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Demagnetizing the superconducting part of the magnetic cloak

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The combination of the superconducting and ferromagnetic materials may produce a special kind of magnetic shield, called the magnetic cloak. It offers magnetic shielding while the external magnetic flux lines are not distorted by him. However, because of the presence of the earth's magnetic field, some magnetic flux remains frozen inside the cloak after cooling it down. This phenomenon may be an obstacle for shielding applications sensitive to magnetic interference. The present study is focused on the elimination of the remnant magnetic field inside the cloak. The demagnetization with help of the dynamic magnetic resistance effect is used for this purpose. In our setup, an external magnetic field acts axially on the superconducting part of the cloak. The reduction of the remnant magnetic field requires a proper combination of exposition time and the amplitude of the applied magnetic field. Here is demonstrated the reduction of the remnant magnetic field to a value of 0.142 μT. Unfortunately, a certain number of periods and amplitude of the applied magnetic field should be found experimentally. The numerical model of the demagnetization process is in good qualitative agreement with the experiment, but the computation time is unacceptable high because of the complexity of the FEM model.

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