Neutrino Factory Target Cryostat Review

(Update Aug 12)

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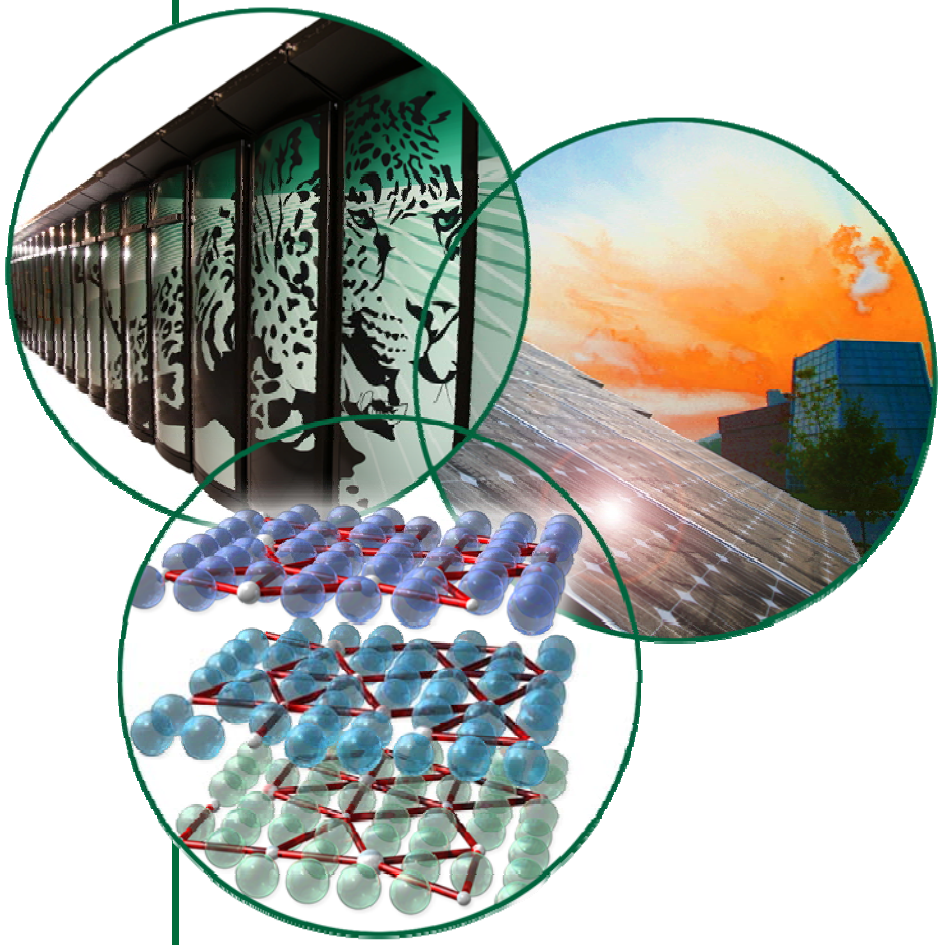
IDS-NF Phone Meeting
August 10, 2010



