

Test Report # 317246 A

Equipment Under Test:	RM191-SM	
Test Date(s):	2/17/16 to 3/18/16	
	9/28/17 to 9/29/17	
	Laird Technologies, Inc.	
Prepared for:	W66N220 Commerce Ct	
	Cedarburg WI. 53012	

Report issued by: Khairul Aldi Zaihal, Laboratory Manager	
Signature:	Date: 10/24/2017
Report Reviewed by: Adam Alger, Quality Systems Engineer	
Signature: Mur O Alger	Date: 10/24/17
Report Constructed by: Khairul Aidi Zainal, Laboratory Manager	
Signature:	Date: 10/23/2017
	Date. 10/25/2017

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Company: Laird Technologies, Inc.		Name: RM191-SM
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Job: C-2844		Serial: LEN DVT 20, LEN DVT 7



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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



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 2/17/2016 to 3/18/2016 and 8/1/2017 to 8/13/2017, the Equipment Under Test (EUT), **RM191-SM**, as provided by **Laird Technologies, Inc.** was tested to the following requirements:

Requirement	Description	Specification	Method	Result
FCC: 15.247 (d)	Spurious Radiated Emissions in Restricted Bands	FCC 15.209	ANSI C63.10	Pass
IC: RSS-247 Sect. 3.3	spurious Radiated Emissions in Restricted Bands	RSS-GEN 8.9	ANSI C05.10	r ass

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	Laird Technologies, Inc
Contact Person	Bill Steineke
Address	W66N220 Commerce Ct. Cedarburg WI. 53012

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	RM191-SM
Model Number	RM191-SM
Serial Number	LEN DVT 20 (conducted Testing) LEN DVT 7 (Radiated Testing)

2.2 Product Description

The LoRa radio, as described in this report is separated into two sets of modes, which differ in their modulation bandwidths and operating channels. The 500kHz bandwidth channels form a traditional DTS modulation system. The 500kHz channels can have a spreading factor (SF) between 7 and 12, with a higher spreading factor corresponding to a lower data rate. Where data is taken in this report for a 500kHz channel, unless stated otherwise, the measurements were taken with a spreading factor of 12 as this constitutes the worst case scenario for emissions. The given 500kHz channels used were:

Low - 903 MHz

Mid – 907.8 MHz

High – 914.2 MHz

The 125kHz channels form a hybrid DTS and frequency hopping system, which meets part 15.247's requirements for a hybrid system. 125kHz channels can have a spreading factor between 7 and 10, with 10 representing the worst case-emissions. The 125kHz channels used were:

Low - 902.3 MHz

Mid – 908.5 MHz

High – 914.9 MHz

The Antenna being added is a PCB notch antenna with a peak gain of -1.5dB in the operating range of 902 to 928MHz

2.3 Modifications Incorporated for Compliance

None at time of test

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2.4 Deviations and Exclusions from Test Specifications

None at time of test

2.5 Additional Information

The EUT was put into the appropriate test mode by connecting to the EUT using UwTerminalX and Going through the menu option. Example:

To demonstrate the LoRa radio transmitter sending modulated packets, use the following steps...

- First set up the LoRa frequency by pressing 5, then entering the 6 digit center frequency (in kHz).
- Press option **4** to set up the transmitter output power. For US, it should be set to 15 (full power), for EU it should be set to 14 (about 14dBm), the default on power up is 15 for US.
- Press option **6** to set up the transmitter spreading factor-valid options are 7 thru 12 (the default on power up is 7).
- Press option **7** to set up the transmitter modulation bandwidth (125,250, or 500 kHz), 125kHz is the default at power up.
- Press option **9** to start packet transmission. The firmware will be locked up and no other keys will be recognized, until you press **1** to break the transmit loop (which also resets the LoRa radio into receive mode)

The EUT is capable of operating on 2 supply voltages (3.6VDC and 1.8 VDC) and was investigated for both operations.

3 REFERENCES

Publication	Edition	Date
CFR 47 Part 15	-	2017
ANSI C63.10	-	2013
RSS-247	2	2017
RSS GEN	4	2014
KDB 558074 D01	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.

Version / Date
Ed. 2 (2009-02)
Ed. 2 (2011-06)
Ed. 1 (2012-01)
2012
February 4, 2016
August 10, 2015
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	1x10 ⁻⁷	0.55x10 ⁻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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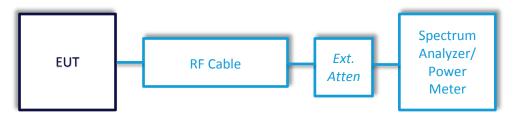


5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of	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.
Measurement	The cable and attenuator factors are loaded into the analyzer or power meter allowing for direct measurement readings without the need for further corrections.
Example Calculations	Measurement (dBm) + Cable factor (dB) + External Attenuator (dB) = Corrected Reading (dBm) Margin (dB) = Limit (dBm) – Corrected Reading (dBm)

Block Diagram



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Operator	Shane Dock
QA	Aidi Zainal
Test Date	2/17/16 to 3/18/16
Location	Conducted measurement area
Temp. / R.H.	70F / 71%
Requirement	15.247 (d)
Method	ANSI C63.10 section 11.12.2

5.1.1 Antenna Port Conducted Emissions – Emissions in Restricted Frequency Bands

Limits:

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

Instrumentation



	Date	: 18-Feb-2016	Type Test :	Conducted Radio			Job # :	<u>C-2401</u>
	Prepared By	r: Shane Dock	Customer :	Laird			Quote #:	316054
N	o. Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960144	Phaseflex	Gore	EKD01D010720	5800373	Verification	Verification	System
2	EE 960087	44GHz EXA Spectrum Analyzer	Agilent	N9010A	MY53400296	12/18/2015	12/18/2016	Active Calibration
3	AA 960156	900MHz High Pass Filter	KWM	HPF-L-14185	unknown	8/4/2015	8/4/2016	Active Calibration

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Test Parameters

_
Frequency
Settings
Settings
Notes

Emissions in Restricted Frequency bands:

1. DTS mode (500kHz bandwidth channel).

a. 3.6 VDC

Channel	Spreading Factor	Peak data Frequency (MHz)	Peak Measurement	Antenna gain (dBi)	Total Additional Gains (dBi)	Final peak (dBm)	Limit (dBm)	Margin (dB)
High - 500k	12	964.7	-65.2	2.0	4.7	-58.5	-41.2	17.3
Mid - 500k	12	1015.5	-57.7	2.0	0.0	-55.7	-41.2	14.4
High - 500k	12	256.0	-67.6	2.0	4.7	-60.9	-49.2	11.7

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Channel	Spreading Factor	Peak data Frequency (MHz)	Peak Measurement	Antenna gain (dBi)	Total Additional Gains (dBi)	Final peak (dBm)	Limit (dBm)	Margin (dB)
Low	12	8126.5	-50.6	2.0	0.0	-48.6	-41.2	7.4
Low	12	7225.5	-55.5	2.0	0.0	-53.5	-41.2	12.2
Low	12	3875.9	-57.9	2.0	0.0	-55.9	-41.2	14.7
Mid	12	8170.6	-54.3	2.0	0.0	-52.3	-41.2	11.0
Mid	12	7262.0	-55.6	2.0	0.0	-53.6	-41.2	12.4
Mid	12	3774.1	-58.1	2.0	0.0	-56.1	-41.2	14.9
High	12	8229.3	-44.1	2.0	0.0	-42.1	-41.2	0.9
High	12	7315.1	-50.6	2.0	0.0	-48.6	-41.2	7.4
High	12	3657.9	-56.7	2.0	0.0	-54.7	-41.2	13.5

Note:

1. Measurements are Peak and compared to quasi peak limit for below 1GHz and Average limit for above 1 GHz.

b. 1.8 VDC

Channel	Spreading Factor	Peak data Frequency (MHz)	Peak Measurement	Antenna gain (dBi)	Total Additional Gains (dBi)	Final peak (dBm)	Limit (dBm)	Margin (dB)
Low-500k	12	934.8	-67.8	2.0	4.7	-61.1	-49.2	11.8
Mid-500k	12	1097.4	-62.5	2.0	0.0	-60.5	-41.2	19.3
High-500k	12	256.0	-71.7	2.0	4.7	-65.0	-49.2	15.8

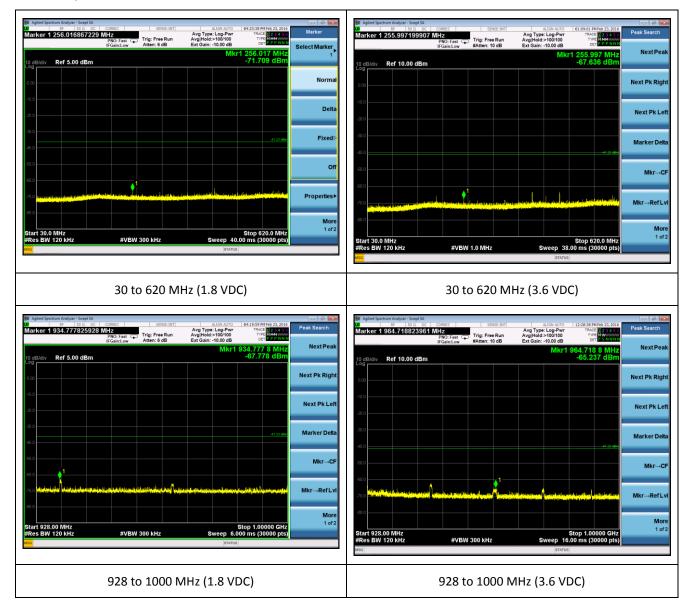
Channel	Spreading Factor	Peak data Frequency (MHz)	Peak Measurement	Antenna gain (dBi)	Total Additional Gains (dBi)	Final peak (dBm)	Limit (dBm)	Margin (dB)
Low	12	8128.5	-53.3	2.0	0.0	-51.3	-41.2	10.1
Low	12	3838.6	-57.9	2.0	0.0	-55.9	-41.2	14.7
Low	12	8362.0	-58.1	2.0	0.0	-56.1	-41.2	14.9
Low	12	7653.0	-58.9	2.0	0.0	-56.9	-41.2	15.7
Mid	12	8170.1	-51.9	2.0	0.0	-49.9	-41.2	8.7
Mid	12	3748.6	-57.6	2.0	0.0	-55.6	-41.2	14.4
Mid	12	4686.7	-57.9	2.0	0.0	-55.9	-41.2	14.7
Mid	12	7261.9	-58.3	2.0	0.0	-56.3	-41.2	15.0
High	12	8226.5	-53.1	2.0	0.0	-51.1	-41.2	9.9
High	12	7312.1	-57.6	2.0	0.0	-55.6	-41.2	14.3
High	12	3753.3	-57.7	2.0	0.0	-55.7	-41.2	14.4

