

# TEST REPORT

**Application No.:** SHCR2202000375HS  
**Applicant:** Lumi United Technology Co., Ltd.  
**Address of Applicant:** Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China  
**Manufacturer:** Lumi United Technology Co., Ltd.  
**Address of Manufacturer:** Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China  
**Factory:** Siterwell Electronics Co., Limited  
**Address of Factory:** No.666 Qingfeng Road, Jiangbei District, Ningbo, 315034, Zhejiang Province, China  
**Equipment Under Test (EUT):**  
**EUT Name:** Smart Radiator Thermostat E1  
**Model No.:** SRTS-A01  
**Trade Mark:** Aqara  
**Standard(s) :** EN 301 489-1 V2.2.3  
 EN 301 489-17 V3.2.4  
**Date of Receipt:** 2022-02-25  
**Date of Test:** 2022-02-25 to 2022-02-28  
**Date of Issue:** 2022-04-02

<b>Test Result:</b>	<b>Pass*</b>
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\* In the configuration tested, the EUT complied with the standards specified above.

*Parlam Zhan*

Parlam Zhan  
Laboratory Manager



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Revision Record			
Version	Description	Date	Remark
00	Original	2022-04-02	

<b>Authorized for issue by:</b>			
		<i>Wade Zhang</i>	
		_____	
		<b>Wade Zhang/Project Engineer</b>	
		<i>Parlam Zhan</i>	
		_____	
		<b>Parlam Zhan/Reviewer</b>	



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## 2 Test Summary

Emission Part				
Item	Standard	Method	Requirement	Result
Radiated Emissions (30MHz-1GHz)	EN 301 489-1 V2.2.3	EN 55032:2015+A1:2020	Class B	Pass
Radiated Emissions (Above 1GHz)	EN 301 489-17 V3.2.4	EN 55032:2015+A1:2020	Class B	Pass

Immunity Part				
Item	Standard	Method	Requirement	Result
Radiated Immunity (80MHz-6GHz)	EN 301 489-1 V2.2.3	EN IEC 61000-4-3: 2020	3V/m, 80%, 1kHz Amp. Mod.	Pass
Electrostatic Discharge	EN 301 489-17 V3.2.4	EN 61000-4-2:2009	4kV Contact Discharge 8kV Air Discharge	Pass



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## 4 General Information

### 4.1 Details of E.U.T.

Power supply:	DC 3V
Operation Frequency:	2405-2480MHz
Modulation Type:	O-QPSK
Channel Spacing:	5MHz
Number of Channels:	16
Antenna Type:	PCB Antenna
Adaptive Type:	LBE under LBT based DAA
Antenna Gain:	0 dBi (Provided by manufacturer)
Receiver Category:	1

### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
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The EUT has been tested as an independent unit.

### 4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Conducted Emission at mains port using AMN	2.6dB (9kHz to 150kHz)
		2.4dB (150kHz to 30MHz)
2	Conducted Emission at mains port using VP	1.8dB (9kHz to 30MHz)
3	Conducted Emission at telecommunication port using AAN	4.2dB (150kHz to 30MHz)
4	Radiated Power	3.2dB
5	Radiated emission	4.5dB (30MHz-1GHz)
		5.1dB (1GHz-6GHz)
		5.4dB (6GHz-18GHz)
6	Radiated disturbance (disturbance current in a LLAS)	2.4dB (9kHz to 30MHz)

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. E&E Lab

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China

Tel: +86 21 6191 5666

Fax: +86 21 6191 5678

No tests were sub-contracted.



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#### 4.5 Test Facility

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

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 6332.01)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the American Association for Laboratory Accreditation(A2LA).

- **FCC (Designation Number: CN1301)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

- **ISED (CAB Identifier: CN0020)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 8617A

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

None

#### 4.6 Abnormalities from Standard Conditions

None

#### 4.7 EMS Monitor

Visual: Working status of EUT.