U.S. DEPARTMENT OF ENERGY

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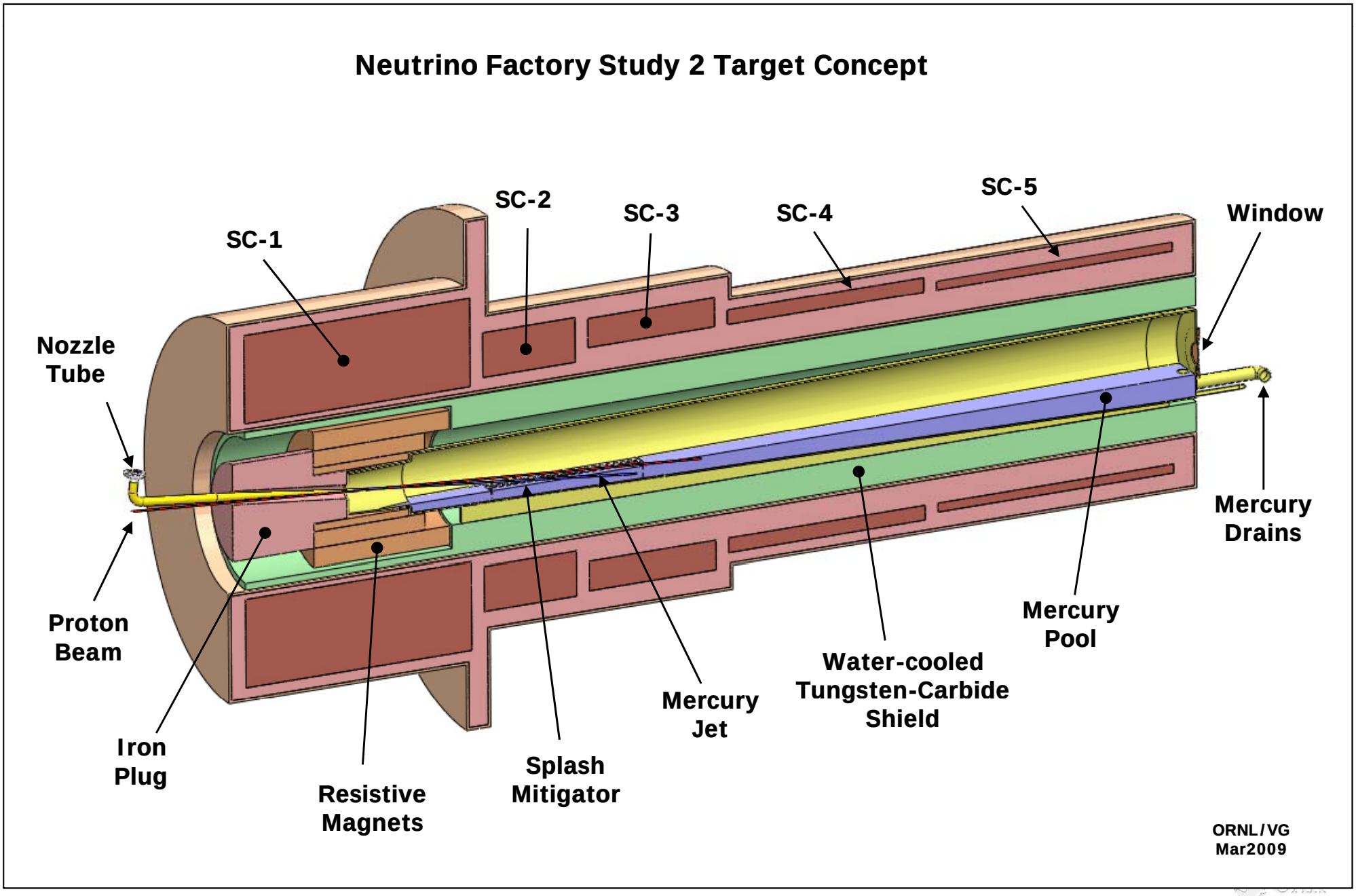
