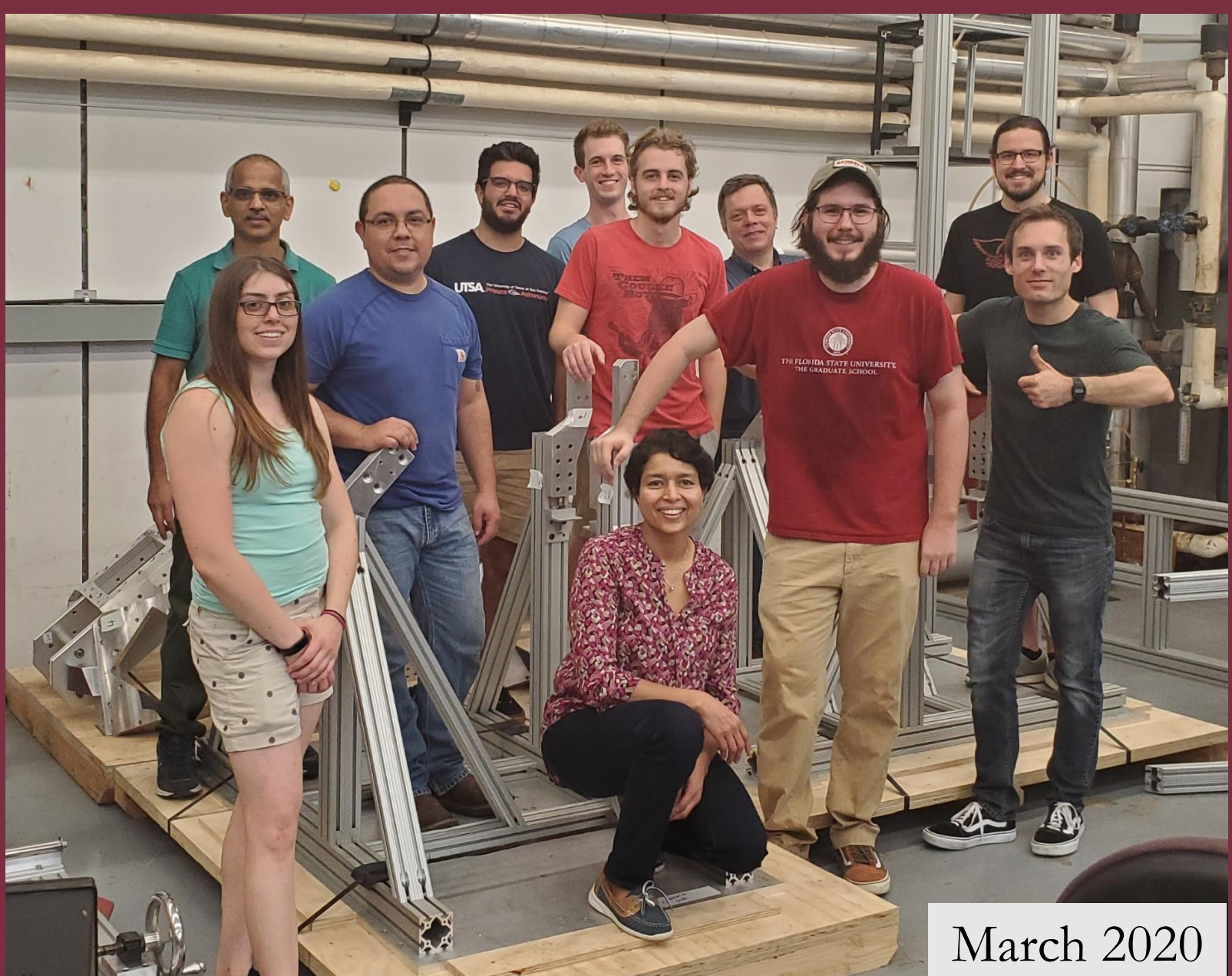
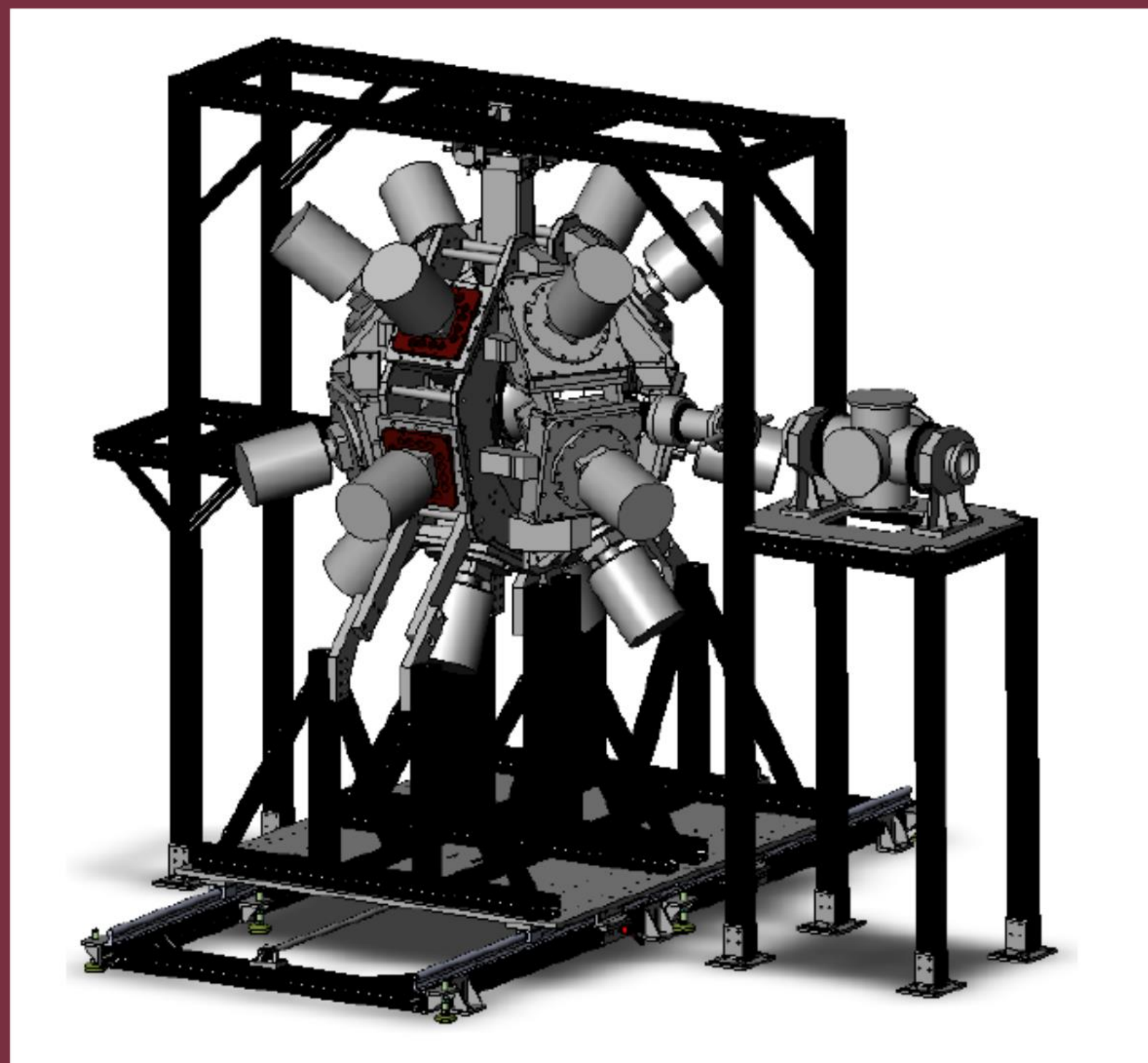


