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Project Title: Isotope Production R&D at LERF, Jefferson Lab’s High Power Electron Linear Accelerator

Applicant/Institution: Dr. Andrew Hutton / Thomas Jefferson National Accelerator Facility

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DOE Office/Office of Science Program: Office of Nuclear Physics

DOE Office/Office of Science Program Office Technical Contact: Dr. Dennis R. Philips

COVER PAGE: SUPPLEMENT FOR COLLABORATIONS

The collaborating institutions are:

Thomas Jefferson National Accelerator Laboratory (Jefferson Lab, Jlab) PI: Dr. Andrew Hutton;

Virginia Commonwealth University (VCU). PI: Dr. Jamal Zweit; and

South Dakota School of Mines and Technology (SDSMT) PI: Dr. Douglas Wells

The three institutions bring together in-depth expertise to this research activity. Relevant to this R&D program are Jefferson Lab’s expertise in SRF electron accelerators, radiation physics and controls and mechanical engineering; VCU’s expertise in radio-chemistry, isotope separation and medical isotope research for therapy; and SDSMT’s expertise in photo-nuclear reactions. Both VCU and SDSMT have extensive knowledge of medical isotope research and market needs.

Dr. Andrew Hutton of Jefferson Lab is the lead PI coordinating the overall research activity. The overall planning of each major aspect of this R&D, namely, the high power target system, irradiation of targets, measurement of yields at different energies, optimization of beam parameters, separation of the desired isotope, and delivery of the isotope to targeted area will be discussed and reviewed by all PIs and investigators. Once all PIs agree on a path for an activity, carrying out that activity is the responsibility of the PI of the expert institution. Each PI will communicate the progress and results to the collaborators at agreed upon intervals. Jefferson Lab will be responsible for providing the electron beam, designing the target system to handle 50kW of beam power, testing the target system and irradiating the targets at different energies. VCU will be responsible for quantitative gamma spectrometry, yield measurements, radio-chemical separation and analysis, conjugation chemistry and image-guided tumor targeting approaches. SDSMT will be responsible for guiding the target irradiations. SDSMT, Jefferson Lab and VCU share the responsibility for measuring the yields and training a graduate student. Graduate student training will include simulations, participating in production runs and subsequent application experiments, including data analysis. All institutions will participate in establishing optimal beam parameters for 67Cu production.

Jefferson Lab’s facilities include LERF and CEBAF, both of which are SRF continuous wave electron accelerators. Jefferson Lab has a well equipped machine shop and radiological instrumentation. VCU’s facilities include state-of-the art radio-chemistry lab, hot cells, and a radioisotope imaging facility for both SPECT/CT and PET/CT. SDSMT brings considerable experience with this type of target irradiation.

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|  | **Names** | **Institution** | **Year1 Budget** | **Year2 Budget** | **TOTAL Budget** |
| **Lead PI** | Dr. Andrew Hutton | Jefferson Lab |  |  |  |
| **Co-PI** | Dr. Jamal Zweit | VCU |  |  |  |
| **Co-PI** | Dr. Douglas Wells | SDSMT |  |  |  |
| **TOTAL** | | |  |  |  |