Physikalisches Kolloquium

Einladung

Physics Colloquium

Invitation

Monday, 08 February 2021

Format: Online via Webex, at 16:15

Understanding Turbulence in Fusion Plasmas

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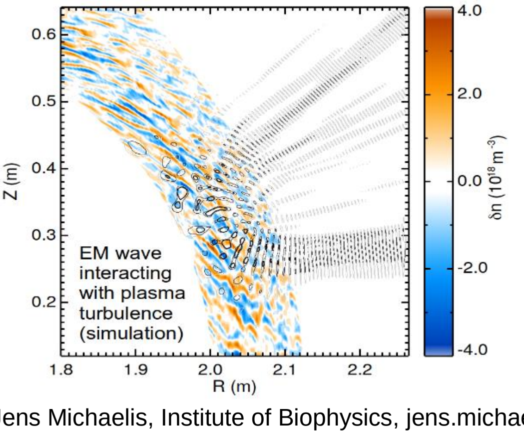
As an emission-free continuous energy source, the integration of fusion power into the future energy mix could help to stabilize the energy supply of industrialized countries during the projected ramp-down of fossil energy supply methods. Research on magnetically confined fusion plasmas has led to the design of the ITER tokamak device, which is currently being constructed in an international effort in France. ITER has the mission to demonstrate for the first time that nuclear fusion power produced inside the plasma can exceed the external power used to heat the plasma by a factor of 10.

The size and thus the economy of a fusion reactor is mainly dictated by turbulence which determines particle and energy fluxes out of the high-temperature plasma. These losses hamper the efficiency of a fusion reactor. During the last two decades, turbulence theory and simulation have advanced significantly. However, their results must be validated against the experimental observations in order to improve the confidence and reliability of predicting turbulence and therefore the efficiency of large future fusion devices.

The fundamentals of turbulence, its generation and its characterization with both measurements and simulations will be presented. Emphasis is placed on the validation of physical models and high-level turbulence codes. which has led to significant gains in understanding. Going further, intermittent turbulence behaviour coupled to large-scale modes has been observed in the high-temperature edge of the fusion plasma. The understanding of this observation has led to the possibility of predicting future device operational boundaries for this kind of edge high-temperature plasma.



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