Contribution ID: **6** Type: **Oral invited talk**

FIONA ToF: a Time-of-Flight detector for studies of superheavy elements at Berkeley Lab

Tuesday, 21 October 2025 15:30 (30 minutes)

Superheavy elements tend to decay mostly by alpha decay and spontaneous fission and their detection and study often relies on the detection of the alpha particles and the fission products using silicon detectors. In addition, half-lives can be deduced through the timestamps of implantation and decay events. This is possible due to the fact that after production, the ions have 10s of MeV of energy, enough to be implanted beyond the dead layer of a typical Si wafer.

In Berkeley Lab, we produce and detect superheavy elements using the 88" cyclotron and the Berkeley Gas-filled Separator. In addition, to eliminate ambiguities, we can identify the mass number of the superheavy elements using the FIONA setup. However, in order to study properties such as their mass, the superheavy ions have to first be stopped in a gas catcher and then trapped in a Paul trap in order to have an acceptable emittance. After cooling and bunching, they can only be accelerated to an energy of a few keV which is not enough to penetrate the dead layer of the Si wafer at the end of FIONA.

To overcome this limitation, we have developed a novel Time-of-Flight detector for use in mass identification experiments with FIONA and future high precision mass measurement experiments with the MR-ToF in Berkeley Lab. This detector combines a double-sided-silicon-strip detector (DSSD) and a micro-channel plate detector (MCP). The former provides the position sensitivity that corresponds to an A/q in FIONA as well as the decay information. The latter is used to detect secondary electrons emitted upon impact on the DSSD which provide the implantation time. This new detector significantly reduces the background in FIONA, allows for lifetime measurements and preserves the position resolution. The design, first results and current and future applications will be discussed.

Email address

mlykiardopoulou@lbl.gov

Supervisor's Name

Supervisor's email

Funding Agency

Classification

Primary author: LYKIARDOPOULOU, Marilena (Lawrence Berkeley National Lab)

Co-authors: CAMPBELL, Christopher (Lawrence Berkeley National Laboratory); Dr LEISTENSCHNEIDER, Erich (Lawrence Berkeley National Lab); GATES, Jacklyn (Lawrence Berkeley National Laboratory); PORE, Jennifer (Lawrence Berkeley National Laboratory); KRUECKEN, Reiner (TRIUMF); ORFORD, Rodney (Lawrence Berkeley National Laboratory)

Presenter: LYKIARDOPOULOU, Marilena (Lawrence Berkeley National Lab)

Session Classification: Ion optics & spectrometers

Track Classification: Low-energy and in-flight separators