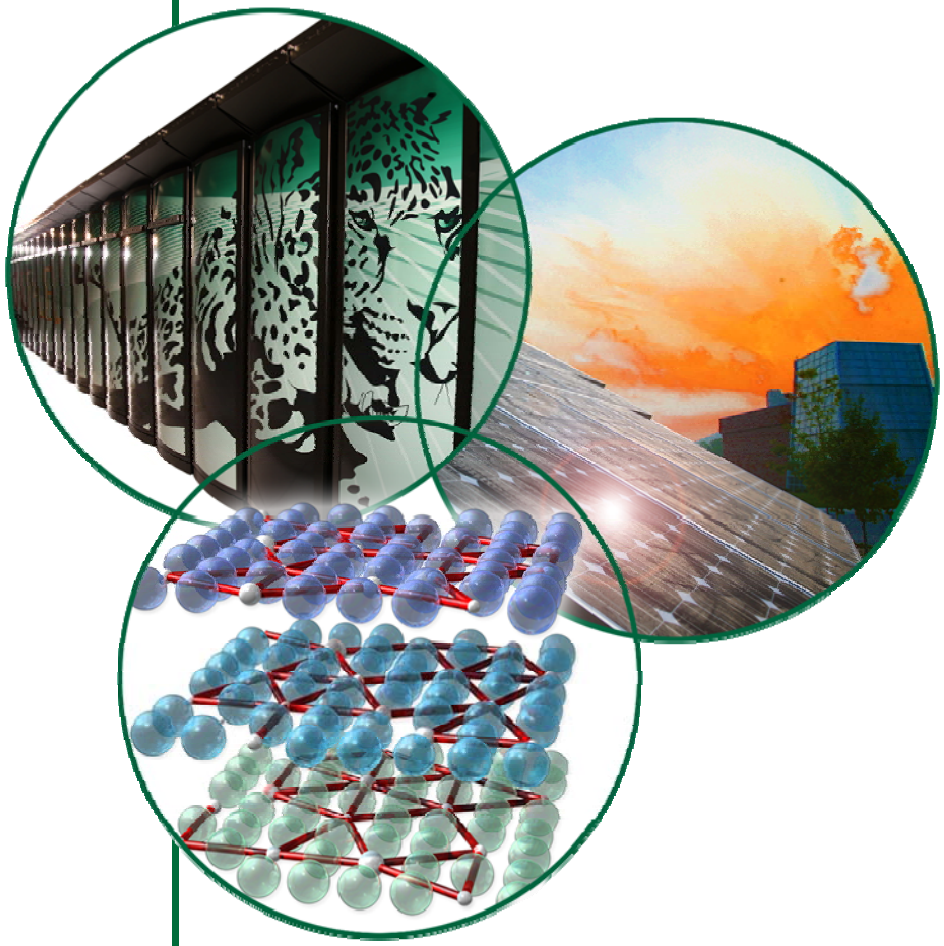
Review of Recent IDS120 Target Concepts

Van Graves

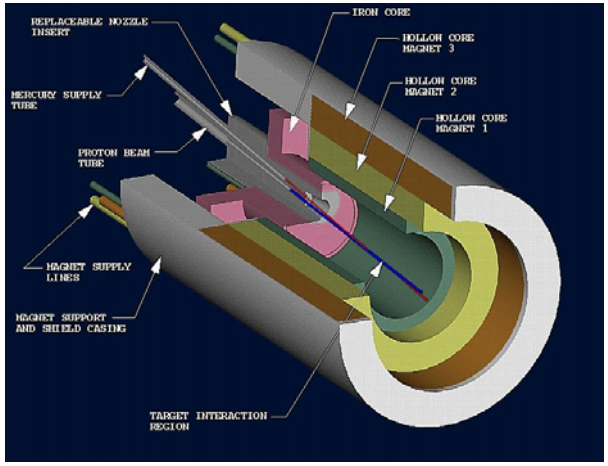


October 31, 2013

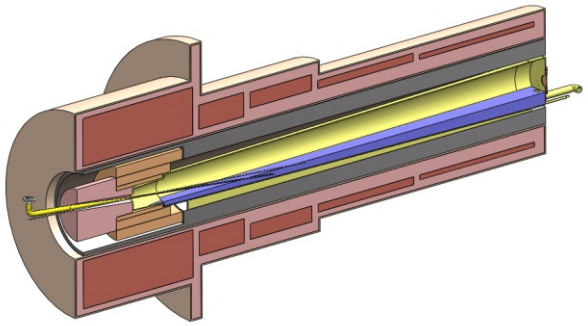
U.S. DEPARTMENT OF ENERGY

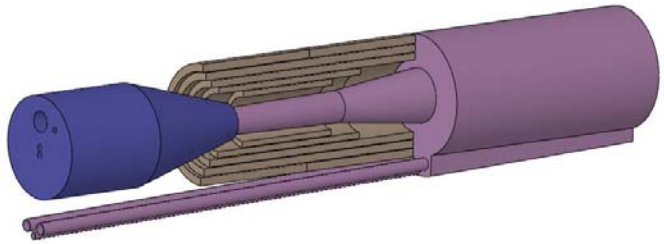
OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

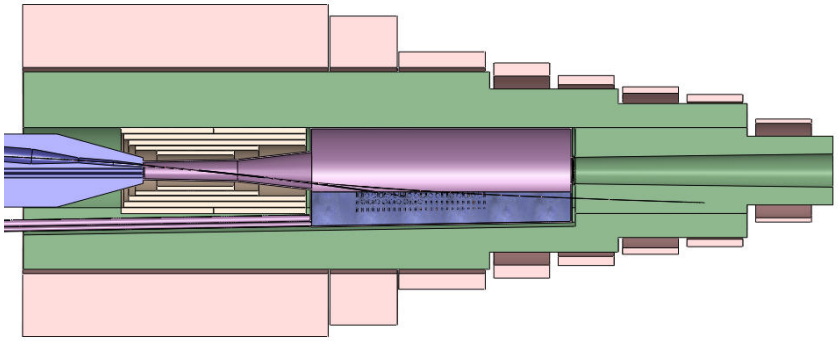
NF Target Concept Evolution (Abridged Version)



- Historical (Study 2) baseline: 20T (15+5) field
- MERIT Experiment: 15T solenoid but was proof-of-concept for 20T system
- MAP: re-started concept development using Study 2 as baseline
  - Early mercury vessel concept had upstream jet with downstream drain; later switched to upstream drain
- Subsequent efforts focused on realistic coil sizes, coil shielding, coil configurations
- Mercury vessel refinement revealed geometric complexities needed to integrate with resistive coils

