EMC REPORT

Applicant:	Red Bear Electronic (Shenzhen) Co Ltd
Address of Applicant:	Rm 610, 6/F, Block B, JinYuan Building, 302 XiXiang Avenue, Bao An District, Shenzhen, China

Equipment Under Test (EUT)

Product Name:	BLE Module
Model No.:	MB-N2, Nano2, Blend2
Applicable standards:	ETSI EN 301 489-1 V1.9.2 (2011-09) ETSI EN 301 489-17 V2.2.1 (2012-09)
Date of sample receipt:	November 23, 2016
Date of Test:	November 23-25, 2016
Date of report issue:	November 25, 2016
Test Result :	PASS *

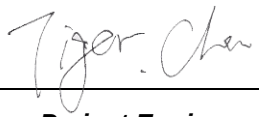
* In the configuration tested, the EUT complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 1999/5/EC are considered.

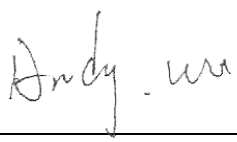
Robinson Lo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*November 25, 2016*	*Original*

Prepared By:  ***Date:*** *November 25, 2016*

Project Engineer

Check By:  ***Date:*** *November 25, 2016*

Reviewer

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4 Test Summary

EMI Test				
Test Item	Test Requirement	Test Method	Application	Result
Radiated Emission	ETSI EN 301 489-17	ETSI EN301 489-1	Enclosure	Pass
Conducted Emission	ETSI EN 301 489-17	ETSI EN301 489-1	AC port	N/A
Harmonic Current Emissions	ETSI EN 301 489-17	ETSI EN301 489-1	AC port	N/A
Voltage Fluctuations and Flicker	ETSI EN 301 489-17	ETSI EN301 489-1	AC port	N/A
EMS Test				
ESD (Electrostatic Discharge)	ETSI EN 301 489-17	EN 61000-4-2	Enclosure	Pass
Radiated Immunity, 80MHz to 2.7 GHz	ETSI EN 301 489-17	EN 61000-4-3	Enclosure	Pass
EFT (Electrical Fast Transients	ETSI EN 301 489-17	EN 61000-4-4	AC port	N/A
Surge Immunity	ETSI EN 301 489-17	EN 61000-4-5	AC port	N/A
Injected Currents 150kHz to 80MHz	ETSI EN 301 489-17	EN 61000-4-6	AC port	N/A
Voltage Dips and Interruptions	ETSI EN 301 489-17	EN 61000-4-11	AC port	N/A

Remark:
Pass: The EUT complies with the essential requirements in the standard.
N/A: not applicable.

5 General Information

5.1 Client Information

Applicant:	Red Bear Electronic (Shenzhen) Co Ltd
Address of Applicant:	Rm 610, 6/F, Block B, JinYuan Building, 302 XiXiang Avenue, Bao An District, Shenzhen, China
Manufacturer/Factory:	Red Bear Electronic (Shenzhen) Co Ltd
Address of Manufacturer/Factory:	Rm 610, 6/F, Block B, JinYuan Building, 302 XiXiang Avenue, Bao An District, Shenzhen, China

5.2 General Description of EUT

Product Name:	BLE Module
Model No.:	MB-N2, Nano2, Blend2
Test Model:	MB-N2
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The only difference is the model name and battery capacity for commercial purpose.	
Operation Frequency:	2402~2480MHz
Channel Numbers:	BT V4.0: 40
Channel Separation:	BT V4.0: 2MHz
Modulation Type:	BT V4.0: GFSK
Antenna Type:	Ceramic antenna
Antenna Gain:	1.3dBi(declare by Applicant)
Power Supply:	DC 3.3V

5.3 Operating Modes

Operating mode	Detail description
Bluetooth mode	Keep the EUT in charging and communications with bluetooth function.

5.4 Description of Support Units

Manufacturer	Description	Model	Serial Number
Apple	PC	A1278	C1MN99ERDTY3

5.5 Test Facility

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

● **FCC —Registration No.: 600491**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, June 22, 2016

● **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. Has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016.

