IDS-NF Target Studies

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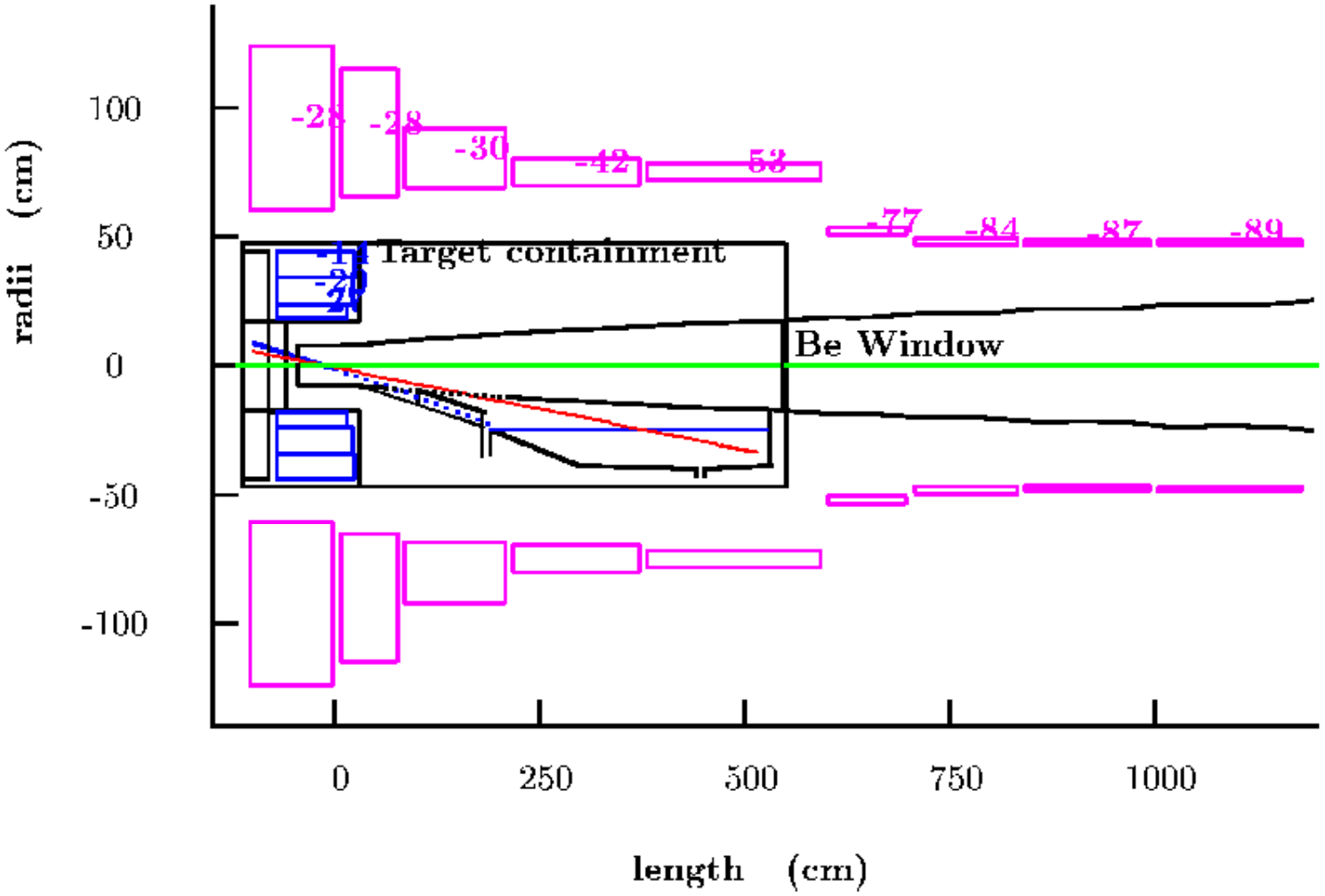
July 8, 2009

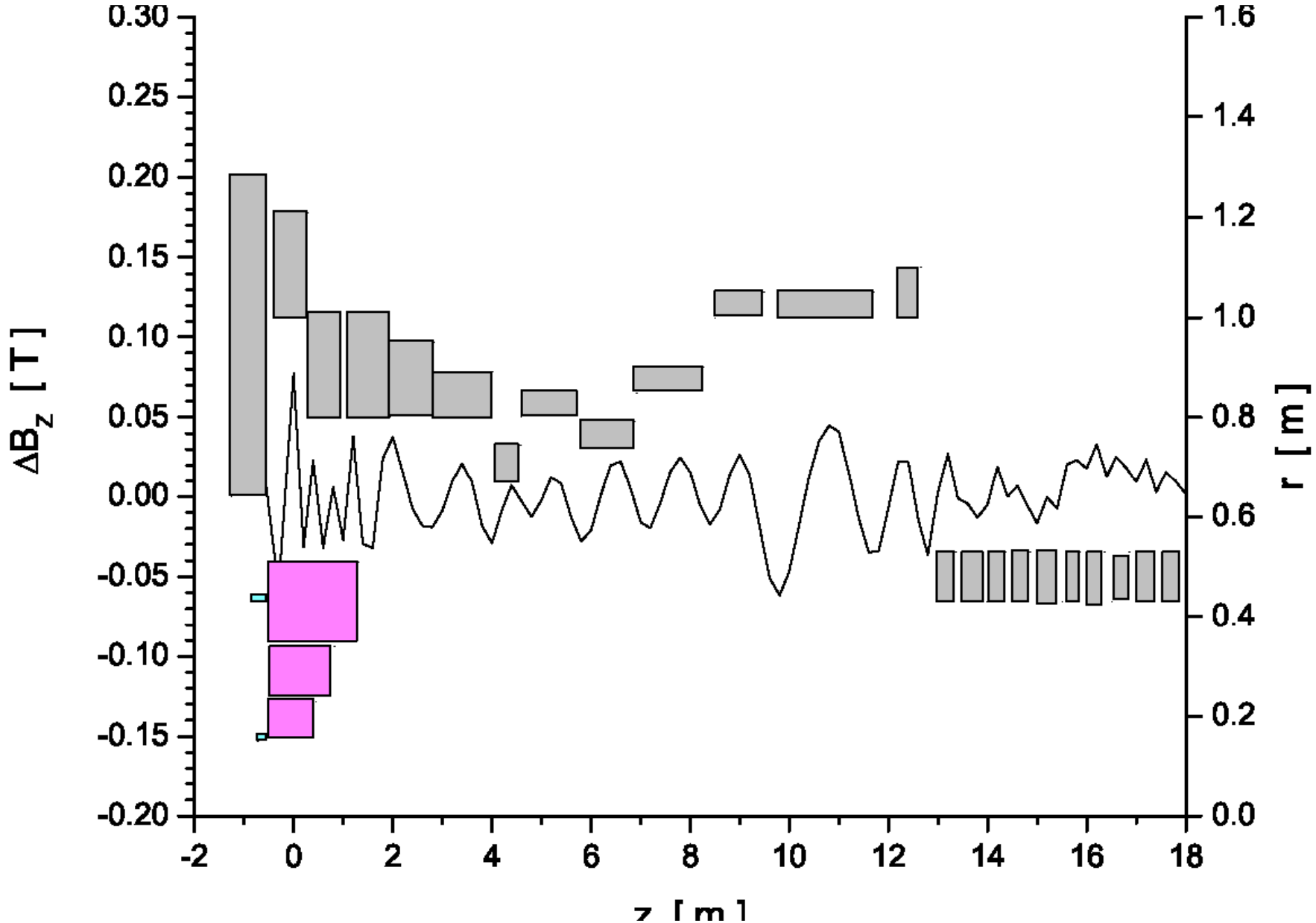
Target Studies Progress

- Study2 vs Study2a Field Taper Analysis
- MARS15 Meson Production Analysis
- Target Cryostat Engineering

