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Preliminary scheme for electron cooling using longitudinal hollow electron beam

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The intra-beam scattering in high charge state intense heavy ion beams is a problem worth considering. By controlling the longitudinal distribution of the ion beam, it may be possible to alleviate the ion beam loss and improve the lifetime of the ion beam caused by intra-beam scattering. Unlike the traditional cooling process of direct current electron beams or longitudinal uniform distribution electron bunch beams, a longitudinal hollow electron beam is used to cool heavy ion beams. Ions at the edge of the ion beam will receive stronger cooling, while ions at the center of the ion beam will receive weaker cooling, avoiding overcooling at the center of the ion beam. This paper discusses the generation, measure-ment, and related issues of longitudinal hollow electron beams. Corresponding solutions and suggestions have been proposed for the problems and challenges that may be encountered in the research. The cooling process of longitudinal hollow electron beams will be simulated and experimentally studied in the future, with the hope of obtaining beneficial effects.

Footnotes

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