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## 5 Equipment List

Radiated Emissions (30MHz-1GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI test receiver	Rohde & Schwarz	ESU40	SHEM051-1	2021/12/20	2022/12/19
EMI test receiver	Rohde & Schwarz	ESR7	SHEM201-1	2021/4/15	2022/4/14
CONTROLLER	INNCO	CO2000	SHEM047-1	N/A	N/A
ANTENNA MAST	INNCO	MA400-EP	SHEM047-2	N/A	N/A
TURN DEVICE	INNCO	DE 3600-RH	SHEM047-3	N/A	N/A
Broadband UHF-VHF ANTENNA	SCHWARZBECK	VULB9168	SHEM048-1	2021/9/21	2023/9/20
Broadband UHF-VHF ANTENNA	SCHWARZBECK	VULB9168	SHEM202-1	2021/5/7	2023/5/6
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2020/5/25	2023/5/24
Pre-amplifier	HP	8447D	SHEM236-1	2021/5/27	2022/5/26
Pre-amplifier	HP	8447D	SHEM143-1	2021/12/20	2022/12/19
RE test Cable	/	/	SHEM173-1&SHEM174-1	2022/1/7	2023/1/6
Test Software	ESE	e3	Version: 6.111221a	N/A	N/A

Radiated Emissions (above 1GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI test receiver	Rohde & Schwarz	ESU40	SHEM051-1	2021-12-20	2022-12-19
CONTROLLER	INNCO	CO200	SHEM047-1	N/A	N/A
ANTENNA MAST	INNCO	MA400-EP	SHEM047-2	N/A	N/A
TURN DEVICE	INNCO	DE 3600-RH	SHEM047-3	N/A	N/A
Double ridged broadband horn ANTENNA	SCHWARZBECK	BBHA9120D	SHEM050-1	2021-09-18	2023-09-17
High-amplifier	SCHWARZBECK	SCU-F0118-G40-BZ4-CS	SHEM050-2	2021-12-20	2022-12-19
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2020-05-25	2023-05-24

Electrostatic Discharge					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Electrostatic Discharge Simulator	TESEQ	NSG 437	SHEM041-2	2021/8/13	2022/8/12
Electrostatic Discharge Simulator	3CTEST	EDS20H	SHEM199-1	2021/9/29	2022/9/28

Radiated Immunity (80MHz-6GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Signal generator	Rohde & Schwarz	SMB100A	SHEM194-1	2021/12/20	2022/12/19
Power Meter	Rohde & Schwarz	NRP	SHEM057-1	2021/4/15	2022/4/14
Power meter sensor	Rohde & Schwarz	NRP-Z91	SHEM057-2	2021/4/15	2022/4/14
Antenna	SCHWARZBECK	STLP9128D	SHEM130-1	N/A	N/A



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Antenna	SCHWARZBECK	STLP9149	SHEM131-1	N/A	N/A
Amplifier	MILMEGA	AS0840-55-55	SHEM133-1	2021/12/20	2022/12/19
Amplifier	MILMEGA	80RF1000-250	SHEM132-1	2021/12/20	2022/12/19
Amplifier	Rohde & Schwarz	BBA150-E60	SHEM171-1	2021/12/20	2022/12/19
Power meter sensor	Rohde & Schwarz	NRP-Z22	SHEM136-1	2021/4/15	2022/4/14
ElectroMagnetic Field Probe	ETS-Lindgren	HI-6105	SHEM134-1	2021/8/6	2022/8/5
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2020/5/25	2023/5/24
Test Software	Rohde & Schwarz	EMC32	Version: 10.20.01	N/A	N/A

**General used equipment**

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Digital pressure meter	YONGZHI	DYM3-01	SHEM082-1	2021-01-22	2024-01-21
Temperature&humidity recorder	ShangHai weather meter work	ZJ 1-2B	SHEM042-1~6	2021-09-07	2022-09-06
Digital Multimeter	FLUKE	17B	SHEM043-3	2021-09-04	2022-09-03
Autoformer regulator	Guangzhou bao de	TDGC2-5KVA	SHEM150-1	N/A	N/A
Multi-purpose tong tester	FLUKE	316	SHEM001-1	2021-12-20	2022-12-19



