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## NG-Trap: System for Measuring Neutron Capture Cross-sections of Short-lived Fission Fragments

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Almost all nuclei heavier than iron are produced through neutron capture nucleosynthesis, about half of them by the rapid (r) process. One of the limiting factors in understanding the r-process is the need for neutron capture cross-section measurements on unstable nuclei. As shown with the recent measurement of  $^{88}\text{Zr}$  (Shusterman *et al.*, Nature 2019), neutron capture cross-sections can exhibit unpredictable behaviour.

We propose a novel method of measuring neutron capture cross-sections of short-lived nuclei. Neutron-rich nuclei produced via neutron-induced fission inside of a gas-filled stopping cell will form a mass-selected cooled low-energy beam, which will be transported into a linear Paul trap (coined 'NG-Trap'), forming a target. This 'cloud target' of up to  $10^{10}$  ions will then be irradiated with neutrons. The reaction products will then be identified and counted using a multiple-reflection time-of-flight mass-spectrometer (MR-TOF-MS), thus extracting the capture cross-sections.

This poster will present a breakthrough achievement towards the goal of generating the required 'cloud target'. A demonstrator system with an ion capacity of more than  $10^{10}$  ions will be presented. This system is a major milestone of the plan to install a high-capacity trap at the Soreq Applied Research Accelerator Facility (SARAF), currently under construction in Yavne, Israel.

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