TEST REPORT

Applicant: Aduro Technologies LLC

Address of Applicant: 475 WASHINGTON BLVD, MARINA DEL REY, California

90292, United States

Manufacturer/Factory: Sichuan Aduro Technology CO., LTD

Address of Building 23, Area A Meijiarongxiang Electronic Info Industry

Manufacturer/Factory: Park, Renshou, Meishan, Sichuan, China

Equipment Under Test (EUT)

Product Name: A19 smart light bulbs

Model No.: 81812-V2

Trade Mark: AduroSmart Eria

FCC ID: 2APKV-518912

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: November 22, 2022

Date of Test: November 23, 2022-February 14, 2023

Date of report issued: February 14, 2023

Test Result: PASS *



Robinson Luo Laboratory Manager

^{*} In the configuration tested, the EUT complied with the standards specified above.



2 Version

Version No.	Date	Description
00	February 14, 2023	Original

Prepared By:	Tranklu	Date:	February 14, 2023
	Project Engineer		
Check By:	Reviewer	Date:	February 14, 2023



3 Contents

			Page
1	cov	ER PAGE	1
2	VER	SION	2
3	CON	ITENTS	3
4		T SUMMARY	
	4.1	MEASUREMENT UNCERTAINTY	4
5	GEN	ERAL INFORMATION	5
	5.1	GENERAL DESCRIPTION OF EUT	-
	5.2	TEST MODE	
	5.3	DESCRIPTION OF SUPPORT UNITS	
	5.4	DEVIATION FROM STANDARDS	
	5.5	ABNORMALITIES FROM STANDARD CONDITIONS	
	5.6	TEST FACILITY	
	5.7 5.8	TEST LOCATION	
		ADDITIONAL INSTRUCTIONS	
6	TES	T INSTRUMENTS LIST	8
7	TES	T RESULTS AND MEASUREMENT DATA	
	7.1	ANTENNA REQUIREMENT	
	7.2	CONDUCTED EMISSIONS	
	7.3	CONDUCTED PEAK OUTPUT POWER	
	7.4 7.5	CHANNEL BANDWIDTH POWER SPECTRAL DENSITY	
	7.6	SPURIOUS EMISSION IN NON-RESTRICTED & RESTRICTED BANDS	
	7.6.1		
	7.6.2		
8	TES	T SETUP PHOTO	
9	FUT	CONSTRUCTIONAL DETAILS	33



4 Test Summary

Test Item	Section in CFR 47	Result	
Antenna requirement	15.203/15.247 (c)	Pass	
AC Power Line Conducted Emission	15.207	Pass	
Conducted Peak Output Power	15.247 (b)(3)	Pass	
Channel Bandwidth	15.247 (a)(2)	Pass	
Power Spectral Density	15.247 (e)	Pass	
Band Edge	15.247(d)	Pass	
Spurious Emission	15.205/15.209	Pass	

Pass: The EUT complies with the essential requirements in the standard.

Remark: Test according to ANSI C63.10:2013

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes			
Radiated Emission	9kHz-30MHz	3.1dB	(1)			
Radiated Emission	30MHz-200MHz	3.8039dB	(1)			
Radiated Emission	200MHz-1GHz	3.9679dB	(1)			
Radiated Emission	1GHz-18GHz	4.29dB	(1)			
Radiated Emission	18GHz-40GHz	3.30dB	(1)			
AC Power Line Conducted Emission 0.15MHz ~ 30MHz 3.44dB (1)						
Note (1): The measurement unce	ertainty is for coverage factor of k	=2 and a level of confidence of 9	95%.			



5 General Information

5.1 General Description of EUT

Product Info:	A19 smart light bulbs
Model No.:	81812-V2
Serial No.:	021623000094
Test sample(s) ID:	GTS202211000223-1
Sample(s) Status	Engineer sample
Operation Frequency:	2405MHz~2480MHz
Channel numbers:	16
Channel separation:	5MHz
Modulation type:	O-QPSK
Antenna Type:	PCB Antenna
Antenna gain:	-1.85dBi (Declared by manufacturer)
Power supply:	Input: AC 110-130V, 50/60Hz, 0.078A, 8.5W



Operation	Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency	
11	2405MHz	15	2425MHz	19	2445MHz	23	2465MHz	
12	2410MHz	16	2430MHz	20	2450MHz	24	2470MHz	
13	2415MHz	17	2435MHz	21	2455MHz	25	2475MHz	
14	2420MHz	18	2440MHz	22	2460MHz	26	2480MHz	

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2405MHz
The middle channel	2440MHz
The Highest channel	2480MHz



5.2 Test mode

Transmitting mode Keep the EUT in continuously transmitting mode.

Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

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

• FCC—Registration No.: 381383

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

• IC —Registration No.: 9079A

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

NVLAP (LAB CODE:600179-0)

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480 Fax: 0755-27798960

5.8 Additional instructions

Test Software	Special test command provided by manufacturer
Power level setup	Default



6 Test Instruments list

Radiated Emission:							
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)	
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 02, 2020	July 01, 2025	
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A	
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	April 22, 2022	April 21, 2023	
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 21, 2022	March 20, 2023	
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June 12, 2022	June 11, 2023	
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 23, 2022	June 22, 2023	
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A	
8	Coaxial Cable	GTS	N/A	GTS213	April 22, 2022	April 21, 2023	
9	Coaxial Cable	GTS	N/A	GTS211	April 22, 2022	April 21, 2023	
10	Coaxial cable	GTS	N/A	GTS210	April 22, 2022	April 21, 2023	
11	Coaxial Cable	GTS	N/A	GTS212	April 22, 2022	April 21, 2023	
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	April 22, 2022	April 21, 2023	
13	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 23, 2022	June 22, 2023	
14	Band filter	Amindeon	82346	GTS219	June 23, 2022	June 22, 2023	
15	Power Meter	Anritsu	ML2495A	GTS540	June 23, 2022	June 22, 2023	
16	Power Sensor	Anritsu	MA2411B	GTS541	June 23, 2022	June 22, 2023	
17	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 22, 2022	April 21, 2023	
18	Splitter	Agilent	11636B	GTS237	June 23, 2022	June 22, 2023	
19	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 29, 2022	Nov. 28, 2023	
20	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 22, 2022	April 21, 2023	
21	Breitband hornantenna	SCHWARZBECK	BBHA 9170	GTS579	Oct. 16, 2022	Oct. 15, 2023	
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 16, 2022	Oct. 15, 2023	
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 16, 2022	Oct. 15, 2023	
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June 23, 2022	June 22, 2023	
25	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 22, 2022	April 21, 2023	



Con	Conducted Emission								
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)			
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May 14, 2022	May 13, 2025			
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 24, 2022	April 23, 2023			
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June 23, 2022	June 22, 2023			
4	ENV216 2-L-V- NETZNACHB.DE ROHDE&SCHWARZ		ENV216	GTS226	April 22, 2022	April 21, 2023			
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A			
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A			
7	Thermo meter	JINCHUANG	GSP-8A	GTS639	April 28, 2022	April 27, 2023			
8	Absorbing clamp	Elektronik- Feinmechanik	MDS21	GTS229	April 15, 2022	April 14, 2023			
9	ISN	SCHWARZBECK	NTFM 8158	GTS565	April 22, 2022	April 21, 2023			
10	High voltage probe	SCHWARZBECK	TK9420	GTS537	April 22, 2022	April 21, 2023			

RF C	RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)	
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 22, 2022	April 21, 2023	
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 22, 2022	April 21, 2023	
3	Spectrum Analyzer	Agilent	E4440A	GTS536	April 22, 2022	April 21, 2023	
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 22, 2022	April 21, 2023	
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 22, 2022	April 21, 2023	
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 22, 2022	April 21, 2023	
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 22, 2022	April 21, 2023	
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 22, 2022	April 21, 2023	

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	April 25, 2022	April 24, 2023
2	Barometer	KUMAO	SF132	GTS647	July 26, 2022	July 25, 2023



7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement: FCC Part15 C Section 15.203 /247(c)

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

EUT Antenna:

The antenna is PCB antenna, reference to the appendix II for details.



