

BaF₂ Detector Characterization for Photon Strength Function of ⁵⁸Fe in Preparation for ⁵⁹Fe(d,p)⁶⁰Fe Experiment



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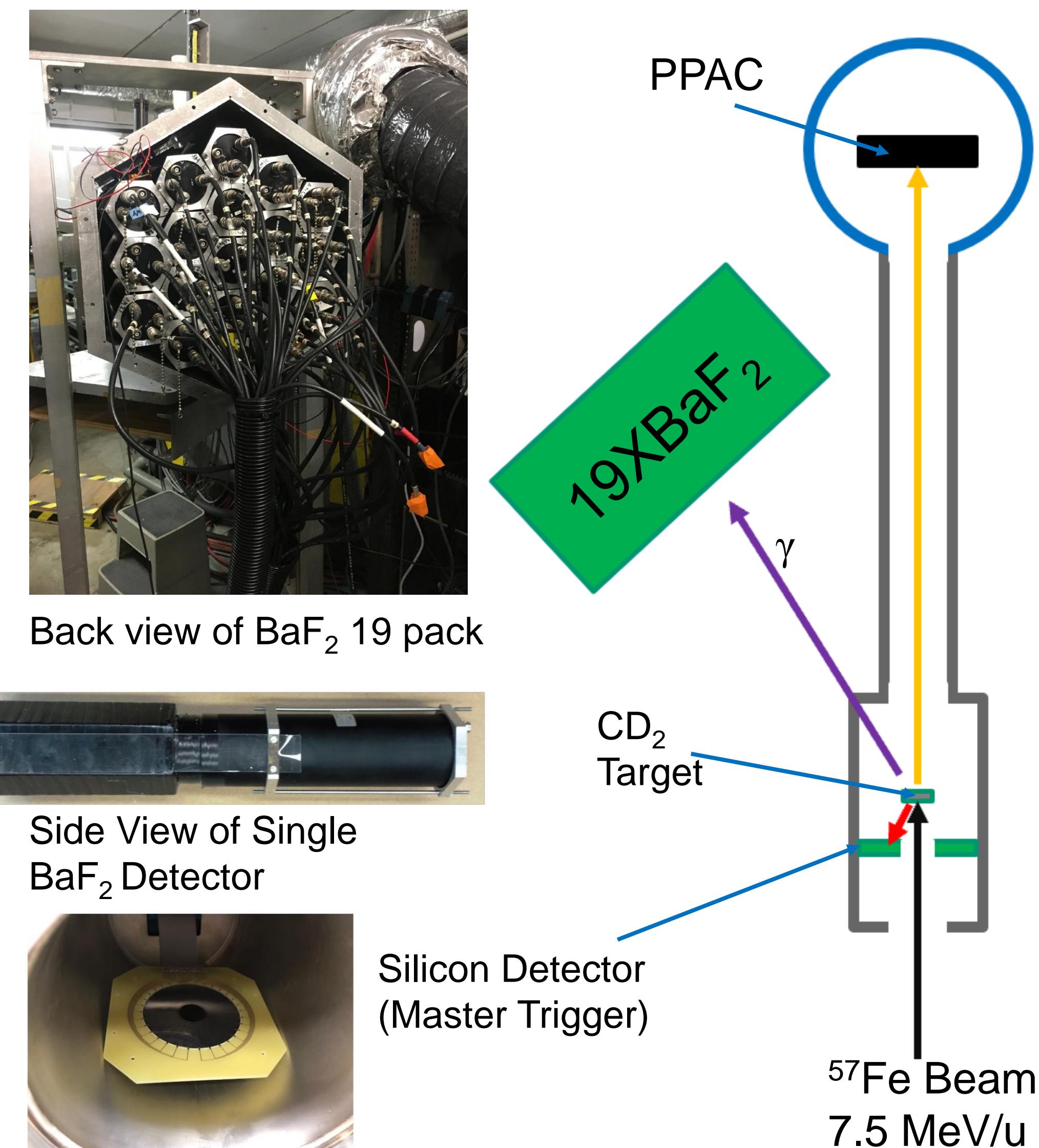


