Test Report

Verified code: 783063

Report No.: E202312279773-4

Customer:	North Valley Electronics,Inc.
Address:	Building 1 and 1-3 floors of Building 2 of Jinan Energy Industry Park, No.1815 Gangyuan 7th Road, High-tech Zone, Jinan City, Shandong Province, China
Sample Name:	Telematics Box
Sample Model:	TX4000
Receive Sample Date:	Dec.28,2023
Test Date:	Dec.30,2023 ~ Jan.11,2024
Reference Document:	CFR 47, FCC Part 2.1091 Radio frequency radiation exposure evaluation: mobile devices.
Test Result:	Pass

Prepared by: Wen Wenwen Reviewed by: Peng Huarui Approved by: Zhao Zetian

GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2024-01-30

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Statement

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5. Without the agreement of the laboratory, the client is not authorized to use the test results for unapproved propaganda.

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E202312279773-4	Original Issue	2024-01-30

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1. GENERAL DESCRIPTION OF EUT

1.1. APPLICANT

Name:	North Valley Electronics,Inc.
Address:	Building 1 and 1-3 floors of Building 2 of Jinan Energy Industry Park, No.1815 Gangyuan 7th Road, High-tech Zone, Jinan City, Shandong Province, China

1.2. MANUFACTURER

Name:	North Valley Electronics,Inc.
Address:	Building 1 and 1-3 floors of Building 2 of Jinan Energy Industry Park, No.1815 Gangyuan 7th Road, High-tech Zone, Jinan City, Shandong Province, China

1.3. FACTORY

Name:	North Valley Electronics,Inc.
Address:	Building 1 and 1-3 floors of Building 2 of Jinan Energy Industry Park, No.1815 Gangyuan 7th Road, High-tech Zone, Jinan City, Shandong Province, China

1.4. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment:	Telematics Box
Model No.:	TX4000
Adding Model:	/
Trade Name:	NVR
FCC ID:	2BEJG-TX4000
Power Supply:	DC 24V(Battery 3.7V) or DC 12V(Battery 3.7V)
Frequency Range:	GSM850: Tx 824MHz~849MHz, Rx 869MHz ~ 894MHz GSM1900: Tx 1850MHz~1910MHz, Rx 1930MHz ~ 1990MHz UMTS Band 2: Tx 1850MHz~1910MHz, Rx 1930MHz ~ 1990MHz UMTS Band 4: Tx 1710MHz~1755MHz, Rx 2110MHz ~ 2155MHz UMTS Band 5: Tx 824MHz~849MHz, Rx 869MHz ~ 894 MHz LTE Band 2: Tx 1850MHz~1910MHz, Rx 1930MHz ~ 1990MHz LTE Band 4: Tx 1710MHz~1755MHz, Rx 2110MHz ~ 2155MHz LTE Band 5: Tx 824MHz~849MHz, Rx 869MHz ~ 894MHz LTE Band 7: Tx 2500MHz~2570MHz, Rx 2620MHz ~ 2690MHz LTE Band 12: Tx 699MHz~716MHz, Rx 729MHz ~ 746MHz LTE Band 13: Tx 777MHz~787MHz, Rx 746MHz ~ 756MHz LTE Band 25: Tx 1850MHz~1915MHz, Rx 1930MHz ~ 1995MHz LTE Band 26(814-824MHz): Tx 814MHz~824MHz, Rx 859MHz ~ 869MHz LTE Band 26(824-849MHz): Tx 824MHz~849MHz, Rx 869MHz ~ 894MHz LTE Band 38: Tx 2570MHz~2620MHz, Rx 2570MHz~2620MHz LTE Band 41: Tx 2496MHz~2690MHz, Rx 2496MHz ~ 2690MHz GNSS:1559MHz ~1610MHz (RX)
Transmit Power:	Reference Section 5 Table 2

Modulation type:	GSM: GMSK,8PSK WCDMA: QPSK LTE: QPSK, 16QAM
Antenna Specification:	Reference Section 5 Table 1
Temperature Range:	-20℃~50℃
Voltage Range	DC 9V~36V
Hardware Version:	0.1.4
Software Version:	00.02.08
Sample No:	E202312279773-0001
Note:	The EUT antenna gain is provided by the applicant. This report is made solely on the basis of such data and/or information. We accept no responsibility for the authenticity and completeness of the above data and information and the validity of the results and/or conclusions.

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2. LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of GRG METROLOGY & TEST GROUP CO., LTD.

Add.:	No.1301 Guanguang Road Xinlan Community, Guanlan Street, Longhua District Shenzhen, 518110, People's Republic of China.
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2.1 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025:2017.

USA	A2LA(Certificate #2861.01)

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	ISED (Company Number: 24897, CAB identifier:CN0069)
USA	FCC (Registration Number: 759402, Designation Number:CN1198)

Copies of granted accreditation certificates are available for downloading from our web site, http://www.grgtest.com

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3. EVALUATION METHOD

Exposure category: General population/uncontrolled environment
EUT Type: Production Unit
Device Type: Mobile Device

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.
In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.
In accordance with KDB447498D04 Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR (*Evaluated*$_k$ term) shall be used to determine exemption for simultaneous transmission according to Formula (C.1)

$$\sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1 \qquad (C.1)$$

Evaluated$_k$	the maximum reported SAR or MPE of fixed, mobile, or portable RF source *k* either in the device or at the transmitter site from an existing evaluation.
Exposure Limit$_k$	either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable sources, as applicable

the sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE shall be less than 1, to determine simultaneous transmission exposure compliance

4. LIMITS FOR GENERAL POPULATION/UNCONTROLLEDEXPOSURE

For mobile devices at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in Table B.2 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (B.1)

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

(B.2)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 (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

5. CALCULATION METHOD

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01
$S=PG/4\pi R^2$
Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to anisotropic radiator
R=distance to the center of radiation of the antenna
From the EUT RF output power, the minimum mobile separation distance, d=20cm, as well as the maximum gain of the used as following information, the RF power density can be obtained.

