

**Shenzhen Global Test Service Co.,Ltd.**

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

TEST REPORT**ETSI EN 301 489-1 V2.2.3 (2019-11)****ETSI EN 301 489-3 V2.1.1(2019-03)****ETSI EN 301 489-17 V3.1.1(2017-02)****EN 55032:2015/ EN 55035:2017****Report Reference No.**.....: **GTS20191209006-2-27**

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Date of issue.....: Dec.23, 2019

Representative Laboratory Name : **Shenzhen Global Test Service Co.,Ltd.**

Address.....: No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

Applicant's name.....: **Shenzhen Bilian Electronic Co.,Ltd.**

Address.....: Building B1, Zhongxing Industrial Zone, Juling, Jutang Community, Guanlan street, LongHua district, Shenzhen, China

Test specification..... :

Standard: ETSI EN 301 489-1 V2.2.3 (2019-11)
 ETSI EN 301 489-3 V2.1.1(2019-03)
 ETSI EN 301 489-17 V3.1.1(2017-02)
 EN 55032:2015/ EN 55035:2017
 EN 61000-3-2:2014/EN 61000-3-3:2013

TRF Originator.....: Shenzhen Global Test Service Co.,Ltd.

Master TRF.....: Dated 2014-12

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Test item description.....: **IEEE 802.11a/b/g/n/ac(1T1R)USB WIFI+BT Combo Module**

Trade Mark.....: N/A

Manufacturer.....: Shenzhen Bilian Electronic Co.,Ltd.

Model/Type reference.....: BL-M8821CU1

Listed model.....: N/A

Hardware version.....: 1.1

Software version.....: V1.1

Ratings.....: DC 3.3V

Result.....: **PASS**

TEST REPORT

Test Report No. :	GTS20191209006-2-27	Dec.23, 2019
		Date of issue

Equipment under Test : IEEE 802.11a/b/g/n/ac(1T1R)USB WIFI+BT Combo Module

Model /Type : BL-M8821CU1

Listed model : N/A

Applicant : **Shenzhen Bilian Electronic Co.,Ltd.**

Address : Building B1, Zhongxing Industrial Zone, Juling, Jutang Community,
Guanlan street, LongHua district, Shenzhen, China

Manufacturer : **Shenzhen Bilian Electronic Co.,Ltd.**

Address : Building B1, Zhongxing Industrial Zone, Juling, Jutang Community,
Guanlan street, LongHua district, Shenzhen, China

Test Result	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1. TEST STANDARDS

The tests were performed according to following standards:

[ETSI EN 301 489-1 V2.2.3 \(2019-11\)](#)—ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU
[ETSI EN 301 489-3 V2.1.1\(2019-03\)](#)—ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

[ETSI EN 301 489-17 V3.1.1\(2017-02\)](#)—ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

[EN 55032:2015](#) Electromagnetic compatibility of multimedia equipment - Emission Requirements

[EN 55035:2017](#) Electromagnetic compatibility of multimedia equipment - Immunity requirements

[EN 61000-3-2: 2014](#) Electromagnetic compatibility (EMC) -- Part 3-2: Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase)

[EN 61000-3-3: 2013](#) Electromagnetic compatibility (EMC) -- Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Dec.13, 2019
Testing commenced on	:	Dec.13, 2019
Testing concluded on	:	Dec.23, 2019

2.2. Product Description

Product Name:	IEEE 802.11a/b/g/n/ac(1T1R)USB WIFI+BT Combo Module
Trade Mark:	N/A
Model/Type reference:	BL-M8821CU1
List Model:	N/A
Model Declaration	N/A
Power supply:	DC 3.3V
Hardware Version	1.1
Software Version	V1.1
Bluetooth	
Frequency Range	2402MHz ~ 2480MHz
Channel Number	79 channels for Bluetooth (DSS) 40 channels for Bluetooth (DTS)
Channel Spacing	1MHz for Bluetooth (DSS) 2MHz for Bluetooth (DTS)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK for Bluetooth (DSS) GFSK for Bluetooth (DTS)
2.4G WLAN	
WLAN CE Operation frequency	IEEE 802.11b:2412-2472MHz IEEE 802.11g:2412-2472MHz IEEE 802.11n HT20:2412-2472MHz IEEE 802.11n HT40:2422-2462MHz
WLAN CE Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
Channel number:	13 Channel for IEEE 802.11b/g/n(HT20) 9 Channel for IEEE 802.11n(HT40)
Channel separation:	5MHz
WIFI(5G Band)	
WLAN CE Operation frequency	5180-5240MHz
WLAN CE Modulation Type	802.11a/n/ac: OFDM
Channel number:	4 Channels for 20MHz bandwidth(5180-5240MHz) 2 channels for 40MHz bandwidth(5190~5230MHz) 1 channels for 80MHz bandwidth(5210MHz)
SRD(5.8G Band)	
WLAN CE Operation frequency	5745-5825MHz
WLAN CE Modulation Type	802.11a/n/ac: OFDM
Channel Number	5 channels for 20MHz bandwidth(5745-5825MHz) 2 channels for 40MHz bandwidth(5755~5795MHz) 1 channels for 80MHz bandwidth(5775MHz)
Antenna Description	External Antenna, used for Bluetooth & WIFI TX/RX, 2.0dBi(Max.) for 2.4G Band and 2.0dBi(Max.) for 5G Band

2.3. EUT operation mode

Test mode	WIFI	Bluetooth
1	■	
2		■

Note:

1. ■ is operation mode.

Pre-scan above all test mode, found below test mode which it was worse case mode.

Pre-test conducted emission and radiated emission at both voltage AC 120V/60Hz and AC 230V/50Hz, recorded worst case.

Test item	Test mode (Worse case mode)
Conducted emission	Mode 1
Radiated emission	Mode 1
EMS	All Mode

2.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	PC	M/N:	Satellite S40Dt-A
		Manufacturer:	TOSHIBA

2.5. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.

No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

3.2. Test Facility

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

CNAS (No. CNAS L8169)

Shenzhen Global Test Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2019 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA (Certificate No. 4758.01)

Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.

3.3. Environmental conditions

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

Normal Temperature:	15-35 ° C
Lative Humidity	30-60 %
Air Pressure	950-1050mbar

3.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“and is documented in the Shenzhen Global Test Service Co.,Ltd. acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.5. Test Description

Emission Measurement		
Radiated Emission	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1(2019-03) ETSI EN 301 489-17 V3.1.1(2017-02) EN 55032:2015	PASS
Conducted Emission(AC Mains)	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1(2019-03) ETSI EN 301 489-17 V3.1.1(2017-02) EN 55032:2015	PASS
Harmonic Current Emissions	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1(2019-03) ETSI EN 301 489-17 V3.1.1(2017-02) EN 61000-3-2:2014	N/A
Voltage Fluctuations and Flicker	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1(2019-03) ETSI EN 301 489-17 V3.1.1(2017-02) EN 61000-3-3:2013	PASS
Immunity Measurement		
Electrostatic Discharge	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1(2019-03) ETSI EN 301 489-17 V3.1.1(2017-02) EN 55035:2017	PASS
RF Electromagnetic Field	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1(2019-03) ETSI EN 301 489-17 V3.1.1(2017-02) EN 55035:2017	PASS
Fast Transients Common Mode	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1(2019-03) ETSI EN 301 489-17 V3.1.1(2017-02) EN 55035:2017	PASS
RF Common Mode 0,15 MHz to 80 MHz	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1(2019-03) ETSI EN 301 489-17 V3.1.1(2017-02) EN 55035:2017	PASS
Voltage Dips and Interruptions	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1(2019-03) ETSI EN 301 489-17 V3.1.1(2017-02) EN 55035:2017	PASS
Surges	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1(2019-03) ETSI EN 301 489-17 V3.1.1(2017-02) EN 55035:2017	PASS

Remark: The measurement uncertainty is not included in the test result.

3.6. Equipments Used during the Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Calibration Due Date
1	EMI Test Receiver	R&S	ESPI 3	101841-cd	2019/09/20	2020/09/19
2	Artificial Mains	ROHDE & SCHWARZ	ESH2-Z5	893606/008	2019/09/20	2020/09/19
3	Pulse Limiter	Agilent	11947A	3107A04120	2019/09/20	2020/09/19
4	EMI Test Receiver	ROHDE & SCHWARZ	ESCI 7	101102	2019/09/20	2020/09/19
5	Spectrum Analyzer	Agilent	N9020A	MY48010425	2019/09/20	2020/09/19
6	Spectrum Analyzer	R&S	FSV40	100019	2019/09/20	2020/09/19
7	Active Loop Antenna	Beijing Da Ze Technology Co.,Ltd.	ZN30900C	15006	2019/10/12	2020/10/11
8	By-log Antenna	SCHWARZBECK	VULB9163	000976	2019/05/26	2020/05/25
9	Double Ridged Horn Antenna (1~18GHz)	SCHWARZBECK	BBHA 9120D	01622	2019/09/23	2020/09/22
10	Horn Antenna (18GHz~40GHz)	Schwarzbeck	BBHA9170	791	2019/09/20	2020/09/19
11	Amplifier (30MHz~1GHz)	Schwarzbeck	BBV 9743	#202	2019/09/20	2020/09/19
12	Amplifier (1GHz~18GHz)	Taiwan Chengyi	EMC05184 5B	980355	2019/09/20	2020/09/19
13	Amplifier (26.5GHz~40GHz)	Schwarzbeck	BBV9179	9719-025	2019/09/20	2020/09/19
14	ESD Simulators	EMC Partner	ESD3000	ESD3000-1680	2019/09/23	2020/09/22
15	RF POWER AMPLIFIER	OPHIR	5225R	1079	2019/09/20	2020/09/19
16	RF POWER AMPLIFIER	OPHIR	5273F	1025	2019/09/20	2020/09/19
17	RF POWER AMPLIFIER	SKET	HAP_0306 G-50W	--	2019/09/20	2020/09/19
18	Stacked Broadband Log Periodic Antenna	SCHWARZBECK	STLP 9128	9128ES-112	2019/09/20	2020/09/19
19	Stacked Mikrowellen Log.-Per Antenna	SCHWARZBECK	STLP 9149	9149-594	2019/09/20	2020/09/19
20	Electric field probe	Narda S.TS./PMM	EP601	611WX90121	2019/09/20	2020/09/19
21	ESG Vector Signal Generator	Agilent	MY490726 27	E4594C	2019/09/20	2020/09/19
22	Power meter	Agilent	MY451044 93	E4602B	2019/09/20	2020/09/19
23	Power sensor	Agilent	MY414952 34	E7201H	2019/09/20	2020/09/19
24	Ultra Compact Simulator	EMC Partner	TRANSIEN T3000	TRA3000 F5-S-D-V-1527	2019/09/20	2020/09/19
25	Coupling Clamp	EMC Partner	CN-	CN-EFT1000-1574	2019/10/12	2020/10/11

