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Anomalous saturation of the temperature dependent resistivity in the deep insulating regime of 2D electron layers in high-quality mesoscopic GaAs/AlGaAs structures DAVID NEILSON, University of Camerino and NEST, ALEX HAMILTON, University of New South Wales — We analyze properties of mesoscopic low density GaAs 2D electron systems with short-ranged disorder. We show that inhomogeneities can cause the resistivity to saturate as $T \to 0$, instead of increasing exponentially as happens in macroscopic samples. This effect is associated with the break up of the 2D system into metallic and insulating domains. In mesoscopic systems in the insulating phase, the isolated metallic domains can be very closely spaced. At low temperature, the close proximity favors direct tunneling between states at the chemical potential on adjacent metallic domains instead of conventional variable-range hopping. Our calculated temperature-dependent transmission rates reproduce all the features of recent measurements of the resistivity $\rho(T)$ in 2D electron layers in gated mesoscopic GaAs/AlGaAs structures [Baenninger *et al.*, Phys. Rev. Lett. **100**, 016805 (2008)]. In particular, even when $\rho >> h/e^2$, the insulating exponential increase in $\rho(T)$ can saturate or show a metallic-like drop as the temperature goes to zero.

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