Exploring the Capabilities of the Houghton College Cyclotron

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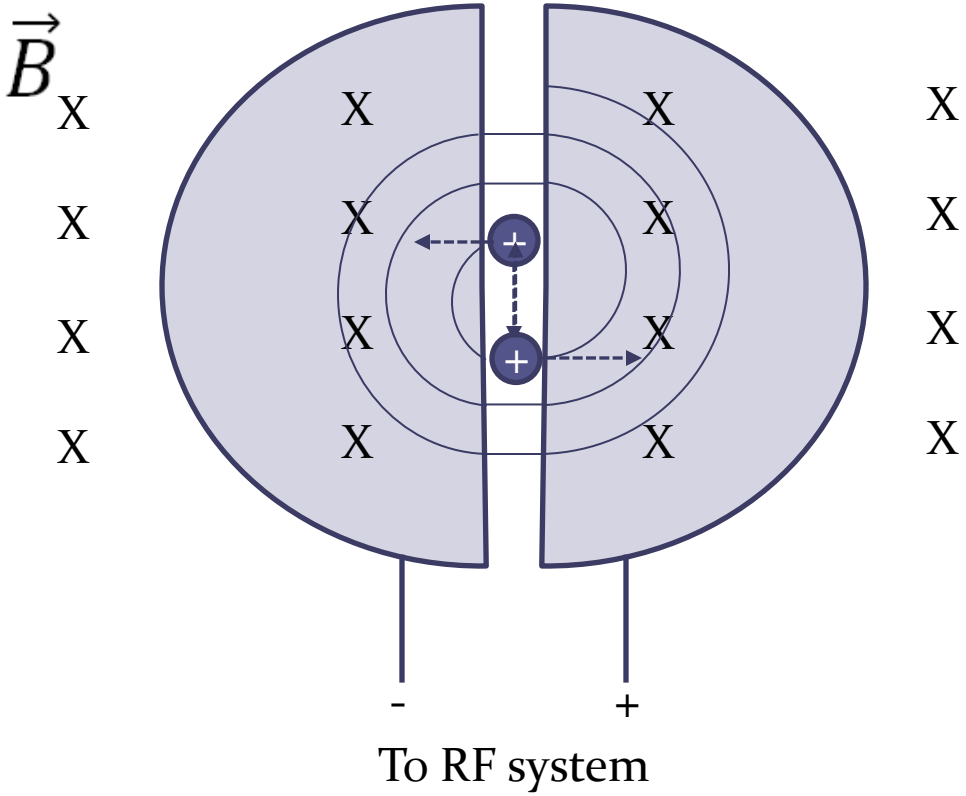
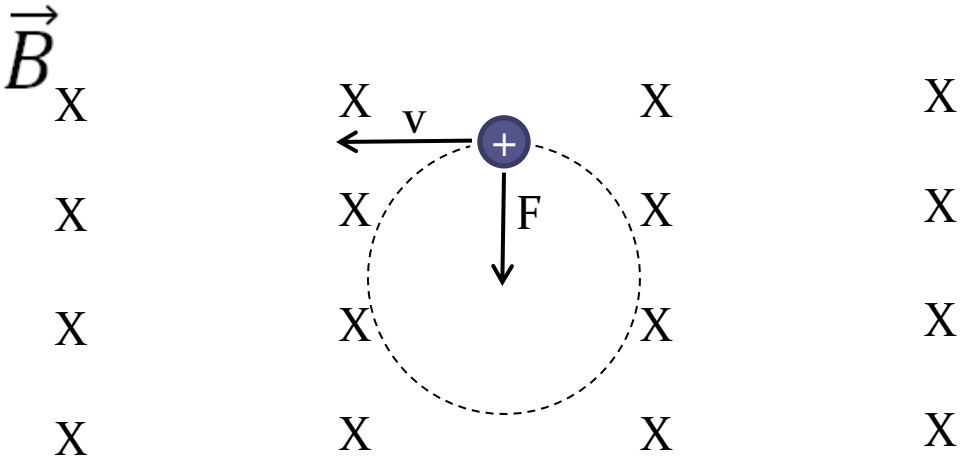
Operating Principle



