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2 Version

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Version No. Date		(Description	9
00	Aug. 06, 2019		Original	
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3 Test Summary

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(+)	Test Item Test Dequirement		Provide	
lest item	lest Requirement	lest method	PASS	
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013		
Radiated Emission	47 CFR Part 15 Subpart C Section 15.209; 15.225(a)(b)(c)(d)	ANSI C63.10-2013	PASS	
Frequency Tolerance	47 CFR Part 15 Subpart C Section 15.225(e)	ANSI C63.10-2013	PASS	
Occupied Bandwidth	47 CFR Part 15 Subpart C Section 15.215	ANSI C63.10-2013	PASS	

Remark:

The tested sample and the sample information are provided by the client.







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5.1 C 5.2 C 5.3 F 5.4 T 5.5 C 5.6 T 5.7 C 5.8 A 5.9 C 5.10	CLIENT INFORMATION GENERAL DESCRIPTION OF EUT. PRODUCT SPECIFICATION SUBJECT EST ENVIRONMENT AND MODE DESCRIPTION OF SUPPORT UNITS EST LOCATION DEVIATION FROM STANDARDS ABNORMALITIES FROM STANDARD DTHER INFORMATION REQUESTE MEASUREMENT UNCERTAINTY (CTIVE TO THIS STANDARD S D CONDITIONS D BY THE CUSTOMER 95% CONFIDENCE LEVELS, K	=2)	5 5 5 6 6 6 6 6 6 6
6 EQUI				7
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5 General Information

5.1 Client Information

Applicant:	ComNav Technology Ltd.	
Address of Applicant:	Building 2, No. 618 Chengliu Middle Rd.	
Manufacturer:	ComNav Technology Ltd.	
Address of Manufacturer:	Building 2, No. 618 Chengliu Middle Rd.	
Factory:	ComNav Technology Ltd.	
Address of Factory:	Building 2, No. 618 Chengliu Middle Rd.	

5.2 General Description of EUT

Product Name:	R500 Data Collecto	
Model No.(EUT):	R500	6.
Trade Mark:	Sino GNSS [®] By ComNav Technology Ltd.	
EUT Supports Radios application:	BT4.0, 3.1+EDR	2402MHz to 2480MHz
	NFC	13.56MHz
	GSM	850/1900 GSM, GPRS, EGPRS
	AC adapter	MODEL No.: HKA01105021-XE INPUT: 100-240V~50/60Hz 0.5A OUTPUT: 5V2.1A
Power Supply:	Li-ion Battery	MODEL No.: BL-R500 Capacity: 6500mAh, 24.0Wh Nominal Voltage: 3.7V Limited Charing Voltage: 4.2V

5.3 Product Specification subjective to this standard

Carrier Frequency:	13.56MHz		S.	
Modulation Type:	FSK			
	2G	pifa antenna, -2.3 dBi		
Antenna Type and Gain:	BT	pifa antenna, 2.37 dBi		
(3)	NFC	FPC antenna, 0 dBi	(67)	
Test voltage:	AC 120V, 60Hz, DC 3	3.7V		
Sample Received Date:	Jan. 25, 2019			
Sample tested Date:	Jan. 25, 2019 to Jul. :	28, 2019	10	

5.4 Test Environment and Mode

Operating Environment:			
Temperature:	25°C		
Humidity:	49% RH		
Atmospheric Pressure:	1010 mbar	6	6
Test mode:	\sim	\sim	
TX mode:	The EUT transmitted	the continuous signal at	the specific channel(s).

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5.5 Description of Support Units

The EUT has been tested independently

5.6 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd.

Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China 518101 Telephone: +86 (0) 755 3368 3668 Fax:+86 (0) 755 3368 3385 No tests were sub-contracted.

5.7 Deviation from Standards

None.

5.8 Abnormalities from Standard Conditions

None.

