

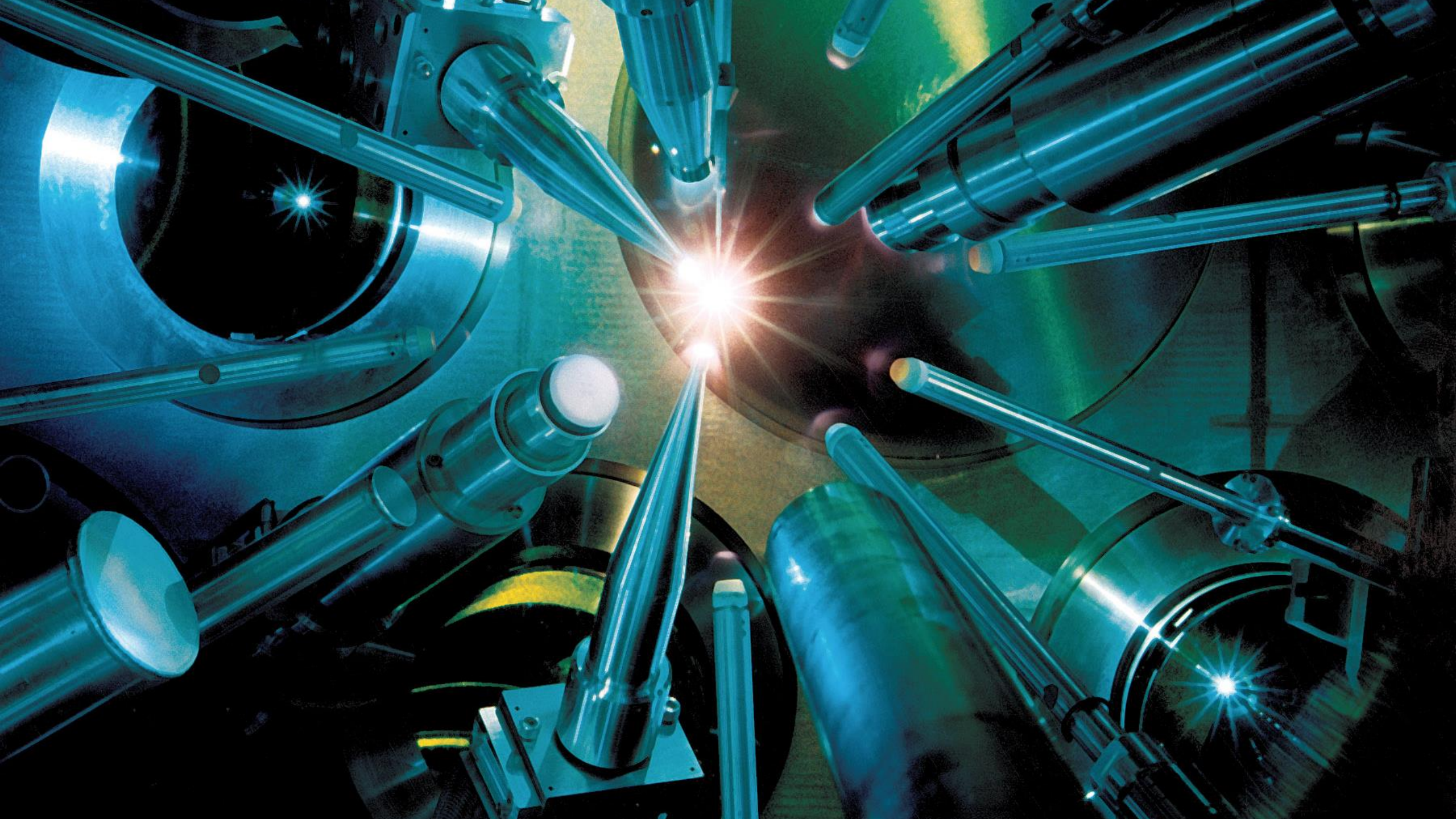
Efficiency Calibration of NaI Detectors for Measuring the $^{12}\text{C}(\text{n}, 2\text{n})^{11}\text{C}$ Cross Section

