



π IN THE SKY⁸

Answer Key

Force Field

What force does a hydrogen ion at $\pi/4$ radians from the equator observe? What about at the North Pole ($\pi/2$ radians)?



1. Convert microteslas to teslas and kilometers per second to meters per second.

$$60\mu\text{T} = 6 \cdot 10^{-5} \text{ T}$$

$$400 \text{ km/s} = 4 \cdot 10^5 \text{ m/s}$$

2. Enter the known values into the Lorentz force equation and compute.

$$F = (1.602 \cdot 10^{-19} \text{ C}) \cdot (4 \cdot 10^5 \text{ m/s}) \cdot (6 \cdot 10^{-5} \text{ T}) \cdot \sin(\pi/4)$$

$$F \approx 3 \cdot 10^{-18} \text{ N}$$

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Does the relative magnetic field agree or disagree with what you'd expect about the location of auroras?

1. **Agrees.** A larger Lorentz force occurs at the North Pole where the formation of auroras is more common.

