



May 6, 2020

Re: Permissive Change for FCC ID: IPH-02356, IC: 1792A-02356, RF Exposure

Pursuant to 47 CFR Section 1.1310 and RSS-102, the limits for RF Exposure are as follows:

	Occupational Limit	FCC radio frequency radiation exposure limits per 1.1310		
		Frequency (MHz)	Occupational Limit (mW/cm ²)	Public Limit (mW/cm ²)
5.0	mW/cm ²	30-300	1	0.2
50.0	W/m ²	300-1,500	f/300	f/1500
	General Public Limit	1,500-10,000	5	1
1.0	mW/cm ²			
10.0	W/m ²			
	Occupational Limit	IC radio frequency radiation exposure limits per RSS-102		
5.0	mW/cm ²	Frequency (MHz)	Occupational Limit (W/m ²)	Public Limit (W/m ²)
50.0	W/m ²	100-6,000	0.6455f ^{0.5}	
	General Public Limit	48-300		1.291
1.0	mW/cm ²	300-6,000		0.02619f ^{0.6834}
10.0	W/m ²	6,000-15,000	50	10

To meet the power density limitation a safe distance determined by the following equation is required:

$$PD_{MPE} = P_{av} \cdot G_t / 4\pi R^2$$

Where,

PD_{MPE} = power density for maximum permissible exposure

G_t = transmitter gain

P_{av} = average power = peak power x duty cycle (D)

$R = R_{safe}$ = distance between transmitter and user

In the case of directional scanning antennas, such as this one, the power at any point is varying with the rotation so the average power density at a fixed point is reduced by the antenna main lobe -3dB beam-width θ , divided by the scanning angle.

$$P_{av}(\text{Scanning}) = P_{av}(\text{Fixed}) \times \theta / 360$$

Solving for R safe distance yields

$$R_{safe} = \sqrt{\frac{P_t \cdot D \cdot G_t}{PD_{MPE} \cdot \frac{360}{\theta} \cdot 4\pi}}$$

Where,

FCC Public Limit, $PD_{MPE} = 1\text{mW/cm}^2 = 10\text{W/m}^2$

FCC Occupational Limit, $PD_{MPE} = 5\text{mW/cm}^2 = 50\text{W/m}^2$

IC Public Limit, $PD_{MPE} = 10\text{W/m}^2 = 1\text{mW/cm}^2$

The R_{safe} distance for the transmitter referenced herein is as follows:

	Model:	21dBi Antenna	22dBi Antenna
P_t	Maximum Output Power [W]:	4000	4000
D	Maximum Duty Cycle [%]:	0.1	0.1
G_t	Maximum Antenna Gain [dBi]:	21.3	22.6
θ	Main Lobe -3dB Beam Width [Degrees]:	5.2	3.7
R_{safe}	User Distance at 100W/m ² [m]:	0.08	0.08
	User Distance at 50W/m ² [m]:	0.11	0.11
	User Distance at 10W/m ² [m]:	0.25	0.24

Sincerely,



Scot Rogers