

CE Test Result for Inspection

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	Apr. 01, 2019
Report No.	1910339R-RFCEP01V00
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: Apr. 01, 2019

Report No.: 1910339R-RFCEP01V00



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 300 328 V2.1.1 (2016-11)
Test Result	Complied

Documented By : Ida Tung
(Adm. Assistant / Ida Tung)

Tested By : Leo Chen
(Assistant Engineer / Leo Chen)

Approved By : 
(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 - 2480MHz
Number of Channels	V5.0:40
Type of Modulation	V5.0: GFSK(1Mbps) (2Mbps)
Antenna Type	Print on PCB Antenna
Channel Control	Auto

Bluetooth V5.0 Center Frequency of Each Channel:

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 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: Transmit - BLE
	Mode 3: Receive - BLE

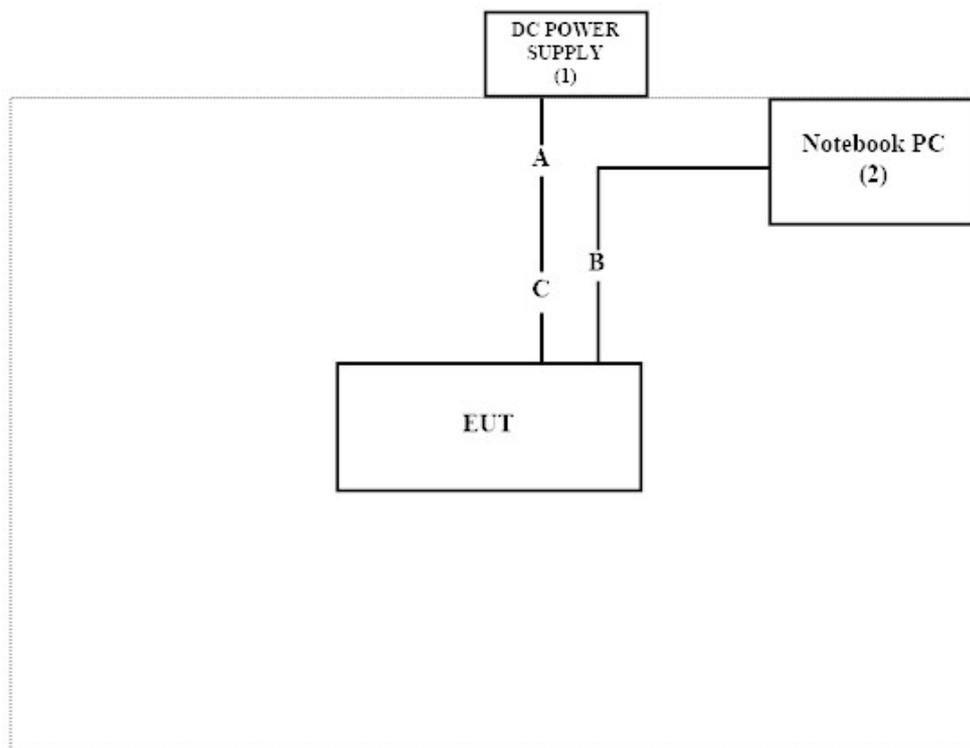
1.2. Tested System Details

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 DC POWER SUPPLY	GWInstek	SPD-3606	GEQ820915	Non-Shielded, 1.8m
2 Notebook PC	TOSHIBA	PORTEGE R30-A Series	PT343N-OQF07J	N/A

Signal Cable Type	Signal cable Description
A Power Cable	Non-shielded, 1.9m
B USB Cable	Shielded, 1.7m
C DC Cable	Non-shielded, 0.5m

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:

Items	Required	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
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 Corporation's Web Site:

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

The address and introduction of DEKRA Corporation's laboratories can be founded in our Web site:

http://www.dekra.com.tw/index_en.aspx

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd.
Site Address: No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan.
TEL: 886-2-2602-7968 / FAX : 866-2-2602-3286
E-Mail : info.tw@dekra.com

1.6. List of Test Equipment

For Conducted measurements /ASR3

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Temperature Chamber	KSON	THS-D4T-100	A0606	2018.04.23	2019.04.22
X	Spectrum Analyzer	R&S	FSV40	101149	2018.12.17	2019.12.16
X	Open Switch Control Unit	R&S	OSP120	101538	2019.02.19	2020.02.18
X	Signal Generator	R&S	SMB100A	110724	2019.01.14	2020.01.13
	Vector Signal Generator	R&S	SMBV100A	261757	2018.12.18	2019.12.17
X	Wireless Connectivity Tester	R&S	CMW270	100978	2018.05.14	2019.05.13
	Bluetooth Tester	R&S	CBT	101238	2018.05.03	2019.05.02

