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 \( n = (2 - 10) \cdot 10^{11} \text{cm}^{-2} \), with the focus on the crossover from ballistic transport \( (T\tau \gg 1) \), where \( \tau \) 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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