Note:

1. Measurements are Peak and compared to quasi peak limit for below 1GHz and Average limit for above 1 GHz.



Screen Captures



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⊮F 50Ω DC larker 1 8.22644754825	2 GHz	ree Run A	ALIGN AUTO Avg Type: Log-Pwr Vg Hold:>100/100 Ext Gain: -10.00 dB	03:48:47 PM Feb 23, 2016 TRACE 2 3 4 5 6 TYPE MMM DET P P N N N	Marker Select Marker	Marker 1 8.229259	D Q DC CORREC 241975 GHz PNO: Fast IFGain:Low	Trig: Free Run Atten: 6 dB	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>100/100 Ext Gain: -10.00 dB	01:46:14 PM Feb 23, 2016 TRACE 2 3 4 5 6 TVPE MMM	Marker Select Marker
o dB/div Ref 5.00 dBm			Mkr1	8.226 45 GHz -53.147 dBm	1*	10 dB/div Ref 5.00	dBm		Mkr	8.229 26 GHz -44.148 dBm	1
5.00					Normal	-5.00					Norm
25.0				-41 23 dEm	Delta	-25.0				1 .41 23 dBm	Del
	3	و المراجع ال	2		Fixed⊳	-45.0 -55.0 -65.0	<u>}3</u>	in an			Fixed
75.0					Off	-75.0					c
Start 1.200 GHz Res BW 1.0 MHz	#VBW 3.0 MI	łz	Sweep 16.0	Stop 10.000 GHz 00 ms (30000 pts)	Properties►	Start 1.200 GHz #Res BW 1.0 MHz	#VE	W 3.0 MHz	Sweep 16.	Stop 9.956 GHz 00 ms (30000 pts)	Properties
2 N 1 1 7.	226 45 GHz -53.147 312 10 GHz -57.660 753 26 GHz -57.664	dBm	N FUNCTION WIDTH	FUNCTION VALUE	More 1 of 2	1 N 1 f 2 N 1 f 3 N 1 f 4	8.229 26 GHz 7.315 10 GHz 3.657 89 GHz	-44.148 dBm -50.612 dBm -56.685 dBm	OWE NOW POINT OWNER		Mor 1 of
<mark>80</mark>			STATUS			MSG			STATUS		
	1200 to 10	0000 M	Hz (1.8 V	DC)			1200	to 10000	MHz (3.6 \	/DC)	

Notes:

- 1. Display lines on the plot are not limit lines.
- 2. Captures included are only for ranges where emissions were seen.

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2. Hybrid mode (125kHz bandwidth channel).

c. 3.6 VDC

Channel	Spreading Factor	Peak data Frequency (MHz)	Peak Measurement	Antenna gain (dBi)	Total Additional Gains (dBi)	Final peak (dBm)	Limit (dBm)	Margin (dB)
Low - 125k	10	966.3	-64.0	2.0	4.7	-57.3	-41.2	16.1

Channel	Spreading Factor	Peak data Frequency (MHz)	Peak Measurement	Antenna gain (dBi)	Total Additional Gains (dBi)	Final peak (dBm)	Limit (dBm)	Margin (dB)
Low	10	3727.1	-57.3	2.0	0.0	-55.3	-41.2	14.0
Low	10	4676.3	-58.4	2.0	0.0	-56.4	-41.2	15.2
Mid	10	8177.0	-51.1	2.0	0.0	-49.1	-41.2	7.9
Mid	10	7268.4	-55.5	2.0	0.0	-53.5	-41.2	12.3
Mid	10	9085.6	-56.6	2.0	0.0	-54.6	-41.2	13.3
High	10	8234.2	-43.7	2.0	0.0	-41.7	-41.2	0.4
High	10	7319.2	-49.6	2.0	0.0	-47.6	-41.2	6.4
High	10	3659.6	-55.3	2.0	0.0	-53.3	-41.2	12.1

Note:

1. Measurements are Peak and compared to quasi peak limit for below 1GHz and Average limit for above 1 GHz.

d. 1.8 VDC

Channel	Spreading Factor	Peak data Frequency (MHz)	Peak Measurement	Antenna gain (dBi)	Total Additional Gains (dBi)	Final peak (dBm)	Limit (dBm)	Margin (dB)
Mid-125k	10	940.5	-67.8	2.0	4.7	-61.1	-49.2	11.9
Low-125k	10	1018.5	-61.8	2.0	0.0	-59.8	-41.2	18.6
Low-125k	10	256.0	-72.7	2.0	4.7	-66.0	-49.2	16.8