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : EMC32 V10.01.00

For Radiated measurements /ACB2

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
	Loop Antenna	TESEQ	HLA6121	37133	2017.10.13	2019.10.12
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-675	2018.06.05	2019.06.04
X	Horn Antenna	ETS-Lindgren	3117	00203761	2018.11.01	2019.10.30
	Horn Antenna	Com-Power	AH-840	101088	2018.08.30	2019.08.29
X	Pre-Amplifier	EMCI	EMC001330	980301	2018.05.17	2019.05.16
X	Pre-Amplifier	EMCI	EMC051835SE	980312	2018.05.16	2019.05.15
	Pre-Amplifier	EMCI	EMC05820SE	980308	2018.06.22	2019.06.21
	Pre-Amplifier	EMCI	EMC184045SE	980314	2018.05.16	2019.05.15
X	Filter	MICRO TRONICS	BRM50702	G249	2018.08.20	2019.08.19
	Filter	MICRO TRONICS	BRM50716	G187	2018.08.20	2019.08.19
X	Spectrum Analyzer	R&S	FSV40	101146	2019.02.18	2020.02.17
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF003	2018.05.25	2019.05.24
	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3383/2	2018.05.16	2019.05.15

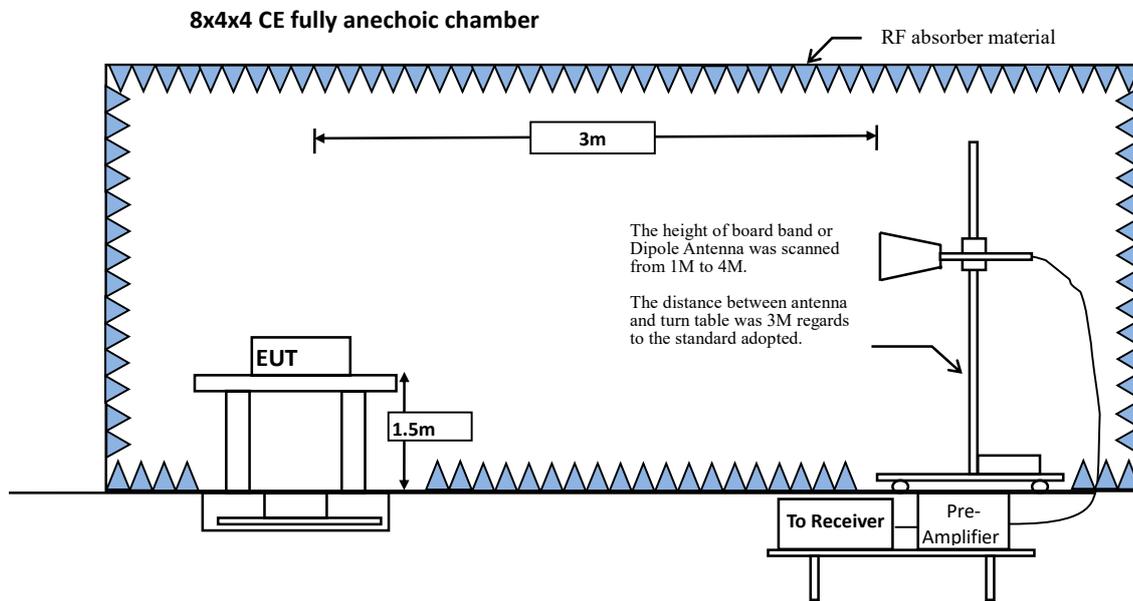
Note:

1. Loop Antenna is calibrated every two year, the other equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

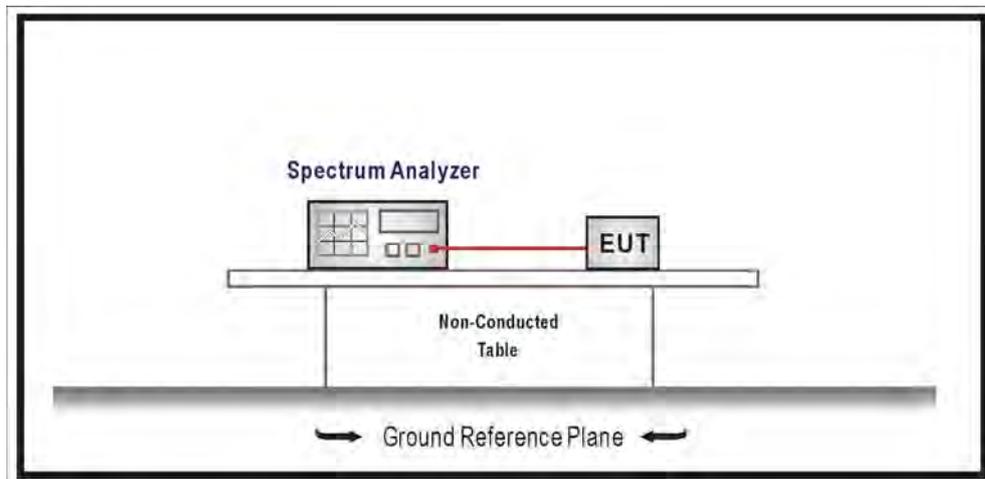
2. Transmitter unwanted emissions in the spurious domain

2.1. Test Setup

For Radiated



For Conducted



2.2. Test Condition

Standard Temperature and Humidity, Standard Test Voltage

2.3. Limits

These limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.

