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Improved efficiency of high resolution thermal and cold neutron imaging

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Spatial resolution and detection efficiency of neutron imaging detectors are the crucial parameters defining the ultimate resolution in neutron radiography, microtomography and other nondestructive testing techniques. The most widely used neutron imaging systems use a neutron-sensitive scintillation screen lens-coupled to a CCD or a CMOS sensor. The highest spatial resolution in those devices is achieved using very thin scintillation screens which reduce image blurring due to light spreading in the scintillator. Thus high spatial resolution and high detection efficiency usually could not be achieved in the same device. Fortunately, neutron detectors using neutron-sensitive microchannel plates (MCPs) overcome that deficiency by providing a long neutron absorption path (˜mm scale) and preserving events within a single sub-10 um pore. At the same time, each neutron in those detectors can be time-tagged with ˜1 us accuracy. The latest boron-10 and gadolinium-doped MCPs developed by Nova Scientific were tested at the cold neutron facility ICON of Paul Scherrer Institute and proved to have 70% neutron detection efficiency.
High spatial and temporal resolution of our neutron counting detectors enable high resolution microtomography, novel studies of material composition, texture, phase and strain through Bragg edge imaging as well as dynamic studies of magnetic fields inside of thick samples, exploiting the neutron spin interactions with magnetic fields.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

http://www.ssl.berkeley.edu/˜ast/Vienna2010/Tremsin_NeutronDetection_Vienna2010.pdf

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