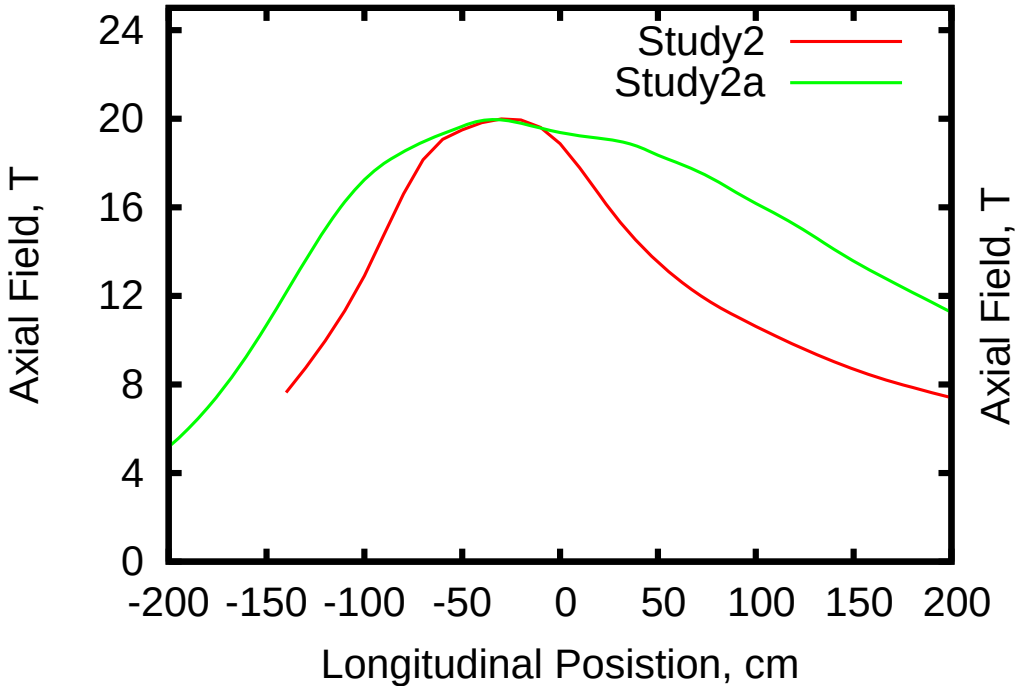
The Study2 Solenoid Layout

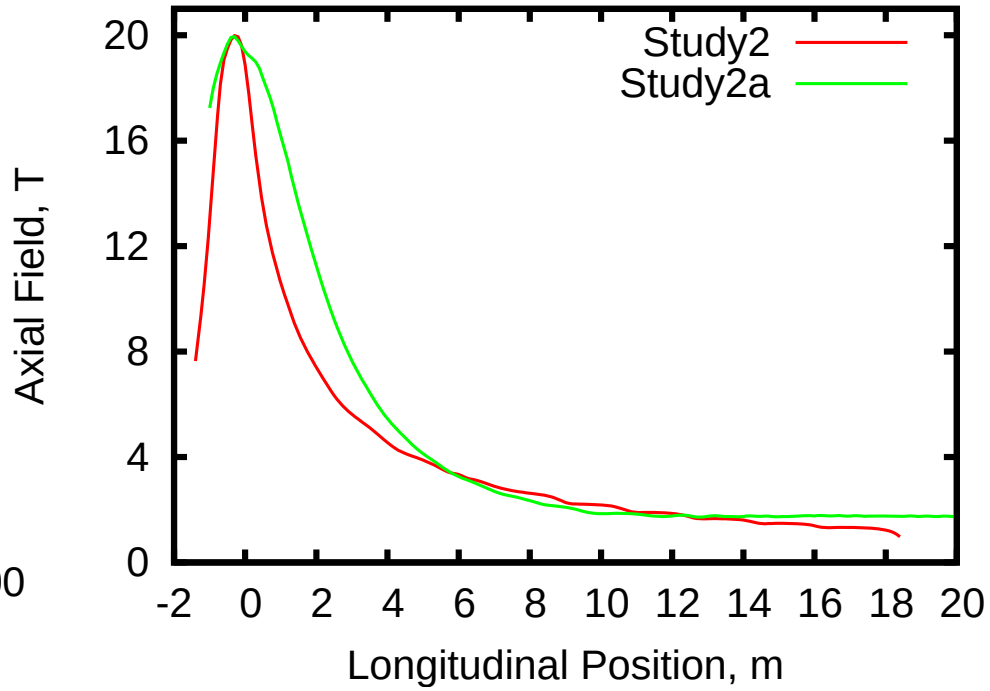


The Study2a Solenoid Layout



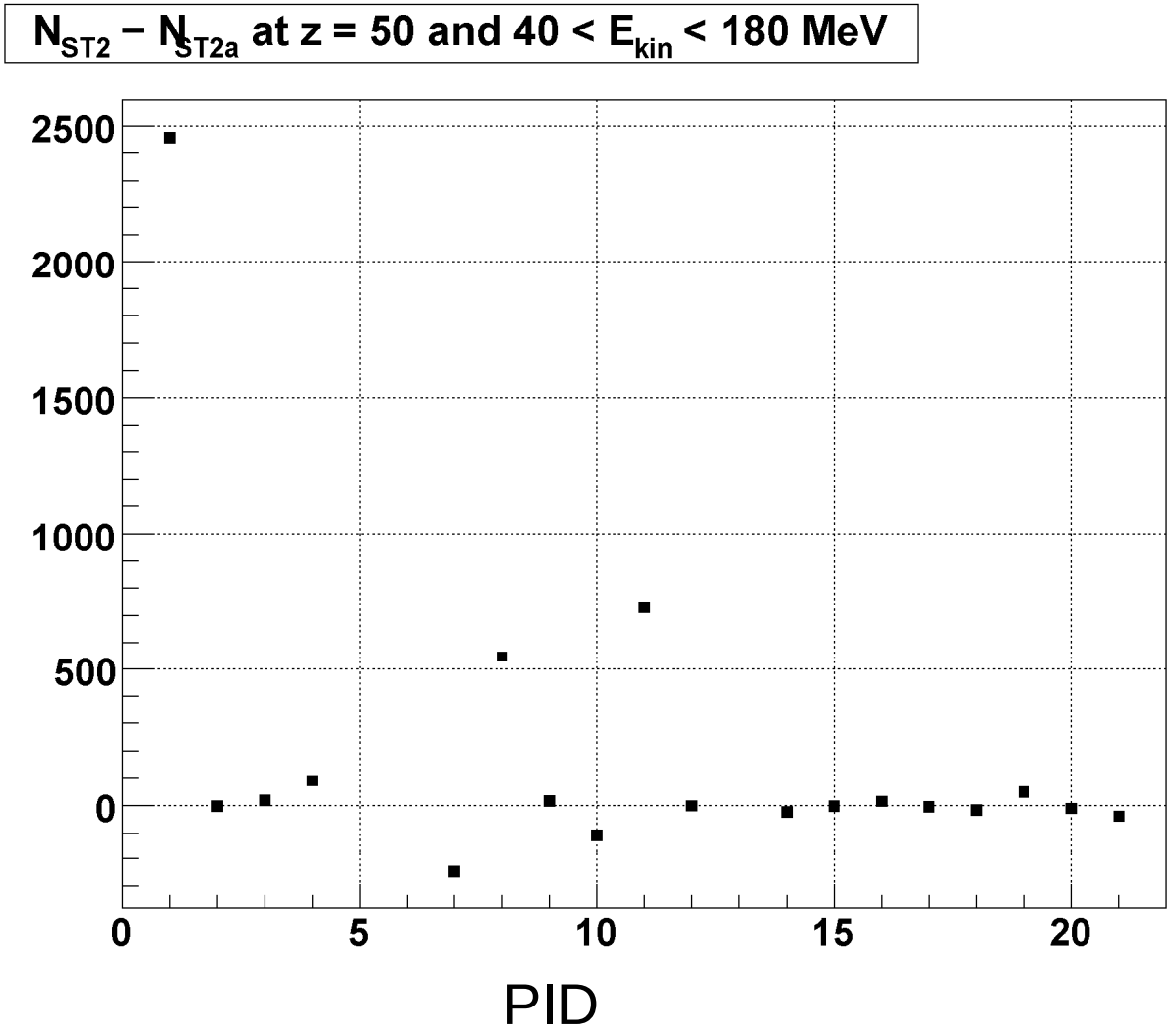
The Field Tapers





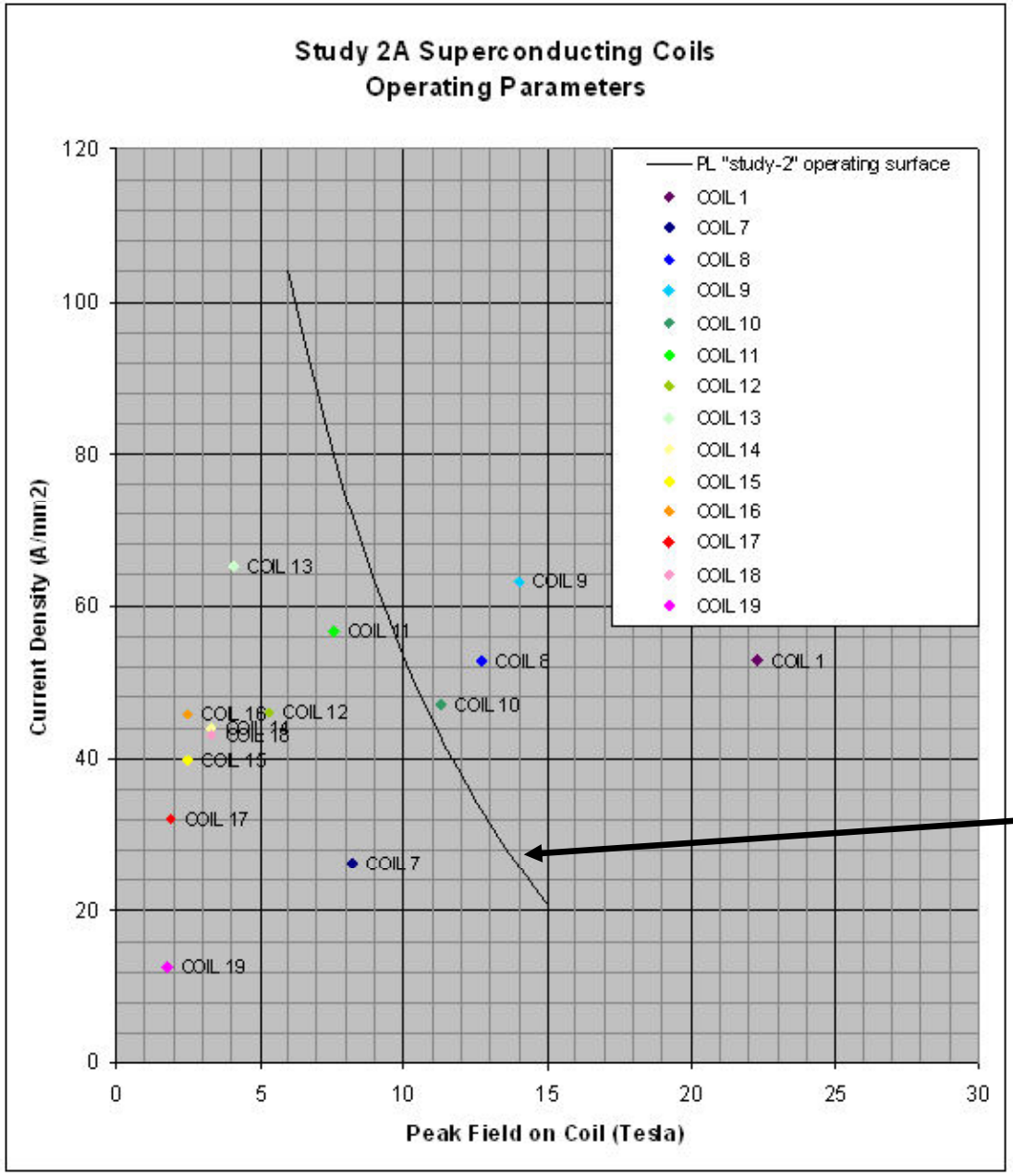
Study2 – Study2a Meson Production

G. Prior



