"Modular Solenoid with Assisted Pinch"

by

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Presented at the
ARIES-IFE Meeting

Atlanta, Georgia

September 4, 2003

The Modular Approach is an extension of past VNL & ARIES work

- Technical credibility of final transport is a key VNL focus
  - Simulations (LSP) meet target focal spot requirement for ballistic neutralized transport
  - NTX experiments confirm theoretical predictions
  - RPD demonstrates self-consistent target, chamber, and final beam transport design
- ARIES broad scoping complements VNL mainline work
  - Ballistic Neutralized Transport, together with Self-Pinch and Assisted Pinch, offer a wide range of possible chamber and driver options
  - PIC simulations significantly enhance the credibility of the pinched modes
  - Chamber and Baseline design activities for Assisted Pinch (chamber dynamics, insulator ports and final focus systems)

The Modular Approach is an extension of past VNL & ARIES work (continued)

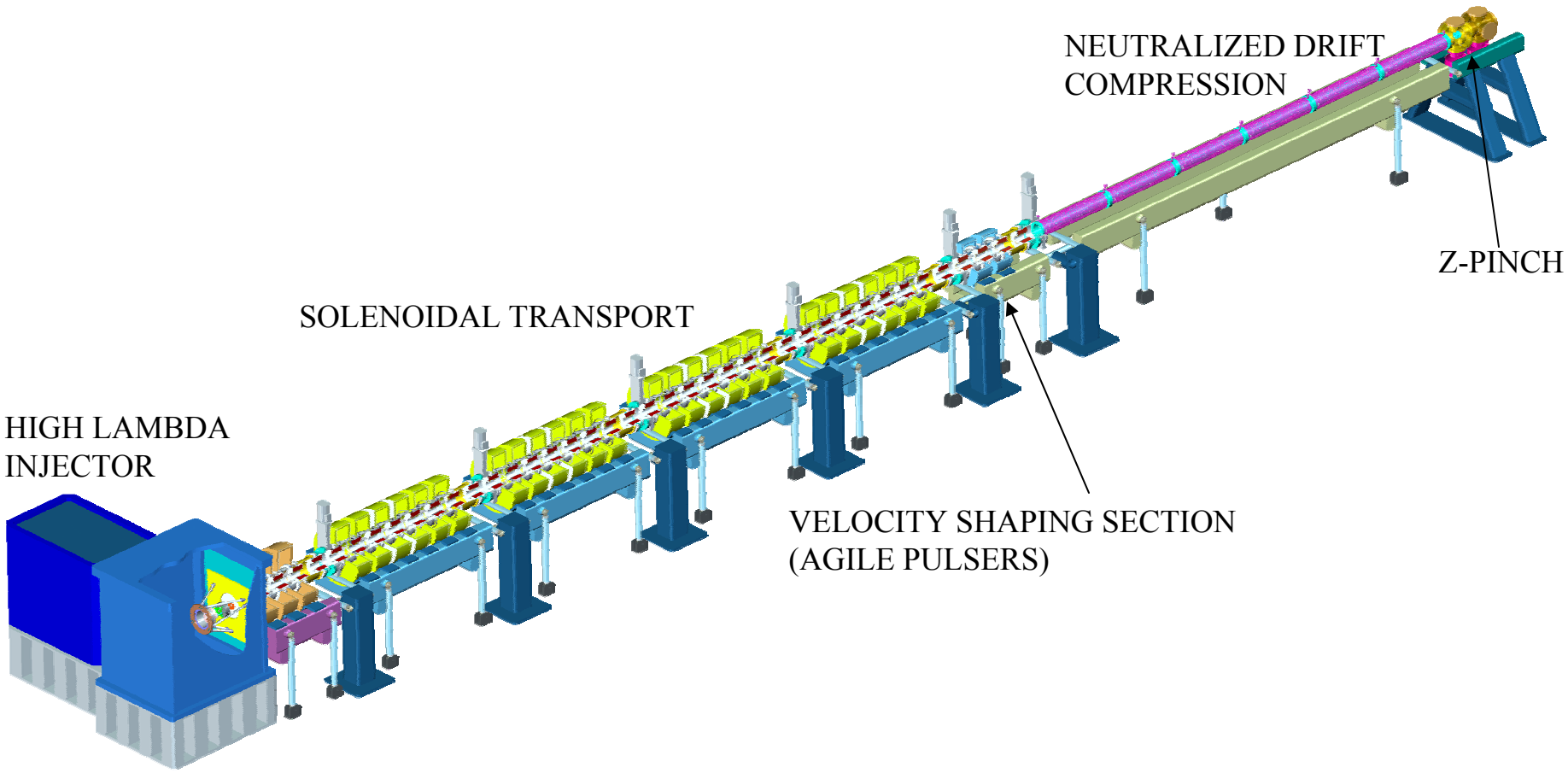
- The Modular Solenoid Approach (proposed by Logan, Lee and Briggs) provide a shorter development path to fusion power plants
- There are several ways for final transport in the modular approach. The requirement of the approach (high line density per beam) is a natural match to the Assisted Pinch Mode.

