Contribution ID: **385** Type: **Poster**

Slowing down 14 MeV fusion neutrons

Monday 20 March 2023 16:00 (2 hours)

The monochromatic neutron filed generated by $^{3}H(^{2}H,n)^{4}He$ reactions is typically used in fusion-related experiments. mainly devoted to material damaging, plasma diagnostics development and cross sections measruements. As a matter of fact, the monochromatic 14 MeV neutrons can be slowed down to obtain thermalised neutrons with the typical spectrum of a spallation neutron source, i.e. a maxwellian peak and an epithermal tail extending up to the maximum energy available. Although the golden standard for the production of intense neutron beams for scattering applications is fission and spallation, nevertheless exploiting the monochromaticity of the source may be an added value. Indeed, obtaining moderated neutron beams at a 14 MeV accelerator-driven neutron source with intensities such that a few neutron techniques might be made available, may represent a unique possibility to perform in the same site fusion-related investigations on materials applying dedicated neutron scattering techniques on material that, upoin 14 MeV neutron irradiation likely are heavily activated, making the transportation to other neutron site not feasibile over long periods.
In this contribution, the strategy to obtain a moderated neutron field from 14 MeV source neutorns is discussed, showing both experimental measurements and Monte Carlo simulations. Some prediction on moderator brightness are provided for a 250 kW accelerator-driven 14 MeV fusion neutron source, currently in the design phase.

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Session Classification: Poster Session MONDAY

Track Classification: Fundamental Science