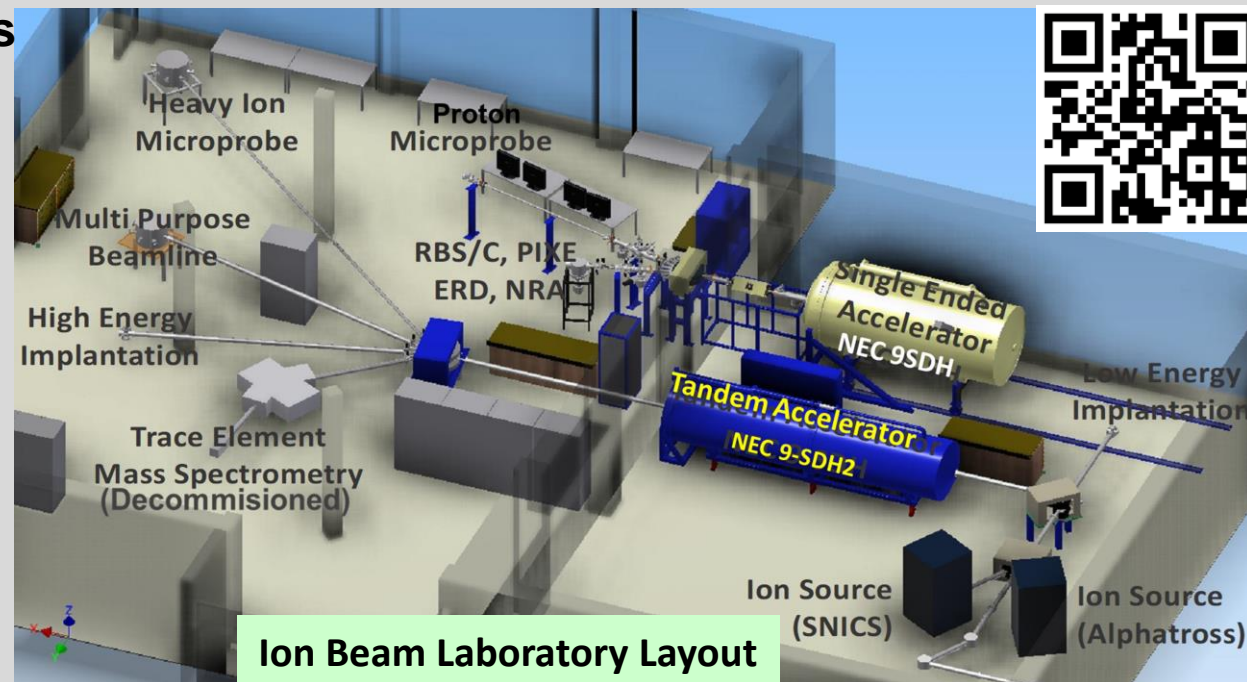


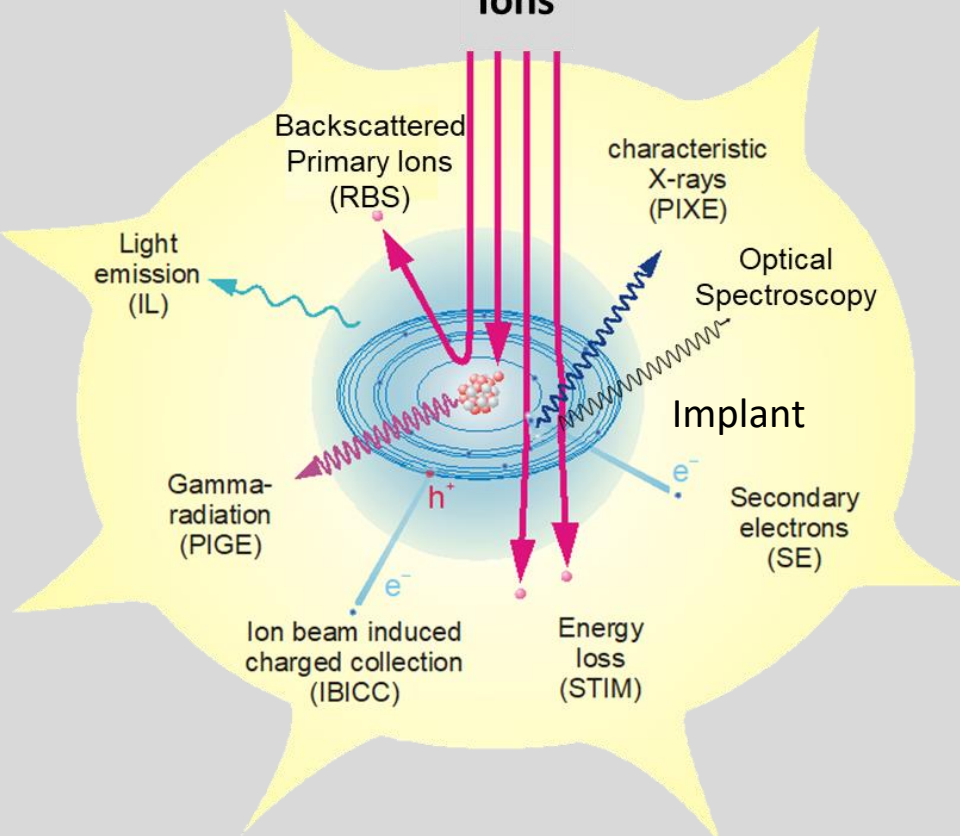
## Physics Department



- Ions: All except Ne, Ar, Kr, Ze and some exotic species
- $80 \text{ keV} < \text{Energy} < 10 \text{ MeV}$  ( $\sim 1 \text{ MeV/amu}$  for all species except H,  $\text{H} < 4 \text{ MeV}$ )
- Implant Dose:  $\leq 5 \times 10^{18} \text{ ions/cm}^2$
- 3.0 MV 9SH Pelletron® Ions: protons, helium  $^3\text{He}$ ,  $^4\text{He}$  and other gases.
- Proton Microprobe System Ions

