

CE Test Report

Product Name	Bluetooth low energy module
Model No.	EYSHSN

Applicant	TAIYO YUDEN CO., LTD.
Address	8-1, Sakae-cho, Takasaki-shi, Gunma 370-8522, JAPAN

Date of Receipt	Jan. 29, 2019
Issued Date	Mar. 04, 2019
Report No.	1910339R-RFCEP02V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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Test Report

Issued Date: Mar. 04, 2019

Report No.: 1910339R-RFCEP02V00



Product Name	Bluetooth low energy module
Applicant	TAIYO YUDEN CO., LTD.
Address	8-1, Sakae-cho, Takasaki-shi, Gunma 370-8522, JAPAN
Manufacturer	TAIYO YUDEN CO., LTD.
Model No.	EYSHSN
EUT Rated Voltage	DC 3V (Power by DC Power supply)
EUT Test Voltage	DC 3V (Power by DC Power supply)
Trade Name	TAIYO YUDEN
Applicable Standard	ETSI EN 301 489-17 V3.1.1 (2017-02) ETSI EN 301 489-1 V2.1.1 (2017-02)
Test Result	Complied

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(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Bluetooth low energy module
Trade Name	TAIYO YUDEN
Model No.	EYSHSN
Frequency Range	2402-2480 MHz
Number of Channels	V5.0: 40CH
Channel Separation	V5.0: 2 MHz
Type of Modulation	V5.0: GFSK (2Mbps)
Channel Control	Auto
Antenna Type	Print on PCB Antenna

Bluetooth V5.0 Center Frequency of Each Channel (Bluetooth):

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 01:	2404 MHz	Channel 02:	2406 MHz	Channel 03:	2408 MHz
Channel 04:	2410 MHz	Channel 05:	2412 MHz	Channel 06:	2414 MHz	Channel 07:	2416 MHz
Channel 08:	2418 MHz	Channel 09:	2420 MHz	Channel 10:	2422 MHz	Channel 11:	2424 MHz
Channel 12:	2426 MHz	Channel 13:	2428 MHz	Channel 14:	2430 MHz	Channel 15:	2432 MHz
Channel 16:	2434 MHz	Channel 17:	2436 MHz	Channel 18:	2438 MHz	Channel 19:	2440 MHz
Channel 20:	2442 MHz	Channel 21:	2444 MHz	Channel 22:	2446 MHz	Channel 23:	2448 MHz
Channel 24:	2450 MHz	Channel 25:	2452 MHz	Channel 26:	2454 MHz	Channel 27:	2456 MHz
Channel 28:	2458 MHz	Channel 29:	2460 MHz	Channel 30:	2462 MHz	Channel 31:	2464 MHz
Channel 32:	2466 MHz	Channel 33:	2468 MHz	Channel 34:	2470 MHz	Channel 35:	2472 MHz
Channel 36:	2474 MHz	Channel 37:	2476 MHz	Channel 38:	2478 MHz	Channel 39:	2480 MHz

Note:

1. The EUT is a Bluetooth low energy module, with built-in Bluetooth V5.0 transceiver.
2. DEKRA is verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode	Mode 1: BLE Mode
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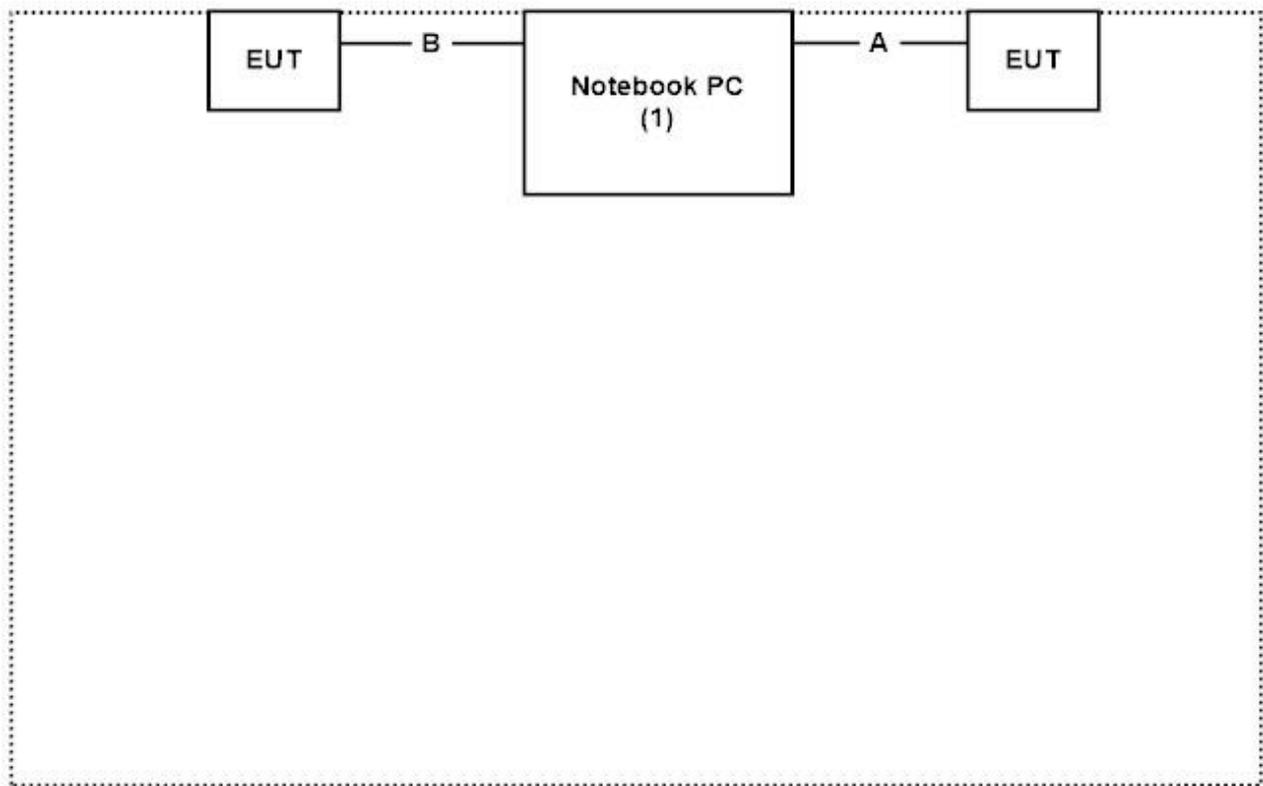
1.2. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Notebook PC	TOSHIBA	R732/H	N/A	N/A

Signal Cable Type	Signal cable Description
A USB Cable	Shielded, 1.7m
B USB Cable	Shielded, 0.9m

1.3. Configuration of tested System



1.4. EUT Exercise Software

(1)	Setup the EUT as shown in Section 1.3.
(2)	Execute software “10_BLE_TEST_Tool_BT5.xls” on the Notebook PC.
(3)	Configure the test mode, the test channel, and the data rate.
(4)	Press “OK” to start the continuous transmit.
(5)	Verify that the EUT works properly.

