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Particle swarm optimization of higher-order corrections to large-acceptance ion optical systems LISA CARPENTER, MATTHEW AMTHOR, Bucknell University — High-acceptance, high-resolution optical systems help to make possible the efficient study of short-lived, rare forms of nuclear matter. Preserving high resolving power with a large transmitted phase space input requires that the optical aberrations be considered and significantly corrected. The choice of higher order multipole strengths presents a challenging, many-dimensional optimization problem. Particle swarm optimization (PSO) is a global optimization technique which has shown promise in many-dimensional systems. In this computational study, PSO is applied to the higher order magnet settings of the ARIS fragment separator to be constructed at FRIB and the proposed SUPERB recoil separator. The PSO technique is expected to more quickly and reliably find global minima than techniques relying only on local optimizers. Several sets of internal PSO parameters were tested, in search of both rapid convergence and high success rates — the likelihood that the best overall solution is found. We will present our optimal parameters and possible extensions of this work, for example creating hybrid algorithms with other optimization techniques such as differential evolution.

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