Channel	Spreading Factor	Peak data Frequency (MHz)	Peak Measurement	Antenna gain (dBi)	Total Additional Gains (dBi)	Final peak (dBm)	Limit (dBm)	Margin (dB)
Low	10	8121.1	-53.0	2.0	0.0	-51.0	-41.2	9.7
Low	10	3807.2	-57.7	2.0	0.0	-55.7	-41.2	14.5
Low	10	4772.3	-58.4	2.0	0.0	-56.4	-41.2	15.2
Mid	10	8177.2	-52.1	2.0	0.0	-50.1	-41.2	8.9
Mid	10	7267.8	-57.6	2.0	0.0	-55.6	-41.2	14.4
Mid	10	3675.8	-57.8	2.0	0.0	-55.8	-41.2	14.6
High	10	8234.7	-53.6	2.0	0.0	-51.6	-41.2	10.4

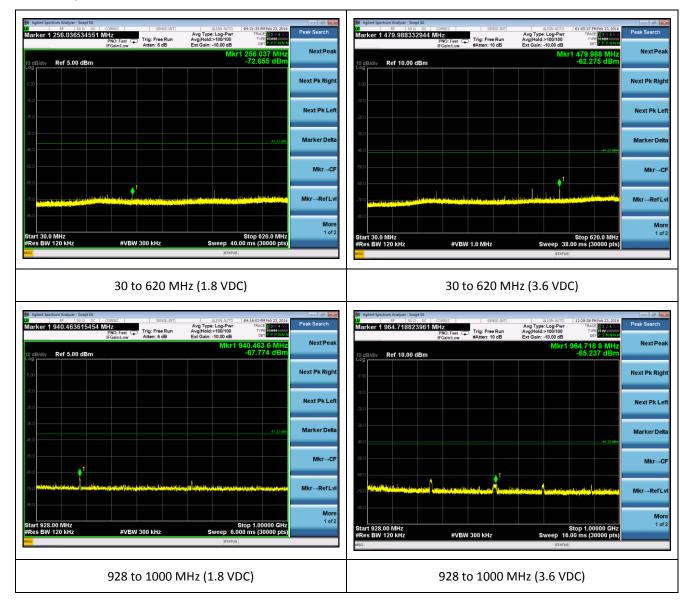
Note:

1. Measurements are Peak and compared to quasi peak limit for below 1GHz and Average limit for above 1 GHz.

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Screen Captures



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Agilent Spectrum Analyzer - Swept SA RF 50 Ω DC Marker 3 3.6758158605		ALISN AUTO 03:44:42 PM Feb 23, 2 Avg Type: Log-Pwr TRACE 10:44 Avg Hold: 100/10 TVPE Ext Gain: -10.00 dB DET	S 6 NN	Agilent Spectrum Analyzer - Swept SA RF S0 Ω DC Marker 1 8.23422114.07		ALIGN AUTO 01:59:01 PM Feb 23, 2016 Avg Type: Log-Pwr Avg/Hold:100/100 Ext Gain: -10.00 dB DET	Marker Select Marker
0 dB/div Ref 5.00 dBm		Mkr3 3.675 82 Gł -57.823 dB		10 dB/div Ref 5.00 dBm		Mkr1 8.234 22 GHz -43.650 dBm	1
-15.0			Next Pk Right	-15.0			Norma
36.0			Next Pk Left	-25.0		1 -41.23 dBH	Delt
			Marker Delta	-45.0 -65.0 -65.0			Fixed
75.0 75.0			Mkr→CF	-75.0			o
tart 1.200 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	Stop 10.000 G Sweep 16.00 ms (30000 p	HZ Mkr→RefLvi ts)	Start 1.200 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz	Stop 9.956 GHz Sweep 16.00 ms (30000 pts)	Properties
2 N 1 f	X Y FI 3.177 17 GHz -52.137 dBm 7.267 80 GHz -57.616 dBm 3.675 82 GHz -57.823 dBm	INCTION FUNCTION WIDTH FUNCTION VALUE	More	1 N 1 f	8.234 22 GHz 43.650 dBm 7.319 19 GHz 49.637 dBm 3.659 64 GHz -55.327 dBm		Mor 1 of
10		STATUS		MSG		STATUS	
	1200 to 10000	MHz (1.8 VDC)			1200 to 10000	MHz (3.6 VDC)	

Notes:

- 1. Display lines on the plot are not limit lines.
- 2. Captures included are only for ranges where emissions were seen.

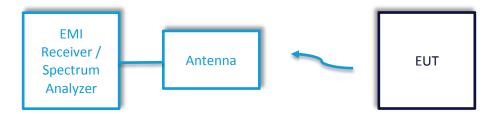
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5.2 Radiated Emissions

Description of Measurement	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. 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. 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.
Example Calculations	Measurement (dBμV) + Cable factor (dB) + Other (dB) + Antenna Factor (dB/m) = Corrected Reading (dBμV/m) Margin (dB) = Limit (dBμV/m) - Corrected Reading (dBμV/m) Example at 4000 MHz: Reading = 40 dBμV + 3.4 dB + 0.9 dB + 6.5 dB/m = 50.8 dBμV/m Average Limit = 20 log (500) = 54 dBμV/m Margin = 54 dBμV/m - 50.8 dBμV/m = 3.2 dB

Block Diagram



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5.2.1 Radiated Emissions

Operator	Zach Wilson, Aidi Zainal, Shane Dock
QA	Aidi Zainal, Coty Hammerer
Test Date	9/28/2017-9/29/2017
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 (µV/m)	100	150	200	500
Field Strength (dBμV/m)	40.0	43.5	46.0	54.0

Instrumentation



Smart Technology. Delivered.

