

Abstract Submitted
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Three-dimensional Relativistic Particle Acceleration by Magnetic Cylinder and Torus KOICHI NOGUCHI, EDISON LIANG, Rice Univ. — We study the time-development of magnetic cylinder and torus in 3D PIC simulation of electron-positron plasma. The cylinder case may represent the uniform region of hoop-stress-supported jets, and the torus represents the case when a jet head emerges from the surface of a collapsar, or when a new born magnetar wind blows out the progenitor envelope. Initial magnetic field distribution is purely azimuthal, and it expands with accelerating plasma. In the cylinder case, plasma forms a radially expanding tube, and electrons and positrons get accelerated in the radial and axial directions without charge separation. In the torus case, charge separation occurs because of the finite axial length of the torus, and electrons and positrons are distributed over radially expanding hemispheres with relativistic acceleration. We will discuss the momentum distribution and radiation.

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