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## 6 Emission Test Results

### 6.1 Radiated Emissions (30MHz-1GHz)

Test Requirement: EN 301 489-1 V2.2.3  
 EN 301 489-17 V3.2.4  
 Test Method: EN 55032:2015+A1:2020  
 Measurement Distance: 3m

**Limit:**

Test Distance: 3m  
 30MHz-230MHz 40 dB(μV/m) quasi-peak  
 230MHz-1GHz 47 dB(μV/m) quasi-peak  
 Detector: Peak for pre-scan (120kHz resolution bandwidth) 30M to 1000MHz

Test Distance: 10m  
 30MHz-230MHz 30 dB(μV/m) quasi-peak  
 230MHz-1GHz 37 dB(μV/m) quasi-peak  
 Detector: Peak for pre-scan (120kHz resolution bandwidth) 30M to 1000MHz

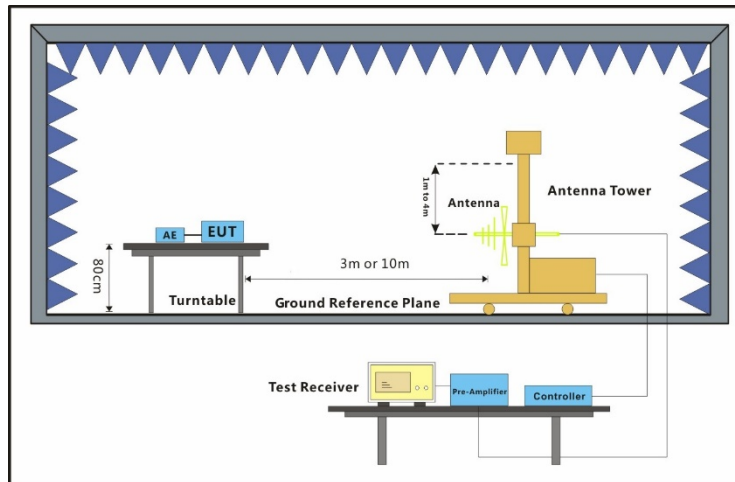
#### 6.1.1 E.U.T. Operation

Operating Environment:  
 Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

#### 6.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	Operation(Zigbee):Keep the EUT communicating with other Zigbee devices.

#### 6.1.3 Test Setup Diagram



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**6.1.4 Measurement Procedure and Data**

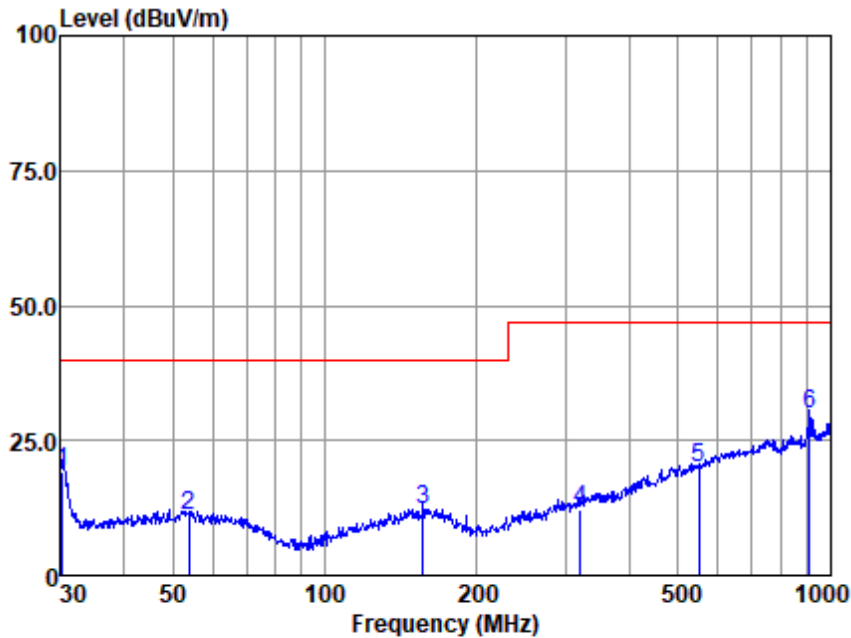
Frequency range: 30MHz-1GHz

An initial pre-scan was performed in the chamber using the spectrum analyser in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by BiConiLog antenna with 2 orthogonal polarities.