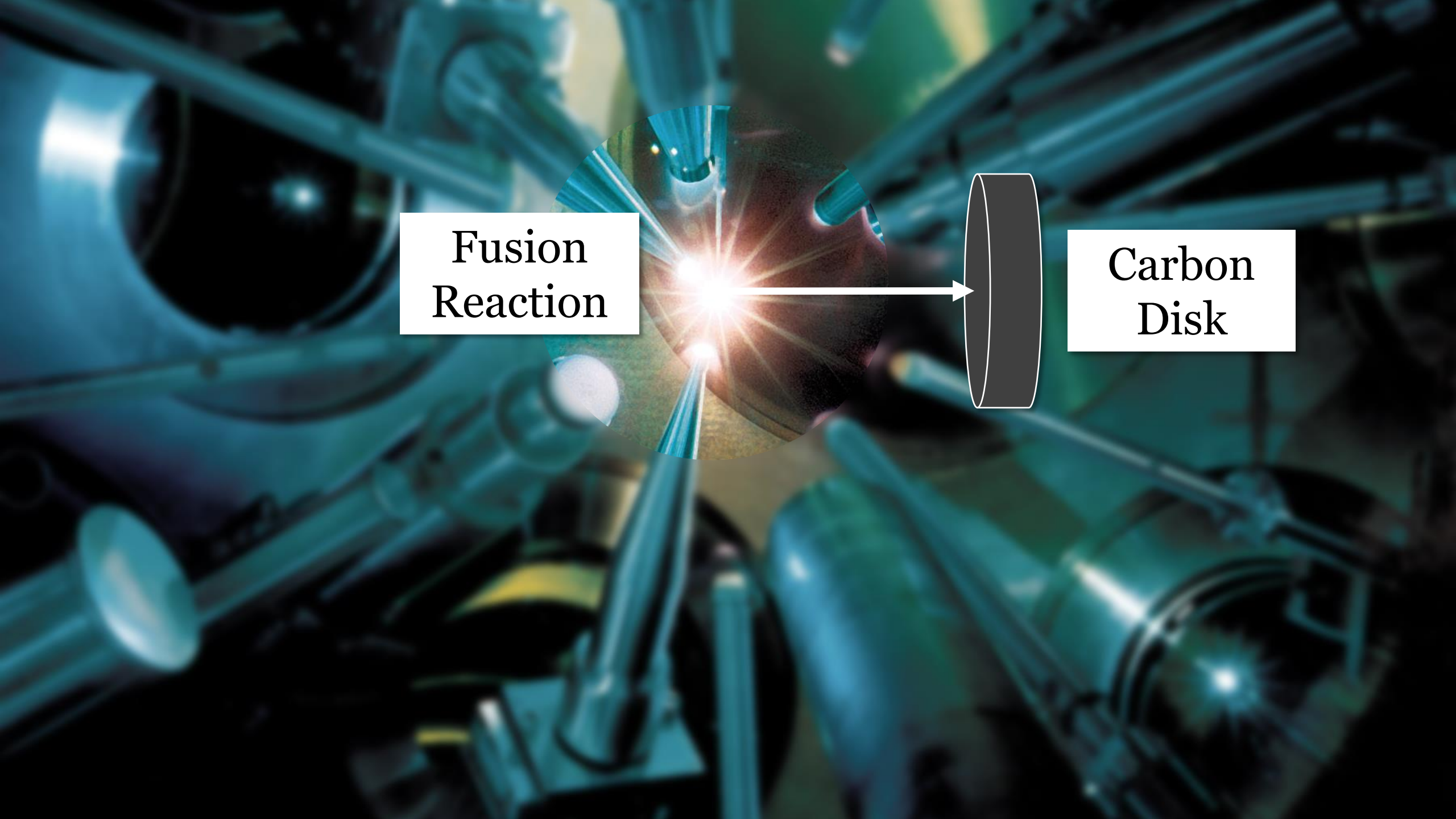
Thomas Eckert

Advisor: Dr. Mark Yuly

2 April, 2016







Fusion
Reaction

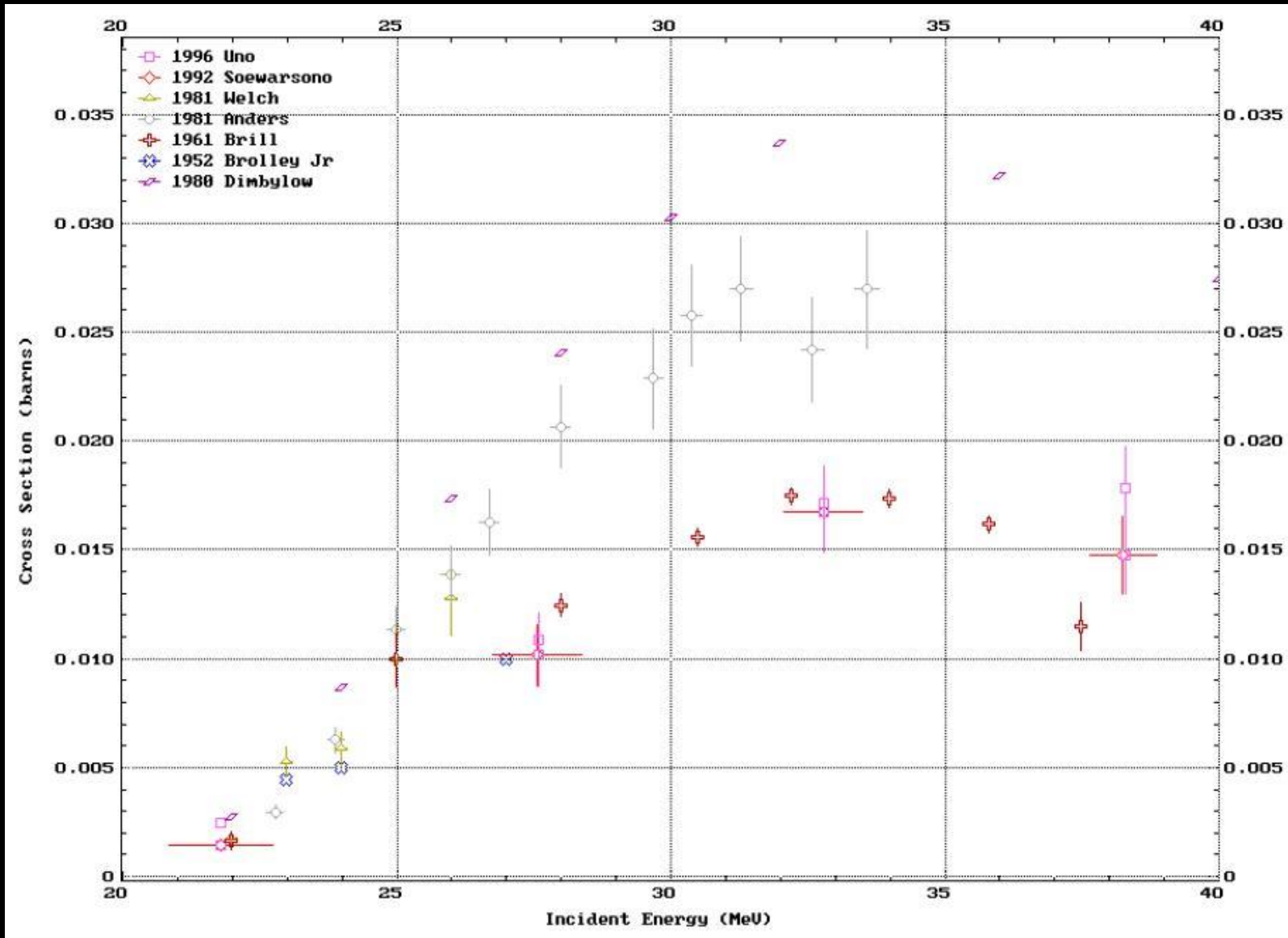
The background of the image is a complex, metallic structure of a fusion reactor, likely the tokamak chamber of a device like JET or ITER. It features various pipes, flanges, and structural supports, all rendered in a cool blue and teal color palette. In the center of the image, there is a circular inset that provides a closer look at the fusion process. Inside this circle, a bright, glowing orange and yellow plasma is visible, with several intense light beams or laser pulses intersecting at a central point, creating a brilliant starburst effect. This central point represents the site of the fusion reaction. A white arrow originates from this central point and points towards the right, leading to a diagram of a carbon disk.



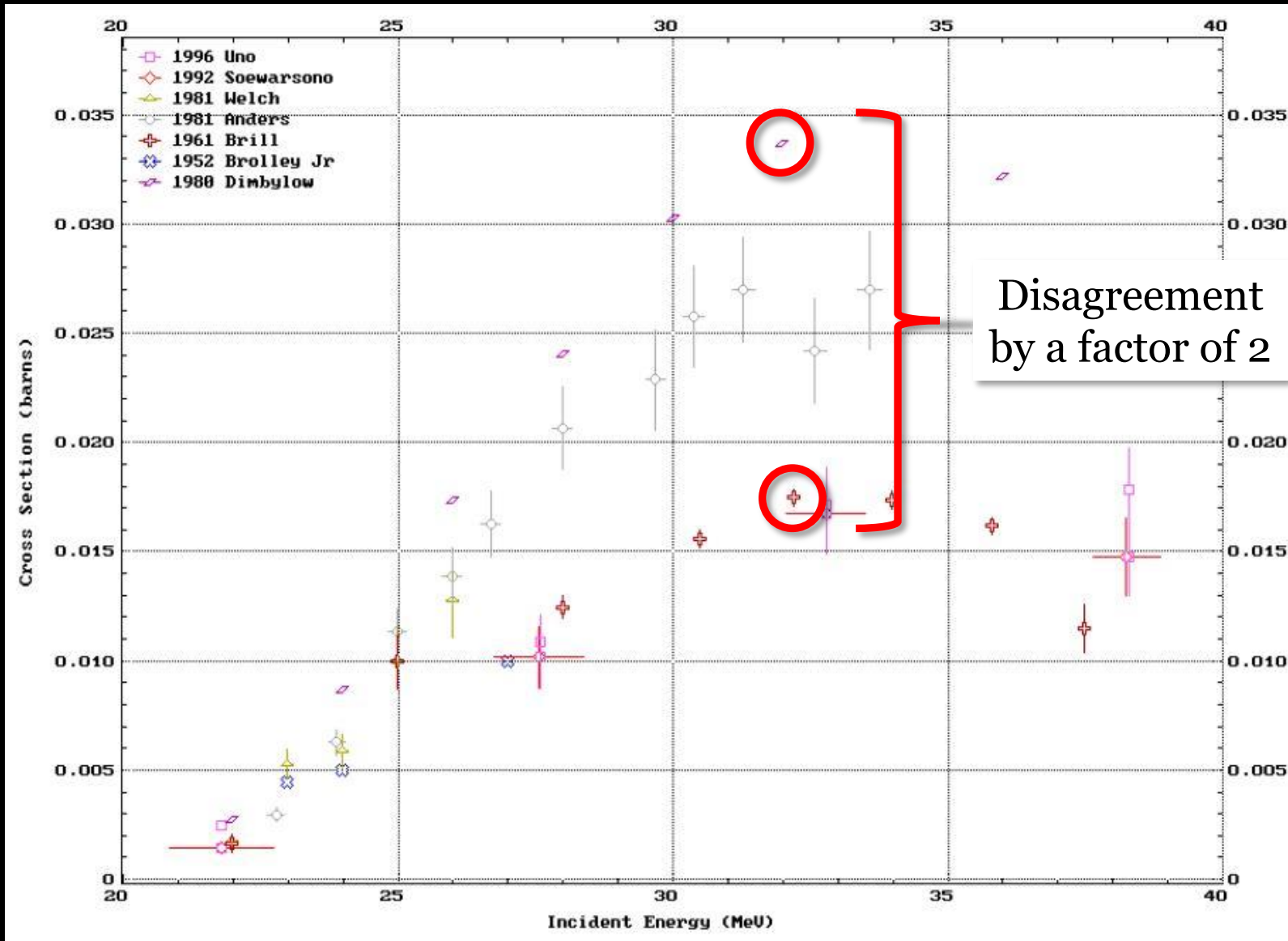
Carbon
Disk

To the right of the central circular inset, there is a diagram of a carbon disk. It is depicted as a dark gray, vertically oriented oval with a thin white outline, representing the cross-section of a disk. A white arrow points from the central fusion reaction point in the circular inset towards this disk, indicating the direction of particle flow or the target of the reaction.

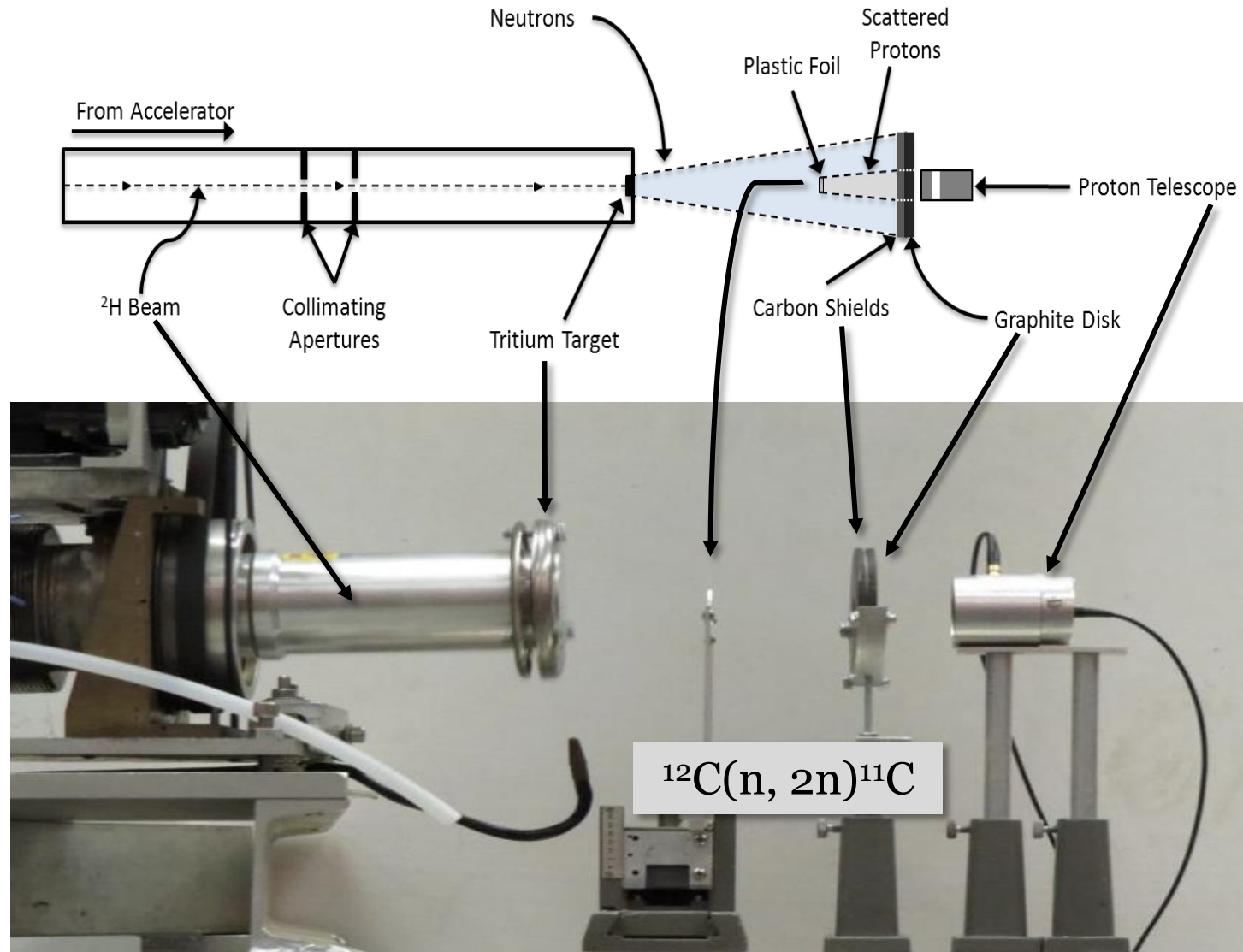
Previous Measurements and Calculations of the Cross Section