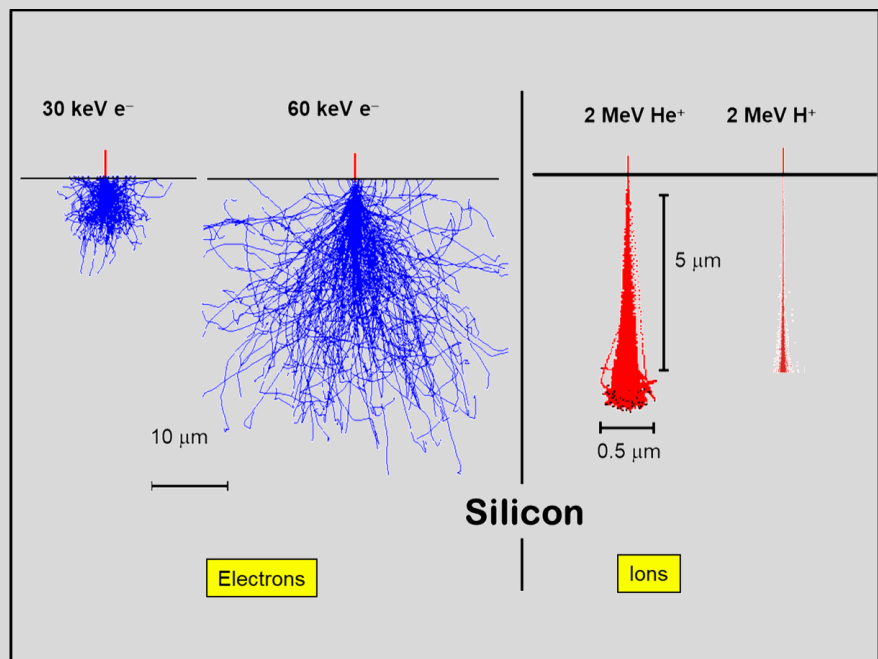
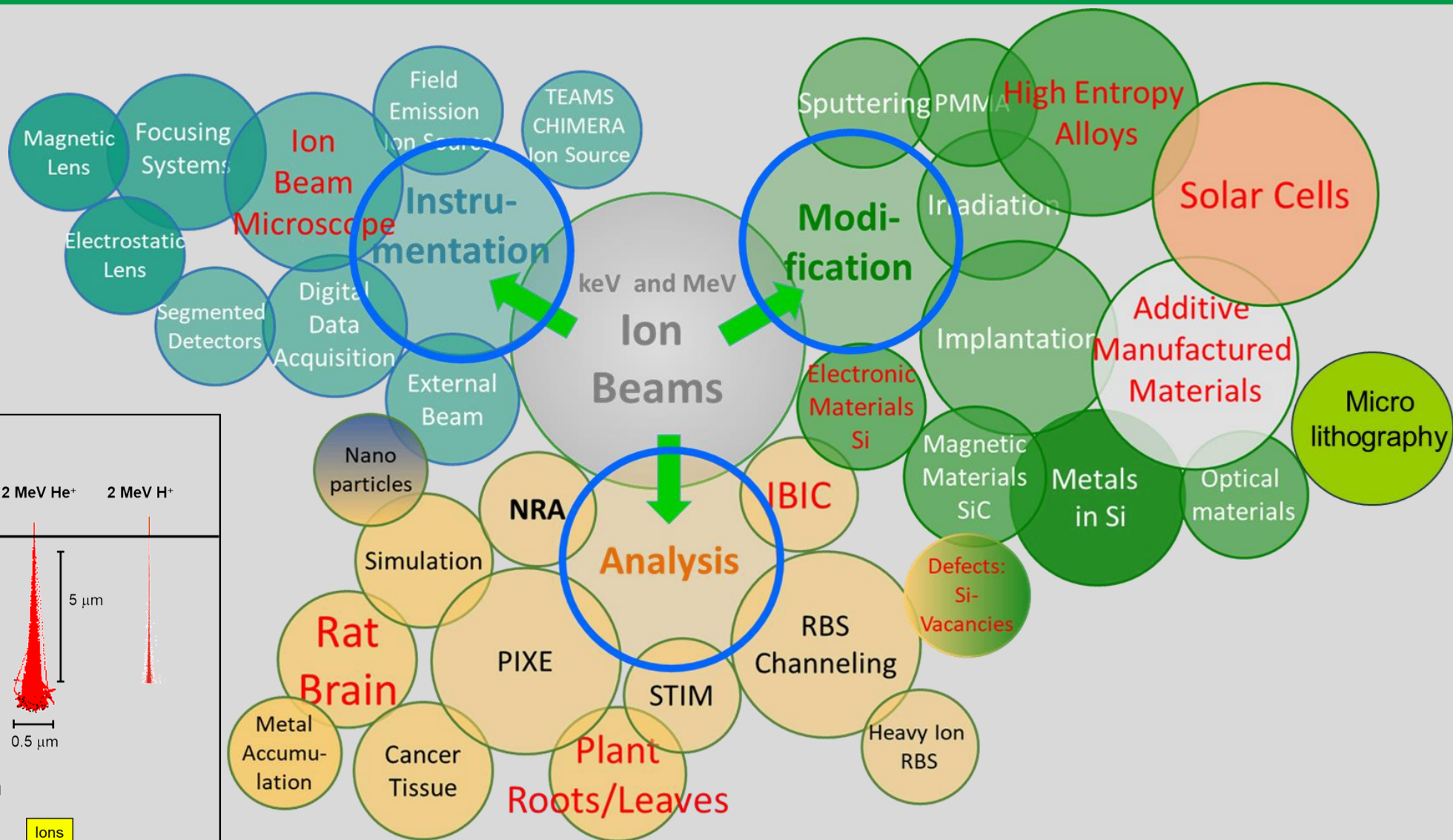


