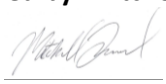
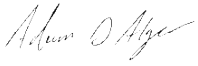
Test Report C-3864F

Equipment Under Test:	CoreLinc Receiver
Requirement(s):	RSS-102, FCC Part 1.1310, 2.1093
Test Date(s):	12/09/2024-12/27/2024
Prepared for:	Lincoln Electric Attn: Laurent Majerus 22801 Saint Clair Ave Cleveland, OH 4117

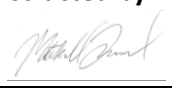
Report Issued by: Mitchell Freund, EMC Test Engineer

Signature:  Date:03/27/2025

Report Reviewed by: Adam Alger, Manager EMC Laboratory

Signature:  Date: 03/27/2025

Report Constructed by: Mitchell Freund, EMC Test Engineer

Signature:  Date: 01/27/2025

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Ezurio Test Services in Review

The Ezurio 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 17025:2017 with Electrical (EMC) Scope

A2LA Certificate Number: 1255.01

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

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Federal Communications Commission (FCC) – USA

Accredited Test Firm Registration Number: 953492

Recognition of two 3 meter Semi-Anechoic Chambers

Government of Canada

Innovation, Science and Economic Development Canada

Accredited U.S. Identification Number: US0218

Recognition of two 3 meter Semi-Anechoic Chambers

1 TEST REPORT SUMMARY

During **12/09/2024-12/27/2024** the Equipment Under Test (EUT), **CoreLinc Receiver**, as provided by **Lincoln Electric** was tested to the following requirements:

Requirements	Description	Method	Compliant
ISED RSS-102	Radio Frequency Exposure Compliance of Radiocommunication Apparatus	RSS-102	Yes
FCC Part 1.1310, 2.1093	Radio Frequency Radiation Exposure Evaluation	KDB 447498 D01	Yes

Notice:

The results relate only to the item tested as configured and described in this report. Any additional configurations, modes of operation, or modifications made to the equipment under test after the specified test date(s) are at the decision of the client and may not apply to the data seen in this test report.

The decision rule for Pass / Fail assessment to the specification or standard listed in this test report has been agreed upon by the client and laboratory to be as follows:

Measurement Type	Rule
Emissions – Amplitude	1 dB below specified limit
Emissions – Frequency	1% less than the specification
Immunity	Tested at specified level

2 CLIENT INFORMATION

Company Name	Lincoln Electric
Contact Person	Laurent Majerus
Address	22801 Saint Clair Ave Cleveland, OH 4117

2.1 Equipment Under Test (EUT) Information

The following information has been supplied by the client

Product Name	CoreLinc Receiver
Model Number	K5784-1
Serial Number	P-WRLS-R-C0-001
FCC ID	2AJY8-LER00057841
IC ID	22017-LER00057841

2.2 Product Description

Receiver for wireless welding remote control.

2.3 Modifications Incorporated for Compliance

Client understands the modifications.

2.4 Additional Information

120 VAC to 42 VDC power supply, Channels: Low Channel = 902.2 MHz, Middle Channel = 915 MHz, and High Channel is 927.8 MHz, programmed with TI Smart RF Studio 7 using a client provided laptop and a TI XDS110 Debug Probe. The receiver operates in continuous mode and duty cycling is not enabled. For testing purposes, a 42V power supply provided by the client was used.

Power supply information: Manufacturer: Mean Well, Part Number: OWA-60U-42.

The nominal input voltage the unit is designed to work with is 40VDC @ 0.04A (~1.6W). The maximum input voltage the unit will be exposed to is 42VDC @ 0.05A (~2.1W). The unit is designed to handle voltage transients up to 55VDC.

