

Test Report # 317246 A

Equipment Under Test: Power Wave Communication Kit

Test Date(s): 8/1/17 to 8/16/17

Prepared for: Samir Farah

The Lincoln Electric Company
22801 St. Clair Ave
Cleveland, OH 44117

Report Issued by: Khairul Aidi Zainal, Laboratory Manager

Signature: 

Date: 10/6/17

Report Reviewed by: Adam Alger, Quality Systems Engineer

Signature: 

Date: 10/02/2017

Report Constructed by: Khairul Aidi Zainal, Laboratory Manager

Signature: 

Date: 9/10/17

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Company: Laird Technologies, Inc.		Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771	Page 1 of 48	Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

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Laird Technologies Test Services in Review

The Laird Technologies, Inc. laboratory located at W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA is recognized through the following organizations:



A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

Scope of accreditation includes all test methods listed herein, unless otherwise noted.



Federal Communications Commission (FCC) – USA

Accredited recognition of two 3 meter Semi-Anechoic Chambers

Accredited Test Firm Registration Number: 953492



Government
of Canada

Innovation, Science and Economic Development Canada

ISED Site listing of two 3 meter Semi-Anechoic Chambers based on RSS-GEN – Issue 4

File Number: IC 3088A-2

File Number: IC 3088A-3

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1 TEST REPORT SUMMARY

During 8/1/2017 to 8/13/2017, the Equipment Under Test (EUT), **Power Wave Communication kit**, as provided by **The Lincoln Electric Company** was tested to the following requirements:

Requirement	Description	Specification	Method	Result
FCC: 15.247 (a)(2) IC: RSS-247 5.2 (1)	Digital Modulation System 6 dB bandwidth	500 kHz	KDB 558074	Pass
FCC: 2.1049 IC: RSS-GEN 6.6	Occupied Bandwidth	Reported	KDB 558074	Pass
FCC: 15.247 (b)(3) IC: RSS-247 5.4 (4)	Maximum Conducted Output Power	30 dBm	KDB 558074	Pass
FCC: 15.247 (e) IC: RSS-247 5.2 (2)	Digital Modulation System Power Spectral Density	8 dBm / 3 kHz	KDB 558074	Pass
FCC: 15.247 (d) IC: RSS-247 5.5	RF Spurious Emissions at the Transmitter Antenna Terminal	20 dBc	KDB 558074	Pass
FCC: 15.247 (d) IC: RSS-GEN 8.10	Spurious Radiated Emissions in Restricted Bands	FCC 15.209 RSS-GEN 8.9	ANSI C63.10	Pass
FCC: 2.1055 (d) IC: RSS-GEN 6.11	Frequency Stability	Reported	ANSI C63.10	Pass
FCC: 15.207 IC: RSS-GEN 8.8	AC Power Line Conducted Emissions	0.150-30 MHz	ANSI C63.10	Pass

Notice:

The results relate only to the item tested and described in this report. Any modifications made to the equipment under test after the specified test date(s) may invalidate the data herein.

If the resulting measurement margin is seen to be within the uncertainty value, as listed in this report, the possibility exists that this unit may not meet the required limit specification if subsequently tested.

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2 CLIENT INFORMATION

Company Name	The Lincoln Electric Company
Contact Person	Samir Farah
Address	22801 St, Clair Avenue, Cleveland, OH. 44117

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	Power Wave Communication Kit
Model Number	G8814
Serial Number	100002017212001, 100002017132023 (radiated) 100002017212002, 100002017123015 (Conducted)
FCC / IC ID	2AJY8-LEWB0000111/22017-LEWB0000111

2.2 Product Description

A connectivity gateway that will be used in conjunction with a welder. This communication gateway implements Bluetooth and WLAN technologies.

2.3 Modifications Incorporated for Compliance

None at time of test

2.4 Deviations and Exclusions from Test Specifications

None at time of test

2.5 Additional Information

The EUT could be programmed for specific test modes in two ways:

1. EUT was programmed into the appropriate test modes using a proprietary test tool, ArcLink Suite. The test tool was installed on a laptop and connection to the EUT was via an Ethernet cable. The revision of the test tool used during testing was 7.0.0.3395
2. Programming through a series of button pushes on the front of the EUT.

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3 REFERENCES

Publication	Edition	Date
CFR 47 Part 15	-	2017
ANSI C63.10	-	2013
RSS-247	2	2017
RSS GEN	4	2014
KDB 558074	4	2017

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4 UNCERTAINTY SUMMARY

Using the guidance of the following publications the calculated measurement uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k = 2.

References	Version / Date
CISPR 16-4-1	Ed. 2 (2009-02)
CISPR 16-4-2	Ed. 2 (2011-06)
CISPR 32	Ed. 1 (2012-01)
ANSI C63.23	2012
A2LA P103	February 4, 2016
A2LA P103c	August 10, 2015
ETSI TR 100-028	V1.3.1 (2001-03)

Measurement Type	Configuration	Uncertainty ±
Radiated Emissions	Biconical Antenna	5.0 dB
Radiated Emissions	Log Periodic Antenna	5.3 dB
Radiated Emissions	Horn Antenna	4.7 dB
AC Line Conducted Emissions	Artificial Mains Network	3.4 dB
Telecom Conducted Emissions	Asymmetric Artificial Network	4.9 dB
Disturbance Power Emissions	Absorbing Clamp	4.1 dB
Radiated Immunity	3 Volts/meter	2.2 dB
Conducted Immunity	CDN/EM/BCI	2.4/3.5/3.4 dB
EFT Burst/Surge	Peak pulse voltage	164 volts
ESD Immunity	15 kV level	1377 Volts

Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	1×10^{-7}	0.55×10^{-7}
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

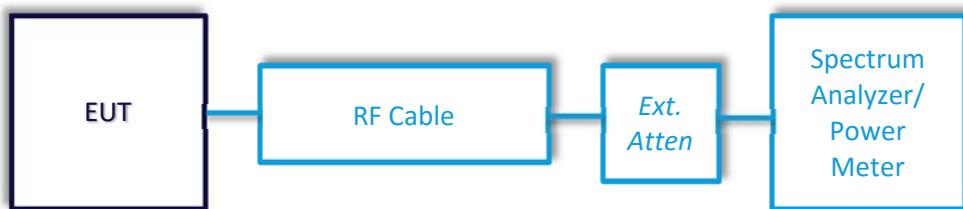
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5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	<p>The direct measurement of emissions at the antenna port of the EUT is achieved by use of a RF connection to a spectrum analyzer or power meter.</p> <p>The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.</p>
Example Calculations	<p>Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm)</p> <p>Margin (dB) = Limit (dBm) – Corrected Reading (dBm)</p>

Block Diagram



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Instrumentation



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Date : 31-Jul-2017		Test : Conducted measurements				Job # : C-2771		
PE: Aidi		Customer: Lincoln Electric		Quote #: 317246				
No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	11/21/2016	11/21/2017	Active Calibration
2	EE 960088	EMI Receiver	Agilent	N9038A	MY51210138	3/2/2017	3/2/2018	Active Calibration
3	EE 960091	Power Sensor	Anritsu	MA2491A	1249277	4/5/2017	4/5/2018	Active Calibration
4	EE 960087	Spectrum Analyzer	Agilent	N9010A	MY53400296	12/22/2016	12/22/2017	Active Calibration
5	EE 960090	Power Meter	Anritsu	ML2495A	1335006	4/5/2017	4/5/2018	Active Calibration
6	AA 960160	UTIFLEX Cable	Micro-Coax	UFC142A-0-0720-2002:218652-001		6/29/2016	8/3/2017	Active Verification

5.1.1 Antenna Port Conducted Emissions – DTS/99% Bandwidth

Operator	Aidi Zainal
QA	Coty Hammerer
Test Date	8/15/17
Location	Conducted measurement area
Temp. / R.H.	70F / 71%
Requirement	15.247 (a) (2)
Method	FCC KDB 558074 D01 DTS Meas Guidance V04, section 8.2 (option 2), C63.10 section 6.9.3

Limits:

Minimum 6 dB BW (MHz)	0.5
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Test Parameters

Frequency	2412, 2437 and 2462 MHz
Settings	Peak Detector (Max hold), RBW=100kHz (DTS Bandwidth),
Settings	Peak Detector (Max hold), RBW=200kHz (99% Bandwidth),
Notes	Only select data rate plots presented.

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Table
A. 802.11 b
DTS Bandwidth:

1MBPS				
Channel	Frequency (MHz)	DTS Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
1	2412.0	9.5	0.5	9.0
6	2437.0	9.6	0.5	9.1
11	2462.0	9.6	0.5	9.1

11MBPS				
Channel	Frequency (MHz)	DTS Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
1	2412.0	10.1	0.5	9.6
6	2437.0	10.1	0.5	9.6
11	2462.0	10.1	0.5	9.6

99% Bandwidth:

1MBPS		
Channel	Frequency (MHz)	99% Bandwidth (MHz)
1	2412.0	14.0
6	2437.0	14.0
11	2462.0	14.0

11MBPS		
Channel	Frequency (MHz)	99% Bandwidth (MHz)
1	2412.0	14.3
6	2437.0	14.4
11	2462.0	14.4

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B. 802.11 g

DTS Bandwidth:

6MBPS				
Channel	Frequency (MHz)	DTS Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
1	2412.0	15.1	0.5	14.6
6	2437.0	15.1	0.5	14.6
11	2462.0	15.1	0.5	14.6

54MBPS				
Channel	Frequency (MHz)	DTS Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
1	2412.0	16.4	0.5	15.9
6	2437.0	16.1	0.5	15.6
11	2462.0	16.4	0.5	15.9

99% Bandwidth:

6MBPS		
Channel	Frequency (MHz)	99% Bandwidth (MHz)
1	2412.0	16.4
6	2437.0	17.2
11	2462.0	16.4

54MBPS		
Channel	Frequency (MHz)	99% Bandwidth (MHz)
1	2412.0	16.6
6	2437.0	16.6
11	2462.0	16.6

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C. 802.11 n

DTS Bandwidth:

MCS0				
Channel	Frequency (MHz)	DTS Bandwidth (MHz)	Limit (MHz)	Margin (MHz)
1	2412.0	15.1	0.5	14.6
6	2437.0	15.1	0.5	14.6
11	2462.0	15.1	0.5	14.6

MCS7				
Channel	Frequency (MHz)	DTS Bandwidth (MHz)	Limit (dBm)	Margin (dB)
1	2412.0	17.6	0.5	17.1
6	2437.0	17.7	0.5	17.2
11	2462.0	17.7	0.5	17.2

99% Bandwidth:

MCS0		
Channel	Frequency (MHz)	99% Bandwidth (MHz)
1	2412.0	17.5
6	2437.0	17.7
11	2462.0	17.5

MCS7		
Channel	Frequency (MHz)	99% Bandwidth (MHz)
1	2412.0	17.8
6	2437.0	17.8
11	2462.0	17.8

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Plots

802.11 b: 1 MBPS



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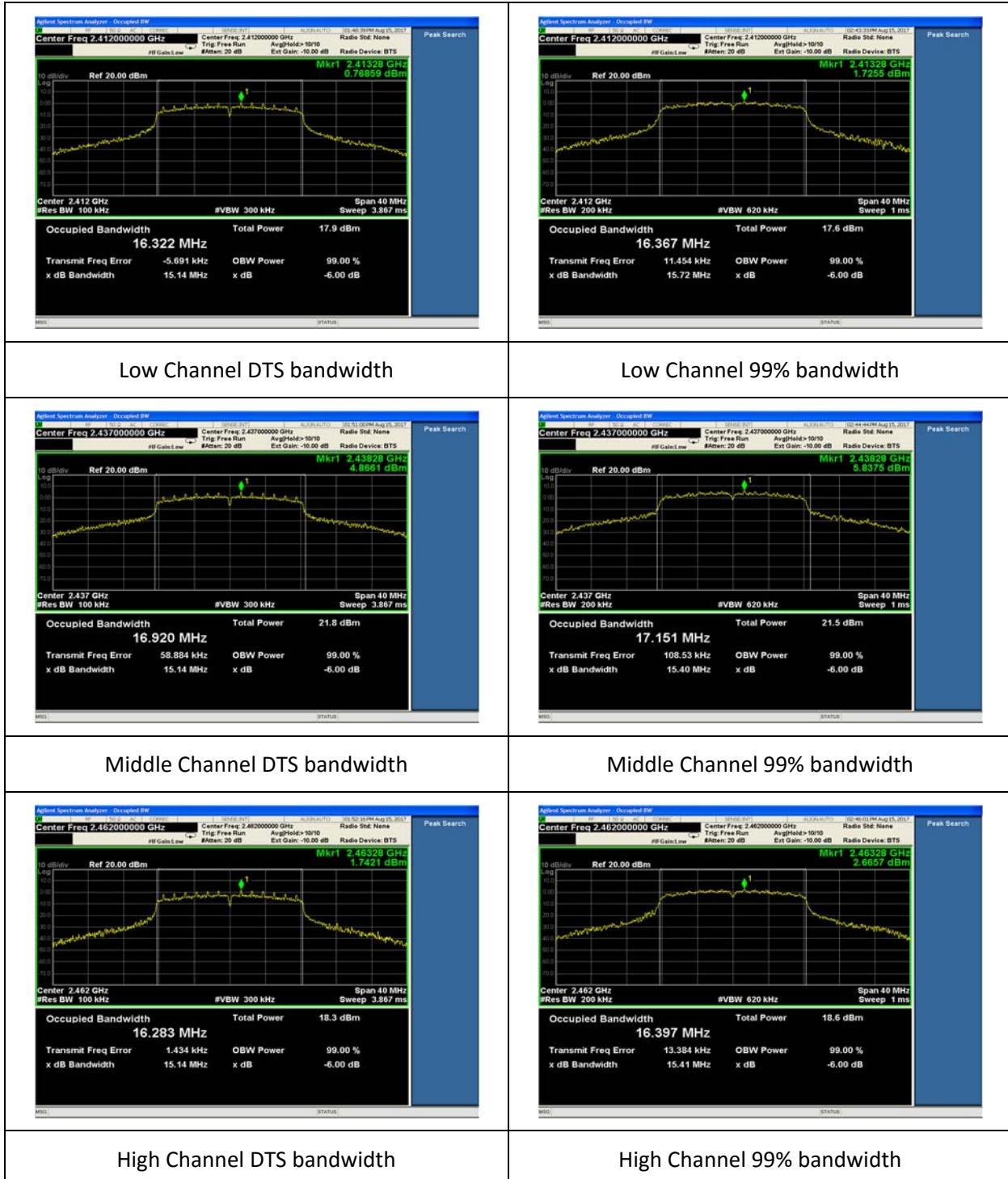
Name: Power Wave Communication Kit

