RF EXPOSURE EVALUATION REPORT

FCC ID	:	TVE-21001T57
Equipment	:	Network Security Gateway
Brand Name	:	FORTINET
Model Name	:	FortiGateRugged 70G-5G-DUALxxxxxxxxxx, FORTIGATERUGGED-70G-5G-DUALxxxxxxxxxx, FGR-70G-5G-DUALxxxxxxxxxx (where "x" can be used as "A-Z", or "0-9", or "-", or blank for software changes or marketing purposes only)
Applicant	:	Fortinet, Inc. 899 KIFER RD SUNNYVALE CA 94086 UNITED STATES
Manufacturer	:	Fortinet, Inc. 899 KIFER RD SUNNYVALE CA 94086 UNITED STATES
Standard	:	47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC has been evaluated this product in accordance with 47 CFR Part2.1091 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. Laboratory, the test report shall not be reproduced except in full.

Approved by: Cona Huang / Deputy Manager

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History of this test report

Report No.	Version	Description	Issued Date
FA410407	Rev. 01	Initial issue of report	Mar. 15, 2024

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Network Security Gateway
Brand Name	FORTINET
Model Name	FortiGateRugged 70G-5G-DUALxxxxxxxxxx, FORTIGATERUGGED-70G-5G-DUALxxxxxxxxxx, FGR-70G-5G-DUALxxxxxxxxxx (where “x” can be used as “A-Z”, or “0-9”, or “-“, or blank for software changes or marketing purposes only)
FCC ID	TVE-21001T57
Integrated WWAN Module	Brand Name: Telit Model Name: FN990A28
Wireless Technology and Frequency Range	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 14: 788 MHz ~ 798 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz LTE Band 30: 2305 MHz ~ 2315 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 42: 3450 MHz ~ 3550 MHz, 3550 MHz ~ 3600 MHz LTE Band 43: 3600 MHz ~ 3700 MHz LTE Band 48: 3550 MHz ~ 3700 MHz LTE Band 66: 1710 MHz ~ 1780 MHz LTE Band 71: 663 MHz ~ 698 MHz 5G NR n2 : 1850 MHz ~ 1910 MHz 5G NR n5 : 824 MHz ~ 849 MHz 5G NR n7 : 2500 MHz ~ 2570 MHz 5G NR n25 : 1850 MHz ~ 1915 MHz 5G NR n30 : 2305 MHz ~ 2315 MHz 5G NR n38 : 2570 MHz ~ 2620 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n48 : 3550 MHz ~ 3700 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n71 : 663 MHz ~ 698 MHz 5G NR n77: 3450 MHz ~ 3550 MHz, 3700 MHz ~ 3980 MHz 5G NR n78: 3450 MHz ~ 3550 MHz, 3700 MHz ~ 3800 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz
Mode	RMC 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM Bluetooth BR/EDR/LE
EUT Stage	Identical Prototype

Reviewed by: Jason Wang

Report Producer: Carlie Tsai

2. Maximum RF average output power among production units

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Mode		Maximum Average power(dBm)
WCDMA	Band II	24.5
	Band IV	24.5
	Band V	24.5
LTE	Band 2	24.0
	Band 4	24.0
	Band 5	24.0
	Band 7	24.0
	Band 12	24.0
	Band 13	24.0
	Band 14	24.0
	Band 17	24.0
	Band 25	24.0
	Band 26	24.0
	Band 30	23.0
	Band 38	24.0
	Band 41	26.5
	Band 42	22.5
	Band 43	22.5
	Band 48	22.5
	Band 66	24.0
	Band 71	24.0
5G NR	n2	24.5
	n5	24.5
	n7	24.5
	n25	24.5
	n30	23.0
	n38	25.0
	n41	27.5
	n48	22.5
	n66	24.5
	n71	24.5
	n77	27.5
	n78	27.5

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Band	Tune-up(dBm)
Bluetooth	8.0

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/f2)	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/f2)	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 20 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

