



RF EXPOSURE EVALUATION REPORT

APPLICANT : JACS Solutions, Inc.
PRODUCT NAME : LTE Indoor CPE
MODEL NAME : TD0551
BRAND NAME : N/A
FCC ID : 2AGCDJACSTD0551
STANDARD(S) : FCC 47 CFR Part 2(2.1091)
RECEIPT DATE : 2023-01-30
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DIRECTORY

- 1. Technical Information..... 3
- 1.1 Applicant and Manufacturer Information..... 3
- 1.2 Equipment under Test (EUT) Description..... 3
- 1.3 Applied Reference Documents 5
- 2. Device Category and RF Exposure Limit 6
- 3. Test Equipment List..... 7
- 4. RF Output Power..... 7
- 5. LTE Carrier Aggregation 8
- 6. RF Exposure Assessment 10
- Annex A General Information..... 13
- Annex B Conducted Power

Change History		
Version	Date	Reason for Change
1.0	2023-03-09	First edition



1. Technical Information

Note: Provide by applicant.

1.1 Applicant and Manufacturer Information

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

1.2 Equipment under Test (EUT) Description

Product Name:	LTE Indoor CPE	
EUT No.:	2#	
Hardware Version:	V1.0	
Software Version:	TD0551_JACS_V1.0.2	
Frequency Bands:	LTE Band 42: 3450 MHz ~ 3550 MHz; 3550 MHz ~ 3600 MHz; LTE Band 43: 3600 MHz ~ 3700 MHz; 3700 MHz ~ 3800 MHz; LTE Band 48: 3550 MHz ~ 3700 MHz WLAN 2.4GHz: 2412 MHz ~ 2462 MHz WLAN 5.2GHz: 5180 MHz ~ 5240 MHz WLAN 5.8GHz: 5745 MHz ~ 5825 MHz	
Modulation Mode:	LTE: QPSK, 16QAM 802.11b: DSSS 802.11a/g/n-HT20/HT40/ac-VHT20/40/80: OFDM	
Carrier Aggregation:	Uplink & Downlink	
Antenna Type:	WWAN: Fixed External Antenna & Fixed Internal Antenna WLAN: PCB Antenna	
Antenna Gain:	Frequency Bands	Antenna Gain (dBi)
	LTE Band 42 (internal antenna)	-0.3
	LTE Band 42 (external antenna)	0.0
	LTE Band 43 (internal antenna)	-0.2
	LTE Band 43 (external antenna)	0.0
	LTE Band 48	-0.2



	(internal antenna)	
	LTE Band 48 (external antenna)	0.1
	WLAN 2.4GHz	2.0
	WLAN 5.2GHz	2.6
	WLAN 5.8GHz	2.8

Note: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.



1.3 Applied Reference Documents

Leading reference documents for testing:

Identity	Document Title	Method determination /Remark
FCC 47 CFR Part 2(2.1091)	Radio Frequency Radiation Exposure Assessment: mobile devices	No deviation
KDB 447498 D01v06	General RF Exposure Guidance	No deviation
Note 1: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.		



2. Device Category and RF Exposure Limit

Per user manual, Based on 47CFR 2.1091, this device belongs to mobile device category with General Population/Uncontrolled exposure.

Mobile Devices:

47CFR 2.1091(b)

For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

General Population/Uncontrolled Exposure:

The general population/uncontrolled exposure limits are applicable to 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 made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

Table 1—Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(B) 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
1500-100,000	-	-	1.0	30

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



3. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial No./ SW Version	Calibration	
				Last Cal.	Due Date
Anritsu	Network Emulator	MT8820C	6200985414	2022.10.11	2023.10.10
Anritsu	Network Emulator	MT8821C	6261830572	2023.02.09	2023.02.08

Note:

The EUT was connected to Base Station Anritsu MT8820C referred to the Setup Configuration. For the maximum power, it was established between EUT and Base Station with following setting:

1. For LTE testing, the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and different configurations.

4. RF Output Power

Remark:

1. The output power of LTE/WLAN refers to the annex B of this report.
2. The output power of WLAN is derived from the report SZ23010057W01/02.

5. LTE Carrier Aggregation

➤ Carrier Aggregation Configuration

<Intra-band>

2CC Uplink Carrier Aggregation for Intra-band				
No.	Combination	MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_42C	42C	-	No

Note:

1. According to the 3GPP 36.101 table 6.2.2A-1 specifics that the aggregation maximum allowed output power is equivalent to the signal carrier scenario for intra-band contiguous carrier aggregation scenarios. When the non-contiguous RB allocation is applied the MPR shell complies with the table 6.2.3A defined in 3GPP 36.101.
2. According to the TCB Workshop publication, the output power of uplink CA would be measured with the wideband signal integration over the component carriers. And SAR measurement would be performed at the worst exposure condition of each band.
3. Additional SAR measurement for LTE UL CA with other DL CA combinations are not required when the maximum output power of this configuration is not $>1/4$ dB higher than the maximum output power for UL CA active.