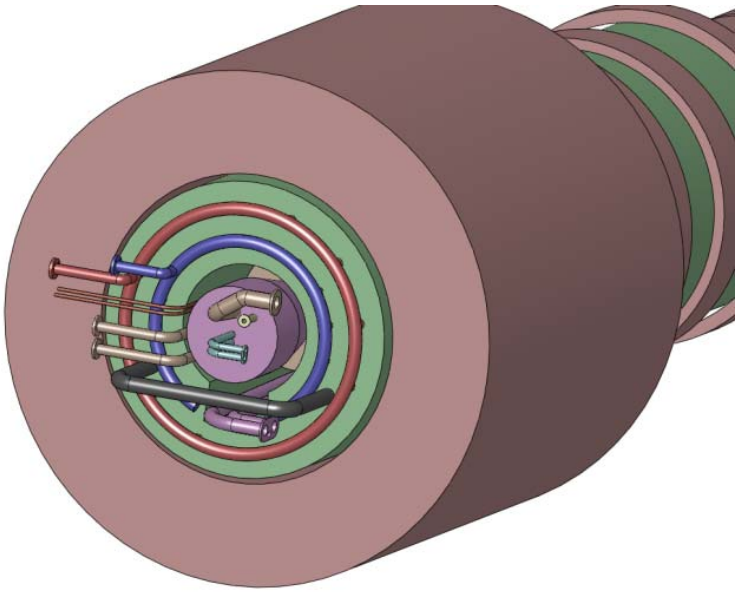


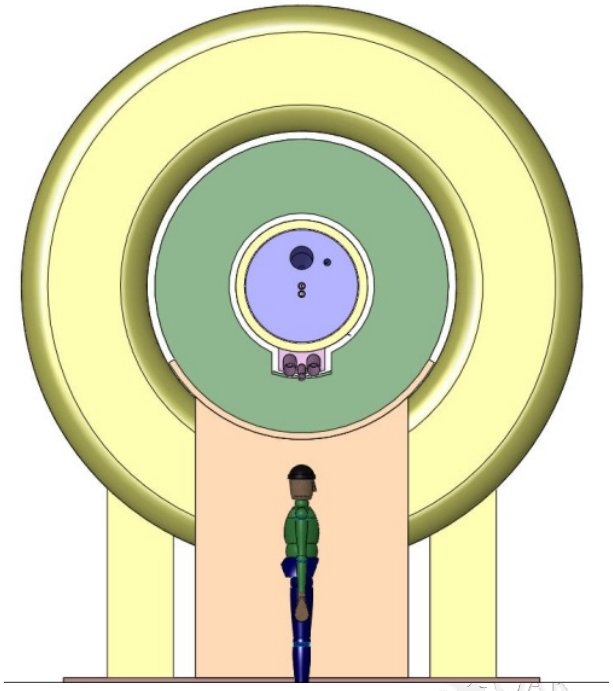




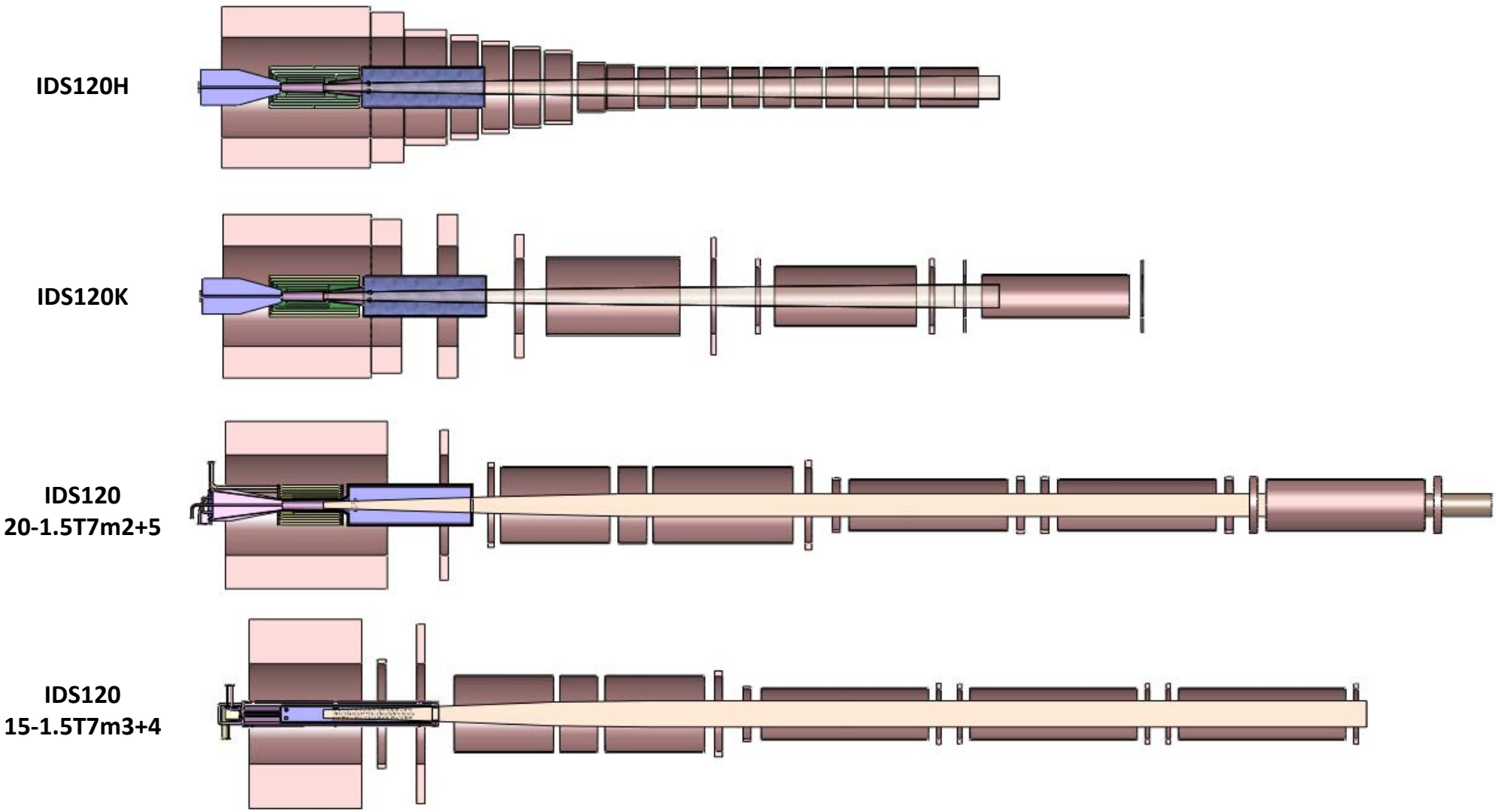
Concept Evolution (cont'd)