Introduction

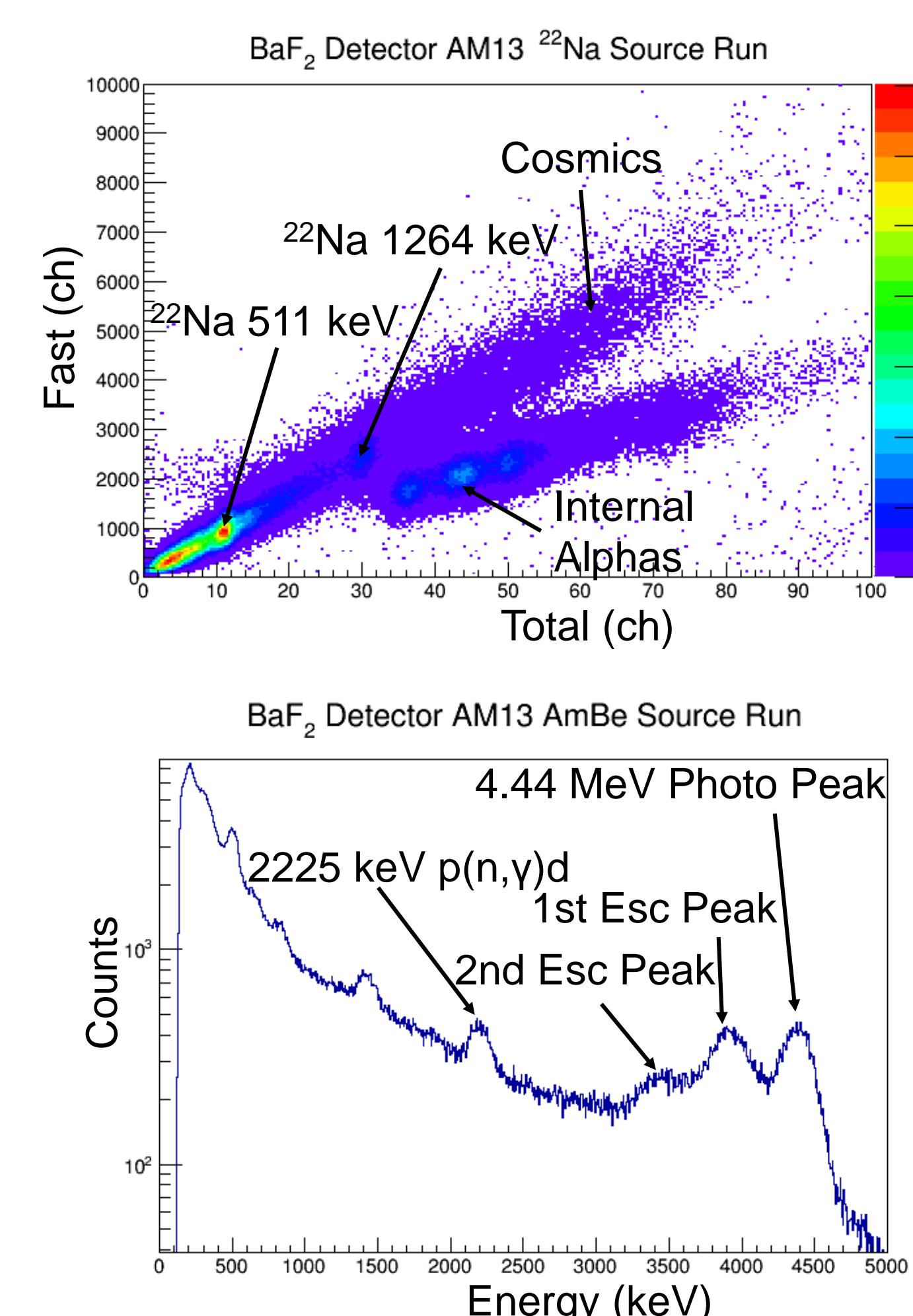
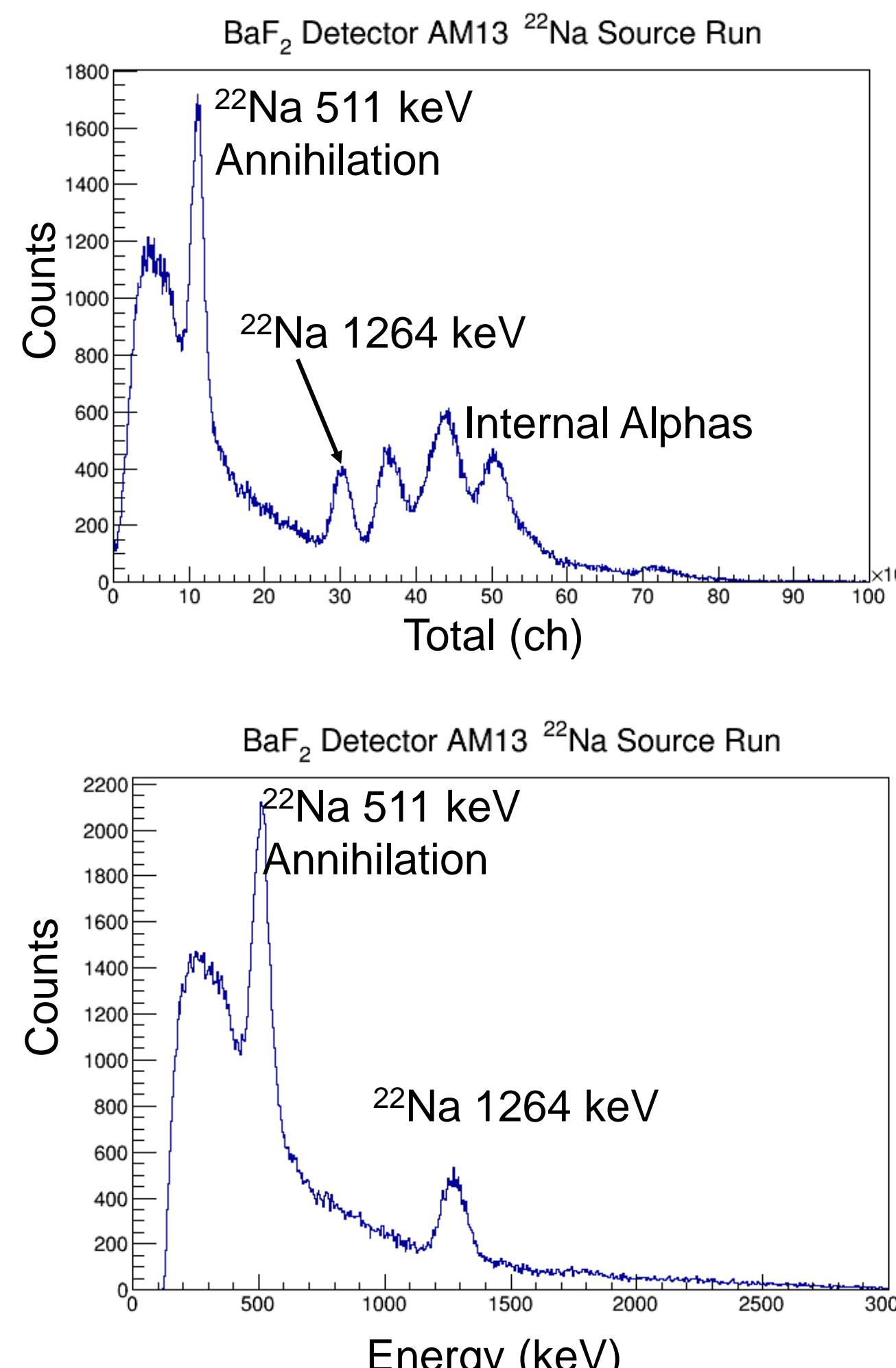
- ⁶⁰Fe has been detected in space [1], on the moon [2], in Antarctic snow [3] and in earth's seabed [4].
- Half-life and associated gamma rays make it potentially useful in tracking the evolution of certain stars [5].
- The photon strength function will be measured in order to obtain a constraint for astrophysical models.
- Two test runs were performed using BaF₂ detectors in conjunction with a silicon detector.



