Contribution ID: **23** Type: **Poster Presentation**

Detection of Gamma Ray from Sort-Lived Fission Products at KUCA and KURNS-LINAC

Thursday, 26 November 2020 17:15 (1h 35m)

Quantification of radioactivity of fission products (FP) is very important for assessment of decay heat after shutdown of a core, etc. For such assessments, comprehensive data sets of fission yield and decay chain, such as JENDL/FPY&FPD-2011, have been developed. However, validation of each nuclide in such data sets has still been cumbersome. In this work, two detection techniques of FPs are studied to give data for such validation.
In order to characterize reactions occurred in nuclear fuel, gamma ray spectroscopy was conducted at Kyoto university critical facility assembly (KUCA). At KUCA, uranium (U)fuel of 93 wt% 235U enrichment was loaded in C-core. They were moderated and shielded by light water. The core power during the critical operation was 4.6 mW. Outside the tank of the core, a HP-Ge detector of 30 % relative efficiency was set and the gamma ray was measured. As the results, peak spectra of fission products such as 90, 95, 97Y, 90,90m,91Rb, 87,88Br, 136Te, etc. were detected although they were overwrapped by prompt gamma ray components. Due to the prompt components, the relative statistical accuracy was from 2 to 20 %. Thanks to the measurements during the critical operation, gamma rays of half-life shorter than 4 s was achieved.
Contrarily, 238U(n,g) gamma ray spectroscopy was conducted with the same HP-Ge for neutrons of thermal and resonance energy at the KU-LINAC-pulsed neutron source facility. The time of flight (TOF) of neutron was measured associated with beam pulse to identify the incident neutron energy. The repetition rate of the pulse was 50 Hz. In the TOF spectrum after the so called "thermal neutron peak", time-background region was identified. The gamma ray in the region out of phase of the beam pulse was considered emitted by decay of radioactive material of which half-life is longer than 20 ms. The measured peak structure was found fairly resemble to that of measured at KUCA.
The detection efficiency of the gamma rays at KUCA was calculated with MCNP-5. That at LINAC was experimentally determined. With the measured count rate and the efficiency, the gamma ray emission rate was deduced and compared against that calculated based on JENDL/FPY&FPD-2011. The ratio of the measured to the calculated value against each gamma ray by the two experiments show fairly resemble trend. That indicates the both experiments are promising to give reference data for validation of FP yield and decay data sets such as JENDL/FPY&FPD-2011.

Primary author: NAUCHI , yasushi (Central Research Institute of Electric Power Industry)

Co-authors: Prof. HORI , Junichi (Institute for Integrated Radiation and Nuclear Science, Kyoto University); Prof. SANO , Tadafumi (Kindai University); Dr TAKAHASHI , Yoshiyuki (Institute for Integrated Radiation and Nuclear Science, Kyoto University); Dr KUSUMI , Koji (Central Research Institute of Electric Power Industry); Prof. UNESAKI , Hironobu (Institute for Integrated Radiation and Nuclear Science, Kyoto University)

Presenter: NAUCHI , yasushi (Central Research Institute of Electric Power Industry)

Session Classification: Poster