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Laser scattering for temporal and spatial diagnostic of low temperature plasmas

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Many recent industrial and technological applications like surface etching, inorganic films deposition, polymerization of surfaces or sterilization are developed within the field of low temperature plasmas. To study, monitor and model plasma processes is of great importance to have diagnostic tools that can provide reliable information on different plasma parameters. In general, laser scattering techniques provide a direct and accurate method for plasma diagnostic with spatial and temporal resolution. Laser Thomson scattering is used for the diagnostic of electron density and temperature, two of the most important parameters in low temperature discharges. With a similar setup Rayleigh and Raman scattering techniques are used for the diagnostic of gas density and temperature. In this contribution we deal with the different technical and theoretical aspects that are required for the application of these laser scattering techniques. Of special importance are the detection limit, laser stray light rejection and laser perturbations of the plasma. The present study is performed on different low temperature microwave discharges, both at low and atmospheric pressure. The laser scattering techniques provide information on the spatial distribution of the mentioned plasma parameters over different discharge conditions, including small micro-plasmas. Similarly, the temporal evolution of pulsed plasmas is studied, unraveling the features of the switching on and off phases of the discharges.

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