

EMC Test Report

Report No.:AGC08501161101EE01

TEST NAME : 1999/5/EC R&TTE Directive Art.3.1(b)
PRODUCT DESIGNATION : Open-Source Sensor Beacon
BRAND NAME : Ruuvi
MODEL NAME : RuuviTag
CLIENT : Ruuvi Innovations Ltd.
DATE OF ISSUE : Nov.24, 2016
STANDARD(S) : EN 301 489-1 V1.9.2 (2011-09)
: EN 301 489-17 V2.2.1 (2012-09)
REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Nov.24, 2016	Valid	Original Report

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1. TEST REPORT CERTIFICATION

Applicant	Ruuvii Innovations Ltd.
Address	c/o Solventia Rauhankatu 20B20, 06100 Porvoo, Finland
Manufacturer	Ruuvii Innovations Ltd.
Address	c/o Solventia Rauhankatu 20B20, 06100 Porvoo, Finland
Product Designation	Open-Source Sensor Beacon
Brand Name	Ruuvii
Test Model	RuuviiTag
Date of test	Nov.16, 2016 to Nov.18, 2016
Deviation	None
Condition of Test Sample	Normal
Report Template	AGCRT-EC-BLE/EMC (2013-03-01)

We, Attestation of Global Compliance (Shenzhen) Co., Ltd., hereby certify that the submitted samples of the above item, as detailed in chapter 2.1 of this report, has been tested in our facility. The test record, data evaluation and test configuration represented herein are true and accurate accounts of measurements of the sample's EMC characteristics under the conditions herein specified.

Tested By

Strive Liang

Strive Liang(Liang Faqiang) Nov.18, 2016

Reviewed By

Forrest Lei

Forrest Lei(Lei Yonggang) Nov.24, 2016

Approved By

Solger Zhang

Solger Zhang(Zhang Hongyi)
Authorized Officer Nov.24, 2016

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2. GENERAL INFORMATION

2.1. DESCRIPTION OF EUT

The EUT is a short range, lower power, Bluetooth device.

It is designed by way of FHSS modulation achieves the system operating.

Details of technical specification refer to the description in follows:

Transmitter/Receiver (TX/RX)

Operating Frequency	2.402 GHz to 2.480GHz
Bluetooth Version	V4.2
Modulation	GFSK for BLE
Hardware Version	B4
Software Version	V1.0
Antenna Type	PCB Antenna
Number of channels	40
Antenna Gain	0dBi
Power Supply	DC 3.0V by battery

Note: The EUT didn't support BR/EDR.

2.2. OBJECTIVE

Perform Electro Magnetic Interference (EMI) and Electro Magnetic Susceptibility (EMS) tests for CE Marking.

2.3. TEST STANDARDS AND RESULTS

The EUT has been tested according to ETSI EN 301 489-1 V1.9.2 (2011-09) and ETSI EN 301 489-17 V2.2.1 (2012-09).

ETSI EN 301 489-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
ETSI EN 301 489-17	Electromagnetic compatibility and Radio spectrum Matters (ERM); Electro Magnetic Compatibility (EMC) standard for radio equipment Part 17: Specific conditions for Broadband Data Transmission Systems

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2.4. TEST ITEMS AND THE RESULTS

No.	Basic Standard	Test Type	Result
EMISSION (EN 301 489-1 §7.1)			
1	EN 55022	Radiated emission	PASS
2	EN 55022	Conducted emission, AC ports	N/A
3	EN 55022	Conducted emission, Telecom ports	N/A
4	EN 61000-3-2	Harmonic current emissions	N/A
5	EN 61000-3-3	Voltage fluctuations & flicker	N/A
IMMUNITY (EN 301 489-1 §7.2)			
6	EN 61000-4-2	Electrostatic discharge immunity	PASS
7	EN 61000-4-3	Radiated RF electromagnetic field immunity	PASS
8	EN 61000-4-4	Electrical fast transient/burst immunity	N/A
9	ISO 7637-1, -2	Transients and surges, DC ports	N/A
10	EN 61000-4-5	Surge immunity, AC ports, Telecom ports	N/A
11	EN 61000-4-6	Immunity to conducted disturbances induced by RF fields	N/A
12	EN 61000-4-11	Voltage dips and short interruptions immunity	N/A

Note:

1. N/A- Not Applicable.
2. The latest versions of basic standards are applied.

2.5. ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15-35°C
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

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3. TEST MODE DESCRIPTION

TEST MODE DESCRIPTION		
NO.	EMI TEST MODE DESCRIPTION	WORST
1	BT Link	V
2	Standby	
NO.	EMS TEST MODE DESCRIPTION	
1	BT Link	
2	Standby	

Note:

- V means EMI worst mode.
- All modes have been tested, and only the worst data recorded in the report.

I/O Port Information (☐ Applicable ☒ Not Applicable)

I/O Port of EUT			
I/O Port Type	Number	Cable Description	Tested With

4. MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

- Uncertainty of Conducted Emission, $U_c = \pm 2.75\text{dB}$
- Uncertainty of Radiated Emission, $U_c = \pm 3.2\text{dB}$

5. SUPPORT EQUIPMENT

Device Type	Manufacturer	Model Name	S/N	Data Cable
IPOD	APPLE	A1367	N/A	0

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6. IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION

Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location 1	2/F., Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China

TEST EQUIPMENT OF RADIATED EMISSION TEST

Description	Manufacturer	Model No.	S/N	Calibration Date	Calibration Due.
Spectrum Analyzer	AGILENT	E4440A	US41421290	July 23, 2016	July 22, 2017
EMI Test Receiver	R&S	ESCI	100694	July 02, 2016	July 01, 2017
Wideband Frequency Antenna	SCHWARZBECK	VULB9168	VULB9168-494	Mar.12, 2016	Mar.11, 2017
Horn Antenna	EM	EM-AH-10180	67	Mar.01, 2016	Feb.28, 2017
Amplifier	EM	EM30180	060552	Feb.29, 2016	Feb.28, 2017

TEST EQUIPMENT OF ESD TEST

Description	Manufacturer	Model No.	S/N	Calibration Date	Calibration Due.
ESD Generator	EM	DITO	P1527160053	Dec.03, 2015	Dec.02, 2016

TEST EQUIPMENT OF RS IMMUNITY TEST

Description	Manufacturer	Model No.	S/N	Calibration Date	Calibration Due.
Signal Generator	R&S	SML03	102525	July 23, 2016	July 22, 2017
Biconilog Antenna	EMCO	ETS	3142C	Mar.01, 2016	Feb.28, 2017
Power Probe	R&S	URV5-Z4	100124	July 29, 2016	July 28, 2017
Power Meter	R&S	NRVD	8323781027	July 29, 2016	July 28, 2017
Power Amplifier	KALMUS	7100LC	04-02/17-06-001	July 01, 2016	Jun.30, 2017
RF Amplifier	MILMEGA	AS0104-55_55	1004793	July 01, 2016	Jun.30, 2017
Directional Couple	WERLATONE	C5571-10	99463	July 16, 2016	July 15, 2017
Directional Couple	WERLATONE	C6026-10	99482	July 16, 2016	July 15, 2017

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7. EMISSION TEST

7.1. RADIATED DISTURBANCE MEASUREMENT

7.1.1. LIMITS OF RADIATED DISTURBANCES

Limits for radiated disturbance 30M to1 GHz at a measurement distance of 3 m

Frequency range (MHz)	Quasi peak limits(dBuV/m), for Class B ITE, at 3m measurement distance
30 - 230	40
230 - 1000	47