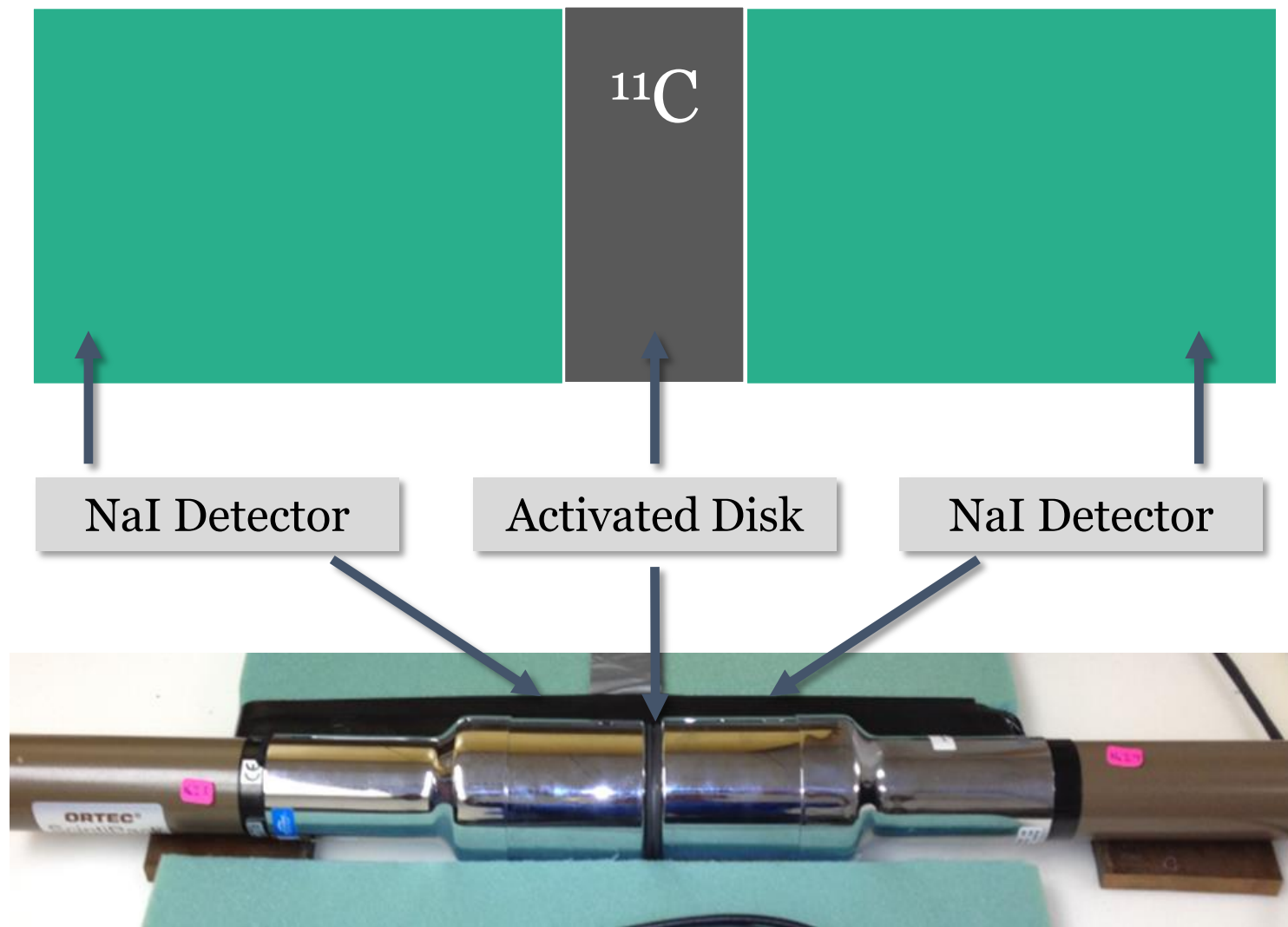
Previous Measurements and Calculations of the Cross Section



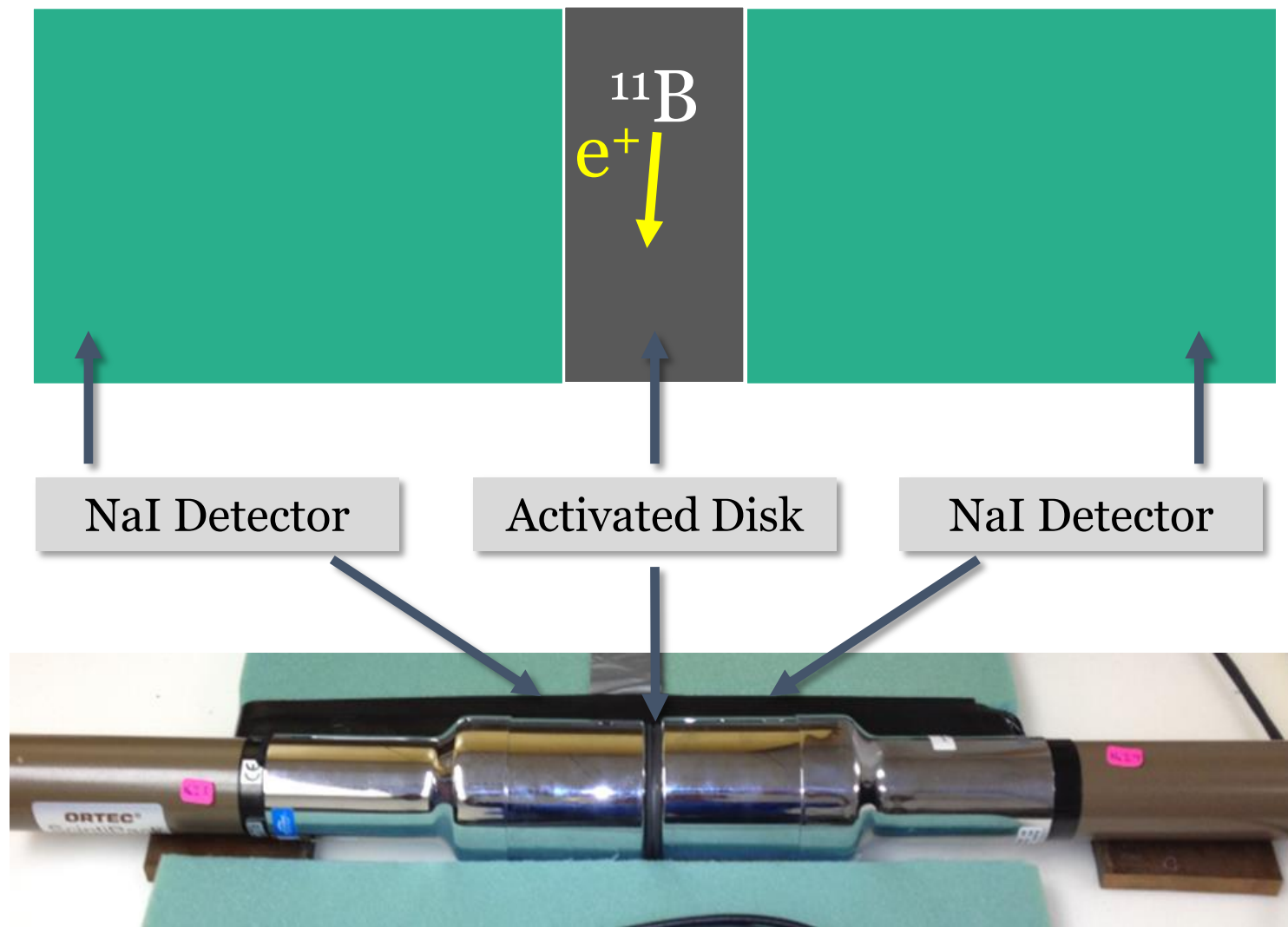
Cross Section Measurement at Ohio University



