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Mesures fondamentales pour la Physique Stellaire

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The description of stars is quickly evolving thanks to the seismic observations of more than thousand stars. The main objective of this new discipline is to introduce as properly as possible the dynamical effects that are up to now yet badly known. This progress will allow a better description of the interaction between stars and planets. It will also contribute to better understand the last stage of evolution and will also put some constrain on fundamental physics: neutrinos and dark matter.

Nevertheless the understanding of the seismic data needs a proper description of the microscopic processes that influence the local sound speed and also the excitation of specific observed modes, and consequently the frequency of the acoustic modes.

Up to recently these microscopic processes were only or mainly estimated theoretically: reaction rates at energy not measurable with low energy accelerators or opacity coefficients that are the result of complex atomic processes. Today stellar plasma or equivalent conditions become to be reproduced in laboratory with laser of high energy. Some measurements have been realized with lasers producing kJ energy like the LULI2000 and a scientific program is under estimation for the LMJ in Bordeaux.

We shall describe this program and the astrophysical questions that it will potentially help to solve. These new investigations will be illustrated by the techniques already used during the last laboratory campaigns and some example of results obtained recently will be quickly shown.