PIDs-- 3:π^+ 4:π^- 7:μ^+ 8:μ^-

Study2a Solenoid Current Densities



P. Loveridge

Engineering Current Limits

Commentary

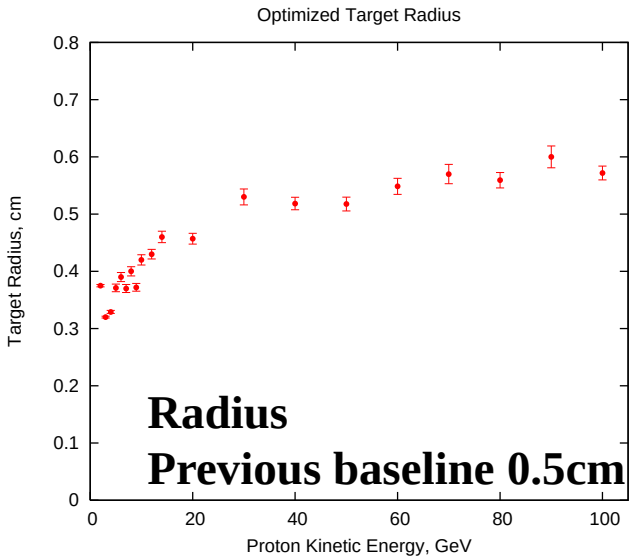
- No meson production advantage observed for Study 2a field taper
- Study2a Solenoid current densities out of practical range

