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Wed-Mo-Po.11-02: Design of a 60 T-100 ms Flat-Top Magnet with a Large Bore at the WHMFC

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The flat-top pulsed magnetic field can meet the requirements of many cutting-edge basic scientific researches on higher magnetic field, longer duration, and higher stability. In this study, a magnet is developed to generate 60 T pulsed magnetic field with 100 ms flat-top. Compared to conventional pulsed magnets, it has a larger internal hole diameter of 38 mm. In the design, a power-magnet collaborative design scheme is proposed. It is a multi-objective optimization model that comprehensively considers the power supply capacity, the parameters of the flat-top pulsed magnetic field producing circuit, and the thermodynamic performance of the pulsed magnet. It can reduce the demand for power supply energy while ensuring the flat-top pulsed magnetic field system to reach the parameter indicator. Fast-cooling technique is used for better cooling performance. The stainless steel screws are installed in the cooling channel. This can reduce the axial deformation caused by the circumferential pressure during the winding process of the coil, and optimize the position of the coil. The power supply of the magnet uses a sequence fire pulse forming network (SFPFN). By optimizing initial voltage and trigger time of each capacitor module in the circuit, a flat-top pulsed magnetic field with a magnetic field of 60 T, a duration of 100 ms, and a flatness of 1% can be obtained.

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