RF EXPOSURE EVALUATION REPORT

FCC ID	:	TVE-3417T0695A
Equipment	:	Network Security Gateway
Brand Name	:	FORTINET
Model Name	:	FortiWiFi 80F-2R-POExxxxxx, FORTIWIFI-80F-2R-POExxxxxx, FWF-80F-2R-POExxxxxx, FortiWiFi 81F-2R-POExxxxxx, FORTIWIFI-81F-2R-POExxxxxx, FWF-81F-2R-POExxxxxx, FortiWiFi 80F-2R-3G4G-POExxxxxx, FORTIWIFI-80F-2R-3G4G-POExxxxxx, FWF-80F-2R-3G4G-POExxxxxx, FortiWiFi 81F-2R-3G4G-POExxxxxx, FORTIWIFI-81F-2R-3G4G-POExxxxxx, FWF-81F-2R-3G4G-POExxxxxx (where "x" can be used "A-Z", or "0-9", or "-", or blank for software purposes or marketing purposes only)
Marketing Name	:	FortiWiFi 80F-2R-POE, FortiWiFi 81F-2R-POE, FortiWiFi 80F-2R-3G4G-POE, FortiWiFi 81F-2R-3G4G-POE
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 Part 2.1091 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. 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.)

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History of this test report

Report No.	Version	Description	Issued Date
FA121023-01	Rev. 01	Initial issue of report	Sep. 23, 2021

1. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Network Security Gateway
Brand Name	FORTINET
Model Name	FortiWiFi 80F-2R-POExxxxxx, FORTIWIFI-80F-2R-POExxxxxx, FWF-80F-2R-POExxxxxx, FortiWiFi 81F-2R-POExxxxxx, FORTIWIFI-81F-2R-POExxxxxx, FWF-81F-2R-POExxxxxx, FortiWiFi 80F-2R-3G4G-POExxxxxx, FORTIWIFI-80F-2R-3G4G-POExxxxxx, FWF-80F-2R-3G4G-POExxxxxx, FortiWiFi 81F-2R-3G4G-POExxxxxx, FORTIWIFI-81F-2R-3G4G-POExxxxxx, FWF-81F-2R-3G4G-POExxxxxx (where "x" can be used "A-Z", or "0-9", or "-", or blank for software purposes or marketing purposes only)
Marketing Name	FortiWiFi 80F-2R-POE, FortiWiFi 81F-2R-POE, FortiWiFi 80F-2R-3G4G-POE, FortiWiFi 81F-2R-3G4G-POE
FCC ID	TVE-3417T0695A
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz WLAN 5.8GHz Band: 5725 MHz ~ 5825 MHz
Mode	WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/HE20/HE40/HE80
EUT Stage	Production Unit
Remark: 1. Variant report to enable 5.3GHz / 5.5GHz WLAN	

Integrated Bluetooth Module	
Brand Name	FORTINET
Model Name	FBLE-2020TI
Wireless Technology and Frequency Range	Bluetooth: 2400 MHz ~ 2483.5 MHz
Mode	Bluetooth LE
Remark: 1. The Bluetooth operation may integrated into this host, additional power density result just verification Sim-Tx analysis is meet FCC requirement.	

Integrated WWAN Module	
Brand Name	AirPrime
Model Name	EM7565
Wireless Technology and Frequency Range	WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 2: 1850.7 MHz ~ 1909.3 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 12: 699.7 MHz ~ 715.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 26: 814.7 MHz ~ 848.3 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz LTE Band 66: 1710.7 MHz ~ 1779.3 MHz
Mode	RMC 12.2Kbps LTE: QPSK, 16QAM, 64QAM
Remark: 1. The WWAN operation may integrated into this host, additional power density result just verification Sim-Tx analysis is meet FCC requirement.	

Reviewed by: Jason Wang

Report Producer: Daisy Peng

2. Maximum RF average output power among production units

Mode	Average power (dBm)	
	LE	
	1Mbps	2Mbps
Tune-up Limit	2	2

	Mode	Channel	Frequency (MHz)	Ant 1+3 (Non-Tx BF) Tune-up Limit	Ant 1+3 (Tx BF) Tune-up Limit	Ant 2 Tune-up Limit
2.4GHz WLAN	802.11b 1Mbps	1	2412	29.00		21.50
		6	2437	29.00		21.50
		11	2462	27.00		21.00
	802.11g 6Mbps	1	2412	24.50		19.00
		6	2437	26.00		16.50
		11	2462	21.50		16.50
	802.11n-HT20 MCS0	1	2412	21.00		16.50
		6	2437	25.50		16.00
		11	2462	22.50		16.50
	802.11n-HT40 MCS0	3	2422	20.50		17.50
		6	2437	19.00		16.00
		9	2452	18.00		9.00
	802.11ac-VHT20 MCS0	1	2412	21.00	21.00	
		6	2437	25.50	25.50	
		11	2462	22.00	22.50	
	802.11ac-VHT40 MCS0	3	2422	20.50	20.50	
		6	2437	19.00	19.00	
		9	2452	18.00	18.00	
	802.11ax-HE20 MCS0	1	2412	21.50	21.00	
		6	2437	25.50	25.50	
		11	2462	22.50	22.50	
	802.11ax-HE40 MCS0	3	2422	20.50	20.50	
		6	2437	19.00	19.00	
		9	2452	18.50	18.00	

