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Shenzhen Branch

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RF Exposure Evaluation Report

Application No.:	SZEM1810009244CR
Applicant:	Shenzhen Mindray Bio-Medical Electronics Co., Ltd.
Address of Applicant:	Mindray Building, Keji 12th Road South, High-tech Ind, Nanshan, Shenzhen, China.
Manufacturer:	Shenzhen Mindray Bio-Medical Electronics Co., Ltd.
Address of Manufacturer:	Mindray Building, Keji 12th Road South, High-tech Industrial Park, Nanshan, Shenzhen
Factory:	Shenzhen Mindray Bio-Medical Electronics Co., Ltd.
Address of Factory:	Mindray Building, Keji 12th Road South, High-tech Industrial Park, Nanshan, Shenzhen
Product Name:	Embedded wireless module
Model No.(EUT):	SX-SDMAC-2832S+
Trade Mark:	Mindray
FCC ID:	ZLZ-PMACS
Standards:	47 CFR Part 1.1307 (2016) 47 CFR Part 1.1310 (2016)
Date of Receipt:	2018-10-25
Date of Test:	2018-10-31 to 2018-11-21
Date of Issue:	2018-11-22
Test Result :	**PASS***

* 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.

2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2018-11-22		Original

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

3 Contents

4 General Information

4.1 General Description of EUT

Power supply:	3.3V DC from mainboard			
Antenna Type:	Please refer to section 4.1 of this report			
Antenna Gain:	Please refer to section 4.1 of this report Note: Five antennas can't simultaneous transmission.			
For 2.4G WiFi:				
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz 802.11n(HT40): 2422MHz to 2452MHz			
Number of Channels:	802.11b/g/n(HT20):11 802.11n(HT40):7			
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)			
Channel Spacing:	5MHz			
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 II-A	802.11a/n(HT20)/ac(HT20)	5260-5320	4
		802.11n(HT40)/ac(HT40)	5270-5310	2
		802.11ac(HT80)	5290	1
	UNII Band II-C	802.11a/n(HT20)/ac(HT20)	5500-5700	11
		802.11n(HT40)/ac(HT40)	5510-5670	5
		802.11ac(HT80)	5530, 5610	2
	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
	* The 5600-5650MHz cannot be used in the Canada market.			
Modulation Type:	802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)			
DFS Function:	Slave without radar detection			
TPC Function:	Not support			
Sample Type:	Fixed device			

Remark:

Model No.: SX-SDMAC-2832S+

There are five antennas of the above model, with only difference as below:

Antenna Type	Supplier	Antenna Part No.	Freq.	Peak Antenna Gain(dBi)	Remark
Dipole	AMPHENOL	MG7018-41-000-R	2.4G 5G	1.87dBi Peak @2.4G 0.94dBi Peak @5G	Antenna1
PCB Dipole	Laird	MAF95310	2.4G 5G	2.79dBi Peak @2.4G 3.38dBi Peak @5G	Antenna2
Dipole	AMPHENOL	MG7324-41-000-R	2.4G 5G	1.32dBi Peak @2.4G 2.75dBi Peak @5G	Antenna3
PCB Dipole	Laird	EMF2449A2-8UFL	2.4G 5G	2.79dBi Peak @2.4G 3.38dBi Peak @5G	Antenna4
PCB Dipole	Yichuang	AZM24510-1A	2.4G 5G	1dBi Peak @2.4G 1dBi Peak @5G	Antenna5

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.

• **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.

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/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

For Uncontrolled Environment, the limit of MPE 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.

5.1.2 Test Procedure

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

5.1.3 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	1.87	1.54	26.56	452.90	0.1386	1	0.1386	PASS
Ant2	2.79	1.90	26.56	452.90	0.1713	1	**0.1713**	PASS
Ant3	1.32	1.36	26.56	452.90	0.1221	1	0.1221	PASS
Ant4	2.79	1.90	26.56	452.90	0.1713	1	0.1713	PASS
Ant5	1	1.26	26.56	452.90	0.1134	1	0.1134	PASS

Note: Refer to report No. SZEM181000924401 for 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	0.94	1.24	13.95	24.83	0.0061	1	0.0061	PASS
Ant2	3.38	2.18	13.95	24.83	0.0108	1	0.0108	PASS
Ant3	2.75	1.88	13.95	24.83	0.0093	1	0.0093	PASS
Ant4	3.38	2.18	13.95	24.83	0.0108	1	0.0108	PASS
Ant5	1	1.26	13.95	24.83	0.0062	1	0.0062	PASS

Note: Refer to report No. SZEM181000924402 for 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