Master 2 Internship

Title: Study of a micro-laser for the laser ignition of hydrogen aeronautical engines

Type: Experimental and theoretical

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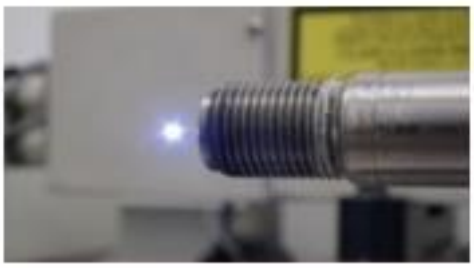
PhD funding (if any): ONERA

Project:

Aeronautical engines installed on airplanes and helicopters use kerosene as fuel. Global warming requires the design of less polluting engines using hydrogen (H2) as fuel. This change of fuel is not without consequences on engine design. Among the many problems to be solved is that of their ignition. In fact, an explosion must be avoided when the H2/air mixture is ignited, which could damage many engine parts. This is possible if ignition, induced by a spark, occurs at privileged points in the combustion chamber. These positions are not accessible to conventional electric spark plugs previously widely used in aeronautics. Recently, in collaboration with the Safran group and ONERA, we showed that plasma produced by focusing a laser pulse could meet this need. The objective of this internship is to contribute to the design, production and testing of an extremely compact laser candle dedicated to the ignition of an aeronautical engine. The source will be built around an Nd:YAG/Cr:YAG crystal pumped at 808 nm by a high-power fiber laser diode. After having modeled the operation of this system, the student will participate in the development of the source and its characterization.



Plasma (spark) induced by focusing of a laser pulse in the air.

This internship could continue as part of a doctoral thesis funded by ONERA, in particular to improve the properties of laser source and test its ability to ignite the different types of hydrogen injectors on the ONERA installations in Palaiseau. The experimental results acquired will be compared to different simulations carried out using digital codes developed by ONERA.