Transmitter Limits for Spurious Emissions		
Frequency Range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

2.4. Test Procedure

The EUT and its test fixture are placed on a turn table which is 1.5 meters 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 3 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. And a high frequency preamplifier were used increase the sensitivity of the measuring. In order to find the maximum emission, all of the interface cables must be manipulated according to ETSI EN 300 328 V2.1.1 (2016-11) on radiated measurement.

The additional notch filter below 1GHz was used to measure the level of harmonics radiated emission during field strength of harmonics measurement. The bandwidth below 1GHz setting on the field strength meter is 100 kHz, and 1MHz bandwidth is adpted above 1GHz. The frequency range from 30MHz to 12.75GHz is checked.

2.5. Test Specification

According to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.9

2.6. Uncertainty

Conducted : ± 1.23 dB

Radiated : ± 3.70 dB above 1GHz

± 3.66 dB below 1GHz

2.7. Test Result for Radiated Spurious Emission

Product : Bluetooth low energy module
 Test Item : Transmitter unwanted emissions in the spurious domain
 Test Mode : Mode 1: Transmit - BLE 1Mbps (2402MHz)

Frequency MHz	Measurement Level dBm	Margin dB	Limit dBm
Horizontal			
44.058	-69.836	-33.836	-36.000
70.768	-70.443	-16.443	-54.000
124.188	-78.687	-42.687	-36.000
191.667	-79.176	-25.176	-54.000
533.275	-78.704	-24.704	-54.000
914.246	-76.798	-40.798	-36.000
Vertical			
41.246	-68.639	-32.639	-36.000
82.014	-65.631	-29.631	-36.000
122.783	-72.470	-36.470	-36.000
457.362	-74.800	-38.800	-36.000
533.275	-74.247	-20.247	-54.000
915.652	-76.090	-40.090	-36.000

Note: "■" means this data is the worst emission level.

Product : Bluetooth low energy module
 Test Item : Transmitter unwanted emissions in the spurious domain
 Test Mode : Mode 1: Transmit - BLE 1Mbps (2402MHz)

Frequency	Measurement	Margin	Limit
MHz	Level	dB	dBm
	dBm		
Horizontal			
4804.000	-58.774	-28.774	-30.000
7206.000	-53.469	-23.469	-30.000
9608.000	-56.635	-26.635	-30.000
Vertical			
4804.000	-58.699	-28.699	-30.000
7206.000	-51.876	-21.876	-30.000
9608.000	-57.846	-27.846	-30.000

Note: "■" means this data is the worst emission level.

Product : Bluetooth low energy module
 Test Item : Transmitter unwanted emissions in the spurious domain
 Test Mode : Mode 1: Transmit - BLE 1Mbps (2480MHz)

Frequency MHz	Measurement Level dBm	Margin dB	Limit dBm
Horizontal			
4960.000	-59.222	-29.222	-30.000
7440.000	-48.966	-18.966	-30.000
9920.000	-55.712	-25.712	-30.000
Vertical			
4960.000	-59.241	-29.241	-30.000
7440.000	-49.450	-19.450	-30.000
9920.000	-56.366	-26.366	-30.000

Note: "■" means this data is the worst emission level.

Product : Bluetooth low energy module
 Test Item : Transmitter unwanted emissions in the spurious domain
 Test Mode : Mode 1: Transmit - BLE 2Mbps (2402MHz)

Frequency MHz	Measurement Level dBm	Margin dB	Limit dBm
Horizontal			
44.058	-69.353	-33.353	-36.000
72.174	-70.622	-16.622	-54.000
125.594	-78.668	-42.668	-36.000
191.667	-78.820	-24.820	-54.000
575.449	-79.467	-25.467	-54.000
939.551	-76.355	-40.355	-36.000
Vertical			
41.246	-67.654	-31.654	-36.000
82.014	-64.639	-28.639	-36.000
125.594	-72.469	-36.469	-36.000
190.261	-77.926	-23.926	-54.000
457.362	-76.158	-40.158	-36.000
533.275	-74.983	-20.983	-54.000

Note: "■" means this data is the worst emission level.

Product : Bluetooth low energy module
 Test Item : Transmitter unwanted emissions in the spurious domain
 Test Mode : Mode 1: Transmit - BLE 2Mbps (2402MHz)

Frequency MHz	Measurement Level dBm	Margin dB	Limit dBm
Horizontal			
4804.000	-59.824	-29.824	-30.000
7206.000	-54.229	-24.229	-30.000
9608.000	-57.145	-27.145	-30.000
Vertical			
4804.000	-59.009	-29.009	-30.000
7206.000	-52.846	-22.846	-30.000
9608.000	-58.036	-28.036	-30.000

Note: "■" means this data is the worst emission level.

