Abstract:
Droplet size and velocity measurements were taken under cold start conditions for a Direct Injection Spark Ignition engine to investigate the effect of transient conditions on spray development. The results show that during cold start, spray development depends primarily on fuel pressure, followed by Manifold Absolute Pressure (MAP). The spray for this single-hole, pressure-swirl fuel injector was characterized using phase doppler interferometry. The fuel spray was characterized by three different regimes. Regime 1 comprised fuel pressures from 6 - 13 bar, MAPs from 0.7 - 1 bar, and was characterized by a large pre-spray along with large drop sizes. The spray profile resembled a solid cone. Regime 2 comprised fuel pressures from 30 - 39 bar and MAPs from 0.51 - 0.54 bar. A large pre-spray and large drop sizes were still present but reduced compared to Regime 1. The spray profile was mostly solid. Regime 3 comprised fuel pressures from 65 - 102 bar and MAPs from 0.36 - 0.46 bar. The fuel spray had a fully developed hollow cone structure. The pre-spray and drop size were reduced compared to Regime 2. Decreasing MAP enlarged the spray angle for all regimes.