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Three-dimensional flow measurements in a tesla turbine rotor THOMAS FUCHS, CONSTANTIN SCHOSSER, RAINER HAIN, CHRISTIAN KAEHLER, Bundeswehr University Munich — Tesla turbines are fluid mechanical devices converting flow energy into rotation energy by two physical effects: friction and adhesion. The advantages of the tesla turbine are its simple and robust design, as well as its scalability, which makes it suitable for custom power supply solutions, and renewable energy applications. To this day, there is a lack of experimental data to validate theoretical studies, and CFD simulations of these turbines. This work presents a comprehensive analysis of the flow through a tesla turbine rotor gap, with a gap height of only 0.5 mm, by means of three-dimensional Particle Tracking Velocimetry (3D-PTV). For laminar flows, the experimental results match the theory very well, since the measured flow profiles show the predicted second order parabolic shape in radial direction and a fourth order behavior in circumferential direction. In addition to these laminar measurements, turbulent flows at higher mass flow rates were investigated.

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