Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Stoner-like theory of Magnetism in Silicon MOSFETs[1] DENIS GOLOSOV, Bar-Ilan University — We consider quasi-two-dimensional gas of electrons in a typical Si-MOSFET, assuming contact repulsive interaction between electrons. Magnetisation and susceptibility are evaluated within the mean-field approach. The finite thickness of inversion layer results in an interaction-induced electron wave function change, not found in both purely two-dimensional and three-dimensional (bulk) cases. Taking this self-consistent change into account leads to an increased susceptibility and ultimately to a ferromagnetic transition deep in the high-density metallic regime. We further find that in the paramagnetic state, magnetisation increases sublinearly with increasing in-plane magnetic field. In the opposite limit of low carrier densities, the effects of long-range interaction become important and can be included phenomenologically via bandwidth renormalisation. Our treatment then suggests that with decreasing density, the metal-insulator transition is preceded by a ferromagnetic instability. We discuss the validity of our mean-field scheme, and relate the results to the available experimental data.

[1]Supported by Israeli Absorption Ministry

Denis Golosov
Hebrew Univ of Jerusalem

Date submitted: 05 Nov 2015 Electronic form version 1.4