

TEST REPORT

ETSI EN 301 489-1 V2.1.0 (2016-04) ETSI EN 301 489-17 V3.1.0 (2016-04)

Product : FLOW WIRELESS SPEAKER
Model Name : P326.93X
Brand : N/A
Report No. : PTCHX04161100301E-EM02

Prepared for

Prepared by

DongGuan Precise Testing Service Co.,Ltd.

Building D, Baoding Technology Park, Guangming Road 2, Guangming Community
Dongcheng District, Dongguan, Guangdong, China

TEST RESULT CERTIFICATION

Applicant's name :
Address :
Manufacture's name :
Address :
Product name : FLOW WIRELESS SPEAKER
Model name : P326.93X
Brand Name : N/A

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the RED 2014/53/EU requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of PTC, this document may be altered or revised by PTC, personal only, and shall be noted in the revision of the document.

Date of Test

Date (s) of performance of tests : Nov.02, 2016 ~ Nov.03, 2016

Date of Issue: Nov.04, 2016

Test Result: **Pass**

Tested By:

August Qiu

August Qiu / Engineer

Approved & Authorized Signer



Chris Du / Manager

	Page
2 TEST SUMMARY.....	4
3 GENERAL INFORMATION.....	5
3.1 GENERAL DESCRIPTION OF E.U.T.....	5
4 EQUIPMENT DURING TEST.....	6
4.1 EQUIPMENTS LIST.....	6
4.2 MEASUREMENT UNCERTAINTY.....	8
5 EMC REQUIREMENTS FOR EMISSIONS.....	9
5.1 CONDUCTED EMISSIONS.....	10
5.2 RADIATED EMISSIONS.....	13
5.3 VOLTAGE FLUCTUATION AND FLICKERS.....	18
5.4 HARMONICS CURRENT.....	21
6 EMC REQUIREMENT FOR IMMUNITY.....	24
6.1 PERFORMANCE CRITERIA DESCRIPTION.....	25
6.2 ELECTROSTATIC DISCHARGE(ESD).....	28
6.3 ELECTRICAL FAST TRANSIENTS (EFT).....	30
6.4 SURGES.....	31
6.5 CONDUCTED IMMUNITY 0.15MHZ TO 80MHZ.....	32
6.6 VOLTAGE DIPS AND INTERRUPTIONS.....	33
7 TEST SETUP.....	35
8 EUT PHOTOS.....	37



PRECISE TESTING

Report No.: PTCHX04161100301E-EM02

2 Test Summary

Test	Test Requirement	Test Method	Limit / Severity	Result
EMC Emission				
Conducted Emissions	EN 301 489-17	EN301489-1, EN 55022	Class B	N/A
Radiated Emissions	EN 301 489-17	EN301489-1, EN 55022	Class B	PASS
Harmonic Current Emissions	EN 301 489-17	EN301489-1, EN 61000-3-2	Clause 7 of EN61000-3-2	N/A
Voltage Fluctuations and Flicker	EN 301 489-17	EN301489-1, EN 61000-3-3	Clause 5 of EN61000-3-3	N/A
EMC Immunity				
Electrostatic Discharge(ESD)	EN 301 489-17	EN301489-1, EN 61000-4-2	±2,4 kV Contact ±2,4,8 kV Air	PASS
Radiated Immunity (R/S)	EN 301 489-17	EN301489-1, EN 61000-4-3	3V/m, 80%, 1kHz, Amp. Mod.	PASS
Electrical Fast Transients (EFT)	EN 301 489-17	EN301489-1, EN 61000-4-4	AC ±0.5/1.0 kV	N/A
Surge Immunity	EN 301 489-17	EN301489-1, EN 61000-4-5	±1kV D.M.† ±2kV C.M.‡	N/A
Conducted Immunity (C/S)	EN 301 489-17	EN301489-1, EN 61000-4-6	3Vrms(emf), 80%, 1kHz Amp. Mod.	N/A
Voltage Dips and Interruptions	EN 301 489-17	EN301489-1, EN 61000-4-11	0 % UT* for 0.5per 0 % UT* for 1per 70 % UT* for 25per 0 % UT* for 250per	N/A
Remark:				
N/A: Not Applicable				



PRECISE TESTING

Report No.: PTCHX04161100301E-EM02

3 General Information

3.1 General Description of E.U.T.

Product Name	:	FLOW WIRELESS SPEAKER
Model Name	:	P326.93X
Model Description	:	N/A
Bluetooth Version	:	BT3.0
Operating frequency	:	2402-2480MHz, 79 channels
Antenna installation:	:	Integrated Antenna
Antenna Gain:	:	0dBi
Type of Modulation	:	BT(1Mbps): GFSK BT EDR(2Mbps): $\pi/4$ -DQPSK BT EDR(3Mbps): 8-DPSK
Power supply	:	DC 5 V for power/DC 3V from battery
Hardware version	:	N/A
Software version	:	N/A



PRECISE TESTING

Report No.: PTCHX04161100301E-EM02

4 Equipment During Test

4.1 Equipments List

CONDUCTED EMISSION							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EMI Test Receiver	Rohde&Schwarz	ESCI	101417	July 15, 2016	July 14, 2017	1 year
2	Artificial Mains Network	Narda	L2-16B	000WX31025	July 15, 2016	July 14, 2017	1 year
RADIATEDEMISSION							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EMI Test Receiver	Rohde&Schwarz	ESCI	101417	July 15, 2016	July 14, 2017	1 year
2	Trilog Broadband	SCHWARZBECK	VULB9160	9160-3355	July 15, 2016	July 14, 2017	1 year
3	Amplifier	EM	EM-30180	060538	July 15, 2016	July 14, 2017	1 year
4	Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1246	July 15, 2016	July 14, 2017	1 year
HARMONICS AND FILCK							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Harmonics & FlickerAnalyzer	LAPLACE	AC2000A	311216	July 15, 2016	July 14, 2017	1 year
2	AC Power Source	MToni	PHF-5010	630976	July 15, 2016	July 14, 2017	1 year
ESD							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	ESD Generator	HTEC	HESD 16	1416011	July 15, 2016	July 14, 2017	1 year
RS							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Signal Generator	Agilent	N517113-50B	MY53050160	Oct.30, 2016	Oct.29, 2017	1 year
2	Amplifier	A&R	150W1000 M3	313157	Oct.30, 2016	Oct.29, 2017	1 year
3	Amplifier	A&R	50SIG6M2	0342835	Oct.30, 2016	Oct.29, 2017	1 year
4	Antenna	SCHWARZBECK	STLP9149	9149.222	Oct.30, 2016	Oct.29, 2017	1 year
5	Isotropic Field Probe	A&R	FL7006	0342652	Oct.30, 2016	Oct.29, 2017	1 year



PRECISE TESTING

6	Log-periodic Antenna	SCHWARZBECK	STLP 9128E	9128E-012	Oct.30, 2016	Oct.29, 2017	1 year
CS							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	C/S Test System	SCHLODER	CDG-6000-25	126A1279/2014	July 15, 2016	July 14, 2017	1 year
2	CDN	SCHLODER	CDN-M2+3	A2210251/2013	July 15, 2016	July 14, 2017	1 year
EFT							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	EFT Generator	HTEC	HEFT51	1416010	July 15, 2016	July 14, 2017	1 year
Surge							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Surge Generator	HTEC	HCOMB 70	142101	July 15, 2016	July 14, 2017	1 year
2	Surge Generator	HTEC	TCOMB 4	142103	July 15, 2016	July 14, 2017	1 year
3	CDN	HTEC	SCDN 161P	142102	July 15, 2016	July 14, 2017	1 year
Dips							
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Dips Tester	HTEC	HPFS 161P	1416009	July 15, 2016	July 14, 2017	1 year



PRECISE TESTING

Report No.: PTCHX04161100301E-EM02

4.2 Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF output power, conducted	$\pm 1.5\text{dB}$
Power Spectral Density, conducted	$\pm 3\text{dB}$
Unwanted Emissions, conducted	$\pm 3\text{dB}$
All emissions, radiated	$\pm 6\text{dB}$
Time	$\pm 2\%$
Duty Cycle	$\pm 2\%$
Temperature	$\pm 1^{\circ}\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 3\%$
Conduction disturbance(150kHz~30MHz)	$\pm 3.26\text{dB}$
Radiated Emission(30MHz~1GHz)	$\pm 4.73\text{dB}$
Radiated Emission(1GHz~25GHz)	$\pm 5.02\text{dB}$

5 EMC Requirements for Emissions

(1) Normal Test Conditions:

Ambient Condition: Normal

(2) Extreme Test Conditions:

N/A

(3) Test Configuration

- measurements shall be made in the operational mode producing the largest emission in the frequency band being investigated consistent with normal applications;
- the equipment shall be configured in a manner which is representative for normal/typical operation, where practical;
- where radio equipment is provided with an integral antenna, it shall be tested with the antenna fitted in a manner typical of normal intended use, unless declared as a removable antenna;
- if the equipment is part of a system, or can be connected to ancillary equipment, then it shall be acceptable to test the equipment while connected to the minimum representative configuration of ancillary equipment necessary to exercise the ports;
- if the equipment has a large number of ports, then a sufficient number shall be selected to simulate actual operational conditions and to ensure that all the different types of termination are covered;
- ports, which in normal operation are connected, shall be connected to an ancillary equipment or to a representative piece of cable terminated to simulate the impedance of the ancillary equipment. RF input/output ports shall be correctly terminated;
- the configuration and mode of operation during the measurements shall be precisely noted in the test report.