**Ion Beam Laboratory Layout**

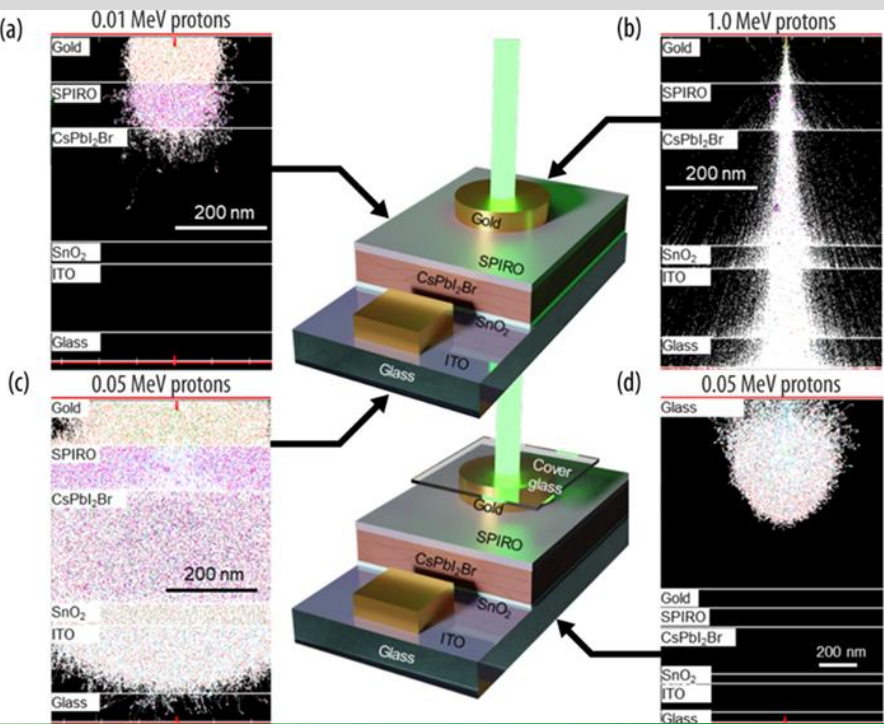


From left to right: Charles Bowen, Jacob Baxley, Aaron Richardson, Jordan Matty, Cory Nook (behind), Mritunjaya (MJ) Parashar, Todd Byers, Darshpreet Kaur Saini, Mohin Sharma, Soumya Sahoo, Gary Glass, Jacob Emerick, Bibhu Rout, Duncan Weathers

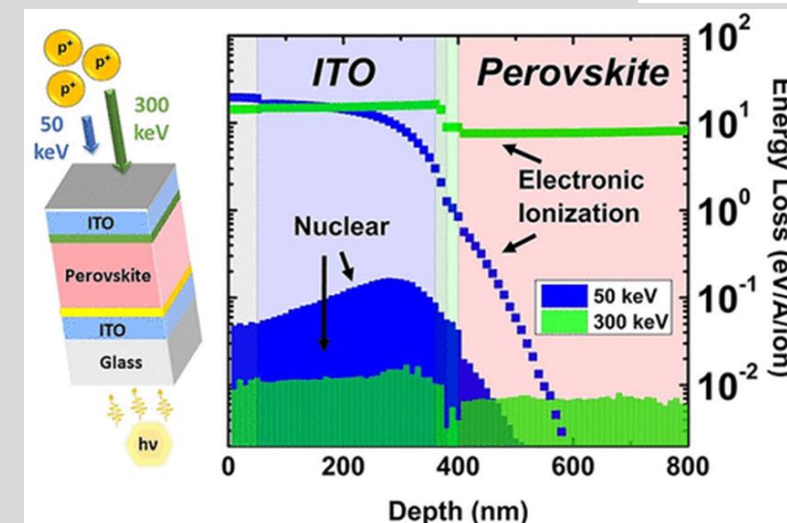
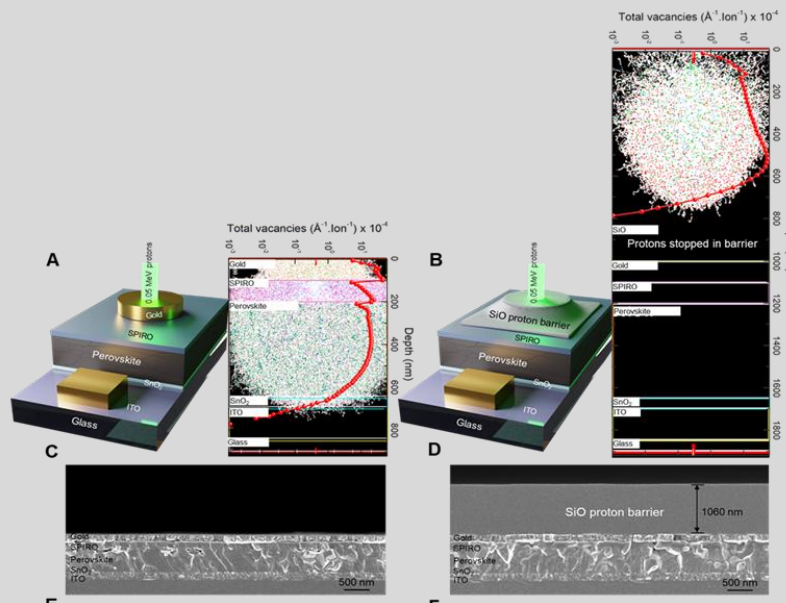




