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Date: 22 December 2022

I.T.L. Product Testing Ltd.

FCC/IC Radio Test Report

for

Roseman Engineering Ltd.

Equipment under test:

Dual Nozzle Tag

Dual Mode

Tested by: _____
M. Zohar

Approved by: I. Mansky

I. Cohen: _____

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Measurement/Technical Report for

Roseman Engineering Ltd.

Dual Nozzle Tag

Dual Mode

FCC ID: JAKNR-DMR

IC: 29097NR-DMR

This report concerns:	Original Grant
Equipment type:	FCC: Part 15, Low Power Transmitter Below 1705 kHz Low Power Transmitter General Field Limits (9kHz-30MHz)
	IC: Wireless Local Area Network Device
Limits used:	FCC: 47CFR 15, Section 15.209 IC: RSS-Gen, Issue 5, April 2018, Amendment 1 (March 2019), Amendment 2 (February 2021)
Measurement procedure used:	FCC: ANSI C.63.10-2020 IC: IC: RSS-Gen, Issue 5, April 2018, Amendment 1 (March 2019), Amendment 2 (February 2021)

Prepared by:

R. Ezrah

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Applicant:

Haim Kashi

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Kiriat Atidim Bldg. 7, Tel Aviv 61580, Israel

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Table of Contents

1. General Information

1.1 Administrative Information

Manufacturer:	Roseman Engineering Ltd.
Manufacturer's Address:	Kiriat Atidim Bldg. 7, Tel Aviv 61580, Israel
Manufacturer's Representative:	Leonid Shikelman
Equipment Under Test (E.U.T):	Dual Nozzle Tag
Equipment Model No.:	Dual Mode
Equipment Serial No.:	Not designated
PMN/HVIN:	RID-DMR-07-C RID-DMR-09-B
Date of Receipt of E.U.T:	February 07 ,2022
Start of Test:	February 07 ,2022
End of Test:	March 11 ,2022
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Bat Sheva St., Lod 7120101, Israel
Test Specifications:	FCC Part 15, Subpart C, Section 15.209 RSS-Gen, Issue 5, (April 2018), Amendment 2 (February 2021)

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation No. IL1005.
3. Department of Innovation, Science and Economic Development (ISED) Canada, CAB identifier: IL1002

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The Wireless Nozzle Reader (WNR) is an active stand-alone device fitted to the nozzle. The WNR is a robust system enclosed in rugged plastic, designed to operate in harsh fuel environments. It is easy to install and does not require any adaptations to the nozzle.
The nozzle is inserted into a vehicle fuel tank inlet. The WNR automatically reads the vehicle identification device data and transmits it to the Island Control Unit (ICU) via the Wireless Automated Fueling (WAF) unit to check the tag authentication and verification. Only then will authorization be approved and fuel dispensed into the vehicle.
Throughout the course of fueling the WNR transmits refresh signals to the WAF unit showing that the fueling is in progress and will do so until the transaction is completed.
The nozzle tag contains a replaceable battery.

1.4 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.10-2020, and RSS-Gen Issue 5 March 2019 Amendment 1 and Amendment 2. Radiated testing was performed at an antenna-to-EUT distance of three meters.

1.5 Test Facility

Emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation No. IL1005.

1.6 Measurement Uncertainty

Conducted Emission
Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)
0.15 – 30 MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 3.44 dB

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site:
30-1000MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 4.96 dB

1 GHz to 6 GHz
Expanded Uncertainty (95% Confidence, K=2):
±5.19 dB

>6 GHz
Expanded Uncertainty (95% Confidence, K=2):
±5.51 dB

2. System Test Configuration

2.1 Justification

1. The E.U.T contains a 10kHz transmitter.
2. Exploratory radiated emission screening was performed in 3 orthogonal orientations to find the "worst case" type and orientation

Orientation	Field Strength	2nd Harmonic	3rd Harmonic
	(dBuV/m)	(dBuV/m)	(dBuV/m)
X axis	47.5	N.L	N.L
Y axis	48.2	N.L	N.L
Z axis	46.8	N.L	N.L

Figure 1. Screening Results

According to the above table, the "worst case" was the Y axis.

2.2 EUT Exercise Software

No special exercise software was used.

2.3 Special Accessories

2.4 Equipment Modifications

No equipment modifications were required to achieve compliance.

