

Underground tests of Quantum Mechanics :the Pauli Exclusion Principle violation and Collapse Models

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We are experimentally investigating possible departures from the standard quantum mechanics' predictions at the Gran Sasso underground laboratory in Italy.

In particular, with radiation detectors we are searching signals predicted by the collapse models (spontaneous emission of radiation) which were proposed to solve the "measurement problem" in quantum physics and signals coming from a possible violation of the Pauli Exclusion Principle.

I shall present the VIP experiment with which we look for possible violations of the Pauli Exclusion Principle by searching for "impossible" atomic transitions and comment the impact of this research in relation to Quantum Gravity models.

I shall also discuss our recent results published in Nature Physics under the title "Underground test of gravity-related wave function collapse", where we ruled out the natural parameter-free version of the gravity-related collapse model. I shall then present more generic results on testing CSL (Continuous Spontaneous Localization) collapse models.

Future perspectives will be also discussed.

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