Spallation Neutron Source Cryogenic Transfer Line

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The Spallation Neutron Source is a state-of-the-art neutron-scattering facility presently being constructed in Oak Ridge, TN as a collaborative effort among six national laboratories. The ion beam generated in the high-power particle-accelerator system is accelerated to 1 GeV in the superconducting portion of the linac. This acceleration is accomplished by niobium superconducting radiofrequency (SRF) cavities operated at 2.1K. Liquid helium supplied by a refrigerator system with a 2400 watt capacity at 2.1K and a 8300 watt shield load at 38/50K provides cooling to the niobium cavities. This paper details the design, fabrication, installation, and innovations of the cryogenic transfer line that transfers the helium to and from the cryomodules containing the niobium cavities. The transfer line is a four coaxial pipe design with primary helium flow in the inner line, surrounded by a vacuum annulus, surrounded by a shield helium flow annulus, surrounded by an outer vacuum annulus. This design is similar, with some key improvements, to that being used on the accelerator at Jefferson Laboratory.

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