Resonance

$$qvB = \frac{mv^2}{r}.$$

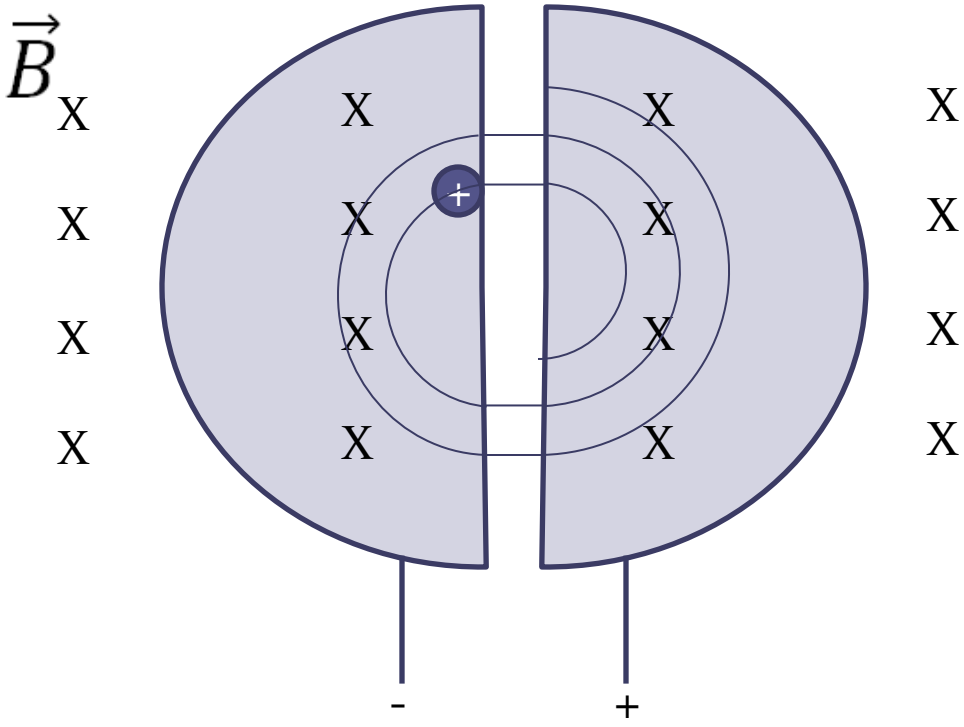


$$\tau \equiv \frac{2\pi r}{v} = \frac{2\pi m}{qB}.$$