Limits for radiated disturbance above 1 GHz at a measurement distance of 3 m

Frequency range (MHz)	Limits (dBuV/m), Class B ITE	
	Peak	Average
1000-3000MHz	70	50
3000-6000MHz	74	54

Notes:

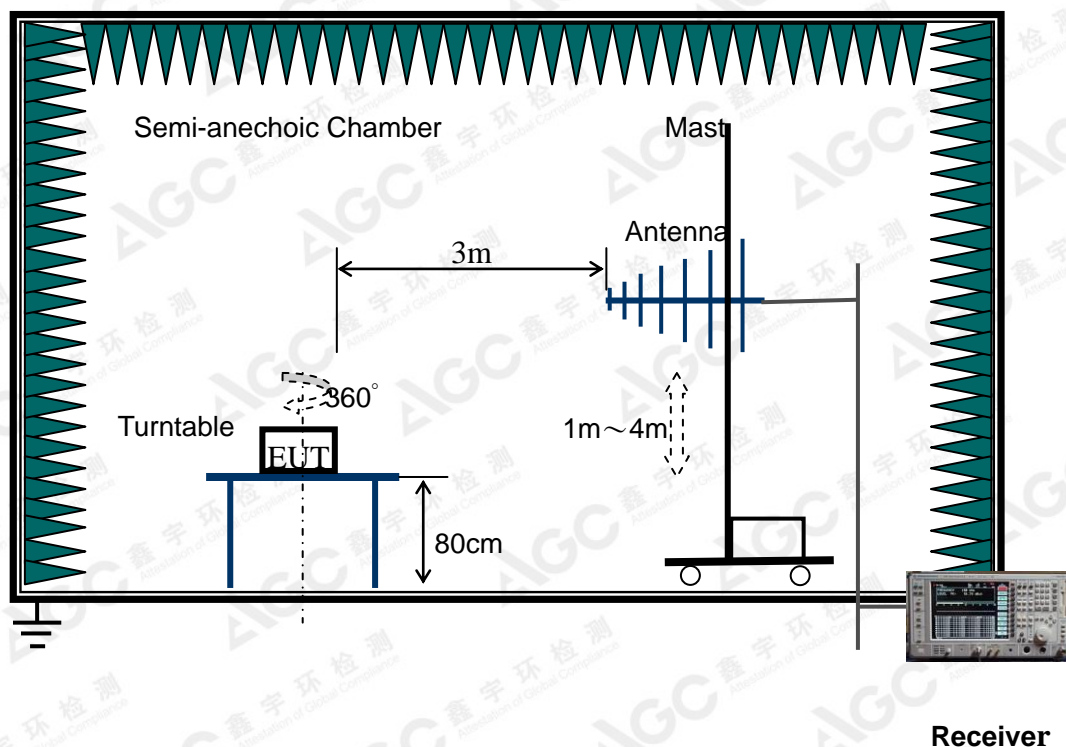
1. The lower limit shall apply at the transition frequency.
2. Additional provisions may be required for cases where interference occurs.

7.1.2. TEST PROCEDURE

- (1). 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.
- (2). The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- (3). The antenna is a broadband antenna, and its height is varied from 1 to 4 meter above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- (4). For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to the heights from 1 to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- (5). The test-receiver system was set to Peak Detector Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emission that did not have 10dB margin would be retested one by one using the quasi-peak method.

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7.1.3. BLOCK DIAGRAM OF TEST SETUP



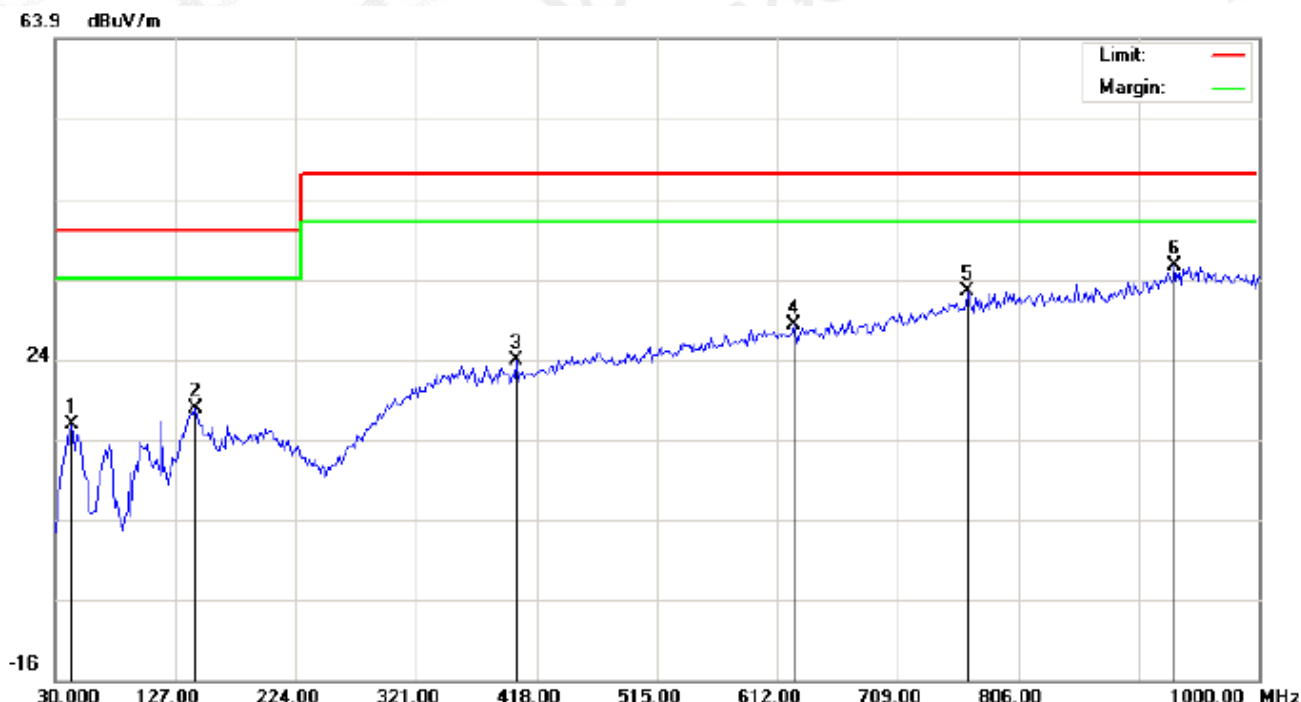
For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

7.1.4 TEST RESULT

See the next page.

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RADIATED EMISSION BELOW 1GHZ- HORIZONTAL



Site: site #1
Limit: EN55022 ClassB 3M Radiation
EUT: Open-Source Sensor Beacon
M/N: RuuviTag
Mode: BT Link
Note:

Polarization: Horizontal
Power:
Distance:

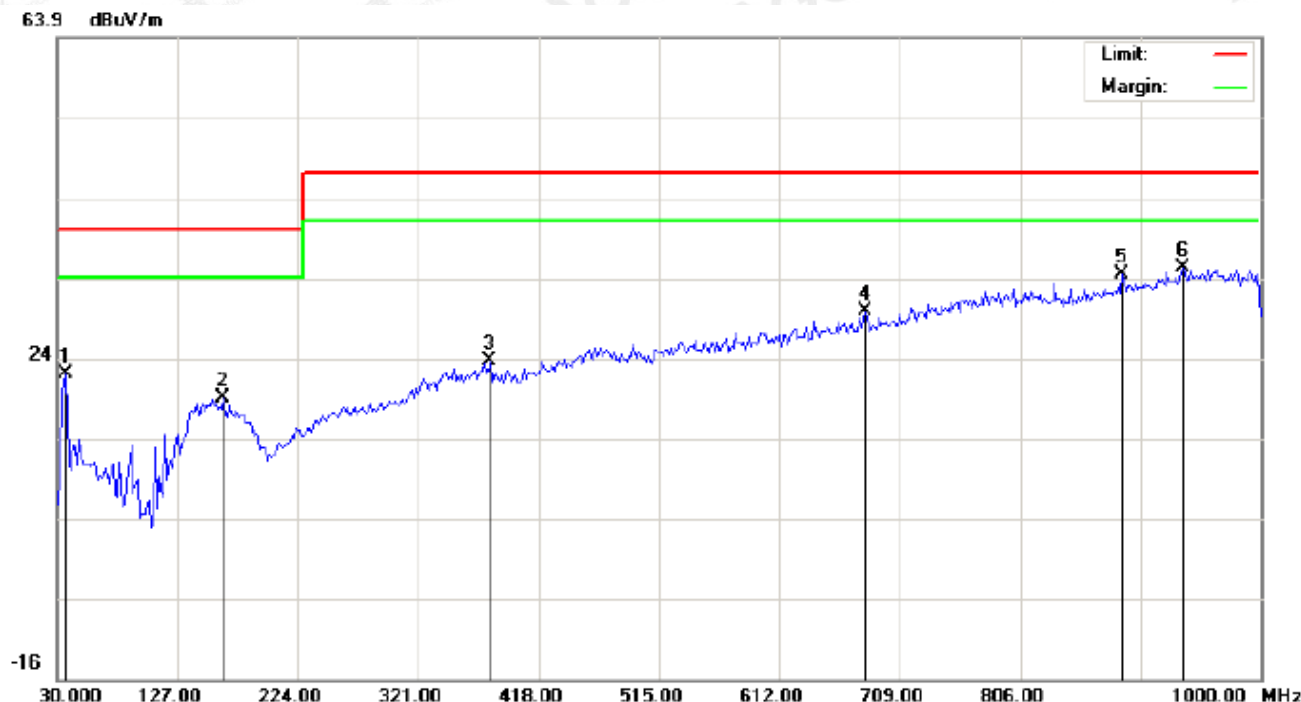
Temperature: 25.3
Humidity: 55.2 %

No.	Mk	Freq. MHz	Reading dBuV	Factor dB/m	Measurement dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		42.9333	4.12	11.71	15.83	40.00	-24.17	peak			
2		143.1667	3.38	14.43	17.81	40.00	-22.19	peak			
3		401.8333	4.68	19.13	23.81	47.00	-23.19	peak			
4		624.9333	4.34	23.79	28.13	47.00	-18.87	peak			
5		765.5833	5.54	26.84	32.38	47.00	-14.62	peak			
6	*	932.1000	6.11	29.50	35.61	47.00	-11.39	peak			

RESULT: PASS

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RADIATED EMISSION BELOW 1GHZ- VERTICAL



Site: site #1

Limit: EN55022 ClassB 3M Radiation

EUT:Open-Source Sensor Beacon

M/N:Ruuvitag

Mode:BT Link

Note:

Polarization: **Vertical**

Power:

Distance:

Temperature: 25.3

Humidity: 55.2 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		36.4667	17.69	4.27	21.96	40.00	-18.04	peak			
2		164.1833	3.88	15.07	18.95	40.00	-21.05	peak			
3		379.1999	4.58	18.93	23.51	47.00	-23.49	peak			
4		681.5167	5.04	24.69	29.73	47.00	-17.27	peak			
5		888.4500	6.17	28.31	34.48	47.00	-12.52	peak			
6	*	936.9500	5.51	29.64	35.15	47.00	-11.85	peak			

RESULT: PASS

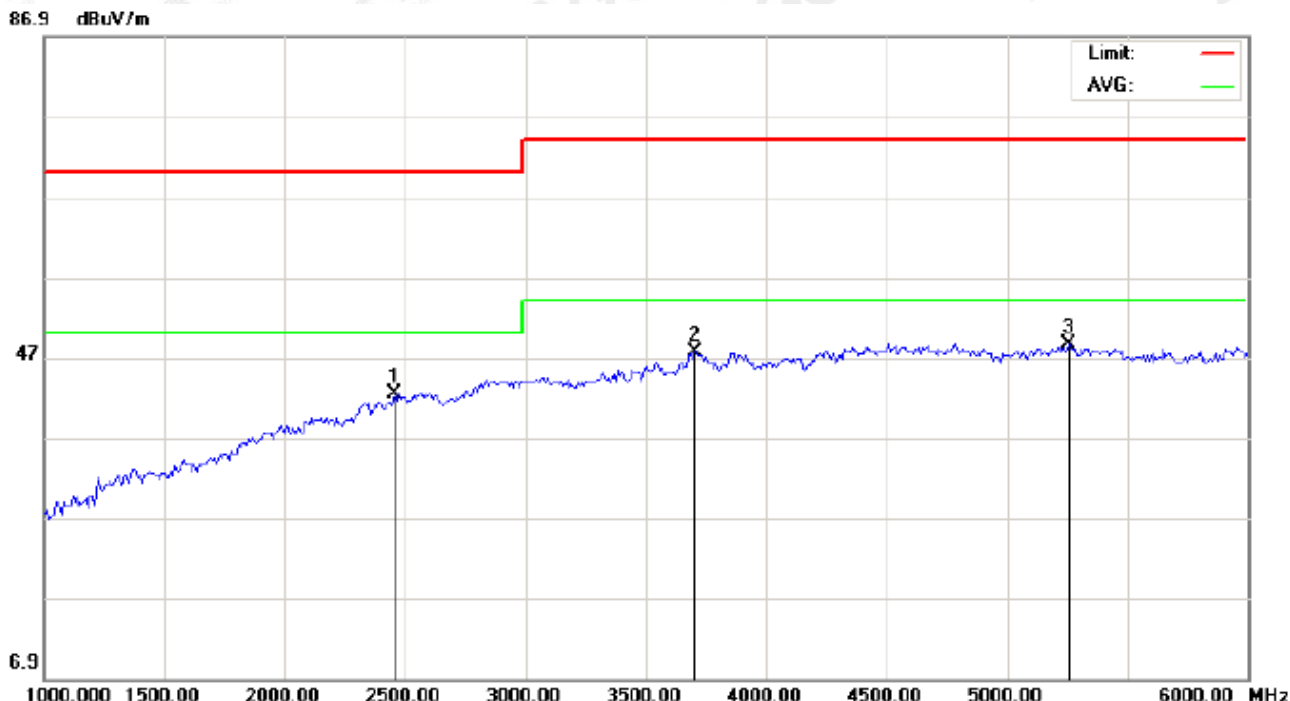
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No.16 E

RADIATED EMISSION ABOVE 1GHZ – HORIZONTAL



Site: site #1
Limit: EN55022 Class B Above 1G(Peak)
EUT: Open-Source Sensor Beacon
M/N: RuuviTag
Mode: BT Link
Note:

