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Study on Screening Current of Like Quasi-isotropic Conductor Based on optimized T-A formulation

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Like quasi-isotropic conductor has the characteristics of high current-carrying, high engineering current density, and flexibility, which makes it uniquely advantageous when used in industrial scenarios such as nuclear fusion, SMEs, and MRI. In spite of that, the operating conditions of the conductor will be complicated by the screening effect caused by the alternating magnetic field. Therefore, the use of efficient methods to study its screening effect under alternating fields can provide an important theoretical basis for its high-field applications. Based on the T-A formulation, this paper proposes some corresponding optimized methods, so that it has high calculation speed and great accuracy when used to simulate the screening effect of complex superconductors. The influence of the amplitude, frequency and angle of the external magnetic field on the screening current distribution is studied using the proposed simulation model, which shows a high degree of consistency with the experimental results, and a higher calculation speed than the traditional T-A formulation. By comprehensively researching the experimental and simulation data, it can be concluded that the frequency of the magnetic field has little effect on the screening current distribution of the like quasi-isotropic conductor, besides, the magnetic field amplitude and penetration field are closely related to the distribution of the conductor screening current. The conductor shows high isotropy under external magnetic field with different angle.

Keywords: Optimized T-A formulation, alternating magnetic field, like quasi-isotropic conductor, screening current.

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