



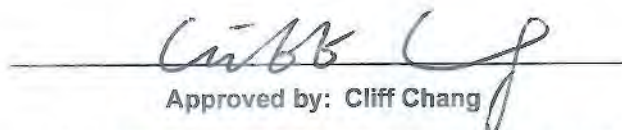
# FCC RADIO EXPOSURE TEST REPORT

FCC ID : RPV-SE5901B-AF  
Equipment : Industrial Cellular Serial Device Server  
Industrial Cellular Modbus Gateway  
Industrial Cellular Modbus Concentrator  
Industrial Cellular Protocol Gateway  
Brand Name :   
Model Name : SE5901B-WW-www-XXX-x-Y-yy-bb,  
SE5901B-IO-4G-GPS-B-S-US, SE5901B-4G-GPS-B-S-US,  
SE5901B-IO-D3G-GPS-S-US,  
SE5901B-D3G-S-US, SE5901B-IO-D3G-S-US,  
SE5901B-4G-US, SE5901B-4G-B-US,  
SE5901B-IO-4G-GPS-US, SE5901B-IO-4G-B-US  
MB5901B- WW-www-XXX-x-Y-yy-ZZ-bb  
PG5901B-WW-www-XXX-x-Y-yy-zzaa-zzaa-bb  
((Refer to 1.2 for more details)  
Applicant : ATOP Technologies, Inc.  
1F, 30, R&D Rd. II, Science-Based Industrial Park, Hsinchu  
30076, Taiwan, R.O.C.  
Manufacturer : ATOP Technologies, Inc.  
1F, 30, R&D Rd. II, Science-Based Industrial Park, Hsinchu  
30076, Taiwan, R.O.C.  
Standard : 47 CFR Part 2.1091

The product was received on Nov. 21, 2018, and testing was started from Jan. 11, 2019 and completed on Feb. 15, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR Part 2.1091 and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

  
Approved by: Cliff Chang

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



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## Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items          | Result (PASS/FAIL) | Remark |
|---------------|-----------------|---------------------|--------------------|--------|
| 3             | -               | Exposure evaluation | PASS               | -      |

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**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.

**Reviewed by: Cliff Chang**

**Report Producer: Wendy Pan**



# 1 General Description

## 1.1 EUT General Information

| RF General Information |                 |                    |                    |                                                                                         |
|------------------------|-----------------|--------------------|--------------------|-----------------------------------------------------------------------------------------|
| Evaluation Mode        | Bandwidth (MHz) | TX Frequency (MHz) | RX Frequency (MHz) | Modulation Type                                                                         |
| WCDMA Band 5           | 5               | 826.4 ~ 846.6      | 871.4 ~ 891.6      | WCDMA: BPSK / QPSK<br>HSDPA: BPSK / QPSK<br>DC-HSDPA: BPSK / QPSK<br>HSUPA: BPSK / QPSK |
| WCDMA Band 2           | 5               | 1852.4 ~ 1907.6    | 1932.4 ~ 1987.6    |                                                                                         |
| WCDMA Band 4           | 5               | 1712.4 ~ 1752.6    | 2112.4 ~ 2152.6    |                                                                                         |



