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Search for 76Ge 0νββ decay and beyond with the GERDA experiment

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Observing the neutrino-less double-beta ($0\nu\beta\beta$) decay would imply that neutrinos have a Majorana mass component and provide evidence of lepton number violation. The Germanium Detector Array (GERDA) experiment searched for $0\nu\beta\beta$ of ^{76}Ge operating enriched high purity germanium detectors in an instrumented Liquid Argon volume at Laboratori Nazionali del Gran Sasso (LNGS) in Italy. At the end of Phase II, with a total exposure of 127.2 kg·yr, no $0\nu\beta\beta$ decay signal was found, and the most stringent lower limit on the ^{76}Ge $0\nu\beta\beta$ decay half-life was set at $1.8{\cdot}10^{26}$ yr at 90% C.L., coinciding with the median sensitivity for the null hypothesis.
The ultra-low background and excellent understanding of the experiment's response achieved in GERDA Phase II also allowed a measurement of the Standard Model $2\nu\beta\beta$ decay half-life of ^{76}Ge with unprecedented precision. It provides essential inputs for nuclear structure calculations that benefit the interpretation of $0\nu\beta\beta$ decay results. Furthermore, the search for distortions of the $2\nu\beta\beta$ decay spectrum allows exploring new physics, like $0\nu\beta\beta$ decay with Majoron emission, Lorentz invariance, or search for sterile neutrinos.
This talk will cover the final result of GERDA on the search for ^{76}Ge $0\nu\beta\beta$ decay, as well as new results on the ^{76}Ge $2\nu\beta\beta$ decay half-life and limits on exotic decay modes.

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