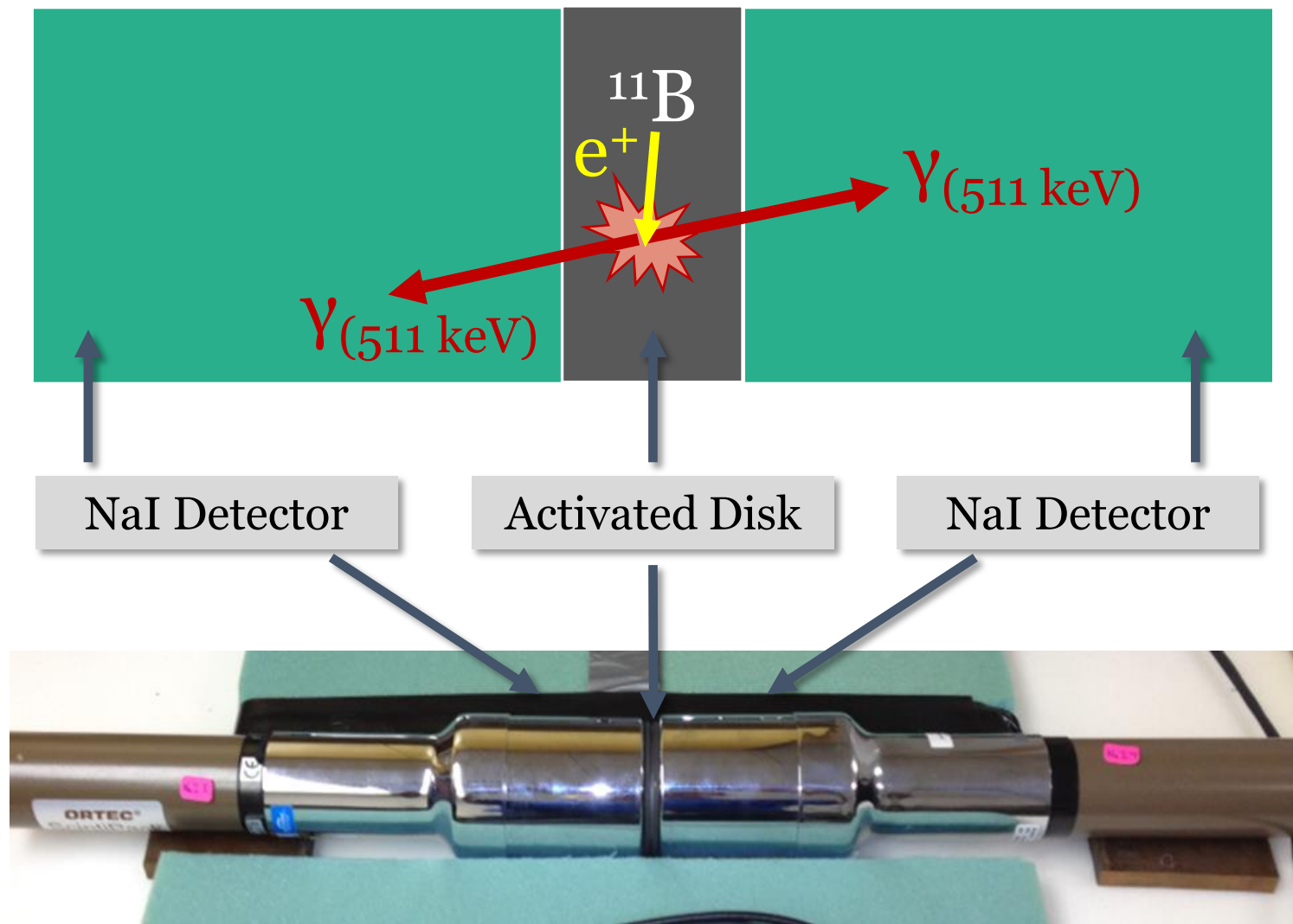
Measurement of ^{11}C



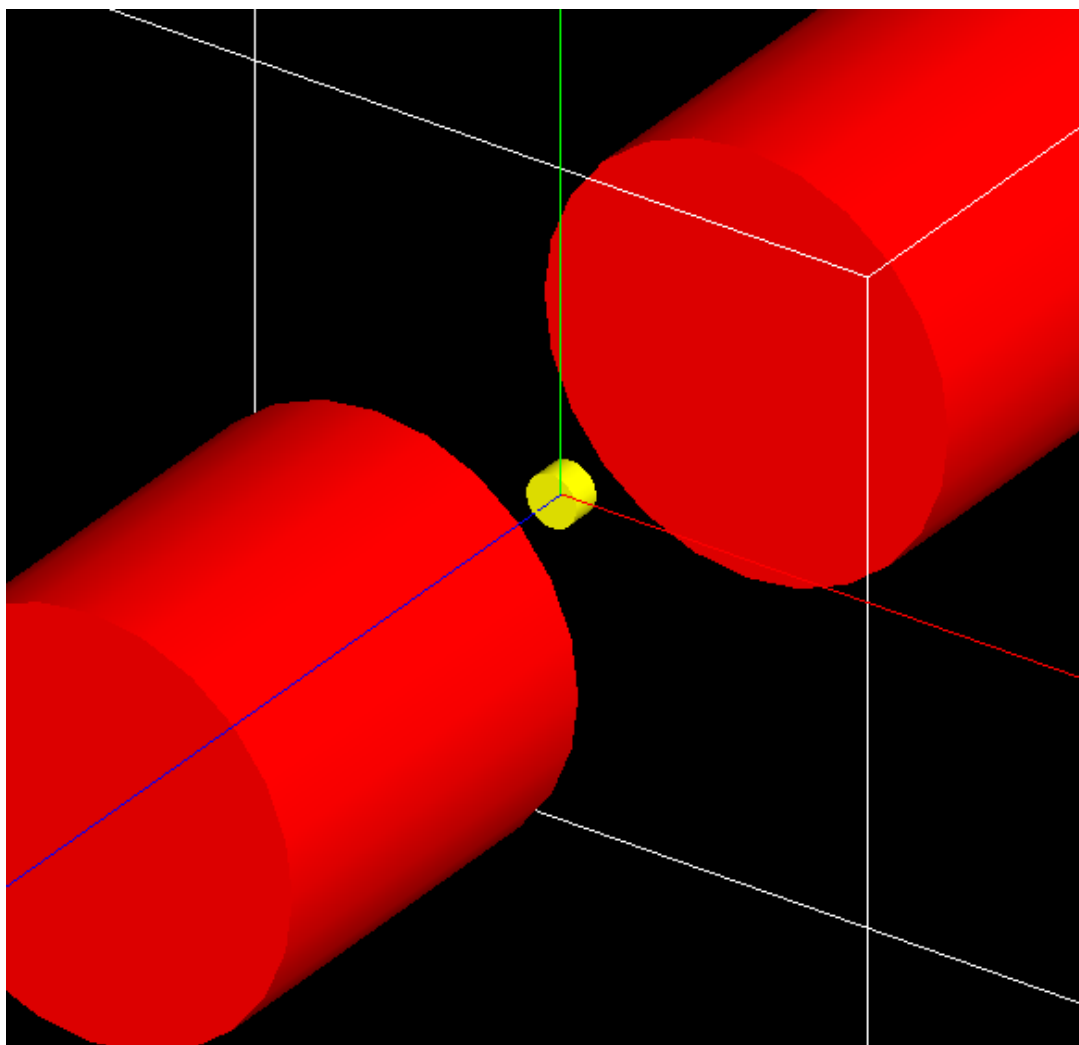
Measurement of ^{11}C



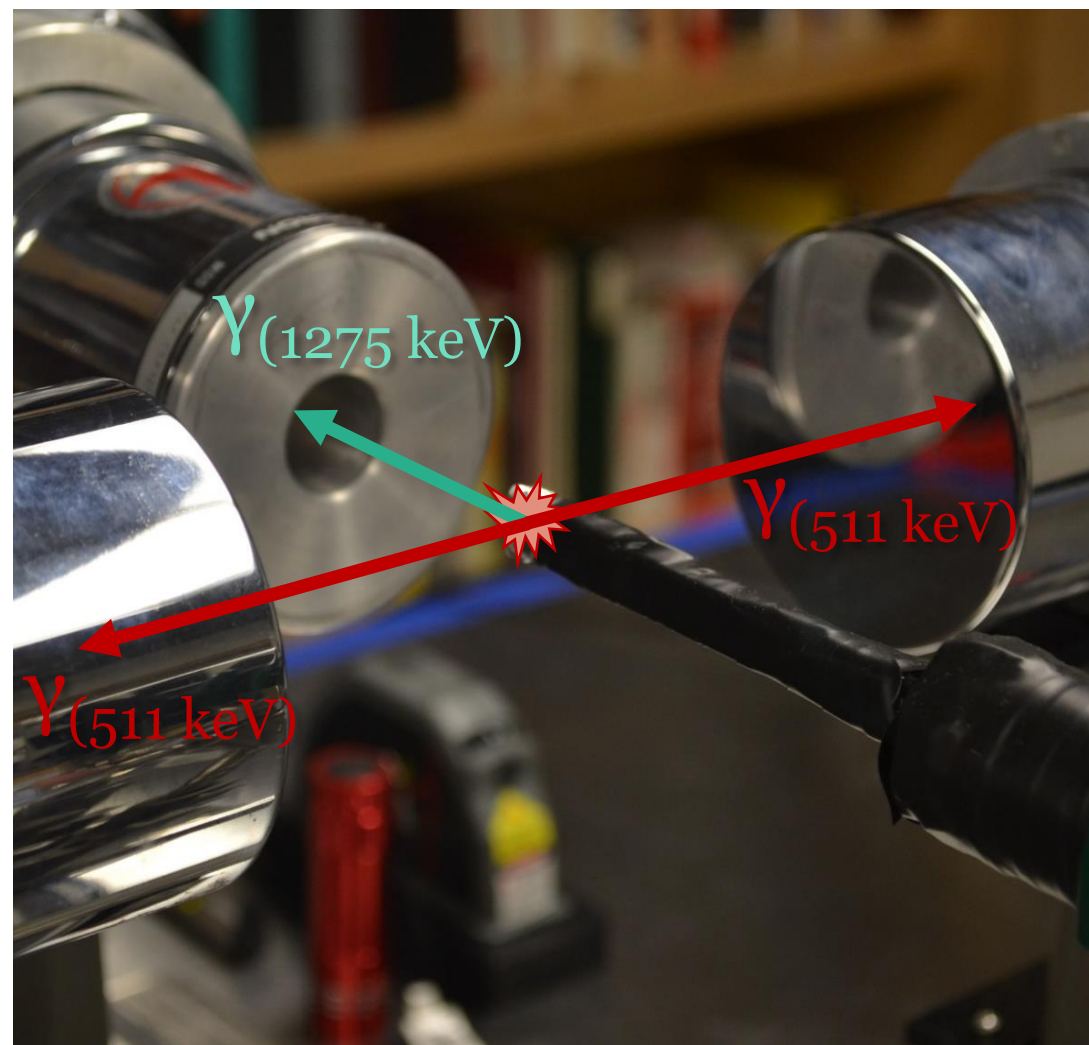
Measurement of ^{11}C



Experiment I



GEANT Simulation



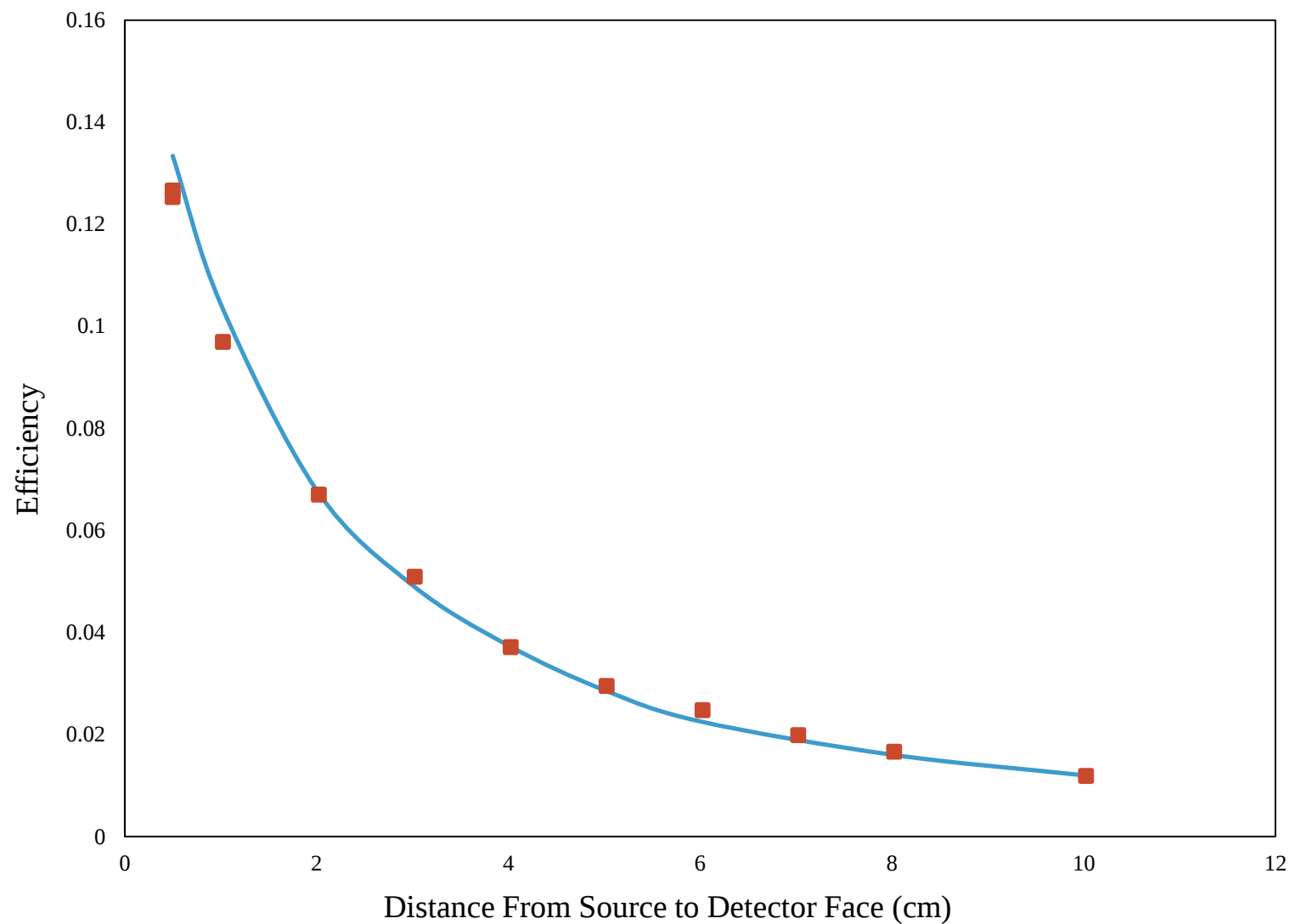
Experiment

Experiment I Efficiencies