	Da	ate : 28-Sep-2017	Test	Radiated emis	sions		Job	<u>C-2844</u>
	F	PE : Aidi Zainal	Customer	Laird			Quote	317380
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 960081	Double Ridge Horn Antenna	EMCO	3115	6907	3/17/2017	3/17/2018	Active Calibration
3	EE 960096	Low Noise Amplifier	Mini-Circuits	ZVA-213X-S+	40201429	3/17/2017	3/17/2018	Active Calibration
4	AA 960177	Cable - low loss 10m	A.H. Systems, Inc	. SAC-18G-10	1704	12/19/2016	12/19/2017	Active Verification
5	EE 960085	EMI Receiver	Agilent	N9038A	MY51210148	5/12/2017	5/12/2018	Active Calibration
6	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	4/17/2017	4/17/2018	Active Calibration
7	AA 960150	Biconical Antenna	ETS Lindgren	3110B	0003-3346	3/3/2017	3/3/2018	Active Calibration
8	AA 960155	High Pass Filter 900 MHz	KWM	HPF-L-14185	7272-03	5/2/2017	5/2/2018	Active Calibration

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Test Parameters

F # A P P P P P P P P P P	2014U- to 2500014U-				
Frequency	30MHz to 25000MHz				
Distance	3 meters				
RBW	1 MHz				
VBW	Avg 30 Hz, Peak 50 MHz				
Notes	 EUT tested in 3 orthogonal orientations Antenna port terminated with 50 ohms Only worst case plots presented in this report All three channels for both Hybrid (125kHz) and DTS (500kHz) mode were investigated Pre-scans confirmed that emissions does not change with supply voltage. 				

Table

A. Emissions between 30MHz and 1000MHz:

1. 125kHz Hybrid mode

Frequency (MHz)	Polarization	EUT	Height (cm)	Azimuth (degrees)	Q. Peak (dBuV/m)	Q. Peak Limit (dBuV/m)	Q.Peak Margin (dB)
848.4	V	V	100.0	0.0	27.8	46.0	18.2
300.0	Н	V	100.0	0.0	18.8	46.0	27.2
980.0	Н	V	100.0	0.0	28.7	54.0	25.3

Note:

a. Measurement above are those of the system noise floor

2. 500kHz DTS mode

Frequency (MHz)	Polarization	EUT	Height (cm)	Azimuth (degrees)	Q. Peak (dBuV/m)	Q. Peak Limit (dBuV/m)	Q.Peak Margin (dB)
848.4	V	V	100.0	0.0	27.8	46.0	18.2
300.0	Н	V	100.0	0.0	18.8	46.0	27.2
980.0	Н	V	100.0	0.0	28.7	54.0	25.3

Note:

a. Measurement above are those of the system noise floor

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B. Emissions between 1000MHz and 100000MHz:

1. 125kHz Hybrid mode

Frequency (MHz)	Polarization	EUT	Height (cm)	Azimuth (degrees)	Peak (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
8120.3	Н	S	154.0	315.3	47.3	74.0	26.7	40.8	54.0	13.2
8176.3	Н	V	164.0	319.8	46.6	74.0	27.4	39.9	54.0	14.1
7319.1	Н	V	172.0	324.9	45.6	74.0	28.4	40.4	54.0	13.6
3659.7	V	Н	154.0	348.7	41.6	74.0	32.4	36.7	54.0	17.3
3634.0	V	Н	191.0	357.2	42.2	74.0	31.8	37.0	54.0	17.0

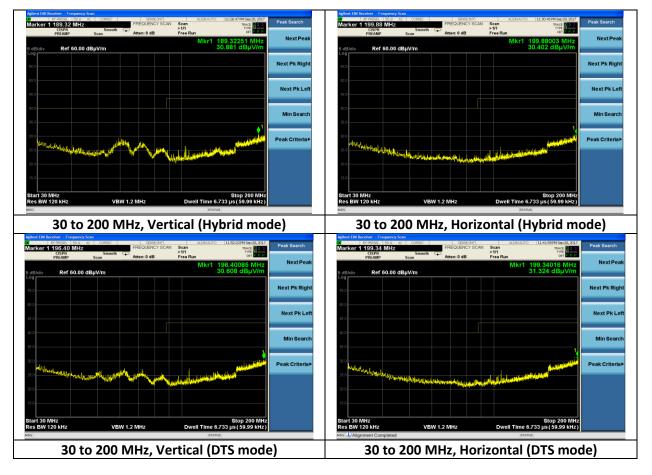
2. 500kHz DTS mode

Frequency (MHz)	Polarization	EUT	Height (cm)	Azimuth (degrees)	Peak (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
8126.9	Н	V	181.0	309.4	46.7	74.0	27.3	41.4	54.0	12.6
8171.7	Н	S	147.0	313.0	46.0	74.0	28.0	40.3	54.0	13.7
7313.6	Н	V	136.0	319.4	46.1	74.0	27.9	40.7	54.0	13.3
3657.2	V	V	150.0	350.8	42.4	74.0	31.6	33.6	54.0	20.4
3630.6	V	V	150.0	351.5	42.1	74.0	31.9	34.1	54.0	19.9
3611.9	V	V	150.0	351.6	42.7	74.0	31.3	34.2	54.0	19.8

