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Nota di contenuto	Introduction -- Plasma Wall Transition Dynamics -- Laser Light Scattering as Plasma Diagnostic -- Experimental Setup on PSI-2 -- Thomson Scattering Setup -- Data Analysis and Calibration -- Steady State Plasma Results -- Plasma Turbulence Results -- Summary and Conclusion.

Turbulence in plasma surface interaction holds crucial uncertainties for its impact on material erosion in the operation of fusion reactors. In this thesis, the design, development and operation of a Thomson scattering diagnostic and its novel implementation with fast visual imaging created a versatile tool to investigate intermittently occurring plasma oscillations. Specifically, ballistic transport events in the plasma edge, constituting turbulent transport, have been targeted in this thesis. With the help of a custom photon counting algorithm, the conditional averaging technique was applied on Thomson scattering for the first time to allow spatial and pseudo-time-resolved measurements. Since plasma turbulence and the emerging transport phenomena are comparable in most magnetized devices, the diagnostic development and the results from the linear plasma device PSI-2 are useful for an implementation of similar techniques in larger fusion experiments. Furthermore, the obtained results indicate a strong enhancement of erosion with turbulent transport and thus underline the importance of dedicated experiments investigating plasma turbulence in the framework of erosion in future fusion reactors.

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