

Preparation for laser cooling of relativistic Li-like O^{5+} at the CSRe

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Synopsis Laser cooling of relativistic heavy ion beams at storage rings is one of the most promising techniques to reach high phase-space densities and achieve a phase transition, an ordered beam, or even a crystalline beam. Compared with the established cooling schemes at storage rings, such as electron cooling and stochastic cooling, laser cooling rate is expected to be much higher and laser-cooled ion beams could reach ultra-low temperatures (~mK). We will present the preparation of laser cooling of 280 MeV/u $^{16}O^{5+}$ ion beams at the experimental cooler storage ring CSRe at the Institute of Modern Physics, Chinese Academy of Sciences.

A schematic view of the experimental setup for laser cooling of relativistic ion beams at the CSRe is shown in Fig. 1 on the left, and the parameters relevant for the experiments are summarized in the table on the right. The experiment is to be performed in 2017. We will present the progress of our preparation of laser

cooling experiments at the CSRe [1], and also outline laser cooling and precision laser spectroscopy of highly charged and relativistic heavy ions at the future large facilities, such as High Intensity heavy ion Accelerator Facility (HIAF) [2].

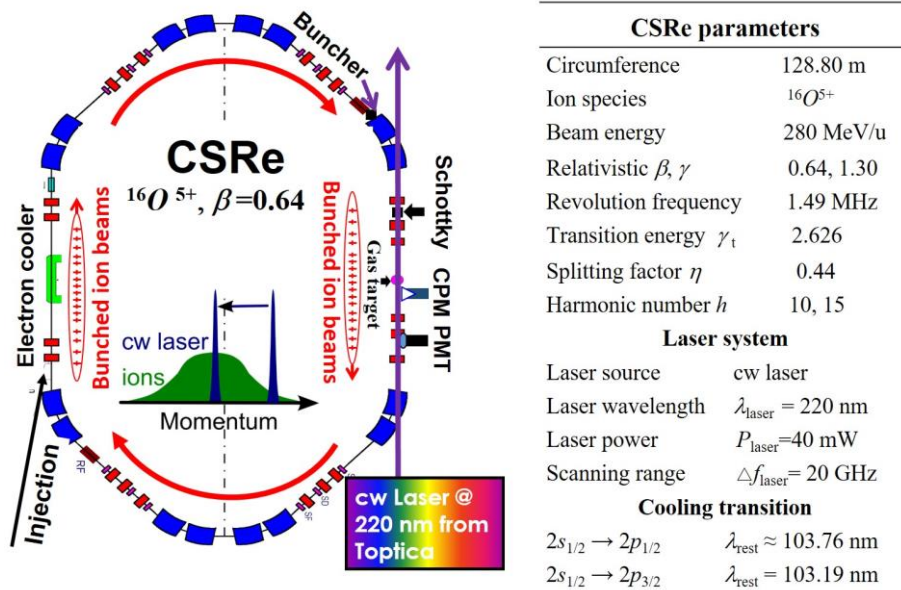


Figure 1. (Left) Schematic view of the experimental setup for laser cooling of 280 MeV/u Li-like $^{16}O^{5+}$ at the CSRe, the locations of a cw laser, laser beam transport, electron-cooler, RF-buncher, resonant Schottky pick-up, and UV-sensitive fluorescence detection systems are shown. (Right) The experimental parameters of laser cooling of $^{16}O^{5+}$ ion beams at the CSRe.

References

- [1] H. B. Wang *et al.* 2017 submitted to NIMB
 [2] X. Ma, *et al.* 2017 submitted to NIMB

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