The red line show in graphic is the limit in standard used in this section.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Test Mode: 01; Polarity: Horizontal



Antenna Polarity :HORIZONTAL  
EUT/Project :0375HS  
Test mode :01

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	30.211	37.79	12.11	0.96	31.54	19.32	40.00	-20.68	QP
2	53.882	27.84	13.73	1.23	31.88	10.92	40.00	-29.08	QP
3	156.458	27.98	13.31	2.17	31.26	12.20	40.00	-27.80	QP
4	321.061	25.93	14.11	3.10	31.00	12.14	47.00	-34.86	QP
5	549.020	27.96	18.79	4.09	31.03	19.81	47.00	-27.19	QP
6	909.667	32.41	23.95	5.34	31.98	29.72	47.00	-17.28	QP

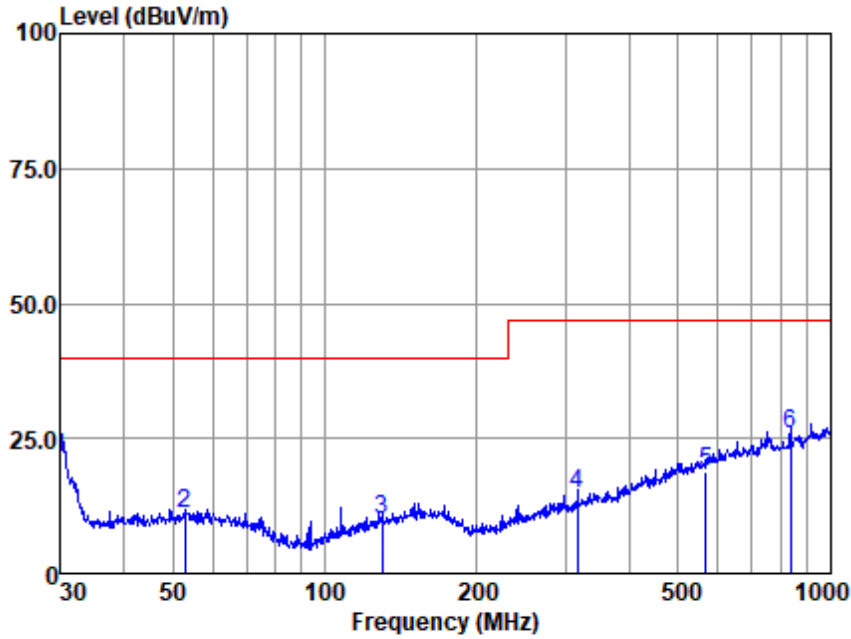
Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



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Test Mode: 01; Polarity: Vertical



Antenna Polarity : VERTICAL  
EUT/Project : 0375HS  
Test mode : 01

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	30.000	39.99	12.07	0.96	31.47	21.55	40.00	-18.45	QP
2	52.945	27.87	13.76	1.24	31.92	10.95	40.00	-29.05	QP
3	129.923	27.55	12.06	2.01	31.68	9.94	40.00	-30.06	QP
4	316.589	28.63	13.98	3.10	31.06	14.65	47.00	-32.35	QP
5	568.613	26.31	19.01	4.20	30.63	18.89	47.00	-28.11	QP
6	833.317	30.10	22.97	4.97	32.05	25.99	47.00	-21.01	QP

Note: Emission Level = Read Level + Antenna Factor + Cable loss - Preamp Factor



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## 6.2 Radiated Emissions (Above 1GHz)