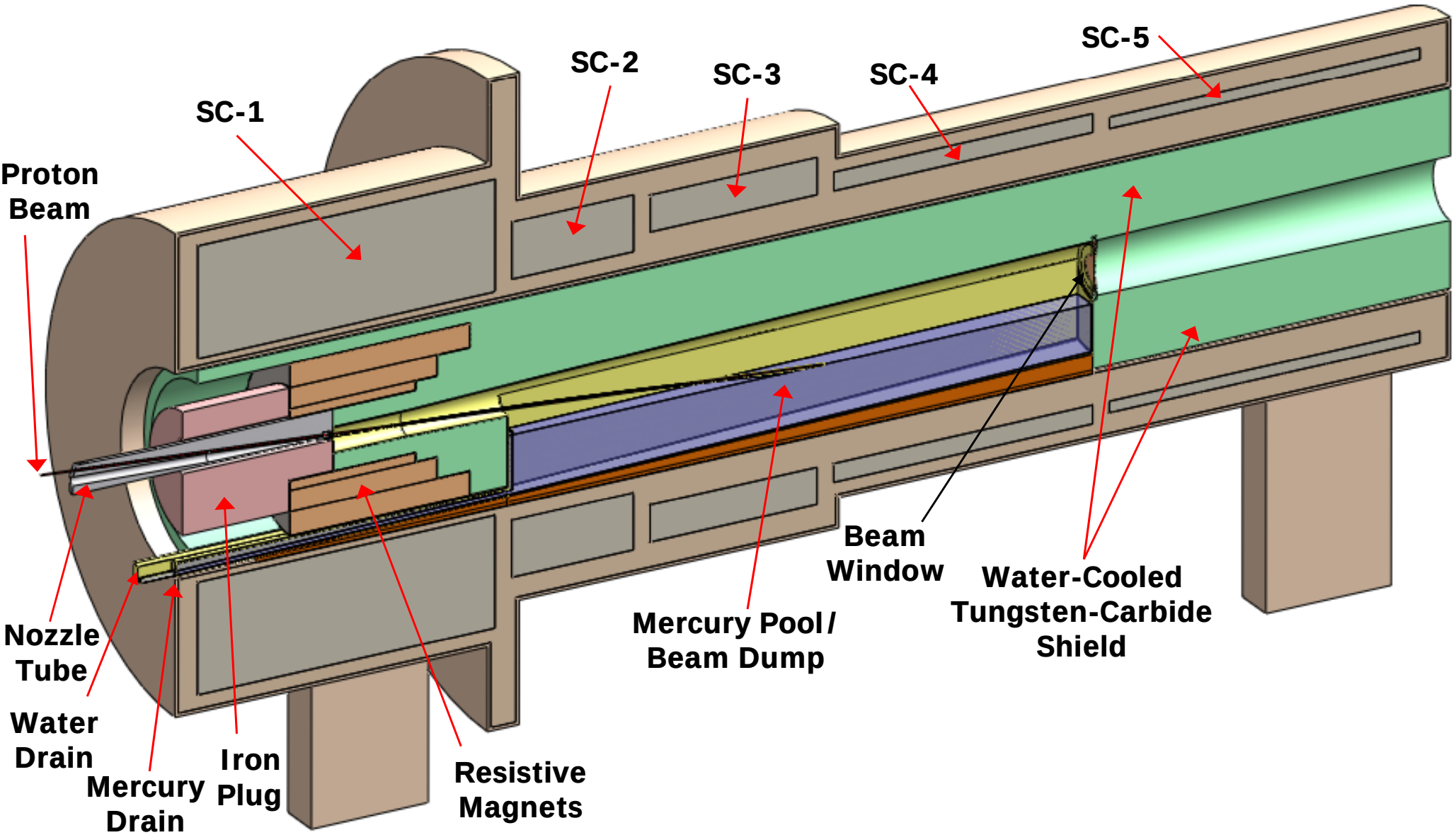
General Target Concept – Downstream Mercury Drain

