

# RF Exposure Evaluation Report

**APPLICANT** : Quectel Wireless Solutions Co., Ltd.  
**EQUIPMENT** : Smart Module  
**BRAND NAME** : Quectel  
**MODEL NAME** : SC696S-NA  
**FCC ID** : XMR2023SC696SNA  
**STANDARD** : 47 CFR Part 2.1091  
FCC KDB 447498 D01 v06

The product evaluation date was started from Sep. 22, 2023 and completed on Sep. 22, 2023. We, Sporton International Inc. (Kunshan), would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.



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Approved by: Si Zhang

***Sporton International Inc. (Kunshan)***

***No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300  
People's Republic of China***



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**Revision History**

| REPORT NO.  | VERSION | DESCRIPTION              | ISSUED DATE   |
|-------------|---------|--------------------------|---------------|
| FA311713-01 | Rev. 01 | Initial issue of report. | Oct. 19, 2023 |
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## **1. Administration Data**

### **1.1. Testing Laboratory**

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

| Testing Laboratory |                                                                                                                                                |                     |                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------------|
| Test Firm          | Sporton International Inc. (Kunshan)                                                                                                           |                     |                                |
| Test Site Location | No. 1098, Pengxi North Road, Kunshan Economic Development Zone<br>Jiangsu Province 215300 People's Republic of China<br>TEL : +86-512-57900158 |                     |                                |
| Test Site No.      | Sporton Site No.                                                                                                                               | FCC Designation No. | FCC Test Firm Registration No. |
|                    | SAR01-KS                                                                                                                                       | CN1257              | 314309                         |

| Applicant    |                                                                                                                       |
|--------------|-----------------------------------------------------------------------------------------------------------------------|
| Company Name | Quectel Wireless Solutions Co., Ltd.                                                                                  |
| Address      | Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, 200233,China |

| Manufacturer |                                                                                                                       |
|--------------|-----------------------------------------------------------------------------------------------------------------------|
| Company Name | Quectel Wireless Solutions Co., Ltd.                                                                                  |
| Address      | Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, 200233,China |

## 2. Description of Equipment Under Test (EUT)

| Product Feature & Specification         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT Type                                | Smart Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Brand Name                              | Quectel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Model Name                              | SC696S-NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| FCC ID                                  | XMR2023SC696SNA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Wireless Technology and Frequency Range | LTE Band 2 : 1850 MHz ~ 1910 MHz<br>LTE Band 4 : 1710 MHz ~ 1755 MHz<br>LTE Band 5 : 824 MHz ~ 849 MHz<br>LTE Band 7: 2500 MHz ~ 2570 MHz<br>LTE Band 12 : 699 MHz ~ 716 MHz<br>LTE Band 13 : 777 MHz ~ 787 MHz<br>LTE Band 14: 788 MHz ~ 798 MHz<br>LTE Band 17: 704 MHz ~ 716 MHz<br>LTE Band 25 : 1850 MHz ~ 1915 MHz<br>LTE Band 26 : 814 MHz ~ 849 MHz<br>LTE Band 66 : 1710 MHz ~ 1780 MHz<br>LTE Band 41: 2496 MHz ~ 2690 MHz<br>LTE Band 71: 663 MHz ~ 698 MHz<br>WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz<br>WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz<br>WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz<br>WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz<br>WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz |
| Mode                                    | LTE: QPSK, 16QAM<br>WLAN 2.4GHz 802.11b/g/n HT20/HT40<br>WLAN 5GHz 802.11a/n HT20/HT40<br>WLAN 5GHz 802.11ac VHT20/VHT40/VHT80<br>Bluetooth BR/EDR/LE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Antenna Gain                            | WLAN2.4GHz/Bluetooth: 0.47 dBi<br>WLAN5.2GHz: -0.67 dBi<br>WLAN5.3GHz: -0.19 dBi<br>WLAN5.5GHz: 1.28 dBi<br>WLAN5.8GHz: 1.10 dBi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Antenna Type                            | WWAN: Fixed External Antenna<br>WLAN/Bluetooth: Folded Dipole Antenna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| HW Version                              | R1.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| SW Version                              | SC696SNANAR60A02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| EUT Stage                               | Identical Prototype                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**Remark:**

- The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

**Comments and Explanations:**

- The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.
- The maximum RF output tune up power, antenna gain also the safe distance used for evaluate RF exposure were declared by manufacturer.

