SoLID: adding steel to allow a foward muon detector
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Abstract

In support of a new proposal which requires the addition of a forward muon detector to SoLID I modeled the addition of two plates of the third layer of CLEO steel behind the detector can. While the plan is to add a total of six such plates to range out particles other than muons, the field in the region is low enough that the forces on the first pair were expected to be small. This proved true, with forces of order one Newton and torques of order 2 N-m.

First model

To get a first estimate overnight I replaced the two rectangular plates with a single disk 300 cm radius by 36 cm thick. Force on this was about one Newton with torque ~1 N-m. This model is shown in Figure 1.

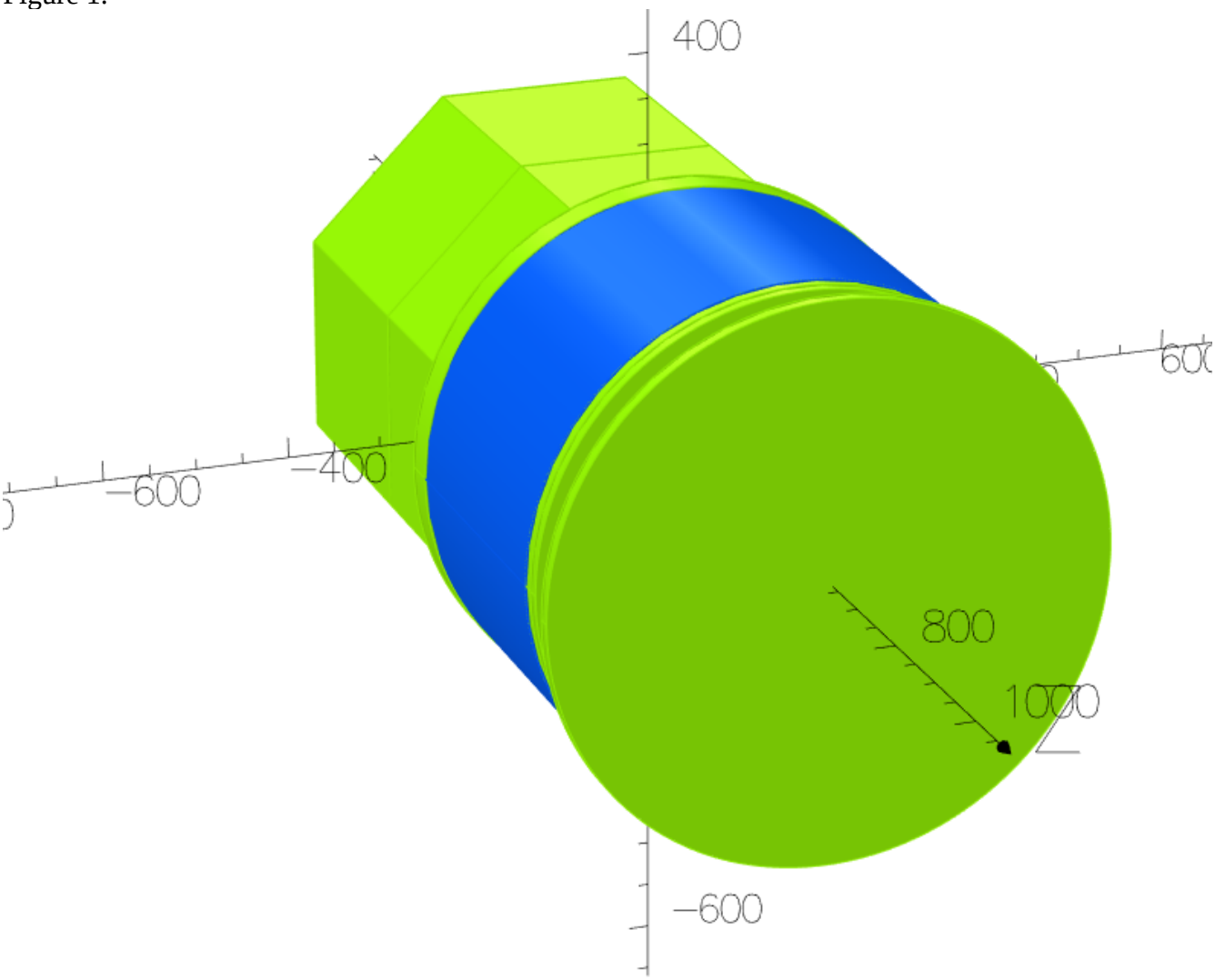

Figure 1. First model. Round plated has 6% more area than the two rectangular plates

Second model

The second model has the two plates 250 cm by 533 cm by 36 cm separted by 34 cm for the beam to pass through to the dump. Rotational symmetry 2 rather than 8 as above, so this took three days to solve. Plates are centered vertically and horizontally about (x,y)=(0,0) and begin at z=620 cm. The next two plates are arranged with horizontal gap and the third pair replicates the ones shown.

