RF Exposure Evaluation Report

Application No.:	SZEM2101001123CR
Applicant:	DZS, Inc
Address of Applicant:	5700 Tennyson Parkway, Plano, Texas, TX 75024, USA
Manufacturer:	DZS, Inc
Address of Manufacturer:	5700 Tennyson Parkway, Plano, Texas, TX 75024, USA
Factory:	1.Aztech Communication Device (DG) Ltd. 2. IOT Manufacturing SDN.BHD
Address of Factory:	1.Jiu Jiang Shui Village Chang Ping Town, Dong Guan City Guang Dong Province, China 2. No.8&10, Setia Business Park, Jalan Laman Setia 7/4, Taman Laman Setia, 81550 Gelang Patah, Johor Bahru, Johor Malaysia
Product Name:	WLAN AP
Model No.:	MR-2100AC, MR-2100AC-XXX (X: 0-9, A-Z or blank, represents different markets), W1615MR, W1615MR-XXX(X: 0-9, A-Z or blank, represents different markets) ♣
♣	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	DZS
FCC ID:	2AZFQMR2100AC
Standards:	47 CFR Part 1.1307, 47 CFR Part 1.1310, 47 CFR Part 2.1091
Date of Receipt:	2021-01-26
Date of Test:	2021-01-30 to 2021-03-10
Date of Issue:	2021-03-11
Test Result :	**PASS***

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

Keny Xu
EMC Laboratory Manager

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1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2021-03-11		Original

Authorized for issue by:				
				
		Edison Li /Project Engineer		
				
		Eric Fu /Reviewer		

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3 General Information

3.1 General Description of EUT

Power Supply:	Switching Adapter1 Model: HS1201500U Input: AC 100-240V, 50/60Hz, Max.0.8A Output: DC 12V, 1.5A, 18W Switching Adapter2 Model: S18B22-120A150-C4 Input: AC 100-240V, 50/60Hz, Max.0.7A Output: DC 12V, 1.5A, 18W			
Test Voltage:	AC 120V, 60Hz and AC 240 V, 50Hz Note: Both nominal AC 120V, 60Hz and AC 240 V, 50Hz are required for testing in accordance with FCC KDB174176 Q4, this report only shows the results of the worst test result(AC 120V/60Hz);			
Cable:	DC cable: 142cm unshielded			
Internal Source:	More than 108MHz			
For 2.4G WiFi:				
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz 802.11n(HT40): 2422MHz to 2452MHz			
Modulation Type:	802.11b: DSSS(CCK, DQPSK, DBPSK) 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) 802.11n(HT20 and HT40): OFDM (BPSK, QPSK, 16QAM, 64QAM)			
Channel Numbers:	802.11b/g, 802.11n HT20: 11 Channels 802.11n HT40: 7 Channels			
Channel Spacing:	5MHz			
Sample Type:	Fixed device			
Antenna Type:	PCB Antenna			
Antenna Gain:	Antenna1:3.82dBi, Antenna2: 3.76dBi Note: MIMO for 802.11n			
For 5G WiFi:				
Operation Frequency:	Band	Mode	Frequency Range(MHz)	Number of channels
	UNII Band I	802.11a/n(HT20)/ac(HT20)	5180-5240	4
		802.11n(HT40)/ac(HT40)	5190-5230	2
		802.11ac(HT80)	5210	1

	UNII Band III	802.11a/n(HT20)/ac(HT20)	5745-5825	5
		802.11n(HT40)/ac(HT40)	5755-5795	2
		802.11ac(HT80)	5775	1
Modulation Type:	802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)			
TPC Function:	Not support			
Sample Type:	Fixed device			
Antenna Type:	PCB Antenna			
Antenna Gain:	Antenna1:3.85dBi, Antenna2: 3.77dBi, Antenna3:3.80dBi, Antenna4: 3.70dBi Note: MIMO for 802.11n/ac			

Remark:

Model No.: MR-2100AC, MR-2100AC-XXX (X: 0-9, A-Z or blank, represents different markets), W1615MR, W1615MR-XXX(X: 0-9, A-Z or blank, represents different markets)

Since according to the declaration from the applicant, the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, with only difference on model No.

3.2 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.

3.3 Test Facility

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

• 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.

• Innovation, Science and Economic Development Canada

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

CAB identifier: CN0006.

IC#: 4620C.

3.4 Deviation from Standards

None.

3.5 Abnormalities from Standard Conditions

None.

3.6 Other Information Requested by the Customer

None.

4 RF Exposure Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 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/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

For Uncontrolled Environment, the MPE limit of 300MHz to 1500MHz is f/1500 mW/cm^2 , the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm^2 . 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.

4.1.2 Test Procedure

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

4.1.3 EUT RF Exposure Evaluation

1) Test Results

Note: The 2.4G WiFi and 5G WiFi can't synchronous transmission at the same time.

For 2.4G WiFi:

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)	MPE Ratios	Result
Ant1+2	3.82	2.41	16.35	43.15	0.0207	1	0.0207	PASS

Note: Refer to report No. SZEM210100112302 or EUT test Max Conducted Peak Output Power value.
The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For 5G WiFi:

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)	MPE Ratios	Result
Ant1+2+3+4	3.85	2.43	16.26	42.27	0.0204	1	0.0204	PASS

Note: Refer to report No. SZEM210100112303 or EUT test Max Conducted Peak Output Power value.
The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

-End of Report-