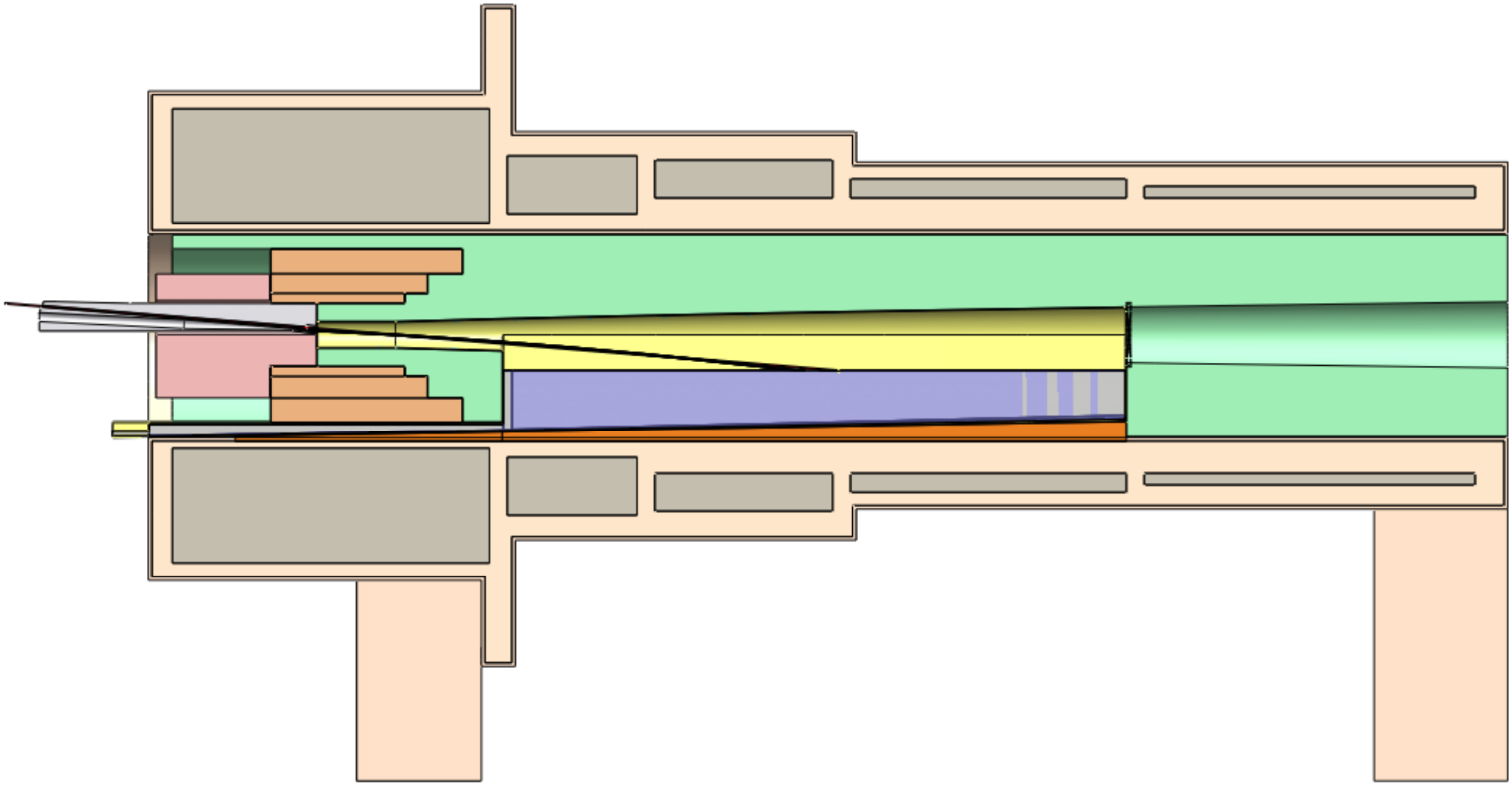


General Target Concept – Upstream Mercury Drain

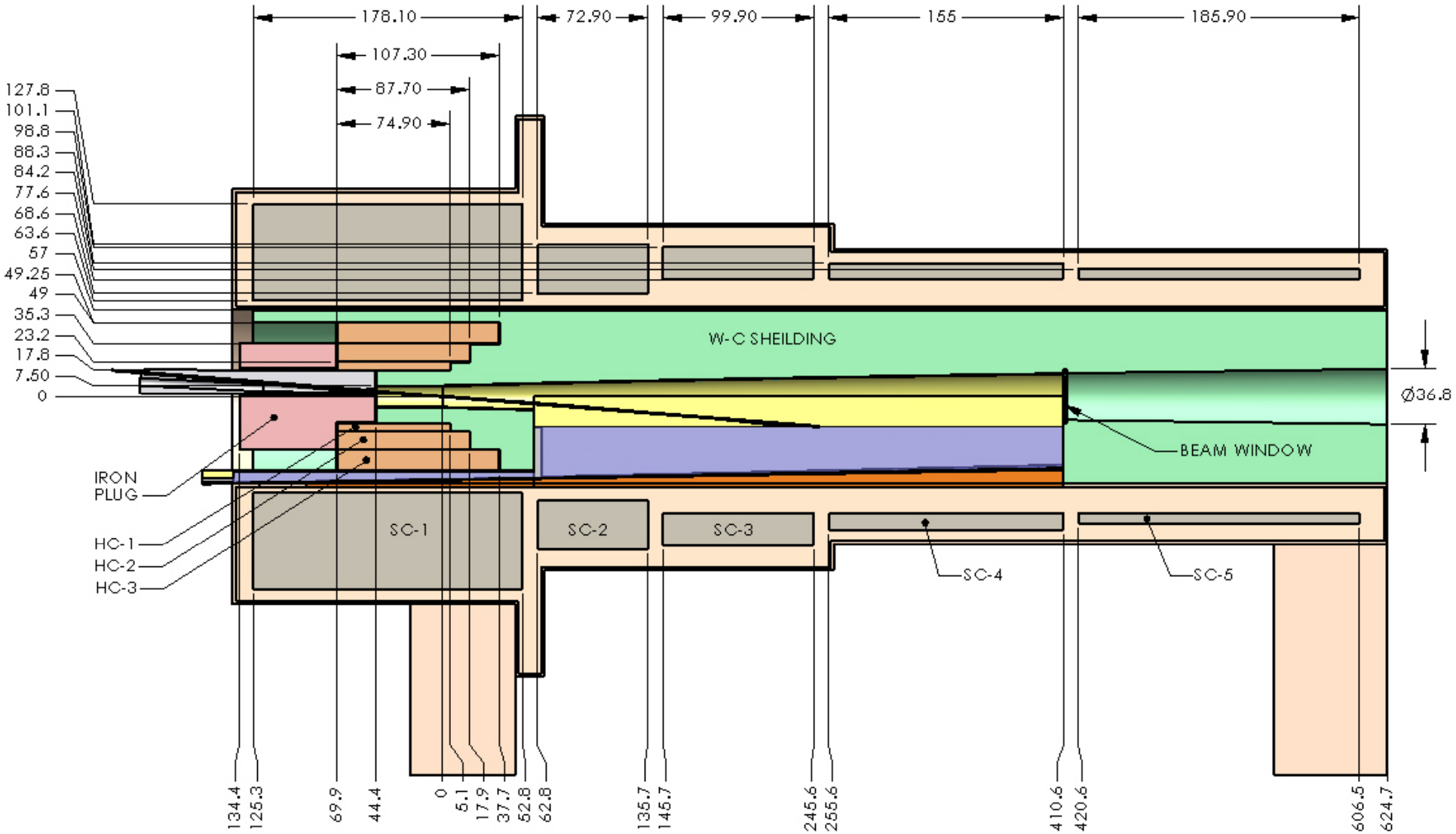


NF Cryostat with Tapered Shielding

- Taper matches capture field
- No shielding under mercury
- Mercury chamber trapped inside shielding



