EN301 489 Test Report

Product Name	:	EZ-BLE Module with HomeKit
Model No.	:	CYBLE-413136-01
		CYBLE-473142-01
		CYBLE-413149-01
		CYBLE-473148-01

Applicant	:	Cypress Semiconductor
Address	:	198 Champion Ct, San Jose, California 95134
		United States

Date of Receipt	:	Mar. 30, 2018
Test Date	:	Mar. 30, 2018 ~ Apr. 17,2018
Issued Date	:	May. 07, 2018
Report No.	:	1832181E-RF-CE-P01V01
Report Version	:	V1.0

Test Report Certification

Issued Date : May. 07, 2018
Report No. : 1832181E-RF-CE-P01V01

Product Name	:	EZ-BLE Module with HomeKit
Applicant	:	Cypress Semiconductor
Address	:	198 Champion Ct, San Jose, California 95134 United States
Manufacturer	:	Cypress Semiconductor
Address	:	198 Champion Ct, San Jose, California 95134 United States
Model No.	:	CYBLE-413136-01 CYBLE-473142-01 CYBLE-413149-01 CYBLE-473148-01
Brand Name	:	N/A
EUT Voltage	:	3.0V~3.6V
Test Voltage	:	AC 230V / 50Hz
Applicable Standard	:	ETSI EN 301 489-1 V2.1.1 (2017-02) ETSI EN 301 489-17 V3.1.1 (2017-02)
Test Result	:	Complied
Performed Location	:	DEKRA Testing and Certification (Suzhou) Co., Ltd. No.99 Hongye Rd., Suzhou Industrial Park, Suzhou,215006, Jiangsu,China TEL: +86-512-62515088 / FAX: +86-512-62515098

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Reviewed By : Jack Zhang
(Engineering Supervisor: Jack Zhang)

Approved By : Harry Zhao
(Engineering Manager: Harry Zhao)

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1. General Information

1.1. EUT Description

Product Name	EZ-BT WICED Module with Mesh
Model No.	CYBLE-413136-01 CYBLE-473142-01 CYBLE-413149-01 CYBLE-473148-01

Note：Cypress Modules CYBLE-413136-01 and CYBLE-473142-01 have the same PCB, peripheral parts and the same encapsulation of the main chip.
Modules CYBLE-413149-01/ CYBLE-473148-01 have the same PCB, RF IC and peripheral parts as CYBLE-413136-01/CYBLE-473142-01, with the lone exception of removal of the Apple Authentication Chip. The Apple Authentication Chip is an isolated circuit on the board and only interacts with the I2C connection of the main IC on the module solution.

Module	RF IC	Apple Authentication IC	RAM Size (KB)	Flash Size (KB)	Package	Supported Bluetooth Standard	Supported Bluetooth version
CYBLE-413136-01	CYW20719B0	YES	512k	1M	QFN40	BLE Only	LE 4.2 Qualified
CYBLE-473142-01	CYW20719B1	YES	512k	1M	QFN40	BLE Only	LE 4.2 Qualified
CYBLE-413149-01	CYW20719B0	NO	512k	1M	QFN40	BLE Only	LE 4.2 Qualified
CYBLE-473148-01	CYW20719B1	NO	512k	1M	QFN40	BLE Only	LE 4.2 Qualified

The ROM firmware in the CYW20719B0 and CYW20719B1 has differences related to Bluetooth Classic (EDR/BR) operation. NOTE that the module solutions stated above are qualified and certified for Bluetooth Low Energy (BLE) operation only. Bluetooth Classic (BR/EDR) support is not supported for these modules. RF characteristics for the Bluetooth Low Energy operation of the CYW20719B0 and CYW20719B0 silicon devices are identical.
The Apple Authentication Chip is used for Apple HomeKit authentication during operation. This chip will be replaced with a FW Authentication scheme recently announced by Apple.

1.2. Mode of Operation

We has 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:

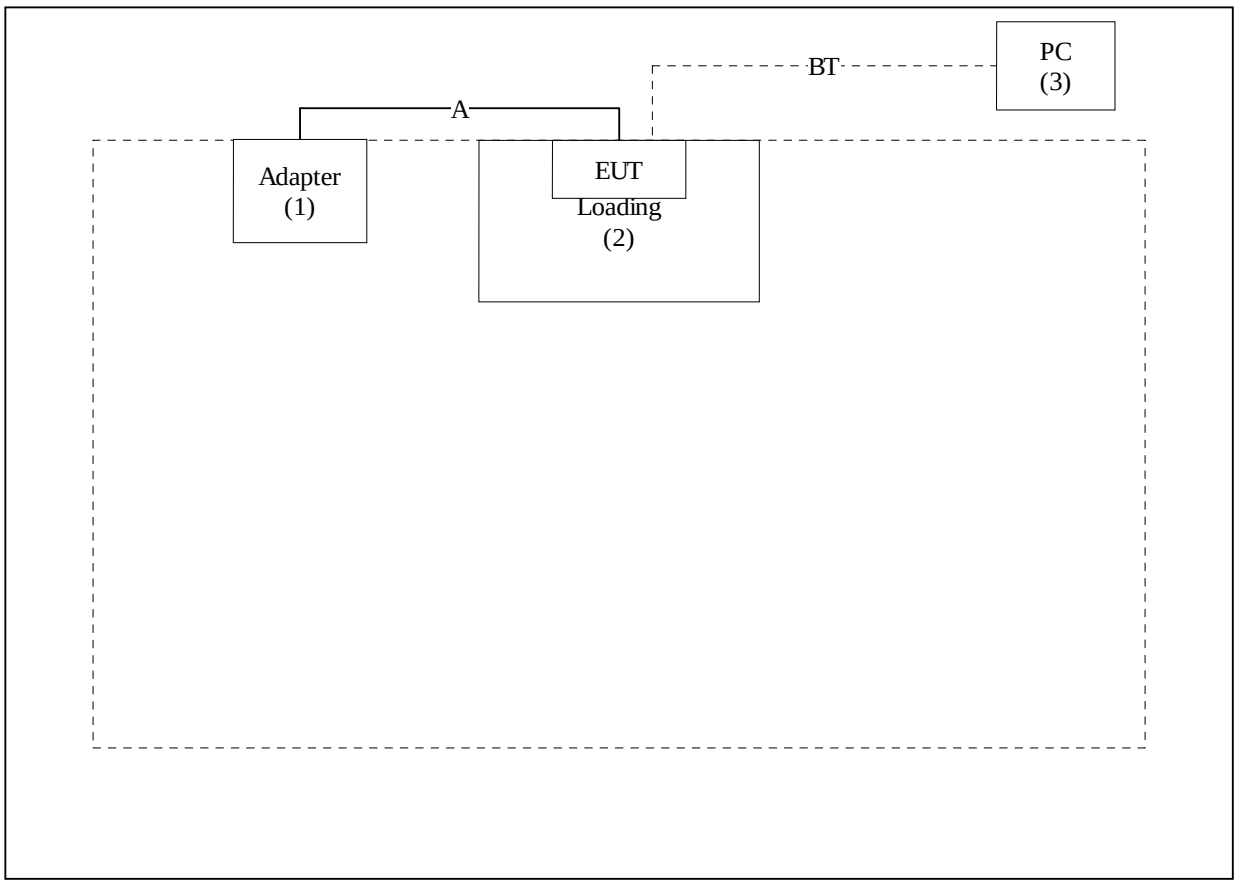
Pre Test Mode	
Emission	Mode 1: Transmission Data
Test Mode	
Emission	Mode 1: Transmission Data
Immunity	Mode 1: Transmission Data
	Mode 2: Standby

1.3. Tested System Details

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

Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Adapter	Apple	A1443	N/A	N/A
2	Loading	Cypress	N/A	N/A	Power by Adapter
3	PC	ASUS	N/A	N/A	Non-Shielded, 1.5m

1.4. Configuration of Tested System

Connection Diagram


Signal Cable Type		Signal Cable Description
A	USB Cable	Shielded, 0.6m

1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	Confirm the EUT worKay normally.
4	Start test.

2. Technical Test

2.1. Summary of Test Result

☒ No deviations from the test standards

☐ Deviations from the test standards as below description:

Emission			
Performed Test Item	Normative References	Test Performed	Deviation
Conducted emission	EN 55032:2015	Yes	No
Asymmetric mode conducted emissions	EN 55032:2015	N/A	N/A
Radiated emission	EN 55032:2015	Yes	No
Harmonic current emissions	EN 61000-3-2: 2006+A1:2009+A2:2009	Yes	No
Voltage fluctuations and flicker	EN 61000-3-3: 2013	Yes	No

Immunity			
Performed Test Item	Normative References	Test Performed	Deviation
Electrostatic discharge	EN 61000-4-2: 2009	Yes	No
Radio frequency electromagnetic field	EN 61000-4-3: 2006+A1:2008+A2:2010	Yes	No
Fast transients common mode	EN 61000-4-4: 2012	Yes	No
Surges	EN 61000-4-5: 2006	Yes	No
Radio frequency common mode	EN 61000-4-6: 2009	Yes	No
Voltage dips and interruptions	EN 61000-4-11: 2004	Yes	No
Transients and surges	ISO 7637-2: 2011	N/A	N/A

2.2. List of Test Equipment

Conducted Emission/ TR1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100906	2019.03.05
Two-Line V-Network	R&S	ENV216	101189	2018.07.16
Two-Line V-Network	R&S	ENV216	101044	2018.06.15
Current Probe	R&S	EZ-17	100678	2019.02.28
50ohm Termination	SHX	TF2	07081402	2018.09.03
50ohm Termination	SHX	TF2	07081403	2018.09.03
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	N/A
Coaxial Cable	Suhner	RG 223	TR1-C1	2019.02.28
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Impedance Stabilization Network / TR1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100906	2019.03.05
Two-Line V-Network	R&S	ENV216	101189	2018.07.16
Two-Line V-Network	R&S	ENV216	101044	2018.06.15
Impedance Stabilization Network	Teseq GmbH	ISN T800	30306	2019.03.05
Impedance Stabilization Network	Teseq GmbH	ISN T8-Cat6	29680	2019.03.05
Current Probe	R&S	EZ-17	100678	2019.03.05
50ohm Termination	SHX	TF2	07081402	2018.09.03
50ohm Termination	SHX	TF2	07081403	2018.09.03
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	N/A
Coaxial Cable	Suhner	RG 223	TR1-C1	2019.02.28
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Radiated Emission / AC1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100175	2018.09.03
EMI Test Receiver	R&S	ESCI	100726	2019.03.05
EMI Receiver	Agilent	N9038A	MY51210196	2018.07.16
Preamplifier	Quietek	AP-025C	CHM-0602008	2019.04.10
Preamplifier	Quietek	AP-025C	CHM-0503006	2019.04.10
Bilog Antenna	Schaffner	CBL6112B	2931	2018.09.21
Bilog Antenna	Schaffner	CBL6112B	2933	2018.09.21
DRG Horn Antenna	ETS-Lindgren	3117	00167055	2018.09.21
Coaxial Cable	Huber+Suhner	RG 214_U	AC1-L	2018.10.10
Coaxial Cable	Huber+Suhner	RG 214_U	AC1-R	2018.10.10
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Radiated disturbance / AC2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100573	2019.03.05
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2018.07.15
Coaxial Cable	Huber+Suhner	RG 214	AC2-C	2019.02.28
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Radiated disturbance / AC3

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100176	2018.09.03
Bilog Antenna	Teseq GmbH	CBL6112D	27613	2018.07.15
Coaxial Cable	Huber+Suhner	RG 214	AC3-C	2019.02.28
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Radiated disturbance / AC5

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Receiver	Agilent	N9038A	MY51210196	2018.07.16
Preamplifier	Miteq	NSP1800-25	1364185	2019.05.03
DRG Horn Antenna	ETS-Lindgren	3117	00167055	2018.07.12
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2019.02.28
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Harmonic current emissions / TR1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Power Analyzer	California	PACS-1	72419	2018.11.06
AC Power Source	California	5001iX-208	56741	2018.11.06
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Voltage fluctuation and flicker / TR1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Power Analyzer	California	PACS-1	72419	2018.11.06
AC Power Source	California	5001iX-208	56741	2018.11.06
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Electrostatic discharge / TR3

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
ESD Simulator	3C TEST	ESD-30A	EC0261406	2018.07.06
Barometer	Fengyun	DYM3	506048	2018.10.23
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Radio-frequency electromagnetic field / AC4

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Signal Generator	Keysight	N5171B	MY53051907	2019.05.07

Power Meter	Agilent	E4416A	GB41293844	2018.09.03
Power Sensor	Agilent	E9323A	MY44420302	2018.09.03
Power Meter	Boonton	4231A	144502	2018.09.03
Power Sensor	Boonton	51011-EMC	33859	2018.09.03
RF Switch	MF	SW1072	RFSW980005	N/A
Power Amplifier	rflight	NTWPAS-103050	16033031	N/A
Power Amplifier	rflight	NTWPAS-00810250E	16033039	N/A
Directional Coupler	Schaffner	CHA 9652B	121	2018.06.25
Directional Coupler	A&R	DC7144A	312249	2018.06.25
Electric Field Probe	ETS-LINDGREN	HI-6105	00114789	2018.05.15
Bilog Antenna	Schaffner	CBL6141A	4278	N/A
Horn Antenna	A&R	AT4002A	312312	N/A
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Fast transients common mode / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	4019	2018.09.03
CDN	Teseq GmbH	CDN 3061	5010	2018.09.03
Automatic Step transformer	Teseq GmbH	VAR 3005-S16	3010	2018.09.03
CDN	Teseq GmbH	CDN 3063	1997	2019.05.07
CDN	Teseq GmbH	CDN 3425	2029	2018.12.10
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Surges / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	4019	2018.09.03
CDN	Teseq GmbH	CDN 3061	5010	2018.09.03
Automatic Step transformer	Teseq GmbH	VAR 3005-S16	3010	2018.09.03
CDN	Teseq GmbH	CDN 3063	1997	2019.05.07
CDN	Teseq GmbH	CDN 118	40652	2018.12.10
CDN	Teseq GmbH	CDN 118	40644	2018.12.10
CDN	Teseq GmbH	CDN 117	31806	2019.03.05
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Radio frequency common mode / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
RF-Generator	Teseq GmbH	NSG 4070B-80	43711	2018.08.06
Attenuation	Teseq GmbH	ATN 6050	33651	2018.08.01
Coupling / Decoupling Network	Schaffner	CDN M016	21249	2018.10.14
Coupling / Decoupling Network	Teseq GmbH	CDN M016	24484	2018.10.14
Coupling / Decoupling Network	Schaffner	CDN T400	19083	2018.10.14
Coupling / Decoupling Network	Teseq GmbH	CDN T400	22461	2018.10.14
Coupling / Decoupling Network	Teseq GmbH	CDN T800	26167	2019.01.07
Coupling / Decoupling Network	Teseq GmbH	CDN M525	31021	2019.03.27
EM Clamp	Schaffner	KEMZ 801	21041	2018.10.14

Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Voltage dips and interruptions / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	4019	2018.09.03
CDN	Teseq GmbH	CDN 3061	5010	2018.09.03
Automatic Step transformer	Teseq GmbH	VAR 3005-S16	3010	2018.09.03
Temperature/Humidity Meter	瑞特斯	RTS-8S	TR1-TH	2019.01.09

Transients and Surges / TR11

Instrument	Manufacturer	Type No.	Serial No	Cali. Due Date
Micro Transient Generator	TESEQ	MT 5511	1475	2018.06.25
Load Dump Generator	TESEQ	LD 5550	2136	2018.06.25
Fast Transient Generator	TESEQ	FT 5531	2056	2018.06.25
Power Amplifier	TESEQ	PA 5840-75/230	4150	2018.06.25
Function Generator	TESEQ	FG 5621	1322	2018.06.25
DC Switch	TESEQ	DS 5630	1318	2018.06.25
Power Amplifier	TESEQ	PA 5640	1262	2018.06.25
Transformer Conducted Coupler	TESEQ	TC 5650	1243	2018.06.25
Automotive emission system	TESEQ	AES 5501	1312	2019.03.05
Power Amplifier	TESEQ	PA 5740	1198	2018.06.25
Temperature/Humidity Meter	BOYANG	HTC-8	TR11	2018.07.15

