CAVITY RING-DOWN SPECTROSCOPY AS A TOOL FOR PLASMA DIAGNOSTICS

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Abstract. Cavity Ring-Down Spectroscopy (CRDS) is one of most sensitive absorption based technique for detection and diagnostics of elements in gaseous phase. It is based on measuring of photons lifetime in a resonator (decay time of oscillating photons traversing the optical cavity), not on light intensity, which allows very good stability of the system (low level of noise). When the wavelength of photons is tuned to some resonant transition of absorbing feature the photon lifetime decreases while by comparison with non-resonant lifetime one can get absorption coefficient (in cm^{-1}) as a function of wavelength – it is optical absorption spectrum in absolute units. From such spectral line-profiles, CRDS technique allows calculation of species concentrations in particular quantum state. Data analysis and experimental features allow complete 3D + temporal monitoring of sample of interest including underlying physical or chemical processes (dissociation or association of molecules, de-excitation processes, ionization, collisions) (see Labazan et al. 2003, Labazan et al. 2006 and Krstulović et al. 2006). CRDS is sensitive, versatile and robust analytical technique to study species in gaseous or plasma phase. This work briefly describes the basic principles of CRDS and summarizes our achievements related to applications for studying of atmospheric pressure plasma jets (APPJ) (see Zaplotnik et al 2015) and single and double laser produced plasmas (LPP) (see Krstulović et al. 2008, Krstulović et al. 2009). Emphasis is given to the temporal resolution and pulsed character of the plasma sources.

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