

ETSI EN 301 489-1 V2.2.1 (2019-03)  
ETSI EN 301 489-17 V3.2.0 (2017-03)

## TEST REPORT

For

### Shenzhen Xin Yuan Electronic Technology Co., Ltd.

401 4F Bldg. building B. No.5, 1st Rd Bantianshangxue Technology Park ,Bantian St, Longgang  
Dist.,Shenzhen Guangdong China

**Model: T-MICRO32**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Module
<b>Report Number:</b> <u>RSZ190325004-02</u>	
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<b>Reviewed By:</b> <u>Nancy Wang</u> RF Engineer	
<b>Prepared By:</b> Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>	

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The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity.

## TABLE OF CONTENTS

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
OBJECTIVE .....	3
PERFORMANCE CRITERION .....	3
TEST METHODOLOGY .....	4
MEASUREMENT UNCERTAINTY .....	4
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>5</b>
DESCRIPTION OF TEST CONFIGURATION .....	5
EQUIPMENT MODIFICATIONS .....	5
SUPPORT EQUIPMENT LIST AND DETAILS .....	5
EXTERNAL I/O CABLE.....	5
BLOCK DIAGRAM OF TEST SETUP .....	6
<b>SUMMARY OF TEST RESULTS .....</b>	<b>7</b>
<b>TEST EQUIPMENT LIST .....</b>	<b>8</b>
<b>§7.1 - RADIATED EMISSIONS.....</b>	<b>9</b>
TEST SYSTEM SETUP.....	9
EMI TEST RECEIVER SETUP.....	9
TEST PROCEDURE .....	9
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	10
TEST RESULTS SUMMARY .....	10
TEST DATA .....	10
<b>§7.2 - RF ELECTROMAGNETIC FIELD (80 MHz to 6000 MHz).....</b>	<b>13</b>
TEST SYSTEM SETUP.....	13
TEST STANDARD .....	13
TEST PROCEDURE .....	14
TEST DATA AND SETUP PHOTO .....	14
<b>§7.2 - ELECTROSTATIC DISCHARGE .....</b>	<b>16</b>
TEST SYSTEM SETUP.....	16
TEST STANDARD .....	16
TEST PROCEDURE .....	17
TEST DATA AND SETUP PHOTO .....	17
<b>EXHIBIT A - EUT PHOTOGRAPHS.....</b>	<b>20</b>
EUT – FRONT VIEW .....	20
EUT – REAR VIEW.....	20
EUT – MAIN BOARD VIEW .....	21
<b>EXHIBIT B - TEST SETUP PHOTOGRAPHS .....</b>	<b>22</b>
RADIATED EMISSIONS – FRONT VIEW (BELOW 1 GHz) .....	22
RADIATED EMISSIONS –REAR VIEW (BELOW 1 GHz).....	22
RADIATED EMISSIONS – FRONT VIEW (ABOVE 1 GHz).....	23
RADIATED EMISSIONS –REAR VIEW (ABOVE 1 GHz) .....	23

## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Product	Module
Tested Model	T-MICRO32
Highest Operating Frequency	2480MHz
Voltage Range	DC3.3V from testing jig
Date of Test	2019-04-11 to 2019-07-12
Sample serial number	190325004
Received date	2019-03-25
Sample/EUT Status	Good condition

### Objective

This test report is prepared on behalf of Shenzhen Xin Yuan Electronic Technology Co., Ltd. in accordance with ETSI EN 301 489-17 V3.2.0 (2017-03), 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.

The objective is to determine compliance with ETSI EN 301 489-17 V3.2.0 (2017-03).

### Performance criterion

#### Performance criterion A

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

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

#### Performance criterion B

During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test. After the test, 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. The performance level may be replaced by a permissible loss of performance. If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

#### Performance 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. A reboot or re-start operation is allowed.

Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

## Test Methodology

All measurements contained in this report were conducted with ETSI EN 301 489-1 V2.2.1 (2019-03).

## Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of test at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown as below. And the uncertainty will be taken into consideration for the test data recorded in the report.

Item		Expanded Measurement uncertainty
Conducted Emissions	AC Mains	1.95 dB (k=2, 95% level of confidence)
	CAT 3	3.70 dB (k=2, 95% level of confidence)
	CAT 5	3.86 dB (k=2, 95% level of confidence)
	CAT 6	4.64 dB (k=2, 95% level of confidence)
Radiated emission	Below 1GHz	4.75 dB (k=2, 95% level of confidence)
	Above 1GHz	4.88 dB (k=2, 95% level of confidence)

*Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.*

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user)

Test Mode 1: Bluetooth transmitting (working and monitoring with CMW500)

Test Mode 2: Wi-Fi transmitting (working and monitoring with Wireless Router)

### Equipment Modifications

No modifications were made to the EUT.