DESIGN



(From left to right) Elizabeth, Lagy, Jason, Chris, Gordon (back), Eli, Vandana (sitting), Ingo (back), Caleb, Kenneth, Mark

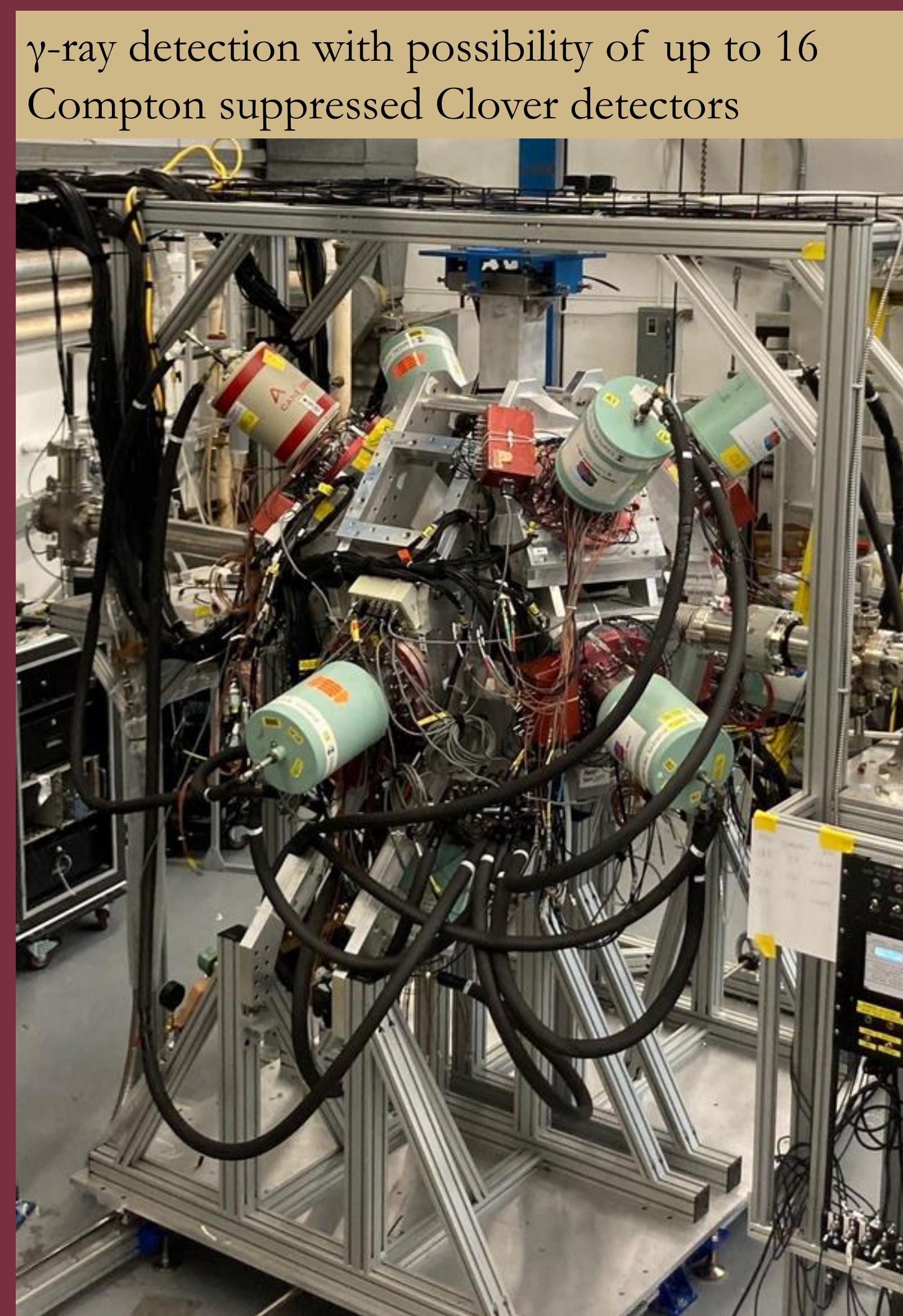


(From left to right) Sam, Jason, Caleb, Rick, Toby (back), Darryl, Powell (back) Vandana (kneeling), Mitch, Lagy

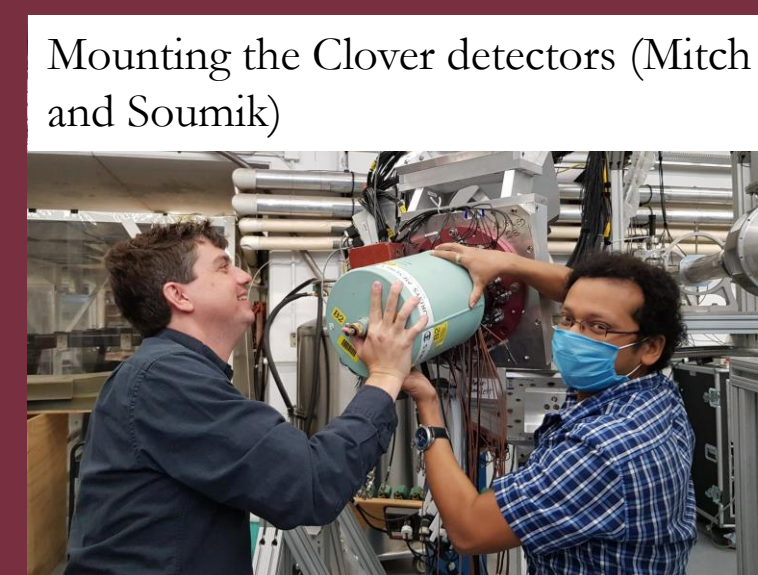


