





Radio Exposure Evaluation Report

FCC ID : XIA-221

Equipment : 4G LTE Cat 1 Industrial IoT Router;
Vodafone MachineLink 4G Lite

Brand Name : NetComm;  NetComm ;  NetCommWireless
Casa; Casa Systems;  casa systems ; Vodafone 

Model Name : NTC-221, NWL-221

Applicant : NetComm Wireless Pty Ltd
Level 5, 18-20 Orion Road
Lane Cove, NSW 2066, Australia

Manufacturer : NetComm Wireless Pty Ltd
Level 5, 18-20 Orion Road
Lane Cove, NSW 2066, Australia

Standard : 47 CFR Part 2.1091

The product was received on Jul. 31, 2020, and testing was started from Aug. 17, 2020 and completed on Sep. 07, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR Part 2.1091 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.



Approved by: Allen Lin

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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Photographs of EUT V01



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
None.

Reviewed by: Sam Tsai

Report Producer: Jenny Yang



1 General Description

1.1 EUT General Information

RF General Information			
Evaluation Mode	TX Frequency (MHz)	RX Frequency (MHz)	Modulation Type
GSM 850	824.2 – 849.2	869.2 – 894.2	GMSK / 8PSK
PCS 1900	1850.2 - 1909.8	1930.2 - 1989.8	GMSK / 8PSK
WCDMA	B2: 1852.4 - 1907.6 B5: 826.4 - 846.6	B2: 1932.4 - 1987.6 B5: 871.4 - 891.6	WCDMA: BPSK / QPSK / 16QAM HSDPA: BPSK / QPSK / 16 QAM HSUPA: BPSK / QPSK / 16 QAM

RF General Information				
Evaluation Mode	Bandwidth (MHz)	TX Frequency (MHz)	RX Frequency (MHz)	Modulation Type
LTE Band 2	1.4	1850.7 - 1909.3	1930.7 - 1989.3	QPSK / 16QAM
	3	1851.5 - 1908.5	1931.5 - 1988.5	
	5	1852.5 - 1907.5	1932.5 - 1987.5	
	10	1855.0 - 1905.0	1935.0 - 1985.0	
	15	1857.5 - 1902.5	1937.5 - 1982.5	
	20	1860.0 - 1900.0	1940.0 - 1980.0	
LTE Band 4	1.4	1710.7 - 1754.3	2110.7 - 2154.3	
	3	1711.5 - 1753.5	2111.5 - 2153.5	
	5	1712.5 - 1752.5	2112.5 - 2152.5	
	10	1715.0 - 1750.0	2115.0 - 2150.0	
	15	1717.5 - 1747.5	2117.5 - 2147.5	
	20	1720.0 - 1745.0	2120.0 - 2145.0	
LTE Band 5	1.4	824.7 - 848.3	869.7 - 893.3	
	3	825.5 - 847.5	870.5 - 892.5	
	5	826.5 - 846.5	871.5 - 891.5	
	10	829.0 - 844.0	874.0 - 889.0	
LTE Band 7	5	2502.5 – 2567.5	2622.5 – 2687.5	
	10	2505 – 2565	2625 – 2685	
	15	2507.5 – 2562.5	2627.5 – 2682.5	
	20	2510 - 2560	2630 - 2680	

1.2 Table for Multiple Listing

Equipment	Model Name	Description
4G LTE Cat 1 Industrial IoT Router	NTC-221	The difference of models is in sales marketing.
Vodafone MachineLink 4G Lite	NWL-221	

Note: The information from manufacturer.

1.3 Testing Location

Testing Location			
<input checked="" type="checkbox"/>	HWA YA	ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)	
		TEL : 886-3-327-3456	FAX : 886-3-327-0973
Test site Designation No. TW1190 with FCC.			
<input type="checkbox"/>	JHUBEI	ADD : No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County, Taiwan (R.O.C.)	
		TEL : 886-3-656-9065	FAX : 886-3-656-9085
Test site Designation No. TW0006 with FCC.			

2 Maximum Permissible Exposure

2.1 Limit of Maximum Permissible Exposure

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
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
1500-100,000	-	-	5	6

(B) 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 E ² , H ² or S (minutes)
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

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

2.2 MPE Calculation Method

The MPE was calculated at 23 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$



2.3 Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

GSM 850, PCS 1900

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
850;D1D	2.50	32.42	34.92	0.50	35.42	3.48337	23	0.52400	0.54947
1900;D1D	3.42	30.25	33.67	0.50	34.17	2.61216	23	0.39295	1.00000

WCDMA

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
02;F9W	3.42	22.97	26.39	0.50	26.89	0.48865	23	0.07351	1.00000
02;D1D	3.42	21.95	25.37	0.50	25.87	0.38637	23	0.05812	1.00000
05;D1D	0.40	23.87	24.27	0.50	24.77	0.29992	23	0.04512	0.55093

LTE

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	S (mW/cm ²)	S Limit (mW/cm ²)
02;G7D	3.42	22.90	26.32	0.50	26.82	0.48084	23	0.07233	1.00000
02;W7D	3.42	21.75	25.17	0.50	25.67	0.36898	23	0.05551	1.00000
04;G7D	3.28	22.62	25.90	0.50	26.40	0.43652	23	0.06567	1.00000
04;W7D	3.28	22.34	25.62	0.50	26.12	0.40926	23	0.06157	1.00000
05;W7D	0.40	23.87	24.27	0.50	24.77	0.29992	23	0.04512	0.54973
07;G7D	3.80	22.84	26.64	0.50	27.14	0.51761	23	0.07786	1.00000
07;W7D	3.80	21.57	25.37	0.50	25.87	0.38637	23	0.05812	1.00000

—————THE END—————