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Radiation Protection Studies of CiADS Linac

The China initiative Accelerator Driven System (CiADS) is currently under construction at Huizhou, China, which represents a key capability in Accelerator-Driven System (ADS) R&D. The CiADS is composed of a high energy superconducting proton accelerator (Linac), a Lead-Bismuth target and a subcritical reactor. The driven Linac is the central component of the CiADS. It will accelerate protons up to the energy of 500 MeV with a maximum average current of 5 mA in CW operation mode. Operation of a proton accelerator at this high energy and high intensity produces strong secondary radiation caused by beam loss protons interacting with beamline components. In such case, the Linac can be a strong radiation source and poses a great risk to research workers and the public during the period of the accelerator commissioning. This paper will present radiation protection studies for the Linac by using the Monte Carlo Code, FLUKA. First, we built a complex geometry model with cryomodules, quadrupoles, mazes and ducts base on the final engineering design of the Linac. Second, we adopted a normal beam-loss conditions of 1 W/m to calculate the secondary flux in main accelerator components and prompt radiation field in the Linac tunnel. The simulation results indicated that high energy neutron is the priority in shielding design. Third, we made multiple deep penetration calculations to obtain the thickness of bulk shielding and local shielding based on the CiADS design criteria. Finally, we assessed the environment impact of the Linac. These simulation data is currently used to support CiADS construction and radiation protection system design.

Scientific Topic 1

Source terms, new accelerator facilities and related topics

Scientific Topic 2

Scientific Topic 3

Scientific Topic 4

Shielding and dosimetry

Scientific Topic 5

Scientific Topic 6

Scientific Topic 7

Scientific Topic 8

Primary authors: Ms HUANG, Yuxuan (Institute of Modern Physics, Chinese Academy of Sciences); Prof. LUO, Peng (Institute of Modern Physics, Chinese Academy of Sciences); Dr XU, Junkui (Institute of Modern Physics, Chinese Academy of Sciences); Mr SONG, Shiyu (Institute of Modern Physics, Chinese Academy of Sciences); Ms RAN, Jianling (Institute of Modern Physics, Chinese Academy of Sciences); Dr WEN, Zhiwen (Institute of Modern Physics, Chinese Academy of Sciences)

Presenter: Ms HUANG, Yuxuan (Institute of Modern Physics, Chinese Academy of Sciences)

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