Investigation on radionuclides released in the accident at J-PARC hadron experimental facility

M. Hagiwara[1,2#], K. Saito[1,2], M. Numajiri[1,2], K. Takahashi [1], J. Kitagawa [1],H. Matsumura[2], T. Miura [1,2], K. Masumoto [2], H. Hideo [2], M. Ieiri[1,3], Y. Sato[1,3], A. Toyoda[1,3] and Y. Uwamino[4]

[1]J-PARC Center, Tokai, Ibaraki 319-1195, Japan
[2]Radiation Science Center, KEK, Tsukuba, Ibaraki 305-0801, Japan
[3] Institute of Particle and Nuclear Studies, KEK, Tsukuba, Ibaraki 305-0801, Japan
[4] RIKEN, Hirosawa 2-1, Wako, Saitama 351-0198, Japan
 # a corresponding author: E-mail hagi@post.kek.jp

The accident at J-PARC hadron experimental facility (HD facility) was triggered by a malfunction of the beam extraction system of the 50-GeV synchrotron (MR). A high intensity pulsed beam was accidentally extracted in an anomalously short period of time and hit the gold target in the HD facility. The heat load by the accidental beam instantaneously exceeded the capability of the target cooling system and a part of the target including radionuclides accumulated during the past beam operations evaporated along the beam axis. Due to the insufficient hermetic sealing between the primary beamline room and the hadron experimental hall (HD hall), the radionuclides diffused in the primary beamline room are partially leaked into the HD hall which was not equipped with an adequate venting system and contaminated the air and floor in the HD hall. Moreover, workers engaged in HD hall inhaled the contaminated air and consequently received internal radiation doses [1].

We have been conducting investigations of the causes of the accident and development of preventive measures against its recurrence. In this study, we summarized investigations conducted regarding radionuclides discharged from the gold targets, which are based on the measurements of airborne samples that had been collected at the HD hall and a lot of smear samples obtained at the HD hall and primary beamline room, and the trend data of radiation monitors equipped in the HD facility and simulations by the PHITS code. The typical nuclides observed in smear samples of the HD hall are similar with those observed in airborne sample, but not with those observed in smear samples of the primary beamline room. The simulation by the PHITS code predict all detected nuclide. The comprehensive analysis provide important information for the complete understanding of the accident and the effectual measures.

References

[1] High Energy Accelerator Research Organization (KEK), Accident at J-PARC Hadron Experimental Facility, 2013., http://legacy.kek.jp/intra-e/info/2013/052714/.