

TEST REPORT

Application No.: HKEM2204000404AT
Applicant: RFDesign Pty Ltd
Address of Applicant: FCC: 1/373 Bradman Street, Acacia Ridge, QLD 4110, AUSTRALIA
 IC: U7, 1 Stockwell Pace Archerfield 4108 Australia

Equipment Under Test (EUT):
EUT Name: RFD900ux2
Model No.: 900ux-US
Trade Mark: RFDesign
FCC ID: 2ADLE-900UX2
IC: 24610-900UX2
HVIN: RFD900ux-US
Standard(s) : 47 CFR Part 1.1307; 47 CFR Part 2.1093
 KDB447498D01 General RF Exposure Guidance v06
 RSS102 Issue 5 March 2015

Date of Receipt: 2022-05-05
Date of Test: 2022-05-06 to 2022-05-13
Date of Issue: 2022-05-16

Test Result:	The submitted sample was found to comply with the test requirement
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Law Man Kit
EMC Manager

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2022-05-16		Original

Authorized for issue by:			
			
		Panny Leung /Project Engineer	Date: 2022-05-16
			
		Law Man Kit /Reviewer	Date: 2022-05-16

2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
RF Exposure	47 CFR Part 1.1307, 47 CFR Part 2.1093, KDB 447498 D01	KDB447498D01	KDB447498D01	PASS
RF Exposure	RSS102 Issue 5	RSS-102 Section 2.5.1	RSS102 Issue 5	PASS

Declaration of EUT Family Grouping:

N/A

Abbreviation:

- Tx: In this whole report Tx (or tx) means Transmitter.
- Rx: In this whole report Rx (or rx) means Receiver.
- RF: In this whole report RF means Radiated Frequency.
- CH: In this whole report CH means channel.
- Volt: In this whole report Volt means Voltage.
- Temp: In this whole report Temp means Temperature.
- Humid: In this whole report Humid means humidity.
- Press: In this whole report Press means Pressure.
- N/A: In this whole report not application.



3 Contents

	Page
1 COVER PAGE	1
2 TEST SUMMARY	3
3 CONTENTS	4
4 GENERAL INFORMATION	5
4.1 DETAILS OF E.U.T.....	5
4.2 DESCRIPTION OF SUPPORT UNITS.....	6
4.3 MEASUREMENT UNCERTAINTY	7
4.4 TEST LOCATION	8
4.5 TEST FACILITY	8
4.6 DEVIATION FROM STANDARDS	8
4.7 ABNORMALITIES FROM STANDARD CONDITIONS	8
5 RADIO SPECTRUM TECHNICAL REQUIREMENT	9
5.1 RF EXPOSURE	9
5.1.1 <i>Test Requirement:</i>	9
5.1.1 <i>IC Radiofrequency radiation</i>	10
5.1.2 <i>EUT RF Exposure Evaluation</i>	11
6 PHOTOGRAPHS	13

4 General Information

4.1 Details of E.U.T.

Power supply:	USB DC 5V VIA USB cable
Test voltage:	DC 5.0V
Antenna Gain:	3dBi
Antenna Type:	Dipole RPSMA
Modulation Type:	GFSK
Number of Channels:	102 (Maximum active channel number is 51)
Operation Frequency:	902.250 - 927.750MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum (FHSS)
Series number:	A1
Hardware Version:	V2.0
Software Version:	3.57
Remark:	
<ol style="list-style-type: none"> 1. Power level setting was not adjustable and is fixed for the SW Version. 2. Either channel 1-51 or channel 52-102 would be used once the power turns on. 	

