High performance analysis and its applications of shielding current density in high-temperature superconducting thin film

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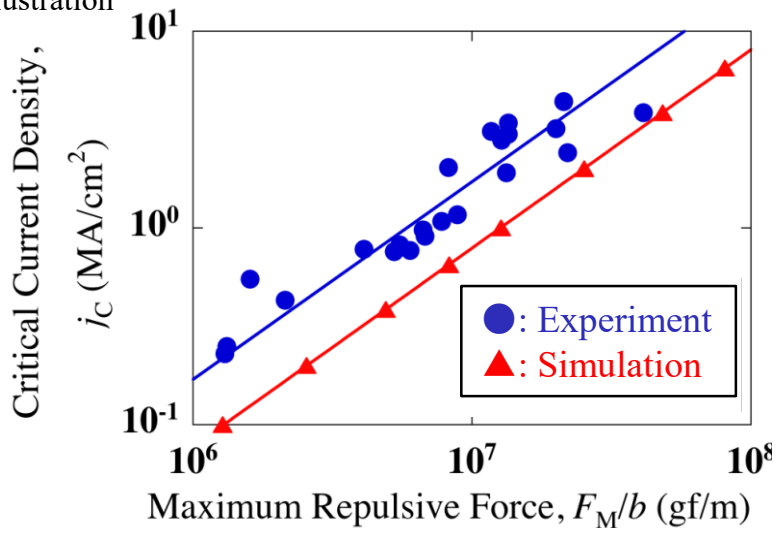
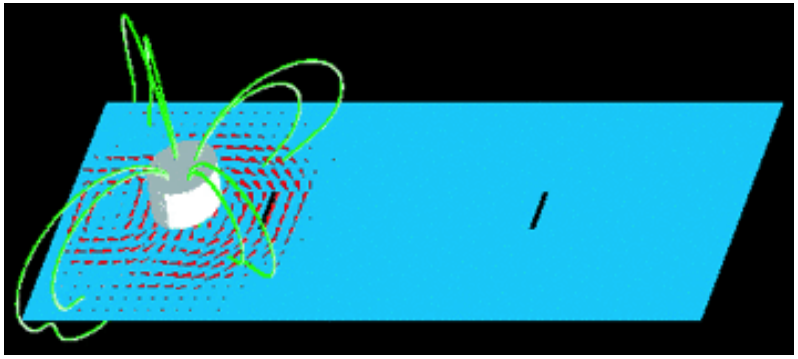
Illustration



Dependence of the critical current density on the maximum repulsive force



Time evolution of the magnetic flux lines and the shielding current density

Content:

In my study, noncontact measurement methods of a critical current density in high-temperature superconductors (HTSs) thin film have been numerically reproduced by solving the time-evolution problem of a shielding current density in the film. For simulating the noncontact methods of the critical current density in the HTS film, the FEM code for implementing the high performance methods (a high-speed method of the simultaneous ordinary differential equations, the evaluation method with the high accuracy of the improper integral, and the relaxation method of the *J*-*E* constitutive equation) has been developed. By using the code, the resolution of the noncontact methods has been calculated. In addition, detectability of the cracks in the film has been investigated.

Appealing point:

As our future work, we consider the implementation of the topology optimization technique in our numerical code for the high-temperature superconducting devices. As a result, it is possible to present a design proposal for maximizing its performance.

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