### Support Equipment List and Details

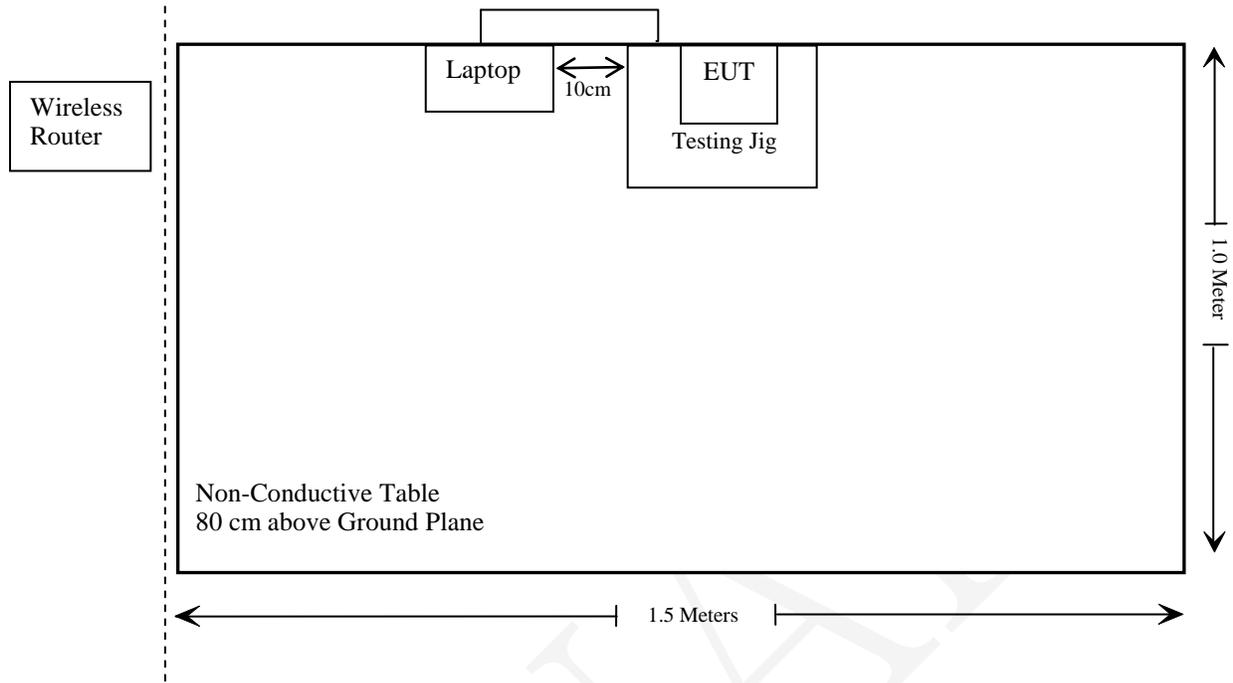
Manufacturer	Description	Model	Serial Number
Xin Yuan	Testing Jig	N/A	N/A
Toshiba	Laptop	Satellite C600	PSCZLNQ-00G006
SAGEM	Wireless ADSL Router	SAGEM F@STTM 2604 White	N/A
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh

### External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded Detachable USB Cable	1.0	Laptop	Testing Jig

### Block Diagram of Test Setup

For Radiation Emission:



## SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
§7.1	Reference to clauses EN 301 489-1 §8.4 AC mains power input/output ports	Not Applicable
	Reference to clauses EN 301 489-1 §8.3 DC power input/output ports	Not Applicable
	Reference to clauses EN 301 489-1 §8.2 Enclosure port of ancillary equipment measured on a stand alone basis	Compliance
	Reference to clauses EN 301 489-1 §8.5 Harmonic current emissions (AC mains input port)	Not Applicable
	Reference to clauses EN 301 489-1 §8.6 Voltage fluctuations and flicker (AC mains input port)	Not Applicable
	Reference to clauses EN 301 489-1 §8.7 Wired network ports	Not Applicable
§7.2	Reference to clauses EN 301 489-1 §9.2 Radio frequency electromagnetic field (80 MHz to 6000 MHz) (EN 61000-4-3)	Compliance
	Reference to clauses EN 301 489-1 §9.3 Electrostatic discharge (EN 61000-4-2)	Compliance
	Reference to clauses EN 301 489-1 §9.4 Fast transients, common mode (EN 61000-4-4)	Not Applicable
	Reference to clauses EN 301 489-1 §9.5 Radio frequency, common mode (EN 61000-4-6)	Not Applicable
	Reference to clauses EN 301 489-1 §9.6 Transients and surges in the vehicular environment (ISO 7637-2)	Not Applicable
	Reference to clauses EN 301 489-1 §9.8 Surges (EN 61000-4-5)	Not Applicable
	Reference to clauses EN 301 489-1 §9.7 Voltage dips and interruptions (EN 61000-4-11)	Not Applicable

Not Applicable: Please refer to Applicability overview tables in sections 7.1 and 7.2 of EN 301 489-1 requirements for Radio and ancillary equipment.

