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Multiprobe Imaging using Neutrons and Gammas at the NECTAR Beam-Line

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NECTAR is a superior beam-line with access to fission neutrons for non-destructive inspection of large and dense objects, where thermal neutrons or X-rays face limitations due to their comparatively low penetration. With the production of fission neutrons at the instrument [1], as well as neutrons interacting with beamline geometry, such as the collimator, gamma rays are produced in the process. The production of these gamma rays is inevitable as they are inherent with the principles of collimating or stopping the neutrons. Furthermore, these gamma rays are highly directional due to their constraint to the same beam-line geometry and come with similar divergence as the neutrons. While difficult to shield, it is possible to utilize them by using gamma sensitive scintillator screens in place of the neutron scintillators, viewed by the same camera and swapped-out in-situ.

Here we present the advantages of combining the information gained from neutron imaging in conjunction with gamma imaging at the NECTAR beam-line, providing a unique probe with unparalleled isotope identification capabilities. Initial results were produced from data measured in the 2019 run-cycle, performed at and supported by the Forschungs-Neutronenquelle Heinz Maier-Leibnitz (FRMII). Furthermore, future improvements and advancements for the development of this technique will be discussed.

[1] T. Bücherl and S. Söllradl, “NECTAR: Radiography and tomography station using fission neutrons”, Journal of large-scale research facilities JLSRF (2015) 1 p.19.

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