

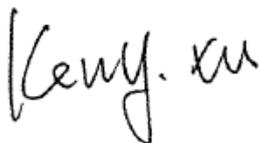
RF EXPOSURE EVALUATION REPORT

Application No.: SZCR2309002949AT
Applicant: Shenzhen Xinguodu Technology Co., Ltd.
Address of Applicant: 17B JinSong Mansion, Terra Industrial & Trade Park Chegongmiao, Futian District, Shenzhen, 518040 China
Manufacturer: Shenzhen Xinguodu Technology Co., Ltd.
Address of Manufacturer: 17B JinSong Mansion, Terra Industrial & Trade Park Chegongmiao, Futian District, Shenzhen, 518040 China
Equipment Under Test (EUT):
EUT Name: POS Terminal
Model No.: UN20 ♣
♣ Please refer to section 3.2 of this report which indicates which model was actually tested and which were electrically identical.
FCC ID: XDQUN20-02
Standard(s) : 47 CFR Part 1.1307
47 CFR Part 1.1310
FCC Rules 47 CFR §2.1091
KDB 447498 D04 interim General RF Exposure Guidance v01
Date of Receipt: 2023-09-08
Date of Evaluation: 2023-09-08 to 2023-09-13
Date of Issue: 2023-09-13

Evaluation Result:

Pass*

* In the configuration evaluated, the EUT complied with the standards specified above.



Keny Xu

EMC Laboratory Manager



Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023-09-13		Original

Authorized for issue by:			
		<i>Vincent Chen</i>	
		Vincent Chen/Project Engineer	
		<i>Eric Fu</i>	
		Eric Fu/Reviewer	



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3 General Information

3.1 General Description of E.U.T.

Product Type:	<input type="checkbox"/> Portable device
	<input checked="" type="checkbox"/> Mobile device
	<input type="checkbox"/> Fixed device

3.2 Details of E.U.T.

Power supply:	Powered by DC adapter: Model: ADS-65HI-12N-3 12048E Input: AC 100-240V, 50/60Hz, Max. 1.5A Output: DC12V, 4.0A, 48.0W
Cable(s):	DC Connect cable: 13cm DC Cable from adapter with one core: 150cm AC Cable 100cm LTE Antenna 150cm
For BT:	
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V4.1 Dual mode
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	FPC Antenna
Antenna Gain:	1.81dBi
For BLE:	
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V4.1 Dual mode
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	FPC Antenna
Antenna Gain:	1.81dBi



For 2.4G WIFI:	
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz; 802.11n(HT40): 2422MHz to 2452MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK); 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20):11; 802.11n(HT40):7
Channel Spacing:	5MHz
Antenna Type:	FPC Antenna
Antenna Gain:	1.81dBi
For 5G WIFI:	
Operation Frequency/Number of channels (20MHz):	5180-5240MHz (4 Channels); U-NII-3: 5745-5825MHz (5 Channels)
Operation Frequency/Number of channels/(40MHz):	5190-5230MHz (2 Channels); U-NII-3: 5755-5795MHz (2 Channels)
Operation Frequency/Number of channels (80MHz):	5210MHz (1 Channel); U-NII-3: 5775MHz (1 Channel)
Modulation Type:	802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM); 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Channel Spacing:	802.11a/n/ac 20: 20MHz; 802.11n/ac 40: 40MHz; 802.11ac 80: 80MHz
DFS Function:	Slave without Radar detection; Without DFS function
TPC Function:	Without TPC function
Antenna Type:	FPC Antenna
Antenna Gain:	3.98dBi
For NFC:	
Operation Frequency:	13.56MHz
Modulation Type:	ASK
Antenna Type:	Loop Antenna
For WCDMA/LTE:	
Operation Frequency Band:	WCDMA Band II/IV/V, LTE Band 2/4/5/12/13/14/66/71
Modulation Type:	(WCDMA): QPSK,16QAM; (LTE) QPSK,16QAM
HSDPA UE Category:	24
HSUPA UE Category:	6
LTE Category:	4
Antenna Type:	Dipole Antenna



Antenna Gain:	WCDMA Band II: 2.17dBi; WCDMA Band IV: 1.59dBi WCDMA Band V: 0.74dBi LTE Band 2: 2.17dBi; Band 4: 1.59dBi; Band 5: 0.74dBi Band 12: 0.63dBi; Band 13: 0.74dBi; Band 14: 0.91dBi Band 66: 1.79dBi; Band 71: 0.63dBi
Based on Module certification (FCC ID: XMR202008EC25AFXD)	

Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

Declaration of EUT Family Grouping:

Model No.: UN20

The model UN20 which has two versions UN20W8 and UN20W0.

Since according to the declaration from the applicant, the electrical circuit design, PCB layout, components used, internal wiring and functions were identical for all the above versions, with only difference on with 4G module or not. The versions were showed on the serial number. Consider the difference, we test the worst case UN20W8 and shows the data in this report. And the 4G module had been certified by (FCC ID: XMR202008EC25AFXD).

3.3 Separation Distance

Minimum test separation distance:	20cm
Remark: This minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander.	



