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# Angular correlation corrections for absolute activity measurements using $\gamma - \gamma$ coincidence

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Coincidence techniques form a standard measurement for realising absolute activity under idealised conditions. The use of singles and coincidence event rates allow a direct solution by solving explicitly for the unknown parameters activity, detector efficiency, and solid angle. An unconventional γ–γ coincidence setup has been explored for application with isotopes with one or more gamma emission cascades. In the case of 60Co, where there is an angular correllation between the emission directions of the respective photons, additional information is required to solve for absolute activity. A direct experimental approach, and the known theoretical angular correlation, are investigated as practical corrections to the absolute activity solution for 60Co.

Two NaI scintillators, positioned on movable rails and centered around a pointlike source of 60Co, were calibrated to detect either of the γ-emissions in the 4+ 2+ 0+ cascade. Singles and coincidence rates between pairs of detectors were recorded and input into an adaptable model to calculate activity. With the detectors placed in opposition their separation distance was varied, resulting in consistent model results and demonstrating independence from solid angle. The detectors were then rotated around the source with measurements at angles of 90◦, 105◦, and 135◦ relative to each other, demonstrating the angular correlation in the gamma cascade which is then normalised by the known angular correlation to achieve consistent results.

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