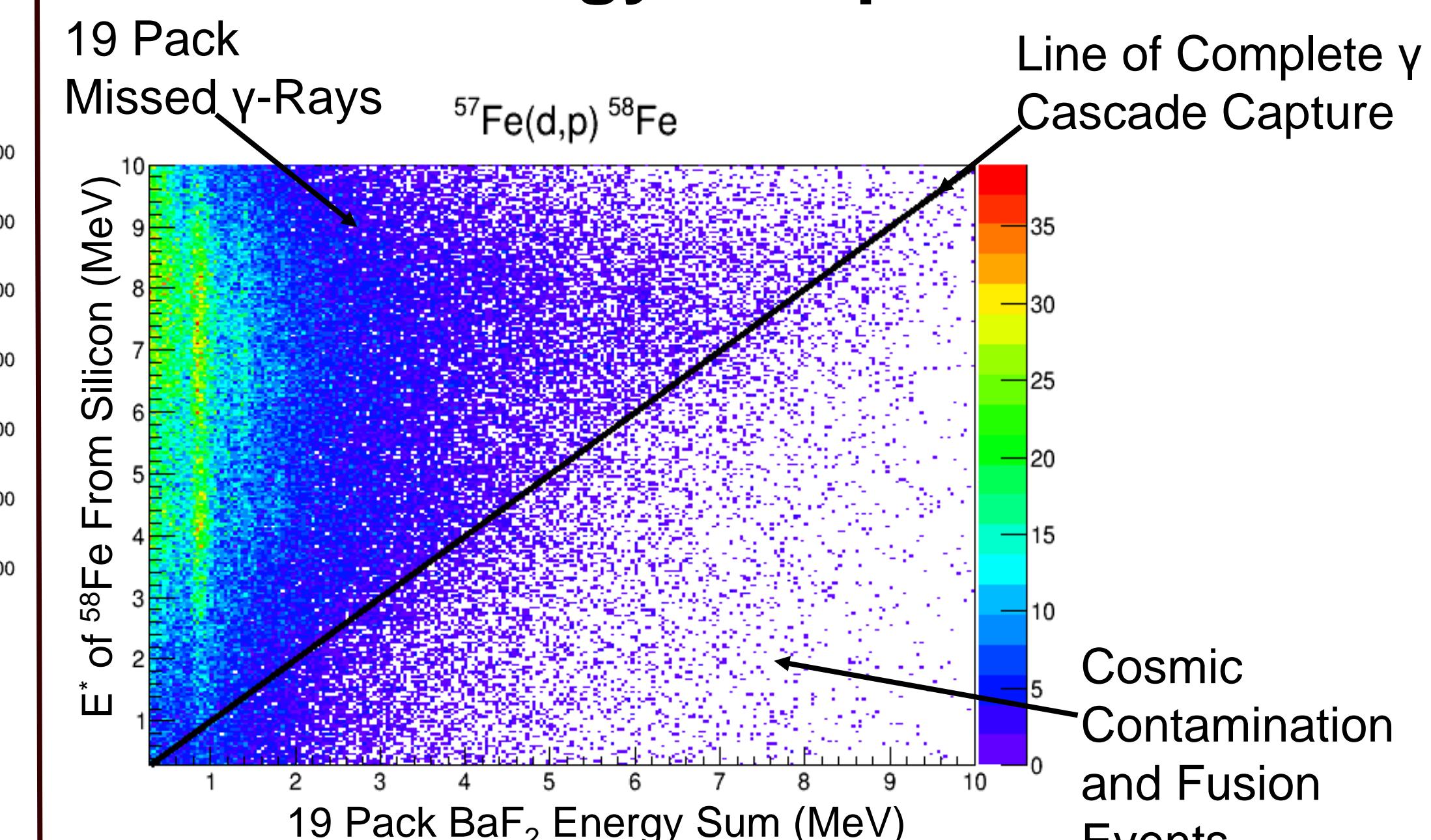
Test Experiment Setup



