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Report No.: SZEM171201302805
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1 Cover Page

RF MPE REPORT

Application No.:	SZEM1712013028CR (SHEM1710006834CR)
Applicant:	NXP SEMICONDUCTORS(SHANGHAI) CO., LTD.
FCC ID:	XXMMCIMX8M-EVK
Equipment Under Test (EUT):	
NOTE: The following sample(s) was/were submitted and identified by the client as	
Product Name:	MCIMX8M-EVK
Model No.(EUT):	MCIMX8M-EVK
Standards:	FCC Rules 47 CFR §2.1091 KDB447498 D01 General RF Exposure Guidance v06
Date of Receipt:	2017-10-12
Date of Test:	2017-12-08
Date of Issue:	2018-01-24
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.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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Revision Record				
Version	Chapter	Date	Modifier	Remark
00	/	2018-01-24	/	Original

Authorized for issue by:				
				
		<hr/> Foray Chen /Project Engineer		
				
		<hr/> Eric Fu /Reviewer		



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3 General Information

3.1 Client Information

Applicant:	NXP SEMICONDUCTORS(SHANGHAI) CO., LTD.
Address of Applicant:	No. 192 Liangjing Rd., Pudong New Area, Shanghai 201303, P.R. China
Manufacturer:	NXP Semiconductor
Address of Manufacturer:	No. 192 Liangjing Rd., Pudong New Area, Shanghai 201303, P.R. China
Factory:	Trivo (Taicang) Technologies Co., Ltd.
Address of Factory:	Building No. 9, YuSheng Industry Park, No. 33 North Changsheng Road, Taicang, Jiangsu, China

3.1 General Description of E.U.T. (MCIMX8M-EVK)

Power supply:	AC Adapter Manufacturer: EDAC POWER ELECTRONICS CO.,LTD Model NO.: EA10682N-120 Input: AC100-240V 2.0A, 50-60Hz Output: DC 12V 5A
Test voltage:	AC 120V/60Hz
Cable:	AC Cable: 180cm DC Cable: 120cm Type C to USB cable: 15cm

3.2 Technical Specifications

Operation Frequency:	BT & BLE: 2402MHz to 2480MHz 2.4GHz WiFi: 802.11 b/g/n(HT20): 2412MHz~2462MHz 802.11 n(HT40): 2422MHz~2452MHz 5GHz WiFi: 802.11a/n(HT20)/ac(HT20): 5180MHz-5240MHz, 5260MHz-5320MHz 5500MHz-5720MHz5745MHz-5825MHz 802.11n(HT40)/ac(HT40): 5190MHz-5230MHz, 5510MHz-5710MHz 5755MHz-5795MHz 802.11ac(HT80): 5210MHz, 5530MHz-5690MHz,5775MHz
Modulation Technique:	BT: GFSK, π /4DQPSK, 8DPSK BLE: GFSK 2.4GHz WiFi: 802.11 b: DSSS(CCK, DQPSK, DBPSK) 802.11 g/n(HT20)/n(HT40): OFDM(64QAM, 16QAM, QPSK, BPSK) 5GHz WiFi: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK) Remark: 256QAM for 802.11 ac only
Data Rate:	2.4GHz WiFi: 802.11 b: 1/2/5.5/11Mbps 802.11 g: 6/9/12/18/24/36/48/54Mbps 802.11n(HT20)/n(HT40): MCS0-MCS7 5GHz WiFi:

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	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: MCS0-7 802.11ac: MCS0-9
Number of Channel:	BT: 79 2.4GHz WiFi: 802.11 b/g/n(HT20): 11 802.11 n(HT40): 7 5GHz WiFi: 5GHz WiFi: 802.11 a/n(HT20)/ac(HT20): 25 802.11 n(HT40)/ac(HT40): 12 802.11 ac(HT80): 6
Antenna Type:	Ceramic Antenna
Antenna Gain:	3dBi for BT 3.0 dBi for 2.4GHz 3.0 dBi for 5GHz



3.3 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.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

3.4 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 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 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.



