

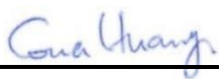
RF EXPOSURE EVALUATION REPORT

FCC ID : N7NEM92
Equipment : Wireless Module
Brand Name : AirPrime
Model Name : EM9293
Applicant : Sierra Wireless, ULC
13811 Wireless Way, Richmond, BC V6V 3A4 Canada
Manufacturer : Sierra Wireless, ULC
13811 Wireless Way, Richmond, BC V6V 3A4 Canada
Standard : 47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC has been evaluated this product in accordance with 47 CFR Part2.1091 and it complies with applicable limit.

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC evaluation.

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Approved by: Cona Huang / Deputy Manager



SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issued Date
FA2D2006	Rev. 01	Initial issue of report	Jul. 31, 2023
FA2D2006	Rev. 02	Update section 4	Sep. 07, 2023

**1. Description of Equipment Under Test (EUT)**

Product Feature & Specification	
EUT Type	Wireless Module
Brand Name	AirPrime
Model Name	EM9293
FCC ID	N7NEM92
Wireless Technology and Frequency Range	WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 42: 3450 MHz ~ 3550 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz 5G NR n2 : 1850 MHz ~ 1910 MHz 5G NR n5 : 824 MHz ~ 849 MHz 5G NR n7 : 2500 MHz ~ 2570 MHz 5G NR n12 : 699 MHz ~ 716 MHz 5G NR n13: 777 MHz ~ 787 MHz 5G NR n14 : 788 MHz ~ 798 MHz 5G NR n25 : 1850 MHz ~ 1915 MHz 5G NR n26 : 814 MHz ~ 849 MHz 5G NR n30 : 2305 MHz ~ 2315 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n48 : 3550 MHz ~ 3700 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n70 : 1695 MHz ~ 1710 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n77: 3700 MHz ~ 3980 MHz, 3450MHz ~ 3550MHz 5G NR n78: 3700 MHz ~ 3800 MHz, 3450MHz ~ 3550MHz
Mode	RMC 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+ (16QAM uplink) LTE: QPSK, 16QAM, 64QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM

Reviewed by: Jason Wang**Report Producer: Paula Chen**

2. Maximum RF average output power among production units

Mode		Maximum Average power(dBm)
WCDMA	Band 2	24.5
	Band 4	24.5
	Band 5	24.5
LTE	Band 2	24.5
	Band 4	24.5
	Band 5	24.5
	Band 7	24
	Band 12	24
	Band 13	24.5
	Band 14	24
	Band 17	24
	Band 25	24
	Band 26	24
	Band 41_PC3	24
	Band 41_PC2	26
	Band 42_PC3	24
	Band 42_PC2	26
	Band 48	24
	Band 66	24.5
	Band 71	24
5G NR	n2	25.5
	n5	25.5
	n7	25.5
	n12	25.5
	n13	25.5
	n14	25.5
	n25	25.5
	n26	25.5
	n30	25.5
	n41_PC3	25.5
	n41_PC2	27.5
	n48	25.5
	n66	25.5
	n70	25.5
	n71	25.5
	n77_PC3	25.5
	n77_PC2	27.5
	n78_PC3	25.5
	n78_PC2	27.5

3. Determination of exemption

Per 1.1307(b)(3), (i) For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

- (A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);
- (B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

$$P_{th} \text{ (mW)} = ERP_{20cm} (d / 20)^x \text{ for distance } d \leq 20cm$$

$$P_{th} \text{ (mW)} = ERP_{20cm} \text{ for distance } 20cm < d \leq 40cm$$

$$x = -\log_{10} \left(\frac{60}{ERP_{20cm} \sqrt{f}} \right)$$

$$ERP_{20cm} \text{ (mW)} \begin{matrix} 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz:} & 2040 f \\ 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz:} & 3060 \end{matrix}$$

- (C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2 R^2$.

4. RF Exposure Evaluation

4.1. Standalone assessment

General Note:

1. Pi is mean the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm.
2. Pth is mean the exemption threshold power (Pth) according to the § 1.1307(b)(3)(i)(B) formula for fixed, mobile, or portable RF source i.
3. The distance of 20cm is for this device.