2.5 Configuration of Tested System

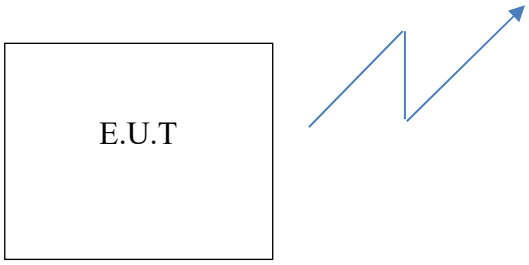

Figure 2. Test Set-Up

3. Test Setup Photos

See a separate file.

4. Field Strength of Fundamental

4.1 Test Specification

Part 15, Subpart C, Section 15.209(a)

RSS-Gen, Issue 5, March 2019 Amendment 1, Section 8.9

4.2 Test Procedure

(Temperature (20°C)/ Humidity (58%RH))

The E.U.T. operation mode and test set-up are as described in Section 2 of this report. The E.U.T. was placed in the chamber on a non-conductive table, 0.8 meters above the ground.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna polarity were adjusted for maximum level reading on the EMI receiver.

The EMI receiver was set to the E.U.T. fundamental frequency and peak detection.

4.3 FCC Test Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	Field strength (dBµV/m)	Field strength* (dBµV/m)@3m
0.009-0.490	2400/F(kHz)	300	48.5-13.8	128.5-73.8
0.490-1.705	24000/F(kHz)	30	33.8-23.0	73.8-63.0
1.705-30.0	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

4.4 IC Test Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Magnetic Field strength (microampere/meter)	Measurement distance (meters)	Magnetic Field strength (dBµA/m)	Magnetic Field strength* (dBµA/m)@3m
0.009-0.490	6.37/F(kHz)	300	-3.0-(-37.7)	77.0-42.2
0.490-1.705	63.7/F(kHz)	30	-17.7-(-28.5)	22.3-11.4
1.705-30.0	0.08	30	-21.9	18.0
Frequency (MHz)	**Field strength (microvolts/meter)**	**Measurement distance (meters)**	**Field strength (dBµV/m)**	**Field strength* (dBµV/m)@3m**
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

4.5 Test Results

Frequency	Peak Reading	Avg. Limit	Margin
(kHz)	**(dBµV/m)**	**(dBµV/m)**	**(dB)**
10.0	48.2	127.6	-79.6

Figure 3. Field Strength of Fundamental FCC Test Results

Frequency	Peak Reading	Avg. Limit*	Margin
(kHz)	**(dBµA/m)**	**(dBµA/m)**	**(dB)**
10.0	-3.3	76.1	-78.8

Figure 4. Magnetic Field Strength of Fundamental IC Test Results

Note :limit calculation :
*20*log(6.37/10)=-3.9dBµA/m@300m=-3.9+ 40*log(300/3)=76.1 dBµA/m@3m*

JUDGEMENT: Passed by 1.6 dB

The details of the highest emissions are given in Figure 5 to Figure 6.

