DarkLight Target design considerations

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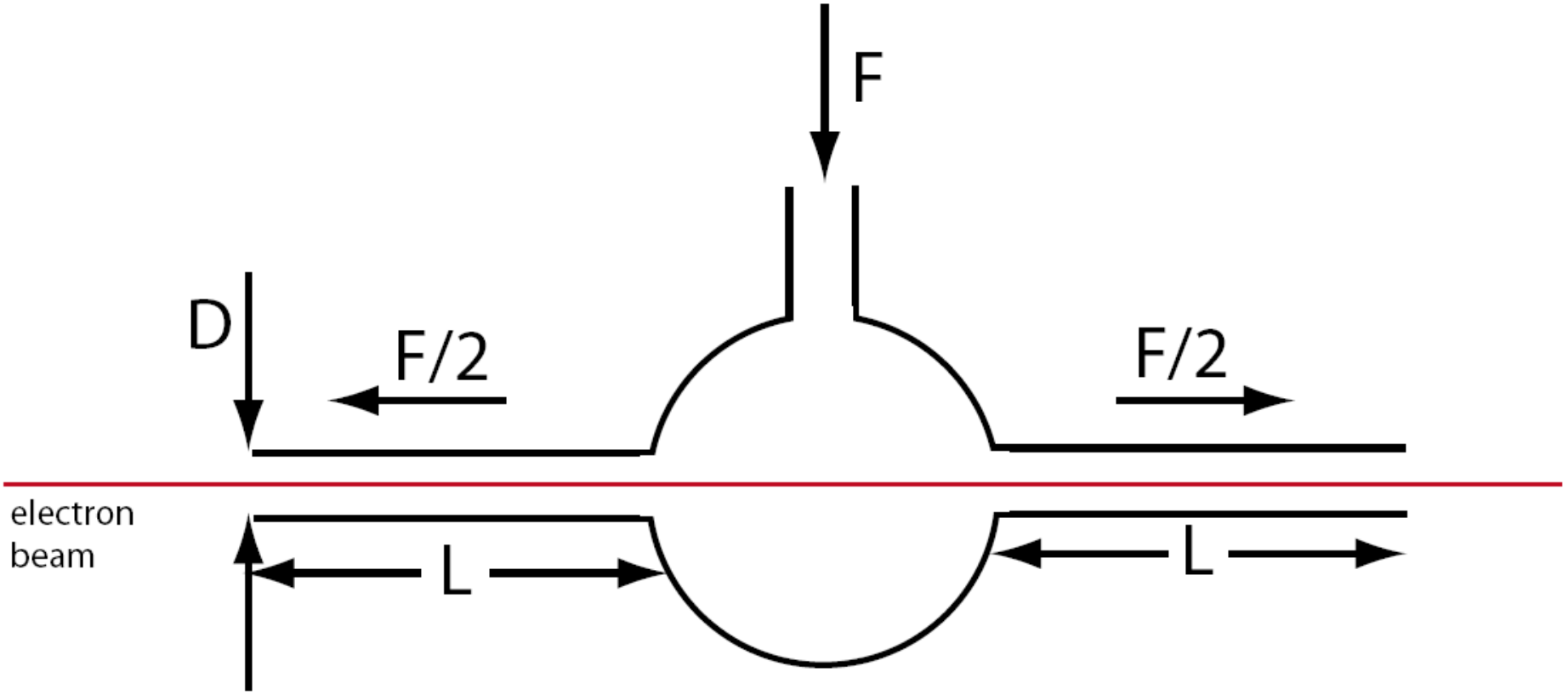
- Must accept 1 MWatt beam => gas target
- Searching for rare events => maximize thickness
- Must allow MeV proton to exit => thin container walls
- Beam core has σ_x~ 50 μm and σ_θ~ 3 mrad
- What about tails?

DarkLight Gas Target Concept



T=15 K, F = 1.5 x 10^{18} s^{-1} (100 mTorr-liter per sec), L= 10 cm, D = 2 mm
Target thickness = 10^{19} cm^{-2}

Challenges/Issues

- Passing 10 mA beam through narrow tubes =>
  halo striking tubes => collimation => backgrounds in detector
- Differential pumping of 100 mTorr-liter/sec of hydrogen
- Stability of beam
- Effect of gas target on FEL beam – R. Russell
- What limits the target thickness?
- Our MIT group has considerable experience in designing optimized windowless targets with intense electron beams in storage rings: HERA/HERMES, Bates SHR/BLAST, DORIS/OLYMPUS
- With location of DarkLight experiment defined, optimized beam optics can be developed and the target design can be considered in detail
- Design of the target will require engineering and technical support from JLab FEL and Bates R&E Center