



# **RF Exposure Evaluation Report**

**APPLICANT** : Quetel Wireless Solutions Co., Ltd.  
**EQUIPMENT** : Smart Module  
**BRAND NAME** : Quetel  
**MODEL NAME** : SC20-W  
**FCC ID** : XMR201709SC20W  
**STANDARD** : 47 CFR Part 2.1091

We, Sporton International (KunShan) INC., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of Sporton International (KunShan) INC., the test report shall not be reproduced except in full.

A handwritten signature in black ink, reading 'Mark Qu'.

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Reviewed by: Mark Qu / Manager

A handwritten signature in blue ink, reading 'Jones Tsai'.

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Approved by: Jones Tsai / Manager

**Sporton International (KunShan) INC.**  
**No.3-2, Pingxiang Road, Kunshan Development Zone, Jiangsu, China**



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**Revision History**

| REPORT NO.  | VERSION | DESCRIPTION             | ISSUED DATE   |
|-------------|---------|-------------------------|---------------|
| FA741007-02 | Rev. 01 | Initial issue of report | Aug. 30, 2017 |
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**1. Administration Data****1.1. Testing Laboratory**

| Testing Laboratory |                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| Test Site          | Sporton International (KunShan) INC.                                                                                   |
| Test Site Location | No.3-2, Pingxiang Road, Kunshan Development Zone, Jiangsu, China<br>TEL: +86-0512-5790-0158<br>FAX: +86-0512-5790-0958 |

| Applicant    |                                                                                             |
|--------------|---------------------------------------------------------------------------------------------|
| Company Name | Quectel Wireless Solutions Co., Ltd.                                                        |
| Address      | 7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai<br>200233, China |

| Manufacturer |                                                                                             |
|--------------|---------------------------------------------------------------------------------------------|
| Company Name | Quectel Wireless Solutions Co., Ltd.                                                        |
| Address      | 7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai<br>200233, China |



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

| Product Feature & Specification                                                                                                                             |                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT Type                                                                                                                                                    | Smart Module                                                                                                                                                                                                                                |
| Brand Name                                                                                                                                                  | Quectel                                                                                                                                                                                                                                     |
| Model Name                                                                                                                                                  | SC20-W                                                                                                                                                                                                                                      |
| FCC ID                                                                                                                                                      | XMR201709SC20W                                                                                                                                                                                                                              |
| Wireless Technology and Frequency Range                                                                                                                     | 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 ~ 5700 MHz<br>WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz |
| Mode                                                                                                                                                        | 802.11b/g/n HT20/HT40<br>802.11a/n HT20/HT40<br>Bluetooth v3.0 + EDR, Bluetooth v4.0 LE, Bluetooth v4.1 LE                                                                                                                                  |
| Antenna Type                                                                                                                                                | WLAN: Dipole Antenna<br>Bluetooth: Dipole Antenna                                                                                                                                                                                           |
| HW Version                                                                                                                                                  | R1.0                                                                                                                                                                                                                                        |
| SW Version                                                                                                                                                  | SC20WSCR04A01H8G                                                                                                                                                                                                                            |
| EUT Stage                                                                                                                                                   | Identical Prototype                                                                                                                                                                                                                         |
| <b>Remark:</b> The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description. |                                                                                                                                                                                                                                             |

**3. Maximum RF average output power among production units****<2.4GHz WLAN>**

| Frequency   | Mode         | Maximum Average Power (dBm) |
|-------------|--------------|-----------------------------|
| WLAN 2.4GHz | 802.11b      | 16.50                       |
|             | 802.11g      | 14.50                       |
|             | 802.11n-HT20 | 14.00                       |
|             | 802.11n-HT40 | 14.00                       |

**<5GHz WLAN>**

| Frequency   | Mode         | Maximum Average Power (dBm) |
|-------------|--------------|-----------------------------|
| WLAN 5.2GHz | 802.11a      | 13.00                       |
|             | 802.11n-HT20 | 14.00                       |
|             | 802.11n-HT40 | 13.50                       |
| WLAN 5.3GHz | 802.11a      | 13.50                       |
|             | 802.11n-HT20 | 14.00                       |
|             | 802.11n-HT40 | 13.50                       |
| WLAN 5.5GHz | 802.11a      | 13.00                       |
|             | 802.11n-HT20 | 13.50                       |
|             | 802.11n-HT40 | 12.50                       |
| WLAN 5.8GHz | 802.11a      | 12.50                       |
|             | 802.11n-HT20 | 12.00                       |
|             | 802.11n-HT40 | 11.00                       |

**<Bluetooth>**

| Frequency | Mode        | Maximum Average Power (dBm) |
|-----------|-------------|-----------------------------|
| Bluetooth | v3.0+EDR    | 8.00                        |
|           | v4.0/4.1 LE | 3.00                        |