**3. Maximum RF average output tune up power among production units****<LTE>**

| Mode |         | Maximum Average power(dBm) |
|------|---------|----------------------------|
| LTE  | Band 2  | 25.0                       |
|      | Band 4  | 25.0                       |
|      | Band 5  | 25.0                       |
|      | Band 7  | 25.0                       |
|      | Band 12 | 25.0                       |
|      | Band 13 | 25.0                       |
|      | Band 14 | 25.0                       |
|      | Band 17 | 25.0                       |
|      | Band 25 | 25.0                       |
|      | Band 26 | 25.0                       |
|      | Band 41 | 25.0                       |
|      | Band 66 | 25.0                       |
|      | Band 71 | 25.0                       |

**<2.4GHz WLAN >**

| Mode   |              | Maximum Average Power (dBm) |
|--------|--------------|-----------------------------|
| 2.4GHz | 802.11b      | 17.00                       |
|        | 802.11g      | 17.00                       |
|        | 802.11n-HT20 | 16.00                       |
|        | 802.11n-HT40 | 16.00                       |

**<Bluetooth>**

| Mode      |        | Maximum Average power(dBm) |
|-----------|--------|----------------------------|
| Bluetooth | BR/EDR | 10.00                      |
|           | LE     | 3.00                       |

**<5GHz WLAN >**

|        | Mode           | Maximum Average Power (dBm) |
|--------|----------------|-----------------------------|
| 5.2GHz | 802.11a        | 17.00                       |
|        | 802.11n-HT20   | 17.00                       |
|        | 802.11n-HT40   | 17.00                       |
|        | 802.11ac-VHT20 | 16.00                       |
|        | 802.11ac-VHT40 | 16.00                       |
|        | 802.11ac-VHT80 | 16.00                       |
| 5.3GHz | 802.11a        | 17.00                       |
|        | 802.11n-HT20   | 17.00                       |
|        | 802.11n-HT40   | 17.00                       |
|        | 802.11ac-VHT20 | 16.00                       |
|        | 802.11ac-VHT40 | 16.00                       |
|        | 802.11ac-VHT80 | 16.00                       |
| 5.5GHz | 802.11a        | 17.00                       |
|        | 802.11n-HT20   | 17.00                       |
|        | 802.11n-HT40   | 17.00                       |
|        | 802.11ac-VHT20 | 16.00                       |
|        | 802.11ac-VHT40 | 15.00                       |
|        | 802.11ac-VHT80 | 15.00                       |
| 5.8GHz | 802.11a        | 17.00                       |
|        | 802.11n-HT20   | 17.00                       |
|        | 802.11n-HT40   | 17.00                       |
|        | 802.11ac-VHT20 | 16.00                       |
|        | 802.11ac-VHT40 | 15.00                       |
|        | 802.11ac-VHT80 | 15.00                       |

