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Search for BSM physics with neutron beta decay in the BRAND project

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Neutron and nuclear beta decay correlation coefficients are sensitive to the exotic scalar and tensor interactions that are beyond the Standard Model (BSM). The BRAND project aims at a test of the Lorentz structure of weak interaction in neutron decay by precision measurements of yet unexplored transverse polarization of electrons in correlation with the neutron spin and electron and recoil proton momenta. The experiment will simultaneously measure eleven neutron correlation coefficients (a, A, B, D, H, L, N, R, S, U, V), where seven of them (H, L, N, R, S, U and V) depend on the transverse electron polarization. Five of these correlations: H, L, S, U and V were never attempted experimentally before. The expected ultimate sensitivity of the proposed experiment respectively BSM couplings will be comparable to that of the ongoing and planned correlation measurements in neutron and nuclear beta decays but offers completely different systematics and additional sensitivity to imaginary parts of the scalar and tensor couplings. In the talk, an overview of the project, physical motivation and applied experimental techniques will be reported. The results of the first pilot run of the experiment performed recently using the cold neutron beam line PF1B at the Laue-Langevin Institute, Grenoble, France will be presented, with an emphasis on the challenges of the proposed proton detection technique.

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