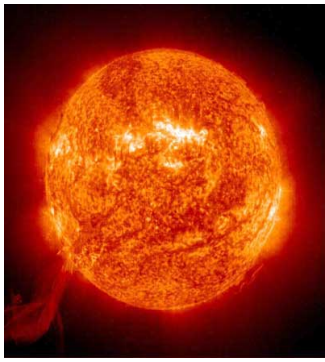
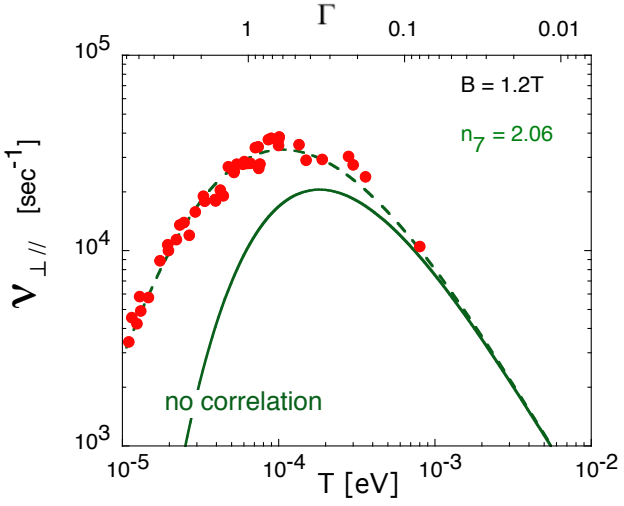
Correlation-Enhanced Collisions, *à la* Salpeter



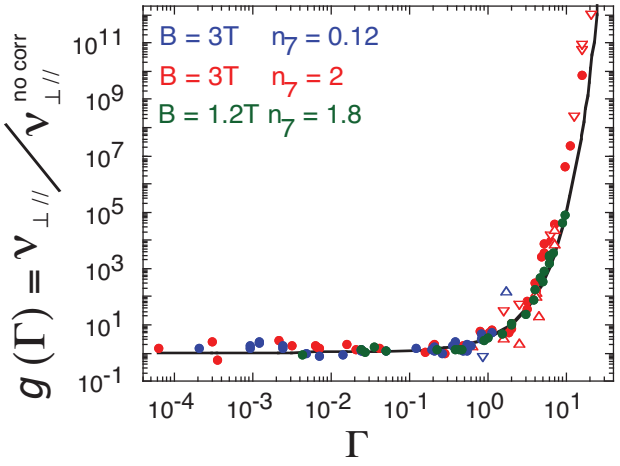
Salpeter predicted that the nuclear fusion rate in a dense, strongly correlated plasma (e.g., a white dwarf star) is enhanced by inter-particle correlations. The predicted enhancement is approximately $exp(\Gamma)$, where Γ is the correlation parameter.



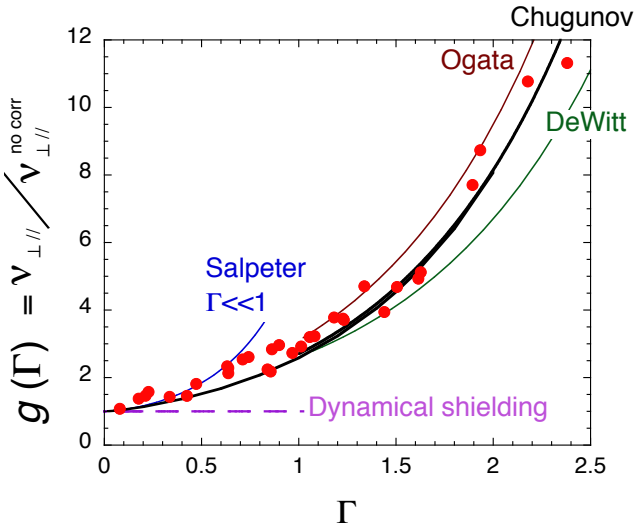
Dubin (2008) proved that this is isomorphic to enhanced perp-to-parallel collisions in a pure ion plasma at low temperatures. For $T<10^{-3}$eV and strong magnetization, an adiabatic invariant suppresses collisions (solid curves), but correlation re-enhances them (dashed curves).

Our measurements (dots) clearly show the magnetization suppression, and show enhancement at low T where $\Gamma>1$.

Enhancements $g(\Gamma)$ up to 9 orders of magnitude from various density and B-field are shown over a wide range of Γ (Anderegg 2013).



Recent DoE/HEDLP funds enabled purchase of laser equipment to improve long term laser stability. Our new results rule out dynamical screening, and are most consistent with equilibrium screening calculations by Chuganov et al. (2007)



D.H.E Dubin, Phys. Plasmas **15**, 055705 (2008)
F. Anderegg et al., Phys. Plasmas **24**, 092118 (2017)