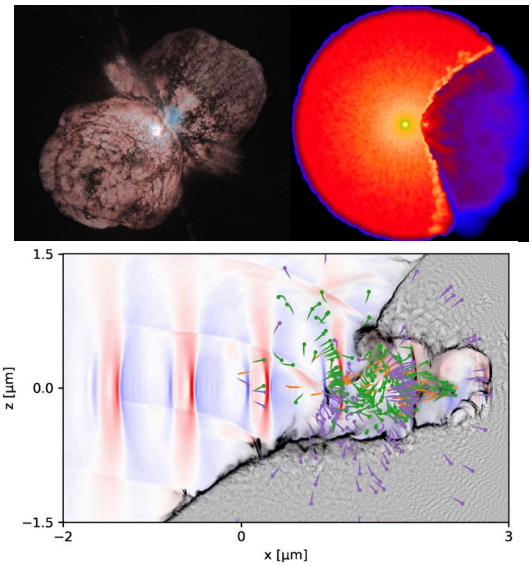
ニュークリアフォトニクスグループ

# Unveiling the Secrets of the Universe with Extreme Laser Intensities using Relativistic and Curved Plasma Mirrors

Alessio Morace　助教

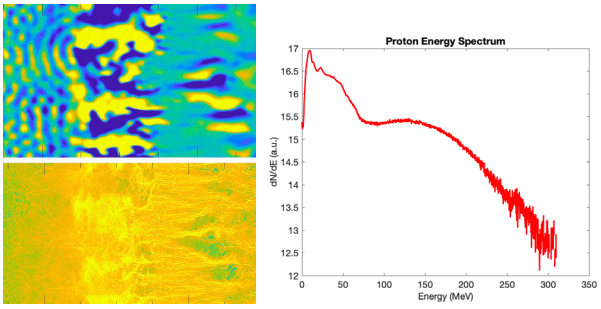
## Introduction

Achieving extreme light intensities is not only a great milestone in its own merit, but it is the key to unveil the secrets of the Universe and a pathway to 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 provide a window into Strong-Field Quantum Electrodynamics, Relativistic Electromagnetic Collisionless Shocks, allow for the generation of relativistic proton sources and provide new approaches to Inertial Fusion Energy.



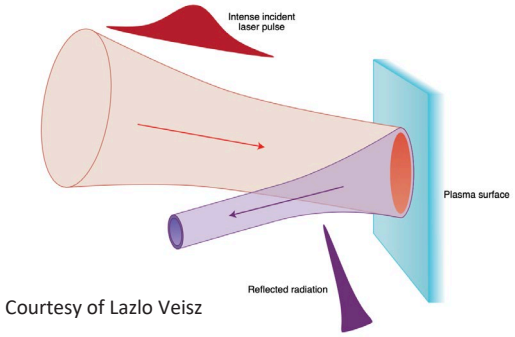

## 応用1 Relativistic electromagnetic collisionless shocks and near relativistic particle beams

Using Hyperbolic/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 creation of Relativistic Electromagnetic Collsionless Shocks, dissipating into near-relativistic proton beams. The high laser intensity could also be used for alternative hybrid ignition schemes for Fast Ignition research.




## 応用2 Relativistic plasma mirrors and the quest for the Schwinger limit

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




**https://www.ile.osaka-u.ac.jp/ja/groups/research01/np/**

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