2.3. Measurement Uncertainty

Conducted Emission / TR1
The maximum measurement uncertainty is evaluated as: Mains: 9kHz~150kHz: 2.80dB 150kHz~30MHz: 2.40dB
Impedance Stabilization Network / TR1
The maximum measurement uncertainty is evaluated as: ISN T800: 150kHz~30MHz: 3.60 dB ISN T8-Cat6: 150kHz~30MHz: 3.50 dB ISN ST08: 150kHz~30MHz: 3.10 dB
Radiated emission / AC1
The maximum measurement uncertainty is evaluated as: Horizontal: 30MHz~300MHz: 3.50 dB 300MHz~1GHz: 3.20 dB 1GHz~18GHz: 4.80 dB Vertical: 30MHz~300MHz: 3.60 dB 300MHz~1GHz: 3.10 dB 1GHz~18GHz: 4.50 dB
Radiated emission / AC2
The maximum measurement uncertainty is evaluated as: Horizontal: 30MHz~300MHz: 3.60 dB 300MHz~1GHz: 3.10 dB Vertical: 30MHz~300MHz: 3.20 dB 300MHz~1GHz: 3.20 dB
Radiated emission / AC3
The maximum measurement uncertainty is evaluated as: Horizontal: 30MHz~300MHz: 3.50 dB 300MHz~1GHz: 3.60 dB Vertical: 30MHz~300MHz: 3.60 dB 300MHz~1GHz: 3.50 dB
Radiated emission / AC5
The maximum measurement uncertainty is evaluated as: Horizontal: 30MHz~300MHz: 3.90 dB 300MHz~1GHz: 3.60 dB 1GHz~18GHz: 5.00 dB Vertical: 30MHz~300MHz: 3.80 dB 300MHz~1GHz: 3.50 dB 1GHz~18GHz: 4.80 dB

Harmonic current emissions / TR1
The maximum measurement uncertainty is evaluated as: 1.8 dB.
Voltage fluctuation and flicker / TR1
The maximum measurement uncertainty is evaluated as: 1.5 dB.
Electrostatic discharge / TR3
The maximum measurement uncertainty is evaluated as Rise Time: 6.4 %, Peak Current: 6 %, Current at 30 ns: 6 %, Current at 60 ns: 6 %.
Radio frequency electromagnetic field / AC4
The maximum measurement uncertainty is evaluated as 1.48dB.
Fast transients common mode / TR2
The maximum measurement uncertainty is evaluated as Voltage: 4%, Time: 2%.
Surges / TR2
The maximum measurement uncertainty is evaluated as Voltage: 4%, Time: 2%.
Radio frequency common mode / TR2
The maximum measurement uncertainty is evaluated as CDN: 1.52dB, EM Clamp: 1.92dB.
Voltage dips and interruptions / TR2
The maximum measurement uncertainty is evaluated as Voltage: 4%, Time: 2%.
Transients and surges / TR11
The maximum measurement uncertainty is evaluated as Voltage: 1.60%, Time: 2.60%.

2.4. Performance Criteria

The performance criteria are used to take a decision on whether a radio equipment passes or fails immunity tests.

For the purpose of the present document four categories of performance criteria apply:

- Performance criteria for continuous phenomena applied to transmitters and receivers
- Performance criteria for transient phenomena applied to transmitters and receivers
- Performance criteria for equipment which does not provide a continuous communication link
- Performance criteria for ancillary equipment tested on a stand alone basis

Normally, the performance criteria depend on the type of radio equipment. Thus, the present document only contains general performance criteria commonly used for the assessment of radio equipment. More specific and product-related performance criteria for a dedicated type of radio equipment may be found in the part of ETSI EN 301 489 series [i.13] dealing with the particular type of radio equipment.

(1) Performance criteria for continuous phenomena applied to transmitters and receivers

If no further details are given in the relevant part of ETSI EN 301 489 series [i.13] dealing with the particular type of radio equipment, the following general performance criteria for continuous phenomena shall apply.

During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed a permissible performance level specified by the manufacturer when the apparatus is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.

If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

(2) Performance criteria for transient phenomena applied to transmitters and receivers

If no further details are given in the relevant part of ETSI EN 301 489 series [i.13] dealing with the particular type of radio equipment, the following general performance criteria for transient phenomena shall apply.

For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:

- For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A SW reboot is not allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

- For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. A SW reboot is not allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

For all other ports the following applies:

- After the test, the equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the equipment is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.
- During the EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or stored data is allowed.
- If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

(3) Performance criteria for equipment which does not provide a continuous communication link

For radio equipment which does not provide a continuous communication link, the performance criteria described in clauses 6.1 and 6.2 are not appropriate, in these cases 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. The related specifications set out in clause 5.3 have also to be taken into account.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in clauses 6.1 and 6.2.

(4) Performance criteria for 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 clauses 6.1 and 6.2 are not appropriate, in these cases 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. The related specifications set out in clause 5.3 have also to be taken into account.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in clauses 6.1 and 6.2.

General performance criteria

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

Performance criteria for Continuous phenomena applied toTransmitters (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.

Performance criteria for Transient phenomena applied to Transmitters (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.

Performance criteria for Continuous phenomena applied to Receivers (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.

Performance criteria for Transient phenomena applied to Receivers (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.

Performance criteria		
Criteria	**During Test**	**After test**
A	Shall operate as intended (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 3) 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 2) Shall be no unintentional transmissions	Functions shall be self-recoverable Shall operate as intended after recovering Shall be no degradation of performance (see note 3) Shall be no loss of stored data or user programmable functions
C	May be loss of function (one or more)	Functions shall be recoverable by the operator Shall operate as intended after recovering Shall be no degradation of performance (see note 3)

NOTE 1: Operate as intended during the test allows a level of degradation 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: Degradation of performance during the test is understood as 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.

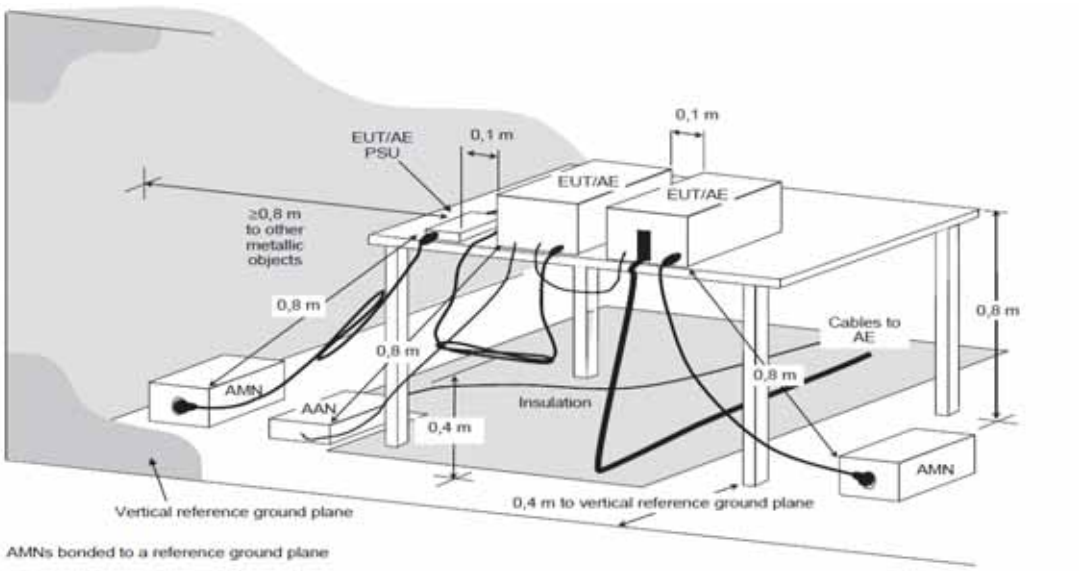
NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. 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.

3. Conducted emission

3.1. Test Specification

According to EMC Standard: EN 55032

3.2. Test Setup



3.3. Limit

Limits of conducted emission for AC mains power input/output ports		
Frequency range MHz	Limits dB(μV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
NOTE 1: The lower limit shall apply at the transition frequencies. NOTE 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

Limits of conducted emission for DC power input/output ports		
Frequency range MHz	Limits dB(μV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
NOTE 1: The lower limit shall apply at the transition frequencies. NOTE 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		
Equipment intended to be used in telecommunication centres only		
Frequency range MHz	Limits dB(μV)	
	Quasi-peak	Average
0.15 to 0.50	79	66
0.50 to 30	73	60
NOTE: The lower limit shall apply at the transition frequency.		

Limits of conducted emission for DC power input/output ports

3.4. Test Procedure

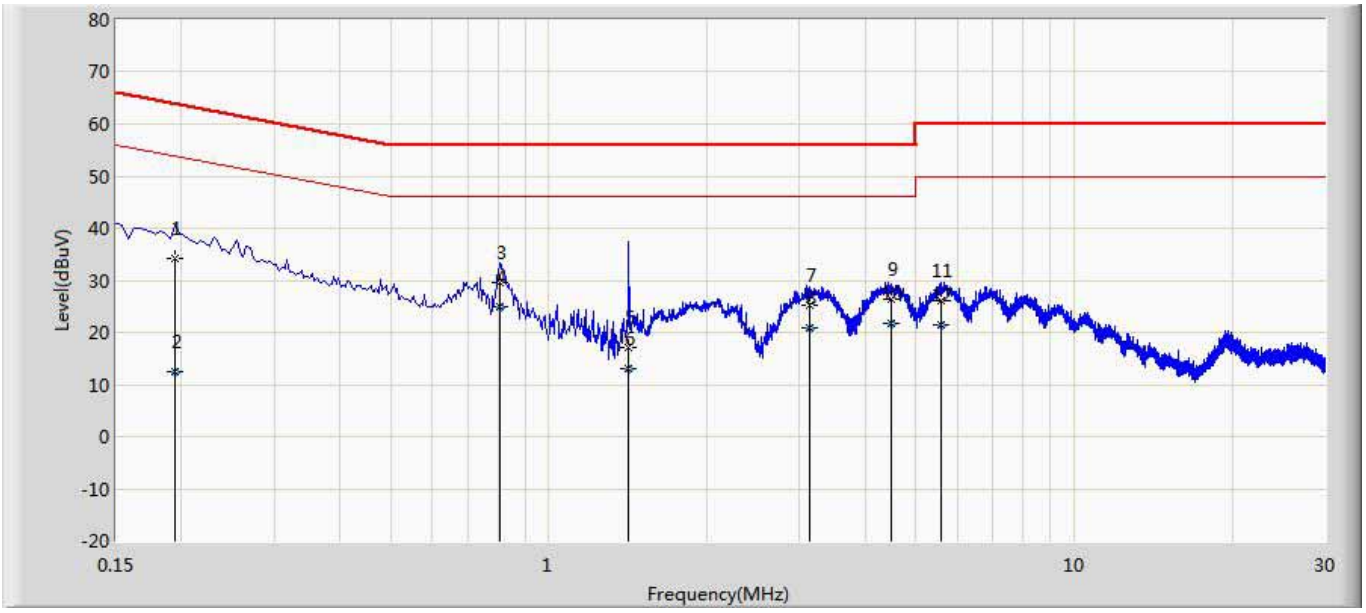
The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
(Please refers to the block diagram of the test setup and photographs.)
Both sides of A.C. 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 on conducted measurement.
Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

3.5. Deviation from Test Standard

No deviation

3.6. Test Result

Engineer: leiwan	
Site: TR1	Time: 2018/04/09
Limit: EN55032_CE_Mains_ClassB	Margin: 0
Probe: ENV216_101190(0.009-30MHz)	Polarity: Line
EUT: EZ-BLE Module with HomeKit	Power: AC 230V/50Hz
Note: Mode 1	

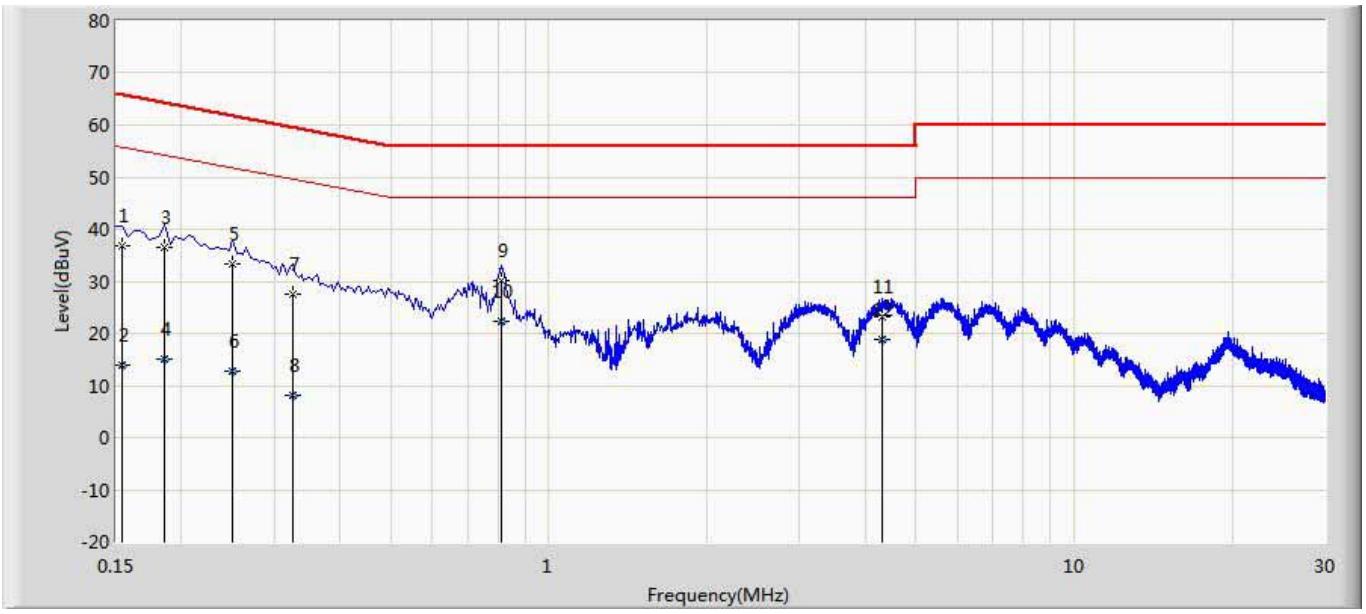


No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
1		0.194	34.236	24.605	-29.628	63.864	9.602	0.028	0.000	QP
2		0.194	12.496	2.866	-41.367	53.864	9.602	0.028	0.000	AV
3		0.806	29.614	19.958	-26.386	56.000	9.604	0.053	0.000	QP
4	*	0.806	24.845	15.189	-21.155	46.000	9.604	0.053	0.000	AV
5		1.418	17.150	7.468	-38.850	56.000	9.610	0.071	0.000	QP
6		1.418	13.136	3.454	-32.864	46.000	9.610	0.071	0.000	AV
7		3.142	25.228	15.487	-30.772	56.000	9.629	0.112	0.000	QP
8		3.142	20.856	11.115	-25.144	46.000	9.629	0.112	0.000	AV
9		4.474	26.240	16.455	-29.760	56.000	9.651	0.134	0.000	QP
10		4.474	21.751	11.966	-24.249	46.000	9.651	0.134	0.000	AV
11		5.594	26.068	16.245	-33.932	60.000	9.672	0.151	0.000	QP
12		5.594	21.474	11.651	-28.526	50.000	9.672	0.151	0.000	AV