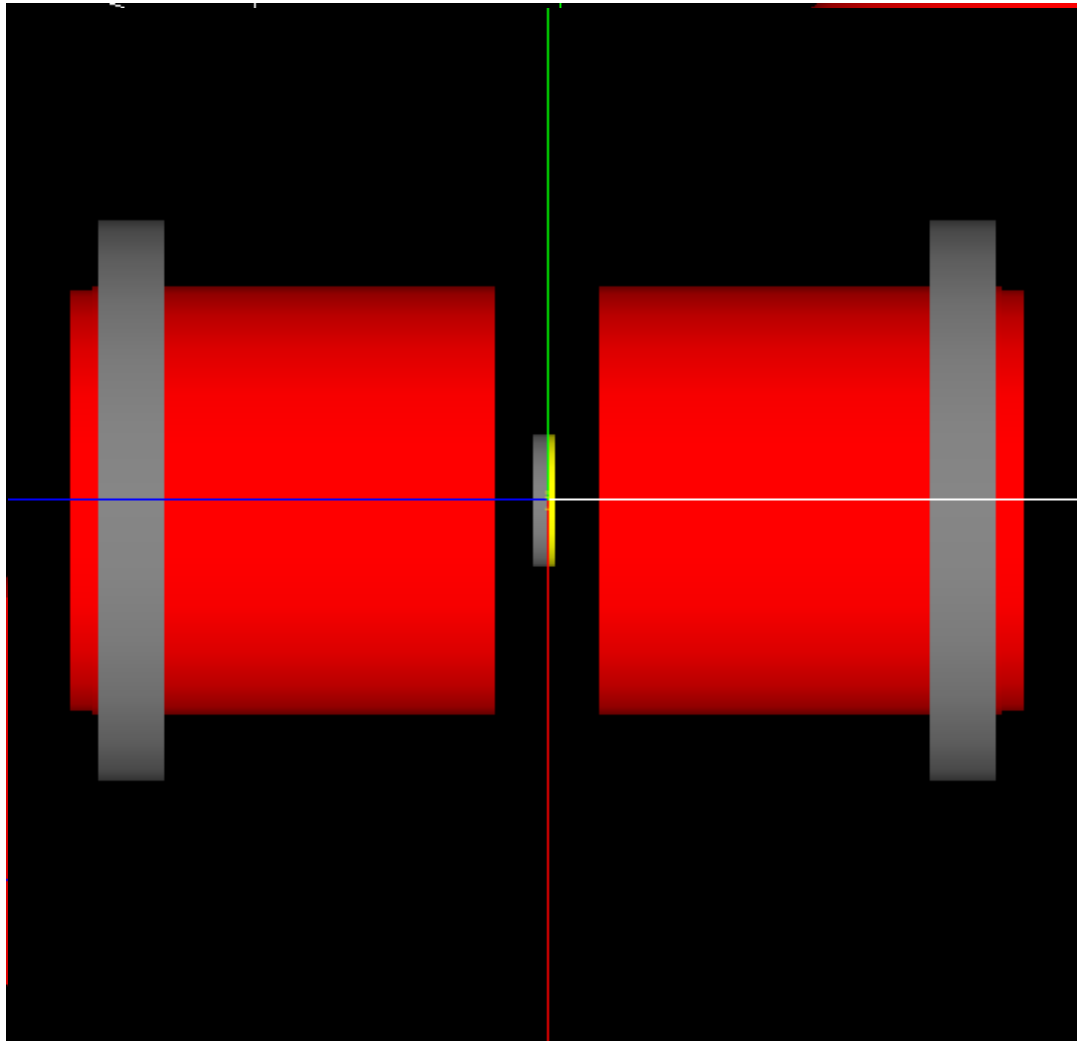
Simulation

Experiment

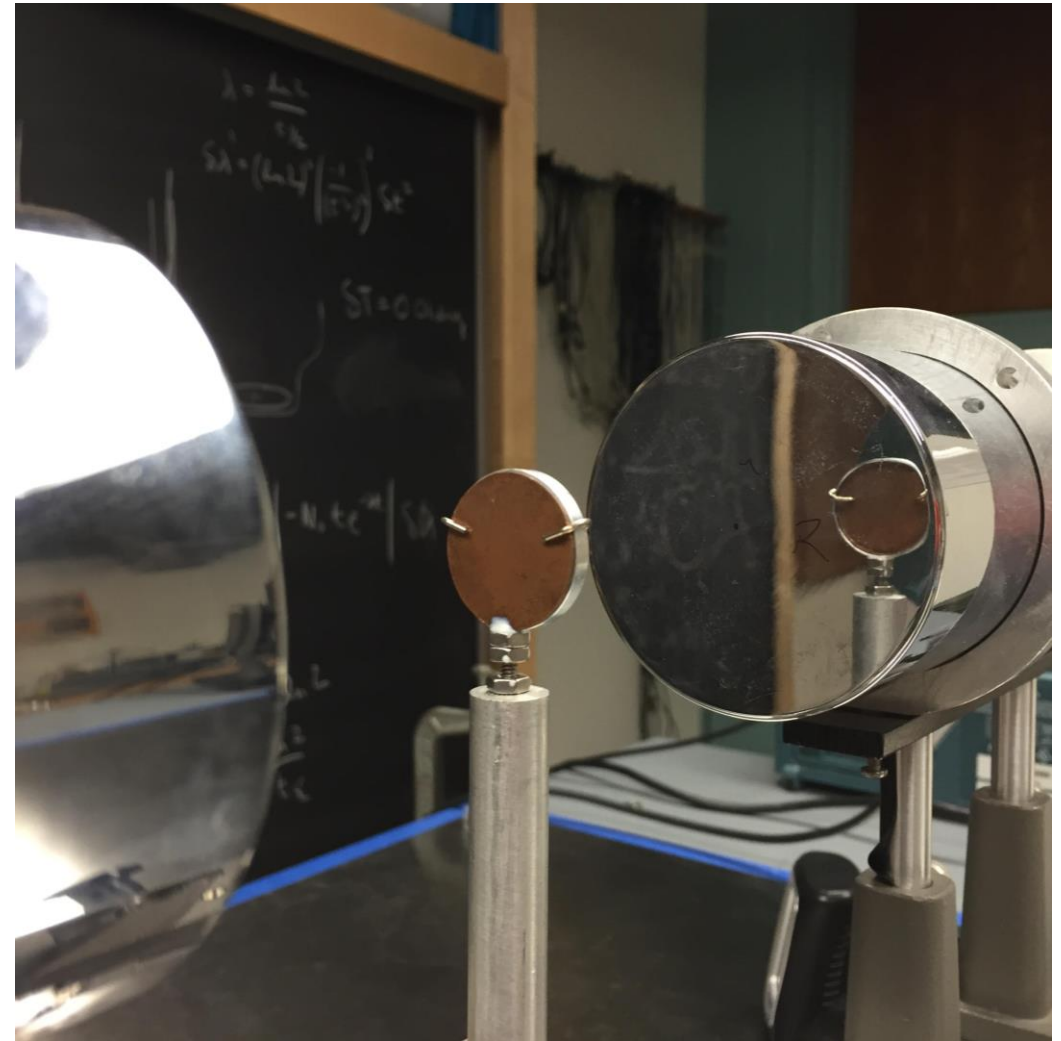
RMS Percent Difference: 2.5%



Experiment II



GEANT Simulation



Experiment

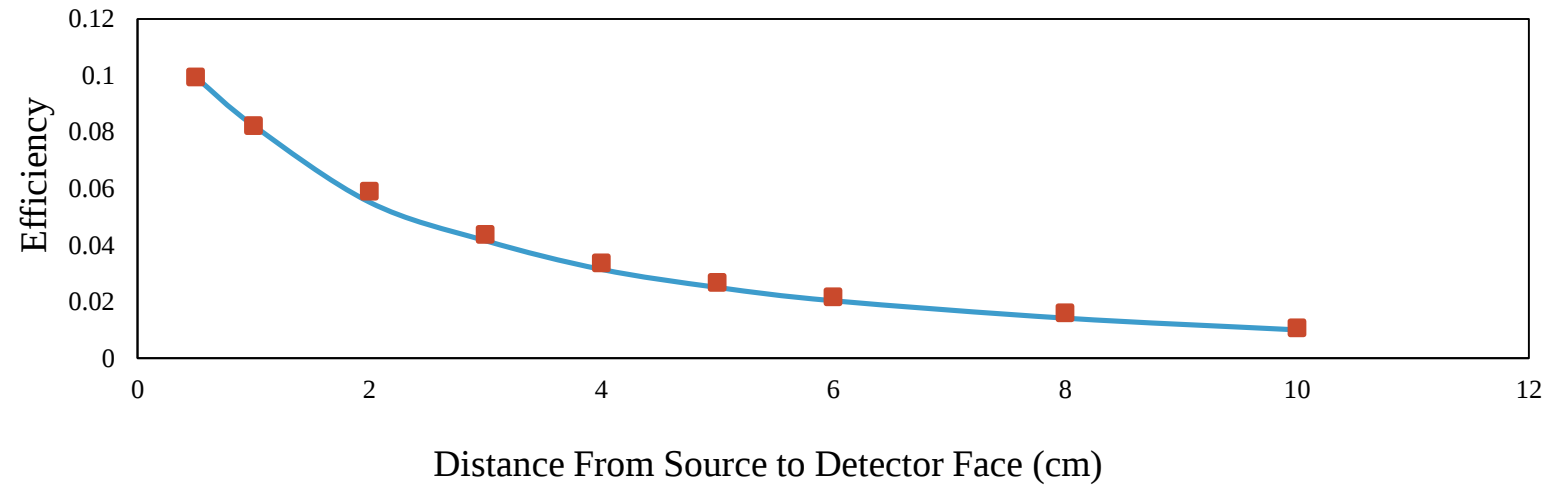
Experiment II Efficiencies

Simulation

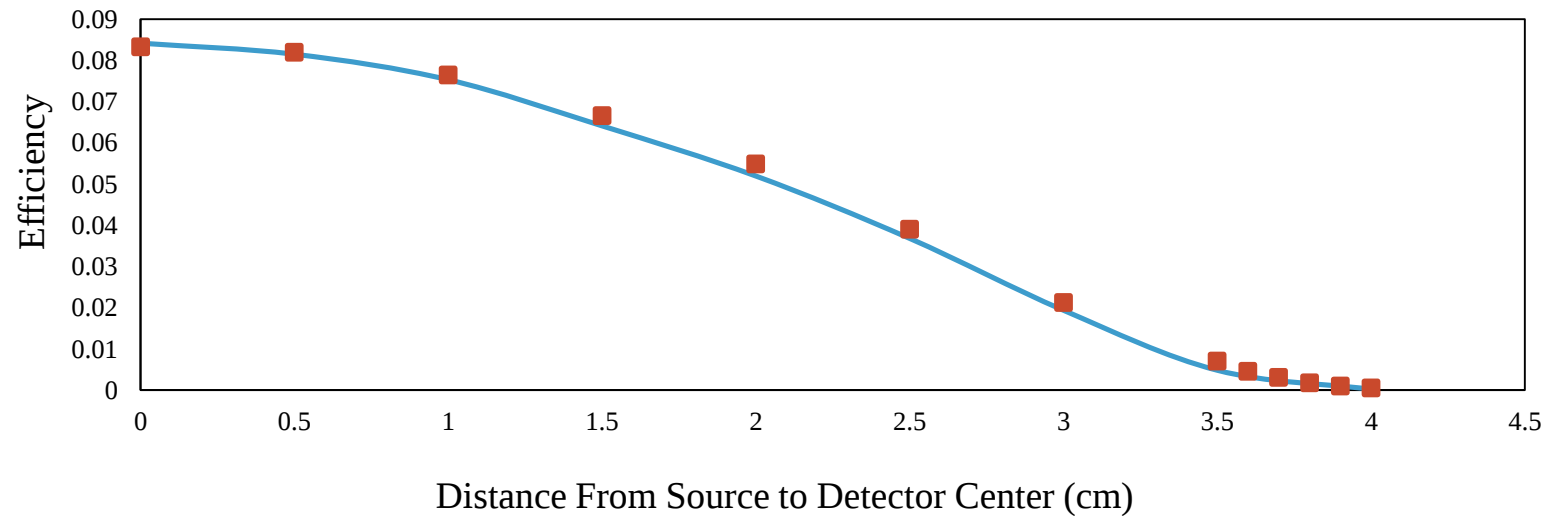
Experiment

