

Symposium on Nuclear Data 2020

Ag102 12.9 m	Ag103 65.7 m	Ag104 69.2m	Ag105 41.29 d	S ymposium on	Ag107 51.839 %	Ag108 2.37 m	Ag109 48.161 %	Ag110 24.6 s	Ag111 7.45 d	Ag112 2.120 s
Pd101 8.47 h	Pd102 1.02 %	Pd103 16.991 d	Pd104 11.14 %	Pd105 22.33 %	N uclear	Pd107 4.36 s	Pd108 26.46 %	Pd109 11.700 s	Pd110 11.72 %	Pd111 20.1 m
Rh100 20.8 h	Rh101 3.3 y	Rh102 1.27 s	Rh103 100 %	Rh104 42.3 s	Rh105 35.98 s	D ata	2020 Nov.	Rh108 5.1 m	Rh109 89 s	Rh110 3.3 s

Contribution ID: 23

Type: **Poster Presentation**

Detection of Gamma Ray from Short-Lived Fission Products at KUCA and KURNS-LINAC / 京都大学臨界集合体実験装置と KURNS-LINAC 施設での短寿命 $FP\gamma$ 線の検出

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% ^{235}U 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}Y , ^{95}Y , ^{97}Y , $^{90}\text{m}\text{Zr}$, ^{91}Zr , ^{87}Br , ^{88}Br , ^{136}Te , 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, $^{238}\text{U}(n,\gamma)$ gamma ray spectroscopy was conducted with the same HP-Ge for neutrons of thermal and resonance energy at the KURNS-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 / 名内, yasushi / 泰志 (Central Research Institute of Electric Power Industry / 電力中央研究所)

Co-authors: Prof. HORI / 堀, Junichi / 順一 (Institute for Integrated Radiation and Nuclear Science, Kyoto University / 京都大学複合原子力科学研究所); Prof. SANO / 佐野, Tadafumi / 忠史 (Kindai University / 近畿大学); Dr TAKAHASHI / 高橋, Yoshiyuki / 佳之 (Institute for Integrated Radiation and Nuclear Science, Kyoto University / 京都大学複合原子力科学研究所); Dr KUSUMI / 楠見, Koji / 紘司 (Central Research Institute of Electric Power Industry / 電力中央研究所); Prof. UNESAKI / 宇根崎, Hironobu / 博信 (Institute for Integrated Radiation and Nuclear Science, Kyoto University / 京都大学複合原子力科学研究所)

Presenter: NAUCHI / 名内, yasushi / 泰志 (Central Research Institute of Electric Power Industry / 電力中央研究所)

Session Classification: Poster