			EFT1000			
26	Signal Line Coupling Network	EMC Partner	CN-R40C05	CN-R40C05-1513	2019/10/12	2020/10/11
27	CS Test system	Frankonia	CIT-10-75	126B1333	2019/09/20	2020/09/19
28	6dB Attenuator	Frankonia	75-A-FFN-06	1509	2019/09/20	2020/09/19
29	CDN	Frankonia	M2+M3	A2210239	2019/09/20	2020/09/19
30	Power Clamp	Frankonia	EMCL-20	132A1216	2019/10/12	2020/10/11
31	Harmonic and Flicker Analyzer	EMC Partner	HARMONI CS 1000	HAR1000-1P 230V-0221	2019/09/19	2020/09/18
32	RF Cable	HUBER+SUHNER	RG214	N/A	2019/09/20	2020/09/19
33	Conducted Emission	Tonscend	JS32-CE	Ver 2.5	/	/
34	Radiated Emission	Tonscend	JS32-RE	Ver 2.5.1.8	/	/

The calibration interval is 1 year.

4. TEST CONDITIONS AND RESULTS

4.1. EMISSION

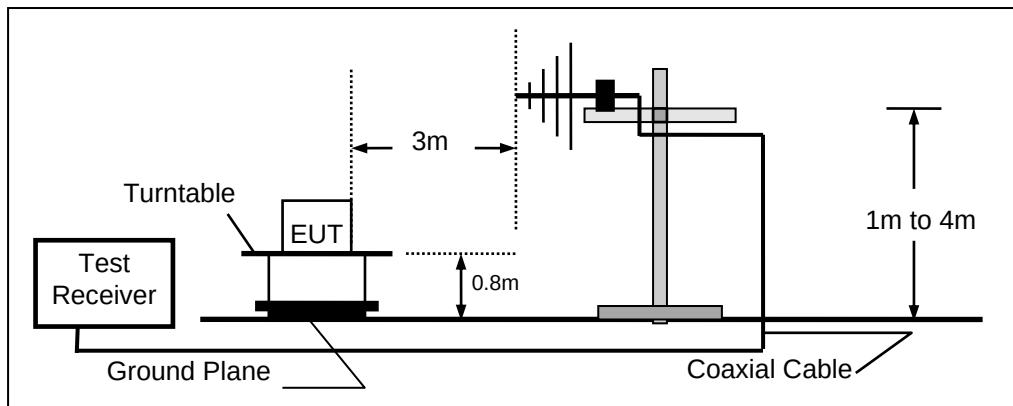
4.1.1. Radiated Emission

LIMIT

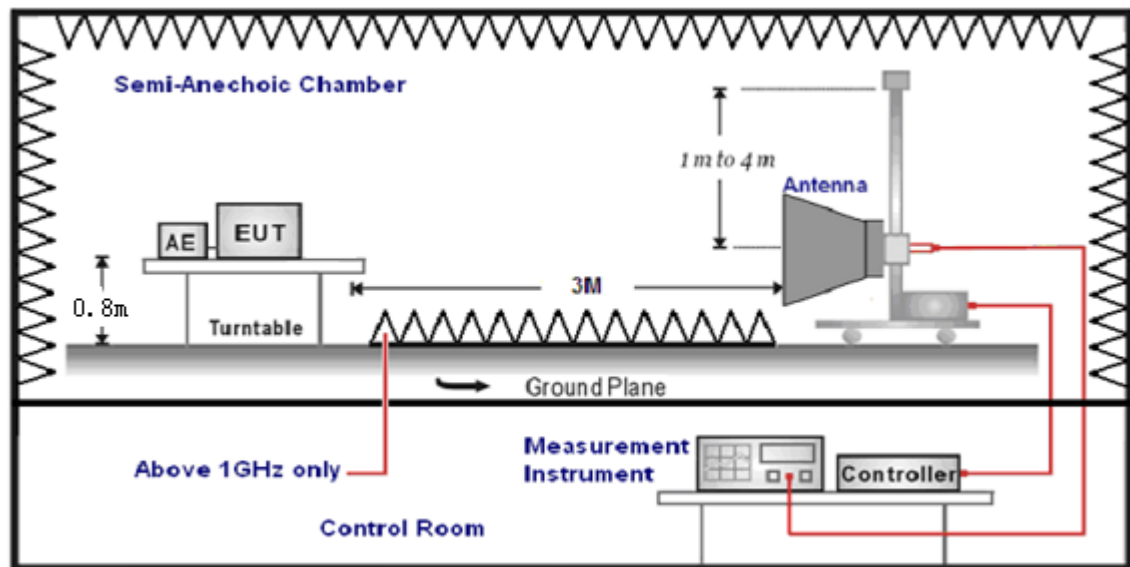
Please refer to ETSI EN301489-1 Clause 8.2.3, Table 4 and EN55032 Annex A, Table A.4,A.5, and Class B

TEST CONFIGURATION

- a) Radiated emission test set-up, frequency below 1000MHz:



- b) Radiated emission test set-up, frequency above 1000MHz



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 8.2.3 for the measurement methods

TEST RESULTS

Passed

Please refer to the below test data:

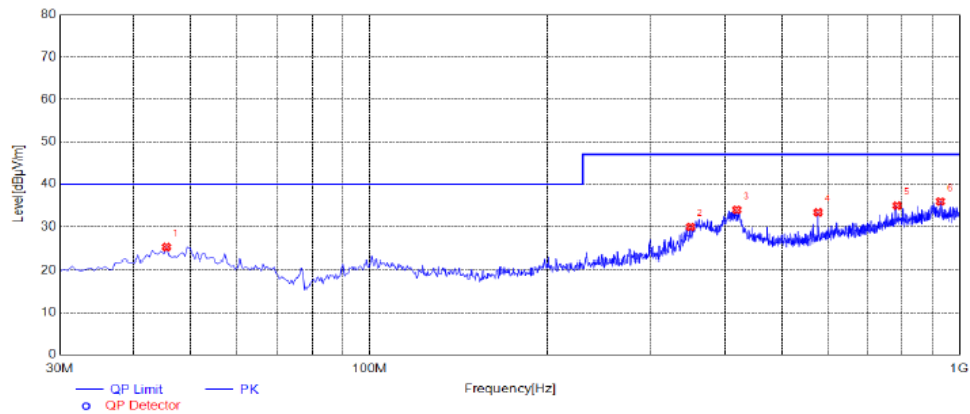
Test mode:

Mode 1

Polarization

Horizontal

Test Graph



Suspected List

NO.	Frequency [MHz]	Reading [dBμV/m]	Factor [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity	Remark
1	45.5200	31.60	-6.44	25.16	40.00	14.84	100	70	PK	Horizontal	PASS
2	350.1000	35.85	-5.93	29.92	47.00	17.08	100	290	PK	Horizontal	PASS
3	419.4550	38.67	-4.78	33.89	47.00	13.11	100	50	PK	Horizontal	PASS
4	576.1100	35.81	-2.48	33.33	47.00	13.67	100	340	PK	Horizontal	PASS
5	784.1750	33.96	0.97	34.93	47.00	12.07	100	80	PK	Horizontal	PASS
6	928.7050	31.17	4.72	35.89	47.00	11.11	100	300	PK	Horizontal	PASS

Note: 1. Result (dBμV/m) = Reading(dBμV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

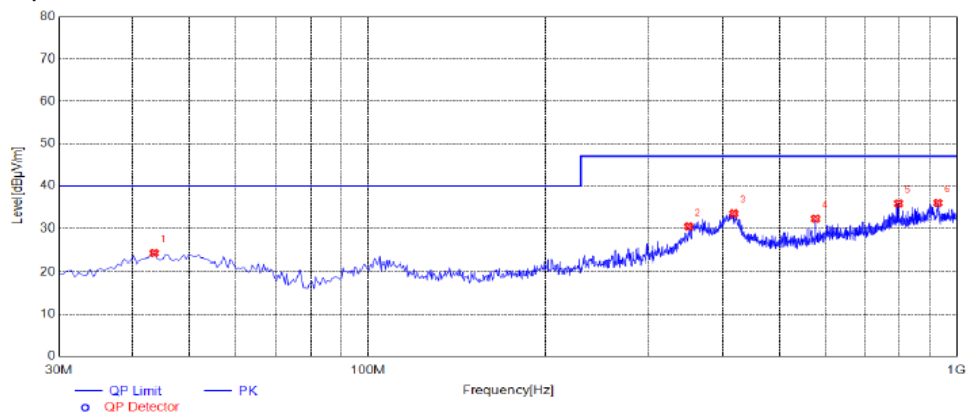
Test mode:

Mode 1

Polarization

Vertical

Test Graph



Suspected List

NO.	Frequency [MHz]	Reading [dBμV/m]	Factor [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector	Polarity	Remark
1	43.5800	30.63	-6.55	24.08	40.00	15.92	100	300	PK	Vertical	PASS
2	350.5850	36.31	-5.95	30.36	47.00	16.64	100	50	PK	Vertical	PASS
3	418.4850	38.27	-4.82	33.45	47.00	13.55	100	40	PK	Vertical	PASS
4	576.1100	34.68	-2.48	32.20	47.00	14.80	100	30	PK	Vertical	PASS
5	797.2700	34.73	1.10	35.83	47.00	11.17	100	200	PK	Vertical	PASS
6	929.6750	30.70	5.26	35.96	47.00	11.04	100	290	PK	Vertical	PASS

Note: 1. Result (dBμV/m) = Reading(dBμV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

Test Mode: TM1(above 1GHz)	Test Distance: 3m
Test voltage: DC 3.3V	Test Results: Passed
Detector Function: Peak+AV	

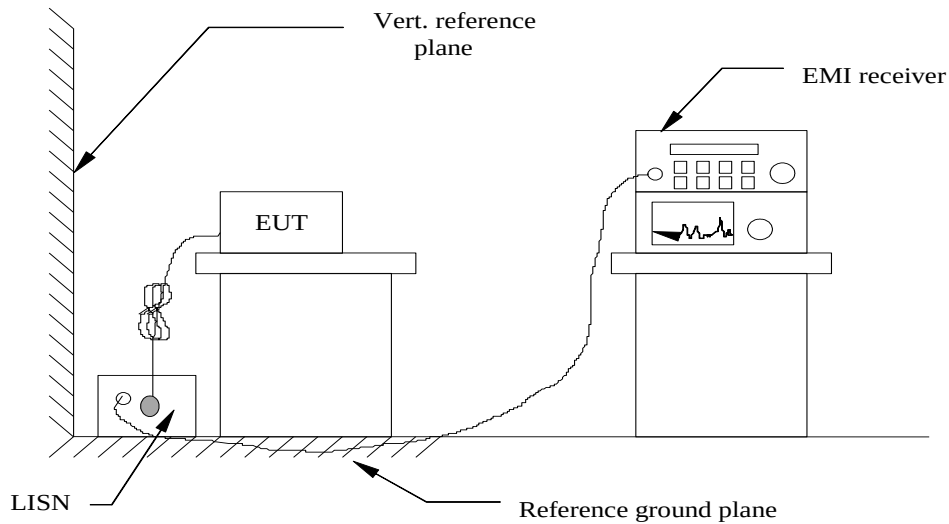
Frequency MHz	Emission Level dB μ V/m		Limits dB μ V/m		Margin dB μ V/m		Polarization
	Peak	AV	Peak	AV	Peak	AV	
1287.84	54.88	38.13	70.00	50.00	-15.12	-11.87	H
1832.96	57.02	32.33	70.00	50.00	-12.98	-17.67	H
2160.14	54.01	36.61	70.00	50.00	-15.99	-13.39	H
3251.16	54.36	39.87	74.00	54.00	-19.64	-14.13	H
4476.91	52.46	34.49	74.00	54.00	-21.54	-19.51	H
5704.19	52.43	33.54	74.00	54.00	-21.57	-20.46	H
1287.11	54.50	38.18	70.00	50.00	-15.50	-11.82	V
1832.19	57.78	32.45	70.00	50.00	-12.22	-17.55	V
2158.99	53.50	37.03	70.00	50.00	-16.50	-12.97	V
3251.06	53.15	40.58	74.00	54.00	-20.85	-13.42	V
4477.66	53.38	34.53	74.00	54.00	-20.62	-19.47	V
5703.11	53.12	33.61	74.00	54.00	-20.88	-20.39	V

4.1.2. Conducted Emission (AC Mains)

LIMIT

Please refer to ETSI EN301489-1 Clause 8.4.3, Table 8 and EN55032 Annex A, Table A.9, A.11

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 8.4.3 for the measurement methods

TEST RESULTS

Passed

Please refer to the below test data:

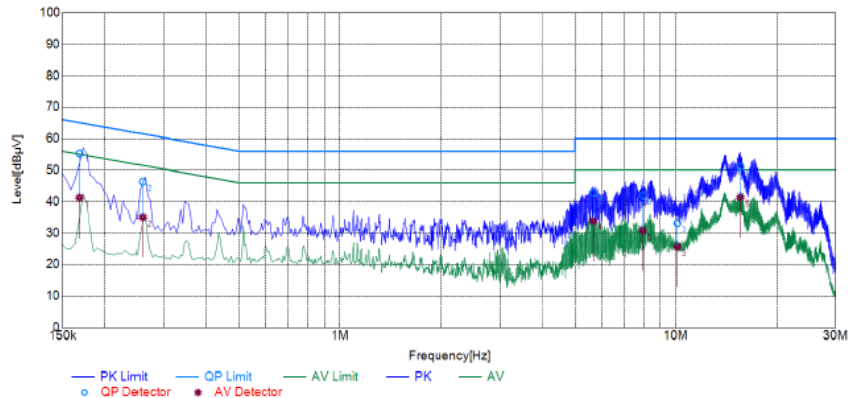
Test mode:

Mode 1

Polarization

L

Test Graph



Final Data List

NO.	Frequency [MHz]	QP Reading [dBμV]	AVG. Reading [dBμV]	Factor [dB]	QP Result [dBμV]	AVG. Result [dBμV]	QP Limit [dBμV]	AVG. Limit [dBμV]	QP Margin [dB]	AVG. Margin [dB]	Line	Remark
1	0.1685	45.01	30.93	10.24	55.27	41.19	65.03	55.03	9.76	13.84	L1	PASS
2	0.2579	36.23	24.96	10.12	46.35	35.08	61.50	51.50	15.15	16.42	L1	PASS
3	10.0951	22.90	15.51	10.59	33.11	25.72	60.00	50.00	26.89	24.28	L1	PASS
4	5.6815	32.28	23.41	10.44	42.72	33.85	60.00	50.00	17.28	16.15	L1	PASS
5	7.9685	31.31	20.23	10.57	41.88	30.80	60.00	50.00	18.12	19.20	L1	PASS
6	15.5764	39.94	30.22	11.11	51.06	41.34	60.00	50.00	8.94	8.66	L1	PASS

Note: 1. Result (dBμV) = Reading (dBμV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

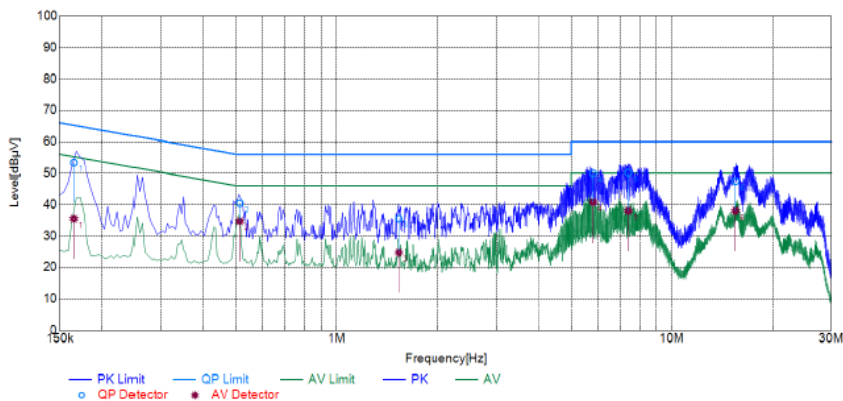
Test mode:

Mode1

Polarization

N

Test Graph



Final Data List

NO.	Frequency [MHz]	QP Reading [dBμV]	AVG. Reading [dBμV]	Factor [dB]	QP Result [dBμV]	AVG. Result [dBμV]	QP Limit [dBμV]	AVG. Limit [dBμV]	QP Margin [dB]	AVG. Margin [dB]	Line	Remark
1	0.1652	43.03	25.26	10.27	53.31	35.54	65.20	55.20	11.89	19.66	N	PASS
2	0.5131	30.12	24.51	10.24	40.37	34.76	56.00	46.00	15.63	11.24	N	PASS
3	1.5316	25.31	14.58	10.24	35.55	24.82	56.00	46.00	20.45	21.18	N	PASS
4	5.8158	39.51	30.26	10.46	49.97	40.72	60.00	50.00	10.03	9.28	N	PASS
5	7.4165	39.61	27.54	10.54	50.14	38.07	60.00	50.00	9.86	11.93	N	PASS
6	15.4845	36.36	26.98	11.09	47.45	38.07	60.00	50.00	12.55	11.93	N	PASS

Note: 1. Result (dBμV) = Reading (dBμV) + Factor (dB).

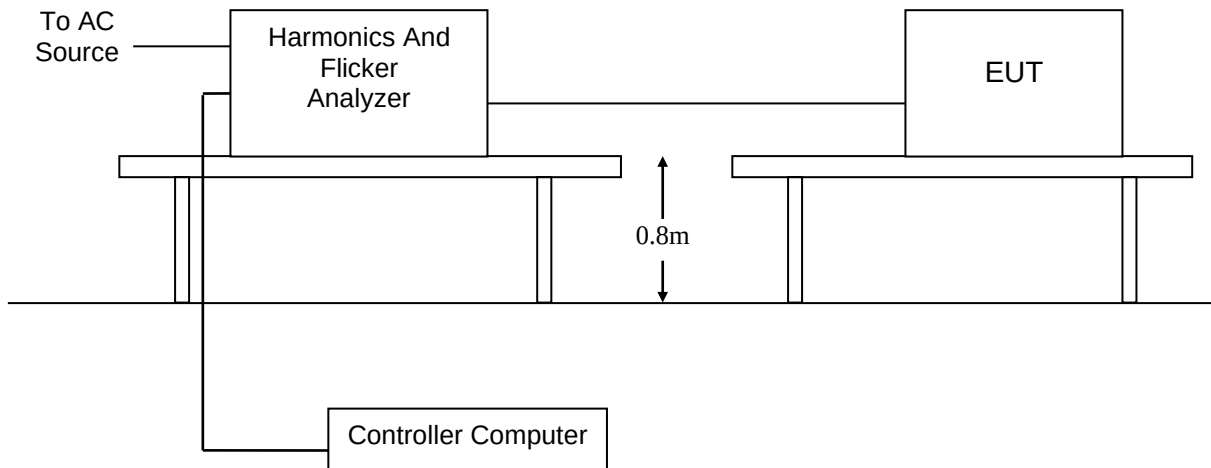
2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

4.1.3. Harmonic Current Emission

LIMIT

Please refer to EN 61000-3-2

TEST CONFIGURATION



TEST PROCEDURE

Please refer to EN 61000-3-2 for the measurement methods.