(4) Test Mode

TM1	Bluetooth link
TM2	Charging

5.1 Conducted Emissions

Test Requirement	: EN 301489-17
Test Method	: EN 301489-1, EN 55022 ,EN 55024
Frequency Range	: 150kHz to 30MHz
Class/Severity	: Class B/ Table 2 of EN55022, EN 55024
Detector	: Peak for pre-scan(9kHz Resolution Bandwidth)

5.1.1. E.U.T. Operation

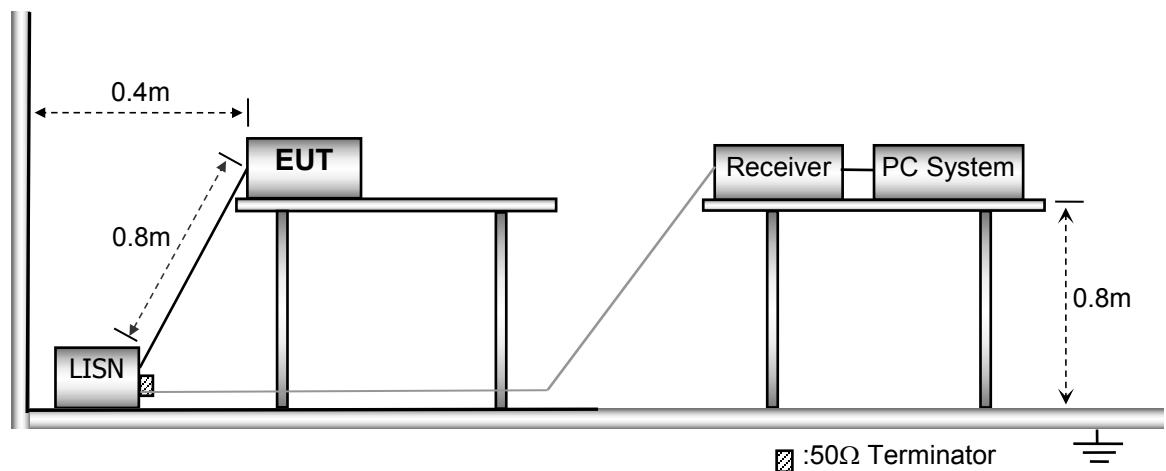
Operating Environment:

Temperature	: 25.5 °C
Humidity	: 51 % RH
Atmospheric Pressure	: 101.2kPa
EUT Operation:	BT mode

Refer to section 5(4).

5.1.2. Test Setup

The conducted emission tests were performed using the setup accordance with the EN 55022.



5.1.3. Measurement Description

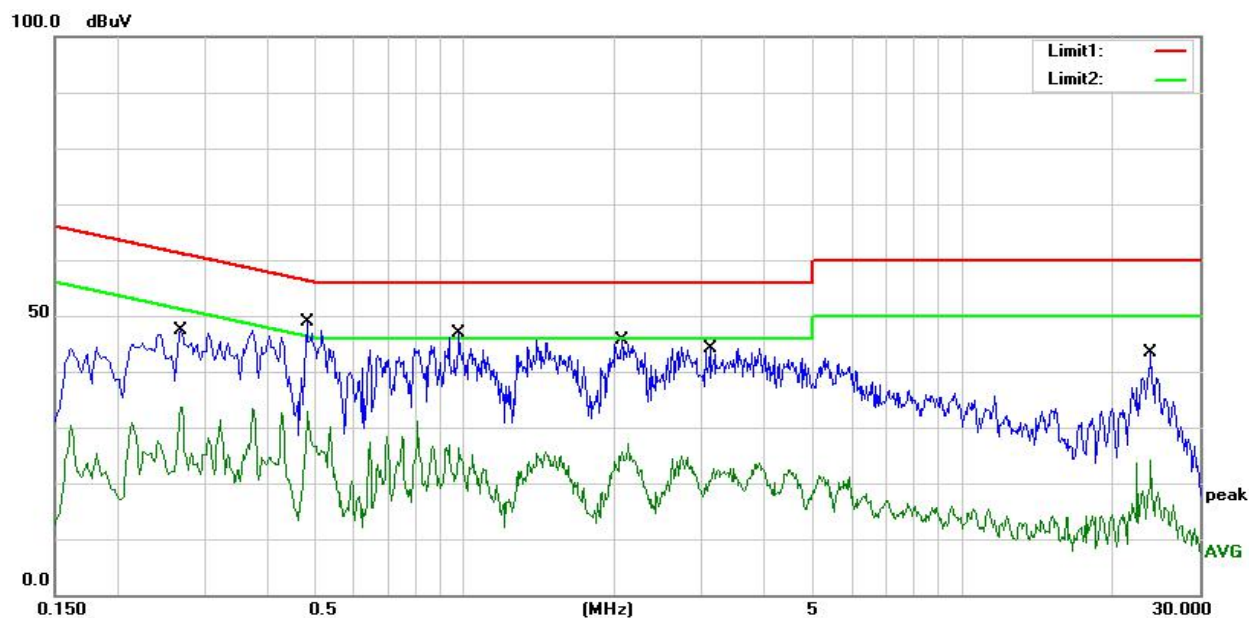
An initial pre-scan was performed on the live and neutral lines.

No further quasi-peak or average measurements were performed since no peak emissions were detected within 10dB line below the average limit.

Please refer to the following peak scan graph for reference.

5.1.4. Test Results

Test Phase: Line,



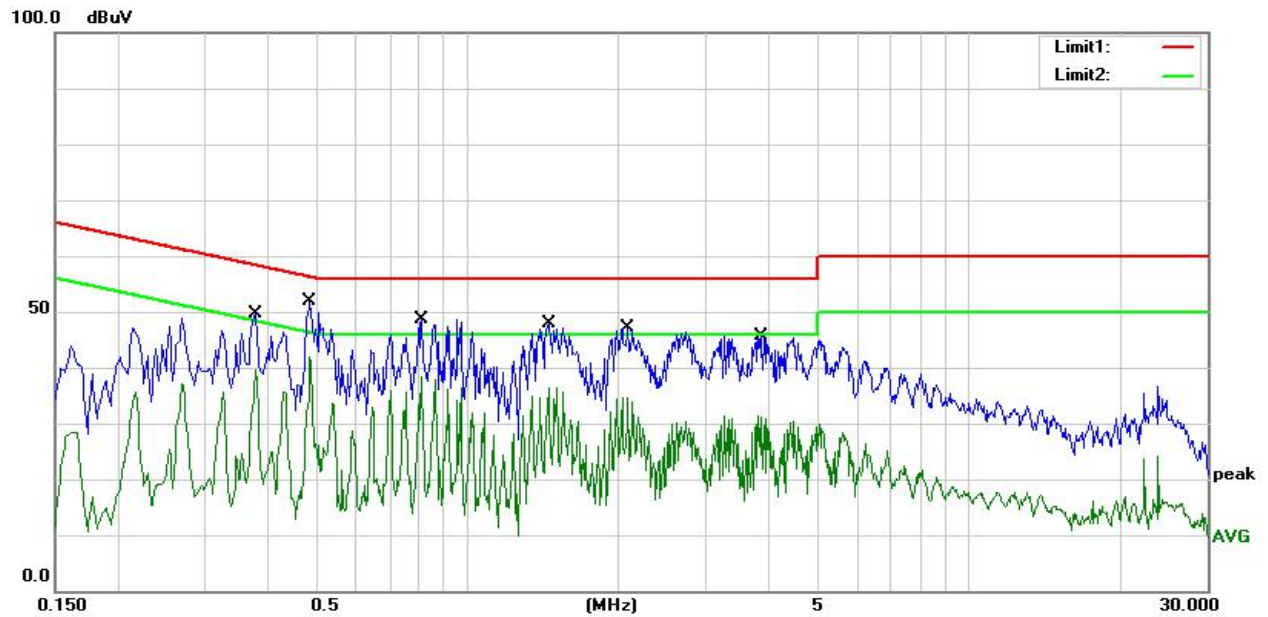
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV/m)	Margin (dB)	Detector
1	0.2700	38.12	9.16	47.28	61.12	-13.84	QP
2	0.2700	24.58	9.16	33.74	51.12	-17.38	AVG
3	0.4820	39.66	9.19	48.85	56.30	-7.45	QP
4	0.4820	23.66	9.19	32.85	46.30	-13.45	AVG
5	0.9780	37.72	9.16	46.88	56.00	-9.12	QP
6	0.9780	17.32	9.16	26.48	46.00	-19.52	AVG
7	2.0740	36.37	9.26	45.63	56.00	-10.37	QP
8	2.0740	17.94	9.26	27.20	46.00	-18.80	AVG
9	3.1140	34.94	9.26	44.20	56.00	-11.80	QP
10	3.1140	14.45	9.26	23.71	46.00	-22.29	AVG
11	24.0020	33.55	9.75	43.30	60.00	-16.70	QP
12	24.0020	14.46	9.75	24.21	50.00	-25.79	AVG



