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# A compact linear Paul trap cooler buncher for CRIS

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Collinear resonance ionisation spectroscopy (CRIS) combines ionisation spectroscopy with a collinear geometry to provide Doppler-free measurements of atomic hyperfine structure, used to determine changes in root mean square charge radii, nuclear ground state spins and nuclear ground state electromagnetic moments. In the technique, an atomic beam is collinearly overlapped with multiple laser fields to resonantly excite then ionise the atoms of interest for deflection and detection.

As the high-power pulsed-lasers required are only available with relatively low repetition rates (<200 Hz), the ion beam must arrive in bunches to avoid duty-cycle losses [1]. This requirement for a bunched beam necessitates the use of an ion trap. The CRIS experiment at ISOLDE, CERN currently makes use of the shared linear Paul trap, ISCOOL [2]. Installing a cooler buncher after the independent ion source at CRIS would allow for continual optimisation of the beam transport and quality. This would reduce the setup times needed before time-pressured experimental runs studying radioactive isotopes and would simplify rapid switching to a stable reference isotope.

This poster presents the work completed towards a compact linear Paul trap cooler buncher for CRIS measurements with the Artemis project at The University of Manchester. The project also acts as an initial prototype for a future ion trap at CRIS, ISOLDE. The design incorporates many 3D printed and PCB based DC optics and mounting pieces, greatly increasing the speed of manufacture. Initial vacuum tests have demonstrated the vacuum compatibility of these plastics, reaching pressures below 1 x $10^{-8}$ mbar.

[1] K. T. Flanagan et al. Phys. Rev. Lett., 111:212501, Nov 2013.
[2] I. Podadera-Aliseda et al. CERN-THESIS-2006-034, Jul 2006.

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