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EMC Verification Test Report

Prepared for:	RFID Inc.
Address:	14190 E Jewell Ave, Ste 4 Aurora, CO 80012
EUT:	StationSeeker
Test Report No.:	20231107-20-E1A

Approved By: Fox Lane

Fox Lane,
EMC Test Engineer

Date: 16 July 2024

Total Pages: 14

ilac-MRA A2LA ACCREDITED TESTING LABORATORY CERTIFICATE NO. 1953.01

Revision Page

Rev. No.	Date	Description
Original	16 July 2024	Reviewed and Issued by FLane Prepared by ESchmidt
A	31 July 2024	Added FCC ID and Radiated emissions diagram - FL

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1 Summary of Test Results

The EUT was tested for compliance with the following standards and/or regulations.

1.1 Emissions Test Results

The EUT was tested for compliance to:

FCC Part 15.209
ISED RSS-210 Issue 10
RSS-Gen Issue 5

Below is a summary of the test results. Complete results of testing can be found in Section 3.

Table 1 – Emissions Test Results

Emissions Tests	Test Method and Limits	Result
Radiated Emissions	FCC Part 15.209 ISED RSS-210 Issue 10 RSS-Gen Issue 5	Complies

2 EUT Description

2.1 Equipment under Test (EUT)

Table 2 – Equipment under Test (EUT)

Manufacturer	RFID Inc.
FCC ID	YVU3049E
Model	3049E
Serial Number	011705 (Lab-assigned SN)
EUT Received Date	12/28/2023
EUT Tested Date	12/28/2023 – 7/3/2024

2.2 Laboratory Description

Testing was performed at the following Facility:

The Nebraska Center for Excellence in Electronics (NCEE Labs)
4740 Discovery Drive
Lincoln, NE 68521

A2LA Certificate Number: 1953.01
FCC Accredited Test Site Designation No: US1060
Industry Canada Test Site Registration No: 4294A-1
NCC CAB Identification No: US0177

Environmental conditions varied slightly throughout the tests:
Relative humidity of 35 ± 10%
Temperature of 24 ± 3° C

2.3 EUT Setup

The EUT was powered by internal batteries. During the radiated emissions tests, the button on the EUT's handle was held down so the device would be in the 'scanning' state and the 125kHz transmitter would be active.

3 Test Results

3.1 Radiated Emissions

Test:	FCC Part 15.209 ISED RSS-210 Issue 10 RSS-Gen Issue 5
Test Specifications:	Class B
Test Result:	Complies

3.1.1 Test Description

Radiated emissions measurements were made from 30MHz to 1GHz at a distance of 10m inside a semi-anechoic chamber. The EUT was rotated 360°, the antenna height varied from 1-4 meters and both the vertical and horizontal antenna polarizations examined. The results were compared against the limits. Measurements were made by first using a spectrum analyzer to acquire the signal spectrum; individual frequencies were then measured using a CISPR 16.1 compliant receiver with the following bandwidth setting:

150kHz – 30MHz: 9kHz IF bandwidth, 4.5kHz steps
30MHz – 1GHz: 120kHz IF bandwidth, 60kHz steps

3.1.2 Test Results

No radiated emissions measurements were found in excess of the limits. Test result data can be seen below.

3.1.3 Test Environment

Testing was performed at the NCEE Labs Lincoln facility in the 10m semi-anechoic chamber. Laboratory environmental conditions varied slightly throughout the test:

Relative humidity of 35 ± 5%
Temperature of 23 ±2° C

3.1.4 Test Setup

Radiated ☒

All the radiated measurements were taken at a distance of 3m from the EUT. The information regarding resolution bandwidth, video bandwidth, span and the detector used can be found in the graphs provided in Appendix C. All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

