Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Point-Contact Andreev-Reflection Spectroscopy in Neutron-Irradiated $Mg^{11}B_2$ R.S. GONNELLI, A. CALZOLARI, D. DAGHERO, M. TORTELLO, G.A. UMMARINO, Dipartimento di Fisica and CNISM, Politecnico di Torino, Italy, V. A. STEPANOV, P.N. Lebedev Physical Institute, RAS, Moscow, Russia, C. TARANTINI, CNR-INFM-LAMIA and Dip.to di Fisica, Università di Genova, Italy, P. MANFRINETTI, CNR-INFM-LAMIA and Dip.to di Chimica e Chimica Industriale, Università di Genova, Italy — We report recent results of point-contact spectroscopy (PCS) in $Mg^{11}B_2$ polycrystalline samples irradiated with neutrons at different fluences up to $\Phi = 1.4 \cdot 10^{20}$ cm^{-2}. A strong depression of the bulk critical temperature T_c down to about 8.7 K was observed after irradiation. The gaps Δ_π and Δ_σ were obtained from the experimental Andreev-reflection conductance curves through a two-band Blonder-Tinkham-Klapwijk fit and reported as a function of the Andreev critical temperature of the junctions, T_c^A. The resulting $\Delta_\pi(T_c^A)$ and $\Delta_\sigma(T_c^A)$ curves clearly show a merging of the gaps when $T_c^A < 9$ K, which perfectly confirms the findings of recent specific-heat measurements in the same samples. "Anomalous" contacts with $T_c^A > T_c$ and a different dependence of the gaps on T_c^A with respect to "standard" ones were obtained in samples irradiated at the highest fluences. The possible origin of these anomalies is discussed in terms of local current-induced annealing and/or nanoscale inhomogeneities - indeed observed by STM in the most irradiated samples.

Renato S. Gonnelli
Dipartimento di Fisica and CNISM,
Politecnico di Torino, 10129 Torino (TO)

Date submitted: 29 Nov 2006 Electronic form version 1.4