



Contribution ID: 30

Type: **Poster**

## Evaluation on the beam dump activation in the linear IFMIF prototype accelerator (LIPAc)

*Tuesday, 7 November 2023 17:47 (1 minute)*

Radiation measurements have been prepared for investigating activation of the 1.1 MW high-power beam dump in the linear IFMIF prototype accelerator (LIPAc). Deuteron beams accelerated up to 5 MeV with a nominal beam current of 125 mA in the current operation phase are stopped in the copper cone in the beam dump located at the end of the LIPAc beam line. In addition to the activation of the copper cone by impinging deuterons, neutrons produced by Cu(d,x) nuclear reactions could activate the other beam dump constituent materials such as the stainless-steel cylinder. It is required to clarify radionuclides mainly contributing to the shutdown dose rate, such as Cu-64 for copper cone and Mn-56 for stainless-steel cylinder, for radiation exposure control during maintenance of the beam dump. A series of beam experiments are planned targeting to increase the beam current from low value (~20 mA) to the nominal, and to achieve continuous wave operations by increasing the duty cycle. By increasing the beam current and the duty cycle, activation of the beam dump could be significant. A NaI (Tl) scintillation survey meter and a CeBr3 detector are used to measure the shutdown dose rate and energy spectrum, respectively, for decay  $\gamma$  rays streamed out from gaps of the radiation shields in the lower part of the beam dump. In addition, a portable high-purity Ge detector is used to measure energy spectrum for back streaming  $\gamma$  rays at the location of around 10 m from the beam dump in the axial direction. The shutdown dose rate calculated with Monte Carlo method was approximately 1  $\mu$ Sv/h right after the beam operation under the beam dump around the gaps of the radiation shields and the location of the Ge detector in a typical condition of the early-stage beam operations, which is 0.1% duty cycle, 8 hours operation for 5 days at the beam current of 125 mA. The present study will report measurement results on radionuclides mainly contributed to the shutdown dose rate and if the calculation results are consistent with the measurement ones.

### Themes for the contribution

7 Operation of targets and beam dumps:

**Primary authors:** Dr KUMAGAI, Kohki (National Institutes for Quantum Science and Technology); Mr CARIN, Yann (IFMIF/EVEDA Project Team); Mr JIMENEZ, David (CIEMAT); Dr KONDO, Keitaro (National Institute for Quantum Science and Technology); Dr KWON, Saerom (National Institute for Quantum Science and Technology); Dr MASUDA, Kai (National Institute for Quantum Science and Technology); Dr OCHIAI, Kentaro (National Institute for Quantum Science and Technology)

**Presenter:** Dr KUMAGAI, Kohki (National Institutes for Quantum Science and Technology)

**Session Classification:** Poster session