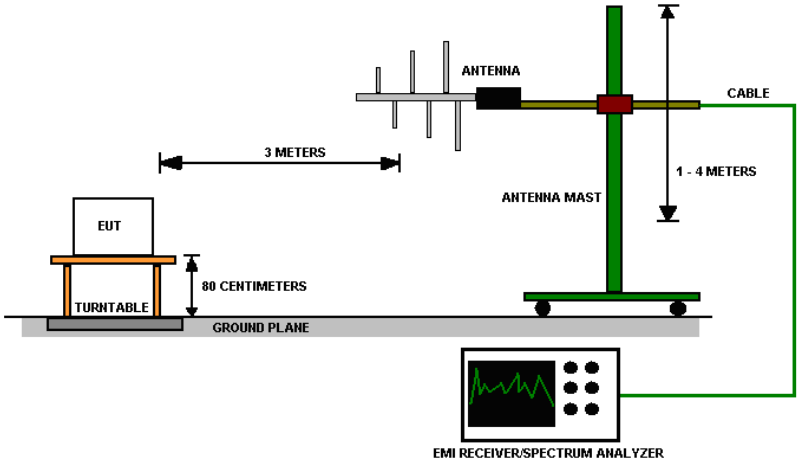

Figure 1 - Radiated Emissions Test Setup

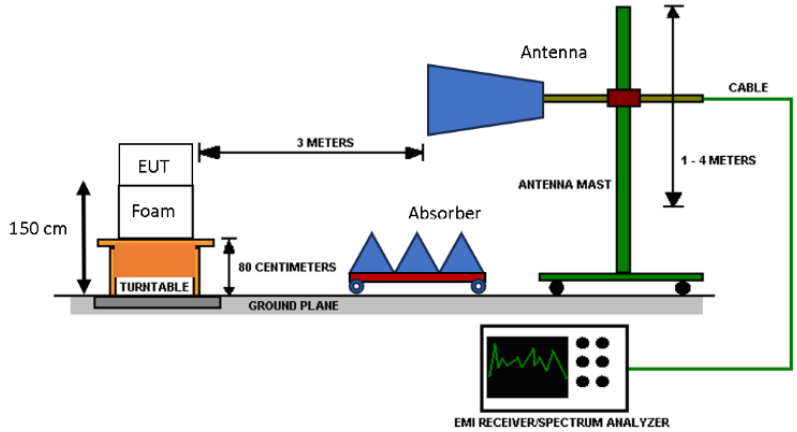

Figure 2 - Radiated Emissions Test Setup, >1GHz

3.1.5 Test Equipment Used

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE	CALIBRATION DUE DATE
Keysight MXE Signal Analyzer (44GHz)	N9038A	MY59050109	July 17, 2023	July 17, 2025
Keysight MXE Signal Analyzer (26.5GHz)**	N9038A	MY56400083	July 17, 2023	July 17, 2025
SunAR RF Motion	JB1	A091418	July 26, 2023	July 26, 2024
ComPower Active Loop Antenna	AL-130R	10160084	July 24, 2023	July 24, 2024
ETS – Lindgren- VSWR on 10m Chamber	10m Semi-anechoic chamber-VSWR	4740 Discovery Drive	July 30, 2020	July 30, 2024
NCEE Labs-NSA on 10m Chamber*	10m Semi-anechoic chamber-NSA	NCEE-001	May 25, 2022	May 25, 2025
RF Cable (antenna to 10m chamber bulkhead)	FSCM 64639	01E3872	June 5, 2023	June 5, 2025
RF Cable (10m chamber bulkhead to control room bulkhead)	FSCM 64639	01E3874	June 5, 2023	June 5, 2025
RF Cable (control room bulkhead to test receiver)	FSCM 64639	01F1206	June 5, 2023	June 5, 2025
N connector bulkhead (10m chamber)	PE9128	NCEEBH1	June 5, 2023	June 5, 2025
N connector bulkhead (control room)	PE9128	NCEEBH2	June 5, 2023	June 5, 2025
TDK Emissions Lab Software	V11.25	700307	NA	NA

