UVA Magnet Design

Criteria for UVA design:

- Optimized for transverse – split access +\-25
- 2 in 10^4 over 30 mm diameter spherical volume
- Rotates from T-sideways to T-normal
- Cryogen free split pair
- Vertical cold access like standard Jlab magnets

Results of design Study

- Oxford was able to meet all criteria
- However this is at the limit as far as angle/homo
- Can build for the same price as original

  SoLID Magnet (no cryofree, T-sideways only)

  - $754,428

Rotation Target Raster

Why is this needed?

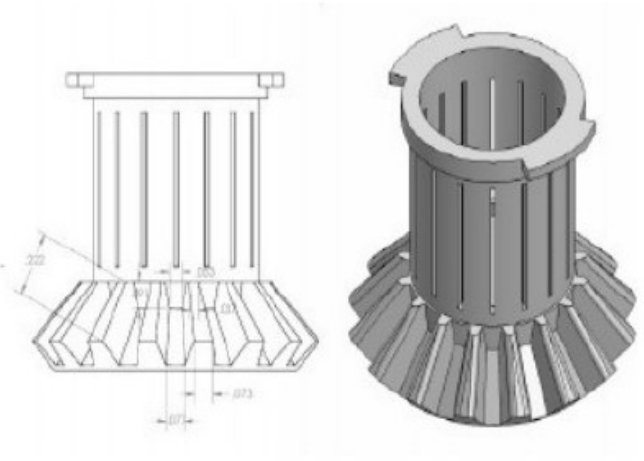
- Depolarization due to radiation damage

- Radiation damage depletes the polarization mechanism pathway for DNP
- Production of free radicals is the leading cause of target maintenance and over head time during production

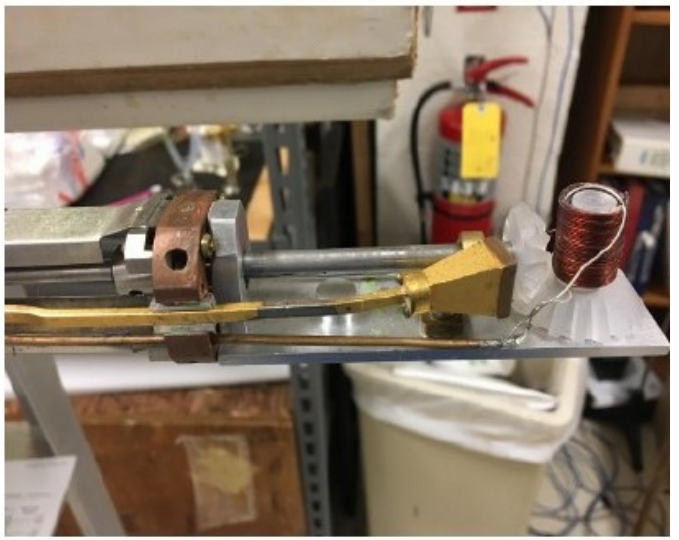
- Depolarization due to local beam heating

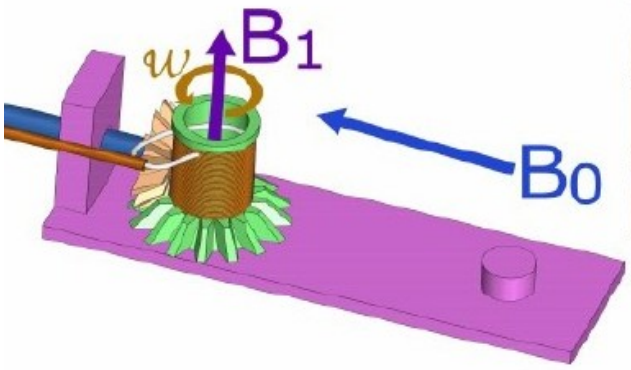
- Local hot-spots caused by interfacial thermal heating
- This depolarization is just the beam spot is very hard to measure as the rest of the sample seen by NMR is cooler

Rotate Target Cup



- Kel-F $(C_2ClF_3)_n$ cup and driving gear
- Motor outside cryostat
- NMR coil around cup
- Already used with several designs at UVA
- 1 Hz achieved with no problem
- Fixed beam spot

