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The APOLLO3 scientific tool for SFR neutronic characterization: current achievements and perspectives

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ASTRID (Advanced Sodium Technological Reactor for Industrial Demonstration) is a Sodium Fast Reactor design that will be France's Flagship 4th Generation Reactor.
Its innovative core contains many axial and radial heterogeneities (in order to obtain a negative void coefficient) and interfaces that are challenging for current deterministic codes to simulate correctly. Hence there is the need for new improvements in modeling (3D simulations, parallel processing) like those being elaborated within the APOLLO3 platform.
The APOLLO3-SFR package built with APOLLO3 solvers defines reference calculation schemes associated with a nuclear data library to calculate all neutronic parameters (critical masses, sodium void, Doppler coefficient, ⊠eff, etc⋯) together with certified biases and uncertainties derived from the VV&UQ process. This VV&UQ process incorporates numerical validation, a-priori uncertainties based on nuclear data covariances as well as experimental validation mainly from MASURCA, a fast mock-up reactor, located at CEA Cadarache.
A future programme called GENESIS will be performed in support to the prototype ASTRID to validate the CFV core specificities. In addition, a part of the GENESIS experimental program contains integral experiment underway at the BFS facility.
The paper presents the various VV&QU activities which are currently conducted to derive all neutronic characteristics with a certified uncertainty.

Country/Int. Organization

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