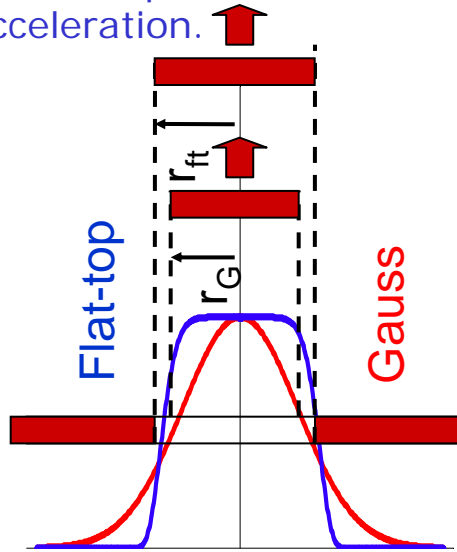
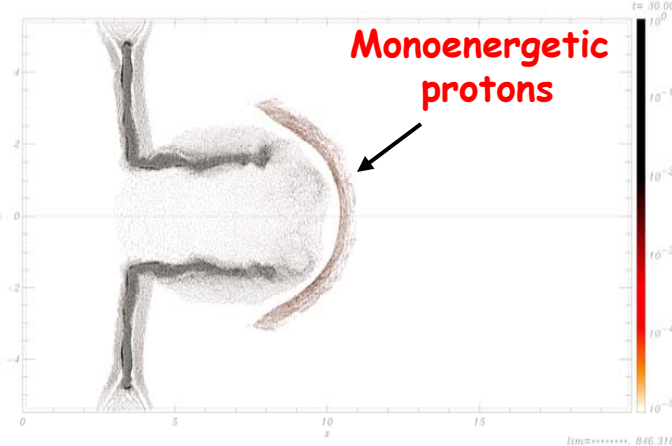


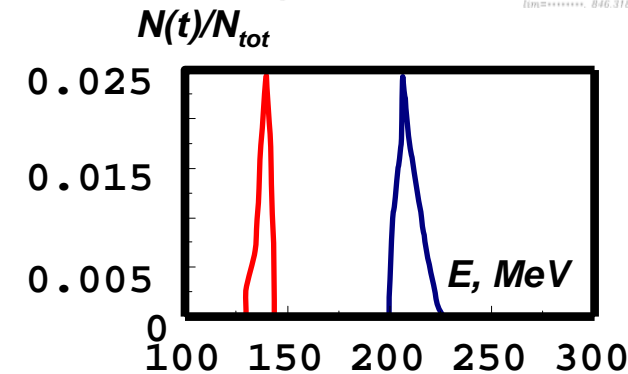
# Generation of Monoenergetic Proton Beams from Double-layer Foils by Flat-top Laser Pulses

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When an ultra-intense laser pulse interacts with an ultra-thin double layer (heavy ions / light ions) it not only expels electrons from the irradiated area but also accelerates the remaining ion core in the direction of pulse propagation. Then this core experiences a Coulomb explosion due to the excess of positive charges, forming a strong longitudinal electric field moving with the aluminum ions. The protons are accelerated in this moving electric field. Thus this regime is an effective combination of the EM wave pressure and Coulomb explosion mechanisms of acceleration.



The use of flat-top beams can lead to a substantial increase in the maximum proton energy and a reduction in energy spread compare to Gaussian beams. The flat-top pulses evacuate electrons from a larger area of the foil, thus generating a stronger longitudinal electric field, as well as providing almost identical initial accelerating conditions for a larger number of protons.



Spectra of protons, accelerated by Gaussian (red) and flat-top (blue) pulses (PIC simulations).

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