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European Spallation Source Polarisation Development

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Polarised neutrons will be a capability offered to users in many ESS instruments. Of the currently approved 15 instruments [1], 12 aim to have the capability [2]. They include 1 imaging instrument, 2 SANS instruments, 2 reflectometers, 3 diffractometers, and 4 spectrometers. In conjunction with in-kind contributions and external grants, the ESS Polarisation Project will support 10 instruments. Polarised ^3He based neutron spin filter will provide shared-use polarisers and analysers. Both Metastable Optical Pumping and Spin-Exchange Optical Pumping methods will be used, the latter will focus on in-situ polarisation applications. Depending on the benefits and the feasibility, selected instruments will use polarising-supermirror based polariser or analyser. Due to the generally wide-bandwidth nature of time-of-flight instruments at the ESS, adiabatic fast passage spin flipper, a.k.a. gradient field radio-frequency spin-flipper will be the primary method of choice. We will adopt innovative designs where applicable for the equipment. Even at an early stage of ESS operation, the neutron flux will be on par with some of the polarised neutron instruments at major facilities. The polarisation developmental effort is underway in parallel to instrument construction, with the aim of delivering polarised neutrons for first-science experiments as instruments are entering operation. Our first ^3He polariser is currently under construction, that will provide shared use as lab-based polariser and analyser on SKADI and LoKI instruments. We will report our latest development in this presentation.

[1] K. Andersen *et al.*, Nucl. Instrum. Methods Phys. Rev. A 957,164302 (2020).

[2] W.T. Lee *et al.*, Report on ESS Polarisation Workshop, ESS-3549713 (2020).

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