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Fundamental physics possibilities at the European Spallation Source

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Despite the success of the Standard Model of particle physics long-standing open questions remain to be understood including the nature of dark matter, baryogenesis, and leptonic CP violation. Attention is being increasingly focused on the so-called intensity frontier at which small-scale experiments make high-precision measurements of a limited number of observables or search for rare or forbidden processes. Experiments can reveal evidence for hitherto unseen high mass-scale physics processes beyond that achievable at colliders or low-rate low energy etc. from phenomena such as sterile or right-handed neutrinos and light dark matter candidates. Presently under construction, the European Spallation Source (ESS) in Lund, Sweden, will be the world's brightest neutron source [1] , as part of its mandate, the ESS will deliver a program of fundamental physics at the intensity frontier. I will present a review of the physics potential of the wide variety of fundamental physics experiments which can be performed both with neutrons and neutrinos, the latter experiments benefit from the capability of the ESS to be a high-intensity neutrino factory. Several experiments are foreseen such as precision measurements of neutron decay parameters [2], gravitational spectroscopy, searches for a non-zero electric dipole moment of the neutron, and neutrons converting to anti-neutrons [3]. Research in the neutrino sector includes coherent elastic neutrino-nucleus scattering [4] as well as possible leptonic CP violation [5].

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