

TEST REPORT

Applicant: JACS Solutions, Inc.
EUT Description: TD0231 5G Industrial Dongle
Model: TD0231
Brand: JACS
FCC ID: 2AGCDJACSTD0231
Standards: FCC 47 CFR Part 2.1091
Date of Receipt: 2025/09/26
Date of Issue: 2025/12/08

TOWE. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

the results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of the model are manufactured with identical electrical and mechanical components. All sample tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise. without written approval of TOWE, the test report shall not be reproduced except in full.



Jim Huang
Approved By:



Carey Chen
Reviewed By:

Revision History

Rev.	Issue Date	Description	Revised by
01	2025/12/08	Original	Carey Chen

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1 General Description

1.1 Lab Information

1.1.1 Testing Location

These measurements tests were conducted at the Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. facility located at F401 and F101, Building E, Hongwei Industrial Zone, Liuxian 3rd Road, Bao'an District, Shenzhen, China. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014
Tel.: +86-755-27212361
Contact Email: info@towewireless.com

1.1.2 Test Facility / Accreditations

A2LA (Certificate Number: 7088.01)

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

FCC Designation No.: CN1353

Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized as an accredited testing laboratory. Designation Number: CN1353.

ISED CAB identifier: CN0152

Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized by ISED as an accredited testing laboratory.
CAB identifier: CN0152
Company Number: 31000

1.2 Client Information

1.2.1 Applicant

Applicant:	JACS Solutions, Inc.
Address:	809 Pinnacle Drive, Suite R, Linthicum Heights, MD 21090, USA

1.2.2 Manufacturer

Manufacturer:	JACS Solutions, Inc.
Address:	809 Pinnacle Drive, Suite R, Linthicum Heights, MD 21090, USA

1.3 Product Information

EUT Description:	TD0231 5G Industrial Dongle		
Model:	TD0231		
Brand:	JACS		
Hardware Version:	V1.0		
Software Version:	TD0231_JACS_V1.0.0		
Frequency Bands:	Band	TX Frequency	RX Frequency
	LTE Band 2	1850 ~ 1910 MHz	1930 ~ 1990 MHz
	LTE Band 4	1710 ~ 1755 MHz	2110 ~ 2155 MHz
	LTE Band 5	824 ~ 849 MHz	869 ~ 894 MHz
	LTE Band 7	2500 ~ 2570 MHz	2620 ~ 2690 MHz
	LTE Band 12	699 ~ 716 MHz	729 ~ 746 MHz
	LTE Band 13	777 ~ 787 MHz	746 ~ 756 MHz
	LTE Band 14	788 ~ 798 MHz	758 ~ 768 MHz
	LTE Band 17	704 ~ 716 MHz	734 ~ 746 MHz
	LTE Band 25	1850 ~ 1915MHz	1930 ~ 1995 MHz
	LTE Band 26 (814 ~ 824 MHz)	814 ~ 824MHz	859 ~ 869 MHz
	LTE Band 26 (824 ~ 849 MHz)	824 ~ 849 MHz	869 ~ 894 MHz
	LTE Band 30	2305 ~ 2315 MHz	2350 ~ 2360 MHz
	LTE Band 38	2570 ~ 2620 MHz	2570 ~ 2620 MHz
	LTE Band 41	2496 ~ 2690MHz	2496 ~ 2690MHz
	LTE Band 48	3550 ~ 3700 MHz	3550 ~ 3700 MHz
	LTE Band 66	1710 ~ 1780 MHz	2110 ~ 2200 MHz
	LTE Band 71	663 ~ 698 MHz	617 ~ 652 MHz
	NR Band n2	1850 to 1910 MHz	1930 to 1990 MHz
	NR Band n5	824 to 849 MHz	869 to 894 MHz
	NR Band n7	2500 to 2570 MHz	2620 to 2690 MHz
	NR Band n12	699 to 716 MHz	729 to 746 MHz
	NR Band n13	777 to 787 MHz	746 to 756 MHz
	NR Band n14	788 to 798 MHz	758 to 768 MHz
	NR Band n25	1850 to 1915MHz	1930 to 1995 MHz
	NR Band n26 (814 to 824 MHz)	814 to 824MHz	859 to 869 MHz
	NR Band n26 (824 to 849 MHz)	824 to 849 MHz	869 to 894 MHz
	NR Band n30	2305 to 2315 MHz	2350 to 2360 MHz
	NR Band n38	2570 to 2620 MHz	2570 to 2620 MHz
	NR Band n41	2496 to 2690 MHz	2496 to 2690 MHz
	NR Band n48	3550 to 3700 MHz	3550 to 3700 MHz
	NR Band n66	1710 to 1780 MHz	2110 to 2200 MHz