Polarization: **Horizontal**
Power:
Distance: 3m

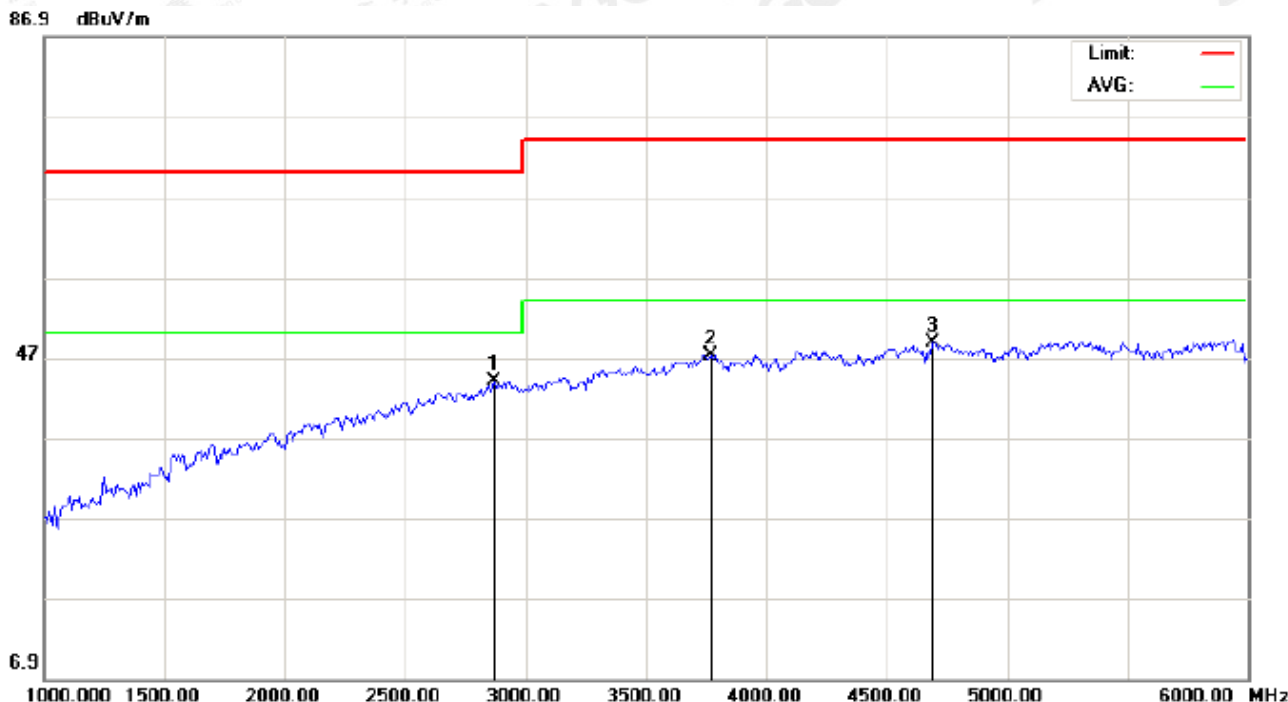
Temperature: 24.6
Humidity: 54.6 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2458.333	52.08	-9.62	42.46	70.00	-27.54	peak			
2		3700.000	54.23	-6.66	47.57	74.00	-26.43	peak			
3	*	5258.333	50.40	-1.81	48.59	74.00	-25.41	peak			

RESULT: PASS

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RADIATED EMISSION ABOVE 1GHZ - VERTICAL



Site: site #1
Limit: EN55022 Class B Above 1G(Peak)
EUT:Open-Source Sensor Beacon
M/N:Ruuvitag
Mode:BT Link
Note:

Polarization: **Vertical**
Power:
Distance: 3m

Temperature: 24.6
Humidity: 54.6 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2866.667	52.64	-8.68	43.96	70.00	-26.04	peak			
2		3766.667	53.50	-6.25	47.25	74.00	-26.75	peak			
3	*	4691.667	51.36	-2.61	48.75	74.00	-25.25	peak			

RESULT: PASS

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8. IMMUNITY TEST

8.1. GENERAL PERFORMANCE CRITERIA

1. Performance criteria for Continuous phenomena applied to Transmitter (CT)

The performance criteria A shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

2. Performance criteria for Transient phenomena applied to Transmitter (TT)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

3. Performance criteria for Continuous phenomena applied to Receiver (CR)

The performance criteria A shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

4. Performance criteria for Transient phenomena applied to Receiver (TR)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

8.2. ELECTROSTATIC DISCHARGE IMMUNITY TEST

8.2.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-2
Discharge Impedance	330Ω / 150 pF
Discharge Voltage	Air Discharge -8 kV , Contact Discharge - 4 kV
Polarity	Positive / Negative
Number of Discharge	Minimum 20 times at each test point
Discharge Mode	Single discharge
Discharge Period	1-second minimum

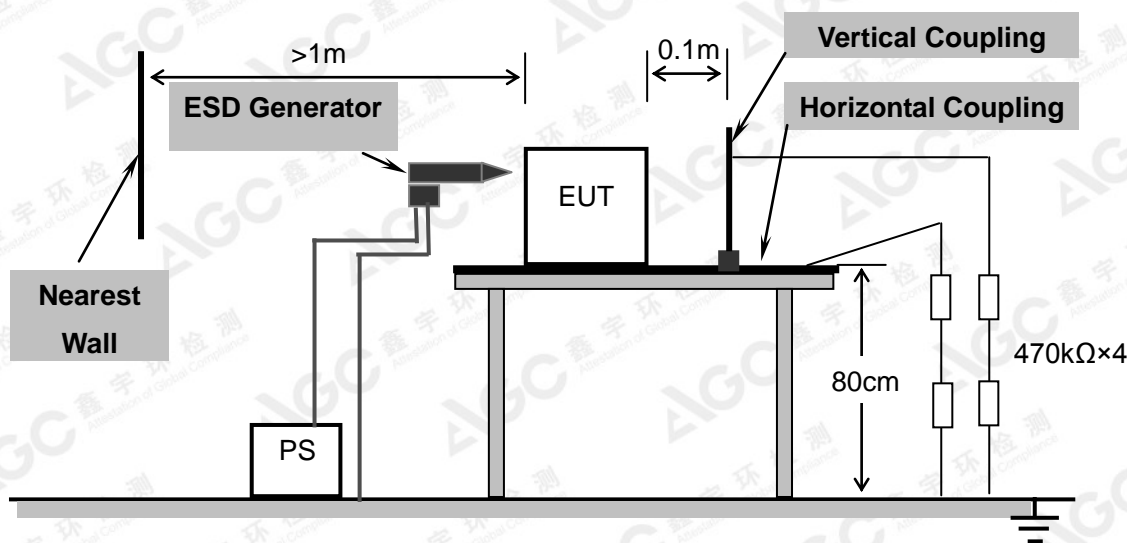
8.2.2 TEST PROCEDURE

The test procedure was in accordance with EN 61000-4-2:

- Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- The time interval between two successive single discharges was at least 1 second.
- The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were completed.
- At least ten single discharges (in the most sensitive polarity) were applied to the Horizontal Coupling Plane at points on each side of the EUT. The ESD generator was positioned vertically at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.
- At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m×0.5m) was placed vertically to and 0.1 meters from the EUT.

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8.2.3 TEST SETUP



For the actual test configuration, please refer to Appendix A : Photographs of the Test Configuration.

8.2.4 TEST RESULT

TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.3.2 and EN 61000-4-2 for the measurement methods.

TEST RESULTS

Criteria	During Test	After Test
A	Shall operate as intended. May show degradation of performance (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 1). No unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). Shall be no loss of stored data or user programmable functions.

NOTE 1: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

DESCRIPTION OF THE ELECTROSTATIC DISCHARGES (ESD)

Amount of Discharges	Voltage	Coupling	Observation	Performance	Result (Pass/Fail)
Mini 20 / Point	±2KV, ±4kV	Contact Discharge	No Contact Discharge Point	A	Pass
Mini 20 / Point	±2KV, ±4kV, ±8kV	Air Discharge	No Air Discharge Point	A	Pass
Mini 20 / Point	±2KV, ±4kV	Indirect Discharge HCP	No Function Loss	A	Pass
Mini 20 / Point	±2KV, ±4kV	Indirect Discharge VCP	No Function Loss	A	Pass

Note: operating mode include all modes of EMS in page 7.

