RF Test Report

Report No.: AGC10232210502EE10

PRODUCT DESIGNATION	:	Open-Source Sensor Beacon
BRAND NAME	:	Ruuvi
MODEL NAME	:	RuuviTag
APPLICANT	:	Ruuvi Innovations Ltd (Oy)
DATE OF ISSUE	:	Jun. 07, 2021
STANDARD(S)	:	ETSI EN 300 330 V2.1.1(2017-02)
REPORT VERSION	:	V1.0

***A**ttestation of **G**lobal **C**ompliance (Shenzhen) Co., Ltd.*

Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jun. 07, 2021	Valid	Initial Release

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1. TEST RESULT CERTIFICATION

Applicant	Ruuvi Innovations Ltd (Oy)
Address	Hämeenkatu 10 B 132, 11100 RIIHIMÄKI, FINLAND
manufacturer	Ruuvi Innovations Ltd (Oy)
Address	Hämeenkatu 10 B 132, 11100 RIIHIMÄKI, FINLAND
Factory	Ruuvi Innovations Ltd (Oy)
Address	Hämeenkatu 10 B 132, 11100 RIIHIMÄKI, FINLAND
Product Designation	Open-Source Sensor Beacon
Brand Name	Ruuvi
Model Name	RuuviTag
Date of Test	May 31, 2021 to Jun. 05, 2021

The above equipment was tested by SHENZHEN ATTESTATION OF GLOBAL COMPLIANCE (SHENZHEN) CO., LTD. for compliance with the requirements set forth in the European Standard ETSI EN 300 330 V2.1.1. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Prepared By	Cool Cheng Project Engineer	Jun. 05, 2021
Reviewed By	Max Zhang Reviewer	Jun. 07, 2021
Approved By	Forrest Lei Authorized Officer	Jun. 07, 2021

2. EUT DESCRIPTION

Details of technical specification for wireless charger refer to the description in follows:

Hardware Version	B8
Software Version	B8
Operation Frequency	13.56MHz
The permitted range of operating frequencies used	13.556-13.567MHz
Number of Channels	1 Channel
Antenna Type	PCB antenna
Product Classes	Class 1
Power Supply	DC 3V by battery

NOTE: For more information, please refer to User's Manual.

3. DESCRIPTION OF TEST ITEMS

Harmonised Standard ETSI EN 300 330		
Requirement		Requirement Conditionality
No	Description	
1	Permitted range of operating frequencies	☐ Applicable ☒ Not Applicable
2	Operating frequency ranges	☐ Applicable ☒ Not Applicable
3	Modulation bandwidth	☐ Applicable ☒ Not Applicable
4	Transmitter H-field requirements	☐ Applicable ☒ Not Applicable
5	Transmitter RF carrier current	☐ Applicable ☒ Not Applicable
6	Transmitter radiated E-field	☐ Applicable ☒ Not Applicable
7	Transmitter conducted spurious emissions	☐ Applicable ☒ Not Applicable
8	Transmitter radiated spurious domain emission limits < 30 MHz	☐ Applicable ☒ Not Applicable
9	Transmitter radiated spurious domain emission limits > 30 MHz	☐ Applicable ☒ Not Applicable
10	Transmitter Frequency stability	☐ Applicable ☒ Not Applicable
11	Receiver spurious emissions	☒ Applicable ☐ Not Applicable
12	Adjacent channel selectivity	☐ Applicable ☒ Not Applicable
13	Receiver blocking or desensitization	☐ Applicable ☒ Not Applicable

4. TEST FACILITY

Test Site	Attestation of Global Compliance(Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

