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Dense Plasma Focus for Short-Lived Isotope Activation

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Short-lived radioisotopes (SLRs) are used for medical applications including positron emission tomography (PET). The required activity for N-13for PET is about 4 GBq for a myocardial blood perfusion assessment. Dense plasma focus (DPF) has been considered as a low cost methods for producing SLRs as an alternative to conventional cyclotron facilities. A low energy dense plasma focus has been built and optimized at the University of Saskatchewan to study the feasibility of SLRs production, in particular N-13 using energetic deuteron ion beams produced in a dense plasma focus. X-ray detectors and a Faraday cup have been used to characterize the DPF properties, particularly the ion beam energy based on time-of-flight measurements. The preliminary results have shown generation of ions with energies up to 2 MeV, well exceeding the threshold energy for N-13 production (328 keV). Electrical signals have been used for circuit analyses in order to interpret the anomalous plasma resistance and plasma inductance during the pinch phase. Simulation of N-13 activation using deuteron beam has been carried out.

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