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Laboratory Astrophysics Experiments At LULI Laboratory

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Laboratory astrophysics is one of the main applications of high power lasers, especially the new facilities that are building up such as NIF, LMJ and OMEGA EP. Depending on the astrophysics situation, one can simulate identical, similar or resembled experiments. At the LULI laboratory, we are developing since a few years a program on radiative shocks. Recent results obtained on the new LULI2000 facility will be presented and compared with 2D radiative simulations. In particular a radiative precursor has been observed and fully characterized (density, temperature). Radial radiative losses have been evidenced and will be discussed. Besides, plasma jets are often observed for Young Stellar Objects (YSO), during their phase of bulk contraction, bipolar outflows (jets) end as emission lobes (bow shocks). The objective of our experiments is to try to generate plasma jets and to characterize them. To this aim, we tried a new target designs in order to generate the plasma jets. The first target was made of a foam filled cone ended with a "nozzle". We did observe a jet-like structure whose time evolution was studied by varying the foam density. High Mach numbers has been measured (5-10) which are similar to some astrophysical objects. An "en-

velop" density structure of these jets have been observed which is compatible with a self-similar solution of a polytropic expansion of a fluid into vacuum. The second target consists on a V-foil, each side of it generating a hot plasma which collides on the symmetrical axis inducing also a high speed jet. Detailed experimental results will be presented and compared to preliminary 2D simulations.