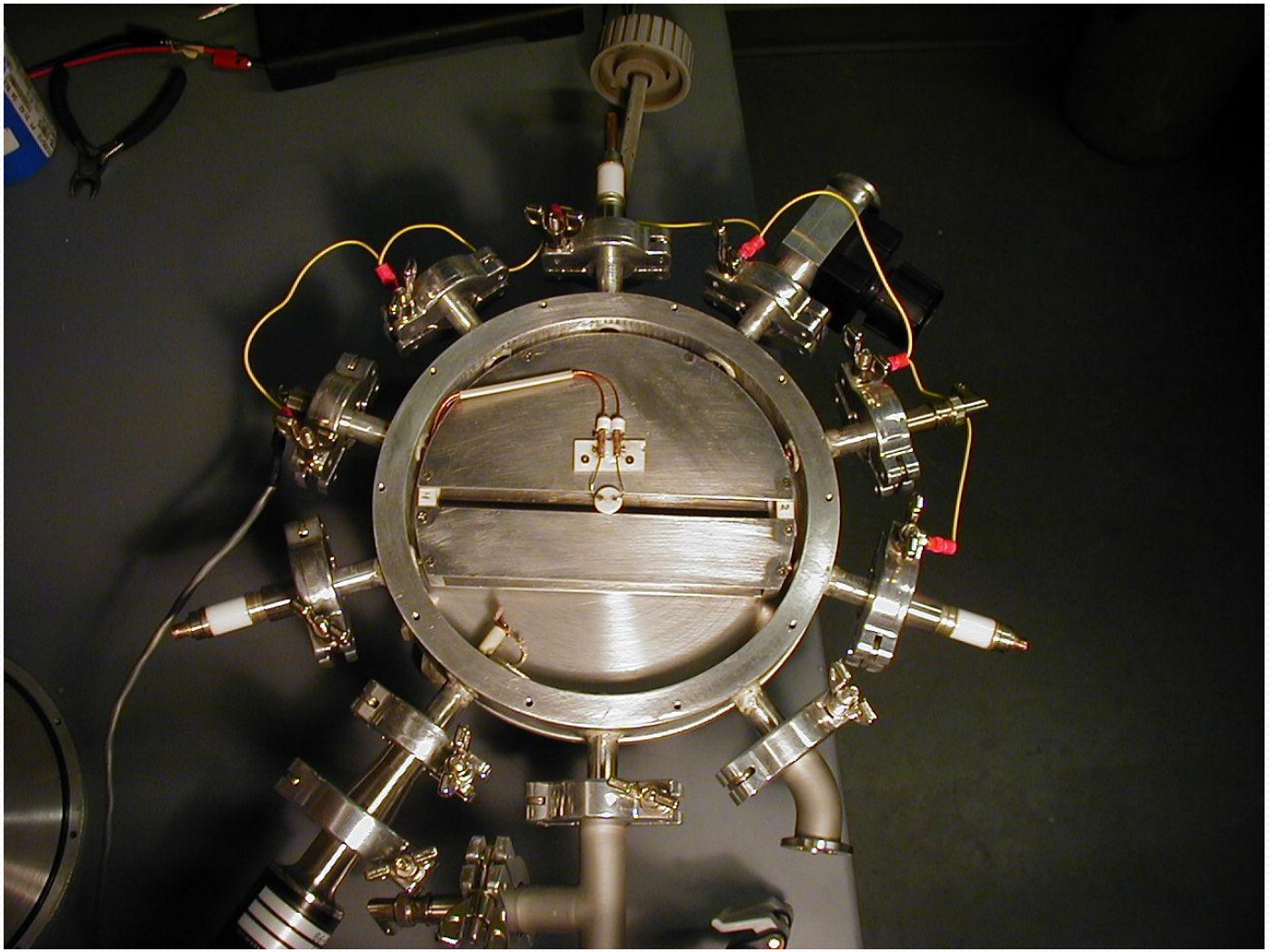
$$f = \frac{qB}{2\pi m}.$$

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

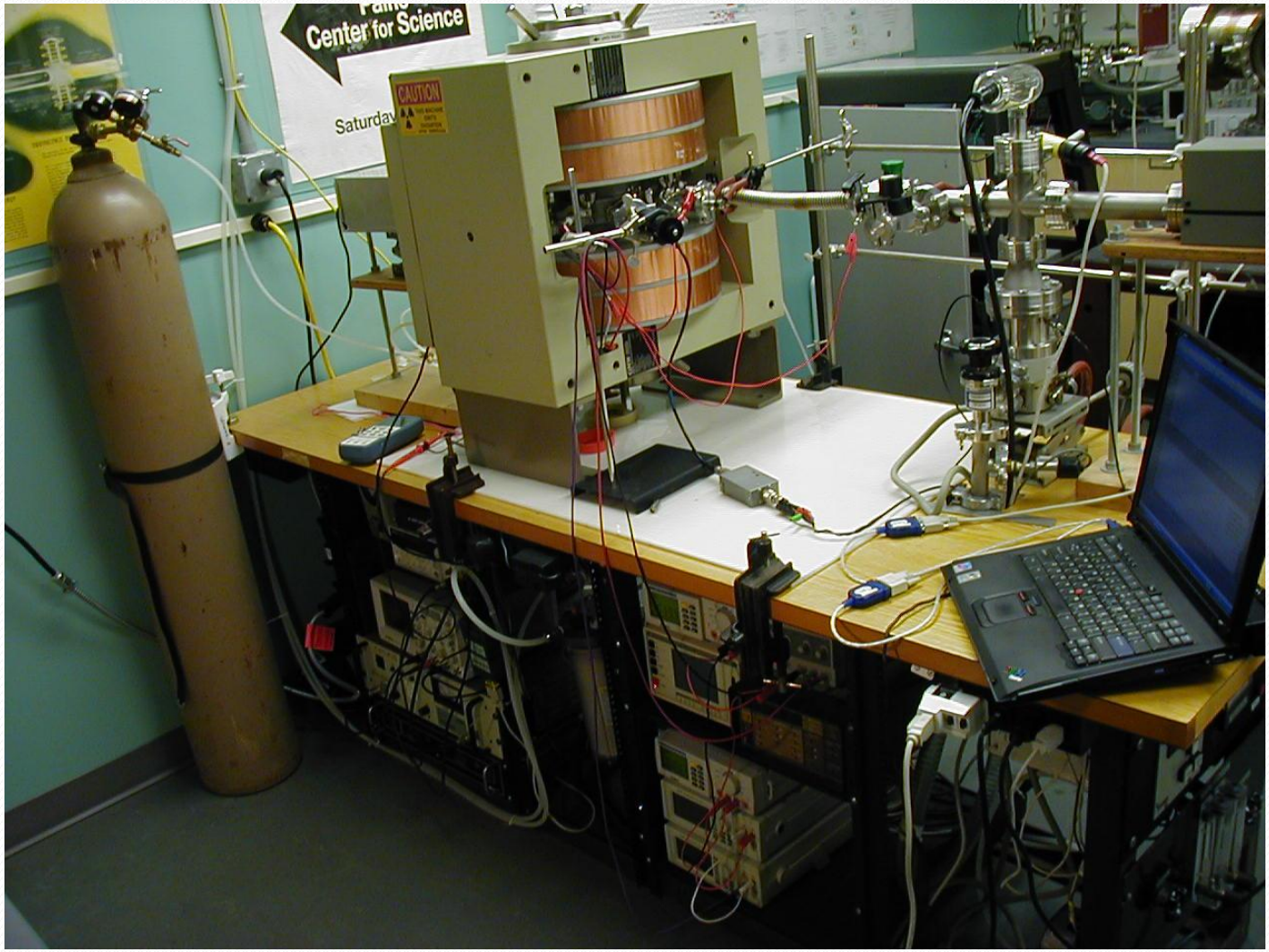