Test Requirement: EN 301 489-1 V2.2.3  
 EN 301 489-17 V3.2.4  
 Test Method: EN 55032:2015+A1:2020  
 Measurement Distance: 3m

Limit:

Frequency range(GHz)	Radiated emissions limit(dBμV/m)	
	Peak	Average
1GHz-3GHz	70	50
3GHz-6GHz	74	54

Detector: Peak for pre-scan (1000kHz resolution bandwidth) 1000M to 6000MHz

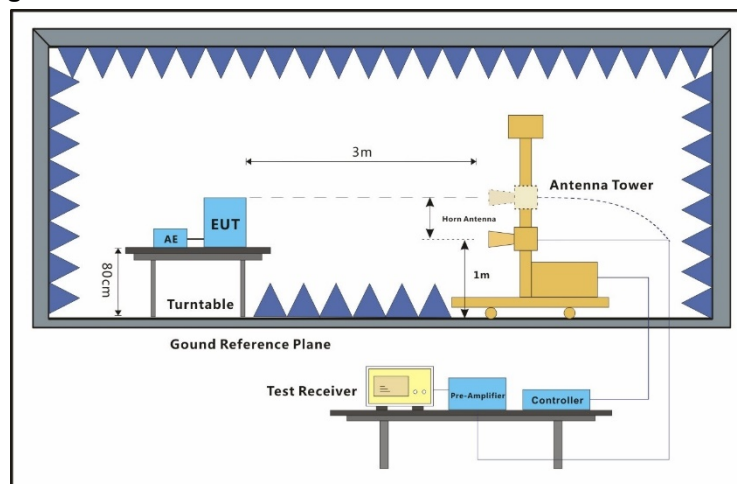
### 6.2.1 E.U.T. Operation

Operating Environment:  
 Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

### 6.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	Operation(Zigbee):Keep the EUT communicating with other Zigbee devices.

### 6.2.3 Test Setup Diagram



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#### 6.2.4 Measurement Procedure and Data

Frequency range: Above 1GHz

An initial pre-scan was performed in the chamber using the spectrum analyser in peak detection mode. Average measurements were conducted based on the peak sweep graph. The EUT was measured by Horn antenna with 2 orthogonal polarities.

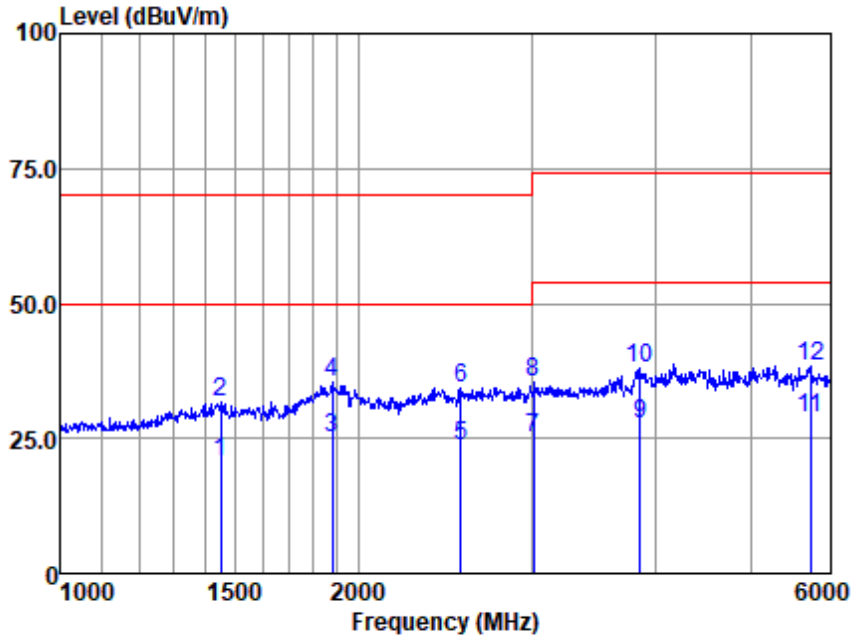
Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor



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Test Mode: 01; Polarity: Horizontal



Antenna Polarity :HORIZONTAL  
EUT/Project :0375HS  
Test mode :01

	Read	Antenna	Cable	Preamp	Emission	Limit	Over		
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark	
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1451.628	30.55	25.01	6.13	41.19	20.50	70.00	-49.50	Average
2	1451.628	41.80	25.01	6.13	41.19	31.75	70.00	-38.25	Peak
3	1882.294	33.55	25.65	7.26	41.30	25.16	70.00	-44.84	Average
4	1882.294	43.67	25.65	7.26	41.30	35.28	70.00	-34.72	Peak
5	2538.859	29.58	27.68	8.74	42.40	23.60	70.00	-46.40	Average
6	2538.859	40.44	27.68	8.74	42.40	34.46	70.00	-35.54	Peak
7	3009.976	28.97	28.60	9.91	42.40	25.08	74.00	-48.92	Average
8	3009.976	39.22	28.60	9.91	42.40	35.33	74.00	-38.67	Peak
9	3854.321	28.96	29.40	11.64	42.40	27.60	74.00	-46.40	Average
10	3854.321	39.23	29.40	11.64	42.40	37.87	74.00	-36.13	Peak
11	5726.896	25.17	32.32	13.61	42.50	28.60	74.00	-45.40	Average
12	5726.896	34.86	32.32	13.61	42.50	38.29	74.00	-35.71	Peak

Note: Emission Level = Read Level + Antenna Factor + Cable loss - Preamp Factor

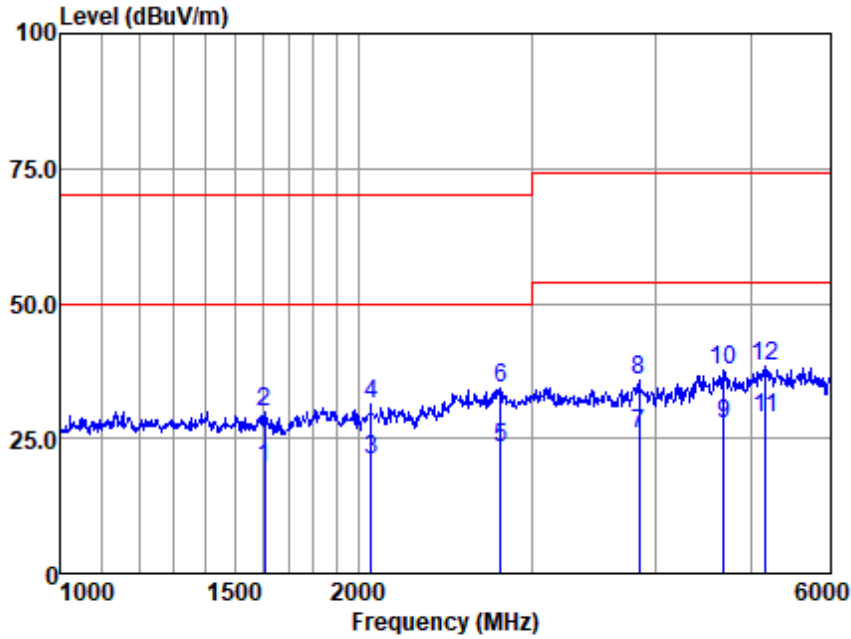


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Test Mode: 01; Polarity: Vertical



