

Title: Calculations of Passive Magnetic Shielding of SRF Cavities

Author: Marta Szymanski

### Abstract

The attenuation factor for the residual magnetic field inside the cavity was highly affected by whether the outer layer of shielding was open or closed. Ultimately, the arrangement which had the outer layer closed and the inner open, gave the most compelling and useful results. After testing with nonlinear versus constant  $\mu$  settings for the outer layer of a metal shielding, we found that using nonlinear values produced both more physical results and more technically stable results. This testing also led us to find that with two shields, a lower permeability on the outer layer gives a higher attenuation factor overall, because the inner layer is allowed to act. We found, not surprisingly, that using two layers was better than using one and that three layers were more effective than two. Also, lengthening the inner layer of shielding produced impressive increases in the attenuation factor. In addition, changing the spacing between the outer two layers in a three shield structure has a significant impact on the residual field inside, up to a point, where no major changes exist. The trend here is that the larger the spacing, the higher the attenuation factor, implying a lower overall residual magnetic field inside the cavity. Combining all these factors and discoveries, it is fathomable to have an overall residual field inside the cavity smaller than 1mG using solely passive magnetic shielding.