| RF General Information |                 |                    |                    |                   |
|------------------------|-----------------|--------------------|--------------------|-------------------|
| Evaluation Mode        | Bandwidth (MHz) | TX Frequency (MHz) | RX Frequency (MHz) | Modulation Type   |
| LTE Band 5             | 1.4             | 824.7 ~ 848.3      | 869.7 ~ 893.3      | LTE: QPSK / 16QAM |
|                        | 3               | 825.5 ~ 847.5      | 870.5 ~ 892.5      |                   |
|                        | 5               | 826.5 ~ 846.5      | 871.5 ~ 891.5      |                   |
|                        | 10              | 829.0 ~ 844.0      | 874.0 ~ 889.0      |                   |
| LTE Band 2             | 1.4             | 1850.7 ~ 1909.3    | 1930.7 ~ 1989.3    |                   |
|                        | 3               | 1851.5 ~ 1908.5    | 1931.5 ~ 1988.5    |                   |
|                        | 5               | 1852.5 ~ 1907.5    | 1932.5 ~ 1987.5    |                   |
|                        | 10              | 1855.0 ~ 1905.0    | 1935.0 ~ 1985.0    |                   |
|                        | 15              | 1857.5 ~ 1902.5    | 1937.5 ~ 1982.5    |                   |
|                        | 20              | 1860.0 ~ 1900.0    | 1940.0 ~ 1980.0    |                   |
| LTE Band 4             | 1.4             | 1710.7 ~ 1754.3    | 2110.7 ~ 2154.3    |                   |
|                        | 3               | 1711.5 ~ 1753.5    | 2111.5 ~ 2153.5    |                   |
|                        | 5               | 1712.5 ~ 1752.5    | 2112.5 ~ 2152.5    |                   |
|                        | 10              | 1715.0 ~ 1750.0    | 2115.0 ~ 2150.0    |                   |
|                        | 15              | 1717.5 ~ 1747.5    | 2117.5 ~ 2147.5    |                   |
|                        | 20              | 1720.0 ~ 1745.0    | 2120.0 ~ 2145.0    |                   |
| LTE Band 12            | 1.4             | 699.7 ~ 715.3      | 729.7 ~ 745.3      |                   |
|                        | 3               | 700.5 ~ 714.5      | 730.5 ~ 744.5      |                   |
|                        | 5               | 701.5 ~ 713.5      | 731.5 ~ 743.5      |                   |
|                        | 10              | 704.0 ~ 711.0      | 734.0 ~ 741.0      |                   |
| LTE Band 13            | 5               | 779.5 ~ 784.5      | 748.5 ~ 753.5      |                   |
|                        | 10              | 782.0              | 751.0              |                   |
| LTE Band 66            | 1.4             | 1710.7 ~ 1779.3    | 2110.7 ~ 2199.3    |                   |
|                        | 3               | 1711.5 ~ 1778.5    | 2111.5 ~ 2198.5    |                   |
|                        | 5               | 1712.5 ~ 1777.5    | 2112.5 ~ 2197.5    |                   |
|                        | 10              | 1715.0 ~ 1775.0    | 2115.0 ~ 2195.0    |                   |
|                        | 15              | 1717.5 ~ 1772.5    | 2117.5 ~ 2192.5    |                   |
|                        | 20              | 1720.0 ~ 1770.0    | 2120.0 ~ 2190.0    |                   |
| LTE Band 71            | 5               | 665.5 ~ 695.5      | 619.5 ~ 649.5      |                   |
|                        | 10              | 668.0 ~ 693.0      | 622.0 ~ 647.0      |                   |
|                        | 15              | 670.5 ~ 690.5      | 624.5 ~ 644.5      |                   |
|                        | 20              | 673.0 ~ 688.0      | 627.0 ~ 642.0      |                   |



## 1.2 Table for Multiple Listing

| Equipment Name                                                                                                                                                          |                                                    | Model Name                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Industrial Cellular Serial Device Server                                                                                                                                |                                                    | SE5901B-WW-www-XXX-x-Y-yy-bb,<br>SE5901B-IO-4G-GPS-B-S-US,<br>SE5901B-4G-GPS-B-S-US,<br>SE5901B-IO-D3G-GPS-S-US,<br>SE5901B-D3G-S-US, SE5901B-IO-D3G-S-US,<br>SE5901B-4G-US, SE5901B-4G-B-US,<br>SE5901B-IO-4G-GPS-US, SE5901B-IO-4G-B-US |
| Industrial Cellular Modbus Gateway<br>Industrial Cellular Modbus Concentrator                                                                                           |                                                    | MB5901B- WW-www-XXX-x-Y-yy-ZZ-bb                                                                                                                                                                                                          |
| Industrial Cellular Protocol Gateway                                                                                                                                    |                                                    | PG5901B-WW-www-XXX-x-Y-yy-zzaa-zzaa-bb                                                                                                                                                                                                    |
| <b>Description: From above difference equipment name and model names serve as the different marketing strategy and the detail different refer to the list as below:</b> |                                                    |                                                                                                                                                                                                                                           |
| WW                                                                                                                                                                      | IO or Blank                                        | WW can be IO or Blank, for COM port type.<br>Blank: D-sub connector<br>IO: Terminal Block with COM, relay and DI/O function                                                                                                               |
| www                                                                                                                                                                     | D3G or 4G or Blank                                 | www can be D3G or 4G or Blank<br>D3G: support 3G<br>4G: support 4G & 3G<br>Blank: No 3G or 4G function                                                                                                                                    |
| XXX                                                                                                                                                                     | GPS or Blank                                       | XXX can be GPS or Blank<br>GPS: Support GPS function<br>Blank: no GPS function                                                                                                                                                            |
| x                                                                                                                                                                       | B or Blank                                         | x can be B or Blank, for Internal battery<br>B: support internal battery<br>Blank: no internal battery                                                                                                                                    |
| Y                                                                                                                                                                       | S or Blank                                         | Y can be S or Blank, for SD card<br>S: support SD card<br>Blank: no SD card                                                                                                                                                               |
| yy                                                                                                                                                                      | US or EU or TW                                     | yy can be US or EU or Blank, for country<br>US: North America<br>EU: Europe<br>Blank: Taiwan                                                                                                                                              |
| ZZ                                                                                                                                                                      | CT or Blank                                        | ZZ can be CT or Blank, for software function<br>CT: concentrator<br>Blank: No concentrator                                                                                                                                                |
| zz                                                                                                                                                                      | 00-99, AA-ZZ, aa-zz or Blank;                      | zz can be 00-99, AA-ZZ, aa-zz or Blank, for software function                                                                                                                                                                             |
| aa                                                                                                                                                                      | 00-99 , AA-ZZ , aa-zz or Blank;                    | aa can be 00-99 , AA-ZZ , aa-zz or Blank, for software function                                                                                                                                                                           |
| bb                                                                                                                                                                      | 00-99 , AA-ZZ , aa-zz or Blank;<br>(Customer Code) | bb can be 00-99, AA-ZZ, aa-zz or Blank, for Customer Code                                                                                                                                                                                 |

From the above models, model: SE5901B-IO-4G-GPS-B-S-US was selected as representative model for the test and its data was recorded in this report.