1.5. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Electrostatic Discharge	Temperature (°C)	15-35	25
	Humidity (%RH)	30-60	51
	Barometric pressure (mbar)	860-1060	950-1000
Radiated susceptibility	Temperature (°C)	15-35	21
	Humidity (%RH)	25-75	50
	Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en.aspx

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1.6. List of Test Equipment

Electrostatic Discharge / SR6

Instrument	Manufacturer	Type No.	Serial No	Cal. Date
ESD Simulator System	Noiseken	ESS-B3011	ESS1233479	2018/05/16
ESD GUN	Noiseken	GT-30R	ESS1233499	2018/05/16
Horizontal Coupling Plane(HCP)	QuiieTek	HCP AL50	N/A	N/A
Vertical Coupling Plane(VCP)	QuiieTek	VCP AL50	N/A	N/A

Radiated susceptibility / CB9

Instrument	Manufacturer	Type No.	Serial No	Cal. Date
Signal Generator	Keysight	N5171B	MY53051650	2018/08/20
Power Sensor	Keysight	N1912A	MY55480006	2018/08/23
Stacked double Log.-Per.-Broadband Antenna	SCHWARZBECK	STLP 9129	9129 011	N/A
Power Amplifier	MILMEGA	80RF1000-300	1071481	N/A
Power Amplifier	MILMEGA	AS0860B-50/50	1071482	N/A
uniform field calibration	Dekra	N/A	N/A	2018/06/15

2. Test Result

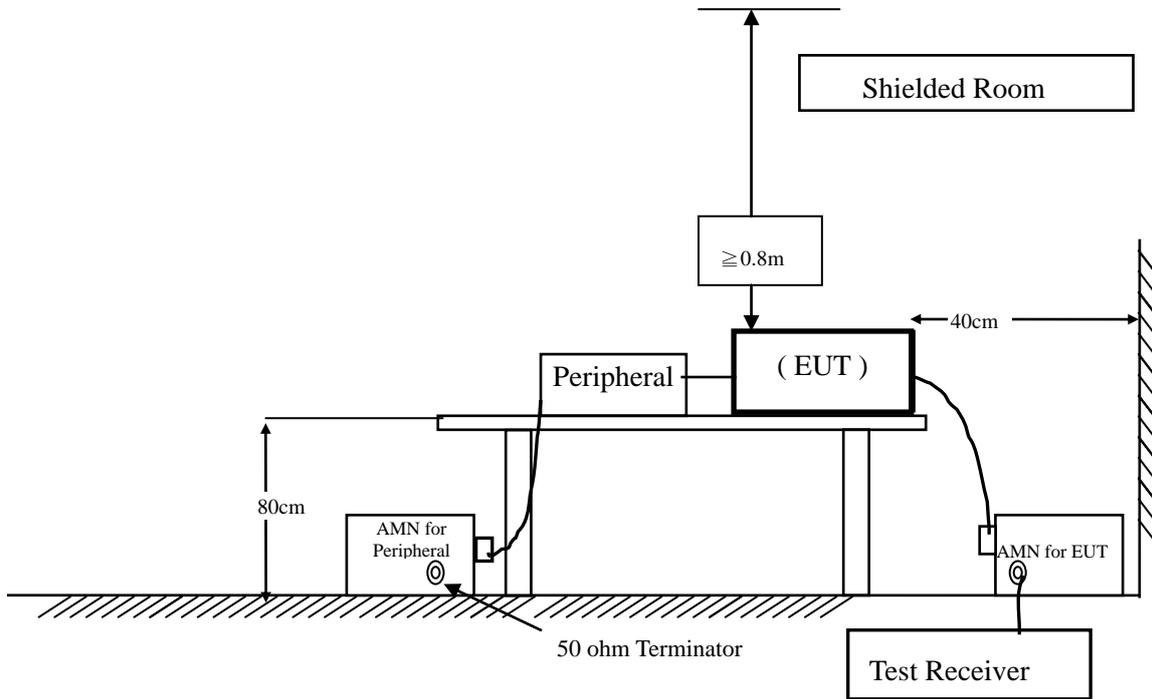
The test results in the emission and the immunity were performed according to the requirements of measurement standard and process. DEKRA Testing and Certification Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. The test data of the emission is listed as below.

All the tests were carried out with the EUT in normal operation, which was defined as:

Test Mode	Mode 1: BLE Mode
-----------	------------------

3. Conducted Emission

3.1. Test Setup



3.2. Limits

(1) Mains terminal

Frequency MHz	Limits (dB μ V)			
	Limit for conducted emissions of equipment intended to be used in telecommunication centers only		Limit for conducted emissions	
	QP	AV	QP	AV
0.15 - 0.50	79	66	66-56	56-46
0.50-5.0	73	60	56	46
5.0 - 30	73	60	60	50

Remarks: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz ~ 0.50 MHz.

(2) Telecommunication ports

Frequency MHz	Limits (dB μ V)			
	Limit for conducted emissions from telecommunication ports of equipment intended for use in telecommunication centers only		Limit for conducted emissions from telecommunication ports	
	QP	AV	QP	AV
0.15 – 0.50	97-87	84-74	84-74	74-64
5.0 – 30	87	74	74	64

Remarks: In the above table, the tighter limit applies at the band edges.

3.3. Test Procedure

AC Mains:

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ETSI EN 301 489-1 V2.1.1 (2017-02) on conducted measurement.

The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

Telecommunication Port:

The mains voltage shall be supplied to the EUT via the LISN when the measurement of telecommunication port is performed. The common mode disturbances at the telecommunication port shall be connected to the ISN, which is 150ohm impedance. Both alternative cables are tested related to the LCL requested. The measurement range is from 150kHz to 30MHz. The bandwidth of measurement is set to 9kHz. The 60dB LCL ISN is used for cat. 5 cable, 50dB LCL ISN is used for cat. 3 and 80dB LCL is wed for alternative one.

3.4. Test Specification

According to ETSI EN 301 489-1 V2.1.1 (2017-02)

EN 55032: 2015+AC: 2016

3.5. Uncertainty

Conducted Emission :

The measurement uncertainty is evaluated as ± 3.44 dB.

Impedance Stabilization Network :

The measurement uncertainty is evaluated as ± 3.88 dB.