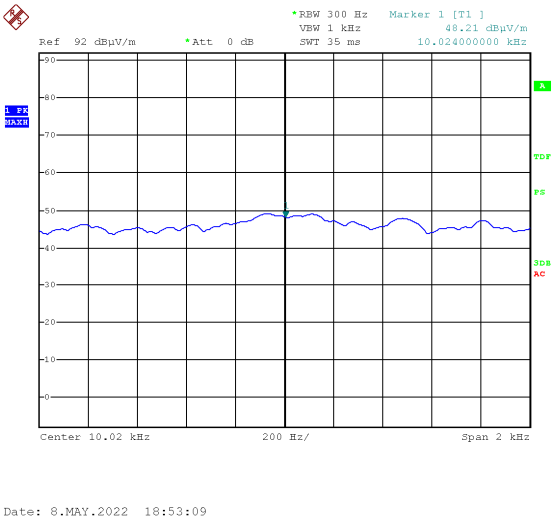

Figure 5. Field Strength of Fundamental, 10kHz electric field

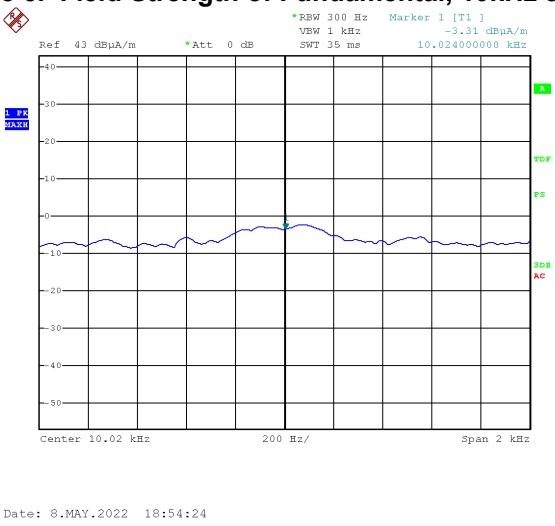

Figure 6. Field Strength of Fundamental, 10kHz magnetic field

4.6 Test Instrumentation Used; Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	20 Feb. 2022	20 Feb. 2023
Loop Antenna	EMCO	6502	2950	05 Jul. 2022	05 Jul. 2023
Full Anechoic Chamber	ETS	S81	SL 11643	NCR	NCR
RF cable	Commscope ORS (Serge)	0623 WBC-400	G020132	25 May 2021	25 May 2022

Figure 7. Test Equipment Used

5. Radiated Emission, 9 kHz - 30 MHz

5.1 Test Specification

FCC, Part 15, Subpart C, Section 209(c)

RSS-Gen Issue 5, Section 8.9

5.2 Test Procedure

(Temperature (22°C)/ Humidity (56%RH))

The E.U.T. operation mode and test set-up are as described in Section 2 of this report. The E.U.T. was placed in the chamber on a non-conductive table, 0.8 meters above the ground.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna polarity were adjusted for maximum level reading on the EMI receiver.

The EMI receiver was set to the E.U.T. Fundamental Frequency and Peak Detection.

The frequency range 9 kHz-30 MHz was scanned.

5.3 FCC Test Limit

The level of any unwanted emissions from an intentional radiator shall not exceed the level of the fundamental emission .in addition the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	Field strength (dBµV/m)	Field strength* (dBµV/m)@3m
0.009-0.490	2400/F(kHz)	300	48.5-13.8	128.5-73.8
0.490-1.705	24000/F(kHz)	30	33.8-23.0	73.8-63.0
1.705-30.0	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

5.4 IC Test Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Magnetic Field strength (microampere/meter)	Measurement distance (meters)	Magnetic Field strength (dBµA/m)	Magnetic Field strength* (dBµA/m)@3m
0.009-0.490	6.37/F(kHz)	300	-3.0-(-37.7)	77.0-42.2
0.490-1.705	63.7/F(kHz)	30	-17.7-(-28.5)	22.3-11.4
1.705-30.0	0.08	30	-21.9	18.0
Frequency (MHz)	**Field strength (microvolts/meter)**	**Measurement distance (meters)**	**Field strength (dBµV/m)**	**Field strength* (dBµV/m)@3m**
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

5.5 Test Results

JUDGEMENT: Passed by -17.3 dB

See additional information in Figure 8 to Figure 9.

Radiated Emission 9 kHz – 30 MHz

Specifications: FCC, Part 15, Subpart C, RSS-Gen, Issue 5, Section 8.9

Antenna Polarization: Horizontal/Vertical
Frequency range: 9 kHz to 30.0 MHz
Test Distance: 3 meters
Detector: Peak
Operation Frequency: 10kHz

Frequency	Polarity	Peak Reading	Limit	Margin
(kHz)	(V/H)	(dBµV/m)	(dBµV/m)	(dB)
No emissions detected above the EMI Receiver noise level which have at least 20dB margin below the limit				

Figure 8. Radiated Emission, FCC Limit

Frequency	Polarity	Peak Reading	Limit	Margin
(kHz)	(V/H)	(dBµA/m)	(dBµA/m)	(dB)
No emissions detected above the EMI Receiver noise level which have at least 20dB margin below the limit				

Figure 9. Radiated Emission, IC Limit

✓ *Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*

5.6 Test Instrumentation Used; Radiated Emission

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	20 Feb. 2022	20 Feb. 2023
Loop Antenna	EMCO	6502	2950	05 Jul. 2022	05 Jul. 2023
Full Anechoic Chamber	ETS	S81	SL 11643	NCR	NCR
RF cable	Commscope ORS (Serge)	0623 WBC-400	G020132	25 May 2021	25 May 2022

Figure 10. Test Equipment Used

5.7 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

FS = RA + AF + CF

FS: Field Strength [dBµv/m]

RA: Receiver Amplitude [dBµv]

AF: Receiving Antenna Correction Factor [dB/m]

CF: Cable Attenuation Factor [dB]

Example: FS = 30.7 dBµV (RA) + 14.0 dB/m (AF) + 0.9 dB (CF) = 45.6 dBµV

No external pre-amplifiers are used.