4 Test Standards and Limits

4.1 FCC Radiofrequency radiation exposure limits:

According to §1.1310, the limit for general population/uncontrolled exposures

Frequency	Power density(mW/cm ²)	Averaging time(minutes)
300MHz~1.5GHz	f/1500	30
1.5GHz~100GHz	1.0	30

5 Measurement and Calculation

5.1 Maximum transmit power

The Power Data is based on the RF Test Report SZEM171201302801 & SZEM171201302802 & SZEM171201302803 & SZEM171201302804

For BT:

Test Mode	Test Frequency (MHz)	Output Power (dBm)	Reading Power (mW)
Classic-GFSK	2402	0.299	1.27
	2441	0.686	1.14
	2480	1.15	1.23
Classic-π/4DQPSK	2402	-0.476	1.37
	2441	-0.215	1.43
	2480	0.278	1.28
Classic-8DPSK	2402	-0.151	1.55
	2441	0.095	1.30
	2480	0.57	1.38
BLE-GFSK	2402	0.6707	1.55
	2440	0.6735	1.30
	2480	0.6747	1.38



For 2.4G WiFi:

Test mode	Test Frequency (MHz)	Output Power (dBm)			Output Power (mW)		
		Antenna 0	Antenna 1	MIMO	Antenna 0	Antenna 1	MIMO
802.11b	2412	17.14	16.66	N/A	51.76	46.34	N/A
	2437	17.79	17.38	N/A	60.12	54.70	N/A
	2462	17.19	16.86	N/A	52.36	48.53	N/A
802.11g	2412	16.06	15.39	N/A	40.36	34.59	N/A
	2437	16.2	16	N/A	41.69	39.81	N/A
	2462	15.99	15.61	N/A	39.72	36.39	N/A
802.11 n20	2412	15.88	15.35	18.63	38.73	34.28	72.95
	2437	16.15	16.01	19.09	41.21	39.90	81.10
	2462	15.82	15.57	18.71	38.19	36.06	74.30
802.11 n40	2422	14.94	13.96	17.49	31.19	24.89	56.10
	2437	15.16	14.52	17.86	32.81	28.31	61.09
	2452	14.56	14.22	17.40	28.58	26.42	54.95

For 5G WiFi:

Test mode	Test Frequency (MHz)	Output Power (dBm)			Output Power (mW)		
		Antenna 0	Antenna 1	MIMO	Antenna 0	Antenna 1	MIMO
802.11a	5180	13.60	12.50		22.91	17.78	
	5220	12.77	11.76		18.92	15.00	
	5240	12.42	11.33		17.46	13.58	
	5260	12.18	11.83		16.52	15.24	
	5280	12.43	11.85		17.50	15.31	
	5320	12.59	12.05		18.16	16.03	
	5500	11.94	12.82		15.63	19.14	
	5600	11.51	12.30		14.16	16.98	
	5700	10.30	11.19		10.72	13.15	
	5720	10.40	10.93		10.96	12.39	
	5745	12.84	13.27		19.23	21.23	
	5785	13.40	13.48		21.88	22.28	
5825	12.60	13.60		18.20	22.91		
802.11n20	5180	10.15	10.33	13.25	10.35	10.79	21.14
	5220	9.43	10.24	12.86	8.77	10.57	19.34
	5240	9.06	8.96	12.02	8.05	7.87	15.92
	5260	11.82	9.72	13.91	15.21	9.38	24.58