Band	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Maximum EIRP (dBm)	Maximum ERP (dBm)	Pi (dBm)	Pi (mW)	Maximum Output RF Power Limit (mW)	Part1.1307 option(b) Threshold (mW)	Part1.1307 option(b) Pi/Pth
WCDMA Band 2	7.50	24.50	32.0	29.85	29.85	966.05	2000	3060.000	0.316
WCDMA Band 4	4.50	24.50	29.0	26.85	26.85	484.17	1000	3060.000	0.158
WCDMA Band 5	8.50	24.50	33.0	30.85	30.85	1216.19	7000	1680.960	0.724
LTE Band 2	7.50	24.50	32.0	29.85	29.85	966.05	2000	3060.000	0.316
LTE Band 4	4.50	24.50	29.0	26.85	26.85	484.17	1000	3060.000	0.158
LTE Band 5	8.50	24.50	33.0	30.85	30.85	1216.19	7000	1680.960	0.724
LTE Band 7	5.50	24.00	29.5	27.35	27.35	543.25	2000	3060.000	0.178
LTE Band 12	8.00	24.00	32.0	29.85	29.85	966.05	3000	1425.960	0.677
LTE Band 13	8.50	24.50	33.0	30.85	30.85	1216.19	3000	1585.080	0.767
LTE Band 14	8.50	24.00	32.5	30.35	30.35	1083.93	3000	1607.520	0.674
LTE Band 17	9.50	24.00	33.5	31.35	31.35	1364.58	3000	1436.160	0.950
LTE Band 25	7.50	24.00	31.5	29.35	29.35	860.99	2000	3060.000	0.281
LTE Band 26	8.50	24.00	32.5	30.35	30.35	1083.93	7000	1660.560	0.653
LTE Band 41_PC3	5.50	24.00	29.5	27.35	27.35	543.25	2000	3060.000	0.178
LTE Band 41_PC2	5.50	26.00	31.5	29.35	29.35	860.99	2000	3060.000	0.281
LTE Band 42_PC3	4.00	24.00	28.0	25.85	25.85	384.59	1000	3060.000	0.126
LTE Band 42_PC2	4.00	26.00	30.0	27.85	27.85	609.54	1000	3060.000	0.199
LTE Band 48	-2.50	24.00	21.5	19.35	24.00	251.19	200	3060.000	0.082
LTE Band 66	4.50	24.50	29.0	26.85	26.85	484.17	1000	3060.000	0.158
LTE Band 71	7.50	24.00	31.5	29.35	29.35	860.99	3000	1352.520	0.637
5G NR n2	7.50	25.50	33.0	30.85	30.85	1216.19	2000	3060.000	0.397
5G NR n5	8.50	25.50	34.0	31.85	31.85	1531.09	7000	1680.960	0.911
5G NR n7	5.50	25.50	31.0	28.85	28.85	767.36	2000	3060.000	0.251
5G NR n12	8.00	25.50	33.5	31.35	31.35	1364.58	3000	1425.960	0.957
5G NR n13	8.50	25.50	34.0	31.85	31.85	1531.09	3000	1585.080	0.966
5G NR n14	8.50	25.50	34.0	31.85	31.85	1531.09	3000	1607.520	0.952
5G NR n25	7.50	25.50	33.0	30.85	30.85	1216.19	2000	3060.000	0.397
5G NR n26	8.50	25.50	34.0	31.85	31.85	1531.09	7000	1660.560	0.922
5G NR n30	-1.50	25.50	24.0	21.85	25.50	354.81	250	3060.000	0.116
5G NR n41_PC3	5.50	25.50	31.0	28.85	28.85	767.36	2000	3060.000	0.251
5G NR n41_PC2	5.50	27.50	33.0	30.85	30.85	1216.19	2000	3060.000	0.397
5G NR n48	-2.50	25.50	23.0	20.85	25.50	354.81	200	3060.000	0.116
5G NR n66	4.50	25.50	30.0	27.85	27.85	609.54	1000	3060.000	0.199
5G NR n70	4.50	25.50	30.0	27.85	27.85	609.54	1000	3060.000	0.199
5G NR n71	7.50	25.50	33.0	30.85	30.85	1216.19	3000	1352.520	0.899
5G NR n77_PC3	2.50	25.50	28.0	25.85	25.85	384.59	1000	3060.000	0.126
5G NR n77_PC2	2.50	27.50	30.0	27.85	27.85	609.54	1000	3060.000	0.199
5G NR n78_PC3	2.50	25.50	28.0	25.85	25.85	384.59	1000	3060.000	0.126
5G NR n78_PC2	2.50	27.50	30.0	27.85	27.85	609.54	1000	3060.000	0.199

4.2. Collocated assessment

General Note:

