Sizing of soot aggregates by two-dimensional multi-angle light scattering (2D-MALS)

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For the understanding of soot formation in combustion processes comprehensive information about local size properties of complex soot aggregates is desired. Elastic light scattering (ELS) is a well-established optical technique which allows for the *in situ* determination of aggregate size and fractal dimension of soot particles in flames [1]. Reimann et al. [2] used a two-dimensional combination of ELS and laser-induced incandescence (LII) for the determination of various parameters of soot particles in a premixed flame from a porous flat flame burner (McKenna type). Although the general approach was successful both the measuring range in terms of aggregate size and the information obtained were limited because of the use of a fixed scattering angle of 90°.

In continuation and extension of this approach we performed two-dimensional ELS-measurements under various scattering angles thus allowing for a simultaneous acquisition of particle parameters at various heights above burner (HAB). Measurements on a premixed ethene flame from a McKenna type burner with an equivalence ratio of 2.7 were carried out by irradiating a laser-light-section and detecting the scattered light using an intensified CCD camera (cf. Fig 1). The detection angle varied equidistantly in the scattering vector q from 17° to 163°, and the evaluation of obtained data was carried out for each pixel line from 10 mm to 20 mm HAB for three different areas: the flame axis only, the area determined by the depth of field and the maximum evaluable region. The obtained radii of gyration show good agreement with former results.

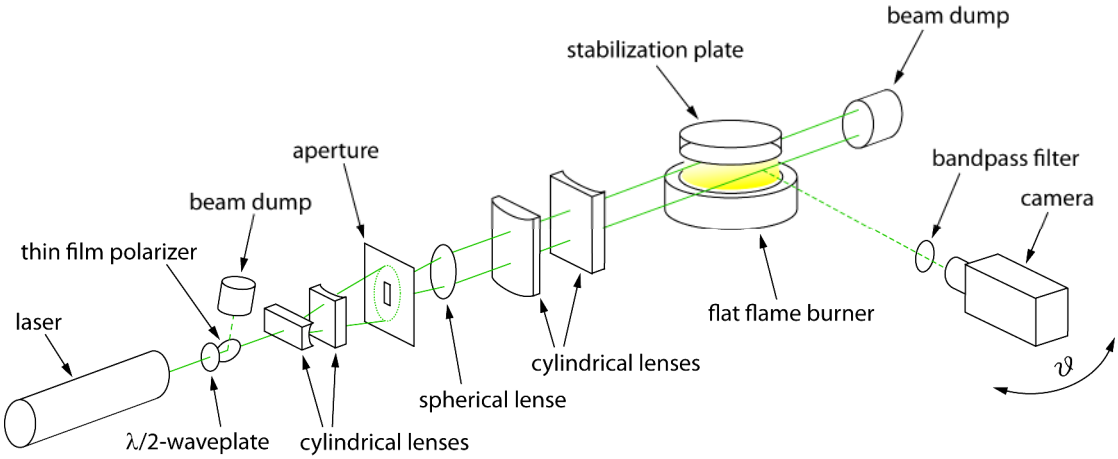

Fig. 1: *Experimental setup*

[1] C.M. Sorensen, Aerosol Sci. Technol. 35: 648-687 (2001)
[2] J. Reimann, S.-A. Kuhlmann, S. Will, Appl. Phys. B 96: 583-592 (2009)