Harmonic Frequencies



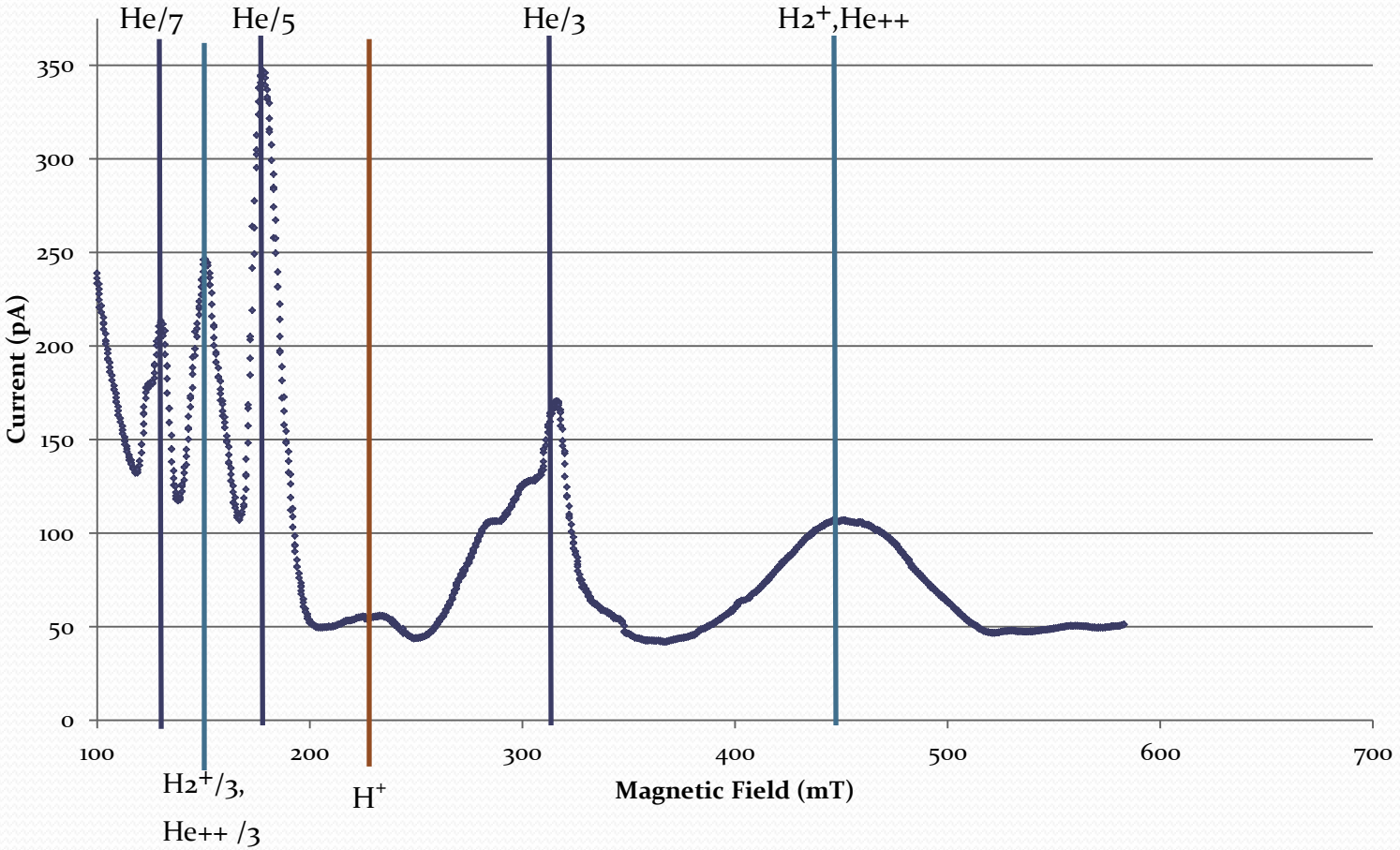
Our Chamber



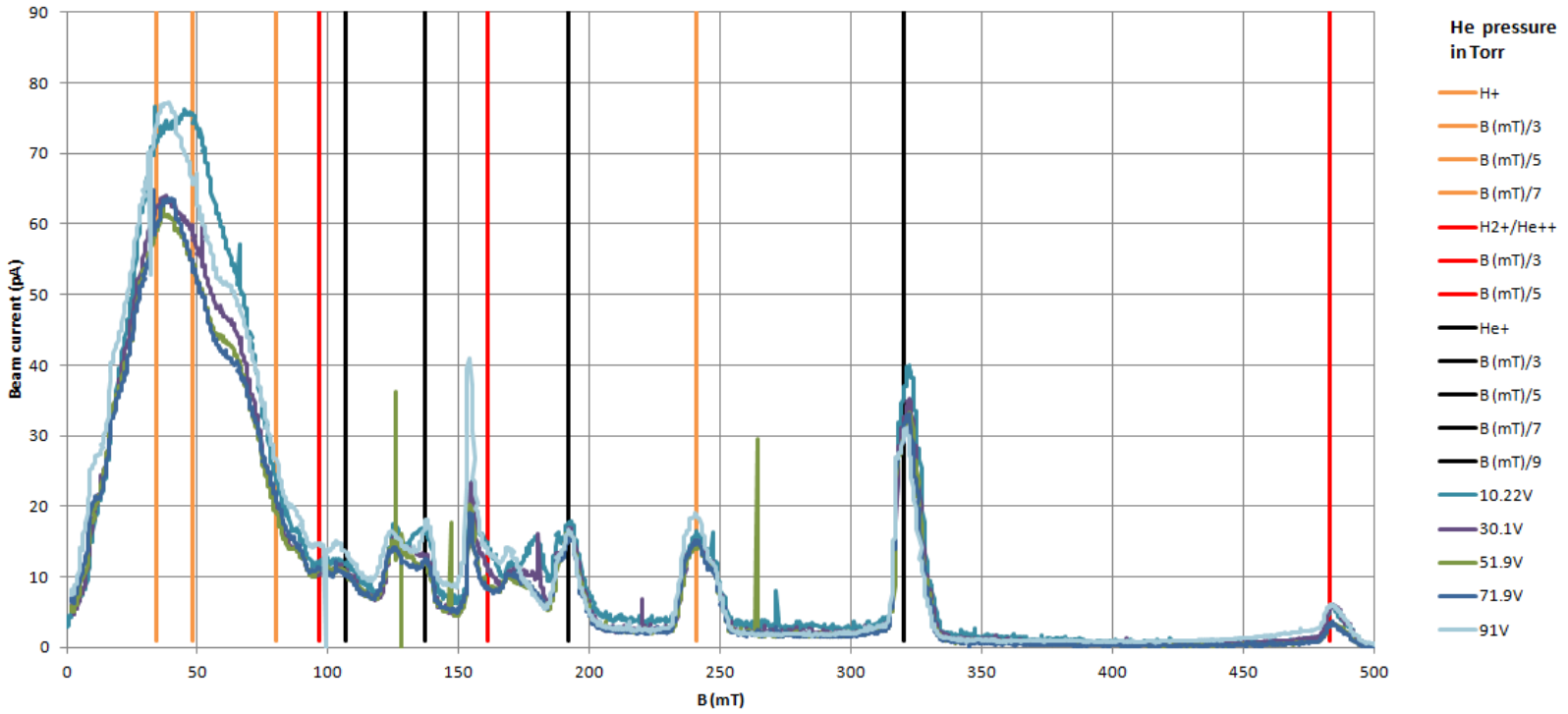
Apparatus



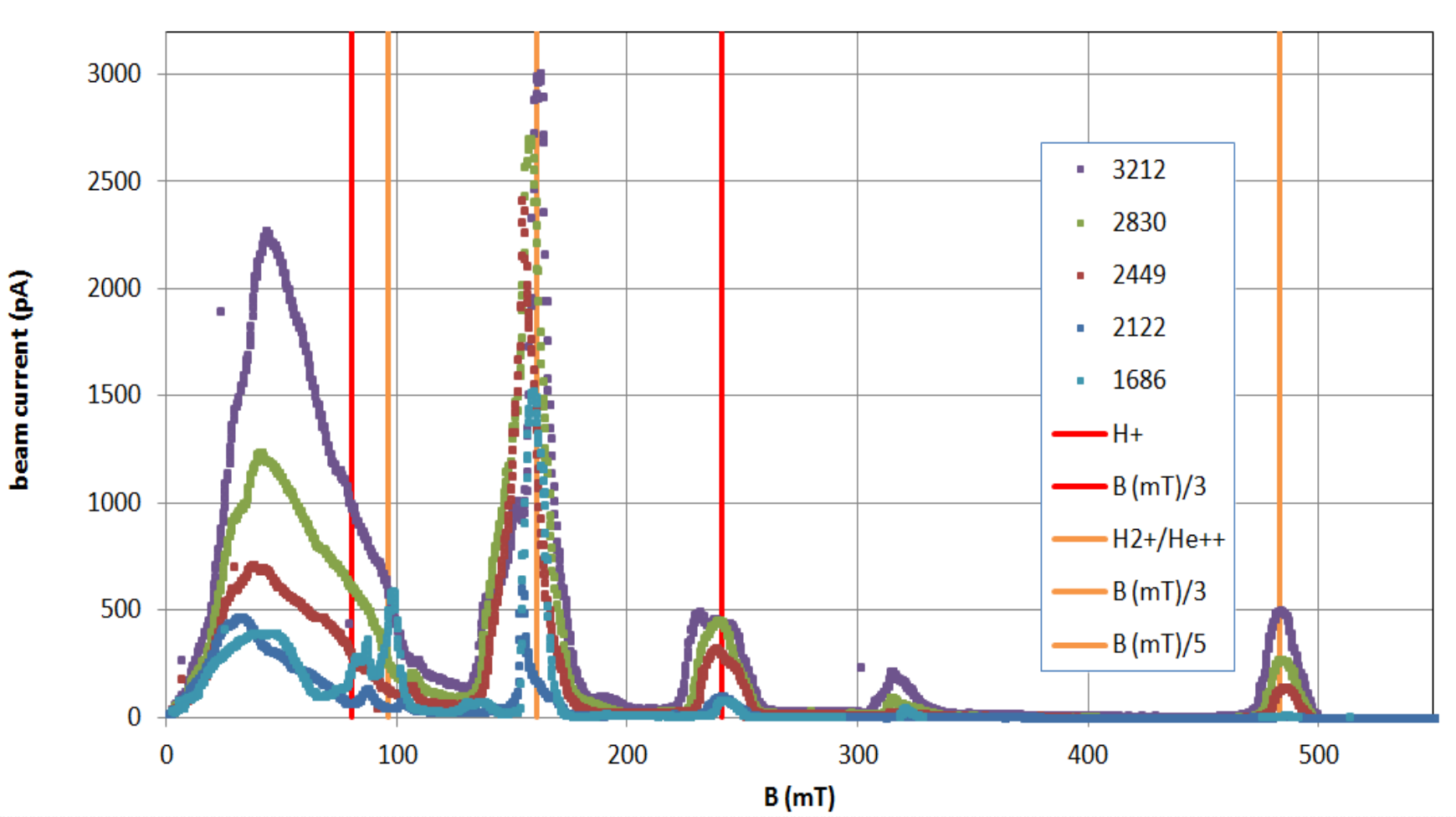
Resonances


He/7
He/5
He/3
H2+,He++
350
300
250
200
150
100
50
0
Current (pA)
100
200
300
400
500
600
700
Magnetic Field (mT)
H2+/3,
He++ /3
H+