PRECISE TESTING

Report No.: PTCHX04161100301E-EM02

Test Phase: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV/m)	Margin (dB)	Detector
1	0.3780	40.33	9.22	49.55	58.32	-8.77	QP
2	0.3780	30.36	9.22	39.58	48.32	-8.74	AVG
3	0.4860	41.77	9.15	50.92	56.24	-5.32	QP
4	0.4860	32.71	9.15	41.86	46.24	-4.38	AVG
5	0.8100	39.34	9.25	48.59	56.00	-7.41	QP
6	0.8100	29.13	9.25	38.38	46.00	-7.62	AVG
7	1.4500	38.54	9.25	47.79	56.00	-8.21	QP
8	1.4500	25.74	9.25	34.99	46.00	-11.01	AVG
9	2.0900	37.83	9.26	47.09	56.00	-8.91	QP
10	2.0900	25.48	9.26	34.74	46.00	-11.26	AVG
11	3.8740	36.44	9.26	45.70	56.00	-10.30	QP
12	3.8740	22.01	9.26	31.27	46.00	-14.73	AVG



PRECISE TESTING

Report No.: PTCHX04161100301E-EM02

5.2 Radiated Emissions

Test Requirement	: EN 301489-17
Test Method	: EN 301489-1, EN 55022
FrequencyRange	: 30MHz to 1GHz, 1GHz to 6GHz
Class/Severity	: Class B/ Table 6 of EN55022 (30MHz to 1GHz),EN 55024 Class B/ Table 8 of EN55022 (1GHz to 6GHz),EN 55024
Detector	: Peak for pre-scan (120kHz Resolution Bandwidth Below 1GHz; 1MHz Resolution Bandwidth Above 1GHz)

5.2.1. EUT Operation

Operating Environment:

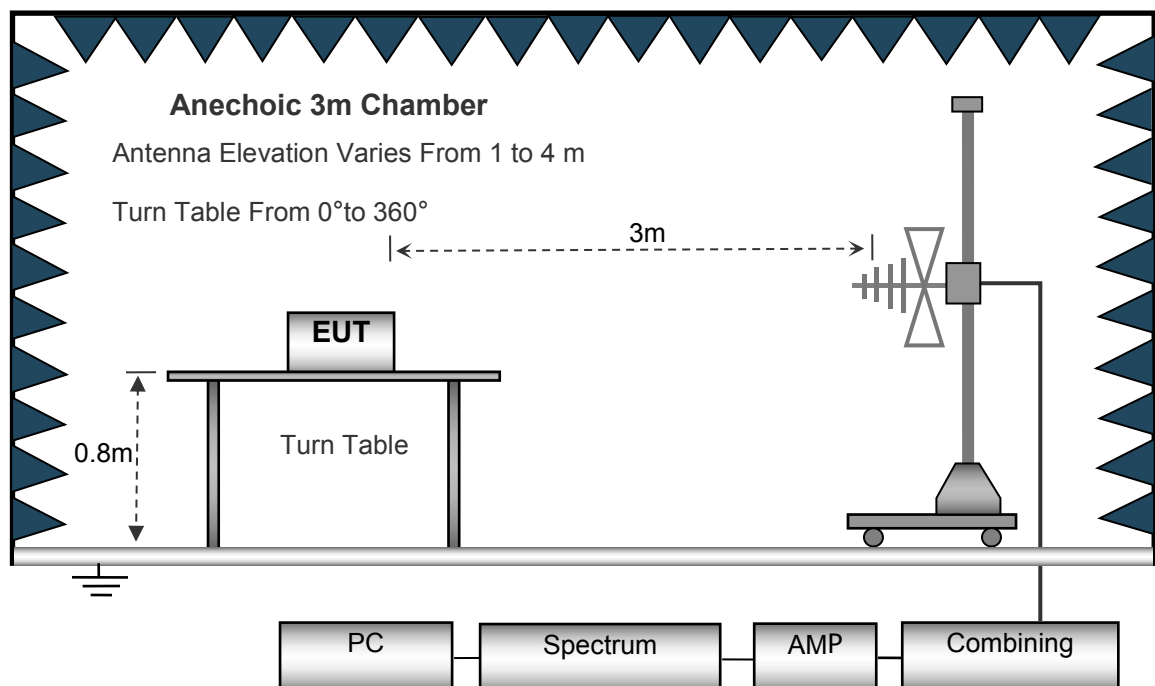
Temperature	: 25.5 °C
Humidity	: 51 % RH
Atmospheric Pressure	: 101.2kPa
EUT Operation:	BT mode

Refer to section 5(4).

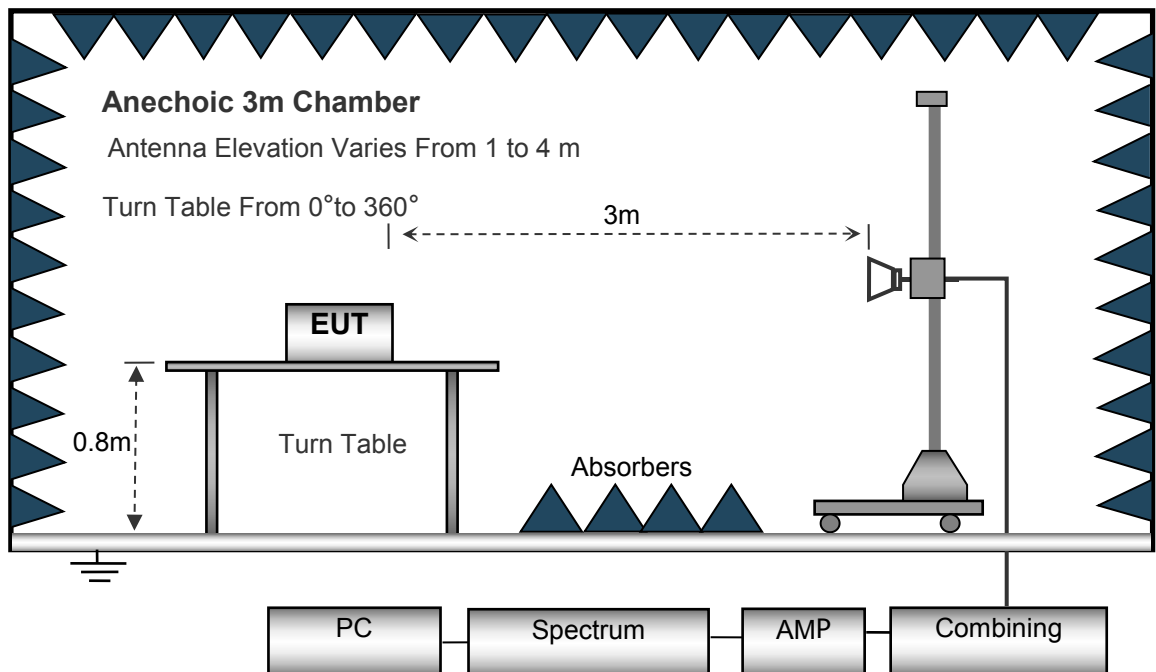
5.2.2. Test Setup

The radiated emission tests were performed using the setup accordance with the EN55022.

