



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

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

## RF Exposure evaluation

**Report Reference No.....: GTSR18080199-WLAN03**

**FCC ID.....: 2AQ4K-L8**

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Date of issue.....: Sep.12, 2018

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

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

**Applicant's name.....: Shandong Praytech Optoelectronic Technology Co.,Ltd.**

Address .....: F2,Blue Venture Valley,South of Keji Road,East of Longhai Road,Nanhai New District, Weihai City,Shandong Province, China

**Test specification .....**

Standard .....: **47CFR §2.1093(d)/KDB447498 v06**

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

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

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**Test item description .....**

Trade Mark .....: Smart Cube projector

Manufacturer .....: /

Model/Type reference.....: Shandong Praytech Optoelectronic Technology Co.,Ltd.

Listed Models .....: L8

Modulation Type .....: H5

Difference .....: All the same except the model number

Hardware Version .....: V4

Software Version .....: V017

Rating .....: DC 3.8V from Battery or DC 5V from adapter

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

## TEST REPORT

Test Report No. :	<b>GTSR18080199-WLAN03</b>	Sep. 12, 2018
		Date of issue

Equipment under Test : **Smart Cube projector**

Model /Type : **L8**

Listed Models : **H5**

Applicant : **Shandong Praytech Optoelectronic Technology Co.,Ltd.**

Address : F2,Blue Venture Valley,South of Keji Road,East of Longhai Road,Nanhai New District, Weihai City,Shandong Province, China

Manufacturer : **Shandong Praytech Optoelectronic Technology Co.,Ltd.**

Address : F2,Blue Venture Valley,South of Keji Road,East of Longhai Road,Nanhai New District, Weihai City,Shandong Province, China

<b>Test Result:</b>	<b>PASS</b>
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The test report merely corresponds to the test sample.

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

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## 1. SUMMARY

### 1.1. EUT configuration

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

● - supplied by the manufacturer

○ - supplied by the lab

<input type="radio"/> /	M/N:	/
	Manufacturer:	/

### 1.2. Product Description

Name of EUT	Smart Cube projector
Trade Mark:	/
Model Number	L8
Listed Models	H5
Power Supply	DC 3.8V from Battery or DC 5V from adapter
WLAN	Supported 802.11a/ 802.11ac/802.11b/802.11g/802.11n
Modulation Type	IEEE 802.11ac: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
Operation frequency	IEEE 802.11a/ac VHT20: 5745MHz-5825MHz IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz/5745MHz-5825MHz IEEE 802.11n HT40 /ac CHT 40:2422-2452MHz/5755-5795 MHz
Directional gain	@2.4G GANT +10log(N)dbi =0.96+10log2=3.97dbi < 6 dbi @5G GANT +10log(N)dbi =2.23+10log2=5.24dbi < 6 dbi
Antenna Type	internal antenna
Antenna gain	0.96 dBi@2.4G , 2.23 dBi@5G
BT	
Modulation Type	GFSK
Operation frequency	2402-2480 MHz
Antenna Type:	Internal Antenna
Antenna Gain:	0.96 dBi

## 2. TEST ENVIRONMENT

### 2.1. Address of the test laboratory

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

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

### 2.2. Test Facility

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

#### FCC-Registration No.: 165725

Shenzhen Global Test Service Co.,Ltd 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 our files.

#### A2LA-Lab Cert. No.: 4758.01

Shenzhen Global Test Service Co.,Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### CNAS-Lab Code: L8169

Shenzhen Global Test Service Co.,Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories. Date of Registration: Dec. 11, 2015. Valid time is until Dec. 10, 2018.

### 2.3. Environmental conditions

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

Temperature:	15-35 °C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

### 2.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Global Test Service Co.,Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

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

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)

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

### **3. Method of measurement**

#### **3.1. Applicable Standard**

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1093 RF exposure requirement

KDB447498 v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

#### **3.2. Requirement**

According to KDB447498 D01 General RF Exposure Guidance v06 Section 4.3.1 Standalone SAR test exclusion considerations: "Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.<sup>22</sup> The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander (see 5) of section 4.1). To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, typically in the SAR measurement or SAR analysis report, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc.<sup>23</sup> "

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f \text{ (GHz)}}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where:}$

- $f \text{ (GHz)}$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50 \text{ mm}$  and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5 \text{ mm}$ , a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

#### **3.3. Simultaneous transmission MPE Considerations**

When one of the following test exclusion conditions is satisfied for all combinations of simultaneous transmission configurations, further equipment approval is not required to incorporate transmitter modules in host devices that operate in the mixed mobile and portable host platform exposure conditions. The grantee is responsible for documenting this according to Class I permissive change requirements. Antennas that qualify for standalone SAR test exclusion must apply the estimated standalone SAR to determine simultaneous transmission test exclusion.

The  $[\sum \text{ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg} + [\sum \text{ of MPE ratios}]] \leq 1.0$ .

The SAR to peak location separation ratios of all simultaneously transmitting antenna pairs operating in portable device exposure conditions are all  $\leq 0.04$ , and the  $[\sum \text{ of MPE ratios}] \leq 1.0$ .