7.2 Conducted Emissions

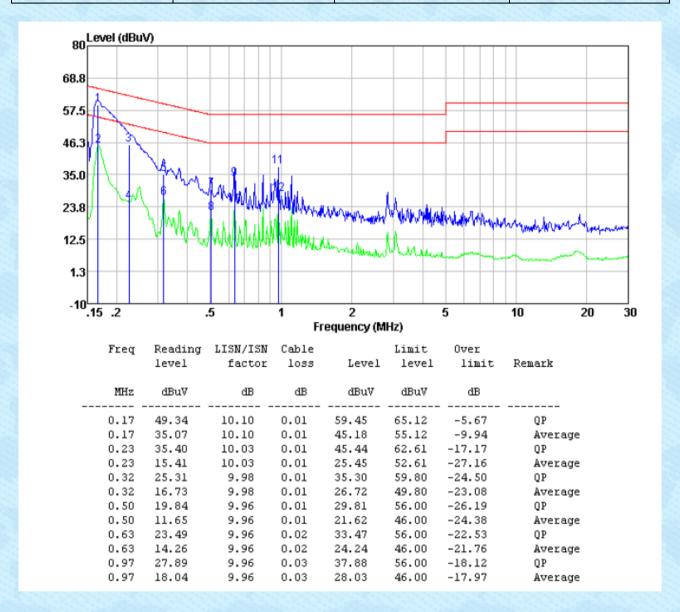
Test Requirement:	FCC Part15 C Section 15.207					
Test Method:	ANSI C63.10:2013					
Test Frequency Range:	150KHz to 30MHz	150KHz to 30MHz				
Class / Severity:	Class B					
Receiver setup:	RBW=9KHz, VBW=30KHz, St	weep time=auto				
Limit:	Fraguency range (MHz)	Limit (dBuV)			
	Frequency range (MHz) Quasi-peak Average					
	0.15-0.5	66 to 56*	56 to 46*			
	0.5-5	56	46			
	5-30	60	50			
	* Decreases with the logarithm	n of the frequency.				
Test setup:	Reference Plane					
	AUX Equipment E.U.T EMI Receiver Remark E.U.T. Equipment Under Test LISN Filter AC power Remark E.U.T. Equipment Under Test LISN Line Impedence Stabilization Network Test table height=0.8m					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.: 25 °C Humid.: 52% Press.: 1012mbar					
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					



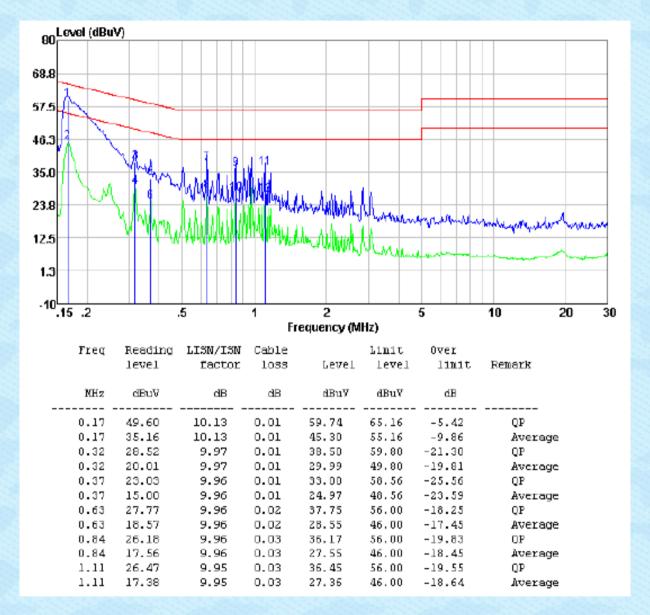
Measurement data

Pre-scan all test modes, found worst case at 2480MHz, and so only show the test result of 2480MHz

Test mode: Transmitting mode Phase Polarity: Line





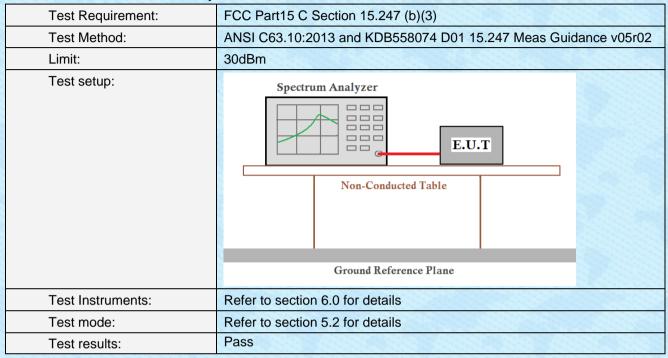


Notes:

- 1. An initial pre-scan was performed on the line and neutral lines with peak detector.
- Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
- 3. Final Level =Receiver Read level + LISN Factor + Cable Loss
- 4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.