RMS Percent Difference: 2.8%

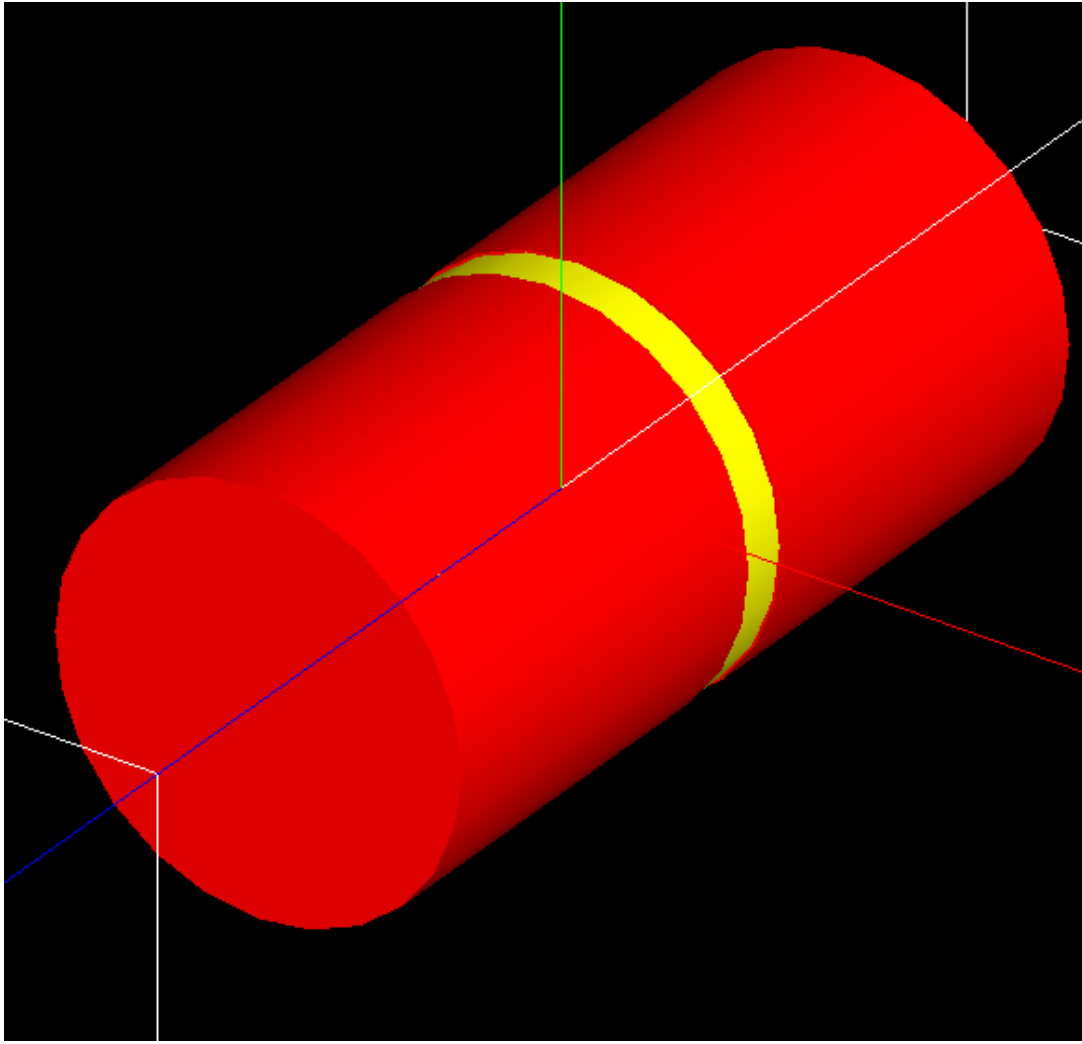
^{68}Ge Copper: Distance Coincidence



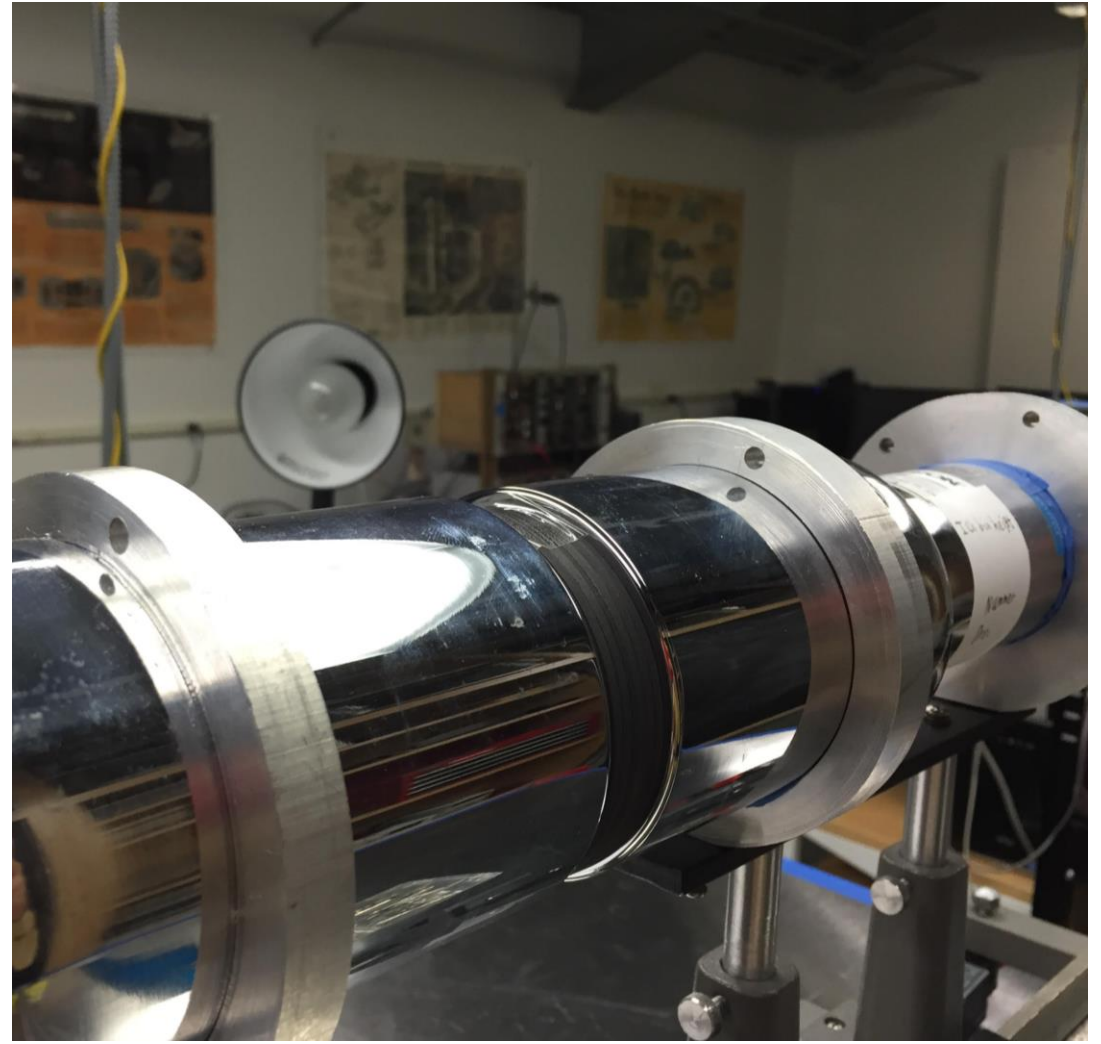
^{68}Ge Copper: Radial Coincidence



Experiment III



GEANT Simulation



Experiment

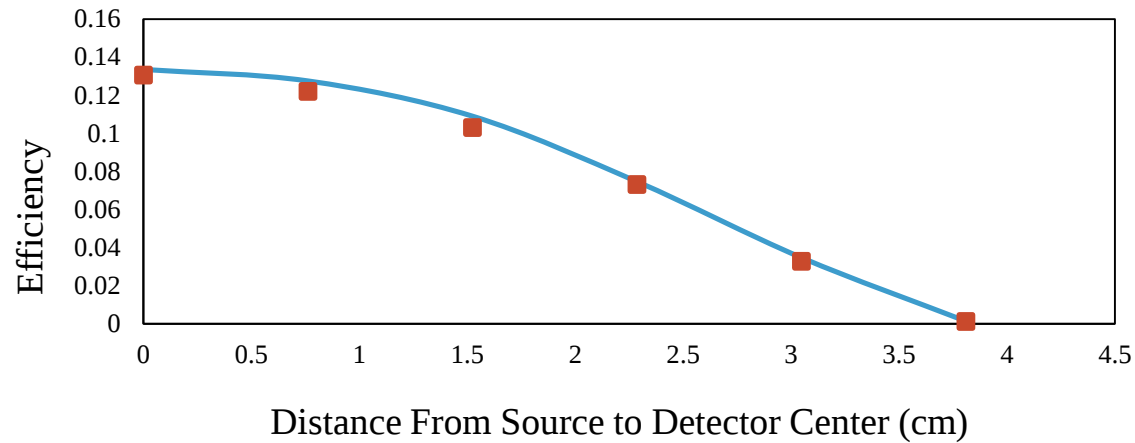
Experiment III Efficiencies

