Advanced Thermal Neutron Detectors GRAHAM SMITH, JACK FRIED, GIANLUIGI DE GERONIMO, GEORGE MAHLER, DON MAKOWIECKI, JOE MEAD, VELJKO RADEKA, NEIL SCHAKNOWSKI, EMERSON VERNON, BO YU, Brookhaven National Laboratory — With the advent of new high intensity spallation sources, there is a vital need for development of advanced position sensitive detectors. Using neutron conversion in helium 3, which yields a large signal with excellent background rejection capability, our research program focuses on improving the rate capability, resolution, efficiency and long term stability of detectors for neutron scattering studies. We have developed a suite of detectors using proportional chambers, the latest being an array of curved, multi-wire segments with interpolating cathode strip electrodes operating simultaneously and seamlessly in a single gas volume. With rate capability of nearly 1 million per sec, this instrument has significantly advanced the state-of-the-art for protein crystallography. To attain even higher count rates, a new concept based on operation in the ionization mode is being explored, in which direct ionization from a neutron conversion is collected with unity gain on one of many pads that form the anode plane. Each pad is implemented with charge sensitive electronics, using purpose-designed application specific integrated circuits. A prototype device with 48 by 48 pads has been successfully developed. Examples of measurements at major neutron user facilities will be presented.

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