Model: G8814

Serial:

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802.11 g: 6 MBPS



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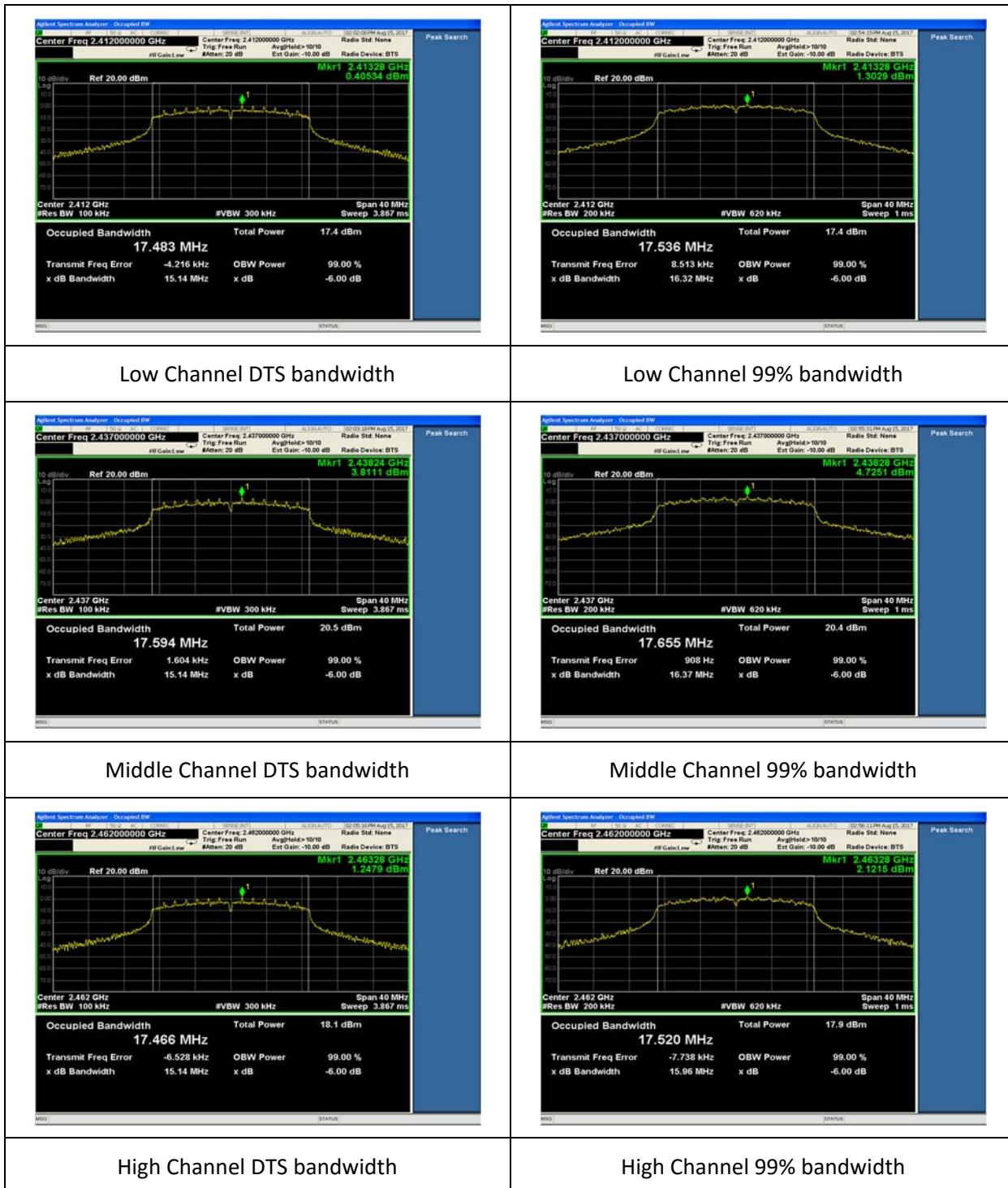
Name: Power Wave Communication Kit

Model: G8814

Serial:

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802.11 n: MCS0



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5.1.2 Antenna Port Conducted Emissions – Conducted Output Power

Operator	Aidi
QA	Coty H.
Test Date	8/14/2017
Location	Conducted measurement area
Temp. / R.H.	72/75
Requirement	15.247 (b) (3)
Method	FCC KDB 558074 D01 DTS Meas Guidance V04, section 9.1.3

Limits:

Maximum Conducted Output Power (dBm)	Maximum Conducted Output Power (watts)
30	1

Test Parameters

Frequency	2412, 2437 and 2462 MHz
Settings	Wideband Power meter and sensor
Settings	Channel mode = Modulated, Measurement = Peak
Settings	Trigger source = internal A

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Table
A. 802.11b

1MBPS				
Channel	Frequency (MHz)	Peak Output power (dBm)	Limit (dBm)	Margin (dB)
1	2412.0	14.7	30.0	15.3
6	2437.0	15.9	30.0	14.1
11	2462.0	15.7	30.0	14.3

11MBPS				
Channel	Frequency (MHz)	Peak Output power (dBm)	Limit (dBm)	Margin (dB)
1	2412.0	14.8	30.0	15.2
6	2437.0	16.2	30.0	13.8
11	2462.0	15.6	30.0	14.4

B. 802.11g

6MBPS				
Channel	Frequency (MHz)	Peak Output power (dBm)	Limit (dBm)	Margin (dB)
1	2412.0	17.5	30.0	12.5
6	2437.0	18.2	30.0	11.8
11	2462.0	18.1	30.0	11.9

54MBPS				
Channel	Frequency (MHz)	Peak Output power (dBm)	Limit (dBm)	Margin (dB)
1	2412.0	16.8	30.0	13.2
6	2437.0	17.5	30.0	12.5
11	2462.0	17.2	30.0	12.8

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C. 802.11n

MCS0				
Channel	Frequency (MHz)	Peak Output power (dBm)	Limit (dBm)	Margin (dB)
1	2412.0	18.0	30.0	12.0
6	2437.0	18.5	30.0	11.5
11	2462.0	18.3	30.0	11.7

MCS7				
Channel	Frequency (MHz)	Peak Output power (dBm)	Limit (dBm)	Margin (dB)
1	2412.0	15.5	30.0	14.5
6	2437.0	17.6	30.0	12.4
11	2462.0	17.1	30.0	12.9

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5.1.3 Antenna Port Conducted Emissions – Power Spectral Density

Operator	Aidi
QA	Coty H.
Test Date	8/15/2017
Location	Conducted measurement area
Temp. / R.H.	70F / 71%
Requirement	15.247 (e)
Method	FCC KDB 558074 D01 DTS Meas Guidance V04, Section 10.2

Limits:

**Power Spectral Density
(dBm/ 3 kHz)**

8

Test Parameters

Frequency	2412, 2437 and 2462 MHz
Settings	Peak detector with Max hold
Settings	RBW=100kHz
Settings	Span 1.5 times DTS BW
Note	Only select data rate plots presented

Table

A. 802.11b

1MBPS				
Channel	Frequency (MHz)	100kHz PSD (dBm)	3kHz Limit (dBm)	Margin (dB)
1	2412.0	3.9	8.0	4.1
6	2437.0	5.5	8.0	2.5
11	2462.0	5.3	8.0	2.7

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11MBPS				
Channel	Frequency (MHz)	100kHz PSD (dBm)	3kHz Limit (dBm))	Margin (dB)
1	2412.0	2.9	8.0	5.1
6	2437.0	4.3	8.0	3.7
11	2462.0	4.1	8.0	3.9

B. 802.11g

6MBPS				
Channel	Frequency (MHz)	100kHz PSD (dBm)	3kHz Limit (dBm)	Margin (dB)
1	2412.0	0.9	8.0	7.1
6	2437.0	4.9	8.0	3.1
11	2462.0	1.8	8.0	6.2

54MBPS				
Channel	Frequency (MHz)	100kHz PSD (dBm)	3kHz Limit (dBm)	Margin (dB)
1	2412.0	-3.2	8.0	11.2
6	2437.0	-1.1	8.0	9.1
11	2462.0	-1.8	8.0	9.8

C. 802.11n

MCS0				
Channel	Frequency (MHz)	100kHz PSD (dBm)	3kHz Limit (dBm)	Margin (dB)
1	2412.0	0.4	8.0	7.6
6	2437.0	3.8	8.0	4.2
11	2462.0	1.3	8.0	6.7

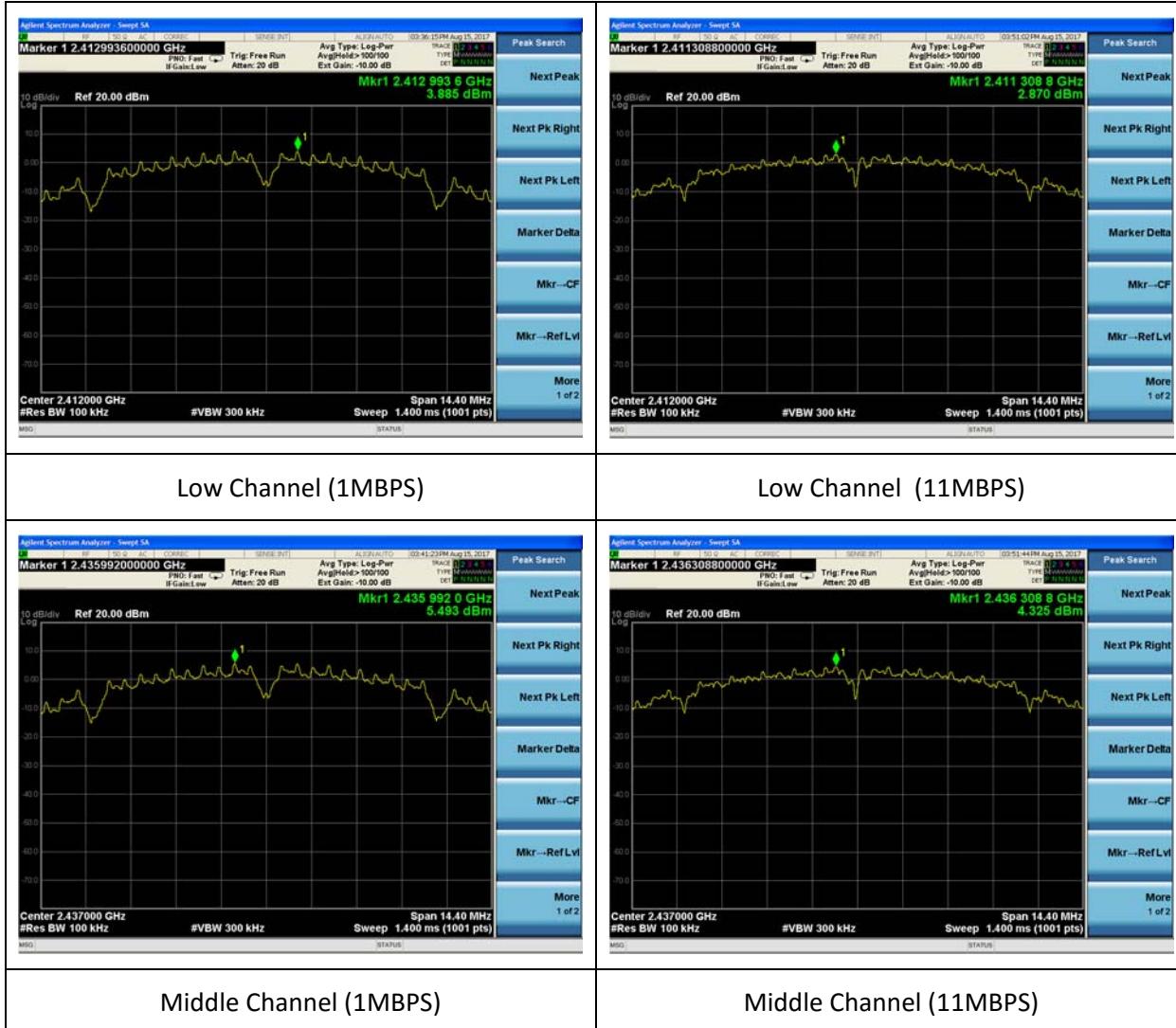
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MCS7				
Channel	Frequency (MHz)	100kHz PSD (dBm)	3kHz Limit (dBm)	Margin (dB)
1	2412.0	-4.8	8.0	12.8
6	2437.0	-2.7	8.0	10.7
11	2462.0	-3.2	8.0	11.2