2.5 Additional Information

Power Setting: 14 Low

Max Power Setting: 20 High

2.6 Test Channels

Channel	Frequency (MHz)	Settings
Low	902.2	WB-DSSS, 30kbps (480 ksps), 195 kHz Deviation, 2 GFSK, 784 kHz RX bandwidth, FEC = 1:2, DSSS = 1:8
Med	915	
High	927.8	

3 REFERENCES

Publication	Edition	Date	AMD 1	AMD 2
eCFR	-	2024	-	-
RSS-102	6	2023	-	-
KDB 447498 D01	Ver. 6	2015	-	-

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
CISPR 16-4-1
CISPR 16-4-2
CISPR 32
ANSI C63.23
A2LA P103
A2LA P103c
ETSI TR 100-028

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

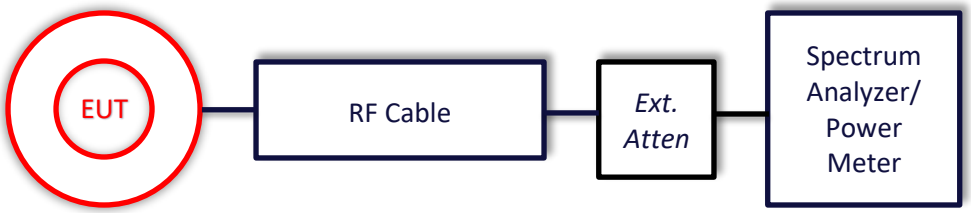
Parameter	ETSI U.C. ±	U.C. ±
Radio Frequency, from F0	$1x10^{-7}$	$0.55x10^{-7}$
Occupied Channel Bandwidth	5 %	2 %
RF conducted Power (Power Meter)	1.5 dB	1.2 dB
RF conducted emissions (Spectrum Analyzer)	3.0 dB	1.7 dB
All emissions, radiated	6.0 dB	5.3 dB
Temperature	1° C	0.65° C
Humidity	5 %	2.9 %
Supply voltages	3 %	1 %

5 TEST DATA

5.1 Antenna Port Conducted Emissions

Description of Measurement	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. 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)

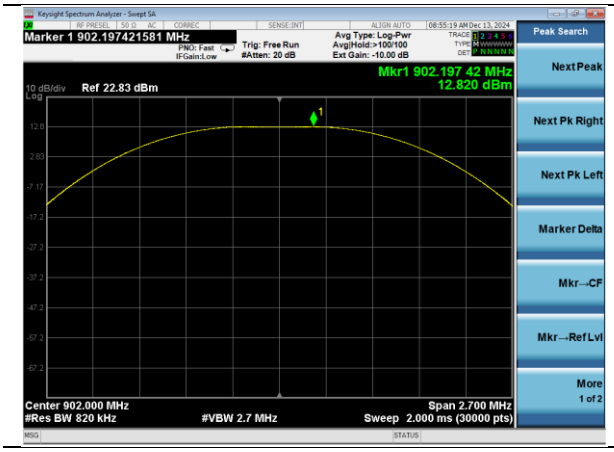
Block Diagram



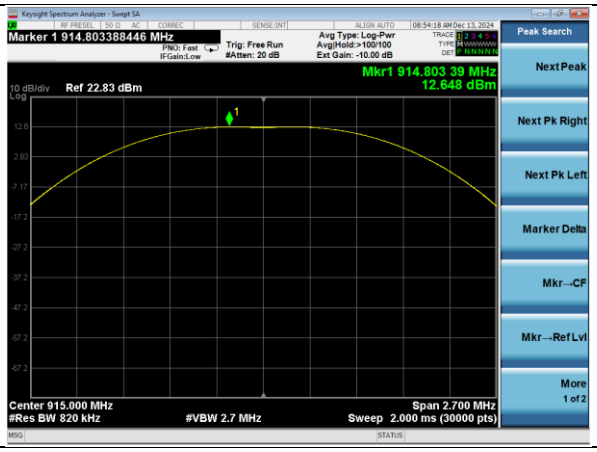
5.1.1 Antenna Port Conducted Emissions – RF Output Power

Channel	Mode	Pk Output Power (dBm)	Limit (dBm)	Margin (dB)	Power Setting
Low	Mod. Tx	12.8	30	17.2	14 Low
Mid	Mod. Tx	12.5	30	17.5	14 Low
High	Mod. Tx	12.2	30	17.8	14 Low

