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RHF LEU U7Mo Design Risk Mitigation Activities: Looking at Alternate Absorber Configurations

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ABSTRACT

The Institute Laue-Langevin (ILL) *Réacteur à Haut Flux* (RHF) based in Grenoble, France is a research reactor designed primarily for neutron beam experiments for fundamental science. It delivers one of the most intense cold neutron fluxes worldwide. The RHF has a single fuel element made of 280 involute-shaped fuel plates. It currently operates with HEU fuel enriched at 93 wt. %.

Early analyses have shown that RHF would need a LEU fuel having a density of at least 7-9gU/cc to maintain performance at an acceptable level. With the development of the UMo dispersion fuel at 8gU/cc, ILL has thoroughly analyzed the possibility to convert with this fuel system. In 2010, in collaboration with Argonne National Laboratory (ANL), ILL identified a LEU fuel element design that would meet safety and performance criteria.

One of the major risks identified with the LEU design is the methodology used to evaluate thermal-hydraulic safety margins – namely Computational Fluid Dynamics (CFD) – differs from the historical method approved by the French regulatory body. The current work re-explores the LEU design using the more traditional and conservative thermal-hydraulic safety methods which tend to predict far less safety margins than CFD.

New neutronics absorber configurations and materials are studied with the goal to improve safety margins substantially.