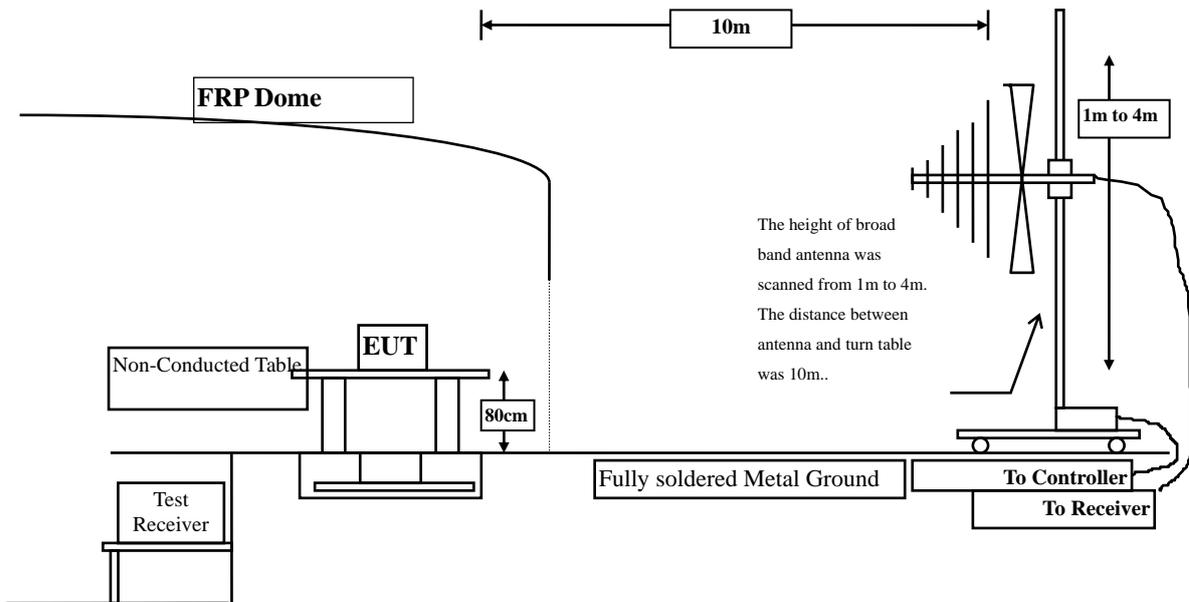
3.6. Test Data of Conducted Emission

Owing to the DC operation of EUT, this test item is not performed.

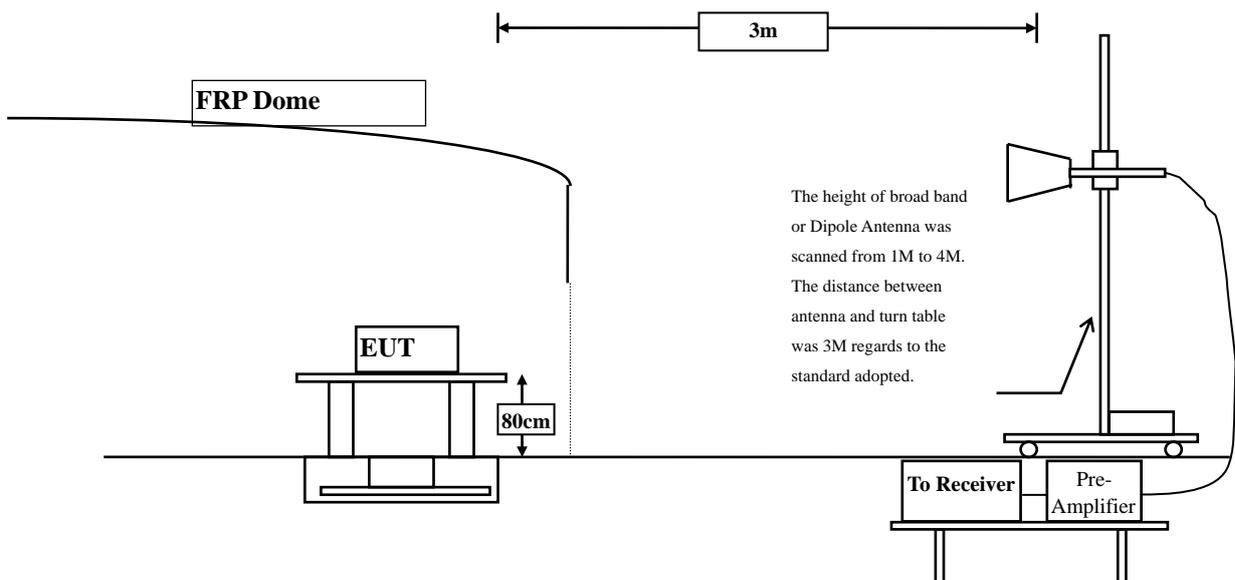
4. Radiated Emission

4.1. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.2. Limits

Limits for radiated disturbance under 1 GHz at a measurement distance of 10 m

Frequency MHz	Limits (dB μ V/m)	
	Limit for radiated emissions from ancillary equipment intended for use in telecommunication centers only, and measured on a stand alone basis	Limit for radiated emissions from ancillary equipment, measured on a stand alone basis
	QP	QP
30-230	40	30
230-1000	47	37

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

Frequency range	Average Limit (dB μ V/m)	Peak limit (dB μ V/m)
1 000 MHz to 3 000 MHz	50	70
3 000 MHz to 6 000 MHz	54	74
NOTE: The lower limit applies at the transition frequency.		

Limits above 1 GHz for radiated emissions from ancillary equipment intended for use in telecommunication centres only, and measured on a stand alone basis at a measurement distance of 3 m

Frequency range	Average Limit (dB μ V/m)	Peak limit (dB μ V/m)
1 000 MHz to 3 000 MHz	56	76
3 000 MHz to 6 000 MHz	60	80
NOTE: The lower limit applies at the transition frequency.		

4.3. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 10 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated on radiated measurement.

Radiated emissions were investigated over the frequency range from 30MHz to 1GHz using a receiver bandwidth of 120kHz. Radiated was performed at an antenna to EUT distance of 10 meters.

Radiated emissions were investigated over the frequency range from 1GHz to 6GHz using a receiver bandwidth of 1MHz. Radiated was performed at an antenna to EUT distance of 3 meters.

4.4. Test Specification

According to ETSI EN 301 489-1 V2.1.1 (2017-02)

EN 55032: 2015+AC: 2016

4.5. Uncertainty

Below 1GHz : The measurement uncertainty is evaluated as ± 4.22 dB.