Note : EUT is a RF modular.

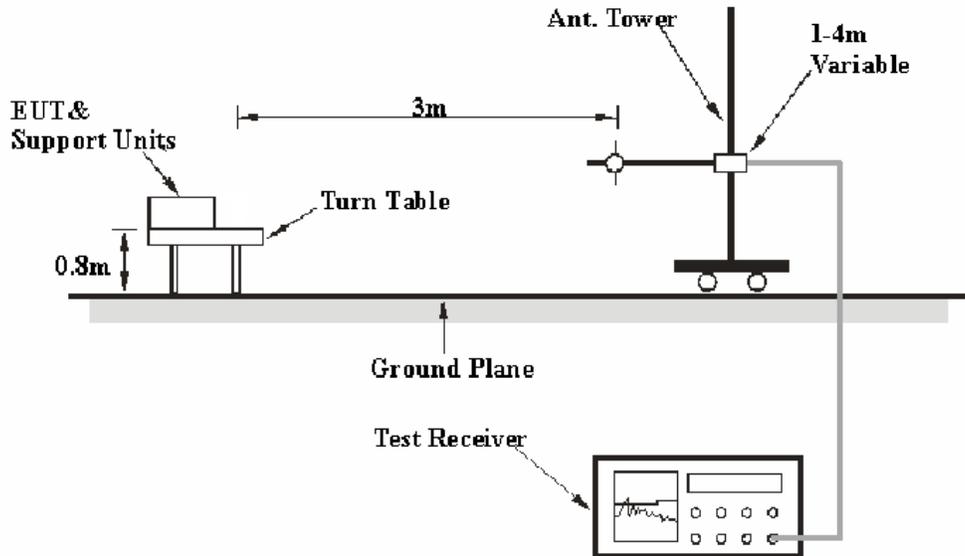
## TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>EMI</b>					
Sonoma Instrument	Amplifier	310N	186238	2018-11-12	2019-11-12
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2018-07-11	2019-07-11
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2019-06-23	2020-06-23
COM-POWER	Pre-amplifier	PA-122	181919	2018-11-12	2019-11-12
A.H. System	Horn Antenna	SAS-200/571	135	2018-09-01	2021-08-31
Rohde & Schwarz	Auto test Software	EMC32	V9.10	NCR	NCR
<b>EMS</b>					
TESEQ	ESD Generator	NSG 438	1476	2018-07-31	2019-07-31
Agilent	Signal Generator	8665B	3744A01692	2018-07-27	2019-07-27
A&R	Power Amplifier	500W100B	0348446	NCR	NCR
A&R	Power Amplifier	60S1G6	0348712	NCR	NCR
A&R	Antenna	ATL80M1G	348837	NCR	NCR
A&R	Antenna	ATT700M12G	0349411	NCR	NCR
Rohde & Schwarz	Wideband Radio Communication Tester	CMW500	1201.002K50-146520-wh	2019-07-09	2020-07-08

**\* Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

## §7.1 - RADIATED EMISSIONS

### Test System Setup



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the CISPR 16-1-4:2012, CISPR 16-2-3:2010. The limit was specified in EN 301 489-1.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

### EMI Test Receiver Setup

The system was investigated from 30 MHz to 6 GHz.

During the radiated emission test, the EMI test receiver Setup was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
1 GHz – 6 GHz	1 MHz	3 MHz	-	Peak
1 GHz – 6 GHz	1 MHz	Reduce Video Bandwidth	-	Average

### Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in the Quasi-peak detection mode for below 1 GHz, and Peak and Average for above 1 GHz.

### Corrected Amplitude & Margin Calculation

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

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude.}$$

### Test Results Summary

According to the recorded data in following table, the EUT complied with the EN 301 489-1,

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

In BACL,  $U_{(L_m)}$  is less than  $U_{\text{cispr}}$ , if  $L_m$  is less than  $L_{\text{lim}}$ , it implies that the EUT complies with the limit.