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

Engineer: leiwan	
Site: TR1	Time: 2018/04/09
Limit: EN55032_CE_Mains_ClassB	Margin: 0
Probe: ENV216_101190(0.009-30MHz)	Polarity: Neutral
EUT: EZ-BLE Module with HomeKit	Power: AC 230V/50Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
1		0.154	36.695	27.077	-29.086	65.781	9.593	0.025	0.000	QP
2		0.154	13.773	4.154	-42.009	55.781	9.593	0.025	0.000	AV
3		0.186	36.585	26.959	-27.629	64.213	9.597	0.028	0.000	QP
4		0.186	15.018	5.392	-39.195	54.213	9.597	0.028	0.000	AV
5		0.250	33.345	23.716	-28.413	61.757	9.598	0.031	0.000	QP
6		0.250	12.720	3.091	-39.037	51.757	9.598	0.031	0.000	AV
7		0.326	27.658	18.028	-31.894	59.552	9.595	0.035	0.000	QP
8		0.326	8.069	-1.561	-41.483	49.552	9.595	0.035	0.000	AV
9		0.810	30.154	20.511	-25.846	56.000	9.590	0.053	0.000	QP
10	*	0.810	22.277	12.634	-23.723	46.000	9.590	0.053	0.000	AV
11		4.306	23.104	13.331	-32.896	56.000	9.641	0.132	0.000	QP
12		4.306	18.778	9.004	-27.222	46.000	9.641	0.132	0.000	AV

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

3.7. Test Photograph

Description: Front View of Conducted emission Test Setup (AC mains power input ports)

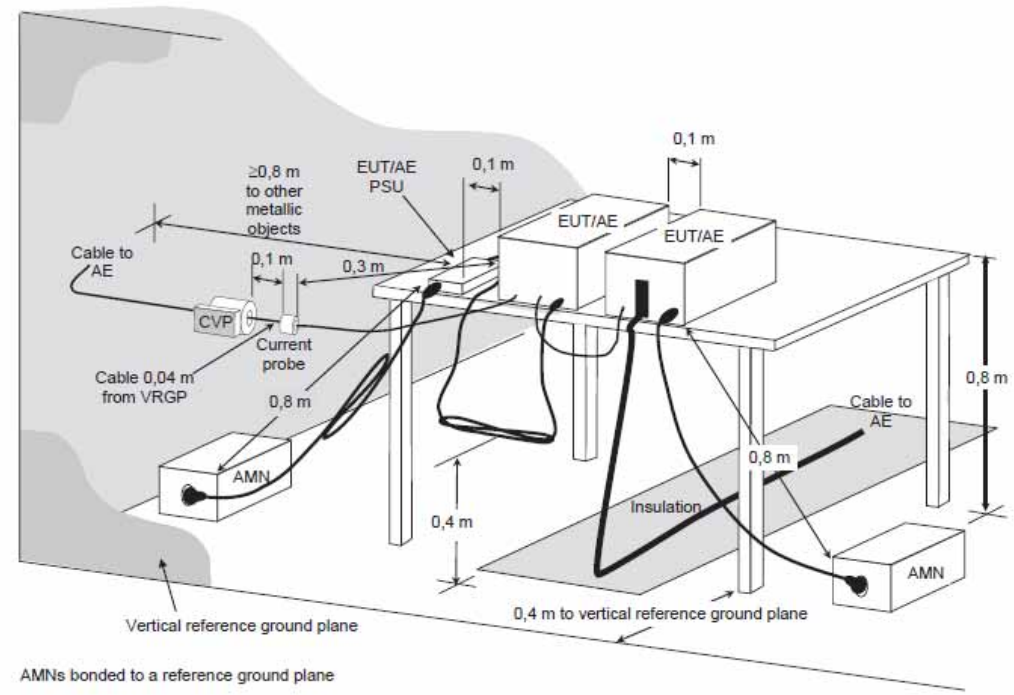
Description: Side View of Conducted emission Test Setup (AC mains power input ports)

4. Impedance Stabilization Network

4.1. Test Specification

According to EMC Standard: EN 55032

4.2. Test Setup



4.3. Limit

Limits of conducted emission for telecommunication ports				
Frequency range MHz	Voltage Limits dB(µV)		Current limits dB(µA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.50	84 to 74	74 to 64	40 to 30	30 to 20
0.50 to 30	74	64	30	20
NOTE 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz. NOTE 2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150Ω to the telecommunication port under test (conversion factor is 20 $\log_{10}150$ / I = 44dB).				
Equipment intended to be used in telecommunication centres only				

Frequency range MHz	Voltage Limits dB(μV)		Current limits dB(μA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.50	97 to 87	84 to 74	53 to 43	40 to 30
0.50 to 30	87	74	43	30
NOTE 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz. NOTE 2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150Ω to the telecommunication port under test (conversion factor is 20 $\log_{10}$150 / I = 44dB).				

4.4. Test Procedure

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 150 ohm 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 75dB LCL ISN is used for cat. 6 cable, the 65dB LCL ISN is used for cat. 5 cable, 55dB LCL ISN is used for cat. 5e.

4.5. Deviation from Test Standard

No deviation.

4.6. Test Result

The EUT does not contain the wired network port, so it needs not to perform this test item.

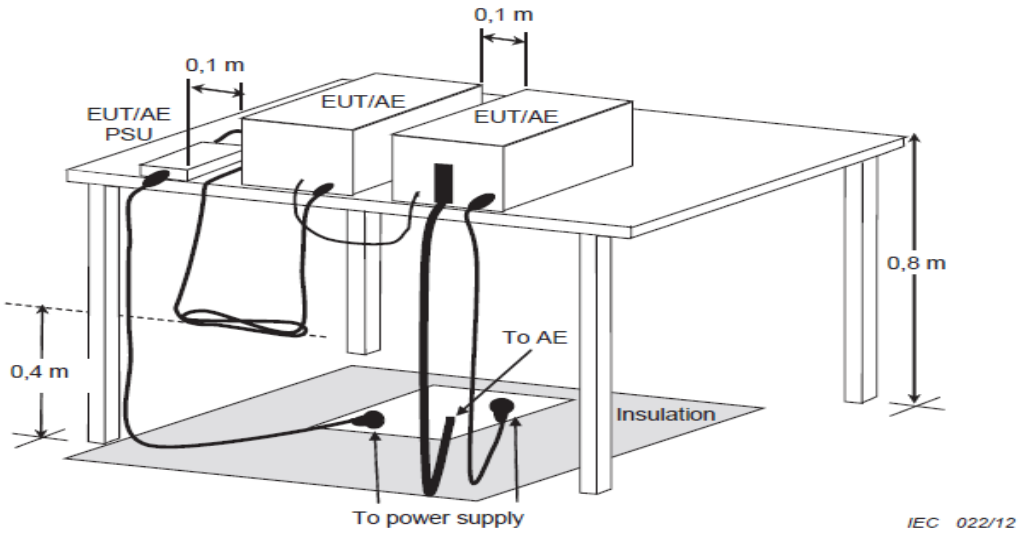
5. Radiated emission

5.1. Test Specification

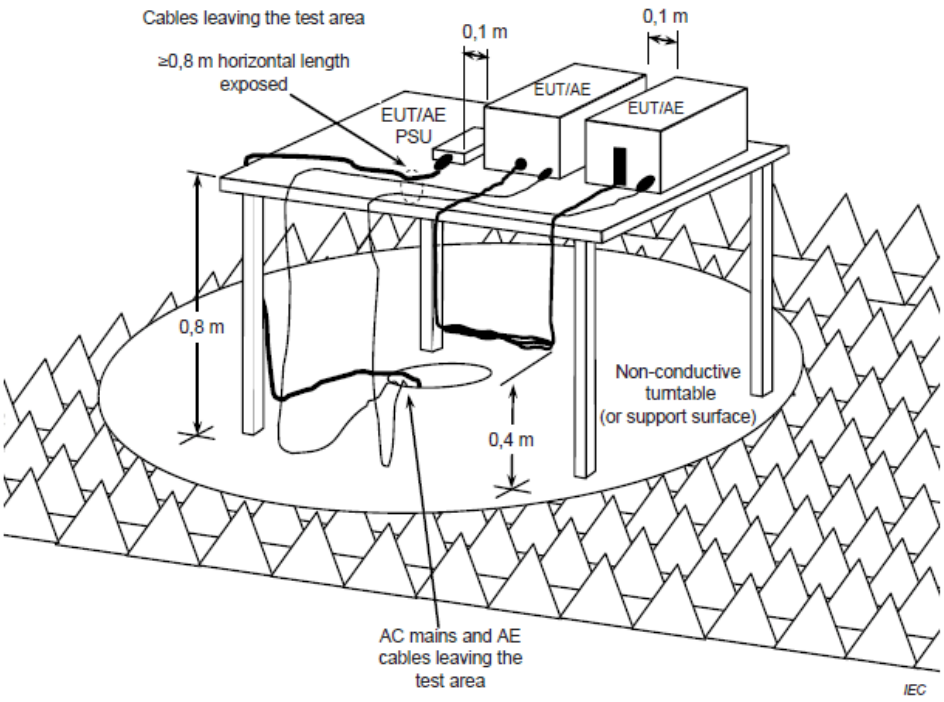
According to EMC Standard: EN 55032

5.2. Test Setup

Below 1GHz Test Setup



Above 1GHz Test Setup



5.3. Limit

Limits below 1GHz

Limits for radiated emission at a measuring distance of 10m	
Frequency range MHz	Quasi-peak limits dB(μV/m)
30 to 230	30
230 to 1000	37
NOTE 1: The lower limit shall apply at the transition frequency. NOTE 2: Additional provisions may be required for cases where interference occurs.	

Limits above 1GHz

Limits for radiated emission at a measuring distance of 3m		
Frequency range GHz	Average limit dB(μV/m)	Peak-peak dB(μV/m)
1 to 3	50	70
3 to 6	54	74
NOTE: The lower limit applies at transition frequency.		
Ancillary equipment intended to be used in telecommunication centres only		
Frequency range GHz	Average limit dB(μV/m)	Peak-peak dB(μV/m)
1 to 3	56	76
3 to 6	60	80
NOTE: The lower limit applies at transition frequency.		

5.4. Test Procedure

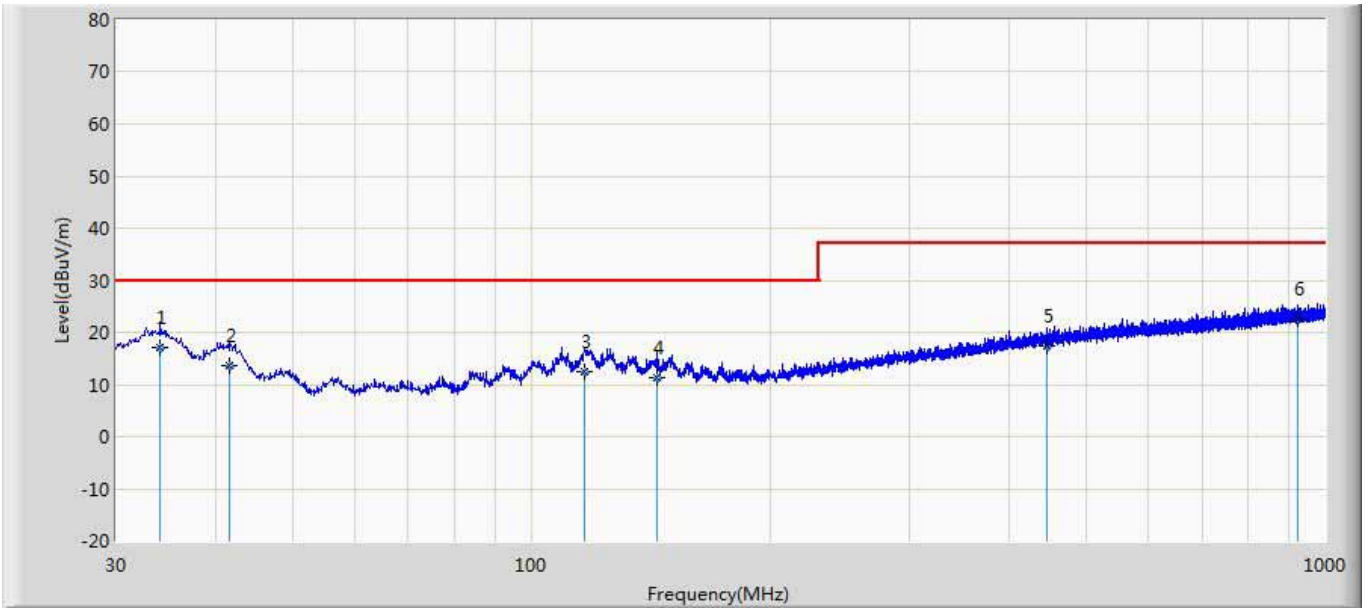
The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3/10 meters. The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.
All cable leaving the table-top EUT for a connection outsidethe test site (for example, mains cable, telephone lines, connections to auxiliary equipment located outside the test area) shall be fitted with ferrite clamps placed on the floor at the point where the cable reached the floor.
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 invested over the frequency range from 30MHz to1GHz using a receiver bandwidth of 120kHz and above 1GHz using a receiver bandwidth of 1MHz.
30MHz to1GHz Radiated was performed at an antenna to EUT distance of 10 meters.
Above1GHz Radiated was performed at an antenna to EUT distance of 3 meters.

5.5. Deviation from Test Standard

No deviation.

5.6. Test Result

Engineer: Leon	
Site: AC1	Time: 2018/04/08
Limit: EN55032_RE(10m)_ClassB	Margin: 0
Probe: CBL6112B_2931(30-1000MHz)	Polarity: Horizontal
EUT: EZ-BLE Module with HomeKit	Power: AC 230V/50Hz
Note: Mode 1	



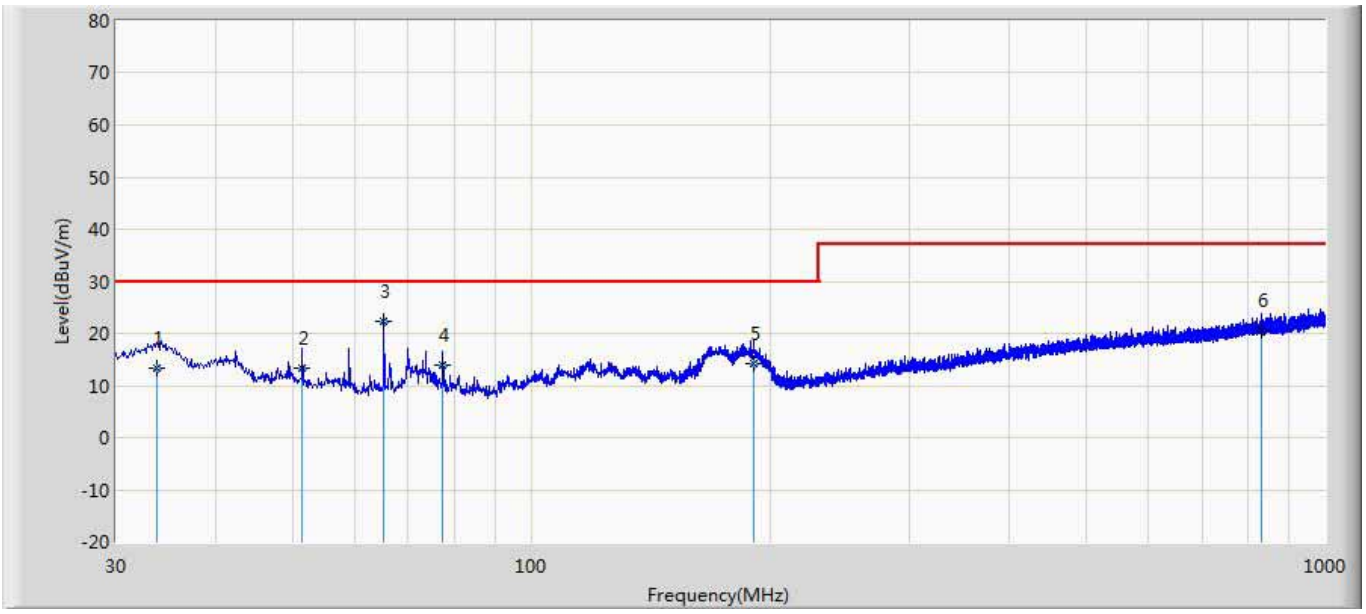
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	*	34.123	17.112	23.500	-12.888	30.000	14.852	1.030	22.270	300	39	QP
2		41.761	13.768	22.500	-16.232	30.000	12.408	1.148	22.288	200	231	QP
3		116.936	12.339	20.100	-17.661	30.000	12.502	2.022	22.284	100	57	QP
4		144.093	11.394	20.500	-18.606	30.000	10.923	2.269	22.298	200	214	QP
5		447.103	17.301	18.300	-19.699	37.000	16.407	4.383	21.789	400	163	QP
6		923.128	22.473	16.300	-14.527	37.000	20.262	6.832	20.921	200	141	QP

Note:

1. " * ", means this data is the worst emission level.

2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

Engineer: Leon	
Site: AC1	Time: 2018/04/08
Limit: EN55032_RE(10m)_ClassB	Margin: 0
Probe: CBL6112B_2933(30-1000MHz)	Polarity: Vertical
EUT: EZ-BLE Module with HomeKit	Power: AC 230V/50Hz
Note: Mode 1	

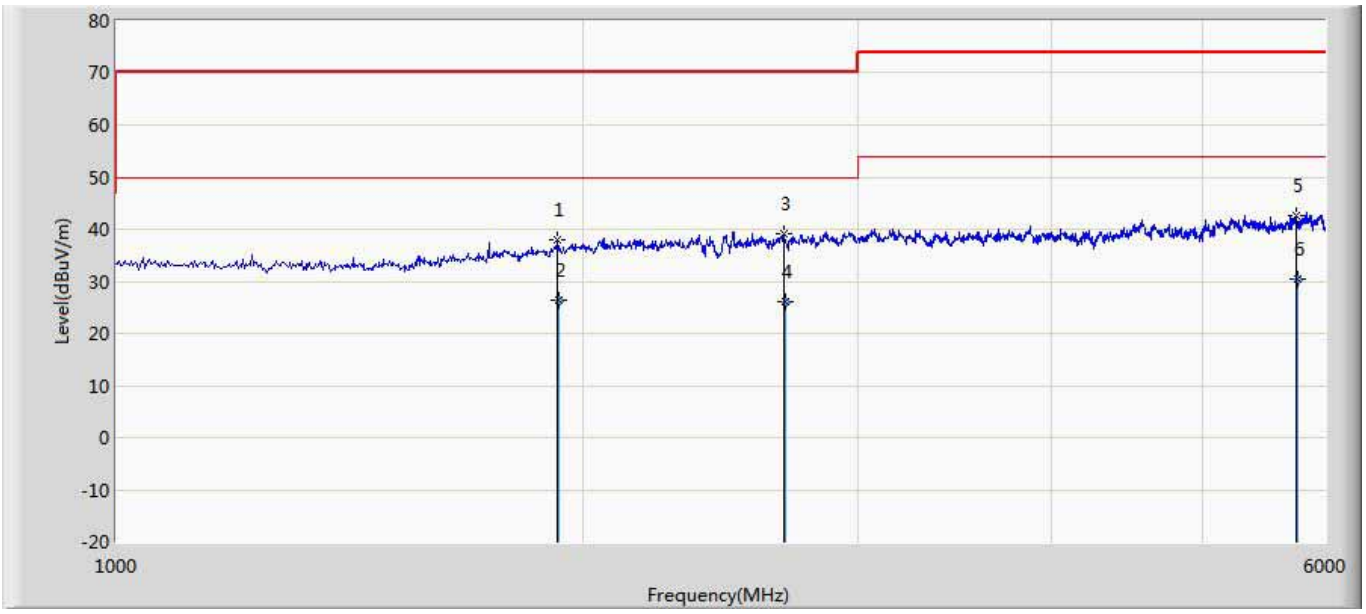


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1		33.759	13.417	20.800	-16.583	30.000	14.822	1.147	23.352	100	25	QP
2		51.461	13.281	28.100	-16.719	30.000	7.083	1.438	23.341	100	253	QP
3	*	65.284	22.373	37.200	-7.627	30.000	6.876	1.637	23.340	200	315	QP
4		77.409	13.974	28.400	-16.026	30.000	7.151	1.792	23.370	300	152	QP
5		191.141	14.232	25.560	-15.768	30.000	9.035	2.971	23.333	200	39	QP
6		831.099	20.458	16.300	-16.542	37.000	19.686	7.092	22.620	200	148	QP

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

Engineer: Bob Yu	
Site: AC5	Time: 2018/04/09
Limit: EN55022_RE(3m)_ClassB	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: EZ-BLE Module with HomeKit	Power: AC 230V/50Hz
Note: Mode 1	



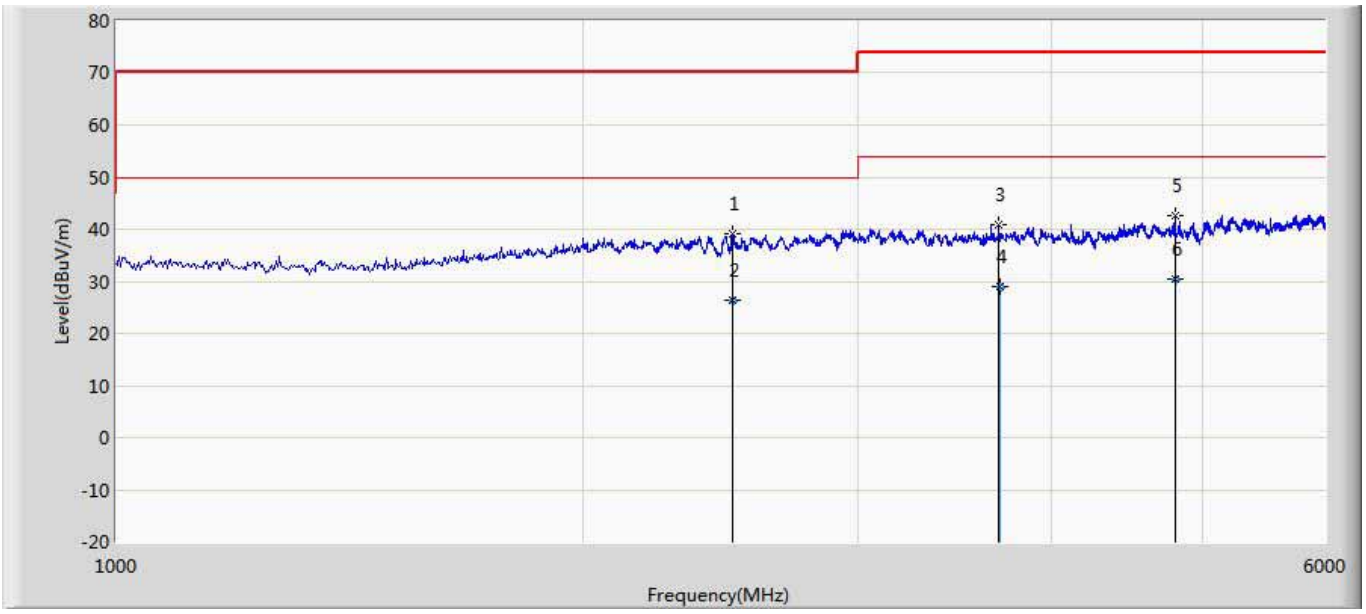
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1		1925.000	38.041	45.249	-31.959	70.000	31.145	3.730	42.083	200	85	PK
2		1927.954	26.495	33.698	-23.505	50.000	31.167	3.727	42.097	200	85	AV
3		2690.000	39.190	44.281	-30.810	70.000	32.490	4.498	42.079	100	245	PK
4		2694.552	25.987	31.289	-24.013	50.000	32.495	4.406	42.203	100	245	AV
5		5752.500	42.657	40.269	-31.343	74.000	34.853	7.399	39.864	200	116	PK
6	*	5756.841	30.529	28.214	-23.471	54.000	34.860	7.421	39.966	200	116	AV

Note:

1.. " * ", means this data is the worst emission level.

2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

Engineer: Bob Yu	
Site: AC5	Time: 2018/04/09 - 15:14
Limit: EN55022_RE(3m)_ClassB	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: EZ-BLE Module with HomeKit	Power: AC 230V/50Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1		2492.500	39.097	44.137	-30.903	70.000	32.291	4.310	41.641	100	283	PK
2		2495.184	26.376	31.360	-23.624	50.000	32.294	4.347	41.625	100	283	AV
3		3702.500	40.797	43.464	-33.203	74.000	33.162	5.323	41.151	100	16	PK
4		3704.625	28.881	31.529	-25.119	54.000	33.163	5.327	41.139	100	16	AV
5		4802.500	42.572	43.092	-31.428	74.000	33.961	6.270	40.750	100	172	PK
6	*	4806.950	30.437	30.954	-23.563	54.000	33.962	6.280	40.758	100	172	AV

Note:

1.. " * ", means this data is the worst emission level.

2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

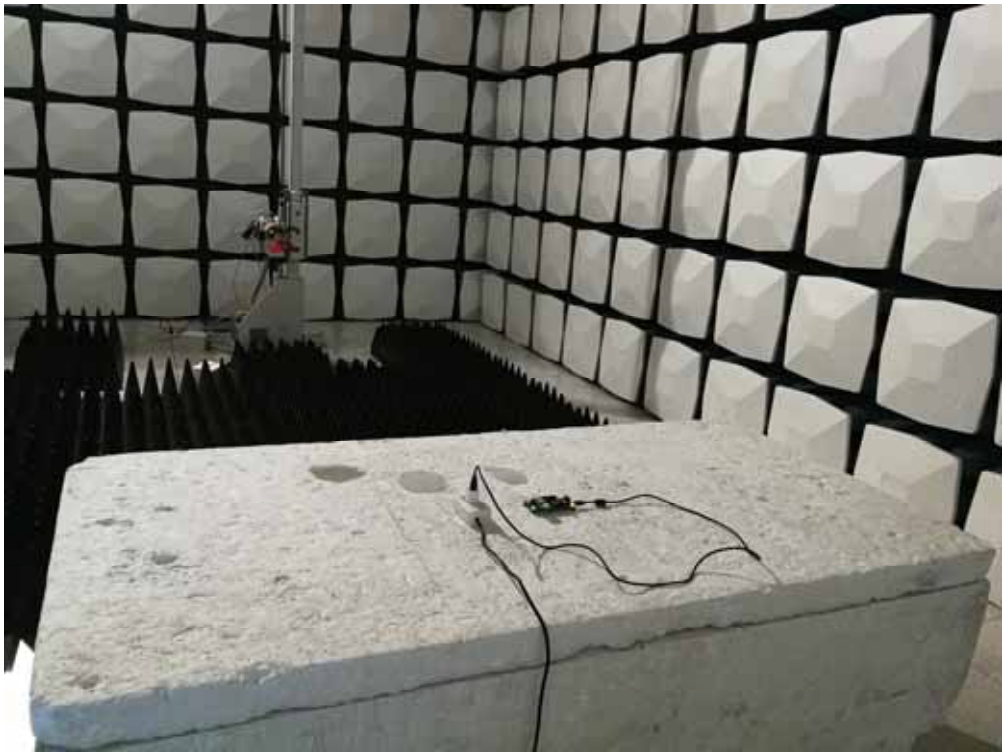
5.7. Test Photograph

Description: Front View of Radiated emission Test Setup (Below 1GHz)

Description: Rear View of Radiated emission Test Setup (Below 1GHz)

Description: Front View of Radiated emission Test Setup (Above 1GHz)

Description: Rear View of Radiated emission Test Setup (Above 1GHz)

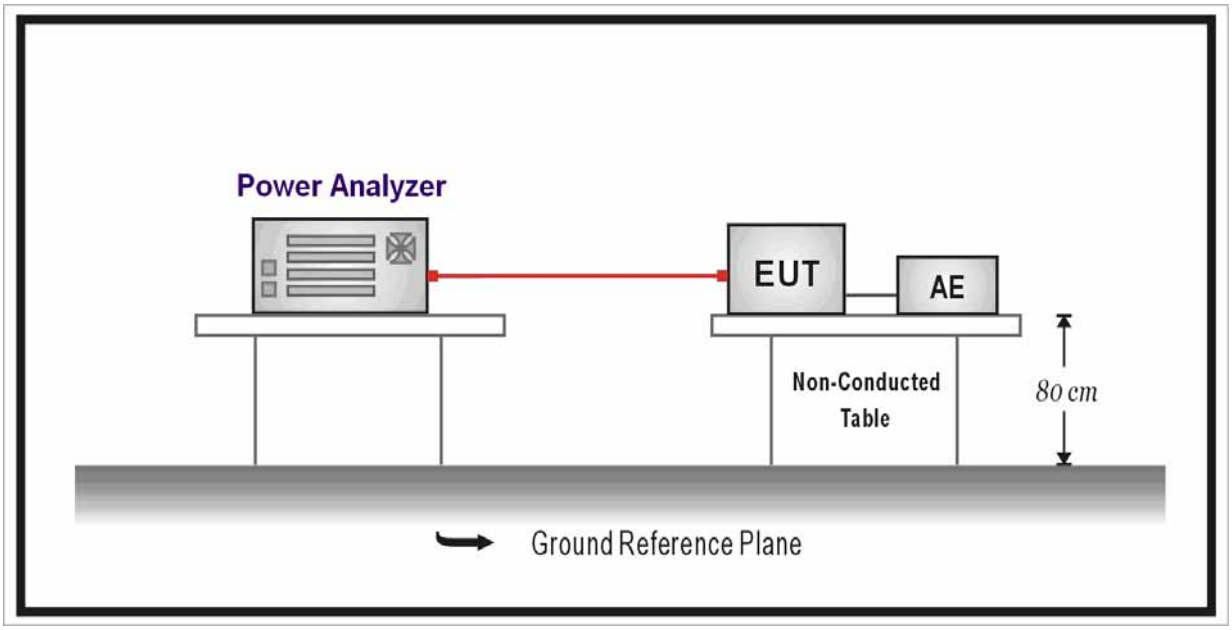


6. Harmonic current emissions

6.1. Test Specification

According to EMC Standard: EN 61000-3-2

6.2. Test Setup



6.3. Limit

(a) 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		

(b) 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.

(c) 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. λ*
5	10
7	7
9	5
11 ≤ n ≤ 39 (odd harmonics only)	3
＊λ is the circuit power factor	

(d) 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
11 ≤ n ≤ 39 (odd harmonics only)	3.85/n	See limit of Class A

6.4. 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 0.98 times and 1.02 times shall be performed.

6.5. Deviation from Test Standard

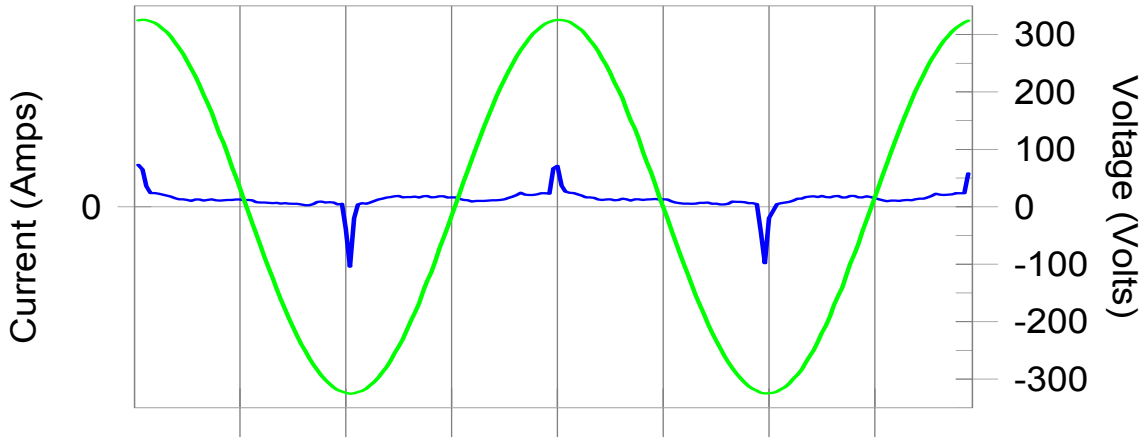
No deviation.