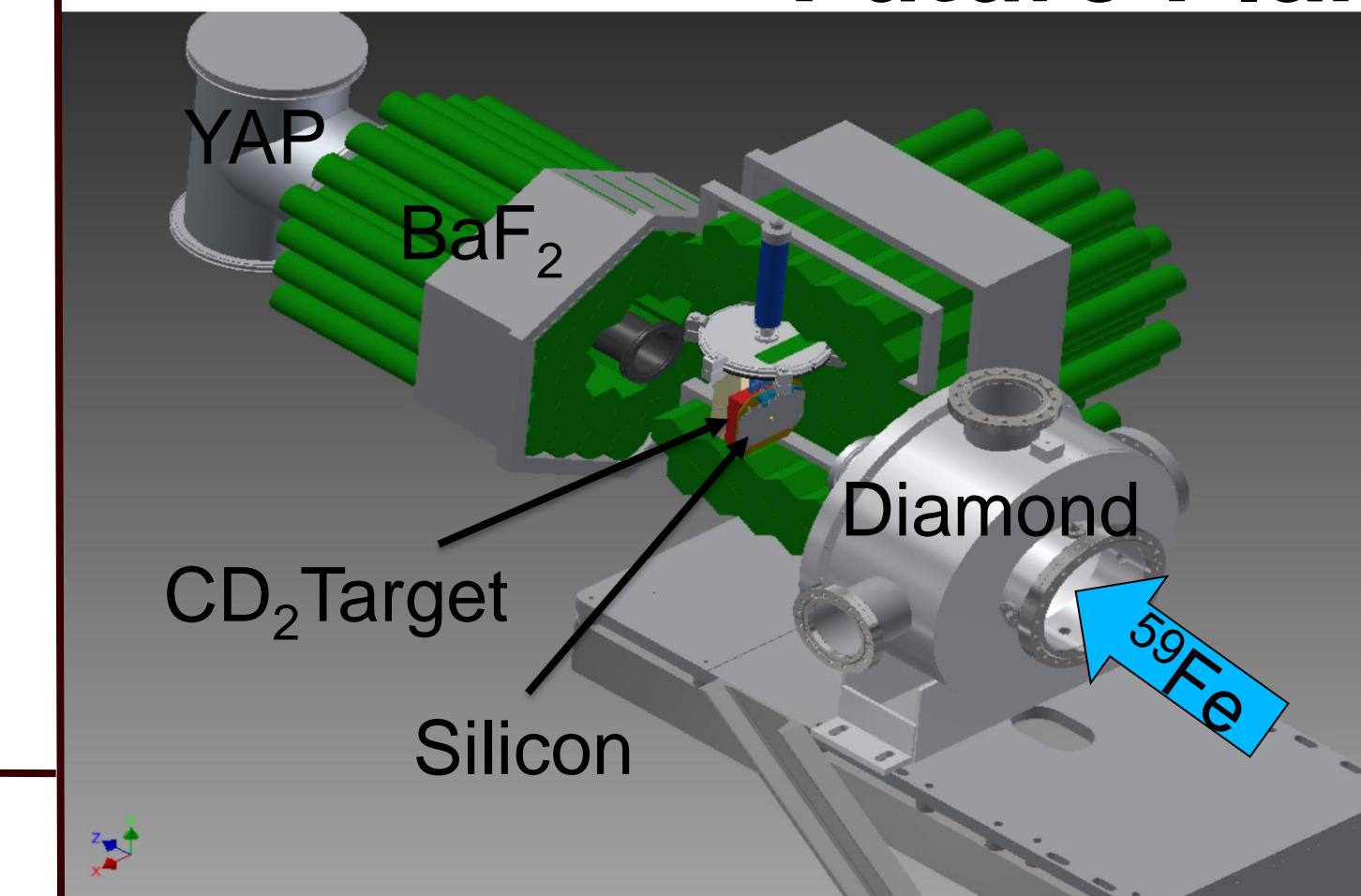
BaF₂ Detector Energy Calibration and PID