Simulation

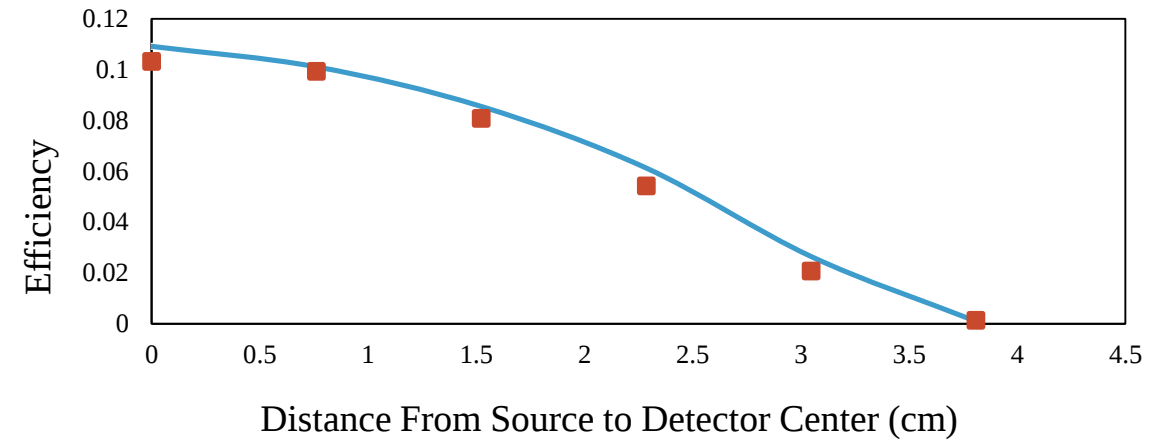
Experiment

RMS Percent Difference: 4.3%

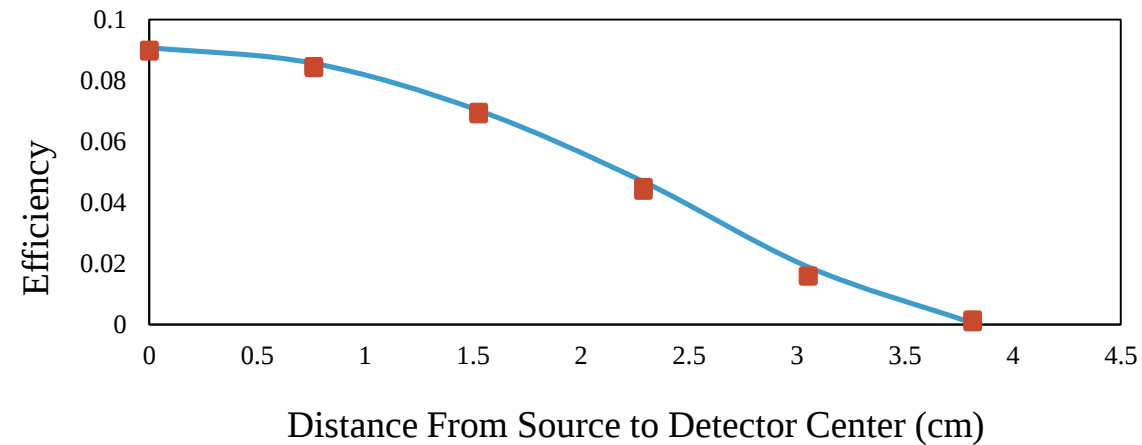
^{68}Ge Carbon 1 disk: Radial Coincidence



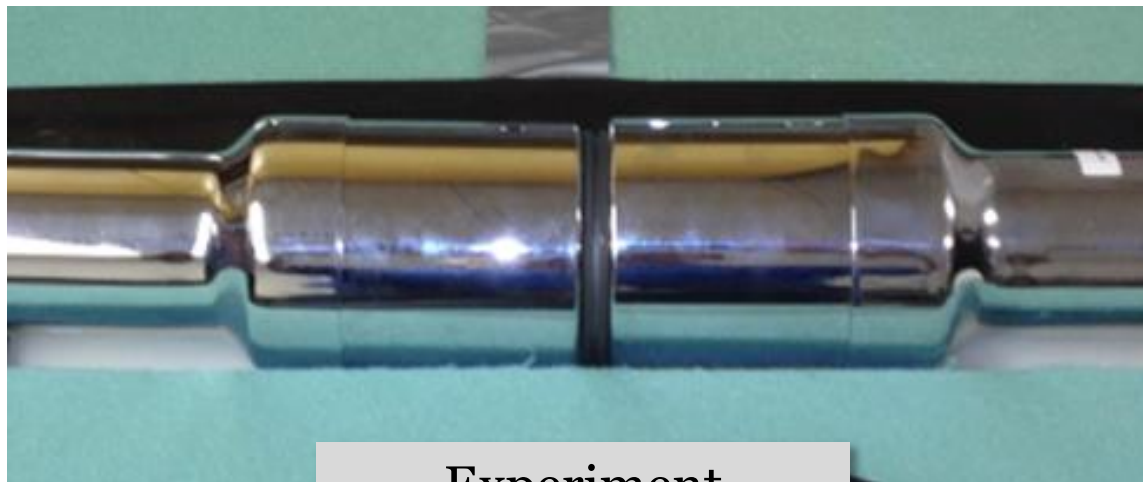
^{68}Ge Carbon Uneven: Radial Coincidence



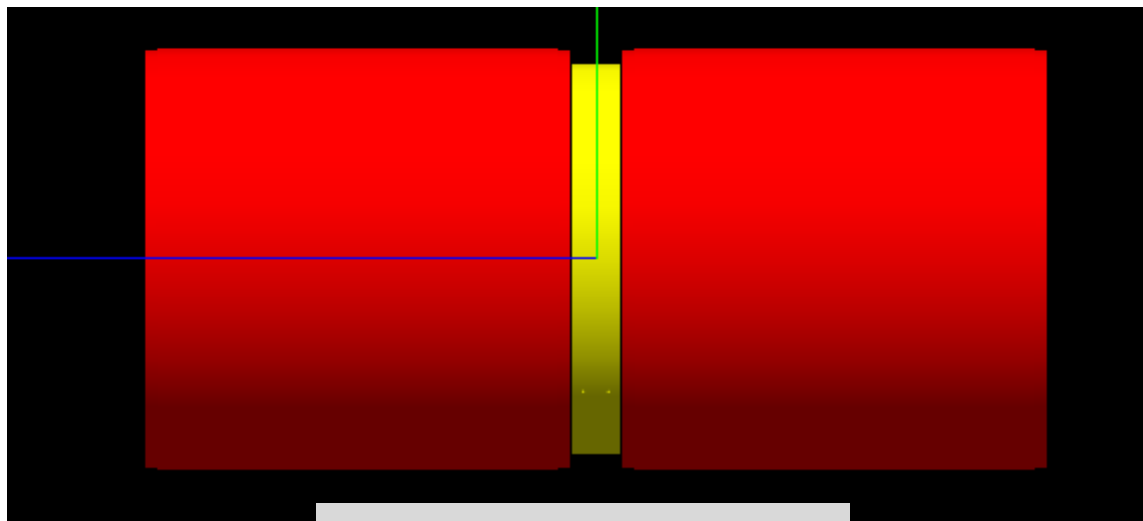