5.6 Test Location

RI was performed at:

China Shenzhen Academy of Metrology and Quality Inspection,
Metrology and Quality Inspection building, Central Section of LongZhu Road, Nan Shan, Shenzhen

All other tests were performed at:

Global United Technology Services Co., Ltd.
Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China
Tel: 0755-27798480
Fax: 0755-27798960

5.7 Deviation from Standards

None.

5.8 Abnormalities from Standard Conditions

None.

5.9 Other Information Requested by the Customer

None.

6 Equipment Used during Test

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W)* 6.0(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	ESU EMI Test Receiver	R&S	ESU26	GTS203	June. 29 2016	June. 28 2017
4	Loop Antenna	Zhinan	ZN30900A	GTS534	June. 29 2016	June. 28 2017
5	BiConiLog Antenna	SCHWARZBECK	VULB9163	GTS214	June. 29 2016	June. 28 2017
6	Double-ridged horn antenna	SCHWARZBECK	9120D	GTS208	June. 29 2016	June. 28 2017
7	Horn Antenna	ETS-LINDGREN	3160-09	GTS218	June. 29 2016	June. 28 2017
8	RF Amplifier	HP	8347A	GTS204	June. 29 2016	June. 28 2017
9	RF Amplifier	HP	8349B	GTS206	June. 29 2016	June. 28 2017
10	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	June. 29 2016	June. 28 2017
11	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	June. 29 2016	June. 28 2017
12	Universal Radio Communication tester	ROHDE&SCHWARZ	CMU 200	GTS538	June. 29 2016	June. 28 2017
13	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
14	Coaxial cable	GTS	N/A	GTS210	N/A	N/A
15	Coaxial Cable	GTS	N/A	GTS211	N/A	N/A
16	Thermo meter	N/A	N/A	GTS256	June. 29 2016	June. 28 2017

ESD:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	ESD Simulator	KIKUSUI	KES4021A	GTS242	June. 29 2016	June. 28 2017
2	Thermo meter	KTJ	TA328	GTS243	June. 29 2016	June. 28 2017

Radiated Immunity:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial NO.**	**Cal.Date (mm-dd-yy)**	**Cal.Due Date (mm-dd-yy)**
1	Signal Generator	Rohde & Schwarz	SMT03	100059	Jan. 17 2016	Jan. 16 2017
2	Power Amplifier	AR	150W1000	300999	Jan. 17 2016	Jan. 16 2017
3	Power Amplifier	AR	25S1G4AM1	305993	Jan. 17 2016	Jan. 16 2017
4	Power Amplifier	AR	150A220M6	305965	Jan. 17 2016	Jan. 16 2017
5	Broadband antenna	CHASE	CBL6111C	2576	Jan. 17 2016	Jan. 16 2017
6	Horn Antenna	AR	AT4002A	2783	Jan. 17 2016	Jan. 16 2017

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (dd-mm-yy)**	**Cal.Due date (dd-mm-yy)**
1	Barometer	ChangChun	DYM3	GTS257	June. 29 2016	June. 28 2017

7 EMC Requirements Specification in ETSI EN 301 489-17

7.1 EMI (Emission)

7.1.1 Radiated Emission

Test Requirement:	ETSI EN 301 489-17
Test Method:	ETSI EN 301 489-1 and EN55016-2-3
Test Frequency Range:	30MHz to 6GHz
Test site:	Measurement Distance: 3m

Receiver setup:

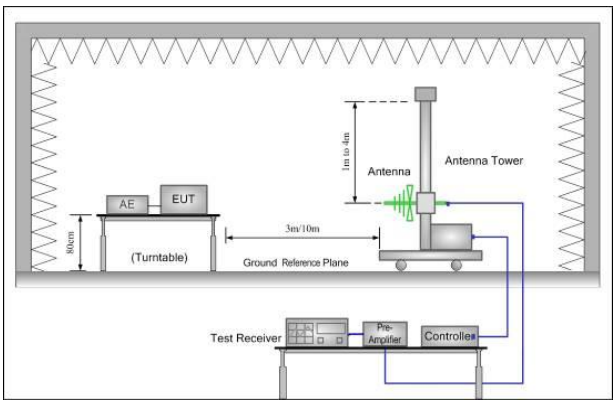
Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	100kHz	300kHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	AV	1MHz	3MHz	Average Value

Limit:

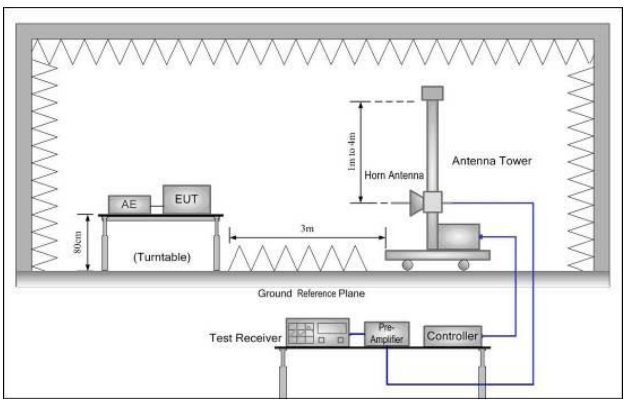
Frequency	Limit (dBuV/m @3m)	Remark
30MHz-230MHz	40.00	Quasi-peak Value
230MHz-1GHz	47.00	Quasi-peak Value
1GHz-3GHz	50.00	Average Value
	70.00	Peak Value
3GHz-6GHz	54.00	Average Value
	74.00	Peak Value

Test setup:

Below 1GHz



Above 1GHz



Test Procedure:	■ **From 30MHz to 1GHz:** 1. The radiated emissions test was conducted in a semi-anechoic chamber. 2. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation. 3. Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emissions spectrum plots of the EUT. 4. The frequencies of maximum emission were determined in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization. ■ **Above 1GHz:** 1. The radiated emissions test was conducted in a fully-anechoic chamber. 2. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation. 3. Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emission spectrum plots of the EUT. 4. The frequencies of maximum emission were determined in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization.
Test environment:	Temp.: 25 °C | Humid.: 50% | Press.: 1 010mbar
Measurement Record:	Uncertainty: ± 4.5dB
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Remark:
1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Measurement Data
Below 1GHz

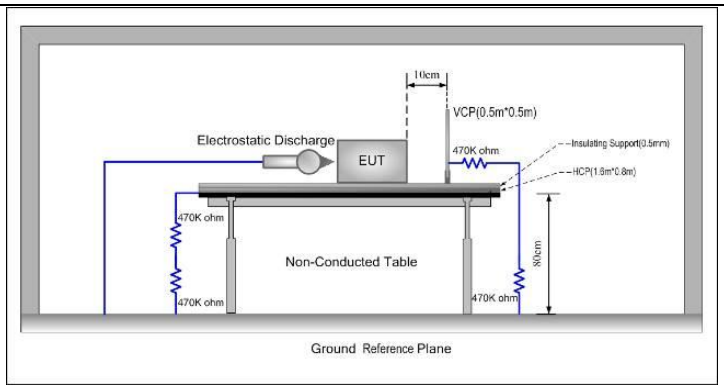
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarity
31.07	44.52	14.32	0.56	30.09	29.31	40.00	-10.69	Vertical
50.76	46.67	15.21	0.78	29.99	32.67	40.00	-7.33	Vertical
92.79	31.92	14.41	1.13	29.73	17.73	40.00	-22.27	Vertical
159.23	46.08	10.64	1.62	29.37	28.97	40.00	-11.03	Vertical
256.52	36.20	14.06	2.16	29.70	22.72	47.00	-24.28	Vertical
317.70	31.29	15.31	2.45	29.90	19.15	47.00	-27.85	Vertical
32.18	45.49	14.32	0.58	30.09	30.30	40.00	-9.70	Horizontal
49.36	46.31	15.29	0.77	30.00	32.37	40.00	-7.63	Horizontal
96.44	32.01	14.94	1.16	29.72	18.39	40.00	-21.61	Horizontal
166.07	47.32	10.85	1.66	29.33	30.50	40.00	-9.50	Horizontal
252.06	39.56	14.07	2.14	29.66	26.11	47.00	-20.89	Horizontal
324.46	32.21	15.53	2.49	29.86	20.37	47.00	-26.63	Horizontal

