Nuclear Physics Seminar

High-precision frontier: applications from atomic physics to BSM

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Measuring a physical quantity with high precision provides an opportunity to test the fundamental laws and unveil new physics. The high-precision frontier has been a complementary approach to the high-energy frontier represented by the LHC [1]. Moreover, the high-precision measurement in atomic physics provides a testing ground for atomic calculations of many-electron systems. In this seminar, I will present two high-precision measurements recently conducted in the accelerator-based nuclear physics laboratories.

The ^{10}C superallowed beta-decay branching ratio measurements were performed at INFN Legnaro National Laboratories in 2023 and 2025. ^{10}C has the largest impact on the Fierz interference term (hence scalar current) search. Despite the importance of the measurement, only two experiments [2, 3] have been performed with the HPGe detector array. Their salient difference in the systematic uncertainty raises a question about the reliability of the measurements. The new experimental setup employed the HPGe tracking array AGATA to increase the efficiency and take advantage of segmented crystals.

Recently, the hyperfine structure constants were measured for the neutron-deficient isotope ^{21}Na using CLaSsy, a setup dedicated to collinear laser spectroscopy at RAON [4]. A systematic comparison with the state-of-the-art ab initio relativistic coupled cluster calculations shows the role of higher-order correlation effects such as triple excitations in ^{21}Na. The experimental setup and the plan for the isotope-shift measurement will be introduced.

References

1. M. González-Alonso, O. Naviliat-Cuncic, and N. Severijns, Prog. Part. Nucl. Phys. **104**, 165 (2019).
2. G. Savard et al., Phys. Rev. Lett. **74**, 1521 (1995).
3. B. K. Fujikawa et al., Phys. Lett. B **449**, 6 (1999).
4. J. Won et al., submitted to Phys. Rev. A (2026); arXiv:2605.26922.

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