5.9 Other Information Requested by the Customer None.

5.10 Measurement Uncertainty (95% confidence levels, k=2)

No.	ltem	Measurement Uncertainty	
1	Radio Frequency	7.9 x 10 ⁻⁸	
2	DE nower, conducted	0.46dB (30MHz-1GHz)	
-	RF power, conducted	0.55dB (1GHz-18GHz)	
5	Dedicted Spurious emission test	4.3dB (30MHz-1GHz)	
3	Radiated Spurious emission test	4.5dB (1GHz-12.75GHz)	
	Conduction omission	3.5dB (9kHz to 150kHz)	
4	Conduction emission	3.1dB (150kHz to 30MHz)	
5	Temperature test	0.64°C	
6	Humidity test	3.8%	
7	DC power voltages	0.026%	









6 Equipment List

Conducted disturbance Test								
Equipment	Manufacturer	Model No.	Model No. Serial Number (m		Cal. Due date (mm-dd-yyyy			
Receiver	R&S	ESCI	100435	05-20-2019	05-19-2020			
Temperature/ Humidity Indicator	Defu	TH128	1	06-14-2019	06-13-2020			
LISN	R&S	ENV216	100098	05-08-2019	05-07-2020			
Barometer	changchun	DYM3	1188	06-20-2019	06-19-2020			





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	(5)		(20)		
	3M S	Semi/full-anecho	ic Chamber		
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
3M Chamber & Accessory Equipment	TDK	SAC-3		05-24-2019	05-23-2022
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-618	07-26-2019	07-25-2020
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B- 076	04-25-2018	04-24-2021
Receiver	R&S	ESCI7	100938- 003	10-21-2019	10-20-2020
Multi device Controller	maturo	NCD/070/107 11112	(A)	01-09-2019	01-08-2020
Temperature/ Humidity Indicator	Shanghai qixiang	HM10	1804298	07-26-2019	07-25-2020
Cable line	Fulai(7M)	SF106	5219/6A	01-09-2019	01-08-2020
Cable line	Fulai(6M)	SF106	5220/6A	01-09-2019	01-08-2020
Cable line	Fulai(3M)	SF106	5216/6A	01-09-2019	01-08-2020
Cable line	Fulai(3M)	SF106	5217/6A	01-09-2019	01-08-2020







7 Test Result & Measurement Data

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7.1 Conducted Emissions

Test Requirement: Test Method:

Test Frequency Range:

47 CFR Part 15C Section 15.207 ANSI C63.10-2013

150kHz to 30MHz

Limit:













Test Mode: Instruments Used: **Test Results:**

Limit (dBµV) Frequency range (MHz) Quasi-peak Average 0.15-0.5 66 to 56* 56 to 46* 0.5 - 556 46 5-30 60 50

- Decreases with the logarithm of the frequency.
- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu$ H + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2009 on conducted measurement.



Transmitting mode Refer to section 6 for details Pass

Hotline: 400-6788-333 E-mail: info@cti-cert.com Complaint call: 0755-33681700 Complaint E-mail: complaint@cti-cert.com www.cti-cert.com



Test Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

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Notes:

- 1. The following Quasi-Peak and Average measurements were performed on the EUT:
- 2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
- 3. 13.56MHz is the Fundamental field strength of NFC. According to the 15.207, the limit is not apply.







Report No. : EED32L00018305 7.2 Radiated Emissions

Test Requirement: Test Method:	47 CFR Part 15 Subpart C Section 15.209; 15.225(a)(b)(c)(d) ANSI C63.10-2013							
Test Site:	3m (Semi-Anechoic Chamber)							
Requirements:	(a) The field strength of ar exceed	ny emissions wit	thin the bar	nd 13.553-1	3.567 MHz shall not			
	 15,848 microvolts/meter at 30 meters. (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters. 							
	(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.							
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark			
	0.009MHz-0.090MHz	Quasi-peak	10kHz	30kHz	Peak			
	0.009MHz-0.090MHz	Quasi-peak	10kHz	30kHz	Average			
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak			
	0.110MHz-0.490MHz	Quasi-peak	10kHz	30kHz	Peak			
	0.110MHz-0.490MHz	Quasi-peak	10kHz	30kHz	Average			
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak			
	30MHz-1GHz	Quasi-peak	120 kHz	300kHz	Quasi-peak			
		Peak	1MHz	3MHz	Peak			
	Above 1GHz							

Peak

1MHz

10Hz

Average

Test Setup:



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Report No. : EED32L00018305

Test Procedure:

- L00018305 Page 13 of 25 1. The EUT is placed on a turntable, which is 0.8m above ground plane.
- 2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. And also, each emission was to be maximized by changing the polarization of
 - receiving antenna both horizontal and vertical.
- 6. Repeat above procedures until the measurements for all frequencies are complete.
- 7. The limit 1.705MHz to 30MHz in clause 4.3 are specified at 30 meters, and measurements were made at 3 meters, the limit is translated to 3 meters by using a formula as follows:

Limit3m = Limit30m + 40log(30m/3)

8. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode: Instruments Used: Test Result: 1.705-30MHz Mode

Refer to section 6 for details

Transmitting mode

Pass

Test Procedure: For testing performed with the loop antenna, testing was performed in accordance to ANSI C63.4: 2014, section 8.2.1. The center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.