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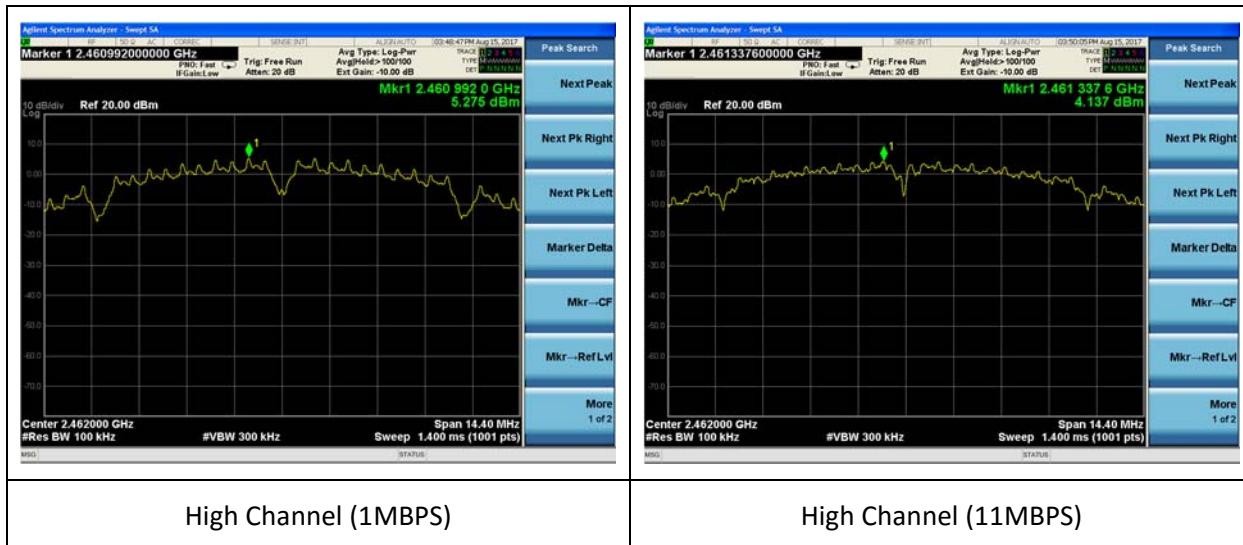
Plots

802.11 b:

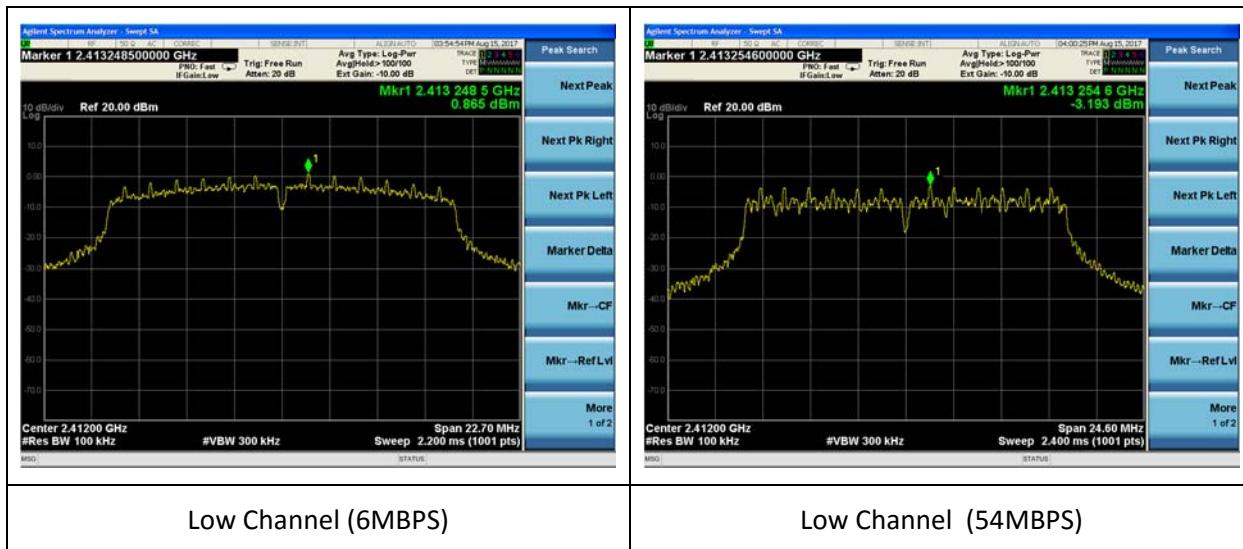


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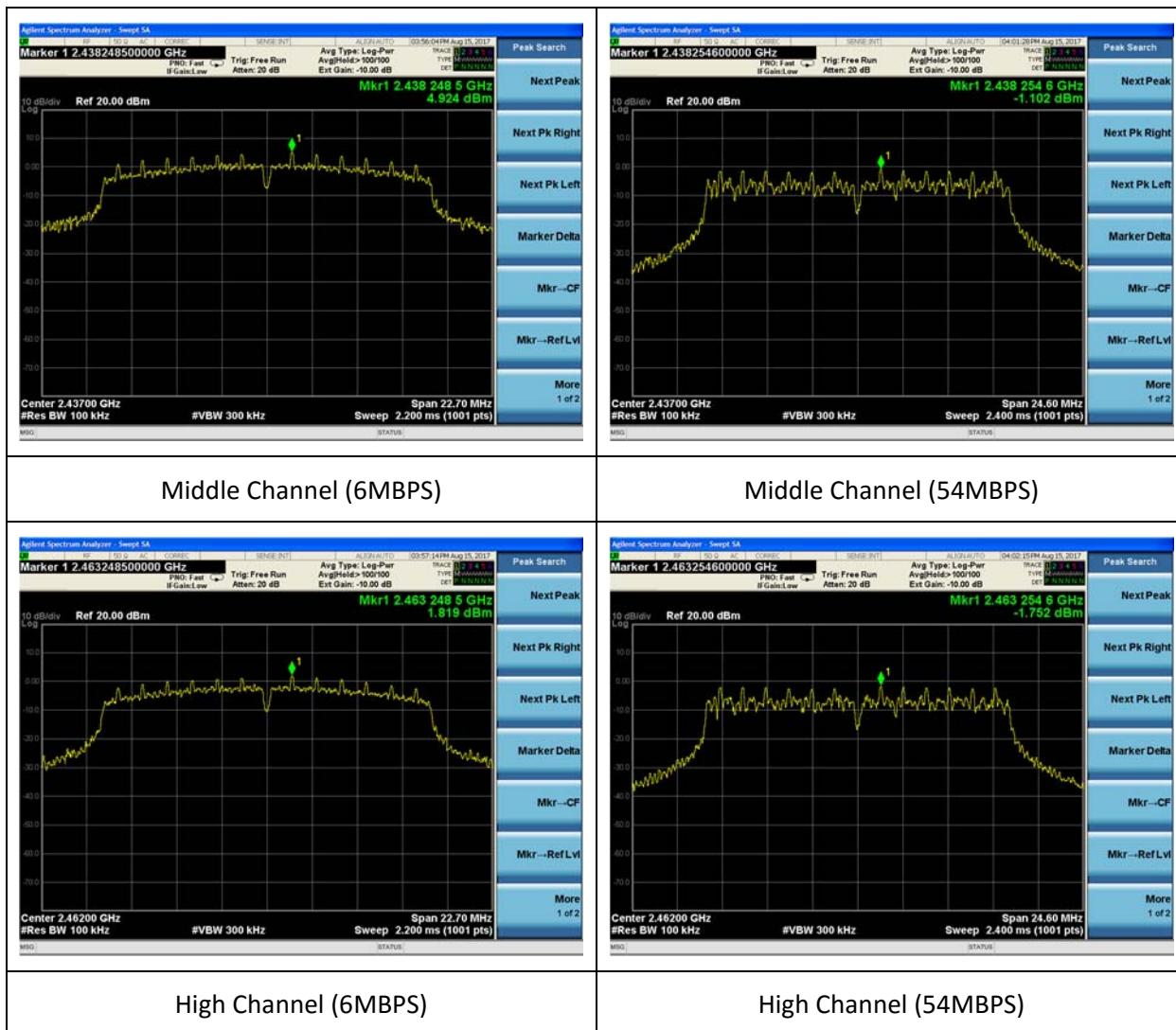


802.11 g:



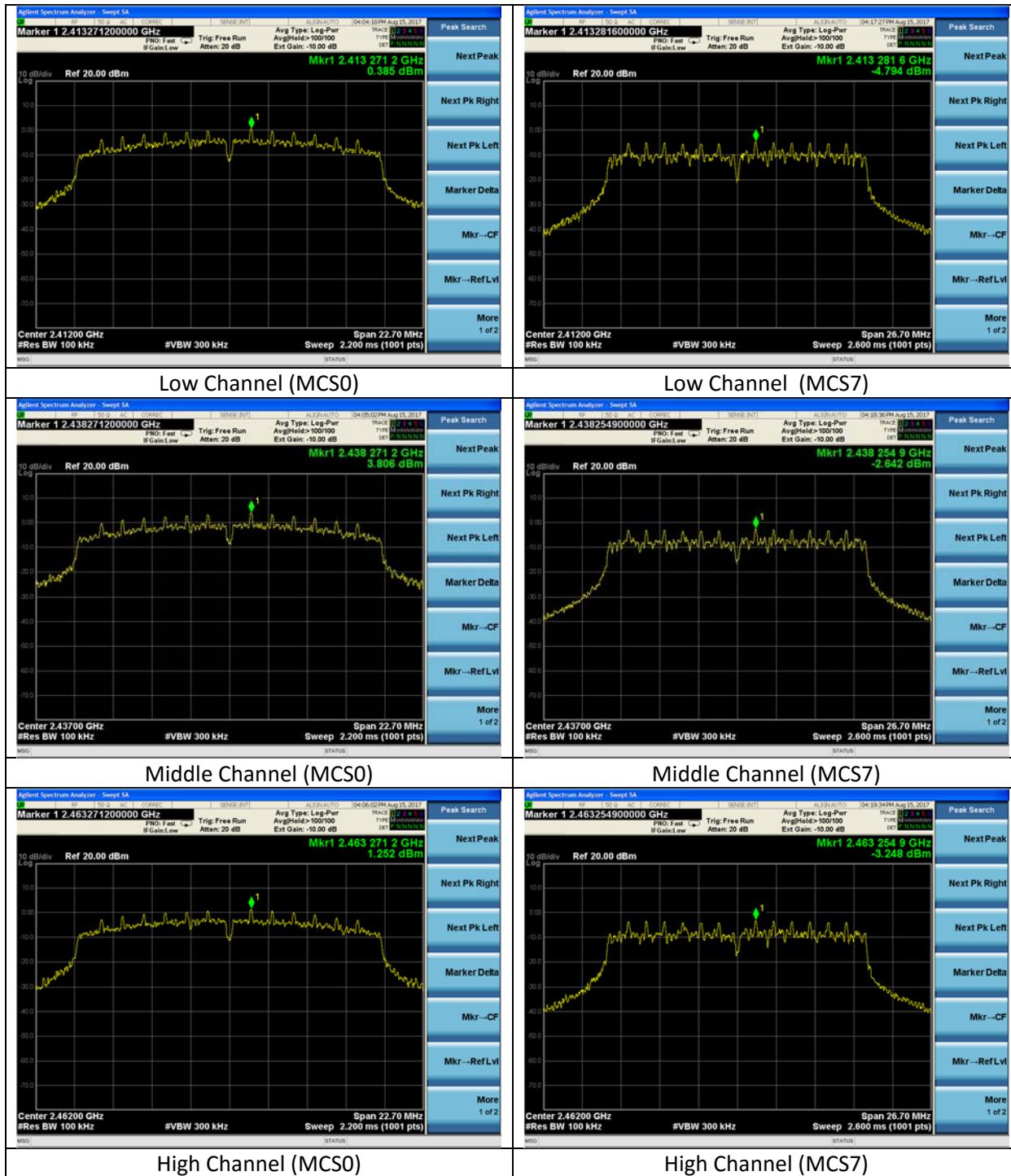
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802.11 n: MCS0



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5.1.4 Antenna Port Conducted Emissions – Tx Conducted Spurious

Operator	Aidi
QA	Coty H.
Test Date	8/16/2017
Location	Conducted measurement area
Temp. / R.H.	72F / 76%
Requirement	15.247 (d)
Method	FCC KDB 558074 D01 DTS Meas Guidance V04, section 11

Limits:

**Spurious Emissions
Limit (dBc from
Reference Point)**

20

Test Parameters

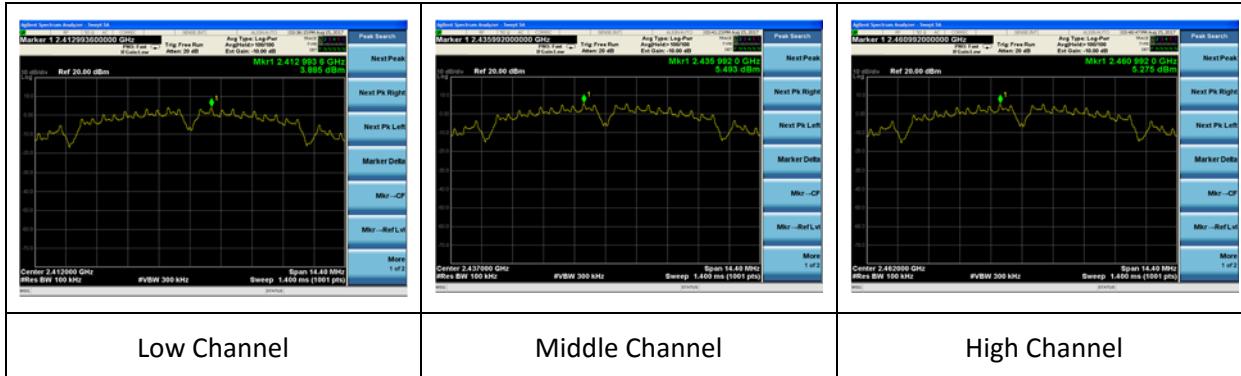
Frequency	2412, 2437 and 2462 MHz
Settings	Peak detector with Max hold
Settings	RBW=100kHz
Settings	VBW = 300kHz
Notes	Spurious emissions < 20dBc
Notes	One data rate for each IEEE standard (lower data rate) presented

All emissions within the range of investigation were found to be greater than 20dB below the limit.

