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Expansion dynamics and measurements of electron density distributions in laser-induced plasma GHANESHWAR GAUTAM, CHRISTIAN PARIGGER, University of Tennnessee at Space Institute — Laser-induced microplasma is generated in a cell containing hydrogen gas of 99.999 purity at a pressure of 1.08 10^5 Pa (810 Torr) by using Nd:YAG laser radiation at the wavelength of 1064 nm. The expansion dynamics are studied using the alpha and beta line shapes of the hydrogen Balmer series. Spatially and temporally resolved spectra are collected with a spectrometer-detector system. The recorded data are wavelength calibrated and detector-sensitivity corrected. Plasma dynamics at expansion speeds of the order of 1 to 10 km/s (Mach number 3 to 30) are of interest for early time delays after plasma generation. The Stark broadened spectral profiles of the hydrogen Balmer alpha line are used in the time delay range of 10 ns to 45 ns to determine plasma electron densities. For time delays of the order of 100 ns to 600 ns, the hydrogen Balmer beta is utilized as well to determine the electron density from the full-width at half-maximum and from the wavelength difference between the blue and red peaks. The experimental data are compared and fitted with computer simulated profiles that are available in the literature. In addition, the pure hydrogen results are compared with data obtained in laboratory air at standard ambient temperature and pressure

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