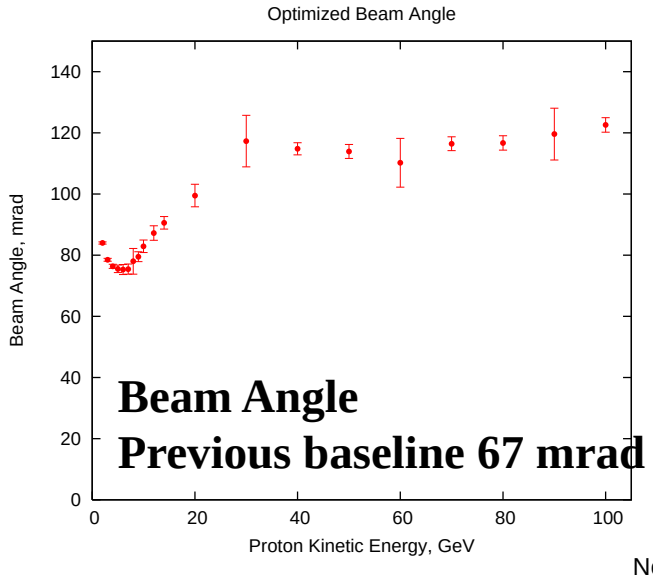
Study2 configuration preferred-But:

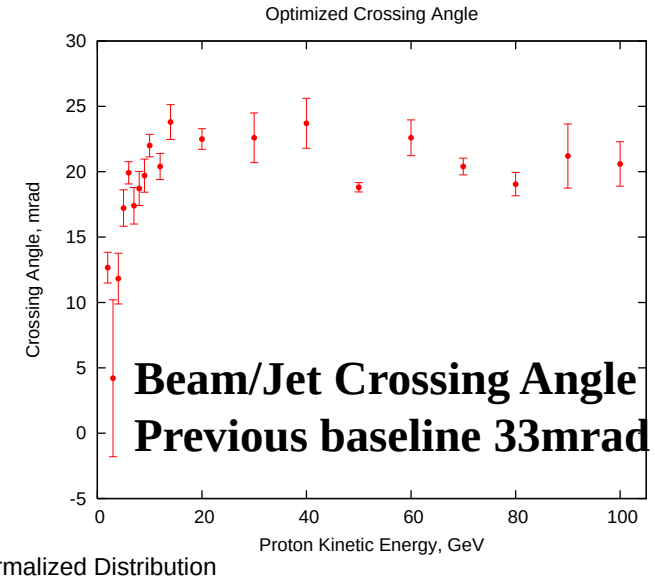
- Radiation limits for 4MW Study2 configuration must be reviewed
- Study2 field tapers to 1.25T (not 1.75T)

Optimized Meson Production

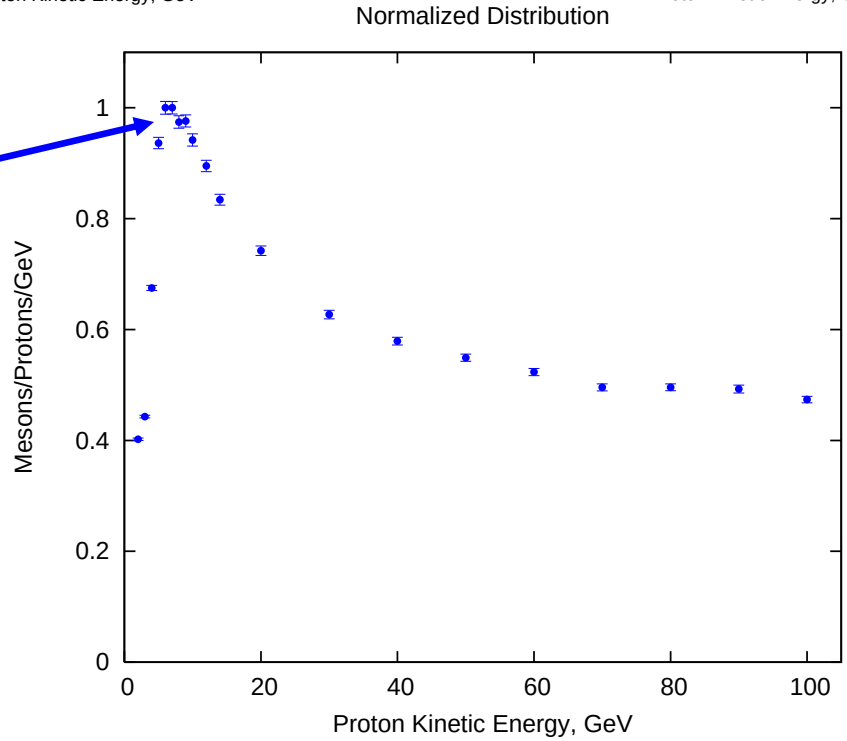
X. Ding, UCLA







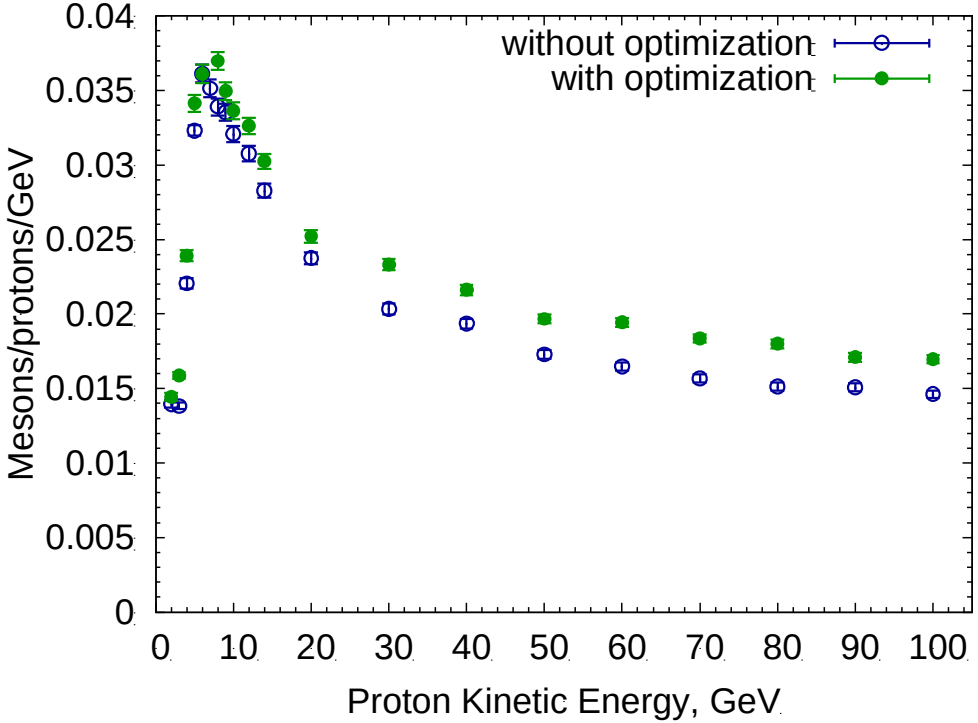
Production of soft pions is most efficient for a Hg target at E_p ~ 6-8 GeV,