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3.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

3.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• **VCCI (Member No. 1937)**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd.

Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• **FCC –Designation Number: CN1336**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

• **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

3.6 Deviation from Standards

None

3.7 Abnormalities from Standard Conditions

None



4 FCC Radiofrequency radiation exposure limits

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.

4.1 Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of §1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1-mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph §1.1307(b)(3)(ii)(A).

The 1-mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

4.2 MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

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
1,500	–	100,000	31.8 mm	–	0.5 mm	19.2R ²

Subscripts L and H are low and high; λ is wavelength.
 From §1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

The table applies to any RF source (i.e. single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are



based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

For mobile devices that are not exempt per Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (B.1) [repeated from §2.1091(c)(1); also in §1.1307(b)(1)(i)(B)].

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad \text{(B.1)}$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

Limit calculation			
Frequency range	Frequency(MHz)	R($\lambda/2\pi$)(m)	Threshold ERP(W)
300~1500MHz	915	0.0522	0.032
1500~100000MHz	2480	0.0193	0.007

4.3 SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.



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The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

The SAR-based exemption formula of §1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}}(d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases} \quad \text{(B.2)}$$

where

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

and f is in GHz, d is the separation distance (cm), and $ERP_{20 \text{ cm}}$ is per Formula (B.1).

Example values shown in Table B.2 are for illustration only.

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

Limit calculation				
Frequency range(GHz)	Frequency(GHz)	X	Distance(cm)	Pth (mW)
0.3~1.5	0.915	1.474	0.5	8.133
1.5~6	2.48	1.905	0.5	2.717



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5 Measurement and Calculation

5.1 Maximum transmit power

For BT:

The Power Data is based on the RF Test Report SZCR230900294902.

Antenna Gain: 1.81dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency	Maximum Conducted Power [dBm]	Maximum Conducted EIRP [dBm]	Maximum Conducted EIRP (mW)
2441	4.75	6.56	4.53

For BLE:

The Power Data is based on the RF Test Report SZCR230900294903.

Antenna Gain: 1.81dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency	Maximum Conducted Power [dBm]	Maximum Conducted EIRP [dBm]	Maximum Conducted EIRP (mW)
2480	-3.83	-2.02	0.63

For 2.4G WIFI:

The Power Data is based on the RF Test Report SZCR230900294904.

Antenna Gain: 1.81dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency	Maximum Conducted Power [dBm]	Maximum Conducted EIRP [dBm]	Maximum Conducted EIRP (mW)
2462	15.48	17.29	53.58



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For 5G WIFI:

The Power Data is based on the RF Test Report SZCR230900294905.

Antenna Gain: 3.98dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency	Maximum Conducted Power [dBm]	Maximum Conducted EIRP [dBm]	Maximum Conducted EIRP (mW)
5210	12.9	16.88	48.75

Note: Refer to report No. SZCR230900294902, SZCR230900294903, SZCR230900294904, SZCR230900294905 for EUT test Max Power Value.

The distance r (4th column) calculated from the Friis transmission formula is far greater than 20 cm separation requirement.

For NFC:

Mode	E-field strength(dBuV/m)	E-field strength(V/m)	ERP (mW)	Limit(mW)	Verdict
NFC	82.11	0.0127	0.0295	1	Pass

$$EIRP = p_t \times g_t = (E \times d)^2 / 30$$

where

p_t	is the transmitter output power in watts
g_t	is the numeric gain of the transmitting antenna (dimensionless)
E	is the electric field strength in V/m
d	is the measurement distance in meters (m)

$$ERP = EIRP/1.64 = (E \times d)^2 / (30 \times 1.64) = (E \times d)^2 / 49.2$$

Note: Refer to report No. SZCR230900294906 for EUT test E-field Value.



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For WCDMA/LTE:

Antenna gain: WCDMA Band II: 2.17dBi; WCDMA Band IV: 1.59dBi; WCDMA Band V: 0.74dBi

LTE Band 2: 2.17dBi; Band 4: 1.59dBi; Band 5: 0.74dBi; Band 12: 0.63dBi; Band 13: 0.74dBi; Band 14: 0.91dBi; Band 66: 1.79dBi; Band 71: 0.63dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Mode	Max Conducted Power (dBm)	Antenna Gain (dBi)	Max EIRP (dBm)	Max EIRP (mW)
WCDMA Band II	25.00	2.17	27.17	521.19
WCDMA Band IV	25.00	1.59	26.59	456.04
LTE Band 2	25.00	2.17	27.17	521.19
LTE Band 4	25.00	1.59	26.59	456.04
LTE Band 66	25.00	1.79	26.79	477.53

Note: Refer to FCC ID: XMR202008EC25AFXD for Max Power Value.

Mode	Max Conducted Power (dBm)	Antenna Gain (dBi)	Max ERP (dBm)	Max ERP (mW)
WCDMA Band V	25.00	0.74	27.89	628.06
LTE Band 5	25.00	0.74	27.89	628.06
LTE Band 12	25.00	0.63	27.78	599.79
LTE Band 13	25.00	0.74	27.89	628.06
LTE Band 14	25.00	0.91	28.06	639.73
LTE Band 71	25.00	0.63	27.78	599.79

Note: Refer to FCC ID: XMR202008EC25AFXD for Max Power Value. and the standard requirement EIRP=ERP+2.15(dB).



