

Status and Plans of the ESS Neutron Source

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(Received November 23, 2019)

The European Spallation Source (ESS) is planned to be a world-leading facility during the third decade of the 21st century. It will be a long pulse source using directly the beam from a high-power proton linac, instead of a synchrotron like its short pulse predecessors, ISIS in the UK, SNS in the USA, J-PARC in Japan and CSNS in China. Neutron beams of unprecedented brightness will be generated thanks to the 5 MW proton beam power and a novel concept for the neutron moderators. State-of-the-art instruments are being designed to exploit this potential. The main institutions of the European partner countries are mobilized to reach these ambitious goals, providing most of the high technology components.

Following the selection of the green-field site of Lund (Sweden) 10 years ago, construction started in 2013 with the goal to be operational in 2026 with a set of 15 instruments. Construction is presently ~60% complete and progressing at high speed. Buildings and infrastructure on site are well advanced. Accelerator components are being manufactured and progressively delivered at Lund. Installation is proceeding simultaneously in the room temperature and in the cryogenic parts of the accelerator. The ion source and Low Energy Beam Transport (LEBT) have already been commissioned. Work is in progress for the Radio Frequency Quadrupole (RFQ) and Medium Energy Beam Transport (MEBT), in parallel with the assembly of the Drift Tube Linac (DTL) tanks. The first series cryomodule with spoke cavities and elliptical Medium Beta cavities will arrive before the end of 2019. Beam from the Medium Beta section is planned to be sent to the test beam dump during the third quarter of 2021. Higher energy beam from the High Beta section will be sent to the target one year later.

The design and progress of realization of the ESS neutron source are described in this paper as well as the plan for its completion.

KEYWORDS: Neutron spallation, Superconducting Linac, High Power Proton Accelerator (HPPA)

1. Introduction

The decision to build the European Spallation Source (ESS) in Lund (Sweden) was taken ten years ago in 2009, and its construction began in 2014 after a design update phase [1] with the goal of delivering first science in 2023 and being in operation for users in 2026. This initial design was further improved while civil construction progressed [2]. The aim is to exceed the performance of all other existing or planned neutron spallation sources and to provide in addition the unique capabilities of a long pulse source [3], using directly the beam from the proton linac to generate neutrons on the target. The main characteristics of the ESS are summarized in Table I. In addition, the ESS facility has to meet ambitious sustainability objectives, like for instance to ensure recycling of more than half the generated heat.

The ESS was set-up as a European Research Infrastructure Consortium (ERIC) by decision of the European Commission in August 2015 [4]. In addition to the two host