➤ Carrier Aggregation Configuration

2CC Downlink Carrier Aggregation				
No.	Combination	MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_42C	-	-	No
2	CA_48C	-	-	No

4CC Downlink Carrier Aggregation				
No.	Combination	MIMO	Restriction	Completely Covered by Measurement Superset
1	CA_42D	-	-	No
2	CA_48D	-	-	No

Note:

1. Uplink maximum output power with downlink carrier aggregation active does not show more than $1/4$ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.
2. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.
3. Selected highest measured power when downlink carrier aggregation is inactive for conducted

power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.

4. For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band.
5. For Intra-band, contiguous CA, the downlink channels selected to perform the uplink power measurement must satisfy 7. 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements.

$$\text{Nominal channel spacing} = \left\lceil \frac{BW_{\text{Channel}(1)} + BW_{\text{Channel}(2)} - 0.1|BW_{\text{Channel}(1)} - BW_{\text{Channel}(2)}|}{0.6} \right\rceil 0.3 \text{ [MHz]}$$

6. The output power of CA uplink & downlink refers to the annex B of this report.

6. RF Exposure Assessment

➤ Standalone Transmission Assessment

<Standalone Antenna Transmission Assessment>

Bands	Frequency (MHz)	Tune-up Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	PD (mW/cm ²)	Limit Value (mW/cm ²)
LTE Band 42 (internal antenna)	3460	24.0	-0.3	234.42	0.047	1.0
LTE Band 42 (external antenna)	3460	24.0	0.0	251.19	0.050	1.0
LTE Band 43 (internal antenna)	3610	24.0	-0.2	239.88	0.048	1.0
LTE Band 43 (external antenna)	3610	24.0	0.0	251.19	0.050	1.0
LTE Band 48 (internal antenna)	3625	24.0	-0.2	239.88	0.048	1.0
LTE Band 48 (external antenna)	3625	24.0	0.1	257.04	0.051	1.0
WLAN 2.4GHz (ANT 1)	2437	24.0	2.0	398.11	0.079	1.0
WLAN 2.4GHz (ANT 2)	2462	24.0	2.0	398.11	0.079	1.0
WLAN 5GHz (ANT 1)	5220	14.0	2.8	47.86	0.010	1.0
WLAN 5GHz (ANT 2)	5220	13.5	2.8	42.66	0.008	1.0

<MIMO Transmission Assessment>

Bands	Frequency (MHz)	Tune-up Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	PD (mW/cm ²)	Limit Value (mW/cm ²)
WLAN 2.4GHz (MIMO)	2412	22.0	2.0	251.19	0.050	1.0
WLAN 5GHz (MIMO)	5240	13.5	2.8	42.66	0.008	1.0



<CA Transmission Assessment>

Bands	Frequency (MHz)	Tune-up Power (dBm)	Antenna Gain (dBi)	EIRP (mW)	PD (mW/cm ²)	Limit Value (mW/cm ²)
CA_42C (internal antenna)	3410	24	-0.3	234.42	0.047	1.0
CA_42C (internal antenna)	3410	24	0.0	251.19	0.050	1.0

Note:

1. According to KDB 447498, MPE assessment is based on source-based time-averaged maximum conducted output power of the RF channel requiring assessment, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.
2. MPE calculate method

$$S = PG/4\pi R^2$$

Where: S= Power density (in appropriate units, e.g. mW/cm²)

P = Time-average maximum tune-up power (in appropriate units, e.g. dBm)

G = numeric gain of the antenna (in appropriate units, e.g. dBi)

R = Separation distance to the centre of radiation of the antenna (20cm)

➤ **Simultaneous Transmission Assessment**

Multi-Band Simultaneous Transmission Consideration

Simultaneous Transmission Consideration	Position	Applicable Combination
	Hand/Body	WLAN 2.4GHz/5GHz MIMO
		WWAN+WLAN 2.4GHz SISO/MIMO
		WWAN+WLAN 5GHz SISO/MIMO

1. This device contains transmitters that may operate simultaneously, therefore simultaneous transmission analysis is required.
2. The worst condition for WWAN & WLAN 2.4GHz/5GHz will be calculated for transmitting simultaneously.

Formula: Result=Power density₁/ limit₁ + Power density₂/ limit₂ < 1.

Transmission Bands	Power Density/ SAR	Limit	Simultaneous Transmission Result
WWAN	0.051	1.0	0.130
WLAN 2.4GHz	0.079	1.0	



Transmission Bands	Power Density/ SAR	Limit	Simultaneous Transmission Result
WWAN	0.051	1.0	0.061
WLAN 5GHz	0.010	1.0	

➤ **Conclusion**

According to FCC 47 CFR Part 2(2.1091), this device complies with human exposure basic restrictions.



Annex A General Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
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2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

The FCC designation number is CN1192, the test firm registration number is 226174.

Note:

The main report is end here and the other Annex B will be submitted separately.

————— END OF REPORT —————