(From left to right) Jonah, Caleb, Soumik, Mitch (kneeling), Tim, Toby Vandana (kneeling)

SET UP



CLARION-2 array at commissioning with 9 clovers; 6 from ORNL, 3 from FSU & 3 rings of GAGG scintillator detector

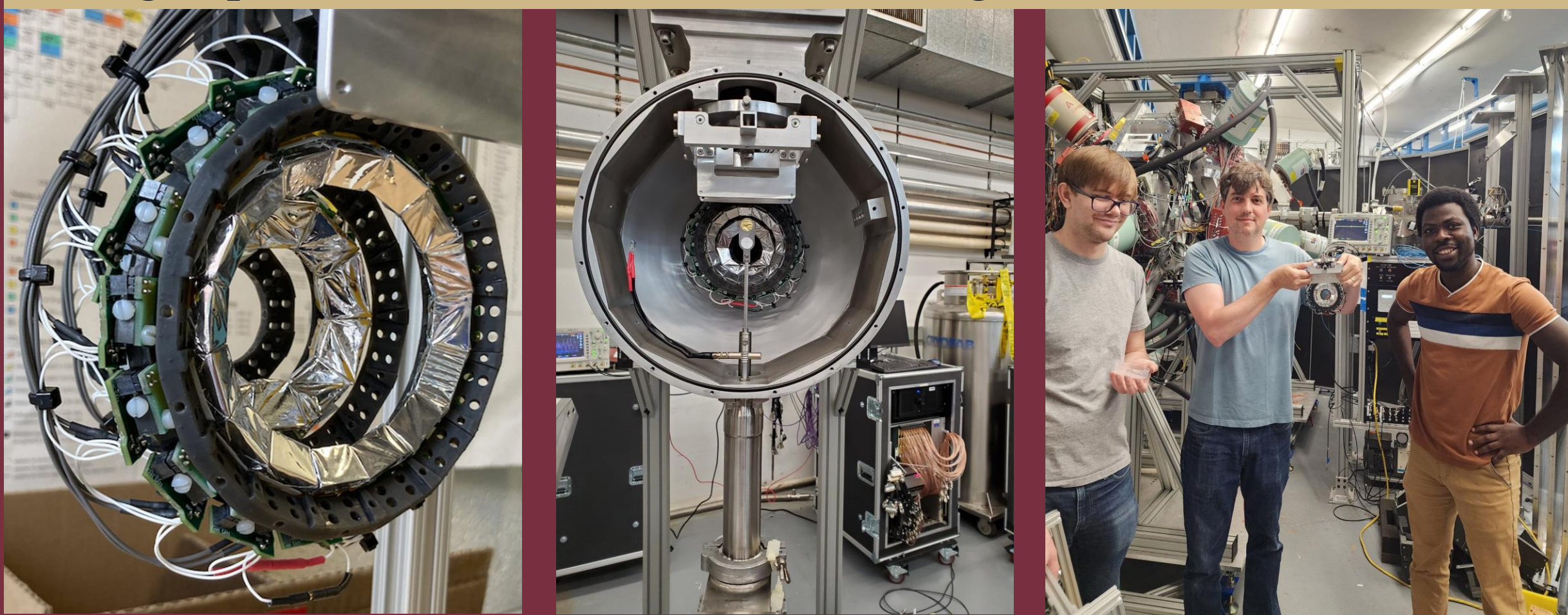


Mounting the Clover detectors (Mitch and Soumik)