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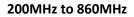
Plots

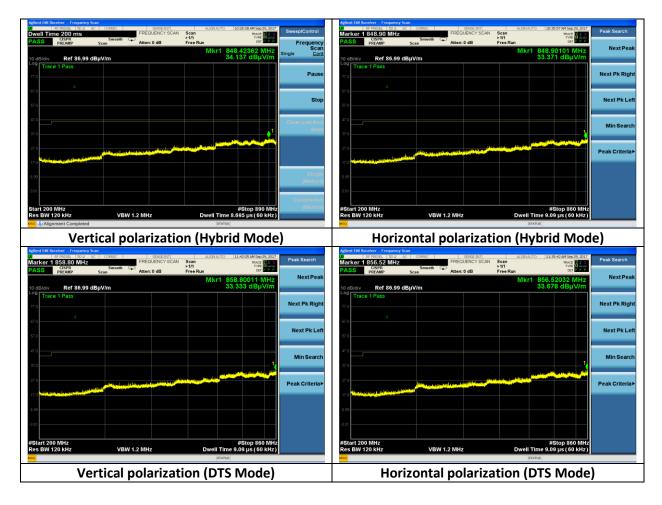


30MHz to 200 MHz

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860MHz to 900MHz

Agend Like Acceler (1459-per Vale Marker 1 366 65 MHz = 1000 (10	Market P October P October P Althout P Althout P Peak Search Peak
Volumer Reverse Construction and Constru	Next Pk Right 770
90	Next Pk Left
100 200 Autoritaria (Autoritaria) (Autoritar	Min Search
270	Peak Criteria 270 Peak Criteria Peak Criteria
19 30	5.9
#Stop 900 MHz #Stop 900 MHz Res BW 120 KHz VBW 1.2 MHz Dwell Time 149.9 µs (60 kHz) and granus	#Stop 900 MHz Res BW 120 KHz VBW 1.2 MHz Dwell Time 149.9 µs (60 KHz)
Vertical polarization (Hybrid Mode)	
Adjetet Bis Rovine: Frequency Scan Stretzer ALSK-U/TO 114437.4459-05.2027 Marker 1 862.88 MHz FREQUENCY SCAN Scan Number 1 862.88 MHz FREQUENCY SCAN Scan Total Base Total Base Total Base FREQUENCY SCAN Scan Scan Total Base Total Base Total Base Total Base Scan	Adjunt IB Roview Frequency Kan Open Search Marker 1 966,356 MHz Mpeter Non Adjunt 70 Lit259/MF50-26/27 Pask Search Marker 1 966,356 MHz FFEOUENCY SCAI Sean Water 1 966,356 MHz FFEOUENCY SCAI Sean Water 1 966,356 MHz Pask Search NextPeak OSNR Sean Atten: 0 dB Free Run Water 1 866,35682 MHz NextPeak NextPeak 10 dB/Wr Ref 86.99 dB/W/m 33.390 dB/W/m NextPeak NextPeak
77 0	Next Pk Right 770 Next Pk Right
go	Next Pk Len
0 2	Min Search
29 σ ₈	Peak Criteria Peak Criteria Peak Criteria
699	
#Start 860 MHz #Stop 900 MHz Res BW 120 kHz VBW 1.2 MHz Dwell Time 149.9 µs (50 kHz) stop	#Ston 860 MHz #Stop 800 MHz Res BW 120 KHz VBW 1.2 MHz Dwell Time 149.9 µs (60 KHz) strute
Vertical polarization (DTS Mode)	Horizontal polarization (DTS Mode)

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Agilent EMI Receiver - Frequency Scan	Agilent EMI Receiver - Frequency Scan
OF #FIFELINE 100 at COMPLEX Sementaria ALEXANTO 1257/04/MM kp20, 2017 Peak Starch PASS PREMAP Scan >1/1 three Preventaria	D IF FREEL IS 0.5 AC COMMC IMMERIANT ALIXANTO 0129/44/MM bit 20, 2017 Peak Search Marker 19 60,000 MHZ B60,000 MHZ FREGULENCY SCAN Scan N/I two Peak Search PASS CISFR Scan Atten: 0 dB Free Run two Free
Mkr1 958,25891 MHz NextPeak 10 dB/div Ref 86.99 dBμV/m 34.222 dBμV/m NextPeak	Mkr1 960 MHz NextPeak 10 dB/div Ref 86.99 dBμV/m 34.675 dBμV/m
Log Trace 1 Pass Next Pk Right	Log Trace 1 Pass 770 Next Pk Right
So Next Pk Left	00
3 1 Min Search 1 Min Search	22 Min Search
270 170 170	270 Peak Criteria
6m	6.9
#Start 928 MHz #Stop 960 MHz	#Start 928 MHz #Stop 960 MHz
Res BW 120 kHz VBW 1.2 MHz Dwell Time 187.6 μs (60 kHz) μα [status]	Res BW 120 kHz VBW 1.2 MHz Dwell Time 187.6 µs(60 kHz)
Vertical polarization (Hybrid Mode)	Horizontal polarization (Hybrid Mode)
Agitent JM Receiver _ Frequency Scat	Aginet Jali Review Frequency Scan Implement Jali (with the start) ALXXN.070 [11:5416-W19629, 2007] Marker H 392-33 MHZ FREGUENCY SCAN Scan Two: [] Ball
PASS CISPR Smooth Scan Atten: 0 dB Free Run or P P	PASS CISPA State Street Action of the state
Mkr1 953,57598 MHz 10 dBldiv Ref 86,99 dBµV/m Loa ∏race 1 Pass	Mkr1 932.38274 MHz 10 dB/div Ref 86.99 dBµV/m 34.497 dBµV/m 1-20 Trace 1 Pasis
770 Next Pk Right	Trace I Pass Next Pk Right
Image: State of the s	Next Pk Left
20 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Min Search Market-
270 Peak Criteria>	20 Peak Criteria
5.99	6.97
381	.391
#Start 928 MH2 #Stop 960 MH2 Res BW 120 KH2 VBW 1.2 MH2 Dwell Time 187.6 µ5(60 AH2)	#Start 928 MHz #Stop 960 MHz Res BW 120 HHz VBW 1.2 MHz Devel Time 15/6 ps (60 KHz)
Vertical polarization (DTS Mode)	Horizontal polarization (DTS Mode)