Product : Bluetooth low energy module
 Test Item : Transmitter unwanted emissions in the spurious domain
 Test Mode : Mode 1: Transmit - BLE 2Mbps (2480MHz)

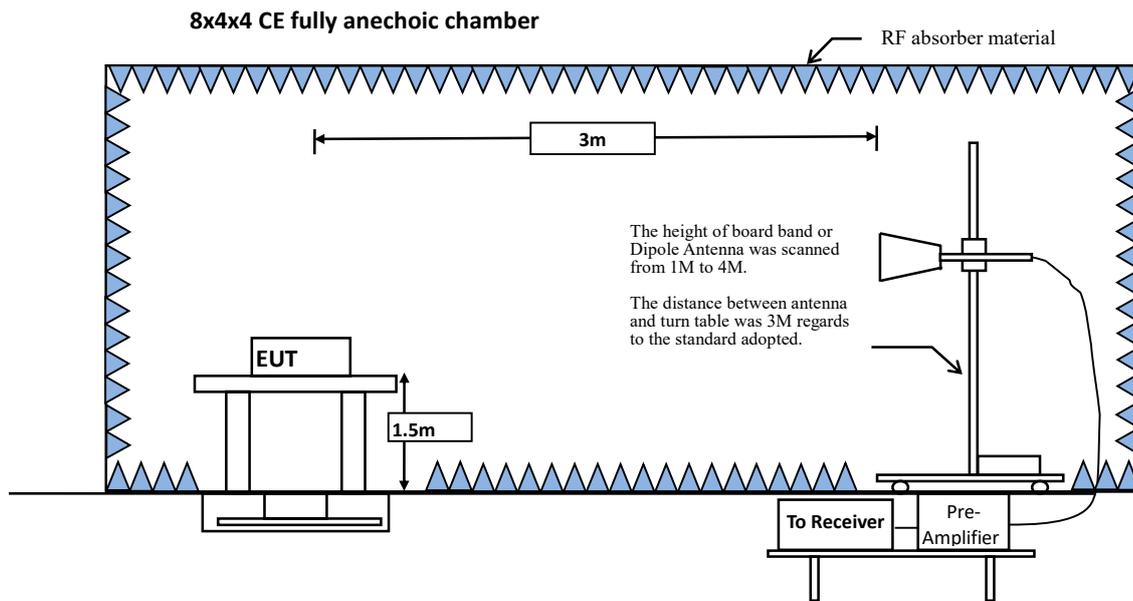
Frequency MHz	Measurement Level dBm	Margin dB	Limit dBm
Horizontal			
4960.000	-59.482	-29.482	-30.000
7440.000	-50.216	-20.216	-30.000
9920.000	-56.132	-26.132	-30.000
Vertical			
4960.000	-59.361	-29.361	-30.000
7440.000	-50.610	-20.610	-30.000
9920.000	-56.636	-26.636	-30.000

Note: "■" means this data is the worst emission level.

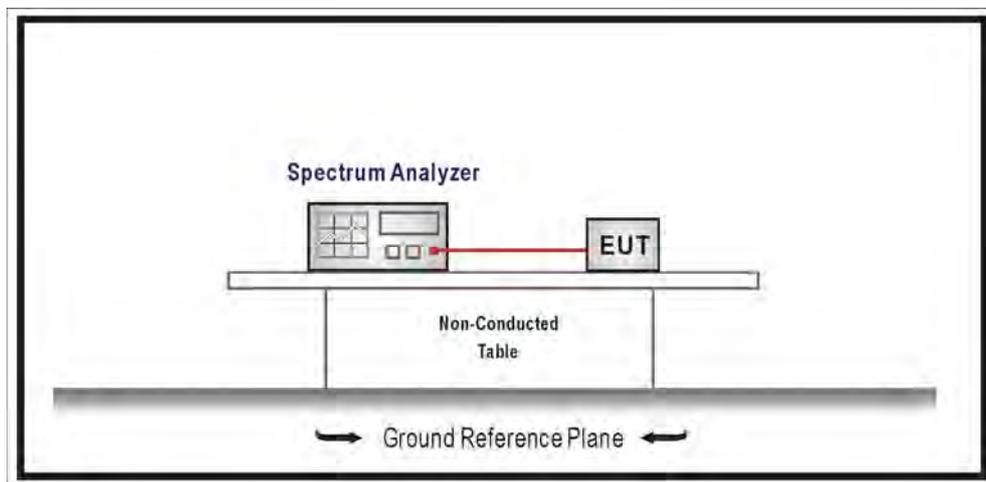
3. Receiver Spurious Emissions

3.1. Test Setup

For Radiated



For Conducted



3.2. Test Condition

Standard Temperature and Humidity, Standard Test Voltage

3.3. Limits

These limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.

Spurious emissions limits for receivers		
Frequency Range	Maximum power	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12.75 GHz	-47 dBm	1 MHz

3.4. Test Procedure

The EUT and its test fixture are placed on a turn table which is 1.5 meters 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 3 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. And a high frequency preamplifier were used increase the sensitivity of the measuring. In order to find the maximum emission, all of the interface cables must be manipulated according to ETSI EN 300 328 V2.1.1 (2016-11) on radiated measurement.