5. ETSI EN 300 330 REQUIREMENT

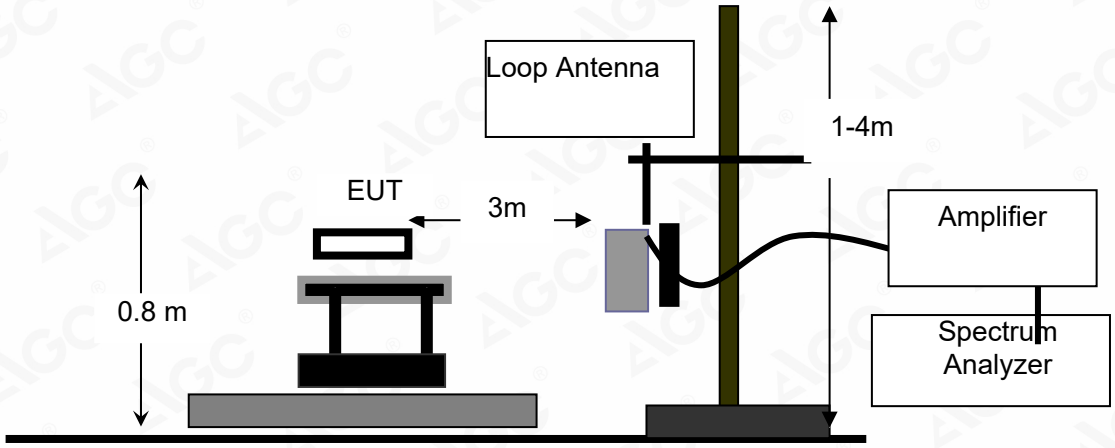
5.1RECEIVER SPURIOUS EMISSIONS

MEASUREMENT EQUIPMENT USED:

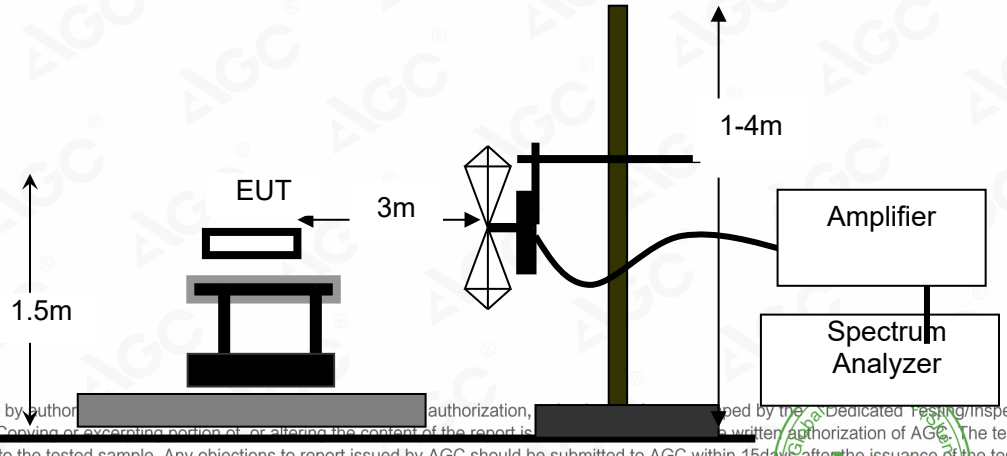
NAME OF EQUIPMENT	MANUFACTURER	MODEL	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	100096	May 15, 2021	May 14, 2022
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Jul. 03, 2020	Jul. 02, 2022
MXG X-Series Vector Signal Generator	Agilent	N5182B	MY50140530	Aug. 21,2020	Aug. 20,2021
ANTENNA	SCHWARZBECK	VULB9168	494	Sep. 20, 2019	Sep. 19, 2021
ANTENNA	ETS-LINDGREN	3142C	00060447	N/A	N/A

TEST SETUP:

FREQUENCY RANGE (9KHZ-30MHZ)