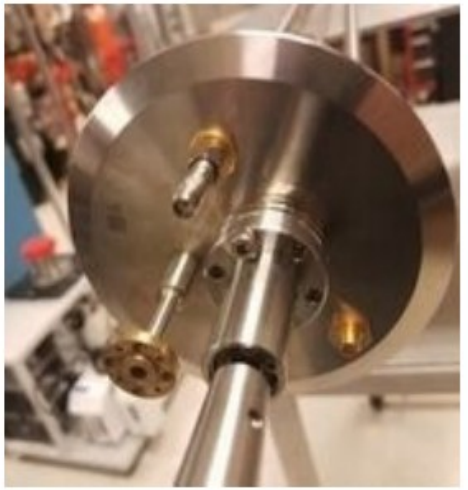




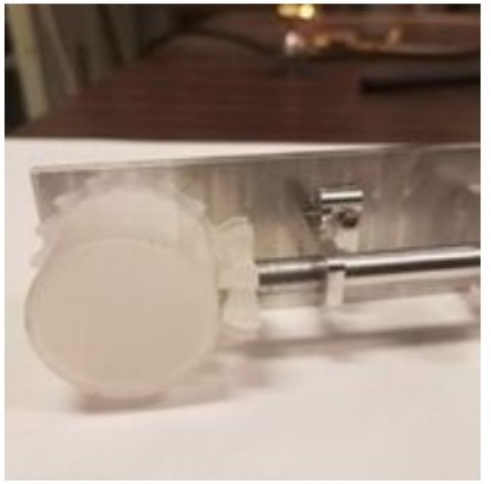
Other Examples used in Testing

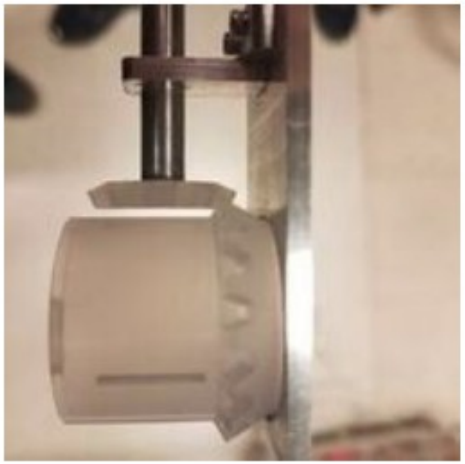




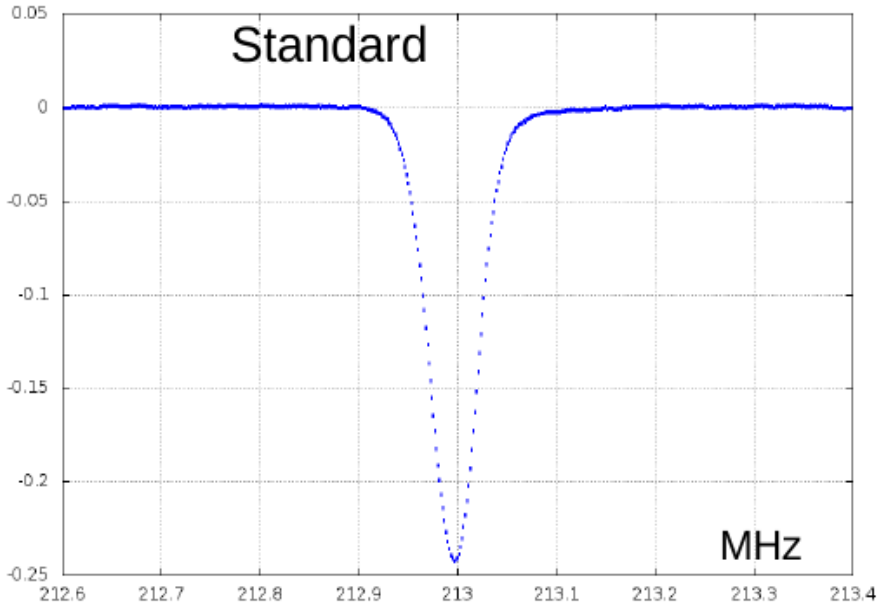




Practical Design for Inbeam

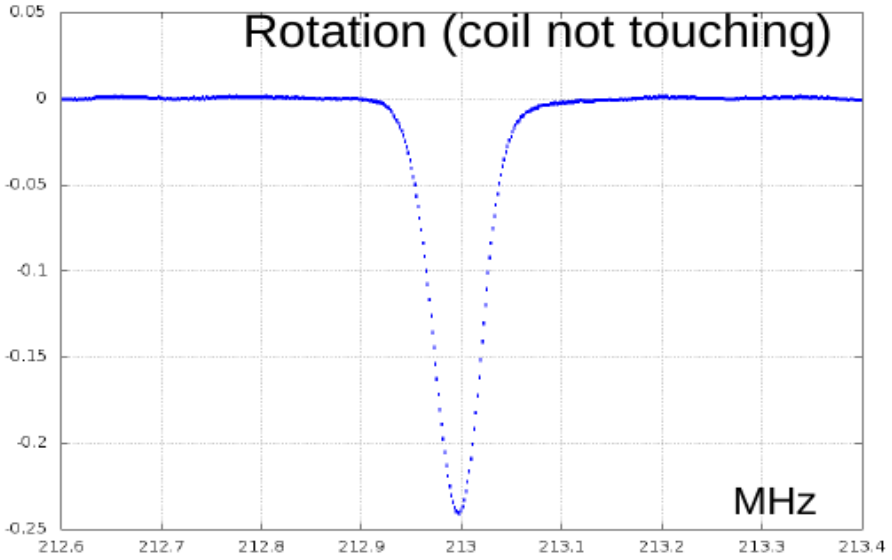




Tested up to 3 Hz



Not Rotating



