

Abstract Submitted  
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**Plasma expansion and invasion in the shock measured by diode laser fluorescence** D.C. SCHRAM, O. GABRIEL, P. COLSTERS, P. VANKAN, R. ENGELN, Technische Universiteit Eindhoven, TECHNISCHE UNIVERSITEIT EINDHOVEN TEAM — Expansion from a remote thermal plasma source, for plasma processing, is first supersonic, with density and temperature dropping due to rarefaction and adiabatic cooling. The plasma then over-expands and forms a valley before it passes a stationary shock front, after which subsonic expansion occurs. If in the over-expanded region the plasma is rarefied it becomes possible that atoms or molecules from outside enter the valley, and gets scattered into the supersonic expansion, therewith effectively mixing gas from outside. This process of “invasion” has been analyzed in detail by LIF with a diode laser on argon 1s5 metastable, with measurements both parallel and perpendicular to the expansion. Acceleration, rarefaction and cooling in the first expansion are in agreement with predictions. In the valley two distributions are observed: the fast, cold supersonic and a slower hotter one coming from outside the barrel shock. This invasion is as strong as the original flux from the source. Also some measurements are shown on O metastable indicating invasion of O<sub>2</sub> molecules in the expansion of Ar plasma.

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