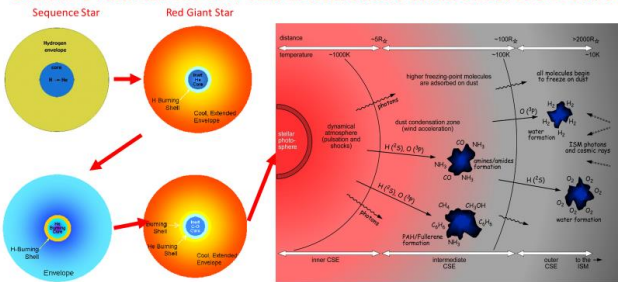




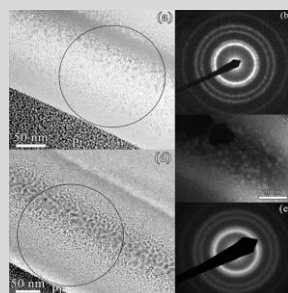
## Radiation Tolerance, **Self-healing**, and High Temperature Stability of Perovskite Solar cells



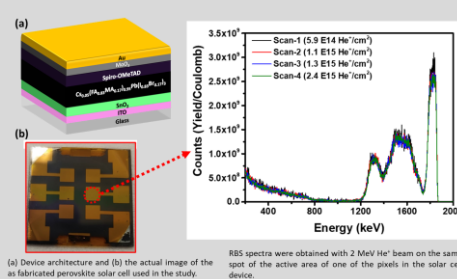
### Stellar evolution for low and intermediate mass stars: AGB stars



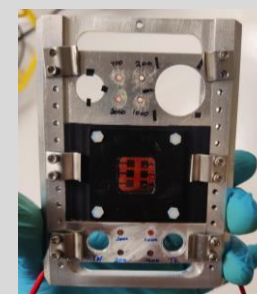
Synthesis of Cosmic dust analogues: magnesiowustite ( $MgSiO_3$ ,  $MgO$ ,  $FeO$ )



Compositional and Charge Collection analysis of Perovskite Solar cells



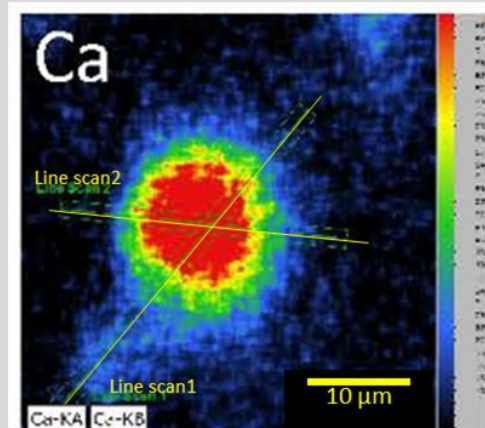
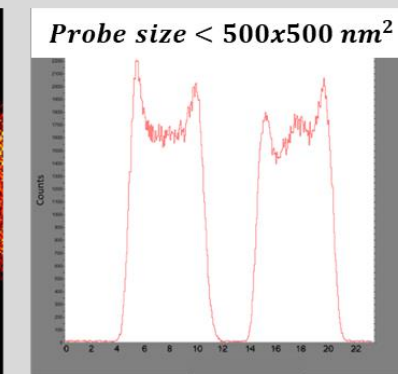
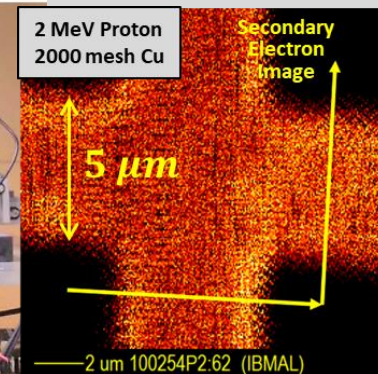
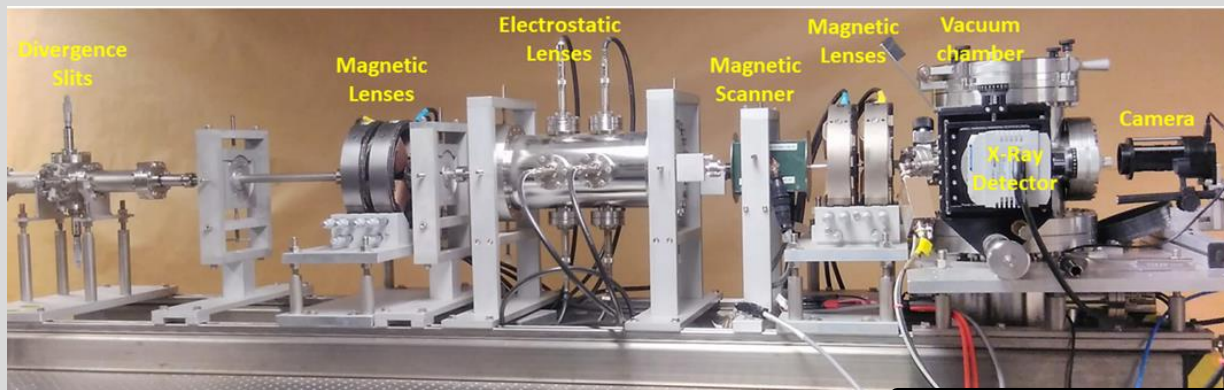
(a) Device architecture and (b) the actual image of the as-fabricated perovskite solar cell used in the study. RBS spectra were obtained with 2 MeV  $He^+$  beam on the same spot of the active area of one of the pixels in the solar cell device.