### Test Data

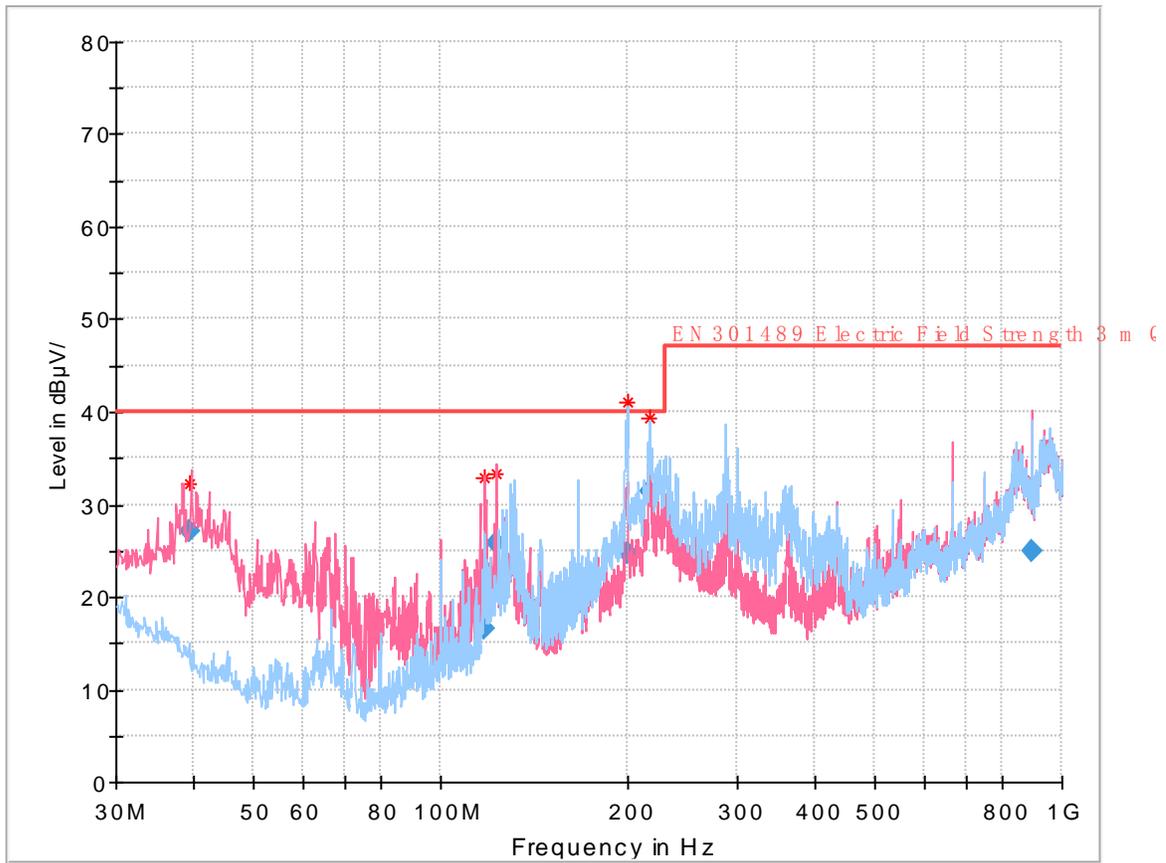
#### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Yooube Zhao on 2019-04-11 and Leo Huang on 2019-04-11.*

*Test Mode 2(worst case):*

**30 MHz-1 GHz:**



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
39.381375	27.15	107.0	V	172.0	-13.4	40.00	12.85
117.632500	16.58	99.0	V	283.0	-14.6	40.00	23.42
122.674125	25.70	127.0	V	230.0	-14.1	40.00	14.30
199.894125	24.65	171.0	H	111.0	-13.8	40.00	15.35
216.466750	31.44	144.0	H	259.0	-13.9	40.00	8.56
897.229750	24.89	101.0	V	258.0	4.3	47.00	22.11

