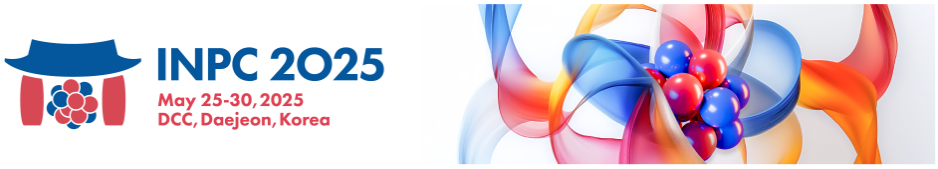

Contribution ID: **200** Type: **Contributed Oral Presentation**

High-precision TDRIV g-factor measurement in 22Ne and its implications for the N=20 Island of Inversion

Tuesday, 27 May 2025 11:50 (15 minutes)

The Island of Inversion in the neutron-rich $N = 20$ region arises in part due to a significant reduction in the energy gap between the sd and fp shells. Recent theoretical calculations [1] and experimental results in ^{30}Mg [2] favor a much smoother transition towards the Island of Inversion than previously thought, with considerable fp admixtures in the ground state of ^{30}Mg and small fp admixtures down to ^{28}Mg. If such admixtures are present already in ^{28}Mg, they are expected to influence the g factor of its 2_1^+ state as the magnetic dipole moments are especially sensitive to the mixing of single-particle configurations.

To test this hypothesis, the first application of the Time Differential Recoil In Vacuum (TDRIV) method [3,4] on a radioactive ion beam aimed to measure the g factor of the 2_1^+ state in ^{28}Mg. The experiment was carried out at HIE-ISOLDE in 2017 using the MINIBALL HPGe detector array, a CD DSSSD for particle detection and the MINIBALL plunger device, and the state of interest was populated via Coulomb excitation of the post-accelerated ^{28}Mg beam. The TDRIV method is based on observing the Larmor frequency, proportional to the g factor, at which the nuclear and atomic spins precess around the total spin of the projectile as it recoils between the target and a secondary foil within a plunger device. In the same experiment a calibration TDRIV measurement of the supposedly well-known g factor of the 2_1^+ state in ^{22}Ne was also performed as a test of the plunger system and in order to determine the plunger zero-offset distance, needed to constrain the ^{28}Mg TDRIV analysis. A striking disagreement was observed between the newly-obtained results from the ^{22}Ne measurement and the adopted g-factor value from the 1970s [5], which introduced significant systematic uncertainties for the ^{28}Mg g-factor result.

In order to reduce the systematic uncertainties of the ^{28}Mg measurement and to resolve the discovered discrepancy in ^{22}Ne an experiment to re-measure the g factor of the 2_1^+ state in ^{22}Ne was performed in September 2024 at GANIL. The experimental setup consisted of the EXOGAM γ-ray spectrometer coupled to the Orsay Universal Plunger System and the newly-developed Orsay Particle Scintillator Array (OPSA). With the provided 10^9 pps ^{22}Ne beam intensity we were able to collect high-statistics particle-γ coincidence data that will allow us to obtain a high-precision and high-accuracy value for the g factor of the 2_1^+ state in ^{22}Ne. The results from the preliminary analysis of this data set will be presented and compared to theoretical predictions. In addition, the implications of these results on the ^{28}Mg g-factor measurement from ISOLDE, and on the extent of the $N = 20$ Island of Inversion will be discussed.

Primary author: STOYCHEV, Konstantin (University of Guelph, Canada)

Co-authors: GEORGIEV, Georgi (IJCLab, Orsay, France); LJUNGVALL, Joa (IPHC Strasbourg); STUCHBERY, Andrew (ANU, Canberra, Australia); THE E845 COLLABORATION

Presenter: STOYCHEV, Konstantin (University of Guelph, Canada)

Session Classification: Parallel Session

Track Classification: Nuclear Structure