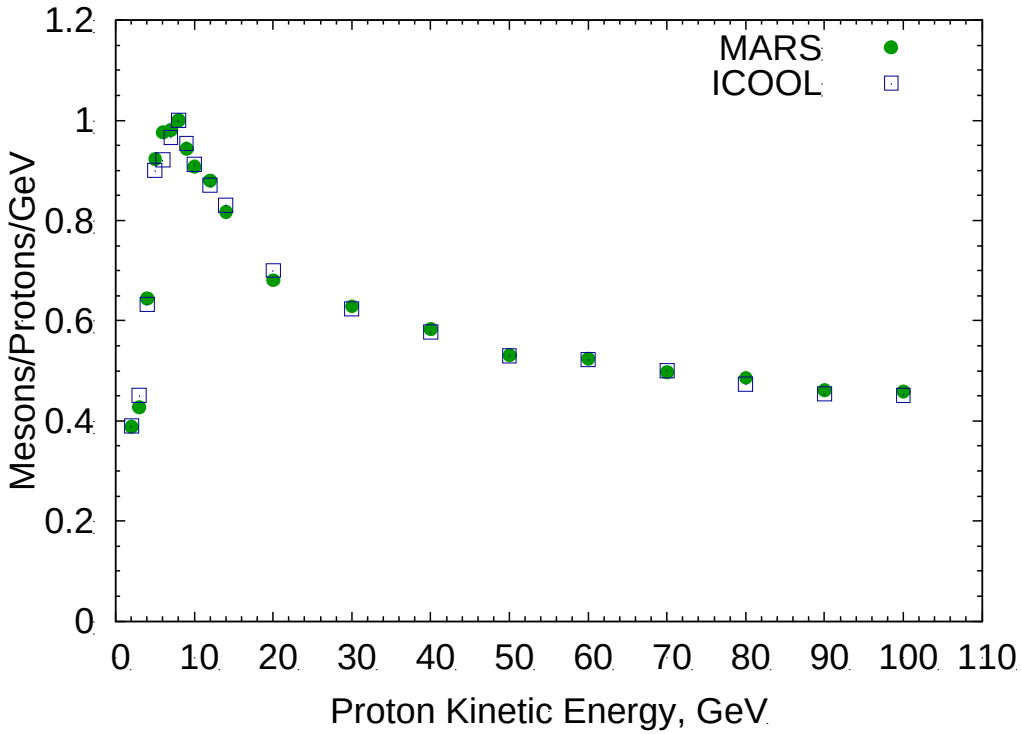


Confirmation of low-energy dropoff by FLUKA highly desirable.