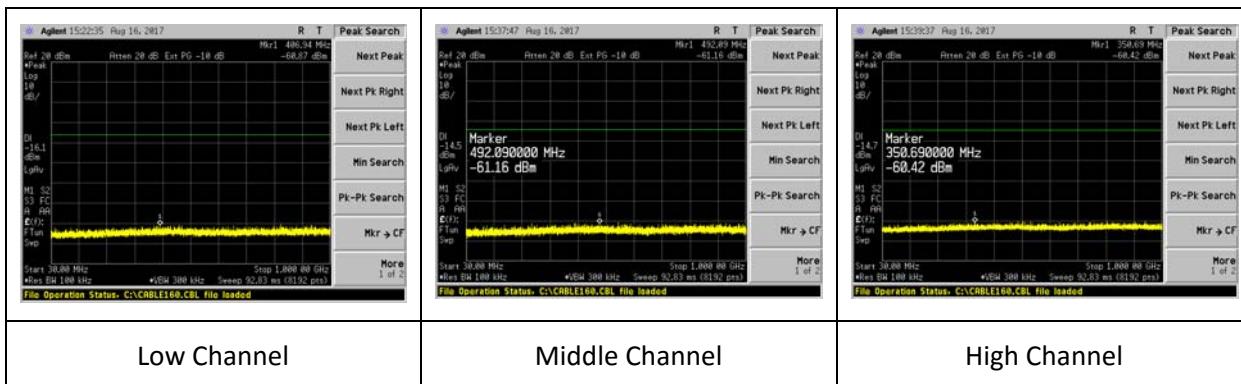
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Job: C-2771		Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

Plots

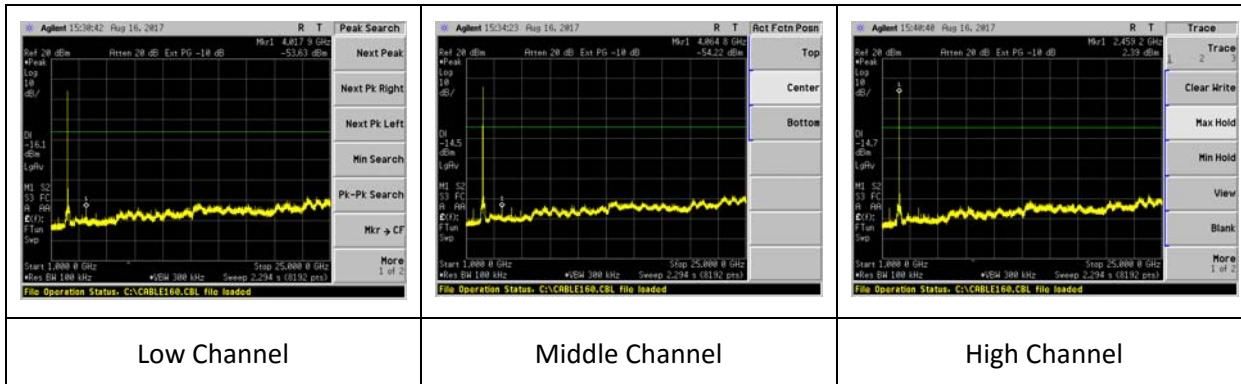
802.11b:



Reference level



30MHz to 1000MHz

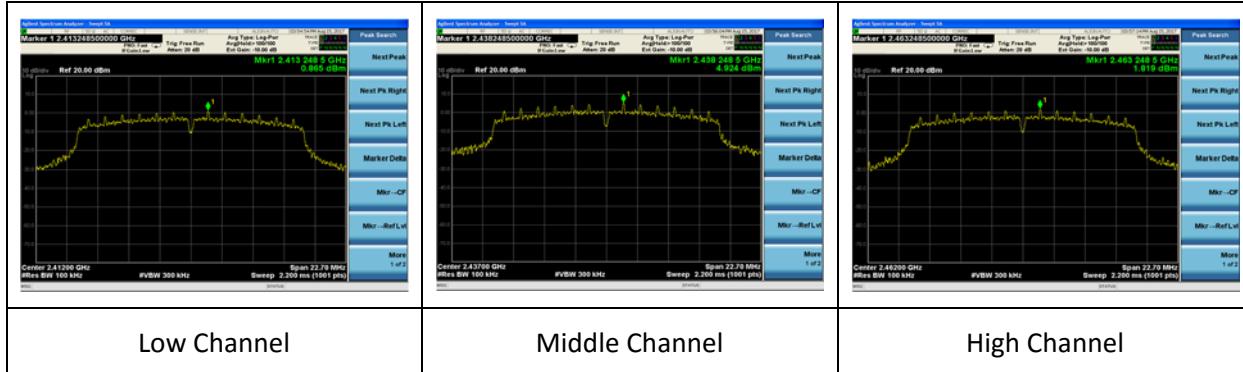


Company: The Lincoln Electric Company
Report: 317246 A
Job: C-2771

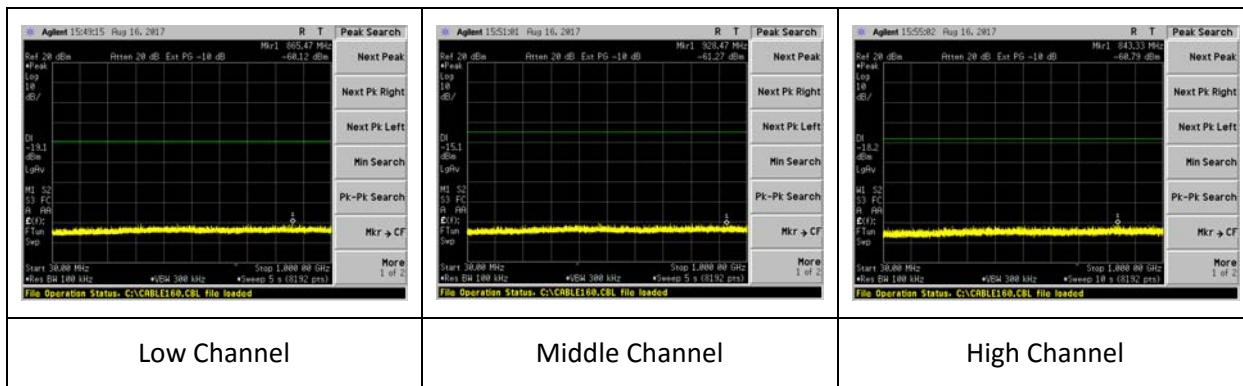
Name: Power Wave Communication Kit
Model: G8814
Serial: 100002017212001, 100002017212002, 100002017132023, 100002017123015

1000MHz to 25000MHz

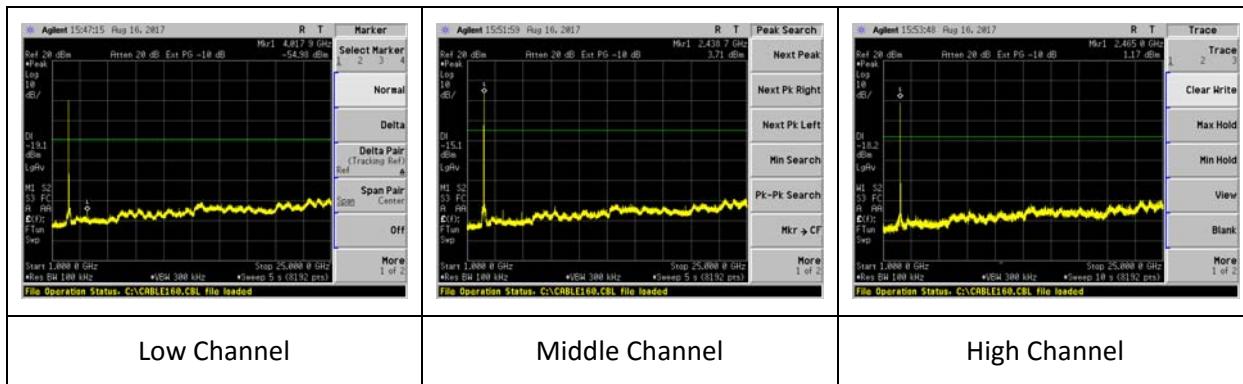
802.11g:



Reference level



30MHz to 1000MHz



Company: The Lincoln Electric Company

Report: 317246 A

Job: C-2771

Name: Power Wave Communication Kit

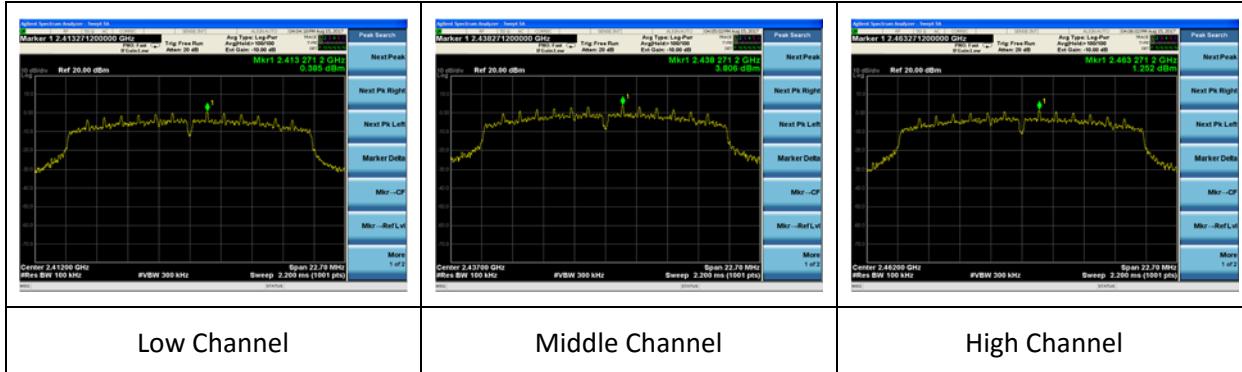
Model: G8814

Serial:

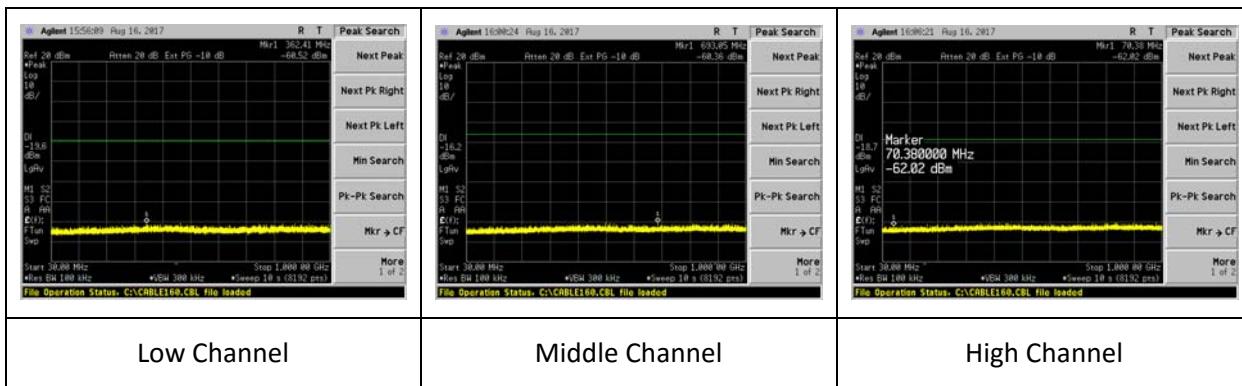
100002017212001, 100002017212002,
100002017132023, 100002017123015

1000MHz to 25000MHz

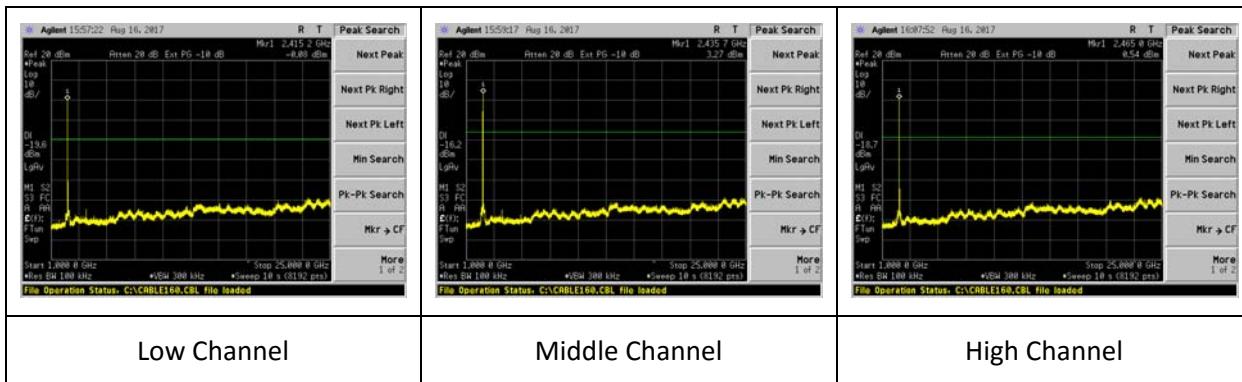
802.11g:



