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Positron and photo-neutron creation using a petawatt laser to irradiate high-Z solid targets

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Over the past decade, using the Texas Petawatt Laser (TPW, 130 J, 130 fs) at Austin, Texas to irradiate high-Z thick targets(Au, Pt, Re…) at intensities up to 5x10^21 W/cm^2, we have created copious amounts of positrons and photo-neutrons, resulting in super-high densities of emergent positrons and neutrons. We are still in the early stages of exploring potential applications of such high-density positrons and neutrons. A unique feature of TPW-irradiated high-Z dense metal targets is the production of excess high-energy gamma-rays > 8 MeV with a yield many times that expected from hot electron bremsstrahlung. These high energy gamma-rays appear to be concentrated near the giant-dipole resonance (GDR) of high-Z elements (8-20 MeV). They are ideal for photo-neutron and photo-fission reactions. This talk will summarize the large volume of data we have obtained and discuss plans for future research.
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Presenter: Prof. LIANG, Edison