The laser lightning rod project

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Controlling lightning is a long time dream of mankind. Along with the rapid evolution of the laser technologies, the idea to develop lighting protection based on filamentation of high-power ultrashort lasers has recently emerged [1]. Started in 2017, the goal of the Laser Lightning Rod (LLR) project is to investigate and develop a new type of lightning protection based on the use of upward lightning discharges initiated through a high-repetition-rate multi-terawatt laser. Funded under the European research program Horizon 2020, the project is a collaboration between LOA, Université de Genève, EPFL, HES-SO, as well as laser company Trumpf Scientific Lasers, and aircraft manufacturer Airbus. The feasibility of the novel technique is based on recent research providing new insights into the mechanism responsible for the guiding of electrical discharges by laser filaments [2,3], on cutting-edge high power laser technology [4] and on the availability of the uniquely suitable Säntis lightning measurement station in Northeastern Switzerland, located at an altitude of 2 500 meter. A low-density channel created by the 1 J, 1 kHz, pulsed laser will operate by promoting the initiation of upward discharges to preemptively transfer cloud charges to the ground (see Fig. 1).

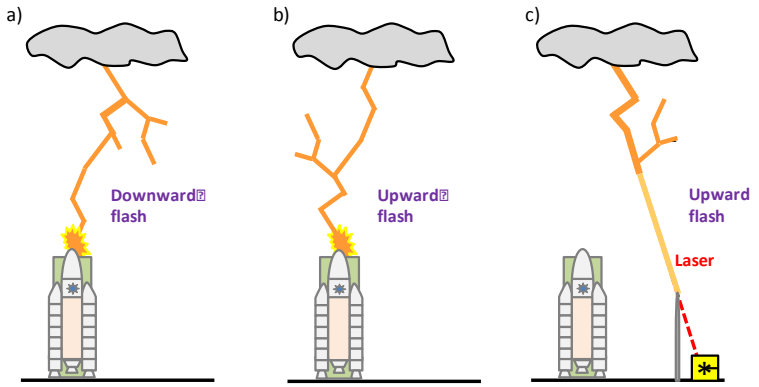

Figure 1. The laser lightning as a protective device: a) Downward lightning to victim; b) upward lightning; c) upward lightning facilitated by laser filamentation discharges the cloud and protects the potential victim.

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