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RF Exposure Exhibit

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EUT Name: NEWCASTLE, NEWPORT

Model No.: FS1E5, FS1E5W, FS2E5, FS2E5W

CFR 47 Part 15.247:2010 and RSS 210:2010

Prepared for:

Denny Lim
WatchGuard Technologies, Inc
505 Fifth Ave S, Suite 500
Seattle WA 98104
Tel: (206)-613-6600

Prepared by:

TUV Rheinland of North America, Inc.

1279 Quarry Lane
Pleasanton, CA 94566
Tel: (925) 249-9123
Fax: (925) 249-9124
http://www.tuv.com/

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1   Test Methodology

In this document, we try to prove the safety of radiation harmfulness to the human body for our product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The Gain of the antenna used in this product is measured in a Semi-Anechoic Chamber, and also the maximum total power input to the antenna is measured. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

1.1   RF Exposure Limit

According to FCC 1.1310 table 1: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm_2)	Average Time (minutes)
(A)Limits For Occupational / Control Exposures				
300 - 1500	…	…	F/300	6
1500 - 100,000	…	…	5	6
(B)Limits For General Population / Uncontrolled Exposure				
300 - 1500	…	…	F/1500	6
1500 - 100,000	…	…	1.0	30

F = Frequency in MHz

1.2   EUT Operating Condition

The software provided by Manufacturer enabled the EUT to transmit data at lowest, middle and highest channel individually. Software provided enables to transmit on multi channels simultaneously.

1.2.1 Classification

The antenna of the product, under normal use condition, is at least 20cm away from the body of the user. Warning statement to the user for keeping at least 20cm or more separation distance with the antenna should be included in user's manual. So, this device is classified as a **Mobile Device**.

1.3 Test Results

1.3.1.1 Antenna Gain

The transmitting antenna was integrated. The antenna gain was +2.0 dBi or 1.59 (numeric).

1.3.1.2 Output Power into Antenna & RF Exposure value at distance 20cm:

Calculations for this report are based on highest power measurement.

Limit for MPE (from FCC part 1.1310 table1) is 1.0 mW/cm^2

Band	Mode	Output Power dBm	Antenna gain (Max)	EIRP dBm	EIRP W	Channels Available	Channels Used	Total EIRP W	Total EIRP dBm
2400 - 2483.5	OFDM	19.4	2.0	21.4	0.137	11	3	0.411	26.14
2401 - 2483.5	CCK	22.4	2.0	24.4	0.275				
5150 - 5250	OFDM	15.4	2.0	17.4	0.055	4	3	0.164	22.15
5725 - 5850	OFDM	19.4	2.0	21.4	0.136	5	3	0.409	26.12
						Totals:	9	0.985	29.93

The highest measured power is +29.93 dBm or 985 mW; average power.

Using the Friss transmission formula, the EIRP is Pout*G, and R is 20cm.

Pd= EIRP/(1600π)

Pd = (985) / (1600π) = 0.196mW/cm2,

which is 0.804 mW/cm2 below to the limit.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

1.3.2   Sample Calculation

The Friss transmission formula: $Pd = (Pout*G) / (4*\pi*R^2)$

Where;
        Pd = power density in mW/cm2
        $Pout$ = output power to antenna in mW
        G = gain of antenna in linear scale
        $\pi \approx 3.1416$
        R = distance between observation point and center of the radiator in cm

Ref. : David K. Cheng, *Field and Wave Electromagnetics*, Second Edition, Page 640, Eq. (11-133).