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Machine protection plans in ESS

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The European Spallation Source (ESS) aims to be the brightest source of neutrons in the world for scientific research. Located in Lund, Sweden, it is currently in the pre-construction phase with a plan to deliver first neutrons in 2019. The baseline specification is for a 5 MW proton power, long pulse facility delivering neutrons to 22 independent instruments that will foster major advances from aging and health, materials technology for sustainable and renewable energy, to experiments in quantum physics, biomaterials and nano-science.

High beam power, which can severely damage accelerator or target components as well as the beam pipe itself, demands fast and reliable Machine Protection System (MPS). The goal of the MPS is to improve the operation safety by reducing the risk of damage to the components of the machine.

Hundreds of diagnostic devices will monitor the machine and the beam health and in case of excessive beam loss or other critical malfunction the beam will be shut down. Only few microseconds are available for MPS to trigger mitigation, therefore very fast interlock system needs to be designed. MPS will provide time-stamping and logging of all input changes. All logs will be synchronized and will serve as a vital input to post-mortem analysis. Support for commissioning and different machine modes will be embedded. Important part of the MPS will be a Beam Permit System (BPS) with a task to check that the facility is configured and secured appropriately, and that all relevant equipment is operating and within the desired setpoint ranges for the operator-selected mode.

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Session Classification: Introduction; Machine protection, experience and challenges