	NR Band n71		663 to 698 MHz	617 to 652 MHz
	NR Band n77		3450 to 3550 MHz	3450 to 3550 MHz
			3700 to 3980 MHz	3700 to 3980 MHz
	NR Band n78		3450 to 3550 MHz	3450 to 3550 MHz
			3700 to 3800 MHz	3700 to 3800 MHz
LTE UL CA:	CA_2C, CA_5B, CA_7C, CA_38C, CA_41C, CA_66B, CA_66C;			
NR Mode:	DC_5A_n2A; DC_14A_n2A; DC_30A_n2A; DC_12A_n2A; DC_66A_n2A; DC_71A_n2A; DC_13A_n2A; DC_7A_n2A; DC_4A_n2A; DC_13A_n5A; DC_2A_n5A; DC_12A_n5A; DC_30A_n5A; DC_66A_n5A; DC_7A_n5A; DC_48A_n5A; DC_5A_n7A; DC_12A_n7A; DC_66A_n7A; DC_71A_n7A; DC_13A_n7A; DC_2A_n7A; DC_4A_n7A; DC_2A_n12A; DC_30A_n12A; DC_66A_n12A; DC_7A_n12A; DC_5A_n12A; DC_48A_n12A; DC_2A_n14A; DC_30A_n14A; DC_66A_n14A; DC_66A_n25A; DC_12A_n25A; DC_48A_n25A; DC_7A_n25A; DC_71A_n25A; DC_5A_n25A; DC_26A_n25A; DC_13A_n25A; DC_2A_n30A; DC_5A_n30A; DC_12A_n30A; DC_14A_n30A; DC_66A_n30A; DC_66A_n38A; DC_2A_n38A; DC_12A_n38A; DC_4A_n38A; DC_5A_n38A; DC_71A_n38A; DC_2A_n41A; DC_66A_n41A; DC_25A_n41A; DC_26A_n41A; DC_5A_n41A; DC_4A_n41A; DC_12A_n41A; DC_71A_n41A; DC_2A_n48A; DC_5A_n48A; DC_13A_n48A; DC_66A_n48A; DC_13A_n66A; DC_2A_n66A; DC_5A_n66A; DC_12A_n66A; DC_14A_n66A; DC_30A_n66A; DC_71A_n66A; DC_48A_n66A; DC_7A_n66A; DC_2A_n71A; DC_66A_n71A; DC_5A_n71A; DC_7A_n71A; DC_48A_n71A; DC_41A_n77A; DC_7A_n77A; DC_2A_n77A; DC_5A_n77A; DC_13A_n77A; DC_66A_n77A; DC_12A_n77A; DC_14A_n77A; DC_30A_n77A; DC_25A_n77A; DC_71A_n77A; DC_7A_n78A; DC_38A_n78A; DC_5A_n78A; DC_66A_n78A; DC_2A_n78A; DC_12A_n78A; DC_13A_n78A; DC_41A_n78A; DC_4A_n78A; DC_71A_n78A; DC_26A_n78A; DC_25A_n78A;			
Antenna Type:	☒ External, ☐ Integrated			
Feature:	UL 2*2 MIMO: NR Band n38; NR Band n41; NR Band n77; NR Band n78;			
Power Class:	Class 1.5: NR Band n41; NR Band n77; NR Band n78; Class 2: LTE Band 38; LTE Band 41; NR Band n38; Class 3: All			
Antenna Gain:	Band	Ant (dBi)	Band	Ant (dBi)
	LTE Band 2	4.92	NR Band n2	4.92
	LTE Band 4	4.94	NR Band n5	1.63
	LTE Band 5	1.63	NR Band n7	2.4
	LTE Band 7	2.4	NR Band n12	1.36
	LTE Band 12	1.36	NR Band n13	2.07
	LTE Band 13	2.07	NR Band n14	1.76
	LTE Band 14	1.76	NR Band n25	4.92
	LTE Band 17	1.32	NR Band n26	1.63
	LTE Band 25	4.92	NR Band n30	1.33
	LTE Band 26	1.63	NR Band n38(MIMO)	2.4
	LTE Band 30	1.33	NR Band n41(MIMO)	2.4
	LTE Band 38	2.4	NR Band n48	0.69
	LTE Band 41	2.4	NR Band n66	4.94
	LTE Band 48	0.69	NR Band n71	1.36
	LTE Band 66	4.94	NR Band n77(MIMO)	1.09

	LTE Band 71	1.36	NR Band n78(MIMO)	1.09
Remark: The above EUT's information was declared by applicant, please refer to the specifications or user's manual for more detailed description.				

