



**FisMat  
2019**

University of Catania - September 30 - October 4, 2019 - Conference Chairs: Ezio Puppini (CNISM) - Corrado Spinella (CNR) - Francesco Priolo (University of Catania)



## FisMat2019 - Submission - View

**Abstract's title:** Investigation of hybrid Josephson junctions for topological applications

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### Abstract

Hybrid superconductor/semiconductor devices constitute a powerful platform where intriguing topological properties can be investigated. Here we present Josephson junction devices formed by a high-mobility InAs quantum-well bridging two Nb superconducting contacts. We demonstrate supercurrent flow with transport measurements, high critical temperature of 8.1 K, and critical fields of the order of 3T. Modulation of supercurrent amplitude can be achieved by acting on two side gates. Low-temperature measurements reveal well-developed quantum Hall plateaus, showing clean quantization of Hall conductance and demonstrating the potential of hybrid devices to investigate the coexistence of superconductivity and Quantum Hall effect. Moreover, we present a different, fully tunable, hybrid semiconductor/superconductor device, in which the width, area, and supercurrent of the two arms of a SQUID-like geometry can be independently controlled with high precision. We demonstrate wide tunability from a SQUID with narrow arms to a Fraunhofer pattern in an extended JJ by electrostatic means. These results pave the way for new device architectures with potential topological applications.