928MHz to 960MHz

Company: Laird Technologies, inc		Name: RM191-SM
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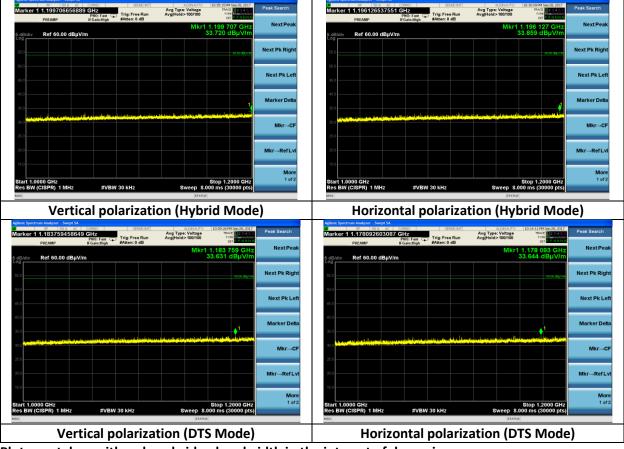


Wint of District Note: W	Agilent EMI Receiver - Frequency Scan REPRESEL SO 9 AC CORREC SENSE:INT	ALIGN AUTO 01:02:47 PM Sep 29, 2017	Agitent EW Receiver - Erequency Scan U RF PRESE, 50 Q, AC CORREC SENSE:RVT ALIGN.AUTO 01:22:14PM Sep 29	2017
Mint 963 703 12 Mirty Mint 963 703 12 Mirty Mint 1 963 703 12 Mirty Mint 2 Mirty Mint 1 963 703 12 Mirty Mint 2 Mirty Mint	Marker 1 993.76 MHz FREQUENCY SCAN	Scan TRACE 1 2 8 >1/1 TYPE NUM	Marker 1 999.76 MHz FREQUENCY SCAN Scan TRACE	Peak Search
Next PR Right Next PR Right <th></th> <th>Mkr1 993.76312 MHz NextPeak</th> <th>Mkr1 999.76012 M</th> <th>12</th>		Mkr1 993.76312 MHz NextPeak	Mkr1 999.76012 M	12
Image: Control of the second of the secon	77 0	Next Pk Right	Trace 1 Pass	Next Pk Right
Peak Criteria Peak Criteria Pea	57 0 57 0	Next Pk Left	50	Next Pk Left
Peak Criteria <th>87 0 97 0</th> <th></th> <th>00 90</th> <th>1. Min Search</th>	87 0 97 0		00 90	1. Min Search
Res BW 120 kHz VBW 12 MHz Devel Time 14.0.9 µc (50 kHz) Image: State in the s	14 January (14, gala (24, and a south and a south fair) ways (14 a south and a south of the sout			Peak Criteria►
Res BW 120 kHz VBW 12 MHz Devel Time 140.9 µc (\$0 kHz) Image: State in the st	5.99		5.59	
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Address 1 Streament Strea	Res BW 120 kHz VBW 1.2 MHz			Hz)
Address 1 Second Second Second Second Address 2 Second Mark or 1 998, 03 MHz Peak Search Next Peak 10 SBR.dow Ref 86.99 dBp.V/m Scend Mark or 1 998, 03 MHz Scend Mark or 1 998, 03 MHz Peak Search Next Peak 10 SBR.dow Ref 86.99 dBp.V/m Sc.055 dBp.V/m Scend Mkr 1 998, 08096 MHz Next Peak 70 SBR.dow Ref 86.99 dBp.V/m Sc.055 dBp.V/m Next Peak Next Peak Next Peak 70 SBR.dow Ref 86.99 dBp.V/m Sc.055 dBp.V/m Next Peak Next Peak Next Peak 70 SBR.dow Ref 86.99 dBp.V/m Sc.055 dBp.V/m Next Peak Next Peak Next Peak 70 SBR.dow Ref 86.99 dBp.V/m Sc.055 dBp.V/m Next Peak Next Peak Next Peak 70 SBR.dow Ref 86.99 dBp.V/m Sc.055 dBp.V/m Next Peak Next Peak Next Peak 70 SBR.dow Next Peak Min Second Next Peak Next Peak Next Peak 70 SBR.dow Sc.055 dBp.V/m Next Pe	Vertical polarizatio	on (Hybrid Mode)	Horizontal polarization (Hybrid M	ode)
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Mkr1 996, 16192, MHz 10 dbldv Ref 86.99 dbµV/m Next Peak 10 dbldv Ref 86.99 dbµV/m Next Pk Right 10 dbldv Next Pk Right Next Pk Right 11 Next Pk Right Peak Criteria> 10 Peak Criteria> Peak Criteria> 10 Peak Criteria> Peak Criteria> Storp 10 Hz Storp 10 Hz Storp 10 Hz Novel 10 KHz VBW 120 KHz				
Coordination of Pars Next Pk Right 770 Next Pk Right 771 Next Pk Right 772 Next Pk Right 773 Next Pk Right 774 Next Pk Right 775 Next Pk Right 775 Next Pk Right 776 Next Pk Right 777 Next Pk Right 778 Next Pk Right 779 Next Pk Right 770 Next Pk Right 771 Next Pk Right 772 Next Pk Right 773 Next Pk Right 774 Next Pk Right 775 Next Pk Right 776 Next Pk Right 777 Next Pk Right 778 Next Pk Right 779 Next Pk Right <tr< th=""><th>Marker 1 996,16 MHz FREQUENCY SCAN</th><th>>1/1 TYPE NUM</th><th>Marker 1 998.08 MHz FREQUENCY SCAN Scan Tracel</th><th>2017 2 3 WW</th></tr<>	Marker 1 996,16 MHz FREQUENCY SCAN	>1/1 TYPE NUM	Marker 1 998.08 MHz FREQUENCY SCAN Scan Tracel	2017 2 3 WW
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and Brand	Image: Press. 19 and 20 and	Print Provide and the second sec	Imarker 1980.00 Miz Issue price Issue price <th>Next Peak</th>	Next Peak
Vertical polarization (DTS Mode) Horizontal polarization (DTS Mode)	Arren 966 16 MHz Arren 0 dB	Mixri 996,16192 MHz Mixri 996,16192 MHz Mixri 996,16192 MHz NextPeak NextPk Right NextPk Right NextPk Left Min Search Peak Criteria	Imarker 1980.08 MHz Seven 1 Seven Print Laboration 1 States 204 Seven 2 Seven 1 Seven Print Seven 1	Next Peak Next Pk Right Next Pk Left Min Search Peak Criteria
	Arren 966 16 MHz Arren 0 dB	• Min Mint 996,18192 Mint Mkrl 996,18192 Mint Next Peak S8,055 GBU/Vin Next Pk Right Next Pk Right Image: Second	Imarker 1980.08 Mizz Since 1 Since 1 <th>Next Peak Next Pk Right Next Pk Left Min Search Peak Criteria</th>	Next Peak Next Pk Right Next Pk Left Min Search Peak Criteria

