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A charge droplet picture of magnetotransport in disordered delta-doped heterostructures[1] MALCOLM KENNETT, Simon Fraser University, VIKRAM TRIPATHI, Tata Institute of Fundamental Research — We discuss theoretically how electrons confined to two dimensions in a delta-doped heterostructure can arrange themselves in a droplet-like spatial distribution due to disorder and screening effects when their density is low. We apply this droplet picture to magnetotransport and derive the expected dependence on electron density of several quantities relevant to this transport, in the regimes of weak and moderate magnetic fields. We find good qualitative and quantitative agreement between our calculations and recent experiments on delta-doped heterostructures. In particular we show that in the regime of magnetic fields where the resistivity ρ varies with magnetic field B as $\rho(B) \propto \exp[\alpha B^2]$, that $\alpha \propto n_e^{-\frac{3}{2}}$, where n_e is the electron density in the 2DEG, even though the average tunneling distance between droplets is much larger than the average inter-electron spacing.

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