	Mode	Channel	Frequency (MHz)	Ant 1+3 (Non-Tx BF) Tune-up Limit	Ant 1+3 (Tx BF) Tune-up Limit	Ant 2 Tune-up Limit
5.2GHz WLAN	802.11a 6Mbps	36	5180	25.50		16.50
		40	5200	25.50		19.50
		44	5220	27.00		22.50
		48	5240	26.00		24.00
	802.11n-HT20 MCS0	36	5180	25.00		16.00
		40	5200	25.00		19.50
		44	5220	26.00		22.50
		48	5240	26.00		24.00
	802.11n-HT40 MCS0	38	5190	21.00		15.50
		46	5230	23.50		20.00
	802.11ac-VHT20 MCS0	36	5180	25.00	25.00	16.00
		40	5200	25.00	25.00	19.00
		44	5220	26.00	26.00	22.00
		48	5240	26.00	26.00	23.50
	802.11ac-VHT40 MCS0	38	5190	20.50	20.50	15.50
		46	5230	23.50	23.50	19.50
	802.11ac-VHT80 MCS0	42	5210	19.50	19.00	10.50
	802.11ax-HE20 MCS0	36	5180	25.00	25.00	
		44	5220	26.50	26.00	
		48	5240	26.50	26.00	
	802.11ax-HE40 MCS0	38	5190	20.50	20.50	
		46	5230	24.00	23.50	
	802.11ax-HE80 MCS0	42	5210	19.50	19.50	

	Mode	Channel	Frequency (MHz)	Ant 1+3 Non BF Tune-up Limit	Ant 1+3 BF Tune-up Limit	Ant 2 Tune-up Limit
5.3GHz WLAN	802.11a 6Mbps	52	5260	21.00		21.50
		56	5280	21.00		21.50
		60	5300	20.50		20.00
		64	5320	21.00		18.00
	802.11n-HT20 MCS0	52	5260	20.00		21.50
		56	5280	20.00		21.50
		60	5300	20.00		19.50
		64	5320	20.00		18.00
	802.11n-HT40 MCS0	54	5270	23.50		18.50
		62	5310	21.50		16.00
	802.11ac-VHT20 MCS0	52	5260	20.00	20.00	21.50
		56	5280	20.00	20.00	21.50
		60	5300	20.00	20.00	19.50
		64	5320	20.00	20.00	17.50
	802.11ac-VHT40 MCS0	54	5270	23.50	23.50	18.50
		62	5310	21.50	21.00	16.00
	802.11ac-VHT80 MCS0	58	5290	20.00	20.00	7.00
	802.11ax-HE20 MCS0	52	5260	20.00	20.00	
		56	5280	20.00	20.00	
		60	5300	20.00	20.00	
		64	5320	20.00	20.00	
	802.11ax-HE40 MCS0	54	5270	24.00	23.50	
		62	5310	21.50	21.50	
	802.11ax-HE80 MCS0	58	5290	20.50	20.00	

	Mode	Channel	Frequency (MHz)	Ant 1+3 Non BF Tune-up Limit	Ant 1+3 BF Tune-up Limit	Ant 2 Tune-up Limit
5.5GHz WLAN	802.11a 6Mbps	100	5500	20.50		18.50
		116	5580	20.50		21.00
		124	5620	20.50		21.00
		132	5660	20.50		21.00
		140	5700	21.00		17.00
		144	5720	21.00		20.50
	802.11n-HT20 MCS0	100	5500	20.00		18.50
		116	5580	20.00		21.00
		124	5620	20.00		21.00
		132	5660	20.00		21.00
		140	5700	20.50		17.00
		144	5720	20.00		21.00
	802.11n-HT40 MCS0	102	5510	23.50		17.00
		110	5550	23.50		19.00
		126	5630	23.50		19.00
		134	5670	23.50		19.00
		142	5710	23.50		21.50
	802.11ac-VHT20 MCS0	100	5500	20.00	19.50	18.00
		116	5580	20.00	20.00	21.00
		124	5620	20.00	20.00	21.00
		132	5660	20.00	20.00	21.00
		140	5700	20.50	20.50	17.00
		144	5720	20.00	19.50	20.50
	802.11ac-VHT40 MCS0	102	5510	23.50	23.00	17.00
		110	5550	23.50	23.50	19.00
		126	5630	23.50	23.50	19.00
		134	5670	23.50	23.50	19.00
		142	5710	23.50	23.00	21.50
	802.11ac-VHT80 MCS0	106	5530	20.00	20.00	14.50
		122	5610	23.50	23.50	18.50
		138	5690	23.50	23.50	21.00
	802.11ax-HE20 MCS0	100	5500	20.00	20.00	
		116	5580	20.00	20.00	
		124	5620	20.00	20.00	
		132	5660	20.00	20.00	
		140	5700	20.50	20.50	
		144	5720	20.00	20.00	
	802.11ax-HE40 MCS0	102	5510	23.50	23.50	
		110	5550	24.00	23.50	
		126	5630	24.00	23.50	
		134	5670	23.50	23.50	
		142	5710	23.50	23.50	
	802.11ax-HE80 MCS0	106	5530	20.50	20.00	
		122	5610	23.50	23.50	
		138	5690	23.50	23.50	

