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The Pole Profile Optimization of High-gradient Quadrupole for the HALF Storage Ring

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The storage ring of Hefei Advanced Light Facility(HALF) will employ high-gradient quadrupoles for the sake of diffraction limit, the typical gradient values of them arrive at 60-80 T/m, the saturation on the pole tip is very serious. Moreover, the gap between two adjacent poles should have a certain interval to accommodate light box, which is equal to reduce the pole width. All the cases increase the designing difficulty of quadrupoles. In this paper, the Non-dominated Sorting Genetic Algorithm(NSGA-2) and Gauss-Newton algorithm(GN) are both adopted to find a proper pole tip profile, the typical multipole components reach the order of 1.0E-6.

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