Frequency Range: Below 1 GHz



Frequency Range: Above 1 GHz



5.2.3. Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

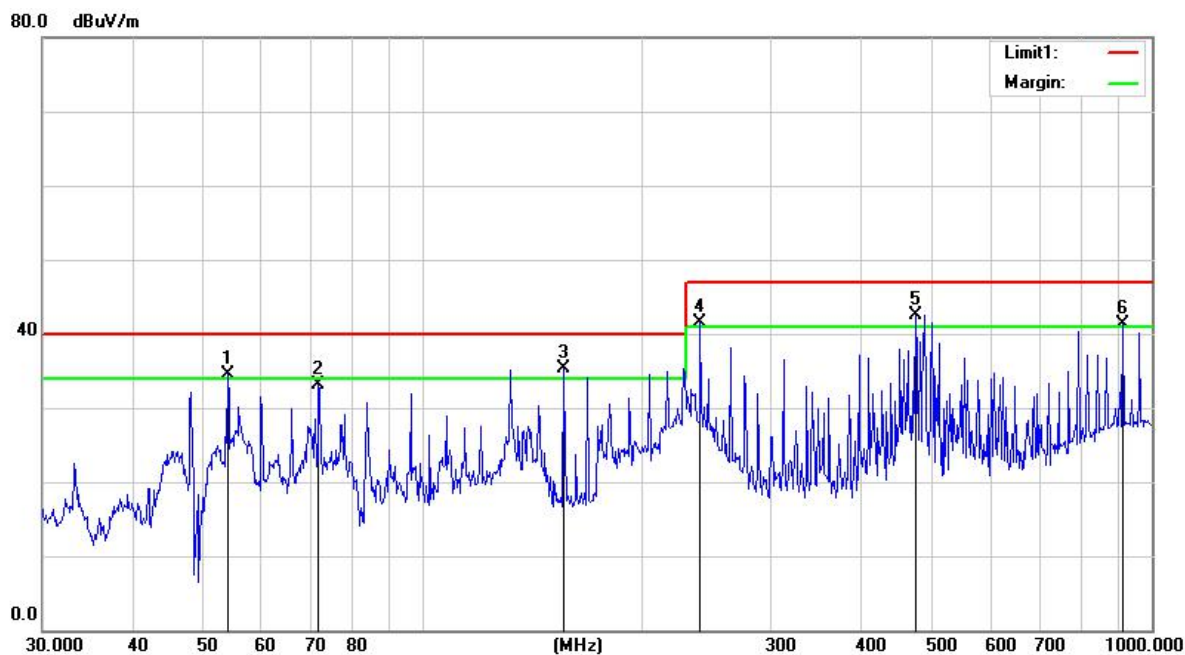
The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

5.2.4. Test Result

Frequency Range: 30MHz ~ 1000MHz

Antenna Polarization: Horizontal



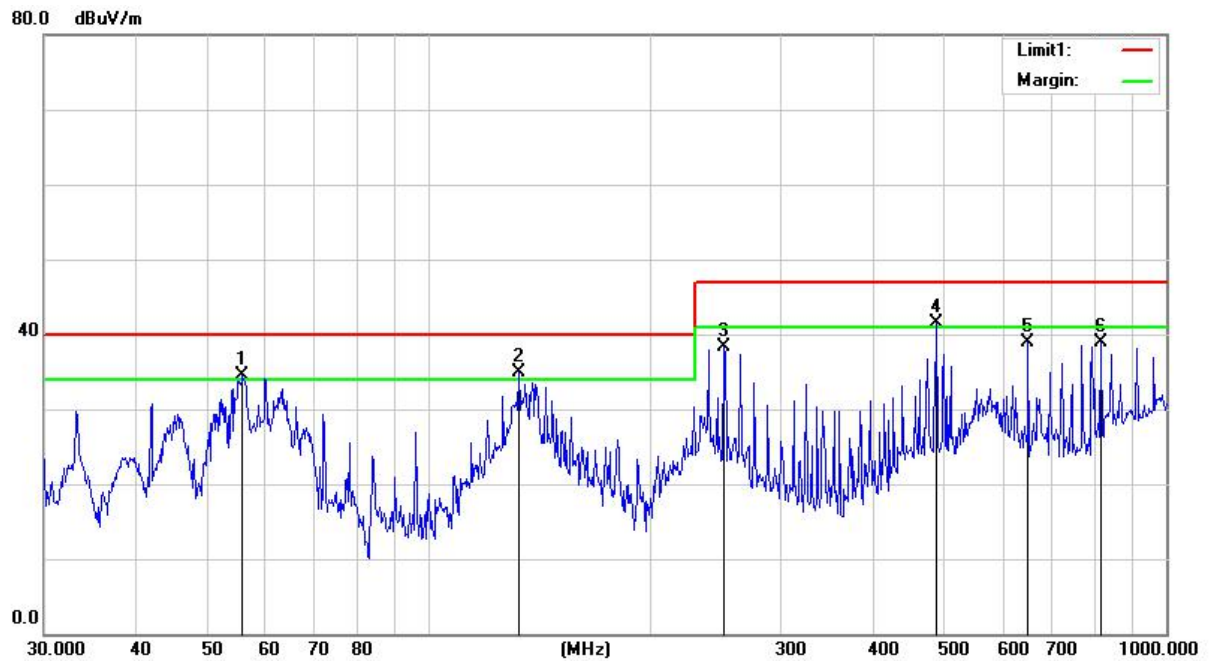
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	53.8817	57.06	-22.59	34.47	40.00	-5.53	QP
2	71.8320	56.87	-23.84	33.03	40.00	-6.97	QP
3	155.9100	53.54	-18.28	35.26	40.00	-4.74	QP
4	239.9873	59.36	-17.76	41.60	47.00	-5.40	QP
5	473.8346	52.20	-9.62	42.58	47.00	-4.42	QP
6	912.8620	43.04	-1.82	41.22	47.00	-5.78	QP



PRECISE TESTING

Report No.: PTCHX04161100301E-EM02

Antenna Polarization: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	55.8046	57.58	-23.13	34.45	40.00	-5.55	QP
2	132.2204	52.39	-17.54	34.85	40.00	-5.15	QP
3	251.1802	54.45	-16.18	38.27	47.00	-8.73	QP
4	487.3150	50.71	-9.21	41.50	47.00	-5.50	QP
5	649.6597	45.23	-6.31	38.92	47.00	-8.08	QP
6	815.9678	42.36	-3.51	38.85	47.00	-8.15	QP



PRECISE TESTING

Report No.: PTCHX04161100301E-EM02

Frequency Range: 1000MHz ~ 6000MHz

Antenna Polarization: Horizontal& Vertical

Remark: Absolute Level= Reading Level+ Factor, Margin= Absolute Level – Limit

Freq. (MHz)	Reading (dBuV)	Corr.Factor (dB)	Measured (dBuV/m)	Limits (dBuV/m)	Margins (dBuV/m)	Ant. H/V	Mark
1750.53	73.45	-10.98	62.47	70.00	-7.53	V	PK
1750.21	52.64	-10.98	41.66	50.00	-8.34	V	Avg
2122.48	65.72	-10.54	55.18	70.00	-14.82	V	PK
2122.46	51.26	-10.54	40.72	50.00	-9.28	V	Avg
1750.55	67.63	-11.52	56.11	70.00	-13.89	H	PK
1750.97	55.54	-11.52	44.02	50.00	-5.98	H	Avg
2150.86	65.78	-10.08	55.70	70.00	-14.30	H	PK
2150.66	53.36	-10.08	43.28	50.00	-6.72	H	Avg



PRECISE TESTING

Report No.: PTCHX04161100301E-EM02

5.3 VOLTAGE FLUCTUATION AND FLICKERS

Test Requirement : IEC/EN 61000-3-3

Tests	Measurement Value	Limit	Descriptions
	IEC555-3	IEC/EN 61000-3-3	
P_{st}	$\leq 1.0, T_p = 10 \text{ min.}$	$\leq 1.0, T_p = 10 \text{ min.}$	Short Term Flicker Indicator
P_{lt}	N/A	$\leq 0.65, T_p = 2 \text{ hr.}$	Long Term Flicker Indicator
$T_{dt(s)}$	$\leq 3\%$	$\leq 3.3\%$	Relative Steady-State V-Chang
$d_{max}(\%)$	$\leq 4\%$	$\leq 4\%$	Maximum Relative V-Chang
$d_c(\%)$	N/A	$\leq 3.3\% \text{ for } > 500 \text{ ms}$	Relative V-change Characteristic

