

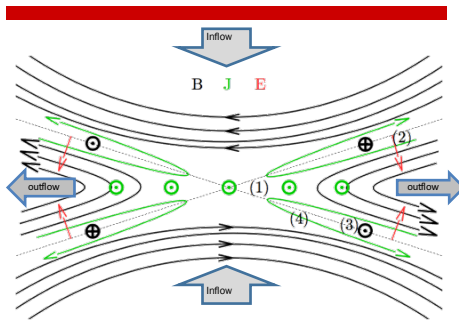
# Investigating magnetic reconnection in ICF conditions



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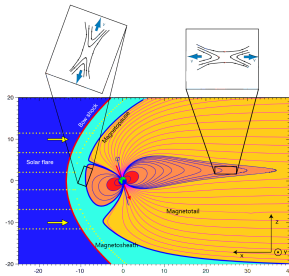
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## Principle of magnetic reconnection

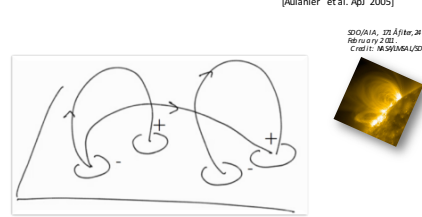


- **Breaking** B-field lines and reconnecting them
- **Ejecting** plasma from the reconnection area

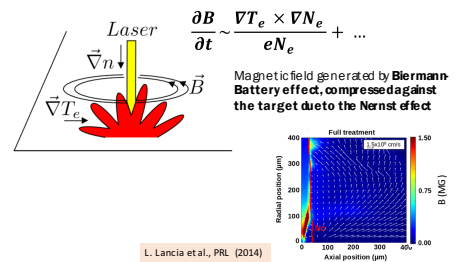
## Magnetic reconnection is everywhere in astrophysics



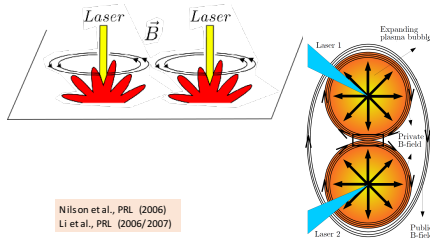
## 3D effects are also there, e.g. solar prominence merging



## How to generate strong B-field loops with high-power lasers

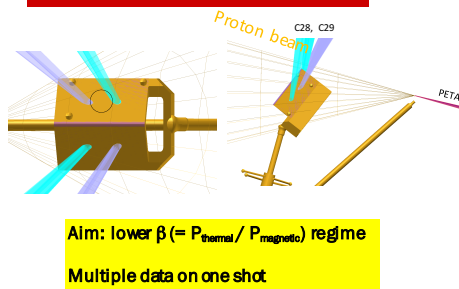


## Close-by lasers allow to investigate reconnection

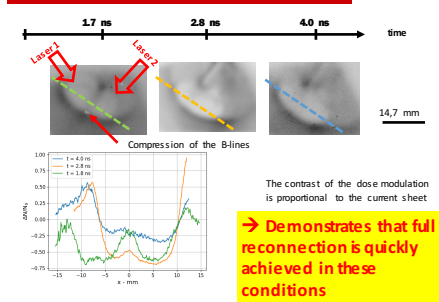


Nilson et al., PRL (2006)  
Li et al., PRL (2006/2007)

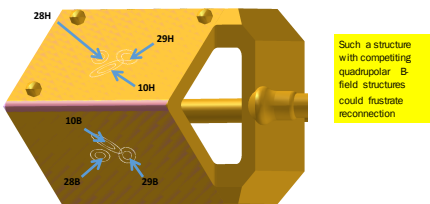
## An experiment on LMJ/PETAL to reach a low-beta regime



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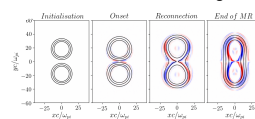


## We also tested a possible collective behaviour inhibiting reconnection



## Why the « shamrock » configuration would inhibit the reconnection?

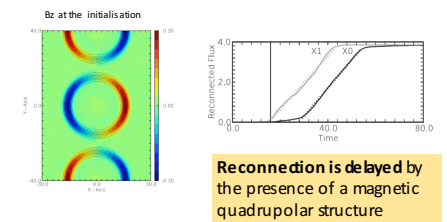
- Simulations show a distortion of the magnetic ribbon:



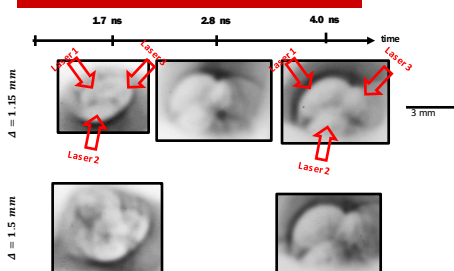
An asymmetric configuration slows down the reconnection:

- We experimentally demonstrated it in the presence of the guide field
- [S. Bolanos et al., <https://arxiv.org/abs/1909.01684>]
- Smets et al. 2014 numerically proved a quadrupolar structure affects the reconnection

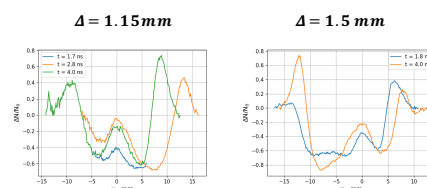
## Magnetic quadrupolar structure affects the reconnection



## « shamrock » reconnection: An inhibited reconnection



## « shamrock » reconnection: An inhibited reconnection



At early time: a pile-up of the magnetic flux at reconnection region. Then [2.7 ns - 4 ns]: The reconnection is in steady state: the current sheet is stable in time

The « shamrock » reconnection is less efficient with respect to the 2 ribbons configuration

## Conclusion



- Previous LULI experiment showed that it takes more time to trigger MR when a guide-field is present

[S. Bolanos et al., <https://arxiv.org/abs/1909.01684>]

- In a lower  $\beta$  regime (LMJ), the strongly-driven reconnection is more efficient



- It can be inhibited/frustrated by a neighbor reconnection site