Contribution ID: **8** Type: **POSTER**

Detection and analysis of fuel cladding damages using gamma ray spectroscopy

Wednesday, June 28, 2017 5:50 PM (1h 10m)

The cleanliness of the primary circuit is a safety requirement for Generation IV nuclear power plants. During operation, fission product concentration into the sodium coolant has to be monitored by dedicated radiation monitoring systems. These systems are based on neutron counting and gamma spectroscopy. Neutron detection allows detecting clad failure when its opening is large enough to enable sodium/oxide interaction and then to release volatile fission products as Br, I and Cs [1]. Gamma spectroscopy is an earlier detection system which measure gaseous isotopes of Xe and Kr released during the first step of the failure. Moreover, gamma spectroscopy is a useful technique to examine the status and the evolution stage of the failure. Indeed, using the isotopic information provides by the system, a figure of merit named release to born ratio R/B as a function of the radioactive constant provides an estimation of the failure stage [2].
The study deals with an X/ɣ rays spectroscopy system named ADONIS and its associated spectrum analysis software SINBAD [3, 4]. This system has been installed at the ISABELLE-1 test loop of the OSIRIS reactor (CEA) [5]. A complete fuel failure has been monitored by the system. The recorded data have been processed and results concerning the fuel analyses will be presented and discussed.
[1] Rohée, E., et al., "Delayed Neutron Detection with graphite moderator for clad failure detection in Sodium-Cooled Fast Reactors." Annals of Nuclear Energy, 92, 440–446, 2016.
[2] R.D. MacDonald, R.D., et al., "Detecting, locating and identifying failed fuel in Canadian power reactors." Atomic Energy of Canada Limited report AECL-9714, 2016.
[3] Barat, A., et al. "A bimodal Kalman smoother for nuclear spectrometry", Nuclear Inst. and Methods in Physics Research A 567, 350–352, 2006.
[4] Rohée, E., et al., "Benchmark of the non-parametric Bayesian deconvolution method implemented in the SINBAD code for X / ɣ rays spectra processing." Nuclear Inst. and Methods in Physics Research, A. In Press, 2016.
[5] "Research Facilities for the Future of Nuclear Energy", Proc. ENS Class 1 Topical Meeting, 261-270, 1996.

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Session Classification: Poster Session 2

Track Classification: Track 2. Fast Reactor Operation and Decommissioning