Internship for a Master Student / Stage Master M2 (2024/25)

Topic: Exploring planetary interiors with shock-compression experiments

Thanks to the development of powerful pulsed devices, such as high energy lasers, today it is possible to bring matter to extremely high temperature (~10^4K) and pressure (~10^6 bar) conditions, similar to those found in planets' interiors. Knowing the behavior of matter at these extreme states is of primary importance to unveil the internal structure of planets. This is not only of interest in its own, but it is also critical to understand the solar system history, formation and evolution. At LULI we can use laser-based shock compression techniques to study physical properties of material relevant for planetary science. In particular we are interested equations of state (EOS), chemical and transport properties of iron-bearing silicates and planetary ices (i.e. H2O/CH4/NH3 systems). These data will contribute to improve interior models of terrestrial-like planets, including super-Earths, as well as icy giants, such as Uranus and Neptune and the numerous Neptune-like exoplanets recently discovered.

What will you learn?

The internship offers the possibility to learn the foundations of the experiments on large laser facilities. Upon availability, you will have the possibility to participate to new experiments. At the same time, you will learn and actively participate to the data analysis of recent experiments. You will be in charge of the analysis of the optical data, such as velocity interferometry and self-emission for pressure and temperature estimation. The analysis also includes some auxiliary experiments for the measurement of ancillary quantities, such as the refractive index under pressure. During the internship, you will have the opportunity to discuss the results you will obtain in the context of international collaborations, including experts in planetary modeling and ab initio calculations.

What do you need to know?

1) most importantly you should have enthusiasm for experiments
2) fundamentals of plasma physics
3) experience with coding (e.g. python), & data handling would be highly appreciated

The project can be adapted to the candidate's knowledge and interests and has a time frame of 2-6 months. Please don't hesitate to reach out

Contact

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