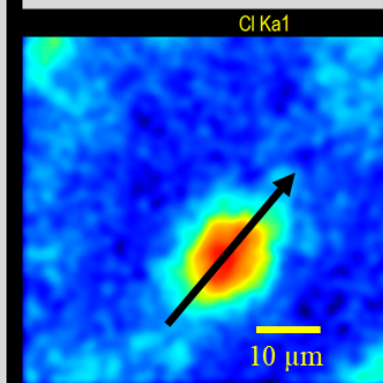
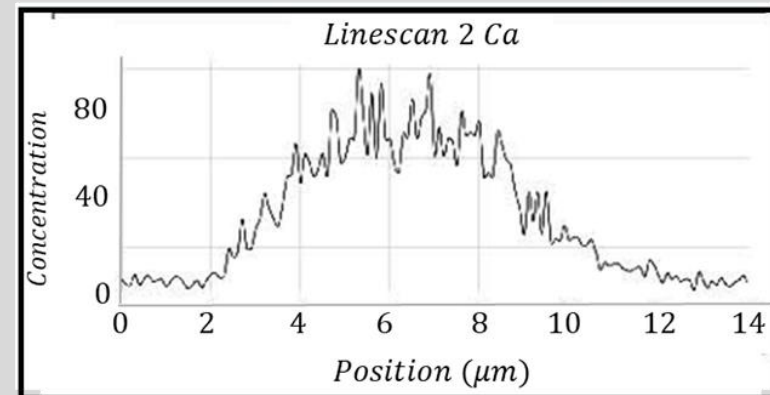
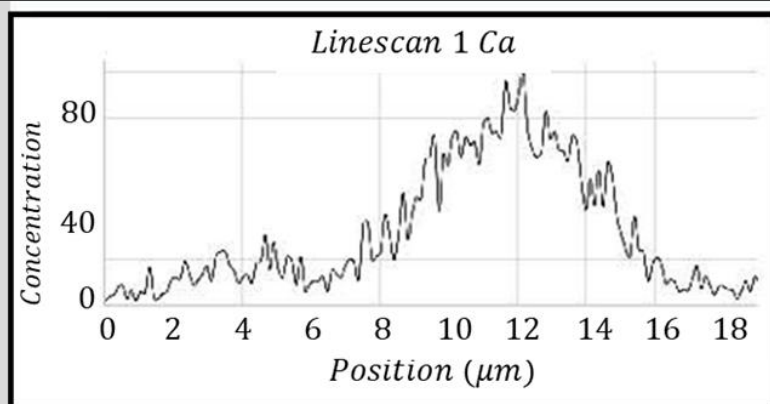
### Recent Publications

- ACS Energy Letters 8 (5), 2408-2413, 2023.
- Nature Energy 8 (2), 191-202, 2023
- Photovoltaics for Space, 175-195, 2023.
- APL Energy (in Press)
- Joule 6 (5), 1015-1031, 2022
- Planetary and Space Science 206, 105319, 2021
- ACS Energy Letters 6 (7), 2362-2368, 2021
- Surfaces and Interfaces 24, 101035, 2021

