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**A Time-of-Flight Ultra-Small-Angle Neutron Scattering Instrument Performance Gain over its Reactor-Based Analog.** M. Agamalian<sup>a</sup>, J. M. Carpenter<sup>a,b</sup>, K. C. Littrell<sup>b</sup>, A. Stoica<sup>a</sup>, C. Rehm<sup>a</sup> and P. Thiyagarajan<sup>b</sup>, <sup>a</sup>Spallation Neutron Source, Oak Ridge National Laboratory, Oak Ridge, TN, <sup>b</sup>Intense Pulsed Neutron Source, Argonne National Laboratory, Argonne, IL.

We present the current version of the conceptual design of a Bonse-Hart Time-of-Flight Ultra-Small-Angle Neutron Scattering (TOF-USANS) Double-Crystal Diffractometer for use at the SNS 25mm H<sub>2</sub>O or 60mm H<sub>2</sub> moderator. The TOF technique allows the separation of seven wavelengths simultaneously satisfying the Bragg condition in the range,  $0.5 \text{ \AA} < \lambda < 3.7 \text{ \AA}$ , providing the opportunity to collect seven sets of USANS data at once. The smallest measurable scattering vector,  $Q_{\min}$ , decreases with the increase of the order of Bragg reflection and reaches the value  $Q_{\min} \approx 2 \times 10^{-6} \text{ \AA}^{-1}$  for the Si(14,14,0) reflection, about one order of magnitude smaller than for conventional reactor-based USANS instruments. The overall flux at the sample position is estimated to be as high as  $\sim 1.3 \times 10^4 \text{ n}/(\text{cm}^2 \text{ sec})$  for the 25mm H<sub>2</sub>O moderator and  $\sim 1.2 \times 10^5 \text{ n}/(\text{cm}^2 \text{ sec})$  for the 60mm H<sub>2</sub> moderator, the latter value being seven times higher than that achieved at the NIST reactor Bonse-Hart USANS, the world's best instrument of this type. Besides, the multi-wavelength performance of the TOF-USANS instrument allows variation of the Bonse-Hart collimation, which cannot be done at reactor-based USANS. This advantage gives the scattered intensity gain factor, which is proportional to the square width of the total Darwin plateau,  $(2\delta D)^2$ . The Bonse-Hart variable collimation gain factor depends of the order Bragg reflection; this factor calculated for the first Bragg peak is as high as  $\sim 19$  over the reactor-based analogue.