*Internal verification
**2 Year Cal Cycle

3.1.6 Test Pictures and/or Figures

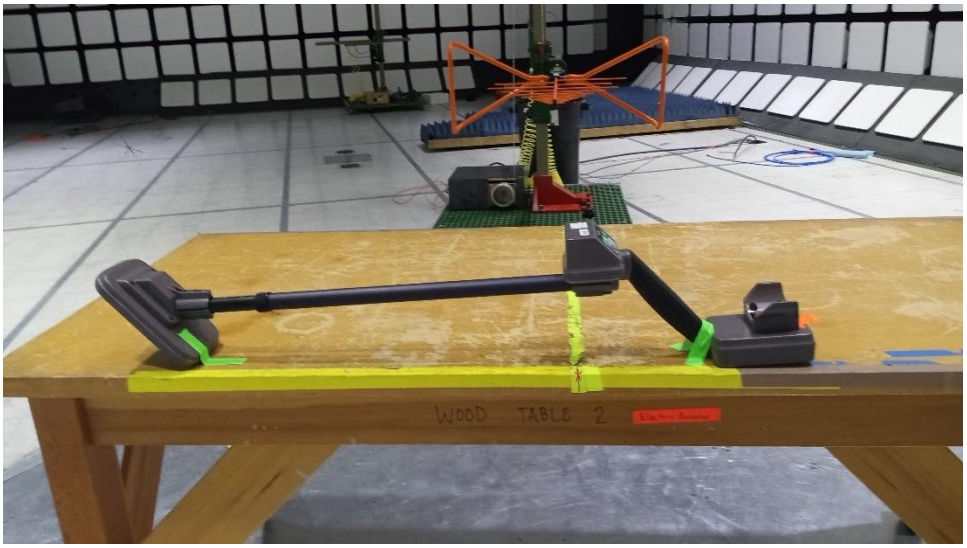

Figure 3 – Radiated Emissions Test Setup, 30MHz - 1GHz

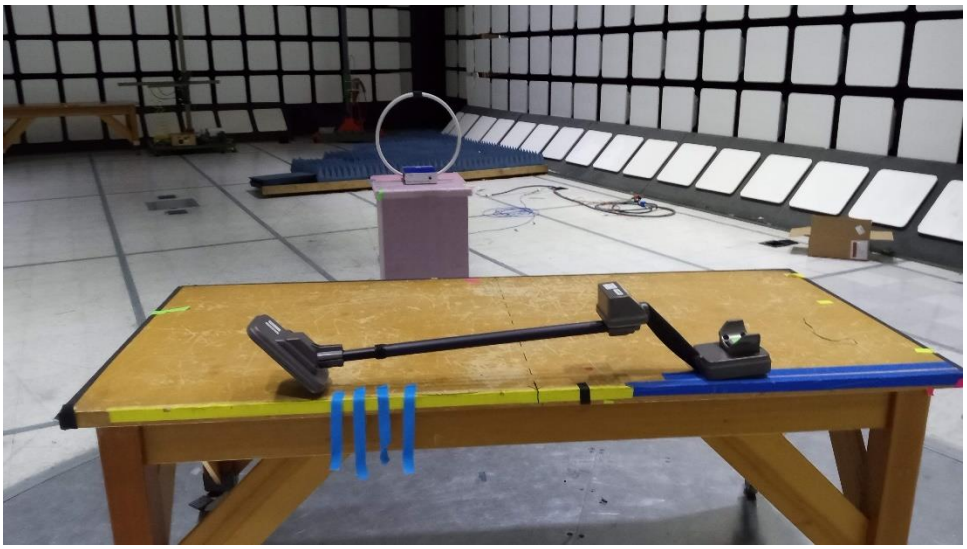

Figure 4 – Radiated Emissions Test Setup, 9kHz – 30MHz

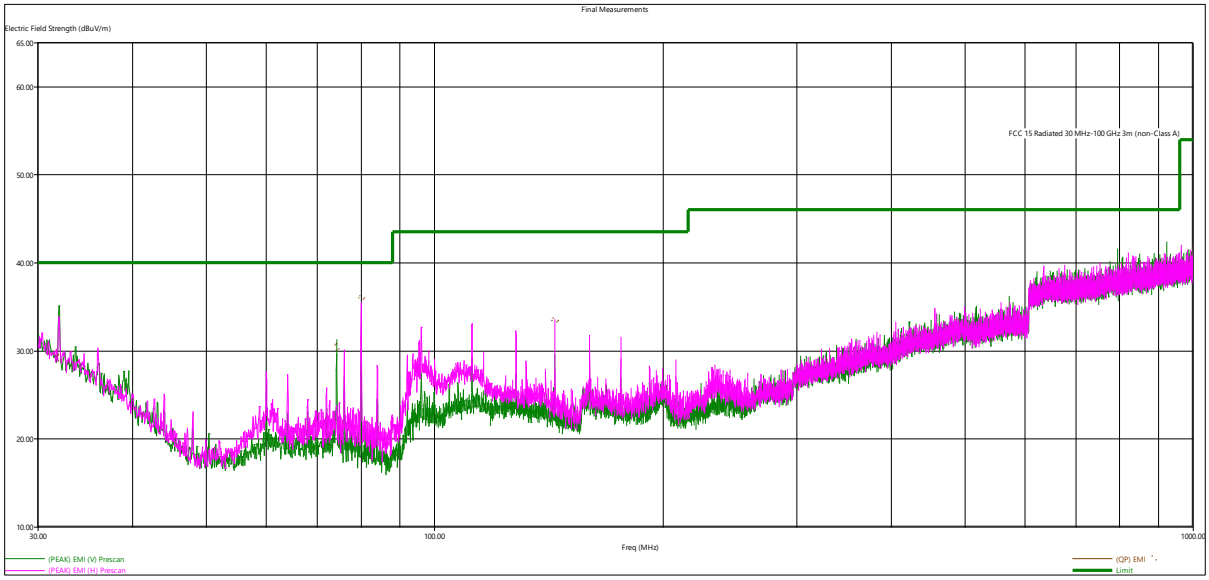

Figure 5 – Radiated Emission Plot, 30MHz – 1GHz

Table 3 – Radiated Emissions QP Data

Freq (MHz)	(QP) EMI (dBuV/m)	Limit (dBuV/m)	(QP) Margin (dB)	Twr Ht (cm)	Ttbl Ang (deg)	Pol
80.006160	**35.97**	**40.00**	**4.03**	**256.00**	**353.25**	**H**
144.017760	33.43	43.52	10.09	185.79	329.25	H
31.978560	29.15	40.00	10.85	179.64	32.00	V
74.245920	30.33	40.00	9.67	215.46	318.00	V

