Contribution ID: **80**

Type: **not specified**

# Physical Design and Simulation of a Fission Spectrometer Based on the Velocity-Kinetic Energy Method

*Thursday, 29 May 2025 12:05 (15 minutes)*

The investigation of neutron-induced fission independent yields of actinides is critically important for both the efficient utilization of nuclear energy and nuclear physics research. The fission spectrometer based on the velocity-kinetic energy method consists of a Time Of Flight (TOF） detector and a Frisch-Grid Ionization Chamber (FGIC), achieving mass yield distribution with a mass resolution less than 1 amu. This presentation focuses on the physical design and simulation studiy of the fission spectrometer. The Micro Channel Plate (MCP) time detector, which constitutes TOF, maintains secondary electron flight time spread of 50 ps and the flight distance is 70 cm. The FGIC operates with isobutane as the working gas, operating at an optimal E/P of 6 V/(cm · Torr) and a pressure of 5000 Pa. When the energy resolution is less than 0.8 % for light fragments and 0.6 % for heavy fragments, the mass resolution can be less than 1 amu. Based on the physical design, fission data for 14 MeV neutron-induced 238U was simulated by coupled calculations using Geant4, COMSOL and Garfield++. The mass yield distribution was calculated by the energy loss correction method. A measurement method for charge yield distribution based on K-means clustering algorithm is proposed, and the Root Mean Square Error (RMSE) and Error Ratio (ER) of the charge yield distribution are 6.36E-6 and 29.26%.The simulated independent yield distribution demonstrate agreement with the ENDF/B-VIII data. The physical design and simulation studies provide a foundation for future fission physics experiments.

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**Session Classification:** Parallel Session 3: Neutron detection & Methodical aspects/Physics of ultra-cold neutrons

**Track Classification:** Parallel session: Parallel session 3