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Test Particle Diffusion In Correlated Plasmas[1] FRANCOIS ANDEREGG, JACOB SARET , C. FRED DRISCOLL, DANIEL. H. DUBIN , University of California, San Diego — Inter-particle correlations have several effects on the dynamical properties of plasmas. The correlation parameter $\Gamma \equiv e^2/aT$ represents the ratio of the nearest neighbor electrostatic energy to the thermal energy. We cool un-neutralized magnesium ion plasmas in a Penning-Malmberg trap, with density n $\cong 10^7$ cm^{-3}, the temperature T is controlled over a wide range of 5eV >T >5x10^{-6}eV, resulting in correlation parameters 10^{-5} <Γ <10. We have measured the perpendicular to parallel collision rate $\nu_{\perp//}$ from the non-correlated to strongly correlated regime, and observe the (Salpeter) enhancement of $\nu_{\perp//}$ up to 10^9 due to correlations [1]. We have also measured test particle diffusion and heat transport in these plasmas in the absence of correlation (Γ<<1). Here, we propose to extend these measurements into the moderately correlated regime. In the range of 10^{-3} <Γ <1, where no experiment or numerical simulation have been done, we will test theory [2] predicting decreasing diffusion coefficient D as T decreases, with transition from D$\propto$T$^{-1/2}$ to D$\propto$T and a transition from D$\propto$ B^{-2} to D$\propto$B^{-1}. [1] F. Anderegg et al., PRL, 102, 185001 (2009). [2] T. Ott and M. Bonitz, PRL, 107, 135003 (2011); S.D. Baalrud and J. Daligaut, Phys. Rev. E, 96, 043202 (2017).

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