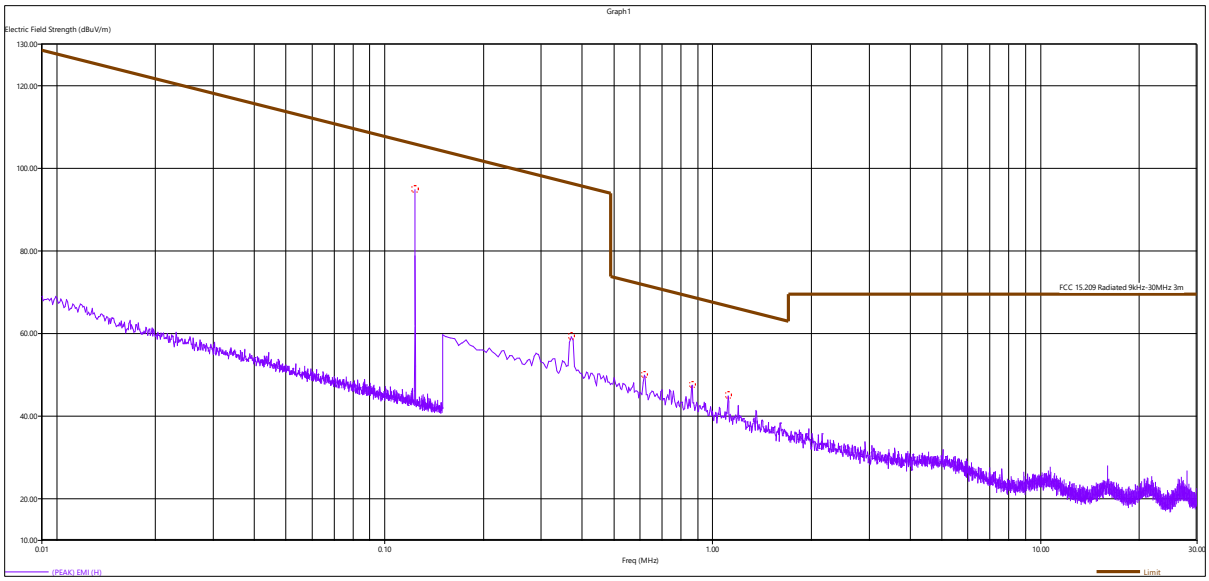

Figure 6 – Radiated Emission Plot, 9kHz – 30MHz

Table 4 – Radiated Emissions Peak Data

Freq (MHz)	(Peak) EMI (dBuV/m)	Limit (dBuV/m)	(Peak) Margin (dB)
0.123600	94.80	105.76	10.97
0.370500	59.21	96.23	37.02
0.618000	49.95	71.78	21.83
0.865500	47.46	68.86	21.40
1.113000	44.94	66.67	21.74

Annex A: Measurement Uncertainty

NCEE Labs does not add uncertainty values to measurements
Where relevant, the following measurement uncertainty levels apply to tests performed in this test report:

Test	Frequency Range	NCEE Labs Uncertainty Value (dB)	Maximum Uncertainty Values per CISPR 16-4-2:2003
Radiated Emissions, 10m	9kHz - 1GHz	4.31	5.20

Expanded uncertainty values are calculated to a confidence level of 95%.

NCEE Labs meets the maximum uncertainty requirements per CISPR 16-4-2:2003, and therefore does not require a minimum passing margin to state that an EUT is less than the field strength limits of the applicable CISPR, IEC or EN limit per CISPR 16-4-2:2003, Section 4.1.

CISPR 16-4-2:2003 is called out in the Normative References in Section 2 of EN 55011:2009.

Annex B: Sample Field Strength Calculation

Radiated Emissions

The field strength is calculated in decibels (dB) by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = R + AF – (-CF + AG)

where FS = Field Strength
R = Receiver Amplitude Receiver reading in dBμV
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Preamplifier Amplifier Gain

Assume a receiver reading of 55.00 dBμV is obtained. The Antenna Factor of 12.00 and a Cable Factor of 1.10 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.10 dBμV/m.

FS = 55.00 + 12.00 – (-1.10 + 20.00) = 48.1 dBμV/m

The 48.1 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

Level in μV/m = Common Antilogarithm [(48.1 dBμV/m)/20]= 254.1 μV/m

Conducted Emissions

Receiver readings are compared directly to the conducted emissions limits in decibels (dB) by adding the cable loss and LISN insertion loss to the receiver reading. The basic equations with a sample calculation is as follows;

FS = R + IL – (-CF)

where V = Conducted Emissions Voltage Measurement
R = Receiver reading in dBμV
IL = LISN Insertion Loss
CF = Cable Attenuation Factor

Assume a receiver reading of 52.00 dBμV is obtained. The LISN insertion loss of 0.80 dB and a Cable Factor of 1.10 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dBμV/m.

V = 52.00 + 0.80 – (-1.10) = 53.90 dBμV/m

The 53.90 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

Level in μV/m = Common Antilogarithm [(48.1 dBμV/m)/20]= 495.45 μV/m

REPORT END