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# The Design and Construction of the Spallation Neutron Source near-backscattering spectrometer BaSiS

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The first instrument officially adopted as part of the Oak Ridge National Laboratory Spallation Neutron Source (SNS) was the beam line 2, near-backscattering spectrometer that eventually was named BaSiS (Backscattering Silicon Spectrometer). BaSiS was the first silicon-based backscattering spectrometer to be installed at a short-pulse spallation neutron source. The original charge from the user community was to develop a spectrometer “with a Q-range of  $<0.1$  inv. Å to  $\sim 4$  inv. Å at an energy resolution of  $\sim 5$  microeV.” Early in the conceptual design phase it was apparent that these requirements could be met or bettered with a near-backscattering spectrometer using Si(111) as the high-resolution and Si(311) as the high-Q analyzer respectively. The main distinguishing feature of BaSiS is its large dynamic range that was a consequence of using time-of-flight explicitly to determine the incident neutron wavelength. For a reasonable instrument length, BaSiS required a narrow cold-neutron emission time distribution from the moderator to match the energy resolution of the analyzer crystals. This requirement strongly influenced the characteristics of the SNS poisoned, decoupled cold para-hydrogen moderator that ultimately proved in high demand by many of the SNS suite of diffractometers. This talk will review the main elements of the BaSiS design, noting how they differed from more conventional high-resolution backscattering spectrometers and how they determined the final operating characteristics of the instrument.

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