### 1.3 Testing Location

| Testing Location                    |        |                                                                                                                               |
|-------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/>            | HWA YA | ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.<br>TEL : 886-3-327-3456 FAX : 886-3-327-0973   |
| <input checked="" type="checkbox"/> | JHUBEI | ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.<br>TEL : 886-3-656-9065 FAX : 886-3-656-9085 |

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086B with Industry Canada.



## 2 RF Exposure Limit Introduction

### (A) Limits for Occupational / Controlled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 0.3-3.0               | 614                               | 1.63                              | (100)*                                   | 6                                                                |
| 3.0-30                | 1842 / f                          | 4.89 / f                          | (900 / f)*                               | 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

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 0.3-1.34              | 614                               | 1.63                              | (100)*                                   | 30                                                               |
| 1.34-30               | 824/f                             | 2.19/f                            | (180/f)*                                 | 30                                                               |
| 30-300                | 27.5                              | 0.073                             | 0.2                                      | 30                                                               |
| 300-1500              |                                   |                                   | F/1500                                   | 30                                                               |
| 1500-100,000          |                                   |                                   | 1.0                                      | 30                                                               |

Note: f = frequency in MHz ; \*Plane-wave equivalent power density

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:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

**E** = Electric field (V/m)

**P** = RF output power (W)

**G** = EUT Antenna numeric gain (numeric)

**d** = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$



### 3 Radio Frequency Radiation Exposure Evaluation

#### 3.1 Power Density Calculation

| Mode                                | DG<br>(dBi) | Power<br>(dBm) | EIRP<br>(dBm) | Tolerance<br>(dB) | Tune-up<br>EIRP<br>(dBm) | Tune-up<br>EIRP<br>(W) | Distance<br>(cm) | S<br>(mW/cm <sup>2</sup> ) | S Limit<br>(mW/cm <sup>2</sup> ) |
|-------------------------------------|-------------|----------------|---------------|-------------------|--------------------------|------------------------|------------------|----------------------------|----------------------------------|
| Band 5_ WCDMA_5MHz                  | 1.04        | 22.21          | 23.25         | 0.50              | 23.75                    | 0.23714                | 20               | 0.04718                    | 0.56440                          |
| Band 2_ WCDMA_5MHz                  | 1.99        | 22.65          | 24.64         | 0.50              | 25.14                    | 0.32659                | 20               | 0.06497                    | 1.00000                          |
| Band 4_ WCDMA_5MHz                  | 1.68        | 22.77          | 24.45         | 0.50              | 24.95                    | 0.31261                | 20               | 0.06219                    | 1.00000                          |
| LTE Band 5<br>_10MHz_Nss1,QPSK_1TX  | 1.04        | 23.92          | 24.96         | 0.50              | 25.46                    | 0.35156                | 20               | 0.06994                    | 0.55767                          |
| LTE Band 2<br>_3MHz_Nss1,QPSK_1TX   | 1.99        | 24.51          | 26.50         | 0.50              | 27.00                    | 0.50119                | 20               | 0.09971                    | 1.00000                          |
| LTE Band 4<br>_15MHz_Nss1,QPSK_1TX  | 1.68        | 24.61          | 26.29         | 0.50              | 26.79                    | 0.47753                | 20               | 0.09500                    | 1.00000                          |
| LTE Band 12<br>_10MHz_Nss1,QPSK_1TX | 0.42        | 22.75          | 23.17         | 0.50              | 23.67                    | 0.23281                | 20               | 0.04632                    | 0.47400                          |
| LTE Band 13<br>_5MHz_Nss1,QPSK_1TX  | 0.90        | 23.27          | 24.17         | 0.50              | 24.67                    | 0.29309                | 20               | 0.05831                    | 0.52300                          |
| LTE Band 66<br>_10MHz_Nss1,QPSK_1TX | 1.68        | 24.94          | 26.62         | 0.50              | 27.12                    | 0.51523                | 20               | 0.10250                    | 66;G7D                           |
| LTE Band 71<br>_20MHz_Nss1,QPSK_1TX | -0.20       | 23.05          | 22.85         | 0.50              | 23.35                    | 0.21627                | 20               | 0.04303                    | 0.45367                          |

Note: 1.The above antenna gain was declared by manufacturer.

2.For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.

————THE END————