2 Maximum Permissible RF Exposure

2.1 RF Exposure Limit Introduction

§1.1310 the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to RF radiation as specified in §1.1307(b).

- (1) Table 1 to § 1.1310(e)(1) sets forth limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

Table 1 to § 1.1310(e)(1) - Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3~3.0	614	1.63	*(100)	≤6
3.0~30	1842/f	4.89/f	*(900/f ²)	<6
30~300	61.4	0.163	1.0	<6
300~1500			f/300	<6
1500~100000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3~1.34	614	1.63	*(100)	<30
1.34~30	824/f	2.19/f	*(180/f ²)	<30
30~300	27.5	0.073	0.2	<30
300~1500			f/1500	<30
1500~100000			1.0	<30

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

- (2) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. The phrase *fully aware* in the context of applying these exposure limits means that an exposed person has received written and/or verbal information fully explaining the potential for RF exposure resulting from his or her employment. With the exception of transient persons, this phrase also means that an exposed person has received appropriate training regarding work practices relating to controlling or mitigating his or her exposure. In situations when an untrained person is transient through a location where occupational/controlled limits apply, he or she must be made aware of the potential for exposure and be supervised by trained personnel pursuant to § 1.1307(b)(2) of this part where use of time averaging is required to ensure compliance with the general population exposure limit. The phrase exercise control means that an exposed person is allowed and also knows how to reduce or avoid exposure by administrative or engineering work practices, such as use of personal protective equipment or time averaging of exposure.
- (3) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. For example, RF sources intended for consumer use shall be subject to the limits for general population/uncontrolled exposure in this section.

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

2.2 Equations

Power Density is given by:

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

Where:

S = Power density in mW/cm²

EIRP= Equivalent isotropic Radiated power in mW

R = Distance from transmitting antenna in cm

Power density in units of mW/cm² is converted to units of W/m² by multiplying by 10.

Distance:

$$R = \sqrt{\frac{\text{EIRP}}{4\pi S}}$$

Where:

S = Power density in mW/cm²

EIRP= Equivalent isotropic Radiated power in mW

R = Distance from transmitting antenna in cm

EIRP:

$$\text{EIRP} = P + G$$

Where:

EIRP = Equivalent isotropic Radiated power in Mw

P = Output power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

Source-Based Duty Cycle:

Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.

Source-based time-averaged EIRP = (DC / 100)* EIRP

Where:

DC = Duty Cycle in %, as applicable

EIRP= Equivalent isotropic Radiated power in mW

MIMO and collocated transmitters (identical limit for all transmitters):

For multiple chain devices, and collocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the PG (in linear units) of each transmitter.

Total EIRP = (EIRP 1) + (EIRP 2) + ... + (EIRP n)

MIMO and collocated transmitters:

For multiple collocated transmitters operating simultaneously in frequency bands where different limit apply:

The power density at the specified separation distance is calculated for each transmitter chain or transmitter.

The fraction of the exposure limit is calculated for each chain or transmitter as

Power density of chain or transmitter / limit applicable to the chain or transmitter.

The fractions are summed.

Compliance is established if the sum of the fractions is less than or equal to one.

3 RF Exposure Results

3.1 Standalone Exposure Calculations

For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band. The manufacturing configures output power so that the maximum power, after accounting for manufacturing tolerances, will never exceed the maximum power level measured.

The antenna gain in the tables below is the maximum antenna gain among various channels within the specified band.