First Beam in the CLARION-2 chamber

Charged particle detection: TRINITY (5 rings of GAGG + annular Si)

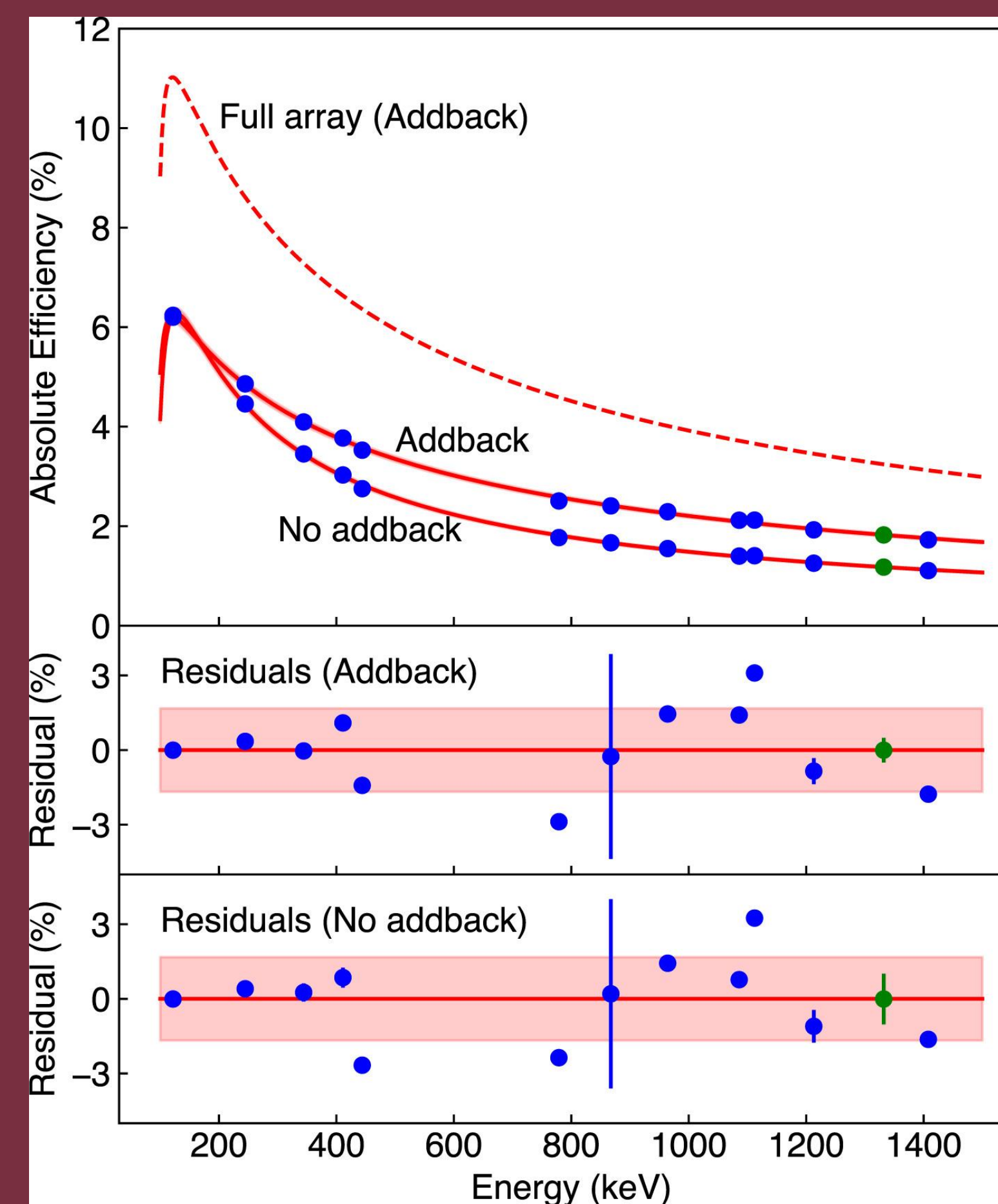


Gadolinium Aluminum Gallium Garnet ($Gd_3Al_2Ga_3O_{12}$) doped with Ce (GAGG:Ce)



(From left to right, front row) Tim, Diya, Samuel; (From left to right, middle row) Ingo, Ben, Ashton, Sam, Eilens, Vandana, Catur; (From left to right, back row) Lagy, Ryan, Jonah, Mitch, Caleb

