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## Azimuthal and axial structures in 3D Particle-in-Cell simulation of Penning discharge

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We report the results of 3D particle-in-cell simulations of cylindrical Penning discharge in the so called reflex configuration with the cathode and anti-cathode biased to the same negative potential. The discharge is supported by thermionic electron emission from the cathode. Electron and ion collisions, including ionization, are fully included. The emphasis is on a specific regime in which plasma potential in the center of the discharge is positive with respect to the chamber walls serving as an anode. We observe azimuthally rotating structures overlapping with the axial fluctuations that are weakly correlated with the azimuthal modes so that the azimuthal modes rotate as a whole and do not show any axial shear. Spatial and temporal scales of the observed structures and fluctuations are characterized. The mechanisms of the underlying instabilities are suggested and discussed.

## Keyword-1

Penning Discharge

## Keyword-2

Plasma Instabilities

## Keyword-3

**Azimuthal Rotating Structures** 

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