Operating Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	EIRP/ERP (dBm)	EIRP/ERP Limit (dBm)	Maximum Power (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Gain According to EIRP/ERP (dBi)	Gain According to Pd (dBi)	Maximum Gain Allowed (dBi)	Results
LTE Band 2/CA_2C	1850.7	4.92	25.00	29.92	33.00	316.2278	0.1953	1.0000	8.00	12.01	8.00	Pass
LTE Band 4	1710.7	4.94	25.00	29.94	30.00	316.2278	0.1962	1.0000	5.00	12.01	5.00	Pass
LTE Band 5/CA_5B	824.7	1.63	25.00	24.48	38.45	316.2278	0.0558	0.5498	15.60	11.56	11.56	Pass
LTE Band 7/CA_7C	2502.5	2.4	25.00	27.40	33.00	316.2278	0.1093	1.0000	8.00	12.01	8.00	Pass
LTE Band 12	699.7	1.36	25.00	24.21	34.77	316.2278	0.0524	0.4665	11.92	10.85	10.85	Pass
LTE Band 13	779.5	2.07	25.00	24.92	34.77	316.2278	0.0618	0.5197	11.92	11.31	11.31	Pass
LTE Band 14	790.5	1.76	25.00	24.61	34.77	316.2278	0.0575	0.5270	11.92	11.38	11.38	Pass
LTE Band 17	706.5	1.32	25.00	24.17	34.77	316.2278	0.0520	0.4710	11.92	10.89	10.89	Pass
LTE Band 25	1850.7	4.92	25.00	29.92	33.00	316.2278	0.1953	1.0000	8.00	12.01	8.00	Pass
LTE Band 26(814-824)	814.7	1.63	25.00	24.48	50.00	316.2278	0.0558	0.5431	27.15	11.51	11.51	Pass
LTE Band 26(824-849)	824.7	1.63	25.00	24.48	38.45	316.2278	0.0558	0.5498	15.60	11.56	11.56	Pass
LTE Band 30	2307.5	1.33	22.00	23.33	23.98	158.4893	0.0428	1.0000	1.98	15.01	1.98	Pass
LTE Band 38/CA_38C	2572.5	2.4	28.00	30.40	33.00	630.9573	0.2181	1.0000	5.00	9.01	5.00	Pass
LTE Band 41/CA_41C	2498.5	2.4	28.00	30.40	33.00	630.9573	0.2181	1.0000	5.00	9.01	5.00	Pass
LTE Band 48	3552.5	0.69	21.00	21.69	23.00	125.8925	0.0294	1.0000	2.00	16.01	2.00	Pass
LTE Band 66/CA_66B/CA_66C	1710.7	4.94	25.00	29.94	30.00	316.2278	0.1962	1.0000	5.00	12.01	5.00	Pass
LTE Band 71	665.5	1.36	25.00	24.21	34.77	316.2278	0.0524	0.4437	11.92	10.63	10.63	Pass
NR Band n2	1852.5	4.92	25.00	29.92	33.00	316.2278	0.1953	1.0000	8.00	12.01	8.00	Pass
NR Band n5	826.5	1.63	25.00	24.48	38.45	316.2278	0.0558	0.5510	15.60	11.57	11.57	Pass
NR Band n7	2502.5	2.4	25.00	27.40	33.00	316.2278	0.1093	1.0000	8.00	12.01	8.00	Pass
NR Band n12	701.5	1.36	25.00	24.21	34.77	316.2278	0.0524	0.4677	11.92	10.86	10.86	Pass
NR Band n13	779.5	2.07	25.00	24.92	34.77	316.2278	0.0618	0.5197	11.92	11.31	11.31	Pass
NR Band n14	790.5	1.76	25.00	24.61	34.77	316.2278	0.0575	0.5270	11.92	11.38	11.38	Pass
NR Band n25	1852.5	4.92	25.00	29.92	33.00	316.2278	0.1953	1.0000	8.00	12.01	8.00	Pass
NR Band n26(814-824)	816.5	1.63	25.00	24.48	50.00	316.2278	0.0558	0.5443	27.15	11.52	11.52	Pass
NR Band n26(824-849)	826.5	1.63	25.00	24.48	38.45	316.2278	0.0558	0.5510	15.60	11.57	11.57	Pass
NR Band n30	2307.5	1.33	22.00	23.33	23.98	158.4893	0.0428	1.0000	1.98	15.01	1.98	Pass
NR Band n38(MIMO)	2575	2.4	28.00	30.40	33.00	630.9573	0.2181	1.0000	5.00	9.01	5.00	Pass
NR Band n41(MIMO)	2501.01	2.4	28.00	30.40	33.00	630.9573	0.2181	1.0000	5.00	9.01	5.00	Pass
NR Band n48	3555	0.69	21.00	21.69	23.00	125.8925	0.0294	1.0000	2.00	16.01	2.00	Pass
NR Band n66	1712.5	4.94	25.00	29.94	30.00	316.2278	0.1962	1.0000	5.00	12.01	5.00	Pass
NR Band n71	665.5	1.36	25.00	24.21	34.77	316.2278	0.0524	0.4437	11.92	10.63	10.63	Pass
NR Band n77(3450-3550)(MIMO)	3455.01	1.09	28.00	29.09	30.00	630.9573	0.1613	1.0000	2.00	9.01	2.00	Pass
NR Band n77(3700-3980)(MIMO)	3705	1.09	28.00	29.09	30.00	630.9573	0.1613	1.0000	2.00	9.01	2.00	Pass
NR Band n78(3450-3550)(MIMO)	3455.01	1.09	28.00	29.09	30.00	630.9573	0.1613	1.0000	2.00	9.01	2.00	Pass
NR Band n78(3700-3800)(MIMO)	3705	1.09	28.00	29.09	30.00	630.9573	0.1613	1.0000	2.00	9.01	2.00	Pass