**Above 1 GHz:**

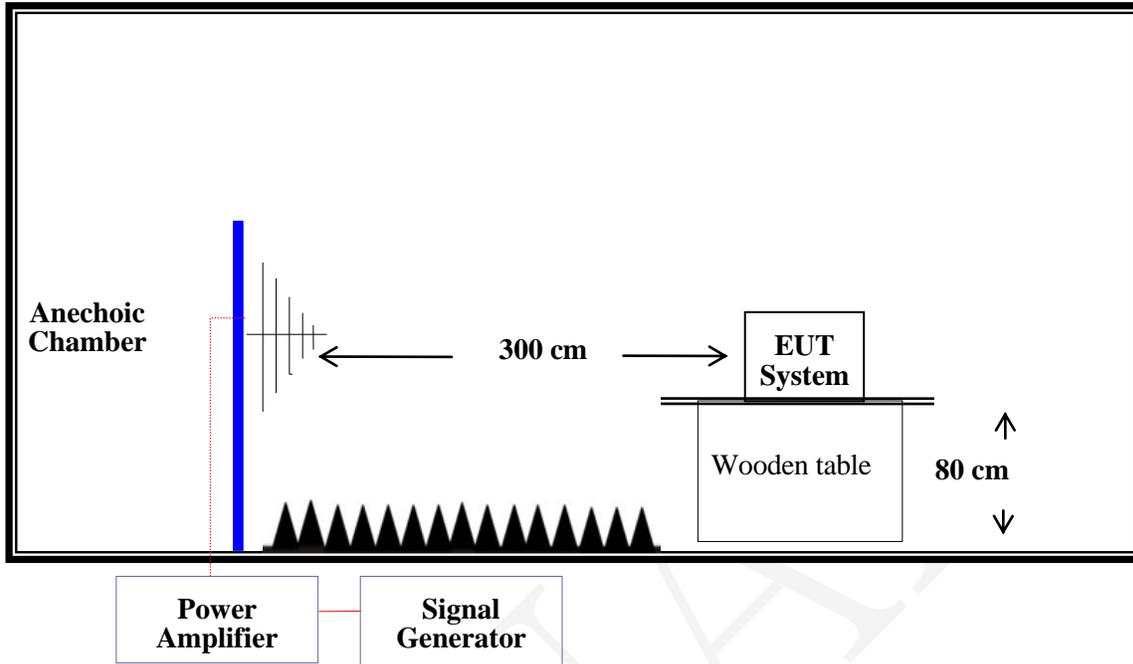
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dB $\mu$ V/m)	EN 301 489-1	
	Reading (dB $\mu$ V)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dB $\mu$ V/m)	Margin (dB)
1374.28	43.61	PK	306	2.0	H	-2.26	41.35	70	28.65
1374.28	28.47	Ave.	306	2.0	H	-2.26	26.21	50	23.79
1374.28	42.83	PK	274	2.0	V	-2.26	40.57	70	29.43
1374.28	28.36	Ave.	274	2.0	V	-2.26	26.10	50	23.90
2617.50	44.29	PK	242	1.3	H	-0.40	43.89	70	26.11
2617.50	29.13	Ave.	242	1.3	H	-0.40	28.73	50	21.27
2617.50	43.28	PK	254	1.8	V	-0.40	42.88	70	27.12
2617.50	28.33	Ave.	254	1.8	V	-0.40	27.93	50	22.07

**Note:**

- 1) Corrected Amplitude = Meter Reading + Correction Factor
- 2) Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain
- 3) Margin = Limit - Corrected Amplitude

## §7.2 - RF ELECTROMAGNETIC FIELD (80 MHz to 6000 MHz)

### Test System Setup



### Test Standard

ETSI EN 301 489-1 V2.2.1 (2019-03) / EN 61000-4-3:2006+A1:2008 +A2: 2010  
 Test Level 2 at 3V / m  
 Test Levels and Performance Criterion

### Test Level

Level	Field Strength (V/m)
1.	1
2.	3
3.	10
X.	Special

**Test Procedure**

The EUT and its simulators are placed on a turn table which is 0.8 meter above the ground. The EUT is set 3 meters away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarizations of the antenna are set on test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a CCD camera are used to monitor the EUT, and a CMW500 used to monitor the BT function, a router used to monitor the WIFI function.

All the scanning conditions are as follows:

Condition of Test	Remarks
1. Field Strength	3 V/m (Test Level 2)
2. Radiated Signal	Modulated
3. Scanning Frequency	80 - 6000 MHz
4. Sweeping time of radiated	0.0015 decade/s
5. Dwell Time	1 Sec.

**Test Data and Setup Photo**

**Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Gavin Guo on 2019-07-12*

**Test Mode 1 & Test Mode 2:**

Modulation: Amplitude 80%, 1 kHz sine wave

Frequency Range (MHz)	Front Side (3 V/m)		Rear Side (3 V/m)		Left Side (3 V/m)		Right Side (3 V/m)	
	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
80-6000	A	A	A	A	A	A	A	A

