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PIV investigation of the intake flow in a parallel valves diesel engine cylinder[1] P. HENRIK ALFREDSSON, JEAN RABAULT[2], JULIE A. VERNET, Kungliga Tekniska Högskolan KTH, BJÖRN LINDGREN, Scania CV AB —
The flow of air (gas) inside the cylinder of internal combustion engines prior to compression may have a large influence on the combustion process. The structure of the in-cylinder flow, which can be swirl or tumble dominated, is to a large extent controlled by the design of the intake ports. In this study the admission flow generated by a parallel valves diesel engine cylinder head was investigated in a steady flow test bench through planar and stereo PIV measurements in both the swirl and tumble planes. By combining several sets of measurements a full three-dimensional, three-component reconstruction of the mean flow field was made. The flow out of the valves has a radial jet character, making the air hit the cylinder wall before flowing down along the cylinder wall. This leads to the formation of a recirculation bubble in the tumble plane. In the swirl plane complex jet dominated structures are found just below the valves giving rise to a counter-rotating vortex pair, where the strongest vortex becomes predominant giving rise to a single coherent swirling structure away from the cylinder head. Variations of the location and strength of the swirling structure may give rise to cycle-to-cycle variations and its stability was analysed by tracking the vortex centre.

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