Meson Production Efficiency

X. Ding

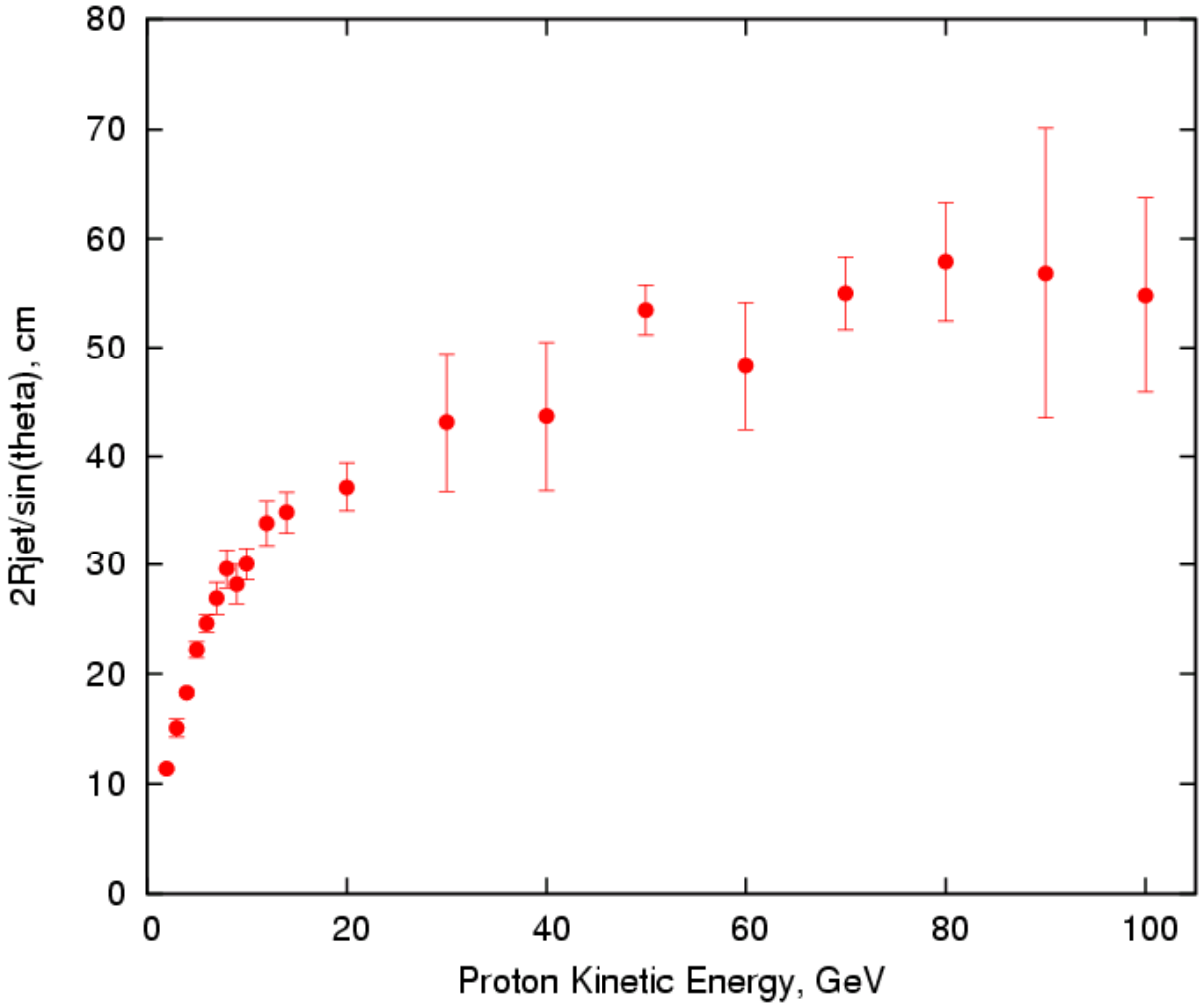




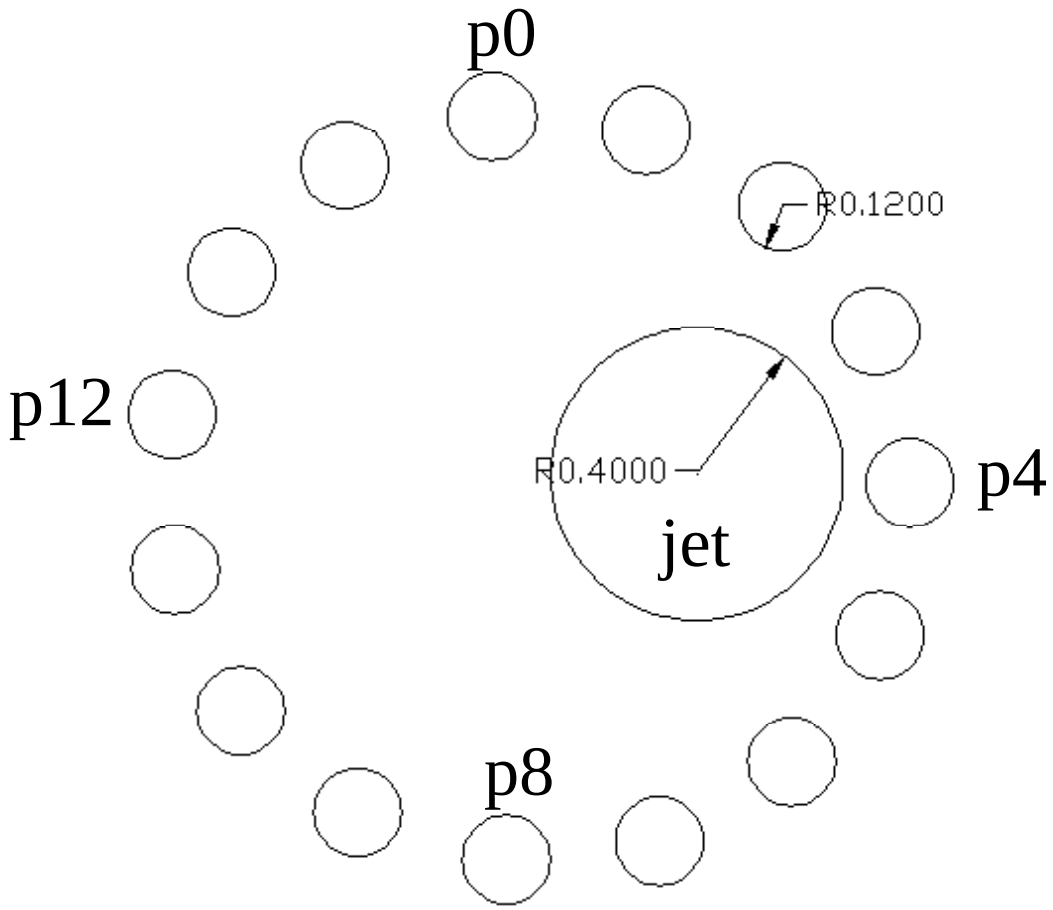
Before/After Optimization

Normalized to Peak effienciecy
MARS15 at 50m; ICOOL at end
Of cooling channel

Path Length of Proton Beam inside the Mercury Jet

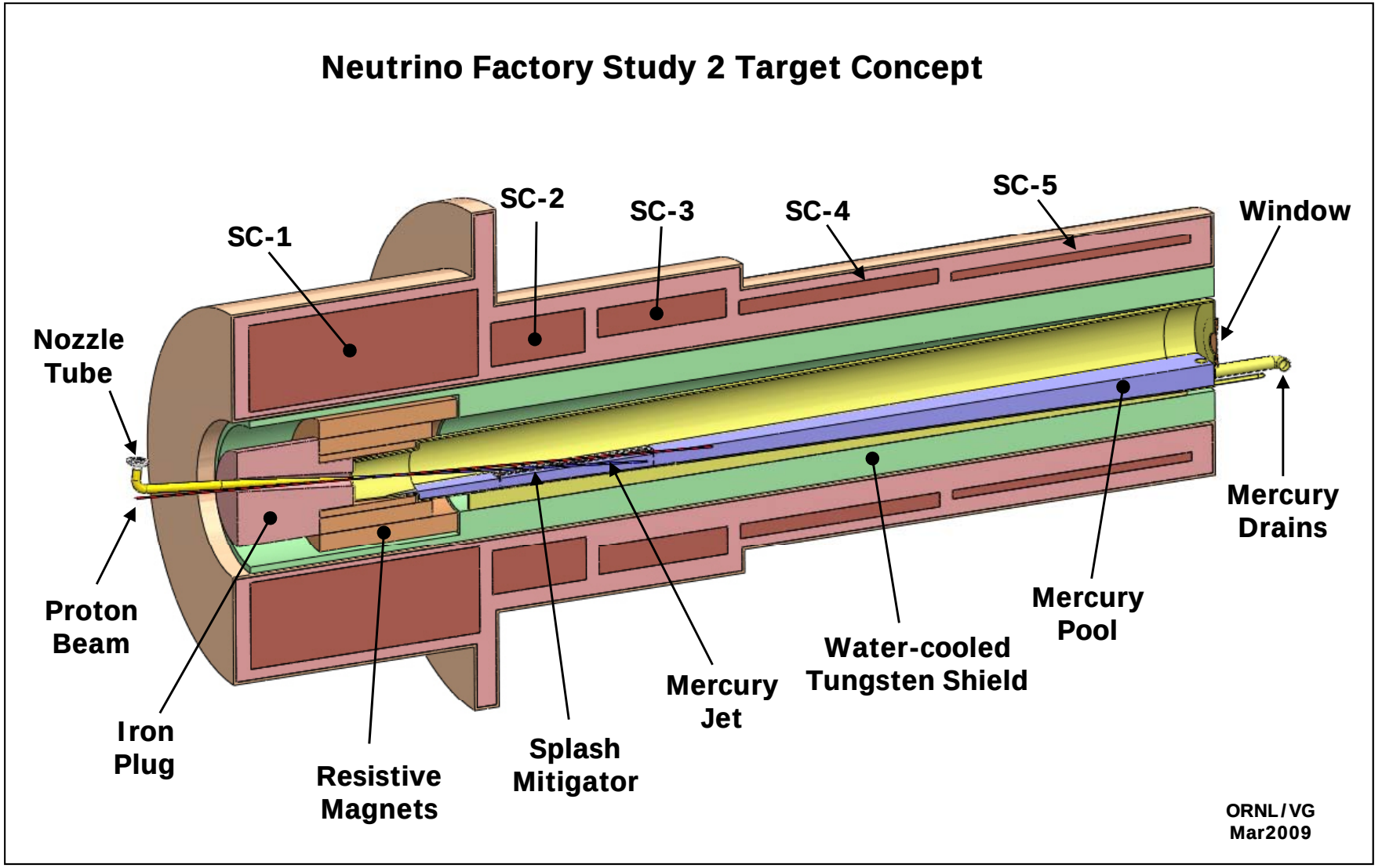


The Required Position of Beam to Jet at z=-75cm to Keep Same Crossing Angle and 24^0 Roll Angle Apart at z=-37.5cm