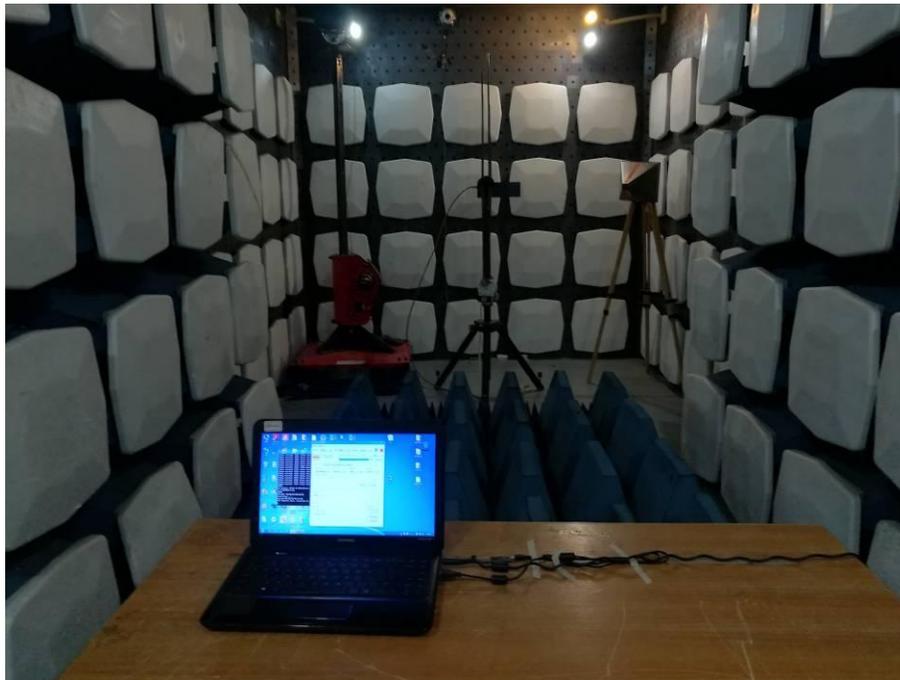
Performance Criterion: A

**EUT Operation Mode 1:**

Note: "A" stand for, during test, operate as intended No loss function, and after test, operate as intended.

**EUT Operation Mode 2:**

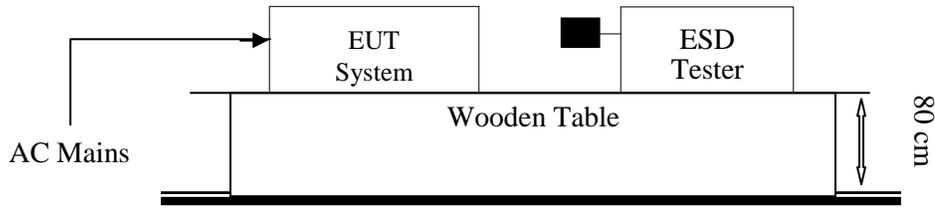
Note: "A" stand for, during test, operate as intended No loss function, no degradation of performance, no unintentional transmissions. and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.



**Test Setup Photo**

## §7.2 - ELECTROSTATIC DISCHARGE

### Test System Setup



Remark: ■ is the tip of the electrode

EN 61000-4-2 specifies that a tabletop EUT shall be placed on a non-conducting table which is 80 centimeters above a ground reference plane and that floor mounted equipment shall be placed on a insulating support approximately 10 centimeters above a ground plane. During the tests, the EUT is positioned over a ground reference plane in conformance with this requirement.

For tabletop equipment, a 1.6 by 0.8-meter metal sheet (HCP) is placed on the table and connected to the ground plane via a metal strap with two 470 k Ohms resistors in series. The EUT and attached cables are isolated from this metal sheet by 0.5-millimeter thick insulating material. A Vertical Coupling Plane (VCP) grounded on the ground plane through the same configuration as in the HCP is used.

### Test Standard

ETSI EN 301 489-1 V2.2.1 (2019-03) / EN 61000-4-2:2009  
 Air Discharge at  $\pm 2$  kV,  $\pm 4$  kV,  $\pm 8$  kV  
 Contact Discharge at  $\pm 2$  kV,  $\pm 4$  kV

### Test Level

Level	Test Voltage Contact Discharge ( $\pm$ kV)	Test Voltage Air Discharge ( $\pm$ kV)
1.	2	2
2.	4	4
3.	6	8
4.	8	15
X.	Special	Special

Performance criterion: B

## Test Procedure

### Air Discharge:

This test is done on a non-conductive surface. 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 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

### Contact Discharge:

All the procedure shall be same as Section 8.3.1 of EN 61000-4-2, except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

### Indirect discharge for horizontal coupling plane

At least 50 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

### Indirect discharge for vertical coupling plane

At least 50 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m × 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 Data and Setup Photo

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	52 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Gavin Guo on 2019-07-12.*

*Test Mode 1 & Test Mode 2:*

**Table 1: Electrostatic Discharge Immunity (Air Discharge)**

EN 61000-4-2 Test Points Location	Test Levels							
	-2 kV	+2 kV	-4 kV	+4 kV	-8 kV	+8 kV	-15 kV	+15 kV
/	/	/	/	/	/	/	/	/

**Table 2: Electrostatic Discharge Immunity (Direct Contact)**

EN 61000-4-2 Test Points Location	Test Levels							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
/	/	/	/	/	/	/	/	/