6.6. Test Result

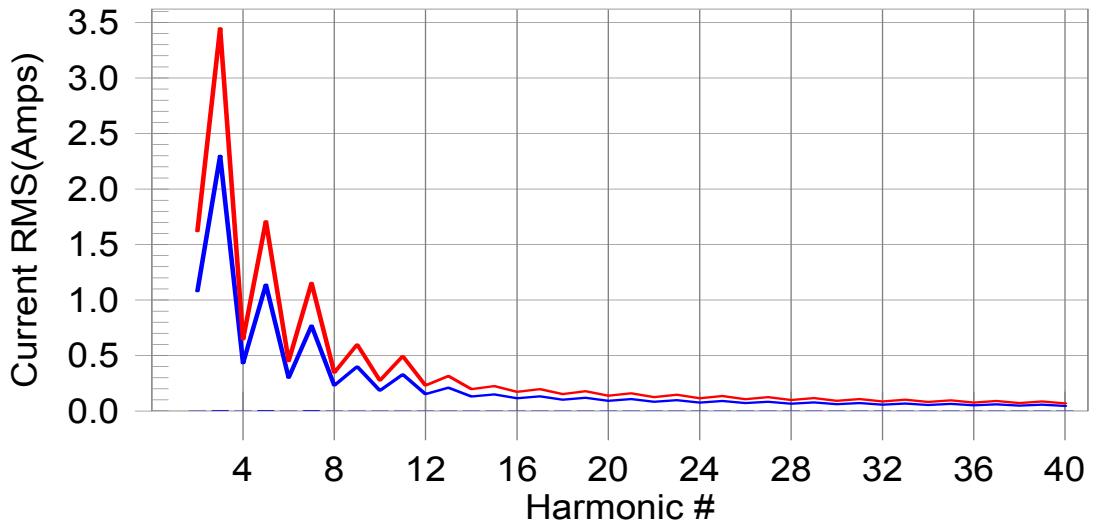
Test Site	TR1	Date of Test	2018.04.09
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	25°C	Humidity	48%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 1		

Test Result: N/L **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class A limit line **European Limits**



Test result: N/L

Test Result: N/L **Source qualification: Normal**
THC(A): 0.007 **I-THD(%): 175.4** **POHC(A): 0.000** **POHC Limit(A): 0.251**

Highest parameter values during test:

V_RMS (Volts):	**229.95**	**Frequency(Hz):**	**50.00**
I_Peak (Amps):	**0.090**	**I_RMS (Amps):**	**0.012**
I_Fund (Amps):	**0.005**	**Crest Factor:**	**7.615**
Power (Watts):	**1.1**	**Power Factor:**	**0.419**

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	N/A	0.001	1.620	N/A	N/L
3	0.003	2.300	N/A	0.004	3.450	N/A	N/L
4	0.001	0.430	N/A	0.001	0.645	N/A	N/L
5	0.002	1.140	N/A	0.003	1.710	N/A	N/L
6	0.000	0.300	N/A	0.000	0.450	N/A	N/L
7	0.002	0.770	N/A	0.002	1.155	N/A	N/L
8	0.000	0.230	N/A	0.000	0.345	N/A	N/L
9	0.002	0.400	N/A	0.002	0.600	N/A	N/L
10	0.000	0.184	N/A	0.000	0.276	N/A	N/L
11	0.002	0.330	N/A	0.002	0.495	N/A	N/L
12	0.000	0.153	N/A	0.000	0.230	N/A	N/L
13	0.002	0.210	N/A	0.002	0.315	N/A	N/L
14	0.000	0.131	N/A	0.000	0.197	N/A	N/L
15	0.002	0.150	N/A	0.002	0.225	N/A	N/L
16	0.000	0.115	N/A	0.000	0.173	N/A	N/L
17	0.002	0.132	N/A	0.002	0.198	N/A	N/L
18	0.000	0.102	N/A	0.000	0.153	N/A	N/L
19	0.002	0.118	N/A	0.002	0.178	N/A	N/L
20	0.000	0.092	N/A	0.000	0.138	N/A	N/L
21	0.001	0.107	N/A	0.001	0.161	N/A	N/L
22	0.000	0.084	N/A	0.000	0.125	N/A	N/L
23	0.001	0.098	N/A	0.001	0.147	N/A	N/L
24	0.000	0.077	N/A	0.000	0.115	N/A	N/L
25	0.001	0.090	N/A	0.001	0.135	N/A	N/L
26	0.000	0.071	N/A	0.000	0.107	N/A	N/L
27	0.001	0.083	N/A	0.001	0.125	N/A	N/L
28	0.000	0.066	N/A	0.000	0.099	N/A	N/L
29	0.001	0.078	N/A	0.001	0.116	N/A	N/L
30	0.000	0.061	N/A	0.000	0.092	N/A	N/L
31	0.001	0.073	N/A	0.001	0.109	N/A	N/L
32	0.000	0.058	N/A	0.000	0.086	N/A	N/L
33	0.001	0.068	N/A	0.001	0.102	N/A	N/L
34	0.000	0.054	N/A	0.000	0.081	N/A	N/L
35	0.001	0.064	N/A	0.001	0.096	N/A	N/L
36	0.000	0.051	N/A	0.000	0.077	N/A	N/L
37	0.000	0.061	N/A	0.000	0.091	N/A	N/L
38	0.000	0.048	N/A	0.000	0.073	N/A	N/L
39	0.000	0.058	N/A	0.000	0.087	N/A	N/L
40	0.000	0.046	N/A	0.000	0.069	N/A	N/L

1. Dynamic limits were applied for this test. The highest harmonics values in the above table may not occur at the same window as the maximum harmonics/limit ratio.

2. According to EN61000-3-2 paragraph 7 the note 1 and 2 are valid for all applications having an active input power >75W. Others the result should be pass.

6.7. Test Photograph

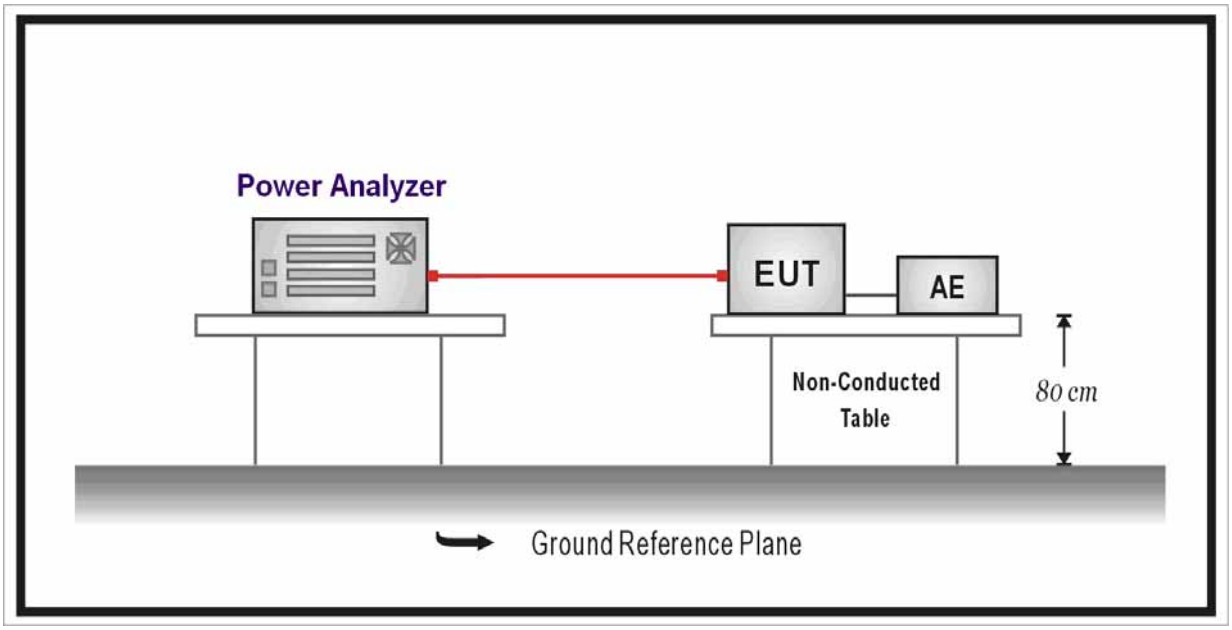
Description: Harmonic current emissions Test Setup

7. Voltage fluctuations and flicker

7.1. Test Specification

According to EMC Standard: EN 61000-3-3

7.2. Test Setup



7.3. Limit

The following limits apply:

- the value of P_{st} shall not be greater than 1.0;
- the value of P_{lt} shall not be greater than 0.65;
- Tmax, the accumulated time value of d(t) with a deviation exceeding 3,3 % during a single voltage change at the EUT terminals, shall not exceed 500 ms;
- the maximum relative voltage change, d_{max}, shall not exceed;

a) 4% without additional conditions;

b) 6% for equipment which is:

- switched manually, or
- switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.

NOTE: The cycling frequency will be further limited by the P_{st} and P_{lt} limit.

For example: a d_{max} of 6% producing a rectangular voltage change characteristic twice per hour will give a P_{lt} of about 0.65.

c) 7% for equipment which is:

- attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
- switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

P_{st} and P_{1t} requirements shall not be applied to voltage changes caused by manual switching.

7.4. 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 0.98 times and 1.02 times shall be performed.

7.5. Deviation from Test Standard

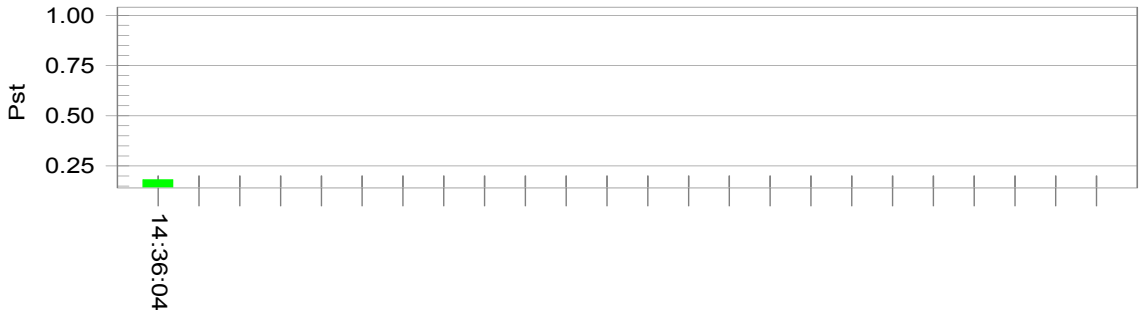
No deviation.

7.6. Test Result

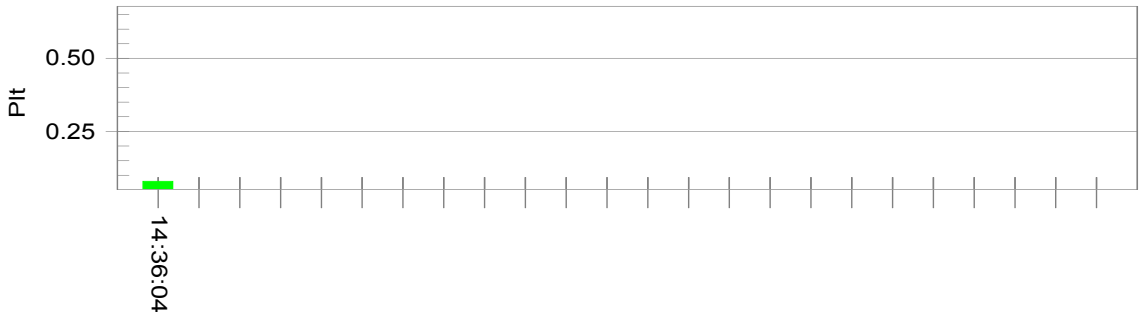
Test Site	TR1	Date of Test	2018.04.09
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	25°C	Humidity	48%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 1		

Test Result: Pass **Status: Test Completed**

Pst_i and limit line **European Limits**



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	**228.82**			
Highest dt (%):	**0.00**	**Test limit (%):**	**N/A**	**N/A**
T-max (mS):	**0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.04**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.182**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.079**	**Test limit:**	**0.650**	**Pass**

7.7. Test Photograph

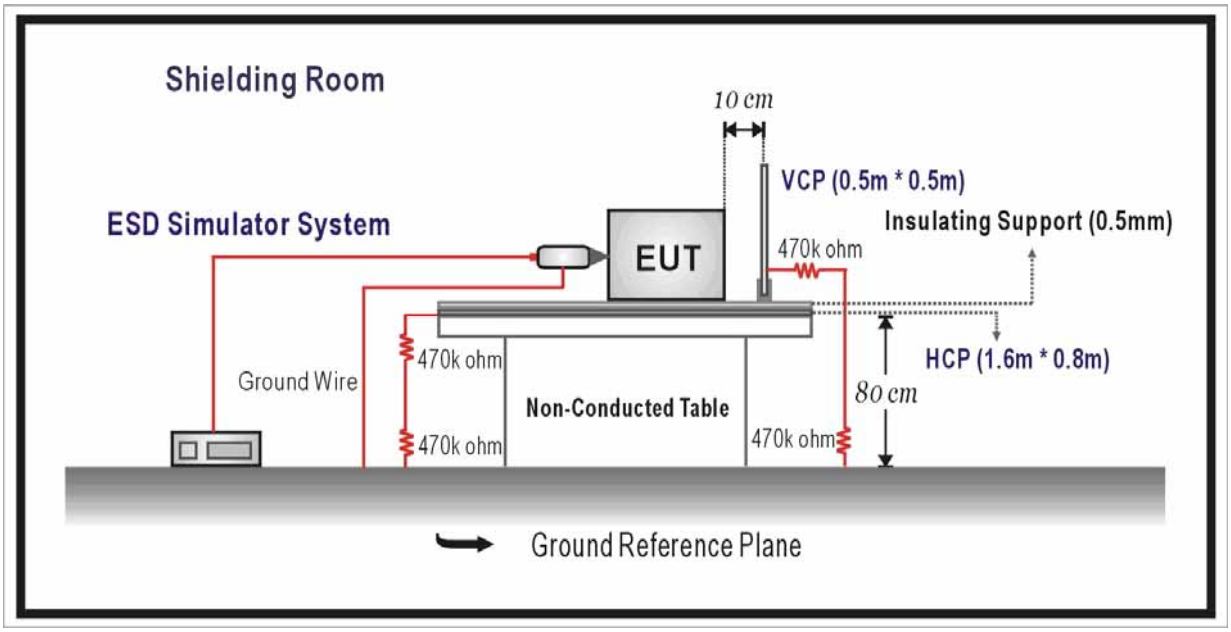
Description: Voltage fluctuations and flicker Test Setup

8. Electrostatic discharge

8.1. Test Specification

According to EMC Standard: EN 61000-4-2

8.2. Test Setup



8.3. Limit

Environmental phenomenon	Test specification	Units	Performance criterion
Enclosure port			
Electrostatic discharge	±4 (Contact discharge) ±8 (Air discharge)	kV (Charge voltage) kV (Charge voltage)	B

8.4. 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.

The selected point, which was performed with electrostatic discharge, was marked on the red label of the EUT.

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.

8.5. Deviation from Test Standard

No deviation.