960MHz to 1000MHz

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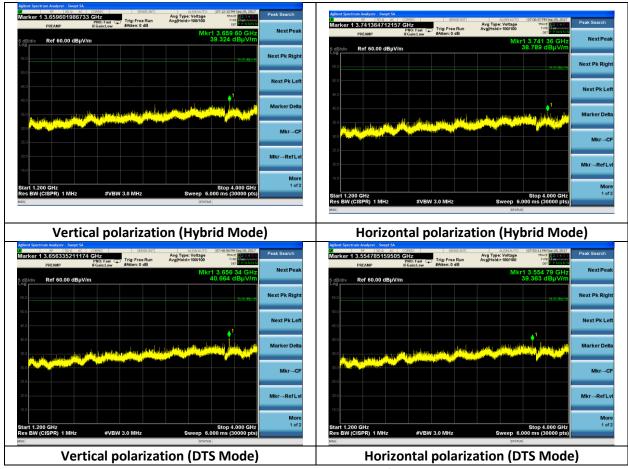


1000MHz to 1200MHz

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

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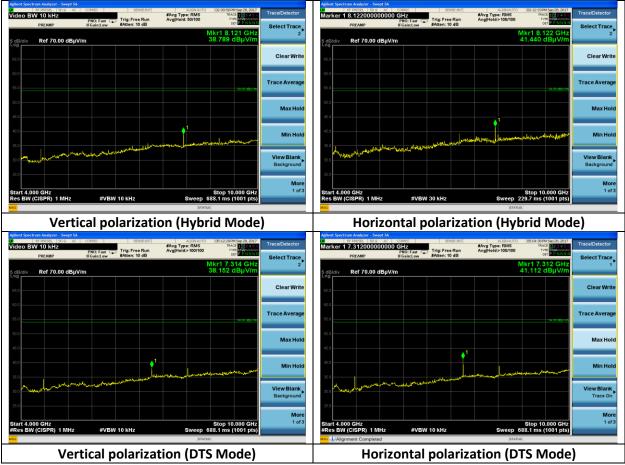


1200MHz to 4000MHz

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

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4000MHz to 10000MHz

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

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6 **REVISION HISTORY**

Version	Date	Notes	Person
V0 2	10/23/17	Draft	Aidi Zainal
V1 10	0/24/2017	Final	Aidi Zainal

END OF REPORT

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