**Table 3: Electrostatic Discharge Immunity (Indirect Contact HCP)**

EN 61000-4-2 Test Points Location	Test Levels							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
Front Side	A	A	A	A	/	/	/	/
Back Side	A	A	A	A	/	/	/	/
Left Side	A	A	A	A	/	/	/	/
Right Side	A	A	A	A	/	/	/	/

**Table 4: Electrostatic Discharge Immunity (Indirect Contact VCP)**

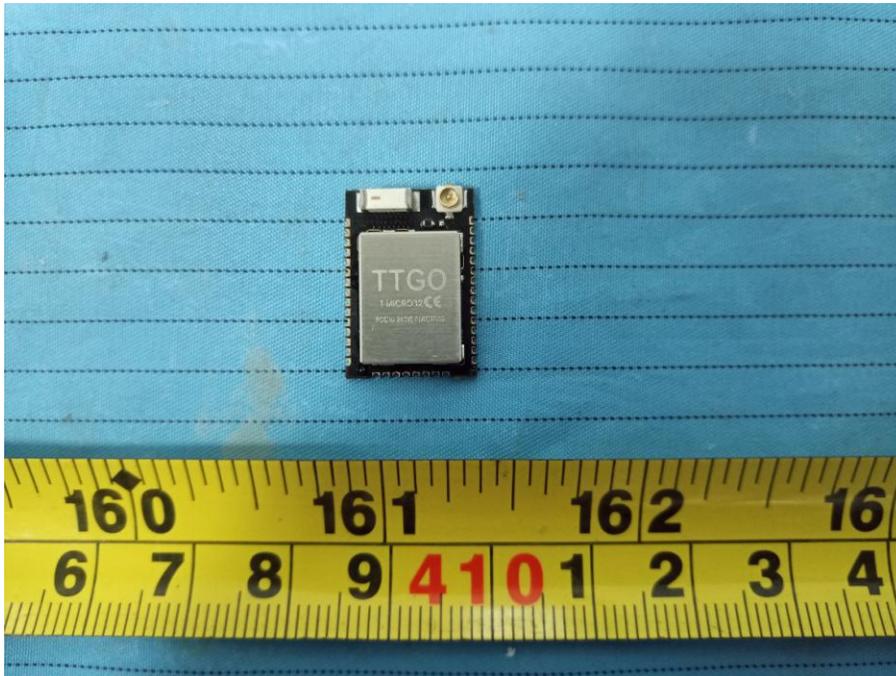
EN 61000-4-2 Test Points Location	Test Levels							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
Front Side	A	A	A	A	/	/	/	/
Back Side	A	A	A	A	/	/	/	/
Left Side	A	A	A	A	/	/	/	/
Right Side	A	A	A	A	/	/	/	/



