Conduction-cooled HTS Magnets Closed-loop System Excited by a rotating magnets flux pump

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I. Introduction

- A conduction-cooled flux pump is designed, which eliminates the need for expensive refrigerants and external power supplies.
- The superconducting DPC coil with large inductance is used to simulate the load magnet.
- The excitation current, magnetic field stability and other parameters are comprehensively measured and analyse.

II. Experimental design

Copper plates should be placed on both sides of the double pie coil (DPC) to conduct cooling, and slotted from the center to the edge.

At the junction of the stator wire and the load coil, the cold is conducted by the upper and lower two sets of L-shaped fixtures.

Parameter design of conduction cooling type flux pump

- The rotor part of flux pump
  - SmCo magnet
  - $B_m = 3200\text{Gs}$
  - Diameter 10mm
- Vacuum dynamic seal
- Large inductance load coil
  - $I_C(40\text{K}) = 117\text{A}$
  - $L = 27.3\text{mH}$
  - 4mm YBCO

III. Results and discussion

Refrigerator temperature characteristic curve

Excitation current

Magnetic field stability

The above results are for one stator strip & one rotor

IV. Conclustion

a) Verifies the feasibility of excitation of high temperature superconducting flux pump in 30-50K temperature zone.

b) The structure design of the flux pump and the conduction cooling scheme of the coil and the stator.

- Further improved
  - Enhance the amplitude of the excitation current
  - Enhance the stability of the magnetic field