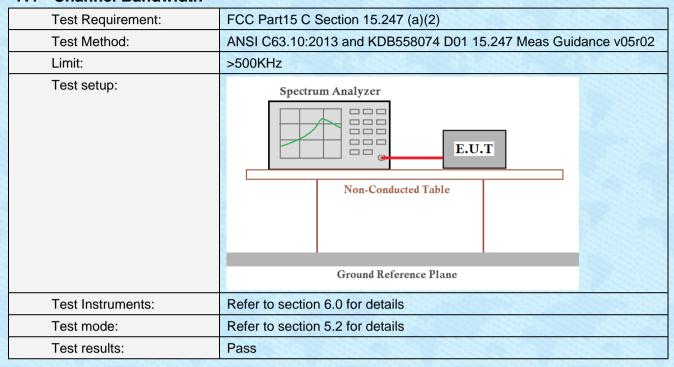
7.3 Conducted Peak Output Power



Measurement Data: The detailed test data see Appendix for ZigBee.



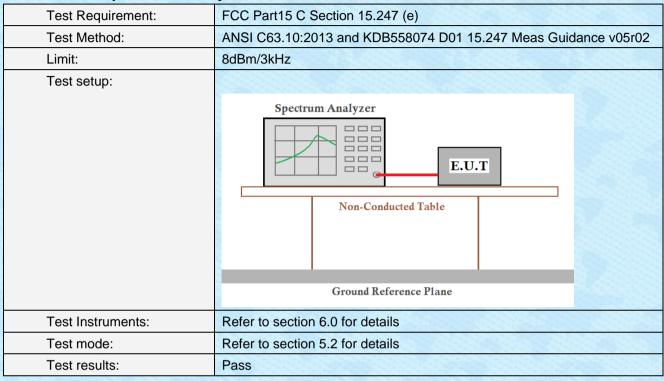
7.4 Channel Bandwidth



Measurement Data: The detailed test data see Appendix for ZigBee.



7.5 Power Spectral Density



Measurement Data: The detailed test data see Appendix for ZigBee.



7.6 Spurious Emission in Non-restricted & restricted Bands

7.6.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)			
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02			
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.			
Test setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane			
Test Instruments:	Refer to section 6.0 for details			
Test mode:	Refer to section 5.2 for details			
Test results:	Pass			

Measurement Data: The detailed test data see Appendix for ZigBee.

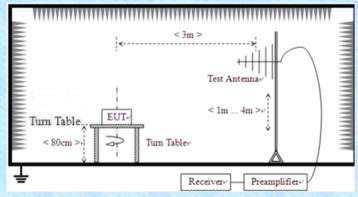


7.6.2 Radiated Emission Method

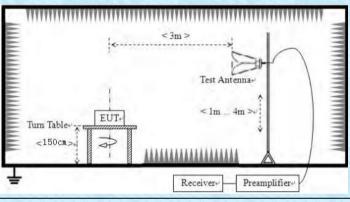
Test Requirement:	FCC Part15 C Section	on 15	.209				
Test Method:	ANSI C63.10:2013						
Test Frequency Range:	9kHz to 25GHz						
Test site:	Measurement Distar	nce: 3	3m				
Receiver setup:	Frequency	D	etector	RBV	٧	VBW	Value
	9KHz-150KHz Quasi-peak 200Hz 600Hz Quasi-peak						
	150KHz-30MHz Quasi-peak 9KHz 30KHz Quasi-ր				Quasi-peak		
	30MHz-1GHz	Qu	asi-peak	120KHz 300KHz		300KHz	Quasi-peak
	Above 1GHz		Peak	1MH	lz	3MHz	Peak
	7,0000 10112		Peak	1MH	lz	10Hz	Average
	Note: For Duty cycle < 98%, average dete						ve For Duty cycle
Limit:	Frequency		Limit (u\	//m)	1	/alue	Measurement Distance
	0.009MHz-0.490M	lHz	2400/F(k	(Hz)	QP	/PK/AV	300m
	0.490MHz-1.705M	lHz	24000/F(I	KHz)		QP	30m
	1.705MHz-30MH	lz	30			QP	30m
	30MHz-88MHz		100			QP	
	88MHz-216MHz 150 QP						
	216MHz-960MH		200			QP	3m
	960MHz-1GHz		500			QP	
	Above 1GHz 500 Average						
	5000 Peak						
Test setup:	For radiated emissions from 9kHz to 30MHz						
	Turn Table EUT+ Im Receiver+						



