

Calculate the magnetic field of bending magnet

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According to

$$Bqv = \frac{mv^2}{r} \quad (1)$$

$$E_k = \frac{1}{2}mv^2 = Uq \quad (2)$$

we can deduce

$$B = \frac{\sqrt{2}}{r} \sqrt{\frac{m}{q}} \sqrt{U}. \quad (3)$$

If units are given:

$$U : [\text{kV}], \quad 1 \text{ kV} = 10^3 \text{ V} \quad (4)$$

$$m : [\text{amu}], \quad 1 \text{ amu} = 1.67 \times 10^{-27} \text{ kg} \quad (5)$$

$$q : [\text{e}], \quad 1 \text{ e} = 1.6 \times 10^{-19} \text{ C} \quad (6)$$

$$r : [\text{cm}], \quad 1 \text{ cm} = 10^{-2} \text{ m} \quad (7)$$

$$B = \frac{\sqrt{2}}{r[\text{cm}]10^{-2}} \sqrt{\frac{m[\text{amu}]}{q[\text{e}]}} \sqrt{\frac{1.67 \times 10^{-27}}{1.6 \times 10^{-19}}} \sqrt{U[\text{kV}]10^{\frac{3}{2}}} = \frac{0.457}{r[\text{cm}]} \sqrt{\frac{m[\text{amu}]}{q[\text{e}]}} \sqrt{U[\text{kV}]} [\text{T}]. \quad (8)$$

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Ion	$\frac{m}{q}$	r[cm]	U[kV]	B[T]
H ₂ ²⁺	1	57	7	0.021
H ₂ ⁺	2	57	7	0.030
O ²⁻	8	57	7	0.060
Ne ⁺	20	57	7	0.095
N ₂ ⁺	28	57	7	0.112
O ₂ ⁺	32	57	7	0.120
Ar ⁺	40	57	7	0.134