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A New Active Field Uniformity Improvement Method with Optimally Designed Compensation coils for Low-temperature Superconducting Magnets

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In order to enhance the quality of measurement results of a Physical Property measurement System using a superconducting magnet, spatially uniform magnetic field is required at the magnet center. However, measured field uniformity is usually worse than that of design result due to manufacturing errors of a magnet system. Therefore, spatial field uniformity compensation is needed to reduce effect of the manufacturing errors on field uniformity. The conventional field compensation methods require recursive routines of field mapping and compensation coil current adjustment, which lead to less effective time-consuming process. In this study, a newly-developed active field compensation algorithm employing Pattern Search, which is one of the optimization theories will be introduced. An active compensation coil channel currents calculation MATLAB code with the pattern search was developed. And the six compensation coil designs and the field distributions calculations with and without the proposed method were also carried out to compare the results. The test results demonstrate feasibility of the proposed field compensation method.

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