ICALEPCS 2025 - The 20th International Conference on Accelerator and Large Experimental Physics Control Systems

Contribution ID: **34** Contribution code: **MOBG001** Type: **Contributed Oral Presentation**

Design and implementation of the ESS personnel safety system

Monday 22 September 2025 11:15 (15 minutes)

The European Spallation Source (ESS) in Lund, Sweden, is a state-of-the-art research facility featuring the world's most powerful linear proton accelerator and a high-intensity neutron source. ESS employs a comprehensive Personnel Safety System (PSS), which integrates several safety interlock systems distributed across the facility. These systems operate independently, but are connected via a centralized interlink, which allows them to coordinate hazard mitigation and determine the facility's readiness for proton beam generation and neutron production.

The ESS PSS architecture is designed to provide a reliable and robust safety framework, with a strong focus on scalability, upgradeability, and maintainability to support long-term and efficient operation. It is based on the Nexus PSS, a PLC-based system that manages communication between distributed safety subsystems. A fiber optic ring network ensures real-time, fail-safe communication with high availability and built-in redundancy. This design allows quick response to safety events and supports system reconfiguration in case of failures while maintaining operational integrity.

This paper provides an overview of the ESS PSS framework, including its integration, communication infrastructure, and approaches to key safety challenges.

Footnotes

Funding Agency

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Session Classification: MOBG MC07 Functional Safety and Protection Systems

Track Classification: MC07: Functional Safety and Protection Systems