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Generation and characterization of high-density gas jets from a 150 micron diameter nozzle in air[1] LUKE HAHN, KEVIN BARTAS, YAN TAY, DONGHOON KUK, KI-YONG KIM, Univ of Maryland-College Park — This work characterizes argon and nitrogen gas jets in unconventional atmospheric pressure instead of the conventional vacuum pressure, and then compares the results directly to that of the conventional technique of creating gas jet targets. A Mach-Zehnder interferometer was used to estimate the number density of the gas jet, and a Rayleigh scattering setup was used to determine if either of the techniques formed atomic clusters and if so, estimating relative quantity. The diameter of the cylindrical nozzle used for is around 150 μm with backing pressures ranging from 13 bars to 69 bars. The highest backing pressure gives us a maximum phase shift value of 9 rad, number density 4.5 10^{20} cm^{-3}. Another characteristic property of these jets is the shock diamond formation due to the flows interaction with atmospheric air particles. The highest number density for a shock diamond was ˜10^{20} cm^{-3} which does not necessarily occur at higher backing pressure. Also, the distance from the first shock diamond to the nozzle orifice does increase with increasing backing pressure, consistent with a theory. This type of high-density, thin gas jets can be used as a laser target for creating dense plasmas and producing energetic particles and X-rays in the atmospheric conditions.

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