

SHIELDING OF SUPERCONDUCTING COILS FOR A 4-MW MUON COLLIDER TARGET SYSTEM

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R.J. Weggel³, X. Ding⁵, V.B. Graves², H.G Kirk¹, K.T. McDonald⁴, H.K. Sayed¹, N. Souchlas³

¹BNL, Upton, NY 11973, USA, ²ORNL, Oak Ridge, TN 38731, USA,

³Particle Beam Lasers, Inc., Northridge, CA 91324 USA,

⁴Princeton University, Princeton, NJ 08544, USA, ⁵UCLA, Los Angeles, CA 90095, USA

The superconducting magnets of a target station at a 4-MW Muon Collider or Neutrino Factory must be shielded against radiation damage (most critically to organic insulation) from secondary particles produced in the target.

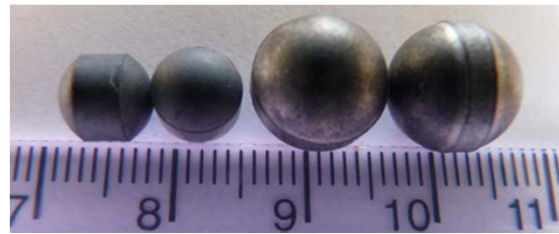
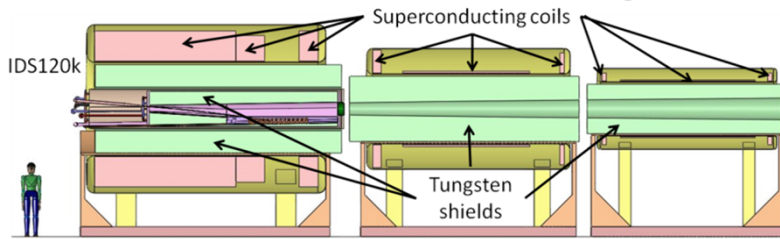
A shield of He-gas-cooled tungsten beads in under consideration.

The mass of this shield will be ~ 200 tons, so stress and deformation of the shield are important mechanical issues.

Another issue is the intercoil forces in the 20-T magnet system which will be as high as 500 tons, and intercryostat forces which will be as high as 50 ton..

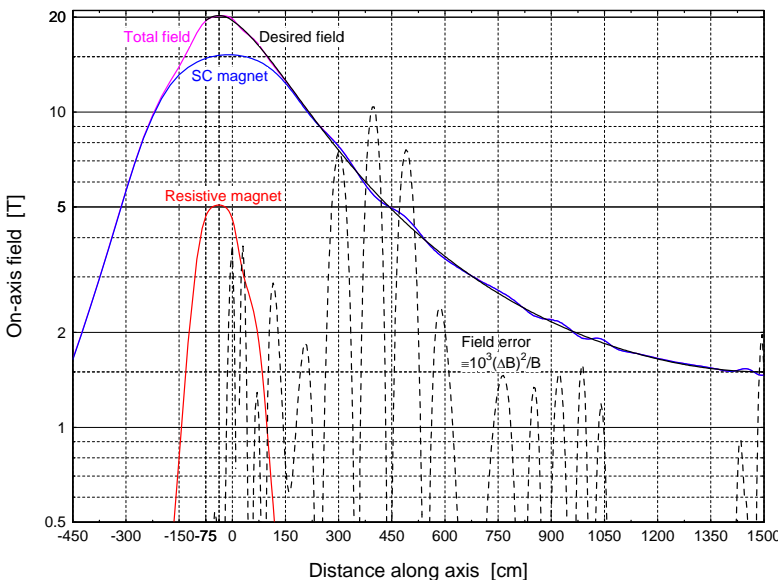
Candidate W beads for use in the shielding:

Sketch of the first 3 modules of the target station:

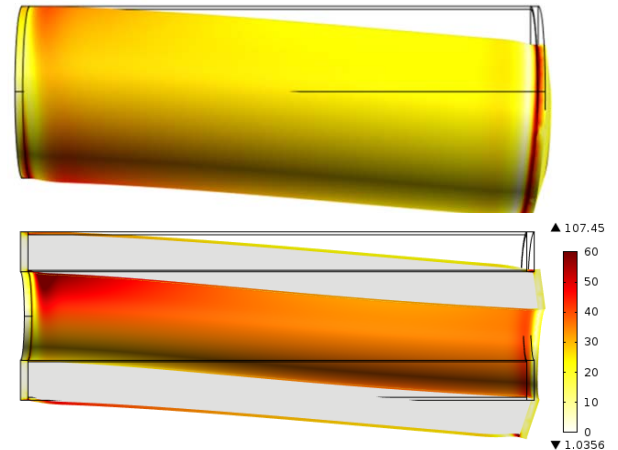


Stress and deformations in the outer shield inside the 1st cryostat.

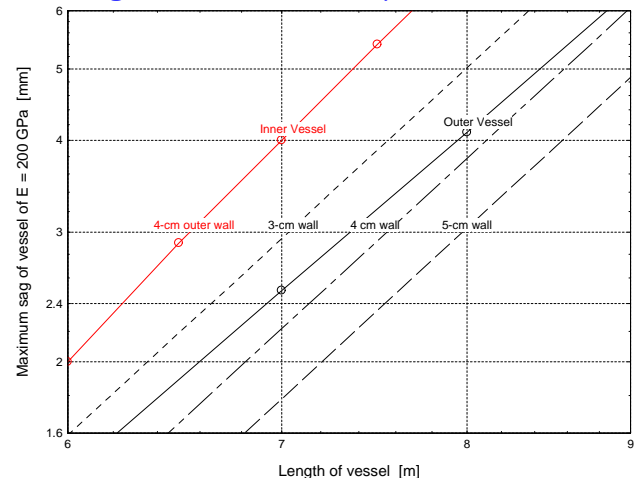
Axial magnetic field profile in T (and relative deviations from the ideal profile $\times 10^3$):



σ_{VM} in the highest-stressed flange is 540 MPa;
 δ_{max} is 5.5 mm.



Sag in mm of various vessels, as a function of their length. We limit to upstream vessel to 7 m.



Forces in MN (~ tons) between various cryostats:

	Cryo. 1	Cryo. 2	Cryo. 3	Cryo. 4	Cryo. 5	All
Cu	0.721	0.102	0.0007	0.0001	0.0000	0.823
Cryo.1	0.0040	46.6	0.182	0.0299	0.0102	46.1
Cryo.2	-46.6	-0.0001	1.94	0.0356	0.0057	-44.8
Cryo.3	-0.182	-1.94	0.0000	0.858	0.0063	-1.26
Cryo.4	-0.0299	-0.0356	-0.858	-0.0001	0.922	0.0034
Cryo.5	-0.0102	-0.0057	-0.0063	-0.9218	-0.0009	-0.0230
Sum	-46.1	44.8	1.26	-0.0035	0.0219	0.0008