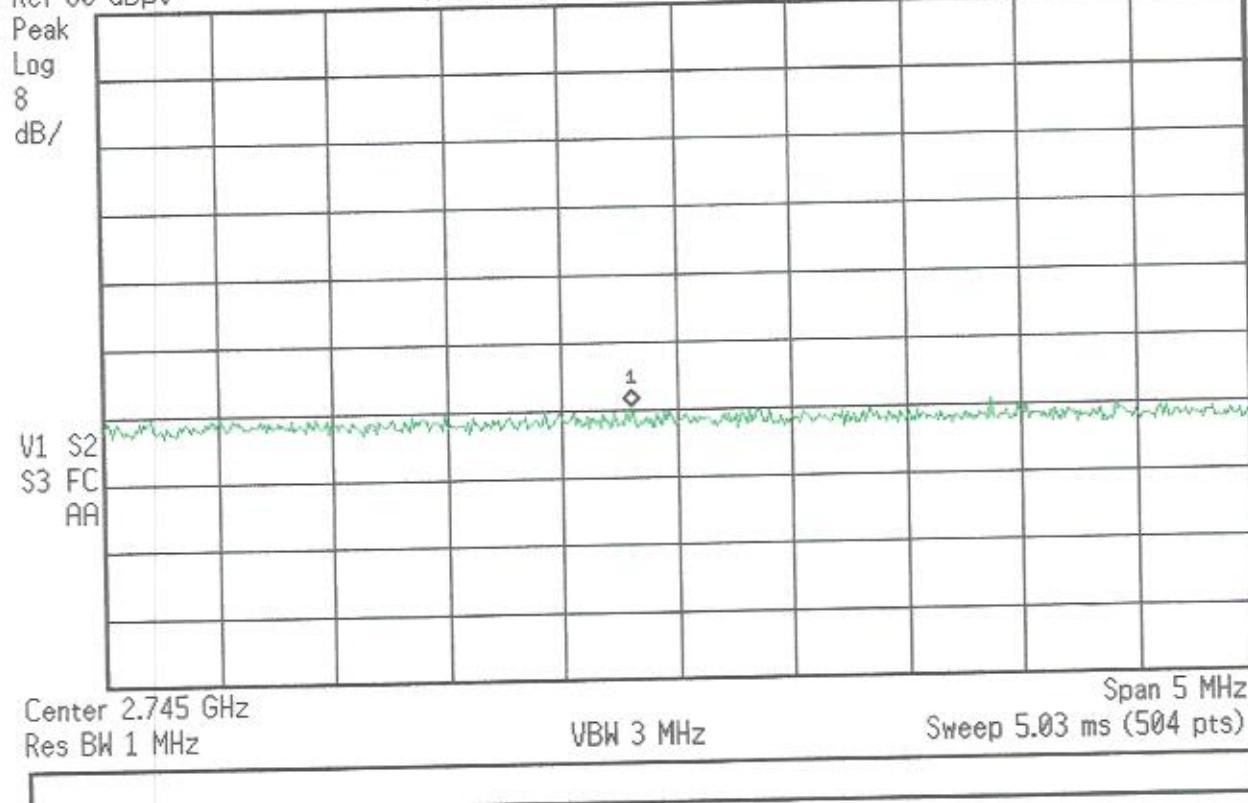
Span 20 MHz
Sweep 5.03 ms (504 pts)



* Agilent 14:36:47 Nov 12, 2012

G0J0#6388 GATEWAY 915 HARMONICS 1M 2 V
Ref 80 dB μ V Atten 5 dB

Mkr1 2.744806 GHz
32.49 dB μ V



15: 52: 07 12 NOV 2012
GOJO#6388 GATEWAY 91
REF 66 8 45 V AT 1

REF 8Ø.Ø dB μ V AT 1Ø dB MKR 3.66Ø3ØØ GHz 38.64 dB μ V

MA SB
SC FC
CORR

CENTER 3.660000 GHz

CENTER 3.660000 GHz
#RES BW 1.0 MHz

VBW 300 kHz SPAN 5.000 MHz
SWP 20.0 msec

15: 59: 24 12 NOV 2012
GOJO#6388 GATEWAY 91
REF ID: 4P-V AT 1

MKR 4.575425 GHz 37.81 dBW

PEAK
LOG
10
dB/

CENTER 4.575 GHz
#RES BW 1.0 MHz

VBW 300 kHz SPAN 5.000 MHz
SWP 20.0 msec

16:13:41 12 NOV 2012
/P GOJO#6388 GATEWAY 915 HARM 1M 6 V MKR 5.489988 GHz
REF 68 48 V AT 10 dB 37.64 dBW

REF 80.0 dB μ V At 10 dB

MKR 5.489988 GHz
37.64 dB μ W

MA SB
SC FC
CORR

CENTER 5 490000 GHz

#RES BW 1.0 MHz

VBW 300 kHz

SPAN 5.000 MHz
SWP 20.0 msec

16: 16: 28 12 NOV 2012
GOJO#6388 GATEWAY 915 HARM 1M 7 V

MKR 6.404850 GHz
37.82 dB μ V

REF 80.0 dB μ V AT 10 dB

PEAK
LOG
10
dB/



MA SB
SC FC
CORR

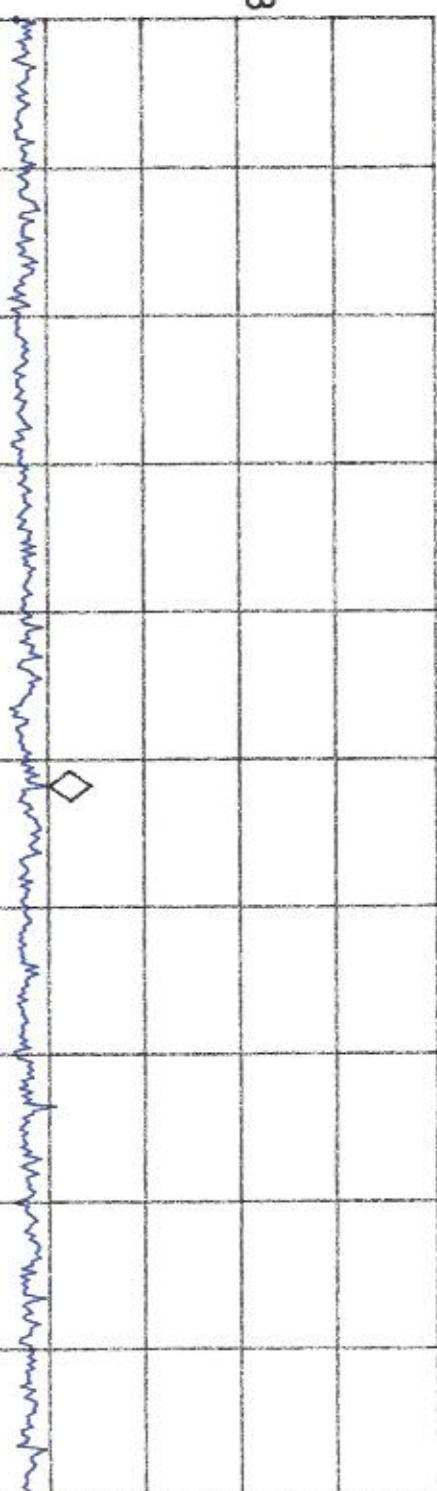
CENTER 6.405000 GHz
#RES BW 1.0 MHz

