

Abstract Submitted  
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**Signature of topological transition in InAs nanowire Josephson junctions** ELIA STRAMBINI, J. PAAJASTE, M. AMADO, S. RODDARO, NEST, CNR-NANO and Scuola Normale Superiore, Pisa, Italy, P. SAN-JOSE, R. AGUADO, ICMM-CSIC, Madrid, Spain, S. BERGERET, CFM-MPC, San Sebastian, Spain, D. ERCOLANI, L. SORBA, F. GIAZOTTO, NEST, CNR-NANO and Scuola Normale Superiore, Pisa, Italy — The coupling of a conventional s-wave superconductors to semiconductors with strong spin-orbit (SO) coupling, like e. g. InAs or InSb nanowires (NWs), gives rise to unconventional p-wave superconductivity that may become a topological superconductor (TS), which is a natural host for exotic edge modes with Majorana character. Recently the enhancement of the critical supercurrent  $I_c$  in a strong SO semiconducting Josephson junction (JJ) have been proposed as a new evidence of the sought-after Majorana bound states.<sup>1</sup> Here we report on the first observation of the colossal  $I_c$  enhancement induced by an external magnetic field on a mesoscopic JJ formed by InAs NWs and Ti/Al leads. This anomalous enhancement appears precisely above a threshold magnetic field  $B_{th}$  orthogonal to the substrate and in junctions of different lengths, suggesting that the origin of the enhancement is intrinsic, i.e. it is not related to geometrical resonances in the junction. None of the standard phenomenon known in JJ, including e. g. Fraunhofer patterns or  $\pi$ -junction behavior, can explain this colossal enhancement while a topological transition at  $B_{th}$  is qualitatively compatible with the observed phenomenology.

<sup>1</sup>Phys.Rev.Lett. **112**, 137007 (2014)

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