Reference level



30MHz to 1000MHz



Company: The Lincoln Electric Company

Report: 317246 A

Job: C-2771

Name: Power Wave Communication Kit

Model: G8814

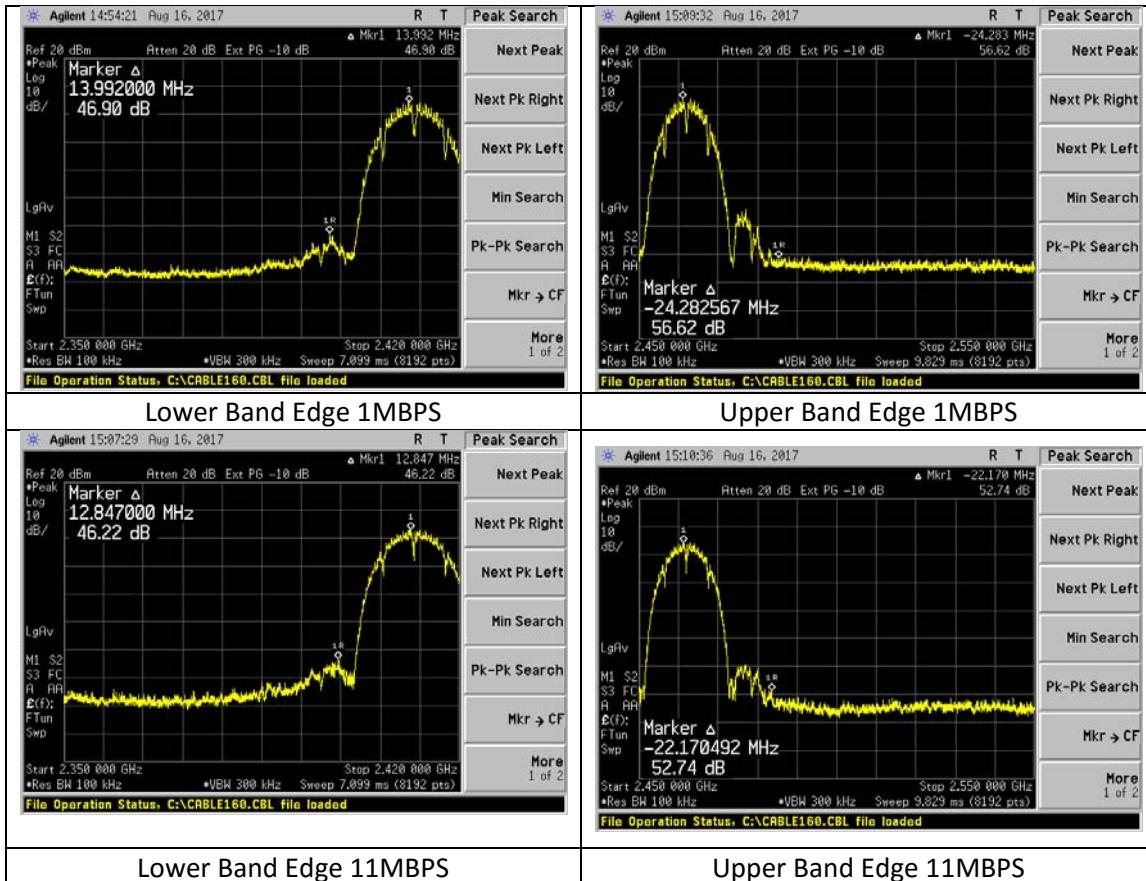
Serial:

100002017212001, 100002017212002,
100002017132023, 100002017123015

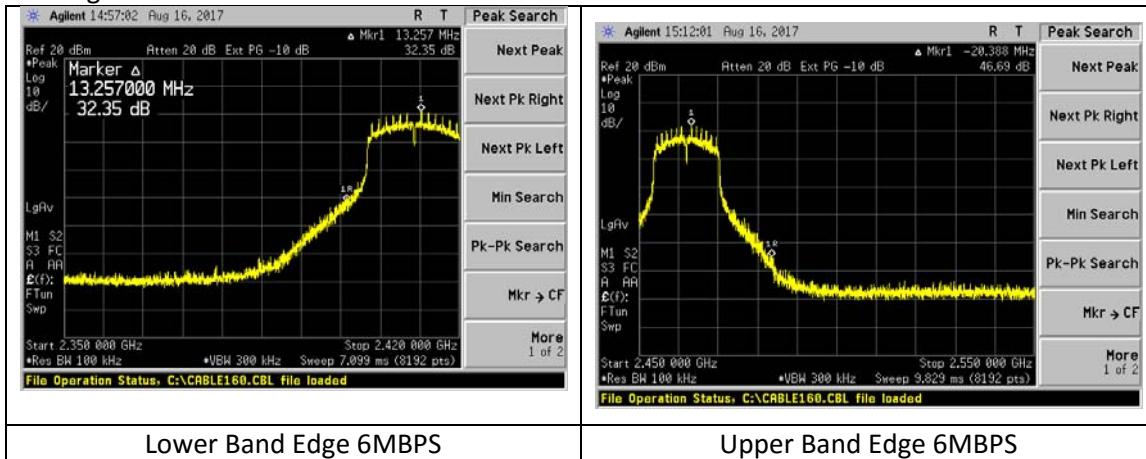
1000MHz to 25000MHz

Band-edges:

A. 802.11b

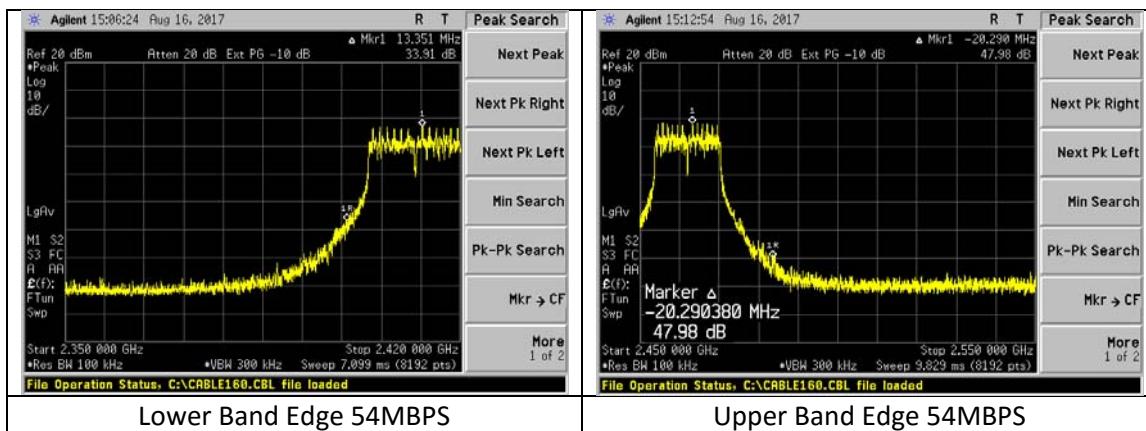


B. 802.11g

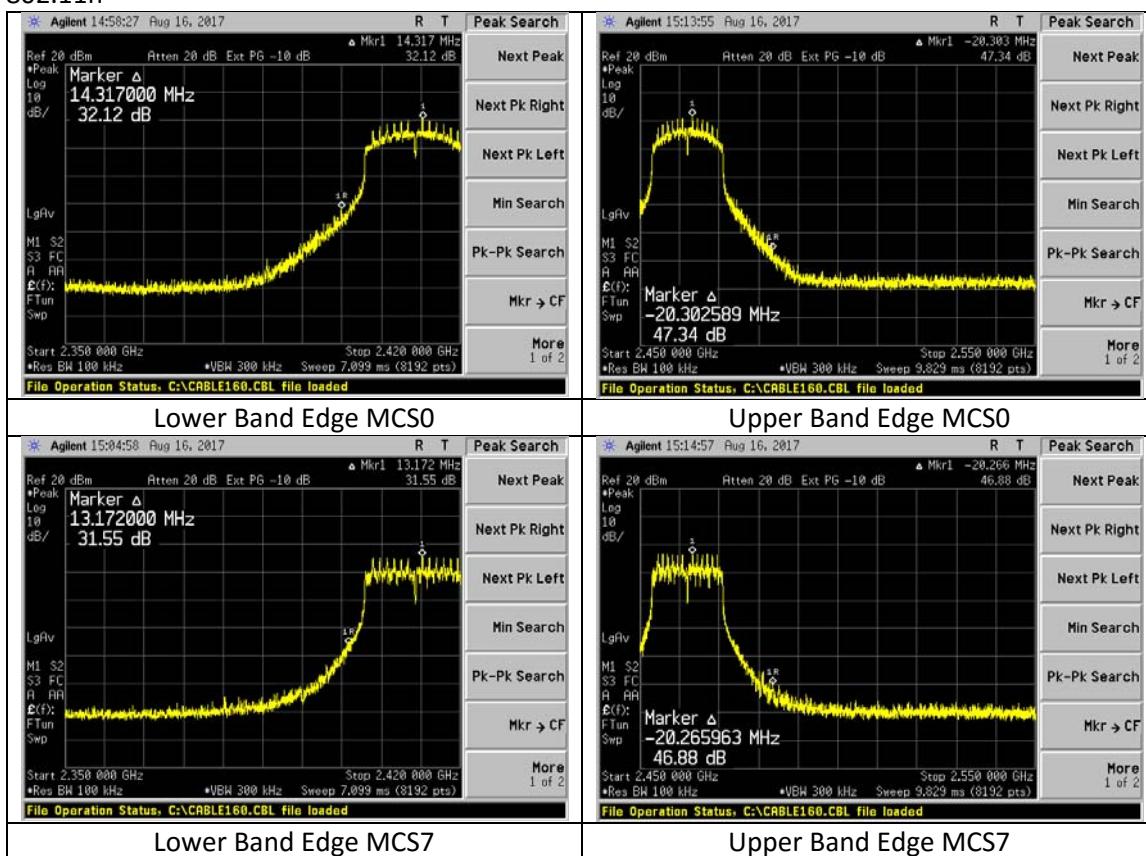


Company: The Lincoln Electric Company
Report: 317246 A
Job: C-2771

Name: Power Wave Communication Kit
Model: G8814
Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015



C. 802.11n



Company: The Lincoln Electric Company
Report: 317246 A
Job: C-2771

Name: Power Wave Communication Kit
Model: G8814
Serial: 100002017212001, 100002017212002, 100002017132023, 100002017123015

5.1.5 Antenna Port Conducted Emissions – Frequency Stability

Operator	Zach Wilson
QA	Aidi Zainal
Test Date	8/17/17
Location	Radio Bench
Temp. / R.H.	70 / 82%
Requirement	2.1055 (d)
Method	ANSI C63.10 Section 6.8

Test Parameters

Frequency	2402, 2440, 2480 MHz
Settings	Transmit in CW mode

Table

	Supply Voltage			Freq Deviation (Hz)	Limit (Hz)
	30.6 VDC	36.0 VDC	41.4VDC		
Low channel (Hz)	2411989199	2411989489	2411988439	1050	241200
Middle channel (Hz)	2436988690	2436988149	2436988233	541	243700
High channel (Hz)	2461989188	2461988712	2461988717	476	246200

EUT frequency stability found to be better than 100PPM

Company: The Lincoln Electric Company	Page 32 of 48	Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771		Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

5.2 Radiated Emissions

Description of Measurement	<p>The frequency spectrum is investigated for intentional and / or unintentional signals emanating from the EUT by use of a standardized test site and measurement antenna.</p> <p>The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed allowing the data to be gathered and reported as corrected values.</p> <p>The maximum emissions from the EUT are determined by turn-table azimuth rotation (360°) and scanning of the measurement antenna. Maximized levels are noted at degree values of azimuth, measurement antenna height, and measurement antenna polarity.</p>
Example Calculations	<p>Measurement (dBμV) + Cable factor (dB) + Other (dB) + Antenna Factor (dB/m) = Corrected Reading (dBμV/m)</p> <p>Margin (dB) = Limit (dBμV/m) - Corrected Reading (dBμV/m)</p> <p>Example at 4000 MHz:</p> <p>Reading = 40 dBμV + 3.4 dB + 0.9 dB + 6.5 dB/m = 50.8 dBμV/m</p> <p>Average Limit = $20 \log (500) = 54$ dBμV/m</p> <p>Margin = 54 dBμV/m - 50.8 dBμV/m = 3.2 dB</p>

Block Diagram



Company: The Lincoln Electric Company		Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771	Page 33 of 48	Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

Instrumentation



Smart Technology. Delivered.

Date : 31-Jul-2017			Test : Radiated Emissions			Job # : C-2771		
PE: Aidi			Customer: Lincoln Electric			Quote #: 317246		
No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960085	EMI Receiver	Agilent	N9038A	MY51210148	5/12/2017	5/12/2018	Active Calibration
2	AA 960158	Double Ridge Horn Antenna	ETS Lindgren	3117	109300	10/13/2016	10/13/2017	Active Calibration
3	EE 960159	Low Noise Amplifier	Mini-Circuits	ZVA-213XS+	462101702	4/12/2017	4/12/2018	Active Calibration
4	AA 960154	High Pass Filter 2.4 GHz	KWM	HPT-L-14186	7272-02	7/25/2016	8/24/2017	Active Calibration
5	EE 960087	Spectrum Analyzer	Agilent	N9010A	MY53400296	12/22/2016	12/22/2017	Active Calibration
6	AA 960176	Cable - low loss 6m	A.H. Systems, Inc.	SAC-26G-6	395	5/15/2017	5/15/2018	Active Verification
7	AA 960174	Small Horn Antenna	ETS Lindgren	3116C-PA	00206880	5/1/2017	5/1/2018	Active Calibration

5.2.1 Radiated Emissions

Operator	Zach Wilson, Aidi Zainal
QA	Aidi Zainal, Coty Hammerer
Test Date	8/1/17 to 8/10/17
Location	Chamber 5
Temp. / R.H.	75 °F / 55%
Requirement	15.247 (d)
Method	ANSI C63.10 Sections 6.3, 6.5, 6.6

Limits:

	30-88 MHz	88-216 MHz	216 – 960 MHz	960+ MHz
Field Strength (μ V/m)	100	150	200	500
Field Strength (dB μ V/m)	40.0	43.5	46.0	54.0

Company: The Lincoln Electric Company	Page 34 of 48	Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771		Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

Test Parameters

Frequency	30MHz to 25000MHz
Distance	3 meters
RBW	1 MHz
VBW	Avg 3 kHz, Peak 50 MHz
Notes	EUT tested in orientation declared by customer as normal operation which is 'Vertical': Display facing forward (refer to test setup photos)
Example Calculation	Limit (dB μ V) = 20 * Log[Limit (μ V)] $40 = 20 * \log (100)$ Raw Data + Antenna Factor + Cable Factor = Reported Data $19.77 \text{ dB}\mu\text{V} + 12.50 \text{ dB/m} + 0.93 \text{ dB} = 38.80 \text{ dB}\mu\text{V/m}$

Table

A. Emissions in the 30MHz to 1000MHz range

Frequency (MHz)	Height (m)	Azimuth (degree)	Quasi Peak Reading (dB μ V/m)	Quasi Peak Limit (dB μ V/m)	Margin (dB)	Antenna Polarity	EUT orientation
33.4	1.00	232	42.9	49.5	6.6	Vertical	TT
45.9	1.37	141.5	40.6	49.5	8.9	Vertical	TT
120.0	1.00	203	39.14	54.0	14.9	Vertical	TT
180.0	1.00	139.75	40.27	54.0	13.7	Vertical	TT
600.0	1.00	0	44.2	54.0	9.8	Vertical	TT
540.0	1.00	173.5	43.9	54.0	10.1	Horizontal	TT

