

Preliminary research of the fast cooldown (FCD) problem of SRF cavities using CFD method

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With the development of superconducting accelerator devices, higher requirements have been proposed for the quality factor Q_0 of superconducting cavities to reduce the operational costs of cryogenic systems. Numerous studies have indicated that fast cooldown (FCD) of the cavity can generate significant temperature gradients on the surface, contributing to the expulsion of magnetic flux and reducing the residual resistance. However, there remains a lack of research on how to optimize the FCD parameters for cryogenic system, as well as the thermodynamic processes involved in the cooling of the superconducting cavity. This paper firstly reviews the current research progress on the impact of FCD on superconducting cavity flux expulsion. Furthermore, the CFD method is utilized to study the heat transfer of cavity during fast cooldown, providing reference and guidance for optimization of fast cooldown parameters.

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