TEST RESULTS

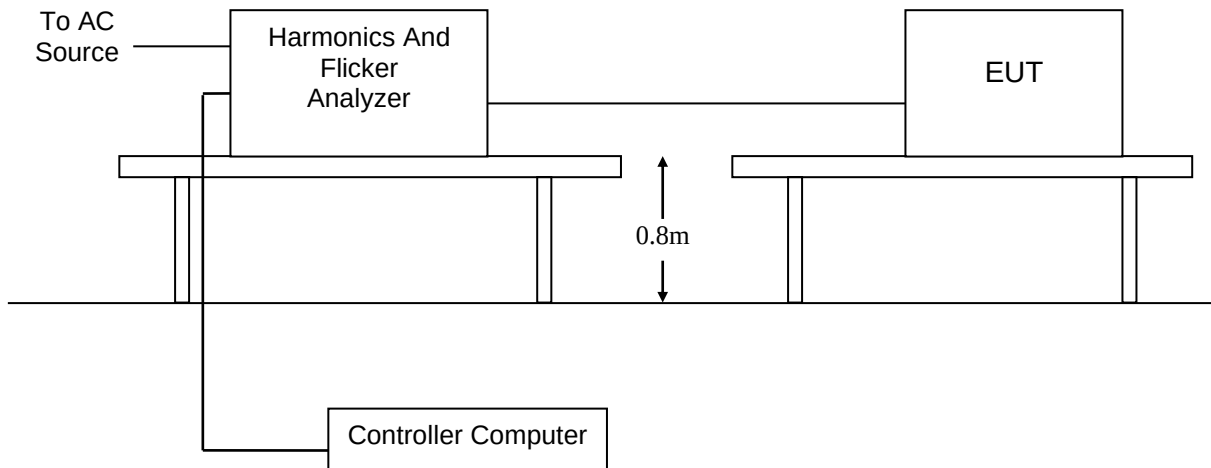
Not applicable to this device (The product without test since the rating power of EUT is less than 75W).

4.1.4. Voltage Fluctuation and Flicker

LIMIT

Please refer to EN 61000-3-3

TEST CONFIGURATION



TEST PROCEDURE

Please refer to EN 61000-3-3 for the measurement methods.

TEST RESULTS

Maximum Flicker results

	EUT values	Limit	Result
Pst	0.036	1.00	PASS
Plt	0.033	0.65	PASS
dc [%]	0.031	3.30	PASS
dmax [%]	0.225	4.00	PASS
dt [s]	0.027	0.50	PASS

4.2. IMMUNITY

4.2.1. Performance criteria

■ ETSI EN301489-17

General performance criteria

- 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.

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

NOTE 1:

Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2:

No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

Performance criteria for Continuous phenomena applied to Transmitters (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 Criterion of EN55035

Criterion A: The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended.

Criterion B: After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended.

Criterion C: 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.

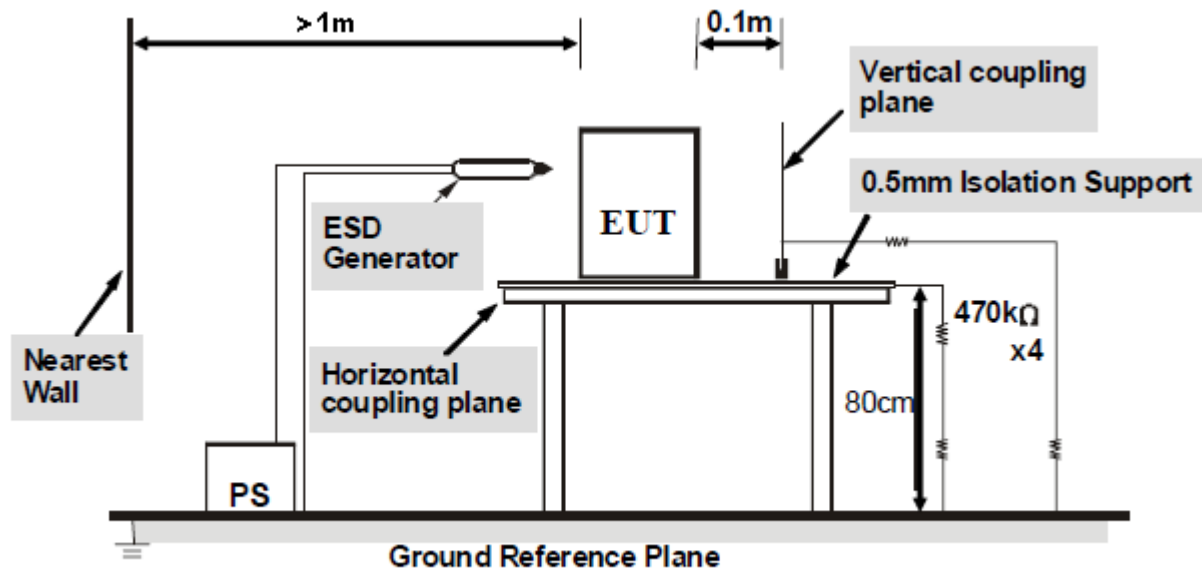
4.2.2. Electrostatic Discharge

LIMIT

SEVERITY LEVELS OF ELECTROSTATIC DISCHARGE

Test level: Contact Discharge at $\pm 2\text{KV}$, $\pm 4\text{KV}$ Air Discharge at $\pm 2\text{KV}$, $\pm 4\text{KV}$, $\pm 8\text{KV}$

TEST CONFIGURATION



TEST PROCEDURE

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

Contact Discharge:

The ESD generator is held perpendicular to the surface to which the discharge is applied and the tip of the discharge electrode touch the surface of EUT. Then turn the discharge switch. The generator is then re-triggered for a new single discharge and repeated at least 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Air Discharge:

Air discharge is used where contact discharge can't be applied. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated at least 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Indirect discharge for horizontal coupling plane:

At least 10 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT.

Indirect discharge for vertical coupling plane:

At least 10 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

TEST MODE

Please reference to the section 2.3

TEST RESULTS

Direct discharge				
Type of discharge	Discharge voltage (KV)	Observations Performance	Criteria Level	Result
Contact discharge	±2	No degradation in performance of the EUT was observed (A)	B	Pass
	±4		B	
Air discharge	±2	A	B	N/A
	±4	A	B	
	±8	A	B	
Indirect discharge				
Type of discharge	Discharge voltage (KV)	Observations Performance	Criteria Level	Result
HCP (6 sides)	±2	A	B	Pass
	±4	A	B	
VCP (4 sides)	±2	A	B	
	±4	A	B	

Remark: The ancillary equipment's specification for an acceptable level of performance or degradation of performance during and/or after the ESD tests.

4.2.3. RF Electromagnetic Field

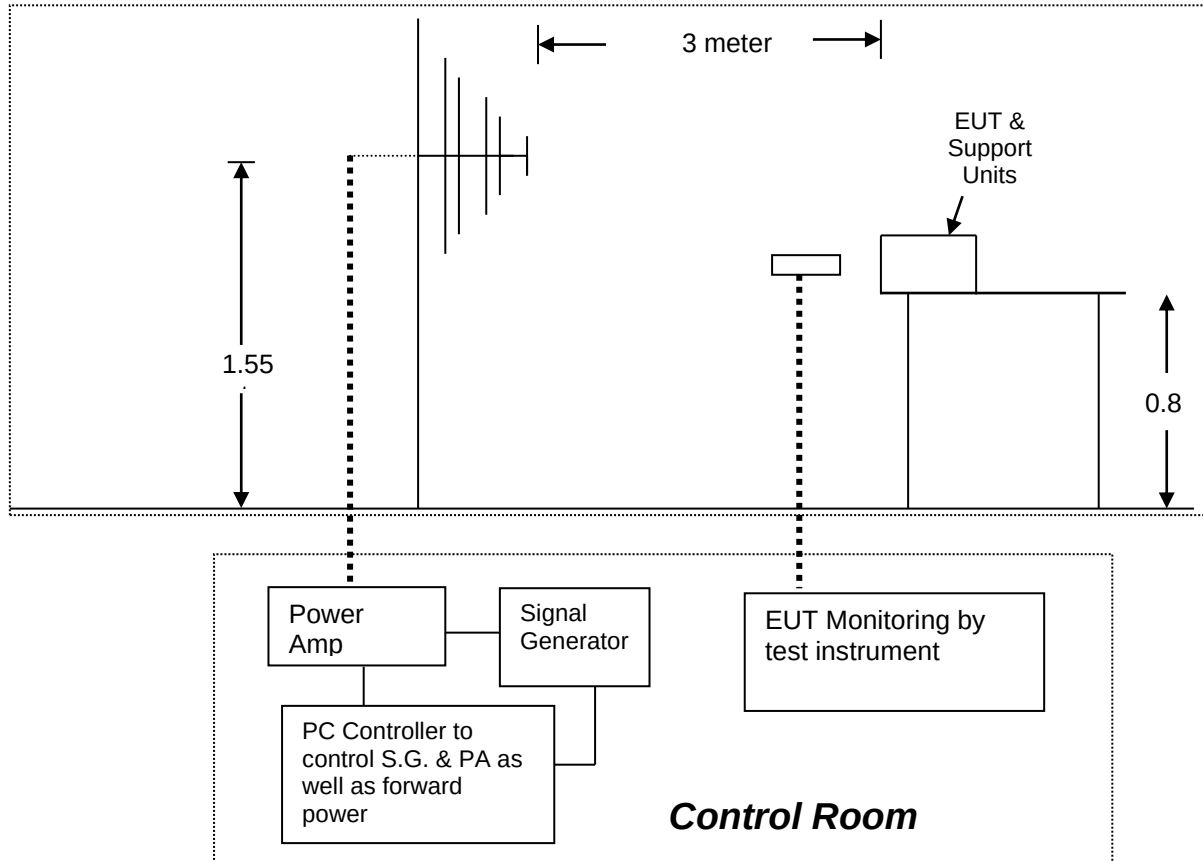
PERFORMANCE CRITERION

Criteria A

TEST LEVEL

3V/m (80%, 1kHz Amplitude Modulation)