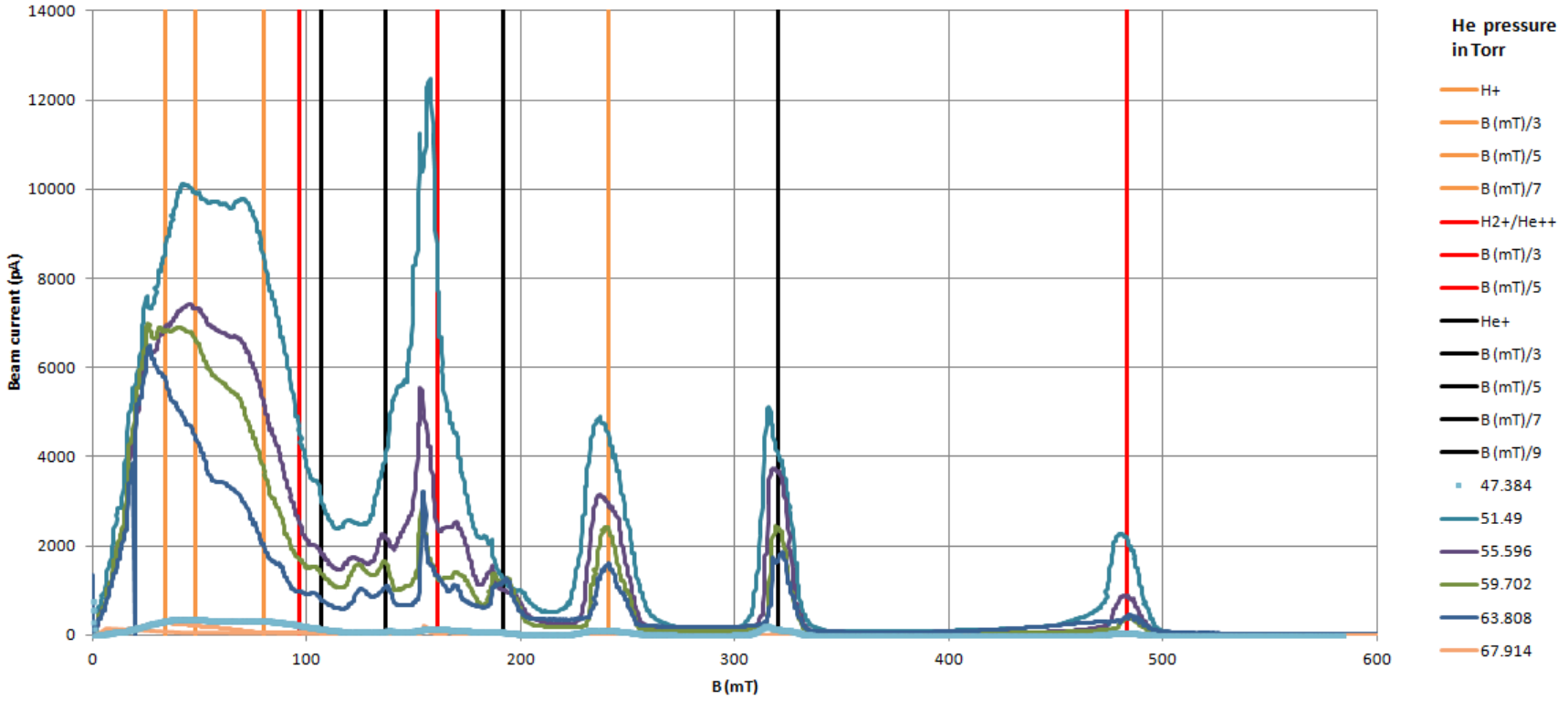
Effect of Filament Bias



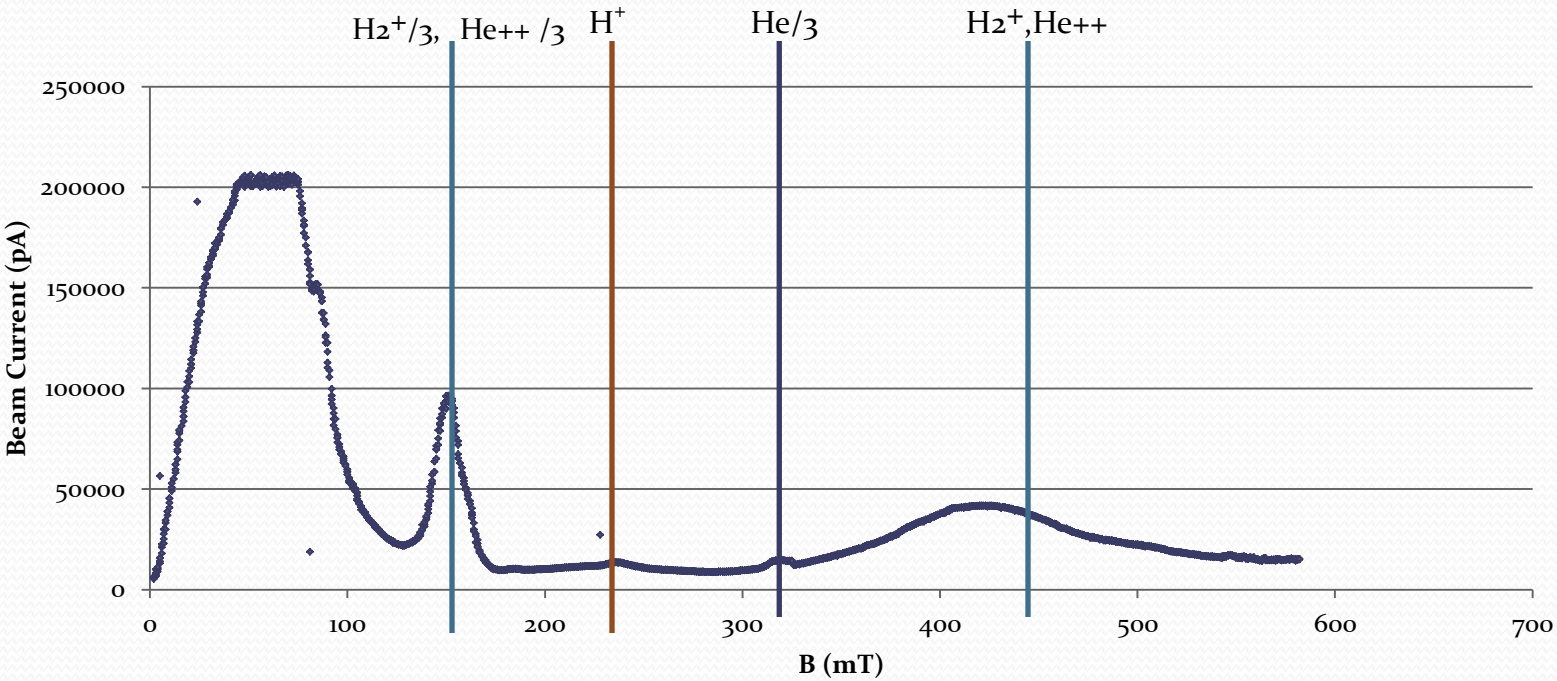
Effect of Dee Voltage



Beam Current vs. Radius

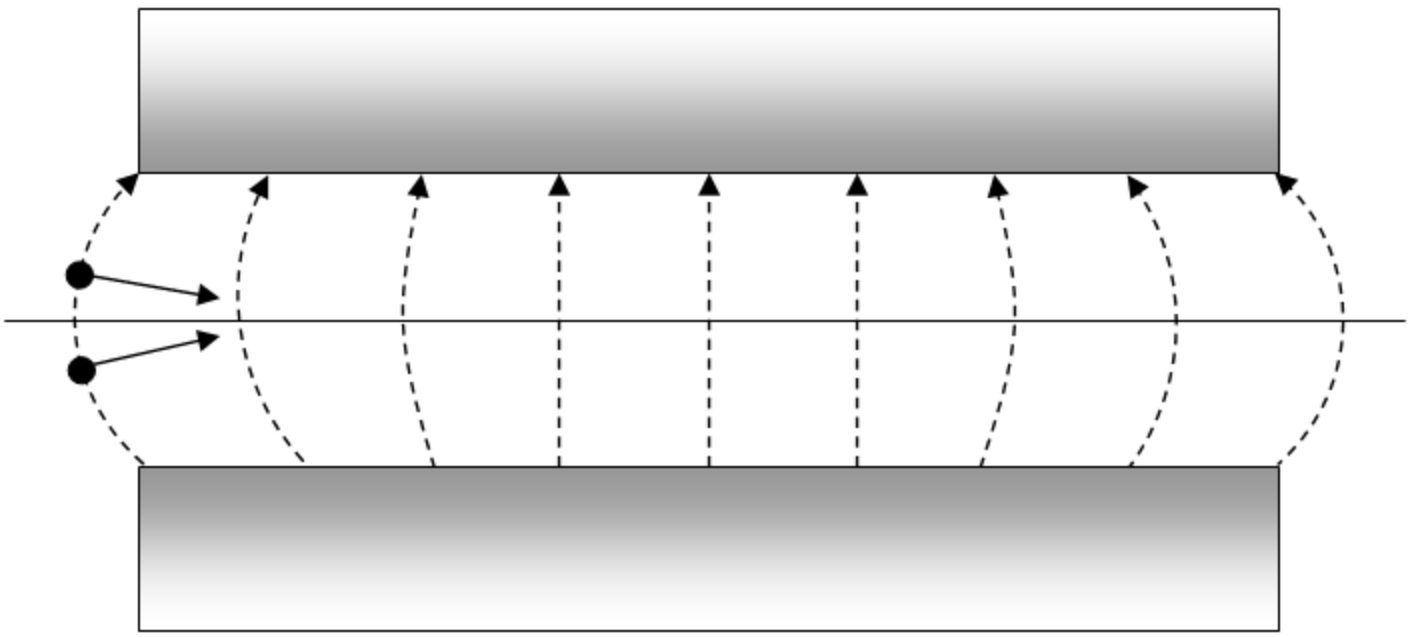


Effect of Higher Pressure



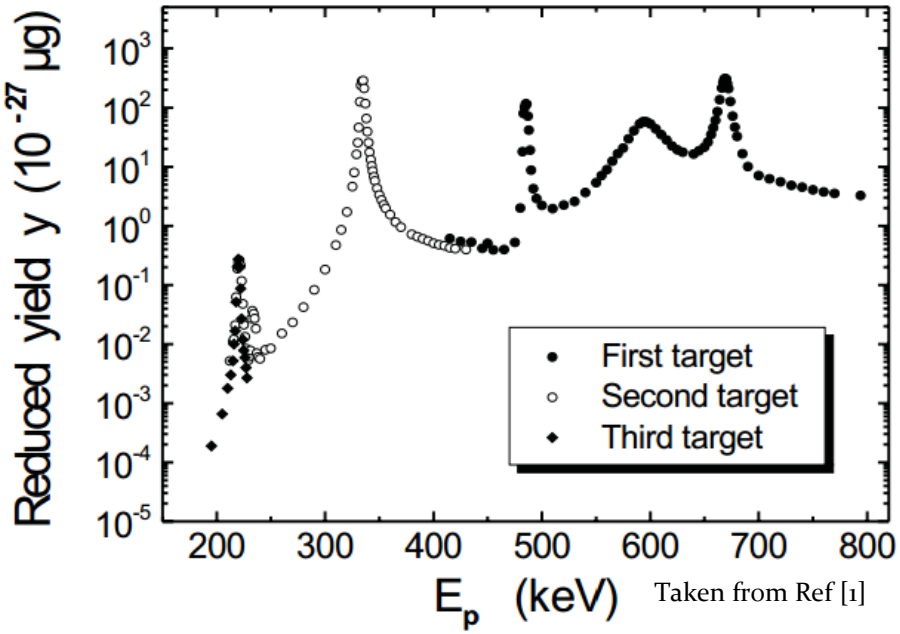