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8.3. RADIATED, RADIO FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST

8.3.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-3
Frequency Range	80 MHz – 1000MHz, 1400MHz-2700MHz
Field Strength	3V/m
Modulation	1 kHz sine wave, 80%, AM modulation
Frequency Step	1% of fundamental
Polarity of Antenna	Horizontal and Vertical
Test Distance	3m
Antenna Height	1.5m
Dwell Time	3 seconds

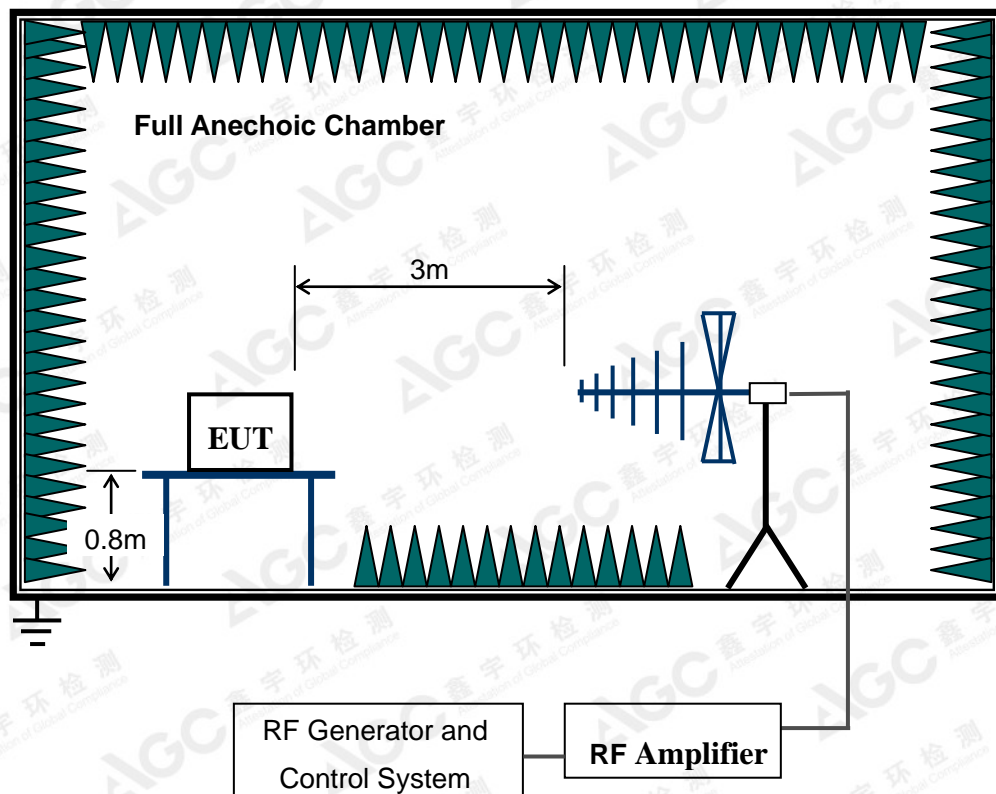
8.3.2 TEST PROCEDURE

The test procedure was in accordance with EN 61000-4-3.

- The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- The test signal was 80% amplitude modulated with a 1 kHz sine wave.
- The frequency range was swept from 80 MHz to 1000MHz and 1400MHz to 2700MHz with the exception of the exclusion band for transmitters, receivers and duplex transceivers. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The field strength level was 3V/m.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

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8.3.3 TEST SETUP



For the actual test configuration, please refer to Appendix A : Photographs of the Test Configuration.

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8.3.4 TEST RESULT

TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.2.2, ETSI EN 301 489-17 and EN 61000-4-3 for the measurement methods.

TEST RESULTS

Criteria	During Test	After Test
A	Shall operate as intended. May show degradation of performance (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.

NOTE 1: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

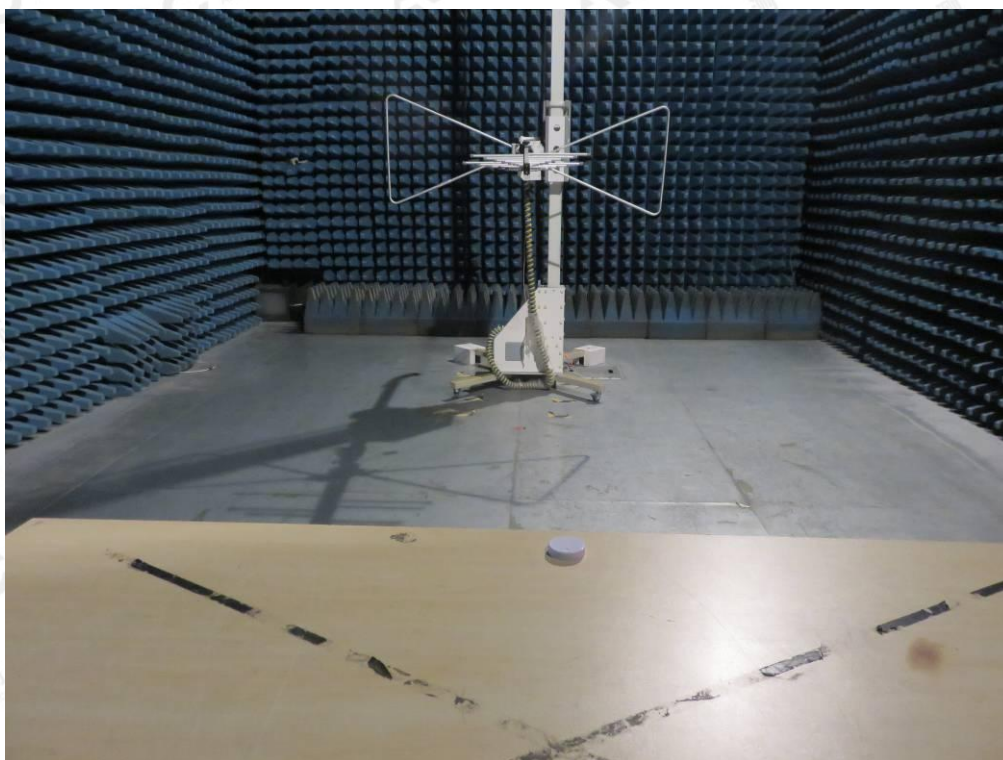
Freq. Range (MHz)	Field	Modulation	Polarity	Position	Observation	Performance	Result (Pass/Fail)
80-1000	3V/m	Yes	H / V	Front	No Function Loss	A	PASS
1400-2700	3V/m	Yes	H / V	Front		A	PASS
80-1000	3V/m	Yes	H / V	Back	No Function Loss	A	PASS
1400-2700	3V/m	Yes	H / V	Back		A	PASS
80-1000	3V/m	Yes	H / V	Left	No Function Loss	A	PASS
1400-2700	3V/m	Yes	H / V	Left		A	PASS
80-1000	3V/m	Yes	H / V	Right	No Function Loss	A	PASS
1400-2700	3V/m	Yes	H / V	Right		A	PASS
80-1000	3V/m	Yes	H / V	Top	No Function Loss	A	PASS
1400-2700	3V/m	Yes	H / V	Top		A	PASS
80-1000	3V/m	Yes	H / V	Bottom	No Function Loss	A	PASS
1400-2700	3V/m	Yes	H / V	Bottom		A	PASS

Note: operating mode include all modes of EMS in page 7.

