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Isotope Production at European Spallation Source –A potential new access to neutrons

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The medical use of radioactive isotopes for diagnosis and treatment is a publicly accepted and well supported success history. The rapid growth of molecular imaging, PET scanning and radionuclide therapy of cancer has increased the demand for isotope production across the globe. Unfortunately, we are also witnessing the decreased availability of large nuclear facilities due to aging facilities and changes in research priority. The need for special isotopes is however still there. It is an obvious possibility to augment the ESS installation with irradiation facilities to enable production and extraction of medically important, otherwise unavailable isotopes.

Here we present a potential location to place isotope production targets in the vicinity of the spallation target as well as initial calculations on available neutron quality, spectrum and flux there. The proposal is based on current ESS design parameters, a 2.0 GeV proton beam on the solid tungsten target at 5 MW beam power.

Two equally important source terms can be identified. These are direct neutron activation in small targets located in points of high thermal neutron flux close to the water moderator and fast neutron activation using unmoderated spallation neutrons.

We propose the formation of an EU funded consortium of research institutions to work out detailed plans for necessary infrastructure at ESS and a feasibility list of worthy, feasible radioisotopes together with their calculated yields. A future facility of this kind may benefit from close collaboration with facilities for electromagnetic isotope separation of radioisotopes, increasing radio-nuclidic purity and specific activity.

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