The additional notch filter below 1GHz was used to measure the level of harmonics radiated emission during field strength of harmonics measurement. The bandwidth below 1GHz setting on the field strength meter is 100 kHz, and 1MHz bandwidth is adpted above 1GHz. The frequency range from 30MHz to 12.75GHz is checked.

3.5. Test Specification

According to ETSI EN 300 328 V2.1.1 (2016-11) Clause 5.4.10

3.6. Uncertainty

Conducted : ± 1.23 dB

Radiated : ± 3.70 dB above 1GHz

± 3.66 dB below 1GHz

3.7. Test Result for Radiated Spurious Emission

Product : Bluetooth low energy module
 Test Item : Receiver Spurious Emissions
 Test Mode : Mode 3: Receive - BLE 1Mbps (2402MHz)

Frequency MHz	Measurement Level dBm	Margin dB	Limit dBm
Horizontal			
42.652	-69.816	-12.816	-57.000
72.174	-70.009	-13.009	-57.000
124.188	-78.436	-21.436	-57.000
190.261	-78.937	-21.937	-57.000
533.275	-80.438	-23.438	-57.000
914.246	-76.322	-19.322	-57.000
Vertical			
44.058	-68.488	-11.488	-57.000
80.609	-65.526	-8.526	-57.000
124.188	-72.006	-15.006	-57.000
190.261	-77.542	-20.542	-57.000
457.362	-76.243	-19.243	-57.000
533.275	-73.630	-16.630	-57.000

Note: "■" means the worst emission level.

Product : Bluetooth low energy module
 Test Item : Receiver Spurious Emissions
 Test Mode : Mode 3: Receive - BLE 1Mbps (2402MHz)

Frequency	Measurement	Margin	Limit
MHz	Level	dB	dBm
Horizontal			
2402.000	-62.970	-15.970	-47.000
4804.000	-59.762	-12.762	-47.000
7206.000	-58.879	-11.879	-47.000
Vertical			
2402.000	-60.726	-13.726	-47.000
4804.000	-58.495	-11.495	-47.000
7206.000	-59.276	-12.276	-47.000

Note: “ ” means the worst emission level.

Product : Bluetooth low energy module
 Test Item : Receiver Spurious Emissions
 Test Mode : Mode 3: Receive - BLE 1Mbps (2480MHz)

Frequency MHz	Measurement Level dBm	Margin dB	Limit dBm
Horizontal			
2480.000	-60.174	-13.174	-47.000
4960.000	-59.105	-12.105	-47.000
7440.000	-58.082	-11.082	-47.000
Vertical			
2480.000	-61.756	-14.756	-47.000
4960.000	-59.315	-12.315	-47.000
7440.000	-58.148	-11.148	-47.000

Note: “” means the worst emission level.

Product : Bluetooth low energy module
 Test Item : Receiver Spurious Emissions
 Test Mode : Mode 3: Receive - BLE 2Mbps (2402MHz)

Frequency	Measurement	Margin	Limit
MHz	Level dBm	dB	dBm
Horizontal			
44.058	-70.797	-13.797	-57.000
72.174	-69.639	-12.639	-57.000
128.406	-79.399	-22.399	-57.000
191.667	-78.583	-21.583	-57.000
533.275	-79.953	-22.953	-57.000
917.058	-76.310	-19.310	-57.000
Vertical			
42.652	-68.071	-11.071	-57.000
82.014	-65.289	-8.289	-57.000
122.783	-72.603	-15.603	-57.000
190.261	-77.948	-20.948	-57.000
457.362	-75.728	-18.728	-57.000
533.275	-75.486	-18.486	-57.000

Note: "■" means the worst emission level.

Product : Bluetooth low energy module
 Test Item : Receiver Spurious Emissions
 Test Mode : Mode 3: Receive - BLE 2Mbps (2402MHz)

Frequency MHz	Measurement Level dBm	Margin dB	Limit dBm
Horizontal			
2402.000	-61.810	-14.810	-47.000
4804.000	-59.472	-12.472	-47.000
7206.000	-58.939	-11.939	-47.000
Vertical			
2402.000	-61.576	-14.576	-47.000
4804.000	-58.715	-11.715	-47.000
7206.000	-59.466	-12.466	-47.000

Note: "■" means the worst emission level.