EUT channels and frequencies list:

Band 1:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
<u>1</u>	<u>902.25</u>	18	906.50	35	910.75
2	902.50	19	906.75	36	911.00
3	902.75	20	907.00	37	911.25
4	903.00	21	907.25	38	911.50
5	903.25	22	907.50	39	911.75
6	903.50	23	907.75	40	912.00
7	903.75	24	908.00	41	912.25
8	904.00	25	908.25	42	912.50
9	904.25	26	908.50	43	912.75
10	904.50	27	908.75	44	913.00
11	904.75	28	909.00	45	913.25
12	905.00	29	909.25	46	913.50
13	905.25	30	909.50	47	913.75
14	905.50	31	909.75	48	914.00
15	905.75	32	910.00	49	914.25
16	906.00	33	910.25	50	914.50
17	906.25	34	910.50	51	914.75

Band 2:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
<u>52</u>	<u>915.25</u>	69	919.50	86	923.75
53	915.50	70	919.75	87	924.00
54	915.75	71	920.00	88	924.25
55	916.00	72	920.25	89	924.50
56	916.25	73	920.50	90	924.75
57	916.50	74	920.75	91	925.00
58	916.75	75	921.00	92	925.25
59	917.00	76	921.25	93	925.50
60	917.25	77	921.50	94	925.75
61	917.50	78	921.75	95	926.00
62	917.75	79	922.00	96	926.25
63	918.00	80	922.25	97	926.50
64	918.25	81	922.50	98	926.75
65	918.50	82	922.75	99	927.00
66	918.75	83	923.00	100	927.25
67	919.00	84	923.25	101	927.50
68	919.25	85	923.50	<u>102</u>	<u>927.75</u>

Remark:

1. Test frequencies are the lowest channel: 902.25MHz, middle channel: 915.25MHz and highest channel: 927.75MHz
2. Either channel 1-51 or channel 52-102 would be used once the power turns on.

4.2 Description of Support Units

The EUT has been tested with corresponding accessories as below:

Supplied by client

Description	Manufacturer	Model No.	SN/Certificate NO
RFD900 Tools	RF Design	V2.11	N/A

Supplied by SGS:

Description	Manufacturer	Model No.	SN/Certificate NO
NoteBook (EMC4)	Dell	P75F	N/A

4.3 Measurement Uncertainty

RF

No.	Item	Measurement Uncertainty
1	Conduction emission	2.8dB (9kHz to 150kHz)
		2.8dB (150kHz to 30MHz)
2	Radio Frequency	$\pm 7.25 \times 10^{-8}$
3	Duty cycle	$\pm 0.37\%$
4	Occupied Bandwidth	$\pm 3\%$
5	RF conducted power (30MHz-40GHz)	1.5dB
6	RF power density	1.5dB
7	Conducted Spurious emissions	1.5dB
8	RF Radiated power & Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.7dB (1GHz-6GHz)
		4.7dB (6GHz-18GHz)
		5.7dB (18GHz-40GHz)
9	Temperature test	$\pm 1^\circ\text{C}$
10	Humidity test	$\pm 3\%$
11	Supply voltages	$\pm 1.5\%$
12	Time	$\pm 3\%$

Remark:

The U_{lab} (lab Uncertainty) is less than U_{cispr} (CISPR Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

According to decision rule based on Clause 4.2 of CISPR 16-4-2, the EUT complied with the standards specified above.

4.4 Test Location

All tests were performed at:

SGS Hong Kong Limited
Unit 2 and 3, G/F, Block A, Po Lung Centre,
11 Wang Chiu Road, Kowloon Bay, Kowloon, Hong Kong
Tel: +852 2305 2570 Fax: +852 2756 4480

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **IAS Accreditation (Lab Code: TL-817)**

SGS Hong Kong Limited has met the requirements of AC89, IAS Accreditation Criteria for Testing Laboratories, and has demonstrated compliance with ISO/IEC Standard 17025:2017, General requirements for the competence of testing and calibration laboratories. This organization is accredited to provide the services specified in the scope of accreditation maintained on the IAS website (www.iasonline.org).

The report must not be used by the client to claim product certification, approval, or endorsement by IAS, NIST, or any agency of the Federal Government.

• **FCC Recognized Accredited Test Firm(CAB Registration No.: 514599)**

SGS Hong Kong Limited has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: HK0015, Test Firm Registration Number: 514599.