- Started considering utility & facility requirements
  - He cooling, splash mitigation, double Hg containment, RH, etc.
- Coil sizes continued to increased due to shielding issues until IDS120
  - Field profile work continued, which led to several coil configurations
  - IDS-NF continued with 20T baseline, MAP began seriously considering 15T
- Early 2013
  - Latest concept models developed for 15T- and 20T-cases in support of IPAC'13 papers
    - Field tapers to 1.5T over 7m rather than 15m
    - Cryostat breaks considered length of mercury module
    - IDS120_15-1.5T7m3+4 (MAP)
    - IDS120_20-1.5T7m2+5 (IDS-NF)



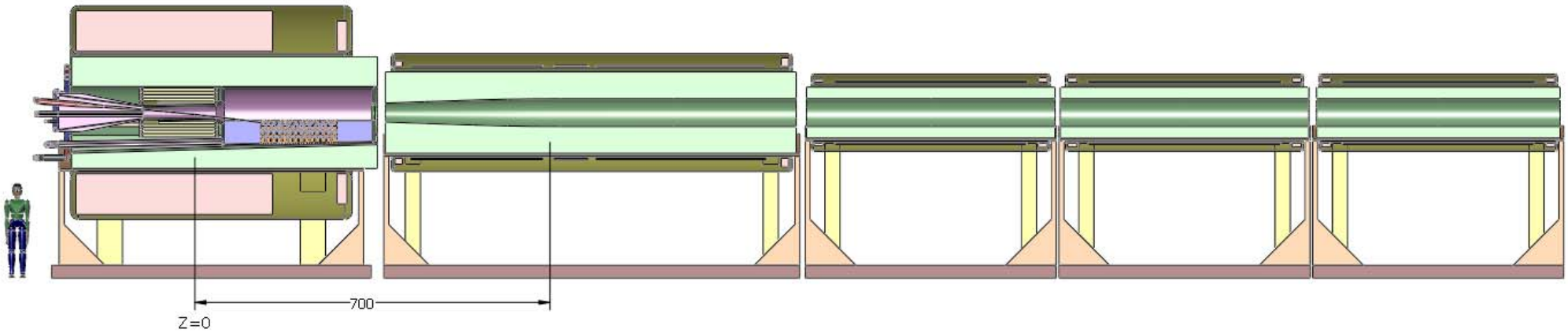


IDS120 Coil Comparison - Sections

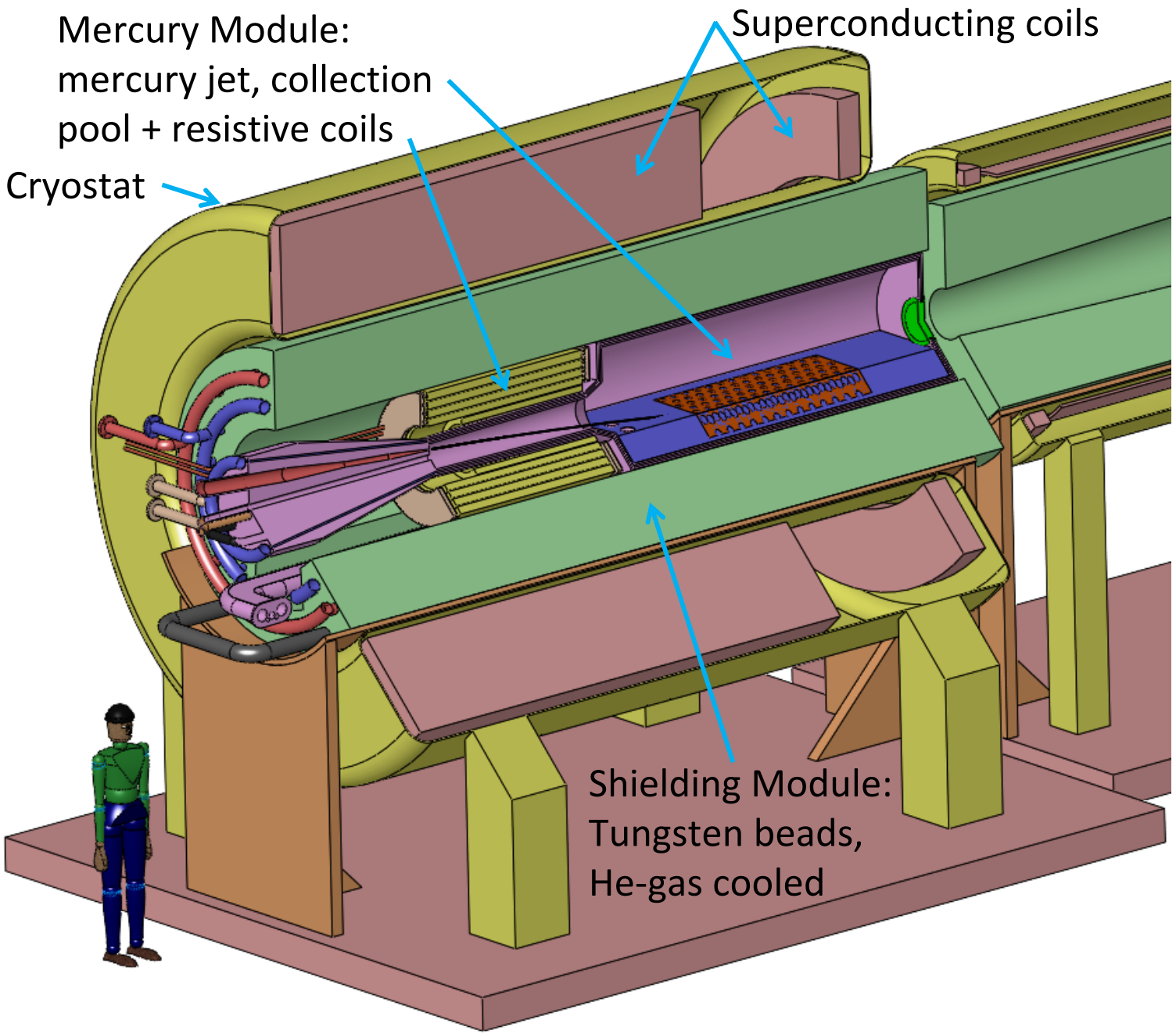


Latest 20T CAD Concept (IDS120_20-1.5T7m2+5)