Rotating

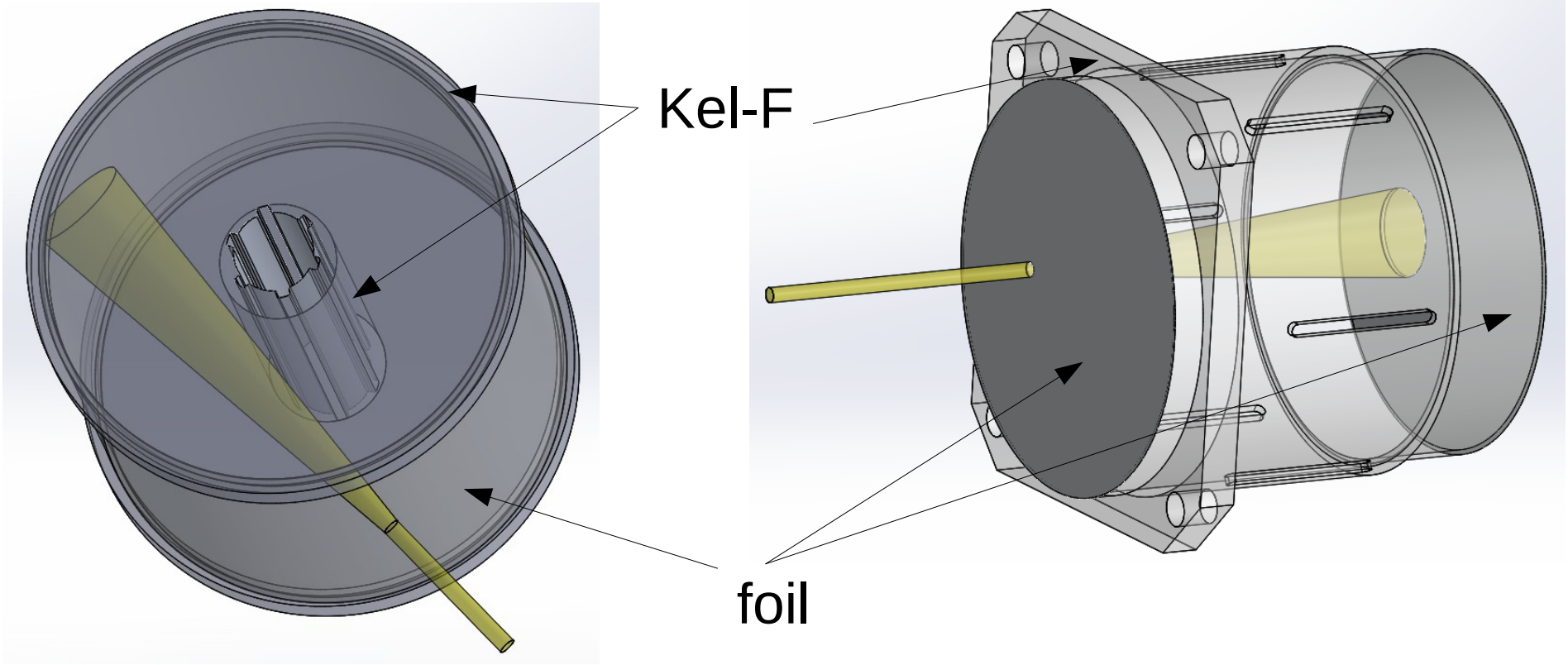
Fast rate so far

Exploring Alternative Design

- Up and down motion without moving actuator

  - Track on rotary feed through or up-down gear
- Fixed insert and NMR coils with only shaft and target cells moving up and down
- Modular, easy to take apart and fill off the stick