1. This MPE analysis is applicable to any collocated transmitters with transmit power for WLAN is less than or equal to 20dBm and for Bluetooth is less than or equal to 15dBm.
2. A maximum antenna gain of 5 dBi for WLAN /BT has been assumed for all collocated antennas.
3. The device support DPS (Dynamic Power Share) function to achieve higher uplink data rate keeping the total power unchanged in 5G NR NSA EN-DC mode according to 3GPP 38.213, when the equipment has a dynamic power sharing capability, it adjusts the LTE or NR transmission power so that the instantaneous total power does not exceed the specified value, when the maximum transmission power of NR (P_{LTE}, P_{NR}) and the specified total power (P_{total}) have been set and the instantaneous calculated total transmission power exceeds P_{total}, the NR transmission power is reduced so that the actual transmission power of the user equipment will not exceed P_{total} power. So if the LTE and NR standalone SAR is testing at total power level, the EN-DC combine MPE(LTE+NR) will not higher than the each standalone LTE and NR MPE, therefore, the simultaneous transmission analysis is used standalone MPE at total power level to show compliance.
4. Either MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR (*Evaluated_k* term) shall be used to determine exemption for simultaneous transmission according to Formula (C.1).
5. The sum of the ratios of the applicable terms for MPE-based and MPE shall be less than 1, to determine WWAN + WLAN + BT simultaneous transmission exposure compliance.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1 \quad (C.1)$$

Band	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Maximum EIRP (dBm)	Maximum ERP (dBm)	Pi (dBm)	Pi (mW)	Part1.1307 option(b) Threshold (mW)	Part1.1307 option(b) Pi/Pth
WCDMA Band 2	7.50	24.50	32.0	29.85	29.85	966.05	3060.000	0.316
WCDMA Band 4	4.50	24.50	29.0	26.85	26.85	484.17	3060.000	0.158
WCDMA Band 5	8.00	24.50	32.5	30.35	30.35	1083.93	1680.960	0.645
LTE Band 2	7.50	24.50	32.0	29.85	29.85	966.05	3060.000	0.316
LTE Band 4	4.50	24.50	29.0	26.85	26.85	484.17	3060.000	0.158
LTE Band 5	8.00	24.50	32.5	30.35	30.35	1083.93	1680.960	0.645
LTE Band 7	5.50	24.00	29.5	27.35	27.35	543.25	3060.000	0.178
LTE Band 12	7.50	24.00	31.5	29.35	29.35	860.99	1425.960	0.604
LTE Band 13	8.00	24.50	32.5	30.35	30.35	1083.93	1585.080	0.684
LTE Band 14	8.00	24.00	32.0	29.85	29.85	966.05	1607.520	0.601
LTE Band 17	8.00	24.00	32.0	29.85	29.85	966.05	1436.160	0.673
LTE Band 25	7.50	24.00	31.5	29.35	29.35	860.99	3060.000	0.281
LTE Band 26	8.00	24.00	32.0	29.85	29.85	966.05	1660.560	0.582
LTE Band 41_PC3	5.50	24.00	29.5	27.35	27.35	543.25	3060.000	0.178
LTE Band 41_PC2	5.50	26.00	31.5	29.35	29.35	860.99	3060.000	0.281
LTE Band 42_PC3	4.00	24.00	28.0	25.85	25.85	384.59	3060.000	0.126
LTE Band 42_PC2	4.00	26.00	30.0	27.85	27.85	609.54	3060.000	0.199
LTE Band 48	-2.50	24.00	21.5	19.35	24.00	251.19	3060.000	0.082
LTE Band 66	4.50	24.50	29.0	26.85	26.85	484.17	3060.000	0.158
LTE Band 71	7.50	24.00	31.5	29.35	29.35	860.99	1352.520	0.637
5G NR n2	7.50	25.50	33.0	30.85	30.85	1216.19	3060.000	0.397
5G NR n5	7.50	25.50	33.0	30.85	30.85	1216.19	1680.960	0.724
5G NR n7	5.50	25.50	31.0	28.85	28.85	767.36	3060.000	0.251
5G NR n12	7.50	25.50	33.0	30.85	30.85	1216.19	1425.960	0.853
5G NR n13	8.00	25.50	33.5	31.35	31.35	1364.58	1585.080	0.861
5G NR n14	8.00	25.50	33.5	31.35	31.35	1364.58	1607.520	0.849
5G NR n25	7.50	25.50	33.0	30.85	30.85	1216.19	3060.000	0.397
5G NR n26	8.00	25.50	33.5	31.35	31.35	1364.58	1660.560	0.822
5G NR n30	-1.50	25.50	24.0	21.85	25.50	354.81	3060.000	0.116
5G NR n41_PC3	5.50	25.50	31.0	28.85	28.85	767.36	3060.000	0.251
5G NR n41_PC2	5.50	27.50	33.0	30.85	30.85	1216.19	3060.000	0.397
5G NR n48	-2.50	25.50	23.0	20.85	25.50	354.81	3060.000	0.116
5G NR n66	4.50	25.50	30.0	27.85	27.85	609.54	3060.000	0.199
5G NR n70	4.50	25.50	30.0	27.85	27.85	609.54	3060.000	0.199
5G NR n71	7.50	25.50	33.0	30.85	30.85	1216.19	1352.520	0.899
5G NR n77_PC3	2.50	25.50	28.0	25.85	25.85	384.59	3060.000	0.126
5G NR n77_PC2	2.50	27.50	30.0	27.85	27.85	609.54	3060.000	0.199
5G NR n78_PC3	2.50	25.50	28.0	25.85	25.85	384.59	3060.000	0.126
5G NR n78_PC2	2.50	27.50	30.0	27.85	27.85	609.54	3060.000	0.199
WLAN2.4GHz Band	5.0	20.00	25.0	22.85	22.85	192.75	3060.000	0.063
WLAN5GHz Band	5.0	20.00	25.0	22.85	22.85	192.75	3060.000	0.063
WLAN6GHz Band	5.0	20.00	25.0	22.85	22.85	192.75	3060.000	0.063
Bluetooth	5.0	15.00	20.0	17.85	17.85	60.95	3060.000	0.020