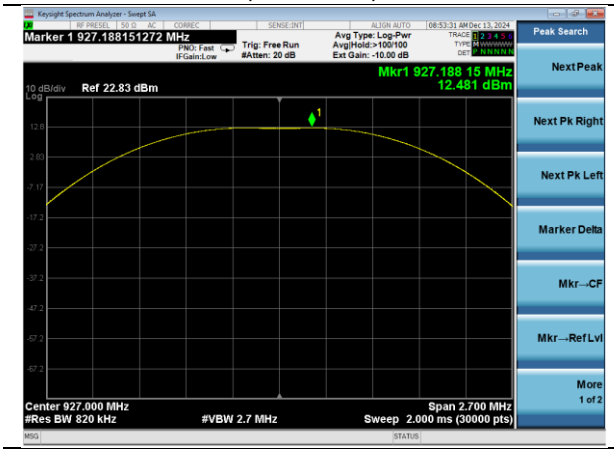
Plots



Channel: 902.2 MHz WB-DSSS, 30kbps (480 ksps), 195 kHz Deviation, 2 GFSK, 784 kHz RX bandwidth, FEC = 1:2, DSSS = 1:8



Channel: 915 MHz WB-DSSS, 30kbps (480 ksps), 195 kHz Deviation, 2 GFSK, 784 kHz RX bandwidth, FEC = 1:2, DSSS = 1:8



Channel: 927.8 MHz WB-DSSS, 30kbps (480 ksps), 195 kHz Deviation, 2 GFSK, 784 kHz RX bandwidth, FEC = 1:2, DSSS = 1:8

6 FCC SAR EXCLUSION

6.1 SAR Exclusion Limit

For separation distance of 50mm or less

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] ·

[$\sqrt{}$f(GHz)] ≤ 7.5 for 10-g SAR

· F(GHz) is the RF channel transmit frequency in GHz

· Power and distance are rounded to the nearest mW and mm before calculation

· The result is rounded to one decimal place for comparison

· The value 7.5 is referred to as numeric thresholds

KDB 447498 D01

6.2 Distance

≥5mm

6.3 Power Calculation

Max Power of Channel = 12.8 dBm (Low Channel)

Tune up Tolerance = 1.0 dB

Total Power = 12.8 dBm + Tune-up Tolerance =13.8 dBm = 24mW

6.4 SAR Test Exclusion Calculation

$$\left[\frac{(24mW)}{(5mm)}\right] \times \sqrt{.902} = 4.6$$

6.5 Result

The EUT is excluded from SAR testing at distances greater than or equal to 5mm as 4.6 is less than 7.5.

7 ISED SAR EXEMPTION

7.1 SAR Exemption Limit

Frequency (MHz)	≤ 5 mm (mW)	10 mm (mW)	15 mm (mW)	20 mm (mW)	25 mm (mW)	30 mm (mW)	35 mm (mW)	40 mm (mW)	45 mm (mW)	> 50 mm (mW)
≤ 300	112.5	290	347.5	407.5	472.5	540	615	700	797.5	905
450	80	177.5	217.5	260	310	367.5	437.5	520	620	740
835	52.5	80	102.5	135	180	240	322.5	430	570	745
1900	15	25	45	82.5	142.5	230	345	485	642.5	807.5
2450	7.5	17.5	40	80	140	222.5	320	425	522.5	612.5
3500	5	15	37.5	72.5	125	180	235	285	335	395
5800	2.5	12.5	32.5	57.5	80	102.5	135	185	255	320

**Power Limits for exemption from SAR evaluation RSS-102*

**Limb-worn devices where the 10 gram of tissue applies, the exemption limits for routine evaluation in table 11 were multiplied by a factor of 2.5.*Distance≥5 mm

7.2 Calculation

Max Power of Channel = 12.8 dBm (Low Channel)

Tune-up Tolerance = 1.0dBi

Antenna Gain = 1.0dBi

Total Power = 12.8 dBm + Tune-up Tolerance + Gain =14.8 dBm = 30mW

7.3 SAR TEST Exemption Calculation

The exemption limit at 5mm is 50mW. The total power of the EUT is 30mW.