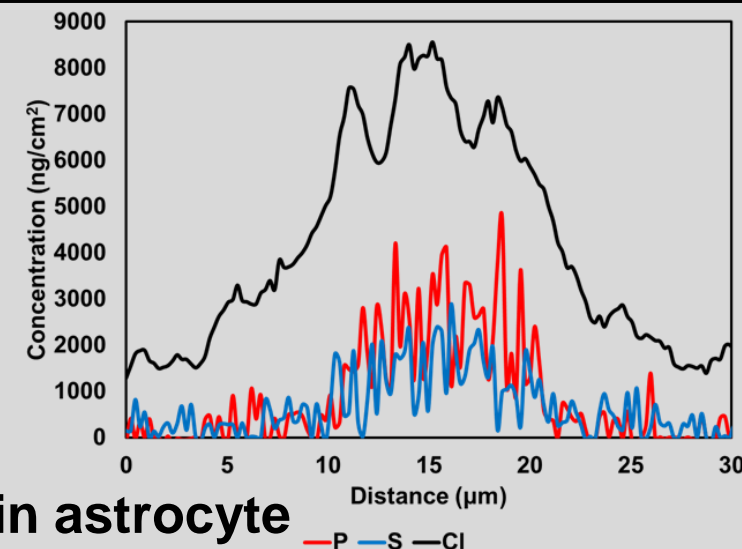
## Proton Microprobe



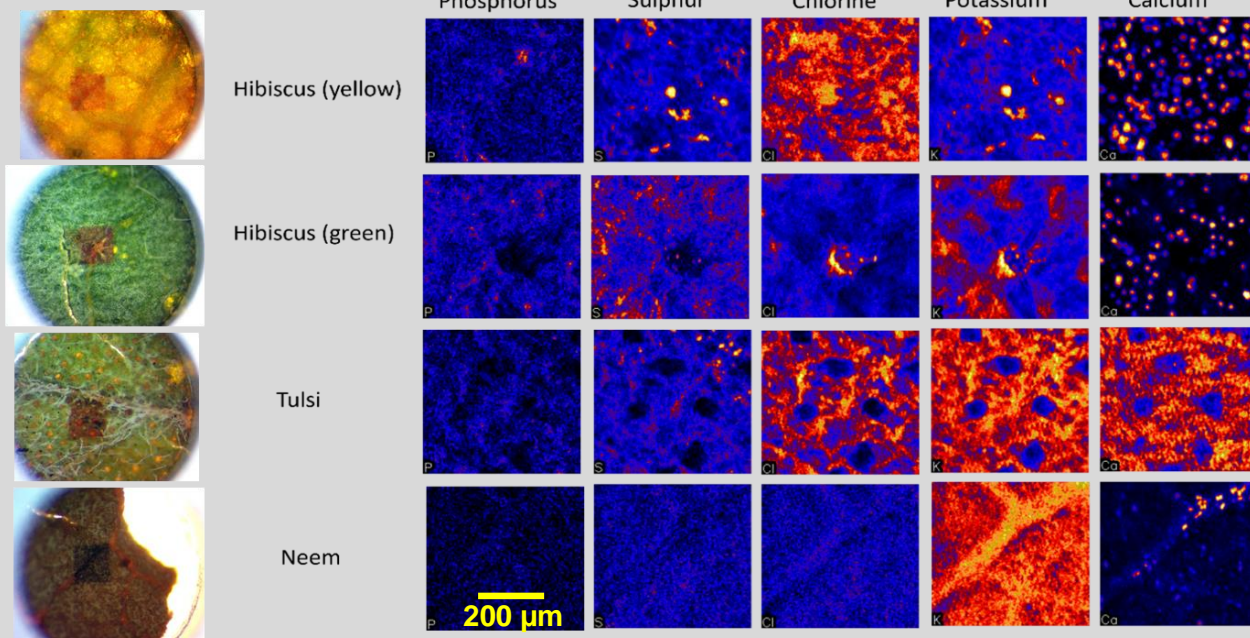
Rat Brain Nerve Cell



Rat brain astrocyte



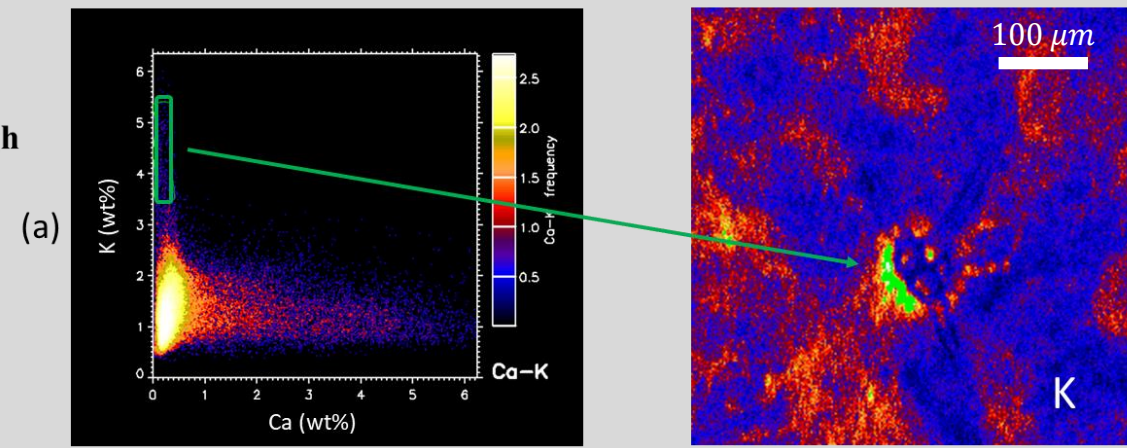




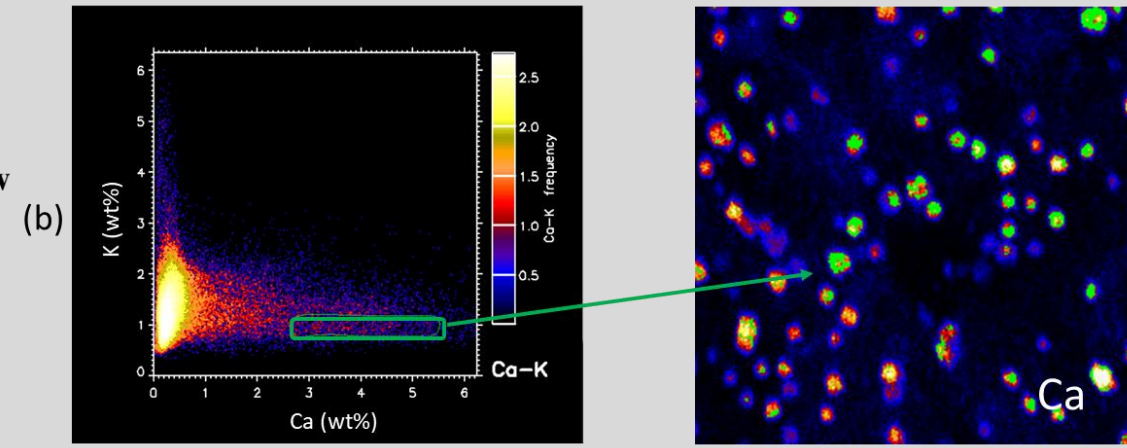
Optical Images

Elemental Maps

## Elemental Correlation between Potassium and Calcium in Green Leaf of Hibiscus



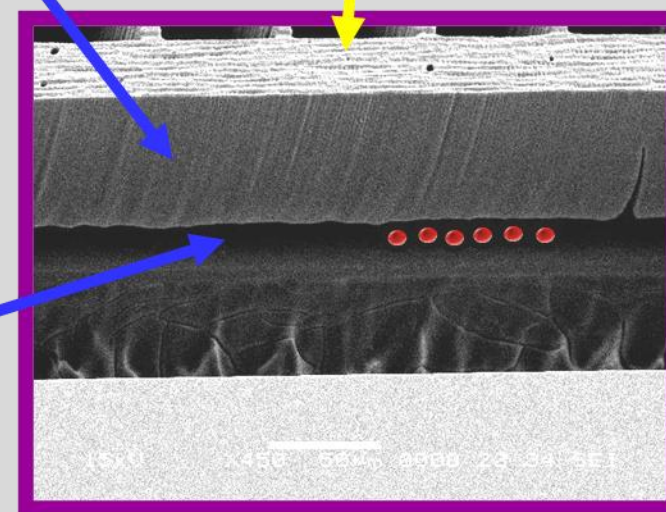
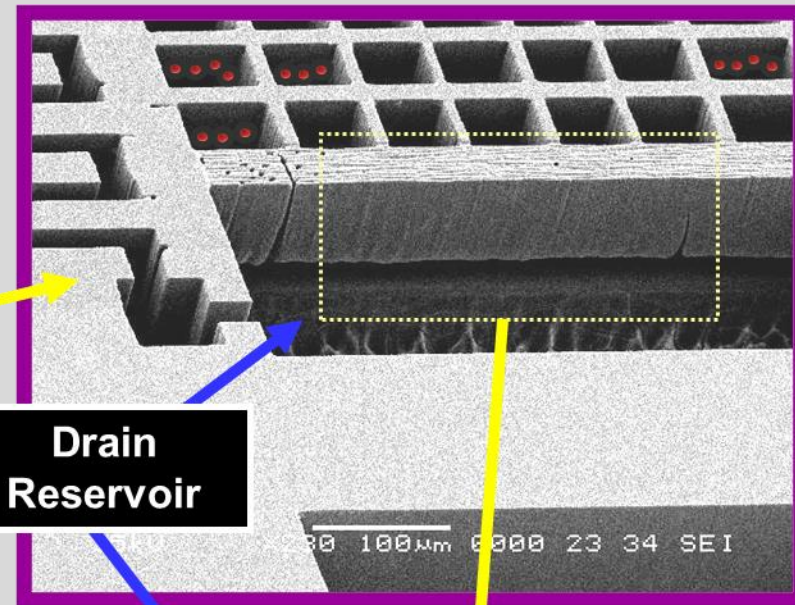