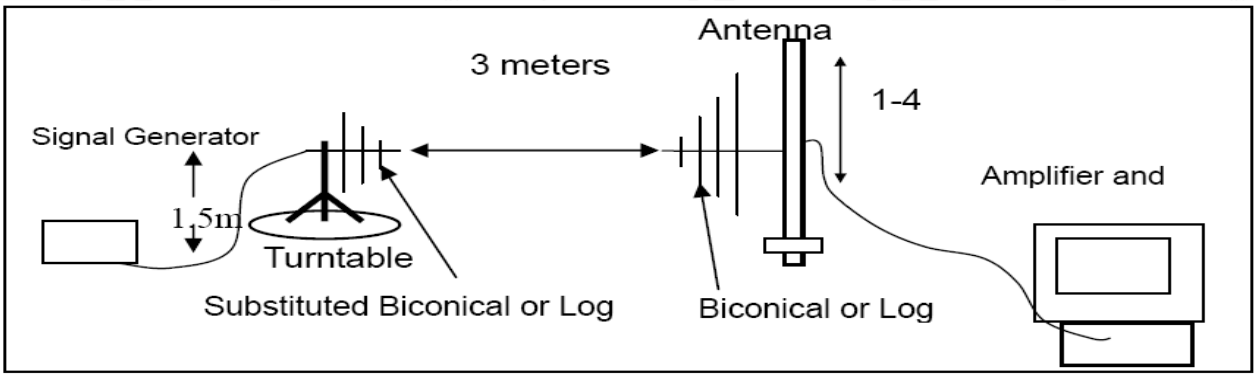


FREQUENCY RANGE (ABOVE 30MHZ)



SUBSTITUTION METHOD:

RADIATED BELOW 1GHZ



TEST PROCEDURE:

For test method of frequency range (9kHz-30MHz)

The EUT was placed on the top of an insulating table 0.8 meters above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

The H-field is measured with a shielded loop antenna connected to a measurement receiver.

The measuring bandwidth and detector type of the measurement receiver shall be in accordance with EN 300 330 Table 1.

For test method of frequency range (30 MHz-1000MHz)

EUT was placed on a 1.5mheight wooden table. The search antenna is placed at 3m distances from the EUT and search antenna height is from 1-4m. With the transmitter operating at continuously mode, the turntable was slowly rotated to locate the direction of maximum emission. Once maximum direction is determined, the search antenna was raised and lowered in both vertical and horizontal polarizations.

The EUT was removed from the turntable and replaced with a linearly polarized antenna connected to a calibrated RF signal generator. The RF generator was set to a measured emission frequency and the search antenna was raised and lowered to produce a maximum received reading. The generator output was increased to match the radiated emission reading measured previously, and the result expressed in dB EIRP or ERP, correcting for substitution antenna gain at each frequency.

TEST RESULT AND LIMIT

BELOW 30MHZ

Frequency (MHz)	Distance (m)	Maximum Field Strength Limit (dBμA/m Q.P.)
9 kHz ≤f <10 MHz	10	5.5dB μA/m at 9 kHz descending 3 dB/oct
10 MHz ≤f <30 MHz	10	-25 dBμA/m

RECEIVER MODE					
Frequency	Reading level	Total Factor	Emission level	10M Limit	Margin
(MHz)	(dBμA/m)	(dB)	(dBμA/m)	(dBμA/m)	(dBμA/m)
--	--	--	--	5.5dBuA/m at 9KHz descending 3dB/oct (9KHz – 10MHz)	--
--	--	--	--		--
--	--	--	--	-25dBuA/m (10MHz – 30MHz)	--
--	--	--	--		--

Remark:

(1) Corrected Power (dBm) = Total Factor + Reading Level

(2) Measuring frequencies from 9KHz to the 30MHz.

(3) Data of measurement within this frequency range shown " -- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Receiver Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
121.56	26.26	V	-68.28	0.04	0.70	-67.62	-57.00	10.62
159.22	30.00	V	-64.35	0.06	1.10	-63.31	-57.00	6.31
355.87	29.60	V	-69.40	0.25	6.15	-63.50	-57.00	6.50
534.53	26.01	V	-73.04	0.44	6.84	-66.65	-57.00	9.65
675.59	31.22	V	-68.51	0.55	6.60	-62.46	-57.00	5.46
829.75	30.00	V	-69.39	0.66	6.35	-63.70	-57.00	6.70
134.81	27.28	H	-66.81	0.05	0.02	-66.84	-57.00	9.84
163.20	29.67	H	-64.82	0.06	1.44	-63.44	-57.00	6.44
341.23	29.96	H	-68.55	0.23	5.68	-63.11	-57.00	6.11
541.32	28.27	H	-70.90	0.45	7.15	-64.20	-57.00	7.20
677.50	28.79	H	-70.40	0.55	6.52	-64.43	-57.00	7.43
827.69	28.49	H	-71.20	0.66	6.45	-65.41	-57.00	8.41

Note: 1.The margins of the other spectrum are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "--" remark, if no specific emission from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