#### **4. RF Exposure Limit Introduction**

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

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

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna



## 5. Radio Frequency Radiation Exposure Evaluation

### 5.1. Standalone Power Density Calculation

| Band        | Frequency (MHz) | Maximum Power (dBm) | MPE evaluation distance (cm) | FCC ERP/EIRP Limit (W) | IC ERP/EIRP Limit (W) | FCC MPE Limit (mW)/cm <sup>2</sup> | IC MPE Limit (mW)/cm <sup>2</sup> | FCC/IC MPE Limit (mW)/cm <sup>2</sup> | FCC/IC MPE Result / FCC/IC MPE Limit Ratio | Ant Gain to meet FCC MPE limit (dBi) | Ant Gain to meet FCC ERP/EIRP limit (dBi) | Max Gain to meet FCC ERP/EIRP and MPE limit (dBi) | Ant Gain to meet IC MPE limit (dBi) | Ant Gain to meet IC ERP/EIRP limit (dBi) | Max Gain to meet IC ERP/EIRP and MPE limit (dBi) | Max Gain to consider same Frequency | Max gain allowed (dBi) |
|-------------|-----------------|---------------------|------------------------------|------------------------|-----------------------|------------------------------------|-----------------------------------|---------------------------------------|--------------------------------------------|--------------------------------------|-------------------------------------------|---------------------------------------------------|-------------------------------------|------------------------------------------|--------------------------------------------------|-------------------------------------|------------------------|
| LTE Band 2  | 1850.0          | 25.00               | 20.00                        | 2.000                  | 2.000                 | 1.000                              | 4.476                             | 0.448                                 | 0.887                                      | 12.0                                 | 8.0                                       | 8.0                                               | 8.5                                 | 8.0                                      | 8.0                                              | 8.0                                 | 8.0                    |
| LTE Band 4  | 1710.0          | 25.00               | 20.00                        | 1.000                  | 1.000                 | 1.000                              | 4.242                             | 0.424                                 | 0.469                                      | 12.0                                 | 5.0                                       | 5.0                                               | 8.2                                 | 5.0                                      | 5.0                                              | 5.0                                 | 5.0                    |
| LTE Band 5  | 824.0           | 25.00               | 20.00                        | 7.000                  | 11.500                | 0.549                              | 2.576                             | 0.258                                 | 0.828                                      | 9.4                                  | 13.4                                      | 9.4                                               | 6.1                                 | 15.6                                     | 6.1                                              | 5.3                                 | 5.3                    |
| LTE Band 7  | 2500.0          | 25.00               | 20.00                        | 2.000                  | 2.000                 | 1.000                              | 5.499                             | 0.550                                 | 0.722                                      | 12.0                                 | 8.0                                       | 8.0                                               | 9.4                                 | 8.0                                      | 8.0                                              | 8.0                                 | 8.0                    |
| LTE Band 12 | 699.0           | 25.00               | 20.00                        | 3.000                  | 3.000                 | 0.466                              | 2.302                             | 0.230                                 | 0.927                                      | 8.6                                  | 9.7                                       | 8.6                                               | 5.6                                 | 9.7                                      | 5.6                                              | 5.3                                 | 5.3                    |
| LTE Band 13 | 777.0           | 25.00               | 20.00                        | 3.000                  | 3.000                 | 0.518                              | 2.474                             | 0.247                                 | 0.862                                      | 9.1                                  | 9.7                                       | 9.1                                               | 5.9                                 | 9.7                                      | 5.9                                              | 5.3                                 | 5.3                    |
| LTE Band 14 | 788.0           | 25.00               | 20.00                        | 3.000                  | 3.000                 | 0.525                              | 2.498                             | 0.250                                 | 0.854                                      | 9.2                                  | 9.7                                       | 9.2                                               | 5.9                                 | 9.7                                      | 5.9                                              | 5.3                                 | 5.3                    |
| LTE Band 17 | 704.0           | 25.00               | 20.00                        | 3.000                  | 3.000                 | 0.469                              | 2.313                             | 0.231                                 | 0.922                                      | 8.7                                  | 9.7                                       | 8.7                                               | 5.6                                 | 9.7                                      | 5.6                                              | 5.3                                 | 5.3                    |
| LTE Band 25 | 1850.0          | 25.00               | 20.00                        | 2.000                  | 2.000                 | 1.000                              | 4.476                             | 0.448                                 | 0.887                                      | 12.0                                 | 8.0                                       | 8.0                                               | 8.5                                 | 8.0                                      | 8.0                                              | 8.0                                 | 8.0                    |
| LTE Band 26 | 814.0           | 25.00               | 20.00                        | 7.000                  | 11.500                | 0.543                              | 2.554                             | 0.255                                 | 0.835                                      | 9.3                                  | 13.4                                      | 9.3                                               | 6.0                                 | 15.6                                     | 6.0                                              | 5.3                                 | 5.3                    |
| LTE Band 41 | 2496.0          | 25.00               | 20.00                        | 2.000                  | 2.000                 | 1.000                              | 5.493                             | 0.549                                 | 0.723                                      | 12.0                                 | 8.0                                       | 8.0                                               | 9.4                                 | 8.0                                      | 8.0                                              | 8.0                                 | 8.0                    |
| LTE Band 66 | 1710.0          | 25.00               | 20.00                        | 1.000                  | 1.000                 | 1.000                              | 4.242                             | 0.424                                 | 0.469                                      | 12.0                                 | 5.0                                       | 5.0                                               | 8.2                                 | 5.0                                      | 5.0                                              | 5.0                                 | 5.0                    |
| LTE Band 71 | 663.0           | 25.00               | 20.00                        | 3.000                  | 3.000                 | 0.442                              | 2.220                             | 0.222                                 | <b>0.961</b>                               | 8.4                                  | 9.7                                       | 8.4                                               | 5.4                                 | 9.7                                      | 5.4                                              | 5.3                                 | 5.3                    |