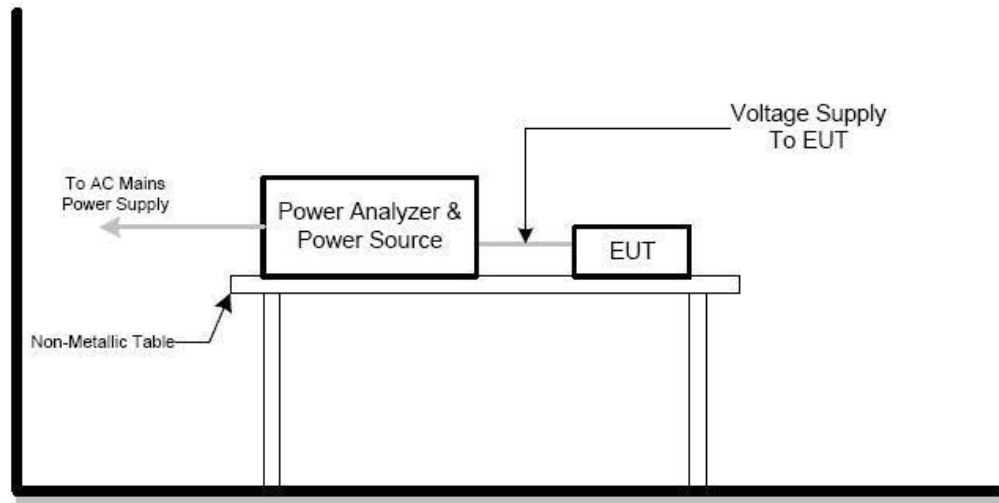
5.2.5. EUT Operation

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

Temperature : 25.5 °C
Humidity : 51 % RH
Atmospheric Pressure : 101.2kPa
EUT Operation: BT mode

Refer to section 5(4).

5.2.6. Test Setup



5.2.7. TEST PROCEDURE

a. Harmonic Current Test:

Test was performed according to the procedures specified in Clause 5.0 of IEC555-2 and/or Sub-clause 6.2 of IEC/EN 61000-3-2 depend on which standard adopted for compliance measurement.

b. Fluctuation and Flickers Test:

Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.

c. All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.



PRECISE TESTING

Report No.: PTCHX04161100301E-EM02

5.2.8. Test Result

Test Parameter	Measurement Value	Limit	Remarks
P _{st}	--	1.0	N/A
P _{lt}	--	0.65	N/A
T _{dt(s)}	--	0.5	N/A
d _{max} (%)	--	4%	N/A
d _c (%)	--	3.3%	N/A

Not apply



PRECISE TESTING

Report No.: PTCHX04161100301E-EM02

5.4 HARMONICS CURRENT

Test Requirement : EN 61000-3-2

IEC 555-2					
Table - I			Table - II		
Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)
Non Portable Tools or TV Receivers	Odd Harmonics		TV Receivers	Odd Harmonics	
	3	2.30		3	0.80
	5	1.14		5	0.60
	7	0.77		7	0.45
	9	0.40		9	0.30
	11	0.33		11	0.17
	13	0.21		13	0.12
	15≤n≤39	0.15 · 15/n		15≤n≤39	0.10 · 15/n
	Even Harmonics			Even Harmonics	
	2	1.08		2	0.30
4	0.43	4	0.15		
8	0.30				
8≤n≤40	0.23 · 8/n		DC	0.05	

EN 61000-3-2/IEC 61000-3-2					
Equipment Category	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in A) (mA/w)	
Class A	Same as Limits Specified in 4-2.1, Table - I, but only odd harmonics required	Class D	3	2.30	3.4
			5	1.14	1.9
			7	0.77	1.0
			9	0.40	0.5
			11	0.33	0.35
			13≤n≤39	see Table I	3.85/n
			only odd harmonics required		

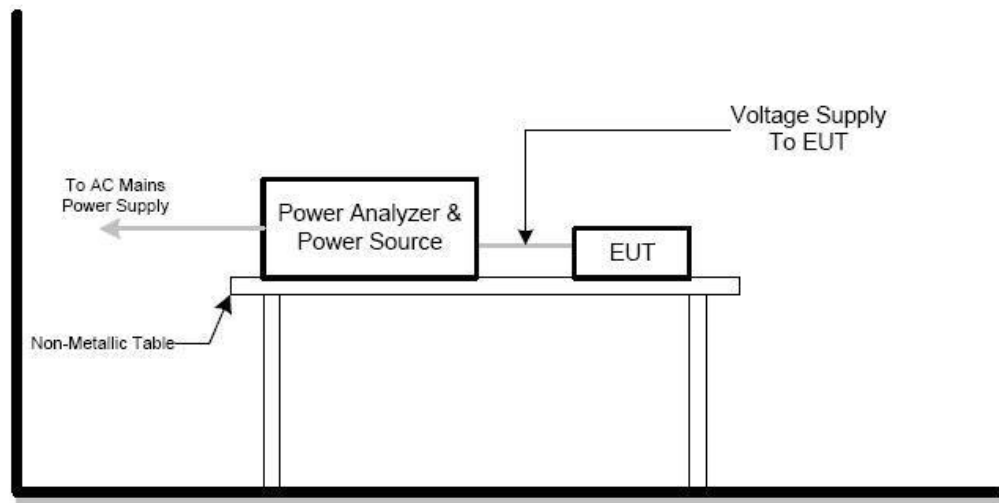
5.4.1 EUT Operation

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

Temperature : 25.5 °C
Humidity : 51 % RH
Atmospheric Pressure : 101.2kPa
EUT Operation: BT mode

Refer to section 5(4).

5.4.2 Test Setup



5.4.3 TEST PROCEDURE

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated

to produce the maximum harmonic components under normal operating conditions.

b. The classification of EUT is according to section 5 of EN 61000-3-2. The EUT is classified as follows:

Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

Class B: Portable tools. Portable tools.; Arc welding equipment which is not professional equipment.

Class C: Lighting equipment.

Class D: Equipment having a specified power less than or equal to 600W of the following types: Personal computers and personal computer monitors and television receivers.

c. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

5.4.4 Test Result

Note: The active input power of the EUT is less than 75 W. No limits apply for equipment with an active input power up to and including 75W

6 EMC Requirement for Immunity

(1). Normal Test Conditions:

Ambient Condition: Normal

(2). Extreme Test Conditions:

N/A

(3). Test Configuration

- the tests shall be made in the mode(s) of operation specified in clause 4 in the relevant part of the EN 301 489 series [i.13] dealing with the particular type of radio equipment;
- the tests shall be carried out at a point within the specified normal operating environmental range and at the rated supply voltage for the equipment;
- if the equipment is part of a system, or can be connected to ancillary equipment, then it shall be acceptable to test the equipment connected to the minimum representative configuration of ancillary equipment necessary to exercise the ports;
- where radio equipment is provided with an integral antenna, it shall be tested with the antenna fitted in a manner typical of normal intended use, unless declared as a removable antenna;
- for the immunity tests of ancillary equipment, without a separate pass/fail criteria, the receiver or transmitter coupled to the ancillary equipment, shall be used to judge whether the ancillary equipment passes or fails;
- if the equipment has a large number of ports, then a sufficient number shall be selected to simulate actual operational conditions and to ensure that all the different types of termination are covered;
- ports, which in normal operation are connected, shall be connected to an ancillary equipment or to a representative piece of cable terminated to simulate the impedance of the ancillary equipment. RF input/output ports shall be correctly terminated;
- ports which are not connected to cables during normal intended operation, e.g. service connectors, programming connectors, temporary connectors etc. shall not be connected to any cables for the purpose of EMC testing. Where cables have to be connected to these ports, or interconnecting cables have to be extended in length in order to exercise the Equipment Under Test (EUT), precautions shall be taken to ensure that the evaluation of the EUT is not affected by the addition or extension of these cables;
- the configuration and mode of operation during the tests shall be precisely noted in the test report.

(4). Test Mode

TM1*	Bluetooth link
TM2	Charging

6.1 Performance Criteria Description

EN 301 489-1 requirements:

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(CT);
- performance criteria for transient phenomena applied to transmitters(TT);
- performance criteria for continuous phenomena applied to receivers(CR);
- performance criteria for transient phenomena applied to receivers(TR).

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 EN 301 489 series [i.13] dealing with the particular type of radio equipment.

Performance Criteria	Description
CT,CR	<p>If no further details are given in the relevant part of EN 301 489 series [i.13] dealing with the particular type of radioequipment, the following general performance criteria for continuous phenomena shall apply.</p> <p>During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss offunction is allowed below 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.</p> <p>During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.</p> <p>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.</p>
TT,TR	<p>If no further details are given in the relevant part of EN 301 489 series [i.13] dealing with the particular type of radio equipment, the following general performance criteria for transient phenomena shall apply. After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function isallowed below 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</p>



	<p>performance.</p> <p>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.</p> <p>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.</p>
--	--

EN 301 489-17 requirements:

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.