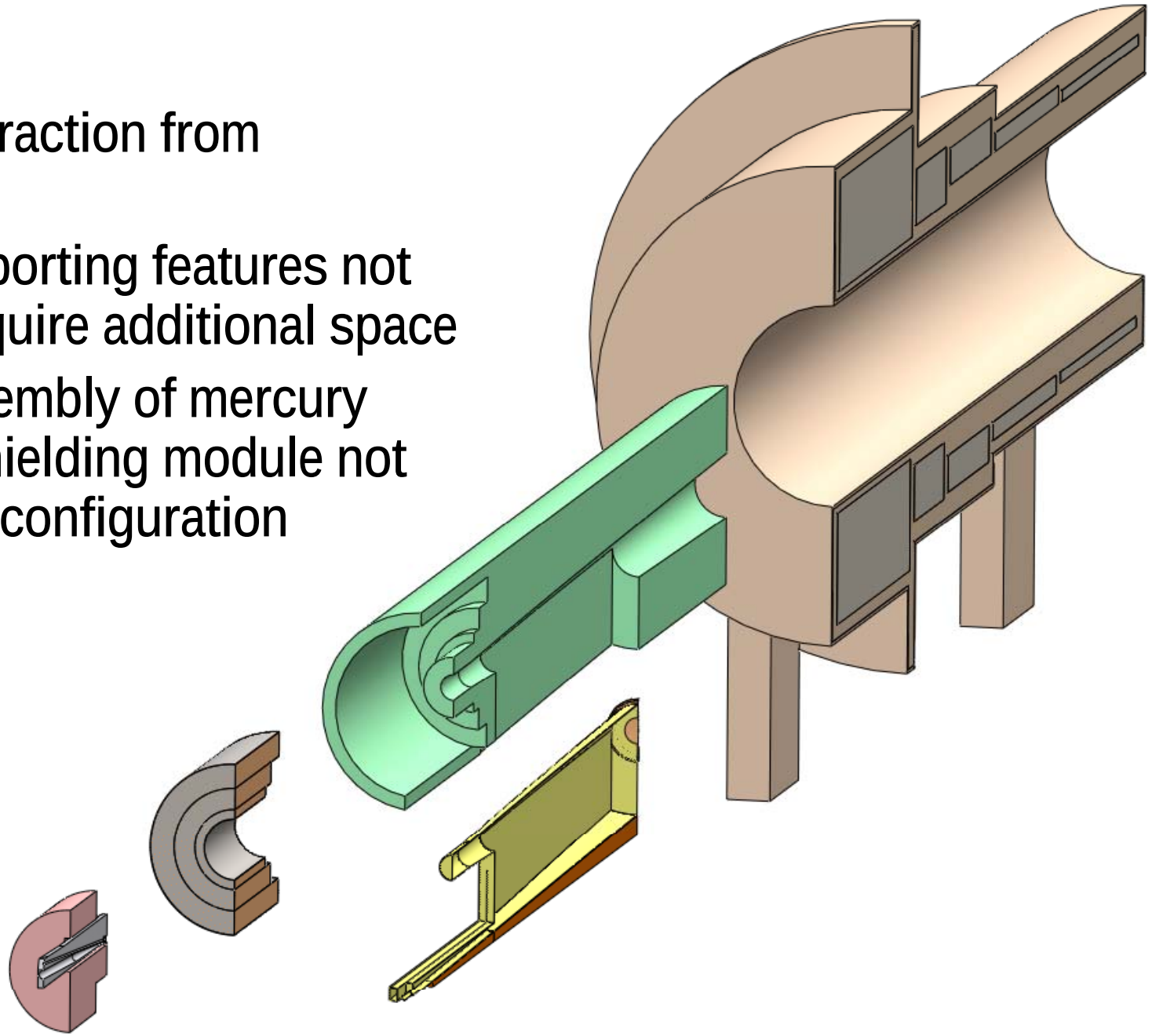
Tapered Shielding Concept Dimensions



Dimensions in cm

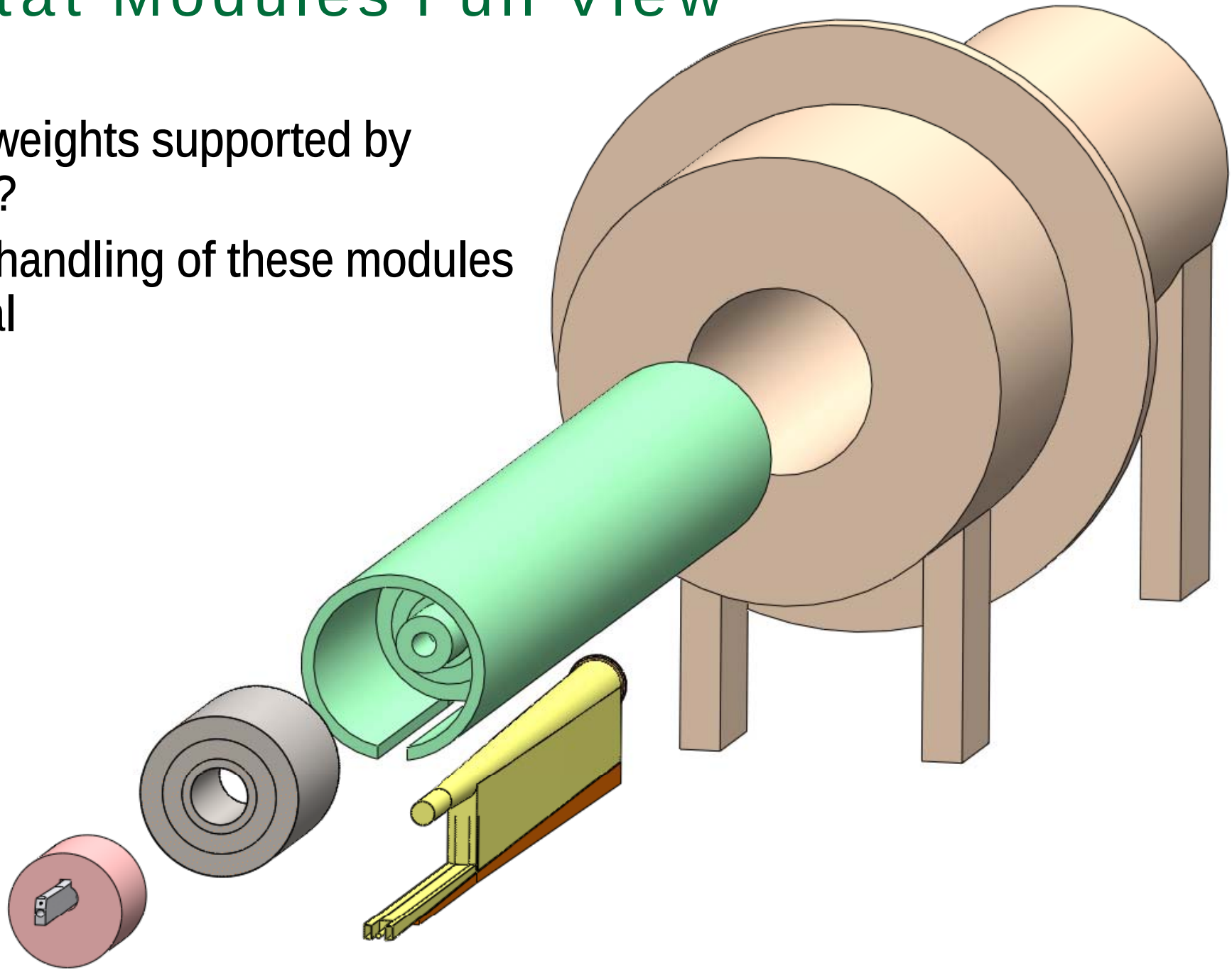
Cryostat Modules

- All insertion/extraction from upstream end
- Locating & supporting features not shown – will require additional space
- Mechanical assembly of mercury chamber and shielding module not possible in this configuration



