ISOTOPE HARVESTING PROJECT: FROM WHITE PAPER TO IMPLEMENTATION

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The Facility for Rare Isotope Beams (FRIB), at Michigan State University, is a premier nuclear science facility with the capability to accelerate beams of stable heavy ions up to hundreds of MeV/u. These primary heavy ion beams will be used to produce exotic secondary beams through a process that leaves 85-90% of the primary beam unreacted. The unreacted beam ultimately is delivered to a water-filled beam dump where a large number by-product radionuclides are formed. The Isotope Harvesting Project (IHP) is an upgrade for FRIB that will enable these otherwise-unused by-product radionuclides to be collected, or "harvested", for additional research in medicine, biochemistry, stewardship science, materials science, horticulture, and astrophysics. The scientific basis and justification for the IHP were captured in a whitepaper with inputs from researchers at multiple universities and U.S. national labs from diverse fields of study [1].

Specific infrastructure is required to realize the promise of radionuclide harvesting, and the U.S. Department of Energy's Isotope Program (DOE-IP) has agreed to support the IHP with an infrastructure grant of $13.2 M over a four-year period which started in September 2020. The proposed IHP infrastructure integrates state-of-the-art radiochemistry equipment and engineering upgrades into FRIB and provides a contiguous laboratory via which these radionuclides will be collected and purified for off-site use.

The major functions of the IHP's radiochemistry laboratory, called the "Isotope Harvesting Vault" (IHV), are summarized as five processes:

— Capturing radionuclides embedded in solid materials, or as ions or gases in FRIB's primary beam-dump cooling water and off- gas circuit via a direct connection to the IHV.
— Chemically processing the radionuclides to remove the majority of impurities.
— Purifying radionuclides to meet user specifications.
— Quantitatively assessing the quality of the produced radionuclides.
— Distributing the radionuclides to off-site laboratories.

This talk will cover the IHP's mission objectives, technical designs, plans for transitioning to operations, and proposed research and training opportunities for early career scientists.

REFERENCES

[1] ABEL, E. P., AVILOV, M., AYRES, V., et al., Isotope Harvesting at FRIB: Additional Opportunities for Scientific Discovery, J. Phys. G: Nucl. Part. Phys. **46** 100501 (2019) 1 – 33.