Antenna Polarity : VERTICAL  
EUT/Project : 0375HS  
Test mode : 01

	Read	Antenna	Cable	Preamp	Emission	Limit	Over		
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark	
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1607.719	28.25	25.27	7.41	41.24	19.69	70.00	-50.31	Average
2	1607.719	38.26	25.27	7.41	41.24	29.70	70.00	-40.30	Peak
3	2058.709	28.20	26.03	8.38	41.47	21.14	70.00	-48.86	Average
4	2058.709	38.55	26.03	8.38	41.47	31.49	70.00	-38.51	Peak
5	2786.779	27.24	28.20	10.29	42.40	23.33	70.00	-46.67	Average
6	2786.779	38.34	28.20	10.29	42.40	34.43	70.00	-35.57	Peak
7	3847.421	26.07	29.37	12.61	42.40	25.65	74.00	-48.35	Average
8	3847.421	36.29	29.37	12.61	42.40	35.87	74.00	-38.13	Peak
9	4685.613	25.61	30.98	13.46	42.40	27.65	74.00	-46.35	Average
10	4685.613	35.42	30.98	13.46	42.40	37.46	74.00	-36.54	Peak
11	5161.626	25.90	31.70	13.68	42.43	28.85	74.00	-45.15	Average
12	5161.626	35.54	31.70	13.68	42.43	38.49	74.00	-35.51	Peak

Note: Emission Level = Read Level + Antenna Factor + Cable loss - Preamp Factor



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## 7 Immunity Test Results

### Performance Criteria Description in EN 301 489-1

<b>Performance criteria for continuous phenomena</b>	During the test, the equipment shall: <ul style="list-style-type: none"> <li>• continue to operate as intended;</li> <li>• not unintentionally transmit;</li> <li>• not unintentionally change its operating state;</li> <li>• not unintentionally change critical stored data.</li> </ul>
<b>Performance criteria for transient phenomena</b>	For all ports and transient phenomena with the exception described below, the following applies: <ul style="list-style-type: none"> <li>• The application of the transient phenomena shall not result in a change of the mode of operation (e.g. unintended transmission) or the loss of critical stored data.</li> <li>• After application of the transient phenomena, the equipment shall operate as intended.</li> </ul> For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies: <ul style="list-style-type: none"> <li>• For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be otherwise restored. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</li> <li>• For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</li> </ul>

### Performance Criteria Description in EN 301 489-17

Criteria	During Test	After Test (i.e. as a result of the application of the test)
<b>A</b>	Shall operate as intended. (see note). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of critical stored data.
<b>B</b>	May be loss of function.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
<b>C</b>	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data.

NOTE: Operate as intended during the test allows a level of degradation in accordance with Minimum performance level.

#### Minimum performance level

For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %.

For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of



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the wireless transmission function needed for the intended use of the equipment.

**Performance criteria for Continuous phenomena**

The performance criteria A shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur during the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur during the test.

**Performance criteria for Transient phenomena**

The performance criteria B shall apply, except for voltage dips greater than or equal to 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur as a result of the application of the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur as a result of the application of the test.



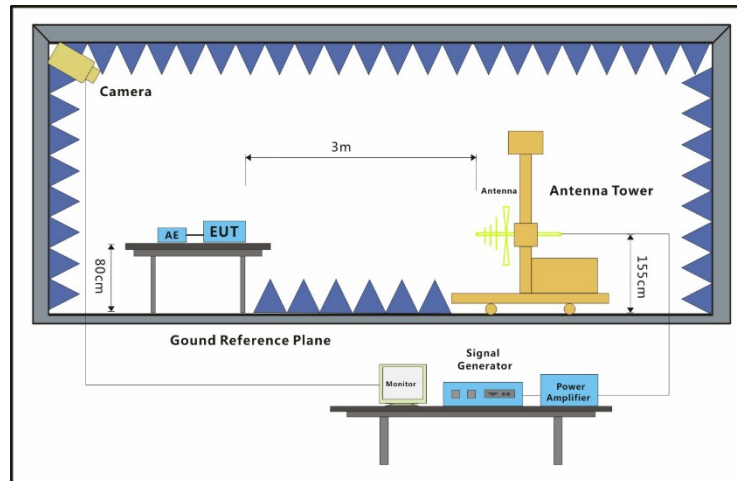
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## 7.1 Radiated Immunity (80MHz-6GHz)

Test Requirement: EN 301 489-1 V2.2.3  
EN 301 489-17 V3.2.4  
Test Method: EN IEC 61000-4-3: 2020

### 7.1.1 Test Setup Diagram



### 7.1.2 E.U.T. Operation

Operating Environment:  
Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

### 7.1.3 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	Operation(Zigbee):Keep the EUT communicating with other Zigbee devices.

