Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Symmetry-dependent electron-electron interaction in coherent tunnel junctions resolved by measurements of zero-bias anomaly JIAN WEI, LIANG LIU, JIASEN NIU, LI XIANG, ICQM, Peking Univ, China, D.-L. LI, J.-F. FENG, X.-F. HAN, IOP, CAS, China, X.-G. ZHANG, Oak Ridge National Laboratory and Univ. of Florida, USA, J.M.D. COEY, Trinity College, Ireland — We provide conclusive experimental evidence that zero-bias anomaly in the differential resistance of magnetic tunnel junctions (MTJs) is due to electron-electron interaction (EEI), clarifying a long standing issue. The magnon effect that caused confusion is now excluded by measuring at low temperatures down to 0.2 K and with reduced ac measurement voltages down to 0.06 mV. The normalized change of conductance is proportional to $\ln(eV/k_BT)$, consistent with the Altshuler-Aronov theory of tunneling that describes the reduction of density of states due to EEI, but inconsistent with magnetic impurity scattering. The slope of the $\ln(eV/k_BT)$ dependence is symmetry dependent: the slopes for parallel and antiparallel states are different for coherent tunnel junctions with symmetry filtering, while nearly the same for those without symmetry filtering (amorphous barriers). This observation may be helpful for verifying symmetry preserved filtering in search of new coherent tunneling junctions, and for probing and separating electron Bloch states of different symmetries in other correlated systems.[1]

[1]Liu et al., arXiv:1410.3636, accepted by Phys. Rev. B

Jian Wei
ICQM, Peking Univ, China

Date submitted: 10 Nov 2014 Electronic form version 1.4