

**FCC RF Exposure Exemption report**

**for**

**TPMS**

**Model No.: SP501**

**FCC ID: TH9SP501**

**of**

**Applicant: Orange Electronic Co., Ltd**

**Address: 5F., No.29, Keya Rd., Daya Dist., Taichung City 428, Taiwan**

**Tested and Prepared**

**by**

**Worldwide Testing Services (Taiwan) Co., Ltd.**

**FCC Registration No.: TW1477, TW1072**

**Industry Canada filed test laboratory Reg. No.: 20037, 5107A**



**Report No.: W6M22309-22995-EE**

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Registration number: W6M22309-22995-EE  
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# Worldwide Testing Services(Taiwan) Co., Ltd.

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## 1 General Information

### 1.1 Notes

The purpose of conformity testing is to increase the probability of adherence to the essential requirements or conformity specifications, as appropriate.

The complexity of the technical specifications, however, means that full and thorough testing is impractical for both technical and economic reasons.

Furthermore, there is no guarantee that a test sample which has passed all the relevant tests conforms to a specification.

Neither is there any guarantee that such a test sample will interwork with other genuinely open systems. The existence of the tests nevertheless provides the confidence that the test sample possesses the qualities as maintained and that its performance generally conforms to representative cases of communications equipment.

#### Laboratory disclaimer-

1. The test results of this test report relate exclusively to the item tested as specified in 1.5.
2. The test report may only be reproduced or published in full.
3. Reproduction or publication of extracts from the report requires the prior written approval of the Worldwide Testing Services(Taiwan) Co., Ltd.
4. Antenna gain is provided by applicant and laboratory issue relevant data and results.

#### **Tester:**

December 21, 2023	Rick Chen	<i>Rick Chen.</i>
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Date	WTS-Lab.	Name	Signature
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#### **Technical responsibility for area of testing:**

December 21, 2023	Kevin Wang	<i>Kevin Wang</i>
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Date	WTS	Name	Signature
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# **Worldwide Testing Services(Taiwan) Co., Ltd.**

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## **1.2 Testing laboratory**

### **1.2.1 Location**

10m OATS

No.5-1, Lishui, Shuang Sing Village, Wanli Dist.,  
New Taipei City 207, Taiwan (R.O.C.)

3 meter semi-anechoic chamber

No.35, Aly. 21, Ln. 228, Ankang Rd., Neihu Dist.,  
Taipei City 114, Taiwan (R.O.C.)  
Tel: 886-2-6613-0228

Worldwide Testing Services (Taiwan) Co., Ltd.  
6F., No. 58, Ln. 188, Ruiguang Rd., Neihu Dist.,  
Taipei City 114, Taiwan (R.O.C.)  
Tel: 886-2-6606-8877

### **1.2.2 Details of accreditation status**

Accredited testing laboratory

FCC filed test laboratory Reg. No.: TW1477, TW1072

Industry Canada filed test laboratory Reg. No.: 20037, 5107A

### **Test location, where different from Worldwide Testing Services (Taiwan) Co., Ltd.**

Name: ./.  
Accredited no.: ./.  
Street: ./.  
Town: ./.  
Country: ./.

## **1.3 Details of approval holder**

Name: Orange Electronic Co., Ltd  
Street: 5F., No.29, Keya Rd., Daya Dist.,  
Town: Taichung City 428,  
Country: Taiwan



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**1.4 Application details**

Date of receipt of test item: October 11, 2023  
Date of test: from October 11, 2023 to October 19, 2023

**1.5 General information of Test item**

Description of test item: TPMS  
Type identification: SP501  
Brand name: Orange Electronic  
Multi-listing model number: RXXXXX, PXXXX, 974-XXX, 1XX-XXX, SPXXXX, CXXXXXX, HXXXX, FXXXX, MXXXX, PSXXXX, QXXXX, BXXXXX, LXXXXX  
Transmitting frequency: 433.932 MHz  
Operation mode: Simplex  
Voltage supply: Battery 3Vd.c.(CR2050HR)  
Antenna type: Incorporated antenna  
Antenna gain: -8 dBi  
Sample no.: #01  
Max output power: 81.52 dBuV/m

Classification:

Fixed Device	<input type="checkbox"/>
Mobile Device (Human Body distance > 20cm)	<input type="checkbox"/>
Portable Device (Human Body distance < 20cm)	<input checked="" type="checkbox"/>

**Manufacturer: (if applicable)**

Name: ./.  
Street: ./.  
Town: ./.  
Country: ./.

**1.6 Test standards**

47 CFR FCC Part 2.1093  
447498 D04 Interim General RF Exposure Guidance v01



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**2 Technical test**

**2.1 Summary of test results**

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

**or**

The deviations were ascertained in the course of the tests performed.

**2.2 Test environment**

Relative humidity content: 20 ... 75 %

Air pressure: 86 ... 103 kPa

Power supply: Battery 3Vd.c.(CR2050HR)

Extreme conditions parameters: ./.

Test item Name	Uncertainty
Estimation Result of Uncertainty of Conducted Output Power Measurement	Expanded Uncertainty : 1.48 dB

The decision rule is: Measurement uncertainty is not included in the calculation of test results.

**2.3 Test Equipment List**

No.	Test equipment	Type	Serial No.	Manufacturer	Cal. Date	Next Cal. Date
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2023/3/22	2024/3/21



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**3 RF Exposure Test Exemptions**

**3.1 1-mW Test Exemption**

$$P \leq 1\text{mW}$$

When the aggregate maximum available power of all transmitting antennas is  $\leq 1$  mW in the same time-averaging period.

**3.2 SAR-Based Exemption**

Max. time-averaged power(conducted power) or ERP  $\leq P_{th}$

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

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

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

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

d: cm  
 f: GHz

**Table B.2 – Example Power Thresholds (mW)**

Frequency (MHz)	Distance (mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169



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**3.3 MPE-Based Exemption**

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 to support an exemption from further evaluation from 300 kHz through 100 GHz.

>300kHz & distance  $R > \lambda/2\pi$  , MPE-based exemption

**Table B.1 –Thresholds for single RF sources subject to routine environmental evaluation**

RF Source Frequency			Minimum Distance			Threshold ERP
$f_L$ MHz	-	$f_H$ MHz	$\lambda_L / 2\pi$	-	$\lambda_H / 2\pi$	W
0.3	-	1.34	159 m	-	35.6 m	$1,920 R^2$
1.34	-	30	35.6 m	-	1.6 m	$3,450 R^2/f^2$
30	-	300	1.6 m	-	159 mm	$3.83 R^2$
300	-	1,500	159 mm	-	31.8 mm	$0.0128 R^2/f^2$
1,500	-	100,000	31.8 mm	-	0.5 mm	$19.2 R^2$

f: MHz

R: m

$\lambda/2\pi$

$v=f\lambda$

v: speed of light =  $3 \times 10^8 m/s$

f: frequency (Hz)

$\lambda$ : wavelength

f (MHz)	$\lambda / 2\pi$ (m)	$\lambda / 2\pi$ (mm)
0.125	382	381,972
13.56	3.52	3,521
300	0.159	159
918	0.052	52
2400	0.020	19.9
5250	0.009	9.09
5600	0.009	8.53
5825	0.008	8.20
6000	0.008	7.96
7000	0.007	6.82
10000	0.005	4.77





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**4 Exemption calculation**

**1-mW Test Exemption**

The maximum power is  $81.52 \text{ dBuV/m} = -13.71 \text{ dBm} = 0.0426 \text{ mW}$

$0.0426 \text{ mW} \leq 1 \text{ mW}$

The device is qualify for simultaneous transmission SAR exemption.