DESIGN OF THE SWEEPER MAGNETS FOR THE HIGH-POWER BOMBARDMENT STATION FOR RADIOISOTOPE PRODUCTION AT iTHEMBA LABS

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iThemba LABS is in the process of expanding its existing facility in the Western Cape in order to increase the production of medical radioisotopes. The basis for this expansion is the acquisition of a new 70 MeV cyclotron, which is phase one of the South African Isotopes Facility (SAIF). The cyclotron will be installed in the existing concrete vaults and will be connected to the newly upgraded radioisotope production infrastructure.

Four high-power bombardment target stations will be installed in two opposite vaults for the production of radioisotopes, with each vault hosting two target stations. Due to power dissipation in the vacuum windows and the target, heat spots can form during irradiation, which might cause the window or the target to break. In order to reduce the heat spots, two H-type dipole magnets are designed and will be installed on each of the four beamlines. The magnets will each be powered by a 2.4 kHz AC power sources with a 90° phase difference between the vertical and horizontal magnets. These magnets will sweep the beam in a circular pattern with a radius of 20 mm on the target surface. In order to prevent eddy currents flowing in the yoke, high magnetic permeability and low loss Manganese-Zinc (MnZn) soft ferrite material will be used to build the magnet yoke. The presentation will discuss the design of magnet yoke, coils, electronic setup and magnetic field simulations of the sweeper magnets.