

Accelerator Engineering Design and R&D on Non-Destructive Testing for ESS

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The European Spallation Source – ESS facility is currently undergoing its construction and installation phase with a high pace and focus on the accelerator and target machines, in parallel of engineering also the scientific instruments. The proton accelerator will be the sole driver for neutron production at ESS in the forthcoming years. The accelerator components are assembled, installed and tested, following the project goals. The corresponding engineering requirements are managed and archived in an online database, reflecting the physics multidisciplinary needs and dictating the engineering design. The lattice data control the positioning of the accelerator and are utilized to generate the CAD skeleton for the mechanical master-model, so-called EPL (ESS Plant Layout). The first parts of the machine, the ion source and low energy beam transport, are now operational with explicit needs for preventive and regular maintenance to serve the nominal ESS operations scheme. The program of Non-Destructive Testing for Machines (NDTM) at ESS is a measurements and testing program, based on the development and implementation of the Resonant Ultrasound Spectroscopy (RUS) on the machine structural materials. The first testing set-up of NDTM is prototyped, based on ultrasound (UT) pinducers that allow for acquisition of spectra from samples of various materials (Nb, SSt, Alu, etc.) and configurations. Specimen considered for measurement and validation come from the production batches that accelerator modules are manufactured from, with the aim to create a database of (experimental) modal responses for the different mechanical subassemblies. Implementation of the NDTM testing set-up in the accelerator tunnel is foreseen for reference measurements but also online validation of operations.