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Project on "*Laser Space Propulsion*"

An experimental campaign was performed on the *HiLASE Perla-B thin-disk laser beamline* in the frame of the Open Access call in the period 24 October-7 November, 2019.

Dr. Séverine A.E. BOYER (CNRS, MINES ParisTech PSL – France ; PI of the project), Dr. Gilles TAHAN (CNES, post-doctorat MINES ParisTech PSL - France) with the HILASE team (Dr. Yoann LEVY, Dr. Michal CHYLA, Bc. Martin CIMRMAN, Prof. Alexander BULGAKOV, and Dr. Antonio LUCIANETTI) prepared and performed this experimental campaign with direct implication on "*Space Propulsion and Space Debris Removal*" *. Prof. Michel ARRIGONI (ENSTA Bretagne - France) and Dr. Jiri PACHMAN (Pardubice University - Czech Republic) were also actively involved in the experimental work.

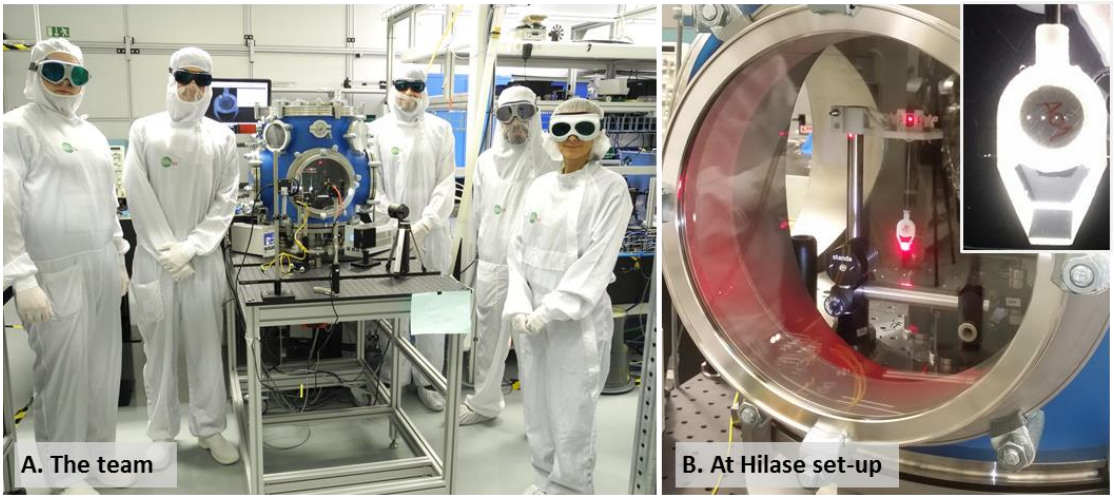
"Space Propulsion and Space Debris Removal" *

Low-earth orbit environment is congested with space debris due to a collisional cascade instability creating more debris than those added by mankind. Irradiation of small (<10 cm) debris by pulsed laser is a good candidate for eliminating them by slowing them down via laser ablation. This would force them to lower their orbit and eventually re-enter atmosphere and disintegrate.

The experiment was aimed at studying the optimization and efficiency of the momentum transfer on different materials under vacuum *upon repetitive-pulsed laser irradiation*.

Such a concept can also be applied directly to exciting new concepts for laser space propulsion for tens-of-kg spacecraft.

The "*Laser Space Propulsion*" project is a collaborative work that involves the CNES-France (Stéphane ORIOL & Christophe BONNAL), the CNRS-France (Michel BOUSTIE & Séverine A.E. BOYER) and PHOTONICS Associates-US (Claude PHIPPS).



On *HiLASE Perla-B thin-disk laser beamline* in November 2019. **A.** The Franco-Czech team with from left to right: Michal CHYLA (Beamline manager), Martin CIMRMAN, Yoann LEVY (Scientist in charge), Gilles TAHAN, and Séverine A.E. BOYER (PI project). **B.** Vacuum chamber with the 3D-printed pendulum and a sample photography after 10 mJ / 100-20-5-1 pulsed laser irradiation.

Science & Technology Facilities Council
EUROPEAN UNION
European Structural and Investment Funds
Operational Programme Research, Development and Education
MINISTRY OF EDUCATION, YOUTH AND SPORTS
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 739573 (HiLASE CoE)
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