

Target development of the accelerator driven High Brilliance neutron Source (HBS)

Wednesday, 29 November 2017 18:40 (6)

Neutron supply for research is nowadays predominately based on spallation or fission. The High Brilliance neutron Source (HBS), currently under development at Forschungszentrum Jülich, will use protons or deuterons from an accelerator in the 10 MeV to 50 MeV range, shot on a low Z-material in order to produce neutrons. The HBS is optimized to be highly cost efficient and scalable. Medium flux devices, which are affordable for universities or companies will be available, as well as high flux facilities, comparable to today's research reactors.

The heart of the system is the target assembly, where nuclear reactions between ions and target nuclei take place to produce neutrons and where the major fraction of the projectiles kinetic energy is converted to heat. The neutron yield is strongly correlated to the beam power, making the thermomechanical properties of the target material a limiting factor. The ion range, which is a function of the ion's initial energy, is limiting the allowable thickness of target materials with low diffusion coefficients like beryllium, due to ion implantation causing severe degradation by blistering.

For an efficient high power target with an acceptable lifetime, smart choice of design parameters is therefore crucial.

Simulations show the feasibility of a 10 kW peak power target producing 10^{13} n/s at 4 % duty cycle, for a system on university scale. Latest target design considerations and techniques for effective heat dissipation will be presented, which allow the maximization of the neutron yield.

Formal Invitation Letter Required

No

Primary author(s) : Mr DOEGE, Paul-Emmanuel (JCNS-2, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany)

Co-author(s) : WOLTERS, Bernd (ZEA-1, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany); Dr MAUERHOFER, Eric (JCNS-2, Forschungszentrum Jülich GmbH, D-52425, Jülich, Germany); Prof. NATOUR, Ghaleb (ZEA-1, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany); Dr BAGGEMANN, Johannes (JCNS-2, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany); Dr BUTZEK, Michael (ZEA-1, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany); Dr ZAKALEK, Paul (JCNS-2, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany); Prof. BRÜCKEL, Thomas (JCNS-2, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany); Dr GUTBERLET, Thomas (JCNS at MLZ, Forschungszentrum Jülich GmbH, Lichtenbergstraße 1, D-85748 Garching, Germany); Mr CRONERT, Tobias (JCNS-2, Forschungszentrum Jülich GmbH, D-52425, Jülich, Germany); Dr RÜCKER, Ulrich (JCNS-2, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany); BEßLER, Yannick (ZEA-1, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany)

Presenter(s) : Mr DOEGE, Paul-Emmanuel (JCNS-2, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany)

Session Classification : Nibbles - Poster, Sponsors DENIM Challenge

Track Classification : Neutron Source