CLARION-2 EFFICIENCY

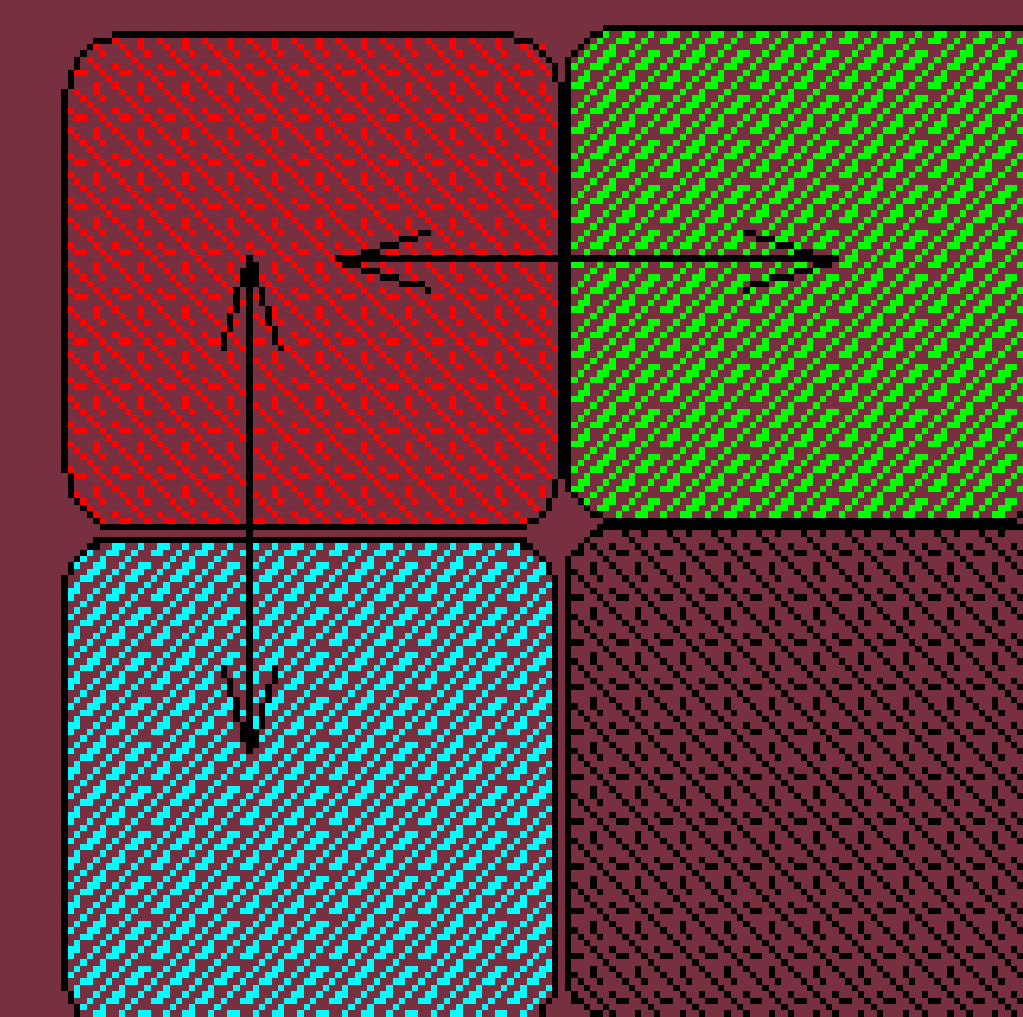


- The red solid lines are empirical efficiency curves from ^{152}Eu and ^{60}Co efficiency calibrations (shown as blue and green points, respectively), with and without Clover add back
- These are for the current array, with 9 out of 16 possible Clovers installed
- The dashed red line is the projected full efficiency of the array with 16 Clovers
- Lower panels show the residuals for add-back and load-back fits, with shaded areas corresponding to the $\approx 2\%$ total uncertainty.