TEST CONFIGURATION



TEST PROCEDURE

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

TEST MODE

Please reference to the section 2.3

TEST RESULTS

Frequency	Level	Modulation	Antenna Polarization	EUT Face	Observations (Performance Criterion)	Result
80 MHz-6 GHz	3 V/m	1 kHz, 80 % Amp. Mod, 1 % increment, dwell time=3seconds	V	Front	A	Pass
			H		A	Pass
			V	Rear	A	Pass
			H		A	Pass
			V	Left	A	Pass
			H		A	Pass
			V	Right	A	Pass
			H		A	Pass
			V	Top	A	Pass
			H		A	Pass
			V	Bottom	A	Pass
			H		A	Pass

4.2.4. Surges

PERFORMANCE CRITERION

Criteria B

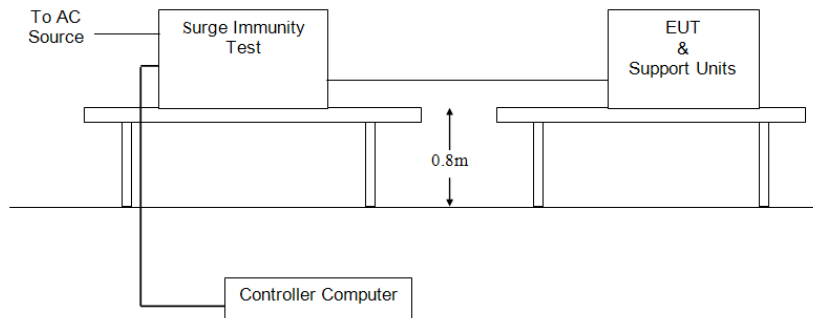
TEST LEVEL

1kV Line to Line: Differential mode

2kV Line to Ground: Common mode

(Voltage Waveform: 1.2/50 us; Current Waveform: 8/20 us)

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.8.2 and EN 61000-4-5 for the measurement methods.

TEST MODE

Please reference to the section 2.3

TEST RESULTS

Location	Level(kV)	Pulse No	Surge Interval	Phase(deg)	Observations (Performance Criterion)	Result
L-N	± 1	5	60s	0°	A	Pass
				90°	A	Pass
				180°	A	Pass
				270°	A	Pass

Remark: A: No degradation in performance of the EUT was observed.

4.2.5. RF- Common Mode 0.15MHz to 80MHz

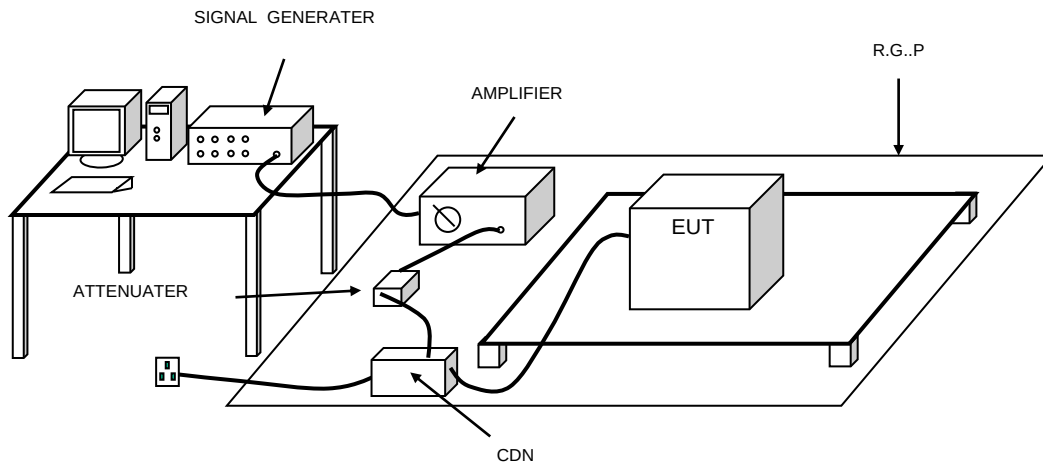
PERFORMANCE CRITERION

Criteria A

TEST LEVEL

3Vrms on AC main port (80%, 1kHz Amplitude Modulation)

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.5.2 and EN 61000-4-6 for the measurement methods.

TEST MODE

Please reference to the section 2.3

TEST RESULTS

Frequency	Injected Position	Level	Modulation	Observations (Performance Criterion)	Result
150kHz to 80MHz	AC Mains	3Vrms	1 kHz, 80 % Amp. Mod, 1 % increment, dwell time=3seconds	A	Pass

4.2.6. Fast Transients Common Mode

PERFORMANCE CRITERION

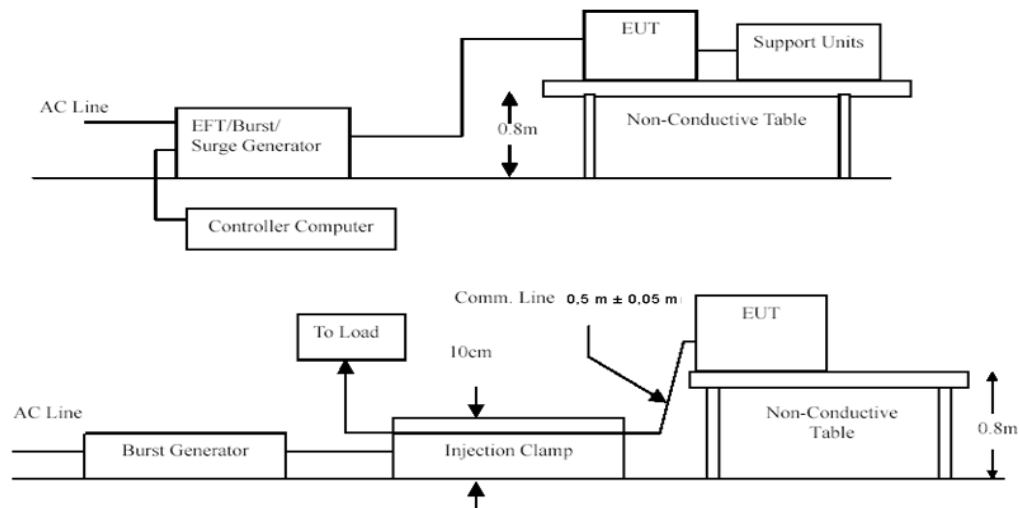
Criteria B

TEST LEVEL

1KV for AC main port

(Impulse Frequency: 5 kHz; Tr/Th: 5/50ns; Burst Duration: 15ms; Burst Period: 3Hz)

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.4.2 and EN 61000-4-4 for the measurement methods.

TEST MODE

Please reference to the section 2.3

TEST RESULTS

Lead under Test	Level (±kV)	Coupling Direct/Clamp	Observations (Performance Criterion)	Result
L	±1	Direct	A	Pass
N	±1	Direct	A	Pass
L-N	±1	Direct	A	Pass

Remark: A: No degradation in performance of the EUT was observed.

4.2.7. Voltage Dips and Interruptions

PERFORMANCE CRITERION

>95% VD, 0.5 period----Performance criterion: B

>95% VD, 1.0 period----Performance criterion: B

30% VD, 25 period----Performance criterion: C

>95% VI, 250 period----Performance criterion: C

TEST LEVEL

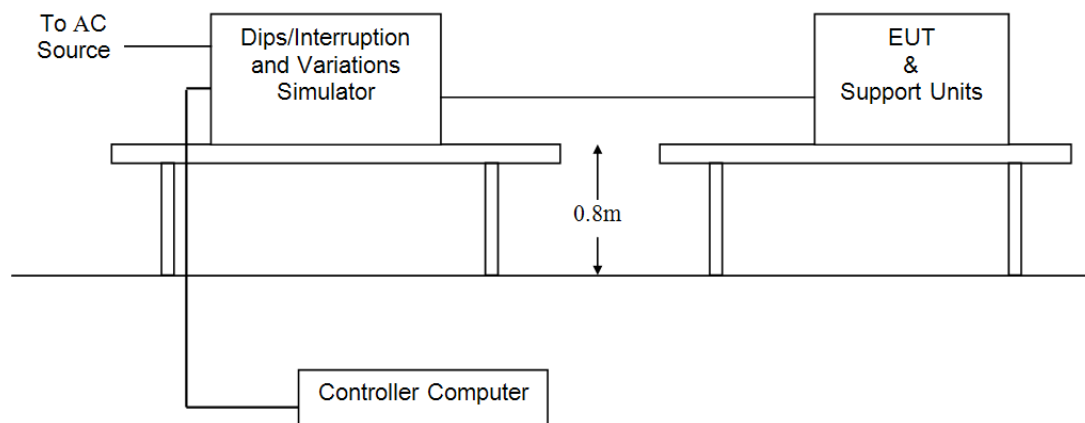
0% of VT(Supply Voltage) for 0.5 period

0% of VT(Supply Voltage) for 1.0 period

70% of VT(Supply Voltage) for 25 period

0% of VT(Supply Voltage) for 250 period

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.7.2 and EN 61000-4-11 for the measurement methods.