SPAN 5.000 MHz
VBW 300 kHz
SWP 20.0 msec

16: 18: 39 NOV 12, 2012
GOJO#6388 GATEWAY 9

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 7.320088 GHz

dB/
ATN
10 dB



PREAMP ON

CENTER 7.320000 GHz
#IF BW 1.0 MHz

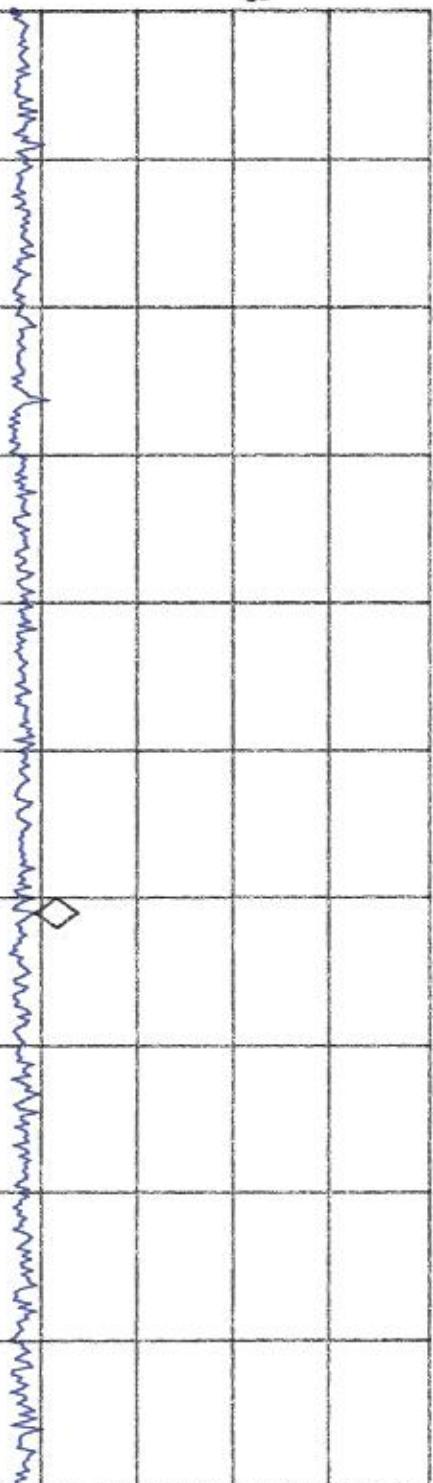
AVG BW 300 kHz SPAN 5.000 MHz
SWP 20.0 msec

16: 21: 47 NOV 12, 2012
GOJO#6388 GATEWAY 915 HARM 1M 9 V

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 8.235550 GHz
39.15 dB μ V
PREAMP ON

LOG REF 80.0 dB μ V

10
dB/
ATN
10 dB



MA SB
SC FC
CORR

CENTER 8.235000 GHz
#IF BW 1.0 MHz

Avg BW 300 kHz

SPAN 5.000 MHz
SWP 20.0 msec

16: 29: 52 NOV 12, 2012
GOJO#6388 GATEWAY 915 HARM 1M 10 V

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 9.150213 GHz
39.10 dB μ V

PREAMP ON

LOG REF 8 ϕ . ϕ dB μ V

1 ϕ							
dB/							
ATN							
1 ϕ dB							



MA SB
SC FC
CORR

CENTER 9.150000 GHz
#IF BW 1.0 MHz

SPAN 5.000 MHz
AVG BW 300 kHz
SWP 20.0 msec

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Test Datasheet-Bandwidth Test Minimum 6dB Bandwidth more than 500 KHz- 915 MHz

