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Generating Planetary Interiors in the Laboratory Using Intense Ion Beams in the Proposed LAPLAS Experiments at FAIR at Darmstadt NAEEM AHMAD TAHIR, GSI Darmstadt, ANTONIO ROBERTO PIRIZ, University of Castilla-La Mancha, ALAXANDAR SHUTOV, IPCP Chernogolovka — Importance of planetary physics has increased manifold due to the discovery of over two thousand extra-solar planets. These include gas giants like Jupiter and Saturn, water rich objects like Uranus and Neptune as well as huge earth like rocky planets called super-earths. To understand the structure of these newly discovered members of the planetary club, as well as that of the solar planets, it is necessary to create the very extreme physical conditions that exist in the interiors of these objects. We have proposed a novel technique of imploding samples like hydrogen, water and iron in multi-layered cylindrical targets using intense heavy ion beams that will be generated at the Facility for Antiprotons and Ion Research (FAIR) at Darmstadt. The scheme known as LAPLAS (LAboratory PLAnetary Sciences), employs a multiple shock reflection scheme that leads to a low-entropy compression of the sample material. Simulations have shown that one can generate pressures of the order of 30 Mbar while the temperature remains low (a few kK) in the sample. The LAPLAS experiment is an integral part of the HEDgeHOB scientific proposal for FAIR. Due to the high line density of the target, proton radiography will be used to diagnose the target.

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