

# Torsion-Induced Four-Fermion Interactions in Gravitational Collapse

*Monday, 9 November 2026 09:00 (30)*

The intrinsic spin of fermions generates torsion in spacetime. This gives rise to a parity-violating, nonuniversal four-fermion interaction, which is expected to become significant in dense matter, such as in early-universe cosmology or in neutron stars. We calculate the effect of the interaction term in a gravitationally collapsing gas of fermions with an isotropic spin distribution. We use the Raychaudhuri equation and the focussing condition for congruences for a collapsing distribution of multiple species of fermions, ignoring other interactions. We establish that a repulsive contribution can arise depending on how torsion couples with different chiralities. The effect of the interaction starts to dominate as density increases, accelerating or decelerating the collapse depending on the torsional coupling constants of different fermions.

Based on : S. G. Choudhury, S. K. Maity, and A. Lahiri. Torsional four-fermion interaction and the Raychaudhuri equation. Eur. Phys. J. C, 84(12):1304, (2024).

**Primary author(s) :** Mr MAITY, Sagar Kumar (S. N. Bose National Center for Basic Sciences)

**Co-author(s) :** Prof. LAHIRI, Amitabha (S. N. Bose National Center for Basic Sciences); Dr GUPTA CHOUDHURY, Shibendu (Indian Institute of Astrophysics)

**Presenter(s) :** Mr MAITY, Sagar Kumar (S. N. Bose National Center for Basic Sciences)

**Session Classification :** Parallel-Astrophysics