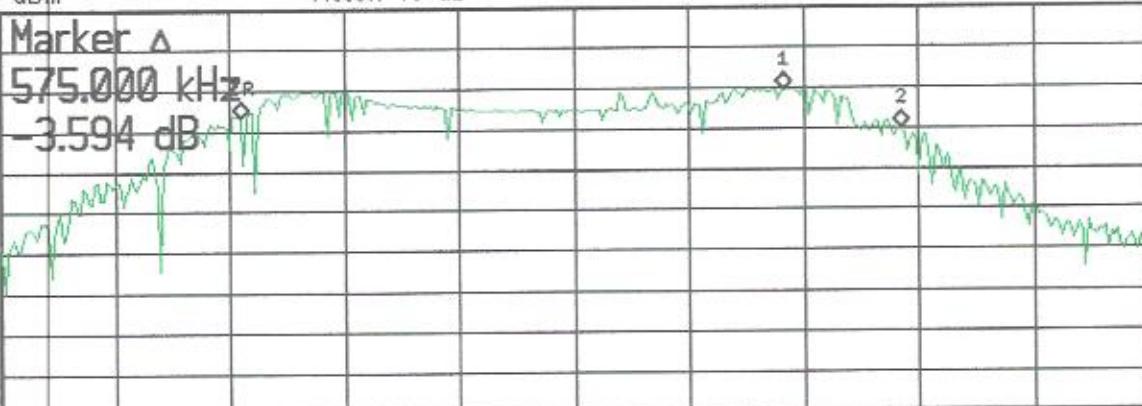
1 Page of Data to Follow

Agilent 09:58:52 Nov 12, 2012

GOJ0#6388 GATEWAY 915 BANDWIDTH FCCC
Ref 30 dBm *Atten 40 dB

Mkr2 Δ 575.0 kHz
-3.594 dB

#Peak
Log
10
dB/



Center 915 MHz
Res BW 120 kHz

VBW 300 kHz

Span 1 MHz

#Sweep 5 ms (401 pts)

Signal (3)	Freq	Peak dBm	Qp dBm	Avg dBm	QP Δ LL1 dB	QP Δ LL2 dB
1	915.2 MHz	9.41				
2	914.7 MHz	3.21				
3	915.3 MHz	-0.38				

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Spurious Emissions Test Data- 915 MHz

Scanned from 16 MHz to the 10th harmonic of the fundamental. All Emissions were found to be more than 20 dB below the limit and were not reported.

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100 kHz Bandwidth Test

4 pages to follow

* Agilent 10:31:58 Nov 12, 2012

G0J0*6388 GATEWAY 915 100KHZ BANDWIDTH FCCC
Ref 30 dBm #Atten 40 dB

Mkr1 957.300 MHz
-40.33 dBm

*Peak
Log
10
dB/

Marker
957.300000 MHz
-40.33 dBm

V1 S2
S3 FC
AA

Start 930 MHz
*Res BW 100 kHz

*VBW 100 kHz

Stop 1 GHz
Sweep 9.019 ms (401 pts)

Deleted signal.

* Agilent 10:29:42 Nov 12, 2012

G0J0#6388 GATEWAY 915 100KHZ BANDWIDTH FCCC
Ref 30 dBm *Atten 40 dB

Mkr1 915.37 MHz
-11.11 dBm

*Peak
Log
10
dB/

Marker
915.370000 MHz
-11.11 dBm

V1 S2
S3 FC
AA

Start 902 MHz
*Res BW 100 kHz

*VBW 100 kHz

Stop 930 MHz
Sweep 4 ms (401 pts)

Deleted signal.

* Agilent 10:25:35 Nov 12, 2012

G0J0*6388 GATEWAY 915 100KHZ BANDWIDTH FCCC

Ref 30 dBm

*Atten 40 dB

Mkr1 914.49 MHz

-13.62 dBm

*Peak

Log

10

dB/

Marker

914.490000 MHz

-13.62 dBm

V1 S2

S3 FC

AA

Start 900 MHz

*Res BW 100 kHz

*VBW 100 kHz

Stop 928 MHz

Sweep 4 ms (401 pts)

Deleted signal.

* Agilent 10:26:56 Nov 12, 2012

G0J0#6388 GATEWAY 915 100KHZ BANDWIDTH FCCC
Ref 30 dBm #Atten 40 dB

Mkr1 914.56 MHz
-6.067 dBm

*Peak
Log
10
dB/

V1 S2
S3 FC
AA

Start 900 MHz
*Res BW 100 kHz

*VBW 100 kHz

Stop 928 MHz
Sweep 4 ms (401 pts)

