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Comparison of PIV and CFD for a Formula 1 Racing Car Front Tire EMIN ISSAKHANIAN, KIN PONG LO, JOHN AXERIO-CILIES, CHRIS ELKINS, GIANLUCA IACCARINO, JOHN EATON, Mechanical Engineering, Stanford University — A 60 percent scale model of a complete Formula One wheel assembly including a deformable tire and brake components is being used to validate the accuracy of CFD results using a variety of simulation techniques and turbulence models. The tire is loaded to match real word deformation and contact patch conditions and is tested at a Reynolds number based on tire diameter of approximately 500,000. PIV measurements are taken around both a simplified model geometry with flat wheel covers and a complex case with full brake cooling ducts and passages. Measurements are compared to RANS, URANS, and LES calculations using parameters identical to those of the experiment. The ability of each these techniques to capture the vortex structures and separation regions of the wake is determined by the similarity of their velocity fields and turbulence values to the experimental results.

Emin Issakhanian
Mechanical Engineering, Stanford University

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