Table 1 Antenna Specification

Frequency Band	Antenna type	Internal Identification	Maximum antenna gain
GSM 850	External antenna	Antenna 1	3.71 dBi
GSM 1900			-1.04 dBi
WCDMA Band 2			-1.04 dBi
WCDMA Band 4			-1.12 dBi
WCDMA Band 5			3.71 dBi
FDD LTE Band 2			-1.04 dBi
FDD LTE Band 4			-1.12 dBi
FDD LTE Band 5			3.71 dBi
FDD LTE Band 7			1.66 dBi
FDD LTE Band 12			5.19 dBi
FDD LTE Band 13			3.72 dBi
FDD LTE Band 25			-1.04 dBi
FDD LTE Band 26			4.08dBi
TDD LTE Band 38			0.89dBi
TDD LTE Band 41			1.66 dBi

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Table 2 Transmit Power

Frequency Band	Mode	Maximum Tune-up Output power (dBm)
GSM 850	GPRS 1slot	35.00
GSM 1900	GPRS 1slot	32.00
WCDMA Band 2	/	25.00
WCDMA Band 4	/	25.00
WCDMA Band 5	/	25.00
FDD LTE Band 2	/	25.00
FDD LTE Band 4	/	25.00
FDD LTE Band 5	/	25.00
FDD LTE Band 7	/	25.00
FDD LTE Band 12	/	25.00
FDD LTE Band 13	/	25.00
FDD LTE Band 25	/	25.00
FDD LTE Band 26	/	25.00
TDD LTE Band 38	/	25.00
TDD LTE Band 41	/	25.00

Note:

The maximum output Power of GPRS, WCDMA&LTE were refer to the module report. (Report NO.: HR/2019/1001601) which issued on 2019-02-28 by SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch.

Other configurations of GPRS / EDGE are considered as secondary modes. The frame-averaged power is linearly reported the maximum burst averaged power over 8 time slots. The calculated method are shown as below:

The duty cycle "x" of different time slots as below:

1 TX slot is 1/8, 2 TX slots is 2/8, 3 TX slots is 3/8 and 4 TX slots is 4/8

Based on the calculation formula:

Frame-averaged power = Burst averaged power + 10 1og (x)

So,

Frame-averaged power (1 TX slot) = Burst averaged power (1 TX slot)– 9.03

Frame-averaged power (2 TX slots) = Burst averaged power (2 TX slots)– 6.02

Frame-averaged power (3 TX slots) = Burst averaged power (3 TX slots)– 4.26

Frame-averaged power (4 TX slots) = Burst averaged power (4 TX slots) – 3.01

6. ESTIMATION RESULT

6.1. MEASUREMENT RESULTS

STANDALONE MPE

Mode	Frequency (MHz)	Tune-up Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
		(dBm)	(mW)				
GSM 850	824 - 849	25.97	395.37	3.71	2.35	0.18	0.55
GSM 1900	1850 - 1910	22.97	198.15	-1.04	0.79	0.03	1.0
WCDMA Band 2	1850 - 1910	25.00	316.23	-1.04	0.79	0.05	1.0
WCDMA Band 4	1710 -1755	25.00	316.23	-1.12	0.77	0.05	1.0
WCDMA Band 5	824 - 849	25.00	316.23	3.71	2.35	0.15	0.55
FDD LTE Band 2	1850 - 1910	25.00	316.23	-1.04	0.79	0.05	1.0
FDD LTE Band 4	1710 -1755	25.00	316.23	-1.12	0.77	0.05	1.0
FDD LTE Band 5	824 - 849	25.00	316.23	3.71	2.35	0.15	0.55
FDD LTE Band 7	2500 - 2570	25.00	316.23	1.66	1.47	0.09	1.0
FDD LTE Band 12	699 - 716	25.00	316.23	5.19	3.30	0.21	0.47
FDD LTE Band 13	777 - 787	25.00	316.23	3.72	2.35	0.15	0.52
FDD LTE Band 25	1850 - 1915	25.00	316.23	-1.04	0.79	0.05	1.00
FDD LTE Band 26(814-824MHz)	814 - 824	25.00	316.23	4.08	2.56	0.16	0.53
FDD LTE Band 26(824-849MHz)	824 - 849	25.00	316.23	4.08	2.56	0.16	0.55
TDD LTE Band 38	2570 - 2620	25.00	316.23	0.89	1.23	0.08	1.00
TDD LTE Band 41	2496 - 2690	25.00	316.23	1.66	1.47	0.09	1.00

Remark: 1. MPE use distance is 20cm from manufacturer declaration of user manual.

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Maximum Simultaneous transmission MPE Ratio for WWAN

Maximum MPE ratio (FDD LTE Band 12)	∑ MPE ratios	Limit	Results
0.45	0.45	1.000	Pass

Note: The estimation distance is 20cm.

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7. CONCLUSION

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

---------- End of Report ----------