

# Elephants Flying Through Space in a Box: The DESIREE Electrospray Ion Source

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An electrospray ionization (ESI) ion source is currently being commissioned at DESIREE. The source has been designed to produce short, intense bunches of pre-cooled molecular ions for injection into the DESIREE storage rings [1]. The source will expand DESIREE capabilities by allowing introduction of large and/or fragile molecules, such as biochromophores, molecules important in atmospheric sciences, and other carbonaceous systems, e.g. substituted PAHs, which are not accessible with other ion sources.

A central feature of the new ESI source is coupling with a cryogenically cooled ring electrode trap (RET), from which short, intense bunches of internally cold molecular ions are extracted and injected into the DESIREE facility.

In an expert commissioning run, bunched beams of Rhodamine 640 cations were stored in DESIREE after trapping in both a room-temperature octupole pre-trap and the cryogenic RET. In both cases, measurable but small ion currents (10s of picoamps) were detectable at the end of each storage cycle. Ejection electrodes on the octupole pre-trap increase the stored beam current, but also heat some portion of the bunch, leading to spontaneous dissociation, as shown in the left figure below. The right figure shows the laser-induced neutral yield rate following the first few laser shots for room-temperature Rhodamine ions from the pre-trap. No laser-induced signal was observed for cold Rhodamine ions from the RET.

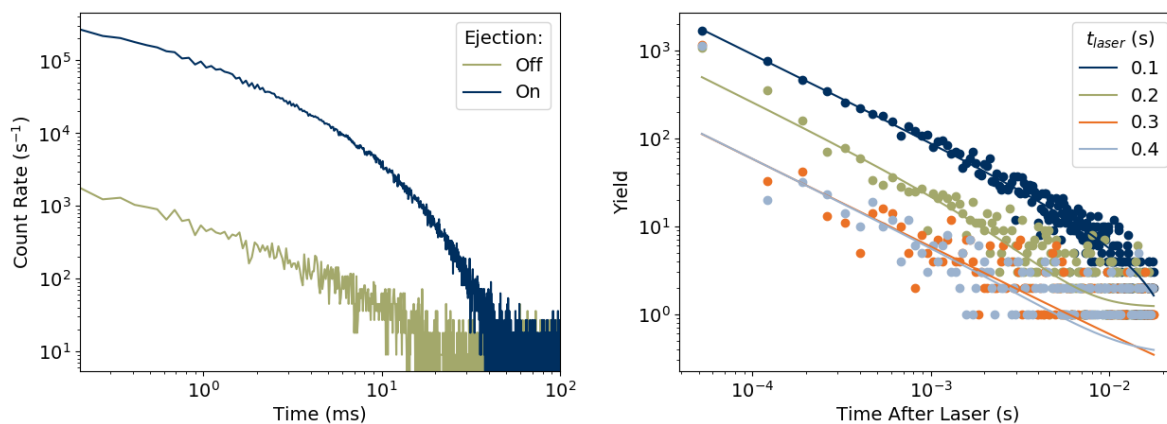


Figure 1: Left: Spontaneous dissociation of Rhodamine 640 cations due to ejection electrodes Right: Laser-induced dissociation of Rhodamine ions.

[1] N. de Ruelle *et al.* Rev. Sci. Instrum. **89**, 075102 (2018).