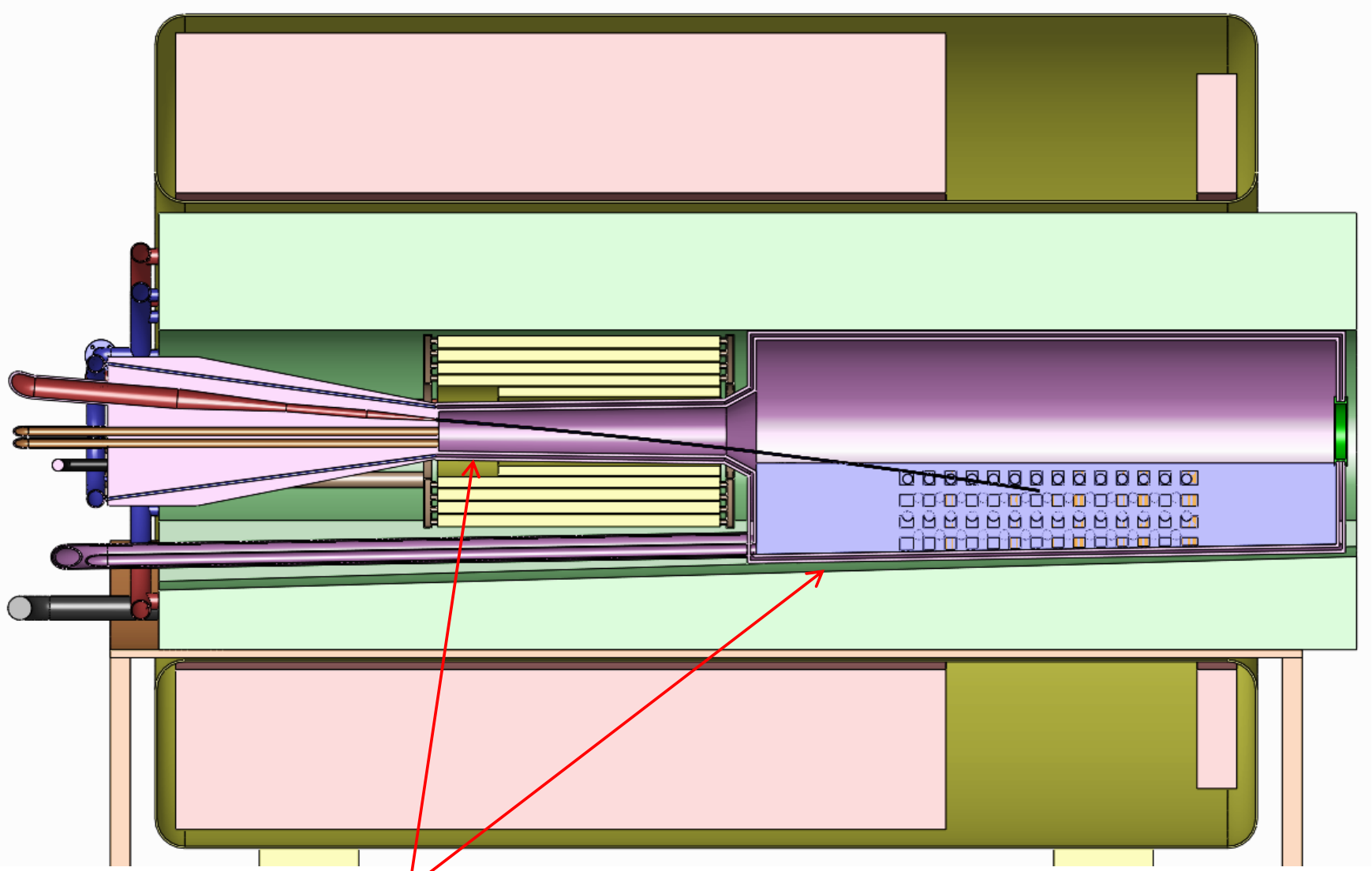
IDS120_20-1.5T7m2+5 Front Section



IDS120_20-1.5T7m2+5 Cryo 1 Iso



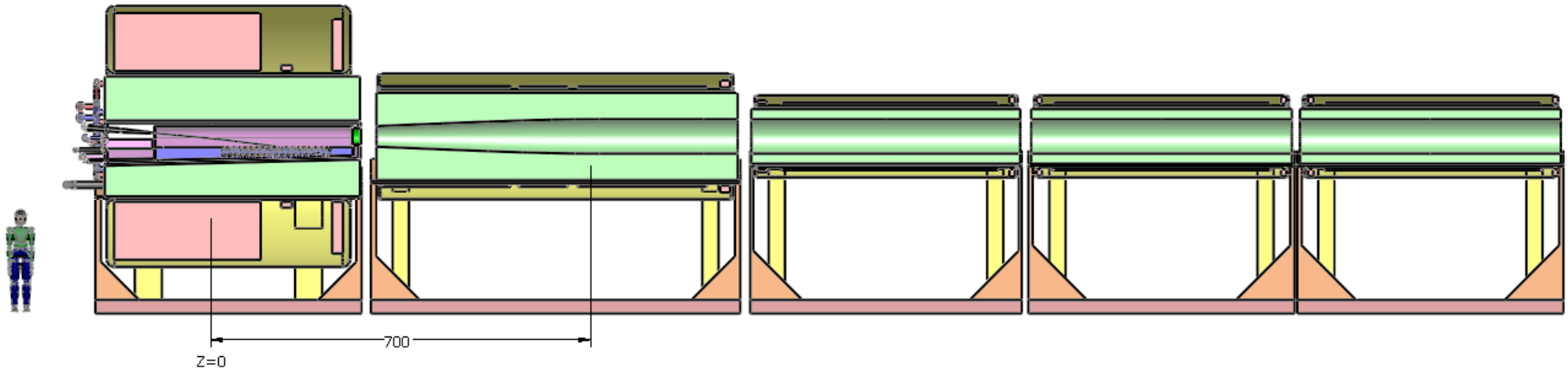
IDS120_20-1.5T7m2+5 Cryo 1 CloseUp



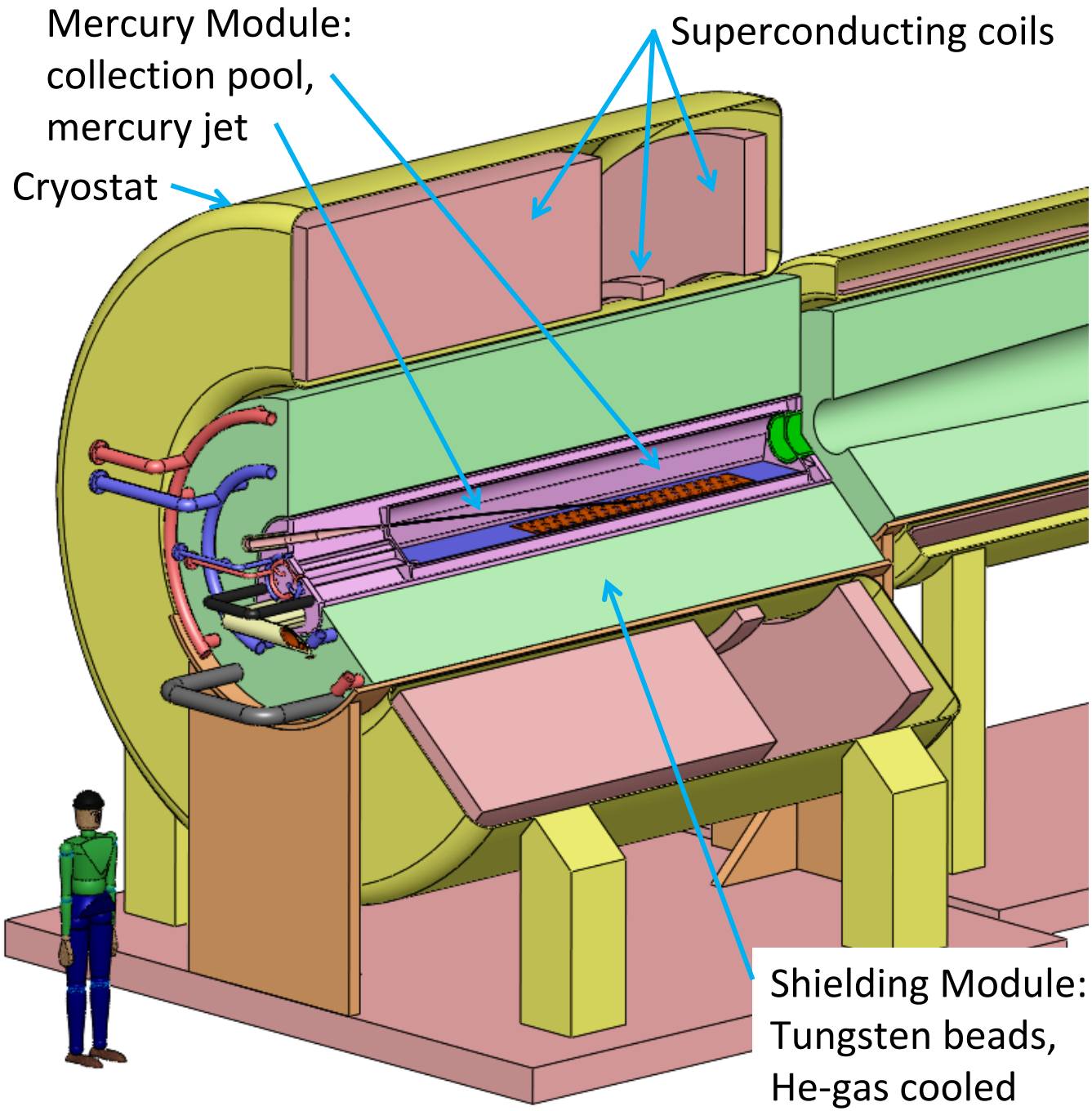
Incorporates concept for double wall mercury containment

Latest 15T CAD Concept (IDS120_15-1.5T7m3+4)

