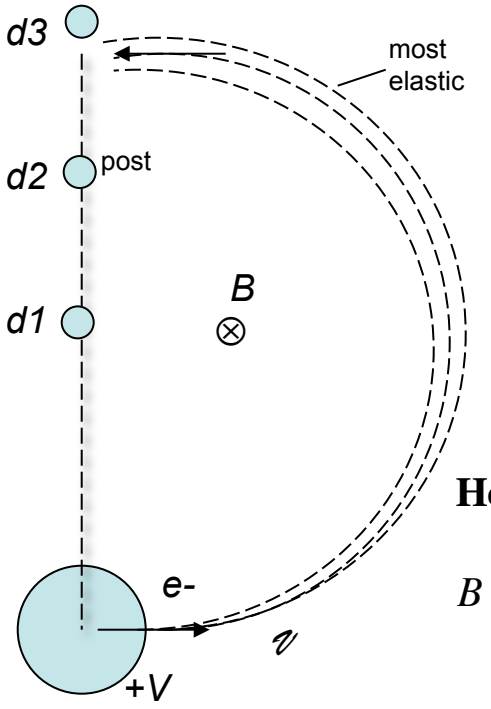
Electron Charge to Mass Ratio



$$\vec{F} = q\ \vec{v} \times \vec{B} = qvB = \frac{mv^2}{r}$$

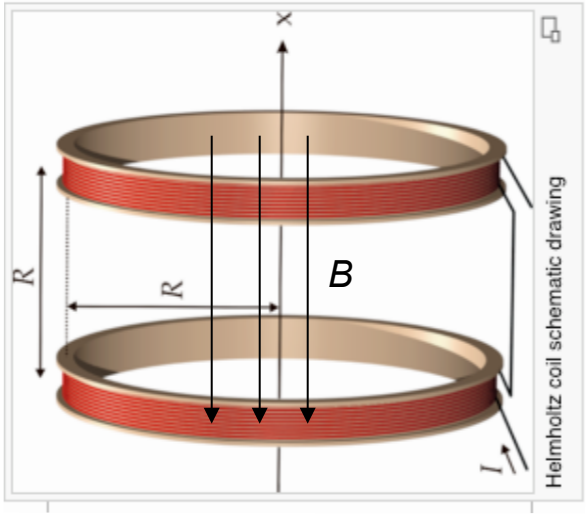
$$p = qBr$$

$$T = \frac{p^2}{2m} = \frac{q^2 B^3 r^3}{2m} = qV_{acc}$$

$$\frac{q}{m} = \frac{2V}{B^2 r^2}$$

Helmholtz Coil

$$B = \left(\frac{4}{5}\right)^{3/2} \frac{\mu_0 N I_{coil}}{R} \quad (T)$$



N =72 , R=33cm , μ_o=1.26 x10^{-6} Tm/A

- Vary *B* so the electron beam hits posts #1,2,3,4,5.

$$d_{1\text{-}5} = 0.065, 0.072, 0.090, 0.103, 0.115 \text{ m}$$

- At each post record V_{acc} I_{coil} .
- Determine e/m for each set of measurements.
- Find the avergage and r.m.s. e/m=Avg+-rms
  If any measurements are more than 3 rms away from the mean eliminate and re-average.
- Compare your measurement to the standard and comment on possible errors

Sample Data

Vacc (V)	I (A)	B (T)	r (m)	e/m	
42	3.26	6.413E-04	0.0325	1.934E+11	
42.1	2.84	5.587E-04	0.036	2.082E+11	
42.3	2.47	4.859E-04	0.045	1.770E+11	
40.6	2.14	4.210E-04	0.0515	1.728E+11	
40.8	1.9	3.737E-04	0.0575	1.767E+11	
			e/m=	**1.856E+11**	**C/kg**
				1.49E+10	