Remark: "Maximum Power" comes from the largest "Tune-up" provided by the customer.

3.1 Multiple Sources Exposure Calculations

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table(A) and Table(B). To comply with the MPE, the fraction of the MPE in terms of E2, H2 (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity.

In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity.

$$\sum_{i=1}^n \frac{S_i}{MPE_i} \leq 1$$

TER (Total exposure ratio) = Power Density (mW/cm²) / Limit (mW/cm²)

Operating Band	Frequency (MHz)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	TER
LTE Band 2/CA_2C	1850.7	0.1953	1.0000	0.1953
LTE Band 4	1710.7	0.1962	1.0000	0.1962
LTE Band 5/CA_5B	824.7	0.0558	0.5498	0.1015
LTE Band 7/CA_7C	2502.5	0.1093	1.0000	0.1093
LTE Band 12	699.7	0.0524	0.4665	0.1124
LTE Band 13	779.5	0.0618	0.5197	0.1189
LTE Band 14	790.5	0.0575	0.5270	0.1091
LTE Band 17	706.5	0.0520	0.4710	0.1103
LTE Band 25	1850.7	0.1953	1.0000	0.1953
LTE Band 26(814-824)	814.7	0.0558	0.5431	0.1028
LTE Band 26(824-849)	824.7	0.0558	0.5498	0.1015
LTE Band 30	2307.5	0.0428	1.0000	0.0428
LTE Band 38/CA_38C	2572.5	0.2181	1.0000	0.2181
LTE Band 41/CA_41C	2498.5	0.2181	1.0000	0.2181
LTE Band 48	3552.5	0.0294	1.0000	0.0294
LTE Band 66/CA_66B/CA_66C	1710.7	0.1962	1.0000	0.1962
LTE Band 71	665.5	0.0524	0.4437	0.1182
NR Band n2	1852.5	0.1953	1.0000	0.1953
NR Band n5	826.5	0.0558	0.5510	0.1013
NR Band n7	2502.5	0.1093	1.0000	0.1093
NR Band n12	701.5	0.0524	0.4677	0.1121
NR Band n13	779.5	0.0618	0.5197	0.1189
NR Band n14	790.5	0.0575	0.5270	0.1091
NR Band n25	1852.5	0.1953	1.0000	0.1953
NR Band n26(814-824)	816.5	0.0558	0.5443	0.1025
NR Band n26(824-849)	826.5	0.0558	0.5510	0.1013
NR Band n30	2307.5	0.0428	1.0000	0.0428
NR Band n38(MIMO)	2575	0.2181	1.0000	0.2181
NR Band n41(MIMO)	2501.01	0.2181	1.0000	0.2181
NR Band n48	3555	0.0294	1.0000	0.0294
NR Band n66	1712.5	0.1962	1.0000	0.1962
NR Band n71	665.5	0.0524	0.4437	0.1182
NR Band n77(3450-3550)(MIMO)	3455.01	0.1613	1.0000	0.1613
NR Band n77(3700-3980)(MIMO)	3705	0.1613	1.0000	0.1613
NR Band n78(3450-3550)(MIMO)	3455.01	0.1613	1.0000	0.1613
NR Band n78(3700-3800)(MIMO)	3705	0.1613	1.0000	0.1613

The product also has multiple transmitters. The Simultaneous Transmission Possibilities are as below:

EN_DC, and MIMO

The worst-case combination:

Combination	TER	Total TER	Limit	Conclusion
DC_66A_n41A	0.1962 + 0.2181	0.4143	<1	PASS
NR Band n41(MIMO)	0.2181	0.2181	<1	PASS

~The End~