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Ultra-high energy density physics in aligned nanowire arrays

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The creation of ultra-high energy density (UHED, > $1x10^8 J/cm^3$) plasmas in compact laboratory setups enables studies

of matter under extreme conditions and can be used for the efficient generation of intense x-ray and neutron pulses. An

accessible way to achieve the UHED regime is the irradiation of vertically aligned high-aspect-ratio nanowire arrays

with relativistic femtosecond laser pulses. These targets have shown to facilitate near total absorption of laser light

several micrometers deep into near-solid-density material. We investigate the depth of the volumetric heating and a

mechanism causing the wires to pinch, thereby delaying the hydrodynamic expansion and achieving extremely high

energy and particle densities.

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