Near-Future Plans

- Max Energy Tune ~400 keV (300 keV currently)
- Magnetic Field Shaping



Possible Reactions- (p,γ) Resonances

- $^{19}F(p,\gamma)\,^{16}O$



Taken from Ref [1]

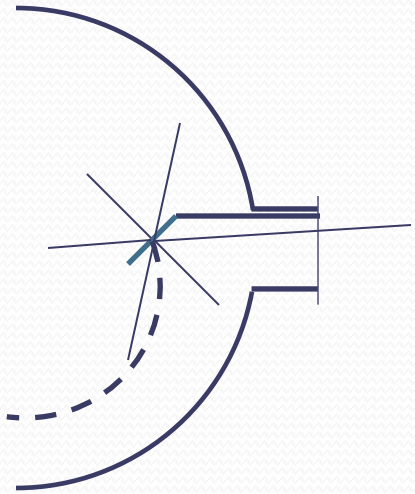
224 keV:~0.2mb
340 keV: 106 mb

- $^{31}P(p,\gamma)\,^{32}S$

355 keV – very small cross section

Other Reactions

- d(^{3}He, p) ^{4}He- 18 MeV protons



- d(d,n) ^{3}He – 2 MeV neutrons

Questions?

Reference

[1] K. Spyrou *et. al. Eur. Phys. J. A* **7**:79-85 (2000).