



Contribution ID: 41

Type: **Talk**

# Overview of the SNS Ring RF Systems and Recent Work

*Monday 9 September 2024 09:35 (25 minutes)*

The Spallation Neutron Source (SNS) facility at Oak Ridge National Laboratory (ORNL) in Oak Ridge, TN, USA completed the proton power upgrade (PPU) project in 2024 and is operating with 1.7 MW of beam power on target (August 2024). A  $\sim 1$  ms long H<sup>-</sup> beam pulse produced by the RF-driven SNS Front-End Ion Source is accelerated to 1.3 GeV in the SNS linear accelerator (linac) and transported to the injection region of the SNS accumulator ring. The SNS operates with a 60 Hz beam pulse repetition rate ( $60 \text{ Hz} \times \sim 1 \text{ ms} = \sim 6\%$  duty cycle). Beam is injected into the accumulator ring via the charge exchange process which uses stripping foils to remove the electrons from the H<sup>-</sup> beam (proton plus two electrons), thereby converting the H<sup>-</sup> beam into a proton beam. It takes  $\sim 900$  ns for 1.3 GeV protons to travel once around the  $\sim 248$  m circumference SNS proton accumulator ring, the “turn time” is then  $\sim 900$  ns and the ring revolution frequency is then  $1 / \text{turn time} = \sim 1.1$  MHz. Four dual-gap ferrite loaded RF cavities in the RF section of the SNS accumulator ring are operated at either the fundamental ring revolution frequency ( $\sim 1.1$  MHz) or the second harmonic frequency ( $\sim 2.2$  MHz) to maintain a  $\sim 250$  ns gap in the accumulated proton beam which is required for clean extraction of beam from the ring and also to suppress the peak current in the center of the proton beam bunch. This presentation will provide an overview of the SNS Ring RF systems and some recent work which includes impedance matching improvements to the second harmonic Ring RF power amplifier input circuits, replacement of the cavity tuning power supplies, and a look at cavity tuning vs. beam loading effects.

**Authors:** NARAYAN, Amith (ORNL); VESTAL, Carter (ORNL); PILLER, Chip (ORNL); HEIDENREICH, Dale (ORNL); MOSS, John (Oak Ridge National Laboratory); RUPP, Louis (ORNL)

**Presenter:** PILLER, Chip (ORNL)

**Session Classification:** Session 1a

**Track Classification:** Project reports, new projects