Exploring Alternative Design

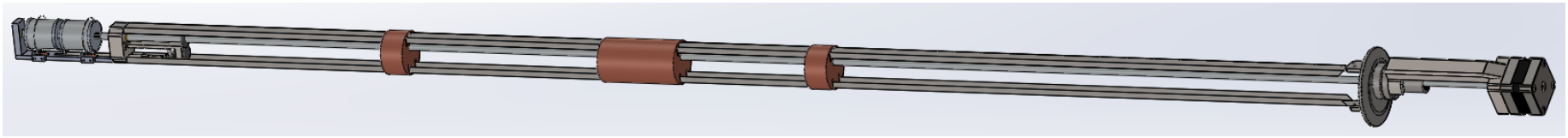


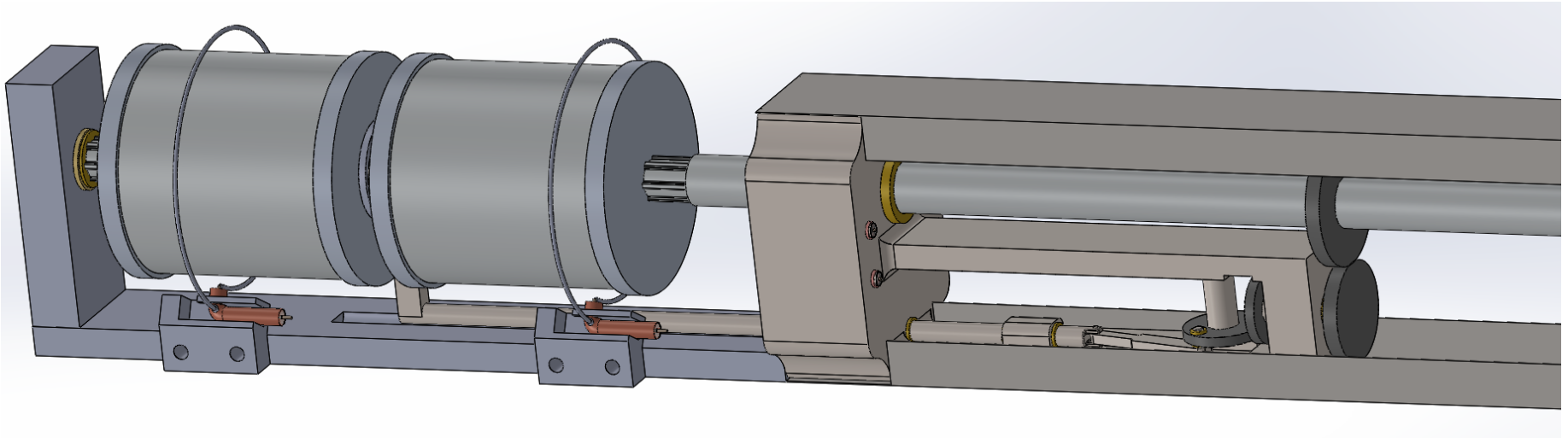
Different Orientation

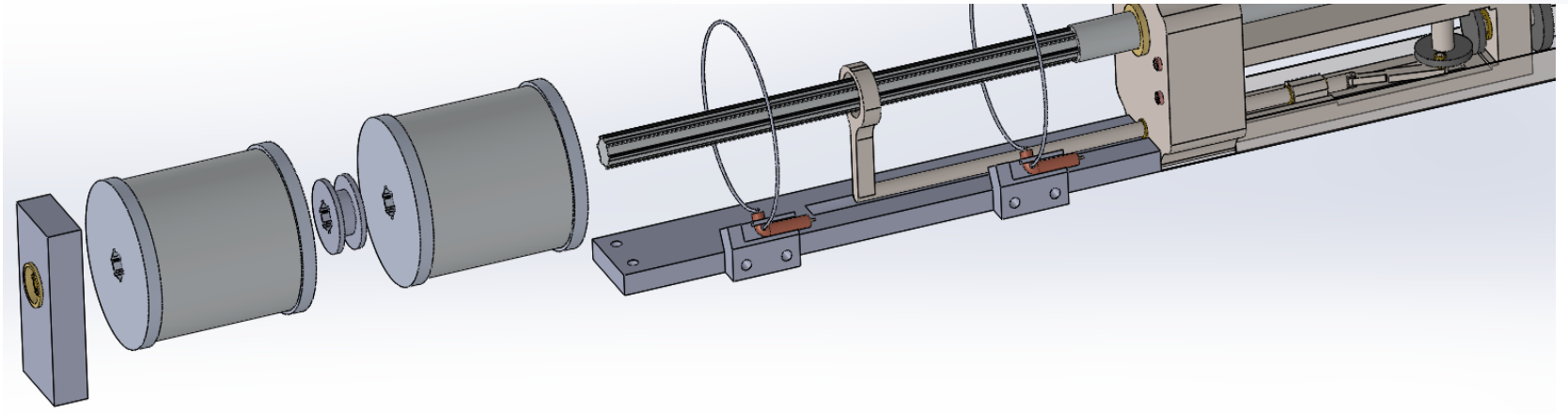
Standard