6. Occupied Bandwidth

6.1 Test Specification

FCC, Part 2, Sub part J, Section 2.1049

RSS-Gen Issue 5, Section 6.6

6.2 Test Procedure

(Temperature (22°C)/ Humidity (56%RH))

The E.U.T. operation mode and test set-up are as described in Section 2 of this report. The E.U.T. was placed in the chamber on a non-conductive table, 0.8 meters above the ground.

The distance between the E.U.T. and test antenna was 3 meters.
The transmitter unit was operated with normal modulation. The RBW set to the range of 1% to 5% of the OBW. The span was set to ~ 3 times the OBW.
99% occupied bandwidth function was set on

6.3 Test Limit

N/A

6.4 Test Results

Frequency	Reading
(kHz)	(kHz)
10.0	N/A (the E.U.T transmit CW)

Figure 11. Bandwidth Test Results

JUDGEMENT: N/A

7. Appendix A - Correction Factors

7.1 ITL #1911: OATS RF Cable

Frequency (MHz)	Cable Loss (dB)		Frequency (MHz)	Cable Loss (dB)
1.00	0.50		450.00	5.83
10.00	1.00		500.00	6.33
20.00	1.34		550.00	6.67
30.00	1.50		600.00	6.83
50.00	1.83		650.00	7.17
100.00	2.67		700.00	7.66
150.00	3.17		750.00	7.83
200.00	3.83		800.00	8.16
250.00	4.17		850.00	8.50
300.00	4.50		900.00	8.83
350.00	5.17		950.00	8.84
400.00	5.50		1000.00	9.00

7.2 ITL #1840: Full-Anechoic Chamber RF Cable

Frequency (MHz)	Cable Loss (dB)
1,000.0	-1.40
1,500.0	-1.70
2,000.0	-2.00
2,500.0	-2.30
3,000.0	-2.60
3,500.0	-2.80
4,000.0	-3.10
4,500.0	-3.30
5,000.0	-3.60
5,500.0	-3.70
6,000.0	-4.00
6,500.0	-4.40
7,000.0	-4.7
7,500.0	-4.80
8,000.0	-5.00
8,500.0	-5.10
9,000.0	-5.60
9,500.0	-5.80
10,000.0	-6.00
10,500.0	-6.20
11,000.0	-6.20
11,500.0	-6.00
12,000.0	-6.00
12,500.0	-6.10
13,000.0	-6.30
13,500.0	-6.50
14,000.0	-6.70

Frequency (MHz)	Cable Loss (dB)
14,500.0	-7.00
15,000.0	-7.30
15,500.0	-7.50
16,000.0	-7.60
16,500.0	-8.00
17,000.0	-8.00
17,500.0	-8.10
18,000.0	-8.20

7.3 ITL # 1075: Active Loop Antenna

Frequency (MHz)	MAF (dBs/m)	AF (dB/m)
0.01	-33.10	18.40
0.02	-37.20	14.30
0.03	-38.20	13.30
0.05	-39.80	11.70
0.10	-40.10	11.40
0.20	-40.30	11.20
0.30	-40.30	11.20
0.50	-40.30	11.20
0.70	-40.30	11.20
1.00	-40.10	11.40
2.00	-40.00	11.50
3.00	-40.00	11.50
4.00	-40.10	11.40
5.00	-40.20	11.30
6.00	-40.40	11.10
7.00	-40.40	11.10
8.00	-40.40	11.10
9.00	-40.50	11.00
10.00	-40.50	11.00
20.00	-41.50	10.00
30.00	-43.50	8.00

7.4 ITL #1356: Biconical Antenna

Frequency (MHz)	AF (dB/m)
30.00	13.00
35.00	10.89
40.00	10.59
45.00	10.63
50.00	10.12
60.00	9.26
70.00	7.74
80.00	6.63
90.00	8.23
100.00	11.12
120.00	13.16
140.00	13.07
160.00	14.80
180.00	16.95
200.00	17.17

End of Report