Contribution ID: **335** Type: **Contributed Oral**

C3Or2C-03: A compact, exchangeable and fast-cooling cryogenic system for HTS antennas

Wednesday 21 May 2025 11:45 (15 minutes)

This paper explores the cooling demands of high-temperature superconducting microwave receiver front-ends, specifically aiming at microstrip antennas within a cryogenic subsystem. Firstly, a transient heat transfer model was developed based on experiments with a 3W@77K pulse tube cryocooler. Then, a cryogenic system with a 15W@77K cryocooler was designed from this model, achieving a cooling time to 75K of 17 minutes and a minimum temperature below 50K, after optimization of heat transfer paths and interface thermal resistance. Furthermore, a thermo-mechanical coupling structure was designed to facilitate rapid cryocooler replacement without compromising the devices'vacuum environment. This configuration allows the antenna to reach 75K in 22 minutes, with a minimum temperature below 55K. The research contributes valuable insights for the design and optimization of cryogenic subsystems in high-temperature superconducting microwave receiver front-ends.

Author: ZHANG, Hongwei (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences)

Co-authors: JIANG, Di (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); CHEN, Feiyi (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); LIU, Huiming (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); HUANG, Rongjin (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); HAN, Yemao (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); ZHOU, Yuan (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); ZHAO, Yuqiang (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); GENG, Zhen (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); ZHOU, Zhengrong (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences)

Presenter: ZHANG, Hongwei (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences)

Session Classification: C3Or2C - Cryogenics for HTS Applications