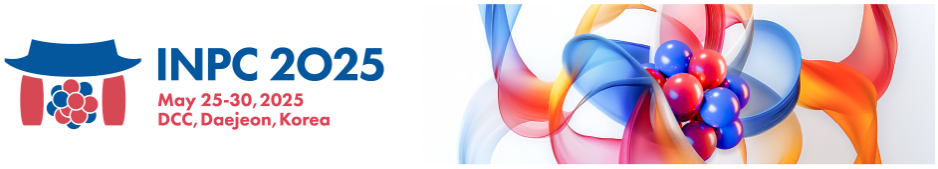

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Development of the Laser Systems for the Laser Spectroscopy in Exotic Nuclei Research

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Laser spectroscopy techniques can simultaneously measure multiple fundamental properties of atomic nuclei (spins, electromagnetic moments, charge radii) by probing the hyperfine structure (HFS) and isotope shift of atomic/ionic energy levels [1]. Collinear Laser Spectroscopy is one of the approaches to measure the HFS spectrum, based on laser-induced fluorescence (LIF) and/or resonance ionization spectroscopy (RIS), and thus requires the use of narrow-band CW (continuous wave) laser, narrow-band and multiple broad-band pulse lasers.

Our group has recently developed a collinear laser spectroscopy system, which could measure the HFS spectrum using both LIF and RIS methods, and thus has high demands for the laser systems [2-4]. Therefore, a compact laser system, including narrow-band CW laser and its frequency-doubling, broadband pulse lasers and its 2nd/3rd/4th harmonic generation, high-power YAG lasers, as well as the frequency-stabilization and calibration system have been installed and tested. In addition to these commercial lasers, a home-made injection-locked cavity [5] including 2nd/3rd/4th harmonic generation to produce narrowband pulse laser, and the Pockel cell system to produce the narrow-band chopping laser beam have recently been developed and fully tested. These laser systems have been successfully applied to the high-resolution laser spectroscopy measurement using both LIF [2-3] and RIS [4] approaches.

In this presentation, the details of the laser systems and their application in laser spectroscopy experiments will be presented, along with the recently results from offline commissioning of stable nuclei and ongoing plans for online experiment of unstable nuclei.

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