Product : Bluetooth low energy module
 Test Item : Receiver Spurious Emissions
 Test Mode : Mode 3: Receive - BLE 2Mbps (2480MHz)

Frequency	Measurement	Margin	Limit
MHz	Level	dB	dBm
	dBm		
Horizontal			
2480.000	-58.034	-11.034	-47.000
4960.000	-58.935	-11.935	-47.000
7440.000	-58.162	-11.162	-47.000
Vertical			
2480.000	-61.396	-14.396	-47.000
4960.000	-58.715	-11.715	-47.000
7440.000	-58.238	-11.238	-47.000

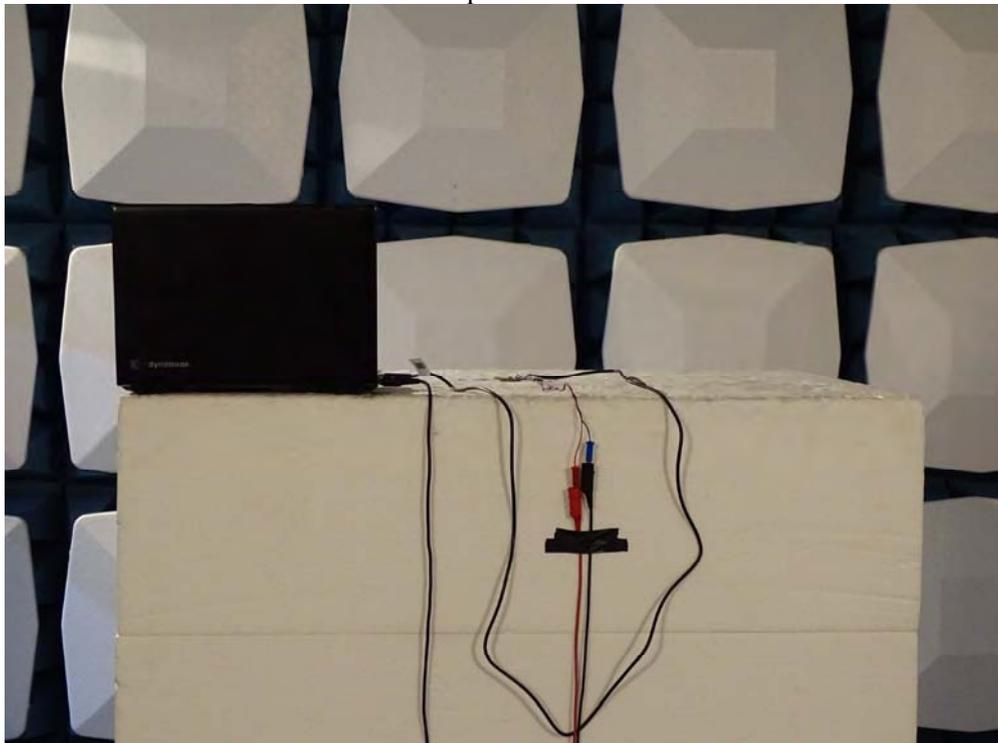
Note: "■" means the worst emission level.

Attachment 1: EUT Test Setup Photographs

Front View of Spurious Emission Test



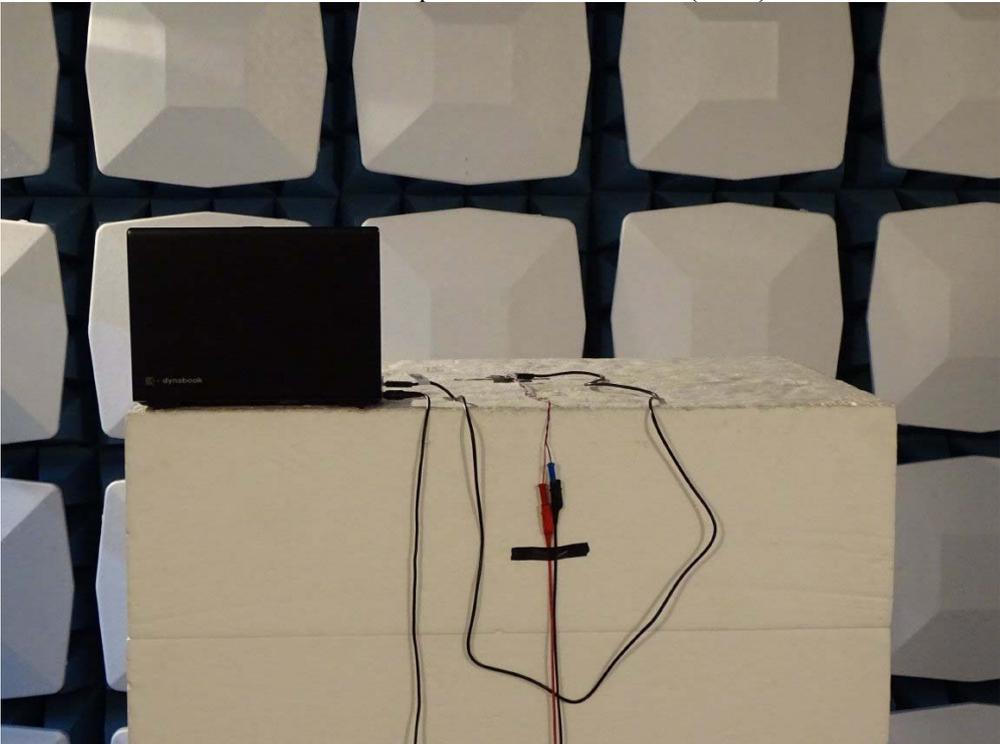
Back View of Spurious Emission Test



Front View of Spurious Emission Test (Horn)

