



APPLIED RESEARCH

IMPACT OF NATURAL RADIOACTIVITY ON QUANTUM COMPUTERS

On 16 June, the journal Nature published a study that looks at the impact of natural radioactivity on the operation of quantum computers.

It highlights how gamma particles and cosmic muons can interfere with the complex mechanisms behind the operation of qubits, the constituent elements of quantum computers. Researchers of INFN Rome 1 Division collaborated in the research, which was conducted at the University of Wisconsin-Madison and together with other American and French institutions.

Qubits, an abbreviation of “quantum bit”, can simultaneously save and process data in parallel making quantum computers faster and more powerful than conventional computers. In any case, by studying the performance of a matrix of qubits for several hours, the scientists observed that, in many cases, several qubits were simultaneously affected by memory errors: a crucial problem for developing a quantum computer. The protocols to correct memory errors predict, in fact, that if a qubit fails, the others can store information, thus making it recoverable. But if several errors occur simultaneously, the information is permanently lost. Using simulations developed by the INFN team, which reproduced the effect of the interaction of natural radiation particles with the superconducting circuits, it was possible to demonstrate that these simultaneous errors occurred due to natural radioactivity. This represents an innovative contribution to the research into qubit operation that will make it possible to expand the research conducted until now and to better understand the effects of natural radioactivity on qubit operation. ■