Note:

1. All Emissions seen in this range was determined to be NOT a function of the radio. The emissions seen originates from the digital portion of the product which is classified as a class A industrial product.
2. TT = Table top

Company: The Lincoln Electric Company	Page 35 of 48	Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771		Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

B. Band-edge emissions

Data rate	Frequency (MHz)	Peak (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Frequency (MHz)	Average (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
1MPS	2488.3	60.8	74.0	13.2	2484.5	50.3	54.0	3.7
11MBPS	2488.2	61.9	74.0	12.1	2486.9	47.0	54.0	7.1
6MBPS	2483.7	65.0	74.0	9.0	2483.6	53.4	54.0	0.6
54MBPS	2484.2	63.6	74.0	10.4	2484.0	53.6	54.0	0.4
MCS0	2487.9	63.6	74.0	10.4	2483.5	53.3	54.0	0.7
MCS7	2484.5	62.4	74.0	11.6	2483.5	50.2	54.0	3.8
1MBPS	2386.5	61.1	74.0	12.9	2385.9	45.3	54.0	8.7
11MBPS	2361.9	61.4	74.0	12.6	2385.2	45.7	54.0	8.3
6MBPS	2316.4	60.8	74.0	13.2	2389.2	48.4	54.0	5.6
54MBPS	2389.7	61.4	74.0	12.6	2384.6	46.6	54.0	7.4
MCS0	2340.9	61.2	74.0	12.8	2389.5	47.7	54.0	6.3
MCS7	2353.7	61.4	74.0	12.6	2389.8	46.9	54.0	7.1

UBE

LBE

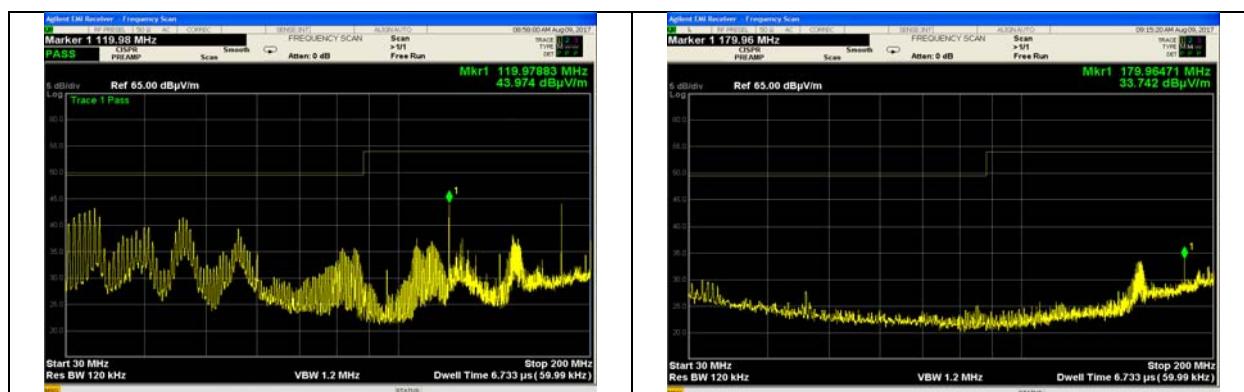
Company: The Lincoln Electric Company	Page 36 of 48	Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771		Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

C. Emissions in the 1000MHz to 2500MHz range

Frequency (MHz)	Peak (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (degrees)	Height(cm)	Polarity
4.824	53.0	74.0	21.0	51.3	54.0	2.7	199.5	124.7	Vertical
4.824	53.4	74.0	20.6	52.1	54.0	1.9	178.5	293.7	Horizontal
4.874	52.3	74.0	21.7	50.5	54.0	3.5	178.8	268.0	Horizontal
4.060	48.8	74.0	25.2	44.8	54.0	9.2	137.5	125.6	Vertical
4.874	51.6	74.0	22.4	49.5	54.0	4.5	199.5	121.2	Vertical
4.102	45.9	74.0	28.1	41.9	54.0	12.1	141.0	113.8	Vertical
4.924	50.1	74.0	23.9	48.0	54.0	6.0	188.0	257.3	Vertical
4.104	42.1	74.0	31.9	34.5	54.0	19.5	84.5	208.4	Horizontal
4.924	51.3	74.0	22.7	49.1	54.0	4.9	177.3	282.0	Horizontal

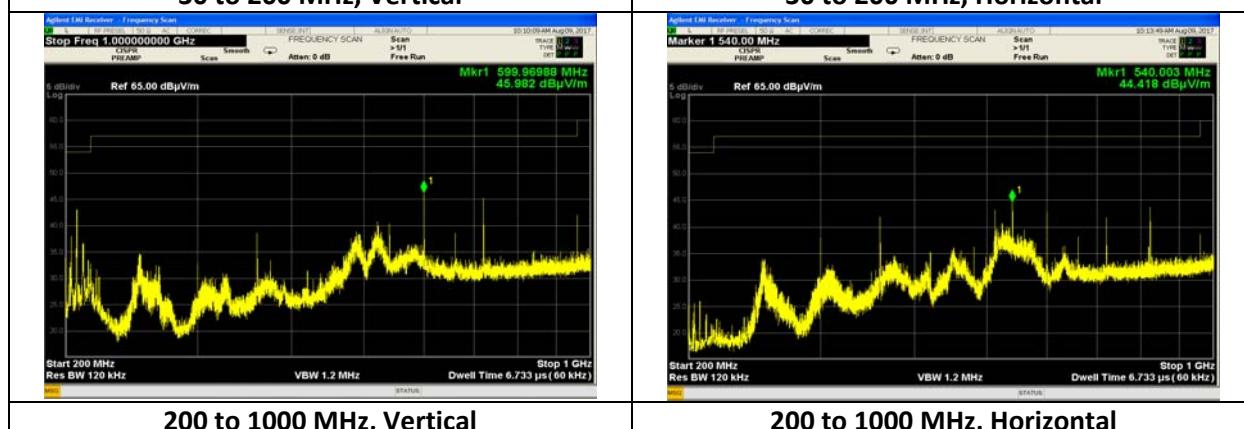
Plots

30MHz to 1000 MHz



30 to 200 MHz, Vertical

30 to 200 MHz, Horizontal

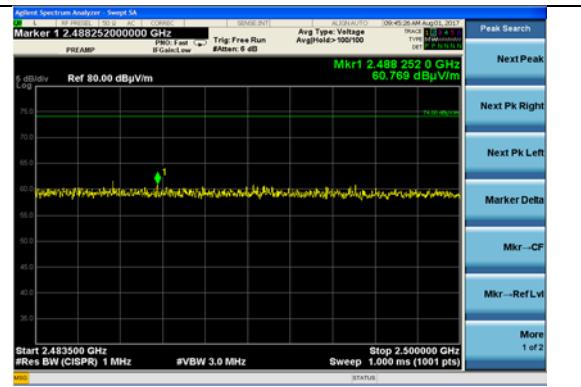
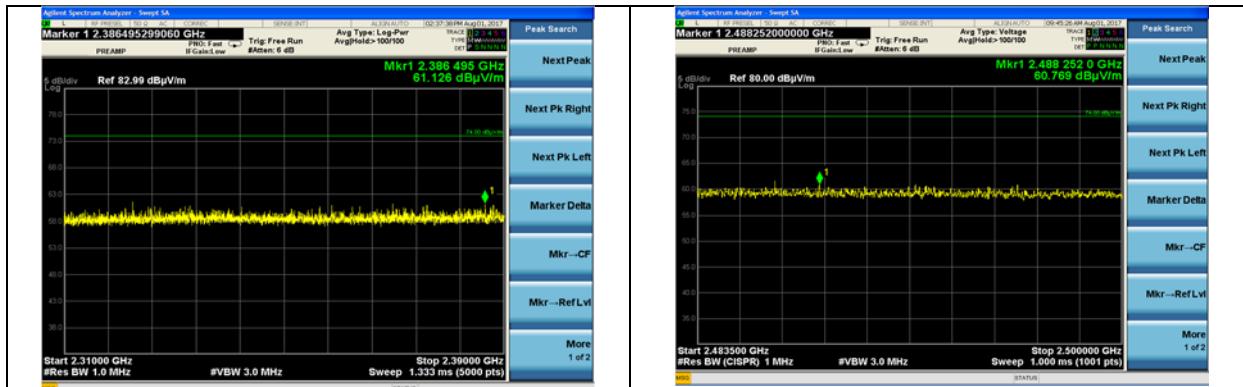


200 to 1000 MHz, Vertical

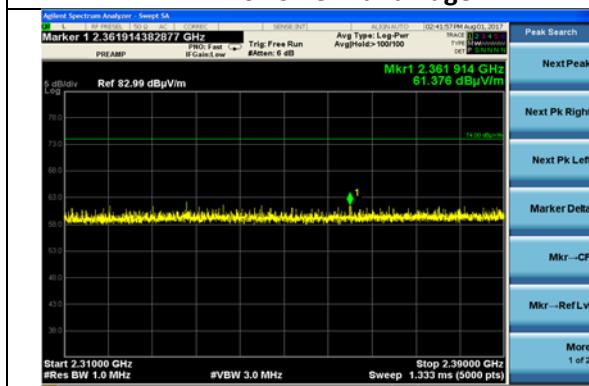
200 to 1000 MHz, Horizontal

2310 to 2390 MHz, 2483.5 to 2500 MHz

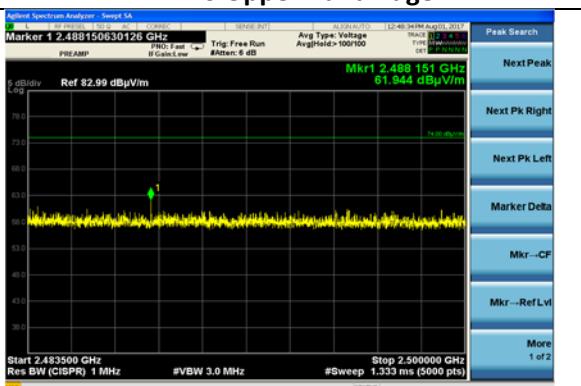
Company: The Lincoln Electric Company	Page 37 of 48	Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771		Serial: 100002017212001, 100002017212002, 100002017132023, 100002017123015



