



Contribution ID: 152

Type: **Poster Session**

Development of the Collinear Laser Spectroscopy system in RAON

Monday, 3 October 2022 23:18 (8 minutes)

Rare Isotope Science Project (RISP) at Institute for Basic Science (IBS) has been carried out to construct a Rare isotope Accelerator complex for ON-line experiments (RAON).

Collinear Laser Spectroscopy (CLS) system will be installed in RAON's ISOL beamline and is being developed for the study of basic nuclear properties such as nuclear spin, electromagnetic moment, and mean square charge radius using laser spectroscopy technology for stable and unstable ion beams. The RAON CLS system is a device that performs spectroscopic experiments through relative frequency modulation due to the Doppler effect by fixing the incident laser frequency and controlling the speed of the ion beam. The RAON CLS system consists of a beam merging section, CEC & Doppler tuning section, Detection section, and off-line ion source (OLIS) section. It has been manufactured and assembly is in progress by TRIUMF, Canada. Since the resonance frequency is different depending on the type of ion beam used in the experiment, it is necessary to be able to generate lasers of various wavelengths. For this purpose, two dye laser (565~610, 610~665 nm) and Ti:Sa laser (670~1050 nm) systems that are tunable laser systems were constructed. For shorter than 570 nm wavelength laser generation, a frequency doubler that can operate in the 500-700 nm (285~330 nm generate) region was constructed. Currently, an optics set of frequency doubler that can operate in the 670-1050 nm (335~525 nm generate) region is being prepared.

We plan to complete the installation of the RAON CLS system by the end of 2022, generate an Al ion beam using OLIS, and conduct the CLS experiments of Al ion beam to complete the commissioning of the RAON CLS system.

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Session Classification: Poster Session