



Contribution ID: 190

Type: **Poster (by default)**

Recent Progress of the UNIST-EBIT for Highly Charged Ion Studies

Highly charged ions (HCIs) are currently utilized in numerous fundamental and applied sciences, including astrophysics, dark matter search, optical clocks, semiconductor lithography, and quantum dot fabrication, to name just a few examples. At UNIST, a tabletop electron beam ion trap (EBIT) has been developed for creating and studying HCIs. The UNIST-EBIT compresses the electron beam by 72 permanent magnets (up to 0.84T) and produces up to He-like Ar ions. The primary objective of the UNIST-EBIT is to obtain X-ray spectrum data essential in astrophysics. We use highly charged Fe ions to understand the visible matter in stars, supernovas, near-stellar clouds, and jets from black holes. Following the first X-ray spectroscopy experiments at the Pohang Accelerator Laboratory Free Electron Laser (PAL-XFEL) facility, a systematic upgrade is underway to address the alignment issues encountered during the initial beam time. Meanwhile, optical clocks based on HCIs are receiving significant attention from the scientific community. The UNIST-EBIT can also provide various HCIs for optical clock applications. For this purpose, designing an extraction beamline along with an initial extraction experiment of Ar ions from the EBIT is underway. To extract Ar ions, we consider constructing an automatic control system with EPICS. In this work, we present the recent progress of the UNIST-EBIT for such future experiments.

Funding Agency

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Yes

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Session Classification: Monday

Track Classification: Production of Highly charged Ion Beams