### 7.1.4 Test Condition and Results:

Performance Criterion: A  
Frequency Range: 80MHz to 6GHz  
Antenna Polarisation: Vertical and Horizontal  
Modulation: 1kHz,80% Amp. Mod,1% increment



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Frequency	Level (V/m)	EUT Face	Dwell time	Result / Observations
80MHz-6GHz	3	Front	2s	A
80MHz-6GHz	3	Back	2s	A
80MHz-6GHz	3	Left	2s	A
80MHz-6GHz	3	Right	2s	A
80MHz-6GHz	3	Top	2s	A
80MHz-6GHz	3	Underside	2s	A

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

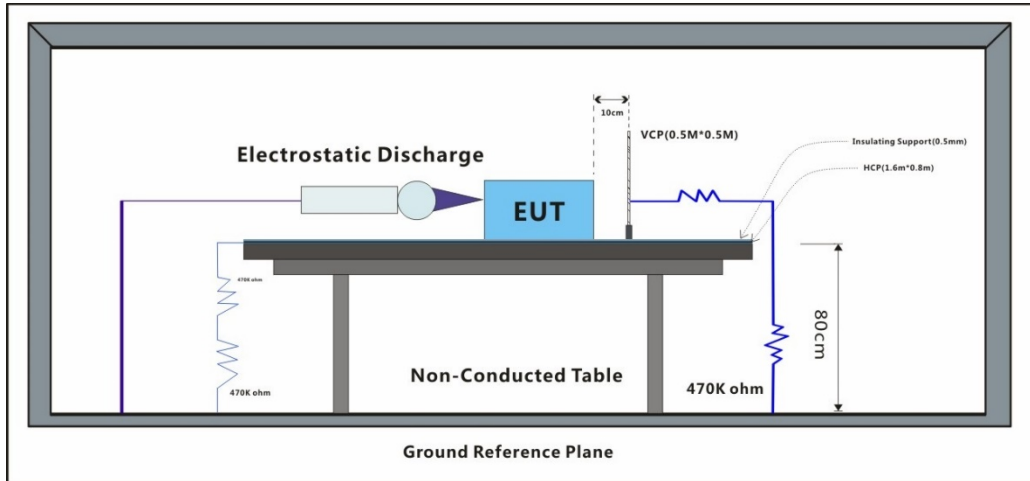


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## 7.2 Electrostatic Discharge

Test Requirement: EN 301 489-1 V2.2.3  
 EN 301 489-17 V3.2.4  
 Test Method: EN 61000-4-2:2009

### 7.2.1 Test Setup Diagram



### 7.2.2 E.U.T. Operation

Operating Environment:  
 Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

### 7.2.3 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	Operation(Zigbee):Keep the EUT communicating with other Zigbee devices.

### 7.2.4 Test Condition and Results:

Performance Criterion: B  
 Discharge Impedance: 330Ω/150pF  
 Number of Discharge: Minimum 10 times at each test point  
 Discharge Mode: Single Discharge  
 Discharge Period: 1 second minimum  
 Test Point: 1. All insulated enclosure and seams.  
 2. All accessible metal parts of the enclosure.  
 3. All side



Discharge type	Level (kV)	Polarity	Test Point	Result / Observations
Air Discharge	2,4,8	+	1	A
Air Discharge	2,4,8	-	1	A
Contact Discharge	4	+	2	A
Contact Discharge	4	-	2	A
Horizontal Coupling	4	+	3	A
Horizontal Coupling	4	-	3	A
Vertical Coupling	4	+	3	A
Vertical Coupling	4	-	3	A

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



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## 8 Photographs

Refer to the < Photographs >

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