A Kilo-Amp Linear-Motor Type Flux Pump

Presentation ID: TUE-PO1-804-02
Corresponding Author : Wei Wang
Email: weiwangca283@gmail.com

Chao Yang, Wei Wang, Hang Xu, Yingwei Zhu, Zhenxuan Yang, Hong Li, Jiafu Wei, Chenghuai Wu, Run Long, Chenling Xiong.

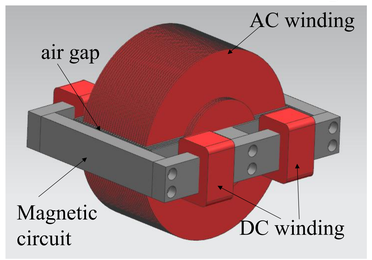
College of Electrical Engineering, Sichuan University, Chengdu 610065,China

MT 27
Nov. 15-19, 2021
Fukuoka, Japan

1.Introduction

Advantages:

- The linear-motor type flux pump can supply power to the superconducting coils without current leads .
- The utility model is small in size and compact in structure.
- There is no mechanical vibration and noise during its operation.



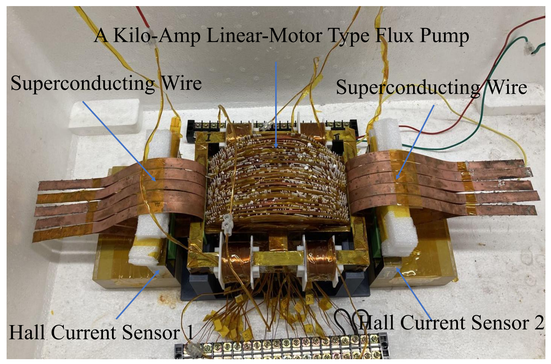
Research Result:

We had designed and fabricated a kilo-amp linear-motor type flux pump, whose maximum output current can exceed 1370A in 77K.

2-1.Experimental Setup

Device structure:

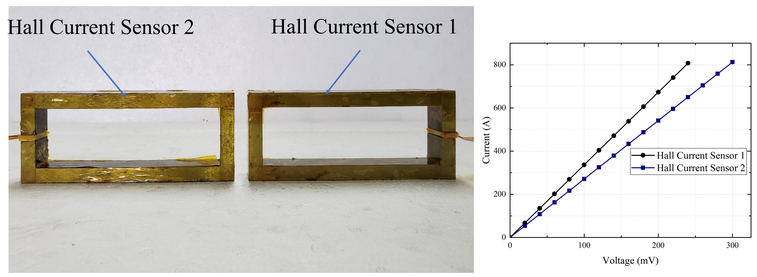
- A kilo-amp linear-motor type flux pump
- 10 Superconducting wires
- Hall current sensor1
- Hall current sensor2



2-2.Experimental Setup

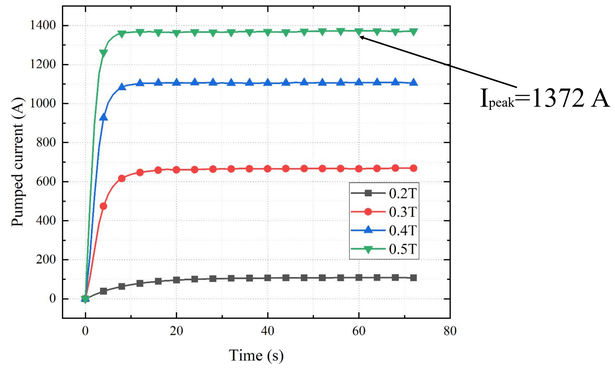
Measure system

- The linear relationship between the measured current and the voltage output by the Hall element is obtained by calibrating the Hall current sensor.
- Using this linear relationship, the direct current in the superconducting coil can be measured.



3-1.Experimental Results And Discussion

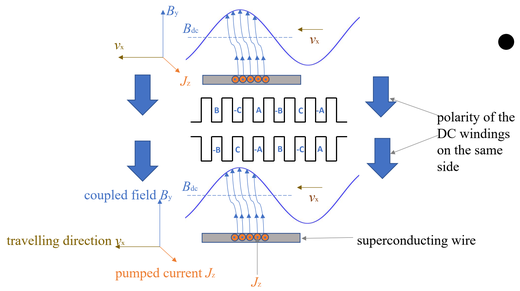
Pumped Current at Different Magnetic Field



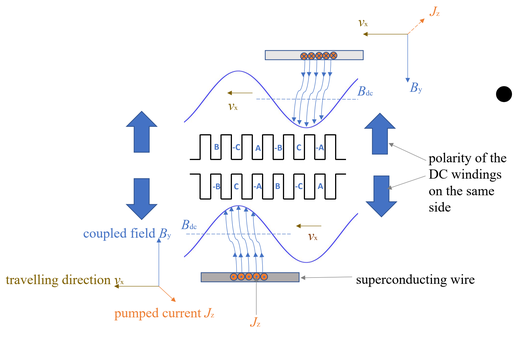
Analysis of current direction of single loop superconducting wire in air gap on both sides

Formula:$\boldsymbol{E} = \boldsymbol{B} \times \boldsymbol{v}$. Change the polarities of the DC windings on the same side. That is to change the direction of the DC bias magnetic field in the air gap. Therefore, the directions of the output currents in the air gap on both sides can be the same or reverse.

3-2.Experimental Results And Discussion

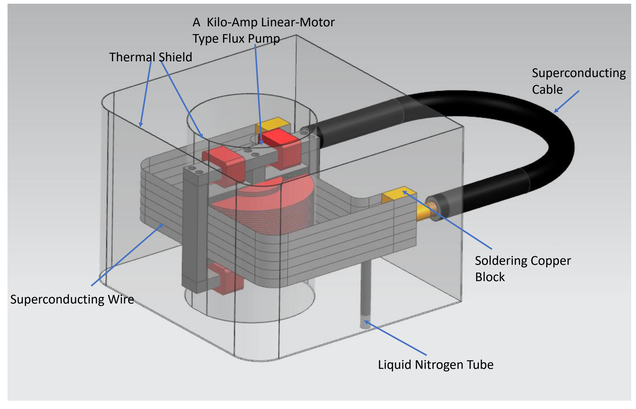


- The polarities of DC windings on the same side are same, and the induced currents in the air gap on both sides are in the same direction.



- The polarities of DC windings on the same side are opposite, and the induced currents in the air gap on both sides are reverse.

4.The Design of Using a Kilo-Amp Linear-Motor Type Flux Pump to Test the Superconducting Cable



ACKNOWLEDGMENTS

This work was supported by the National Natural Science Foundation of China under grant numbers 51877143, and the Science and Technology Project of Sichuan Province, China under grant number 2021YFS0088.