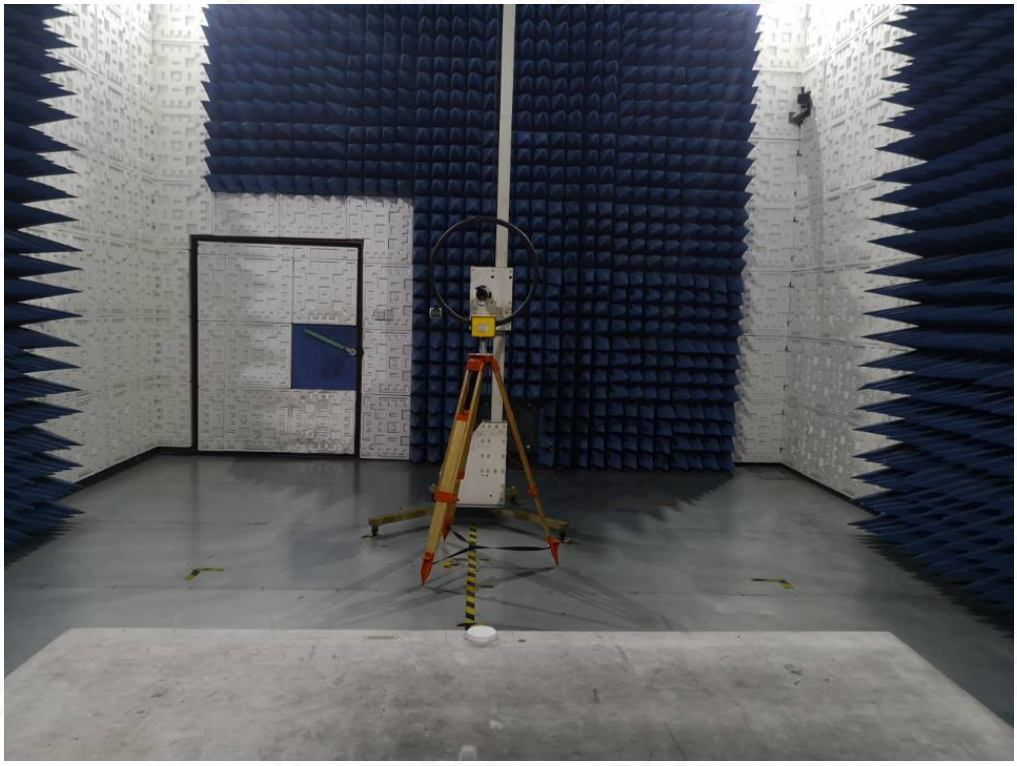
6. INTERPRETATION OF MEASUREMENT RESULTS

All the measurement equipments and accessories have been carefully selected to meet the maximum measurement uncertainty specified below:

RF Frequency	± 1 x 10^{-7}
RF Power, Conducted	± 0.75dB
Maximum Frequency Deviation: _ Within 300Hz and 6KHz of Audio Frequency _ Within 6KHz and 25KHz of Audio Frequency	± 5% ± 3dB
Adjacent channel power	± 3dB
Conducted Emission of Transmitter, Valid Up to 12.75GHz	± 4dB
Conducted Emissions of Receivers	± 3dB
Radiated Emission of Transmitter, Valid Up to 12.75GHz	± 6dB
Radiated Emissions of Receivers	± 6dB

P.S. Uncertainty figures are valid to confidence level of 95% calculated according to the methods described in the ETSI TR 100 028.

APPENDIX A:PHOTOGRAPHS OF TEST SETUP



APPENDIX B: PHOTOGRAPHS OF THE EUT

Refer to Attached file (Appendix I)

----END OF REPORT----

Conditions of Issuance of Test Reports

1. All samples and goods are accepted by the Attestation of Global Compliance (Shenzhen) Co., Ltd (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on the basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the "Clients").

2. Any report issued by Company as a result of this application for testing services (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to its customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.

3.The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.

4. The non-CMA report issued by AGC is only permitted to be used by the client as internal reference use and shall not be used for public demonstration purpose.

5. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.

6. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.

7. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.

8.Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.

9. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.

10. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.