Hybrid Target	Solenoid/Neutralized Drift (NDC)	Assisted Pinch
• Pulse shape	Controlled by initial velocity shaping at entrance to NDC	Independent of beam current
• Range shortening	Beam at exit of NDC maintains initial velocity tilt	Can accommodate large energy variations
• Spot size (~5mm radius)	Driver optimized with high Q/M	Tighter focusing with high Q/M
• Spot size	Some stripping can occur in NDC	Insensitive to Z - variation
• Symmetry	Few beam driver	Anharmonic focusing in Z-pinch symmetrizes
• Shallow entrance angle	Nearly parallel beamlines	Beam merging in adiabatic lens

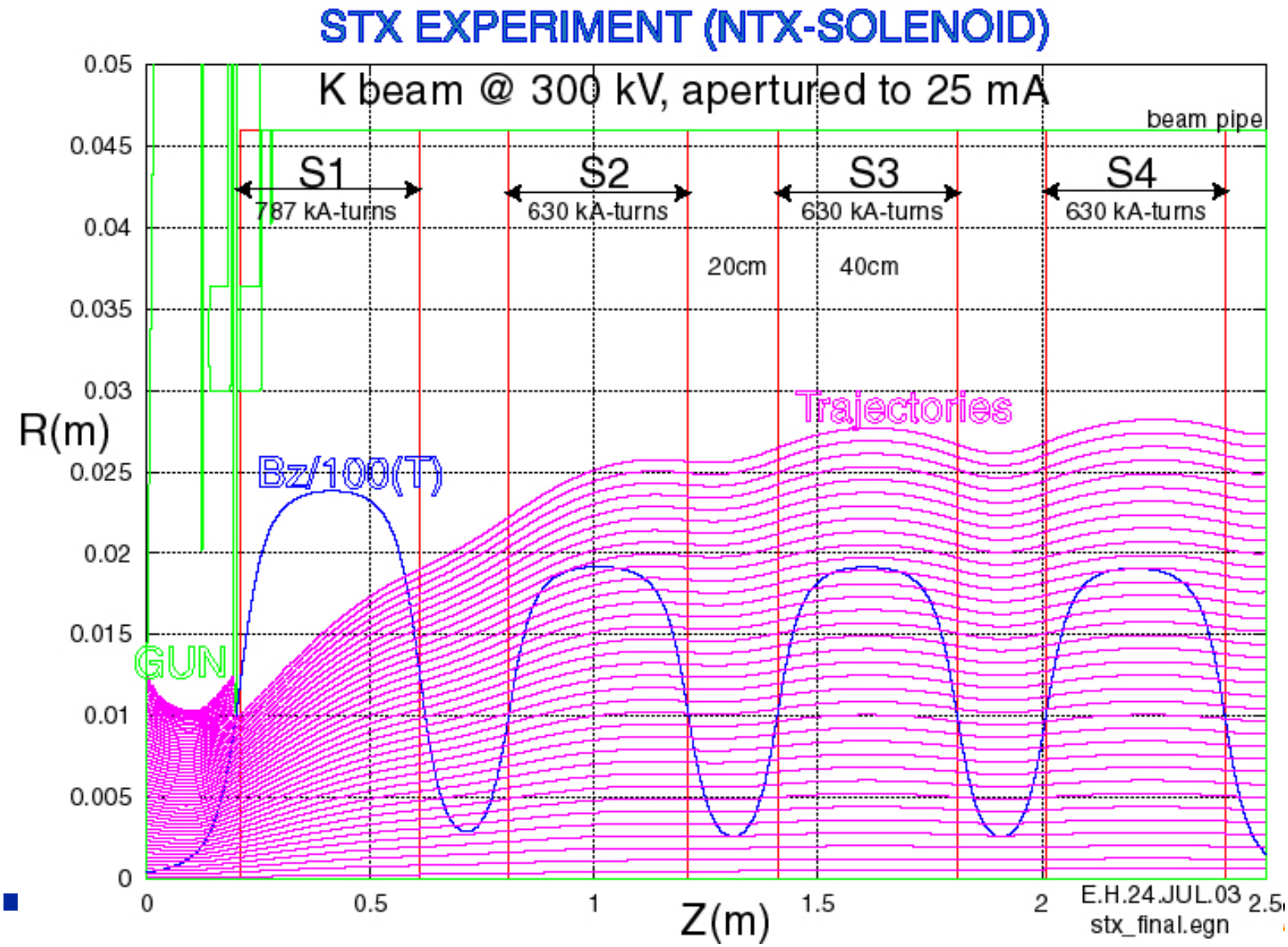
We are investigating the Modular Alternative

