Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Low-Bias Anomaly and Tunnel-Fluctuoscopy[1] ANDREAS GLATZ, Argonne National Laboratory, ANDREY VARLAMOV, CNR-SPIN, Viale del Politecnico, 1, 00133 Roma (Italy), VALERII VINOKUR, Argonne National Laboratory — Electron tunneling spectroscopy pioneered by Esaki and Giaever offers a powerful tool for studying electronic spectra in superconductors. The phenomenological theory by Giaever and Megerle related the tunneling current to the electronic densities of states and to the difference of their equilibrium distribution functions in electrodes. This led to impressive discoveries having revealed, in particular, of the wide, $eV_{pg} \sim \Delta_{BCS}$, pseudogap in the tunneling spectrum of superconductors above their critical temperatures. However, it turns that this standard approach is insufficient to reveal the nontrivial, related to Andreev reflection of the tunneling electrons from superconducting fluctuation domains in the biased electrode, zero-bias anomaly carrying important information about the scattering, interactions, and decoherence. Here, operating in frameworks of the microscopic theory of tunneling, we report the existence of a such low-energy singularity in a tunneling conductivity of N-I-N(S) junction directly indicating on the presence of fluctuating Cooper pairs. Our findings mark a radical departure from the conventional picture of the ZBA and open new horizons for quantitative analysis of electronic spectra of superconductors in fluctuation regime.

[1]The research was supported by the U.S. DOE, Office of Basic Energy Sciences, Division of Materials Science and Engineering, under the Contract No. DE AC02-06CH11357

Andreas Glatz
Argonne National Laboratory

Date submitted: 15 Nov 2013 Electronic form version 1.4