# Application of Optical Diagnostics for Fuel Spray Characterization

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It is well known that fuel spray characteristics are of vital importance to the fuel economy and emissions of modern day direct-injection engines. While extensive knowledge of the dilute downstream region in fuel sprays has been acquired over the years, much less is known of the dense near-tip region. It is in this region where the early stages of spray development occur, the consequences of which govern subsequent events and ultimately impact fuel economy and emissions. This region has proved difficult to obtain quantitative measurements due to extremely high optical densities resulting in excessive scattering. Lack of experimental data has left researchers to only hypothesize the characteristics of the region. Recently, the development and application of advanced diagnostics has provided new insight into the region. In particular, x-ray absorption measurements in the near-tip region have quantified the fuel mass distribution at the nozzle exit. The findings of the work have resulted in a new understanding of the region that contradicts many previous beliefs. This presentation will discuss the application of various conventional and advanced optical diagnostics for spray characterization with special emphasis on x-ray techniques.