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Accelerator Production of Isotopes for Medical Use[1]

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The increase in use of radioisotopes for medical imaging and therapy has led to the development of novel routes of isotope production. For example, the production and purification of longer-lived position emitting radiometals has been explored to allow for nuclear imaging agents based on peptides, antibodies and nanoparticles. These isotopes (^{64}Cu, ^{89}Zr, ^{86}Y) are typically produced via irradiation of solid targets on smaller medical cyclotrons at dedicated facilities. Recently, isotope harvesting from heavy ion accelerator facilities has also been suggested. The Facility for Rare Isotope Beams (FRIB) will be a new national user facility for nuclear science to be completed in 2020. Radioisotopes could be produced by dedicated runs by primary users or may be collected synergistically from the water in cooling-loops for the primary beam dump that cycle the water at flow rates in excess of hundreds of gallons per minute. A liquid water target system for harvesting radioisotopes at the National Superconducting Cyclotron Laboratory (NSCL) was designed and constructed as the initial step in proof-of-principle experiments to harvest useful radioisotopes in this manner. This talk will provide an overview of isotope production using both dedicated machines and harvesting from larger accelerators typically used for nuclear physics.

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