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An Analysis of Methods to Generate a 4D Transverse Phase Space Distribution with Angular Momentum

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Many high intensity proton or ion accelerators employ sources with solenoidal magnetic fields that produce beams carrying a large amount of angular momentum. To simulate such beams, one has to generate a 4D transverse phase space distribution with the right amount of angular momentum as initial conditions. In this paper, we first show that such distributions can be obtained through different methods such as linear transformation or the addition of azimuthal impulses. Next, we discuss how the resulting distributions differ, whether such differences affect beam transport, and which method tends to produce more realistic distributions. We hope that these studies will help clarify simulations in high intensity ion and proton accelerators, particularly in the front ends.

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