



Contribution ID: 59

Type: **Presentation**

SINQ++: Upgrading the Swiss Spallation Source for Advanced Neutron Science

Tuesday, 21 October 2025 11:45 (20 minutes)

The SINQ++ project is a strategic upgrade of the Swiss Spallation Neutron Source (SINQ) at the Paul Scherrer Institute (PSI), designed to address critical challenges in neutron science. Building on SINQ's established role as a high-performing continuous neutron source, SINQ++ will introduce a new cold neutron source, doubling brightness across all instruments and offering enhancements up to 200-fold for specific applications. The upgrade aims to expand the scope of experimental possibilities at SINQ, enabling complex neutron scattering and imaging studies that demand high sensitivity and advanced instrumentation.

The project includes an extension of SINQ's target hall to the North, creating capacity for up to six new instruments. These instruments could cater to emerging fields such as grazing incidence small-angle scattering (GISANS), advanced neutron microscopy, and backscattering for soft and biological materials. We also envisage the development of new critical infrastructure for enabling applications beyond fundamental research, including, for example, neutron irradiation for testing advanced nuclear materials, advanced radiochemistry technologies, and simulating cosmic neutron radiation for aerospace electronics certification.

In this talk, we will discuss technical aspects of the SINQ++ cold source upgrade, its integration with the existing HIPA accelerator, and innovations in instrument design, such as neutron focusing optics and 3D-printed shielding. By leveraging these advancements, SINQ++ will solidify Switzerland's position as a leader in neutron science, addressing global challenges and fostering cross-disciplinary innovation in the European neutron ecosystem.

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Session Classification: FACILITIES UPDATES