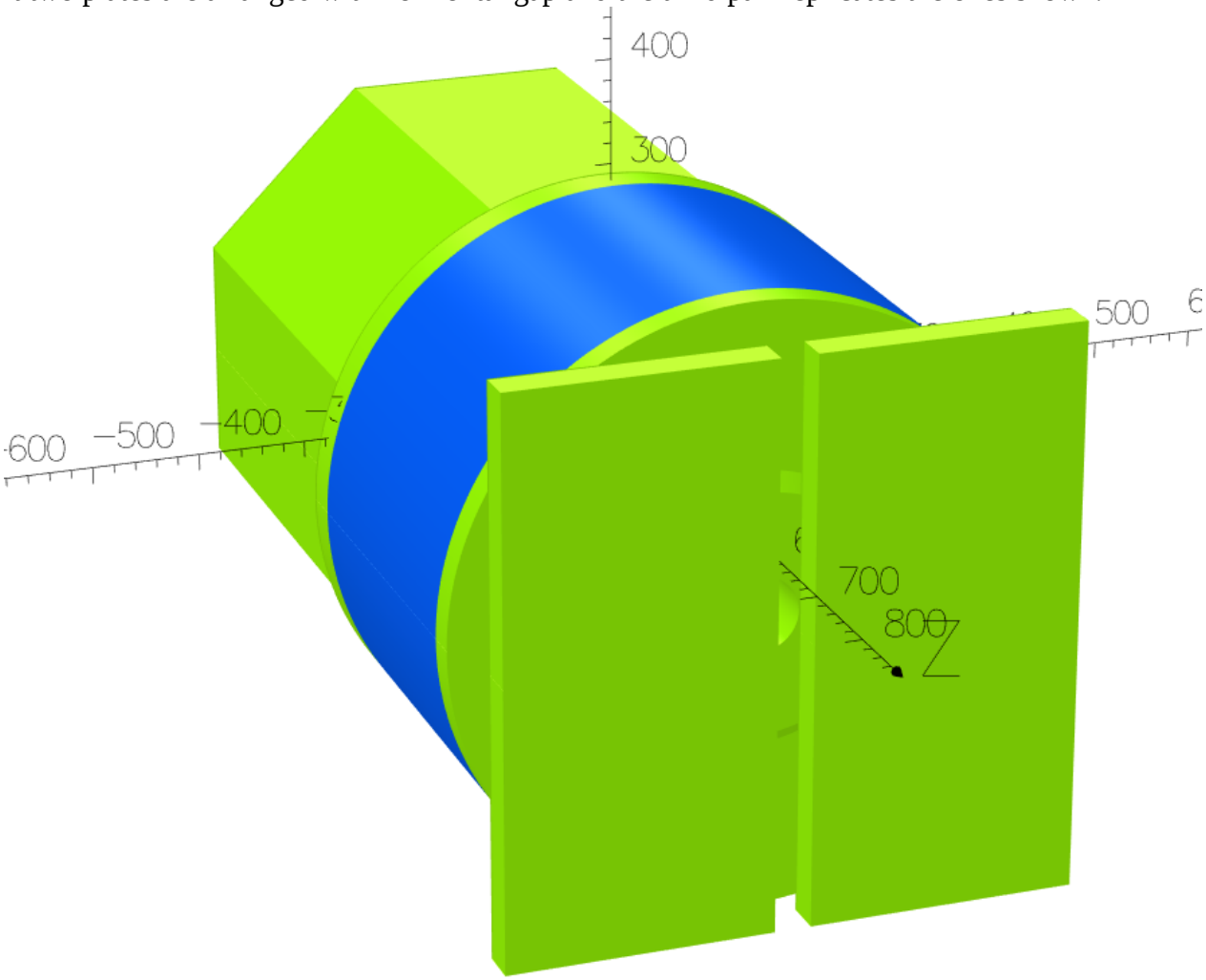

Figure 2 More realistic model. Blue steel Has B-H curve adjusted for cable slots.

