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## Testing Pauli Exclusion Principle for electrons at the LNGS underground laboratory

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The VIP-2 experiment at the Underground Gran Sasso Laboratory (LNGS) aims to perform high sensitivity tests of the Pauli Exclusion Principle (PEP) for electrons, and search for a possible small violation. The PEP violation would be a clear indication of physics beyond the Standard Model.

The VIP-2 collaboration performs tests of PEP violation in various configurations.

A first experimental method consists in circulating a DC current in a copper strip, searching for the X radiation emitted by a PEP prohibited transition (from the 2p level to the 1s level of copper when this is already occupied by two electrons).

The VIP experiment already set a strong limit on the PEP violation probability for electrons  $\frac{1}{2}\beta^2 < 4.7 \times 10^{-29}$ . The goal of the upgraded VIP-2 experiment is to improve this limit by at least two orders of magnitude and explore theories beyond Standard Model allowing for small violations. The VIP-2 experimental apparatus and preliminary results of the analysis of a first set of collected data will be presented.

On the other side, it was recently shown that a large class of Quantum Gravity models embed the violation of PEP as a consequence of the space-time non-commutativity.

High sensitivity tests of PEP violation in closed systems, i.e. without the necessity to circulate current, turn out to be excellent measurements to put strong experimental limits on the energy scale of the non-commutativity emergence in Quantum Gravity. The preliminary results of exploratory studies based on High Purity Germanium (HPGe) detectors and high radio-purity Roman Pb targets will be presented

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