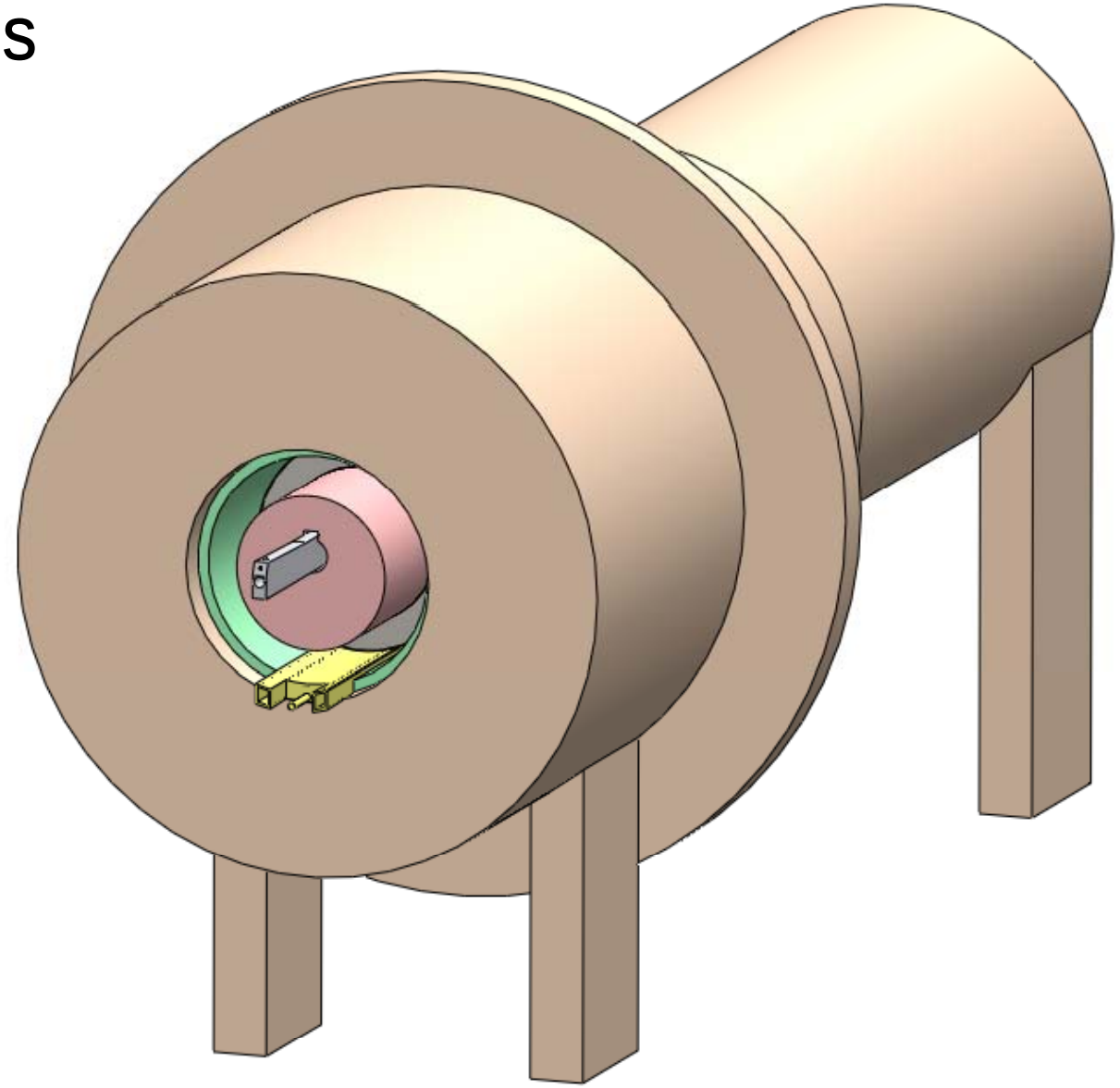
Cryostat Modules Full View

- Module weights supported by cryostat?
- Remote handling of these modules not trivial



Assembled Cryostat

- Resistive magnet leads & water cooling for these modules also enter from upstream



Some Questions as Design Progresses

- Can system perform without iron plug and/or resistive magnets?
  - Removal simplifies remote maintenance, provides more space for nozzle & beam dump.
- What does internal cryostat structure (weight support, magnet force restraints) look like, and how does it affect overall cryostat size?
- Are 5 SC magnets required in this cryostat?
  - Downstream beam window should be at end of cryostat for remote maintenance from downstream end.
- What shielding thickness is required to protect SC1?
  - This will ultimately drive cryostat bore diameter.

Summary & Reminders

- Current NF target design based on physics performance characteristics
- Further consideration shows it is an assembly of several subsystems, each with different design requirements and trade-offs
  - Several areas of engineering-related R&D, including heat removal, Hg flow, nozzle development, beam windows
- With Hg target (nor with any other target), hands-on maintenance cannot be assumed at any point in operation
  - Remote features must be incorporated into initial design
- Final system concept will result from an integrated design approach with input from several technical areas