May reduce uneven irradiation from secondaries

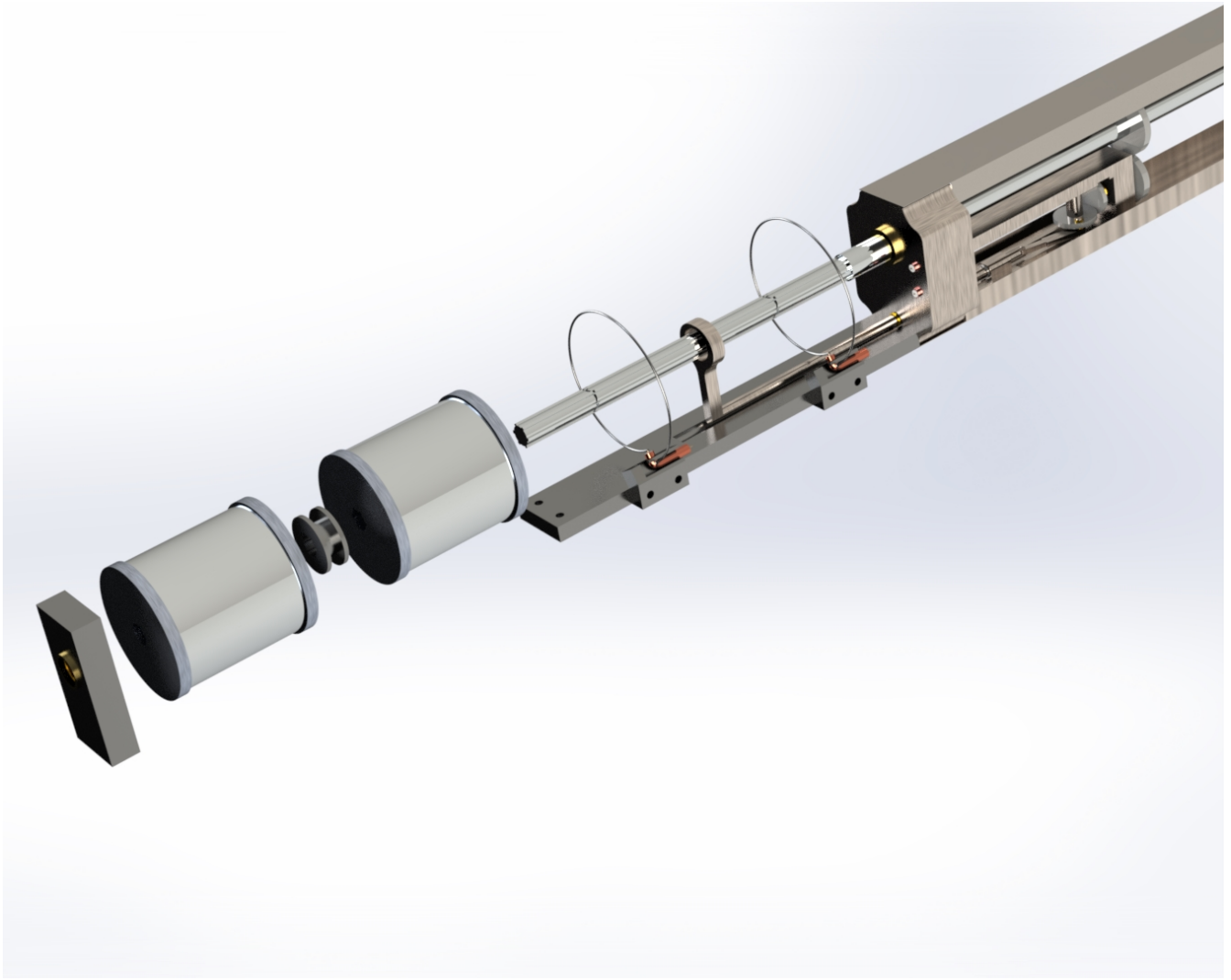
Exploring Alternative Design







Disassemble



- Take each cell off
- Load on its own
- Store full target cells

Up and Down motion from Inside