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The design of a compact conduction-cooling system for SRF characterization

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The precise and efficient testing of the RF performance of superconducting radio frequency (SRF) samples under superconducting conditions serves as the fundamental support for developing new SRF materials. The traditional SRF material RF performance testing systems have technical bottlenecks such as strong dependence on liquid helium, long testing cycles, and high operating costs. In this paper, a conduction-cooling RF performance testing system for SRF materials is presented. This system has the ability to achieve high-field and high-resolution measurement of the surface resistance without liquid helium cooling. The system is designed based on an optimized mushroom-type sample host cavity, which mainly works at 3.9 GHz TE011 mode. The radius of the sample is 33 mm. The microwave surface loss of the cavity can be reduced by coating niobium-tin on the inner surface and the conduction-cooling structure is well designed. The resolution and range of Rs measurement are analyzed by Multiphysics simulation in this work.

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Footnotes

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Author: WANG, GAI (Anhui University)

Co-authors: Mr QUAN, Shengwen (Peking University); WANG, Fang (Peking University); REN, Manqian (Peking University); WANG, Ziyu (Peking University); YAO, Zeqin (Peking University); ZHANG, Xiang (Peking University); XU, Zhongxiang (Anhui University)

Presenter: WANG, GAI (Anhui University)

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