For this model the force and torque values are
Forces in N:
x-direction: -0.02
y-direction: 0.3
z-direction: -1.5

Torques around (0.0,0.0,0.0) in N cm:
around x: -219
around y: -17
around z: 0.5

Conclusion: One need not take into account magnetic forces in this installation.

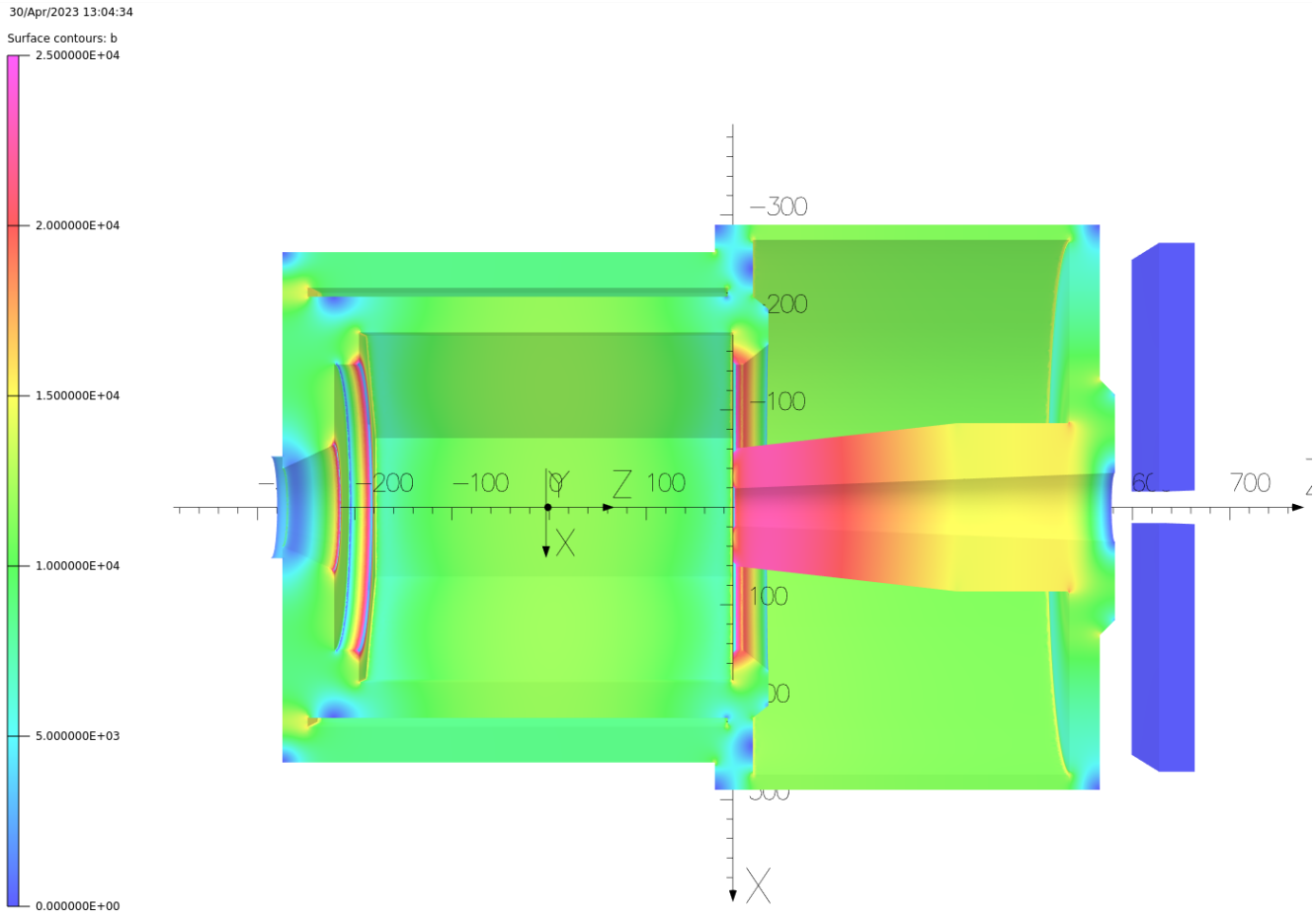

Figure 3 |B| on the surface of the model. New plates at right.