

Production of High Specific Activity ^{72}As , ^{77}As and ^{67}Cu for Research and Clinical Applications:
Effective design and recycling of targets and radioisotope separation.

Principle Investigators

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≈\$1.2 million over 2 years

Project 1: Production of high specific activity ^{67}Cu moderate energy protons (≈ 43 MeV):

Reduce - 3 column to ≤ 2 columns and simultaneously recycle enriched ^{68}Zn .

Project 2: Accelerator production of ^{72}As using protons of moderate energy (~ 50 MeV):

(a) To design $^{\text{nat}}\text{As}$ target - robust at high proton currents for ^{72}As (p, 4n) ^{72}Se reaction; and

(b) Assess radiation stability of $^{72}\text{Se}/^{72}\text{As}$ generator system for up to 50 mCi of ^{72}Se .

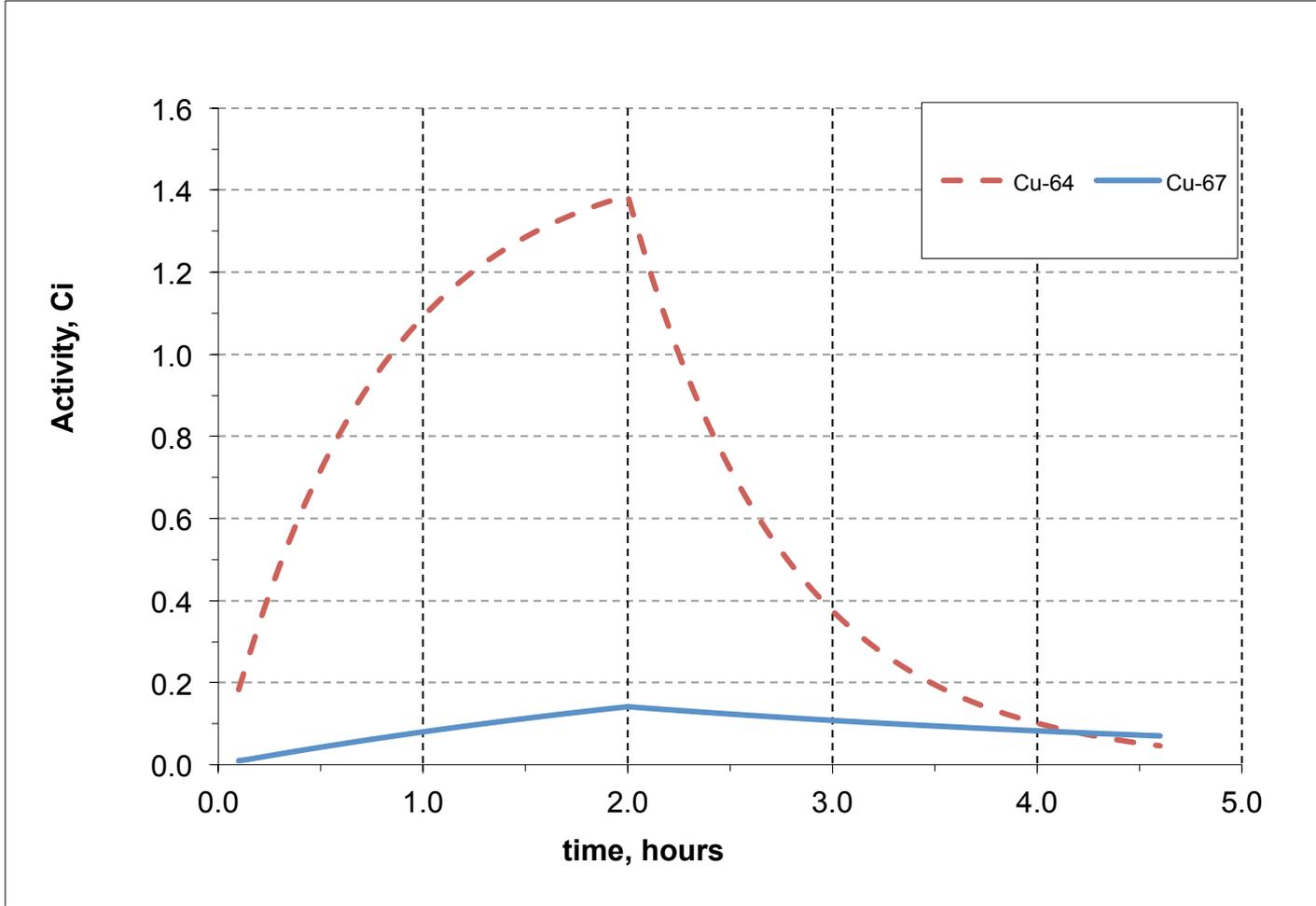
Project 3: Reactor production of high specific activity ^{77}As :

Produce therapeutic matched pair for the diagnostic ^{72}As .

Project 4: Development of no carrier added radioarsenic ($^{72/77}\text{As}$) precursor:

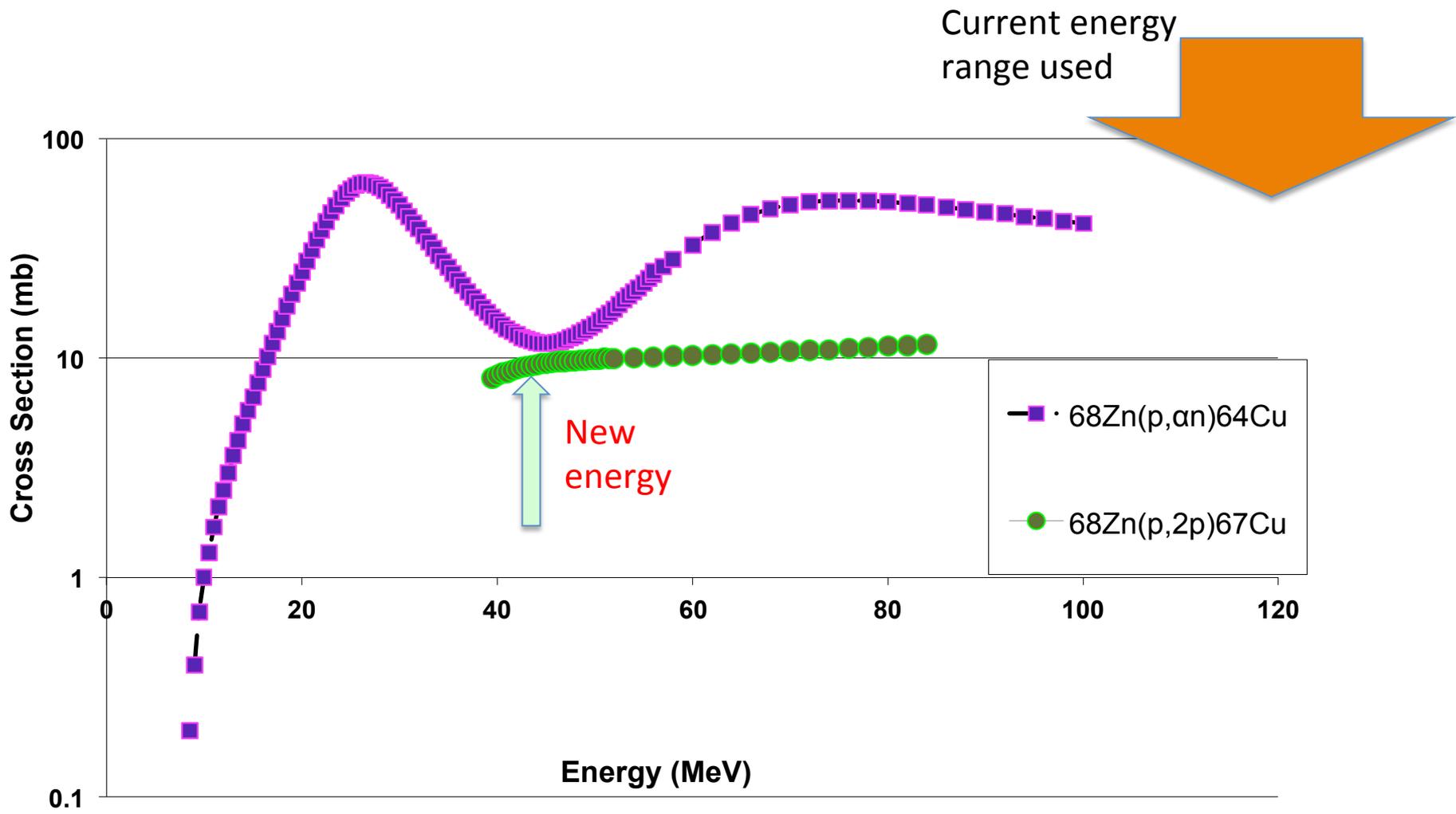
Project No. 1 Current Process – Challenge for ^{67}Cu

Production rate of ^{64}Cu is \gg ^{67}Cu at 100 – 118 MeV



Project No. 1

Excitation Function for Production of ^{67}Cu using protons



Project 2:

High Specific Activity ^{72}As (BNL and MU)

Arsenic-72 (half-life 26 h) - positron emitting daughter of ^{72}Se (8.5 d)

Generator style production of ^{72}As .

Proton irradiation of natural As is preferred for production of ^{72}Se .

Project 2:

Challenge - Design of Target Material for BLIP ??

Table 2. Compounds of As considered for the target material.

Material	Melting point	Comments
As metal	817 ⁰ C at 28 atm	613 ⁰ C subl, soluble HNO ₃
As ₂ O ₃	Decomposes at 312.3 ⁰ C	water soluble
As ₂ O ₅	315 ⁰ C	water soluble
As ₂ S ₂	307 ⁰ C	water insoluble

Alloys of As and Copper (i.e. Cu₃As) have been produced in an effort to stabilize arsenic from volatilization during irradiation.

*The final choice will depend on
the heat load calculations and
ease of chemical conversion to desired ⁷²Se form*

Collaboration Opportunities

Funding independent of normal BLIP/RHIC funds.

Dedicated Beam Time

Targetry Design - canning; machining; loading; target arrays

Modelling - heat calculations

- MCNPX calculations for comparison with Empire

Materials – target cans

Automating processes.

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