For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



Test Procedure:

- 1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or



	average	average method as specified and then reported in a data sheet.					
Test Instruments:	Refer to se	Refer to section 6.0 for details					
Test mode: Refer to section 5.2 for details							
Test environment:	Temp.: 25 °C Humid.: 52% Press.: 10					1012mbar	
Test voltage:	AC 120V, 6	AC 120V, 60Hz					
Test results: Pass							

Measurement data:

Remark:

Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

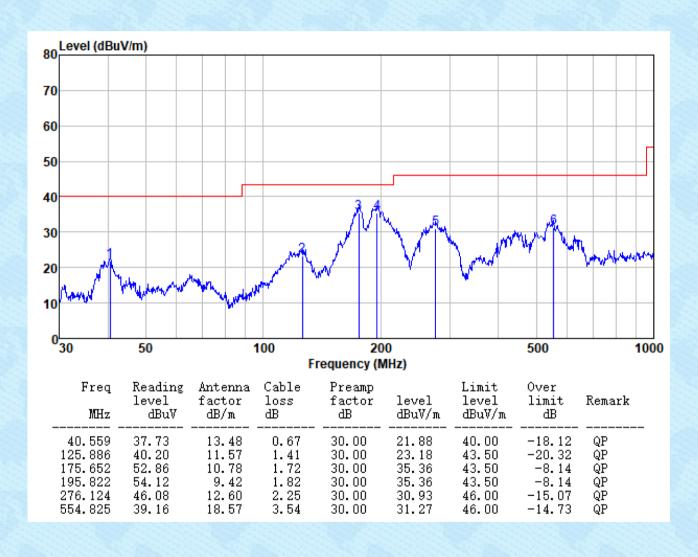
■ 9kHz~30MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.



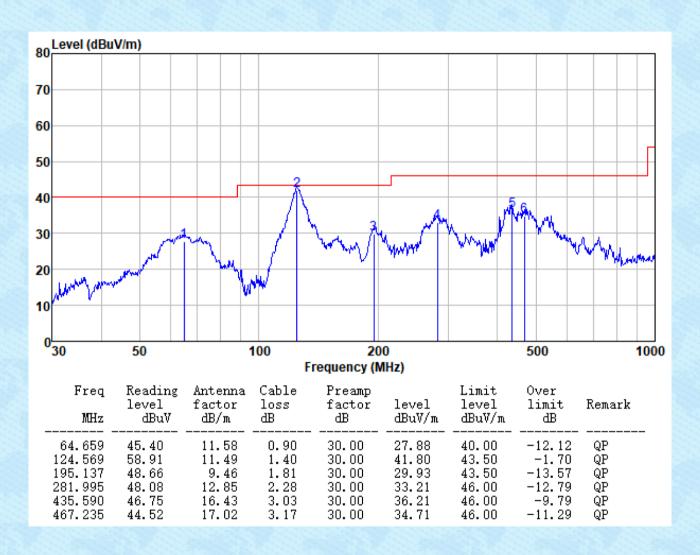
■ Below 1GHz

Pre-scan all test modes, found worst case at 2480MHz, and so only show the test result of 2480MHz **Horizontal:**





Vertical:

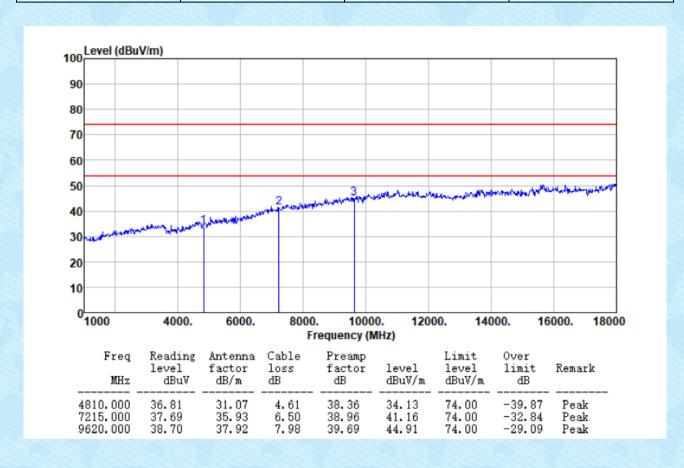




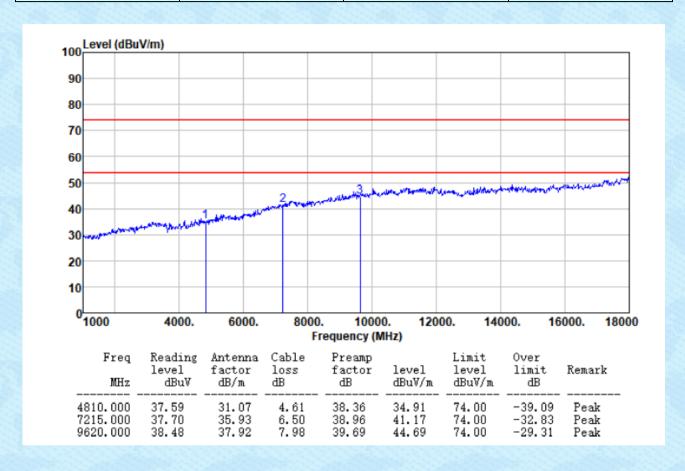
■ Above 1GHz

■ Unwanted Emissions in Restricted Frequency Bands

est channel: Lowest Polarization: Horizonta	
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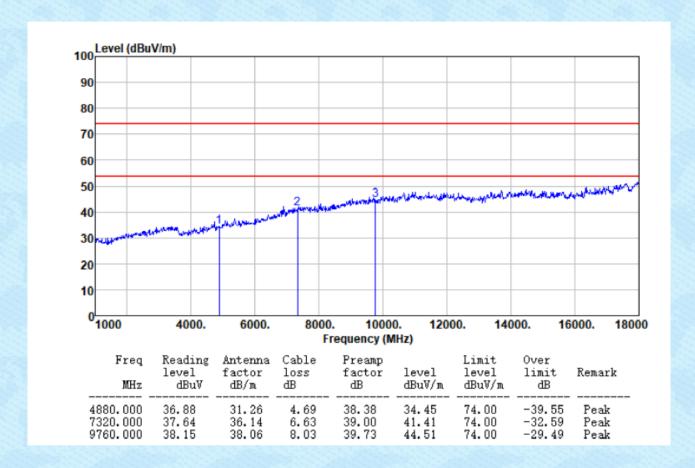