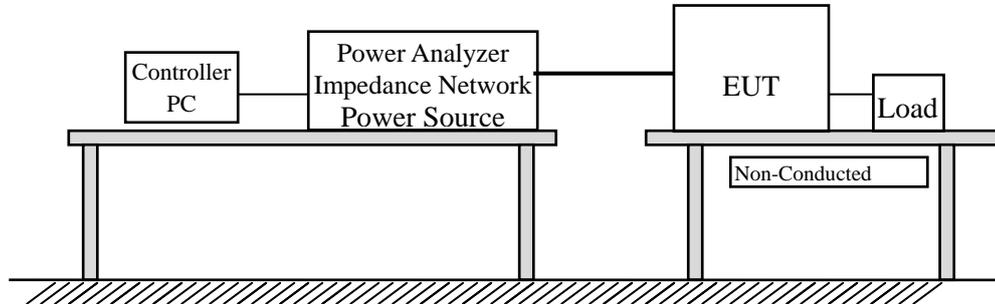
Above 1 GHz : The measurement uncertainty is evaluated as ± 5.08 dB.

4.6. Test Data of Radiated Emission

Owing to the DC operation of EUT, this test item is not performed.

5. Power Harmonics, Voltage Fluctuation and Flicker

5.1. Test Setup



5.2. Limits

➤Limits of Class A Harmonics Currents

Harmonics Order n	Maximum Permissible harmonic current A	Harmonics Order n	Maximum Permissible harmonic current A
Odd harmonics		Even harmonics	
3	2.30	2	1.08
5	1.14	4	0.43
7	0.77	6	0.30
9	0.40	8 ≤ n ≤ 40	0.23 * 8/n
11	0.33		
13	0.21		
15 ≤ n ≤ 39	0.15 * 15/n		

➤Limits of Class B Harmonics Currents

For Class B equipment, the harmonic of the input current shall not exceed the maximum permissible values given in table that is the limit of Class A multiplied by a factor of 1.5.

➤Limits of Class C Harmonics Currents

Harmonics Order n	Maximum Permissible harmonic current Expressed as a percentage of the input current at the fundamental frequency %
2	2
3	$30 \cdot \lambda^*$
5	10
7	7
9	5
$11 \leq n \leq 39$ (odd harmonics only)	3

* λ is the circuit power factor

➤Limits of Class D Harmonics Currents

Harmonics Order n	Maximum Permissible harmonic current per watt mA/W	Maximum Permissible harmonic current A
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
$13 \leq n \leq 39$ (odd harmonics only)	$3.85/n$	See limit of Class A

5.3. Test Procedure

The EUT is supplied in series with power analyzer from a power source having the same normal voltage and frequency as the rated supply voltage and the equipment under test. And the rated voltage at the supply voltage of EUT of 0.94 times and 1.06 times shall be performed.

5.4. Test Specification

According to EN 61000-3-2: 2014, EN 61000-3-3: 2013

5.5. Uncertainty

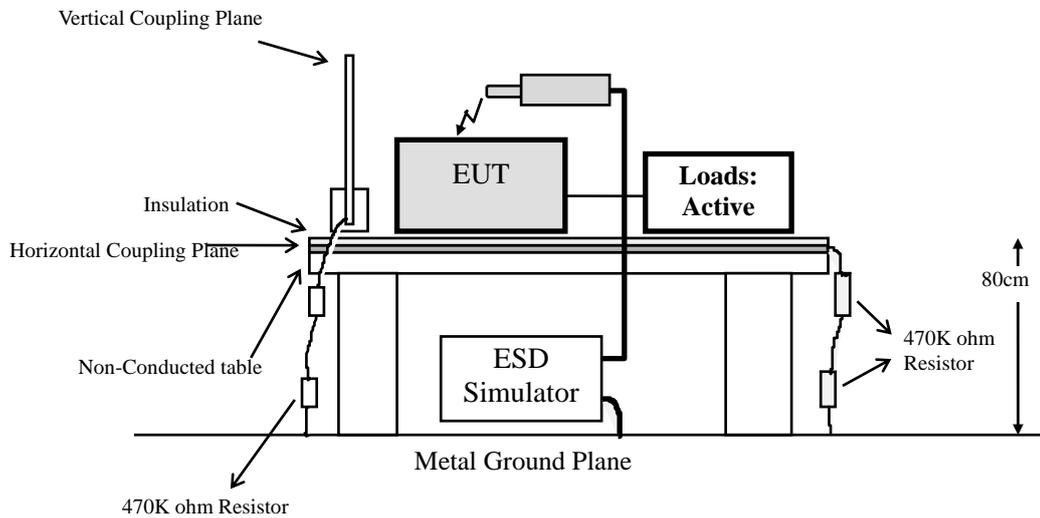
The measurement uncertainty is evaluated as 2 dB.

5.6. Test Data of Power Harmonics, Voltage Flucturation and Flicker

Owing to the DC operation of EUT, this test item is not performed.

6. Electrostatic Discharge (ESD)

6.1. Test Setup



6.2. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Enclosure Port				
	Electrostatic Discharge	kV(Charge Voltage)	±8 Air Discharge ±4 Contact Discharge	B

6.3. Test Procedure

Direct application of discharges to the EUT:

Contact discharge was applied only to conductive surfaces of the EUT.

Air discharges were applied only to non-conductive surfaces of the EUT.

During the test, it was performed with single discharges. For the single discharge time between successive single discharges will be keep longer 1 second. It was at least ten single discharges with positive and negative at the same selected point.

Indirect application of discharges to the EUT:

Vertical Coupling Plane (VCP):

The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge. It was at least ten single discharges with positive and negative at the same selected point.

Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge. It was at least ten single discharges with positive and negative at the same selected point.

6.4. Test Specification

According to IEC 61000-4-2 Ed. 2.0: 2008

6.5. Uncertainty

The calibrated uncertainty for the waveform of voltage as being 1.5 %

The calibrated uncertainty for the waveform of current as being 4.6 %

The calibrated uncertainty for the waveform of timing as being 6.7%

6.6. Test Data of Electrostatic Discharge

Product : Bluetooth low energy module
 Test Item : Electrostatic Discharge
 Test Site : No.6 Shielded Room
 Test Mode : Mode 1: BLE Mode

Item	Amount of Discharge	Voltage	Required Criteria	Complied To Criteria (A, B, C)	Results
Indirect Discharge	25	+2kV, +4kV	B	A	Pass
(HCP)	25	-2kV, -4kV	B	A	Pass
Indirect Discharge	25	+2kV, +4kV	B	A	Pass
(VCP)	25	-2kV, -4kV	B	A	Pass

Note:

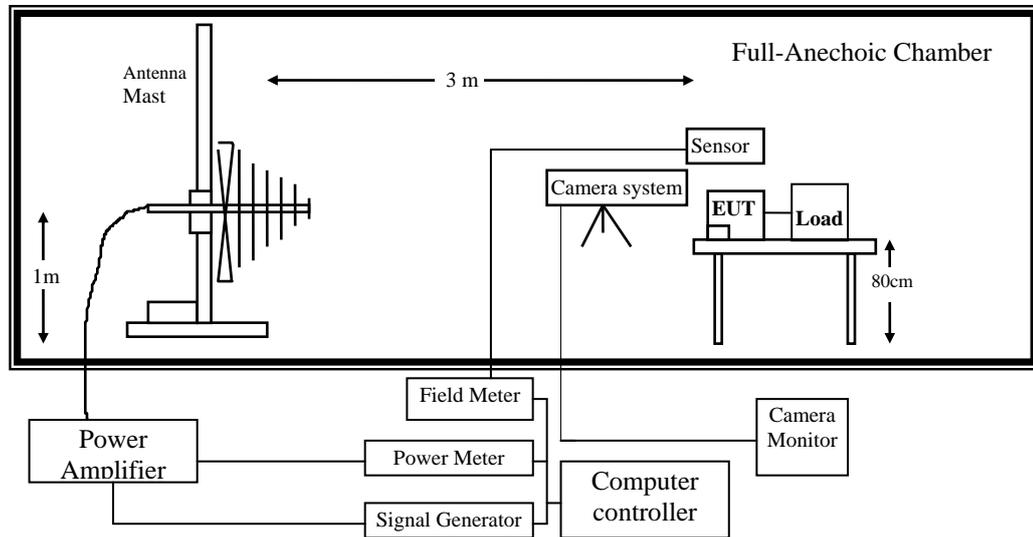
The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

NR: No Requirement

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
 - EUT stopped operation and could / could not be reset by operator at ____ kV.
 - No false alarms or other malfunctions were observed during or after the test.

7. Radiated Susceptibility (RS)

7.1. Test Setup



7.2. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Enclosure Port				
	Radio-Frequency	MHz	80-6000	A
	Electromagnetic Field	V/m(Un-modulated, rms)	3	
	Amplitude Modulated	% AM (1kHz)	80	

7.3. Test Procedure

The EUT and load, which are placed on a table that is 0.8 meter above ground, are placed with one coincident with the calibration plane such that the distance from antenna to the EUT was 3 meters.

Both horizontal and vertical polarization of the antenna and four sides of the EUT are set on measurement.

In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.

All the scanning conditions are as follows:

Condition of Test	Remarks
1. Field Strength	3 V/m Level 2
2. Radiated Signal	AM 80% Modulated with 1kHz sinusoidal audio signal
3. Scanning Frequency	80MHz - 6000MHz
4. Dwell Time	3 Seconds
5. The rate of Swept of Frequency	1.5×10^{-3} decades/s

7.4. Test Specification

According to IEC 61000-4-3 Ed. 3.2: 2010

7.5. Uncertainty

3.57 dB

7.6. Test Data of Radiated Susceptibility

Product : Bluetooth low energy module
 Test Item : Radiated Susceptibility
 Test Site : No.9 EMC fully Chamber
 Test Mode : Mode 1: BLE Mode

Frequency (MHz)	Position (Angle)	Polarity (H or V)	Field Strength (V/m)	Required Criteria	Complied To Criteria (A, B, C)	Results
80-6000	0°	H	3	A	A	Pass
80-6000	0°	V	3	A	A	Pass
80-6000	90°	H	3	A	A	Pass
80-6000	90°	V	3	A	A	Pass
80-6000	180°	H	3	A	A	Pass
80-6000	180°	V	3	A	A	Pass
80-6000	270°	H	3	A	A	Pass
80-6000	270°	V	3	A	A	Pass

Note:

The exclusion band for immunity testing of equipment operating in the 2.4 GHz band shall be:

lower limit of exclusion band = lowest allocated band edge frequency -120 MHz, i.e. 2 280 MHz.
 upper limit of exclusion band = highest allocated band edge frequency +120 MHz, i.e. 2 603.5MHz.

The exclusion band for immunity testing of equipment operating in the 5 GHz Wi-Fi band shall be:

lower limit of exclusion band = lowest allocated band edge frequency -270 MHz, i.e. 4 880 MHz;
 upper limit of exclusion band = highest allocated band edge frequency +270 MHz, i.e. 5 995 MHz.

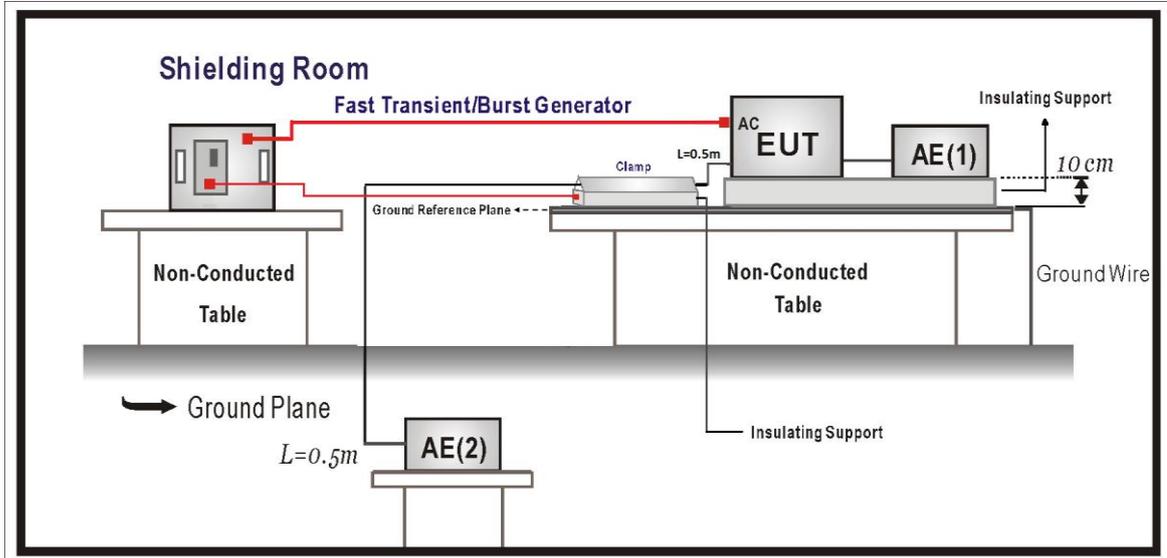
The exclusion band for immunity testing of equipment operating in the 5.8 GHz band shall be:

lower limit of exclusion band = lowest allocated band edge frequency -270 MHz, i.e. 5 455 MHz;
 as the immunity requirements have an upper frequency range of 6 GHz and any upper edge exclusion band would be greater than this for the 5,8 GHz band. The above frequency shall also be regarded as the upper end of the test range.