	10.75	0.69	40.59	41.28	69.50	-28.22
5	10.92	0.61	38.75	38.93	69.50	-30.57
1	11.03	0.43	29.49	29.69	69.50	-39.81
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Hotline: 400-6788-333

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	Freq	Antenna_Factor	Cable_Loss	Read_Level	Level	Limit_Line	Over_Limit	Polorization	Bomark
/	(MHz)	(dB/m)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)	Foialization	Remark
Ś	13.063	10.75	0.68	10.80	31.56	69.50	-37.94	Х	QP
	13.353	10.75	0.68	23.40	44.16	80.50	-36.34	Х	QP
	13.559	10.75	0.69	49.65	70.42	123.90	-53.48	Х	QP
	13.697	10.75	0.69	20.55	41.32	90.40	-49.08	x	QP
	13.772	10.74	0.69	21.37	42.14	80.50	-38.36	X	QP
	14.130	10.74	0.69	9.36	30.13	69.50	-39.37	Х	QP

Remark: The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case X axis is shown in the report.



30MHz-1000MHz









	No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		Antenna Height	Table Degree	
			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
	1		53.3266	6.32	14.18	20.50	40.00	-19.50	peak	200	355	
	2		127.1943	9.30	10.22	19.52	43.50	-23.98	peak	200	355	
	3		191.3426	6.32	11.42	17.74	43.50	-25.76	peak	200	355	
	4		304.0881	7.28	14.44	21.72	46.00	-24.28	peak	100	156	
	5		473.2064	5.70	17.93	23.63	46.00	-22.37	peak	200	0	
-	6	*	622.8857	7.19	20.47	27.66	46.00	-18.34	peak	100	105	















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Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor





Test Requirement:

Frequency range:

Test Method:

Requirement :

Test Mode:





Report No. : EED32L00018305 7.3 Frequency Tolerance

47 CFR Part 15 Subpart C Section 15.225(e)

ANSI C63.10-2013

Operation within the band 13.110-14.010 MHz

The frequency tolerance of the carrier signal shall be maintained within +/-0.01% of the operating frequency over a temperature variation of

-20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Transmitter mode

The EUT was placed in an environmental test chamber and powered such that control element received normal voltage and the transmitter provided maximum RF output.

Instruments Used:

Method of measurement:

Test Result:

Refer to section 6 for details

Pass

est Frequency: 13.5	56MHz	Temperature:22°C		
Supply Voltage (V)	Test Result (MHz)	Deviation (kHz)	Limit (kHz)	Result
3.7	13.5600	0	1.356	Pass

est Frequency: 13.	56MHz	Temperature:20℃		
Supply Voltage (V)	Test Result (MHz)	Deviation (kHz)	Limit (kHz)	Result
3.1	13.5602	0.2	1.356	Pass
3.4	13.5601	0.1	1.356	Pass
3.7	13.5599	0.1	1.356	Pass
4.0	13.5603	0.3	1.356	Pass
4.3	13.5604	0.4	1.356	Pass

Test Frequency: 1	3.56MHz		Vo	Itage: 3.7V		
Temperature (℃)	Test Result (MHz)	Deviation (kHz)	Limit (kHz)	Result		
-20	13.5604	0.4	1.356	(2)		
-10	13.5602	0.2	1.356			
0	13.5603	0.3	1.356			
10	13.5598	0.2	1.356	Daaa		
20	13.5599	0.1	1.356	Pass		
30	13.5602	0.2	1.356	S		
40	13.5603	0.3	1.356			
50	13.5603	0.3	1.356			
	100	20	10	-0-		















Report No. : EED32L00018305 7.4 Occupied Bandwidth

Test Requirement: Test Method: Frequency range:





ANSI C63.10-2013

Operation within the band 13.110 - 14.010 MHz

Spectrum Analyzer



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Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equip compliance with the 20dB attenuation specification may base on measurement at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be decompliance by measuring the radiated emissions.

Test Setup:



E.U.T Non-Conducted Table

Ground Reference Plane

Test Mode:Transmitter modeInstruments Used:Refer to section 6 for detailsTest Result:PassThe graph as below: represents the emissions take for this device.



















APPENDIX 2 PHOTOGRAPHS OF EUT

Refer to Report No.EED32L00018301 for EUT external and internal photos.

*** End of Report ***

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