Energy Comparison



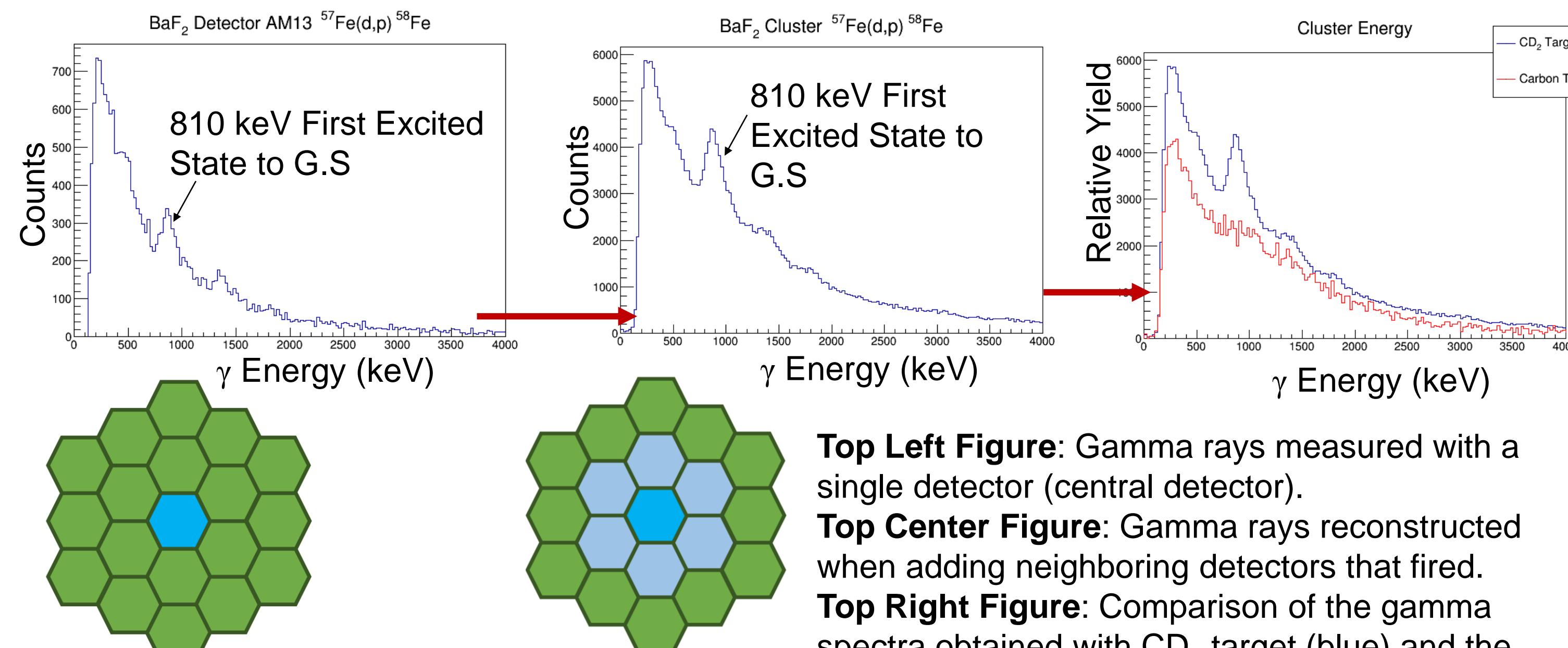
Future Plans



- Add more BaF₂ detectors to increase coverage.
- Implement a diamond beam purity detector and a $\Theta=0^\circ$ YAP timing detector.

Top: CAD drawing of anticipated final experimental setup.
Bottom: GEANT simulation for BaF₂ array efficiency for single photons and gamma cascades.

Experiment Gamma Ray Reconstruction



Top Left Figure: Gamma rays measured with a single detector (central detector).
Top Center Figure: Gamma rays reconstructed when adding neighboring detectors that fired.
Top Right Figure: Comparison of the gamma spectra obtained with CD₂ target (blue) and the carbon target (red).

References

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Acknowledgments

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