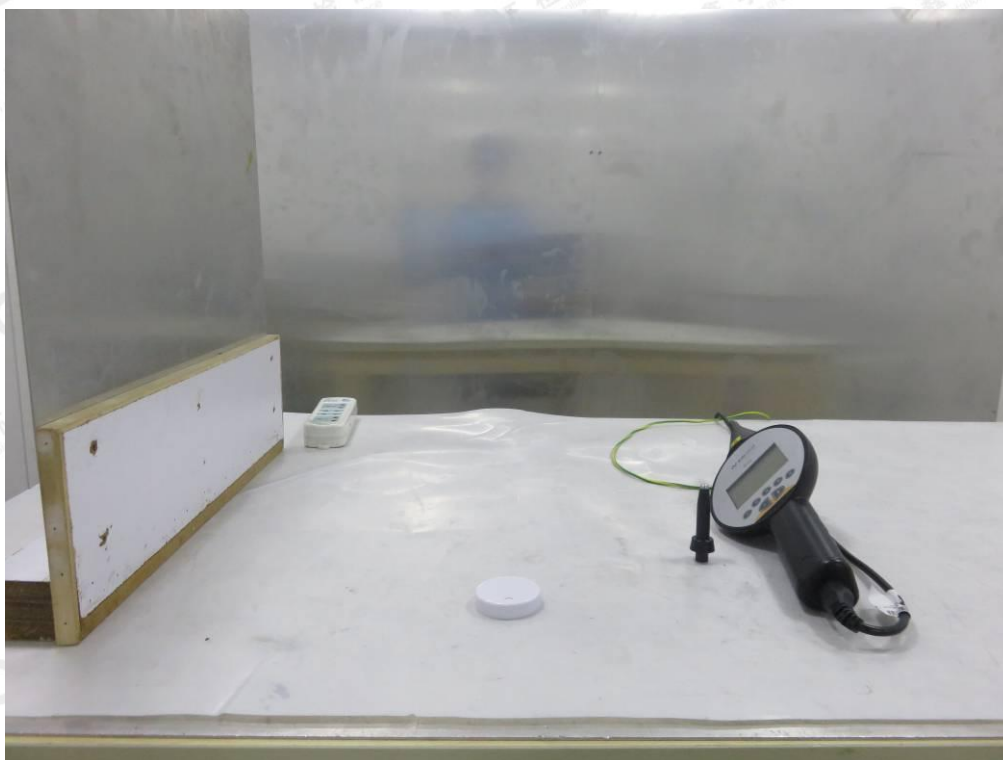
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APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST SETUP

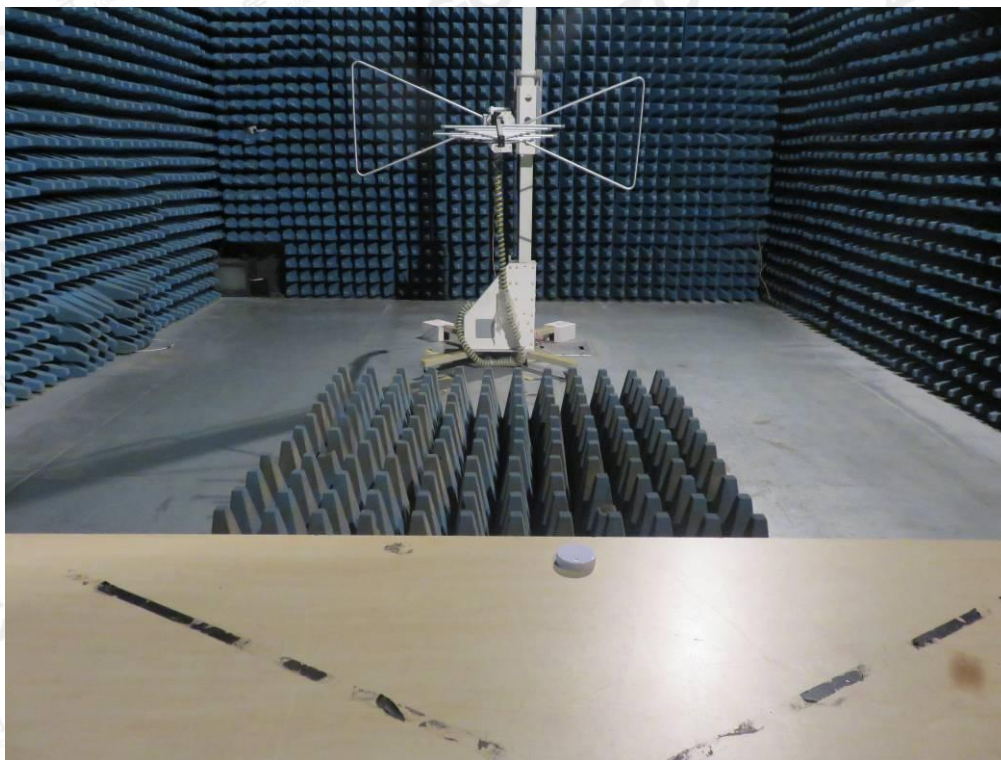


EN 61000-4-2 ESD TEST SETUP



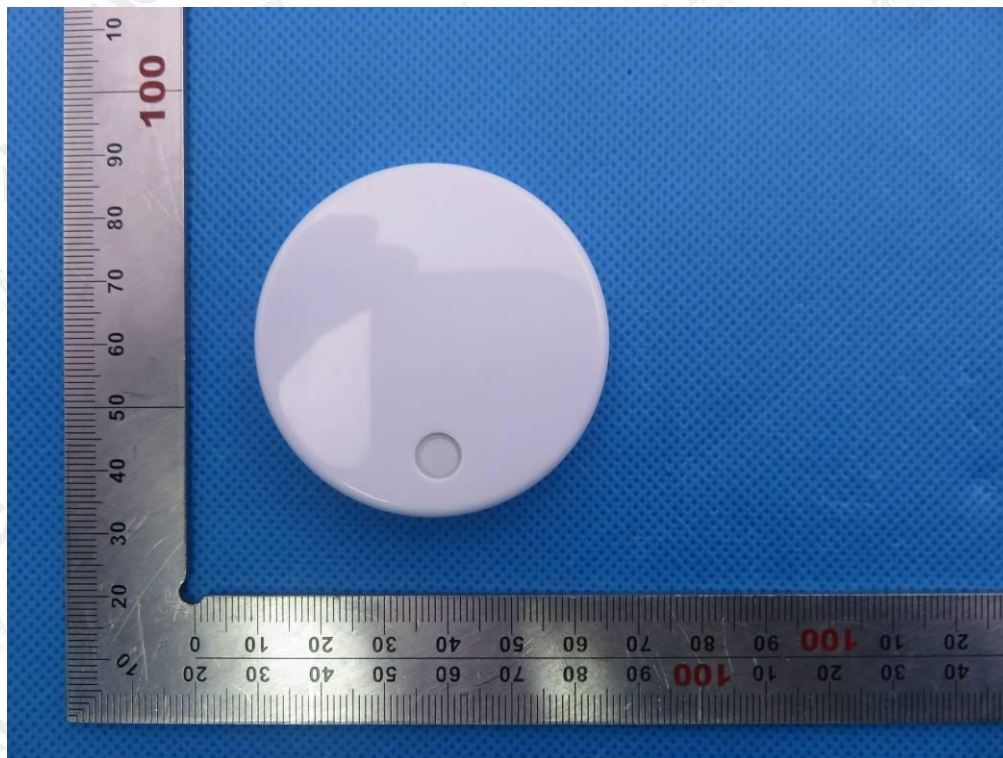
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EN 61000-4-3 RS TEST SETUP