• **Industry Canada (Site Registration No.: 26103; CAB Identifier No.: HK0015)**

SGS Hong Kong Limited has been recognized by Department of Innovation, Science and Economic Development (ISED) Canada as a wireless testing laboratory. The acceptance letter from the ISED is maintained in our files. CAB Identifier No: HK0015, Site Registration Number: 26103.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



5 Radio Spectrum Technical Requirement

5.1 RF Exposure

5.1.1 Test Requirement:

CFR 47 Part 1.1310

Limit:

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in Part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

According to IEEE C95.3:2002 section 5.5.1.1, The power density S at a point on the axis at a distance d from a transmitting antenna is given by the Friis free-space transmission formula

$$S = \frac{PG}{4\pi d^2}$$

S = power density (mW/cm²)

P = the net power delivered to the antenna (mW)

G = gain of the antenna in linear scale

d = distance between observation point and center of the radiator (cm)

5.1.1 IC Radiofrequency radiation

According to RSS-102 Issue 5, section 2.5.2 Exemption.

RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $22.48/f^{0.5}W$ (adjusted for tune-up tolerance), where f is in MHz;

at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);

at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834} W$ (adjusted for tune-up tolerance), where f is in MHz;

at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).



5.1.2 EUT RF Exposure Evaluation

Antenna Gain: 3 dBi

The maximum Gain measured in fully anechoic chamber is 2.0

Output Power Into Antenna & RF Exposure Evaluation Distance:

For FCC;

FHSS:

Channel	Frequency (MHz)	Conduct power (including Tune-up tolerance) (dBm)	Conduct power (mW)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)	Result
Low	902.25	28.6	724.436	0.2876	0.6015	PASS
Middle	915.25	28.5	707.946	0.2810	0.6102	PASS
High	927.75	28.4	691.831	0.2746	0.6185	PASS

- Note: 1. Refer to report No. HKEM22040040401 for EUT test conducted power value;
2. Two working bands couldn't transmit simultaneously.

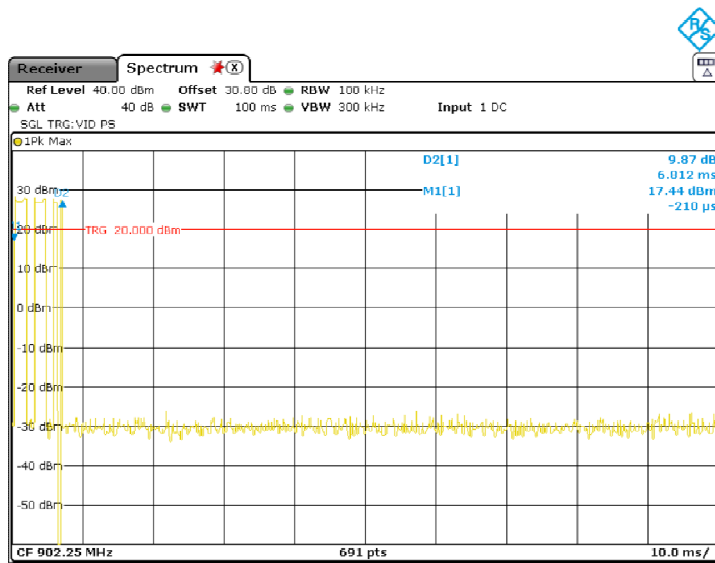
For IC:

Correction factor for average power:

On time= 6.812ms

Duty cycle within 100ms = 6.812/100=0.068

Average factor = 20log0.068 = -23.3dB



Channel	Frequency (MHz)	Conduct power (dBm)	E.I.R.P (dBm)	time-averaged output power (dBm)	E.I.R.P (W)	Limit (W)	Result
Low	902.25	28.6	31.6	8.3	0.007	1.37	PASS
Middle	915.25	28.5	31.5	8.2	0.007	1.38	PASS
High	927.75	28.4	31.4	8.1	0.006	1.40	PASS

Note: 1. Refer to report No. HKEM220400040401 for EUT test conducted power value and On time;
 2. Two working bands couldn't transmit simultaneously.



6 Photographs

Remark: Photos refer to Appendix: External Photo, Internal Photo and setup Photo.

- End of the Report -
