

1. Record Nr.	UNINA9910337875303321
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Titolo	The Dynamics of Electrons in Linear Plasma Devices and Its Impact on Plasma Surface Interaction // by Michael Hubeny
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2019
ISBN	3-030-12536-X
Edizione	[1st ed. 2019.]
Descrizione fisica	1 online resource (XIV, 126 p. 67 illus., 37 illus. in color.)
Collana	Springer Theses, Recognizing Outstanding Ph.D. Research, , 2190-5053
Disciplina	530.44 621.484
Soggetti	Plasma (Ionized gases) Energy systems Tribology Corrosion and anti-corrosives Coatings Surfaces (Physics) Interfaces (Physical sciences) Thin films Atoms Physics Plasma Physics Energy Systems Tribology, Corrosion and Coatings Surface and Interface Science, Thin Films Atoms and Molecules in Strong Fields, Laser Matter Interaction
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
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.

Sommario/riassunto

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.
