



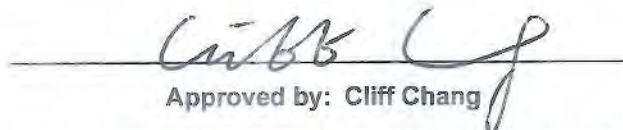
FCC RADIO EXPOSURE TEST REPORT

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 HSDPA: BPSK / QPSK DC-HSDPA: BPSK / QPSK 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, 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
Industrial Cellular Modbus Gateway 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
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:		
WW	IO or Blank	WW can be IO or Blank, for COM port type. Blank: D-sub connector IO: Terminal Block with COM, relay and DI/O function
www	D3G or 4G or Blank	www can be D3G or 4G or Blank D3G: support 3G 4G: support 4G & 3G Blank: No 3G or 4G function
XXX	GPS or Blank	XXX can be GPS or Blank GPS: Support GPS function Blank: no GPS function
x	B or Blank	x can be B or Blank, for Internal battery B: support internal battery Blank: no internal battery
Y	S or Blank	Y can be S or Blank, for SD card S: support SD card Blank: no SD card
yy	US or EU or TW	yy can be US or EU or Blank, for country US: North America EU: Europe Blank: Taiwan
ZZ	CT or Blank	ZZ can be CT or Blank, for software function CT: concentrator 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; (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		
☐	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973
☒	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. 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 ²)	Averaging Time E ² , H ² 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 ²)	Averaging Time E ² , H ² 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 (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
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 _10MHz_Nss1,QPSK_1TX	1.04	23.92	24.96	0.50	25.46	0.35156	20	0.06994	0.55767
LTE Band 2 _3MHz_Nss1,QPSK_1TX	1.99	24.51	26.50	0.50	27.00	0.50119	20	0.09971	1.00000
LTE Band 4 _15MHz_Nss1,QPSK_1TX	1.68	24.61	26.29	0.50	26.79	0.47753	20	0.09500	1.00000
LTE Band 12 _10MHz_Nss1,QPSK_1TX	0.42	22.75	23.17	0.50	23.67	0.23281	20	0.04632	0.47400
LTE Band 13 _5MHz_Nss1,QPSK_1TX	0.90	23.27	24.17	0.50	24.67	0.29309	20	0.05831	0.52300
LTE Band 66 _10MHz_Nss1,QPSK_1TX	1.68	24.94	26.62	0.50	27.12	0.51523	20	0.10250	66;G7D
LTE Band 71 _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————