	Mode	Channel	Frequency (MHz)	Ant 1+3 (Non-Tx BF) Tune-up Limit	Ant 1+3 (Tx BF) Tune-up Limit	Ant 2 Tune-up Limit
5.8GHz WLAN	802.11a 6Mbps	149	5745	26.00		22.50
		157	5785	29.00		22.00
		165	5825	29.00		22.00
	802.11n-HT20 MCS0	149	5745	27.50		22.50
		157	5785	28.50		22.00
		165	5825	28.50		22.00
	802.11n-HT40 MCS0	151	5755	28.00		21.50
		159	5795	27.00		22.00
	802.11ac-VHT20 MCS0	149	5745	27.50	27.50	22.50
		157	5785	28.50	28.50	22.00
		165	5825	28.50	28.50	22.00
	802.11ac-VHT40 MCS0	151	5755	28.00	27.50	21.50
		159	5795	27.00	26.50	22.00
	802.11ac-VHT80 MCS0	155	5775	24.50	24.50	18.50
	802.11ax-HE20 MCS0	149	5745	28.00	27.50	
		157	5785	28.50	28.50	
		165	5825	28.50	28.50	
	802.11ax-HE40 MCS0	151	5755	28.00	28.00	
		159	5795	27.00	26.50	
	802.11ax-HE80 MCS0	155	5775	24.50	24.50	

Integrated WWAN operation

Mode		Maximum Average power(dBm)
WCDMA	Band II	24
	Band IV	24
	Band V	24
LTE	Band 2	24
	Band 4	24
	Band 5	24
	Band 7	23
	Band 12	24
	Band 13	24
	Band 26	24
	Band 41	23
	Band 66	24

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

<WWAN Module>

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	1.65	24.00	25.7	0.37	367.28	0.073	1.000	0.073
WCDMA Band 4	1.71	24.00	25.7	0.37	372.39	0.074	1.000	0.074
WCDMA Band 5	1.62	24.00	25.6	0.36	364.75	0.073	0.536	0.135
LTE Band 2	1.65	24.00	25.7	0.37	367.28	0.073	1.000	0.073
LTE Band 4	1.71	24.00	25.7	0.37	372.39	0.074	1.000	0.074
LTE Band 5	1.62	24.00	25.6	0.36	364.75	0.073	0.549	0.132
LTE Band 7	3.12	23.00	26.1	0.41	409.26	0.081	1.000	0.081
LTE Band 12	0.32	24.00	24.3	0.27	270.40	0.054	0.466	0.115
LTE Band 13	0.11	24.00	24.1	0.26	257.63	0.051	0.518	0.099
LTE Band 26	1.62	24.00	25.6	0.36	364.75	0.073	0.543	0.134
LTE Band 41	3.12	23.00	26.1	0.41	409.26	0.081	1.000	0.081
LTE Band 66	1.71	24.00	25.7	0.37	372.39	0.074	1.000	0.074

<Bluetooth Module>

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	0.74	2.00	2.7	0.00	1.88	0.000	1.000	0.0004

<Non-Beamforming mode>

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
WLAN2.4GHz Band	3.24	29.00	32.2	1.67	1674.94	0.333	1.000	0.333
WLAN5GHz Band	3.27	29.00	32.3	1.69	1686.55	0.336	1.000	0.336

<Beamforming mode>

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
WLAN2.4GHz Band	6.25	25.50	31.8	1.50	1496.24	0.298	1.000	0.298
WLAN5GHz Band	6.28	28.50	34.8	3.01	3006.08	0.598	1.000	0.598

Note:

1. For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.
2. This device supports Beamforming for WLAN 2.4GHz VHT20/VHT40/HE20/HE40 and WLAN 5GHz a/ HT20/HT40/VHT20/VHT40/VHT80/HE20/HE40/HE80 only; therefore, in the table above which consider maximum directional Gain 6.25dBi for WLAN 2.4GHz Beamforming mode and 6.28dBi for WLAN 5GHz Beamforming mode.

WWAN Power Density / Limit	WLAN Power Density / Limit	Bluetooth Power Density / Limit	Σ(Power Density / Limit) of WWAN+WLAN+Bluetooth
0.135	0.598	0.0004	0.7334

Note:

1. Σ(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + WLAN + Bluetooth.
2. Considering the WWAN collocation with the WLAN and Bluetooth 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.