^{68}Ge Carbon 3 disks: Radial Coincidence



Number of ^{11}C in the Ohio University Experiment

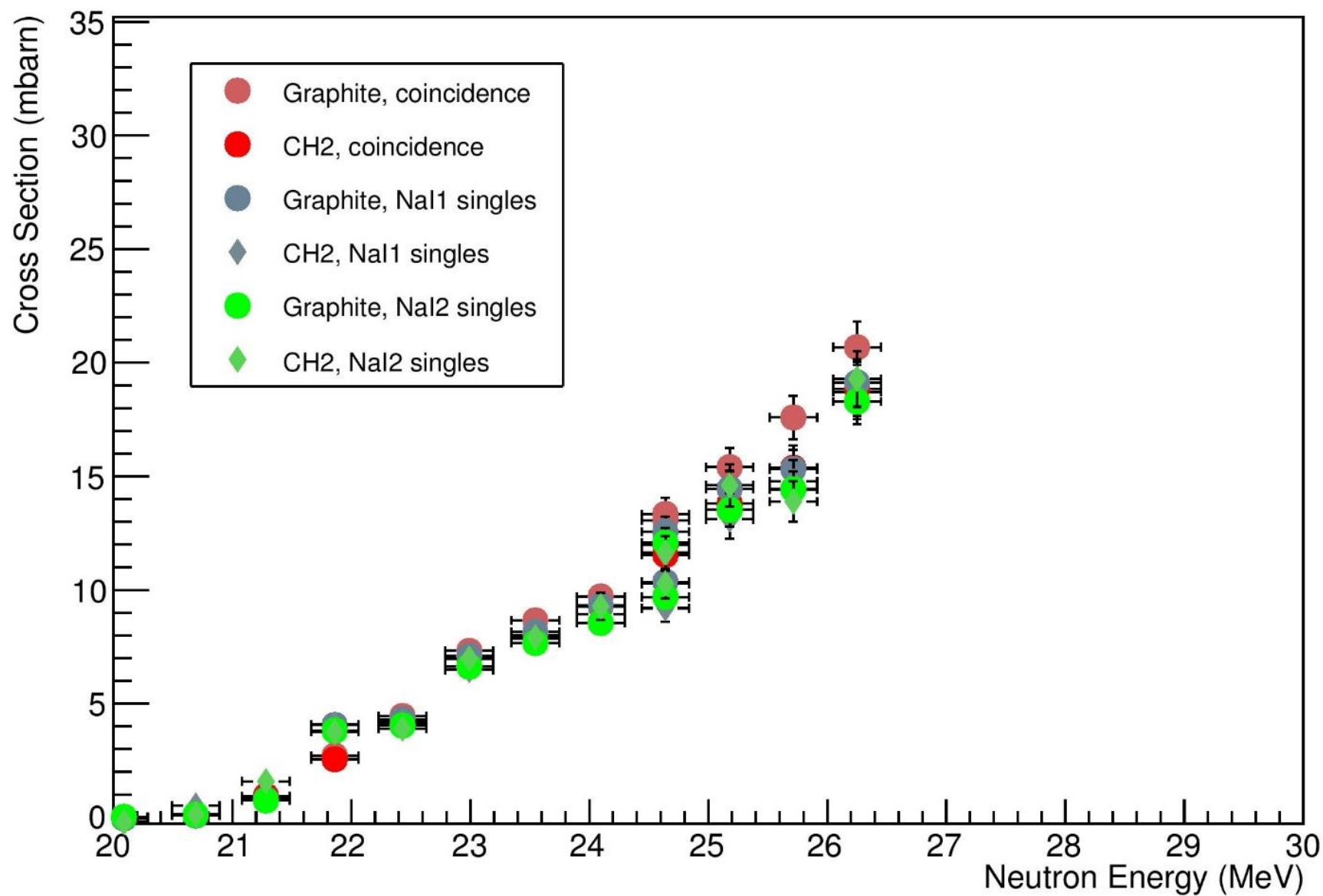


Experiment



GEANT Simulation

PRELIMINARY $^{12}\text{C}(n, 2n)^{11}\text{C}$ Cross Section Measurements



PRELIMINARY $^{12}\text{C}(n, 2n)^{11}\text{C}$ Cross Section Measurements