8.6. Test Result

Test Site	TR3	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	44%RH
Barometric Pressure	102kPa	Test Engineer	Kay
Test Mode	Mode 1		

Air Discharge								
Test Location	Test Level						Observation	Result
	+2kV	-2kV	+4kV	-4kV	+8kV	-8kV		
1	A	A	A	A	A	A	Note	Pass

Contact Discharge						
Test Location	Test Level				Observation	Result
	+2kV	-2kV	+4kV	-4kV		
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Horizontal Coupling						
Test Location	Test Level				Observation	Result
	+2kV	-2kV	+4kV	-4kV		
Front	A	A	A	A	Note	Pass
Rear	A	A	A	A	Note	Pass
Left	A	A	A	A	Note	Pass
Right	A	A	A	A	Note	Pass

Vertical Coupling						
Test Location	Test Level				Observation	Result
	+2kV	-2kV	+4kV	-4kV		
Front	A	A	A	A	Note	Pass
Rear	A	A	A	A	Note	Pass
Left	A	A	A	A	Note	Pass
Right	A	A	A	A	Note	Pass

NOTE: There was no change compared with initial operation during the test.

Test Site	TR3	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	44%RH
Barometric Pressure	102kPa	Test Engineer	Kay
Test Mode	Mode 2		

Air Discharge								
Test Location	Test Level						Observation	Result
	+2kV	-2kV	+4kV	-4kV	+8kV	-8kV		
1	A	A	A	A	A	A	Note	Pass

Contact Discharge						
Test Location	Test Level				Observation	Result
	+2kV	-2kV	+4kV	-4kV		
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Horizontal Coupling						
Test Location	Test Level				Observation	Result
	+2kV	-2kV	+4kV	-4kV		
Front	A	A	A	A	Note	Pass
Rear	A	A	A	A	Note	Pass
Left	A	A	A	A	Note	Pass
Right	A	A	A	A	Note	Pass

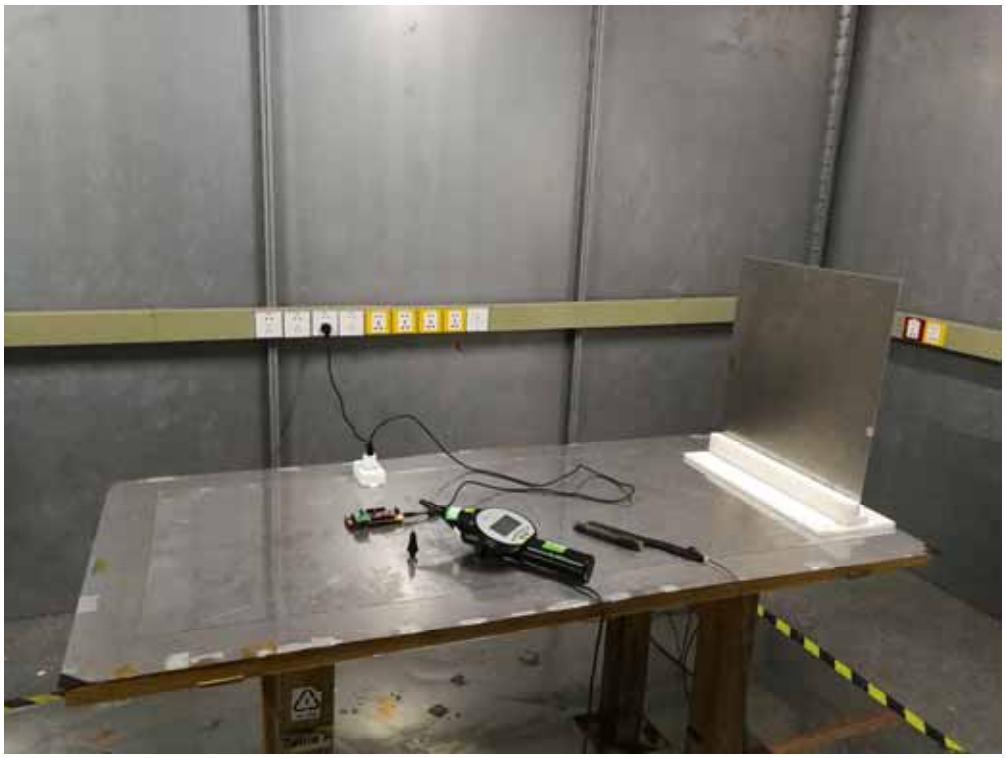
Vertical Coupling						
Test Location	Test Level				Observation	Result
	+2kV	-2kV	+4kV	-4kV		
Front	A	A	A	A	Note	Pass
Rear	A	A	A	A	Note	Pass
Left	A	A	A	A	Note	Pass
Right	A	A	A	A	Note	Pass

NOTE: There was no change compared with initial operation during the test.

8.7. Test Photograph

Test Mode: Mode 1&2

Description: Electrostatic discharge Test Setup



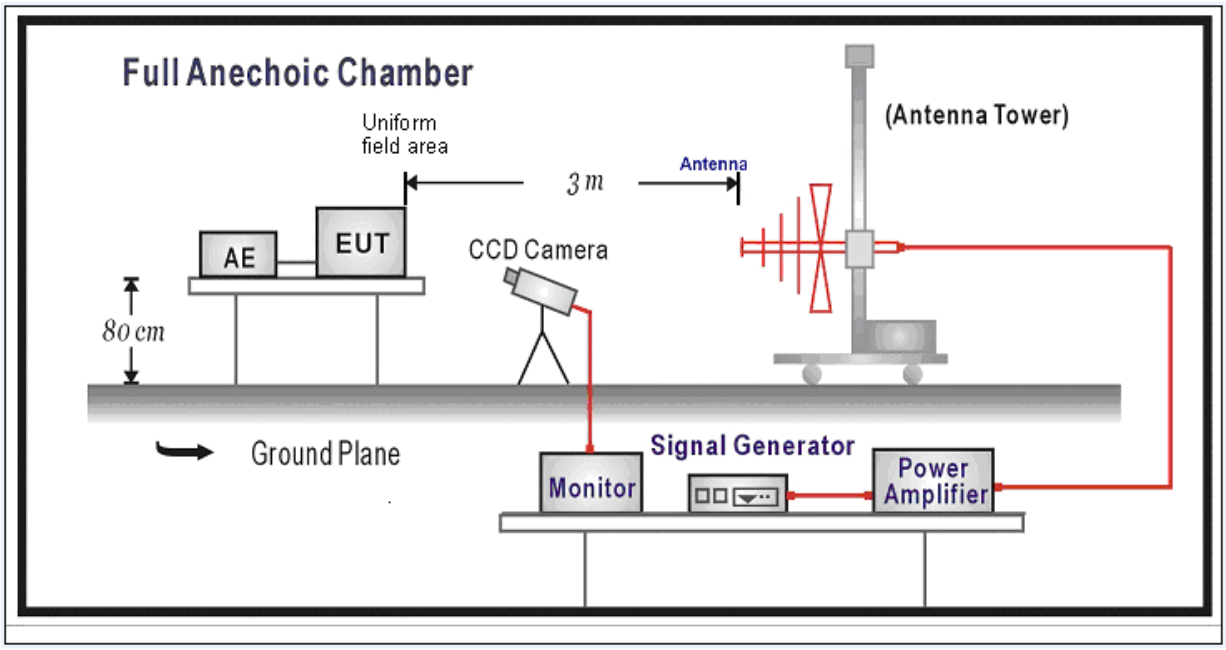
Electrostatic discharge Test Location

9. Radio frequency electromagnetic field

9.1. Test Specification

According to EMC Standard: EN 61000-4-3

9.2. Test Setup



9.3. Limit

Environmental phenomenon	Test specification	Units	Performance criterion
Enclosure port			
Radio frequency electromagnetic field	80 – 6000 3 80	MHz V/m (unmodulated, r.m.s) % AM (1kHz)	A
NOTE 1: If the wanted signal is modulated at 1000Hz, then an audio signal of 400Hz shall be used. NOTE 2: The test shall be performed over the frequency range 80MHz to 6000MHz with the exception of the exclusion band for transmitters, receivers and duplex transceivers [see clause 4 of EN 301 489-1 V2.1.1(2016-11)], as appropriate.			

The frequencies on which the transmitter part of the EUT is intended to operate shall be excluded from radiated emission measurements when performed in transmit mode of operation.

There shall be no frequency exclusion band applied to emission measurements of the receiver part of transceivers or the stand alone receiver under test, and/or associated ancillary equipment.

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.

NOTE: These receiver exclusion band ranges align with the relevant blocKay test ranges.

9.4. 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	3V/m
2.	Radiated Signal	AM 80% Modulated with 1kHz
3.	Scanning Frequency	80 - 6000MHz,
4	Dwell Time	3 Seconds
5.	Frequency Step Size Δf	1%

9.5. Deviation from Test Standard

No deviation.

9.6. Test Result

Test Site	AC4	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	44%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 1		

Frequency (MHz)	Polarity	Position	Field Strength (V/m)	Test Result Criterion	Observation	Result
80-2280	H+V	Front+ Rear Left+ Right	3	A	Note 1	Pass
2603.5 -6000	H+V	Front+ Rear Left+ Right	3	A	Note 1	Pass

NOTE 1: There was no change compared with initial operation during the test.

NOTE 2: The exclusion band for 2,45 GHz equipment falling within the scope of the present document extends from 2280 MHz to 2603.5 MHz.

Test Site	AC4	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	44%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 2		

Frequency (MHz)	Polarity	Position	Field Strength (V/m)	Test Result Criterion	Observation	Result
80-2280	H+V	Front+ Rear Left+ Right	3	A	Note 1	Pass
2603.5 -6000	H+V	Front+ Rear Left+ Right	3	A	Note 1	Pass

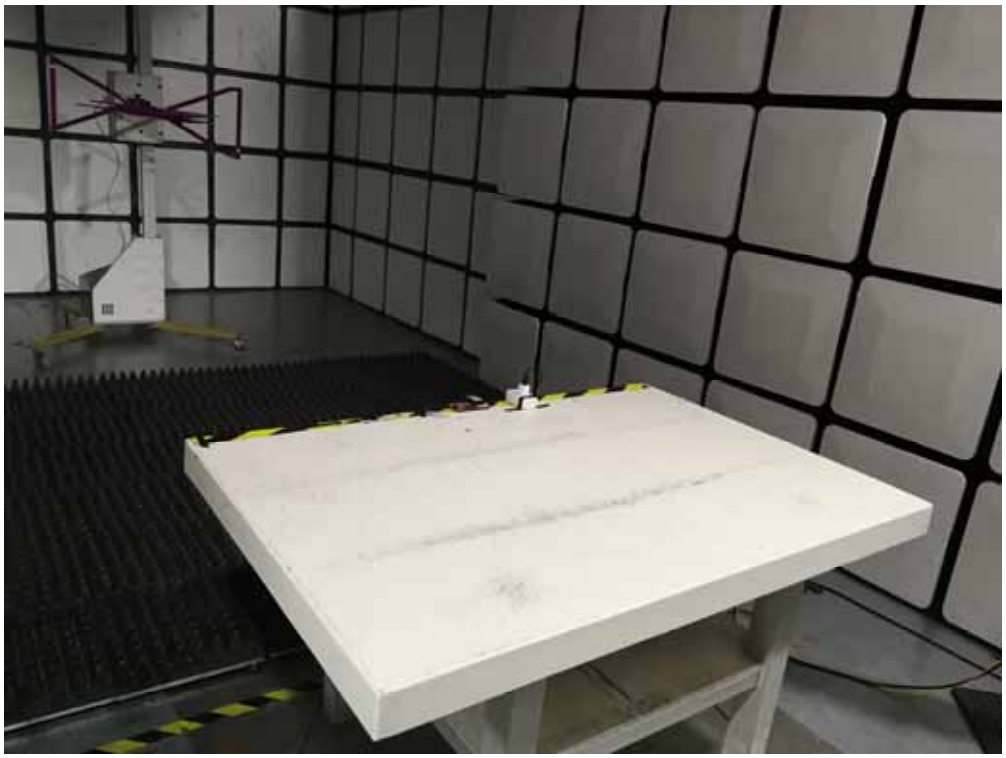
NOTE 1: There was no change compared with initial operation during the test.

NOTE 2: The exclusion band for 2,45 GHz equipment falling within the scope of the present document extends from 2280 MHz to 2603.5 MHz.

9.7. Test Photograph

Test Mode: Mode 1&2

Description: Radio frequency electromagnetic field Test Setup(Below 1GHz)



Test Mode: Mode 1&2

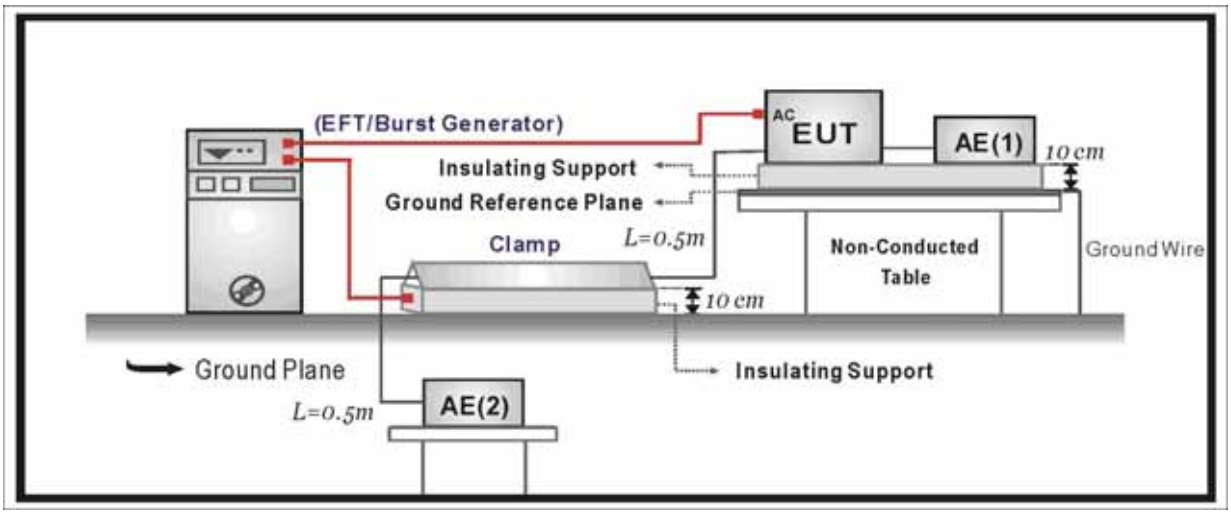
Description: Radio frequency electromagnetic field Test Setup(Above 1GHz)

10. Fast transients common mode

10.1. Test Specification

According to EMC Standard: EN 61000-4-4

10.2. Test Setup



10.3. Limit

Environmental phenomenon	Test specification	Units	Performance criterion
AC mains power input ports			
Fast transients common mode	±1.0 5/50 5	kV (peak) Tr/Th ns Repetition frequency (kHz)	B
DC power input ports (See Note)			
Fast transients common mode	±0.5 5/50 5	kV (peak) Tr/Th ns Repetition frequency (kHz)	B
Signal ports, telecommunication ports, and control ports (See Note)			
Fast transients common mode	±0.5 5/50 5	kV (peak) Tr/Th ns Repetition frequency (kHz)	B
NOTE: This test shall be additionally performed on signal ports, telecommunication ports, control ports, and DC power ports, of radio equipment and associated ancillary equipment, if the cables may be longer than 3m.			

10.4. Test Procedure

The EUT is placed on a table that is 0.8 meter height. A ground reference plane is placed on the table, and uses a (0,1 ± 0,01)m insulation between the EUT and ground reference plane. The minimum area of the ground reference plane is 0.8m*1m, and 0.65mm(copper or aluminium of 0,25 mm minimum thickness) thick min, and projected beyond the EUT by at least 0.1m on all sides.