Possible multiple proton beam entry points

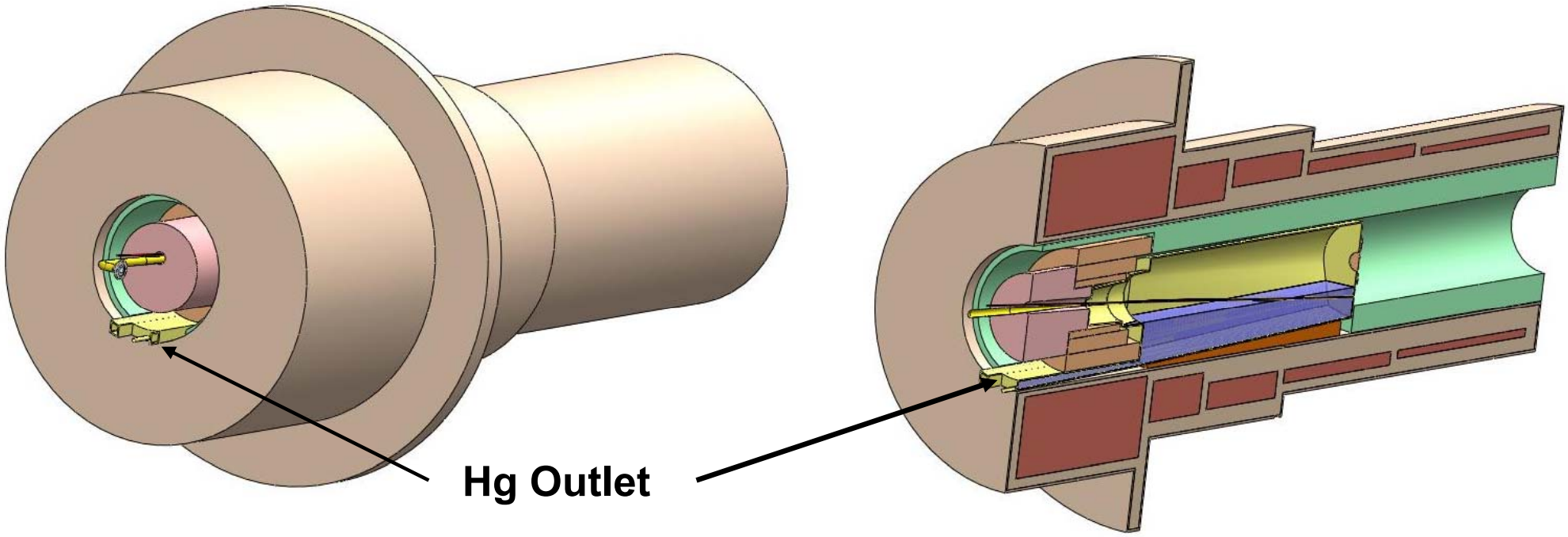
The Study 2 Target System



Van Graves, ORNL

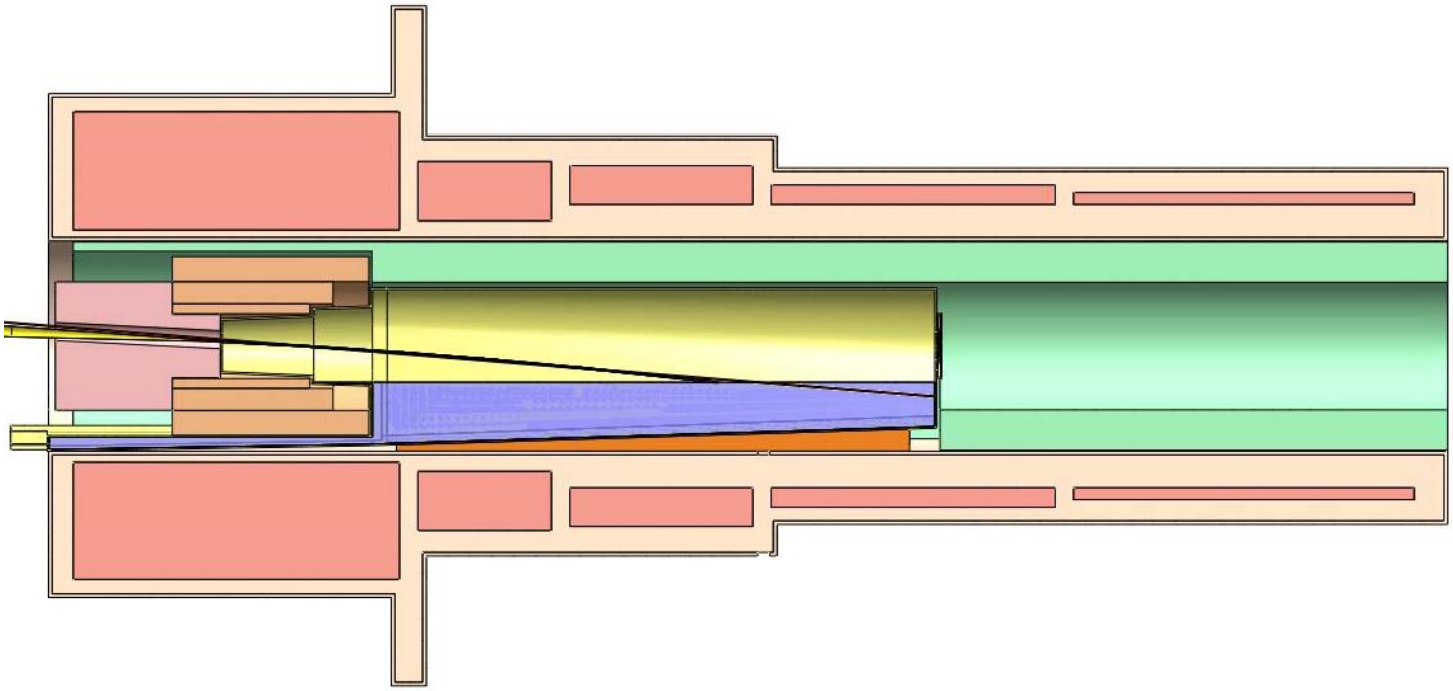
Front Drain Views

- Investigated possibility of having the Hg drain from the nozzle end of the cryostat
- Based on Study 2 cryostat layout

