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Quantum effects in the conductivity of high-mobility Si MOSFETs at ultra-low temperatures. NIKOLAI N. KLIMOV, Rutgers University, ALEXANDER KUNTSEVICH, VLADIMIR M. PUDALOV, Lebedev Physics Institute, HARRY KOJIMA, MICHAEL E. GERSHENSON, Rutgers University — By thorough suppression of electromagnetic noise in our experimental set-up, we were able to cool the electrons in high-mobility Si MOSFETs down to 17mK. We have studied how the conductivity depends on the temperature and the in-plane magnetic field over the density range $n = (2-10)\cdot 10^{11} cm^{-2}$, with the focus on the crossover from ballistic transport ($T\tau \gg 1$, where τ is the momentum relaxation time) to diffusive transport ($T\tau \ll 1$). For our samples, this crossover was observed $T \sim 0.3K$. The quasi-linear dependence $\sigma(T)$ observed in the ballistic regime [1] is in a quantitative agreement with the theory of interaction corrections to the conductivity [2]. At lower temperatures, the interaction corrections are strongly affected by the inter-valley scattering. We have determined the inter-valley scattering rate by analyzing the weak-localization corrections and the dephasing time in the studied Si inversion layers. We will discuss how the interaction corrections in the diffusive regime are modified by the inter-valley scattering. [1] V.M.Pudalov, M.E.Gershenson, H.Kojima, G.Brunthaler, A.Prinz, G.Bauer, Phys.Rev.Lett. 91,126403 (2003) [2] G.Zala, B.N.Narozhny, and I.L.Aleiner, Phys. Rev.B 64, 214204 (2001); 65, 020201 (2002).

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