For AC mains power input ports and DC power input ports:
The EUT is connected to the power mains through a coupling device that directly couples the EFT/B interference signal.
Each of the line conductors is impressed with burst noise for 1 minute.
The length of the power lines between the coupling device and the EUT is (0,5 – 0/+0,1)m for tabletop equipment testing.

For signal ports, telecommunication ports, and control ports:
The EFT interference signal is through a coupling clamp device couples to the signal of the EUT with burst noise for 1 minute.
The length of the signal lines between the coupling device and the EUT is (0,5 – 0/+0,1)m for tabletop equipment testing.

10.5. Deviation from Test Standard

No deviation.

10.6. Test Result

Test Site	AC4	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	44%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 1		

Inject Line	Polarity	Test Level (kV)	Test Duration (second)	Inject Method	Test Result Criterion	Observation	Result
L	+	1	60	Direct	A	Note	Pass
L	-	1	60	Direct	A	Note	Pass
N	+	1	60	Direct	A	Note	Pass
N	-	1	60	Direct	A	Note	Pass
L+N	+	1	60	Direct	A	Note	Pass
L+N	-	1	60	Direct	A	Note	Pass

NOTE: There was no change compared with initial operation during the test.

Test Site	AC4	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	44%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 2		

Inject Line	Polarity	Test Level (kV)	Test Duration (second)	Inject Method	Test Result Criterion	Observation	Result
L	+	1	60	Direct	A	Note	Pass
L	-	1	60	Direct	A	Note	Pass
N	+	1	60	Direct	A	Note	Pass
N	-	1	60	Direct	A	Note	Pass
L+N	+	1	60	Direct	A	Note	Pass
L+N	-	1	60	Direct	A	Note	Pass

NOTE: There was no change compared with initial operation during the test.

10.7. Test Photograph

Test Mode: Mode 1&2

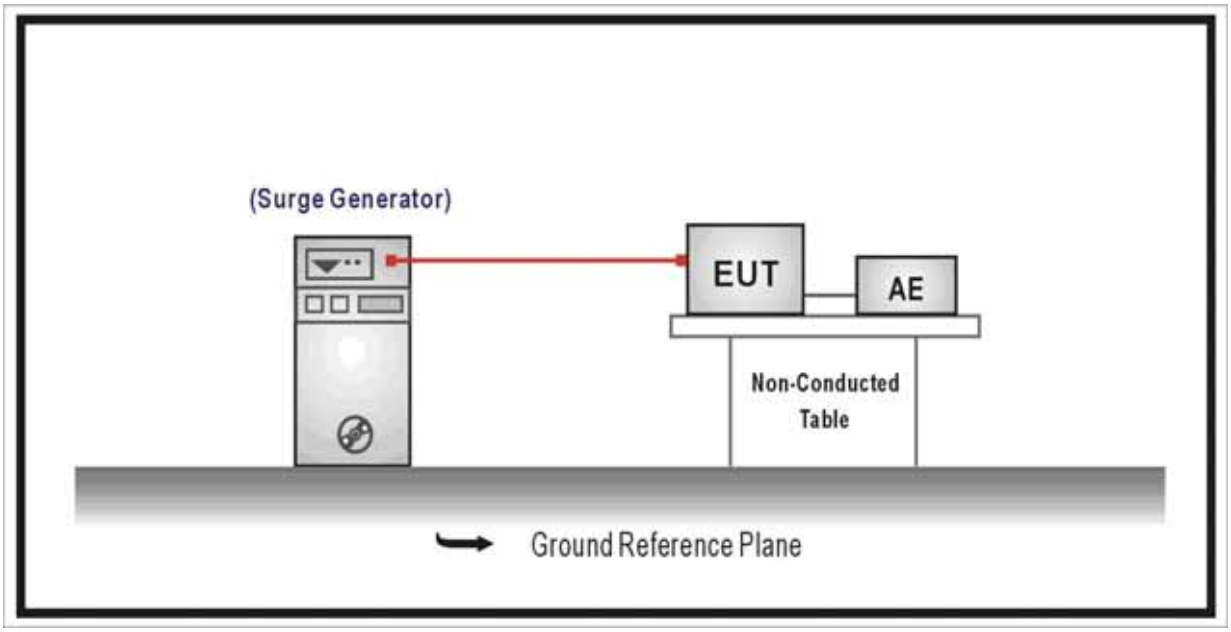
Description: Fast transients common mode Test Setup (AC mains power input ports)

11. Surges

11.1. Test Specification

According to EMC Standard: EN 61000-4-5

11.2. Test Setup



11.3. Limit

Environmental phenomenon	Test specification	Units	Performance criterion
AC mains power input ports (See Note 1)			
Surges	1.2/50 (8/20) 1 line to line 2 line to ground	Tr/Th us kV (peak) kV (peak)	B
Telecommunication ports directly connected to outdoor cables (See Note 1 and 2)			
Surges	1.2/50 (8/20) 1 line to ground	Tr/Th us kV (peak)	B
Telecommunication ports directly connected to indoor cables (See Note 1 and 3)			
Surges	1.2/50 (8/20) 0.5 line to ground	Tr/Th us kV (peak)	B
NOTE 1: Where normal functioning cannot be achieved because of the impact of the CDN on the EUT, no test shall be required. NOTE 2: In telecom centers 1kV line to ground and 0.5kV line to line shall be used. NOTE 3: The test level for telecommunication ports, intended to be connected to indoor cables (longer than 30m) shall be 0.5kV line to ground.			

11.4. Test Procedure

The EUT is placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m minimum and 0.65mm thick minimum 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 AC mains power input 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 0^0, 90^0, 180^0, 270^0 and the peak value of the a.c. voltage wave. (Positive and negative)

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

For telecommunication ports:

The signal line of EUT is connected to coupling and decoupling network that directly couples the surge interference signal.

Only Line to ground is impressed with a sequence of five surge voltages with interval of 1 minute.

11.5. Deviation from Test Standard

No deviation.

11.6. Test Result

Test Site	TR2	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	44%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 1		

Inject Line	Polarity	Angle (degree)	Test Level (kV)	Test Interval (second)	Test Result Criterion	Observation	Result
L+N	+	0	0.5/1	60	A	Note	Pass
L+N	-	0	0.5/1	60	A	Note	Pass
L+N	+	90	0.5/1	60	A	Note	Pass
L+N	-	90	0.5/1	60	A	Note	Pass
L+N	+	180	0.5/1	60	A	Note	Pass
L+N	-	180	0.5/1	60	A	Note	Pass
L+N	+	270	0.5/1	60	A	Note	Pass
L+N	-	270	0.5/1	60	A	Note	Pass

NOTE: There was no change compared with initial operation during the test.

Test Site	TR2	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	44%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 2		

Inject Line	Polarity	Angle (degree)	Test Level (kV)	Test Interval (second)	Test Result Criterion	Observation	Result
L+N	+	0	0.5/1	60	A	Note	Pass
L+N	-	0	0.5/1	60	A	Note	Pass
L+N	+	90	0.5/1	60	A	Note	Pass
L+N	-	90	0.5/1	60	A	Note	Pass
L+N	+	180	0.5/1	60	A	Note	Pass
L+N	-	180	0.5/1	60	A	Note	Pass
L+N	+	270	0.5/1	60	A	Note	Pass
L+N	-	270	0.5/1	60	A	Note	Pass

NOTE: There was no change compared with initial operation during the test.

11.7. Test Photograph

Test Mode: Mode 1&2

Description: Surges Test Setup (AC mains power input ports)

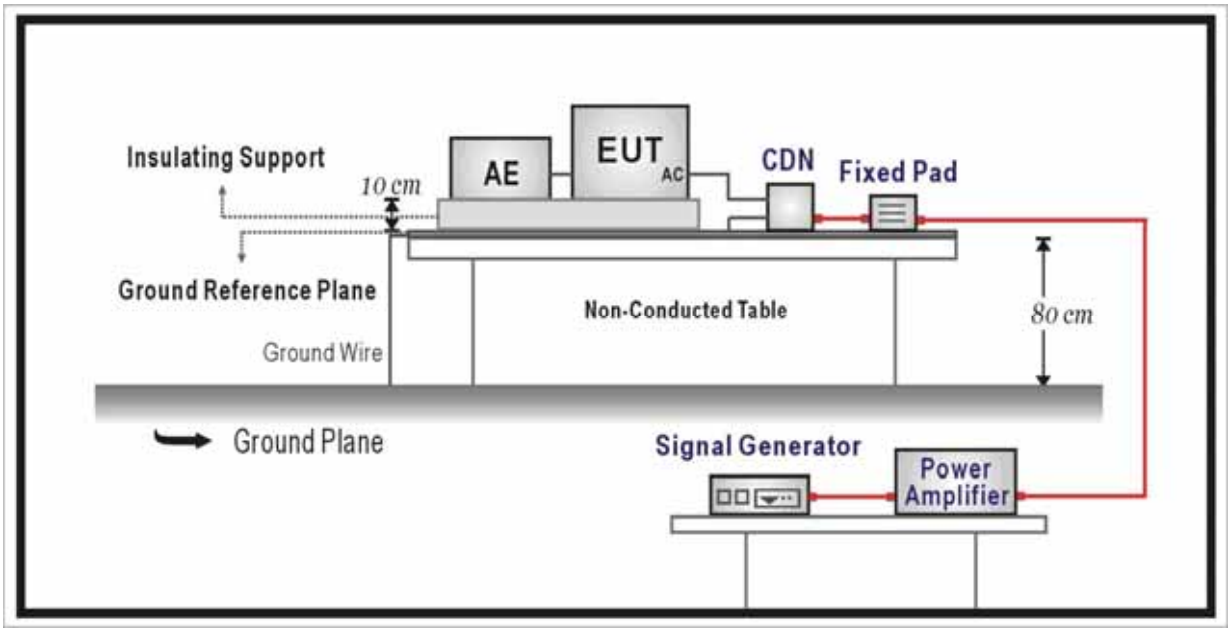
12. Radio frequency common mode

12.1. Test Specification

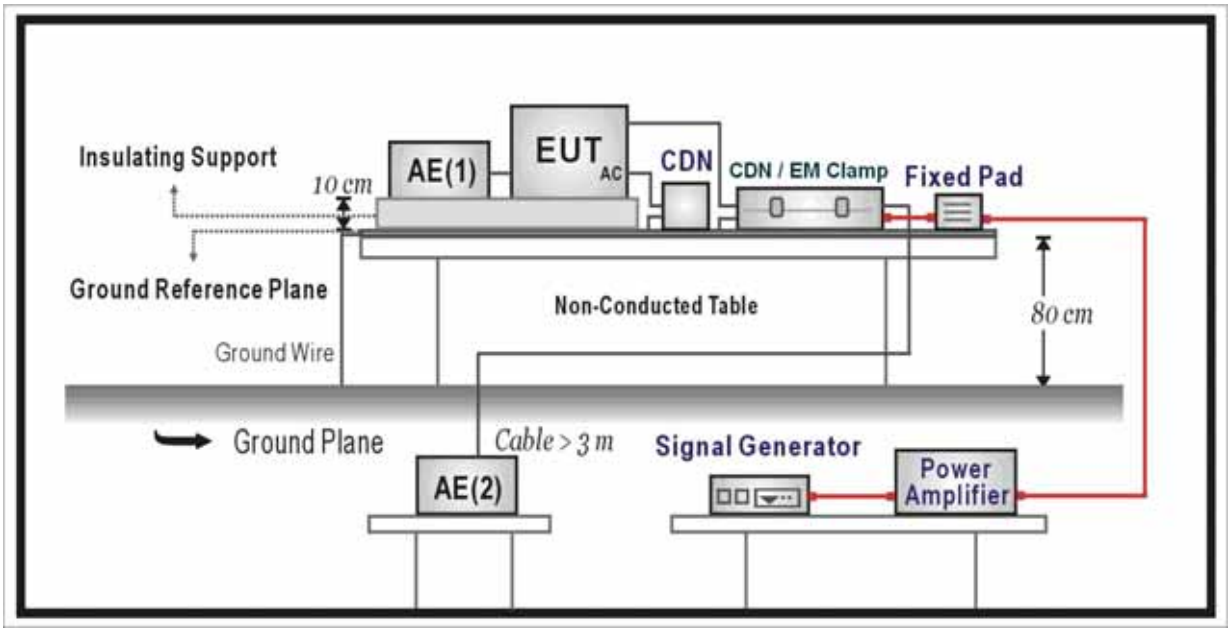
According to EMC Standard: EN 61000-4-6

12.2. Test Setup

CDN Test Setup



EM Clamp Test Setup



12.3. Limit

Environmental phenomenon	Test specification	Units	Performance criterion
AC mains power ports (See Note 1 and 2)			
Radio frequency common mode	0.15 - 80 3 80	MHz V (unmodulated, r.m.s) % AM (1kHz)	A
DC power ports (See Note 1, 2 and 3)			
Radio frequency common mode	0.15 - 80 3 80	MHz V (unmodulated, r.m.s) % AM (1kHz)	A
Signal ports, telecommunication ports, and control ports (See Note 1, 2 and 3)			
Radio frequency common mode	0.15 - 80 3 80	MHz V (unmodulated, r.m.s) % AM (1kHz)	A
NOTE 1: If the wanted signal is modulated at 1000Hz, then an audio signal of 400Hz shall be used. NOTE 2: The test shall be performed over the frequency range 150kHz to 80MHz with the exception of the exclusion band for transmitters, and for receivers and duplex transceivers [see clause 4 of EN 301 489-1 V2.1.1 (2016-11)]. NOTE 3: This test shall be additionally performed on signal ports, telecommunication ports, control ports, and DC power ports, of radio equipment and associated ancillary equipment, if the cables may be longer than 3m.			

12.4. Test Procedure

The EUT is placed on a table that is 0.8 meter height, and a ground reference plane on the table, EUT is placed upon table and use a 0,1 m ± 0,05 m insulation between the EUT and ground reference plane.Where coupling and/or decoupling devices are required, they shall be located between 0,1 m and 0,3 m from the EUT . This distance is to be measured horizontally from the projection of the EUT on to the reference ground plane to the coupling and/or decoupling device.

For AC mains power ports and DC 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.

For signal ports, telecommunication ports, and control 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.

	Condition of Test	Remarks
1.	Field Strength	3V
2.	Radiated Signal	AM 80% Modulated with 1kHz
3.	Scanning Frequency	0.15 - 80MHz
4	Dwell Time	3 Seconds
5.	Frequency Step Size Δf	1%

12.5. Deviation from Test Standard

No deviation.

12.6. Test Result

Test Site	TR2	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	42%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 1		

Frequency (MHz)	Inject Voltage (V)	Inject Ports	Inject Method	Test Result Criterion	Observation	Result
0.15-80	3	AC Mains	CDN	A	Note	Pass

NOTE: There was no change compared with initial operation during the test.

