



TÜVRheinland[®]
Precisely Right.

RF Exposure Exhibit

EUT Name: Norton Core Secure WiFi Router

Model No.: 518

CFR Part 1.1310 and RSS 102 Iss. 5 March 2015

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1 Test Methodology

In this document, we evaluate the RF Exposure to human body due the intentional transmission from the transmitter (EUT). The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. 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.

The Friis 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

2 FCC RF Exposure Evaluation

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)
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
30-1500	F(MHz)/1500MHz	30
1500-100000	1.0	30

F = Frequency in MHz

*=Plane wave equivalent density

The EUT is categorized as **General Population / Uncontrolled Exposure**.

For WLAN, only 4x4 MIMO beamforming operating mode is evaluated here because it is the worst-case configuration. The maximum output power is as follows

Frequency Band	Operating Mode	Total Conducted RMS	Antenna Gain ¹	EIRP
2400 – 2483.5 MHz	4x4 MIMO Beamforming 802.11n, HT20	20.2 dBm	8.7 dBi	28.9 dBm (776 mW)
5150 – 5250 MHz (UNII-1)	4x4 MIMO Beamforming 802.11ac	24.2 dBm	8.5 dBi	32.7dBm (1.9 W)
5725 – 5850 MHz (UNII-3)	4x4 MIMO Beamforming 802.11ac	25.3 dBm	8.7 dBi	34.0 dBm (2.5 W)
2400 – 2483.5 MHz	Bluetooth LE	6.1 dBm	3.4 dBi	9.5 dBm (8.9 mW)

Notes:

1. WLAN antenna gain includes antenna gain from each transmitting antenna and beamforming gain.

Stand Alone Analysis

Operating Mode	Stand-Alone Power Density	Power Density Limit	Percentage of Limit
4x4 MIMO Beamforming 802.11n, HT20	0.15 mW/cm ²	1.0 mW/cm ²	15%
4x4 MIMO Beamforming 802.11ac (UNII-1)	0.37 mW/cm ²	1.0 mW/cm ²	37%
4x4 MIMO Beamforming 802.11ac (UNII-3)	0.50 mW/cm ²	1.0 mW/cm ²	50%
Bluetooth LE	0.0018 mW/cm ²	1.0 mW/cm ²	0.18%

Simultaneous Transmission Analysis

For each simultaneous transmission configuration, the sum of the ratio of power density to the limit of each radio should not exceed 1.0.

Simultaneous Transmission Configuration	Ratio to Limit	Sum of Ratios
802.11ac – UNII-1 Bluetooth LE	37% 0.18%	37.18%
802.11ac – UNII-3 Bluetooth LE	50% 0.18%	50.18%
802.11ac – UNII-1 802.11n, HT20	37% 15%	52%
802.11ac – UNII-3 802.11n, HT20	50% 15%	65%

All sum of ratios are below 100%. The EUT meets the MPE limits for all simultaneous transmission configurations.