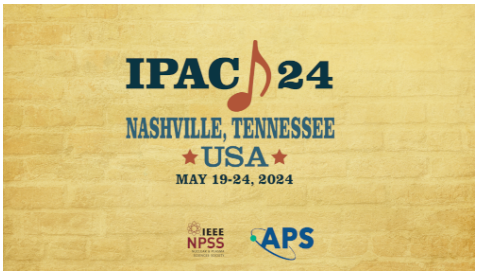

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Development of an active beam-stabilization system for electrofission experiments at the S-DALINAC

Wednesday, 22 May 2024 16:00 (2 hours)

The r-process fission cycle terminates the synthesis of heavy elements in binary neutron-star mergers. Fission processes of transuranium nuclides will be studied in electrofission reactions at the thrice-recirculating electron accelerator S-DALINAC*. Due to the minuscule fissile target, the experimental setup requires an active beam-stabilization system with high accuracy and a beam position resolution in the sub-millimeter range. Requirements and concepts for this system regarding beam diagnostics elements, feedback control and readout electronics will be presented. The usage of a cavity beam position monitor and optical transition radiation screens to monitor the required beam parameters will be discussed in detail. Additionally, various measurements including a study of beam stability performed in the injector section of the S-DALINAC to assess requirements and limits for the beam-stabilization system will be presented. Finally, the application of advanced machine learning methods, such as neural networks and agent-based reinforcement learning, will be discussed.

Footnotes

- N. Pietralla, Nuclear Physics News, Vol. 28, No. 2, 4 (2018).

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