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Type: Talk

Testing the Pauli Exclusion Principle with the VIP-2 Experiment and beyond

Tuesday 6 September 2022 10:00 (30 minutes)

The Pauli Exclusion Principle (PEP) is one of the main cornerstones of the Quantum Theory at the basis of many phenomena, from the stability of the matter to neutron stars and from white dwarfs to superconductivity. Violation of the PEP, albeit small, could be motivated by physics beyond the known frontiers of the Standard Model which entail extra space dimensions, violation of the Lorentz invariance, non-commutative spacetime. These scenarios can be experimentally constrained with state-of-the-art X-ray spectroscopy, searching for forbidden electronic transition in atomic systems.

We look for the PEP violation with a complementary approach.

The VIP-2 Experiment at Laboratori Nazionali del Gran Sasso targets models where PEP violation signal can be realized only introducing new electrons into the atomic system. This is achieved by circulating a strong direct current in a copper target, searching for X-ray radiation emitted by the forbidden transitions using Silicon Drift Detectors. The analysis of the experimental VIP-2 data is presented. A brief outlook of the future VIP-3 experiment is also shown.

A large class of Quantum Gravity models have been shown to embed PEP violation as a consequence of spacetime non-commutativity, avoiding the external-electron requirement. The energy scale of these quantum gravity models can be experimentally constrained with high-purity germanium detectors and low-radioactivity roman lead targets. The results of exploratory studies are discussed.

Is this abstract from experiment?

Yes

Name of experiment and experimental site

VIP-2 Experiment at Laboratori Nazionali del Gran Sasso (INFN-LNGS)

Is the speaker for that presentation defined?

Yes

Details

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Internet talk

Maybe

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