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TECHNOLOGICAL RESEARCH

COSMIC SILENCE MAKES QUANTUM COMPUTERS MORE POWERFUL

In the paper published in <u>Nature Communications</u>, a team of researchers from INFN and from the Karlsruhe Institute of Technology

(Germany) tested the operation of a superconducting circuit in a quantum regime located in the INFN Gran Sasso National Laboratories (LNGS), thus demonstrating that protecting a superconducting qubit from the effects of natural radioactivity significantly improves its performance.

At the LNGS, the natural shielding provided by the 1400 metres of rock allows the flux of cosmic rays to be reduced by about a million times compared to surface laboratories, offering an unparalleled environment for its characteristics of radio-purity. The study was developed as part of the DEMETRA project, funded by an INFN grant dedicated to young researchers, with the aim of understanding and eliminating one of the sources of disturbance for qubits: natural radioactivity.

Thanks to the unique characteristics of the LNGS, in terms of cryogenic infrastructure and an environment with a very low natural radioactivity, the SQMS (Superconducting quantum materials and systems centre) project, for the development of a new quantum computer, decided to invest in the development of a facility at the Gran Sasso National Laboratories to test its devices. SQMS is coordinated by Fermilab in Chicago and funded by the US Department of Energy (DoE), with the INFN as the only non-US partner.