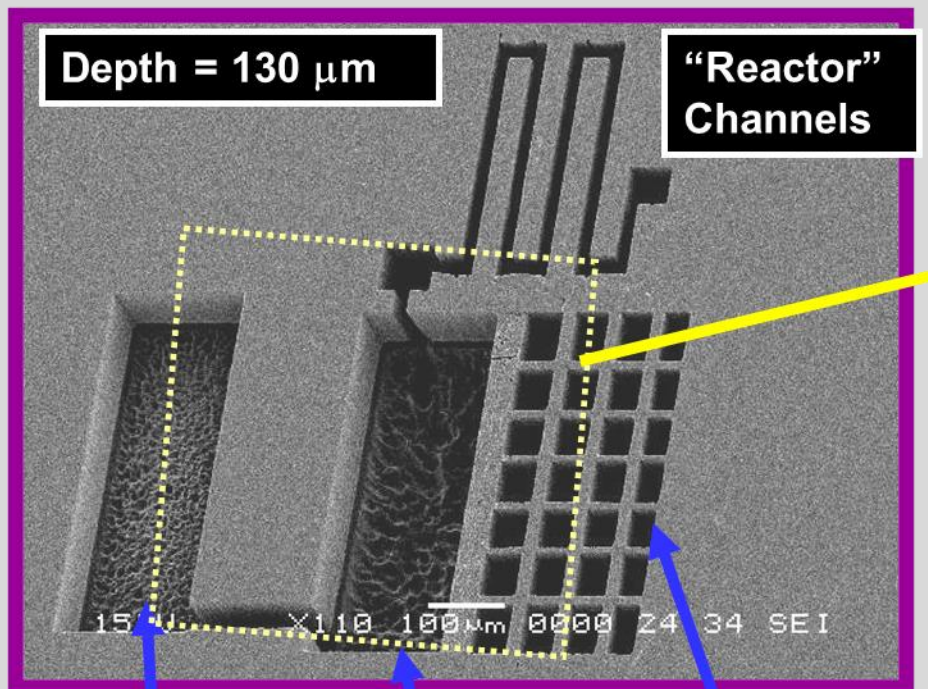
Elements	Al	Si	P	S	Cl	K	Ca	Mn	Fe	Cu	Zn
Concentration (ng/mg)	6170	966	2762	3055	15078	42887	1743	35	56	0	0



Elements	Al	Si	P	S	Cl	K	Ca	Mn	Fe	Cu	Zn
Concentration (ng/mg)	2240	576	1655	2331	2288	9824	40208	0	45	0	4







Reservoir

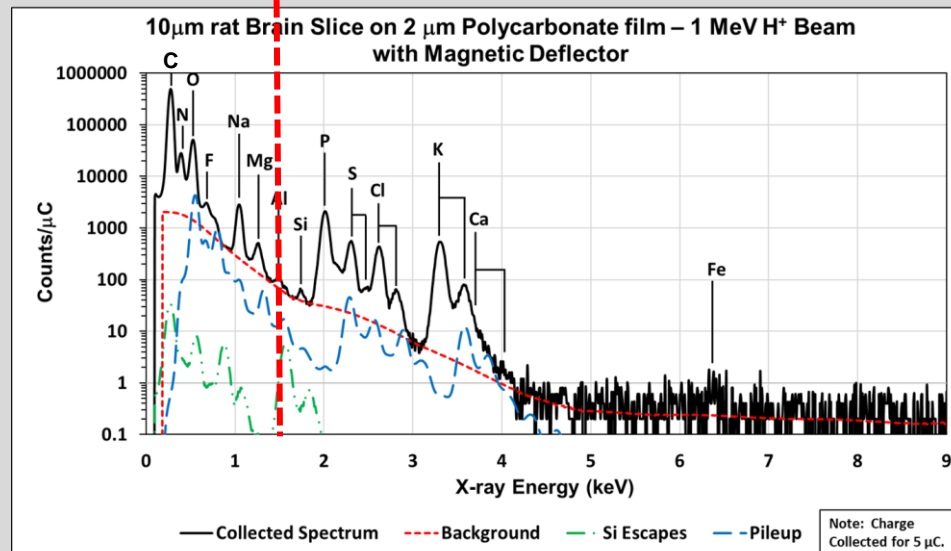
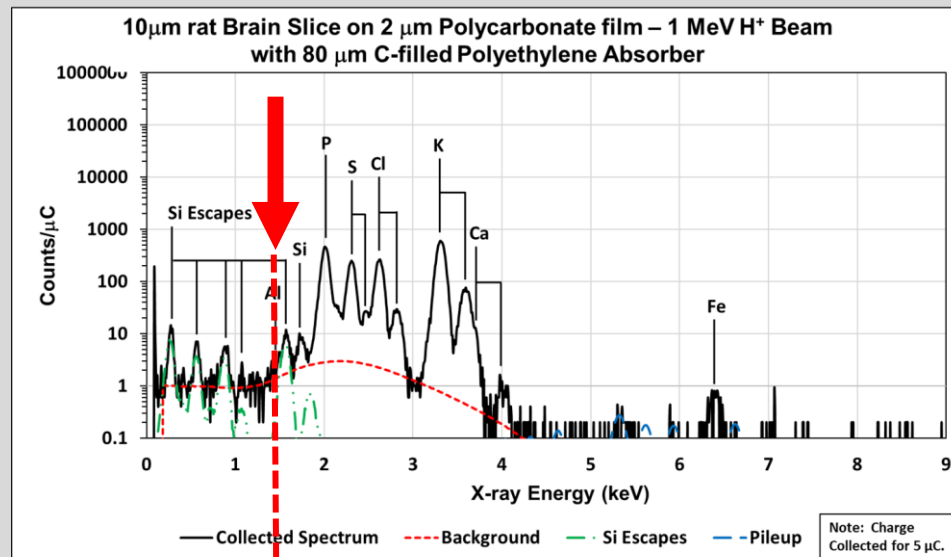
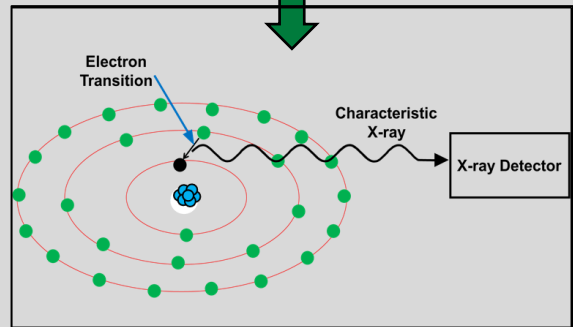
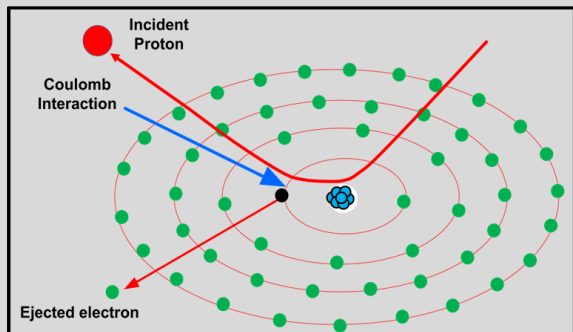
Drain Reservoir