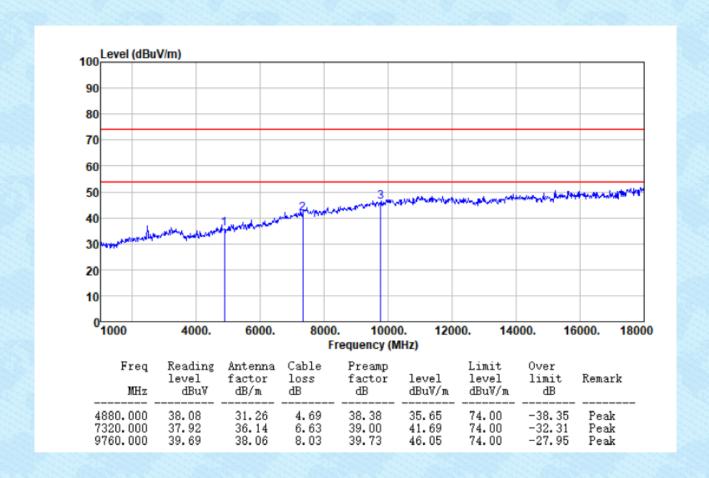


		Test channel:	Middle	Polarization:	Horizontal
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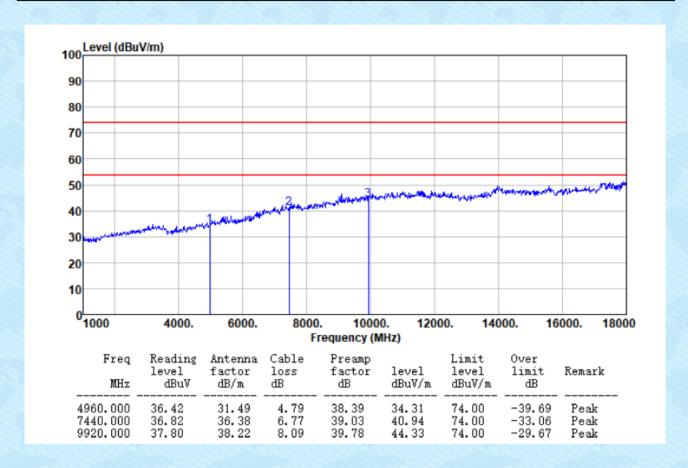


nel: Middle Polarization: Vertical	Polarization: Vertical	Middle	Test channel:
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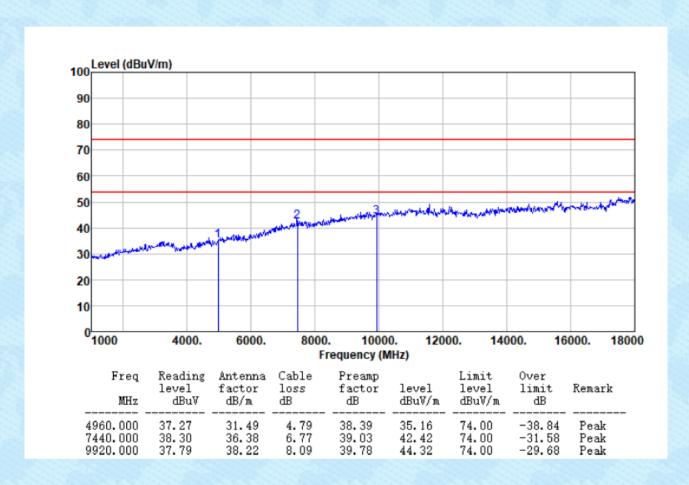




Test channel:	Highest	Polarization:	Horizontal
1 oot onarmor.	Tilgiloot	i dianzadon.	1 IOTIZOTICAI







Remarks:

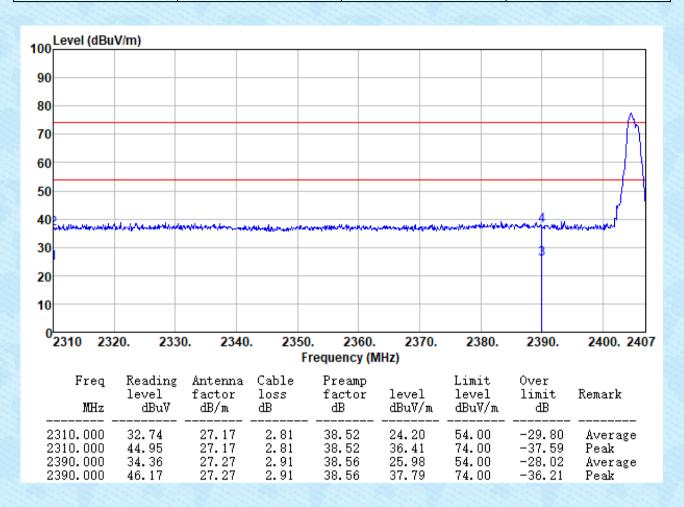
- 1. Final Level =Receiver Read level + Antenna Factor + Cable Loss Preamplifier Factor
- 2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Telephone: +86 (0) 755 2779 8480 Fax: +86 (0) 755 2779 8960 Page 28 of 33