Remark:
1. The EUT was test at 3m in field chamber.
2. If the average limit is met when using a Peak detector, the EUT shall be deemed to meet both peak and average limits. And measurement with the average detector is unnecessary.

7.2 Immunity

Performance Criteria of ETSI EN 301 489-17, clause 6	
Continuous phenomena applied to transmitters (CT)	1. During the test, the uplink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check). 2. At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained. 3. In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.
Transient phenomena applied to Transmitters (TT)	1. At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link. 2. At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained. 3. In addition to confirming the above performance during a call, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.
Continuous phenomena applied to Receivers (CR)	1. During the test, the RXQUAL of the downlink shall not exceed the value of three, measured during each individual exposure in the test sequence. 2. During the test, the downlink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check). 3. At the conclusion of the test, the EUT shall operate as intended with no loss of user control the The communication link shall have been maintained.
Transient phenomena applied to Receivers (TR)	1. At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link. 2. At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained
Ancillary equipment tested on a stand alone basis	If ancillary equipment is intended to be tested on a stand alone basis, the performance criteria described in the clauses above are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests. The performance specification shall be included in the product description and documentation.

7.2.1 Electrostatic Discharge

Test Requirement:	ETSI EN 301 489-17
Test Method:	EN 61000-4-2
Discharge Voltage:	Contact Discharge: ±2kV, ±4kV Air Discharge: ±2kV, ±4kV, ±8kV HCP/VCP: ±2kV, ±4kV
Polarity:	Positive & Negative
Number of Discharge:	Contact Discharge: Minimum 10 times at each test point, Air Discharge: Minimum 10 times at each test point.
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum
Limit:	Criteria B
Test setup:	
Test Procedure:	**Air discharge:** 1. The test was applied on non-conductive surfaces of EUT. 2. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. 3. After each discharge, the discharge electrode was removed from the EUT. 4. The generator was re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. 5. This procedure was repeated until all the air discharge completed **Contact Discharge:** 1. The test was applied on conductive surfaces of EUT. 2. the generator was re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. 3. the tip of the discharge electrode was touch the EUT before the discharge switch was operated. **Indirect discharge for horizontal coupling plane** 1. At least 10 single discharges shall be applied at the front edge of each HCP opposite the centre point of each unit of the EUT and 0.1m from the front of the EUT. 2. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge. 3. Consideration should be given to exposing all sides of the EUT.

	Indirect discharge for vertical coupling plane 1. At least 10 single discharges were applied to the center of one vertical edge of the coupling plane. 2. The coupling plane, of dimensions 0.5m X 0.5m, was placed parallel to, and positioned at a distance of 0.1m from the EUT. 3. Discharges were applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.
Test environment:	Temp.: 24 °C Humid.: 51% Press.: 1 010mbar
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Record:

Test points:	I: No port
	II: Buttons, plastic parts and seams

Direct discharge

Discharge Voltage (KV)	Type of discharge	Test points	Observations Performance	Result
± 2, ± 4	Contact	I	N/A	N/A
± 2, ± 4,± 8	Air	II	N/A	N/A