T. Gray *et al.*, NIM A **1041**, 167392 (2022)

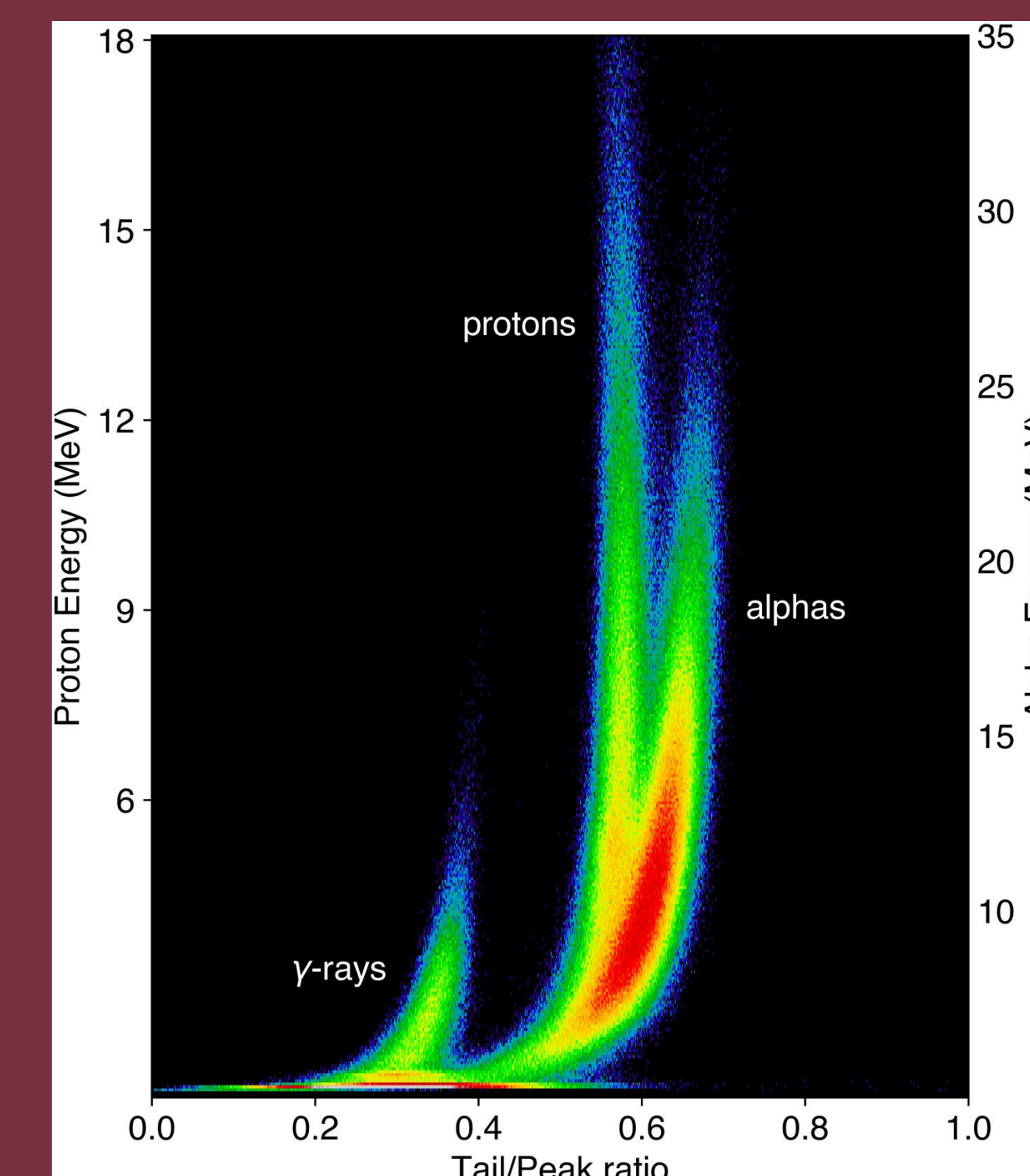
ANGULAR DISTRIBUTION & POLARIZATION

- Angular Distribution gives spin information and can be obtained using 4 different HPGe angles (48.24° , 90° , 131.75° , and 150°)
- Linear Polarization measurement gives information about parity of the state.
- Clover detectors used as polarimeters. The Asymmetry A is positive for electric and negative for magnetic transitions
- N_V and N_H are the number of γ -rays scattered in vertical and horizontal directions, a is polarization sensitivity of detector crystals ≈ 1