Test Site	TR2	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	42%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 2		

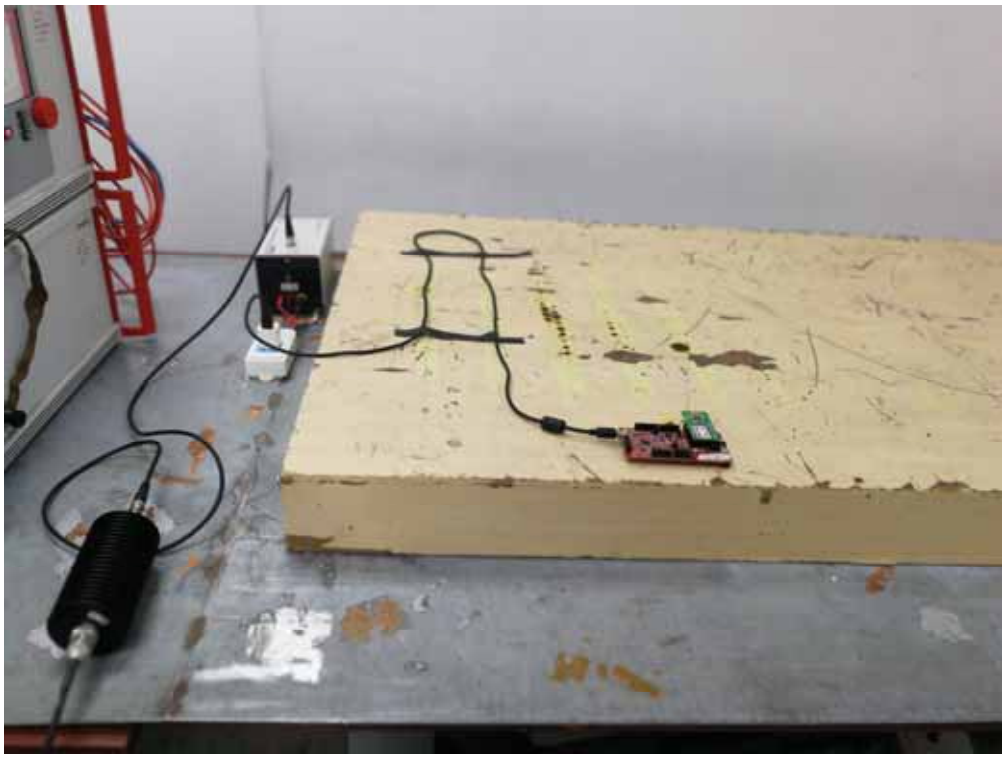
Frequency (MHz)	Inject Voltage (V)	Inject Ports	Inject Method	Test Result Criterion	Observation	Result
0.15-80	3	AC Mains	CDN	A	Note	Pass

NOTE: There was no change compared with initial operation during the test.

12.7. Test Photograph

Test Mode: Mode 1&2

Description: Radio frequency common mode Test Setup (AC mains power ports)

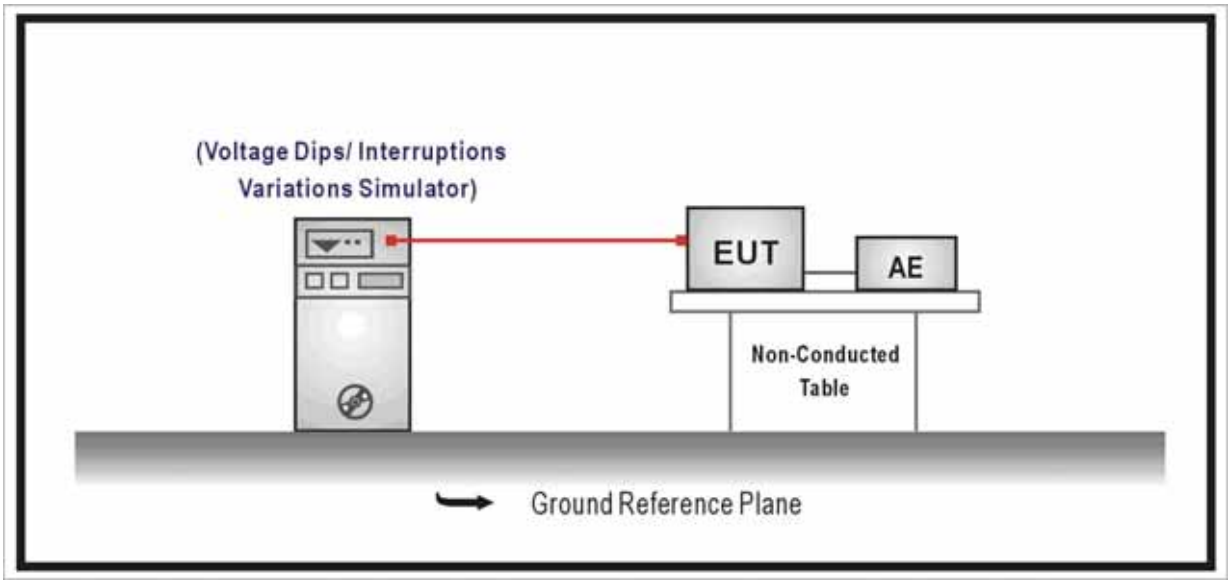


13. Voltage dips and interruptions

13.1. Test Specification

According to EMC Standard: EN 61000-4-11

13.2. Test Setup



13.3. Limit

Environmental phenomenon	Test specification	Units	Performance criterion
AC mains power input ports			
Voltage dips	0 0.5	% residual cycle	B
	0 1	% residual cycle	B
	70 25	% residual cycle	B
Voltage interruptions	0 250	% residual cycle	C
NOTE: Changes to occur at 0 degree crossover point of the voltage waveform.			

13.4. Test Procedure

The EUT is placed on a table which is 0.8 meter above a metal ground plane measured 1m*1m minimum, and 0.65mm thick minimum, 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 and 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.

13.5. Deviation from Test Standard

No deviation.

13.6. Test Result

Test Site	TR2	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	44%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 1		

Voltage % residual	Test Duration (cycle)	Test Result Criterion	Observation	Result
0	0.5	A	Note 1	Pass
0	1	A	Note 1	Pass
70	25	A	Note 2	Pass
0	250	C	Note 2	Pass

NOTE1: There was no change compared with initial operation during the test.

NOTE 2: The EUT function loss during the test, but self-recoverable after the test.

Test Site	TR2	Date of Test	2018.04.13
EUT	EZ-BLE Module with HomeKit	Test Voltage	AC 230V / 50Hz
Temperature	22°C	Humidity	44%RH
Barometric Pressure	101kPa	Test Engineer	Kay
Test Mode	Mode 2		

Voltage % residual	Test Duration (cycle)	Test Result Criterion	Observation	Result
0	0.5	A	Note	Pass
0	1	A	Note	Pass
70	25	A	Note	Pass
0	250	C	Note	Pass

NOTE1 : There was no change compared with initial operation during the test.

NOTE 2: The EUT function loss during the test, but self-recoverable after the test.

13.7. Test Photograph

Test Mode: Mode 1&2

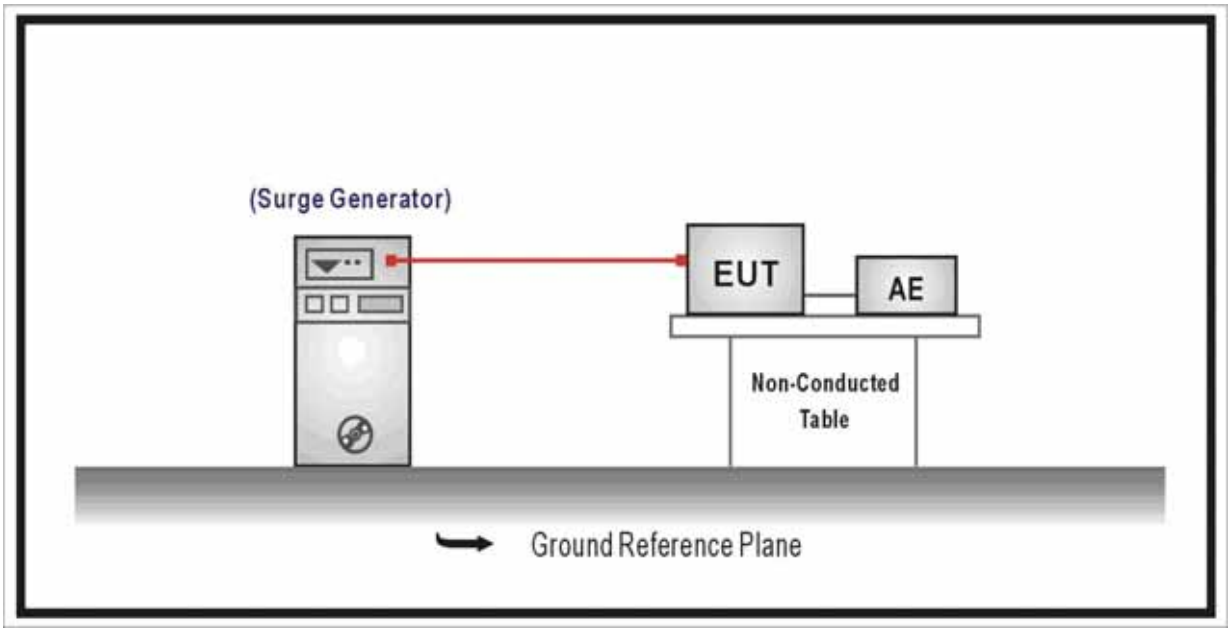
Description: Voltage dips and interruptions Test Setup

14. Transients and surges

14.1. Test Specification

According to EMC Standard: ISO 7637-2

14.2. Test Setup



14.3. Limit

EUT applying pulses 1, 2a, 2b, 3a, 3b, and 4, using immunity test level Ⅲ. For the purpose of EMC testing it is sufficient to apply pulses 1, 2a and 4, 10 times each, and apply the test pulses 3a and 3b for 20 minutes each.

14.4. Test Procedure

Test requirements for 12V DC powered equipment:

Where the manufacturer in his installation documentation requires the radio equipment to have a direct connection to the 12V main vehicle battery the requirements in a) shall apply.

Where the manufacturer does not require the radio equipment to have a direct connection to the 12V main vehicle battery the requirements in a) and b) shall apply:

Pulse 3a and 3b, level II, with the test time reduced to 5 min for each;

Pulse 4, level II, 5 pulses, with the characteristics as follows:

Vs = -5V; Va = -2.5V; t6 = 25ms; t7 = 50ms; t8 = 5s; tf = 5ms; pulse cycle time: 60s

Pulse, level II: t1 = 2.5s; 10 pulses;

Pulse 2, level II: t1 = 2.5s; 10 pulses;
Pulse 7, 5 pulses.
Where the manufacturer declares that the radio equipment requires a direct connection to the main vehicle battery, and therefore the tests in accordance with the requirements b) are not carried out, this shall be stated in the test report.

Test requirements for 24V DC powered equipment:
Where the manufacturer in his installation documentation requires the radio equipment to have a direct connection to the 24 V main vehicle battery the requirements in (1) shall apply.
Where the manufacturer does not require the radio equipment to have a direct connection to the 24 V main vehicle battery the requirements in (1) and (2) shall apply:
(1) Pulse 3a and 3b, level II, with the test time reduced to 5 min for each;
Pulse 4, level II, 5 pulses, with the characteristics as follows:
Vs = -10V; Va = -5V; t6 = 25ms; t7 = 50ms; t8 = 5s; tf = 10ms; pulse cycle time: 60s
(2) Pulse 1a, level II: t1 = 2.5s; Ri = 25Ω; 10 pulses;
Pulse 2b, level II: t1 = 2.5s; Ri = 100Ω; 10 pulses;
Pulse 2, 10 pulses.
Where the manufacturer declares that the radio equipment requires a direct connection to the main vehicle battery, and therefore the tests in accordance with the requirements d) are not carried out, this shall be stated in the test report.
Radio and ancillary equipment designed to operate at both DC power voltages shall be tested in both configurations.

14.5. Deviation from Test Standard

No deviation.

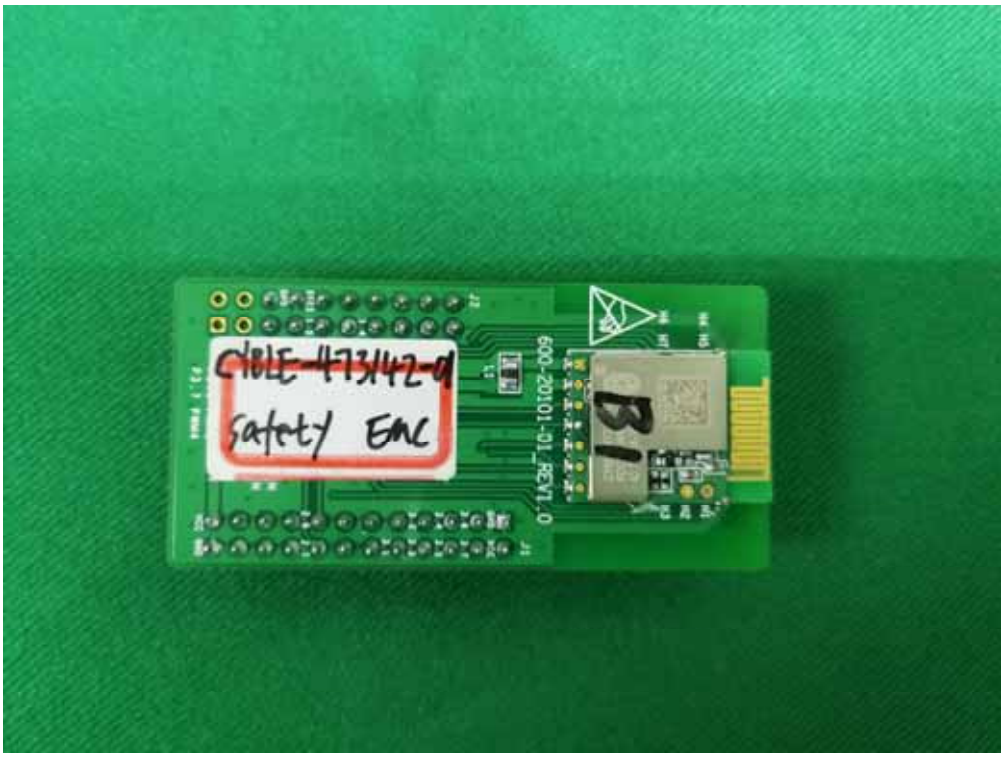
14.6. Test Result

The EUT is not used in the vehicular environment, so it need not to perform this test item.

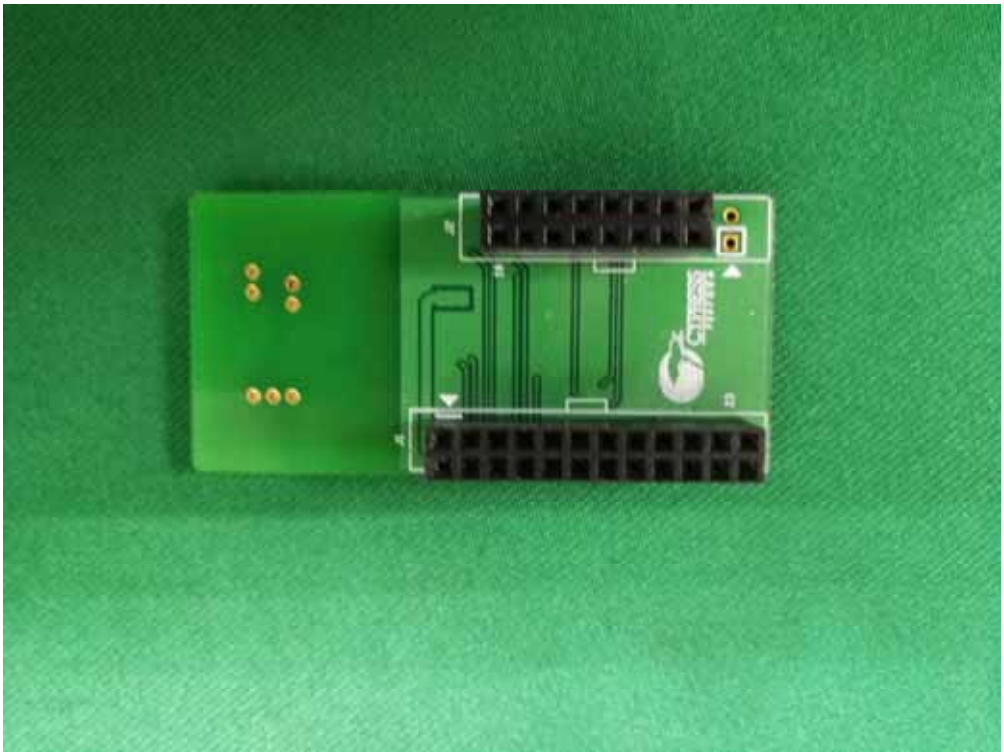
15. Attachment

EUT Photograph

(1) EUT Photo



(2) EUT Photo



(3) EUT Photo

(4) EUT Photo