

MonPS03

The characteristic of Evaporative Cooling Magnet for ECRIS

Xiong Bin^{1,2}, Ruan Lin¹, Gu Guobiao¹, Lu Wang³, Zhang Xuezheng³, Zhan Wenlong³

1 Institute of Electrical Engineering, CAS, Beijing 100190, China

2 University of Chinese Academy of Sciences, Beijing 100049, China

3 Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou 73000, China

Corresponding Author: Xiong Bin, E-mail address: xiongbn@mail.iee.ac.cn

Compared with traditional de-ionized pressurized-water cooled magnet of ECRIS, evaporative cooling magnet has some special characteristics about cooling efficiency and operation. The analysis is carried out according to the design and running of LECR4 (Lanzhou Electron Cyclotron Resonance ion source No. 4, since Jul, 2013), whose magnet is cooled by evaporative cooling technology. The insulation coolant replaces the de-ionized pressurized-water to absorb the heat of coils, and the properties of coolant keep stable for a long time under no treatment. The coils of magnet are immersed in the liquid coolant and the cooling is more efficient, so the current density of coils can be improved further. The heat transfer executes under atmospheric pressure, and the temperature of coils is lower than 70°C when the current density of coils is 12A/mm². On the other hand, the heat transfer temperature of coolant is about 50°C, and the heat can be transferred to fresh air which can save cost of water cooling system. The running of LECR4 about two years shows that evaporative cooling technology can be used into magnet of ECRIS, and the application advantages are very obvious.