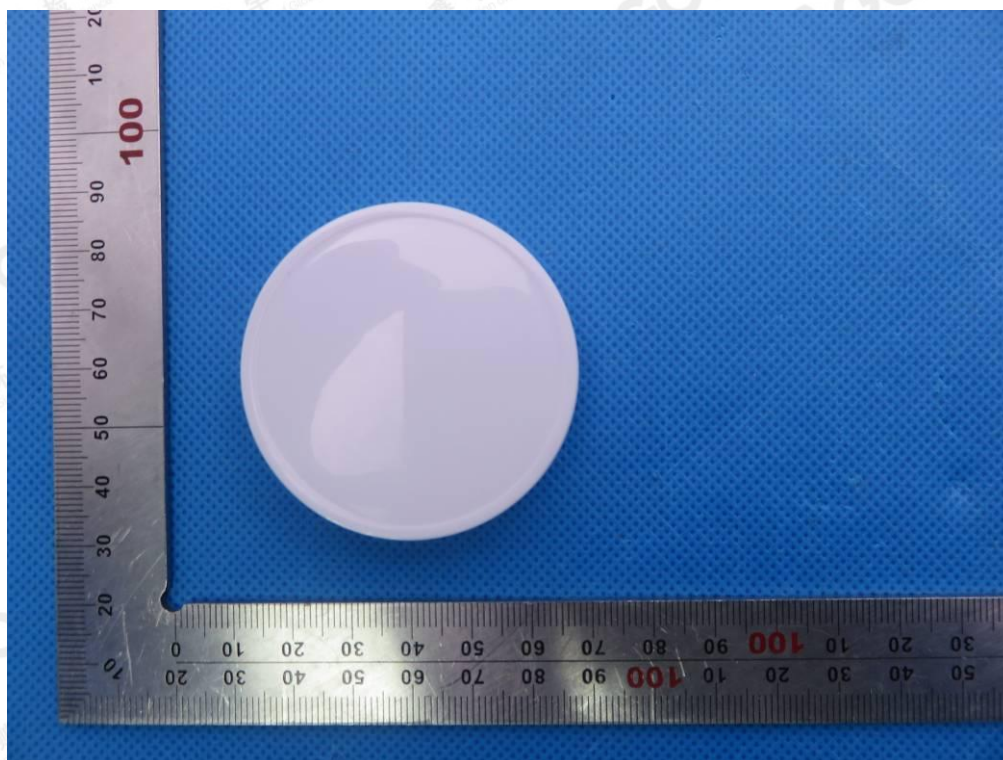


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APPENDIX B: PHOTOGRAPHS OF EUT
TOP VIEW OF EUT

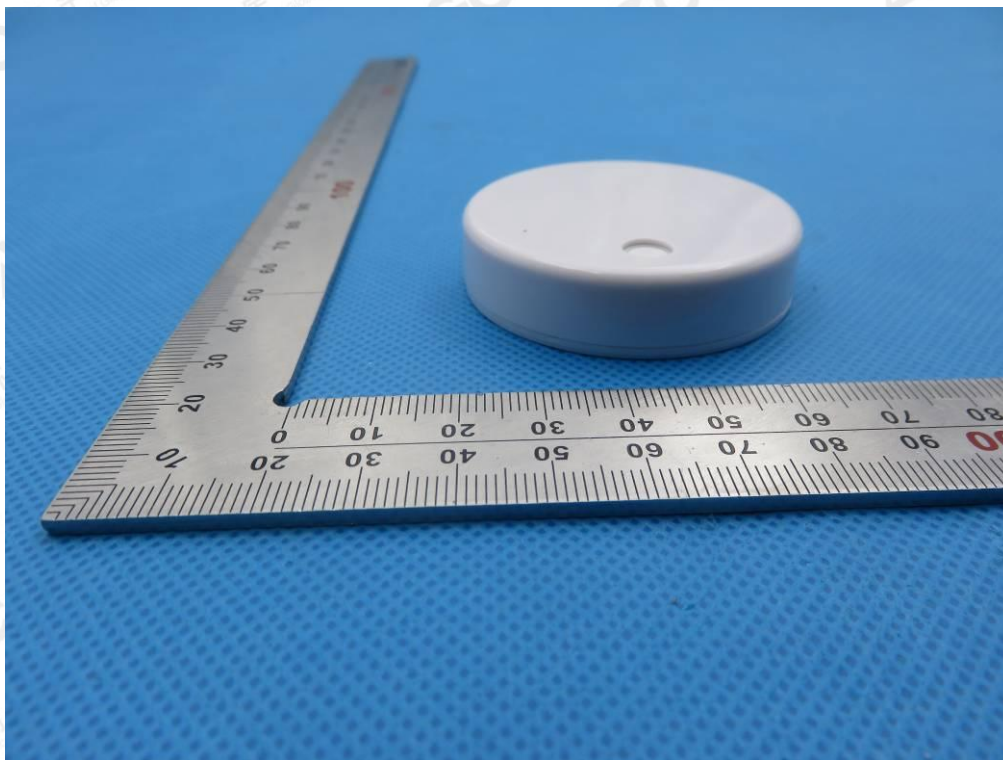


BOTTOM VIEW OF EUT



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FRONT VIEW OF EUT



BACK VIEW OF EUT



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LEFT VIEW OF EUT

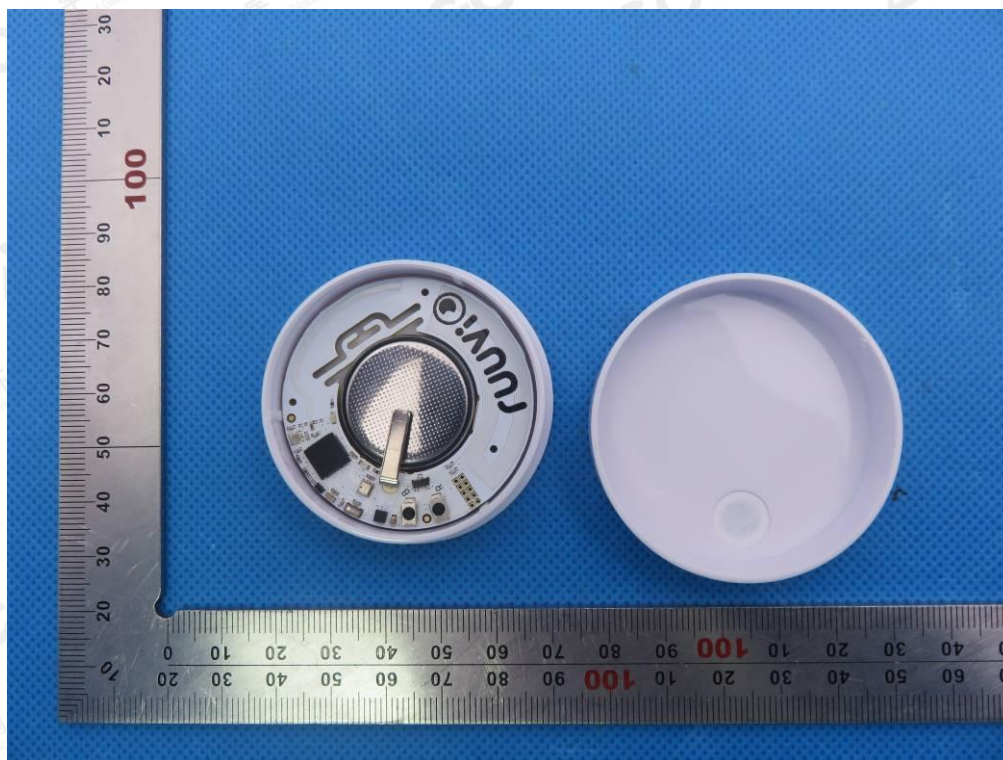