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

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	Description
CT	<p>The performance criteria A shall apply.</p> <p>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.</p>
TT	<p>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.</p> <p>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.</p>
CR	<p>The performance criteria A shall apply.</p> <p>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.</p>
TR	<p>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.</p> <p>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.</p>

6.2 Electrostatic Discharge(ESD)

Test Requirement	: EN 301 489-17, EN 55024
Test Method	: EN 301 489-1, EN 61000-4-2
Discharge Impedance	: 330 Ω / 150 pF
Discharge Voltage	: Air Discharge: +/-2,4,8 kV Contact Discharge: +/-2,4 kV HCP & VCP: +/-2,4 kV
Polarity	: Positive & Negative
Discharge Repeat Times	: At Least 20 times at each test point
Discharge Mode	: Single Discharge
Discharge Period	: second minimum

6.2.1E.U.T. Operation

Operating Environment:

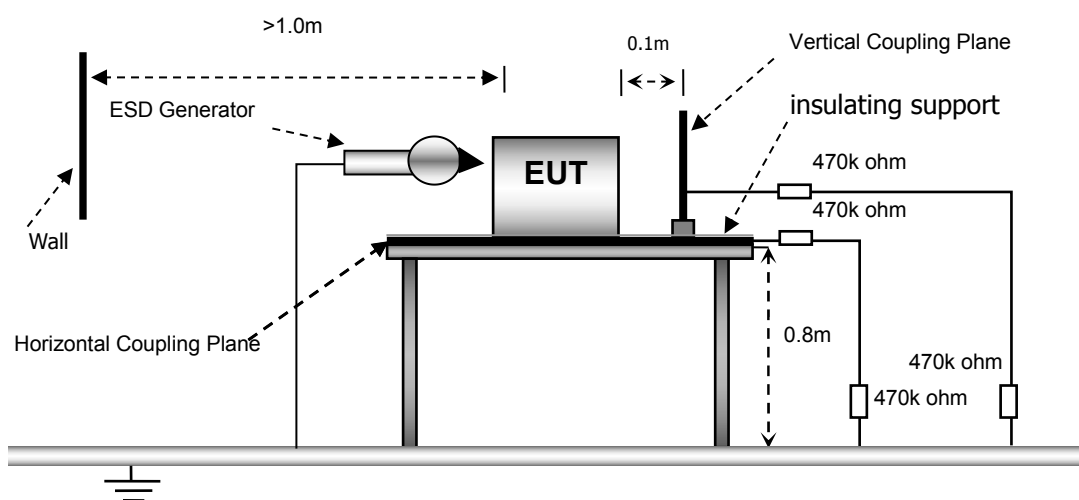
Temperature	: 21.5°C
Humidity	: 52.0% RH
Barometric Pressure	: 101.3kPa

EUT Operation:

Refer to section 6(4).

6.2.2Block Diagram of Setup

The ESD test was performed in accordance with the EN 61000-4-2.



6.2.3 Test Results

Indirect Application			Performance Criteria	
Discharge Level(kV)	Polarity(+/-)	Test Point	Horizontal Coupling	Vertical Coupling
2,4	+/-	1	PASS	PASS
Remark: Test points : 1. All sides(Front/Top/Back/Left/Right Sides).				

Direct Application			Performance Criteria	
Discharge Level (kV)	Polarity(+/-)	Test Point	Contact Discharge	Air Discharge
2,4,8	+/-	1	N/A	PASS
2,4	+/-	2	PASS	N/A
Remark: Test points : 1. All Exposed Surface & Seams; 2. All metallic part N/A: Not applicable.				

6.2.4 Radiated Immunity(R/S)

Test Requirement	:	EN 301 489-17
Test Method	:	EN 301 489-1, EN 61000-4-3
Face Under Test	:	Three Mutually Orthogonal Faces
Severity	:	3V/m, 1kHz, 80% Amp. Mod. from 80MHz to 1GHz,
Test Result	:	PASS

6.2.5 E.U.T. Operation

Operating Environment:

Temperature	:	21.4°C
Humidity	:	52.1% RH
Barometric Pressure	:	101.2kPa

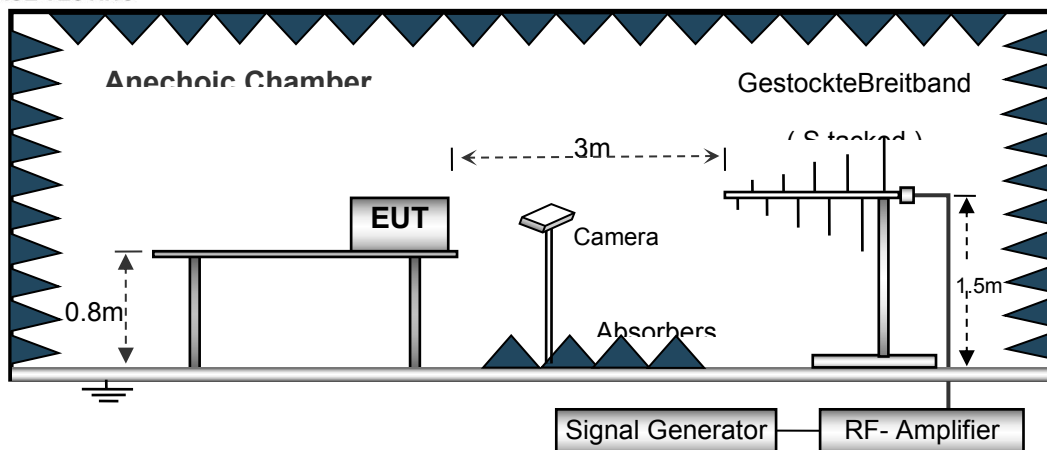
EUT Operation :BT mode

Refer to section 6(4).

6.2.6 Block Diagram of Setup

The Radiated Immunity test was performed in accordance with the EN 61000-4-3.

PRECISE TESTING



6.2.7 Test Results

Frequency	Level	Modulation	ANT. Polarization	EUT Face	Performance Criteria
80MHz -1GHz,	3V/m	1kHz, 80%, Amp. Mod.	Horizontal/ Vertical	Front,Back Left,Right	PASS
1.4GHz - 2.7GHz	3V/m	1kHz, 80%, Amp. Mod.	Horizontal/ Vertical	Front,Back Left,Right	PASS

6.3 Electrical Fast Transients (EFT)

Test Requirement	:	EN 301 489-17, EN 55024
Test Method	:	EN 301 489-1, EN 61000-4-4
Polarity	:	Positive & Negative
Repetition Frequency	:	5kHz
Burst Duration	:	300ms
Test Duration	:	2 minutes per level & polarity

6.3.1 E.U.T. Operation

Operating Environment :	
Temperature	: 21.5°C
Humidity	: 52.2% RH
Barometric Pressure	: 101.2kPa

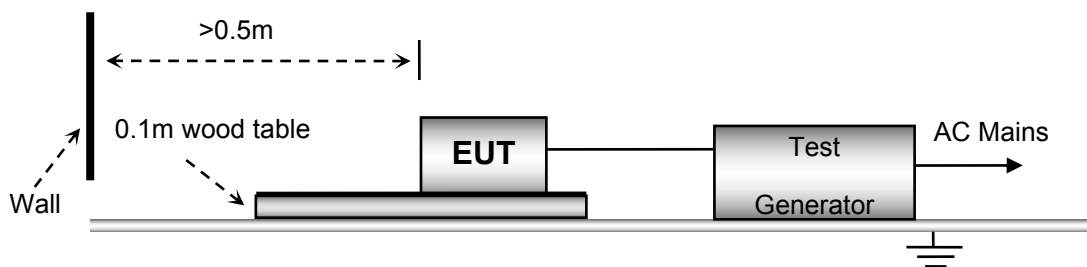
EUT Operation : BT mode

Refer to section 6(4).

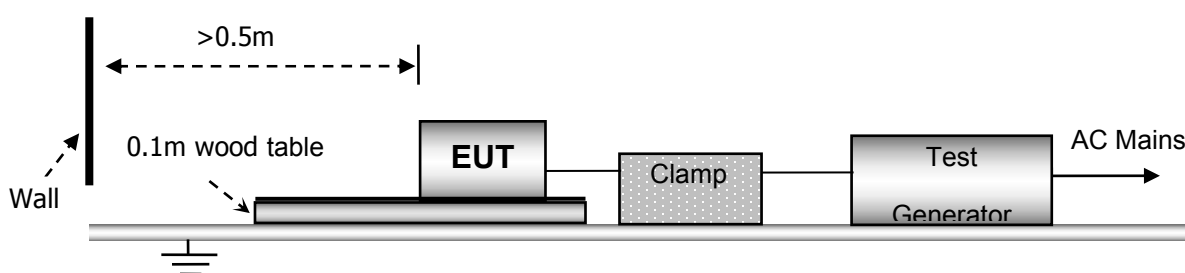
6.3.2 Block Diagram of Test Setup

The Electrical Fast Transients Immunity test was performed in accordance with the EN 61000-4-4.

