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Submicron Resolution Neutron Radiography R. GREGORY DOWNING, National Institute of Standards and Technology, Gaithersburg, MD 20899 — Imaging diverse materials such as biological and electronic samples at nanometer scales is of current importance; however, capable analytical tools are few. An entirely novel position sensitive neutron detector was conceived based upon illumination of a thin converter causing reactions that diametrically emitted two particles. The converter is carefully aligned between facing position-sensitive particle detectors. The neutron-induced reaction particles strike both detectors in near temporal unison. The nanosecond difference in arrival time uniquely reveals the energy of each particle. Knowing the initial energies of the particles from fundamental physics, the geometry of the system, and the residual energy of the particles then the precise spatial coordinates of the neutron reaction are determined. The data are deconvolved to form a temporal and spatial map of the neutron field illuminating the area of the converter. This detector promises spatial resolution that ranges from a few micrometers to tens of nanometers, an improvement 10 to over 100 times existing systems. Applications for the detector include radiography and tomography for a host of organic and inorganic material studies. A trial demonstration at the NCNR will utilize an intense conditioned neutron beam and high speed data processing capabilities.

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