

INTERNATIONAL NUCLEAR ENERGY RESEARCH INITIATIVE

Development of a 2E-2V Instrument for Fission Fragment Research

PI (U.S.): Fredrik Tovesson, Los Alamos National Laboratory

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PI (Euratom): Stephan Oberstedt, Joint Research Center – Institute for Reference Materials and Measurements

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Collaborators: Idaho National Laboratory

The objective of the project is to produce accurate data files of fission measurements and evaluations for several key isotopes over the incident neutron energy range relevant to present and future nuclear applications. Design, optimization, and safety assessment of future fast reactor systems require improved fission fragment nuclear data for major and minor actinides. The project will contribute to the ENDF/B-VII and JEFF 3.1 nuclear data libraries.

The research team will develop instrumentation for high-resolution fission fragment velocity, energy, and nuclear charge measurements. The resulting data provides fission fragment mass and the corresponding yield curves. This work supports ongoing developments at two spectrometer facilities: the VERDI (VELOCITY foR Direct particle IDENTIFICATION) spectrometer at the Institute for Reference Materials and Measurements, and a similar dual-arm spectrometer at Los Alamos National Laboratory (LANL). The current VERDI spectrometer measures energy and velocity from only one of the two fission fragments emitted in binary fission (hence, *1E-1V*), while the advanced instruments will simultaneously measure *both* fission fragments (*2E-2V*). In addition, the LANL dual-arm instrument will also use Bragg curve spectroscopy to measure nuclear charge.

The collaboration will consist of exchange of expertise and technologies, joint experimental efforts, sharing of detector designs, and communication of technical and scientific information. The two instruments will be developed in parallel, and the teams will share technologies that benefit the joint program. Experimental activities will be carried out at both laboratories' facilities, including the Geel Linear Accelerator (GELINA), the 7 MV Van de Graaff neutron source (MONNET), and the Los Alamos Neutron Science Center (LANSCE). Key project milestones are as follows:

- Design study (Year 1)
- Prototype design/technical report (Year 2)
- Initial measurements (Year 3)