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Experimental study on vacuum control method for Paschen tests of the superconducting magnet

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Abstract

In order to verify the integrity of the insulation of superconducting magnet, it is needed to perform the Paschen test on the insulation after its manufacture. The vacuum vessel for the Paschen test is required to keep for an adequately long time under the pressure values of different degrees. To achieve the low pressure of the vacuum vessel, isolating the pumping unit from the vessel is not applicable as degassing inside the vessel will eventually ruin the pressure. Therefore, one dynamic balance control system for low pressure control is designed. The feature of the system is that adjusting the opening of intake valve by Proportion Integration Differentiation (PID) control system automatically, while the vacuum pump is working constantly. The results show the dynamic balance control system can keep the pressure value of 1±0.05 Pa, 10±0.15 Pa, 100±0.2 Pa and 1000±0.5 Pa, respectively and the holding time of each vacuum degree is more than 2 hours, which satisfy the basic vacuum requirement for the Paschen test of the superconducting magnet.

Keywords: Superconducting magnet, Paschen test, Vacuum control, Dynamic balance, PID control system

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No

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