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KOMAC Project and Relevant Nuclear Data

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KAERI (Korea Atomic Energy Research Institute) has been performing the project KOMAC (Korea Multi-purpose Accelerator Complex) since 1997. The final objective of the project is to build a 20 MW (1 GeV, 20 mA, cw) proton linear accelerator to undertake basic research, industrial applications, and nuclear transmutation. The initial part of the project has been approved under the 21C Frontier R&D Program of the Korean Government (Ministry of Science and Technology), and bean in July 2002 to be build up to 100 MeV 20 mA during the next 10 years (till July 2012). The beam will be extracted at 20 MeV using RFQ and DTL from around July 2005. The 100MeV beam will be supplied from around 2010.

In order to satisfy various user requirements, energy degraders, beam spreaders, and beam stoppers must be deployed in combination with each other. Candidate materials for the devices are graphite, aluminum, gold foil, and copper.

Shielding and activation can be major concerns of the high power facility. They may be classified into two types. One is caused by beam dump in and around the target or structural materials during normal operation or by accidents. The other is caused by loss of beam during acceleration or bending. The former is rather simple if we know the material composition of the target or dump. However, it is rather difficult to estimate the latter type since it is largely dependent on the design and manufacturing of the acceleration cavities and beam transfer components. The accumulated activation effect may be estimated only after a few years of operation.

For the design of proper radiation shielding, nuclear data and calculating tools are required to prove that the radiation hazard of the facility is below the limit specified in ICRP-60. The neutron production reaction data for the component materials is one of the key data. There are some libraries of proton incident nuclear data such as Russian MENDL, IAEA Charged Particle Data

Library for Medical application, as well as the KAERI Charged Particle Data Library. However, it is hard to find data suitable for license applications. Since most experimental data is focused on residual nuclide yields for medical isotope production.

One of the challenges in the nuclear data community is to predict and measure, with high accuracy, the accumulated radioactivity in such a high current device. The long half-life nuclides such as zinc-65 formed by beam loss might be accumulated for many years to come and can cause difficulty in maintenance. And the high energy neutrons generated through interactions between the proton beams and component materials can cause the accumulation of long lived radioactive elements in the concrete shields and structures. This effect might be one of the key factors in determining the limit of impurities in the materials for future ADS design, and also, in determining its plant lifetime.