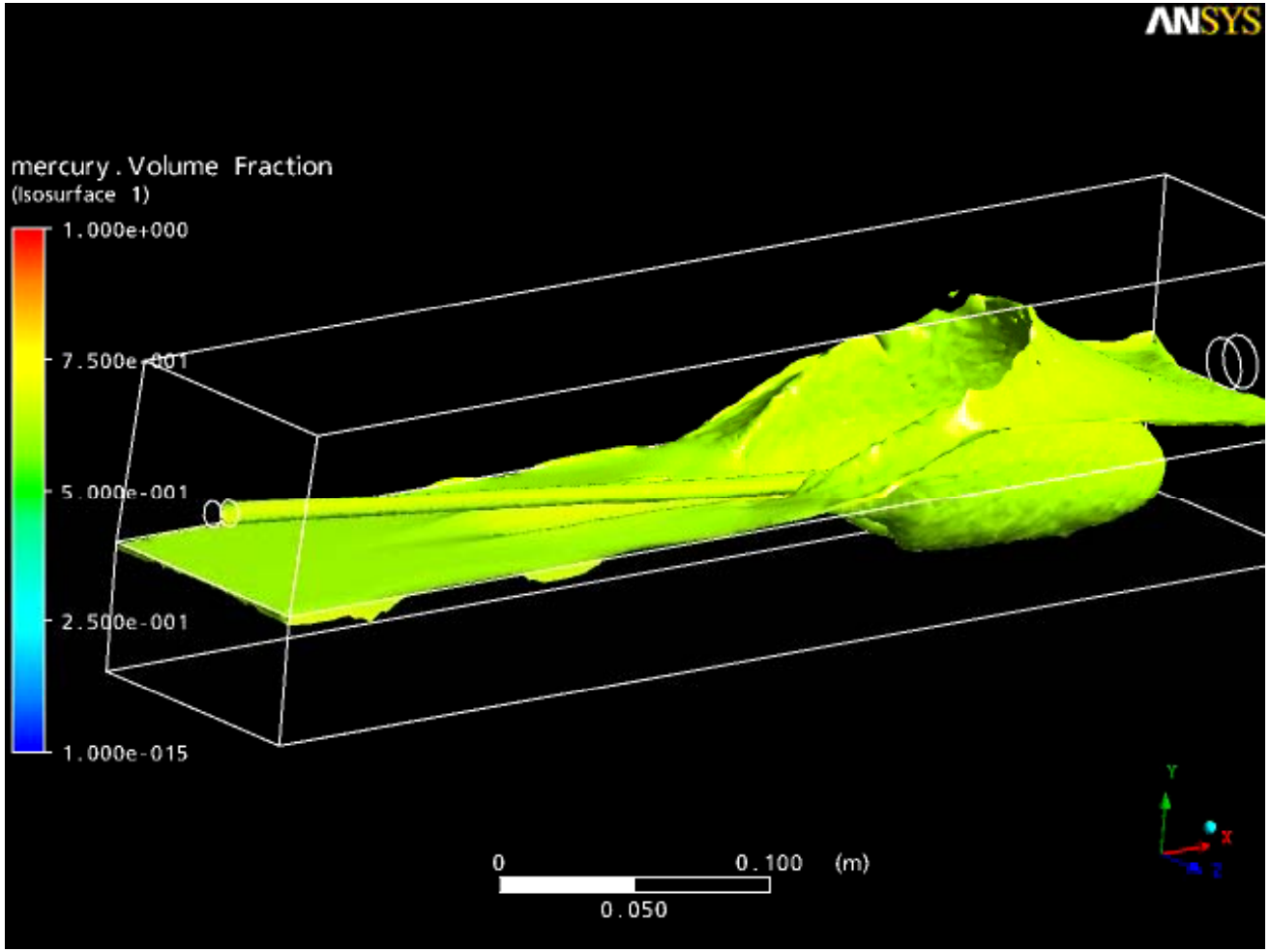


Cross Section View

- Mercury Chamber extends forward under resistive magnets
- Allows the mercury exiting the vessel to flow out the front of the cryostat

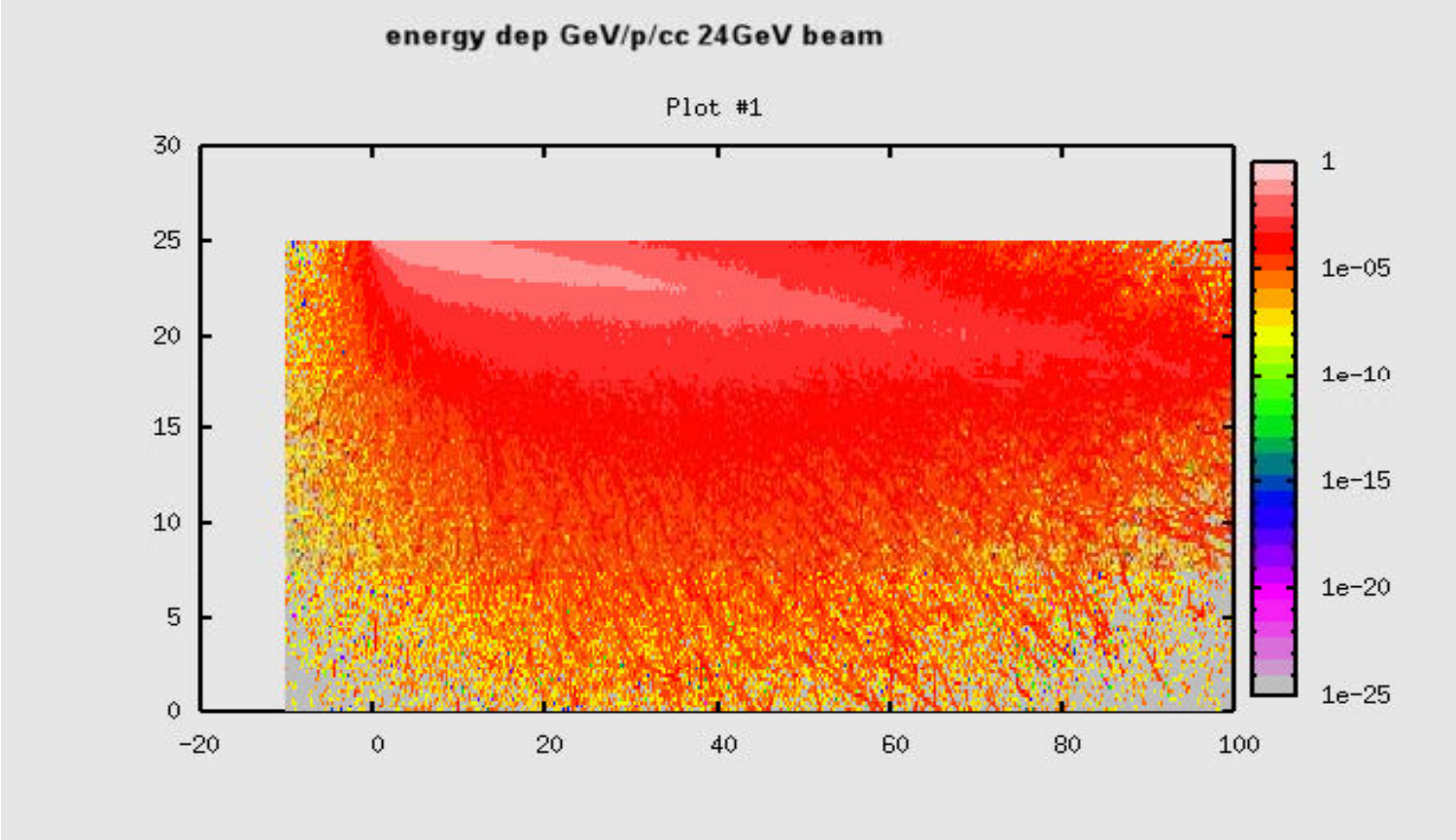


The Jet/Beam Dump Interaction



T. Davonne, RAL

Fluka Simulation - Energy deposition in mercury pool with 24GeV beam



T. Davonne, RAL

Splash Mitigation

- **Study 2 assumed a particle bed of tungsten balls to minimize effects of jet entering pool**
- **Many other feasible concepts to accomplish this function**
- **Pool circulation and drainage locations also need to be studied**
- **Prototypic testing needed for comparison & final determination**