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#4-52 Experimental investigation of the VENUS-F core model underestimation of the fast neutron spectrum component

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At the VENUS-F zero power reactor, miniature fission chambers have been used to measure fission rate ratios in order to get insights on the neutron flux energy distribution. Monte Carlo models of VENUS-F have been validated against those experimental results.
Customarily, non-threshold (e.g.: of ^{235}U and ^{239}Pu) and threshold fission rates (e.g.: of ^{237}Np, ^{240}Pu and ^{238}U) are considered to retrieve information on the whole and fast energy spectrum, respectively.
Recently, the CoRREx (Complement to the Reaction Rate Experiments) campaign has been carried out to characterize the latest core configuration loaded at VENUS-F.
Fission chambers with various deposits (^{235}U, ^{239}Pu), ^{237}Np, ^{240}Pu and ^{238}U) were irradiated and discrepancies were found in the modeled fission spectral index of ^{238}U-to-^{235}U. Such a discrepancy was attributed to underestimation of the fast neutron flux spectrum in the Monte Carlo model of the experiment.

Parallel to CoRREx, to measure the fast neutron flux spectrum, the VALUE (VENUS-F Automated Learning Unfolding Experiment) campaign is planned.
With the progress of machine learning techniques, new neutron flux spectrum unfolding methodologies have been investigated. Those offer now a chance to take the problem of the neutron flux spectrum measurement from a different angle.
Among the several possible detector-unfolding methodology combinations, the ones relying on solid state detectors are investigated with great interest because of their large operation domain, allowing for diverse reactor applications.
VALUE foresees irradiation of solid state detectors (SiC and diamond) and fission chambers in the VENUS-F CoRREx configuration.

In this contribution, we present the first results of VALUE: namely, deposited energy in the solid state detectors and spectral indices measured with different fission chambers than in CoRREx (e.g., $^{nat.}$U, ^{232}Th).
For the first time at VENUS-F, a calculation-to-experiment comparison of the energy deposited in solid state detectors will be presented.
Moreover, the new measurements of threshold spectral indices outlined above would allow the investigation of the calculation-to-experiment observed in CoRREx.
Finally, the spectral index measurements presented are a fundamental first step in the validation for the neutron flux spectrum unfolding methodology developed at CEA.

Primary author: GRIMALDI, Federico (Belgian Nuclear Research Centre SCK CEN, Université libre de Bruxelles)

Co-authors: Ms BELFIORE, Enrica (CEA Cadarache, DES/IRESNE/DTN/LMN, 13108 Saint-Paul les Durance, France); DI CROCE, Federico (SCK CEN and Université libre de Bruxelles); KRÁSA, Antonin (Belgian Nuclear Research Centre); WAGEMANS, Jan (SCK CEN); Mr VITTIGLIO, Guido (Belgian Nuclear Research Centre); Prof. LABEAU, Pierre-Etienne (Université libre de Bruxelles); Dr BLAISE, Patrick (Framatome, DTIPD, Rue Professeur Jean Bernard 2, Lyon, France); BEN MOSBAH, Mehdi (CEA Cadarache, DES/IRESNE/DTN/LMN, 13108 Saint--Paul les Durance, France); Dr ANTONI, Rodolphe (CEA Cadarache, DES/IRESNE/DTN/LMN, 13108 Saint-Paul les

Durance, France)

Presenter: GRIMALDI, Federico (Belgian Nuclear Research Centre SCK CEN, Université libre de Bruxelles)

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