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# Tue-Mo-Po2.02-02 [4]: Research on Repeated Pulsed High Magnetic Field Control System Based on Pulsed Generator Power Supply

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The repeated pulsed high magnetic field system is widely used for neutron diffraction, terahertz radiation, guiding magnetic field and so on. In these applications, more and more attentions are paid on magnetic field waveform consistency. The pulsed generator power supply, with large energy storage and controllable output voltage, is suitable for generating repeated controllable pulsed magnetic field. However, it's very difficult to control the magnetic field waveform because of the rapid change of the magnetic field, the time-varying nonlinear magnet resistance and low frequencies working characteristic of phase-controlled rectifier. Base on the analyses of the operation conditions, a transient average-value model of pulsed generator power supply was established which figured out the function relationship between the magnet resistance and the magnetic field waveform. Therefore, by computing the real-time resistance of the magnet, controlling the output voltage of the power supply, the response speed of the phase-controlled rectifier would be improved. There are some errors in the theoretical calculation model of magnet resistance, so a novel on-line modified method of the magnet resistance employing the gradient descent technique is proposed. Based on this real-time calculation of the resistance, a feedforward-feedback controller is designed. As for feedforward control, the predicable disturbances of the system such as the change of magnet resistance are compensated, as for feedback control, the error caused by random disturbance is reduced. So that the control performance is enhanced and the consistence of magnetic field waveform is improved. The simulations and the experiments verified the feasibility of this control strategy, and generated a series of 30 T consistent pulse magnetic fields.

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