Indirect discharge

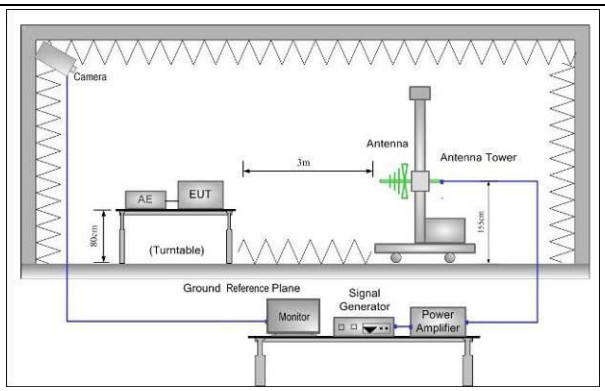
Discharge Voltage (KV)	Type of discharge	Test points	Observation Performance	Result
± 2, ± 4	HCP-Bottom/Top/ Front/Back/Left/Right	Edge of the HCP	A	Pass
± 2, ± 4	VCP-Front/Back /Left/Right	Center of the VCP	A	Pass

Remark:

A: Normal performance within the specification limits.

N/A :Not applicable

7.2.2 Radiated Immunity

Test Requirement:	ETSI EN 301 489-17
Test Method:	EN 61000-4-3
Frequency range:	80MHz to 1GHz, 1.4GHz to 2.7GHz
Test Level:	3V/m
Modulation:	80%, 1kHz Amplitude Modulation
Performance Criterion:	Criteria A
Test setup:	
Test Procedure:	1. For table-top equipment, the EUT was placed in the chamber on a non-conductive table 0.8m high. For arrangement of floor-standing equipment, the EUT was mounted on a non-conductive support 0.1m above the supporting plane. For human body-mounted equipment, the EUT may be tested in the same manner as table top items. 2. If possible, a minimum of 1 m of cable is exposed to the electromagnetic field. Excess length of cables interconnecting units of the EUT shall be bundled low-inductively in the approximate center of the cable to form a bundle 30 cm to 40 cm in length. 3. The EUT was initially placed with one face coincident with the calibration plane. The EUT face being illuminated was contained within the UFA (Uniform Field Area). 4. The frequency ranges to be considered were swept with the signal modulated and pausing to adjust the RF signal level or to switch oscillators and antennas as necessary.Where the frequency range was swept incrementally, the step size was not exceed 1 % of the preceding frequency value. 5. The dwell time of the amplitude modulated carrier at each frequency was not be less than the time necessary for the EUT to be exercised and to respond, and was not less than 0,5 s. 6. The test normally was performed with the generating antenna facing each side of the EUT. 7. The polarization of the field generated by each antenna necessitates testing each selected side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. 8. The EUT was performed in a configuration to actual installation conditions, a video camera and/or a audio monitor were used to monitor the performance of the EUT.

Test monitor:	**Traffic mode:** Uplink level, downlink level, RX quality
	Idle mode: 1. The test system shall simulate a Base Station (BS) with Broadcast Control Channel/Common Control Channel (BCCH/CCCH) on one carrier. 2. The EUT shall be synchronized to the BCCH, listening to the CCCH and able to respond to paging messages.
Test environment:	Temp.: 25 °C Humid.: 52% Press.: 1 010mbar
Test Instruments:	Refer to section 6.0 for details
Test results:	Pass

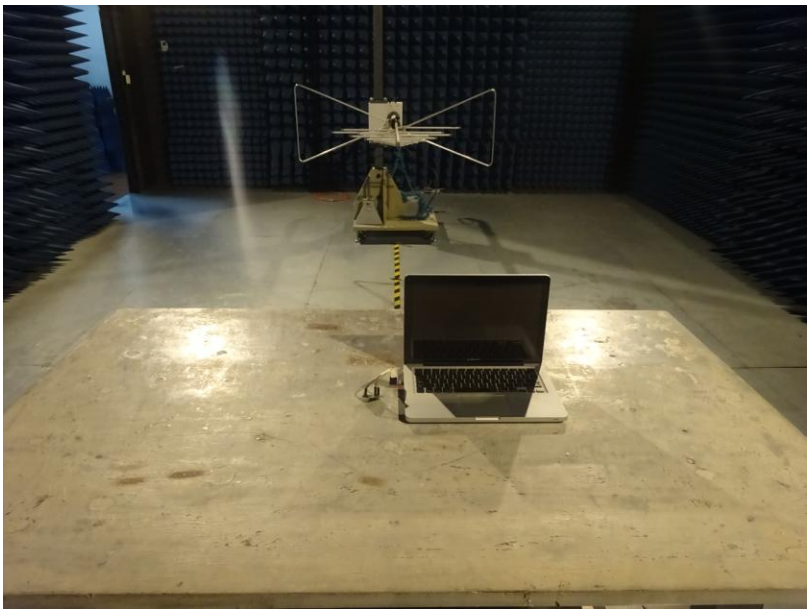
Measurement Record:

Frequency	Level	Modulation	Antenna Polarization	EUT Face	Observations (Performance Criterion)
80 MHz-1 GHz 1.4GHz-2.7GHz	3 V/m	1 kHz, 80 % Amp. Mod, 10 % increment, dwell time=3seconds	V	Front	A
			H		A
			V	Rear	A
			H		A
			V	Left	A
			H		A
			V	Right	A
			H		A
			V	Top	A
			H		A
			V	Bottom	A
			H		A

Remarks:
A: Normal performance within the specification limits.

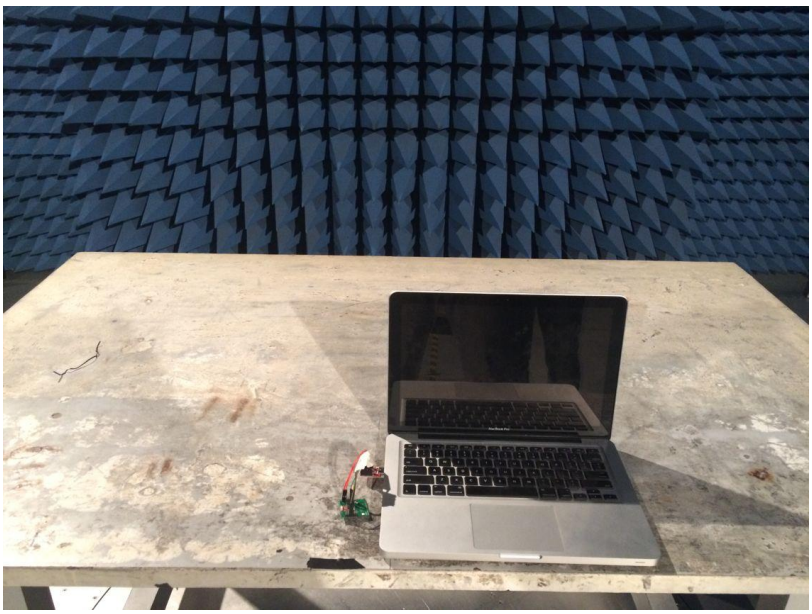
8 Test Setup Photo

Radiated Emission

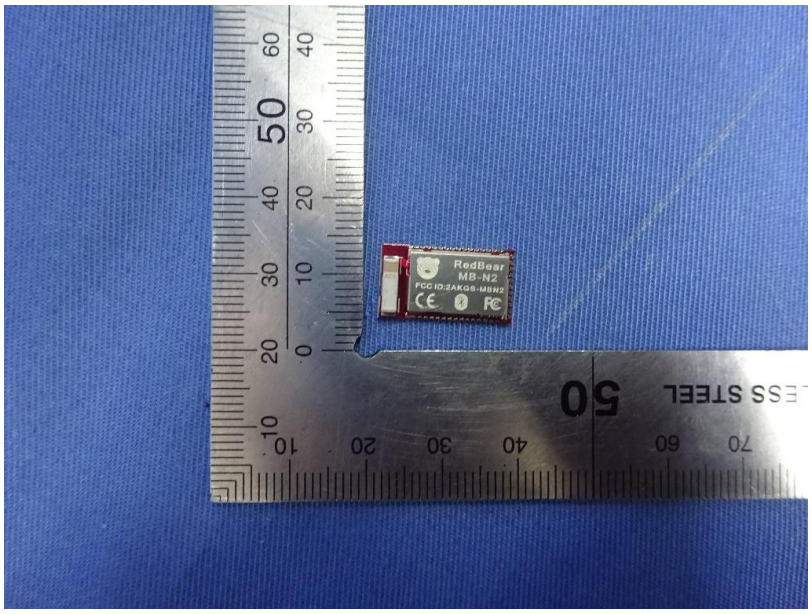


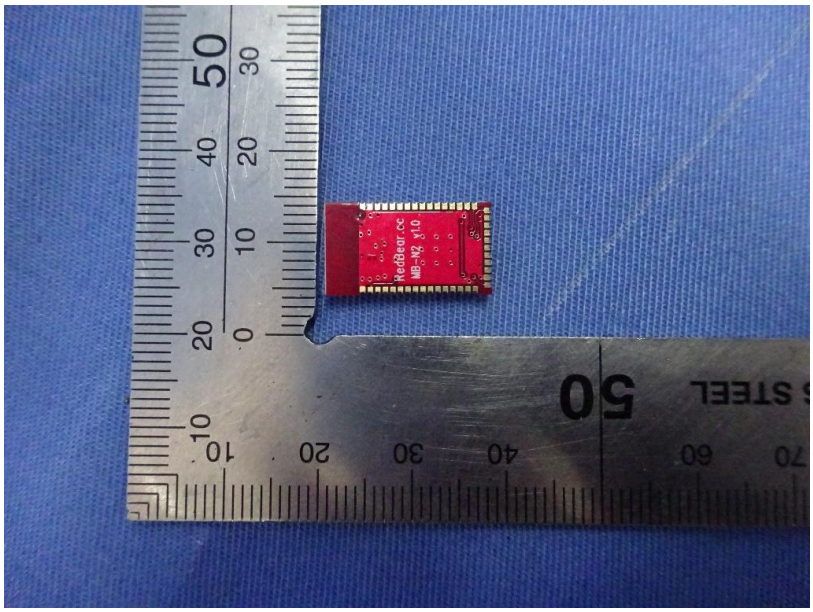
ESD

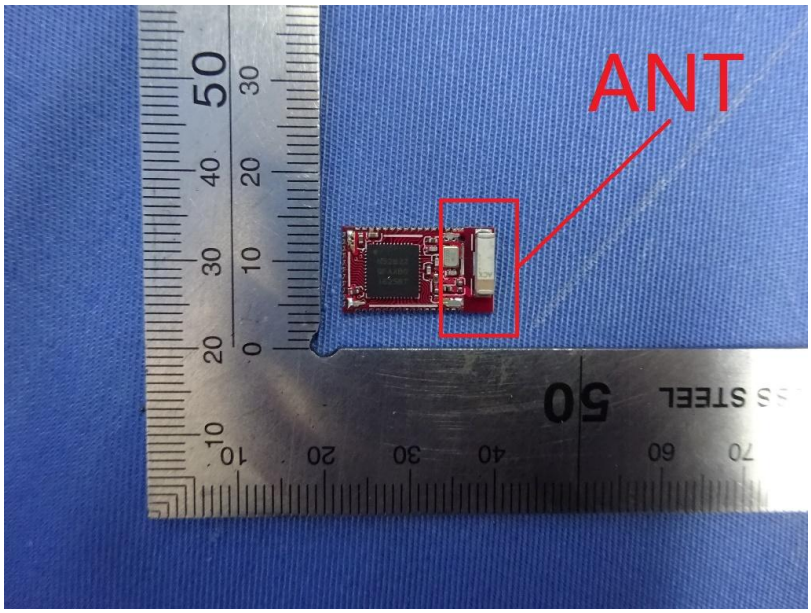
RS



9 EUT Constructional Details







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