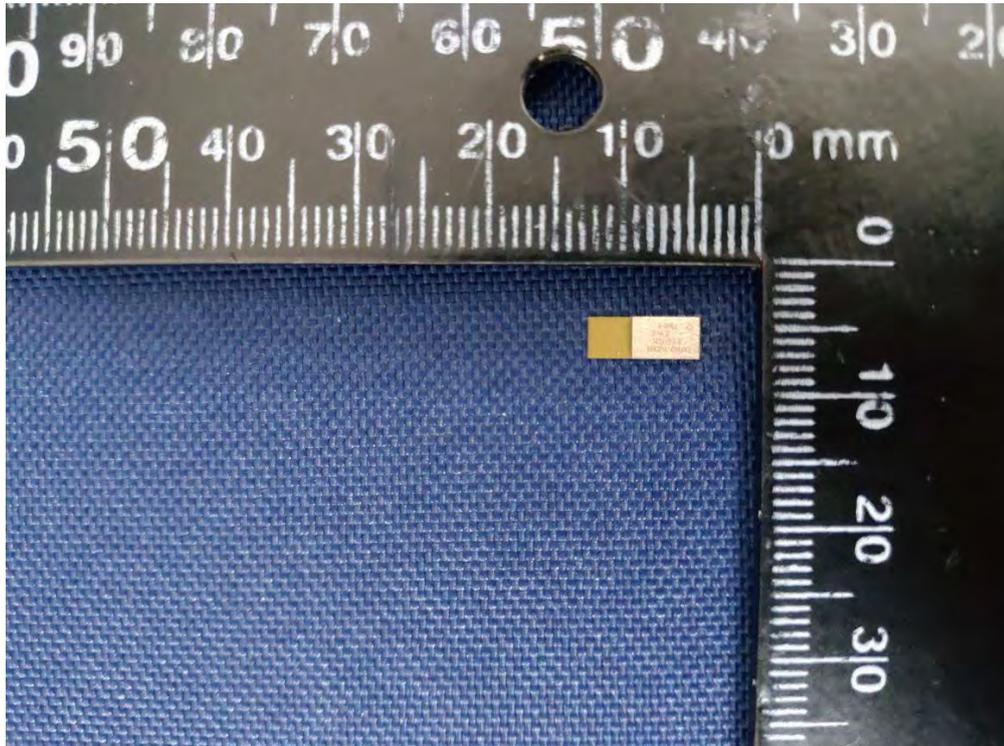


Back View of Spurious Emission Test (Horn)