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Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
WCDMA Band 2	1.52	24.50	26.0	0.40	399.94	0.080	1.000	0.080
WCDMA Band 4	2.96	24.50	27.5	0.56	557.19	0.111	1.000	0.111
WCDMA Band 5	1.82	24.50	26.3	0.43	428.55	0.085	0.549	0.155
LTE Band 2	1.52	24.00	25.5	0.36	356.45	0.071	1.000	0.071
LTE Band 4	2.96	24.00	27.0	0.50	496.59	0.099	1.000	0.099
LTE Band 5	1.82	24.00	25.8	0.38	381.94	0.076	0.549	0.138
LTE Band 7	0.85	24.00	24.9	0.31	305.49	0.061	1.000	0.061
LTE Band 12	-0.70	24.00	23.3	0.21	213.80	0.043	0.466	0.091
LTE Band 13	-0.33	24.00	23.7	0.23	232.81	0.046	0.518	0.089
LTE Band 14	0.30	24.00	24.3	0.27	269.15	0.054	0.525	0.102
LTE Band 17	-0.76	24.00	23.2	0.21	210.86	0.042	0.469	0.089
LTE Band 25	1.68	24.00	25.7	0.37	369.83	0.074	1.000	0.074
LTE Band 26	1.82	24.00	25.8	0.38	381.94	0.076	0.543	0.140
LTE Band 30	0.41	23.00	23.4	0.22	219.28	0.044	1.000	0.044
LTE Band 38	0.94	24.00	24.9	0.31	311.89	0.062	1.000	0.062
LTE Band 41	2.62	26.50	29.1	0.82	816.58	0.163	1.000	0.163
LTE Band 42	0.26	22.50	22.8	0.19	188.80	0.038	1.000	0.038
LTE Band 43	0.03	22.50	22.5	0.18	179.06	0.036	1.000	0.036
LTE Band 48	0.03	22.50	22.5	0.18	179.06	0.036	1.000	0.036
LTE Band 66	2.96	24.00	27.0	0.50	496.59	0.099	1.000	0.099
LTE Band 71	-0.55	24.00	23.5	0.22	221.31	0.044	0.442	0.100
n2	1.52	24.50	26.0	0.40	399.94	0.080	1.000	0.080
n5	1.82	24.50	26.3	0.43	428.55	0.085	0.549	0.155
n7	0.85	24.50	25.4	0.34	342.77	0.068	1.000	0.068
n25	1.68	24.50	26.2	0.41	414.95	0.083	1.000	0.083
n30	0.41	23.00	23.4	0.22	219.28	0.044	1.000	0.044
n38	0.94	25.00	25.9	0.39	392.64	0.078	1.000	0.078
n41	2.62	27.50	30.1	1.03	1028.02	0.205	1.000	0.205
n48	0.03	22.50	22.5	0.18	179.06	0.036	1.000	0.036
n66	2.96	24.50	27.5	0.56	557.19	0.111	1.000	0.111
n71	-0.55	24.50	24.0	0.25	248.31	0.049	0.442	0.112
n77	0.26	27.50	27.8	0.60	597.04	0.119	1.000	0.119
n78	0.26	27.50	27.8	0.60	597.04	0.119	1.000	0.119

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Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
Bluetooth	1.53	8.00	9.5	0.01	8.97	0.002	1.000	0.002

4.2. Collocated Power Density Calculation

Note:

1. The device support DPS (Dynamic Power Share) function to achieve higher uplink data rate keeping the total power unchanged in 5G NR NSA EN-DC mode according to 3GPP 38.213, when the equipment has a dynamic power sharing capability, it adjusts the LTE or NR transmission power so that the instantaneous total power does not exceed the specified value, when the maximum transmission power of NR (P LTE, P NR) and the specified total power (P total) have been set and the instantaneous calculated total transmission power exceeds P total, the NR transmission power is reduced so that the actual transmission power of the user equipment will not exceed Ptotal power. So if the LTE and NR standalone SAR is testing at total power level, the EN-DC combine MPE(LTE+NR) will not higher than the each standalone LTE and NR MPE, therefore, the simultaneous transmission analysis is used standalone MPE at total power level to show compliance.

WWAN 1 Power Density / Limit	WWAN 2 Power Density / Limit	Bluetooth Power Density / Limit	∑(Power Density / Limit) of WWAN 1+WWAN 2+Bluetooth
0.205	0.205	0.002	0.412

Note:

1. The device is equipped with two identical WWAN modules, both of which have the same maximum power and utilize the same antenna gain.
2. ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN 1 + WWAN 2 + Bluetooth.
3. Considering the collocation with the three transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.