For AC Mains or DC Ports:



For Signal, Telecommunication or Control Ports:



6.3.3 Test Results

Lead under Test	Test Level	Test Voltage	Performance Criteria
AC Mains	2	$\pm 1.0\text{kV}$	N/A

Not apply

6.4 Surges

Test Requirement	:	EN 301 489-17, EN 55024
Test Method	:	EN 301 489-1, EN 61000-4-5
Interval	:	60s between each surge
No. of surges	:	5 positive, 5 negative at 0° , 90° , 180° , 270° .

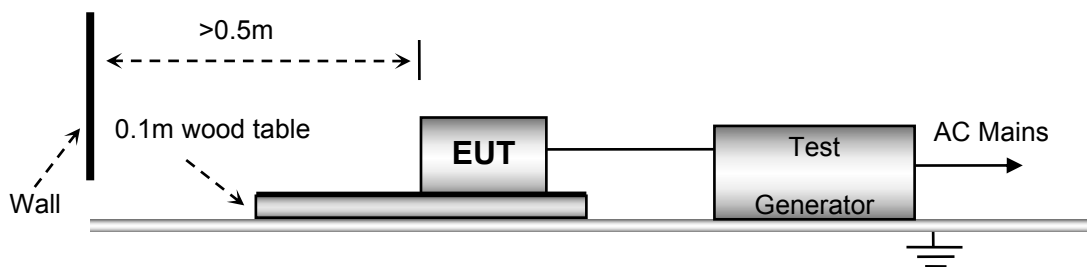
6.4.1 E.U.T. Operation

Operating Environment :	
Temperature	: 21.6°C
Humidity	: 52.1% RH
Barometric Pressure	: 101.2kPa
EUT Operation :	BT mode
Refer to section 6(4).	

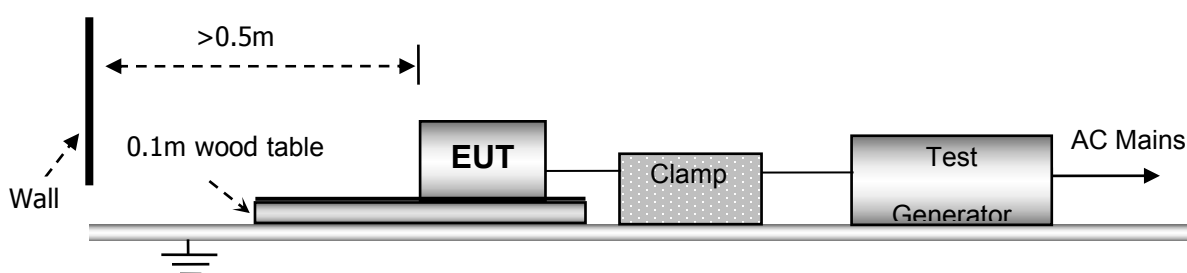
6.4.2 Block Diagram of Test Setup

The Surges Immunity test was performed in accordance with the EN 61000-4-5.

For AC Mains or DC Ports:



For Telecommunication Port:



6.4.3 Test Results

Lead under Test	Test Level	Test Voltage	Path	Performance Criteria
AC Mains	2	$\pm 1\text{kV}$	L-N	N/A

Not apply

6.5 Conducted Immunity 0.15MHz to 80MHz

Test Requirement	: EN 301 489-17, EN 55024
Test Method	: EN 301 489-1, EN 61000-4-6
Test level	: 3V rms (unmodulated emf into 150 Ω)
Modulation	: 80%, 1kHz Amplitude Modulation.

6.5.1 E.U.T. Operation

Operating Environment :

Temperature	: 21.5°C
Humidity	: 52.1% RH
Barometric Pressure	: 101.3kPa

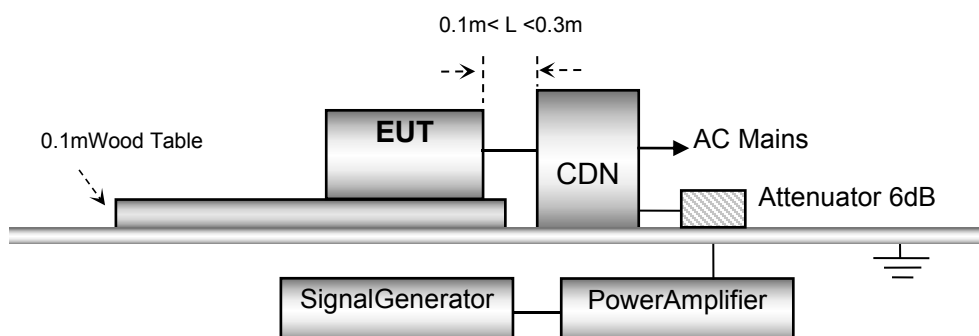
EUT Operation : BT mode

Refer to section 6(4).

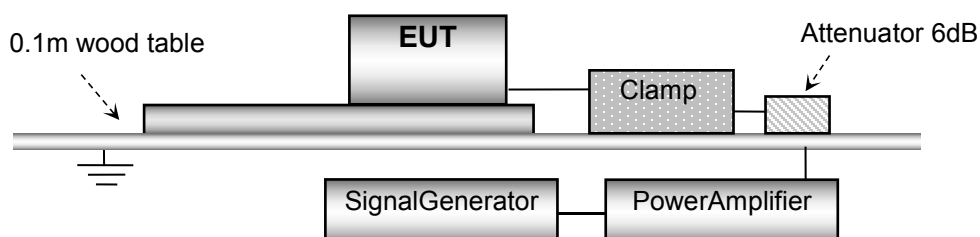
6.5.2 Block Diagram of Test Setup

The Injected Currents Immunity test was performed in accordance with the EN 61000-4-6.

For AC Mains or DC Ports:



For Signal, Telecommunication or Control Ports:



6.5.3 Test Results

Line	Frequency	Test Level	Voltage Level	Modulation	Step Size	Dwell Time	Performance Criteria
AC Mains	0.15MHz to 80MHz	2	3Vrms	80%, 1kHz Amp. Mod.	1%	1s	N/A

No not apply

6.6 Voltage Dips and Interruptions

Test Requirement	: EN 301 489-17, EN 550 24
Test Method	: EN 301 489-1, EN 61000-4-11
No. of Dips / Interruptions	: 3 per Level at 10ms intervals

6.6.1 E.U.T. Operation

Operating Environment :

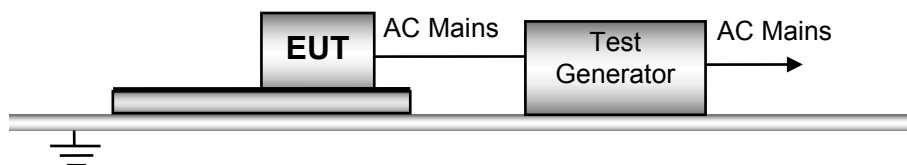
Temperature	: 21.5°C
Humidity	: 52.1% RH
Barometric Pressure	: 101.2kPa

EUT Operation : BT mode

Refer to section 6(4).

6.6.2 Block Diagram of Setup

The Voltage Dips and Interruptions Immunity test was performed in accordance with the EN 61000-4-11.