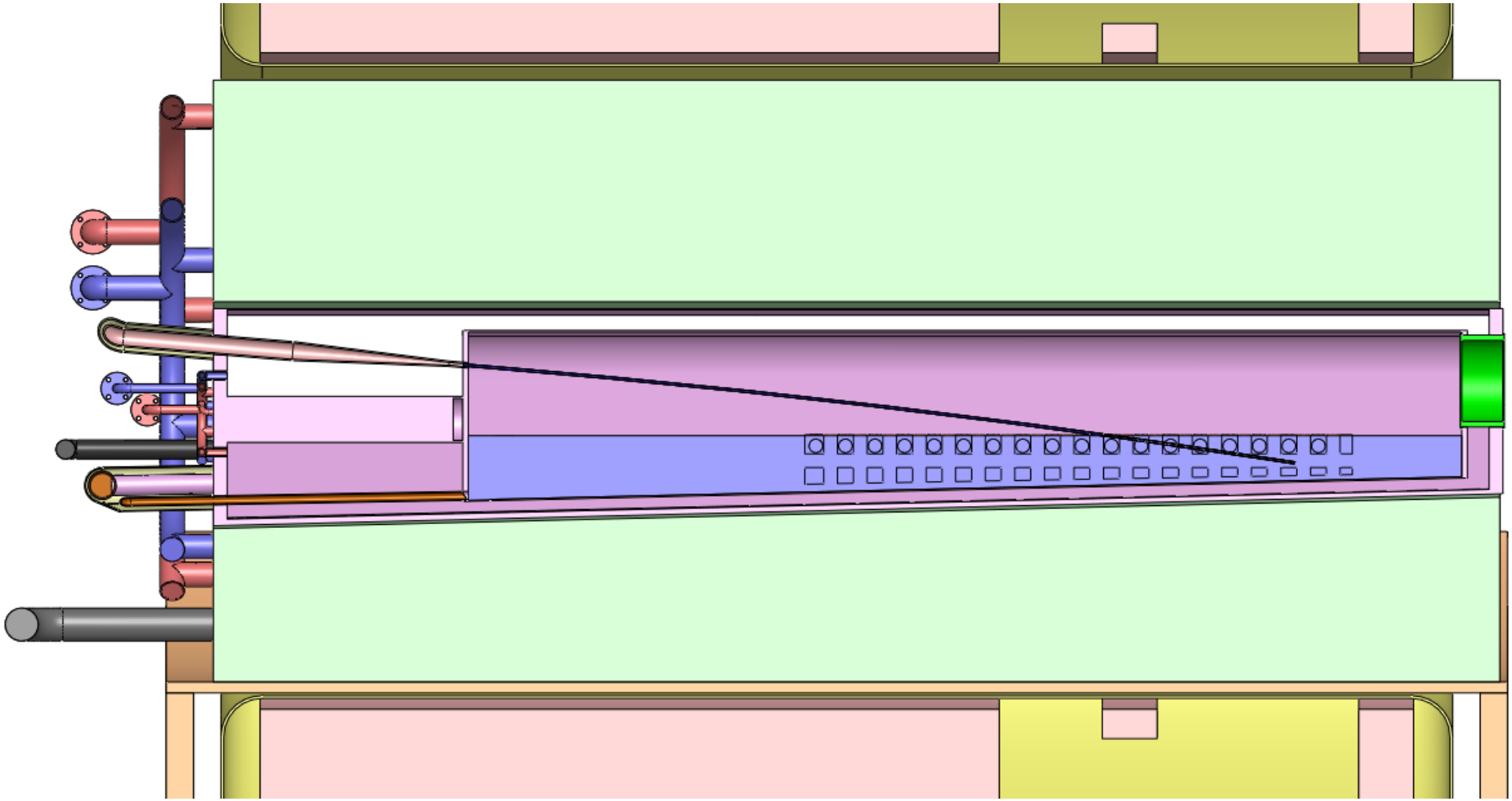
IDS120_15-1.5T7m3+4 Front Section



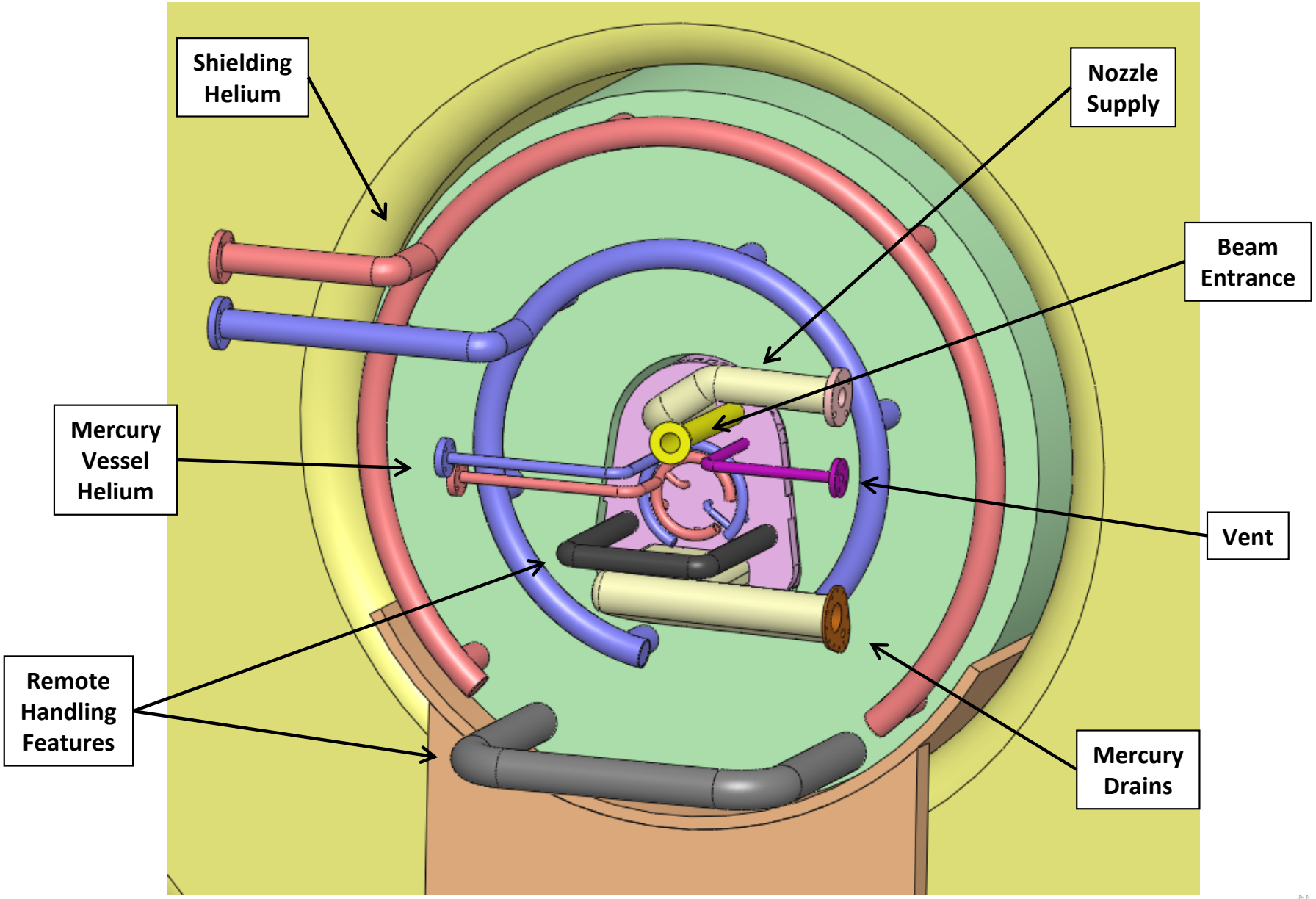
IDS120_15-1.5T7m3+4 Cryo1



IDS120_15-1.5T7m3+4 Target Module Section

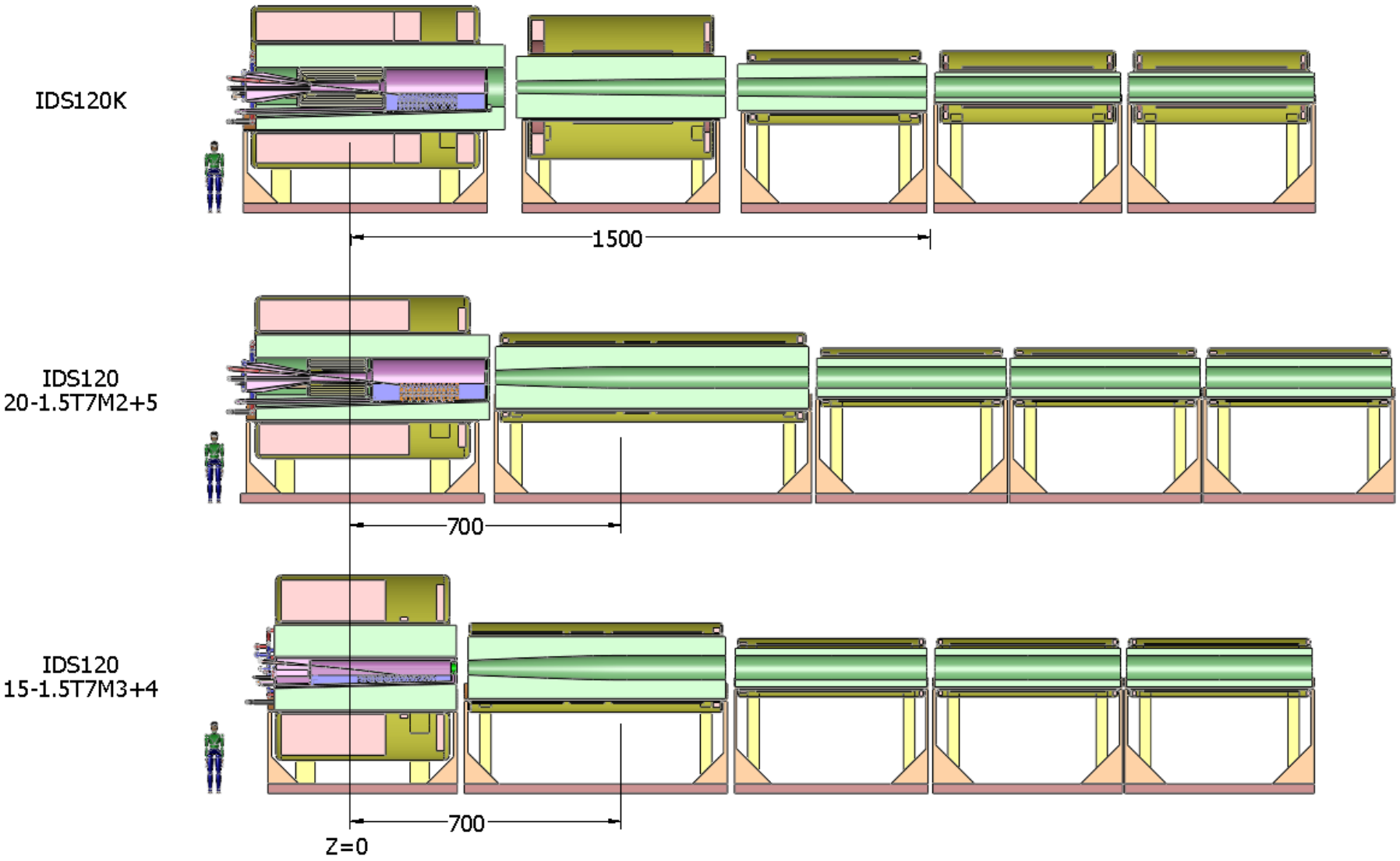


