ENERGY FLOW AND DEPOSITION IN A 4-MW MUON-COLLIDER TARGET SYSTEM

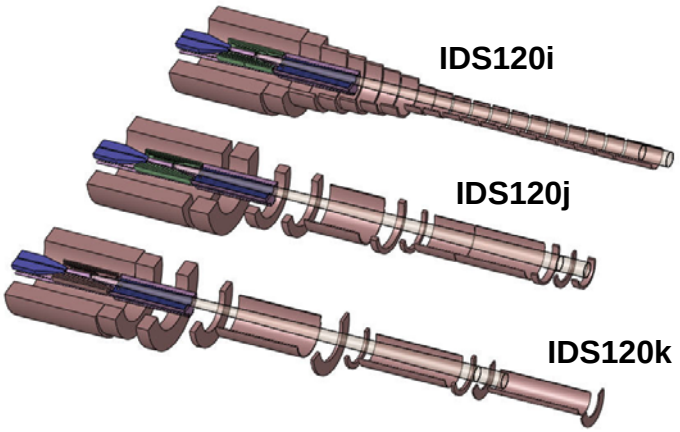
(IPAC12, WEPPD036)

N. Souchlas[3], X. Ding[5], V.B. Graves[2], H.G Kirk[1], K.T. McDonald[4], H.K. Sayed[1], R.J. Weggel[3]
[1]BNL, Upton, NY 11973, USA, [2]ORNL, Oak Ridge, TN 38731, USA,
[3]Particle Beam Lasers, Inc., Northridge, CA 91324 USA,
[4]Princeton University, Princeton, NJ 08544, USA, [5]UCLA, Los Angeles, CA 90095, USA

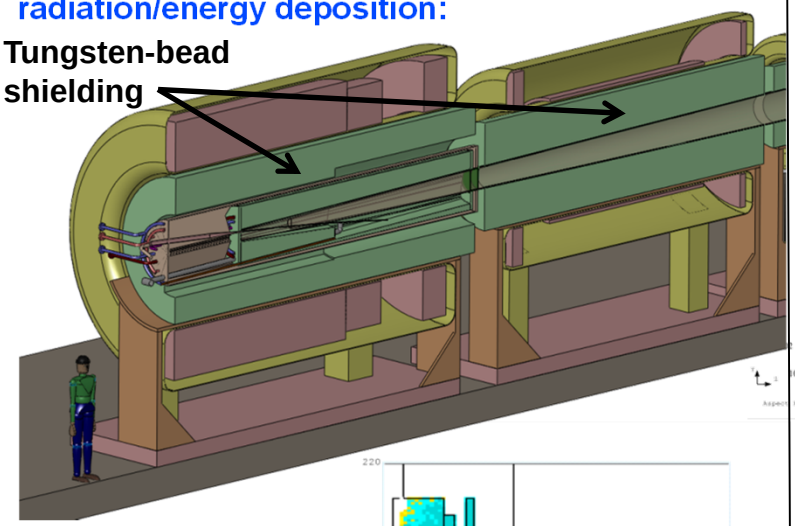
A series of studies was performed using the MARS15+MCNP code to optimize the He-gas-cooled tungsten shielding of superconducting magnets for the target station at a Muon Collider or Neutrino Factory. The goal is to provide a 10-year lifetime of these magnets against radiation damage due to secondary particles from the target. For this, the peak density of deposited power can be no more than 0.1 mW/g,

⇒ Central superconducting coil must have inner radius of 1.2 m, and stored energy ~ 3 GJ.

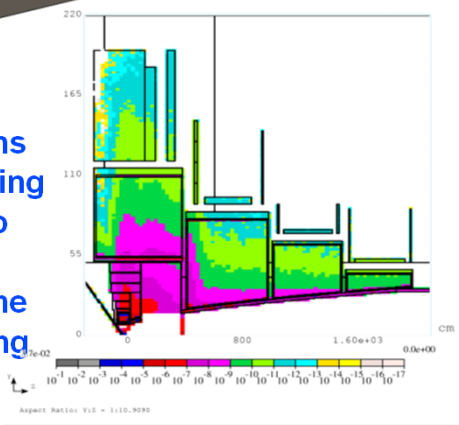
Evolution of coil design;
Increase gaps between coils to permit cryogenic and cooling services, and more internal shielding of downstream magnets



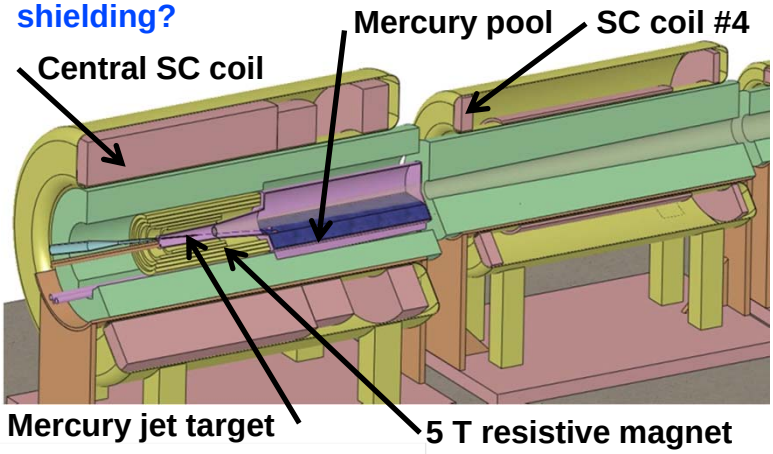
Extend the tungsten-bead shielding into coil gaps to protect the coils from secondary radiation/energy deposition:

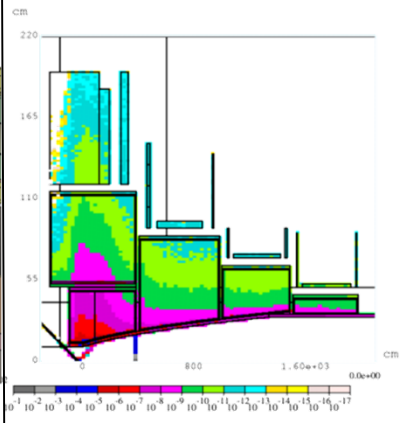


MARS15 simulations confirm that shielding is adequate to keep energy deposition < 0.1 mW/g when the gaps in the shielding are 20 cm.



The resistive coils around the target, needed to boost the central field from 15 to 20 T, greatly complicated the mechanics of the inner target module. Could these magnets be replaced by shielding, and the mercury pool have no shielding?





MARS15 simulations again confirm that shielding is adequate to keep energy deposition < 0.1 mW/g, even for the upper part of SC coil #4:

MARS15 study of azimuthal dependence of energy deposition in SC coil #4: