Contribution ID: **115** Type: **Oral**

In-source Laser Spectroscopy Studies of Neutron-rich Thallium at IDS/ RILIS-ISOLDE

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Laser spectroscopy is one of the most powerful tools for studying ground and isomeric state nuclear properties. By observing small changes in atomic transitions, we can deduce the nuclear spin, electromagnetic moments, and changes in mean-square charge radii across long chains of isotopes. This allows us to study how the shapes and the configurations of the nuclei vary along the chain and hence to test our models that attempt to describe how nuclear structures evolve across the chart.

In this contribution, I will present the results from hyperfine structure and isotope shift studies of neutron-rich $^{207-209}$Tl performed at the ISOLDE Decay Station (IDS), combined with the application of the Laser Ion Source and Trap (LIST) to suppress the isobaric contamination typical to this mass region. Therefore, the changes in the mean-square charge radii and magnetic dipole moments were extracted. The results display a kink [1] in the mean-square charge radii along the Tl isotopic chain when crossing the N=126 shell closure, which is the same phenomenon observed from other elements around this region [2, 3, 4]. The magnetic dipole moments for $1/2^+$ thallium ground states have a large jump at N=126. Theoretical calculations including particle-vibrational coupling with the self-consistent theory of finite Fermi systems based on energy density functional are used to model the data [5].

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