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	5280	12.29	9.57	14.15	16.94	9.06	26.00
	5320	12.51	9.09	14.14	17.82	8.11	25.93
	5500	9.87	10.02	12.96	9.71	10.05	19.75
	5600	9.41	9.81	12.62	8.73	9.57	18.30
	5700	8.31	8.35	11.34	6.78	6.84	13.62
	5720	8.54	8.60	11.58	7.14	7.24	14.39
	5745	12.81	12.80	15.82	19.10	19.05	38.15
	5785	13.37	13.14	16.27	21.73	20.61	42.33
	5825	12.54	13.18	15.88	17.95	20.80	38.74
802.11n40	5190	11.85	11.62	14.75	15.31	14.52	29.83
	5230	10.64	10.74	13.70	11.59	11.86	23.45
	5270	11.80	11.22	14.53	15.14	13.24	28.38
	5310	13.44	12.09	15.83	22.08	16.18	38.26
	5510	11.69	12.20	14.96	14.76	16.60	31.35
	5590	11.63	11.49	14.57	14.55	14.09	28.65
	5670	10.10	11.01	13.59	10.23	12.62	22.85
	5710	10.13	10.95	13.57	10.30	12.45	22.75
	5755	13.64	15.25	17.53	23.12	33.50	56.62
	5795	13.93	15.49	17.79	24.72	35.40	60.12
802.11ac20	5180	10.31	10.22	13.28	10.74	10.52	21.26
	5220	9.57	9.39	12.49	9.06	8.69	17.75
	5240	9.04	8.90	11.98	8.02	7.76	15.78
	5260	11.84	10.21	14.11	15.28	10.50	25.77
	5280	12.39	9.25	14.11	17.34	8.41	25.75
	5320	12.45	9.11	14.10	17.58	8.15	25.73
	5500	9.03	9.54	12.30	8.00	8.99	16.99
	5600	8.89	9.49	12.21	7.74	8.89	16.64
	5700	7.66	7.97	10.83	5.83	6.27	12.10
	5720	8.67	9.12	11.91	7.36	8.17	15.53
	5745	12.84	14.79	16.93	19.23	30.13	49.36
	5785	13.40	14.87	17.21	21.88	30.69	52.57
5825	12.61	15.12	17.05	18.24	32.51	50.75	
802.11ac40	5190	11.76	11.70	14.74	15.00	14.79	29.79
	5230	10.74	10.86	13.81	11.86	12.19	24.05
	5270	11.85	11.08	14.49	15.31	12.82	28.13
	5310	13.14	12.12	15.67	20.61	16.29	36.90

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	5510	11.69	10.92	14.33	14.76	12.36	27.12
	5590	11.52	11.85	14.70	14.19	15.31	29.50
	5670	10.67	10.81	13.75	11.67	12.05	23.72
	5710	10.63	10.52	13.59	11.56	11.27	22.83
	5755	13.69	15.20	17.52	23.39	33.11	56.50
	5795	14.00	15.47	17.81	25.12	35.24	60.36
802.11ac80	5210	10.98	10.96	13.98	30.62	23.01	53.63
	5290	14.86	13.62	17.29	17.18	18.37	35.54
	5530	12.35	12.64	15.51	13.27	15.03	28.31
	5610	11.23	11.77	14.52	11.72	14.16	25.88
	5690	10.69	11.51	14.13	33.27	45.81	79.08
	5775	15.22	16.61	18.98	30.62	23.01	53.63



5.2 MPE Calculation

The best case gain of the antenna is 3dBi, 3dB logarithmic terms convert to numeric result is nearly 1.995

For 2.4GHz WiFi: The Max Conducted Output Power is 81.10mW(0.0811W);

For 5GHz WiFi: The Max Conducted Output Power is 79.08mW(0.079W);

According to the formula $S = \frac{PG}{4R^2\pi}$, we can calculate S which is MPE.

Note:

1) P (Watts) =Power Input to antenna = $10^{\frac{dBm}{10}} / 1000$

2) G (Antenna gain in numeric) = $10^{(Antenna\ gain\ in\ dBi / 10)}$

3) R = distance to the center of radiation of antenna (in meter) = 20cm

4) MPE limit = 1mW/cm²

For WiFi:

2.4GHz WiFi: $S = \frac{PG}{4R^2\pi} = \frac{81.10 \times 1.995}{4 \times 400 \times 3.14} = 0.032\ mW/cm^2$

5GHz WiFi: $S = \frac{PG}{4R^2\pi} = \frac{79.08 \times 1.995}{4 \times 400 \times 3.14} = 0.031\ mW/cm^2$

For BT:

The Max Conducted Peak Output Power is 1.55mW

The best case gain of the antenna is 3dBi. 3dB logarithmic terms convert to numeric result is nearly 1.995

So, $S = \frac{PG}{4R^2\pi} = \frac{1.55 \times 1.995}{4 \times 400 \times 3.14} = 0.0006\ mW/cm^2$

The BT and the WiFi modules can simultaneous transmitting at frequency 2.4GHz band. But the maximum rate of MPE is $\frac{0.0006}{1.0} + \frac{0.032}{1.0} = 0.033 \leq 1.0$. according to the KDB447498 section 7.2 determine the device is exclusion from SAR test.

--End of the Report--