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Proton-induced population of the isomeric state in Zr-89 using short-pulse, high-energy laser systems MATTHEW GARDNER, ANDREW SIMONS, PETER THOMPSON, AWE, CHRISTOPHER ALLWORK, MICHAEL RUBERY, AWE/University of Surrey, ROBERT CLARKE, Rutherford Appleton Laboratory — Short-pulse (ps), high-energy laser systems can be used to accelerate electrons, protons and ions to high energies via laser-plasma interactions. Such protons are then capable of causing nuclear reactions within target materials, the subsequent decay of which may be measured using scintillation detectors. During one such experimental campaign, AWE's HELEN laser system was used in chirped-pulse amplification (CPA) mode to produce individual laser pulses of ∼50 J energy at an irradiance of 1E19 W/cm^2. Protons were accelerated by these pulses from a thin aluminium foil target via the target-normal sheath acceleration (TNSA) mechanism, and were incident upon a target of Y-89. The Y-89(p,n)Zr-89* reaction was observed via the direct measurement of decay gammas emitted at 587 keV during the isomeric transition between the excited and ground states of Zr-89. Half- life measurements add further confirmation of the source of these gamma rays against the background of gamma- and X-rays emitted during the laser-plasma interaction.

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