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Kr83 Isomers Induced by High Intensity femtosecond Lasers

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A high rate of producing nuclear isomers is critical for many applications, like nuclear clocks and nuclear γ -ray lasers etc. However, due to small production cross sections and quick decays, as well as limited intensities of driving beams, it is extremely difficult to achieve a high producing rate via traditional accelerators or reactors. Here, we present a pumping of nuclear isomeric states by a femtosecond hundred-TW tabletop laser. Nuclei populated on the isomer state of ^{83}Kr are observed with a peak efficiency of $2.34\text{E}15$ particles/s for the first time. This high efficient and universal production method can be widely used for pumping isotopes with excited-state lifetimes down to picoseconds, and could be a benefit for fields like nuclear transition mechanisms and nuclear γ -ray lasers.

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