



**SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch**

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RF Exposure Evaluation Report

Application No.: HKES1711003258IT
Applicant: Pismo Labs Technology Limited
Address of Applicant: Unit A5, 5/F, HK Spinners Industrial Building, Phase 6, 481 Castle Peak Road, Cheung Sha Wan, Kowloon, Hong Kong
Manufacturer: Pismo Labs Technology Limited
Address of Manufacturer: Unit A5, 5/F, HK Spinners Industrial Building, Phase 6, 481 Castle Peak Road, Cheung Sha Wan, Kowloon, Hong Kong
Equipment Under Test (EUT):
EUT Name: Peplink / Pepwave / Pismo Labs Wireless Product
Model No.: AP One Rugged with M12 Connector, AP One Rugged Extreme, AP One Rugged EX, AP One Rugged M12, PismoAC6M12, PismoAC6 M12♣
♣ Please refer to section 4 of this report which indicates which model was actually tested and which were electrically identical.
FCC ID: U8G-P1AC6M12
Standard(s) : 47 CFR Part 1.1307
47 CFR Part 1.1310
KDB447498D01 General RF Exposure Guidance v06
Date of Receipt: 2017-11-16
Date of Test: 2017-12-01 to 2017-12-29
Date of Issue: 2018-03-07

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.



Keny Xu
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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2 Version

<i>Revision Record</i>				
<i>Version</i>	<i>Chapter</i>	<i>Date</i>	<i>Modifier</i>	<i>Remark</i>
01		2018-03-07		Original

Authorized for issue by:			
			
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		Harry Wu /Project Engineer	
			
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		Eric Fu /Reviewer	



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4 General Information

4.1 General Description of EUT

Power Supply:	DC12V-36V Adapter: Model: DSA-36PFH-12 FUS 120300AN Input: AC100-240V, 50/60Hz, 1A Output: DC12V, 3A			
For WiFi 2.4G:				
Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz			
Modulation Type:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20 and HT40): OFDM (BPSK, QPSK, 16QAM, 64QAM)			
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels IEEE 802.11n HT40: 7 Channels			
Sample Type:	Mobile device			
Antenna Type:	Dedicated			
Antenna Gain:	Antenna 1: 3.5dBi, Antenna 2: 3.5dBi, Antenna 3: 3.5dBi			
For WiFi 5G:				
Operation Frequency:	Band	Mode	Frequency Range(MHz)	Number of channels
	UNII Band I	IEEE 802.11a/n(HT20)/ac(HT20)	5180-5240	4
		IEEE 802.11n(HT40)/ac(HT40)	5190-5230	2
		IEEE 802.11ac(HT80)	5210	1
	UNII Band III	IEEE 802.11a/n(HT20)/ac(HT20)	5745-5825	5
		IEEE 802.11n(HT40)/ac(HT40)	5755-5795	2
IEEE 802.11ac(HT80)		5775	1	
Modulation Type:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) IEEE 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)			
Sample Type:	Mobile device			
Antenna Type:	Dedicated			
Antenna Gain:	Antenna 1: 5.8dBi, Antenna 2: 5.8dBi, Antenna 3: 5.8dBi			

Remark:

Model No.: AP One Rugged with M12 Connector, AP One Rugged Extreme, AP One Rugged EX, AP One Rugged M12, PismoAC6M12, PismoAC6 M12

Only the model AP One Rugged M12 was tested, since the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, with only difference on model names for the marketing requirement.



4.2 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China
518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

4.3 Test Facility

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

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 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. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3



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4.4 Deviation from Standards

None.

4.5 Abnormalities from Standard Conditions

None.

4.6 Other Information Requested by the Customer

None.



5 RF Exposure Evaluation

5.1 RF Exposure Compliance Requirement

5.1.1 Limits

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: $Pd = (Pout * G) / (4 * Pi * R^2)$

Where

Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

5.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.



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4.1.3 EUT RF Exposure Evaluation

2.4G Wifi:

Antenna Gain: Antenna 1: 3.5dBi, Antenna 2: 3.5dBi, Antenna 3: 3.5dBi

Antenna Gain: The maximum Gain 2 measured in fully anechoic chamber is 2.24 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

SISO mode (Maximum E.I.R.P: 802.11g @ Ant. 2):

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit	MPE Ratios	Result
middle	2437	15.43	34.91	0.016	1.0	0.016	PASS

MIMO mode (Maximum E.I.R.P: 802.11n(HT20))

Channel	Frequency (MHz)	Max. Conducted Peak Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 30 cm (mW/cm ²)	Limit	MPE Ratios	Result
Lowest	2422	18.64	73.114	0.033	1.0	0.033	PASS

Note: Refer to report No. HKES171100325802 for EUT test Max Conducted Peak Output Power value.

The distance r (4th column) calculated from the Friis transmission formula is far greater than 20 cm separation requirement.



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5G Wifi:

Antenna Gain: 5.8dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.80 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

SISO mode (Maximum E.I.R.P: 802.11a @ Ant. 2):

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit	MPE Ratios	Result
Highest	5240	9.27	8.45	0.006	1.0	0.006	PASS

MIMO mode (Maximum E.I.R.P: 802.11ac(HT20))

Channel	Frequency (MHz)	Max. Conducted Peak Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 30 cm (mW/cm ²)	Limit	MPE Ratios	Result
Highest	5240	13.20	20.893	0.016	1.0	0.016	PASS

Note: Refer to report No. HKES171100325803 for EUT test Max Conducted Peak Output Power value. The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

exposure conditions for simultaneous transmission operations

Since the 2.4G Wifi and 5G Wifi use the same antennas, for MIMO mode, 2.4G Wifi and 5G Wifi can't transmit simultaneously, the simultaneous transmission MPE is evaluated under SISO mode.

Simultaneous transmission MPE test is not required, because the Max. sum of the MPE ratios for WiFi 2.4G and WiFi 5G is $0.016+0.006=0.022 < 1$

- End of the Report -