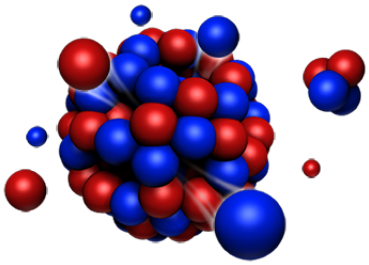

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Engineering design and transient fluid dynamic simulations of the second generation of low dimension cold Moderator for the European Spallation Source ESS

Tuesday, 15 October 2019 11:45 (25 minutes)

Studies by the ESS neutronic team have shown that low-dimensional moderators can improve the neutron brightness by more than a factor of two, compared to the common volume moderators. ESS will therefore be equipped with such a moderator. The intended time-averaged proton beam power is 5 WM. Due to ramp up of the accelerator the first generation will operate under partial load of less than 2 MW time-averaged proton beam power, with the so-called butterfly-2 moderator (BF2), consisting of two separate aluminum vessels filled with liquid hydrogen. Further parametric studies have shown that geometrical optimizations can lead to an additional gain of brightness of up to 30% for several beamlines, which resulted in the butterfly-1 (BF1) moderator (single vessel) design. Therefore, the BF1 cold moderator should be used in the second generation of ESS. The following paper will cover the verification of the technical feasibility of the optimized neutronic design. The transient fluid dynamic simulations will be in the focus of this work. Based on the existing requirements, i.a. avoiding local boiling, a theoretical maximum allowable beam power will be estimated. Pulsed heat deposition and resulting temperature fluctuations and pressure waves will be analyzed as well.

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