TEST MODE

Please reference to the section 2.3

TEST RESULTS

Test Level % UT	Duration (Periods)	Phase angle	No. of drop out	Time between dropout	Observations (Performance Criterion)	Result
0	0.5	0°, 90°, 180°, 270°	3	10s	A	Pass
0	1.0	0°, 90°, 180°, 270°	3	10s	A	Pass
70	25	0°, 90°, 180°, 270°	3	10s	A	Pass
0	250	0°, 90°, 180°, 270°	3	10s	B	Pass

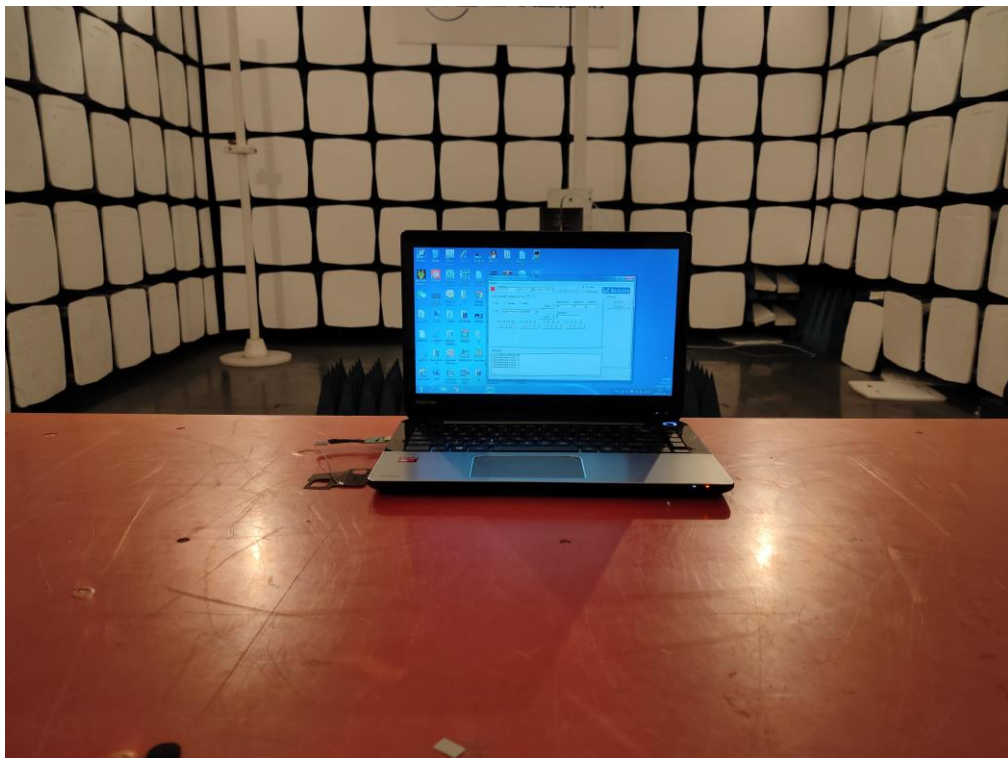
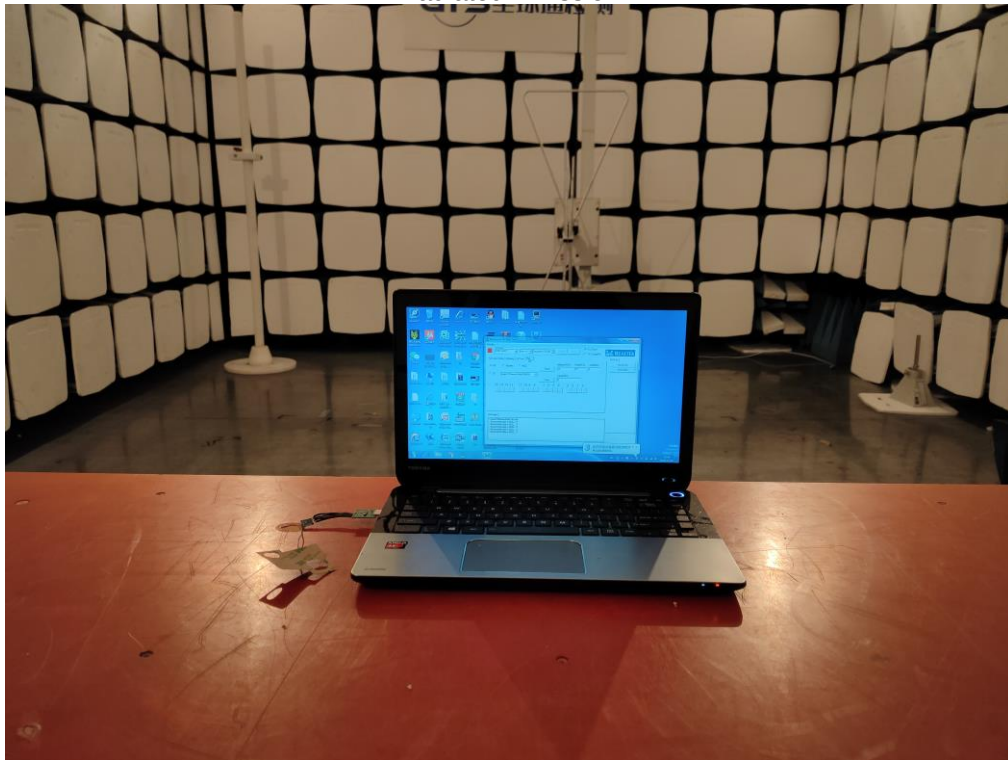
Remark :

A: No degradation in performance of the EUT was observed.

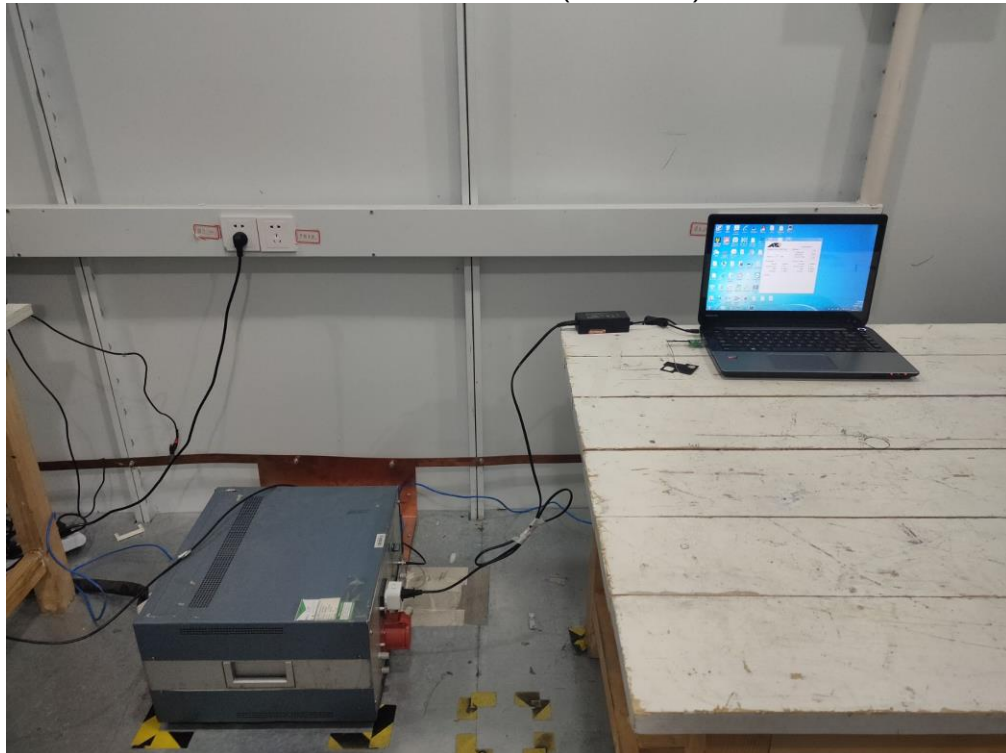
B: During the test, the power shut down, after the experiment, the function can automatically return to normal.