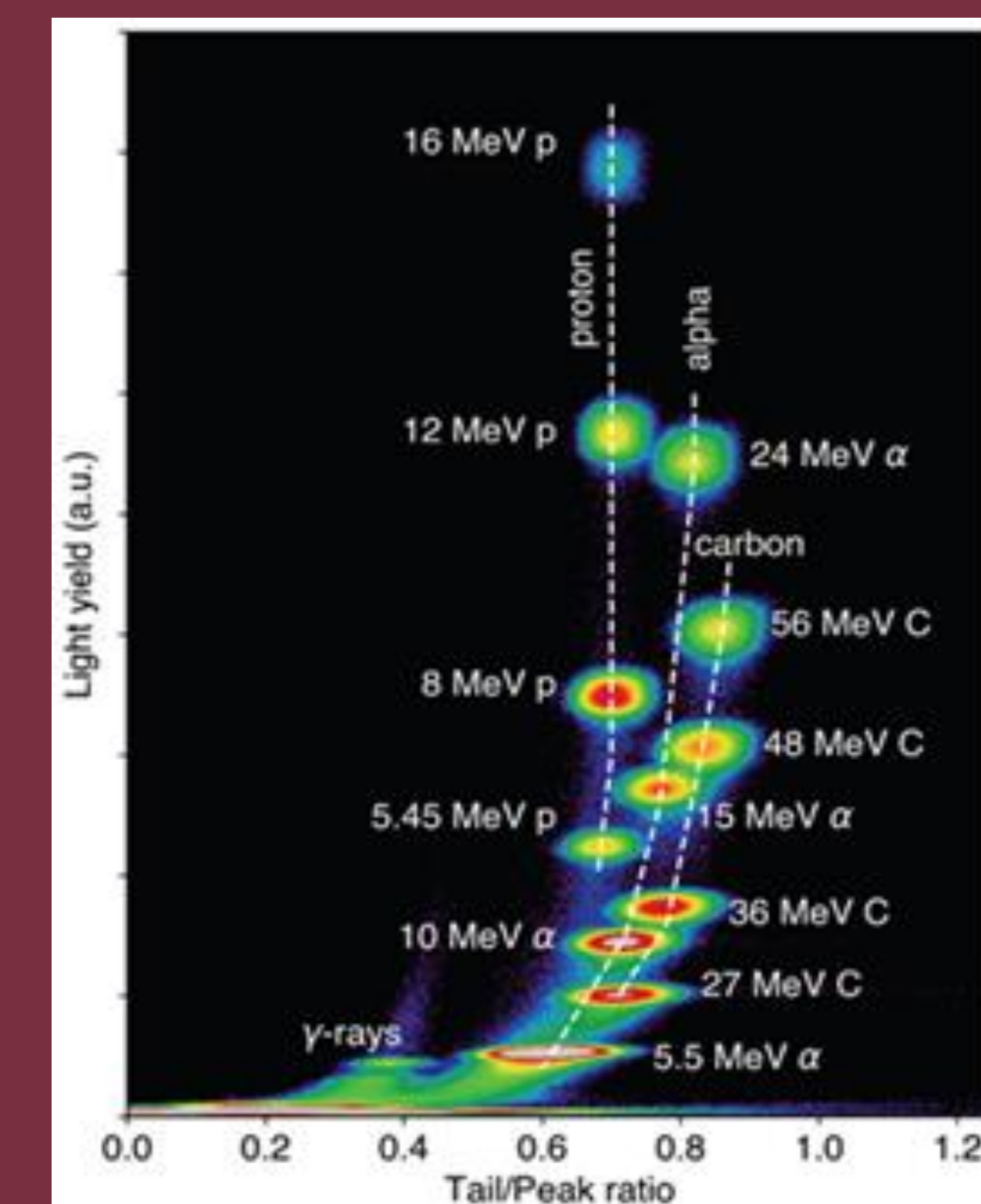


$$A = \frac{a N_V - N_H}{a N_V + N_H}$$

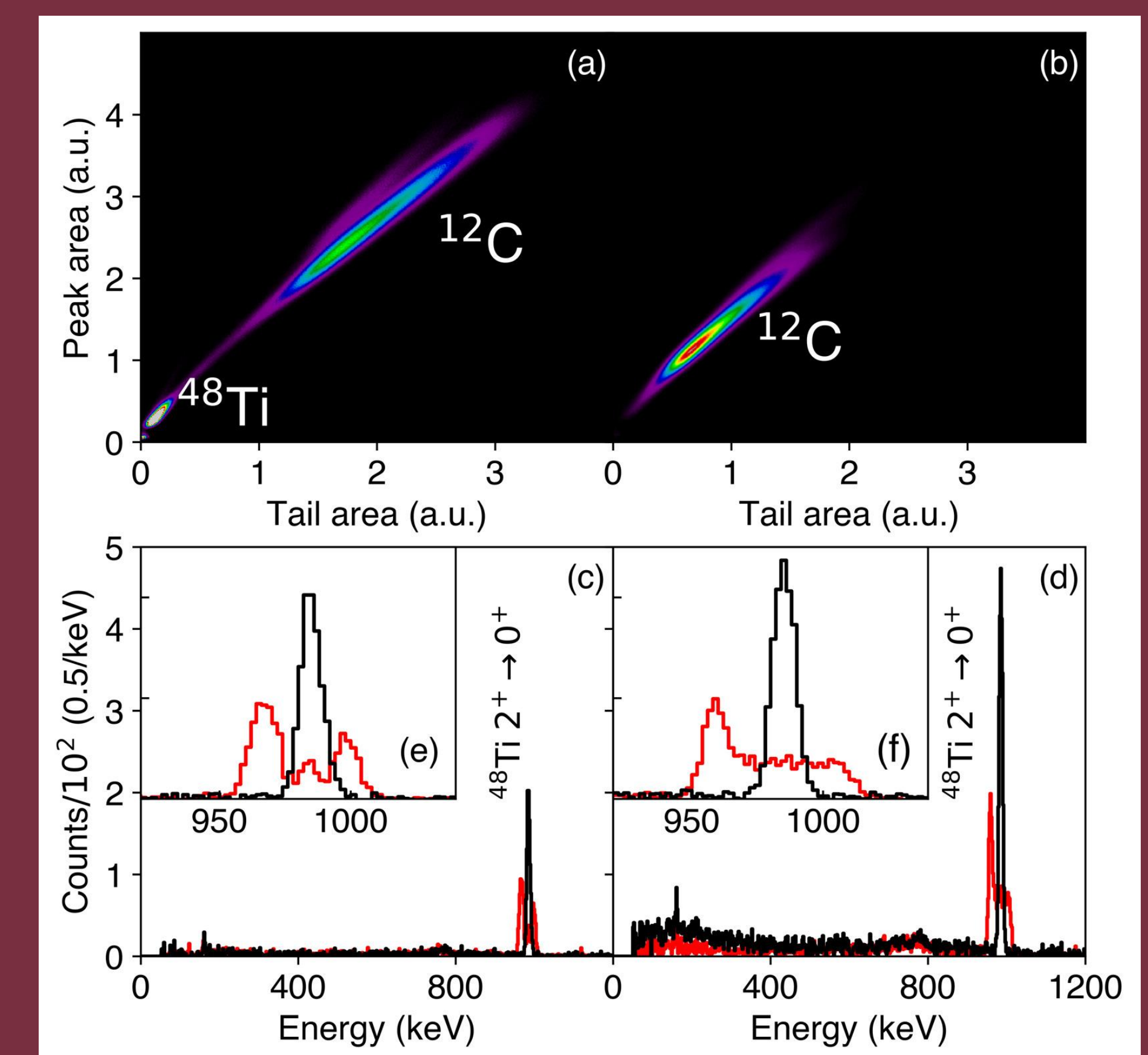
FIRST RESULTS



GAGG:Ce PID spectrum from $^{16}\text{O} + ^{18}\text{O}$ fusion-evaporation.

