# Large-area Suspended Graphene as Target for Laser Ion Acceleration

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## Abstract

Acceleration of energetic ions through laser of high intensity is a thriving research field for laboratory astrophysics, high energy physics, and medical applications. Thin and durable target is needed to generate high energy ions through laser-plasma interactions. We develop a facile method to prepare large-area suspended graphene (LSG) as target for laser ion acceleration. The target fabrication process and the preliminary result of laser ion acceleration is presented. The LSG targets were irradiated using femto-second peta-Watt laser (J-KAREN) and pico-second peta-Watt laser (LFEX), respectively. The results show that multi-layer suspended graphene survives the heating and radiation pressure from laser pre-pulse without plasma mirror, and that carbon atoms and protons can be accelerated to energy up to tens of MeV. Furthermore, the LSG can act as a supporting scaffold for other materials, such as nanometer thick polymer and high Z materials. Preliminary test shots showed generation of more abundant energetic carbon ions for PMMA coated LSG and highly ionized high Z ions.