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**Importance of Gyrokinetic Exact Landau Collisions in Fusion Plasma Turbulence (PhD Oral-24)**[1] QINGJIANG PAN, DARIN ERNST, Massachusetts Institute of Technology MIT — Gyrokinetic simulations are routinely performed to understand and predict magnetic confinement. Previous works have used model collision operators (e.g., Lorentz, Abel, Sugama models) with approximate field-particle terms of unknown accuracy and/or have neglected collisional finite Larmor radius (FLR) effects. This work moves beyond models to implement a gyrokinetic exact linearized Fokker–Planck collision operator for the first time in a gyrokinetic code (the GENE code)[2]. The conservative and symmetric Landau form[3] preserves the conservation laws and H-theorem. The new exact operator allows the accuracy of collision models to be assessed. Comparison with the recent Sugama model implemented in the same code[4] shows significant differences for temperature-gradient-driven trapped electron mode (TEM) turbulence (up to 68% in fluxes) and zonal flow damping, also for microtearing modes in a JET-ILW pedestal. The difference is parameter-dependent; the two operators closely agree for density-gradient-driven TEM turbulence and some drift-type modes in the JET pedestal.

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[2]Q. Pan, D. R. Ernst, P. Crandall, Phys. Plasmas **27** (2020).
[3]Q. Pan, D. R. Ernst, Phy. Rev. E **99** (2019).
[4]P. Crandall et al., Comput. Phys. Commun. **255** (2020).

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