5. TEST SETUP PHOTOS OF THE EUT

Radiated Emission



Conducted Emission(AC Mains)



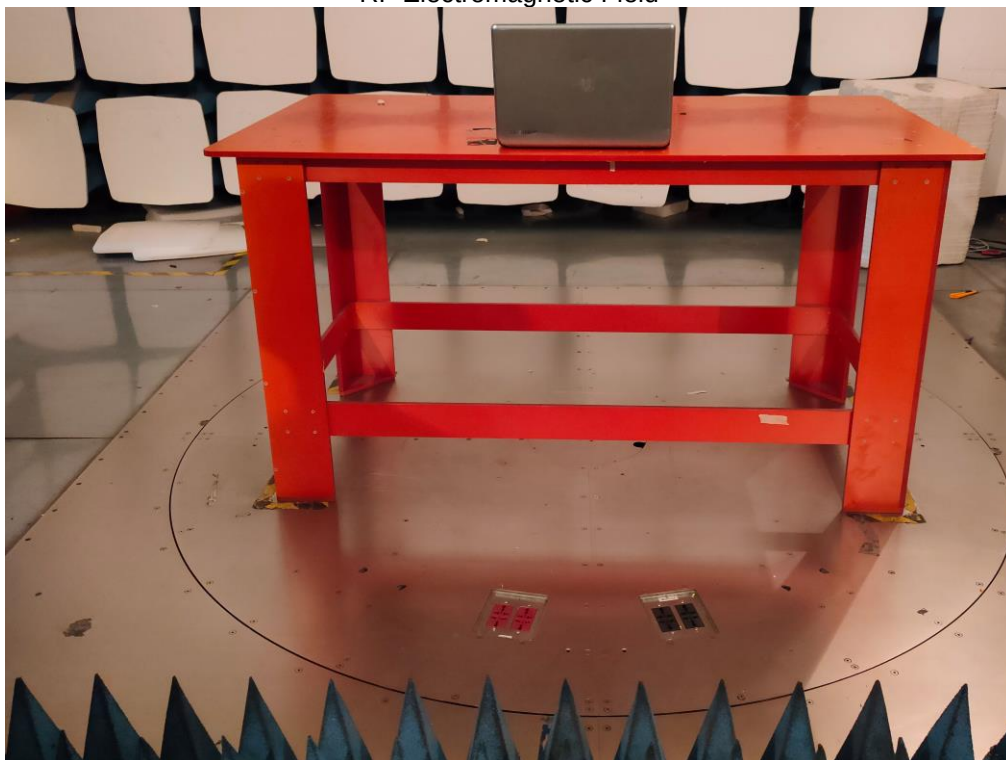
Harmonic Current/ Voltage Fluctuation and Flicker



