

RF EXPOSURE EVALUATION REPORT

FCC ID : XIA-227
Equipment : 4G LTE Cat 1 Industrial IoT Router
Vodafone MachineLink 4G Lite
Brand Name : NetComm;  NetComm  NetCommWireless
Model Name : Casa; Casa Systems;  casa systems  Vodafone
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 1.1307

We, SPORTON INTERNATIONAL INC has been evaluated this product in accordance with 47 CFR Part 1.1307 and it complies with applicable limit.

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC evaluation.

The 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: Cona Huang / Deputy Manager



SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



Table of Contents





1. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	4
2. MAXIMUM RF AVERAGE OUTPUT POWER AMONG PRODUCTION UNITS	5
3. RF EXPOSURE LIMIT INTRODUCTION	6
4. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	7
4.1. Standalone Power Density Calculation	7



History of this test report

Report No.	Version	Description	Issued Date
FA171916	Rev. 01	Initial issue of report	Nov. 10, 2021

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	4G LTE Cat 1 Industrial IoT Router Vodafone MachineLink 4G Lite
Brand Name	NetComm;   Casa; Casa Systems;  
Model Name	NWL-22X & NTC-22X (X=7)
FCC ID	XIA-227
Sample 1	NTC-22X (X=7)
Sample 2 / 3	NWL-22X (X=7)
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 40: 2305 MHz ~ 2315 MHz LTE Band 41: 2496 MHz ~ 2690 MHz
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM, 64QAM
EUT Stage	Production Unit
Remark: 1. This product has two kinds of antenna Model No. NANT-00001 and NANT-00006, RF exposure evaluation was chosen highest gain in power density calculation.	

Reviewed by: Jason Wang

Report Producer: Daisy Peng

Sample	Model Name	LED Quantity	PCBA
1	NTC-227	8	A (No Embedded SIM)
2	NWL-227	7	A (No Embedded SIM)
3			B (Embedded SIM)
Note: 1. Same PCB, antenna and antenna locations and the only differences are in housing, number of LEDs, and with or without embedded SIM. 2. From the above models, Sample 3 was selected as representative model for the test and its data was recorded in this report.			

Antenna Information		
Band	Model No.: NANT-00001	Model No.: NANT-00006
	Gain(dBi)	Gain(dBi)
GSM 850	3.13	0.40
GSM 1900	3.42	2.72
WCDMA Band 2	3.42	2.72
WCDMA Band 4	3.28	2.09
WCDMA Band 5	3.13	0.40
LTE Band 2	3.42	2.72
LTE Band 4	3.28	2.09
LTE Band 5	3.13	0.40
LTE Band 7	3.80	3.17
LTE Band 12	4.71	0.69
LTE Band 13	4.71	0.69
LTE Band 25	3.42	2.72
LTE Band 26	3.13	0.40
LTE Band 38	3.80	3.17
LTE Band 40	2.65	2.19
LTE Band 41	3.80	3.24

2. Maximum RF average output power among production units

Band	Maximum Average power(dBm)
GSM 850 (1 Tx slot)	35.00
GSM 850 (2 Tx slots)	35.00
GSM 850 (3 Tx slots)	35.00
GSM 850 (4 Tx slots)	35.00
GSM 1900 (1 Tx slot)	32.00
GSM 1900 (2 Tx slots)	32.00
GSM 1900 (3 Tx slots)	32.00
GSM 1900 (4 Tx slots)	32.00
WCDMA Band 2	25.00
WCDMA Band 4	25.00
WCDMA Band 5	25.00
LTE Band 2	25.00
LTE Band 4	25.00
LTE Band 5	25.00
LTE Band 7	25.00
LTE Band 12	25.00
LTE Band 13	21.00
LTE Band 25	25.00
LTE Band 26	25.00
LTE Band 38	25.00
LTE Band 40	25.00
LTE Band 41	23.00



3. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
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				
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

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:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna



4. Radio Frequency Radiation Exposure Evaluation

4.1. Standalone Power Density Calculation

Band	Antenna Gain (dBi) Model No.: NANT-00001	Antenna Gain (dBi) Model No.: NANT-00006	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 23cm (mW/cm ²)	Limit (mW/cm ²)
GSM 850 (1 Tx slot)	3.13	0.40	35.00	38.1	6.50	818.46	0.123	0.549
GSM 850 (2 Tx slots)	3.13	0.40	35.00	38.1	6.50	1625.32	0.245	0.549
GSM 850 (3 Tx slots)	3.13	0.40	35.00	38.1	6.50	2437.81	0.367	0.549
GSM 850 (4 Tx slots)	3.13	0.40	35.00	38.1	6.50	3258.37	0.490	0.549
GSM 1900 (1 Tx slot)	3.42	2.72	32.00	35.4	3.48	438.53	0.066	1.000
GSM 1900 (2 Tx slots)	3.42	2.72	32.00	35.4	3.48	870.84	0.131	1.000
GSM 1900 (3 Tx slots)	3.42	2.72	32.00	35.4	3.48	1306.17	0.197	1.000
GSM 1900 (4 Tx slots)	3.42	2.72	32.00	35.4	3.48	1745.82	0.263	1.000
WCDMA Band 2	3.42	2.72	25.00	28.4	0.70	695.02	0.105	1.000
WCDMA Band 4	3.28	2.09	25.00	28.3	0.67	672.98	0.101	1.000
WCDMA Band 5	3.13	0.40	25.00	28.1	0.65	650.13	0.098	0.536
LTE Band 2	3.42	2.72	25.00	28.4	0.70	695.02	0.105	1.000
LTE Band 4	3.28	2.09	25.00	28.3	0.67	672.98	0.101	1.000
LTE Band 5	3.13	0.40	25.00	28.1	0.65	650.13	0.098	0.549
LTE Band 7	3.80	3.17	25.00	28.8	0.76	758.58	0.114	1.000
LTE Band 12	4.71	0.69	25.00	29.7	0.94	935.41	0.141	0.466
LTE Band 13	4.71	0.69	21.00	25.7	0.37	372.39	0.056	0.518
LTE Band 25	3.42	2.72	25.00	28.4	0.70	695.02	0.105	1.000
LTE Band 26	3.13	0.40	25.00	28.1	0.65	650.13	0.098	0.543
LTE Band 38	3.80	3.17	25.00	28.8	0.76	758.58	0.114	1.000
LTE Band 40	2.65	2.19	25.00	27.7	0.58	582.10	0.088	1.000
LTE Band 41	3.80	3.24	23.00	26.8	0.48	478.63	0.072	1.000

Conclusion:

According to 47 CFR §1.1307, the RF exposure analysis concludes that the RF Exposure is FCC compliant.