| Band        | Frequency (MHz) | Antenna Gain (dBi) | Maximum Power (dBm) | Maximum EIRP (dBm) | Average EIRP (mW) | Power Density at 20cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Power Density / Limit |
|-------------|-----------------|--------------------|---------------------|--------------------|-------------------|---------------------------------------------|-----------------------------|-----------------------|
| Bluetooth   | 2402.0          | 0.47               | 10.00               | 10.470             | 11.143            | 0.002                                       | 1.000                       | <b>0.002</b>          |
| 2.4GHz WLAN | 2412.0          | 0.47               | 17.00               | 17.470             | 55.847            | 0.011                                       | 1.000                       | <b>0.011</b>          |
| 5.2GHz WLAN | 5180.0          | -0.67              | 17.00               | 16.330             | 42.954            | 0.009                                       | 1.000                       | 0.009                 |
| 5.3GHz WLAN | 5260.0          | -0.19              | 17.00               | 16.810             | 47.973            | 0.010                                       | 1.000                       | 0.010                 |
| 5.5GHz WLAN | 5500.0          | 1.28               | 17.00               | 18.280             | 67.298            | 0.013                                       | 1.000                       | <b>0.013</b>          |
| 5.8GHz WLAN | 5745.0          | 1.10               | 17.00               | 18.100             | 64.565            | 0.013                                       | 1.000                       | 0.013                 |

**Note:**

- For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.
- Chose the maximum power to do MPE analysis.

**5.2. Collocated Power Density Calculation**

| WWAN<br>Power Density / Limit | Bluetooth<br>Power Density / Limit   | $\Sigma$ (Power Density / Limit)<br>of<br>WWAN + Bluetooth   |
|-------------------------------|--------------------------------------|--------------------------------------------------------------|
| 0.961                         | 0.002                                | 0.963                                                        |
| WWAN<br>Power Density / Limit | WLAN 2.4GHz<br>Power Density / Limit | $\Sigma$ (Power Density / Limit)<br>of<br>WWAN + WLAN 2.4GHz |
| 0.961                         | 0.011                                | 0.972                                                        |
| WWAN<br>Power Density / Limit | WLAN 5GHz Power Density / Limit      | $\Sigma$ (Power Density / Limit)<br>of<br>WWAN + WLAN 5GHz   |
| 0.961                         | 0.013                                | 0.974                                                        |

**Note:**

1. For colocation analysis, LTE Band 71 is chosen for summation due to the highest (power density/limit) among all WWAN wireless modes.
2.  $\Sigma$ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + Bluetooth or WLAN2.4GHz or WLAN5GHz.
3. Considering all transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 2 collocated transmitters is compliant.

**Conclusion:**

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

-----THE END-----