Contribution ID: **191** Type: **Poster**

#4-191 TRIPOLI-4 model of the JSI TRIGA Mark II reactor applied to experimental fission chamber neutron profiles measurements

Wednesday, June 11, 2025 4:25 PM (5 minutes)

This article focuses on the fission chamber axial profiles performed by the CEA LDCI lab within the JSI TRIGA Mark II reactor during a bilateral CEA/JSI experimental campaign. Discretized neutron flux distributions at reduced power are experimentally assessed in different locations inside the reactor core. Four different irradiation locations were specially identified for potential further innovative nuclear instrumentation developments and qualification: central channel (highest neutron flux), small measuring positions in-between full elements (unperturbed environment), large triangular channel and peripheral channel (called F8, within the thermal neutron bump at the outskirt of the core). Different irradiation environments were evaluated: in air solely for the triangular channel, in water for both central channel, measuring position n° 17 and F8 irradiation channel. For each of these locations, local fission rate measurements were performed using uranium-235 and uranium-238 miniature fission chambers, fabricated at the CEA Cadarache fission chamber workshop, forming neutron flux profiles using a JSI pneumatic driven system ensuring precise and reproducible fission chamber positioning. Detector acquisitions were achieved using the recently industrialized Libera MONACO 3 system dedicated to fission chamber measurements in any neutron flux range conditions. Those absolute measurements were extended to altitudes above and under reactor support grids to assess the ability of the TRIPOLI-4 modeling to calculate neutrons flux outside the reactor fuel region.
Providing those recent measurements, the calculation to experiment comparison results aim at improving neutron transport simulations, increasing the reliability of the characterization of the reactor's neutron calculation scheme and helping future characterization of the TRIPOLI-4 gamma calculation scheme under development.

Such specific calculation to experiment benchmarks contribute to the constant refining calculation methods and numerical tools for nuclear instrumentation developments in support of future reactor experimental campaigns, and also highlighting the importance of calibrated fission chambers in the development of innovative nuclear instrumentation and the understanding of reactor behavior.

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Session Classification: #04 - Research Reactors and Particle Accelerators

Track Classification: 04 Research Reactors and Particle Accelerators