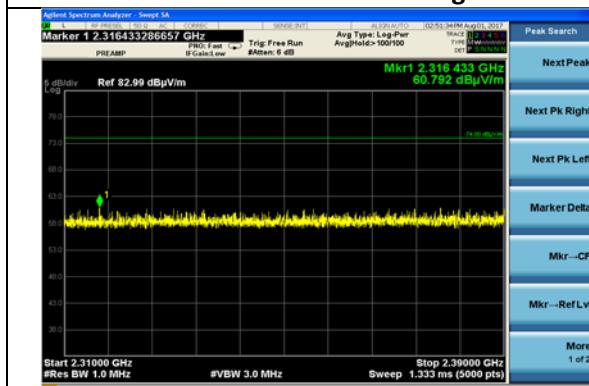
1 MBPS Lower Band Edge



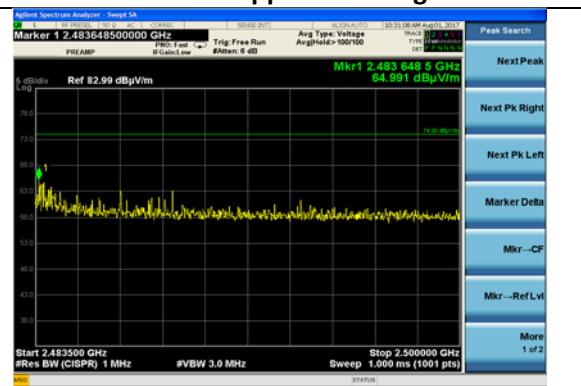
1 MBPS Upper Band Edge



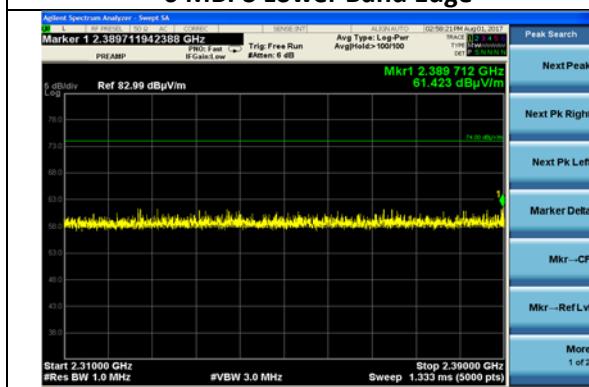
11 MBPS Lower Band Edge



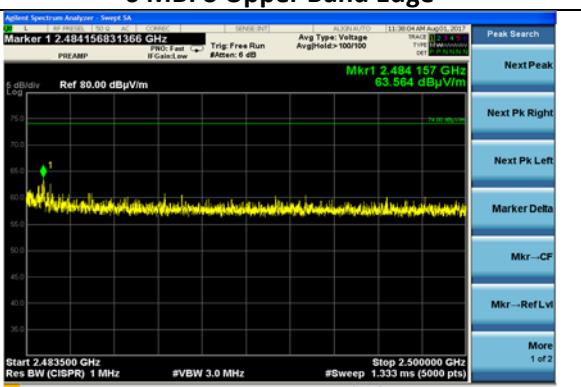
11 MBPS Upper Band Edge



6 MBPS Lower Band Edge



6 MBPS Upper Band Edge



Company: The Lincoln Electric Company

Report: 317246 A

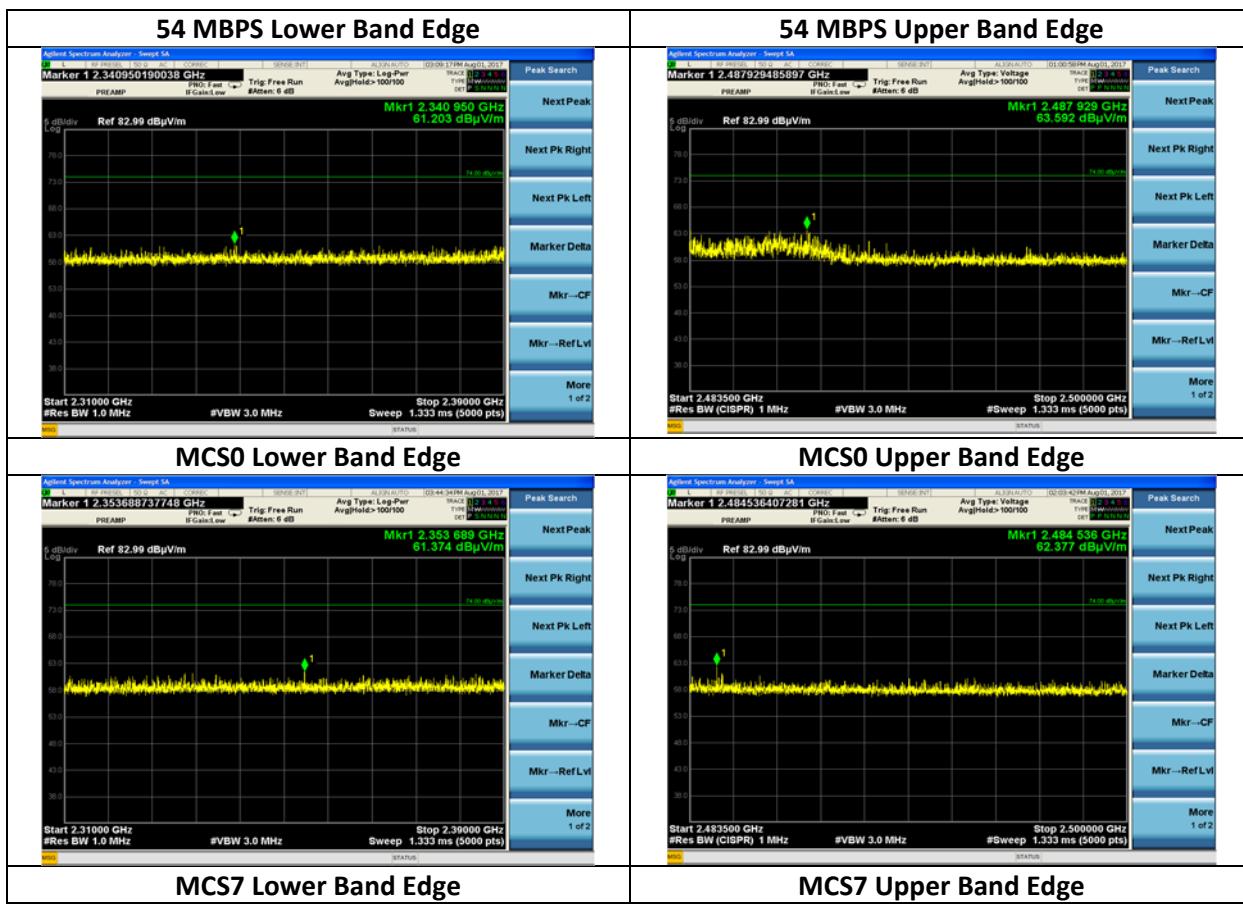
Job: C-2771

Name: Power Wave Communication Kit

Model: G8814

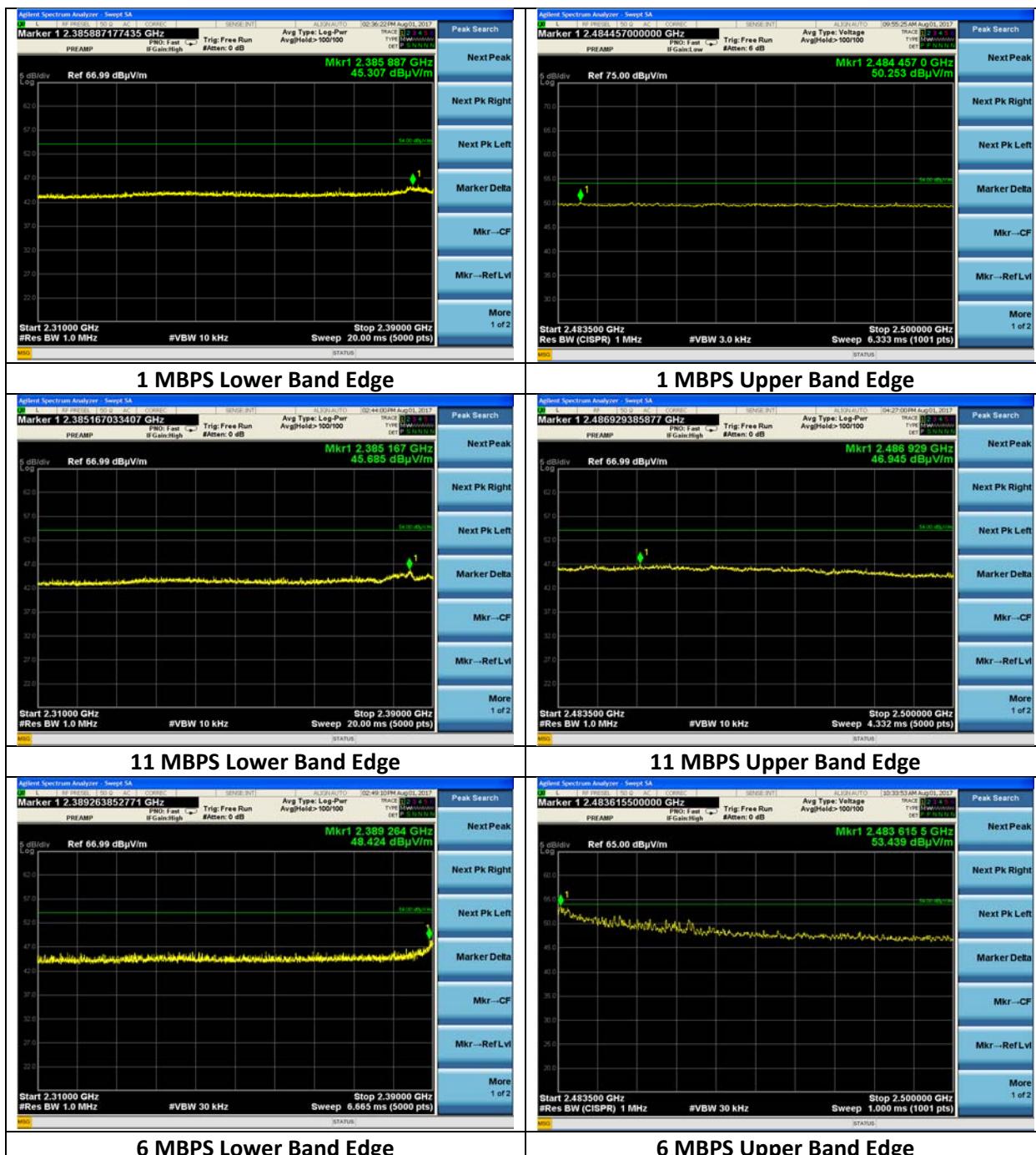
Serial:

100002017212001,100002017212002,
100002017132023, 100002017123015



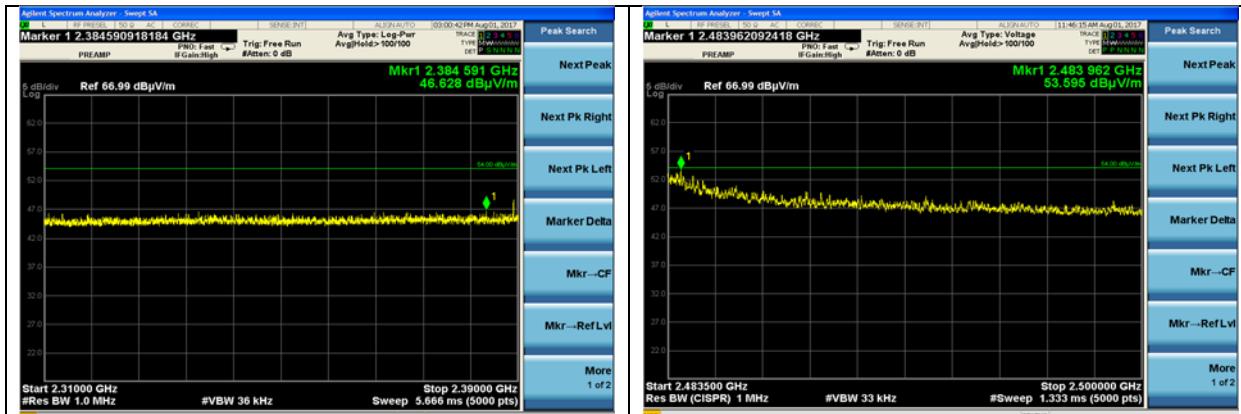
PEAK

Company: The Lincoln Electric Company		Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771		Serial: 100002017212001, 100002017212002, 100002017132023, 100002017123015

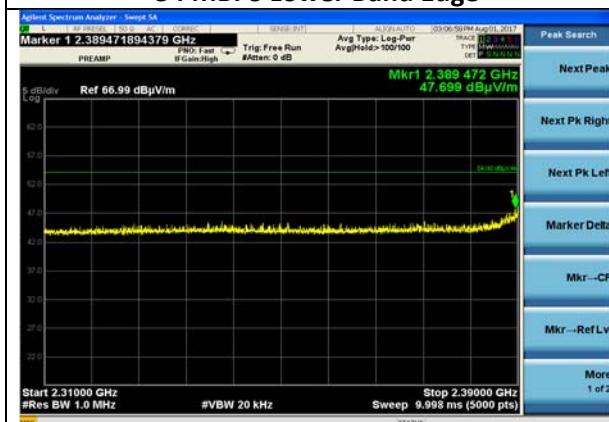


Company: The Lincoln Electric Company
Report: 317246 A
Job: C-2771

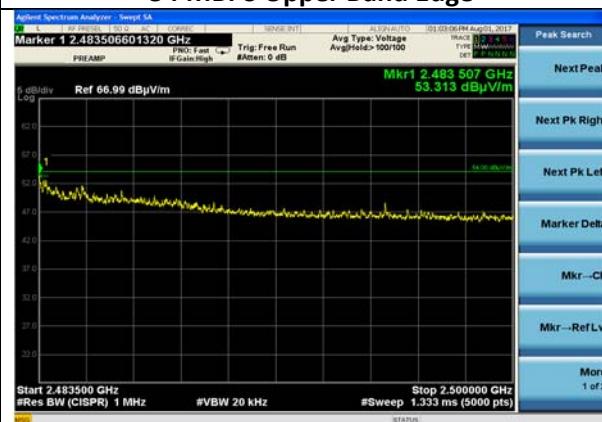
Name: Power Wave Communication Kit
Model: G8814
Serial: 100002017212001, 100002017212002, 100002017132023, 100002017123015



