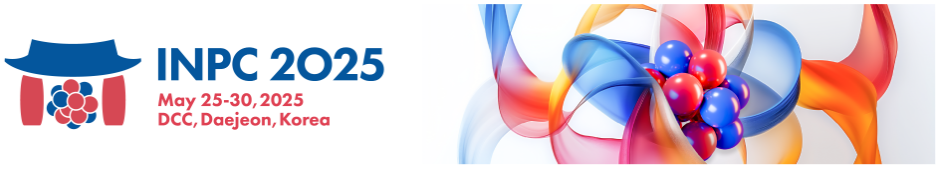

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Probing the structure of the weak interactions

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The Standard Model as a very successful theory of electroweak interactions postulates the basic assumption about the pure „V(ector)-A(xial vector)“character of the interaction. Nevertheless, the existence of other types of weak interactions (Scalar, Tensor) is still not experimentally ruled out. Low-energy searches for these „forbidden components“studying e.g. β-ν angular correlations in β-decay are complementary to high-energy experiments e.g. at the LHC.
The experimental project WISArD (Weak-Interaction Studies with 32Ar Decay) situated at the isotope separator ISOLDE/CERN probes the existence of these S/T currents in the weak interactions (or at least significantly improve their current experimental limits) via the precise study of the kinematic shift of β-delayed protons emitted in the decay of 32Ar. Due to presence of both Fermi and Gamow-Teller β-decays, both the S and T currents can be searched for simultaneously. The experiment aims to reach a sensitivity limit of 0.1% .
The experimental apparatus consists of a cryostat with a superconducting 9T magnet and a dedicated system of particle detectors installed in the magnet bore around a thin catcher foil, where radioactive 32Ar ions delivered by ISOLDE are implanted. The presence of the strong magnetic field allows to spatially separate positrons and protons allowing to observe them with different detectors thus providing low background for the β-p coincidences. The precise measurement of the deformed β-delayed proton spectrum due to kinematic shift enables investigating the shape of the energy spectrum of recoiling ions after the β-decay which is sensitive to the possible admixture of S/T components in the weak interaction.
The successful proof-of-principle measurement performed in 2018 using existing equipment provided already an interesting result [1]. Since then several major upgrades were installed [2] and in May 2024 a full data taking was performed aiming to reach a competitive result at the per-mil level of uncertainty for the angular correlation coefficient.
The current status of the WISArD setup, newest experimental results and perspectives as well as plans for future will be presented.

References:
[1] V. Araujo-Escalona et al., Phys.Rev. C101(2020) 055501
[2] D.Atanasov et al., Nucl.Instr.Meth. A1050 (2023) 16159

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