5.2 RF Exposure Calculation

Remark: we used the maximum power between the conducted power and ERP/EIRP to perform RF exposure exemption evaluation.

For BT:

The Max EIRP is 4.53mW. The best case gain of the antenna is 1.81dBi.

	Evaluation method	RF Power(mW)	Exempt Limit(mW)	MPE ratio	Verdict
<input type="checkbox"/>	Blanket 1 mW Blanket Exemption	/	1mW	0	N/A
<input type="checkbox"/>	MPE-based Exemption(ERP)	/	7mW(ERP)	0	N/A
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	4.53	3060	0.00148	Pass

For BLE:

The Max EIRP is 0.63mW. The best case gain of the antenna is 1.81dBi.

	Evaluation method	RF Power(mW)	Exempt Limit(mW)	MPE ratio	Verdict
<input type="checkbox"/>	Blanket 1 mW Blanket Exemption	/	1mW	0	N/A
<input type="checkbox"/>	MPE-based Exemption(ERP)	/	7mW(ERP)	0	N/A
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	0.63	3060	0.0002	Pass

For 2.4G WIFI:

The Max EIRP is 53.58mW. The best case gain of the antenna is 1.81dBi.

	Evaluation method	RF Power(mW)	Exempt Limit(mW)	MPE ratio	Verdict
<input type="checkbox"/>	Blanket 1 mW Blanket Exemption	/	1mW	0	N/A
<input type="checkbox"/>	MPE-based Exemption(ERP)	/	7mW(ERP)	0	N/A
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	53.58	3060	0.0175	Pass



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For 5G WIFI:

The Max EIRP is 48.75mW. The best case gain of the antenna is 3.98dBi.

	Evaluation method	RF Power(mW)	Exempt Limit(mW)	MPE ratio	Verdict
<input type="checkbox"/>	Blanket 1 mW Blanket Exemption	/	1mW	0	N/A
<input type="checkbox"/>	MPE-based Exemption(ERP)	/	7mW(ERP)	0	N/A
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	48.75	3060	0.0159	Pass

For NFC:

The Max Power is 0.0295mW.

	Evaluation method	RF Power(mW)	Exempt Limit(mW)	MPE ratio	Verdict
<input checked="" type="checkbox"/>	Blanket 1 mW Blanket Exemption	0.0295	1mW	0.0295	Pass
<input type="checkbox"/>	MPE-based Exemption(ERP)	/	7mW(ERP)	/	N/A
<input type="checkbox"/>	SAR-based Exemption(P_{th})	/	3060	/	N/A

So, the device is to qualify for SAR test exemption, the exemption report is in lieu of the SAR report.

For WCDMA/LTE:

The best case gain is WCDMA Band II: 2.17dBi; WCDMA Band IV: 1.59dBi; WCDMA Band V: 0.74dBi
 LTE Band 2: 2.17dBi; Band 4: 1.59dBi; Band 5: 0.74dBi; Band 12: 0.63dBi; Band 13: 0.74dBi; Band 14: 0.91dBi; Band 66: 1.79dBi; Band 71: 0.63dBi

	Evaluation method	Operating Band	RF Power(mW)	Exempt Limit(mW)	MPE ratio	Verdict
<input type="checkbox"/>	Blanket 1 mW Blanket Exemption	/	/	1mW	0	N/A
<input type="checkbox"/>	MPE-based Exemption(ERP)	/	/	7mW(ERP)	0	N/A
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	WCDMA Band II	521.19	3060	0.1703	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	WCDMA Band IV	456.04	3060	0.1490	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	WCDMA Band V	628.06	1681.16	0.3736	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(P_{th})	LTE Band 2	521.19	3060	0.1703	Pass



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<input checked="" type="checkbox"/>	SAR-based Exemption(Pth)	LTE Band 4	456.04	3060	0.1490	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(Pth)	LTE Band 5	628.06	1681.16	0.3737	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(Pth)	LTE Band 12	599.79	1426.16	0.4206	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(Pth)	LTE Band 13	628.06	1585.28	0.3962	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(Pth)	LTE Band 14	639.73	1607.72	0.3979	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(Pth)	LTE Band 66	477.53	3060	0.1561	Pass
<input checked="" type="checkbox"/>	SAR-based Exemption(Pth)	LTE Band 71	599.79	1352.52	0.4435	Pass

So, the device is to qualify for SAR test exemption, the exemption report is in lieu of the SAR report.

For simultaneously transmitter:

Operating Mode	MPE ratio	MPE limit	Verdict
BT+LTE	0.44498	1	Pass
2.4GWIFI+LTE	0.461	1	Pass
5GWIFI+LTE	0.4594	1	Pass

Remark: NFC didn't support simultaneously transmission with other transmitters.

6 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for SZCR2309002949AT.

--End of the Report--



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