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Target physics programme for DRIF/CEA laser Megajoule project (LMJ)

The laser megajoule project which will operate by the second decade of 21st century at Bordeaux, France, has several goals :

-ICF for DT fusion gain with indirect drive scheme as nominal. Others schemes such as direct drive and fast ignition are also considered

-High temperature plasmas' topics such as equation of state, spectral opacities, radiative transfer, NLTE atomic physics, hydrodynamics,....

-Other applications such as astrophysics, nuclear properties for fusion reactors,...

To give with more and more precision the baseline specifications of the LMJ, in term of power and energy, arrangement of the 240 beams and their shaping (cones and balance) , the modelings in codes of the key physics occuring in the indirect drive fusion gain targets have to be improved continuously. For this purpose, devoted experiments has been already proposed on present lasers, but also on the next generation to come, around 2002 at LIL at Bordeaux.

Concerning the present lasers, Phebus and P102 at Limeil, Luli at Palaiseau and Nova at Livermore under a CEA/DOE collaborative agreement from 1994 up to now, we have thus tested :

- laser plasma interaction through beam reflectivity and beam steering measurements with or without several types of smoothing.
- spectral X-ray conversion efficiency in open and closed geometry (as for example a function of the electron conductivity)
- capsules' behavior, including symmetry of irradiation, ablator and DT physics (EOS, spectral and mean opacities) and implosion stablity with regard to shells' roughnesses.

Due to some remaining uncertainties in answers, the classical baseline gain target Limeil 1000 whose drive temperature was 350 eV, has thus evolved to gain targets in the range « 300 eV-350 eV » with different types of ablators.

Most of present lasers will be closed by the end of this century. So, a new collaborative agreement is being established for experiments on Omega upgrade (Rochester) as soon as 1999. Owing to a greater number of beams (30 for indirect drive, 60 for direct drive) , more specific applications will be mainly tested such as :

- enhanced symmetry with possibilities of cones and balance as for LMJ.
- instabilities growth rates closer to LMJ's ones in quasi 1D targets
- spectral X-ray conversion efficiency in 1D- situation to allow better comparison with codes.

The aim is to get more accurate definition of fusion gain targets correponding to the possible specifications of the LMJ.

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