

## **Unina Superconducting Quantum Computing Center: physics, implementation, operation & hardware evolution**

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### **Abstract:**

Quantum computing is at its early stages but has already shown major advances and promising performances for efficient case-specific computational studies. In the framework of the High-Performance, Big Data and Quantum Computing National Center ICSC, funded by the PNRR, at the University of Napoli “Federico II” we have built a scalable superconducting quantum computer with 25 qubits, that will be upgraded to 40 qubits by the end of the year, named after the siren “Partenope” of the Napoli’s mythology. “Partenope” is part of a larger low- temperature infrastructure that includes another dilution refrigerator (“Leucosia”), dedicated to the characterization of superconducting junctions, the key element of superconducting quantum computers, and more generally to superconducting quantum devices and small-scale proof-of-concepts quantum processors. This infrastructure will be upgraded shortly with another dilution fridge (“Ligea”). “Partenope” facility will be available to the ICSC Community. The Center will be also supported by a nanofab, which can support an in-house hardware evolution.