Experimental investigation of MHD effect due to FCI electric

conductivity and structure difference

Zengyu Xu, Chuanjie Pan, Xiujie Zhang, Yanjing Chen, Xuru Duan and Yong Liu Southwestern Institute of Physics P.O. Box 432, Chengdu, Sichuan 610041, PRC

After the imitation experiment of FCI flow MHD effect investigation was carried out using LMEL-U facility in the Southwerstern Institute of Physics (SWIP), China, other experiments are also performed of FCI having a difference in the conductivities and the structures. The experimental results show that FCI result in the complex and drama velocity contribution in the center-plane of the cross section of the duct; and which is out of the numeric simulation and classical MHD theory expectations. But the results can be understood on physics by using the secondary flowing MHD phenomena. The secondary flow caused the complex velocity contribution MHD effect is a great challenge for liquid metal blanket system heat transfer design. The experimental results also show that the all of the four FCI conditions can reduce the MHD pressure drop.

The experiments are carried out under the conditions: The uniform magnetic field space is 740 mm (length) x 170 mm (width) x 80 mm (height). The maximum strength of the applied (transverse) magnetic field is 2 T (maximum Hartmann number is 2400). In the test-section, the outer rectangular duct made of stainless steel is 1500 mm long and 68 x 60 mm the cross-sectional dimensions and 2 mm wall thickness, while the inner FCI box made of epoxy or 304-type stainless steel is 1 m long and the cross-sectional dimensions of the test-article are 54 x 46 mm and 56 x 48 mm, respectively; and the wall thickness are 2 mm and 1 mm, respectively. FCI with a pressure equilibrium slot (PES) is in 3 mm width and some pressure equilibrium holes (PEHs) is in 10 mm in diameter. The pressure drop is measured over the section of 500 mm long, which is well distanced from both the edges of the FCI box (250 mm apart) so that the experimental data is gotten in the flow full developed zone. All data is acquired with a computer with 16-bit analog-to-digital board having 2.5 μ V resolutions.

Topic: J **Corresponding Author:** Zengyu Xu **E-mail Address:** <u>xuzy@swip.ac.cn</u>