Testing Laboratory 1190

FCC RADIO EXPOSURE TEST REPORT

FCC ID	:	TVE-121101A
Equipment	:	Wireless Network Extender
Brand Name	:	FORTINET
Model Name	:	FortiExtender 211Exxxxxx, FORTIEXTENDER-211Exxxxxx, FEX-211Exxxxxx, FortiExtender 212Exxxxxx, FORTIEXTENDER-212Exxxxxx, FEX-212Exxxxxx (Please refer to section 1.2 for detail information.)
Applicant	:	Fortinet, Inc. 899 Kifer Road, Sunnyvale, CA 94086 USA
Manufacturer	:	Fortinet, Inc. 899 Kifer Road, Sunnyvale, CA 94086 USA
Standard	:	47 CFR Part 2.1091

The product was received on Apr. 09, 2019, and testing was started from Sep. 03, 2019 and completed on Jul. 16, 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 variant 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: Cliff Chang

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
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History of this test report

Report No.	Version	Description	Issued Date
FA9O3129-03	01	Initial issue of report	Aug. 25, 2020

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:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen

Report Producer: Vicky Huang

1 General Description

1.1 EUT General Information

RF General Information			
Evaluation Mode	**Frequency Range (MHz)**	**Operating Frequency (MHz)**	**Modulation Type**
Bluetooth	2400-2483.5	2402-2480	BR / EDR: FHSS (GFSK / π/4-DQPSK / 8DPSK) LE: GFSK

Note: The EUT contains a certified WWAN module (FCC ID: N7NEM75)

1.2 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

EUT	Model Name	LTE Module	BT	PCBA	Description
1	FortiExtender 211Exxxxxx	LTE module chip: EM7565*1	BT*1	Same PCBA	All three model names are the same, no difference. The purpose for these three model names are for marketing sales.
	FORTIEXTENDER-211Exxxxxx	LTE module chip: EM7565*1	BT*1	Same PCBA	
	FEX-211Exxxxxx	LTE module chip: EM7565*1	BT*1	Same PCBA	
2	FortiExtender 212Exxxxxx	LTE module chip: EM7565*2	BT*1	Same PCBA	All three model names are the same, no difference. The purpose for these three model names are for marketing sales.
	FORTIEXTENDER-212Exxxxxx	LTE module chip: EM7565*2	BT*1	Same PCBA	
	FEX-212Exxxxxx	LTE module chip: EM7565*2	BT*1	Same PCBA	
(where “x” can be “0-9”, or “A-Z”, or “-“, or blank for marketing purposes or software changes only and no HW related changes.)					

From the above models, model: FEX-211E(EUT1) and FEX-212E(EUT2) was selected as representative model for the test and its data was recorded in this report.

1.3 Table for Class II Change

This product is an extension of original one reported under Sporton project number: FA9O3129

Below is the table for the change of the product with respect to the original one

Modifications	Performance Checking
1. Add EUT 2(contain two LTE modules). (Please refer to section 1.2 for detail information.) 2. Add three model names for EUT 2. (Please refer to section 1.2 for detail information.)	MPE

Note: The Bluetooth MPE results were based on original report.

1.4 Testing Location

Testing Location			
☐	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.	
		TEL : 886-3-327-3456	FAX : 886-3-327-0973
☒	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.	
		TEL : 886-3-656-9065	FAX : 886-3-656-9085

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.

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/ cm²)	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)*	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/ cm²)	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)*	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 21 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

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

For Bluetooth

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)
2.4G;BT-BR	4.00	9.00	13.00	0.50	13.50	0.02239	21	0.00404	1.00000
2.4G;BT-LE	4.00	10.87	14.87	0.50	15.37	0.03443	21	0.00621	1.00000

For WWAN

Band	Frequency (MHz)	Maximum Power (dBm)	Antenna Gain (dBi)	Tune-up tolerance (dB)	Tune-up EIRP (dBm)	Tune-up EIRP (W)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Power Density /Limit
WCDMA Band 2	1850	24.00	4.80	0.50	29.30	0.85114	21	0.15358	1.00000	0.15358
WCDMA Band 4	1710	24.00	4.80	0.50	29.30	0.85114	21	0.15358	1.00000	0.15358
WCDMA Band 5	824	24.00	3.20	0.50	27.70	0.58884	21	0.10625	0.54933	0.19342
LTE Band 2	1850	24.00	4.80	0.50	29.30	0.85114	21	0.15358	1.00000	0.15358
LTE Band 4	1710	24.00	4.80	0.50	29.30	0.85114	21	0.15358	1.00000	0.15358
LTE Band 5	824	24.00	3.20	0.50	27.70	0.58884	21	0.10625	0.54933	0.19342
LTE Band 7	2500	23.80	4.60	0.50	28.90	0.77625	21	0.14007	1.00000	0.14007
LTE Band 12	699	24.00	3.20	0.50	27.70	0.58884	21	0.10625	0.46600	0.22800
LTE Band 13	777	24.00	3.20	0.50	27.70	0.58884	21	0.10625	0.51800	0.20512
LTE Band 26	814	24.00	3.20	0.50	27.70	0.58884	21	0.10625	0.54267	0.19579
LTE Band 30	2305	23.00	4.60	0.50	28.10	0.64565	21	0.11650	1.00000	0.11650
LTE Band 41	2496	23.80	4.60	0.50	28.90	0.77625	21	0.14007	1.00000	0.14007
LTE Band 66	1710	24.00	4.80	0.50	29.30	0.85114	21	0.15358	1.00000	0.15358