- Meet criteria A: Operate as intended during and after the test
- Meet criteria B: Operate as intended after the test
- Meet criteria C: Loss/Error of function
- Additional Information
 - There was no observable degradation in performance.
 - EUT stopped operation and could / could not be reset by operator at _____ V/m at frequency _____MHz.
- No false alarms or other malfunctions were observed during or after the test.

8. Electrical Fast Transient/Burst (EFT/B)

8.1. Test Setup



8.2. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Ports for signal lines and control lines				
	Fast Transients Common Mode	kV (Peak)	± 0.5	B
		Tr/Th ns	5/50	
		Rep. Frequency kHz	5	
Input DC Power Ports				
	Fast Transients Common Mode	kV (Peak)	± 0.5	B
		Tr/Th ns	5/50	
		Rep. Frequency kHz	5	
Input AC Power Ports				
	Fast Transients Common Mode	kV (Peak)	± 1	B
		Tr/Th ns	5/50	
		Rep. Frequency kHz	5	

8.3. Test Procedure

The EUT and load are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides.

For Signal Ports and Telecommunication Ports:

The EFT interference signal is through a coupling clamp device couples to the signal and control lines of the EUT with burst noise for 1min.

For Input DC and AC Power Ports:

The EUT is connected to the power mains through a coupling device that directly couples the EFT interference signal.

Each of the Line and Neutral conductors is impressed with burst noise for 1 min.

The length of power cord between the coupling device and the EUT shall be 1m.

8.4. Test Specification

According to IEC 61000-4-4 Ed. 3.0: 2012

8.5. Uncertainty

The calibrated uncertainty for the waveform of voltage as being 6.3 %

The calibrated uncertainty for the waveform of frequency as being 5.1 %

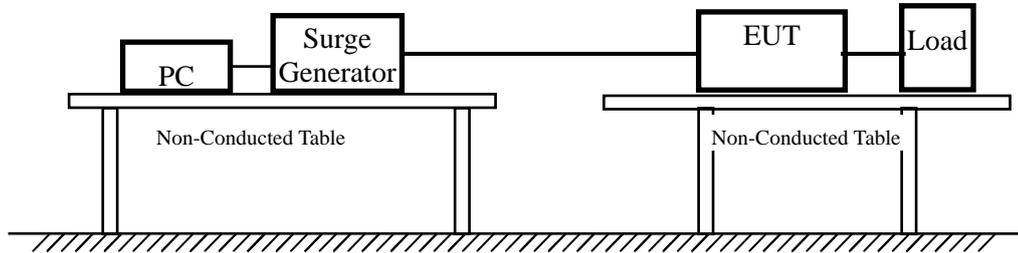
The calibrated uncertainty for the waveform of timing as being 5.3%

8.6. Test Result

Owing to the DC operation of EUT, this test item is not performed.

9. Surge

9.1. Test Setup



9.2. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Telecommunication Ports (See 1) and 2)				
	Surges Line to Ground	Tr/Th us kV	10/700 ± 1	C
Telecommunication Ports in Telecom Centres (See 1) and 2)				
	Surges Line to Ground	Tr/Th us kV	10/700 ± 0.5	C
AC Input and AC Output Power Ports				
	Surges Line to Line Line to Ground	Tr/Th us kV kV	1.2/50 (8/20) ±1 ± 2	B
AC Input and AC Output Power Ports in Telecom Centres				
	Surges Line to Line Line to Ground	Tr/Th us kV kV	1.2/50 (8/20) ±0.5 ± 1	B

Notes:

- 1) Applicable only to ports which according to the manufacturer's may directly to outdoor cables.
- 2) Where the coupling network for the 10/700 μ s waveform affects the functioning of high speed data ports, the test shall be carried out using a 1,2/50 (8/20) μ s waveform and appropriate coupling network.

9.3. Test Procedure

The EUT and its load are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides. The length of power cord between the coupling device and the EUT shall be 2m or less.

For Signal Ports and Telecommunication Ports

The disturbance signal is through a coupling and decoupling networks (CDN) device couples to the signal and Telecommunication lines of the EUT.

For Input and Output AC Power or DC Input and DC Output Power Ports:

The EUT is connected to the power mains through a coupling device that directly couples the Surge interference signal.

The surge noise shall be applied synchronized to the voltage phase at 0° , 90° , 180° , 270° and the peak value of the a.c. voltage wave. (Positive and negative)

Each of Line-Earth and Line-Line is impressed with a sequence of five surge voltages with interval of 1 min.

9.4. Test Specification

According to IEC 61000-4-5 Ed. 3.1: 2014+A1: 2017

9.5. Uncertainty

The calibrated uncertainty for the waveform of voltage as being 5.6 %

The calibrated uncertainty for the waveform of current as being 7.7 %

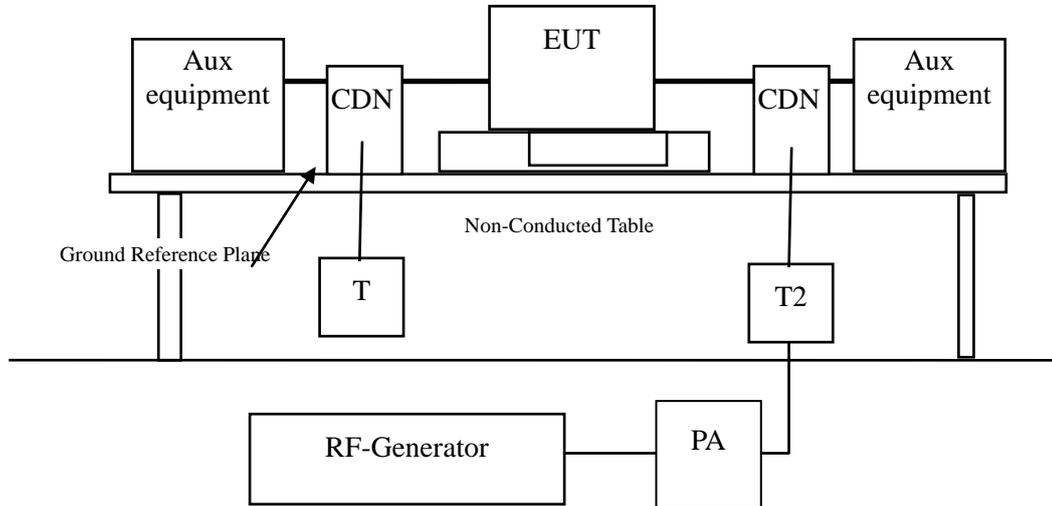
The calibrated uncertainty for the waveform of timing as being 4.6 %

9.6. Test Result

Owing to the DC operation of EUT, this test item is not performed.

