Contribution ID: **1995** Contribution code: **TUPB052** Type: **Poster Presentation**

LWFA-driven photonuclear and photo-spallation reactions for the production of medical radionuclides 67Cu and 225Ac

Tuesday 3 June 2025 16:00 (2 hours)

Recent results of production of the medical radionuclides 67Cu, 225Ac using a laser wakefield accelerator (LWFA) are presented. This emerging technique utilises powerful, ultrashort laser pulses that are focussed into a gas jet to create a plasma wake that traps and accelerates electrons to very high energies with large accelerating gradients. Accelerated electrons interact with high-Z material to produce high-energy photons by bremsstrahlung, which then produce 67Cu via the 68Zn(γ, p)67Cu photonuclear reaction and 225Ac via photo-spallation of 232Th.
67Cu, with 62 h half-life, is considered ideal radioisotope for treatment of lymphoma and colon cancer.*225Ac, with 9.92-day half life and four alpha emissions per decay, is ideal for targeted alpha therapy, especially localized prostate cancer.**
We present the experimental setup, maximising electron pulse intensity by optimising laser beam properties and target composition of gas jet. The gamma beam and the design of 68Zn and 232Th target are optimised using FLUKA simulations. We will also report on the development of detectors for online monitoring of the electron and gamma beams, and produced activities of the radionuclides.

Footnotes

- G. Hao et al., Scientific Reports. 11, 3622 (2021), doi: /10.1038/s41598-021-82812-1 ** Bidkar AP et al., Theranostics. 11;14(7) :2969-2992 (2024), doi: 10.7150/thno.96403.

Paper preparation format

Word

Region represented

Europe

Funding Agency

This project is funded by the Department of Energy Security and Net Zero in the UK as a part of Medical Radionuclide Innovation Program.

Author: BINGOL, Baris (University of Strathclyde)

Co-authors: JAROSZYNSKI, Dino (University of Strathclyde); BRUNETTI, Enrico (University of Strathclyde); LORUSSO, Giuseppe (National Physical Laboratory); MANAHAN, Grace (University of Strathclyde); PEREZ-HERNANDEZ,

Jose A (Centro de Láseres Pulsados); IVANOV, Peter (National Physics Laboratory); WIGGINS, Samuel (University of Strathclyde); CIPICCIA, Silvia (University of Strathclyde)

Presenter: BINGOL, Baris (University of Strathclyde)

Session Classification: Tuesday Poster Session

Track Classification: MC8: Applications of Accelerators, and Engagement for Industry and Society: MC8.U04 Isotope Production