Note:

1.The above antenna gain was declared by manufacturer.
2.For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band

For EUT 1:

Simultaneous Transmission Analysis Mode: Bluetooth+WWAN(WCDMA)

WWAN(WCDMA) Power Density / Limit	Bluetooth Power Density / Limit	∑(Power Density / Limit) of WWAN(WCDMA)+Bluetooth
0.19342	0.00621	0.19963

Note:

1 For collocation analysis, WCDMA Band 5 is chosen for summation due to the highest (power density/limit) among all WWAN modes.

2 ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)]

3 The aggregated (power density /limit) is smaller than 1, and MPE of collocated transmitters is compliant.

Simultaneous Transmission Analysis Mode: Bluetooth+WWAN(LTE)

WWAN(LTE) Power Density / Limit	Bluetooth Power Density / Limit	∑(Power Density / Limit) of WWAN(LTE)+Bluetooth
0.00494	0.00621	0.01115

Note:

1 For collocation analysis, LTE Band 12 is chosen for summation due to the highest (power density/limit) among all WWAN modes.

2 ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)]

3 The aggregated (power density /limit) is smaller than 1, and MPE of collocated transmitters is compliant.

For EUT 2:

Simultaneous Transmission Analysis Mode: Bluetooth+Module 1-WWAN(LTE)+Module 2-WWAN(LTE)

Module 1-WWAN(LTE) Power Density / Limit	Module 2-WWAN(LTE) Power Density / Limit	Bluetooth Power Density / Limit	∑(Power Density / Limit) of Bluetooth+ Module 1-WWAN(LTE)+ Module 2-WWAN(LTE)
0.00494	0.00494	0.00621	0.01608

Note:

1 For collocation analysis, Module 1-LTE Band 12 / Module 2-LTE Band 12 is chosen for summation due to the highest (power density/limit) among all WWAN modes.

2 ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)]

3 The aggregated (power density /limit) is smaller than 1, and MPE of collocated transmitters is compliant.

Simultaneous Transmission Analysis Mode: Bluetooth+Module 1-WWAN(LTE)+Module 2-WWAN(WCDMA)

Module 1-WWAN(LTE) Power Density / Limit	Module 2-WWAN(WCDMA) Power Density / Limit	Bluetooth Power Density / Limit	∑(Power Density / Limit) of Bluetooth+ Module 1-WWAN(LTE)+ Module 2-WWAN(WCDMA)
0.00494	0.19342	0.00621	0.20456

Note:

1 For collocation analysis, Module 1-LTE Band 12 / Module 2-WCDMA Band 5 is chosen for summation due to the highest (power density/limit) among all WWAN modes.

2 ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)]

3 The aggregated (power density /limit) is smaller than 1, and MPE of collocated transmitters is compliant.

Simultaneous Transmission Analysis Mode: Bluetooth+Module 1-WWAN(WCDMA)+Module 2-WWAN(LTE)

Module 1-WWAN(WCDMA) Power Density / Limit	Module 2-WWAN(LTE) Power Density / Limit	Bluetooth Power Density / Limit	∑(Power Density / Limit) of Bluetooth+ Module 1-WWAN(LTE)+ Module 2-WWAN(WCDMA)
0.19342	0.00494	0.00621	0.20456

Note:

1 For collocation analysis, Module 1-WCDMA Band 5 / Module 2-LTE Band 12 is chosen for summation due to the highest (power density/limit) among all WWAN modes.

2 ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)]

3 The aggregated (power density /limit) is smaller than 1, and MPE of collocated transmitters is compliant.

Simultaneous Transmission Analysis Mode: Bluetooth+Module 1-WWAN(WCDMA)+Module 2-WWAN(WCDMA)

Module 1-WWAN(WCDMA) Power Density / Limit	Module 2-WWAN(WCDMA) Power Density / Limit	Bluetooth Power Density / Limit	∑(Power Density / Limit) of Bluetooth+ Module 1-WWAN(LTE)+ Module 2-WWAN(WCDMA)
0.19342	0.19342	0.00621	0.39304

Note:

1 For collocation analysis, Module 1-WCDMA Band 5 / Module 2-WCDMA Band 5 is chosen for summation due to the highest (power density/limit) among all WWAN modes.

2 ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)]

3 The aggregated (power density /limit) is smaller than 1, and MPE of collocated transmitters is compliant.

———THE END———