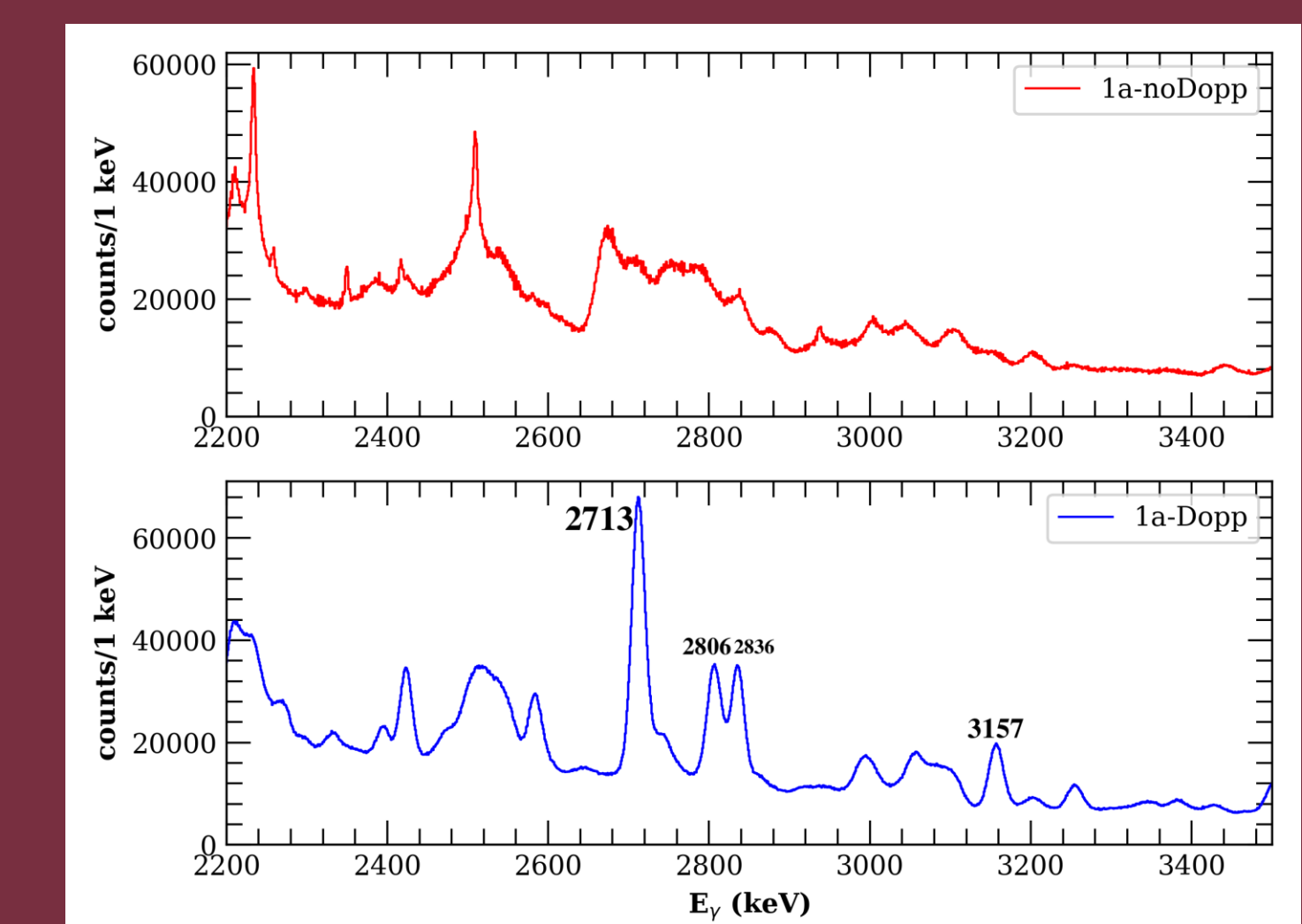


PID from forward scattering on a thin Au foil during commissioning. White dashed lines to guide the eye connect the proton, α , and carbon peaks.



GAGG:Ce PID and Doppler-corrected HPGe spectra from Coulomb excitation of ^{48}Ti on ^{12}C .

- PID spectra are shown in (a) and (b) for Rings 2 and 4, respectively
- Doppler-corrected γ -ray spectra are shown in (c) and (d), for Rings 2 and 4, respectively in black, while the spectra before Doppler correction are shown in red
- The FWHM of the 983-keV $2^+ \rightarrow 0^+$ peak is 57 keV before Doppler correction, and 7.8 keV after
- Peak shapes before and after Doppler correction are displayed in insets (e) and (f)



- Alpha gated gamma energy spectrum from $^{16}\text{O} + ^{18}\text{O}$ at $E_{\text{lab}} = 30$ MeV.
- Top (without Doppler correction)
- Bottom (Doppler correction using GAGG).
- Labelled peaks correspond to known gamma transitions in ^{29}Si .

TIMELINE

- Commissioned in Dec 2021
- First experiments in Jan-March 22
- \rightarrow Coulomb Excitation of $^{48,49,50}\text{Ti}$ (ORNL)
- \rightarrow $^{16}\text{O} + ^{18}\text{O}$ (FSU)
- \rightarrow $^7\text{Li} + ^{64}\text{Ni}$ (FSU)

T. Gray *et al.*, NIM A **1041**, 167392 (2022)