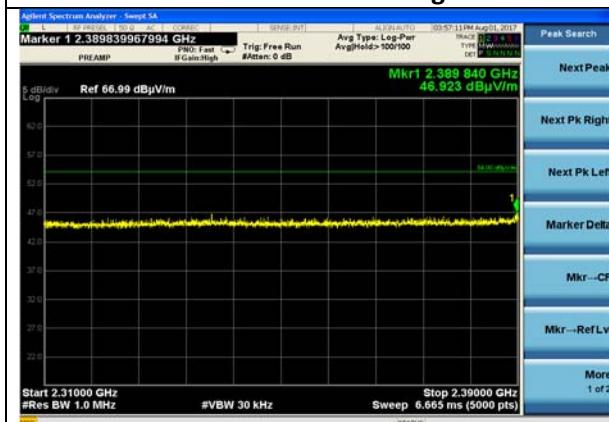
54 MBPS Lower Band Edge



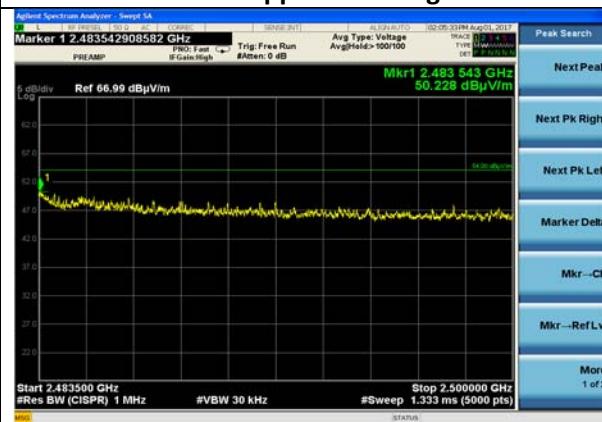
54 MBPS Upper Band Edge



MCS0 Lower Band Edge



MCS0 Upper Band Edge



MCS7 Lower Band Edge

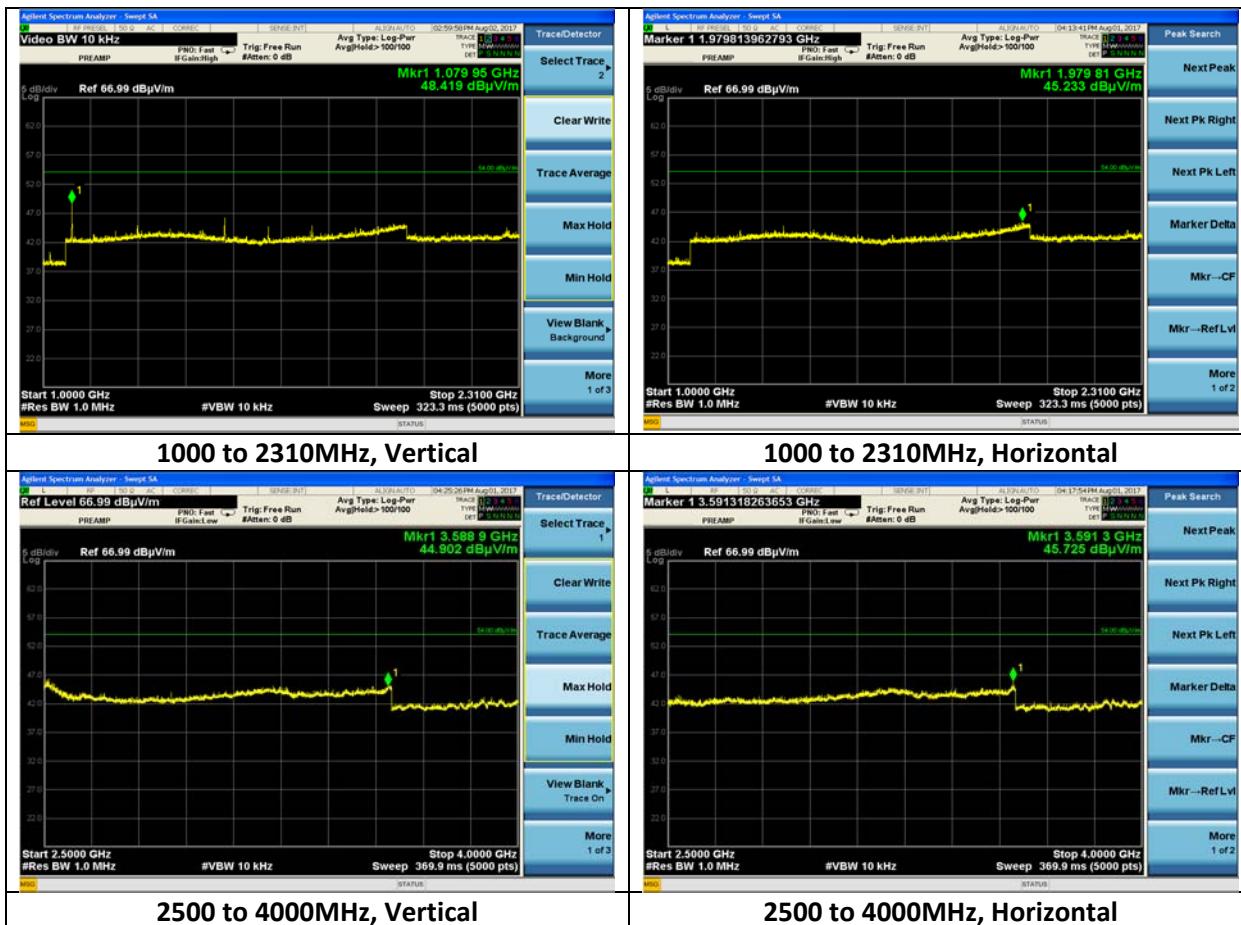
MCS7 Upper Band Edge

Average

Company: The Lincoln Electric Company
Report: 317246 A
Job: C-2771

Name: Power Wave Communication Kit
Model: G8814
Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

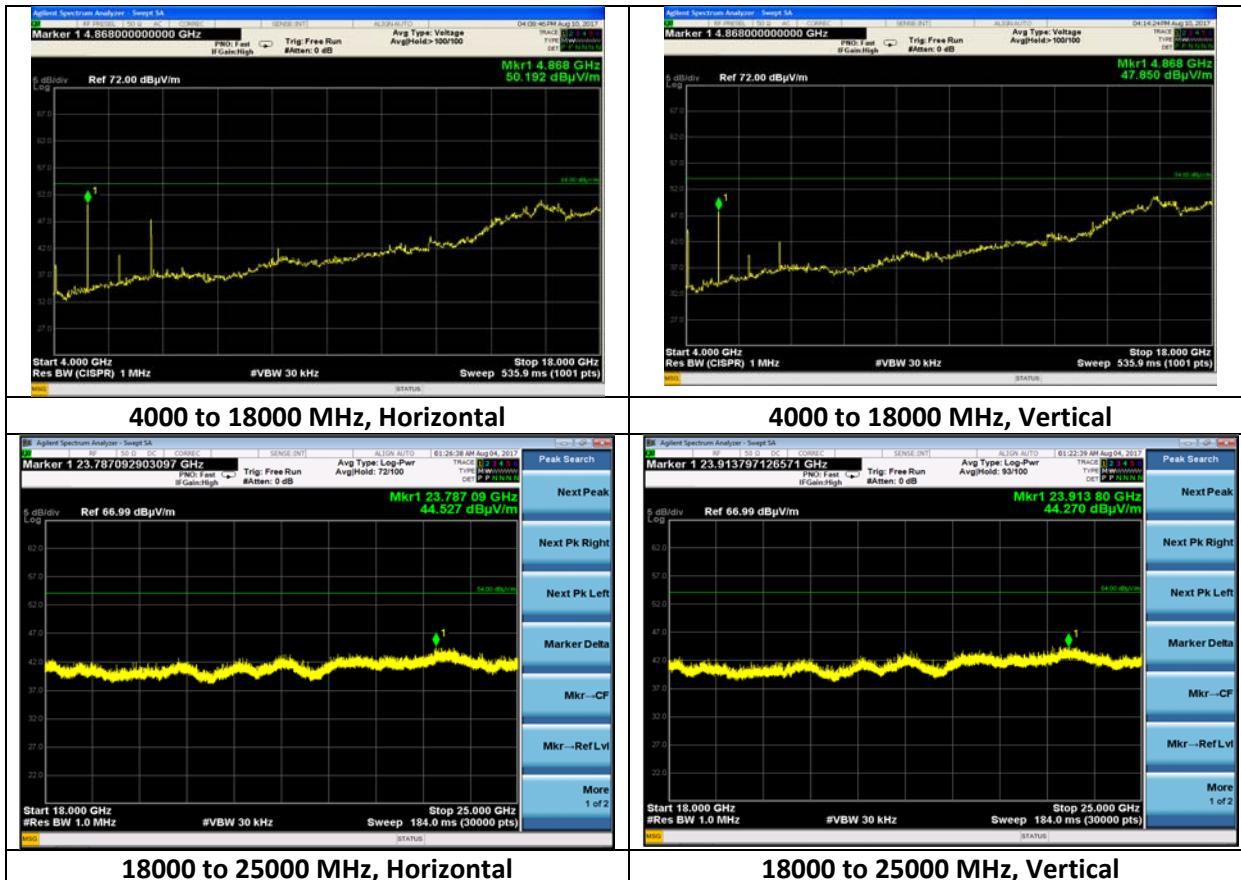
1000 to 4000 MHz



Plots are taken with reduced video bandwidth in the interest of dynamic range

Company: The Lincoln Electric Company		Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771	Page 42 of 48	Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

4000 to 25000MHz



Plots are taken with reduced video bandwidth in the interest of dynamic range

Company: The Lincoln Electric Company

Report: 317246 A

Job: C-2771

Name: Power Wave Communication Kit

Model: G8814

Serial:

100002017212001, 100002017212002,
100002017132023, 100002017123015

5.2.2 Compliance to KDB 594280 D01

Statement from manufacturer:



T H E L I N C O L N E L E C T R I C C O M P A N Y
22801 Saint Clair Avenue • Cleveland, Ohio 44117 • U.S.A. Tel: +1 (216) 481-8100 • Fax: +1 (216) 486-1751

Date 8/30/17

To Whom It May Concern:

Subject: Methods used for limiting the WLAN transmit frequency range and output power of the G8814 Power Wave Communication Kit.

The purpose of this letter is to describe the methods used to limit the operating frequency and output power of the WLAN transmitter in the G8816 Power Wave Communication Kit.

The operating channels are limited to channels 1 through 11 of the 2.4GHz ISM band for 20MHz channel bandwidth. These channel limitations are enforced using the following method:

Restricted access to WLAN configuration tools:

As the device is configured from the factory, it is impossible for any third party (users, installers, integrators, service personnel, etc.) to gain access to any parameters through the user interface which can configure the device to operate on WLAN channels 12, 13, or 14. Furthermore, Lincoln Electric provides no means for a third party to configure the device through an authorized software modification or by network configuration to allow the device to operate on WLAN channels 12, 13, or 14.

The EUT does NOT have the ability to operate at different power levels.

The power levels are set via firmware. This firmware is installed onto the radio module at the factory. The user has no access to any power level control. In addition, the module will be programmed at the factory to only operate and actively scan on these specific channels:

Channels 1-11, 2412-2462 MHz 802.11b mode
Channels 1-11, 2412-2462 MHz 802.11g mode
Channels 1-11, 2412-2462 MHz 802.11n mode (20MHz channel)



Samir Farah
Compliance Engineering Manager
The Lincoln Electric Company

Company: The Lincoln Electric Company		Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771	Page 44 of 48	Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

5.3 AC Mains Conducted Emissions

A line impedance stabilization network (LISN) or artificial mains network (AMN) allows the emissions of the power supply conductors to be measured while isolating the EUT from the supply mains.

Description of Measurement

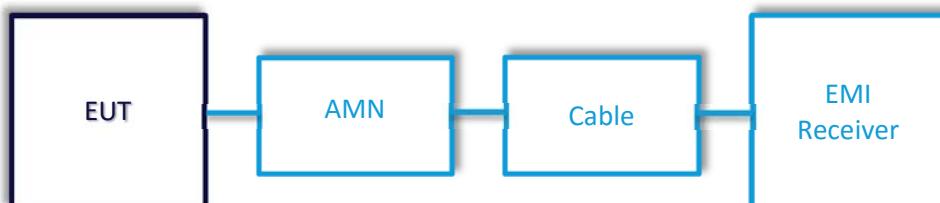
The AMN, cable, and other necessary measurement system correction factors are loaded onto the EMI receiver when the measurements are performed. The data is gathered and reported as the corrected values.

Maximum emissions are determined with a peak max hold trace then measurements at a selection of the highest points are made with quasi-peak and average detectors. Results are recorded and compared to limit for each line. (e.g. line and neutral)

Example Calculations

Measurement (dB μ V) + Cable factor (dB) + Other (dB) = Corrected Reading (dB μ V)

Margin (dB) = Limit (dB μ V) - Corrected Reading (dB μ V)

Block Diagram


Company: The Lincoln Electric Company		Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771	Page 45 of 48	Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

5.3.1 AC Mains Conducted Emissions

Operator	Aidi Zainal
QA	Adam Alger
Test Date	8/16/2017
Location	Conducted Area
Temp. / R.H.	70F / 77%
Requirement	FCC: 15.207 IC: RSS-GEN 8.8
Method	ANSI C63.10 Section 6.2

Limits:

Frequency of Emission (MHz)	Quasi-Peak Limit (dBuV)	Average Limit (dBuV)
0.15 - 0.50	66 to 56	56 to 46
0.5 – 5	56	46
5-30	60	50

Test Parameters

Frequency	150 kHz - 30 MHz
Settings	RBW 9 kHz
Settings	VBW 90 kHz
EUT Power	36VDC, supplied by generic AC to DC (which is powered via 120VAC)

Company: The Lincoln Electric Company	Page 46 of 48	Name: Power Wave Communication Kit
Report: 317246 A		Model: G8814
Job: C-2771		Serial: 100002017212001,100002017212002, 100002017132023, 100002017123015

Instrumentation



Smart Technology. Delivered.

Date : 31-Jul-2017

Test : AC Mains emissions

Job # : C-2771

PE: Audi

Customer : Lincoln Electric

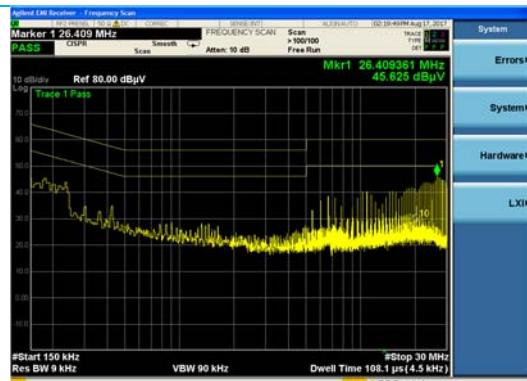
Quote # : 317246

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960089	LSN	COM-POWER	LJ215A	191943	3/13/2017	3/13/2018	Active Calibration
2	EE 960088	EMI Receiver	Agilent	N9338A	MY51210138	3/2/2017	3/2/2018	Active Calibration

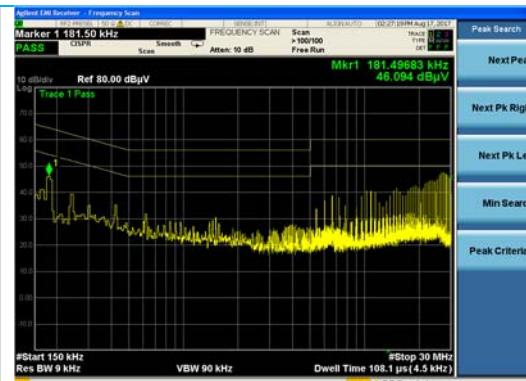
Table

Frequency (MHz)	Line	Quasi-Peak			Average		
		Q-Peak Reading (dB μ V)	Q-Peak Limit (dB μ V)	Quasi-Peak Margin (dB)	Average Reading (dB μ V)	Average Limit (dB μ V)	Average Margin (dB)
0.187	1	41.1	64.2	23.1	32.7	54.2	21.5
10.806	1	39.7	60.0	20.3	38.7	50.0	11.3
22.208	1	42.8	60.0	17.2	41.6	50.0	8.4
27.611	1	44.6	60.0	15.4	42.8	50.0	7.2
0.180	2	44.9	64.5	19.6	34.1	54.5	20.4
10.203	2	39.7	60.0	20.3	38.6	50.0	11.4
27.013	2	46.9	60.0	13.1	45.5	50.0	4.5

Plots



Line 1



Line 2

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6 REVISION HISTORY

Version	Date	Notes	Person
V0	8/25/2017	Draft	Aidi Zainal
V1	10/6/17	Final	Aidi Zainal

END OF REPORT

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