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The future of ESS is bright

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Aiming for highest neutron peak brightness, limits are set by the capabilities of heat removal and for pulsed sources even more by the instantaneous power impact. In this respect, the long pulse ESS is still below its limits and has a high potential to boost its performance. Considering the current ESS, the goal should be a compression of proton pulses near to 50 to 100 μs , comparable to the moderation time of thermal neutrons. It will increase the peak brightness for thermal neutrons up to about a factor 50 and for thermal instruments, sufficiently high resolution can be achieved even without pulse shaping choppers. Including cold instruments, on average there is an order of magnitude increase in performance with some appealing options for the instrument suite.

The upgrade of the ESS linac with a compressor ring is part of the neutrino physics proposal of the ESS, ESSnuSB. Its use for neutron production with 1.2 μs proton-pulses at 5MW will cause likely unacceptable thermomechanical shocks in the spallation target. Alternative proposals for slow extraction from the accumulator ring are less challenging for the target but more so for the accumulator extraction zone for which too high irradiation must be avoided. Clearly, the design of such options to generate compressed proton pulses of medium duration is strongly motivated by gaining the ultimate possible neutron peak brightness to tap the full high potential of the ESS.

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