- Driver feasibility
- IBX - solenoid options
- Near-term experimental possibilities:
  - solenoid transport with pulsed magnets
  - High line-density injector (accel-decel)
  - Neutralized drift compression

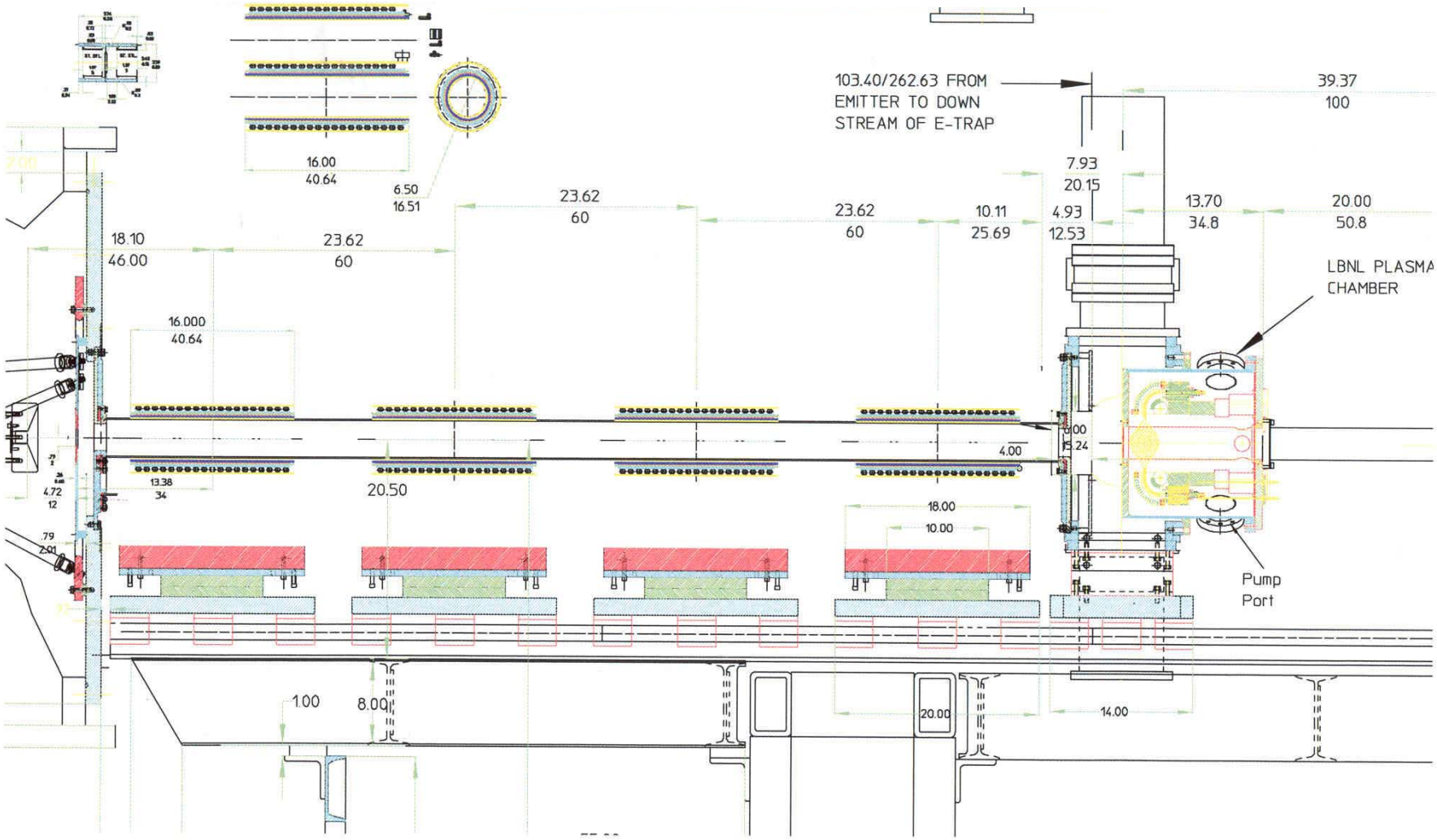
IBX-Solenoidal version



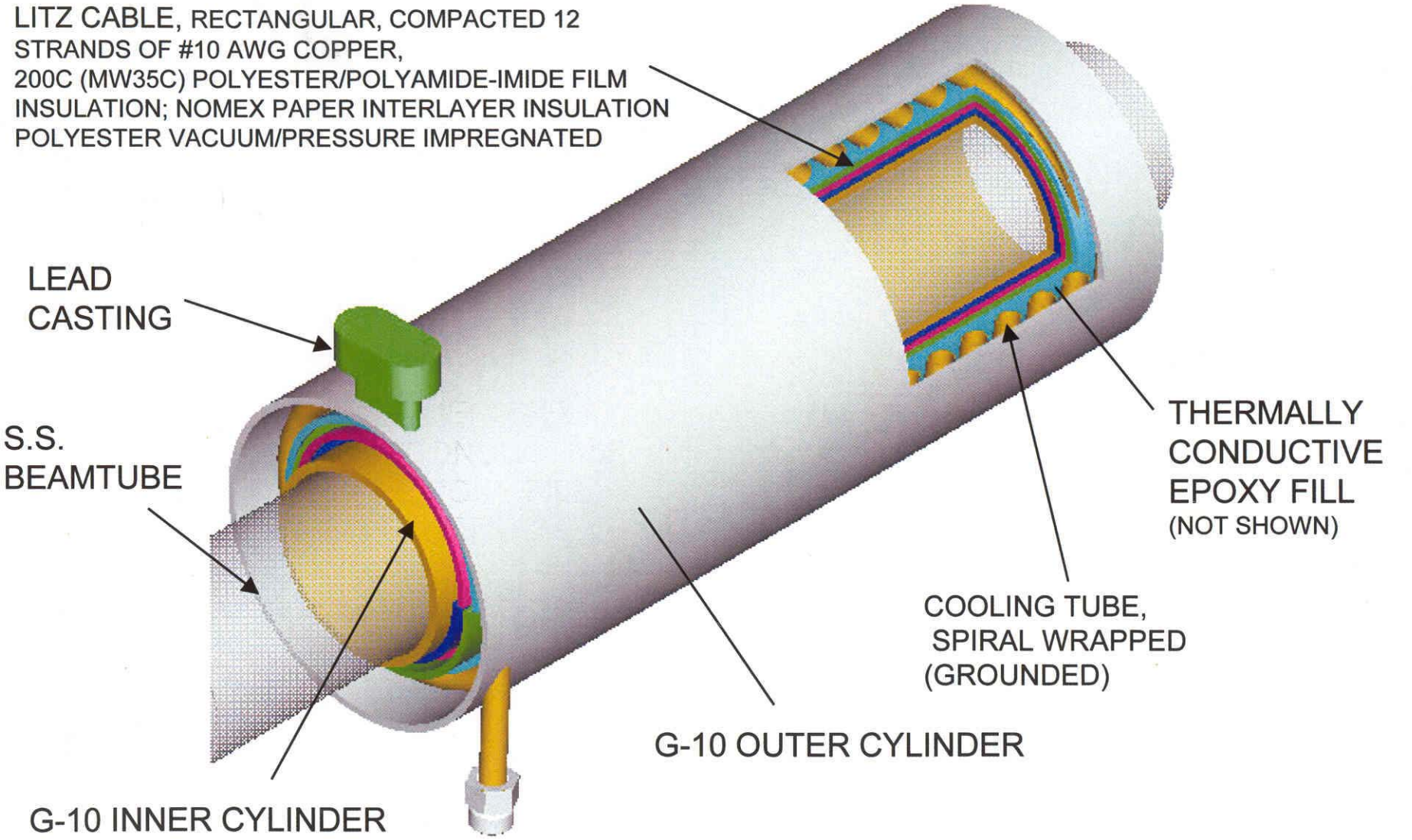
SOLENOIDAL TRANSPORT EXPERIMENT



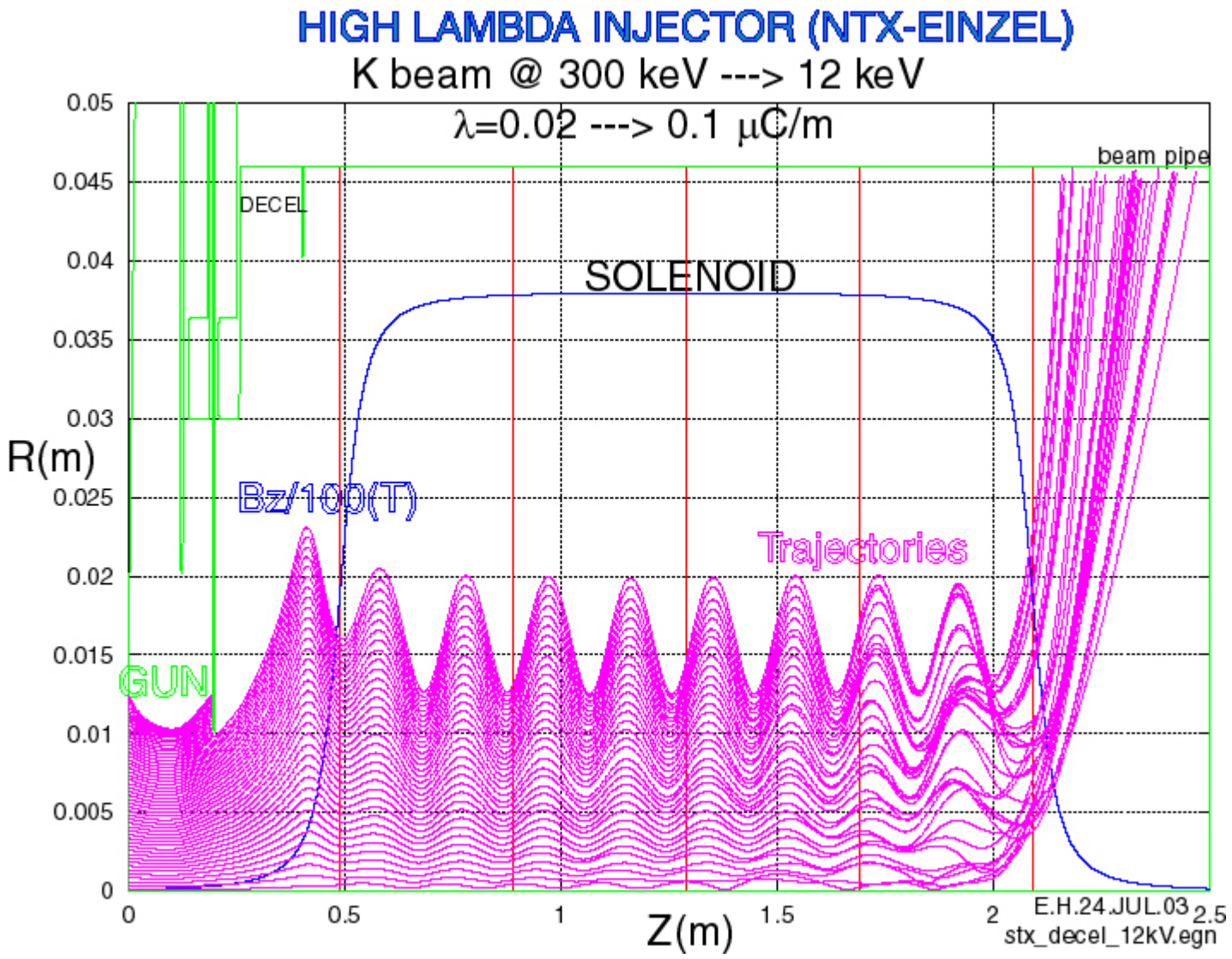
Solenoidal Transport Experiment Layout



NTX 4 Layer Pulsed Solenoid Design



HIGH LAMBDA INJECTOR



VNL collaboration with the ARIES team, over the past three years, has been a very beneficial and pleasurable experience.