

Lincoln, NE 68521 Phone: 402.323.6233 Fax: 402.323.6238 www.nceelabs.com

### **RF Exposure rev4**

Reference: CFR 47 FCC Part 1.1310

RSS-102. Issue 5

# **Description**:

All measurements were peak power readings taken from test reports from accredited test labs. Antenna gains were taken from the manufacturer's specifications.

<u>Limits</u>: Maximum exposure limits from CFR 47, FCC Part 1.1310:

Table 1 - Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m) Magnetic field strength (A/m)		Power density (mW/cm²)	Averaging time (minutes)				
(A) Limits for Occupational/Controlled Exposure								
0.3-3.0	614	1.63	*100	6				
3.0-30	1842/f	4.89/f	*900/f <sup>2</sup>	6				
30-300	61.4	0.163	1.0	6				
300-1,500			f/300	6				
1,500-100,000			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/f <sup>2</sup>	30				
30-300	27.5	0.073	0.2	30				
300-1,500			f/1500	30				
1,500-100,000			1.0	30				



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Occupational/Controlled	0
General Population/uncontrolled	1

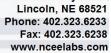
Transmitter	Frequency	Antenna Gain	Power (conducted)	Power (conducted) +10% for tolerance	Power Density	Limit at specified distance	% of limit	Highest	Total
	MHz	numerical	mW	mW	mW/cm^2	mW/cm^2			
1	2412	1.74	180.30	198.33	0.06869	1	6.87%		
1	2442	1.74	189.67	208.64	0.07226	1	7.23%	1	7.23%
1	2462	1.74	171.79	188.97	0.06545	1	6.54%		
								TOTAL	7.23%

**Distance** 20 cm PASS? **YES** 

# Calculations:

Table 2 - Calculations according to CFR 47, Part 1.1310, Table 1(B)

Transmitter 1: Murata 1DX module on Hunter Douglas Wireless Hub





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Table 3 - From Table 4 of RSS-102 Issue 5

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m²)	Reference Period (minutes)
$0.003 - 10^{21}$	83	90	-	Instantaneous*
0.1-10	=	0.73/f		6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

**Note:** f is frequency in MHz.

<sup>\*</sup>Based on nerve stimulation (NS).

<sup>\*\*</sup> Based on specific absorption rate (SAR).

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Table 4 - Calculation according to Industry Canada RSS-102, Table 6

Occupational/Controlled	0
General Population/uncontrolled	1

Transmitter	Frequency	Antenna Gain	Power (conducted)	Power (conducted) +10% for tolerance	Power Density	Limit at specified distance	% of limit	Highest	Total
	MHz	numerical	mW	mW	mW/cm^2	mW/cm^2			
1	2412	1.74	180.30	198.33	0.06869	0.536602	12.80%		
1	2442	1.74	189.67	208.64	0.07226	0.540397	13.37%	1	13.37%
1	2462	1.74	171.79	188.97	0.06545	0.544179	12.03%		
								TOTAL	13.37%

<u>Notes</u>: The minimum separation distance was defined as the closest point from the transmitting antenna to any part of the body or extremity of a user or bystander.

Transmitter 1: Murata 1DX module on Hunter Douglas Wireless Hub

The limit was converted from W/cm<sup>2</sup> to mW/m<sup>2</sup> by dividing by 10 (W $\rightarrow$ mW = .001) × (/cm<sup>2</sup> $\rightarrow$ /m<sup>2</sup> = 100) = 0.1 = /10

The power density is calculated as shown below:

 $S = (P \times G)/(4 \times \pi \times d^2)$  – used to calculate exposure at 20 cm

 $d = \sqrt{(S/(P \times G) \times 4 \times \pi)}$  – used to calculate minimum distance to meet limits

 $1 \, mW/cm^2 = 10 \, W/m^2$ 

S= power density

P = transmitter conducted power (in mW)

G = antenna numeric gain

D = distance to radiation center