Suspended Grid

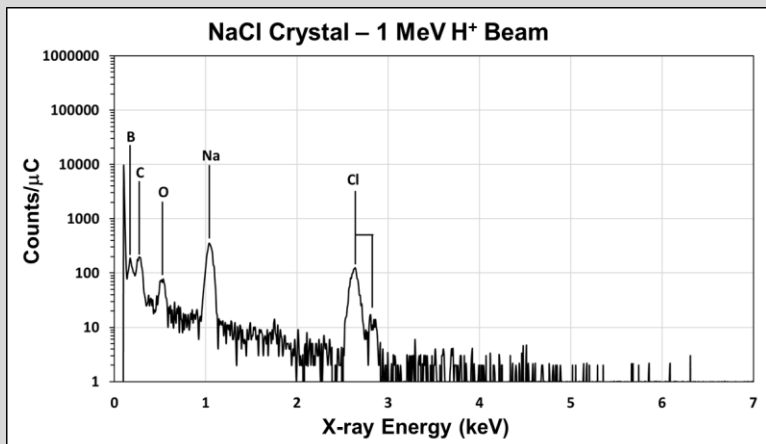
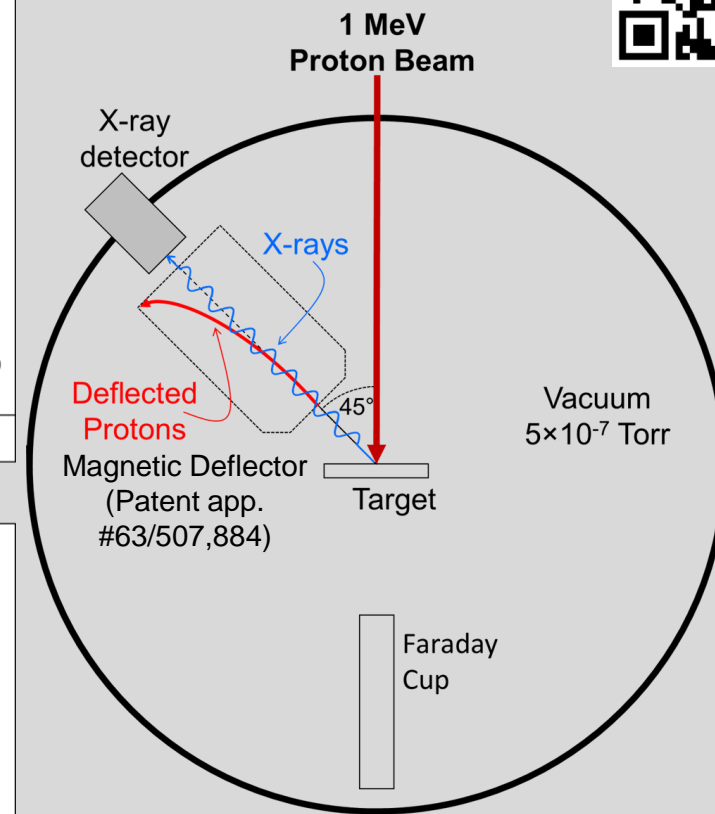
Drain

3 MeV protons (2  $\mu\text{m}$  x 2  $\mu\text{m}$ ); 2.7 mm thick PMMA

## Particle Induced X-ray Emission (PIXE)



## Low-Z PIXE setup



## 27<sup>th</sup> International Conference on the Application of Accelerators in Research and Industry (CAARI) and the 55<sup>th</sup> Symposium of Northeastern Accelerator Personnel (SNEAP)

July 21 through 26, 2024  
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