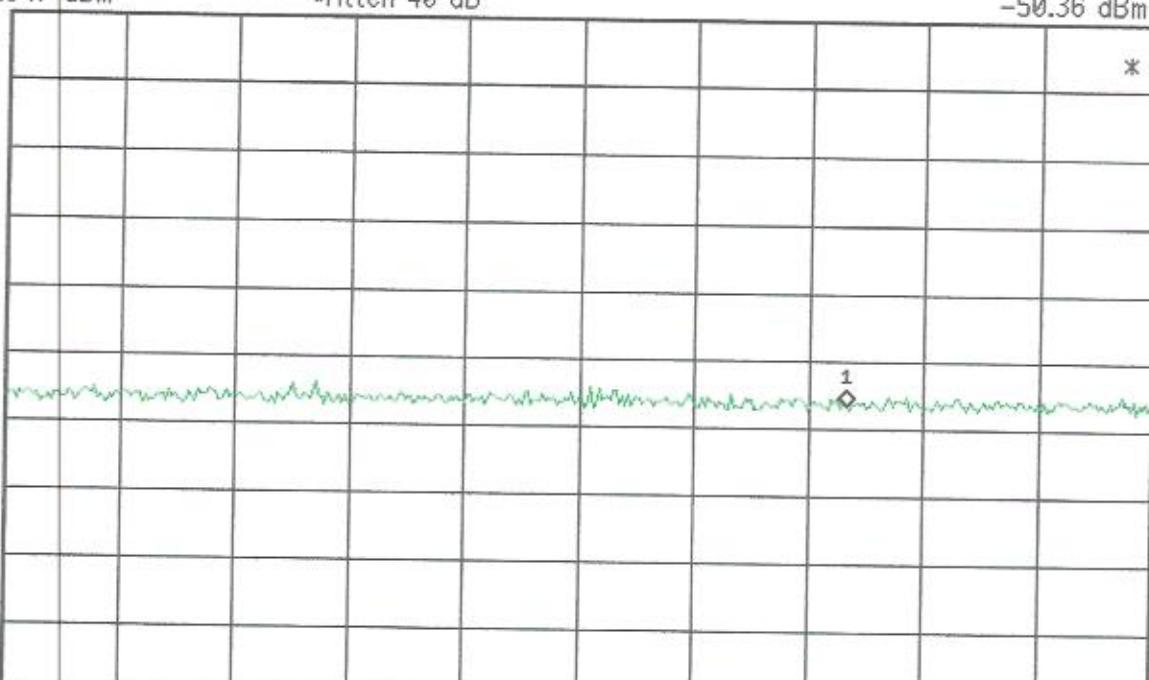
Deleted signal.

Agilent 10:17:12 Nov 12, 2012

GOJ0#6388 GATEWAY 915 100KHZ BANDWIDTH FCCC
Ref 6.347 dBm #Atten 40 dB

Mkr1 873.25 MHz
-50.36 dBm

*Peak
Log
10
dB/



V1 S2

S3 FC
AA

Start 800 MHz

*Res BW 100 kHz

*VBW 100 kHz

Stop 900 MHz

Sweep 12.88 ms (401 pts)

Deleted signal.

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Peak Power Output Test- 915 MHz

1 page to follow.