Electrostatic Discharge



RF Electromagnetic Field



RF Common Mode 0,15 MHz to 80 MHz



Fast Transients Common Mode & Surge & DIPS



6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

6.1. External photos of the EUT

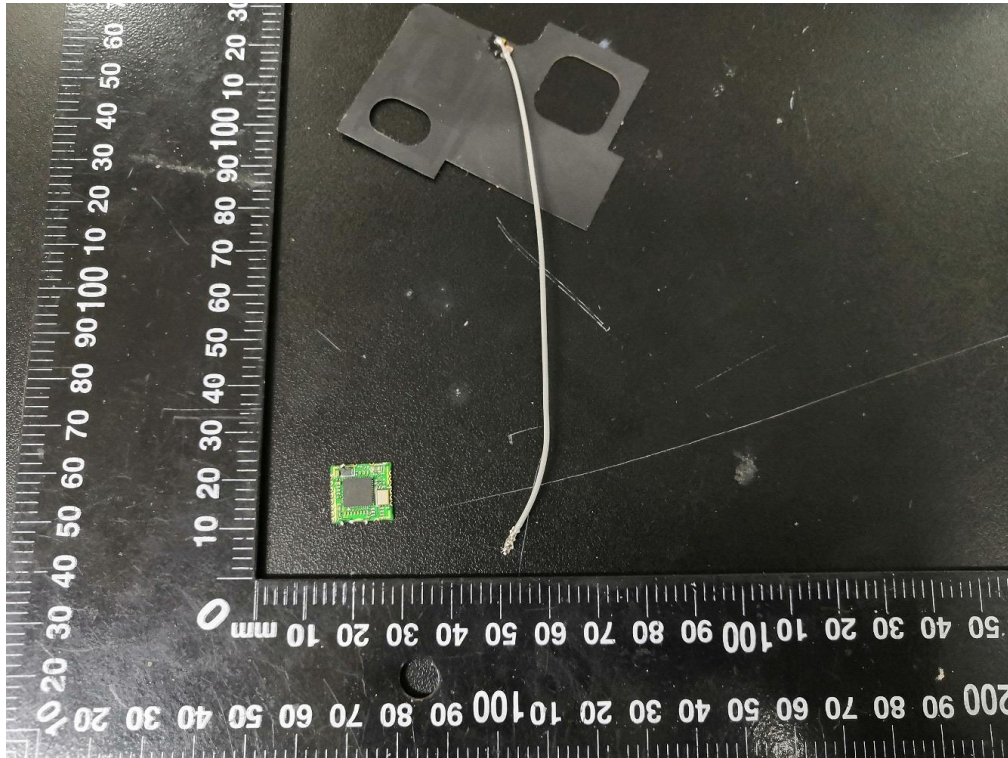


Fig. 1

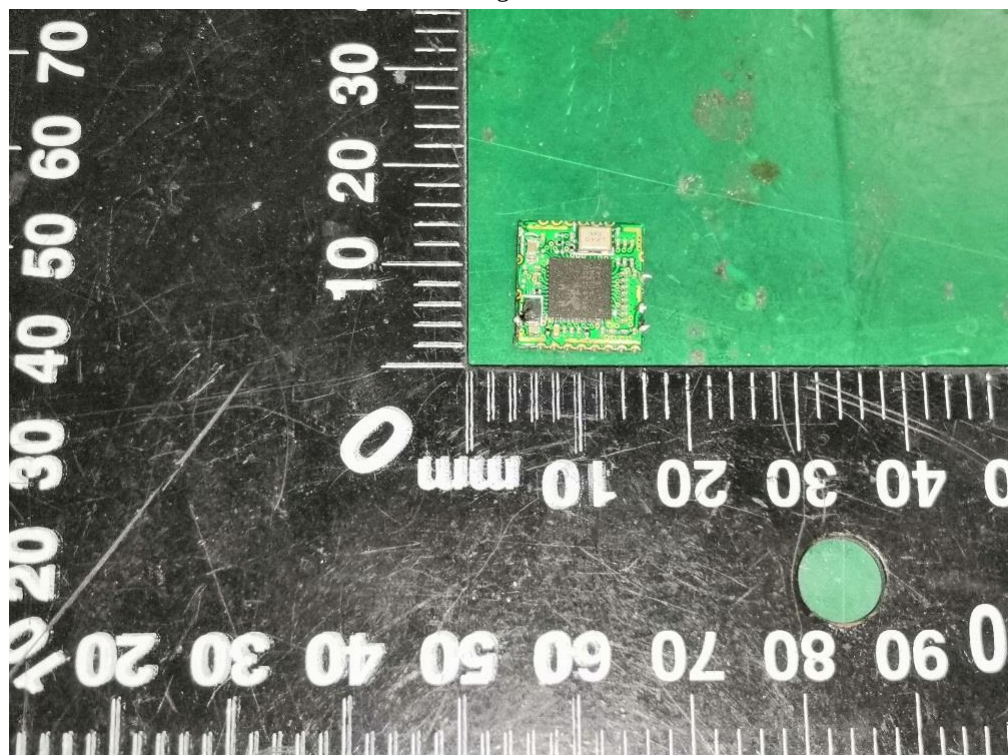


Fig. 2

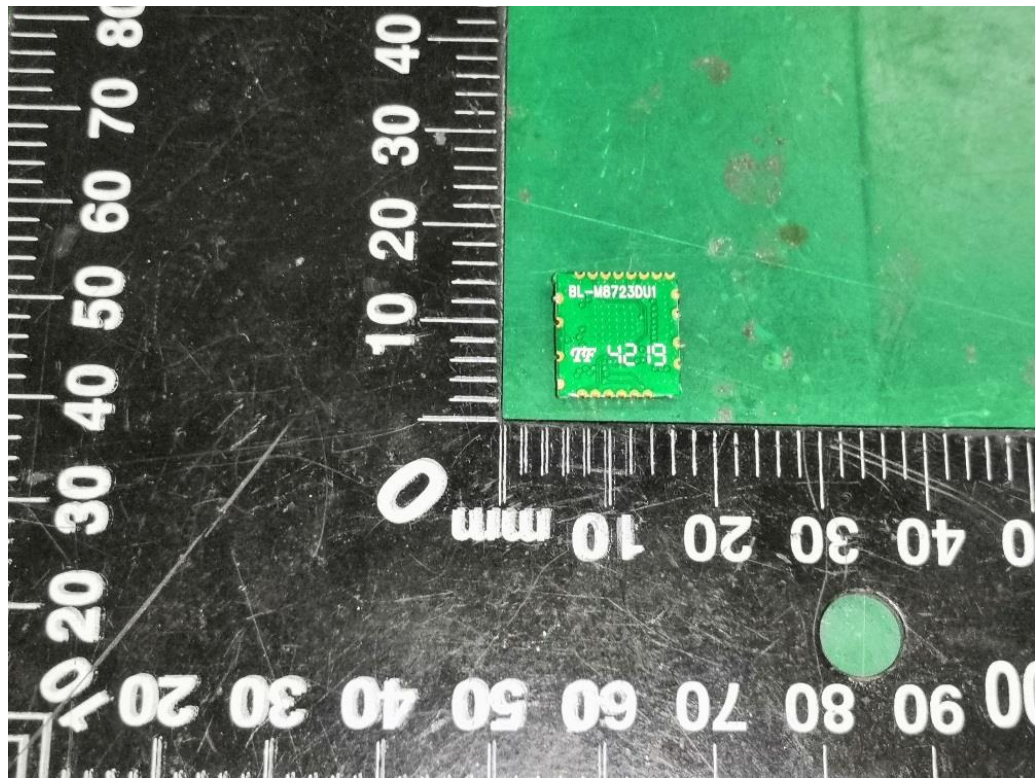


Fig. 3

6.2.Internal photos of the EUT

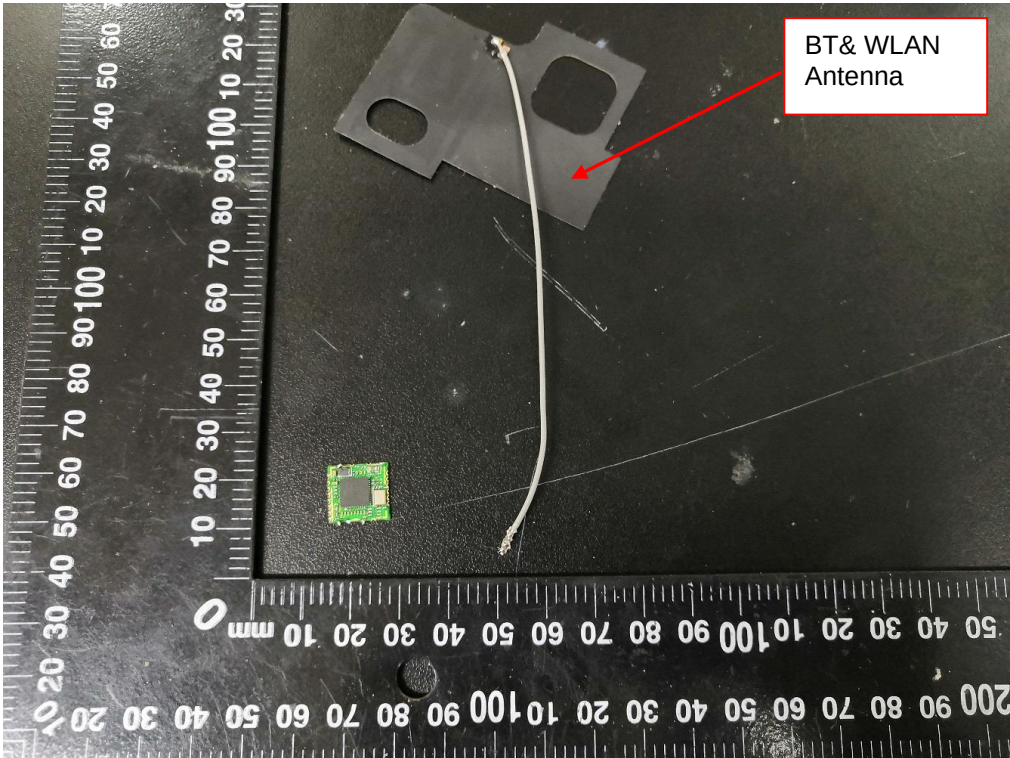


Fig. 4

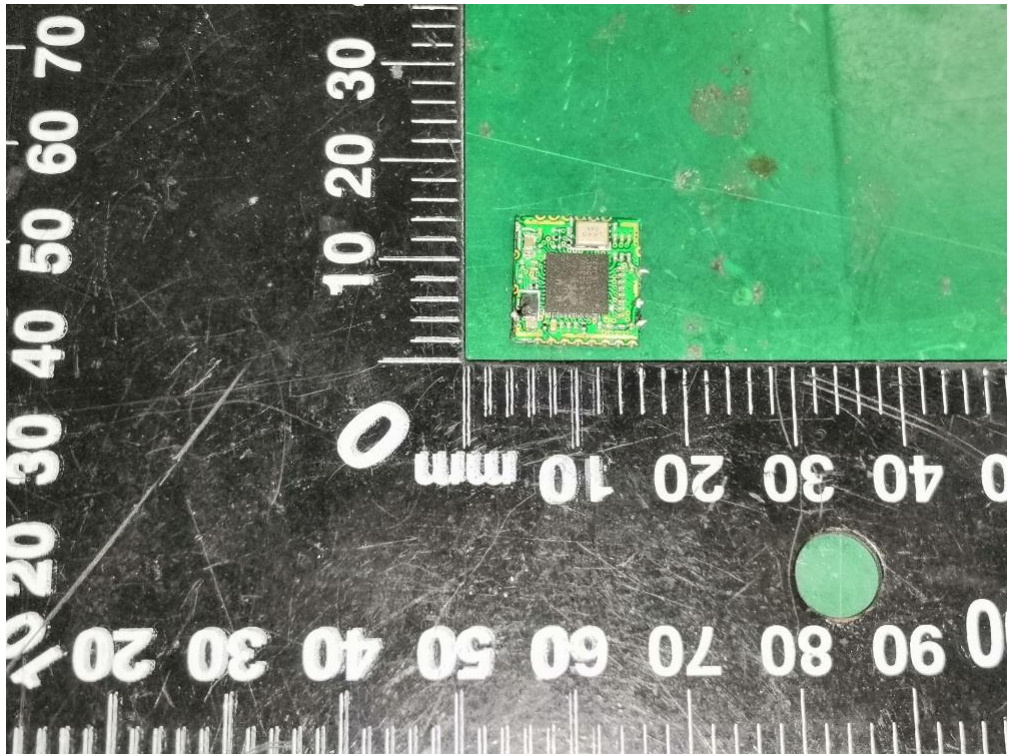


Fig. 5

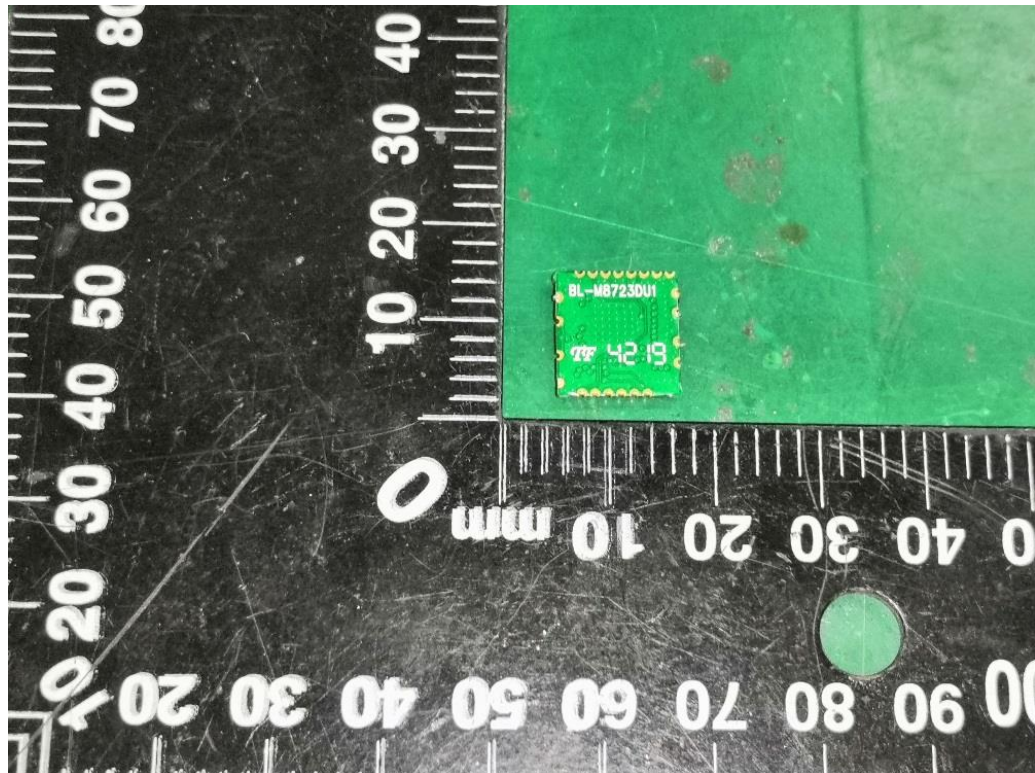


Fig. 6

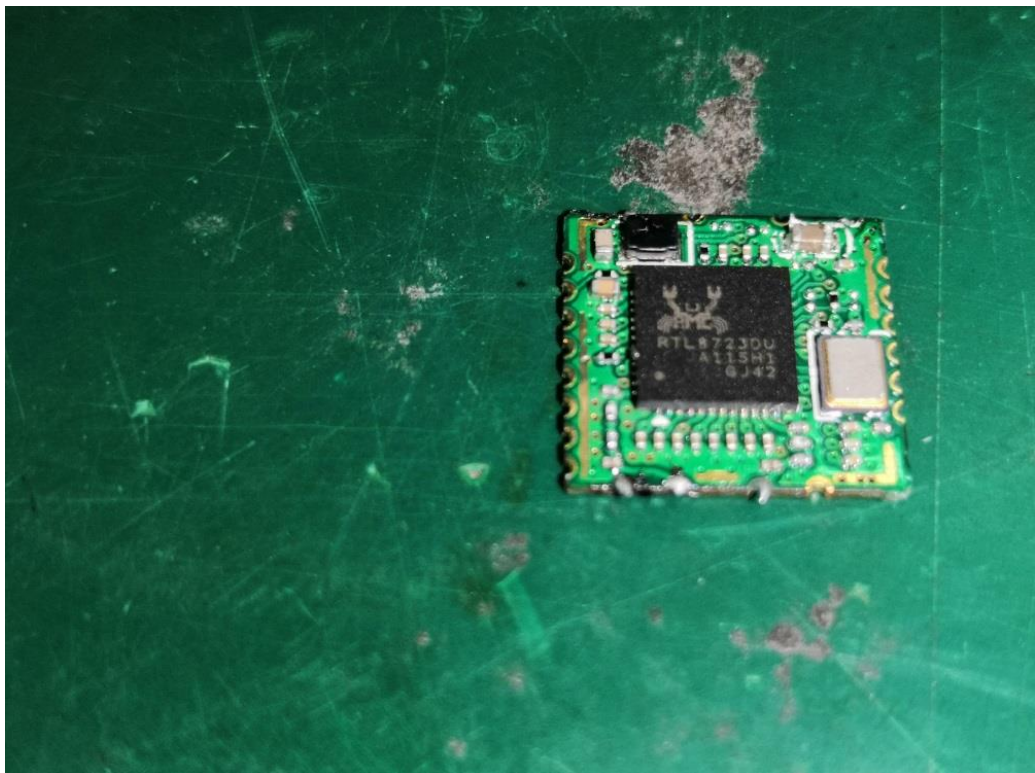


Fig. 7

.....End of Report.....