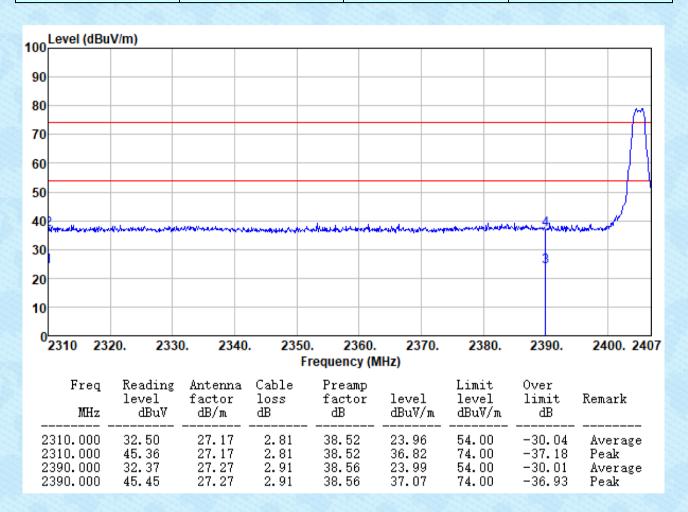
Unwanted Emissions in Non-restricted Frequency Bands

Test channel: Lowest Polarization: Horizontal



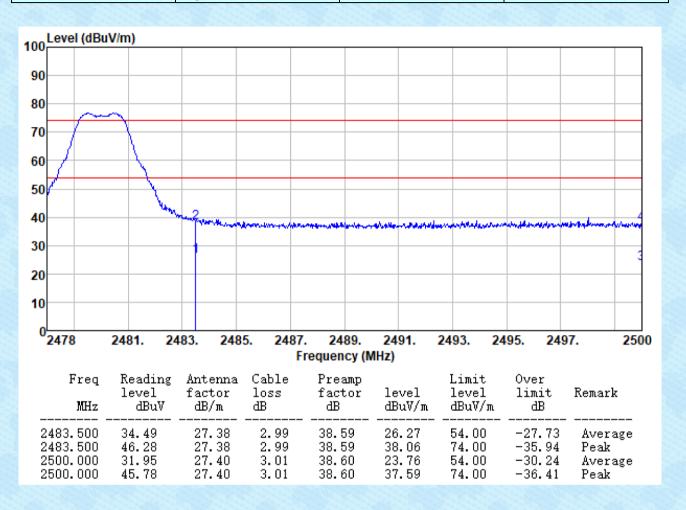


Test channel: Lowest Polarization: Vertical



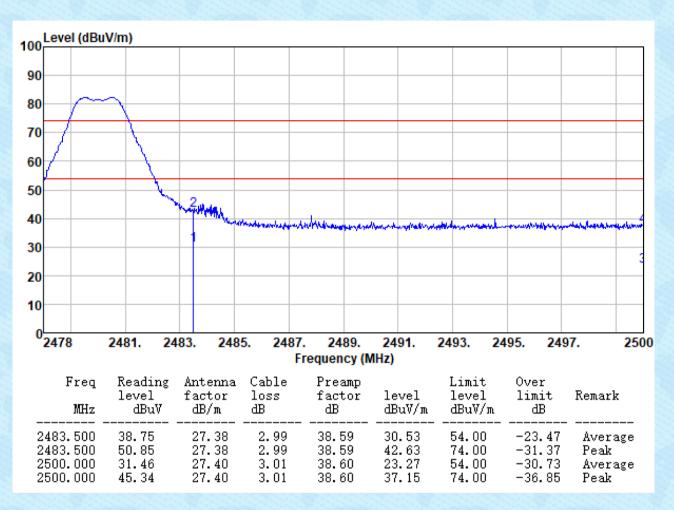


Test channel: Highest Polarization: Horizontal	ı	Test channel:	Highest	Polarization:	Horizontal
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Test channel: Highest Polarization: Vertical
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Remark:

- 1. Final Level = Receiver Read level + Antenna Factor + Cable Loss Preamplifier Factor
- 2. The emission levels of other frequencies are very lower than the limit and not show in test report.



8 Test Setup Photo

Reference to the appendix I for details.

9 EUT Constructional Details

Reference to the appendix II for details.

-----End-----