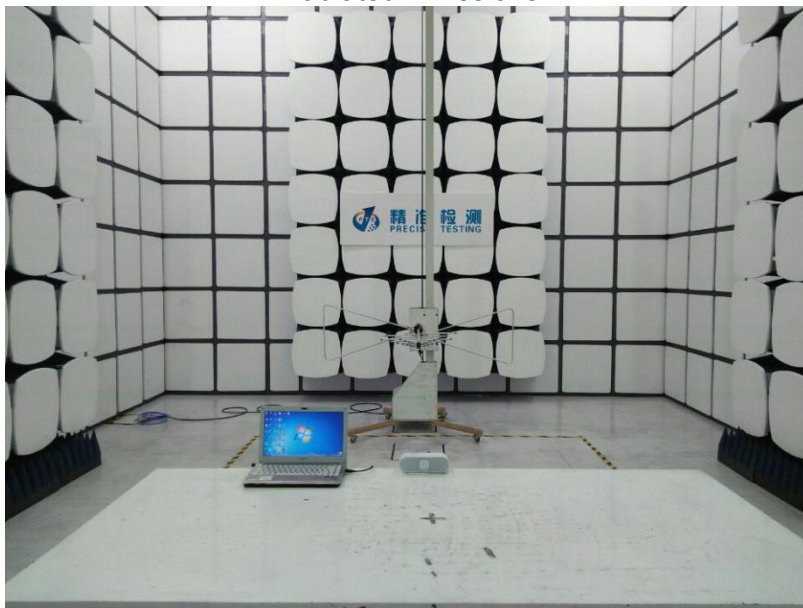


6.6.3 Test Results

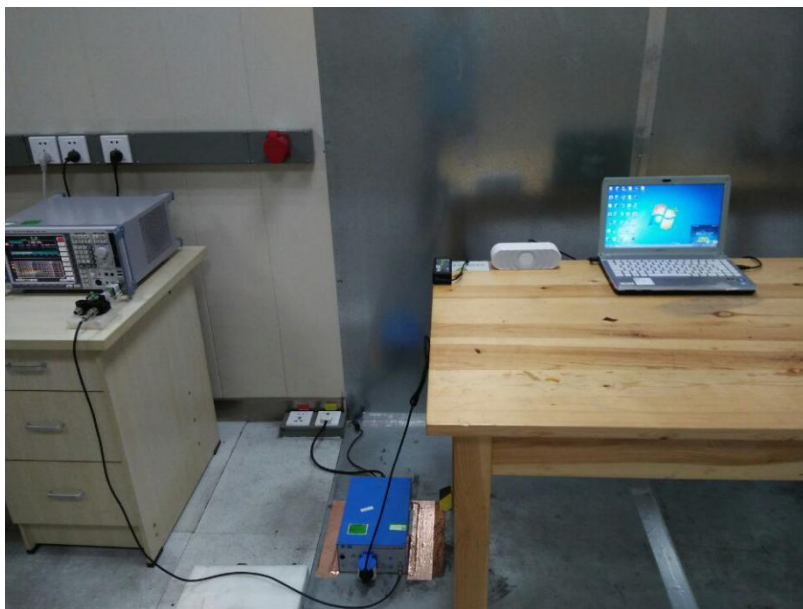
Type	Residual Voltage	Phase	Cycle	No of dropout	Performance Criteria
Voltage Dips	0	0°	0.5	3	N/A
	0	0°	1	3	N/A
	70	0°	25	3	N/A
Voltage Interruption	0	0°	250	3	N/A

Not apply

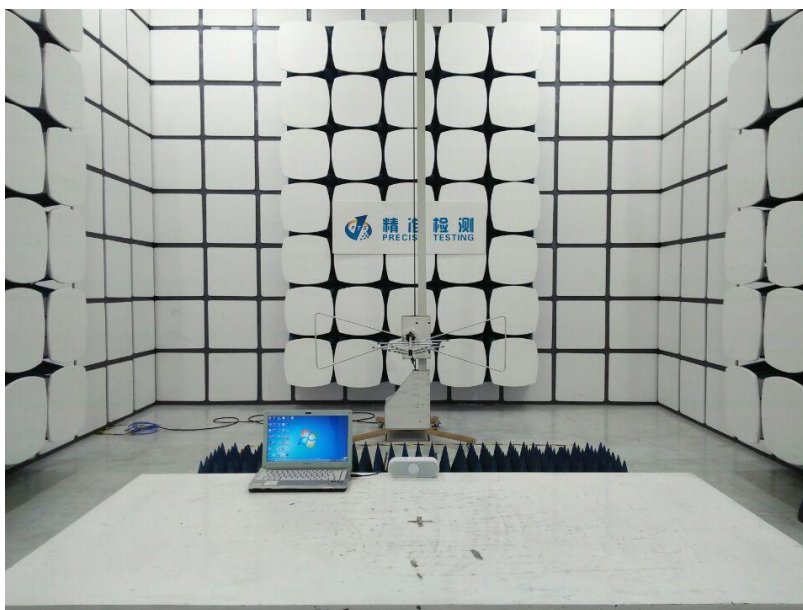
Radiated Emissions



Conducted Emission



RS



ESD



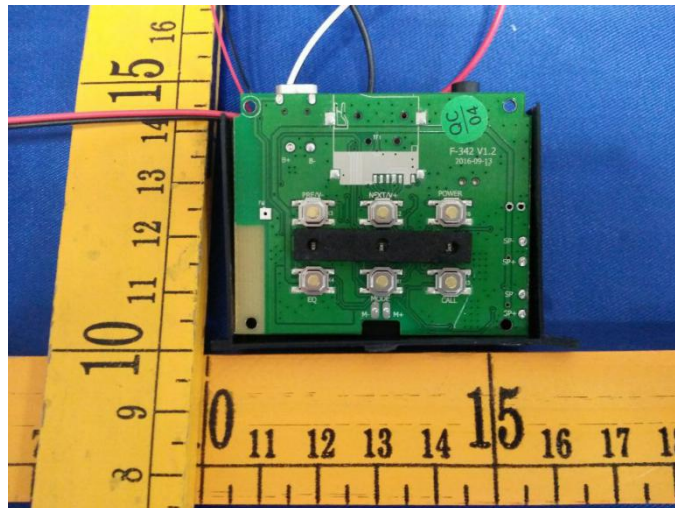
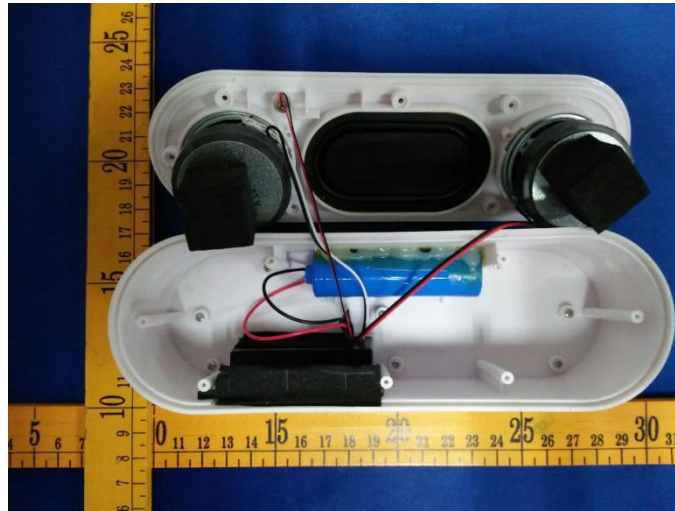
8 EUT Photos

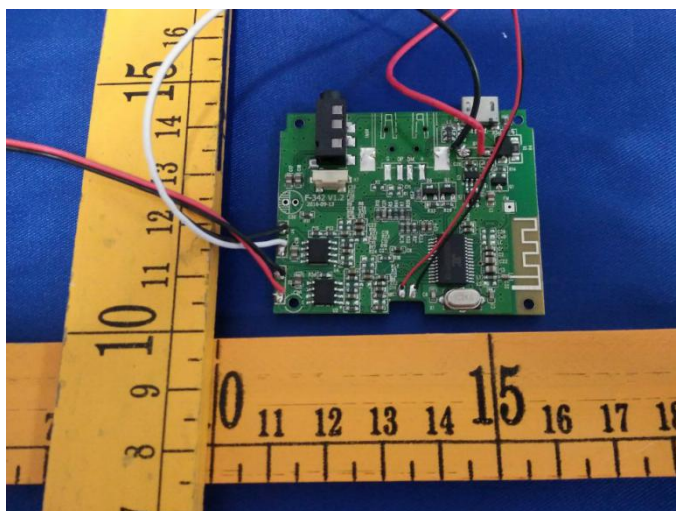
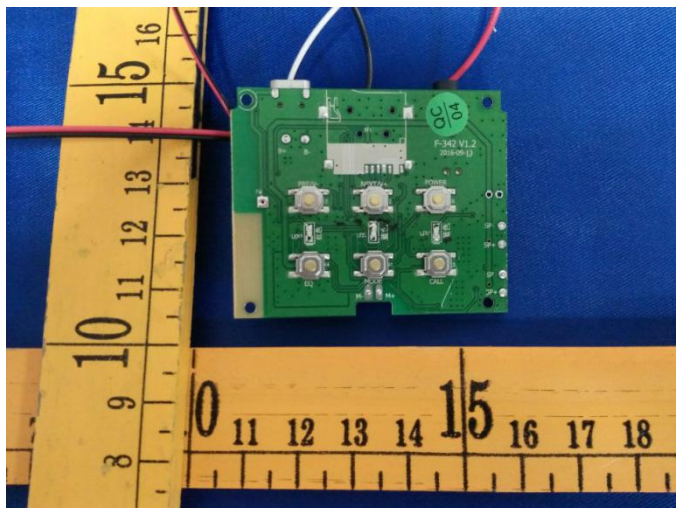
External Photos





Internal Photos





*****THE END REPORT*****