## **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) | Antenna Gain (dBi) | Maximum Power (dBm) | Maximum EIRP (dBm) | Maximum EIRP (W) | Maximum Output Power Limit (W) | Average EIRP (mW) | Power Density at 20cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Power Density / Limit |
|-------------------------|-----------------|--------------------|---------------------|--------------------|------------------|--------------------------------|-------------------|---------------------------------------------|-----------------------------|-----------------------|
| WLAN2.4GHz 802.11b      | 2412            | 3.0                | 16.5                | 19.50              | 0.089            | 1.000                          | 89.125            | 0.018                                       | 1.000                       | 0.018                 |
| WLAN2.4GHz 802.11g      | 2412            | 3.0                | 14.5                | 17.50              | 0.056            | 1.000                          | 56.234            | 0.011                                       | 1.000                       | 0.011                 |
| WLAN2.4GHz 802.11n-HT20 | 2412            | 3.0                | 14.0                | 17.00              | 0.050            | 1.000                          | 50.119            | 0.010                                       | 1.000                       | 0.010                 |
| WLAN2.4GHz 802.11n-HT40 | 2422            | 3.0                | 14.0                | 17.00              | 0.050            | 1.000                          | 50.119            | 0.010                                       | 1.000                       | 0.010                 |
| WLAN5.2GHz 802.11a      | 5180            | 4.0                | 13.0                | 17.00              | 0.050            | 0.250                          | 50.119            | 0.010                                       | 1.000                       | 0.010                 |
| WLAN5.2GHz 802.11n-HT20 | 5180            | 4.0                | 14.0                | 18.00              | 0.063            | 0.250                          | 63.096            | 0.013                                       | 1.000                       | 0.013                 |
| WLAN5.2GHz 802.11n-HT40 | 5190            | 4.0                | 13.5                | 17.50              | 0.056            | 0.250                          | 56.234            | 0.011                                       | 1.000                       | 0.011                 |
| WLAN5.3GHz 802.11a      | 5260            | 4.0                | 13.5                | 17.50              | 0.056            | 0.250                          | 56.234            | 0.011                                       | 1.000                       | 0.011                 |
| WLAN5.3GHz 802.11n-HT20 | 5260            | 4.0                | 14.0                | 18.00              | 0.063            | 0.250                          | 63.096            | 0.013                                       | 1.000                       | 0.013                 |
| WLAN5.3GHz 802.11n-HT40 | 5270            | 4.0                | 13.5                | 17.50              | 0.056            | 0.250                          | 56.234            | 0.011                                       | 1.000                       | 0.011                 |
| WLAN5.5GHz 802.11a      | 5500            | 4.0                | 13.0                | 17.00              | 0.050            | 0.250                          | 50.119            | 0.010                                       | 1.000                       | 0.010                 |
| WLAN5.5GHz 802.11n-HT20 | 5500            | 4.0                | 13.5                | 17.50              | 0.056            | 0.250                          | 56.234            | 0.011                                       | 1.000                       | 0.011                 |
| WLAN5.5GHz 802.11n-HT40 | 5510            | 4.0                | 12.5                | 16.50              | 0.045            | 0.250                          | 44.668            | 0.009                                       | 1.000                       | 0.009                 |
| WLAN5.8GHz 802.11a      | 5745            | 4.0                | 12.5                | 16.50              | 0.045            | 1.000                          | 44.668            | 0.009                                       | 1.000                       | 0.009                 |
| WLAN5.8GHz 802.11n-HT20 | 5745            | 4.0                | 12.0                | 16.00              | 0.040            | 1.000                          | 39.811            | 0.008                                       | 1.000                       | 0.008                 |
| WLAN5.8GHz 802.11n-HT40 | 5755            | 4.0                | 11.0                | 15.00              | 0.032            | 1.000                          | 31.623            | 0.006                                       | 1.000                       | 0.006                 |
| Bluetooth v3.0+EDR      | 2402            | 3.0                | 8.0                 | 11.00              | 0.013            | 0.125                          | 12.589            | 0.003                                       | 1.000                       | 0.003                 |
| Bluetooth v4.0/4.1 LE   | 2402            | 3.0                | 3.0                 | 6.00               | 0.004            | 1.000                          | 3.981             | 0.001                                       | 1.000                       | 0.001                 |

**Note:** For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.

**5.2. Collocated Power Density Calculation**

| Power Density / Limit |           |           | $\Sigma$ (Power Density / Limit)<br>of<br>2.4GHz WLAN+5GHz WLAN+Bluetooth |
|-----------------------|-----------|-----------|---------------------------------------------------------------------------|
| 1                     | 2         | 3         | 1+2+3                                                                     |
| 2.4GHz WLAN           | 5GHz WLAN | Bluetooth |                                                                           |
| 0.018                 | 0.013     | 0.003     | 0.034                                                                     |

**Note:**  $\Sigma$  (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)].

**Conclusion:**

Based on 47 CFR §2.1091, the analysis concludes that this product is compliant with the FCC RF exposure requirements in mobile exposure condition.