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Quantum mechanics under test in the underground laboratory of Gran Sasso

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<https://us02web.zoom.us/j/89301579118>

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

In particular, with advanced radiation detectors, we are searching for signals coming from a possible violation of the Pauli Exclusion Principle, motivated by quantum gravity models, and we test, with unprecedented sensitivity, collapse models which were proposed to solve the “measurement problem” in quantum physics.

In my talk I shall present the most recent results we obtained in testing the Pauli Exclusion Principle [1] by searching for “impossible” atomic transitions and in testing various types of collapse models by searching the spontaneous emission of radiation, predicted by these models.

In particular, I shall discuss our recent results, published in Nature Physics [2] under the title “Underground test of gravity-related wave function collapse”, where we ruled out the natural parameter-free version of the gravity-related model.

I shall then present more generic results on testing CSL (Continuous Spontaneous Localization) collapse models and will conclude with future perspectives, both from experimental and theoretical points of view.

References:

[1] <https://www.mdpi.com/1099-4300/22/11/1195>

[2] <https://www.nature.com/articles/s41567-020-1008-4?proof=t>