Loading of relativistic Maxwellian distribution revisited

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A generator for random variates from relativistic Maxwellian distribution is an important tool in particle-in-cell simulations and test-particle calculations. Conventionally, a relativistic Maxwellian momentum distribution is widely assumed as an initial distribution, which is known as the Maxwell–Juttner distribution. For generating random variates from the Maxwell–Juttner distribution, rejection methods are adopted. In the present study, random variates are generated from a relativistic Maxwellian energy distribution with an inverse transform sampling in the same way as a non-relativistic energy distribution. Then, the coordinate transform from the energy space to the momentum space is made. Performance of the present scheme will be compared against a conventional scheme with a Maxwell–Juttner distribution.

Keywords: relativity, distribution function, random number generation

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