10. Conducted Susceptibility (CS)

10.1. Test Setup



10.2. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
AC Input and AC Output & DC Input and DC output Power Ports & Functional Earth Ports				
	Radio-Frequency	MHz	0.15-80	A
	Common Mode.	V (rms, Unmodulated)	3	
	Amplitude Modulated	% AM (1kHz)	80	
		Source Impedance Ω	150	

10.3. Test Procedure

The EUT are placed on a table that is 0.8 meter height, and a Ground reference plane on the table, EUT are placed upon table and use a 10cm insulation between the EUT and Ground reference plane.

For Signal Ports and Telecommunication Ports

The disturbance signal is through a coupling and decoupling networks (CDN) or EM-clamp device couples to the signal and Telecommunication lines of the EUT.

For Input DC and AC Power Ports

The EUT is connected to the power mains through a coupling and decoupling networks for power supply lines. And directly couples the disturbances signal into EUT.

Used CDN-M2 for two wires or CDN-M3 for three wires.

All the scanning conditions are as follows:

Condition of Test	Remarks
1. Field Strength	130dB μ V(3V) Level 2
2. Radiated Signal	AM 80% Modulated with 1kHz sinusoidal audio signal
3. Scanning Frequency	0.15MHz – 80MHz
4 Dwell Time	3 Seconds
5. Frequency step size Δf :	1%
6. The rate of Swept of Frequency	1.5×10^{-3} decades/s

10.4. Test Specification

According to IEC 61000-4-6 Ed. 4.0: 2013

10.5. Uncertainty

The uncertainty of the injected modulated signal level through CDN is 2.15 dB

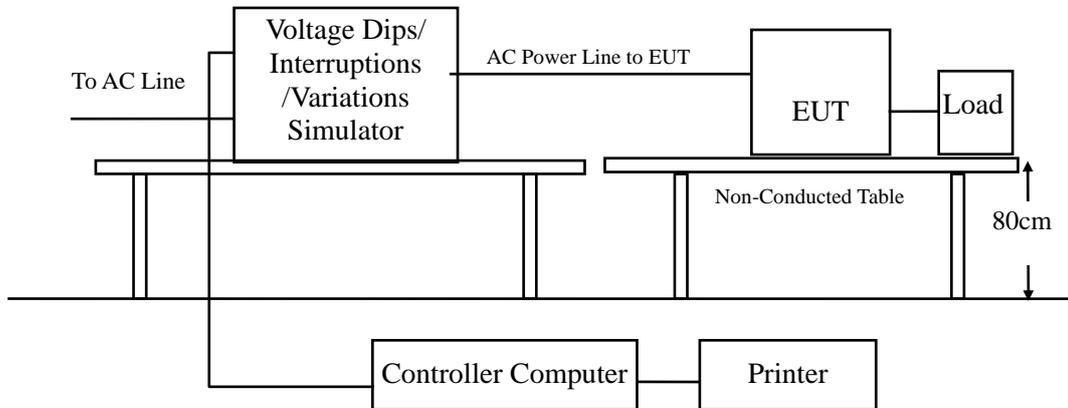
The uncertainty of the injected modulated signal level through EM Clamp/Direct Injection is 3.3 dB

10.6. Test Result

Owing to the DC operation of EUT, this test item is not performed.

11. Voltage Dips and Interruption

11.1. Test Setup



11.2. Test Level

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
AC Input and AC Output Power Ports				
	Voltage Dips	% Reduction (Cycle)	100 % 0.5	B
	Voltage Dips	% Reduction (Cycle)	100 % 1	B
	Voltage Dips	% Reduction (Cycle)	30 % 25	B
	Voltage Interruptions	% Reduction (Cycle)	100 % 250	C (see note)

NOTE: Equipment is fitted with or connected to a battery back-up, the performance criteria is “B”.

11.3. Test Procedure

The EUT and its load are placed on a table which is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides. The power cord shall be used the shortest power cord as specified by the manufacturer.

For Voltage Dips/ Interruptions test:

The selection of test voltage is based on the rated power range. If the operation range is large than 20% of lower power range, both end of specified voltage shall be tested. Otherwise, the typical voltage specification is selected as test voltage.

The EUT is connected to the power mains through a coupling device that directly couples to the Voltage Dips and Interruption Generator.

The test levels shall be:

- voltage dip: 0 % residual voltage for 0,5 cycle;
- voltage dip: 0 % residual voltage for 1 cycle;
- voltage dip: 70 % residual voltage for 25 cycles (at 50 Hz);
- voltage interruption: 0 % residual voltage for 250 cycles (at 50 Hz).

Voltage phase shifting are shall occur at 0° , 45° , 90° , 135° , 180° , 225° , 270° , 315° of the voltage.

11.4. Test Specification

According to IEC 61000-4-11 Ed. 2.1: 2004+A1: 2017

11.5. Uncertainty

The calibrated uncertainty for the waveform of voltage as being 5.5 %

The calibrated uncertainty for the waveform of timing as being 4.5%

11.6. Test Result

Owing to the DC operation of EUT, this test item is not performed.