IDS120_15-1.5T7m3+4 Utility Connections

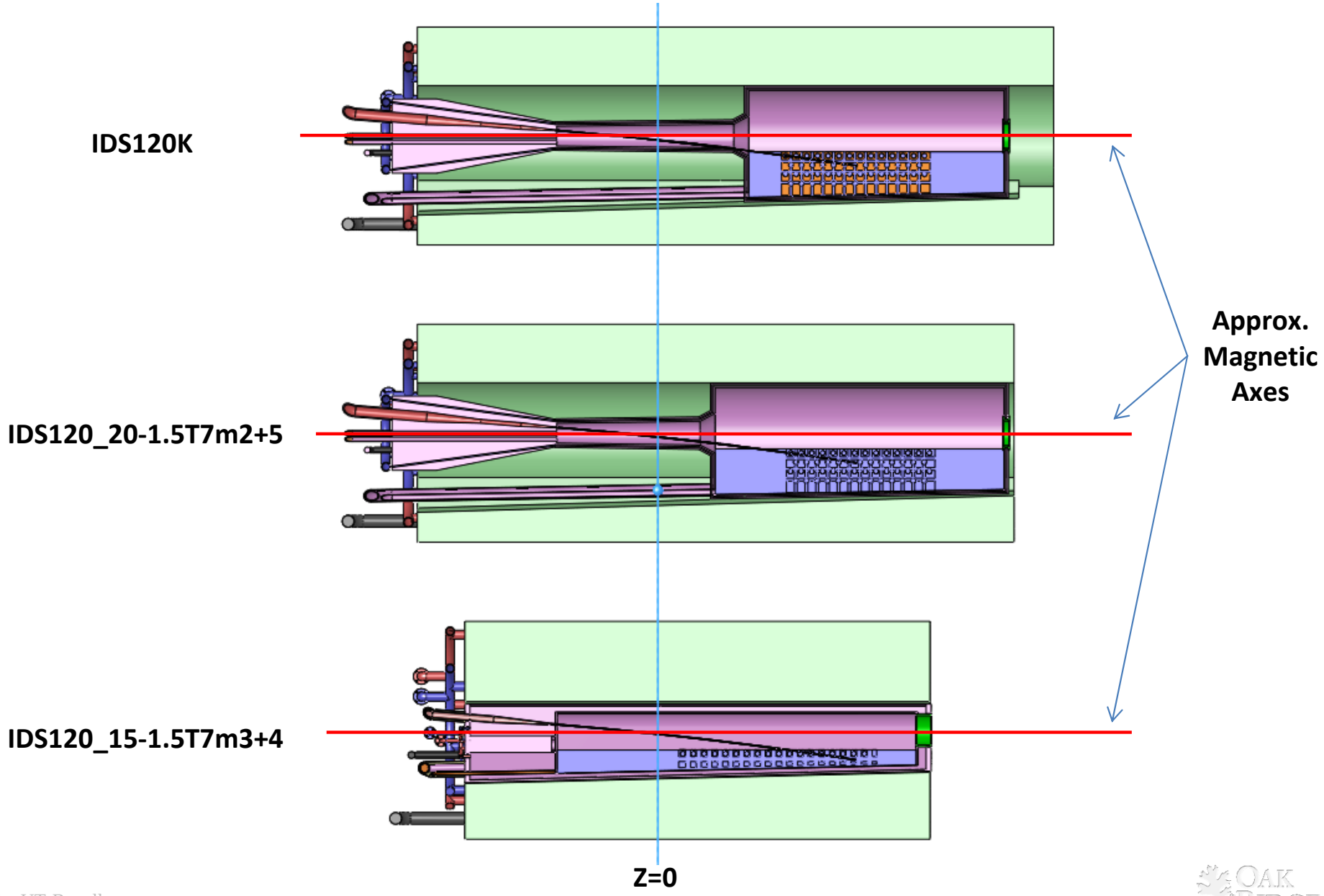


20T-15T Comparisons

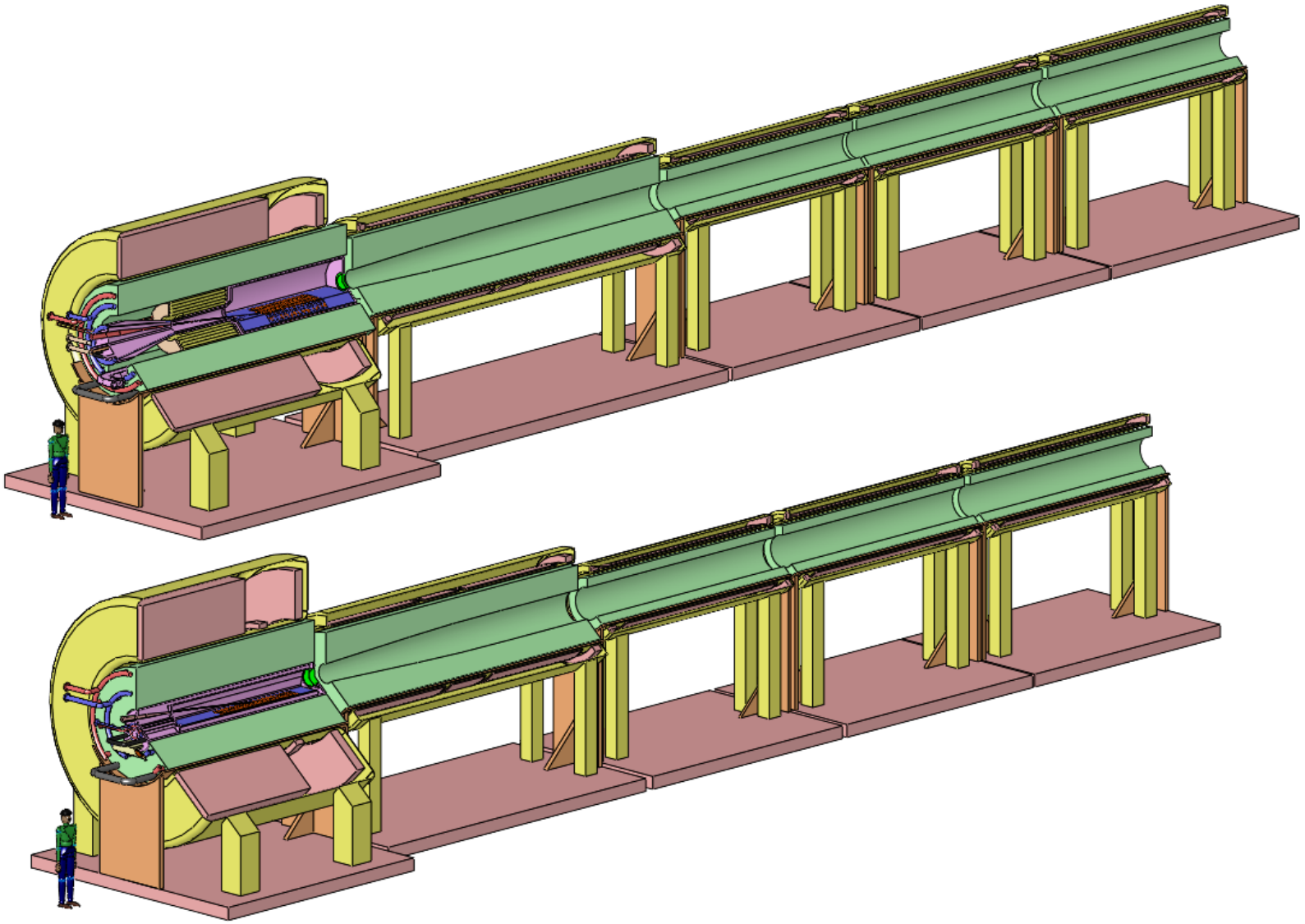
Field Taper Comparison



Vessel Comparison

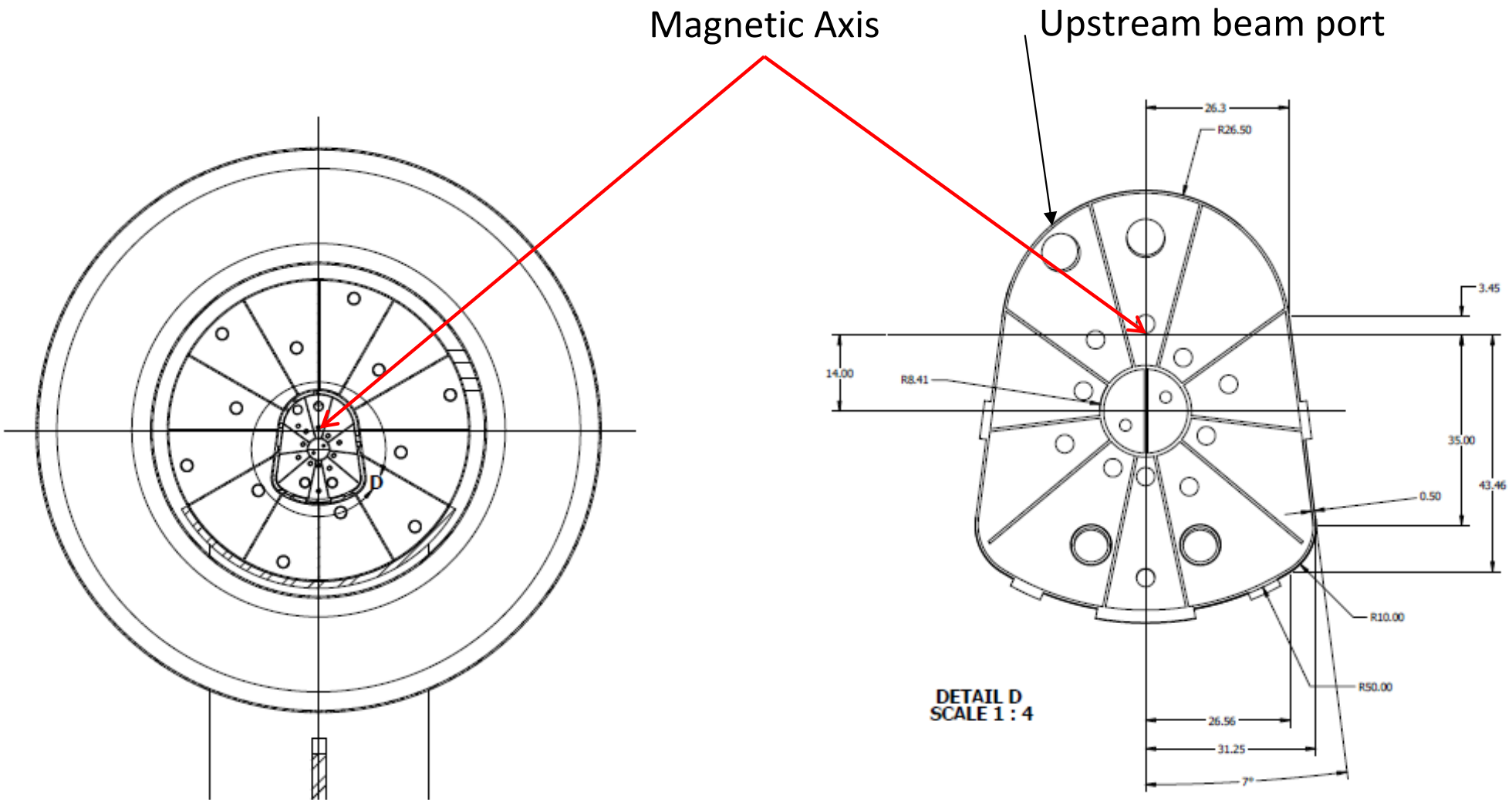


System Comparison



Mercury Module

IDS120J Mercury Module is Still Current



View from downstream

Current Mercury Module Description

- Modular design for remote handling
- Provisions for beam entry, Hg entry/exit, Hg draining, He entry/exit, chamber venting
- Double wall Hg containment
- Double wall Be window
- Horizontal top, sloped bottom (for draining)
- Interstitial space radially sectioned for He down-and-back cooling path