AGA 7: Nuclear Proliferation

Time: Thursday 16:30–17:30 Location: DO24 Reuter Saal

AGA 7.1 Thu 16:30 DO24 Reuter Saal

Peaceful Fusion — •Matthias Englert — IANUS, TU Darmstadt

Like other intense neutron sources fusion reactors have in principle a potential to be used for military purposes. Although the use of fissile material is usually not considered when thinking of fusion reactors (except in fusion-fission hybrid concepts) quantitative estimates about the possible production potential of future commercial fusion reactor concepts show that significant amounts of weapon grade fissile materials could be produced even with very limited amounts of source materials. In this talk detailed burnup calculations with VESTA and MCMATH using an MCNP model of the PPCS-A will be presented. We compare different irradiation positions and the isotopic vectors of the plutonium bred in different blankets of the reactor wall with the liquid lead-lithium alloy replaced by uranium. The technical, regulatory and policy challenges to manage the proliferation risks of fusion power will be addressed as well. Some of these challenges would benefit if addressed at an early stage of the research and development process. Hence, research on fusion reactor safeguards should start as early as possible and accompany the current research on experimental fusion reactors.

AGA 7.2 Thu 17:00 DO24 Reuter Saal

Proliferation Risks of Small, Fast Reactors — •Friederike Friess, Moritz Kütt, and Matthias Englert — IANUS, TU Darmstadt

Small modular reactors are promoted as an alternative to meet the world's growing energy demands, often with an emphasis on enhanced proliferation resistance. We assessed the proliferation attractiveness of a fast liquid sodium cooled reactor design based on the Toshiba 4S and calculated the isotopic composition and total amount of plutonium produced in the fuel during and after irradiation as well as the dose rate of the spent fuel.

For the analysis we used the neutron transport code MCNP and validated the model by calculating criticality and flux distributions in the core model. Burn-up calculations were performed with VESTA and MCMATH, the data from both codes were processed with Magicplot.

The fissile material attractiveness was assessed using the Figure of Merit introduced by Bathke et al. Dose rates of the spent fuel were calculated to compare with spent fuel from conventional light water reactors. The results show that several significant quantities of weapon-grade plutonium are produced in the core during the proposed reactor lifetime.