12. EMC Reduction Method During Compliance Testing

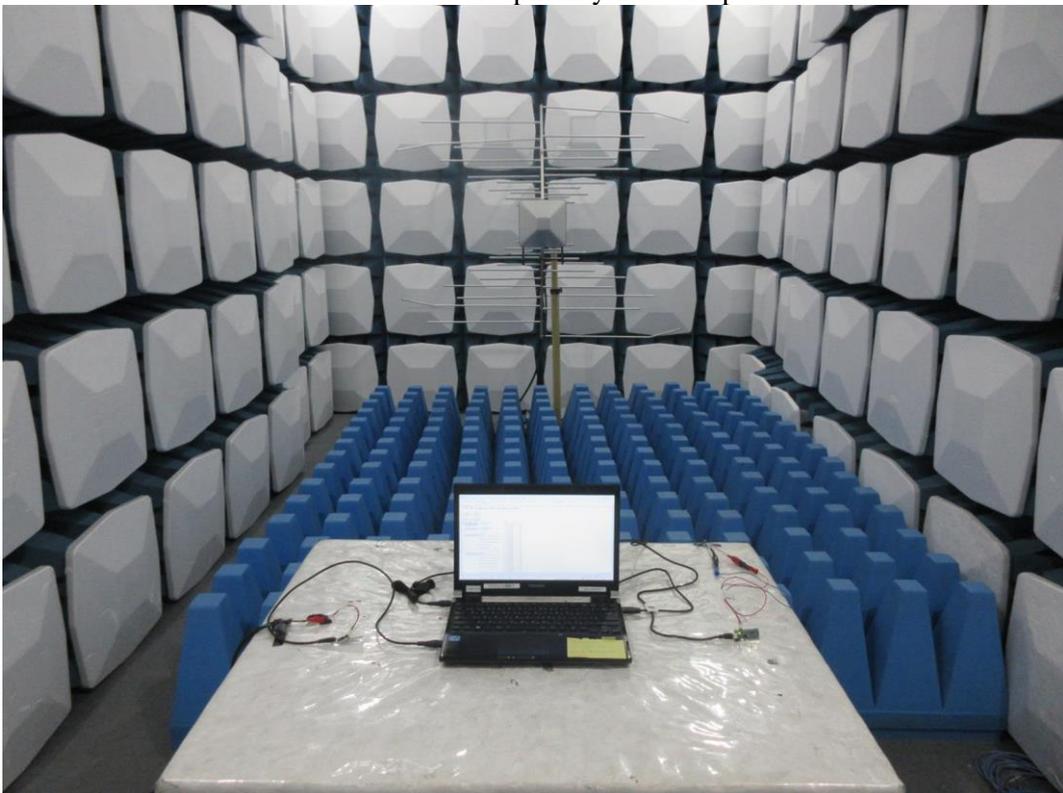
No modification was made during testing.

Attachment 1: EUT Test Setup Photographs

ESD Test Setup

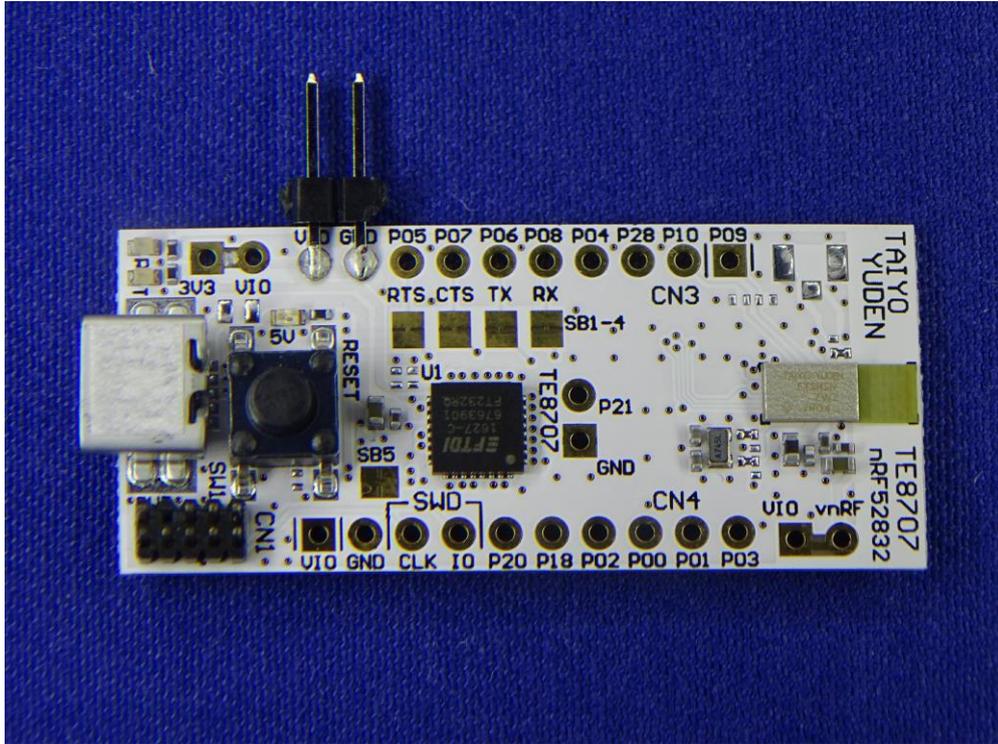


Radiated Susceptibility Test Setup

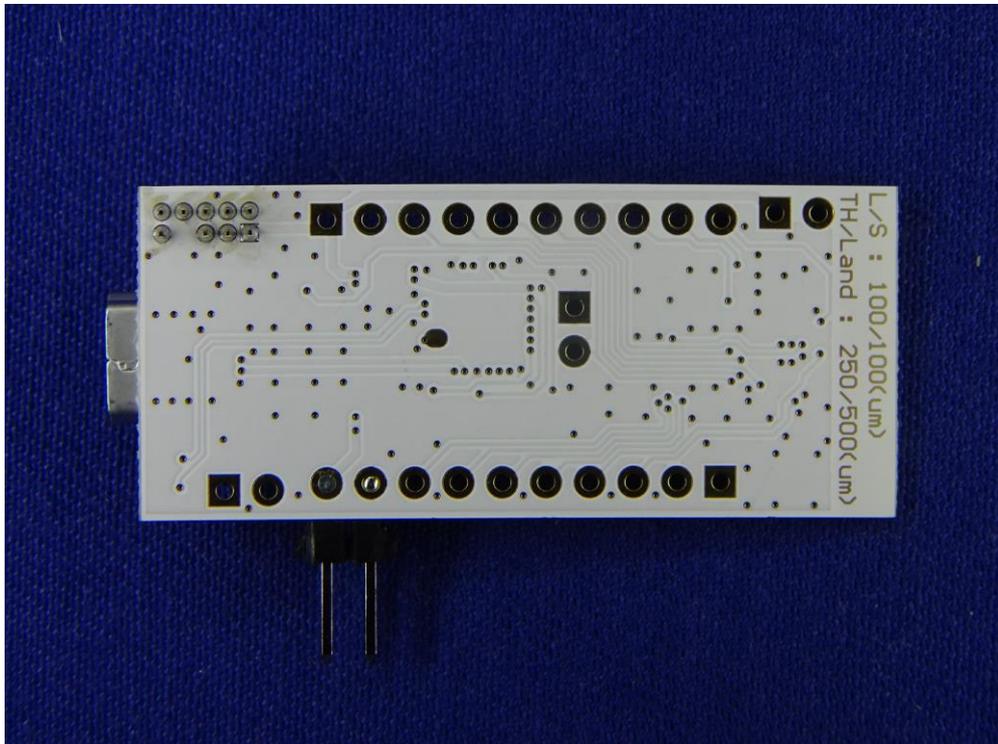


Attachment 2 : EUT Detailed Photographs

(1) EUT Photo



(2) EUT Photo



(3) EUT Photo