#### **3.4. Antenna Information**

L8 can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna Identification in Internal photos	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
Antenna 1	2.4G/5G Wifi and BT LE Chain 1	Internal Antenna	2.4GHz – 2.4835 GHz 5GHz – 6 GHz	0.96dBi(Max.) for 2.4G Band and 2.23dBi(Max.) for 5G Band
Antenna 2	2.4G/5G Wifi Chain 2 Bluetooth	Internal Antenna	2.4GHz – 2.4835 GHz 5GHz – 6 GHz	0.96dBi(Max.) for 2.4G Band and 2.23dBi(Max.) for 5G Band

## 4. Evaluation Result

### 4.1. Conducted Power Results

Mode	Channel	Frequency(MHz)	Average Conducted Output Power (dBm)	Average Conducted Output Power (dBm)
			ANT1	ANT2
GFSK	0	2402	-5.12	/
	19	2440	-4.57	/
	40	2480	-5.28	/
IEEE 802.11b	1	2412	7.86	7.94
	6	2437	7.86	8.60
	11	2462	8.00	8.66
IEEE 802.11g	1	2412	7.52	7.38
	6	2437	7.93	7.01
	11	2462	7.12	7.40
IEEE 802.11n HT20	1	2412	5.50	5.71
	6	2437	5.90	6.13
	11	2462	5.48	5.34
IEEE 802.11n HT40	3	2422	3.89	3.49
	6	2437	4.84	4.34
	9	2452	4.27	4.68
IEEE 802.11a	149	5745	7.06	7.05
	157	5785	6.23	6.21
	165	5825	7.15	6.98
IEEE 802.11n HT20	149	5745	6.98	7.16
	157	5785	7.39	7.33
	165	5825	6.95	7.45
IEEE 802.11ac VHT20	149	5745	6.55	6.62
	157	5785	6.48	7.05
	165	5825	5.55	6.36
IEEE 802.11n HT40	151	5755	5.16	5.25
	159	5795	5.96	5.74
IEEE 802.11ac VHT40	151	5755	5.02	5.12
	159	5795	5.91	5.86

## 4.2. Manufacturing tolerance

GFSK (Average)			
Channel	Channel 0	Channel 19	Channel 40
Target (dBm)	-5.0	-5.0	-5.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11b (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	8.0	8.0	8.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	7.0	7.0	7.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Average)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	6.0	6.0	6.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT40 (Average)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	4.0	4.0	4.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11a (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	6.5	6.5	6.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11 n HT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	6.5	6.5	6.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11 ac VHT20 (Average)			
Channel	Channel 149	Channel 157	Channel 165
Target (dBm)	6.5	6.5	6.5
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11 n HT40 (Average)			
Channel	Channel 151	Channel 159	
Target (dBm)	5.0	5.0	
Tolerance $\pm$ (dB)	1.0	1.0	
IEEE 802.11 ac VHT40 (Average)			
Channel	Channel 151	Channel 159	
Target (dBm)	5.0	5.0	
Tolerance $\pm$ (dB)	1.0	1.0	

### 4.3. Evaluation Results for Standalone

Antenna chain 1

Band/Mode	f (GHz)	Antenna Distance (mm)	RF output power		SAR Test Exclusion Threshold	SAR Test Exclusion	Estimation Standalone SAR (W/kg)
			dBm	mW			
GFSK	2.5	5	-4.0	0.3981	0.13<3.0	Yes	0.0168
IEEE 802.11b	2.5	5	9.0	7.9433	2.51<3.0	Yes	0.3349
IEEE 802.11g	2.5	5	8.0	6.3096	2.00<3.0	Yes	0.2660
IEEE 802.11n HT20	2.5	5	7.0	5.0119	1.58<3.0	Yes	0.2113
IEEE 802.11n HT40	2.5	5	5.0	3.1623	1.00<3.0	Yes	0.1333
IEEE 802.11a	5.85	5	7.5	5.6234	2.72<3.0	Yes	0.3627
IEEE 802.11n HT20	5.85	5	7.5	5.6234	2.72<3.0	Yes	0.3627
IEEE 802.11ac VHT20	5.85	5	7.5	5.6234	2.72<3.0	Yes	0.3627
IEEE 802.11n HT40	5.85	5	6.0	3.9811	1.93<3.0	Yes	0.2568
IEEE 802.11ac VHT40	5.85	5	6.0	3.9811	1.93<3.0	Yes	0.2568

Antenna chain 2

Band/Mode	f (GHz)	Antenna Distance (mm)	RF output power		SAR Test Exclusion Threshold	SAR Test Exclusion	Estimation Standalone SAR (W/kg)
			dBm	mW			
IEEE 802.11b	2.5	5	9.0	7.9433	2.51<3.0	Yes	0.3349
IEEE 802.11g	2.5	5	8.0	6.3096	2.00<3.0	Yes	0.2660
IEEE 802.11n HT20	2.5	5	7.0	5.0119	1.58<3.0	Yes	0.2113
IEEE 802.11n HT40	2.5	5	5.0	3.1623	1.00<3.0	Yes	0.1333
IEEE 802.11a	5.85	5	7.5	5.6234	2.72<3.0	Yes	0.3627
IEEE 802.11n HT20	5.85	5	7.5	5.6234	2.72<3.0	Yes	0.3627
IEEE 802.11ac VHT20	5.85	5	7.5	5.6234	2.72<3.0	Yes	0.3627
IEEE 802.11n HT40	5.85	5	6.0	3.9811	1.93<3.0	Yes	0.2568
IEEE 802.11ac VHT40	5.85	5	6.0	3.9811	1.93<3.0	Yes	0.2568

*Remark:*

1. Output power including tune up tolerance;
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to f) in section 4.1 is applied to determine SAR test exclusion.

### 4.4. Simultaneous Transmission for SAR Exclusion

The sample supports two antennas, need consider simultaneous transmission;

$$\Sigma \text{ of (the highest measured or estimated SAR}_{\text{antenna1}} + \text{ SAR}_{\text{antenna2}}) / 1.6 = (0.3627 + 0.3627) / 1.6 \\ = 0.45 < 1.0;$$

## 5. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06.

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