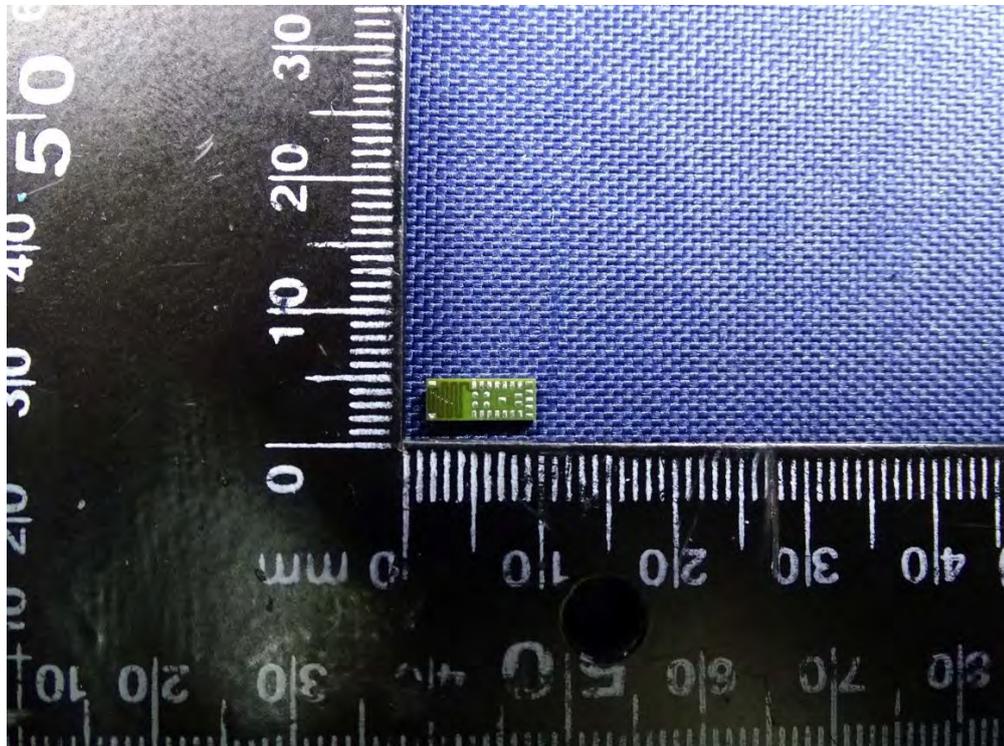


Attachment 2 : EUT Detailed Photographs

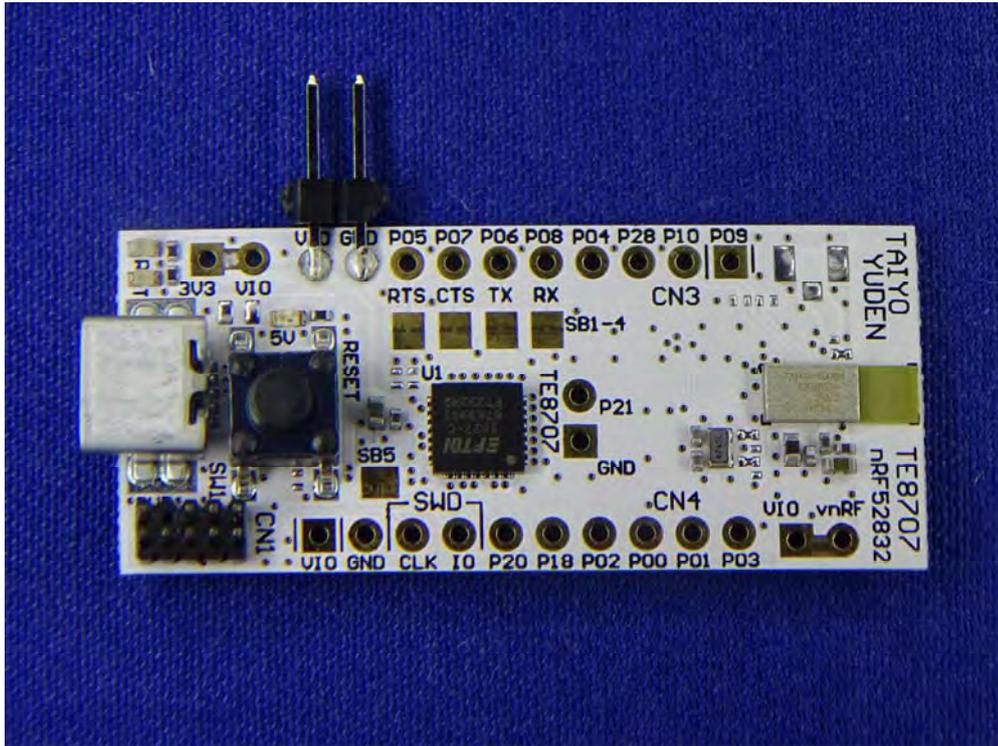
(1) EUT Photo



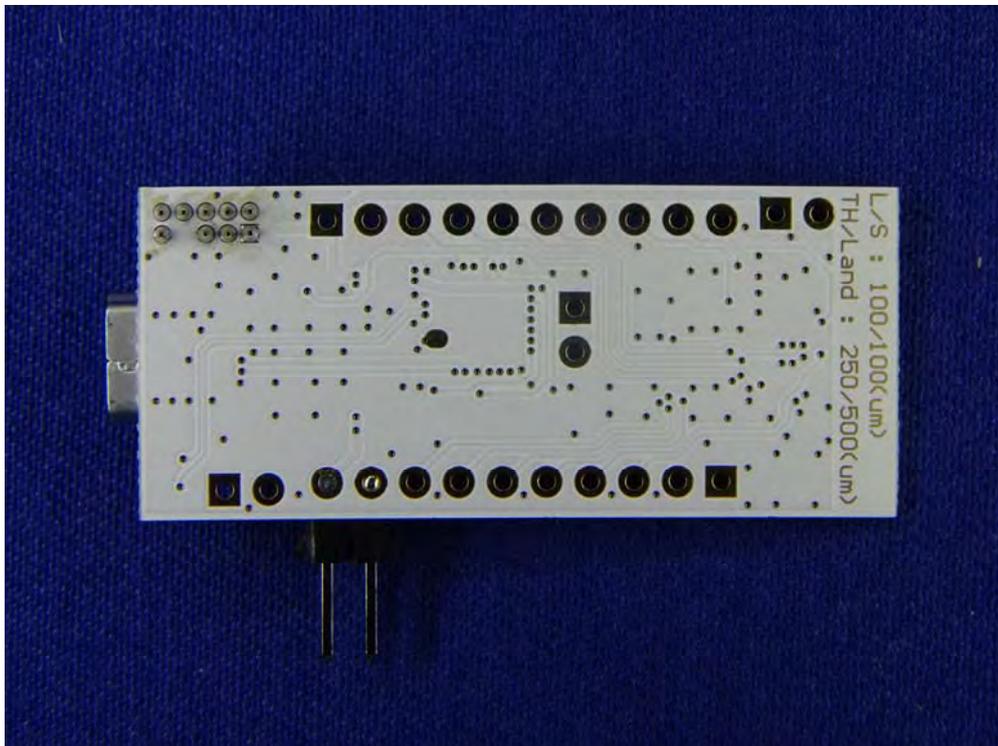
(2) EUT Photo



(3) EUT Photo



(4) EUT Photo



(5) EUT Photo

