ニュークリアフォトニクスグループ

Achieving high-gain nuclear fusion with Extreme Laser Intensities using Relativistic and Curved Plasma Mirrors

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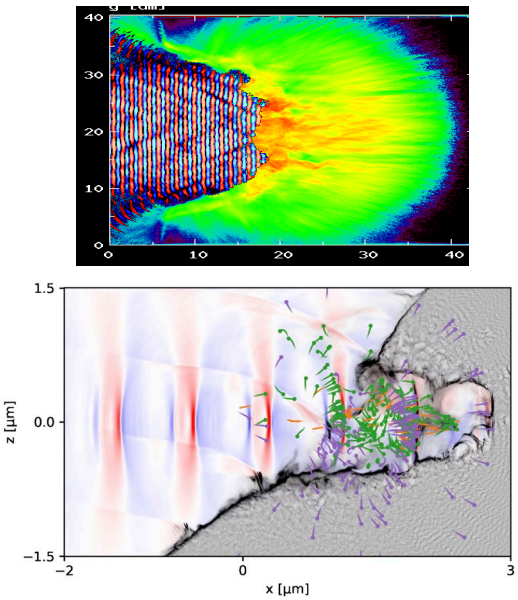
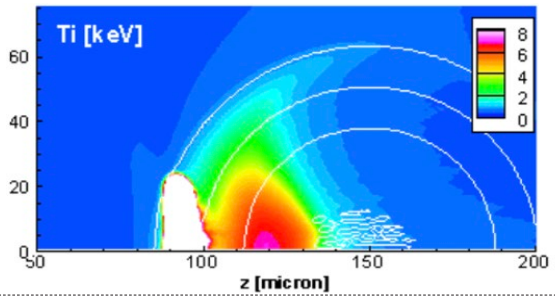
Introduction

Achieving extreme light intensities is not only a great milestone in its own merit, but it is likely the key to approach to achieve high-gain Fusion Energy. By using Relativistic Plasma Mirrors with femtosecond laser pulses and Curved Plasma Mirrors with picosecond laser pulses, we aim at the creation of extreme laser intensities that will directly allow for new methods of depositing energy in the compressed core of imploded DT capsules or spheres. Exploring the Physics of Extreme Light Intensities will also allow to address key issues in fundamental physics, including Astrophysics and Strong Field QED.



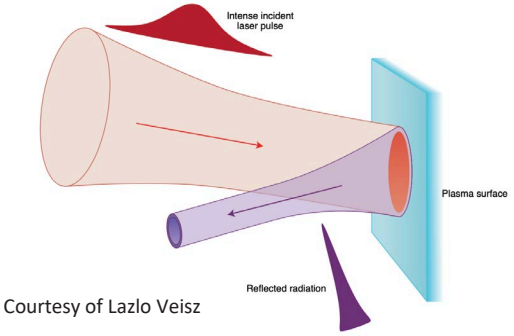
応用1　Hybrid Hole-Boring/RPA and fast electron ignitor beam for fast ignition using Ellipsoidal Plasma Mirrors

Using Ellipsoidal Plasma Mirrors on picosecond, kJ-class PetaWatt lasers is possible to attain intensities exceeding 10^{21}W/cm^2 and establish the conditions for the direct acceleration of Carbon ions as well as ultra-relativistic electrons constituting a hybrid ignitor beam for Fast Ignition. Extreme laser intensities could also be used to achieve near relativistic proton beam acceleration.



応用2　Relativistic plasma mirrors for Doppler-Boosted ignitor beam and SF-QED science

PetaWatt-class femtosecond lasers tightly focused on a Plasma Mirror surface induce instantaneous surface curvature that will focus down Doppler-Boosted harmonic beams to intensities approaching 10^{25} W/cm^2. Focused harmonics can be used to trigger Thermonuclear burst in Inertial Confinement Fusion research, as well as capable of revealing Strong-Field QED phenomena and bring us closer to the Schwinger limit.



Courtesy of Lazlo Veisz

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キーワード　Extreme Intensity , Fusion Energy Research