RIGHT VIEW OF EUT

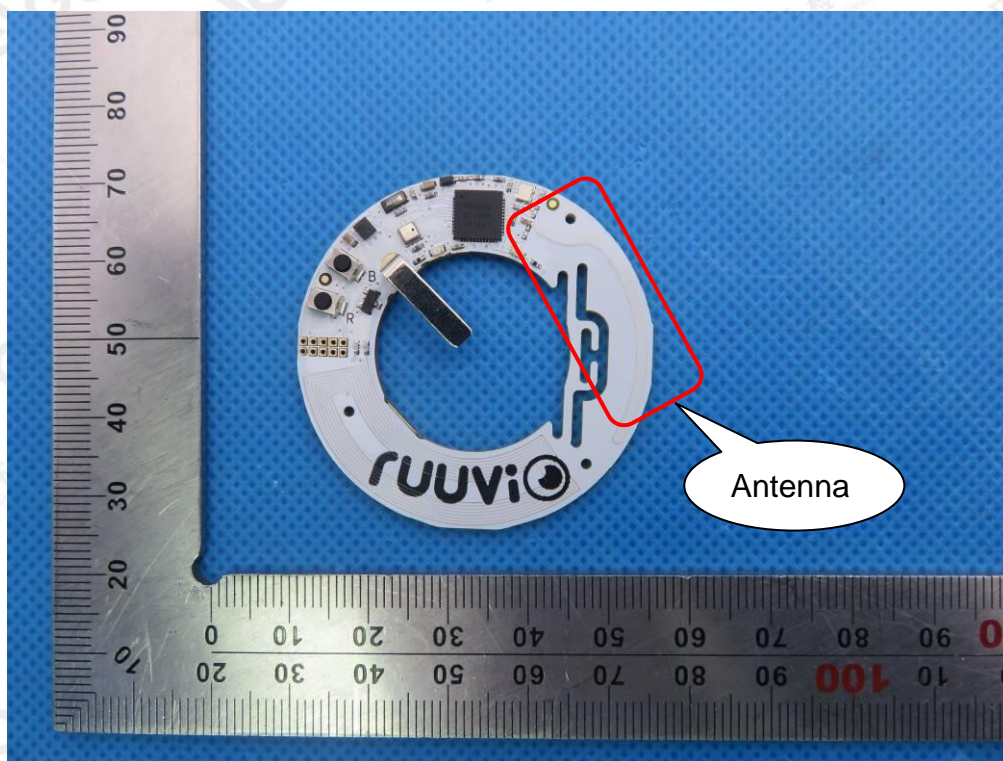


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OPEN VIEW OF EUT

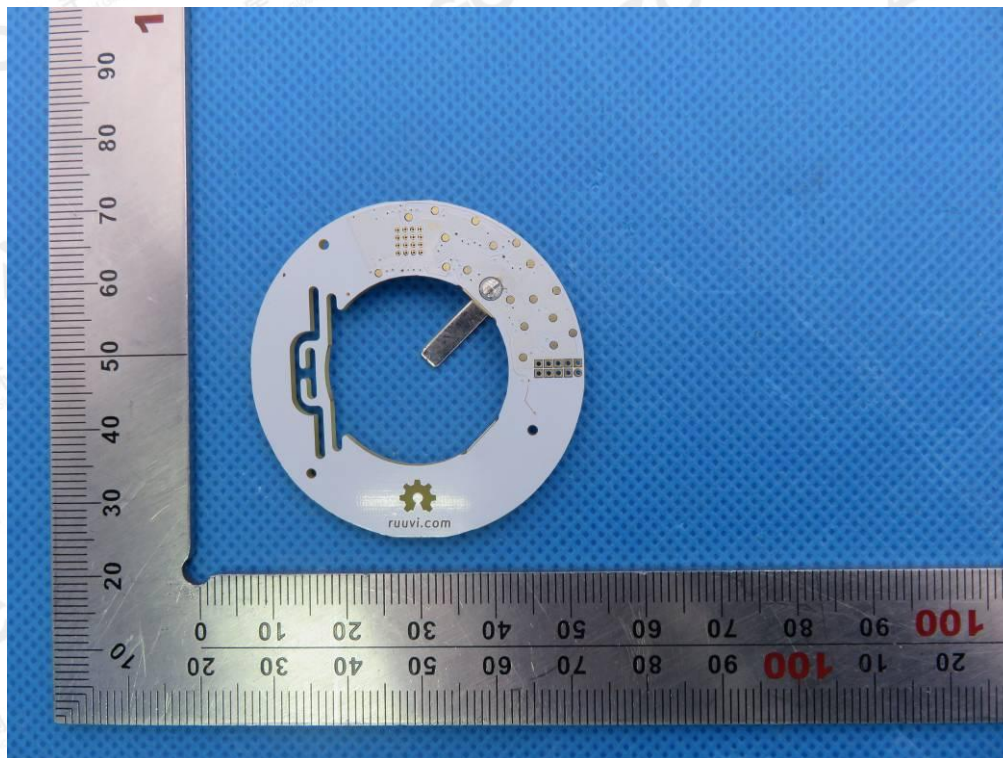


INTERNAL VIEW OF EUT-1

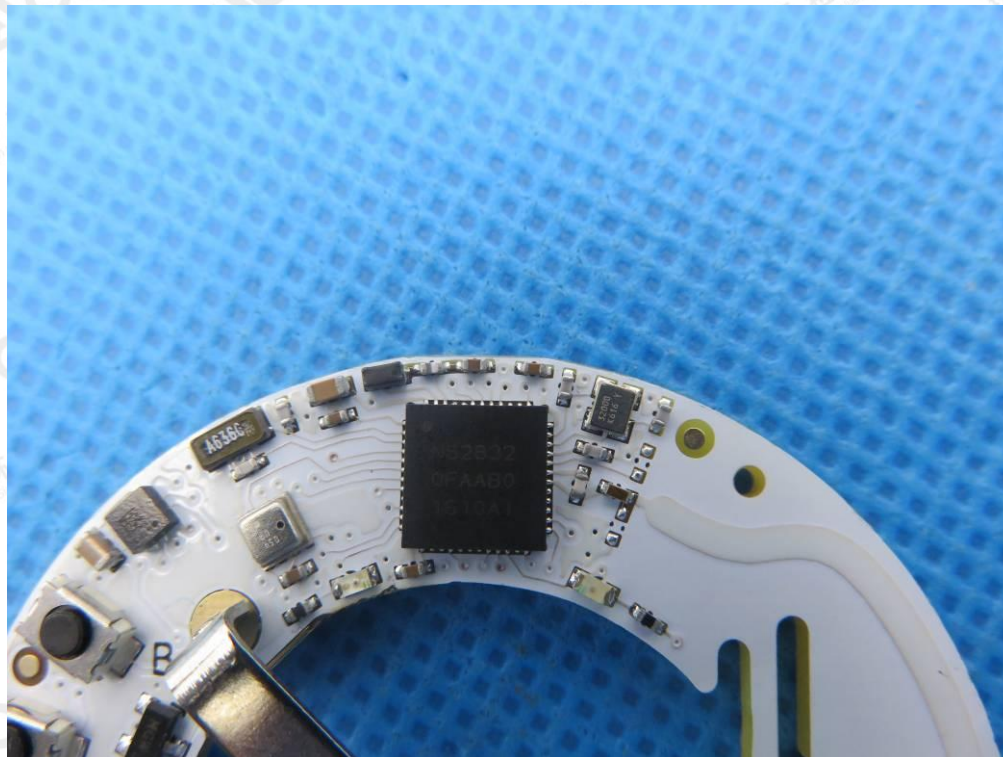


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INTERNAL VIEW OF EUT-2



INTERNAL VIEW OF EUT-3



----END OF REPORT----

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