30mW ≤ 50mW

7.4 ISED SAR Total Exposure Ratio Calculation

7.1.8 SAR estimation for exempted transmitters

SAR values from exempted transmitters shall be included in the total exposure assessment. A SAR value of 0.4 W/kg for 1 g, 1 W/kg for 10 g, or an estimated SAR value based on the ratio of the power level and the power exemption limit may be used to determine the standalone SAR value for test configurations that do not require a SAR evaluation based on test reductions or on the exemption limits outlined in section 6.3. The estimated SAR value, $SAR_{estimated}$ is calculated using equation (2):

$$SAR_{estimated} = \frac{P_{max}}{P_{max,exemption}} \times 0.25 \times SAR_{limit} W/kg \quad (2)$$

where:

- P_{max} is the maximum power level including tune-up tolerance for the exempted transmitter
- $P_{max,exemption}$ is the maximum power level of exemption at the same frequency and distance for the exempted transmitter
- SAR_{limit} is the applicable SAR limit (e.g. 1.6 W/kg for 1 g or 4 W/kg for 10 g)

For example, transmitter A has a maximum output power of 2 mW and the power exemption threshold is 3 mW at that specific frequency and distance (i.e. 2.45 GHz with a separation distance of 5 mm). The estimated SAR = (2 mW / 3 mW) * 0.4 W/kg = 0.27 W/kg.

The SAR levels from exempted transmitters shall be included in the total exposure ratio assessment. Detailed guidance is included in section 8.2.2.1.

SAR estimated = ($P_{max}/P_{max,exemption}$) x 0.25×$SAR_{limit}$W/kg

SAR estimated = (30/50) x .25 x 4W/kg

SAR estimated = 0.60 W/kg

8.2.2.1 SAR-based ER (above 10 MHz to 6 GHz)

The thermal-based ER for transmitters operating above 10 MHz ($Er_{therm>10MHz}$) is evaluated based on the operating frequency or test frequency and the type of measurement or simulation result. The ER resulting from SAR-based measurements/simulations above 10 MHz to 6 GHz can be calculated using equation (9)

$$ER_{therm>10\ MHz,t} = \frac{SAR_t}{SAR_{limit,t}}, 10\ MHz < f_t \leq 6\ GHz \quad (9)$$

where:

- SAR_t is the SAR value of the t-th transmitter/test frequency
- $SAR_{limit,t}$ is the basic restriction limit that is applicable for the t-th transmitter and
- f_t is the operating frequency / test frequency of the t-th transmitter

The ER resulting from SAR-based exempted transmitters can be calculated using equation (10) :

$$ER_{therm>10\ MHz,u} = \frac{SAR_{estimated,u}}{SAR_{limit,u}}, 10\ MHz < f_u \leq 6\ GHz \quad (10)$$

where:

- $SAR_{estimated,u}$ is the SAR value of the exempted u-th transmitter/test frequency (refer to section 7.1.8)
- $SAR_{limit,u}$ is the basic restriction limit that is applicable for the u-th transmitter and
- f_u is the operating frequency / test frequency of the u-th transmitter

SAR estimated = 0.60 W/kg

SAR limit = 4 W/kg

ER therm > 10 MHz = (0.6/4), 10 MHz < 902 MHz ≤ 6 GHz = 0.150

7.5 Result

The EUT is exempt from routine SAR testing at distances greater than or equal to 5mm as 30mW is less than 50mW and has a total exposure ratio of less than 1.

8 REVISION HISTORY

Version	Date	Notes	Person
0.0	1/16/2025	Initial Draft	Mitchell Freund
1.0	1/27/2025	Final Draft	Mitchell Freund
2.0	3/13/2025	TCB Comments Addressed	Mitchell Freund
3.0	3/27/2025	TCB Comments Addressed	Mitchell Freund

END OF REPORT