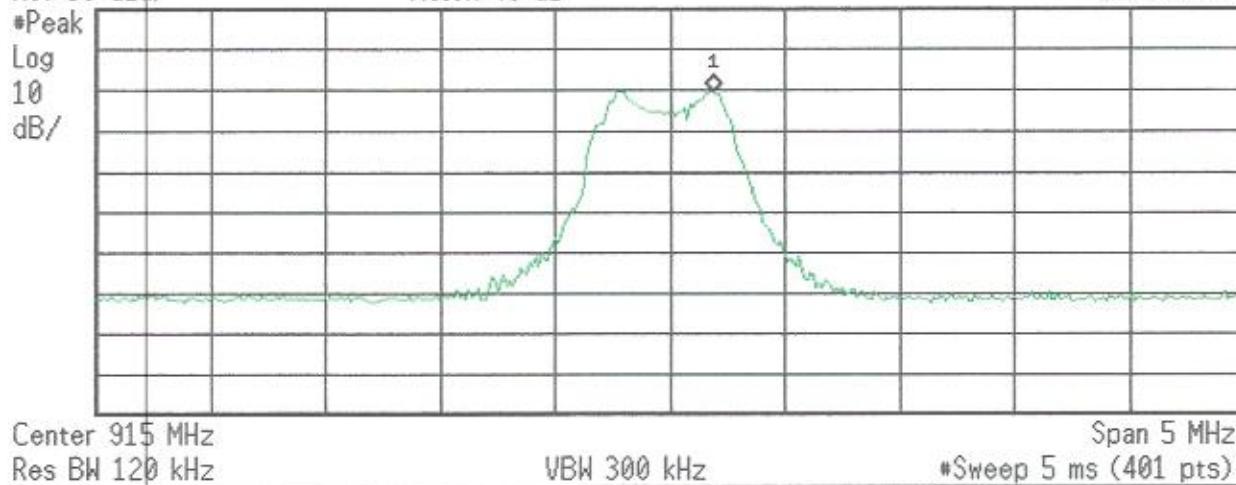
Peak Power Margin

Limit is 30 dBm. Level was 9.63 dBm. Therefore, margin is 20.37 below the limit.

Agilent 09:39:17 Nov 12, 2012

G0J0#6388 GATEWAY 915 PEAK POWER FCCC
Ref 30 dBm Atten 40 dB

Mkr1 915.1875 MHz
9.424 dBm



Signal (1) 1	Freq	Peak Ampl dBm	Qp Ampl dBm	Avg Ampl dBm	QP △ LL1 dB	QP △ LL2 dB
	915.2 MHz	9.42				

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Peak Power Density Test- 915 MHz

1 Page to follow.

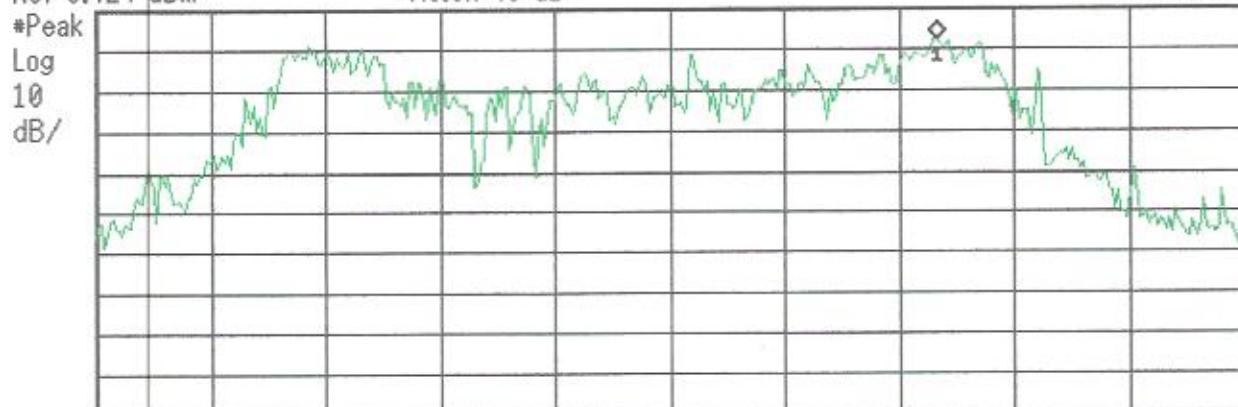
Density Margin

Density limit is 8 dBm. Level was 1.919 dBm. Therefore, margin is 6.081 below the limit.

* Agilent 10:06:46 Nov 12, 2012

GOJ0#6388 GATEWAY 915 DENSITY FCCC
Ref 9.424 dBm #Atten 40 dB

Mkr1 915.1744 MHz
1.919 dBm



Center 915 MHz
#Res BW 3 kHz

*VBW 300 kHz

Span 750 kHz
#Sweep 83.34 ms (401 pts)

Signal (θ)	Freq	Peak Ampl dBm	Qp Ampl dBm	Avg Ampl dBm	QP △ LL1 dB	QP △ LL2 dB
Deleted signal.						

Deleted signal.

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Measurement Protocol

The methodology used during the testing performed on the EUT in this report was ANSI C63.4:2009.

The EUT was powered with a 120 VAC 60 Hz during the collection of data included within this report.

The data is compared to FCC Part 15.247 Class C limits.

KDB 558074 was used as a measurement guide during collection of data in this report

Please have a company official review this report and sign.



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