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Fitting of Diverging Thermoelectric Power in a Strongly Interacting 2D Electron System of Si-MOSFETs HYUN-TAK KIM, ETRI in Korea — The diverging-effective mass (DEM) in a metallic system is evidence of strong correlation between fermions in strongly correlated systems. The identification of the DEM still remains to be revealed The effective mass, $m^*=m_o/(1-\rho^4)$ [1] where ρ is band filling helps clarify the diverging thermoelectric power, S, measured in inhomogeneous Si-MOSFET systems [2]. As a carrier density n_s decreases, S increases rapidly This is regarded as the metal-insulator transition (MIT) near $n_c \approx 79\text{x}10^{-1}\text{cm}^{-2}$, where n_c is about 0.02% to $n_{Si} \approx 3.4\text{x}10^{-14}\text{cm}^{-2}$ in Si. This can be solved in assuming that $\rho = n_c/n_s$ increases as n_s decreases. n_c is an excited(doped) carrier density in the semiconductor induced by gate and can be also regarded as a metallic carrier density, that is, $n_c \equiv n_{seminon} = n_{metal}$. n_s is given as $n_{tot} \equiv n_s = n_c + n_{seminon}$ where $n_{seminon}$ is a carrier density in a nonmetallic phase. The carrier density measured by Hall effect is the sum of carriers both induced by gate field and generated by MIT. Moreover, a larger metallic phase is not made due to a conducting path in the field-effect structure after a metallic phase is formed. Thus, increasing n_s indicates increasing n_{non}; this corresponds to an overdoping to increase inhomogeneity. It's fitting is given from $S = (\alpha\pi^3 k_B^2 T/3e)(1/E_F) = (\alpha 8\pi^3 k_B^2 T/3h^2)(m^*/e^* n_c) = S_o(1/\rho)(1/(1-\rho^4))$, where $e^* = \rho e$ [1], $\rho = n_c/n_s$, T=0.8K, $m^*=m_o/(1-\rho^4)$ [1], $\alpha = 0.6$, and $S_o = (\alpha 8\pi^3 k_B^2 T/3h^2)(m_o/en_c) \approx 12.36$ are used. The data S [2] are closely fitted by m* [1] Physica C 341-348(2000)259. [2] Phys. Rev. Lett. 109 (2012) 096405.

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