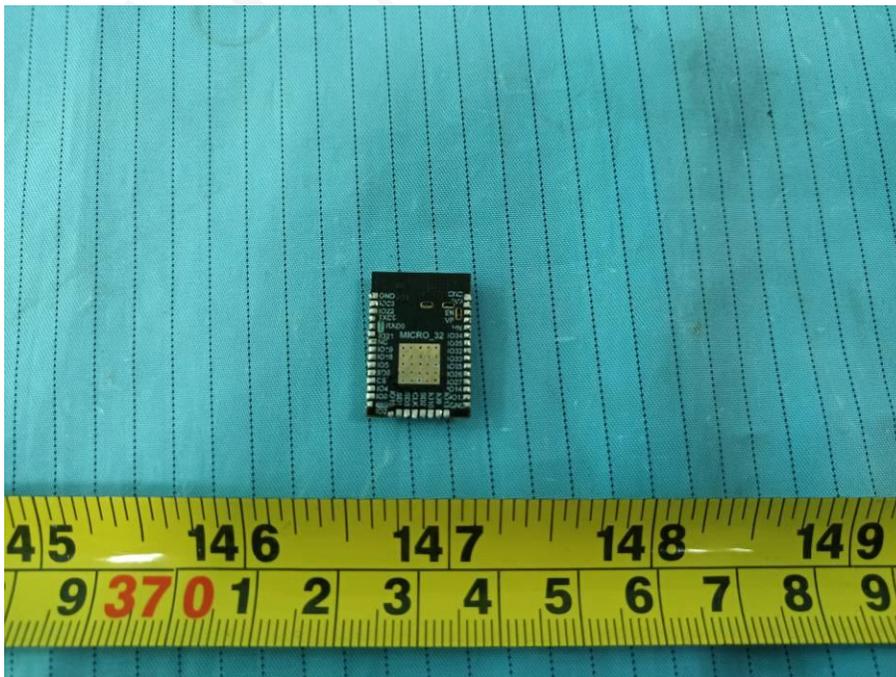
**Test Setup Photo**

## EXHIBIT A - EUT PHOTOGRAPHS

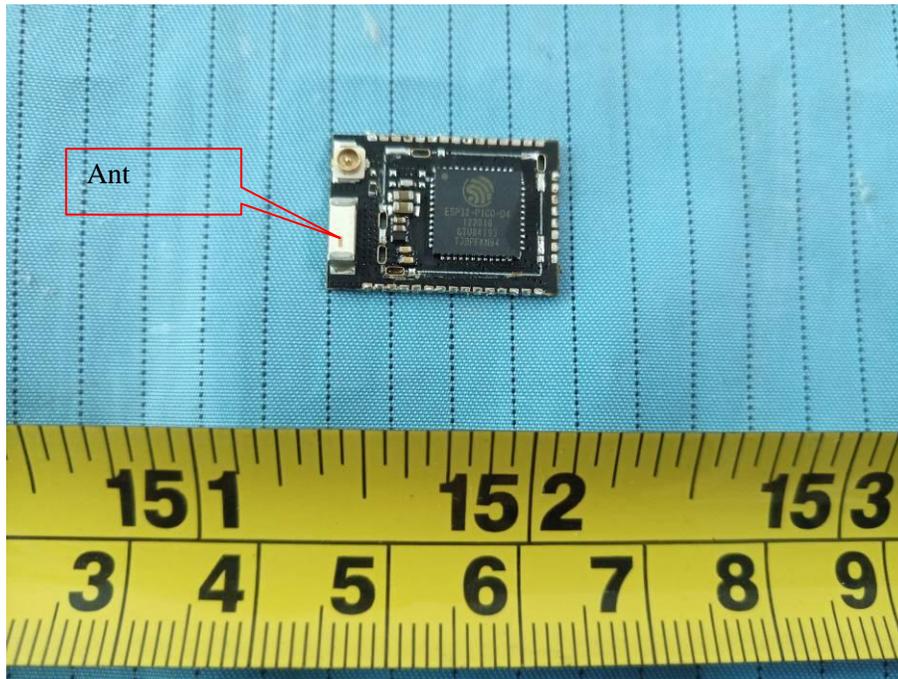
**EUT – Front View**



**EUT – Rear View**

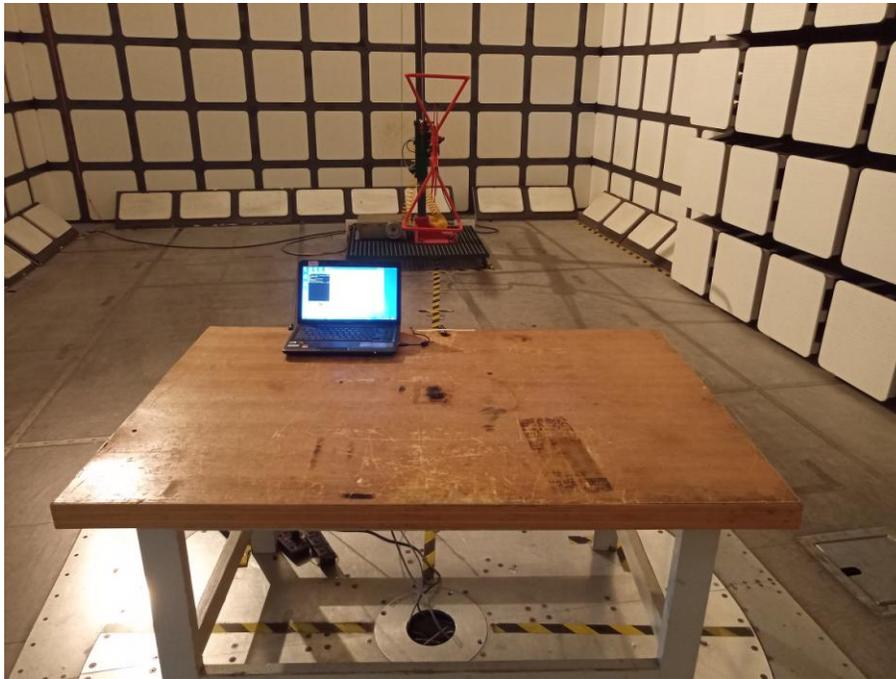


**EUT – Main Board View**



## **EXHIBIT B - TEST SETUP PHOTOGRAPHS**

**Radiated Emissions – Front View (Below 1 GHz)**



**Radiated Emissions –Rear View (Below 1 GHz)**



**Radiated Emissions – Front View (Above 1 GHz)**



**Radiated Emissions –Rear View (Above 1 GHz)**



**\*\*\*\*\* END OF REPORT \*\*\*\*\***