Maximum WWAN Pi/Pth Ratio	WLAN Pi/Pth Ratio	Bluetooth Pi/Pth Ratio	Σ (Pi/Pth Ratio) of WWAN + WLAN + Bluetooth
0.899	0.063	0.020	0.982

Conclusion:

Based on FCC 47 CFR §1.1307, the analysis concludes that this product when transmitting in standalone within a host device, is compliant with the FCC RF exposure requirements in mobile exposure condition, provided the conducted power and antenna gain do not exceed the limits for each given frequency band per wireless technology as follow table:

Devoce	Technology	Band	Maximum Conducted Power (dBm)	Stanalone Allow Antenna Gain (dBi)	Collocated Allow Antenna Gain (dBi)
EM9293	UMTS	WCDMA Band 2	24.50	7.50	7.50
		WCDMA Band 4	24.50	4.50	4.50
		WCDMA Band 5	24.50	8.50	8.00
	LTE	LTE Band 2	24.50	7.50	7.50
		LTE Band 4	24.50	4.50	4.50
		LTE Band 5	24.50	8.50	8.00
		LTE Band 7	24.00	5.50	5.50
		LTE Band 12	24.00	8.00	7.50
		LTE Band 13	24.50	8.50	8.00
		LTE Band 14	24.00	8.50	8.00
		LTE Band 17	24.00	9.50	8.00
		LTE Band 25	24.00	7.50	7.50
		LTE Band 26	24.00	8.50	8.00
		LTE Band 41_PC3	24.00	5.50	5.50
		LTE Band 41_PC2	26.00	5.50	5.50
		LTE Band 42_PC3	24.00	4.00	4.00
		LTE Band 42_PC2	26.00	4.00	4.00
		LTE Band 48	24.00	-2.50	-2.50
		LTE Band 66	24.50	4.50	4.50
		LTE Band 71	24.00	7.50	7.50
	5G NR	5G NR n2	25.50	7.50	7.50
		5G NR n5	25.50	8.50	7.50
		5G NR n7	25.50	5.50	5.50
		5G NR n12	25.50	8.00	7.50
		5G NR n13	25.50	8.50	8.00
		5G NR n14	25.50	8.50	8.00
		5G NR n25	25.50	7.50	7.50
		5G NR n26	25.50	8.50	8.00
		5G NR n30	25.50	-1.50	-1.50
		5G NR n41_PC3	25.50	5.50	5.50
		5G NR n41_PC2	27.50	5.50	5.50
		5G NR n48	25.50	-2.50	-2.50
		5G NR n66	25.50	4.50	4.50
		5G NR n70	25.50	4.50	4.50
		5G NR n71	25.50	7.50	7.50
		5G NR n77_PC3	25.50	2.50	2.50
		5G NR n77_PC2	27.50	2.50	2.50
		5G NR n78_PC3	25.50	2.50	2.50
		5G NR n78_PC2	27.50	2.50	2.50